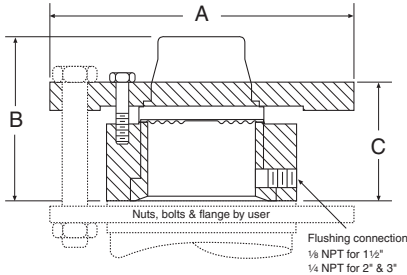


Type 100 Series Threaded Capsule Diaphragm Seal

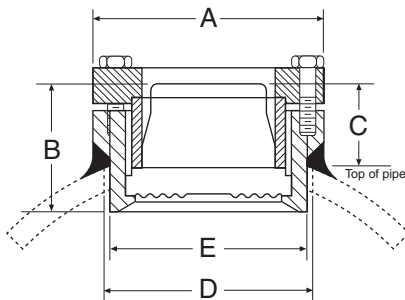
DIMENSIONS

Type 103 – Flanged 1½", 2", 3" (raised face only)
one piece bottom housing with flushing connection



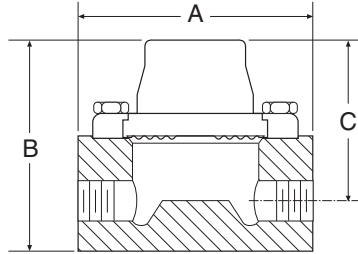
Flange Size	Rating #	A in mm	B in mm	C in mm
150		5 (127)		
1½"	300 or 600	6¼ (159)	3 (76)	2½ (64)
	900 or 1500	7 (178)		
2"		6 (152)		
300 or 600		6½ (165)	3½ (89)	2¾ (71)
	900 or 1500	8½ (216)		
3"		7½ (191)	3¾ (95)	2⅞ (73)
300 or 600		8¼ (210)	3⅞ (98)	2⅞ (73)
	900	9½ (241)		
	1500	10½ (267)	3⅞ (98)	2¾ (70)

Type 105 – Saddle
4" Pipe only



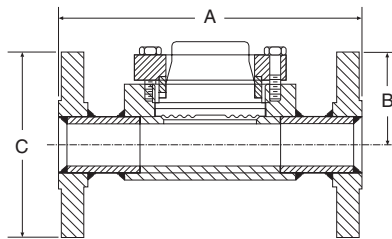
A in mm	B in mm	C in mm	D in mm	E in mm
3½ (89)	1½ (38)	1¾ (41)	3 (76)	2¾ (70)

Type 104 – In-Line Threaded
¼, ½, ¾, 1 NPT



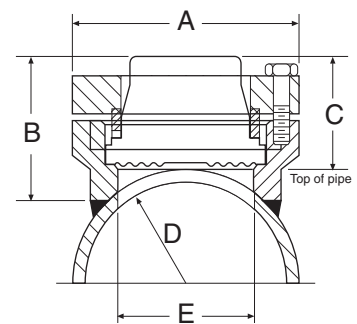
Process Connection	A in mm	B in mm	C in mm
¼ NPT		2½ (64)	2½ (64)
½ NPT	4 (102)	3¾ (95)	2¾ (71)
¾ NPT		3¾ (95)	3 (76)
1 NPT		3¾ (95)	3 (76)

Type 106 – In-Line Flanged
½", 1", 1½", 2", 3"



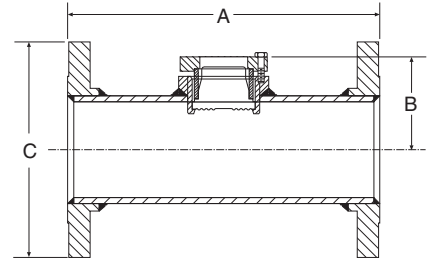
Flange Size	Rating #	A in mm	B in mm	C in mm
½"	150	7 (178)	2⅞ (73)	3½ (89)
	300	7 (178)	3¾ (95)	
1"	150	7 (178)	2⅞ (73)	4¼ (108)
	300	8 (203)	4¾ (120)	
1½"	150	8 (203)	2⅞ (73)	5 (127)
	300	9 (229)	6⅞ (173)	
2"	150	9 (229)	2⅞ (73)	6 (152)
	300	10 (254)	6⅞ (173)	
3"	150	11 (279)	3¾ (95)	7½ (191)
	300	12 (305)	8¼ (210)	

Type 105 – Saddle
3" Pipe only



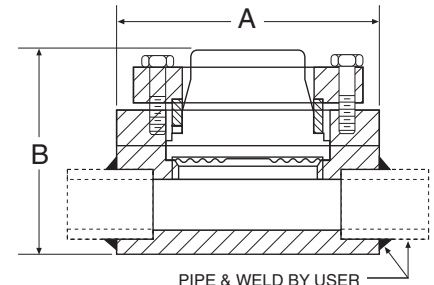
A in mm	B in mm	C in mm	D in mm	E in mm
3½ (89)	2¼ (57)	1⅞ (48)	1¾ (44)	2½ (64)

Type 106 – In-Line Flanged
4", 6", 8"



Flange Size	Rating #	A in mm	B in mm	C in mm
4"	150	13 (330)	3¾ (95)	9 (229)
	300	14 (356)	10 (254)	
6"	150	16 (406)	4⅞ (125)	11 (279)
	300	17 (432)	12½ (318)	
8"	150	16 (406)	5⅞ (148)	13½ (343)

Type 107 – In-Line Welded
¼", ½", ¾", 1", 1½", 2"



Pipe Size	A in mm	B in mm
¼"		2⅞ (73)
½", ¾"		2⅞ (73)
1"	4 (102)	2⅞ (73)
1½"		2⅞ (73)
2"		2⅞ (73)

Type 310, 315 All-Welded “Mini” Diaphragm Seal



PRODUCT FEATURES

- Compact size to fit space-restricted areas
- Designed to protect transducers, mini-switches and 3/8" or smaller pressure gauges from corrosion, plugging or freeze-up
- All-welded metal construction prevents leakage of process media
- Rated for 2500 psi at 100°F
- Fill/bleed connection is standard
- Available with male process connection (Type 310)

The compact size of the Ashcroft® 310 mini-seal allows it to fit into space-restricted areas and is designed to protect transducers, mini-switches, and 3/8" or smaller dial size pressure gauges from corrosion, plugging or freeze-up. All welded metal construction prevents leakage of process media. It is rated for 2500 psi at 100°F and has a 316L stainless steel top housing standard. Lower housing materials include 316L stainless steel or Hastelloy C. Diaphragm materials include 316L stainless, Hastelloy C or Tantalum. 1/4 NPT or 1/2 NPT process connection sizes are available.

PRODUCT SPECIFICATIONS

Model Number:	Type 310, 315
Process Connection Size:	1/4", 1/2" (1/8", 3/4", 1"- 310 only) (see table A)
Instrument Connection Size:	1/8", 1/4 NPT
Diaphragm Material:	316L SS, Hastelloy C276, Tantalum, Monel
Bottom Housing Materials:	316L SS, Hastelloy C276, Monel, Hastelloy B
Filling Fluid:	Glycerin, Silicone, Halocarbon, Syltherm

Type 310, 315 All-Welded “Mini” Diaphragm Seal

Table A – Process Connection

Process Connection	Size	Code
Threaded – male NPT*	1/8	01
Threaded – male NPT*	1/4	02
Threaded – male NPT*	1/2	04
Threaded – male NPT*	3/4	06
Threaded – male NPT*	1	08
Threaded – female NPT†	1/4	25
Threaded – female NPT†	1/2	50

*Available in Type 310 only.

†Available in Types 310 & 315.

Pressure Ratings – All 2500 psi except flanged seals are per ASME B 16.5, temperature limit determined by diaphragm, bottom housing and/or filling fluid.

Table B – Type

Description	Code
All-welded mini-seal	310
All-welded midi-seal w/flushing connection	315

Table C – Diaphragm Materials

Materials	Code
316L stainless steel	S
Hastelloy C-276	H
Tantalum	U
Monel	P

Table D – Housing Materials

Bottom ⁽¹⁾	Code	Top ⁽²⁾
316L SS	S	316L SS
Hastelloy C-276	H	316L SS
Monel	M	Monel

(1) Other bottom housing materials on application.

(2) Top housing material is 316L SS (standard). Monel mini-seal standard with monel top housing.

Table E – Instrument Connection

Instrument Connection	Size	Code
Threaded – female NPT	1/4	02T
Threaded – female NPT	1/8	01T

NOTES:

- (1) For use with most 3/2" and smaller gauges. Movementless gauge 4 1/2" (exception).
- (2) Other bottom housing materials on application.
- (3) Top housing material is 316L SS (standard). Monel mini-seal standard with monel top housing.
- (4) Not available with monel bottom housing.

Table F – Filling Fluid

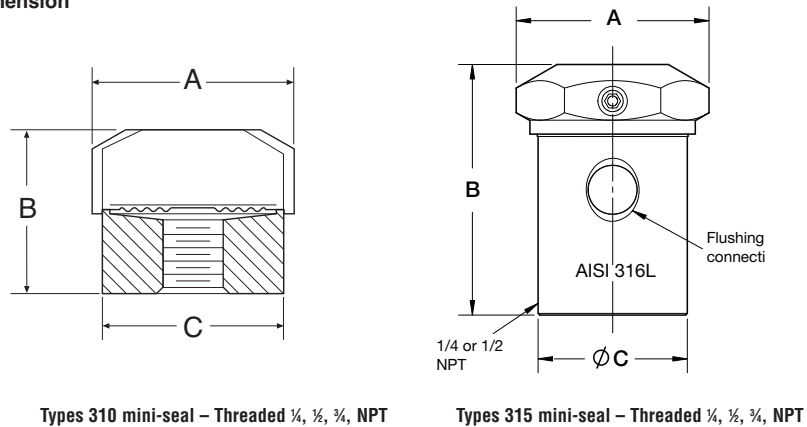
Fill	Service	Connection to Instrument	Temperature Range °F	Code
Glycerin	Pressure	Direct Only	0/400	CG
Silicone	Pressure/Vacuum	Direct or Flexible Line	-40/600	CK
Halocarbon	Pressure/Vacuum in presence of strong oxidizing agent	Direct or Flexible Line	-70/300	CF
Syltherm	Pressure	Direct or Flexible Line	-40/750	HA

Monel is a registered trademark of Huntington Alloys, Inc.
 Hastelloy is a registered trademark of Cabot Corp.
 Halocarbon is a registered trademark of Halocarbon Products
 GYLON 3510 is a registered trademark of Garlock Inc.

HOW TO ORDER:

1. From Table A... select PROCESS CONNECTION (e.g., 1/4" process code 25)
2. From Table B... select TYPE (310)
3. From Table C... select DIAPHRAGM MATERIAL. (e.g., 316L stainless steel-code S)
4. From Table D... select BOTTOM HOUSING MATERIAL. (e.g., 316 stainless steel-code S)
5. From Table E... select INSTRUMENT CONNECTION size. (e.g., 1/4 NPT-code 02T)
6. From Table F... select FILLING FLUID, if diaphragm seal will be attached to instrument. (e.g., Glycerin-code CG)

Coded order: 25-310SS-02T-CG

Dimension


	A		B		C	
	in	mm	in	mm	in	mm
Type 310	1.75	(38)	.81	(30)	1.34	(34)
Type 315	1.73	(44)	2.25	(57.2)	1.34	(34)



MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL
AMARUQ WTP – NUNAVUT
VEOLIA PROJECT: 5000 218 009

BALDOR

INTEGRAL HORSEPOWER SERIES, MOTOR

WATER TECHNOLOGIES

LEFT BLANK



Integral Horsepower AC Induction Motors

Installation & Operating Manual

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Section 1

General Information

- Overview** This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.
- Important:** **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**
- Before you install, operate or perform maintenance, become familiar with the following:
- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
 - The National Electrical Code
 - Local codes and Practices

Limited Warranty

www.baldor.com/support/warranty_standard.asp

- Safety Notice:** This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.
- Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.
- WARNING:** **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**
- WARNING:** **Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.**
- WARNING:** **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**
- WARNING:** **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**
- WARNING:** **Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.**
- WARNING:** **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**
- WARNING:** **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**
- WARNING:** **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**
- WARNING:** **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**
- WARNING:** **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**
- WARNING:** **Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.**

Safety Notice Continued

- WARNING:** UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.
- WARNING:** Pacemaker danger – Magnetic and electromagnetic fields in the vicinity of current carrying carrying conductors and permanent magnet motors can result result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay way from the area surrounding a permanent magnet motor.
- WARNING:** Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.
- WARNING:** Use only UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust.
- WARNING:** Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.
- WARNING:** Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.
- Caution:** To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.
- Caution:** Do not over-lubricate motor as this may cause premature bearing failure.
- Caution:** Do not over tension belts. Excess tension may damage the motor or driven equipment.
- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.
- Caution:** If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.
- Caution:** To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.
- Caution:** If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Handling The motor should be lifted using the lifting lugs or eye bolts provided.

Caution: Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WP11 motor.
2. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
3. When lifting a WP11 (Weather Proof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.

-
4. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation.
Do not lift the assembly using the motor lugs or eye bolts provided. Lugs or eye bolts are designed to lift motor only. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Storage

Storage requirements for motors and generators that will not be placed in service for at least six months from date of shipment.

Improper motor storage will result in seriously reduced reliability and failure. An electric motor that does not experience regular usage while being exposed to normally humid atmospheric conditions is likely to develop rust in the bearings or rust particles from surrounding surfaces may contaminate the bearings. The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.

A wooden crate "shell" should be constructed to secure the motor during storage. This is similar to an export box but the sides & top must be secured to the wooden base with lag bolts (not nailed as export boxes are) to allow opening and reclosing many times without damage to the "shell".

Minimum resistance of motor winding insulation is 5 Meg ohms or the calculated minimum, which ever is greater. Minimum resistance is calculated as follows: **$R_m = kV + 1$**

where: (Rm is minimum resistance to ground in Meg-Ohms and
kV is rated nameplate voltage defined as Kilo-Volts.)

Example: For a 480VAC rated motor $R_m = 1.48$ meg-ohms (use 5 MΩ).

For a 4160VAC rated motor $R_m = 5.16$ meg-ohms.

Preparation for Storage

1. Some motors have a shipping brace attached to the shaft to prevent damage during transportation. The shipping brace, if provided, must be removed and stored for future use. The brace must be reinstalled to hold the shaft firmly in place against the bearing before the motor is moved.
2. Store in a clean, dry, protected warehouse where control is maintained as follows:
 - a. Shock or vibration must not exceed 2 mils maximum at 60 hertz, to prevent the bearings from brinelling. If shock or vibration exceeds this limit vibration isolation pads must be used.
 - b. Storage temperatures of 10°C (50°F) to 49°C (120°F) must be maintained.
 - c. Relative humidity must not exceed 60%.
 - d. Motor space heaters (when present) are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional.
Note: Remove motor from containers when heaters are energized, reprotect if necessary.
3. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
 - a. If motor insulation resistance decreases below the minimum resistance, contact your Baldor District office.
 - b. Place new desiccant inside the vapor bag and re-seal by taping it closed.
 - c. If a zipper-closing type bag is used instead of the heat-sealed type bag, zip the bag closed instead of taping it. Be sure to place new desiccant inside bag after each monthly inspection.
 - d. Place the shell over the motor and secure with lag bolts.
4. Where motors are mounted to machinery, the mounting must be such that the drains and breathers are fully operable and are at the lowest point of the motor. Vertical motors must be stored in the vertical position. Storage environment must be maintained as stated in step 2.

-
5. Motors with anti-friction bearings are to be greased at the time of going into extended storage with periodic service as follows:
 - a. Motors marked "Do Not Lubricate" on the nameplate do not need to be greased before or during storage.
 - b. Ball and roller bearing (anti-friction) motor shafts are to be rotated manually every 3 months and greased every 6 months in accordance with the Maintenance section of this manual.
 - c. Sleeve bearing (oil lube) motors are drained of oil prior to shipment. The oil reservoirs must be refilled to the indicated level with the specified lubricant, (see Maintenance). The shaft should be rotated monthly by hand at least 10 to 15 revolutions to distribute oil to bearing surfaces.
 - d. "Provisions for oil mist lubrication" – These motors are packed with grease. Storage procedures are the same as paragraph 5b.
 - e. "Oil Mist Lubricated" – These bearings are protected for temporary storage by a corrosion inhibitor. If stored for greater than 3 months or outdoor storage is anticipated, connected to the oil mist system while in storage. If this is not possible, add the amount of grease indicated under "Standard Condition" in Section 3, then rotate the shaft 15 times by hand.
 6. All breather drains are to be fully operable while in storage (drain plugs removed). The motors must be stored so that the drain is at the lowest point. All breathers and automatic "T" drains must be operable to allow breathing and draining at points other than through the bearings around the shaft. Vertical motors should be stored in a safe stable vertical position.
 7. Coat all external machined surfaces with a rust preventing material.
An acceptable product for this purpose is Exxon Rust Ban # 392.

Non-Regreaseable Motors

Non-regreaseable motors with "Do Not Lubricate" on the nameplate should have the motor shaft rotated 15 times to redistribute the grease within the bearing every 3 months or more often.

All Other Motor Types

Before storage, the following procedure must be performed.

1. Remove the grease drain plug, if supplied, (opposite the grease fitting) on the bottom of each bracket prior to lubricating the motor.
2. The motor with regreaseable bearing must be greased as instructed in Section 3 of this manual.
3. Replace the grease drain plug after greasing.
4. The motor shaft must be rotated a minimum of 15 times after greasing.
5. Motor Shafts are to be rotated at least 15 revolutions manually every 3 months and additional grease added every nine months (see Section 3) to each bearing.
6. Bearings are to be greased at the time of removal from storage.

Removal From Storage

1. Remove all packing material.
2. Measure and record the electrical resistance of the winding insulation resistance meter at the time of removal from storage. The insulation resistance must not be less than 50% from the initial reading recorded when the motor was placed into storage. A decrease in resistance indicates moisture in the windings and necessitates electrical or mechanical drying before the motor can be placed into service. If resistance is low, contact your Baldor District office.
3. Regrease the bearings as instructed in Section 3 of this manual.
4. Reinstall the original shipping brace if motor is to be moved. This will hold the shaft firmly against the bearing and prevent damage during movement.

Section 2

Installation & Operation

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

It is important that motors be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor.

Proper ventilation for the motor must be provided. Obstructed airflow can lead to reduction of motor life.

1. **Open Drip–Proof/WPI** motors are intended for use indoors where atmosphere is relatively clean, dry, well ventilated and non–corrosive.
2. **Totally Enclosed and WPII** motors may be installed where dirt, moisture or dust are present and in outdoor locations.

Severe Duty, IEEE 841 and Washdown Duty enclosed motors are designed for installations with high corrosion or excessive moisture conditions. These motors should not be placed into an environment where there is the presence of flammable or combustible vapors, dust or any combustible material, unless specifically designed for this type of service.

Hazardous Locations are those where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers, or flyings. Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements. In the US market, guidance is provided by the National Electric Code.

Caution:

Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important. The pulley, sprocket, or gear used in the drive should be located on the shaft as close to the shaft shoulder as possible.

It is recommended to heat the pulley, sprocket, or gear before installing on the motor shaft.

Forcibly driving a unit on the motor shaft will damage the bearings.

1. **Direct Coupling**

For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.

2. **End-Play Adjustment**

The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.

3. **Pulley Ratio**

The pulley ratio should not exceed 8:1.

Caution:

Do not over tension belts. Excess tension may damage the motor or driven equipment.

4. **Belt Drive**

Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

5. Sleeve bearing motors are only suitable for coupled loads.

- Doweling & Bolting** After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)
1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
 2. Drill corresponding holes in the foundation.
 3. Ream all holes.
 4. Install proper fitting dowels.
 5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

WARNING: Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.

- Guarding** Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions. This is particularly important where the parts have surface irregularities such as keys, key ways or set screws. Some satisfactory methods of guarding are:
1. Covering the machine and associated rotating parts with structural or decorative parts of the driven equipment.
 2. Providing covers for the rotating parts. Covers should be sufficiently rigid to maintain adequate guarding during normal service.

Power Connection Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices. Flying leads must be insulated with two full wraps of electrical grade insulating tape or heat shrink tubing.

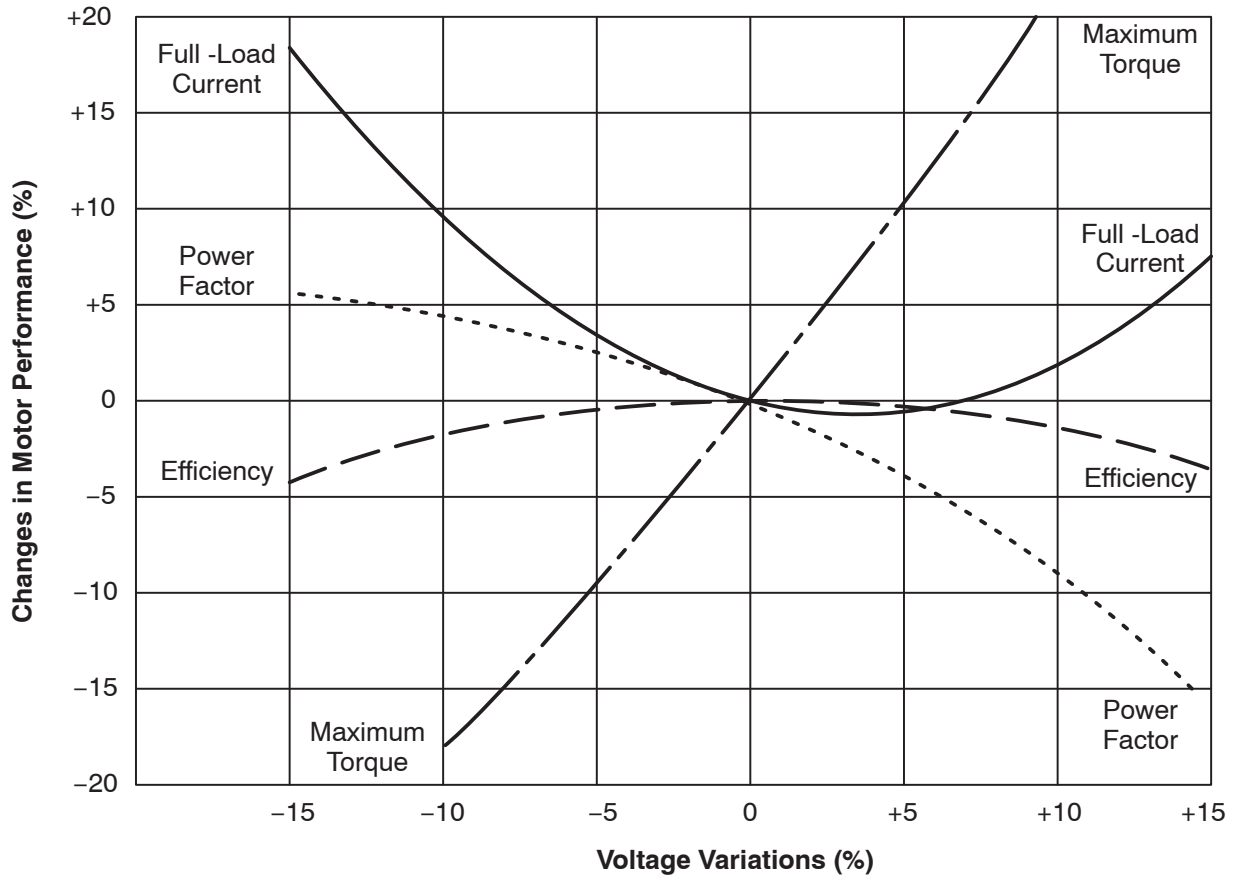
Conduit Box For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

- AC Power** Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:
1. AC power is within $\pm 10\%$ of rated voltage with rated frequency. (See motor name plate for ratings).
OR
 2. AC power is within $\pm 5\%$ of rated frequency with rated voltage.
OR
 3. A combined variation in voltage and frequency of $\pm 10\%$ (sum of absolute values) of rated values, provided the frequency variation does not exceed $\pm 5\%$ of rated frequency.
- Performance within these voltage and frequency variations are shown in Figure 2-2.

Figure 2-1 Accessory Connections

HEATERS H1 ——— H2 H1 ——— H2	One heater is installed in each end of motor. Leads for each heater are labeled H1 & H2. (Like numbers should be tied together).
THERMISTORS T1 ——— T2	Three thermistors are installed in windings and tied in series. Leads are labeled T1 & T2.
WINDING RTDS RED ——— WHITE	Winding RTDs are installed in windings (2) per phase. Each set of leads is labeled W1, W2, W3, W4, W5, & W6.
BEARING RTD RED ——— WHITE	* One bearing RTD is installed in Drive endplate (PUPE), leads are labeled RTDDE. * One bearing RTD is installed in Opposite Drive endplate (FREPE), leads are labeled RTDODE. * Note RTD may have 2-Red/1-White leads; or 2-White/1-Red Lead.

Figure 2-2 Typical Motor Performance VS Voltage Variations



Rotation All three phase motors are reversible. To reverse the direction of rotation, disconnect and lock out power and interchange any two of the three line leads for three phase motors. For single phase motors, check the connection diagram to determine if the motor is reversible and follow the connection instructions for lead numbers to be interchanged. Not all single phase motors are reversible.

Adjustable Frequency Power Inverters used to supply adjustable frequency power to induction motors produce wave forms with lower order harmonics with voltage spikes superimposed. Turn-to-turn, phase-to-phase, and ground insulation of stator windings are subject to the resulting dielectric stresses. Suitable precautions should be taken in the design of these drive systems to minimize the magnitude of these voltage spikes. Consult the drive instructions for maximum acceptable motor lead lengths, and proper grounding.

First Time Start Up Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor District Office or Baldor Service Center.

Section 3

Maintenance & Troubleshooting

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

General Inspection Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Relubrication & Bearings Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is **Polyrex EM (Mobil)**. Do not mix greases unless compatibility has been checked and verified.

Equivalent and compatible greases include:

Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

Relubrication Intervals Recommended relubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2, 3-3 and 3-4.

Table 3-1 Relubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)		**	3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)		**	* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)		**	*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Relubrication intervals are for ball bearings.

For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table 3-2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40° C	Clean, Little Corrosion
Severe	16 Plus	50° C	Moderate dirt, Corrosion
Extreme	16 Plus	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<-29° C **	

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Relubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor Drive endplate. For best relubrication results, only use the appropriate amount of grease for each bearing size (not the same for both).

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the “Large” bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add * oz (Grams)	Volume of grease to be added	
			in ³	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100–112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315–450)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315–450)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225–280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB of grease to be added

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

Relubrication Procedure Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: Do not over-lubricate motor as this may cause premature bearing failure.

With Grease Outlet Plug

1. With the motor stopped, clean all grease fittings with a clean cloth.
2. Remove grease outlet plug.

Caution: Over-lubricating can cause excessive bearing temperatures, premature lubrication breakdown and bearing failure.

3. Add the recommended amount of grease.
4. Operate the motor for 15 minutes with grease plug removed.
This allows excess grease to purge.
5. Re-install grease outlet plug.

Without Grease Provisions

Note: Only a Baldor authorized and UL or CSA certified service center can disassemble a UL/CSA listed explosion proof motor to maintain it's UL/CSA listing.

1. Disassemble the motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)
3. Assemble the motor.

Sample Relubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-4 shows that 1.2 in³ or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $\frac{3}{4}$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $\frac{3}{4}$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked and repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.

Suggested bearing and winding RTD setting guidelines

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80°C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTD (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

Winding RTDs – Temperature Limit In °C (40°C Maximum Ambient)

Motor Load	Class B Temp Rise ≤ 80°C (Typical Design)		Class F Temp Rise ≤ 105°C		Class H Temp Rise ≤ 125°C	
	Alarm	Trip	Alarm	Trip	Alarm	Trip
≤ Rated Load	130	140	155	165	175	185
Rated Load to 1.15 S.F.	140	150	160	165	180	185

Note: • Winding RTDs are factory production installed, not from Mod-Express.

• When Class H temperatures are used, consider bearing temperatures and relubrication requirements.

Bearing RTDs – Temperature Limit In °C (40°C Maximum Ambient)

Bearing Type Oil or Grease	Anti-Friction		Sleeve	
	Alarm	Trip	Alarm	Trip
Standard*	95	100	85	95
High Temperature**	110	115	105	110

Note: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.

** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as “standard” lubricants) include the following:

– Texaco Polystar	– Rykon Premium #2	– Chevron SRI #2
– Mobilith SHC-100	– Pennzoil Pennzlube EM-2	– Chevron Black Pearl
– Darmex 707	– Darmex 711	– Petro-Canada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation.

Contact Baldor application engineering for special lubricants or further clarifications.



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VEOLIA PROJECT: 5000 218 009

CFF

SERIES SS-2, BALL VALVE

WATER TECHNOLOGIES

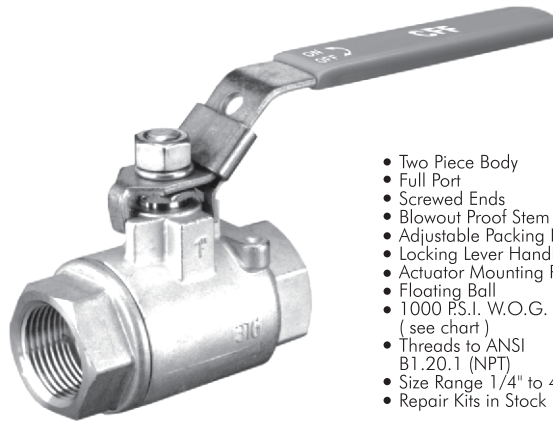
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C.F.F. SS · SERIES 316 STAINLESS STEEL VALVES

BALL VALVES

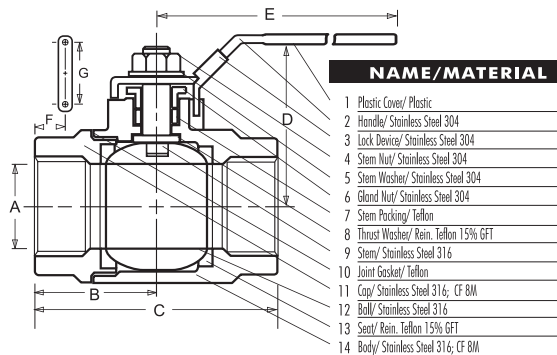


BALL



- Two Piece Body
- Full Port
- Screwed Ends
- Blowout Proof Stem
- Adjustable Packing Nut
- Locking Lever Handle
- Actuator Mounting Pad
- Floating Ball
- 1000 P.S.I. W.O.G.
(see chart)
- Threads to ANSI
B1.20.1 (NPT)
- Size Range 1/4" to 4"
- Repair Kits in Stock

**Manufactured in accordance with
ISO 9002 quality standards.**



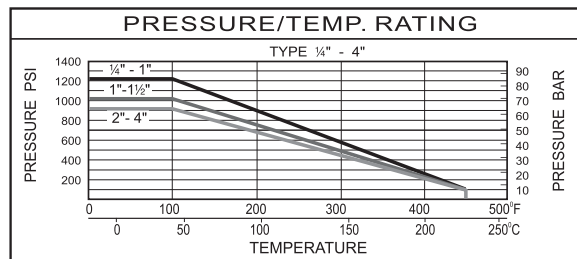
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SS · 2 BALL VALVE

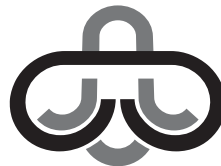
BALL VALVES

DIMENSIONS								
	Nominal Size	(mm/in) A	(mm/in) B	(mm/in) C	(mm/in) D	(mm/in) E	(mm/in) F	(mm/in) G
8	¼	11.6	30	60	45	110	12.7	28.45
		0.457	1.181	2.362	1.772	433.1	0.50	1.120
10	⅜	12.7	30	60	45	110	12.7	28.45
		0.50	1.181	2.362	1.772	433.1	0.50	1.120
15	½	15	32	64	45	130	12.7	28.45
		0.591	1.260	2.520	1.772	5.118	0.50	1.120
20	¾	20	38.5	77	50	130	22.10	34.80
		0.787	1.516	3.032	1.969	5.118	0.87	1.37
25	1	25.4	45	90	65	155	22.10	38.10
		1.00	1.772	3.543	2.559	6.102	0.87	1.37
32	1¼	32	50	100	70	155	23.62	38.10
		1.260	1.967	3.937	2.756	6.102	0.93	1.50
40	1½	38.1	59	118	75	185	23.62	38.10
		1.50	2.323	4.646	2.953	7.283	0.93	1.50
50	2	50.8	68.5	137	85	185	23.62	38.10
		2.00	2.697	5.398	3.346	7.283	0.93	1.50
65	2½	65	82.5	165	136	250	—	70
		2.561	3.248	6.496	5.364	9.843	—	2.756
80	3	80	97.5	195	149	250	—	70
		3.152	3.839	7.677	5.866	9.843	—	2.756

Design and materials are subject to change without notice.



FLOW COEFFICIENT CV										
Size (in.)	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Cv	6	7	10	25	35	46	80	110	310	360
Operating Torques (lbs.)	36	36	43	65	101	158	187	230	430	1380



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CHEMLINE

TYPE 21, BALL VALVE

WATER TECHNOLOGIES

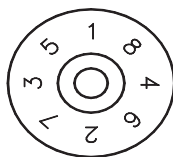
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MAINTENANCE & INSTALLATION INSTRUCTIONS

For Chemline Type 21 True Union Ball Valve Size 1/2" - 4"

Installation:

1. Make sure all surfaces are clear and free of debris prior to installing valve in pipeline. Pipeline should be empty at connection site.
2. Valve should be set to the closed position.
3. When installing valves with socket connections, ensure that only PVC solvent cement is used. Excessive use of cement can cause sticking in the valve interior, therefore use caution when applying cement, especially on vertical piping.
4. For threaded connections we recommend the use of sealing tape and, with the use of a strap wrench, to tighten no more than 2 full turns past finger-tight. Use of a pipe wrench can deform the pipe or union nut and cause damage to the valve and/or connection(s).
5. Flanged connections should be torqued evenly and in a symmetrical pattern with a torque wrench and as per the figure and chart below:



RECOMMENDED FLANGE BOLT TORQUES

VALVE SIZE	FLANGE	BOLT TORQUE	IN FT-LB	AXIAL MISALIGNMENT	PARALLELISM (INCH)
	PSI - 50	PSI - 100	PSI - 150		
1½	11	13	14	0.04	0.03
2	13	14	16	0.04	0.03
2½	13	14	16	0.04	0.03
3	18	20	22	0.04	0.03
4	20	20	22	0.04	0.04
5	22	15	29	0.04	0.04
6	25	15	32	0.04	0.04
8	25	32	40	0.06	0.04
10	25	32	40	0.06	0.04
12	29	36	43	0.06	0.04
14	32	36	43	0.06	0.04
16	36	[58-85 PSI]	58	0.06	0.04
18	36	[58-85 PSI]	-		
20	72	-	-		
24	72	-	-		

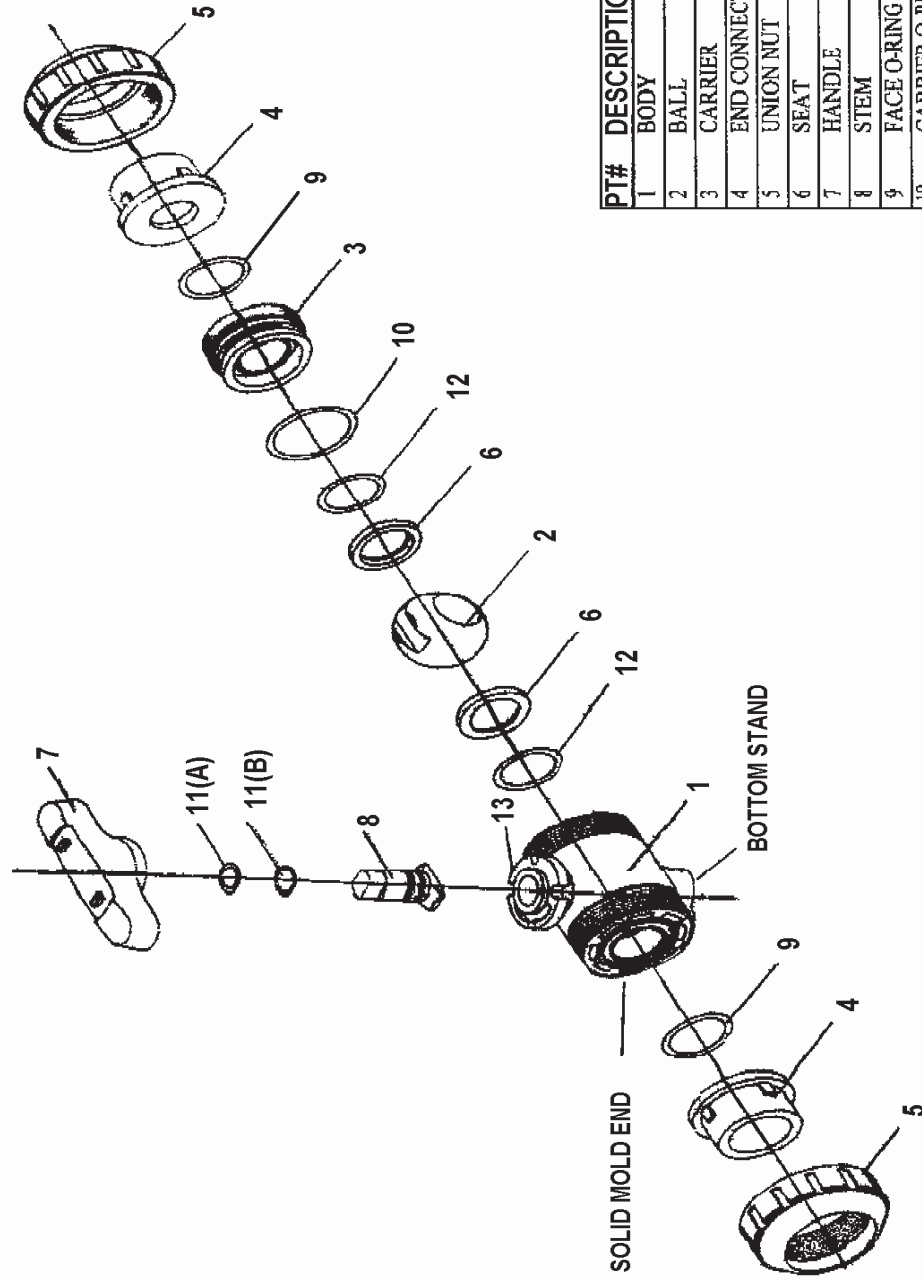
Maintenance Instructions Type 21 Ball Valve cont.***Maintenance:***

Refer to **ASSEMBLY DRAWING T21V Rev. 0.** And proceed as follows:

1. Turn valve to the closed position.
2. Unscrew union nut (5) from both ends of valve.
3. Remove end connectors (4).
4. On solid mold end, remove face o-ring (9). This completely disassembles this end of valve.
5. Pull upward on handle (7) to remove.
6. On opposite end of valve, remove face o-ring (9) and use handle (7) as a spanner wrench to remove carrier (3).
7. Remove carrier o-ring (10).
8. Remove seat (6) and seat cushion (12) to expose ball (2).
9. Remove ball (2) by pushing from solid molded end of body.
10. Remove stem (6) by pushing it down into body (1).
11. Remove stem o-rings 11(A) and 11(B) from groves in stem.
12. Remove other seat (6) and seat cushion (12).
13. Inspect all parts for wear and replace as necessary.
14. Before re-assembling valve, lubricate all o-rings with Dow Corning III silicone compound or equivalent.
15. To re-assemble valve follow steps 1 through 10 in reverse order.

NOTE: If mounting actuator on mounting flange (13), make sure handle (7) is removed and stem (6) and actuator are aligned.

After replacing carrier (3), the face of the carrier should remain slightly projected from the end of the body. Make sure the ball rotates smoothly with only a touch of resistance.



PT#	DESCRIPTION	QTY	MATERIALS
1	BODY	1	PVC/PP/PVDF/CPVC
2	BALL	1	PVC/PP/PVDF/CPVC
3	CARRIER	1	CPE/EPDM/VITON/HYP.
4	END CONNECTOR	2	PVC/PP/PVDF/CPVC
5	UNION NUT	2	PVC/PP/PVDF/CPVC
6	SEAT	1	CPE/EPDM/CITON/HYP.
7	HANDLE	1	PVC/PP/PVDF/CPVC
8	STEM	1	PVC/PP/PVDF/CPVC
9	FACE O-RING	2	CPE/EPDM/VITON/HYP.
10	CARRIER O-RING	1	CPE/EPDM/VITON/HYP.
11(A)	STEM O-RING (Upper)	1	CPE/EPDM/VITON/HYP.
11(B)	STEM O-RING (Lower)	1	CPE/EPDM/VITON/HYP.
12	SEAT CUSHION	2	CPE/EPDM/VITON/HYP.
13	MOUNTING FLANGE	1	PVC/PP/PVDF/CPVC

TITLE	CHEMLINE TYPE 21 TRUE UNION BALL VALVE		SCALE		DATE	CHEMLINE PLASTICS	
	REFERENCE		DR. BY			CHEMLINE	
SIZES 1/2" - 4"		CHKD BY				DWG. NO.	T21V
		APP. BY				REV.	0

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ChemFlare™ End Connectors



SERIES: ChemFlare™

VALVE SIZES: 3/8", 1/2", 3/4", 1" & 1-1/4"

TUBING SIZES: 1/4", 3/8", 1/2", 3/4", 1" & 1-1/4"



All Chemline valves with True Union ends are available with ChemFlare™ end connections. ChemFlare™ is a long term leak-free connection design for difficult applications such as sodium hypochlorite¹. These flared end connections are easy to install and allow for compact plumbing and a small footprint.

They are available on all Chemline valves which have True Union ends, flow meters and controls up to 1-1/4". They connect PFA tubing down to 1/4" size.

Tubing must be flared using a mechanical flare tool or by heating and using a forming flare tool (preferred method). Consult Chemline for flare tools.

Features

Full Valve Working Pressure

Weldless Design

- Eliminates all fusion welds and glued joints
- Threaded connection between flared end and tube nut is not wetted

Easy Installation

- Flaring the tube ends is easy
- Assembly is by hand²

Low Down Time

- No welding or curing waiting time. The system may be pressure tested immediately.

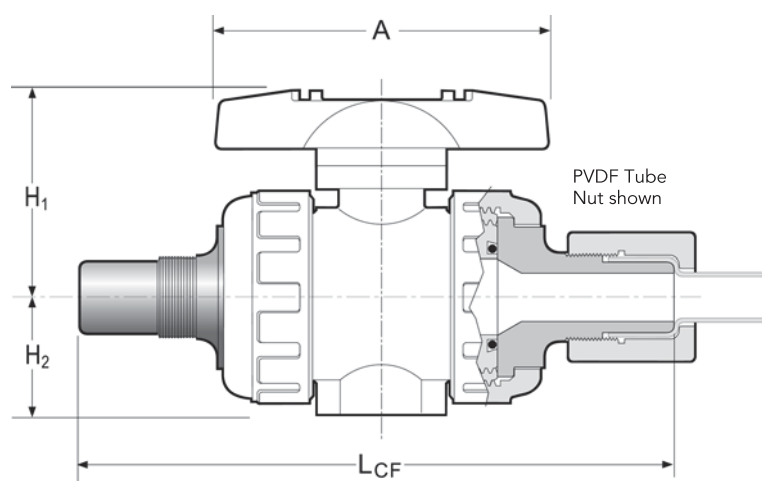
Minimum Dead Volume

- The flared tubing connection has minimum dead volume desirable on sodium hypochlorite and ultrapure applications

¹ For sodium hypochlorite applications Chemline recommends venting ball valves by drilling a hole on the upstream side of the ball in the closed position.

² ChemFlare™ fitting nuts should be hand tightened only. Use of a wrench can result in excessive tightening and stripped threads.

ChemFlare™ for Type 21 Ball Valves



DIMENSIONS INCHES

Valve Size	Tube Size ¹	A	H ₁	H ₂	LCF
1/2"	1/4"	3.6	2.03	1.14	5.52
1/2"	3/8"	3.6	2.03	1.14	6.04
1/2"	1/2"	3.6	2.03	1.14	6.12
3/4"	3/4"	3.9	2.34	1.38	6.52
1"	1"	4.3	2.68	1.54	7.26
1-1/4"	1-1/4"	4.8	3.17	1.85	9.58

MAXIMUM PRESSURES PSI

Valve Size	Tube Size ¹	PVC				PP					PVDF					
		20°C 68°F	30°C 86°F	40°C 104°F	50°C 122°F	30°C 86°F	40°C 104°F	50°C 122°F	60°C 140°F	70°C 158°F	30°C 86°F	50°C 122°F	70°C 158°F	80°C 176°F	90°C 194°F	100°C 212°F
1/2"	1/4"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1/2"	3/8"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1/2"	1/2"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
3/4"	3/4"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1"	1"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1-1/4"	1-1/4"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15

Temperature Ranges: PVC 0 to 60°C (32 to 140°F), PP -20 to 90°C (-4 to 194°F), PVDF -40 to 100°C (-40 to 212°F).

¹ChemFlare™ ends are available for reduced tube sizes down to 1/4". Tube nuts are always supplied with end connectors.

SAMPLE SPECIFICATION

1. All True Union Ball Valves in PVC, CPVC, PP or PVDF shall be Chemline Type 21 or equal sizes 1/2" to 2" in PVC, CPVC, and PVDF rated at 230 psi and in PP 150 psi maximum working pressure. Sizes 2-1/2", 3" and 4" rated at 150 psi maximum working pressure with EPDM, FKM (Viton®) or CPE seals. Cushioned PTFE ball seats shall be provided for positive closure with minimum stem torques.
2. All valves will have Safety Shear stem design, blowout-proof with double o-rings for safety. The top o-ring groove shall be deeper so that if the stem breaks under excessive torque the lower o-ring will remain intact and the valve will hold pressure.
3. All valves shall be full port and two-way blocking.
4. All PVC/EPDM and PVC/FKM (Viton®) valves shall be certified under NSF/ANSI Standard 61 for contact with drinking water.
5. All valves will be CRN (Canadian Registration Number) registered with TSSA.
6. All valves for sodium hypochlorite service shall have the ball vented on the upstream side to prevent the accumulation of chlorine gas due to off-gassing.
7. All valves shall have chemical resistant labels permanently marked with manufacturing number to provide production level traceability.
8. PVC compound shall have an ASTM cell classification 12454, as per ASTM D-1784 (CSA Report LO 4000-1172) and a chemical resistance equal to S20-1-3-R as per ASTM D5260.
9. End connections shall be ChemFlare™ design for connection to flared PFA tubing.

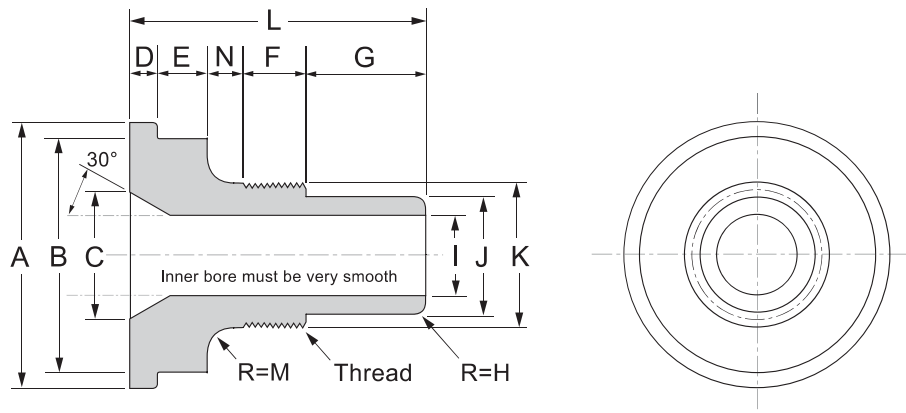
ChemFlare™ for Type 21 Ball Valves



TYPE 21 CONNECTOR DIMENSIONS INCHES

Tube Conn.	Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Thread
1/4"	21005-4-4N ¹	1.470	1.215	0.590	0.185	0.310	0.500	0.440	0.047	0.125	0.302	0.500	1.435	0.000	0.000	1/2 – 20 UNF
3/8"	21005-4-6N	1.470	1.215	0.590	0.185	0.310	0.500	0.500	0.047	0.251	0.420	0.625	1.695	0.200	0.200	5/8 – 20 UN
1/2"	21005-4-8N	1.470	1.215	0.590	0.185	0.310	0.419	0.591	0.055	0.376	0.547	0.735	1.705	0.200	0.200	3/4 – 20 UNEF
3/4"	21005-4-12N	1.470	1.215	0.590	0.185	0.310	0.441	0.591	0.055	0.626	0.785	1.000	1.802	0.200	0.200	1 – 20 UNEF
1/4"	21007-4-4N	1.860	1.500	0.797	0.180	0.370	0.500	0.440	0.047	0.125	0.302	0.500	1.510	0.000	0.000	1/2 – 20 UNF
3/8"	21007-4-6N	1.860	1.500	0.797	0.180	0.370	0.500	0.500	0.047	0.251	0.420	0.625	1.770	0.200	0.200	5/8 – 20 UN
1/2"	21007-4-8N	1.860	1.500	0.797	0.180	0.370	0.419	0.591	0.055	0.376	0.574	0.735	1.780	0.200	0.200	3/4 – 20 UNEF
3/4"	21007-4-12N	1.860	1.500	0.797	0.180	0.370	0.441	0.591	0.055	0.626	0.785	1.000	1.802	0.200	0.200	1 – 20 UNEF
1"	21007-4-16N	1.860	1.500	0.797	0.180	0.370	0.600	0.635	0.130	0.876	1.142	1.435	1.955	0.200	0.200	1-7/16 – 12 UN
1/4"	21010-4-4N	2.100	1.800	0.987	0.230	0.340	0.500	0.440	0.047	0.125	0.302	0.500	1.510	0.000	0.000	1/2 – 20 UNF
3/8"	21010-4-6N	2.100	1.800	0.987	0.230	0.340	0.500	0.500	0.047	0.251	0.420	0.625	1.770	0.200	0.200	5/8 – 20 UN
1/2"	21010-4-8N	2.100	1.800	0.987	0.230	0.340	0.419	0.591	0.055	0.376	0.547	0.735	1.780	0.200	0.200	3/4 – 20 UNEF
3/4"	21010-4-12N	2.100	1.800	0.987	0.230	0.340	0.441	0.591	0.055	0.626	0.785	1.000	1.802	0.200	0.200	1 – 20 UNEF
1"	21010-4-16N	2.100	1.800	0.987	0.230	0.340	0.600	0.635	0.130	0.876	1.142	1.435	1.955	0.200	0.200	1-7/16 – 12 UN
1/4"	21012-4-4FN	2.530	2.190	1.220	0.230	0.454	0.500	0.440	0.047	0.125	0.302	0.500	1.624	0.000	0.000	1/2 – 20 UNF
3/8"	21012-4-6FN	2.530	2.190	1.220	0.230	0.454	0.500	0.500	0.047	0.251	0.420	0.625	1.884	0.200	0.200	5/8 – 20 UN
1/2"	21012-4-8FN	2.530	2.190	1.220	0.230	0.454	0.419	0.591	0.055	0.376	0.547	0.735	1.894	0.200	0.200	3/4 – 20 UNEF
3/4"	21012-4-12N	2.530	2.190	1.220	0.230	0.454	0.441	0.591	0.055	0.626	0.785	1.000	1.916	0.200	0.200	1 – 20 UNEF
1"	21012-4-16N	2.530	2.190	1.220	0.230	0.454	0.600	0.635	0.130	0.876	1.142	1.435	2.069	0.200	0.200	1-7/16 – 12 UN
1-1/4"	21012-4-20N	2.530	2.190	1.220	0.230	0.454	0.760	0.820	0.165	1.095	1.430	1.745	2.414	0.150	0.150	1-3/4 – 11.5 UN
1"	21015-4-16N	3.040	2.680	1.500	0.280	0.354	0.600	0.635	0.130	0.876	1.142	1.435	2.069	0.200	0.200	1-7/16 – 12 UN
1"	21020-4-16N	3.800	3.170	2.000	0.340	0.454	0.600	0.635	0.130	0.876	1.142	1.435	2.069	0.200	0.200	1-7/16 – 12 UN
1-1/4"	21020-4-20N	3.800	3.170	2.000	0.340	0.454	0.760	0.820	0.165	1.095	1.430	1.745	2.414	0.150	0.150	1-3/4 – 11.5 UN

¹All fittings with 1/4" tube connections to have threads up to the flange face. See dimensions M and N.



ORDERING EXAMPLE

ChemFlare™ End Connections for Type 21 Ball Valves		21	005	-4	A	8N	-1
Valve Size	005 – 1/2"	007 – 3/4"	010 – 1"	012 – 1-1/4"			
End Connector	-4 – for all sizes						
Material	A – PVC	C – CPVC	B – PP	K – PVDF			
Tube Size ²	4N – 1/4"	6N – 3/8"	8N – 1/2"	12N – 3/4"	16N – 1"	20N – 1-1/4"	
Tube Nut	-1 – includes nut		Blank – without nut				

Example: Chemline ChemFlare™ End Connectors for Type 21 True Union Ball Valves, 1/2" valve size, PVC, with 1/2" tube size, including nuts.

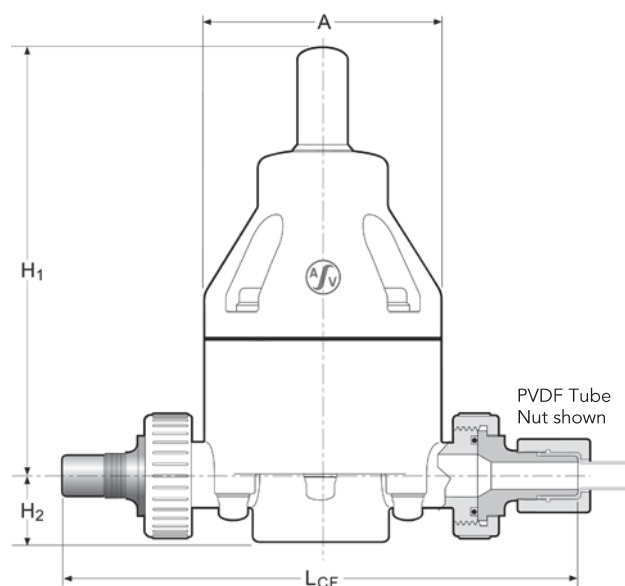
²Tube size must be equal or smaller than the valve size.



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ChemFlare™ for SB Series Back Pressure/Relief Valves



DIMENSIONS INCHES

Valve Size	Tube Size ¹	A	H ₁	H ₂ PVC	H ₂ PP/PVDF	L _{CF}
3/8"	3/8"	3.2	6.9	1.0	0.9	8.20
1/2"	1/4"	3.2	6.9	1.0	0.9	7.74
1/2"	3/8"	3.2	6.9	1.0	0.9	8.26
1/2"	1/2"	3.2	6.9	1.0	0.9	8.34
3/4"	3/4"	4.2	8.0	1.5	1.4	9.72
1"	1"	4.2	8.0	1.5	1.4	10.20
1-1/4"	1-1/4"	5.8	10.3	2.2	2.1	13.25

MAXIMUM PRESSURES PSI

Valve Size	Tube Size ¹	PVC				PP					PVDF					
		20°C 68°F	30°C 86°F	40°C 104°F	50°C 122°F	30°C 86°F	40°C 104°F	50°C 122°F	60°C 140°F	70°C 158°F	30°C 86°F	50°C 122°F	70°C 158°F	80°C 176°F	90°C 194°F	100°C 212°F
1/2"	1/4"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1/2"	3/8"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1/2"	1/2"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
3/4"	3/4"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1"	1"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15
1-1/4"	1-1/4"	150	105	60	15	150	90	60	37	15	150	100	60	45	30	15

Temperature Ranges: PVC 0 to 60°C (32 to 140°F), PP -20 to 90°C (-4 to 194°F), PVDF -40 to 100°C (-40 to 212°F).

¹ChemFlare™ ends are available for reduced tube sizes down to 1/4". Tube nuts are always supplied with end connectors.

SAMPLE SPECIFICATION

1. All Back Pressure/Relief Valves in PVC, PP or PVDF shall be Chemline SB10 or SB11 Series or equal in sizes 1/2" to 2". SB10 shall have inlet set pressure range of 3 to 60 psi and SB11 shall have an inlet set pressure range of 7 to 150 psi. SB12 valves shall have an inlet set pressure range of 5 to 150 psi. All valves shall have a maximum inlet pressure rating of 150 psi. Valves shall be suitable for aggressive, clean, non-scaling chemicals.
2. All valves shall have a large PTFE coated control diaphragm to fully open at 10-15% over pressure, provide low hysteresis ("backlash") and no flutter.
3. Static seals shall be EPDM or FPM (Viton®).
4. End connections shall be ChemFlare™ design for connection to flared PFA tubing.
5. PVC compound shall have an ASTM cell classification 13463-A, with minimum suffix "A" designation for chemical resistance as per ASTM D-1784.
6. All polypropylene material shall conform to ASTM D-4101 PP 0211B67272 material requirements.
7. All PVDF material shall be unpigmented conforming to ASTM D-3222 Type 2 suspension resin material requirements and also with USDA Title 21, Chapter I, Part 177.2510 requirements for contact with food.
8. All valves shall have chemical resistant labels permanently marked with manufacturing number to provide production level traceability.

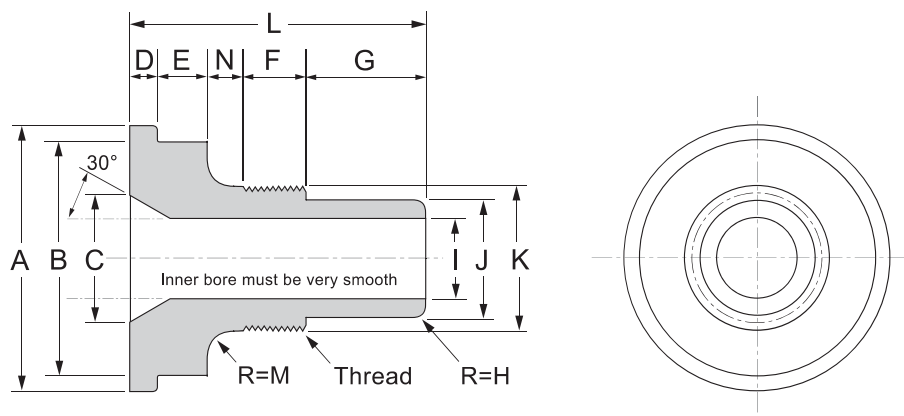
ChemFlare™ for SB Series Back Pressure/Relief Valves



SB/SR CONNECTOR DIMENSIONS INCHES

Tube Conn.	Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Thread
1/4"	SB002-17-4N ¹	0.927	0.845	0.250	0.200	0.230	0.500	0.440	0.047	0.125	0.302	0.500	1.370	0.000	0.000	1/2 – 20 UNF
1/4"	SB003-17-4N ¹	0.940	0.865	0.317	0.200	0.250	0.500	0.440	0.047	0.125	0.302	0.500	1.390	0.000	0.000	1/2 – 20 UNF
3/8"	SB003-17-6N	0.940	0.865	0.317	0.200	0.250	0.500	0.500	0.047	0.251	0.420	0.625	1.650	0.200	0.200	5/8 – 20 UN
1/2"	SB003-17-8N	0.940	0.865	0.317	0.200	0.250	0.419	0.591	0.055	0.376	0.547	0.735	1.660	0.200	0.200	3/4 – 20 UNEF
1/4"	SB005-17-4N ¹	1.190	1.080	0.590	0.200	0.250	0.500	0.440	0.047	0.125	0.302	0.500	1.390	0.000	0.000	1/2 – 20 UNF
3/8"	SB005-17-6N	1.190	1.080	0.590	0.200	0.250	0.500	0.500	0.047	0.251	0.420	0.625	1.650	0.200	0.200	5/8 – 20 UN
1/2"	SB005-17-8N	1.190	1.080	0.590	0.200	0.250	0.419	0.591	0.055	0.376	0.574	0.735	1.660	0.200	0.200	3/4 – 20 UNEF
3/4"	SB005-17-12N	1.190	1.080	0.590	0.200	0.250	0.441	0.591	0.055	0.626	0.785	1.000	1.482	0.200	0.200	1 – 20 UNEF
1/4"	SB007-17-4N	1.520	1.410	0.797	0.240	0.250	0.500	0.440	0.047	0.125	0.302	0.500	1.430	0.000	0.000	1/2 – 20 UNF
3/8"	SB007-17-6N	1.520	1.410	0.797	0.240	0.250	0.500	0.500	0.047	0.251	0.420	0.625	1.690	0.200	0.200	5/8 – 20 UN
1/2"	SB007-17-8N	1.520	1.410	0.797	0.240	0.250	0.419	0.591	0.055	0.376	0.547	0.735	1.700	0.200	0.200	3/4 – 20 UNEF
3/4"	SB007-17-12N	1.520	1.410	0.797	0.240	0.250	0.441	0.591	0.055	0.626	0.785	1.000	1.722	0.200	0.200	1 – 20 UNEF
1"	SB007-17-16N	1.520	1.410	0.797	0.240	0.250	0.600	0.635	0.130	0.876	1.142	1.435	2.004	0.200	0.200	1-7/16 – 12 UN
1/4"	SB010-17-4N	1.750	1.630	1.090	0.240	0.310	0.500	0.440	0.047	0.125	0.302	0.500	1.490	0.000	0.000	1/2 – 20 UNF
3/8"	SB010-17-6N	1.750	1.630	1.090	0.240	0.310	0.500	0.500	0.047	0.251	0.420	0.625	1.750	0.200	0.200	5/8 – 20 UN
1/2"	SB010-17-8N	1.750	1.630	1.090	0.240	0.310	0.419	0.591	0.055	0.376	0.547	0.735	1.760	0.200	0.200	3/4 – 20 UNEF
3/4"	SB010-17-12N	1.750	1.630	1.090	0.240	0.310	0.441	0.591	0.055	0.626	0.785	1.000	1.782	0.200	0.200	1 – 20 UNEF
1"	SB010-17-16N	1.750	1.630	1.090	0.240	0.310	0.600	0.635	0.130	0.876	1.142	1.435	2.004	0.200	0.200	1-7/16 – 12 UN
1"	SB012-17-16N	2.223	2.068	1.090	0.240	0.310	0.600	0.635	0.130	0.876	1.142	1.435	2.004	0.200	0.200	1-7/16 – 12 UN

¹All fittings with 1/4" tube connections to have threads up to the flange face. See dimensions M and N.



ORDERING EXAMPLE

ChemFlare™ End Connections for SB Series Back Pressure/Relief Valves		SB	005	-17	A	8N	-1
Valve Size	003 – 3/8"	005 – 1/2"	007 – 3/4"	010 – 1"	012 – 1-1/4"		
End Connector	-17 – for all sizes						
Material	A – PVC	C – CPVC	B – PP	K – PVDF			
Tube Size ²	4N – 1/4"	6N – 3/8"	8N – 1/2"	12N – 3/4"	16N – 1"	20N – 1-1/4"	
Tube Nut	-1 – includes nut		Blank – without nut				

Example: Chemline ChemFlare™ End Connectors for SB10, SB11 and SB12 Back Pressure Relief Valves, 1/2" valve size, PVC, with 1/2" tube size, including nuts.

²Tube size must be equal or smaller than the valve size.



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VEOLIA PROJECT: 5000 218 009

CHEMLINE

TYPE SM2, METERING BALL VALVE

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Metering Ball Valves



SERIES: SM2

SIZES: 1/2" – 1"

ENDS: Threaded, Socket, Butt¹ or ChemFlare™²

SEATS: PTFE

O-RINGS: EPDM, FPM (Viton®)



Integral 180° Scale with 5° Increments

- Linear flow control and settable flow rates

Chemline SM Series Metering Ball Valve is designed for fine linear flow control of chemicals or clean fluids. The ball is solid with graduated V-groove cut on the outside surface. Precise linear flow control is accomplished through 180° rotation of the handle. With a positioning electric actuator, this becomes an inexpensive control valve. If higher C_v values are required, refer to SP Series Proportional ball valves.

Features

Precise Linear Flow Control

- Provided by a special V-groove ball and wide handle travel (0° to 180°)

Full Size Range

- 6 valves sizes 1/2" to 2" offers a large selection of C_v values

High End Ball Valve Features

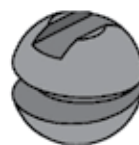
- Full Blocking design
- Double Stem O-Rings for safety
- PTFE seats with elastomer cushion
 - Automatically compensates for seat wear or expansion
- 230 psi pressure rated (PVC)

Low Stem Torques

- Due to floating ball design and cushioned PTFE seats

Bidirectional

- Works with flow in either direction



Ball Detail



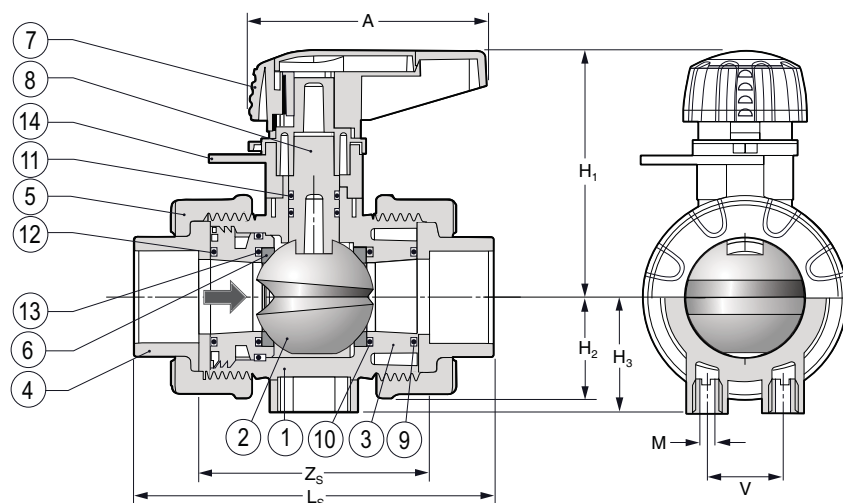
¹Butt ends for fusion to Chemline metric PP piping.
²For ChemFlare™ end connectors, consult Chemline.

Metering Ball Valves



PARTS

No.	Part	Pcs.	Materials
1	Body	1	PVC, PP, PVDF
2	Ball	1	PVC, PP, PVDF
3	Carrier	1	PVC, PP, PVDF
4	End Connector	2	PVC, PP, PVDF
5	Union Nut	5	PVC, PP, PVDF
6	Ball Seat	2	PTFE
7	Handle	1	PVC
8	Stem	1	PVC, PP, PVDF
9	Carrier Face O-Ring	1	EPDM, FPM(Viton®)
10	Carrier O-Ring	1	EPDM, FPM(Viton®)
11	Stem O-Ring ¹	2	EPDM, FPM(Viton®)
12	Face O-Ring	1	EPDM, FPM(Viton®)
13	Seat Cushion ¹	2	EPDM, FPM(Viton®)
14	Position Indicator Scale	1	PVC



DIMENSIONS INCHES

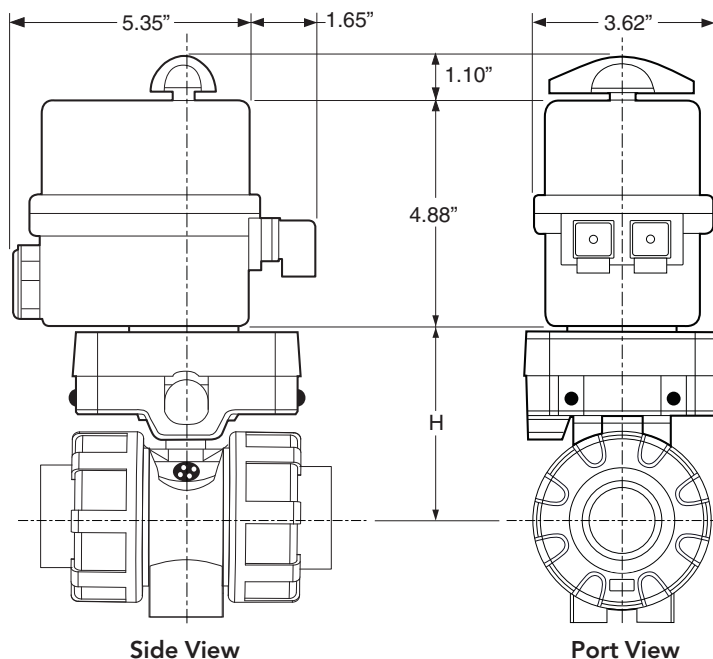
Size							PVC			PP		
	A	H ₁	H ₃	H	M	V	Z _s	L _s	H ₂	Z _s	L _s	H ₂
1/2"	2.62	2.48	1.10	2.50	M5	0.98	2.48	3.74	0.99	2.64	3.74	1.06
3/4"	3.21	3.03	1.20	2.70	M5	0.98	2.83	4.33	1.16	3.03	4.29	1.18
1"	3.21	3.39	1.60	3.00	M6	1.02	3.11	4.84	1.39	3.27	4.69	1.57

ELECTRICALLY OR PNEUMATICALLY ACTUATED

The metering ball valve becomes a proportional control valve with the addition of a Q or E Series electric or P Series pneumatic actuator with 4-20 mA positioner

- Thermoplastic housing and mounting bracket
- Manual override
- Position indication
- Mechanical travel stops
- Different voltages are available

E Series Electric Actuator on a SM2 Valve



Q Series Electric

E Series Electric



P Series Pneumatic

Metering Ball Valves



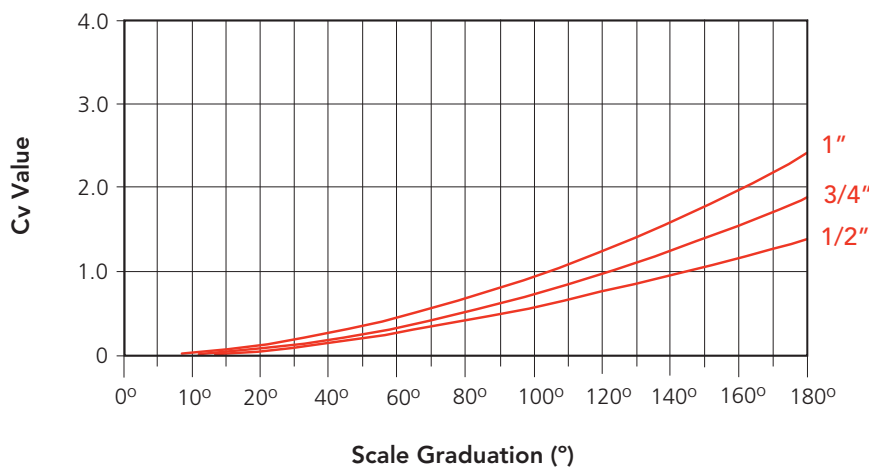
WORKING PRESSURES PSI

NET WEIGHTS LB. Cv VALUES

Size	PVC			PP				PVC	PP	USGPM Flow at 1 psi ΔP
	20°C 68°F	40°C 104°F	60°C 140°F	20°C 68°F	40°C 104°F	60°C 140°F	80°C 176°F			
1/2"	230	130	30	150	100	65	20	0.35	0.29	1.4
3/4"	230	130	30	150	100	65	20	0.60	0.44	1.9
1"	230	130	30	150	100	65	20	0.84	0.64	2.3

Temperature Ranges: PVC 0 to 60°C (32 to 140°F), PP 0 to 95°C (32 to 203°F)

Cv VALUE vs. VALVE OPENING



SAMPLE SPECIFICATION

1. All low flow control valves, 1/2" to 1", will be Chemline SM Series metering ball valves.
2. Body material will be PVC or PP, and o-rings will be EPDM or FPM (Viton®).
3. Body will be full blocking design with double stem o-rings for safety, rated at 230 psi maximum working pressure for PVC and 150 psi for PP material.
4. Ball will be floating design, molded solid with a V-groove for linear flow control over a 180° range of handle rotation.
5. Seats will be PTFE with elastomer cushions for positive closure with minimum stem torques and automatic compensation for seat wear and expansion.
6. Position indicating scale will be 0° to 180° with 5° increments for fine flow control and settable flow rates.
7. End connections will be 1/2" to 1" ANSI socket or FNPT threaded or 150 lb flanged or butt fusion for Chemline metric PP pipe or ChemFlare™ for PFA tubing.

ORDERING EXAMPLE

Chemline Metering Ball Valves				SM2	A	010	E	S
Valve Material	A – PVC	B – PP						
Size	005 – 1/2"	007 – 3/4"	010 – 1"					
Seals	E – EPDM	V – FPM (Viton®)						
Ends	S – Socket	T – Threaded	B – Butt ¹	CF – ChemFlare™				

Example: SM2 Series Ball Valve, PVC, 1", EPDM seals, socket ends.

¹ PP metric butt fusion ends (1/2" to 2") connect to Chemline PP piping systems.

VACUUM RATING

- 29.9 inches mercury

OPTIONS & ACCESSORIES

- Reduced Ends
- Electric or Pneumatic Actuator with Positioner
 - Operates as a linear control valve



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VEOLIA PROJECT: 5000 218 009

CHEMLINE

SERIES BT-BC-FV-FT, BALL CHECK AND FOOT VALVES

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MAINTENANCE INSTRUCTIONS

For Chemline Ball Check Valves and Ball Foot Valves Sizes 1/2" to 4"

Maintenance

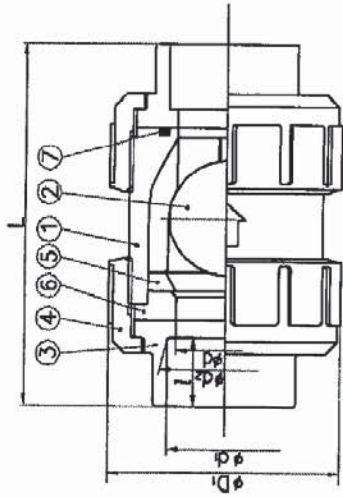
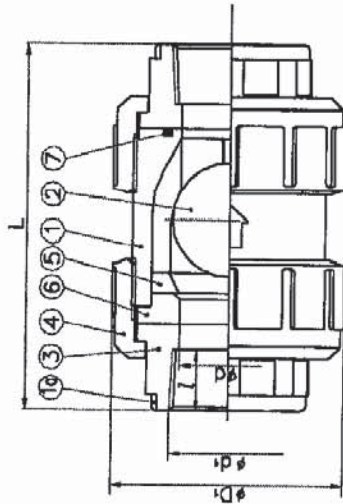
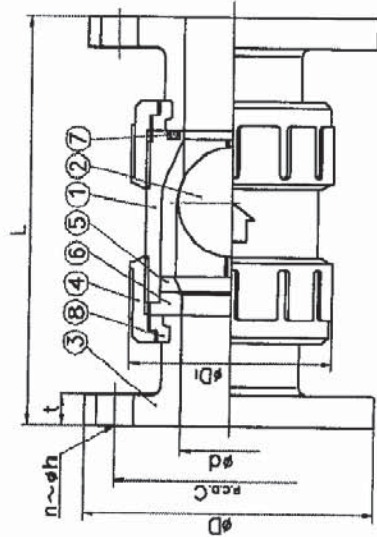
Refer to dwg. **APR-050** or **ASSEMBLY DRAWING BC-003 rev.0** and proceed as follows:

1. Loosen union nut (5) and remove valve from line.
(Note: make sure there is no pressure in line prior to removing valve.)
2. **Important** Hold seat/seal (3) in place while removing valve, as the seat, stop ring (6) and ball (2) may fall out.
3. Remove seat (3), stop ring (6) and ball (2). Inspect for excessive wear. The ball should not show signs of wear or deformation.
4. When re-installing ball (2), stop ring (6) and seat (3), check inside body for any foreign debris that may have become lodged in the valve.
5. Replace union nut (5) and tighten.
6. For Foot Valves with strainer baskets, remove basket (7) and clean thoroughly.

FLANGE END

THREAD CONNECTION

SOCKET CONNECTION



DIMENSIONS TABLE

NOMINAL SIZE	FLANGE										THREAD									
	ANSI 150LBS										ANSI									
	D	C	n	h	L	t	d ₁	L	d	D ₁										
1/2" 15	3.50	2.38	4	0.63	5.12	0.47	1/2-14 NPT	0.59	3.39	0.59	1.89									
3/4" 20	3.86	2.76	4	0.63	6.10	0.55	3/4-14 NPT	0.67	4.06	0.79	2.36									
1" 25	4.25	3.13	4	0.63	6.50	0.55	1-11/2 NPT	0.79	4.45	0.98	2.76									
1 1/4" 30	—	—	—	—	—	—	1 1/4-11/2 NPT	0.87	5.00	1.22	3.78									
1 1/2" 40	5.00	3.88	4	0.63	7.56	0.63	1 1/2-11/2 NPT	0.98	5.94	1.57	3.78									
2" 50	5.98	4.74	4	0.75	8.43	0.63	2-11/2 NPT	1.10	6.97	2.01	4.17									

UNIT: inch

NOMINAL SIZE	PVC, C-PVC										SOCKET									
	ANSI SCH 40										ANSI SCH 80									
	d ₁	d ₂	L	L	d ₁	d ₂	L	L	d ₁	d ₂	d ₁	d ₂	L	L	d ₁	d ₂	L	L	d ₁	d ₂
1/2" 15	0.648	0.836	0.688	3.43	0.848	0.836	0.875	3.80	0.825	—	0.890	3.83	0.831	—	0.625	3.31	—	—	—	—
3/4" 20	0.658	1.045	0.719	3.86	1.058	1.046	1.000	4.41	1.030	—	1.015	4.49	1.041	—	1.000	4.43	—	—	—	—
1" 25	1.325	1.310	0.875	4.37	1.325	1.310	1.125	4.88	1.300	—	1.140	4.98	1.305	—	0.815	4.35	—	—	—	—
1 1/4" 30	1.670	1.655	0.938	4.92	1.670	1.655	1.250	5.55	1.650	—	1.265	5.58	—	—	—	—	—	—	—	—
1 1/2" 40	1.912	1.894	1.094	5.94	1.912	1.894	1.375	6.50	1.890	—	1.390	6.57	1.889	—	1.250	5.57	—	—	—	—
2" 50	2.382	2.369	1.156	6.77	2.382	2.369	1.500	7.44	2.360	—	1.515	7.57	2.344	—	1.250	6.49	—	—	—	—

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

Customer
Customer PO#
Chemline PS#

Part No.
Body Material
Elastomer Material
End Connection

1a	RING	2	STAINLESS STEEL (SS304) used for 1/2"~1"
8	STOP RING (R)	2	PVDF
7	O-RING	1	EPDM O-RING
6	SEAT RING	1	O-RING
5	STOP RING (A)	1	PVC
4	UNION NUT	2	C-PVC
3	END CONNECTOR	2	PP
2	BALL	1	PVDF
1	BODY	1	PVDF
No.	DESCRIPTION	Material	REMARKS
TRUE UNION BALL CHECK VALVE ASS'LY			
FLANGE END, SOCKET CONNECTION, THREAD CONNECTION			
ANSI: 1/2"~2"			

DRAWN	LC	DATE	SCALE
CHECKED		09/28/98	
APPROVED		DRAWING No.	
		APR-050	

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MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL
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CHEMLINE

TYPE 57, BUTTERFLY VALVE

WATER TECHNOLOGIES

LEFT BLANK

Serial No.

H-V036E-4

Butterfly Valves

Type 57 : 40mm(1 1/2") - 350mm(14")

Type 56 : 400mm(16")

User's Manual



Contents

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(12) Handling of Residual and Waste Materials	14
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ASAHI AV VALVES

(1) General Operating Instructions

Operate the valve within the pressure vs. temperature range.

The valve can be damaged by operating beyond the allowable range.

Select a valve material that is compatible with the media, refer to “CHEMLINE CHEMICAL RESISTANCE GUIDE”.

Some chemicals may damage incompatible valve materials.

Do not use the valve on condition that fluid has crystallized.

(The valve will not operate properly.)

Do not step on the valve or apply excessive weight on valve. (It can be damaged.)

Do not exert excessive force in closing the valve.

Make sure to consult a waste treatment dealer to dispose of the valves.

(Poisonous gas is generated when the valve is burned improperly.)

Allow sufficient space for maintenance and inspection.

Keep the valve away from excessive heat or fire. (It can be deformed, or destroyed.)

Do not change or replace valve parts under line pressure.

The valve is not designed to bear any kind of external load. Never stand on or place anything heavy on the valve at anytime.

Using a positive-pressure gas with our plastic piping may pose dangerous condition due to the repellent force peculiar to compressed fluids, even when the gas is under the same pressure as water. Therefore, be sure to take the necessary safety precautions such as covering the piping protective material. For inquiries, please contact us.

(2) General Instructions for Transportation, Unpacking and Storage

Keep the valve in its original packaging until needed for installation.

Avoid contact with any coal tar creosote, insecticides, vermicides or paint.

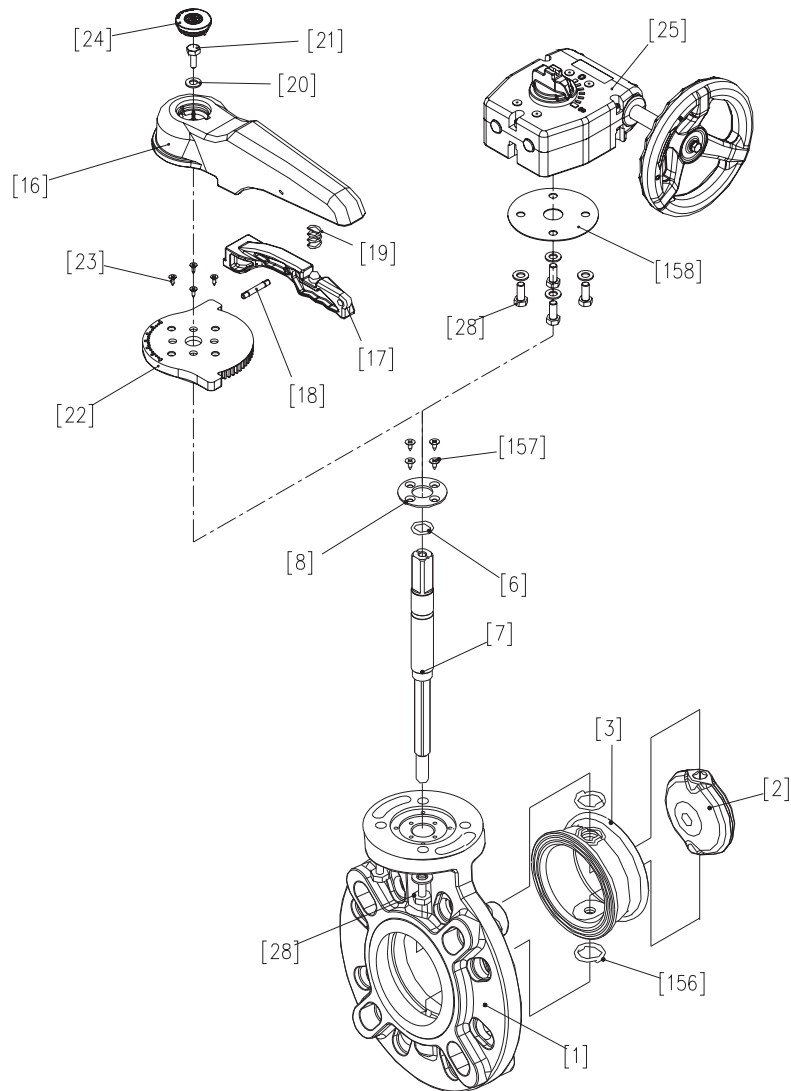
The force of swelling may damage the valve.

The valve is not designed to handle any kind of impact. Avoid throwing or dropping the valve.

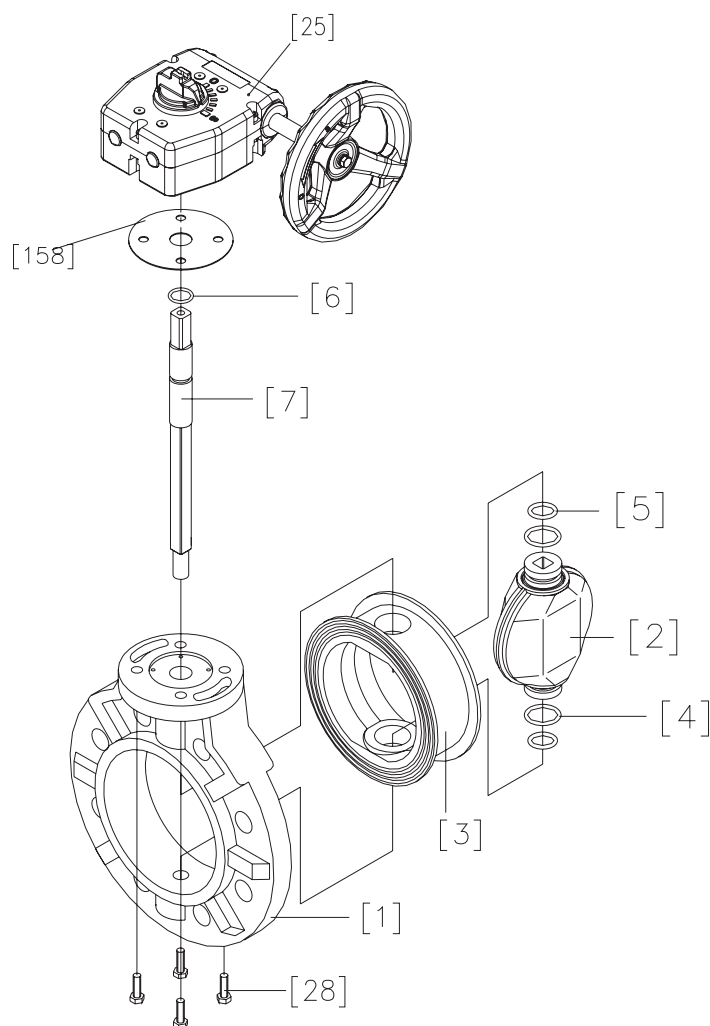
Avoid scratching the valve with any sharp object.

(3) Parts description

Type57: 40mm (1-1/2") – 350mm (14")

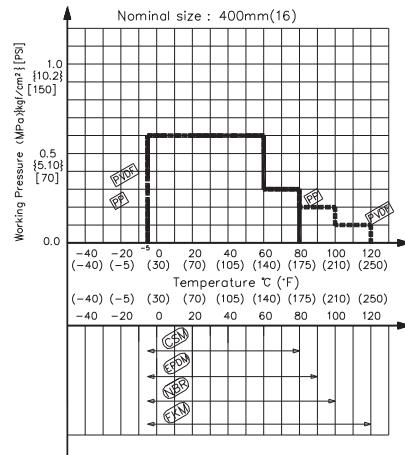
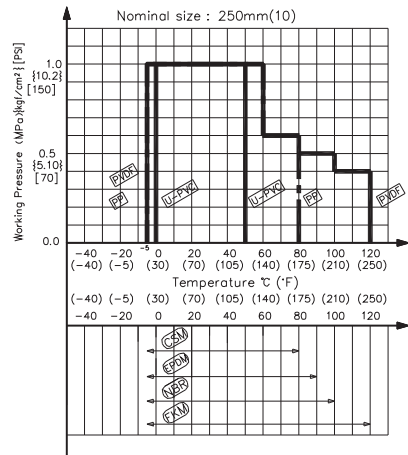
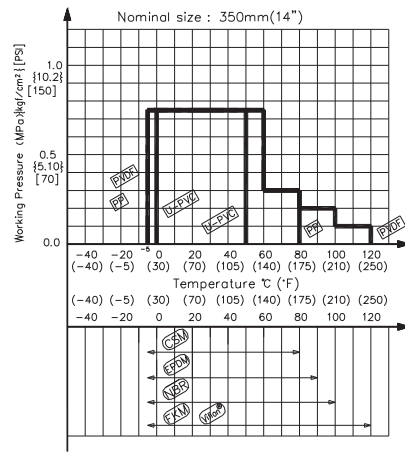
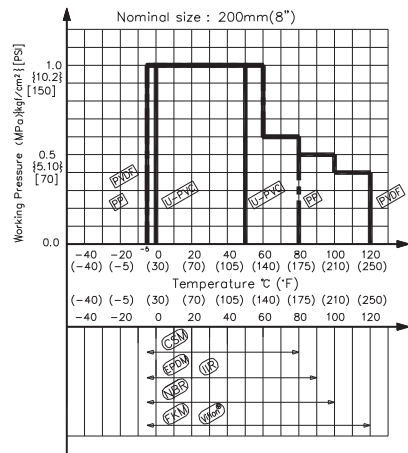
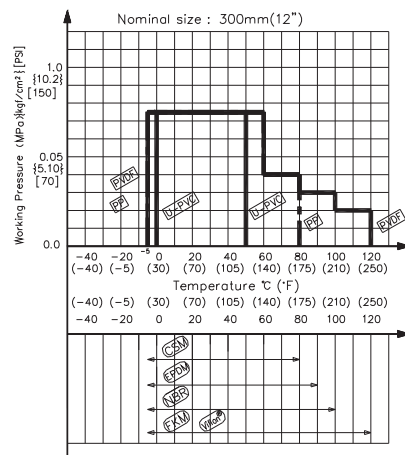
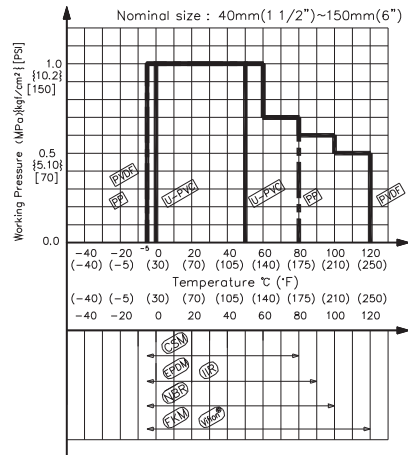


No.	Description	No.	Description	No.	Description
[1]	Body	[17]	Handle Lever	[24]	Cap (A)
[2]	Disc	[18]	Pin	[25]	Gear Box
[3]	Seat	[19]	Spring	[28]	Bolt (C)
[6]	O-Ring (C)	[20]	Washer (A)	[156]	Stabilization Ring
[7]	Stem	[21]	Bolt (A)	[157]	Screw (F)
[8]	Stem Holder (A)	[22]	Locking Plate	[158]	Gasket (L)
[16]	Handle (A)	[23]	Screw (B)		

Type56 (Gear Type): 400mm (16")

No.	Description	No.	Description	No.	Description
[1]	Body	[5]	O-Ring (B)	[28]	Bolt (C)
[2]	Disc	[6]	O-Ring (C)	[158]	Gasket (L)
[3]	Seat	[7]	Stem		
[4]	O-Ring (A)	[25]	Gear Box		

(4) Working Temperature vs. Pressure



Caution

Do not operate the valve beyond the range of working temperature and pressure.
(The valve can be damaged.)

(5) Installation Procedure



Caution

- 1) The valve disc is sent in the position indicated by solid lines in Fig. 5-1 prior to shipment from the factory. If the valve is opened or closed after unpacking, it must be reset in this position before installation. Failure to do so will result in damage to the surface of the valve seat during handling and installation.
- 2) The valve must not be dropped or thrown against other objects, since the sealing surface of the disc and the sealing surface of the valve seat may easily be damaged.
- 3) Care must be used during piping installation to ensure that the pipes or flanges are properly aligned so that the valve disc does not contact them in any setting. Misalignment as in Fig. 5-2 will result in damage to the valve.
- 4) The installed valve must never be opened or closed when foreign matter such as sand is present in the pipeline.

Fig. 5-1

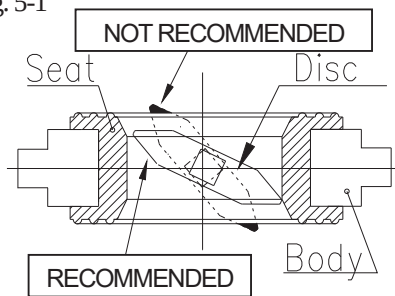
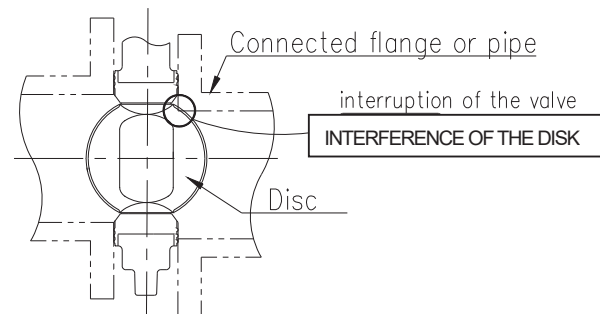
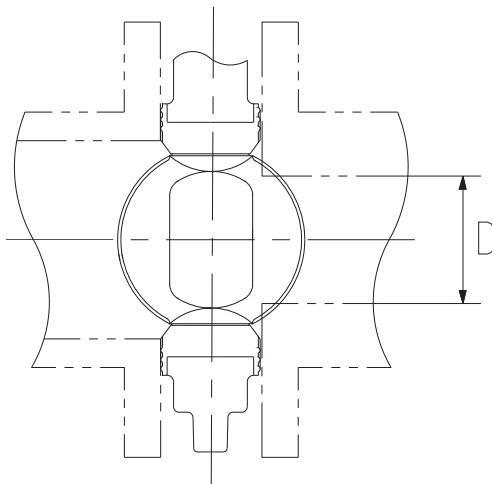


Fig. 5-2



In case of the thick wall of the connection part (flange and pipe) is too thick, shave the flange or the pipe inside in order to avoid the contact of pipe and disc. If inside diameter of the connection part is larger than size D, shaving is not necessary.



Nominal Size	Diameter D
40mm (1 1/2")	30mm (1.18")
50mm (2")	44mm (1.73")
65mm (2 1/2")	67mm (2.64")
80mm (3")	71mm (2.80")
100mm (4")	90mm (3.54")
125mm (5")	115mm (4.53")
150mm (6")	136mm (5.35")
200mm (8")	179mm (7.05")
250mm (10")	237mm (9.33")
300mm (12")	289mm (11.38")
350mm (14")	340mm (13.39")
400mm (16")	370mm (14.57")

Necessary items

● Torque Wrench

● Spanner Wrench

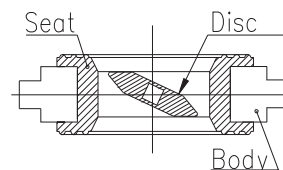
Procedure



Caution

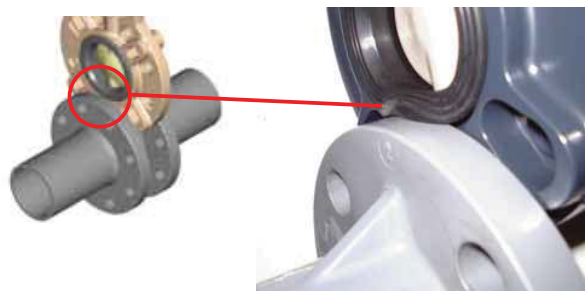
The disk [2] is prevented from overflowing. (The disk [2] is damaged.)

- 1) Install the valve between flanges and open the valve slightly.
- 2) Insert bolts, set nuts and washer and tighten the bolts and nuts temporarily by hand.



Caution

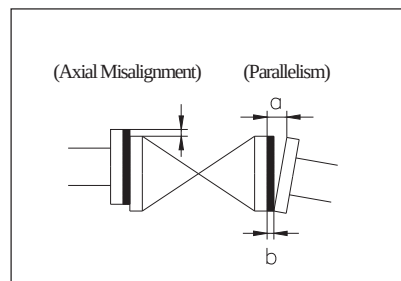
When you insert a valve between flanges, please insert after extending the fields of flanges fully.
(If you insert a valve by force without fully extending fields of flanges, a liner may be turned over and suffer a crack..)



The parallelism and axial misalignment of the flange surface should be under the values shown in the following table to prevent damage the valve. (A failure to observe them can cause destruction due to stress application to the pipe)

Unit : mm (inch)

Nom. Size	Axial Misalignment	Parallelism (a-b)
40 - 80mm (1 1/2"-3")	1.0 (0.04)	0.8 (0.03)
100-150mm (4"-6")	1.0 (0.04)	1.0 (0.04)
200-400mm (8"-16")	1.5 (0.06)	1.0 (0.04)



- 3) Tighten the bolts and nuts gradually with torque wrench to the specified torque in a diagonal manner.

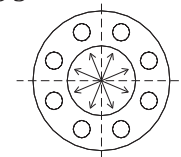
(Refer to Fig. 5-3)

Recommended torque value

Unit N-m kgf-cm [lb-inch]

Nom. Size	40mm (1 1/2")	50, 65mm (2", 2 1/2")	80, 100 mm (3", 4")
Torque value	20.0 {204} [177]	22.5 {230} [200]	30.0 {306} [266]

Fig. 5-3



Nom. Size	125, 150 mm (5", 6")	200, 250 mm (8", 10")	300, 350 mm (12", 14")	400 mm (16")
Torque value	40.0 {408} [355]	55.0 {561} [488]	60.0 {612} [532]	80.0 {816} [710]

Caution : Avoid excessive tightening. (The valve can be damaged.)

<JIS Standard>

Dimension of Insert Bolt A

Nom. Size		Bolt (Minimum)			Nut	Washer
		d	L	S		
40mm	1 1/2"	M16	125mm (4.92")	35mm (1.38")	M16	16mm (0.63")
50mm	2"		125mm (4.92")			
65mm	2 1/2"		130mm (5.12")			
80mm	3"		130mm (5.12")			
100mm	4"		145mm (5.71")			
125mm	5"	M20	165mm (6.50")	40mm (1.57")	M20	20mm (0.79")
150mm	6"		175mm (6.89")			
200mm	8"		190mm (7.48")			
250mm	10"	M22	220mm (8.66")		M22	22mm (0.87")
300mm	12"		245mm (9.65")			
350mm	14"		250mm (9.82")			
400mm	16"	M24	300mm (11.81")	45mm (1.77")	M24	24mm (0.94")

Dimension of Insert Bolt B

Nom. Size		Bolt (Minimum)				Nut	Washer
		1	L ₁	S ₁	S ₂		
400mm	16"	M24	120mm (4.72")	45mm (1.77")	27mm (1.06")	M24	24mm (0.94")

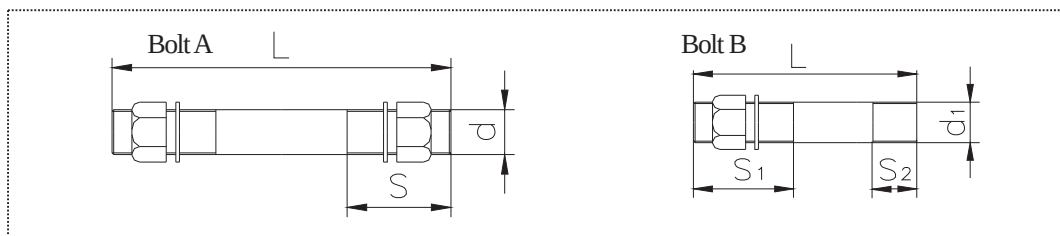
<ANSI Standard>

Dimension of Insert Bolt A

Nom. Size		Bolt (Minimum)			Nut	Washer
		d	L	S		
40mm	1 1/2"	5/8" - 11	125mm (4.92")	35mm (1.38")	5/8" - 11	5/8" Flat (0.63")
50mm	2"		125mm (4.92")			
65mm	2 1/2"		130mm (5.12")			
80mm	3"		130mm (5.12")			
100mm	4"		145mm (5.71")			
125mm	5"	3/4" - 10	165mm (6.50")	40mm (1.57")	3/4" - 10	3/4" Flat (0.79")
150mm	6"		175mm (6.89")			
200mm	8"		190mm (7.48")			
250mm	10"	7/8" - 9	220mm (8.66")		7/8" - 9	7/8" Flat (0.87")
300mm	12"		245mm (9.65")			
350mm	14"		250mm (9.82")			
400mm	16"	1" - 8	300mm (11.81")	45mm (1.77")	1" - 8	1" Flat (0.94")

Dimension of Insert Bolt B

Nom. Size		Bolt (Minimum)				Nut	Washer
		1	L ₁	S ₁	S ₂		
400mm	16"	1" - 8	120mm (4.72")	45mm (1.77")	27mm (1.06")	1" - 8	1" Flat (0.94")

**Caution**

The gasket is unnecessary. (The seat [3] carries out the role of the gasket.)

(6) Operating Procedure



Caution

The lever operation and the steering wheel operation are done by the hand.

- 1) Open and close the valve by turning handle smoothly.
Turn clockwise to close and counterclockwise to open.
- 2) In case of lever type (40-200 mm {1 1/2"-8"}), the direction of handle is same as the disc as shown in Fig. 6-1.
For the full-shut (Close) position, the handle is perpendicular to the piping axis direction.
For the full-opened position, the handle is parallel to the piping axis direction.

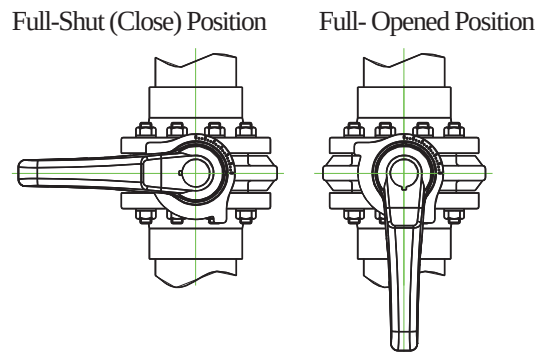


Fig. 6-1

- 3) In case of gear type (40-400 mm {1 1/2"-16"}), the indicator shows the position of the disc on the top of gear box. (Fig.6-2)
For the full-shut (close) position, the indication shows Shut (S).
For the full-opened position, the indication shows Open (O).

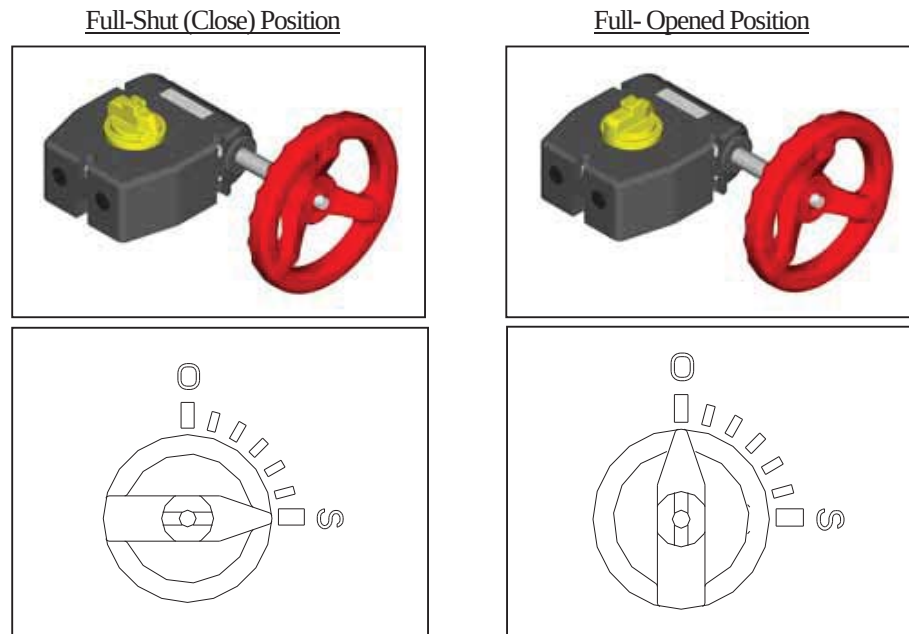


Fig. 6-2

Technical Data for Operation

Nom. Size	Stem Torque (N m)		Required Hand-Wheel Torque (N m)		Length of Lever and Diameter of Handle (mm)		Required Operating Force (N)	
	Peak	Seal	Peak	Seal	Lever	Gear	Lever	Gear
40mm (1 1/2")	5	5	0.4	0.4	220	80	23	5.0
50mm (2")	10	10	0.8	0.8	220	80	46	10
65mm (2 1/2")	15	15	1.2	1.2	220	80	68	15
80mm (3")	20	20	1.7	1.7	250	80	80	22
100mm (4")	30	30	2.5	2.5	250	80	120	32
125mm (5")	65	40	5.4	3.3	320	80	125	42
150mm (6")	85	65	7.0	5.4	320	80	205	68
200mm (8")	190	165	16	13	420	80	395	163
250mm (10")	300	250	25	21	-	80	-	263
300mm (12")	370	330	25	22	-	150	-	147
350mm (14")	420	400	28	27	-	150	-	180
400mm (16")	930	780	63	53	-	150	-	353

Note : Data mentioned in the table above is reference only.

These data are measured in standard condition and it slightly differs depending on conditions.

(7) Disassembly and Assembly Procedure for Parts Replacement

Necessary items

● Protective Gloves	● Vise	● Circular Stick (Plastic or Wood)
● Goggles	● Grease (Silicone)	● Pressing Machine
● Spanner Wrench	● Square Lumber	● Hammer
		● Screw Driver (+)
		● Screw Driver (-)



Caution

Wear protective gloves and goggles in case some dangerous fluid remains in the valve body.

(You might be injured by working without them.)

The handle part can be removed with line pressure present. The locking plate [22] can't be removed with line pressure present. If locking plate [22] needs to be removed, there can not be line pressure present.

<< Disassembly >>

Procedure

- 1) Drain fluid completely from the pipeline.
- 2) Leave the valve slightly opened.
- 3) Loosen the connecting bolts and nuts.
- 4) Remove the valve from the pipeline.

Lever Type <Nominal size 40mm-200mm (1 1/2"-8")>

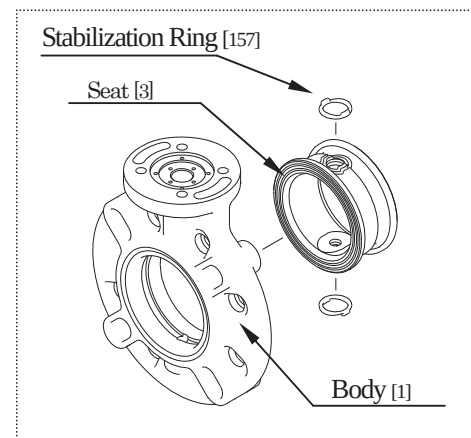
- 5) To remove handle[16], first take off the cap [24] by using screw driver (-) and release bolt [21] by using socket wrench, then pull up the handle [16] while holding handle lever[17].
- 6) To take off locking plate [22], release 4 self-tapping screws [23] by using screw driver(+) and take off stem holder[8].

Gear Type <Nominal size 40mm-400mm (1 1/2"-16")>

- 5) Loosen set bolt [28] for gear box [25] and pull off the gear box upward with gasket [158].
- 6) <Nominal size 40mm-350mm (1 1/2"-14") *It advances 400mm (16") as follows.>
To take off stem holder [8]. Release 4 tapping screws [157] by using screw driver (+).

Lever & Gear Type

- 7) Hold flat surface of Stem [7] with vise and pull off valve body[1].
- 8) (A) Set the valve body [1] on square lumbers at edges of valve body on the press and put a lumber on the disc[2].
Operate the press slowly and push disc [2] and seat [3] out of the valve body[1].
(B) Set the valve body [1] on square lumbers at edges of valve body and put a circular stick on the disc[2].
Strike the circular stick with a hammer and remove disc [2] and seat [3] out of the valve body[1].
- 9) Set the disc [2] parallel to the working desk to half opened position. Push the seat[3], and remove the disc[2].
- 10) <Nominal size 40mm-350mm (1 1/2"-14") *It advances 400mm (16") as follows.>
Remove the stabilization ring [156] and the O-ring(C) [6]from the stem[7].



<<Assembly>>

Procedure

- 1) Put the O-ring(C) [6] onto the stem[7].
- 2) Before starting assembly, grease (Silicone) should be spread on the top and bottom disc[2], the stem hole of the seat [3] and the stem O-ring(C)[6].
- 3) <Nominal size: 40mm-350mm(1 1/2"-14") *It advances 400mm (16") as follows.>
Insert the stabilization ring [156] into the upper side slot of the seat [3]. The upper side slot of seat [3] has larger stem hole than lower side.

**Caution**

Make certain tabs are properly aligned. Both upper and lower stabilization ring [156] are identical.

- 4) Insert the stem [7] about 1/3 into the body [1]. Install the seat [3] into the body [1] by aligning upper seat stem hole with the stem [7].
- 5) Collapse the left or right side of seat [3] in towards opposing side exposing lower stem hole by screw driver (-).
<Nominal size: 40mm-350mm(1 1/2"-14") *It advances 400mm (16") as follows.>
Install the stabilization ring [156] into the body [1] aligning tabs of ring with center groove of the body [1]. Seat [3] tabs should line up when bottom of seat is reset into body of valve.
- 6) Remove the stem [7].
- 7) Reset the seat [3] into the body [1].

**Caution**

<Nominal size: 40mm-350mm(1 1/2"-14") *It advances 400mm (16") as follows.>

Make certain stabilization rings [156] sit flush inside of seat [3] with tabs properly aligned. If stabilization rings [156] are not installed correctly, the seat [3] will not sit in the body [1] properly. This is indicated by a visible gap between seat [1] and body [1], and disc [2] will not fit properly.

- 8) To install disc [2], make certain valve size on disc [2] is in upright direction. Install top of disc [2] into seat [3] aligning with upper stem hole.
- 9) Rotate disc [2] to 75% (Approx.) closed position and install stem [7] about 50% into the body [1].
- 10) Press in bottom of disc [2] to lower stem hole.

**Caution**

Look into valve body [1] to be certain full square in disc [2] is centered with upper valve [1] stem hole. If not, repeat step 8), 9), and 10).

Make certain line scribed on top of stem [7] indicates disc [2] position while installing stem [7].

- 11) Install the stem [7] into valve body [1] and disc [2]. If disc [2] is properly aligned, stem [7] should slide in smoothly. If stem [7] does not slide in smoothly, report from step 8) to properly align the disc [2] in the valve body [1].
- 12) <Nominal size: 40mm-350mm(1 1/2"-14") *It advances 400mm (16") as follows.>
Install stem holder [8] onto valve body [1] with countersunk holes facing up using 4 screws [157].
- 13) To install lever or gear operator reverse disassembly procedure #5).
- 14) After assembly, make sure that the valve can be fully opened and closed smoothly.

(8) Installation procedure for handle

Necessary items

- Plastic Hammer
- Socket Wrench
- Screw Driver
- Goggles
- Protective Gloves



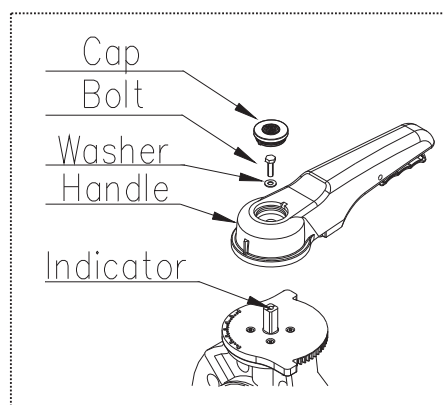
Caution

Do not give any unjust force to cap, in installing or removing the cap.
It can be damaged

Installation

Procedure

- 1) Install the handle on the stem. Set the direction of handle in the indication line at the top of stem.
- 2) Fix the handle at the top of stem with the attached bolts and washer by using socket wrench.
- 3) Set the convex part at the side of the cap and the concave of the handle, and set in the cap by striking lightly by using a plastic hammer.

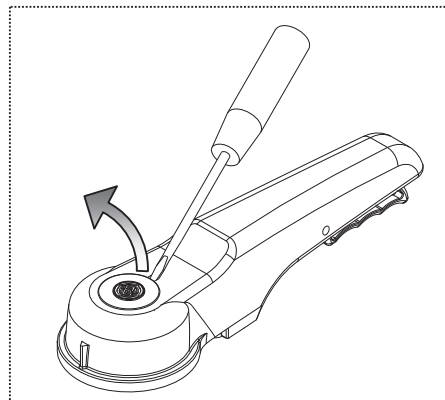


Nominal Size	40-100mm (1 1/2"-4")	125-200mm (5"-8")
Bolt Size	M6×15L	M8×15L
Socket Size	10	13

Remove

Procedure

- 1) To remove the cap, push up the side of the cap by using a screw driver
- 2) Loose the bolts and washer by using a socket wrench, then remove the handle.

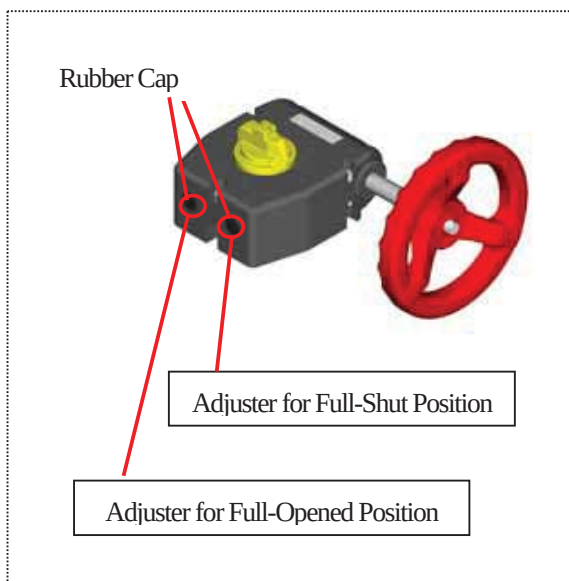


(9) Adjustment Procedure for Stopper Gear Type

Necessary Items

- Hexagon Wrench

The adjustments for full-opened and full-shut position are step-less, and it can be done with the stopper adjuster.



Adjustment for Full-shut (Full-opened) position

- 1) Remove the rubber cap of Full-closing (Full-opening) adjuster.
- 2) Loosen the first stopper hex-bolt completely by Hex. Wrench.
- 3) Adjust the disc of valve to required position.
- 4) Tighten the stopper hex-bolts.
- 5) Put the rubber cap of Full-closing (Full-opening) adjuster back on gearbox.

(10) Inspection Items

Inspect the following items.

(1)	Check for flaw, crack, or deformation on the valve.
(2)	Check for leaks to the outside.
(3)	Check for the deformation of seat due to improper installation of valve.
(4)	Check for the smoothness of handle operation..

(11) Troubleshooting

Phenomenon	Cause	Treatment
Fluid is not stopped in the full closed position at the seat.	1) The stopper is not set correctly. 2) The seat is damaged or worn. 3) Foreign materials are caught. 4) The disc is damaged or worn. 5) The connecting bolts are over tightened or tightened unevenly.	Adjust the stopper. Replace the seat. Clean it up. Replace the disc. Adjust and retighten.
Fluid leaks to the outside.	1) The seat is damaged or worn. 2) The connecting bolts are not tightened in proper torque or evenly.	Replace the seat. Adjust and retighten.
The handle does not work smoothly.	1) Foreign materials have adhered. 2) The gear box is damaged. 3) The connecting bolt is over tightened.	Clean it up. Repair or replace. Adjust and retighten.
Valve does not operate	1) The gear box is damaged 2) The stem is damaged.	Repair or replace. Replace the stem.

(12) Handling of Residual and Waste Materials



Caution

Make sure to consult waste treatment dealer to dispose valves.
 (Poisonous gas is generated when the valve is burned improperly.)

LEFT BLANK



MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL
AMARUQ WTP – NUNAVUT
VEOLIA PROJECT: 5000 218 009

CHEMLINE
SERIES E, ELECTRIC ACTUATOR

LEFT BLANK

PLUS

CE

Système sécurité
**FAIL
SAFE**
Security system

Positionnement
POSI
Positioning

3 Positions
GF3
3 Positions

10Nm
⇓
100Nm

Facteur de marche
50%
Duty rating

Indice de protection
IP66
Enclosure

Anti-condensation
intégrée

Integrated
anti-condensation



ER PLUS

ACTIONNEUR ÉLECTRIQUE

ELECTRIC ACTUATOR

ELEKTRISCHE STELLANTRIEBE

ACTUADOR ELÉCTRICO

DOCUMENTATION TECHNIQUE
MISE EN SERVICE

TECHNICAL LITERATURE
SET UP PROCEDURE

TECHNISCHE UNTERLAGEN
BETRIEBSANLEITUNG

DOCUMENTACIÓN TECNICA
PUESTA EN SERVICIO



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DESCRIPTION

Ces actionneurs électriques ont été conçus pour permettre le pilotage d'une vanne 1/4 tour. Pour tout autre application, nous consulter préalablement. Nous ne pouvons être tenus responsables en cas d'autre utilisation.

TRANSPORT ET STOCKAGE

- Les transporteurs étant responsables des avaries et des retards de livraison, les destinataires doivent émettre des réserves, le cas échéant, avant de prendre livraison des marchandises. Les envois directs d'usine sont soumis aux mêmes conditions.
- Le transport sur site est effectué dans un emballage rigide.
- Les produits doivent être stockés dans des endroits propres, secs et aérés, de préférence sur des palettes de manutention ou sur des étagères.

MAINTENANCE

- La maintenance est assurée par notre usine. Si le matériel ne fonctionne pas, vérifier le câblage suivant le schéma électrique et l'alimentation de l'actionneur électrique concerné.
- Pour toute question, prendre contact avec le service après-vente.
- Pour nettoyer l'extérieur de l'appareil, utiliser un chiffon (et de l'eau savonneuse).
NEPAS UTILISER D'AGENT A BASE DE SOLVANT OU D'ALCOOL

GARANTIE

- 100% des actionneurs ont été testés et réglés en usine.
- Ces produits sont garantis 2 ans ou 50000 manœuvres contre tous vices de fabrication et de matière, à partir de la date de livraison (facteur de service et classe du modèle suivant la norme CEI34).
- Cette garantie n'est valable que dans le cas où le matériel aura été, entre temps, ni démonté, ni réparé. Cette garantie ne s'étend pas à l'usure provoquée par suite de chocs ou maladresse, ainsi que par l'utilisation du matériel dans les conditions qui ne seraient pas conforme à ses caractéristiques. Cette garantie est strictement limitée au remplacement de la ou des pièces d'origines reconnues défectueuses, par nos services, après expertise. Les frais de port aller et retour, ainsi que la main d'œuvre, restent à la charge du client. Aucune responsabilité ne serait nous incomber au sujet des accidents ou risques directs ou indirects découlant d'une défectuosité de nos matériels. La garantie ne couvre pas les conséquences d'immobilisation et exclut tout versement d'indemnité. Les accessoires et adaptations ne sont pas couverts par cette garantie. Au cas où le client n'aurait pas réalisé ponctuellement les paiements stipulés aux échéances convenues, notre garantie sera suspendue jusqu'au paiement des échéances en retard et sans que cette suspension puisse augmenter la durée de la garantie à la mise à disposition.

RETOUR DE MARCHANDISE

- L'acheteur est tenu de vérifier au moment de la livraison la conformité de la marchandise par rapport à sa définition.
- L'acceptation par l'acheteur de la marchandise dégage le fournisseur de toute responsabilité, si l'acheteur découvre une non-conformité postérieurement à la date d'acceptation. Dans un tel cas, les frais de mise en conformité seront à la charge de l'acheteur qui supportera également seul, les conséquences financières du dommage. Les retours des marchandises sont acceptés que si nous les avons préalablement autorisés : ils doivent nous parvenir franco de tous frais à domicile et ne comporter que des produits dans leur emballage d'origine. Les marchandises rendues sont portées au crédit de l'acheteur, déduction faite des 20% de reprise du matériel calculé sur la base du montant initial des marchandises retournées.

CONSIGNES DE SECURITE



A lire avant toute installation du produit

- L'alimentation électrique doit être coupée avant toute intervention sur l'actionneur électrique (avant de démonter le capot ou de manipuler la commande manuelle de secours).
- Toute intervention doit être effectuée par un électricien qualifié ou une personne formée aux règles d'ingénierie électrique, de sécurité et tout autre directive applicable.
- Respecter impérativement l'ordre des consignes de raccordement et de mise en service décrites dans le manuel sans quoi le bon fonctionnement n'est plus garanti. Vérifier les indications portées sur la plaque d'identification de l'actionneur : elles doivent correspondre à votre réseau électrique d'alimentation.



- Ne pas monter l'actionneur « tête en bas ».

Risques encourus :

Disfonctionnement du mécanisme de débrayage

Possible écoulement de graisse sur la partie électronique

- Ne pas monter l'actionneur à moins de 30 cm d'une source de perturbations électromagnétiques

INSTRUCTIONS AND SECURITY

DESCRIPTION

These electric actuators have been designed to perform the control of a valve with 90° rotation. Please consult us for any different application. We cannot be held responsible if the mentioned actuators are used in contradiction to this advice.

TRANSPORT AND STORAGE

- The forwarding agents being held as responsible for damages and delays of the delivered goods, the consignees are obliged to express if applicable their reserves, prior to accept the goods. The goods delivered directly ex works are subject to the same conditions.
- The transport to the place of destination is carried out by using rigid packing material.
- The products must be stored in clean, dry, and ventilated places preferably on appropriate palettes or shelves.

MAINTENANCE

- Maintenance is ensured by our factory. If the supplied unit does not work, please check the wiring according to the electric diagram as well as the power supply of the concerned electric actuator.
- For any question, please contact our after-sales service.
- To clean the outside of the actuator, use a lint and soapy water.

DO NOT USE CLEANING PRODUCT WITH SOLVENT OR ALCOHOL

GUARANTEE

- 100% of the actuators are fully tested and set in the factory.
- These products are guaranteed two years from the delivery date or 50,000 operating cycles against all types of manufacturing and material faults (operating time and model class according to standard CEI34).
- This guarantee will only be valid if the unit has not been disassembled or self-repaired during its service life. It does not cover any wear and damage caused by shocks or faulty operation neither by the use of the unit under conditions not in accordance with its nominal characteristics. The guarantee is strictly limited to the replacement of original parts found defective on checking by our service personnel. The cost of shipping to our premises, the return of devices to the customer as well as the repair cost will be chargeable. We will not assume the responsibility for any direct or indirect accidents/risks originated by a failure of our products. The guarantee does not cover the consequences of breakdown and excludes any payments for indemnities. The accessories and adaptations are excluded from the guarantee. In the case where a customer has not proceeded to payments within the agreed period, our guarantee will be suspended until the delayed payments have been received and with the consequence that this suspension will not prolong the guarantee period in any case.

RETURN OF GOODS

- The customer is obliged to check the conformity of the goods with regard to their definition at the time of delivery.
- The acceptance of the goods by the purchaser disclaims the supplier of all responsibility if the purchaser discovers any non-conformity after the date of acceptance. In such case, the repair cost will be borne by the purchaser who will also exclusively bear all financial consequences of any resulting damage. Returned goods will only be accepted if our prior agreement has been given to this procedure : the goods must be sent free of all cost and being shipped solely and in their original packing. The returned goods will be credited to the purchaser with a reduction of 20% on the unit's price charged in accordance with the original invoice of the returned goods.

SAFETY INSTRUCTIONS



To be read prior to the installation of the product

- The electric power supply must be switched-off before any intervention on the electric actuator (i.e. prior demounting its cover or manipulating the manual override knob).
- Any intervention must only be carried out by a qualified electrician or other person instructed in accordance with the regulations of electric engineering, safety, and all other applicable directives.
- Strictly observe the wiring and set-up instructions as described in the manual: otherwise, the proper working of the actuator can not be guaranteed anymore. Verify that the indications given on the identification label of the actuator fully correspond to the characteristics of the electric supply.



- Do not mount the actuator « upside down ».

Risks:

Declutching mechanism failure

Possible flow of the grease on the electronic board

- Do not mount the actuator less than 30 cm of a electromagnetic disturbances source.

BESCHREIBUNG

Die elektrischen Stellantriebe wurden entwickelt, um Ventile mit Vierteldrehung zu steuern. Bitte ziehen Sie uns vor jeder anderen Verwendung zur Rate. Für jeglichen weitergehenden Einsatz können wir keine Verantwortung übernehmen.

TRANSPORT UND LAGERUNG

- Da die Spediteure für Schäden und Lieferverspätungen verantwortlich sind, müssen die Empfänger gegebenenfalls vor Annahme der Waren Vorbehalte äußern. Lieferungen direkt ab Werk unterliegen den gleichen Bedingungen.
- Der Transport vor Ort erfolgt in einer festen Verpackung.
- Die Lagerung muss an einem sauberen, gelüfteten und trockenen Ort erfolgen, bevorzugt auf Transportpaletten oder in Regalen.

WARTUNG

- Die Wartung wird in unserem Werk vorgenommen. Falls das Material nicht funktioniert, überprüfen Sie bitte die Kabelanschlüsse nach dem Schaltplan und die Stromzufuhr des betreffenden elektrischen Stellantriebes.
- Bei Fragen wenden Sie sich bitte an den Kundendienst.
- Verwenden Sie zur Außenreinigung des Antriebs ein Tuch und Seifenlösung.

BITTE NIE LÖSUNGSMITTEL ODER ALKOHOLHALTIGE MITTEL ZUR REINIGUNG BENUTZEN.

GARANTIE

- 100% der Stellantriebe werden im Werk geprüft und eingestellt.
- Die Produkte unterliegen einer Garantie von zwei Jahren oder 50000 Bedienvorgängen bezüglich allen Herstellungs- und Materialfehlern, vom Datum der Auslieferung an (Einschaltdauer und Modellklasse nach Norm CEI34).
- Diese Garantie tritt nur in Kraft, wenn die Ware zwischenzeitlich weder repariert noch zerlegt worden ist. Sie bezieht sich weder auf Verschleiß durch Stöße oder Fehlbedienung noch auf den Einsatz des Materials unter nicht geeigneten Bedingungen. Diese Garantie ist eingeschränkt auf den Ersatz des oder der Originalteile, die von uns nach Begutachtung als defekt anerkannt wurden. Die Frachtkosten für Hin- und Rückweg sowie der Arbeitslohn obliegen dem Kunden. Wir übernehmen keinerlei Verantwortung bezüglich Unfällen oder direkten oder indirekten Risiken, die sich aus einem Defekt unserer Waren ergeben. Die Garantie deckt die Folgen eines Stillstandes nicht ab und schließt jede Entschädigungszahlung aus. Zubehör und Umbauten fallen nicht unter die Garantie. Für den Fall, daß der Kunde zeitweise nicht den Zahlungen zu den vereinbarten Fälligkeiten nachgekommen ist, wird die Garantie bis zur Zahlung der verspäteten Fälligkeiten ausgesetzt, ohne daß diese Unterbrechung die Dauer der gewährleisteten Garantie verlängert.

RÜCKSENDUNG VON WAREN

- Der Käufer ist gehalten, bei Erhalt der Ware die Übereinstimmung mit den Vorgaben zu überprüfen.
- Die Annahme der Ware durch den Käufer befreit den Lieferanten von jeglicher Verantwortung, falls der Käufer eine Reklamation nach dem Zeitpunkt der Annahme feststellt. In einem solchen Fall obliegen dem Käufer allein die Kosten für die Beseitigung sowie die Folgekosten des Schadens. Warenrücksendungen werden nur angenommen, wenn wir sie zuvor genehmigt haben: sie müssen frei Haus, ohne jegliche Gebühren, an unseren Firmensitz geliefert werden und dürfen ausschliesslich originalverpackte Ware enthalten. Die zurückgesendeten Waren werden dem Käufer gutgeschrieben, abzüglich 20% Warenrücksendungspauschale, veranschlagt auf Grundlage des ursprünglichen Rechnungsbetrags der zurückgesandten Waren.

ANLEITUNG UND SICHERHEITSHINWEISE



Vor jeglicher Installation des Produktes zu lesen

- Die Stromzufuhr muss vor jeglichem Eingriff am elektrischen Stellantrieb unterbrochen werden (bevor die Haube abgenommen oder die Handnotbetätigung bedient wird).
- Jeglicher Eingriff darf nur von qualifizierten Elektrikern oder von nach den Regeln der Elektrotechnik, der Sicherheit und allen anderen anwendbaren Normen geschultem Personal vorgenommen werden.
- Beachten Sie unbedingt die Reihenfolge der Anweisungen zum Anschliessen und zur Inbetriebnahme, welche im Handbuch beschrieben werden, ansonsten wird die einwandfreie Funktion nicht gewährleistet. Überprüfen Sie die Angaben auf dem Typenschild des Stellantriebes : sie müssen Ihrer Stromversorgung entsprechen.



- Antrieb nie über Kopf einbauen

Risiken:

Störung der Kupplung des Antriebes

Mögliche Fettleckage auf die elektronische Karte

- Immer einen Mindestabstand von 30cm zu einer elektromagnetischen Störquelle einhalten .

INSTRUCCIONES Y SEGURIDAD

DESCRIPCIÓN

Estos actuadores eléctricos han sido concebidos para permitir el pilotaje de válvulas 1/4 de vuelta. Para otra aplicación, consultarnos. No podemos valorar responsabilidad en caso de otra utilización.

TRANSPORTE Y ALMACENAMIENTO

Al ser responsables los transportistas de averías y retrasos de entrega, los destinatarios deben emitir reservas, si llega el caso, antes de tomar entrega de las mercancías. Los envíos directos de fábrica están sometidos en las mismas condiciones.

- El transporte sobre sitio es efectuado en un embalaje rígido.
- Los productos deben ser almacenados en lugares limpios, secos y airados, preferentemente sobre paletas de manutención o sobre estanterías.

MANTENIMIENTO

- El mantenimiento es asegurado por nuestra fábrica. Si el material no funciona, verificar que el cableado, sigue el esquema eléctrico y la alimentación del actuador eléctrico concernido.
- Para toda pregunta, entrar en contacto con servicio posventa.
- Para limpiar el exterior del actuador, utilizar un trapo, y del agua jabonosa.

NO UTILIZAR PRODUCTO DE LIMPIEZA CON DISOLVENTE O ALCOHOL

GARANTÍA

- El 100% de los actuadores están sometidos a un testigo y vienen ajustados de fábrica.
- Este producto es garantizado 2 años o 50000 maniobras contra todo vicio de fabricación y de materia, a partir de la fecha de entrega (factor de servicio y clase del modelo, sigue la norma CEI34).
- Esta garantía es valida tan solo en caso de que el material habrá sido, entre tanto, ni desmontado, ni reparado. Esta garantía no se extiende al desgaste provocado por choques o torpeza, así como por la utilización del material en las condiciones que serian conformes a sus características. Esta garantía es estrictamente limitada a la sustitución de una o varias piezas de orígenes reconocidas defectuosas por nuestros servicios, después de someterlos a un control de expertos. Los gastos de transportes ida y vuelta así como la mano de obra, se quedan al cargo del cliente. Ninguna responsabilidad debe incumbirnos respeto a los accidentes o los riesgos directos o indirectos que emanarían de una defectuosidad de nuestros materiales. La garantía no cubre las consecuencias de inmovilización y excluye todo pago de indemnidad. Los accesorios y las adaptaciones no son cubiertos por esta garantía. En caso de que el cliente no habría realizado puntualmente los pagos estipulados a los vencimientos convencionales, nuestra garantía será suspendida hasta el pago de los vencimientos tardes y sin que esta suspensión pueda aumentar la duración de la garantía a la disposición.

DEVOLUCIÓN DE LA MERCANCÍA

- El comprador debe verificar al momento de la entrega la conformidad de la mercancía en relación a su definición.
- La aceptación por el comprador de la mercancía suelta al proveedor de toda responsabilidad; igual que si el comprador descubre una non conformidad posteriormente a la fecha de aceptación. En tal caso, los gastos de devolución para conformidad están a cargo del comprador que soportara también las consecuencias financieras del daño. Las devoluciones de las mercancías son aceptadas que si previamente las autorizamos: deben llegar sin cargo a nuestro domicilio y comportar solamente productos dentro sus embalajes de origen. Las mercancías devueltas son abonadas a cuenta del comprador, deducción hecha de 20% por devolución del material, calculado sobre el importe inicial de las mercancías a devueltas.

CONSEJOS DE SEGURIDAD



A leer antes de toda instalación del producto.

- La alimentación eléctrica debe ser cortada antes de toda intervención sobre el actuador eléctrico (antes de desmontar la tapa o de manipular el mando de socorro).
- Toda intervención debe ser efectuada por un electricista cualificado o una otra persona formada a las reglas de seguridad y otras directivas aplicables.
- Respetar obligatoriamente el orden de las consignas de conexión y de las puestas en marcha descritas en el manual al fin de garantizar el buen funcionamiento. Verificar las indicaciones puestas sobre la placa de identificación del actuador : deben corresponder a su red eléctrico de alimentación.



- No montar el actuador "cabeza de bajo"

Riesgos incurridos :

**Avería del mecanismo de desembrague
derrame Posible de grasa sobre la tarjeta electrónica**

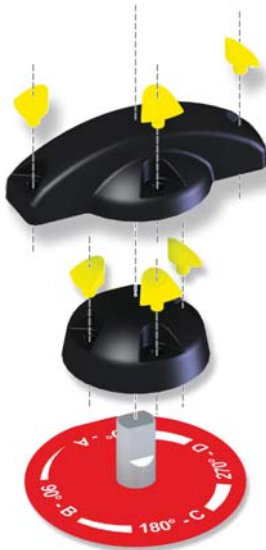
- No montar el actuador por menos de 30 cm de una fuente de perturbaciones electromagnéticas

Indicateur modulable, livré avec 5 repères de signalisation (3 jaunes + 2 noirs), à positionner en fonction du type de vanne à piloter.

Modular position indicator with three removable position markers (3 yellow + 2 black), adjustable according the type of valve to be actuated.

Stellungsanzeige mit 5 einstellbaren Markierungsknöpfen (3 gelbe + 2 schwarze), die je nach Armaturtyp zu positionnieren sind

Indicador modulable, entregado con 5 marcas de señalización (3 amarillos y 2 negros), a colocar con arreglo al tipo de válvula a maniobrar



poignée avec indicateur de position pour ER10/20

Handle with position indicator for ER10/20

Hebel mit integrierter Stellungsanzeige für ER10/20

puñado con indicador de posición para ER10/20

Indicateur de position pour ER35-60-100

Position indicator for ER35-60-100

Stellungsanzeige für ER35-60-100

Indicador de posición para ER35-60-100



Vanne 2 voies en position fermée

2 ways valve in closed position

2 Wege Armatur in Zu Stellung

Válvulas de 2 vías en position cerrada



Vanne 3 voies de type L

3 ways L type valve

3 Wege Ventil Typ „L“

Válvulas de 3 vías de tipo L

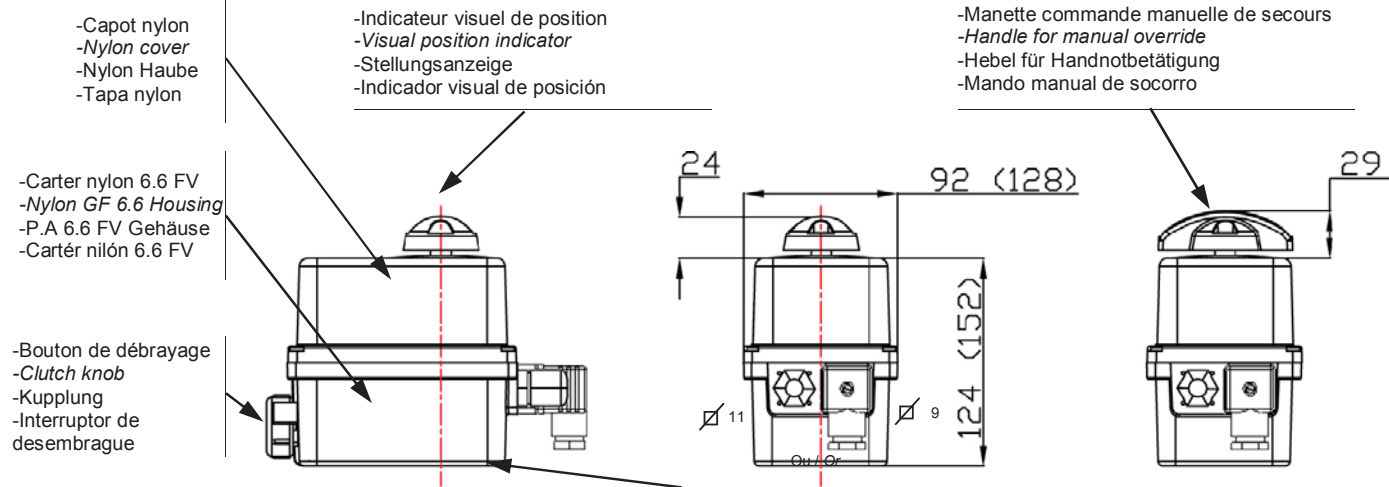


Vanne 3 voies de type T

3 ways T type valve

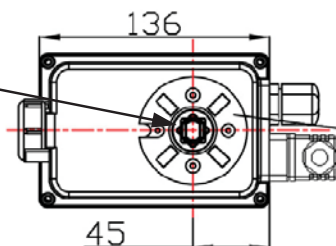
3 Wege Ventil Typ „T“

Válvulas de 3 vías de tipo T



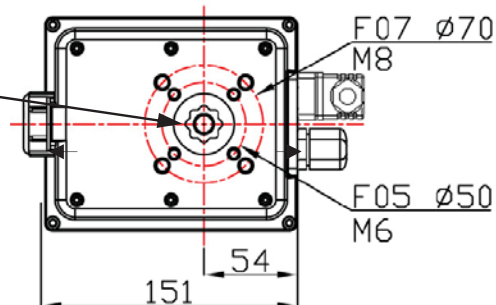
ER10/20

-Etoile / Star
-Stern / Estrella 14



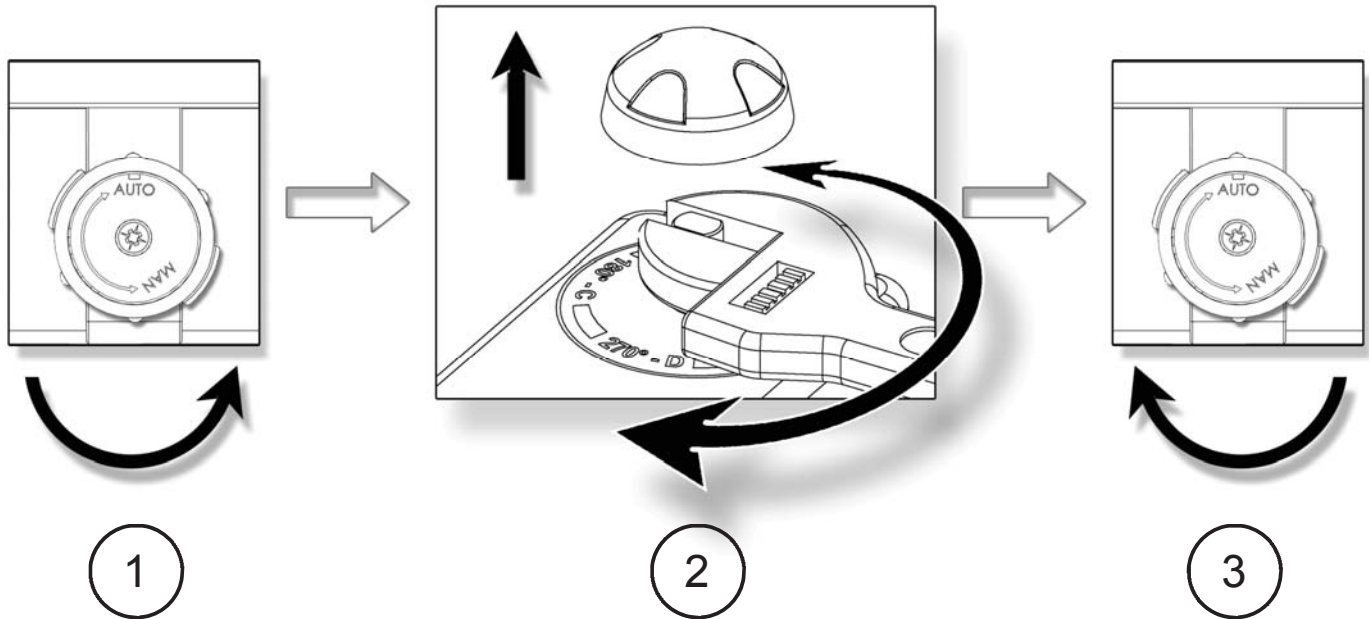
ER35/60/100

-Etoile 22
-Star 22
-Stern 22
-Estrella 22



Carré / Etoile	Profondeur
Square / Star drive nut	Depth
Vierkant / Stern	Tiefe
Cuadrado / Estrella	Profundidad
14	16
17	19
22	24

Fixation ISO F	Diamètre	Taraudé M	Profondeur	Nombre de vis
ISO F flange	Diameter	M threaded	Depth	Screws quantity
ISO F Anschluss	Diameter	M Gewinde	Tiefe	Anzahl der Schrauben
Fijación ISO F	Diámetro	Aterrajado M	Profundidad	Número de tornillos
F03	36	M5	14.2	4
F04	42	M5	14.2	4
F05	50	M6	14.2 / 16.4	4
F07	70	M8	16.4	4



L'actionneur fonctionne en priorité électrique. S'assurer que l'alimentation est coupée avant de le manœuvrer manuellement.

FR

1. Tourner le bouton de débrayage vers la position MAN (sens antihoraire) et le maintenir dans cette position.
2. Tourner l'axe sortant de l'actionneur à l'aide d'une clé à molette.
3. Pour revenir en position automatique, relâcher le bouton de débrayage (rappel par ressort).



The priority functioning mode of this actuator is electric. Be sure that the power supply is switched off before using the manual override.

GB

1. Turn the knob to position MAN (counter-clockwise) and hold it in position.
2. Turn the outgoing drive shaft of the actuator with the help of an adjusting spanner.
3. In order to re-engage the reduction, release the knob (spring return).



Die Priorität der Funktion des Antriebs ist Automatikbetrieb. Bitte prüfen, dass die Stromversorgung abgeschaltet ist bevor der Antrieb von Hand betätigt wird.

D

1. Stellen Sie den Schalter auf MAN (gegen den Uhrzeigersinn) um und halten Sie ihn in dieser Position.
2. Drehen Sie die Achse des Stellantriebes mit Hilfe eines Rollgabelschlüssels.
3. Um den Kraftschluss wiederherzustellen, lassen Sie den Kupplungsschalter los (federrückstellend).



El actuador funciona en prioridad eléctrica. Asegurarse que la alimentación es cortada antes de maniobrarlo manualmente.

ES

1. Girar el interruptor de desembrague hacia la posición MAN y mantenerlo en esta posición.
2. Girar el eje saliente del actuador con la ayuda de una llave inglesa.
3. Para reenganchar la reducción, relajar el interruptor de desembrague (retorno por muelles)

FR	BRANCHEMENTS ÉLECTRIQUES - INSTRUCTIONS	11
GB	ELECTRIC WIRING - INSTRUCTIONS	11
D	ELEKTRISCHE VERBINDUNG - INSTRUKTIONEN	12
ES	CONEXIONES ELÉCTRICAS - INSTRUCCIONES	12

FR	SCHÉMA ÉLECTRIQUE	13
GB	ELECTRIC WIRING	13
D	SCHALTPLAN.....	13
ES	ESQUEMA ELÉCTRICO	13

Symboles utilisés :



Danger : risque de choc électrique



Terre de protection



Tension continue



Tension alternative

- Le branchement à une prise de Terre est obligatoire au-delà de 42V suivant la norme en vigueur.
- L'actionneur étant branché en permanence, il doit être raccordé à un dispositif de sectionnement (interrupteur, disjoncteur), assurant la coupure d'alimentation de l'appareil.
- La température du bornier peut atteindre 90°C
- Pour une utilisation avec de grandes longueurs de câbles, le courant induit généré par les câbles ne doit pas dépasser 1mA
- Afin d'optimiser la sécurité des installations, le câblage du report défaut (D1 et D2) est fortement conseillé.

Used symbols :



Danger : risk of electric shock



Earth protection



Direct voltage



Alternating voltage

- As stipulated in the applicable regulation, the connection to earth contact is compulsory for devices with working voltages exceeding 42 V.
- The actuator is always powered, so it must be connected to a disconnection system (switch, circuit breaker) to ensure the actuator power cut.
- The terminal temperature can reach 90°C
- For a use with a long power supply wiring, the induction current generated by the wires mustn't be higher than 1mA
- To optimize the installation security, please connect the failure feedback signal (D1 and D2).

Verwendete Symbole :



Gefahr : Gefahr eines elektrischen Schlages



Schutzerdung



Gleichspannung



Wechselspannung

- Die Erdung ist nach der geltenden Norm bei über 42V vorgeschrieben.
- Der Antrieb ist dauerhaft unter Spannung, daher muß beim Anschluß ein Abschaltsystem (Leistungsschalter) vorgesehen werden um die Unterbrechung der Stromzufuhr zu gewährleisten.
- Die Terminal-Temperatur kann bis zu 90°C erreichen.
- Bei Verwendung einer langen Zuleitung für die Spannungsversorgung darf die Induktionsspannung der Leitung nicht größer als 1mA sein.
- Um die Sicherheit der Anlagen zu optimieren empfehlen wir die Verkabelung der Fehlermeldung (D1/D2 Stecker)

Símbolos utilizados:



Peligro: riesgo de choque eléctrico



Tierra de protección



Tensión continua



Tensión alternativa

- El enchufe a una toma de tierra es obligatorio más allá de 42V según la norma corriente.
- El actuador esta siempre conectado, debe ser empalmado a un dispositivo de seccionamiento (interruptor, disyuntor), asegurando la cortadura de alimentación del aparato.
- La temperatura del Terminal de conexión puede alcanzar 90°C
- Para una utilización con los grandes largo de cables, la corriente induce engendrado por los cables no debe adelantar 1mA
- Para optimizar la seguridad de las instalaciones, el cableado del señal de retorno de la información de defecto (D1 y D2) es aconsejado

**RESPECTER LES CONSIGNES DE SECURITE**

Nos presse-étoupe acceptent un câble de diamètre compris entre 7mm et 12mm.

- Retirer l'indicateur visuel, dévisser les 4 vis et retirer le capot.

CABLAGE DE L'ALIMENTATION ET DE LA COMMANDE

- Vérifier sur l'actionneur que la tension indiquée sur l'étiquette correspond à la tension du réseau.
- Connecter les fils sur le connecteur suivant le mode de pilotage souhaité. (Voir schémas p.13 ou p.22 pour les modèles POSI)
- Pour garantir le bon fonctionnement de la résistance anti-condensation, l'actionneur doit être alimenté en permanence

CABLAGE DE LA RECOPIE (Sauf POSI : p.21)

Nos actionneurs sont par défaut équipés de 2 contacts fins de course auxiliaires secs, soit normalement ouverts, soit normalement fermés (voir schéma électrique DSBL0436). Par défaut, la came blanche est utilisée pour détecter l'ouverture (FC1) et la came noire pour détecter la fermeture (FC2).

Les fins de courses auxiliaires doivent être connectés avec des câbles rigides. Si la tension appliquée est supérieure à 42V, l'utilisateur doit prévoir un fusible dans la ligne d'alimentation.

- Dévisser le presse-étoupe droit et passer le câble.
- Enlever 25mm de gaine et dénuder chaque fil de 8mm.
- Connecter les fils sur le bornier suivant le schéma p.13 (ou p.22 pour les modèles POSI) .
- Revisser le presse-étoupe (s'assurer du bon remontage de celui-ci afin de garantir une bonne étanchéité).

REGLAGE DES CONTACTS FINS DE COURSE

L'actionneur est pré-réglé en usine. Ne pas toucher les 2 comes inférieures sous peine de perturber le fonctionnement de l'actionneur voire d'endommager ce dernier.

- Pour ajuster la position des contacts auxiliaires, faire pivoter les 2 comes supérieures en utilisant la clé appropriée.
- Remonter le capot, visser les 4 vis et monter l'indicateur visuel.

**RESPECT SAFETY INSTRUCTIONS**

Our cable glands are designed for cables with a diameter between 7mm and 12mm.

- Remove the position indicator, unscrew the four screws and take off the cover.

SUPPLY AND CONTROL WIRING

- Ensure that the voltage indicated on the actuator ID label corresponds to the voltage supply.
- Connect the wires to the connector in accordance with the required control mode. (see diagram p.13 or p.22 for POSI models)
- To ensure the correct functioning of the anti condensation heater, the actuator must be always supplied

WIRING OF THE FEEDBACK SIGNAL (Except POSI: p.21)

Our actuators are equipped with two simple limit switch contacts normally set either in open position, either in closed position (see wiring diagram DSBA0436). As per factory setting, the white cam is used to detect the open position (FC1) and the black cam is used to detect the closed position (FC2).

The auxiliary limit switches must be connect with rigid wires. If the applied voltage is higher than 42V, the user must foresee a fuse in the power supply line.

- Unscrew the right cable gland and insert the cable.
- Remove 25mm of the cable sheath and strip each wire by 8mm.
- Connect the wires to the terminal strip in accordance with the diagram 13 (or p.22 for POSI models).
- Tighten the cable gland (Ensure that it's well mounted to guaranty the proofness).

SETTING OF END LIMIT SWITCHES

The actuator is pre-set in our factory. Do not touch the two lower cams in order to avoid any malfunctioning or even damage to the actuator.

- To adjust the position of the auxiliary contacts, make rotate the two superior cams by using the appropriate wrench.
- Re-mount the cover, fasten the four screws and attach the position indicator.



BEACHTEN SIE UNBEDINGT DIE SICHERHEIT ANWEISUNGEN

Unsere Kabelverschraubungen sind zulässig für Kabel mit einem Durchmesser zwischen 7mm und 12mm.

- Den Stellanzeiger abziehen, die vier Schrauben lösen und die Haube abnehmen.

VERKABELUNG DER STROMZUFUHR UND DER STEUERUNG

- Überprüfen Sie am Stellantrieb, daß die angegebene Spannung auf dem Typenschild der Spannung des Netzes entspricht.
- Schließen Sie die Drähte an der Verbindung an, je nach gewünschter Steuerungsart. (bitte siehe Schaltplan S.13 oder 23 für POSI)
- Die richtige Funktion der Heizwiderstände zu gewährleisten, muss der Antrieb immer mit Strom versorgt sein

VERKABELUNG DER RÜCKMELDUNG (außer den Modellen POSI: S.21)

Unsere Stellantriebe sind serienmäßig mit 2 einfachen Endschalterkontakten versehen, welche normalerweise geöffnet sind (NO). Gemäß Voreinstellung dient die weiße Nocke dazu, die Öffnung zu erfassen (FC1) und die schwarze Nocke, um das Schliessen zu erfassen (FC2).

- Die Klemmen "Kunde" müssen mit biegesteif Anschlusskabel verkabelt werden. Sollte die Spannung 42v überschritten, so muss vom Anwender eine Sicherung in der Stromzufuhr vorgesehen werden.

- Lösen Sie die Kabelverschraubung und führen Sie das Kabel durch.
- Entfernen Sie 25mm der Ummantelung und legen Sie jeden Draht auf 8mm frei.
- Schließen Sie die Drähte gemäß dem nebenstehenden Schaltplan an der Klemmleiste an. (siehe Schaltplan S.13 oder S.23 für POSI)
- Die Kabelverschraubung wieder festziehen.

EINSTELLUNG DER ENDSCHALTERKONTAKTE

Der Stellantrieb wird im Werk voreingestellt. Berühren Sie die beiden unteren Nocken nicht, da sonst die Funktion des Stellantriebes gestört oder letzterer sogar beschädigt werden kann.

- Um die Position der Hilfskontakte einzustellen, drehen Sie die beiden oberen Nocken unter Zuhilfenahme eines geeigneten Schlüssels.
- Die Haube wieder anbringen, die vier Schrauben anziehen und den Stellanzeiger aufstecken.



RESPETAR LAS CONSIGNAS DE SEGURIDAD

Nuestros prensas a estopa aceptan un cable de diámetro entre 7mm y 12mm.

- Quitar el indicador visual, destornillar los 4 tornillos y quitar la tapa.

CABLEADO DE LA ALIMENTACIÓN

- Verificar sobre el actuador que el voltaje indicado sobre la etiqueta corresponde al voltaje de la red.
- Conectar los cables sobre el conector siguiendo el modo de pilotaje deseado. (ver esquema p.13 o p.23 para los actuadores POSI)
- Para un buen funcionamiento de la resistencia anti-condensación, el actuador debe ser alimentado en permanencia

CABLEADO DE LA RECOPIA (salvo los modelos POSI : P.21)

Nuestros actuadores son equipados por defecto de 2 contactos de finales de carrera auxiliares secos normalmente abiertos o normalmente cerrados (Ver el esquema eléctrico DSBL0436). Por defecto, la leva blanca es utilizada para detectar la apertura (FC1) y la leva negra para detectar el cierre (FC2).

Los finales de carrera deben ser conectados con cables rígidos. Si la tensión aplicada es superiora a 42V, el usuario debe prever un fusible en la alimentación.

- Destornillar la prensa a estopa de derecho y pasar el cable .
- Quitar 25mm de tubo y desnudar cada cable de 8mm .
- Conectar los cables sobre el terminal según el esquema p.13 (o p.23 para los actuadores POSI)..
- Reatornillar la prensa-estopa correctamente para garantizar una buena hermeticidad

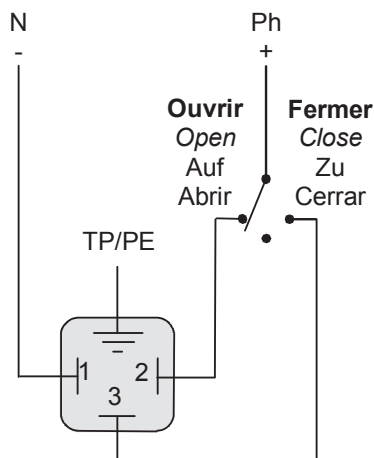
REGLAJE DE LOS CONTACTOS DE FINALES DE CARRERA

El actuador es preajustado en fábrica. No tocar las 2 levas inferiores so pena de perturbar el funcionamiento del actuador incluso de dañarlo .

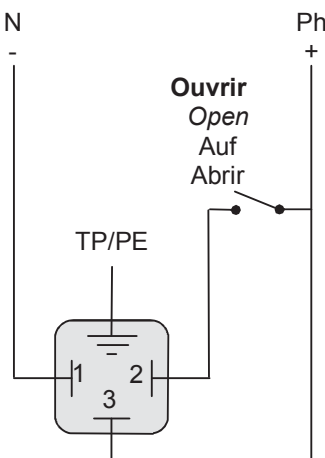
- Para ajustar la posición de los contactos auxiliares, hacer girar las 2 levas superiores utilizando la llave apropiada.
- Volver a montar la tapa, atornillar los 4 tornillos y montar el indicador visual .

CABLAGE CLIENT SUGGERE / SUGGESTED CUSTOMER WIRING
EMPFOHLENE VERDRAHTUNG / CABLEADO SUGERIDO CLIENTE

Mode 3 points modulants
3-points modulating mode
3-Punkt-Modus
Modo 3 puntos modulantes

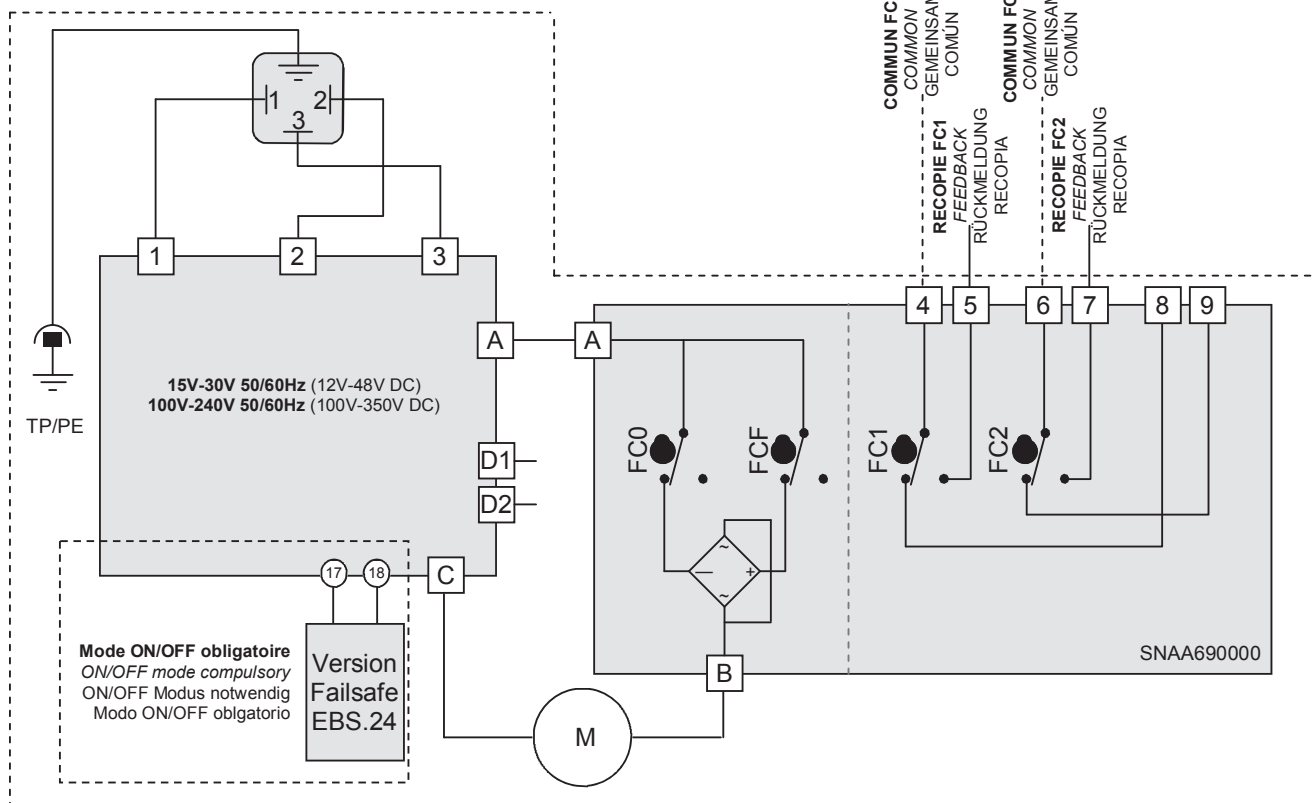


Mode Tout ou rien (ON/OFF)
On-Off mode
Auf-Zu Modus
Modo Todo o nada (ON-OFF),



REP	DESIGNATION / BESCHREIBUNG DESIGNACIÓN
FC0	Fin de course ouverture Open limit switch Endschalter AUF Final de carrera apertura
FCF	Fin de course fermeture Close limit switch Endschalter ZU Final de carrera cierre
FC1	Fin de course auxiliaire 1 Auxiliary limit switch 1 Zusätzlicher Endschalter 1 Final de carrera auxiliar 1
FC2	Fin de course auxiliaire 2 Auxiliary limit switch 2 Zusätzlicher Endschalter 2 Final de carrera auxiliar 2
D1/D2	Bornier report défaut (24V DC / 3A max) Failure report Terminal strip (24V DC / 3A max) Fehlermeldung Klemmleiste (24V DC / 3A max) Terminal retorno de defecto (24V DC / 3A max)

RECOPIE / FEEDBACK
RÜCKMELDUNG



- 1 — **COM**
- 2 — **OPEN : FCO**
- 3 — **CLOSE : FCF**

ALIMENTATION
POWER
SUPPLY
SPANNUNGSVER-
SORGUNG
ALIMENTACIÓN

- 4 — **COM**
- 5 — **OPEN(NO) : FC1**
- 6 — **COM**
- 7 — **CLOSE(NO) : FC2**
- 8 — **OPEN(NC) : FC1**
- 9 — **CLOSE(NC) : FC2**

FINS DE COURSE
LIMIT SWITCH
OUTPUT
RÜCKMELDUNG
RECOPIA

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

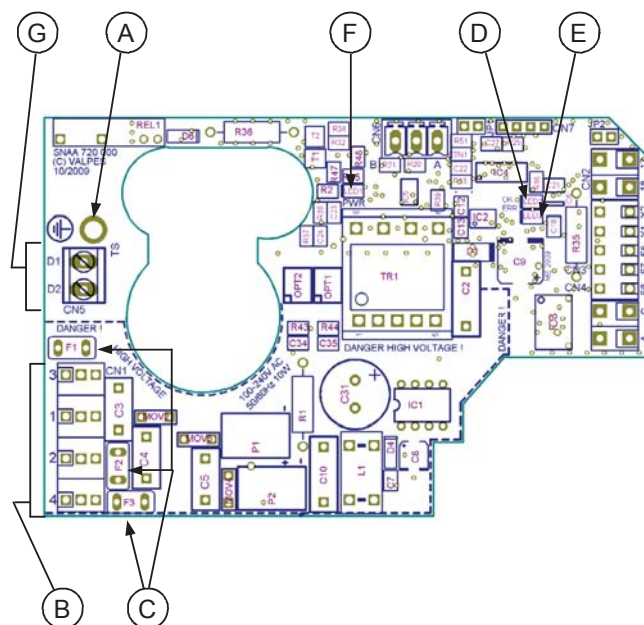
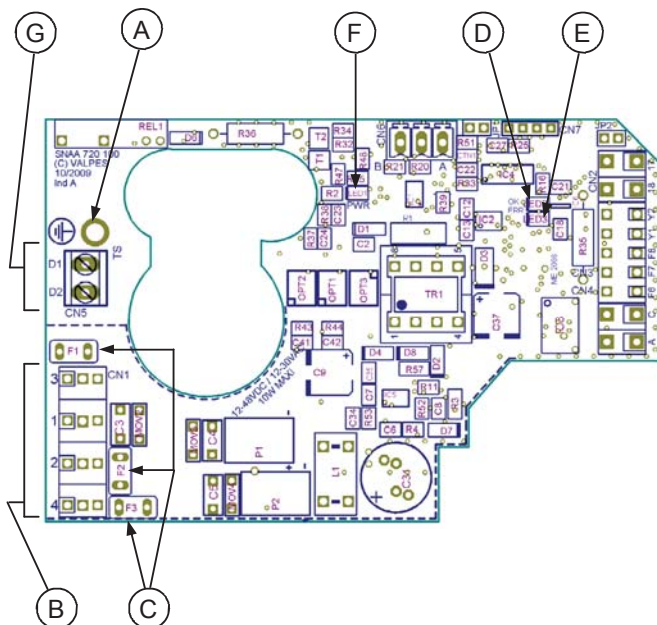


DSBL0436

Cartes d'alimentation et commande pour ER 10-20-35 / Pilot and power supply cards for ER 10-20-35
Steuerung und Stromversorgung Karten für ER 10-20-35 / Tarjetas de alimentación y mando para ER 10-20-35

SNA720100
15V-30V 50/60Hz (12V-48V DC)

SNA720000
100V-240V 50/60Hz (100V-350V DC)



Rep.	Désignation	Designation	Bezeichnung	Designación
A	Vis de terre	Earth screw	Erde Schraube	Tornillo de tierra
B	Bornier alimentation et commande	Pilot and power supply terminal strip	Steuerung und Stromversorgung Verbindung	Terminal de alimentación y mando
C*	Fusibles protection carte	Card protection fuses	Karte Sicherung	Fusibles de protección de la tarjeta
D	LED 2 : microprocesseur ok	LED 2 : microprocessor ok	LED 2 : Mikroprozessor ok	Diodo 2 : microprocesador ok
E**	LED 3 : défaut détecté	LED 3 : detected failure	LED 3 : Aufgespürter Fehler	Diodo 3 : Defecto detectado
F	LED 1 : présence tension	LED 1 : power presence	LED 1 : Spannungsanwesenheit	Diodo 1 : Presencia de tensión
G	Bornier report défaut (24V DC - 3A max)	Failure report Terminal strip (24V DC - 3A max)	Fehlermeldung Klemmleiste (24V DC - 3A max)	Terminal retorno de defecto (24V DC - 3A max)

* **Fusibles pour carte multi-tensions / Fuses for multivolt card / Sicherung für Multispannung Karte :**
- Carte / Card / Karte **SNA720100** : 2A / T 250V (Multicomp MST 2A 250V)
- Carte / Card / Karte **SNA720000** : 500mA / T 250V (Multicomp MST500MA 250V)

** **Défauts possibles : limitation de courant, limitation thermique ou erreur programme**
=> vérifier que le couple de la vanne n'est pas supérieur au couple maximum fourni par l'actionneur
=> vérifier que l'actionneur ne dépasse pas la durée sous tension donnée (surchauffe possible)
Pour redémarrer l'actionneur, inverser le sens de marche ou l'éteindre et le remettre sous tension.

Possible defects : limitation of current, thermic limitation or program error
=> check that the valve torque is not superior to the maximum torque stand by the actuator
=> check that the actuator do not exceed the duty cycle indicated (possible overheat)
To re-start the actuator, reverse the sense of rotation or switch the power off and on.

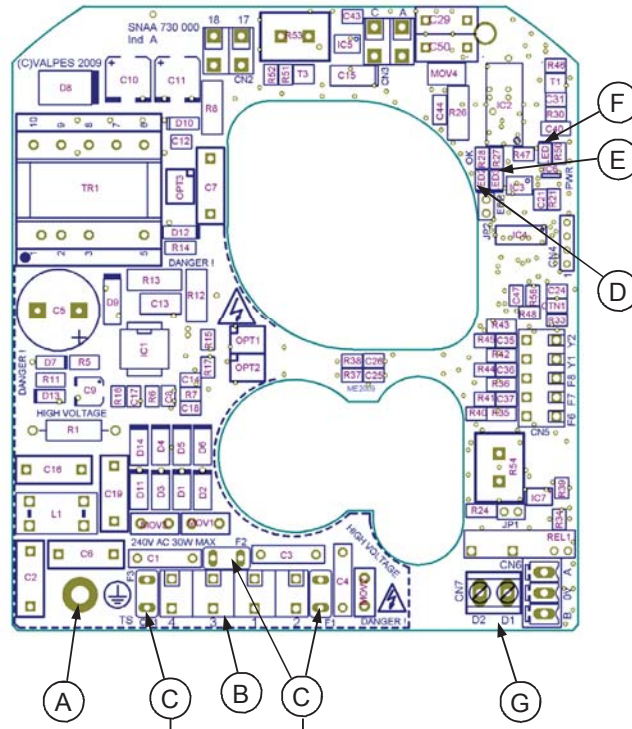
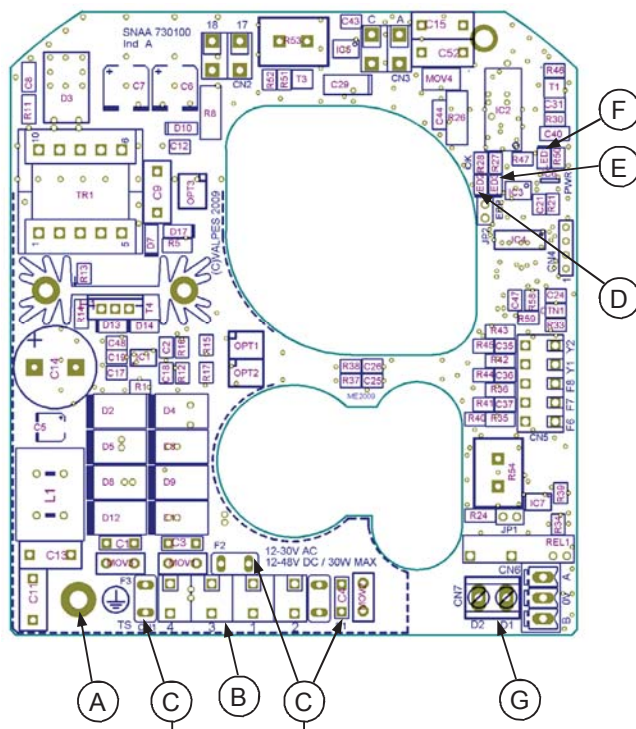
Mögliche Fehler : Strombegrenzung, thermische Begrenzung oder Programmfehler
=> Überprüfen sie das Drehmoment von dem Ventil
=> Überprüfen sie das die Einschaltdauer nicht grober als spezifiziert in die technischen Daten von den Antrieb ist
Um die Antrieb neue zu starten, muss man den Drehrichtung auswechseln oder die Spannung Auf/Zu Umschalten.

Defectos posibles : limitación de corriente, limitación térmica o error del programa
=> comprobar que el par de la valvula no es superior al par máxima soportado por el actuador
=> comprobar que el actuador no adelanta el tiempo bajo tensión dado (recalentamiento posible)
Para arrancar de nuevo el actuador, invertir la dirección del funcionamiento o apagarlo y ponerlo bajo tensión.

Cartes d'alimentation et commande pour ER 35-60-100 / Pilot and power supply cards for ER 35-60-100
Steuerung und Stromversorgung Karten für ER 35-60-100 / Tarjetas de alimentación y mando para ER 35-60-100

SNA730100
15V-30V 50/60Hz (12V-48V DC)

SNA730000
100V-240V 50/60Hz (100V-350V DC)



Rep.	Désignation	Designation	Bezeichnung	Designación
A	Vis de terre	Earth screw	Erde Schraube	Tornillo de tierra
B	Bornier alimentation et commande	Pilot and power supply terminal strip	Steuerung und Stromversorgung Verbindung	Terminal de alimentación y mando
C*	Fusibles protection carte	Card protection fuses	Karte Sicherung	Fusibles de protección de la tarjeta
D	LED 2 : microprocesseur ok	LED 2 : microprocessor ok	LED 2 : Mikroprozessor ok	Diodo 2 : microprocesador ok
E**	LED 3 : défaut détecté	LED 3 : detected failure	LED 3 : Aufgespürter Fehler	Diodo 3 : Defecto detectado
F	LED 1 : présence tension	LED 1 : power presence	LED 1 : Spannungsanwesenheit	Diodo 1 : Presencia de tensión
G	Bornier report défaut (24V DC - 3A max)	Failure report Terminal strip (24V DC - 3A max)	Fehlermeldung Klemmleiste (24V DC - 3A max)	Terminal retorno de defecto (24V DC - 3A max)

* Fusibles pour carte multi-tensions / Fuses for multivolt card / Sicherung für Multispannung Karte :
- Carte / Card / Karte SNA730100 : 5A / T 125V (Littelfuse 39615000000)
- Carte / Card / Karte SNA730000 : 3,15A / T 250V (Multicomp MST 3,15A 250V)

** Défaits possibles : limitation de courant, limitation thermique ou erreur programme
=> vérifier que le couple de la vanne n'est pas supérieur au couple maximum fourni par l'actionneur
=> vérifier que l'actionneur ne dépasse pas la durée sous tension donnée (surchauffe possible)
Pour redémarrer l'actionneur, inverser le sens de marche ou l'éteindre et le remettre sous tension.

Possible defects : limitation of current, thermic limitation or program error
=> check that the valve torque is not superior to the maximum torque stand by the actuator
=> check that the actuator do not exceed the duty cycle indicated (possible overhear)
To re-start the actuator, reverse the sense of rotation or switch the power off and on.

Mögliche Fehler : Strombegrenzung, thermische Begrenzung oder Programmfehler
=> Überprüfen sie das Drehmoment von dem Ventil
=> Überprüfen sie das die Einschaltdauer nicht grober als spezifiziert in die technischen Daten von den Antrieb ist
Um die Antrieb neue zu starten, muss man den Drehrichtung auswechseln oder die Spannung Auf/Zu Umschalten.

Defectos posibles : limitación de corriente, limitación térmica o error del programa
=> comprobar que el par de la valvula no es superior al par máxima soportado por el actuador
=> comprobar que el actuador no adelanta el tiempo bajo tensión dado (recalentamiento posible)
Para arrancar de nuevo el actuador, invertir la dirección del funcionamiento o apagarlo y ponerlo bajo tensión.

FAILSAFE - Description et caractéristiques

FAILSAFE - Description and specifications.....	15	15
FAILSAFE - Beschreibung und Eigenschaften.....	15	
FAILSAFE - Descripción y características	15	

FAILSAFE - Schéma électrique

FAILSAFE - Electric wiring	16	16
FAILSAFE - Schaltplan.....	16	
FAILSAFE - Esquema eléctrico	16	

Actionneurs avec système de sécurité intégré (mode Tout ou Rien obligatoire)

Actuator with failsafe integrated security system (ON/OFF mode compulsory)

Stellantriebe mit Sicherheitsblock (AUF/ZU Modus notwendig)

Actuadores con sistema de seguridad (Modo ON/OFF obligatorio)

Le modèle failsafe intègre un bloc batterie de secours piloté par une carte électronique. Sa fonction est de prendre le relais en cas de coupure d'alimentation aux bornes 1, 2 et 3 de l'actionneur. Le modèle failsafe peut être configuré en normalement ouvert (NO) ou normalement Fermé (NF) selon l'application client.

La carte pilotant la batterie gère le cycle de charge et vérifie l'état de la batterie. Si un défaut est détecté au niveau de la batterie, un contact sec entre les bornes 65 et 66 s'ouvre. Si ce contact est relayé par le client il a ainsi la possibilité de détecter un défaut sans ouvrir l'actionneur et de prévoir le remplacement de la batterie.

Le modèle failsafe fonctionne en câblage ON/OFF.

Un autre schéma de câblage est possible en utilisant les bornes 1, 2, 3 et 65, 66, l'avantage de ce câblage est que le pilotage moteur n'est autorisé que lorsque le contact entre 65 et 66 est fermé et donc le bloc batterie en état de marche.

Failsafe option integrate battery pack monitored by electronic board in the actuator. Its function is to relay in case of power supply failure on terminal PIN 1,2 and 3 of the actuator. The fail safe option could be set on different position like normally open (NO) or normally close (NC) depends on customer application.

The electronic board monitors the battery pack and check the status of battery (cycle load and failure)

If a battery failure is detected, a contact on PIN 65 and 66 switch off. If customer use this contact he could be aware that there is a failure on battery in the actuator without remove cover and plan the replacement.

Fail safe option required ON/OFF mode.

An another wiring diagram is also available using terminal PIN 1, 2, 3 and 65, 66. The advantage of it is actuator could not ne derive if failure battery pack is detected

FAILSAFE-Modelle beinhalten einen Batteriesatz, der von der elektronischen Karte im Antrieb gesteuert wird. Seine Aufgabe ist, einen Spannungsausfall an Klemme 1,2 und 3 zu überbrücken. Die FAILSAFE-Position kann zwischen ÖFFNER (NC) oder SCHLIESSER (NO) abhängig vom Verwendungszweck frei gewählt werden.

Die elektronische Karte prüft stets den Batteriesatz (Ladezustand bzw. Ausfall). Wenn ein Batterieausfall erkannt wird, kann dieser über einen an Klemme 65 und 66 angelegten Schaltkreis signalisiert werden. Somit kann der Anwender den Zustand der Batterie überwachen, ohne den Antriebsdeckel entfernen zu müssen.

Die FAILSAFE-Option ist sowohl im AUF/ZU-Modus als auch im 3-Punkt-Modulier-Modus verwendbar.

Durch Spannungsversorgung an Klemme 1, 2, 3 über Klemme 65 und 66 kann sichergestellt werden, daß der Antrieb bei schlechtem Batteriezustand nicht mehr die Sicherheitsposition verlässt.

El modelo failsafe integra un bloque de baterías de seguridad, pilotado por una tarjeta electrónica. Su función es de tomar el relevo en caso de apagón a los conectadores 1, 2 y 3 del actuador. El modelo failsafe puede ser configurado en normalmente abierto (NO) o normalmente cerrado (NF), según la utilización del cliente.

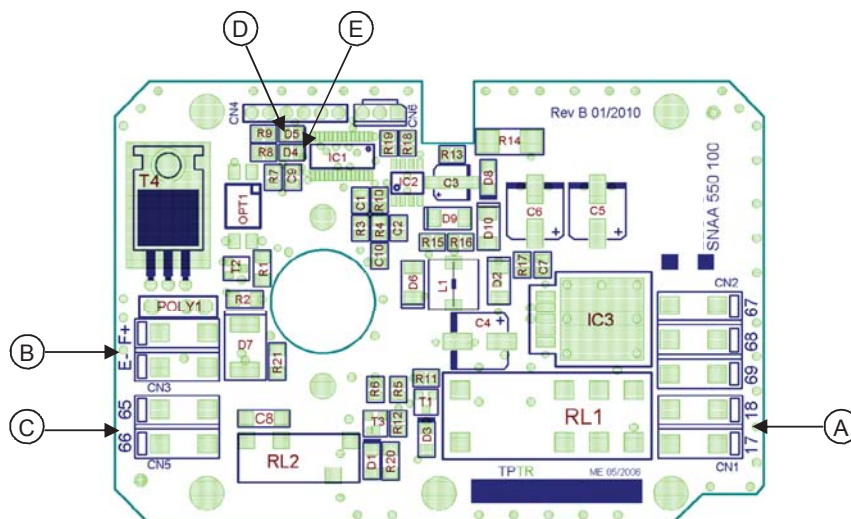
La tarjeta comprueba el ciclo de carga y el estado de la batería. Si un defecto es detectado al nivel de la batería, un contacto seco entre los conectadores 65 y 66 se abre. Si este contacto es utilizado, el cliente tiene la posibilidad de detectar un defecto sin abrir el actuador y así prever el reemplazo de la batería.

El modelo failsafe funciona con el modo ON/OFF.

Un otro tipo de cableado es posible utilizando los conectadores 1, 2, 3 y 65, 66, la ventaja de este cableado es que el pilotaje del motor es autorizado solamente cuando el contacto entre 65 y 66 es cerrado, luego, que el bloque de baterías en estado de funcionamiento.

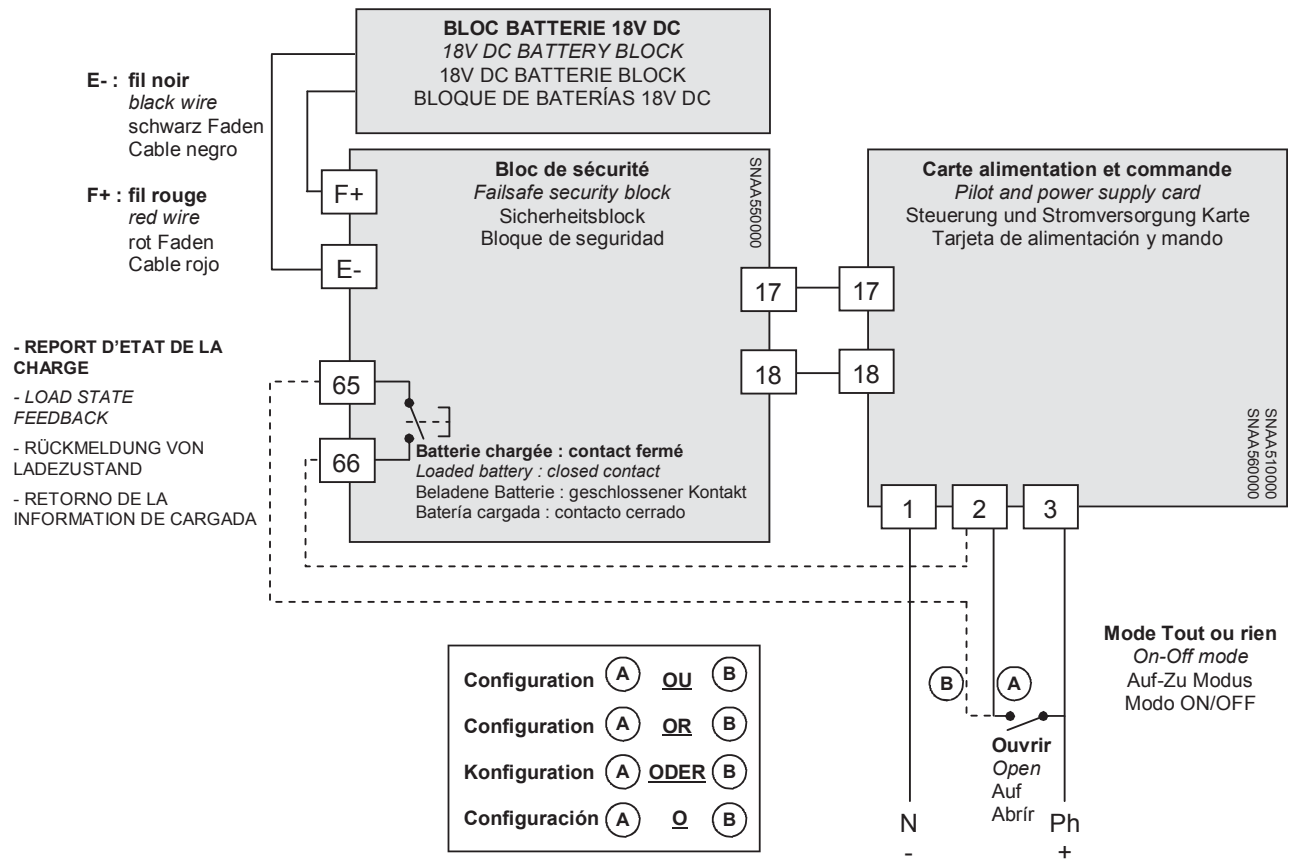
Tension / Voltage / Spannung / Voltaje	18V DC
Courant nominal / Nominal current / Nennstrom / Corriente nominal	0,8A
Courant maximal / Maximal current / Max. Strom / Corriente máximo	2,4A
Durée initiale de charge / Initial loading time / Ladezeit / Duración de carga	14h max
Relais de report d'état de la charge / Load state feedback relay Rückmelderelais für Ladezustand /	24V DC - 1A max
Température / Temperature / Temperatur / Temperatura	-10°C à/to/bis/a 40°C

CARTE ELECTRONIQUE CHARGEUR / LOADING ELECTRONIC CARD
 LOADER ELECTRONISCHE KARTE / TARJETA ELÉCTRICA CARGADORA



Rep.	Désignation	Designation	Bezeichnung	Designación
A	Connecteur 18V DC	18V DC terminal strip	18V DC Verbindung	Conector 18V DC
B	Connecteur bloc batterie	Block battery terminal strip	Batterie Block Verbindung	Conector de las baterías
C	Connecteur report d'état (défaut de charge/batterie)	State feedback terminal strip (load or battery failure)	Verbindung für Rückmeldung (Ladezustand bzw. Ausfall)	Conector del retorno de information (
D*	LED verte	Green LED	Grüne LED	LED verde
E**	LED rouge	Red LED	Rote LED	LED rojo

- * **LED verte allumée : fonctionnement sur réseau / LED verte clignotante : fonctionnement sur batteries (max. 3min)**
 Green LED lighting : functioning on network / Green LED twinkling : functioning on battery (max. 3min)
 Grüne LED leuchtet auf : Betrieb auf Netz / Grüne LED blinkt auf : Betrieb auf Batterie (max. 3min)
 LED verde enciendo : funcionamiento conectado sobre el red eléctrico / LED verde parpadeo : funcionamiento con baterías (max. 3min)
- ** **LED rouge éteinte : batteries chargées / LED rouge clignotante : batteries en charge (max. 14h)**
 Red LED switched off : loaded battery / Red LED twinkling : battery loading (max. 14h)
 Rote LED leuchtet auf : beladene Batterie / Rote LED blinkt auf : Batterie beladet (max. 14h)
 LED rojo apagado : baterías cargadas / LED rojo parpadeo : baterías se cargan (max. 14h)



Fermé par défaut / Pre-set to closed / Voreinstellung geschlossen / Cerrado por defecto

Configuration A ou B :

A- Mode standard : en cas de pilotage de l'actionneur avec un automate, le report d'état de la charge peut être connecté à celui-ci pour plus de sécurité.

B- Mode de sécurité totale (en utilisant le relais de report d'état, bornes 65 et 66) : l'actionneur n'ouvrira la vanne que si le bloc de sécurité est opérationnel (charge suffisante, carte initialisée).

Configuration A or B :

A- Standard mode : when piloting the actuator with an automat (PLC), the load state feedback can be connected to it for more safety.

B- Total security mode (using the feedback relay, terminals 65 and 66) : the actuator will open only if the security block is operational (sufficient loading, initialized card).

Konfiguration A oder B :

A- Standard Modus : Im Falle der Steuerung des Antrieb mit einer Automat kann der Rückmeldung des Batteriesladung an diesen hier für Sicherheit angeschlossen sein.

B- Total Sicherheit Modus (mit benutzung des Rückmeldungsrelais, Klemmen 65 und 66) : der Antrieb wird den Hahn nur öffnen wenn das Sicherheitsblock geladen ist (gemügenede Ladung, initialisierte Karte).

Configuración A o B :

A - Modo estándar : en caso de un pilotaje del actuador con un automático, el retorno de la información de carga puede ser conectado a éste para más de seguridad.

B - Moda de seguridad total (utilizando el relé de retorno de estado, conectadores 65 y 66): el actuador abrirá la válvula solamente si el bloque de seguridad es operativo (carga suficiente, tarjeta inicializada).

POSI - Carte électronique

<i>POSI - Electronic card</i>	18	18
<i>POSI - Elektronische Karte</i>	18	
<i>POSI - Tarjeta electrónica</i>	18	

POSI - Branchements électriques

<i>POSI - Electric connections</i>	19	19
<i>POSI - Elektrische Verbindung</i>	19	
<i>POSI - Conexiones eléctricas</i>	19	

POSI - Schéma électrique

<i>POSI - Electric wiring</i>	20	20
<i>POSI - Schaltplan</i>	21	
<i>POSI - Esquema eléctrico</i>	21	

POSI - Séquence de paramétrage

<i>POSI - Parameter selection sequence</i>	23	22
<i>POSI - Parametrisierungsschritte</i>	24	
<i>POSI - Secuencia de reglaje</i>	25	

Différents types de consigne (pilotage carte Bornier N°15 et N°16)

Nos cartes sont paramétrables en usine sur demande. Le signal de commande (consigne) et signal de recopie peuvent être de nature différente (courant ou tension). **Sans aucune information du client les cartes sont paramétrées en courant 4-20mA (consigne+recopie client)**

Pilotage en 0-10V et 0-20mA :

Lors d'un événement extérieur, absence de consigne (coupure accidentelle câble par ex) mais en présence de l'alimentation carte.

La convention veut que l'actionneur se retrouve en une position définie (vanne ouverte ou fermée). En standard nos actionneurs se fermeront en absence de consigne, mais d'autres états sont possibles sur demande

Pilotage en 4-20mA.

La convention veut que l'actionneur reste dans sa position lors de la coupure de la consigne (coupure accidentelle câble par ex) mais en présence de l'alimentation carte.

Lors du rétablissement de la consigne l'actionneur se repositionne automatiquement selon la valeur de la consigne

Various control types (control signal on terminals N°15 and N°16)

On request, our cards can be set in factory. The consign and the feedback signal can have different forms (current or voltage).

Without any information from the customer, the cards are set for current 4-20mA (control + feedback signal)

Control in modes 0-10V and 0-20mA

In case of outside event, absence of control signal (accidental wires cut for example) but in presence of power, the actuator will travel to defined position (open or closed valve).

In standard our actuators will close themselves in absence of control signal but there are other possibilities on request.

Control in mode 4-20mA

In case of outside event, absence of control signal (accidental wires cut for example) but in presence of power, the actuator will stay in its position.

In the both cases, when the control signal is restored, the actuator reach automatically the position corresponding to control signal value.

Verschiedene Steuersignale (über Anschlüsse 15 und 16)

Unsere Karten können nach Bedarf parametrierbar werden. Ein- und Ausgangssignal können dabei unabhängig voneinander gewählt werden (Strom- oder Spannungssignal). **Standardmäßige Voreinstellung ist 4-20mA für Ein- und Ausgangssignal.**

Ansteuerung mit 0-10V oder 0-20mA:

Bei Ausfall des Steuersignals (z.B. Kabelbruch) aber Aufrechterhaltung der Spannungsversorgung fährt der Antrieb in die voreingestellte Sicherheitsposition (Auf oder Zu). **Standardmäßige Voreinstellung ist « Schliesser ».**

Ansteuerung mit 4-20mA:

Bei Ausfall des Steuersignals (z.B. Kabelbruch) aber Aufrechterhaltung der Spannungsversorgung verharrt der Antrieb in seiner letzten Position. In beiden Fällen fährt der Antrieb automatisch in die dem Steuersignal entsprechende Position, sobald es wieder anliegt.

Diferentes tipos de mando – Bornes N°15 y N°16)

Nuestras tarjetas, a petición, pueden ser parametrizadas en fábrica. El señal de mando y el señal de recopia pueden ser de tipos diferentes, corriente o tensión. **Sin ninguna información del cliente las tarjetas son parametrizadas en el modo corriente 4-20mA (mando + recopia cliente)**

Pilotaje en 0-10V y 0-20mA :

En el caso de un acontecimiento exterior, ausencia de mando (corte accidental del cableado por ejemplo) pero en presencia de la alimentación de la tarjeta, el actuador coloca la válvula en una posición definida (válvula abierta o cerrada).

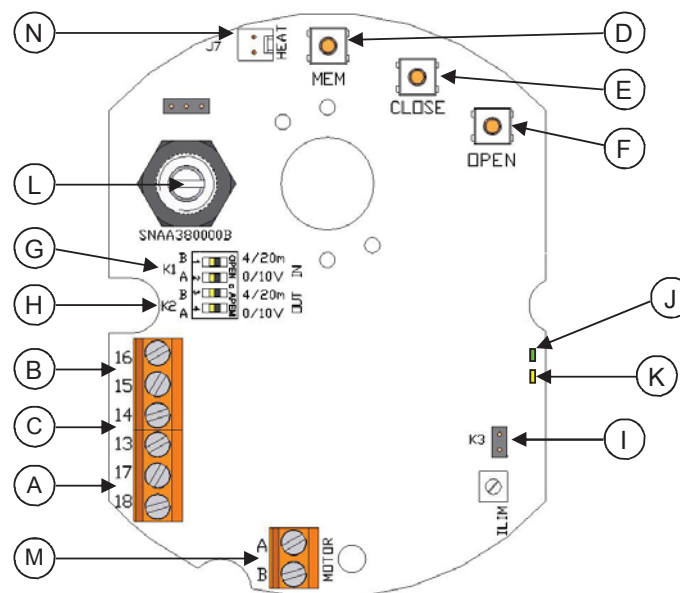
Por defecto, nuestros actuador se cerrarán en ausencia de mando pero otras posibilidades son posibles a petición.

Pilotaje en 4-20mA.

En el caso de un acontecimiento exterior, ausencia de mando (corte accidental del cableado por ejemplo) pero en presencia de la alimentación de la tarjeta, el actuador se queda en la misma posición.

Cuando se restablece el mando, el actuador se repositiona automáticamente según el valor del mando

Carte de positionnement P6 (0-20mA / 4-20mA / 0-10V)
P6 positioning card (0-20mA / 4-20mA / 0-10V)
P6 Regelkarte (0-20mA / 4-20mA / 0-10V)
Tarjeta de posicionamiento P6 (0-20mA / 4-20mA / 0-10V)



Rep.	Désignation	Designation
A	Bornier d'alimentation 24V AC/DC	24V AC/DC power supply terminal trip
B	Bornier de consigne	Instruction terminal trip
C	Bornier de recopie	Feed back terminal trip
D	Bouton de réglage MEM	Adjustment button MEM
E	Bouton de réglage CLOSE	Adjustment button CLOSE
F	Bouton de réglage OPEN	Adjustment button OPEN
G	Cavalier K1	K1 shunt
H	Cavalier K2	K2 shunt
I	Cavalier K3	K3 shunt
J	LEDs verte et rouge	Green and red LEDs
K	LED jaune : présence tension	Yellow LED : power supply indication
L	Potentiomètre	Potentiometer
M	Connexion moteur	Motor connexion
N	Connecteur résistance de réchauffage	Heating resistor connector

Rep.	Bezeichnung	Designación
A	24V AC/DC Spannungsversorgung	Terminal de alimentación 24V AC/DC
B	Anschlussklemmen des Signalgebers	Terminal de mando
C	Anschlussklemmen der Rückmeldung	Terminal de recopia
D	Einstellknopf MEM	Pulsador de reglaje MEM
E	Einstellknopf CLOSE	Pulsador de reglaje CLOSE
F	Einstellknopf OPEN	Pulsador de reglaje OPEN
G	K1 Steckbrücke	Grapa K1
H	K2 Steckbrücke	Grapa K2
I	K3 Steckbrücke	Grapa K3
J	Grüne und rote LEDs	LEDs verdes y rojos
K	Gelb LED : Stromversorgung Anzeige	LED amarillo : Presencia de tención
L	Potentiometer	Potenciómetro
M	Motor Zusammenhang	Conexión del motor
N	Heizwiderstandsverbindung	Conector de la resistencia de calefacción



ACTIONNEUR DEJA PRE-REGLE EN USINE

CABLAGE CONSIGNE ET RECOPIE DE LA CARTE P6

Afin de limiter les perturbations électromagnétiques, l'utilisation de câbles blindés est obligatoire (câbles supérieurs à 3m).

- Dévisser le presse-étoupe droit et passer le câble.
- Connecter la consigne entre les bornes 15 et 16 (annexe p.20 rep.B).
La borne 15 est la polarité négative (-) et la borne 16 la polarité positive (+).
- Connecter la recopie entre les bornes 13 et 14 (annexe p.20 rep.C).
La borne 13 est la polarité positive (+) et la borne 14 la polarité négative (-).
- Revisser le presse-étoupe (s'assurer du bon remontage de celui-ci afin de garantir une bonne étanchéité).

Montage départ usine : par défaut, consigne et recopie en 4-20mA, sens normal.

Pour reparamétrer la carte : voir page 24, « Séquence de paramétrage ».

Pour vérifier le bon fonctionnement de la carte : voir page 24, « Mode de fonctionnement normal ».



ACTUATOR PRE-SET IN FACTORY

POSITIONING CARD WIRING (OUTPUT AND INPUT SIGNAL)

In order to avoid electromagnetic perturbations, it is compulsory to use shielded cables (cables longer than 3m).

- Unscrew the right gland and pass the cable.
- Connect the input signal between terminals 15 and 16 (attached p.20 mark.B)..
Terminal 15 is the negative polarity (-) and terminal 16 is the positive polarity (+).
- Connect the output signal between terminals 13 and 14.(attached p.20 mark.B)..
Terminal 13 is the positive polarity (+) and terminal 14 is the negative polarity (-).
- Tighten the cable gland (Ensure that it's well mounted to guaranty the proofness).

The feedback must be connect with rigid wires. If the applied voltage is higher than 42V, the user must foresee a fuse in the power supply line.

Factory setting : by default, 4-20mA input and output signals with normal rotation sense.

To proceed to a new setting of the card : please see page 25, "Parameter selection sequence".

To check the proper operation of the card : please see page 25, "Normal operating mode".



STELLANTRIEB IST SCHON IM WERK VOREINGESTELLT

REGELUNGKARTE VERKABELUNG (SIGNALELMELDUNG UND RUCKMELDUNG)

Um elektromagnetische Störungen zu vermeiden, müssen abgeschirmte Kabel benutzt werden (Kabel länger als 3m).

- Lösen Sie die Kabelverschraubung und führen Sie das Kabel durch.
- Verkabeln Sie den Signalgeber zwischen den Klemmen 15 und 16.
Die Klemme 15 ist negativ gepolt (-) und die Klemme 16 positiv (+).
- Verkabeln Sie den Positionrückmelder zwischen den Klemmen 13 und 14.
Die Klemme 13 ist positiv gepolt (+) und die Klemme 14 negativ (-).
- Die Kabelverschraubung wieder befestigen.

Aufbau ab Werk : Voreingestellt, Signalgeber und Rückmeldung 4-20mA, im normal Drehrichtung.

Um die Karte wieder zu programmieren : siehe Seite 26, « Parametrisierungsschritte ».

Um die richtige Arbeitsweise zu prüfen : siehe Seite 26, « Normalbetrieb ».



ACTUADOR YA PREREGADO EN FÁBRICA

CABLEADO, MANDO Y RECOPIA DE LA TARJETA P6

Al fin de limitar las perturbación electromagnéticas, la utilización de cables blindados es obligatoria (cables de longitud más que 3m).

- Destornillar la prensa a estopa de derecho y pasar el cable .
- Conectar el mando entre los bornes 15 y 16. (anexo p.20 Ref. B)
El borne 15 es la polaridad negativa (-) y el borne 16 la polaridad positiva (+).
- Conectar la recopia entre los bornes 13 y 14. (anexo p.20 Ref. C).
El borne 13 es la polaridad positiva (+) y el borne 14 la polaridad negativa (-).
- Reatornillar la prensa-estopa correctamente para garantizar una buena hermeticidad

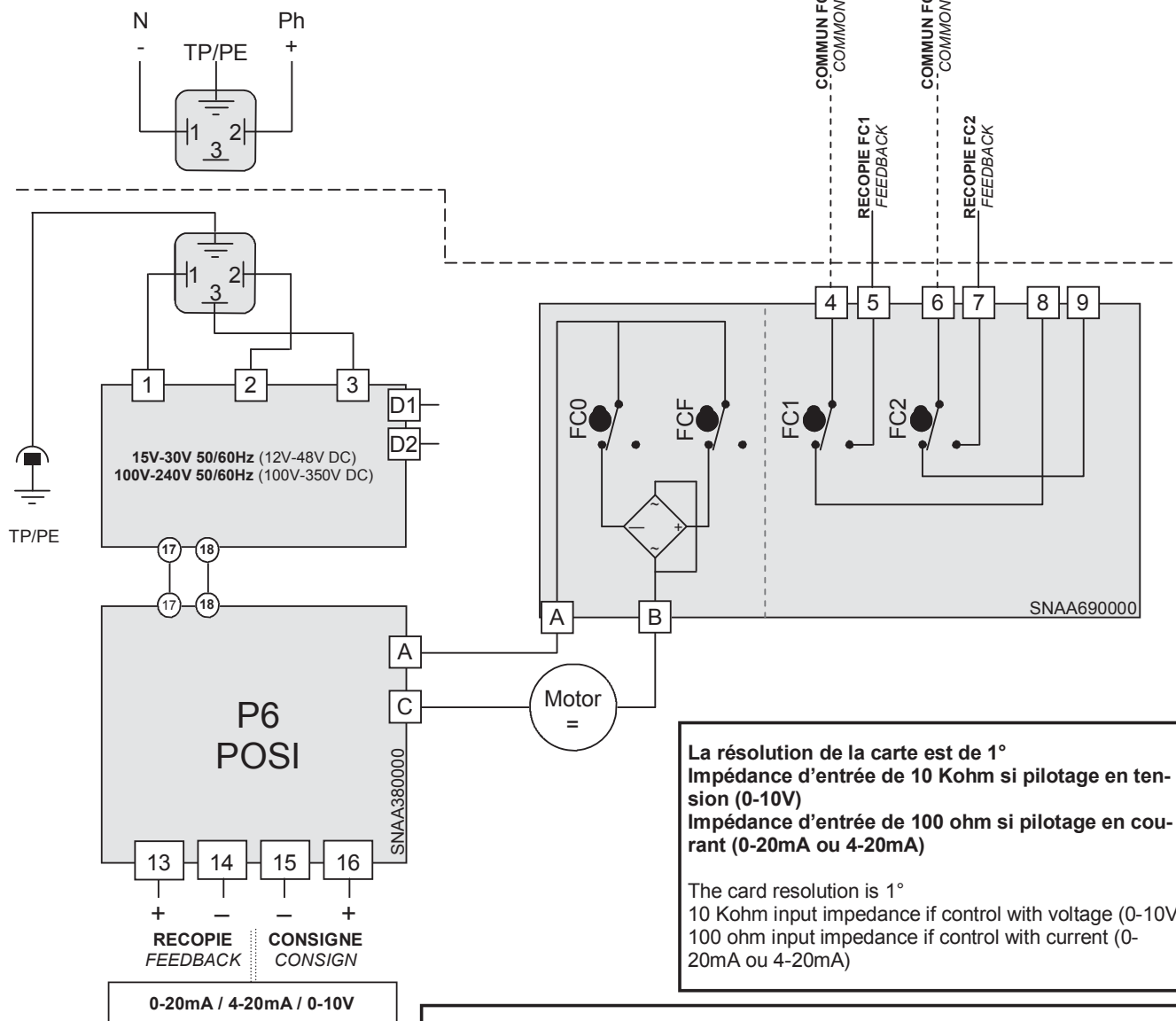
Montaje a la salida de fábrica : Por defecto, mando y recopia en 4-20mA, dirección normal.

Para ajustar de nuevo la tarjeta : ver página 27, « Secuencia de reglaje ».

Para verificar el buen funcionamiento de la tarjeta : ver página 27, « Modo de funcionamiento normal ».

ALIMENTATION : CONNECTEUR 3P+T DIN43650
POWER SUPPLY : 3P+T DIN43650 CONNECTOR

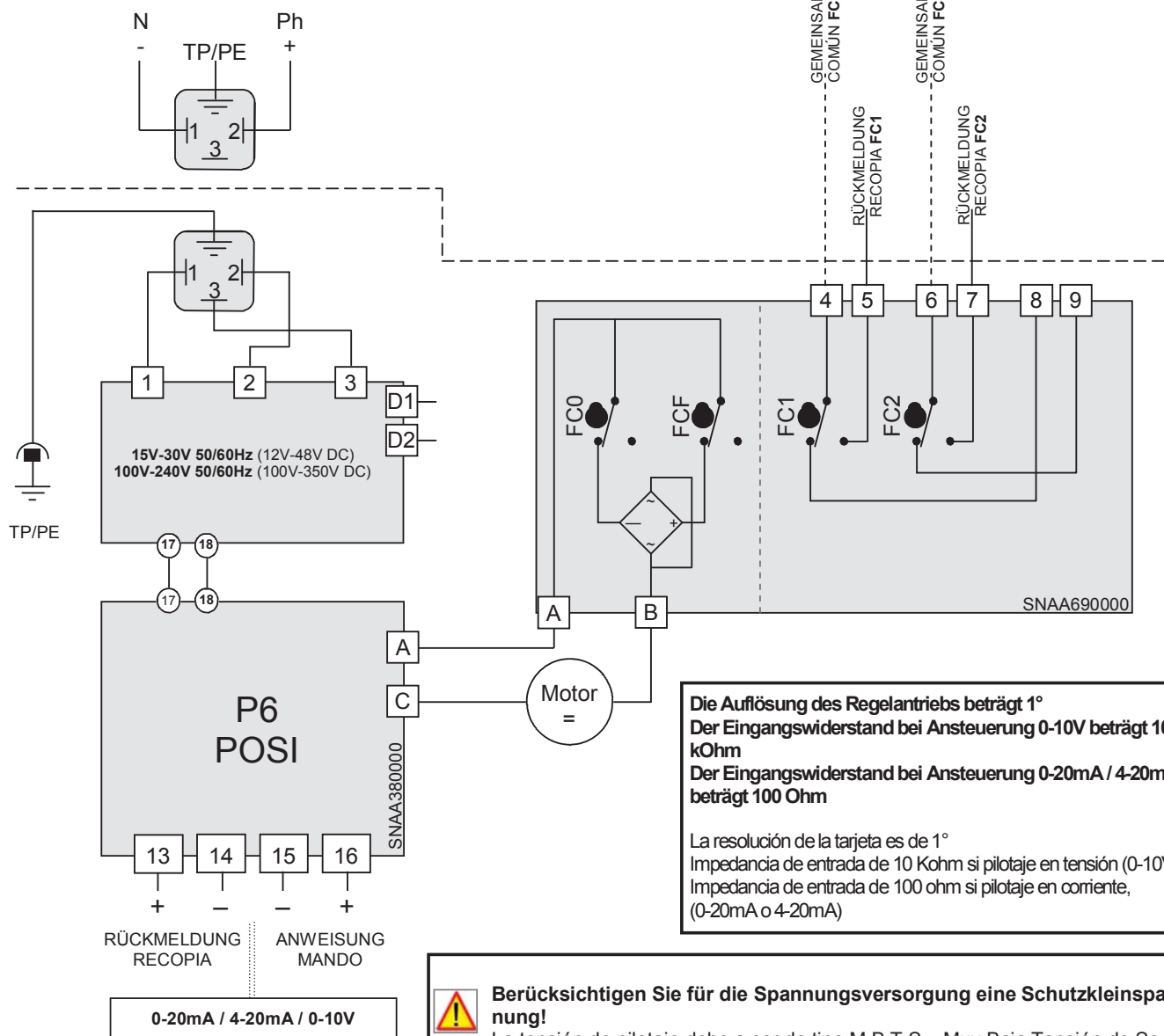
RECOPIE / FEEDBACK



REP	DESIGNATION
FC0	Fin de course ouverture Open limit switch
FCF	Fin de course fermeture Close limit switch
FC1	Fin de course auxiliaire 1 Auxiliary limit switch 1
FC2	Fin de course auxiliaire 2 Auxiliary limit switch 2
D1/D2	Bornier report défaut (24V DC / 3A max) Failure report Terminal strip (24V DC / 3A max)

- La tension de pilotage doit être de type T.B.T.S. (Très Basse Tension de Sécurité)
The control voltage must be .S.E.L.V. (Safety Extra Low Voltage)
- La température du bornier peut atteindre 90°C
The terminal temperature can reach 90°C
- La recopie doit être connecté avec des câbles rigides. Si la tension appliquée est supérieure à 42V, l'utilisateur doit prévoir un fusible dans la ligne d'alimentation.
The feedback must be connect with rigid wires. If the applied voltage is higher than 42V, the user must foresee a fuse in the power supply line.
- Pour une utilisation avec de grandes longueurs de câbles, le courant induit généré par les câbles ne doit pas dépasser 1mA
For a use with a long power supply wiring, the induction current generated by the wires musn't be higher than 1mA
- Les câbles utilisés doivent être rigides (tensions pour la recopie : 4 à 250V AC/DC)
The used wires must be rigid (feedback voltages : 4 to 250V AC

SPANNUNGSVERSORGUNG : 3P+T DIN43650 VERBINDUNG
ALIMENTACIÓN : CONECTOR 3P+T DIN43650



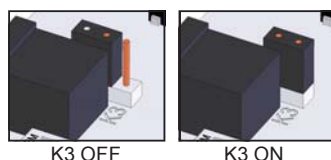
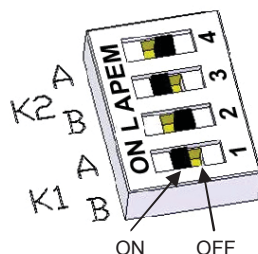
REP	BESCHREIBUNG DESIGNACIÓN
FC0	Endschalter AUF Final de carrera apertura
FCF	Endschalter ZU Final de carrera cierre
FC1	Zusätzlicher Endschalter 1 Final de carrera auxiliar 1
FC2	Zusätzlicher Endschalter 2 Final de carrera auxiliar 2
D1/D2	Fehlermeldung Klemmleiste (24V DC / 3A max) Terminal retorno de defecto (24V DC / 3A max)

-  **Berücksichtigen Sie für die Spannungsversorgung eine Schutzkleinspannung!**
La tensión de pilotaje debe ser de tipo M.B.T.S. , Muy Baja Tensión de Seguridad,
 -  **Die Terminal-Temperatur kann bis zu 90°C erreichen**
La temperatura del Terminal de conexión puede alcanzar 90°C
 -  **Die Klemmen “Kunde” müssen mit biegesteif Anschlusskabel verkabelt werden. Sollte die Spannung 42v überschritten, so muss vom Anwender eine Sicherung in der Stromzufuhr vorgesehen werden.**
La recopia debe ser conectada con cables rígidos. Si la tensión aplicada es superiora a 42V, el usuario debe prever un fusible en la alimentación.
 -  **Bei Verwendung einer langen Zuleitung für die Spannungsversorgung darf die Induktionsspannung der Leitung nicht größer als 1mA sein.**
Para una utilización con los grandes largo de cables, la corriente induce en-gendrado por los cables no debe adelantar 1mA
 -  **Die Anschlusskabel müssen biegesteif sein (Rückmeldespannungen 4 bis 250V AC/DC)**
Los cables eléctricos utilizados deben ser rígidos (tención para el señal de retorno : 4 hasta 250V AC/DC)

SEQUENCES DE PARAMETRAGE

1 Positionnement des cavaliers K1, K2 et K3

- Positionner les cavaliers d'après le tableau suivant (avant chaque modification, mettre la carte hors tension) :



Consigne	Recopie	Cavalier K1		Cavalier K2		Cavalier 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 Choix du sens de la vanne



2.1 Sens normal (par défaut)

- Appuyer sur **OPEN** et mettre la carte sous tension en maintenant le bouton enfoncé.
- La **LED verte s'allume**. Relâcher le bouton **OPEN**.
- Débrancher la carte.



2.2 Sens inverse

- Appuyer sur **CLOSE** et mettre la carte sous tension en maintenant le bouton enfoncé.
- La **LED rouge s'allume**. Relâcher le bouton **CLOSE**.
- Débrancher la carte.

3 Choix du type de consigne



3.1 Consigne en tension 0-10V

- Appuyer sur **MEM** et mettre la carte sous tension en maintenant le bouton enfoncé.
- La **LED rouge clignote 3 fois**. Relâcher le bouton.
- Débrancher la carte.



3.2 Consigne en courant 0-20mA

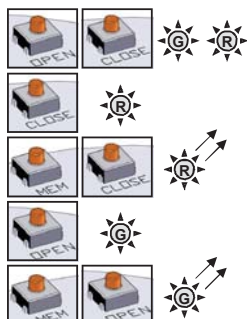
- Appuyer sur **MEM** et **OPEN** et mettre la carte sous tension en maintenant les boutons enfoncés.
- La **LED rouge clignote 3 fois**. Relâcher les boutons.
- Débrancher la carte.



3.3 Consigne en courant 4-20mA (par défaut)

- Appuyer sur **MEM** et **CLOSE** et mettre la carte sous tension en maintenant les boutons enfoncés.
- La **LED rouge clignote 3 fois**. Relâcher les boutons.
- Débrancher la carte.

4 Mode apprentissage



- Appuyer sur **OPEN** et **CLOSE** et mettre la carte sous tension en maintenant les boutons enfoncés.
- Les **2 LEDs s'allument**. Relâcher les boutons, les 2 LEDs s'éteignent. Le mode apprentissage est sélectionné.

- Appuyer sur **CLOSE** pour faire venir la vanne en position fermée. La **LED rouge s'allume**.
- Mémoriser la position fermée par **MEM + CLOSE**, la **LED rouge clignote 2 fois** pour acquitter.

- Appuyer sur **OPEN** pour faire venir la vanne en position ouverte. La **LED verte s'allume**.
- Mémoriser la position ouverte par **MEM + OPEN**, la **LED verte clignote 2 fois** pour acquitter.

- Les positions sont mémorisées, débrancher la carte.

MODE DE FONCTIONNEMENT NORMAL

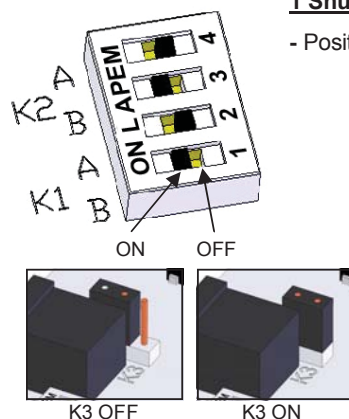
- Mettre la carte sous tension. La **LED verte clignote 3 fois**.
- Lors du fonctionnement normal, la LED verte s'allume lorsque le moteur ouvre la vanne, et la LED rouge lorsque le moteur ferme la vanne.
- Lorsque les 2 LEDs sont éteintes, le moteur n'est pas sollicité.

- En cas de couple trop important, les **2 LEDs s'allument** pour indiquer la limitation et l'actionneur s'arrête. Pour le redémarrer, il faut soit inverser le sens de marche, soit éteindre et remettre sous tension la carte.

PARAMETER SELECTION SEQUENCE

1 Shunts positioning K1, K2 and K3

- Position the shunts as follows (before modification, switch off the card) :



Input signal	Output signal	Schunt K1		Schunt K2		Schunt 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 Selection of the flow direction of the valve

2.1 Normal flow direction (by default)

- Press the **OPEN** button and apply the operating voltage to the card while keeping this button depressed.
- The **green LED lights up**. Release the **OPEN** button.
- Disconnect the card.



2.2 Inverse flow direction

- Press the **CLOSE** button and apply the operating voltage to the card while keeping this button depressed.
- The **red LED lights up**. Release the **CLOSE** button.
- Disconnect the card.



3 Selection of the type of set value

3.1 Voltage set value 0-10V

- Press the **MEM** button and apply the operating voltage to the card while keeping this button depressed.
- The **red LED will light up 3 times**. Release this button.
- Disconnect the card.



3.2 Current set value 0-20mA

- Press the **MEM** and **OPEN** buttons and apply the operating voltage to the card while keeping these buttons depressed.
- The **red LED will light up 3 times**. Release these buttons.
- Disconnect the card.



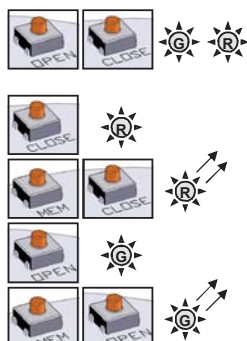
3.3 Current set value 4-20mA (by default)

- Press the **MEM** and **CLOSE** buttons and apply the operating voltage to the card while keeping these buttons depressed.
- The **red LED will light up 3 times**. Release these buttons.
- Disconnect the card.



4 Learning mode

- Press the **OPEN** and **CLOSE** buttons and apply the operating voltage to the card while keeping these buttons depressed.
- The **2 LEDs will light up**. Release these buttons and the 2 LEDs will extinguish. The card is now in the learning mode.
- Press the **CLOSE** button to put the valve in its closed position. The **red LED will light up**.
- Store this selected closed position by pushing **MEM + CLOSE**, the **red LED will light up 2 times** as a confirmation of acknowledgement.
- Press the **OPEN** button to put the valve in its open position. The **green LED will light up**.
- Store this selected open position by pushing **MEM + OPEN**, the **green LED will light up 2 times** as a confirmation of acknowledgement.
- Now, the positions selected have been stored. Disconnect the card.



NORMAL OPERATING MODE

- Apply the operating voltage to the card. The **green LED will light up 3 times**.
- Under normal operating conditions, the green LED will light up when the drive motor opens the valve, and the red LED will light up when the drive motor closes it.
- If both LEDs remain extinguished, it means that the drive motor has not been triggered.



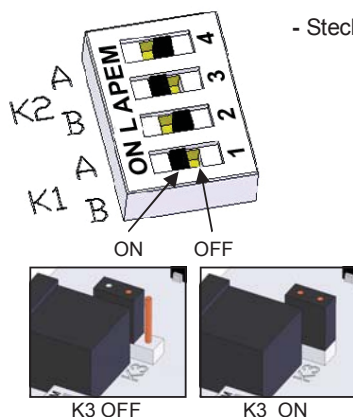
- In the case of an over torque, the motor stops and the **2 LEDS lights** then together to indicate the action of the torque limiter. To re-start it, you must either reverse the sense of rotation, either switch the power off and on.



PARAMETRISIERUNGSSCHRITTE

1 Position der Steckbrücke K1, K2 und K3

- 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.



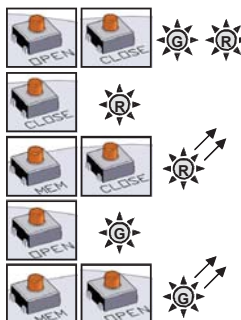
3.3 Eingang Signal bei Strom 4-20mA (Ab Werk voreingestellt)

- 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.



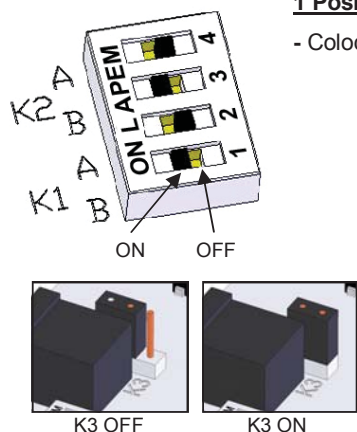
- Im zu hoch Drehmoment Fall, **leuchten die beiden LEDs an** und stoppt der Antrieb. Um der Antrieb wieder zu starten, muss man den Drehrichtung auswechseln oder die Spannung Auf/Zu Umschalten.



SECUENCIA DE REGLAJE

1 Posicionamiento de las grapas K1, K2 y K3

- 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.



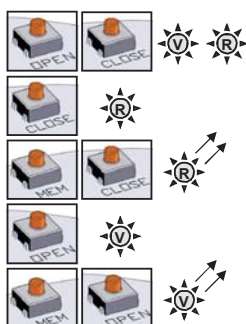
3.3 Mando bajo tensión 4-20mA (por defecto)

- 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.

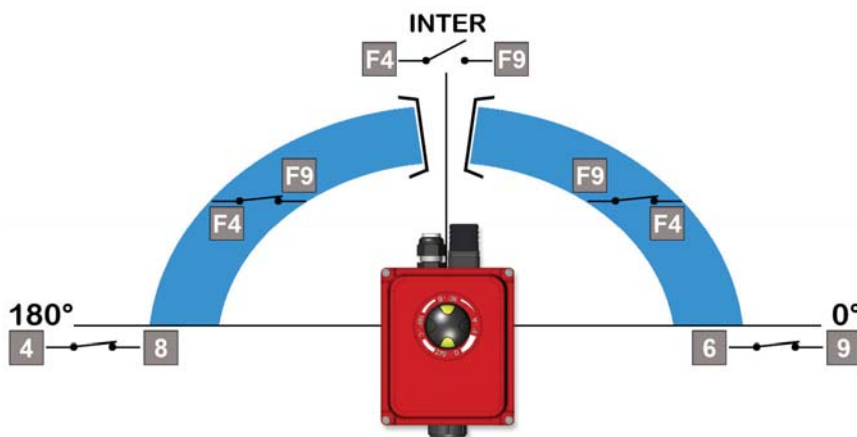
Andere Voreinstellungen sind möglich und müssen im Bedarfsfall durch den Kunden im Auftrag vermerkt sein.

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.

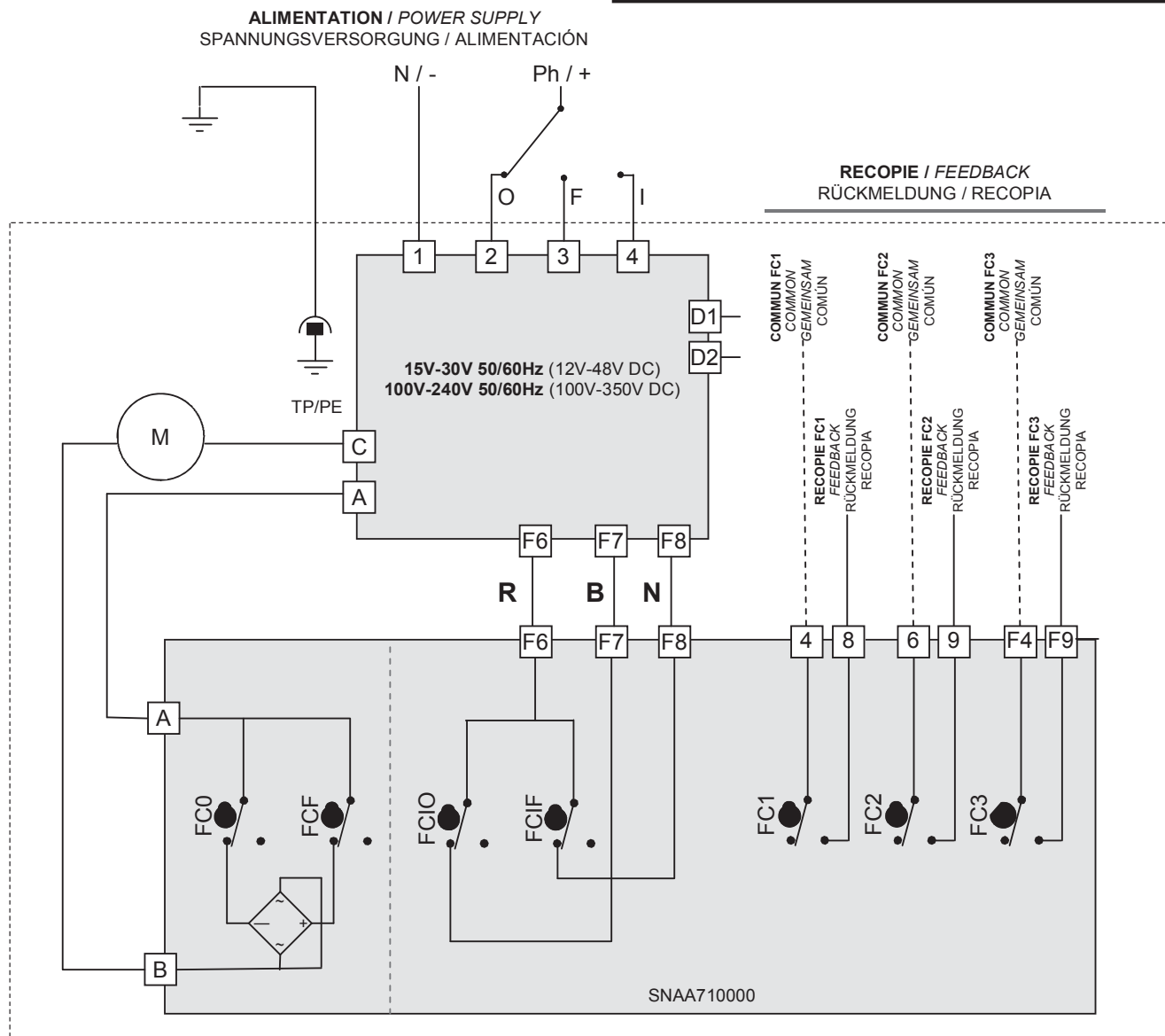
Las 3 posiciones son pilotadas por 4 contactos, FCO,FCF,FCIO,FCIF, y 3 contactos de recopía, (FC1,FC2,FC3)

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

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

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 MECANIKES / 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 category	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 schützt, Spritz wasserdicht « Durchfluss <12.5 L/min » / Estando 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 manio- bra 1/4 (ER rápido)	11s	11s	25s	7s	12s	23s
Stellzeit (langsam) / Tiempo de manio- bra 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 End- schalter / 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 conector					
Einschaltstromspitze Corriente de arranque	35A					

ACTIONNEUR ÉLECTRIQUE
ELECTRIC ACTUATOR
ELEKTRISCHE STELLANTRIEBE
ACTUADOR ELÉCTRICO





MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL
AMARUQ WTP – NUNAVUT
VEOLIA PROJECT: 5000 218 009

CHEMLINE
SERIES PA, PNEUMATIC ACTUATOR

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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 to 265°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)

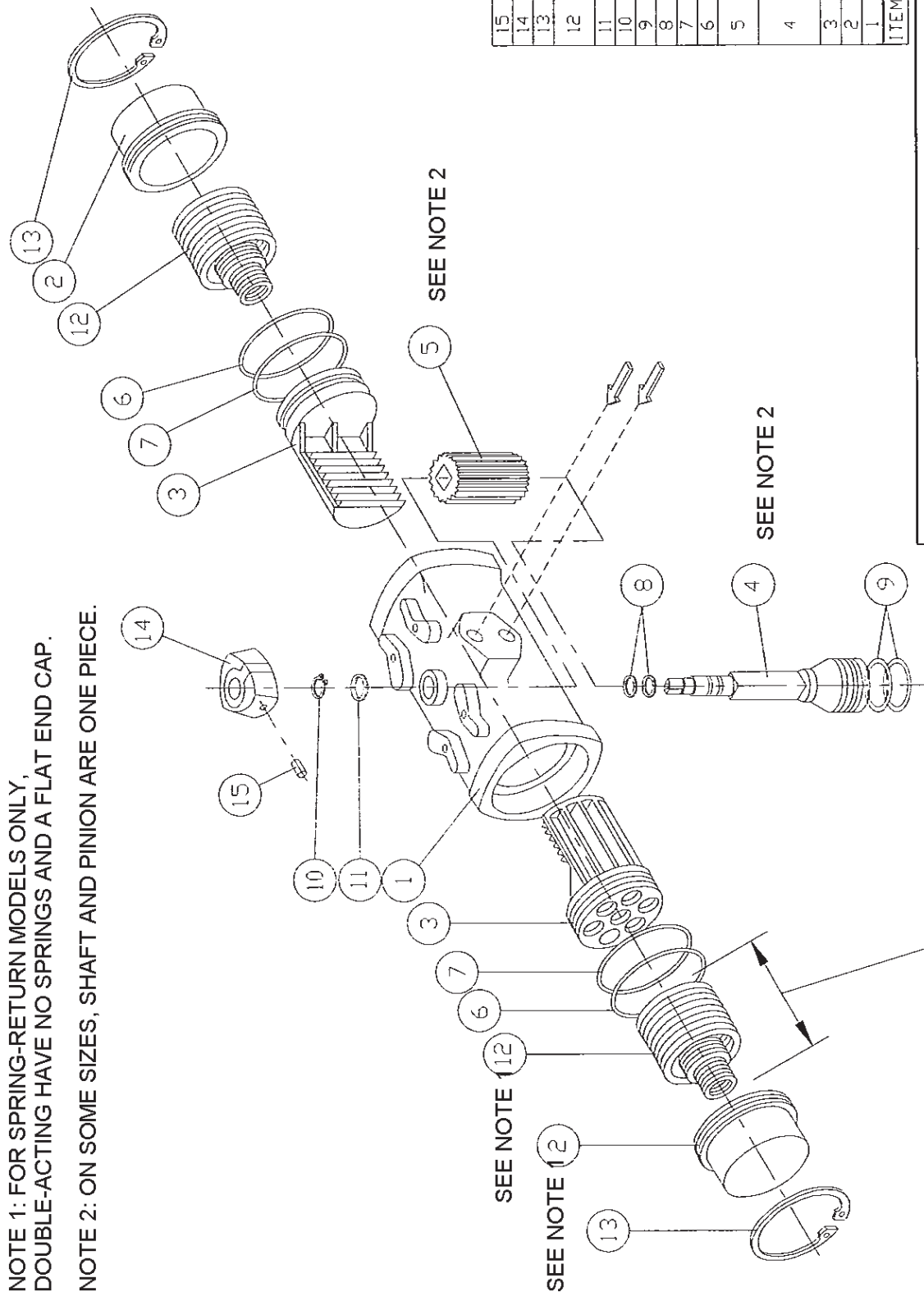
Maintenance & Installation Instructions P Series Actuators cont.

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

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

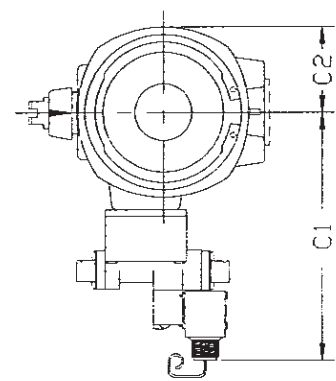
CHEMLINE PLASTICS

P-SERIES ACTUATOR EXPLODED VIEW

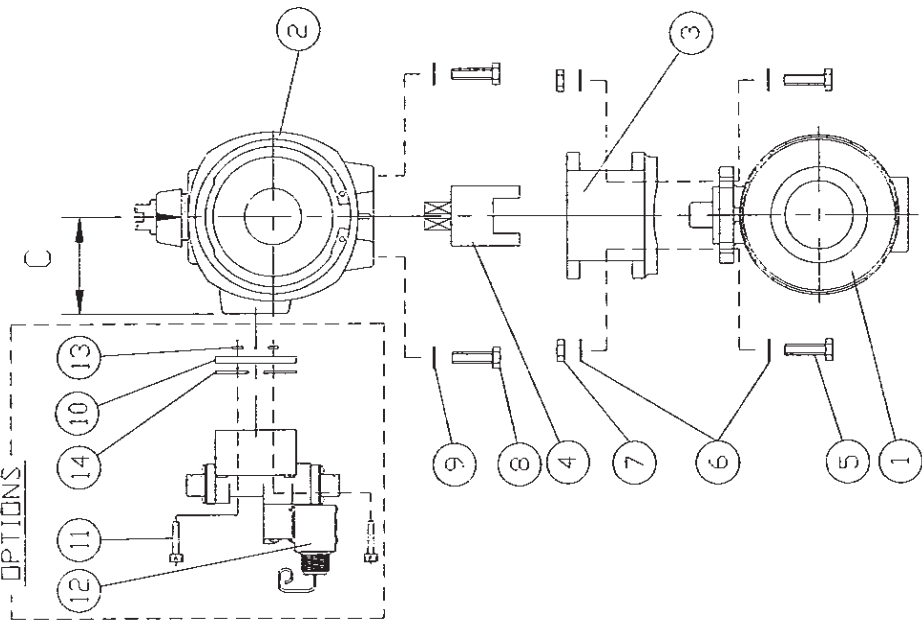
SIZE	A	DWG. NO.	1233	REV	A
SCALE	NTS	SHEET	1	OF	1

CONCENTRIC COMPRESSION
SPRING ON AIR-TO-SPRING
MODELS ONLY (BOTH ENDS)

WITH OPTIONS



OPTIONS



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.

UNIT: INCH

VALVE SIZE	A-A	A-S	A-A	A-S	A-A	A-S	A-A	A-S	C1	C2
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 SDC HD (OPTIONS)	300SS	1
10	MOUNTING PLATE (OPTIONS)	ZYTEL	1
9	FLAT WASHER (M5.0)	STAINLESS STEEL	4
8	BOLT (FOR A79 (PW) USE M5.0x8-16LG) (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" : M5.0x8) (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" : M5.0x8-16LG) (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

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WO# / CO#	

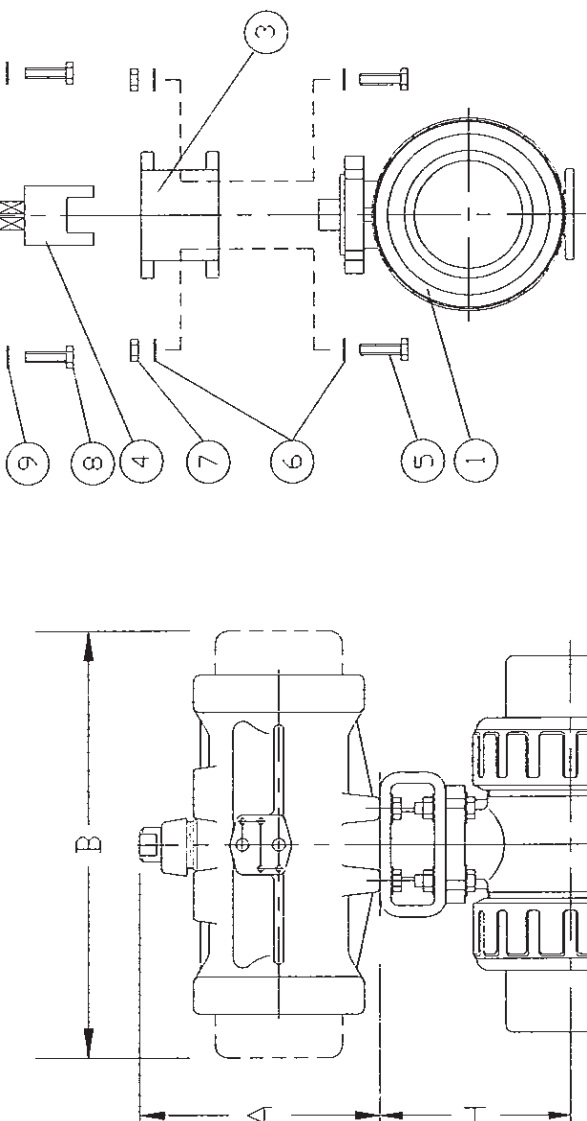
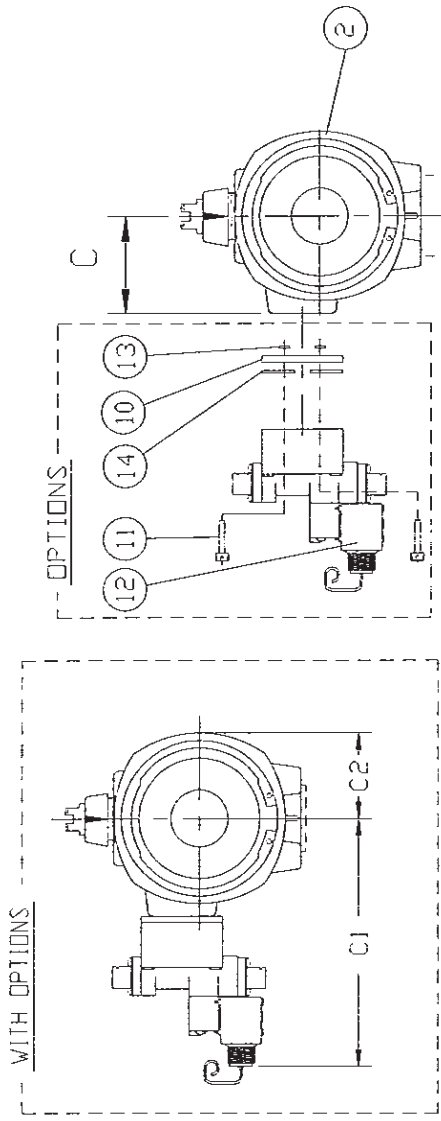
CHEMLINE PLASTICS

BALL VALVE TYPE 21
PNEUMATIC ACT.
1/2" THRU 2"

SIZE A	DWG. NO.	REV
	0114BV	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	6.74	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 M5.0x8-16LG) (FOR B79 (PO) USE M6.0x1-16LG) (FOR C79 (PI) 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

CHEMLINE PLASTICS

BALL VALVE TYPE 21
PNEUMATIC ACT.
2-1/2" THRU 4"

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

SCALE NTS

SHEET 1 OF 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.

WITH OPTIONS

OPTIONS

DIMENSIONS TABLE

UNIT: inch

VALVE SIZE	A			B			C			C1			C2		
	A-A	A-S	A-A-S	A-A	A-S	A-A-S	A-A	A-S	A-A-S	A-A	A-S	A-A-S	A-A	A-S	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	1.21	1.21	1.21	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	1.21	1.21	1.21	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	1.21	1.21	1.21	1.21	1.21
1-1/2"	3.34	3.34	4.40	4.22	5.86	1.47	1.73	5.41	5.66	1.21	1.41	1.21	1.41	1.21	1.41
2"	3.34	5.00	4.22	7.64	1.47	1.97	5.41	5.89	1.21	1.95	1.21	1.95	1.21	1.95	1.21
3"	5.00	6.49	7.00	11.49	1.97	2.56	5.89	6.48	1.85	2.36	1.85	2.36	1.85	2.36	1.85
4"	6.49	6.49	9.21	11.49	2.56	2.56	6.48	6.48	2.36	2.36	2.36	2.36	2.36	2.36	2.36

NOMINAL SIZE	FLANGED			THREADED			PVC GPVC			SOCKET			SPW00 (BUTTEND)		
	H	H1	L	H	H1	L	H1	L	H1	L	H1	L	H1	L	H1
1/2"	2.75	3.70	5.63	2.89	4.02	3.08	4.45	2.80	3.90	3.09	4.45	3.27	4.88	3.27	4.88
3/4"	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	3.90	5.67
1"	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	4.53	6.06
1 1/2"	4.0	3.98	6.50	8.35	5.31	6.42	5.17	2.4	5.16	5.83	5.85	7.24	6.02	6.85	6.02
2"	5.0	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	7.01
3"	5.47	10.06	11.97	9.25	10.39	9.59	11.10	8.82	9.88	11.10	10.69	11.61	9.69	11.61	9.69
4"	6.97	12.01	14.65	11.77	14.17	11.58	13.90	10.98	12.20	14.37	11.85	12.72	11.85	12.72	11.85

ITEM	DESCRIPTION	MATERIAL	QTY
14	GASKET (OPTIONS)	NBR	2
13	D-RING (OPTIONS)	NBR	2
12	SOLENOID (ASCD) (OPTIONS)	ZYTEL	1
11	SCREW SDC 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 M5.0x8-16L.0) (FOR 879 (PD) USE M6.0x1-16L.0) (FOR C79 (PY) USE M8.0x125-16L.0)	STAINLESS STEEL	4
7	NUT (FOR 1/2" THRU 1-1/4" : M5.0x8) (FOR 1-1/2" THRU 2" : M6.0x1) (FOR 3" : M8.0x125) (FOR 4" : M10.0x150)	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" : M5.0x8-16L.0) (FOR 1-1/2" THRU 2" : M6.0x1-20L.0) (FOR 3" : M8.0x125-35L.0) (FOR 4" : M10.0x150-40L.0)	STAINLESS STEEL	4
4	COUPLING	STAINLESS STEEL 303	1
3	MOUNTING BRACKET	PPG	1
2	ACTUATOR	GLASS FILLED POLYAMIDE STAINLESS STEEL (OPTION) RILSAM COATED CAST ALUMINUM (OPTION)	1
1	MULTI-PORT BALL VALVE TYPE23	PVC GPVC 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

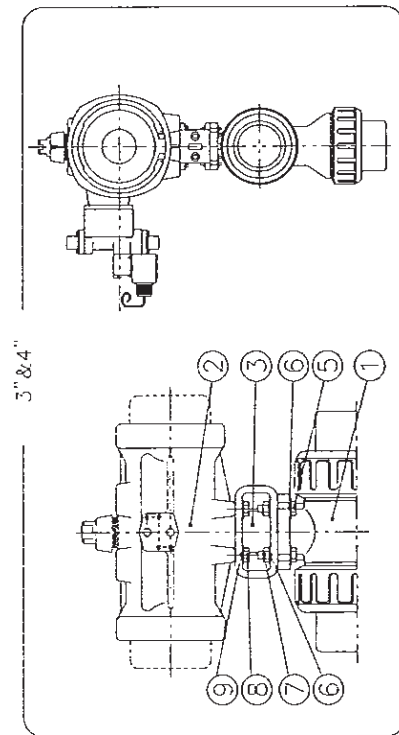
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NAME	DATE
DR. KENICHI MIYAZAKI	1/28/03
APP. DAVE HURLEY	1/28/03
PROD. LEO LESTER	1/28/03
WO# / CO#	
FILE	

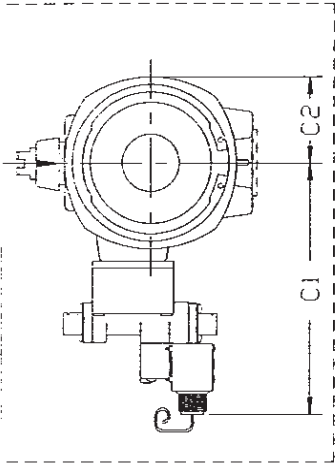
CHEMLINE PLASTICS

TYPE 23 MULTI-PORT BALL VALVE 1/2" TO 4" WITH PNEUMATIC ACTUATOR

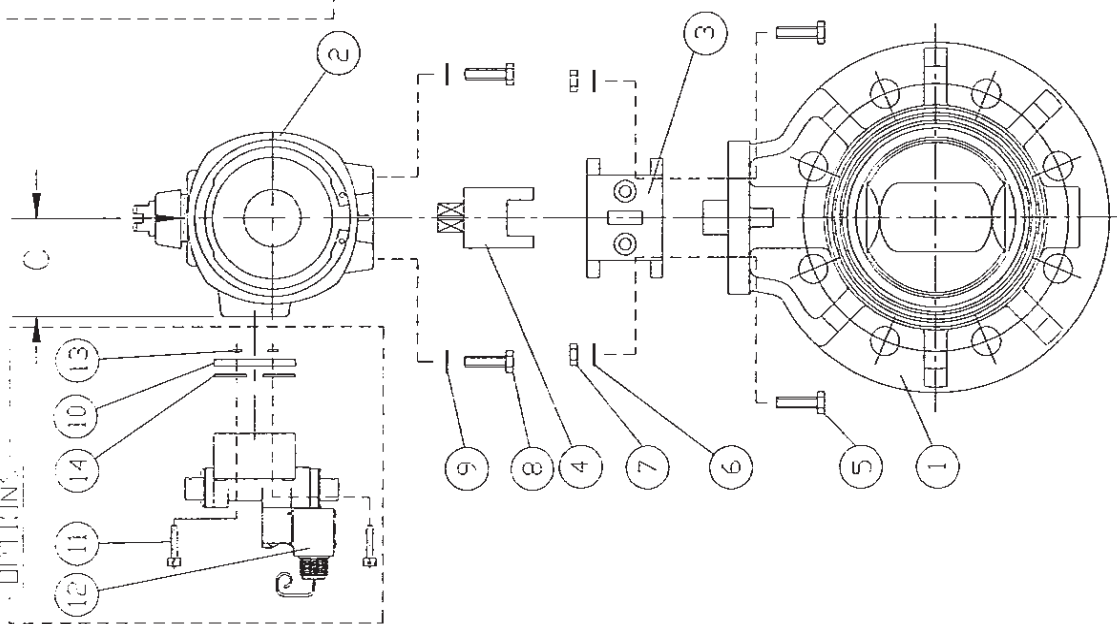
SIZE	A	DWG. NO.	REV
		0139BV	A
SCALE	NTS	SHEET 1	OF 1



WITH OPTIONS



UNIT: INCH



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

UNIT: INCH

ITEM	DESCRIPTION	MATERIAL	QTY
14	GASKET (OPTIONS)	NBR	2
13	O-RING (OPTIONS)	NBR	2
12	SOLENOID (ASCO) (OPTIONS)	ZYTEL	1
11	SCREW SDC 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) ☐ RULSAN 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

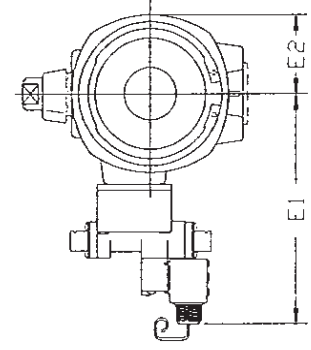
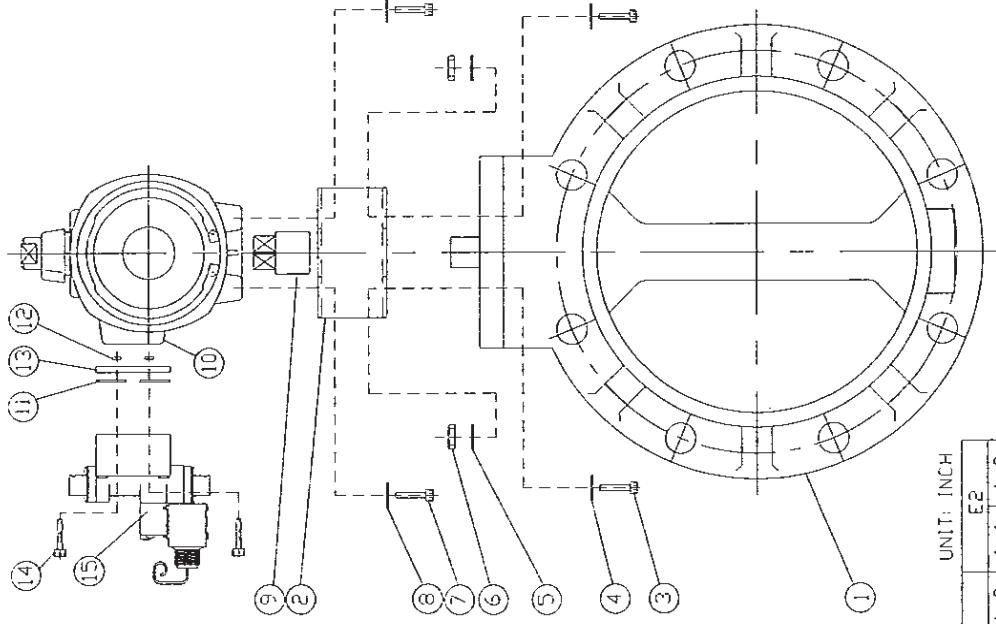
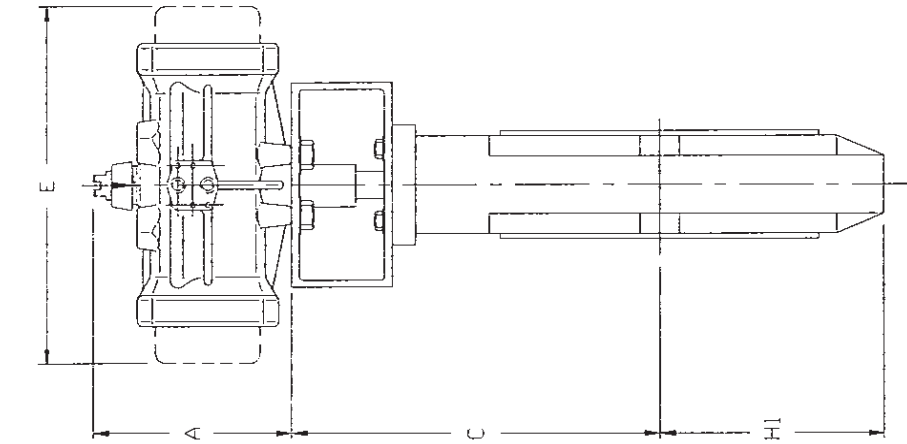
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NAME	DATE
DR KENICHI MIYAZAKI	10/1/01
APPD DAVE HURLEY	10/1/01
PROD LED LESTER	10/1/01
WO# / CO#	
FILE	

CHEMLINE PLASTICS

BUTTERFLY VALVE TYPE 56
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

UNIT: INCH

VALVE SIZE	C	H1	A	A-S	E	E1	E2
1 1/2	5.50	2.95	4.40	5.00	4.92	6.02	6.25
2	5.57	3.25	4.40	5.00	4.92	6.02	6.25
2 1/2	6.08	3.66	4.40	5.00	4.92	6.02	6.25
3	6.28	3.94	5.00	6.49	7.00	11.49	6.25
4	6.56	4.53	5.00	6.49	7.00	11.49	6.25
5	8.05	5.00	5.00	8.54	7.00	17.04	6.25
6	9.01	5.63	6.49	8.54	9.21	17.04	6.84
8	11.27	6.69	8.54	11.26	12.12	25.28	7.83
10	12.46	7.99	8.54	13.07	12.12	20.83	7.83
12	14.59	9.53	11.26	13.07	16.46	20.83	8.42
14	14.81	10.24	11.26	15.47	16.46	22.44	8.42
16	16.78	11.81	11.26	16.53	16.46	32.83	8.42

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

No.	DESCRIPTION	MATERIAL	QTY
15	SOLENOID, ASCO (OPTIONS)	ZYTEL	1
14	SCREW, SDC 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

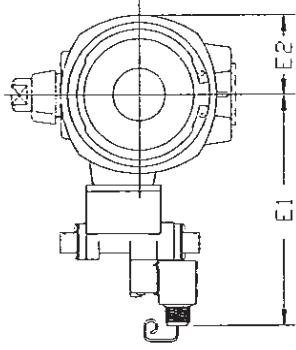
CHEMLINE PLASTICS

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

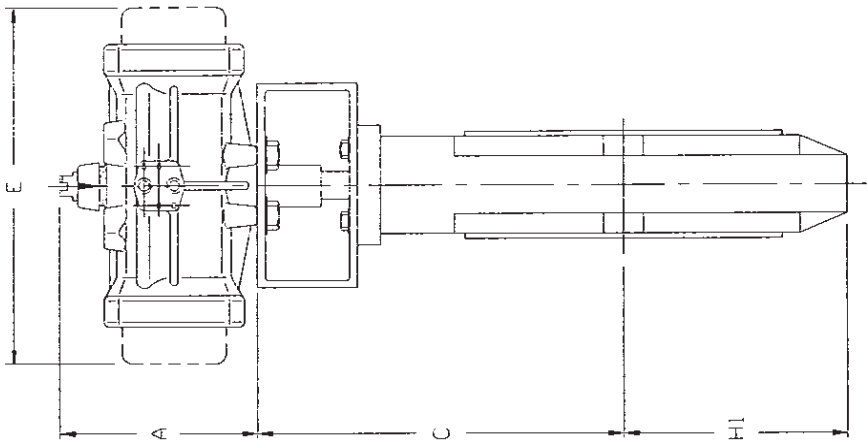
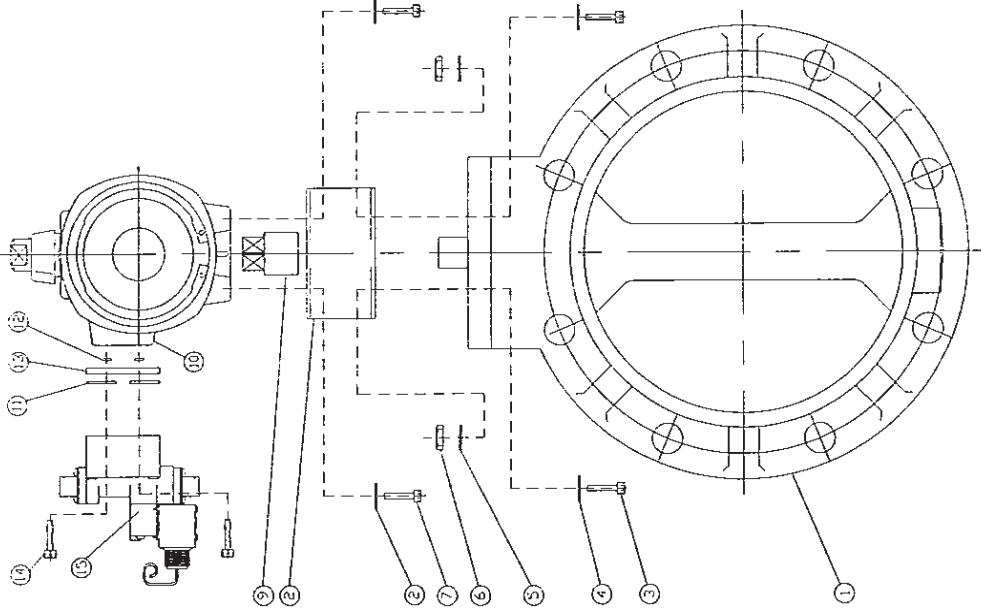
SIZE A DWG. NO. 0167BF REV B
SCALE NTS SHEET 1 OF 1

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



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, SDC 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	A-A	A-S	A-A	A-S	E	E1	E2
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.

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

CHEMLINE PLASTICS

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

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

WATER TECHNOLOGIES

LEFT BLANK

MAINTENANCE INSTRUCTIONS

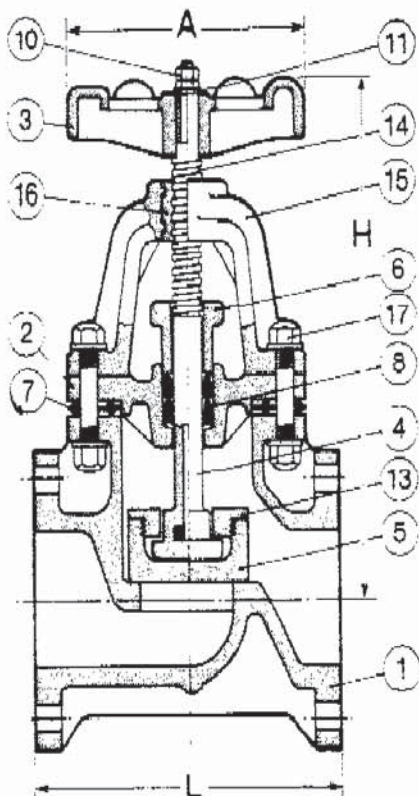
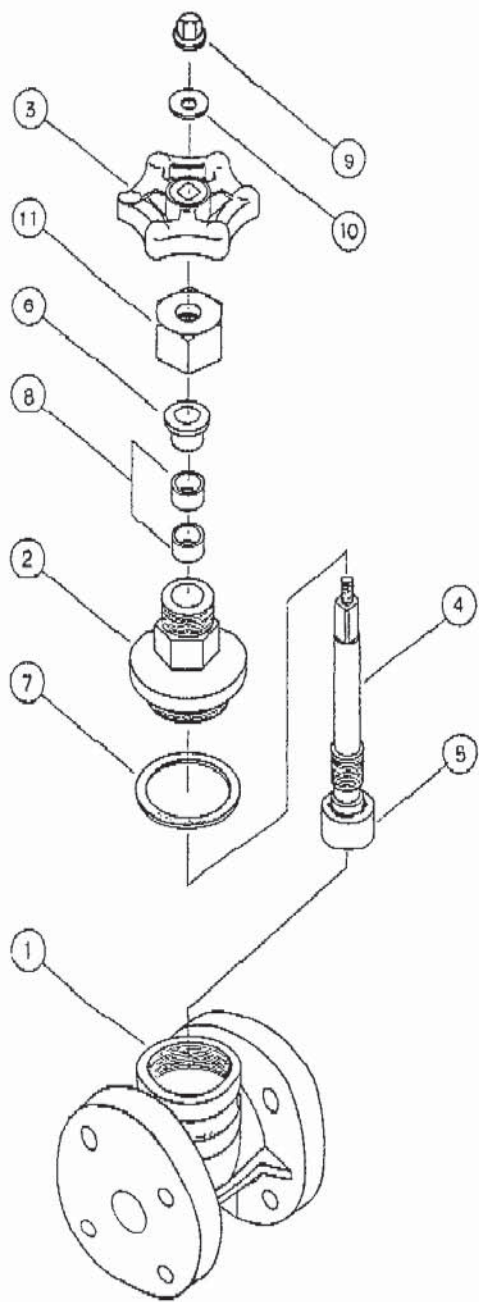
For Chemline Globe Valves Sizes 1/2" - 2"

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
9	WASHER	1	PVC
10	DISC RETAINER	1	PP
11	YOLK	1	BRASS
12	YOLK SLEEVE	1	BRONZE
13	BOLT & NUT	8	SS, 304
14	STUD & NUT	2	SS, 304

CHEMLINE PLASTICS		DATE	SCALE	OR BY	CHKD. BY	APP. BY
CHEMLINE						
DWG. NO.			REFERENCE		1/2" - 2"	
REV.			GV01(A)		0	

MAINTENANCE INSTRUCTIONS

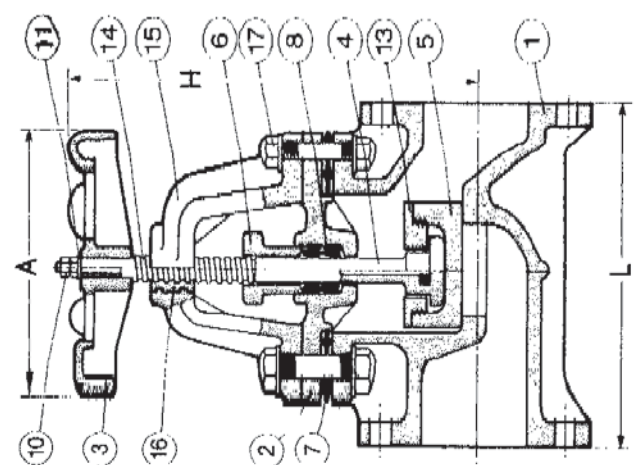
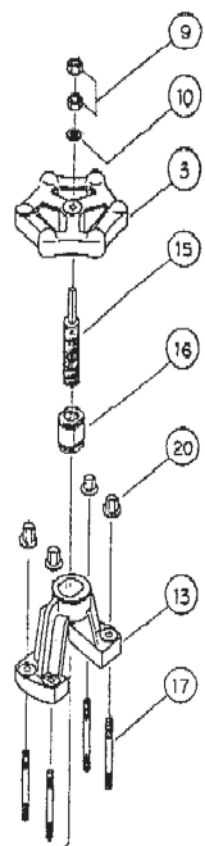
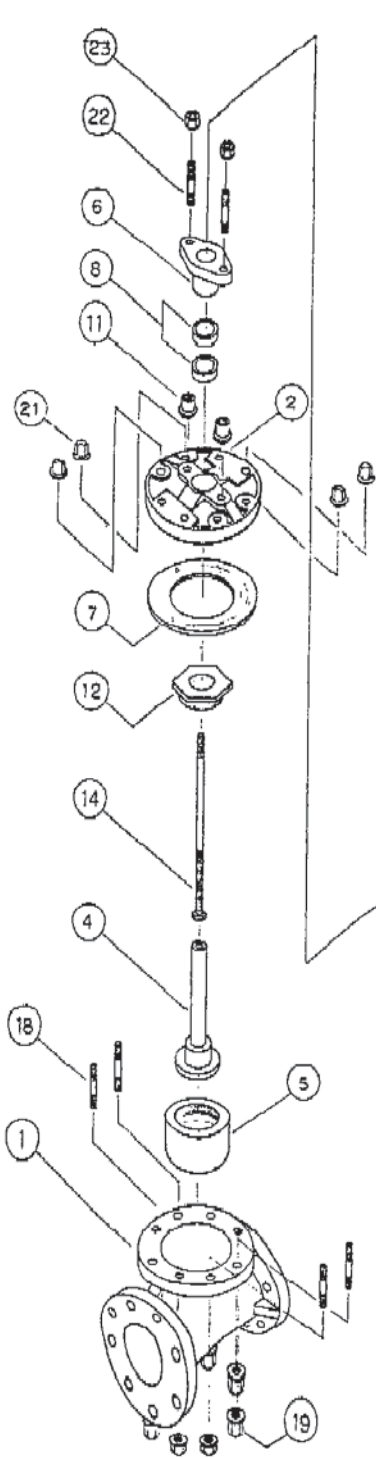
For Chemline Globe Valves Sizes 2-1/2" - 4"

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		SCALE		DATE	
CHEMLINE GLOBE VALVE SIZES		DR. BY			
REFERENCE		C.H.D. BY		DWG. NO.	
2 - 1/2" - 4"				GV01 (B)	
				REV.	
				0	





MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL
AMARUQ WTP – NUNAVUT
VEOLIA PROJECT: 5000 218 009

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. **To adjust pressure use the adjustment screw (8) and a pressure gauge.**
 - 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° C or less. Check with Chemline Engineering Technical staff prior to installation.

Maintenance

Refer to **ASSEMBLY DRAWING SB10/11 rev 0.** 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).

Note: Piston assembly (5) is all parts
(5a) outer piston assembly
(5b) inner piston assembly
(5c) seat
(5d) piston o-ring

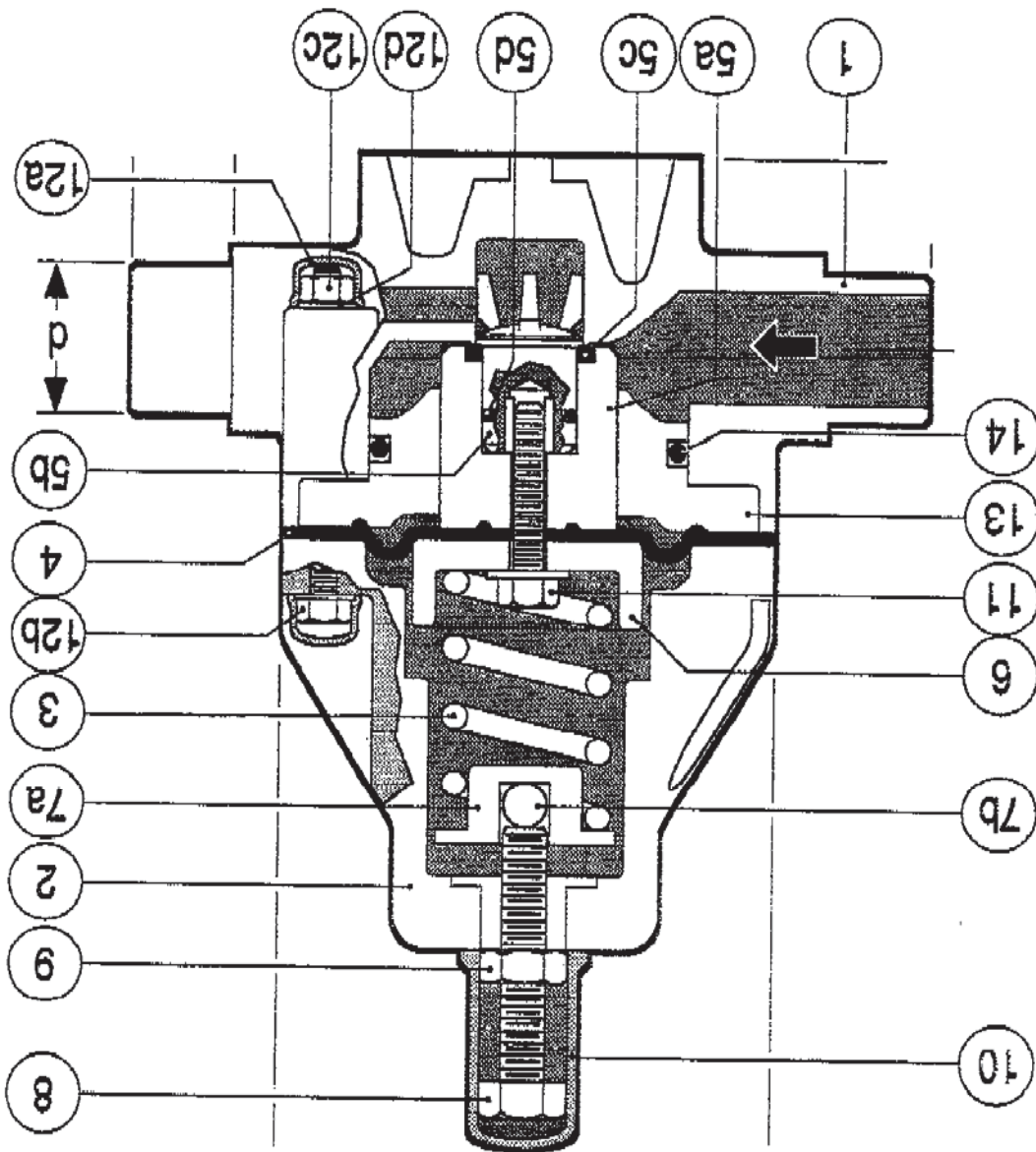
Maintenance Instructions SB Series Pressure Relief Valves cont.

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 DIAPHRAGM (4)		CLAMPING PRESSURE FOR DIAPHRAGM (4) TOO LOW.	TIGHTEN SCREWS (12)
PRESSURE RISES ABOVE SET PRESSURE	{A) (B) (C)	VALVE SEAT (5c) & SEALS (14) & (5d) ARE DEFECTIVE DIAPHRAGM (4) LEAKING 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
5(b)	(PART OF ASSY)	
5(c)	INNER PISTON	1
5(d)	(PART OF ASSY)	
6	SEAT	2
7(a)	(PART OF ASSY)	
7(b)	PISTON O-RING	2
8	(PART OF ASSY)	
9	SPRING PLATE	1
10	PRESS. PLATE	1
11	BALL BEARING	1
12	ADJ. SCREW	1
13	COUNTER NUT	1
14	CAP	1
15	PISTON SCREW	1
16	BODY CAP	4/6
17	BODY BOLT	4/6
18	BODY NUT	4/6
19	BODY WASHER	4/6
20	INT. FLANGE	2
21	SEAL	2

TITLE CHEMLINE SB PRESSURE RELIEF VALVES

REFERENCE

3/8" - 1-1/2"

SCALE
DR. BY
CHKD. BY
APP. BY

DATE

CHEMLINE
PLASTICS



DWG. NO.
SB1011

REV.
0

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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. **To adjust pressure use the adjustment screw (8) and a pressure gauge.**
 - 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° C or less. Check with Chemline Engineering Technical staff prior to installation.

Maintenance:

Refer to **ASSEMBLY DRAWING SB1201 rev 0.** 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).

Installation & Maintenance Instructions SB/12 Series cont.

6. Draw piston assembly (5) downward and out of body (1).

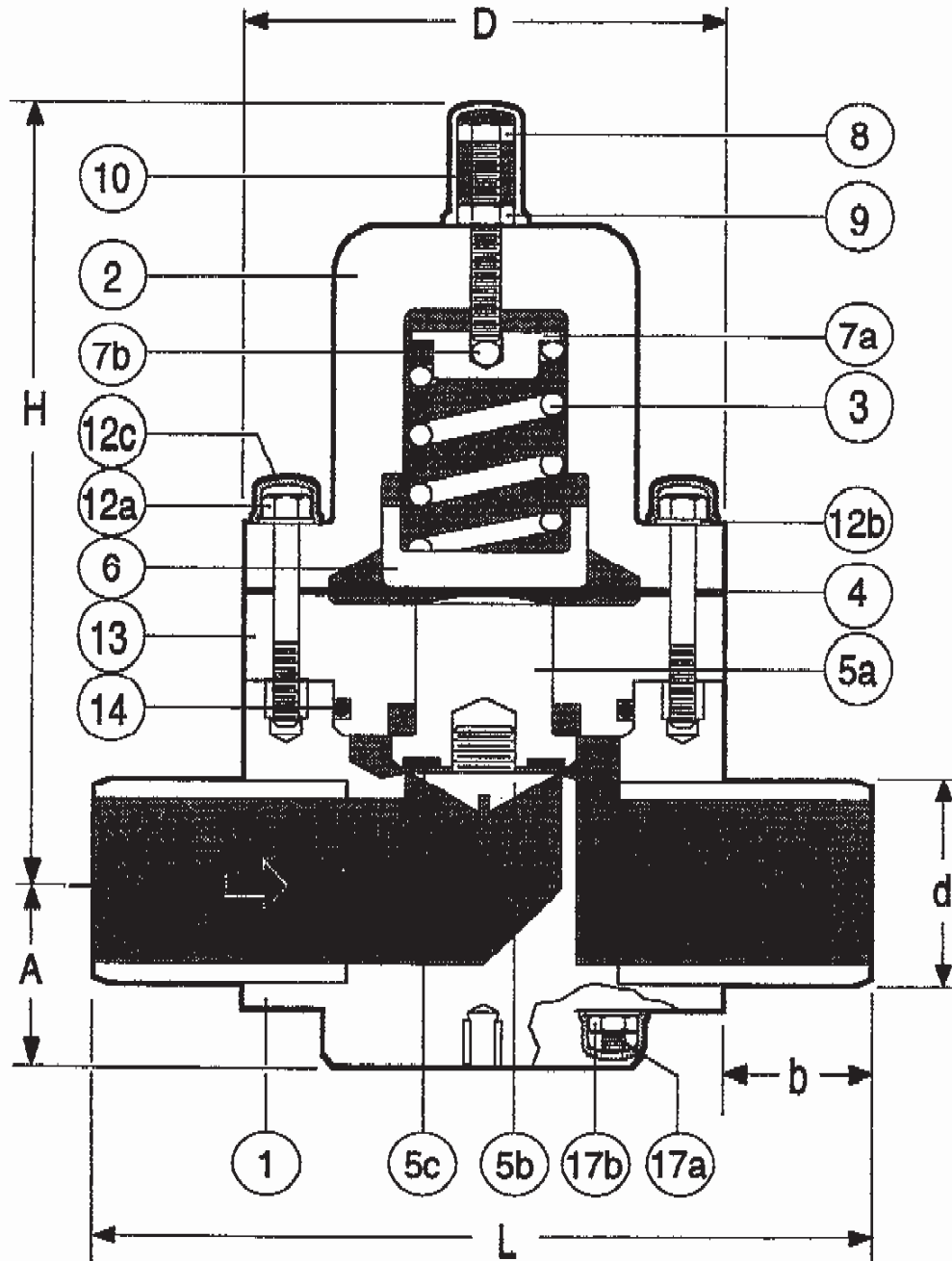
Note: Piston assembly (5) is all parts (5a) outer piston assembly
(5b) plug
(5c) seat

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 DIAPHRAGM (4)	CLAMPING PRESSURE FOR DIAPHRAGM (4) TOO LOW.	TIGHTEN SCREWS (12)
PRESSURE RISES ABOVE SET PRESSURE	{A) VALVE SEAT (5c) & SEALS (14) ARE (B) DEFECTIVE DIAPHRAGM (4) (C) LEAKING 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
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

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

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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 $\frac{1}{4}$ turn (approx. 30 in-lb).

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Gauge Isolators



SERIES: SG

INLET CONNECTION: 1/4" or 1/2" Threaded¹

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

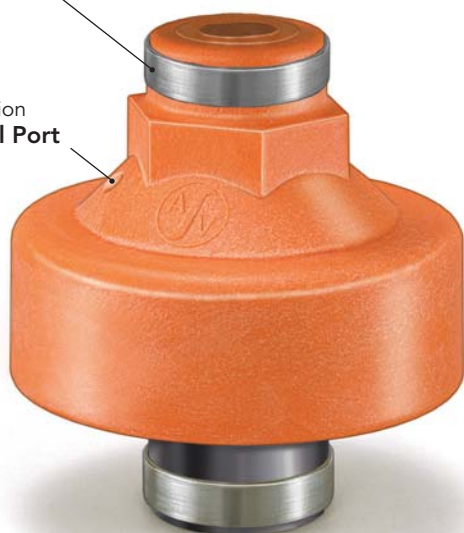
DIAPHRAGM: PTFE

CRN
Registered
Consult Chemline



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 glycerine². 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

- PPG³ top chamber
- Heavy wall connection ports

CRN Registration number by province

- Ontario: OH16085.5

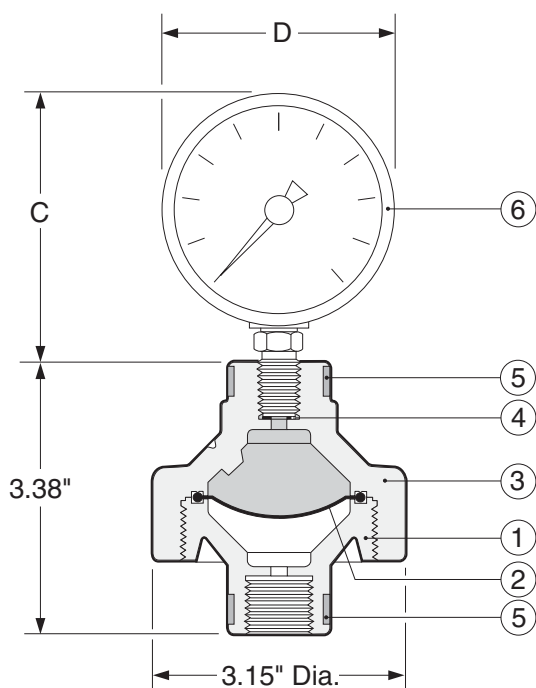
Optional Gauges

- Isolators are available alone or with gauge mounted and prefilled with glycol²



- 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

¹PPG = 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	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

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.

WEIGHTS

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.



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VEOLIA PROJECT: 5000 218 009

CHEMLINE

SERIES FC/FS, VARIABLE AREA FLOW METER

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INSTALLATION & MAINTENANCE INSTRUCTIONS

For Chemline FC/FS Series Variable Area Flowmeter Sizes 5" and 7"

Installation & Maintenance:

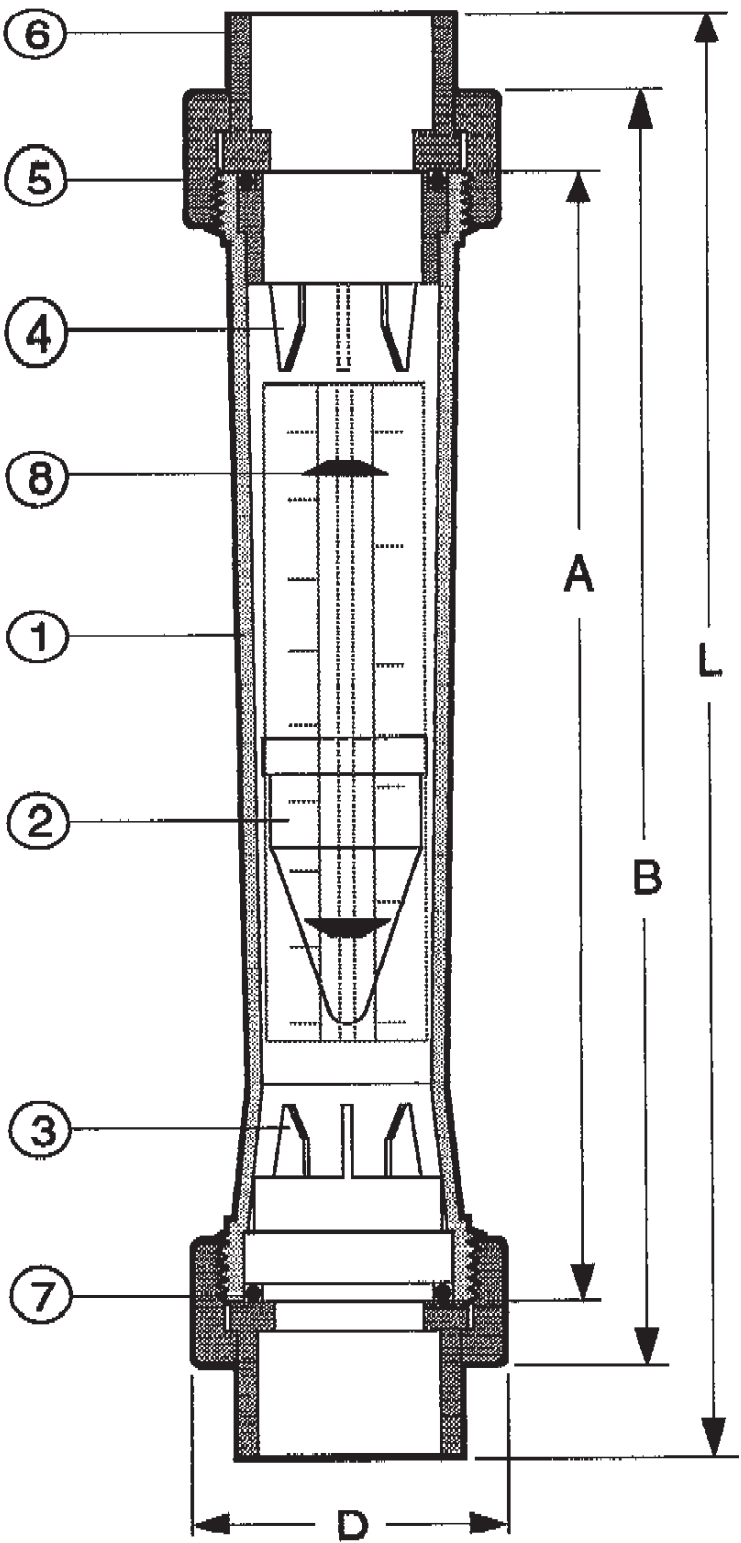
Refer to **ASSEMBLY DRAWING SFM1 REV 0**. And proceed as follows:

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

<i>Construction</i>				
Tube	Union Nuts	Ends	Pressure	Temperature
PVC	PVC	PVC	150 psi	0 to 60° C
Polyamide (PA)	PVC	PVC	150 psi	0 to 60° C
Polyamide (PA)	PPG	PP or CPVC	150 psi	0 to 80° C
Polysulfone (PSU)	PPG	PP or CPVC	150 psi	0 to 90° C
Polysulfone (PSU)	PVDF	PVDF	150 psi	0 to 120° C
PVDF	PVDF	PVDF	150 psi	-40 to 120° 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		SCALE	REFERENCE	
FS / FC VARIABLE-AREA FLOWMETERS		NTS		
CHEMLINE PLASTICS LIMITED		DR. BY	DB	DATE
55 GUARDSMAN ROAD, THORNHILL, ONTARIO L3T 6L2		CHK BY		02/22/91
TEL: (905) 889-7890 - FAX (905) 889-8553		APP BY		
		DWG. NO.		REV.
		SFM1		0

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ENDRESS + HAUSER

PROLINE PROMAG 50W, ELECTROMAGNETIC FLOWMETER

WATER TECHNOLOGIES

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Operating Instructions

Proline Promag 50

HART

Electromagnetic flowmeter

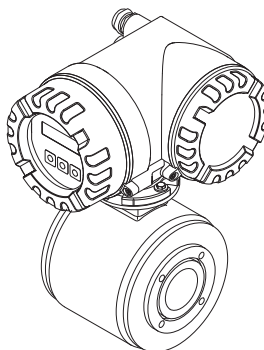
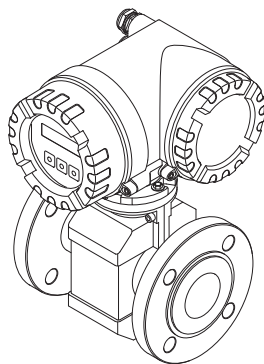
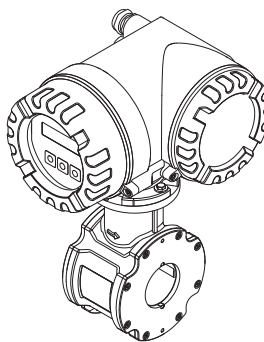
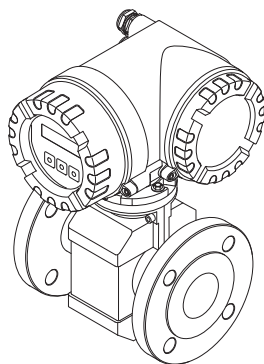


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1 Safety instructions

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 $\mu\text{S}/\text{cm}$ is required for measuring demineralized water. Most liquids can be measured as of a minimum conductivity of 5 $\mu\text{S}/\text{cm}$.

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.  Europe,  USA,  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

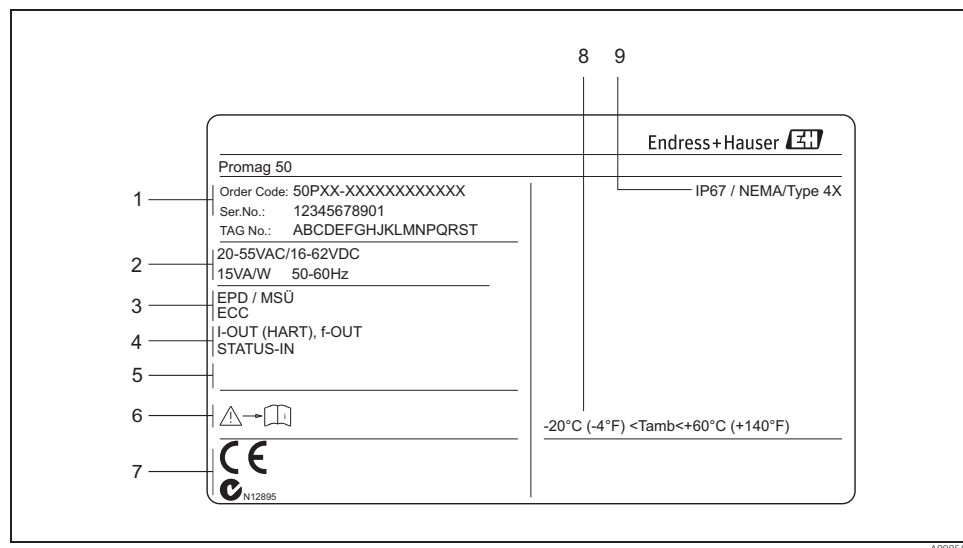


Fig. 1: Nameplate specifications for the "Promag 50" transmitter (example)

- 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

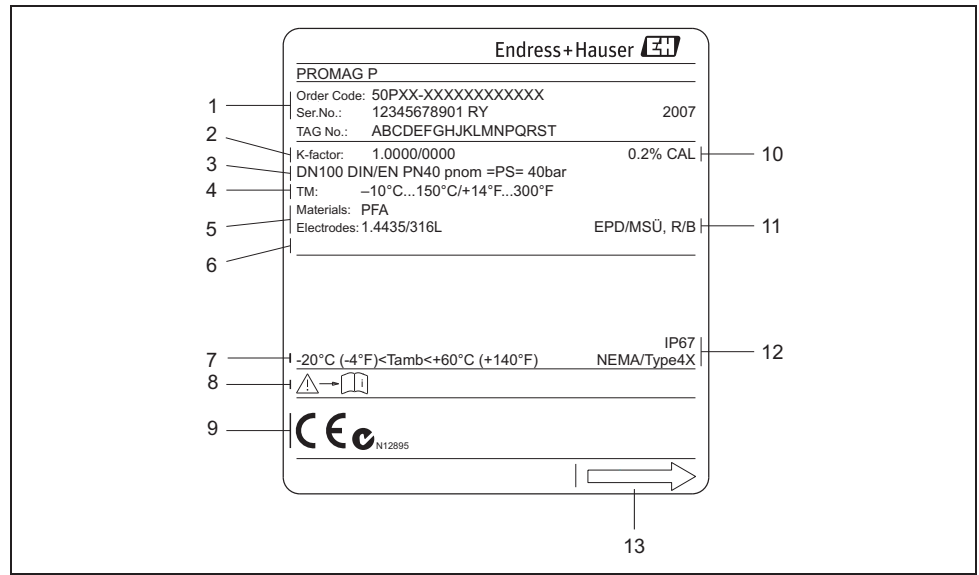


Fig. 2: Nameplate specifications for the "Promag" sensor (example)

- 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

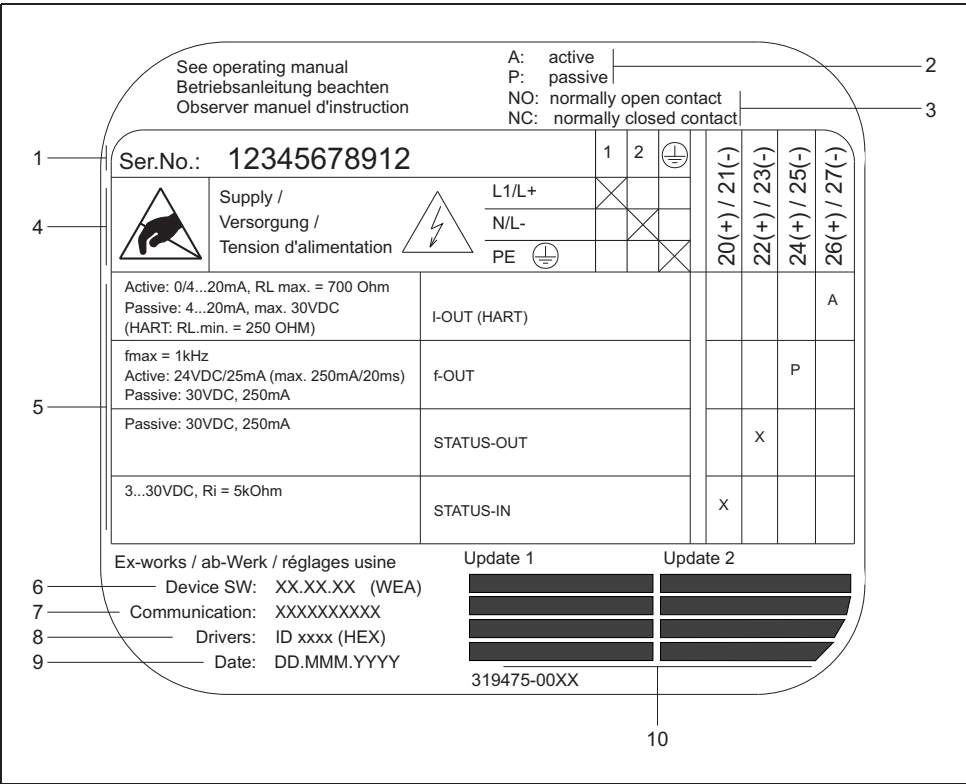


Fig. 3: Nameplate specifications for transmitter (example)

- 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 $DN \leq 300$ (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.

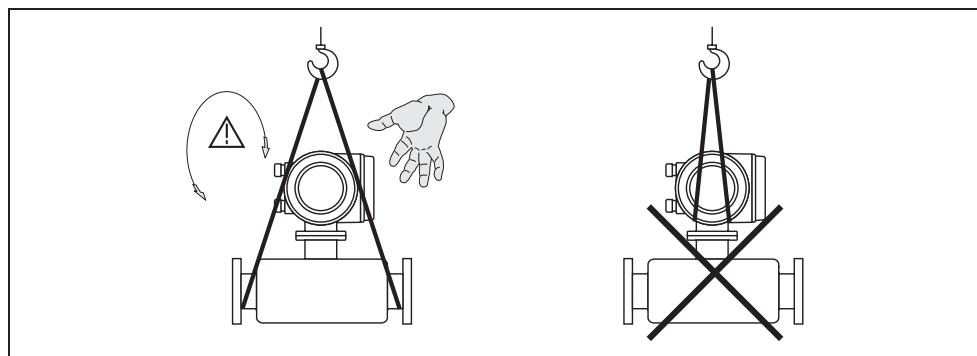


Fig. 4: Transporting sensors with $DN \leq 300$ (12")

a0004294

Transporting flanged devices $DN \geq 350$ (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.

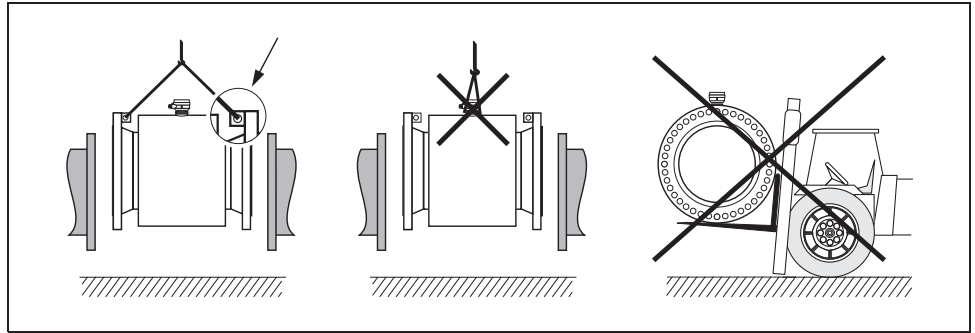


Fig. 5: Transporting sensors with $DN \geq 350$ (14")

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.

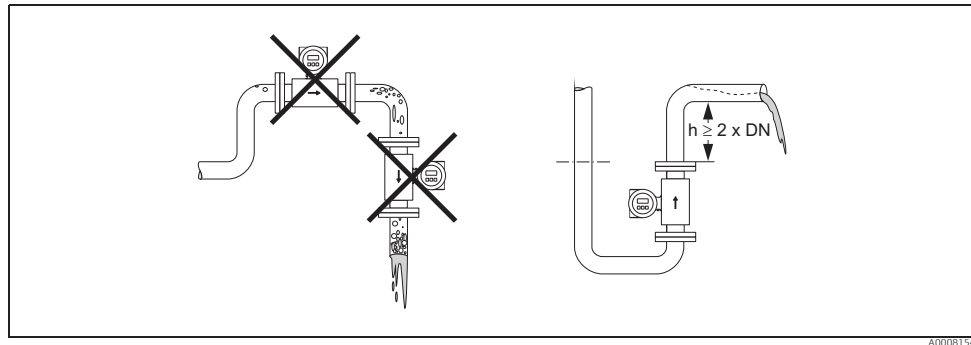


Fig. 6: Mounting location

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](#).

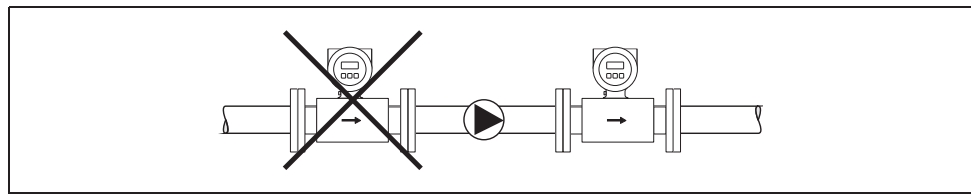


Fig. 7: Installation of pumps

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.

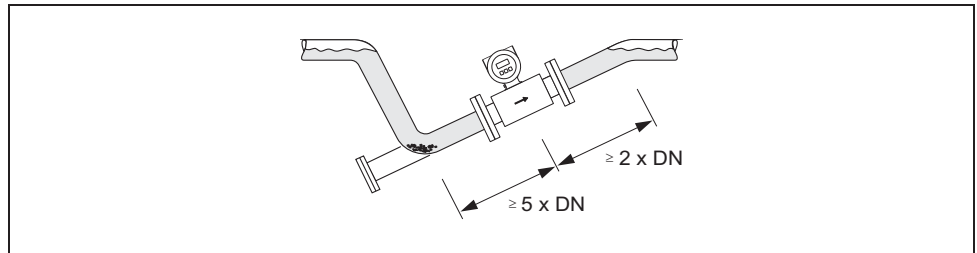


Fig. 8: Installation in a partially filled pipe

A0008155

Down pipes

Install a siphon or a vent valve downstream of the sensor in down pipes whose length $h \geq 5$ 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.

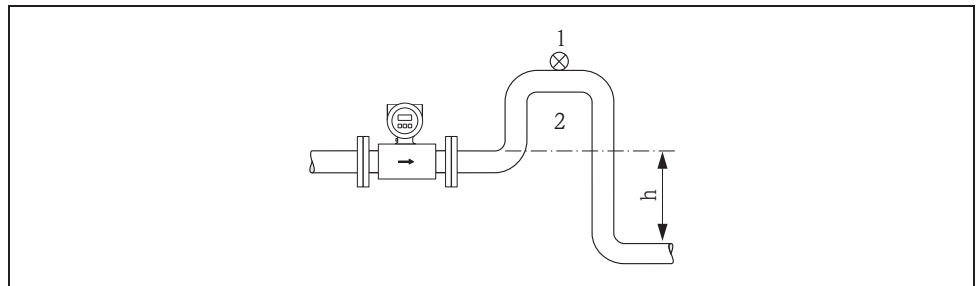


Fig. 9: Measures for installation in a down pipe

A0008157

- 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.

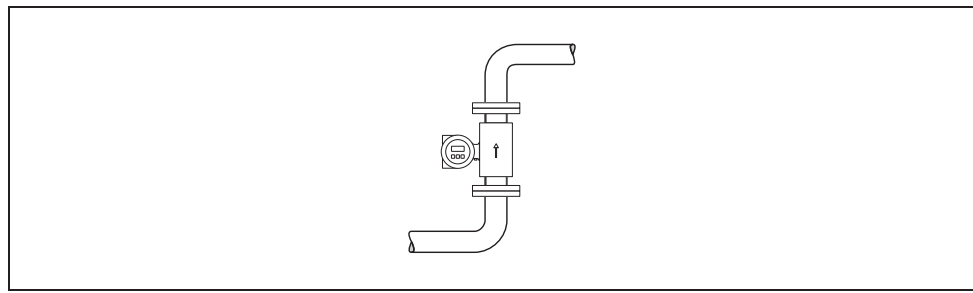


Fig. 10: Vertical orientation

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.

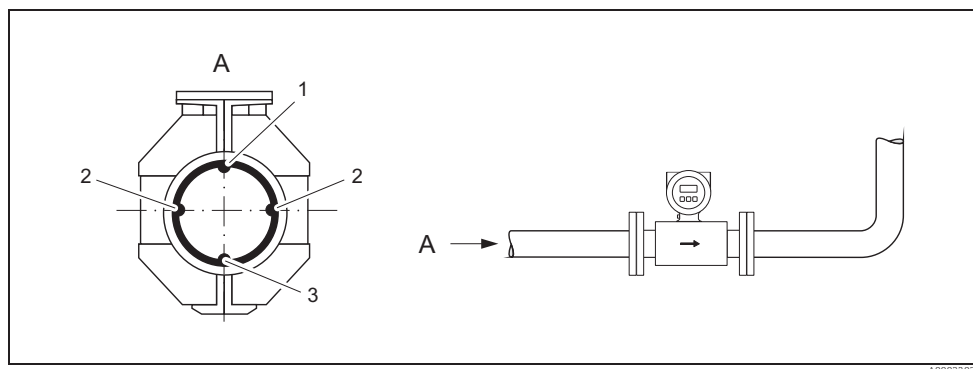


Fig. 11: Horizontal orientation

- 1 EPD electrode for the detection of empty pipes (not with Promag D and Promag H (DN 2 to 15 / 1/12 to 1/2"))
- 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: $\geq 5 \times \text{DN}$
- Outlet run: $\geq 2 \times \text{DN}$

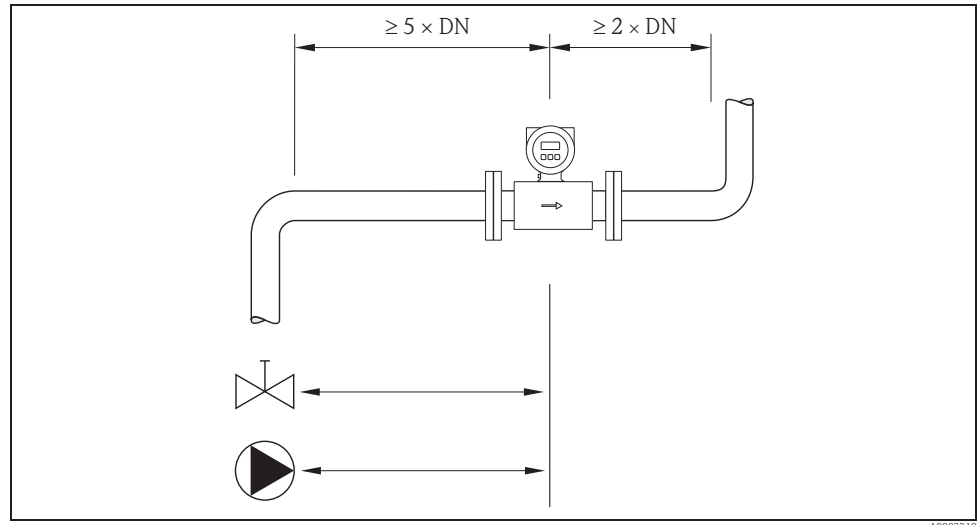


Fig. 12: Inlet and outlet runs

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.

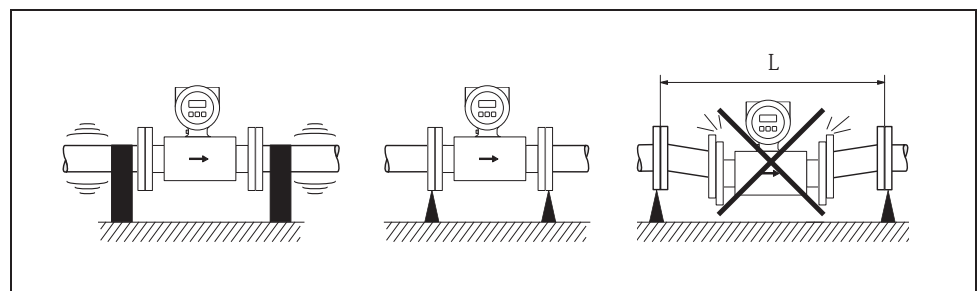


Fig. 13: Measures to prevent vibration of the device ($L > 10 \text{ m (32.8 ft)}$)

3.2.5 Foundations, supports

If the nominal diameter is $DN \geq 350$ (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.

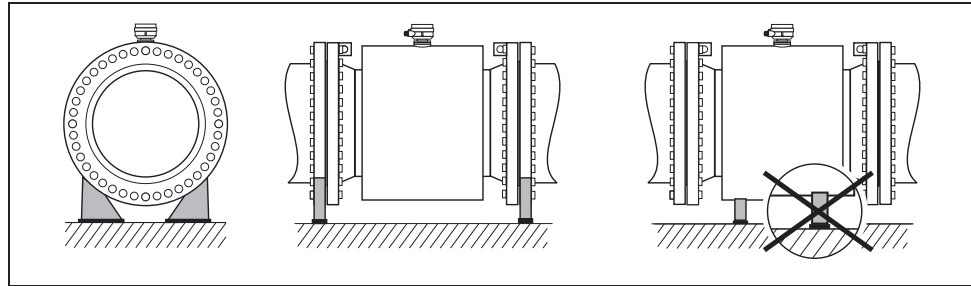


Fig. 14: Correct support for large nominal diameters ($DN \geq 350 / 14''$)

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.

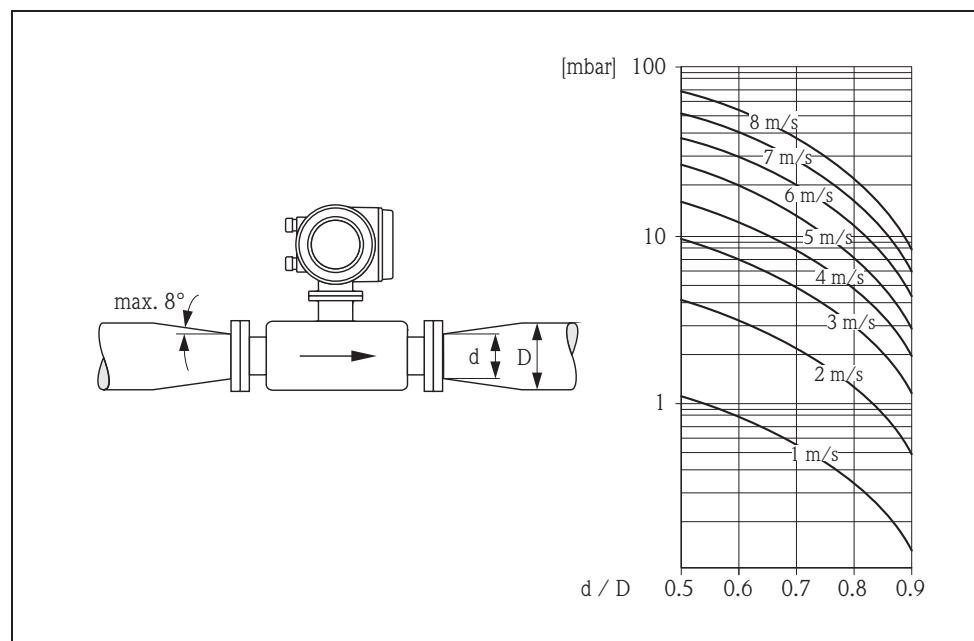


Fig. 15: Pressure loss due to adapters

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 ($v \approx 0.3$ or 10 m/s) in [dm ³ /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 ($v \approx 0.3$ or 10 m/s) in [m ³ /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 [inch]	Promag D	Promag E/P	Promag H	Promag L	Promag W
Min./max. full scale value ($v \approx 0.3$ 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
Min./max. full scale value ($v \approx 0.3$ 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 ($\rightarrow$ 16). A minimum conductivity of $20 \mu\text{S}/\text{cm}$ is required for measuring demineralized water. Most liquids can be measured as of a minimum conductivity of $5 \mu\text{S}/\text{cm}$.
- The maximum connecting cable length is 10 m (32.8 ft) when empty pipe detection (EPD $\rightarrow$ 76) is switched on.

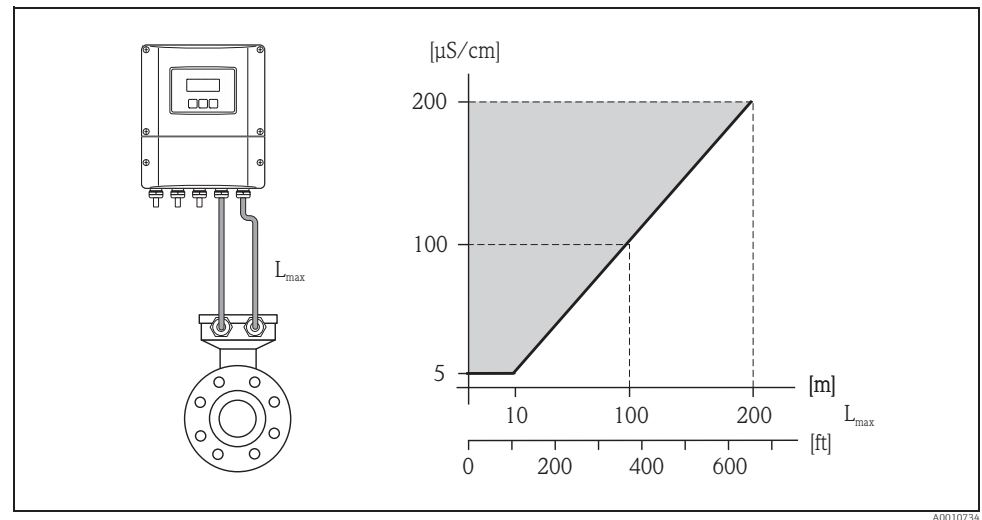


Fig. 16: Permissible cable length for the remote version

Area shaded gray = permitted range
 $L_{\max}$ = connecting cable length in [m]
 Fluid conductivity in $[\mu\text{S}/\text{cm}]$

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).

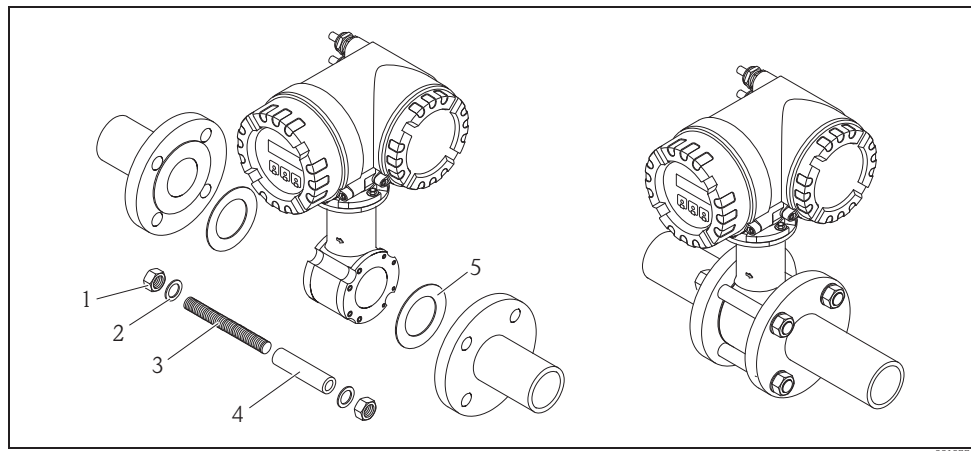


Fig. 17: Mounting the sensor

- 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 and the pitch circle diameter.

	Process connection		
	EN (DIN)	ASME	JIS
DN 25 to 40 (1 to 1 1/2")	 A0010896	 A0010824	 A0010896
DN 50 (2")	 A0010897	 A0010825	 A0010825
DN 65 (-)	 A0012170	 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 [mm]	Mounting bolts [mm]	Centering sleeve length [mm]	Tightening torque [Nm] with a process flange with a	
			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 [mm]	Mounting bolts [mm]	Centering sleeve length [mm]	Tightening torque [Nm] with a process flange with a	
			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 [inch]	Mounting bolts [inch]	Centering sleeve length [inch]	Tightening torque [lbf · ft] with a process flange with a	
			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

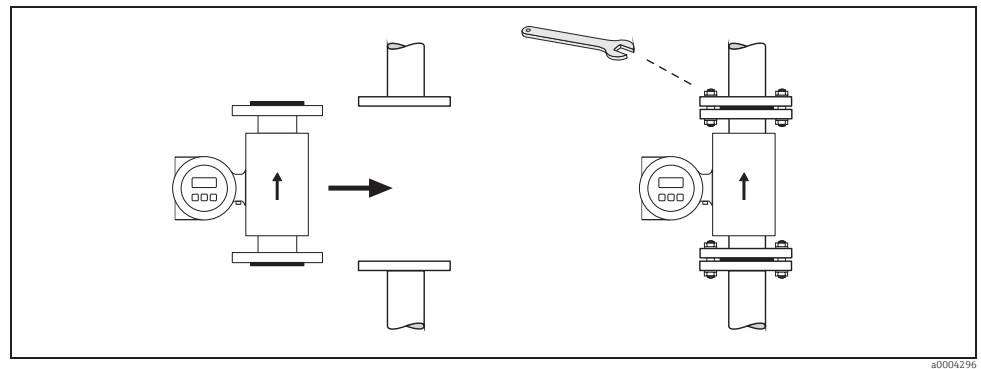


Fig. 18: Installing the Promag E sensor

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 Pressure rating [lbs]	Threaded fasteners	Max. tightening torque PTFE	
[mm]	[inch]			[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).

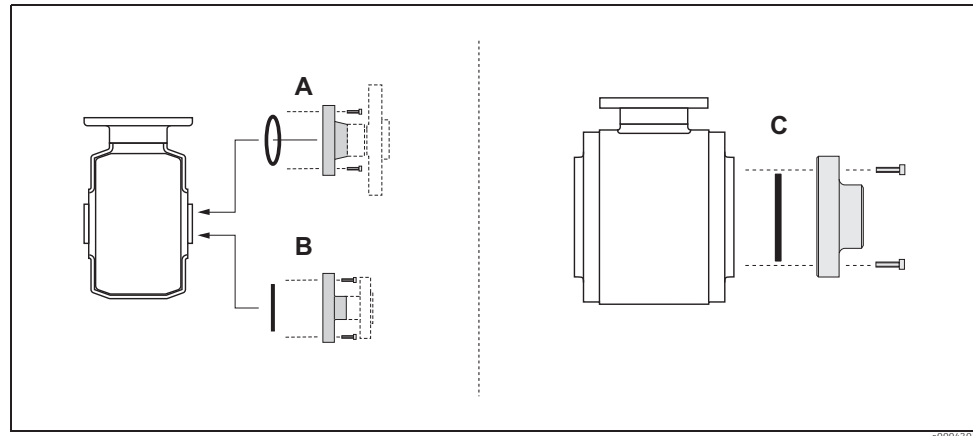


Abb. 19: Promag H process connections (DN 2 to 25 / 1/12 to 1", DN 40 to 100 / 1½ to 4")

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 seal

- 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).

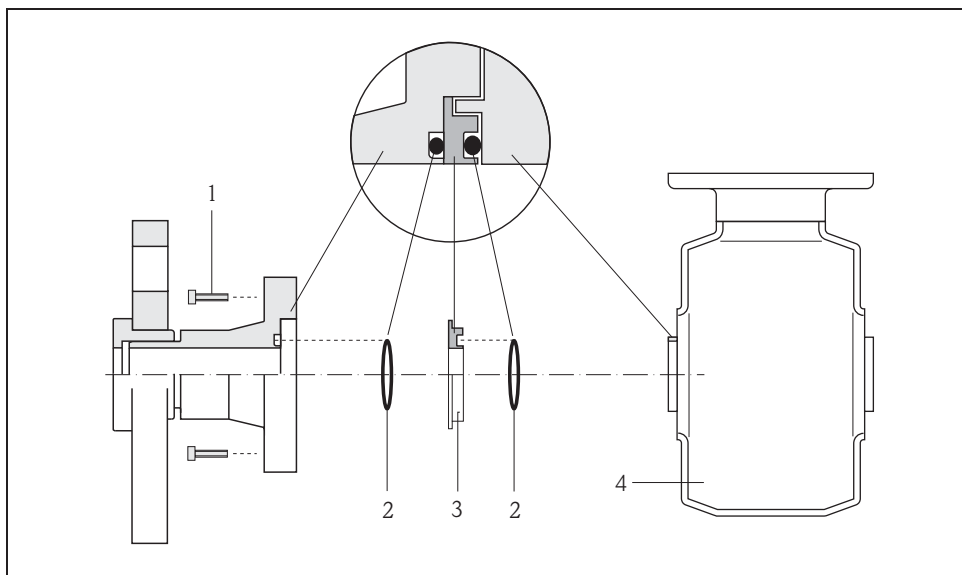


Fig. 20: Installing ground rings with Promag H (DN 2 to 25 / 1/12 to 1")

- 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 concentric installation in the measuring section is required

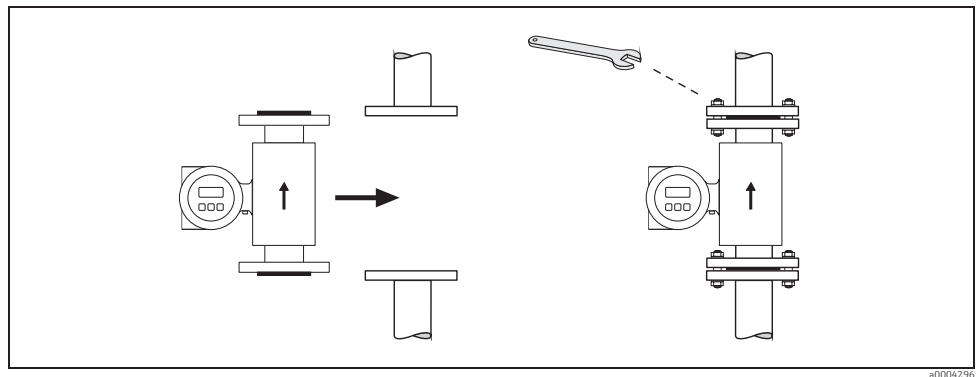


Fig. 21: Installing the Promag L sensor

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 [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque		
			Hard rubber [Nm]	Polyurethane [Nm]	PTFE [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 Pressure rating [lbs]	Threaded fasteners	Max. tightening torque					
[mm]	[inch]			Hard rubber		Polyurethane		PTFE	
				[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 Pressure rating	Threaded fasteners	Max. tightening torque					
[mm]	[inch]			Hartgummi		Polyurethane		PTFE	
				[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 Pressure rating	Threaded fasteners	Max. tightening torque		
			Hard rubber [Nm]	Polyurethane [Nm]	PTFE [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 [mm]	AS 4087 Pressure rating	Threaded fasteners	Max. tightening torque		
			Hard rubber [Nm]	Polyurethane [Nm]	PTFE [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

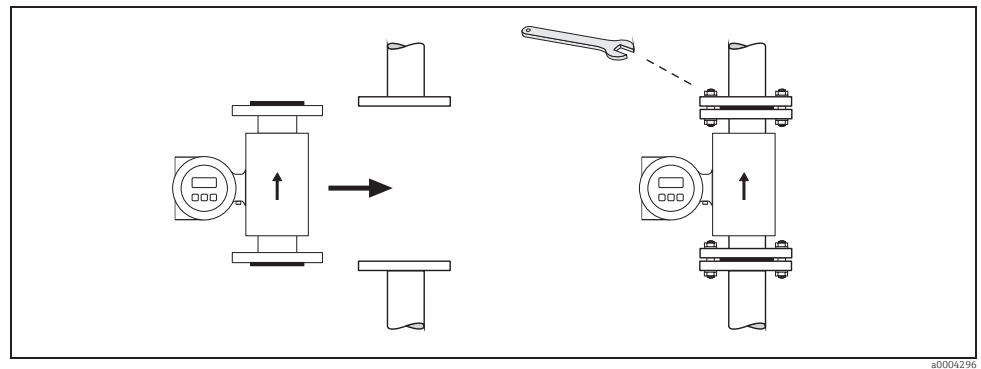


Fig. 22: Installing the Promag P sensor

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.

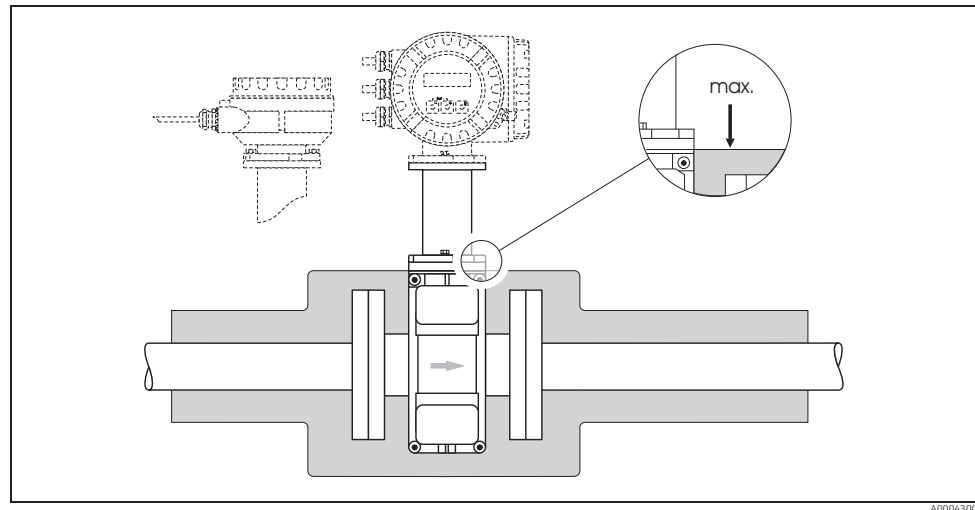


Fig. 23: Promag P (high-temperature version): Insulating the pipe

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		ASME Pressure rating [lbs]	Threaded fasteners	Max. tightening torque			
[mm]	[inch]			PTFE		PFA	
				[Nm]	[lbf · ft]	[Nm]	[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 Pressure rating [lbs]	Threaded fasteners	Max. tightening torque			
[mm]	[inch]			PTFE		PFA	
				[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 [mm]	JIS Pressure rating	Threaded fasteners	Max. tightening torque [Nm]	
			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

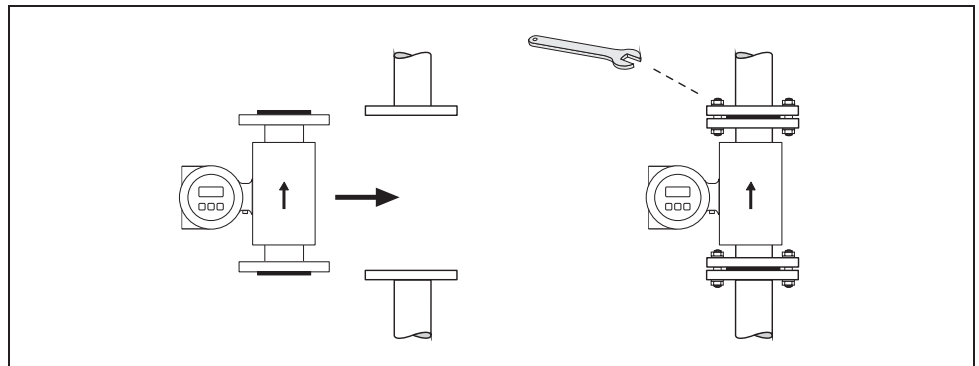


Fig. 24: Installing the Promag W sensor

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		Polyurethane	
				[Nm]	[lbf · ft]	[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.

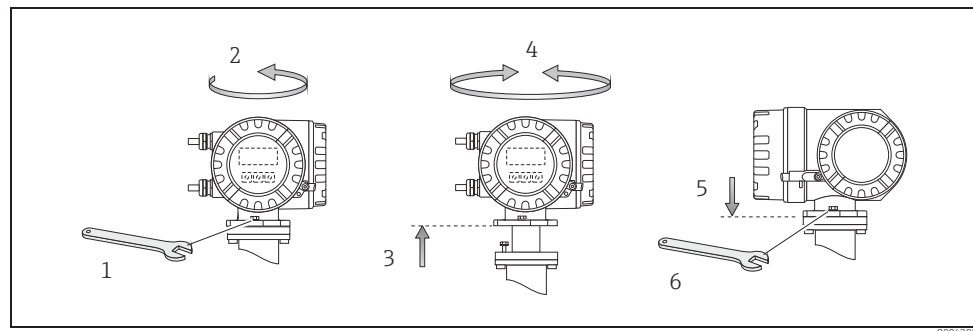


Fig. 25: Turning the transmitter housing (aluminum field housing)

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. $2 \times 90^\circ$ in either direction).
4. Lower the housing into position.
5. Retighten the two securing screws.

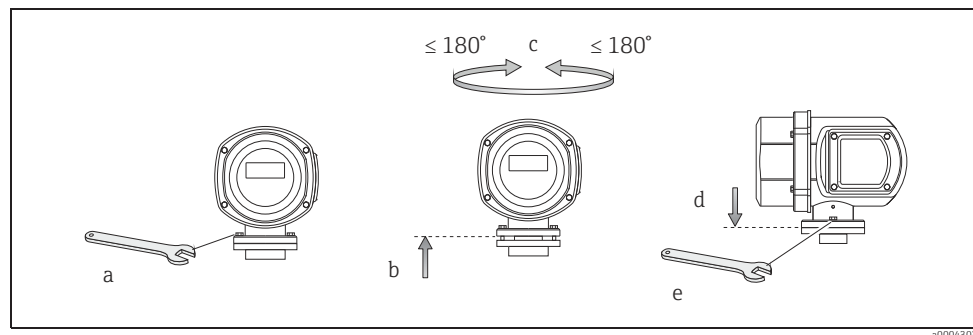


Fig. 26: Turning the transmitter housing (stainless-steel field housing)

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. $4 \times 45^\circ$ 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.

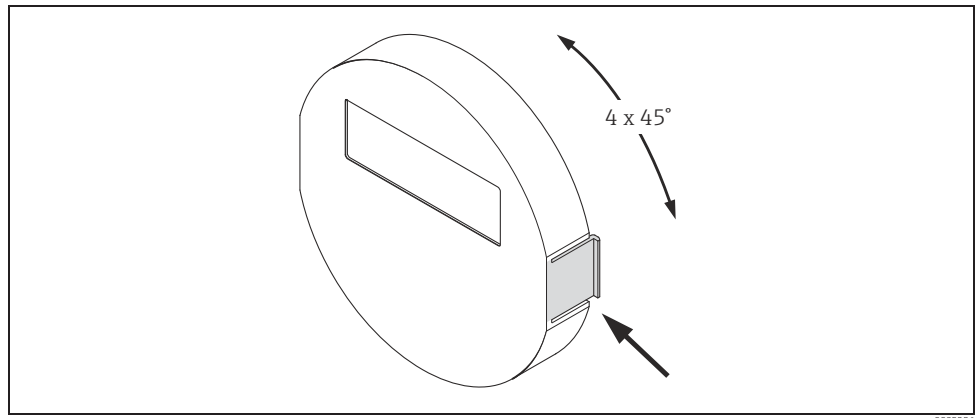


Fig. 27: Turning the local display (field housing)

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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.

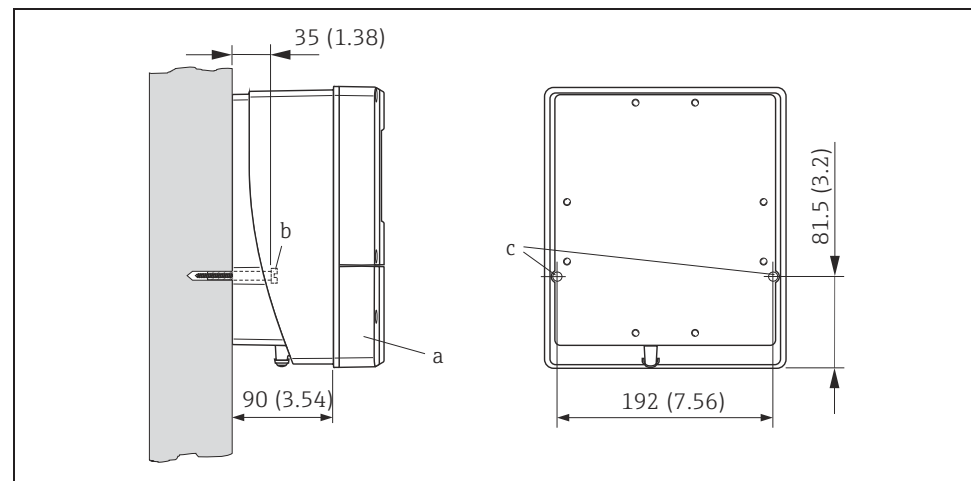


Fig. 28: Mounted directly on the wall

a0001130

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.

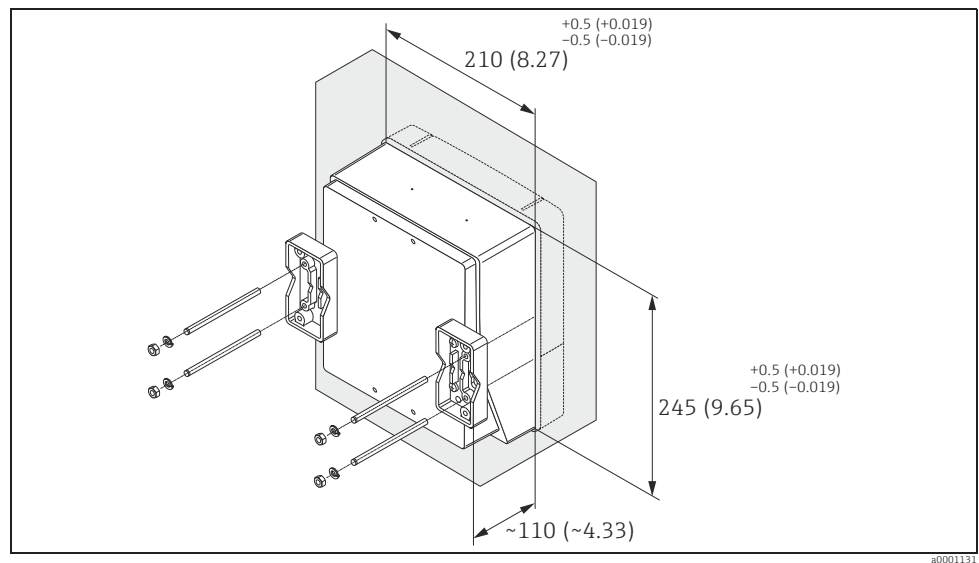


Fig. 29: Panel installation (wall-mount housing)

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.

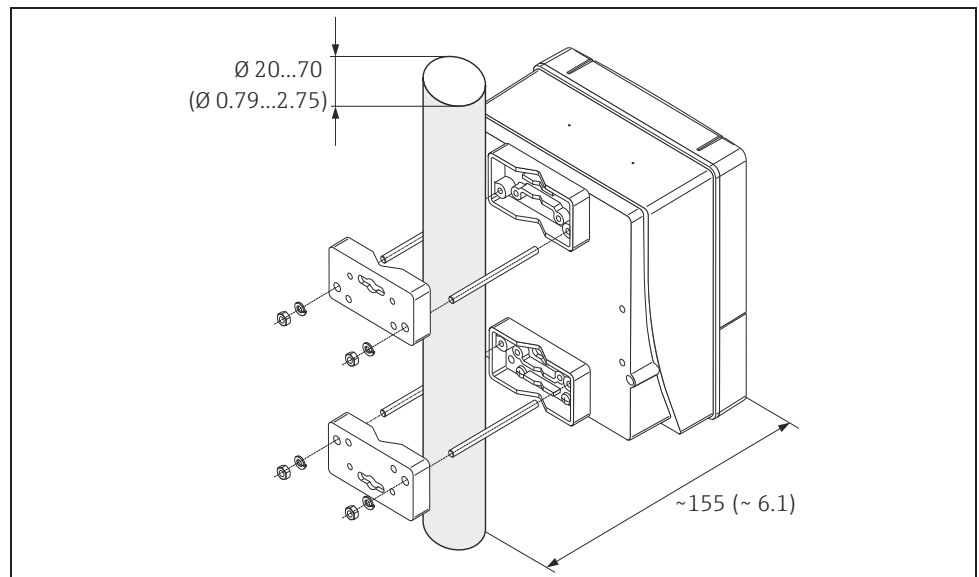


Fig. 30: Pipe mounting (wall-mount housing)

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 $\geq 5 \times \text{DN}$ Outlet run $\geq 2 \times \text{DN}$
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)

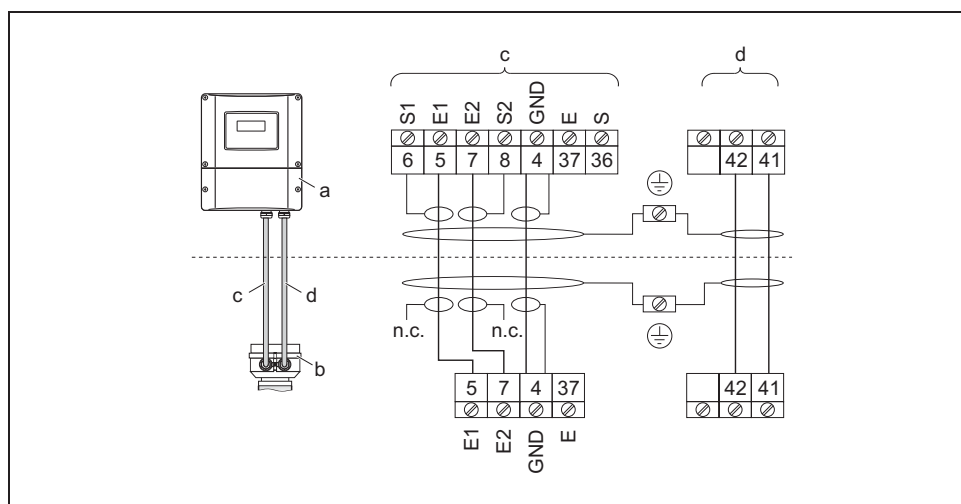


Caution!

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



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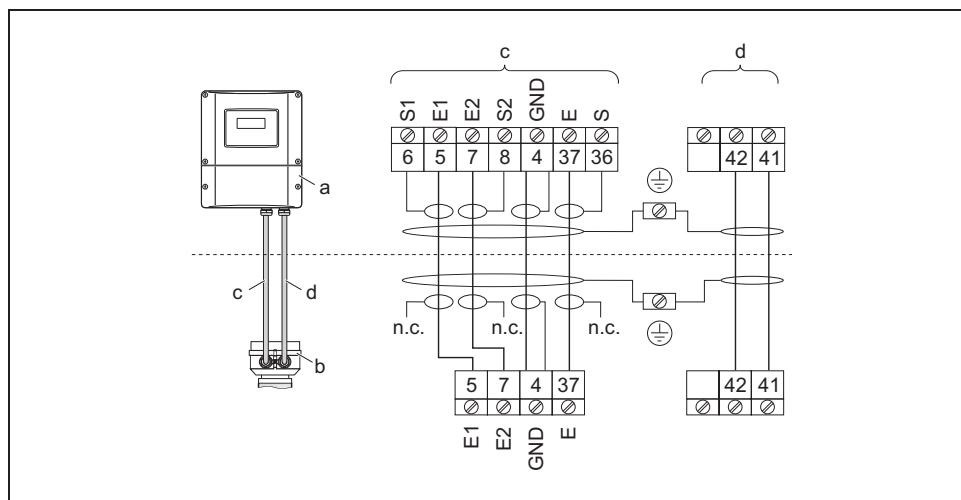
Fig. 31: Connecting the remote version of Promag D

- 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



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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

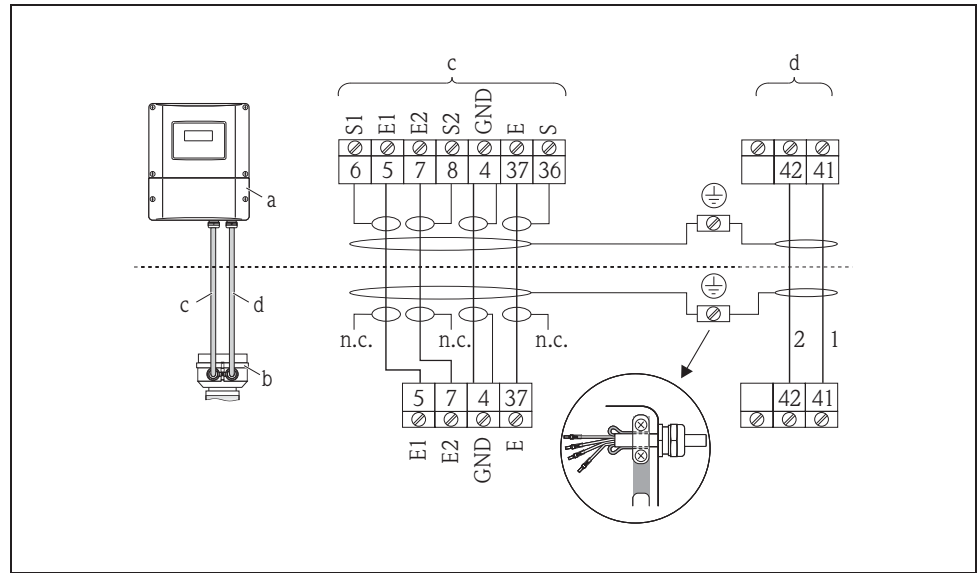


Fig. 33: Connecting the remote version of Promag H

- 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

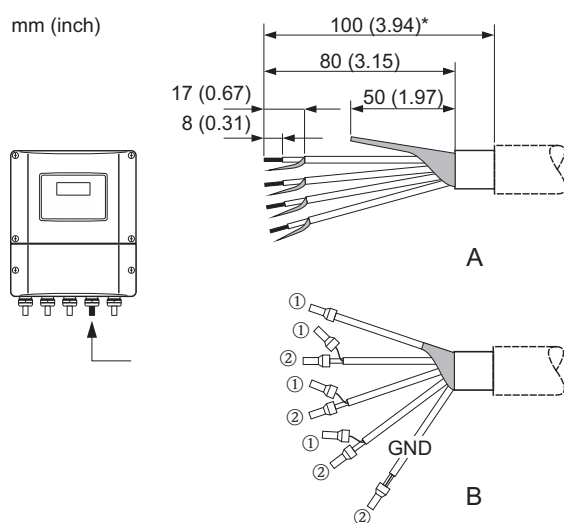
Terminate the signal and coil current cables as shown in the figure below (Detail A).
Ferrules must be provided on the fine-wire cores (Detail B: ① = red ferrules, Ø 1.0 mm; ② = white ferrules, Ø 0.5 mm).
* Stripping only for reinforced cables

 Caution!

When fitting the connectors, pay attention to the following points:

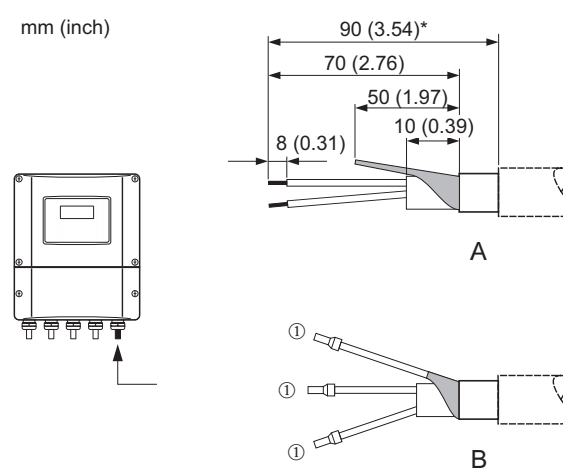
- **Signal cable** → Make sure that the ferrules do not touch the wire shield on the sensor side.
Minimum distance = 1 mm (exception "GND" = green cable)
- **Coil current cable** → Insulate one core of the three-core wire at the level of the core reinforcement; you only require two cores for the connection.

Signal cable



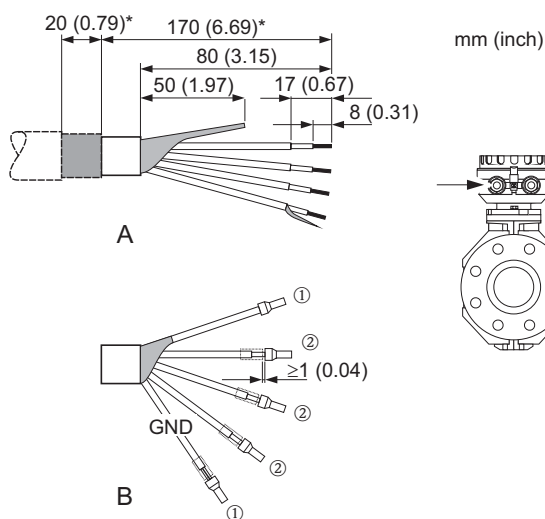
A0002687

Coil current cable



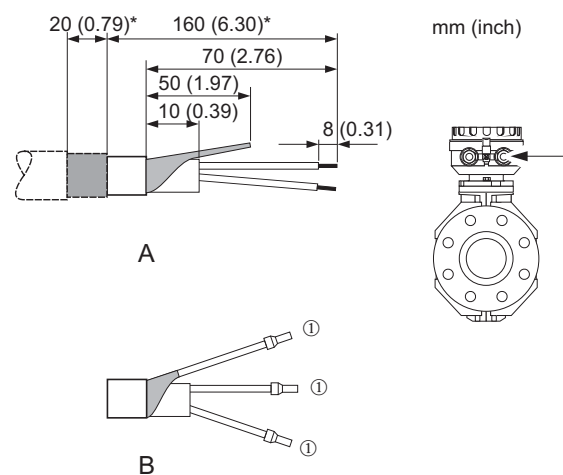
A0002688

Signal cable



A0002646

Coil current cable



A0002650

**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, Ø 1.0 mm; ② = white ferrules, Ø 0.5 mm).

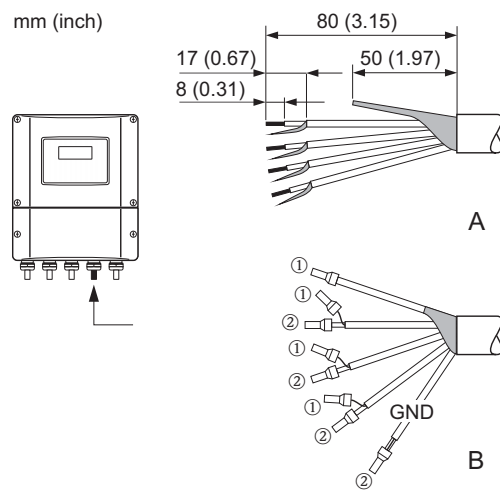
 **Caution!**

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.

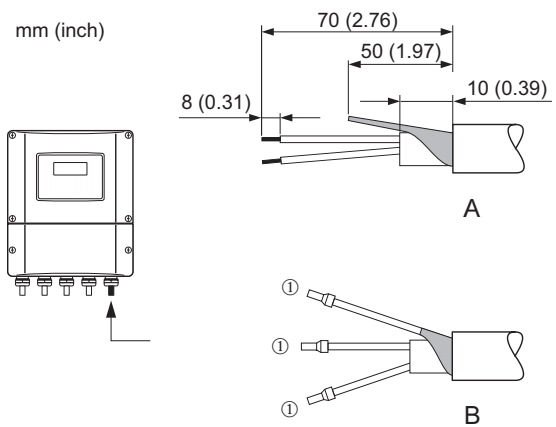
TRANSMITTER

Signal cable



A0002686

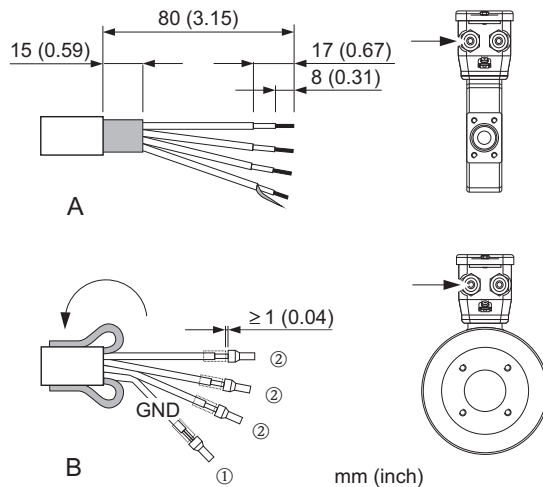
Coil current cable



A0002684

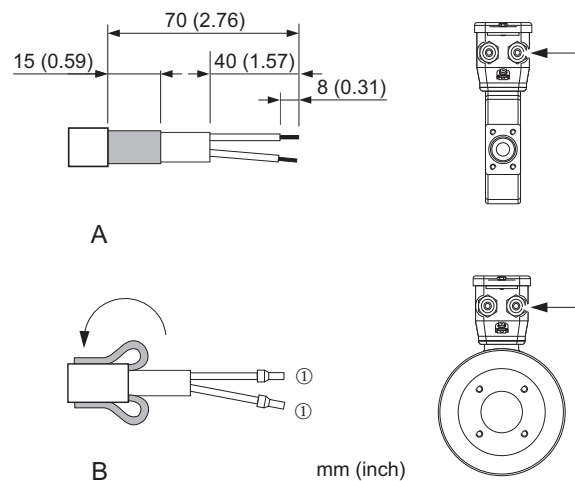
SENSOR

Signal cable



A0002647

Coil current cable



A0002648

4.1.2 Cable specifications

Signal cable

- $3 \times 0.38 \text{ mm}^2$ PVC cable with common, braided copper shield ($\varnothing \sim 7 \text{ mm}$) and individually shielded cores
- With Empty Pipe Detection (EPD): $4 \times 0.38 \text{ mm}^2$ PVC cable with common, braided copper shield ($\varnothing \sim 7 \text{ mm}$) and individually shielded cores
- Conductor resistance: $\leq 50 \text{ } \Omega/\text{km}$
- Capacitance: core/shield: $\leq 420 \text{ pF/m}$
- Permanent operating temperature: -20 to $+80 \text{ }^\circ\text{C}$
- Cable cross-section: max. 2.5 mm^2

Coil cable

- $2 \times 0.75 \text{ mm}^2$ PVC cable with common, braided copper shield ($\varnothing \sim 7 \text{ mm}$)
- Conductor resistance: $\leq 37 \text{ } \Omega/\text{km}$
- Capacitance: core/core, shield grounded: $\leq 120 \text{ pF/m}$
- Operating temperature: -20 to $+80 \text{ }^\circ\text{C}$
- Cable cross-section: max. 2.5 mm^2
- Test voltage for cable insulation: $\geq 1433 \text{ V AC r.m.s. } 50/60 \text{ Hz}$ or $\geq 2026 \text{ V DC}$

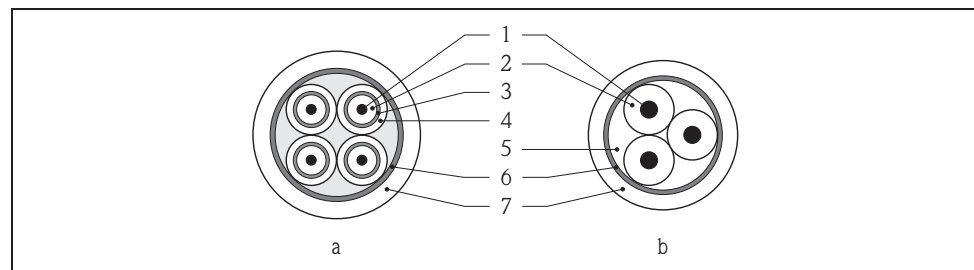


Fig. 34: Cable cross-section

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.

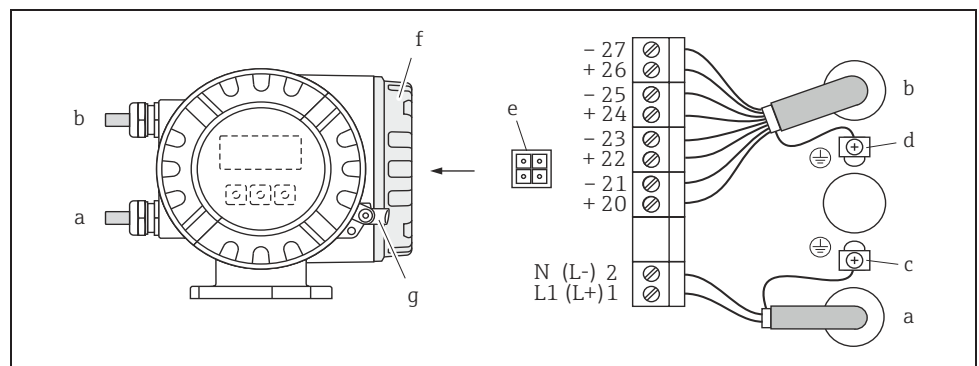


Fig. 35: Connecting the transmitter (aluminum field housing). Cable cross-section: max. 2.5 mm²

- 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

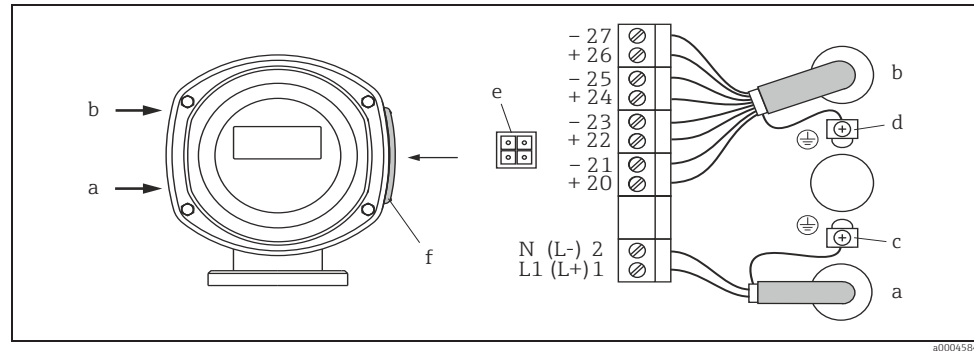


Fig. 36: Connecting the transmitter (stainless steel field housing); cable cross-section: max. 2.5 mm²

- 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

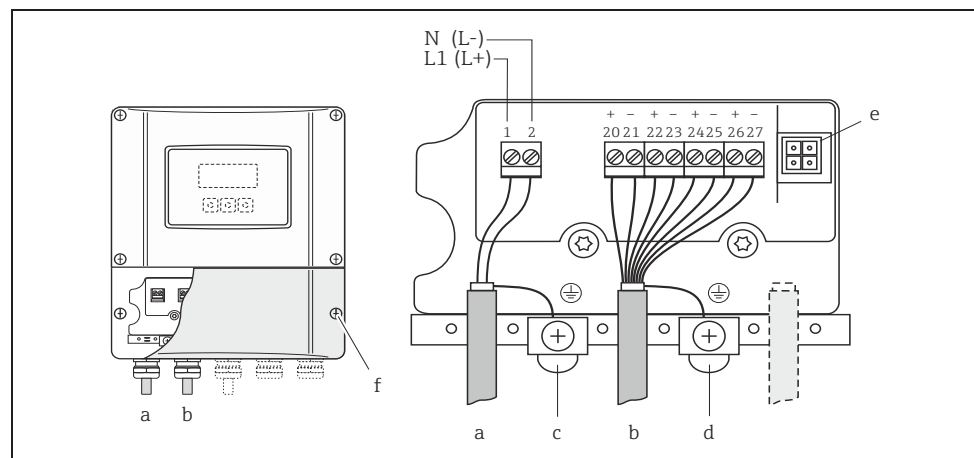


Fig. 37: Connecting the transmitter (wall-mount housing); cable cross-section: max. 2.5 mm²

- 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

Order version	Terminal No. (inputs / outputs)			
	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".

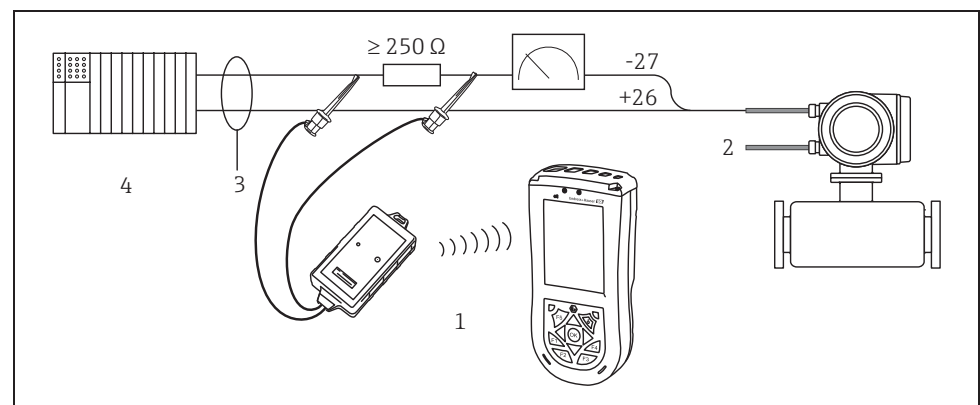


Fig. 38: Electrical connection of HART handheld Field Xpert SFX100

- 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.

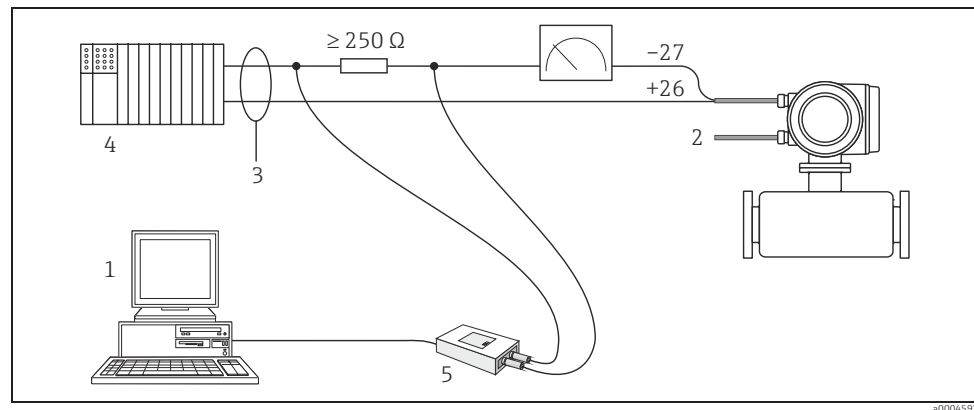


Fig. 39: Electrical connection of a PC with operating software

- 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.
- Examples for connections → 57

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

- Reference electrode integrated in the sensor as standard
- Examples 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.

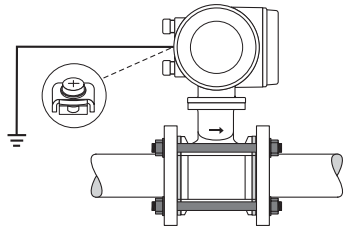


Caution!

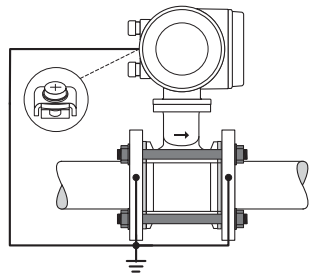
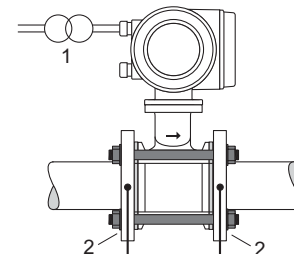
If using process connections made of a synthetic material, ground rings have to be used to ensure that potential is equalized (→ 27). The necessary ground rings can be ordered separately from Endress+Hauser as accessories (→ 79).

4.3.4 Exampels for potential equalization connections for Promag D

Standard case

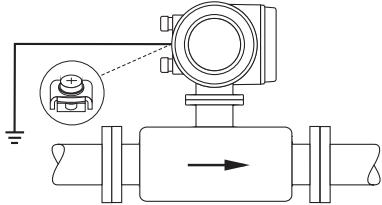
Operating conditions	Potential equalization
When using the measuring device in a: ■ Metal, grounded pipe ■ Plastic pipe ■ Pipe with insulating lining Potential equalization takes place via the ground terminal of the transmitter (standard situation).  Note! When installing in metal pipes, we recommend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

Special cases

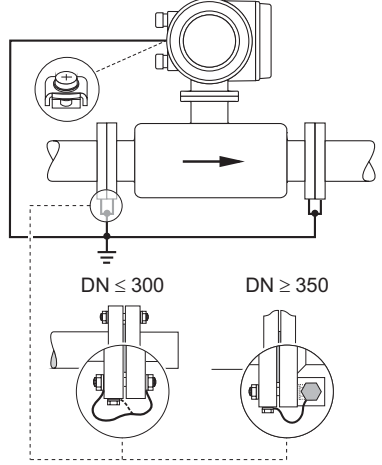
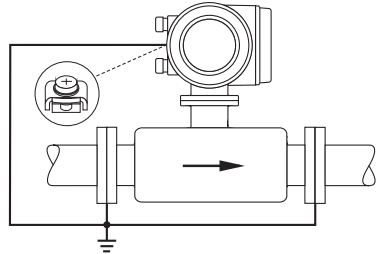
Operating conditions	Potential equalization
When using the measuring device in a: ■ Metal pipe that is not grounded This connection method also applies in situations where: ■ Customary potential equalization cannot be ensured ■ Excessively high equalizing currents can be expected Potential equalization 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

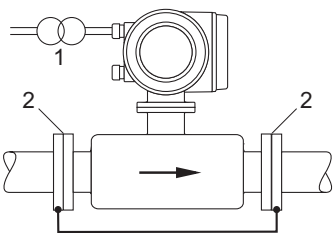
4.3.5 Exampels for potential equalization connections for Promag E/L/P/W

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.	 A0011892 <i>Fig. 43: Via the ground terminal of the transmitter</i>

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.	 A0011893 <i>Fig. 44: Via the ground terminal of the transmitter and the flanges of the pipe</i>
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.	 A0011895 <i>Fig. 45: Via the ground terminal of the transmitter</i>

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.	 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.

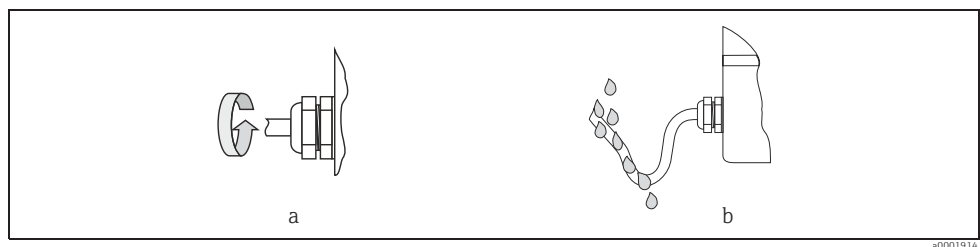


Fig. 47: Installation instructions, cable entries



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).

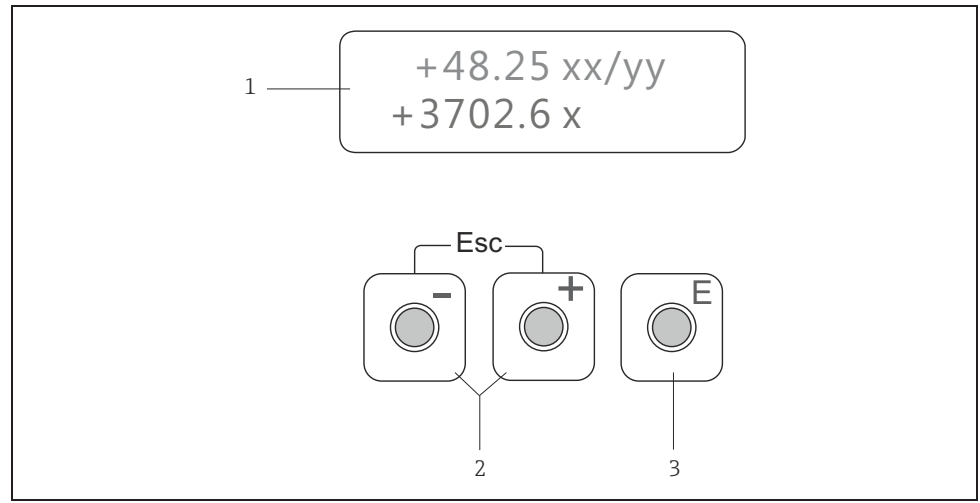


Fig. 48: Display and operating elements

- 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 → → 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
 → 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

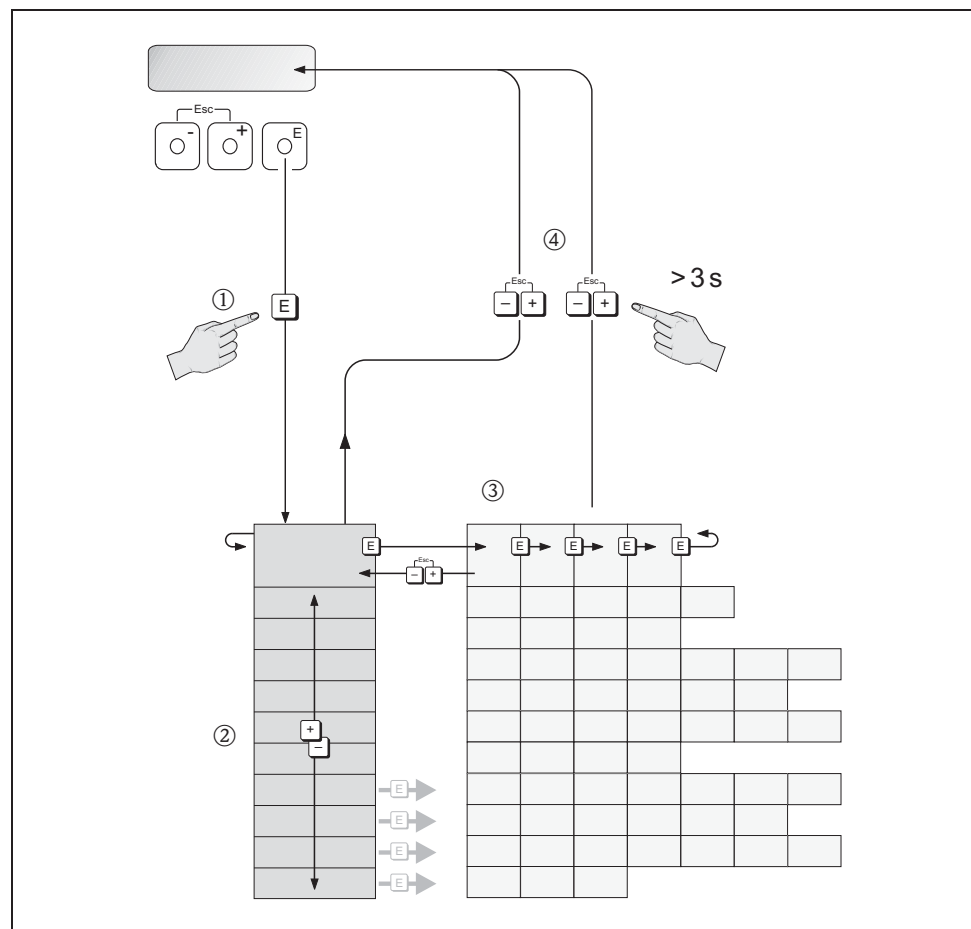


Fig. 49: Selecting functions and configuring parameters (function matrix)

A0001142

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  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.

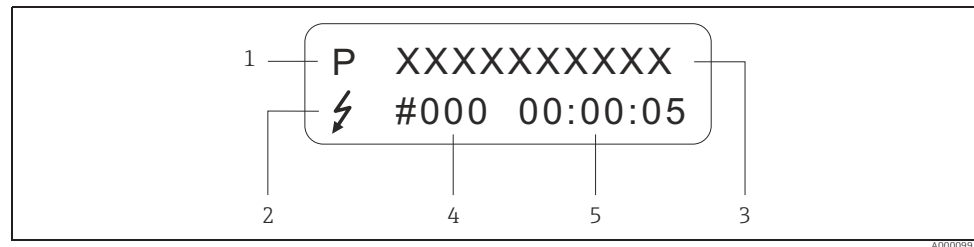


Fig. 50: Error messages on the display (example)

- 1 Error type:
– P = process error
– S = system error
- 2 Error message type:
– ⚡ = 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 (⚡)

- Displayed as → Lightning flash (⚡), 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:	11 _{hex} (ENDRESS+HAUSER)	→ Function MANUFACTURER ID
Device ID:	41 _{hex}	→ 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 <i>Factory setting:</i> 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 <i>Factory setting:</i> 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 <i>Factory setting:</i> 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 <i>Factory setting:</i> 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 <i>Factory setting:</i> ■ 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 <i>Factory setting:</i> ■ 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 overshoot
	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

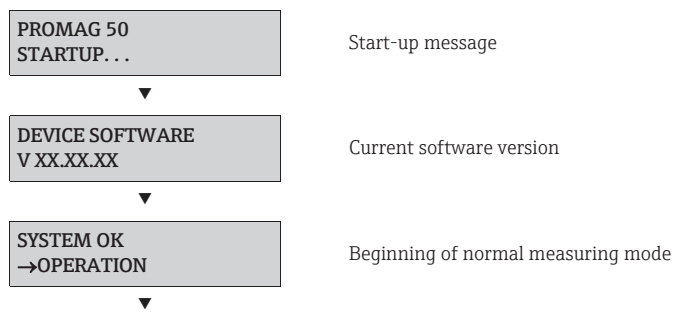
6.1 Function check

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:



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.

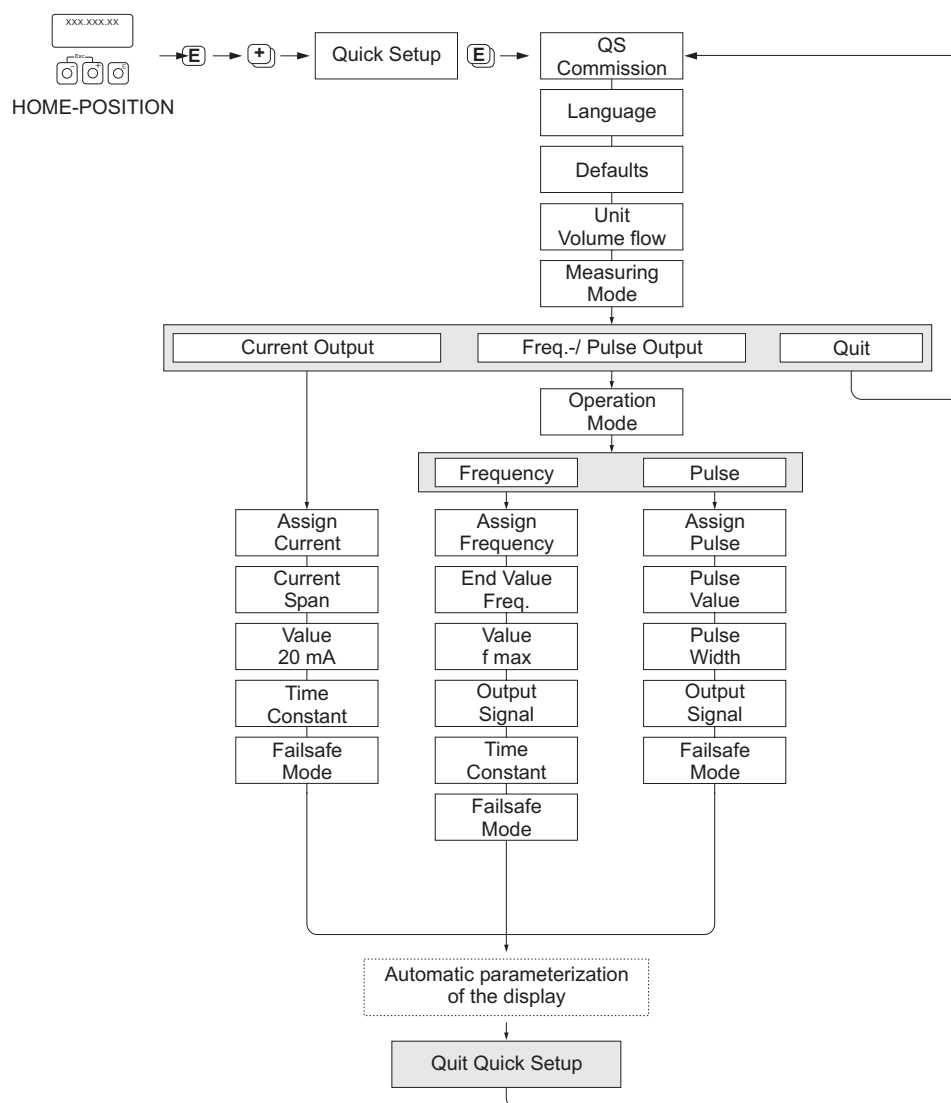


Fig. 51: "QUICK SETUP COMMISSIONING" menu for the rapid configuration of important device functions

A0005413-EN

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.

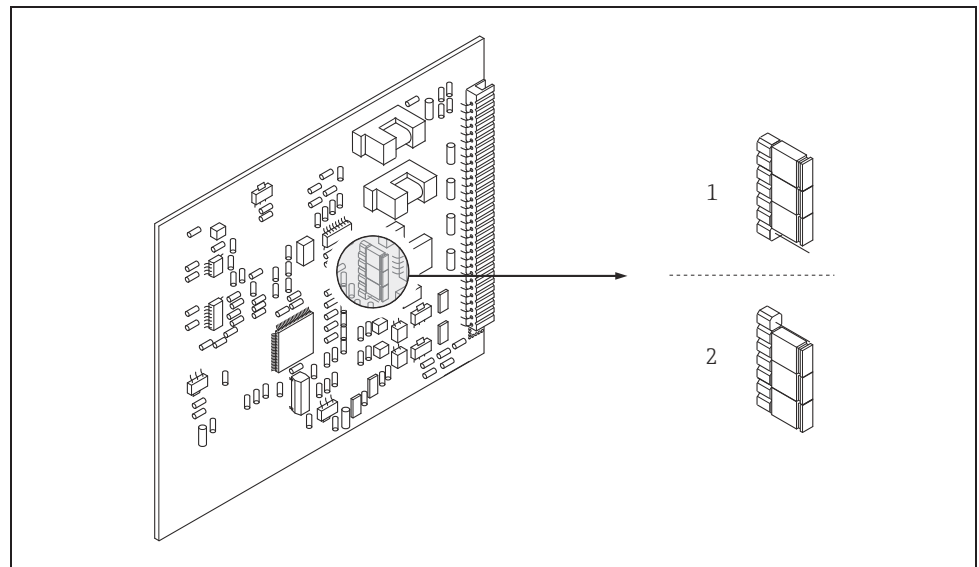


Fig. 52: Configuring current outputs using jumpers (I/O board)

- 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 → → → PROCESS PARAMETER → → → 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 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 to confirm.
6. Having completed the adjustment, select the setting "OFF" and exit the function by pressing .
7. Switch on empty pipe detection in the EPD function:
 - EPD empty pipe adjustment: Select ON STANDARD or ON SPECIAL and press to confirm
 - OED empty pipe adjustment: Select OED and confirm with .



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 [Ex 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: f = 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 (⚡) 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 ⚡ = 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.). <i>Determine the pulse width:</i> – 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: $\frac{1}{2 \cdot 10 \text{ Hz}} = 50 \text{ ms}$ 3. Reduce flow.

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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.	- Remote version: - Switch off the power supply and check the wiring → 47 - If necessary, reverse the connections at terminals 41 and 42 - Change the setting in the "INSTALLATION DIRECTION SENSOR" function accordingly
Measured-value reading fluctuates even though flow is steady.	- Check grounding and potential equalization → 56 - Check the fluid for presence of gas bubbles. - 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.	- Check grounding and potential equalization → 56 - Check the fluid for presence of gas bubbles. - 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.	- Perform empty-pipe/full-pipe adjustment and then switch on Empty Pipe detection → 76 - Remote version: Check the terminals of the EPD cable → 47 - Fill the measuring tube.
The current output signal is always 4 mA, irrespective of the flow signal at any given time.	- Select the "BUS ADDRESS" function and change the setting to "0". - 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 FALLSAFE 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	<i>STOP</i> The totalizers are paused until the error is rectified. <i>ACTUAL VALUE</i> The fault is ignored. The totalizer continues to count in accordance with the current flow value. <i>HOLD VALUE</i> 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

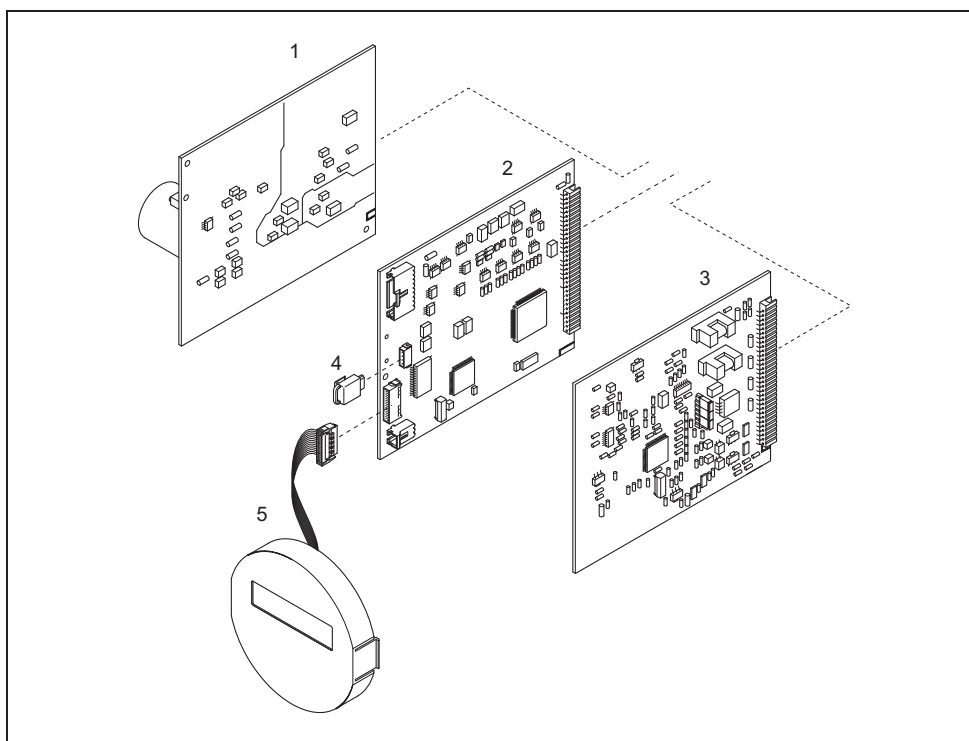


Fig. 53: Spare parts for Promag 50 transmitter (field and wall-mounted housings)

- 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!

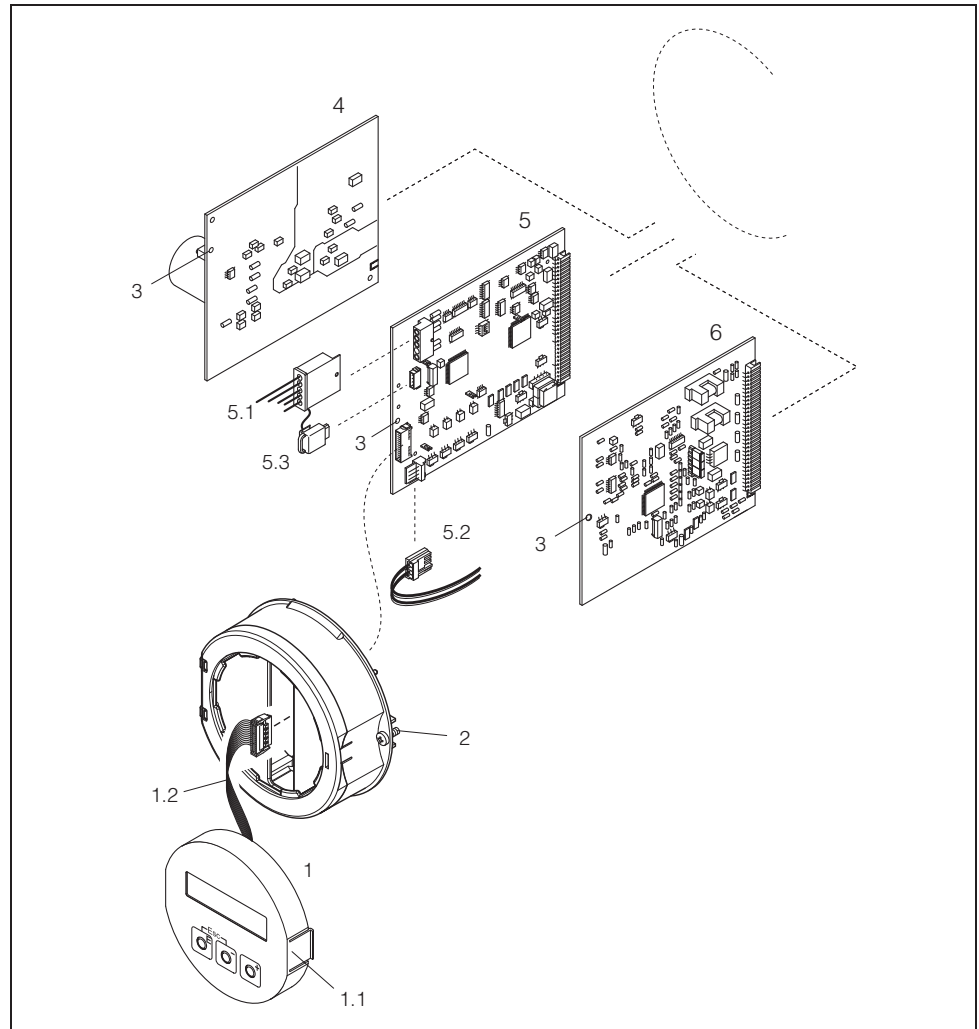
- Risk of electric shock!
Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
- Risk of damaging electronic components (ESD protection). Static electricity can damage electronic components or impair their 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.



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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.

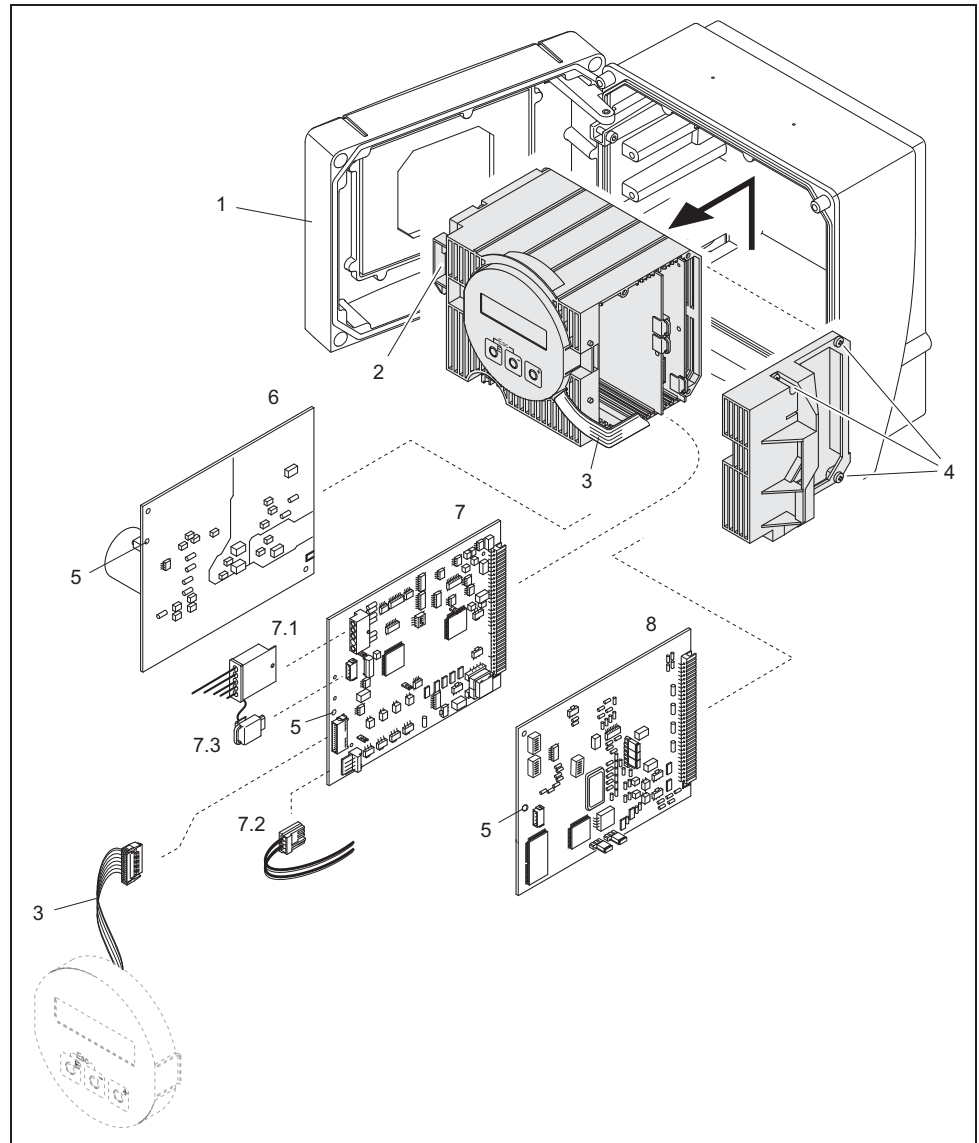


Fig. 55: Wall-mount housing: removing and installing printed circuit boards

- 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.

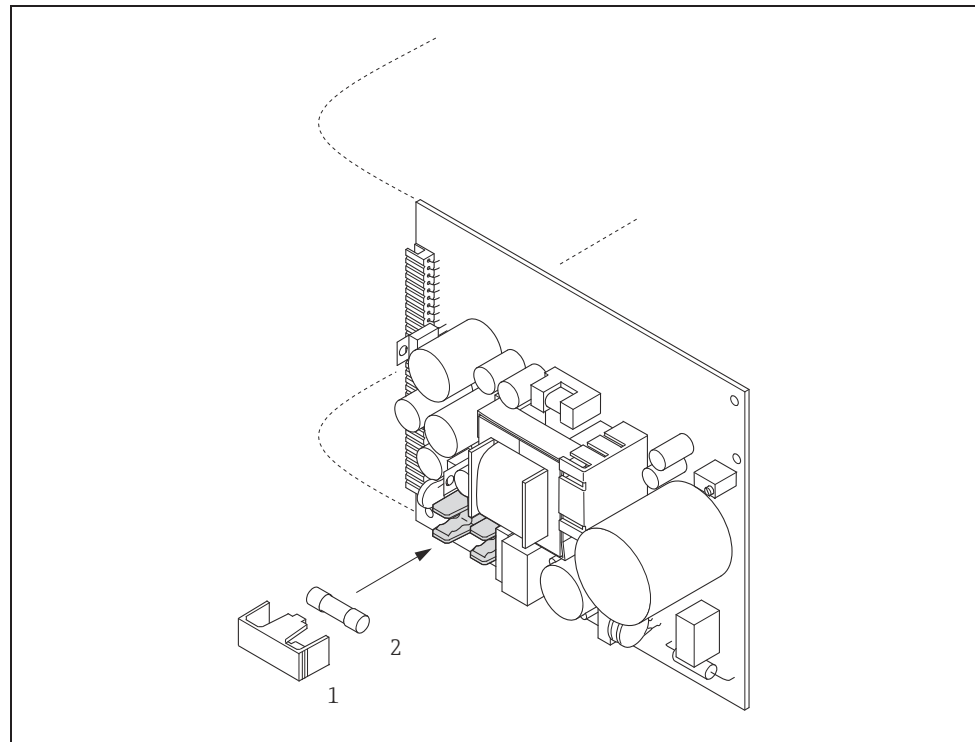


Fig. 56: Replacing the device fuse on the power supply board

- 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.

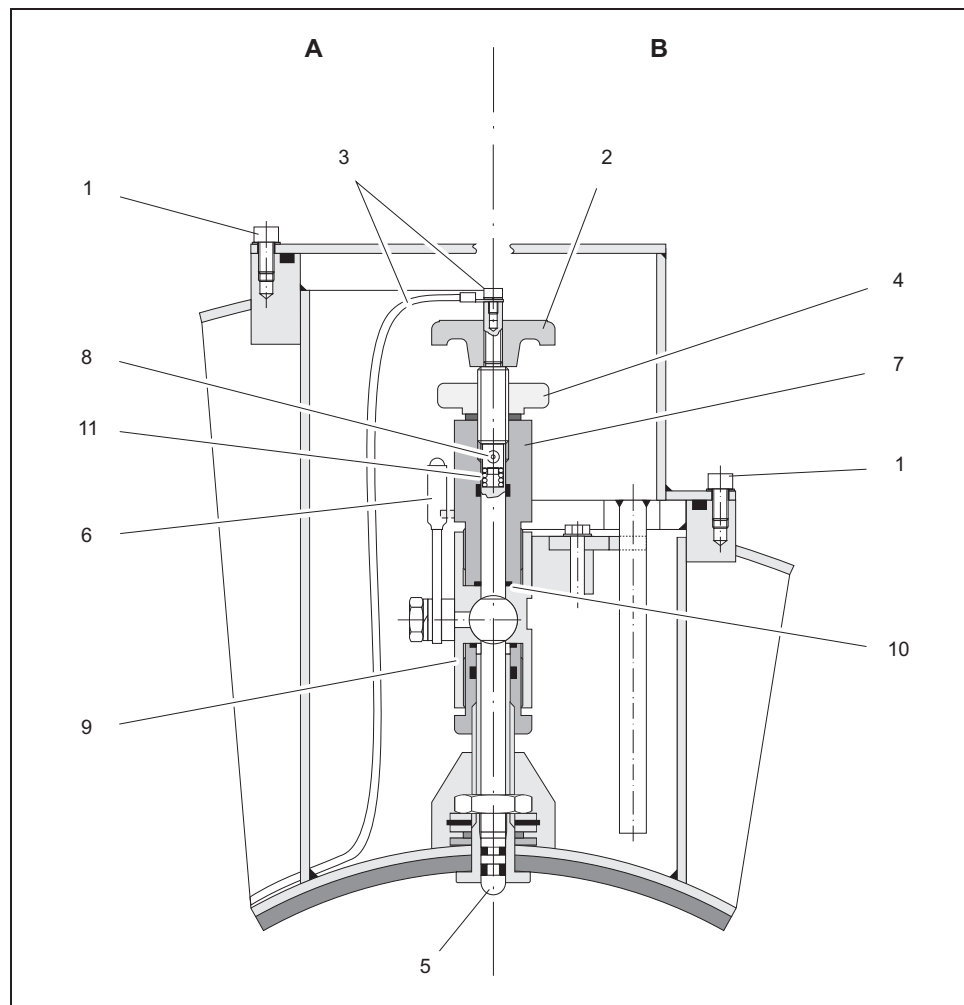


Fig. 57: Apparatus for replacing exchangeable measuring electrodes

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
- $R_i = 5$ k Ω
- 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: $R_L \geq 250$ Ω)
 - Passive: 4 to 20 mA, supply voltage V_S 18 to 30 V DC, $R_i \geq 150$ Ω
- Time constant can be selected (0.01 to 100 s)
- Full scale value adjustable
- Temperature coefficient: typ. 0.005% o.f.s./ $^{\circ}\text{C}$, 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: $+28 \pm 2$ °C ($+82 \pm 4$ °F)
- Ambient temperature: $+22 \pm 2$ °C ($+72 \pm 4$ °F)
- Warm-up period: 30 minutes

Installation:

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

Maximum measured error

- Current output: plus typically $\pm 5 \mu\text{A}$
- Pulse output: $\pm 0.5\%$ o.r. $\pm 1 \text{ mm/s}$
Option: $\pm 0.2\%$ o.r. $\pm 2 \text{ mm/s}$ (o.r. = of reading)

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

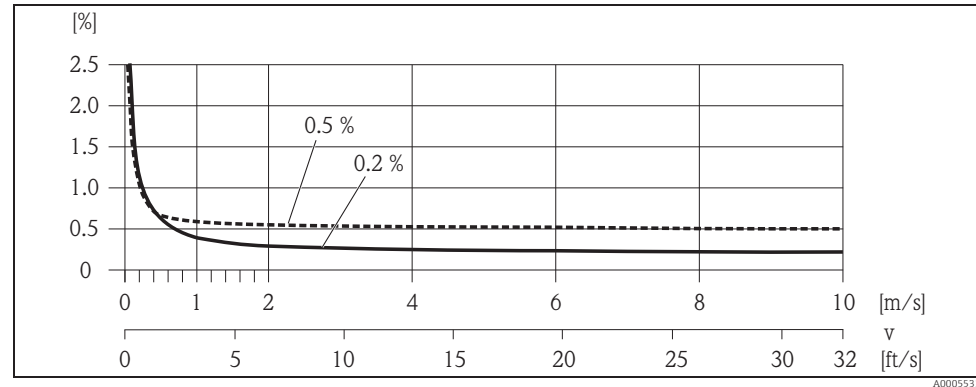


Fig. 58: Max. measured error in % of reading

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Repeatability

Max. $\pm 0.1\%$ o.r. $\pm 0.5 \text{ mm/s}$ (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: $\geq 5 \times \text{DN}$
- Outlet run: $\geq 2 \times \text{DN}$

Adapters

→ 16

Length of connecting cable

→ 19

10.1.8 Environment**Ambient temperature range**

- Transmitter: -20 to $+60 \text{ }^{\circ}\text{C}$ (-4 to $+140 \text{ }^{\circ}\text{F}$)



Note!

At ambient temperatures below -20 ($-4 \text{ }^{\circ}\text{F}$) the readability of the display may be impaired.

- Sensor (Flange material carbon steel): -10 to $+60 \text{ }^{\circ}\text{C}$ ($+14$ to $+140 \text{ }^{\circ}\text{F}$)

**Caution!**

- The permitted temperature range of the measuring tube lining may not be undershot or overshoot (→ "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

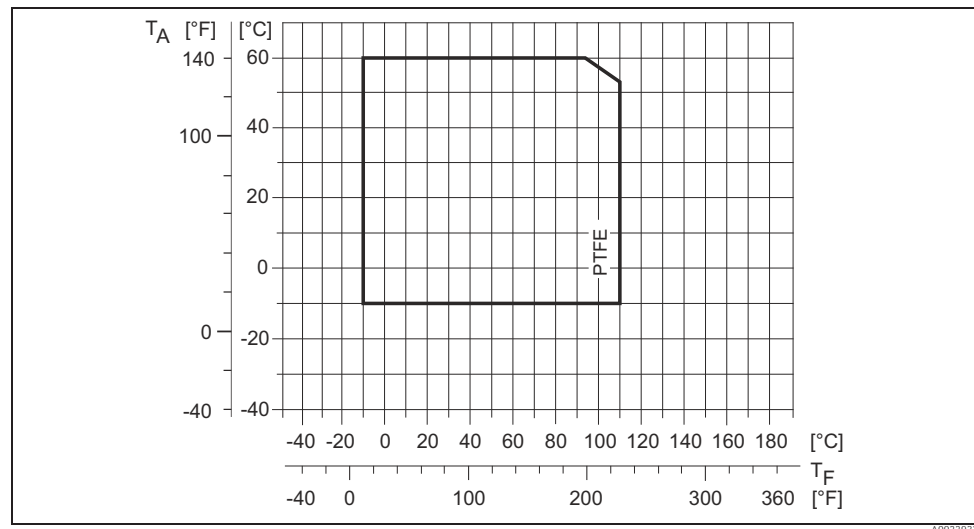


Fig. 59: Compact and remote version Promag E (TA = ambient temperature; TF = fluid temperature)

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")

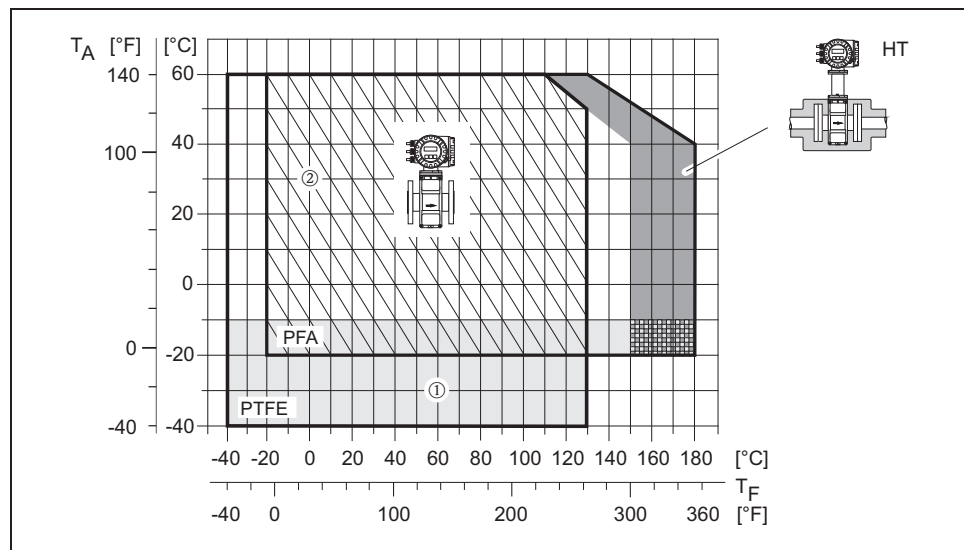
Promag P

Standard

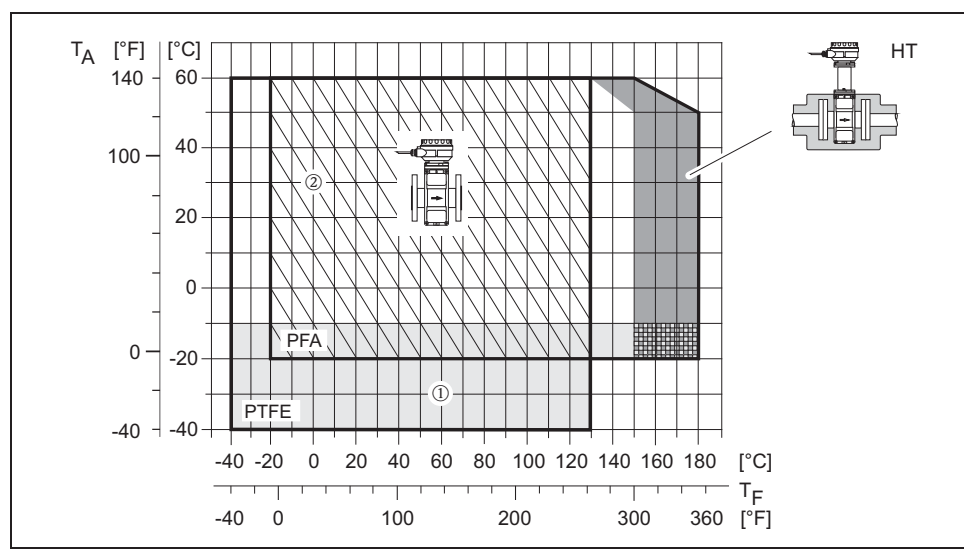
- –40 to +130 °C (–40 to +266 °F) for PTFE (DN 15 to 600 / ½ to 24"),
Restrictions → see the following diagrams
- –20 to +130 °C (–4 to +266 °F) for PFA/HE (DN 25 to 200 / 1 to 8"),
Restrictions → see the following diagrams
- –20 to +150 °C (–4 to +302 °F) for PFA (DN 25 to 200 / 1 to 8"),
Restrictions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



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



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 $\geq 5 \mu\text{S/cm}$ ($\geq 20 \mu\text{S/cm}$ 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							
[mm]	[inch]	25 °C		80 °C		100 °C		110 °C	
		77 °F		176 °F		212 °F		230 °F	
		[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							
[mm]	[inch]	25 °C		80 °C		100 °C		110 °C	
		77 °F		176 °F		212 °F		230 °F	
		[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					
[mm]	[inch]	25 °C	80 °C	100 °C	130 °C	150 °C	180 °C
		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		
[mm]	[inch]		25 °C	50 °C	80 °C
			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			
[mm]	[inch]	25 °C		90 °C	
		77 °F		194 °F	
		[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					
[mm]	[inch]	25 °C	80 °C	100 °C	130 °C	150 °C	180 °C
		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									
[mm]	[inch]	25 °C		80 °C		100 °C		130 °C		150 °C	180 °C
		77 °F		176 °F		212 °F		266 °F		302 °F	356 °F
		[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							
[mm]	[inch]		25 °C	50 °C	80 °C	100 °C	130 °C	150 °C	180 °C	
			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		Compact version	Remote version (without cable)	
Nominal diameter [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)						Transmitter
		Sensor				ASME	JIS	
[mm]	[inch]	PN 6	PN 10	PN 16	PN 40			Class 150
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		Compact version DIN	Remote version (without cable)	
Nominal diameter [mm]	[inch]		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				
25	1"	PN 6	-	PN 10	-	PN 16	7.3	ASME / Class 150	7.9	PN 16	-	Tabelle E	-
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		
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				
25	1"	PN 6	-	PN 10	-	PN 16	5.3	ASME / Class 150	5.9	PN 16	-	Tabelle E	-
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		
375	15"		-		102		-		-		103		
400	16"		87.4		102		124		166		118		
450	18"		97.4		110		139		189		131		
500	20"		112		130		174		226		180		
600	24"		153		160		303	300	258				
700	28"		188		238		288	264	365				
750	30"		-		-		-	316	443				
800	32"		238		313		364	381	501				
900	36"		306		391		456	468	700				
1000	40"		357		466		579	585	757				
1050	42"		-		-		-	668	-				
1200	48"		527		715		866	899	-				
-	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)						
[mm]	[inch]	EN (DIN) / AS*		JIS		ASME / AWWA		EN (DIN) / AS*		Sensor		Trans-mitter		
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	10K	11.1	Class 150	-	PN 16	10.0	10K	9.1	Class 150	-	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	10K	41.9	Class 150	45	PN 10	43	10K	39.9	Class 150	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"	PN 10	175	10K	255	Class 150	255	PN 10	173	10K	173	Class 150	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

Weight data in kg														
Nominal diameter		Compact version					Remote version (without cable)							
[mm]	[inch]	EN (DIN) / AS*		JIS		ASME / AWWA		EN (DIN) / AS*		Sensor		ASME / AWWA	Trans-mitter	
25	1"	PN 40	7.3		7.3		7.3	PN 40	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	10K	11.1	Class 150	-	PN 16	10.0	10K	9.1	Class 150	-	6.0
80	3"		14.0		12.5		14.0		12.0		10.5		12.0	6.0
100	4"		16.0		14.7		16.0		14.0		12.7		14.0	6.0
125	5"		21.5		21.0		-		19.5		19.0		-	6.0
150	6"		25.5		24.5		25.5		23.5		22.5		23.5	6.0
200	8"		45		41.9		45		43		39.9		43	6.0
250	10"		65		69.4		65		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
700	28"		355				400		353				398	6.0
-	30"		-				460		-				458	6.0
800	32"		435				550		433				548	6.0
900	36"		575				800		573				798	6.0
1000	40"		700				900		698				898	6.0
-	42"		-				1100		-				1098	6.0
1200	48"		850				1400		848				1398	6.0
-	54"		-				2200		-				2198	6.0
1400	-		1300				-		1298				-	6.0
-	60"		-				2700		-				2698	6.0
1600	-		1700				-		1698				-	6.0
-	66"		-				3700		-				3698	6.0
1800	72"		2200				4100		2198				4098	6.0
-	78"		-				4600		-				4598	6.0
2000	-		2800				-		2798				-	6.0
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														

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)	
[mm]	[inch]		Sensor	Transmitter
		ASME	ASME	Wall-mount housing
		Class 150	Class 150	
15	½"	14.3	9.92	13.2
25	1"	16.1	11.7	
40	1 ½"	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 version ¹⁾	
[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	Class 150	10	13
25	1"		16		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"		165		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
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		Compact version		Remote version (without cable)	
Nominal diameter				Sensor	Transmitter
[mm]	[inch]				
25	1"	Class 150	16	Class 150	12
40	1 ½"		21		13
50	2"		23		13
80	3"		31		13
100	4"		35		13
150	6"		56		13
200	8"		99		13
250	10"		143		13
300	12"		243		13
350	14"		386		13
400	16"		452		13
450	18"		562		13
500	20"		628		13
600	24"		893		13
700	28"	Class D	882	Class D	13
-	30"		1014		13
800	32"		1213		13
900	36"		1764		13
1000	40"		1985		13
-	42"		2426		13
1200	48"		3087		13
-	54"		4851		13
-	60"		5954		13
-	66"		8159		13
1800	72"		9041		13
-	78"		10143		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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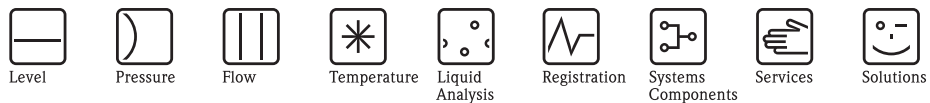
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www.addresses.endress.com

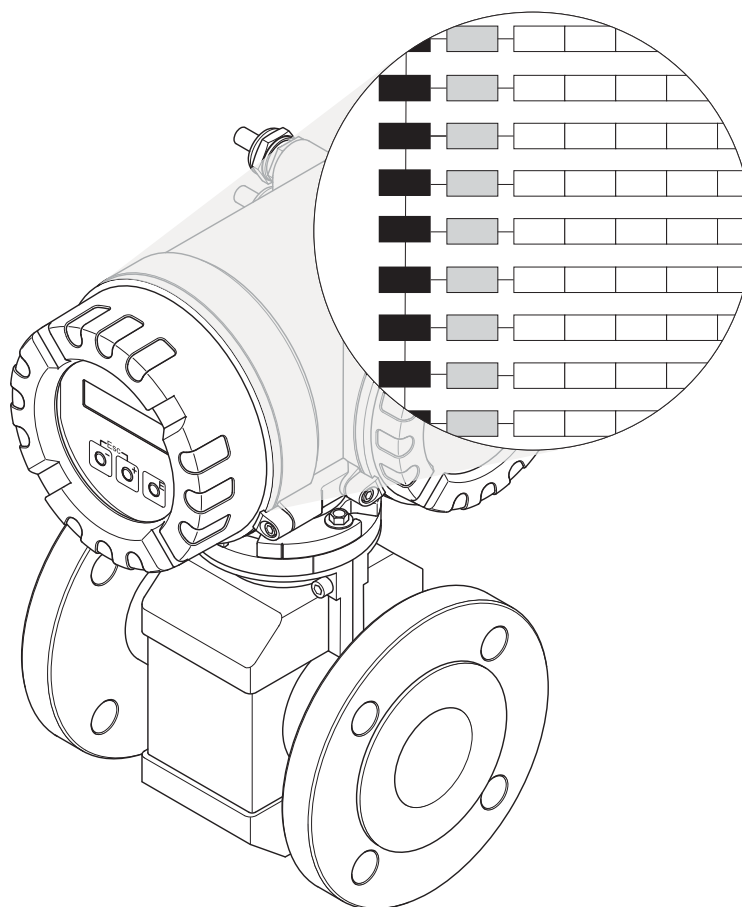
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Description of Device Functions

Proline Promag 50

Electromagnetic Flow Measuring System



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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.

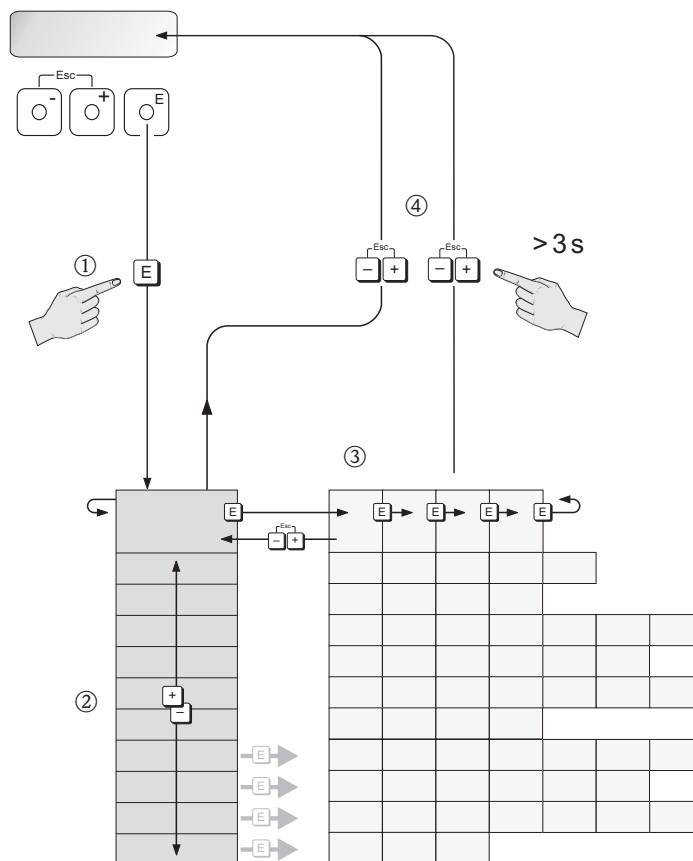
An overview of all the groups available is provided in the table of contents on Page 3 and in the graphical representation of the function matrix on Page 6.

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 - and save with E (all text on the display now appears in German).
4. Exit the function matrix (ESC > 3 seconds).



1.2 Illustration of the function matrix

Function groups

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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 dm³/min; 1.4359 m³/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 → cm³/s; cm³/min; cm³/h; cm³/day Cubic decimeter → dm³/s; dm³/min; dm³/h; dm³/day Cubic meter → m³/s; m³/min; m³/h; m³/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 → ft³/s; ft³/min; ft³/h; ft³/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. m³/p) Options: Metric → cm³; dm³; m³; ml; l; hl; Ml Mega US → cc; af; ft³; 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)

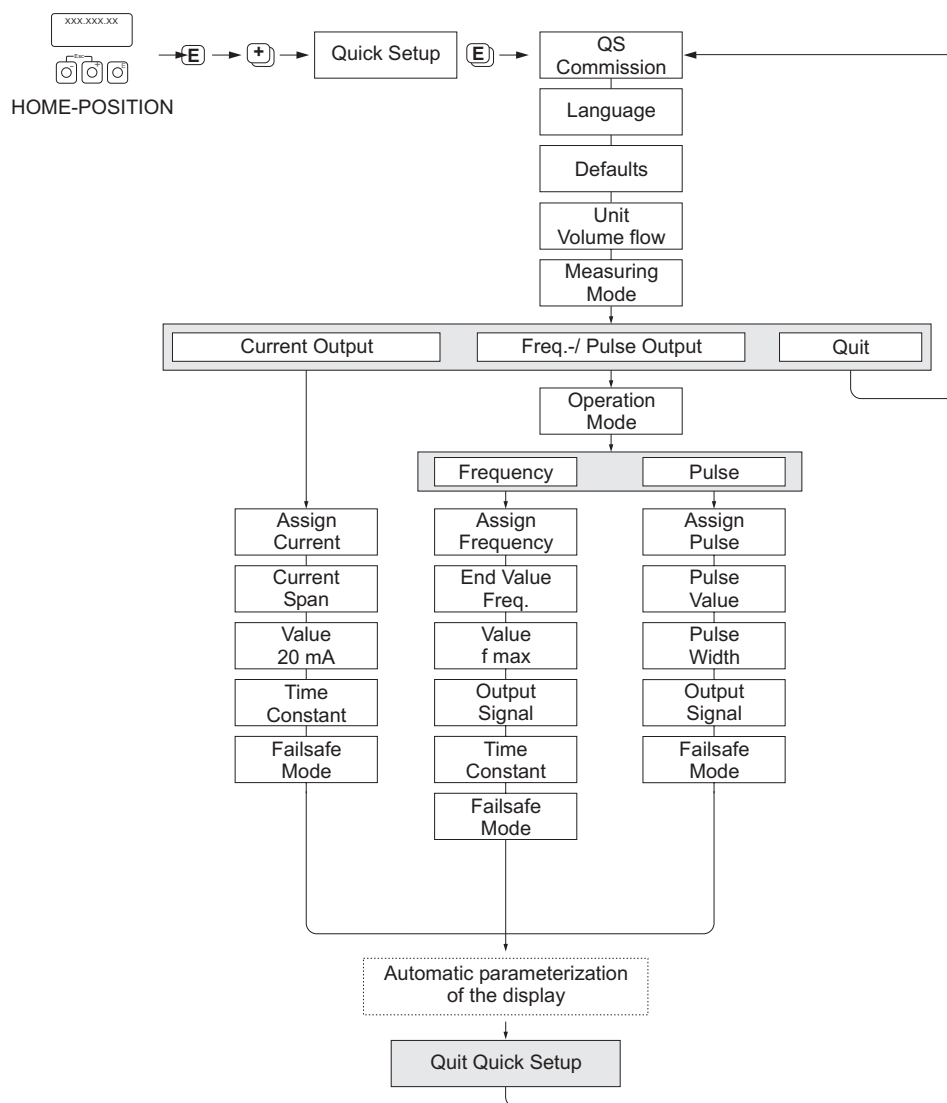
4 Group QUICK SETUP

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 dm³)  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 dm³) The value returned by the SUM function = 896,845.7 dm³ Effective total quantity = 2,896,845.7 dm³ Display shows: Integer with exponent, including sign and unit, e.g. 2 E7 dm³
UNIT TOTALIZER	Use this function to define the unit for the totalizer. Options: Metric → cm³; dm³; m³; ml; l; hl; Ml Mega US → cc; af; ft³; 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

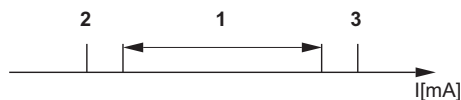
Use this function to define the current span. The selection specifies the operational range and the lower and upper signal on alarm. For the current output the option HART can be defined additionally.

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

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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] / [dm³...m³ or US-gal...US-Mgal] corresponds to the factory setting for the final value (see Page 58 ff.) . Freq. 125 100 0 ① ② Q 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. A0001279 24 Endress + Hauser

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:

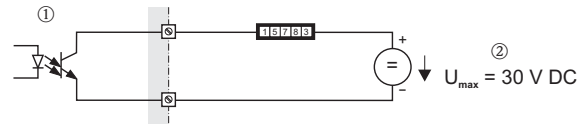
- If POSITIVE is selected, the internal transistor is activated with a **positive** signal level.
- If NEGATIVE is selected, the internal transistor is activated with a **negative** signal level (0 V).

 **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.



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① = Open collector

② = External power supply

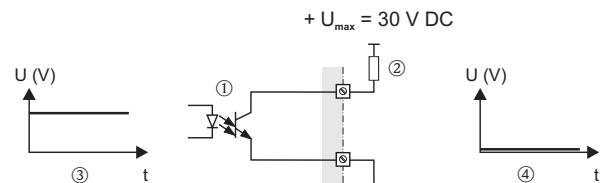
 **Note!**

For continuous currents up to 25 mA ($I_{\max} = 250 \text{ mA} / 20 \text{ ms}$).

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.



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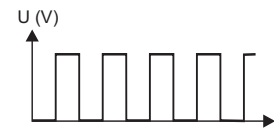
① = Open collector

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.

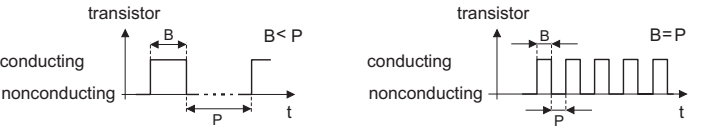


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(continued on next page)

Function description PULSE/FREQUENCY OUTPUT	
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

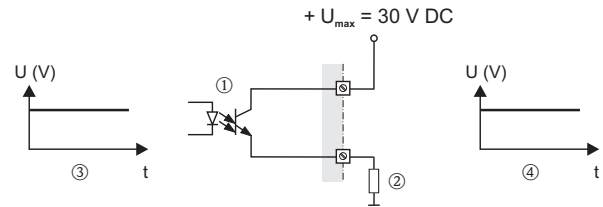
Function description PULSE/FREQUENCY OUTPUT	
SIMULATION FREQUENCY	 Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to activate simulation of the frequency output. Options: OFF ON Factory setting: OFF  Note! ■ The "SIMULATION 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 flow is 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
(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.



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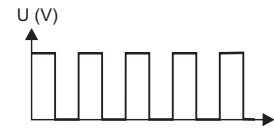
① = Open Collector

② = Pull-Down-Resistance

③ = Transistor activation in "POSITIVE" quiescent state (at zero flow)

④ = Output signal level in quiescent state (at zero flow)

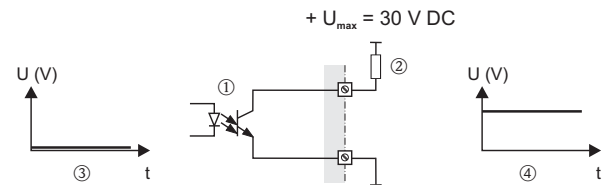
In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.



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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.



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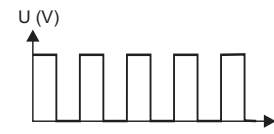
① = Open Collector

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.



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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  key.  Note! Simulation is started by confirming the CONTINUOUSLY option with the  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  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  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.

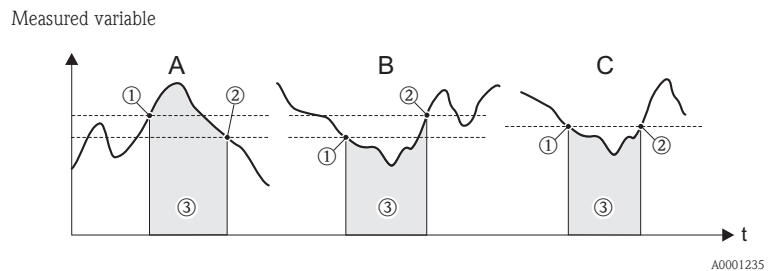
11.1 Information on the response of the status output

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

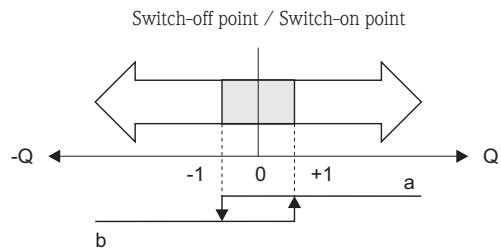
C = Maximum safety → ① SWITCH-OFF POINT = ② SWITCH-ON POINT (this configuration is to avoid)

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 $1 \text{ m}^3/\text{h}$, the status output switches off at $-1 \text{ m}^3/\text{h}$ (not conductive) and switches on again at $+1 \text{ m}^3/\text{h}$ (conductive).

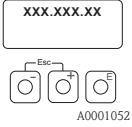
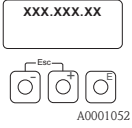
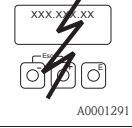
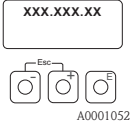
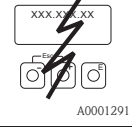
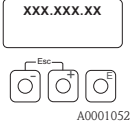
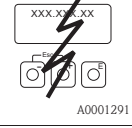
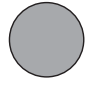
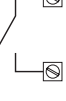
Set the switch point to 0 if your process calls for direct switchover (no switching hysteresis). If low flow cut off is used, it is advisable to set hysteresis to a value greater than or equal to the low flow rate.

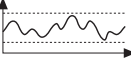
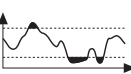


a = Status output conductive

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 overshoot or undershot	 A0001243	conductive  A0001237
	Limit value overshoot or undershot	 A0001244	not conductive  A0001238

12 Group STATUS INPUT

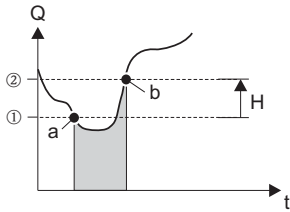
Function description STATUS INPUT	
This group is not available unless the measuring device is equipped with a status input.	
ASSIGN STATUS INPUT	Use this function to assign a switching function to the status input. Options: OFF RESET TOTALIZER 1 POSITIVE ZERO RETURN RESET TOTALIZER 2 RESET ALL TOTALIZERS 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 ($\cong$ 11 hex) for Endress+Hauser
DEVICE ID	Use this function to view the device ID in hexadecimal numerical format. User interface: 41 ($\cong$ 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 ($a + a \cdot H$) H = Hysteresis value: 0 to 100% ■ = Low flow cut off active Q = Flow

A0003882

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)

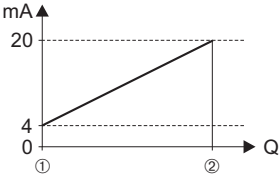
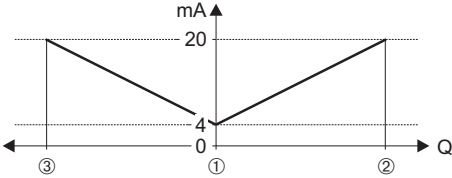
Function description PROCESS PARAMETER	
EMPTY PIPE DETECTION (EPD) (continued)	Notes on empty pipe detection (EPD and OED) ■ Flow cannot be measured correctly unless the measuring pipe is completely full. This status can be monitored at all times by means of the EPD/OED. ■ An empty or partially filled 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.

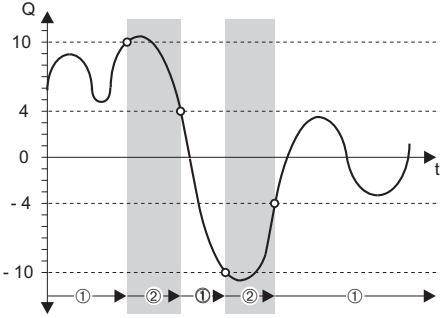
Function description PROCESS PARAMETER	
EPD/OED ADJUSTMENT	Use this function to activate the EPD/OED adjustment for an empty or full measuring tube.  Note! A detailed description and other helpful hints for the empty-pipe/full-pipe adjustment procedure can be found on Page 44. Options: OFF FULL PIPE 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  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  to confirm. 5. Having completed the adjustment, select the setting "OFF" and exit the function by pressing . 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  to confirm. – OED → Select OED and confirm with .  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 additional 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 . ■ 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  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 . ■ 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  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 corresponding to the setting before being forwarded to the higher-order controller (process controller, 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 m³/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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LIQUIPHANT M FTL51, LEVEL SWITCH (VIBRONIC)

WATER TECHNOLOGIES

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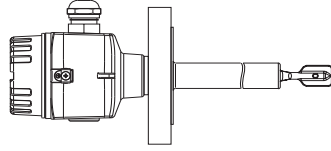
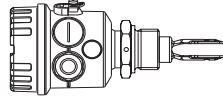
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Products

Solutions

Service

Operating Instructions **Liquiphant M FTL50, FTL51**



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

DE- Inhalt	EN -Contents	FR - Sommaire
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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.
Endress+Hauser

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 disconnect 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 Liquephant 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 Liquephant 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 interruttore per l'alimentazione in prossimità del dispositivo. Marcare l'interruttore come disconnessione del dispositivo.	NL- Veiligheidsinstructies Gebruik de Liquephant 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 Inbedrijfsstellingsvoorschriften, 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.

