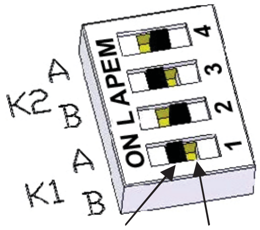
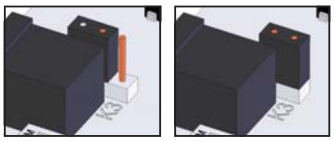
PARAMETRISIERUNGSSCHRITTE

1 Position der Steckbrücke K1, K2 und K3




K3 OFF K3 ON

- Steckbrücken Positionierung (Vor jeder Änderung, die Karte spannungsfrei machen) :

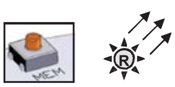
Signalgeber	Rückmeldung	Steckbrücke K1		Steckbrücke K2		Steckbrücke K3
		A	B	A	B	
0-10V	**0-10V**	ON	OFF	ON	OFF	OFF
0-10V	**0-20mA**	ON	OFF	OFF	ON	OFF
0-10V	**4-20mA**	ON	OFF	OFF	ON	ON
0-20mA	**0-10V**	OFF	ON	ON	OFF	OFF
0-20mA	**0-20mA**	OFF	ON	OFF	ON	OFF
0-20mA	**4-20mA**	OFF	ON	OFF	ON	ON
4-20mA	**0-10v**	OFF	ON	ON	OFF	OFF
4-20mA	**0-20mA**	OFF	ON	OFF	ON	OFF
4-20mA	**4-20mA**	OFF	ON	OFF	ON	ON

2 Festlegung der Drehrichtung des Absperrventils

2.1 Normale Drehrichtung (Voreingestellt)
- Auf **OPEN** drücken und die Karte einschalten, dabei den Knopf gedrückt halten.
- Die **GRÜNE LED leuchtet auf**. Den Knopf **OPEN** loslassen.
- Die Karte spannungsfrei machen.

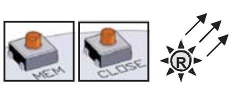
2.2 Umgekehrte Drehrichtung
- Auf **CLOSE** drücken und die Karte einschalten, dabei den Knopf gedrückt halten.
- Die **ROTE LED leuchtet auf**. Den Knopf **CLOSE** loslassen.
- Die Karte spannungsfrei machen.

3 Einstellung des Eingang Signal



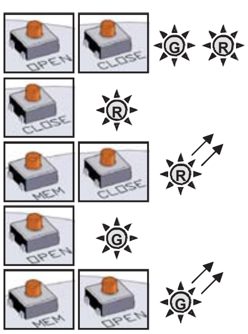
3.1 Eingang Signal bei Spannung 0-10V
- auf **MEM** drücken und die Karte einschalten, dabei den Knopf gedrückt halten.
- die **rote LED leuchtet dreimal auf**. Den Knopf loslassen.
- Die Karte spannungsfrei schalten.

3.2 Eingang Signal bei Strom 0-20mA
- auf **MEM** und **OPEN** drücken und die Karte einschalten, dabei die Knöpfe gedrückt halten.
- die **rote LED leuchtet dreimal auf**. Die Knöpfe loslassen.
- Die spannungsfrei schalten.



3.3 Eingang Signal bei Strom 4-20mA (Ab Werk voreingestellt)
- auf **MEM** und **CLOSE** drücken und die Karte einschalten, dabei die Knöpfe gedrückt halten.
- die **rote LED leuchtet dreimal auf**. Die Knöpfe loslassen.
- Die spannungsfrei schalten.

4 Lernmodus



- auf **OPEN** und **CLOSE** drücken und die Karte einschalten, dabei die Knöpfe gedrückt halten.
- Die **beiden LEDs leuchten auf**. Die Knöpfe loslassen, die **beiden LEDs erlöschen**. Der Lernmodus ist gewählt.
- auf **CLOSE** drücken, um das Absperrventil in die geschlossene Position zu bringen. **Die rote LED leuchtet auf**.
- Die geschlossene Position durch **MEM + CLOSE** speichern, die **rote LED leuchtet 2 zur Bestätigung auf**.
- auf **OPEN** drücken, um das Absperrventil in die geöffnete Position zu bringen. **Die grüne LED leuchtet auf**.
- Die geöffnete Position durch **MEM + OPEN** speichern, die **grüne LED leuchtet 2 zur Bestätigung auf**.
- Die Positionen sind gespeichert, die Karte spannungsfrei machen.

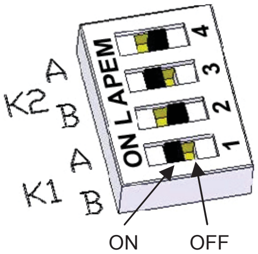
NORMALBETRIEB

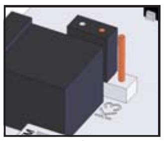
- Die Karte einschalten. Die **grüne LED leuchtet dreimal auf**, um anzuzeigen, dass der Startvorgang korrekt ausgeführt wird.
- Im Normalbetrieb leuchtet die grüne LED auf, wenn der Antrieb das Absperrventil öffnet, und die rote LED, wenn der Antrieb das Absperrventil schliesst.
- Wenn keine der beiden LEDs aufleuchtet, wird der Antrieb nicht angesteuert.

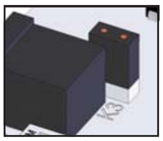
- Im zu hoch Drehmoment Fall, **leuchten die beiden LEDs an** und stoppt der Antrieb. Um der Antrieb wieder zu starten, muss man den Drehrichtung auswechseln oder die Spannung Auf/Zu Umschalten.

SECUENCIA DE REGLAJE

1 Posicionamiento de las grapas K1, K2 y K3




K3 OFF


K3 ON

- Colocar las grapas según la tabla siguiente (antes de cada modificación, Desconectar la tarjeta) :

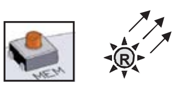
Mando	Recopia	Grapa K1		Grapa K2		grapa K3
		A	B	A	B	
0-10V	**0-10V**	ON	OFF	ON	OFF	OFF
0-10V	**0-20mA**	ON	OFF	OFF	ON	OFF
0-10V	**4-20mA**	ON	OFF	OFF	ON	ON
0-20mA	**0-10V**	OFF	ON	ON	OFF	OFF
0-20mA	**0-20mA**	OFF	ON	OFF	ON	OFF
0-20mA	**4-20mA**	OFF	ON	OFF	ON	ON
4-20mA	**0-10v**	OFF	ON	ON	OFF	OFF
4-20mA	**0-20mA**	OFF	ON	OFF	ON	OFF
4-20mA	**4-20mA**	OFF	ON	OFF	ON	ON

2 Elección de la dirección de la válvula

2.1 Dirección normal (por defecto)
- apoyar sobre **OPEN** y poner la tarjeta bajo tensión manteniendo el pulsador hundido.
- **El LED verde se enciende**. Relajar el pulsador **OPEN**.
- Desconectar la tarjeta.

2.2 Dirección inversa
- apoyar sobre **CLOSE** y poner la tarjeta bajo tensión manteniendo el pulsador hundido.
- **El LED rojo se enciende**. Relajar el pulsador **CLOSE**.
- Desconectar la tarjeta.

3 Elección del tipo de mando

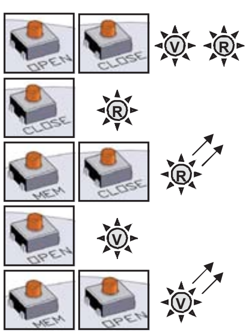


3.1 Mando bajo tensión 0-10V
- apoyar sobre **MEM** y poner la tarjeta bajo tensión manteniendo el pulsador hundido.
- **El LED rojo parpadea 3 veces**. Relajar el pulsador.
- Desconectar la tarjeta.

3.2 Mando bajo tensión 0-20mA
- apoyar sobre **MEM** y **OPEN** y poner la tarjeta bajo tensión manteniendo los pulsadores hundidos.
- **El LED rojo parpadea 3 veces**. Relajar el pulsador.
- Desconectar la tarjeta.

3.3 Mando bajo tensión 4-20mA (por defecto)
- apoyar sobre **MEM** y **CLOSE** y poner la tarjeta bajo tensión manteniendo los pulsadores hundidos.
- **El LED rojo parpadea 3 veces**. Relajar el pulsador.
- Desconectar la tarjeta.

4 Modo aprendizaje



- apoyar sobre **OPEN** y **CLOSE** y poner la tarjeta bajo tensión manteniendo los pulsadores hundidos.
- **Los 2 LED se encienden**. Relajar los pulsadores , Los 2 LED se apagan. El Modo aprendizaje es seleccionado.

- apoyar sobre **CLOSE** , Para hacer venir la válvula en posición cerrada. **El LED rojo se enciende**.
- Memorizar la posición cerrada apoyando sobre **MEM + CLOSE**, El **LED rojo parpadea 2 veces** para confirmar.

- apoyar sobre **OPEN** , Para hacer venir la válvula en posición abierta. **El LED verde se enciende**.
- Memorizar la posición abierta apoyando sobre **MEM + OPEN**, El **LED verde parpadea 2 veces** para confirmar.

- Las posiciones memorizadas, Desconectar la tarjeta.

MODO FUNCIONAMIENTO NORMAL

- Poner la tarjeta bajo tensión, El **LED verde parpadea 3 veces.**
- Durante el funcionamiento normal, el LED verde se enciende cuando el motor abre la válvula y el LED rojo cuando el motor cierre la válvula.
- Cuando los 2 LED son apagados, el motor no es solicitado.

- En caso de par demasiado importante, los **2 LED se encienden** para indicar la limitación y el actuador cesa de funcionar. Para arrancarlo de nuevo, hay que o invertir la dirección de funcionamiento, o desconectar y poner de nuevo la tarjeta bajo tensión.

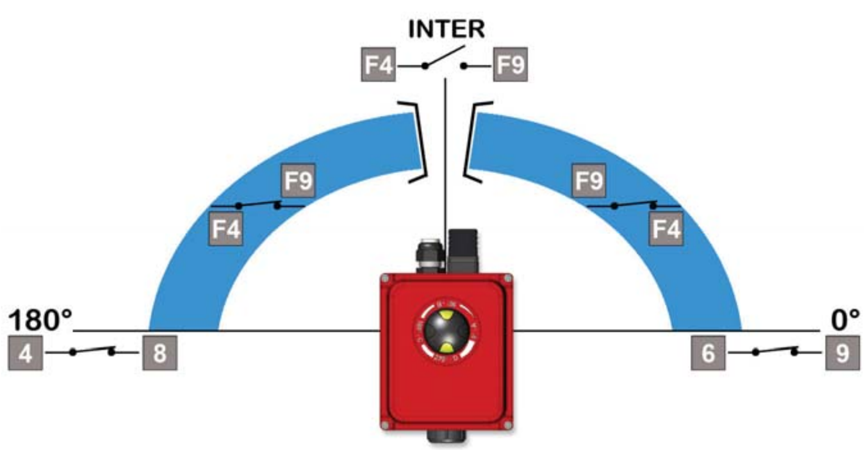
Actionneurs avec possibilité d'une troisième position
Actuator with a third position
Stellantrieb mit einer dritten Position
Actuadores con una tercera posición

L'option GF3 permet à l'actionneur d'être piloté en 3 positions. Les trois positions peuvent être comprises entre 0° et 180°. En standard les actionneurs sont réglés en usine à 0° 90° 180°, ce qui correspond à une vanne 3 voies standard. D'autres configurations sont possibles mais cela doit être précisé par le client lors de la commande.
Les 3 positions sont pilotées par 4 contacts (FCO,FCF,FCIO,FCIF) et 3 contacts de recopie (FC1,FC2,FC3)
Les contacts FC1,FC2 sont des contacts NO (fermeture du circuit en position extrême) et FC3 est un contact NF. (ouverture du circuit en position intermédiaire).

GF3 option allow actuator to be drive and stop in 3 positions.
These 3 positions could be between 0° to 180°.In standard actuators are setting in our workshop at 0° 90° 180° that's fit with standard 3 ways ball valve .
Others positions still available but customer have to price on the order witch position is request.
These 3 positions are controlled by 4 switches (FCO,FCF,FCIO and FCIF) and 3 switches for feed back signal
Switches FC1,FC2 are NO contact (close the circuit in extreme position) and FC3 is a NC contact (open the circuit in intermediate position)

Die GF3-Ausführung erlaubt dem Anwender, den Antrieb in 3 vordefinierte Stellungen zu verfahren.
Diese 3 Positionen können in einem Schwenkbereich zwischen 0° bis 180° liegen. In der Standardausführung werden sie passend zu 3-Wege-Standardventilen auf 0°, 90° und 180° voreingestellt.
Andere Voreinstellungen sind möglich und müssen im Bedarfsfall durch den Kunden im Auftrag vermerkt sein.
Das Anfahren der 3 Positionen wird durch 4 Mikroschalter (FCO,FCF,FCIO and FCIF) und die Positionsrückmeldung durch 3 weitere Mikroschalter realisiert. Die Schalter FC1 und FC2 haben "Öffner"-Funktion (schliessen den Stromkreis am jeweiligen Ende des Schwenkbereichs) und der Schalter FC3 hat "Schliesser"-Funktion (öffnet den Stromkreis in der Zwischenstellung).

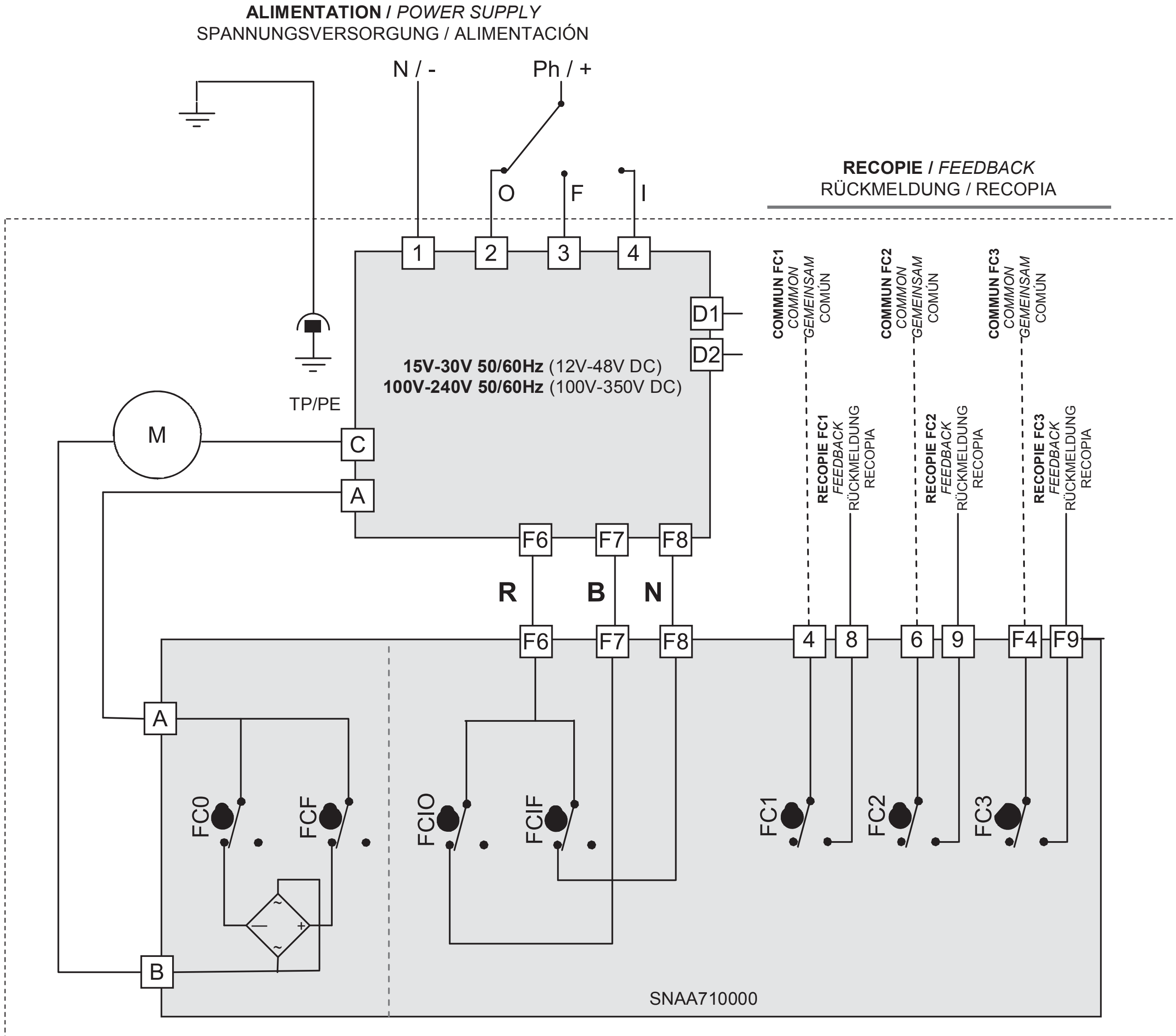
La opción GF3 permite que el actuador es pilotado en 3 posiciones. Las tres posiciones pueden ser comprendidas entre 0° y 180°. En estándar, los actuadores son reglados en fábrica a 0° 90° 180°, lo que corresponde a una válvula 3 vías estándares. Otras configuraciones son posibles pero el cliente debe precisarlo cuando hace el pedido.
Las 3 posiciones son pilotadas por 4 contactos, FCO,FCF,FCIO,FCIF, y 3 contactos de recopía, (FC1,FC2,FC3)
Los contactos FC1,FC2 son contactos normalmente abiertos (circuito cerrado en posición extrema) y FC3 es un contacto cerrado abierto (circuito abierto en posición intermediaria).



	Borne / Terminal 6 & 9	4 & 8	F4 & F9
0°	**Fermé** / Closed / Zu / Cerrado	**Ouvert** / Open / Auf / abierto	**Fermé** / Closed / Zu / Cerrado
inter	**Ouvert** / Open / Auf / abierto	**Ouvert** / Open / Auf / abierto	**Ouvert** / Open / Auf / abierto
180°	**Ouvert** / Open / Auf / abierto	**Fermé** / Closed / Zu / Cerrado	**Fermé** / Closed / Zu / Cerrado

GF3 - DESCRIPTION ET CARACTÉRISTIQUES

La température du bornier peut atteindre 90°C
The terminal temperature can reach 90°C
Die Terminal-Temperatur kann bis zu 90°C erreichen.
La temperatura del Terminal de conexión puede alcanzar 90°C



REP	DESIGNATION / BESCHREIBUNG / DESIGNACIÓN	REP	DESIGNATION / BESCHREIBUNG / DESIGNACIÓN
FCO	**Fin de course ouverture** *Open limit switch* Endschalter AUF Final de carrera apertura	FC1	**Fin de course auxiliaire 1** *Auxiliary limit switch 1* Zusätzlicher Endschalter 1 Final de carrera auxiliar 1
FCF	**Fin de course fermeture** *Close limit switch* Endschalter ZU Final de carrera cierre	FC2	**Fin de course auxiliaire 2** *Auxiliary limit switch 2* Zusätzlicher Endschalter 2 Final de carrera auxiliar 2
FCIO	**Fin de course intermédiaire ouverture** *Intermediate open limit switch* Zwischenendschalter AUF Final de carrera intermedia apertura	FC3	**Fin de course auxiliaire 3** *Auxiliary limit switch 3* Zusätzlicher Endschalter 3 Final de carrera auxiliar 3
FCIF	**Fin de course intermédiaire fermeture** *Intermediate close limit switch* Zwischenendschalter ZU Final de carrera intermedia cierre	D1/D2	**Bornier report défaut (24V DC / 3A max)** *Failure reportTerminal strip (24V DC / 3A max)* Fehlermeldung Klemmleiste (24V DC / 3A max) Terminal retorno de defecto (24V DC / 3A max)

DONNÉES TECHNIQUES

DONNEES TECHNIQUES / *TECHNICAL DATA*						
Type (actionneur électrique 1/4 tour) / Type (1/4 turn electric actuator)	ER10	ER20	ER35	ER35	ER60	ER100
Protection IP / *IP protection (EN60529)*	IP66 (étanche aux poussières, jet d'eaux « débit <12.5 L/min » dusttight, water spraying « flow <12.5 L/min »)					
Résistance à la corrosion (utilisation en intérieur et extérieur) */ Corrosion resistance (outdoor and indoor use)*	Plastique / *plastic : PA6.6 FV 25% V0 et / and Nylon* *Toutes pièces métalliques :INOX 304L ou Acier + traitement Zn* *Raw material : 304L Stainless Steel or Steel + Zn treatment*					
Température / *Temperature*	-10°C à/*to +55°C (FAILSAFE : -10°C à/to +40°C)*					
Hydrométrie / *Hydrometry*	< 81% à 31°C (88°F) avec décroissance linéaire jusqu'à 50% à 40°C(selon EN61010-1) < 81% to 31°C (88°F) with lineary decrease down to 50% at 40°C (according EN61010-1)					
Degré de pollution / *Pollution degree*	Classe 2 / *Class 2*					
Altitude / *Altitude*	0 à/*to 2000m*					
Poids / *Weight*	1 Kg			2.1 Kg		
DONNEES MECANIQUES / *MECHANICAL DATA*						
Couple nominal / *Nominal torque*	10Nm	20Nm	35Nm	35Nm	60Nm	100Nm
Temps de manœuvre 90° (ER rapide) *1/4 turn travel time (Fast ER)*	11s	11s	25s	7s	12s	23s
Temps de manœuvre 90° (ER lent) *1/4 turn travel time (slow ER)*				41s	79s	119s
Temps de manœuvre 90° (ER POSI) *1/4 turn travel time (ER POSI)*		25s		41s	79s	119s
Embase de fixation / *Mounting actuator base (ISO5211)*	Etoile/*Star 14* *F03-F04-F05*			Etoile/*Star 22* *F05-F07*		
Angle de rotation / *Swing angle*	90° (autres sur demande / *others on request)*					
Butées mécaniques / *Mechanical end stops*	90° +/- 5°					
Commande manuelle / *Manual override*	Axe sortant / *Out axle*					
Sens de rotation / *Direction of rotation*	Sens antihoraire pour ouvrir / *Anticlockwise to open*					
DONNEES ELECTRIQUES / *ELECTRICAL DATA*						
Tension / *Voltage ±10%*	15V à/to 30V AC (12V à/to 48V DC) ou/*or 100V à/to 240V AC (100V à/to 350V DC)*					
Fréquence / *Frequency*	50/60Hz					
Puissance consommée *Power consumption*	15W (0.08A) cos φ = 0.75			45W (0.15A) cos φ = 0.75		
Catégorie surtension / *Overvoltage catego-ry*	Catégorie II / *Category II*					
Limiteur de couple / *Torque limiter*	Électrique / *electric*					
Durée sous tension / *Duty cycle (CEI34)*	50%					
Tension maximale contacts fins de course / *Limit switches maximal voltage*	4V à/to 250V AC/DC (Surtension catégorie II / Overvoltage category II)					
Courant maximal contacts fins de course / *Limit switches maximal current*	10mA à/to 5A max					
Raccordement électrique */ Electrical wiring*	1 Presse étoupe ISO M20 / *1 ISO M20 gland* *1 connecteur 3P+T DIN43650 / 1 DIN43650 3P+T connector*					
Courrant de démarrage *Inrush current*	35A					

TECHNISCHEN DATEN / DATOS TECNICOS						
Typ (90° elektrisches Stellantrieb) / Tipo (actuador eléctrico 1/4 vuelta)	ER10	ER20	ER35	ER35	ER60	ER100
IP Schutzart / Protección IP (EN60529)	IP66 (Staub schutzt, Spritz wasserdicht « Durchfluss <12.5 L/min » / Estanco a los polvos, chorros de agua « caudal <12.5 L/min »)					
Rostschutz (Innen und Außeneinsatz) Resistencia a la corrosión (utilización Interior y exterior)	Plastik / plástico : PA6.6 FV 25% und / y Nylon Alle Metall Teile :INOX 304L oder Stahlguss + Härtung Zn Todas las piezas metálicas : inox 304 o acero + tratamiento Zn					
Temperatur / Temperatura	-10°C bis/hasta *+55°C (FAILSAFE: -10°C bis/hasta +40°C)*					
Hydrometrie / Hidrometría	< 81% a 31°C (88°F) con un decrecimiento lineal hasta 50% a 40°C(según EN61010-1) < 81% bis 31°C (88°F) mit linearer Abnahme bis zu 50% bei 40°C (gemäß EN61010-1)					
Verschmutzungsgrad / Grado de polución	Klasse 2 / *Class 2*					
Höhe / Altitud	0 bis/hasta *2000m*					
Gewicht / Peso	1 Kg			2.1 Kg		
MECHANISCHE DATEN / DATOS MECÁNICOS						
Drehmoment / Par nominal	10Nm	20Nm	35Nm	35Nm	60Nm	100Nm
Stellzeit (Standard) / Tiempo de maniobra 1/4 (ER rápido)	11s	11s	25s	7s	12s	23s
Stellzeit (langsam) / Tiempo de maniobra 1/4 (ER lento)				41s	79s	119s
Stellzeit () / Tiempo de maniobra 1/4 (ER POSI)		25s		41s	79s	119s
Befestigungssockel / Platina de fijación (ISO5211)	Stern/*Estrella 14* *F03-F04-F05*			Stern/*Estrella 22* *F05-F07*		
Drehwinkel / Ángulo de rotación	90° (andere auf Anfrage / *otros bajo demanda)*					
Mechanische Endlagenbegrenzung / Topes mecánicos	90° +/- 5°					
Handbetätigung / Mando manual	Rusgehende Achse / *eje saliente*					
Drehrichtung / Dirección de rotación	Gegen uhr Richtung zu öffnen / *Dirección anti-horario para abrir*					
ELEKTRISCHE TEILEN / DATOS ELÉCTRICOS						
Spannung / *Voltaje ±10%*	15V bis/hasta 30V AC (12V bis/hasta 48V DC) oder/*o 100V bis/hasta 240V AC (100V bis/hasta 350V DC)*					
Frequenz / Frecuencia	50/60Hz					
Gesamte Leistungsaufnahme / Potencia consumida	15W (0.08A) cos φ = 0.75			45W (0.15A) cos φ = 0.75		
Überspannungskategorie / Categoría sobretensión	Kategorie II / *Categoría II*					
Drehmoment Begrenzer / Limitador de par	Elektrisch / *Eléctrico*					
Einschalt-Dauer / Tiempo bajo tensión (CEI34)	50%					
Maximale Spannung der elektrischen Endschalter / Tensión máxima contactos finales de carrera	4V *bis/hasta 250V AC/DC* (Überspannung kategorie II / categoría sobretensión II)					
Maximaler Strom der elektrischen Endschalter / Intensidad máxima contactos finales de carrera	10mA *bis/hasta 5A max*					
Elektrischer Anschluss / Conexión eléctrica	1 Kabel Verschraubung ISO M20 / prensaestopas *1 ISO M20* *1 Konnektor 3P+T DIN43650 / 1 DIN43650 3P+T conectador*					
Einschaltstromspitze Corriente de arranque	35A					

ACTIONNEUR ÉLECTRIQUE
ELECTRIC ACTUATOR
ELEKTRISCHE STELLANTRIEBE
ACTUADOR ELÉCTRICO

PLUS

DSBA3200 rév.20/12/2010

MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

CHEMLINE

SERIES PA, PNEUMATIC ACTUATOR

LEFT BLANK

CHEMLINE Plastics Limited

55 Guardsman Road
Thornhill, Ontario
L3T 6L2
Canada
Tel: 905-889-7890
Fax: 905-889-8553

Your Pipeline To Quality Valves, Strainers, Flowmeters and Controls

INSTALLATION AND MAINTENANCE INSTRUCTIONS
For Chemline P-Series Pneumatic Actuators

General:

The P series actuator is a double-opposed piston, double rack and pinion, quarter-turn operator.

The body and end caps are Polyamide plastic in the PP-Series, Rilsan-coated Aluminum in the PA and PG-Series, 316 stainless steel in the P3-Series and Xylan-coated Aluminum in the PH-Series.

This style of actuator has two opposed pistons with racks engaging with a single pinion on actuator shaft. Racks and pinion engage with massive teeth over the full length of the pinion, resulting in balanced forces with minimal backlash. The lower air port opens the actuator in a counter-clockwise direction and the upper port closes the actuator in a clockwise direction, looking from the top of the actuator.

Operating medium requirement:

1. The condition and quality of the compressed air supply to an actuator will affect the efficiency and the life of the seals, bearings and actuator in general. Actuators are to be used with clean, dry air, gas or non-aggressive fluids for satisfactory operation, although lubricated air is acceptable and fluids must be compatible with actuator internals and contain no suspended particles. Natural gas can also be used with the Rilsan-coated aluminum models.

2. We recommend installing a shutoff valve ahead of the actuator to allow the removal of the specific valve and actuator.

3. If air lubricators are used, the lubricant selected must be compatible with Nylon 66 (also known as Polyamide) and Nitrile (also known as Buna –N).

4. Factory assembled units are sized for operating air pressures of 60 psi minimum to 120 psi maximum If lower air supply pressures are available, actuator/valve combination has to be resized.

5. Actuator operating environment temperature limits are –32°C to 90°C (–32°C to265°C for the PH-Series).

Maintenance & Installation Instructions P Series Actuators cont.

Installation:

1. Unpowered actuators are in their "normal" state and are mounted onto valves placed in their fail-safe state, resulting in "Normally-Closed" or "Normally-Open" assemblies. The flats and the ISO slot on the top output shaft, as well as the indicator knob, should be aligned or modified to indicate the valve position.

2. Remove the valve handle according to that valve's maintenance manual.

3. On old-style multi-port valves, install the interference-fit saddle on/around the neck of the valve, tighten the set-screws, drop/tap the coupling into the hole in the saddle and onto the valve shaft, then mount the actuator with appropriate nuts/bolts/washers.

4. On Type-21/23 ball valves and Type-56/57 butterfly valves, center the mounting bracket on the ISO mounting pad, secure with nuts/bolts/washers, drop/tap the coupling onto the valve shaft and mount the actuator as above.

5. Test the actuator for alignment by cycling to the fully open and fully closed positions. Loosen mounting nuts and adjust if necessary, then retighten the nuts and retest for positioning. All nuts/bolts should be snug (hand-tight) but not excessively over-tightened.

6. If the mounted valve is installed other than straight up (actuator on top), the actuator should be supported separately in order to prevent side-loading, loosening of fasteners and increased pressure on the valve stem.

Maintenance:

'P' Series double rack and pinion actuators do not need any preventive maintenance. However, we recommend that you stock the spare parts listed below. Specify actuator model# and drawing part# or description when ordering. Refer to **ASSEMBLY DRAWING PPNA rev 0**. and proceed as follows:

(1) One set of piston O-rings (7)
(2) One set of end cap O-rings (6)
(3) One set of output shaft O-rings (8 & 9)
(4) Retaining ring shaft (10)
(5) Flat Washer (11)

Maintenance & Installation Instructions P Series Actuators cont.

IMPORTANT - **Extreme care should be taken when disassembling end caps on spring return models as they are under tension.**

1. Isolate actuator from electrical power supply and compressed air supply. Remove from line.

2. Sandwich actuator lengthwise through end caps (2) in a hydraulic press or large vise. Remove end cap retaining ring (13) and gradually release hydraulic pressure, or open vise until springs are fully released.

3. To replace piston O-rings (7) and end cap O-rings (6), remove end cap (2), spring(s) (12) and O-rings (6 & 7).

4. To replace output shaft O-rings (8 & 9), retaining ring shaft (10) and flat washers (11), remove position indicator (14), lift up and replace retaining ring (10) and flat washer (11).

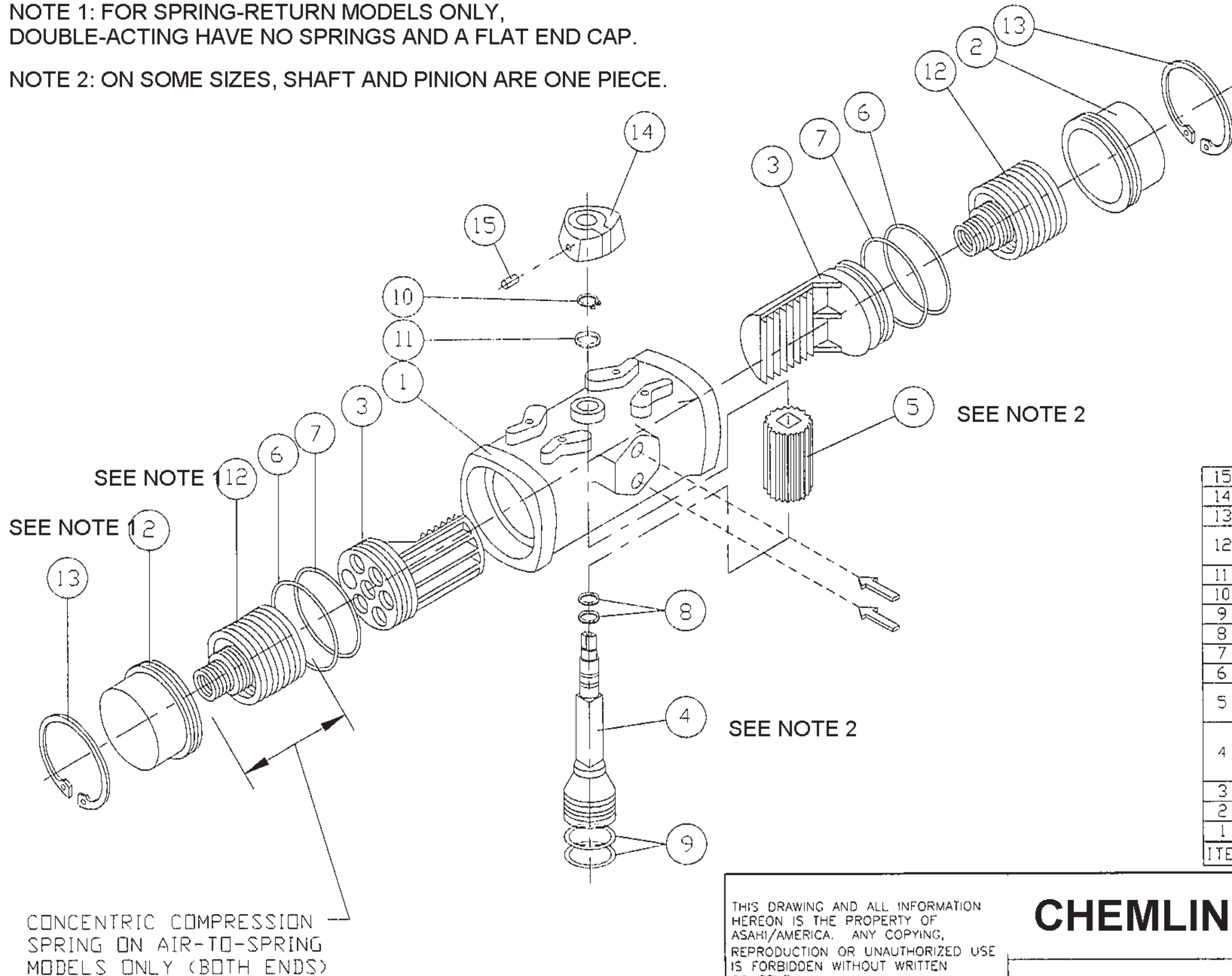
5. Pull down shaft (4) and/or pinion (5), remove and replace shaft top O-rings (8) and shaft bottom O-rings (9).

6. To reassemble, reinstall the shaft (4) and/or pinion (5), washer (11) and retaining ring (10). Sit the actuator on a benchtop with the air port/solenoid mounting pad side of the actuator body (1) facing you while the slotted top part of the shaft (4) is pointing up. Slide the pistons (3) into the body from either end so that the teeth on the left-hand piston face you while the teeth on the right-hand piston face away from you. Ensure that both sets of piston teeth face and engage the pinion/shaft, then turn the shaft clockwise, as seen from the top, to pull the pistons into the body. Confirm that both pistons bottom out against the shaft properly by checking that the slot on top of the actuator shaft is pointing end-to-end when the shaft can turn no further and by comparing the distance from both piston faces to the ends of the body. If pistons are not engaged identically, turn shaft counterclockwise to push out pistons and hold one or both pistons to skip pinion teeth, if applicable, and repeat until both pistons bottom out at the same time. This bottoming out simulates the 90-degree rotation that occurs when air is applied to the actuator. Proceed with spring installation, if applicable, then reverse steps 2, 3 and 4.

Periodic checks should be performed to ensure tightness of all fittings.

NOTE 1: FOR SPRING-RETURN MODELS ONLY,
DOUBLE-ACTING HAVE NO SPRINGS AND A FLAT END CAP.

NOTE 2: ON SOME SIZES, SHAFT AND PINION ARE ONE PIECE.



ITEM	DESCRIPTION	QTY
15	SET SCREW	1
14	POSITION INDICATOR	1
13	RETAINING RING (END CAP)	2
12	SPRING SET	1
11	FLAT WASHER	1
10	RETAINING RING (SHAFT)	1
9	O-RING (SHAFT BOTTOM)	2
8	O-RING (SHAFT TOP)	2
7	O-RING (PISTON)	2
6	O-RING (END CAP)	2
5	PINION	1
4	SHAFT	1
3	PISTON (WITH RACK)	2
2	END CAP	2
1	ACTUATOR BODY	1

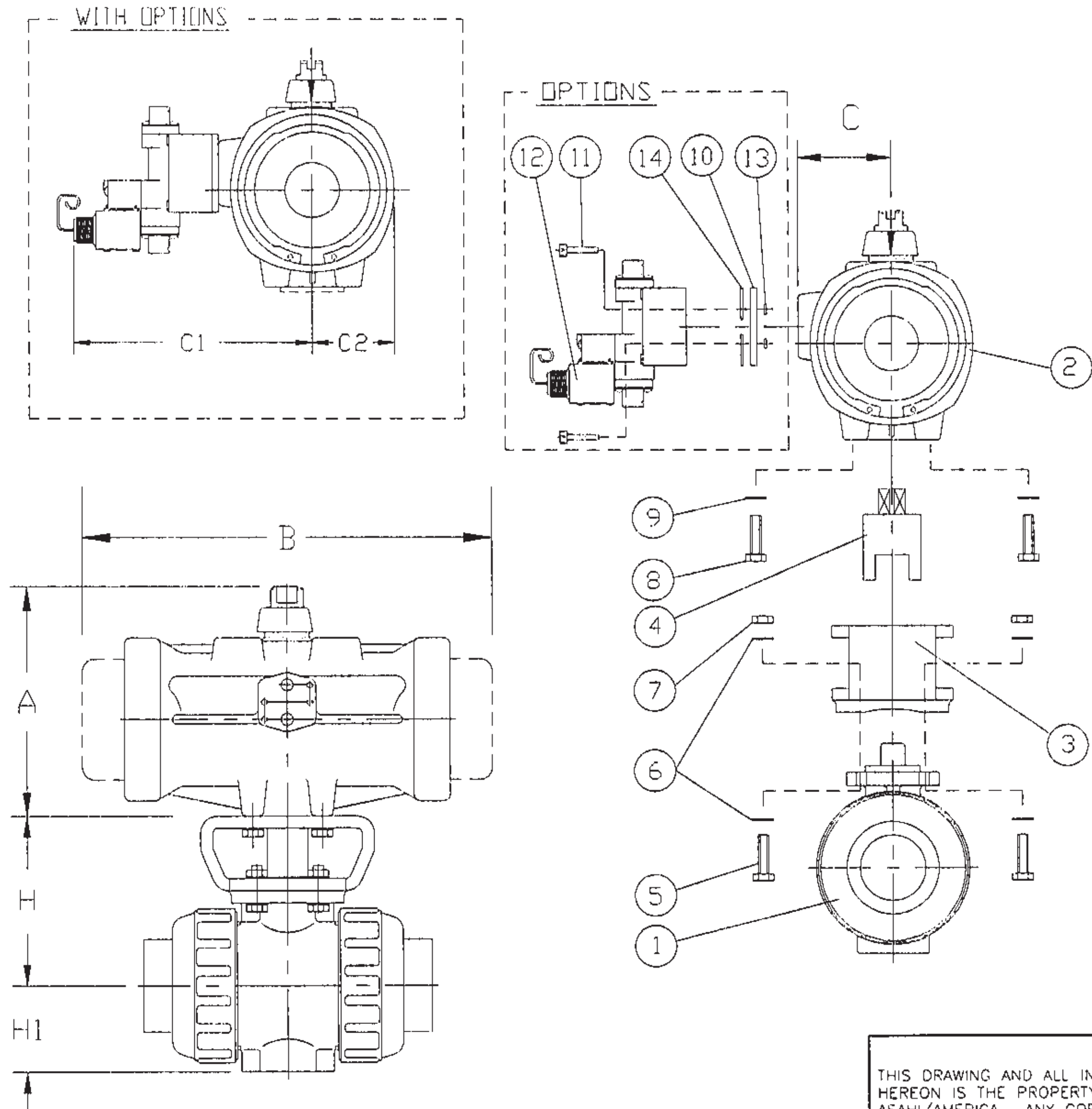
CHEMLINE PLASTICS

P-SERIES ACTUATOR EXPLODED VIEW

	NAME	DATE
DR	KENICHI MIYAZAKI	9/4/01
APPD	DAVE HURLEY	9/4/01
PROD	LEO LESTER	9/4/01
WO#/CO#		
FILE		

SIZE	DWG. NO.	REV
A	1233	A

SCALE NTS SHEET 1 OF 1



UNIT: INCH

VALVE SIZE	A		B		C		C1		C2	
	A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S
1/2"	3.34	3.34	4.22	5.55	1.47	1.47	5.41	5.41	1.21	1.21
3/4"	3.34	3.34	4.22	5.55	1.47	1.47	5.41	5.41	1.21	1.21
1"	3.34	3.34	4.22	5.55	1.47	1.47	5.41	5.41	1.21	1.21
1-1/4"	3.34	3.34	4.22	5.55	1.47	1.47	5.41	5.41	1.21	1.21
1-1/2"	3.34	4.40	4.22	5.86	1.47	1.73	5.41	5.66	1.21	1.41
2"	3.34	5.00	4.22	7.64	1.47	1.97	5.41	5.89	1.21	1.85

ITEM	DESCRIPTION	MATERIAL	QTY
14	GASKET (OPTIONS)	NBR	2
13	O-RING (OPTIONS)	NBR	2
12	SOLENOID (ASCO) (OPTIONS)	ZYTEL	1
11	SCREW SOC HD (OPTIONS)	300SS	1
10	MOUNTING PLATE (OPTIONS)	ZYTEL	1
9	FLAT WASHER (M6.0)	STAINLESS STEEL	4
8	BOLT (FOR A79 (PW) USE M5.0x.8-16LG) (FOR B79 (PO) USE M6.0x1-16LG) (FOR C79 (PI) USE M8.0x1.25-16LG)	STAINLESS STEEL	4
7	NUT (FOR 1/2" THRU 1-1/4" : M5.0x.8) (FOR 1/2" THRU 1-1/4" : M6.0x1)	STAINLESS STEEL	4
6	FLAT WASHER (FOR 1/2" THRU 1-1/4" : M5.0) (FOR 1/2" THRU 1-1/4" : M6.0)	STAINLESS STEEL	8
5	BOLT (FOR 1/2" THRU 1-1/4" : M5.0x.8-16LG) (FOR 1/2" THRU 1-1/4" : M6.0x1-20LG)	STAINLESS STEEL	4
4	COUPLING	STAINLESS STEEL 303	1
3	MOUNTING BRACKET	PPG	1
2	ACTUATOR	☐ GLASS FILLED POLYAMIDE ☐ STAINLESS STEEL (OPTION) ☐ RILSAN COATED CAST ALUMINUM (OPTION)	1
1	BALL VALVE TYPE 21	PVC,CPVC,PP,PVDF	1

UNIT: INCH

VALVE SIZE	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
H	2.76	3.01	3.29	3.64	3.98	4.43
H1	1.14	1.38	1.54	1.85	2.17	2.60

NOTE. The shape and appearance of assembly differ a little with nominal size compared to this drawing.

	NAME	DATE
DR	KENICHI MIYAZAKI	8/14/01
APPD	DAVE HURLEY	8/14/01
PROD	LEO LESTER	8/14/01

WO#/CO#

FILE

CHEMLINE PLASTICS

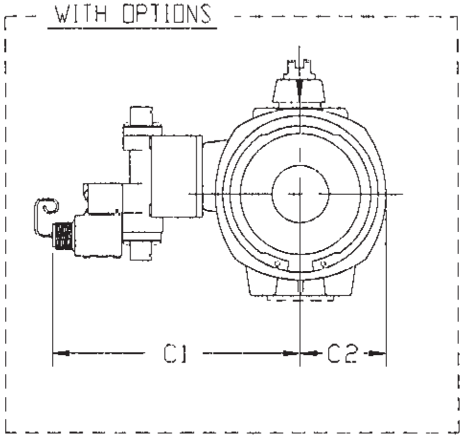
BALL VALVE TYPE21
PNEUMATIC ACT.
1/2" THRU 2"

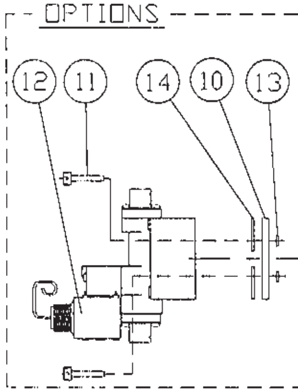
SIZE A | DWG. NO. 0114BV | REV A

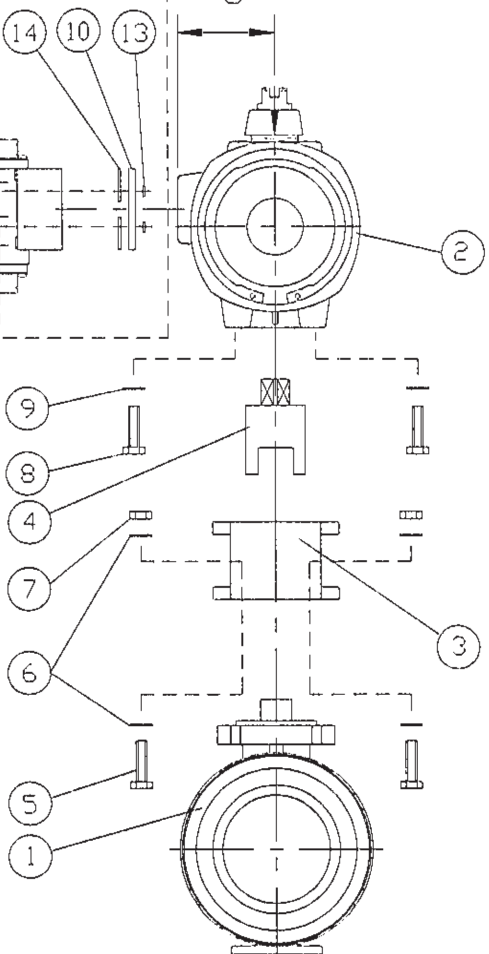
SCALE NTS | SHEET 1 OF 1

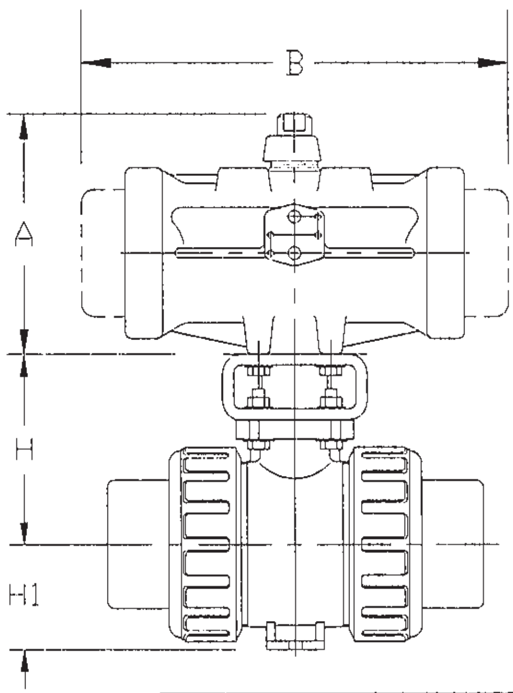
UNIT: INCH

VALVE SIZE	A		B		C		C1		C2	
	A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S
2-1/2"	5.00	5.00	7.00	8.74	1.97	1.97	5.89	5.89	1.85	1.85
3"	5.00	6.49	7.00	11.49	1.97	2.56	5.89	6.48	1.85	2.36
4"	6.49	6.49	9.21	11.49	2.56	2.56	6.48	6.48	2.36	2.36









ITEM	DESCRIPTION	MATERIAL	QTY
14	GASKET (OPTIONS)	NBR	2
13	O-RING (OPTIONS)	NBR	2
12	SOLENOID (ASCO) (OPTIONS)	ZYTEL	1
11	SCREW SOC HD (OPTIONS)	300SS	1
10	MOUNTING PLATE (OPTIONS)	ZYTEL	1
9	FLAT WASHER (M6.0)	STAINLESS STEEL	4
8	BOLT (FOR A79 (PW) USE M5.0x.8-16LG) (FOR B79 (PO) USE M6.0x1-16LG) (FOR C79 (P1) USE M8.0x1.25-16LG)	STAINLESS STEEL	4
7	NUT (FOR 2-1/2" AND 3" : M8.0x1.25) (FOR 4" : M10.0x1.50)	STAINLESS STEEL	4
6	FLAT WASHER (FOR 2-1/2" AND 3" : M8.0) (FOR 4" : M10.0)	STAINLESS STEEL	8
5	BOLT (FOR 2-1/2" AND 3" : M8.0x1.25-35LG) (FOR 4" : M10.0x1.50-40LG)	STAINLESS STEEL	4
4	COUPLING	STAINLESS STEEL 303	1
3	MOUNTING BRACKET	PPG	1
2	ACTUATOR	☐ GLASS FILLED POLYAMIDE ☐ STAINLESS STEEL (OPTION) ☐ RILSAN COATED CAST ALUMINUM (OPTION)	1
1	BALL VALVE TYPE 21	PVC,CPVC,PP,PVDF	1

UNIT: INCH

VALVE SIZE	2-1/2"	3"	4"
H	5.12	5.47	6.97
H1	2.83	3.35	4.33

NOTE. The shape and appearance of assembly differ a little with nominal size compared to this drawing.

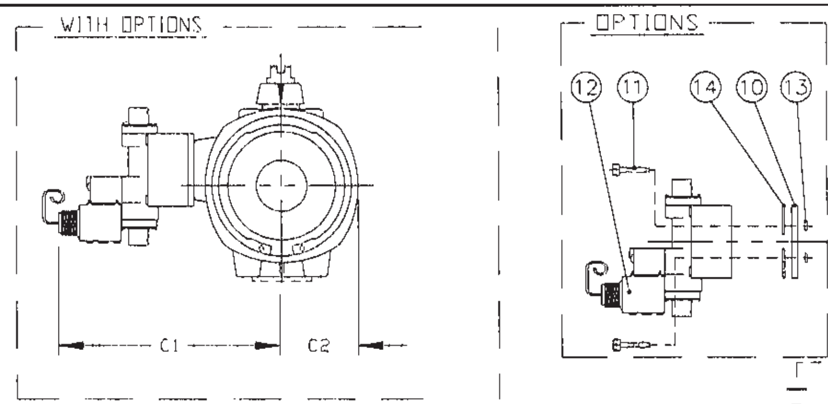
	NAME	DATE
DR	KENICHI MIYAZAKI	8/14/01
APPD	DAVE HURLEY	8/14/01
PROD	LEO LESTER	8/14/01
WO#/CO#		
FILE		

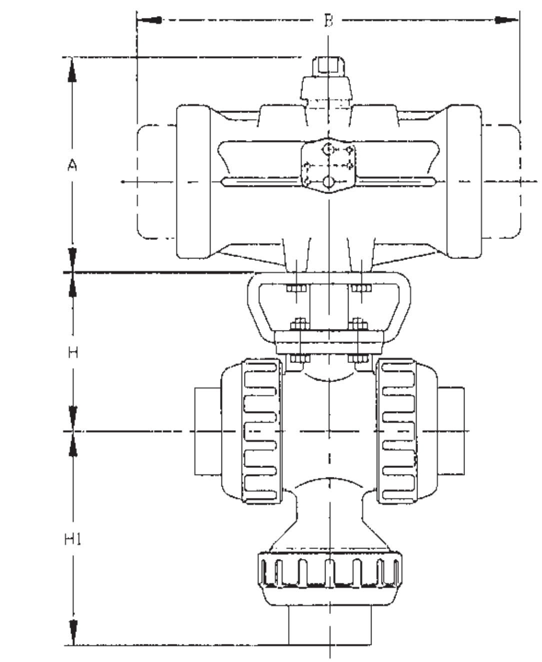
CHEMLINE PLASTICS

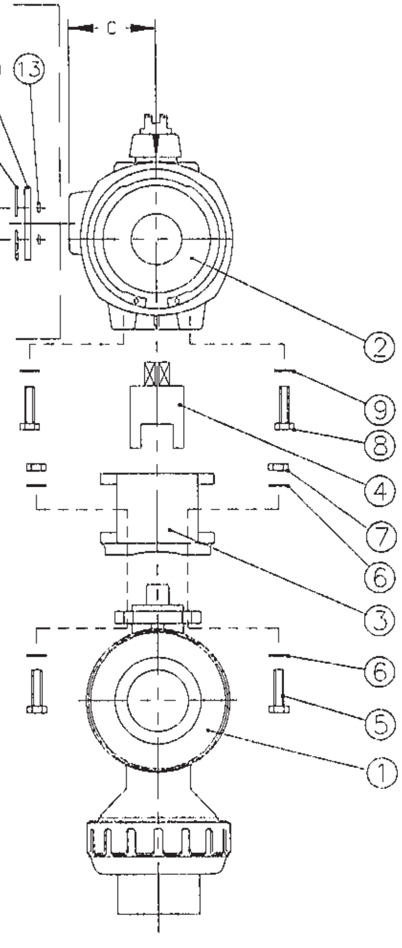
BALL VALVE TYPE21
PNEUMATIC ACT.
2-1/2" THRU 4"

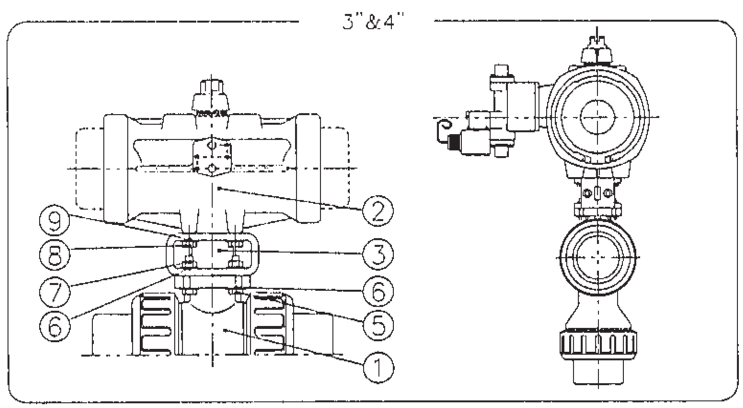
SIZE A | DWG. NO. 0115BV | REV A

SCALE NTS | SHEET 1 OF 1









DIMENSIONS TABLE

UNIT: inch

VALVE SIZE	A		B		C		C1		C2	
	A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S
1/2"	3.34	3.34	4.22	5.55	1.47	1.47	5.41	5.41	1.21	1.21
3/4"	3.34	3.34	4.22	5.55	1.47	1.47	5.41	5.41	1.21	1.21
1"	3.34	3.34	4.22	5.55	1.47	1.47	5.41	5.41	1.21	1.21
1-1/2"	3.34	4.40	4.22	5.86	1.47	1.73	5.41	5.66	1.21	1.41
2"	3.34	5.00	4.22	7.64	1.47	1.97	5.41	5.89	1.21	1.85
3"	5.00	6.49	7.00	11.49	1.97	2.56	5.89	6.48	1.85	2.36
4"	6.49	6.49	9.21	11.49	2.56	2.56	6.48	6.48	2.36	2.36

NOMINAL SIZE		H	FLANGED		THREADED		SOCKET						SPIGOT (BUTT END)	
							PVC,CPVC		PP,PVDF (DIN)		PP,PVDF (IPS)			
			H1	L	H1	L	H1	L	H1	L	H1	L	H1	L
½"	15mm	2.76	3.70	5.63	2.89	4.02	3.08	4.45	2.80	3.90	3.09	4.45	3.27	4.88
¾	20	3.01	4.50	6.77	3.48	4.72	3.56	5.08	3.27	4.49	3.61	5.08	3.90	5.67
1	25	3.29	5.24	7.36	4.13	5.16	4.32	5.75	3.94	4.84	4.37	5.75	4.53	6.06
1½	40	3.98	6.50	8.35	5.53	6.42	5.71	7.24	5.16	5.83	5.85	7.24	6.02	6.85
2	50	4.43	7.34	9.21	6.61	7.76	6.66	8.23	6.06	6.93	6.76	8.23	7.01	8.82
3	80	5.47	10.06	11.97	9.25	10.39	9.59	11.10	8.82	9.88	11.10	11.10	9.69	11.61
4	100	6.97	12.01	14.65	11.77	14.17	11.58	13.90	10.98	12.20	14.37	14.37	11.85	12.72

ITEM	DESCRIPTION	MATERIAL	QTY
14	GASKET (OPTIONS)	NBR	2
13	O-RING (OPTIONS)	NBR	2
12	SOLENOID (ASCO) (OPTIONS)	ZYTEL	1
11	SCREW SOC HD (OPTIONS)	STAINLESS STEEL	1
10	MOUNTING PLATE (OPTIONS)	ZYTEL	1
9	FLAT WASHER (M6.0)	STAINLESS STEEL	4
8	BOLT (FOR A79 (PW) USE M5.0x.8-16LG) (FOR B79 (PO) USE M6.0x1-16LG) (FOR C79 (PI) USE M8.0x1.25-16LG)	STAINLESS STEEL	4
7	NUT (FOR 1/2" THRU 1-1/4" : M5.0x.8) (FOR 1-1/2" THRU 2" : M6.0x1) (FOR 3" : M8.0x1.25) (FOR 4" : M10.0x1.50)	STAINLESS STEEL	4
6	FLAT WASHER (FOR 1/2" THRU 1-1/4" : M5.0) (FOR 1-1/2" THRU 2" : M6.0) (FOR 3" : M8.0) (FOR 4" : M10.0)	STAINLESS STEEL	8
5	BOLT (FOR 1/2" THRU 1" : M5.0x.8-16LG) (FOR 1-1/2" THRU 2" : M6.0x1-20LG) (FOR 3" : M8.0x1.25-35LG) (FOR 4" : M10.0x1.50-40LG)	STAINLESS STEEL	4
4	COUPLING	STAINLESS STEEL 303	1
3	MOUNTING BRACKET	PPG	1
2	ACTUATOR	☐ GLASS FILLED POLYAMIDE ☐ STAINLESS STEEL (OPTION) ☐ RILSAN COATED CAST ALUMINUM (OPTION)	1
1	MULTIPORT BALL VALVE TYPE23	PVC,CPVC,PP,PVDF	1

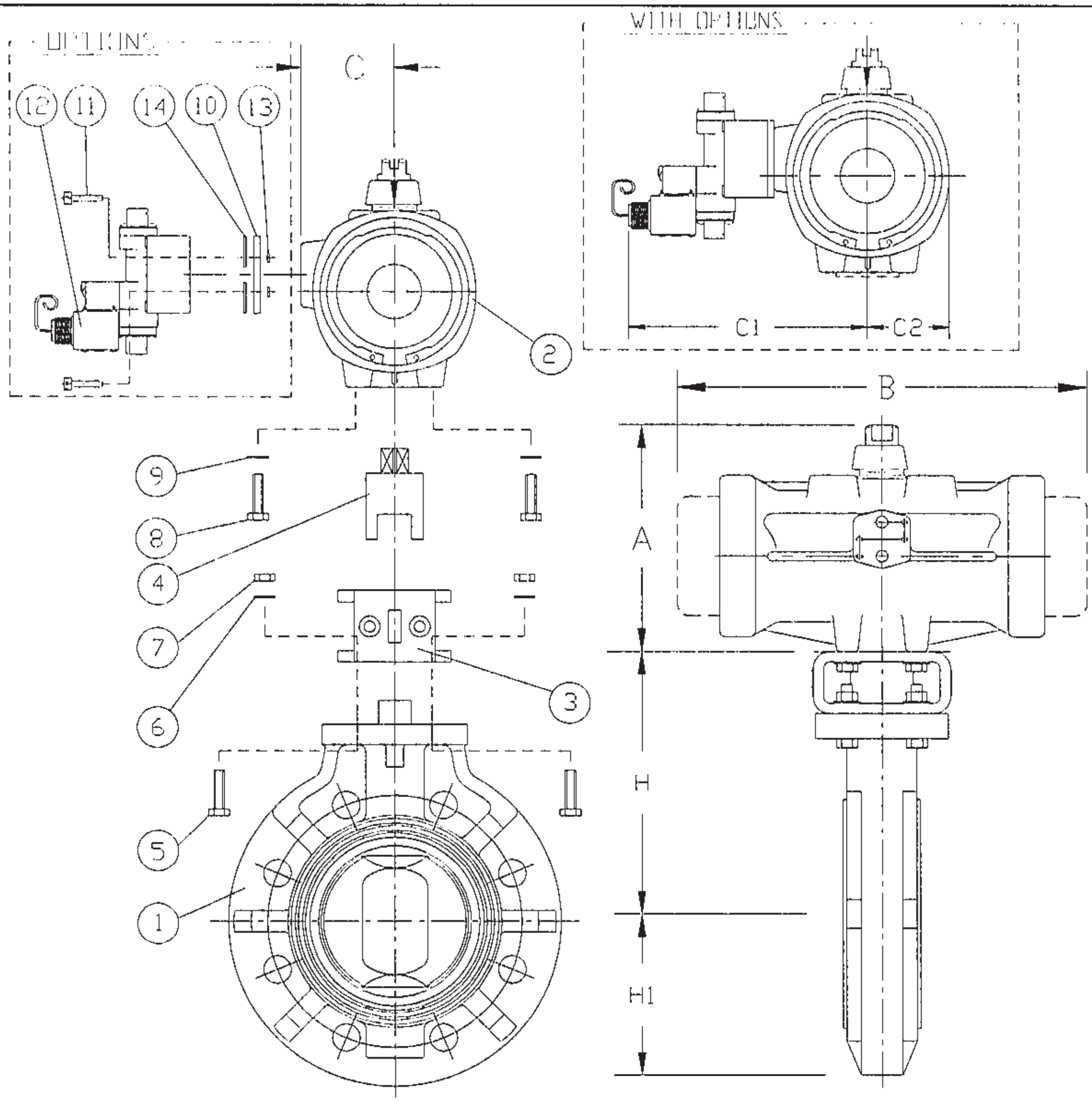
NOTE: 1) THE SHAPE AND APPEARANCE OF ASSEMBLY DIFFER A LITTLE WITH NOMINAL SIZE COMPARED TO THIS DRAWING.
2) FOR DETAILED VALVE DIMENSIONS, REFER TO DWG. NO. 0126BV, 0127BV, 0128BV.
L-PORT : DWG. NO. 0126BV
DOUBLE L-PORT : DWG NO. 0127BV
CROSS PORT . DWG NO 0128BV

	NAME	DATE
DR	KENICHI MIYAZAKI	1/28/03
APPD	DAVE HURLEY	1/28/03
PROD	LEO LESTER	1/28/03
WO#/CO#		
FILE		

CHEMLINE PLASTICS

TYPE 23 MULTIPORT BALL VALVE 1/2" TO 4" WITH PNEUMATIC ACTUATOR

SIZE	DWG. NO.	REV
A	0139BV	A
SCALE NTS	SHEET 1 OF 1	



UNIT: INCH

VALVE SIZE	A A-A	A A-S	B A-A	B A-S	C A-A	C A-S	C1 A-A	C1 A-S	C2 A-A	C2 A-S
1-1/2"	4.40	5.00	4.92	8.74	1.73	1.73	5.66	5.89	1.41	1.85
2"	4.40	5.00	4.92	8.74	1.73	1.73	5.66	5.89	1.41	1.85
2-1/2"	4.40	5.00	4.92	8.74	1.73	1.73	5.66	5.89	1.41	1.85
3"	5.00	6.49	7.00	11.50	1.96	1.96	5.89	6.48	1.85	2.36
4"	5.00	6.49	7.00	11.50	1.96	1.96	5.89	6.48	1.85	2.36
5"	5.00	8.54	7.00	17.04	1.96	1.96	5.89	7.47	1.85	3.23
6"	6.49	8.54	9.21	17.04	2.55	2.55	6.48	7.47	2.36	3.23

ITEM	DESCRIPTION	MATERIAL	QTY
14	GASKET (OPTIONS)	NBR	2
13	O-RING (OPTIONS)	NBR	2
12	SOLENOID (ASCO) (OPTIONS)	ZYTEL	1
11	SCREW SOC HD (OPTIONS)	STAINLESS STEEL 303	1
10	MOUNTING PLATE (OPTIONS)	ZYTEL	1
9	FLAT WASHER (FOR BP79 : M6.0) (FOR CP79 AND DP79 : M8.0) (FOR E79 : M10.0)	STAINLESS STEEL	4
8	BOLT (FOR BP79 : M6.0x1.00-16LG) (FOR CP79 AND DP79 : M8.0x1.25-16LG) (FOR E79 : M10.0x1.50-20LG)	STAINLESS STEEL	4
7	NUT (FOR 1-1/2" THRU. 4" : M8.0x1.25) (FOR 6" : M10.0x1.50)	STAINLESS STEEL	4
6	FLAT WASHER (FOR 1-1/2" THRU. 4" : M8.0) (FOR 6" : M10.0)	STAINLESS STEEL	8
5	BOLT (FOR 1-1/2" THRU. 4" : M8.0x1.25-35LG) (FOR 6" : M10.0x1.50-40LG)	STAINLESS STEEL	4
4	COUPLING	STAINLESS STEEL 303	1
3	MOUNTING BRACKET	PPG	1
2	ACTUATOR	☐ GLASS FILLED POLYAMIDE ☐ STAINLESS STEEL (OPTION) ☐ RILSAN COATED CAST ALUMINUM (OPTION)	1
1	BUTTERFLY VALVE TYPE 56	PVC,PP,PVDF	1

UNIT: INCH

VALVE SIZE	1-1/2"	2"	2-1/2"	3"	4"	5"	6"
H	5.51	5.75	6.18	6.46	7.16	8.46	8.97
H1	2.95	3.27	3.66	3.94	4.53	5.00	5.63

NOTE: 1. The shape and appearance of assembly differ a little with nominal size compared to this drawing.
2. For 1-1/2" thru. 4" Mounting Bracket : F7 x F05,F07
For 5" and 6" Mounting Bracket : F10 x F07,F10

	NAME	DATE
DR	KENICHI MIYAZAKI	10/1/01
APPD	DAVE HURLEY	10/1/01
PROD	LEO LESTER	10/1/01

WO#/CO#

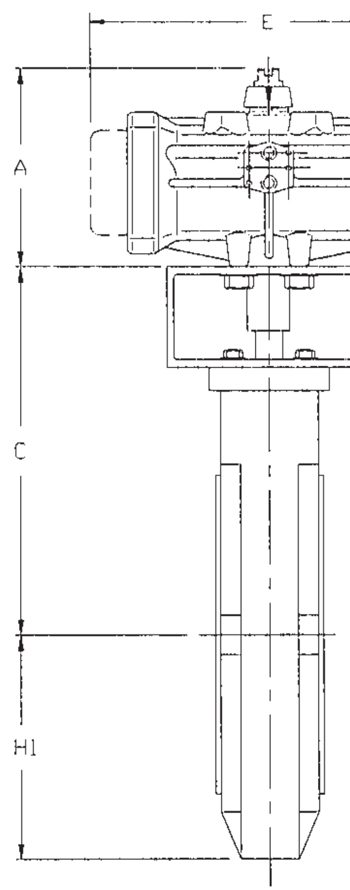
FILE

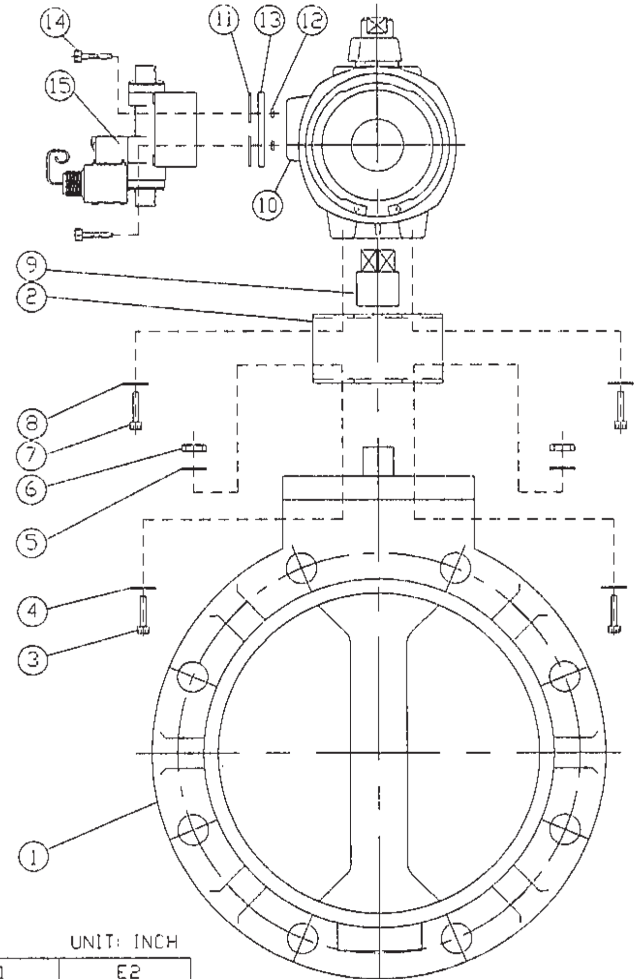
CHEMLINE PLASTICS

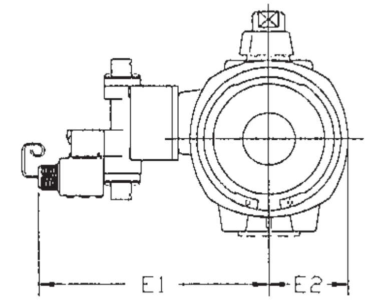
BUTTERFLY VALVE TYPE56
PNEUMATIC ACT.
1-1/2" THRU 6"

SIZE A | DWG. NO. 0204BF | REV A

SCALE NTS | SHEET 1 OF 1







NOTE: ACTUATOR BODY IS CAST ALUMINUM WITH RILSAN (POLYAMIDE NYLON 11) COATING FOR VALVE SIZES 8 THROUGH 24 AIR-AIR AND 5 THROUGH 12 AIR-SPRING. ACTUATOR BODY IS AVAILABLE IN STAINLESS STEEL OR GLASS FILLED POLYAMIDE FOR VALVE SIZES 1 1/2 THROUGH 6 AIR-AIR AND 1 1/2 THROUGH 4 AIR-SPRING

No.	DESCRIPTION	MATERIAL	QTY
15	SOLENOID, ASCO (OPTIONS)	ZYTEL	1
14	SCREW, SOC HEAD (OPTIONS)	STAINLESS STEEL 303	2
13	PLATE MOUNTING (OPTIONS)	ZYTEL	1
12	O-RING (OPTIONS)	NBR	2
11	GASKET (OPTIONS)	NBR	2
10	ACTUATOR (SEE NOTE)	SERIES 79P	1
9	SHAFT ADAPTER	STAINLESS STEEL 303	1
8	FLAT WASHER	STAINLESS STEEL 303	4
7	SCREW	STAINLESS STEEL 303	4
6	NUT, HEX LOCKING	STAINLESS STEEL 303	4
5	WASHER, FLAT	STAINLESS STEEL 303	4
4	WASHER, FLAT	STAINLESS STEEL 303	4
3	SCREW	STAINLESS STEEL 303	4
2	MOUNTING BRACKET	STAINLESS STEEL 303	1
1	BUTTERFLY VALVE TYPE56	PVC, PP, PVDF	1

UNIT: INCH

VALVE SIZE	C	H1	A		E		E1		E2	
			A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S
1 1/2	5.50	2.95	4.40	5.00	4.92	8.74	6.02	6.25	1.41	1.85
2	5.57	3.25	4.40	5.00	4.92	8.74	6.02	6.25	1.41	1.85
2 1/2	6.08	3.66	4.40	5.00	4.92	8.74	6.02	6.25	1.41	1.85
3	6.28	3.94	5.00	6.49	7.00	11.49	6.25	6.84	1.85	2.36
4	6.56	4.53	5.00	6.49	7.00	11.49	6.25	6.84	1.85	2.36
5	8.05	5.00	5.00	8.54	7.00	17.04	6.25	7.83	1.85	3.23
6	9.01	5.63	6.49	8.54	9.21	17.04	6.84	7.83	2.36	3.23
8	11.27	6.69	8.54	11.26	12.12	25.28	7.83	8.42	3.23	3.78
10	12.46	7.99	8.54	13.07	12.12	20.83	7.83	9.41	3.23	4.76
12	14.69	9.53	11.26	13.07	16.46	20.83	8.42	9.41	3.78	4.76
14	14.81	10.24	11.26	15.47	16.46	22.44	8.42	11.84	3.78	6.75
16	16.78	11.81	11.26	16.53	16.46	32.83	8.42	12.52	3.78	7.16

NOTE. The shape and appearance of assembly differ a little with nominal size compared to this drawing.

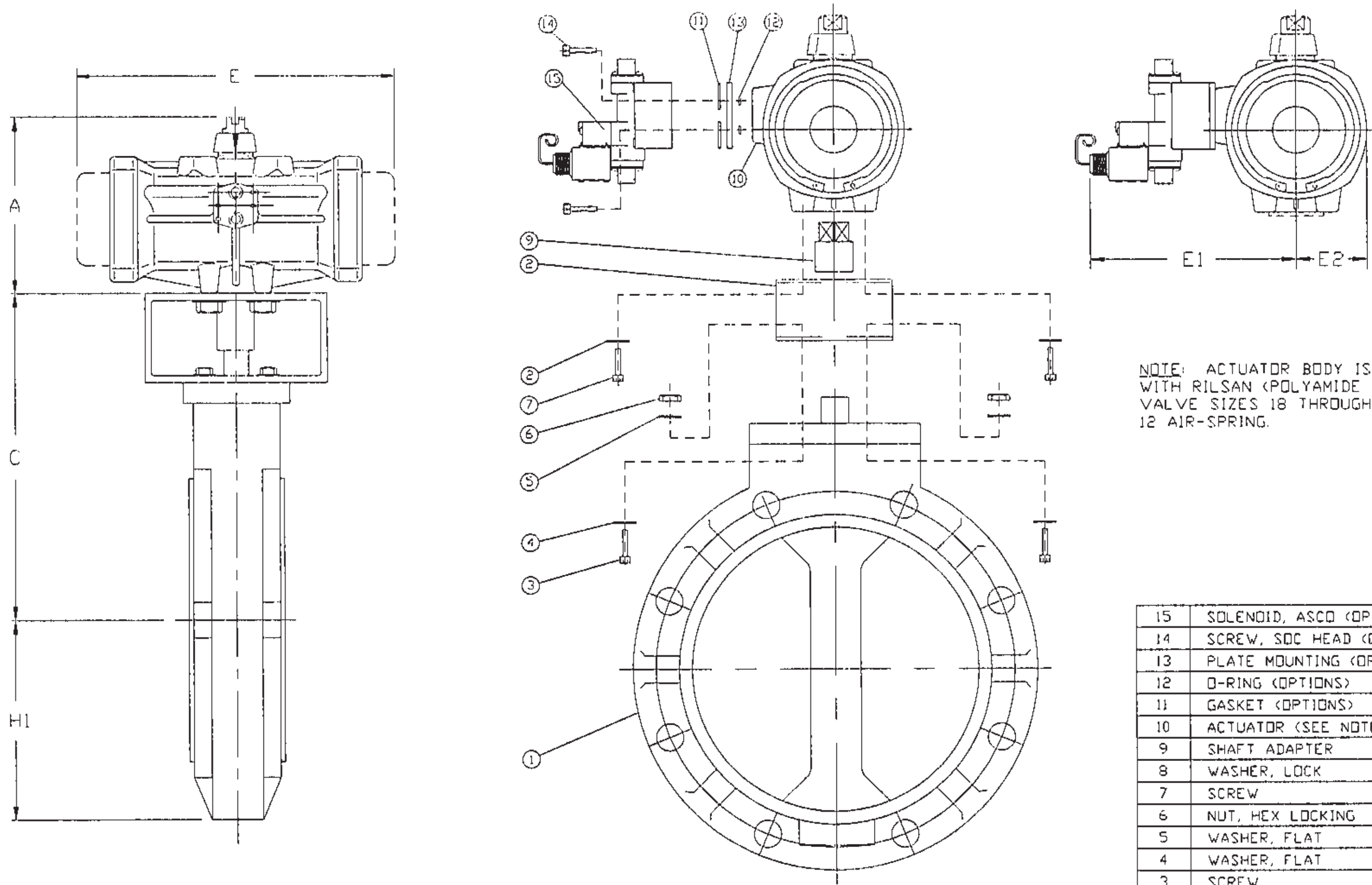
	NAME	DATE
DR	KENICHI MIYAZAKI	9/6/01
APPD	DAVE HURLEY	9/6/01
PROD	LEO LESTER	9/6/01
WO#/CO#		
FILE		

CHEMLINE PLASTICS

BUTTERFLY VALVE TYPE56
PNEUMATIC ACT.
1-1/2" THRU. 16"

SIZE	DWG. NO.	REV
A	0167BF	B

SCALE NTS | SHEET 1 OF 1



NOTE: ACTUATOR BODY IS CAST ALUMINUM WITH RILSAN (POLYAMIDE NYLON II) COATING FOR VALVE SIZES 18 THROUGH 24 AIR-AIR AND 12 AIR-SPRING.

No.	DESCRIPTION	MATERIAL	QTY
15	SOLENOID, ASCO (OPTIONS)	ZYTEL	1
14	SCREW, SOC HEAD (OPTIONS)	300SS	2
13	PLATE MOUNTING (OPTIONS)	ZYTEL	1
12	O-RING (OPTIONS)	NBR	2
11	GASKET (OPTIONS)	NBR	2
10	ACTUATOR (SEE NOTE)	SERIES 79P	1
9	SHAFT ADAPTER	300SS	1
8	WASHER, LOCK	300SS	4
7	SCREW	300SS	4
6	NUT, HEX LOCKING	300SS	4
5	WASHER, FLAT	300SS	4
4	WASHER, FLAT	300SS	4
3	SCREW	300SS	4
2	MOUNTING BRACKET	300SS	1
1	BUTTERFLY VALVE TYPE75	PVC, PP, PVDF	1

UNIT: INCH

VALVE SIZE	C	H1	A		E		E1		E2	
			A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S
18	17.57	12.40	11.26	16.53	16.46	32.83	8.42	12.52	3.78	7.16
20	18.75	13.78	13.07	16.53	17.09	32.83	9.41	12.52	4.76	7.16
24	21.31	16.02	13.07	16.53	17.09	32.83	9.41	12.52	4.76	7.16

NOTE. The shape and appearance of assembly differ a little with nominal size compared to this drawing.

CHEMLINE PLASTICS

BUTTERFLY VALVE TYPE75
PNEUMATIC ACT.
18" THRU. 24"

	NAME	DATE
DR	KENICHI MIYAZAKI	9/6/01
APPD	DAVE HURLEY	9/6/01
PROD	LEO LESTER	9/6/01
WO#/CO#		
FILE		

SIZE A | DWG. NO. 1230 | REV A
SCALE NTS | SHEET 1 OF 1

MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

CHEMLINE

SERIES GV, GLOBE VALVE

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55 Guardsman Road
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L3T 6L2
Canada
Tel: 905-889-7890
Fax: 905-889-8553

MAINTENANCE INSTRUCTIONS
For Chemline Globe Valves Sizes 1/2" - 2"

Maintenance (Sizes 1/2" to 2")

Refer to **ASSEMBLY DRAWING GV-01(A).** And proceed as follows:

1. Remove bonnet and stem assembly (2 through 5) by unscrewing gland nut (6). The complete stem assembly should lift out of the valve body.
   (Note: make sure there is no pressure in line prior to removing valve.)

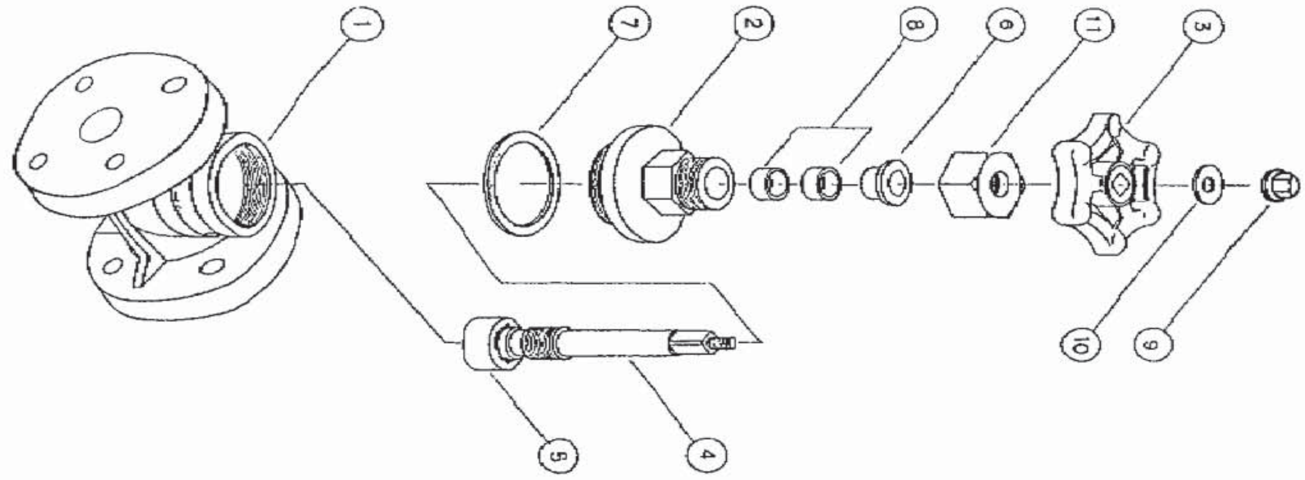
2. The stem (4) is removed from the bonnet assembly by first removing the handwheel (3) by unscrewing nut (9). Loosen the stem packing (8) and inspect for excessive wear and cracking.

3. Lubricate the seal (7) before replacing the shaft (4). Dow Corning III silicone compound recommended.

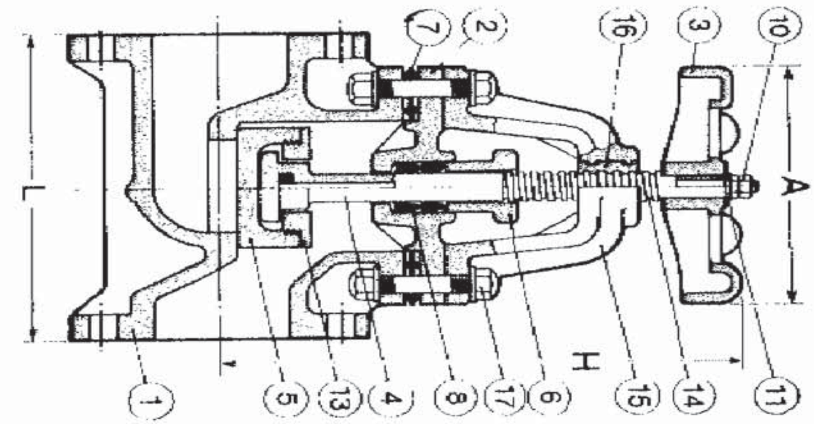
4. Inspect the body seat (1) and disc seat (5) for excessive wear and pitting. Pitting is caused by foreign objects being jammed between the sealing surfaces when closing the valve. If the disc seat (5) is damaged, replace the part.
   Important: If the body seat is damaged replace the complete valve.

5. To reassemble valve, reverse steps 1 to 4 above.

   (NOTE) When replacing the stem assembly back into the valve body, be sure that the stem NOT in the closed position. If it is, the stem may be over extended and could damage the body seat when the bonnet is re-tightened.



PART	DESCRIPTION	QTY	MATERIAL
1	BODY	1	PVC/PP
2	BONNET	1	PVC/PP
3	HANDWHEEL	1	PP
4	STEM	1	PVC/PP
5	DISC	1	PP
6	GLAND	1	PVC/PP
7	BONNET SEAL	1	EPDM
8	STEM PACKING	2	EPDM
10	NUT	1	PVC
11	WASHER	1	PVC
12	GLAND NUT	1	PVC/PP
13	DISC RETAINER	1	PP
14	STEM TOP	1	BRASS
15	YOLK	1	PP
16	YOLK SLEEVE	1	BRONZE
17	BOLT & NUT	8	SS. 304
18	STUD & NUT	2	SS. 304



TITLE CHEMLINE GLOBE VALVE SIZES	SCALE		DATE	CHEMLINE PLASTICS	
	DR. BY				
REFERENCE 1/2" - 2"	CHKD. BY			DWG NO.	REV.
	APP. BY			GV01(A)	0

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Fax: 905-889-8553

MAINTENANCE INSTRUCTIONS
For Chemline Globe Valves Sizes 2-1/2"- 4"

Maintenance (2-1/2" - 4")

Refer to **ASSEMBLY DRAWING GV-01(B).** And proceed as follows:

1. Remove bonnet and stem assembly (2 through 5) by unscrewing gland nut (2), or by loosening and removing bolts (17). The complete stem assembly should lift out of the valve body. (Note: make sure there is no pressure in line prior to removing valve.)

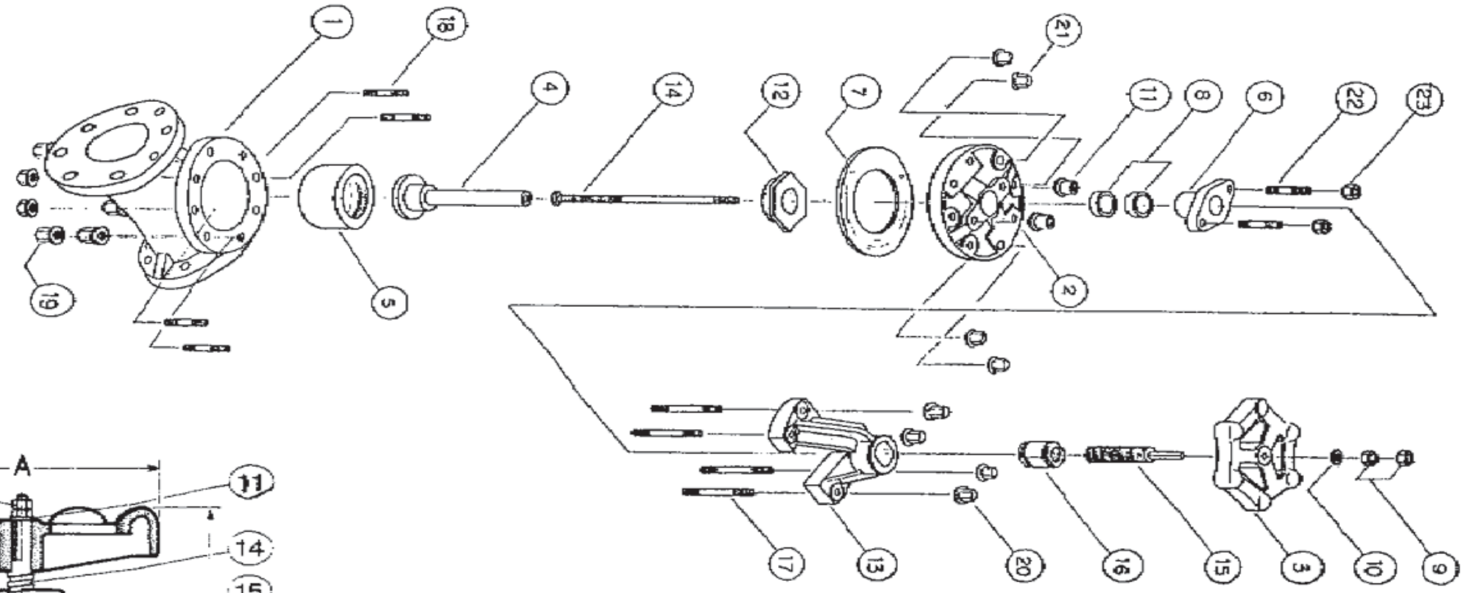
2. The stem (4) is removed from the bonnet assembly by first removing the handwheel (3) by unscrewing nut (9). Loosen the stem and inspect for excessive wear and cracking.

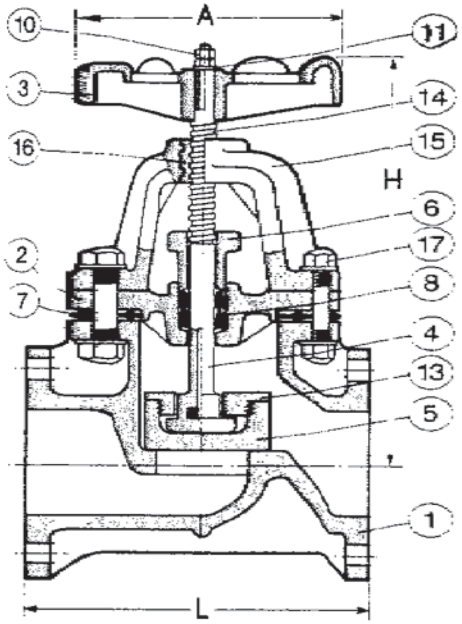
3. Lubricate the seal (7) before replacing the shaft (4). Dow Corning III silicone compound recommended.

4. Inspect the body seat (1) and disc seat (5) for excessive wear and pitting. Pitting is caused by foreign objects being jammed between the sealing surfaces when closing the valve. If the disc seat (5) is damaged, replace the part.
   Important: If the body seat is damaged replace the complete valve.

5. To reassemble valve, reverse steps 1 to 4 above.

   (NOTE) When replacing the stem assembly back into the valve body, be sure that the stem is NOT in the closed position. If it is, the stem may be over extended and could damage the body seat when the body is re-tightened.





1	BODY	1	PVC/PP	11	WASHER	1	PVC
2	PVC	1	PVC/PP	12	GLAND NUT	1	PVC/PP
3	HANDWHEEL	1	PP	13	DISC RETAINER	1	PP
4	STEM	1	PVC/PP	14	STEM TOP	1	BRASS
5	DISC	1	PP	15	YOLK	1	PP
6	GLAND	1	PVC/PP	16	YOLK SLEEVE	1	BRONZE
7	BONNET SEAL	1	EPDM	17	BOLT & NUT	8	304 S.S.
8	STEM PACKING	2	EPDM	18	STUD & NUT	2	304 S.S
10	NUT	1	PVC				

TITLE CHEMLINE GLOBE VALVE SIZES	SCALE		DATE	CHEMLINE PLASTICS
	DR. BY			
REFERENCE 2 - 1/2" - 4"	CHKD. BY			DWG. NO. GV01 (B)
	APP. BY			REV. 0

CHEMLINE

SERIES SB12, BACK PRESSURE/RELIEF VALVE

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MAINTENANCE INSTRUCTIONS
For Chemline 3/8" - 1-1/2" SB Series Pressure Relief Valves

Installation:

1. Always mount a filter or strainer in the line immediately before the valve to avoid damage to the valve from dirt or particles. Valve is spring operated, therefore can be installed in any orientation.

2. **<u>To adjust pressure use the adjustment screw (8) and a pressure gauge</u>**.
   - the valve will be closed at the set pressure and will start to open when the operating pressure rises above the set pressure.
   - connect the compressed air supply to the inlet of the valve. Adjust the flow of the air to the desired set pressure by turning clockwise to increase the set pressure, counterclockwise to decrease it.
   - with the valve being closed, adjust the screw (8) until the valve starts to open. Fix the adjusting screw in place with the locking nut (9).

3. For installation in an application where the temperature is 0^{o} C or less. Check with Chemline Engineering
   Technical staff prior to installation.

Maintenance

Refer to **<u>ASSEMBLY DRAWING SB10/11 rev 0.</u>** And proceed as follows.

1. Loosen and remove cap (10).

2. Loosen counter nut (9) and remove adjustment screw (8).

3. Remove body cap (12a), body bolt (12b), body nut (12c) and washer (12d).

4. Lift up and remove bonnet (2).

5. Remove pressure plate (7a) and ball bearing (7b) to reach relief spring (3).

6. Loosen piston screw (11), remove spring plate (6) and draw piston assembly (5) downward and out of body (1).
   <u>Note:</u> Piston assembly (5) is all parts (5a) outer piston assembly
   (5b) inner piston assembly
   (5c) seat
   (5d) piston o-ring

Maintenance Instructions SB Series Pressure Relief Valves cont.

Piston assembly is removed from body as a unit. It can then be further disassembled into the component parts listed above.

7 Remove diaphragm (4).

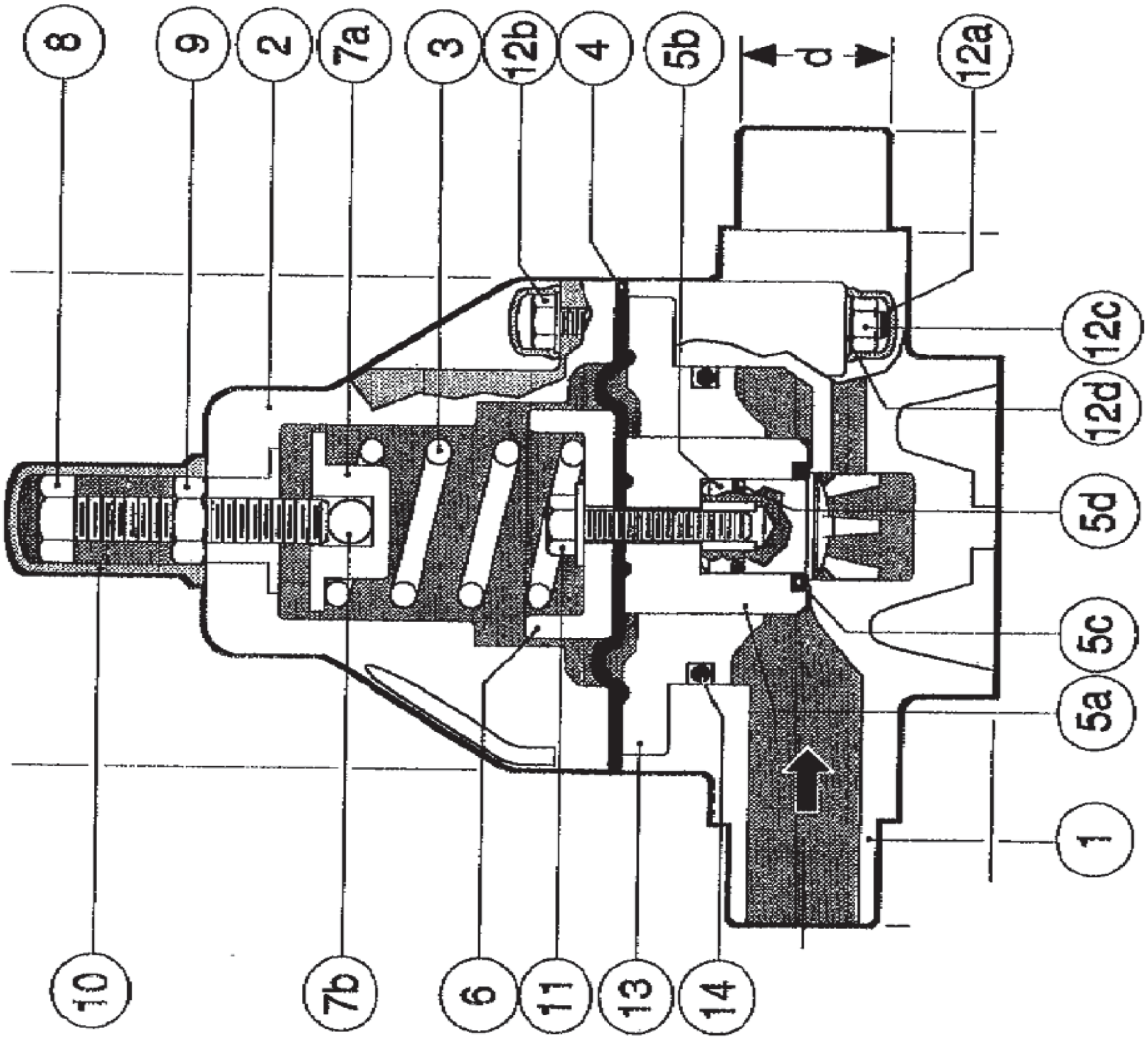
8. Remove seal (14) at intermediate flange (13).

9. Inspect all parts for wear and abrasion, replace seals, diaphragm etc. if necessary.

10. To re-assemble valve follow steps 1 through 9 in reverse order.

TROUBLESHOOTING

FAILURE	REASON	REPAIR
VALVE LEAKS AT DIAPHGRAM (4)	CLAMPING PRESSURE FOR DIAPHRAGM (4) TOO LOW.	TIGHTEN SCREWS (12)
PRESSURE RISES ABOVE SET PRESSURE	{A) VALVE SEAT (5c) & SEALS (14) & (5d) ARE DEFECTIVE (B) DIAPHRAGM (4) LEAKING (C) PISTON (5) BORE AT BODY (1) DIRTY	CHECK SEALS OF PISTON (5) BODY (14) - REPLACE REPLACE. DISMANTLE PISTON (5) AND CLEAN BORE
VALVE CLOSED (DOES NOT OPEN)	VALVE MOUNTED IN WRONG DIRECTION.	TURN VALVE IN DIRECTION OF ARROWS
FLUIDS PENETRATE ADJUSTING SCREW (8)	DIAPHRAGM (4) DEFECTIVE.	REPLACE DIAPHRAGM (4)
LEAKING AT PLUG AT VALVE BODY	O-RING SEAL LEAKING	DISMANTLE PLUG AND REPLACE SEAL



Part	Description	Pcs
1	BODY	1
2	BONNET	1
3	RELIEF SPRING	1
4	DIAPHRAGM	1
5(a)	OUTER PISTON	1
	(PART OF ASSY)	
5(b)	INNER PISTON	1
	(PART OF ASSY)	
5(c)	SEAT	2
	(PART OF ASSY)	
5(d)	PISTON O-RING	2
	(PART OF ASSY)	
6	SPRING PLATE	1
7(a)	PRESS. PLATE	1
7(b)	BALL BEARING	1
8	ADJ. SCREW	1
9	COUNTER NUT	1
10	CAP	1
11	PISTON SCREW	1
12 (a)	BODY CAP	4/6
12 (b)	BODY BOLT	4/6
12 (c)	BODY NUT	4/6
12 (d)	BODY WASHER	4/6
13	INT. FLANGE	2
14	SEAL	2

TITLE: CHEMLINE SB PRESSURE RELIEF VALVES	SCALE		DATE	CHEMLINE PLASTICS
	DR. BY			
REFERENCE: 3/8" - 1-1/2"	CHKD. BY			DWG. NO. SB1011 — REV. 0
	APP. BY			

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L3T 6L2
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Tel: 905-889-7890
Fax: 905-889-8553

MAINTENANCE & INSTALLATION INSTRUCTIONS
For Chemline 2” – 4” SB Series Pressure Relief Valves

Installation:

1. Always mount a filter or strainer in the line immediately before the valve to avoid damage to the valve from dirt or particles. Valve is spring operated, therefore can be installed in any orientation.

2. **<u>To adjust pressure use the adjustment screw (8) and a pressure gauge</u>**.
   - the valve will be closed at the set pressure and will start to open when the operating pressure rises above the set pressure.
   - connect the compressed air supply to the inlet of the valve. Adjust the flow of the air to the desired set pressure by turning clockwise to increase the set pressure, counterclockwise to decrease it.
   - with the valve being closed, adjust the screw (8) until the valve starts to open. Fix the adjusting screw in place with the locking nut (9).

3. For installation in an application where the temperature is 0^{o} C or less. Check with Chemline Engineering
Technical staff prior to installation.

Maintenance:

Refer to **<u>ASEMBLY DRAWING SB1201 rev 0.</u>** And proceed as follows:

1. Loosen and remove cap (10).

2. Loosen counter nut (9) and remove adjustment screw (8).

3. Remove body cap (12c), body nut and bolt (12a) and washer (12b).

4. Lift up and remove bonnet (2).

5. Remove pressure plate (7a) and ball bearing (7b) to reach relief spring (3).

6. Draw piston assembly (5) downward and out of body (1).
   Note: Piston assembly (5) is all parts (5a) outer piston assembly
   (5b) plug
   (5c) seat
   Piston assembly is removed from the body as a unit. It can then be further disassembled into the component parts listed above.

7. Remove diaphragm (4).

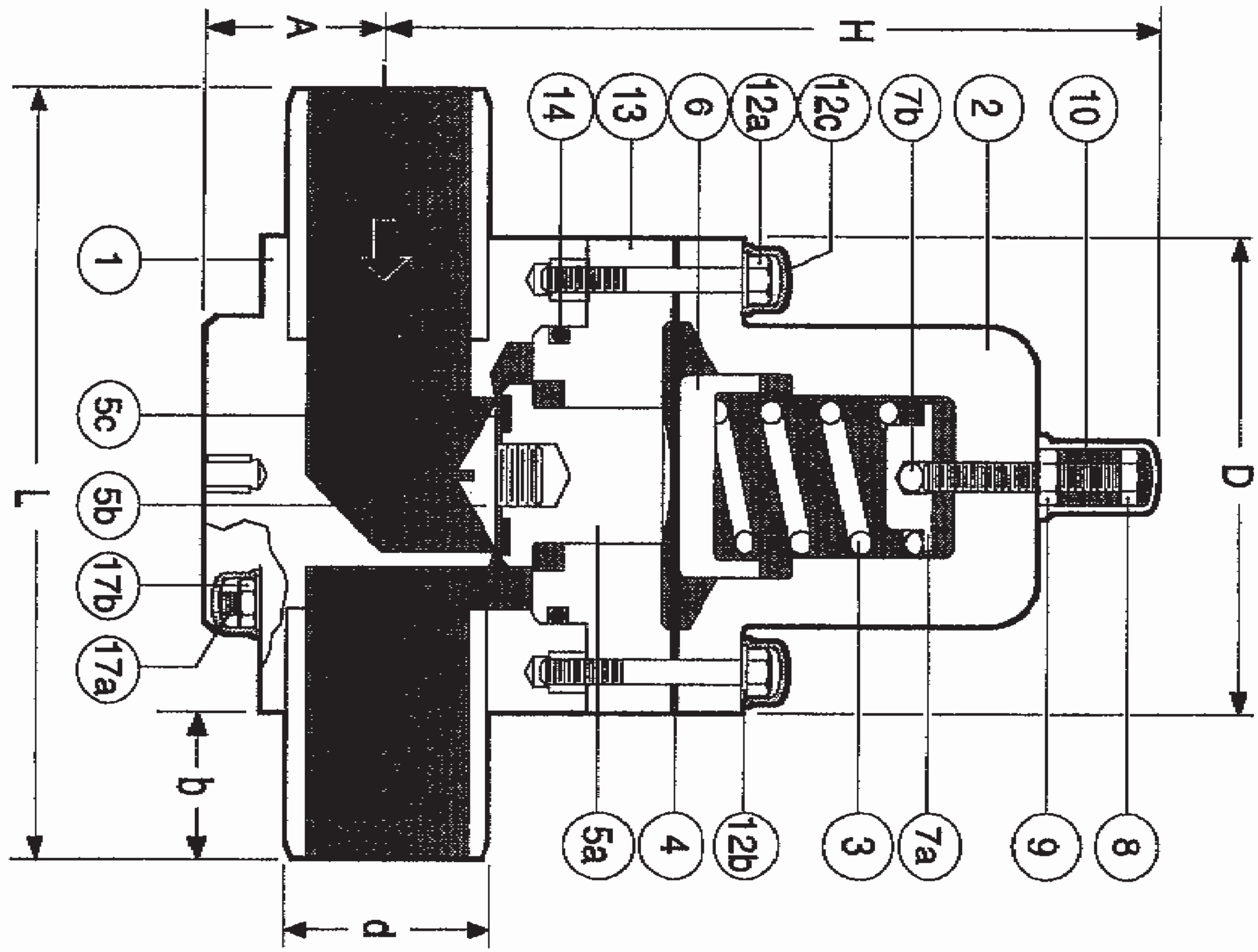
8. Remove seal (14) at intermediate flange (13).

9. Inspect all parts for wear and abrasion, replace seals, diaphragms etc. if necessary.

10. To re-assemble valve follow steps 1 through 10 in reverse order.

TROUBLESHOOTING

FAILURE		REASON	REPAIR
VALVE LEAKS AT DIAPHGRAM (4)		CLAMPING PRESSURE FOR DIAPHRAGM (4) TOO LOW.	TIGHTEN SCREWS (12)
PRESSURE RISES ABOVE SET PRESSURE	{A)	VALVE SEAT (5c) & SEALS (14) ARE DEFECTIVE	CHECK SEALS OF PISTON (5) BODY (14) - REPLACE
	(B)	DIAPHRAGM (4) LEAKING	REPLACE.
	(C)	PISTON (5) BORE AT BODY (1) DIRTY	DISMANTLE PISTON (5) AND CLEAN BORE
VALVE CLOSED (DOES NOT OPEN)		VALVE MOUNTED IN WRONG DIRECTION.	TURN VALVE IN DIRECTION OF ARROWS
FLUIDS PENETRATE ADJUSTING SCREW (8)		DIAPHRAGM (4) DEFECTIVE.	REPLACE DIAPHRAGM (4)
LEAKING AT PLUG AT VALVE BODY		O-RING SEAL LEAKING	DISMANTLE PLUG AND REPLACE SEAL



PART	DESCRIPTION	PCS
1	BODY	1
2	BONNET	1
3	RELIEF SPRING	1
4	DIAPHRAGM	1
5 (a)	OUTER PISTON	1
5 (b)	PLUG	1
5 (c)	SEAT	2
6	SPRING PLATE	1
7 (a)	PRESSURE PLATE	1
7 (b)	BALL BEARING	1
8	ADJUSTING SCREW	1
9	COUNTER NUT	1
10	CAP	1
12 (a)	BODY NUT & BOLT	4/6
12 (b)	BODY WASHER	4/6
12 (c)	BODY CAP	4/6
13	INTERMED. FLANGE	2
14	SEAL	2

TITLE	SCALE		DATE	CHEMLINE PLASTICS
CHEMLINE SB/12 SERIES	DR. BY			
REFERENCE	CHKD. BY			DWG. NO. / REV.
PRESSURE RELIEF VALVES 2-4"	APP. BY			SB1201 / 0

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MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

CHEMLINE

SERIES SG, DIAPHRAGM SEAL WITH PRESSURE GAUGE

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MAINTENANCE INSTRUCTIONS
For Chemline SG Series Gauge Isolator 1/4”and 1/2”

Maintenance:

Refer to drawing on page 2 of the **SG Gauge Isolator Data Page**

1. Gauge isolators can be mounted and filled with glycerine at Chemline prior to delivery, or isolators can be mounted and filled on site.
2. Remove isolator from valve.
3. To disassemble isolator remove gauge (6) from upper chamber/bonnet (3).
4. Separate bonnet (3) from body (1).
5. Drain glycerin (or other fluid) from both chambers (1 & 3), prior to removing diaphragm (2).
6. Check teflon diaphragm (2) for wear and replace if necessary.
7. Refill upper chamber (3) and replace diaphragm (2).
8. To reassemble diaphragm follow steps 1 through 4 in reverse, to hand-tight plus ¼ turn (approx. 30 in-lb).

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PDF Published June 23, 2014

Gauge Isolators

CHEMLINE PLASTICS
SUPERIOR FLOW SOLUTIONS

PVC | PP | PVDF

CRN Registered Consult Chemline

NSF[4] Certified to NSF/ANSI 61

SERIES: SG

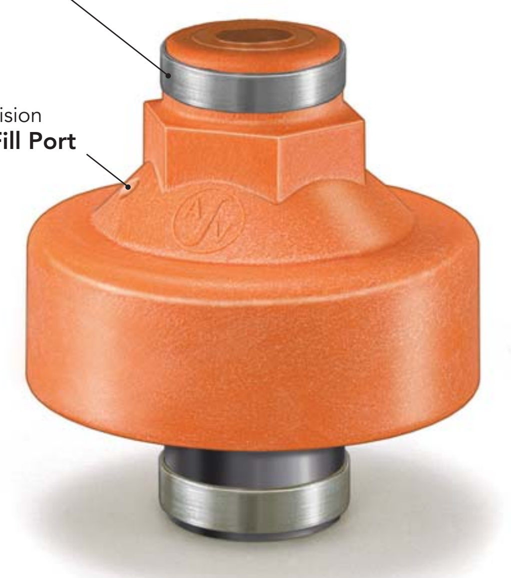
INLET CONNECTION: 1/4" or 1/2" Threaded[1]

INSTRUMENT CONNECTION: 1/4" or 1/2" Threaded

DIAPHRAGM: PTFE

Stainless Steel Bands Prevent FNPT ports from splitting

Provision for **Fill Port**



Chemline SG Series Gauge Isolators allow inexpensive pressure gauges, or any other pressure instrument to be used in corrosive services. The upper chamber (gauge side) is filled with a stable fluid such as glycol or glycerine[2]. A diaphragm separates it from the lower chamber which receives the media under pressure.

The 1/2" gauge connection allows use of the popular 4" and 4-1/2" diameter gauges. Pressure switches or transmitters may also be installed. Customers can easily fill isolators and install their own gauges.

features

Easy to Mount Gauges

- It is easy to fill an isolator and field mount a gauge. No special equipment is required.
- Will accept popular 4" and 4-1/2" diameter gauges

Provision for Fill Port

- Housing may be drilled and tapped by Chemline or customer for a threaded fill port. This is used for filling isolator using a vacuum filling station

High Chemical Resistance

- Choice of body materials for a wide range of applications
- PTFE bonded EPDM dished diaphragm for high chemical resistance and sensitivity

Heavy Duty Design for Safety

- PPG[3] top chamber
- Heavy wall connection ports

CRN Registration number by province

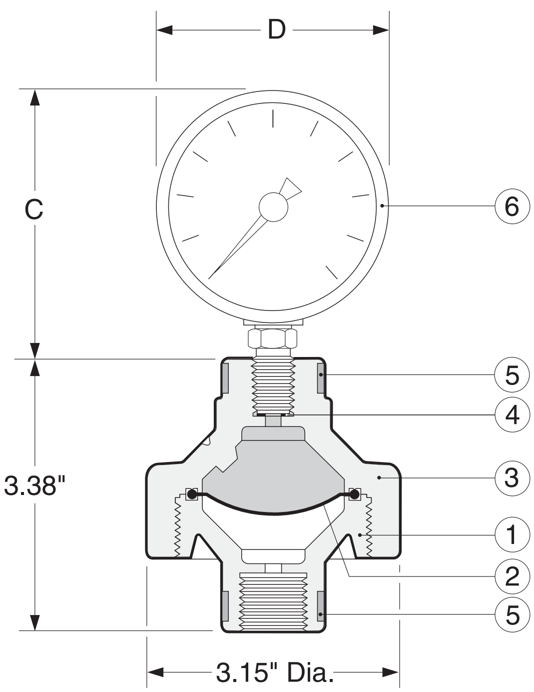
- Ontario: OH16085.5

Optional Gauges

- Isolators are available alone or with gauge mounted and prefilled with glycol[2]

A With 2" gauge
B With 4-1/2" gauge
C With 2" back mount gauge
D With pressure transmitter

[1] Other available inlet connections are 1/2" socket or 1/2" to 1" flanged.
[2] Other fluids are available for special applications such as chlorine service.
[3] Glass reinforced polypropylene.
[4] PVC isolators are certified under NSF/ANSI Standard 61 for contact with drinking water.



PARTS

No.	Part	Pcs.	Materials
1	Body	1	PVC, PP, PVDF
2	Diaphragm	1	PTFE
3	Bonnet	1	PPG[1]
4	Gasket	1	EPDM
5	Stainless Steel Bands	2	304 SS
6	Optional Gauge	1	See below

[1]PPG = Glass reinforced polypropylene

OPTIONAL GAUGES

- Chemline offers the gauges listed below mounted to isolator and prefilled with glycol, glycerine or special fluid for chlorine applications. These gauges have dials and cases filled with either glycol (standard), glycerine or silicon for corrosion resistance and dampening.
- Chemline SG gauge isolators are not recommended for vacuum applications. They will not affect the gauge accuracy as low as approximately 3 psi. The accuracy depends on the process conditions and the gauge installed on it.

OTHER OPTIONS

- **Flanged** inlet connections
- **Threaded Fill Port** – drilled, tapped and plugged
- Chemline will mount any pressure instrument supplied free issue by customer

DIMENSIONS (Gauge Isolator with optional gauge installed) INCHES

Optional Gauge Ordering No.	Gauge Diameter	Gauge Connection	Housing	Bourdon Tube	Window	Accuracy	Dimensions C	Dimensions D(max.)
P025-xx	2-1/2″	1/4″	316 SS	Brass	Polycarbonate	±1.5% of span	3.1	2.5
P025-xx-SS	2-1/2″	1/4″	316 SS	316 SS	Polycarbonate	±1.5% of span	3.1	2.5
P025-xx-SS/BM	2-1/2″ Back Mount	1/4″	316 SS	316 SS	Polycarbonate	±1.5% of span	1.6	2.5
P025-xx-BM	2-1/2″ Back Mount	1/4″	316 SS	Brass	Polycarbonate	±1.5% of span	1.6	2.5
P040-xx-SS	4″	1/2″	316 SS	316 SS	Safety Glass	±1% of span	4.5	4.0
P045-xx-SS	4-1/2″	1/2″	PBTP Plastic[2]	316 SS	Acrylic	±0.5% of span	6.3	5.8

xx denotes the maximum gauge pressure i.e., 30, 60, 100, 160 or 200 psi. See data page for recommended working pressures.
[2] PBTP = glass filled polyester.

WORKING PRESSURES PSI / WEIGHTS

Material	10 – 20°C 50 – 68°F	30°C 86°F	40°C 104°F	50°C 122°F	60°C 140°F	70°C 158°F	80°C 176°F	90°C 194°F	100°C 212°F	120°C 248°F	Net Weights Pounds[3]
PVC	150	100	80	45	15	–	–	–	–	–	1.0
PP	150	125	100	80	65	45	–	–	–	–	0.7
PVDF	150	150	150	125	105	85	70	60	45	30	1.3

Temperature Ranges: PVC 0 to 60°C (32 to 140°F), **PP** 10 to 80°C (50 to 176°F), **PVDF** –30 to 120°C (–22 to 248°F).
NR = Not Recommended. [3] Weights are for unfilled 1/2″ x 1/2″ isolators without gauges. 1/2″ x 1/4″ isolators are 20% lighter.

ORDERING EXAMPLE

Chemline Gauge Isolators	SG	A	005-	002	P	G
Body Material	**A** – PVC **B** – PP **K** – PVDF					
Inlet Size	**002** – 1/4″ **005** – 1/2″(Standard)					
Instrument Connection	**002** – 1/4″ **005** – 1/2″					
Diaphragm	**P** – PTFE bonded EPDM					
Filling & Mounting	**G** –Add only if isolator is supplied filled with glycol and gauge or pressure instrument is mounted by Chemline. Separate gauge item numbers are listed above.					

Example: Chemline SG Series Gauge Isolator, PVC, 1/2″ x 1/4″ FNPT inlet x instrument connections, PTFE diaphragm.

CHEMLINE PLASTICS
SUPERIOR FLOW SOLUTIONS
55 Guardsman Road, Thornhill, ON, L3T 6L2, Canada | ISO 9001:2008 Certified
tel.905.889.7890 | fax.905.889.8553 | request@chemline.com | chemline.com

CHEMLINE

SERIES FC/FS, VARIABLE AREA FLOW METER

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CHEMLINE Plastics Limited

Your Pipeline To Quality Valves, Strainers, Flowmeters and Controls

55 Guardsman Road
Thornhill, Ontario
L3T 6L2
Canada
Tel: 905-889-7890
Fax: 905-889-8553

INSTALLATION & MAINTENANCE INSTRUCTIONS
For Chemline FC/FS Series Variable Area Flowmeter Sizes 5” and 7”

Installation & Maintenance:

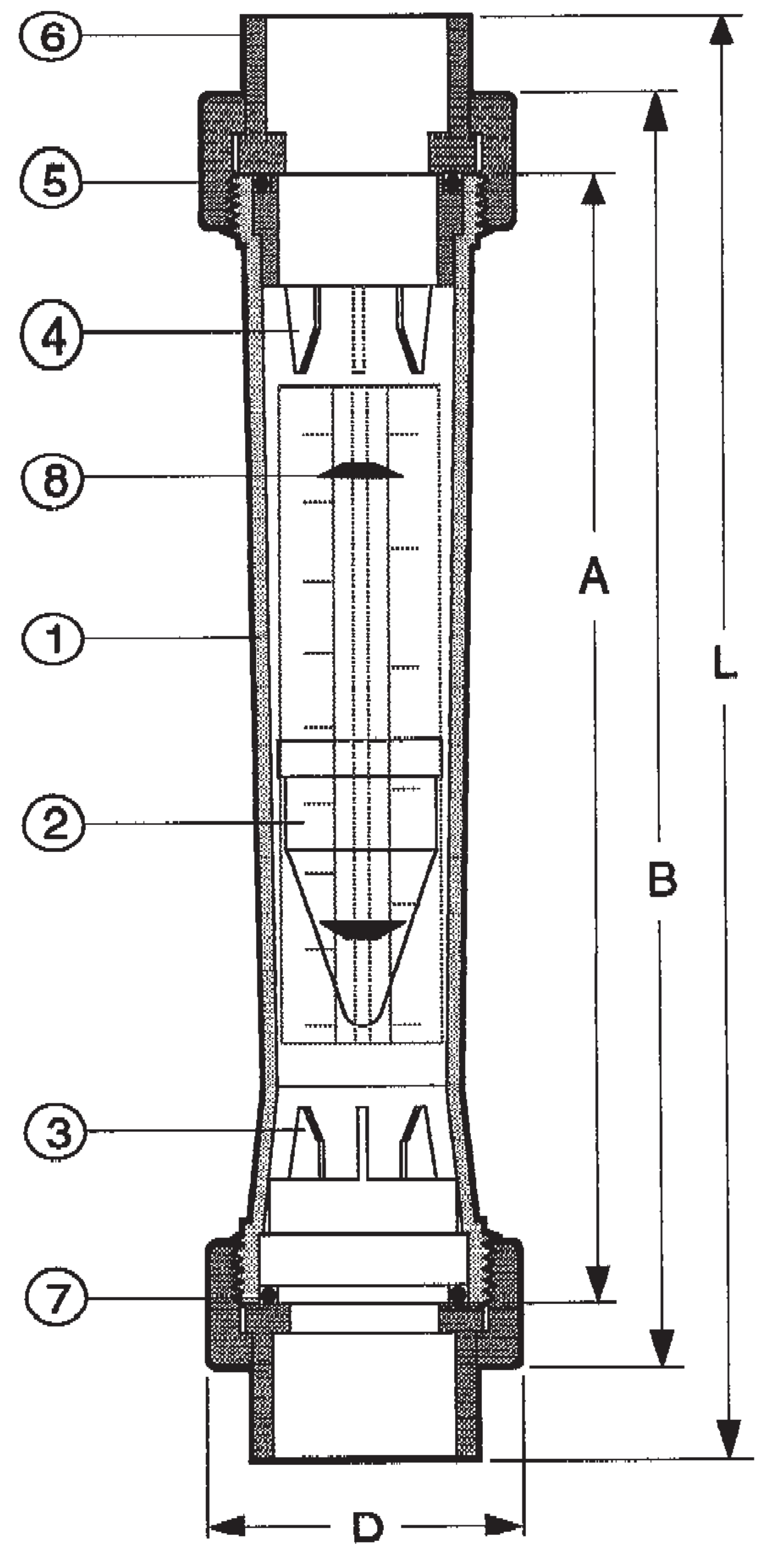
Refer to **ASSEMBLY DRAWING SFM1 REV 0**. And proceed as follows:

1. Install in line (where flow readings are required).
2. Unscrew union nuts (5).
3. Remove end connectors (6).
4. Tube (1) will slide out when end connectors (6) are removed.
5. Upper and lower float stops will come out with the end connectors (6).
6. Remove and clean or replace o-rings (7).
7. Remove float (2) from tube (1) and clean.
8. Remove range indicator (8) from tube and clean or replace.
9. It is recommended that spare o-rings (7) and range indicators (8) be kept.

Maximum Working Pressures and Temperature Ranges

Construction				
Tube	**Union Nuts**	**Ends**	**Pressure**	**Temperature**
PVC	PVC	PVC	150 psi	0 to 60^{o} C
Polyamide (PA)	PVC	PVC	150 psi	0 to 60^{o} C
Polyamide (PA	PPG	PP or CPVC	150 psi	0 to 80^{o} C
Polysulfone (PSU)	PPG	PP or CPVC	150 psi	0 to 90^{o} C
Polysulfone (PSU)	PVDF	PVDF	150 psi	0 to 120^{o} C
PVDF	PVDF	PVDF	150 psi	-40 to 120^{o} C

Ranges, Conversion Charts, Sizing, Scale Correction Factors etc. are available on the Chemline Data Page and also available from the Chemline Technical Department.



TITLE

FS / FC VARIABLE-AREA FLOWMETERS

CHEMLINE PLASTICS LIMITED
55 GUARDSMAN ROAD, THORNHILL, ONTARIO L3T 6L2
TEL: (905) 889-7890 - FAX (905) 889-8553

SCALE	NTS	DATE	REFERENCE
DR. BY	DB	02/22/91	
CHK BY			DWG. NO. SFM1
APP BY			REV. 0

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MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

ENDRESS + HAUSER

PROLINE PROMAG 50W, ELECTROMAGNETIC FLOWMETER

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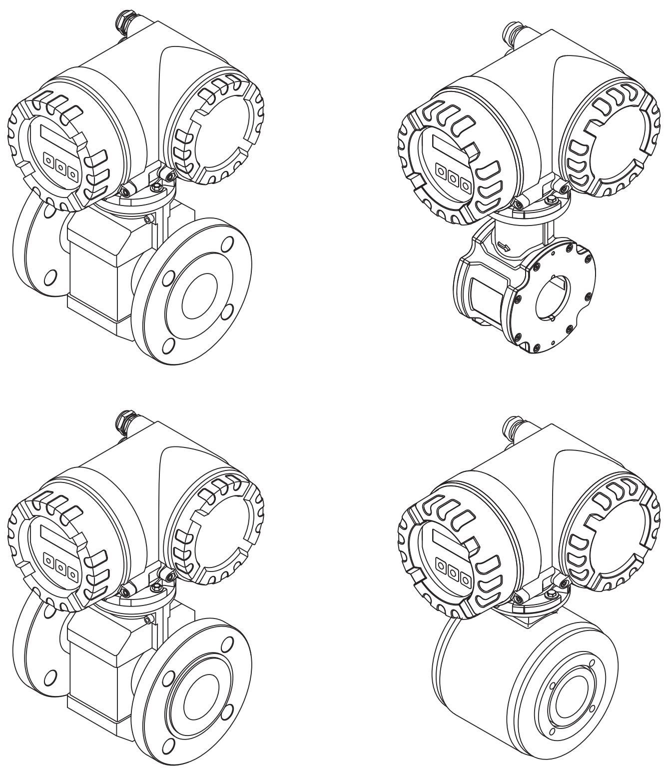
BA00046D/06/EN/16.15
71279854

Valid as of version
V 2.04.XX (device software)

Operating Instructions
Proline Promag 50 HART

Electromagnetic flowmeter



Endress+Hauser

People for Process Automation

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1 Safety instructions

1.1 Designated use

The measuring device described in this Operating Manual is to be used only for measuring the flow rate of conductive fluids in closed pipes.

A minimum conductivity of 20 μS/cm is required for measuring demineralized water. Most liquids can be measured as of a minimum conductivity of 5 μS/cm.

Examples:
- Acids, alkalis
- Drinking water, wastewater, sewage sludge
- Milk, beer, wine, mineral water, etc.

Resulting from incorrect use or from use other than that designated the operational safety of the measuring devices can be suspended. The manufacturer accepts no liability for damages being produced from this.

1.2 Installation, commissioning and operation

Please note the following:
- Installation, connection to the electricity supply, commissioning and maintenance of the device must be carried out by trained, qualified specialists authorized to perform such work by the facility's owner-operator. The specialist must have read and understood this Operating Manual and must follow the instructions it contains.
- The device must be operated by persons authorized and trained by the facility's owner-operator. Strict compliance with the instructions in the Operating Manual is mandatory.
- With regard to special fluids, including fluids used for cleaning, Endress+Hauser will be happy to assist in clarifying the corrosion-resistant properties of wetted materials. However, minor changes in temperature, concentration or in the degree of contamination in the process may result in variations in corrosion resistance. For this reason, Endress+Hauser does not accept any responsibility with regard to the corrosion resistance of wetted materials in a specific application.
  The user is responsible for the choice of suitable wetted materials in the process.
- If welding work is performed on the piping system, do not ground the welding appliance through the Promag flowmeter.
- The installer must ensure that the measuring system is correctly wired in accordance with the wiring diagrams. The transmitter must be grounded apart from when special protective measures are taken (e.g. galvanically isolated SELV or PELV power supply)
- Invariably, local regulations governing the opening and repair of electrical devices apply.

1.3 Operational safety

Please note the following:
- Measuring systems for use in hazardous environments are accompanied by separate Ex documentation, which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory. The symbol on the front of this Ex documentation indicates the approval and the certification body (e.g. Ex Europe, FM USA, SP Canada).
- The measuring device complies with the general safety requirements in accordance with EN 61010-1, the EMC requirements of IEC/EN 61326 and NAMUR Recommendations NE 21 and NE 43.
- Depending on the application, the seals of the process connections of the Promag H sensor require periodic replacement.

- When hot fluid passes through the measuring tube, the surface temperature of the housing increases. In the case of the sensor, in particular, users should expect temperatures that can be close to the fluid temperature. If the temperature of the fluid is high, implement sufficient measures to prevent burning or scalding.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to these Operating Instructions.

1.4 Return

The measuring device must be returned if repairs or a factory calibration are required, or if the wrong measuring device has been ordered or delivered. According to legal regulations, Endress+Hauser, as an ISO-certified company, is required to follow certain procedures when handling returned products that are in contact with medium.

To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website at www.services.endress.com/return-material

1.5 Notes on safety conventions and icons

The devices are designed to meet state-of-the-art safety requirements, have been tested, and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with EN 61010-1 "Safety requirements for electrical equipment for measurement, control and laboratory use".
The devices can, however, be a source of danger if used incorrectly or for anything other than the designated use. Consequently, always pay particular attention to the safety instructions indicated in this Operating Manual by the following icons:

Warning!
"Warning" indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.

Caution!
"Caution" indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.

Note!
"Note" indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

2 Identification

2.1 Device designation

The flow measuring system consists of the following components:

- Promag 50 transmitter
- Promag D/E/H/L/P/W sensor

In the *compact version*, the transmitter and sensor form a single mechanical unit; in the *remote version* they are installed separately.

2.1.1 Nameplate of the transmitter

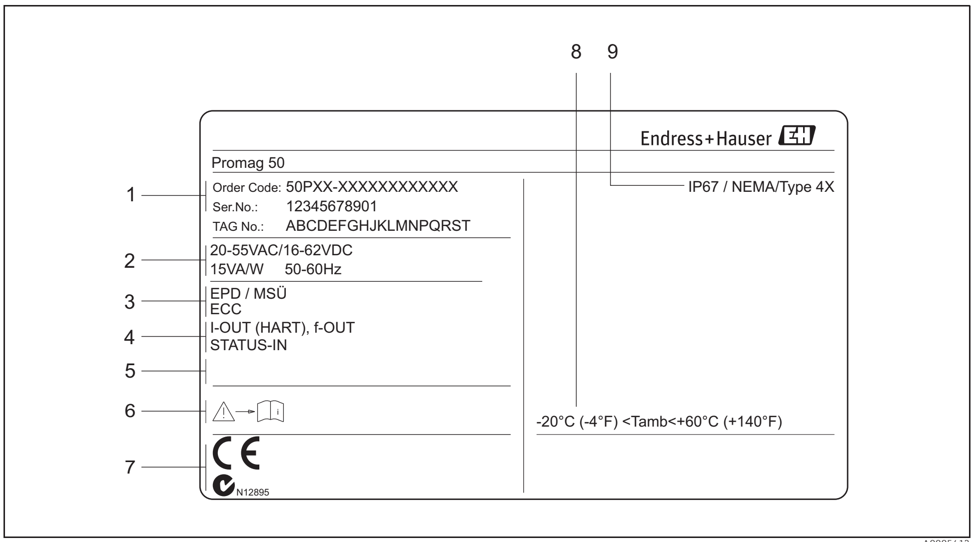


Fig. 1: Nameplate specifications for the "Promag 50" transmitter (example)

1 Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.
2 Power supply, frequency, power consumption
3 Additional information:
EPD/MSÜ: with Empty Pipe Detection
ECC: with electrode cleaning
4 Outputs available:
I-OUT (HART): with current output (HART)
f-OUT (HART): with frequency output
STATUS-IN: with status input (power supply)
5 Reserved for information on special products
6 Observe device documentation
7 Reserved for additional information on device version (approvals, certificates)
8 Permitted ambient temperature range
9 Degree of protection

2.1.2 Nameplate of the sensor

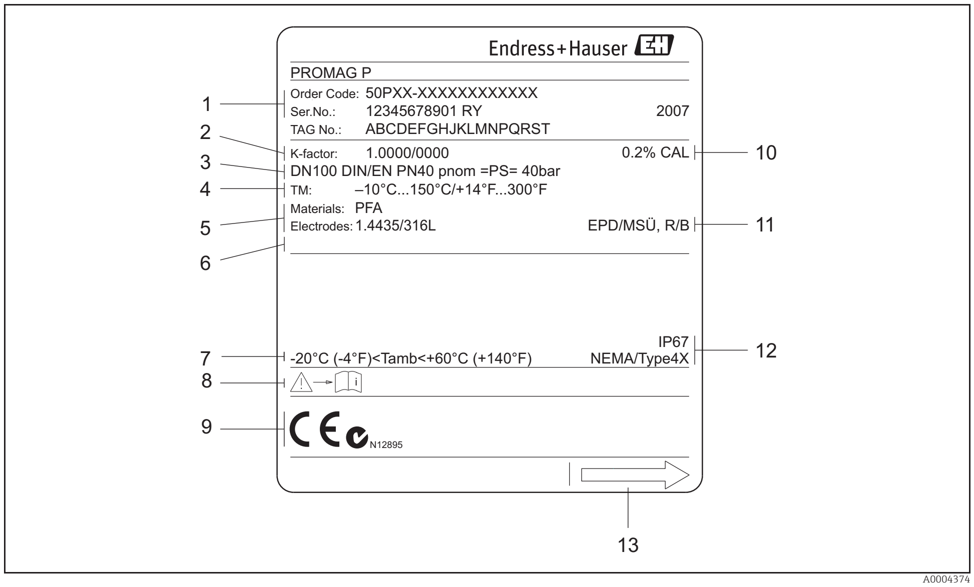


Fig. 2: Nameplate specifications for the "Promag" sensor (example)

1 *Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.*
2 *Calibration factor with zero point*
3 *Nominal diameter / Pressure rating*
4 *Fluid temperature range*
5 *Materials: lining/measuring electrodes*
6 *Reserved for information on special products*
7 *Permitted ambient temperature range*
8 *Observe device documentation*
9 *Reserved for additional information on device version (approvals, certificates)*
10 *Calibration tolerance*
11 *Additional information (examples):*
– *EPD/MSÜ: with Empty Pipe Detection electrode*
– *R/B: with reference electrode*
12 *Degree of protection*
13 *Flow direction*

2.1.3 Nameplate, connections

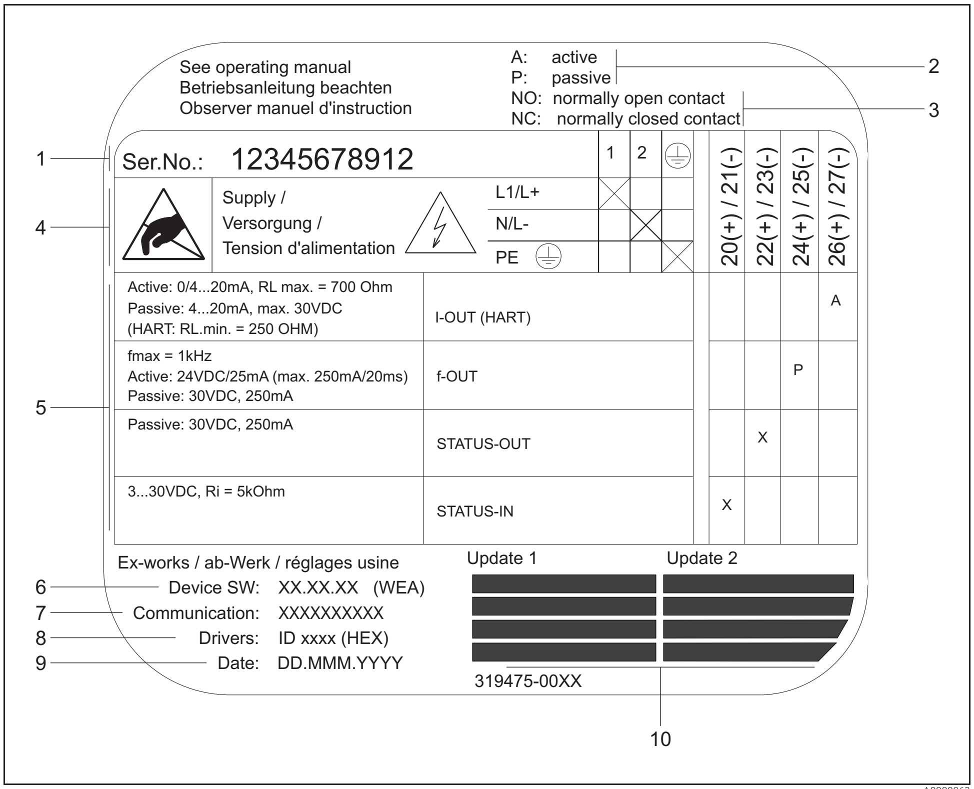


Fig. 3: Nameplate specifications for transmitter (example)

1 *Serial number*
2 *Possible configuration of current output*
3 *Possible configuration of relay contacts*
4 *Terminal assignment, cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC*
*Terminal **No. 1**: L1 for AC, L+ for DC*
*Terminal **No. 2**: N for AC, L– for DC*
5 *Signals present at inputs and outputs, possible configuration and terminal assignment (20 to 27), see also "Electrical values of inputs/outputs"*
6 *Version of device software currently installed*
7 *Installed communication type, e.g.: HART, PROFIBUS PA, etc.*
8 *Information on current communication software (Device Revision and Device Description), e.g.: Dev. 01 / DD 01 for HART*
9 *Date of installation*
10 *Current updates to data specified in points 6 to 9*

2.2 Certificates and approvals

The devices are designed to meet state-of-the-art safety requirements in accordance with sound engineering practice. They have been tested and left the factory in a condition in which they are safe to operate.

The devices comply with the applicable standards and regulations in accordance with EN 61010-1 "Safety requirements for electrical equipment for measurement, control and laboratory use" and with the EMC requirements of IEC/EN 61326/A1.

The measuring system described in this Operating Manual is therefore in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

2.3 Registered trademarks

KALREZ® and VITON®
Registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP®
Registered trademark of Ladish & Co., Inc., Kenosha, USA

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

HistoROM™, S-DAT®, Field Xpert™, FieldCare®, Fieldcheck®, Applicator®
Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

3 Installation

3.1 Incoming acceptance, transport and storage

3.1.1 Incoming acceptance

On receipt of the goods, check the following:
- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.1.2 Transport

The following instructions apply to unpacking and to transporting the device to its final location:
- Transport the devices in the containers in which they are delivered.
- Do not remove the protective plates or caps on the process connections until you are ready to install the device. This is particularly important in the case of sensors with PTFE linings.

Special notes on flanged devices

Caution!
- The wooden covers mounted on the flanges from the factory protect the linings on the flanges during storage and transportation. In case of Promag L they are additionally used to hold the lap joint flanges in place. Do not remove these covers until **immediately before** the device in the pipe.
- Do not lift flanged devices by the transmitter housing, or the connection housing in the case of the remote version.

Transporting flanged devices DN ≤ 300 (12")

Use webbing slings slung round the two process connections. Do not use chains, as they could damage the housing.

Warning!
Risk of injury if the measuring device slips. The center of gravity of the assembled measuring device might be higher than the points around which the slings are slung.
At all times, therefore, make sure that the device does not unexpectedly turn around its axis or slip.

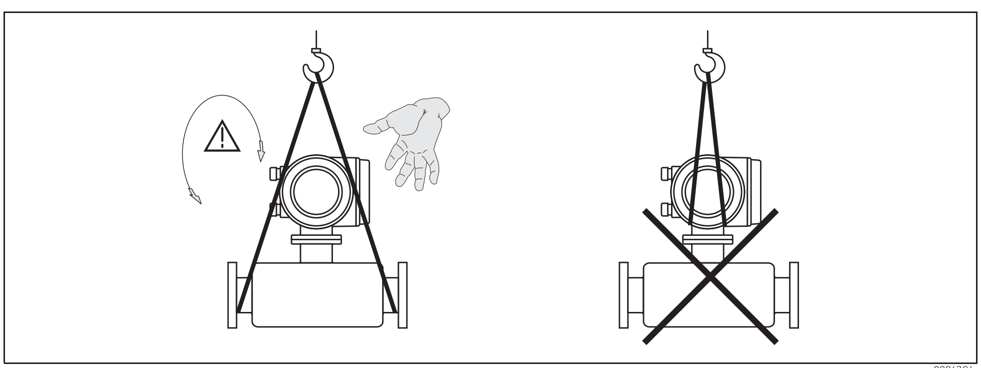


Fig. 4: Transporting sensors with DN ≤ 300 (12")

Transporting flangeddevices DN ≥ 350 (14")

Use only the metal eyes on the flanges for transporting the device, lifting it and positioning the sensor in the piping.

Caution!
Do not attempt to lift the sensor with the tines of a fork-lift truck beneath the metal casing. This would buckle the casing and damage the internal magnetic coils.

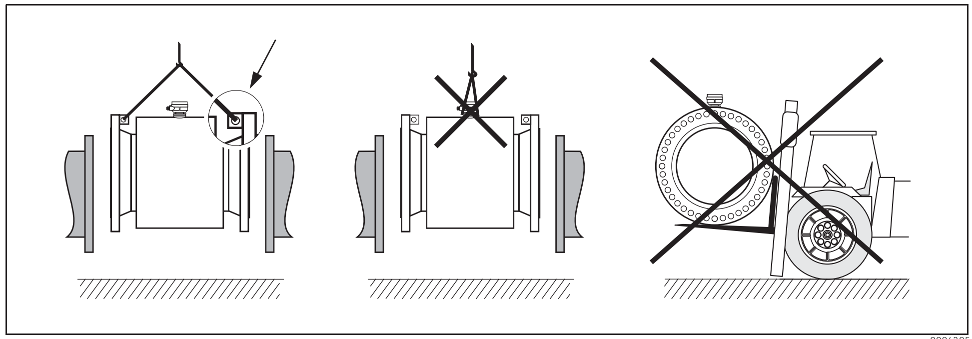


Fig. 5: Transporting sensors with DN ≥ 350 (14")

3.1.3 Storage

Please note the following:
- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors → 102.
- Do not remove the protective plates or caps on the process connections until you are ready to install the device. This is particularly important in the case of sensors with PTFE linings.
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.

3.2 Installation conditions

3.2.1 Dimensions

The dimensions and installation lengths of the sensor and transmitter can be found in the "Technical Information" for the device in question. This document can be downloaded as a PDF file from www.endress.com. A list of the "Technical Information" documents available is provided in the "Documentation" section on → 127.

3.2.2 Mounting location

Entrained air or gas bubble formation in the measuring tube can result in an increase in measuring errors.
Avoid the following locations:
- Highest point of a pipeline. Risk of air accumulating!
- Directly upstream from a free pipe outlet in a vertical pipeline.

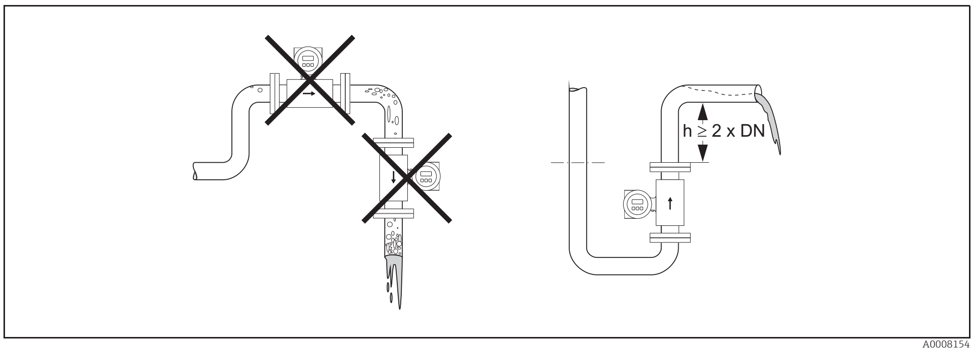


Fig. 6: Mounting location

Installation of pumps

Do **not** install the sensor on the intake side of a pump. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. Information on the lining's resistance to partial vacuum can be found on → 107.

It might be necessary to install pulse dampers in systems incorporating reciprocating, diaphragm or peristaltic pumps. Information on the measuring system's resistance to vibration and shock can be found on → 103.

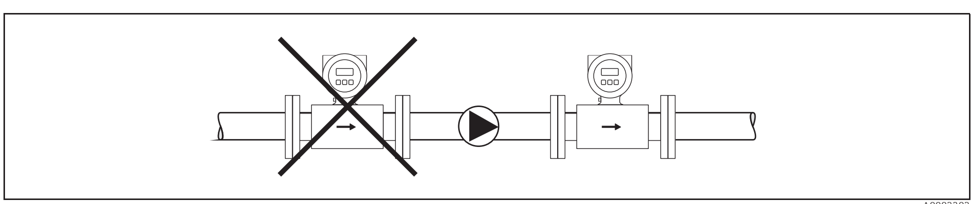
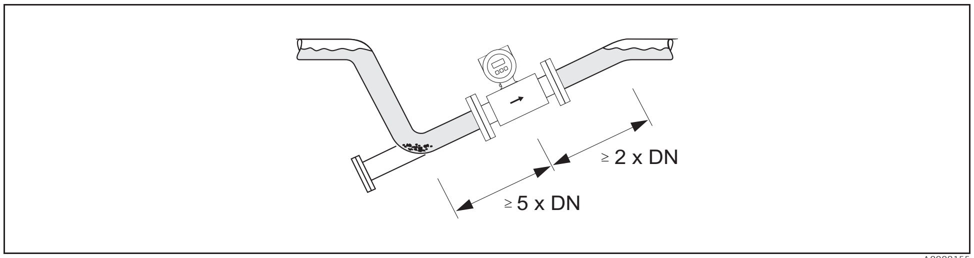


Fig. 7: Installation of pumps

Partially filled pipes

Partially filled pipes with gradients necessitate a drain-type configuration.
The Empty Pipe Detection function (EPD → 📄 76) offers additional protection by detecting empty or partially filled pipes.

Caution!
Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.

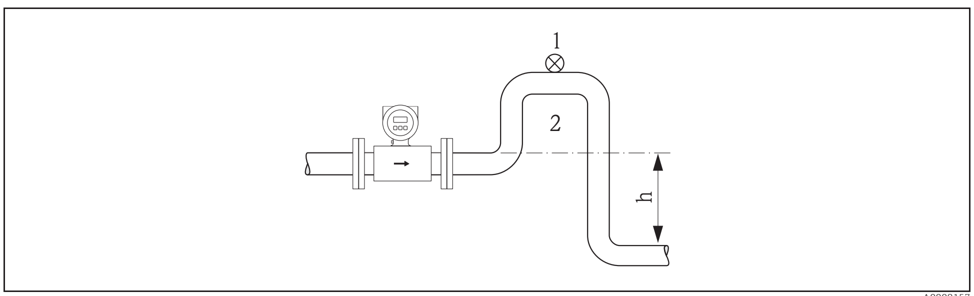


A0008155

Fig. 8: Installation in a partially filled pipe

Down pipes

Install a siphon or a vent valve downstream of the sensor in down pipes whose length h ≥ 5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube.
This measure also prevents the system losing prime, which could cause air pockets.
Information on the lining's resistance to partial vacuum can be found on → 📄 107.



A0008157

Fig. 9: Measures for installation in a down pipe

1 Vent valve
2 Pipe siphon
h Length of down pipe

3.2.3 Orientation

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube. However, Promag offers the additional Empty Pipe Detection (EPD) function to ensure the detection of partially filled measuring tubes, e.g. in the case of degassing fluids or varying process pressure:

- Electrode Cleaning Circuit (ECC) for applications with accretive fluids, e.g. electrically conductive deposits (→ "Description of Device Functions" manual).
- Empty Pipe Detection (EPD) ensures the detection of partially filled measuring tubes, e.g. in the case of degassing fluids (→ 76)
- Exchangeable Measuring Electrodes for abrasive fluids (→ 95)

Vertical orientation

This is the ideal orientation for self-emptying piping systems and for use in conjunction with Empty Pipe Detection.

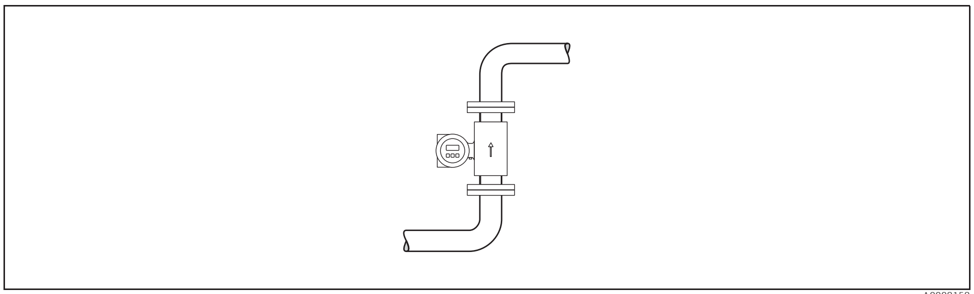


Fig. 10: Vertical orientation

Horizontal orientation

The measuring electrode plane should be horizontal. This prevents brief insulation of the two measuring electrodes by entrained air bubbles.

Caution!
Empty Pipe Detection functions correctly only when the measuring device is installed horizontally and the transmitter housing is facing upward (→ 10). Otherwise there is no guarantee that Empty Pipe Detection will respond if the measuring tube is only partially filled or empty.

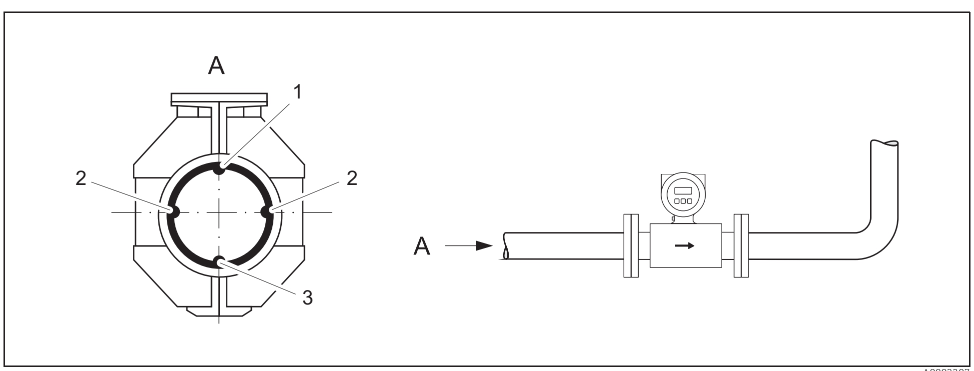
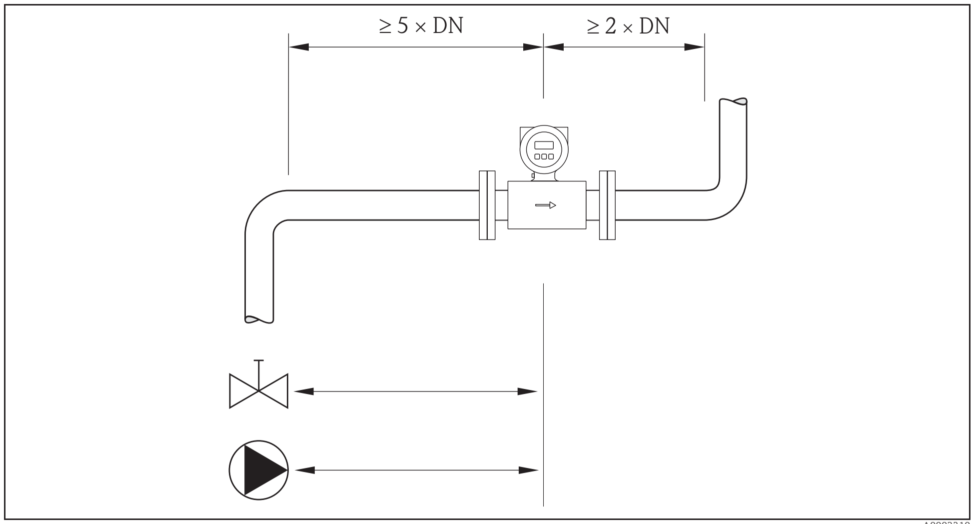


Fig. 11: Horizontal orientation

1 EPD electrode for the detection of empty pipes (not with Promag D and Promag H (DN 2 to 15 / 1/12 to ½"))
2 Measuring electrodes for signal detection
3 Reference electrode for the potential equalization (not with Promag D and H)

Inlet and outlet run

If possible, install the sensor upstream from fittings such as valves, T-pieces, elbows, etc. The following inlet and outlet runs must be observed in order to meet accuracy specifications:
- Inlet run: ≥ 5 × DN
- Outlet run: ≥ 2 × DN



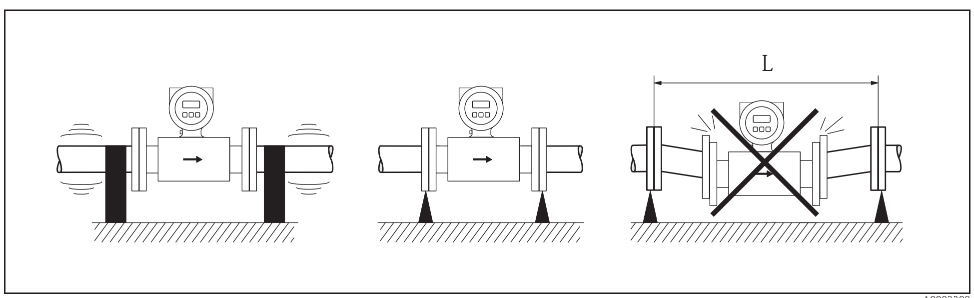
A0003210

Fig. 12: Inlet and outlet runs

3.2.4 Vibrations

Secure the piping and the sensor if vibration is severe.

Caution!
If vibrations are too severe, we recommend the sensor and transmitter be mounted separately. Information on resistance to vibration and shock can be found on → 103.



A0003208

Fig. 13: Measures to prevent vibration of the device (L > 10 m (32.8 ft))

3.2.5 Foundations, supports

If the nominal diameter is DN ≥ 350 (14"), mount the sensor on a foundation of adequate load-bearing strength.

Caution!
Risk of damage.
Do not support the weight of the sensor on the metal casing: the casing would buckle and damage the internal magnetic coils.

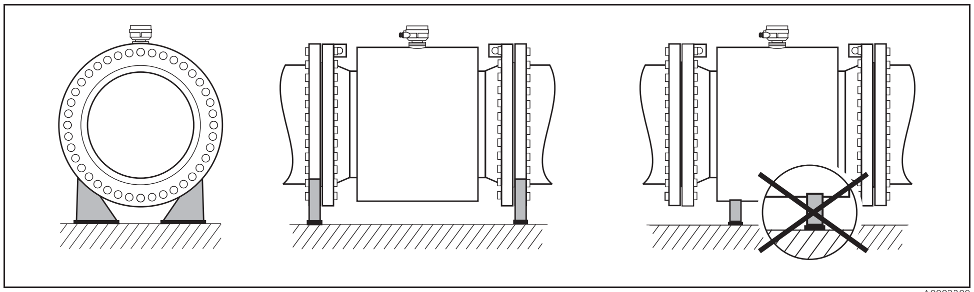


Fig. 14: Correct support for large nominal diameters (DN ≥ 350 / 14")

3.2.6 Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes.
The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids. The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders.

Note!
The nomogram only applies to liquids of viscosity similar to water.

1. Calculate the ratio of the diameters d/D.
2. From the nomogram read off the pressure loss as a function of flow velocity (*downstream* from the reduction) and the d/D ratio.

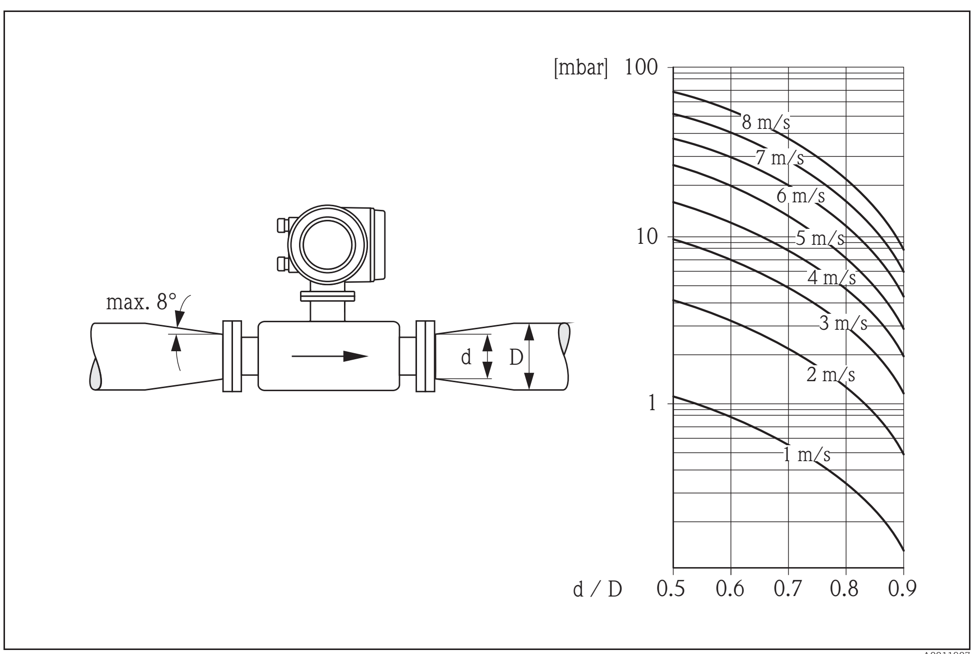


Fig. 15: Pressure loss due to adapters

3.2.7 Nominal diameter and flow rate

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 and 3 m/s (6.5 to 9.8 ft/s).

The velocity of flow (v), moreover, has to be matched to the physical properties of the fluid:
- v < 2 m/s (v < 6.5 ft/s): for abrasive fluids
- v > 2 m/s (v > 6.5 ft/s): for fluids producing buildup

Note!
Flow velocity can be increased, if necessary, by reducing the nominal diameter of the sensor (→ 16).

Recommended flow (SI units)

Nominal diameter	Promag D	Promag E/P	Promag H	Promag L	Promag W
[mm]	Min./max. full scale value (v ≈ 0.3 or 10 m/s) in [dm³/min]				
2	–	–	0.06 to 1.8	–	–
4	–	–	0.25 to 7	–	–
8	–	–	1 to 30	–	–
15	–	4 to 100	4 to 100	–	–
25	9 to 300	9 to 300	9 to 300	9 to 300	9 to 300
32	–	15 to 500	–	15 to 500	15 to 500
40	25 to 700	25 to 700	25 to 700	25 to 700	25 to 700
50	35 to 1100	35 to 1100	35 to 1100	35 to 1100	35 to 1100
65	60 to 2000	60 to 2000	60 to 2000	60 to 2000	60 to 2000
80	90 to 3000	90 to 3000	90 to 3000	90 to 3000	90 to 3000
100	145 to 4700	145 to 4700	145 to 4700	145 to 4700	145 to 4700
125	–	220 to 7500	–	220 to 7500	220 to 7500
[mm]	Min./max. full scale value (v ≈ 0.3 or 10 m/s) in [m³/h]				
150	–	20 to 600	–	20 to 600	20 to 600
200	–	35 to 1100	–	35 to 1100	35 to 1100
250	–	55 to 1700	–	55 to 1700	55 to 1700
300	–	80 to 2400	–	80 to 2400	80 to 2400
350	–	110 to 3300	–	110 to 3300	110 to 3300
375	–	–	–	140 to 4200	140 to 4200
400	–	140 to 4200	–	140 to 4200	140 to 4200
450	–	180 to 5400	–	180 to 5400	180 to 5400
500	–	220 to 6600	–	220 to 6600	220 to 6600
600	–	310 to 9600	–	310 to 9600	310 to 9600
700	–	–	–	420 to 13500	420 to 13500
750	–	–	–	480 to 15200	480 to 15200
800	–	–	–	550 to 18000	550 to 18000
900	–	–	–	690 to 22500	690 to 22500
1000	–	–	–	850 to 28000	850 to 28000
1050	–	–	–	950 to 40000	950 to 40000
1200	–	–	–	1250 to 40000	1250 to 40000
1400	–	–	–	–	1700 to 55000
1600	–	–	–	–	2200 to 70000
1800	–	–	–	–	2800 to 90000
2000	–	–	–	–	3400 to 110000

Recommended flow (US units)

Nominal diameter	Promag D	Promag E/P	Promag H	Promag L	Promag W
[inch]	Min./max. full scale value (v ≈ 0.3 or 10 m/s) in [gal/min]				
1/12"	–	–	0.015 to 0.5	–	–
1/8"	–	–	0.07 to 2	–	–
8"	–	–	0.25 to 8	–	–
½"	–	1.0 to 27	1.0 to 27	–	–
1"	2.5 to 80	2.5 to 80	2.5 to 80	2.5 to 80	2.5 to 80
1 ¼"	–	4 to 130	–	–	4 to 130
1 ½"	7 to 190	7 to 190	7 to 190	7 to 190	7 to 190
2"	10 to 300	10 to 300	10 to 300	10 to 300	10 to 300
2 ½"	16 to 500	16 to 500	16 to 500	16 to 500	16 to 500
3"	24 to 800	24 to 800	24 to 800	24 to 800	24 to 800
4"	40 to 1250	40 to 1250	40 to 1250	40 to 1250	40 to 1250
5"	–	60 to 1950	–	60 to 1950	60 to 1950
6"	–	90 to 2650	–	90 to 2650	90 to 2650
8"	–	155 to 4850	–	155 to 4850	155 to 4850
10"	–	250 to 7500	–	250 to 7500	250 to 7500
12"	–	350 to 10600	–	350 to 10600	350 to 10600
14"	–	500 to 15000	–	500 to 15000	500 to 15000
15"	–	–	–	600 to 19000	600 to 19000
16"	–	600 to 19000	–	600 to 19000	600 to 19000
18"	–	800 to 24000	–	800 to 24000	800 to 24000
20"	–	1000 to 30000	–	1000 to 30000	1000 to 30000
24"	–	1400 to 44000	–	1400 to 44000	1400 to 44000
28"	–	–	–	1900 to 60000	1900 to 60000
30"	–	–	–	2150 to 67000	2150 to 67000
32"	–	–	–	2450 to 80000	2450 to 80000
36"	–	–	–	3100 to 100000	3100 to 100000
40"	–	–	–	3800 to 125000	3800 to 125000
42"	–	–	–	4200 to 135000	4200 to 135000
48"	–	–	–	5500 to 175000	5500 to 175000
[inch]	Min./max. full scale value (v ≈ 0.3 or 10 m/s) in [Mgal/d]				
54"	–	–	–	–	9 to 300
60"	–	–	–	–	12 to 380
66"	–	–	–	–	14 to 500
72"	–	–	–	–	16 to 570
78"	–	–	–	–	18 to 650

3.2.8 Length of connecting cable

In order to ensure measuring accuracy, comply with the following instructions when installing the remote version:

- Fix cable run or lay in armored conduit. Cable movements can falsify the measuring signal especially in the case of low fluid conductivities.
- Route the cable well clear of electrical machines and switching elements.
- Ensure potential equalization between sensor and transmitter, if necessary.
- The permitted connecting cable length L_{max} is determined by the fluid conductivity (→ 16). A minimum conductivity of 20 μS/cm is required for measuring demineralized water. Most liquids can be measured as of a minimum conductivity of 5 μS/cm.
- The maximum connecting cable length is 10 m (32.8 ft) when empty pipe detection (EPD → 76) is switched on.

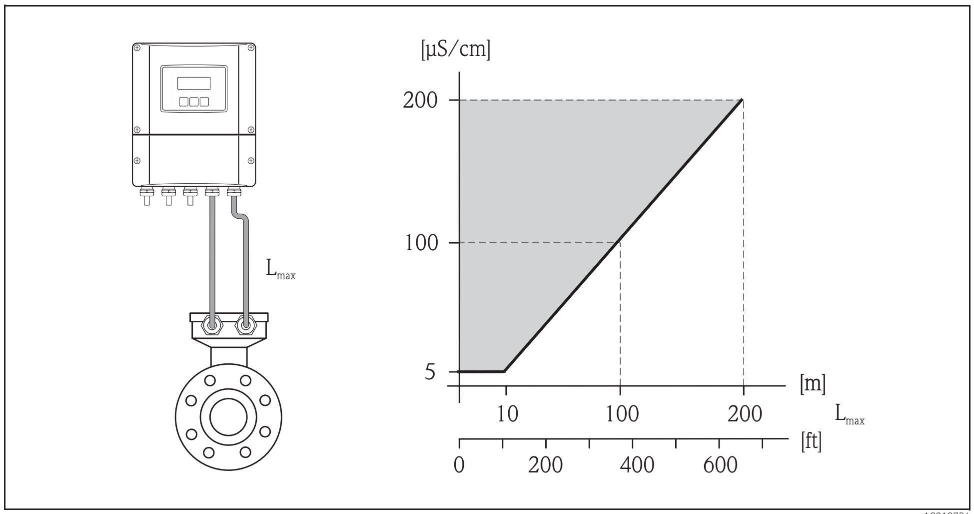


Fig. 16: Permissible cable length for the remote version

Area shaded gray = permitted range
Lmax = connecting cable length in [m]
Fluid conductivity in [μS/cm]

3.3 Installation instructions

3.3.1 Installing the Promag D sensor

The sensor is installed between the pipe flanges with a mounting kit. The device is centered using recesses on the sensor (→ 21).

Note!
A mounting kit consisting of mounting bolts, seals, nuts and washers can be ordered separately (→ 79). Centering sleeves are provided with the device if they are required for the installation.

Caution!
When installing the transmitter in the pipe, observe the necessary torques (→ 22).

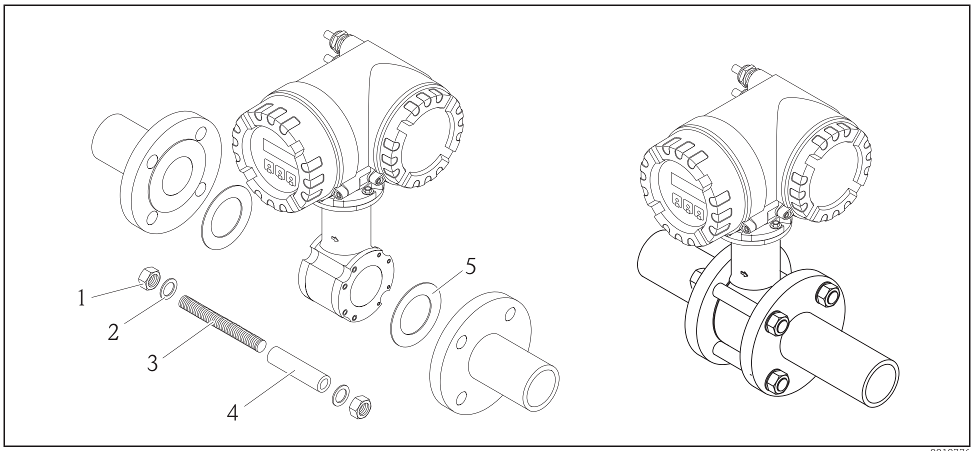


Fig. 17: Mounting the sensor

1 Nut
2 Washer
3 Mounting bolt
4 Centering sleeve
5 Seal

Seals

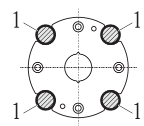
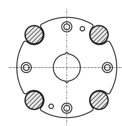
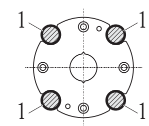
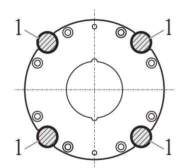
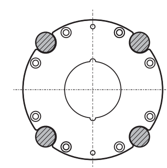
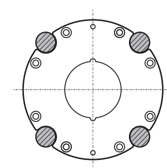
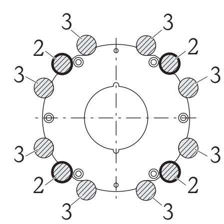
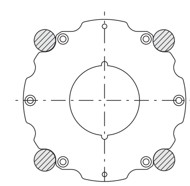
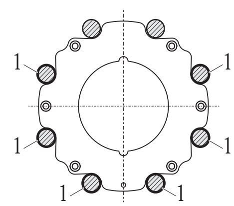
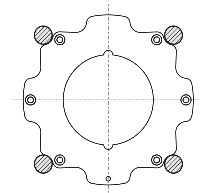
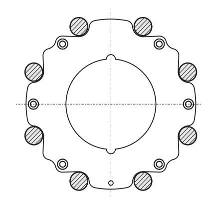
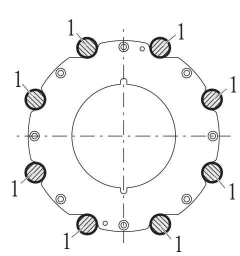
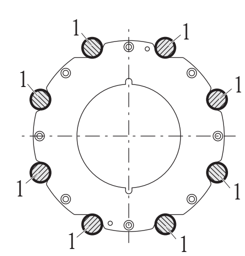
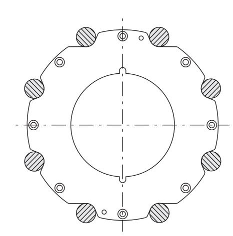
When installing the sensor, make sure that the seals used do not project into the pipe cross-section.

Caution!
Risk of short circuit! Do not use electrically conductive sealing compounds such as graphite! An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

Note!
Use seals with a hardness rating of 70° Shore A.

Arrangement of the mounting bolts and centering sleeves

The device is centered using recesses on the sensor. The arrangement of the mounting bolts and the use of the centering sleeves supplied depend on the nominal diameter, the flange standard und the pitch circle diameter.

	Process connection		
	EN (DIN)	ASME	JIS
DN 25 to 40 (1 to 1 ½")	 A0010896	 A0010824	 A0010896
DN 50 (2")	 A0010897	 A0010825	 A0010825
DN 65 (–)	 A0012170	----------------	 A0012171
DN 80 (3")	 A0010898	 A0010827	 A0010826
DN 100 (4")	 A0012168	 A0012168	 A0012169

1 = Mounting bolts with centering sleeves
2 = EN (DIN) flanges: 4-hole → with centering sleeves
3 = EN (DIN) flanges: 8-hole → without centering sleeves

Screw tightening torques (Promag D)

Please note the following:
- The tightening torques listed below are for lubricated threads only.
- Always tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

The tightening torques apply to situations where an EPDM soft material flat seal (e.g. 70° Shore A) is used.

Tightening torques, mounting bolts and centering sleeves for EN (DIN) PN 16

Nominal diameter	Mounting bolts	Centering sleeve length	Tightening torque [Nm] with a process flange with a	
[mm]	[mm]	[mm]	smooth seal face	raised face
25	4 × M12 × 145	54	19	19
40	4 × M16 × 170	68	33	33
50	4 × M16 × 185	82	41	41
65[1]	4 × M16 × 200	92	44	44
65[2]	8 × M16 × 200	– [3]	29	29
80	8 × M16 × 225	116	36	36
100	8 × M16 × 260	147	40	40

[1] EN (DIN) flanges: 4-hole → with centering sleeves
[2] EN (DIN) flanges: 8-hole → without centering sleeves
[3] A centering sleeve is not required. The device is centered directly via the sensor housing.

Tightening torques, mounting bolts and centering sleeves for JIS 10K

Nominal diameter	Mounting bolts	Centering sleeve length	Tightening torque [Nm] with a process flange with a	
[mm]	[mm]	[mm]	smooth seal face	raised face
25	4 × M16 × 170	54	24	24
40	4 × M16 × 170	68	32	25
50	4 × M16 × 185	– *	38	30
65	4 × M16 × 200	– *	42	42
80	8 × M16 × 225	– *	36	28
100	8 × M16 × 260	– *	39	37

* A centering sleeve is not required. The device is centered directly via the sensor housing.

Tightening torques, mounting bolts and centering sleeves for ASME Class 150

Nominal diameter	Mounting bolts	Centering sleeve length	Tightening torque [lbf · ft] with a process flange with a	
[inch]	[inch]	[inch]	smooth seal face	raised face
1"	4 × UNC 1/2" × 5.70"	– *	14	7
1 ½"	4 × UNC 1/2" × 6.50"	– *	21	14
2"	4 × UNC 5/8" × 7.50"	– *	30	27
3"	4 × UNC 5/8" × 9.25"	– *	31	31
4"	8 × UNC 5/8" × 10,4"	5,79	28	28

* A centering sleeve is not required. The device is centered directly via the sensor housing.

3.3.2 Installing the Promag E sensor

Caution!
- The protective covers mounted on the two sensor flanges guard the PTFE, which is turned over the flanges. Consequently, do not remove these covers until **immediately before** the sensor is installed in the pipe.
- The covers must remain in place while the device is in storage.
- Make sure that the lining is not damaged or removed from the flanges.

Note!
Bolts, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is designed for installation between the two piping flanges.
- Observe in any case the necessary screw tightening torques on → 24
- If grounding disks are used, follow the mounting instructions which will be enclosed with the shipment

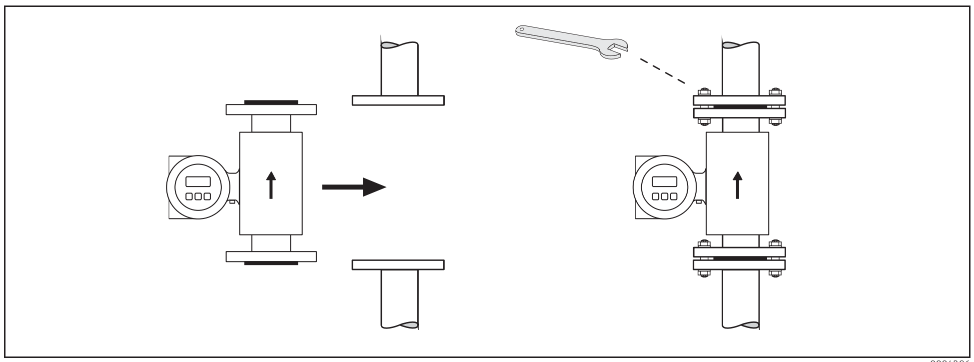

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Fig. 18: Installing the Promag E sensor

Seals

Comply with the following instructions when installing seals:
- PFA or PTFE lining → **No** seals are required!
- For DIN flanges, use only seals according to EN 1514-1.
- Make sure that the seals do not protrude into the piping cross-section.

Caution!
Risk of short circuit! Do not use electrically conductive sealing compounds such as graphite! An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

Ground cable

- If necessary, special ground cables for potential equalization can be ordered as an accessory (→ 79).
- Information on potential equalization and detailed mounting instructions for the use of ground cables can be found on → 56

Tightening torques for threaded fasteners (Promag E)

Please note the following:
- The tightening torques listed below are for lubricated threads only.
- Always tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Tightening torques for:
- EN (DIN) → 🖹 24
- ASME → 🖹 25
- JIS → 🖹 25

Promag E tightening torques for EN (DIN)

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque [Nm]
15	PN 40	4 × M 12	11
25	PN 40	4 × M 12	26
32	PN 40	4 × M 16	41
40	PN 40	4 × M 16	52
50	PN 40	4 × M 16	65
65 *	PN 16	8 × M 16	43
80	PN 16	8 × M 16	53
100	PN 16	8 × M 16	57
125	PN 16	8 × M 16	75
150	PN 16	8 × M 20	99
200	PN 10	8 × M 20	141
200	PN 16	12 × M 20	94
250	PN 10	12 × M 20	110
250	PN 16	12 × M 24	131
300	PN 10	12 × M 20	125
300	PN 16	12 × M 24	179
350	PN 6	12 × M 20	200
350	PN 10	16 × M 20	188
350	PN 16	16 × M 24	254
400	PN 6	16 × M 20	166
400	PN 10	16 × M 24	260
400	PN 16	16 × M 27	330
450	PN 6	16 × M 20	202
450	PN 10	20 × M 24	235
450	PN 16	20 × M 27	300
500	PN 6	20 × M 20	176
500	PN 10	20 × M 24	265
500	PN 16	20 × M 30	448
600	PN 6	20 × M 24	242
600	PN 10	20 × M 27	345
600 *	PN 16	20 × M 33	658
* Designed acc. to EN 1092-1 (not to DIN 2501)			

Promag E tightening torques for ASME

Nominal diameter		ASME		Max. tightening torque PTFE	
[mm]	[inch]	Pressure rating [lbs]	Threaded fasteners	[Nm]	[lbf · ft]
15	½"	Class 150	4 × ½"	6	4
25	1"	Class 150	4 × ½"	11	8
40	1 ½"	Class 150	4 × ½"	24	18
50	2"	Class 150	4 × 5/8"	47	35
80	3"	Class 150	4 × 5/8"	79	58
100	4"	Class 150	8 × 5/8"	56	41
150	6"	Class 150	8 × ¾"	106	78
200	8"	Class 150	8 × ¾"	143	105
250	10"	Class 150	12 × 7/8"	135	100
300	12"	Class 150	12 × 7/8"	178	131
350	14"	Class 150	12 × 1"	260	192
400	16"	Class 150	16 × 1"	246	181
450	18"	Class 150	16 × 1 1/8"	371	274
500	20"	Class 150	20 × 1 1/8"	341	252
600	24"	Class 150	20 × 1 ¼"	477	352

Promag E tightening torques for JIS

Nominal diameter [mm]	JIS Pressure rating	Threaded fasteners	Max. tightening torque [Nm] PTFE
15	20K	4 × M 12	16
25	20K	4 × M 16	32
32	20K	4 × M 16	38
40	20K	4 × M 16	41
50	10K	4 × M 16	54
65	10K	4 × M 16	74
80	10K	8 × M 16	38
100	10K	8 × M 16	47
125	10K	8 × M 20	80
150	10K	8 × M 20	99
200	10K	12 × M 20	82
250	10K	12 × M 22	133
300	10K	16 × M 22	99

3.3.3 Installing the Promag H sensor

The sensor is supplied to order, with or without pre-installed process connections. Pre-installed process connections are secured to the sensor with 4 or 6 hex-head threaded fasteners.

Caution!
The sensor might require support or additional attachments, depending on the application and the length of the piping run. When plastic process connections are used, the sensor must be additionally supported mechanically. A wall-mounting kit can be ordered separately from Endress+Hauser as an accessory (→ 79).

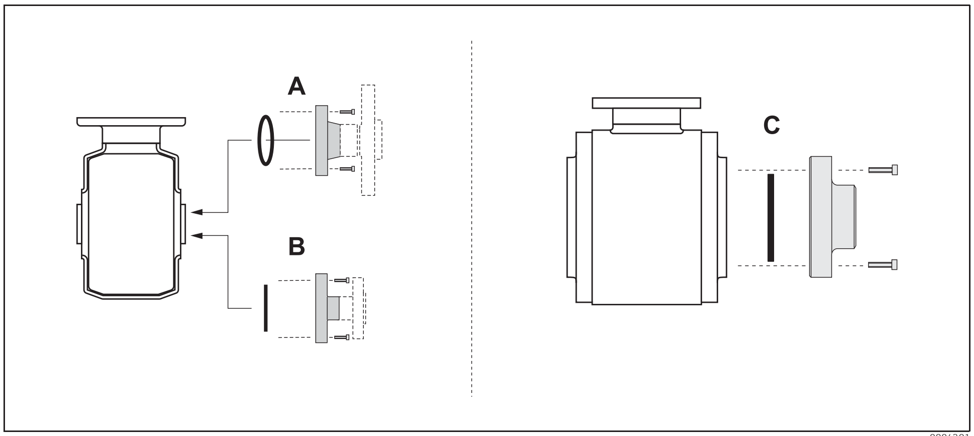

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Abb. 19: Promag H process connections (DN 2 to 25 / 1/12 to 1", DN 40 to 100 / 1½ to 4")

A = DN 2 to 25 / 1/12 to 1": process connections with O-ring
- *welding flanges (DIN EN ISO 1127, ODT / SMS),*
- *flange (EN (DIN), ASME, JIS), flange PVDF (EN (DIN), ASME, JIS)*
- *external and internal thread, hose connection, PVC adhesive fitting*

B = DN 2 to 25 / 1/12 to 1": process connections with aseptic gasket vseal
- *weld nipples (DIN 11850, ODT/SMS)*
- *Clamp (ISO 2852, DIN 32676, L14 AM7)*
- *coupling (DIN 11851, DIN 11864-1, SMS 1145)*
- *flange DIN 11864-2*

C = DN 40 to 100 / 1½ to 4": process connections with aseptic gasket seal
- *weld nipples (DIN 11850, ODT/SMS)*
- *Clamp (ISO 2852, DIN 32676, L14 AM7)*
- *coupling (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145)*
- *flange DIN 11864-2*

Seals

When installing the process connections, make sure that the seals are clean and correctly centered.

Caution!
- With metal process connections, you must fully tighten the screws. The process connection forms a metallic connection with the sensor, which ensures a defined compression of the seal.
- With plastic process connections, note the max. torques for lubricated threads (7 Nm / 5.2 lbf ft). With plastic flanges, always use seals between connection and counter flange.
- The seals must be replaced periodically, depending on the application, particularly in the case of gasket seals (aseptic version)!
  The period between changes depends on the frequency of cleaning cycles, the cleaning temperature and the fluid temperature. Replacement seals can be ordered as accessories → 79.

Usage and assembly of ground rings (DN 2 to 25 / 1/12 to 1")

In case the process connections are made of plastic (e.g. flanges or adhesive fittings), the potential between the sensor and the fluid must be equalized using additional ground rings. If the ground rings are not installed this can affect the accuracy of the measurements or cause the destruction of the sensor through the electrochemical erosion of the electrodes.

Caution!
- Depending on the option ordered, plastic disks may be installed at the process connections instead of ground rings. These plastic disks serve only as spacers and have no potential equalization function. In addition, they provide a sealing function at the interface between the sensor and process connection. For this reason, with process connections without ground rings, these plastic disks/seals must not be removed, or must always be installed.
- Ground rings can be ordered separately from Endress+Hauser as accessories (→ 📄 79). When placing the order, make certain that the ground ring is compatible with the material used for the electrodes. Otherwise, there is a risk that the electrodes may be destroyed by electrochemical corrosion! Information about the materials can be found on → 📄 120.
- Ground rings, including the seals, are mounted within the process connections. Therefore, the fitting length is not affected.

1. Loosen the four or six hexagonal headed bolts (1) and remove the process connection from the sensor (4).
2. Remove the plastic disk (3), including the two O-ring seals (2).
3. Place one seal (2) in the groove of the process connection.
4. Place the metal ground ring (3) on the process connection.
5. Now place the second seal (2) in the groove of the ground ring.
6. Finally, mount the process connection on the sensor again.
   With plastic process connections, note the max. torques for lubricated threads (7 Nm / 5.2 lbf ft).

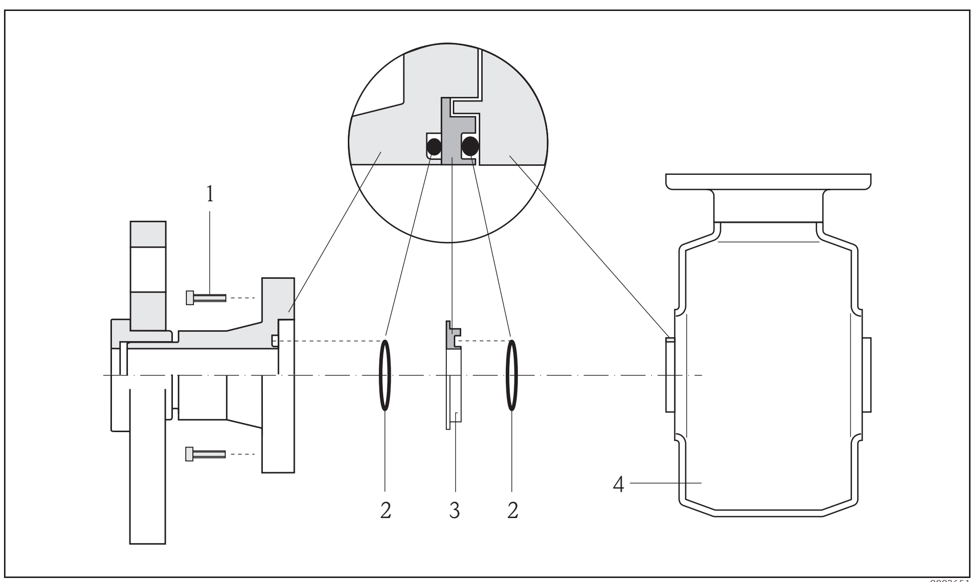


Fig. 20: Installing ground rings with Promag H (DN 2 to 25 / 1/12 to 1")

1 = Hexagonal-headed bolt (process connection)
2 = O-ring seals
3 = Ground ring or plastic disk (spacer)
4 = Sensor

Welding the transmitter into the piping (weld nipples)

Caution!
Risk of destroying the measuring electronics. Make sure that the welding machine is *not* grounded via the sensor or the transmitter.

1. Tack-weld the sensor into the pipe. A suitable welding jig can be ordered separately as an accessory (→ 📄 79).
2. Loosen the screws on the process connection flange and remove the sensor, complete with the seal, from the pipe.
3. Weld the process connection to the pipe.
4. Reinstall the sensor in the pipe. Make sure that everything is clean and that the seal is correctly seated.

Note!
- If thin-walled foodstuffs pipes are not welded correctly, the heat could damage the installed seal. It is therefore advisable to remove the sensor and the seal prior to welding.
- The pipe has to be spread approximately 8 mm to permit disassembly.

Cleaning with pigs

If pigs are used for cleaning, it is essential to take the inside diameters of the measuring tube and process connection into account. All the dimensions and lengths of the sensor and transmitter are provided in the separate documentation "Technical Documentation" → 📄 127.

3.3.4 Installing the Promag L sensor

Caution!
- The protective covers mounted on the two sensor flanges (DN 25 to 300 / 1 to 12") are used to hold the lap joint flanges in place and to protect the PTFE liner during transportation. Consequently, do not remove these covers until immediately before the sensor is installed in the pipe.
- The covers must remain in place while the device is in storage.
- Make sure that the lining is not damaged or removed from the flanges.

Note!
Bolts, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is designed for installation between the two piping flanges.
- Observe in any case the necessary screw tightening torques on → 📄 30
- If grounding disks are used, follow the mounting instructions which will be enclosed with the shipment
- To comply with the device specification, a concentrical installation in the measuring section is required

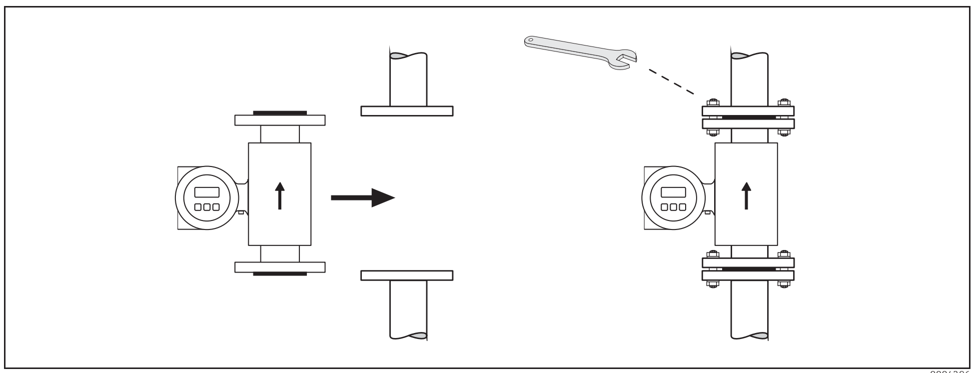


Fig. 21: Installing the Promag L sensor

Seals

Comply with the following instructions when installing seals:
- Hard rubber lining → additional seals are **always** necessary.
- Polyurethane lining → **no** seals are required.
- PTFE lining → **no** seals are required.
- For DIN flanges, use only seals according to EN 1514-1.
- Make sure that the seals do not protrude into the piping cross-section.

Caution!
Risk of short circuit!
Do not use electrically conductive sealing compounds such as graphite! An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

Ground cable

- If necessary, special ground cables for potential equalization can be ordered as an accessory (→ 📄 79).
- Information on potential equalization and detailed mounting instructions for the use of ground cables can be found on → 📄 58.

Screw tightening torques (Promag L)

Please note the following:
- The tightening torques listed below are for lubricated threads only.
- Always tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Promag L tightening torques for EN (DIN)

Nominal diameter	EN (DIN)		Max. tightening torque		
			Hard rubber	Polyurethane	PTFE
[mm]	Pressure rating [bar]	Threaded fasteners	[Nm]	[Nm]	[Nm]
25	PN 10/16	4 × M 12	-	6	11
32	PN 10/16	4 × M 16	-	16	27
40	PN 10/16	4 × M 16	-	16	29
50	PN 10/16	4 × M 16	-	15	40
65*	PN 10/16	8 × M 16	-	10	22
80	PN 10/16	8 × M 16	-	15	30
100	PN 10/16	8 × M 16	-	20	42
125	PN 10/16	8 × M 16	-	30	55
150	PN 10/16	8 × M 20	-	50	90
200	PN 16	12 × M 20	-	65	87
250	PN 16	12 × M 24	-	126	151
300	PN 16	12 × M 24	-	139	177
350	PN 6	12 × M 20	111	120	-
350	PN 10	16 × M 20	112	118	-
400	PN 6	16 × M 20	90	98	-
400	PN 10	16 × M 24	151	167	-
450	PN 6	16 × M 20	112	126	-
450	PN 10	20 × M 24	153	133	-
500	PN 6	20 × M 20	119	123	-
500	PN 10	20 × M 24	155	171	-
600	PN 6	20 × M 24	139	147	-
600	PN 10	20 × M 27	206	219	-
700	PN 6	24 × M 24	148	139	-
700	PN 10	24 × M 27	246	246	-
800	PN 6	24 × M 27	206	182	-
800	PN 10	24 × M 30	331	316	-
900	PN 6	24 × M 27	230	637	-
900	PN 10	28 × M 30	316	307	-
1000	PN 6	28 × M 27	218	208	-
1000	PN 10	28 × M 33	402	405	-
1200	PN 6	32 × M 30	319	299	-
1200	PN 10	32 × M 36	564	568	-
* Designed acc. to EN 1092-1 (not to DIN 2501)					

Promag L tightening torques for ASME

Nominal diameter		ASME	Threaded fasteners	Max. tightening torque					
		Pressure rating		Hard rubber		Polyurethane		PTFE	
[mm]	[inch]	[lbs]		[Nm]	[lbf · ft]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
25	1"	Class 150	4 × 5/8"	-	-	5	4	14	13
40	1 ½"	Class 150	8 × 5/8"	-	-	10	17	21	15
50	2"	Class 150	4 × 5/8"	-	-	15	11	40	29
80	3"	Class 150	4 × 5/8"	-	-	25	18	65	48
100	4"	Class 150	8 × 5/8"	-	-	20	15	44	32
150	6"	Class 150	8 × ¾"	-	-	45	33	90	66
200	8"	Class 150	8 × ¾"	-	-	65	48	87	64
250	10"	Class 150	12 × 7/8"	-	-	126	93	151	112
300	12"	Class 150	12 × 7/8"	-	-	146	108	177	131
350	14"	Class 150	12 × 1"	135	100	158	117	-	-
400	16"	Class 150	16 × 1"	128	94	150	111	-	-
450	18"	Class 150	16 × 1 1/8"	204	150	234	173	-	-
500	20"	Class 150	20 × 1 1/8"	183	135	217	160	-	-
600	24"	Class 150	20 × 1 ¼"	268	198	307	226	-	-

Promag L tightening torques for AWWA

Nominal diameter		AWWA	Threaded fasteners	Max. tightening torque					
		Pressure rating		Hartgummi		Polyurethane		PTFE	
[mm]	[inch]			[Nm]	[lbf · ft]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
700	28"	Class D	28 × 1 ¼"	247	182	292	215	-	-
750	30"	Class D	28 × 1 ¼"	287	212	302	223	-	-
800	32"	Class D	28 × 1 ½"	394	291	422	311	-	-
900	36"	Class D	32 × 1 ½"	419	309	430	317	-	-
1000	40"	Class D	36 × 1 ½"	420	310	477	352	-	-
1050	42"	Class D	36 × 1 ½"	528	389	518	382	-	-
1200	48"	Class D	44 × 1 ½"	552	407	531	392	-	-

Promag L tightening torques for AS 2129

Nominal diameter	AS 2129	Threaded fasteners	Max. tightening torque		
	Pressure rating		Hard rubber	Polyurethane	PTFE
[mm]			[Nm]	[Nm]	[Nm]
350	Table E	12 × M 24	203	-	-
400	Table E	12 × M 24	226	-	-
450	Table E	16 × M 24	226	-	-
500	Table E	16 × M 24	271	-	-
600	Table E	16 × M 30	439	-	-
700	Table E	20 × M 30	355	-	-
750	Table E	20 × M 30	559	-	-
800	Table E	20 × M 30	631	-	-
900	Table E	24 × M 30	627	-	-
1000	Table E	24 × M 30	634	-	-
1200	Table E	32 × M 30	727	-	-

Promag L tightening torques for AS 4087

Nominal diameter	AS 4087	Threaded fasteners	Max. tightening torque		
	Pressure rating		Hard rubber	Polyurethane	PTFE
[mm]			[Nm]	[Nm]	[Nm]
350	PN 16	12 × M 24	203	-	-
375	PN 16	12 × M 24	137	-	-
400	PN 16	12 × M 24	226	-	-
450	PN 16	12 × M 24	301	-	-
500	PN 16	16 × M 24	271	-	-
600	PN 16	16 × M 27	393	-	-
700	PN 16	20 × M 27	330	-	-
750	PN 16	20 × M 30	529	-	-
800	PN 16	20 × M 33	631	-	-
900	PN 16	24 × M 33	627	-	-
1000	PN 16	24 × M 33	595	-	-
1200	PN 16	32 × M 33	703	-	-

3.3.5 Installing the Promag P sensor

Caution!
- The protective covers mounted on the two sensor flanges guard the PTFE, which is turned over the flanges. Consequently, do not remove these covers until **immediately before** the sensor is installed in the pipe.
- The covers must remain in place while the device is in storage.
- Make sure that the lining is not damaged or removed from the flanges.

Note!
Bolts, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is designed for installation between the two piping flanges.
- Observe in any case the necessary screw tightening torques on → 34
- If grounding disks are used, follow the mounting instructions which will be enclosed with the shipment

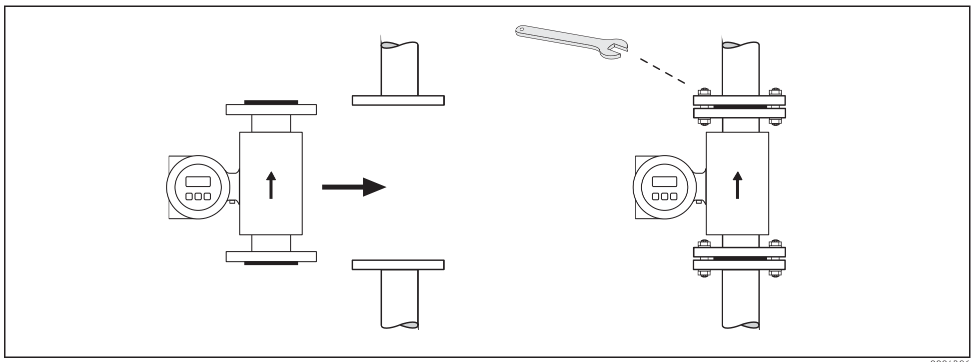


Fig. 22: Installing the Promag P sensor

Seals

Comply with the following instructions when installing seals:
- PFA or PTFE lining → **No** seals are required!
- For DIN flanges, use only seals according to EN 1514-1.
- Make sure that the seals do not protrude into the piping cross-section.

Caution!
Risk of short circuit! Do not use electrically conductive sealing compounds such as graphite! An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

Ground cable

- If necessary, special ground cables for potential equalization can be ordered as an accessory (→ 79).
- Information on potential equalization and detailed mounting instructions for the use of ground cables can be found on → 56

Installing the high-temperature version (with PFA lining)

The high-temperature version has a housing support for the thermal separation of sensor and transmitter. The high-temperature version is always used for applications in which high ambient temperatures are encountered **in conjunction with** high fluid temperatures. The high-temperature version is obligatory if the fluid temperature exceeds +150 °C.

Note!
You will find information on permissible temperature ranges on → 104

Insulation

Pipes generally have to be insulated if they carry very hot fluids, in order to avoid energy losses and to prevent accidental contact with pipes at temperatures that could cause injury. Guidelines regulating the insulation of pipes have to be taken into account.

Caution!
Risk of measuring electronics overheating. The housing support dissipates heat and its entire surface area must remain uncovered. Make sure that the sensor insulation does not extend past the top of the two sensor shells.

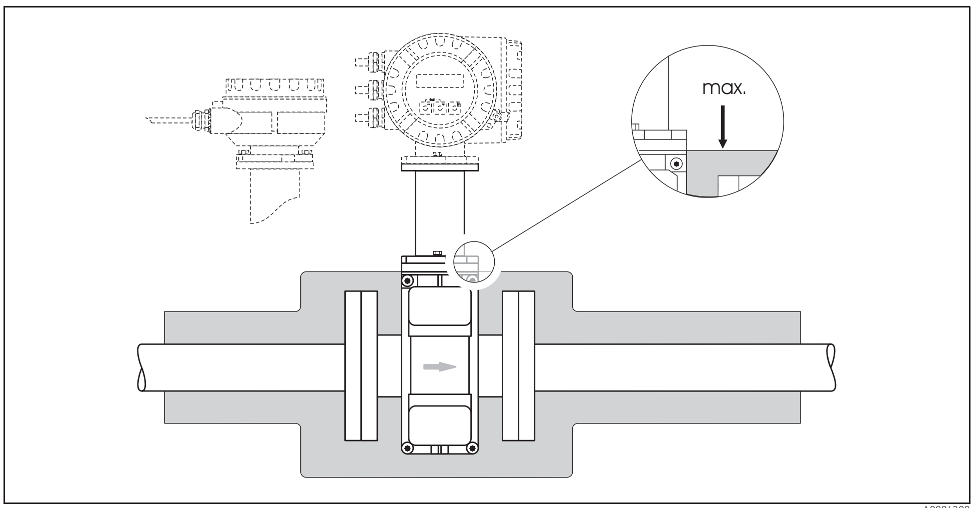


Fig. 23: Promag P (high-temperature version): Insulating the pipe

Tightening torques for threaded fasteners (Promag P)

Please note the following:
- The tightening torques listed below are for lubricated threads only.
- Always tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Tightening torques for:
- EN (DIN) → 35
- ASME → 35
- JIS → 36
- AS 2129 → 36
- AS 4087 → 36

Promag P tightening torques for EN (DIN)

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque [Nm] PTFE	PFA
15	PN 40	4 × M 12	11	–
25	PN 40	4 × M 12	26	20
32	PN 40	4 × M 16	41	35
40	PN 40	4 × M 16	52	47
50	PN 40	4 × M 16	65	59
65 *	PN 16	8 × M 16	43	40
65	PN 40	8 × M 16	43	40
80	PN 16	8 × M 16	53	48
80	PN 40	8 × M 16	53	48
100	PN 16	8 × M 16	57	51
100	PN 40	8 × M 20	78	70
125	PN 16	8 × M 16	75	67
125	PN 40	8 × M 24	111	99
150	PN 16	8 × M 20	99	85
150	PN 40	8 × M 24	136	120
200	PN 10	8 × M 20	141	101
200	PN 16	12 × M 20	94	67
200	PN 25	12 × M 24	138	105
250	PN 10	12 × M 20	110	–
250	PN 16	12 × M 24	131	–
250	PN 25	12 × M 27	200	–
300	PN 10	12 × M 20	125	–
300	PN 16	12 × M 24	179	–
300	PN 25	16 × M 27	204	–
350	PN 10	16 × M 20	188	–
350	PN 16	16 × M 24	254	–
350	PN 25	16 × M 30	380	–
400	PN 10	16 × M 24	260	–
400	PN 16	16 × M 27	330	–
400	PN 25	16 × M 33	488	–
450	PN 10	20 × M 24	235	–
450	PN 16	20 × M 27	300	–
450	PN 25	20 × M 33	385	–
500	PN 10	20 × M 24	265	–
500	PN 16	20 × M 30	448	–
500	PN 25	20 × M 33	533	–
600	PN 10	20 × M 27	345	–
600 *	PN 16	20 × M 33	658	–
600	PN 25	20 × M 36	731	–
* Designed acc. to EN 1092-1 (not to DIN 2501)				

Promag P tightening torques for ASME

Nominal diameter [mm]	[inch]	ASME Pressure rating [lbs]	Threaded fasteners	Max. tightening torque PTFE [Nm]	PTFE [lbf · ft]	PFA [Nm]	PFA [lbf · ft]
15	½"	Class 150	4 × ½"	6	4	–	–
15	½"	Class 300	4 × ½"	6	4	–	–
25	1"	Class 150	4 × ½"	11	8	10	7
25	1"	Class 300	4 × 5/8"	14	10	12	9
40	1 ½"	Class 150	4 × ½"	24	18	21	15
40	1 ½"	Class 300	4 × ¾"	34	25	31	23
50	2"	Class 150	4 × 5/8"	47	35	44	32
50	2"	Class 300	8 × 5/8"	23	17	22	16
80	3"	Class 150	4 × 5/8"	79	58	67	49

Nominal diameter		ASME		Max. tightening torque			
		Pressure	Threaded	PTFE		PFA	
[mm]	[inch]	rating [lbs]	fasteners	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
80	3"	Class 300	8 × ¾"	47	35	42	31
100	4"	Class 150	8 × 5/8"	56	41	50	37
100	4"	Class 300	8 × ¾"	67	49	59	44
150	6"	Class 150	8 × ¾"	106	78	86	63
150	6"	Class 300	12 × ¾"	73	54	67	49
200	8"	Class 150	8 × ¾"	143	105	109	80
250	10"	Class 150	12 × 7/8"	135	100	–	–
300	12"	Class 150	12 × 7/8"	178	131	–	–
350	14"	Class 150	12 × 1"	260	192	–	–
400	16"	Class 150	16 × 1"	246	181	–	–
450	18"	Class 150	16 × 1 1/8"	371	274	–	–
500	20"	Class 150	20 × 1 1/8"	341	252	–	–
600	24"	Class 150	20 × 1 ¼"	477	352	–	–

Promag P tightening torques for JIS

Nominal diameter	JIS		Max. tightening torque [Nm]	
[mm]	Pressure rating	Threaded fasteners	PTFE	PFA
25	10K	4 × M 16	32	27
25	20K	4 × M 16	32	27
32	10K	4 × M 16	38	–
32	20K	4 × M 16	38	–
40	10K	4 × M 16	41	37
40	20K	4 × M 16	41	37
50	10K	4 × M 16	54	46
50	20K	8 × M 16	27	23
65	10K	4 × M 16	74	63
65	20K	8 × M 16	37	31
80	10K	8 × M 16	38	32
80	20K	8 × M 20	57	46
100	10K	8 × M 16	47	38
100	20K	8 × M 20	75	58
125	10K	8 × M 20	80	66
125	20K	8 × M 22	121	103
150	10K	8 × M 20	99	81
150	20K	12 × M 22	108	72
200	10K	12 × M 20	82	54
200	20K	12 × M 22	121	88
250	10K	12 × M 22	133	–
250	20K	12 × M 24	212	–
300	10K	16 × M 22	99	–
300	20K	16 × M 24	183	–

Promag P tightening torques for AS 2129

Nominal diameter [mm]	AS 2129 Pressure rating	Threaded fasteners	Max. tightening torque [Nm] PTFE
25	Table E	4 × M 12	21
50	Table E	4 × M 16	42

Promag P tightening torques for AS 4087

Nominal diameter [mm]	AS 4087 Pressure rating	Threaded fasteners	Max. tightening torque [Nm] PTFE
50	PN 16	4 × M 16	42

3.3.6 Installing the Promag W sensor

Note!
Bolts, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is designed for installation between the two piping flanges.
- Observe in any case the necessary screw tightening torques on → 37
- If grounding disks are used, follow the mounting instructions which will be enclosed with the shipment

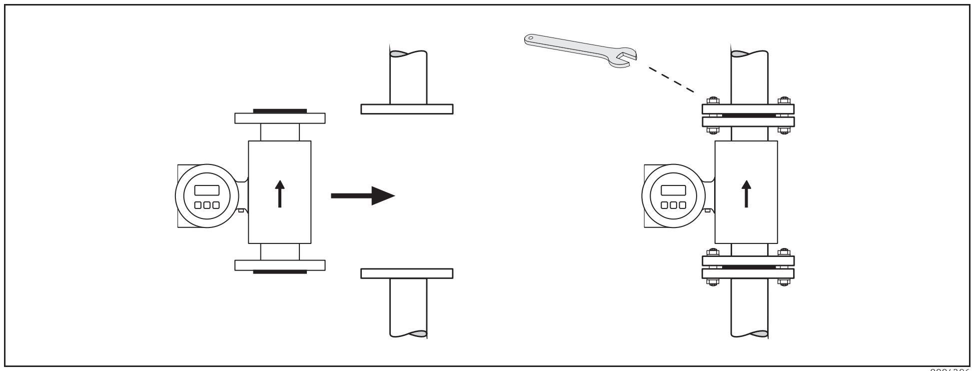


Fig. 24: Installing the Promag W sensor

Seals

Comply with the following instructions when installing seals:
- Hard rubber lining → additional seals are **always** necessary.
- Polyurethane lining → **no** seals are required.
- For DIN flanges, use only seals according to EN 1514-1.
- Make sure that the seals do not protrude into the piping cross-section.

Caution!
Risk of short circuit!
Do not use electrically conductive sealing compounds such as graphite! An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

Ground cable

- If necessary, special ground cables for potential equalization can be ordered as an accessory (→ 79).
- Information on potential equalization and detailed mounting instructions for the use of ground cables can be found on → 58

Screw tightening torques (Promag W)

Please note the following:
- The tightening torques listed below are for lubricated threads only.
- Always tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Tightening torques for:
- EN (DIN)→ 📄 38
- JIS→ 📄 40
- ASME→ 📄 39
- AWWA → 📄 40
- AS 2129 → 📄 41
- AS 4087 → 📄 41

Promag W tightening torques for EN (DIN)

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque [Nm] Hard rubber	Polyurethane
25	PN 40	4 × M 12	-	15
32	PN 40	4 × M 16	-	24
40	PN 40	4 × M 16	-	31
50	PN 40	4 × M 16	48	40
65*	PN 16	8 × M 16	32	27
65	PN 40	8 × M 16	32	27
80	PN 16	8 × M 16	40	34
80	PN 40	8 × M 16	40	34
100	PN 16	8 × M 16	43	36
100	PN 40	8 × M 20	59	50
125	PN 16	8 × M 16	56	48
125	PN 40	8 × M 24	83	71
150	PN 16	8 × M 20	74	63
150	PN 40	8 × M 24	104	88
200	PN 10	8 × M 20	106	91
200	PN 16	12 × M 20	70	61
200	PN 25	12 × M 24	104	92
250	PN 10	12 × M 20	82	71
250	PN 16	12 × M 24	98	85
250	PN 25	12 × M 27	150	134
300	PN 10	12 × M 20	94	81
300	PN 16	12 × M 24	134	118
300	PN 25	16 × M 27	153	138
350	PN 6	12 × M 20	111	120
350	PN 10	16 × M 20	112	118
350	PN 16	16 × M 24	152	165
350	PN 25	16 × M 30	227	252
400	PN 6	16 × M 20	90	98
400	PN 10	16 × M 24	151	167
400	PN 16	16 × M 27	193	215
400	PN 25	16 × M 33	289	326
450	PN 6	16 × M 20	112	126
450	PN 10	20 × M 24	153	133
450	PN 16	20 × M 27	198	196
450	PN 25	20 × M 33	256	253
500	PN 6	20 × M 20	119	123
500	PN 10	20 × M 24	155	171
500	PN 16	20 × M 30	275	300
500	PN 25	20 × M 33	317	360
600	PN 6	20 × M 24	139	147
600	PN 10	20 × M 27	206	219
600 *	PN 16	20 × M 33	415	443
600	PN 25	20 × M 36	431	516
700	PN 6	24 × M 24	148	139
700	PN 10	24 × M 27	246	246
700	PN 16	24 × M 33	278	318

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque [Nm]	
			Hard rubber	Polyurethane
700	PN 25	24 × M 39	449	507
800	PN 6	24 × M 27	206	182
800	PN 10	24 × M 30	331	316
800	PN 16	24 × M 36	369	385
800	PN 25	24 × M 45	664	721
900	PN 6	24 × M 27	230	637
900	PN 10	28 × M 30	316	307
900	PN 16	28 × M 36	353	398
900	PN 25	28 × M 45	690	716
1000	PN 6	28 × M 27	218	208
1000	PN 10	28 × M 33	402	405
1000	PN 16	28 × M 39	502	518
1000	PN 25	28 × M 52	970	971
1200	PN 6	32 × M 30	319	299
1200	PN 10	32 × M 36	564	568
1200	PN 16	32 × M 45	701	753
1400	PN 6	36 × M 33	430	398
1400	PN 10	36 × M 39	654	618
1400	PN 16	36 × M 45	729	762
1600	PN 6	40 × M 33	440	417
1600	PN 10	40 × M 45	946	893
1600	PN 16	40 × M 52	1007	1100
1800	PN 6	44 × M 36	547	521
1800	PN 10	44 × M 45	961	895
1800	PN 16	44 × M 52	1108	1003
2000	PN 6	48 × M 39	629	605
2000	PN 10	48 × M 45	1047	1092
2000	PN 16	48 × M 56	1324	1261
* Designed acc. to EN 1092-1 (not to DIN 2501)				

Promag W tightening torques for ASME

Nominal diameter [mm]	[inch]	ASME Pressure rating [lbs]	Threaded fasteners	Max. tightening torque Hard rubber [Nm]	[lbf · ft]	Polyurethane [Nm]	[lbf · ft]
25	1"	Class 150	4 × ½"	-	-	7	5
25	1"	Class 300	4 × 5/8"	-	-	8	6
40	1 ½"	Class 150	4 × ½"	-	-	10	7
40	1 ½"	Class 300	4 × ¾"	-	-	15	11
50	2"	Class 150	4 × 5/8"	35	26	22	16
50	2"	Class 300	8 × 5/8"	18	13	11	8
80	3"	Class 150	4 × 5/8"	60	44	43	32
80	3"	Class 300	8 × ¾"	38	28	26	19
100	4"	Class 150	8 × 5/8"	42	31	31	23
100	4"	Class 300	8 × ¾"	58	43	40	30
150	6"	Class 150	8 × ¾"	79	58	59	44
150	6"	Class 300	12 × ¾"	70	52	51	38
200	8"	Class 150	8 × ¾"	107	79	80	59
250	10"	Class 150	12 × 7/8"	101	74	75	55
300	12"	Class 150	12 × 7/8"	133	98	103	76
350	14"	Class 150	12 × 1"	135	100	158	117
400	16"	Class 150	16 × 1"	128	94	150	111
450	18"	Class 150	16 × 1 1/8"	204	150	234	173
500	20"	Class 150	20 × 1 1/8"	183	135	217	160
600	24"	Class 150	20 × 1 ¼"	268	198	307	226

Promag W tightening torques for JIS

Nominal diameter [mm]	JIS Pressure rating	Threaded fasteners	Max. tightening torque [Nm]	
			Hard rubber	Polyurethane
25	10K	4 × M 16	-	19
25	20K	4 × M 16	-	19
32	10K	4 × M 16	-	22
32	20K	4 × M 16	-	22
40	10K	4 × M 16	-	24
40	20K	4 × M 16	-	24
50	10K	4 × M 16	40	33
50	20K	8 × M 16	20	17
65	10K	4 × M 16	55	45
65	20K	8 × M 16	28	23
80	10K	8 × M 16	29	23
80	20K	8 × M 20	42	35
100	10K	8 × M 16	35	29
100	20K	8 × M 20	56	48
125	10K	8 × M 20	60	51
125	20K	8 × M 22	91	79
150	10K	8 × M 20	75	63
150	20K	12 × M 22	81	72
200	10K	12 × M 20	61	52
200	20K	12 × M 22	91	80
250	10K	12 × M 22	100	87
250	20K	12 × M 24	159	144
300	10K	16 × M 22	74	63
300	20K	16 × M 24	138	124

Promag W tightening torques for AWWA

Nominal diameter		AWWA Pressure rating	Threaded fasteners	Max. tightening torque			
				Hard rubber		Polyurethane	
[mm]	[inch]			[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
700	28"	Class D	28 × 1 ¼"	247	182	292	215
750	30"	Class D	28 × 1 ¼"	287	212	302	223
800	32"	Class D	28 × 1 ½"	394	291	422	311
900	36"	Class D	32 × 1 ½"	419	309	430	317
1000	40"	Class D	36 × 1 ½"	420	310	477	352
1050	42"	Class D	36 × 1 ½"	528	389	518	382
1200	48"	Class D	44 × 1 ½"	552	407	531	392
1350	54"	Class D	44 × 1 ¾"	730	538	633	467
1500	60"	Class D	52 × 1 ¾"	758	559	832	614
1650	66"	Class D	52 × 1 ¾"	946	698	955	704
1800	72"	Class D	60 × 1 ¾"	975	719	1087	802
2000	78"	Class D	64 × 2"	853	629	786	580

Promag W tightening torques for AS 2129

Nominal diameter [mm]	AS 2129 Pressure rating	Threaded fasteners	Max. tightening torque [Nm] Hard rubber
50	Table E	4 × M 16	32
80	Table E	4 × M 16	49
100	Table E	8 × M 16	38
150	Table E	8 × M 20	64
200	Table E	8 × M 20	96
250	Table E	12 × M 20	98
300	Table E	12 × M 24	123
350	Table E	12 × M 24	203
400	Table E	12 × M 24	226
450	Table E	16 × M 24	226
500	Table E	16 × M 24	271
600	Table E	16 × M 30	439
700	Table E	20 × M 30	355
750	Table E	20 × M 30	559
800	Table E	20 × M 30	631
900	Table E	24 × M 30	627
1000	Table E	24 × M 30	634
1200	Table E	32 × M 30	727

Promag W tightening torques for AS 4087

Nominal diameter [mm]	AS 4087 Pressure rating	Threaded fasteners	Max. tightening torque [Nm] Hard rubber
50	Table E	4 × M 16	32
80	PN 16	4 × M 16	49
100	PN 16	4 × M 16	76
150	PN 16	8 × M 20	52
200	PN 16	8 × M 20	77
250	PN 16	8 × M 20	147
300	PN 16	12 × M 24	103
350	PN 16	12 × M 24	203
375	PN 16	12 × M 24	137
400	PN 16	12 × M 24	226
450	PN 16	12 × M 24	301
500	PN 16	16 × M 24	271
600	PN 16	16 × M 27	393
700	PN 16	20 × M 27	330
750	PN 16	20 × M 30	529
800	PN 16	20 × M 33	631
900	PN 16	24 × M 33	627
1000	PN 16	24 × M 33	595
1200	PN 16	32 × M 33	703

3.3.7 Turning the transmitter housing

Turning the aluminum field housing

Warning!
The turning mechanism in devices with Ex d/de or FM/CSA Cl. I Div. 1 classification is not the same as that described here. The procedure for turning these housings is described in the Ex-specific documentation.

1. Loosen the two securing screws.
2. Turn the bayonet catch as far as it will go.
3. Carefully lift the transmitter housing:
   – Promag D: approx. 10 mm (0.39 in) above the securing screws
   – Promag E/H/L/P/W: to the stop
4. Turn the transmitter housing to the desired position:
   – Promag D: max. 180° clockwise or max. 180° counterclockwise
   – Promag E/H/L/P/W: max. 280° clockwise or max. 20° counterclockwise
5. Lower the housing into position and re-engage the bayonet catch.
6. Retighten the two securing screws.

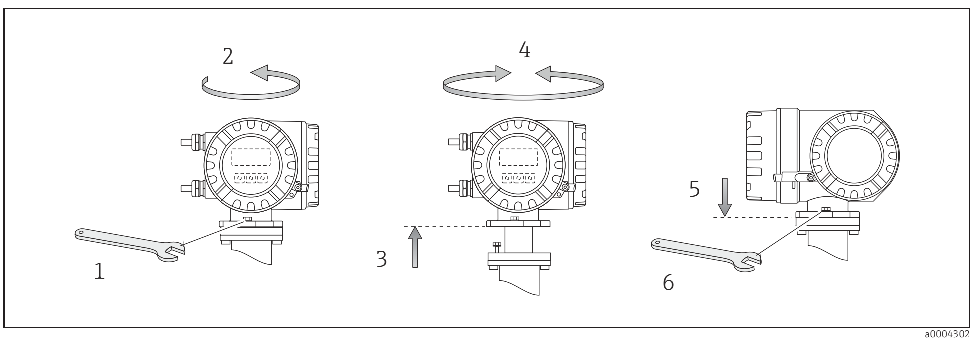


Fig. 25: Turning the transmitter housing (aluminum field housing)

Turning the stainless-steel field housing

1. Loosen the two securing screws.
2. Carefully lift the transmitter housing as far as it will go.
3. Turn the transmitter housing to the desired position (max. 2 × 90° in either direction).
4. Lower the housing into position.
5. Retighten the two securing screws.

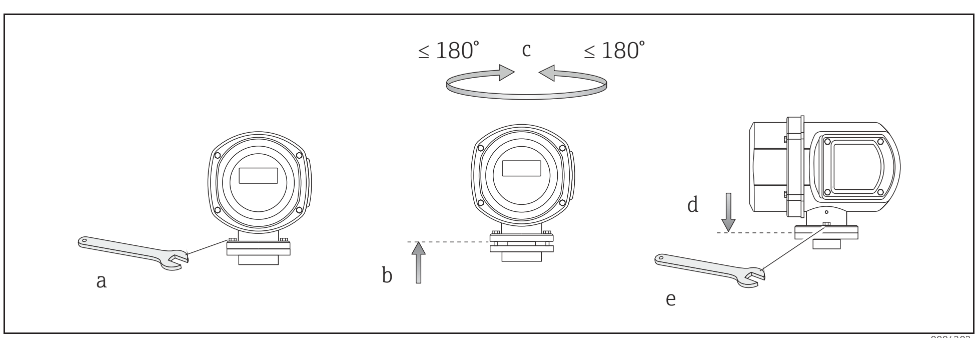


Fig. 26: Turning the transmitter housing (stainless-steel field housing)

3.3.8 Turning the onsite display

1. Unscrew the cover of the electronics compartment from the transmitter housing.
2. Press the side latches on the display module and remove it from the electronics compartment cover plate.
3. Turn the display to the desired position (max. 4 × 45° in both directions) and reset it onto the cover plate of the electronics compartment.
4. Screw the cover of the electronics compartment firmly back onto the transmitter housing.

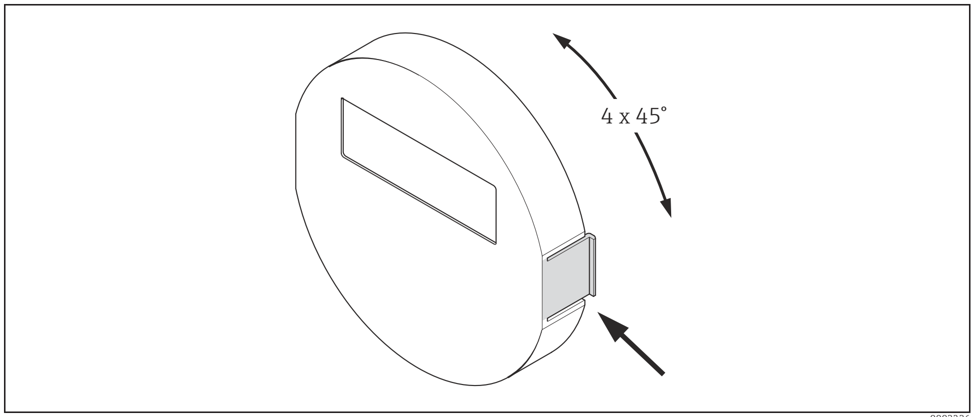


Fig. 27: Turning the local display (field housing)

3.3.9 Installing the wall-mount housing

There are various ways of installing the wall-mount transmitter housing:

- Direct wall mounting
- Installation in control panel (with separate mounting kit, accessories) → 📄 45
- Pipe mounting (with separate mounting kit, accessories) → 📄 45

Caution!
- Make sure that the ambient temperature does not exceed the permissible range at the mounting location, −20 to +60 °C (−4 to +140 °F), optional −40 to +60 °C (−40 to +140 °F). Install the device at a shady location. Avoid direct sunlight.
- Always install the wall-mount housing in such a way that the cable entries are pointing down.

Direct wall mounting

1. Drill the holes as illustrated in the graphic.
2. Remove the cover of the connection compartment (a).
3. Push the two securing screws (b) through the appropriate bores (c) in the housing.
   – Securing screws (M6): max. Ø 6.5 mm (0.26")
   – Screw head: max. Ø 10.5 mm (0.41")
4. Secure the transmitter housing to the wall as indicated.
5. Screw the cover of the connection compartment (a) firmly onto the housing.

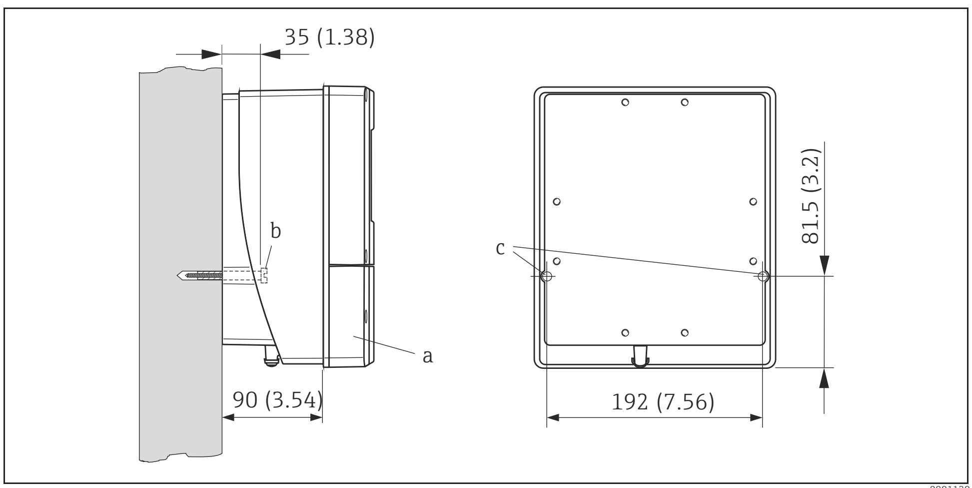


Fig. 28: Mounted directly on the wall

Panel-mounted installation

1. Prepare the opening in the panel as illustrated in the graphic.
2. Slide the housing into the opening in the panel from the front.
3. Screw the fasteners onto the wall-mount housing.
4. Place the threaded rods in the fasteners and screw them down until the housing is seated tightly against the panel. Afterwards, tighten the locking nuts. Additional support is not necessary.

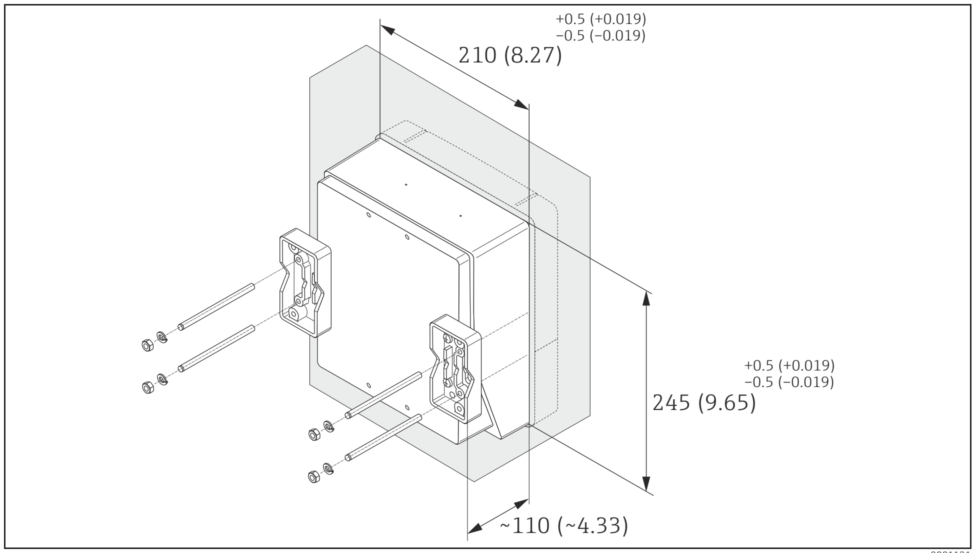


Fig. 29: Panel installation (wall-mount housing)

Pipe mounting

The assembly should be performed by following the instructions in the graphic.

Caution!
If the device is mounted to a warm pipe, make certain that the housing temperature does not exceed +60 °C (+140 °F), which is the maximum permissible temperature.

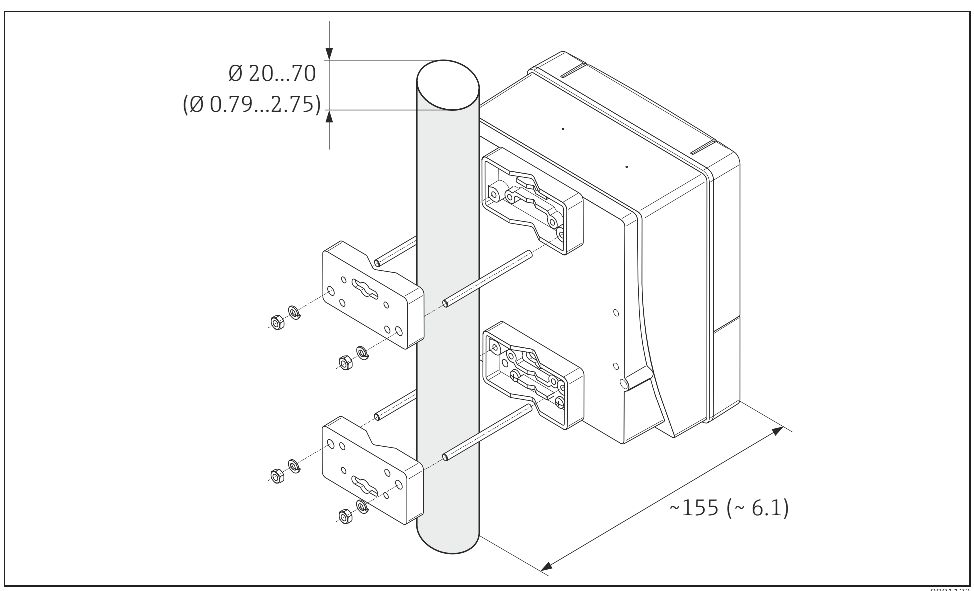


Fig. 30: Pipe mounting (wall-mount housing)

3.4 Post-installation check

Perform the following checks after installing the measuring device in the pipe:

Device condition and specifications	Notes
Is the device damaged (visual inspection)?	-
Does the device correspond to specifications at the measuring point, including process temperature and pressure, ambient temperature, minimum fluid conductivity, measuring range, etc.?	→ 🗎 104
Installation	**Notes**
Does the arrow on the sensor nameplate match the actual direction of flow through the pipe?	-
Is the position of the measuring electrode plane correct?	→ 🗎 14
Is the position of the empty pipe detection electrode correct?	→ 🗎 14
Were all screws tightened to the specified torques when the sensor was installed?	Promag D → 🗎 22 Promag E → 🗎 24 Promag L → 🗎 30 Promag P → 🗎 34 Promag W → 🗎 37
Were the correct seals used (type, material, installation)?	Promag D → 🗎 20 Promag E → 🗎 23 Promag H → 🗎 26 Promag L→ 🗎 29 Promag P → 🗎 33 Promag W → 🗎 37
Are the measuring point number and labeling correct (visual inspection)?	-
Process environment / process conditions	**Notes**
Were the inlet and outlet runs respected?	Inlet run ≥ 5 × DN Outlet run ≥ 2 × DN
Is the measuring device protected against moisture and direct sunlight?	-
Is the sensor adequately protected against vibration (attachment, support)?	Acceleration up to 2 g by analogy with IEC 600 68-2-8

4 Wiring

Warning!
When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to these Operating Instructions.
Please do not hesitate to contact your Endress+Hauser representative if you have any questions.

Note!
The device does not have an internal circuit breaker. For this reason, assign the device a switch or power-breaker switch capable of disconnecting the power supply line from the mains.

4.1 Connecting the remote version

4.1.1 Connecting Promag D/E/H/L/P/W

Warning!
- Risk of electric shock! Switch off the power supply before opening the device. Do **not** install or wire the device while it is connected to the power supply. Failure to comply with this precaution can result in irreparable damage to the electronics.
- Risk of electric shock! Connect the protective conductor to the ground terminal on the housing before the power supply is applied.

Caution!
- Only sensors and transmitters with the same serial number can be connected to one another. Communication problems can occur if the devices are not connected in this way.
- Risk of damaging the coil driver. Always switch off the power supply before connecting or disconnecting the coil cable.

Procedure

1. Transmitter: Remove the cover from the connection compartment (a).
2. Sensor: Remove the cover from the connection housing (b).
3. Feed the signal cable (c) and the coil cable (d) through the appropriate cable entries.

   Caution!
   Route the connecting cables securely (see "Connecting cable length" → 19).
4. Terminate the signal and coil current cable as indicated in the table:
   Promag D/E/L/P/W → Refer to the table → 50
   Promag H → Refer to the "Cable termination" table → 51
5. Establish the wiring between the sensor and the transmitter.
   The electrical wiring diagram that applies to your device can be found:
   - In the corresponding graphic:
     → 31 (Promag D) → 32 (Promag E/L/P/W); → 33 (Promag H)
   - In the cover of the sensor and transmitter

   Note!
   The cable shields of the Promag H sensor are grounded by means of the strain relief terminals (see also the "Cable termination" table → 51)

   Caution!
   Insulate the shields of cables that are not connected to eliminate the risk of short-circuits with neighboring cable shields inside the connection housing.
6. Transmitter: Screw the cover on the connection compartment (a).
7. Sensor: Secure the cover on the connection housing (b).

Promag D

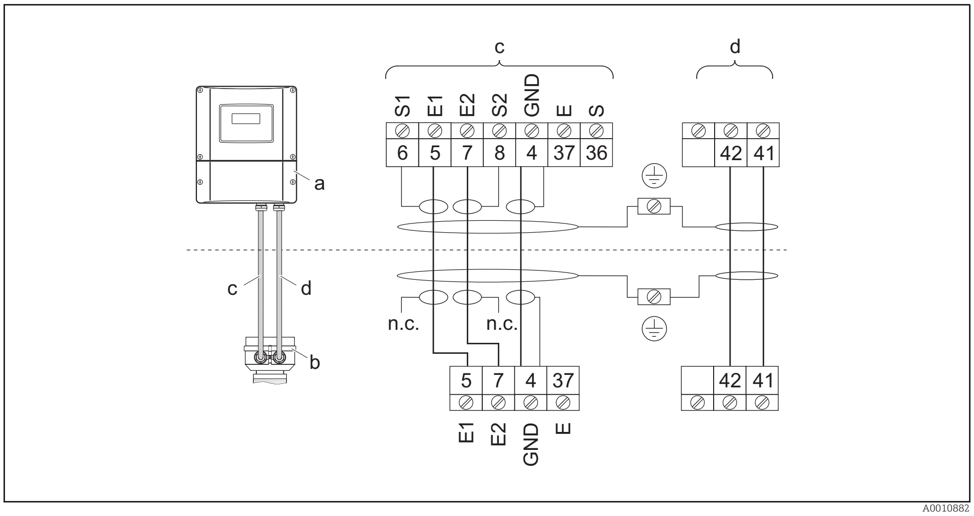


Fig. 31: Connecting the remote version of Promag D

a Wall-mount housing connection compartment
b Cover of the sensor connection housing
c Signal cable
d Coil current cable
n.c. Not connected, insulated cable shields

Wire colors/Terminal No.:
5/6 = braun, 7/8 = white, 4 = green, 37/36 = yellow

Promag E/L/P/W

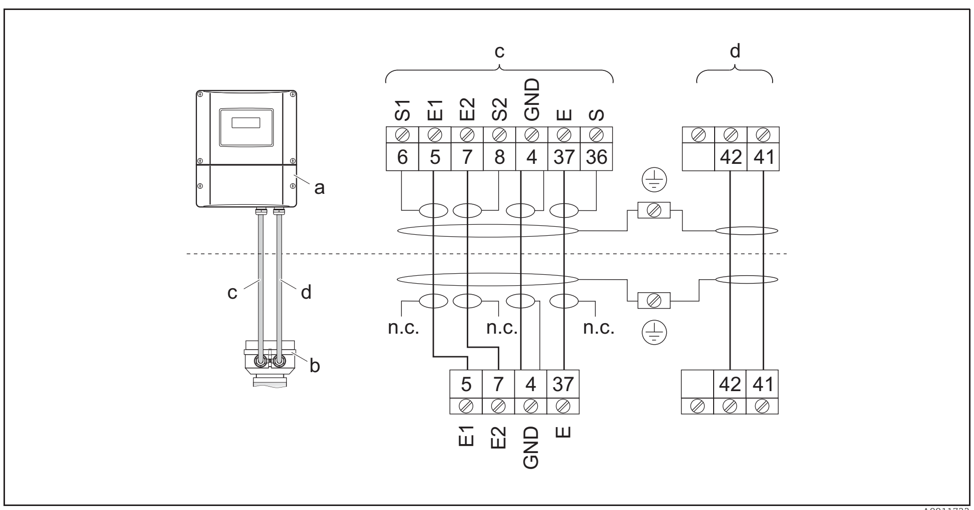


Fig. 32: Connecting the remote version of Promag E/L/P/W

a Wall-mount housing connection compartment
b Cover of the sensor connection housing
c Signal cable
d Coil current cable
n.c. Not connected, insulated cable shields

Wire colors/Terminal No.:
5/6 = braun, 7/8 = white, 4 = green, 37/36 = yellow

Promag H

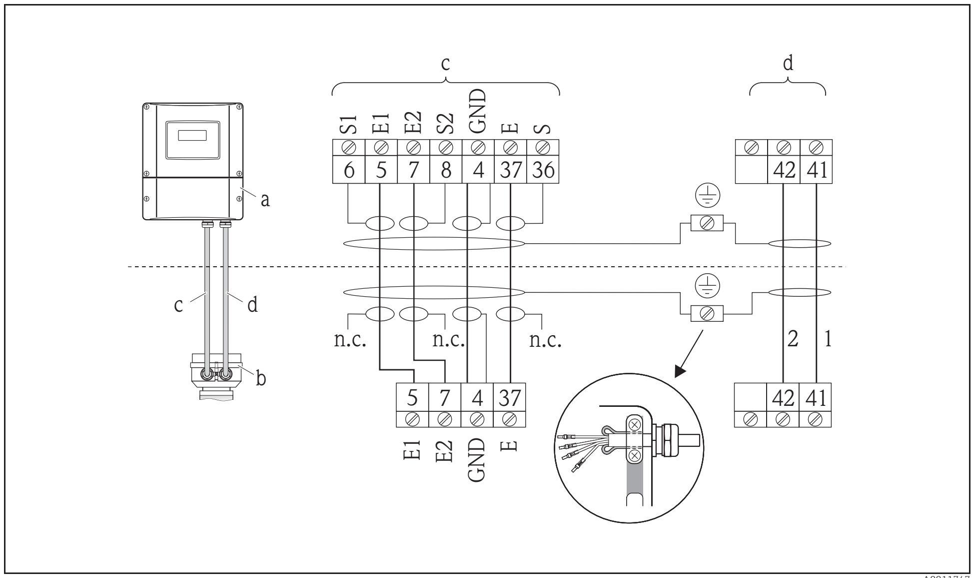


Fig. 33: Connecting the remote version of Promag H

a Wall-mount housing connection compartment
b Cover of the sensor connection housing
c Signal cable
d Coil current cable
n.c. Not connected, insulated cable shields

Wire colors/Terminal No.:
5/6 = braun, 7/8 = white, 4 = green, 37/36 = yellow

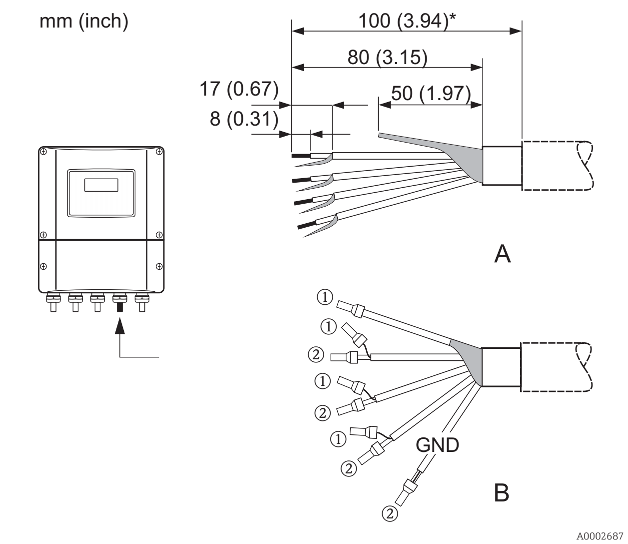
Cable termination for the remote version
Promag D/E/L/P/W

Terminate the signal and coil current cables as shown in the figure below (Detail A).
Ferrules must be provided on the fine-wire cores (Detail B: ① = red ferrules, ∅ 1.0 mm; ② = white ferrules, ∅ 0.5 mm).
* Stripping only for reinforced cables

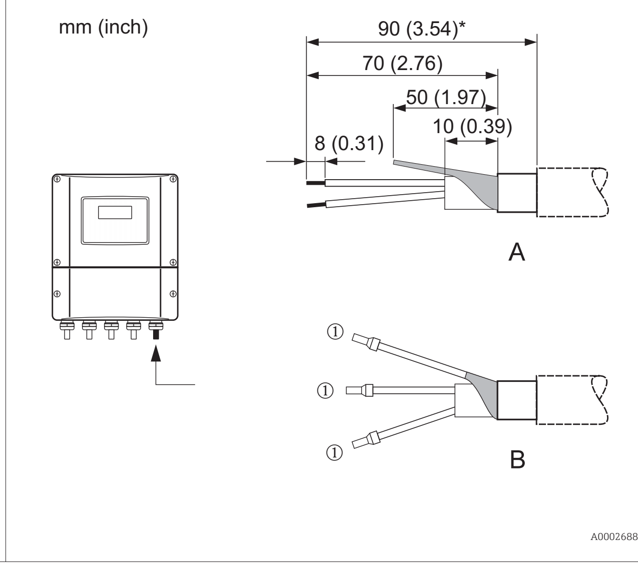
Caution!
When fitting the connectors, pay attention to the following points:
- *Signal cable* → Make sure that the ferrules do not touch the wire shield on the sensor side.
  Minimum distance = 1 mm (exception "GND" = green cable)
- *Coil current cable* → Insulate one core of the three-core wire at the level of the core reinforcement; you only require two cores for the connection.

TRANSMITTER

Signal cable

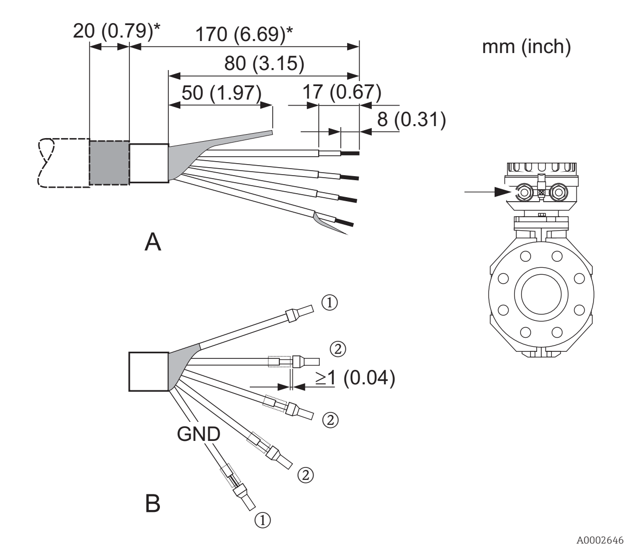


Coil current cable

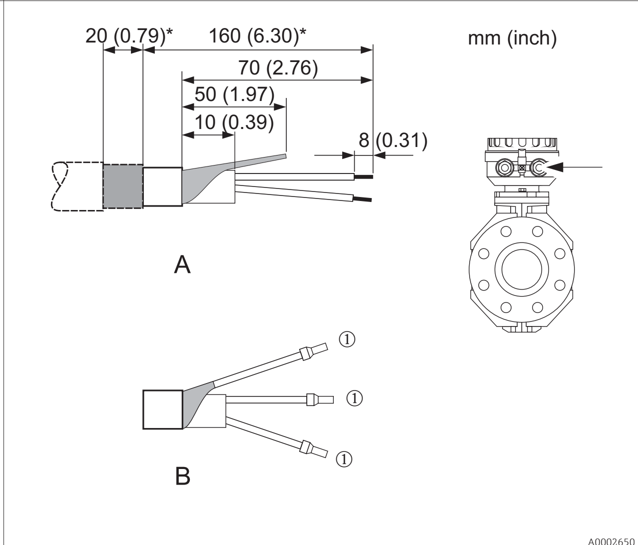


SENSOR

Signal cable



Coil current cable



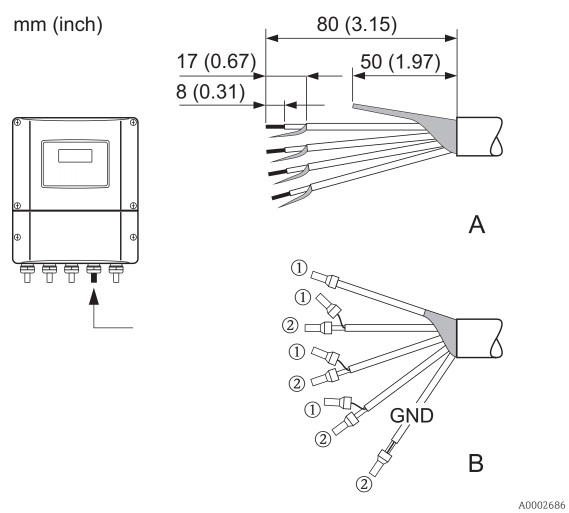
Cable termination for the remote version
Promag H

Terminate the signal and coil current cables as shown in the figure below (Detail A).
Ferrules must be provided on the fine-wire cores (Detail B: ① = red ferrules, ∅ 1.0 mm; ② = white ferrules, ∅ 0.5 mm).

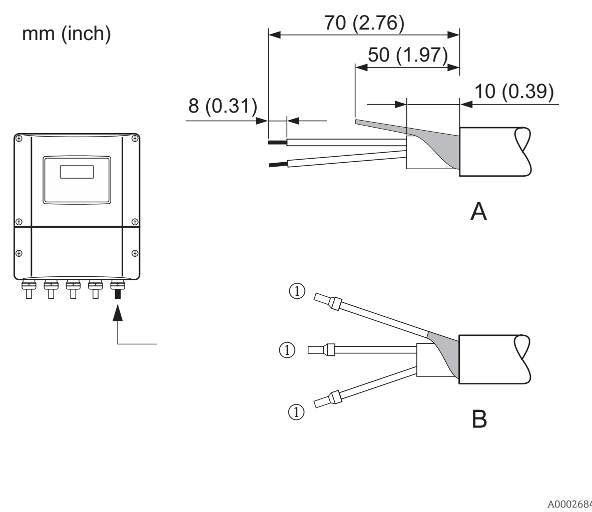
Caution!
When fitting the connectors, pay attention to the following points:
- *Signal cable* → Make sure that the ferrules do not touch the wire shield on the sensor side.
  Minimum distance = 1 mm (exception "GND" = green cable).
- *Coil current cable* → Insulate one core of the three-core wire at the level of the core reinforcement; you only require two cores for the connection.
- On the sensor side, reverse both cable shields approx. 15 mm over the outer jacket. The strain relief ensures an electrical connection with the connection housing.

TRANSMITTER

Signal cable

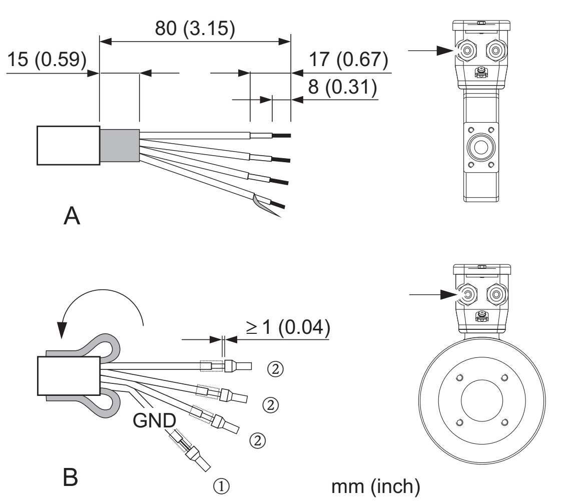


Coil current cable

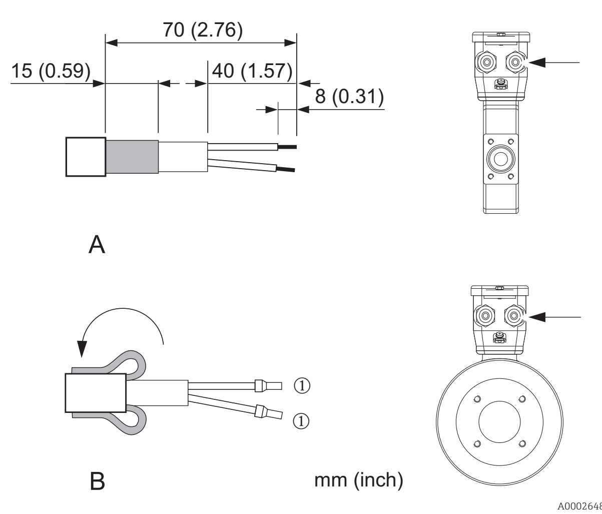


SENSOR

Signal cable



Coil current cable



4.1.2 Cable specifications

Signal cable

- 3 × 0.38 mm² PVC cable with common, braided copper shield (∅ ~7 mm) and individually shielded cores
- With Empty Pipe Detection (EPD): 4 × 0.38 mm² PVC cable with common, braided copper shield (∅ ~ 7 mm) and individually shielded cores
- Conductor resistance: ≤ 50 Ω/km
- Capacitance: core/shield: ≤ 420 pF/m
- Permanent operating temperature: –20 to +80 °C
- Cable cross-section: max. 2.5 mm²

Coil cable

- 2 × 0.75 mm² PVC cable with common, braided copper shield (∅ ~ 7 mm)
- Conductor resistance: ≤ 37 Ω/km
- Capacitance: core/core, shield grounded: ≤ 120 pF/m
- Operating temperature: –20 to +80 °C
- Cable cross-section: max. 2.5 mm²
- Test voltage for cable insulation: ≥1433 V AC r.m.s. 50/60 Hz or ≥2026 V DC

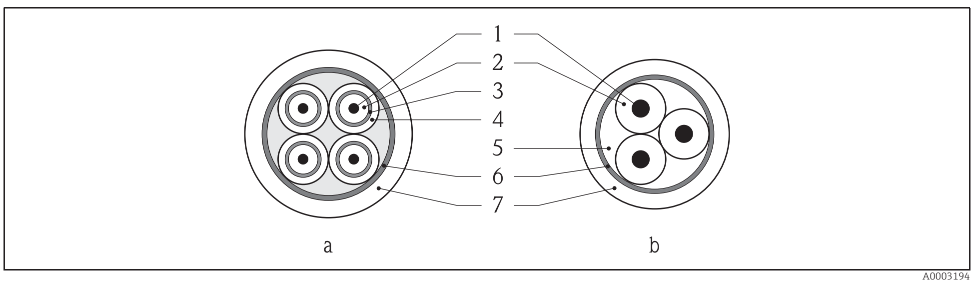


Fig. 34: Cable cross-section

a Signal cable
b Coil current cable

1 Core
2 Core insulation
3 Core shield
4 Core jacket
5 Core reinforcement
6 Cable shield
7 Outer jacket

Reinforced connecting cables

As an option, Endress+Hauser can also deliver reinforced connecting cables with an additional, reinforcing metal braid. Reinforced connecting cables should be used when laying the cable directly in the ground, if there is a risk of damage from rodents or if using the measuring device below IP 68 degree of protection.

Operation in zones of severe electrical interference:

The measuring device complies with the general safety requirements in accordance with EN 61010 and the EMC requirements of IEC/EN 61326.

Caution!
Grounding is by means of the ground terminals provided for the purpose inside the connection housing. Ensure that the stripped and twisted lengths of cable shield to the ground terminal are as short as possible.

4.2 Connecting the measuring unit

4.2.1 Connecting the transmitter

Warning!
- Risk of electric shock! Switch off the power supply before opening the device. Do not install or wire the device while it is energized. Failure to comply with this precaution can result in irreparable damage to the electronics.
- Risk of electric shock! Connect the protective conductor to the ground terminal on the housing before the power supply is applied (not necessary if the power supply is galvanically isolated).
- Compare the specifications on the nameplate with the local voltage supply and frequency. Also comply with national regulations governing the installation of electrical equipment.

1. Remove the cover of the connection compartment (f) from the transmitter housing.
2. Feed the power supply cable (a) and the signal cable (b) through the appropriate cable entries.
3. Perform the wiring:
   – Wiring diagram (aluminum housing) → 35
   – Wiring diagram (stainless steel housing) → 36
   – Wiring diagram (wall-mount housing) → 37
   – Terminal assignment → 55
4. Screw the cover of the connection compartment (f) firmly onto the transmitter housing.

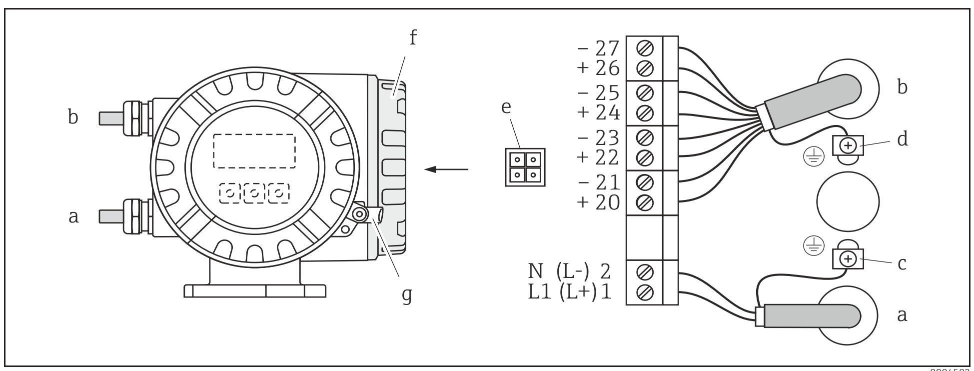


Fig. 35: Connecting the transmitter (aluminum field housing). Cable cross-section: max. 2.5 mm²

a Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC
*Terminal **No. 1**: L1 for AC, L+ for DC*
*Terminal **No. 2**: N for AC, L- for DC*
*b Signal cable: Terminals **Nos. 20–27** → 55*
c Ground terminal for protective ground
d Ground terminal for signal cable shield
e Service connector for connecting service interface FXA193 (Fieldcheck, FieldCare)
f Cover of the connection compartment
g Securing clamp

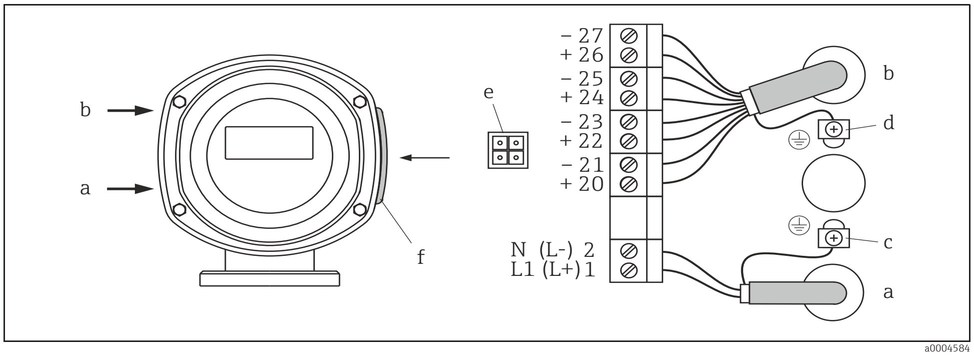


Fig. 36: Connecting the transmitter (stainless steel field housing); cable cross-section: max. 2.5 mm²

a *Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC*
*Terminal **No. 1**: L1 for AC, L+ for DC*
*Terminal **No. 2**: N for AC, L- for DC*
b *Signal cable: Terminals **Nos. 20–27** →* *55*
c *Ground terminal for protective ground*
d *Ground terminal for signal cable shield*
e *Service connector for connecting service interface FXA193 (Fieldcheck, FieldCare)*
f *Cover of the connection compartment*

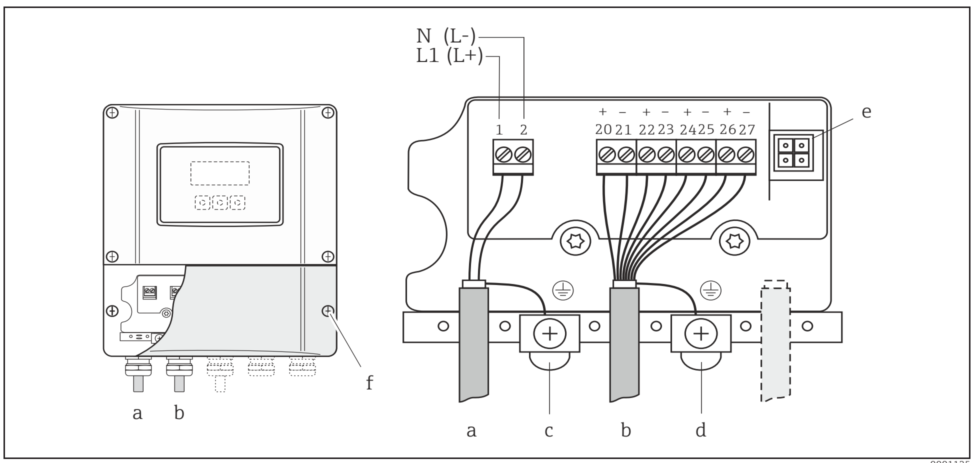


Fig. 37: Connecting the transmitter (wall-mount housing); cable cross-section: max. 2.5 mm²

a *Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC*
*Terminal **No. 1**: L1 for AC, L+ for DC*
*Terminal **No. 2**: N for AC, L- for DC*
b *Signal cable: Terminals **Nos. 20–27** →* *55*
c *Ground terminal for protective ground*
d *Ground terminal for signal cable shield*
e *Service connector for connecting service interface FXA193 (Fieldcheck, FieldCare)*
f *Cover of the connection compartment*

4.2.2 Terminal assignment

	Terminal No. (inputs / outputs)			
Order version	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
50***-***********W	-	-	-	Current output HART
50***-***********A	-	-	Frequency output	Current output HART
50***-***********D	Status input	Status output	Frequency output	Current output HART
50***-***********S	-	-	Frequency output Ex i	Current output, Ex i, active, HART
50***-***********T	-	-	Frequency output Ex i	Current output, Ex i, passive, HART

Note!
Functional values of the inputs and outputs → 99

4.2.3 HART connection

Users have the following connection options at their disposal:
- Direct connection to transmitter by means of terminals 26(+) and 27 (–)
- Connection by means of the 4 to 20 mA circuit.

Note!
- The measuring loop's minimum load must be at least 250 Ω.
- After commissioning, make the following settings:
- CURRENT SPAN function → "4–20 mA HART"
- Switch HART write protection on or off → 66

Connection of the HART handheld communicator

See also the documentation issued by the HART Communication Foundation, and in particular HCF LIT 20: "HART, a technical summary".

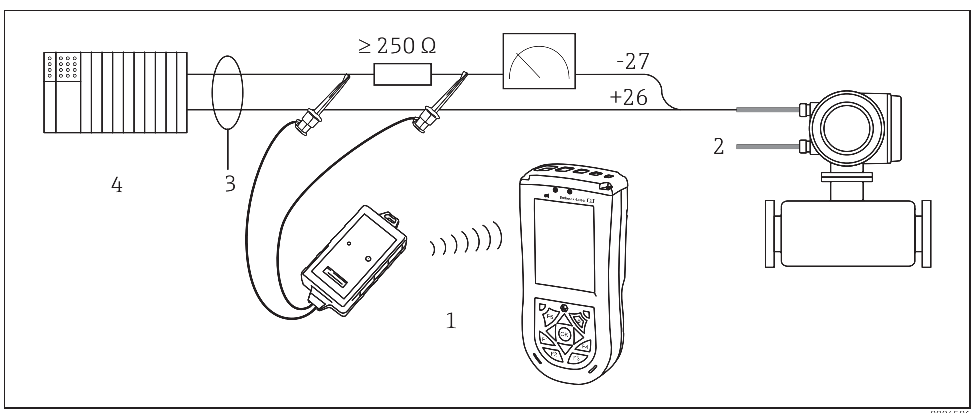


Fig. 38: Electrical connection of HART handheld Field Xpert SFX100

1 HART handheld Field Xpert SFX100
2 Auxiliary energy
3 Shielding
4 Other devices or PLC with passive input

Connection of a PC with an operating software

In order to connect a PC with operating software (e.g. "FieldCare"), a HART modem (e.g. "Commubox FXA195") is needed.

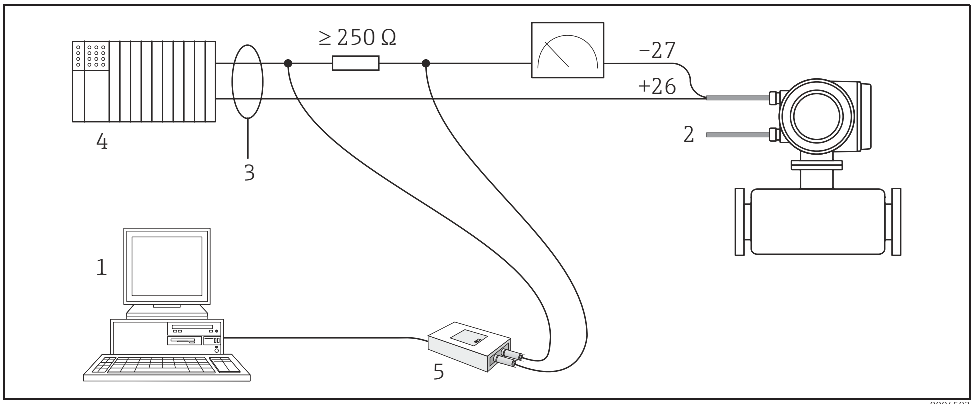


Fig. 39: Electrical connection of a PC with operating software

1 PC with operating software
2 Auxiliary energy
3 Shielding
4 Other devices or PLC with passive input
5 HART modem, e.g. Commubox FXA195

4.3 Potential equalization

Warning!
The measuring system must be included in the potential equalization.

Perfect measurement is only ensured when the fluid and the sensor have the same electrical potential. This is ensured by the reference electrode integrated in the sensor as standard.

The following should also be taken into consideration for potential equalization:
- Internal grounding concepts in the company
- Operating conditions, such as the material/grounding of the pipes (see Table)

4.3.1 Potential equalization for Promag D

- No reference electrode is integrated!
  For the two ground disks of the sensor an electrical connection to the fluid is always ensured.
- Exampels for connections → 🗎 57

4.3.2 Potential equalization for Promag E/L/P/W

- Reference electrode integrated in the sensor as standard
- Exampels for connections → 🗎 58

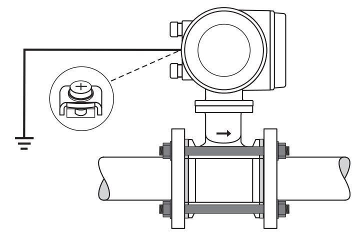
4.3.3 Potential equalization for Promag H

No reference electrode is integrated!
For the metal process connections of the sensor an electrical connection to the fluid is always ensured.

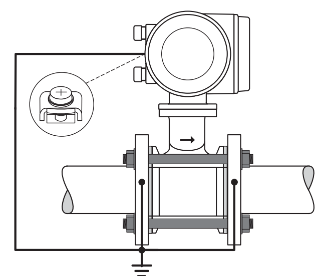
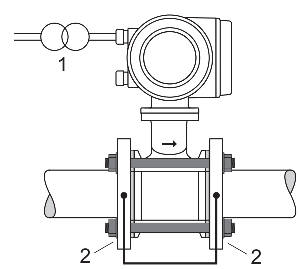
Caution!
If using process connections made of a synthetic material, ground rings have to be used to ensure that potential is equalized (→ 🗎 27). The necessary ground rings can be ordered separately from Endress+Hauser as accessories (→ 🗎 79).

4.3.4 Exampels for potential equalization connections for Promag D

Standard case

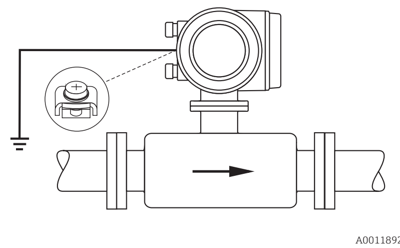
Operating conditions	Potential equalization
When using the measuring device in a: ▪ Metal, grounded pipe ▪ Plastic pipe ▪ Pipe with insulating lining Potential equalization takes place via the ground terminal of the transmitter (standard situation). Note! When installing in metal pipes, we recommend you connect the ground terminal of the transmitter housing with the piping.	 a00012172 *Fig. 40: Via the ground terminal of the transmitter*

Special cases

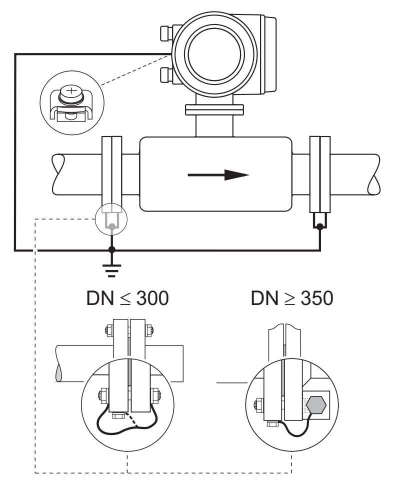
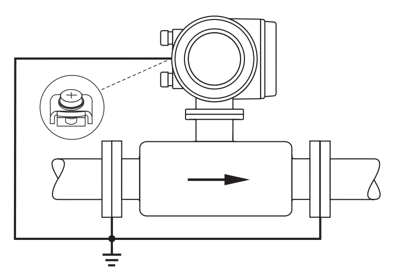
Operating conditions	Potential equalization
When using the measuring device in a: ▪ Metal pipe that is not grounded This connection method also applies in situations where: ▪ Customary potential equalization cannot be ensured ▪ Excessively high equalizing currents can be expected Potential equalization takes place via the ground terminal of the transmitter and the two pipe flanges. Here, the ground cable (copper wire, 6 mm² / 0.0093 in²) is mounted directly on the conductive flange coating with flange screws.	 a00012173 *Fig. 41: Via the ground terminal of the transmitter and the flanges of the pipe .*
When using the measuring device in a: ▪ Pipe with a cathodic protection unit The device is installed potential-free in the pipe. Only the two flanges of the pipe are connected with a ground cable (copper wire, 6 mm² (0.0093 in²)). Here, the ground cable is mounted directly on the conductive flange coating with flange screws. Note the following when installing: ▪ The applicable regulations regarding potential-free installation must be observed. ▪ There should be **no** electrically conductive connection between the pipe and the device. ▪ The mounting material must withstand the applicable torques.	 a00012174 *Fig. 42: Potential equalization and cathodic protection* *1 Power supply isolation transformer* *2 Electrically isolated*

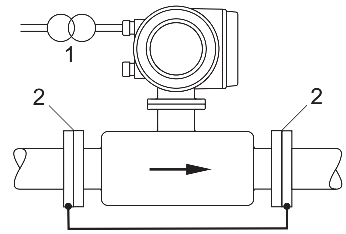
4.3.5 Exampels for potential equalization connections for Promag E/L/P/W

Standard case

Operating conditions	Potential equalization
When using the measuring device in a: ▪ Metal, grounded pipe Potential equalization takes place via the ground terminal of the transmitter (standard situation). Note! When installing in metal pipes, we recommend you connect the ground terminal of the transmitter housing with the piping.	 *Fig. 43: Via the ground terminal of the transmitter*

Special cases

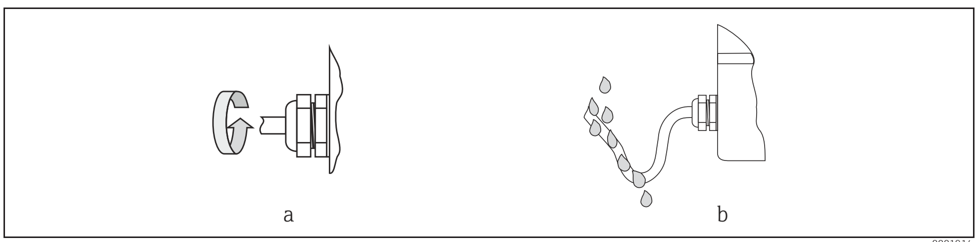
Operating conditions	Potential equalization
When using the measuring device in a: ▪ Metal pipe that is not grounded This connection method also applies in situations where: ▪ Customary potential equalization cannot be ensured ▪ Excessively high equalizing currents can be expected Both sensor flanges are connected to the pipe flange by means of a ground cable (copper wire, 6 mm² / 0.0093 in²) and grounded. Connect the transmitter or sensor connection housing, as applicable, to ground potential by means of the ground terminal provided for the purpose. Ground cable installation depends on the nominal diameter: ▪ DN ≤ 300 (12"): The ground cable is mounted directly on the conductive flange coating with the flange screws. ▪ DN ≥ 350 (14"): The ground cable is mounted directly on the metal transport bracket. Note! The ground cable for flange-to-flange connections can be ordered separately as an accessory from Endress+Hauser.	 *Fig. 44: Via the ground terminal of the transmitter and the flanges of the pipe*
When using the measuring device in a: ▪ Plastic pipe ▪ Pipe with insulating lining This connection method also applies in situations where: ▪ Customary potential equalization cannot be ensured ▪ Excessively high equalizing currents can be expected Potential equalization takes place using additional ground disks, which are connected to the ground terminal via a ground cable (copper wire, min. 6 mm² / 0.0093 in²). When installing the ground disks, please comply with the enclosed Installation Instructions.	 *Fig. 45: Via the ground terminal of the transmitter*

Operating conditions	Potential equalization
When using the measuring device in a: ▪ Pipe with a cathodic protection unit The device is installed potential-free in the pipe. Only the two flanges of the pipe are connected with a ground cable (copper wire, 6 mm² / 0.0093 in²). Here, the ground cable is mounted directly on the conductive flange coating with flange screws. Note the following when installing: ▪ The applicable regulations regarding potential-free installation must be observed. ▪ There should be **no** electrically conductive connection between the pipe and the device. ▪ The mounting material must withstand the applicable torques.	 A0011896 *Fig. 46: Potential equalization and cathodic protection* *1 Power supply isolation transformer* *2 Electrically isolated*

4.4 Degree of protection

The devices meet all the requirements of IP 67 degree of protection.

Compliance with the following points is mandatory following installation in the field or servicing in order to ensure that IP 67 protection is maintained:
- The housing seals must be clean and undamaged when inserted into their grooves. The seals must be dried, cleaned or replaced if necessary.
- All threaded fasteners and screw covers must be firmly tightened.
- The cables used for connection must be of the specified outside diameter → 📄 52.
- Firmly tighten the cable entries.
- The cables must loop down before they enter the cable entries ("water trap"). This arrangement prevents moisture penetrating the entry. Always install the measuring device in such a way that the cable entries do not point up.
- Remove all unused cable entries and insert plugs instead.
- Do not remove the grommet from the cable entry.



a0001914

Fig. 47: Installation instructions, cable entries

Caution!
Do not loosen the threaded fasteners of the sensor housing, as otherwise the degree of protection guaranteed by Endress+Hauser no longer applies.

Note!
The Promag E/L/P/W sensors can be supplied with IP 68 rating (permanent immersion in water to a depth of 3 meters (10 ft)). In this case the transmitter must be installed remote from the sensor.
The Promag L sensors with IP 68 rating are only available with stainless steel flanges.

4.5 Post-connection check

Perform the following checks after completing electrical installation of the measuring device:

Device condition and specifications	Notes
Are cables or the device damaged (visual inspection)?	-
Electrical connection	**Notes**
Does the supply voltage match the specifications on the nameplate?	▪ 85 to 250 V AC (50 to 60 Hz) ▪ 20 to 28 V AC (50 to 60 Hz) 11 to 40 V DC
Do the cables used comply with the necessary specifications?	→ 🖹 52
Do the cables have adequate strain relief?	-
Is the cable type route completely isolated? Without loops and crossovers?	-
Are the power-supply and signal cables correctly connected?	See the wiring diagram inside the cover of the terminal compartment
Only remote version: Is the flow sensor connected to the matching transmitter electronics?	Check serial number on nameplates of sensor and connected transmitter.
Only remote version: Is the connecting cable between sensor and transmitter connected correctly?	→ 🖹 47
Are all screw terminals firmly tightened?	-
Have the measures for grounding/potential equalization been correctly implemented?	→ 🖹 56
Are all cable entries installed, firmly tightened and correctly sealed? Cables looped as "water traps"?	→ 🖹 59
Are all housing covers installed and firmly tightened?	-

5 Operation

5.1 Display and operating elements

The local display enables you to read all important parameters directly at the measuring point and configure the device.
The display area consists of two lines; this is where measured values are displayed, and/or status variables (direction of flow, partially filled pipe, bar graph, etc.). You can change the assignment of display lines to variables at will in order to customize the display to suit your needs and preferences (→ "Description of Device Functions" manual).

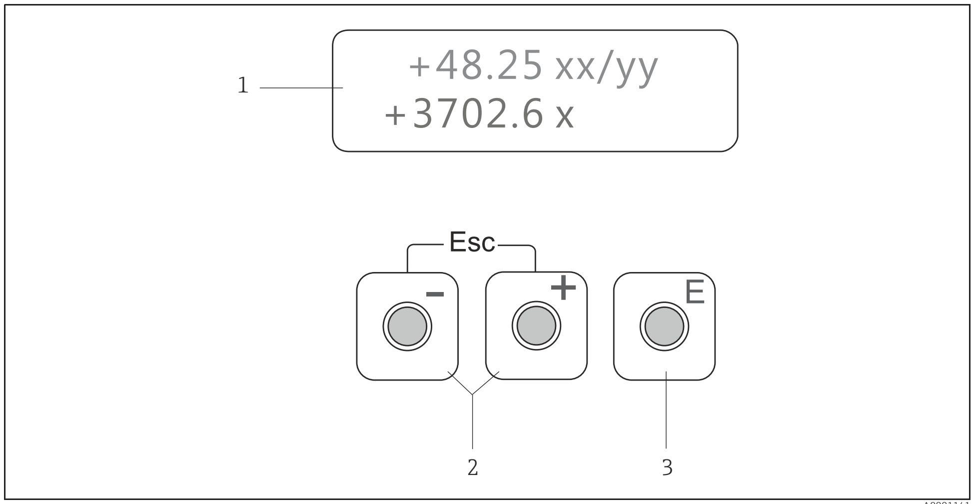


Fig. 48: Display and operating elements

1 Liquid crystal display
The two-line liquid-crystal display shows measured values, dialog texts, error messages and information messages. The display as it appears when normal measuring is in progress is known as the HOME position (operating mode).
- *Upper display line: Shows primary measured values, e.g. volume flow in [ml/min] or in [%].*
- *Lower display line: Shows supplementary measured variables and status variables, e.g. totalizer reading in [m3], bar graph, measuring point designation*

2 Plus/minus keys
- *Enter numerical values, select parameters*
- *Select different function groups within the function matrix*

Press the +/- keys simultaneously to trigger the following functions:
- *Exit the function matrix step by step → HOME position*
- *Press and hold down +/- keys for longer than 3 seconds → Return directly to HOME position*
- *Cancel data entry*

3 Enter key
- *HOME position → Entry into the function matrix*
- *Save the numerical values you input or settings you change*

5.2 Brief operating instructions on the function matrix

Note!
- See the general notes on → 63.
- Detailed description of all the functions → "Description of Device Functions" manual

The function matrix comprises two levels, namely the function groups and the functions of the function groups.
The groups are the highest-level grouping of the control options for the device. A number of functions is assigned to each group. You select a group in order to access the individual functions for operating and configuring the device.

1. HOME position → E → Enter the function matrix
2. Select a function group (e.g. OPERATION)
3. Select a function (e.g. LANGUAGE)
   Change parameter/enter numerical values:
   +/- → select or enter enable code, parameters, numerical values
   E → save your entries
4. Exit the function matrix:
   – Press and hold down Esc key (-+) for longer than 3 seconds → HOME position
   – Repeatedly press Esc key (-+) → return step by step to HOME position

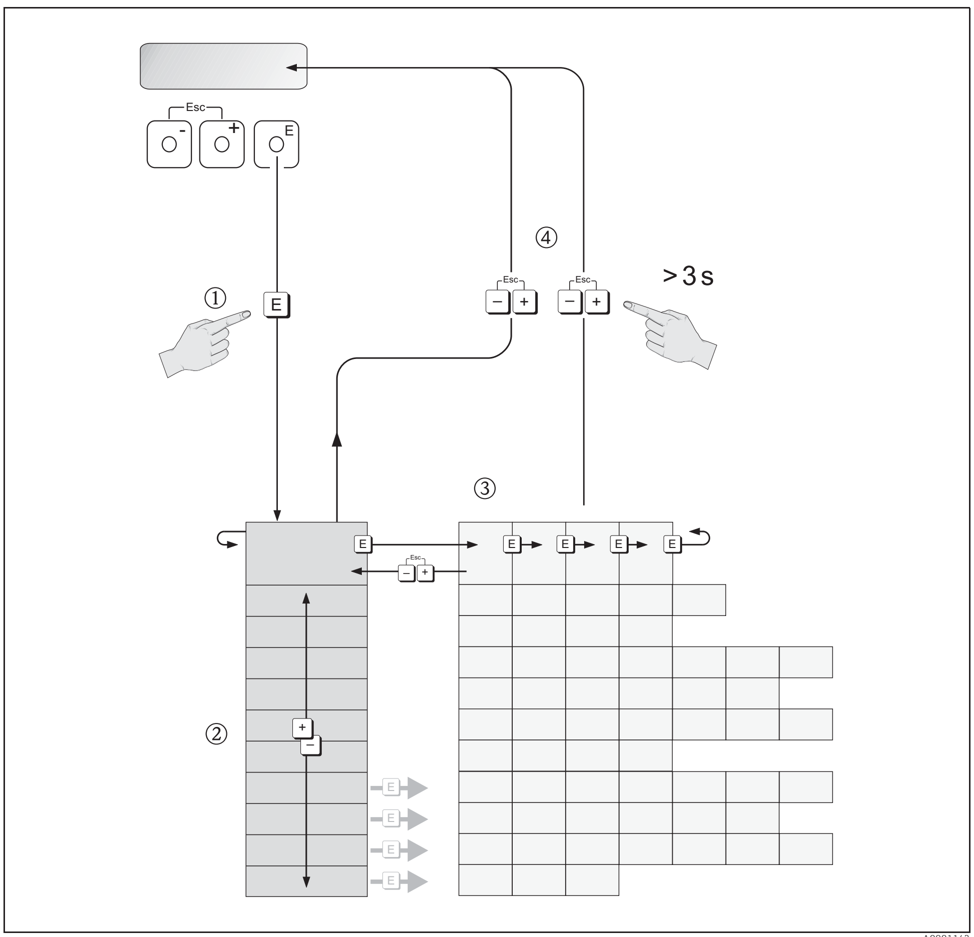


Fig. 49: Selecting functions and configuring parameters (function matrix)

5.2.1 General notes

The Quick Setup menu (→ 73) is adequate for commissioning in most instances. Complex measuring operations on the other hand necessitate additional functions that you can configure as necessary and customize to suit your process parameters. The function matrix, therefore, comprises a multiplicity of additional functions which, for the sake of clarity, are arranged in a number of function groups.

Comply with the following instructions when configuring functions:
- You select functions as described on → 62.
- You can switch off certain functions (OFF). If you do so, related functions in other function groups will no longer be displayed.
- Certain functions prompt you to confirm your data entries.
  Press +/- to select "SURE [YES]" and press E again to confirm. This saves your setting or starts a function, as applicable.
- Return to the HOME position is automatic if no key is pressed for 5 minutes.

Note!
- The transmitter continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the power supply fails, all preset and configured values remain safely stored in the EEPROM.

Caution!
All functions are described in detail, including the function matrix itself, in the "Description of Device Functions" manual, which is a separate part of these Operating Instructions.

5.2.2 Enabling the programming mode

The function matrix can be disabled. Disabling the function matrix rules out the possibility of inadvertent changes to device functions, numerical values or factory settings. A numerical code (factory setting = 50) has to be entered before settings can be changed.
If you use a code number of your choice, you exclude the possibility of unauthorized persons accessing data (→ see the "Description of Device Functions" manual).

Comply with the following instructions when entering codes:
- If programming is disabled and the +/- operating elements are pressed in any function, a prompt for the code automatically appears on the display.
- If "0" is specified as the customer's code, programming is always enabled.
- The Endress+Hauser service organization can be of assistance if you mislay your personal code.

Caution!
Changing certain parameters such as all sensor characteristics, for example, influences numerous functions of the entire measuring system, particularly measuring accuracy.
There is no need to change these parameters under normal circumstances and consequently, they are protected by a special code known only to the Endress+Hauser service organization. Please contact Endress+Hauser if you have any questions.

5.2.3 Disabling the programming mode

Programming is disabled if you do not press the operating elements within 60 seconds following automatic return to the HOME position.
You can also disable programming in the "ACCESS CODE" function by entering any number (other than the customer's code).

5.3 Displaying error messages

5.3.1 Type of error

Errors which occur during commissioning or measuring operation are displayed immediately. If two or more system or process errors occur, the error with the highest priority is the one shown on the display.

The measuring system distinguishes between two types of error:

- *System errors* → 📄 *83:*
  This group comprises all device errors, e.g. communication errors, hardware faults, etc.
- *Process errors* → 📄 85:
  This group comprises all application errors, e.g. empty pipe, etc.

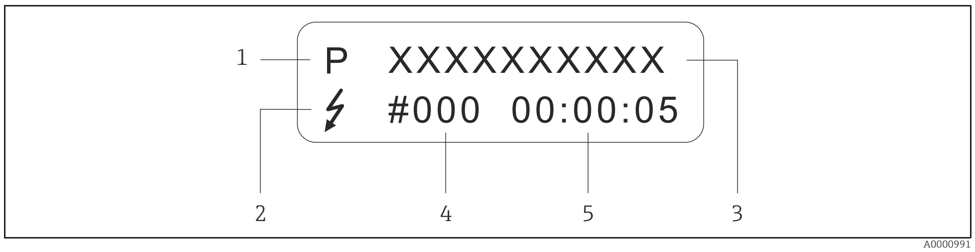


Fig. 50: Error messages on the display (example)

1 Error type:
– P = process error
– S = system error
2 Error message type:
– ϟ = fault message
– ! = notice message
3 Error designation: e.g. EMPTY PIPE = measuring tube is only partly filled or completely empty
4 Error number: e.g. #401
5 Duration of most recent error occurrence (in hours, minutes and seconds)

5.3.2 Error message types

Users have the option of weighting certain errors differently, in other words having them classed as "Fault messages" or "Notice messages". You can define messages in this way with the aid of the function matrix (→ "Description of Device Functions" manual).
Serious system errors, e.g. module defects, are always identified and classed as "fault messages" by the measuring device.

Notice message (!)

- Displayed as → Exclamation mark (!), error type (S: system error, P: process error)
- The error in question has no effect on the outputs of the measuring device.

Fault message (ϟ)

- Displayed as → Lightning flash (ϟ), error type (S: system error, P: process error).
- The error in question has a direct effect on the outputs.
  The response of the individual outputs (failsafe mode) can be defined in the function matrix using the "FAILSAFE MODE" function (→ "Description of Device Functions" manual).

Note!
For security reasons, error messages should be output via the status output.

5.4 Communication

In addition to local operation, the measuring device can be configured and measured values can be obtained by means of the HART protocol. Digital communication takes place using the 4–20 mA current output HART → 📄 55.

The HART protocol allows the transfer of measuring and device data between the HART master and the field devices for configuration and diagnostics purposes.
The HART master, e.g. a handheld terminal or PC-based operating programs (such as FieldCare), require device description (DD) files which are used to access all the information in a HART device. Information is exclusively transferred using so-called "commands". There are three different command classes:

- *Universal commands:*
  All HART device support and use universal commands.
  The following functionalities are linked to them:
  – Identify HART devices
  – Reading digital measured values (volume flow, totalizer, etc.)
- *Common practice commands:*
  Common practice commands offer functions which are supported and can be executed by most but not all field devices.
- *Device-specific commands:*
  These commands allow access to device-specific functions which are not HART standard. Such commands access individual field device information, amongst other things, such as empty/full pipe calibration values, low flow cutoff settings, etc.

✎ Note!
The device has access to all three command classes. A list of all the "Universal commands" and "Common practice commands" is provided on → 📄 67.

5.4.1 Operating options

For the complete operation of the measuring device, including device-specific commands, there are DD files available to the user to provide the following operating aids and programs:

Field Xpert HART Communicator

Selecting device functions with a HART Communicator is a process involving a number of menu levels and a special HART function matrix.
The HART manual in the carrying case of the HART Communicator contains more detailed information on the device.

Operating program "FieldCare"

FieldCare is Endress+Hauser's FDT-based plant Asset Management Tool and allows the configuration and diagnosis of intelligent field devices. By using status information, you also have a simple but effective tool for monitoring devices. The Proline flow measuring devices are accessed via a service interface or via the service interface FXA193.

Operating program "SIMATIC PDM" (Siemens)

SIMATIC PDM is a standardized, manufacturer-independent tool for the operation, configuration,
maintenance and diagnosis of intelligent field devices.

Operating program "AMS" (Emerson Process Management)

AMS (Asset Management Solutions): program for operating and configuring devices.

5.4.2 Current device description files

The following table illustrates the suitable device description file for the operating tool in question and then indicates where these can be obtained.

HART protocol:

Valid for device software:	2.04.XX	→ Function DEVICE SOFTWARE
Device data HART Manufacturer ID: Device ID:	 11_{hex} (ENDRESS+HAUSER) 41_{hex}	 → Function MANUFACTURER ID → Function DEVICE ID
HART version data:	Device Revision 6/ DD Revision 1	
Software release:	01.2011	

Operating program:	Sources for obtaining device descriptions:
Handheld Field Xpert SFX100	Use update function of handheld terminal
FieldCare / DTM	▪ www.endress.com → Download ▪ CD-ROM (Endress+Hauser order number 56004088) ▪ DVD (Endress+Hauser order number 70100690)
AMS	www.endress.com → Download
SIMATIC PDM	www.endress.com → Download

Tester/simulator:	Sources for obtaining device descriptions:
Fieldcheck	Update by means of FieldCare with the flow device FXA193/291 DTM in the Fieldflash module

Note!
The "Fieldcheck" tester/simulator is used for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed out and used for official certification. Contact your Endress+Hauser representative for more information.

5.4.3 Device variables

The following device variables are available using the HART protocol:

Code (decimal)	Device variable
0	OFF (not assigned)
1	Volume flow
250	Totalizer 1
251	Totalizer 2

At the factory, the process variables are assigned to the following device variables:
- Primary process variable (PV) → Volume flow
- Second process variable (SV) → Totalizer 1
- Third process variable (TV) → not assigned
- Fourth process variable (FV) → not assigned

Note!
You can set or change the assignment of device variables to process variables using Command 51.

5.4.4 Switching HART write protection on/off

The HART write protection can be switched on and off using the HART WRITE PROTECT device function (→ "Description of Device Functions" manual).

5.4.5 Universal and common practice HART commands

The following table contains all the universal commands supported by the device.

Command No. HART command / Access type		**Command data (numeric data in decimal form)**	**Response data (numeric data in decimal form)**
Universal commands			
0	Read unique device identifier Access type = read	none	Device identification delivers information on the device and the manufacturer. It cannot be changed. The response consists of a 12 byte device ID: – Byte 0: fixed value 254 – Byte 1: Manufacturer ID, 17 = E+H – Byte 2: Device type ID, 65 = Promag 50 – Byte 3: Number of preambles – Byte 4: Universal commands rev. no. – Byte 5: Device-specific commands rev. no. – Byte 6: Software revision – Byte 7: Hardware revision – Byte 8: Additional device information – Bytes 9-11: Device identification
1	Read primary process variable Access type = read	none	– Byte 0: HART unit code of the primary process variable – Bytes 1-4: Primary process variable Factory setting: Primary process variable = Volume flow Note! ▪ Manufacturer-specific units are represented using the HART unit code "240". ▪ You can change the assignment of device variables to process variables using Command 51.
2	Read the primary process variable as current in mA and percentage of the set measuring range Access type = read	none	– Bytes 0-3: actual current of the primary process variable in mA – Bytes 4-7: % value of the set measuring range Factory setting: Primary process variable = Volume flow Note! You can change the assignment of device variables to process variables using Command 51.
3	Read the primary process variable as current in mA and four dynamic process variables Access type = read	none	24 bytes are sent as a response: – Bytes 0-3: primary process variable current in mA – Byte 4: HART unit code of the primary process variable – Bytes 5-8: Primary process variable – Byte 9: HART unit code of the second process variable – Bytes 10-13: Second process variable – Byte 14: HART unit code of the third process variable – Bytes 15-18: Third process variable – Byte 19: HART unit code of the fourth process variable – Bytes 20-23: Fourth process variable *Factory setting:* ▪ Primary process variable = Volume flow ▪ Second process variable = Totalizer 1 ▪ Third process variable = OFF (not assigned) ▪ Fourth process variable = OFF (not assigned) Note! ▪ Manufacturer-specific units are represented using the HART unit code "240". ▪ You can change the assignment of device variables to process variables using Command 51.
6	Set HART shortform address Access type = write	Byte 0: desired address (0 to 15) Factory setting: 0 Note! With an address >0 (multidrop mode), the current output of the primary process variable is set to 4 mA.	Byte 0: active address

Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
11	Read unique device identification using the TAG (measuring point designation) Access type = read	Bytes 0-5: TAG	Device identification delivers information on the device and the manufacturer. It cannot be changed. The response consists of a 12 byte device ID if the given TAG agrees with the one saved in the device: – Byte 0: fixed value 254 – Byte 1: Manufacturer ID, 17 = E+H – Byte 2: Device type ID, 65 = Promag 50 – Byte 3: Number of preambles – Byte 4: Universal commands rev. no. – Byte 5: Device-specific commands rev. no. – Byte 6: Software revision – Byte 7: Hardware revision – Byte 8: Additional device information – Bytes 9-11: Device identification
12	Read user message Access type = read	none	Bytes 0-24: User message Note! You can write the user message using Command 17.
13	Read TAG, descriptor and date Access type = read	none	– Bytes 0-5: TAG – Bytes 6-17: descriptor – Bytes 18-20: Date Note! You can write the TAG, descriptor and date using Command 18.
14	Read sensor information on primary process variable	none	– Bytes 0-2: Sensor serial number – Byte 3: HART unit code of sensor limits and measuring range of the primary process variable – Bytes 4-7: Upper sensor limit – Bytes 8-11: Lower sensor limit – Bytes 12-15: Minimum span Note! ▪ The data relate to the primary process variable (= volume flow). ▪ Manufacturer-specific units are represented using the HART unit code "240".
15	Read output information of primary process variable Access type = read	none	– Byte 0: Alarm selection ID – Byte 1: Transfer function ID – Byte 2: HART unit code for the set measuring range of the primary process variable – Bytes 3-6: upper range, value for 20 mA – Bytes 7-10: lower range, value for 4 mA – Bytes 11-14: Damping constant in [s] – Byte 15: Write protection ID – Byte 16: OEM dealer ID, 17 = E+H Factory setting: Primary process variable = Volume flow Note! ▪ Manufacturer-specific units are represented using the HART unit code "240". ▪ You can change the assignment of device variables to process variables using Command 51.
16	Read the device production number Access type = read	none	Bytes 0-2: Production number
17	Write user message Access = write	You can save any 32-character long text in the device under this parameter: Bytes 0-23: Desired user message	Displays the current user message in the device: Bytes 0-23: Current user message in the device
18	Write TAG, descriptor and date Access = write	With this parameter, you can store an 8 character TAG, a 16 character descriptor and a date: – Bytes 0-5: TAG – Bytes 6-17: descriptor – Bytes 18-20: Date	Displays the current information in the device: – Bytes 0-5: TAG – Bytes 6-17: descriptor – Bytes 18-20: Date
19	Write the device production number Access = write	Bytes 0-2: Production number	Bytes 0-2: Production number

The following table contains all the common practice commands supported by the device.

Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
Common practice commands			
34	Write damping value for primary process variable Access = write	Bytes 0-3: Damping value of the primary process variable "volume flow" in seconds *Factory setting:* Primary process variable = Current output damping	Displays the current damping value in the device: Bytes 0-3: Damping value in seconds
35	Write measuring range of primary process variable Access = write	Write the desired measuring range: – Byte 0: HART unit code of the primary process variable – Bytes 1-4: upper range, value for 20 mA – Bytes 5-8: lower range, value for 4 mA *Factory setting:* Primary process variable = Volume flow Note! ▪ The start of the measuring range (4 mA) must correspond to the zero flow. ▪ If the HART unit code is not the correct one for the process variable, the device will continue with the last valid unit.	The currently set measuring range is displayed as a response: – Byte 0: HART unit code for the set measuring range of the primary process variable – Bytes 1-4: upper range, value for 20 mA – Bytes 5-8: lower range, value for 4 mA Note! ▪ Manufacturer-specific units are represented using the HART unit code "240". ▪ You can change the assignment of device variables to process variables using Command 51.
38	Device status reset (configuration changed) Access = write	none	none Note! It is also possible to execute this HART command when write protection is activated (= ON)!
40	Simulate input current of primary process variable Access = write	Simulation of the desired output current of the primary process variable. An entry value of 0 exits the simulation mode: Bytes 0-3: Output current in mA *Factory setting:* Primary process variable = Volume flow Note! You can set the assignment of device variables to process variables using Command 51.	The momentary output current of the primary process variable is displayed as a response: Bytes 0-3: Output current in mA
42	Perform master reset Access = write	none	none
44	Write unit of primary process variable Access = write	Set unit of primary process variable. Only units which are suitable for the process variable are transferred to the device: Byte 0: HART unit code *Factory setting:* Primary process variable = Volume flow Note! ▪ If the written HART unit code is not the correct one for the process variable, the device will continue with the last valid unit. ▪ If you change the unit of the primary process variable, this has a direct impact on the system units.	The current unit code of the primary process variable is displayed as a response: Byte 0: HART unit code Note! Manufacturer-specific units are represented using the HART unit code "240".
48	Read additional device status Access = read	none	The device status is displayed in extended form as the response: Coding: see table → 71

Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
50	Read assignment of the device variables to the four process variables Access = read	none	Display of the current variable assignment of the process variables: – Byte 0: Device variable code to the primary process variable – Byte 1: Device variable code to the second process variable – Byte 2: Device variable code to the third process variable – Byte 3: Device variable code to the fourth process variable *Factory setting:* ▪ Primary process variable: Code 1 for volume flow ▪ Second process variable: Code 250 for totalizer ▪ Third process variable: Code 0 for OFF (not assigned) ▪ Fourth process variable: Code 0 for OFF (not assigned)
51	Write assignment of the device variables to the four process variables Access = write	Setting of the device variables to the four process variables: – Byte 0: Device variable code to the primary process variable – Byte 1: Device variable code to the second process variable – Byte 2: Device variable code to the third process variable – Byte 3: Device variable code to the fourth process variable *Factory setting:* ▪ Primary process variable: Volume flow ▪ Second process variable: Totalizer 1 ▪ Third process variable: OFF (not assigned) ▪ Fourth process variable: OFF (not assigned)	The variable assignment of the process variables is displayed as a response: – Byte 0: Device variable code to the primary process variable – Byte 1: Device variable code to the second process variable – Byte 2: Device variable code to the third process variable – Byte 3: Device variable code to the fourth process variable
53	Write device variable unit Access = write	This command sets the unit of the given device variables. Only those units which suit the device variable are transferred: – Byte 0: Device variable code – Byte 1: HART unit code Code of the supported device variables: See information → 66 Note! ▪ If the written unit is not the correct one for the device variable, the device will continue with the last valid unit. ▪ If you change the unit of the device variable, this has a direct impact on the system units.	The current unit of the device variables is displayed in the device as a response: – Byte 0: Device variable code – Byte 1: HART unit code Note! Manufacturer-specific units are represented using the HART unit code "240".
59	Write number of preambles in response message Access = write	This parameter sets the number of preambles which are inserted in the response messages: Byte 0: Number of preambles (4 to 20)	The current number of preambles is displayed in the response telegram: Byte 0: Number of preambles

5.4.6 Device status and error messages

You can read the extended device status, in this case, current error messages, via Command "48". The command delivers information which is partly coded in bits (see table below).

Note!
- You can find a detailed explanation of the device status and error messages and their elimination on → 71
- Bits and bytes not listed are not assigned.

Byte	Bit	Error No.	Short error description
0	0	001	Serious device error
	1	011	Measuring amplifier has faulty EEPROM
	2	012	Error when accessing data of the measuring amplifier EEPROM
1	1	031	S-DAT: defective or missing
	2	032	S-DAT: Error accessing saved values
	5	051	I/O and the amplifier are not compatible.
3	3	111	Totalizer checksum error
	4	121	I/O board and amplifier not compatible.
4	3	251	Internal communication fault on the amplifier board.
	4	261	No data reception between amplifier and I/O board
5	0	321	Coil current of the sensor is outside the tolerance.
	7	339	Flow buffer: The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds.
6	0	340	
	1	341	
	2	342	
	3	343	Frequency buffer: The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds.
	4	344	
	5	345	
	6	346	
	7	347	Pulse buffer: The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds.
7	0	348	
	1	349	
	2	350	
	3	351	Current output: Flow is out of range.
	4	352	
	5	353	
	6	354	
	7	355	Frequency output: Flow is out of range.
8	0	356	
	1	357	
	2	358	

Byte	Bit	Error No.	Short error description
8	3	359	Pulse output: Flow is out of range.
	4	360	
	5	361	
	6	362	
10	7	401	Measuring tube partially filled or empty
11	2	461	EPD calibration not possible because the fluid's conductivity is either too low or too high.
	4	463	The EPD calibration values for empty pipe and full pipe are identical, and therefore incorrect.
12	1	474	Maximum flow value entered is overshot
	7	501	Amplifier software version is loaded. Currently no other commands are possible.
13	0	502	Upload/download of device files. Currently no other commands are possible.
14	3	601	Positive zero return active
	7	611	Simulation current output active
15	0	612	
	1	613	
	2	614	
	3	621	Simulation frequency output active
	4	622	
	5	623	
	6	624	
	7	631	Simulation pulse output active
16	0	632	
	1	633	
	2	634	
	3	641	Simulation status output active
	4	642	
	5	643	
	6	644	
17	7	671	Simulation of the status input active
18	0	672	
	1	673	
	2	674	
	3	691	Simulation of response to error (outputs) active
	4	692	Simulation of volume flow active

6 Commissioning

6.1 Function check

Make sure that all final checks have been completed before you start up your measuring point:

- Checklist for "Post-installation check" → 46
- Checklist for "Post-connection check" → 60

6.2 Switching on the measuring device

Once the connection checks have been successfully completed, it is time to switch on the power supply. The device is now operational. The measuring device performs a number of post switch-on self-tests. As this procedure progresses the following sequence of messages appears on the local display:

PROMAG 50 STARTUP. . .	Start-up message
▼	
DEVICE SOFTWARE V XX.XX.XX	Current software version
▼	
SYSTEM OK →OPERATION	Beginning of normal measuring mode
▼	

Normal measuring mode commences as soon as start-up completes.
Various measured-value and/or status variables (HOME position) appear on the display.

Note!
If start-up fails, an error message indicating the cause is displayed.

6.3 Quick Setup

In the case of measuring devices without a local display, the individual parameters and functions must be configured via the operating program, e.g. FieldCare.
If the measuring device is equipped with a local display, all the important device parameters for standard operation, as well as additional functions, can be configured quickly and easily by means of the following Quick Setup menu.

6.3.1 "Commissioning" Quick Setup menu

This Quick Setup menu guides you systematically through the setup procedure for all the major device functions that have to be configured for standard measuring operation.

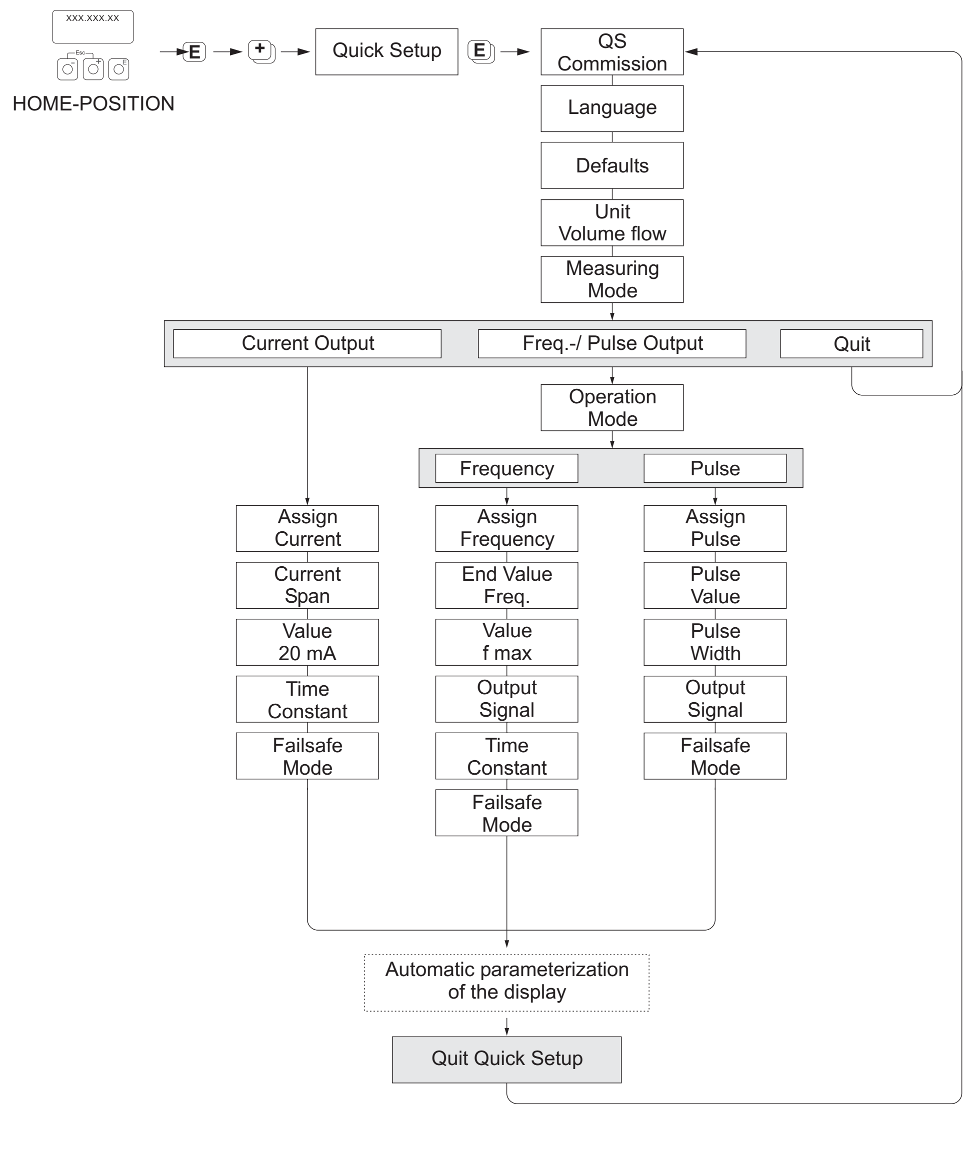


Fig. 51: "QUICK SETUP COMMISSIONING" menu for the rapid configuration of important device functions

6.4 Configuration

6.4.1 Current output: active/passive

The current output is configured as "active" or "passive" by means of various jumpers on the I/O board.

Warning!
Risk of electric shock! Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

1. Switch off power supply.
2. Remove the I/O board → 90
3. Position the jumper → 52

   Caution!
   Risk of destroying the measuring device. Set the jumpers exactly as shown in the graphic. Pay strict attention to the position of the jumpers as indicated in the graphic.
4. Installation of the I/O board is the reverse of the removal procedure.

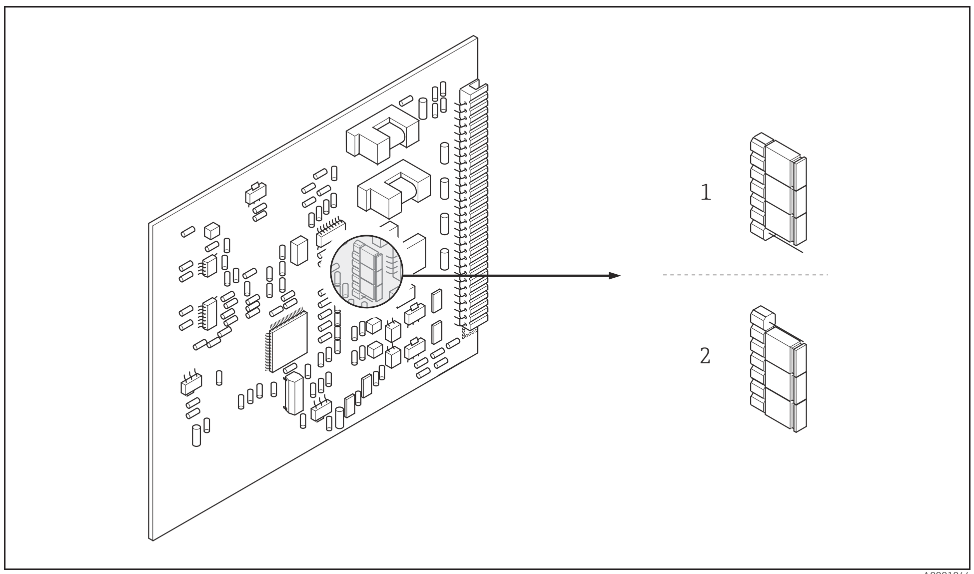


Fig. 52: Configuring current outputs using jumpers (I/O board)

1 Active current output (factory setting)
2 Passive current output

6.5 Adjustment

6.5.1 Empty-pipe/full-pipe adjustment

Flow cannot be measured correctly unless the measuring tube is completely full.
This status can be permanently monitored using the Empty Pipe Detection:

- EPD = Empty Pipe Detection (with the help of an EPD electrode)
- OED = Open Electrode Detection (Empty Pipe Detection with the help of the measuring electrodes, if the sensor is not equipped with an EPD electrode or the orientation is not suitable for using EPD).

Caution!
Detailed information on the empty-pipe/full-pipe adjustment procedure can be found in the "Description of Device Functions" manual:
- EPD/OED ADJUSTMENT (carrying out the adjustment).
- EPD (switching on and off EPD/OED).
- EPD RESPONSE TIME (input of the response time for EPD/OED).

Note!
- The EPD function is not available unless the sensor is fitted with an EPD electrode.
- The devices are already calibrated at the factory with water (approx. 500 μS/cm).
  If the fluid conductivity differs from this reference, empty-pipe/full-pipe adjustment has to be performed again on site.
- The default setting for EPD when the devices are delivered is OFF; the function has to be activated if required.
- The EPD process error can be output by means of the configurable relay output.

Performing empty-pipe and full-pipe adjustment (EPD)

1. Select the appropriate function in the function matrix:
   HOME → E → + → PROCESS PARAMETER → E → + → EPD ADJUSTMENT
2. Empty the piping:
   – The wall of the measuring tube should still be wet with fluid during EPD empty pipe adjustment
   – The wall of the measuring tube/the measuring electrodes should **no longer** be wet with fluid during OED empty pipe adjustment
3. Start empty-pipe adjustment: Select "EMPTY PIPE ADJUST" or "OED EMPTY ADJUST" and press E to confirm.
4. After empty-pipe adjustment, fill the piping with fluid.
5. Start full-pipe adjustment: Select "FULL PIPE ADJUST" or "OED FULL ADJUST" and press E to confirm.
6. Having completed the adjustment, select the setting "OFF" and exit the function by pressing E.
7. Switch on empty pipe detection in the EPD function:
   – EPD empty pipe adjustment: Select ON STANDARD or ON SPECIAL and press E to confirm
   – OED empty pipe adjustment: Select OED and confirm with E.

   Caution!
   The adjustment coefficients must be valid before you can activate the EPD function. If adjustment is incorrect the following messages might appear on the display:
   – FULL = EMPTY
     The adjustment values for empty pipe and full pipe are identical. In cases of this nature you must repeat empty-pipe or full-pipe adjustment!
   – ADJUSTMENT NOT OK
     Adjustment is not possible because the fluid's conductivity is out of range.

6.6 Data storage device (HistoROM)

At Endress+Hauser, the term HistoROM refers to various types of data storage modules on which process and measuring device data are stored. It is possible to plug these modules into other devices to copy device configurations from one device to another, for example.

6.6.1 HistoROM/S-DAT (sensor-DAT)

The S-DAT is an exchangeable data storage device in which all sensor relevant parameters are stored, i.e., diameter, serial number, calibration factor, zero point.

7 Maintenance

No special maintenance work is required.

7.1 Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing and the seals.

7.2 Seals

The seals of the Promag H sensor must be replaced periodically, particularly in the case of gasket seals (aseptic version).
The period between changes depends on the frequency of cleaning cycles, the cleaning temperature and the fluid temperature.

Replacement seals (accessories) → 📄 79.

8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. Your Endress+Hauser service organization can provide detailed information on the specific order codes on request.

8.1 Device-specific accessories

Accessory	Description	Order code
Proline Promag 50 transmitter	Transmitter for replacement or storage. Use the order code to define the following specifications: ▪ Approvals ▪ Degree of protection/version ▪ Cable for remote version ▪ Cable entry ▪ Display/power supply/operation ▪ Software ▪ Outputs/inputs	50XXX – XXXXX******

8.2 Measuring principle-specific accessories

Accessory	Description	Order code
Mounting set for Promag 50 transmitter	Mounting set for the transmitter (remote version). Suitable for: ▪ Wall mounting ▪ Pipe mounting ▪ Panel-mounted installation Mounting set for aluminum field housing. Suitable for: ▪ Pipe mounting	DK5WM – *
Wall-mounting kit for Promag H	Wall-mounting kit for the Promag H sensor.	DK5HM – **
Cable for remote version	Coil and signal cables, various lengths.	DK5CA – **
Mounting kit for Promag D, wafer version	▪ Mounting bolts ▪ Nuts incl. washers ▪ Flange seals ▪ Centering sleeves (if required for the flange)	DKD** – **
Set of seals for Promag D	Set of seals consisting of two flange seals.	DK5DD – ***
Mounting kit for Promag H	▪ 2 process connections ▪ Threaded fasteners ▪ Seals	DKH** – ****
Set of seals for Promag H	For regular replacement of the seals of the Promag H sensor.	DK5HS – ***
Welding jig for Promag H	Weld nipple as process connection: welding jig for installation in pipe.	DK5HW – ***
Adapter connection for Promag A, H	Adapter connections for installing a Promag 10 H instead of a Promag 30/33 A or Promag 30/33 H DN 25.	DK5HA – *****
Ground rings for Promag H	Ground rings for potential equalization.	DK5HR – ***
Ground cable for Promag E/L/P/W	Ground cable for potential equalization.	DK5GC – ***
Ground disk for Promag E/L/P/W	Ground disk for potential equalization.	DK5GD – * * ***
Process display RIA45	Multifunctional 1-channel display unit: ▪ Universal input ▪ Transmitter power supply ▪ Limit relay ▪ Analog output	RIA45 – ******

Accessory	Description	Order code
Process display RIA251	Digital display device for looping into the 4 to 20 mA current loop.	RIA251 – **
Field display unit RIA16	Digital field display device for looping into the 4 to 20 mA current loop.	RIA16 – ***
Application Manager RMM621	Electronic recording, display, balancing, control, saving and event and alarm monitoring of analog and digital input signals. Values and conditions determined are output by means of analog and digital output signals. Remote transmission of alarms, input values and calculated values using a PSTN or GSM modem.	RMM621 – **********

8.3 Communication-specific accessories

Accessory	Description	Order code
HART Communicator Field Xpert SFX 100	Handheld terminal for remote configuration and for obtaining measured values via the HART current output (4 to 20 mA) and FOUNDATION Fieldbus. Contact your Endress+Hauser representative for more information.	SFX100 – *******
Fieldgate FXA320	Gateway for remote interrogation of HART sensors and actuators via Web browser: ▪ 2-channel analog input (4 to 20 mA) ▪ 4 binary inputs with event counter function and frequency measurement ▪ Communication via modem, Ethernet or GSM ▪ Visualization via Internet/Intranet in Web browser and/or WAP cellular phone ▪ Limit value monitoring with alarm by e-mail or SMS ▪ Synchronized time stamping of all measured values.	FXA320 – *****
Fieldgate FXA520	Gateway for remote interrogation of HART sensors and actuators via Web browser: ▪ Web server for remote monitoring of up to 30 measuring points ▪ Intrinsically safe version [EEx ia]IIC for applications in hazardous areas ▪ Communication via modem, Ethernet or GSM ▪ Visualization via Internet/Intranet in Web browser and/or WAP cellular phone ▪ Limit value monitoring with alarm by e-mail or SMS ▪ Synchronized time stamping of all measured values ▪ Remote diagnosis and remote configuration of connected HART devices	FXA520 – ****
FXA195	The Commubox FXA195 connects intrinsically safe Smart transmitters with HART protocol to the USB port of a personal computer. This makes the remote operation of the transmitters possible with the aid of configuration programs (e.g. FieldCare). Power is supplied to the Commubox by means of the USB port	FXA195 – *

8.4 Service-specific accessories

Accessory	Description	Order code
Applicator	Software for selecting and planning flowmeters. The Applicator software can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC. Contact your Endress+Hauser representative for more information.	DXA80 – *
Fieldcheck	Tester/simulator for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed out and used for official certification. Contact your Endress+Hauser representative for more information.	50098801
FieldCare	FieldCare is Endress+Hauser's FDT-based asset management tool. It can configure all intelligent field units in your system and helps you manage them. By using status information, it is also a simple but effective way of checking their status and condition.	See the product page on the Endress+Hauser Web site: www.endress.com
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a DSD card or USB stick. Memograph M boasts a modular design, intuitive operation and a comprehensive security concept. The ReadWin® 2000 PC software is part of the standard package and is used for configuring, visualizing and archiving the data captured. The mathematics channels which are optionally available enable continuous monitoring of specific power consumption, boiler efficiency and other parameters which are important for efficient energy management.	RSG40 – ************
FXA193	Service interface from the device to the PC for operation via FieldCare.	FXA193 – *

9 Troubleshooting

9.1 Troubleshooting instructions

Always start troubleshooting with the checklist below if faults occur after start-up or during operation. The routine takes you directly to the cause of the problem and the appropriate remedial measures.

Check the display	
No display visible and no output signals present.	1. Check the supply voltage → terminals 1, 2 2. Check the power line fuse → 🗎 94 85 to 260 V AC: 0.8 A slow-blow / 250 V 20 to 55 V AC / 16 to 62 V DC: 2 A slow-blow / 250 V 3. Measuring electronics defective → order spare parts → 🗎 89
No display visible, but output signals are present.	1. Check whether the ribbon-cable connector of the display module is correctly plugged into the amplifier board → 🗎 90 2. Display module defective → order spare parts → 🗎 89 3. Measuring electronics defective → order spare parts → 🗎 89
Display texts are in a foreign language.	Switch off power supply. Press and hold down both the OS buttons and switch on the measuring device. The display text will appear in English (default) and is displayed at maximum contrast.
Measured value indicated, but no signal at the current or pulse output.	Electronics board defective → order spare parts → 🗎 89
↓	
Error messages on display	
Errors which occur during commissioning or measuring operation are displayed immediately. Error messages consist of a variety of icons: the meanings of these icons are as follows (example): – Error type: **S** = system error, **P** = process error – Error message type: ϟ = fault message, **!** = notice message – **EMPTY PIPE** = Type of error, e.g. measuring tube is only partly filled or completely empty – **03:00:05** = duration of error occurrence (in hours, minutes and seconds) – **#**401 = error number Caution! ▪ See the information on → 🗎 64! ▪ The measuring system interprets simulations and positive zero return as system errors, but displays them as notice message only.	
Error number: No. 001 – 399 No. 501 – 699	System error (device error) has occurred → 🗎 83
Error number: No. 401 - 499	Process error (application error) has occurred → 🗎 85
↓	
Other error (without error message)	
Some other error has occurred.	Diagnosis and rectification → 🗎 86

9.2 System error messages

Serious system errors are **always** recognized by the device as "Fault message", and are shown as a lightning flash (ϟ) on the display. Fault messages immediately affect the outputs.

Caution!
In the event of a serious fault, a flowmeter might have to be returned to the manufacturer for repair. The necessary procedures on → 🗎 5 must be carried out before you return a flowmeter to Endress+Hauser. Always enclose a duly completed "Declaration of Contamination" form. You will find a master copy of this form at the back of this manual.

Note!
Also observe the information on → 🗎 64.

No.	Error message / Type	Cause	Remedy (spare part → 🗎 89)
S = System error ϟ = Fault message (with an effect on the outputs) ! = Notice message (without an effect on the outputs)			
No. # 0xx → Hardware error			
001	S: CRITICAL FAILURE $: # 001	Serious device error	Replace the amplifier board.
011	S: AMP HW EEPROM $: # 011	Amplifier: Defective EEPROM	Replace the amplifier board.
012	S: AMP SW EEPROM $: # 012	Amplifier: Error accessing EEPROM data	The EEPROM data blocks in which an error has occurred are displayed in the TROUBLESHOOTING function. Press Enter to acknowledge the errors in question; default values are automatically inserted instead of the errored parameter values. Note! The measuring device has to be restarted if an error has occurred in a totalizer block (see error No. 111 / CHECKSUM TOTAL).
031	S: SENSOR HW DAT $: # 031	1. S-DAT is not plugged into the amplifier board correctly (or is missing). 2. S-DAT is defective.	1. Check whether the S-DAT is correctly plugged into the amplifier board. 2. Replace the S-DAT if it is defective. Check that the new replacement DAT is compatible with the measuring electronics. Check the: - Spare part set number - Hardware revision code 3. Replace measuring electronics boards if necessary. 4. Plug the S-DAT into the amplifier board.
032	S: SENSOR SW DAT $: # 032		
No. # 1xx → Software error			
101	S: GAIN ERROR AMP $: # 101	Gain deviation compared to reference gain > 25%.	Replace the amplifier board.
111	S: CHECKSUM TOTAL $: # 111	Totalizer checksum error.	1. Restart the measuring device. 2. Replace the amplifier board if necessary.
121	S: A / C COMPATIB. !: # 121	Due to different software versions, I/O board and amplifier board are only partially compatible (possibly restricted functionality). Note! – This message is only listed in the error history. – Nothing is shown on the display.	Module with lower software version has either to be updated by FieldCare with the required software version or the module has to be replaced.

No.	Error message / Type	Cause	Remedy (spare part → 🖹 89)
No. # 2xx → Error in DAT / no communication			
251	S: COMMUNICATION I/O $: # 251	Internal communication fault on the amplifier board.	Replace the amplifier board.
261	S: COMMUNICATION I/O $: # 261	No data reception between amplifier and I/O board or faulty internal data transfer.	Check the BUS contacts.
No. # 3xx → System limits exceeded			
321	S: TOL. COIL CURR. $: # 321	Sensor: Coil current is out of tolerance.	⚠ Warning! Switch off power supply before manipulating the coil current cable, coil current cable connector or measuring electronics boards! Remote version: 1. Check wiring of terminals 41/42 → 🖹 47 2. Check coil current cable connector. Compact and remote version: Replace measuring electronics boards if necessary
339 to 342	S: STACK CUR OUT n !: # 339 to 342	The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds.	1. Change the upper or lower limit setting, as applicable. 2. Increase or reduce flow, as applicable. Recommendations in the event of fault category = FAULT MESSAGE ($) ▪ Configure the fault response of the output to "ACTUAL VALUE" so that the temporary buffer can be cleared. ▪ Clear the temporary buffer by the measures described under Item 1.
343 to 346	S: STACK FREQ. OUT n !: # 343 to 346		
347 to 350	S: STACK PULSE OUT n !: # 343 to 346	The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds.	1. Increase the setting for pulse weighting 2. Increase the max. pulse frequency if the totalizer can handle a higher number of pulses. 3. Increase or reduce flow, as applicable. Recommendations in the event of fault category = FAULT MESSAGE ($) ▪ Configure the fault response of the output to "ACTUAL VALUE" so that the temporary buffer can be cleared. ▪ Clear the temporary buffer by the measures described under Item 1.
351 to 354	S: CURRENT RANGE n !: # 351 to 354	Current output: flow is out of range.	1. Change the upper or lower limit setting, as applicable. 2. Increase or reduce flow, as applicable.
355 to 358	S: FREQ. RANGE n !: # 355 to 358	Frequency output: flow is out of range.	1. Change the upper or lower limit setting, as applicable. 2. Increase or reduce flow, as applicable.
359 to 362	S: PULSE RANGE !: # 359 to 362	Pulse output: the pulse output frequency is out of range.	1. Increase the setting for pulse weighting 2. When selecting the pulse width, choose a value that can still be processed by a connected counter (e.g. mechanical counter, PLC etc.). *Determine the pulse width:* – Variant 1: Enter the minimum duration that a pulse must be present at the connected counter to ensure its registration. – Variant 2: Enter the maximum (pulse) frequency as the half "reciprocal value" that a pulse must be present at the connected counter to ensure its registration. Example: The maximum input frequency of the connected counter is 10 Hz. The pulse width to be entered is: $\frac{1}{2 \cdot 10\ \text{Hz}} = 50\ \text{ms}$ a0004437 3. Reduce flow.

No.	Error message / Type	Cause	Remedy (spare part → 89)
No. # 5xx → Application error			
501	S: SW.-UPDATE ACT. !: # 501	New amplifier or communication (I/O module) software version is loaded. Currently no other functions are possible.	Wait until the procedure is finished. The device will restart automatically.
502	S: UP-/DOWNLOAD ACT !: # 502	Uploading or downloading the device data via operating program. Currently no other functions are possible.	Wait until the procedure is finished.
No. # 6xx → Simulation mode active			
601	S: POS. ZERO-RETURN !: # 601	Positive zero return active Caution! This message has the highest display priority!	Switch off positive zero return
611 to 614	S: SIM. CURR. OUT. n !: # 611 to 614	Simulation current output active	
621 to 624	S: SIM. FREQ. OUT. n !: # 621 to 624	Simulation frequency output active	Switch off simulation
631 to 634	S: SIM. PULSE n !: # 631 to 634	Simulation pulse output active	Switch off simulation
641 to 644	S: SIM. STAT. OUT n !: # 641 to 644	Simulation status output active	Switch off simulation
671 to 674	S: SIM. STATUS IN n !: # 671 to 674	Simulation status input active	Switch off simulation
691	S: SIM. FAILSAFE !: # 691	Simulation of response to error (outputs) active	Switch off simulation
692	S: SIM. MEASURAND !: # 692	Simulation of a measured variable active (e.g. mass flow).	Switch off simulation
698	S: DEV. TEST ACT. !: # 698	The measuring device is being checked on site via the test and simulation device.	–

9.3 Process error messages

Note!
Also observe the information on → 64.

No.	Error message / Type	Cause	Remedy (spare part → 89)
P = Process error $ = Fault message (with an effect on the outputs) ! = Notice message (without an effect on the outputs)			
401	EMPTY PIPE $: # 401	Measuring tube partially filled or empty	1. Check the process conditions of the plant 2. Fill the measuring tube
461	ADJ. NOT OK !: # 461	EPD calibration not possible because the fluid's conductivity is either too low or too high.	The EPD function cannot be used with fluids of this nature.
463	FULL = EMPTY $: # 463	The EPD calibration values for empty pipe and full pipe are identical, therefore incorrect.	Repeat calibration, making sure procedure is correct → 76.

9.4 Process errors without messages

Symptoms	Rectification
Remark: You may have to change or correct certain settings in functions in the function matrix in order to rectify the fault.	
Flow values are negative, even though the fluid is flowing forwards through the pipe.	1. Remote version: – Switch off the power supply and check the wiring → 📄 47 – If necessary, reverse the connections at terminals 41 and 42 2. Change the setting in the "INSTALLATION DIRECTION SENSOR" function accordingly
Measured-value reading fluctuates even though flow is steady.	1. Check grounding and potential equalization → 📄 56 2. Check the fluid for presence of gas bubbles. 3. In the "SYSTEM DAMPING" function → increase the value
Measured-value reading shown on display, even though the fluid is at a standstill and the measuring tube is full.	1. Check grounding and potential equalization → 📄 56 2. Check the fluid for presence of gas bubbles. 3. Activate the "LOW FLOW CUTOFF" function, i.e. enter or increase the value for the switching point.
Measured-value reading on display, even though measuring tube is empty.	1. Perform empty-pipe/full-pipe adjustment and then switch on Empty Pipe detection → 📄 76 2. Remote version: Check the terminals of the EPD cable → 📄 47 3. Fill the measuring tube.
The current output signal is always 4 mA, irrespective of the flow signal at any given time.	1. Select the "BUS ADDRESS" function and change the setting to "0". 2. Value for creepage too high. Reduce the value in the "LOW FLOW CUTOFF" function.
The fault cannot be rectified or some other fault not described above has arisen. In these instances, please contact your Endress+Hauser service organization.	The following options are available for tackling problems of this nature: **Request the services of an Endress+Hauser service technician** If you contact our service organization to have a service technician sent out, please be ready to quote the following information: – Brief description of the fault – Nameplate specifications (→ 📄 6): order code, serial number **Returning devices to Endress+Hauser** The necessary procedures (→ 📄 5) must be carried out before you return a flowmeter requiring repair or calibration to Endress+Hauser. Always enclose a duly completed "Declaration of Conformity" form with the flowmeter. You will find a master copy of this form at the back of this manual. **Replace transmitter electronics** Components in the measuring electronics defective → order spare parts → 📄 89

9.5 Response of outputs to errors

Note!
The failsafe mode of totalizers, current, pulse and frequency outputs can be customized by means of various functions in the function matrix. You will find detailed information on these procedures in the "Description of Device Functions" manual.

You can use positive zero return to set the signals of the current, pulse and status outputs to their fallback value, for example when measuring has to be interrupted while a pipe is being cleaned. This function takes priority over all other device functions: simulations, for example, are suppressed.

Failsafe mode of outputs and totalizers		
	Process/system error is current	**Positive zero return is activated**
Caution! System or process errors defined as "Notice messages" have no effect whatsoever on the inputs and outputs. See the information on → 67		
Current output	MINIMUM VALUE 0–20 mA → 0 mA 4–20 mA → 2 mA 4–20 mA HART → 2 mA 4–20 mA NAMUR →3.5 mA 4–20 mA HART NAMUR →3.5 mA 4–20 mA US → 3.75 mA 4–20 mA HART US → 3,75 mA 0–20 mA (25 mA) → 0 mA 4–20 mA (25 mA) → 2 mA 4–20 mA (25 mA) HART → 2 mA MAXIMUM VALUE 0–20 mA → 22 mA 4–20 mA → 22 mA 4–20 mA HART → 22 mA 4–20 mA NAMUR → 22.6 mA 4–20 mA HART NAMUR → 22.6 mA 4–20 mA US → 22.6 mA 4–20 mA HART US → 22.6 mA 0–20 mA (25 mA) → 25 mA 4–20 mA (25 mA) → 25 mA 4–20 mA (25 mA) HART → 25 mA HOLD VALUE Last valid value (preceding occurrence of the fault) is output. ACTUAL VALUE Measured value display on the basis of the current flow measurement. The fault is ignored.	Output signal corresponds to "zero flow"
Pulse output	MIN/MAX VALUE → FALLBACK VALUE Signal output → no pulses HOLD VALUE Last valid value (preceding occurrence of the fault) is output. ACTUAL VALUE Fault is ignored, i.e. normal measured-value output on the basis of ongoing flow measurement.	Output signal corresponds to "zero flow"
Frequency output	*FALLBACK VALUE* Signal output → 0 Hz *FAILSAFE LEVEL* Output of the frequency specified in the FALÌLSAFE VALUE function. *HOLD VALUE* Measured value display on the basis of the last saved value preceding occurrence of the fault. *ACTUAL VALUE* Measured value display on the basis of the current flow measurement. The fault is ignored.	Output signal corresponds to "zero flow"

Failsafe mode of outputs and totalizers		
	Process/system error is current	**Positive zero return is activated**
Totalizer	*STOP* The totalizers are paused until the error is rectified. *ACTUAL VALUE* The fault is ignored. The totalizer continues to count in accordance with the current flow value. *HOLD VALUE* The totalizer continues to count the flow in accordance with the last valid flow value (before the error occurred).	Totalizer stops
Status output	In the event of a fault or power supply failure: Status output → non-conductive	No effect on status output

9.6 Spare parts

Detailed troubleshooting instructions are provided in the previous sections → 📄 82
The measuring device, moreover, provides additional support in the form of continuous self-diagnosis and error messages.
Fault rectification can entail replacing defective components with tested spare parts. The illustration below shows the available scope of spare parts.

Note!
You can order spare parts directly from your Endress+Hauser service organization by providing the serial number printed on the transmitter's nameplate → 📄 6

Spare parts are shipped as sets comprising the following parts:
- Spare part
- Additional parts, small items (threaded fasteners, etc.)
- Mounting instructions
- Packaging

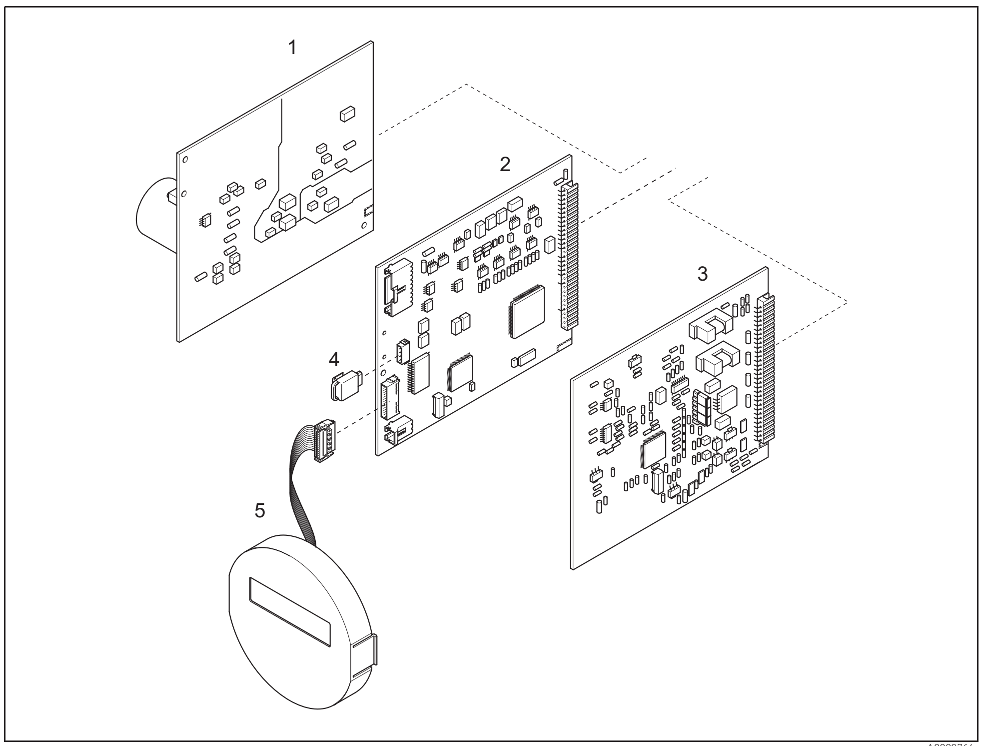


Fig. 53: Spare parts for Promag 50 transmitter (field and wall-mounted housings)

1 Power unit board (85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC)
2 Amplifier board
3 I/O board (COM module)
4 HistoROM / S-DAT (sensor data memory)
5 Display module

9.6.1 Removing and installing printed circuit boards

Field housing: removing and installing printed circuit boards → 54

Warning!
- Risk of electric shock!
  Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
- Risk of damaging electronic components (ESD protection). Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface purpose-built for electrostatically sensitive devices!
- If you cannot guarantee that the dielectric strength of the device is maintained in the following steps, then an appropriate inspection must be carried out in accordance with the manufacturer's specifications.
- When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to these Operating Instructions.

Caution!
Use only original Endress+Hauser parts.

1. Switch off power supply.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Remove the local display (1) as follows:
   – Press in the latches (1.1) at the side and remove the display module.
   – Disconnect the ribbon cable (1.2) of the display module from the amplifier board.
4. Remove the screws and remove the cover (2) from the electronics compartment.
5. Remove the boards (4, 6): Insert a suitable tool into the hole (3) provided for the purpose and pull the board clear of its holder.
6. Remove amplifier board (5):
   – Disconnect the plug of the electrode signal cable (5.1) including S-DAT (5.3) from the board.
   – Loosen the plug locking of the coil current cable (5.2) and gently disconnect the plug from the board, i.e. without moving it to and fro.
   – Insert a thin pin into the hole (3) provided for the purpose and pull the board clear of its holder.
7. Installation is the reverse of the removal procedure.

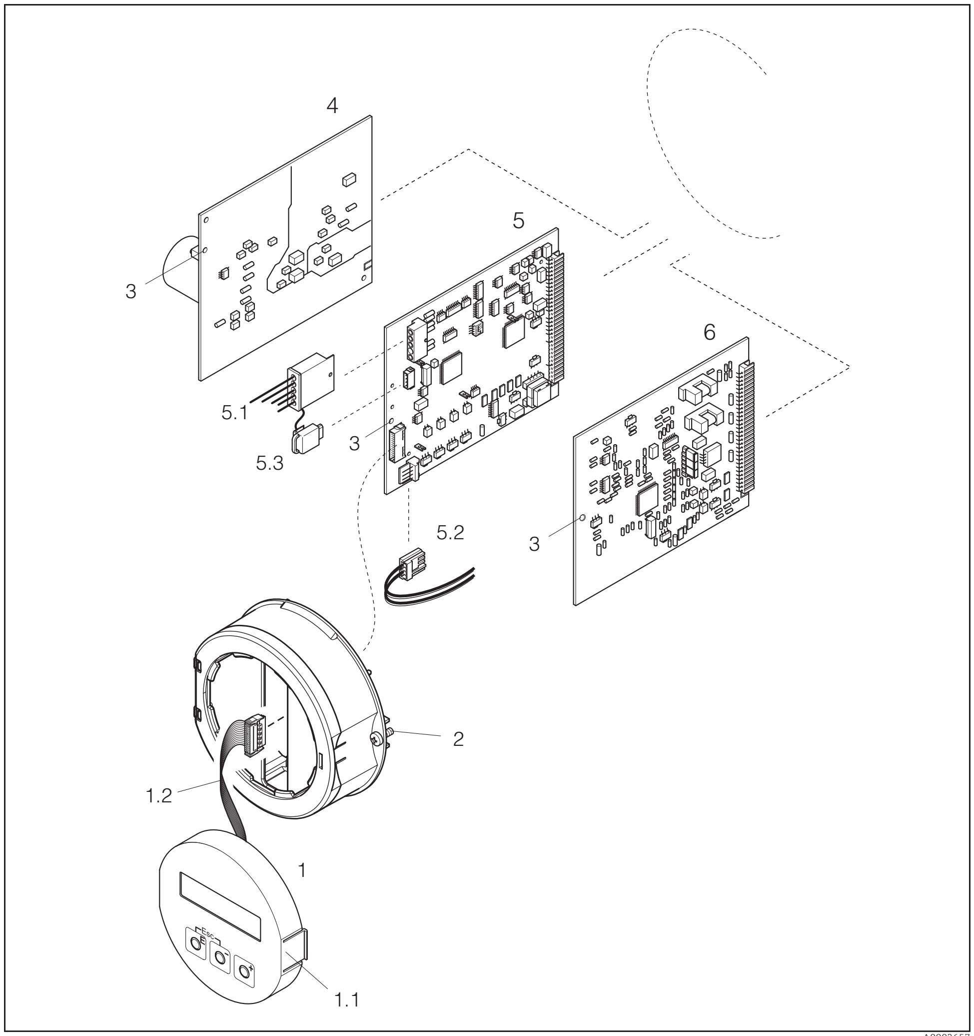


Fig. 54: Field housing: removing and installing printed circuit boards

1 Local display
1.1 Latch
1.2 Ribbon cable (display module)
2 Screws of electronics compartment cover
3 Aperture for installing/removing boards
4 Power supply board
5 Amplifier board
5.1 Electrode signal cable (sensor)
5.2 Coil current cable (sensor)
5.3 Histo-ROM / S-DAT (sensor data memory)
6 I/O board

Wall-mount housing: removing and installing printed circuit boards → ▣ 55

Warning!
- Risk of electric shock!
  Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
- Risk of damaging electronic components (ESD protection). Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface purpose-built for electrostatically sensitive devices!
- If you cannot guarantee that the dielectric strength of the device is maintained in the following steps, then an appropriate inspection must be carried out in accordance with the manufacturer's specifications.
- When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to these Operating Instructions.

Caution!
Use only original Endress+Hauser parts.

1. Switch off power supply.
2. Remove the screws and open the hinged cover (1) of the housing. Remove screws of the electronics module (2).
3. Then push up electronics module and pull it as far as possible out of the wall-mounted housing.
4. Disconnect the following cable plugs from amplifier board (7):
   – Electrode signal cable plug (7.1) including S-DAT (7.3).
   – Plug of coil current cable (7.2). To do so, loosen the plug locking of the coil current cable and gently disconnect the plug from the board, i.e. without moving it to and fro.
   – Ribbon cable plug (3) of the display module.
5. Remove the screws and remove the cover (4) from the electronics compartment.
6. Remove the boards (6, 7, 8): Insert a suitable tool into the hole (5) provided for the purpose and pull the board clear of its holder.
7. Installation is the reverse of the removal procedure.

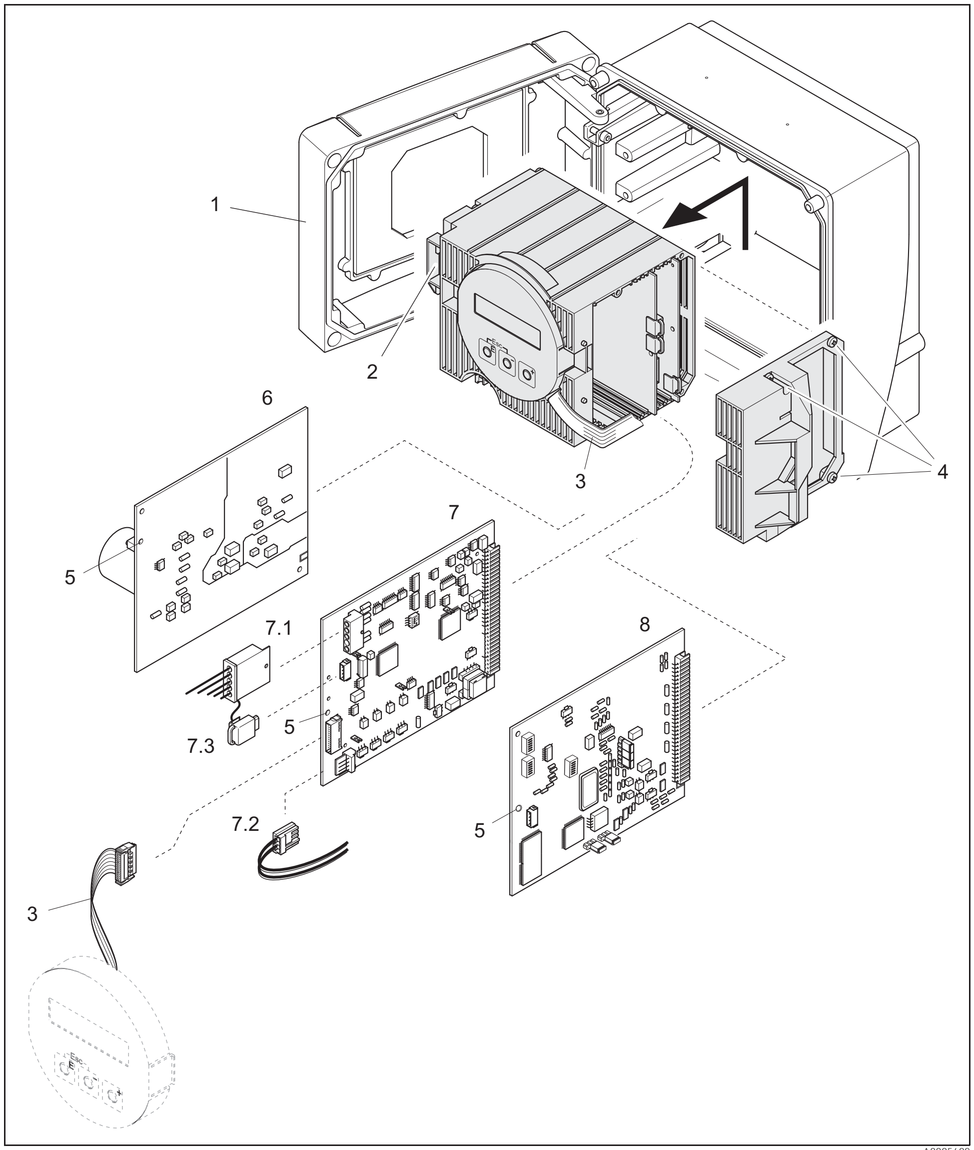


Fig. 55: Wall-mount housing: removing and installing printed circuit boards

1 Housing cover
2 Electronics module
3 Ribbon cable (display module)
4 Cover of electronics compartment (3 screws)
5 Aperture for installing/removing boards
6 Power supply board
7 Amplifier board
7.1 Electrode signal cable (sensor)
7.2 Coil current cable (sensor)
7.3 Histo-ROM / S-DAT (sensor data memory)
8 I/O board

9.6.2 Replacing the device fuse

Warning!
Risk of electric shock! Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

The main fuse is on the power supply board (→ 56).
The procedure for replacing the fuse is as follows:

1. Switch off power supply.
2. Remove the power supply board: field housing → 90, wall-mount housing → 92
3. Remove cap (1) and replace the device fuse (2).
   Use only fuses of the following type:
   – Power supply 20 to 55 V AC / 16 to 62 V DC → 2.0 A slow-blow / 250 V; 5.2 × 20 mm
   – Power supply 85 to 260 V AC → 0.8 A slow-blow / 250 V; 5.2 × 20 mm
   – Ex-rated devices → see the Ex documentation.
4. Installation is the reverse of the removal procedure.

Caution!
Use only original Endress+Hauser parts.

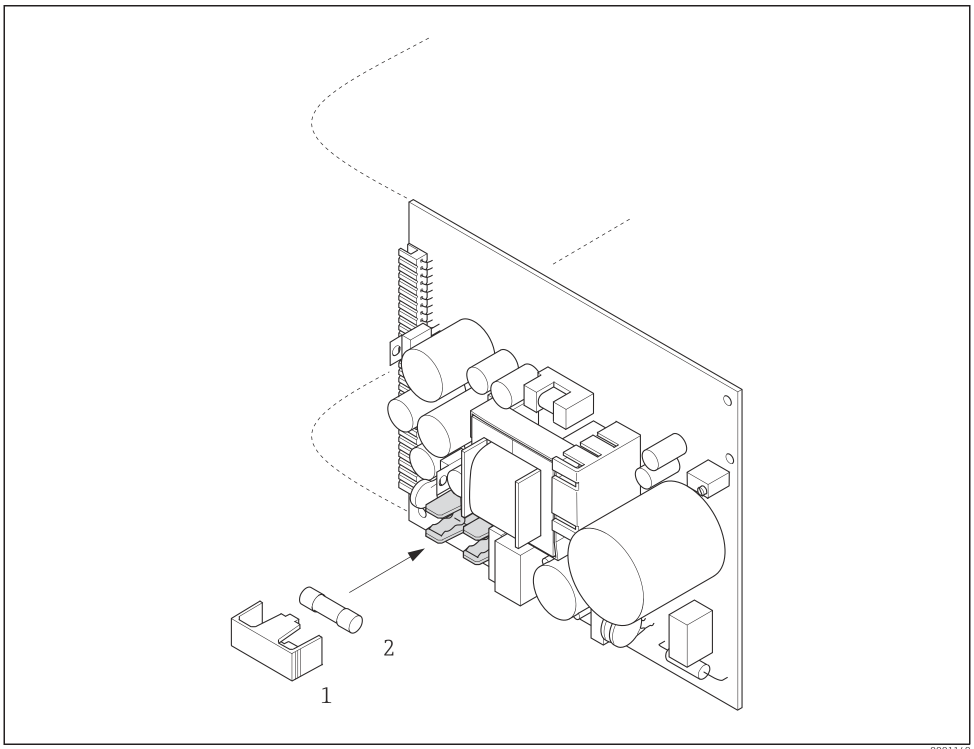


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Fig. 56: Replacing the device fuse on the power supply board

1 Protective cap
2 Device fuse

9.6.3 Replacing the exchangeable electrode

The Promag W sensor (DN 350 to 2000 / 14 to 78") is available with exchangeable measuring electrodes as an option. This design permits the measuring electrodes to be replaced or cleaned under process conditions.

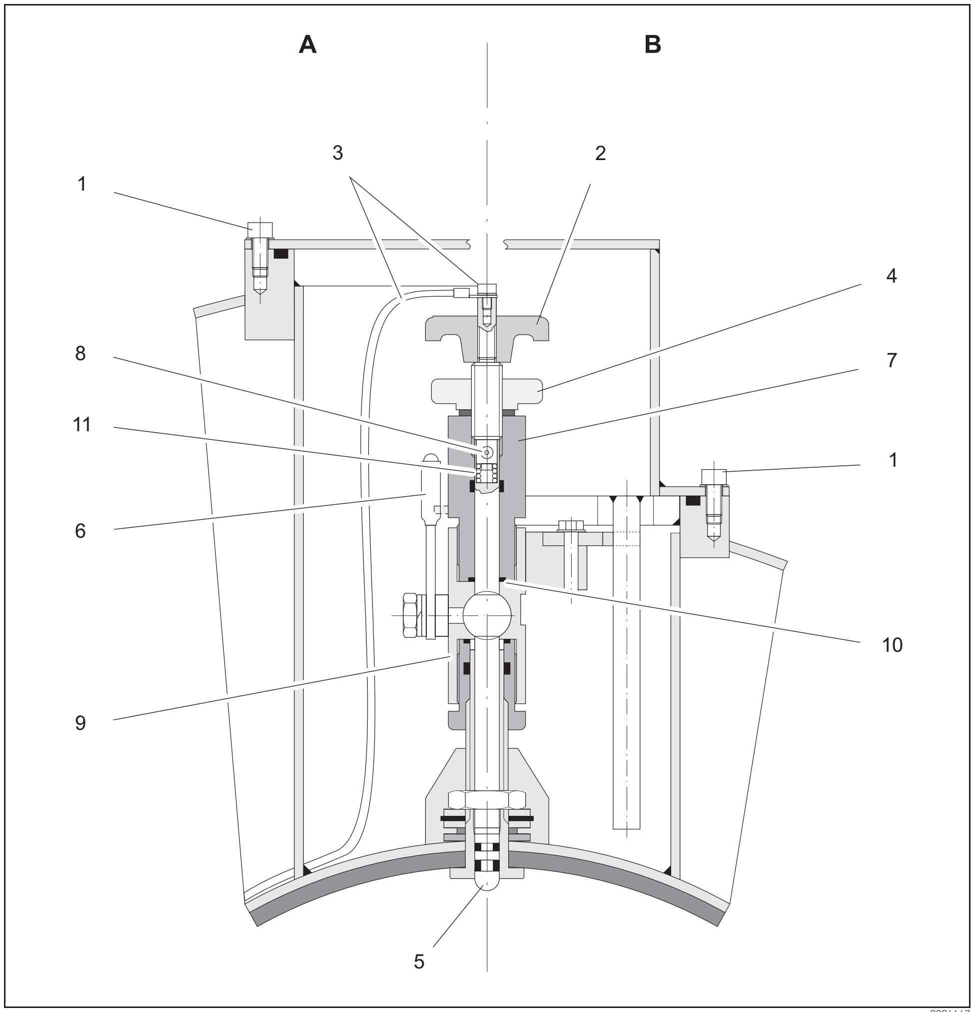

Fig. 57: Apparatus for replacing exchangeable measuring electrodes

View A = DN 1200 to 2000 (48 to 78")

View B = DN 350 to 1050 (14 to 42")

1 Allen screw
2 Handle
3 Electrode cable
4 Knurled nut (locknut)
5 Measuring electrode
6 Stop cock (ball valve)
7 Retaining cylinder
8 Locking pin (for handle)
9 Ball-valve housing
10 Seal (retaining cylinder)
11 Coil spring

Removing the electrode	Installing the electrode
1 Loosen Allen screw (1) and remove the cover.	1 Insert new electrode (5) into retaining cylinder (7) from below. Make sure that the seals at the tip of the electrode are clean.
2 Remove electrode cable (3) secured to handle (2).	2 Mount handle (2) on the electrode and insert locking pin (8) to secure it in position. Caution! Make sure that coil spring (11) is inserted. This is essential to ensure correct electrical contact and correct measuring signals.
3 Loosen knurled nut (4) by hand. This knurled nut acts as a locknut.	3 Pull the electrode back until the tip of the electrode no longer protrudes from retaining cylinder (7).
4 Remove electrode (5) by turning handle (2). The electrode can now be pulled out of retaining cylinder (7) as far as a defined stop. Warning! Risk of injury. Under process conditions (pressure in the piping system) the electrode can recoil suddenly against its stop. Apply counter-pressure while releasing the electrode.	4 Screw the retaining cylinder (7) onto ball-valve housing (9) and tighten it by hand. Seal (10) on the cylinder must be correctly seated and clean. Note! Make sure that the rubber hoses on retaining cylinder (7) and stop cock (6) are of the same color (red or blue).
5 Close stop cock (6) after pulling out the electrode as far as it will go. Warning! Do not subsequently open the stop cock, in order to prevent fluid escaping.	5 Open stop cock (6) and turn handle (2) to screw the electrode all the way into the retaining cylinder.
6 Remove the electrode complete with retaining cylinder (7).	6 Screw knurled nut (4) onto the retaining cylinder. This firmly locates the electrode in position.
7 Remove handle (2) from electrode (5) by pressing out locking pin (8). Take care not to lose coil spring (11).	7 Use the Allen screw to secure electrode cable (3) to handle (2). Caution! Make sure that the machine screw securing the electrode cable is firmly tightened. This is essential to ensure correct electrical contact and correct measuring signals.
8 Remove the old electrode and insert the new electrode. Replacement electrodes can be ordered separately from Endress+Hauser.	8 Reinstall the cover and tighten Allen screw (a).

9.7 Return

Caution!
Do not return a measuring device if you are not absolutely certain that all traces of hazardous substances have been removed, e.g. substances which have penetrated crevices or diffused through plastic.
Costs incurred for waste disposal and injury (burns, etc.) due to inadequate cleaning will be charged to the owner-operator.

The following steps must be taken before returning a flow measuring device to Endress+Hauser, e.g. for repair or calibration:
- Always enclose a duly completed "Declaration of contamination" form. Only then can Endress+Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EC REACH Regulation No. 1907/2006.
- Remove all residues. Pay special attention to the grooves for seals and crevices which could contain residues. This is particularly important if the substance is hazardous to health, e.g. flammable, toxic, caustic, carcinogenic, etc.

Note!
You will find a preprinted "Declaration of contamination" form at the back of these Operating Instructions.

9.8 Disposal

Observe the regulations applicable in your country!

9.9 Software history

Date	Software version	Changes to software	Operating Instructions
01.2011	Amplifier: V 2.04.XX	Introduction of new nominal diameters; calf values to 2.5	71249447 / 15.14
11.2009	Amplifier: V 2.03.XX	Introduction of Calf history	71106181 / 12.09 71105332 / 11.09
06.2009	Amplifier: V 2.02.XX	Introduction of Promag L	71095684 / 06.09
03.2009	Amplifier: V 2.02.XX	Introduction of Promag D Introduction of new nominal diameter	71088677 / 03.09
11.2004	Amplifier: 1.06.01 Communication module: 1.04.00	Software update relevant only for production	50097089 / 10.03
10.2003	Amplifier: 1.06.00 Communication module: 1.03.00	Software expASMEon: ▪ Language groups ▪ Flow direction pulse output selectable New functionalities: ▪ Second Totalizer ▪ Adjustable backlight (display) ▪ Operation hours counter ▪ Simulation function for pulse output ▪ Counter for access code ▪ Reset function (fault history) ▪ Up-/download with FieldTool	50097089 / 10.03

Date	Software version	Changes to software	Operating Instructions
08.2003	Communication module: 1.02.01	Software expASMEon: ▪ New / revised functionalities New functionalities: ▪ Current span NAMUR NE 43 ▪ Failsafe mode function ▪ Troubleshooting function ▪ System and process error messages ▪ Response of status output	50097089 / 08.03
08.2002	Amplifier: 1.04.00	Software expASMEon: ▪ New / revised functionalities New functionalities: ▪ Current span NAMUR NE 43 ▪ EPD (new mode) ▪ Failsafe mode function ▪ Acknowledge fault function ▪ Troubleshooting function ▪ System and process error messages ▪ Response of status output	50097089 / 08.02
03.2002	Amplifier: 1.03.00	Software expASMEon: ▪ Suitability for custody transfer measurement Promag 50/51	none
06.2001	Amplifier: 1.02.00 Communication module: 1.02.00	Software expASMEon: ▪ New functionalities: New functionalities: ▪ General device functions ▪ "OED" software function ▪ "Pulse width" software function	50097089 / 06.01
09.2000	Amplifier: 1.01.01 Communication module: 1.01.00	Software expASMEon: ▪ Functional adaptations	none
08.2000	Amplifier: 1.01.00	Software expASMEon: ▪ Functional adaptations	none
04.2000	Amplifier: 1.00.00 Communication module: 1.00.00	Original software Compatible with: ▪ FieldTool ▪ Commuwin II (version 2.05.03 and higher) ▪ HART Communicator DXR 275 (from OS 4.6) with Rev. 1, DD1	50097089 / 04.00

✎ Note!
Uploads or downloads between the individual software versions are only possible with a special service software.

10 Technical data

10.1 Technical data at a glance

10.1.1 Application

→ 📄 4

10.1.2 Function and system design

Measuring principle

Electromagnetic flow measurement on the basis of Faraday's Law.

Measuring system

→ 📄 6

10.1.3 Input

Measured variable

Flow velocity (proportional to induced voltage)

Measuring range

Typically v = 0.01 to 10 m/s (0.033 to 33 ft/s) with the specified accuracy

Operable flow range

Over 1000 : 1

Input signal

Status input (auxiliary input)

- Galvanically isolated
- U = 3 to 30 V DC
- Ri = 5 kΩ
- Can be configured for: totalizer reset, positive zero return, error message reset.

10.1.4 Output

Output signal

Current output

- Galvanically isolated
- Active/passive can be selected:
  - Active: 0/4 to 20 mA, R_L < 700 Ω (HART: R_L ≥ 250 Ω)
  - Passive: 4 to 20 mA, supply voltage V_S 18 to 30 V DC, R_i ≥150 Ω)
- Time constant can be selected (0.01 to 100s)
- Full scale value adjustable
- Temperature coefficient: typ. 0.005% o.f.s./°C, resolution: 0.5 µA

o.f.s. = of full scale value

Pulse/frequency output

- Galvanically isolated
- Passive: 30 V DC / 250 mA
- Open collector
- Can be configured as:
  - Pulse output
    Pulse value and pulse polarity can be selected, max. pulse width adjustable (0.5 to 2000 ms)
  - Frequency output
    Full scale frequency 2 to 1000 Hz (f_{max} = 1.25 Hz), on/off ratio 1:1, pulse width max. 10 s

Signal on alarm

Current output

Failsafe mode can be selected (e.g. in accordance with NAMUR Recommendation NE 43)

Pulse/frequency output

Failsafe mode can be selected

Status output

"Not conductive" in the event of fault or power supply failure

Load

See "Output signal"

Switching output

Status output

- Galvanically isolated
- Max. 30 V DC/250 mA
- Open collector
- Can be configured for: error messages, empty pipe detection (EPD), flow direction, limit values

Low flow cut off

Low flow cut off, switch-on point can be selected as required

Galvanic isolation

All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

10.1.5 Power supply

Electrical connections

→ 📄 47

Supply voltage (power supply)

- 20 to 55 V AC, 45 to 65 Hz
- 85 to 260 V AC, 45 to 65 Hz
- 16 to 62 V DC

Cable entry

Power supply and signal cables (inputs/outputs):

- Cable entry M20 × 1.5 (8 to 12 mm/0.31 to 0.47 inch)
- Sensor cable entry for armored cables M20 × 1.5 (9.5 to 16 mm / 0.37 to 0.63 inch)
- Threads for cable entries ½" NPT, G ½"

Connecting cable for remote version:

- Cable entry M20 × 1.5 (8 to 12 mm/0.31 to 0.47 inch)
- Sensor cable entry for armored cables M20 × 1.5 (9.5 to 16 mm / 0.37 to 0.63 inch)
- Threads for cable entries ½" NPT, G ½"

Cable specifications

→ 📄 52

Power consumption

Power consumption

- AC: <15 VA (incl. sensor)
- DC: <15 W (incl. sensor)

Switch-on current

- max. 8.5 A (< 50 ms) for 24 V DC
- max. 3 A (< 5 ms) for 260 V AC

Power supply failure

- Lasting min. 1 cycle frequency:
- EEPROM saves measuring system data
- S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point etc.)

Potential equalization

→ 📄 56

10.1.6 Performance characteristics

Reference operating conditions

To DIN EN 29104 and VDI/VDE 2641:

- Fluid temperature: +28 ± 2 °C (+82 ± 4 °F)
- Ambient temperature: +22 ± 2 °C (+72 ± 4 °F)
- Warm-up period: 30 minutes

Installation:

- Inlet run >10 × DN
- Outlet run > 5 × DN
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.

Maximum measured error

- Current output: plus typically ± 5 μA
- Pulse output: ± 0.5% o.r. ± 1 mm/s
  Option: ± 0.2% o.r. ± 2 mm/s (o.r. = of reading)

Fluctuations in the supply voltage do not have any effect within the specified range.

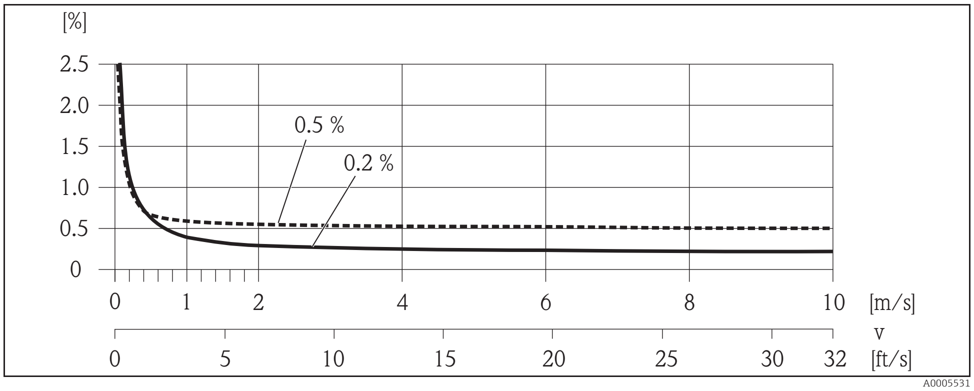

Fig. 58: Max. measured error in % of reading

Repeatability

Max. ± 0.1% o.r. ± 0.5 mm/s (o.r. = of reading)

10.1.7 Installation

Installation instructions

Any orientation (vertical, horizontal), restrictions and installation instructions → 📄 12

Inlet and outlet run

If possible, install the sensor upstream from fittings such as valves, T-pieces, elbows, etc. The following inlet and outlet runs must be observed in order to meet accuracy specifications (→ 📄 15, → 🖼 12):
- Inlet run: ≥ 5 × DN
- Outlet run: ≥ 2 × DN

Adapters

→ 📄 16

Length of connecting cable

→ 📄 19

10.1.8 Environment

Ambient temperature range

- Transmitter: –20 to +60 °C (–4 to +140 °F)

  Note!
  At ambient temperatures below –20 (–4 °F) the readability of the display may be impaired.

- Sensor (Flange material carbon steel): –10 to +60 °C (+14 to +140 °F)

Caution!
- The permitted temperature range of the measuring tube lining may not be undershot or overshot (→ "Operating conditions: Process" → "Medium temperature range").
- Install the device in a shady location. Avoid direct sunlight, particularly in warm climatic regions.
- The transmitter must be mounted separate from the sensor if both the ambient and fluid temperatures are high.

Storage temperature

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.

Caution!
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- A storage location must be selected where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.

Degree of protection

- Standard: IP 67 (NEMA 4X) for transmitter and sensor
- Optional: IP 68 (NEMA 6P) for remote version of Promag E/L/P/W sensor.
  Promag L only with stainless steel flanges.

Shock and vibration resistance

Acceleration up to 2 g following IEC 60068-2-6
(high-temperature version: no data available)

CIP cleaning

Caution!
The maximum fluid temperature permitted for the device may not be exceeded.

CIP cleaning is possible:
Promag E (100 °C / 212 °F), Promag H/P

CIP cleaning is not possible:
Promag D/L/W

SIP cleaning

Caution!
The maximum fluid temperature permitted for the device may not be exceeded.

SIP cleaning is possible:
Promag H

SIP cleaning is not possible:
Promag D/E/L/P/W

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326 and NAMUR Recommendation NE 21
- Emission: to limit value for industry EN 55011

10.1.9 Process

Medium temperature range

The permissible temperature depends on the lining of the measuring tube

Promag D

0 to +60 °C (+32 to +140 °F) for polyamide

Promag E

–10 to +110 °C (+14 to +230 °F) for PTFE,
Restrictions → see the following diagram

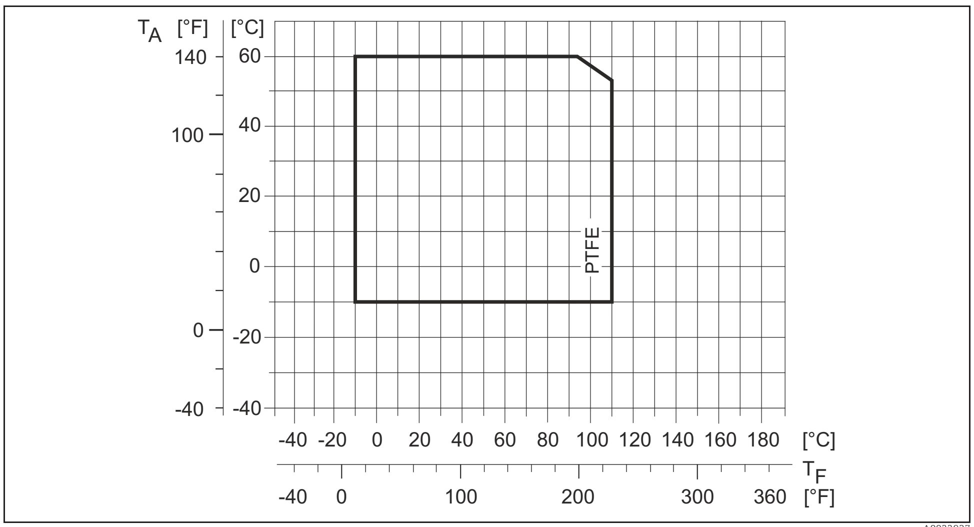

Fig. 59: Compact and remote version Promag E (TA = ambient temperature; TF = fluid temperature)

Promag H

Sensor:
- DN 2 to 25 (1/12 to 1"): –20 to +150 °C (–4 to +302 °F)
- DN 40 to 100 (1 ½ to 4"): –20 to +150 °C (–4 to +302 °F)

Seals:
- EPDM: –20 to +150 °C (–4 to +302 °F)
- Silicone (VMQ): –20 to +150 °C (–4 to +302 °F)
- Viton (FKM): –20 to +150 °C (–4 to +302 °F)
- Kalrez: –20 to +150 °C (–4 to +302 °F)

Promag L

- 0 to +80 °C (+32 to +176 °F) for hard rubber (DN 350 to 2400 / 14 to 90")
- –20 to +50 °C (–4 to +122 °F) for polyurethane (DN 25 to 1200 / 1 to 48")
- –20 to +90 °C (–4 to +194 °F) for PTFE (DN 25 to 300 / 1 to 12")

Promag P

Standard
- –40 to +130 °C (–40 to +266 °F) for PTFE (DN 15 to 600 / ½ to 24"),
  Restrictions → see the following diagrams
- –20 to +130 °C (–4 to +266 °F) for PFA/HE (DN 25 to 200 / 1 to 8"),
  Restrictions → see the following diagrams
- –20 to +150 °C (–4 to +302 °F) for PFA (DN 25 to 200 / 1 to 8"),
  Restrictions → see the following diagrams

Optional
High-temperature version (HT): –20 to +180 °C (–4 to +356 °F) for PFA (DN 25 to 200 / 1 to 8")

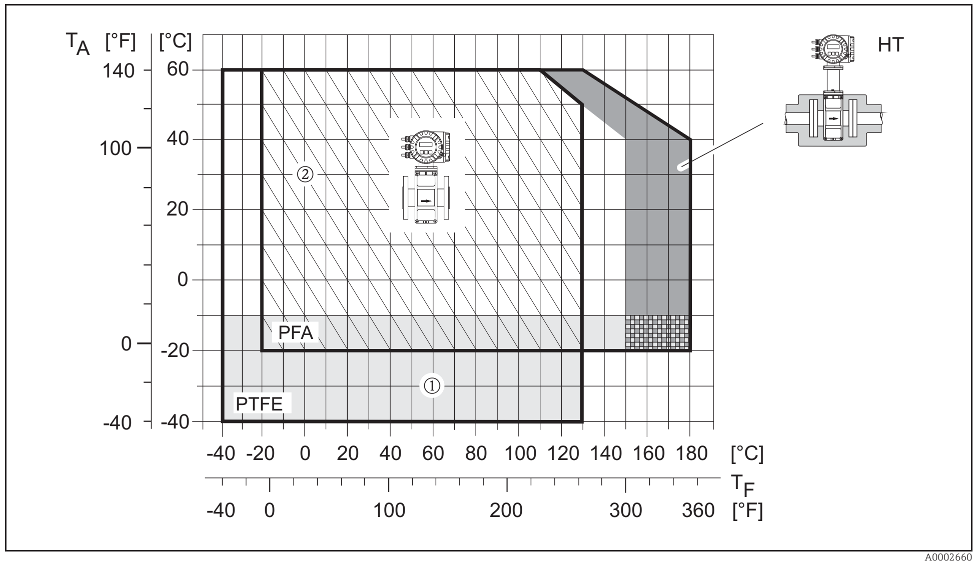

Abb. 60: Compact version Promag P (with PFA- or PTFE-lining)

TA = ambient temperature; TF = fluid temperature; HT = high-temperature version with insulation
m = light gray area → temperature range from –10 to –40 °C (–14 to –40 °F) is valid for stainless steel version only
n = diagonal hatched area → foam lining (HE) and degree of protection IP 68 = fluid temperature max. 130°C / 266 °F

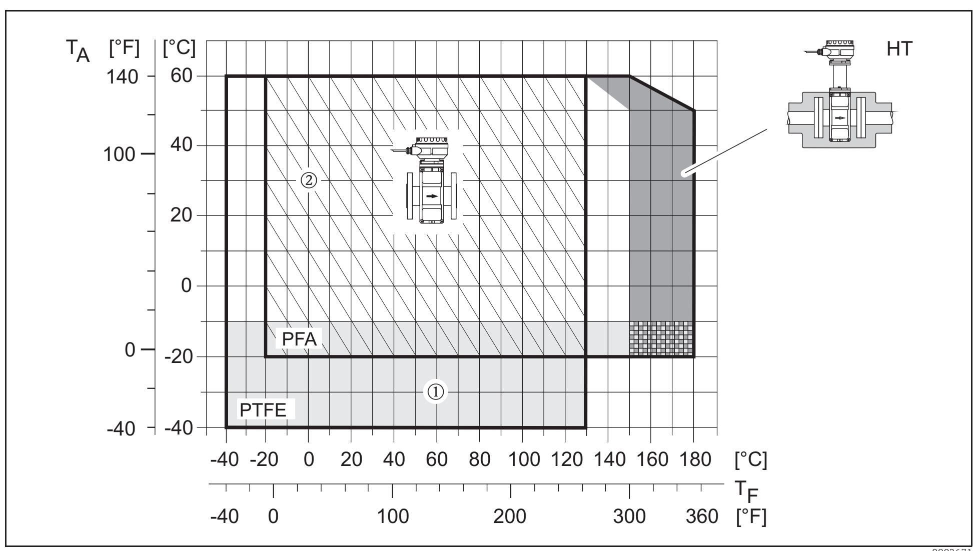

Abb. 61: Remote version Promag P (with PFA- or PTFE-lining)

TA = ambient temperature; TF = fluid temperature; HT = high-temperature version with insulation
m = light gray area → temperature range from –10 to –40 °C (–14 to –40 °F) is valid for stainless steel version only
n = diagonal hatched area → foam lining (HE) and degree of protection IP68 = fluid temperature max. 130°C / 266 °F

Promag W

- 0 to +80 °C (+32 to +176 °F) for hard rubber (DN 50 to 2000 / 2 to 78")
- –20 to +50 °C (–4 to +122 °F) for polyurethane (DN 25 to 1200 / 1 to 48")

Conductivity

The minimum conductivity is ≥ 5 μS/cm (≥ 20 μS/cm for demineralized water)

Note!
Note that in the case of the remote version, the requisite minimum conductivity is also influenced by the length of the connecting cable → 19

Medium pressure range (nominal pressure)

Promag D

- EN 1092-1 (DIN 2501)
  - PN 16
- ASME B 16.5
  - Class 150
- JIS B2220
  - 10K

Promag E

- EN 1092-1 (DIN 2501)
  - PN 10 (DN 200 to 600 / 8 to 24")
  - PN 16 (DN 65 to 600 / 3 to 24")
  - PN 40 (DN 15 to 150 / ½ to 2")
- ASME B 16.5
  - Class 150 (½ to 24")
- JIS B2220
  - 10K (DN 50 to 300 / 2 to 12")
  - 20K (DN 15 to 40 / ½ to 1½")

Promag H

The permissible nominal pressure depends on the process connection and the seal:
- PN 16, PN 40, Class 150, 10 K → Welding nipple, couplings, flanges, hose connection, adhesive fitting (with O-ring seal)
- PN 16 → Welding nipple, couplings, clamp, flange (with aseptic gasket seal)

Promag L

- EN 1092-1 (DIN 2501)
  - PN 6 (DN 350 to 2400 / 14 to 90")
  - PN 10 (DN 200 to 2400 / 8 to 90")
  - PN 16 (DN 25 to 300 / 1 to 12")
- EN 1092-1, lap joint flange, stampel plate
  - PN 10 (DN 25 to 300 / 1 to 12")
- ASME B16.5
  - Class 150 (1 to 24")
- AWWA
  - Class D (28 to 90")
- AS2129
  - Table E (350 to 1200 / 14 to 48")
- AS4087
  - PN 16 (350 to 1200 / 14 to 48")

Promag P

- EN 1092-1 (DIN 2501)
  - PN 10 (DN 200 to 600 / 8 to 24")
  - PN 16 (DN 65 to 600 / 3 to 24")
  - PN 25 (DN 200 to 600 / 8 to 24")
  - PN 40 (DN 25 to 150 / 1 to 6")

- ASME B 16.5
  - Class 150 (1 to 24")
  - Class 300 (1 to 6")
- JIS B2220
  - 10K (DN 50 to 300 / 2 to 12")
  - 20K (DN 25 to 300 / 1 to 12")
- AS 2129
  - Table E (DN 25 / 1"), 50 / 2")
- AS 4087
  - PN 16 (DN 50 / 2")

Promag W

- EN 1092-1 (DIN 2501)
  - PN 6 (DN 350 to 2000 / 14 to 84")
  - PN 10 (DN 200 to 2000 / 8 to 84")
  - PN 16 (DN 65 to 2000 / 3 to 84")
  - PN 25 (DN 200 to 1000 / 8 to 40")
  - PN 40 (DN 25 to 150 / 1 to 6")
- ASME B 16.5
  - Class 150 (1 to 24")
  - Class 300 (1 to 6")
- AWWA
  - Class D (28 to 78")
- JIS B2220
  - 10K (DN 50 to 300 / 2 to 12")
  - 20K (DN 25 to 300 / 1 to 12")
- AS 2129
  - Table E (DN 80 / 3", 100 / 4", 150 to 1200 / 6 to 48")
- AS 4087
  - PN 16 (DN 80 / 3", 100 / 4", 150 to 1200 / 6 to 48")

Pressure tightness

Promag D

Measuring tube: 0 mbar abs (0 psi abs) with a fluid temperature of ≤ 60 °C (140 °F)

Promag E (Measuring tube lining: PTFE)

Nominal diameter		Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures							
		25 °C		80 °C		100 °C		110 °C	
		77 °F		176 °F		212 °F		230 °F	
[mm]	[inch]	[mbar]	[psi]			[mbar]	[psi]	[mbar]	[psi]
15	½"	0	0	0	0	0	0	100	1.45
25	1"	0	0	0	0	0	0	100	1.45
32	–	0	0	0	0	0	0	100	1.45
40	1 ½"	0	0	0	0	0	0	100	1.45
50	2"	0	0	0	0	0	0	100	1.45
65	–	0	0	*	*	40	0.58	130	1.89
80	3"	0	0	*	*	40	0.58	130	1.89
100	4"	0	0	*	*	135	1.96	170	2.47
125	–	135	1.96	*	*	240	3.48	385	5.58
150	6"	135	1.96	*	*	240	3.48	385	5.58
200	8"	200	2.90	*	*	290	4.21	410	5.95
250	10"	330	4.79	*	*	400	5.80	530	7.69

Nominal diameter		Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures							
		25 °C		80 °C		100 °C		110 °C	
		77 °F		176 °F		212 °F		230 °F	
[mm]	[inch]	[mbar]	[psi]			[mbar]	[psi]	[mbar]	[psi]
300	12"	400	5.80	*	*	500	7.25	630	9.14
350	14"	470	6.82	*	*	600	8.70	730	10.59
400	16"	540	7.83	*	*	670	9.72	800	11.60
450	18"	Partial vacuum is impermissible!							
500	20"								
600	24"								
* No value can be quoted.									

Promag H (Measuring tube lining: PFA)

Nominal diameter		Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures					
		25 °C	80 °C	100 °C	130 °C	150 °C	180 °C
[mm]	[inch]	77 °F	176 °F	212 °F	266 °F	302 °F	356 °F
2 to 100	1/12 to 4"	0	0	0	0	0	0

Promag L (Measuring tube lining: Polyurethane, Hard rubber)

Nominal diameter		Measuring tube lining	Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures		
			25 °C	50 °C	80 °C
[mm]	[inch]		77 °F	122 °F	176 °F
25 to 1200	1 to 48"	25 to 1200	1 to 48"	0	–
350 to 2400	14 to 90"	Hard rubber	0	0	0

Promag L (Measuring tube lining: PTFE)

Nominal diameter		Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures			
		25 °C		90 °C	
		77 °F		194 °F	
[mm]	[inch]	[mbar]	[psi]	[mbar]	[psi]
25	1"	0	0	0	0
32	–	0	0	0	0
40	1 ½"	0	0	0	0
50	2"	0	0	0	0
65	–	0	0	40	0.58
80	3"	0	0	40	0.58
100	4"	0	0	135	1.96
125	–	135	1.96	240	3.48
150	6"	135	1.96	240	3.48
200	8"	200	2.90	290	4.21
250	10"	330	4.79	400	5.80
300	12"	400	5.80	500	7.25

Promag P (Measuring tube lining: PFA)

Promag P Nominal diameter		Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures					
		25 °C	80° C	100 °C	130 °C	150 °C	180 °C
[mm]	[inch]	77 °F	176° F	212 °F	266 °F	302 °F	356 °F
25	1"	0	0	0	0	0	0
32	-	0	0	0	0	0	0
40	1 ½"	0	0	0	0	0	0
50	2"	0	0	0	0	0	0
65	-	0	*	0	0	0	0
80	3"	0	*	0	0	0	0
100	4"	0	*	0	0	0	0
125	-	0	*	0	0	0	0
150	6"	0	*	0	0	0	0
200	8"	0	*	0	0	0	0
* No value can be quoted.							

Promag P (Measuring tube lining: PTFE)

Nominal diameter		Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures									
		25 °C		80 °C		100 °C		130 °C		150 °C	180 °C
		77 °F		176 °F		212 °F		266 °F		302 °F	356 °F
[mm]	[inch]	[mbar]	[psi]			[mbar]	[psi]	[mbar]	[psi]		
25	1"	0	0	0	0	0	0	100	1.45	–	–
32	–	0	0	0	0	0	0	100	1.45	–	–
40	1 ½"	0	0	0	0	0	0	100	1.45	–	–
50	2"	0	0	0	0	0	0	100	1.45	–	–
65	–	0	0	*	*	40	0.58	130	1.89	–	–
80	3"	0	0	*	*	40	0.58	130	1.89	–	–
100	4"	0	0	*	*	135	1.96	170	2.47	–	–
125	–	135	1.96	*	*	240	3.48	385	5.58	–	–
150	6"	135	1.96	*	*	240	3.48	385	5.58	–	–
200	8"	200	2.90	*	*	290	4.21	410	5.95	–	–
250	10"	330	4.79	*	*	400	5.80	530	7.69	–	–
300	12"	400	5.80	*	*	500	7.25	630	9.14	–	–
350	14"	470	6.82	*	*	600	8.70	730	10.59	–	–
400	16"	540	7.83	*	*	670	9.72	800	11.60	–	–
450	18"	Partial vacuum is impermissible!									
500	20"										
600	24"										
* No value can be quoted.											

Promag W

Nominal diameter		Measuring tube lining	Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] ([psi]) at various fluid temperatures						
			25 °C	50 °C	80 °C	100 °C	130 °C	150 °C	180 °C
[mm]	[inch]		77 °F	122 °F	176 °F	212 °F	266 °F	302 °F	356 °F
25 to 1200	1 to 40"	Polyurethane	0	0	–	–	–	–	–
50 to 2000	2 to 78"	Hard rubber	0	0	0	–	–	–	–

Limiting flow

→ 📄 17

Pressure loss

- No pressure loss if the sensor is installed in a pipe of the same nominal diameter (Promag H: only DN 8 and larger).
- Pressure losses for configurations incorporating adapters according to DIN EN 545 (see "Adapters" → 📄 16)

10.1.10 Mechanical construction

Design, dimensions

The dimensions and installation lengths of the sensor and transmitter can be found in the "Technical Information" for the device in question. This document can be downloaded as a PDF file from www.endress.com. A list of the "Technical Information" documents available is provided in the "Documentation" section on → 📄 127.

Weight (SI units)

Promag D

Weight data in kg				
Nominal diameter		Compact version	Remote version (without cable)	
[mm]	[inch]		Sensor	Transmitter
25	1"	4.5	2.5	6.0
40	1 ½"	5.1	3.1	6.0
50	2"	5.9	3.9	6.0
65	2 ½"	6.7	4.7	6.0
80	3"	7.7	5.7	6.0
100	4"	10.4	8.4	6.0
Transmitter Promag (compact version): 3.4 kg (Weight data valid without packaging material)				

Promag E

Weight data in kg							
Nominal diameter		Compact version					
		EN (DIN)				ASME	JIS
[mm]	[inch]	PN 6	PN 10	PN 16	PN 40	Class 150	10K
15	½"	–	–	–	6.5	6.5	6.5
25	1"	–	–	–	7.3	7.3	7.3
32	–	–	–	–	8.0	–	7.3
40	1½"	–	–	–	9.4	9.4	8.3
50	2"	–	–	–	10.6	10.6	9.3
65	–	–	–	12.0	–	–	11.1
80	3"	–	–	14.0	–	14.0	12.5
100	4"	–	–	16.0	–	16.0	14.7
125	–	–	–	21.5	–	–	21.0
150	6"	–	–	25.5	–	25.5	24.5
200	8"	–	45.0	46.0	–	45.0	41.9
250	10"	–	65.0	70.0	–	75.0	69.4
300	12"	–	70.0	81.0	–	110.0	72.3
350	14"	77.4	88.4	99.4	–	137.4	–
400	16"	89.4	104.4	120.4	–	168.4	–
450	18"	99.4	112.4	133.4	–	191.4	–
500	20"	114.4	132.4	182.4	–	228.4	–
600	24"	155.4	162.4	260.4	–	302.4	–

- Transmitter (compact version): 1.8 kg
- Weight data without packaging material

Weight data in kg								
Nominal diameter		Remote version (without cable)						
		Sensor						Transmitter
		EN (DIN)				ASME	JIS	
[mm]	[inch]	PN 6	PN 10	PN 16	PN 40	Class 150	10K	Wall-mount housing
15	½"	–	–	–	4.5	4.5	4.5	6.0
25	1"	–	–	–	5.3	5.3	5.3	
32	–	–	–	–	6.0	–	5.3	
40	1½"	–	–	–	7.4	7.4	6.3	
50	2"	–	–	–	8.6	8.6	7.3	
65	–	–	–	10.0	–	–	9.1	
80	3"	–	–	12.0	–	12.0	10.5	
100	4"	–	–	14.0	–	14.0	12.7	
125	–	–	–	19.5	–	–	19.0	
150	6"	–	–	23.5	–	23.5	22.5	
200	8"	–	43.0	44.0	–	43.0	39.9	
250	10"	–	63.0	68.0	–	73.0	67.4	
300	12"	–	68.0	79.0	–	108.0	70.3	
350	14"	73.1	84.1	95.1	–	133.1		
400	16"	85.1	100.1	116.1	–	164.1		
450	18"	95.1	108.1	129.1	–	187.1		
500	20"	110.1	128.1	178.1	–	224.1		
600	24"	158.1	158.1	256.1	–	298.1		

- Transmitter (remote version): 3.1 kg
- Weight data without packaging material

Promag H

Weight data in kg				
Nominal diameter		Compact version	Remote version (without cable)	
[mm]	[inch]	DIN	Sensor	Transmitter
2	1/12"	5.2	2	6.0
4	1/8"	5.2	2	6.0
8	3/8"	5.3	2	6.0
15	½"	5.4	1.9	6.0
25	1"	5.5	2.8	6.0
40	1 ½"	6.5	4.5	6.0
50	2"	9.0	7.0	6.0
65	2 ½"	9.5	7.5	6.0
80	3"	19.0	17.0	6.0
100	4"	18.5	16.5	6.0
Transmitter Promag (compact version): 3.4 kg (Weight data valid for standard pressure ratings and without packaging material)				

Promag L

Weight data in kg							
Nominal diameter		Compact version (including transmitter)[1]					
[mm]	[inch]	EN (DIN)			ASME/ AWWA	AS	
		PN 6	PN 10	PN 16	ASME / Class 150	PN 16	Tabelle E
25	1"	–	–	7.3	7.9	–	–
32	1 ¼"	–	–	8.0	–	–	–
40	1 ½"	–	–	9.0	7.5	–	–
50	2"	–	–	9.4	7.6	–	–
65	2 ½"	–	–	10.4	–	–	–
80	3"	–	–	12.4	12.8	–	–
100	4"	–	–	14.4	16.1	–	–
125	5"	–	–	15.9	–	–	–
150	6"	–	–	23.9	24.4	–	–
200	8"	–	43.4	44.9	49.6	–	–
250	10"	–	63.4	70.7	75.1	–	–
300	12"	–	68.4	85.8	100	–	–
350	14"	77.4	88.4	103	137	99.4	99.4
375	15"	–	–	–	–	105	–
400	16"	89.4	104	124	168	120	120
450	18"	99.4	112	139	191	133	143
500	20"	114	132	174	228	182	182
600	24"	155	162	303	302	260	260
					AWWA / Class D		
700	28"	190	240	288	266	367	346
750	30"	–	–	–	318	445	433
800	32"	240	315	364	383	503	493
900	36"	308	393	456	470	702	690
1000	40"	359	468	579	587	759	761
1050	42"	–	–	–	670	–	–
1200	48"	529	717	866	901	–	1237
–	54"	–	–	–	1273	–	–
1400	–	784	1114	1274	–	–	–
–	60"	–	–	–	1594	–	–
1600	–	1058	1624	1872	–	–	–
1650	66"	–	–	–	2131	–	–
1800	72"	1418	2107	2409	2568	–	–
2000	78"	1877	2630	2997	3113	–	–
–	84"	–	–	–	3755	–	–
2200	–	2512	3422	–	–	–	–
–	90"	–	–	–	4797	–	–
2400	–	2996	4094	–	–	–	–
Transmitter Promag (compact version): 3.1 kg (Weight data valid without packaging material)							

1) Lap joint flanges / welded flanges DN > 300 (12")

Weight data in kg								
Nominal diameter		Remote version (sensor plus sensor housing without cable)[1]						
[mm]	[inch]	EN (DIN)			ASME/ AWWA		AS	
		PN 6	PN 10	PN 16			PN 16	Tabelle E
25	1"	–	–	5.3	ASME / Class 150	5.9	–	–
32	1 ¼"	–	–	6.0		–	–	–
40	1 ½"	–	–	7.0		5.5	–	–
50	2"	–	–	7.4		5.6	–	–
65	2 ½"	–	–	8.4		–	–	–
80	3"	–	–	10.4		10.8	–	–
100	4"	–	–	12.4		14.1	–	–
125	5"	–	–	13.9		–	–	–
150	6"	–	–	21.9		22.4	–	–
200	8"	–	41.4	42.9		47.6	–	–
250	10"	–	61.4	68.7		73.1	–	–
300	12"	–	66.4	83.8		98	–	–
350	14"	75.4	86.4	103		135	97.4	97.4
375	15"	–	102	–		–	103	–
400	16"	87.4	102	124		166	118	118
450	18"	97.4	110	139		189	131	141
500	20"	112	130	174		226	180	180
600	24"	153	160	303		300	258	258
700	28"	188	238	288	AWWA / Class D	264	365	344
750	30"	–	–	–		316	443	431
800	32"	238	313	364		381	501	491
900	36"	306	391	456		468	700	688
1000	40"	357	466	579		585	757	759
1050	42"	–	–	–		668	–	–
1200	48"	527	715	866		899		1235
–	54"	–	–	–		1271	–	–
1400	–	782	1112	1274		–	–	–
–	60"	–	–	–		1592	–	–
1600	–	1056	1622	1872		–	–	–
1650	66"	–	–	–		2129	–	–
1800	72"	1416	2105	2409		2566	–	–
2000	78"	1875	2628	2997		3111	–	–
–	84"	–	–	–		3753	–	–
2200	–	2510	3420	–		–	–	–
–	90"	–	–	–		4795	–	–
2400	–	2994	4092	–		–	–	–
Transmitter Promag (remote version): 3.4 kg (Weight data valid without packaging material)								

1) Lap joint flanges / welded flanges DN > 300 (12")

Weight data in kg						
Nominal diameter		Compact version[1]		Remote version (without cable)[1]		
[mm]	[inch]	EN (DIN)		Sensor EN (DIN)		Transmitter
25	1"	PN 10	5.8	PN 10	3.8	4.2
32	1 ¼"		5.4		3.4	4.2
40	1 ½"		6.3		4.7	4.2
50	2"		5.4		3.4	4.2
65	2 ½"		6.2		4.2	4.2
80	3"		7.2		5.2	4.2
100	4"		9.7		7.7	4.2
125	5"		13.2		11.2	4.2
150	6"		17.2		15.2	4.2
200	8"		35.7		33.7	4.2
250	10"		54.2		52.2	4.2
300	12"		55.2		53.2	4.2
Transmitter Promag (compact version): 1.8 kg (Weight data valid for standard pressure ratings and without packaging material)						

1) Lap joint flanges, stamped plate

Promag P

Weight data in kg														
Nominal diameter		Compact version						Remote version (without cable)						
								Sensor						Trans-mitter
[mm]	[inch]	EN (DIN) / AS*		JIS		ASME/ AWWA		EN (DIN) / AS*		JIS		ASME/ AWWA		
15	½"	PN 40	6.5	10K	6.5	Class 150	6.5	PN 40	4.5	10K	4.5	Class 150	4.5	6.0
25	1"		7.3		7.3		7.3		5.3		5.3		5.3	6.0
32	1 ¼"		8.0		7.3		–		6.0		5.3		–	6.0
40	1 ½"		9.4		8.3		9.4		7.4		6.3		7.4	6.0
50	2"		10.6		9.3		10.6		8.6		7.3		8.6	6.0
65	2 ½"	PN 16	12.0		11.1		–	PN 16	10.0		9.1		–	6.0
80	3"		14.0		12.5		14.0		12.0		10.5		12.0	6.0
100	4"		14.4		14.7		16.0		14.0		12.7		14.0	6.0
125	5"		16.0		21.0		–		19.5		19.0		–	6.0
150	6"		21.5		24.5		25.5		23.5		22.5		23.5	6.0
200	8"	PN 10	45		41.9		45	PN 10	43		39.9		43	6.0
250	10"		65		69.4		75		63		67.4		73	6.0
300	12"		70		72.3		110		68		70.3		108	6.0
350	14"		115				175		113				173	6.0
400	16"		135				205		133				203	6.0
450	18"		175				255		173				253	6.0
500	20"		175				285		173				283	6.0
600	24"		235				405		233				403	6.0
Transmitter Promag (compact version): 3.4 kg High-temperature version: + 1.5 kg (Weight data valid for standard pressure ratings and without packaging material) * Flanges according to AS are only available for DN 25 and 50.														

Promag W

<table>
<tr><th colspan="15">Weight data in kg</th></tr>
<tr><th colspan="2" rowspan="2">Nominal diameter</th><th colspan="6" rowspan="2">Compact version</th><th colspan="7">Remote version (without cable)</th></tr>
<tr><th colspan="6">Sensor</th><th rowspan="2">Trans-mitter</th></tr>
<tr><th>[mm]</th><th>[inch]</th><th colspan="2">EN (DIN) / AS*</th><th colspan="2">JIS</th><th colspan="2">ASME/ AWWA</th><th colspan="2">EN (DIN) / AS*</th><th colspan="2">JIS</th><th colspan="2">ASME/ AWWA</th></tr>
<tr><td>25</td><td>1"</td><td rowspan="4">PN 40</td><td>7.3</td><td rowspan="12">10K</td><td>7.3</td><td rowspan="20">Class 150</td><td>7.3</td><td rowspan="4">PN 40</td><td>5.3</td><td rowspan="12">10K</td><td>5.3</td><td rowspan="20">Class 150</td><td>5.3</td><td>6.0</td></tr>
<tr><td>32</td><td>1 ¼"</td><td>8.0</td><td>7.3</td><td>–</td><td>6.0</td><td>5.3</td><td>–</td><td>6.0</td></tr>
<tr><td>40</td><td>1 ½"</td><td>9.4</td><td>8.3</td><td>9.4</td><td>7.4</td><td>6.3</td><td>7.4</td><td>6.0</td></tr>
<tr><td>50</td><td>2"</td><td>10.6</td><td>9.3</td><td>10.6</td><td>8.6</td><td>7.3</td><td>8.6</td><td>6.0</td></tr>
<tr><td>65</td><td>2 ½"</td><td rowspan="5">PN 16</td><td>12.0</td><td>11.1</td><td>–</td><td rowspan="5">PN 16</td><td>10.0</td><td>9.1</td><td>–</td><td>6.0</td></tr>
<tr><td>80</td><td>3"</td><td>14.0</td><td>12.5</td><td>14.0</td><td>12.0</td><td>10.5</td><td>12.0</td><td>6.0</td></tr>
<tr><td>100</td><td>4"</td><td>16.0</td><td>14.7</td><td>16.0</td><td>14.0</td><td>12.7</td><td>14.0</td><td>6.0</td></tr>
<tr><td>125</td><td>5"</td><td>21.5</td><td>21.0</td><td>–</td><td>19.5</td><td>19.0</td><td>–</td><td>6.0</td></tr>
<tr><td>150</td><td>6"</td><td>25.5</td><td>24.5</td><td>25.5</td><td>23.5</td><td>22.5</td><td>23.5</td><td>6.0</td></tr>
<tr><td>200</td><td>8"</td><td rowspan="13">PN 10</td><td>45</td><td>41.9</td><td>45</td><td rowspan="13">PN 10</td><td>43</td><td>39.9</td><td>43</td><td>6.0</td></tr>
<tr><td>250</td><td>10"</td><td>65</td><td>69.4</td><td>65</td><td>63</td><td>67.4</td><td>73</td><td>6.0</td></tr>
<tr><td>300</td><td>12"</td><td>70</td><td>72.3</td><td>110</td><td>68</td><td>70.3</td><td>108</td><td>6.0</td></tr>
<tr><td>350</td><td>14"</td><td>115</td><td colspan="2" rowspan="20"></td><td>175</td><td>113</td><td colspan="2" rowspan="20"></td><td>173</td><td>6.0</td></tr>
<tr><td>400</td><td>16"</td><td>135</td><td>205</td><td>133</td><td>203</td><td>6.0</td></tr>
<tr><td>450</td><td>18"</td><td>175</td><td>255</td><td>173</td><td>253</td><td>6.0</td></tr>
<tr><td>500</td><td>20"</td><td>175</td><td>285</td><td>173</td><td>283</td><td>6.0</td></tr>
<tr><td>600</td><td>24"</td><td>235</td><td>405</td><td>233</td><td>403</td><td>6.0</td></tr>
<tr><td>700</td><td>28"</td><td>355</td><td rowspan="12">Class D</td><td>400</td><td>353</td><td rowspan="12">Class D</td><td>398</td><td>6.0</td></tr>
<tr><td>–</td><td>30"</td><td>–</td><td>460</td><td>–</td><td>458</td><td>6.0</td></tr>
<tr><td>800</td><td>32"</td><td>435</td><td>550</td><td>433</td><td>548</td><td>6.0</td></tr>
<tr><td>900</td><td>36"</td><td>575</td><td>800</td><td>573</td><td>798</td><td>6.0</td></tr>
<tr><td>1000</td><td>40"</td><td>700</td><td>900</td><td>698</td><td>898</td><td>6.0</td></tr>
<tr><td>–</td><td>42"</td><td rowspan="10">PN 6</td><td>–</td><td>1100</td><td rowspan="10">PN 6</td><td>–</td><td>1098</td><td>6.0</td></tr>
<tr><td>1200</td><td>48"</td><td>850</td><td>1400</td><td>848</td><td>1398</td><td>6.0</td></tr>
<tr><td>–</td><td>54"</td><td>–</td><td>2200</td><td>–</td><td>2198</td><td>6.0</td></tr>
<tr><td>1400</td><td>–</td><td>1300</td><td>–</td><td>1298</td><td>–</td><td>6.0</td></tr>
<tr><td>–</td><td>60"</td><td>–</td><td>2700</td><td>–</td><td>2698</td><td>6.0</td></tr>
<tr><td>1600</td><td>–</td><td>1700</td><td>–</td><td>1698</td><td>–</td><td>6.0</td></tr>
<tr><td>–</td><td>66"</td><td>–</td><td>3700</td><td>–</td><td>3698</td><td>6.0</td></tr>
<tr><td>1800</td><td>72"</td><td>2200</td><td>4100</td><td>2198</td><td>4098</td><td>6.0</td></tr>
<tr><td>–</td><td>78"</td><td>–</td><td>4600</td><td>–</td><td>4598</td><td>6.0</td></tr>
<tr><td>2000</td><td>–</td><td>2800</td><td>–</td><td>2798</td><td>–</td><td>6.0</td></tr>
<tr><td colspan="15">Transmitter Promag (compact version): 3.4 kg
(Weight data valid for standard pressure ratings and without packaging material)
*Flanges according to AS are only available for DN 80, 100, 150 to 400, 500 and 600</td></tr>
</table>

Weight (US units)

Promag D

Weight data in lbs				
Nominal diameter		Compact version	Remote version (without cable)	
[mm]	[inch]		Sensor	Transmitter
25	1"	10	6	13
40	1 ½"	11	7	13
50	2"	13	9	13
80	3"	17	13	13
100	4"	23	19	13
Transmitter Promag (compact version): 7.5 lbs (Weight data valid without packaging material)				

Promag E (ASME)

Weight data in lbs				
Nominal diameter		Compact version	Remote version (without cable)	
			Sensor	Transmitter
		ASME	ASME	
[mm]	[inch]	Class 150	Class 150	Wall-mount housing
15	½"	14.3	9.92	13.2
25	1"	16.1	11.7	
40	1½"	20.7	16.3	
50	2"	23.4	19.0	
80	3"	30.9	26.5	
100	4"	35.3	30.9	
150	6"	56.2	51.8	
200	8"	99.2	94.8	
250	10"	165.4	161.0	
300	12"	242.6	238.1	
350	14"	303.0	293.5	
400	16"	371.3	361.8	
450	18"	422.0	412.6	
500	20"	503.6	494.1	
600	24"	666.8	657.3	

- Transmitter: 4.0 lbs (compact version); 6.8 lbs (remote version)
- Weight data without packaging material

Promag H

Weight data in lbs				
Nominal diameter		Compact version	Remote version (without cable)	
[mm]	[inch]		Sensor	Transmitter
2	1/12"	11	4	13
4	1/8"	11	4	13
8	3/8"	12	4	13
15	½"	12	4	13
25	1"	12	6	13
40	1 ½"	14	10	13
50	2"	20	15	13
65	2 ½"	21	17	13
80	3"	42	37	13
100	4"	41	36	13
Transmitter Promag (compact version): 7.5 lbs (Weight data valid for standard pressure ratings and without packaging material)				

Promag L (ASME/AWWA)

Weight data in lbs					
Nominal diameter		Compact version[1)]		Remote version1)	
[mm]	[inch]	ASME/AWWA		ASME/AWWA	
25	1"	ASME / Class 150	17.4	ASME / Class 150	13
32	1 ¼"		–		–
40	1 ½"		16.5		12.1
50	2"		16.8		12.3
65	2 ½"		–		–
80	3"		28.2		23.8
100	4"		35.5		31.1
125	5"		–		–
150	6"		53.8		49.4
200	8"		109		105
250	10"		166		161
300	12"		221		216
350	14"		302		298
375	15"		–		–
400	16"		370		366
450	18"		421		417
500	20"		503		498
600	24"		666		662
700	28"	AWWA / Class D	587	AWWA / Class D	582
750	30"		701		697
800	32"		845		840
900	36"		1036		1032
1000	40"		1294		1290
1050	42"		1477		1473
1200	48"		1987		1982
–	54"		2807		2803
1400	–		–		–
–	60"		3515		3510
1600	–		–		–
1650	66"		4699		4694
1800	72"		5662		5658
2000	78"		6864		6860
–	84"		8280		8275
2200	–		–		–
–	90"		10577		10573
2400	–		–		–
Transmitter Promag (compact version): 4.0 lbs Transmitter Promag (remote version): 6.8 lbs (Weight data valid without packaging material)					

1) Lap joint flanges / welded flanges DN > 300 (12")

Promag P (ASME/AWWA)

Weight data in lbs					
Nominal diameter		Compact version		Remote version (without cable)	
[mm]	[inch]			Sensor	Transmitter
15	½"	Class 150	14	10	13
25	1"	Class 150	16	12	13
40	1 ½"	Class 150	21	16	13
50	2"	Class 150	23	19	13
80	3"	Class 150	31	26	13
100	4"	Class 150	35	31	13
150	6"	Class 150	56	52	13
200	8"	Class 150	99	95	13
250	10"	Class 150	165	161	13
300	12"	Class 150	243	238	13
350	14"	Class 150	386	381	13
400	16"	Class 150	452	448	13
450	18"	Class 150	562	558	13
500	20"	Class 150	628	624	13
600	24"	Class 150	893	889	13

Transmitter Promag (compact version): 7.5 lbs
High-temperature version: 3.3 lbs
(Weight data valid for standard pressure ratings and without packaging material)

Promag W (ASME/AWWA)

Weight data in lbs						
Nominal diameter		Compact version		Remote version (without cable)		
[mm]	[inch]				Sensor	Transmitter
25	1"	Class 150	16	Class 150	12	13
40	1 ½"		21		16	13
50	2"		23		19	13
80	3"		31		26	13
100	4"		35		31	13
150	6"		56		52	13
200	8"		99		95	13
250	10"		143		161	13
300	12"		243		238	13
350	14"		386		381	13
400	16"		452		448	13
450	18"		562		558	13
500	20"		628		624	13
600	24"		893		889	13
700	28"	Class D	882	Class D	878	13
–	30"		1014		1010	13
800	32"		1213		1208	13
900	36"		1764		1760	13
1000	40"		1985		1980	13
–	42"		2426		2421	13
1200	48"		3087		3083	13
–	54"		4851		4847	13
–	60"		5954		5949	13
–	66"		8159		8154	13
1800	72"		9041		9036	13
–	78"		10143		10139	13
Transmitter Promag (compact version): 7.5 lbs (Weight data valid for standard pressure ratings and without packaging material)						

Material

Promag D

- Transmitter housing: powder-coated die-cast aluminum
- Sensor housing: powder-coated die-cast aluminum
- Measuring tube: polyamide, O-rings EPDM
  (Drinking water approvals: WRAS BS 6920, ACS, NSF 61, KTW/W270)
- Electrodes: 1.4435 (316, 316L)
- Ground disks: 1.4301 (304)

Promag E

- Transmitter housing
  - Compact housing: powder-coated die-cast aluminum
  - Wall-mount housing: powder-coated die-cast aluminum
- Sensor housing
  - DN 25 to 300 (1 to 12"): powder-coated die-cast aluminum
  - DN 350 to 600 (14 to 24"): with protective lacquering
- Measuring tube
  - DN ≤ 300 (12"): stainless steel 1.4301 (304) or 1.4306 (304L) (with Al/Zn protective coating)
  - DN ≥ 350 (14"): stainless steel 1.4301 (304) or 1.4306 (304L) (with protective lacquering)
- Electrodes: 1.4435 (316, 316L), Alloy C22, Tantalum
- Flanges (with protective lacquering)
  - EN 1092-1 (DIN2501): RSt37-2 (S235JRG2); Alloy C22; Fe 410W B
  - ANSI: A105
  - JIS: RSt37-2 (S235JRG2); HII
- Seals: to DIN EN 1514-1
- Ground disks: 1.4435 (316, 316L) or Alloy C22

Promag H

- Transmitter housing:
  - Compact housing: powder-coated die-cast aluminum or stainless steel field housing (1.4301 (316L))
  - Wall-mounted housing: powder-coated die-cast aluminum
  - Window material: glas or polycarbonate
- Sensor housing: stainless steel 1.4301 (304)
- Wall mounting kit: stainless steel 1.4301 (304)
- Measuring tube: stainless steel 1.4301 (304)
- Liner: PFA (USP class VI; FDA 21 CFR 177.1550: 3A)
- Electrodes:
  - Standard: 1.4435 (316, 316L)
  - Option: Alloy C22, Tantalum, Platinum
- Flange:
  - All connections stainless-steel 1.4404 (316L)
  - EN (DIN), ASME, JIS made of PVDF
  - Adhesive fitting made of PVC
- Seals
  - DN 2 to 25 (1/12 to 1"): O-ring (EPDM, Viton, Kalrez), gasket seal (EPDM*, Viton, Silicone*)
  - DN 40 to 100 (1½ to 4"): gasket seal (EPDM*, Silicone*)
    * = USP class VI; FDA 21 CFR 177.2600: 3A
- Ground rings: 1.4435 (316, 316L) (optional: Tantalum, Alloy C22)

Promag L

- Transmitter housing:
  - Compact housing: powder-coated die-cast aluminum
  - Wall-mounted housing: powder-coated die-cast aluminum
- Sensor housing
  - DN 25 to 300 (1 to 12"): powder-coated die-cast aluminum
  - DN 350 to 1200 (14 to 48"): with protective lacquering

- Measuring tube:
  - DN ≤ 300 (12"); stainless steel 1.4301 (304) or 1.4306 (304L)
  - DN ≥ 350 (14"); stainless steel 202 or 304
- Electrodes: 1.4435 (316, 316L), Alloy C22
- Flange
  - EN 1092-1 (DIN 2501): DN ≤ 300: 1.4306; 1.4307; 1.4301 (304); 1.0038 (S235JRG2)
  - EN 1092-1 (DIN 2501): DN ≥ 350: A105; 1.0038 (S235JRG2)
  - AWWA: A181/A105; 1.0425 (316L) (P265GH); 1.0044 (S275JR)
  - AS 2129: A105; 1.0345 (P235GH); 1.0425 (316L) (P265GH); 1.0038 (S235JRG2); FE 410 WB
  - AS 4087: A105; 1.0425 (316L) (P265GH); 1.0044 (S275JR)
- Seals: to DIN EN 1514-1
- Ground disks: 1.4435 (316, 316L) or Alloy C22

Promag P

- Transmitter housing:
  - Compact housing: powder-coated die-cast aluminum
  - Wall-mounted housing: powder-coated die-cast aluminum
- Sensor housing
  - DN 15 to 300 (½ to 12"): powder-coated die-cast aluminum
  - DN 350 to 2000 (14 to 84"): with protective lacquering
- Measuring tube
  - DN ≤ 300 (12"): stainless steel 1.4301 (304) or 1.4306 (304L); for flanges made of carbon steel with Al/Zn protective coating
  - DN ≥ 350 (14"): stainless steel 1.4301 (304) or 1.4306 (304L); for flanges made of carbon steel with Al/Zn protective coating
- Electrodes: 1.4435 (316, 316L), Platinum, Alloy C22, Tantalum, Titanium
- Flange
  - EN 1092-1 (DIN2501): 1.4571 (316L); RSt37-2 (S235JRG2); Alloy C22; FE 410W B (DN ≤ 300 (12") with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - ASME: A105; F316L
    (DN ≤ 300 (12") with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AWWA: 1.0425
  - JIS: RSt37-2 (S235JRG2); HII; 1.0425 (316L)
    (DN ≤ 300 (12") with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AS 2129
    - DN 25 (1"): A105 or RSt37-2 (S235JRG2)
    - DN 40 (1½"): A105 or St44-2 (S275JR)
  - AS 4087: A105 or St44-2 (S275JR)
- Seals: to DIN EN 1514-1
- Ground disks: 1.4435 (316, 316L) or Alloy C22

Promag W

- Transmitter housing:
  - Compact housing: powder-coated die-cast aluminum
  - Wall-mounted housing: powder-coated die-cast aluminum
- Sensor housing
  - DN 25 to 300 (1 to 12"): powder-coated die-cast aluminum
  - DN 350 to 2000 (14 to 84"): with protective lacquering

- Measuring tube
  - DN ≤ 300 (12"): stainless steel 1.4301 (304) or 1.4306 (304L) (for flanges made of carbon steel with Al/Zn protective coating)
  - DN ≥ 350 (14"): stainless steel 1.4301 (304) or 1.4306 (304) (for flanges made of carbon steel with protective lacquering)
- Electrodes: 1.4435 (316, 316L) or Alloy C22, Tantalum
- Flange
  - EN 1092-1 (DIN2501): 1.4571 (316L); RSt37-2 (S235JRG2); Alloy C22; FE 410 WB (DN ≤ 300 (12") with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - ASME: A105; F316L (DN ≤ 300 (12") with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AWWA: 1.0425
  - JIS: RSt37-2 (S235JRG2); HII; 1.0425 (316L) (DN ≤ 300 (12") with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AS 2129
    - DN 150 to 300 (6 to 12"), DN 600 (24"): A105 or RSt37-2 (S235JRG2)
    - DN 80 to 100 (3 to 4"), 350 to 500 (14 to 20"): A105 or St44-2 (S275JR)
  - AS 4087: A105 or St44-2 (S275JR)
- Seals: to DIN EN 1514-1
- Ground disks: 1.4435 (316, 316L), Alloy C22, Titanium, Tantalum

Pressure-temperature ratings

The material load diagrams (pressure-temperature graphs) for the process connections are to be found in the "Technical Information" documents of the device in question:
List of supplementary documentation → 🗎 127.

Fitted electrodes

Promag D

- 2 measuring electrodes for signal detection

Promag E/L/P/W

- 2 measuring electrodes for signal detection
- 1 EPD electrode for empty pipe detection
- 1 reference electrode for potential equalization

Promag H

- 2 measuring electrodes for signal detection
- 1 EPD electrode for empty pipe detection (apart from DN 2 to 15)

Process connections

Promag D

Wafer version → without process connections

Promag E

Flange connections:
- EN 1092-1 (DIN 2501)
  - DN ≤ 300 (12") = form A
  - DN ≥ 350 (14") = flat face
  - DN 65 PN 16 and DN 600 PN 16 only as per EN 1092-1
- ASME
- JIS

Promag H

With O-ring:
- Weld nipple DIN (EN), ISO 1127, ODT/SMS
- Flange EN (DIN), ASME, JIS
- Flange made of PVDF EN (DIN), ASME, JIS
- External thread
- Internal thread
- Hose connection
- PVC adhesive fitting

With gasket seal:
- Weld nipple DIN 11850, ODT/SMS
- Clamp ISO 2852, DIN 32676, L14 AM7
- Threaded joint DIN 11851, DIN 11864-1, ISO 2853, SMS 1145
- Flange DIN 11864-2

Promag L

Flange connection:
- EN 1092-1 (DIN 2501)
  - DN ≤ 300 (12") = form A
  - DN ≥ 350 (14") = form B
- ASME B16.5
- AWWA C207
- AS

Promag P/W

Flange connections:
- EN 1092-1 (DIN 2501)
  - DN ≤ 300 = form A
  - DN ≥ 350 = flat face
  - DN 65 PN 16 and DN 600 PN 16 only as per EN 1092-1
- ASME
- AWWA (only Promag W)
- JIS
- AS

Surface roughness

All data relate to parts in contact with fluid.

- Liner → PFA: ≤ 0.4 µm (15 µin)
- Electrodes: 0.3 to 0.5 µm (12 to 20 µin)
- Process connection made of stainless-steel (Promag H):
  - with O-ring seal: ≤ 1.6 µm (63 µin)
  - with aseptic gasket seal: ≤ 0.8 µm (31.5 µin)
  - optional: ≤ 0.38 µm (15 µin)

10.1.11 Human interface

Display elements

- Liquid crystal display: illuminated, two-line, 16 characters per line
- Custom configurations for presenting different measured-value and status variables
- 2 totalizers

Note!
At ambient temperatures below –20 (–4 °F) the readability of the display may be impaired.

Operating elements

- Local operation with three keys (⊟ ⊞ Ⓔ)
- "Quick Setup" menus for straightforward commissioning

Language groups

Language groups available for operation in different countries:
- Western Europe and America (WEA):
  English, German, Spanish, Italian, French, Dutch and Portuguese
- Eastern Europe/Scandinavia (EES):
  English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
- Southeast Asia (SEA):
  English, Japanese, Indonesian

Note!
You can change the language group via the operating program "FieldCare".

Remote operation

Operation via HART protocol and Fieldtool

10.1.12 Certificates and approvals

CE mark

The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

C-tick mark

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval

Information about currently available Ex versions (ATEX, FM, CSA, IECEx, NEPSI etc.) can be supplied by your Endress+Hauser Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.

Sanitary compatibility

Promag D/E/L/P/W

No applicable approvals or certification

Promag H

- 3A authorization and EHEDG-certified
- Seals: in conformity with FDA (except Kalrez seals)

Drinking water approval

Promag D/L/W

- WRAS BS 6920
- ACS
- NSF 61
- KTW/W270

Promag E/H/P

No drinking water approval

Pressure Equipment Directive

Promag D/L

No pressure measuring device approval

Promag E/H/P/W

The devices can be ordered with or without a PED approval. If a device with a PED approval is required, this must be explicitly stated in the order. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary.

- With the PED/G1/x (x = category) marking on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" specified in Annex I of the Pressure Equipment Directive 97/23/EC.
- Devices bearing this marking (PED) are suitable for the following types of medium: Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)
- Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art.3 Section 3 of the Pressure Equipment Directive 97/23/EC. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive.

Other standards and guidelines

- EN 60529
  Degrees of protection by housing (IP code).
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC/EN 61326
  Electromagnetic compatibility (EMC requirements)
- ASME/ISA-S82.01
  Safety Standard for Electrical and Electronic Test, Measuring, Controlling and related Equipment - General Requirements. Pollution degree 2, Installation Category II.
- CAN/CSA-C22.2 (No. 1010.1-92)
  Safety requirements for Electrical Equipment for Measurement and Control and Laboratory Use. Pollution degree 2, Installation Category I.
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.

10.1.13 Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser Sales Center: www.endress.com/worldwide

Note!
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

10.1.14 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor → 79.
Your Endress+Hauser service organization can provide detailed information on the specific order codes on request.

10.1.15 Documentation

- Flow measuring technology (FA00005D/06)
- Technical Information Promag 50D (TI00082D/06)
- Technical Information Promag 50E (TI01161D/06)
- Technical Information Promag 50L (TI00097D/06)
- Technical Information Promag 50/53H (TI00048D/06)
- Technical Information Promag 50/53P (TI00047D/06)
- Technical Information Promag 50/53W (TI00046D/06)
- Description of Device Functions Promag 50 HART (BA00049D/06)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.

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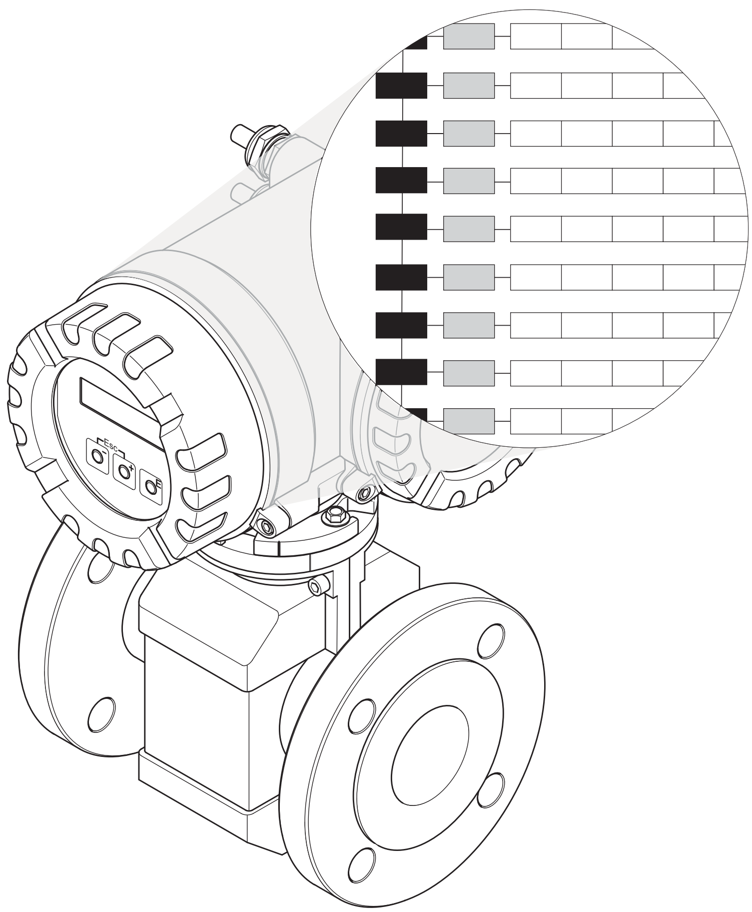
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Description of Device Functions

Proline Promag 50

Electromagnetic Flow Measuring System



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Valid as of version:
V 2.03.XX (Device software)

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Registered trademarks

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

HistoROM™, S-DAT®, FieldCare®
Registered trademarks of Endress+Hauser Flowtec AG, Reinach, CH

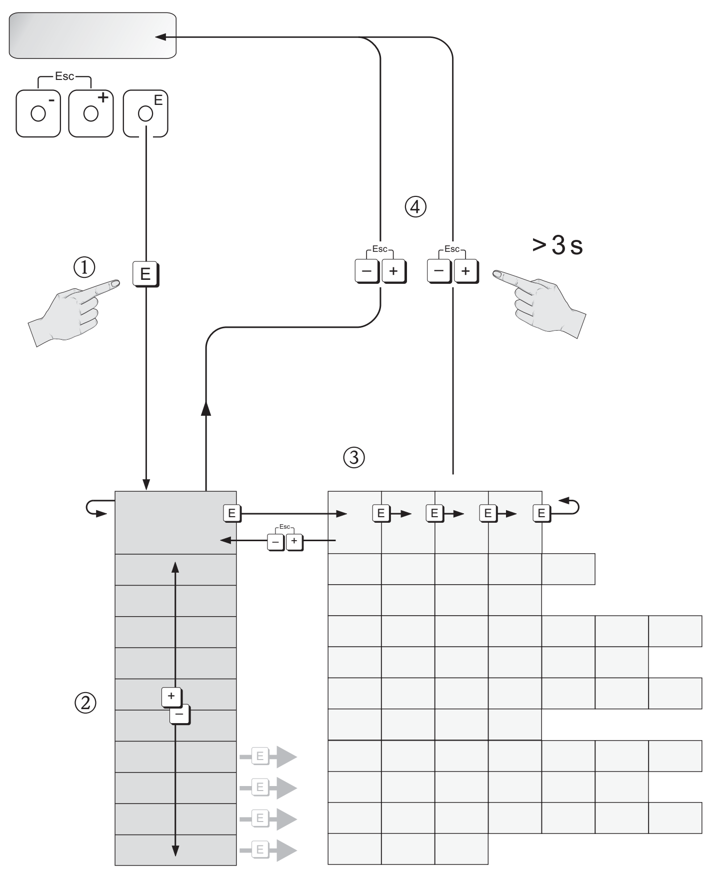
1 Function matrix Promag 50

1.1 The function matrix: layout and use

The function matrix is a two-level construct: the groups form one level and the groups' functions the other.
The groups are the highest-level grouping of the operating options for the measuring device.
A number of functions is assigned to each group.
You select a group in order to access the individual functions for operating and parameterizing the measuring device.
An overview of all the groups available is provided in the table of contents on Page 3 and in the graphical representation of the function matrix on Page 6.
An overview of all the functions available is provided on Page 6, complete with page references to the detailed function descriptions.
The descriptions of the individual functions start on Page 7.

Example of how to parameterize a function (in this case changing the language for the UI):

1. Enter into the function matrix (E-key).
2. Select the OPERATION group.
3. Select the LANGUAGE function, change the setting from ENGLISH to DEUTSCH with +- and save with E (all text on the display now appears in German).
4. Exit the function matrix (ESC > 3 seconds).



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1.2 Illustration of the function matrix

Function groups	Functions →									
MEASURING VALUES (P. 7)	VOLUME FLOW (P. 7)									
SYSTEM UNITS (P. 8)	UNIT VOL. FLOW (P. 8)	UNIT VOLUME (P. 8)	UNIT LENGTH (P. 9)	FORMAT DATE/TIME (P. 9)						
QUICK SETUP (P. 10)	QUICK SETUP COMMISSION (P. 10)									
OPERATION (P. 11)	LANGUAGE (P. 11)	ACCESS CODE (P. 12)	PRIVATE CODE (P. 12)	STATUS ACCESS (P. 12)	ACCESS CODE COUNTER (P. 12)					
USER INTERFACE (P. 13)	ASSIGN LINE 1 (P. 13)	ASSIGN LINE 2 (P. 13)	100% VALUE (P. 13)	FORMAT (P. 14)	DISPL. DAMPING (P. 14)	CONTRAST LCD (P. 14)	BACKLIGHT (P. 15)	DISPLAY TEST (P. 15)		
TOTALIZER 1/2 (P. 16)	ASSIGN TOTALIZER (P. 16)	SUM (P. 16)	OVERFLOW (P. 16)	UNIT TOTALIZER (P. 16)	TOTALIZER MODE (P. 17)	RESET TOTALIZ. (P. 17)				
HANDLING TOTALIZ. (P. 18)	RESET ALL TOTAL. (P. 18)	FAILSAFE MODE (P. 18)								
CURRENT OUTPUT (P. 19)	ASSIGN CURRENT OUTP. (P. 19)	CURRENT SPAN (P. 20)	VALUE 20 mA (P. 21)	TIME CONSTANT (P. 21)	FAILSAFE MODE (P. 21)	ACTUAL CURRENT (P. 21)	SIMUL. CURRENT (P. 22)	VALUE SIM. CURRENT (P. 22)		
PULSE/FREQ. OUTP. (P. 23)	OPERATION MODE (P. 23)	ASSIGN FREQ. (P. 23)	END VALUE FREQ. (P. 23)	VALUE-f HIGH (P. 24)	OUTPUT SIGNAL (P. 25)	TIME CONSTANT (P. 27)	FAILSAFE MODE (P. 27)	FAILSAFE VALUE (P. 27)	ACTUAL FREQ. (P. 27)	SIMUL. FREQ. (P. 28)
	VALUE SIM. FREQ. (P. 28)	ASSIGN PULSE (P. 28)	PULSE VALUE (P. 29)	PULSE WIDTH (P. 29)	OUTPUT SIGNAL (P. 30)	FAILSAFE MODE (P. 32)	SIMULATION PULSE (P. 32)	VALUE SIM. PULSE (P. 33)		
STATUS OUTPUT (P. 34)	ASSIGN STATUS (P. 34)	ON-VALUE (P. 34)	OFF-VALUE (P. 35)	TIME CONSTANT (P. 35)	ACTUAL STATUS (P. 35)	SIM. SWITCH POINT (P. 35)	VAL. SIM. SWIT. PT. (P. 36)			
STATUS INPUT (P. 40)	ASSIGN STATUS (P. 40)	ACTIVE LEVEL (P. 40)	MIN. PULSE WIDTH (P. 40)	SIM. STATUS INP. (P. 40)	VALUE SIM. STATUS (P. 41)					
COMMUNICATION (P. 42)	TAG NAME (P. 42)	TAG DESCR. (P. 42)	BUS ADDRESS (P. 42)	HART PROTOCOL (P. 42)	MANUFACT. ID (P. 42)	DEVICE ID (P. 42)	DEVICE REVISION (P. 42)			
PROCESS PARAM. (P. 43)	ASSIGN LF CUT OFF (P. 43)	ON-VALUE (P. 43)	OFF-VALUE (P. 43)	EMPTY PIPE DET. (P. 44)	EPD/OED ADJ. (P. 46)	EPD/OED RES.TIME (P. 47)	ECC (P. 47)	ECC DURATION (P. 47)	ECC RECOVERY TIME (P. 48)	ECC CLEAN. CYCL. (P. 48)
SYSTEM PARAM. (P. 49)	INSTALL. DIRECT. (P. 49)	MEASURING MODE (P. 49)	POS. ZERO RETURN (P. 50)	SYSTEM DAMPING (P. 51)	INTEGRAT. TIME (P. 51)					
SENSOR DATA (P. 52)	CALIBRATION DATE (P. 52)	K-FACTOR (P. 52)	ZERO POINT (P. 52)	NOM. DIAMETER (P. 52)	MEAS. PERIOD (P. 53)	OVERVLTG TIME (P. 53)	EPD ELECTRODE (P. 53)	POLARITY ECC (P. 53)		
SUPERVISION (P. 54)	CURR. SYS. COND. (P. 54)	PREV. SYS. COND. (P. 54)	ASSIGN SYS. ERR. (P. 54)	ERROR CATEG. (P. 54)	ASSIGN PROC. ERR. (P. 54)	ERROR CATEG. (P. 55)	ALARM DELAY (P. 55)	SYSTEM RESET (P. 55)	OPERAT. HRS. (P. 55)	
SIMULAT. SYSTEM (P. 56)	SIM. FAILS. MODE (P. 56)	SIM. MEAS. VARIAB. (P. 56)	VAL.SIM.MEAS.VAR. (P. 56)							
SENSOR VERSION (P. 57)	SERIAL NUMBER (P. 57)	SENSOR TYPE (P. 57)	HW REV. SENS. (P. 57)	SW REV. NO. S-DAT (P. 57)						
AMPLIFIER VERS. (P. 57)	DEVICE SOFTWARE (P. 57)	SW REV. AMPL. (P. 57)	LANGUAGE GROUP (P. 57)	I/O MODULE TYPE (P. 57)	SW REV. I/O MOD. (P. 57)					

2 Group MEASURING VALUES

Function description MEASURING VALUES	
✎ Note! ■ The engineering unit of the measured variable displayed here can be set in the SYSTEM UNITS group, (see Page 8). ■ If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
VOLUME FLOW	The volume flow currently measured appears on the display. **User interface:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)

3 Group SYSTEM UNITS

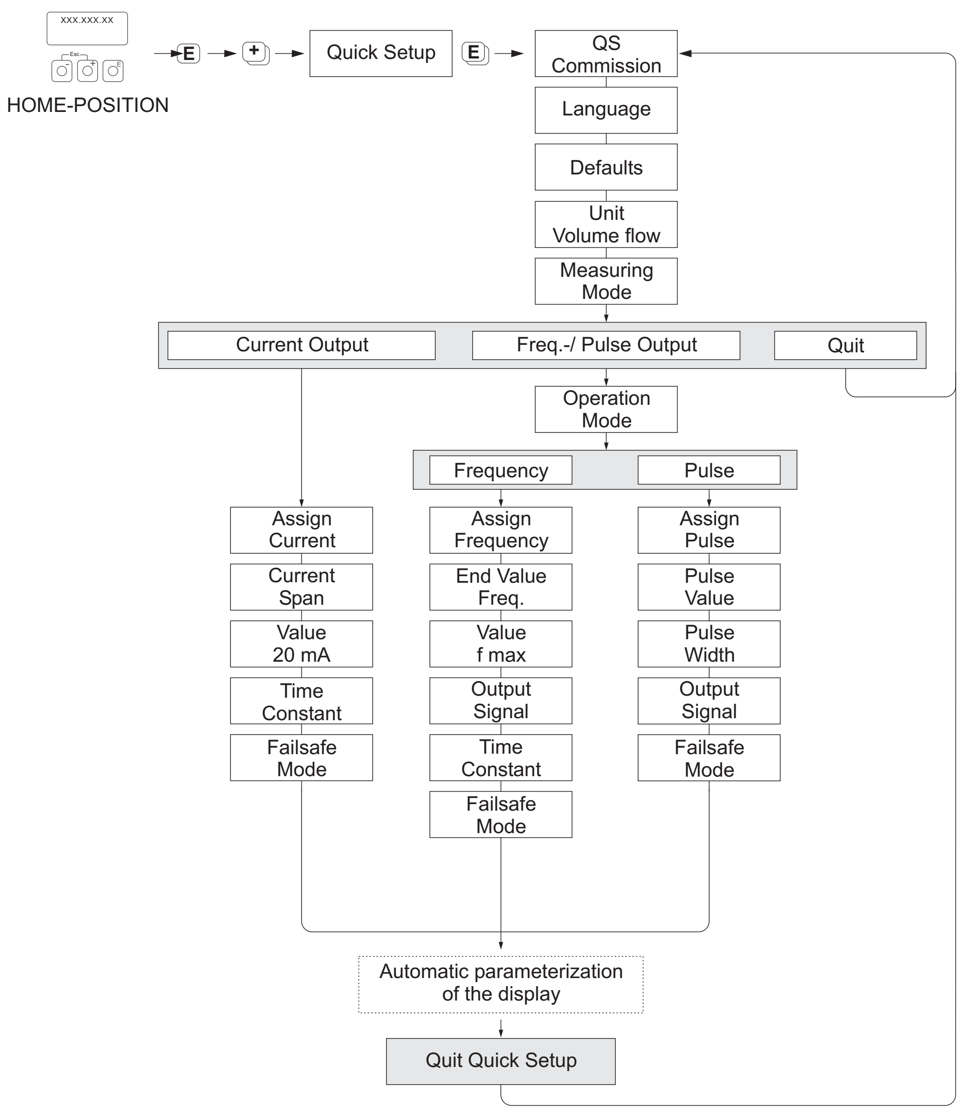
Function description SYSTEM UNITS	
Use this function group to select the unit for the measured variable.	
UNIT VOLUME FLOW	Use this function to select the unit for displaying the volume flow. The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Switch points (limit value for volume flow, flow direction) ■ Low flow **Options:** Metric: Cubic centimeter → cm^3/s; cm^3/min; cm^3/h; cm^3/day Cubic decimeter → dm^3/s; dm^3/min; dm^3/h; dm^3/day Cubic meter → m^3/s; m^3/min; m^3/h; m^3/day Milliliter → ml/s; ml/min; ml/h; ml/day Liter → l/s; l/min; l/h; l/day Hectoliter → hl/s; hl/min; hl/h; hl/day Megaliter → Ml/s; Ml/min; Ml/h; Ml/day US: Cubic centimeter → cc/s; cc/min; cc/h; cc/day Acre foot → af/s; af/min; af/h; af/day Cubic foot → ft^3/s; ft^3/min; ft^3/h; ft^3/day Fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day Gallon → gal/s; gal/min; gal/h; gal/day Kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/day Million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial: Gallon → gal/s; gal/min; gal/h; gal/day Mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day **Factory setting:** Depends on nominal diameter and country (see Page 58 ff.).
UNIT VOLUME	Use this function to select the unit for displaying the volume. The unit you select here is also valid for: ■ Pulse weighting (e.g. m^3/p) **Options:** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml Mega US → cc; af; ft^3; oz f; gal; Kgal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals) → bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** Depends on nominal diameter and country (see Page 58 ff.). ✎ Note! The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

Function description SYSTEM UNITS	
UNIT LENGTH	Use this function to select the unit for displaying the length of the nominal diameter. The unit you select here is also valid for: ▪ Nominal diameter of sensor (see function NOMINAL DIAMETER on Page 48) **Options:** MILLIMETER INCH **Factory setting:** MILLIMETER (SI units: not for USA and Canada) INCH (US units: only for USA and Canada)
FORMAT DATE/TIME	Use this function to select the format for the date and the time. The unit you select here is also valid for: Displaying the current calibration date (function CALIBRATION DATE on Seite 52) **Options:** DD.MM.YY 24H MM/DD/YY 12H A/P DD.MM.YY 12H A/P MM/DD/YY 24H **Factory setting:** DD.MM.YY 24H (SI units) MM/DD/YY 12H A/P (US units)

4 Group QUICK SETUP

Function description QUICK SETUP	
QUICK SETUP COMMISSION	Use this function to start the Quick Setup menu for commissioning. **Options:** YES NO **Factory setting:** NO

Note!
The display returns to the QUICK SETUP COMMISSION cell if you press the ESC key combination during interrogation.



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5 Group OPERATION

Function description OPERATION	
LANGUAGE	Use this function to select the language for all texts, parameters and messages shown on the local display. ✎ Note! The displayed options depend on the available language group shown in the LANGUAGE GROUP function. **Options:** Language group WEST EU / USA: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS PORTUGUESE Language group EAST EU / SCAND: ENGLISH NORSK SVENSKA SUOMI POLISH RUSSIAN CZECH Language group ASIA: ENGLISH BAHASA INDONESIA JAPANESE (Silbenschrift) **Factory setting:** Country-dependent (see Page 58 ff.) ✎ Note! ▪ If you press the +- keys simultaneously at startup, the language defaults to "ENGLISH". ▪ You can change the language group via the configuration program FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

Function description OPERATION	
ACCESS CODE	All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the +/- keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled). You can enable programming by entering your personal code, (**factory setting = 50**, see function PRIVATE CODE on Page 12) **User input:** max. 4-digit number: 0...9999 ✎ Note! ■ The programming levels are disabled if you do not press a key within 60 seconds following automatic return to the HOME position. ■ You can also disable programming in this function by entering any number (other than the defined private code). ■ The Endress+Hauser service organization can be of assistance if you mislay your personal code.
PRIVATE CODE	Use this function to enter a personal code number for enabling programming. **User input:** 0...9999 (max. 4-digit number) **Factory setting:** 50 ✎ Note! ■ Programming is always enabled with the code "0". ■ Programming has to be enabled before this code can be changed. When programming is disabled this function is not available, thus preventing others from accessing your personal code.
STATUS ACCESS	Use this function to check the access status for the function matrix. **User interface:** ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)
ACCESS CODE COUNTER	Displays how often the customer code, service code or the digit "0" (code-free) has been entered to gain access to the function matrix. **Display:** max. 7-digit number: 0...9999999 **Factory setting:** 0

6 Group USER INTERFACE

Function description USER INTERFACE	
ASSIGN LINE 1	Use this function to define which display value is assigned to the main line (top line of the local display) for display during normal measuring operation. **Options:** OFF VOLUME FLOW VOLUME FLOW IN % TOTALIZER 1 TOTALIZER 2 **Factory setting:** VOLUME FLOW
ASSIGN LINE 2	Use this function to define which display value is assigned to the additional line (bottom line of the local display) for display during normal measuring operation. **Options:** OFF VOLUME FLOW VOLUME FLOW IN % VOLUME FLOW BARGRAPH IN % TOTALIZER 1 TAG NAME OPERATING/SYSTEM CONDITION FLOW DIRECTION TOTALIZER 2 **Factory setting:** TOTALIZER 1
100% VALUE	✎ Note! This function is only available if VOLUME FLOW IN % or VOLUME FLOW BARGRAPH IN % was selected in the function ASSIGN LINE 1 or ASSIGN LINE 2. Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country (see Page 58 ff.).

Function description USER INTERFACE	
FORMAT	Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! ▪ Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. ▪ The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → l/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY DAMPING	Use this function to enter a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** 0...100 seconds **Factory setting:** 3 s ✎ Note! Setting the time constant to zero seconds switches off damping.
CONTRAST LCD	Use this function to optimize display contrast to suit local operating conditions. **User input:** 10...100% **Factory setting:** 50%

Function description USER INTERFACE	
BACKLIGHT	Use this function to optimize the backlight to suit local operating conditions. **User input:** 0...100% ✎ Note! Entering the value "0" means that the backlight is "switched off". The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. **Factory setting:** 50%
DISPLAY TEST	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line and additional line are darkened for at least 0.75 seconds. 3. The main line and additional line show an "8" in each field for at least 0.75 seconds. 4. The main line and additional line show a "0" in each field for at least 0.75 seconds. 5. The main line and additional line show nothing (blank display) for at least 0.75 seconds. When the test completes the local display returns to its initial state and the setting changes to OFF.

7 Group TOTALIZER 1/2

Function description TOTALIZER 1/2	
ASSIGN TOTALIZER	Use this function to assign a measured variable (volume flow) to the totalizer. **Options:** OFF VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! The totalizer is reset to "0" as soon as the selection is changed.
SUM	Use this function to view the total for the totalizer measured variable aggregated since measuring commenced. The value can be positive or negative. **User interface:** max. 7-digit floating-point number, including sign and unit (e.g. 896,845.7 dm^3) ✎ Note! The totalizer response to faults is defined in the FAILSAFE MODE function (see Page 18).
OVERFLOW	Use this function to view the overflow for the totalizer aggregated since measuring commenced. Total flow quantity is represented by a floating decimal point number consisting of max. 7 digits. You can use this function to view higher numerical values (>9 999 999) as overflows. The effective quantity is thus the total of OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: 2 E7 kg (= 2 000 000 dm^3) The value returned by the SUM function = 896,845.7 dm^3 Effective total quantity = 2,896,845.7 dm^3 **Display shows:** Integer with exponent, including sign and unit, e.g. 2 E7 dm^3
UNIT TOTALIZER	Use this function to define the unit for the totalizer. **Options:** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml Mega US → cc; af; ft^3; oz f; gal; Kgal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** Depends on nominal diameter and country (see Page 58 ff.).

Function description TOTALIZER 1/2	
TOTALIZER MODE	Use this function to define how the flow components are to be totalised. **Options:** BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Positive flow components only REVERSE Negative flow components only **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARD
RESET TOTALIZER	Use this function to reset the sum and the overflow of the totalizer to "zero" (= RESET). **Options:** NO YES **Factory setting:** NO ✎ Note! If the device is equipped with a status input and if it is appropriately configured, totalizer resetting can also be triggered by a pulse.

8 Group HANDLING TOTALIZER

Function description HANDLING TOTALIZER	
RESET ALL TOTALIZERS	Use this function to reset the totals (including all overflows) of the totalizers (1...2) to "zero". **Options:** NO YES **Factory setting:** NO ✎ Note! If the device has a status input and if it is appropriately configured, a reset for the totalizer (1...2) can also be triggered by a pulse (see the ASSIGN STATUS INPUT function on Page 31).
FAILSAFE MODE	Use this function to define the totalizer response in case of fault. **Options:** STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizer continues to count on the basis of the current flow measuring value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow that is based on the last valid flow measuring value (before the fault occurred). **Factory setting:** STOP

9 Group CURRENT OUTPUT

Function description CURRENT OUTPUT	
ASSIGN CURRENT OUTPUT	Use this function to assign a measured variable to the current output. **Options:** OFF VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! If you select OFF, the only function shown in this group is the function (ASSIGN CURRENT OUTPUT).

Function description CURRENT OUTPUT

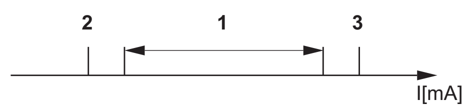
CURRENT SPAN

Use this function to define the current span. The selection specifies the operational range and the lower and upper signal on alarm. For the current output the option HART can be defined additionally.

Options:
0–20 mA
4–20 mA
4–20 mA HART
4–20 mA NAMUR
4–20 mA HART NAMUR
4–20 mA US
4–20 mA HART US
0–20 mA (25 mA)
4–20 mA (25 mA)
4–20 mA (25 mA) HART

Factory setting:
4–20 mA HART NAMUR

Current span, operational range and signal on alarm level



a	1	2	3
0-20 mA	0 - 20.5 mA	0	22
4-20 mA	4 - 20.5 mA	2	22
4-20 mA HART	4 - 20.5 mA	2	22
4-20 mA NAMUR	3.8 - 20.5 mA	3.5	22.6
4-20 mA HART NAMUR	3.8 - 20.5 mA	3.5	22.6
4-20 mA US	3.9 - 20.8 mA	3.75	22.6
4-20 mA HART US	3.9 - 20.8 mA	3.75	22.6
0-20 mA (25 mA)	0 - 24 mA	0	25
4-20 mA (25 mA)	4 - 24 mA	2	25
4-20 mA (25 mA) HART	4 - 24 mA	2	25

A0001222

a = Current span
1 = Operational range (measuring information)
2 = Lower signal on alarm level
3 = Upper signal on alarm level

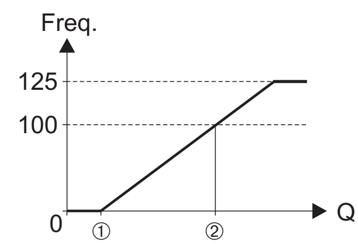
✎ Note!
- When switching the hardware from an active (factory setting) to a passive output signal select a current span of 4–20 mA.
- If the measured value exceeds the measuring range a notice message is generated (#351...354, current span).
- In case of a fault the behaviour of the current output is according to the selected option in the function FAILSAFE MODE (see Page 21). Change the error category in the function ASSIGN SYSTEM ERROR (see Page 54) to generate a fault message instead of a notice message.

Function description CURRENT OUTPUT	
VALUE 20 mA	Use this function to assign the 20 mA current a full scale value. Positive and negative values are permissible. The required measuring range is defined by defining the VALUE 20 mA. In the SYMMETRY measuring mode, (see Page 45), the value assigned applies to both flow directions; in the STANDARD measuring mode it applies only to the flow direction selected. **User input:** 5-digit floating-point number, with sign **Factory setting:** Depends on nominal diameter and country (see Page 58 ff.). ✎ Note! ■ The appropriate unit is taken from the group SYSTEM UNITS, (see Page 8). ■ The value for 0 or 4 mA always corresponds to the zero flow (0 [unit]). This value is fixed and cannot be edited.
TIME CONSTANT	Use this function to enter a time constant defining how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** fixed-point number 0.01...100.00 s **Factory setting:** 3.00 s
FAILSAFE MODE	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects only the current output. The failsafe mode of other outputs and the totalizers is defined in the corresponding function groups. **Options:** MIN. CURRENT The current output adopts the value of the lower signal on alarm level (as defined in the function CURRENT SPAN). MAX. CURRENT The current output adopts the value of the upper signal on alarm level (as defined in the function CURRENT SPAN). HOLD VALUE (**not recommended**) Measuring value output is based on the last measuring value saved before the error occurred . ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored . **Factory setting:** MIN. CURRENT
ACTUAL CURRENT	Use this function to view the computed actual value of the output current. **User interface:** 0.00...25.00 mA

Function description CURRENT OUTPUT	
SIMULATION CURRENT	Use this function to activate simulation of the current output. **Options:** OFF ON **Factory setting:** OFF Note! ▪ The "SIMULATION CURRENT OUTPUT" notice message indicates that simulation is active. ▪ The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION CURRENT	Note! This function is not available unless the function SIMULATION CURRENT is active (= ON). Use this function to define a selectable value (e.g. 12 mA) to be output at the current output. This value is used to test downstream devices and the measuring device itself. **User input:** Floating-point number: 0.00...25.00 mA **Factory setting:** 0.00 mA Caution! The setting is not saved if the power supply fails.

10 Group PULSE/FREQUENCY OUTPUT

Function description PULSE/FREQUENCY OUTPUT	
This group is not available unless the measuring device is equipped with a pulse/frequency output.	
OPERATION MODE	Use this function to configure the output as a pulse output or frequency output. The functions available in this function group vary, depending on which option you select here. **Options:** PULSE FREQUENCY **Factory setting:** PULSE
ASSIGN FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to assign a measured variable to the frequency output. **Options:** OFF VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! If you select OFF, the only functions shown in this function group are the functions ASSIGN FREQUENCY and OPERATION MODE.
END VALUE FREQ.	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to define a full scale frequency for the frequency output. You define the associated measured value of the measuring range in the function VALUE-f HIGH on Page 24. **User input:** 4-digit fixed-point number 2...1250 Hz **Factory setting:** 1000 Hz Example: ▪ VALUE-f HIGH = 1000 l/h, end frequency = 1000 Hz: i.e. at a flow of 1000 l/h, a frequency of 1000 Hz is output. ▪ VALUE-f HIGH = 3600 l/h, end frequency = 1000 Hz: i.e. at a flow of 3600 l/h, a frequency of 1000 Hz is output. ✎ Note! ▪ In the FREQUENCY operating mode the output signal is symmetrical (on/off ratio = 1:1). At low frequencies the pulse duration is limited to a maximum of 2 seconds, i.e. the on/off ratio is no longer symmetrical. ▪ The initial frequency is always 0 Hz. This value is fixed and cannot be edited.

Function description PULSE/FREQUENCY OUTPUT	
VALUE-f HIGH	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to assign a value to the end value frequency. Positive and negative values are permissible. The required measuring range is defined by defining the VALUE-f HIGH. In the SYMMETRY measuring mode, (see Page 45), the value assigned applies to both flow directions; in the STANDARD measuring mode it applies only to the flow direction selected. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3...m^3 or US-gal...US-Mgal] corresponds to the factory setting for the final value (see Page 58 ff.) .  ① = *Value-f min.* ② = *Value-f high* ✎ Note! ▪ The appropriate unit is taken from the group SYSTEM UNITS, (see Page 8). ▪ The value-f min. for the initial frequency always corresponds to the zero flow (0 [unit]). This value is fixed and cannot be edited.

Function description PULSE/FREQUENCY OUTPUT

OUTPUT SIGNAL

✎ Note!
Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function.

For selecting the output configuration of the frequency output.

Options:
PASSIVE - POSITIVE
PASSIVE - NEGATIVE

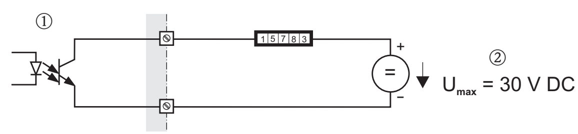
Factory setting: PASSIVE - POSITIVE

Explanation
- PASSIVE = power is supplied to the frequency output by means of an external power supply.

Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behaviour (at zero flow) of the frequency output.
The internal transistor is activated as follows:
- If POSITIVE is selected, the internal transistor is activated with a **positive** signal level.
- If NEGATIVE is selected, the internal transistor is activated with a **negative** signal level (0 V).

✎ Note!
With the passive output configuration, the output signal levels of the frequency output depend on the external circuit (see examples).

Example for passive output circuit (PASSIVE)
If PASSIVE is selected, the frequency output is configured as an open collector.

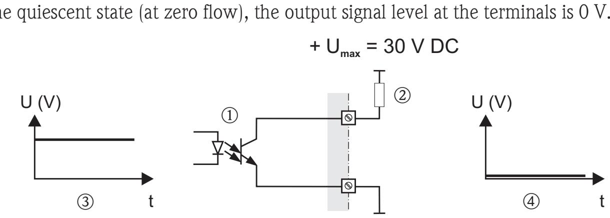


A0001225

① = *Open collector*
② = *External power supply*

✎ Note!
For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms).

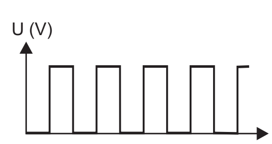
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-up resistance.
In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.



A0004687

① = *Open collector*
② = *Pull-up resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.



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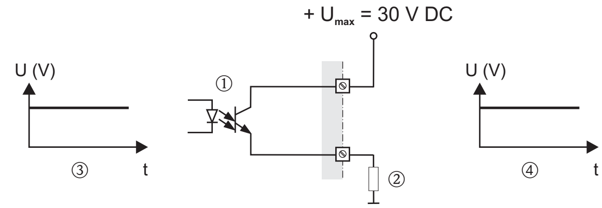
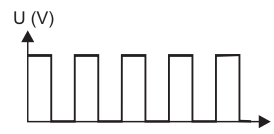
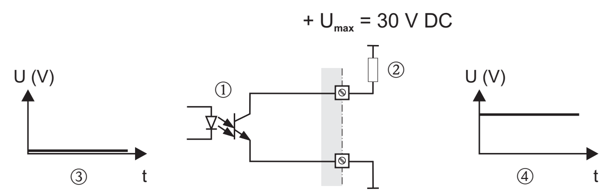
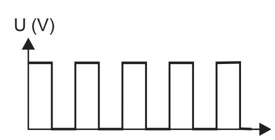
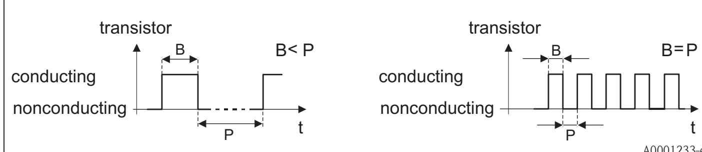
(continued on next page)

Function description PULSE/FREQUENCY OUTPUT	
OUTPUT SIGNAL (continued)	**Example for output configuration PASSIVE-POSITIVE:** Output configuration with an external pull-down resistance. In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.  A0004689 ① = *Open collector* ② = *Pull-down resistance* ③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)* ④ = *Output signal level in quiescent state (at zero flow)* In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981 **Example for output configuration PASSIVE-NEGATIVE:** Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.  A0004690 ① = *Open collector* ② = *Pull-up resistance* ③ = *Transistor activation in "NEGATIVE" quiescent state (at zero flow)* ④ = *Output signal level in quiescent state (at zero flow)* In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981

Function description PULSE/FREQUENCY OUTPUT	
TIME CONSTANT	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to enter a time constant defining how the frequency output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** Floating-point number 0.00...100.00 s **Factory setting:** 0.00 s
FAILSAFE MODE	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. For safety reasons it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. Use this function to define this state. The setting you select here affects only the frequency output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** FALLBACK VALUE Output is 0 Hz. FAILSAFE LEVEL Output is the frequency specified in the FAILSAFE VALUE function. HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE
FAILSAFE VALUE	✎ Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function and FAILSAFE LEVEL was selected in the function FAILSAFE MODE. Use this function to define the frequency that the measuring device should output in the event of a fault. **User input:** max. 4-digit number: 0...1250 Hz **Factory setting:** 1250 Hz
ACTUAL FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to view the computed value of the output frequency. **User interface:** 0...1250 Hz

Function description PULSE/FREQUENCY OUTPUT	
SIMULATION FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to activate simulation of the frequency output. **Options:** OFF ON **Factory setting:** OFF ✎ Note! ■ The "SIMULATION FREQUENCY OUTPUT" notice message indicates that simulation is active. ■ The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION FREQUENCY	✎ Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function and the function VALUE SIMULATION FREQUENCY is active (= ON). Use this function to define a selectable frequency value (e.g. 500 Hz) to be output at the frequency output. This value is used to test downstream devices and the measuring device itself. **User input:** 0...1250 Hz **Factory setting:** 0 Hz Caution! The setting is not saved if the power supply fails.
ASSIGN PULSE	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to assign a measured variable to the pulse output. **Options:** OFF VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! If you select OFF, the only functions shown in this function group are the functions ASSIGN PULSE and OPERATION MODE.

Function description PULSE/FREQUENCY OUTPUT	
PULSE VALUE	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to define the flow at which a pulse is triggered. These pulses can be totalled by an external totalizer and in this way the total flow since measuring commenced can be registered. **User input:** 5-digit floating-point number, [unit] **Factory setting:** Depends on nominal diameter and country (see Page 58 ff.). ✎ Note! The appropriate unit is taken from the group SYSTEM UNITS (see Page 8).
PULSE WIDTH	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to enter the maximum pulse width of the output pulses. **User input:** 0.5...2000 ms **Factory setting:** 100 ms Pulse output is **always** with the pulse width (B) entered in this function. The intervals (P) between the individual pulses are automatically configured. However, they must at least correspond to the pulse width (B = P).  B = Pulse width entered (the illustration applies to positive pulses) P= Intervals between the individual pulses ✎ Note! When entering the pulse width, select a value that can still be processed by an external totalizer (e.g. mechanical totalizer, PLC, etc.). ☝ Caution! If the pulse number or frequency resulting from the pulse value entered, (see function PULSE VALUE on Page 27), and from the current flowis too large to maintain the pulse width selected (interval P is smaller than the pulse width B entered), a system error message (pulse memory) is generated after buffering/balancing time.

Function description PULSE/FREQUENCY OUTPUT

OUTPUT SIGNAL

✎ Note!
Function is not available unless the PULSE setting was selected in the OPERATION MODE function.

For selecting the output configuration of the pulse output.

Options:
PASSIVE - POSITIVE
PASSIVE - NEGATIVE

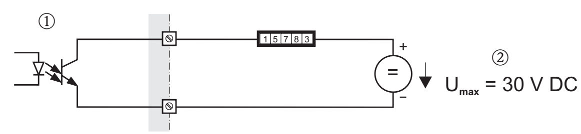
Factory setting: PASSIVE - POSITIVE

Explanation
- PASSIVE = power is supplied to the pulse output by means of an external power supply.

Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behaviour (at zero flow) of the pulse output.
The internal transistor is activated as follows:
- If POSITIVE is selected, the internal transistor is activated with a **positive** signal level.
- If NEGATIVE is selected, the internal transistor is activated with a **negative** signal level (0 V).

✎ Note!
With the passive output configuration, the output signal levels of the pulse output depend on the external circuit (see examples).

Example for passive output circuit (PASSIVE)
If PASSIVE is selected, the pulse output is configured as an open collector.

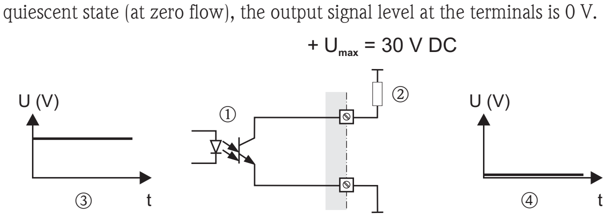


A0001225

① = *Open Collector*
② = *External power supply*

✎ Note!
For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms).

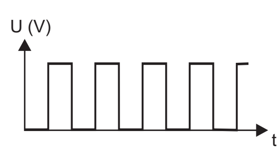
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-up resistance.
In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.



A0004687

① = *Open Collector*
② = *Pull-Up-Resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.



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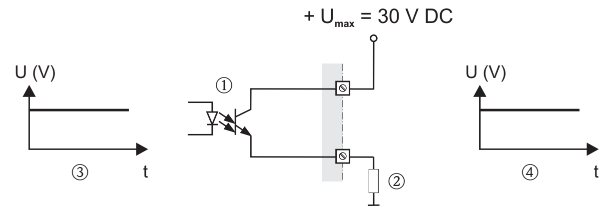
Function description PULSE/FREQUENCY OUTPUT

OUTPUT SIGNAL
(continued)

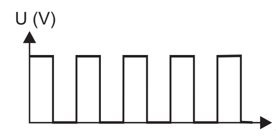
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-down resistance. In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.



A0004689

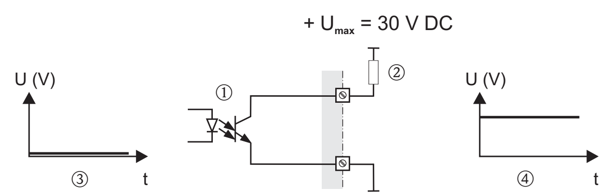
① = *Open Collector*
② = *Pull-Down-Resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.



A0001981

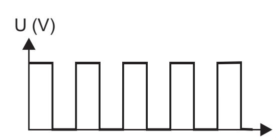
Example for output configuration PASSIVE-NEGATIVE:
Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.



A0004690

① = *Open Collector*
② = *Pull-Up-Resistance*
③ = *Transistor activation in "NEGATIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.



A0001981

Function description PULSE/FREQUENCY OUTPUT	
FAILSAFE MODE	Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE. For safety reasons it is advisable to ensure that the pulse output assumes a predefined state in the event of a fault. Use this function to define this state. The setting you select here affects only the pulse output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** FALLBACK VALUE Output is 0 pulse. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE
SIMULATION PULSE	Note! This function is not available unless the PULSE option was selected in the OPERATION MODE function. Use this function to activate simulation of the pulse output. **Options:** OFF COUNTDOWN The pulses specified in the VALUE SIMULATION PULSE function are output. CONTINUOUSLY Pulses are continuously output with the pulse width specified in the PULSE WIDTH function. Simulation is started once the CONTINUOUSLY option is confirmed with the E key. Note! Simulation is started by confirming the CONTINUOUSLY option with the E key. The simulation can be switched off again via the SIMULATION PULSE function. **Factory setting:** OFF Note! ■ The notice message #631 "SIM. PULSE" indicates that simulation is active. ■ The on/off ratio is 1:1 for both types of simulation. ■ The measuring device continues to measure while simulation is in progress, i.e. the current measured values are output correctly via the other outputs. Caution! The setting is not saved if the power supply fails.

Function description PULSE/FREQUENCY OUTPUT	
VALUE SIMULATION PULSE	Note! This function is not available unless the COUNTDOWN option was selected in the SIMULATION PULSE function. Use this function to specify the number of pulses (e.g. 50) which are output during the simulation. This value is used to test downstream devices and the measuring device itself. The pulses are output with the pulse width specified in the PULSE WIDTH function. The on/off ratio is 1:1. Simulation is started once the specified value is confirmed with the E key. The display remains at "0" if the specified pulses have been output. **User input:** 0...10000 **Factory setting:** 0 Note! Simulation is started by confirming the simulation value with the E key. The simulation can be switched off again via the SIMULATION PULSE function. Caution! The setting is not saved if the power supply fails.

11 Group STATUS OUTPUT

Function description STATUS OUTPUT	
This group is not available unless the measuring device is equipped with a status output.	
ASSIGN STATUS OUTPUT	Use this function to assign a switching function to the status output. **Options:** OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE or NOTICE MESSAGE EPD or OED (Empty Pipe Detection / Open Electrode Detection, only if active) FLOW DIRECTION VOLUME FLOW LIMIT VALUE **Factory setting:** FAULT MESSAGE ✎ Note! ▪ The behaviour of the status output is a normally closed behaviour, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. ▪ It is very important to read and comply with the information on the switching characteristics of the status output, (see Page 34). ▪ If you select OFF, the only function shown in this function group is the function ASSIGN STATUS OUTPUT.
ON-VALUE	✎ Note! This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN STATUS OUTPUT. Use this function to assign a value to the switch-on point (status output pulls up). The value can be equal to, greater than or less than the switch-off point. Positive and negative values are permissible. **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] ✎ Note! ▪ The appropriate unit is taken from the group SYSTEM UNITS, (see Page 8). ▪ Only the switch-on point is available for flow direction output (no switch-off point). If you enter a value not equal to the zero flow (e.g. 5), the difference between the zero flow and the value entered corresponds to half the switchover hysteresis.

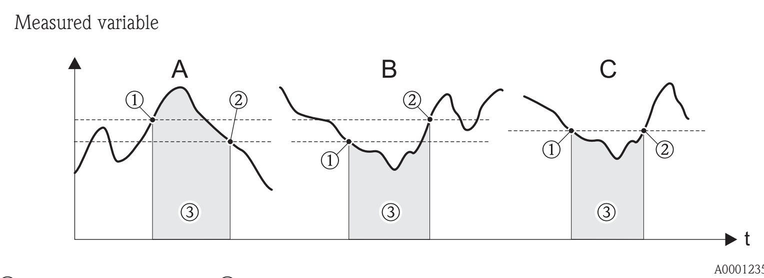
Function description STATUS OUTPUT	
OFF-VALUE	Note! This function is not available unless LIMIT VALUE was selected in the function ASSIGN STATUS OUTPUT. Use this function to assign a value to the switch-off point (status output drops out). The value can be equal to, greater than or less than the switch-on point. Positive and negative values are permissible. **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] Note! ▪ The appropriate unit is taken from the group SYSTEM UNITS, (see Page 8). ▪ If SYMMETRY is selected in the function MEASURING MODE (Page 45) and values with different signs are entered for the switch-on and switch-off points, the notice message "INPUT RANGE EXCEEDED" appears.
TIME CONSTANT	Use this function to enter a time constant defining how the measuring signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). The purpose of damping, therefore, is to prevent the status output changing state continuously in response to fluctuations in flow. **User input:** fixed-point number 0.00...100.00 s **Factory setting:** 0.00 s
ACTUAL STATUS OUTPUT	Use this function to check the current status of the status output. **User interface:** NOT CONDUCTIVE CONDUCTIVE
SIMULATION SWITCH POINT	Use this function to activate simulation of the status output. **Options:** OFF ON **Factory setting:** OFF Note! ▪ The "SIMULATION STATUS OUTPUT" message indicates that simulation is active. ▪ The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. Caution! The setting is not saved if the power supply fails.

Function description STATUS OUTPUT	
VALUE SIMULATION SWITCH POINT	Note! This function is not available unless the function SIMULATION SWITCH POINT is active (= ON). Use this function to define the switching response of the status output during the simulation. This value is used to test downstream devices and the measuring device itself. **Options:** NOT CONDUCTIVE CONDUCTIVE **Factory setting:** NOT CONDUCTIVE Caution! The setting is not saved if the power supply fails.

11.1 Information on the response of the status output

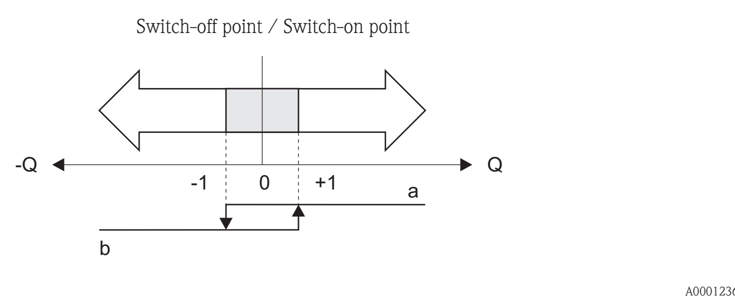
General
If you have configured the status output for "LIMIT VALUE" or "FLOW DIRECTION", you can configure the requisite switch points in the functions ON-VALUE and OFF-VALUE. When the measured variable in question reaches these predefined values, the status output switches as shown in the illustrations below.

Status output configured for limit value
The status output switches as soon as the measured variable undershoots or overshoots a defined switch point. Application: Monitoring flow or process-related boundary conditions.



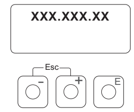
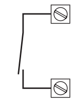
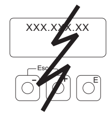
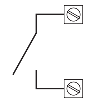
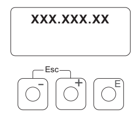
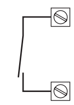
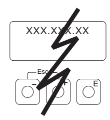
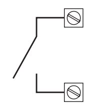
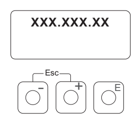
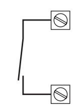
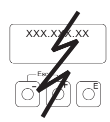
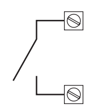
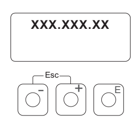
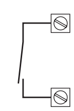
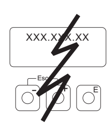
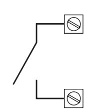
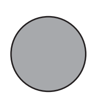
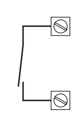
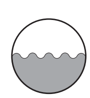
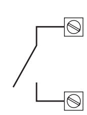
A = Maximum safety → ① SWITCH-OFF POINT > ② SWITCH-ON POINT
B = Maximum safety → ① SWITCH-OFF POINT < ② SWITCH-ON POINT
C = Maximum safety → ① SWITCH-OFF POINT = ② SWITCH-ON POINT (this configuration is to avoid)
③ = Status output switched off (not conductive)

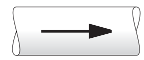
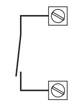
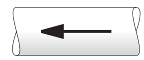
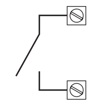
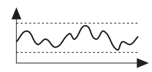
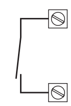
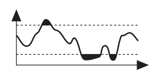
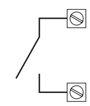
Status output configured for flow direction
The value entered in the function SWITCH-ON POINT defines the switch point for the positive and negative directions of flow. If, for example, the switch point entered is = 1 m^3/h, the status output switches off at –1 m^3/h (not conductive) and switches on again at +1 m^3/h (conductive).
Set the switch point to 0 if your process calls for direct switchover (no switching hysteresis). If low flow cut off is used, it is advisable to set hysteresis to a value greater than or equal to the low flow rate.



a = Status output conductive
b = Status output not conductive

11.2 Switching response of the status output

Function	Status		Open collector response (transistor)	
ON (operation)	System in measuring mode	 A0001052	conduc-tive	 A0001237
	System not in measuring mode (power supply failed)	 A0001291	not conduc-tive	 A0001238
Fault message	System OK	 A0001052	conduc-tive	 A0001237
	(System or process error) Fault → Error response of outputs/inputs and totalizer	 A0001291	not conduc-tive	 A0001238
Notice message	System OK	 A0001052	conduc-tive	 A0001237
	(System or process error) Fault → Continuation of measuring	 A0001291	not conduc-tive	 A0001238
Fault message or notice message	System OK	 A0001052	conduc-tive	 A0001237
	(System or process error) Fault → Response to error or Note → Continuation of measuring	 A0001291	not conduc-tive	 A0001238
Empty pipe detec-tion (EPD) / Open electrode detection (OED)	Measuring tube full	 A0001292	conduc-tive	 A0001237
	Measuring tube partially filled / empty measuring tube	 A0001293	not conduc-tive	 A0001238

Function	Status	Open collector response (transistor)
Flow direction	Forward  A0001241	conductive  A0001237
	Reverse  A0001242	not conductive  A0001238
Limit value Volume flow	Limit value not overshot or undershot  A0001243	conductive  A0001237
	Limit value overshot or undershot  A0001244	not conductive  A0001238

12 Group STATUS INPUT

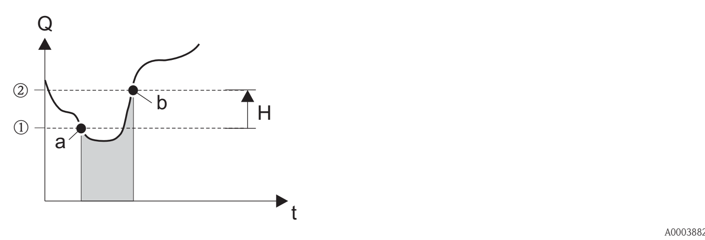
Function description STATUS INPUT	
This group is not available unless the measuring device is equipped with a status input.	
ASSIGN STATUS INPUT	Use this function to assign a switching function to the status input. **Options:** OFF RESET TOTALIZER 1 POSITIVE ZERO RETURN RESET TOTALIZER 2 RESET ALL TOTALIZERS **Factory setting:** OFF Note! Positive zero return is active as long as the active level is available at the status input (continuous signal). All other assignments react to a change in level (pulse) at the status input.
ACTIVE LEVEL	Use this function to define whether the assigned switch function, (see function ASSIGN STATUS INPUT) is released or sustained when the level is present (HIGH) or not present (LOW). **Options:** HIGH LOW **Factory setting:** HIGH
MINIMUM PULSE WIDTH	Use this function to define a minimum pulse width which the input pulse must achieve in order to trigger the selected switching function. **User input:** 20...100 ms **Factory setting:** 50 ms
SIMULATION STATUS INPUT	Use this function to activate simulation of the status input, i.e. to trigger the function assigned to the status input, (see function ASSIGN STATUS INPUT on Page 31). **Options:** OFF ON **Factory setting:** OFF Note! ▪ The "SIMULATION STATUS INPUT" notice message indicates that simulation is active. ▪ The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the outputs. Caution! The setting is not saved if the power supply fails.

Function description STATUS INPUT	
VALUE SIMULATION STATUS INPUT	Note! This function is not available unless the function SIMULATION STATUS INPUT is active (= ON). Use this function to select the level to be simulated at the status input. **Options:** HIGH LOW **Factory setting:** LOW Caution! The setting is not saved if the power supply fails.

13 Group COMMUNICATION

Function description COMMUNICATION	
TAG NAME	Use this function to enter a tag name for the measuring device. You can edit and read this tag name at the local display or via the HART protocol. **User input:** max. 8-character text, permitted characters are: A–Z, 0–9, +, –, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _" (no text)
TAG DESCRIPTION	Use this function to enter a tag description for the measuring device. You can edit and read this tag description at the local display or via the HART protocol. **User input:** max. 16-character text, permitted characters are: A–Z, 0–9, +, –, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _" (No text)
BUS ADDRESS	Use this function to define the address for the exchange of data with the HART protocol. **User input:** 0...15 **Factory setting:** 0 ✎ Note! Addresses 1...15: a constant 4 mA current is applied.
HART PROTOCOL	Use this function to display if the HART protocol is active. **User interface:** OFF = HART protocol not active ON = HART protocol active ✎ Note! The HART protocol is activated by selecting 4–20 mA HART or 4–20 mA (25 mA) HART in the function CURRENT SPAN (see Page 20).
MANUFACTURER ID	Use this function to view the manufacturer. **User interface:** – Endress+Hauser – 17 (≅ 11 hex) for Endress+Hauser
DEVICE ID	Use this function to view the device ID in hexadecimal numerical format. **User interface:** 41 (≅ 65 dez) for Promag 50
DEVICE REVISION	Use this function to view the device-specific revision of the HART command interface. **User interface:** E.g.: 5

14 Group PROCESS PARAMETER

Function description PROCESS PARAMETER	
ASSIGN LOW FLOW CUT OFF	Use this function to assign the switch point for low flow cut off. **Options:** OFF VOLUME FLOW **Factory setting:** VOLUME FLOW
ON-VALUE LOW FLOW CUT OFF	Use this function to enter the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active. **User input:** 5-digit floating-point number, [unit] **Factory setting:** Depends on nominal diameter and country (see Page 58 ff.). ✎ Note! The appropriate unit is taken from the group SYSTEM UNITS (see Page 8).
OFF-VALUE LOW FLOW CUT OFF	Use this function to enter the switch-off point for low flow cut off. Enter the switch-off point as a positive hysteresis value from the switch-on point. **User input:** Integer 0...100% **Factory setting:** 50%  *① = switch-on point , ② = switch-off point* *a = Low flow cut off is switched on* *b = Low flow cut off is switched off (a + a · H)* *H = Hysteresis value: 0 to 100%* *= Low flow cut off active* *Q = Flow*

Function description PROCESS PARAMETER	
EMPTY PIPE DETECTION (EPD)	Flow cannot be measured correctly unless the measuring tube is full. This status can be monitored at all times with the Empty Pipe Detection function. Use this function to activate Empty Pipe Detection (EPD) or Open Electrode Detection (OED). ▪ EPD = Empty Pipe Detection (with the help of an EPD electrode) ▪ OED = Open Electrode Detection (empty pipe detection with the help of the measuring electrodes, if the sensor is not equipped with an EPD electrode or the orientation is not suitable for using EPD). **Options:** OFF – ON SPECIAL – OED – ON STANDARD OFF (neither EPD nor OED are active) ON SPECIAL (only for DN <400): Switching on the Empty Pipe Detection (EPD) for devices in remote version (transmitter and sensor are installed separately). OED: Switching on the Open Electrode Detection (OED). ON STANDARD: Switching on the Empty Pipe Detection (EPD) for: – Devices in compact version (transmitter and sensor form a single mechanical unit). – Applications where a facing and coating of the fluid on the measuring tube line and measuring electrode accrues. **Factory setting:** OFF ✎ Note! ▪ The options ON STANDARD and ON SPECIAL are not available unless the sensor is equipped with an EPD electrode. ▪ The default setting for the EPD/OED functions when the device is delivered is OFF. The functions must be activated as required. ▪ The devices are calibrated at the factory with water (approx. 500 µS/cm). If the conductivity of certain fluids deviates from this reference, empty pipe/full pipe adjustment must be performed again on site (see function EPD/OED ADJUSTMENT on page 46). ▪ The adjustment coefficients must be valid before you can switch on the EPD or OED. If these coefficients are not available, the function EPD/OED ADJUSTMENT is displayed (see Page 44). ▪ If there are problems with the adjustment, the following error messages appear on the screen: – ADJUSTMENT FULL = EMPTY: The adjustment values for empty pipe and full pipe are identical. In such instances, empty pipe adjustment/full pipe adjustment **must** be carried out **again**. – ADJUSTMENT NOT OK: Adjustment is not possible as the fluid conductivity values are outside the permitted range. (continued on next page)

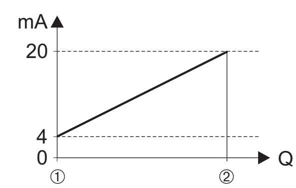
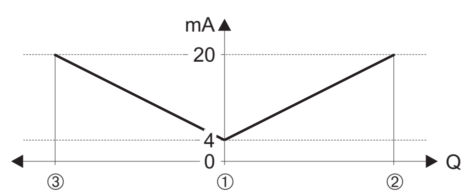
Function description PROCESS PARAMETER	
EMPTY PIPE DETECTION (EPD) (continued)	**Notes on empty pipe detection (EPD and OED)** ▪ Flow cannot be measured correctly unless the measuring pipe is completely full. This status can be monitored at all times by means of the EPD/OED. ▪ An empty or partially filled pipe is a process error. A default factory setting defines that a fault message is issued and that this process error has an effect on the outputs. ▪ The EPD/OED process error can be output via the configurable status output. ▪ Use the function ASSIGN PROCESS ERROR to define whether a notice or fault message should be triggered (see Page 54). ▪ A plausibility check of the adjustment values will only be executed by activating the empty pipe detection. If an empty or full pipe adjustment is performed during the empty pipe detection is active, the empty pipe detection has to be de- and again activated, after finishing the adjustment, to start the plausibility check. **Response to partially filled pipes** If the EPD/OED is switched on and responds to a partially filled or empty pipe, the fault message "EMPTY PIPE" appears on the display. If the pipe is partially empty and the EPD/OED is **not** switched on, the response can vary in identically configured systems: ▪ Flow reading fluctuates ▪ Zero flow ▪ Excessively high flow values **Notes on Open Electrode Detection (OED)** Open Electrode Detection (OED) functions like the Empty Pipe Detection (EPD). In contrast to the EPD where the measuring device must be equipped with a separate (optional) electrode, the OED detects partial filling by means of the two measuring electrodes which are present as standard (fluid no longer covers the measuring electrodes). Open electrode detection can also be used if: ▪ the sensor is not installed in the optimal position for using EPD (optimal = installed horizontally). ▪ the sensor is not equipped with an additional (optional) EPD electrode. ✎ Note! ▪ Cable connection length: When mounting a remote version, please observe the maximum permissible cable length of 15 metres in order to keep the OED function. ▪ OED empty pipe adjustment: To achieve the best results for the open electrode detection, it is important to have the electrodes surface as dry as possible (no liquid film) while the empty-pipe adjustment is being made. Even during normal operation, the OED function is only secured if there is no longer any liquid film present on the electrodes when the measuring pipe is empty.

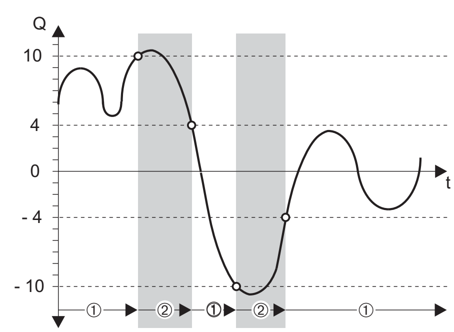
Function description PROCESS PARAMETER	
EPD/OED ADJUSTMENT	Use this function to activate the EPD/OED adjustment for an empty or full measuring tube. Note! A detailed description and other helpful hints for the empty-pipe/full-pipe adjustment procedure can be found on Page 44. **Options:** OFF FULL PIPE ADJUST EMPTY PIPE ADJUST OED FULL ADJUST OED EMPTY ADJUST **Factory setting:** OFF **Procedure for EPD or OED empty-pipe / full-pipe adjustment** 1. Empty the piping. In case of an EPD adjustment, the wall of the measuring tube should be wetted with fluid for the adjustment procedure but this is not the case with an OED adjustment! 2. Start empty-pipe adjustment: Select "EMPTY PIPE ADJUST" or "OED EMPTY ADJUST" and press E to confirm. 3. After empty-pipe adjustment, fill the piping with fluid. 4. Start full-pipe adjustment: Select "FULL PIPE ADJUST" or "OED FULL ADJUST" and press E to confirm. 5. Having completed the adjustment, select the setting "OFF" and exit the function by pressing E . 6. Now select the "EMPTY PIPE DETECTION" function. Switch on Empty Pipe Detection by selecting the following settings: – EPD → Select ON STANDARD or ON SPECIAL and press E to confirm. – OED → Select OED and confirm with E . Caution! The adjustment coefficients must be valid before you can activate the EPD/OED function. If adjustment is incorrect the following messages might appear on the display: – FULL = EMPTY The adjustment values for empty pipe and full pipe are identical. In cases of this nature you **must** repeat empty-pipe or full-pipe adjustment **again**! – ADJUSTMENT NOT OK Adjustment is not possible because the fluid's conductivity is out of range.

Function description PROCESS PARAMETER	
EPD/OED RESPONSE TIME	✎ Note! This function is not available unless ON STANDARD, ON SPECIAL or OED was selected in the EMPTY PIPE DETECTION function. Use this function to enter the time span for which the criteria for an "empty" pipe have to be satisfied without interruption before a notice message or fault message is generated. The setting defined here is used by the active empty pipe detection (EPD) or open electrode detection (OED). **User input:** fixed-point number 1.0...100 s **Factory setting:** 1.0 s ✎ Note! OED detection time: The recognition of open electrodes is, in contrast to the empty pipe detection (EPD), very slow reacting (delay at least 25 seconds) and is only activated after an aditional delay from the programmed response time! We recommend in most applications to use the empty pipe detection (EPD) which is an optimal solution for detecting partly filled measuring tubes.
ECC	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to activate cyclical electrode cleaning. **Options:** OFF ON **Factory setting:** ON (only if the optional electrode cleaning function ECC is available) **Notes on electrode cleaning (ECC)** Conductive deposits on the electrodes and on the walls of the measuring tube (e.g. magnetite) can falsify measurement values. The Electrode Cleaning Circuitry (ECC) was developed to prevent such conductive deposits accreting in the vicinity of the electrodes. ECC functions as described above for all available electrode materials except tantalum. If tantalum is used as the electrode material, the ECC protects the electrode surface only against oxidation. Caution! If the ECC is switched off for a prolonged period in applications with conductive deposits, a layer forms inside the measuring tube and this can falsify measurement values. If the layer is allowed to accrete beyond a certain level, it might no longer be possible to remove it by switching on the ECC. If this happens the measuring tube must be cleaned and the layer removed.
ECC DURATION	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the electrode cleaning duration. **User input:** fixed-point number 0.01...30.0 s **Factory setting:** 2.0 s

Function description PROCESS PARAMETER	
ECC RECOVERY TIME	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the recovery time for which the last flow value measured prior to cleaning is retained. A recovery time is necessary as the signal outputs can fluctuate after electrode cleaning on account of electrochemical interference voltages. **User input:** max. 3-digit number: 1... 600 s **Factory setting:** 5 s Caution! The last value measured prior to cleaning is output for the duration of the recovery time (max. 600 s). This in turn means that the measuring system does not register changes in flow, e.g. stoppage, during this time span.
ECC CLEANING CYCLE	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the cleaning cycle for electrode cleaning. **User input:** Integer: 30...10080 min **Factory setting:** 40 min

15 Group SYSTEM PARAMETERS

Function description SYSTEM PARAMETERS	
INSTALLATION DIRECTION SENSOR	Use this function to reverse the sign of the flow quantity, if necessary. **Options:** NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) **Factory setting:** NORMAL ✎ Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate).
MEASURING MODE	Use this function to select the measuring mode for all outputs. **Options:** STANDARD SYMMETRY **Factory setting:** STANDARD The responses of the individual outputs in each of the measuring modes are described in detail on the following pages: **Current output and frequency output** STANDARD Only the flow components for the selected flow direction are totalled, (positive or negative full scale value ② = flow direction). Flow components in the opposite direction are not taken into account (suppression). Example for current output:  A0001248 SYMMETRY The output signals of the current and frequency outputs are independent of the direction of flow (absolute amount of the measured variable). The "VALUE 20 mA" or "VALUE-f HIGH" ③ (e.g. backflow) corresponds to the mirrored VALUE 20 mA or VALUE-f HIGH ② (e.g. flow). Positive and negative flow components are taken into account. Example for current output:  A0001249 ✎ Note! The direction of flow can be output via the configurable status output. (continued on next page)

Function description SYSTEM PARAMETERS	
MEASURING MODE (continued)	**Pulse output** STANDARD Only positive flow components are totalled. Negative components are not taken into account. SYMMETRY Positive and negative flow components are taken into account. ✎ Note! The direction of flow can be output via the configurable status output. **Status output** ✎ Note! The information is only applicable if LIMIT VALUE was selected in the function ASSIGN STATUS OUTPUT. STANDARD The status output signal switches at the defined switch points. SYMMETRY The status output signal switches at the defined switch points, irrespective of the sign. In other words, if you define a switch point with a positive sign, the status output signal switches as soon as the value is reached in the negative direction (negative sign), (see illustration). Example for the SYMMETRY measuring mode: Switch-on point: Q = 4 Switch-off point: Q = 10 ① = Status output switched on (conductive) ② = Status output switched off (not conductive)  A0001247
POSITIVE ZERO RETURN	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all function and outputs of the measuring device. **Options:** OFF ON → Signal output is set to the "ZERO FLOW" value. **Factory setting:** OFF

Function description SYSTEM PARAMETERS	
SYSTEM DAMPING	Use this function to set the filter depth of the digital filter. This reduces the sensitivity of the measuring signal to interference peaks (e.g. high solids content, gas bubbles in the fluid, etc.). The system reaction time decreases with an increasing filter setting. **User input:** 0...15 **Factory setting:** 9 ✎ Note! The system damping acts on all functions and outputs of the measuring device.
INTEGRATION TIME	Use this function to set the integration time. Under normal circumstances it is not necessary to change the factory settings. **User input:** 3.3...65 ms **Factory setting:** 20 ms at 50 Hz → mains frequency (e.g. Europe) 16.7 ms at 60 Hz → mains frequency (e.g. USA) Caution! The integration time must not be selected with a greater value than the measuring period (see Page 53). ✎ Note! The integration time defines the duration of internal totaling of the induced voltage in the fluid (measured by the measuring electrode), i.e. the time in which the measuring device records the true flow (afterwards the magnetic field for the next integration is created from the opposite pole).

16 Group SENSOR DATA

Function description SENSOR DATA	
All sensor data (calibration factors, zero point and nominal diameter etc.) are set at the factory and saved on the S-DAT sensor memory chip. Caution! Under normal circumstances you should not change the following parameter settings, because changes affect numerous functions of the entire measuring facility in general and the accuracy of the measuring system in particular. For this reason, the functions described below cannot be changed even when you enter your personal code. Contact the Endress+Hauser service organization if you have any questions about these functions.	
CALIBRATION DATE	Use this function to view the current calibration date and time for the sensor. **User interface:** Calibration date and time **Factory setting:** Calibration date and time of the current calibration. Note! The calibration date and time format is defined in the FORMAT DATE TIME function, → Page 9.
K-FACTOR	Use this function to display the current calibration factor for the sensor. The calibration factor is determined and set at the factory. **User interface:** 5-digit fixed-point number: 0.5000...2.0000 **Factory setting:** Depends on nominal diameter and calibration Note! This value is also provided on the sensor nameplate.
ZERO POINT	This function shows the current zero-point correction value for the sensor. Zero-point correction is determined and set at the factory. **User interface:** max. 4-digit number: –1000...+1000 **Factory setting:** Depends on nominal diameter and calibration Note! This value is also provided on the sensor nameplate.
NOMINAL DIAMETER	This function shows the nominal diameter for the sensor. The nominal diameter depends on the size of the sensor and is set at the factory. **User interface:** 2...2000 mm or 1/12...78" **Factory setting:** Depends on the size of the sensor Note! This value is also provided on the sensor nameplate.

Function description SENSOR DATA	
MEASURING PERIOD	Use this function to set the time for a full measuring period. The duration of the measuring period is calculated from the rise time of the magnetic field, the brief recovery time, the integration time (which can be set) and the empty pipe detection time. **User input:** 0.0...1000 ms **Factory setting:** Depends on nominal diameter Note! The system checks the time entered and sets the measuring period which is actually used internally to a plausible value. If you enter 0 ms, the system automatically computes the shortest time.
OVERVOLTAGE TIME	Use this function to specify the time in which overvoltage is applied to the coil circuit in order to build up the magnetic field as fast as possible. The overvoltage time is adjusted automatically while measuring is in progress. The overvoltage time depends on the sensor type and the nominal diameter and is set at the factory. **User interface:** 4-digit floating-point number: 0.0...100.0 ms **Factory setting:** Depends on nominal diameter
EPD ELECTRODE	Use this function to check whether the sensor is equipped with an EPD electrode. **User interface:** YES NO **Factory setting:** YES → Electrode fitted as standard
POLARITY ECC	Use this function to display the actual current polarity for optional electrode cleaning (ECC). Electrode cleaning uses either a positive or negative current, depending on the electrode material. The measuring device automatically selects the correct polarity on the basis of the electrode-material data stored in the S-DAT. **User interface:** POSITIVE → for electrodes made of: 1.4435, Hastelloy C, platinum, titanium NEGATIVE → for electrodes made of: tantalum Caution! If the incorrect current is applied to the electrodes, the electrode material is destroyed.

17 Group SUPERVISION

Function description SUPERVISION	
CURRENT SYSTEM CONDITION	Use this function to check the present system status. **User interface:** "SYSTEM OK" or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITIONS	Use this function to view the fifteen most recent fault and notice messages since measuring last started. **User interface:** The last 15 fault/notice messages appear on the display
ASSIGN SYSTEM ERROR	Use this function to view all system errors and the associated error categories (fault message or notice message). By selecting a certain system error, its error category can be changed in the subsequent function ERROR CATEGORY. **Options:** CANCEL List of system errors ✎ Note! ■ You can exit this function as follows: select "CANCEL" and confirm with E. ■ A list of possible system errors is provided in the Operating Instructions Promag 50, BA 046D/06/en
ERROR CATEGORY	✎ Note! This function is only available if a system error has been selected in the function ASSIGN SYSTEM ERROR. Use this function to define whether a system error triggers a notice message or a fault message. If you select FAULT MESSAGES, all outputs respond to an error in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note! Press the E key twice to call up the ASSIGN SYSTEM ERROR function.
ASSIGN PROCESS ERROR	Use this function to view all process errors and the associated error categories (fault message or notice message). By selecting an individual process error, its error category can be changed in the subsequent function ERROR CATEGORY. **Options:** CANCEL List of process errors ✎ Note! ■ You can exit this function as follows: select "CANCEL" and confirm with E. ■ A list of possible process errors is provided in the Operating Instructions Promag 50, BA 046D/06/en

Function description SUPERVISION	
ERROR CATEGORY	✎ Note! This function is only available if a process error has been selected in the function ASSIGN PROCESS ERROR. Use this function to define whether a process error triggers a notice message or a fault message. If you select FAULT MESSAGES, all outputs respond to an error in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note! Press the E key twice to call up the ASSIGN PROCESS ERROR function.
ALARM DELAY	Use this function to define a time span in which the criteria for an error have to be satisfied without interruption before an error or notice message is generated. Depending on the setting and the type of error, this suppression acts on: ■ Display ■ Status output ■ Current output ■ Frequency output **User input:** 0...100 s (in steps of one second) **Factory setting:** 0 s Caution! If this function is activated error and notice messages are delayed by the time correspon-ding to the setting before being forwarded to the higher-order controller (process control-ler, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If error and notice messages cannot be suppressed, a value of 0 seconds must be entered here.
SYSTEM RESET	Use this function to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting power supply) **Factory setting:** NO
OPERATION HOURS	The hours of operation of the device appear on the display. **Display:** Depends on the number of hours of operation elapsed: Hours of operation < 10 hours → display format = 0:00:00 (hr:min:sec) Hours of operation 10...10,000 hours → display format = 0000:00 (hr:min) Hours of operation > 10,000 hours → display format = 000000 (hr)
PERMANENT STORAGE	This function indicates whether permanent storage of all parameters in the EEPROM has been switched on or off. **Display:** 0 = OFF 1 = ON **Factory setting:** ON

18 Group SIMULATION SYSTEM

Function description SIMULATION SYSTEM	
SIMULATION FAILSAFE MODE	Use this function to set all inputs, outputs and the totalizer to their defined failsafe modes, in order to check whether they respond correctly. During this time, the words "SIMULATION FAILSAFE MODE" appear on the display. **Options:** ON OFF **Factory setting:** OFF
SIMULATION MEASURED VARIABLE	Use this function to set all inputs, outputs and the totalizer to their defined flow-response modes, in order to check whether they respond correctly. During this time, the words "SIMULATION MEASURAND" appear on the display. **Options:** OFF VOLUME FLOW **Factory setting:** OFF Caution! ▪ The measuring device cannot be used for measuring while this simulation is in progress. ▪ The setting is not saved if the power supply fails.
VALUE SIMULATION MEASURED VARIABLE	Note! This function is not available unless the SIMULATION MEASURED VARIABLE function is active (= VOLUME FLOW). Use this function to specify a selectable value (e.g. 12 m^3/s). This value is used to test downstream devices and the measuring device itself. **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] Caution! The setting is not saved if the power supply fails. Note! The appropriate unit is taken from the group SYSTEM UNITS, (see Page 8)

19 Group SENSOR VERSION

Function description SENSOR VERSION	
SERIAL NUMBER	Use this function to view the serial number of the sensor.
SENSOR TYPE	Use this function to view the sensor type.
HARDWARE REVISION NUMBER SENSOR	Use this function to view the hardware revision number of the sensor.
SOFTWARE REVISION NUMBER S-DAT	Use this function to view the software revision number of the software used to create the content of the S-DAT

20 Group AMPLIFIER VERSION

Function description AMPLIFIER VERSION	
DEVICE SOFTWARE	Displays the current device software version.
SOFTWARE REVISION NUMBER AMPLIFIER	Use this function to view the software revision number of the amplifier.
LANGUAGE GROUP	Use this function to view the language group. The following language groups can be ordered: WEST EU / USA, EAST EU / SCAND., ASIA. **Display:** available language group ✎ Note! ▪ The language options of the available language group are displayed in the LANGUAGE function. ▪ You can change the language group via the configuration software FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.
I/O MODULE TYPE	Use this function to view the configuration of the I/O module complete with terminal numbers.
SOFTWARE REVISION NUMBER I/O MODULE	Use this function to view the software revision number of the I/O module.

21 Factory settings

21.1 SI units (not for USA and Canada)

Low flow, full scale value, pulse value, totalizer

Nominal diameter		Low flow		Full scale value		Pulse value		Totalizer
[mm]	[inch]	(approx. v = 0.04 m/s)		(approx. v = 2.5 m/s)		(approx. 2 pulses/s at v = 2.5 m/s)		
2	$^1/_{12}$"	0.01	dm^3/min	0.5	dm^3/min	0.005	dm^3	dm^3
4	$^5/_{32}$"	0.05	dm^3/min	2	dm^3/min	0.025	dm^3	dm^3
8	$^5/_{16}$"	0.1	dm^3/min	8	dm^3/min	0.10	dm^3	dm^3
15	$^1/_2$"	0.5	dm^3/min	25	dm^3/min	0.20	dm^3	dm^3
25	1"	1	dm^3/min	75	dm^3/min	0.50	dm^3	dm^3
32	1 $^1/_4$"	2	dm^3/min	125	dm^3/min	1.00	dm^3	dm^3
40	1 $^1/_2$"	3	dm^3/min	200	dm^3/min	1.50	dm^3	dm^3
50	2"	5	dm^3/min	300	dm^3/min	2.50	dm^3	dm^3
65	2 $^1/_2$"	8	dm^3/min	500	dm^3/min	5.00	dm^3	dm^3
80	3"	12	dm^3/min	750	dm^3/min	5.00	dm^3	dm^3
100	4"	20	dm^3/min	1200	dm^3/min	10.00	dm^3	dm^3
125	5"	30	dm^3/min	1850	dm^3/min	15.00	dm^3	dm^3
150	6"	2.5	m^3/h	150	m^3/h	0.025	m^3	m^3
200	8"	5.0	m^3/h	300	m^3/h	0.05	m^3	m^3
250	10"	7.5	m^3/h	500	m^3/h	0.05	m^3	m^3
300	12"	10	m^3/h	750	m^3/h	0.10	m^3	m^3
350	14"	15	m^3/h	1000	m^3/h	0.10	m^3	m^3
400	16"	20	m^3/h	1200	m^3/h	0.15	m^3	m^3
450	18"	25	m^3/h	1500	m^3/h	0.25	m^3	m^3
500	20"	30	m^3/h	2000	m^3/h	0.25	m^3	m^3
600	24"	40	m^3/h	2500	m^3/h	0.30	m^3	m^3
700	28"	50	m^3/h	3500	m^3/h	0.50	m^3	m^3
–	30"	60	m^3/h	4000	m^3/h	0.50	m^3	m^3
800	32"	75	m^3/h	4500	m^3/h	0.75	m^3	m^3
900	36"	100	m^3/h	6000	m^3/h	0.75	m^3	m^3
1000	40"	125	m^3/h	7000	m^3/h	1.00	m^3	m^3
–	42"	125	m^3/h	8000	m^3/h	1.00	m^3	m^3
1200	48"	150	m^3/h	10000	m^3/h	1.50	m^3	m^3
–	54"	200	m^3/h	13000	m^3/h	1.50	m^3	m^3
1400	–	225	m^3/h	14000	m^3/h	2.00	m^3	m^3
–	60"	250	m^3/h	16000	m^3/h	2.00	m^3	m^3
1600	–	300	m^3/h	18000	m^3/h	2.50	m^3	m^3
–	66"	325	m^3/h	20500	m^3/h	2.50	m^3	m^3
1800	72"	350	m^3/h	23000	m^3/h	3.00	m^3	m^3
–	78"	450	m^3/h	28500	m^3/h	3.50	m^3	m^3
2000	–	450	m^3/h	28500	m^3/h	3.50	m^3	m^3

Language

Country	Language
Australia	English
Austria	Deutsch
Belgium	English
Czech Republic	Czech
Denmark	English
England	English
Finland	Suomi
France	Francais
Germany	Deutsch
Hong Kong	English
Hungary	English
India	English
Indonesia	Bahasa Indonesia
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Netherlands	Nederlands
Norway	Norsk
Poland	Polish
Portugal	Portuguese
Russia	Russian
Singapore	English
South Africa	English
Spain	Espanol
Sweden	Svenska
Switzerland	Deutsch
Thailand	English

Length

	Unit
Length	mm

21.2 US units (only for USA and Canada)

Low flow, full scale value, pulse value, totalizer

Nominal diameter		Low flow		Full scale value		Pulse value		Totalizer
[inch]	[mm]	(approx. v = 0.04 m/s)		(approx. v = 2.5 m/s)		(approx. 2 pulses/s at v = 2.5 m/s)		
1/12"	2	0.002	gal/min	0.1	gal/min	0.001	gal	gal
5/32"	4	0.008	gal/min	0.5	gal/min	0.005	gal	gal
5/16"	8	0.025	gal/min	2	gal/min	0.02	gal	gal
1/2"	15	0.10	gal/min	6	gal/min	0.05	gal	gal
1"	25	0.25	gal/min	18	gal/min	0.20	gal	gal
1 1/4"	32	0.50	gal/min	30	gal/min	0.20	gal	gal
1 1/2"	40	0.75	gal/min	50	gal/min	0.50	gal	gal
2"	50	1.25	gal/min	75	gal/min	0.50	gal	gal
2 1/2"	65	2.0	gal/min	130	gal/min	1	gal	gal
3"	80	2.5	gal/min	200	gal/min	2	gal	gal
4"	100	4.0	gal/min	300	gal/min	2	gal	gal
5"	125	7.0	gal/min	450	gal/min	5	gal	gal
6"	150	12	gal/min	600	gal/min	5	gal	gal
8"	200	15	gal/min	1200	gal/min	10	gal	gal
10"	250	30	gal/min	1500	gal/min	15	gal	gal
12"	300	45	gal/min	2400	gal/min	25	gal	gal
14"	350	60	gal/min	3600	gal/min	30	gal	gal
16"	400	60	gal/min	4800	gal/min	50	gal	gal
18"	450	90	gal/min	6000	gal/min	50	gal	gal
20"	500	120	gal/min	7500	gal/min	75	gal	gal
24"	600	180	gal/min	10500	gal/min	100	gal	gal
28"	700	210	gal/min	13500	gal/min	125	gal	gal
30"	–	270	gal/min	16500	gal/min	150	gal	gal
32"	800	300	gal/min	19500	gal/min	200	gal	gal
36"	900	360	gal/min	24000	gal/min	225	gal	gal
40"	1000	480	gal/min	30000	gal/min	250	gal	gal
42"	–	600	gal/min	33000	gal/min	250	gal	gal
48"	1200	600	gal/min	42000	gal/min	400	gal	gal
54"	–	1.3	Mgal/d	75	Mgal/d	0.0005	Mgal	Mgal
–	1400	1.3	Mgal/d	85	Mgal/d	0.0005	Mgal	Mgal
60"	–	1.3	Mgal/d	95	Mgal/d	0.0005	Mgal	Mgal
–	1600	1.7	Mgal/d	110	Mgal/d	0.0008	Mgal	Mgal
66"	–	2.2	Mgal/d	120	Mgal/d	0.0008	Mgal	Mgal
72"	1800	2.6	Mgal/d	140	Mgal/d	0.0008	Mgal	Mgal
78"	–	3.0	Mgal/d	175	Mgal/d	0.001	Mgal	Mgal
–	2000	3.0	Mgal/d	175	Mgal/d	0.001	Mgal	Mgal

Language, length

	Unit
Language	English
Length	inch

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People for Process Automation

BA049D/06/en/11.09
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FM+SGML6.0

MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

ENDRESS + HAUSER

LIQUIPHANT M FTL51, LEVEL SWITCH (VIBRONIC)

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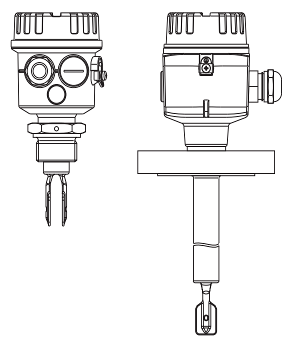
KA00143F/00/A6/14.17
71352535

Products Solutions Service



Operating Instructions
Liquiphant M FTL50, FTL51

DE - Grenzschalter
EN - Point Level Switch
FR - Détecteur de niveau
ES - Detector de nivel
IT - Interruttore di livello
NL - Niveauschakelaar

Endress+Hauser
People for Process Automation

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Achtung!
= verboten;
führt zu fehlerhaftem Betrieb
oder Zerstörung.

Caution!
= forbidden;
leads to incorrect operation
or destruction.

Attention!
= interdit; peut provoquer
des dysfonctionnements
ou la destruction.

ES - Indice

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Atención!
= Prohibido; peligro
de mal funcionamiento
o de destrucción.

Attenzione!
= Vietato; pericolo
di malfunzionamento
o di distruzione.

Opgelet!
= verboden;
leidt tot foutieve werking
of storing.

DE– Sicherheitshinweise

Der Liquiphant M FTL50, FTL51 darf nur als Grenzschalter für Flüssigkeiten verwendet werden.
Bei unsachgemäßem Einsatz können Gefahren von ihm ausgehen.
Das Gerät darf **nur von qualifiziertem und autorisiertem Fachpersonal** unter strenger Beachtung dieser Betriebsanleitung, der einschlägigen Normen, der gesetzlichen Vorschriften und der Zertifikate (je nach Anwendung) eingebaut, angeschlossen, in Betrieb genommen und gewartet werden.
In der Gebäudeinstallation ist ein Netzschalter für das Gerät leicht erreichbar in dessen Nähe zu installieren.
Er ist als Trennvorrichtung für das Gerät zu kennzeichnen.

EN– Notes on Safety

The Liquiphant M FTL50, FTL51 is designed for point level detection in liquids.
If used incorrectly it is possible that application-related dangers may arise.
The level limit switch Liquiphant M FTL50, FTL51 may be installed, connected, commissioned, operated and maintained **by qualified and authorised personnel only**, under strict observance of these operating instructions, any relevant standards, legal requirements, and, where appropriate, the certificate.
Install an easily accessible power switch in the proximity of the device.
Mark the power switch as a disconnector for the device.

FR – Conseils de sécurité

Le Liquiphant M FTL50, FTL51 doit être exclusivement utilisé comme détecteur de niveau pour liquides.
Il peut être source de danger en cas d'utilisation non conforme aux prescriptions.
L'appareil ne doit être installé, raccordé, mise en service et entretenu **que par un personnel qualifié et autorisé**, qui tiendra compte des indications contenues dans la présente mise en service, des normes en vigueur et des certificats disponibles (selon l'application).
Installer un commutateur réseau à proximité immédiate de l'appareil, en veillant à ce qu'il soit facilement accessible.
Marquer ce commutateur comme prise de coupure de l'appareil.

ES - Notas sobre seguridad

El detector de nivel Liquiphant M FTL50, FTL51 ha sido diseñado para la detección de límite en fluidos.
Su empleo inapropiado puede resultar peligroso.
El equipo deberá ser montado, conectado, instalado y mantenido **única y exclusivamente por personal cualificado y autorizado**, bajo rigurosa observación de las presentes instrucciones de servicio, de las normativas y legislaciones vigentes, así como de los certificados (dependiendo de la aplicación).
Instalar un interruptor de fácil acceso en las proximidades del equipo.
Identificar el interruptor como desconectador del equipo.

IT - Note sulla sicurezza

Il Liquiphant M FTL50, FTL51 è particolarmente studiato per l'impiego come soglia di livello in liquidi.
Un'installazione non corretta può determinare pericolo.
Lo strumento può essere montato **solamente da personale qualificato ed autorizzato**.
La messa in esercizio e la manutenzione devono rispettare le indicazioni di collegamento, le norme e i certificati di seguito riportati.
Installare un interuttore per l'alimentazione in prossimità del dispositivo.
Marcare l'interuttore come disconnessione del dispositivo.

NL- Veiligheidsinstructies

Gebruik de Liquiphant M FTL50, FTL51 alleen als niveauschakelaar voor vloeistoffen.
Indien niet correct gebruikt kunnen gevaarlijke situaties ontstaan.
Het instrument **alleen door gekwalificeerd en geautoriseerd personeel** laten inbouwen, aansluiten, in bedrijf nemen en onderhouden.
Neem de instructies in deze Inbedrijfstellingsvoorschriften, de desbetreffende normen, de wettelijke voorschriften en eventuele certificaten in acht.
Installeer een makkelijk bereikbare voedingschakelaar in de nabijheid van het instrument.
Kenmerk de voedingschakelaar specifiek voor het instrument.

DE- Behandlung
Am Gehäuse, Flansch oder Verlängerungsrohr anfassen.

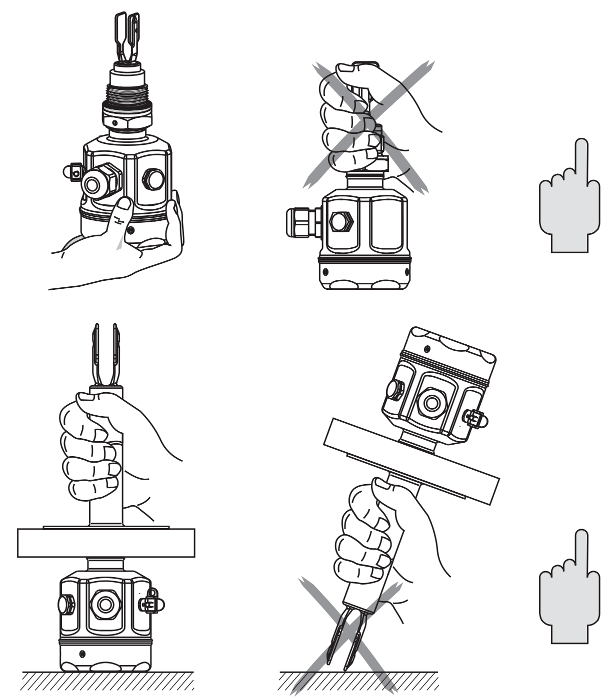
EN- Handling
Hold by housing, flange or extension tube.

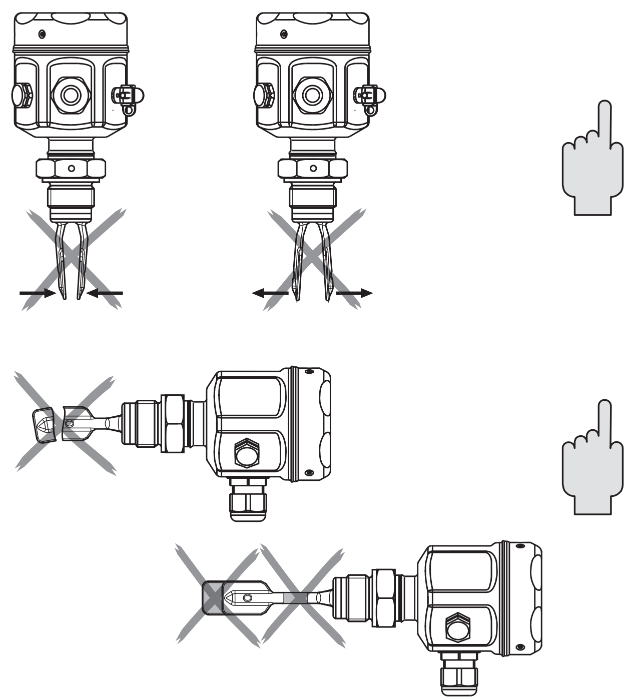
FR - Manipulation
Tenir par le boîtier, la bride ou le tube prolongateur.

ES - Modo de empleo
Coger por el cabezal, brida o tubo de extensión.

IT - Accorgimenti
Afferrare la custodia,
per la flangia o
per il tubo di estensione.

NL- Behandeling
Vastpakken via behuizing, flens of verlengbuis.





DE- **Nicht** verbiegen
Nicht kürzen
Nicht verlängern

EN- Do **not** bend
Do **not** shorten
Do **not** lengthen

FR - **Ne pas** déformer
Ne pas raccourcir
Ne pas rallonger

ES - **No** torcer
No acortar
No alargar

IT - **Non** stringere o allargare
Non accorciare o allungare
Non piegare

NL- **Niet** verbuigen
Niet inkorten
Niet verlengen

DE- Geräte-Identifikation

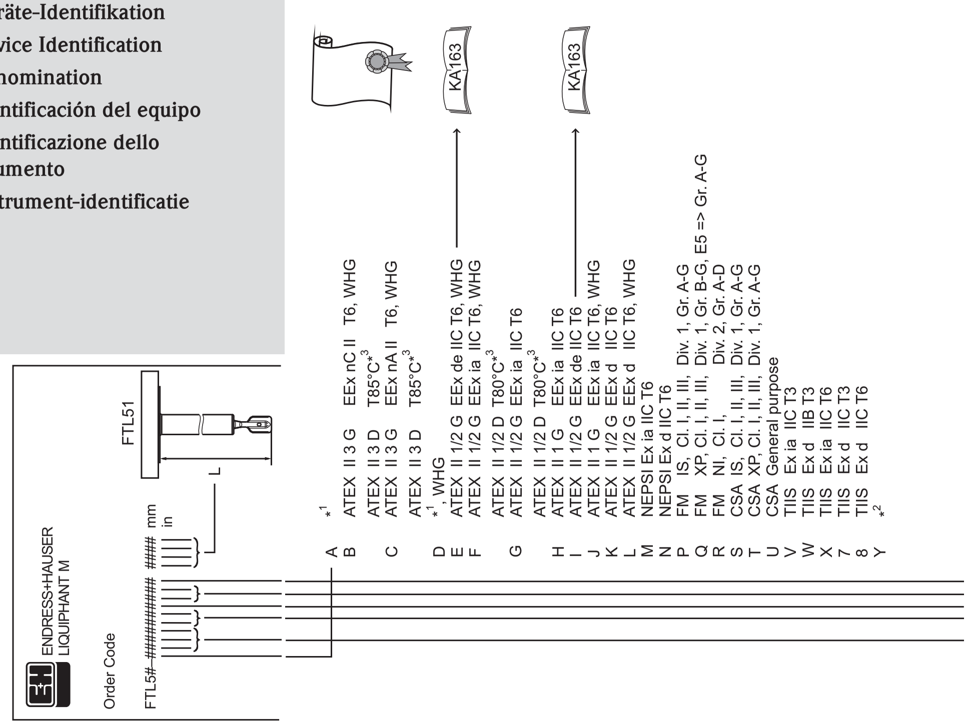
EN- Device Identification

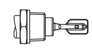
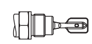
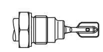
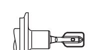
FR - Dénomination

ES - Identificación del equipo

IT - Identificazione dello strumento

NL- Instrument-identificatie



A## B## C## D## F## K## N##	Flansche / Flanges / Brides / Brida / Flangia / Flens		→ 12 13
GE2	R ¾,	DIN 2999, 316L	
GE5	R ¾,	DIN 2999, AlloyC4	
GE6	R ¾,	DIN 2999, AlloyC22	
GF2	R 1,	DIN 2999, 316L	
GF5	R 1,	DIN 2999, AlloyC4	
GF6	R 1,	DIN 2999, AlloyC22	
GM2	NPT ¾, ANSI,	316L	max. 100 bar, 150 °C
GM5	NPT ¾, ANSI,	AlloyC4	
GM6	NPT ¾, ANSI,	AlloyC22	
GN2	NPT 1, ANSI,	316L	
GN5	NPT 1, ANSI,	AlloyC4	
GN6	NPT 1, ANSI,	AlloyC22	
GQ2	G ¾,	ISO 228, 316L	
GQ5	G ¾,	ISO 228, AlloyC4	
GQ6	G ¾,	ISO 228, AlloyC22	
GR2	G 1,	ISO 228, 316L	max. 100 bar, 150 °C
GR5	G 1,	ISO 228, AlloyC4	
GR6	G 1,	ISO 228, AlloyC22	
GW2	G 1,	ISO 228, 316L	 max. 25 bar, 150 °C max. 40 bar, 100 °C
TC2	DN25-38 (1...1½"), Tri-Clamp	ISO 2852, 316L	
TE2	DN40-51 (2"), Tri-Clamp	ISO 2852, 316L	max. 16 bar, 120 °C max. 2 bar, 150 °C
YY9	*[2]		

→ 10 11

*[1] ohne / without / sans / sin / senza / zonder

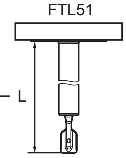
*[2] andere / others / autres / otros / altri / andere

*[3] nicht gültig für PBT / not valid for PBT / non valable pour PBT / no es válido para PBT / non valido per PBT / niet geldig voor PBT

ENDRESS+HAUSER
LIQUIPHANT M

Order Code

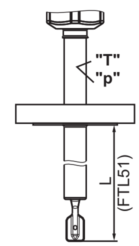
FTL51



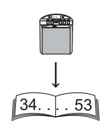
FTL5#–########## #### mm
in

L

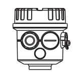
AA	*2,		Ra < 3.2 µm/80 grit (FTL50)
BB	……. mm,	316L,	Ra < 3.2 µm/80 grit
BE	……. mm,	AlloyC4,	Ra < 3.2 µm/80 grit
CB	……. in,	316L,	Ra < 3.2 µm/80 grit
CE	……. in,	AlloyC4,	Ra < 3.2 µm/80 grit
DB	"L II",	316L,	Ra < 3.2 µm/80 grit
DE	"L II",	AlloyC4,	Ra < 3.2 µm/80 grit
IA	*2,		+ **"T"** (FTL50)
JB	……. mm,	316L	+ **"T"**
JE	……. mm,	AlloyC4	+ **"T"**
KB	……. in,	316L	+ **"T"**
KE	……. in,	AlloyC4	+ **"T"**
LB	"L II",	316L	+ **"T"**
LE	"L II",	AlloyC4	+ **"T"**
QA	*2,		+ **"p"** (FTL50)
RB	……. mm,	316L	+ **"p"**
RE	……. mm,	AlloyC4	+ **"p"**
SB	……. in,	316L	+ **"p"**
SE	……. in,	AlloyC4	+ **"p"**
TB	"L II",	316L	+ **"p"**
TE	"L II",	AlloyC4	+ **"p"**
YY	*2		

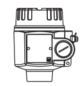


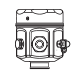
A	FEL50A,	PROFIBUS PA
1	FEL51,	19…253 V AC
2	FEL52,	10… 55 V DC, PNP
4	FEL54,	19…253 V AC, 19…55 V DC, DPDT
5	FEL55,	11… 36 V DC, 8/16 mA
6	FEL56,	NAMUR, L-H
7	FEL57,	PFM
8	FEL58,	NAMUR, H-L
9	*2	



E1	F27	NEMA6P,	NPT ¾	
E4	F16,	NEMA4X,	NPT ½	
E5	F13/17,	NEMA4X,	NPT ¾	
E6	F15,	NEMA4X,	NPT ½	
F1	F27,	IP68,	G ½	
F4	F16,	IP66,	G ½	
F5	F13/17,	IP66,	G ½	
F6	F15,	IP66,	G ½	
G1	F27,	IP68,	M20	
G4	F16,	IP66,	M20	
G5	F13/17,	IP66,	M20	
G6	F15,	IP66,	M20	
N4	F16,	IP66,	M12	
N5	F13/17,	IP66,	M12	
N6	F15,	IP66,	M12	
Y9	*[2]			


F16 (PBT)


F13/17 (Alu)
F27 (316L)


F15 (316L)

#3 Kompakt-Gehäuse / compact housing / boîtier compact / cabezal compacto / testa compatta / compacte behuizing → KA220

#7 Alu/sep. → KA163

A	*[1]
B	PVIS free
C	EN 10204 - 3.1, 316L
K	Spec. adjustment density H20
L	Spec. adjustment density H20, EN10204-3.1
N	EN 10204 - 3.1, NACE MR0175, 316L
P	100 bar (FTL51)
R	100 bar, EN 10204 - 3.1, NACE MR0175, 316L (FTL51)
S	GL/ABS marine certificate (FTL51: max. 1600 mm)
Y	*[2]

*[1] ohne / without / sans / sin / senza / zonder

*[2] andere / others / autres / otros / altri / andere

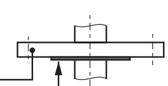
"L II" Schaltpunkt / Switchpoint / Point de commutation / Punto de conmutación / Punto di commutazione / Schakelpunt

Liquiphant II FTL 360/365, FDL 30/35

"T" Temperaturdistanzstück / Temperature spacer / Elément de refroidissement / Tramo disipador detemperatura / Distanziale per temperatura / Temperatuurreductiestuk

"p" Druckdichte Durchführung / Pressure sealed bushing / Entrée résistant à la pression / Extensión resistente a la presión / Passacavo a tenutadi pressione / Gasdichte doorvoering

DE- Flansche
EN- Flanges
FR - Brides
ES - Brida
IT - Flangia
NL- Flens



ANSI B 16.5

AA2	1¼",	150 lbs, RF, 316/316L
AB2	1¼",	300 lbs, RF, 316/316L (FTL51)
AC2	1½",	150 lbs, RF, 316/316L
AD2	1½",	300 lbs, RF, 316/316L (FTL51)
AE2	2",	150 lbs, RF, 316/316L
AE5	2",	150 lbs, RF, AlloyC4 >316/316L
AE6	2",	300 lbs, RF, Alloy C22 >316/316L
AF2	2",	300 lbs, RF, 316/316L
AG2	2",	600 lbs, RF, 316/316L (FTL51)
AJ2	2½",	300 lbs, RF, 316/316L (FTL51)
AL2	3",	150 lbs, RF, 316/316L
AM2	3",	300 lbs, RF, 316/316L (FTL51)
AN2	3",	600 lbs, RF, 316/316L (FTL51)
AP2	4",	150 lbs, RF, 316/316L
AQ2	4",	300 lbs, RF, 316/316L (FTL51)
AR2	4",	600 lbs, RF, 316/316L (FTL51)
A82	1",	150 lbs, RF, 316/316L

EN 1092-1

BA2	DN32,	PN6 A,	316L
BB2	DN32,	PN25/40 A,	316L
BC2	DN40,	PN6 A,	316L
BD2	DN40,	PN25/40 A,	316L
BE2	DN50,	PN6 A,	316L
BG2	DN50,	PN25/40 A,	316L
BH2	DN65,	PN6 A,	316L
BJ2	DN50,	PN100 A,	316L (FTL51)
BK2	DN65,	PN25/40 A,	316L
BM2	DN80,	PN10/16 A,	316L
BN2	DN80,	PN25/40 A,	316L
BQ2	DN100,	PN10/16 A,	316L
BR2	DN100,	PN25/40 A,	316L

B12	DN80,	PN100 A,	316L (FTL51)
B82	DN25,	PN25/40 A,	316L
CA2	DN32,	PN6 B1,	316L
CA5	DN32,	PN6,	AlloyC4 >316L
CA6	DN32,	PN6,	AlloyC22 >316L
CE2	DN50,	PN6 B1,	316L
CE5	DN50,	PN6,	AlloyC4 >316L
CE6	DN50,	PN6,	AlloyC22 >316L
CG2	DN50,	PN25/40 B1,	316L
CG5	DN50,	PN25/40,	AlloyC4 >316L
CG6	DN50,	PN25/40,	AlloyC22 >316L
CJ2	DN50,	PN100 B2,	316L (FTL51)
CN2	DN80,	PN25/40 B1,	316L
CN5	DN80,	PN25/40,	AlloyC4 >316L
CN6	DN80,	PN25/40,	AlloyC22 >316L
CQ2	DN100,	PN10/16 B1,	316L
CQ5	DN100,	PN10/16,	AlloyC4 >316L
CQ6	DN100,	PN10/16,	AlloyC22 >316L
C12	DN80,	PN100 B2,	316L (FTL51)
C82	DN25,	PN25/40 B1,	316L
C85	DN25,	PN25/40,	AlloyC4 >316L
C86	DN25,	PN25/40,	AlloyC22 >316L
DG2	DN50,	PN40 B1,	316L
DN2	DN80,	PN40 B1,	316L
D82	DN25,	PN40 B1,	316L
FG2	DN50,	PN40 C,	316L
NG2	DN50,	PN40 D,	316L

JIS B2220

KA2	10K 25,	RF,	316L
KC2	10K 40,	RF,	316L
KE2	10K 50,	RF,	316L
KE5	10K 50,	RF,	AlloyC4 >316L
KE6	10K 50,	RF,	AlloyC22 >316L
KL2	10K 80,	RF,	316L
KP2	10K 100,	RF,	316L

DE- Verwendung
Grenzstanddetektion in Flüssigkeiten

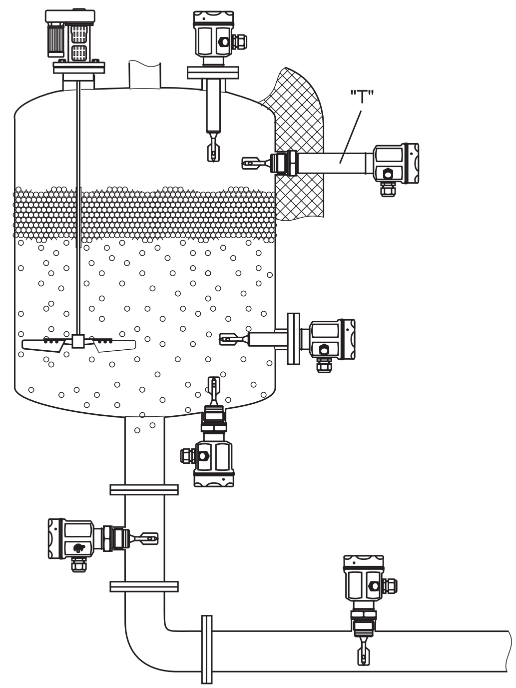
EN- Application
Point level detection in fluids

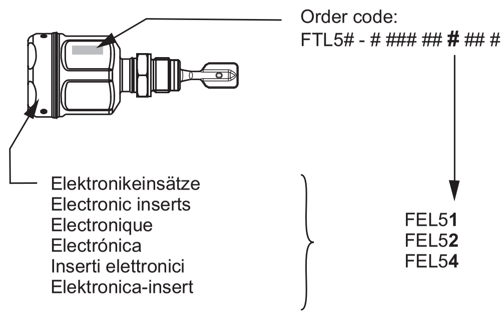
FR - Utilisation
Détection de niveau dans les liquids

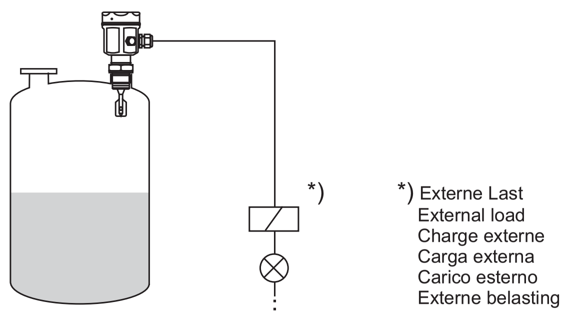
ES - Aplicación
Detección de nivel en líquidos agua

IT - Applicazione
Controllo livello nei liquidi

NL- Toepassing
Niveaudetectie in vloeistoffen







DE- Messeinrichtung
für direkten Anschluss

EN- Measuring system
for direct connection

FR - Ensemble de détection de niveau
pour raccordement direct

ES - Sistema de medida
para conexión directa

IT - Sistema di misura
per connessione diretta

NL- Meetopstelling
voor directe aansluiting

DE- Messeinrichtung
für Anschluss über Schaltgerät

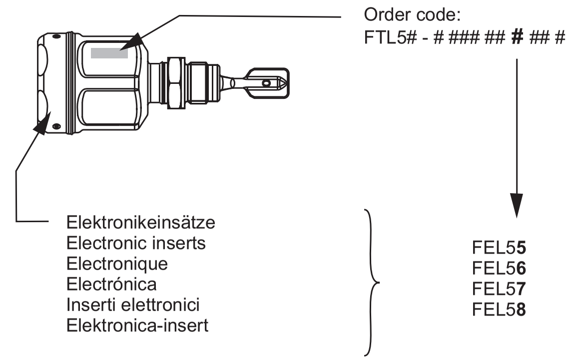
EN- Measuring system
for connection via switching unit

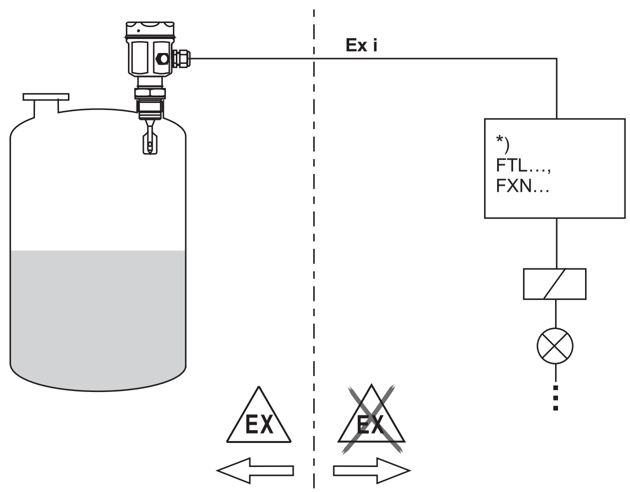
FR - Ensemble de détection de niveau
pour raccordement via détecteur

ES - Sistema de medida
para conexión vía interruptores

IT - Sistema di misura
per connessione mediante unità di commutazione

NL- Meetopstelling
voor aansluiting aan een schakelversterker





*) Schaltgerät, SPS, Trennverstärker
Switching unit, PLC, isolating amplifier
Détecteur, API, convertisseur/ séparateur
Interruptor, PLC, amplificador aislado
Unità di commutazione, PLC, barriera di separazione
Schakelversterker, PLC, scheidingsversterker

DE- Messeinrichtung
für Anschluss an PROFIBUS PA

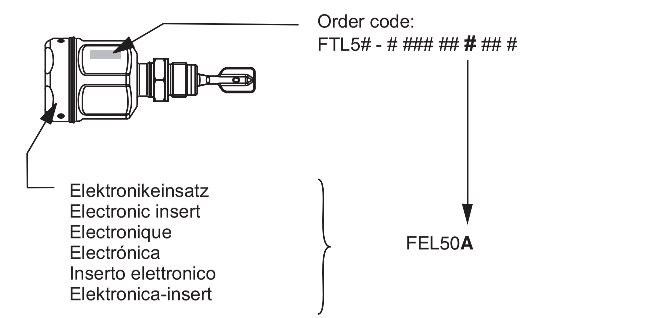
EN- Measuring system
for connection to PROFIBUS PA

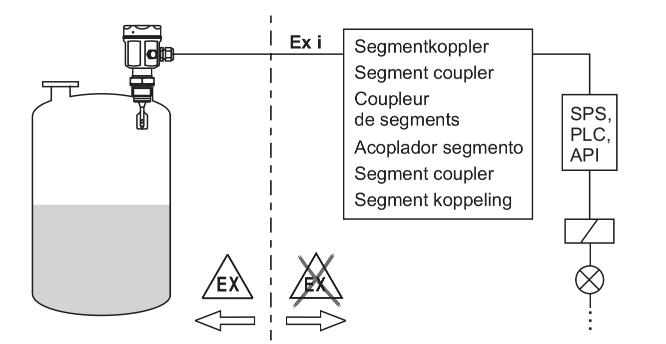
FR - Ensemble de détection de niveau
pour le raccordement à PROFIBUS PA

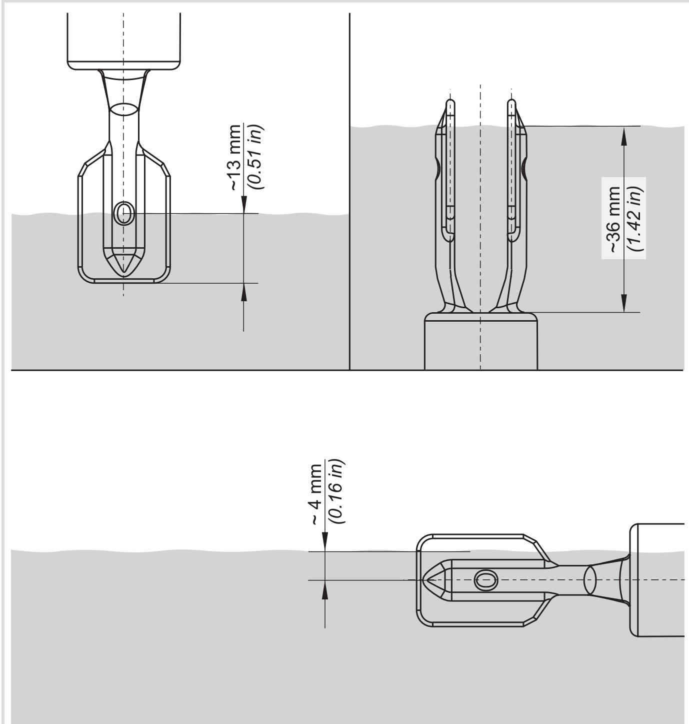
ES - Sistema de medida
para conexión a PROFIBUS PA

IT - Sistema di misura
per connessione a PROFIBUS PA

NL- Meetopstelling
voor aansluiting aan PROFIBUS PA







DE- Einbau
Schaltpunkt in Abhängigkeit vom Einbau

EN- Installation
Switchpoint depends on mounting position

FR - Montage
Point de commutation en fonction de l'implantation

ES - Montaje
Punto de conmutación dependiendo de la posición de montaje

IT - Montaggio
Punto di commutazione in funzione della posizione di montaggio

NL- Inbouw
Schakelpunt afhankelijk van inbouw

DE- Einbaubeispiele
in Abhängigkeit von der
Viskosität ν der Flüssigkeit

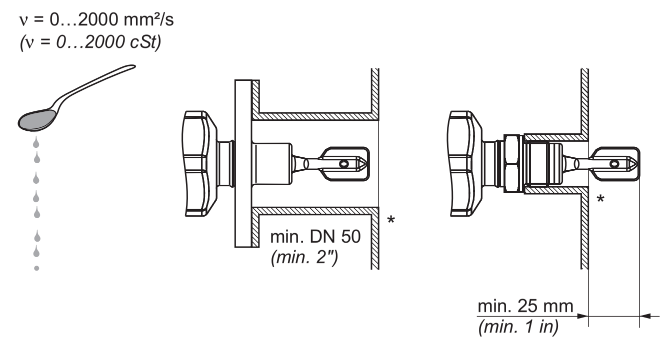
EN- Mounting examples
as a function of liquid viscosity ν

FR - Exemples d'implantation
dépendant de la viscosité ν
du liquide

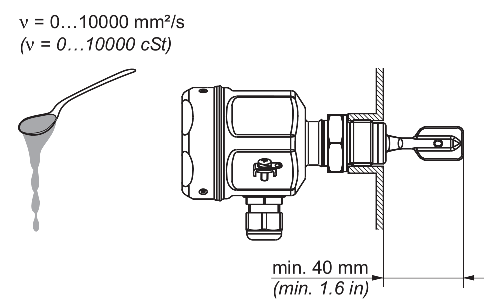
ES - Ejemplos de montaje
dependiendo de la viscosidad ν
del líquido

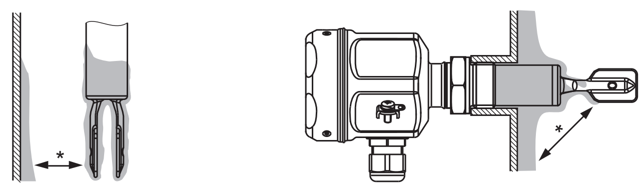
IT - Esempi di montaggio
come funzione di viscosità ν
del liquido

NL- Inbouwvoorbeelden
afhankelijk van de viscositeit ν
van de vloeistof

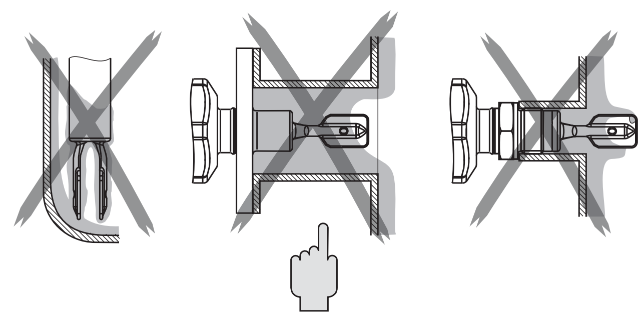


* entgraten / deburr / ébarber / libre / sbavare / ontbramen





* Abstand! / Distance! / Distance! / ¡Distancia! / Distanza! / Afstand!



DE- Ansatzbildung berücksichtigen.
Schwinggabel darf Ansatz nicht berühren.

EN- Consider build-up.
Fork may not contact the build-up.

FR - Tenir compte du colmatage.
Fourche ne doit pas entrer en contact avec le dépôt.

ES - Tener en cuenta las adherencias.
Las horquillas no deben estar en contacto con las adherencias.

IT - Tenere conto dei depositi.
La forcella non deve entrare in contatto con i depositi.

NL- Rekening houden met aangroei.
Trilvork mag de aangroei niet aanraken.

DE– Bei dynamischer Belastung abstützen

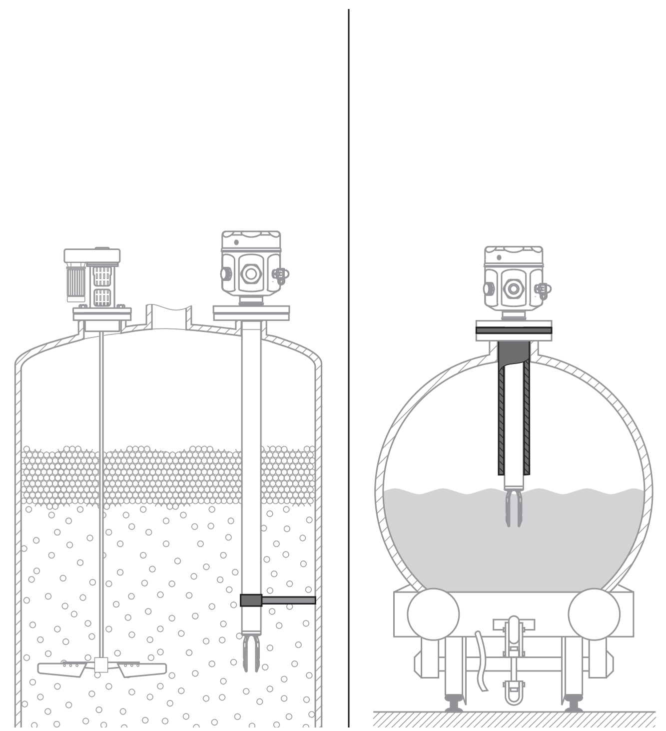
EN– In cases of dynamic forces support

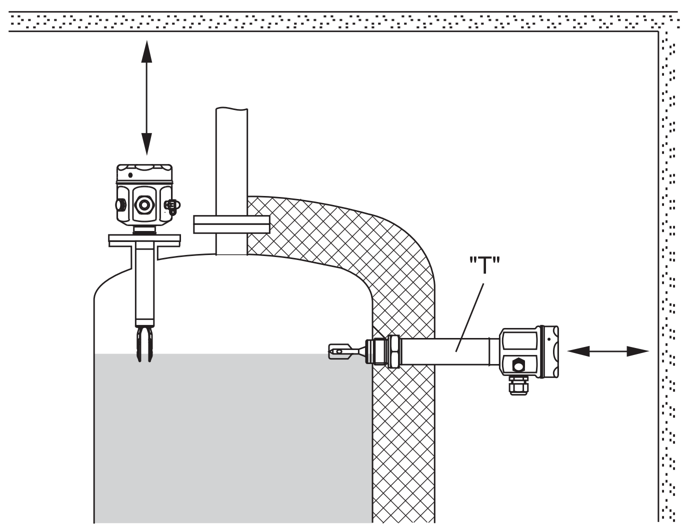
FR – En cas de contraintes dynamiques, étayer le tube

ES – En caso de cargas dinámicas altas debe ser apoyado

IT – In caso di carichi dinamici, rinforzare con un supporto meccanico

NL– Bij mechanische belasting verstevigen





DE– Freiraum vorsehen

EN– Allow clearance

FR – Prévoir un espace libre

ES – Prever espacio

IT – Lasciare spazio per estrazione

NL– Ruimte vrijhouden

DE– Schwinggabel ausrichten:
Markierung oben oder unten

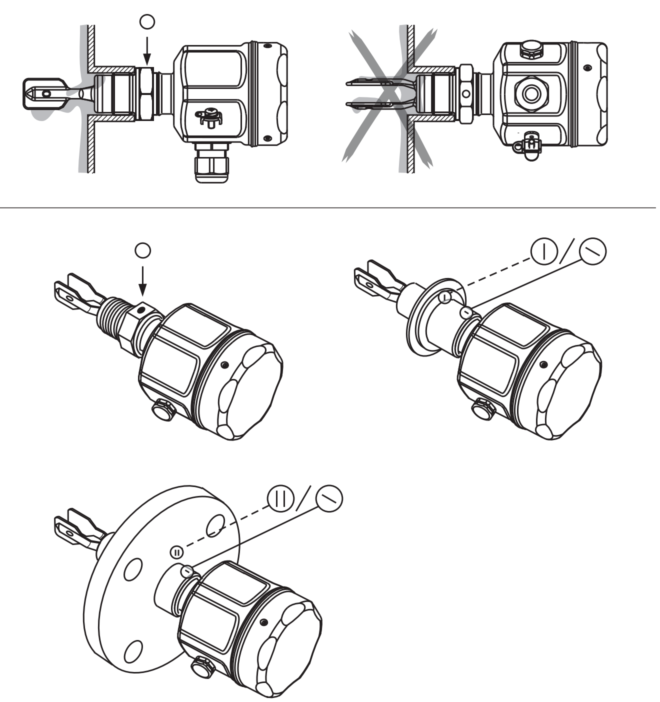
EN– Orientation of fork tines:
Marking above or below

FR – Orientation des lames vibrantes:
Repères en haut ou en bas

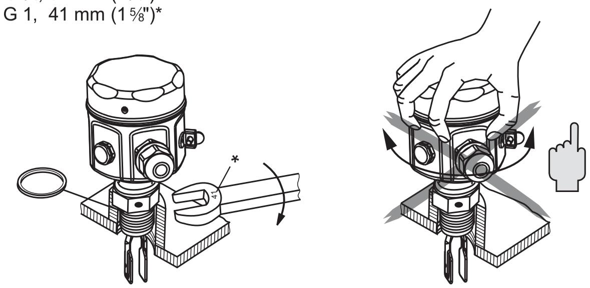
ES – Orientación de la horquilla:
Marca arriba o abajo

IT – Allineamento della forcella:
Marcatura in alto o in basso

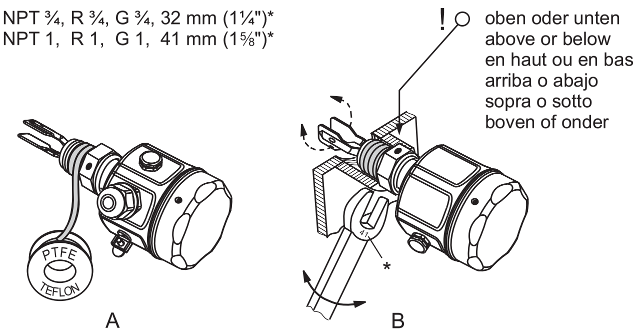
NL– Vork uitrichten:
Markering boven of onder



G ¾, 32 mm (1¼")*
G 1, 41 mm (1⅝")*



NPT ¾, R ¾, G ¾, 32 mm (1¼")*
NPT 1, R 1, G 1, 41 mm (1⅝")*



DE– Liquiphant einschrauben.
Nicht am Gehäuse drehen.

EN– Screw Liquiphant into process connection.
Don't use housing to turn.

FR – Visser le Liquiphant.
Ne pas se servir du boîtier.

ES – Roscar el Liquiphant a la conexión a proceso.
No girar el cabezal.

IT – Avvitare il Liquiphant all'attacco di processo.
Allo scopo **non** utilizzare la custodia.

NL– Schroef de Liquiphant in de procesaansluiting.
Draai hierbij **niet** aan de behuizing.

DE- Ausrichten in Rohrleitungen:
Markierung in Fließrichtung

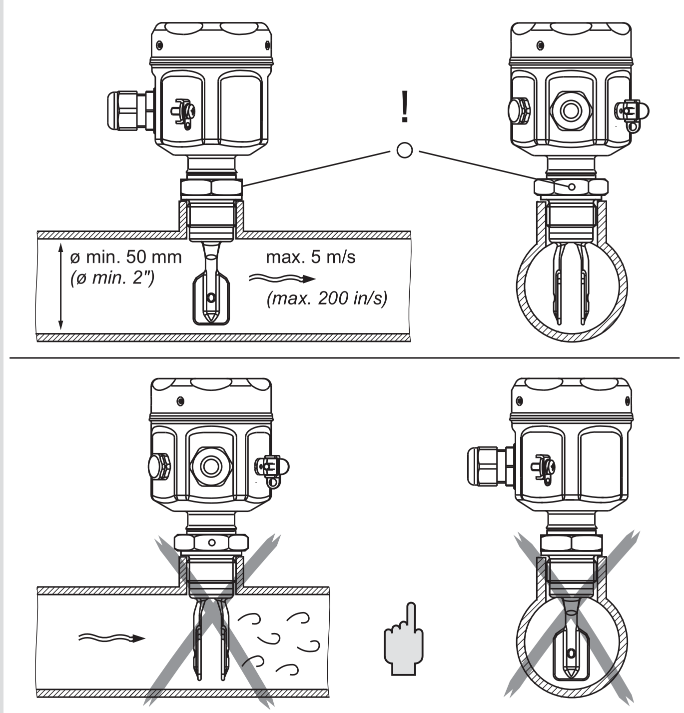
EN- Orientation in pipes:
Marking in direction of flow

FR - Orientation dans une conduite:
Repère dans le sens de l'écoulement

ES - Montaje y orientación dentro de tuberías:
Marca en dirección del caudal

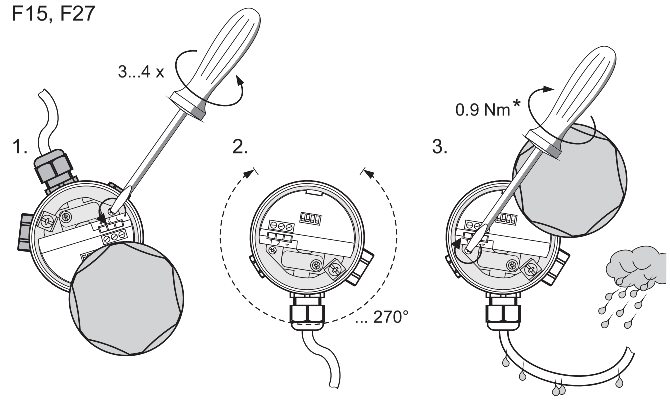
IT - Allineamento per montaggio in tubazioni:
Marcatura nella direzione del flusso

NL- Opstelling in leidingen:
Markering in de stroomrichting

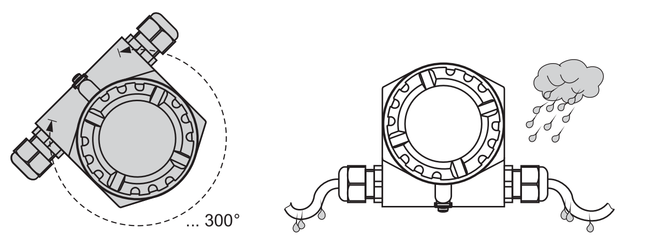


DE– Kabeleinführung ausrichten
EN– Cable gland orientation
FR – Positionnement de l'entrée de câble
ES – Ajuste del prensaestopa
IT – Posizionamento del passacavo
NL– Kabelinvoer uitrichten

F15, F27



F16, F13, F17



* Anzugsdrehmoment /
Torque /
Couple de serrage /
Esfuerzo de torsión /
Coppia di torsione /
Aandraaimoment

DE- Einstellungen
Minimum-/Maximum-
Sicherheitsschaltung

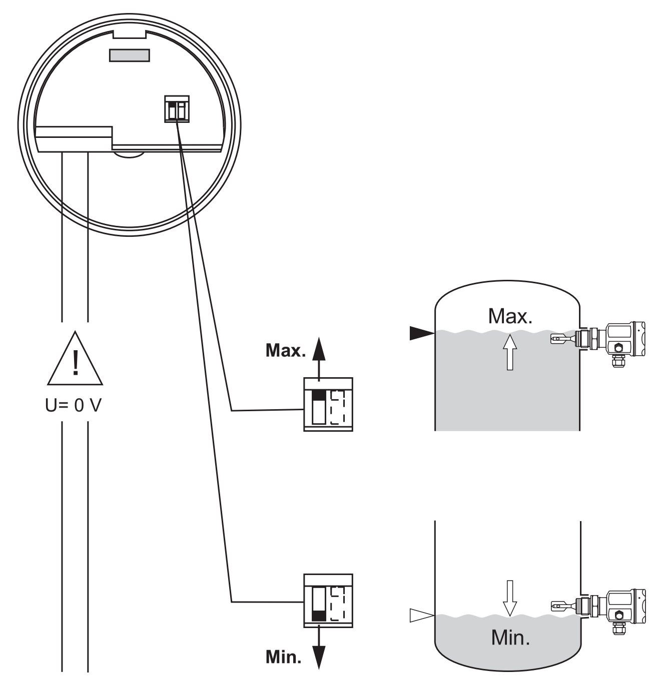
EN- Setting-up
Minimum/maximum
fail-safe mode

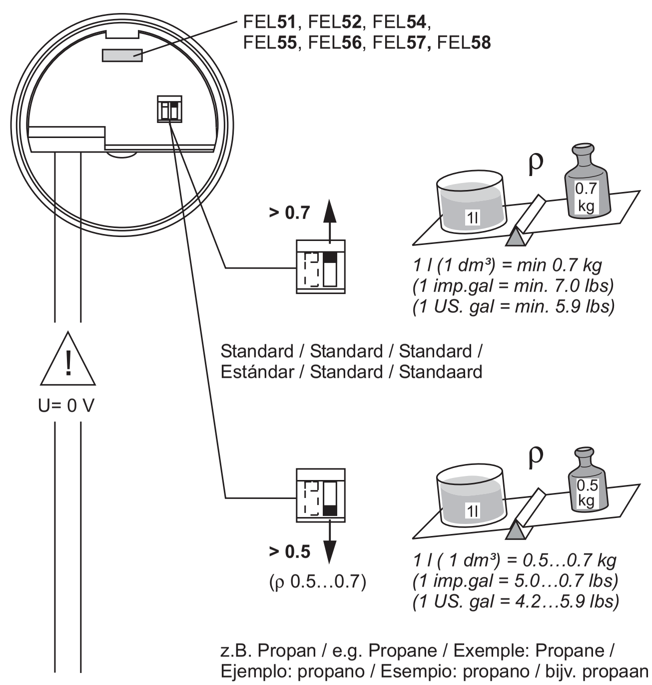
FR - Réglage
Sécurité minimum/maximum

ES - Ajuste
Conmutador de seguridad
mín./máx.

IT - Messa in servizio
Selezione della modalità
di sicurezza min./max.

NL- Instellingen
Minimum/maximum
veiligheidsschakeling





DE- Dichte der Flüssigkeit.
Dichte ρ gemessen in g/cm^3 oder in kg/l.

EN- Liquid density.
Density ρ measured in g/cm^3 or in kg/l.

FR - Densité du liquide.
Unité de mesure de la densité ρ : g/cm^3 ou kg/l.

ES - Densidad de líquidos.
Densidad ρ medida en g/cm^3 o en kg/l.

IT - Densità del liquido.
Densità ρ misurata in g/cm^3 o in kg/l.

NL- Dichtheid van de vloeistof.
Dichtheid ρ gemeten in g/cm^3 of in kg/l.

DE- Selbsttest FEL57
(Funktion siehe Seite 46, 47 und Schaltgerät)

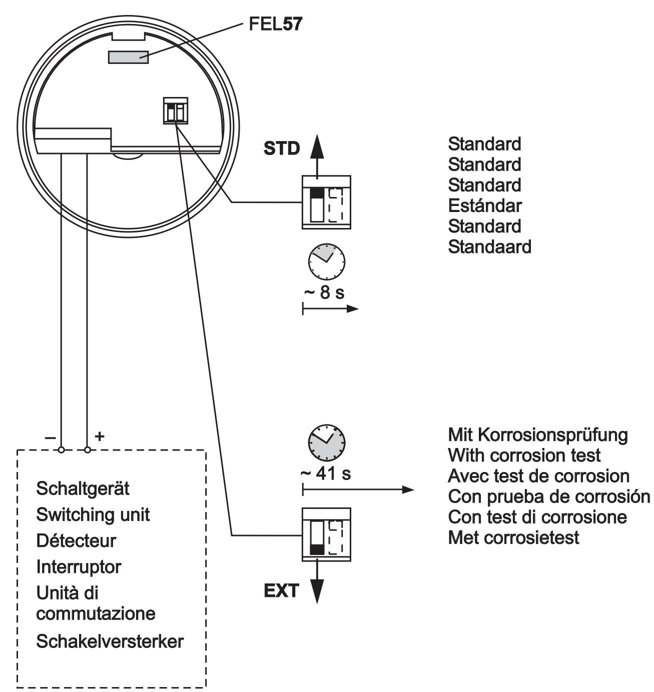
EN- Selftest FEL57
(see page 46, 47 and switching unit for sequence)

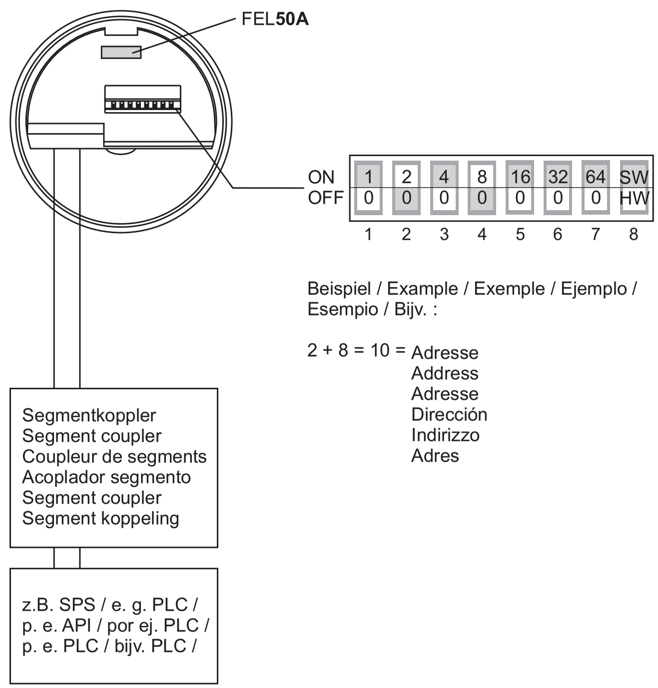
FR - Auto-test FEL57
(voir pages 46, 47 et détecteur)

ES - Prueba automática FEL57
(ver pág. 46, 47 e interruptor para secuencia)

IT - Prova automatica FEL57
(vds. pag. 46, 47 e unità di commutazione)

NL- Functietest FEL57
(zie voor functie pag 46, 47 en schakelversterker)





DE- Geräteadresse einstellen (Einstellung der Parameter siehe BA141F)

EN- Setting Device Address (Setting the parameters, see BA141F)

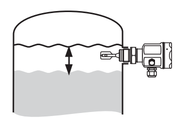
FR - Réglage de l'adresse d'appareil (Réglage des paramètres voir BA141F)

ES - Configuración de la dirección del equipo (Ver configuración parámetros en BA141F)

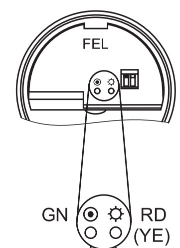
IT - Impostare indirizzo del dispositivo (Per impostazione parametri vds. BA141F)

NL- Instrumentadres instellen (Parameter instelling zie BA141F)

DE- Lichtsignale
EN- Light signals
FR - Signaux lumineux
ES - Señales luminosas
IT - Segnali luminosi
NL- Lichtsignalen



Füllstand variieren
Vary level
Varier le niveau
Nivel variable
Variare livello
Niveau variëren



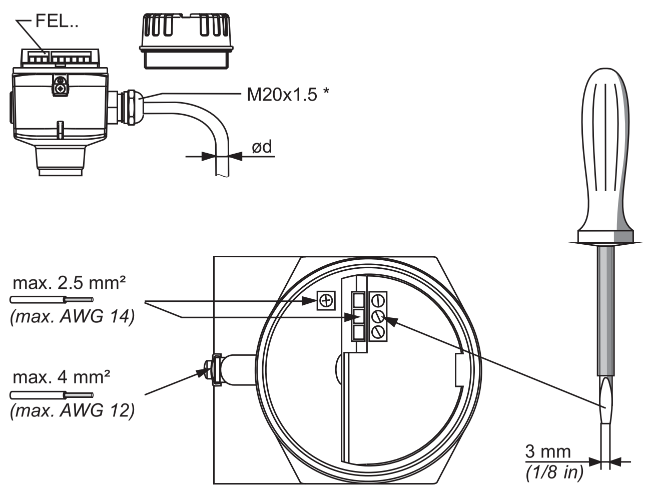
Leuchtdioden / LEDs / DEL / LEDs / LED / LED's

- Betrieb / Stand-by / Fonctionnement / Reposo / Attesa / stand-by
- Schaltzustand / Switching status / Etat de commutation / Estado conexión / Stato di commutazione / schakelstand
- FEL57, FEL50A: Bedeckung / Covering / Recouvrement / Cubierto / Copertura / bedekking

- leuchtet / on / allumée / iluminado / on / aan
- blinkt / flashes / clignote / parpadea / lampeggia / knippert
- aus / off / éteinte / apagado / off / uit
- Ausgangssignal / Output signal / Signal de sortie / Señal de salida / Segnale uscita / uitgangssignaal
- Störung / Fault / Défaut / Fallo / Guasto / storing

DE- Anschluss
EN- Connections
FR - Raccordement
ES - Conexiones
IT - Collegamenti elettrici
NL- Aansluiting

Nationale Normen und Vorschriften beachten!
Note national regulations!
Respecter les lois et règles locales en vigueur!
Considere reglamentaciones nacionales
Osservare le norme nazionali!
Nationale voorschriften in acht nemen!



***Cable entry**
Nickel-plated brass:
Ød = 7...10,5 mm (0,28...0,41 in)
Plastic:
Ød = 5...10 mm (0,2...0,38 in)
Stainless steel:
Ød = 7...12 mm (0,28...0,47 in)

DE- Anschluss FEL51
Zweileiter-
Wechselstromanschluss

EN- Connections FEL51
Two-wire AC connection

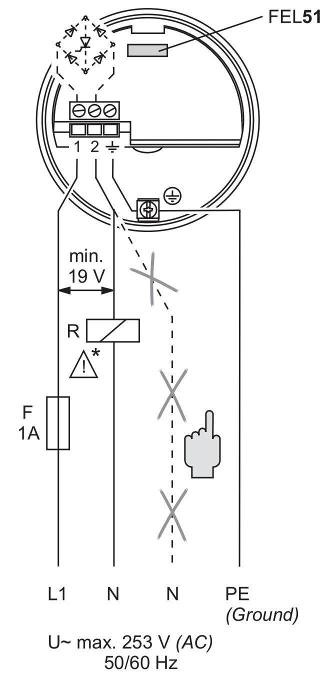
FR - Raccordement FEL51
Raccordement 2 fils
courant alternatif

ES - Conexiones FEL51
Conexión a corriente alterna
a dos hilos

IT - Collegamenti elettrici FEL51
Collegamento bifilare
con corrente alternata

NL- Aansluiting FEL51
2- draads
wisselspanningsaansluiting

Zerstörung
Destruction
Destruction
Destrucción
Distruzione
Storing



⚠* Externe Last R **muss** angeschlossen werden

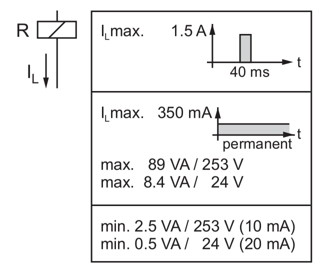
External load R **must** be connected

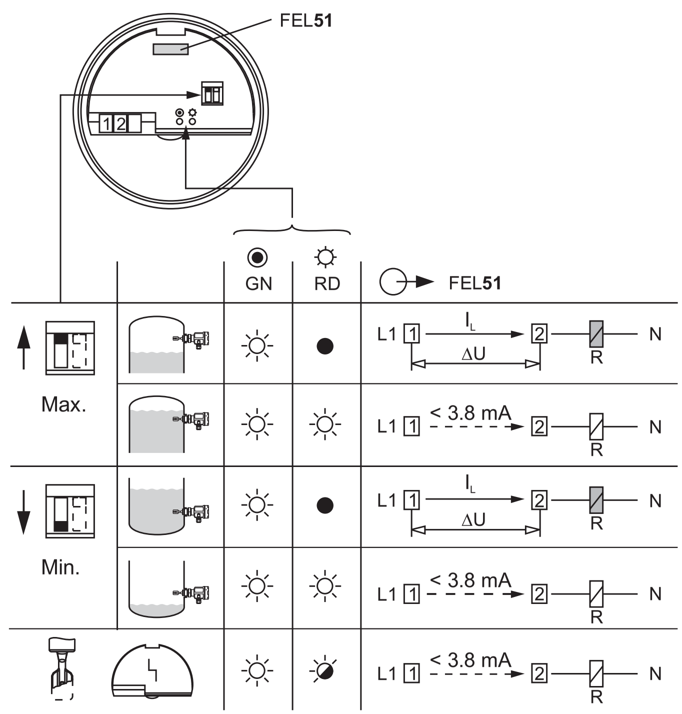
Charge externe R **doit** être raccordée

La carga externa R **debe** estar conectada

Il carico esterno R **deve** essere connesso

Externe belasting R **moet** aangesloten worden





DE- Funktion FEL51
EN- Function FEL51
FR - Fonction FEL51
ES - Funcionamiento FEL51
IT - Funzione FEL51
NL- Functie FEL51

ΔU_{FEL51} max. 12 V

DE- Anschluss FEL52
Gleichstromanschluss (PNP)

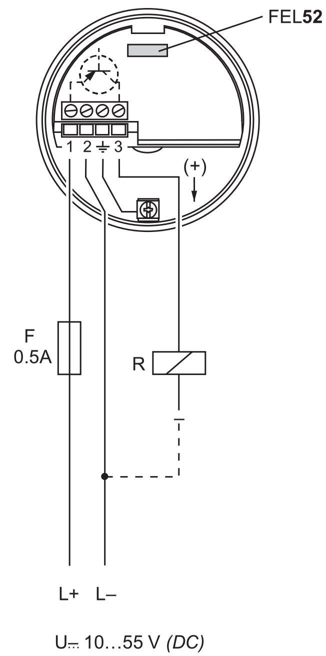
EN- Connections FEL52
DC connection (PNP)

FR - Raccordement FEL52
Courant continu (PNP)

ES - Conexiones FEL52
Alimentación CC (PNP)

IT - Collegamenti elettrici FEL52
Collegamento CC (PNP)

NL- Aansluiting FEL52
Gelijkspanningsaansluiting (PNP)



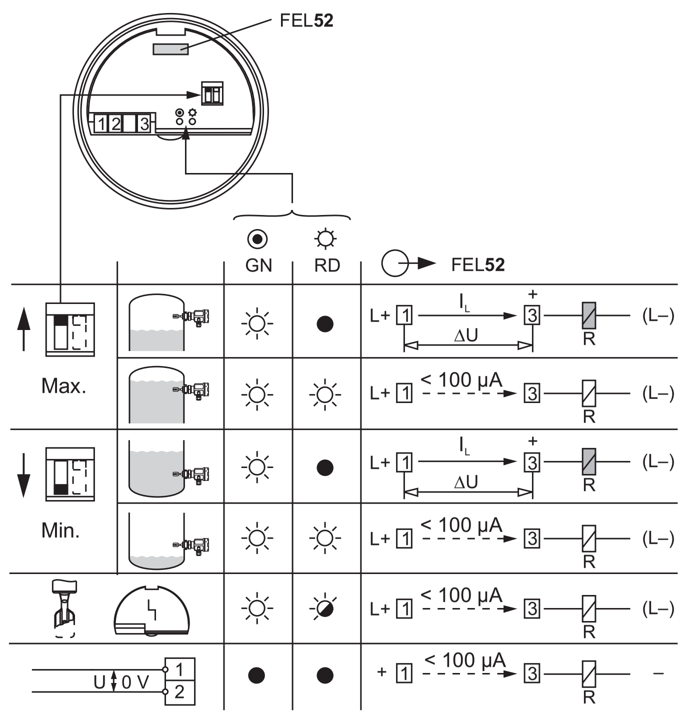
auch für DI-Module
also for DI modules
également pour des modules DI
también para módulos DI
anche per DI modules
aan de DI-module

EN 61131-2

R = externe Last
external load
charge externe
carga exterior
carico esterno
externe belasting

Imax. 350 mA
Umax. 55 V

DE- Funktion FEL52
EN- Function FEL52
FR - Fonction FEL52
ES - Funcionamiento FEL52
IT - Funzione FEL52
NL- Functie FEL52



ΔU_{FEL52} max. 3 V

DE- Anschluss FEL54
Allstromanschluss
Relaisausgang

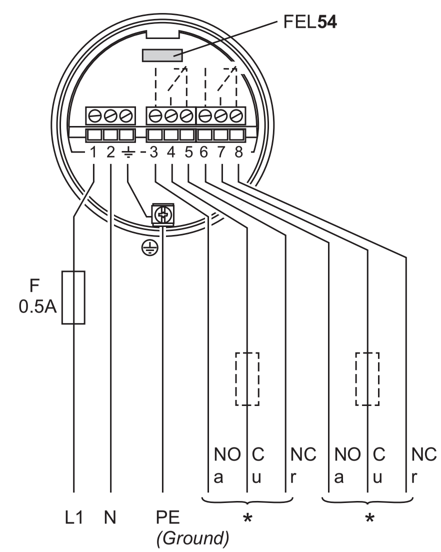
EN- Connections FEL54
Universal connection
Relay output

FR - Raccordement FEL54
Tous courants
Sorties relais

ES - Conexiones FEL54
Conexión universal
Salida por relé

IT - Collegamenti elettrici FEL54
Collegamento corrente universale
Uscita relè

NL- Aansluiting FEL54
Universele spanningsaansluiting
Relaisuitgang

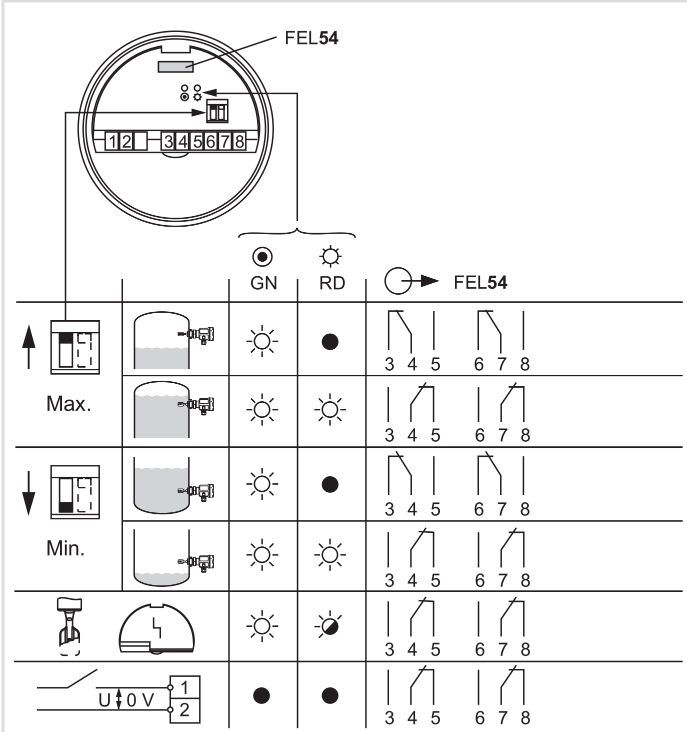


U~ 19…253 V *(AC)*

L+ L–
U⎓ 19… 55 V *(DC)*

* U~ max. 253 V, I~ max. 6 A
P~ max. 1500 VA, cos φ = 1
P~ max. 750 VA, cos φ > 0.7
I⎓ max. 6 A, U⎓ < 30 V
I⎓ max. 0.2 A, U⎓ < 125 V

DE- Funktion FEL54
EN- Function FEL54
FR - Fonction FEL54
ES - Funcionamiento FEL54
IT - Funzione FEL54
NL- Functie FEL54



DE- Anschluss FEL55
Ausgang 8/16 mA
* In nasser Umgebung.

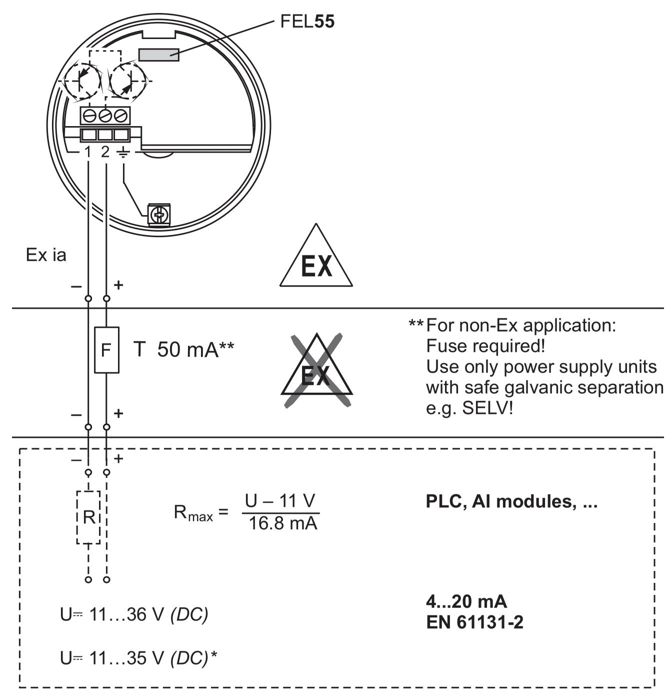
EN- Connections FEL55
Output 8/16 mA
* Wet location.

FR - Raccordement FEL55
Sortie 8/16 mA
* Dans les environnements humides.

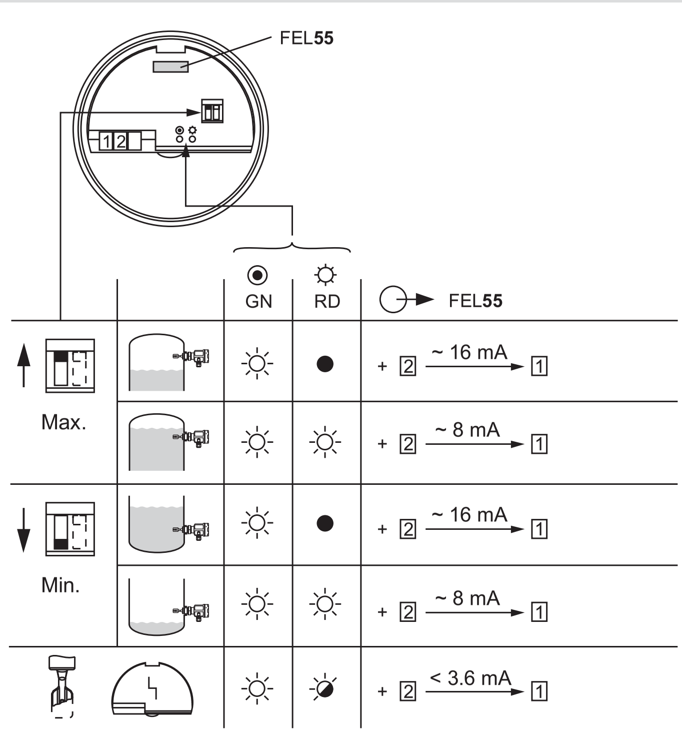
ES - Conexiones FEL55
Salida 8/16 mA
* En ambientes húmedos.

IT - Collegamenti elettrici FEL55
Uscita 8/16 mA
* In ambienti umidi.

NL- Aansluiting FEL55
Uitgang 8/16 mA
* In vochtige omgevingen.



DE- Funktion FEL55
EN- Function FEL55
FR - Fonction FEL55
ES - Funcionamiento FEL55
IT - Funzione FEL55
NL- Functie FEL55



DE- Anschluss FEL56
NAMUR- Ausgang L-H
< 1,0 mA / > 2,2 mA

EN- Connections FEL56
NAMUR output L-H
< 1,0 mA / > 2,2 mA

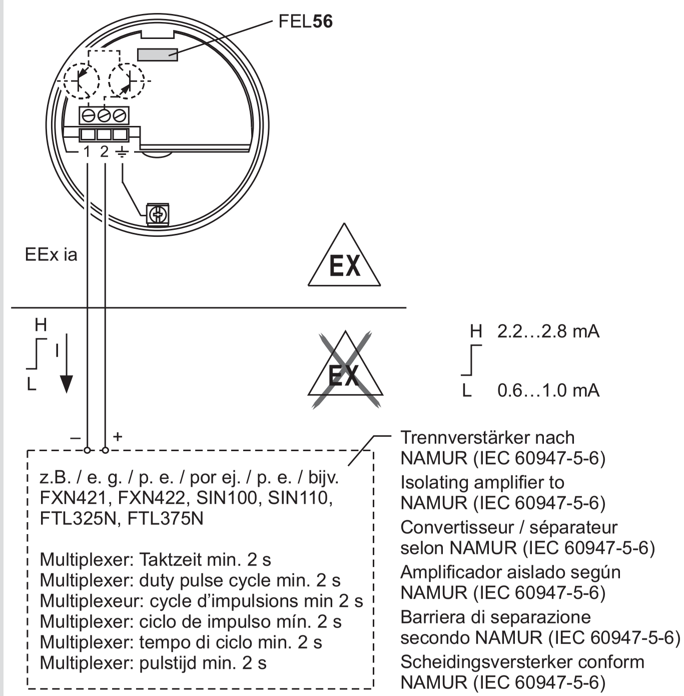
FR - Raccordement FEL56
Sortie NAMUR L-H
< 1,0 mA / > 2,2 mA

ES - Conexiones FEL56
Salida NAMUR L-H
< 1,0 mA / > 2,2 mA

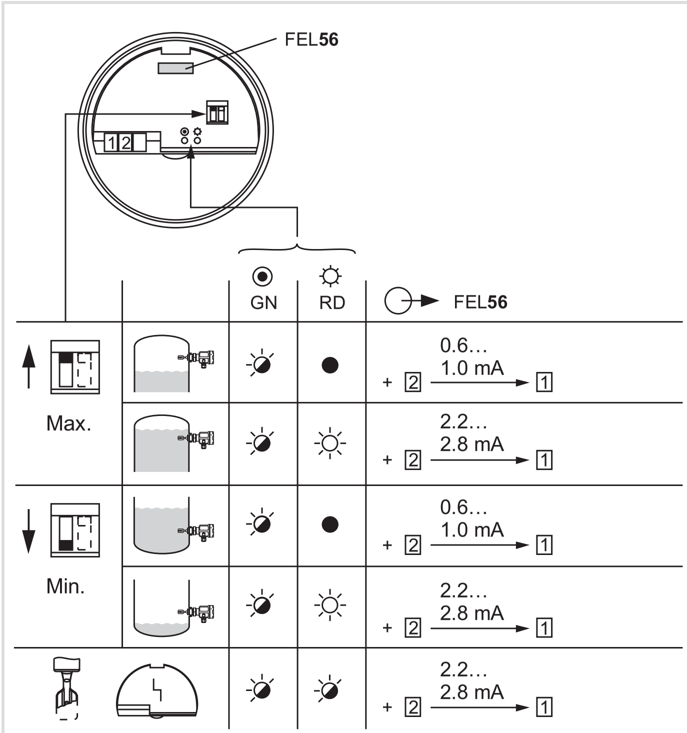
IT - Collegamenti elettrici FEL56
NAMUR uscita L-H
< 1,0 mA / > 2,2 mA

NL- Aansluiting FEL56
NAMUR uitgang L-H
< 1,0 mA / > 2,2 mA

Power supply
DC: 8.2 V +/- 20%



DE- Funktion FEL56
EN- Function FEL56
FR - Fonction FEL56
ES - Funcionamiento FEL56
IT - Funzione FEL56
NL- Functie FEL56



DE- Anschluss FEL57
Ausgang PFM
150 Hz / 50 Hz

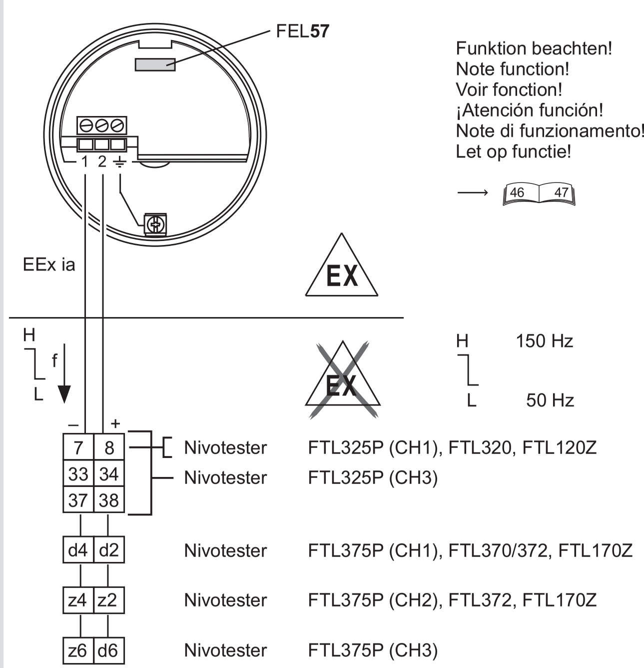
EN- ConnectionsFEL 57
PFM output
150 Hz / 50 Hz

FR - Raccordement FEL57
Sortie PFM
150 Hz / 50 Hz

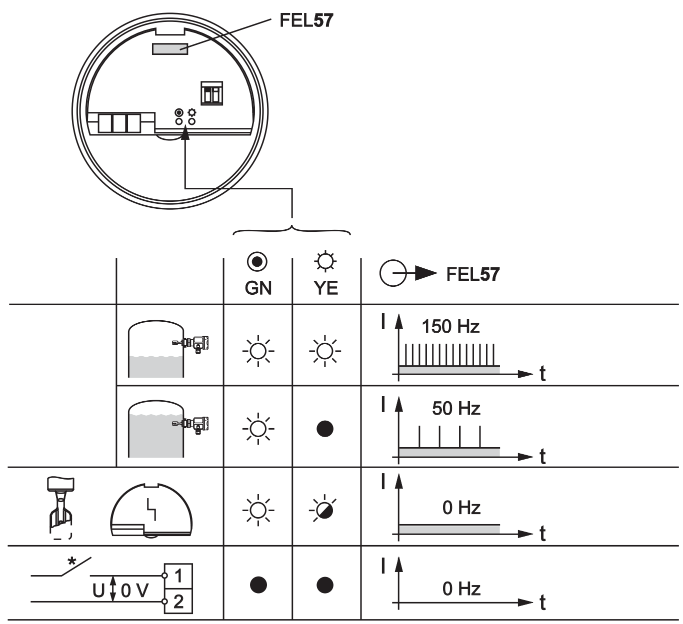
ES - Conexiones FEL57
Salida PFM
150 Hz / 50 Hz

IT - Collegamenti elettrici FEL57
PFM uscita
150 Hz / 50 Hz

NL- Aansluiting FEL57
PFM uitgang
150 Hz / 50 Hz



DE- Funktion FEL57
EN- Function FEL57
FR - Fonction FEL57
ES - Funcionamiento FEL57
IT - Funzione FEL57
NL- Functie FEL57



* Einschaltverhalten / Switch-on behaviour /
Comportement à la mise sous tension / Comportamiento del cambio de estado /
Comportamento accensione / Inschakelgedrag

DE- Einschaltverhalten
Selbsttest (STD)

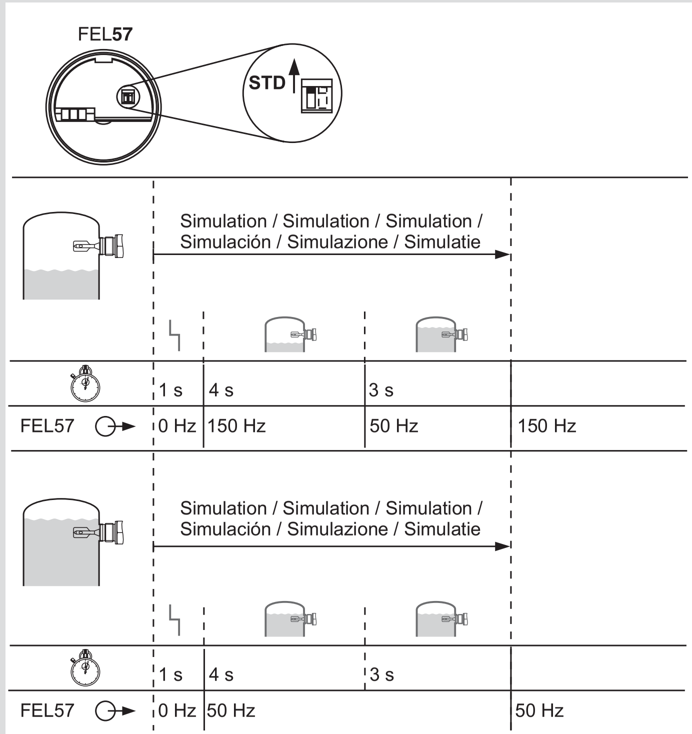
EN- Switch-on behaviour
Selftest (STD)

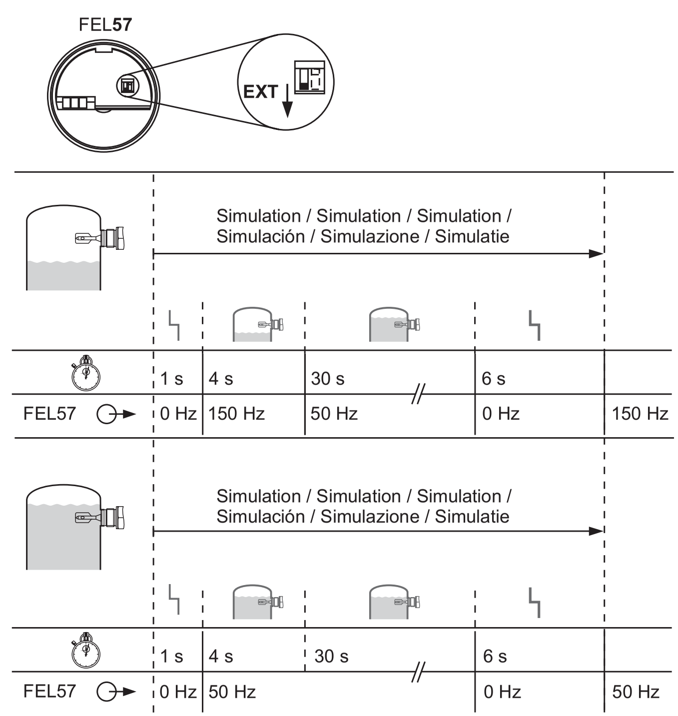
FR - Comportement à la mise sous tension
Auto-test (STD)

ES - Comportamiento del cambio de e stado
Prueba automática (STD)

IT - Comportamento in fase di accensione
Prova automatica (STD)

NL- Inschakelgedrag
Functietest (STD)





DE- Einschaltverhalten
Selbsttest (EXT)

EN- Switch-on behaviour
Selftest (EXT)

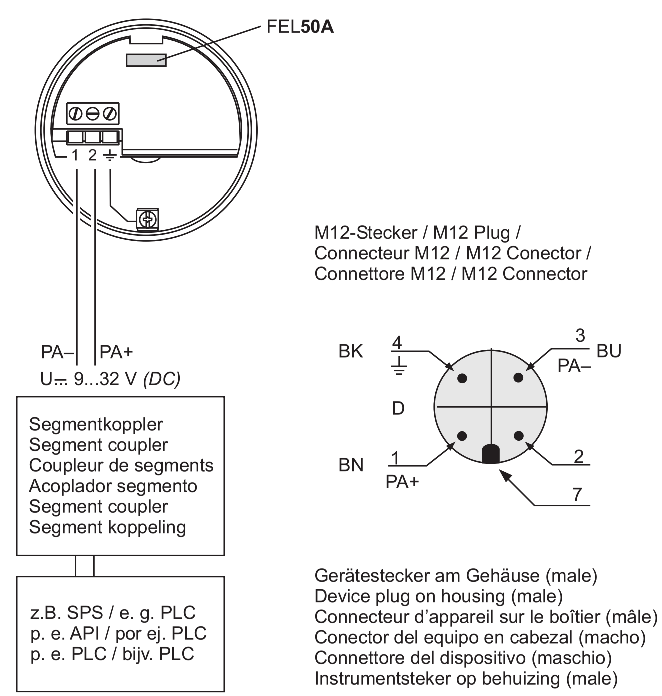
FR - Comportement à la mise sous tension
Auto-test (EXT)

ES - Comportamiento del cambio de e stado
Prueba automática (EXT)

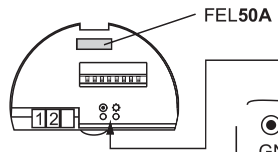
IT - Comportamento in fase di accensione
Prova automatica (EXT)

NL- Inschakelgedrag
Functietest (EXT)

DE- Anschluss FEL50A
EN- Connections FEL50A
FR - Raccordement FEL50A
ES - Conexiones FEL50A
IT - Collegamenti elettrici FEL50A
NL- Aansluiting FEL50A



DE- Funktion FEL50A
EN- Function FEL50A
FR - Fonction FEL50A
ES - Funcionamiento FEL50A
IT - Funzione FEL50A
NL- Functie FEL50A



		GN	YE	FEL50A PA-Bussignal / PA Bus Signal / Signal bus PA / Señal Bus PA / Segnale bus PA / PA bussignaal
nicht invertiert not inverted non inversé no invertido non invertito niet geïnverteerd		☼	●	OUT_D = 0
		☼	☼	OUT_D = 1
invertiert inverted inversé invertido invertito geïnverteerd		☼	☼	OUT_D = 0
		☼	●	OUT_D = 1
↔ SPS Commuwin II		◐	–	Kommunikation/ Communication/ Communication / Comunicación / Comunicazione / Communicatie
		–	◐	Status siehe BA141F Status, see BA141F Etat, voir BA141F Estado, ver BA141F Stato, vedere BA141F Status, zie BA141F
U ↕ 0 V 1 2		●	●	../..

DE- Anschluss FEL58
NAMUR- Ausgang H-L
> 2,2 mA / < 1,0 mA

EN- Connections FEL58
NAMUR output H-L
> 2,2 mA / < 1,0 mA

FR - Raccordement FEL58
Sortie NAMUR H-L
> 2,2 mA / < 1,0 mA

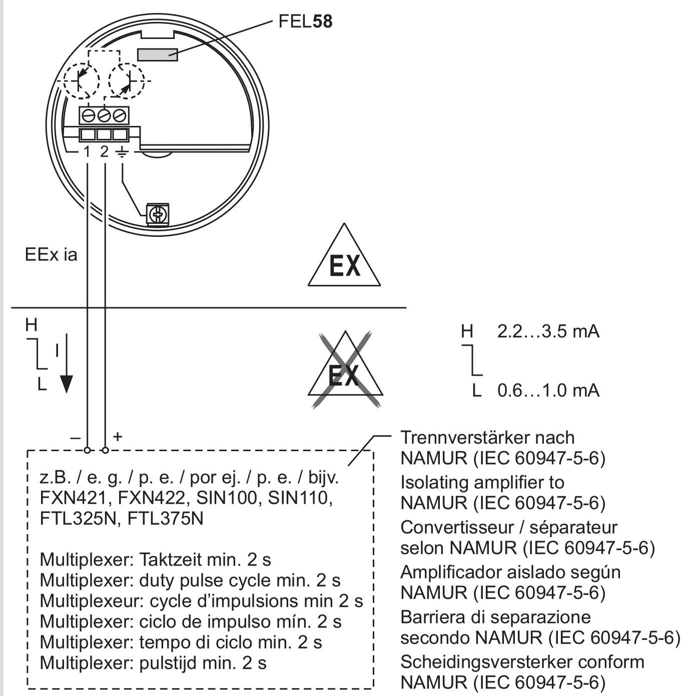
ES - Conexiones FEL58
Salida NAMUR H-L
> 2,2 mA / < 1,0 mA

IT - Collegamenti elettrici FEL58
NAMUR uscita H-L
> 2,2 mA / < 1,0 mA

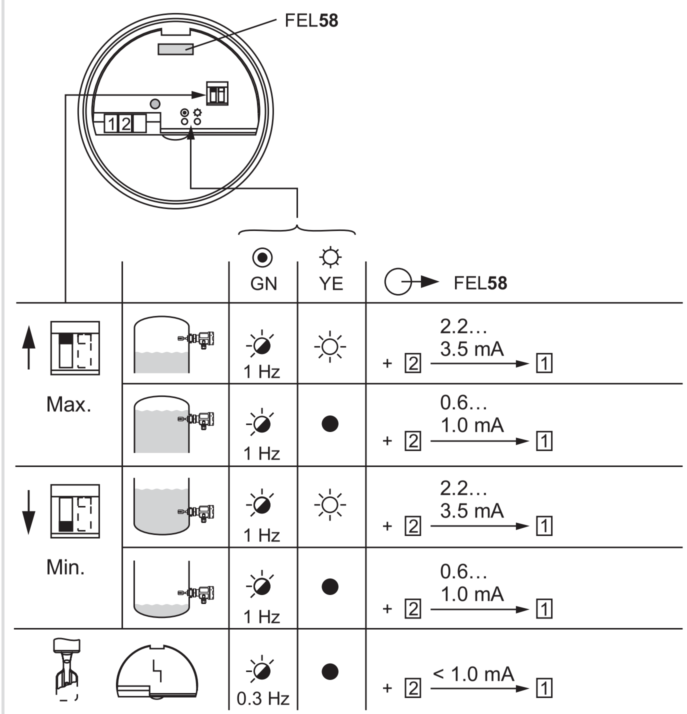
NL- Aansluiting FEL58
NAMUR uitgang H-L
> 2,2 mA / < 1,0 mA

Power supply

DC: 8.2 V +/- 20%



DE- Funktion FEL58
EN- Function FEL58
FR - Fonction FEL58
ES - Funcionamiento FEL58
IT - Funzione FEL58
NL- Functie FEL58



DE- Funktion Prüftaste FEL58
Sicherheitsschaltung MAX

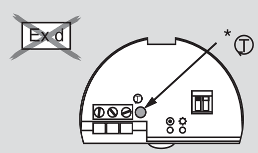
EN- Function test button FEL58
Fail-safe mode MAX

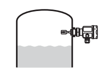
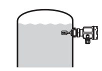
FR - Fonction touche test FEL58
Sécurité MAX

ES - Funcionamiento
botón de prueba FEL58
Conmutador de seguridad MAX

IT - Funzione pulsante test FEL58
Selezione della modalità di
sicurezza MAX

NL- Functie testknop FEL58
Veiligheidsschakeling MAX



MAX + T		
1. Normaler Betrieb / Normal operation / Fonctionnement normal / Funcionamiento normal / Funzionamento normale / Normaal bedrijf	GN YE 1 Hz + 2.2… 3.5 mA 2 → 1	GN YE 1 Hz + 0.6… 1.0 mA 2 → 1
2. Prüftaste drücken / Press test button / Appuyer sur la touche test / Pulse el botón de prueba / Premere il pulsante test / Testknop indrukken >3 s	GN YE + 0 mA 2 - - → 1	GN YE + 0 mA 2 - - → 1
3. Prüftaste loslassen, nach ~2 s normaler Betrieb / Release the test button, after ~2 s normal operation / Relâcher la touche test, après ~2 s fonctionnement normal / Deje de presionar el botón de prueba, después de ~2 s funcionamiento normal / Rilasciare il pulsante test, dopo ~2 s funzionamento normale / De testknop loslaten, na ~2 s normaal bedrijf	GN YE 1 Hz + 2.2… 3.5 mA 2 → 1	GN YE 1 Hz + 0.6… 1.0 mA 2 → 1

MIN + T		
1. Normaler Betrieb / Normal operation / Fonctionnement normal / Funcionamiento normal / Funzionamento normale / Normaal bedrijf	GN YE 1 Hz + 2.2… 3.5 mA 2 → 1	GN YE 1 Hz + 0.6… 1.0 mA 2 → 1
2. Prüftaste drücken / Press test button / Appuyer sur la touche test / Pulse el botón de prueba / Premere il pulsante test / Testknop indrukken >3 s	GN YE + 0 mA 2 → 1	GN YE + 0 mA 2 → 1
3. Prüftaste loslassen, nach ~2 s normaler Betrieb / Release the test button, after ~2 s normal operation / Relâcher la touche test, après ~2 s fonctionnement normal / Deje de presionar el botón de prueba, después de ~2 s funcionamiento normal / Rilasciare il pulsante test, dopo ~2 s funzionamento normale / De testknop loslaten, na ~2 s normaal bedrijf	GN YE 1 Hz + 2.2… 3.5 mA 2 → 1	GN YE 1 Hz + 0.6… 1.0 mA 2 → 1

DE- Funktion Prüftaste FEL58 Sicherheitsschaltung MIN

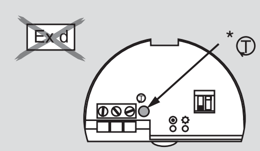
EN- Function test button FEL58 Fail-safe mode MIN

FR - Fonction touche test FEL58 Sécurité MIN

ES - Funcionamiento botón de prueba FEL58 Conmutador de seguridad MIN

IT - Funzione pulsante test FEL58 Selezione della modalità di sicurezza MIN

NL- Functie testknop FEL58 Veiligheidsschakeling MIN



DE- Wartung, Reinigung
Anbackungen entfernen

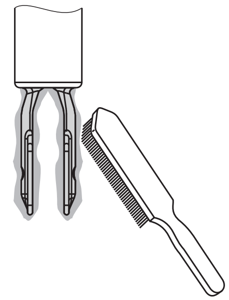
EN- Maintenance, Cleaning
Removal of encrustation

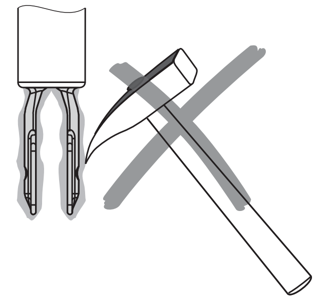
FR - Entretien, Nettoyage
Enlever les incrustations

ES - Mantenimiento, Limpieza
Eliminación de adherencias

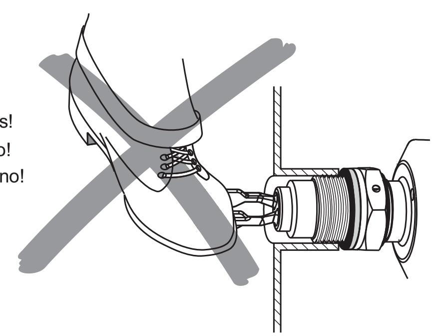
IT - Manutenzione, Pulizia
Rimozione dei depositi

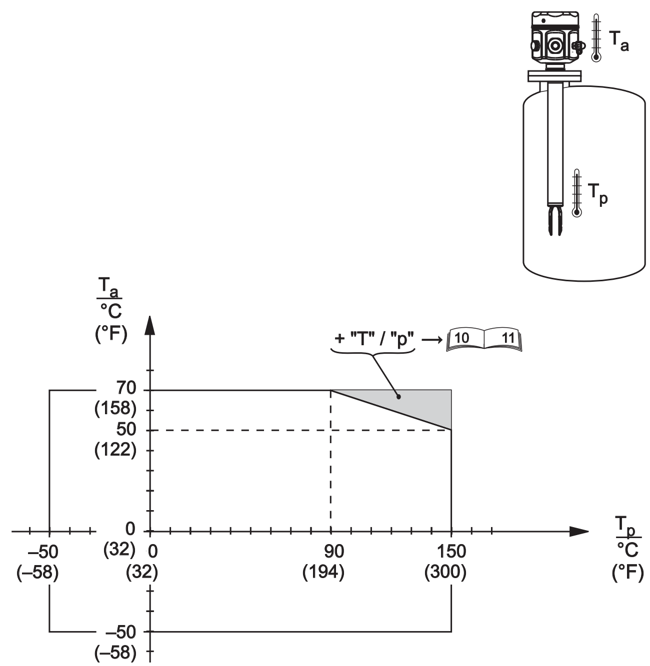
NL- Onderhoud, Reiniging
Aangroei verwijderen





Nicht besteigen!
Don’t use as a step!
Ne pas marcher
sur les lames vibrantes!
No usar como peldaño!
Non usare come scalino!
Niet op staan!





DE- Technische Daten
Umgebungstemperatur T_a
Prozesstemperatur T_p

EN- Technical Data
Ambient temperature T_a
Process temperature T_p

FR - Caractéristiques techniques
Température ambiante T_a
Température de process T_p

ES - Datos técnicos
Temperatura ambiente T_a
Temperatura del proceso T_p

IT - Dati tecnici
Temperatura ambiente T_a
Temperatura di processo T_p

NL- Technische gegevens
Omgevingstemperatuur T_a
Procestemperatuur T_p

DE- Prozessdruck p_e
Prozesstemperatur T_p

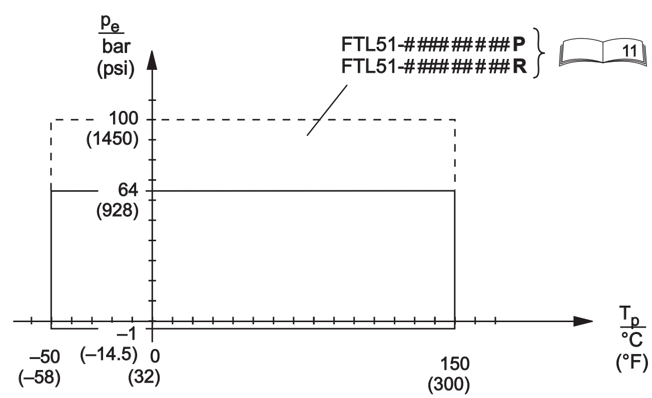
EN- Process pressure p_e
Process temperature T_p

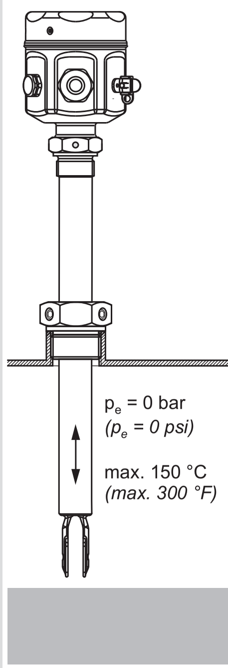
FR - Pression de process p_e
Température de process T_p

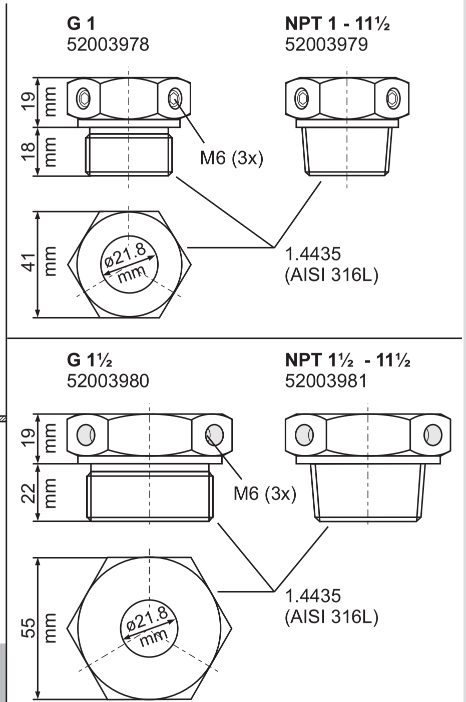
ES - Presión del proceso p_e
Temperatura del proceso T_p

IT - Pressione di processo p_e
Temperatura di processo T_p

NL- Procesdruk p_e
Procestemperatuur T_p







DE- Zubehör
Schiebemuffen für drucklosen Betrieb

EN- Accessories
Sliding sleeves for unpressurised operation

FR - Accessoires
Manchons coulissants pour applications sans pression

ES - Accesorios
Manguitos deslizantes para operación sin presión

IT - Accessori
Manicotto scorrevole per impieghi privi di pressione

NL- Toebehoren
Schuifmof voor drukloze toepassing

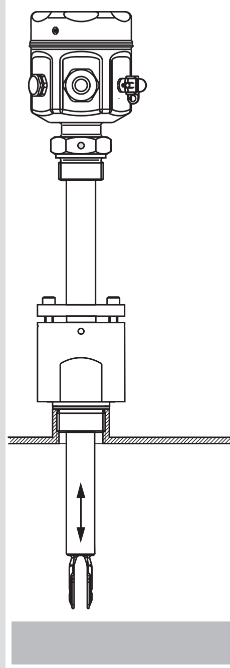
siehe / see / voir / ver / vedi / zie :
KA00151F (G 1, NPT 1)
KA00152F (G 1½, NPT 1½)

100 mm = 3. 94 in

DE- Hochdruck-Schiebemuffen
EN- High pressure sliding sleeves
FR - Manchons coulissants haute pression
ES - Manguitos deslizantes para alta presión
IT - Manicotto scorrevole per impieghi ad alta pressione
NL- Schuifmof voor toepassing onder druk

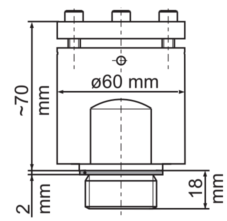
siehe / see / voir / ver / vedi / zie :
KA00153F (G 1, NPT 1)
KA00154F (G 1½, NPT 1½)

100 mm = 3. 94 in



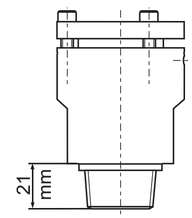
G 1
1.4435 (AISI 316L)
52003663

AlloyC4: 52003664
AlloyC22: 71118691



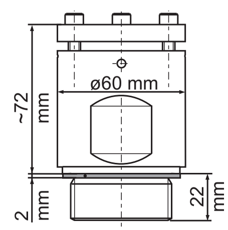
NPT 1 - 11½
1.4435 (AISI 316L)
52003667

AlloyC4: 52003668
AlloyC22: 71118694



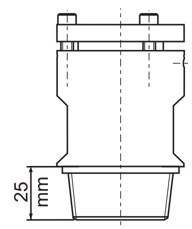
G 1½
1.4435 (AISI 316L)
52003665

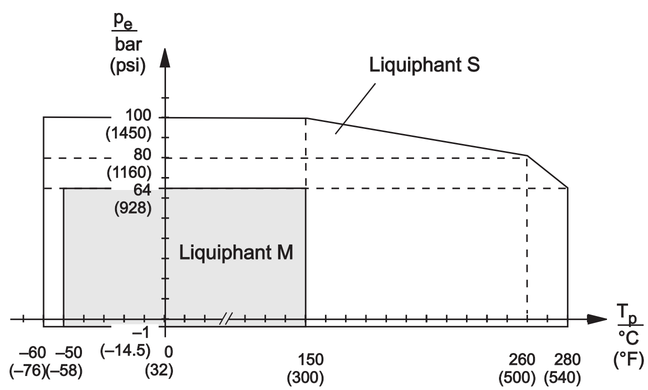
AlloyC4: 52003666
AlloyC22: 71118693



NPT 1½ - 11½
1.4435 (AISI 316L)
52003669

AlloyC4: 52003670
AlloyC22: 71118695





DE– Hochdruck-Schiebemuffen:
Prozessdruck p_e
Prozesstemperatur T_p

EN– High pressure sliding sleeves:
Process pressure p_e
Process temperature T_p

FR – Manchons coulissants haute pression:
Pression de process p_e
Température de process T_p

ES – Manguitos deslizantes para alta presión:
Presión del proceso p_e
Temperatura del proceso T_p

IT – Manicotto scorrevole per impieghi ad alta pressione:
Pressione di processo p_e
Temperatura di processo T_p

NL– Schuifmof voor toepassing onder druk:
Procesdruk p_e
Procestemperatuur T_p

Fehlfunktion	Ursache	Maßnahme
Schaltet nicht	Versorgungsspannung fehlt	Versorgung prüfen
	Signalleitung defekt	Signalleitung prüfen
	Elektronikeinsatz defekt - FEL51 direkt an L1 und N angeschlossen	Austauschen - FEL51 immer über externe Last anschließen
	Dichte der Flüssigkeit zu gering	Am Elektronikeinsatz Dichte auf > 0,5 einstellen
	Schwinggabel verkrustet	Schwinggabel säubern
	Schwinggabel korrodiert (Anzeige am FEL: rot/gelb blinkt, FEL58: grün blinkt 0,3 Hz)	Schwinggabel komplett mit Prozessanschluss austauschen
	FEL51: Relais mit zu großem Innen-widerstand angeschlossen	Geeignetes Relais anschließen
	FEL51: Relais mit zu geringem Haltestrom angeschlossen	Widerstand parallel zum Relais anschließen
	FEL54: Kontakte verschweißt (nach einem Kurzschluss)	FEL54 austauschen; Sicherung in den Kon-taktstromkreis
Schaltet falsch	Minimum-/Maximum- Sicherheits-schaltung vertauscht	Am Elektronikeinsatz Sicherheitsschaltung richtig einstellen
Fehlschaltung, sporadisch	Dichter schwerer Schaum, wilde Turbulenzen, aufgeschäumte Flüssigkeit	Liquiphant im Bypass montieren
	Extreme Funkstörung	Verbindungskabel abschirmen
	Extreme Vibrationen	Entkoppeln, dämpfen, Schwinggabel 90° drehen
	Wasser im Gehäuse	Deckel und Kabeldurchführungen fest zuschrauben
	FEL52: Ausgang überlastet	Last, (Leitungs-) Kapazität verringern
Fehlschaltung nach Netzausfall	FEL57, Verhalten beim Einschalttest (wiederkehrende Prüfung)	Schaltverhalten FEL57 beachten; Anlagensteuerung nach Netzausfall bis ca. 45 s blockieren

EN- Trouble-shooting

Fault	Reason	Remedy
Does not switch	No power	Check power
	Faulty signal line	Check signal line
	Faulty electronic insert - FEL51 connected directly to L1 and N	Exchange - always connect FEL51 via external load
	Density of liquid too low	Set density to > 0.5 at electronic insert
	Fork encrusted	Clean fork
	Fork corroded (Indication on FEL: red/yellow flashes, FEL58: green flashes 0.3 Hz)	Exchange fork and process connection
	FEL51: Internal resistance of connected relay too large	Connect suitable relay
	FEL51: Holding current of connected relay too low	Connected resistor in parallel with relay
	FEL54: Contacts welded together (after short-circuit)	Exchange FEL54; put fuse in contact circuit
Switches incorrectly	Min-/Max- fail-safe mode set wrongly	Set correct mode at electronic insert
Sporadic faulty switching	Thick heavy foam, very turbulent conditions, foaming liquid	Mount Liquiphant in bypass
	Extreme RFI	Use screened cable
	Extreme vibration	Decouple, damp, turn fork 90°
	Water in housing	Screw cover and cable gland tight
	FEL52: Output overloaded	Reduce load,(cable) capacitance
Switches incorrectly after power failure	FEL57, behaviour during switch-on test (functional test)	Observe switching behaviour of FEL57; After power failure blockplant control for up to 45 s

Défaut	Cause	Mesure
Ne commute pas	Tension d'alimentation manquante	Vérifier la tension d'alimentation
	Câble de signal défectueux	Vérifier le câble de signal
	Electronique défectueuse – FEL51 relié directement á L1 et N	Remplacer – Relier FEL51 toujours via la charge externe
	Densité du liquide trop faible	Régler la densité sur > 0,5 sur l'électronique
	Lames vibrantes encroûtées	Nettoyer les lames vibrantes
	Lames vibrantes corrodées (Sur FEL: rouge/jaune clignote, FEL58: vert clignote 0,3 Hz)	Remplacer les lames vibrantes ainsi que le raccord process
	FEL51: relais avec résistance interne trop élevée	Raccorder un relais approprié
	FEL51: relais avec courant de maintien trop faible	Raccorder une résistance en parallèle au relais
	FEL54: contacts soudés (après un court-circuit)	Remplacer FEL54; fusible dans le circuit courant
Mauvaise commutation	Sécurité min/max inversée	Régler correctement le circuit de sécurité sur l'électronique
Mauvaise commutation, sporadique	Mousse dense et lourde, fortes turbulences, liquide émulsionné	Monter le Liquiphant en bypass
	Parasites puissants	Blinder le câble de liaison
	Vibrations importantes	Découpler, amortir, tourner la fourche de 90°
	Eau dans le boîtier	Visser fermement le couvercle et les entrées de câble
	FEL52: surcharge de la sortie	Réduire la charge et la capacité (de ligne)
Mauvaise commutation après coupure	FEL57, comportement lors du test de mise sous tension (test cyclique)	Observer le comportement du FEL57 à la mise sous tension; bloquer la commande de l'installation après coupure de courant pendant max. 45 s

Fallo	Causa	Solución
No conmuta	No hay alimentación	Comprobar alimentación
	Señal defectuosa	Comprobar cable de señal
	Electrónica defectuosa – FEL51 conectada directamente a L1 y N	Cambio – Siempre conectar FEL51 vía una carga externa
	Densidad del líquido demasiado baja	Fijar densidad a > 0.5 en la electrónica
	Horquillas con adherencias	Limpiar horquillas
	Horquillas corroidas (En FEL: rojo/amarillo parpadea, FEL58: verde parpadea 0.3 Hz)	Cambiar la horquilla y la conexión a proceso
	FEL51: Relé con resistencia interna demasiado grande	Conectar un relé adecuado
	FEL51: El relé conectado retiene muy poca corriente	Resistencia conectada en paralelo con el relé
	FEL54: Contactos soldados juntos (después del corto circuito)	Cambiar FEL54; poner fusible en el circuito de contacto
Conmuta incorrectamente	El modo de fallo mín./máx. está mal ajustado	Ajustar el modo correcto en la electrónica
Fallos de conmutación esporádicos	Espuma muy densa, turbulencias, líquidos espumosos	Montar el Liquiphant en bypass
	RFI extremo	Utilizar cable apantallado
	Vibraciones extremas	Desacoplar, amortiguar y girar las horquillas 90°
	Agua en el cabezal	Roscar la cubierta y el prensaestopas firmemente
	FEL52: Salida con sobretensión	Reducir carga, capacidad (cable)
Conmuta incorrectamente después de un fallo de alimentación	FEL57, comportamiento durante la comprobación de conmutación (test de funcionamiento)	Observar el comportamiento de conmutación del FEL57; del fallo de alimentación, bloqueo del control de la planta durante 45 s aprox.

IT – Individuazione e eliminazione delle anomalie

Guasto	Motivo	Rimedio
Non commuta	Mancanza alimentazione	Controllare l'alimentazione
	Linea segnale guasta	Controllare segnale linea
	Inserto elettronico guasto - FEL51 connesso direttamente a L1 e N	Sostituire - connettere sempre FEL51 mediante carico esterno
	Densità del liquido troppo bassa	Impostare la densità a > 0,5 sull'inserto elettronico
	Forcella incrostata	Pulire la forcella
	Forcella corrosa (Sul FEL: rosso/giallo lampeggiano, FEL58: verde lampeggiano 0,3 Hz)	Sostituire la forcella e la connessione al processo
	FEL51: resistenza interna del relè connesso troppo grande	Collegare il relè adeguato
	FEL51: corrente di mantenimento del relè connesso troppo grande	Connettere resistenza in parallelo al relè
	FEL54: contatti saldati insieme (dopo il corto circuito)	Sostituire FEL54; mettere il fusibile nel circuito di contatto
Commuta non correttamente	Modalità di sicurezza min-/max-impostata in modo errato	Impostare la modalità corretta nell'inserto elettronico
Commutazione sporadicamente difettosa	Schiuma pesante e torbida condizioni molto turbolente, liquido che produce schiuma	Montare il Liquiphant nel bypass
	RFI forte	Usare cavo schermato
	Forte vibrazione	Disaccoppiare, smorzare, ruotare la forcella di 90°
	Acqua nella custodia	Avvitare correttamente il coperchio e il passacavi
	FEL52: Uscita sovraccaricata	Ridurre il carico, capacità (cavo)
Commutazione non corretta dopo la mancanza alimentazione	FEL57, comportamento durante la fase di test all'accensione (test di funzionamento)	Osservare il comportamento di commutazione del FEL57; dopo il ripristino di una mancanza di alimentazione inibire il controllo dell'impianto per 45 s

Fout	Oorzaak	Maatregel
Schakelt niet	Voeding ontbreekt	Voeding kontroleren
	Signaalleiding defect	Signalleiding kontroleren
	Insert defect - FEL51 direct op L1 en N aangesloten	Ver vangen - FEL51 altijd via een belasting aansluiten
	Dichtheid van de vloeistof te gering	Op elektronica- insert dichtheid op > 0, 5 instellen
	Trilvork te veel vervuild	Trilvork reinigen
	Trilvork gecorrodeerd (LED op FEL knippert rood/geel, FEL58: groen knippert 0,3 Hz)	Trilvork compleet met procesaansluiting vervangen
	FEL51: Relais met te groteinwendige weerstand aangesloten	Passender relais aansluiten
	FEL51: Relais met te geringe houdstroom aangesloten	Weerstand parallel aan relais aansluiten
	FEL54: Contacten verkleeft (na een kortsluiting)	FEL54 vervangen; zekering in circuit aanbrengen
Schakelt foutief	Minimum- /Maximum- fail-safe instelling verwisseld	FEL fail-safe keuze correct instellen
Sporadische foutschakeling	Dik zwaar schuim, wilde turbulentie, opgeschuimde vloeistof	Liquiphant in by-pass monteren
	Extreme RFI invloed	Verbindingskabel afschermen
	Extreme vibraties	Ontkoppelen, dempen, vork 90° draaien
	Water in de behuizing	Deksel en wartels vast aandraaien
	FEL52: uitgang overbelast	Schakelbelasting verminderen
Foutmelding	FEL57, gedrag bij inschakelen na netuitval (periodieke testfunctie)	Schakelgedrag FEL57 controleren; procesherstart na netuitval ca. 45 s blokkeren

DE– Ergänzung Fehlersuche

Ist das Schaltverhalten der Gabel ungewöhnlich, kann an PIN 4 der Diagnosebuchse die Gabel-frequenz gemessen werden.
Bei den Elektronikeinsätzen FEL51/52/54/55/56/57/58 ist dies eine sinusförmige Schwingung deren Amplitude einen Rückschluss auf den Gabelzustand zulässt.
Bei FEL50A ist aufgrund eines Rechtecksignals nur noch die Gabelfrequenzmessung möglich.

EN– Trouble- shooting Supplement

If the switching behaviour of the fork is abnormal, the fork frequency can be measured at PIN 4 of the diagnosis socket.
With electronic inserts FEL51/52/54/55/56/57/58 this is a sinusoidal vibration whose amplitude makes it possible to determine the condition of the fork.
With FEL50A, only the fork frequency measurement is possible due to a rectangular pulse signal.

FR – Additif recherche de défauts

Si la commutation de la fourche est inhabituelle, il est possible de mesurer la fréquence de cette dernière au PIN 4 de la prise diagnostic.
Pour l es électroniques FEL51/52/54/55/56/57/58 il s'agit d'une oscillation sinusoïdale dont l'amplitude permet d'évaluer l'état de la fourche.
Pour FEL50A, le signal rectangulaire ne permet qu'une mesure de la fréquence de fourche.

ES – Suplemento para la identificación de fallos

Si el comportamiento de conmutación de la horquilla es anormal, puede medir la frecuencia de la misma en el PIN 4 del interruptor de diagnosis.
Con las electrónicas FEL51/52/54/55/56/57/58 se consigue una vibración sinusoidal cuya amplitud hace posible determinar la condición de la horquilla.
Con FEL50A, sólo es posible medir la frecuencia de la horquilla debido a una señal de impulsos rectangular.

IT – Supplemento alla ricerca dei malfunzionamenti

Se le condizioni di commutazione dei rebbi non è normale la frequenza di vibrazione può essere misurata al PIN 4 del connettore per la diagnosi.
Con gli inserti elettronici FEL51/52/54/55/56/57/58 è possibile determinare la condizione dei rebbi anche tramite l'ampiezza dell'onda sinusoidale.
Con FEL50A il segnale è un onda quadra, per cui è possibile valutare solo il valore di frequenza.

NL– Bijlage problemen oplossen

Indien het schakelgedrag van de trilvork niet normaal verloopt kan de frequentie van de vork gemeten worden op pen 4 van de diagnoseconnector.
Bij de elektronica inserts van de FEL51/52/54/55/56/57/58 is dit een sinusvormige trilling waarvan de amplitude een beeld geeft van de conditie van de vork.
Bij de FEL50A is alleen de vorkfrequentie te meten als gevolg van een rechthoekig pulssignaal.

DE- Ersatzteile
Elektronikeinsätze

EN- Spare parts
Electronic inserts

FR - Pièces de rechange
Electroniques

ES - Repuestos
Electrónicas

IT - Ricambi
Inserti elettronici

NL- Reserve-onderdelen
Elektronica inserts

FEL51	52002304
FEL52	52002305
FEL54	52002306
FEL55	52002307
FEL56	52002308
FEL57	52002309
FEL58	52006454
FEL50A	52010527

Installationsregel: Bei der Installation ist zu beachten, dass elektrische Betriebsmittel (Elektronikeinsätze) die mit nichteigensicheren Stromkreisen gespeist wurden, grundsätzlich **nicht** mehr mit eigensicheren Stromkreisen zusammengeschaltet werden dürfen.

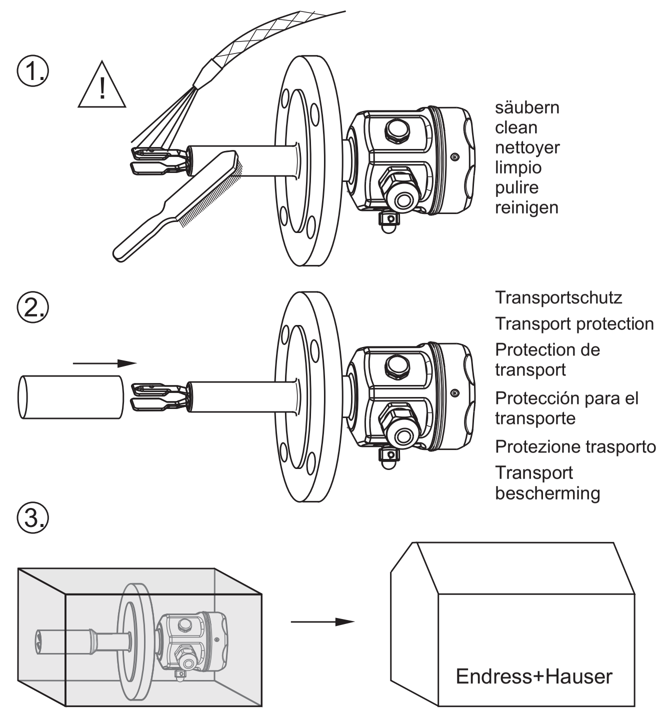
Installation specification: During installation, please keep in mind that electrical resources (electronic inserts) which are powered by non-intrinsically-safe circuits may **no** longer be interconnected with intrinsically-safe circuits.

Directive d'installation : Lors de l'installation, tenir compte du fait que les matériels électriques (électroniques) alimentés par des circuits sans sécurité intrinsèque **ne** doivent plus être connectés à des circuits à sécurité intrinsèque.

Normas de instalación: Durante la instalación, tenga en cuenta que los elementos eléctricos (electrónicas) alimentadas por circuitos no instrínsecamente seguros, **no** podrán estar interconectadas con circuitos intrínsecamente seguros.

Specifiche di installazione: Durante l'installazione è necessario tenere presente che gli impianti elettrici (inserti elettronici) alimentati da circuiti elettrici non a sicurezza intrinseca **non** possono più essere collegati con circuiti elettrici a sicurezza intrinseca.

Installatievoorschrift: Bij de installatie moet erop worden gelet, dat elektrisch materieel (elektronica-units) die via niet-intrinsiekveilige circuits worden gevoed, in principe **niet** meer met intrinsiekveilige circuits mogen worden samengeschakeld.



DE- Reparatur
bei Endress+Hauser

EN- Repair
at Endress+Hauser

FR - Réparations
chez Endress+Hauser

ES - Reparaciones
en Endress+Hauser

IT - Riparare
presso la Endress+Hauser

NL- Reparatie
bij Endress+Hauser

DE- Ergänzende Dokumentation
EN- Supplementary Documentation
FR - Documentation complémentaire
ES - Documentación adicional
IT - Documentazione supplementare
NL- Aanvullende documentatie

Technische Information / Technical Information / Information technique /
Información técnica / Informazioni tecniche / Technische Informatie

TI328F	Liquiphant FTL50, FTL50H, FTL51, FTL51H
TI426F	Weld-in adapter, leven and pressure

Betriebsanleitung / Operating Instruction / Mise en service /
Instrucciones de funcionamiento / Istruzioni operative / Inbedrijfstellingsvoorschrift

BA00141F FEL50A, PROFIBUS PA

Sicherheitshinweise / Notes on Safety / Conseils de sécurité /
Notas sobre seguridad / Note sulla sicurezza / Veiligheidsinstructies

XA00031F	CE Ex	II 1/2 G,	Ex d	IIC/IIB
XA00063F	CE Ex	II 1/2 G, II 1/2 D,	Ex ia/ib	IIC/IIB
XA00064F	CE Ex	II 1 G,	Ex ia	IIC/IIB
XA00108F	CE Ex	II 1/2 G,	Ex de	IIC/IIB
XA00113F	CE Ex	II 1/2 G,	Ex ia/ib	IIC
XA00114F	CE Ex	II 1/2 G,	Ex d	IIC
XA00115F	CE Ex	II 1/2 G,	Ex de	IIC
XA00154F	CE Ex	II 1/2 G, II 1/2 D,	Ex ia/ib	IIC/IIB
XA00158F	CE Ex	II 1/2 G,	Ex ia/ib	IIC
XA00159F	CE Ex	II 1 G,	Ex ia	IIC/IIB
XA00182F	CE Ex	II 3 G, II 3 D,	Ex nA/nC	IIC/IIIC

71352535

MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

ENDRESS + HAUSER

SOLISWITCH FTE31, LEVEL LIMIT SWITCH (PADDLE TYPE)

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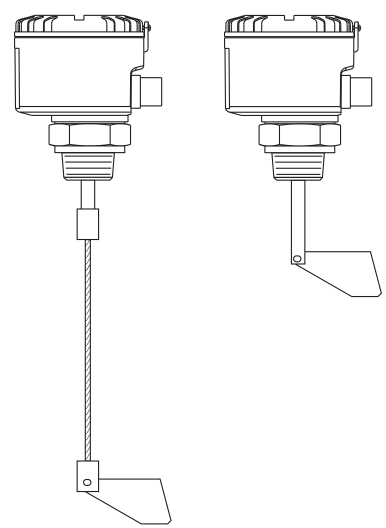
KA 094R/09/a3/01.09
No.: 510 00917

FTE 31



d Füllstandgrenzschalter
e Level Limit Switch
f Détecteur de niveau

Endress+Hauser
The Power of Know How

d Inhalt

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Abmessungen und Werkstoffe	13
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e Contents

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f Sommaire

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Entretien	10
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d Sicherheitshinweise

Der FTE 31 darf nur als Füllstandsgrenzschalter für spezifizierte Schüttgüter eingesetzt werden. Bei unsachgemäßem Gebrauch können Gefahren von ihm ausgehen.

Das Gerät darf nur von **qualifiziertem und autorisiertem Fachpersonal unter besonderer Beachtung dieser Betriebsanleitung**, der gesetzlichen Vorschriften und der Zertifikate (je nach Anwendung) eingebaut, angeschlossen, in Betrieb genommen und gewartet werden.

Achtung!
= verboten - führt zu fehlerhaftem Betrieb oder Zerstörung.

e Notes on safety

The FTE 31 paddle switch is a level limit switch, designed for use in fine-grained bulk solids in non-hazardous areas.
If used incorrectly it is possible that application-related dangers may arise.
The FTE 31 paddle switch may be installed, connected, commissioned, operated and maintained **by qualified and authorised personnel only,** under strict observance of these operating instructions, any relevant standards, legal requirements, and, where appropriate, the certificate.

Caution!
= forbidden - leads to incorrect operation or destruction.

f Conseils de sécurité

Le FTE 31 est un détecteur de niveau à palette rotative pour produits solides en vrac de faible granulométrie, utilisable en zones non explosibles. Il peut être source de danger en cas d´utilisation non conforme aux prescriptions. L´appareil ne doit être installé, raccordé, mis en service et maintenu **que par un personnel qualifié et autorisé,** qui tiendra compte des indications contenues dans la présente mise en service, des normes en vigueur et des certificats disponibles (selon l´application).

Attention!
= interdit - peut provoquer des dysfonctionnements ou la destruction.

d Einbaubeispiele

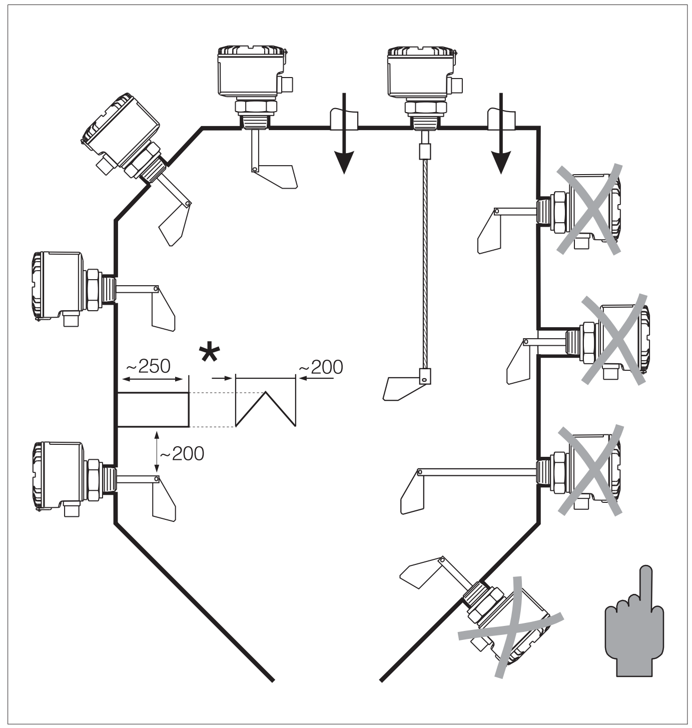
* Schutzdach

e Mounting examples

* Protective roof

f Exemples d´implantation

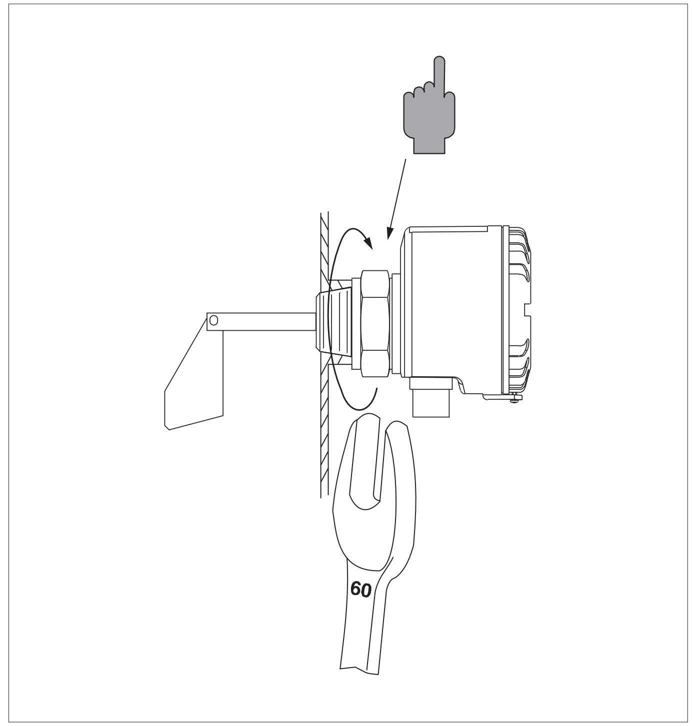
* Déflecteur



d Füllstandgrenzschalter FTE 31 einschrauben
Nicht am Gehäuse drehen!

e Screw the FTE 31 paddle switch into the process connection
Don´t use housing to turn!

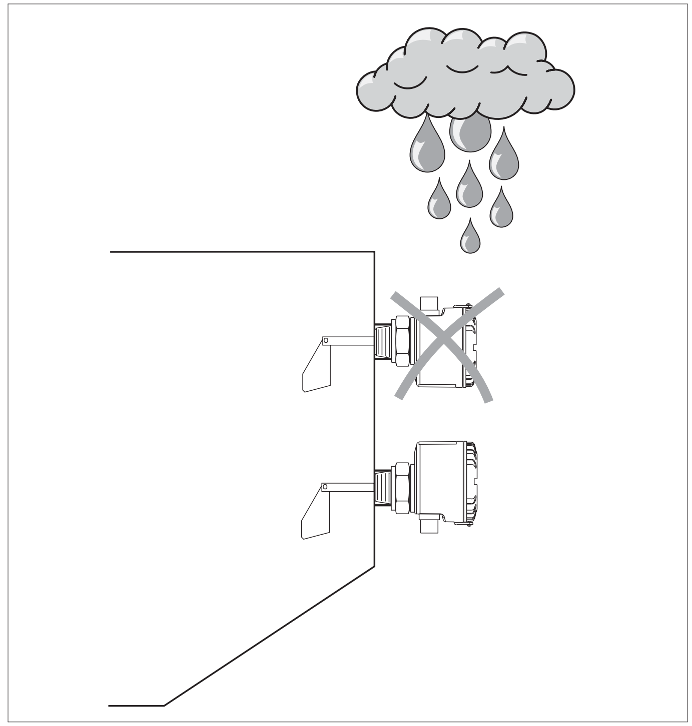
f Visser le détecteur à palette rotative FTE 31
Ne pas se servir du boîtier!

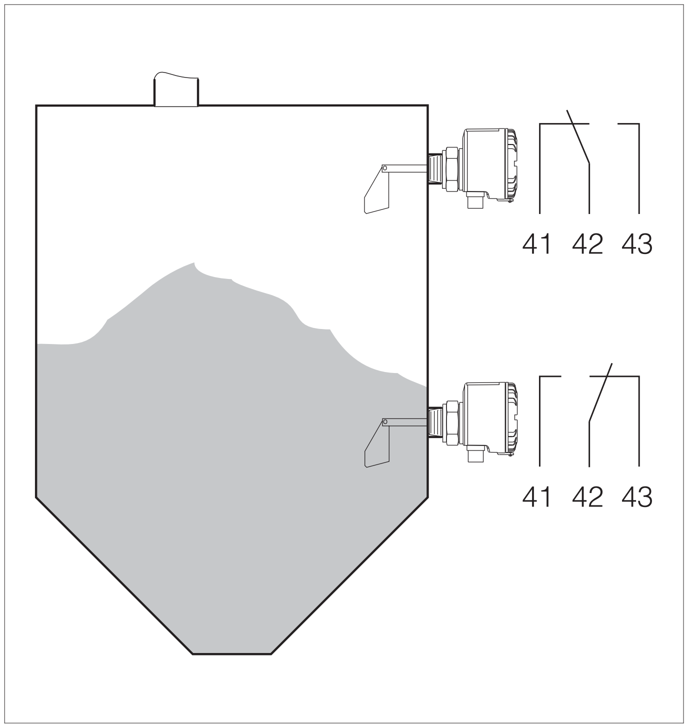


d Gehäuse in richtige Position drehen.

e Screw the housing to the correct position.

f Positionner le boîtier.





d **Funktion**

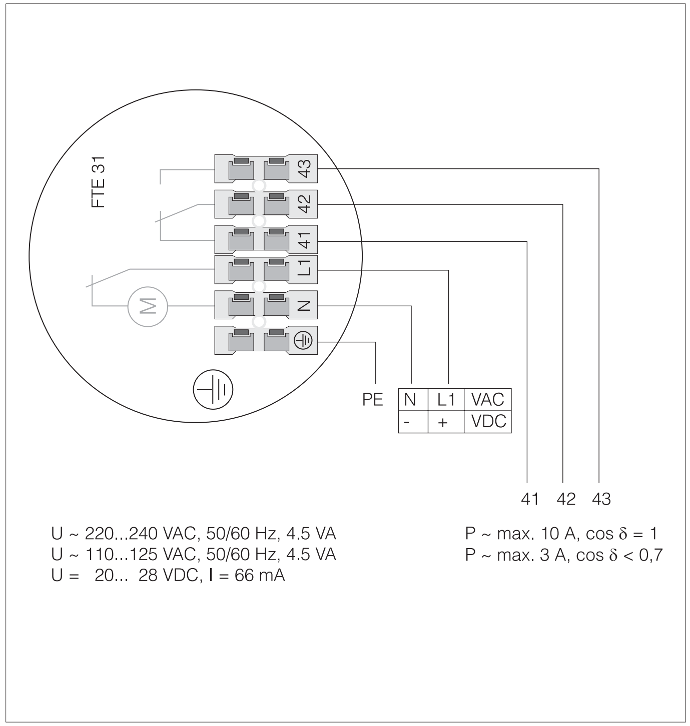
e **Function**

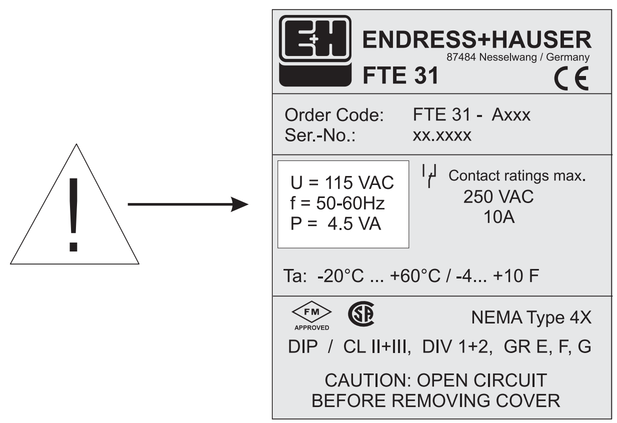
f **Fonction**

d **Anschluss FTE 31**

e **Connection FTE 31**

f **Raccordement FTE 31**





d Beachten Sie die Anschluss-spannung auf dem Typen-schild

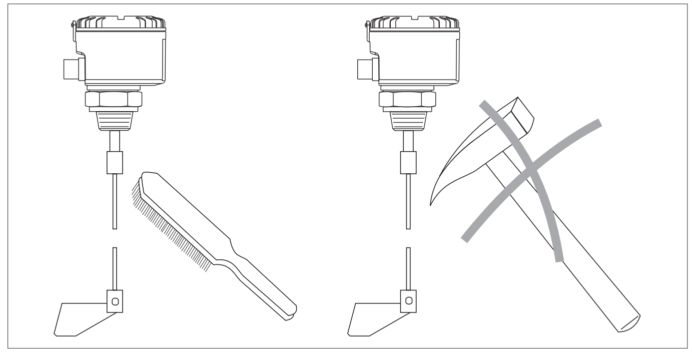
e Take note of the power supply indicated on the legend plate

f Tenir complete de la tension indiquée sur la plaque signalétique

d **Wartung**
Anbackungen entfernen

e **Maintenance**
Build up removal

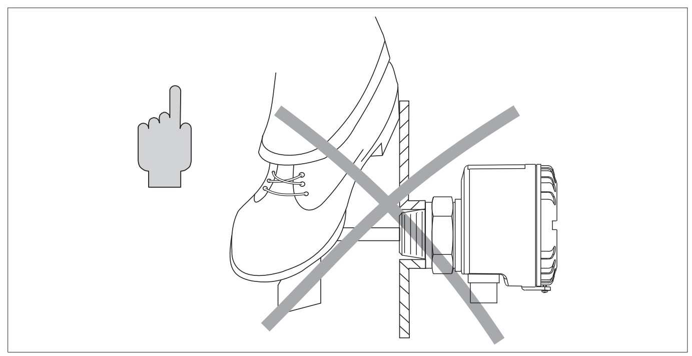
f **Entretien**
Enlever les incrustations

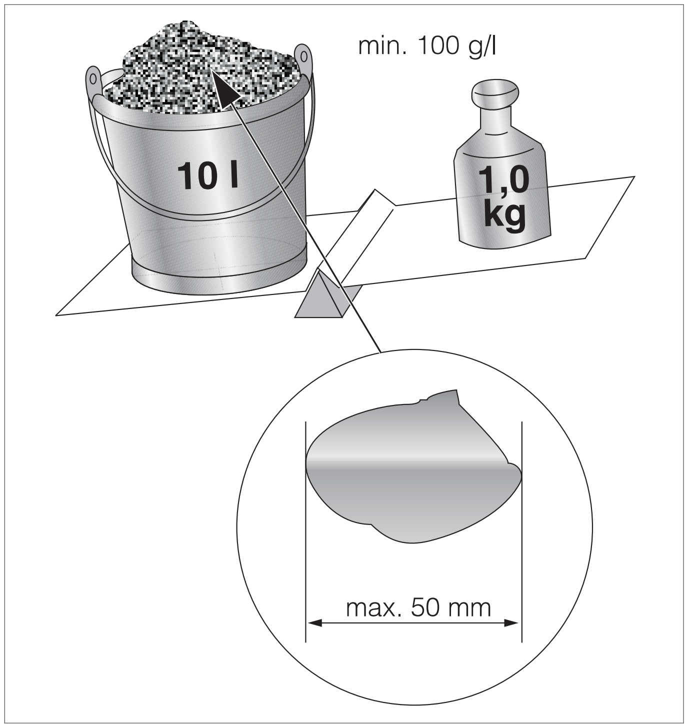


d **Nicht** besteigen!

e **Don´t** use as a step!

f **Ne pas** marcher sur les lames vibrantes!





d **Technische Daten**

Schüttgröße und
Korngewicht

e **Technical data**

Solids density
and grain size in mm.

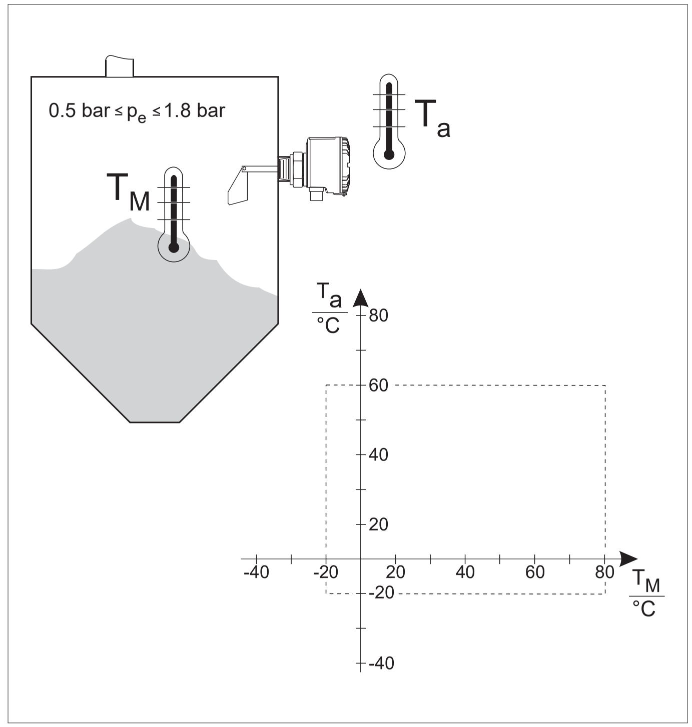
f **Caractéristiques techniques**

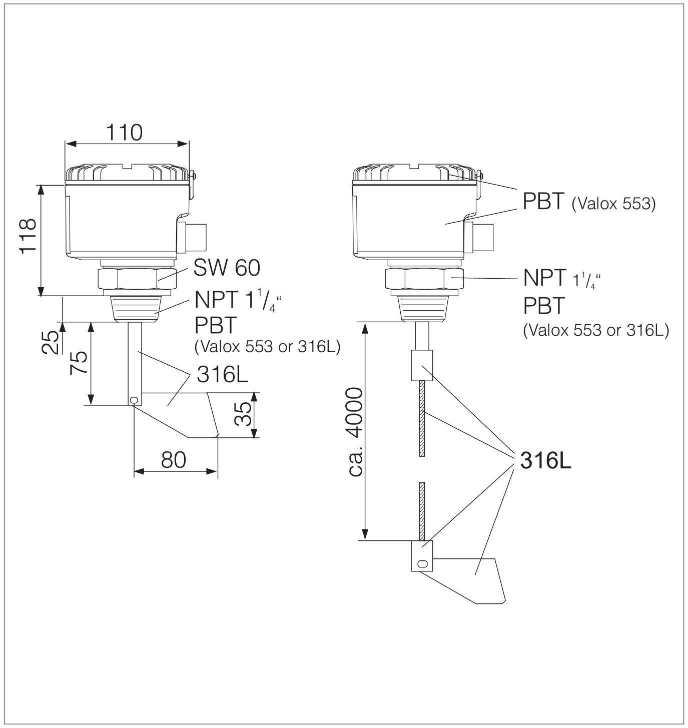
Densité apparente
et granulométrie en mm.

d Umgebungstemperatur T_a
Betriebstemperatur T_M
Betriebsdruck p_e

e Ambient temperature T_a
Operating temperature T_M
Operating pressure p_e

f Température ambiante T_a
Température de service T_M
Pression de service p_e





d **Abmessungen in mm und Werkstoffe**

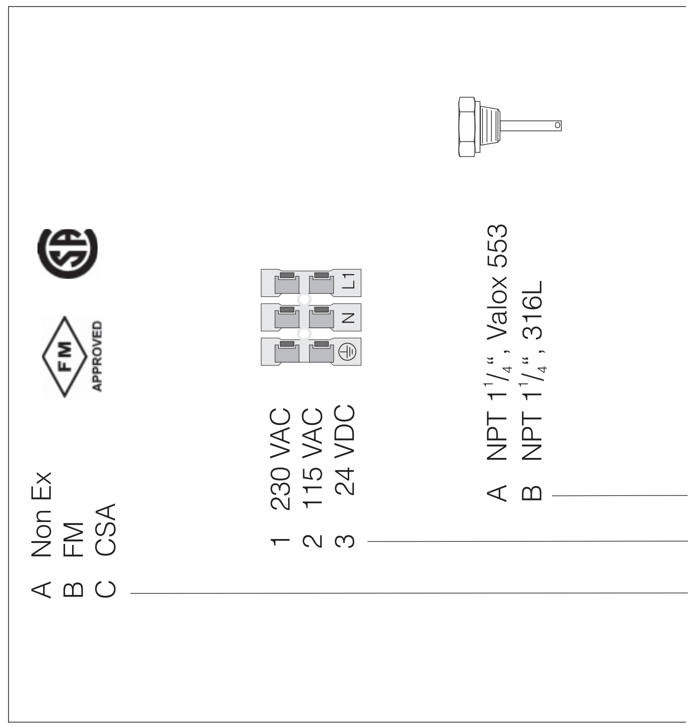
e **Dimensions in mm and materials**

f **Dimensions en mm et matériaux**

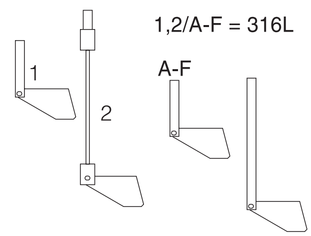
d **Geräte Identifikation**

e **Device identification**

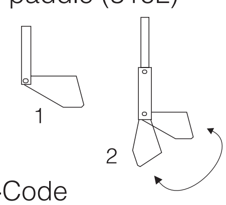
f **Dénomination**



1	75 mm
2	4 m, 1.4571
A-F	100 mm - 600 mm



1 Standard (316L)
2 fold-down paddle (316L)



FTE31-						⇐ Order-Code

d Ergänzende Dokumentation

e Supplementary documentation

f Documentation complémentaire

TI 068R/09/de Technische Information
Füllstandgrenzschalter FTE 31

TI 068R/09/en Technical information
Paddle limit switch FTE 31

d Notizen:

e Notes:

f Notes:

d	✎ **Hinweis!**	Mechanische Lebensdauer: min. 500 000 Schaltzyklen
e	✎ **Note!**	Mechanical life time: min. 500 000 switch cycles
f	✎ **Remarque !**	Durée de vie mécanique : min. 500 000 cycles de commutation
es	✎ **¡Nota!**	Vida estimada: mínimo 500 000 usos
i	✎ **Nota !**	Tempo di vita delle parti meccaniche: min. 500 000 cicli di commutazione
nl	✎ **Opmerking!**	Mechanische levensduur: min. 500 000 schakelcycli

d	**Reparatur**	Bei Austausch von Teilen nur original E+H Ersatzteile verwenden!
e	**Repairs**	When exchanging only use original E+H spare parts.
f	**Réparation**	Lors du remplacement de pièces, n'utiliser que des pièces de rechange d'origine E+H.
es	**Repuestos**	Cuando realice sustituciones utilice sólo recambios originales E+H.
i	**Riparazioni**	In caso di riparazione utilizzare solo ricambi originali E+H.
nl	**Reparatie**	Bij wisseling van onderdelen uitsluitend originele E+H service onderdelen toepassen

Austria
Endress+Hauser Ges.m.b.H.
Wien
Tel. (0222) 88056-0, Fax (0222) 88056-35

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Endress+Hauser S.A./N.V.
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Greenwood, Indiana
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International
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Instruments International
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The Power of Know How

KA 094R/09/a3/01.09 Mat-Nr.: 510 00917 SS/CV5

MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

ENDRESS + HAUSER

CERABAR T PMC131, PRESSURE TRANSDUCER

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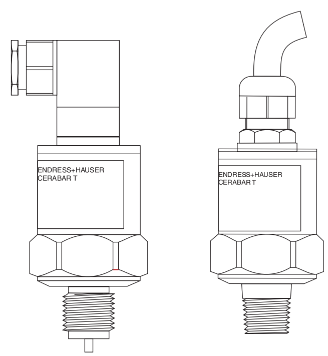
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

Cerabar T PMC131



de - Drucktransducer
en - Pressure Transducer
fr - Transducteur de pression
it - Trasduttore di pressione
es - Transmisorde presión
nl - Druk-transducer

KA00085P/00/A6/13.12
71158704

Endress+Hauser
People for Process Automation

de – Inhalt

Geräte-Identifikation 4
Abmessungen 5
Montage 6
Elektrischer Anschluss 8
Technische Daten 10

en – Contents

Device Identification 4
Dimensions 5
Mounting 6
Electrical Connection 8
Technical Data 10

fr – Sommaire

Dénomination de l'appareil 4
Dimensions 5
Montage 6
Raccordement électrique 8
Caractéristiques techniques 10

de – Sicherheitshinweise

Der Cerabar T dient der Absolut- und Relativdruckmessung in Gasen, Dämpfen, Flüssigkeiten und Stäuben. Bei unsachgemäßem Einsatz können Gefahren von ihm ausgehen. Das Gerät darf nur von qualifiziertem und autorisiertem Fachpersonal unter strenger Beachtung dieser Betriebsanleitung und der Technischen Information TI00415P, der einschlägigen Normen, gesetzlichen Vorschriften und Zertifikate eingebaut, angeschlossen, in Betrieb genommen und gewartet werden.

en – Notes on Safety

The Cerabar T is designed for measuring absolute and gauge pressure of gases, vapours, liquids and dusts. If used incorrectly it is possible that application related dangers may arise.The Cerabar T may be installed, commissioned, operated and maintained by qualified and authorised personnel only, under strict observance of these operating instructions and Technical Information TI00415P, any relevant standards, legal requirements, and, where appropriate, the certificate.

fr – Conseils de sécurité

Le Cerabar T est destiné à la mesure de pression absolue et relative dans les gaz, vapeurs, liquides et poussières. Il peut être source de danger en cas d'utilisation non conforme aux prescriptions. L'appareil ne doit être installé, raccordé, mis en service et maintenu que par un personnel qualifié et autorisé, qui tiendra compte des indications contenues dans la présente mise en service et de l' Information Technique TI00415P, des normes en

vigueur et des certificats disponibles (selon l'application).

es – Indice

Identificación del equipo 4
Dimensiones 5
Montaje 7
Conexiones eléctricas 8
Datos técnicos 10

es – Notas sobre seguridad

Cerabar T está diseñado para medir presión absoluta y relativa en gases, vapores, liquidos y sólidos pulvurulentos. Su empleo inapropiado puede resultar peligroso. El equipo deberá ser montado, conectado, instalado y mantenido única y exclusivamente por personal cualificado y autorizado, bajo rigurosa observación de las presentes instrucciones de servicio y de la Informatión Técnica TI00415P, de las normativas y legislaciones vigentes, así como de los certificados (dependiendo de la aplicación).

it – Indice

Identificazione (strumento) 4
Dimensioni 5
Montaggio 7
Collegamento elettrico 8
Dati tecnici 10

it – Note sulla sicurezza

Il Cerabar T è stato progettato per la misura della pressione assoluta e relativa di gas, vapori, liquidi e polveri. Un'installazione non corretta può determinare pericolo per le persone e le cose. Lo strumento deve essere montato collegato e messo in servizio solamente da personale qualificato ed autorizzato, nel totale rispetto delle indicazioni operative qui riportate, delle prescrizioni presenti nelle informazioni tecniche TI00415P ed in accordo a tutte le norme e legislazioni vigenti e le certificazioni utilizzate.

nl – Inhoud

Instrument-identificatie 4
Afmetingen 5
Montage 7
Elektrische aansluiting 8
Omgevingscondities 10

nl – Veiligheidsinstructies

De Cerabar T is ontworpen voor het meten absoluut en overdruk van gassen, dampen, vloeistoffen en vaste stoffen. Bij niet correct gebruik kunnen gevaarlijke situaties onstaan. Het instrument mag uitsluitend door gekwalificeerd en geautoriseerd vakpersoneel geinstalleerd, aangesloten en inbedrijf genomen worden met inachtneming van dit inbedrij-fstellingsvoorschrift, het bijbehorende Technisch Informatie blad TI00415P en de betreffende normen, de wettelijke voorschriften en eventuele certificaten in acht.

de - Geräte-Identifikation

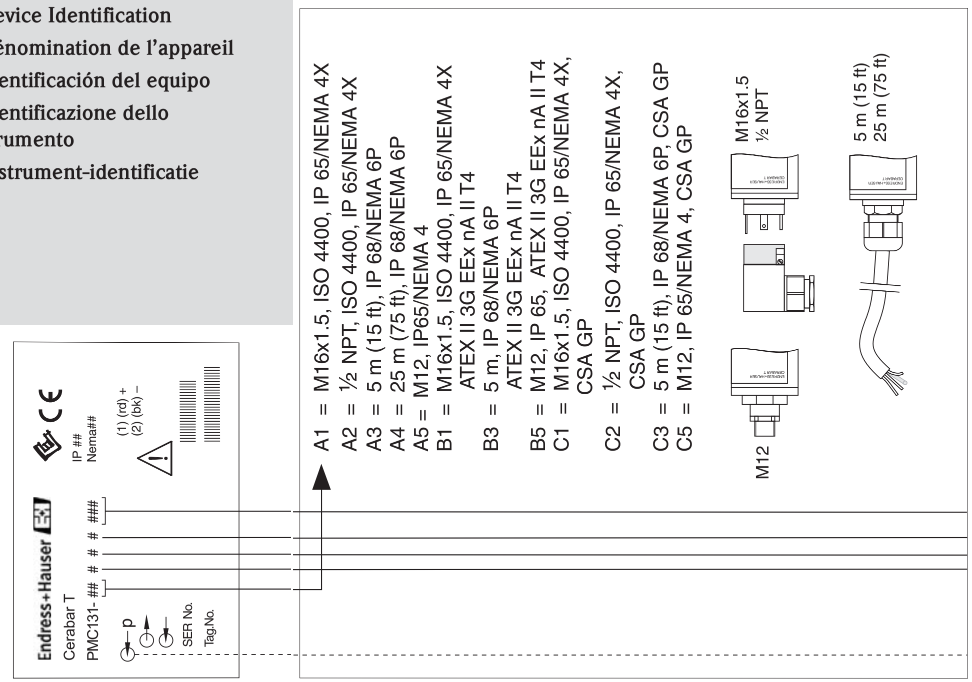
en - Device Identification

fr - Dénomination de l'appareil

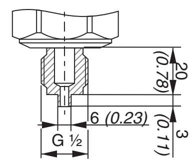
es - Identificación del equipo

it - Identificazione dello strumento

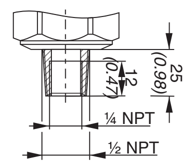
nl - Instrument-identificatie



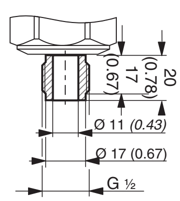
1 = G ½A, ISO 228
1.4301 (AISI 304)



2 = ½ MNPT, ¼ FNPT,
1.4301 (AISI 304)



5 = G ½A, ø11 mm, ISO228
1.4301 (AISI 304)



F = FKM Viton
S = FKM Viton, O_2

1 = ohne/without/sans/sin/senza/zonder
2 = Protokoll/Protocol/Protocole
S = German Lloyd

p

D10 = 0..100 mbar, 0...10 kPa
...
R4T = 0...500 psi a

de – Montage

- Die Funktion des Drucktransducers ist unabhängig von der Einbaulage.
- Zum Schutz des Gewindes und der Druckmembran darf die Schutzkappe am Gewindestutzen erst kurz vor dem Einbau entfernt werden.
- Der Drucktransducer ist nach den gleichen Richtlinien wie ein Manometer zu montieren. Wir empfehlen die Verwendung von Absperrhähnen und Wassersackrohren.
- Beim Einbau ist darauf zu achten, dass kein Tropfwasser in das Gehäuse eindringen kann.
- Einsatzgrenzen für Sauerstoff beachten (bei FKM Viton/O_2 gemäß BAM-Liste).
- Bei Anwendungen in explosionsfähiger Atmosphäre der Zone 2 (Zündschutzart Ex nA), Gehäuse vor Schlageinwirkung schützen.

en – Mounting

- The function of the transducer is independent of mounting orientation.
- To protect the thread and pressure diaphragm from damage, the protective cover on the threaded nozzle should be removed just before installation only.
- The pressure transducer is to be mounted like a manometer. The guidelines are identical. Isolating valves and water pocket pipes should be used.
- When installing, ensure that no water enters the housing.
- Note the application limits for oxygen (for FKM Viton/O_2 as per BAM list).
- In the event of applications in a Zone 2 explosive atmosphere (Ex nA explosion protection) protect the housing from impact.

fr – Montage

- Le fonctionnement du transducteur de pression est indépendant de son implantation.
- Afin de protéger le filetage et la membrane, ne retirer le capot de protection, placé sur le raccord fileté, qu'au moment du montage.
- Le transducteur de pression doit être monté conformément aux directives concernant les manomètres. Nous recommandons l'utilisation de robinets d'isolement et de siphons.
- Lors du montage, veiller à ce qu'il n'y ait pas d'infiltration d'eau dans le boîtier.
- Tenir compte des limites d'utilisation sur l'oxygène (pour FKP Viton/O_2 selon liste BAM).
- Les applications en atmosphère explosible de zone 2 (mode de protection antidéflagrant Ex nA), protéger le boîtier contre les chocs.

es - Montaje

- El funcionamiento del transmisor de presión es independiente de la orientación de montaje.
- No retirar la protección del casquillo roscado hasta el momento previo a su instalación para evitar dañar la rosca o el diafragma de presión.
- El transmisor de presión se deberá montar como un manómetro. El procedimiento es el mismo. Utilizar válvulas de corte y sifón.
- Durante la instalación asegurar que no entre agua en la caja.
- Observar los límites de utilización en oxígeno (para FKP Viton/O_2 según lista BAM).
- En las aplicaciones en atmósferas con riesgo de explosión de la zona 2 (tipo de protección contra ignición Ex nA) se debe proteger la carcasa contra el efecto de los impactos.

it - Montaggio

- Il funzionamento del trasduttore non dipende dalla posizione di montaggio.
- Per proteggere la filettatura e la membrana di pressione da eventuali danneggiamenti, eliminare il coperchio di protezione dell'ugello filettato solo immediatamente prima dell'installazione.
- Il trasduttore di pressione deve essere montato come un manometro. Utilizzare solo valvole di arresto e tubi separatori d'acqua.
- Durante l'installazione, assicurarsi che non entri acqua nella custodia.
- Osservare i limiti operativi per ossigeno (per FKM Viton/O_2 in accordo con lista BAM).
- Per l'utilizzo in ambienti a rischio di esplosione della zona 2 (Protezione antideflagrante Ex nA), proteggere le custodie contro gli urti.

nl - Montage

- Het functioneren van de Druk-transducer is onafhankelijk van de montagepositie.
- Ter bescherming van de buite-ndraad en het membraan moet de beschermhuls pas vlak voor de montage verwijderd worden.
- De Druk-transducer moet identiek als een manometer gemonteerd worden. De richtlijnen t.a.v. gebruik van afsluitkranen, afstandsstukken en watersloten moeten worden aangehouden.
- Bij installatie ervoor zorgen dat er geen water in de behuizing kan komen, ook niet via de connector/wartel.
- Toepassingen in zuurstof bekijken (met FKM Viton/O_2 conform BAM lijst).
- Bescherm de behuizing tegen schokken bij toepassingen in explosiegevaarlijke atmosferen zone 2 (ontstekingsklasse Ex nA).

de - Elektrischer Anschluss
Stecker-Version

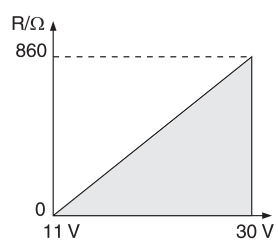
en - Electrical Connection
Plug version

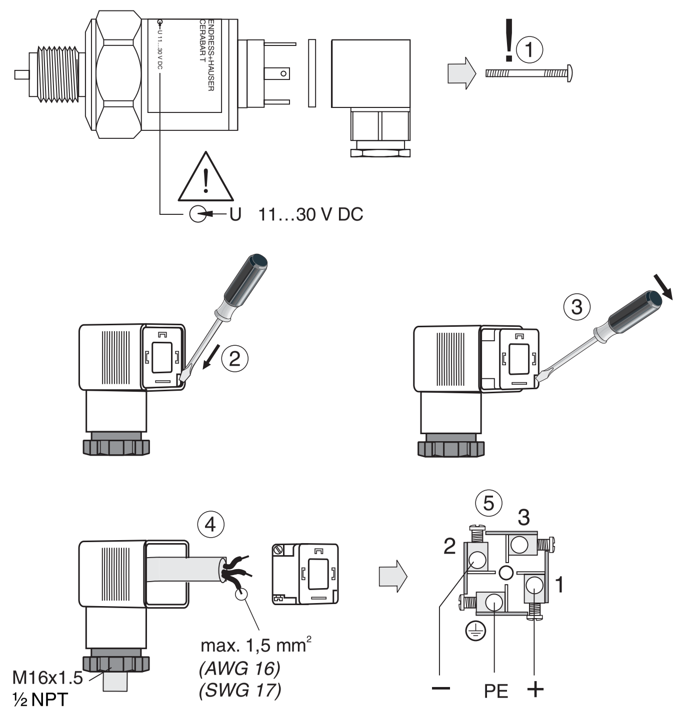
fr - Raccordement électrique
Version connecteur

es - Conexión eléctrica
Con conector

it - Collegamento elettrico
Spina

nl - Elektrische aansluiting
Steker-versie





de - Elektrischer Anschluß
Kabel-/Stecker-Version

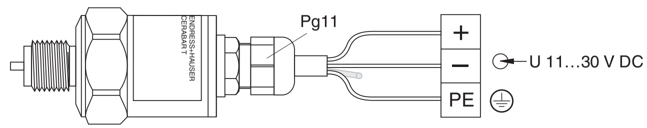
en - Electrical Connection
Cable/plug version

fr - Raccordement électrique
Version câble/connecteur

es - Conexión eléctrica
Cable/conector

it - Collegamento elettrico
Cavo/spina

nl - Elektrische aansluiting
Kabel-/steker-versie



de - Referenzluft- Zuführung
Nicht verschließen! Vor Wasser schützen!

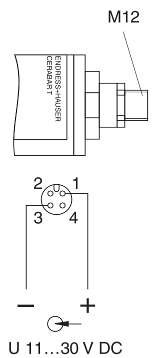
en - Reference air tube
Do not close! Protect from water!

fr - Mise à l'atmosphère
Ne pas boucher! Protéger de l'eau!

es - Tubo de compensación de presión atmosférica
No tapar! Proteger del agua!

it - Ingresso aria di riferimento
Non chiudere! Proteggere dall'acqua!

nl - Drukvereffening
Niet laten vervuilen en beschermen tegen vocht!



de + = rot; – = schwarz, PE = grün/gelb
en + = red; – = black, PE = green/yellow
fr + = rouge; – = noir, PE = vert/jaune
es + = rojo, – = negro, PE = verde/amarillo
it + = rosso, – = nero, PE = verde/giallo
nl + = rood; – = zwart, PE = groen/geel

de – Einsatzbedingungen

- Umgebungstemperatur: –20…85 °C
- Lagerungstemperatur: –50…100 °C
- Meßstofftemperaturgrenze: max. 100 °C
- Meßstoffdruckgrenze: p_{max}
- Geräte mit CSA GP-Zulassung dürfen nur mit einer SELV oder Class 2 Spannungsversorgung betrieben werden.

en – Operating Conditions

- Ambient temperature range: –20…85°C
- Storage temperature range: –50…100°C
- Limiting temperature range: max. 100°C
- Limiting pressure range: p_{max}
- Devices with CSA GP approval may only be operated with a SELV or Class 2 power supply.

fr – Conditions d'utilisation

- Température ambiante: –20…85 °C
- Température de stockage: –50…100 °C
- Limite de température du produit: max. 100 °C
- Limite de pression du produit: p_{max}
- Les appareils avec agrément CSA GP ne doivent être utilisés qu'avec une tension d'alimentation SELV ou Class 2.

es – Condiciones de operación

- Rango de temperatura ambiental: –20…85 °C
- Rango de temperatura de almacenamiento: –50…100 °C
- Temperatura máxima de trabajo: máx. 100 °C
- Presión máx. de trabajo: p_{max}
- Los equipos con la certificación CSA GP sólo pueden trabajar con alimentación de clase 2 o SELV.

it – Condizioni operative

- Temperatura ambiente: –20…85 °C
- Temperatura per la conservazione in magazzino: –50…100 °C
- Temperatura limite del prodotto: max. 100 °C
- Pressione limite del prodotto: p_{max}
- Strumenti con approvazione CSA GP possono essere alimentati solo con unità tipo SELV o Classe 2

nl – Omgevingscondities

- Omgevingstemperatuur: –20…+85 °C
- Opslagtemperatuur: –50…100 °C
- Producttemp. : max. 100 °C
- max. procesdruk: p_{max}
- Instrumenten met een CSA GP certificaat mogen uitsluitend via een SELV of een klasse 2 voeding gevoed worden.

www.endress.com/worldwide

KA00085P/00/A6/13.12   71158704/CCS/FM9

71158704

MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

ENDRESS + HAUSER

CERABAR S PMC71, PRESSURE TRANSMITTER

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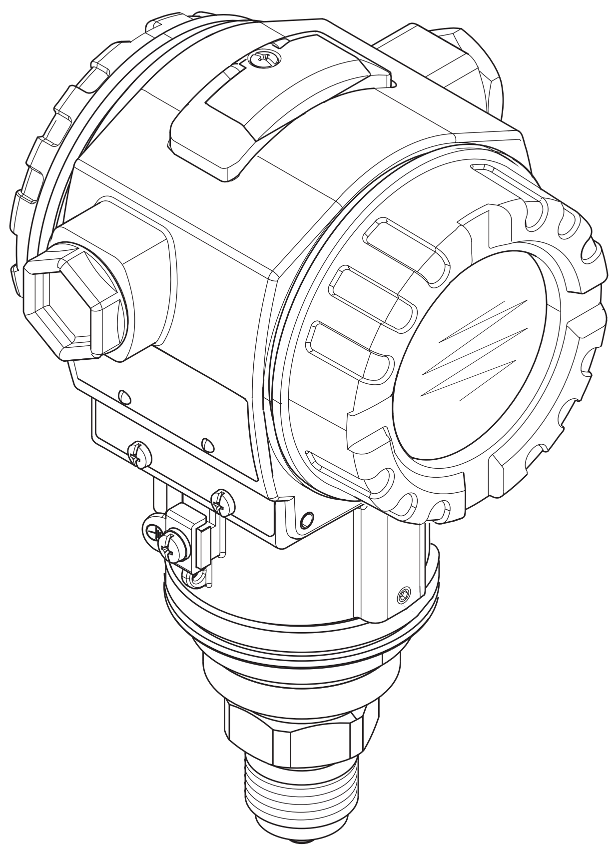
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

Cerabar S PMC71, PMP71, PMP75

Process pressure measurement

HART COMMUNICATION PROTOCOL

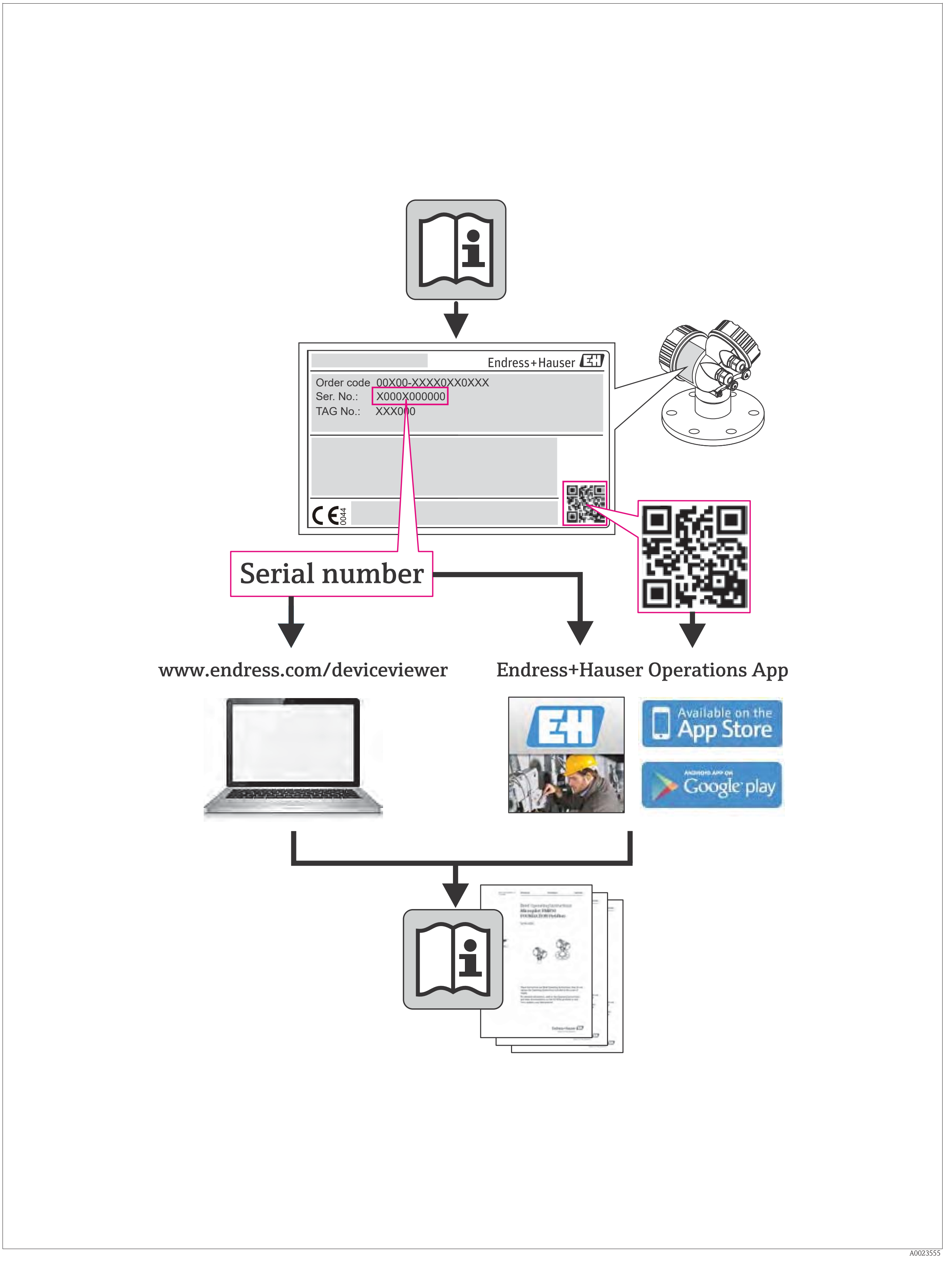


BA00271P/00/EN/18.14
71270361

valid from Software version:
02.20.zz

Endress+Hauser

People for Process Automation


Endress+Hauser
Order code 00X00-XXXX0XX0XXX
Ser. No.: X000X000000
TAG No.: XXX000
0044
Serial number
www.endress.com/deviceviewer
Endress+Hauser Operations App
Available on the App Store
Google play

A0023555

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1.2 Installation, commissioning and operation 4
1.3 Operational safety and process safety 4
1.4 Notes on safety conventions and icons 5

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1 Safety instructions

1.1 Designated use

The Cerabar S is a pressure transmitter for measuring pressure and level.

The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated.

1.2 Installation, commissioning and operation

The device has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise, e.g. product overflow due to incorrect installation or calibration. For this reason, the instrument must be installed, connected, operated and maintained according to the instructions in this manual: personnel must be authorised and suitably qualified. The manual must have been read and understood, and the instructions followed. Modifications and repairs to the device are permissible only when they are expressly approved in the manual. Pay particular attention to the technical data on the nameplate.

1.3 Operational safety and process safety

Alternative monitoring measures must be taken to ensure operational safety and process safety during configuration, testing and maintenance work on the device.

1.3.1 Hazardous areas (optional)

Devices for use in hazardous areas are fitted with an additional nameplate (→ 🗎 6). If the device is to be installed in an explosion hazardous area, then the specifications in the certificate as well as all national and local regulations must be observed. The device is accompanied by separate "Ex documentation", which is an integral part of this Operating Instructions. The installation regulations, connection values and Safety Instructions listed in this Ex document must be observed. The documentation number of the related Safety Instructions is also indicated on the additional nameplate.

- Ensure that all personnel are suitably qualified.

1.3.2 Functional Safety SIL3 (optional)

If using devices for applications with safety integrity, the Functional Safety Manual (SD00190P) must be observed thoroughly.

1.4 Notes on safety conventions and icons

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Safety conventions	
	Warning! A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument.
	Caution! Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument.
	Note! A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.
	Device certified for use in explosion hazardous area If the device has this symbol embossed on its nameplate, it can be installed in an explosion hazardous area or a non-explosion hazardous area, according to the approval.
	Explosion hazardous area Symbol used in drawings to indicate explosion hazardous areas. – Devices used in hazardous areas must possess an appropriate type of protection.
	Safe area (non-explosion hazardous area) Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. – Devices used in hazardous areas must possess an appropriate type of protection. Lines used in hazardous areas must meet the necessary safety-related characteristic quantities.
	Direct voltage A terminal to which or from which a direct current or voltage may be applied or supplied.
~	**Alternating voltage** A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied.
	Grounded terminal A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system.
	Protective grounding (earth) terminal A terminal which must be connected to earth ground prior to making any other connection to the equipment.
	Equipotential connection (earth bonding) A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice.
t >85°C	**Temperature resistance of the connection cables** States, that the connection cables must be resistant to a temperature of at least 85 °C (185 °F).
	Safety instruction For safety instructions refer to the manual for the appropriate instrument version.

2 Identification

2.1 Product identification

The following options are available for identification of the measuring device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in W@M Device Viewer (www.endress.com/deviceviewer): All information about the measuring device is displayed.

For an overview of the technical documentation provided, enter the serial number from the nameplates in the W@M Device Viewer (www.endress.com/deviceviewer).

2.2 Device designation

2.2.1 Nameplate

Note!
- The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of 20°C (68°F) or 100°F (38 °C) for ASME flanges.
- The pressure values permitted at higher temperatures can be found in the following standards:
  – EN 1092-1: 2001 Tab. 18 [1)]
  – ASME B 16.5a – 1998 Tab. 2-2.2 F316
  – ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  – JIS B 2220
- The test pressure corresponds to the over pressure limit (OPL) of the device = MWP x 1.5 [2)].
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.

1) With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.
2) The equation does not apply for PMP71 and PMP75 with a 40 bar (600 psi) or a 100 bar (1500 psi) measuring cell.

Aluminium and stainless steel housing (T14)

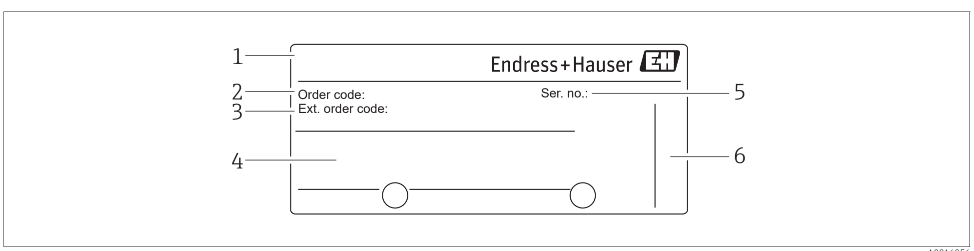


Fig. 1: Nameplate

1 Device name
2 Order code (for re-orders)
3 Extended order code (complete)
4 Technical data
5 Serial number (for identification)
6 Address of manufacturer

Devices for use in hazardous areas are fitted with an additional nameplate.

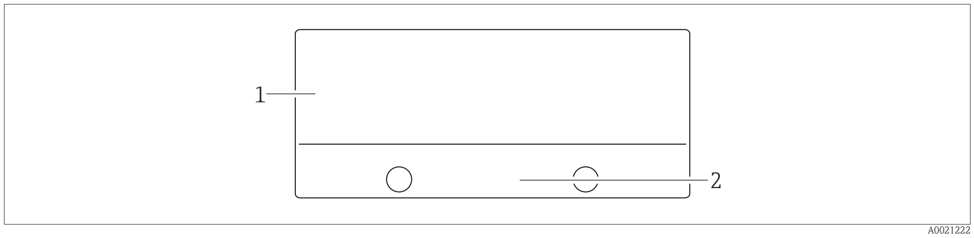


Fig. 2: Additional nameplate

1 Approval-specific information
2 Document number for safety instructions or drawing number

Devices suitable for oxygen applications or with PVDF process connection are fitted with an additional nameplate.

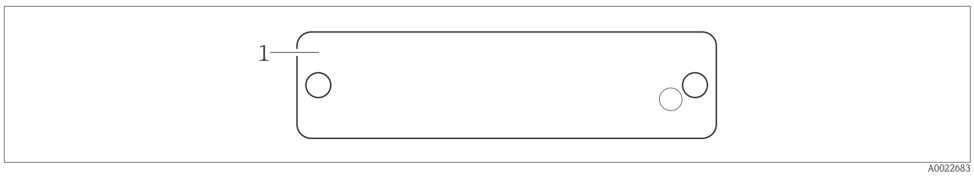


Fig. 3: Additional nameplate

1 Application limits

Hygenic stainless steel housing (T17)

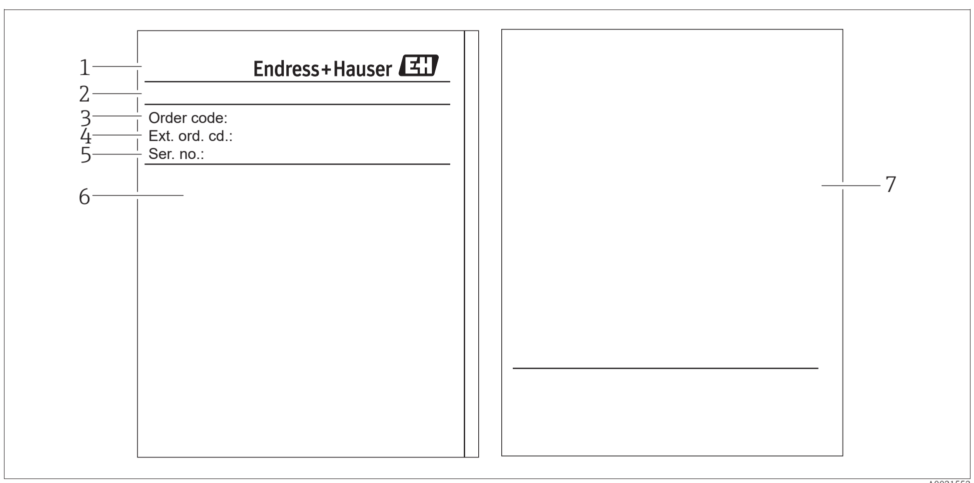


Fig. 4: Nameplate

1 Device name
2 Address of manufacturer
3 Order code (for re-orders)
4 Extended order code (complete)
5 Serial number (for identification)
6 Technical data
7 Approval-specific information and document number for safety instructions or drawing number

2.2.2 Identifying the sensor type

See parameter "Sensor Meas.Type" in Operating Instruction BA00274P.

2.3 Scope of delivery

The scope of delivery comprises:
- Cerabar S pressure transmitter
- For devices with the "HistoROM/M-DAT" option:
  CD-ROM with Endress+Hauser operating program
- Optional accessories

Documentation supplied:
- The Operating Instructions BA00271P and BA00274P are available via the Internet.
  → See: www.endress.com → Download.
- Brief Operating Instructions KA01019P
- Leporello KA00218P
- Final inspection report
- Also Safety Instructions with ATEX, IECEx and NEPSI devices
- Optional: factory calibration form, test certificates

2.4 Certificates and approvals

CE mark, declaration of conformity

The device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives. Endress+Hauser confirms the successful testing of the device by affixing to it the CE mark.

2.5 Registered trademarks

KALREZ®, VITON®, TEFLON®
Registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP®
Registered trademark of Ladish & Co., Inc., Kenosha, USA

HART®
Registered trademark of the HART Communication Foundation, Austin, USA.

GORE-TEX®
Registered trademark of W.L. Gore & Associates, Inc., USA

3 Installation

3.1 Incoming acceptance, transport, storage

3.1.1 Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.1.2 Transport

Caution!
Follow the safety instructions and transport conditions for devices of more than 18 kg (39.69 lbs).
Transport the measuring device to the measuring point in its original packaging or at the process connection.

3.1.3 Storage

The device must be stored in a dry, clean area and protected against damage from impact (EN 837-2).

Storage temperature range:
- –40 °C to +90°C (–40 °F to +194°F)
- On-site display: –40 °C to +85°C (–40 °F to +185°F)
- Separate housing: –40 °C to +60°C (–40 °F to +140°F)

3.2 Installation conditions

3.2.1 Dimensions

For dimensions, please refer to "Mechanical construction" section in TI00383P.

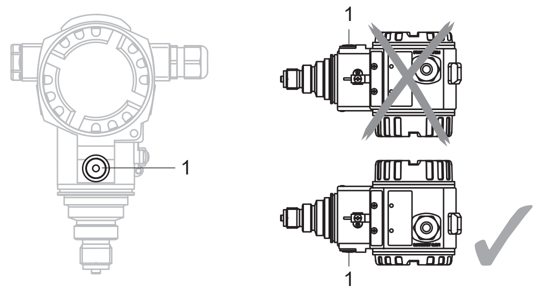
3.3 Installation instructions

Note!
- Due to the orientation of the Cerabar S, there may be a shift in the measured value, i.e. when the container is empty, the measured value does not display zero. You may correct this zero point shift either directly on the device using the "E"-key or by remote operation. See
  → 26, "Function of the operating elements – on-site display not connected" or
  → 41, "Position adjustment".
- For PMP75, please refer to → 12, "Installation instructions for devices with diaphragm seals – PMP75".
- To ensure optimal readability of the on-site display, it is possible to rotate the housing up to 380°.
  → 18, "Rotating the housing".
- Endress+Hauser offers a mounting bracket for installing on pipes or walls.
  → 15, "Wall and pipe-mounting (optional)".

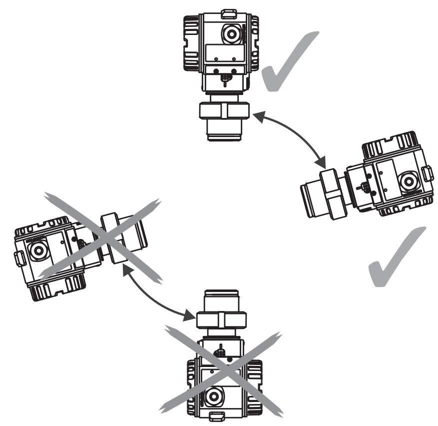
3.3.1 Installation instructions for devices without diaphragm seals – PMP71, PMC71

Note!
- If a heated Cerabar S is cooled during the cleaning (e.g. by cold water), a vacuum develops for a short time, whereby water can penetrate the sensor through the pressure compensation (1).

If this is the case, mount the sensor with the pressure compensation (1) pointing downwards.



- Keep the pressure compensation and GORE-TEX® filter (1) free from contaminations and water.
- Cerabar S without diaphragm seal are mounted as per the norms for a manometer (DIN EN 837-2). We recommend the use of shut-off devices and siphons. The orientation depends on the measuring application.
- Do not clean or touch process isolating diaphragm seals with hard or pointed objects.
- The device must be installed as follows in order to comply with the cleanability requirements of the ASME-BPE (Part SD Cleanability):



Pressure measurement in gases

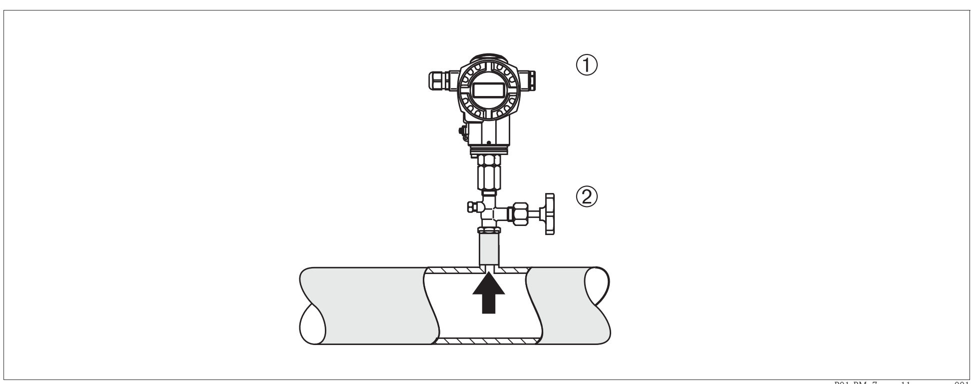


Fig. 5: Measuring arrangement for pressure measurement in gases

1 Cerabar S
2 Shut-off device

Mount Cerabar S with shut-off device above the tapping point so that any condensate can flow into the process.

Pressure measurement in steams

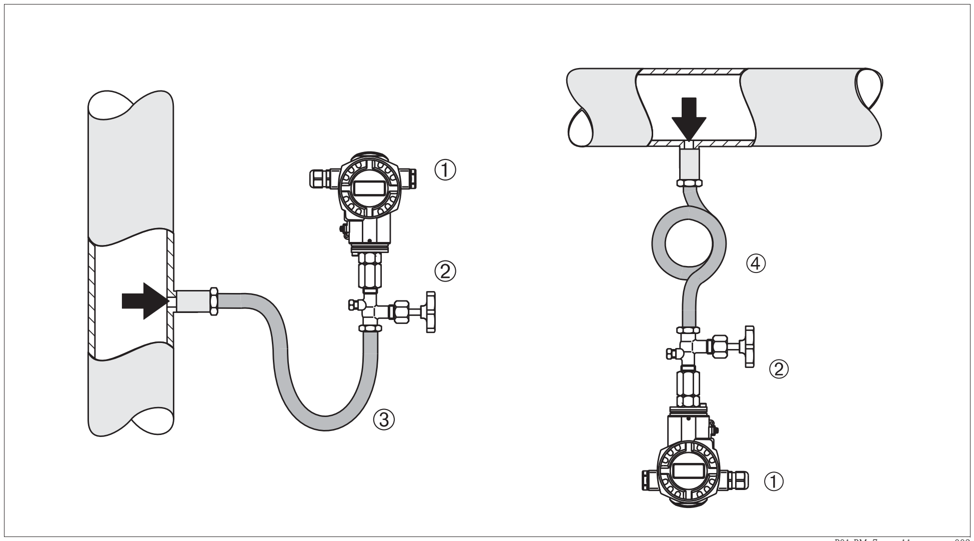


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Fig. 6: Measuring arrangement for pressure measurement in steams

1 Cerabar S
2 Shut-off device
3 U-shaped siphon
4 Circular siphon

- Use siphons for pressure measurement in steam. The siphon reduces the temperature to almost ambient temperature. Preferably mount the Cerabar S with the siphon below the tapping point. Advantages:
  – defined water column only causes minimal/negligible measured errors
  – only minimal/negligible thermal effects on the device
  Mounting above the tapping point is also possible. Pay attention to the maximum permitted ambient temperature of the transmitter!
- Fill the siphon with liquid before commissioning.

Pressure measurement in liquids

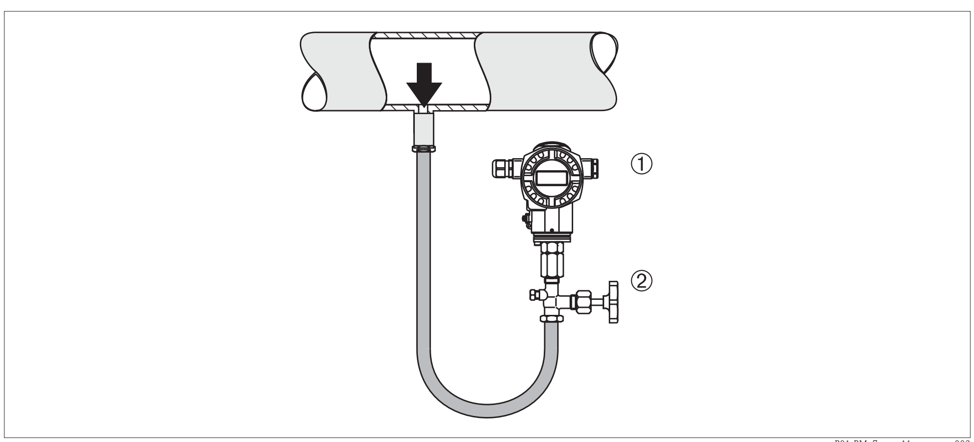

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Fig. 7: Measuring arrangement for pressure measurement in liquids

1 Cerabar S
2 Shut-off device

Mount Cerabar S with shut-off device below or at the same level as the tapping point.

Level measurement

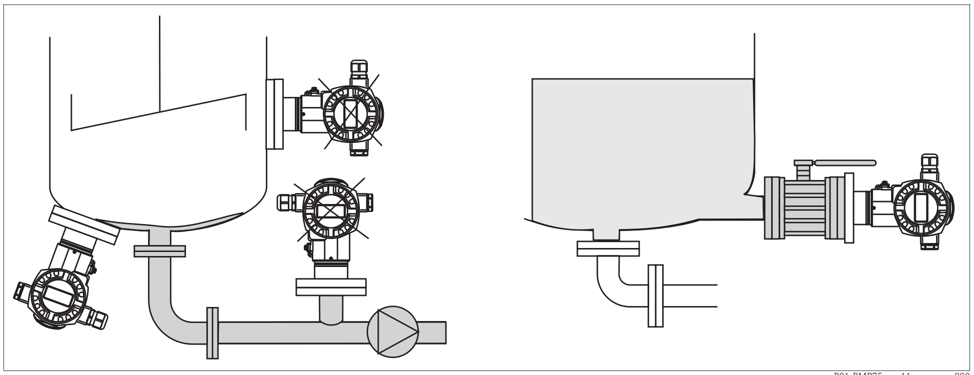


Fig. 8: Measuring arrangement for level

- Mount Cerabar S below the lowest measuring point.
- Do not mount the device at the following positions:
  In the fill flow, in the tank outlet or at a point in the container which could be affected by pressure pulses from an agitator.
- Do not mount the device in the suction area of a pump.
- The calibration and functional test can be carried out more easily if you mount the device after a shut-off device.

PVDF adapter

Note!
For instruments with PVDF adapter, a maximum torque of 7 Nm (5.16 lbf ft) is permitted.
The thread connection may become loose at high temperatures and pressures. This means that the integrity of the thread must be checked regularly and may need to be tightened using the torque given above. Teflon tape is recommended for sealing with the 1/2 NPT thread.

3.3.2 Installation instructions for devices with diaphragm seals – PMP75

Note!
- The Cerabar S with diaphragm seal is screwed in, flanged or clamped, depending on the type of diaphragm seal.
- The diaphragm seal and the pressure sensor together form a closed an calibrated system which is filled with filling fluid through a hole in the upper part. This hole is sealed and not to be opened.
- Do not clean or touch process isolating diaphragm of the diaphragm seals with hard or pointed objects.
- Do not remove the protection of the process isolating diaphragm until shortly before installation.
- When using a mounting bracket, sufficient strain relief must be ensured for the capillaries in order to prevent the capillary bending down (bending radius ≥ 100 mm (3.94 in)).
- Please note that the hydrostatic pressure of the liquid columns in the capillaries can cause zero point shift. The zero point shift can be corrected. → 📄 41, "Position adjustment".
- Please note the application limits of the diaphragm seal filling oil as detailed in the Technical Information for Cerabar S TI00383P, Section "Planning instructions for diaphragm seal systems".

In order to obtain more precise measurement results and to avoid a defect in the device, mount the capillaries as follows:
- Vibration-free (in order to avoid additional pressure fluctuations)
- Not in the vicinity of heating or cooling lines
- Insulate if the ambient temperature is below ore above the reference temperature
- With a bending radius of ≥100 mm (3.94 in).

Vacuum application

For applications under vacuum, Endress+Hauser recommends mounting the pressure transmitter underneath the diaphragm seal. A vacuum load of the diaphragm seal caused by the presence of filling oil in the capillaries is hereby prevented.

When the pressure transmitter is mounted above the diaphragm seal, the maximum height difference H1 in accordance with the illustration below on the left must not be exceeded.
The maximum height difference is dependent on the density of the filling oil and the smallest ever pressure that is permitted to occur at the diaphragm seal (empty container), see illustration below, on the right.

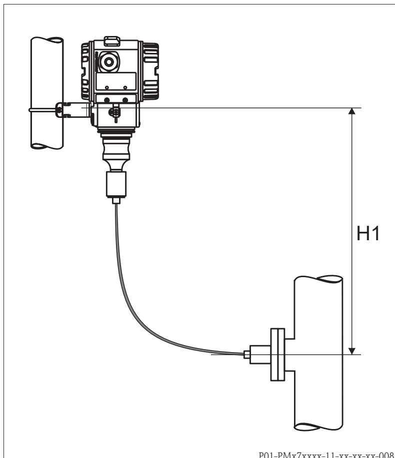


Fig. 9: Installation above the diaphragm seal

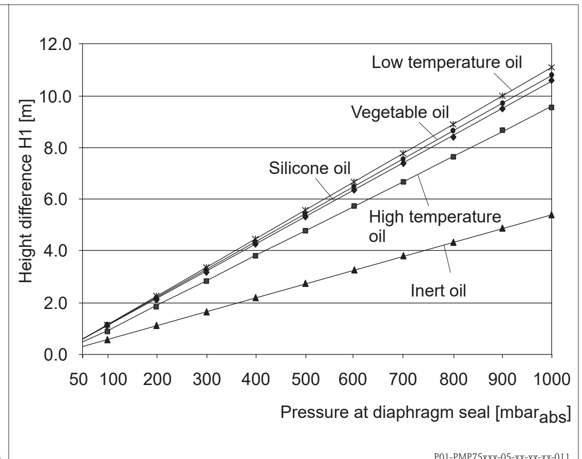
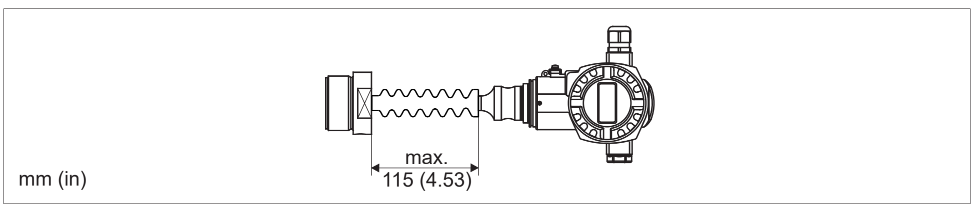


Fig. 10: Diagram of maximum installation height above the diaphragm seal for vacuum applications dependent on the pressure at the diaphragm seal

Mounting with temperature isolator



Endress+Hauser recommends the use of temperature separators in the event of constant extreme fluid temperatures which lead to the maximum permissible electronics temperature of +85 °C (+185 °F) being exceeded. To minimise the influence of rising heat, Endress+Hauser recommends the device be mounted horizontally or with the housing pointing downwards. The additional installation height also brings about a zero point shift of approx. 21 mbar (0.315 psi) due to the hydrostatic columns in the temperature isolator. You can correct this zero point shift. See also
→ 🗎 26, "Function of the operating elements – on-site display not connected" or
→ 🗎 41, "Position adjustment".

3.3.3 Seal for flange mounting

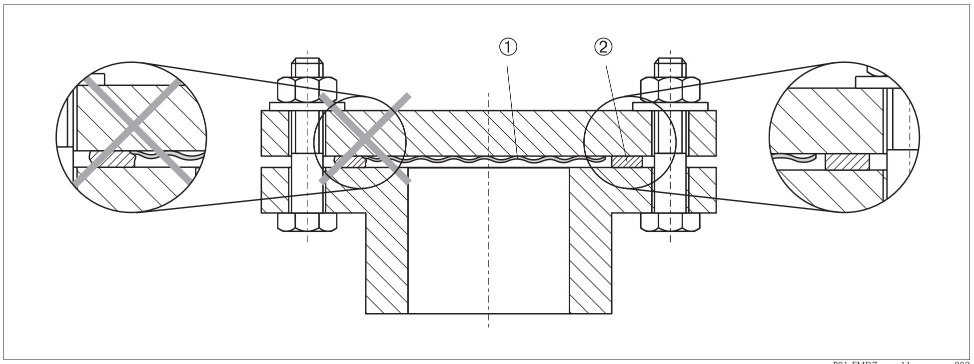


Fig. 11: Mounting the versions with flange or diaphragm seal

1 Process isolating diaphragm
2 Seal

Warning!
The seal is not allowed to press on the process isolating diaphragm as this could affect the measurement result.

3.3.4 Installation with heat insulation – PMC71 high temperature version and PMP75

The devices must only be insulated up to a certain height. The maximum permitted insulation height is labelled on the devices and applies to an insulation material with a specific heat conductivity and to the maximum permitted ambient and process temperature (see following table). The data were determined under the most critical application "quiescent air".

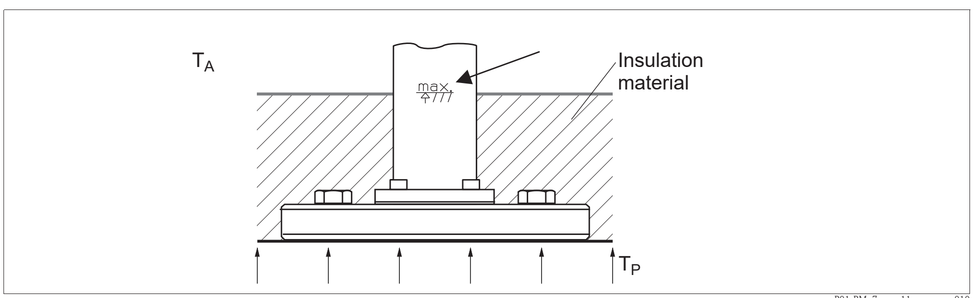


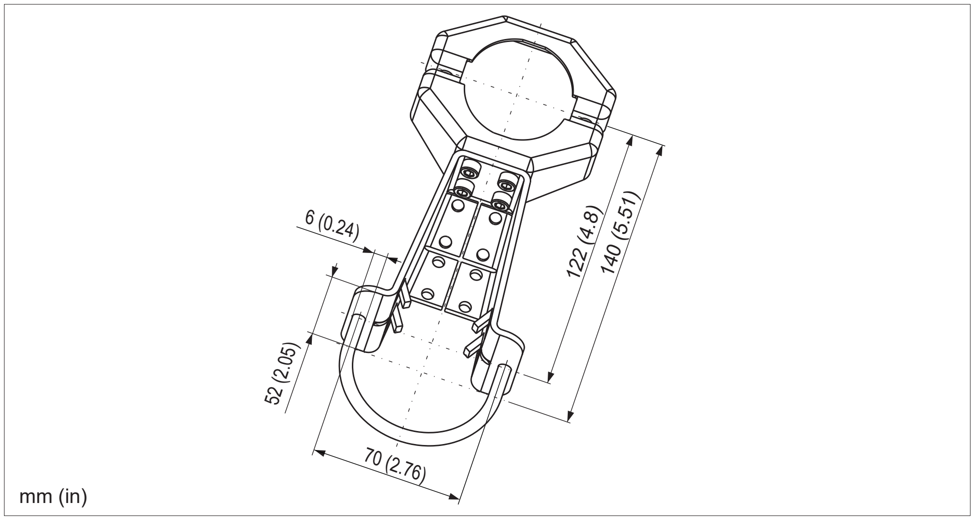
Fig. 12: Maximum insulation height, here e.g. PMC71 with flange

	PMC71	PMP75
Ambient temperature (T_A)	≤ 70°C (158°F)	≤ 70°C (158°F)
Process temperature (T_P)	≤ 150°C (302°F)	≤ 400°C (752°F) 1))
Heat conductivity Insulation material	≤ 0,04 W/(m x K)	

1) Depending on the diaphragm seal filling oil used (see Technical Information TI00383P Cerabar S)

3.3.5 Wall and pipe-mounting (optional)

Endress+Hauser offers a mounting bracket for installing on pipes or walls.



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Please note the following when mounting:
- Devices with capillary lines: mount capillaries with a bending radius of ≥ 100 mm (3.94 in).
- In the case of pipe mounting, the nuts on the bracket must be tightened uniformly with a torque of at least 5 Nm (3.69 lbf ft).

3.3.6 Assembling and mounting the "separate housing" version

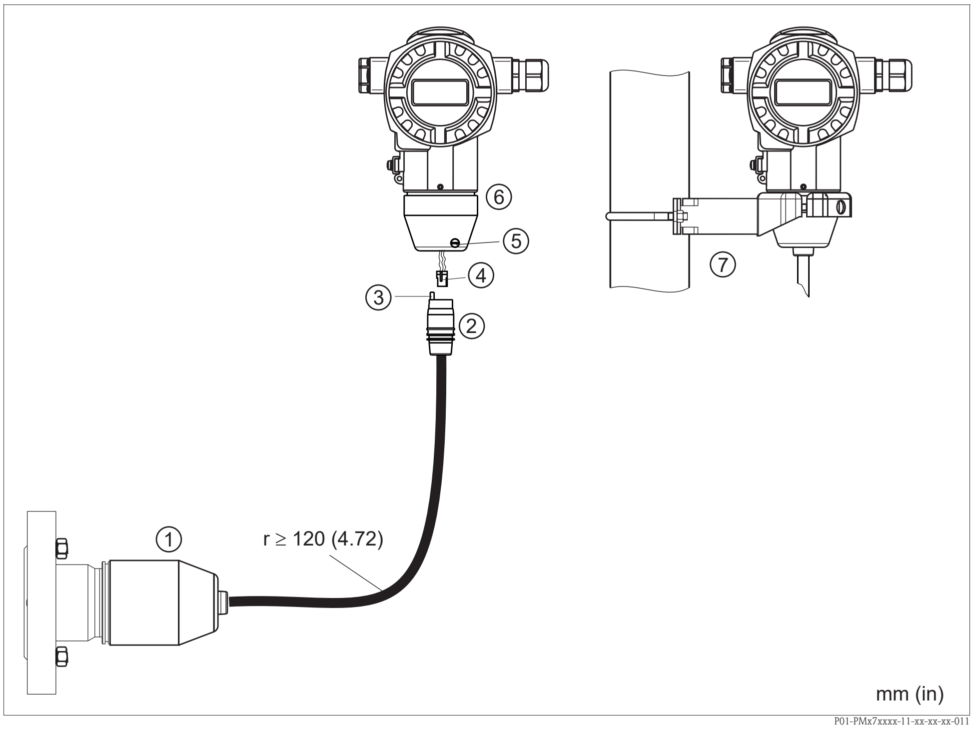

Fig. 13: "Separate housing" version

1 In the "separate housing" version, the sensor is supplied with process connection and cable fitted.
2 Cable with connection jack
3 Pressure compensation
4 Plug
5 Locking screw
6 Housing fitted with housing adapter, included
7 Mounting bracket suitable for wall and pipe mounting, included

Assembly and mounting

1. Connect plug (item 4) into the corresponding connection jack of the cable (item 2).
2. Plug the cable into the housing adapter (item 6).
3. Tighten the locking screw (item 5).
4. Mount the housing on a wall or pipe using the mounting bracket (item 7). When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbf ft). Mount the cable with a bending radius (r) ≥ 120 mm (4.72 in).

3.3.7 PMP71, version prepared for diaphragm seal mount – welding recommendation

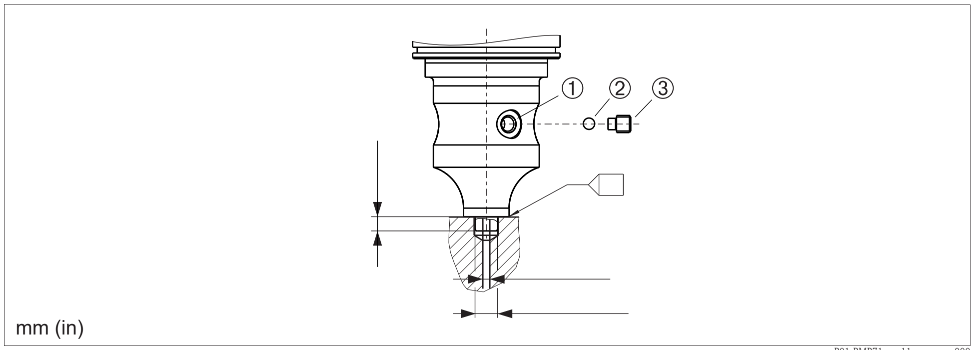

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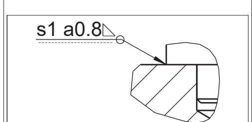
Fig. 14: Version U1: prepared for diaphragm seal mount

1 Hole for filling fluid
2 Bearing
3 Threaded pin
A1 See the following table "Welding recommendation"

Welding recommendation

For the "U1 Prepared for diaphragm seal mount" version in feature 70 "Process connection; Material" in the order code of up to including 40 bar (600 psi)-sensors, Endress+Hauser recommends welding on the diaphragm seal as follows: the total welding depth of the fillet weld is 1 mm (0.04 in) at an external diameter of 16 mm (0.63 in). Welding is performed according to the WIG method.

Consecutive seam no.	**Sketch/welding groove shape, dimension as per DIN 8551**	**Base material matching**	**Welding process DIN EN ISO 24063**	**Welding position**	**Inert gas, additives**
A1 for sensors ≤ 40 bar (600 psi)	 P01-PMP71xxx-11-xx-xx-xx-001	Adapter made of 316L (1.4435) to be welded to diaphragm seal made of 316L (1.4404/1.4435)	141	PB	Inert gas Ar/H 95/5 Additive: 1.4430 (ER 316L Si)

3.3.8 Rotating the housing

The housing can be rotated up to 380° by loosening the Allen screw.

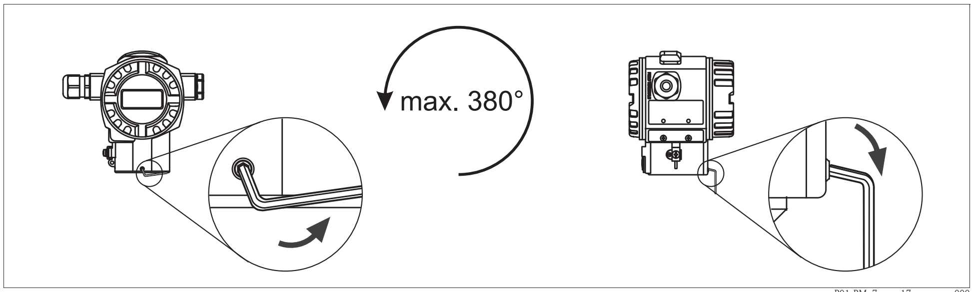


Fig. 15: Aligning the housing

– T14 housing: Loosen setscrew with a 2 mm (0.08 in) Allen key.
Hygenic T17 housing:Loosen setscrew with a 3 mm (0.12 in) Allen key.
– Rotate housing (max. up to 380°).
– Retighten setscrew with 1 Nm (0,74 lbf ft).

3.3.9 Closing the housing cover

Note!
When closing the housing cover, please ensure that the thread of the cover and housing are free from dirt, e.g. sand.If you feel any resistance when closing the cover, check the thread on both again to ensure that they are free from dirt.

Close cover on a hygenic stainless steel housing (T17)

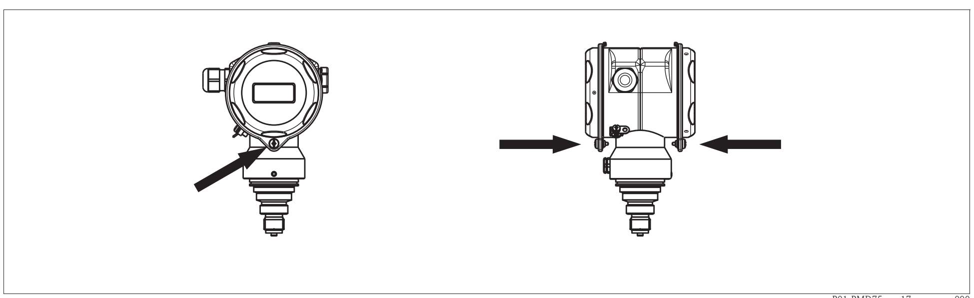


Fig. 16: Close cover

The covers for the terminal and electronics compartment are hooked into the casing and closed with a screw. These screws should be finger-tightened (2 Nm (1.48 lbf ft)) to the stop to ensure that the covers sit tightly.

3.4 Post-installation check

After installing the device, carry out the following checks:
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

4 Wiring

4.1 Connecting the device

Warning!
Risk of electric shock!
If the operating voltage is > 35 VDC: Dangerous contact voltage at terminals.
In a wet environment, do not open the cover if voltage is present.

Warning!
Limitation of electrical safety due to incorrect connection!
- Risk of electric shock and/or explosion in hazardous areas! In a wet environment, do not open the cover if voltage is present.
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- Devices with integrated overvoltage protection must be earthed.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- The supply voltage must match the supply voltage on the nameplate (→ 🗎 6, "Nameplate").
- Switch off the supply voltage before connecting the device.
- Remove housing cover of the terminal compartment.
- Guide cable through the gland. Preferably use twisted, screened two-wire cable.
- Connect device in accordance with the following diagram.
- Screw down housing cover.
- Switch on supply voltage.

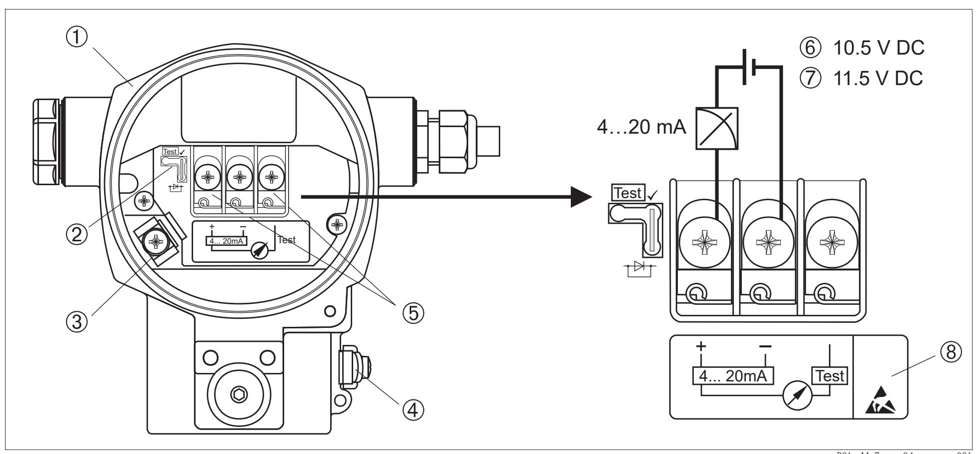


Fig. 17: Electrical connection 4 to 20 mA HART. Observe also → 🗎 21, "Supply voltage".

1 *Housing*
2 *Jumper for 4 to 20 mA test signal.*
→ 🗎 21, "Taking 4 to 20 mA test signal" part.
3 *Internal earth terminal*
4 *External earth terminal*
5 *4 to 20 mA test signal between plus and test terminal*
6 *Minimum supply voltage = 10.5 V DC, jumper is inserted in accordance with the illustration.*
7 *Minimum supply voltage = 11.5 V DC, jumper is inserted in "Test" position.*
8 *Devices with integrated overvoltage protection are labelled OVP (overvoltage protection) here.*

4.1.1 Devices with Harting plug Han7D

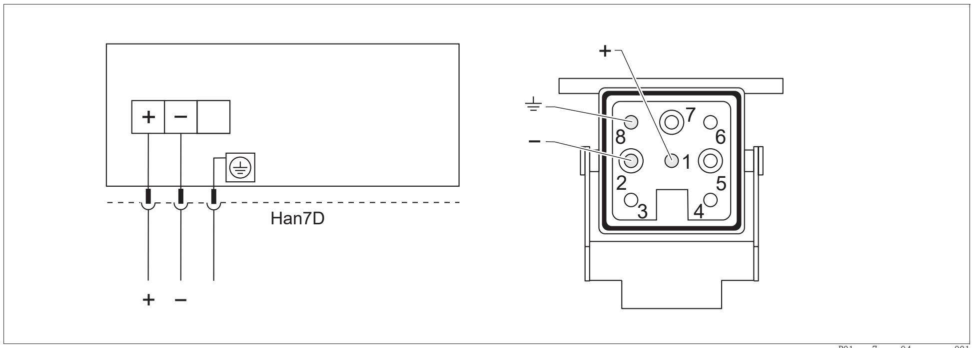


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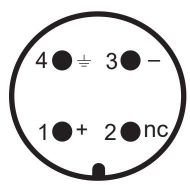
Fig. 18: Left: electrical connection for devices with Harting plug Han7D
Right: view of the plug connector at the device

4.1.2 Devices with M12 plug



PIN	Meaning
1	signal +
2	not used
3	signal -
4	ground

4.1.3 Connecting the cable version

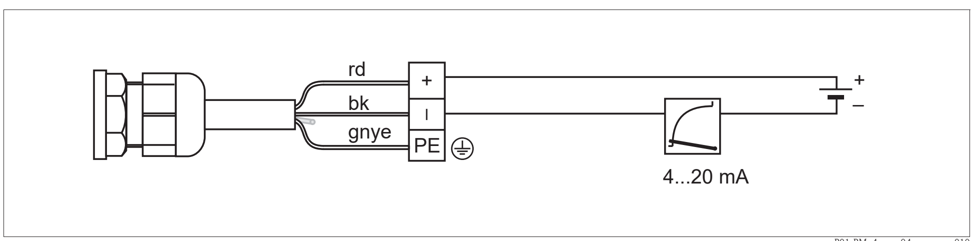


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Fig. 19: rd = red, bk = black, gnye = green-yellow

4.2 Connecting the measuring unit

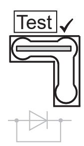
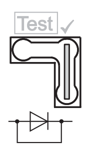
4.2.1 Supply voltage

Note!
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.

Electronic version	Jumper for 4 to 20 mA test signal in "Test" position (Delivery status)	Jumper for 4 to 20 mA test signal in "Non-Test" position
4 to 20 mA HART, for non-hazardous areas	11.5 to 45 V DC	10.5 to 45 V DC

Taking 4 to 20 mA test signal

A 4 to 20 mA signal may be measured via the positive and test terminal without interrupting the measurement. The minimum supply voltage of the device can be reduced by simply changing the position of the jumper. As a result, operation is also possible with lower voltage sources. To keep the measured error below 0.1 %, the current measuring device should display an internal resistance of < 0.7 Ω. Observe the position of the jumper in accordance with the following table.

Jumper position for test signal	Description
	– Taking 4 to 20 mA test signal via plus and test terminal: possible. (Thus, the output current can be measured without interruption via the diode.) – Delivery status – Minimum supply voltage: 11.5 V DC
	– Taking 4 to 20 mA test signal via plus and test terminal: not possible. – Minimum supply voltage: 10.5 V DC

4.2.2 Cable specification

- Endress+Hauser recommends using twisted, screened two-wire cables.
- Terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)
- Cable external diameter: 5 to 9 mm (0.2 to 0.35 in)

4.2.3 Load

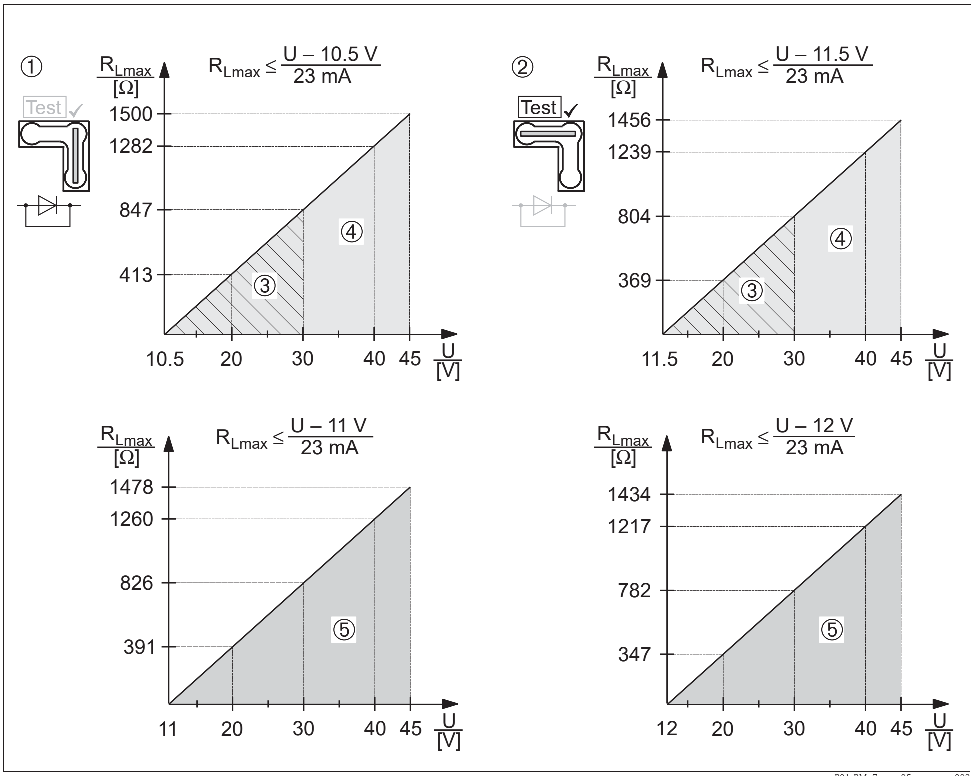


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Fig. 20: Load diagram, observe the position of the jumper and the explosion protection.
(→ 🗎 21, "Taking 4 to 20 mA test signal" part.)

1 *Jumper for the 4 to 20 mA test signal inserted in "Non-Test" position*
2 *Jumper for the 4 to 20 mA test signal inserted in "Test" position*
3 *Supply voltage 10.5 (11.5) to 30 V DC for 1/2 G, 1 GD, 1/2 GD, FM IS , CSA IS, IECEx ia, NEPSI Ex ia*
4 *Supply voltage10.5 (11.5) to 45 V DC for devices for non-hazardous areas, 1/2 D, 1/3 D, 2 G Ex d, 3 G Ex nA, FM XP, FM DIP, FM NI, CSA XP and CSA Dust-Ex, NEPSI Ex d*
5 *Supply voltage 11 (12) to 45 V DC for PMC71, Ex d[ia], NEPSI Ex d[ia]*
R_{Lmax} *Maximum load resistance*
U *Supply voltage*

Note!
When operating via a handheld terminal or via PC with an operating program, a minimum communication resistance of 250 Ω must exist within the loop.

4.2.4 Screening/potential matching

- You achieve optimum screening against disturbances if the screening is connected on both sides (in the cabinet and on the device). If you have to reckon with potential equalisation currents in the plant, only earth screening on one side, preferably at the transmitter.
- When using in hazardous areas, you must observe the applicable regulations.
  Separate Ex documentation with additional technical data and instructions is included with all Ex systems as standard.

4.2.5 Connecting Field Xpert SFX100

Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART current output (4-20mA).
For details refer to Operating Instructions BA00060S/04/EN.

4.2.6 Connecting Commubox FXA195

The Commubox FXA195 connects intrinsically safe transmitters with the HART protocol to a computer's USB port. This allows remote operation of the transmitter using Endress+Hauser's FieldCare operating program. Power is supplied to the Commubox through the USB port. The Commubox is also suitable for connection to intrinsically safe circuits. → See Technical Information TI00404F for further information.

4.2.7 Connecting Commubox FXA291/ToF Adapter FXA291 for operation via FieldCare

Connecting Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field instruments with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI00405C/07/EN.

Note!
For the device you need the "ToF Adapter FXA291" as an additional accessory.

Connecting ToF Adapter FXA291

The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook to the device. For details refer to KA00271F/00/A2.

4.3 Potential matching

Ex applications: Connect all devices to the local potential matching.
Observe the applicable regulations.

4.4 Overvoltage protection (optional)

Devices showing version "M" in feature 100 "Additional options 1" or feature 110 "Additional options 2" in the order code are equipped with overvoltage protection (see also Technical Information TI00383P "Ordering information".

- Overvoltage protection:
  - Nominal functioning DC voltage: 600 V
  - Nominal discharge current: 10 kA
- Surge current check î = 20 kA as per DIN EN 60079-14: 8/20 µs satisfied
- Arrester AC current check I = 10 A satisfied

Warning!
Devices with integrated overvoltage protection must be earthed.

4.5 Post-connection check

Perform the following checks after completing electrical installation of the device:

- Does the supply voltage match the specifications on the nameplate?
- Is the device properly connected (→ 19)?
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

As soon as voltage is applied to the device, the green LED on the electronic insert lights up for a few seconds or the connected on-site display lights up.

5 Operation

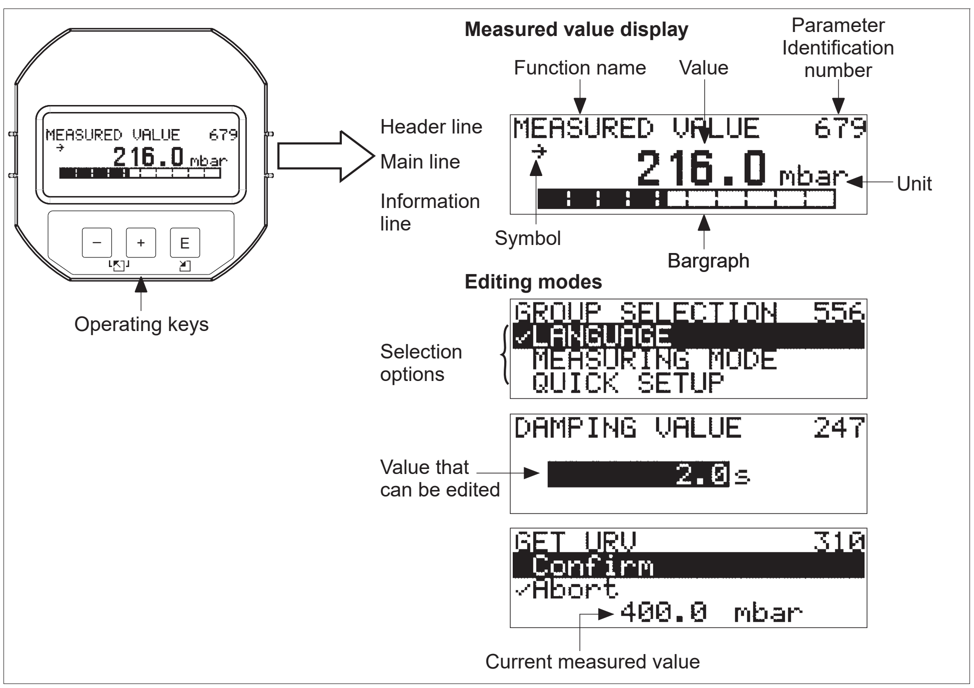
Feature 20 "Output; operation" in the order code provides you with information on the operating options available to you.

Versions in the order code		Operation
A	4 to 20 mA HART; external operation, LCD	Via on-site display and 3 keys on the exterior of the device
B	4 to 20 mA HART; internal operation, LCD	Via on-site display and 3 keys on the inside of the device
C	4 to 20 mA; internal operation	Without on-site display, 3 keys on the inside of the device

5.1 On-site display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation.
The on-site display shows measured values, dialog texts, fault messages and notice messages.
The display of the device can be turned in 90° steps. Depending on the installation position of the device, this makes it easy to operate the device and read the measured values.

Functions:
- 8-digit measured value display including sign and decimal point, bargraph for current display
- Simple and complete menu guidance thanks to separation of the parameters into several levels and groups
- Each parameter is given a 3-digit ID number for easy navigation
- Option for configuring the display according to individual requirements and desires, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators, etc.)
- Rapid and safe commissioning with the Quick Setup menus



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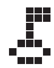
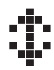
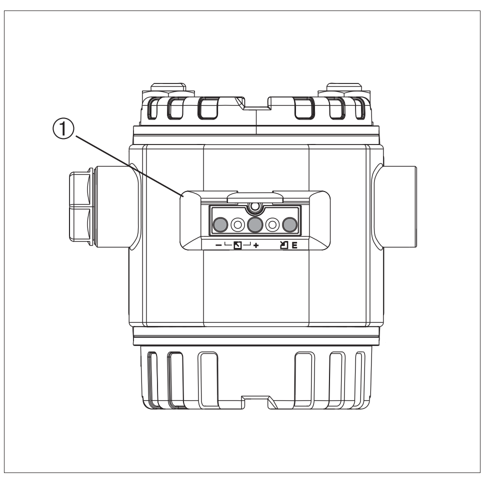
The following table illustrates the symbols that can appear on the on-site display. Four symbols can occur at one time.

Symbol	Meaning
	**Alarm symbol** – Symbol flashing: warning, device continues measuring. – Symbol permanently lit: error, device does not continue measuring. *Note:* The alarm symbol may overlie the tendency symbol.
	**Lock symbol** The operation of the device is locked. Unlock device, → 38.
	**Communication symbol** Data transfer via communication. *Note:* The alarm symbol may overlie the communication symbol.
	**Tendency symbol (increasing)** The measured value is increasing.
	**Tendency symbol (decreasing)** The measured value is decreasing.
	**Tendency symbol (constant)** The measured value has remained constant over the past few minutes.

5.2 Operating elements

5.2.1 Position of operating elements

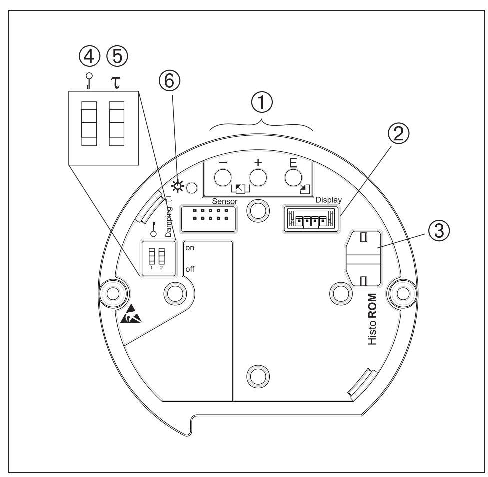
With regard to aluminium or stainless steel housings (T14), the operating keys are located either outside the device under the protection cap or inside on the electronic insert. In hygenic stainless steel housings (T17), the operating keys are always located inside on the electronic insert.



P01-PMx7xxxx-19-xx-xx-009

Fig. 21: Operating keys, external

1 Operating keys on the exterior of the device under the protective flap



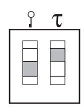
P01-xxxxxxxx-19-xx-xx-104

Fig. 22: Operating keys, internal

1 Operating keys
2 Slot for optional display
3 Slot for optional HistoROM®/M-DAT
4 DIP-switch for locking/unlocking measured-value-relevant parameters
5 DIP-switch for damping on/off
6 Green LED to indicate value being accepted

5.2.2 Function of the operating elements – on-site display not connected

Press and hold the key or the key combination for at least 3 seconds to execute the corresponding function. Press the key combination for at least 6 seconds for a reset.

Operating key(s)	Meaning
–	Adopt lower range value. A reference pressure is present at the device. See also → 27, "Pressure measuring mode" or → 28, "Level measuring mode".
+	Adopt upper range value. A reference pressure is present at the device. See also → 27, "Pressure measuring mode" or → 28, "Level measuring mode".
E	Position adjustment
+ and – and E	Reset all parameters. The reset via operating keys corresponds to the software reset code 7864.
+ and E	Copy the configuration data from the optional HistoROM®/M-DAT module to the device.
– and E	Copy the configuration data from the device to the optional HistoROM®/M-DAT module.
 P01-xxxxxxxx-19-xx-xx-xx-057	– DIP-switch 1: for locking/unlocking measured-value-relevant parameters Factory setting: off (unlocked) – DIP-switch 2: damping on/off, Factory setting: on (damping on)

5.2.3 Function of the operating elements – on-site display connected

Operating key(s)	Meaning
+	– Navigate upwards in the picklist – Edit the numerical values and characters within a function
–	– Navigate downwards in the picklist – Edit the numerical values and characters within a function
E	– Confirm entry – Jump to the next item
+ and E	Contrast setting of on-site display: darker
– and E	Contrast setting of on-site display: brighter
+ and –	ESC functions: – Exit edit mode without saving the changed value. – You are in a menu within a function group. The first time you press the keys simultaneously, you go back a parameter within the function group. Each time you press the keys simultaneously after that, you go up a level in the menu. – You are in a menu at a selection level. Each time you press the keys simultaneously, you go up a level in the menu. *Note:* The terms function group, level and selection level are explained in → 30, "General structure of the operating menu".

5.3 On-site operation – on-site display not connected

Note!
To operate the device with a HistoROM®/M-DAT module see → 32, "HistoROM®/M-DAT (optional)".

5.3.1 Pressure measuring mode

If no on-site display is connected, the following functions are possible by means of the three keys on the electronic insert or on the exterior of the device:

- Position adjustment (zero point correction)
- Setting lower range value and upper range value
- Device reset, → 26, "Function of the operating elements – on-site display not connected".

Note!

- The operation must be unlocked. → 37, "Locking/unlocking operation".
- The device is configured for the Pressure measuring mode as standard. You can switch measuring modes by means of the MEASURING MODE parameter. → 40, "Selecting language and measuring mode".
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

Carry out position adjustment.[1]		**Setting lower range value.**		**Setting upper range value.**	
Pressure is present at device.		Desired pressure for lower range value is present at device.		Desired pressure for upper range value is present at device.	
↓		↓		↓	
Press "E"-key for 3 s.		Press "–"-key for 3 s.		Press "+"-key for 3 s.	
↓		↓		↓	
Does the LED on the electronic insert light up briefly?		Does the LED on the electronic insert light up briefly?		Does the LED on the electronic insert light up briefly?	
Yes	No	Yes	No	Yes	No
↓	↓	↓	↓	↓	↓
Applied pressure for position adjustment has been accepted.	Applied pressure for position adjustment has not been accepted. Observe the input limits.	Applied pressure for lower range value has been accepted.	Applied pressure for lower range value has not been accepted. Observe the input limits.	Applied pressure for upper range value has been accepted.	Applied pressure for upper range value has not been accepted. Observe the input limits.

1) Observe "Warning", → 40, "Commissioning".

5.3.2 Level measuring mode

If no on-site display is connected, the following functions are possible by means of the three keys on the electronic insert or on the exterior of the device:

- Position adjustment (zero point correction)
- Set the lower and upper pressure value and assign to the lower and upper level value
- Device reset, → 26, "Function of the operating elements – on-site display not connected".

Note!

- The "-" and "+"- keys only have a function in the following cases:
  - LEVEL SELECTION "Level Easy Pressure", CALIBRATION MODE "Wet"
  - LEVEL SELECTION "Level Standard", LEVEL MODE "Linear", CALIBRATION MODE "Wet"

  The keys have no function in other settings.
- The device is configured for the Pressure measuring mode as standard. You can switch measuring modes by means of the MEASURING MODE parameter. → 40, "Selecting language and measuring mode".
  The following parameters are set to the following values in the factory:
  - LEVEL SELECTION: Level Easy Pressure
  - CALIBRATION MODE: Wet
  - OUTPUT UNIT or LIN. MEASURAND: %
  - EMPTY CALIB.: 0.0
  - FULL CALIB.: 100.0.
  - SET LRV: 0.0 (corresponds to 4 mA value)
  - SET URV: 100.0 (corresponds to 20 mA value)

  These parameters can only be modified by means of the on-site display or remote operation such as the FieldCare.
- The operation must be unlocked. → 37, "Locking/unlocking operation".
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.
- See also → 44, "Level measurement". For parameter description see Operating Instructions BA00274P.
- LEVEL SELECTION, CALIBRATION MODE, LEVEL MODE, EMPTY CALIB., FULL CALIB, SET LRV and SET URV are parameter names used for on-site display or remote operation such as FieldCare, for instance.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

Carry out position adjustment.[1]	
Pressure is present at device.	
↓	
Press "E"-key for 3 s.	
↓	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
Applied pressure for position adjustment has been accepted.	Applied pressure for position adjustment has not been accepted. Observe the input limits.

Setting lower pressure value.	
Desired pressure for lower pressure value (EMPTY PRESSURE[2]) is present at device.	
↓	
Press "–"-key for 3 s.	
↓	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
The pressure present was saved as the lower pressure value (EMPTY PRESSURE[1]) and assigned to the lower level value (EMPTY CALIB.[1]).	The pressure present was not saved as the lower pressure value. Observe the input limits.

Setting upper pressure value.	
Desired pressure for upper pressure value (FULL PRESSURE[1]) is present at device.	
↓	
Press "+"-key for 3 s.	
↓	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
The pressure present was saved as the upper pressure value (FULL PRESSURE[1]) and assigned to the upper level value (FULL CALIB.[1]).	The pressure present was not saved as the upper pressure value. Observe the input limits.

1) Observe "Warning", → 40, "Commissioning".

2) Parameter name used for the on-site display or remote operation such as the FieldCare.

5.4 On-site operation – on-site display connected

If the on-site display is connected, the three operating keys are used to navigate through the operating menu, → 🗎 26, "Function of the operating elements – on-site display connected".

5.4.1 General structure of the operating menu

The menu is split into four levels. The three upper levels are used to navigate while you use the bottom level to enter numerical values, select options and save settings. The structure of the OPERATING MENU depends on the measuring mode selected, e.g. if the "Pressure" measuring mode is selected, only the functions necessary for this mode are displayed.

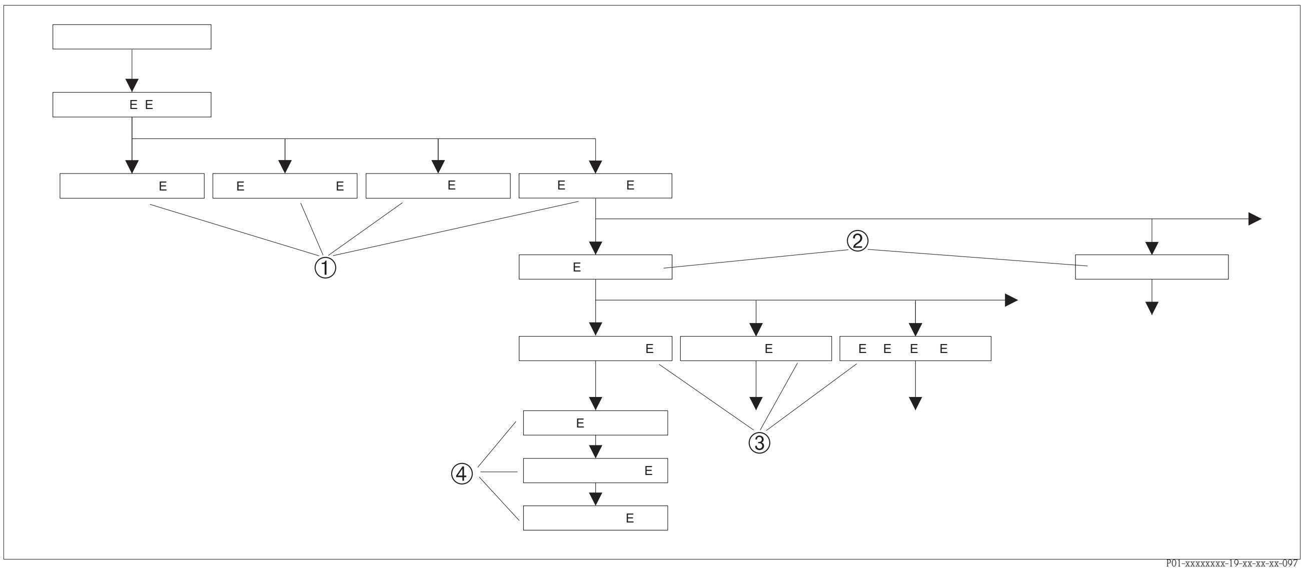


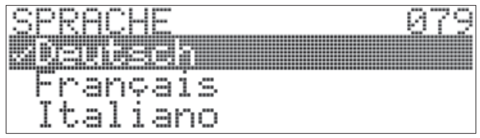
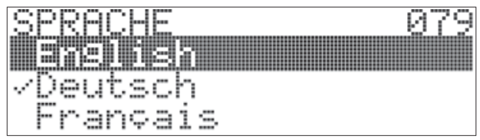
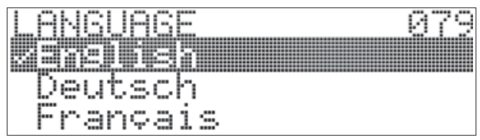
Fig. 23: Structure of the operating menu

1 1. Selection level
2 2. Selection level
3 Function groups
4 Parameter

Note!
The LANGUAGE and MEASURING MODE parameters are only displayed via the on-site display on the 1st selection level. In the digital communication, the LANGUAGE parameter is displayed in the DISPLAY group and the MEASURING MODE parameter is displayed in the QUICK SETUP menus or in the BASIC SETUP function group.

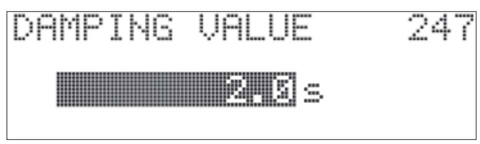
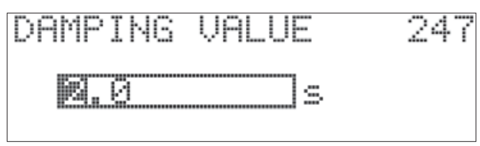
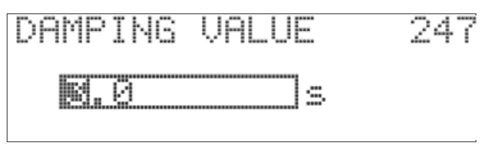
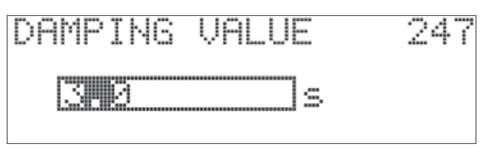
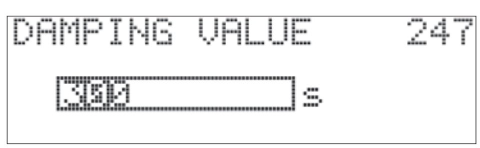
5.4.2 Selecting an option

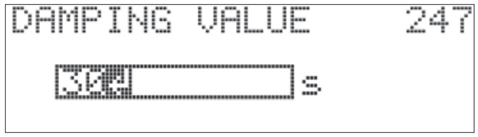
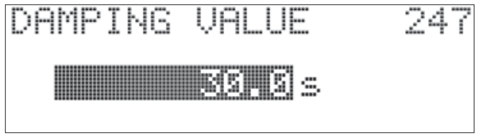
Example: select "English" as the language of the menu.

On-site display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-017	German is selected as the language. A ✓in front of the menu text indicates the active option.
 P01-xxxxxxxx-19-xx-xx-xx-033	Select English with "+" or "–".
 P01-xxxxxxxx-19-xx-xx-xx-034	1. Confirm your choice with "E". A ✓ in front of the menu text indicates the active option. (English is now selected as the menu language.) 2. Jump to the next item with "E".

5.4.3 Editing a value

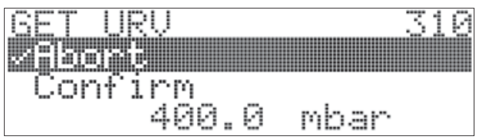
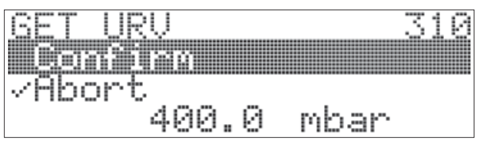
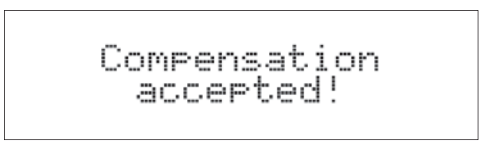
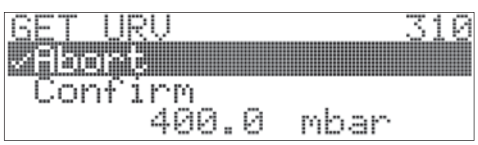
Example: adjusting DAMPING VALUE function from 2.0 s to 30.0 s.
→ 📄 26, "Function of the operating elements – on-site display connected".

On-site display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-023	The on-site display shows the parameter to be changed. The value highlighted in black can be changed. The "s" unit is fixed and cannot be changed.
 P01-xxxxxxxx-19-xx-xx-xx-027	1. Press "+" or "–" to get to the editing mode. 2. The first digit is highlighted in black.
 P01-xxxxxxxx-19-xx-xx-xx-028	1. Use "+" to change "2" to "3". 2. Confirm "3" with "E". The cursor jumps to the next position (highlighted in black).
 P01-xxxxxxxx-19-xx-xx-xx-029	The decimal point is highlighted in black, i.e. you can now edit it.
 P01-xxxxxxxx-19-xx-xx-xx-030	1. Keep pressing "+" or "–" until "0" is displayed. 2. Confirm "0" with "E". The cursor jumps to the next position. ↵ is displayed and is highlighted in black. → See next graphic.

On-site display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-031	Use "E" to save the new value and exit the editing mode. See next graphic.
 P01-xxxxxxxx-19-xx-xx-xx-032	The new value for the damping is now 30.0 s. – Jump to the next parameter with "E". – You can get back to the editing mode with "+" or "–".

5.4.4 Taking pressure applied at device as value

Example: configuring upper range value – assign 20 mA to the pressure value 400 mbar (6 psi).

On-site display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-035	The bottom line on the on-site display displays the pressure present, here 400 mbar (6 psi).
 P01-xxxxxxxx-19-xx-xx-xx-036	Use "+" or "–" to switch to the "Confirm" option. The active selection is highlighted in black.
 P01-xxxxxxxx-19-xx-xx-xx-037	Use "E" to assign the value (400 mbar (6 psi)) to the GET URV parameter. The device confirms the calibration and jumps back to the parameter, here GET URV (see next graphic).
 P01-xxxxxxxx-19-xx-xx-xx-035	Switch to the next parameter with "E".

5.5 HistoROM®/M-DAT (optional)

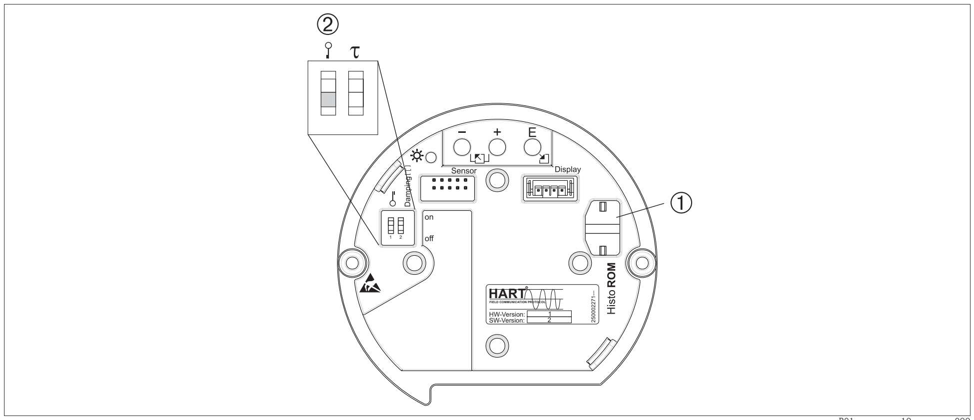
HistoROM®/M-DAT is a memory module, which is attached to the electronic insert and fulfils the following functions:

- Back-up copy of configuration data
- Copying configuration data of a transmitter into another transmitter
- Cyclic recording of pressure and sensor-temperature measured values
- Recording diverse events, such as alarms, configuration changes, counters for measuring range undershooting and exceeding for pressure and temperature, exceeding and undershooting the user limits for pressure and temperature, etc.

Warning!
Detach HistoROM®/M-DAT from the electronic insert or attach it to the insert in a deenergised state only.

Note!
- The HistoROM®/M-DAT module may be retrofitted at any time (Order No.: 52027785).
- The HistoROM data and the data in the device are analysed once a HistoROM®/M-DAT is attached to the electronic insert and power is reestablished to the device. During the analysis, the messages "W702, HistoROM data not consistent" and "W706, Configuration in HistoROM and device not identical" can occur. For measures, → 🗎 49, "Messages."

5.5.1 Copying configuration data



P01-xxxxxxxx-19-xx-xx-xx-099

Abb. 24: Electronic insert with optional HistoROM®/M-DAT memory module

1 Optional HistoROM®/M-DAT
2 To copy configuration data from the HistoROM®/M-DAT module to a device or from a device to a HistoROM®/M-DAT, the operation must be unlocked DIP-switch 1, Position "off" ,parameter INSERT PIN NO. = 100). Observe → 🗎 37, "Locking/unlocking operation".

On-site operation – on-site display not connected

Copying configuration data from a device to a HistoROM®/M-DAT module:

Note!
The operation must be unlocked.

1. Disconnect device from supply voltage.
2. Attach the HistoROM®/M-DAT module to the electronic insert.
3. Reestablish supply voltage to the device.
4. Press "E" and "-"-keys (for at least 3 seconds) until the LED on the electronic insert lights up.
5. Wait approx. 20 seconds. Configuration data are loaded from the device to the HistoROM®/M-DAT. The device is not restarted.
6. Disconnect device from the supply voltage again.
7. Detach memory module.
8. Reestablish supply voltage to the device.

Copying configuration data from a HistoROM®/M-DAT to a device:

Note!
The operation must be unlocked.

1. Disconnect device from supply voltage.
2. Attach the HistoROM®/M-DAT module to the electronic insert. Configuration data from another device are stored in the HistoROM®/M-DAT.
3. Reestablish supply voltage to the device.
4. Press "E" und "+"-keys (for at least 3 seconds) until the LED on the electronic insert lights up.
5. Wait approx. 20 seconds. All parameters except DEVICE SERIAL No, DEVICE DESIGN., CUST. TAG NUMBER, LONG TAG NUMBER, DESCRIPTION, BUS ADDRESS, CURRENT MODE and the parameters in the POSITION ADJUSTMENT and PROCESS CONNECTION group are loaded into the device by HistoROM®/M-DAT. The device is restarted.
6. Before removing the HistoROM®/M-DAT again from the electronic insert, disconnect the device from supply voltage.

On-site operation via on-site display (optional) or remote operation

Copying configuration data from a device to a HistoROM®/M-DAT:

Note!
The operation must be unlocked.

1. Disconnect device from supply voltage.
2. Attach the HistoROM®/M-DAT module to the electronic insert.
3. Reestablish supply voltage to the device.
4. The DOWNLOAD SELECT. parameter setting has no influence on an upload from the device into HistoROM.
   (Menu path: (GROUP SELECTION →) OPERATING MENU → OPERATION)
5. Using the HistoROM CONTROL parameter select the option "Device → HistoROM" as the data transfer direction.
   (Menu path: GROUPSELECTION → OPERATING MENU → OPERATION)
6. Wait approx. 20 seconds. Configuration data are loaded from the device to the HistoROM®/M-DAT. The device is not restarted.
7. Disconnect device from the supply voltage again.
8. Detach memory module.
9. Reestablish supply voltage to the device.

Copying configuration data from a HistoROM®/M-DAT to a device:

Note!
The operation must be unlocked.

1. Disconnect device from supply voltage.
2. Attach the HistoROM®/M-DAT module to the electronic insert. Configuration data from another device are stored in the HistoROM®/M-DAT.
3. Reestablish supply voltage to the device.
4. Use the DOWNLOAD SELECT parameter to select which parameters are to be overwritten (Menu path: (GROUPS SELECTION →) OPERATING MENU → OPERATION).

   The following parameters are overwritten according to the selection:
   – **Configuration copy (factory setting):**
     all parameters except DEVICE SERIAL No., DEVICE DESIGN, CUST. TAG NUMBER, LONG TAG NUMBER, DESCRIPTION, BUS ADDRESS, CURRENT MODE and the parameters in the POSITION ADJUSTMENT, PROCESS CONNECTION, CURR. TRIM (SERVICE/SYSTEM 2), SENSOR TRIM and SENSOR DATA group.
   – **Device replacement:**
     all parameters except DEVICE SERIAL No., DEVICE DESIGN and the parameters in the POSITION ADJUSTMENT, PROCESS CONNECTION, CURR. TRIM (SERVICE/SYSTEM 2), SENSOR TRIM and SENSOR DATA group.
   – **Electronics replace**:
     all parameters except the parameters in the CURR. TRIM (SERVICE/SYSTEM 2) and SENSOR DATA group.
   Factory setting: Configuration copy
5. Using the HistoROM CONTROL parameter select the option "HistoROM → Device" as the data transfer direction.
   (Menu path: GROUP SELECTION → OPERATING MENU → OPERATION)
6. Wait approx. 20 seconds. Configuration data are loaded from the device to the HistoROM®/M-DAT. The device is restarted.
7. Before removing the HistoROM®/M-DAT again from the electronic insert, disconnect the device from supply voltage.

5.6 Operation via SFX100

Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART current output (4-20mA).
For details refer to Operating Instructions BA00060S/04/EN.

5.7 Endress+Hauser operating program

The operating program FieldCare is an Endress+Hauser Plant Asset Management Tool based on FDT technology. You can use FieldCare to configure all your Endress+Hauser devices, as well as devices from other manufacturers that support the FDT standard. Hardware and software requirements you can find on the www.endress.com → select your country → Search: FieldCare → FieldCare → Technical Data.

FieldCare supports the following functions:
- Configuration of transmitters in online operation
- Loading and saving device data (upload/download)
- Tank linearization
- HistoROM®/M-DAT analysis
- Documentation of the measuring point

Connection options:
- HART via Fieldgate FXA520
- HART via Commubox FXA195 and USB interface of a computer
- Commubox FXA291 with ToF Adapter FXA291 via service interface

✎ Note!
- See also → 🗎 23, "Connecting Commubox FXA195".
- In the "Level Standard" measuring mode, the configuration data that were loaded with FDT upload cannot be written again (FDT download). These data are only used to document the measuring point.
- Further information on the FieldCare can be found on the Internet:
  http://www.endress.com → Download → Text Search: FieldCare.

5.8 Locking/unlocking operation

Once you have entered all the parameters, you can lock your entries against unauthorised and undesired access.

You have the following possibilities for locking/unlocking the operation:
- Via a DIP-switch on the electronic insert, locally on the display.
- Via the on-site display (optional)
- Via digital communication.

The -symbol on the on-site display indicates that operation is locked. Parameters which refer to how the display appears, e.g. LANGUAGE and DISPLAY CONTRAST can still be altered.

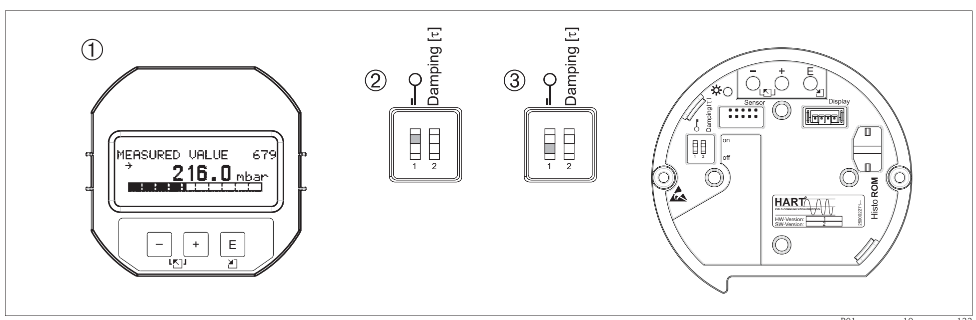
Note!
If operation is locked by means of the DIP-switch, you can only unlock operation again by means of the DIP-switch. If operation is locked by means of the on-site display or remote operation e.g. FieldCare, you can only unlock operation again by means of the on-site display or remote operation.

The table provides an overview of the locking functions:

Locking via	**View/read parameter**	**Modify/write via**[1]		**Unlocking via**		
		On-site display	**Remote operation**	**DIP-switch**	**On-site display**	**Remote operation**
DIP-switch	Yes	No	No	Yes	No	No
On-site display	Yes	No	No	No	Yes	Yes
Remote operation	Yes	No	No	No	Yes	Yes

1) Parameters which refer to how the display appears, e.g. LANGUAGE and DISPLAY CONTRAST can still be altered.

5.8.1 Locking/unlocking operation locally via DIP-switch



P01-xxxxxxxx-19-xx-xx-xx-133

Fig. 25: DIP-switch position "Hardware locking" on the electronic insert

1 If necessary, remove on-site display (optional)
2 DIP-switch is at "on": operation is locked.
3 DIP-switch is at "off": operation is unlocked (operation possible)

5.8.2 Locking/unlocking operation via on-site display or remote operation

	Description
Locking operation	1. Select INSERT PIN NO. parameter, Menu path: OPERATING MENU → OPERATION → INSERT PIN NO. 2. To lock operation, enter a number for this parameter between 0 to 9999 that is ≠100.
Unlocking operation	1. Select INSERT PIN NO. parameter. 2. To unlock operation, enter "100" for the parameter.

5.9 Factory setting (reset)

By entering a certain code, you can completely, or partially, reset the entries for the parameters to the factory settings. (For factory settings refer to the Operating Instructions BA00274P "Cerabar S/ Deltabar S/Deltapilot S, Description of device functions".) Enter the code by means of the ENTER RESET CODE parameter (Menu path: (GROUP SELECTION →) OPERATING MENU → OPERATING).
There are various reset codes for the device. The following table illustrates which parameters are reset by the particular reset codes. Operation must be unlocked to reset parameters (→ 37, "Locking/unlocking operation").

Note!
Any customer-specific configuration carried out by the factory is not affected by a reset (customer-specific configuration remains). If, after a reset, you wish the parameters to be reset to the factory settings, please contact Endress+Hauser Service.

Reset code	Description and effect
1846	**Display reset** – This reset resets all parameters which have to do with how the display appears (DISPLAY group). – Any simulation which may be running is ended. – The device is restarted.
62	**PowerUp reset (warm start)** – This reset resets all the parameters in the RAM. Data are read back anew from the EEPROM (processor is initialised again). – Any simulation which may be running is ended. – The device is restarted.
2710	**Measuring mode level reset** – Depending on the settings for the LEVEL MODE, LIN MEASURAND, LINdMEASURAND or COMB. MEASURAND parameters, the parameters needed for this measuring task will be reset. – Any simulation which may be running is ended. – The device is restarted. Example LEVEL MODE = linear and LIN. MEASURAND = Height ▪ HEIGHT UNIT = m ▪ CALIBRATION MODE = wet ▪ EMPTY CALIB. = 0 ▪ FULL CALIB. = Sensor end value converted to mH_2O, e.g. 4.79 mH_2O for a 400 mbar (6 psi) sensor

333	**User reset**
	– Affects the following parameters:
	  – Function group POSITION ADJUSTMENT
	  – Function group BASIC SETUP, except for the customer-specific units
	  – Function group EXTENDED SETUP
	  – Group OUTPUT
	  – Function group HART DATA: CURRENT MODE, BUS ADDRESS and PREAMBLE NUMBER
	– Any simulation which may be running is ended.
	– The device is restarted.

Reset code	Description and effect

7864	**Total reset**
	– Affects the following parameters:
	  – Function group POSITION ADJUSTMENT
	  – Function group BASIC SETUP
	  – Function group EXTENDED SETUP
	  – Function group LINEARISATION (an existing linearisation table is erased)
	  – Group OUTPUT
	  – Function group PEAK HOLD INDICATOR
	  – Function group HART DATA
	  – All configurable messages ("Error" type) are set to factory setting.
	    → 🗎 49, "Messages" and → 🗎 57, "Response of outputs to errors".
	  – Function group USER LIMITS
	  – Function group SYSTEM 2
	– Any simulation which may be running is ended.
	– The device is restarted.

8888	**HistoROM reset** The measured value memory and event memory are cleared. During the reset, the HistoROM must be attached to the electronic insert.

6 Commissioning

Warning!
- If a pressure smaller than the minimum permitted pressure is present at the device, the messages "E120 Sensor low pressure" and "E727 Sensor pressure error - overrange" are output in succession.
- If a pressure greater than the maximum permitted pressure is present at the device, the messages "E115 Sensor overpressure" and "E727 Sensor pressure error - overrange" are output in succession.
- Messages E727, E115 and E120 are "Error"-type messages and can be configured as a "Warning" or an "Alarm". These messages are configured as "Warning" messages at the factory. This setting prevents the current output from assuming the set alarm current value for applications (e.g. cascade measurement) where the user is consciously aware of the fact that the sensor range can be exceeded
- We recommend setting messages E727, E115 and E120 to "Alarm" in the following instances:
  – The sensor range does not have to be exceeded for the measuring application.
  – Position adjustment has to be carried out that has to correct a large measured error as a result of the orientation of the device (e.g. devices with a diaphragm seal).

Note!
The device is configured for the Pressure measuring mode as standard. The measuring range and the unit in which the measured value is transmitted correspond to the specifications on the nameplate.

6.1 Function check

Carry out a post-installation and a post-connection check as per the checklist before commissioning the device.

- "Post-installation check" checklist, → 🗎 18.
- "Post-connection check" checklist, → 🗎 23.

6.2 Selecting language and measuring mode

6.2.1 On-site operation

The LANGUAGE and MEASURING MODE parameters are located on the top menu level.
See also → 🗎 30, "General structure of the operating menu".

The following measuring modes are available:
- Pressure
- Level

6.2.2 Digital communication

The MEASURING MODE parameter is displayed in the digital communication in the QUICK SETUP menus and in the BASIC SETUP function group (OPERATING MENU → SETTINGS → BASIC SETUP).

The following measuring modes are available:
- Pressure
- Level

The LANGUAGE parameter is arranged in the DISPLAY group (OPERATING MENU → DISPLAY).
- Use the LANGUAGE parameter to select the menu language for the on-site display.
- Select the menu language for FieldCare by means of the "Language Button" in the configuration window. Select the menu language for the FieldCare frame via the "Extra" menu → "Options" → "Display" → "Language".

6.3 Position adjustment

Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the measured value parameter does not display zero. There are three options to choose from when performing position adjustment.
(Menu path: (GROUP SELECTION →) OPERATING MENU → SETTINGS → POSITION ADJUSTMENT)

Parameter name	Description
POS. ZERO ADJUST (685) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. **Example:** – MEASURED VALUE = 2.2 mbar (0.032 psi) – Correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option. This means that you are assigning the value 0.0 to the pressure present. – MEASURED VALUE (after pos. zero adjust) = 0.0 mbar – The current value is also corrected. The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. **Factory setting:** 0.0
POS. INPUT VALUE (563) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. To correct the pressure difference, you need a reference measurement value (e. g. from a reference device). **Example:** – MEASURED VALUE = 0.5 mbar (0.0073 psi) – For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE, e.g. 2.0 mbar (0.029 psi). (MEASURED VALUE$_{new}$ = POS. INPUT VALUE) – MEASURED VALUE (after entry for POS. INPUT VALUE) = 2.0 mbar (0.029 psi) – The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. CALIB. OFFSET = MEASURED VALUE$_{old}$ – POS. INPUT VALUE, here: CALIB. OFFSET = 0.5 mbar (0.0073 psi) – 2.0 mbar (0.029 psi) = – 1.5 mbar (0.022 psi)) – The current value is also corrected. **Factory setting:** 0.0
CALIB. OFFSET (319) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure is known. **Example:** – MEASURED VALUE = 2.2 mbar (0.032 psi) – Via the CALIB. OFFSET parameter, enter the value by which the MEASURED VALUE should be corrected. To correct the MEASURED VALUE to 0.0 mbar, you must enter the value 2.2 here. (MEASURED VALUE $_{new}$ = MEASURED VALUE$_{old}$ – CALIB. OFFSET) – MEASURED VALUE (after entry for calib. offset) = 0.0 mbar – The current value is also corrected. **Factory setting:** 0.0

6.4 Pressure measurement

6.4.1 Information on pressure measurement

Note!
- There is a Quick Setup menu for each of the measuring modes Pressure and Level which guides you through the most important basic functions. With the setting in the MEASURING MODE parameter, you specify which Quick Setup menu should be displayed.
  → 40, "Selecting language and measuring mode".
- For a detailed description of the parameters see the Operating Instructions BA00274P "Cerabar S/Deltabar S/Deltapilot S, Description of device functions"
  – Table 6, POSITION ADJUSTMENT
  – Table 7, BASIC SETUP
  – Table 15, EXTENDED SETUP
- For pressure measurement, select the "Pressure" option by means of the MEASURING MODE parameter. The operating menu is structured appropriately.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

6.4.2 Quick Setup menu for Pressure measuring mode

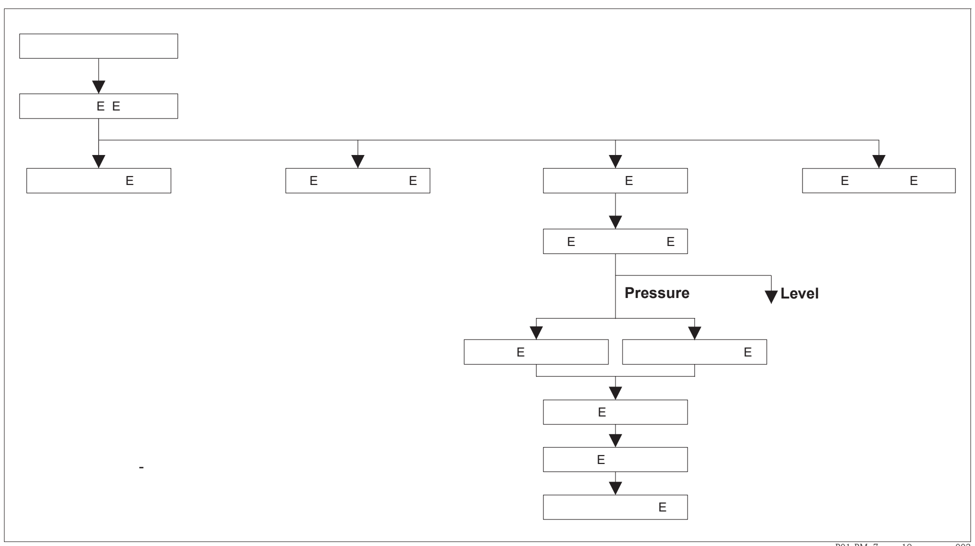


Fig. 26: Quick Setup menu for Pressure measuring mode

On-site operation
Measured value display On-site display: Switch from the measured value display to GROUP SELECTION with E.
GROUP SELECTION Select MEASURING MODE.
MEASURING MODE Select "Pressure" option.
GROUP SELECTION Select QUICK SETUP menu.

Digital communication
Measured value display Select QUICK SETUP menu.
MEASURING MODE Select "Pressure" option.

On-site operation	Digital communication
POS. ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.	**POS. ZERO ADJUST** Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.
POS. INPUT VALUE Due to orientation of the device, there may be a shift in the measured value. For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE.	**POS. INPUT VALUE** Due to orientation of the device, there may be a shift in the measured value. For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE.
SET LRV Set the measuring range (enter 4 mA value). Specify a pressure value for the lower current value (4 mA value). A reference pressure does not have to be present at the device.	**SET LRV** Set the measuring range (enter 4 mA value). Specify a pressure value for the lower current value (4 mA value). A reference pressure does not have to be present at the device.
SET URV Set the measuring range (enter 20 mA value). Specify a pressure value for the upper current value (20 mA value). A reference pressure does not have to be present at the device.	**SET URV** Set the measuring range (enter 20 mA value). Specify a pressure value for the upper current value (20 mA value). A reference pressure does not have to be present at the device.
DAMPING TIME Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure.	**DAMPING TIME** Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure.

✎ Note!
For on-site operation, see also
→ 26, "Function of the operating elements – on-site display connected" and
→ 30, "On-site operation – on-site display connected".

6.5 Level measurement

6.5.1 Information on level measurement

✎ Note!

- The Pressure and Level operating modes each have a quick setup menu which guides you through the most important basic functions. → 🗎 46, "Quick Setup menu for Level measuring mode".
- Furthermore, the three level modes "Level Easy Pressure", "Level Easy Height" and "Level Standard" are available to you for level measurement. You can select from the "Linear", "Pressure linearized" and "Height linearized" level types for the "Level Standard" level mode. The table in the "Overview of level measurement" section below provides an overview of the various measuring tasks.
  - In the "Level Easy Pressure" and "Level Easy Height" level modes, the values entered are not tested as extensively as in the "Level Standard" level mode. The values entered for EMPTY CALIB./FULL CALIB., EMPTY PRESSURE/FULL PRESSURE, EMPTY HEIGHT/FULL HEIGHT and SET LRV/SET URV must have a minimum interval of 1 % for the "Level Easy Pressure" and "Level Easy Height" level modes. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
  - The "Level Easy Pressure" and "Level Easy Height" level modes encompass fewer parameters than the "Level Standard" mode and are used for quick and easy configuration of a level application.
  - Customer-specific units of fill level, volume and mass or a linearization table may only be entered in the "Level Standard" level mode.
  - Where the device is intended for use as a subsystem in a safety function (SIL), a "Device configuration with enhanced parameter security" (SAFETY CONFIRM.) is only possible for the "Level" operating mode in the "Level Easy Pressure" level mode. All parameters previously entered are checked after a password is entered. Once the "Level Easy Height" or "Level Standard" has been selected, the configuration will first have to be reset to the ex-works setting using the RESET parameter (menu path: (GROUP SELECTION →) OPERATING MENU → OPERATION) using the reset code "7864".
    For further information see the Cerabar S (SD00190P) Functional Safety Manual.
- See the Operating Instructions BA00274P "Cerabar S/Deltabar S/Deltapilot S, Description of device functions".

6.5.2 Overview of level measurement

Measuring task	LEVEL SELECTION/ LEVEL MODE	Measured variable options	Description	Comment	Measured value display
The measured variable is in direct proportion to the measured pressure. Calibration is performed by entering two pressure-level value pairs.	LEVEL SELECTION: Level Easy Pressure	Via OUTPUT UNIT parameter: %, level, volume or mass units.	– Calibration with reference pressure – wet calibration, see Operating Instructions BA00274P. – Calibration without reference pressure – dry calibration, see Operating Instructions BA00274P.	– Incorrect entries are possible – SIL mode possible – Customised units are not possible	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is in direct proportion to the measured pressure. Calibration is performed by entering the density and two height-level value pairs.	LEVEL SELECTION: Level Easy Height	Via OUTPUT UNIT parameter: %, level, volume or mass units.	– Calibration with reference pressure – wet calibration, see Operating Instructions BA00274P. – Calibration without reference pressure – dry calibration, see Operating Instructions BA00274P.	– Incorrect entries are possible – SIL mode not possible – Customised units are not possible	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is in direct proportion to the measured pressure.	LEVEL SELECTION: Level standard/ LEVEL MODE: Linear	Via LIN. MEASURAND parameter: – % (level) – Level – Volume – Mass	– Calibration with reference pressure – wet calibration, see Operating Instructions BA00274P. – Calibration without reference pressure – dry calibration, see Operating Instructions BA00274P.	– Incorrect entries are rejected by the device – SIL mode not possible – Customised level, volume and mass units are possible	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is not in direct proportion to the measured pressure as, for example, with containers with a conical outlet. A linearisation table must be entered for the calibration.	LEVEL SELECTION: Level standard/ LEVEL MODE: Pressure linearized	Via LINd MEASURAND parameter: – Pressure + % – Pressure + volume – Pressure + mass	– Calibration with reference pressure: semiautomatic entry of linearisation table, see Operating Instructions BA00274P. – Calibration without reference pressure: manual entry of linearisation table, see Operating Instructions BA00274P.	– Incorrect entries are rejected by the device – SIL mode not possible – Customised level, volume and mass units are possible	The measured value display and the TANK CONTENT parameter show the measured value.
– Two measured variables are required or – The container shape is given by value pairs, such as height and volume. The 1st measured variable %-height or height must be in direct proportion to the measured pressure. The 2nd measured variable volume, mass or % must not be in direct proportion to the measured pressure. A linearisation table must be entered for the 2nd measured variable. The 2nd measured variable is assigned to the 1st measured variable by means of this table.	LEVEL SELECTION: Level standard/ LEVEL MODE: Height linearized	Via COMB. MEASURAND parameter: – Height + volume – Height + mass – Height + % – %-Height + volume – %-Height + mass – %-Height + %	– Calibration with reference pressure: wet calibration and semiautomatic entry of linearisation table, see Operating Instructions BA00274P. – Calibration without reference pressure: dry calibration and manual entry of linearisation table, see Operating Instructions BA00274P.	– Incorrect entries are rejected by the device – SIL mode not possible – Customised level, volume and mass units are possible	The measured value display and the TANK CONTENT parameter show the 2nd measured value (volume, mass or %). The LEVEL BEFORE LIN parameter displays the 1st measured value (%-height or height).

6.5.3 Quick Setup menu for Level measuring mode

Note!

- Some parameters are only displayed if other parameters are appropriately configured. For example, the EMPTY CALIB. parameter is only displayed in the following cases:
  – LEVEL SELECTION "Level Easy Pressure" and CALIBRATION MODE "Wet"
  – LEVEL SELECTION "Level Standard", LEVEL MODE "Linear" and CALIBRATION MODE "WET"
  You can find the LEVEL MODE parameter in the BASIC SETTINGS function group (menu path: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETTINGS).
- The following parameters are set to the following values in the factory:
  – LEVEL SELETION: Level Easy Pressure
  – CALIBRATION MODE: Wet
  – OUTPUT UNIT or LIN. MEASURAND: %
  – EMPTY CALIB.: 0.0
  – FULL CALIB.: 100.0
  – SET LRV (BASIC SETTINGS group): 0.0 (corresponds to 4 mA value)
  – SET URV (BASIC SETTINGS group): 100.0 (corresponds to 20 mA value).
- The quick setup is suitable for simple and quick commissioning. If you wish to make more complex settings, e.g. change the unit from "%" to "m", you will have to calibrate using the BASIC SETTINGS group. See Operating Instructions BA00274P.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

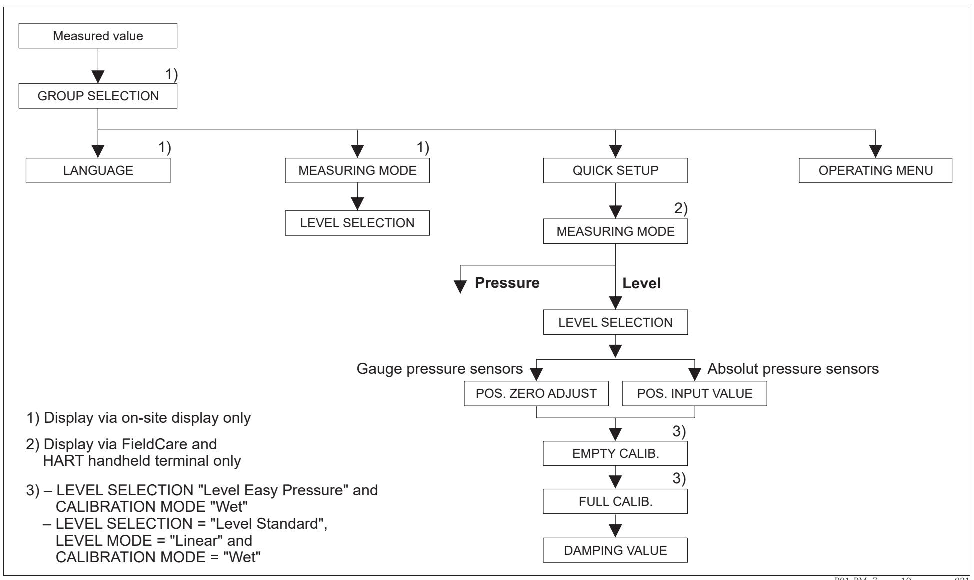


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Fig. 27: Quick Setup menu for the Level measuring mode

On-site operation	Digital communication
Measured value display On-site display: Switch from the measured value display to GROUP SELECTION with E.	**Measured value display** Select QUICK SETUP menu.
GROUP SELECTION Select MEASURING MODE.	**MEASURING MODE** Select "Level" option.
MEASURING MODE Select "Level" option.	

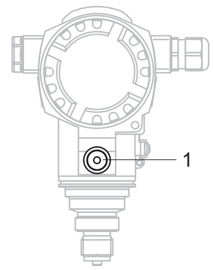
On-site operation	Digital communication
LEVEL SELECTION Select level mode. For an overview see → 🗎 45.	**LEVEL SELECTION** Select level mode. For an overview see → 🗎 45.
GROUP SELECTION Select QUICK SETUP menu.	
POS. ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.	**POS. ZERO ADJUST** Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.
POS. INPUT VALUE Due to orientation of the device, there may be a shift in the measured value. For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE.	**POS. INPUT VALUE** Due to orientation of the device, there may be a shift in the measured value. For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE.
EMPTY CALIB. [1] Enter level for the lower calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.	**EMPTY CALIB.** [1] Enter level for the lower calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.
FULL CALIB. [1] Enter level for the upper calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.	**FULL CALIB.** [1] Enter level for the upper calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.
DAMPING TIME Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure.	**DAMPING TIME** Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure.

1) – LEVEL SELECTION "Level Easy Pressure" and CALIBRATION MODE "Wet"
– LEVEL SELECTION "Level Standard", LEVEL MODE "Linear" and CALIBRATION MODE "Wet"

Note!
For on-site operation, see also
→ 🗎 26, "Function of the operating elements – on-site display connected" and
→ 🗎 30, "On-site operation – on-site display connected".

7 Maintenance

Keep the pressure compensation and GORE-TEX® filter (1) free from contaminations and water.



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7.1 Cleaning instructions

Endress+Hauser offer flushing rings as accessories to clean process isolating diaphragms without taking the transmitters out of the process.
For further information please contact your local Endress+Hauser Sales Center.

7.1.1 PMP75

We recommend you perform CIP (cleaning in place (hot water)) before SIP (sterilization in place (steam)) for pipe diaphragm seals.
A frequent use of sterilization in place (SIP) will increase the stress on the process isolating diaphragm. Under unfavorable circumstances in the long term view we cannot exclude that a frequent temperature change could lead to a material fatigue of the process isolating diaphragm and possibly to a leakage.

7.2 Exterior cleaning

Please note the following points when cleaning the device:

- The cleaning agents used should not attack the surface and the seals.
- Mechanical damage to the process isolating diaphragm, e.g. due to pointed objects, must be avoided.
- Observe degree of protection. See therefor nameplate if necessary (→ 🗎 6).

8 Trouble-shooting

8.1 Messages

The following table lists all the possible messages that can occur.
The device differentiates between the error types "Alarm", "Warning" and "Error". You may specify whether the instrument should react as if for an "Alarm" or "Warning" for "Error" messages.
→ See "Error type/NA 64" column and Section 8.2 "Response of outputs to errors".

In addition, the "Error type/NA 64" column classifies the messages in accordance with NAMUR Recommendation NA 64:
- Break down: indicated with "B"
- Maintenance need: indicated with "C" (check request)
- Function check: indicated with "I" (in service)

Error message display on the on-site display:
- The measured value display shows the message with the highest priority. → See "Priority" column.
- The ALARM STATUS parameter shows all the messages present in descending order of priority. You can scroll through all the messages present with the [-]-key or [+]-key.

Message display via the digital communication:
The ALARM STATUS parameter shows the message with the highest priority.
See "Priority" column.

Note!
- If the device detects a defect in the on-site display during initialization, special error messages are generated. For the error messages → 57, "On-site display error messages".
- For support and further information, please contact Endress+Hauser Service.
- See also Section "Repair", "Repair of Ex-certified devices" and "Spare Parts".

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
101 (A101)	Alarm B	Failure (F)	B>Sensor electronic EEPROM error	– Electromagnetic effects are greater than specifications in the technical data. (→ 63) This message normally only appears briefly. – Sensor defect.	– Wait a few minutes. – Restart the device. Perform reset (Code 62). – Block off electromagnetic effects or eliminate source of disturbance. – Replace sensor.	17
102 (W102)	Warning C	Maintenance request (M)	C>Checksum error in EEPROM: peakhold segment	– Main electronics defect. Correct measurement can continue as long as you do not need the peak hold indicator function.	– Replace main electronics.	53
106 (W106)	Warning C	Funktion check (C)	C>Downloading - please wait	– Downloading.	– Wait for download to complete.	52
110 (A110)	Alarm B	Failure (F)	B>Checksum error in EEPROM: configuration segment	– The supply voltage is disconnected when writing. – Electromagnetic effects are greater than specifications in the technical data. (→ 63) – Main electronics defect.	– Reestablish supply voltage. Perform reset (Code 7864) if necessary. Carry out calibration again. – Block off electromagnetic effects or eliminate sources of disturbance. – Replace main electronics.	6
113 (A113)	Alarm B	Failure (F)	B>ROM failure in transmitter electronic	– Main electronics defect.	– Replace main electronics.	1

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
115 (E115)	Error B factory setting: Warning C	Out of specification (S)	B>Sensor overpressure	– Overpressure present. – Sensor defect.	– Reduce pressure until message disappears. – Replace sensor.	29
116 (W116)	Warning C	Maintenance request (M)	C>Download error, repeat download	– The file is defect. – During the download, the data are not correctly transmitted to the processor, e.g. because of open cable connections, spikes (ripple) on the supply voltage or electromagnetic effects.	– Use another file. – Check cable connection PC – transmitter. – Block off electromagnetic effects or eliminate sources of disturbance. – Perform reset (Code 7864) and carry out calibration again. – Repeat download.	36
120 (E120)	Error B factory setting: Warning C	Out of specification (S)	B>Sensor low pressure	– Pressure too low. – Sensor defect.	– Increase pressure until message disappears. – Replace sensor.	30
121 (A121)	Alarm B	Failure (F)	B>Checksum error in factory segment of EEPROM	– Main electronics defect.	– Replace main electronics.	5
122 (A122)	Alarm B	Failure (F)	B>Sensor not connected	– Cable connection sensor –main electronics disconnected. – Electromagnetic effects are greater than specifications in the technical data. (→ 🗎 63) – Main electronics defect. – Sensor defect.	– Check cable connection and repair if necessary. – Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics. – Replace sensor.	13
130 (A130)	Alarm B	Failure (F)	B>EEPROM is defect.	– Main electronics defect.	– Replace main electronics.	10
131 (A131)	Alarm B	Failure (F)	B>Checksum error in EEPROM: min/max segment	– Main electronics defect.	– Replace main electronics.	9
132 (A132)	Alarm B	Failure (F)	B>Checksum error in totalizer EEPROM	– Main electronics defect.	– Replace main electronics.	7
133 (A133)	Alarm B	Failure (F)	B>Checksum error in History EEPROM	– An error occurred when writing. – Main electronics defect.	– Perform reset (Code 7864) and carry out calibration again. – Replace electronics.	8
602 (W602)	Warning C	Funktion check (C)	C>Linearisation curve not monoton	– The linearisation table is not monotonic increasing or decreasing.	– Add to linearisation table or perform linearisation again.	57

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
604 (W604)	Warning C	Funktion check (C)	C>Linearisation table not valid. Less than 2 points or points too close	– The linearisation table consists of less than 2 points. – At least 2 points in the linearisation table are too close together. A minimum gap of 0.5 % of the distance between two points must be maintained. Spans for the "Pressure linearized" option: HYDR. PRESS MAX. – HYDR. PRESS MIN.; TANK CONTENT MAX. – TANK CONTENT MIN. Spans for the "Height linearized" option: LEVEL MAX – LEVEL MIN; TANK CONTENT MAX. – TANK CONTENT MIN.	– Add to linearisation table. If necessary, perform linearisation again. – Correct linearisation table and accept again.	58
613 (W613)	Warning I	Funktion check (C)	I>Simulation is active	– Simulation is switched on, i.e. the device is not measuring at present.	– Switch off simulation.	60
620 (E620)	Error C Factory setting: Warning C	Out of specification (S)	C>Current output out of range	The current is outside the permitted range 3.8 to 20.5 mA. – The pressure applied is outside the set measuring range (but within the sensor range). – Loose connection at sensor cable	– Check pressure applied, reconfigure measuring range if necessary (See also Operating Instructions BA00274P, chapter 4 to 6 or these Operating Instructions) – Perform reset (Code 7864) and carry out calibration again. – Wait a short period of time and tighten the connection, or avoid loose connection.	49
700 (W700)	Warning C	Maintenance request (M)	C>Last configuration not stored	– An error occurred when writing or reading configuration data or the power supply was disconnected. – Main electronics defect.	– Perform reset (Code 7864) and carry out calibration again. – Replace main electronics.	54
701 (W701)	Warning C	Funktion check (C)	C>Measuring chain config. exceeds sensor range	– The calibration carried out would result in the sensor nominal operating range being undershot or overshot.	– Carry out calibration again.	50
702 (W702)	Warning C	Maintenance request (M)	C>HistoROM data not consistent.	– Data were not written correctly to the HistoROM, e.g. if the HistoROM was detached during the writing process. – HistoROM does not have any data.	– Repeat upload. – Perform reset (Code 7864) and carry out calibration again. – Copy suitable data to the HistoROM. (See also → 🗎 33, "Copying configuration data".)	55
703 (A703)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	22
704 (A704)	Alarm B	Funktion check (C)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	12
705 (A705)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	21

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
706 (W706)	Warning C	Maintenance request (M)	C>Configuration in HistoROM and device not identical	– Configuration (parameters) in the HistoROM and in the device is not identical.	– Copy data from the device to the HistoROM. (See also → 33, "Copying configuration data".) – Copy data from the HistoROM to the device. (See also → 33, "Copying configuration data".) The message remains if the HistoROM and the device have different software versions. The message goes out if you copy the data from the device to the HistoROM. – Device reset codes such as 7864 do not have any effect on the HistoROM. That means that if you do a reset, the configurations in the HistoROM and in the device may not be the same.	59
707 (A707)	Alarm B	Funktion check (C)	B>X-VAL. of lin. table out of edit limits.	– At least one X-VALUE in the linearisation table is either below the value for HYDR. PRESS MIN. or MIN. LEVEL or above the value for HYDR. PRESS. MAX. or LEVEL MAX.	– Carry out calibration again. (See also Operating Instructions BA00274P, chapter 5 or these Operating Instructions)	38
710 (W710)	Warning C	Funktion check (C)	B>Set span too small. Not allowed.	– Values for calibration (e.g. lower range value and upper range value) are too close together. – The sensor was replaced and the customer-specific configuration does not suit the sensor. – Unsuitable download carried out.	– Adjust calibration to suit sensor. (See also Operating Instructions BA00274P, parameter description MINIMUM SPAN or these Operating Instructions) – Adjust calibration to suit sensor. – Replace sensor with a suitable sensor. – Check configuration and perform download again.	51
711 (A711)	Alarm B	Funktion check (C)	B>LRV or URV out of edit limits	– Lower range value and/or upper range value undershoot or overshoot the sensor range limits. – The sensor was replaced and the customer-specific configuration does not suit the sensor. – Unsuitable download carried out.	– Reconfigure lower range value and/or upper range value to suit the sensor. Pay attention to position factor. – Reconfigure lower range value and/or upper range value to suit the sensor. Pay attention to position factor. – Replace sensor with a suitable sensor. – Check configuration and perform download again.	37
713 (A713)	Alarm B	Funktion check (C)	B>100% POINT level out of edit limits	– The sensor was replaced.	– Carry out calibration again.	39
715 (E715)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor over temperature	– The temperature measured in the sensor is greater than the upper nominal temperature of the sensor. (See also Operating Instructions BA00274P, parameter description Tmax SENSOR or these Operating Instructions) – Unsuitable download carried out.	– Reduce process temperature/ ambient temperature. – Check configuration and perform download again.	32

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
716 (E716)	Error B Factory setting: Alarm B	Failure (F)	B>Process isolating diaphragm broken	– Sensor defect.	– Replace Sensor. – Reduce pressure.	24
717 (E717)	Error C Factory setting: Warning C	Out of specification (S)	C>Transmitter over temperature	– The temperature measured in the electronics is greater than the upper nominal temperature of the electronics (+88 °C (+190 °F)). – Unsuitable download carried out.	– Reduce ambient temperature. – Check configuration and perform download again.	34
718 (E718)	Error C Factory setting: Warning C	Out of specification (S)	C>Transmitter under temperature	– The temperature measured in the electronics is smaller than the lower nominal temperature of the electronics (–43 °C (-45 °F)). – Unsuitable download carried out.	– Increase ambient temperature. Insulate device if necessary. – Check configuration and perform download again.	35
719 (A719)	Alarm B	Funktion check (C)	B>Y-VAL of lin. table out of edit limits	– At least on Y-VALUE in the linearisation table is below the MIN. TANK CONTANT or above the MAX. TANK CONTENT.	– Carry out calibration again. (See also Operating Instructions BA00274P, chapter 5 or these Operating Instructions)	40
720 (E720)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor under temperature	– The temperature measured in the sensor is smaller than the lower nominal temperature of the sensor. (See also Operating Instructions BA00274P, parameter description Tmin SENSOR or Operating Instructions) – Unsuitable download carried out. – Loose connection at sensor cable	– Increase process temperature/ ambient temperature. – Check configuration and perform download again. – Wait a short period of time and tighten the connection, or avoid loose connection.	33
721 (A721)	Alarm B	Funktion check (C)	B>ZERO POSITION level out of edit limits	– LEVEL MIN or LEVEL MAX has been changed.	– Perform reset (Code 2710) and carry out calibration again.	41
722 (A722)	Alarm B	Funktion check (C)	B>EMPTY CALIB. or FULL CALIB. out of edit limits	– LEVEL MIN or LEVEL MAX has been changed.	– Perform reset (Code 2710) and carry out calibration again.	42
723 (A723)	Alarm B	Funktion check (C)	B>MAX. FLOW out of edit limits	– FLOW-MEAS. TYPE has been changed.	– Carry out calibration again.	43
725 (A725)	Alarm B	Failure (F)	B>Sensor connection error, cycle disturbance	– Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) – Setscrew loose. – Sensor or main electronics defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Retighten setscrew with 1 Nm (0,74 lbf ft) (see Chap. 3.3.8). – Replace sensor or main electronics.	25

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
726 (E726)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor temperature error - overrange	– Electromagnetic effects are greater than specifications in the technical data. (→ 63) – Process temperature is outside permitted range. – Sensor defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Check temperature present, reduce or increase if necessary. – If the process temperature is within the permitted range, replace sensor.	31
727 (E727)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor pressure error - overrange	– Electromagnetic effects are greater than specifications in the technical data. (→ 63) – Pressure is outside permitted range. – Sensor defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Check pressure present, reduce or increase if necessary. – If the pressure is within the permitted range, replace sensor.	28
728 (A728)	Alarm B	Failure (F)	B>RAM error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	2
729 (A729)	Alarm B	Failure (F)	B>RAM error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	3
730 (E730)	Error C Factory setting: Warning C	Out of specification (S)	C>LRV user limits exceeded	– Pressure measured value has undershot the value specified for the Pmin ALARM WINDOW parameter. – Loose connection at sensor cable	– Check system/pressure measured value. – Change value for Pmin ALARM WINDOW if necessary. (See also Operating Instructions BA00274P, parameter description Pmin ALARM WINDOW or these Operating Instructions) – Wait a short period of time and tighten the connection, or avoid loose connection.	46
731 (E731)	Error C Factory setting: Warning C	Out of specification (S) Out of specification (S)	C>URV user limits exceeded	– Pressure measured value has overshot the value specified for the Pmax ALARM WINDOW parameter. – Loose connection at sensor cable	– Check system/pressure measured value. – Change value for Pmax ALARM WINDOW if necessary. (See also Operating Instructions BA00274P, parameter description Pmax ALARM WINDOW or these Operating Instructions) – Wait a short period of time and tighten the connection, or avoid loose connection.	45
732 (E732)	Error C Factory setting: Warning C		C>LRV Temp. User limits exceeded	– Temperature measured value has undershot the value specified for the Tmin ALARM WINDOW parameter.	– Check system/temperature measured value. – Change value for Tmin ALARM WINDOW if necessary. (See also Operating Instructions BA00274P, parameter description Tmin ALARM WINDOW or these Operating Instructions)	48
733 (E733)	Error C Factory setting: Warning C	Out of specification (S)	C>URV Temp. User limits exceeded	– Temperature measured value has overshot the value specified for the Tmax ALARM WINDOW parameter.	– Check system/temperature measured value. – Change value for Tmax ALARM WINDOW if necessary. (See also Operating Instructions BA00274P, parameter description Tmax ALARM WINDOW or these Operating Instructions)	47

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
736 (A736)	Alarm B	Failure (F)	B>RAM error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	4
737 (A737)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	20
738 (A738)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	19
739 (A739)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	23
740 (E740)	Error C Factory setting: Warning C	Maintenance request (M)	C>Calculation overflow, bad configuration, hardware defect	– Level measuring mode: the measured pressure has undershot the value for HYDR. PRESS. MIN. or overshot the value for HYDR. PRESS MAX. – Level measuring mode: The measured level did not reach the LEVEL MIN value or exceeded the LEVEL MAX value. – Flow measuring mode: the measured pressure has undershot the value for MAX. PRESS FLOW.	– Check configuration and carry out calibration again if necessary. – Select a device with a suitable measuring range. – Check configuration and carry out calibration again if necessary. (See also Operating Instructions BA00274P, parameter description LEVEL MIN. these Operating Instructions) – Check configuration and carry out calibration again if necessary. – Select a device with a suitable measuring range.	27
741 (A741)	Alarm B	Funktion check (C)	B>TANK HEIGHT out of edit limits	– LEVEL MIN or LEVEL MAX has been changed.	– Perform reset (Code 2710) and carry out calibration again.	44
742 (A742)	Alarm B	Failure (F)	B>Sensor connection error (upload)	– Electromagnetic effects are greater than specifications in the technical data. (→ 63) This message normally only appears briefly. – Cable connection sensor –main electronics disconnected. – Sensor defect.	– Wait a few minutes. – Perform reset (Code 7864) and carry out calibration again. – Check cable connection and repair if necessary. – Replace sensor.	18
743 (E743)	Alarm B	Failure (F)	B>Electronic PCB error during initialisation	– This message normally only appears briefly. – Main electronics defect.	– Wait a few minutes. – Restart the device. Perform reset (Code 62). – Replace main electronics.	14
744 (A744)	Alarm B	Failure (F)	B>Main electronic PCB error	– Electromagnetic effects are greater than specifications in the technical data. (→ 63) – Main electronics defect.	– Restart the device. Perform reset (Code 62). – Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics.	11
745 (W745)	Warning C	Maintenance request (M)	C>Sensor data unknown	– Sensor does not suit the device (electronic sensor nameplate). Device continues measuring.	– Replace sensor with a suitable sensor.	56

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
746 (W746)	Warning C	Funktion check (C)	C>Sensor connection error - initialising	– Electromagnetic effects are greater than specifications in the technical data. (→ 63) This message normally only appears briefly. – Overpressure or low pressure present.	– Wait a few minutes. – Restart the device. Perform reset (Code 7864). – Block off electromagnetic effects or eliminate source of disturbance. – Reduce or increase pressure.	26
747 (A747)	Alarm B	Failure (F)	B>Sensor software not compatible to electronics	– Sensor does not suit the device (electronic sensor nameplate).	– Replace sensor with a suitable sensor.	16
748 (A748)	Alarm B	Failure (F)	B>Memory failure in signal processor	– Electromagnetic effects are greater than specifications in the technical data. (→ 63) – Main electronics defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics.	15

8.1.1 On-site display error messages

If the device detects a defect in the on-site display during initialization, the following error messages can be displayed:

Message	Measure
Initialization, VU Electr. Defect A110	Exchange on-site display.
Initialization, VU Electr. Defect A114	
Initialization, VU Electr. Defect A281	
Initialization, VU Checksum Err. A110	
Initialization, VU Checksum Err. A112	
Initialization, VU Checksum Err. A171	

8.2 Response of outputs to errors

The device differentiates between the error types Alarm, Warning and Error.
See the following table and → 49, "Messages".

Output	A (Alarm)	W (Warning)	E (Error: Alarm/Warning)
Current output	Assumes the value specified via the OUTPUT FAIL MODE[1)], ALT. CURR. OUTPUT[1] and SET MAX. ALARM[1] parameter. See also the following section "Configuring current output for an alarm".	Device continues measuring.	For this error, you can enter whether the device should react as in the event of an alarm or as in the event of a warning. See corresponding "Alarm" or "Warning" column. (See also Operating Instructions BA00274P, parameter description SELECT ALARM TYPE or these Operating Instructions)
Bargraph (on-site display)	The bargraph adopts the value defined by the OUTPUT FAIL MODE [1] parameter.	The bargraph adopts the value which corresponds to the current value.	See this table, "Alarm" or "Warning" column, depending on selection.
On-site display	– The measured value and message are displayed alternately – Measured value display: ϟ-symbol is permanently displayed. Message display – 3-digit number such as A122 and description	– The measured value and message are displayed alternately – Measured value display: ϟ-symbol flashes. Message display: – 3-digit number such as W613 and description	– The measured value and message are displayed alternately – Measured value display: see corresponding "Alarm" or "Warning" column Message display: – 3-digit number such as E731 and description
Remote operation (digital communication)	In the case of an alarm, the ALARM STATUS[2)] parameter displays a 3-digit number such as 122 for "Sensor not connected".	In the case of a warning, the ALARM STATUS[2] parameter displays a 3-digit number such as 613 for "Simulation is active".	In the case of an error, the ALARM STATUS[2] parameter displays a 3-digit number such as 731 for "URV user limits exceeded".

1) Menu path: (GROUP SELECTION →) OPERATING MENU → OUTPUT

2) Menu path: (GROUP SELECTION →) OPERATING MENU → MESSAGES

8.2.1 Configuring current output for an alarm

You can configure the current output for the event of an alarm by means of the OUTPUT FAIL MODE, ALT. CURR. OUTPUT and SET MAX. ALARM parameters. These parameters are displayed in the OUTPUT group (menu path: (GROUP SELECTION →) OPERATING MENU → OUTPUT).

In the event of an alarm, the current and the bargraph assume the value entered with the OUTPUT FAIL MODE parameter.

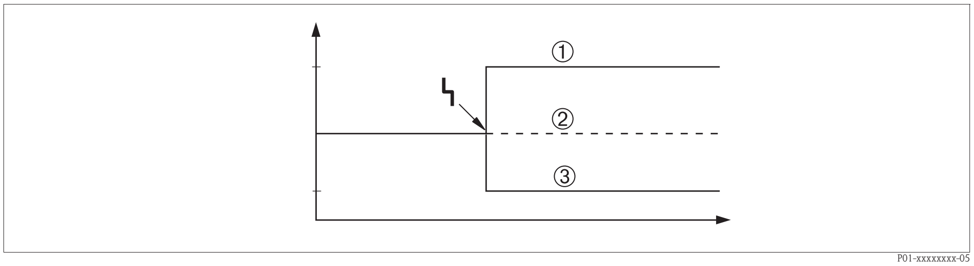

Fig. 28: Current output in the event of an alarm

Options:
1 Max. alarm (110%): can be set between 21 to 23 mA via the SET MAX. ALARM parameter
2 Hold meas. value: last measured value is kept
3 Min. alarm (–10%): 3.6 mA

Factory setting:
- OUTPUT FAIL MODE: Max. Alarm (110%)
- SET MAX. ALARM: 22 mA

Use the ALT. CURR. OUTPUT parameter to set the current output value for the error messages E 120 "Sensor low pressure" and E 115 "Sensor overpressure". You have the following options:
- Normal: the current output assumes the value set via the OUTPUT FAIL MODE and SET MAX. ALARM parameters.
- Special
  – Lower sensor limit undershot (E 120 "Sensor low pressure"): 3.6 mA
  – Upper sensor limit overshot (E 115 "Sensor overpressure") overshot: current output assumes the value set via the SET MAX ALARM parameter.

  Attention : when using the case "special", the behavior is limited to an over/underpressure in a range LRL -10% up to LRL -30% and URL +10% up to URL +30%.

Factory setting:
ALT. CURR. OUTPUT: normal

8.3 Confirming messages

Depending on the settings for the ALARM DISPL. TIME and ACK. ALARM MODE parameters, the following measures should be taken to clear a message:

Settings [1]	Measures
– ALARM DISPL. TIME = 0 s – ACK. ALARM MODE = off	– Rectify cause of the message (→ 🗎 49).
– ALARM DISPL. TIME > 0 s – ACK. ALARM MODE = off	– Rectify cause of the message (→ 🗎 49). – Wait for the alarm display time to elapse.
– ALARM DISPL. TIME = 0 s – ACK. ALARM MODE = on	– Rectify cause of the message (→ 🗎 49). – Confirm message using ACK. ALARM parameter.
– ALARM DISPL. TIME > 0 s – ACK. ALARM MODE = on	– Rectify cause of the message (→ 🗎 49). – Confirm message using ACK. ALARM parameter. – Wait for the alarm display time to elapse. If a message appears and the alarm display time elapses before the message has been acknowledged, the message will be cleared once it has been acknowledged.

1) Menu path for ALARM DISPL. TIME and ACK. ALARM MODE: (GROUP SELECTION →) OPERATING MENU → DIAGNOSTICS → MESSAGES

If the on-site display displays a message, you can suppress it with the E-key.
If there are several messages, the on-site display shows the message which has the highest priority (→ 🗎 49). Once you have suppressed this message using the E-key, the message with the next highest priority is displayed. You can use the E-key to suppress each message, one after the other. The ALARM STATUS parameter continues to display all the messages present.

8.4 Repair

The Endress+Hauser repairs concept provides for measuring devices to have a modular design and also the customer may carry out repairs (→ 60, "Spare Parts").

Note!
- For certified devices, please consult Chapter "Repair of Ex-certified devices".
- For more information on service and spare parts contact the Endress+Hauser Service. See www.endress.com/worldwide.

8.5 Repair of Ex-certified devices

Warning!
When repairing Ex-certified devices, please note the following:
- Only specialist personnel or Endress+Hauser may undertake repairs of certified devices.
- Relevant standards, national hazardous area regulations and Safety Instructions and Certificates must be observed.
- Only genuine Endress+Hauser spare parts may be used.
- When ordering spare parts, please check the device designation on the nameplate. Identical parts may only be used as replacements.
- Electronic inserts or sensors already in use in a standard instrument may not be used as spare parts for a certified device.
- Carry out repairs according to the instructions. After repairs, the device must fulfil the requirements of the specified individual tests.
- A certified device may only be converted into another certified variant by Endress+Hauser.
- All repairs and modifications must be documented.

8.6 Spare Parts

- Some replaceable measuring device components are identified by means of a spare part nameplate. This contains information about the spare part.
- All the spare parts for the measuring device along with the order code are listed In the W@M Device Viewer (www.endress.com/deviceviewer) and can be ordered. If available, users can also download the associated Installation Instructions.

Note!
Measuring device serial number:
- Located on the device and spare part nameplate.
- Can be read out via the "DEVICE SERIAL No" parameter in the "TRANSMITTER DATA" submenu.

8.7 Return

The measuring device must be returned if repairs or a factory calibration are required, or if the wrong measuring device has been ordered or delivered. According to legal regulations, Endress+Hauser, as a ISO-certified company, is required to follow certain procedures when handling returned products that are in contact with process fluids.
To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website at www.services.endress.com/return-material.

8.8 Disposal

When disposing, separate and recycle the device components based on the materials.

8.9 Software history

<table>
<tr><th rowspan="2">Date</th><th rowspan="2">Software version</th><th rowspan="2">Changes software</th><th colspan="2">Documentation</th></tr>
<tr><th>Operating Instructions</th><th>Description of Instrument Functions</th></tr>
<tr><td>11.2003</td><td>01.00.zz</td><td>Original software.
Compatible with:
– ToF Tool Field Tool Package, version 1.04.00 or higher
– Commuwin II version 2.08.-1, Update G or higher
– HART Communicator 375 with Device Rev.: 10, DD Rev.: 1</td><td>BA271P/00/EN/10.03
52020517</td><td>—</td></tr>
<tr><td>06.2004</td><td>02.00.zz</td><td>– Number of parameters in the Quick Setup menus has been reduced.
– On-site operation: LANGUAGE and MEASURING MODE parameters have been moved to the top level.
– New SAFETY CONFIRM. group implemented for SIL.
→ See also SD00190P Safety Manual Cerabar S.
– MEASURING MODE "Level", LEVEL MODE "Linear": AREA UNIT and TANK SECTION parameters have been replaced with the TANK VOLUME and TANK HEIGHT parameters.
– Function of the UNIT FLOW parameter has been split across four parameters.
– Function of the SIMULATED VALUE parameter has been split across six parameters.
– SENSOR TRIM and CURRENT TRIM groups have been removed.
– Sensor adapt reset, code 1209 and sensor calibration reset, code 2509 have been removed.
– Quick Setup menus are available via ToF Tool.
Compatible with:
– ToF Tool Field Tool Package version 2.00.00 or higher
– Commuwin II version 2.08.-1, Update > G
– HART Communicator 375/475 with Device Rev.: 20, DD Rev.: 1</td><td>BA271P/00/EN/05.04
52022795</td><td>BA274P/00/EN/05.04
52021469</td></tr>
<tr><td rowspan="2">06.2005</td><td rowspan="2">02.01.zz</td><td rowspan="2">– Operating keys also integrated on the optional on-site display.
– Chinese and Japanese are available as the menu language on request.
Compatible with:
– ToF Tool Field Tool Package version 3.00.00 or higher
– FieldCare version 2.01.00, DTM Library version 2.06.00, DTM: Deltabar S/MD7x/V02.00 V 1.4.98.74*
– HART Communicator 375/475 with Device Rev.: 20, DD Rev.: 1*
* Menu languages Chinese and Japanese not selectable</td><td>BA271P/00/EN/06.05
71000115</td><td>BA274P/00/EN/05.04
52021469</td></tr>
<tr><td>BA271P/00/EN/11.05
71009589</td><td>BA274P/00/EN/05.04
52021469</td></tr>
</table>

Date	Software version	Changes software	Documentation	
			Operating Instructions	Description of Instrument Functions
06.2006	02.10.zz	– New "Level Easy Pressure" and "Level Easy Height" level modes implemented. New LEVEL SELECTION parameter implemented. – OPERATION group with DOWNLOAD SELECT parameter extended. – SAFETY CONFIRM group extended for the "Level" operating mode in the "Level Easy Pressure" level selection. → See also SD00190P Safety Manual Cerabar S. – Factory setting for the "Error" messages redefined. – Chinese and Japanese included as menu languages by default. Compatible with: – ToF Tool Field Tool Package version 4.0 – FieldCare version 2.02.00 – HART Communicator 375/475 with Device Rev.: 21, DD Rev.: 1	BA271P/00/EN/07.06 71027246	BA274P/00/EN/07.06 71027249
			BA271P/00/EN/08.06 71027246	BA274P/00/EN/07.06 71027249
			BA271P/00/EN/10.07 71043296	BA274P/00/EN/07.07 71061022
			BA271P/00/EN/12.07 71043296	BA274P/00/EN/07.07 71061022
			BA271P/00/EN/05.08 71071770	BA274P/00/EN/05.08 71071855
			BA271P/00/EN/08.08 71077544	BA274P/00/EN/05.08 71071855
			BA271P/00/EN/06.09 71095434	BA274P/00/EN/06.09 71095452
			BA271P/00/EN/05.10 71111792	BA274P/00/EN/05.10 71118244
			BA00271P/00/EN/13.11 71139779	BA00274P/00/EN/13.11 71139795
			BA00271P/00/EN/14.12 71161896	BA00274P/00/EN/13.11 71139795
01.2013	02.11.zz	"Russian" is included as a menu language by default. The menu language "Nederlands" is no longer supported.	BA00271P/00/EN/15.13 71204567	BA00274P/00/EN/14.13 71204628
			BA00271P/00/EN/16.14 71254295	BA00274P/00/EN/15.14 71254474
06.2014	02.20.zz	HART7 protocole revision has been implemented.	BA00271P/00/EN/17.14 71260306	BA00274P/00/EN/16.14 71260321
			BA00271P/00/EN/18.14 71270361	BA00274P/00/EN/17.14 71270402

9 Technical data

For technical data, please refer to TI00383P.

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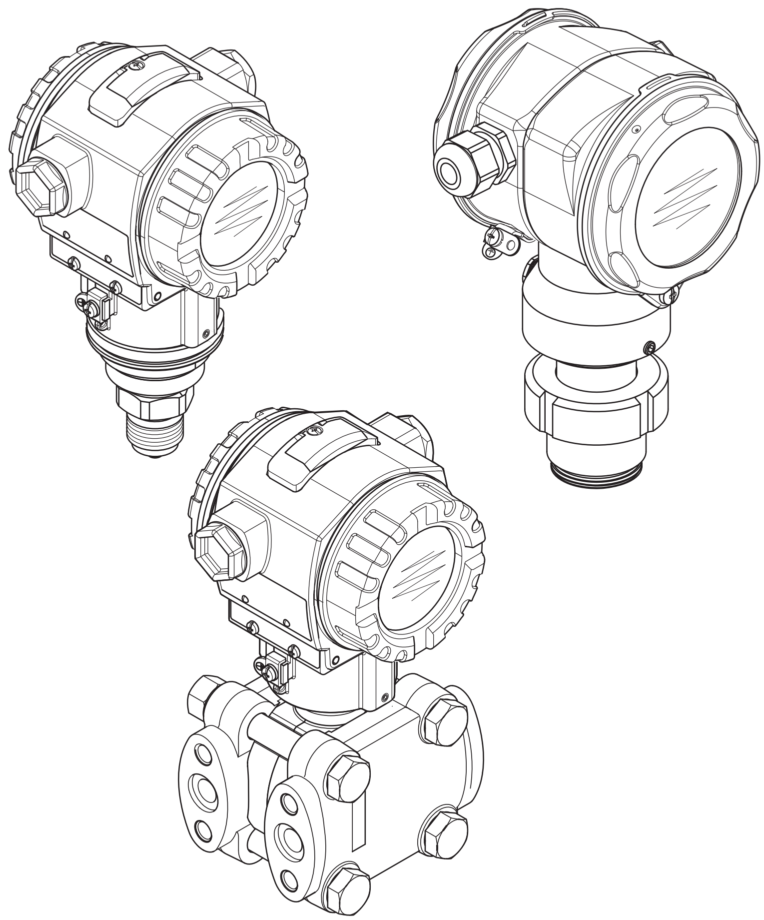
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions – Description of Instrument Functions

Cerabar S PMC71, PMP71/75
Deltabar S FMD77, FMD78, PMD75
Deltapilot S FMB70

Process pressure / Differential pressure, Flow / Hydrostatic

HART COMMUNICATION PROTOCOL



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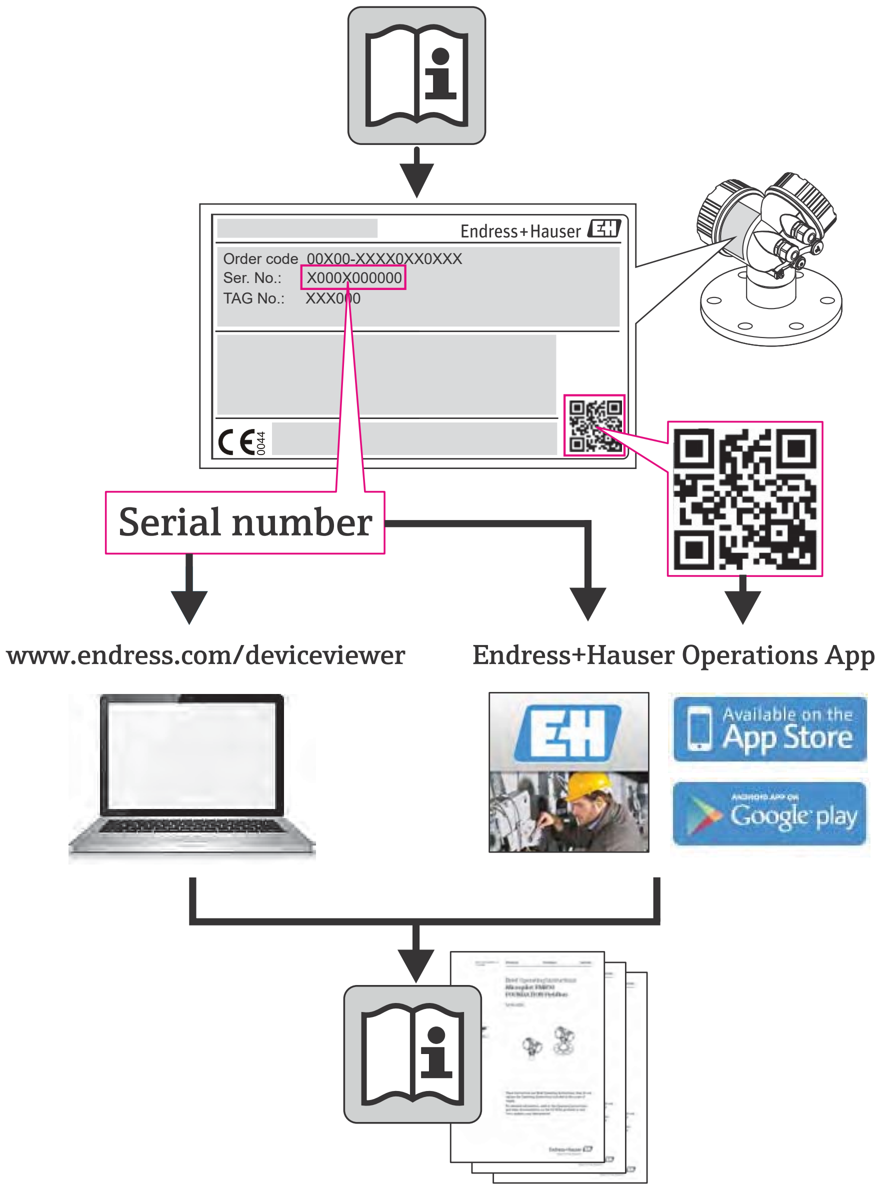
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1 Notes on use

Section 7 describes all the parameters in order of how they appear in the menu. Sections 4 to 6 provide typical examples of configuration.

Sections 1.1 to 1.3 describe ways of finding a certain parameter description more easily.

1.1 Finding parameter description using ID numbers

Each parameter is shown on the on-site display with a unique identification number (ID). Section 2 lists all the parameters in numerical order. The page reference/link takes you to the parameter in question.
In the Operating program, additional parameters and, to an extent, other parameters are displayed. These parameters are not listed in Section 2. You can find these parameters by means of the index. → See also Section 1.3.

1.2 Finding function group using graphic representation

All the function groups are shown in table form in Section 3. The page reference/link takes you to the function group in question. In Section 7, all the parameters of a function group are compiled in a table.

1.3 Finding parameter description using parameter names (index)

The index lists all the parameters in alphabetical order. The page reference/link takes you to the parameter in question.

2 Finding parameter description using ID numbers

ID number	Parameter name	Description, see page
001	DENSITY UNIT – Level Selection "Level Easy Pressure"	64 or 97
003	HEIGHT UNIT	64
004 004 004	FULL CALIB. – QUICK SETUP FULL CALIB. – Level Selection "Level Easy Pressure" FULL CALIB. – Level Selection "Level Easy Height"	51 61 65
005	FULL PRESSURE	61
006	FULL HEIGHT	66
007	ADJUST DENSITY – Level Selection "Level Easy Height"	64 or 97
008 008	CALIBRATION MODE – Level Selection "Level Easy Pressure" CALIBRATION MODE – Level Selection "Level Easy Height"	60 64
009	EMPTY HEIGHT	65
010 010 010	EMPTY CALIB. – QUICK SETUP EMPTY CALIB. – Level Selection "Level Easy Pressure" EMPTY CALIB. – Level Selection "Level Easy Height"	50 60 or 61 65
011	EMPTY PRESSURE	61
012 012	SET URV – Level Selection "Level Easy Pressure" SET URV – Level Selection "Level Easy Height"	61 66
013 013	SET LRV – Level Selection "Level Easy Pressure" SET LRV – Level Selection "Level Easy Height"	61 66
014	DOWNLOAD SELECT	126
015	FULL PRESSURE	See [1)]
016	EMPTY PRESSURE	See [1]
017	FULL CALIB.	See [1]
018	EMPTY CALIB.	See [1]
020	LEVEL SELECTION	46
021	SET LRV	See [1]
022	SET URV	See [1]
023 023	OUTPUT UNIT – Level Selection "Level Easy Pressure" OUTPUT UNIT – Level Selection "Level Easy Height"	60 64
025	PROCESS DENSITY – Level Selection "Level Easy Pressure"	97
036	PREAMBLE NUMBER	115
042	CURR. TRIM 20mA	131
043	OFFSET 4mA TRIM	131
044	OFFSET 20mA TRIM	131
045	CURR. TRIM 4mA	131
046	ALARM STATUS	128
047	ENTER RESET CODE	126
048	INSERT PIN No	126
050	LEVEL BEFORE LIN	123
055	CUST. TAG NUMBER	117
060	PRESS. ENG. UNIT	56, 59, 63, 67 or 92
075	CUSTOMER UNIT P	56, 59, 63, 68 or 92
079	LANGUAGE	44
245	SET LRV – "Pressure" measuring mode	48 or 56
246	SET URV – "Pressure" measuring mode	48 or 57
247	DAMPING VALUE	48, 51, 53, 57, 61, 66, 77, 81, 90 or 95
250	SENSOR SER. No.	119
251	Pmin SENS. DAMAGE	120
252	Pmax SENS. DAMAGE	120
254	OUTPUT CURRENT	111
264	SOFTWARE VERSION	117
266	HARDWARE REV.	117
270	SIM. CURRENT	128
271	HART MESSAGE	116
272	ADDITIONAL INFO.	117
301	PRESSURE – "Pressure" measuring mode PRESSURE – "Level" measuring mode PRESSURE – "Flow" measuring mode	122 122 123
305	LONG TAG NUMBER	117

1) See Safety Manual SD00189P for Deltabar S, SD00190P for Cerabar S and SD00213P for Deltapilot S.

ID number	Parameter name	Description, see page
309	GET LRV	57
310	GET URV	57
311	MAX. FLOW	52 or 95
313	UNIT VOLUME – "Linear" level type UNIT VOLUME – "Pressure Linearized" level type UNIT VOLUME – "Height Linearized" level type	71 or 75 79 84
314	EMPTY CALIB. – QUICK SETUP EMPTY CALIB. – "Linear" level type EMPTY CALIB. – "Height Linearized" level type	50 73 87
315	FULL CALIB. – QUICK SETUP FULL CALIB. – "Pressure Linearized" level type FULL CALIB. – "Height Linearized" level type	51 74 87
316	ADJUST DENSITY – "Linear" level type ADJUST DENSITY – "Height Linearized" level type ADJUST DENSITY– "Level" extended setup	74 88 97
317	CUST. UNIT FACT. P	56, 68 or 93
318	TEMP. ENG. UNIT – "Pressure" measuring mode TEMP. ENG. UNIT – "Level" measuring mode TEMP. ENG. UNIT – "Flow" measuring mode	96 97 99
319	CALIB. OFFSET	54
323	SET. L. FL. CUT-OFF	99
329	FACT. U. U. TOTAL. 1	108
330	FACT. U. U. TOTAL. 2	109
331	RESET TOTALIZER1	109
332	Pmin ALARM WINDOW	130
333	Pmax ALARM WINDOW	130
334	Tmin ALARM WINDOW	130
335	Tmax ALARM WINDOW	130
336	ALARM DELAY	129
339	DISPLAY CONTRAST	111
342	SET MAX. ALARM	113
343	SET MIN. CURRENT	113
345	BUS ADDRESS	115
350	DEVICE DESIGN.	117
351	DEVICE TYPE, Deltabar S	115
352	CONFIG RECORDER	117
354	DEVICE SERIAL No	117
357	PCB TEMPERATURE	117
358	ALLOWED MIN. TEMP	117
359	ALLOWED MAX. TEMP	117
360	MAT. PROC. CONN. +	118
361	MAT. PROC. CONN. -	118
362	SEAL TYPE	118
363	DIP STATUS	117
365	MAT. MEMBRANE	120
366	FILLING FLUID	120
367	SENSOR TEMP.	122 or 123
368	Tmin SENSOR	120
369	Tmax SENSOR	120
370	TANK CONTENT	123
375	SUPPRESSED FLOW	123
378	MEAS. VAL. TREND	122 or 123
380	COUNTER:P > Pmax	124
382	RESET PEAKHOLD	125
383	MAX. MEAS. PRESS.	124
386	ELECTR. SERIAL No	117
388	OUTPUT FAIL MODE	112
389	MEASURING MODE	45
390	LINEAR/SQROOT	113
391	UNIT FLOW	93
392	CALIBRATION MODE – "Linear" level type CALIBRATION MODE – "Height Linearized" level type	73 87
397	LIN. EDIT MODE	101
398	TOTALIZER 1 UNIT – "Volume p. cond." flow type	108
399	TOTALIZER 2 UNIT – "Volume p. cond." flow type	109
400	NEG. FLOW TOT. 1	108
401	ACK. ALARM MODE	128

ID number	Parameter name	Description, see page
404	COUNTER:T > Tmax	124
409	OPERATING HOURS	126
413	SIMULATION MODE	127
414	SIM. PRESSURE	127
416	NEG. FLOW TOT. 2	109
419	MENU DESCRIPTOR	110
423	ALTERNATE DATA	110
432	MANUFACTOR ID	116
434	CORRECTED PRESS. – "Pressure" measuring mode CORRECTED PRESS. – "Level" measuring mode CORRECTED PRESS. – "Flow" measuring mode	122 122 123
442	LOW FLOW CUT-OFF	99
467	COUNTER:P < Pmin	124
469	MIN. MEAS. PRESS.	124
471	MAX. MEAS. TEMP.	124
472	COUNTER:T < Tmin	124
474	MIN. MEAS. TEMP.	124
476	SIM. ERROR NO.	128
480	ALARM DISPL. TIME	129
481	HART DATE	116
482	PROC. CONN. TYPE	118
484	PRESS. SENS LOLIM	119
485	PRESS. SENS HILIM	119
487	SENS H/WARE REV	120
488	PCB COUNT:T > Tmax	124
490	PCB MAX. TEMP.	124
492	PCB COUNT:T < Tmin	124
494	PCB MIN. TEMP.	124
500	ACK. ALARM	129
052	CURRENT MODE	115
549	MEASURING TABLE (display)	103
549	EDITOR TABLE, LINE-NUMB (enter values)	102
550	EDITOR TABLE, X-VAL. (enter values)	102
551	EDITOR TABLE, Y-VAL. (enter values)	102, 102
563	POS. INPUT VALUE	48, 50 or 54
564	LAST DIAG. CODE	128
570	Pmax PROC. CONN.	117
571	MASS FLOW UNIT	94
581	SENSOR MEAS.TYPE	120
584	SENSOR PRESSURE – "Pressure" measuring mode SENSOR PRESSURE – "Level" measuring mode SENSOR PRESSURE – "Flow" measuring mode	122 122 123
585	HART VERSION	114
591	MINIMUM SPAN	119
595	SELECT ALARMTYPE	129
597	ALT. CURR. OUTPUT	113
600	SELECT ALARMTYPE	129
603	RESET ALL ALARMS	129
607	CUST. UNIT FACT. V – "Linear" level type CUST. UNIT FACT. V – "Pressure Linearized" level type CUST. UNIT FACT. V – "Height Linearized" level type	72 79 85
608	CUSTOMER UNIT V – "Linear" level type CUSTOMER UNIT V – "Pressure Linearized" level type CUSTOMER UNIT V – "Height Linearized" level type	71 79 85
609	CUST. UNIT FACT. F	95
610	CUSTOMER UNIT F	94
627	TOT. 1 USER UNIT	108
628	TOT. 2 USER UNIT	109
634	MAX PRESS. FLOW	53 or 95
637	SET LRV – "Flow" extended setup	99
638	SET URV – "Flow" extended setup	100
639	SIM.FLOW VALUE	127
640	FLOW-MEAS. TYPE	93
652	TOTALIZER 1	124
655	TOTAL. 1 OVERFLOW	124
657	TOTALIZER 2	124
658	TOTAL. 2 OVERFLOW	124
660	STD. FLOW UNIT	94

ID number	Parameter name	Description, see page
661	NORM FLOW UNIT	93
662	TOTALIZER 1 UNIT – "Mass" flow type	108
663	TOTALIZER 2 UNIT – "Mass" flow type	109
664	TOTALIZER 1 UNIT – "Gas. std. conditions" flow type	108
665	TOTALIZER 2 UNIT – "Gas. std. conditions" flow type	109
666	TOTALIZER 1 UNIT – "Gas. norm conditions" flow type	108
667	TOTALIZER 2 UNIT – "Gas. norm conditions" flow type	109
679	MEASURED VALUE – "Pressure" MEASURED VALUE – "Level" MEASURED VALUE – "Flow"	121 122 123
685	POS. ZERO ADJUST	48, 50, 52 or 54
688	MAIN DATA FORMAT	110
694	CURR. CHARACT. – "Pressure"	112
695	CURR. CHARACT. – "Flow"	112
696	CURR. CHARACT. – "Height"	112
699	DEVICE REVISION	115
703	CUST. UNIT FACT. M – "Linear" level type CUST. UNIT FACT. M – "Pressure Linearized" level type CUST. UNIT FACT. M – "Height Linearized" level type	73 80 86
704	CUSTOMER UNIT M – "Linear" level type CUSTOMER UNIT M – "Pressure Linearized" level type CUSTOMER UNIT M – "Height Linearized" level type	72 80 86
705	CUST. UNIT FACT. H – "Linear" level type CUST. UNIT FACT. H – "Height Linearized" level type	71 or 76 84 or 89
706	CUSTOMER UNIT H – "Linear" level type CUSTOMER UNIT H – "Height Linearized" level type	70 or 76 84 or 89
708	HEIGHT UNIT – "Linear" level type HEIGHT UNIT – "Height Linearized" level type	70 or 76 83 or 88
709	MASS UNIT – "Linear" level type MASS UNIT – "Pressure Linearized" level type MASS UNIT – "Height Linearized" level type	72 80 85
710	EMPTY PRESSURE – "Linear" level type EMPTY PRESSURE – "Height Linearized" level type	74 87
711	FULL PRESSURE – "Linear" level type FULL PRESSURE – "Height Linearized" level type	74 87
712	LEVEL MAX	86
713	TANK CONTENT MAX	101
714	SIM. LEVEL	127
715	SIM. TANK CONT.	128
717	MEASURING TABLE (selection)	103
718	LEVEL MODE	68
719	SET LRV – "Level" basic setup	77
720	SET URV – "Level" basic setup	77
755	LEVEL MIN	86
759	TANK CONTENT MIN	101
760	ASSIGN CURRENT	113
761	HYDR. PRESS MAX.	81
762	SET LRV – "Level" extended setup	98
763	SET URV – "Level" extended setup	98
764	CURR. CHARACT. – "Tank content"	112
770	EDITOR TABLE (continue entry)	103
775	HYDR. PRESS MIN.	80
802	DEVICE TYPE, Cerabar S	115
804	LIN. MEASURAND	70
805	LINd. MEASURAND	79
806	COMB. MEASURAND	83
808	TABLE SELECTION	101
809	EDITOR TABLE (select table)	102
810	ADJUSTED DENSITY – "Linear" level type ADJUSTED DENSITY – "Height Linearized" level type	74 87
811	PROCESS DENSITY	97
812	DENSITY UNIT – "Linear" level type DENSITY UNIT – "Height Linearized" level type	74 88
813	100 % POINT – "Linear" level type 100 % POINT – "Height Linearized" level type	77 89

ID number	Parameter name	Description, see page
814	ZERO POSITION – "Linear" level type ZERO POSITION – "Height Linearized" level type	77 90
815	TANK DESCRIPTION	103
831	HistoROM AVAIL.	126
832	HistoROM CONTROL	127
836	SAFETY LOCKSTATE SAFETY LOCK	See [1)]
838	SAFETY PASSWORD	See [1]
840	DIGIT SETS	111
841	DIGIT SETS	See [1]
844	ACK. ALARM MODE	See [1]
845	MEASURING MODE	See [1]
847	CALIB. OFFSET	See [1]
848	MAX. FLOW	See [1]
849	MAX PRESS. FLOW	See [1]
850	LOW FLOW CUT-OFF	See [1]
851	SET. L. FL. CUT-OFF	See [1]
852	SET LRV	See [1]
853	SET URV	See [1]
854	LINEAR/SQROOT.	See [1]
855	DAMPING VALUE	See [1]
856	CONF. PASSWORD	See [1]
858	TANK VOLUME	75
859	TANK HEIGHT	76
875	CURRENT OUTPUT	See [1]

1) See Safety Manual SD00189P for Deltabar S, SD00190P for Cerabar S and SD00213P for Deltapilot S.

3 Graphic representation of function groups

Note!
The "Flow" measuring mode is only available for the Deltabar S differential pressure transmitter. The groups marked with "*" are only displayed for Deltabar S.

1st selection level	2nd selection level (groups)	Function groups		Description, see page
LANGUAGE	LANGUAGE (079)		→	44
MEASURING MODE	MEASURING MODE (389)		→	45
QUICK SETUP pressure			→	47
QUICK SETUP level			→	49
QUICK SETUP flow*			→	52
OPERATING MENU (555)	→ SETTINGS (557)	→ POSITION ADJUSTMENT	→	53
		→ BASIC SETUP pressure	→	55
		→ BASIC SETUP level, "Level Easy Pressure"	→	58
		→ BASIC SETUP level, "Level Easy Height"	→	62
		→ BASIC SETUP level, "Level Easy Standard"	→	67
		→ BASIC SETUP flow*	→	91
		→ EXTENDED SETUP pressure	→	96
		→ EXTENDED SETUP level	→	96
		→ EXTENDED SETUP flow*	→	98
		→ LINEARISATION – on-site display	→	100
		→ LINEARISATION – Digital communication	→	104
		→ TOTALIZER SETUP *	→	107
	→ SAFETY CONFIRM.		→	See 1)
	→ DISPLAY (558)		→	110
	→ OUTPUT (559)		→	111
	→ TRANSMITTER INFO (560)	→ HART DATA	→	114
		→ TRANSMITTER DATA	→	117
		→ PROCESS CONNECTION	→	117
		→ SENSOR DATA	→	119
	→ PROCESSINFO (561)	→ PROCESS VALUES pressure	→	121
		→ PROCESS VALUES level	→	122
		→ PROCESS VALUES flow*	→	123
		→ PEAK HOLD INDICATOR	→	124
	→ OPERATING		→	126
	→ DIAGNOSTICS (562)	→ SIMULATION	→	127
		→ MESSAGES	→	128
		→ USER LIMITS	→	130
	→ SERVICE (561)	→ SYSTEM 2	→	131

1) See Safety Manual SD00189P for Deltabar S, SD00190P for Cerabar S and for SD00213P Deltapilot S.

4 Pressure measurement

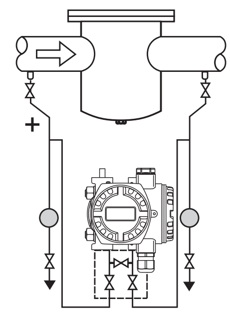
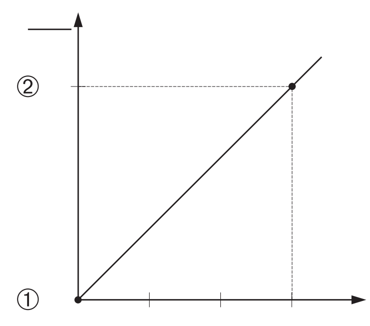
4.1 Calibration with reference pressure

Example:
In this example, a device with a 500 mbar (7.5 psi) sensor is configured for the 0...+300 mbar (4.5 psi)measuring range, i.e. 0 mbar and 300 mbar (4.5 psi) are assigned to the 4 mA value and 20 mA value respectively.

Prerequisite:
- The pressure values 0 mbar and 300 mbar (4.5 psi) can be specified. The device is already installed, for example.

Note!
- See also Operating Instructions Deltabar S (BA00270P), Section 6.6 "Differential pressure measurement", Cerabar S (BA00271P), Section 6.4 "Pressure measurement" or Deltapilot S (BA00332P), Section 6.5 "Pressure measurement".
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 53, Table 6: POSITION ADJUSTMENT
  - Page 55, Table 7: BASIC SETUP.
- For a description of further relevant parameters, see
  - Page 96, Table 15: EXTENDED SETUP
  - Page 121, Table 25: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
1	Deltabar S: before configuring the device for your application, the pressure piping must be cleaned and filled with fluid. See Operating Instructions BA00270P, Section 6.6.	 P01-PMD75xxx-19-xx-xx-xx-000  P01-xxxxxxxx-05-xx-xx-xx-010 *Fig. 1: Calibration with reference pressure* *1 See table, step 6.* *2 See table, step 7.*
2	Carry out position adjustment if necessary. See Page 53, Table 6: POSITION ADJUSTMENT.	
3	If necessary, select the "Pressure" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE	
4	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP	
5	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.	
6	The pressure for the lower range value (4 mA value) is present at the device, here 0 mbar for example.	
	Select GET LRV parameter.	
	Confirm value present. The pressure value present is assigned to the lower current value (4 mA).	
7	The pressure for the upper range value (20 mA value) is present at the device, here 300 mbar (4.5 psi) for example.	
	Select GET URV parameter.	
	Confirm value present. The pressure value present is assigned to the upper current value (20 mA).	
8	Result: The measuring range is set for 0...+300 mbar (4.5 psi).	

Note!
- You can also specify a customer-specific unit. See parameter description for PRESS. ENG. UNIT (→ Page 56).

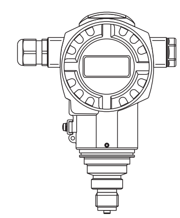
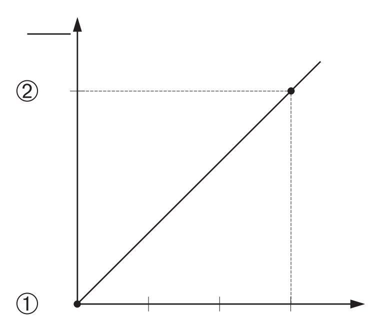
4.2 Calibration without reference pressure

Example:
In this example, a device with a 400 mbar (6 psi) sensor is configured for the 0...+300 mbar (4.5 psi) measuring range, i.e. 0 mbar and 300 mbar (4.5 psi) are assigned to the 4 mA value and 20 mA value respectively.

Prerequisite:
- This is a theoretical calibration, i.e. the pressure values for the lower range and upper range value are known.

Note!
- See also Operating Instructions Deltabar S (BA00270P), Section 6.6 "Differential pressure measurement", Cerabar S (BA00271P), Section 6.4 "Pressure measurement" or Deltapilot S (BA00332P), Section 6.5 "Pressure measurement".
- Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero. → To perform a position adjustment see also Page 53, Table 6: Position adjustment.
- For a description of the parameters mentioned, see
  – Page 45, Table 2: MEASURING MODE
  – Page 53, Table 6: POSITION ADJUSTMENT
  – Page 55, Table 7: BASIC SETUP.
- For a description of further relevant parameters, see
  – Page 96, Table 15: EXTENDED SETUP
  – Page 121, Table 27: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

<table>
<tr><th></th><th colspan="2">Description</th></tr>
<tr><td>1</td><td>If necessary, select the "Pressure" measuring mode via the MEASURING MODE parameter.
On-site display:
Menu path: GROUP SELECTION → MEASURING MODE
Digital communication:
Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE</td><td rowspan="9">
P01-PMP71xxx-19-xx-xx-xx-000


P01-xxxxxxxx-05-xx-xx-xx-010
Fig. 2: Calibration without reference pressure
1 See table, step 4.
2 See table, step 5.</td></tr>
<tr><td>2</td><td>On-site display:
Select BASIC SETUP function group.
Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP</td></tr>
<tr><td>3</td><td>Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.</td></tr>
<tr><td rowspan="2">4</td><td>Select SET LRV parameter.</td></tr>
<tr><td>Enter value, here 0 mbar, for the SET LRV parameter and confirm. This pressure value is assigned to the lower current value (4 mA).</td></tr>
<tr><td rowspan="2">5</td><td>Select SET URV parameter.</td></tr>
<tr><td>Enter value, here 300 mbar (4.5 psi), for the SET URV parameter and confirm. This pressure value is assigned to the upper current value (20 mA).</td></tr>
<tr><td>6</td><td>Result:
The measuring range is set for 0...+300 mbar (4.5 psi).</td></tr>
</table>

Note!
- You can also perform calibration without reference pressure by means of the QUICK SETUP menu. → See Page 47 ff, Table 3: QUICK SETUP menu.
- You can also specify a customer-specific unit. See parameter description for PRESS. ENG. UNIT (→ Page 56).

5 Level measurement

5.1 Overview of level measurement

Measuring task	LEVEL SELECTION/ LEVEL MODE	Measured variable options	Description	Comment	Measured value display
The measured variable is in direct proportion to the measured pressure. Calibration is performed by entering two pressure-level value pairs.	LEVEL SELECTION: Level Easy Pressure	Via OUTPUT UNIT parameter: %, level, volume or mass units.	– Calibration with reference pressure – wet calibration, see Page 15, Section 5.2.1 – Calibration without reference pressure – dry calibration, see Page 17, Section 5.2.2	– Incorrect entries are possible – SIL mode possible – Customised units are not possible	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is in direct proportion to the measured pressure. Calibration is performed by entering the density and two height-level value pairs.	LEVEL SELECTION: Level Easy Height	Via OUTPUT UNIT parameter: %, level, volume or mass units.	– Calibration with reference pressure – wet calibration, see Page 19, Section 5.3.1 – Calibration without reference pressure – dry calibration, see Page 22, Section 5.3.2	– Incorrect entries are possible – SIL mode not possible – Customised units are not possible	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is in direct proportion to the measured pressure.	LEVEL SELECTION: Level standard/ LEVEL MODE: Linear	Via LIN. MEASURAND parameter: – % (Level) – Level – Volume – Mass	– Calibration with reference pressure – wet calibration, see Page 24, Section 5.4.1 – Calibration without reference pressure – dry calibration, see Page 26, Section 5.4.2	– Incorrect entries are rejected by the device – SIL mode not possible – Customised level, volume and mass units are possible	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is not in direct proportion to the measured pressure as, for example, with containers with a conical outlet. A linearisation table must be entered for the calibration.	LEVEL SELECTION: Level standard/ LEVEL MODE: Pressure Linearized	Via LINd MEASURAND parameter: – Pressure + % – Pressure + Volume – Pressure + Mass	– Calibration with reference pressure: semiautomatic entry of linearisation table, see Page 28, Section 5.5.1 – Calibration without reference pressure: manual entry of linearisation table, see Page 31, Section 5.5.2	– Incorrect entries are rejected by the device – SIL mode not possible – Customised level, volume and mass units are possible	The measured value display and the TANK CONTENT parameter show the measured value.
– Two measured variables are required or – The container shape is given by value pairs, such as height and volume. The 1st measured variable %-height or height must be in direct proportion to the measured pressure. The 2nd measured variable volume, mass or % must not be in direct proportion to the measured pressure. A linearisation table must be entered for the 2nd measured variable. The 2nd measured variable is assigned to the 1st measured variable by means of this table.	LEVEL SELECTION: Level standard/ LEVEL MODE: Height Linearized	Via COMB. MEASURAND parameter: – Height + Volume – Height + Mass – Height + % – %-Height + Volume – %-Height + Mass – %-Height + %	– Calibration with reference pressure: wet calibration and semiautomatic entry of linearisation table, see Page 33, Section 5.6.1 – Calibration without reference pressure: dry calibration and manual entry of linearisation table, see Page 37, Section 5.6.2	– Incorrect entries are rejected by the device – SIL mode not possible – Customised level, volume and mass units are possible	The measured value display and the TANK CONTENT parameter show the 2nd measured value (volume, mass or %). The LEVEL BEFORE LIN parameter displays the 1st measured value (%-height or height).

5.2 "Level Easy Pressure" level selection

5.2.1 Calibration with reference pressure – wet calibration

Example:
In this example, the level in a tank should be measured in m. The maximum level is 3 m (9.8 ft). The pressure range is set to 0 to 300 mbar (4.5 psi).

Prerequisite:
- The measured variable is in direct proportion to the pressure.
- The tank can be filled or emptied.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- The values entered for EMPTY CALIB./FULL CALIB. and SET LRV/SET URV must have a minimum interval of 1% for the "Level Easy Pressure" level mode. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 53, Table 6: POSITION ADJUSTMENT
  - Page 58, Table 8: LEVEL SELECTION "Level Easy Pressure"
- For a description of further relevant parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description
1	Deltabar S: Before you configure the device for your application, the pressure piping must be cleaned and filled with medium. See Operating Instructions BA00270P, Section 6.5.1
2	Carry out position adjustment if necessary. See Page 53, Table 6: POSITION ADJUSTMENT.
3	If necessary, select the "Level" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP→ MEASURING MODE
4	If necessary, select "Level Easy Pressure" level mode using the LEVEL SELECTION parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION

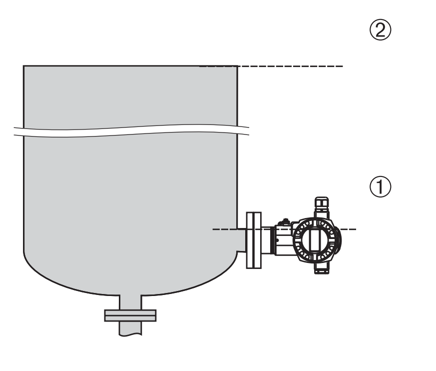
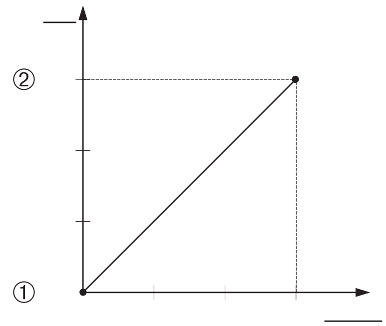


Fig. 3: Calibration with reference pressure – wet calibration

1 See Table, Step 9.
2 See Table, Step 10.

	Description
5	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP
6	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
7	Select a level unit via the OUTPUT UNIT parameter, here m for example.
8	Select the "Wet" option by means of the CALIBRATION MODE parameter.
9	Hydrostatic pressure for the lower calibration point is present at the device, here 0 mbar for example.
	Select EMPTY CALIB. parameter.
	Enter the level value, here 0 m for example. Confirm the value to assign the pressure value present to the lower level value. Note! To accept the value displayed you must first switch to the Edit mode (see the "Editing values" section) and then press the "E" button to save the value.
10	Hydrostatic pressure for the upper calibration point is present at the device, here 300 mbar (4.5 psi) for example.
	Select FULL CALIB. parameter.
	Enter the level value, here 3 m (9.8 ft) for example. Confirm the value to assign the pressure value present to the upper level value. Note! To accept the value displayed you must first switch to the Edit mode (see the "Editing values" section) and then press the "E" button to save the value.
11	Set the value for the lower current value (4 mA) by means of the SET LRV parameter.
12	Set the value for the upper current value (20 mA) by means of the SET URV parameter.
13	Result: The measuring range is set for 0 to 3 m (9.8 ft).



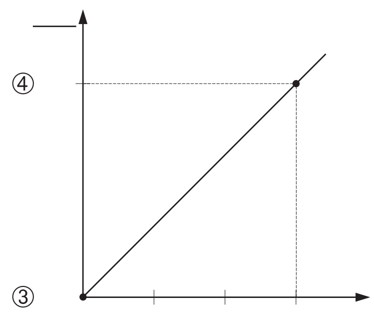


Fig. 4: Calibration with reference pressure – wet calibration

1 See Table, Step 9.
2 See Table, Step 10.
3 See Table, Step 11.
4 See Table, Step 12.

Note!

1. You can also perform calibration with reference pressure by means of the QUICK SETUP menu. → See Page 49 ff, Table 4: QUICK SETUP menu.
2. For this level mode, the measured variables %, level, volume and mass are available. → See also parameter description for OUTPUT UNIT, Page 60.
3. For operation using the on-site display, the parameters EMPTY CALIB. (→ Page 61) and FULL CALIB. (→ Page 61) also show the respective pressure present at the device. For operation using Digital communication, the pressure present at the device is displayed in the PROCESS VALUES group (menu path: OPERATING MENU→ PROCESSINFO → PROCESS VALUES).

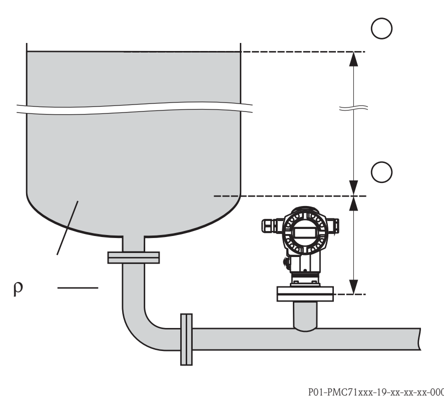
5.2.2 Calibration without reference pressure – dry calibration

Example:
In this example, the volume in a tank should be measured in litres.The maximum volume of 1000 litres (264 US gal) corresponds to a pressure of 450 mbar (6.75 psi). The minimum volume of 0 litres corresponds to a pressure of 50 mbar (0.75 psi), as the device is mounted below the level lower range value. The device is mounted below the level lower range value.

Prerequisite:
- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the pressure and volume values for the lower and upper calibration point must be known.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- The values entered for EMPTY CALIB./FULL CALIB. and SET LRV/SET URV must have a minimum interval of 1% for the "Level Easy Pressure" level mode. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
- Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero. → To perform a position adjustment see also Page 53, Table 6: Position adjustment.
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 58, Table 8: LEVEL SELECTION "Level Easy Pressure"
- For a description of further relevant parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
1	Select the "Level" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP→ MEASURING MODE	 *Fig. 5: Calibration without reference pressure – dry calibration* *1 See Table, Steps 7 and 8.* *2 See Table, Steps 9 and 10.*
2	If necessary, select "Level Easy Pressure" level mode using the LEVEL SELECTION parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION	
3	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP	

	Description
4	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
5	Select a volume unit via the OUTPUT UNIT parameter, here l (litres) for example..
6	Select the "Dry" option by means of the CALIBRATION MODE parameter.
7	Enter the volume value for the lower calibration point via the EMPTY CALIB. parameter, here 0 l for example.
8	Enter the pressure value for the lower calibration point via the EMPTY PRESSURE parameter, here 50 mbar (0.75 psi) for example.
9	Enter the volume value for the upper calibration point via the FULL CALIB. parameter, here 1000 l (264 gal) for example.
10	Enter the pressure value for the upper calibration point via the FULL PRESSURE parameter, here 450 mbar (6.75 psi) for example.
11	Set the value for the lower current value (4 mA) by means of the SET LRV parameter.
12	Set the value for the upper current value (20 mA) by means of the SET URV parameter.
13	Result: The measuring range is set for 0 to 1000 l (264 gal).

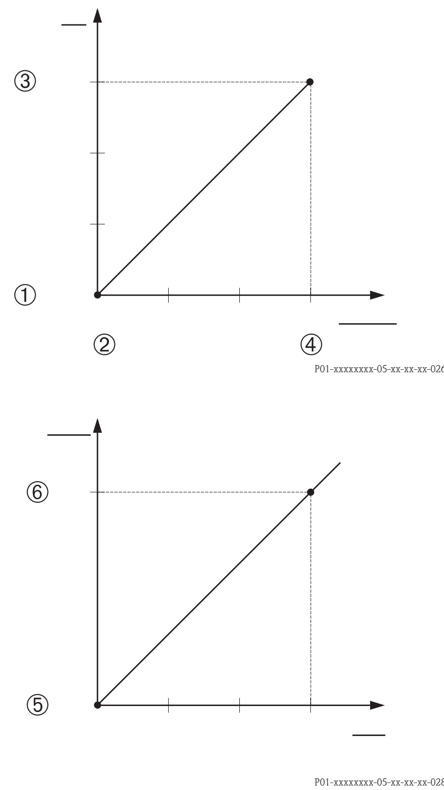


Fig. 6: Calibration with reference pressure – wet calibration

1 See Table, Step 7.
2 See Table, Step 8.
3 See Table, Step 9.
4 See Table, Step 10.
5 See Table, Step 11.
6 See Table, Step 12.

Note!

1. For this level mode, the measured variables %, level, volume and mass are available. → See also parameter description for OUTPUT UNIT, Page 60.

5.3 "Level Easy Height" level selection

5.3.1 Calibration with reference pressure – wet calibration

Example:
In this example, the volume in a tank should be measured in litres. The maximum volume of 1000 litres (264 US gal) corresponds to a level of 4.5 m (15 ft). The minimum volume of 0 litres corresponds to a level of 0.5 m (1.6 ft), as the device is mounted below the level lower range value. The density of the medium is 1 kg/dm^3.

Prerequisite:
- The measured variable is in direct proportion to the pressure.
- The tank can be filled or emptied.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- The values entered for EMPTY CALIB./FULL CALIB., EMPTY PRESSURE/FULL PRESSURE, EMPTY HEIGHT/FULL HEIGHT and SET LRV/SET URV must have a minimum interval of 1% for the "Level Easy Height" level mode. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 53, Table 6: POSITION ADJUSTMENT
  - Page 62, Table 9: LEVEL SELECTION "Level Easy Height"
- For a description of further relevant parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

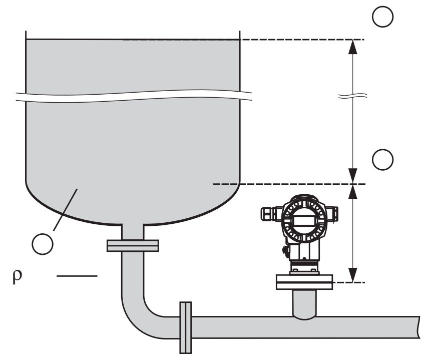
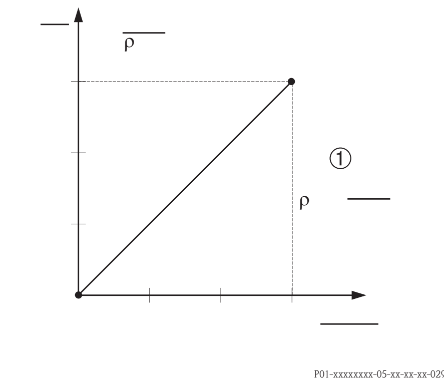
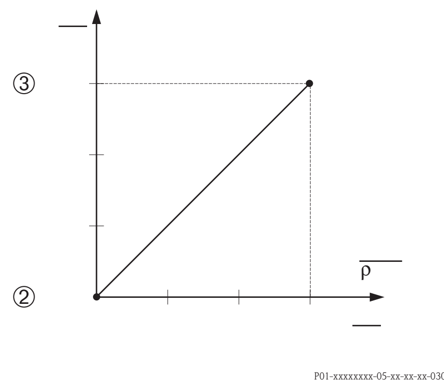
<table>
<tr><th></th><th colspan="2">Description</th></tr>
<tr><td>1</td><td>Deltabar S: Before you configure the device for your application, the pressure piping must be cleaned and filled with medium. See Operating Instructions BA00270P, Section 6.5.1</td><td rowspan="5">

Fig. 7: Calibration with reference pressure – wet calibration
1 See Table, Steps 10 and 11.
2 See Table, Step 12.
3 See Table, Step 13.</td></tr>
<tr><td>2</td><td>Carry out position adjustment if necessary. See Page 53, Table 6: POSITION ADJUSTMENT.</td></tr>
<tr><td>3</td><td>Select the "Level" measuring mode via the MEASURING MODE parameter.
On-site display:
Menu path: GROUP SELECTION → MEASURING MODE
Digital communication:
Menu path: OPERATING MENU → SETTINGS → BASIC SETUP→ MEASURING MODE</td></tr>
<tr><td>4</td><td>If necessary, select the "Level Easy Height" level mode using the LEVEL SELECTION parameter.
On-site display:
Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION
Digital communication:
Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION</td></tr>
<tr><td>5</td><td>On-site display:
Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP</td></tr>
</table>

	Description
6	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
7	Select a volume unit via the OUTPUT UNIT parameter, here l (litres) for example..
8	Select a height unit via the HEIGHT UNIT parameter, here m for example.
9	Select the "Wet" option via the CALIBRATION MODE parameter.
10	Select a density unit via the DENSITY UNIT parameter, here kg/dm^3 for example.
11	Enter the density of the fluid using the ADJUST DENSITY parameter, here kg/dm^3 for example.
12	Enter the volume value for the lower calibration point via the EMPTY CALIB. parameter, here 0 l for example. (The currently measured hydrostatic pressure is displayed as height, here 0.5 m (1.6 ft) for example.) ✎ Note! To accept the value displayed you must first switch to the Edit mode (see the "Editing values" section) and then press the "E" button to save the value.
13	Enter the volume value for the upper calibration point via the FULL CALIB. parameter, here 1000 l (264 US gal) for example. (The currently measured hydrostatic pressure is displayed as height, here 4.5 m (15 ft) for example.) ✎ Note! To accept the value displayed you must first switch to the Edit mode (see the "Editing values" section) and then press the "E" button to save the value.
14	Set the value for the lower current value (4 mA) by means of the SET LRV parameter.
15	Set the value for the upper current value (20 mA) by means of the SET URV parameter.
16	Result: The measuring range is set for 0 to 1000 l (264 US gal).





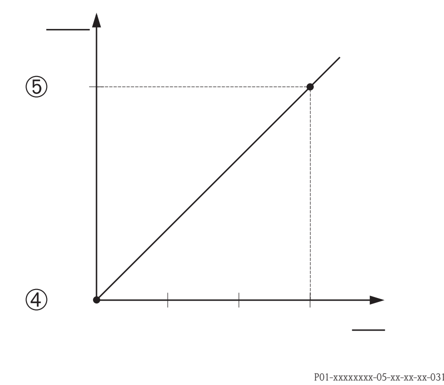


Fig. 8: Calibration with reference pressure – wet calibration

1 See Table, Steps 10 and 11.
2 See Table, Step 12.
3 See Table, Step 13.
4 See Table, Step 14.
5 See Table, Step 15.

✎ Note!

1. For this level mode, the measured variables %, level, volume and mass are available. → See also parameter description for OUTPUT UNIT, Page 64.

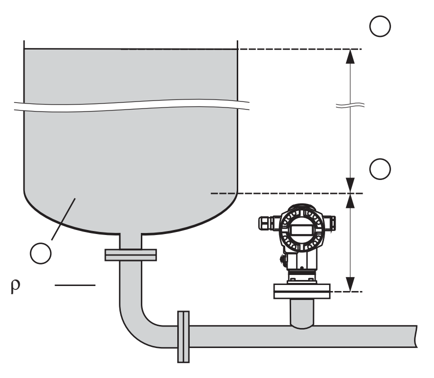
5.3.2 Calibration without reference pressure – dry calibration

Example:
In this example, the volume in a tank should be measured in litres. The maximum volume is 1000 l (264 US gal), and the maximum height is 4.5 m (15 ft). The minimum volume of 0 litres corresponds to a level of 0.5 m (1.6 ft), as the device is mounted below the level lower range value. The density of the fluid is 1 kg/dm^3.

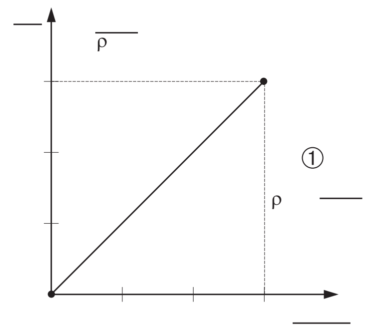
Prerequisite:
- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the height and volume values for the lower and upper calibration point must be known.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- The values entered for EMPTY CALIB./FULL CALIB., EMPTY PRESSURE/FULL PRESSURE, EMPTY HEIGHT/FULL HEIGHT and SET LRV/SET URV must have a minimum interval of 1% for the "Level Easy Height" level mode. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
- Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero. → To perform a position adjustment see also Page , Table 6: Position adjustment.
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 62, Table 9: LEVEL SELECTION "Level Easy Height"
- For a description of further relevant parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
1	Select the "Level" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP→ MEASURING MODE	 P01-PMC71xxx-19-xx-xx-xx-007 *Fig. 9: Calibration without reference pressure – dry calibration* *1 See Table, Steps 8 and 9.* *2 See Table, Steps 10 and 11.* *3 See Table, Steps 12 and 13.*
2	If necessary, select "Level Easy Height" level mode using the LEVEL SELECTION parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION	
3	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP	

	Description
4	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
5	Select a volume unit via the OUTPUT UNIT parameter, here l (litres) for example.
6	Select a height unit via the HEIGHT UNIT parameter, here m for example.
7	Select the "Dry" option via the CALIBRATION MODE parameter.
8	Select a density unit via the DENSITY UNIT parameter, here kg/dm^3 for example.
9	Enter the density of the fluid using the ADJUST DENSITY parameter, here kg/dm^3 for example.
10	Enter the volume value for the lower calibration point via the EMPTY CALIB. parameter, here 0 l for example.
11	Enter the height value for the lower calibration point via the EMPTY HEIGHT parameter, here 0.5 m (1.6 ft) for example.
12	Enter the volume value for the upper calibration point via the FULL CALIB. parameter, here 1000 l (litres) (264 US gal) for example.
13	Enter the height value for the upper calibration point via the FULL HEIGHT parameter, here 4.5 m (15 ft) for example.
14	Set the value for the lower current value (4 mA) by means of the SET LRV parameter.
15	Set the value for the upper current value (20 mA) by means of the SET URV parameter.
16	Result: The measuring range is set for 0 to 1000 l (litres) (264 US gal).



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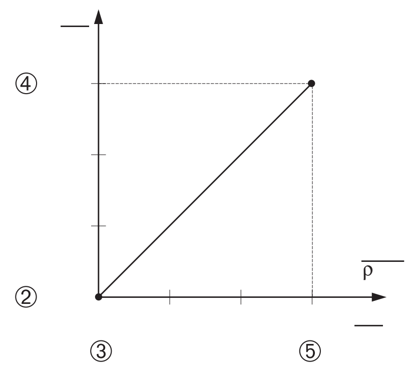

P01-xxxxxxxx-05-xx-xx-xx-032

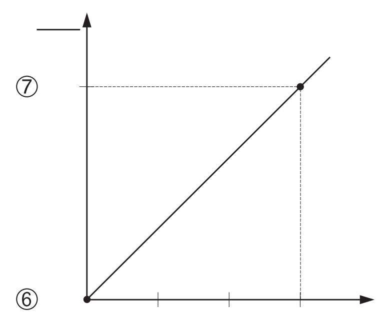

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Fig. 10: Calibration with reference pressure – wet calibration

1 See Table, Steps 8 and 9.
2 See Table, Step 10.
3 See Table, Step 11.
4 See Table, Step 12.
5 See Table, Step 13.
6 See Table, Step 14.
7 See Table, Step 15.

Note!

1. For this level mode, the measured variables %, level, volume and mass are available. → See also parameter description for OUTPUT UNIT, Page 64.

5.4 "Level Standard" level selection, "Linear" level type

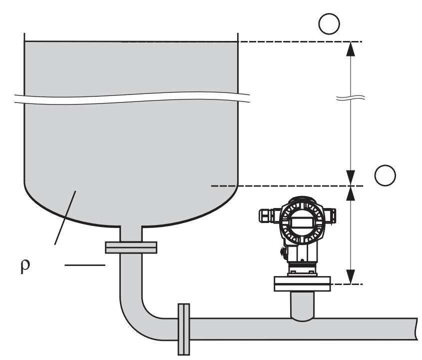
5.4.1 Calibration with reference pressure – wet calibration

Example:
In this example, the level in a tank should be measured in m. The maximum level is 3 m (9.8 ft). The pressure range is set to 0 to 300 mbar (4.5 psi).

Prerequisite:
- The measured variable is in direct proportion to the pressure.
- The tank can be filled or emptied.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- For a description of the parameters mentioned, see
  – Page 45, Table 2: MEASURING MODE
  – Page 53, Table 6: POSITION ADJUSTMENT
  – Page 67, Table 10: BASIC SETUP
  – Page 70, Table 11: BASIC SETUP – "Linear" level type.
- For a description of further relevant parameters, see
  – Page 96, Table 16: EXTENDED SETUP
  – Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
1	Deltabar S: before configuring the device for your application, the pressure piping must be cleaned and the device filled with fluid. See Operating Instructions BA00270P, Section 6.5.1	 P01-PMC71xxx-19-xx-xx-xx-006
2	Carry out position adjustment if necessary. See Page 53, Table 6: POSITION ADJUSTMENT.	
3	If necessary, select the "Level" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE	
4	If necessary, select "Level Standard" level mode using the LEVEL SELECTION parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION	*Fig. 11: Calibration with reference pressure – wet calibration* *1 See table, step 11.* *2 See table, step 12.*

	Description
5	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP
6	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
7	Select the "Linear" option by means of the LEVEL MODE parameter.
8	Select the "Level" option by means of the LIN. MEASURAND parameter.
9	Select a level unit via the HEIGHT UNIT parameter, here m for example.
10	Select the "Wet" option by means of the CALIBRATION MODE parameter.
11	The pressure for the lower calibration point is present at the device, here 0 mbar for example.
	Select EMPTY CALIB. parameter.
	Enter the level value, here 0 m for example. Confirm the value to assign the pressure value present to the lower level value.
12	The pressure for the upper calibration point is present at the device, here 450 mbar (6.75 psi) for example.
	Select FULL CALIB. parameter.
	Enter the level value, here 3 m (9.8 ft) for example. Confirm the value to assign the pressure value present to the upper level value.
13	Set the value for the lower current value (4 mA) by means of the SET LRV parameter.
14	Set the value for the upper current value (20 mA) by means of the SET URV parameter.
15	Result: The measuring range is set for 0...3 m (9.8 ft).

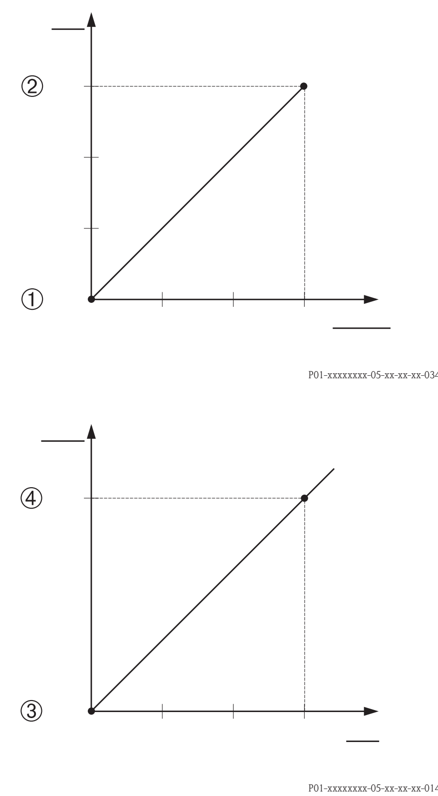


Fig. 12: Calibration with reference pressure – wet calibration

1 See table, step 11.
2 See table, step 12.
3 See table, step 13.
4 See table, step 14.

Note!

1. You can also perform calibration with reference pressure by means of the QUICK SETUP menu. → See Page 49 ff, Table 4: QUICK SETUP menu.
2. You can also specify customer-specific units. See parameter description for PRESS. ENG. UNIT (→ Page 67), HEIGHT UNIT (→ Page 70), UNIT VOLUME (→ Page 71) and MASS UNIT (→ Page 72).
3. For this level type, the measured variables %, level, volume and mass are available. → See Page 70 ff.
4. The EMPTY PRESSURE (→ Page 74) and FULL PRESSURE (→ Page 74) parameters display the pressure values belonging to the EMPTY CALIB. and FULL CALIB. parameters.

5.4.2 Calibration without reference pressure – dry calibration

Example:

In this example, the volume in a tank should be measured in m^3. The maximum volume is 5 m^3 and the maximum height 4 m (13 ft). The density of the fluid is 1 kg/dm^3. The device is mounted below the level lower range value.

Prerequisite:

- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration, i.e. the tank volume, tank height and density of the fluid are known.

Note!

- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero. → To perform a position adjustment see also Page , Table 6: Position adjustment.
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 67, Table 10: BASIC SETUP
  - Page 70, Table 11: BASIC SETUP – "Linear" level type.
- For a description of further relevant parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 26: PROCESS VALUES.

Warning!

If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

<table>
<tr><th></th><th colspan="2">Description</th></tr>
<tr><td>1</td><td>Select the "Level" measuring mode via the MEASURING MODE parameter.

On-site display:
Menu path: GROUP SELECTION → MEASURING MODE

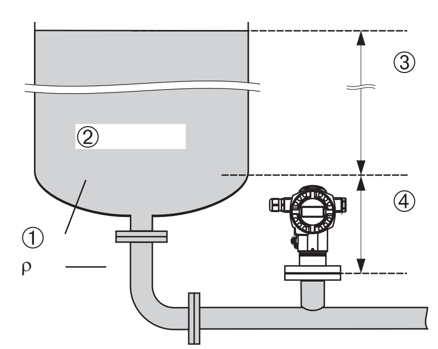
Digital communication:
Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE</td><td rowspan="3">

Fig. 13: Calibration without reference pressure – dry calibration

1 See table, step 9.
2 See table, step 10.
3 See table, step 11.
4 See table, step 12.</td></tr>
<tr><td>2</td><td>If necessary, select "Level Standard" level mode using the LEVEL SELECTION parameter.

On-site display:
Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION

Digital communication:
Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION</td></tr>
<tr><td>3</td><td>On-site display:
Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP</td></tr>
</table>

	Description
4	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
5	Select the "Linear" option by means of the LEVEL MODE parameter.
6	Select the "Volume" option by means of the LIN. MEASURAND parameter.
7	Select a volume unit via the UNIT VOLUME parameter, here m^3 for example.
8	Select the "Dry" option by means of the CALIBRATION MODE parameter. See also the following note, point 3.
9	Enter the value for density via the ADJUST DENSITY parameter, here 1 kg/dm^3 for example.
10	Enter the tank volume via the TANK VOLUME parameter, here 5 m^3 for example.
11	Enter the tank height via the TANK HEIGHT parameter, here 4 m (13 ft) for example.
12	Enter the level offset via the ZERO POSITION parameter, here –0.5 m (-1,6 ft) for example.
13	Set the value for the lower current value (4 mA) by means of the SET LRV parameter.
14	Set the value for the upper current value (20 mA) by means of the SET URV parameter.
15	Result: The measuring range is set for 0...5 m^3.

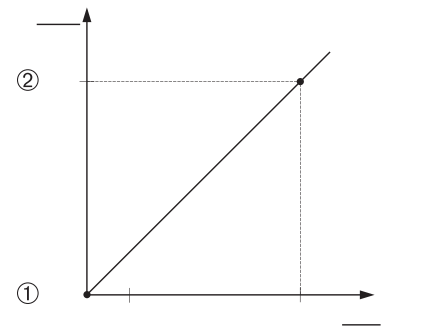


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Fig. 14: Current output calibration

5 See table, step 13.
6 See table, step 14.

Note!

1. For this level type, the measured variables %, level, volume and mass are available.
   → See Page 70 ff.
2. You can also specify customer-specific units. See parameter description for PRESS. ENG. UNIT (→ Page 67), HEIGHT UNIT (→ Page 70), UNIT VOLUME (→ Page 71) and MASS UNIT (→ Page 72).
3. A level value is assigned to the lower and upper current value by means of the SET LRV (→ Page 77) and SET URV (→ Page 77) parameters respectively. Once you have selected the "Dry" calibration mode, the error message A711 "LRV or URV out of edit limits" can appear. The error message goes out as soon as level values which are within the editing limits are entered for the SET LRV and SET URV parameters.
   By means of the ENTER RESET CODE parameter (→ Page 126), you can use the code 2710 to automatically set the SET LRV and SET URV parameters to level values which are within the editing limits.

5.5 "Level Standard" level selection, "Pressure Linearized" level type

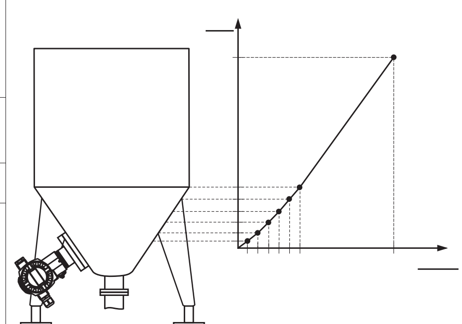
5.5.1 Semiautomatic entry of the linearisation table

Example:
In this example, the volume in a tank with a conical outlet should be measured in m^3.

Prerequisite:
- The tank can be filled. The linearisation characteristic must rise continuously.
- A minimum gap of 0.5 % of the distance between two points must be maintained. Spans for the "Pressure linearized" option: HYDR. PRESS MAX. – HYDR. PRESS MIN.; TANK CONTENT MAX. – TANK CONTENT MIN. Spans for the "Height linearized" option: LEVEL MAX – LEVEL MIN; TANK CONTENT MAX. – TANK CONTENT MIN.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 53, Table 6: POSITION ADJUSTMENT
  - Page 67, Table 10: BASIC SETUP
  - Page 78, Table 11: BASIC SETUP – "Pressure Linearized" level type
  - Page 100, Table 18: LINEARISATION – on-site operation
  - Page 104, Table 19: LINEARISATION – Digital communication.
- For a description of further relevant parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 26: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
1	Deltabar S: before configuring the device for your application, the pressure piping must be cleaned and filled with fluid. See Operating Instructions BA00270P, Section 6.5.1.	 P01-PMP75xxx-19-xx-xx-xx-002
2	Carry out position adjustment if necessary. See Page 53, Table 6: POSITION ADJUSTMENT.	
	Carry out basic setup:	
3	If necessary, select the "Level" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE	
4	If necessary, select "Level Standard" level mode using the LEVEL SELECTION parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION	

	Description	
5	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP	
6	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.	
7	Select the "Pressure Linearized" option by means of the LEVEL MODE parameter. See also the following note, point 3.	
8	Select the "Volume" option by means of the LINd. MEASURAND parameter.	
9	Select a volume unit via the UNIT VOLUME parameter, here m^3 for example.	
10	Select HYDR. PRESS MIN. parameter.	
	Enter the minimum hydrostatic pressure to be expected, here 0 mbar for example.	
11	Select HYDR. PRESS MAX .	
	Enter the maximum hydrostatic pressure to be expected.	
	Carry out linearisation:	
12	Change the function group: Menu path: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION	
13	Select TANK CONTENT MIN parameter.	
	Specify the minimum tank contents to be expected, here 0 m^3 for example.	
14	Select TANK CONTENT MAX parameter.	
	Specify the maximum tank contents to be expected, here 3.5 m^3 for example.	
15	On-site display: Select the "Editor table" option by means of the TABLE SELECTION parameter.	
16	Select the "Semiautomatic" option by means of the LIN. EDIT MODE parameter.	
17	Select the "New table" option by means of the EDITOR TABLE parameter.	

	Description
18	Enter linearisation table (min. 2 points, max. 32 points).
	Fill the tank to the height of the 1st point.
	LINE-NUMB: confirm value displayed.
	X-VAL.: the hydrostatic pressure present is displayed. On-site display, Digital communication: The X-VAL. displayed is saved by confirming the Y-value. See following line, Y-VAL. HART handheld terminal: Confirm X-VAL. displayed.
	Y-VAL.: enter the volume value, here 0 m^3 for example, and confirm the value.
19	On-site display: If you want to enter another point for the linearisation table, select the "Next point" option and enter the point as described in step 18. If you want to finish entering the values and activate the linearisation table, select the "Accept input table" option. Digital communication: You can enter further points for the linearisation table as explained in step 18. Once all the points have been entered, the table must be activated by means of the TAB. ACTIVATE parameter.
19	Result: The linearisation table has been entered.

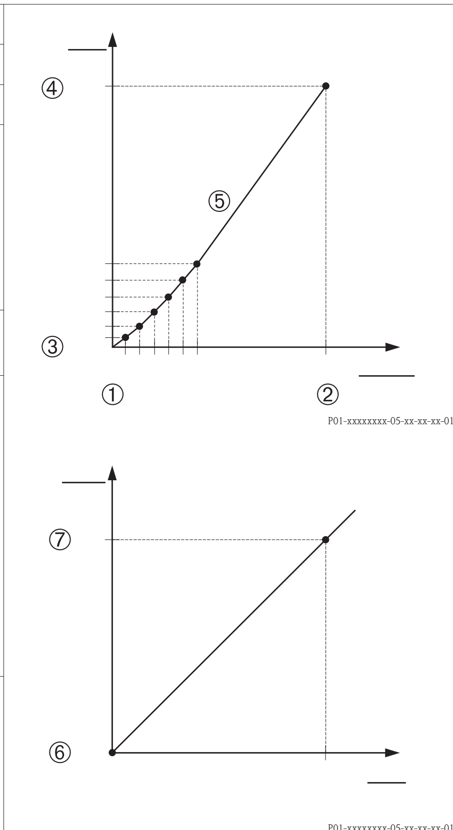


Fig. 15: Semiautomatic entry of the linearisation table

1 See table, step 10.
2 See table, step 11.
3 See table, step 13.
4 See table, step 14.
5 See table, steps 15 – 19.
6 See the following note, point 4.
7 See the following note, point 4

Note!

1. For this level type, the measured variables %, volume and mass are available.
   → See Page 78 ff.
2. You can also specify customer-specific units. See parameter description for PRESS. ENG. UNIT (→ Page 67), HEIGHT UNIT (→ Page 79), UNIT VOLUME (→ Page 79) and MASS UNIT (→ Page 80).

3. Once you have selected the "Pressure Linearized" level type, the warning message "W710 Set span too small. Not allowed." can appear. At this stage the linearisation table already consists of two points as standard. It could be the case that the 2nd value, and thus the highest X-VAL. of the linearisation table, is smaller than the minimum span permitted (→ MINIMUM SPAN, Page 119). The message goes out as soon as the highest X-VAL. is larger than the minimum span.
4. A level value is assigned to both the lower and upper current value with the SET LRV (→ Page 98) and SET URV (→ Page 98) parameters. If you enter values for TANK CONTENT MIN (→ Page 101 or 104) and TANK CONTENT MAX (→ Page 101 or 105), the SET LRV and SET URV parameters are also changed. If you want to assign values other than those for TANK CONTENT MIN and TANK CONTENT MAX to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

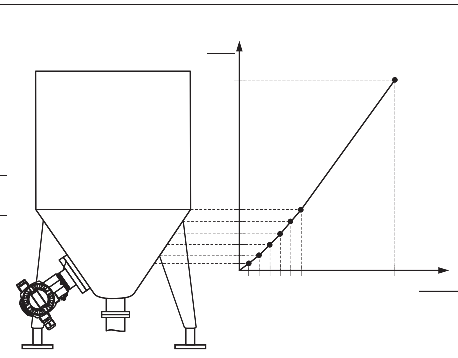
5.5.2 Manual entry of the linearisation table

Example:
In this example, the volume in a tank with a conical outlet should be measured in m^3.

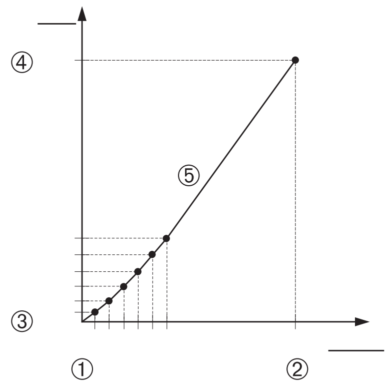
Prerequisite:
- This is a theoretical calibration, i.e. the points for the linearisation table are known.
- A minimum gap of 0.5 % of the distance between two points must be maintained. Spans for the "Pressure linearized" option: HYDR. PRESS MAX. – HYDR. PRESS MIN.; TANK CONTENT MAX. – TANK CONTENT MIN. Spans for the "Height linearized" option: LEVEL MAX – LEVEL MIN; TANK CONTENT MAX. – TANK CONTENT MIN.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 53, Table 6: POSITION ADJUSTMENT
  - Page 67, Table 10: BASIC SETUP
  - Page 78, Table 12: BASIC SETUP – "Pressure Linearized" level type
  - Page 100, Table 18: LINEARISATION – on-site operation
  - Page 104, Table 19: LINEARISATION – Digital communication.
- For a description of further relevant parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
1	Perform basic setup as per Section 5.3.1, steps 2 to 10.	 P01-PMP75xxx-19-xx-xx-xx-002
	Carry out linearisation:	
2	Change the function group: Menu path: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION	
3	Select TANK CONTENT MIN parameter .	
	Specify the minimum tank contents to be expected, here 0 m^3 for example.	
4	Select TANK CONTENT MAX parameter .	
	Specify the maximum tank contents to be expected, here 3.5 m^3 for example.	

	Description
5	On-site display: Select the "Editor table" option by means of the TABLE SELECTION parameter.
6	Select the "Manual" option by means of the LIN. EDIT MODE parameter.
7	Select the "New table" option by means of the EDITOR TABLE parameter.
8	Enter linearisation table (min. 2 points, max. 32 points).
	LINE-NUMB: confirm value displayed.
	X-VAL.: enter the pressure value and confirm.
	Y-VAL.: enter the volume value, here 0 m^3 for example, and confirm.
9	On-site display If you want to enter another point for the linearisation table, select the "Next point" option and enter the point as described in step 8. If you want to finish entering the values and activate the linearisation table, select the "Accept input table" option. Digital communication: You can enter further points for the linearisation table as explained in step 8. Once all the points have been entered, the table must be activated by means of the TAB. ACTIVATE parameter.
10	Result: The linearisation table has been entered.



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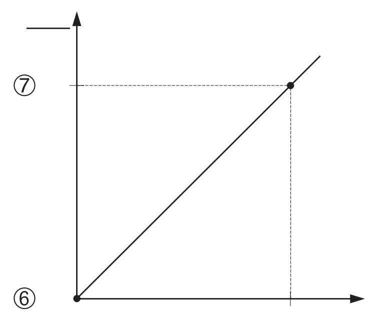

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Fig. 16: Manual entry of the linearisation table

1 See Section 5.3.1, table, step 9.
2 See Section 5.3.1, table, step 10.
3 See table, step 3.
4 See table, step 4.
5 See table, steps 5 – 9.
6 See the following note, point 4.
7 See the following note, point 4.

✎ Note!

1. For this level type, the measured variables %, volume and mass are available.
   → See Page 78 ff.
2. You can also specify customer-specific units. See parameter description for PRESS. ENG. UNIT (→ Page 67), HEIGHT UNIT (→ Page 79), UNIT VOLUME (→ Page 79) and MASS UNIT (→ Page 80).
3. Once you have selected the "Pressure Linearized" level type, the warning message "W710 Set span too small. Not allowed." can appear. At this stage the linearisation table already consists of two points as standard. It could be the case that the 2nd value, and thus the highest X-VAL. of the linearisation table, is smaller than the minimum span permitted (→ MINIMUM SPAN, Page 119). The message goes out as soon as the highest X-VAL. is larger than the minimum span.
4. A level value is assigned to both the lower and upper current value with the SET LRV (→ Page 98) and SET URV (→ Page 98) parameters. If you enter values for TANK CONTENT MIN (→ Page 101 or 104) and TANK CONTENT MAX (→ Page 101 or 105), the SET LRV and SET URV parameters are also changed. If you want to assign values other than those for TANK CONTENT MIN and TANK CONTENT MAX to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

5.6 "Level Standard" level selection, "Height Linearized" level type

5.6.1 Wet calibration and semiautomatic entry of the linearisation table

Example:
In this example, the height and the volume should be measured at the same time.

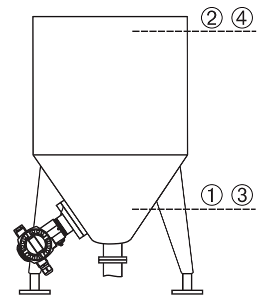
Prerequisite:
- The tank can be filled. The linearisation characteristic must rise continuously.
- A minimum gap of 0.5 % of the distance between two points must be maintained. Spans for the "Pressure linearized" option: HYDR. PRESS MAX. – HYDR. PRESS MIN.; TANK CONTENT MAX. – TANK CONTENT MIN. Spans for the "Height linearized" option: LEVEL MAX – LEVEL MIN; TANK CONTENT MAX. – TANK CONTENT MIN.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 53, Table 6: POSITION ADJUSTMENT
  - Page 67, Table 10: BASIC SETUP
  - Page 83, Table 13: BASIC SETUP – "Height Linearized" level type
  - Page 100, Table 18: LINEARISATION – on-site operation
  - Page 104, Table 19: LINEARISATION – Digital communication.
- For a description of further parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
1	Deltabar S: before configuring the device for your application, the pressure piping must be cleaned and filled with fluid. See Operating Instructions BA00270P, Section 6.5.1	
2	Carry out position adjustment if necessary. See Page 53, Table 6: POSITION ADJUSTMENT.	
	Perform calibration for the 1st measured variable:	
3	If necessary, select the "Level" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE	
4	If necessary, select "Level Standard" level mode using the LEVEL SELECTION parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE "Level" → LEVEL SELECTION Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE "Level" → LEVEL SELECTION	

	Description
5	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION →OPERATING MENU → SETTINGS → BASIC SETUP
6	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
7	Select the "Height Linearized" option by means of the LEVEL MODE parameter.
8	Select the "Height + Volume" option by means of the COMB. MEASURAND parameter.
9	Select the unit for the 1st measured value via the HEIGHT UNIT parameter, here m for example.
10	Select the unit for the 2nd measured variable via the UNIT VOLUME parameter, here m3 for example.
11	Select LEVEL MIN parameter.
	Enter the minimum level to be expected, here 0 m for example.
12	Select LEVEL MAX parameter.
	Enter the maximum level to be expected, here 3 m (9.8 ft) for example.
13	Select the "Wet" option via the CALIBRATION MODE parameter (calibration mode for the 1st measured variable).
14	The pressure for the lower calibration point is present at the device, here 0 mbar for example.
	Select EMPTY CALIB. parameter.
	Enter the level value, here 0 m for example. Confirm the value to assign the pressure value present to the lower level value.
15	The pressure for the upper calibration point is present at the device, here 300 mbar (4.5 psi) for example.
	Select FULL CALIB. parameter.
	Enter the level value, here 3 m (9.8 ft) for example. Confirm the value to assign the pressure value present to the upper level value.
16	Result: The calibration for the 1st measured variable is carried out.



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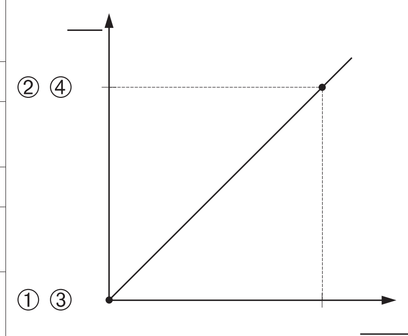

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Fig. 17: Calibrating the 1st measured variable

1 See table, step 11.
2 See table, step 12.
3 See table, step 14.
4 See Table, step 15.

	Description
	Perform linearisation (calibration for the 2nd measured variable)
17	Change the function group. Menu path: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION
18	Select TANK CONTENT MIN parameter.
	Specify the minimum tank contents to be expected, here 0 m^3 for example.
19	Select TANK CONTENT MAX parameter.
	Specify the maximum tank contents to be expected, here 5 m^3 for example.
20	On-site display: Select the "Editor table" option by means of the TABLE SELECTION parameter.
21	Select the "Semiautomatic" option by means of the LIN. EDIT MODE parameter.
22	Select the "New table" option by means of the EDITOR TABLE parameter.
23	Enter linearisation table (min. 2 points, max. 32 points).
	Fill the tank to the height of the 1st point.
	LINE-NUMB: confirm value displayed.
	X-VAL.: the hydrostatic pressure present is measured and converted to the corresponding level and displayed. On-site display, Digital communication: The X-VAL. displayed is saved by confirming the Y-value. See following line, Y-VAL. HART handheld terminal: Confirm X-VAL. displayed.
	Y-VAL.: enter the volume value, here 0 m^3 for example, and confirm the value.
24	On-site display If you want to enter another point for the linearisation table, select the "Next point" option and enter the point as described in step 23. If you want to finish entering the values and activate the linearisation table, select the "Accept input table" option. Digital communication: You can enter further points for the linearisation table as explained in step 23. Once all the points have been entered, the table must be activated by means of the TAB. ACTIVATE parameter.
25	Result: – The linearisation table has been entered. – The measured value display and the TANK CONTENT parameter display the 2nd measured value (here the volume). – The LEVEL BEFORE LIN parameter displays the 1st measured value (here the height). See also the following note, point 5.

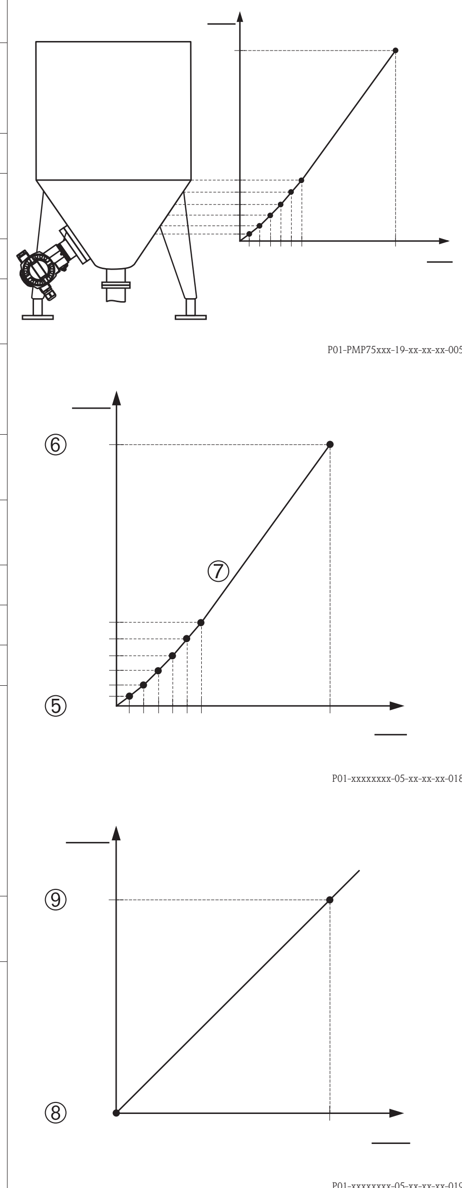


Fig. 18: Calibrating the 2nd measured variable

5 See table, step 18.
6 See table, step 19.
7 See table, steps 20 – 24.
8 See the following note, point 4.
9 See the following note, point 4.

Note!

1. For this level type, the measured variables "Height + %", "Height + Volume", "Height + Mass", "%-Height + %", "%-Height + Volume" and "%-Height + Mass" are available. → See Page 79 ff.
2. You can also specify customer-specific units. See parameter description for PRESS. ENG. UNIT (→ Page 67), HEIGHT UNIT (→ Page 83), UNIT VOLUME (→ Page 84) and MASS UNIT (→ Page 85).
3. Once you have selected the "Pressure Linearized" level type, the warning message "W710 Set span too small. Not allowed." can appear. At this stage the linearisation table already consists of two points as standard. It could be the case that the 2nd value, and thus the highest X-VAL. of the linearisation table, is smaller than the minimum span permitted (→ MINIMUM SPAN, Page 119). The message goes out as soon as the highest X-VAL. is larger than the minimum span.
4. A level value is assigned to both the lower and upper current value with the SET LRV (→ Page 98) and SET URV (→ Page 98) parameters.
   You can use the ASSIGN CURRENT parameter (→ Page 113) to specify whether the current output should depict the 1st or 2nd measured variable. Depending on the setting of the ASSIGN CURRENT parameter, enter the following values for SET LRV and SET URV:
   – ASSIGN CURRENT = tank content (factory setting) ⇒ %-value, volume value or mass value
   – ASSIGNMENT = height ⇒ level value

   The following applies for the setting ASSIGN CURRENT "Tank content":
   If you enter values for TANK CONTENT MIN (→ Page 101 or 104) and TANK CONTENT MAX (→ Page 101 or 105), the SET LRV and SET URV parameters are also changed. If you want to assign values other than those for TANK CONTENT MIN and TANK CONTENT MAX to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

   The following applies for the setting ASSIGN CURRENT "Height":
   If you enter values for LEVEL MIN (→ Page 86) and LEVEL MAX (→ Page 86), the SET LRV and SET URV parameters are also changed. If you want to assign values other than those for LEVEL MIN and LEVEL MAX to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

5. You can use the MENU DESCRIPTOR parameter (→ Page 110) to specify which measured value should be displayed on the on-site display.

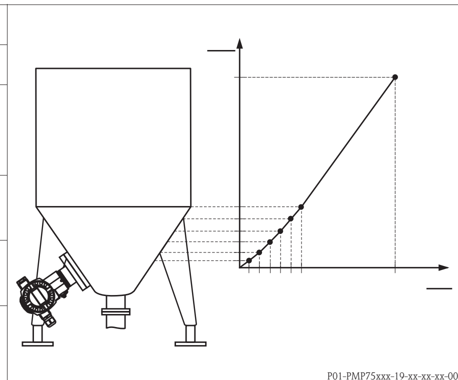
5.6.2 Dry calibration and manual entry of the linearisation table

Example:
In this example, the height and the volume should be measured at the same time.

Prerequisite:
- This is a theoretical calibration, i.e. the points for the linearisation table are known.
- A minimum gap of 0.5 % of the distance between two points must be maintained. Spans for the "Pressure linearized" option: HYDR. PRESS MAX. – HYDR. PRESS MIN.; TANK CONTENT MAX. – TANK CONTENT MIN. Spans for the "Height linearized" option: LEVEL MAX – LEVEL MIN; TANK CONTENT MAX. – TANK CONTENT MIN.

Note!
- See also Operating Instructions for Deltabar S (BA00270P) or Cerabar S (BA00271P), Section 6.5 "Level measurement" or Deltapilot S (BA00332P), Section 6.4 "Level measurement".
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 67, Table 10: BASIC SETUP
  - Page 83, Table 12: BASIC SETUP – "Height Linearized" level type
  - Page 100, Table 18: LINEARISATION – on-site operation
  - Page 104, Table 19: LINEARISATION – Digital communication.
- For a description of further parameters, see
  - Page 96, Table 16: EXTENDED SETUP
  - Page 122, Table 28: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description	
	Perform calibration for the 1st measured variable:	
1	Perform calibration as per Section 5.4.1, steps 3 to 12.	
2	Select the "Dry" option via the CALIBRATION MODE parameter (calibration mode for the 1st measured variable).	
3	Enter the density of the fluid via the ADJUST DENSITY parameter, here 1 kg/dm^3 for example.	
4	If necessary, enter a level offset via the ZERO POSITION parameter, here 0 m for example.	
5	Result: The calibration for the 1st measured variable is carried out.	

	Description
	Perform linearisation (calibration for the 2nd measured variable)
6	Change the function group. Menu path: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION
7	Select TANK CONTENT MIN parameter.
	Specify the minimum tank contents to be expected, here 0 m^3 for example.
8	Select TANK CONTENT MAX parameter.
	Specify the maximum tank contents to be expected, here 5 m^3 for example.
9	On-site display: Select the "Editor table" option by means of the TABLE SELECTION parameter.
10	Select the "Manual" option by means of the LIN. EDIT MODE parameter.
11	Select the "New table" option by means of the EDITOR TABLE parameter.
12	Enter linearisation table (min. 2 points, max. 32 points).
	LINE-NUMB: confirm value displayed.
	X-VAL.: enter the height value and confirm.
	Y-VAL.: enter the volume value, here 0 m^3 for example, and confirm.
13	On-site display If you want to enter another point for the linearisation table, select the "Next point" option and enter the point as described in step 12. If you want to finish entering the values and activate the linearisation table, select the "Accept input table" option. Digital communication: You can enter further points for the linearisation table as explained in step 12. Once all the points have been entered, the table must be activated by means of the TAB. ACTIVATE parameter.
14	Result: – The linearisation table has been entered. – The measured value display and the TANK CONTENT parameter display the 2nd measured value (here the volume). – The LEVEL BEFORE LIN parameter displays the 1st measured value (here the height). See also the following note, point 5.

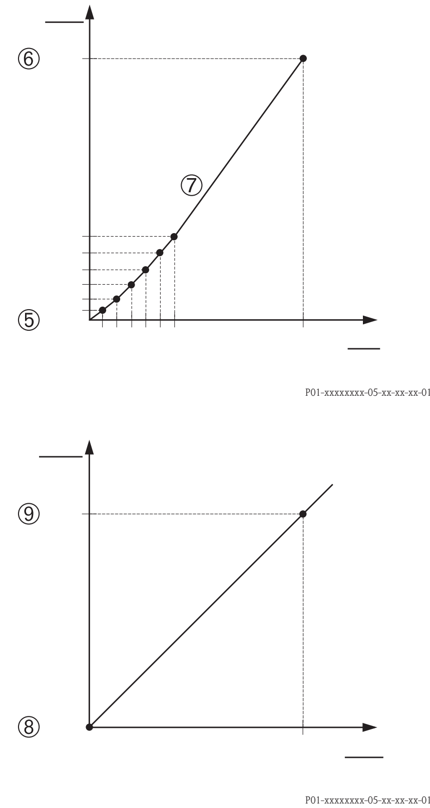


Fig. 19: Calibrating the 2nd measured variable

5 See table, step 7.
6 See table, step 8.
7 See table, steps 9 – 13.
8 See the following note, point 4.
9 See the following note, point 4.

Note!

1. For this level type, the measured variables "Height + %", "Height + Volume", "Height + Mass", "%-Height + %", "%-Height + Volume" and "%-Height + Mass" are available. → See Page 79 ff.
2. You can also specify customer-specific units. See parameter description for PRESS. ENG. UNIT (→ Page 67), HEIGHT UNIT (→ Page 83), UNIT VOLUME (→ Page 84) and MASS UNIT (→ Page 85).
3. Once you have selected the "Pressure Linearized" level type, the warning message "W710 Set span too small. Not allowed." can appear. At this stage the linearisation table already consists of two points as standard. It could be the case that the 2nd value, and thus the highest X-VAL. of the linearisation table, is smaller than the minimum span permitted (→ MINIMUM SPAN, Page 119). The message goes out as soon as the highest X-VAL. is larger than the minimum span.

4. A level value is assigned to both the lower and upper current value with the SET LRV (→ Page 98) and SET URV (→ Page 98) parameters.
   You can use the ASSIGN CURRENT parameter (→ Page 113) to specify whether the current output should depict the 1st or 2nd measured variable. Depending on the setting of the ASSIGN CURRENT parameter, enter the following values for SET LRV and SET URV:
   – ASSIGN CURRENT = tank content (factory setting) ⇒ %- value, volume value or mass value
   – ASSIGNMENT = height ⇒ level value

   The following applies for the setting ASSIGN CURRENT "Tank content":
   If you enter values for TANK CONTENT MIN (→ Page 101 or 104) and TANK CONTENT MAX (→ Page 101 or 105), the SET LRV and SET URV parameters are also changed. If you want to assign values other than those for TANK CONTENT MIN and TANK CONTENT MAX to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

   The following applies for the setting ASSIGN CURRENT "Height":
   If you enter values for LEVEL MIN (→ Page 86) and LEVEL MAX (→ Page 86), the SET LRV and SET URV parameters are also changed. If you want to assign values other than those for LEVEL MIN and LEVEL MAX to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

5. You can use the MENU DESCRIPTOR parameter (→ Page 110) to specify which measured value should be displayed on the on-site display.

6 Flow measurement

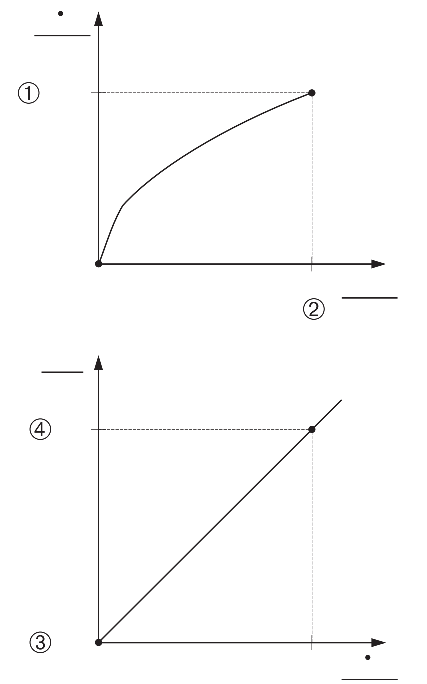
6.1 Calibration

Example:
In this example, a volume flow should be measured in m^3/s.

Note!
- The "Flow measurement" measuring mode is only available for the Deltabar S differential pressure transmitter.
- See also Operating Instructions BA00270P Deltabar S, Section 6.4 "Flow measurement".
- For a description of the parameters mentioned, see
  - Page 45, Table 2: MEASURING MODE
  - Page 53, Table 6: POSITION ADJUSTMENT
  - Page 91 ff, Table 12: BASIC SETUP
  - Page 98 ff, Table 15: EXTENDED SETUP.
- For a description of further parameters, see
  - Page 98, Table 15: EXTENDED SETUP
  - Page 123, Table 29: PROCESS VALUES.

Warning!
If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured.

	Description
1	Before configuring the device for your application, the pressure piping must be cleaned and the device filled with fluid. See Operating Instructions BA00270P, Section 6.4.1.
2	Carry out position adjustment if necessary. See Page 53, Table 6: POSITION ADJUSTMENT.
3	If necessary, select the "Flow" measuring mode via the MEASURING MODE parameter. On-site display: Menu path: GROUP SELECTION → MEASURING MODE Digital communication: Menu path: OPERATING MENU → SETTINGS → BASIC SETUP → MEASURING MODE
4	On-site display: Select BASIC SETUP function group. Menu path: GROUP SELECTION → OPERATING MENU → SETTINGS → BASIC SETUP
5	Select a pressure unit via the PRESS. ENG. UNIT parameter, here mbar for example.
6	Select the "Volume p. cond." option by means of the FLOW-MEAS. TYPE parameter.
7	Select a flow unit via the UNIT FLOW parameter, here m^3/h for example.
8	Select MAX. FLOW parameter. Enter the maximum flow value of the primary element, here 6000 m^3/h for example. See also layout sheet of primary element.
9	Select MAX PRESS. FLOW parameter. Enter the maximum pressure, here 400 mbar (6 psi) for example. See also layout sheet of primary element.
10	Result: The device is configured for flow measurement.



P01-xxxxxxxx-19-xx-xx-xx-013

Fig. 20: Flow measurement calibration

1 See table, step 8.
2 See table, step 9.
3 See the following note, point 4.
4 See the following note, point 4.

Note!

1. You can also perform calibration by means of the QUICK SETUP menu. → See Page 52 ff, Table 5: QUICK SETUP menu.
2. Using the FLOW-MEAS. TYPE parameter, you can choose between the following flow types:
   – Volume p. cond. (volume under operating conditions)
   – Gas norm. cond. (norm volume under norm conditions in Europe: 1013.25 mbar and 273.15 K (0°C))
   – Gas std. cond. (standard volume under standard conditions in USA: 1013.25 mbar (14.7 psi) and 288. 15 K (15°C/59°F))
   – Mass
3. Depending on the flow type selected, you can choose between various units. You can also specify a customer-specific unit.
   See parameter description for PRESS. ENG. UNIT (→ Page 92), UNIT FLOW (→ Page 93), NORM FLOW UNIT (→ Page 93), STD. FLOW UNIT (→ Page 94) and MASS FLOW UNIT (→ Page 94).
4. A flow value or a pressure value is assigned to both the lower and upper current value with the SET LRV (→ Page 99) and SET URV (→ Page 100) parameters.

You can use the LINEAR/SQROOT parameter (→ Page 113) to specify whether the current output should depict the linear pressure signal or the Flow (square root) flow signal. Depending on the setting of the LINEAR/SQROOT parameter, enter the following values for SET LRV and SET URV:
– LINEAR/SQROOT = Flow (square root) (factory setting) ⇒ flow value
– LINEAR/SQROOT = Differential pres. ⇒ pressure value

The following applies for the setting LINEAR/SQROOT "Flow (square root)":
As per the factory settings, the lower current value is set to equal zero and the upper current value is set to the MAX. FLOW value. If you enter a value for MAX. FLOW, the SET URV parameter is also changed. If you want to assign values other than zero and MAX. FLOW to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

The following applies for the setting LINEAR/SQROOT "Differential pres.":
As per the factory settings, the lower current value is set to equal zero and the upper current value is set to the MAX. PRESS. FLOW value. If you enter a value for MAX PRESS. FLOW, the SET URV parameter is also changed. If you want to assign values other than zero and MAX PRESS. FLOW to the lower and upper current values, the desired values must be entered for SET LRV and SET URV.

5. In the lower measuring range, small flow quantities (creepages) can lead to large measured value fluctuations. You can activate low flow cut-off via the LOW FLOW CUT-OFF parameter (→ Page 99).

6.2 Totalizers

Example:
In this example, the volume flow should be totalised and displayed in the unit m^3E^3. Negative flows should be added to the flow rate.

Note!
- For a description of the parameters mentioned, see
  - Page 107 ff, Table 18: TOTALIZER SETUP
  - Page 123 ff, Table 29: PROCESS VALUES
- Totalizer 1 can be reset. Totalizer 2 cannot be reset.

	Description
1	Calibrate the device as per Section 6.1.
2	Change the function group: (GROUP SELECTION →) OPERATING MENU → SETTINGS → TOTALIZER SETUP
3	Select a flow unit via the TOTALIZER 1 UNIT parameter, here m^3 E^3 for example.
4	Use the NEG. FLOW TOT. 1 parameter to specify the totalising mode for negative flows, here the "Positive" option for example.
5	Reset totalizer 1 to zero via the RESET TOTALIZER parameter.
6	Result: The TOTALIZER 1 and TOTAL. 1 OVERFLOW parameters display the totalised volume flow.

Note!
- You can also specify a customer-specific unit. → See parameter description for TOTALIZER 1 UNIT (→ Page 108) and TOTALIZER 2 UNIT (→ Page 109).
- The TOTALIZER 1 and TOTAL. 1 OVERFLOW parameters display the totalised flow value of the first totalizer. The TOTALIZER 2 and TOTAL. 2 OVERFLOW parameters display the totalised flow value of the second totalizer. → See Page 123 ff, PROCESS VALUES function group.
- You can use the MENU DESCRIPTOR parameter (→ Page 110) to specify which measured value should be displayed on the on-site display.

7 Description of parameters

Note!
- The following tables list all the parameters as per the menu structure. Each table corresponds to a function group in the menu tree. The overall menu structure is illustrated in Section 9.1.
- The menu structure for on-site operation and the digital communication are slightly different. The differences mainly affect the MEASURING MODE and LANGUAGE parameters and the LINEARISATION function group.
- In the operating program or HART handheld terminal, additional parameters are displayed. These parameters are marked accordingly.
- The menu path is indicated in the header of each table. You can use this path to get to the parameters in question.
- The menu has a different structure depending on the measuring mode selected. This means that some function groups are only displayed for one measuring mode, e.g. the "LINEARISATION" function group for the "Level" measuring mode. If certain requirements have to be met for a function group, these are listed in the first row of the table.
- Some parameters are only displayed if other parameters are appropriately configured. For example, the EMPTY CALIB. parameter is not displayed in the Quick Setup menu ("Level" measuring mode) unless the "Linear" option was selected for the LEVEL MODE parameter and the "Wet" option was selected for the CALIBRATION MODE parameter. There is a comment in the parameter description here stating: Note: prerequisite: LEVEL MODE = Linear and CALIBRATION MODE = Wet.
- Parameter names are written in upper case in the text.
- In the "Parameter name" column, the unique identification number (ID) of the parameter is indicated in brackets. This ID only appears on the on-site display.

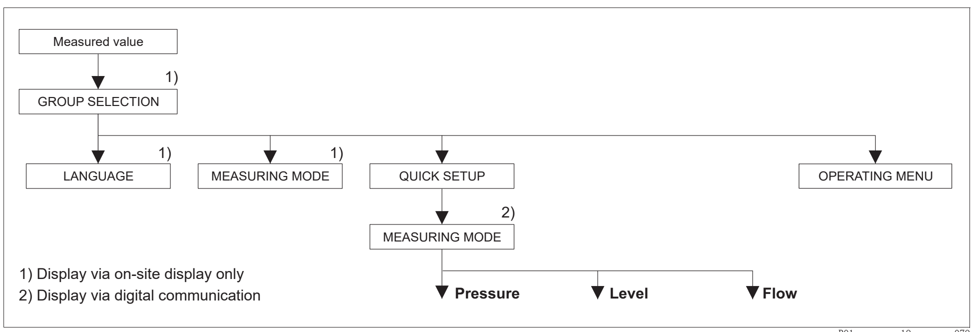


Fig. 21: 1st selection level in menu, LANGUAGE (→ see Page 44, Table 1) and MEASURING MODE (→ see Page 45, Table 2)

Table 1: GROUP SELECTION → LANGUAGE – on-site operation	
Parameter name	**Description**
LANGUAGE (079) Selection	Select the menu language for the on-site display. Note! ■ In the operating program and in the HART handheld terminal, the LANGUAGE parameter is arranged in the DISPLAY function group. ■ Select the menu language for FieldCare via the "Options" menu → "Settings" → "Language" tab → "Tool language" field. **Factory setting:** English

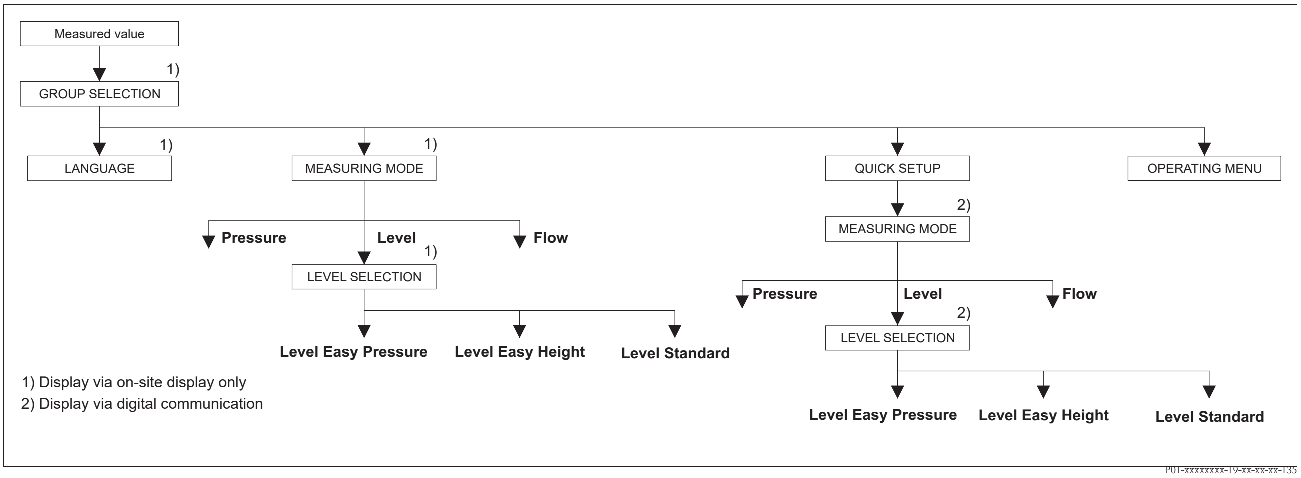


Fig. 22: "Level" measuring mode, LEVEL SELECTION parameter

Table 2: GROUP SELECTION → MEASURING MODE – on-site operation	
Parameter name	**Description**
MEASURING MODE (389) Selection	Select the measuring mode. The operating menu is structured according to the selected measuring mode. Note! ■ The MEASURING MODE parameter is displayed in the operating program and in the HART handheld terminal in the QUICK SETUP menus and in the BASIC SETUP function group (OPERATING MENU → SETTINGS → BASIC SETUP). Warning! If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured. **Options:** ■ Pressure ■ Level ■ Deltabar S: Flow **Factory setting:** ■ Cerabar S and Deltabar S: Pressure ■ Deltapilot S: Level

<table>
<tr><th colspan="2">Table 2: GROUP SELECTION → MEASURING MODE – on-site operation</th></tr>
<tr><th>Parameter name</th><th>Description</th></tr>
<tr><td>LEVEL SELECTION (020)
Options</td><td>Select level mode.

Prerequisite:
■ MEASURING MODE = Level

Note!
■ In the "Level Easy Pressure" and "Level Easy Height" level modes, the values entered are not tested as extensively as in the "Level Standard" level mode. The values entered for EMPTY CALIB./FULL CALIB., EMPTY PRESSURE/FULL PRESSURE, EMPTY HEIGHT/FULL HEIGHT and SET LRV/SET URV must have a minimum interval of 1% for the "Level Easy Pressure" and "Level Easy Height" level modes. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
→ For an overview of the different level modes and types, see Page 14, Section 5.1 "Overview of level measurement".
■ The "Level Easy Pressure" and "Level Easy Height" level modes encompass fewer parameters than the "Level Standard" mode and are used for quick and easy configuration of a level application.
■ Customer-specific units of fill level, volume and mass or a linearization table may only be entered in the "Level Standard" level mode.
■ Where the device is intended for use as a subsystem in a safety function (SIL), a "Device configuration with enhanced parameter security" (SAFETY CONFIRM.) is only possible for the "Level" operating mode in the "Level Easy Pressure" level mode. All parameters previously entered are checked after a password is entered. Once the "Level Easy Height" or "Level Standard" has been selected, the configuration will first have to be reset to the ex-works setting using the RESET parameter (menu path: (GROUP SELECTION →) OPERATING MENU → OPERATION) using the reset code "7864".
→ For additional information, see the Safety Manual for Deltabar S (SD00189), Cerabar S (SD00190) or Deltapilot S (SD00213P).

Options:
■ Level Easy Pressure
Specify two pressure-level value pairs for this level mode. The pressure measured value is converted directly to the unit which is selected via the OUTPUT UNIT parameter (→ Page 60). Two calibration modes, "Wet" and "Dry", are available.
– Wet calibration takes place by filling and emptying the container. In the case of two different levels, the level, volume, mass or percentage value entered is assigned to the pressure measured at this point in time.
– Dry calibration is a theoretical calibration. For this calibration, specify two pressure-level value pairs via the EMPTY CALIB., EMPTY PRESSURE, FULL CALIB. and FULL PRESSURE parameters. → Parameter descriptions see Page 61 ff.
■ Level Easy Height
For this level mode, specify a height unit, density and two height-level value pairs. The pressure measured value is converted to a height value using the density entered and the height unit. Two calibration modes, "Wet" and "Dry", are available.
– Wet calibration takes place by filling and emptying the container. In the case of two different levels, the level, volume, mass or percentage value entered is assigned to the converted height value.
– Dry calibration is a theoretical calibration. For this calibration, specify two height-level value pairs via the EMPTY CALIB., EMPTY HEIGHT, FULL CALIB. and FULL HEIGHT parameters. → Parameter descriptions see Page 65 ff.
■ Level standard
Once you have selected this level mode, you can use the LEVEL MODE parameter (→ Page 68) to choose between "Linear", "Pressure Linearized" and "Height Linearized".

Factory setting:
Level Easy Pressure</td></tr>
<tr><td colspan="2">→ For LEVEL SELECTION = "Level Easy Pressure" see Page 58, Table 8.
→ For LEVEL SELECTION = "Level Easy Height" see Page 62, Table 9.
→ For LEVEL SELECTION = "Level standard" see Page 67, Table 10.</td></tr>
</table>

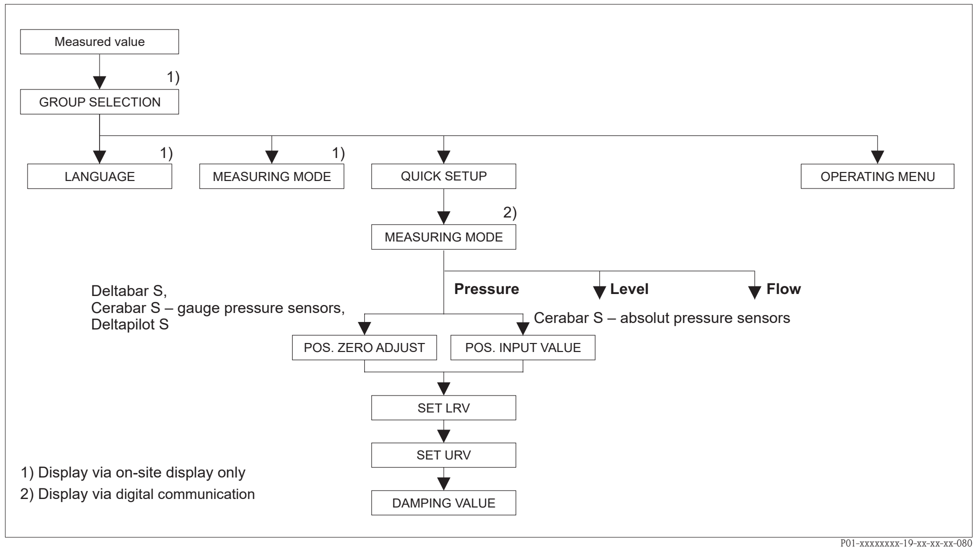


Fig. 23: Quick Setup menu for the "Pressure" measuring mode

Table 3: (GROUP SELECTION →) QUICK SETUP "Pressure"	
Parameter name	**Description**
This menu displays the most important parameters for the "Pressure" measuring mode. **Prerequisite:** ■ MEASURING MODE = Pressure (→ see also Page 45). **Note:** See also – Page 55 ff, Table 7: BASIC SETUP – Page 96, Table 15: EXTENDED SETUP – Page 121 ff, Table 27: PROCESS VALUES – Page 11 ff, Section 4 "Pressure measurement".	
MEASURING MODE Selection	Select the measuring mode. The operating menu is structured according to the selected measuring mode. ⚠ Warning! If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured. **Prerequisite:** ■ Digital communication **Options:** ■ Pressure ■ Level ■ Deltabar S: Flow **Factory setting:** ■ Cerabar S and Deltabar S: Pressure ■ Deltapilot S: Level

Table 3: (GROUP SELECTION →) QUICK SETUP "Pressure"	
Parameter name	**Description**
POS. ZERO ADJUST (685) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. Due to the orientation of the device, there may be a shift in the measured value, i.e. for example, when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero. **Example:** – MEASURED VALUE = 2.2 mbar (0.033 psi) – Correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option. This means that you are assigning the value 0.0 to the pressure present. – MEASURED VALUE (after pos. zero adjust) = 0.0 mbar – The current value is also corrected. The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. **Prerequisite:** ▪ This parameter is displayed for Deltabar S, Cerabar S with gauge pressure sensor and Deltapilot S. **Options:** ▪ Abort ▪ Confirm **Factory setting:** 0.0
POS. INPUT VALUE (563) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. To correct the pressure difference, you need a reference measurement value (e. g. from a reference device). Due to the orientation of the device, there may be a shift in the measured value, i.e. for example, when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero or the desired value. **Example:** – MEASURED VALUE = 0.5 mbar (0.0075 psi) – For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE, e.g. 2 mbar. (MEASURED VALUE$_{new}$ = POS. INPUT VALUE) – MEASURED VALUE (after entry for POS. INPUT VALUE) = 2.0 mbar (0.03 psi) – The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. CALIB. OFFSET = MEASURED VALUE $_{old}$ – POS. INPUT VALUE, here: CALIB. OFFSET = 0.5 mbar (0.0075 psi) – 2.0 mbar (0.03 psi) = – 1.5 mbar (0.0225 psi)) – The current value is also corrected. **Prerequisite:** ▪ This parameter is displayed for Cerabar S with absolute pressure sensors. **Factory setting:** 0.0
SET LRV (245) Entry	Set lower range value – without reference pressure. Enter pressure value for the lower current value (4 mA). **Factory setting:** 0.0 or as per order specifications
SET URV (246) Entry	Set upper range value – without reference pressure. Enter pressure value for the upper current value (20 mA). **Factory setting:** High sensor limit (→ see PRESS. SENS HILIM, Page 119) or as per order specifications
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

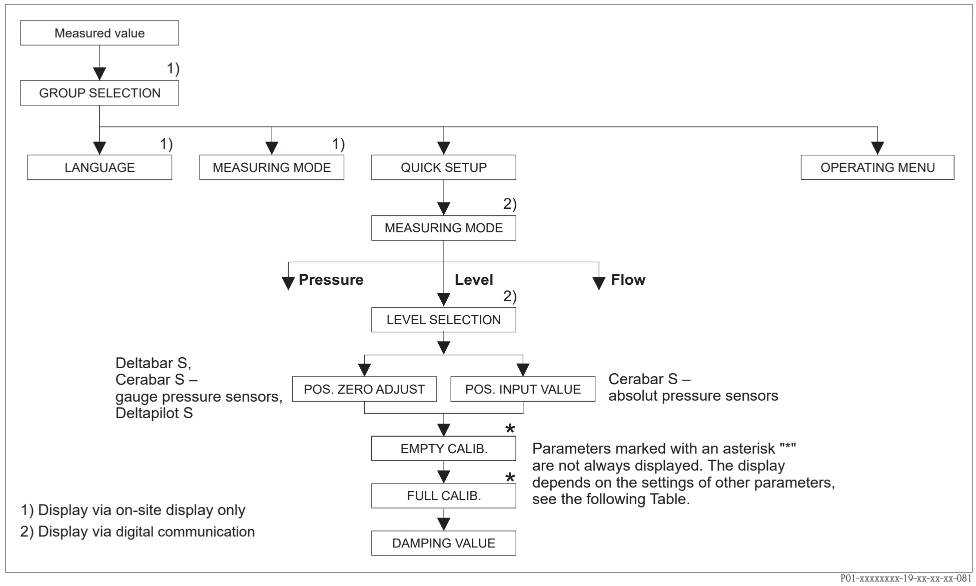


Fig. 24: Quick Setup menu for the "Level" measuring mode

Table 4: (GROUP SELECTION →) QUICK SETUP "Level"	
Parameter name	**Description**
This menu displays the most important parameters for the "Level" measuring mode. **Prerequisite**: ■ MEASURING MODE = Level (→ see also Page 45). **Note:** See also – Page 67 ff, Tables 10 to 13: BASIC SETUP – Page 96 ff, Table 16: EXTENDED SETUP – Page 100 ff, Table 18: LINEARISATION – on-site operation – Page 104 ff, Table 19: LINEARISATION – Digital communication – Page 122 ff, Table 28: PROCESS VALUES – Page 14 ff, Section 5 "Level measurement".	
MEASURING MODE Selection	Select the measuring mode. The operating menu is structured according to the selected measuring mode. ⚠ Warning! If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured. **Prerequisite:** ■ Digital communication **Options**: ■ Pressure ■ Level ■ Deltabar S: Flow **Factory setting:** ■ Cerabar S and Deltabar S: Pressure ■ Deltapilot S: Level
LEVEL SELECTION (020) Options	Select level mode. → Parameter description, see Page 46. **Factory setting:** Level Easy Pressure

<table>
<tr><th colspan="2">Table 4: (GROUP SELECTION →) QUICK SETUP "Level"</th></tr>
<tr><th>Parameter name</th><th>Description</th></tr>
<tr><td>POS. ZERO ADJUST (685)
Entry</td><td>Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known.
Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero.

Example:
– MEASURED VALUE = 2.2 mbar (0.033 psi)
– Correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option. This means that you are assigning the value 0.0 to the pressure present.
– MEASURED VALUE (after pos. zero adjust) = 0.0 mbar
– The current value is also corrected.

The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected.

Prerequisite:
■ This parameter is displayed for Deltabar S, Cerabar S with gauge pressure sensor and Deltapilot S.

Options:
■ Abort
■ Confirm

Factory setting:
0.0</td></tr>
<tr><td>POS. INPUT VALUE (563)
Entry</td><td>Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. To correct the pressure difference, you need a reference measurement value (e. g. from a reference device).
Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero or the desired value.

Example:
– MEASURED VALUE = 0.5 mbar (0.0075 psi)
– For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE, e.g. 2.0 mbar (0.03 psi).
(MEASURED VALUE $_{new}$ = POS. INPUT VALUE)
– MEASURED VALUE (after entry for POS. INPUT VALUE) = 2.0 mbar (0.03 psi)
– The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected.
CALIB. OFFSET = MEASURED VALUE$_{old}$ – POS. INPUT VALUE,
here: CALIB. OFFSET = 0.5 mbar (0.0075 psi) – 2.0 mbar (0.03 psi) = – 1.5 mbar (0.0225 psi))
– The current value is also corrected.

Prerequisite:
■ This parameter is displayed for Cerabar S with absolute pressure sensors.

Factory setting:
0.0</td></tr>
<tr><td>EMPTY CALIB. (314)/(010)
Entry</td><td>Enter level value for the lower calibration point (container empty).
The container is either empty or part full. By entering a value for this parameter, you are assigning a level value to the pressure present at the device.

Prerequisite:
■ LEVEL SELECTION = Level Easy Pressure (→ see also Page 46),
CALIBRATION MODE = Wet (→ see also Page 60)
■ LEVEL SELECTION = Level Standard (→ see also Page),
LEVEL MODE = Linear (→ see also Page 68),
CALIBRATION MODE = Wet (→ see also Page 73)

✎ Note!
For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged.

Factory setting:
0.0</td></tr>
</table>

Table 4: (GROUP SELECTION →) QUICK SETUP "Level"	
Parameter name	**Description**
FULL CALIB. (315)/(004) Entry	Enter level value for the upper calibration point (container full). The container is either completely or almost full. By entering a value for this parameter, you are assigning a level value to the pressure present at the device. **Prerequisite:** ▪ LEVEL SELECTION = Level Easy Pressure (→ see also Page 46), CALIBRATION MODE = Wet (→ see also Page 60) ▪ LEVEL SELECTION = Level Standard, LEVEL MODE = Linear (→ see also Page 68), CALIBRATION MODE = Wet (→ see also Page 73) Note! For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged. **Factory setting:** 100.0
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

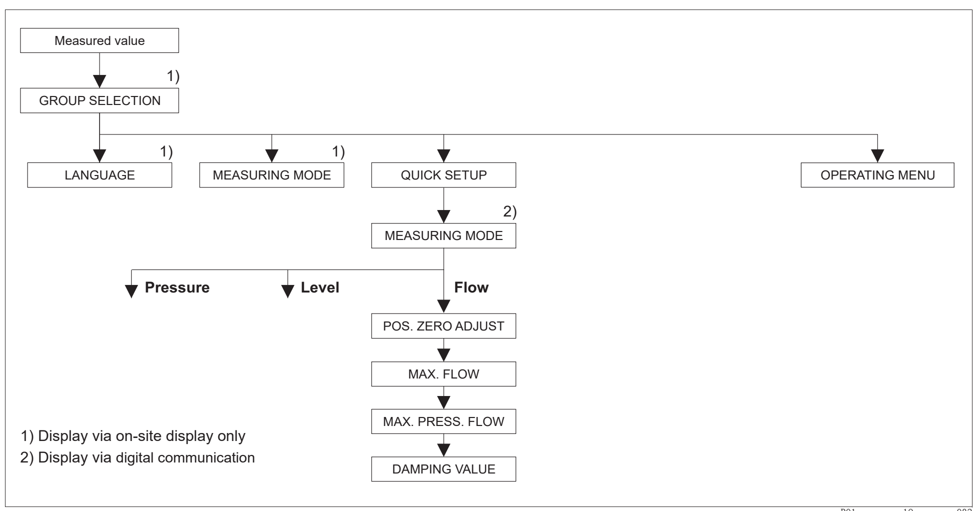


Fig. 25: Quick Setup menu, "Flow" measuring mode

Table 5: (GROUP SELECTION →) QUICK SETUP "Flow"	
Parameter name	**Description**
This menu displays the most important parameters for the "Flow" measuring mode. **Prerequisite**: ▪ Deltabar S differential pressure transmitter ▪ MEASURING MODE = Flow (→ see also Page 45). **Note:** See also – Page 91, Table 14: BASIC SETUP – Page 98, Table 17: EXTENDED SETUP – Page 107, Table 20: TOTALIZER SETUP – Page 40 ff, Section 6 "Flow measurement".	
MEASURING MODE Selection	Select the measuring mode. The operating menu is structured according to the selected measuring mode. ⚠ Warning! If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured. **Prerequisites:** ▪ Digital communication **Options**: ▪ Pressure ▪ Level ▪ Deltabar S: Flow **Factory setting:** ▪ Cerabar S and Deltabar S: Pressure ▪ Deltapilot S: Level
POS. ZERO ADJUST (685) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. (A reference pressure is present at the device.) Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the MEASURED VALUE parameter does not display zero. **Example:** – MEASURED VALUE = 2.2 mbar (0,033 psi) – Correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option. This means that you are assigning the value 0.0 to the pressure present. – MEASURED VALUE (after pos. zero adjust) = 0.0 mbar – The current value is also corrected. The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. **Selection:** ▪ Abort ▪ Confirm **Factory setting:** 0.0
MAX. FLOW (311) Entry	Enter maximum flow of primary element. See also layout sheet of primary element. The maximum flow is assigned to the maximum pressure which you enter via MAX PRESS. FLOW. ✎ Note! Use the LINEAR/SQROOT parameter (→ Page 113) to specify the current signal for the "Flow" measuring mode. The following applies for the "Flow (square root)" setting: If you enter a new value for MAX. FLOW, the value for SET URV is also changed. Use SET URV to assign a flow to the upper current value. If you want to assign the upper current value a value other than that for MAX. FLOW, you must enter the desired value for SET URV. (→ SET URV, Page 100). **Factory setting:** 1.0

Table 5: (GROUP SELECTION →) QUICK SETUP "Flow"	
Parameter name	**Description**
MAX PRESS. FLOW (634) Entry	Enter maximum pressure of primary element. → See layout sheet of primary element. This value is assigned to the maximum flow value (→ see MAX. FLOW). Note! Use the LINEAR/SQROOT parameter (→ Page 113) to specify the current signal for the "Flow" measuring mode. The following applies for the "Differential pres." setting: If you enter a new value for MAX PRESS. FLOW, the value for SET URV is also changed. Use SET URV to assign a pressure value to the upper current value. If you want to assign the upper current value a value other than that for MAX PRESS. FLOW, you must enter the desired value for SET URV. (→ SET URV, Page 100). **Factory setting:** High sensor limit (→ See PRESS. SENS HILIM, Page 119)
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

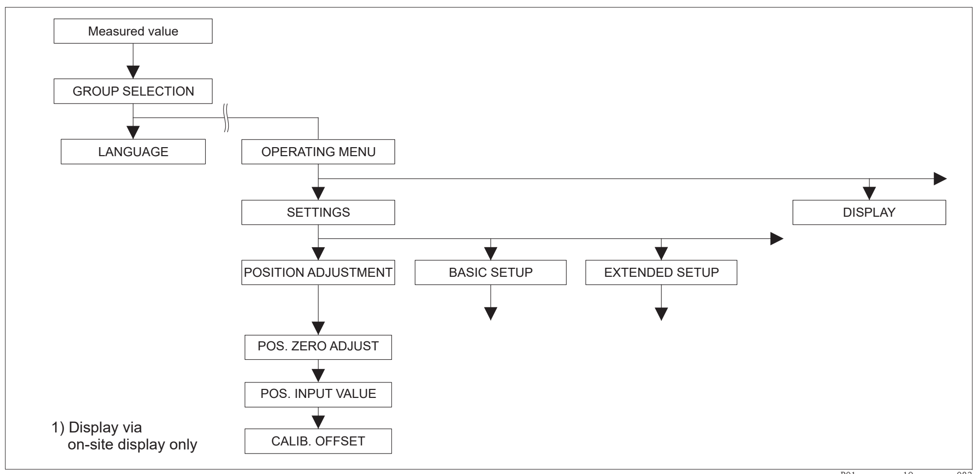


Fig. 26: POSITION ADJUSTMENT function group

Table 6: (GROUP SELECTION →) OPERATING MENU → SETTINGS → POSITION ADJUSTMENT	
Parameter name	**Description**
Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the measured value does not display zero. Deltabar S and Cerabar S offer three different ways of performing a position adjustment. Recommendation: ■ The pressure difference between zero (set point) and the measured pressure need not be known. – POS. ZERO ADJUST: Deltabar S or Cerabar S with gauge pressure sensor or Deltapilot S. – POS. INPUT VALUE: Cerabar S with absolute pressure sensor. ■ The pressure difference between zero (set point) and the measured pressure is known. – CALIB. OFFSET: Deltabar S, Cerabar S with gauge pressure sensor, Cerabar S with absolute pressure sensor or Deltapilot S.	

Table 6: (GROUP SELECTION →) OPERATING MENU → SETTINGS → POSITION ADJUSTMENT	
Parameter name	**Description**
POS. ZERO ADJUST (685) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. **Example:** – MEASURED VALUE = 2.2 mbar (0.033 psi) – Correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option. This means that you are assigning the value 0.0 to the pressure present. – MEASURED VALUE (after pos. zero adjust) = 0.0 mbar – The current value is also corrected. The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. **Selection:** ▪ Abort ▪ Confirm **Factory setting:** 0.0
POS. INPUT VALUE (563) Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. To correct the pressure difference, you need a reference measurement value (e. g. from a reference device). **Example:** – MEASURED VALUE = 0.5 mbar (0.0075 psi) – For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE, e.g. 2.0 mbar (0.03 psi). (MEASURED VALUE$_{new}$ = POS. INPUT VALUE) – MEASURED VALUE (after entry for POS. INPUT VALUE) = 2.0 mbar (0.03 psi) – The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. CALIB. OFFSET = MEASURED VALUE$_{old}$ – POS. INPUT VALUE, here: CALIB. OFFSET = 0.5 mbar (0.0075 psi) – 2.0 mbar (0.03 psi) = – 1.5 mbar (0.0225 psi)) – The current value is also corrected. **Factory setting:** 0.0
CALIB. OFFSET (319) Entry	Position adjustment - the pressure difference between zero (set point) and the measured pressure is known. **Example:** – MEASURED VALUE = 2.2 mbar (0.033 psi) – Via the CALIB. OFFSET parameter, enter the value by which the MEASURED VALUE should be corrected. To correct the MEASURED VALUE to 0.0 mbar, you must enter the value 2.2 here. (MEASURED VALUE$_{new}$ = MEASURED VALUE$_{old}$ – CALIB. OFFSET) – MEASURED VALUE (after entry for calib. offset) = 0.0 mbar – The current value is also corrected. **Factory setting:** 0.0

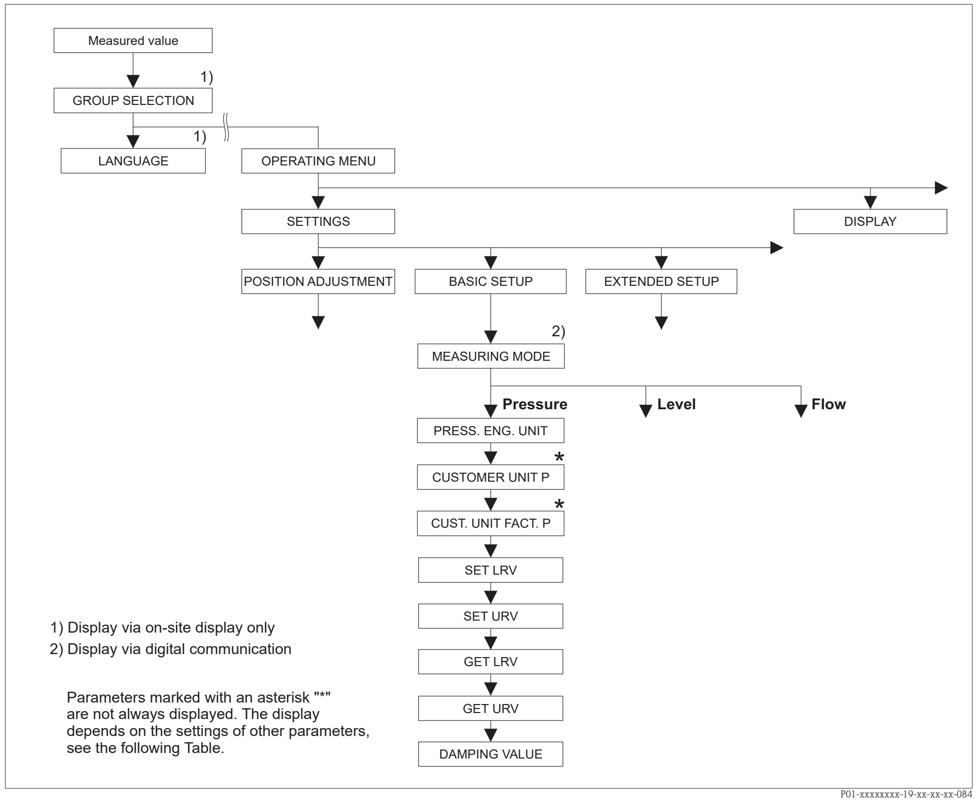


Fig. 27: BASIC SETUP function group for the "Pressure" measuring mode

Table 7: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Pressure"	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = Pressure (→ see also Page 45). **Note:** See also – Page 47, Table 3: QUICK SETUP – Page 96, Table 15: EXTENDED SETUP – Page 121 ff, Table 27: PROCESS VALUES – Page 11 ff, Section 4 "Pressure measurement".	
MEASURING MODE Selection	Select the measuring mode. The operating menu is structured according to the selected measuring mode. ⚠ Warning! If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured. **Prerequisite:** ■ Digital communication **Options:** ■ Pressure ■ Level ■ Deltabar S: Flow **Factory setting:** ■ Cerabar S and Deltabar S: Pressure ■ Deltapilot S: Level

Table 7: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Pressure"	
Parameter name	**Description**
PRESS. ENG. UNIT (060) Selection	Select pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ■ mbar, bar ■ mmH2O, mH2O, inH2O, ftH2O [1)] ■ Pa, hPa, kPa, MPa ■ psi ■ mmHg, inHg [2)] ■ Torr ■ g/cm^2, kg/cm^2 ■ lb/ft^2 ■ atm ■ gf/cm^2, kgf/cm^2 ■ User unit, → See also the following parameter description for CUSTOMER UNIT P and CUST. UNIT FACT. P. 1) The conversion factor of the pressure units refers to a reference temperature of 4 °C (39.2 °F). 2) The conversion factor of the pressure units refers to a reference temperature of 0 °C (32 °F). **Factory setting:** Depends on the sensor nominal measuring range mbar or bar or as per order specifications
CUSTOMER UNIT P (075) Entry	Enter text (unit) for customer-specific pressure unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. P. **Prerequisite:** ■ PRESS. ENG. UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT P parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** – – – – – – – –
CUST. UNIT FACT. P (317) Entry	Enter conversion factor for a customer-specific pressure unit. The conversion factor must be entered in relation to the SI unit "Pa". → See also CUSTOMER UNIT P. **Prerequisite:** ■ PRESS. ENG. UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE =10000 Pa ≙ 1 PU – Entry CUSTOMER UNIT P: PU – Entry CUST. UNIT FACT. P: 0.0001 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0
SET LRV (245) Entry	Set lower range value – without reference pressure. Enter pressure value for the lower current value (4 mA). **Factory setting:** 0.0 or as per order specifications

Table 7: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Pressure"	
Parameter name	**Description**
SET URV (246) Entry	Set upper range value – without reference pressure. Enter pressure value for the upper current value (20 mA). **Factory setting:** High sensor limit (→ See PRESS. SENS HILIM, Page 119)
GET LRV (309) Entry	Set lower range value – reference pressure is present at device. The pressure for the lower current value (4 mA) is present at device. With the "Confirm" option, you assign the lower current value to the pressure value present. On-site display: the pressure value present is displayed in the bottom line. **Options:** ■ Abort ■ Confirm
GET URV (310) Entry	Set upper range value – reference pressure is present at device. The pressure for the upper current value (20 mA) is present at device. With the "Confirm" option, you assign the upper current value to the pressure value present. On-site display: the pressure value present is displayed in the bottom line. **Options:** ■ Abort ■ Confirm
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

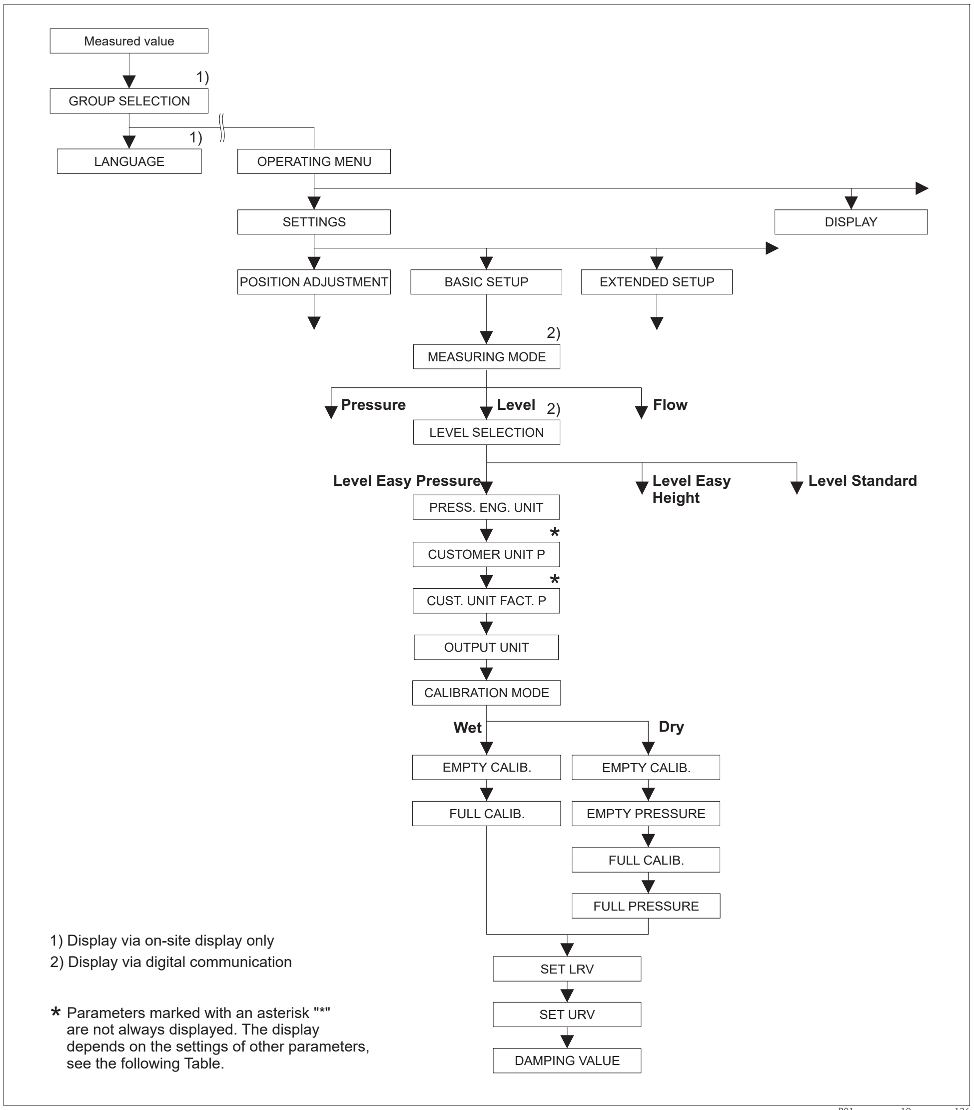


Fig. 28: BASIC SETUP function group for the "Level" measuring mode and "Level Easy Pressure" level selection

Table 8: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Pressure"
The following parameters are displayed if you have selected the "Level Easy Pressure" option for the LEVEL SELECTION parameter. Specify two pressure-level value pairs for this level mode. Two calibration modes, "Wet" and "Dry", are available. **Prerequisite:** ▪ MEASURING MODE = Level (→ see also Page 45.) ▪ LEVEL SELECTION = Level Easy Pressure (→ See also Page 46.)

Table 8: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Pressure"	
PRESS. ENG. UNIT (060) Selection	Select pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ■ mbar, bar ■ mmH2O, mH2O, inH2O, ftH2O 1) ■ Pa, hPa, kPa, MPa ■ psi ■ mmHg, inHg 2) ■ Torr ■ g/cm², kg/cm² ■ lb/ft² ■ atm ■ gf/cm², kgf/cm² ■ User unit, → See also the following parameter description for CUSTOMER UNIT P and CUST. UNIT FACT. P. 1) The conversion factor of the pressure units refers to a reference temperature of 4 °C (39.2 °F). 2) The conversion factor of the pressure units refers to a reference temperature of 0 °C (32 °F). **Factory setting:** Depends on the sensor nominal measuring range mbar or bar or as per order specifications
CUSTOMER UNIT P (075) Entry	Enter text (unit) for customer-specific pressure unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. P. **Prerequisite:** ■ PRESS. ENG. UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT P parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. P (317) Entry	Enter conversion factor for a customer-specific pressure unit. The conversion factor must be entered in relation to the SI unit "Pa". → See also CUSTOMER UNIT P. **Prerequisite:** ■ PRESS. ENG. UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE =10000 Pa ≙ 1 PU – Entry CUSTOMER UNIT P: PU – Entry CUST. UNIT FACT. P: 0.0001 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0

Table 8: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Pressure"	
OUTPUT UNIT (023) Selection	Select unit for measured value display and MEASURED VALUE parameter (→ Page 122). Note! The selected unit is used only to describe the measured value. This means that when selecting a new output unit, the measured value is not converted. Example: ■ current measured value: 0.3 ft ■ new output unit: m ■ new measured value: 0.3 m (9.8 ft) **Options** ■ % ■ mm, cm, dm, m ■ ft, inch ■ cm^3, dm^3, m^3,m^3 E^3 ■ l, hl ■ ft^3, ft^3 E^3 ■ gal, bbl, Igal ■ g, kg, t ■ lb, ton, oz **Factory setting:** %
CALIBRATION MODE (008) Selection	Select calibration mode. **Options:** ■ Wet Wet calibration takes place by filling and emptying the container. In the case of two different levels, the level, volume, mass or percentage value entered is assigned to the pressure measured at this point in time. (→ See also this table, parameter descriptions for EMPTY CALIB. and FULL CALIB.) ■ Dry Dry calibration is a theoretical calibration. For this calibration, specify two pressure-level value pairs via the following parameters: EMPTY CALIB., EMPTY PRESSURE, FULL CALIB. and FULL PRESSURE. **Factory setting:** Wet
EMPTY CALIB. (010) Entry	Enter level, volume, mass or percentage value for the lower calibration point (container empty). The container is either empty or part full. By entering a value for this parameter, you assign a level, volume, mass or percentage value to the pressure present at the device. The unit is selected via the OUTPUT UNIT parameter (→ Page 60). **Prerequisite:** ■ CALIBRATION MODE = Wet Note! For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged. **Factory setting:** 0.0
FULL CALIB. (004) Entry	Enter height, volume or mass value for the upper calibration point (container full). The container is either completely or almost full. By entering a value for this parameter, you assign a height, volume or mass value to the pressure present at the device. The unit is selected via the OUTPUT UNIT parameter (→ Page 60). **Prerequisite:** ■ CALIBRATION MODE = Wet Note! For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged. **Factory setting:** 100.0

Table 8: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Pressure"	
EMPTY CALIB. (010) Entry	Enter level, volume, mass or percentage value for the lower calibration point (container empty). The values entered for the EMPTY CALIB. and EMPTY PRESSURE parameters form the pressure-level value pair for the lower calibration point. The unit is selected via the OUTPUT UNIT parameter (→ Page 60). **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** 0.0
EMPTY PRESSURE (011) Entry	Enter pressure value for the lower calibration point (container empty). → See also EMPTY CALIB. **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** 0.0
FULL CALIB. (004) Entry	Enter height, volume, mass or percentage value for the upper calibration point (container full). The values entered for the FULL CALIB. and FULL PRESSURE parameters form the pressure-level value pair for the upper calibration point. The unit is selected via the OUTPUT UNIT parameter (→ Page 60). **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** 100.0
FULL PRESSURE (005) Entry	Enter pressure value for the upper calibration point (container full). → See also FULL CALIB. **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** 100.0
SET LRV (013) Entry	Enter value for the lower current value (4 mA). The unit is selected via the OUTPUT UNIT parameter (→ Page 60). **Factory setting:** 0.0
SET URV (012) Entry	Enter value for the upper current value (20 mA). The unit is selected via the OUTPUT UNIT parameter (→ Page 60). **Factory setting:** 100.0
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0 to 999.0 s **Factory setting:** 2.0 s or as per order specifications

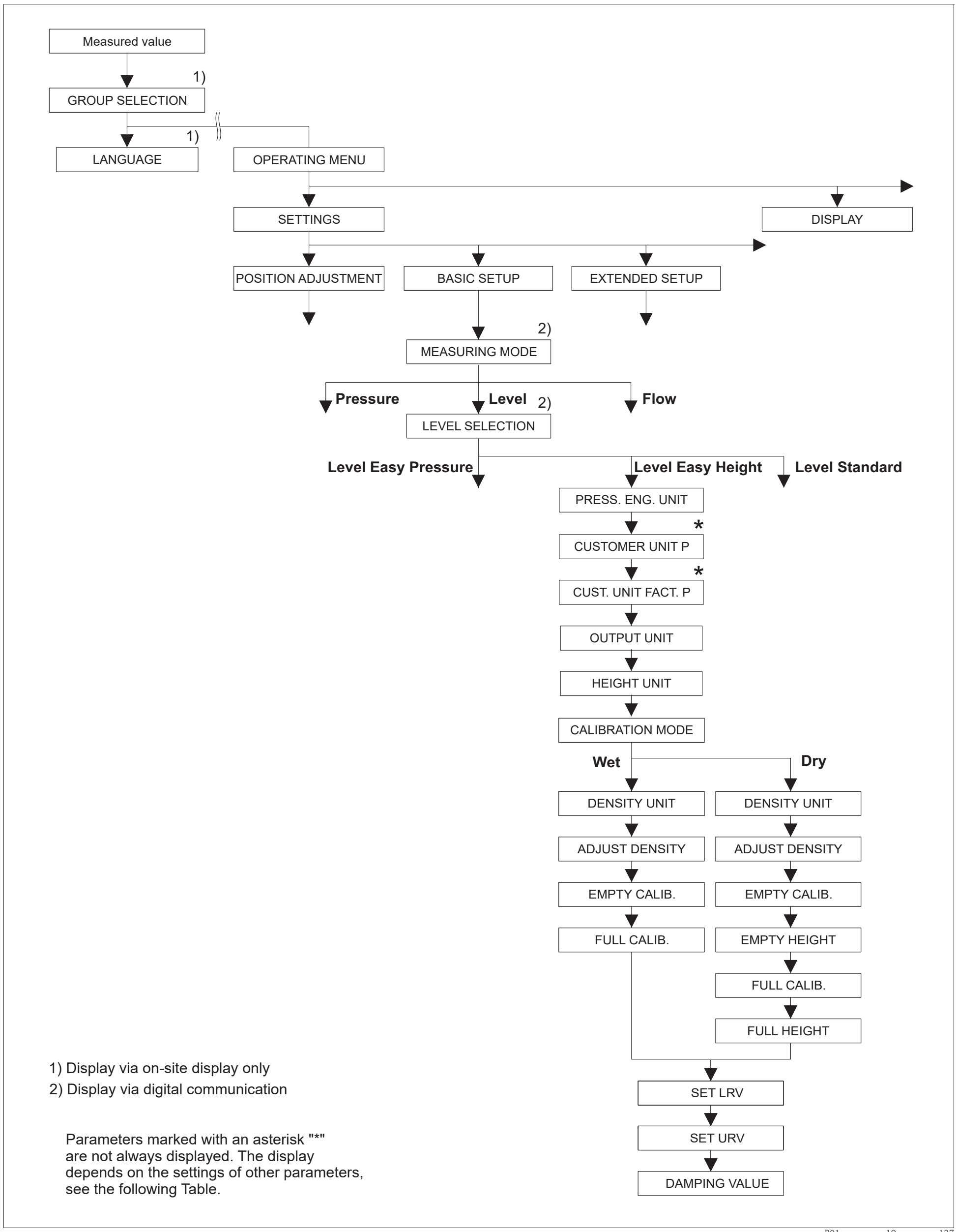


Fig. 29: BASIC SETUP function group for "Level" measuring mode and "Level Easy Height" level selection

Table 9: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Height"
The following parameters are displayed if you have selected the "Level Easy Height" option for the LEVEL SELECTION parameter. For this level mode, specify a height unit, density and two height-level value pairs. The pressure measured value is converted to a height value using the density entered and the height. Two calibration modes, "Wet" and "Dry", are available. **Prerequisite:** ■ MEASURING MODE = Level (→ see also Page 45.) ■ LEVEL SELECTION = Level Easy Height (→ See also Page 46.)

Table 9: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Height"	
PRESS. ENG. UNIT (060) Options	Select pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ■ mbar, bar ■ mmH2O, mH2O, inH2O, ftH2O 1) ■ Pa, hPa, kPa, MPa ■ psi ■ mmHg, inHg 2) ■ Torr ■ g/cm², kg/cm² ■ lb/ft² ■ atm ■ gf/cm², kgf/cm² ■ User unit, → See also the following parameter description for CUSTOMER UNIT P and CUST. UNIT FACT. P. 1) The conversion factor of the pressure units refers to a reference temperature of 4 °C (39.2 °F). 2) The conversion factor of the pressure units refers to a reference temperature of 0 °C (32 °F). **Factory setting:** Depends on the sensor nominal measuring range mbar or bar or as per order specifications
CUSTOMER UNIT P (075) Entry	Enter text (unit) for customised pressure unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. P. **Prerequisite:** ■ PRESS. ENG. UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customised unit is displayed only in the CUSTOMER UNIT P parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. P (317) Entry	Enter conversion factor for a customer-specific pressure unit. The conversion factor must be entered in relation to the SI unit "Pa". → See also CUSTOMER UNIT P. **Prerequisite:** ■ PRESS. ENG. UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE =10000 Pa ≙ 1 PU – Entry CUSTOMER UNIT P: PU – Entry CUST. UNIT FACT. P: 0.0001 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0

Table 9: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Height"	
OUTPUT UNIT (023) Options	Select unit for measured value display and MEASURED VALUE parameter (→ Page 122). Note! The selected unit is used only to describe the measured value. This means that when selecting a new output unit, the measured value is not converted. Example: ■ current measured value: 0.3 ft ■ new output unit: m ■ new measured value: 0.3 m (9.8 ft) **Options:** ■ % ■ mm, cm, dm, m ■ ft, inch ■ cm^3, dm^3, m^3,m^3 E^3 ■ l, hl ■ ft^3, ft^3 E^3 ■ gal, bbl, Igal ■ g, kg, t ■ lb, ton, oz **Factory setting:** %
HEIGHT UNIT (003) Options	Select height unit. The measured pressure is converted to the chosen height unit using the DENSITY UNIT and ADJUST DENSITY parameters. **Options:** ■ mm ■ cm ■ dm ■ m ■ inch ■ ft **Factory setting:** m
CALIBRATION MODE (008) Options	Select calibration mode. **Options:** ■ Wet Wet calibration takes place by filling and emptying the container. The measured pressure is converted to the chosen height unit using the HEIGHT UNIT, DENSITY UNIT and ADJUST DENSITY parameters. In the case of two different levels, the level, volume, mass or percentage value entered is assigned to the converted height value. ■ Dry Dry calibration is a theoretical calibration. For this calibration, specify two height-level value pairs via the EMPTY CALIB., EMPTY HEIGHT, FULL CALIB. and FULL HEIGHT parameters. **Factory setting:** Dry
DENSITY UNIT (001) Options	Select density unit. The measured pressure is converted to a height using the HEIGHT UNIT, DENSITY UNIT and ADJUST DENSITY parameters. **Options:** ■ g/cm^3 ■ kg/dm^3 ■ kg/m^3 ■ US lb/in^3 ■ US lb/ft^3 **Factory setting:** kg/dm^3
ADJUST DENSITY (007) Entry	Enter density of fluid. The measured pressure is converted to a height using the HEIGHT UNIT, DENSITY UNIT and ADJUST DENSITY parameters. **Factory setting:** 1.0

Table 9: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Height"	
EMPTY CALIB. (010) Entry	Enter level, volume, mass or percentage value for the lower calibration point (container empty). The container is either empty or part full. The measured pressure is converted to a height value using the HEIGHT UNIT, DENSITY UNIT and ADJUST DENSITY parameters and displayed. Using the parameter EMPTY CALIB., you assign a level, volume, mass or percentage value to the height value. The unit is selected via the OUTPUT UNIT parameter (→ Page 64). **Prerequisite:** ▪ CALIBRATION MODE = Wet Note! For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged. **Factory setting:** 0.0
FULL CALIB. (004) Entry	Enter level, volume, mass or percentage value for the upper calibration point (container full). The container is either completely or almost full. Using the parameters HEIGHT UNIT, DENSITY UNIT and ADJUST DENSITY, the measured pressure is converted to a height value and displayed. Using the parameter FULL CALIB., you assign a level, volume, mass or percentage value to the height value. The unit is selected via the OUTPUT UNIT parameter (→ Page 64). **Prerequisite:** ▪ CALIBRATION MODE = Wet Note! For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged. **Factory setting:** 100.0
EMPTY CALIB. (010) Entry	Enter level, volume, mass or percentage value for the lower calibration point (container empty). The values entered for the EMPTY CALIB. and EMPTY HEIGHT parameters form the height-level value pair for the lower calibration point. The unit is selected via the OUTPUT UNIT parameter (→ Page 64). **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** 0.0
EMPTY HEIGHT (009) Entry	Height value for the lower calibration point (container empty). The unit is selected via the HEIGHT UNIT parameter (→ Page 64). → See also EMPTY CALIB. **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** Upper range limit (URL) coverted to an height unit
FULL CALIB. (004) Entry	Enter level, volume, mass or percentage value for the upper calibration point (container full). The values entered for the FULL CALIB. and FULL HEIGHT parameters form the height-level value pair for the upper calibration point. The unit is selected via the OUTPUT UNIT parameter (→ Page 64). **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** 100.0

Table 9: (GROUP SELECTION→) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL SELECTION "Level Easy Height"	
FULL HEIGHT (006) Entry	Enter height value for the upper calibration point (container full). The unit is selected via the HEIGHT UNIT parameter (→ Page 64). → See also FULL CALIB. **Prerequisite:** ■ CALIBRATION MODE = Dry **Factory setting:** 0.0
SET LRV (013) Entry	Enter level, volume, mass or percentage value for the lower current value (4 mA). The unit is selected via the OUTPUT UNIT parameter (→ Page 64). **Factory setting:** 0.0
SET URV (012) Entry	Enter level, volume, mass or percentage value for the upper current value (20 mA). The unit is selected via the OUTPUT UNIT parameter (→ Page 64). **Factory setting:** 100.0
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0 to 999.0 s **Factory setting:** 2.0 s or as per order specifications

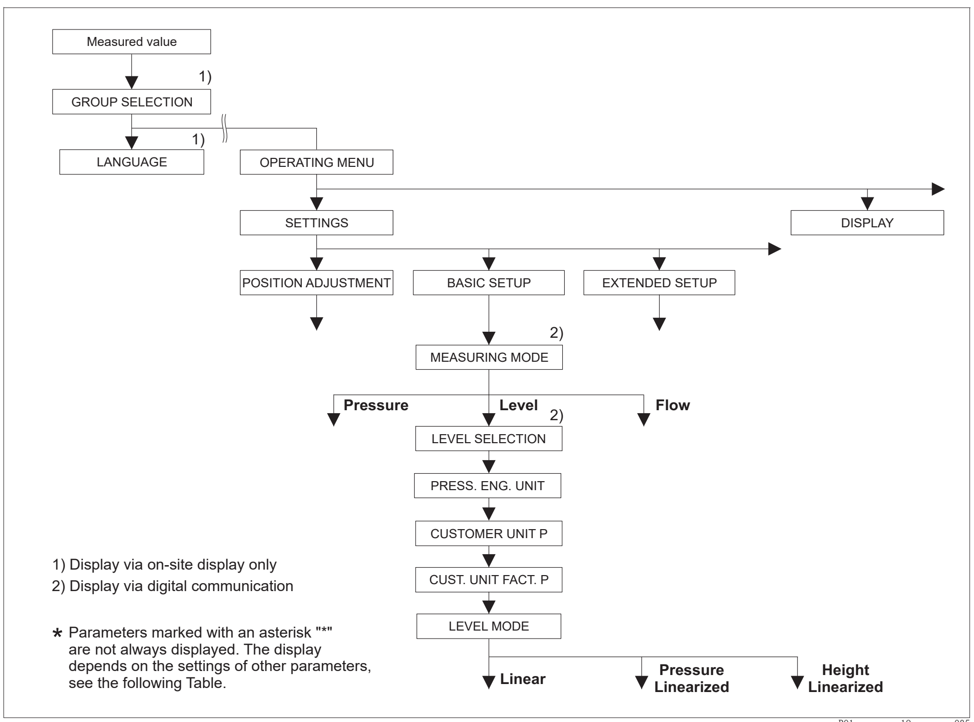


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Fig. 30: BASIC SETUP function group for the "Level" measuring mode, depending on the setting for the LEVEL MODE parameter
→ See Page 69, Fig. 31 for LEVEL MODE = Linear,
→ See Page 78, Fig. 33 for LEVEL MODE = Pressure Linearized,
→ See Page 82, Fig. 34 for LEVEL MODE = Height Linearized

Table 10: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level"	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = level (→ see also Page 45). **Note:** See also – Page 70 ff, Tables 11 to 13: BASIC SETUP – contd. – Page 96 ff, Table 16: EXTENDED SETUP – Page 100 ff, Table 18: LINEARISATION – on-site operation – Page 104 ff, Table 19: LINEARISATION – Digital communication – Page 122 ff, Table 28: PROCESS VALUES – Page 14 ff, Section 5 "Level measurement".	
MEASURING MODE Selection	Select the measuring mode. The operating menu is structured according to the selected measuring mode. ⚠ Warning! If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured. **Prerequisite:** ■ Digital communication **Options**: ■ Pressure ■ Level ■ Deltabar S: Flow **Factory setting:** Pressure
PRESS. ENG. UNIT (060) Selection	Select pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ■ mbar, bar ■ mmH2O, mH2O, inH2O, ftH2O 1) ■ Pa, hPa, kPa, MPa ■ psi ■ mmHg, inHg 2) ■ Torr ■ g/cm^2, kg/cm^2 ■ lb/ft^2 ■ atm ■ gf/cm^2, kgf/cm^2 ■ User unit, → See also the following parameter description for CUSTOMER UNIT P and CUST. UNIT FACT. P. 1) The conversion factor of the pressure units refers to a reference temperature of 4 °C (39.2 °F). 2) The conversion factor of the pressure units refers to a reference temperature of 0 °C (32 °F). **Factory setting:** Depends on the sensor nominal measuring range mbar or bar or as per order specifications

Table 10: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level"	
Parameter name	**Description**
CUSTOMER UNIT P (075) Entry	Enter text (unit) for customer-specific pressure unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. P. **Prerequisite:** ▪ PRESS. ENG. UNIT = User unit ✎ Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT P parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. P (317) Entry	Enter conversion factor for a customer-specific pressure unit. The conversion factor must be entered in relation to the SI unit "Pa". → See also CUSTOMER UNIT P. **Prerequisite:** ▪ PRESS. ENG. UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE =10000 Pa ≙ 1 PU – Entry CUSTOMER UNIT P: PU – Entry CUST. UNIT FACT. P: 0.0001 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0
LEVEL MODE (718) Selection	Select level type. **Options:** ▪ Linear: the measured variable (level, volume, mass or %) is in direct proportion to the measured pressure. → See also Page 70 ff, Table 9. ▪ Pressure Linearized: the measured variable (volume, mass or %) is not in direct proportion to the measured pressure such as in the case of containers with a conical outlet. For the calibration, enter a linearisation table with at least 2 and not more than 32 points. → See also Page 78 ff, Table 10. ▪ Height Linearized: select this level type if you require two measured variables or if the container shape is given with value pairs, e.g. height and volume. The following combinations are possible: – Height + Volume – Height + Mass – Height + % – %-Height + Volume – %-Height + Mass – %-Height + % Perform two calibrations for this level type. First for the measured variable height or %-height like for the "Linear" option and then for the measured variable volume, mass or % like for the "Pressure Linearized" option. → See also Page 83 ff, Table 11. **Factory setting:** Linear
→ For LEVEL MODE = Linear, see Page 70, Table 9. → For LEVEL MODE = Pressure Linearized, see Page 78, Table 10. → For LEVEL MODE = Height Linearized, see Page 83, Table 11.	

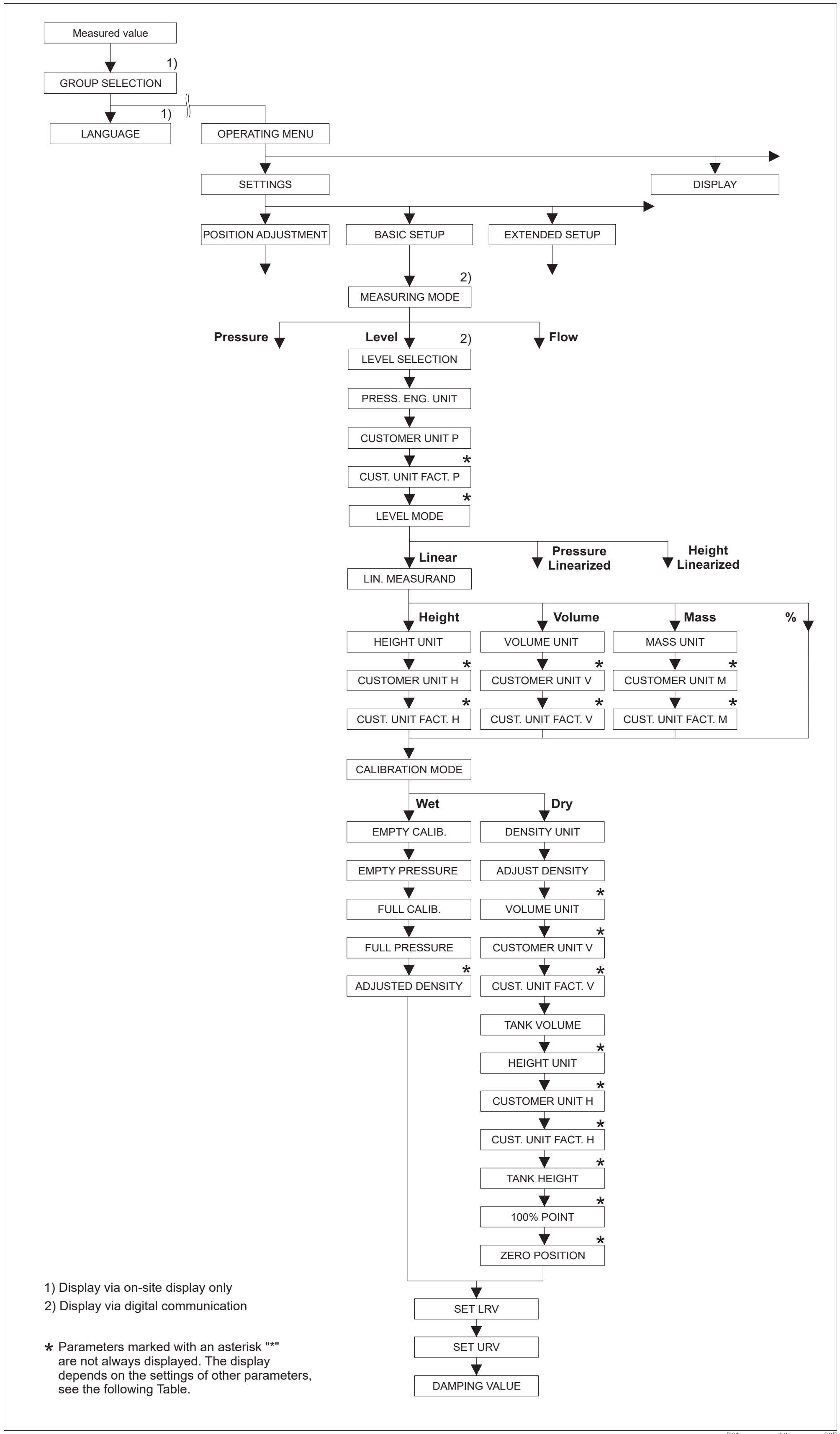


Fig. 31: BASIC SETUP function group for the "Level" measuring mode and "Linear" level type

Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"	
Parameter name	**Description**
The following parameters are displayed if you selected the "Linear" option for the LEVEL MODE parameter. For this level type, the measured variable (level, volume, mass or %) is in direct proportion to the measured pressure. **Prerequisite**: ■ MEASURING MODE = Level (→ see also Page 45). ■ LEVEL SELECTION = Level Standard (→ see also Page 46). ■ LEVEL MODE = Linear (→ see also Page 68). **Note:** See also – Page 67 ff, Table 10: BASIC SETUP – general – Page 96 ff, Table 16: EXTENDED SETUP – Page 122 ff, Table 28: PROCESS VALUES – Page 14 ff, Section 5 "Level measurement".	
LIN. MEASURAND (804) Selection	Select measured variable. **Options:** ■ Level ■ Volume ■ Mass ■ % (Level) **Factory setting:** % (Level)
HEIGHT UNIT (708) Selection	Select level unit. **Prerequisite:** ■ LIN. MEASURAND = Level **Options:** ■ mm ■ cm ■ dm ■ m ■ inch ■ ft ■ User unit, → see also the following parameter description for CUSTOMER UNIT H and CUST. UNIT FACT. H. **Factory setting:** m
CUSTOMER UNIT H (706) Entry	Enter text (unit) for customer-specific level unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. H. **Prerequisite:** ■ LIN. MEASURAND = Level, HEIGHT UNIT = User unit ✎ Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT H parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _

Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"	
Parameter name	**Description**
CUST. UNIT FACT. H (705) Entry	Enter conversion factor for a customer-specific level unit. The conversion factor must be entered in relation to the SI unit "m". → See also CUSTOMER UNIT H. **Prerequisite:** ▪ LIN. MEASURAND = Level, HEIGHT UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE = 0.5 m (1.6 ft) ≙ 1 PU – Entry CUSTOMER UNIT H: PU – Entry CUST. UNIT FACT. H: 2 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0
UNIT VOLUME (313) Selection	Select volume unit. **Prerequisite:** ▪ LIN. MEASURAND = Volume **Options:** ▪ l ▪ hl ▪ cm^3 ▪ dm^3 ▪ m^3 ▪ m^3 E^3 ▪ ft ▪ ft^3 E^3 ▪ gal ▪ Igal ▪ bbl ▪ User unit, → see also the following parameter description for CUSTOMER UNIT V and CUST. UNIT FACT. V. **Factory setting:** m^3
CUSTOMER UNIT V (608) Entry	Enter text (unit) for customer-specific volume unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. V **Prerequisite:** ▪ LIN. MEASURAND = Volume, UNIT VOLUME = User unit ✎ Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT H parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _

Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"

Parameter name	Description
CUST. UNIT FACT. V (607) Entry	Enter conversion factor for a customer-specific volume unit. The conversion factor must be entered in relation to the SI unit "m^3". → See also CUSTOMER UNIT V. **Prerequisite:** ■ LIN. MEASURAND = Volume, UNIT VOLUME = User unit **Example:** – You want the measured value to be displayed in "buckets". – MEASURED VALUE = 0.01 m3 ≙ 1 bucket – Entry CUSTOMER UNIT V: bucket – Entry CUST. UNIT FACT. V: 100 – Result: MEASURED VALUE = 1 bucket **Factory setting:** 1.0
MASS UNIT (709) Selection	Select mass unit. **Prerequisite:** ■ LIN. MEASURAND = Mass **Options:** ■ g ■ kg ■ t ■ oz ■ lb ■ ton ■ User unit, → see also the following parameter description for CUSTOMER UNIT M and CUST. UNIT FACT. M. **Factory setting:** kg
CUSTOMER UNIT M (704) Entry	Enter text (unit) for customer-specific mass unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. M. **Prerequisite:** ■ LIN. MEASURAND = Mass, MASS UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT M parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _

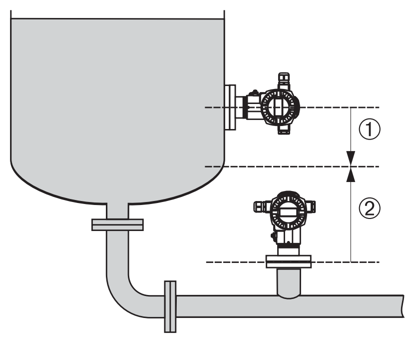
Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"	
Parameter name	**Description**
CUST. UNIT FACT. M (703) Entry	Enter conversion factor for a customer-specific mass unit. The conversion factor must be entered in relation to the SI unit "kg". → See also CUSTOMER UNIT M. **Prerequisite:** ▪ LIN. MEASURAND = Mass, MASS UNIT = User unit **Example:** – You want the measured value to be displayed in "buckets". – MEASURED VALUE = 10 kg ≘ 1 bucket – Entry CUSTOMER UNIT M: bucket – Entry CUST. UNIT FACT. M: 0.1 – Result: MEASURED VALUE = 1 bucket **Factory setting:** 1.0
CALIBRATION MODE (392) Selection	Select calibration mode. **Options:** ▪ Wet Wet calibration takes place by filling and emptying the container. This calibration mode requires two pressure-level value pairs to be entered. In the case of two different levels, the level value is entered and the pressure measured at this moment is assigned to the level value. → See also the following parameter description for EMPTY CALIB., EMPTY PRESSURE, FULL CALIB. and FULL PRESSURE. ▪ Dry Dry calibration is a theoretical calibration which you can carry out even if the device is not mounted or the container is empty. – For the "Level" measured variable, the density of the fluid (→ see Page 74, ADJUST DENSITY) must be entered. – For the "Volume" measured variable, the density of the fluid and the tank volume and tank height must be entered (→ see Page 74, ADJUST DENSITY, TANK VOLUME and TANK HEIGHT). – For the "Mass" measured variable, the tank volume and the tank height must be entered (→ see Page 75, TANK VOLUME and TANK HEIGHT). The density must also be entered in the case of a zero point shift (level offset) (→ see Page 74, ADJUST DENSITY). – For the "%" measured variable, the density of the fluid must be entered and a level assigned to the 100 % point (→ see Page 74 and 77, ADJUST DENSITY and 100% POINT). If the measurement should not start at the mounting location of the device, a level offset must be entered (→ see Page 77, ZERO POSITION). ✎ Note! LIN. MEASURAND: "% (Level)", "Mass" and "Volume": If the change to dry calibration is made after a wet calibration, the density must be entered correctly using the ADJUST DENSITY and DENSITY PROCESS parameter before changing the calibration mode. → See also Page 97. **Factory setting:** Wet
EMPTY CALIB. (314) Entry	Enter level value for the lower calibration point (container empty). The container is either empty or part full. By entering a value for this parameter, you are assigning a level value to the pressure present at the device. → See also EMPTY PRESSURE. **Prerequisite:** ▪ CALIBRATION MODE = Wet ✎ Note! For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged. **Factory setting:** 0.0

Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"	
Parameter name	**Description**
EMPTY PRESSURE (710) Display	Displays the pressure value for the lower calibration point (container empty). → See also EMPTY CALIB. **Prerequisite:** ■ CALIBRATION MODE = Wet **Factory setting:** 0.0
FULL CALIB. (315) Entry	Enter level value for the upper calibration point (container full). The container is either completely or almost full. By entering a value for this parameter, you are assigning a level value to the pressure present at the device. → See also FULL PRESSURE. **Prerequisite:** ■ CALIBRATION MODE = Wet Note! For this parameter, the on-site display shows the level value to be entered and the pressure present at the device. In order for the level value to be saved together with the pressure present at the device, the entry field for the level value must first be activated using the "+"- or "–" key before confirming with the "E" key. This applies also if the level value is to remain unchanged. **Factory setting:** 100.0
FULL PRESSURE (711) Display	Displays the pressure value for the upper calibration point (container full). → See also FULL CALIB. **Prerequisite:** ■ CALIBRATION MODE = Wet **Factory setting:** High sensor limit (→ see PRESS. SENS HILIM, Page 119)
ADJUSTED DENSITY (810) Display	Displays the density calculated from the upper and lower level point. **Prerequisite:** ■ CALIBRATION MODE = Wet, LIN. MEASURAND = Level
DENSITY UNIT (812) Selection	Select density unit. **Prerequisite:** ■ LIN. MEASURAND = Level, CALIBRATION MODE = Dry ■ LIN. MEASURAND = % (Level), CALIBRATION MODE = Dry ■ LIN. MEASURAND = Volume, CALIBRATION MODE = Dry ■ LIN. MEASURAND = Mass, CALIBRATION MODE = Dry **Options:** ■ g/cm^3 ■ kg/dm^3 ■ kg/m^3 ■ US lb/in^3 ■ US lb/ft^3 **Factory setting:** kg/dm^3
ADJUST DENSITY (316) Entry	Enter density of fluid. **Prerequisite:** ■ LIN. MEASURAND = Level, CALIBRATION MODE = Dry ■ LIN. MEASURAND = % (Level), CALIBRATION MODE = Dry ■ LIN. MEASURAND = Volume, CALIBRATION MODE = Dry ■ LIN. MEASURAND = Mass, CALIBRATION MODE = Dry **Factory setting:** 1000.0

Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"	
Parameter name	**Description**
UNIT VOLUME (313) Selection	Select volume unit. **Prerequisite:** ▪ LIN. MEASURAND = Volume **Options:** ▪ l ▪ hl ▪ cm^3 ▪ dm^3 ▪ m^3 ▪ m^3 E^3 ▪ ft ▪ ft^3 E^3 ▪ gal ▪ Igal ▪ bbl ▪ User unit, → see also the following parameter description for CUSTOMER UNIT V and CUST. UNIT FACT. V. **Factory setting:** m^3
CUSTOMER UNIT V (608) Entry	Enter text (unit) for customer-specific volume unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. V **Prerequisite:** ▪ LIN. MEASURAND = Volume, UNIT VOLUME = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT H parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. V (607) Entry	Enter conversion factor for a customer-specific volume unit. The conversion factor must be entered in relation to the SI unit "m^3". → See also CUSTOMER UNIT V. **Prerequisite:** ▪ LIN. MEASURAND = Volume, UNIT VOLUME = User unit **Example:** – You want the measured value to be displayed in "buckets". – MEASURED VALUE = 0.01 m3 ≘ 1 bucket – Entry CUSTOMER UNIT V: bucket – Entry CUST. UNIT FACT. V: 100 – Result: MEASURED VALUE = 1 bucket **Factory setting:** 1.0
TANK VOLUME (858) Entry	Enter tank volume. **Prerequisite:** ▪ LIN. MEASURAND = Volume, CALIBRATION MODE = Dry ▪ LIN. MEASURAND = Mass, CALIBRATION MODE = Dry **Factory setting:** 1.0 m^3

Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"

Parameter name	Description
HEIGHT UNIT (708) Selection	Select level unit. **Prerequisite:** ▪ LIN. MEASURAND = % (Level), CALIBRATION MODE = Dry **Options:** ▪ mm ▪ dm ▪ cm ▪ m ▪ inch ▪ ft ▪ User unit, → see also the following parameter description for CUSTOMER UNIT H and CUST. UNIT FACT. H. **Factory setting:** m
CUSTOMER UNIT H (706) Entry	Enter text (unit) for customer-specific level unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. H. **Prerequisite:** ▪ LIN. MEASURAND = % (Level), CALIBRATION MODE = Dry, HEIGHT UNIT = User unit ✎ Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT H parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. H (705) Entry	Enter conversion factor for a customer-specific level unit. The conversion factor must be entered in relation to the SI unit "m". → See also CUSTOMER UNIT H. **Prerequisite:** ▪ LIN. MEASURAND = % (Level), CALIBRATION MODE = Dry, HEIGHT UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE = 0.5 m (1.6 ft) ≙ 1 PU – Entry CUSTOMER UNIT H: PU – Entry CUST. UNIT FACT. H: 2 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0
TANK HEIGHT (859) Entry	Enter tank height. **Prerequisite:** ▪ LIN. MEASURAND = Volume, CALIBRATION MODE = Dry ▪ LIN. MEASURAND = Mass, CALIBRATION MODE = Dry **Factory setting:** 1.0 m

Table 11: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Linear"	
Parameter name	**Description**
100% POINT (813) Entry	Enter level value for 100% point. **Prerequisite:** ▪ LIN. MEASURAND = % (Level), CALIBRATION MODE = Dry **Example:** – The 100 %-point should correspond to 4 m (13 ft). – Select the "m" unit via the HEIGHT UNIT parameter. – Enter the value "4" for this parameter (100% POINT). **Factory setting:** 1.0
ZERO POSITION (814) Entry	Enter value for level offset. If the measurement should not start at the mounting location of the device, e.g. for containers with a sump, carry out zero point shift (level offset). **Prerequisite:** ▪ CALIBRATION MODE = Dry **Factory setting:** 0.0  P01-PMP75xxx-19-xx-xx-xx-001 *Fig. 32: Zero point shift* *1 Device is mounted above the level lower range value: a positive value has to be entered for ZERO POSITION.* *2 Device is mounted below the level lower range value: a negative value has to be entered for ZERO POSITION.*
SET LRV (719) Entry	Enter level value for the lower current value (4 mA). **Factory setting:** 0.0
SET URV (720) Entry	Enter level value for the upper current value (20 mA). **Factory setting:** 100.0
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

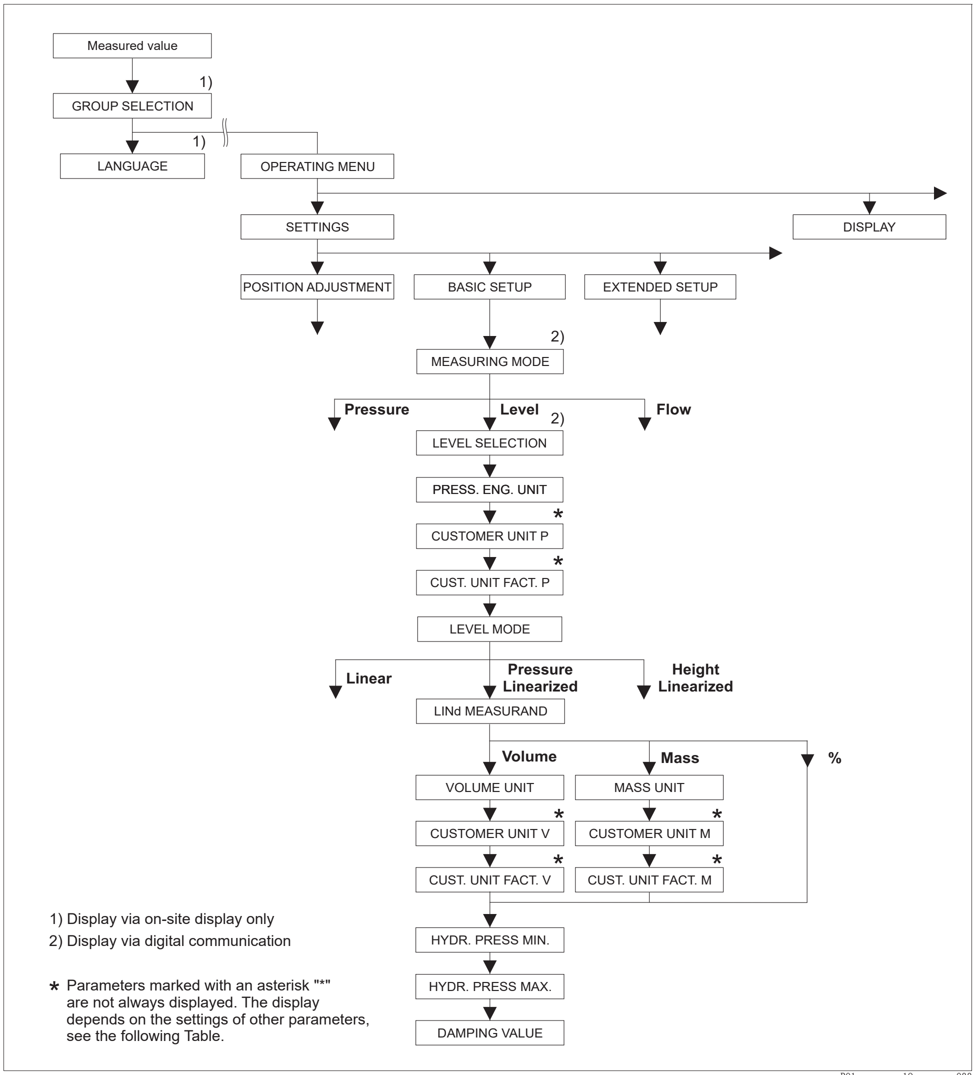


Fig. 33: BASIC SETUP function group for the "Level" measuring mode and the "Pressure Linearized" level type, continue calibration with LINEARISATION function group
→ See Page 100 ff for on-site operation and Page 104 ff for operation with digital communication.

Table 12: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Pressure Linearized"

Parameter name	Description
The following parameters are displayed if you selected the "Pressure Linearized" option for the LEVEL MODE parameter. For this level type, the measured variable (volume, mass or %) is not in direct proportion to the measured pressure. For the calibration, enter a linearisation table with at least 2 and not more than 32 points. **Prerequisite:** ▪ MEASURING MODE = Level (→ see also Page 45). ▪ LEVEL SELECTION = Level Standard (→ see also Page 46). ▪ LEVEL MODE = Pressure Linearized (→ see also Page 68). **Note:** See also – Page 67 ff, Table 10: BASIC SETUP – general – Page 96 ff, Table 16: EXTENDED SETUP – Page 100 ff, Table 18: LINEARISATION – on-site operation – Page 104 ff, Table 19: LINEARISATION – Digital communication – Page 122 ff, Table 28: PROCESS VALUES – Page 14 ff, Section 5 "Level measurement".	

Table 12: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Pressure Linearized"	
Parameter name	**Description**
LINd. MEASURAND (805) Selection	Select measured variable. **Options:** ■ Pressure and Volume ■ Pressure and Mass ■ Pressure and % **Factory setting:** Pressure and %
UNIT VOLUME (313) Selection	Select volume unit. **Prerequisite:** ■ LINd. MEASURAND = Pressure and Volume **Options:** ■ l ■ hl ■ cm^3 ■ dm^3 ■ m^3 ■ m^3 E^3 ■ ft ■ ft^3 E^3 ■ gal ■ Igal ■ bbl ■ User unit, → see also the following parameter description for CUSTOMER UNIT V and CUST. UNIT FACT. V. **Factory setting:** m^3
CUSTOMER UNIT V (608) Entry	Enter text (unit) for customer-specific volume unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. V **Prerequisite:** ■ LINd. MEASURAND = Pressure and Volume, UNIT VOLUME = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT V parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. V (607) Entry	Enter conversion factor for a customer-specific volume unit. The conversion factor must be entered in relation to the SI unit "m^3". → See also CUSTOMER UNIT V. **Prerequisite:** ■ LINd. MEASURAND = Pressure and Volume, UNIT VOLUME = User unit **Example:** – You want the measured value to be displayed in "buckets". – MEASURED VALUE = 0.01 m3 ≙ 1 bucket – Entry CUSTOMER UNIT V: bucket – Entry CUST. UNIT FACT. V: 100 – Result: MEASURED VALUE = 1 bucket **Factory setting:** 1.0

<table>
<tr><th colspan="2">Table 12: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Pressure Linearized"</th></tr>
<tr><th>Parameter name</th><th>Description</th></tr>
<tr><td>MASS UNIT (709)
Selection</td><td>Select mass unit.
Prerequisite:
▪ LINd. MEASURAND = Pressure and Mass
Options:
▪ g
▪ kg
▪ t
▪ oz
▪ lb
▪ ton
▪ User unit, → see also the following parameter description for CUSTOMER UNIT M and CUST. UNIT FACT. M.
Factory setting:
kg</td></tr>
<tr><td>CUSTOMER UNIT M (704)
Entry</td><td>Enter text (unit) for customer-specific mass unit.
You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. M.
Prerequisite:
▪ LINd. MEASURAND = Pressure and Mass,
MASS UNIT = User unit
Note!
Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed.
If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed.
In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT M parameter. The measured value is displayed with the additional text "User Unit".
Factory setting:
_ _ _ _ _ _ _ _</td></tr>
<tr><td>CUST. UNIT FACT. M (703)
Entry</td><td>Enter conversion factor for a customer-specific mass unit.
The conversion factor must be entered in relation to the SI unit "kg". → See also CUSTOMER UNIT M.
Prerequisite:
▪ LINd. MEASURAND = Pressure and Mass,
MASS UNIT = User unit
Example:
– You want the measured value to be displayed in "buckets".
– MEASURED VALUE = 10 kg ≙ 1 bucket
– Entry CUSTOMER UNIT M: bucket
– Entry CUST. UNIT FACT. M: 0.1
– Result: MEASURED VALUE = 1 bucket
Factory setting:
1.0</td></tr>
<tr><td>HYDR. PRESS MIN. (775)
Entry</td><td>Enter the minimum hydrostatic pressure to be expected.
The input limits for the calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the minimum hydrostatic pressure to be expected, the more accurate the measurement result.
Factory setting:
0.0</td></tr>
</table>

Table 12: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Pressure Linearized"	
Parameter name	**Description**
HYDR. PRESS MAX. (761) Entry	Enter the maximum hydrostatic pressure to be expected. The input limits for the calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the maximum hydrostatic pressure to be expected, the more accurate the measurement result. **Factory setting:** High sensor limit (→ See PRESS. SENS HILIM, Page 119)
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

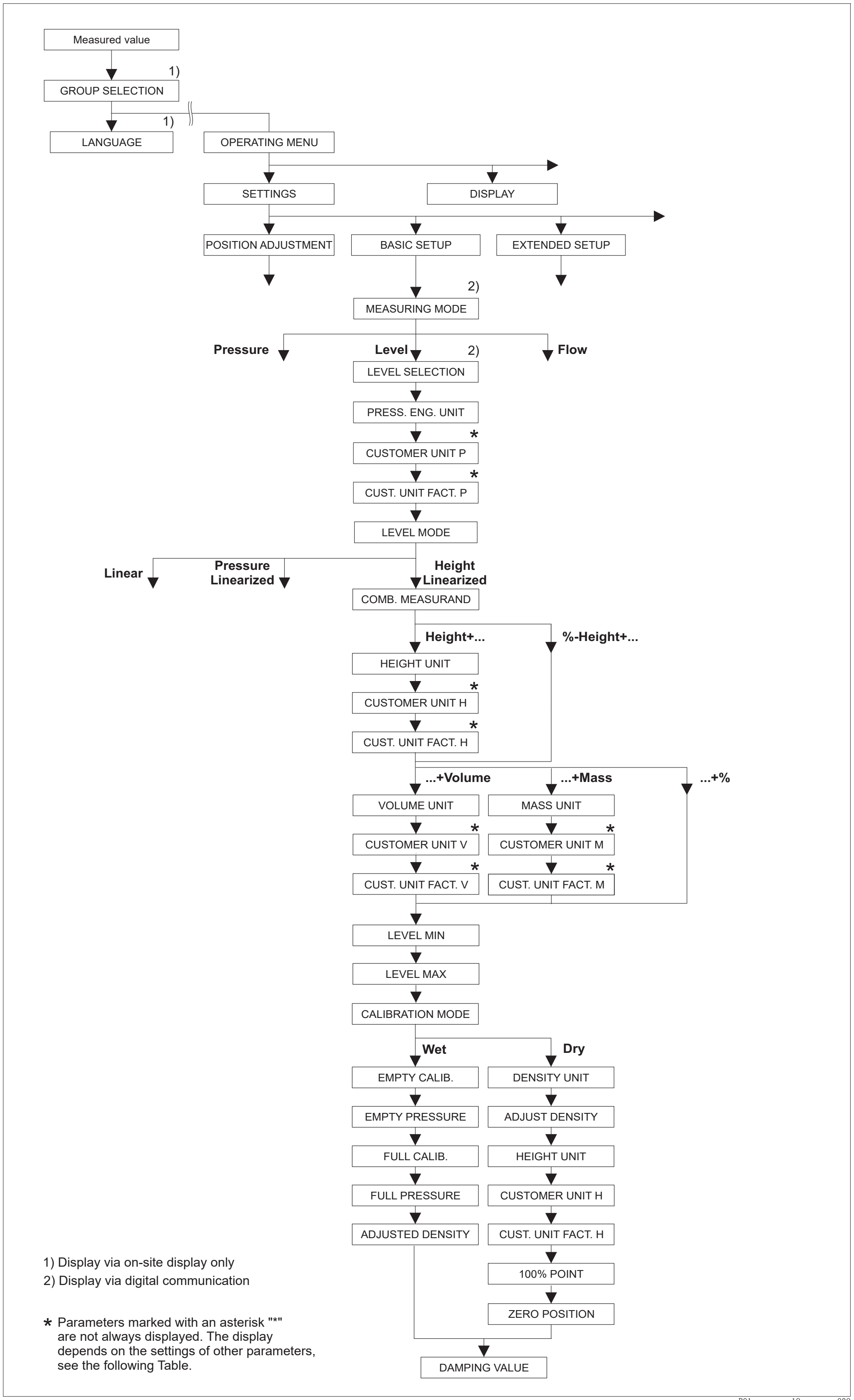


Fig. 34: BASIC SETUP function group for the "Level" measuring mode and the "Height Linearized" level type, continue calibration with LINEARISATION function group → See Page 100 ff for on-site operation and Page 104 ff for operation with digital communication.

<table>
<tr><th colspan="2">Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"</th></tr>
<tr><th>Parameter name</th><th>Description</th></tr>
<tr><td colspan="2">The following parameters are displayed if you selected the "Height Linearized" option for the LEVEL MODE parameter.

Select this level type if you require two measured variables or if the container shape is given with value pairs, e.g. height and volume.
The following combinations are possible:
▪ Height + Volume
▪ Height + Mass
▪ Height + %
▪ %-Height + Volume
▪ %-Height + Mass
▪ %-Height + %

The 1st measured variable (%-Height or Height) must be in direct proportion to the measured pressure. The 2nd measured variable (Volume, Mass or %) must not be in direct proportion. A linearisation table must be entered for the 2nd measured variable. The 2nd measured variable is assigned to the 1st measured variable by means of this table.

Prerequisite:
▪ MEASURING MODE = Level (→ see also Page 45).
▪ LEVEL SELECTION = Level Standard (→ see also Page 46).
▪ LEVEL MODE = Height Linearized (→ see also Page 68).

Note:
See also
– Page 67 ff, Table 10: BASIC SETUP – general
– Page 96 ff, Table 16: EXTENDED SETUP
– Page 100 ff, Table 18: LINEARISATION – on-site operation
– Page 104 ff, Table 19: LINEARISATION – Digital communication
– Page 122 ff, Table 28: PROCESS VALUES
– Page 14 ff, Section 5 "Level measurement".</td></tr>
<tr><td>COMB. MEASURAND (806)
Selection</td><td>Select measured variable.

Options:
▪ Height and Volume
▪ Height and Mass
▪ Height and %
▪ %-Height and Volume
▪ %-Height and Mass
▪ %-Height and %

Factory setting:
%-Height and %</td></tr>
<tr><td>HEIGHT UNIT (708)
Selection</td><td>Select level unit for the 1st measured variable.

Prerequisite:
▪ COMB. MEASURAND = Height and Volume, Height and Mass or Height and %

Options:
▪ mm
▪ dm
▪ cm
▪ m
▪ inch
▪ ft
▪ User unit, → see also the following parameter description for CUSTOMER UNIT H and CUST. UNIT FACT. H.

Factory setting:
m</td></tr>
</table>

Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"	
Parameter name	**Description**
CUSTOMER UNIT H (706) Entry	Enter text (unit) for customer-specific level unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. H. **Prerequisite:** ■ COMB. MEASURAND = Height and Volume, HEIGHT UNIT = User unit ■ COMB. MEASURAND = Height and Mass, HEIGHT UNIT = User unit ■ COMB. MEASURAND = Height and %, HEIGHT UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT H parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. H (705) Entry	Enter conversion factor for a customer-specific level unit. The conversion factor must be entered in relation to the SI unit "m". → See also CUSTOMER UNIT H. **Prerequisite:** ■ COMB. MEASURAND = Height and Volume, HEIGHT UNIT = User unit ■ COMB. MEASURAND = Height and Mass, HEIGHT UNIT = User unit ■ COMB. MEASURAND = Height and %, HEIGHT UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE = 0.5 m (1,6 ft) ≙ 1 PU – Entry CUSTOMER UNIT H: PU – Entry CUST. UNIT FACT. H: 2 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0
UNIT VOLUME (313) Selection	Select the volume unit for the 2nd measured value. **Prerequisite:** ■ COMB. MEASURAND = Height and Volume or %-Height and Volume **Options:** ■ l ■ hl ■ cm^3 ■ dm^3 ■ m^3 ■ m^3 E^3 ■ ft ■ ft^3 E^3 ■ gal ■ Igal ■ bbl ■ User unit, → see also the following parameter description for CUSTOMER UNIT V and CUST. UNIT FACT. V. **Factory setting:** m^3

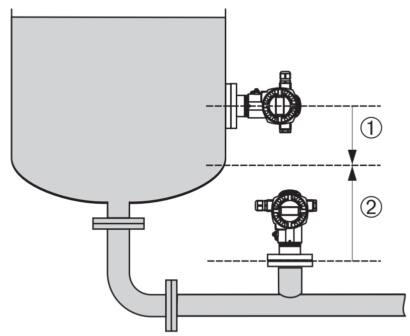
Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"	
Parameter name	**Description**
CUSTOMER UNIT V (608) Entry	Enter text (unit) for customer-specific volume unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. V **Prerequisite:** ▪ COMB. MEASURAND = Height and Volume, HEIGHT UNIT = User unit ▪ COMB. MEASURAND = %-Height and Volume, HEIGHT UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT V parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. V (607) Entry	Enter conversion factor for a customer-specific volume unit. The conversion factor must be entered in relation to the SI unit "m^3". → See also CUSTOMER UNIT V. **Prerequisite:** ▪ COMB. MEASURAND = Height and Volume, HEIGHT UNIT = User unit ▪ COMB. MEASURAND = %-Height and Volume, HEIGHT UNIT = User unit **Example:** – You want the measured value to be displayed in "buckets". – MEASURED VALUE = 0.01 m3 ≙ 1 bucket – Entry CUSTOMER UNIT V: bucket – Entry CUST. UNIT FACT. V: 100 – Result: MEASURED VALUE = 1 bucket **Factory setting:** 1.0
MASS UNIT (709) Selection	Select the mass unit for the 2nd measured value. **Prerequisite:** ▪ COMB. MEASURAND = Height and Mass or %-Height and Mass **Options:** ▪ g ▪ kg ▪ t ▪ oz ▪ lb ▪ ton ▪ User unit, → see also the following parameter description for CUSTOMER UNIT M and CUST. UNIT FACT. M. **Factory setting:** kg

Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"	
Parameter name	**Description**
CUSTOMER UNIT M (704) Entry	Enter text (unit) for customer-specific mass unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. M. **Prerequisite:** ▪ COMB. MEASURAND = Height and Mass, MASS UNIT = User unit ▪ COMB. MEASURAND = %-Height and Mass, MASS UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT M parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. M (703) Entry	Enter conversion factor for a customer-specific mass unit. The conversion factor must be entered in relation to the SI unit "kg". → See also CUSTOMER UNIT M. **Prerequisite:** ▪ COMB. MEASURAND = Height and Mass, MASS UNIT = User unit ▪ COMB. MEASURAND = %-Height and Mass, MASS UNIT = User unit **Example:** – You want the measured value to be displayed in "buckets". – MEASURED VALUE = 10 kg ≙ 1 bucket – Entry CUSTOMER UNIT M: bucket – Entry CUST. UNIT FACT. M: 0.1 – Result: MEASURED VALUE = 1 bucket **Factory setting:** 1.0
LEVEL MIN (755) Entry	Enter the minimum level to be expected. The input limits for the calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the minimum level to be expected, the more accurate the measurement result. Note! ▪ The following applies for the setting LEVEL MODE "Height Linearized" and ASSIGN CURRENT "Linear": If you enter a new value for LEVEL MIN, the value for SET LRV is also changed. Use SET LRV to assign a height to the lower current value. If you want to assign the lower current value a value other than that for LEVEL MIN, you must enter the desired value for SET LRV. (→ SET LRV, Page 98 and ASSIGN CURRENT, Page 113) **Factory setting:** 0.0
LEVEL MAX (712) Entry	Enter the maximum level to be expected. The input limits for the calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the maximum level to be expected, the more accurate the measurement result. Note! ▪ The following applies for the setting LEVEL MODE "Height Linearized" and ASSIGN CURRENT "Linear": If you enter a new value for LEVEL MAX, the value for SET URV is also changed. Use SET URV to assign a height to the upper current value. If you want to assign the upper current value a value other than that for LEVEL MAX, you must enter the desired value for SET URV. (→ SET URV, Page 98 and ASSIGN CURRENT, Page 113) **Factory setting:** 100.0

Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"	
Parameter name	**Description**
CALIBRATION MODE (392) Selection	Select the calibration mode for the calibration of the 1st measured variable. **Options:** ▪ Wet Wet calibration takes place by filling the container. This calibration mode requires two pressure-level value pairs to be entered. In the case of two different levels, the level value is entered and the pressure measured at this moment is assigned to the level value. → See also the following parameter description for EMPTY CALIB., EMPTY PRESSURE, FULL CALIB. and FULL PRESSURE. ▪ Dry Dry calibration is a theoretical calibration which you can carry out even if the device is not mounted or the container is empty. – For the "Level" measured variable, the density of the fluid (→ see Page 88, ADJUST DENSITY) must be entered. – For the "%" measured variable, the density of the fluid must be entered and a level assigned to the 100 % point (→ see Page 88, ADJUST DENSITY and 100% POINT). If the measurement should not start at the mounting location of the device, a level offset must be entered (→ see Page 90, ZERO POSITION). Note! If the change to dry calibration is made after a wet calibration, the density must be entered correctly using the ADJUST DENSITY and DENSITY PROCESS parameter before changing the calibration mode. → See also Page 97. **Factory setting:** Wet
EMPTY CALIB. (314) Entry	Enter level value for the lower calibration point (container empty). The container is either empty or part full. By entering a value for this parameter, you are assigning a level value to the pressure present at the device. → See also EMPTY PRESSURE. **Prerequisite:** ▪ CALIBRATION MODE = Wet **Factory setting:** 0.0
EMPTY PRESSURE (710) Display	Displays the pressure value for the lower calibration point (container empty). → See also EMPTY CALIB. **Prerequisite:** ▪ CALIBRATION MODE = Wet
FULL CALIB. (315) Entry	Enter level value for the upper calibration point (container full). The container is either completely or almost full. By entering a value for this parameter, you are assigning a level value to the pressure present at the device. → See also FULL PRESSURE. **Prerequisite:** ▪ CALIBRATION MODE = Wet **Factory setting:** 100.0
FULL PRESSURE (711) Display	Displays the pressure value for the upper calibration point (container full). → See also FULL CALIB. **Prerequisite:** ▪ CALIBRATION MODE = Wet **Factory setting:** High sensor limit (→ see PRESS. SENS HILIM, Page 119)
ADJUSTED DENSITY (810) Display	Displays the density calculated from the upper and lower level point. **Prerequisite:** ▪ COMB. MEASURAND = Height and Volume, CALIBRATION MODE = Wet ▪ COMB. MEASURAND = Height and Mass, CALIBRATION MODE = Wet ▪ COMB. MEASURAND = Height and %, CALIBRATION MODE = Wet

Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"	
Parameter name	**Description**
DENSITY UNIT (812) Selection	Select density unit. **Prerequisite:** ▪ COMB. MEASURAND = %-Height and %, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height and Volume, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height and Mass, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = Height and %, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = Height and Volume, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = Height and Mass, CALIBRATION MODE = Dry **Options:** ▪ g/cm^3 ▪ kg/dm^3 ▪ kg/m^3 ▪ US lb/in^3 ▪ US lb/ft^3 **Factory setting:** kg/dm^3
ADJUST DENSITY (316) Entry	Enter density of fluid. **Prerequisite:** ▪ COMB. MEASURAND = %-Height and %, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height and Volume, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height and Mass, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = Height and %, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = Height and Volume, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = Height and Mass, CALIBRATION MODE = Dry **Factory setting:** 1.0
HEIGHT UNIT (708) Selection	Select level unit. **Prerequisite:** ▪ COMB. MEASURAND = %-Height and Volume, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height and Mass, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height + %, CALIBRATION MODE = Dry **Options:** ▪ mm ▪ dm ▪ cm ▪ m ▪ inch ▪ ft ▪ User unit, → see also the following parameter description for CUSTOMER UNIT H and CUST. UNIT FACT. H. **Factory setting:** m

Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"	
Parameter name	**Description**
CUSTOMER UNIT H (706) Entry	Enter text (unit) for customer-specific level unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. H. **Prerequisite:** ▪ COMB. MEASURAND = %-Height and Volume, CALIBRATION MODE = Dry, HEIGHT UNIT = User unit ▪ COMB. MEASURAND = %-Height and Mass, CALIBRATION MODE = Dry, HEIGHT UNIT = User unit ▪ COMB. MEASURAND = %-Height and %, CALIBRATION MODE = Dry, HEIGHT UNIT = User unit Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT H parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
CUST. UNIT FACT. H (705) Entry	Enter conversion factor for a customer-specific level unit. The conversion factor must be entered in relation to the SI unit "m". → See also CUSTOMER UNIT H. **Prerequisite:** ▪ COMB. MEASURAND = %-Height and Volume, CALIBRATION MODE = Dry, HEIGHT UNIT = User unit ▪ COMB. MEASURAND = %-Height and Mass, CALIBRATION MODE = Dry, HEIGHT UNIT = User unit ▪ COMB. MEASURAND = %-Height and %, CALIBRATION MODE = Dry, HEIGHT UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE = 0.5 m (1.6 ft) ≘ 1 PU – Entry CUSTOMER UNIT H: PU – Entry CUST. UNIT FACT. H: 2 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0
100% POINT (813) Entry	Enter level value for 100% point. **Prerequisite:** ▪ COMB. MEASURAND = %-Height and Volume, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height and Mass, CALIBRATION MODE = Dry ▪ COMB. MEASURAND = %-Height + %, CALIBRATION MODE = Dry **Example:** – The 100 %-point should correspond to 4 m (13 ft). – Select the "m" unit via the HEIGHT UNIT parameter. – Enter the value "4" for this parameter (100% POINT). **Factory setting:** 1.0

Table 13: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Level", LEVEL MODE "Height Linearized"	
Parameter name	**Description**
ZERO POSITION (814) Entry	Enter value for level offset. If the measurement should not start at the mounting location of the device, e.g. for containers with a sump, carry out zero point shift (level offset). **Prerequisite:** ▪ CALIBRATION MODE = Dry  *Fig. 35: Zero point shift* *1 Device is mounted above the level lower range value: a positive value has to be entered for ZERO POSITION.* *2 Device is mounted below the level lower range value: a negative value has to be entered for ZERO POSITION.* **Factory setting:** 0.0
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

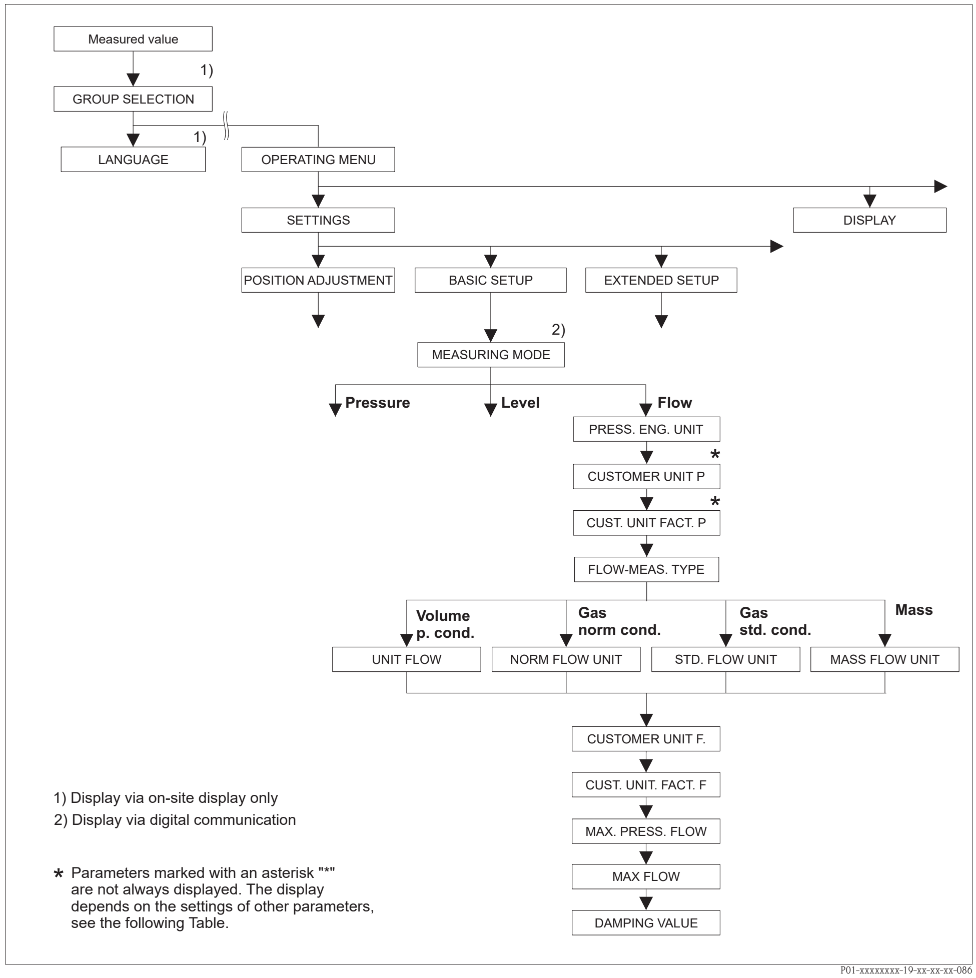


Fig. 36: BASIC SETUP function group for the "Flow" measuring mode

Table 14: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Flow"	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = Flow (→ see also Page 45). **Note:** See also – Page 52, Table 5: QUICK SETUP – Page 98, Table 15: EXTENDED SETUP – Page 107, Table 18: TOTALIZER SETUP – Page 123, Table 27: PROCESS VALUES. – Page 40 ff, Section 6 "Flow measurement".	

Table 14: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Flow"	
Parameter name	**Description**
MEASURING MODE Selection	Select the measuring mode. The operating menu is structured according to the selected measuring mode. ⚠ Warning! If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured. **Prerequisite:** ▪ Digital communication **Options:** ▪ Pressure ▪ Level ▪ Deltabar S: Flow **Factory setting:** ▪ Cerabar S and Deltabar S: Pressure ▪ Deltapilot S: Level
PRESS. ENG. UNIT (060) Selection	Select pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ▪ mbar, bar ▪ mmH2O, mH2O, inH2O, ftH2O 1) ▪ Pa, hPa, kPa, MPa ▪ psi ▪ mmHg, inHg 2) ▪ Torr ▪ g/cm², kg/cm² ▪ lb/ft² ▪ atm ▪ gf/cm², kgf/cm² ▪ User unit, → See also the following parameter description for CUSTOMER UNIT P and CUST. UNIT FACT. P. 1) The conversion factor of the pressure units refers to a reference temperature of 4 °C (39.2 °F). 2) The conversion factor of the pressure units refers to a reference temperature of 0 °C (32 °F). **Factory setting:** Depends on the sensor nominal measuring range mbar or bar or as per order specifications
CUSTOMER UNIT P (075) Entry	Enter text (unit) for customer-specific pressure unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. P. **Prerequisite:** ▪ PRESS. ENG. UNIT = User unit ✎ Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT P parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _

Table 14: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Flow"	
Parameter name	**Description**
CUST. UNIT FACT. P (317) Entry	Enter conversion factor for a customer-specific pressure unit. The conversion factor must be entered in relation to the SI unit "Pa". → See also CUSTOMER UNIT P. **Prerequisite:** ▪ PRESS. ENG. UNIT = User unit **Example:** – You want the measured value to be displayed in "PU" (PU: packing unit). – MEASURED VALUE =10000 Pa ≙ 1 PU – Entry CUSTOMER UNIT P: PU – Entry CUST. UNIT FACT. P: 0.0001 – Result: MEASURED VALUE = 1 PU **Factory setting:** 1.0
FLOW-MEAS. TYPE (640) Selection	Select the flow type. **Options:** ▪ Volume p. cond. (volume under operating conditions) ▪ Gas norm. cond. (norm volume under norm conditions in Europe: 1013.25 mbar and 273.15 K (0°C)) ▪ Gas std. cond. (standard volume under standard conditions in USA: 1013.25 mbar (14.7 psi) and 288.15 K (15°C/59°F)) ▪ Mass (mass under operating conditions) **Factory setting:** Volume p. cond.
UNIT FLOW (391) Selection	Select volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (FLOW-MEAS. TYPE). When the flow mode is changed, conversion is not possible. **Prerequisite:** ▪ FLOW-MEAS. TYPE = Volume p. cond. **Options:** ▪ m3/s, m3/min, m3/h, m3/day ▪ l/s, l/min, l/h ▪ hl/s, hl/min, hl/day ▪ ft3/s, ft3/min, ft3/h, ft3/day ▪ ACFS, ACFM, ACFH, ACFD ▪ ozf/s, ozf/min ▪ US Gal/s, US Gal/min, US Gal/h, US Gal/day ▪ Imp. Gal/s, Imp. Gal/min, Imp. Gal/h ▪ bbl/s, bbl/min, bbl/h, bbl/day ▪ User unit, → see also this table, parameter description for CUSTOMER UNIT F and CUST. UNIT FACT. F **Factory setting:** m^3/s
NORM FLOW UNIT (661) Selection	Select norm volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (FLOW-MEAS. TYPE). When the flow mode is changed, conversion is not possible. **Prerequisite:** ▪ FLOW-MEAS. TYPE = Gas norm conditions **Options:** ▪ Nm3/s, Nm3/min, Nm3/h, Nm3/day ▪ User unit, → see also this table, parameter description for CUSTOMER UNIT F and CUST. UNIT FACT. F **Factory setting:** Nm^3/s

Table 14: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Flow"	
Parameter name	**Description**
STD. FLOW UNIT (660) Selection	Select standard volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (FLOW-MEAS. TYPE). When the flow mode is changed, conversion is not possible. **Prerequisite:** ▪ FLOW-MEAS. TYPE = Gas std. conditions **Options:** ▪ Sm3/s, Sm3/min, Sm3/h, Sm3/day ▪ SCFS, SCFM, SCFH, SCFD ▪ User unit, → see also this table, parameter description for CUSTOMER UNIT F and CUST. UNIT FACT. F **Factory setting:** Sm^3/s
MASS FLOW UNIT (571) Selection	Select mass flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (FLOW-MEAS. TYPE). When the flow mode is changed, conversion is not possible. **Prerequisite:** ▪ FLOW-MEAS. TYPE = Mass **Options:** ▪ g/s, kg/s, kg/min, kg/min, kg/h ▪ t/s, t/min, t/h, t/day ▪ oz/s, oz/min ▪ lb/s, lb/min, lb/h ▪ ton/s, ton/min, ton/h, ton/day ▪ User unit, → see also the following parameter description for CUSTOMER UNIT F and CUST. UNIT FACT. F **Factory setting:** kg/s
CUSTOMER UNIT F (610) Entry	Enter text (unit) for customer-specific flow unit. You can enter a maximum of eight alphanumeric characters here. → See also CUST. UNIT FACT. F. **Prerequisite:** ▪ UNIT FLOW = User unit ▪ NORM FLOW UNIT = User unit ▪ STD. FLOW UNIT = User unit ▪ MASS FLOW UNIT = User unit ✎ Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the CUSTOMER UNIT F parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _

Table 14: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP "Flow"	
Parameter name	**Description**
CUST. UNIT FACT. F (609) Entry	Enter conversion factor for a customer-specific flow unit. The conversion factor must be entered in relation to an appropriate SI unit, e.g. m^3/s for the "Volume p. cond." flow mode. → See also CUSTOMER UNIT F. **Prerequisite:** ▪ UNIT FLOW = User unit ▪ NORM FLOW UNIT = User unit ▪ STD. FLOW UNIT = User unit ▪ MASS FLOW UNIT = User unit **Example:** – You want the measured value to be displayed in "bucket/h". – MEASURED VALUE =0.01 m3/s ≙ 3600 bucket/h – Entry CUSTOMER UNIT F: bucket/h – Entry CUST. UNIT FACT. F: 360000 – Result: MEASURED VALUE = 3600 bucket/h **Factory setting:** 1.0
MAX. FLOW (311) Entry	Enter maximum flow of primary element. → See also layout sheet of primary element. The maximum flow is assigned to the maximum pressure which you enter via MAX PRESS. FLOW. Note! Use the LINEAR/SQROOT parameter (→ Page 113) to specify the current signal for the "Flow" measuring mode. The following applies for the "Flow (square root)" setting: If you enter a new value for MAX. FLOW, the value for SET URV is also changed. Use SET URV to assign a flow to the upper current value. If you want to assign the upper current value a value other than that for MAX. FLOW, you must enter the desired value for SET URV. (→ SET URV, Page 100). **Factory setting:** 1.0
MAX PRESS. FLOW (634) Entry	Enter maximum pressure of primary element. → See layout sheet of primary element. This value is assigned to the maximum flow value (→ see MAX. FLOW). Note! Use the LINEAR/SQROOT parameter (→ Page 113) to specify the current signal for the "Flow" measuring mode. The following applies for the "Differential pres." setting: If you enter a new value for MAX PRESS. FLOW, the value for SET URV is also changed. Use SET URV to assign a pressure value to the upper current value. If you want to assign the upper current value a value other than that for MAX PRESS. FLOW, you must enter the desired value for SET URV. (→ SET URV, Page 100). **Factory setting:** High sensor limit (→ see PRESS. SENS HILIM, Page 119)
DAMPING VALUE (247) Entry	Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and current output react to a change in the pressure. **Input range:** 0.0...999.0 s **Factory setting:** 2.0 s or as per order specifications

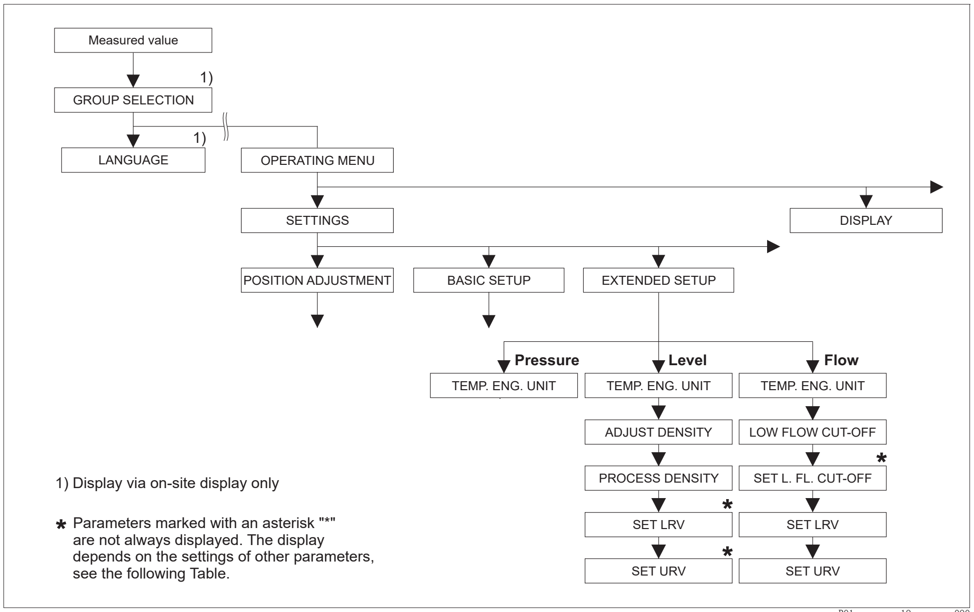


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Fig. 37: EXTENDED SETUP function group
→ For the "Pressure" measuring mode, see Page 96, Table 15
→ For the "Level" measuring mode, see Page 96, Table 16
→ For the "Flow" measuring mode, see Page 98, Table 17

Table 15: (GROUP SELECTION →) OPERATING MENU → SETTINGS → EXTENDED SETUP "Pressure"	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = Pressure (→ see also Page 45). **Note:** ■ See also Page 11 ff, Section 4 "Pressure measurement".	
TEMP. ENG. UNIT (318) Selection	Select the unit for the temperature measured values. → See also PCB TEMPERATURE (Page 117) and SENSOR TEMP. (Page 122). **Options:** ■ °C ■ °F ■ K ■ R **Factory setting:** °C

Table 16: (GROUP SELECTION →) OPERATING MENU → SETTINGS → EXTENDED SETUP "Level"	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = Level (→ see also Page 45). **Note:** ■ See also Page 14 ff, Section 5 "Level measurement".	

Table 16: (GROUP SELECTION →) OPERATING MENU → SETTINGS → EXTENDED SETUP "Level"	
Parameter name	**Description**
TEMP. ENG. UNIT (318) Selection	Select the unit for the temperature measured values. → See also PCB TEMPERATURE (Page 117) and SENSOR TEMP. (Page 122). **Options:** ▪ °C ▪ °F ▪ K ▪ R **Factory setting:** °C
DENSITY UNIT (001)/(812) Options	Select density unit. **Options:** ▪ g/cm^3 ▪ kg/dm^3 ▪ kg/m^3 ▪ US lb/in^3 ▪ US lb/ft^3 **Factory setting:** kg/dm^3
ADJUST DENSITY (007)/(316) Entry	Enter density of fluid. Note! LIN. MEASURAND: "% (Level)", "Mass" and "Volume" and MEASUAND KOMB.: If a change to dry calibration is made after a wet calibration using the CALIBRATION MODE parameter (→ Page 73 or 87), the density for this parameter must be entered correctly before changing the calibration mode. In the event that the pressure falls with increasing levels (LIN. MEASURED: Volume), such as in the case of a residual volume measurement, a negative value shall be entered for this parameter. **Factory setting:** 1.0
PROCESS DENSITY (025)/(811) Entry	Enter a new density value for density correction. The calibration was carried out with the medium water, for example. Now the container is to be used for another fluid with another density. The calibration is corrected appropriately by entering the new density value in the PROCESS DENSITY parameter. Note! LIN. MEASURAND: "% (Level)", "Mass" and "Volume" and MEASUAND KOMB.: If a change to dry calibration is made after a wet calibration using the CALIBRATION MODE parameter (→ Page 73 or 87), the density for this parameter must be entered correctly before changing the calibration mode. In the event that the pressure falls with increasing levels (LIN. MEASURED: Volume), such as in the case of a residual volume measurement, a negative value shall be entered for this parameter. **Factory setting:** 1.0

Table 16: (GROUP SELECTION →) OPERATING MENU → SETTINGS → EXTENDED SETUP "Level"	
Parameter name	**Description**
SET LRV (762) Entry	Enter value for the lower current value (4 mA). **Prerequisite:** ▪ LEVEL MODE = Pressure Linearized or Height Linearized Note! ▪ For the LEVEL MODE "Height Linearized", you can use the ASSIGN CURRENT parameter (→ Page 113) to specify whether the current output should depict the 1st or 2nd measured variable (height or tank content). Depending on the setting of the ASSIGN CURRENT parameter, enter the following value for SET LRV: – ASSIGN CURRENT = tank content (factory setting) ⇒ %- value, volume value or mass value – ASSIGN CURRENT = height ⇒ level value The following applies for the LEVEL MODE "Pressure Linearized" or LEVEL MODE "Height Linearized" + ASSIGN CURRENT "Tank content": ▪ If you enter a new value for TANK CONTENT MIN, the value for SET LRV is also changed. If you want to assign the lower current value a value other than that for TANK CONTENT MIN, you must enter the desired value for SET LRV. (→ TANK CONTENT MIN, Page 101 or 104.) The following applies for the LEVEL MODE "Height Linearized" + ASSIGN CURRENT "Height": ▪ If you enter a new value for LEVEL MIN, the value for SET LRV is also changed. If you want to assign the lower current value a value other than that for LEVEL MIN, you must enter the desired value for SET LRV. (→ LEVEL MIN, Page 86.) **Factory setting:** 0.0
SET URV (763) Entry	Enter value for the upper current value (20 mA). **Prerequisite:** ▪ LEVEL MODE = Pressure Linearized or Height Linearized Note! ▪ For the LEVEL MODE "Height Linearized", you can use the ASSIGN CURRENT parameter (→ Page 113) to specify whether the current output should depict the 1st or 2nd measured variable (height or tank content). Depending on the setting of the ASSIGN CURRENT parameter, enter the following value for SET URV: – ASSIGN CURRENT = tank content (factory setting) ⇒ %- value, volume value or mass value – ASSIGN CURRENT = height ⇒ level value The following applies for the LEVEL MODE "Pressure Linearized" or LEVEL MODE "Height Linearized" + ASSIGN CURRENT "Tank content": ▪ If you enter a new value for TANK CONTENT MAX, the value for SET URV is also changed. If you want to assign the upper current value a value other than that for TANK CONTENT MAX, you must enter the desired value for SET URV. (→ TANK CONTENT MAX, Page 101 or 105.) The following applies for the LEVEL MODE "Height Linearized" + ASSIGN CURRENT "Height": ▪ If you enter a new value for LEVEL MAX, the value for SET URV is also changed. If you want to assign the lower current value a value other than that for LEVEL MAX, you must enter the desired value for SET URV. (→ LEVEL MAX, Page 86.) **Factory setting:** 100.0

Table 17: (GROUP SELECTION →) OPERATING MENU → SETTINGS → EXTENDED SETUP "Flow"	
Parameter name	**Description**
Prerequisite: ▪ MEASURING MODE = Flow (→ see also Page 45). **Note:** ▪ See also Page 40 ff, Section 6 "Flow measurement".	

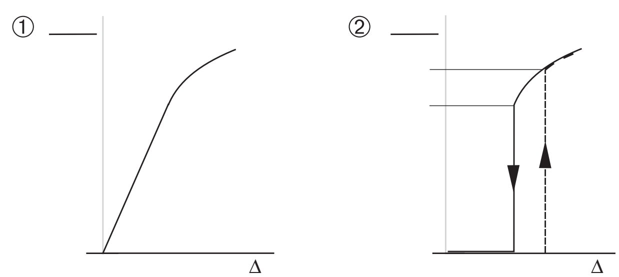
Table 17: (GROUP SELECTION →) OPERATING MENU → SETTINGS → EXTENDED SETUP "Flow"	
Parameter name	**Description**
TEMP. ENG. UNIT (318) Selection	Select the unit for the temperature measured value. → See also PCB TEMPERATURE (Page 117) and SENSOR TEMP. (Page 123). **Options:** ▪ °C ▪ °F ▪ K ▪ R **Factory setting:** °C
LOW FLOW CUT-OFF (442) Selection	Switches "low flow cut-off" function on and off. In the lower measuring range, small flow quantities (creepages) can lead to large measured value fluctuations. Switching on this function stops these flow quantities from being recorded. → See also SET. L. FL. CUT-OFF. **Options:** ▪ Off ▪ On **Factory setting:** Off
SET. L. FL. CUT-OFF (323) Entry	Enter switch-off point of low flow cut-off. The hysteresis between the switch-on point and the switch-off point is always 1 % of the end flow value. → See also LOW FLOW CUT-OFF. **Prerequisite:** ▪ LOW FLOW CUT-OFF = on **Input range:** Switch-off point: 0...50 % of end flow value (→ MAX. FLOW).  P01-PMD7xxxx-05-xx-xx-xx-000 **Factory setting:** 5 % (of end flow value)
SET LRV (637) Entry	Depending on the setting in the LINEAR/SQROOT parameter (→ Page 113), enter a flow value or a pressure value for the lower current value (4 mA) here. ▪ LINEAR/SQROOT = Flow (square root) (factory setting) ⇒ flow value ▪ LINEAR/SQROOT = Differential pres. ⇒ pressure value **Factory setting:** 0

Table 17: (GROUP SELECTION →) OPERATING MENU → SETTINGS → EXTENDED SETUP "Flow"	
Parameter name	**Description**
SET URV (638) Entry	Depending on the setting in the LINEAR/SQROOT parameter (→ Page 113), enter a flow value or a pressure value for the upper current value (20 mA) here. ■ LINEAR/SQROOT = Flow (square root) (factory setting) ⇒ flow value ■ LINEAR/SQROOT = Differential pres. ⇒ pressure value The following applies for the setting LINEAR/SQROOT "Flow (square root)": ■ If you enter a new value for MAX. FLOW, the value for SET URV is also changed. If you want to assign the upper current value a value other than that for MAX. FLOW, you must enter the desired value for SET URV. (→ MAX. FLOW, Page 95). The following applies for the setting LINEAR/SQROOT "Differential pres.": ■ If you enter a new value for MAX PRESS. FLOW, the SET URV value is also changed. If you want to assign the upper current value a value other than that for MAX PRESS. FLOW, you must enter the desired value for SET URV. (→ MAX PRESS. FLOW, Page 95). **Factory setting:** MAX. FLOW

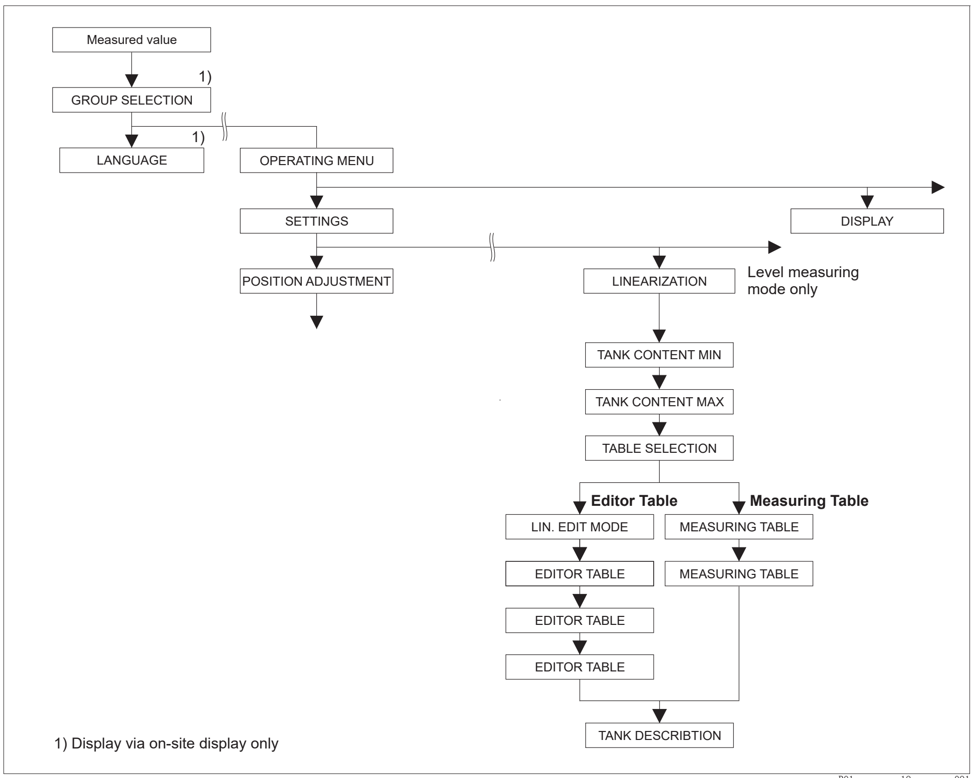


Fig. 38: LINEARISATION function group for on-site operation

Table 18: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – on-site operation	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = Level (→ see also Page 45). ■ LEVEL MODE = Pressure Linearized or Height Linearized (→ see also Page 68). **Note:** – See also Page 14 ff, Section 5 "Level measurement".	

Table 18: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – on-site operation	
Parameter name	**Description**
TANK CONTENT MIN (759) Entry	Enter the minimum tank contents to be expected. The input limits for the calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the minimum tank content to be expected, the more accurate the measurement result. Note! ■ If you enter a new value for TANK CONTENT MIN, the value for SET LRV is also changed. Use SET LRV to assign a %-value, volume value or mass value to the lower current value. If you want to assign the lower current value a value other than that for TANK CONTENT MIN, you must enter the desired value for SET LRV. (→ SET LRV, Page 98). ■ For the setting LEVEL MODE "Height Linearized" and ASSIGN CURRENT "Linear", the TANK CONTENT MIN parameter does not affect the SET LRV parameter. (→ SET LRV, Page 98 and ASSIGN CURRENT, Page 113) **Factory setting:** 0.0
TANK CONTENT MAX (713) Entry	Enter the maximum tank contents to be expected. The input limits for the subsequent calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the maximum tank content to be expected, the more accurate the measurement result. Note! ■ If you enter a new value for TANK CONTENT MAX, the value for SET URV is also changed. Use SET URV to assign a %-value, volume value or mass value to the upper current value. If you want to assign the upper current value a value other than that for TANK CONTENT MAX, you must enter the desired value for SET URV. (→ SET URV, Page 98.) ■ For the setting LEVEL MODE "Height Linearized" and ASSIGN CURRENT "Linear", the TANK CONTENT MAX parameter does not affect the SET URV parameter. (→ SET URV, Page 98 and ASSIGN CURRENT, Page 113) **Factory setting:** 100.0
TABLE SELECTION (808) Selection	Select table. The device works with a measuring and an editor table. The measuring table is used to calculate the measured value. To make sure measuring also runs properly when entering a new table, there is another table, the editor table, for entering new values. **Options:** ■ View meas. table ■ Editor table **Factory setting:** View meas. table
LIN. EDIT MODE (397) Selection	Select the entry mode for the linearisation table. **Prerequisite:** ■ TABLE SELECTION = Editor table **Options:** ■ Manual: the container neither has to be filled nor emptied for this entry mode. Enter the value pairs for the linearisation table. ■ Semiautomatic: the container is filled or emptied in stages in this entry mode. The device automatically records the hydrostatic pressure. The associated volume, mass or %-value is entered. **Factory setting:** Manual

Table 18: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – on-site operation	
Parameter name	**Description**
EDITOR TABLE (809) Selection	Select table. **Prerequisite:** ▪ TABLE SELECTION = editor table **Options:** ▪ New table: enter new linearisation table. ▪ Edit measure table: The measuring table is loaded as an editor table so that changes can be made. → See also TAB. SELECTION ▪ Continue edit: Edit an editor table that already exists. → See also TABLE EDITOR (770) **Factory setting:** New table
EDITOR TABLE Entry ("Semiautomatic" edit mode) – LINE-NUMB (549) – Y-VAL. (551)	Enter table in the "Semiautomatic" editing mode. A linearisation table must have at least 2 points and may not have more than 32 points. A point consists of LINE-NUMB, X-VAL. and Y-VAL. For this editing mode, the container is filled or emptied in stages. **Example:** Enter point for LEVEL MODE = Pressure Linearized – LINE-NUMB: confirm value displayed. – Y-VAL.: depending on the setting in the LINd. MEASURAND parameter, enter the volume, mass or % value. – X-VAL.: the hydrostatic pressure present is displayed and saved by confirming the Y-value. **Example:** Enter point for LEVEL MODE = Height Linearized – LINE-NUMB: confirm value displayed. – Y-VAL.: depending on the setting in the COMB. MEASURAND parameter, enter the volume, mass or % value. – X-VAL.: the hydrostatic pressure present is measured. Depending on the setting in the COMB. MEASURAND parameter, the measured pressure is converted to a level unit or a % and displayed. The value is saved by confirming the Y-value. **Factory setting:** LINE-NUMB = 1, X-VAL. = 0.0, Y-VAL. = 0.0
EDITOR TABLE Entry ("manual" edit mode) – LINE-NUMB (549) – Y-VAL. (551) – X-VAL. (550)	Enter table in the "manual" editing mode. A linearisation table must have at least 2 points and may not have more than 32 points. A point consists of a line number, X-value and Y-value. The container neither has to be filled nor emptied for this editing mode. **Example:** Enter point for LEVEL MODE = Pressure Linearized – LINE-NUMB: confirm value displayed. – X-VAL.: enter pressure value. – Y-VAL.: depending on the setting in the LINd. MEASURAND parameter, enter the related volume, mass or % value. **Example:** Enter point for LEVEL MODE = Height Linearized – LINE-NUMB: confirm value displayed. – X-VAL.: the hydrostatic pressure present is measured. Depending on the setting in the COMB. MEASURAND parameter, enter a level value or % value. – Y-VAL.: depending on the setting in the COMB. MEASURAND parameter, enter the related volume, mass or % value. **Factory setting:** LINE-NUMB = 1, X-VAL. = 0.0, Y-VAL. = 0.0

Table 18: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – on-site operation	
Parameter name	**Description**
EDITOR TABLE (770) Options	Select the function for the editor table. **Options:** ■ Next point: enter next point. ■ Last input point: jump back to previous point to correct a mistake for example. ■ Accept input table: save editor table as measuring table. This overwrites the old measuring table. ■ Abort: save values entered up to this point for the editor table and display next parameter. The editor table is not activated as a measuring table. ■ Insert point: see example below. ■ Delete point: the current point is deleted. See example below. **Example:** Add point, in this case between the 4th and 5th point for example – Select point 5 via the EDITOR TABLE/LINE NUMB parameter. – Confirm current X and Y values with Enter. – Using the TABLE EDITOR (770) parameter, select the option "Insert point". – Point 5 is displayed for the TABLE EDITOR/LINE NUMB parameter. New values for the X-VAL and Y-VAL parameters. **Example:** delete point, in this case the 5th point for example – Select point 5 via the EDITOR TABLE/LINE NUMB parameter. – Using the TABLE EDITOR (770) parameter, select the option "Delete point". – The 5th point is deleted. All of the following points are pushed up one number i.e. following deletion, the 6th point becomes Point 5. **Factory setting:** Next point
MEASURING TABLE (549) Display	A point of the linearisation table saved (measuring table) appears on the display The parameter first displays the first point of the linearisation table. By entering a line number, you can directly display the corresponding point in the linearisation table.
MEASURING TABLE (717) Selection	Select the function for the measuring table. **Options:** ■ Next point: view next point of the measuring table. ■ Last input point: view previous point of the measuring table. ■ Abort: cancel measuring table display. Display next parameter. **Factory setting:** Next point
TANK DESCRIPTION (815) Entry	Enter tank description. (max. 32 alphanumeric characters) **Factory setting:** _

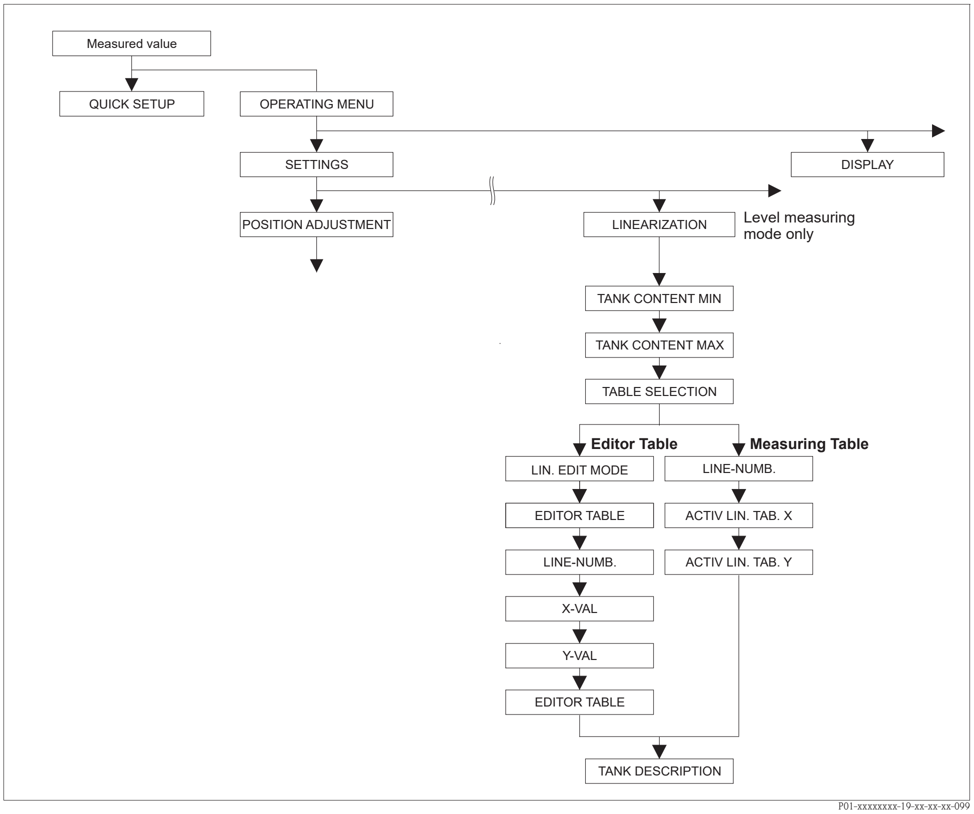


Fig. 39: LINEARISATION function group for digital communication

Table 19: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – Digital communication	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = Level (→ see also Page 45). ■ LEVEL MODE = Pressure Linearized or Height Linearized (→ see also Page 68). **Note:** – See also Page 14 ff, Section 5 "Level measurement".	
TANK CONTENT MIN Entry	Enter the minimum tank contents to be expected. The input limits for the calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the minimum tank content to be expected, the more accurate the measurement result. Note! ■ If you enter a new value for TANK CONTENT MIN, the value for SET LRV is also changed. Use SET LRV to assign a %-value, volume value or mass value to the lower current value. If you want to assign the lower current value a value other than that for TANK CONTENT MIN, you must enter the desired value for SET LRV. (→ SET LRV, Page 98). ■ For the setting LEVEL MODE "Height Linearized" and ASSIGN CURRENT "Linear", the TANK CONTENT MIN parameter does not affect the SET LRV parameter. (→ SET LRV, Page 98 and ASSIGN CURRENT, Page 113) **Factory setting:** 0.0

<table>
<tr><th colspan="2">Table 19: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – Digital communication</th></tr>
<tr><th>Parameter name</th><th>Description</th></tr>
<tr><td>TANK CONTENT MAX
Entry</td><td>Enter the maximum tank contents to be expected.
The input limits for the subsequent calibration (editing limits) are derived from the value entered. The closer the value entered corresponds to the maximum tank content to be expected, the more accurate the measurement result.

Note!
■ If you enter a new value for TANK CONTENT MAX, the value for SET URV is also changed. Use SET URV to assign a %-value, volume value or mass value to the upper current value. If you want to assign the upper current value a value other than that for TANK CONTENT MAX, you must enter the desired value for SET URV. (→ SET URV, Page 98.)
■ For the setting LEVEL MODE "Height Linearized" and ASSIGN CURRENT "Linear", the TANK CONTENT MAX parameter does not affect the SET URV parameter. (→ SET URV, Page 98 and ASSIGN CURRENT, Page 113)

Factory setting:
100.0</td></tr>
<tr><td>TABLE SELECTION
Selection</td><td>Select table.
The device works with a measuring and an editor table. The measuring table is used to calculate the measured value. To make sure measuring also runs properly when entering a new table, there is another table, the editor table, for entering new values.

Options:
■ View meas. table
■ Editor table

Factory setting:
View meas. table</td></tr>
<tr><td>LIN. EDIT MODE
Selection</td><td>Select the entry mode for the linearisation table.

Prerequisite:
■ TABLE SELECTION = Editor table

Options:
■ Manual:
The container neither has to be filled nor emptied for this entry mode. Enter the value pairs for the linearisation table.
■ Semiautomatic: the container is filled or emptied in stages in this entry mode. The device automatically records the hydrostatic pressure. The associated volume, mass or %-value is entered.

Factory setting:
Manual</td></tr>
<tr><td>EDITOR TABLE
Selection</td><td>Select table.

Prerequisite:
■ TABLE SELECTION = Editor table

Options:
■ New table:
Enter new linearisation table.
■ View meas. table:
View saved linearisation table and change points if necessary.
■ Continue edit:
Edit a linearisation table that already exists.

Note!
Operating program:
■ If you select the "View meas. table" option, the saved measuring table is loaded in the operating priogram. Use the "Lin.-Tab." window to view the entire table, change values if necessary and write the modified table to the device.
■ If you change a value via the X-VAL. or Y-VAL. parameters, the table in the "Lin.-Tab." window is not updated. To view the table saved in the device, this table must first be read out of the device.

Factory setting:
New table</td></tr>
</table>

Table 19: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – Digital communication	
Parameter name	**Description**
LINE-NUMB Entry	Enter the line number for the linearisation table. A linearisation table must have at least 2 points and may not have more than 32 points. ■ TABLE SELECTION = View meas. table Via this parameter you can select the point of the linearisation table which should be displayed. ■ TABLE SELECTION = Editor table Enter a point via the LINE-NUMB, X-VAL. and Y-VAL. parameters. → See also this table, parameter description for LIN. EDIT MODE, X-VAL. ("Manual" entry mode), X-VAL. ("Semiautomatic" entry mode) and Y-VAL. Note! In the operating program, you can enter a complete linearisation table in one go via the "Lin.-Tab." window.
X-VAL. ("Manual" entry mode) Entry	Enter the pressure value for the linearisation table. → See also LIN. EDIT MODE, LINE-NUMB and Y-VAL. **Prerequisite:** ■ TABLE SELECTION = Editor table
X-VAL. ("Semiautomatic" entry mode) Display	In the "Semiautomatic" entry mode, the container is filled or emptied in stages. The X-VAL. displays the measured hydrostatic pressure. **Prerequisite:** ■ TABLE SELECTION = Editor table **Operating program** The X-VAL. is saved by confirming the Y-value. **HART Handheld** Confirm X-VAL. displayed. → See also LIN. EDIT MODE, LINE-NUMB and Y-VAL.
Y-VAL. Entry	Enter the volume, mass or %-value belonging to the X-VAL. for the linearisation table. **Prerequisite:** ■ TABLE SELECTION = Editor table Depending on the setting in the LINd. MEASURAND or COMB. MEASURAND parameters, enter a volume, mass or %-value here. → See also this table, parameter description for LIN. EDIT MODE, LINE-NUMB, X-VAL. ("Manual" entry mode), X-VAL. ("Semiautomatic" entry mode).
EDITOR TABLE Options	Select the function for the editor table. **Prerequisite:** ■ TABLE SELECTION = Editor table **Options:** ■ Next point: without function ■ Last input point: without function ■ Accept input table: save editor table as measuring table. This overwrites the old measuring table. ■ Abort: save values entered up to this point for the editor table and display next parameter. The editor table is not activated as a measuring table. ■ Insert point: see example below. ■ Delete point: the current point is deleted. See example below. **Example:** Add point, in this case between the 4th and 5th point for example – Select point 5 via the LINE NUMB parameter. – Using the TABLE EDITOR parameter, select the option "Insert point". – Point 5 is displayed for the LINE NUMB parameter. New values for the X-VAL and Y-VAL parameters. **Example:** delete point, in this case the 5th point for example – Select point 5 via the LINE NUMB parameter. – Using the TABLE EDITOR parameter, select the option "Delete point". – The 5th point is deleted. All of the following points are pushed up one number i.e. following deletion, the 6th point becomes Point 5. **Factory setting:** Next point

Table 19: (GROUP SELECTION →) OPERATING MENU → SETTINGS → LINEARISATION – Digital communication	
Parameter name	**Description**
ACTIV LIN. TAB. X Display	An X-value of the linearisation table already saved appears on the display You can select a point of the linearisation table via the LINE-NUMB parameter. **Prerequisite:** ■ TABLE SELECTION = View meas. table Note! In the operating program, you can view the entire saved table in the "Tables" window.
ACTIV LIN. TAB. Y Display	A Y-value of the linearisation table already saved appears on the display You can select a point of the linearisation table via the LINE-NUMB parameter. **Prerequisite:** ■ TABLE SELECTION = View meas. table Note! In the operating program, you can view the entire saved table in the "Tables" window.
TANK DESCRIPTION Entry	Enter tank description. (max. 32 alphanumeric characters) **Factory setting:** ________________________________

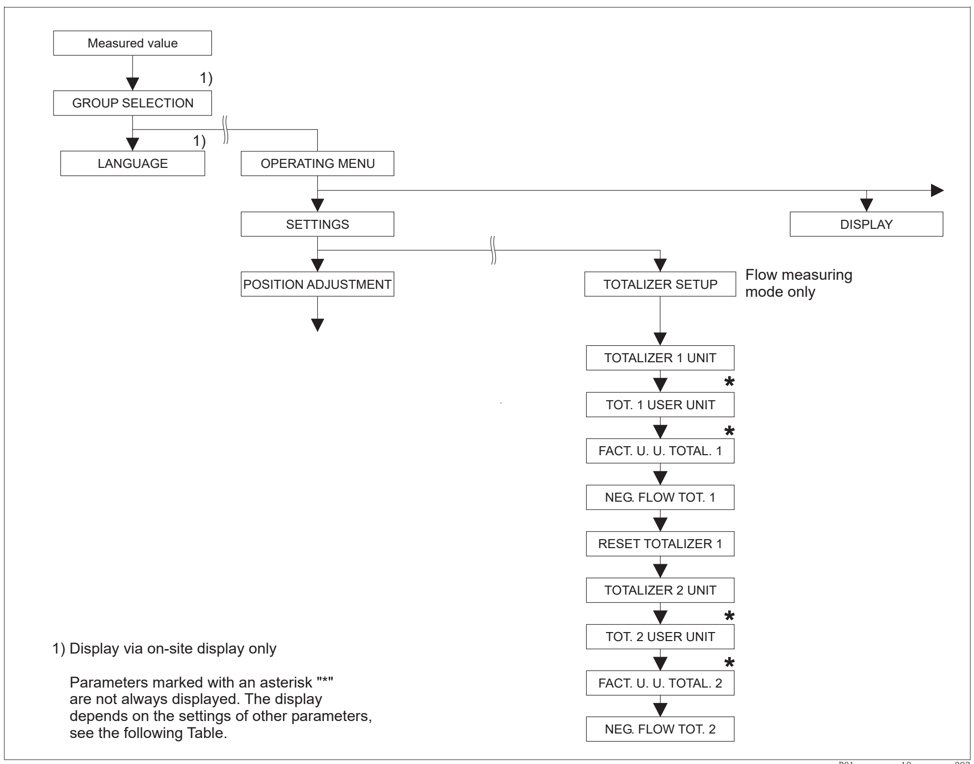


Fig. 40: TOTALIZER SETUP function group

Table 20: (GROUP SELECTION →) OPERATING MENU → SETTINGS → TOTALIZER SETUP	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = Flow (→ see also Page 45). **Note:** ■ See also Page 40 ff, Section 6 "Flow measurement".	

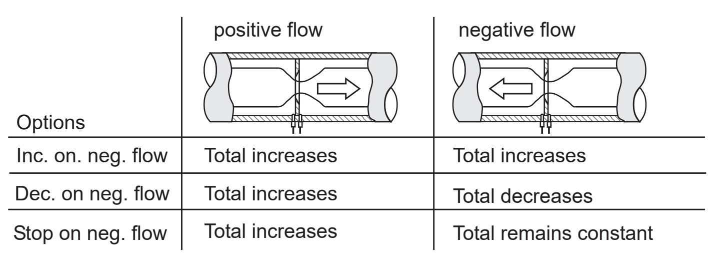
Table 20: (GROUP SELECTION →) OPERATING MENU → SETTINGS → TOTALIZER SETUP	
Parameter name	**Description**
TOTALIZER 1 UNIT (398), (666), (664), (662) Selection	Select unit for totalizer 1. Depending on the setting in the FLOW-MEAS. TYPE parameter (→ Page 93) this parameter offers a list of volume, norm volume, standard volume and mass units. When a new volume or mass unit is selected, totalizer-specific parameters are converted and displayed with the new unit within a unit group. When the flow mode is changed, the totalizer value is not converted. The 3-digit ID number on the on-site display depends on the FLOW-MEAS. TYPE selected: – (398): FLOW-MEAS. TYPE "Volume p. cond." – (662): FLOW-MEAS. TYPE "Mass" – (664): FLOW-MEAS. TYPE "Gas. std. cond." – (666): FLOW-MEAS. TYPE "Gas. norm conditions" **Factory setting:** m^3
TOT. 1 USER UNIT (627) Entry	Enter text (unit) for customer-specific unit for totalizer 1. You can enter a maximum of eight alphanumeric characters here. → See also FACT. U. U. TOTAL. 1. **Prerequisite:** ■ TOTALIZER 1 UNIT = User unit ✎ Note! Only the first five characters are shown on the on-site display. For example, if "crates" is specified as the customer-specific unit, "crate" is displayed. If the unit contains a slash, up to eight characters can be shown on the on-site display. The maximum number of characters in the counter is again limited to five. For example, if "crates/m2" is specified as the customer-specific unit, "crate/m2" is displayed. In the FieldCare, all eight characters are displayed. In the HART handheld terminal, the customer-specific unit is only displayed in the TOT. 1 USER UNIT parameter. The measured value is displayed with the additional text "User Unit". **Factory setting:** _ _ _ _ _ _ _ _
FACT. U. U. TOTAL. 1 (329) Entry	Enter conversion factor for a customer-specific unit for totalizer 1. The conversion factor must be entered in relation to an appropriate SI unit, e.g. m^3 for the "Volume p. cond." FLOW-MEAS. TYPE. → See also TOT. 1 USER UNIT. **Prerequisite:** ■ TOTALIZER 1 UNIT = User unit **Example:** You want the measured value to be displayed in "buckets". – MEASURED VALUE =1 m3 ≘ 100 buckets – Entry TOT. 1 USER UNIT: bucket – Entry FACT. U. U. TOTAL. 1: 100 – Result: MEASURED VALUE = 100 buckets **Factory setting:** 1.0
NEG. FLOW TOT. 1 (400) Selection	Specify way of counting negative flows for totalizer 1.  P01-xMD7xxxx-16-xx-xx-xx-003 **Factory setting:** Inc. on neg. flow

Table 20: (GROUP SELECTION →) OPERATING MENU → SETTINGS → TOTALIZER SETUP	
Parameter name	**Description**
RESET TOTALIZER1 (331) Selection	You reset totalizer 1 to zero with this parameter. **Options:** ▪ Abort (do not reset) ▪ Reset **Factory setting:** Abort
TOTALIZER 2 UNIT (399), (663), (665), (667) Selection	Select unit for totalizer 2. → See also TOTAL 1. ENG. UNIT. The 3-digit ID number on the on-site display depends on the FLOW-MEAS. TYPE selected: – (399): FLOW-MEAS. TYPE "Volume p. cond." – (663): FLOW-MEAS. TYPE "Mass" – (665): FLOW-MEAS. TYPE "Gas. std. cond." – (667): FLOW-MEAS. TYPE "Gas. norm conditions" **Factory setting:** m^3
TOT. 2 USER UNIT (628) Entry	Enter text (unit) for customer-specific unit for totalizer 2. → See also TOT. 1 USER UNIT. **Prerequisite:** ▪ TOTALIZER 2 UNIT = User unit **Factory setting:** _ _ _ _ _ _ _ _
FACT. U. U. TOTAL. 2 (330) Selection	Enter conversion factor for a customer-specific unit for totalizer 2. → See also FACT. U. U. TOTAL. 1. **Prerequisite:** ▪ TOTALIZER 2 UNIT = User unit **Factory setting:** 1.0
NEG. FLOW TOT. 2 (416) Selection	Specify way of counting negative flows for totalizer 2. → See NEG. FLOW TOT. 1. **Factory setting:** Positive

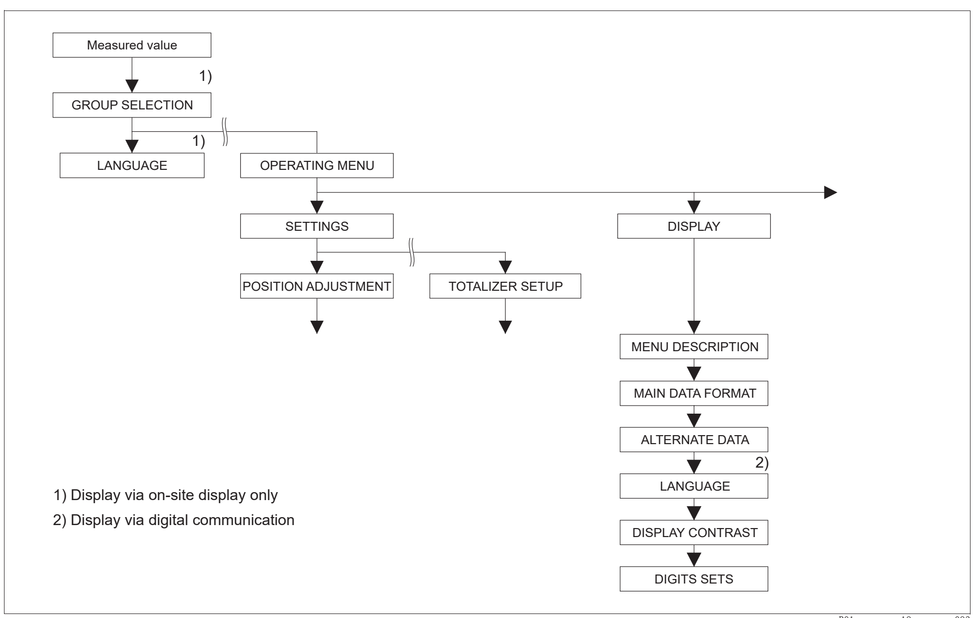


Fig. 41: DISPLAY group

Table 21: (GROUP SELECTION →) OPERATING MENU → DISPLAY	
Parameter name	**Description**
MENU DESCRIPTOR (419) Selection	Specify contents for the main line of the on-site display in the measuring mode. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.1 "On-site display". **Options:** ■ Main measured value (PV) ■ Main measured value (%) ■ Pressure ■ Flow ■ Level ■ Tank content ■ Current ■ Temperature ■ Error number ■ Totalizer 1 ■ Totalizer 2 The selection depends on the measuring mode chosen. **Factory setting:** Main measured value (PV)
MAIN DATA FORMAT (688) Selection	Specifies the number of places after the decimal point for the value displayed in the main line. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or (BA00332P) Deltapilot S, Section 5.1 "On-site display". **Options:** ■ Auto ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx ■ x.xxxxx **Factory setting:** Auto
ALTERNATE DATA (423) Selection	Switch on "Alternating display" mode. In this display mode, the on-site display alternates between the following measured values depending on the measuring mode selected. – Pressure: Main measured value (PV), Pressure, Temperature and Current – Level Standard: Main measured value (PV), Pressure, Level, Tank content, Temperature and Current – Level Easy: Main measured value (PV), Pressure, Temperature and Current – Flow: Main measured value (PV), Pressure, Flow, Temperature, Current, Totalizer 1 and Totalizer 2 **Options:** ■ Off ■ On **Factory setting:** Off
LANGUAGE Selection	Select the menu language for the on-site display. Note! ■ For on-site operation, the LANGUAGE parameter is arranged directly under GROUP SELECTION (menu path: GROUP SELECTION → LANGUAGE, see also Page 44). ■ Select the menu language for FieldCare via the "Options" menu → "Settings" → "Language" tab → "Tool language" field. **Factory setting**: English

Table 21: (GROUP SELECTION →) OPERATING MENU → DISPLAY	
Parameter name	**Description**
DISPLAY CONTRAST (339) Entry	Adjust contrast of on-site display. You specify the contrast of the display with a number. Changes are only accepted as single steps, i.e. to change the value from "8" to "4", you need to save four times. You can also adjust the contrast of the display by means of the keys on the electronic insert or at the device. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.2.3 "Function of operating keys". **Input range:** 4...13, 4: contrast weaker (brighter), 13: contrast stronger (darker). **Factory setting:** 8
DIGITS SETS (840) Display	This parameter is used to check the correct display of characters and digits on the user interface. If the characters and digits are displayed correctly, this parameter displays the string "0123456789.-".

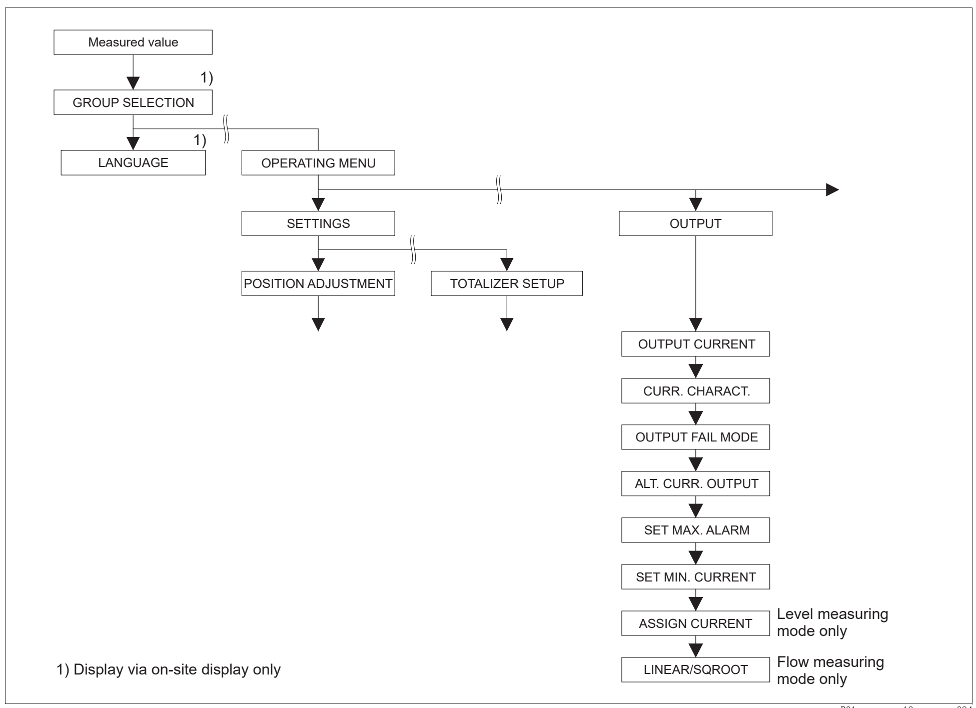


Fig. 42: OUTPUT group

Table 22: (GROUP SELECTION →) OPERATING MENU → OUTPUT	
Parameter name	**Description**
OUTPUT CURRENT (254) Display	Displays the current current value.

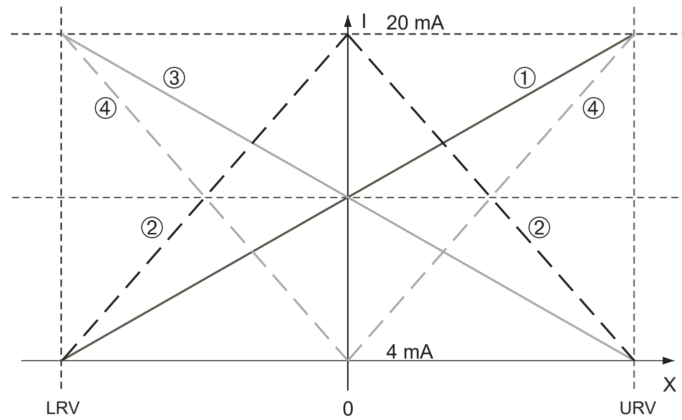
Table 22: (GROUP SELECTION →) OPERATING MENU → OUTPUT	
Parameter name	**Description**
CURR. CHARACT. (694), (695), (696), (764) Selection	Select curve of current output. **Options:**  P01-xxxxxxxx-05-xx-xx-xx-009 *Fig. 43: Illustration of current output curves* *1 Linear: lower range value = 4 mA, upper range value = 20 mA* *2 Bi-linear: lower range value = 4 mA, centre or zero = 20 mA, upper range value = 4 mA* *3 Linear inverse: lower range value = 20 mA, upper range value = 4 mA* *4 Bi-linear inverse: lower range value = 20 mA, centre or zero = 4 mA, upper range value = 20 mA* *LRV Lower range value* *URV Upper range value* *I Current* *X Measured value (Pressure/Level/Flow)* *The "CURR. CHARACT." function refers to the operating mode previously selected.* The 3-digit ID number on the on-site display depends on the MEASURING MODE selected: – (694): MEASURING MODE "Pressure" or MEASURING MODE "Flow" with the setting for LINEAR/SQROOT "Differential pres. – (695): MEASURING MODE "Flow" with the setting LINEAR/SQROOT "Flow (square root)" – (696): MEASURING MODE "Level", LEVEL MODE "Linear" or "Pressure Linearized" and LEVEL MODE "Height Linearized" with the setting for ASSIGN CURRENT "Level" – (764): MEASURING MODE "Level", LEVEL MODE "Height Linearized" with the setting for ASSIGN CURRENT "Tank content" **Factory setting:** Linear
OUTPUT FAIL MODE (388) Entry	Select the current value in the event of an alarm. In the event of an alarm, the current and the bargraph assume the current value specified with this parameter. **Options:** ■ Max. alarm (110%): can be set between 21...23 mA ■ Hold meas. value: last measured value is kept. ■ Min. alarm (–10%): 3.6 mA → See also this table SET MAX. ALARM and Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 8.2.1. "Setting current output for alarm". **Factory setting:** Max. alarm 110% (22 mA)

Table 22: (GROUP SELECTION →) OPERATING MENU → OUTPUT	
Parameter name	**Description**
ALT. CURR. OUTPUT (597) Selection	Set current output if sensor limits undershot or overshot. **Options:** ■ Normal: the current output assumes the value set via the OUTPUT FAIL MODE and SET MAX. ALARM parameters. ■ Special: – Lower sensor limit undershot (E120): Current output = 3.6 mA – Upper sensor limit overshot (E115): current output assumes the value set via the SET MAX. ALARM parameter. Attention : when using the case "special", the behavior is limited to an over/ underpressure in a range LRL -10%, URL +10%. **Factory setting:** Normal
SET MAX. ALARM (342) Entry	Enter current value for maximum alarm current. → See also OUTPUT FAIL MODE. **Input range:** 21...23 mA **Factory setting:** 22 mA
SET MIN. CURRENT (343) Entry	Enter lower current limit. Some switching units sometimes do not accept currents less than 4.0 mA. **Options:** ■ 3.8 mA ■ 4.0 mA **Factory setting:** 3.8 mA
ASSIGN CURRENT (760) Selection	Specify current signal for the "Level" measuring mode. See also SET LRV (→ Page 98) and SET URV (→ Page 98). **Prerequisite:** ■ MEASURING MODE = Level, LEVEL MODE = Height Linearized **Options:** ■ Height ■ Tank content **Factory setting:** Tank content
LINEAR/SQROOT (390) Selection	Specify current signal for the "Flow" measuring mode. See also SET LRV (→ Page 99) and SET URV (→ Page 100). **Prerequisite:** ■ MEASURING MODE = Flow **Options:** ■ Differential pres.: the linear pressure signal is used for the current output. ■ Flow (square root): the root flow signal is used for the current output. The "Flow (square root)" current signal is indicated on the on-site display with a root symbol. **Factory setting:** Flow (square root)

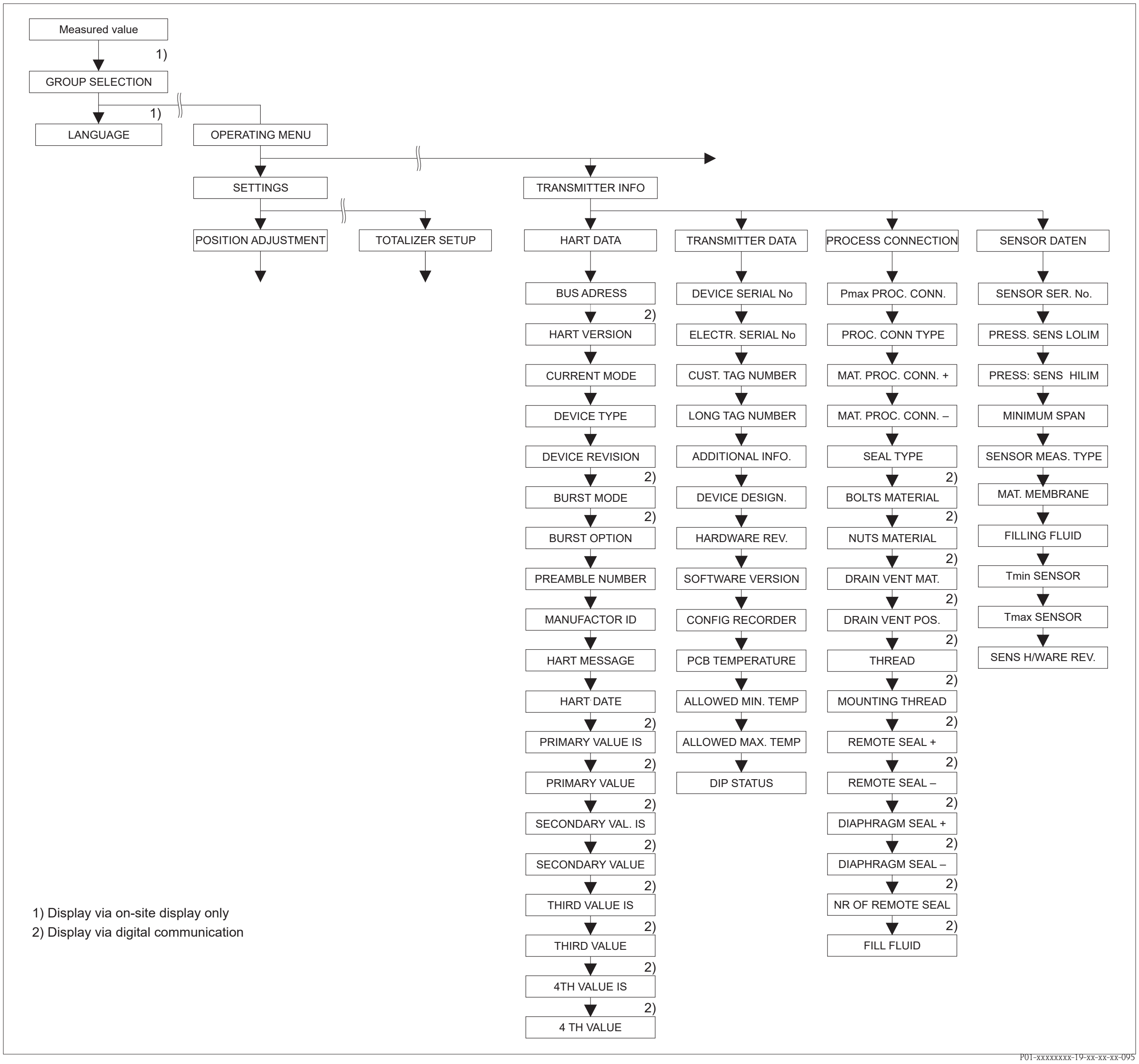


Fig. 44: TRANSMITTER INFO group
→ For the HART DATA function group, see Page 114, Table 23
→ For the TRANSMITTER DATA function group, see Page 117, Table 24
→ For the PROCESS CONNECTION function group, see Page 117, Table 25
→ For the SENSOR DATA function group, see Page 119, Table 26

Table 23: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → HART DATA	
Parameter name	**Description**
HART VERSION (585) Display	Displays the HART Version.

Table 23: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → HART DATA	
Parameter name	**Description**
CURRENT MODE (052) Selection	Set the current mode for HART communication. **Selection via on-site display and FieldCare:** ▪ Signaling Measured value transmission by the current value ▪ Fixed Fixed current 4.0 mA (multidrop mode) (Measured value transmission only via HART digital communication) **Factory setting:** Signaling **Selection via HART Handheld Terminal:** ▪ enabled Measured value transmission by the current value ▪ disabled Fixed current 4.0 mA (multidrop mode) (Measured value transmission only via HART digital communication) **Factory setting:** enabled
BUS ADDRESS (345) Entry	Enter the address for the exchange of data with the HART protocol. (HART 5.0: range 0 to 15, wherein if the address = 0 this produces the "Signaling" setting; HART 6.0/7.0: range 0 to 63) **Factory setting:** 0
DEVICE TYPE (351) Display	Displays the device type in decimal numerical format, here Deltabar S: 23 The extended device type is a composition of the manufacturer number (17) and the device type (23). **Prerequisite:** ▪ Deltabar S differential pressure transmitter
DEVICE TYPE (802) Display	Displays the device type in decimal numerical format, here Cerabar S: 24 The extended device type is a composition of the manufacturer number (17) and the device type (24). **Prerequisite:** ▪ Pressure transmitter Cerabar S
DEVICE TYPE (002) Display	Displays the device type in decimal numerical format, here Deltapilot S: 26 The extended device type is a composition of the manufacturer number (17) and the device type (26). **Prerequisite:** ▪ Pressure transmitter Deltapilot S
DEVICE REVISION (699) Display	Displays the device revision
BURST MODE Selection	Switches "Burst Mode" function on and off. **Selection:** ▪ On ▪ Off **Prerequisite:** ▪ Digital communication
BURST OPTION Entry	Use this parameter to specify which command is sent to the master. **Voraussetzung:** ▪ Digital communication **Factory setting:** 3 (HART commando 3)
PREAMBLE NUMBER (036) Entry	Enter the number of preambles in the HART protocol. (Synchronisation of the modem modules along a transmission path, each modem module could "swallow" a byte - at least 2 bytes must arrive.) **Input range:** 2...20 **Factory setting:** 5

Table 23: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → HART DATA	
Parameter name	**Description**
MANUFACTOR ID (432) Display	Displays the manufacturer number in a decimal numerical format. Here: 17 Endress+Hauser
HART MESSAGE (271) Entry	Enter message (max. 32 alphanumeric characters). On command from the master, this message is sent via the HART protocol. **Factory setting:** _ or as per order specifications
HART DATE (481) Entry	Enter the date of the last configuration change. **Factory setting:** DD.MM.YY (date of final test)
PRIMARY VALUE IS Display	This parameter displays the following measured value depending on the measuring mode selected: – Measuring mode "Pressure": PRESSURE – "Level" measuring mode, "Linear" or "Pressure Linearized" level type: LEVEL BEFORE LIN – Measuring mode "Level", level type "Height Linearized": TANK CONTENT – Measuring mode "Flow": SUPPRESSED FLOW → See also PRIMARY VALUE. **Prerequisite:** ▪ Digital communication
PRIMARY VALUE Display	Displays the primary value. → See also PRIMARY VALUE IS. **Prerequisite:** ▪ Digital communication
SECONDARY VAL. IS	Select second process value. You can choose between the following process values depending on the measuring mode selected: – PRESSURE – CORRECTED PRESS. – SENSOR PRESSURE – SENSOR TEMP. – PCB TEMPERATURE – SUPPRESSED FLOW – TOTALIZER 1 – TOTALIZER 2 – LEVEL BEFORE LIN – TANK CONTENT **Prerequisite:** ▪ Digital communication
SECONDARY VALUE	Display second process value. → See also SECONDARY VAL. IS. **Prerequisite:** ▪ Digital communication
THIRD VALUE IS	Select third process value. → See also SECONDARY VAL. IS. **Prerequisite:** ▪ Digital communication
THIRD VALUE	Display third process value. → See also SECONDARY VAL. IS. **Prerequisite:** ▪ Digital communication
4TH VALUE IS	Select fourth process value. → See also SECONDARY VAL. IS. **Prerequisite:** ▪ Digital communication
4TH VALUE	Display fourth process value. → See also SECONDARY VAL. IS. **Prerequisite:** ▪ Digital communication

Table 24: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → TRANSMITTER DATA	
Parameter name	**Description**
DEVICE SERIAL No (354) Display	Displays the serial number of the device (11 alphanumeric characters).
ELECTR. SERIAL No (386) Display	Displays the serial number of the main electronics (11 alphanumeric characters).
CUST. TAG NUMBER (055) Entry	Enter TAG number (max. 8 alphanumeric characters). **Factory setting:** _ _ _ _ _ _ _ _ or as per order specifications
LONG TAG NUMBER (305) Entry	Enter TAG number (max. 32 alphanumeric characters). **Factory setting:** _ or as per order specifications
ADDITIONAL INFO. (272) Entry	Enter tag description (max. 16 alphanumeric characters). **Factory setting:** _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ or as per order specifications
DEVICE DESIGN. (350) Display	Displays the device designation and order code.
HARDWARE REV. (266) Display	Displays the revision number of the main electronics e.g.: V02.00
SOFTWARE VERSION (264) Display	Displays the software version e.g.: V02.10
CONFIG RECORDER (352) Display	Displays the configuration counter. This counter is increased by one with each change to a parameter or group. The counter counts to 65535 and then starts again at zero. Changes in the parameters of the DISPLAY function group do not increase the counter.
PCB TEMPERATURE (357) Display	Displays the measured temperature of the main electronics.
ALLOWED MIN. TEMP (358) Display	Displays the lower temperature limit of the main electronics.
ALLOWED MAX. TEMP (359) Display	Displays the upper temperature limit of the main electronics.
DIP STATUS (363) Display	Displays the status of DIP switch 1 on the electronic insert. You can lock or unlock parameters relevant to the measured value with DIP switch 1. If operation is locked by means of the INSERT PIN No. parameter, you can only unlock operation again by means of this parameter. (→ INSERT PIN NO, see Page 126.) → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.9 "Locking/unlocking operation". **Display:** ▪ On (locking switched on) ▪ Off (locking switched off) **Factory setting:** Off (locking switched off)

Table 25: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → PROCESS CONNECTION	
Parameter name	**Description**
Pmax PROC. CONN. (570) Entry	For entering and displaying the maximum permitted pressure of the process connection. **Factory setting:** In accordance with nameplate data (→ see also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 2.1.1 nameplate)

Table 25: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → PROCESS CONNECTION	
Parameter name	**Description**
PROC. CONN. TYPE (482) Selection	For selecting and displaying the process connection type. **Options:** ■ Not used ■ Unknown ■ Special ■ Oval flange ■ Thread female ■ Thread male ■ Flange ■ Remote seal
MAT. PROC. CONN. + (360) Selection	For selecting and displaying the material of the process connection (P+). → See also parameter description for MAT. PROC. CONN. - **Options:** ■ Not used ■ Unknown ■ Special ■ Steel ■ 304 st. steel ■ 316 st. steel ■ Alloy C ■ Monel ■ Tantalum ■ Titanium ■ PTFE (Teflon) ■ 316L st. steel ■ PVC ■ Inconel ■ PVDF ■ ECTFE **Factory setting:** As per order specifications
MAT. PROC. CONN. - (361) Selection	For selecting and displaying the material of the process connection (P–). → See also parameter description for MAT. PROC. CONN. + **Prerequisite:** ■ Deltabar S differential pressure transmitter
SEAL TYPE (362) Selection	For selecting and displaying the material of the process seal. **Options:** ■ Not used ■ Unknown ■ Special ■ FKM Viton ■ NBR ■ EPDM ■ Urethane ■ IIR ■ Kalrez ■ FKM Viton oxyg ■ CR ■ MVQ ■ PTFE glass ■ PTFE graphite ■ PTFE oxygen ■ Copper ■ Copper f. oxygen **Factory setting:** As per order specifications
BOLTS MATERIAL	For selecting and displaying the material of the bolts. **Prerequisite:** ■ Digital communication

Table 25: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → PROCESS CONNECTION	
Parameter name	**Description**
NUTS MATERIAL	For selecting and displaying the material of the nuts. **Prerequisite:** ▪ Digital communication
DRAIN VENT MAT.	For selecting and displaying the material of the vent valves. **Prerequisite:** ▪ Digital communication
DRAIN VENT POS.	For selecting and displaying the position of the vent valves. **Prerequisite:** ▪ Digital communication
THREAD	For selecting and displaying the process connection thread. **Prerequisite:** ▪ Digital communication
MOUNTING THREAD	For selecting and displaying the ways of securing the device. **Prerequisite:** ▪ Digital communication
REMOTE SEAL +	For selecting and displaying the diaphragm seal type on the positive side. **Prerequisite:** ▪ Digital communication
REMOTE SEAL –	For selecting and displaying the diaphragm seal type on the negative side. **Prerequisite:** ▪ Digital communication
DIAPHRAG. MAT. +	For selecting and displaying the material of the process isolating diaphragm on the positive side. **Prerequisite:** ▪ Digital communication
DIAPHRAG. MAT. –	For selecting and displaying the material of the process isolating diaphragm on the negative side. **Prerequisite:** ▪ Digital communication
NR OF REMOTE SEAL	For selecting and displaying the number of diaphragm seals. **Prerequisite:** ▪ Digital communication
FILL FLUID	For selecting and displaying the diaphragm seal fill fluid. **Prerequisite:** ▪ Digital communication

Table 26: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → SENSOR DATA (all measuring modes)	
Parameter name	**Description**
SENSOR SER. No. (250) Display	Displays the serial number of the sensor (11 alphanumeric characters).
PRESS. SENS LOLIM (484) Display	Displays the lower measuring limit of the sensor.
PRESS. SENS HILIM (485) Display	Displays the upper measuring limit of the sensor.
MINIMUM SPAN (591) Display	Displays the smallest possible span.

Table 26: (GROUP SELECTION →) OPERATING MENU → TRANSMITTER INFO → SENSOR DATA (all measuring modes)

Parameter name	Description
SENSOR MEAS.TYPE (581) Display	Displays the sensor type. ▪ Deltabar S = differential ▪ Cerabar S with gauge pressure sensor = relative ▪ Cerabar S with absolute pressure sensor = absolute ▪ Deltapilot S = relative
Pmin SENS. DAMAGE (251) Display	Displays the minimum permissible absolute pressure of the sensor (vacuum-proofing).
Pmax SENS. DAMAGE (252) Display	Displays the maximum permissible absolute pressure of the sensor (overpressure-proofing).
MAT. MEMBRANE (365) Display	Displays the material of the process isolating diaphragm. **Factory setting:** As per version in the order code → For Deltabar S, see Technical Information TI00382P, for Cerabar S, see Technical Information TI00383P or for Deltapilot S, see Technical Information TI00416P, "Ordering information" section.
FILLING FLUID (366) Display	Displays the filling fluid.
Tmin SENSOR (368) Display	Displays the lower nominal temperature limit of the sensor.
Tmax SENSOR (369) Display	Displays the upper nominal temperature limit of the sensor.
SENS H/WARE REV (487) Display	Displays the revision number of the sensor hardware. e.g.: 1

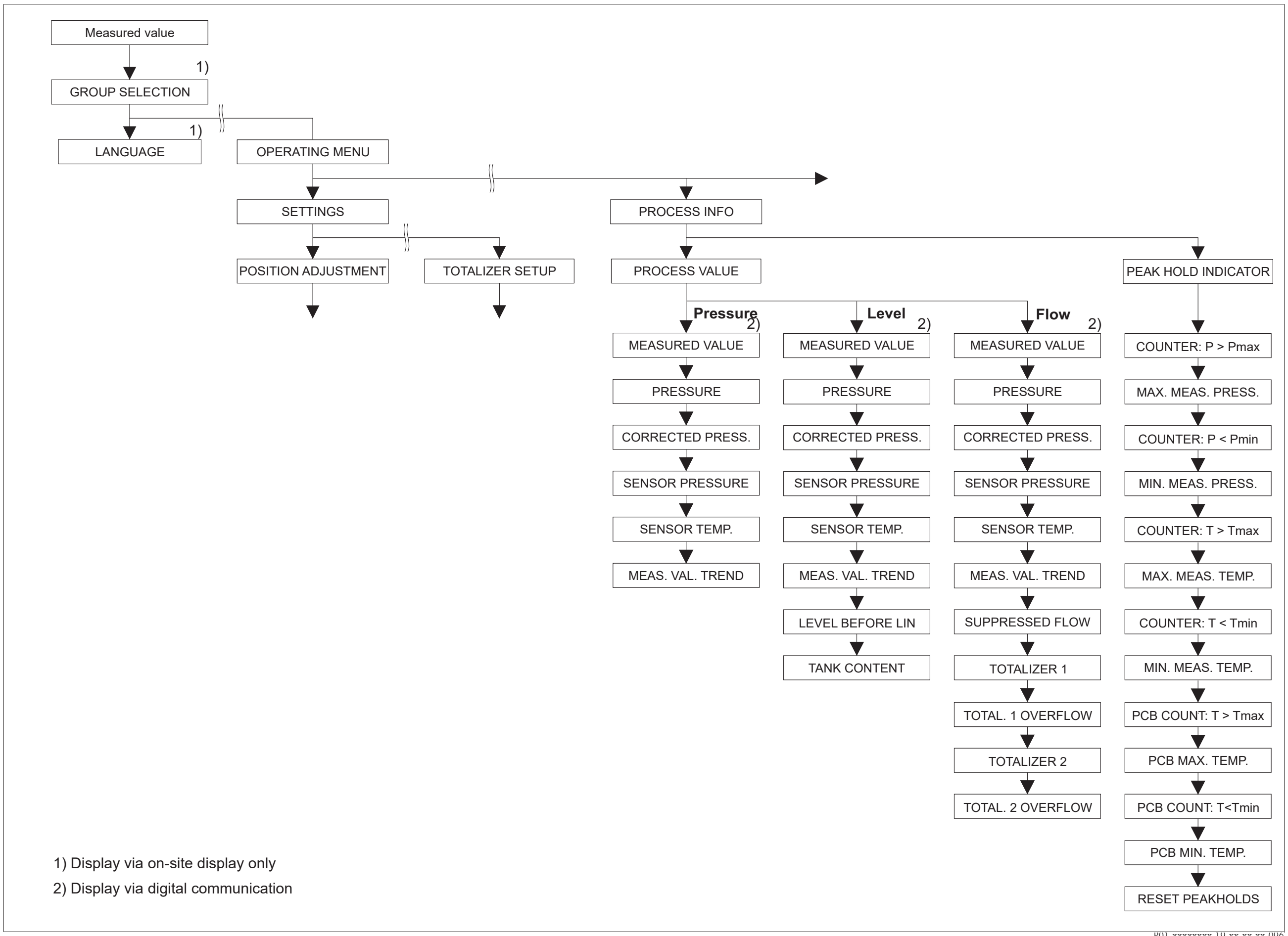


Fig. 45: PROCESSINFO group
→ For the PROCESS VALUES function group, "Pressure" measuring mode, see Page 121, Table 27
→ For the PROCESS VALUES function group, "Level" measuring mode, see Page 122, Table 28
→ For the PROCESS VALUES function group, "Flow" measuring mode, see Page 123, Table 29
→ For the PEAK HOLD INDICATOR function group, see Page 124, Table 30

Table 27: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PROCESS VALUES "Pressure"	
Parameter name	**Description**
Prerequisite: ■ MEASURING MODE = pressure (→ see also Page 45).	
MEASURED VALUE (679)	Displays the measured value In the "Pressure" measuring mode, this value corresponds to the PRESSURE parameter. **Prerequisite:** ■ Digital communication **On-site operation:** ■ For on-site operation, the MEASURED VALUE parameter is displayed on the 1st level.

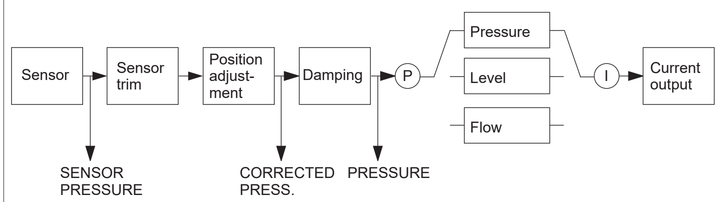
Table 27: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PROCESS VALUES "Pressure"	
Parameter name	**Description**
PRESSURE (301) Display	Displays the measured pressure after sensor recalibration, position adjustment and damping. This value corresponds to the MEASURED VALUE parameter in the "Pressure" measuring mode.  P01-xMx7xxxx-05-xx-xx-xx-009
CORRECTED PRESS. (434) Display	Displays the measured pressure after sensor trim and position adjustment and before damping. → See also PRESSURE diagram.
SENSOR PRESSURE (584) Display	Displays the measured pressure before sensor trim, position adjustment and damping. → See also PRESSURE diagram.
SENSOR TEMP. (367) Display	Displays the temperature currently measured in the sensor. This temperature can deviate from the process temperature.
MEAS. VAL. TREND (378) Display	Displays the trend of the pressure measured value. Possibilities: increasing, decreasing, constant

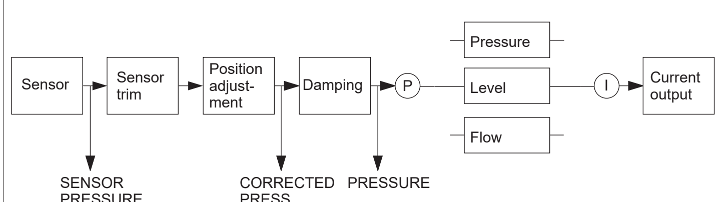
Table 28: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PROCESS VALUES "Level"	
Parameter name	**Description**
Prerequisite: ▪ MEASURING MODE = Level (→ see also Page 45).	
MEASURED VALUE (679)	Displays the measured value In the "Level" measuring mode with "Linear" or "Pressure Linearized" level type, this value corresponds to the LEVEL BEFORE LIN parameter In the "Level" measuring mode with "Height Linearized" level type, this value corresponds to the TANK CONTENT parameter. **Prerequisite:** ▪ Digital communication **On-site operation:** ▪ For on-site operation, the MEASURED VALUE parameter is displayed on the 1st level.
PRESSURE (301) Display	Displays the measured pressure after sensor recalibration, position adjustment and damping. This value corresponds to the MEASURED VALUE parameter in the "Pressure" measuring mode.  P01-xMx7xxxx-05-xx-xx-xx-010
CORRECTED PRESS. (434) Display	Displays the measured pressure after sensor trim and position adjustment and before damping. → See also PRESSURE diagram.
SENSOR PRESSURE (584) Display	Displays the measured pressure before sensor trim, position adjustment and damping. → See also PRESSURE diagram.
SENSOR TEMP. (367) Display	Displays the temperature currently measured in the sensor. This temperature can deviate from the process temperature.

Table 28: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PROCESS VALUES "Level"	
Parameter name	**Description**
MEAS. VAL. TREND (378) Display	Displays the trend of the pressure measured value. Possibilities: increasing, decreasing, constant
LEVEL BEFORE LIN (050) Display	Displays the level value prior to linearisation. **Prerequisite:** ▪ LEVEL MODE = Linear or Height Linearized Depending on the setting for the LIN. MEASURAND or COMB. MEASURAND parameter, this parameter displays the current level in % or in a unit of level.
TANK CONTENT (370) Display	Displays the level value after linearisation. **Prerequisite:** ▪ LEVEL MODE = Pressure Linearized or Height Linearized Depending on the settings for the LINd. MEASURAND or COMB. MEASURAND parameter, the current tank content is displayed in % or in a unit of volume or mass. This value corresponds to the MEASURED VALUE.

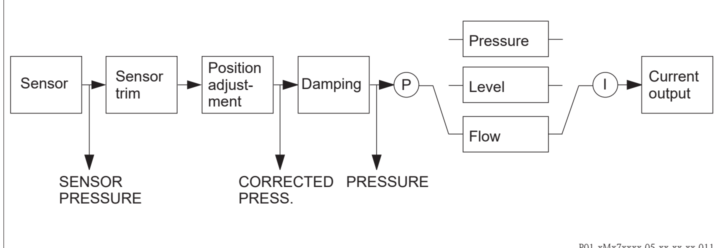
Table 29: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PROCESS VALUES "Flow"	
Parameter name	**Description**
Prerequisite: ▪ MEASURING MODE = Flow (→ see also Page 45).	
MEASURED VALUE (679)	Displays the measured value In the "Flow" measuring mode, this value corresponds to the SUPPRESSED FLOW parameter. **Prerequisite:** ▪ Digital communication **On-site operation:** ▪ For on-site operation, the MEASURED VALUE parameter is displayed on the 1st level.
PRESSURE (301) Display	Displays the measured pressure after sensor recalibration, position adjustment and damping. This value corresponds to the MEASURED VALUE parameter in the "Pressure" measuring mode. 
CORRECTED PRESS. (434) Display	Displays the measured pressure after sensor trim and position adjustment and before damping. → See also PRESSURE diagram.
SENSOR PRESSURE (584) Display	Displays the measured pressure before sensor trim, position adjustment and damping. → See also PRESSURE diagram.
SENSOR TEMP. (367) Display	Displays the temperature currently measured in the sensor. This temperature can deviate from the process temperature.
MEAS. VAL. TREND (378) Display	Displays the trend of the pressure measured value. Possibilities: increasing, decreasing, constant
SUPPRESSED FLOW (375) Display	Displays the current flow. Depending on the flow mode selected (→ FLOW-MEAS. TYPE), a volume flow, mass flow, standard volume flow or corrected volume flow is displayed.

Table 29: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PROCESS VALUES "Flow"	
Parameter name	**Description**
TOTALIZER 1 (652) Display	Displays the total flow value of totalizer 1. You can reset the value with the RESET TOTALIZER 1 parameter. The TOTAL. 1 OVERFLOW parameter displays the overflow. **Example:** The value 123456789 m^3 is displayed as follows: – TOTALIZER 1: 3456789 m^3 – TOTAL. 1 OVERFLOW: 12 E7
TOTAL. 1 OVERFLOW (655) Display	Displays the overflow value of totalizer 1. → See also TOTALIZER 1.
TOTALIZER 2 (657) Display	Displays the total flow value of totalizer 2. You cannot reset totalizer 2. The TOTAL. 2 OVERFLOW parameter displays the overflow. → See also example for TOTALIZER 1.
TOTAL. 2 OVERFLOW (658) Display	Displays the overflow value of totalizer 2. → See also TOTALIZER 2 and example for TOTALIZER 1.

Table 30: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PEAK HOLD INDICATOR	
Parameter name	**Description**
COUNTER:P > Pmax (380) Display	Displays the overpressure counter of the sensor The limit value is: upper nominal pressure limit of sensor + 10 % of upper nominal pressure limit of sensor. You can reset this counter by means of the RESET PEAKHOLD parameter.
MAX. MEAS. PRESS. (383) Display	Displays the largest measured pressure value (peak hold indicator). You can reset this indicator by means of the RESET PEAKHOLD parameter.
COUNTER P < Pmin (467) Display	Displays the vacuum pressure counter of the sensor The limit value is: lower nominal pressure limit of sensor – 10 % of upper nominal pressure limit of sensor. You can reset this counter by means of the RESET PEAKHOLD parameter.
MIN. MEAS. PRESS. (469) Display	Displays the smallest measured pressure value (peak hold indicator). You can reset this indicator by means of the RESET PEAKHOLD parameter.
COUNTER:T > Tmax (404) Display	Displays the number of times the specified temperature range of the sensor has been overshot. You can reset this counter by means of the RESET PEAKHOLD parameter.
MAX. MEAS. TEMP. (471) Display	Displays the largest measured temperature in the sensor (peak hold indicator). You can reset this indicator by means of the RESET PEAKHOLD parameter.
COUNTER:T < Tmin (472) Display	Displays the number of times the specified temperature range of the sensor has been undershot. You can reset this counter by means of the RESET PEAKHOLD parameter.
MIN. MEAS. TEMP. (474) Display	Displays the smallest measured temperature in the sensor (peak hold indicator). You can reset this indicator by means of the RESET PEAKHOLD parameter.
PCB COUNT:T > Tmax (488) Display	Displays the number of times the specified temperature range of the electronics has been overshot.
PCB MAX. TEMP. (490) Display	Displays the largest electronics temperature measured.
PCB COUNT:T < Tmin (492) Display	Displays the number of times the specified temperature range of the electronics has been undershot.
PCB MIN. TEMP. (494) Display	Displays the smallest electronics temperature measured.

Table 30: (GROUP SELECTION →) OPERATING MENU → PROCESSINFO → PEAK HOLD INDICATOR	
Parameter name	**Description**
RESET PEAKHOLD (382) Selection	This parameter lists all the peak hold indicator parameters that can be reset. You can select the peak hold indicators you want to reset. **Options:** ■ None ■ Max. pressure ■ Min. pressure ■ Pmax history ■ Pmin history ■ Max. temp. ■ Min. temp. ■ Tmax history ■ Tmin history ■ Reset all **Factory setting:** None

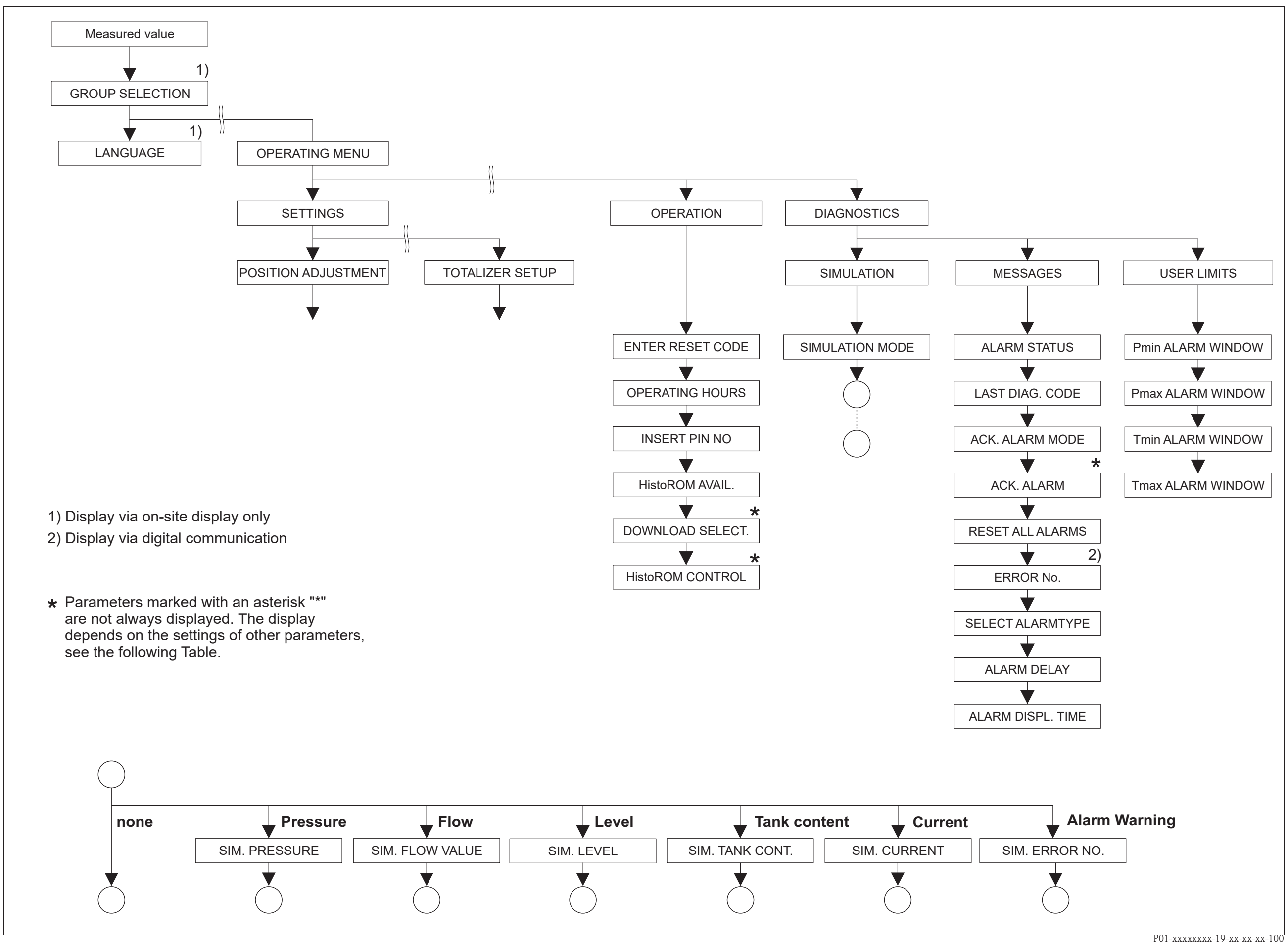


Fig. 46: OPERATING and DIAGNOSTICS group
→ For the OPERATING group, see Page 126, Table 31
→ For the SIMULATION function group, see Page 127, Table 32
→ For the MESSAGES function group, see Page 128, Table 33
→ For the USER LIMITS function group, see Page 130, Table 34

Table 31: (GROUP SELECTION →) OPERATING MENU → OPERATING

Parameter name	**Description**
ENTER RESET CODE (047) Entry	Reset parameters completely or partially to factory values or delivery status. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.10 "Factory setting" (reset). **Factory setting:** 0
OPERATING HOURS (409) Display	Displays the hours of operation. This parameter cannot be reset.
INSERT PIN NO (048) Entry	For entering a code to lock or unlock operation. ✎ Note! ▪ The -symbol on the on-site display indicates that operation is locked. Parameters which refer to how the display appears, e.g. LANGUAGE and DISPLAY CONTRAST can still be altered. ▪ If operation is locked by means of the DIP-switch, you can only unlock operation again by means of the DIP-switch. If operation is locked by means of the on-site display or remote operation e.g. FieldCare, you can unlock operation again by means of the on-site display or using remote operation. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.9 "Locking/unlocking operation". **Options:** ▪ Lock: enter a number between 0...9999 which is ≠100. ▪ Unlock: enter the number 100. **Factory setting:** 100
HistoROM AVAIL. (831) Display	Indicates whether the optional HistoROM®/M-DAT memory module is connected to the electronic insert. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.5 "HistoROM®/M-DAT (optional)". **Options:** ▪ Yes (HistoROM®/M-DAT is attached to the electronic insert) ▪ No (HistoROM®/M-DAT is not attached to the electronic insert)
DOWNLOAD SELECT (014) Options	Select download function from HistoROM to device. The selection has no effect on an upload from the device to the HistoROM. **Prerequisite:** ▪ A HistoROM®/M-DAT is attached to the electronic insert (HistoROM AVAIL. = yes) **Options:** ▪ Configuration copy: For this option, all parameters apart from the DEVICE SERIAL No, DEVICE DESIGN., CUST. TAG NUMBER, LONG TAG NUMBER, ADDITIONAL INFO., BUS ADDRESS, CURRENT MODE and the parameters of the POSITION ADJUSTMENT and PROCESS CONNECTION group are overwritten. ▪ Device replacement: With this option, all parameters except for DEVICE SERIAL No, DEVICE DESIGN. and the parameters of the POSITION ADJUSTMENT and PROCESS CONNECTION group are overwritten. ▪ Electronics replace: With this option, all parameters except for the parameters of the POSITION ADJUSTMENT group are overwritten. **Factory setting:** Copy config. (if HistoROM®/M-DAT is attached to the electronic insert)

Table 31: (GROUP SELECTION →) OPERATING MENU → OPERATING	
Parameter name	**Description**
HistoROM CONTROL (832) Selection	For selecting the direction for copying the data. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.5. "HistoROM®/M-DAT (optional)". **Prerequisite:** ■ A HistoROM®/M-DAT is attached to the electronic insert (HistoROM AVAIL. = yes) **Options:** ■ Abort ■ HistoROM → Device ■ Device → HistoROM **Factory setting:** Abort (if HistoROM®/M-DAT is connected to the electronic insert)

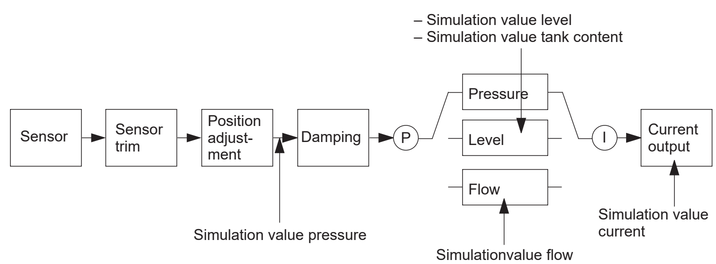
Table 32: (GROUP SELECTION →) OPERATING MENU → DIAGNOSTICS → SIMULATION	
Parameter name	**Description**
SIMULATION MODE (413) Selection	Switch on simulation and select simulation type. Any simulation running is switched off if the measuring mode or level type is changed. **Options:** ■ None ■ Pressure, → see also this table parameter description for SIM. PRESSURE ■ Flow (only differential pressure transmitter), → see also this table parameter description for SIM. FLOW VALUE ■ Level, → see also this table parameter description for SIM. LEVEL ■ Tank content, → see also this table parameter description for SIM. TANK CONT. ■ Current, → see also this table parameter description for SIM. CURRENT Note: The "Flow" measuring mode has to be selected in the LINEAR/SQROOT parameter to ensure the current output corresponds to the simulated flow value. ■ Alarm/warning, , → see also this table parameter description for SIM. ERROR NO.  P01-xMx7xxxx-05-xx-xx-xx-012 **Factory setting:** None
SIM. PRESSURE (414) Entry	Enter simulation value. → See also SIMULATION MODE. **Prerequisite:** ■ SIMULATION MODE = Pressure **Factory setting:** Current pressure measured value
SIM. FLOW VALUE (639) Entry	Enter simulation value. → See also SIMULATION MODE. **Prerequisite:** ■ MEASURING MODE = Pressure and SIMULATION MODE = Flow ■ MEASURING MODE = Flow and SIMULATION MODE = Flow

Table 32: (GROUP SELECTION →) OPERATING MENU → DIAGNOSTICS → SIMULATION	
Parameter name	**Description**
SIM. LEVEL (714) Entry	Enter simulation value. → See also SIMULATION MODE. **Prerequisite:** ▪ MEASURING MODE = Level and SIMULATION MODE = Level
SIM. TANK CONT. (715) Entry	Enter simulation value. → See also SIMULATION MODE. **Prerequisites:** ▪ MEASURING MODE = Level, LEVEL MODE = Pressure Linearized and SIMULATION MODE = Tank content ▪ MEASURING MODE = Level, LEVEL MODE = Height Linearized and SIMULATION MODE = Tank content
SIM. CURRENT (270) Entry	Enter simulation value. → See also SIMULATION MODE. **Prerequisite:** ▪ SIMULATION MODE = Current value **Factory setting:** Current current value
SIM. ERROR NO. (476) Entry	⚠ Warning! The SIMULATION parameter overwrites fault states (alarm/warning) that are actually present. When the simulation is ended, the fault states (alarm/warning) still persist but are no longer displayed! When the device is restarted it returns to its fault state. Enter message number. → See also SIMULATION MODE. → See also these Operating Instructions, Section 8.1 "Messages", "Code" table column. **Prerequisite:** ▪ SIMULATION MODE = Alarm/Warning **Factory setting:** 613 (simulation active)

Table 33: (GROUP SELECTION →) OPERATING MENU → DIAGNOSTICS → MESSAGES	
Parameter name	**Description**
ALARM STATUS (046) Display	Displays the current messages present. → See also these Operating Instructions, Section 8.1. "Messages" and Section 8.3 "Confirming messages". **On-site display** ▪ The measured value display shows the message with the highest priority. ▪ The ALARM STATUS parameter shows all the messages in descending order of priority. You can scroll through all the messages present with the + or − key. **Operating program** ▪ The "Status" field and the ALARM STATUS parameter show the message with the highest priority.
LAST DIAG. CODE (564) Display	Displays the last messages that occurred and were eliminated. ✎ Note! ▪ On-site display: you can scroll through the last 15 messages with the + or − key. ▪ Digital communication: the last message appears on the display. ▪ Use the RESET ALL ALARMS parameter to delete the messages listed in the LAST DIAG. CODE parameter.
ACK. ALARM MODE (401) Selection	Switch on acknowledge alarm mode. → See also ACK. ALARM. **Options:** ▪ On ▪ Off **Factory setting:** Off

Table 33: (GROUP SELECTION →) OPERATING MENU → DIAGNOSTICS → MESSAGES	
Parameter name	**Description**
ACK. ALARM (500) Selection	Acknowledge alarm. **Prerequisite:** ■ ACK. ALARM MODE = on **Options:** ■ Abort ■ Confirm The cause of the alarm must be eliminated, the message must be acknowledged via the ACK. ALARM parameter and, where applicable, the ALARM DISPL. TIME (→ Page 129) has to have elapsed before the device starts measuring again following an alarm. → See also these Operating Instructions, Section 8.3 "Confirming messages". **Factory setting:** Abort
RESET ALL ALARMS (603) Selection	Use this parameter to reset all the messages of the LAST DIAG. CODE parameter. **Options:** ■ Abort ■ Confirm **Factory setting:** Abort
ERROR No. Entry	For "Error"-type messages, you can decide whether the device should behave as in the event of an alarm (A) or as in the event of a warning (W). Enter the corresponding message number for this parameter. → See also SELECT ALARMTYPE. → See also these Operating Instructions, Section 8.1 "Messages" and Section 8.2 "Response of outputs to errors". **Prerequisite:** ■ Digital communication
SELECT ALARMTYPE (595) – Entry (600) – Selection	For "Error"-type messages, you can decide whether the device should behave as in the event of an alarm (A) or as in the event of a warning (W). → See also ERROR No. → See also these Operating Instructions, Section 8.2 "Response of outputs to errors". **Options**: ■ Alarm (A): output current assumes a defined value. ■ Warning (W): device continues measuring **On-site operation:** 1. Enter the corresponding message number for ERROR No. field. 2. Select "Alarm" or "Warning" option. **Digital communication:** 1. Enter the corresponding message number via the ERROR No. parameter. 2. Use the SELECT ALARMTYPE parameter to select the "Alarm" or "Warning" option.
ALARM DELAY (336) Entry	Enter alarm response time for all "Error" messages. Note! There is no alarm if the cause of the error is eliminated within the alarm delay time. **Input range:** 0...100 s **Factory setting:** 0.0 s
ALARM DISPL. TIME (480) Entry	Enter alarm display time for all "Error" messages. Once the cause of the error is rectified, the alarm display time starts running. Note! The following applies if the setting for ACK. ALARM MODE = on: If an alarm appears and the alarm display time elapses before the alarm has been acknowledged, the message will be cleared once it has been acknowledged. → See also these Operating Instructions, Section 8.3 "Confirming messages". **Input range:** 0...999.9 s **Factory setting:** 0.0 s

Table 34: (GROUP SELECTION →) OPERATING MENU → DIAGNOSTICS → USER LIMITS	
Parameter name	**Description**
Pmin ALARM WINDOW (332) Entry	Customer-specific process monitoring – enter lower pressure limit. You can use the SELECT ALARMTYPE parameter to enter how the device responds if the operating pressure undershoots the specified value. → See also these Operating Instructions, Section 8.1 "Messages", table, Code E730 and Section 8.2. "Response of outputs to errors". **Factory setting:** Low sensor limit ▪1.1 (→ For the low sensor limit, see PRESS. SENS LOLIM.)
Pmax ALARM WINDOW (333) Entry	Customer-specific process monitoring – enter upper pressure limit. You can use the SELECT ALARMTYPE parameter to enter how the device responds if the operating pressure undershoots the specified value. → See also these Operating Instructions, Section 8.1 "Messages", table, Code E731 and Section 8.2. "Response of outputs to errors". **Factory setting:** High sensor limit ▪1.1 (→ For the high sensor limit, see PRESS. SENS HILIM.)
Tmin ALARM WINDOW (334) Entry	Customer-specific process monitoring – enter lower temperature limit. You can use the SELECT ALARMTYPE parameter to enter how the device responds if the operating pressure undershoots the specified value. → See also these Operating Instructions, Section 8.1 "Messages", table, Code E732 and Section 8.2. "Response of outputs to errors". **Factory setting:** Lower sensor temperature application limit – 10 K (→ For the lower temperature application limit, see Tmin SENSOR)
Tmax ALARM WINDOW (335) Entry	Customer-specific process monitoring – enter upper temperature limit. You can use the SELECT ALARMTYPE parameter to enter how the device responds if the operating pressure undershoots the specified value. → See also these Operating Instructions, Section 8.1 "Messages", table, Code E733 and Section 8.2. "Response of outputs to errors". **Factory setting:** Upper sensor temperature application limit +10 K (→ For the upper temperature application limit, see Tmax SENSOR)

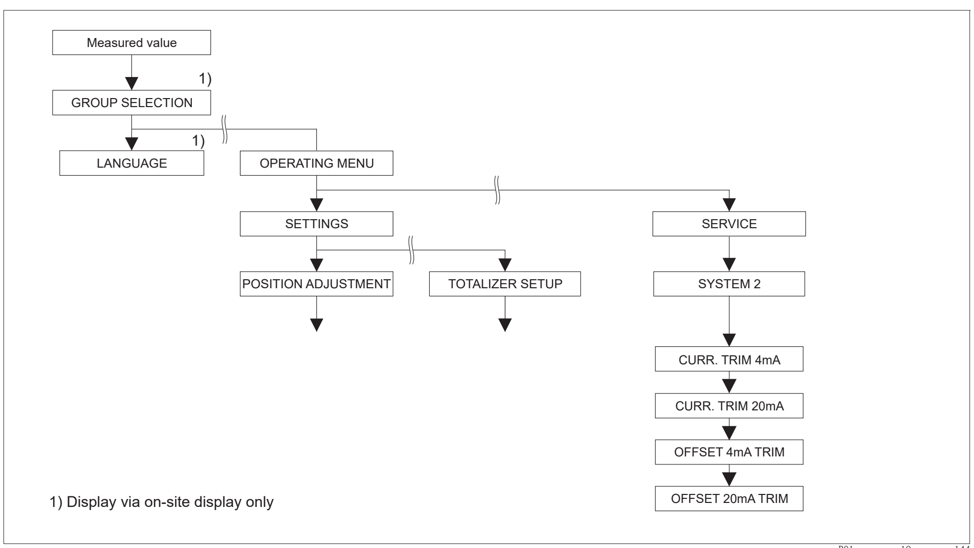


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Fig. 47: SYSTEM 2 group

Table 35: (GROUP SELECTION →) OPERATING MENU → SERVICE → SYSTEM 2	
Parametername	**Beschreibung**
CURR. TRIM 4mA (045) Entry	Enter current value for the lower point (4 mA) of the current output trim line. You can adapt the current output to the transmission conditions with this parameter and CURR. TRIM 20mA. Perform current trim for the lower point as follows: 1. Select SIMULATION group. (Menu path: (GROUP SELECTION) → OPERATING MENU → DIAGNOSTICS → SIMULATION) 2. Select option "Current" via SIMULATION parameter. 3. Enter "4 mA" for SIM. CURRENT parameter. 4. Select SYSTEM 2 group. (Menu path: (GROUP SELECTION) → OPERATING MENU → SERVICE) 5. Enter the current value measured with the switching unit for the CURR. TRIM 4mA parameter. **Input range:** Measured current ±0.2 mA **Factory setting:** 4 mA
CURR. TRIM 20mA (042) Entry	Enter current value for the upper point (20 mA) of the current output trim line. You can adapt the current output to the transmission conditions with this parameter and CURR. TRIM 4mA. Perform current trim for the upper point as follows: 1. Select SIMULATION group. (Menu path: (GROUP SELECTION) → OPERATING MENU → DIAGNOSTICS → SIMULATION) 2. Select option "Current" via SIMULATION parameter. 3. Enter "20 mA" for SIM. CURRENT parameter. 4. Select SYSTEM 2 group. (Menu path: (GROUP SELECTION) → OPERATING MENU → SERVICE) 5. Enter the current value measured with the switching unit for the CURR. TRIM 20mA parameter. **Input range:** Measured current ±0.2 mA **Factory setting:** 20 mA
OFFSET 4mA TRIM (043) Display	Displays the difference between 4 mA and the value entered for the CURRENT TRIM 4mA parameter. **Factory setting:** 0
OFFSET 20mA TRIM (044) Display	Displays the difference between 20 mA and the value entered for the CURRENT TRIM 20mA parameter. **Factory setting:** 0

8 Trouble-shooting

8.1 Messages

The following table lists all the possible messages that can occur.
The device differentiates between the error types "Alarm", "Warning" and "Error". You may specify whether the instrument should react as if for an "Alarm" or "Warning" for "Error" messages.
→ See "Error type/NA 64" column and parameter descriptions for ERROR No. and SELECT ALARMTYPE (→ Page 129).

In addition, the "Error type/NA 64" column classifies the messages in accordance with NAMUR Recommendation NA 64:
- Break down: indicated with "B"
- Maintenance need: indicated with "C" (check request)
- Function check: indicated with "I" (in service)

Error message display on the on-site display:
- The measured value display shows the message with the highest priority. → See "Priority" column.
- The ALARM STATUS (→ Page 128) parameter shows all the messages present in descending order of priority. You can scroll through all the messages present with the [-]-key or [+]-key.

Message display via the digital communication:
- The ALARM STATUS (→ Page 128) parameter shows the message with the highest priority. → See "Priority" column.

Note!
- If the device detects a defect in the on-site display during initialization, special error messages are generated. → For the error messages, see Page 139, Section 8.1.1 "On-site display error messages".
- For support and further information, please contact Endress+Hauser Service.
- → See also Section 8.4, 8.5 and 8.6.

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
101 (A101)	Alarm B	Failure (F)	B>Sensor electronic EEPROM error	– Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). This message normally only appears briefly. – Sensor defect.	– Wait a few minutes. – Restart the device. Perform reset (Code 62). – Block off electromagnetic effects or eliminate source of disturbance. – Replace sensor.	17
102 (W102)	Warning C	Maintenance request (M)	C>Checksum error in EEPROM: peakhold segment	– Main electronics defect. Correct measurement can continue as long as you do not need the peak hold indicator function.	– Replace main electronics.	53
106 (W106)	Warning C	Funktion check (C)	C>Downloading - please wait	– Downloading.	– Wait for download to complete.	52

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
110 (A110)	Alarm B	Failure (F)	B>Checksum error in EEPROM: configuration segment	– The supply voltage is disconnected when writing. – Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Main electronics defect.	– Reestablish supply voltage. Perform reset (Code 7864) if necessary. Carry out calibration again. – Block off electromagnetic effects or eliminate sources of disturbance. – Replace main electronics.	6
113 (A113)	Alarm B	Failure (F)	B>ROM failure in transmitter electronic	– Main electronics defect.	– Replace main electronics.	1
115 (E115)	Error B factory setting: Warning C	Out of specification (S)	B>Sensor overpressure	– Overpressure present. – Sensor defect.	– Reduce pressure until message disappears. – Replace sensor.	29
116 (W116)	Warning C	Maintenance request (M)	C>Download error, repeat download	– The file is defect. – During the download, the data are not correctly transmitted to the processor, e.g. because of open cable connections, spikes (ripple) on the supply voltage or electromagnetic effects.	– Use another file. – Check cable connection PC – transmitter. – Block off electromagnetic effects or eliminate sources of disturbance. – Perform reset (Code 7864) and carry out calibration again. – Repeat download.	36
120 (E120)	Error B factory setting: Warning C	Out of specification (S)	B>Sensor low pressure	– Pressure too low. – Sensor defect.	– Increase pressure until message disappears. – Replace sensor.	30
121 (A121)	Alarm B	Failure (F)	B>Checksum error in factory segment of EEPROM	– Main electronics defect.	– Replace main electronics.	5
122 (A122)	Alarm B	Failure (F)	B>Sensor not connected	– Cable connection sensor –main electronics disconnected. – Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Main electronics defect. – Sensor defect.	– Check cable connection and repair if necessary. – Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics. – Replace sensor.	13
130 (A130)	Alarm B	Failure (F)	B>EEPROM is defect.	– Main electronics defect.	– Replace main electronics.	10
131 (A131)	Alarm B	Failure (F)	B>Checksum error in EEPROM: min/max segment	– Main electronics defect.	– Replace main electronics.	9
132 (A132)	Alarm B	Failure (F)	B>Checksum error in totalizer EEPROM	– Main electronics defect.	– Replace main electronics.	7
133 (A133)	Alarm B	Failure (F)	B>Checksum error in History EEPROM	– An error occurred when writing. – Main electronics defect.	– Perform reset (Code 7864) and carry out calibration again. – Replace electronics.	8
602 (W602)	Warning C	Funktion check (C)	C>Linearisation curve not monotone	– The linearisation table is not monotonic increasing or decreasing.	– Add to linearisation table or perform linearisation again.	57

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
604 (W604)	Warning C	Funktion check (C)	C>Linearisation table not valid. Less than 2 points or points too close	Note! From software version "02.10.xx" onwards, there is no min. span for the Y-points.		
				– The linearisation table consists of less than 2 points.	– Add to linearisation table. If necessary, perform linearisation again.	58
				– At least 2 points in the linearisation table are too close together. A minimum gap of 0.5 % of the distance between two points must be maintained. Spans for the "Pressure linearized" option: HYDR. PRESS MAX. – HYDR. PRESS MIN.; TANK CONTENT MAX. – TANK CONTENT MIN. Spans for the "Height linearized" option: LEVEL MAX – LEVEL MIN; TANK CONTENT MAX. – TANK CONTENT MIN.	– Correct linearisation table and accept again.	
613 (W613)	Warning I	Funktion check (C)	I>Simulation is active	– Simulation is switched on, i.e. the device is not measuring at present.	– Switch off simulation.	60
620 (E620)	Error C Factory setting: Warning C	Out of specification (S)	C>Current output out of range	The current is outside the permitted range 3.8 to 20.5 mA. – The pressure applied is outside the set measuring range (but within the sensor range).	– Check pressure applied, reconfigure measuring range if necessary (→ See also these Operating Instructions, chapter 4 to 6.) – Perform reset (Code 7864) and carry out calibration again.	49
				– Loose connection at sensor cable	– Wait a short period of time and tighten the connection, or avoid loose connection.	
700 (W700)	Warning C	Maintenance request (M)	C>Last configuration not stored	– An error occurred when writing or reading configuration data or the power supply was disconnected.	– Perform reset (Code 7864) and carry out calibration again.	54
				– Main electronics defect.	– Replace main electronics.	
701 (W701)	Warning C	Funktion check (C)	C>Measuring chain config. exceeds sensor range	– The calibration carried out would result in the sensor nominal operating range being undershot or overshot.	– Carry out calibration again.	50
702 (W702)	Warning C	Maintenance request (M)	C>HistoROM data not consistent.	– Data were not written correctly to the HistoROM, e.g. if the HistoROM was detached during the writing process.	– Repeat upload. – Perform reset (Code 7864) and carry out calibration again.	55
				– HistoROM does not have any data.	– Copy suitable data to the HistoROM. (→ See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S) or BA00332P (Deltapilot S), Section 5.5.1 "Copying configuration data".)	
703 (A703)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics.	– Briefly disconnect device from the power supply.	22
				– Main electronics defect.	– Replace main electronics.	

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
704 (A704)	Alarm B	Funktion check (C)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	12
705 (A705)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	21
706 (W706)	Warning C	Maintenance request (M)	C>Configuration in HistoROM and device not identical	– Configuration (parameters) in the HistoROM and in the device is not identical.	– Copy data from the device to the HistoROM. – Copy data from the HistoROM to the device. The message remains if the HistoROM and the device have different software versions. The message goes out if you copy the data from the device to the HistoROM. – Device reset codes such as 7864 do not have any effect on the HistoROM. That means that if you do a reset, the configurations in the HistoROM and in the device may not be the same. → See also Operating Instructions BA00270P (Deltabar S), BA00271P (Cerabar S), BA00332P (Deltapilot S) Section 5.5.1 "Copying configuration data".	59
707 (A707)	Alarm B	Funktion check (C)	B>X-VAL. of lin. table out of edit limits.	– At least one X-VALUE in the linearisation table is either below the value for HYDR. PRESS MIN. or MIN. LEVEL or above the value for HYDR. PRESS. MAX. or LEVEL MAX.	– Carry out calibration again. (→ See also these Operating Instructions, chapter 5.)	38
710 (W710)	Warning C	Funktion check (C)	B>Set span too small. Not allowed.	– Values for calibration (e.g. lower range value and upper range value) are too close together. – The sensor was replaced and the customer-specific configuration does not suit the sensor. – Unsuitable download carried out.	– Adjust calibration to suit sensor. (→ See also Page 119, parameter description MINIMUM SPAN.) – Adjust calibration to suit sensor. – Replace sensor with a suitable sensor. – Check configuration and perform download again.	51
711 (A711)	Alarm B	Funktion check (C)	B>LRV or URV out of edit limits	– Lower range value and/or upper range value undershoot or overshoot the sensor range limits. – The sensor was replaced and the customer-specific configuration does not suit the sensor. – Unsuitable download carried out.	– Reconfigure lower range value and/or upper range value to suit the sensor. Pay attention to position factor. – Reconfigure lower range value and/or upper range value to suit the sensor. Pay attention to position factor. – Replace sensor with a suitable sensor. – Check configuration and perform download again.	37
713 (A713)	Alarm B	Funktion check (C)	B>100% POINT level out of edit limits	– The sensor was replaced.	– Carry out calibration again.	39

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
715 (E715)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor over temperature	– The temperature measured in the sensor is greater than the upper nominal temperature of the sensor. (→ See also Page 120, parameter description Tmax SENSOR.) – Unsuitable download carried out.	– Reduce process temperature/ ambient temperature. – Check configuration and perform download again.	32
716 (E716)	Error B Factory setting: Alarm B	Failure (F)	B>Process isolating diaphragm broken	– Sensor defect.	– Replace sensor. – Reduce pressure.	24
717 (E717)	Error C Factory setting: Warning C	Out of specification (S)	C>Transmitter over temperature	– The temperature measured in the electronics is greater than the upper nominal temperature of the electronics (+88 °C). – Unsuitable download carried out.	– Reduce ambient temperature. – Check configuration and perform download again.	34
718 (E718)	Error C Factory setting: Warning C	Out of specification (S)	C>Transmitter under temperature	– The temperature measured in the electronics is smaller than the lower nominal temperature of the electronics (–43 °C). – Unsuitable download carried out.	– Increase ambient temperature. Insulate device if necessary. – Check configuration and perform download again.	35
719 (A719)	Alarm B	Funktion check (C)	B>Y-VAL of lin. table out of edit limits	– At least on Y-VALUE in the linearisation table is below the MIN. TANK CONTANT or above the MAX. TANK CONTENT.	– Carry out calibration again. (→ See also Operating Instructions BA00274P, chapter 5 or these Operating Instructions, Page 2.)	40
720 (E720)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor under temperature	– The temperature measured in the sensor is smaller than the lower nominal temperature of the sensor. (→ See also Page 120, parameter description Tmin SENSOR.) – Unsuitable download carried out. – Loose connection at sensor cable	– Increase process temperature/ ambient temperature. – Check configuration and perform download again. – Wait a short period of time and tighten the connection, or avoid loose connection.	33
721 (A721)	Alarm B	Funktion check (C)	B>ZERO POSITION level out of edit limits	– LEVEL MIN or LEVEL MAX has been changed.	– Perform reset (Code 2710) and carry out calibration again.	41
722 (A722)	Alarm B	Funktion check (C)	B>EMPTY CALIB. or FULL CALIB. out of edit limits	– LEVEL MIN or LEVEL MAX has been changed.	– Perform reset (Code 2710) and carry out calibration again.	42
723 (A723)	Alarm B	Funktion check (C)	B>MAX. FLOW out of edit limits	– FLOW-MEAS. TYPE has been changed.	– Carry out calibration again.	43

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
725 (A725)	Alarm B	Failure (F)	B>Sensor connection error, cycle disturbance	– Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Setscrew loose. – Sensor or main electronics defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Retighten setscrew with 1 Nm (0,74 lbf ft) (see chapter "Rotating the housing" in BA00270P (Deltabar S), BA00271P (Cerabar S), BA00332P (Deltapilot S). – Replace sensor or main electronics.	25
726 (E726)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor temperature error - overrange	– Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Process temperature is outside permitted range. – Sensor defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Check temperature present, reduce or increase if necessary. – If the process temperature is within the permitted range, replace sensor.	31
727 (E727)	Error C Factory setting: Warning C	Out of specification (S)	C>Sensor pressure error - overrange	– Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Pressure is outside permitted range. – Sensor defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Check pressure present, reduce or increase if necessary. – If the pressure is within the permitted range, replace sensor.	28
728 (A728)	Alarm B	Failure (F)	B>RAM error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	2
729 (A729)	Alarm B	Failure (F)	B>RAM error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	3
730 (E730)	Error C Factory setting: Warning C	Out of specification (S)	C>LRV user limits exceeded	– Pressure measured value has undershot the value specified for the Pmin ALARM WINDOW parameter. – Loose connection at sensor cable	– Check system/pressure measured value. – Change value for Pmin ALARM WINDOW if necessary. (→ See also Page 130, parameter description Pmin ALARM WINDOW.) – Wait a short period of time and tighten the connection, or avoid loose connection.	46

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
731 (E731)	Error C Factory setting: Warning C	Out of specification (S)	C>URV user limits exceeded	– Pressure measured value has overshot the value specified for the Pmax ALARM WINDOW parameter.	– Check system/pressure measured value. – Change value for Pmax ALARM WINDOW if necessary. (→ See also Page 130, parameter description Pmax ALARM WINDOW.)	45
		Out of specification (S)		– Loose connection at sensor cable	– Wait a short period of time and tighten the connection, or avoid loose connection.	
732 (E732)	Error C Factory setting: Warning C		C>LRV Temp. User limits exceeded	– Temperature measured value has undershot the value specified for the Tmin ALARM WINDOW parameter.	– Check system/temperature measured value. – Change value for Tmin ALARM WINDOW if necessary. (→ See also Page 130, parameter description Tmin ALARM WINDOW.)	48
733 (E733)	Error C Factory setting: Warning C	Out of specification (S)	C>URV Temp. User limits exceeded	– Temperature measured value has overshot the value specified for the Tmax ALARM WINDOW parameter.	– Check system/temperature measured value. – Change value for Tmax ALARM WINDOW if necessary. (→ See also Page 130, parameter description Tmax ALARM WINDOW.)	47
736 (A736)	Alarm B	Failure (F)	B>RAM error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	4
737 (A737)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	20
738 (A738)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	19
739 (A739)	Alarm B	Failure (F)	B>Measurement error	– Fault in the main electronics. – Main electronics defect.	– Briefly disconnect device from the power supply. – Replace main electronics.	23
740 (E740)	Error C Factory setting: Warning C	Maintenance request (M)	C>Calculation overflow, bad configuration	– Level measuring mode: the measured pressure has undershot the value for HYDR. PRESS. MIN. or overshot the value for HYDR. PRESS MAX.	– Check configuration and carry out calibration again if necessary. – Select a device with a suitable measuring range.	27
				– Level measuring mode: The measured level did not reach the LEVEL MIN value or exceeded the LEVEL MAX value.	– Check configuration and carry out calibration again if necessary. (→ See also parameter description LEVEL MIN., Page 86.)	
				– Flow measuring mode: the measured pressure has undershot the value for MAX. PRESS FLOW.	– Check configuration and carry out calibration again if necessary. – Select a device with a suitable measuring range.	
741 (A741)	Alarm B	Funktion check (C)	B>TANK HEIGHT out of edit limits	– LEVEL MIN or LEVEL MAX has been changed.	– Perform reset (Code 2710) and carry out calibration again.	44

Code	Error type/ NA 64	Corresponds NE 107	Message/description	Cause	Measure	Prio rity
742 (A742)	Alarm B	Failure (F)	B>Sensor connection error (upload)	– Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). This message normally only appears briefly. – Cable connection sensor – main electronics disconnected. – Sensor defect.	– Wait a few minutes. – Perform reset (Code 7864) and carry out calibration again. – Check cable connection and repair if necessary. – Replace sensor.	18
743 (E743)	Alarm B	Failure (F)	B>Electronic PCB error during initialisation	– This message normally only appears briefly. – Main electronics defect.	– Wait a few minutes. – Restart the device. Perform reset (Code 62). – Replace main electronics.	14
744 (A744)	Alarm B	Failure (F)	B>Main electronic PCB error	– Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Main electronics defect.	– Restart the device. Perform reset (Code 62). – Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics.	11
745 (W745)	Warning C	Maintenance request (M)	C>Sensor data unknown	– Sensor does not suit the device (electronic sensor nameplate). Device continues measuring.	– Replace sensor with a suitable sensor.	56
746 (W746)	Warning C	Funktion check (C)	C>Sensor connection error - initialising	– Electromagnetic effects are greater than specifications in the technical data. This message normally only appears briefly. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Overpressure or low pressure present.	– Wait a few minutes. – Restart the device. Perform reset (Code 7864). – Block off electromagnetic effects or eliminate source of disturbance. – Reduce or increase pressure.	26
747 (A747)	Alarm B	Failure (F)	B>Sensor software not compatible to electronics	– Sensor does not suit the device (electronic sensor nameplate).	– Replace sensor with a suitable sensor.	16
748 (A748)	Alarm B	Failure (F)	B>Memory failure in signal processor	– Electromagnetic effects are greater than specifications in the technical data. → See Technical Information TI00382P (Deltabar S), TI00383P (Cerabar S) or TI00416P (Deltapilot S). – Main electronics defect.	– Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics.	15

8.1.1 On-site display error messages

If the device detects a defect in the on-site display during initialization, the following error messages can be displayed:

Message	Measure
Initialization, VU Electr. Defect A110	Exchange on-site display.
Initialization, VU Electr. Defect A114	
Initialization, VU Electr. Defect A281	
Initialization, VU Checksum Err. A110	
Initialization, VU Checksum Err. A112	
Initialization, VU Checksum Err. A171	

8.2 Response of outputs to errors

The device differentiates between the error types Alarm, Warning and Error.
→ See also Section 8.1 "Messages" und Page 111 ff, Table 20: OUTPUT and Page 111 ff, Table 31: MESSAGES the following table and Page 132, Section 8.1 "Messages".

Output	A (Alarm)	W (Warning)	E (Error: Alarm/Warning)
Current output	Assumes the value specified via the OUTPUT FAIL MODE[1], ALT. CURR. OUTPUT[1] and SET MAX. ALARM[1] parameter. → See also the following section "Configuring current output for an alarm".	Device continues measuring.	For this error, you can enter whether the device should react as in the event of an alarm or as in the event of a warning. See corresponding "Alarm" or "Warning" column. (→ See also these Operating Instructions, parameter description SELECT ALARM TYPE.)
Bargraph (on-site display)	The bargraph adopts the value defined by the OUTPUT FAIL MODE [1] parameter.	The bargraph adopts the value which corresponds to the current value.	→ See this table, column "Alarm" or "Warning".
On-site display	– The measured value and message are displayed alternately – Measured value display: -symbol is permanently displayed. Message display – 3-digit number such as A122 and description	– The measured value and message are displayed alternately – Measured value display: -symbol flashes. Message display: – 3-digit number such as W613 and description	– The measured value and message are displayed alternately – Measured value display: see corresponding "Alarm" or "Warning" column Message display: – 3-digit number such as E731 and description
Remote operation (Digital communication)	In the case of an alarm, the ALARM STATUS[2] parameter displays a 3-digit number such as 122 for "Sensor not connected".	In the case of a warning, the ALARM STATUS[2] parameter displays a 3-digit number such as 613 for "Simulation is active".	In the case of an error, the ALARM STATUS[2] parameter displays a 3-digit number such as 731 for "URV user limits exceeded".

1) Menu path: (GROUP SELECTION →) OPERATING MENU → OUTPUT

2) Menu path: (GROUP SELECTION →) OPERATING MENU → MESSAGES

8.3 Confirming messages

Depending on the settings for the ALARM DISPL. TIME (→ Page 129) and ACK. ALARM MODE (→ Page 128) parameters, the following measures should be taken to clear a message:

Settings [1]	**Measures**
– ALARM DISPL. TIME = 0 s – ACK. ALARM MODE = off	– Rectify cause of the message (see also Section 8.1).
– ALARM DISPL. TIME > 0 s – ACK. ALARM MODE = off	– Rectify cause of the message (see also Section 8.1). – Wait for the alarm display time to elapse.
– ALARM DISPL. TIME = 0 s – ACK. ALARM MODE = on	– Rectify cause of the message (see also Section 8.1). – Confirm message using ACK. ALARM parameter.
– ALARM DISPL. TIME > 0 s – ACK. ALARM MODE = on	– Rectify cause of the message (see also Section 8.1). – Confirm message using ACK. ALARM parameter. – Wait for the alarm display time to elapse. If a message appears and the alarm display time elapses before the message has been acknowledged, the message will be cleared once it has been acknowledged.

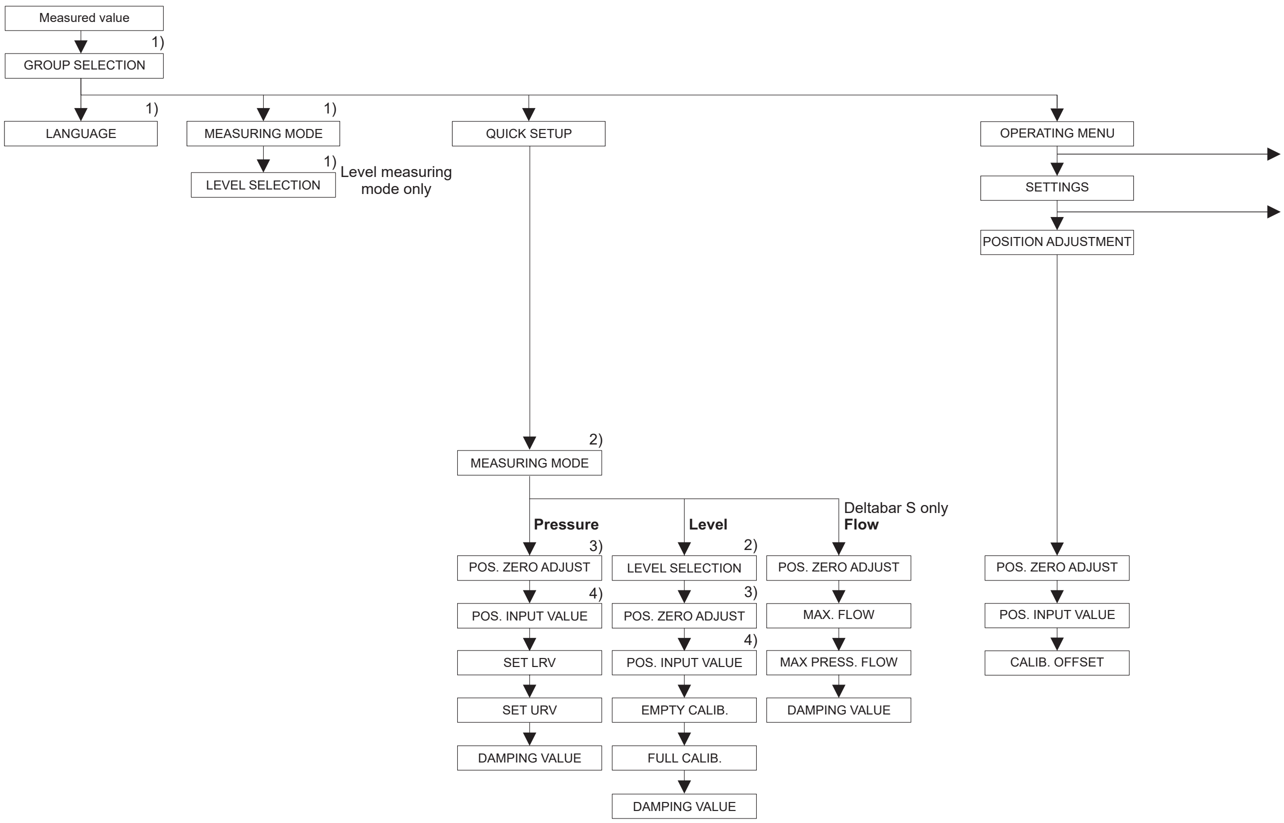
1) Menu path for ALARM DISPL. TIME and ACK. ALARM MODE: (GROUP SELECTION →) OPERATING MENU → DIAGNOSTICS → MESSAGES

If the on-site display displays a message, you can delete it with the E-key.
If there are several messages, the on-site display shows the message which has the highest priority (see also Section 8.1). Once you have deleted this message using the E-key, the message with the next highest priority is displayed. You can use the E-key to delete each message, one after the other. The ALARM STATUS parameter continues to display all the messages present.

9 Appendix

9.1 Operating menu for on-site display, Digital communication

Note!
- The entire menu is depicted on the following pages.
- The menu has a different structure depending on the measuring mode selected. This means that some function groups are only displayed for one measuring mode, e.g. "LINEARISATION" function group for the Level measuring mode (Menu path: (GROUP SELECTION →) OPERATING MENU → SETTINGS → BASIC SETUP).
- In addition, there are also parameters that are only displayed if other parameters are appropriately configured. For example the Customer Unit P parameter is only displayed if the "User unit" option was selected for the PRESS. ENG. UNIT parameter. These parameters are indicated with a "*".
- For a description of the parameters, please refer to chapter 7 "Description of parameters". The exact dependency of individual parameters on one another is explained here.



1) Display via on-site display only

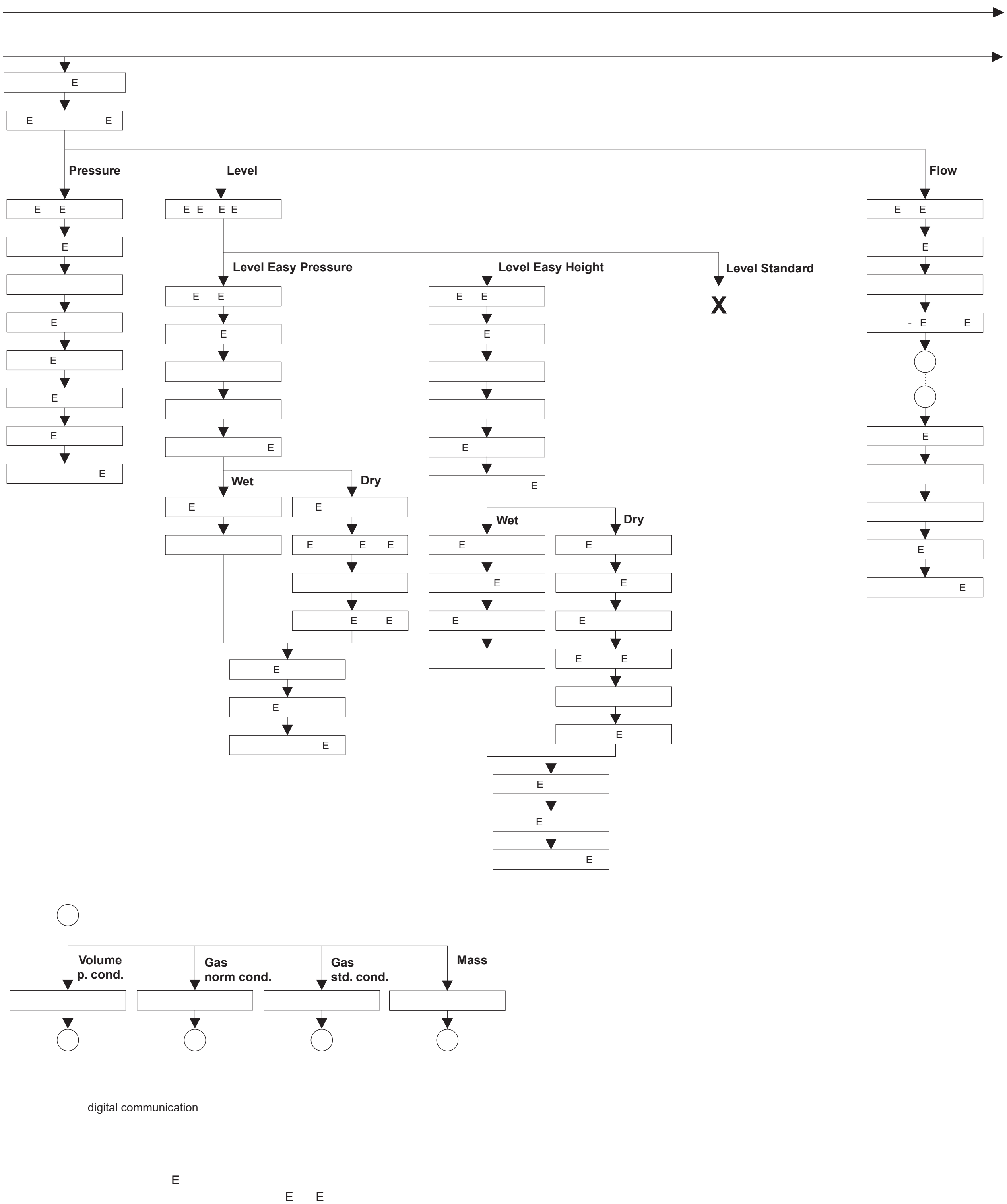
2) Display via digital communication

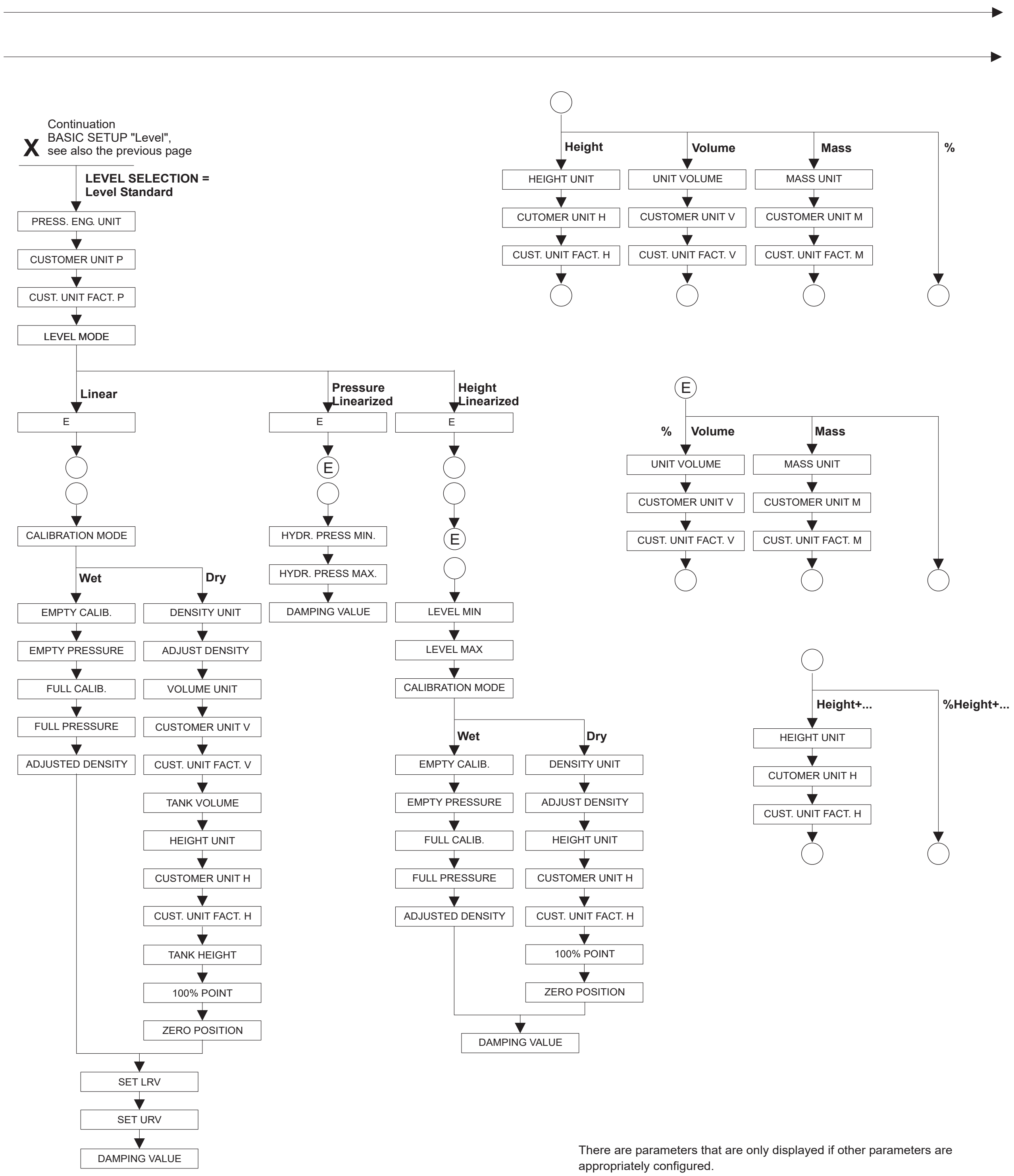
3) Cerabar S with gauge pressure sensor, Deltabar S or Deltapilot S

4) Cerabar S with absolut pressure sensor

There are parameters that are only displayed if other parameters are appropriately configured.
For example the CUSTOMER UNIT P parameter is only displayed if the "User unit" option was selected for the PRESS. ENG. UNIT parameter.
These parameters are indicated with a "*".

P01-xxxxxxxx-19-xx-xx-xx-138


Pressure
Level
Flow
Level Easy Pressure
Level Easy Height
Level Standard
X
Wet
Dry
Wet
Dry
Volume p. cond.
Gas norm cond.
Gas std. cond.
Mass
digital communication
P01-xxxxxxxx-19-xx-xx-xx-139



There are parameters that are only displayed if other parameters are appropriately configured.
For example the CUST. UNIT FACT. H parameter is only displayed if the "User unit" option was selected for the HEIGHT UNIT parameter.
These parameters are indicated with a "*".

P01-xxxxxxxx-19-xx-xx-xx-140