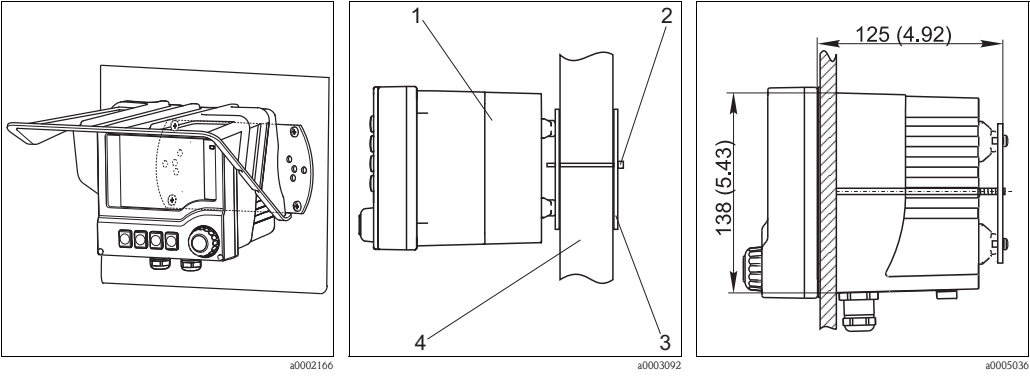


Mounting options



Wall mounting
– Weather protection cover is optional

Pipe or post mounting
1 Liquiline CM42
2, 3 Mounting plate (1x accessories)
4 Pipe or post

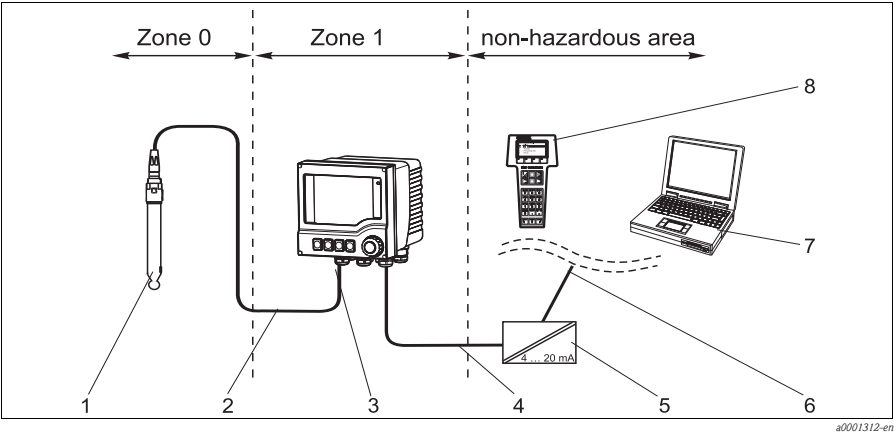
Panel mounting



	Wall mounting	Pipe mounting	Panel installation
Plastic housing			
without protection cover	Mounting plate: in standard	Mounting kit: 51518263	Installation kit: 51518173
with protection cover	Protection cover: 51517382	Mounting kit: 51518263 Protection cover: 51517382	
Stainless steel housing			
without protection cover	Mounting plate: in standard	Mounting kit: 51518286	Installation kit: 51518284
with protection cover	Protection cover: CYY101-A	Protection cover: CYY101-A Round post installation: 50062121	

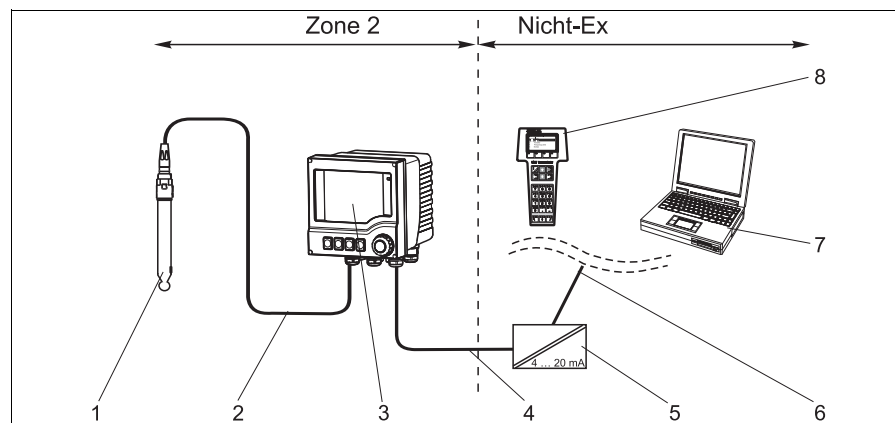
Installation in Ex area

CM42-*G



Installation in Ex area

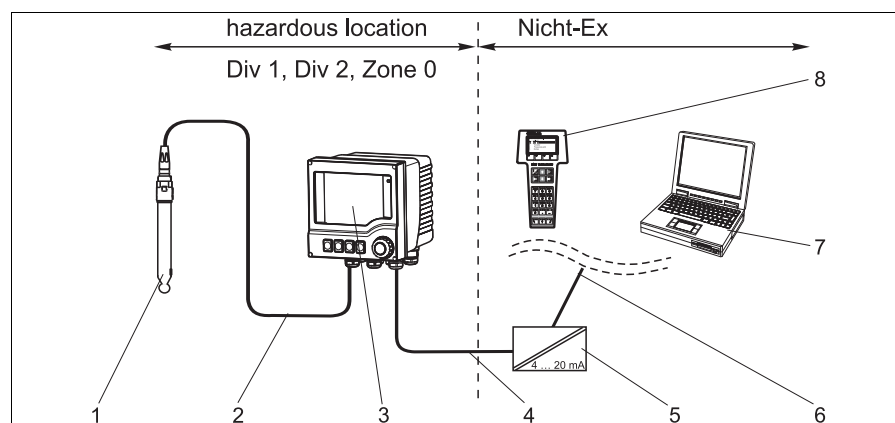
- | | |
|--|--------------------------------------|
| 1 Sensor in Ex version | 5 Active barrier, e.g. Preline RN221 |
| 2 Intrinsically safe sensor circuit Ex ia | 6 Signal line Hart/PROFIBUS/FF |
| 3 Transmitter | 7 Fieldcare via PROFIBUS/FF |
| 4 Supply and signal circuit Ex ib (4 to 20 mA) | 8 Hart handheld terminal |

CM42-*V


a0014574-de

Installation in Ex area

- | | | | |
|---|--|---|------------------------------------|
| 1 | Sensor in Ex version | 5 | Active barrier, e.g. Preline RN221 |
| 2 | Power limited sensor circuit Ex nL | 6 | Signal line Hart/PROFIBUS/FF |
| 3 | Transmitter | 7 | Fieldcare via PROFIBUS/FF |
| 4 | Supply and signal circuit Ex nA (4 to 20 mA) | 8 | Hart handheld terminal |

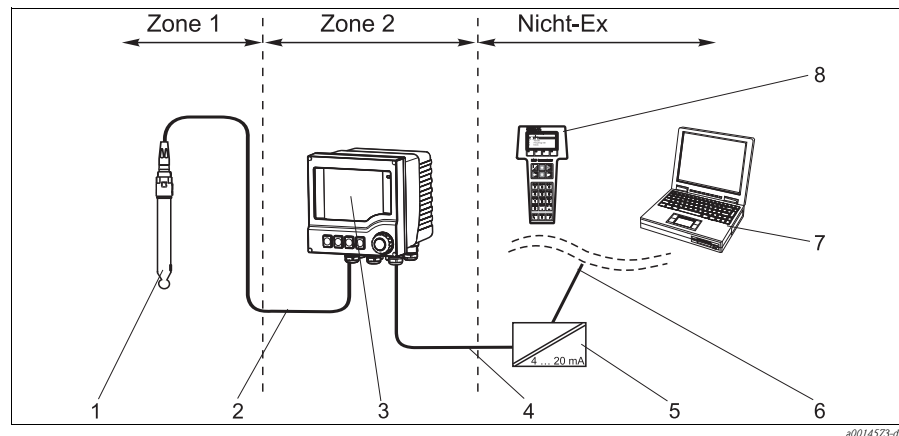
CM42-*P/S


a0014573-de

Installation in Ex area

- | | | | |
|---|--|---|------------------------------------|
| 1 | Sensor in Ex version | 5 | Active barrier, e.g. Preline RN221 |
| 2 | Intrinsically safe sensor circuit | 6 | Signal line Hart/PROFIBUS/FF |
| 3 | Transmitter | 7 | Fieldcare via PROFIBUS/FF |
| 4 | Supply and signal circuit (4 to 20 mA) | 8 | Hart handheld terminal |

CM42-*X/Z



Installation in Ex area

- | | | | |
|---|--|---|------------------------------------|
| 1 | Sensor in Ex version | 5 | Active barrier, e.g. Preline RN221 |
| 2 | Power limited sensor circuit Ex nL | 6 | Signal line Hart/PROFIBUS/FF |
| 3 | Transmitter | 7 | Fieldcare via PROFIBUS/FF |
| 4 | Supply and signal circuit Ex nA (4 to 20 mA) | 8 | Hart handheld terminal |

Environment

Ambient temperature range

Non-hazardous area version

–30 to 70 °C (–20 to 160 °F)

Hazardous area version: ATEX II (1)2G

–20 to 50 °C (T6)

–20 to 55 °C (T4)

Hazardous area version: ATEX II 3G

–10 to 50 °C (T6)

Hazardous area version: FM

–20 to 50 °C (0 to 130 °F) (T6)

Hazardous area version: CSA

–20 to 50 °C (0 to 130 °F) (T6)

–20 to 55 °C (0 to 120 °F) (T4)

Ambient temperature limits

–30 to +80 °C (–20 to 175 °F)

Storage temperature

–40 to 80 °C (–40 to 175 °F)

Electromagnetic compatibility

Interference emission and interference immunity as per EN 61326-1: 2006, class A for industry

Ingress protection

IP66 / IP 67 / NEMA 4X

Relative humidity

10 to 95%, not condensing

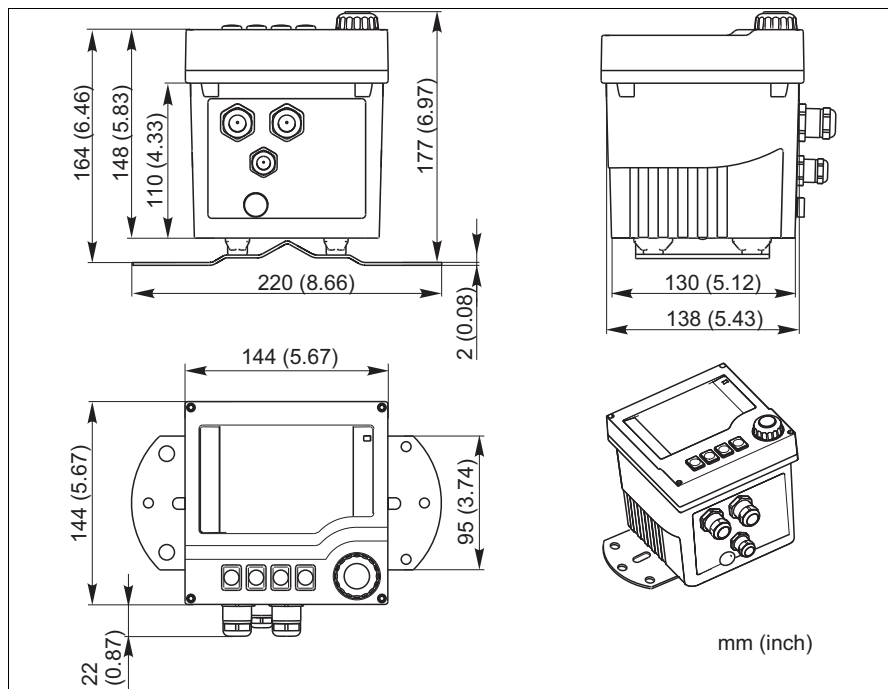
Pollution degree

The product is suitable for pollution degree 3.

Mechanical construction

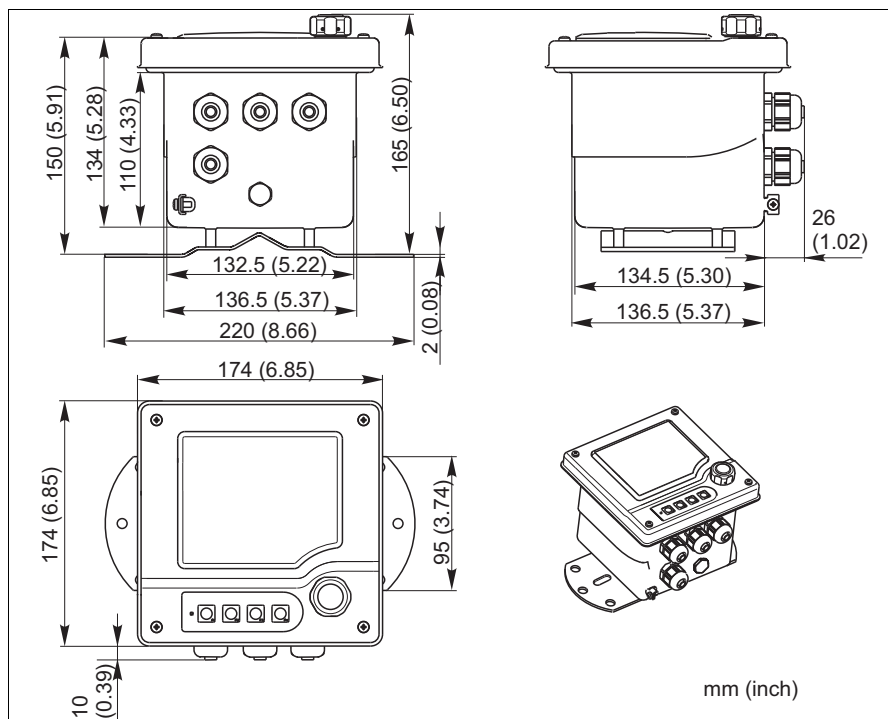
Dimensions

Plastic housing



Plastic housing

Stainless steel housing



Dimensions

Weight

Plastic housing

1.5 kg (3.3 lb)

Stainless steel housing

2.1 kg (4.6 lb)

Material

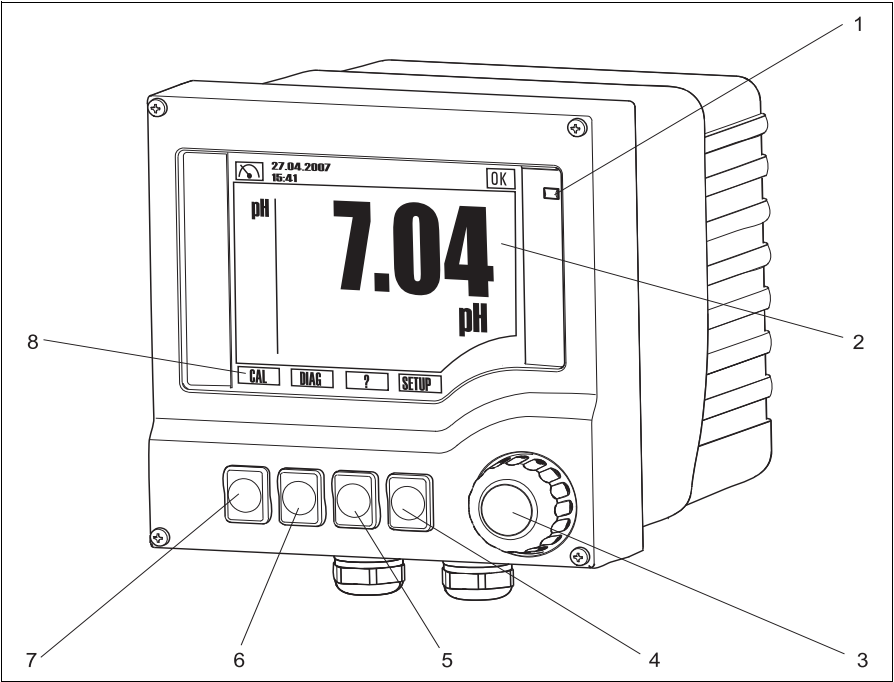
Plastic housing Housing Housing seals	PC-FR (polycarbonate, flame-retardant) Foamed silicone, EPDM
Stainless steel housing Housing Housing seals	Stainless steel 1.4301 (AISI 304) EPDM
Plastic and stainless steel housing Module housing Soft keys Cable mounting rail Display panel	PC (polycarbonate) TPE Stainless steel 1.4301 (AISI 304) PC-FR (polycarbonate, flame-retardant)

Human interface

Display properties

LCD: FSTN technology (FSTN = Foil Super Twisted Nematic)
Size: 94 x 76 mm (3.7 x 3.0")
Resolution: 240 x 160 dots

Operating elements



- Overview of operation
- 1 Alarm LED
 - 2 Display, current display: pH measuring mode
 - 3 Navigator
 - 4-7 Soft keys
 - 8 Soft key function (depends on menu)

Ordering information

Product structure

Sensor input									
A	No Module								
C	Conductivity, conductive measurement								
I	Conductivity, inductive measurement								
K	Digital sensor: conductivity, conductive measurement								
M	Digital sensor: pH/ORP with glass electrodes								
N	Digital sensor: pH with ISFET sensors								
O	Digital sensor: amperometric oxygen measurement								
P	pH (glass/ISFET) or ORP								
Approval									
A	Non-hazardous area, CSA GP								
G	ATEX II (1)2G, Ex ia/ib IIC T6 / II 3 D tD A22 IP67 T85°C								
P	FM IS NI Cl. I, Div. 1&2, Groups A-D								
S	CSA IS NI Cl. I, II, III, Div. 1&2, Groups A-G								
T	TIIS Ex ib IIC T4								
V	ATEX II 3G Ex nA[nL] IIC T6 / II 3 D tD A22 IP67 T85°C								
X	ATEX II (2)3G Ex nA[ia] IIC T6 / II 3 D tD A22 IP67 T85°C								
Z	NEPSI Ex nA[ia] EC T6								
Certificate									
A	not selected								
B	Test certificate acc. to EN 10204, 3.1								
C	Test certificate acc. to EN 10204, 3.1, factory calibration certificate								
Output									
0	1 current output 4 to 20 mA, HART								
1	2 current outputs 4 to 20 mA, 1x HART								
2	PROFIBUS PA								
3	FOUNDATION Fieldbus								
4	2 current outputs 4 to 20 mA, SIL								
Housing									
0	Plastic								
1	Stainless steel 1.4301 (AISI 304)								
Cable entry									
0	M20 x 1.5								
1	NPT ½"								
2	G½								
Software									
EA	Standard version								
EB	Advanced version								
Device language									
C	Cz/En (Czech docs)								
D	De/En (German docs)								
E	En/De (English docs)								
F	Fr/En (French docs)								
J	Ja/En (Japanese docs)								
K	Kr/En (Korean docs)								
L	Pl/En (Polish docs)								
N	Nl/En (Dutch docs)								
P	Po/En (Portuguese docs)								
R	Ru/En (Russian docs)								
S	Es/En (Spanish docs)								
T	It/En (Italian docs)								
W	Sv/En (Swedish docs)								
Z	Zh/En (Chinese docs)								
Documentation									
0	Installation and configuration								
Additional equipment									
0	Basic version								
1	SystemDAT CY42-S1								
CM42-									complete order code

Optional

Device designation (tag), stainless steel 1.4404
Just add a "1" to the order code.

Scope of delivery

The scope of delivery comprises (depending on the device version):

- A transmitter acc. to the ordered version
- A mounting plate including 4 screws
- A sticker sheet (embedded in the housing, containing nameplates and terminal assignment stickers)
- A test certificate acc. to EN 10204-3.1 (optional)
- A factory calibration certificate
- An Operating Instructions BA381C "Commissioning"
- An Operating Instructions BA382C "Operation"
- A CD ROM with additional documentation
- A Safety Manual acc. to SIL 2 (optional)
- Service brochure "Maintenance documentation SIL 2" (optional)

Certificates and approvals

CE approval

Declaration of conformity

The product meets the requirements of the harmonized European standards. It thus complies with the legal requirements of the EC directives.


The manufacturer confirms successful testing of the product by affixing the **CE** symbol.

Ex approval

Depending on the version ordered:

- ATEX II (1)2G, Ex ia/ib IIC T6 / II 3 D tD A22 IP67 T85°C
- ATEX II 3G Ex nA[nL] IIC T6 / II 3 D tD A22 IP67 T85°C
- ATEX II (2)3G Ex nA[ia] IIC T6 / II 3 D tD A22 IP67 T85°C
- NEPSI Ex nA[ia] EC T6
- NEPSI Ex nA[nL] EC T6
- CSA IS NI Cl.I, II, III, Div. 1&2, Grps. A-G
- FM IS NI Cl.I, Div. 1&2, Grps. A-D
- TIIS Ex ib IIC T4

Accessories

 In the following sections, you find the accessories available at the time of issue of this documentation. For information on accessories that are not listed here, please contact your local service or sales representation.

Mounting kits

Post mounting kit for plastic housing

- 1 Mounting plate
- 2 Threaded rods M5x75 mm A2
- 2 Hexagonal nuts M5 A2, DIN 934
- 2 Spring washers, A2 DIN127, Form B5 (M5)
- 2 Washers A 5.3, DIN125 A2
- order no. 51518263

Post mounting kit for stainless steel housing

- 1 Mounting plate
- 2 Threaded rods M5x75 mm A2
- 2 Hexagonal nuts M5 A2, DIN 934
- 2 Spring washers, DIN127, Form B5 (M5)
- 2 Washers A 5.3, DIN125 A2
- order no. 51518286

Panel installation kit for plastic housing for panel cutout 138x138 mm (5.43x5.43 inch)

- 1 Panel installation seal
- 2 Tensioning screws M6x150 mm
- 4 Hexagonal nuts M6, DIN934 A2
- 4 Spring washers, A2 DIN127, Form B6
- 4 Washers A6.4, DIN125 A2
- order no. 51518173

Panel installation kit for stainless steel housing for panel cutout 138x138 mm (5.43x5.43 inch)

- 1 Panel installation seal
- 2 Tensioning screws M6x150 mm
- 4 Hexagonal nuts M6, DIN934 A2
- 4 Spring washers, A2 DIN127, Form B6
- 4 Washers A6.4, DIN125 A2
- order no. 51518284

Weather protection cover

- Weather protection cover for plastic housing
order no. 51517382
- Weather protection cover for stainless steel housing
order no. CYY101-A

Active barrier

Active barrier RN221N

- With power supply for safe separation of 4 to 20 mA current circuits
- Technical Information TI073R/09/en

Fieldbus accessories

HART handheld terminal DXR375

- For communicating with a HART-compatible device via a 4 to 20 mA line
- order no. DXR 375

HART modem Commubox FXA191

- Interface module between HART and serial PC interface
- Technical Information TI237F/00/en
- order no. 016735-0000

Fieldbus connection socket

- FOUNDATION Fieldbus M20 7/8" connection
- order no. 51517974

M12 connector

- Four-pole metal connector for mounting on transmitter
- For connecting to connection box or cable jack. Cable length 150 mm (5.91")
- order no. 51502184

C-module accessories bag

- Capacitor for connecting the cable shielding to ground potential
- Kit documentation SD108C/07/a3
- order no. 71003097

Measuring cables

CYK10 Memosens data cable

- For digital sensors with Memosens technology
- Ordering according to product structure, see Technical Information (TI376C/07/en)

CYK81 measuring cable

- Non-terminated measuring cable for extension of sensor cables of e.g. Memosens sensors, CUS31/CUS41
- 2 wires, twisted pair with shield and PVC-sheath (2 x 2 x 0.5 mm² + shield)
- Sold by the meter, order no.: 51502543

CPK9 special measuring cable

- For sensors with TOP68 plug-in head, for high-temperature and high-pressure applications, IP 68
- Ordering acc. to product structure, see Technical Information (TI118C/07/en)

CPK12 special measuring cable

- For pH/ORP glass electrodes and ISFET sensors with TOP68 plug-in head
- Ordering acc. to product structure, see Technical Information (TI118C/07/en)

CYK71 measuring cable

- Non-terminated cable for the connection of sensors (e.g. conductivity sensors) or the extension of sensor cables
- Sold by the meter, order numbers:
 - non-Ex version, black: 50085333
 - Ex version, blue: 51506616

Extension cable CLK5

- For inductive conductivity sensors, for extension via the VBM junction box, sold by the meter
- Order no.: 50085473

Sensors**pH/ORP glass sensors**

Orbisint CPS11/CPS11D

- pH sensor for process applications
- Optionally with Memosens technology
- With PTFE diaphragm
- Ordering acc. to product structure, see Technical Information (TI028C/07/en)

Orbisint CPS12/CPS12D

- ORP electrode for process applications
- Optionally with Memosens technology
- With PTFE diaphragm
- Ordering acc. to product structure, see Technical Information (TI367C/07/en)

Ceraliquid CPS41/CPS41D

- pH sensor
- Optionally with Memosens technology
- With ceramics diaphragm and liquid KCl electrolyte
- Ordering acc. to product structure, see Technical Information (TI079C/07/en)

Ceraliquid CPS42/CPS42D

- ORP electrode
- Optionally with Memosens technology
- With ceramics diaphragm and liquid KCl electrolyte
- Ordering acc. to product structure, see Technical Information (TI373C/07/en)

Ceragel CPS71/CPS71D

- pH sensor
- Optionally with Memosens technology
- With double chamber reference system and integrated bridge electrolyte
- Ordering acc. to product structure, see Technical Information (TI245C/07/en)

Ceragel CPS72/CPS72D

- ORP electrode
- Optionally with Memosens technology
- With double chamber reference system and integrated bridge electrolyte
- Ordering acc. to product structure, see Technical Information (TI374C/07/en)

Orbipore CPS91/CPS91D

- pH sensor
- Optionally with Memosens technology
- With open aperture for media with high dirt load
- Ordering acc. to product structure, see Technical Information (TI375C/07/en)

Orbipore CPS92/CPS92D

- ORP sensor
- Optionally with Memosens technology
- With open aperture for media with high dirt load
- Ordering acc. to product structure, see Technical Information (TI435C/07/en)

ISFET sensors

Tophit CPS471/CPS471D

- Sterilizable and autoclavable ISFET sensor for food and pharmaceuticals, process technology, water treatment and biotechnology;
- Ordering acc. to product structure, see Technical Information (TI283C/07/en)

Tophit CPS441/CPS441D

- Sterilizable ISFET sensor for media with low conductivity, with liquid KCl electrolyte;
- Ordering acc. to product structure, see Technical Information (TI352C/07/en)

Tophit CPS491/CPS491D

- ISFET sensor with open aperture for media with high dirt load;
- Ordering acc. to product structure, see Technical Information (TI377C/07/en)

Pfaunder electrodes

Ceramax CPS341D

- Electrode with pH sensitive enamel
- Meets highest demands of measuring accuracy, pressure, temperature, sterility and durability
- Ordering acc. to product structure, s. Technical Information (TI468C/07/en)

Inductive sensors

Indumax P CLS50

- Highly resistant conductivity sensor for standard, Ex and high-temperature applications,
- Ordering according to product structure, see Technical Information TI182C/07/en

Indumax H CLS52

- Inductive conductivity sensor with fast responding temperature sensor for foodstuff applications
- Ordering according to product structure, see Technical Information TI167C/07/en

Indumax H CLS54

- Inductive conductivity sensor in certified, hygienic design for food, beverages, pharma and biotechnology
- Ordering according to product structure, see Technical Information TI400C/07/en

Conductive sensors

Condumax W CLS12

- For process temperatures up to 160 °C (320 °F) and process pressures up to 40 bar (580 psi)
- Ordering according to product structure, see Technical Information TI082C/07/en

Condumax W CLS13

- For process temperatures up to 250 °C (480 °F) and process pressures up to 40 bar (580 psi)
- Ordering according to product structure, see Technical Information TI083C/07/en

Condumax W CLS15/CLS15D

- For measurement in pure and ultrapure water and in Ex applications
- Optionally with Memosens (CLS15D)
- Ordering according to product structure, see Technical Information TI109C/07/en

Condumax H CLS16/CLS16D

- Hygienic sensor for measurement in pure and ultrapure water and in Ex applications
- With EHEDG and 3A certificates
- Optionally with Memosens (CLS16D)
- Ordering according to product structure, see Technical Information TI227C/07/en

Condumax W CLS19

- Competitive sensor for measurement in pure and ultrapure water
- Ordering according to product structure, see Technical Information TI110C/07/en

Condumax W CLS21/CLS21D

- Two-electrode sensor in fixed cable and plug-in head version
- Optionally with Memosens (CLS21D)
- Ordering according to product structure, see Technical Information TI085C/07/en

Amperometric oxygen sensors

Oxymax H COS22D

- Sterilizable sensor for dissolved oxygen, with Memosens technology
- Ordering acc. to product structure, see Technical Information (TI446C/07/en)

Oxymax COS51D

- Amperometric sensor for dissolved oxygen, with Memosens technology
- Ordering acc. to product structure, see Technical Information (TI413C/07/en)

Software update and upgrade

CY42 DAT module

- Function upgrade, update and memory module
- Ordering as per order structure

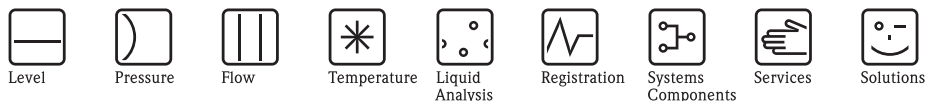
Version	
S1	SystemDAT for software update and language catalog extension
F1	FunctionDAT for extending the function to 2 current outputs
F2	FunctionDAT for extending the function to advanced software
C1	CopyDAT for saving and transferring the configuration
CY42-	Complete order code

Instruments International

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4153 Reinach
Switzerland

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info@ii.endress.com

Endress+Hauser 
People for Process Automation



Technical Information

Liquisys M CUM223/253

Turbidity and suspended solids transmitter



Your benefits

- Field or panel-mounted housing
- Universal application
 - One instrument for turbidity and suspended solids
 - Units: FNU (formazine standard), ppm, g/l, % or % SS
- Simple handling
 - Logically arranged menu structure
 - Ultrasimple calibration with user samples and alarm signalling for calibration errors
- Safe operation
 - Overvoltage (lightning) protection
 - Direct access for manual contact control
 - User-defined alarm configuration
 - Automatic sensor self-recognition with calibration data transfer

The basic unit can be extended with:

- 2 or 4 additional contacts for use as:
 - Limit contacts (also for temperature)
 - P(ID) controller
 - Timer for simple rinse processes
 - Complete cleaning with Chemoclean
- Plus package:
 - Any current output configuration via table
 - Automatic cleaning start
 - Display in customer units (e.g. density) via table assignment
 - Live check of sensor
- HART® or PROFIBUS® PA / DP
- 2nd current output for temperature, main measured value or actuating variable
- Current input for flow rate monitoring with controller shut off or for feedforward control

Application

The modular design of the transmitter allows easy adaption to a variety of customer requirements. Starting with the basic version for "measurement and alarm generation", the transmitter can be equipped with additional software and hardware modules for special applications. These modules can also be retrofitted as required.

Areas of application

- Sewage treatment plants, suspended solids measurement
- Wastewater treatment
- Water treatment and drinking water monitoring
- Surface water: rivers, lakes, ocean
- Service water

Function and system design

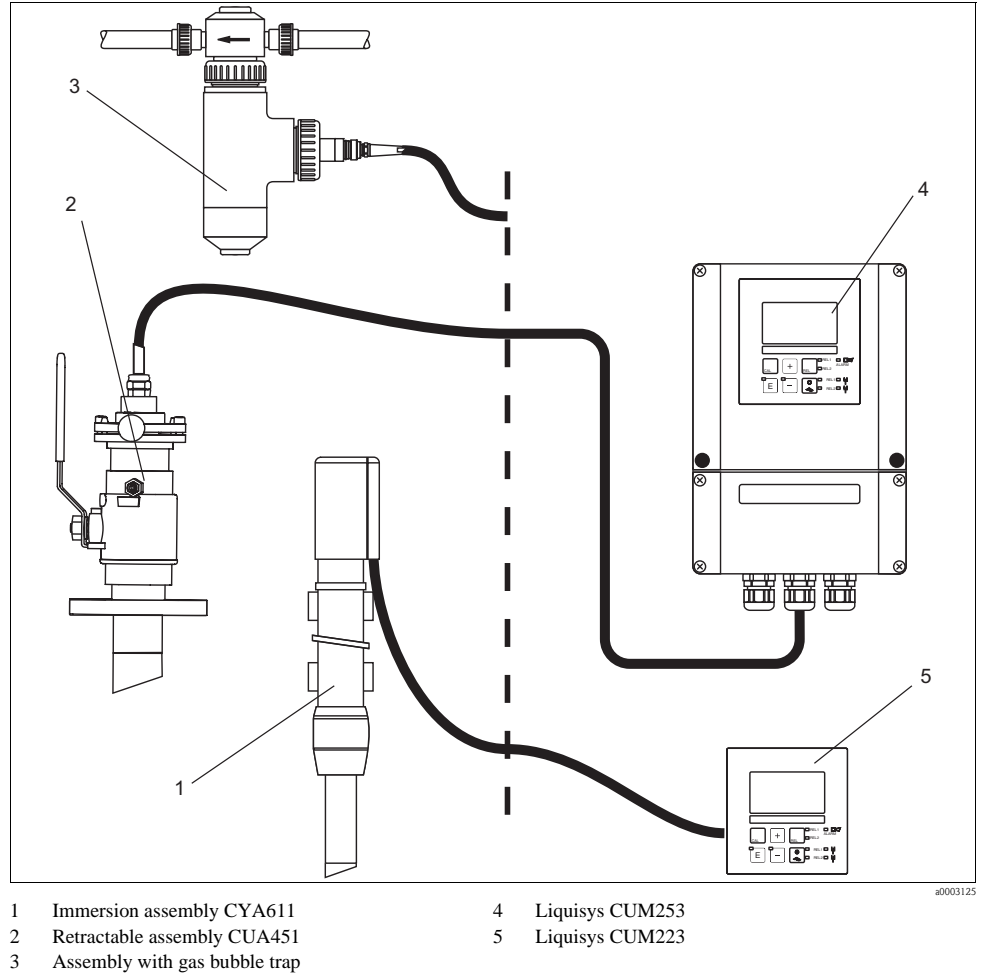
Features of the basic version	<p>Measurement of turbidity and suspended solids</p> <p>The sensor is selected from the menu. During measurement, the value measured can be displayed in the other measuring mode. The temperature is displayed at the same time if desired.</p> <p>Configuration</p> <p>Different alarms are required depending on application and operator. Therefore the transmitter permits independent configuration of the alarm contact and error current for each individual error. Unnecessary or undesirable alarms can be suppressed in this manner. Up to four contacts can be used as limit contacts (also for temperature), to implement a P(ID) controller or for cleaning functions. Direct manual operation of the contacts (bypassing the menu) provides quick access to limit, control or cleaning contacts, permitting speedy correction of deviations. The serial numbers of the instrument and modules and the order code can be called up on the display.</p>				
Additional functions of the Plus package TS	<p>Current output configuration</p> <p>In order to output wide measuring ranges while still achieving a high resolution in specific ranges, the current output can be configured as required via a table. This permits bilinear or quasi-logarithmic curves, etc.</p> <p>Process Check System (PCS)</p> <p>It comprises two independent safety functions:</p> <ul style="list-style-type: none"> ■ Errors in applications without control are detected by monitoring the limit between plausible and implausible measured values, i.e. the alarm threshold. ■ Errors in applications with control are detected by the controller monitor which monitors freely adjustable, maximum permissible time intervals and reference value overshoot or undershoot. <p>Live check</p> <p>The live check issues an alarm when the sensor signal does not change over a defined period of time. This may be caused by blocking, passivation, separation from the process, etc.</p>				
Additional functions of version TS	<p>Display of various measurement units</p> <p>In addition to turbidity (FNU, NTU) and concentration (ppm / % SS), the display can also show other units (e.g. density). A table is used for conversion (calibration in %).</p>				
Second current output	<p>The second current output can be configured for temperature, main measured value (turbidity, suspended solids) or actuating variable.</p>				
Current input	<p>The current input of the transmitter allows two different applications: controller shut-down in case of lower flow rate violation or total failure in the main flow as well as feedforward control. Both functions are also combinable.</p>				
Explosion-proof versions for zone 2	<table> <tr> <td data-bbox="441 1423 889 1480">Application of transmitter and sensor in hazardous area zone 2</td><td data-bbox="906 1423 1412 1480">Field housing CUM253 with power supply 24 V</td></tr> <tr> <td data-bbox="441 1512 889 1652">Application of transmitter as related electrical equipment in non-hazardous area or in simple pressurized apparatus; application of sensor in hazardous area zone 2</td><td data-bbox="906 1512 1412 1652">Field housing CUM253 with power supply 230 V or Panel-mounted housing CUM223 with power supply 230 V or 24 V</td></tr> </table>	Application of transmitter and sensor in hazardous area zone 2	Field housing CUM253 with power supply 24 V	Application of transmitter as related electrical equipment in non-hazardous area or in simple pressurized apparatus; application of sensor in hazardous area zone 2	Field housing CUM253 with power supply 230 V or Panel-mounted housing CUM223 with power supply 230 V or 24 V
Application of transmitter and sensor in hazardous area zone 2	Field housing CUM253 with power supply 24 V				
Application of transmitter as related electrical equipment in non-hazardous area or in simple pressurized apparatus; application of sensor in hazardous area zone 2	Field housing CUM253 with power supply 230 V or Panel-mounted housing CUM223 with power supply 230 V or 24 V				

Measuring system

A complete measuring systems comprises:

- The transmitter Liquisys M CUM223 or CUM253
- A sensor with or without an integrated temperature sensor
- An immersion, flow or retractable assembly

Options: extension cable CYK81, junction box VBM or RM



Input

Measured variables	Turbidity, suspended solids, temperature	
Measuring range	CUS31:	0.000 to 9999 FNU/NTU 0.00 to 3000 ppm 0.0 to 3.0 g/l 0.0 to 200.0 %
	CUS41:	0.00 to 9999 FNU/NTU 0.00 to 9999 ppm 0.0 to 300.0 g/l 0.0 to 200.0 %
	Temperature:	-5.0 to +70.0°C (+23 to +158°F)
Cable specification	Cable length:	max. 200 m (656 ft.)
Signal input	Digital communication	
Temperature measurement	NTC 30 k Ω at 25°C (77°F)	
Binary inputs	Voltage:	10 to 50 V
	Power consumption:	max. 10 mA
Current input	4 to 20 mA, galvanically separated Load: 260 Ω at 20 mA (voltage drop 5.2 V)	

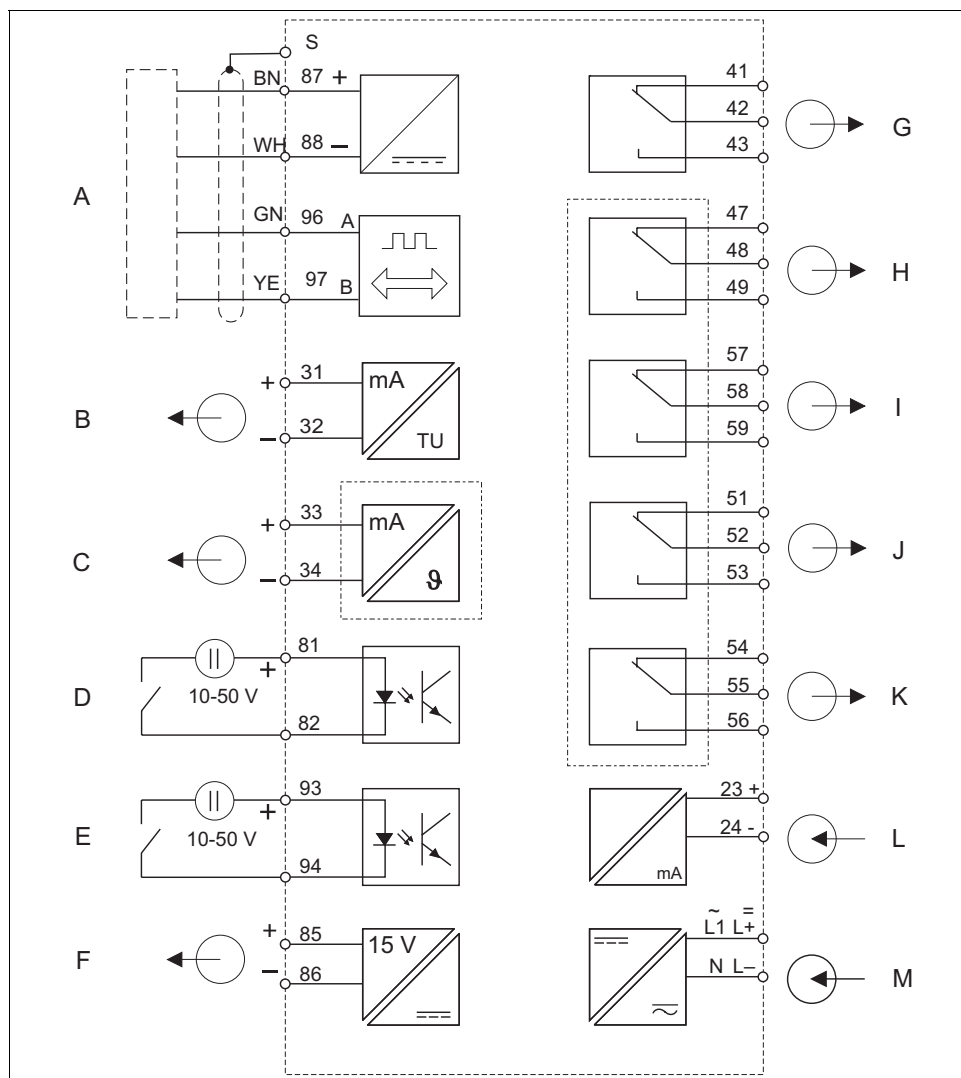
Output

Current range	0/4 to 20 mA, galvanically separated, active	
Error current	2.4 or 22 mA in case of an error	
Load	Maximum 500 Ω	
Transmission range	CUS31/CUS41:	adjustable, min. Δ 0.1 FNU, Δ 0.1 ppm, Δ 0.1 g/l, Δ 0.1 %
	Temperature:	adjustable, Δ 10 to Δ 100 % of measuring range
Resolution	Max. 700 digits/mA	
Isolation voltage	Max. 350 V _{RMS} /500 V DC	
Overvoltage protection	According to EN 61000-4-5	
Auxiliary voltage output	Output voltage:	15 V \pm 0.6
	Output current:	max. 10 mA
Contact outputs	Switching current with ohmic load (cos φ = 1):	max. 2 A
	Switching current with inductive load (cos φ = 0.4):	max. 2 A
	Switching voltage:	max. 250 V AC, 30 V DC
	Switching power with ohmic load (cos φ = 1):	max. 500 VA AC, 60 W DC
	Switching power with inductive load (cos φ = 0.4):	max. 500 VA AC, 60 W DC

Limit contactor	Pickup/dropout delay:	0 to 2000 s
Controller	Function (adjustable):	pulse length/pulse frequency controller
	Controller response:	PID
	Control gain K_p :	0.01 to 20.00
	Integral action time T_n :	0.0 to 999.9 min
	Derivative action time T_v :	0.0 to 999.9 min
	Period for pulse length controller:	0.5 to 999.9 s
	Frequency for pulse frequency controller:	60 to 180 min ⁻¹
	Basic load:	0 to 40% of max. set value
Alarm	Function (selectable):	Latching / momentary contact
	Alarm threshold adjustment range:	Turbidity / suspended solids / temperature: complete measuring range
	Alarm delay:	0 to 2000 s 0 to 2000 min

Power supply

Electrical connection



Electrical connection of the transmitter

A	Sensor	H	Relay 1 (current-free contact position)
B	Signal output 1 turbidity/solids content	I	Relay 2 (current-free contact position)
C	Signal output 2 temperature	J	Relay 3 (current-free contact position)
D	Binary input 1 (Hold)	K	Relay 4 (current-free contact position)
E	Binary input 2 (Chemoclean)	L	Current input 4 to 20 mA
F	Aux. voltage output	M	Power supply
G	Alarm (current-free contact position)		

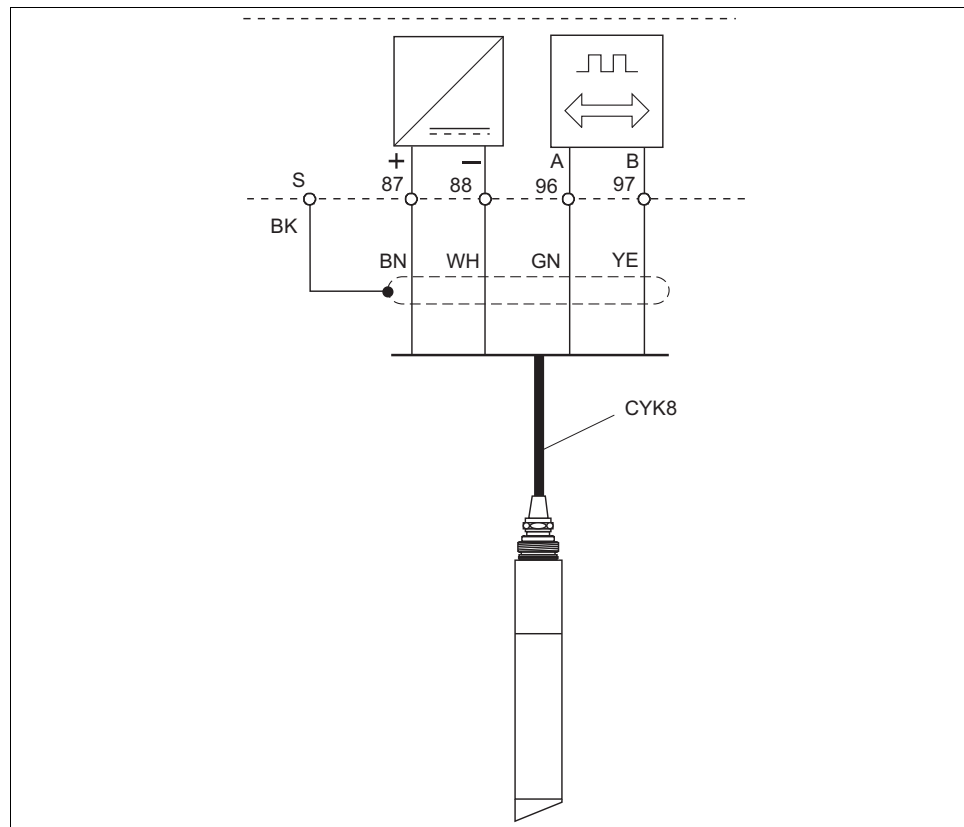


Note!

The device is approved for protection class II and is generally operated without a protective ground connection. The circuits "C" and "F" are not galvanically isolated from each other.

Connection of sensor

The sensors are delivered with measuring cables. Use a junction box and an extension cable to extend the measuring cable (see "Accessories")



Connection of the turbidity sensors CUS31 and CUS41

a0003129

Power supply

Depending on ordered version:
100/115/230 V AC +10/-15 %, 48 to 62 Hz
24 V AC/DC +20/-15 %

Power consumption

max. 7.5 VA

Mains protection

Fine-wire fuse, medium-slow blow 250 V/3.15 A

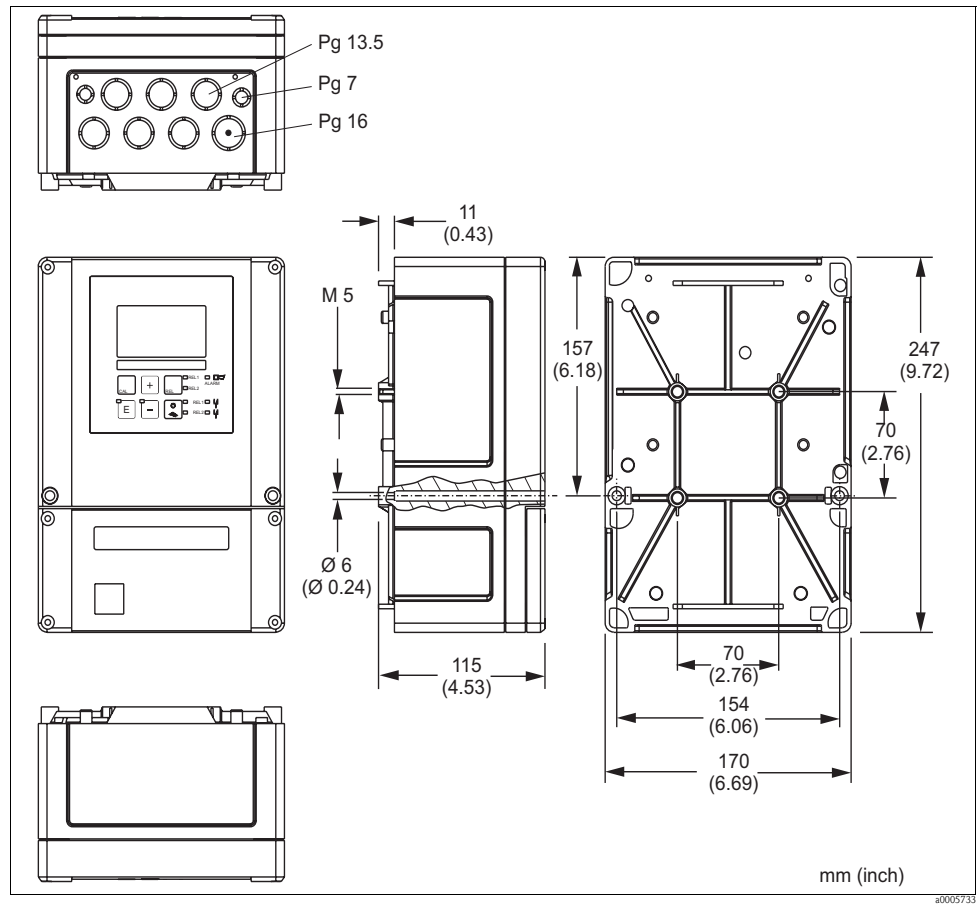
Performance characteristic

Measured value resolution	CUS31:	0.001 FNU/NTU, 0.01 ppm, 0.01 g/l, 0.01 %
	CUS41:	0.01 FNU/NTU, 0.01 ppm, 0.01 g/l, 0.01 %
	Temperature:	0.1 °C
Measurement deviation	Display	
	CUS31/CUS41:	± 2 % of measured value (min. 0.02 FNU)
	Temperature:	max. 1.0 % of measuring range
	Signal output	
	CUS31/CUS41:	1 % of current output range (min. 0.02 FNU)
	Temperature:	max. 1.25 % of current output range
Repeatability¹⁾	± 1 % of measured value (min. 0.01 FNU)	

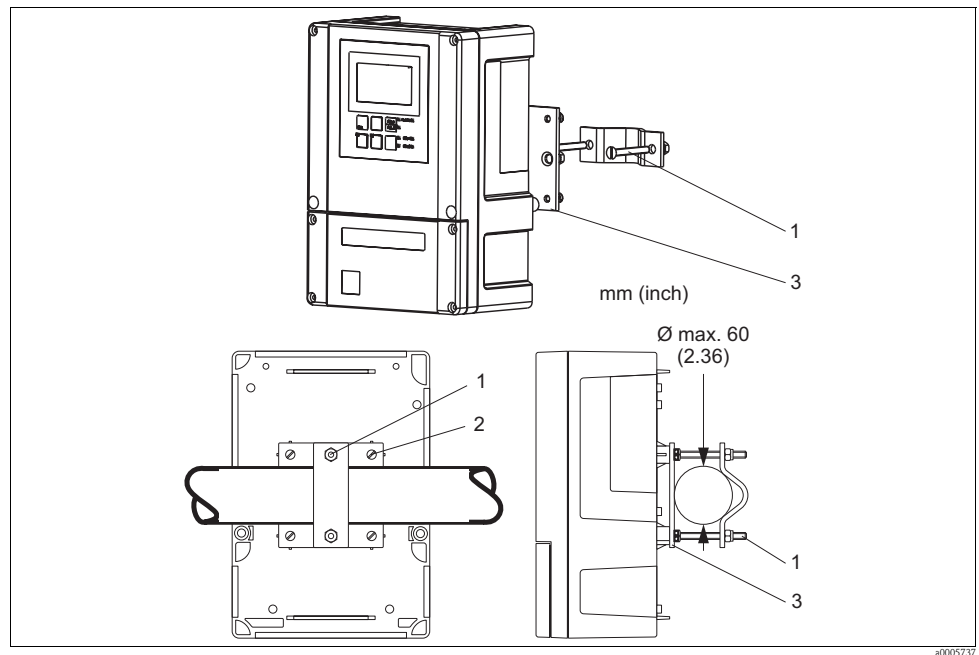
1) acc. to IEC 746-1, for nominal operating conditions

Installation conditions

Installation instructions

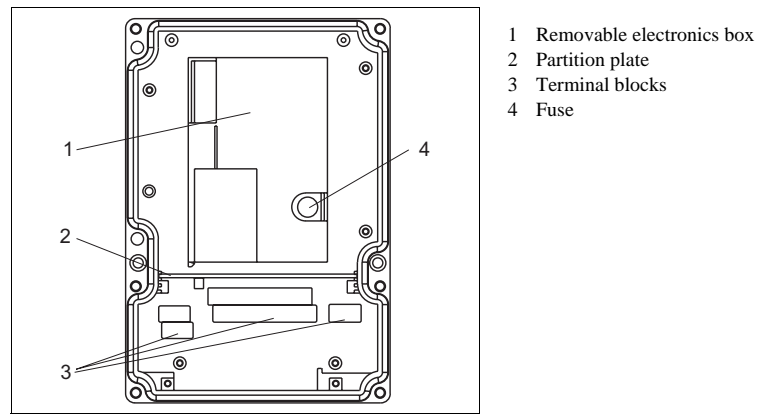


Field instrument

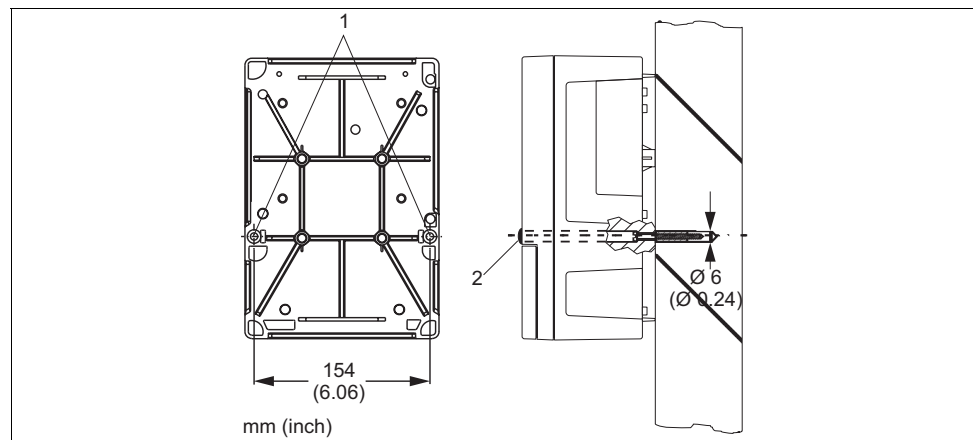


Mounting on pipes

1 - 3 Mounting screws and mounting plate

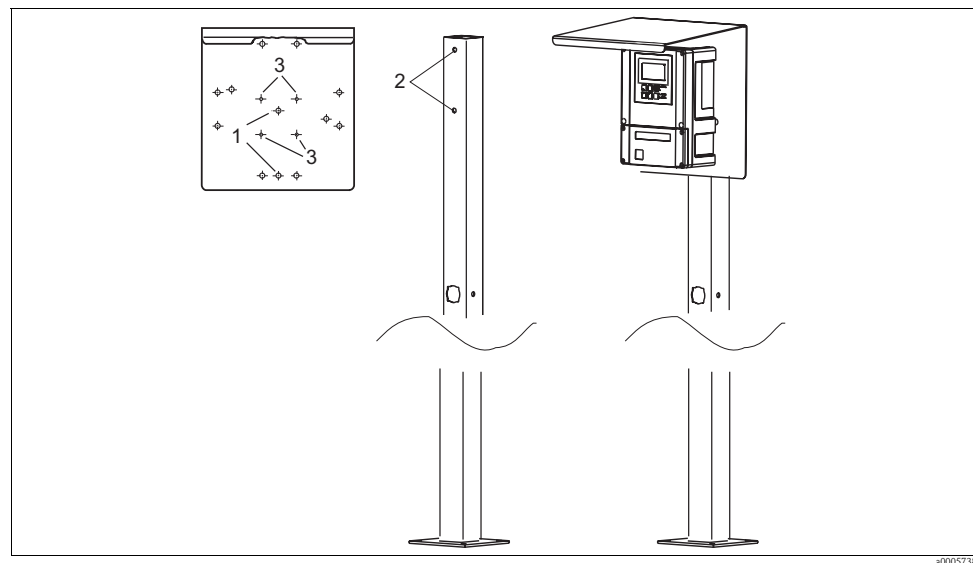


View into the field instrument



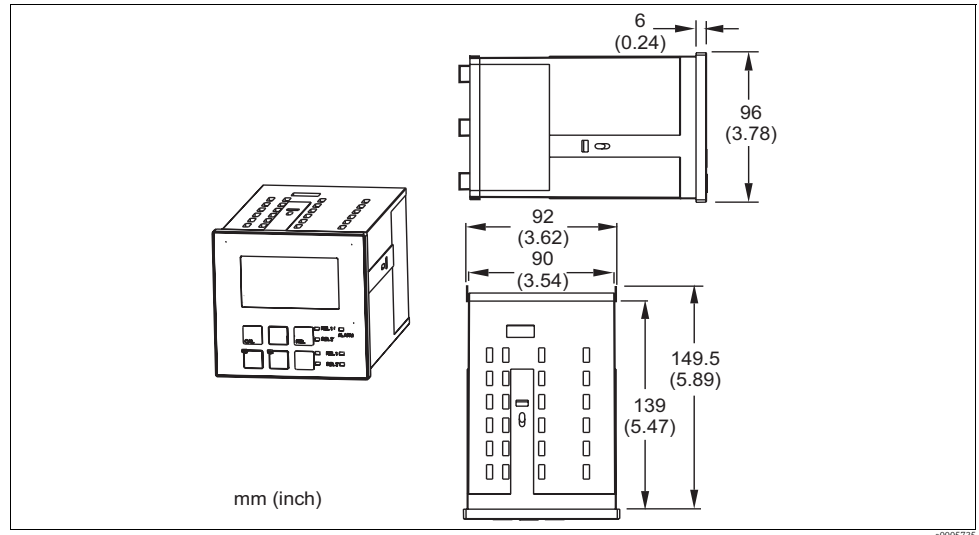
Wall mounting of the field instrument

- 1 Mounting holes
- 2 Protecting cap

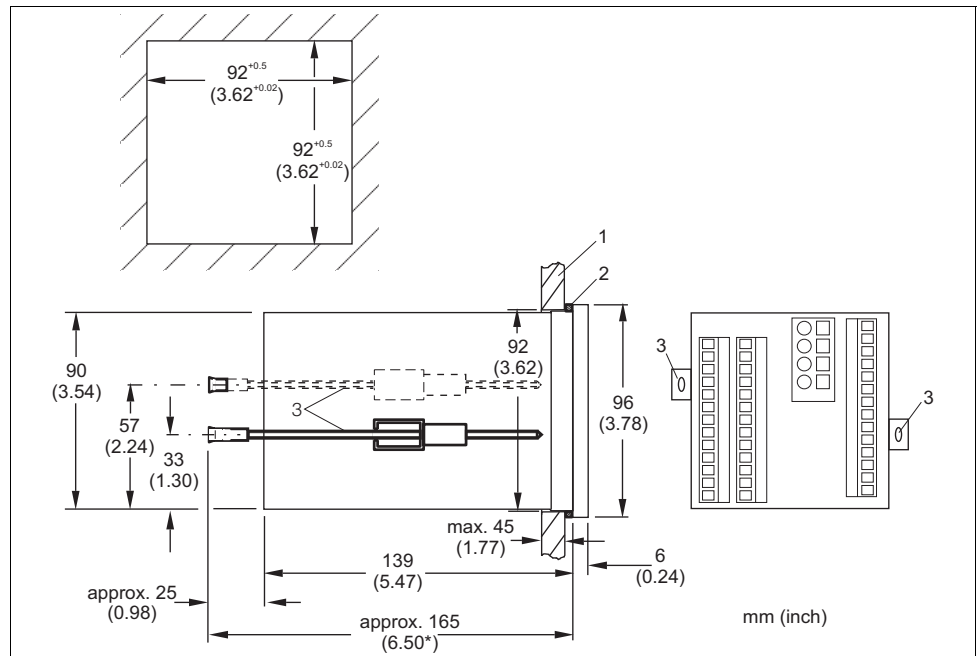


Mounting of the field instrument with mounting post and weather protection cover

- 1 - 3 Mounting holes



Dimensions of panel-mounted instrument



Installation of the panel-mounted instrument

- 1 Wall of control cabinet
- 2 Gasket
- 3 Tensioning screws
- * Required installation depth

Environment

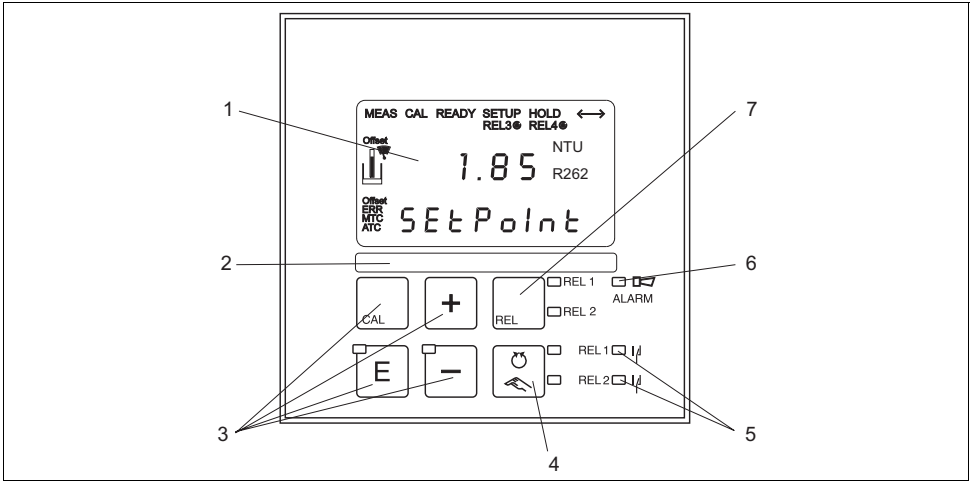
Ambient temperature	-10 to +55°C (+14 to +131°F)	
Ambient temperature limit	-20 to +60°C (-4 to +140°F)	
Storage and transport temperature	-25 to +65°C (-13 to +149°F)	
Electromagnetic compatibility	Interference emission and interference immunity acc. to EN 61326: 1997 / A1: 1998	
Ingress protection	Panel-mounted instrument: Field instrument:	IP 54 / NEMA 3S (front), IP 30 / NEMA 1 (housing) IP 65 (NEMA 4X)
Relative humidity	10 to 95%, non-condensing	

Mechanical construction

Dimensions	Panel-mounted instrument: Field instrument:	96 x 96 x 145 mm (3.78 x 3.78 x 5.71 inches) Installation depth: approx. 165 mm (6.50") 247 x 170 x 115 mm (9.72 x 6.69 x 4.53 inches)
Weight	Panel-mounted instrument: Field instrument:	max. 0.7 kg (1.5 lb) max. 2.3 kg (5.1 lb)
Materials	Housing of panel-mounted instrument: Field housing: Front membrane:	Polycarbonate ABS PC Fr Polyester, UV-resistant
Terminals	Cross section	max. 2.5 mm ² (14 AWG)

Human interface

Display elements



Operating elements

- 1 LC display for displaying the measured values and configuration data
- 2 Field for user labelling
- 3 4 main operating keys for calibration and device configuration
- 4 Changeover switch for automatic/manual mode of the relays
- 5 LEDs for limit contactor relay (switch status)
- 6 LED for alarm function
- 7 Display of the active contact and key for relay changeover in manual mode

Instrument control functions

All instrument control functions are arranged in a logical menu structure. Following access code entry, the individual parameters can be easily selected and modified as needed.

Certificates and approvals

CE symbol

Declaration of conformity

The product meets the requirements of the harmonized European standards. It thus complies with the legal requirements of the EC directives.

The manufacturer confirms successful testing of the product by affixing the CE symbol.

Ex approval for zone 2

Version	Approval
CUM253-..6...	ATEX II 3G EEx nA[L] IIC T4
CUM253-..4... CUM223-..4... CUM223-..6...	ATEX II 3G [EEx nAL] IIC

Ordering information

Product structure

Version			
TB	Suspended solids with factory setup > residual concrete water		
TU	Turbidity and suspended solids measurement		
TS	Turbidity and suspended solids measurement, with additional functions (Plus package)		
Power supply; approval			
0	230 V AC		
1	115 V AC		
2	230 V AC; CSA Gen. Purp.		
3	115 V AC; CSA Gen. Purp.		
4	230 V AC; ATEX II 3G [EEx nAL] IIC		
5	100 V AC		
6	24 V AC/DC; ATEX II 3G [EEx nAL] IIC for CUM223, EEx nA[L] IIC T4 for CUM253		
7	24 V AC/DC; CSA Gen. Purp.		
8	24 V AC/DC		
Output			
0	1 x 20 mA, turbidity/SS		
1	2 x 20 mA, turbidity/SS and temperature/main measured value/actuating variable		
3	PROFIBUS PA		
4	PROFIBUS DP		
5	1 x 20 mA, turbidity/SS with HART®		
6	2 x 20 mA, turbidity/SS with HART® and temp./main measured value/actuating variable		
Additional contacts; analog input			
05	Not selected		
10	2 x relay (limit/controller/timer)		
15	4 x relay (limit/controller/Chemoclean)		
16	4 x relay (limit/controller/timer)		
20	2 x relay (limit/controller/timer); current input		
25	4 x relay with cleaning (limit/controller/Chemoclean); current input		
26	4 x relay with timer (limit/controller/timer); current input		
CUM253-			complete order code
CUM223-			

Additional functions of the Plus package

- Current output table to cover wide ranges with varying resolution, fields O33x
- Process Check System (PCS): live check of the sensor, function group P
- Concentration measurement, function group K
- Automatic cleaning function start, field F8

Scope of delivery

The delivery of the field instrument includes:

- 1 transmitter CUM253
- 1 plug-in screw terminal
- 1 cable gland Pg 7
- 1 cable gland Pg 16 reduced
- 2 cable glands Pg 13.5
- 1 Operating Instructions BA200C/07/en
- versions with HART communication:
 - 1 Operating Instructions Field Communication with HART, BA208C/07/en
- versions with PROFIBUS communication:
 - 1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA209C/07/en
- versions with explosion protection for hazardous area zone II (ATEX II 3G):
 - Safety instructions for use in explosion-hazardous areas, XA194C/07/a3

The delivery of the panel-mounted instrument includes:

- 1 transmitter CUM223
- 1 set of plug-in screw terminals
- 2 tensioning screws
- 1 Operating Instructions BA200C/07/en
- versions with HART communication:
 - 1 Operating Instructions Field Communication with HART, BA208C/07/en
- versions with PROFIBUS communication:
 - 1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA209C/07/en
- versions with explosion protection for hazardous area zone II (ATEX II 3G):
 - Safety instructions for use in explosion-hazardous areas, XA194C/07/a3

Accessories

Sensors

Turbimax W CUS31

- Turbidity sensor for drinking water and wastewater applications, 90 ° scattered light method
- Ordering acc. to product structure, see Technical Information (TI176C/07/en)

Turbimax W CUS41

- Turbidity sensor for wastewater and solid content measurements, 90 ° scattered light method
- Ordering acc. to product structure, see Technical Information (TI177C/07/en)

Assemblies

Retractable assembly Cleanfit CUA451

- retractable assembly with ball valve; for turbidity sensors; material: stainless steel
- ordering acc. to product structure (Technical Information TI369C/07/en)

Flow assembly Flowfit CUA250

- for CUS31/CUS41
- ordering acc. to product structure (Technical Information TI096C/07/en)

Immersion assembly Dipfit W CYA611

- for sensor immersion in basins, open channels and tanks, PVC;
- Ordering acc. to product structure (Technical Information TI166C/07/en)

Connection accessories

CYK81 measuring cable

- non-terminated measuring cable for extension of sensor cables of e.g. Memosens, CUS31/CUS41
- 2 wires, twisted pair with shield and PVC-sheath (2 x 2 x 0.5 mm² + shield)
- Sold by the meter, order no. 51502543

Junction box VBM

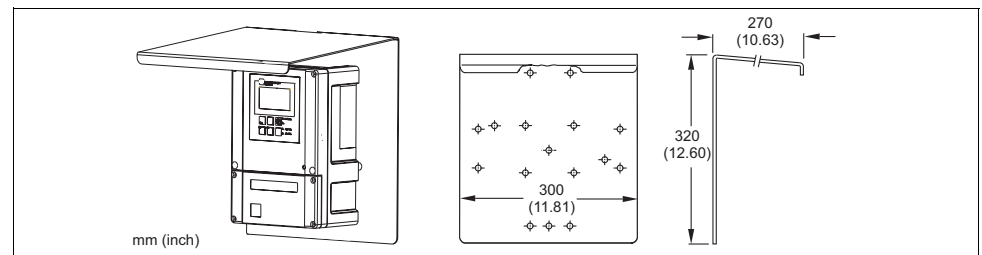
- For cable extension, with 10 terminals
- IP 65 (≅ NEMA 4X)
- Material: aluminum
- Order numbers:
 - cable entry Pg 13.5: 50003987
 - cable entry NPT ½": 51500177

Junction box RM

- To lengthen the cable for Memosens or CUS31/CUS41
- With 2 x Pg 13.5
- IP 65 (≅ NEMA 4X)
- Order no. 51500832

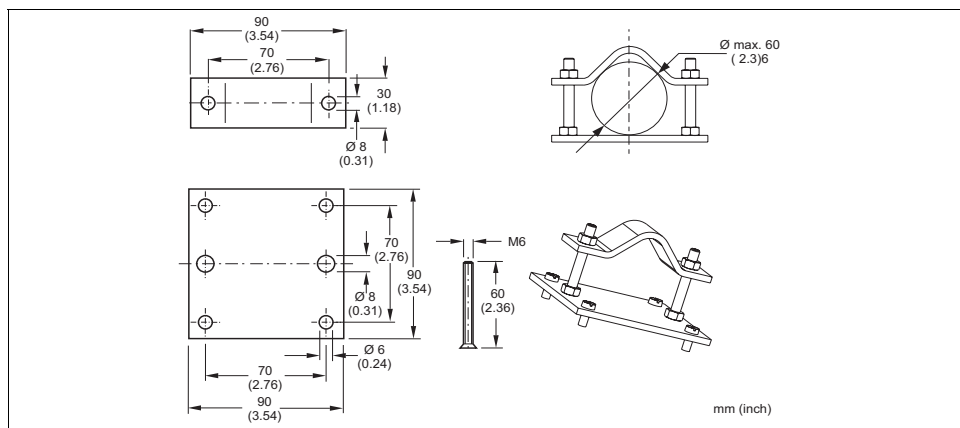
Mounting accessories

- Weather protection cover CYY101 for mounting of field housing, for outdoor installation material: stainless steel 1.4031 (AISI 304); order no. CYY101-A



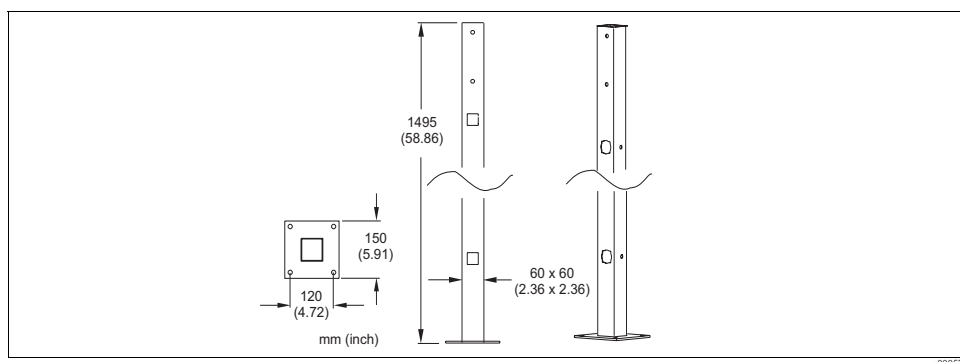
Weather protection cover for field instrument

- Kit for mounting of field housing on horizontal or vertical pipes (Ø max. 60 mm (2.36")) order no. 50086842



Pipe mounting kit

- Universal upright post CYY102
Square post for mounting of field housing, material: stainless steel 1.4301 (AISI 304);
order no. CYY102-A



Square post

Immersion assembly holder CYH101

- for pH, ORP, oxygen, conductivity assemblies and for oxygen and turbidity sensors;
- Ordering acc. to product structure (Technical Information TI092C/07/en)

Pendulum frame

- for pendulous suspension of CPA111, CLA111, CPA510 and CYA611 assemblies
- Order no. 50080196

Optoscope

- Optoscope
Interface between transmitter and PC / laptop for service purposes.
The Windows software "Scopeware" required for the PC or laptop is supplied with the Optoscope. The Optoscope is supplied in a sturdy plastic case with all the accessories required.
Order no. 51500650

United States

Endress+Hauser, Inc.
2350 Endress Place
Greenwood, IN 46143
Tel. 317-535-7138
Sales 888-ENDRESS
Service 800-642-8737
fax 317-535-8498
inquiry@us.endress.com
www.us.endress.com

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Endress+Hauser Canada
1075 Sutton Drive
Burlington, ON L7L 5Z8
Tel. 905-681-9292
800-668-3199
Fax 905-681-9444
info@ca.endress.com
www.ca.endress.com

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54030. Tlalpan de Baz
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México
Tel: +52 55 5321 2080
Fax +52 55 5321 2099
eh.mexico@mx.endress.com
www.mx.endress.com



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Orbisint CPS11 and CPS11D

pH electrodes, analog or with digital Memosens technology

For standard applications in process and environment technology, with dirt-repellent PTFE diaphragm, optional built-in temperature sensor



Application

- Long-term monitoring and limit monitoring of processes with stable process conditions
 - Pulp and paper industry
 - Plastics chemistry
 - Chemical processes
 - Power plants (e.g. flue gas washers)
 - Incineration plants
 - Food industry
 - Breweries
- Water treatment
 - Drinking water
 - Cooling water
 - Well water

With ATEX, FM and CSA approval for application in hazardous areas

Your benefits

- Robust electrode requiring low maintenance thanks to large PTFE ring diaphragm
- Application under pressures of up to 16 bar (232 psi)
- Process glass for highly alkaline applications available
- Built-in Pt 100 or Pt 1000 temperature sensor for effective temperature compensation (optional)
- Certified biocompatibility
- Sterilizable
- Long service life thanks to double junction system of metal lead and thus long electrode poison diffusion path
- Poison-resistant reference with ion trap (optional, CPS11D only)

Further benefits offered by Memosens technology

- Maximum process safety through contactless inductive signal transmission
- Data safety through digital data transmission
- Easy handling thanks to storage of sensor-specific data in the sensor
- Predictive maintenance possible thanks to registration of sensor load data in the sensor

Function and system design

Measuring principle

pH measurement

The pH value is used as a unit of measurement for the acidity or alkalinity of a liquid medium. The membrane glass of the electrode supplies an electrochemical potential which is dependent upon the pH value of the medium. This potential is generated by the selective penetration of H^+ ions through the outer layer of the membrane. An electrochemical boundary layer with an electric potential forms at this point. An integrated Ag/AgCl reference system serves as reference electrode.

The transmitter converts the measured voltage into the corresponding pH value using the Nernst equation.

General properties

■ Low maintenance

The sterilizable dirt-repellent PTFE ring diaphragm of the electrode prevents blocking and assures long-time stability and accuracy.

■ Long service life

The double junction system of the metal lead offers better protection from electrode poisons and guarantees a considerably longer service life.

■ Durability

Depending on the ordered version, the electrode is pressure proof up to 16 bar (232 psi) and can be applied at temperatures of up to 135 °C (275 °F.)

Important properties of CPS11D

Maximum process safety

The inductive and non-contacting measured value transmission of Memosens guarantees maximum process safety and offers the following benefits:

- All problems caused by moisture are eliminated.
 - The plug-in connection is free from corrosion.
 - Measured value distortion from moisture is not possible.
 - The plug-in system can even be connected under water.
- The transmitter is galvanically decoupled from the medium. The result: No more need to ask about "symmetrically high-impedance" or "unsymmetrical" (for pH/ORP measurement) or an impedance converter.
- EMC safety is guaranteed by screening measures for the digital measured value transmission.
- Application in explosion-hazardous areas is unproblematic; the integrated electronics are intrinsically safe.

Data safety through digital data transfer

The Memosens technology digitalizes the measured values in the sensor and transfers them to the transmitter contactlessly and free from interference potential. The result:

- An automatic error message is generated if the sensor fails or the connection between sensor and transmitter is interrupted.
- The availability of the measuring point is dramatically increased by immediate error detection.

Easy handling

Sensors with Memosens technology have integrated electronics that allow for saving calibration data and further information such as total hours of operation and operating hours under extreme measuring conditions. When the sensor is mounted, the calibration data are automatically transferred to the transmitter and used to calculate the current measured value. Storing the calibration data in the sensor allows for calibration away from the measuring point. The result:

- Sensors can be calibrated under optimum external conditions in the measuring lab. Wind and weather do neither affect the calibration quality nor the operator.
- The measuring point availability is dramatically increased by the quick and easy replacement of precalibrated sensors.
- The transmitter does not need to be installed close to the measuring point but can be placed in the control room.
- Maintenance intervals can be defined based on all stored sensor load and calibration data and predictive maintenance is possible.
- The sensor history can be documented on external data carriers and evaluation programs at any time. Thus, the current application of the sensors can be made to depend on their previous history.

Communication with the transmitter

Always connect digital sensors to a transmitter with Memosens technology. Data transmission to a transmitter for analog sensors is not possible.

Data storage of CPS11D

Digital sensors are able to store the following system data in the sensor.

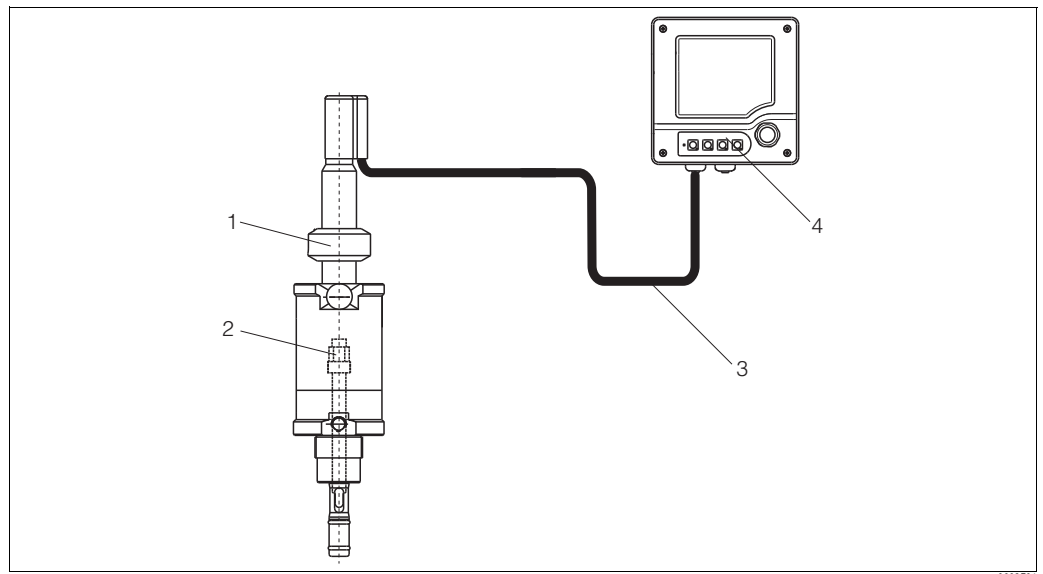
- Manufacturing data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Calibration date
 - Calibrated slope at 25 °C (77 °F)
 - Calibrated zero point at 25 °C (77 °F)
 - Temperature offset
 - Number of calibrations
 - Serial number of the transmitter used for the last calibration
- Application data
 - Temperature application range
 - pH application range
 - Date of first commissioning
 - Maximum temperature value
 - Operating hours at temperatures above 80 °C (176 °F) and 100 °C (212 °F)
 - Operating hours at very low and very high pH values (Nernst voltage below -300 mV, above +300 mV)
 - Number of sterilizations
 - Glass membrane impedance

These system data can be displayed with Mycom S and Liquiline M transmitters.

Measuring system

A complete measuring system comprises:


- CPS11 pH electrode or CPS11D digital sensor
- Transmitter, e.g. Liquiline M CM42 (with Memosens technology for CPS11D)
- Special measuring cable, e.g. CPK9 or Memosens data cable CYK10
- Immersion, flow or retractable assembly, e.g. Cleanfit P CPA472




Measuring system for pH measurement

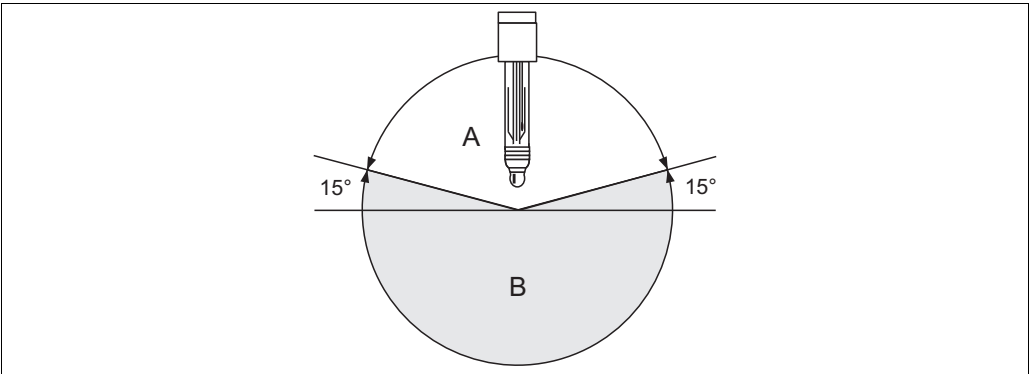
- 1 Cleanfit P CPA472 retractable assembly
- 2 CPS11/CPS11D pH electrode
- 3 Special measuring cable CPK9 for electrodes with TOP68 plug-in head / CYK10 for digital sensors
- 4 Liquiline M CM42 transmitter

Input

Measured variables	pH value Temperature
Measuring ranges	Electrode version AA, AS (for water / wastewater): pH: 1 to 12 pH Temperature: -15 to 80 °C (5 to 176 °F) Electrode version BA (for process applications, sterilizable) pH: 0 to 14 pH Temperature: 0 to 135 °C (32 to 275 °F) Electrode version FA (for hydrofluoric acid): pH: 0 to 10 pH Temperature: 0 to 70 °C (32 to 158 °F) Electrode version BT with ion trap (for pulp, paper, chemical applications) pH: 0 to 14 Temperature: 0 to 135 °C (32 to 275 °F)
	<div> Caution! Please note the process operating conditions.</div>

Installation

Installation instructions	<p>Do not install the electrode upside down. The inclination angle must be at least 15° from the horizontal. A smaller inclination angle is not permitted as such an inclination results in air cushion forming in the glass sphere. This might impair full wetting of the pH membrane with inner electrolyte.</p> <div><div></div><div><p>Caution!</p><ul style="list-style-type: none">■ Make sure that the assembly's threaded connection for the electrode is clean and well running before installing the electrode.■ Hand tighten the electrode (3 Nm)! (Given value only applies to installation in Endress+Hauser assemblies.)■ Make sure to follow the installation instructions in the operating instructions of the used assembly.</div></div>
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Electrode installation; inclination angle min. 15° from the horizontal

A Permitted inclination angle

B Non-permitted inclination angle

Environment

Ambient temperature



Caution!
Danger of frost damage
Do not use the electrode at temperatures below $-15\text{ }^{\circ}\text{C}$ ($5\text{ }^{\circ}\text{F}$).

Storage temperature

0 to $50\text{ }^{\circ}\text{C}$ (32 to $122\text{ }^{\circ}\text{F}$)

Ingress protection

IP 67: GSA plug-in head (with closed plug-in connection)
IP 68: TOP68 plug-in head, autoclavable up to $135\text{ }^{\circ}\text{C}$ ($275\text{ }^{\circ}\text{F}$), 1 m (3.28 ft) water column, $50\text{ }^{\circ}\text{C}$ ($122\text{ }^{\circ}\text{F}$), 168 h
IP 68: Memosens plug-in head, 10 m (32.81 ft) water column, $25\text{ }^{\circ}\text{C}$ ($77\text{ }^{\circ}\text{F}$), 45 days, 1M KCl

Process

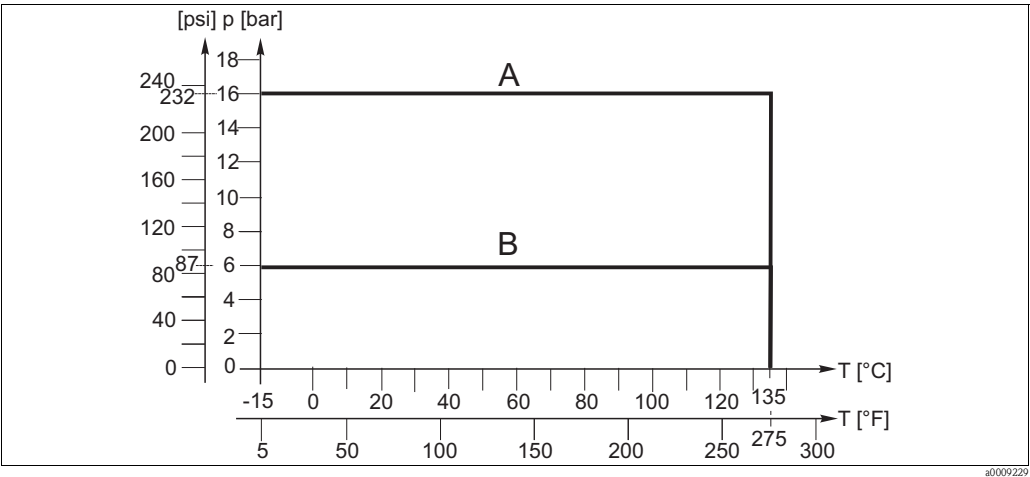
Process temperature

Version AA, AS: -15 to $80\text{ }^{\circ}\text{C}$ (5 to $176\text{ }^{\circ}\text{F}$)
Version BA, BT: 0 to $135\text{ }^{\circ}\text{C}$ (32 to $275\text{ }^{\circ}\text{F}$)
Version FA: 0 to $70\text{ }^{\circ}\text{F}$ (32 to $158\text{ }^{\circ}\text{F}$)

Process pressure

0 to 6 bar (0 to 87 psi) / 16 bar (232 psi) (versions CPS11-xBAxESA, CPS11D-7BAxx, CPS11D-7BTxx)

Pressure temperature load curve



Pressure temperature load curve

A Versions CPS11-xBAxESA, CPS11D-7BAxx, CPS11D-7BTxx
B CPS11 and CPS11D (except CPS11-xBAxESA, CPS11D-7BAxx, CPS11D-7BTxx)

Conductivity

min. $50\text{ }\mu\text{S}/\text{cm}$

pH range

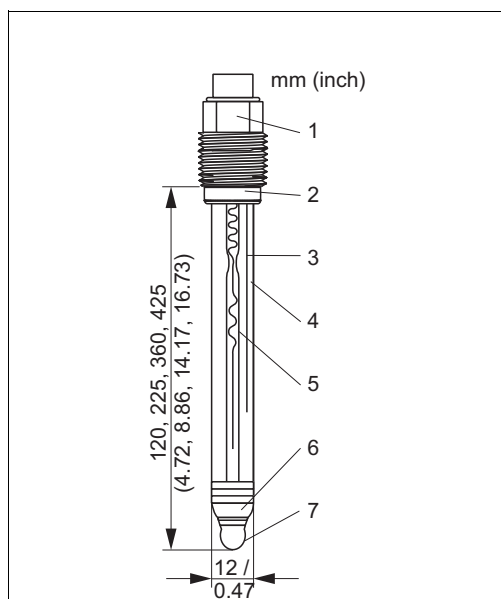
Version AA, AS: 1 to 12 pH
Version BA, BT: 0 to 14 pH
Version FA: 0 to 10 pH



Caution!
Danger of electrode damage
Do not operate the electrodes in applications outside the given specifications!

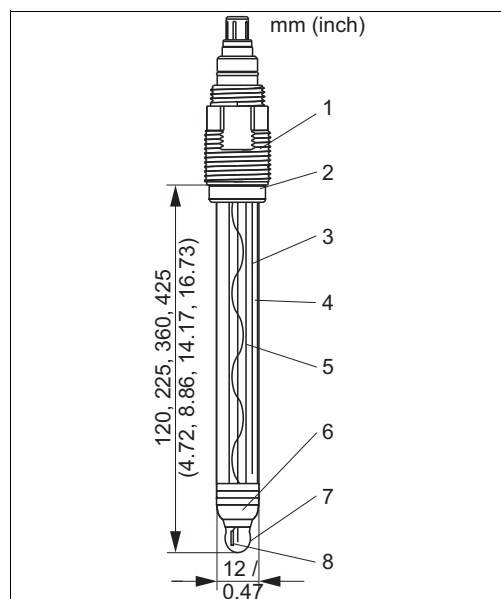
Mechanical construction

Design, dimensions



CPS11 with GSA plug-in head

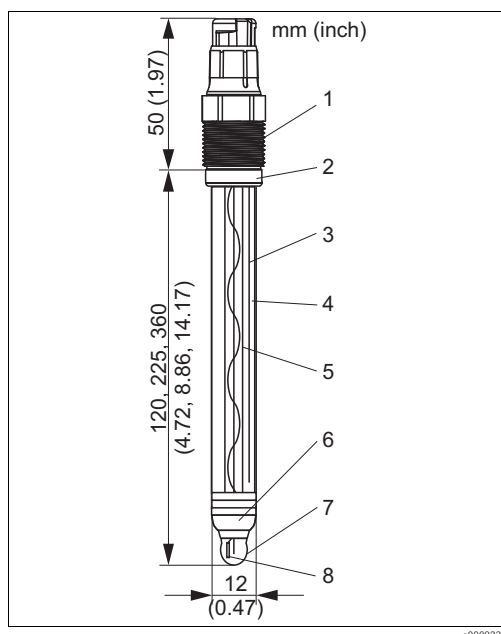
- 1 GSA plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl metal lead - reference
- 4 "Advanced Gel" electrolyte
- 5 Ag/AgCl metal lead - pH
- 6 PTFE diaphragm
- 7 pH glass membrane



CPS11 with TOP68, built-in temperature sensor

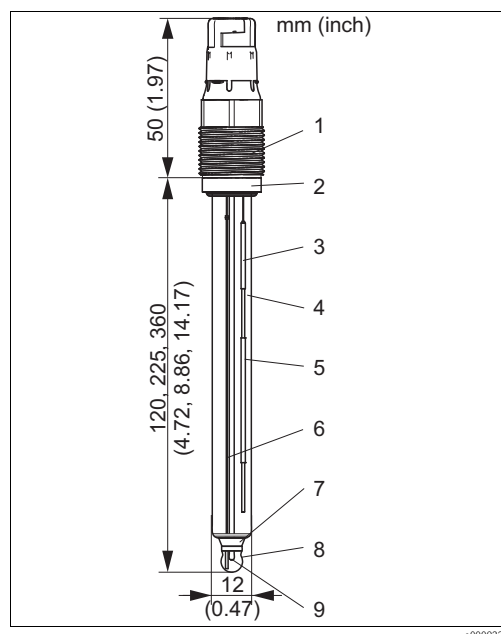
- 1 TOP68 plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl metal lead - reference
- 4 "Advanced Gel" electrolyte
- 5 Ag/AgCl metal lead - pH
- 6 PTFE diaphragm
- 7 pH glass membrane
- 8 Pt 100 temperature sensor

Design, dimensions CPS11D



CPS11D with Memosens, built-in temperature sensor

- 1 Memosens plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl metal lead - reference
- 4 "Advanced Gel" electrolyte
- 5 Ag/AgCl metal lead - pH
- 6 PTFE diaphragm
- 7 pH glass membrane
- 8 Temperature sensor




CPS11D-7BTxx

- 1 Memosens plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl metal lead - reference
- 4 "Advanced Gel" electrolyte
- 5 Ion trap
- 6 Ag/AgCl metal lead - pH
- 7 PTFE diaphragm
- 8 pH glass membrane
- 9 Temperature sensor

Weight	approx. 0.1 kg (0.22 lbs)	
Material	Electrode shaft pH membrane glasses Metal lead Diaphragm	process glass types A, B, F Ag/AgCl ring-shaped Teflon® diaphragm, sterilizable
Process connection	Pg 13.5	
Temperature sensor	CPS11: CPS11D:	Pt 100, Pt 1000 NTC
Plug-in heads	CPS11: ESA GSA CPS11D:	plug-in head Pg 13.5, TOP68 for electrodes with or without temperature sensor, 16 bar (232 psi) triple safety overpressure, Ex plug-in head Pg 13.5 for electrodes without temperature sensor Memosens plug-in head for digital, contactless data transmission
Reference system	CPS11: CPS11D: Versions AA, AS, BA, FA Version BT	Ag/AgCl metal lead with Advanced Gel 3 M KCl, AgCl free Ag/AgCl metal lead with Advanced Gel 3 M KCl, AgCl free Ag/AgCl metal lead with ion trap and Advanced Gel 3 M KCl

Certificates and approvals

Ex approval	<p>CPS11 (TOP68)</p> <ul style="list-style-type: none"> ■ ATEX II 1G EEX ia IIC T3/T4/T6 ■ FM Class I Div. 2, in combination with the Liquiline M CM42 and Mycom S CPM153 transmitters <p>CPS11D</p> <ul style="list-style-type: none"> ■ ATEX II 1G EEX ia IIC T3/T4/T6 ■ FM / CSA Class I Div. 2, in combination with the Liquiline M CM42 and Mycom S CPM153 transmitters <p> Note! Ex versions of digital sensors with Memosens technology are indicated by an orange-red ring in the plug-in head.</p>
Biocompatibility	<p>Biocompatibility validated according to:</p> <ul style="list-style-type: none"> ■ ISO 10993-5:1993 ■ USP, current revision
TÜV certificate	<p>TOP68 plug-in head</p> <p>Pressure resistance 16 bar (232 psi), min. triple overpressure safety</p> <p>Memosens plug-in head</p> <p>Pressure resistance 16 bar (232 psi), min. triple overpressure safety</p>
Electromagnetic compatibility of CPS11D	Interference emission and interference immunity complies with EN 61326: 1997 / A1: 1998

Ordering information

Product structure CPS11

Electrode type				
	1	without temperature sensor		
	2	with built-in Pt 100 (not available with GSA plug-in head)		
	3	with built-in Pt 1000 (not available with GSA plug-in head)		
Application range				
	AA	pH = 1 to 12, T = -15 to 80 °C (5 to 176 °F), 6 bar (87 psi)		
	AS	pH = 1 to 12, T = -15 to 80°C (5 to 176 °F), 6 bar (87 psi), salt ring		
	BA	pH = 0 to 14, T = 0 to 135 °C (32 to 275 °F), sterilizable, 16 bar (232 psi) in combination with ESA plug-in head		
	FA	pH = 0 to 10, T = 0 to 70 °C (32 to 158 °F), HF resistant up to 1 g/l, 6 bar (87 psi)		
Shaft length				
	2	120 mm (4.72")		
	4	225 mm (8.86")		
	5	360 mm (14.17")		
	6	425 mm (16.73")		
Plug-in head				
	ESA	Plug-in head Pg 13.5, TOP68, 16 bar (232 psi) in combination with BA application range, Ex		
	GSA	Plug-in head Pg 13.5, DIN coax, non-Ex		
CPS11-				complete order code

Product structure CPS11D

Version				
	7	max. 135 °C (275 °F), built-in temperature sensor		
Application range				
	AA	pH = 1 to 12, T = -15 to 80 °C (5 to 176 °F), 6 bar (87 psi)		
	AS	pH = 1 to 12, T = -15 to 80 °C (5 to 176 °F), 6 bar (87 psi), salt ring		
	BA	pH = 0 to 14, T = 0 to 135 °C (32 to 275 °F), 16 bar (232 psi), sterilizable		
	BT	pH = 0 to 14, T = 0 to 135 °C (32 to 275 °F), 16 bar (232 psi), ion trap		
	FA	pH = 0 to 10, T = 0 to 70 °C (32 to 158 °F), 6 bar (87 psi), HF resistant up to 1 g/l		
Shaft length				
	2	120 mm (4.72")		
	4	225 mm (8.86")		
	5	360 mm (14.17")		
	6	425 mm (16.73")		
Approval				
	1	Non-hazardous area		
	G	ATEX II 1G EEx ia IIC T3/T4/T6		
CPS11D-				complete order code

Accessories



Note!

In the following sections, you find the accessories available at the time of issue of this documentation. For information on accessories that are not listed here, please contact your responsible service.

Transmitters

Liquiline M CM42

- Modular two-wire transmitter, stainless steel or plastic, field or panel instrument,
- various Ex approvals (ATEX, FM, CSA, Nepsi, TIIS),
- HART, PROFIBUS or FOUNDATION Fieldbus available
- Ordering acc. to product structure, see Technical Information (TI381C/07/en)

Liquisys M CPM223/253

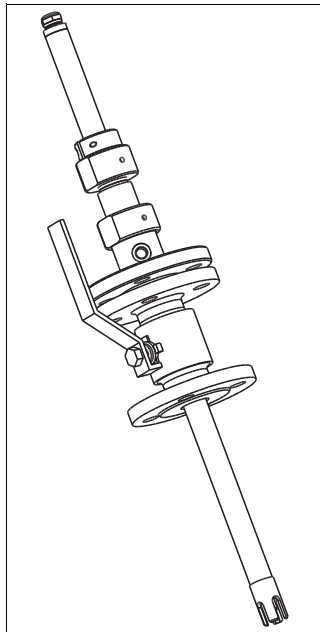
- Transmitter for pH and ORP, field or panel-mounted housing,
- HART or PROFIBUS available
- Ordering acc. to product structure, see Technical Information (TI194C/07/en)

Mycom S CPM153

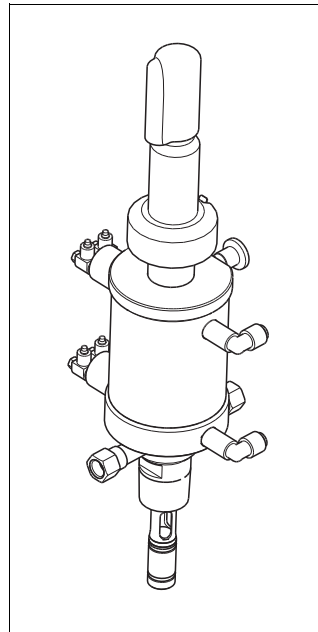
- Transmitter for pH and ORP, one or two channel version, Ex or non-Ex,
- HART or PROFIBUS available
- Ordering acc. to product structure, see Technical Information (TI233C/07/en)

Assemblies (Selection)

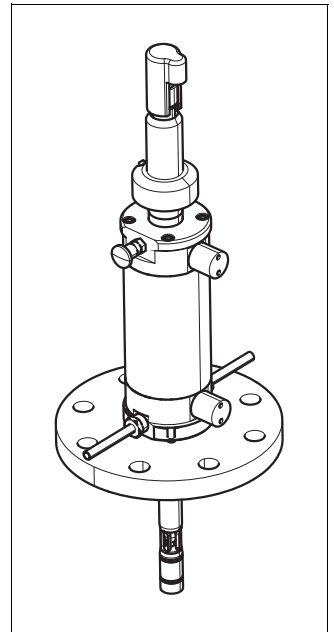
- Cleanfit W CPA450
Manually operated, retractable assembly for installation of 120 mm (4.72") pH/ORP electrodes in tanks and pipes,
Ordering acc. to product structure, see Technical Information (TI183C/07/en)
- Cleanfit P CPA471
Compact retractable stainless steel assembly for installation in tanks and pipes, manual or pneumatic operation
Ordering acc. to product structure, see Technical Information (TI217C/07/en)
- Cleanfit P CPA472
Compact retractable plastic assembly for installation in tanks and pipes, manual or pneumatic operation,
Ordering acc. to product structure, see Technical Information (TI223C/07/en)
- Cleanfit P CPA472D
Robust retractable assembly for pH, ORP and other industry sensors, manual or pneumatic operation,
heavy-duty version;
Ordering acc. to product structure, see Technical Information (TI403C/07/en)

*Cleanfit W CPA450*

a0003135

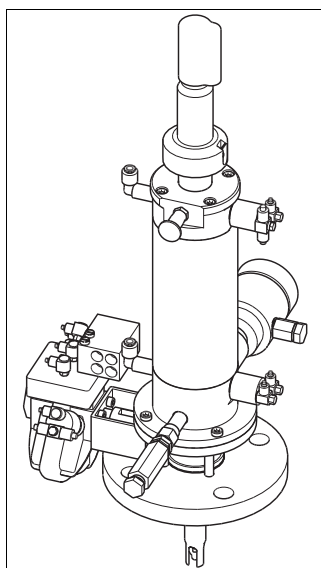
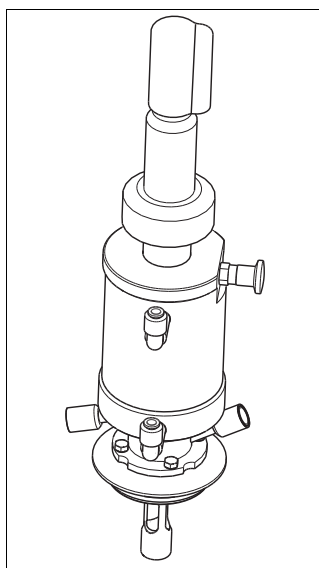
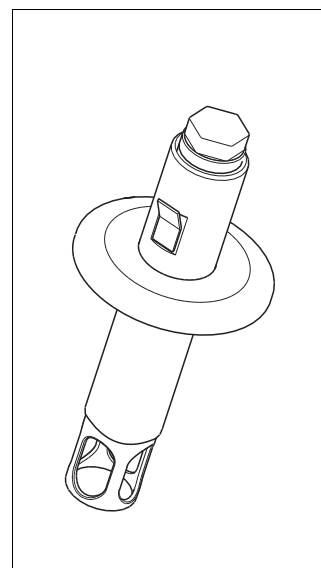
*Cleanfit P CPA471 or 472*

a0003137

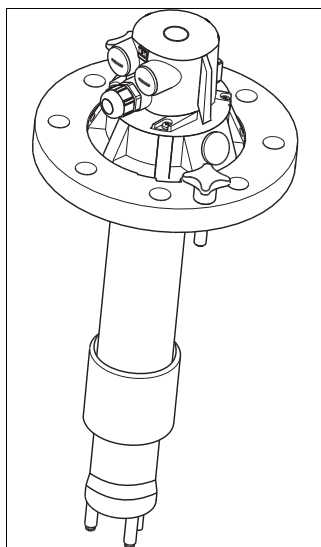
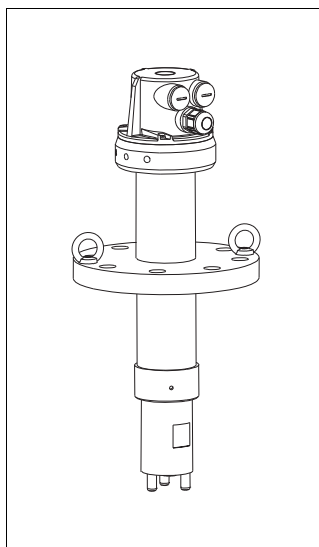
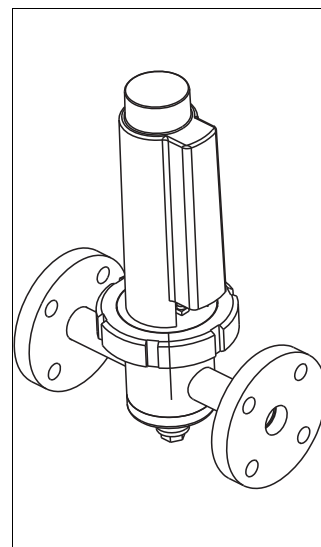
*Cleanfit P CPA472D*

a0009269

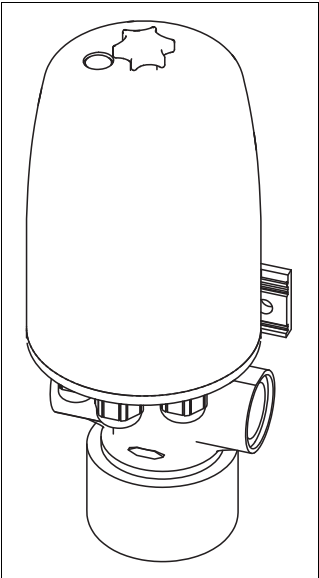
- **Cleanfit P CPA473**
Retractable stainless steel process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment,
Ordering acc. to product structure, see Technical Information (TI344C/07/en)
- **Cleanfit P CPA474**
Retractable plastic process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment,
Ordering acc. to product structure, see Technical Information (TI345C/07/en)
- **Cleanfit H CPA475**
Retractable assembly for installation in tanks and pipes under sterile conditions,
Ordering acc. to product structure, see Technical Information (TI240C/07/en)
- **Unifit H CPA442**
Process assembly for the food industry, biotechnology and pharmaceutical industry,
Ordering acc. to product structure, see Technical Information (TI306C/07/en)

Cleanfit P CPA473 or 474 a0003138Cleanfit H CPA475 a0003136Unifit H CPA442 a0003139

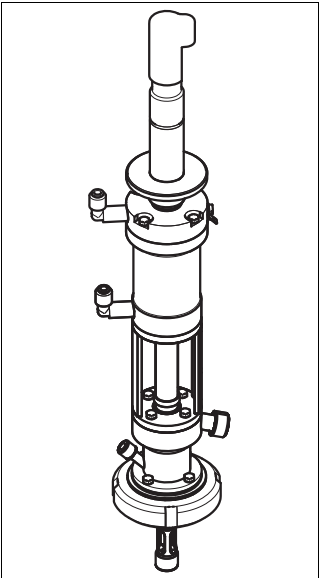
- **Dipfit W CPA111**
Plastic immersion and installation assembly for open and closed tanks,
Ordering acc. to product structure, see Technical Information (TI112C/07/en)
- **Dipfit P CPA140**
Immersion assembly for pH/ORP electrodes for demanding processes,
Ordering acc. to product structure, see Technical Information (TI178C/07/en)
- **Flowfit P CPA240**
Flow assembly for pH/ORP electrodes, for demanding processes,
Ordering acc. to product structure, see Technical Information (TI179C/07/en)

Dipfit W CPA111 a0003140Dipfit P CPA140 a0003141Flowfit P CPA240 a0003142

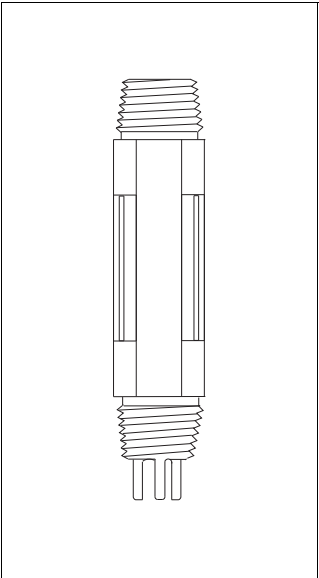
- **Flowfit W CPA250**
Flow assembly for pH/ORP electrodes,
Ordering acc. to product structure, see Technical Information (TI041C/07/en)
- **Probit H CPA465**
Retractable assembly for installation in tanks and pipes under sterile conditions,
Ordering acc. to product structure, see Technical Information (TI146C/07/en)
- **Ecofit CPA640**
Process connection adapter and cable set for 120 mm (4.72") pH/ORP electrodes,
Ordering acc. to product structure, see Technical Information (TI264C/07/en)



Flowfit W CPA250



Probit H CPA465



Ecofit CPA640

Buffer solutions

High-quality buffer solutions of Endress+Hauser

The secondary buffer solutions have been referenced to primary reference material of the PTB (German Federal Physico-technical Institute) and to standard reference material of NIST (National Institute of Standards and Technology) according to DIN 19266 by a DKD (German Calibration Service) accredited laboratory.

pH value		
A	pH 2.00 (accuracy ± 0.02 pH)	
C	pH 4.00 (accuracy ± 0.02 pH)	
E	pH 7.00 (accuracy ± 0.02 pH)	
G	pH 9.00 (accuracy ± 0.02 pH)	
I	pH 9.20 (accuracy ± 0.02 pH)	
K	pH 10.00 (accuracy ± 0.05 pH)	
M	pH 12.00 (accuracy ± 0.05 pH)	
Quantity		
01	20 x 18 ml (0.68 fl.oz) only buffer solutions pH 4.00 and 7.00	
02	250 ml (8.45 fl.oz)	
10	1000 ml (0.26 US gal)	
50	5000 ml (1.32 US gal) canister for Topcal S	
Certificates		
A	Buffer analysis certificate	
Version		
1	Standard	
CPY20-		complete order code

Measuring cables

CPK9 special measuring cable

- For sensors with TOP68 plug-in head, for high-temperature and high-pressure applications, IP 68
- Ordering acc. to product structure, see Technical Information (TI118C/07/en)

CPK1 special measuring cable

- For pH/ORP electrodes with GSA plug-in head
- Ordering acc. to product structure, see Technical Information (TI118C/07/en)

CPK12 special measuring cable

- For pH/ORP glass electrodes and ISFET sensors with TOP68 plug-in head
- Ordering acc. to product structure, see Technical Information (TI118C/07/en)

CYK10 Memosens data cable

- For digital sensors with Memosens technology
- Ordering according to product structure, see below

Certificates			
	A	Standard, non Ex	
	G	ATEX II 1G EEx ia IIC T6/T4	
Cable length			
		03	Cable length: 3 m (9.8 ft)
		05	Cable length: 5 m (16 ft)
		10	Cable length: 10 m (33 ft)
		15	Cable length: 15 m (49 ft)
		20	Cable length: 20 m (66 ft)
		25	Cable length: 25 m (82 ft)
		88	... m length
		89	... ft length
Ready-made			
		1	Wire terminals
CYK10-			complete order code



Note!

Ex versions of CYK10 are indicated by an orange-red coupling end.

Instruments International

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Endress+Hauser 
People for Process Automation



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Prosonic M FMU40/41/42/43/44

Ultrasonic Level Measurement

Compact transmitters for non-contact level measurement of fluids, pastes and coarse bulk materials



Application

- Continuous, non-contact level measurement in fluids, pastes, sullages and coarse bulk materials
- Flow measurement in open channels and measuring weirs
- System integration via:
 - HART® (standard), 4 to 20mA
 - PROFIBUS® PA
 - FOUNDATION™ Fieldbus
- Maximum measuring range:
 - FMU 40: 16 ft (5 m) in fluids / 6 ft (2 m) in bulk materials
 - FMU 41: 26 ft (8 m) in fluids / 12 ft (3.5 m) in bulk materials
 - FMU 42: 33 ft (10 m) in fluids / 16 ft (5 m) in bulk materials
 - FMU 43: 50 ft (15 m) in fluids / 23 ft (7 m) in bulk materials
 - FMU44: 65 ft (20 m) in fluids / 33 ft (10 m) in bulk materials

Features and benefits

- Quick and simple commissioning via menu-guided on-site operation with four-line plain text display
- Envelope curves on the on-site display for simple diagnosis
- Easy remote operation, diagnosis and measuring point documentation with the supplied FieldCare operating program.
- Suitable for explosion hazardous areas (Gas-Ex, Dust-Ex)
- Linearization function (up to 32 points) for conversion of the measured value into any unit of length, volume or flow rate
- Non-contact measurement method minimizes service requirements
- optional remote display and operation (up to 65 ft / 20 m from transmitter)
- Installation possible from thread 1½ NPT, G 1½" or 2" NPT or universal slip-on flange
- Integrated temperature sensor for Time of Flight correction provides accurate measurements, even with temperature changes

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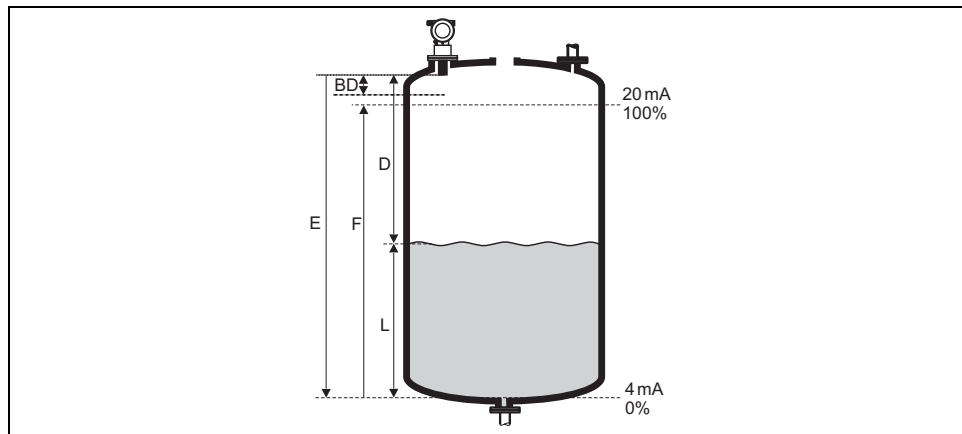
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Function and system design

Measuring principle



E: Empty distance; F: Span (full distance); D: Distance from sensor membrane - product surface; L: Level; BD: Blocking distance

Sensor	BD	Max. range fluids	Max. range bulk materials
FMU40	9.84" (0.25 m)	16 ft (5 m)	6.5 ft (2 m)
FMU41	13.8" (0.35 m)	26 ft (8 m)	11.5 ft (3.5 m)
FMU42	15.7" (0.4 m)	33 ft (10 m)	16 ft (5 m)
FMU43	23.6" (0.6 m)	50 ft (15 m)	23 ft (7 m)
FMU44	19.7" (0.5 m)	65 ft (20 m)	33 ft (10 m)

Time-of-flight method

The sensor of the Prosonic M transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The Prosonic M measures the time t between pulse transmission and reception. The instrument uses the time t (and the velocity of sound c) to calculate the distance D between the sensor membrane and the product surface:

$$D = c \cdot t / 2$$

As the device knows the empty distance E from a user entry, it can calculate the level as follows:

$$L = E - D$$

An integrated temperature sensor compensates for changes in the velocity of sound caused by temperature changes.

Interference echo suppression

The interference echo suppression feature on the Prosonic M ensures that interference echos (e.g. from edges, welded joints and installations) are not interpreted as a level echo.

Calibration

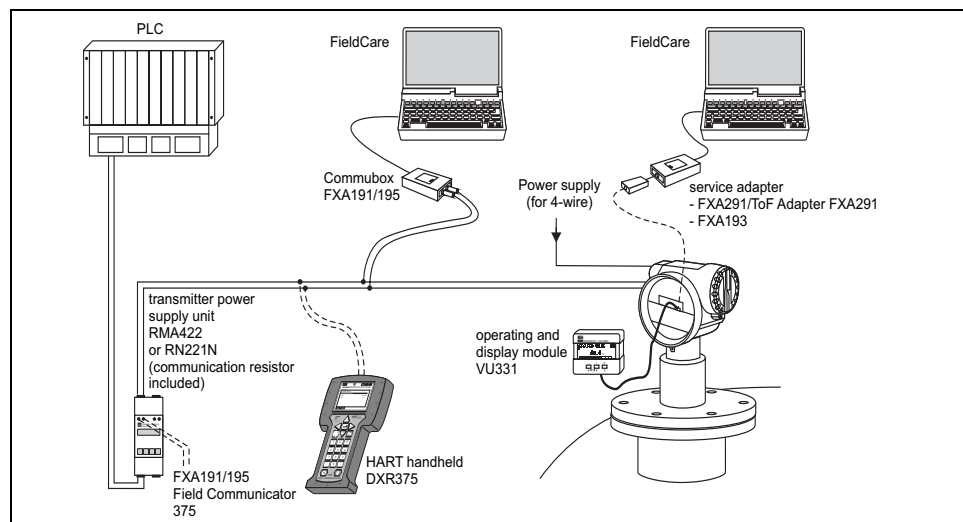
Enter the empty distance E and the span F to calibrate the device.

Blocking distance

Span F may not extend into the blocking distance BD . Level echos from the blocking distance cannot be evaluated due to the transient characteristics of the sensor.

4 to 20 mA output with HART protocol

The complete measuring system consists of:



L00-FMxxxxx-14-00-06-en-007

If the HART communication resistor is not built into the supply unit, it is necessary to insert a communication resistor of 250 Ω into the 2-wire line.

Local operation

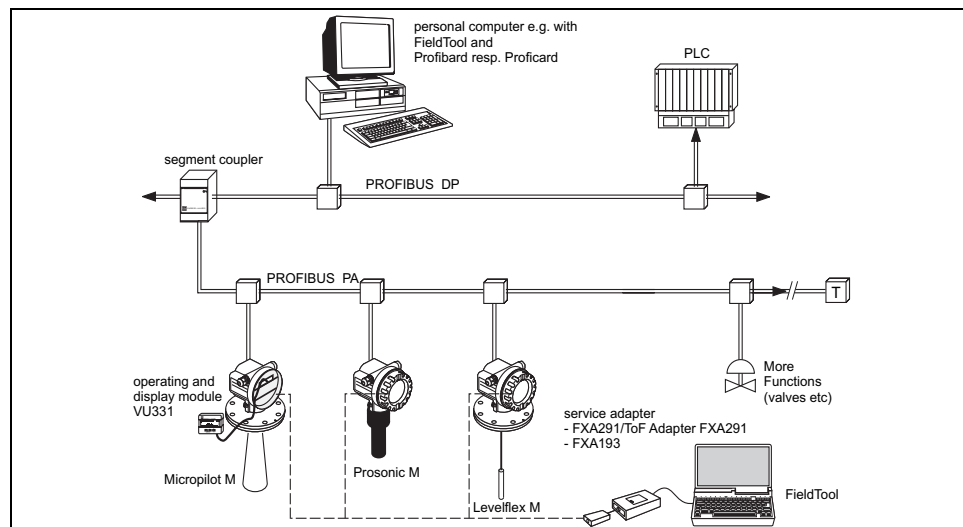
- with display and operating module VU 331
- with a Personal Computer, FXA 193 and the operating software ToF Tool

Remote operation

- with HART handheld terminal DXR 375
- with a Personal Computer, Commubox FXA 191 and the operating software COMMUWIN II respectively ToF Tool.

System integration using PROFIBUS PA

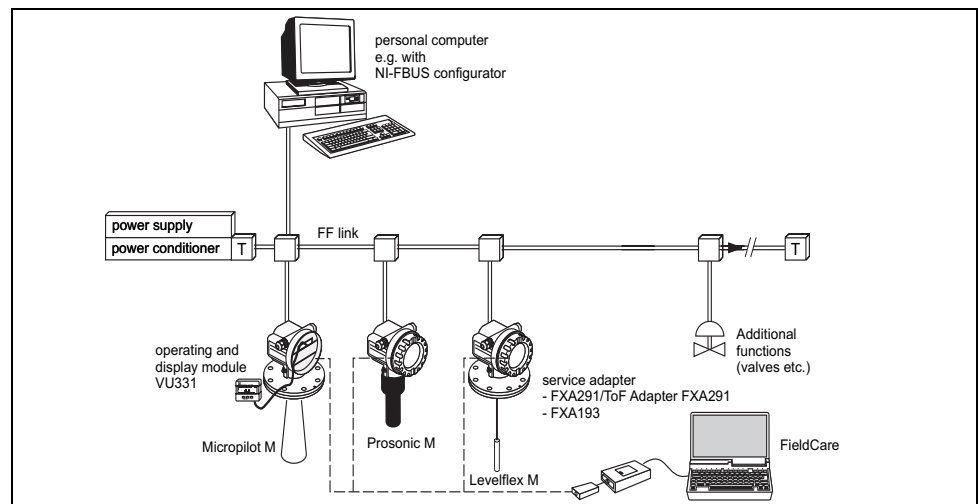
A maximum of 32 transmitters (8 if mounted in an explosion hazardous location EEx ia IIC according to FISCO-model) can be connected to the bus. The segment coupler provides the operating voltage to the bus. Both on-site as well as remote operation are possible.



L00-FMxxxxx-14-00-06-en-001

System integration using Foundation Fieldbus (FF)

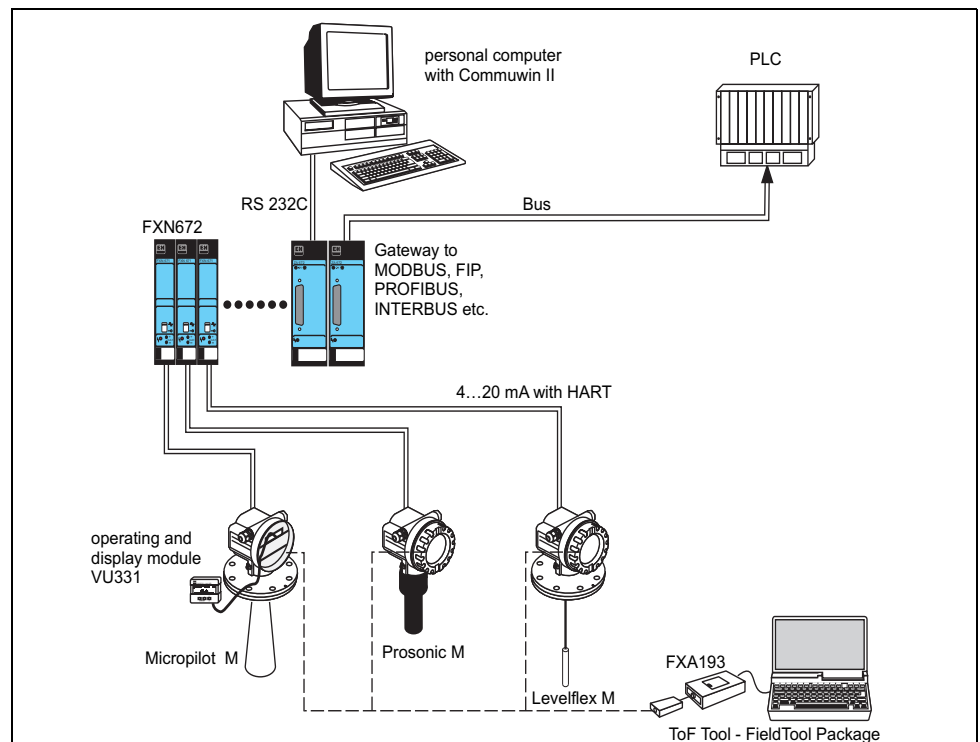
A maximum of 32 transmitters (standard or EEx d) can be connected to the bus. For protection class EEx ia: the maximum number of transmitters depends on the established rules and standards for intrinsically safe circuits (EN 60070-14) and proof of intrinsic safety. Both on-site and remote operation are possible.



100-FMxxXXX-14-00-06-en-003

System integration using Endress+Hauser Rackbus

You can interconnect a maximum of 64 2-wire devices with HART protocol to a Rackbus. Use an FXN 672 interface module for each device. You can integrate this bus into a higher-level bus by using a ZA gateway. Gateways are available for MODBUS, FIP, PROFIBUS, INTERBUS etc. Both on-site and remote operation are possible.



100-FMxxXXX-14-00-06-en-006



NOTE! The FXN672 can be used with all 2-wire devices of the Prosonic M family.

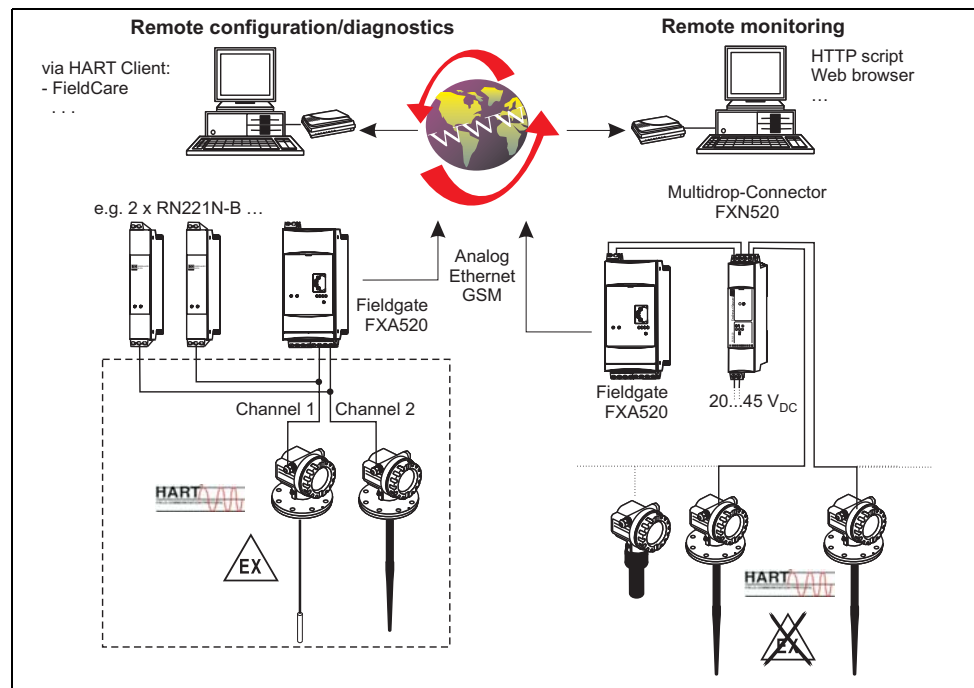
System integration via Fieldgate

Vendor Managed Inventory

By using Fieldgates to interrogate tank or silo levels remotely, suppliers of raw materials can provide their regular customers with information about the current supplies at any time and, for example, account for them in their own production planning. For their part, the Fieldgates monitor the configured level limits and, if required, automatically activate the next supply. The spectrum of options here ranges from a simple purchasing requisition via e-mail through to fully automatic order administration by coupling XML data into the planning systems on both sides.

Remote maintenance of measuring equipment

Fieldgates not only transfer the current measured values, they also alert the responsible standby personnel, if required, via e-mail or SMS. In the event of an alarm or also when performing routine checks, service technicians can diagnose and configure connected HART devices remotely. All that is required for this is the corresponding HART operating software (e.g. ToF Tool - FieldTool Package, FieldCare, ...) for the connected device. Fieldgate passes on the information transparently, so that all options for the respective operating software are available remotely. Some on-site service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.



100-FXA520xx-14-00-06-en-009



Note!

The number of instruments which can be connected in mutidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI 400F (Multidrop Connector FXN520). The program is available from your Endress+Hauser sales organisation or in the internet at:

"www.endress.com Download" (Text Search = "Fieldnetcalc").

Input

Measured variable

The distance D between the sensor membrane and the product surface is measured.

Using the linearisation function, the device uses D to calculate:

- level L in any units
- volume V in any units
- flow Q across measuring weirs or open channels in any units

Measuring range

The measuring range is limited by the range of a sensor. The sensor range is, in turn, dependent on the operating conditions. To estimate the actual range, proceed as follows (see also the calculation example in the diagram):

1. Determine which of the influences shown in the following table are appropriate for your process.
2. Add the corresponding attenuation values.
3. From the total attenuation, use the diagram to calculate the range.

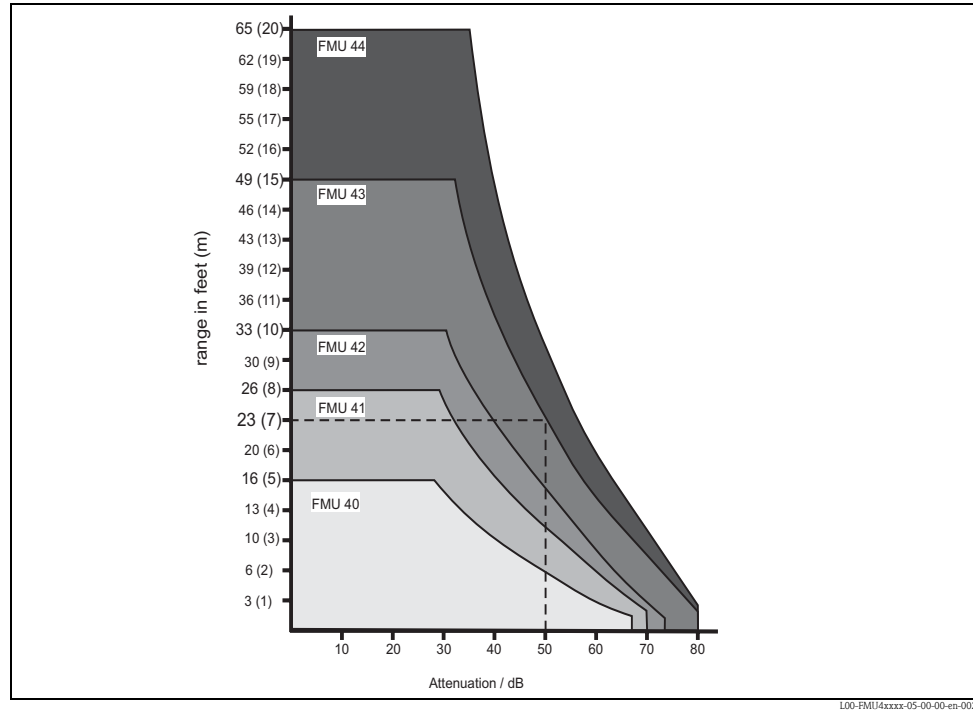
Fluid surface	Attenuation
Calm	0 dB
Waves	5 to 10 dB
Strong turbulence (e.g. stirrers)	10 to 20 dB
Foaming	Ask Endress+Hauser

Bulk material surface	Attenuation
Hard, rough (e.g. rubble)	40 dB
Soft (e.g. peat, dust-covered clinker)	40 to 60 dB

Dust	Attenuation
No dust formation	0 dB
Little dust formation	5 dB
Heavy dust formation	5 to 20 dB

Filling curtain in detection range	Attenuation
None	0 dB
Small quantities	5 to 10 dB
Large quantities	10 to 40 dB

Temperature difference between sensor and product surface	Attenuation
to 68°F (20°C)	0 dB
to 104°F (40°C)	5 to 10 dB
to 176°F (80°C)	10 to 20 dB



Example (for FMU 43)

For typical solid applications, a certain amount of dust coverage is normally present. Therefore, the following range results from the table and the diagram

■ Dust-covered rubble	approx. 50 dB	
■ no dust formation	0 dB	
■ No filling curtain in detection range	0 dB	
■ Temperature diff. < 68°F (20°C)	0 dB	
	approx. 50 dB	=> range approx. 23 ft (7 m)

These measuring conditions have been taken into account during the calculation of the maximum measuring range in solid applications.

Operating frequency

Sensor	Operating frequency
FMU40	approx. 70 kHz
FMU41	approx. 50 kHz
FMU42	approx. 42 kHz
FMU43	approx. 35 kHz
FMU44	approx. 30 kHz

Output

Output signal

according to the instrument version ordered:

- 4 to 20 mA with HART protocol
- PROFIBUS PA
- Foundation Fieldbus (FF)

Signal on alarm

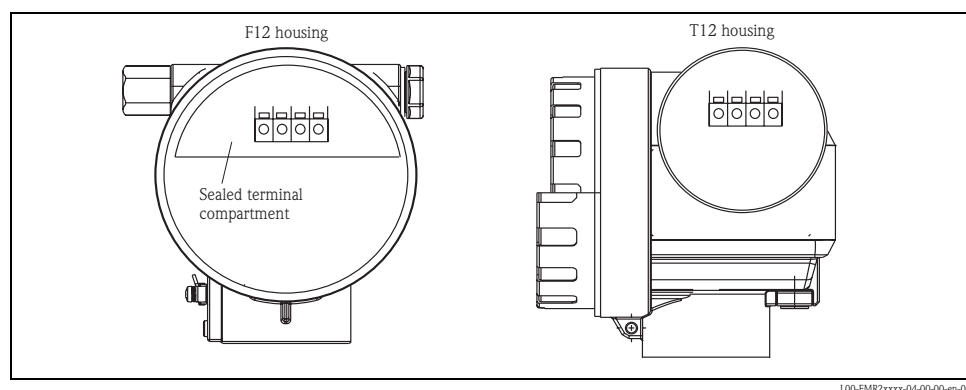
Error information can be accessed via the following interfaces:

- Local display (error symbol, error code and plain text description)
- Current output (error current configurable)
- Digital interface

Load HART	Minimum load for HART communication: 250 Ω
Output damping	Freely selectable, 0 to 255 s
Linearization	<p>The linearization function of the Prosonic M allows conversion of the measured value into any unit of length or volume. In open channels or measuring weirs, also a flow linearization is possible (calculation of the flow from the measured level). The linearization table for calculating the volume in an horizontal cylindrical tank is preprogrammed. You can also enter any number of other tables containing up to 32 value pairs either manually or semi-automatically (by filling the vessel under controlled conditions).</p> <p>The supplied ToF Tool operating program can automatically calculate the table for any tank, weir or flume and upload it into the device.</p> <p>Flow curves for open channels can be calculated and entered into the instrument by the ToF Tool as well.</p>

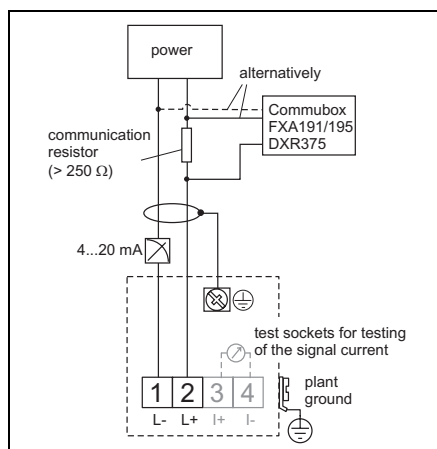
Auxiliary energy

Terminal compartment	In the F12 housing, the terminals are located underneath the housing cover. In the T12 housing, they are under the cover of the separate terminal compartment.
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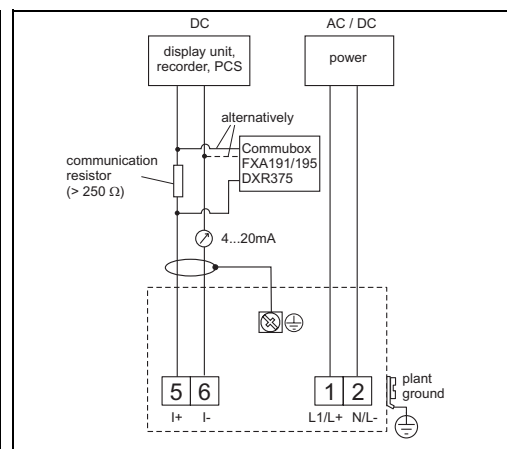


L00-FMR2xxxx-04-00-00-en-001

Terminal assignment	4 to 20 mA with HART, 2-wire	4 to 20 mA active with HART, 4-wire
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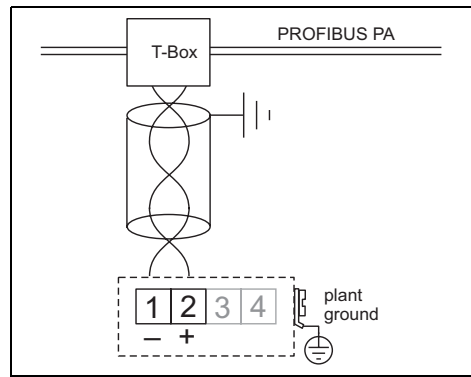
L00-FMxxxxxx-04-00-00-en-015



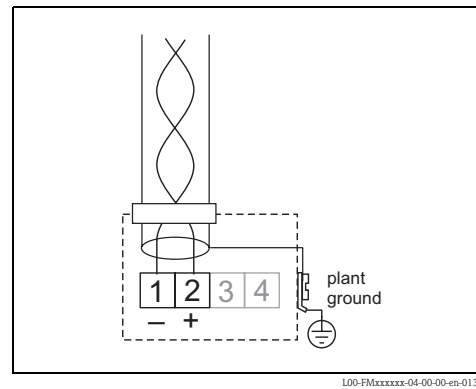
L00-FMxxxxxx-04-00-00-en-011

- Connect the connecting line to the screw terminals (line cross-sections of 20 to 14 AWG / 0.5 to 2.5mm) in the terminal compartment.
- Use 2-wire twisted pair cable with shield for the connection.
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device (see also Technical Information TI 241F/00/en "EMC Test Procedures")

PROFIBUS PA



Foundation Fieldbus



The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. Use 2-wire twisted pair cable with shield.

Refer to the following operating manuals for information on cable types, and how to set up and ground the network:

- BA 198F/00/de „PROFIBUS -DP/-PA, Guidelines for planning and commissioning“
- BA 013S/04/en „Foundation Fieldbus, Installation and Commissioning Guidelines“

Fieldbus plug connectors

For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector (PROFIBUS PA plug)

<p style="text-align: center;">L00-FMxxxxx-04-00-00-yy-016</p>	Pin	Meaning
	1	Ground
	2	Signal +
	3	Signal -
	4	not connected

Pin assignment of the 7/8" plug connector (FOUNDATION Fieldbus plug)

<p style="text-align: center;">L00-FMxxxxx-04-00-00-yy-017</p>	Pin	Meaning
	1	Signal -
	2	Signal +
	3	not connected
	4	ground

Supply voltage**HART, 2-wire**

The following values are the voltages across the terminals directly at the instrument:

Version		Current consumption	Terminal voltage minimum	Terminal voltage maximum
2-wire HART	Standard	4 mA	14 V	36 V
		20 mA	8 V	36 V
	Intrinsically safe (EEx ia)	4 mA	14 V	30 V
		20 mA	8 V	30 V
	Explosion proof (EEx d)	4 mA	14 V	30 V
		20 mA	11 V	30 V
Fixed current, adjustable, e.g. for solar power operation (measured value via HART)	Standard	11 mA	10 V	36 V
	Intrinsically safe (EEx ia)	11 mA	10 V	30 V
Fixed current for HART multidrop mode	Standard	4 mA ¹⁾	14 V	36 V
	Intrinsically safe (EEx ia)	4 mA ¹⁾	14 V	30 V

1) Start-up current 11 mA

HART, 4-wire, active

Version	Voltage	max. load
DC	10.5 to 32 V	600 Ω
AC 50/60 Hz	90 to 253 V	600 Ω

Terminals

Cable cross-section: 0.5 to 2.5 mm (20 to 14 AWG)

Cable entry

- Cable gland: M20x1.5 (recommended cable diameter 0.24" to 0.39" / 6 to 10 mm)
- Cable entry G ½ or ½ NPT
- PROFIBUS-PA M12 plug
- Fieldbus Foundation 7/8" plug

Power consumption

Version	Power consumption
2-wire	51 mW to 800 mW
4-wire AC	max. 4VA
4-wire DC; FMU 40/41	330 mW to 830 mW
4-wire DC; FMU 42/43	600 mW to 1 W

Current consumption (2-wire-instruments)

Communication	Current consumption
HART	3.6 to 22 mA
PROFIBUS PA	max. 13 mA
Foundation Fieldbus	max. 15 mA

HART ripple	47 to 125 Hz: Vpp = 200 mV (measured at 500 Ω)
Max. noise HART	500 Hz to 10 kHz: Vrms = 2.2 mV (measured at 500 Ω)
Galvanic isolation	With 4-wire devices, the evaluation electronics and main power supply are galvanically isolated from each other.

Performance characteristics

Reaction time	<p>The reaction time depends on the parameter settings. The minimum values are:</p> <ul style="list-style-type: none"> ■ 2-wire devices (FMU40/41/42): min. 2 s ■ 2-wire devices (FMU43 - PROFIBUS PA or FOUNDATION Fieldbus): min. 2 s ■ 2-wire devices (FMU44): min. 3 s ■ 4-wire devices (FMU40/41/42/43/44): 0.5 s
Reference operating conditions	<ul style="list-style-type: none"> ■ Temperature = +68°F (+20°C) ■ Pressure = 14.7 psia (1013 mbar abs.) ■ Humidity = 50 % ■ Ideal reflective surface (e.g. calm, smooth fluid surface) ■ No interference reflections within signal beam ■ Set application parameters: <ul style="list-style-type: none"> – Tank shape = flat ceiling – Medium property = liquid – process conditions = calm surface

Measured value resolution

Sensor	Measured value resolution
FMU40	0.04" (1 mm)
FMU41	0.04" (1 mm)
FMU42	0.08" (2 mm)
FMU43	0.08" (2 mm)
FMU44	0.08" (2 mm)

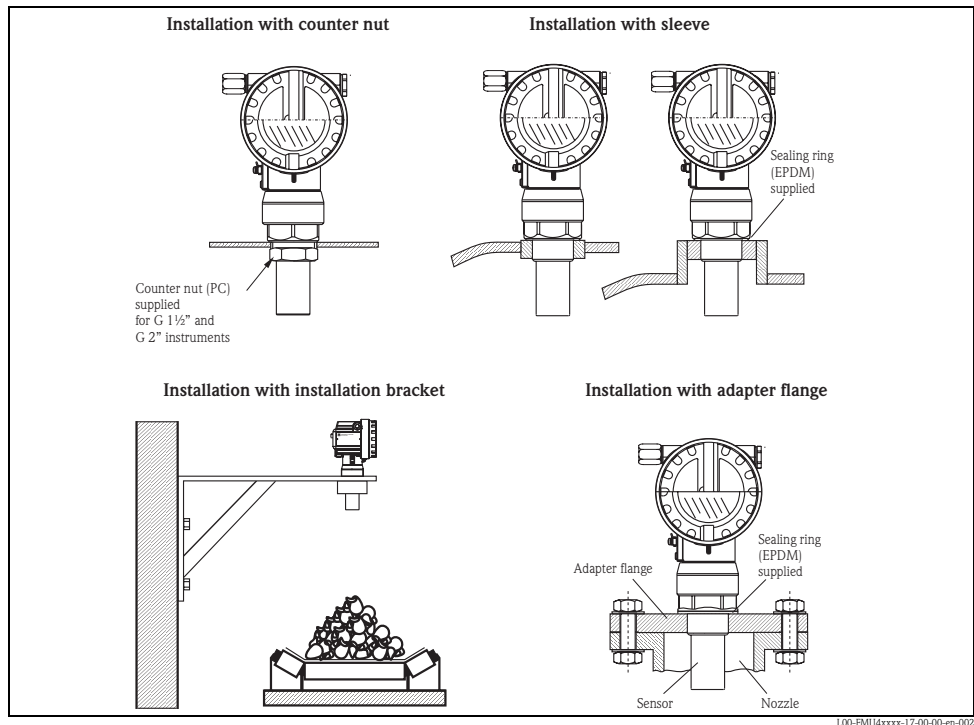
Pulse frequency	<ul style="list-style-type: none"> ■ 2-wire devices (FMU40/41/42): max. 0.5 Hz ■ 2-wire devices (FMU43 - PROFIBUS PA or FOUNDATION Fieldbus): max. 0.5 Hz ■ 2-wire devices (FMU44): max. 0.3 Hz ■ 4-wire devices (FMU40/41/42/43/44): max. 2 Hz <p>The exact values are dependent on the type of device and the parameter settings.</p>
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Measuring error	<p>Typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis):</p> <table> <tr> <th>Sensor</th><th>Measuring error</th></tr> <tr> <td>FMU40</td><td>$\pm 0.08"$ (2 mm) or 0.2% of set measuring distance (empty calibration)¹</td></tr> <tr> <td>FMU41</td><td>$\pm 0.08"$ (2 mm) or 0.2% of set measuring distance (empty calibration)¹</td></tr> <tr> <td>FMU42</td><td>$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration)¹</td></tr> <tr> <td>FMU43</td><td>$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration)¹</td></tr> <tr> <td>FMU44</td><td>$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration)¹</td></tr> </table>	Sensor	Measuring error	FMU40	$\pm 0.08"$ (2 mm) or 0.2% of set measuring distance (empty calibration) ¹	FMU41	$\pm 0.08"$ (2 mm) or 0.2% of set measuring distance (empty calibration) ¹	FMU42	$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration) ¹	FMU43	$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration) ¹	FMU44	$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration) ¹
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FMU42	$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration) ¹												
FMU43	$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration) ¹												
FMU44	$\pm 0.16"$ (4 mm) or 0.2% of set measuring distance (empty calibration) ¹												

¹whichever is greater

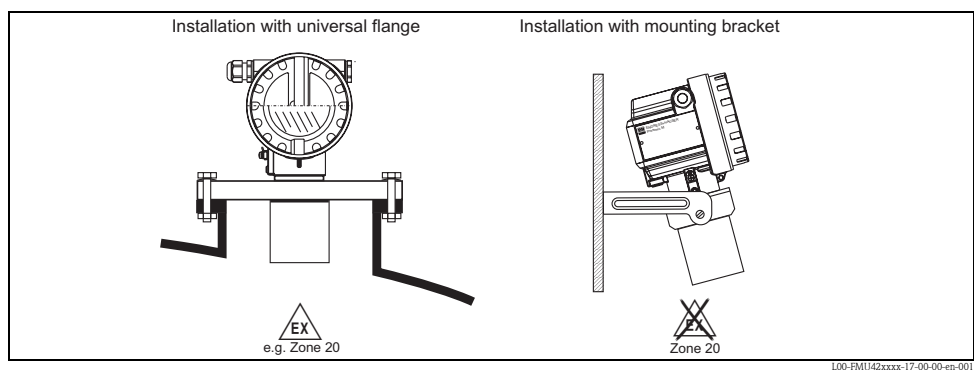
Installation conditions

Installation variants FMU 40, FMU 41

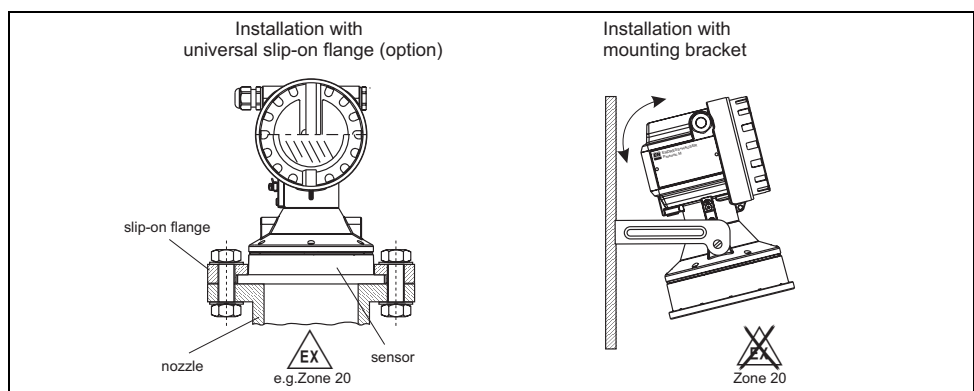


For installation bracket or adapter flange s. chapter "Accessories".

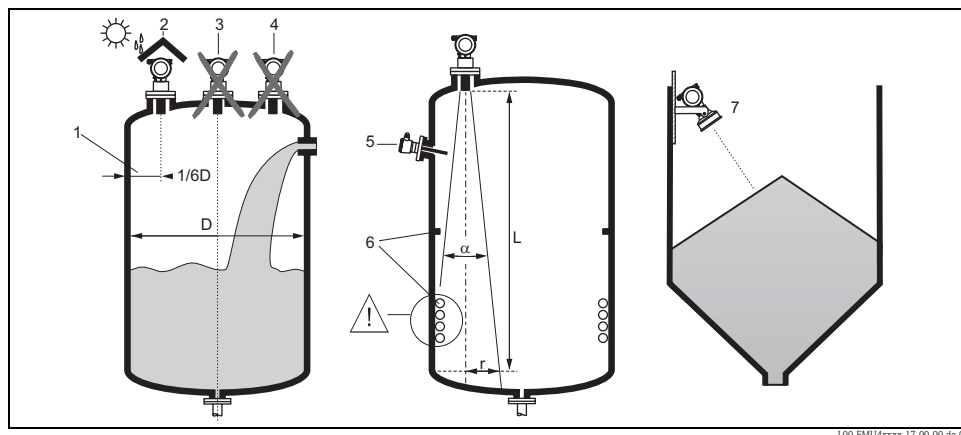
Installation variants FMU42, FMU44



Installation variants FMU 43



Installation conditions for level measurements



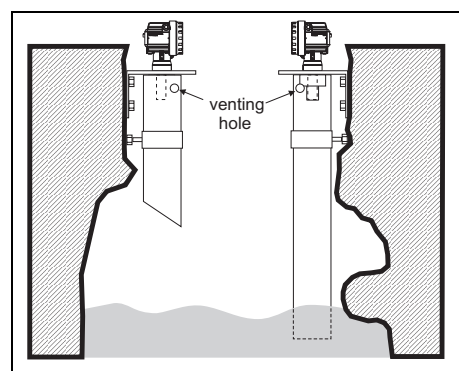
L00-FMU4xxxx-17-00-00-de-005

- Do not install the sensor in the middle of the tank (3). We recommend leaving a distance between the sensor and the tank wall (1) measuring $1/6D$ of the tank diameter.
- Use a protective cover, in order to protect the device from direct sun or rain (2).
- Avoid measurements through the filling curtain (4).
- Make sure that equipment (5) such as limit switches, temperature sensors, etc. are not located within the emitting angle α . In particular, symmetrical equipment (6) such as heating coils, baffles etc. can influence measurement.
- Align the sensor so that it is vertical to the product surface (7).
- Never install two ultrasonic measuring devices in a tank, as the two signals may affect each other.
- To estimate the detection range, use the 3 dB emitting angle α .

Sensor	α	L_{\max}	r_{\max}
FMU40	11°	16 ft (5 m)	18.9" (0.48 m)
FMU41	11°	26 ft (8 m)	30.3" (0.77 m)
FMU42	9°	33 ft (10 m)	31.1" (0.79 m)
FMU43	6°	50 ft (15 m)	31.1" (0.79 m)
FMU44	11°	65 ft (20 m)	76" (1.93 m)

Installation in narrow shafts

In narrow shafts with strong interference echoes, we recommend using an ultrasound guide pipe (e.g. PE or PVC wastewater pipe) with a minimum diameter of 4" (100 mm). Make sure that the pipe is not soiled by accumulated dirt. If necessary, clean the pipe at regular intervals.

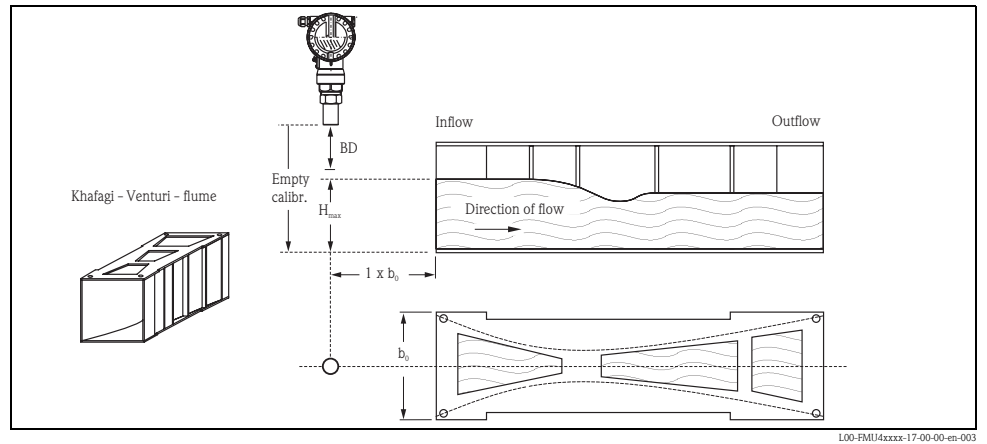


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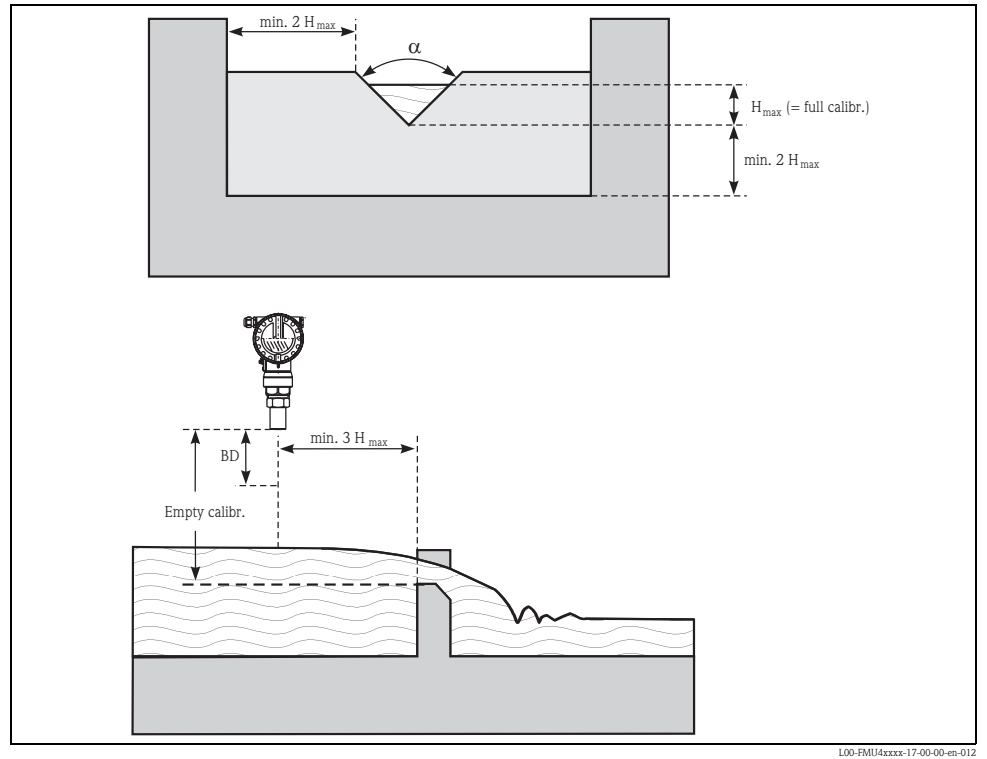
Installation conditions for flow measurements

- Install the Prosonic M at the inflow side, as close above the maximum water level H_{\max} as possible (take into account the blocking distance BD).
- Position the Prosonic M in the middle of the channel or weir.
- Align the sensor membrane parallel to the water surface.
- Keep to the installation distance of the channel or weir.
- You can enter the "Flow to Level" linearisation curve ("Q/h curve") using ToF Tool or manually via the on-site display.

Example: Khafagi-Venturi flume

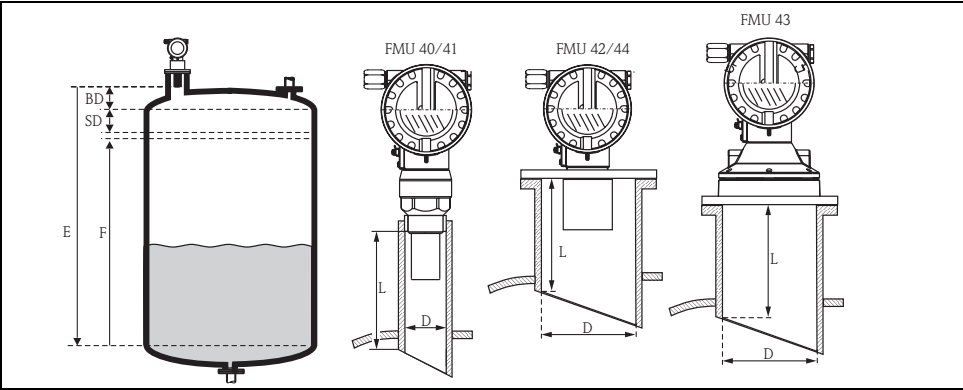


Example: Triangular weir



**Blocking distance,
nozzle installation**

Install the Prosonic M at a height so that the blocking distance BD is not undershot, even at maximum fill level. Use a pipe nozzle if you cannot maintain the blocking distance in any other way. The interior of the nozzle must be smooth and may not contain any edges or welded joints. In particular, there should be no burr on the inside of the tank side nozzle end. Note the specified limits for nozzle diameter and length. To minimize disturbing factors, we recommend an angled nozzle edge (ideally 45°).



BD: blocking distance; SD: safety distance; E: empty calibration; F: full calibration (span); D: nozzle diameter; L: nozzle length

Sensor	BD	Max. range liquids	Max. range bulk materials	nozzle diameter inches (mm)	max. nozzle length inches (mm)
FMU40	9.8" (0.25 m)	16 ft (5 m)	6.5 ft (2 m)	2 (50)	approx. 3.15 (80)
				3 (80)	approx. 9.45 (240)
				4 (100)	approx. 11.8 (300)
FMU41	13.8" (0.35 m)	26 ft (8 m)	11.5 ft (3.5 m)	3 (80)	approx. 9.45 (240)
				4 (100)	approx. 11.8 (300)
FMU42	15.7" (0.4 m)	33 ft (10 m)	16 ft (5 m)	3 (80)	approx. 9.8 (250)
				4 (100)	approx. 11.8 (300)
FMU43	23.6" (0.6 m)	50 ft (15 m)	23 ft (7 m)	min. 4 (100)	approx. 11.8 (300)
FMU44	19.7" (0.5 m)	65 ft (20 m)	33 ft (10 m)	min. 6 (150)	approx. 15.7 (400)



Caution!
If the blocking distance is not above the maximum level, it may cause device malfunction.

Note!
In order to notice if the level approaches the blocking distance, you can specify a safety distance (SD). If the level is within this safety distance, the Prosonic M outputs a warning or alarm message.

Ambient conditions

Ambient temperature	-40 to +176°F (-40 to +80°C) The functionality of the LC display becomes restricted at Tu< -4°F (-20°C) and Tu> +140°F (+60°C). If the device is operated outdoors in strong sunlight, you should use a protective cover.
Storage temperature	-40 to +176°F (-40 to +80°C)
Resistance to alternating temperature cycles	to DIN EN 60068-2-14; Nb test : +176°F/-40°F (+80°C/-40°C), 1 K/min, 100 cycles
Climate class	DIN EN 60068-2-38 (Test Z/AD) DIN/IEC 68 T2-30Db

Ingress protection

- With closed housing, tested according to
 - IP 68, NEMA 6P (24h at 6 ft / 1.83m under water surface)
 - IP 66, NEMA 4x
- With open housing: IP 20, NEMA 1 (also ingress protection of the display)



Caution!

Degree of protection IP 68 NEMA 6P applies for M12 PROFIBUS-PA plugs only when the PROFIBUS cable is plugged in.

Vibration resistance

DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2000 Hz, 1 (m/s²)/Hz; 3 x 100 min

Electromagnetic compatibility (EMC)

- Interference emission to EN 61326, Equipment Class B
- Interference immunity to EN 61326, Appendix A (Industrial) and NAMUR Recommendation NE 21 (EMC).
- A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communication signal (HART).

Process conditions

Process temperature

-40 to +176°F (-40 to +80°C)

A temperature sensor is integrated in the sensor for correction of the temperature-dependent time-of-flight.

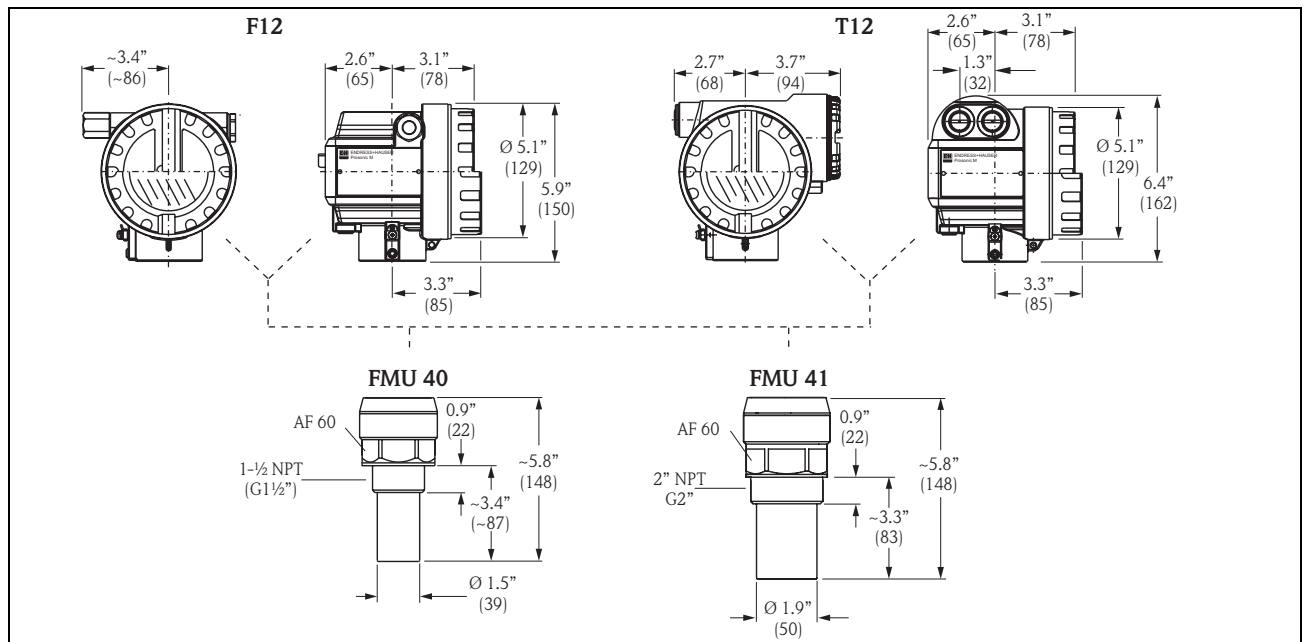
Process pressure

- FMU 40/41: 10 to 44 psia (0.7 bar to 3bar abs.)
- FMU 42/43/44: 10 to 36 psia (0.7 bar to 2.5bar abs.)

Mechanical construction

Design; dimensions

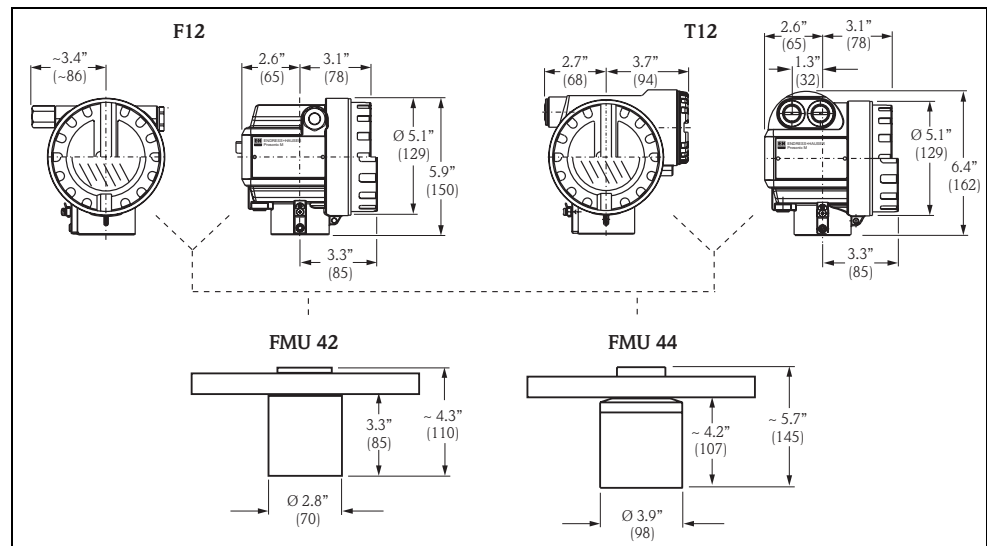
FMU40, FMU41



Dimensions in inches (mm)

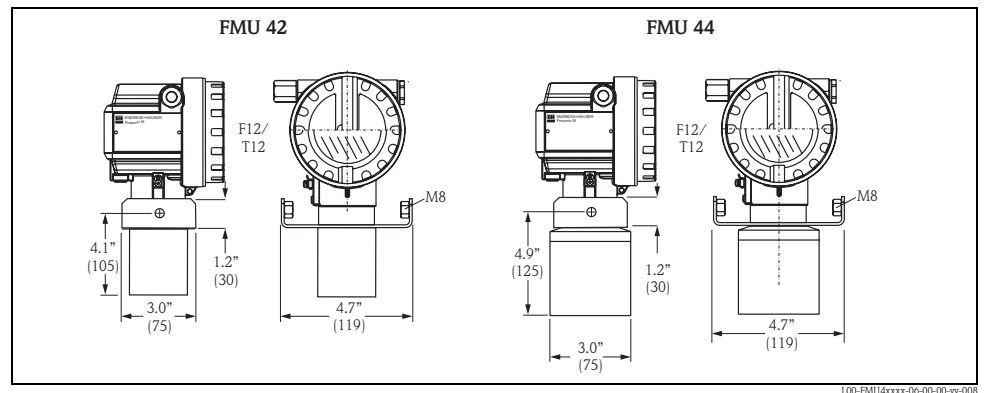
L00-FMU4xxxx-06-00-00-yy-000

FMU42, FMU44 with slip-on flange



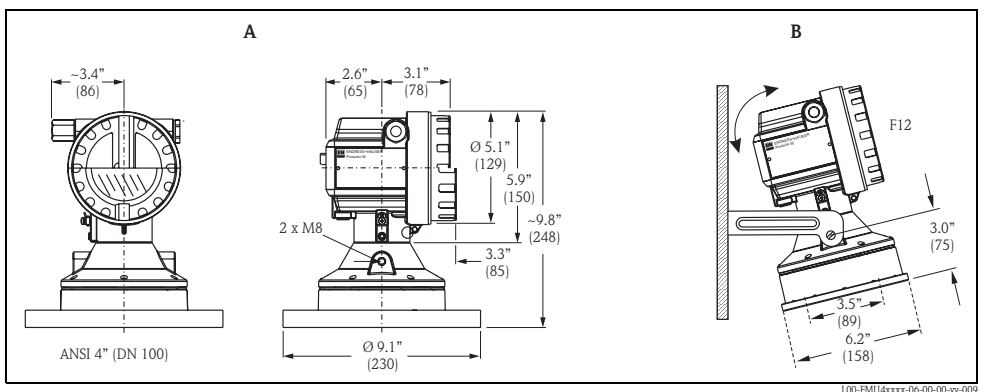
Dimensions in inches (mm)

FMU42, FMU44 with mounting bracket



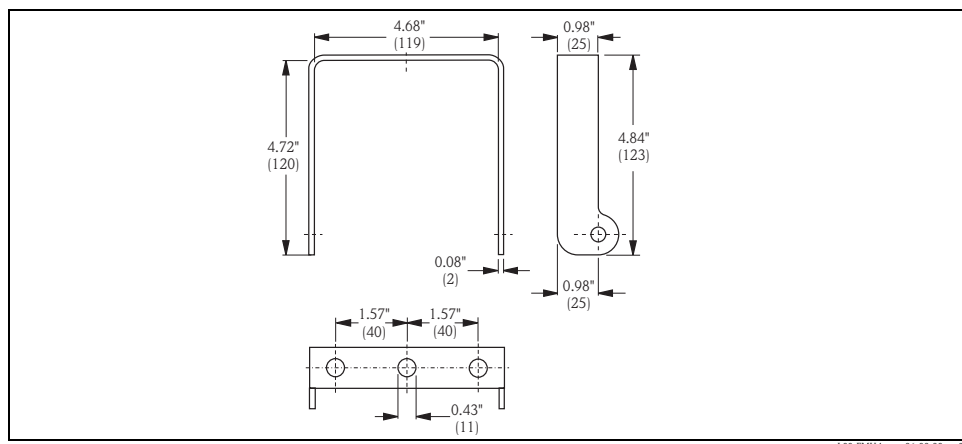
Dimensions in inches (mm)

FMU43



Dimensions in inches (mm);
A: with slip-on flange; B: with mounting bracket

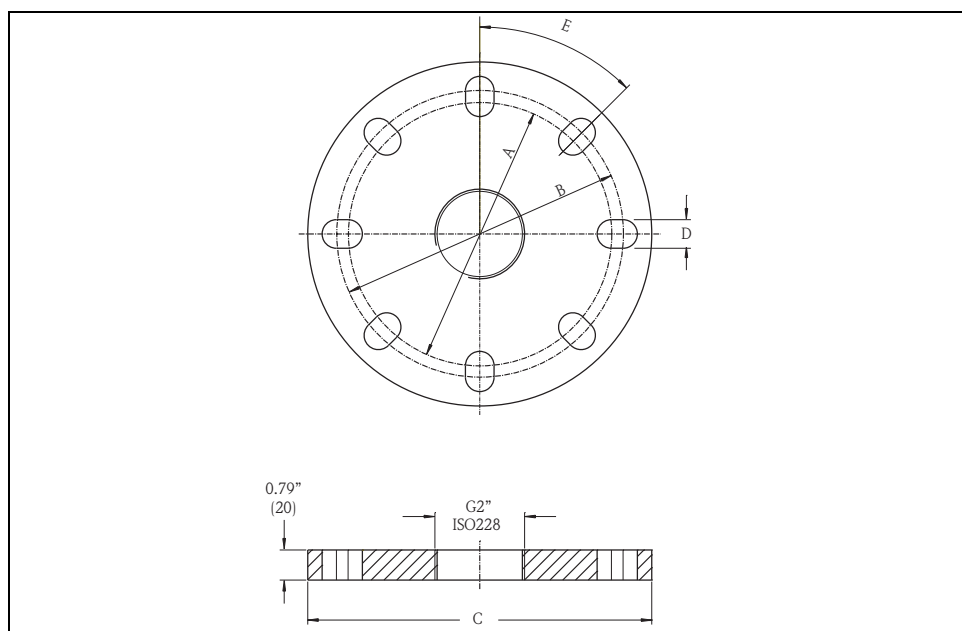
Mounting bracket for FMU42, FMU43 and FMU44



L00-FMU4xxxx-06-00-00-yy-010

Dimensions in inches (mm)

Flanges for FMU42 and FMU44



L00-FMU4xxxx-06-00-00-yy-011

suitable for	A	B	C	D	E	number of bolt holes
3" 150lbs / DN80 PN16 / 10K 80	150 mm (5.91")	160 mm (6.30")	200 mm (7.87")	19 mm (0.75")	45°	8
4" 150 lbs / DN100 PN16 / 10K 100	175 mm (6.90")	190,5 mm (7.50")	228,6 mm (9.00")	19 mm (0.75")	45°	8
6" 150 lbs / DN150 PN16 / 10 K 150	240 mm (9.45")	241,3 mm (9.50")	285 mm (11.22")	23 mm (0.91")	45°	8
8" 150 lbs	298,5 mm (11.75")	298,5 mm (11.75")	342,9 mm (13.50")	22, 5 mm (0.89")	45°	8
DN200 PN16 / 10 K 200	290 mm (11.42")	295 mm (11.61")	340 mm (13.39")	23 mm (0.91")	30°	12

Weight

Sensor	Weight
FMU40	approx. 5.5 lb (2.5 kg)
FMU41	approx. 6 lb (2.6 kg)
FMU42	approx. 6.6 lb (3 kg)
FMU43	approx. 8 lb (3.5 kg)
FMU44	approx. 9 lb (4 kg)

Housing design**Types of housings**

- F12 housing with sealed terminal compartment for standard or intrinsically safe (EEx ia) applications
- T12 housing with separate terminal compartment and explosionproof encapsulation

Material

Aluminum, seawater resistant, powder-coated

Cover

- Aluminum, for version without local display
- Inspection glass for version with local display. This version cannot be supplied together with the ATEX II 1 / 2 D certificate.

**Process connection,
sealing material,
sensor material**

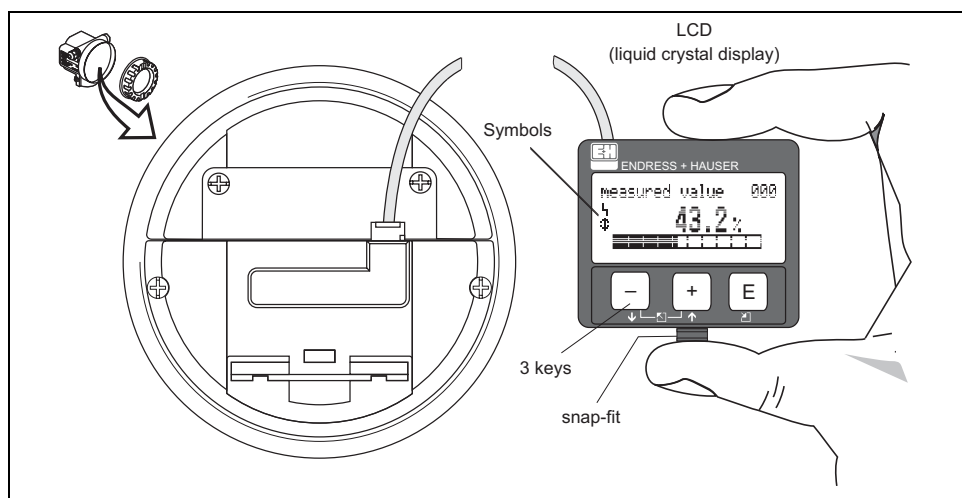
Sensor	Process connection	Material in contact with process
FMU40	<ul style="list-style-type: none">■ Thread G 1½"■ Thread NPT 1½" - 11.5	Sensor: PVDF Seal: EPDM
FMU41	<ul style="list-style-type: none">■ Thread 2"■ Thread NPT 2" - 11,5	Sensor: PVDF Seal: EPDM
FMU42	<ul style="list-style-type: none">■ Universal flange DN 80 PN16 / ANSI 3" 150 lbs / JIS 10K 80■ Universal flange DN 100 PN16 / ANSI 4" 150 lbs / JIS 10K 100■ Mounting bracket	Sensor: PVDF Seal: VITON or EPDM Flange: PP, PVDF or SS 316L (1.4435 or 1.4404) ¹
FMU43	<ul style="list-style-type: none">■ Universal flange DN 100 / ANSI 4" / JIS16K100■ Mounting bracket	Sensor: UP and SS 316Ti Seal: EPDM Flange: PP or SS 316Ti
FMU44	<ul style="list-style-type: none">■ Universal flange DN 100 PN16 / ANSI 4" 150 lbs / JIS 10K 100■ Universal flange DN 150 PN16 / ANSI 6" 150 lbs / JIS 10K 150■ Universal flange DN200 PN16 / JIS 10K 200■ Flange ANSI 8" 150 lbs■ Mounting bracket	Sensor PVDF Seal: VITON or EPDM Flange: PP, PVDF or SS 316L (1.4435 or 1.4404) ¹

¹ Endress+Hauser supplies DIN/EN flanges made of stainless steel AISI 316L with material number 1.4435 or 1.4404. With regard to their temperature stability properties, the materials 1.4435 and 1.404 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

Human interface

Display and operating elements















The LCD module VU 331 for display and operation is located beneath the housing cover. The measured value is legible through the glass in the cover. Open the cover to operate the device.



L00-FMxxxxx-07-00-00-en-001

Symbol in display				
	continuous	flashing		
Meaning	Alarm	Warning	Communication	Security Locking

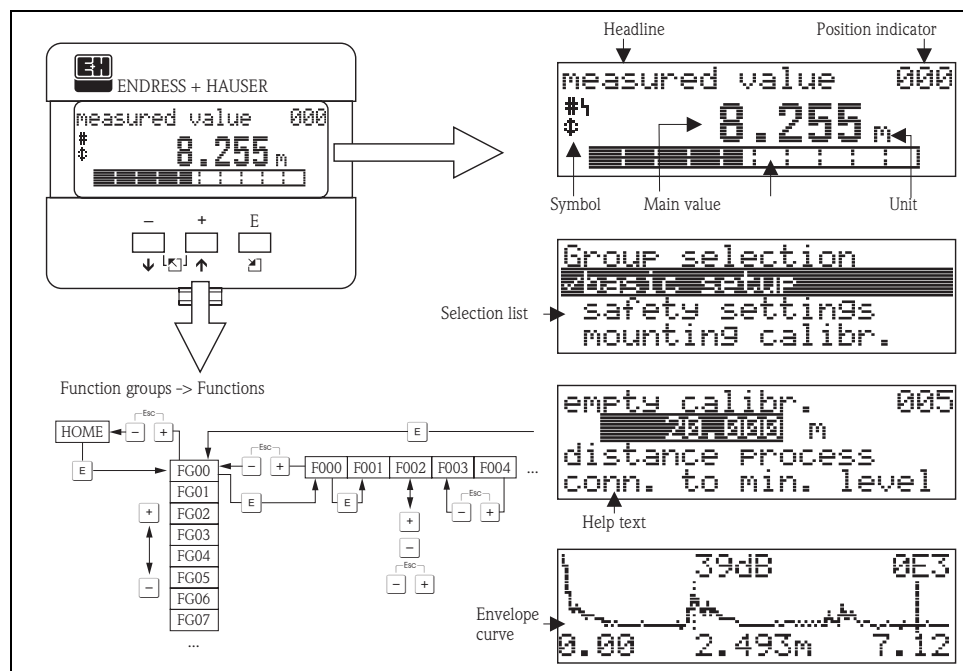
Function of the keys

Key(s)	Meaning
 or 	Navigate upwards in the selection list Edit numeric value within a function
 or 	Navigate downwards in the selection list Edit numeric value within a function
 or 	Navigate to the left within a function group
	Navigate to the right within a function group, confirmation.
 and  or  and 	Contrast settings of the LCD
 and  and 	Hardware lock / unlock After a hardware lock, an operation of the instrument via display or communication is not possible! The hardware can only be unlocked via the display. An unlock parameter must be entered to do so.

Local operation

Operation with VU 331

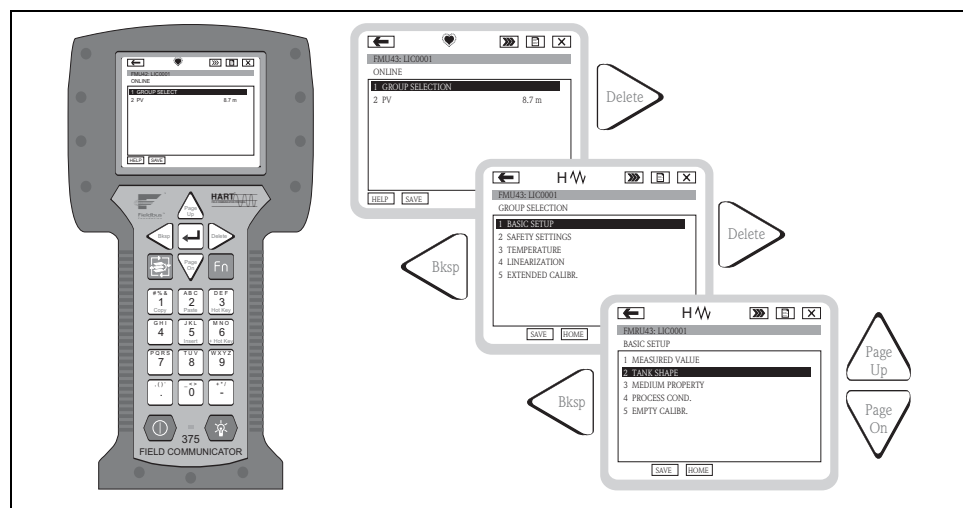
The LC-Display VU 331 allows configuration via 3 keys directly at the instrument. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.



100-FMU14xxxx-07-00-00-en-004

Operation with the handheld terminal DXR 375

On devices with HART communication, you can also access the menu using the handheld terminal DXR 375.



100-FMU14xxxx-07-00-00-de-005

Remote operation

Operation with ToF Tool

The ToF Tool is a graphical operation software for instruments from Endress+Hauser. It is used to support commissioning, securing of data, signal analysis and documentation of the instruments. It is compatible with the following operating systems: WinNT4.0, Win2000 and WinXP.

The ToF Tool supports the following functions:

- Online configuration of transmitters
- Signal analysis via envelope curve
- Linearisation table (graphically supported creation, editing, importing and exporting)
- Loading and saving of instrument data (Upload/Download)
- Documentation of measuring point



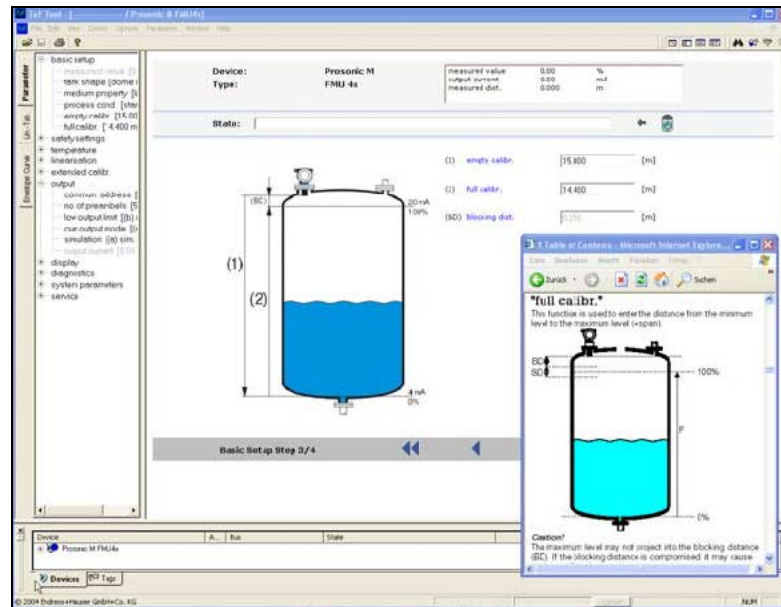
Note!

Further information you may find on the CD-ROM, which is enclosed to the instrument.

Connection options

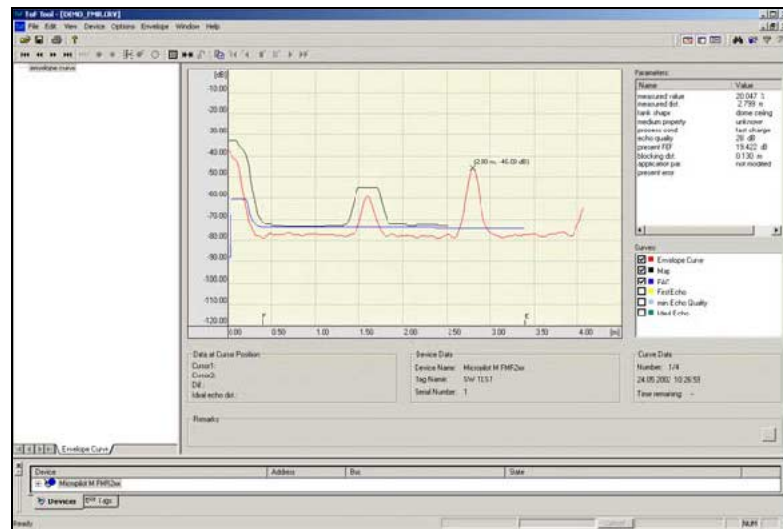
- HART with Commubox FXA 191 (available as accessory)
- PROFIBUS PA
- Service-interface with adapter FXA 193 (available as accessory)

Menu-guided commissioning:



100-FMU4xxxx-19-00-00-en-003

Signal analysis via envelope curve:



L00-FMU4xxxx-19-00-00-en-004

Operation with FieldCare

FieldCare is Endress+Hauser's FDT based Plant Asset Management Tool. It can configure all intelligent field devices in your plant and supports you in managing them. By using status information, it also provides a simple but effective means of checking their health.

- Supports Ethernet, HART, PROFIBUS, FOUNDATION Fieldbus etc.
- Operates all Endress+Hauser devices
- Operates all third-party actuators, I/O systems and sensors supporting the FDT standard
- Ensures full functionality for all devices with DTMs
- Offers generic profile operation for any third-party fieldbus device that does not have a vendor DTM

Operation with Commuwin II (for communication variants HART or PROFIBUS-PA)

Commuwin II is an operating software with graphical support (MS Windows) for intelligent transmitters with the communication protocols Rackbus, Rackbus RS-485, HART and PROFIBUS-PA.

Commuwin II supports the following functions:

- Online configuration of transmitters
- Loading and saving of instrument data (Upload/Download)
- Orderly visualisation of measured values and limit values
- Display and recording of measured values with a line recorder

It is not possible to display envelope curves with Commuwin II. To display them, please use the ToF Tool program supplied.

Connections:

- HART with Commubox FXA 191 (available as accessory)
- PROFIBUS PA

Operation with NI-FBUS Configurator (only Foundation Fieldbus)

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:

- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Save and print a configuration

Certificates and Approvals

CE mark	The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.
Hazardous approvals	The available certificates are listed in the ordering information. Note the associated safety instructions (XA) and control or installation drawing documents (ZD). Documentation can be requested from Endress+Hauser.
External standards and guidelines	<p>EN 60529 Protection class of housing (IP-code)</p> <p>EN 61326 Electromagnetic compatibility (EMC requirements)</p> <p>NAMUR Standards committee for measurement and control in the chemical industry</p>

Ordering information

Product structure FMU 40

Certificates				
A	Variant for non-hazardous area			
E	NEPSI Ex nA II T6			
G	ATEX II 3G EEx nA II T6			
I	NEPSI Ex ia IIC T6			
J	NEPSI Ex d[ia] IIC T6			
K	TIIS Ex ia II C T6			
N	CSA General Purpose			
Q	NEPSI DIP			
S	FM IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2			
T	FM XP Cl. I,II,III Div. 1 Gr. A-G			
U	CSA IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2			
V	CSA XP Cl. I,II,III Div. 1 Gr. A-G			
1	ATEX II 1/2 G or II 2 G; EEX ia IIC T6			
2	ATEX II 1/2D, Alu blind cover			
4	ATEX II 1/2 G or II 2 G; EEX d [ia] IIC T6			
5	ATEX II 1/3D			
Y	Special certificate			
Process connection				
R	G 1½" thread ISO 228			
N	NPT 1½" - 11.5 thread			
Y	Special version			
Power supply/communication				
B	2 wire, 4...20mA-loop/HART			
H	4 wire, 10.5...32VDC / 4-20mA HART			
G	4 wire, 90...253VAC / 4-20mA HART			
D	2 wire, PROFIBUS PA			
F	2 wire, Foundation Fieldbus			
Y	Special version			
Display / on-site operation				
1	Without LC display			
2	With LC display VU 331 incl. on-site operation			
3	Prepared for remote display FHX 40			
9	Special version			
Housing				
A	Aluminum F12 housing coated to IP 68			
C	Aluminum T12 housing coated to IP 68; with separate terminal compartment			
D	Aluminum T12 housing coated to IP 68; with separate terminal compartment; with overvoltage protection			
9	Special version			
Screw union/entry				
2	M20x1.5 screw union			
3	G 1/2" entry			
4	NPT 1/2" entry			
5	M12 PROFIBUS-PA plug-in connector			
6	7/8" FF plug			
9	Special version			
FMU 40 -				Product designation

Product structure FMU 41

Certificates					
A	Variant for non-hazardous area				
E	NEPSI Ex nA II T6				
G	ATEX II 3G EEx nA II T6				
I	NEPSI Ex ia IIC T6				
J	NEPSI Ex d(Ia) IIC T6				
K	TIIS Ex ia II C T6				
N	CSA General Purpose				
Q	NEPSI DIP				
S	FM IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2				
T	FM XP Cl. I,II,III Div. 1 Gr. A-G				
U	CSA IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2				
V	CSA XP Cl. I,II,III Div. 1 Gr. A-G				
1	ATEX II 1/2 G or II 2 G; EEX ia IIC T6				
2	ATEX II 1/2D, Alu blind cover				
4	ATEX II 1/2 G or II 2 G; EEX d [ia] IIC T6				
5	ATEX II 1/3D				
Y	Special certificate				
Process connection					
R	G 2" thread ISO 228				
N	NPT 2" - 11.5 thread				
Y	Special version				
Power supply/communication					
B	2 wire, 4...20mA-loop/HART				
H	4 wire, 10.5...32VDC / 4-20mA HART				
G	4 wire, 90...253VAC / 4-20mA HART				
D	2 wire, PROFIBUS PA				
F	2 wire, Foundation Fieldbus				
Y	Special version				
Display / on-site operation					
1	Without LC display				
2	With LC display VU 331 incl. on-site operation				
3	Prepared for remote display FHX 40				
9	Special version				
Housing					
A	Aluminum F12 housing coated to IP 68				
C	Aluminum T12 housing coated to IP 68 with separate terminal compartment				
D	Aluminum T12 housing coated to IP 68; with separate terminal compartment; with overvoltage protection				
9	Special version				
Screw union/entry					
2	M20x1.5 screw union				
3	G 1/2" entry				
4	NPT 1/2" entry				
5	M12 PROFIBUS-PA plug-in connector				
6	7/8" FF plug				
9	Special version				
FMU 41 -					Product designation

Product structure FMU 42

Certificates									
A	Variant for non-hazardous area								
E	NEPSI Ex nA II T6								
G	ATEX II 3G EEx nA II T6								
I	NEPSI Ex ia IIC T6								
J	NEPSI Ex d (Ia) IIC T6								
K	TIIS Ex ia II C T6 (in preparation)								
N	CSA General Purpose								
Q	NEPSI DIP								
S	FM IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2								
T	FM XP Cl. I,II,III Div. 1 Gr. A-G								
U	CSA IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2								
V	CSA XP Cl. I,II,III Div. 1 Gr. A-G								
1	ATEX II 1/2 G EEX ia IIC T6								
2	ATEX II 1/2 D, Alu bond cover								
4	ATEX II 1/2 G EEX d [ia] IIC T6								
5	ATEX II 1/3D								
Y	Special certificate								
Process connection									
M	mounting bracket FAU20								
P	DN80/ANSI 3"/JIS10K80, PP, Universal flange								
Q	DN80/ANSI 3"/JIS10K80, PVDF, Universal flange								
S	DN80/ANSI 3"/JIS10K80, 316L, Universal flange								
T	DN100/ANSI 4"/JIS16K100, PP, Universal flange								
U	DN100/ANSI 4"/JIS16K100, PVDF, Universal flange								
V	DN100/ANSI 4"/JIS16K100, 316L, Universal flange								
Y	Special version								
Power supply/communication									
B	2 wire, 4...20mA-loop/HART								
H	4 wire, 10.5...32VDC / 4-20mA HART								
G	4 wire, 90...253VAC / 4-20mA HART								
D	2 wire, PROFIBUS PA								
F	2 wire, Foundation Fieldbus								
Y	Special version								
Display / on-site operation									
1	Without LC display								
2	With LC display VU 331 incl. on-site operation								
3	Prepared for remote display FHX 40								
9	Special version								
Housing									
A	Aluminum F12 housing coated to IP 68								
C	Aluminum T12 housing coated to IP 68, with separate terminal compartment								
D	Aluminum T12 housing coated to IP 68, with separate terminal compartment; with overvoltage protection								
Y	Special version								
Gland/Entry									
2	M20x1.5 gland								
3	G 1/2" entry								
4	NPT 1/2" entry								
5	M12 PROFIBUS-PA plug								
6	7/8" FF plug								
9	Special version								
Sealing Sensor/Flange									
2	VITON flat sealing								
3	EPDM flat sealing								
9	special version								
Additional options									
A	Additional options not selected								
FMU 42 -									Product designation

Product structure FMU 43

Certificates				
A				Variant for non-hazardous area
M				FM DIP Class II, III, Div. 1, Gr. E,F,G NI
N				CSA General Purpose
P				CSA DIP, Class II, III, Div. 1, Gr. E,F,G NI
Q				NEPSI DIP
2				ATEX II 1/2 D or II 2 D, Aluminium Deckel
5				ATEX II 1/3 D or II 3 D, Sichtdeckel
Y				Special version
Process connection/material				
P				Flange DN 100/ANSI 4"/JIS 16K100, PP (universal slip-on flange included)
S				Flange DN 100/ANSI 4"/JIS 16K100, SS 316TI (universal slip-on flange included)
K				Without slip-on flange/without mounting bracket (customer mounting equipment)
M				With mounting bracket
Y				Special version
Power supply/communication				
H				4 wire, 10.5...32VDC / 4-20mA HART
G				4 wire, 90...253VAC / 4-20mA HART
D				2 wire, PROFIBUS PA
F				2 wire, Foundation Fieldbus
Y				Special version
Display / on-site operation				
1				Without LC display
2				With LC display VU 331 incl. on-site operation
3				Prepared for remote display FHX 40
9				Special version
Housing				
A				Aluminum F12 housing coated to IP 68
9				Special version
Screw union/entry				
2				M20x1.5 screw union
3				G 1/2" entry
4				NPT 1/2" entry
5				M12 PROFIBUS-PA plug-in connector
6				7/8" FF plug
9				Special version
FMU 43 -				Product designation

Product structure FMU 44

Approval			
A			Non-hazardous area
1			ATEX II 1/2G EEx ia IIC T6 (in preparation)
4			ATEX II 1/2G EEx d (ia) IIC T6 (in preparation)
G			ATEX II 3 G EEx nA II T6 (in preparation)
2			ATEX II 1/2 D, Alu blind cover (in preparation)
5			ATEX II 1/3 D
S			FM IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.I Div.2 (in preparation)
T			FM XP Cl.I,II,III Div.1 Gr.A-G (in preparation)
N			CSA General Purpose
U			CSA IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.I Div.2
V			CSA XP Cl.I,II,III Div.1 Gr.A-G
K			TIIS EEx ia IIC T6 (in preparation)
I			NEPSI Ex ia IIC T6 (in preparation)
J			NEPSI Ex d(ia) IIC T6 (in preparation)
E			NEPSI Ex nA II T6 (in preparation)
Q			NEPSI DIP (in preparation)
Y			Special version, to be specified
Process connection			
T			UNI flange 4"/DN100/100, PP, max 3bar abs./ 44psia, suitable for 4" 150lbs / DN100 PN16 / 10K 100
U			UNI flange 4"/DN100/100, PVDF, max. 3bar abs./ 44 psia, suitable for 4" 150lbs / DN100 PN16 / 10K 100
V			UNI flange 4"/DN100/100, 316L, max 3bar abs./ 44psia, suitable for 4" 150lbs / DN100 PN16 / 10K 100
E			UNI flange 6"/DN150/150, PP, max 3bar abs./ 44psia, suitable for 6" 150lbs / DN150 PN16 / 10K 150
F			UNI flange 6"/DN150/150, PVDF, max 3bar abs./ 44psia, suitable for 6" 150lbs /DN150 PN16 / 10K 150
G			UNI flange 6"/DN150/150, 316L, max 3bar abs. 44psia, suitable for 6" 150lbs / DN150 PN16 / 10K 150
H			UNI flange DN200/200, PP, max 3bar abs./ 44 psia, suitable for DN200 PN16 / 10K 200
J			UNI flange DN200/200, PVDF, max 3bar abs./ 44psia, suitable for DN200 PN16 / 10K 200
K			UNI flange DN200/200, 316L, max 3bar abs./ 44psia, suitable for DN200 PN16 / 10K 200
L			8" 150lbs FF, PP, max 3bar abs./ 44psia
N			8" 150lbs FF, PVDF, max 2bar abs./ 44psia
A			8" 150lbs FF, 316L, max 3bar abs./44psia
M			Mounting bracket FAU20
Y			Special version, to be specified
Power supply; Output			
B			2-wire; 4-20mA HART
D			2-wire; PROFIBUS PA
F			2-wire; FOUNDATION Fieldbus
G			4-wire 90-250VAC; 4-20mA HART
H			4-wire 10.5-32VDC; 4-20mA HART
Y			Special version, to be specified
Operation			
1			w/o display, via communication
2			4-line display VU331, Envelope curve display on site
3			Prepared for FHX40, Remote display (accessory)
9			Special version, to be specified
FMU 44 -			product designation, part 1

Housing									
						A	F12 Alu, coated IP68 NEMA6P		
						C	T12 Alu, coated IP68 NEMA6P, Separate conn. compartment		
						D	T12 Alu, coated IP68 NEMA6P + OVP, Sep. conn. compartment, OVP = overvoltage protection		
						9	Special version, to be specified		
Cable entry									
						2	Gland M20 (EEx d > thread M20)		
						3	Thread G1/2		
						4	Thread NPT 1/2		
						5	Plug M12		
						6	Plug 7/8"		
						9	Special version, to be specified		
Process Sealing Sensor/ Flange									
						2	Viton		
						3	EPDM		
						9	Special version, to be specified		
Additional option									
						A	Basic version		
						Y	Special version, to be specified		
FMU 44 -							complete product designation		

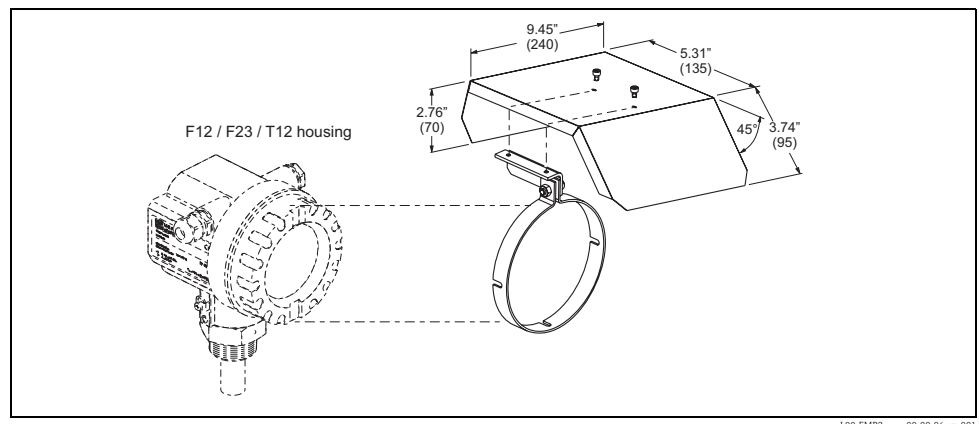
Scope of delivery

- Instrument according to the version ordered
 - "ToF Tool FieldTool Package (2 CD-ROMs: Program CD-ROM, Utility CD-ROM)
 - Operating manual according to the communication version
 - for certified instrument versions: Safety Instructions, Control- or Installation drawings
 - for FMU 40 *R**** and FMU 41 *R****: counter nut (PC)
 - for FMU 40/41: sealing ring (EPDM)
 - for gland M20x1.5:
 - 1 cable gland for 2-wire instruments
 - 2 cable glands for 4-wire instruments
- The cable glands are mounted on delivery.

Accessories

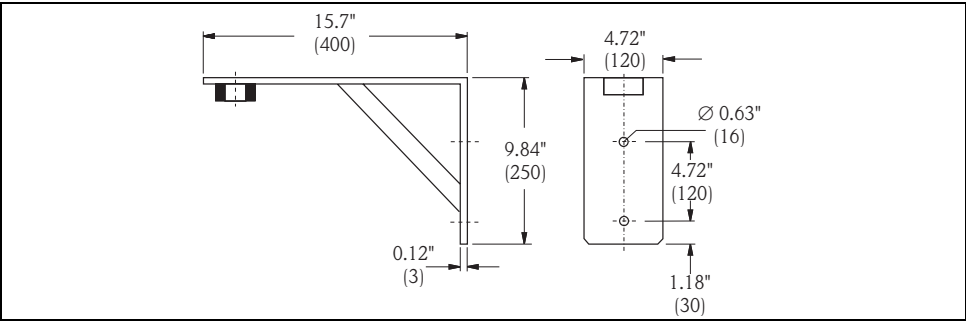
Weather protection cover

A Weather protection cover made of stainless steel is recommended for outdoor mounting (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



L00-FMR2xxxx-00-00-06-en-001

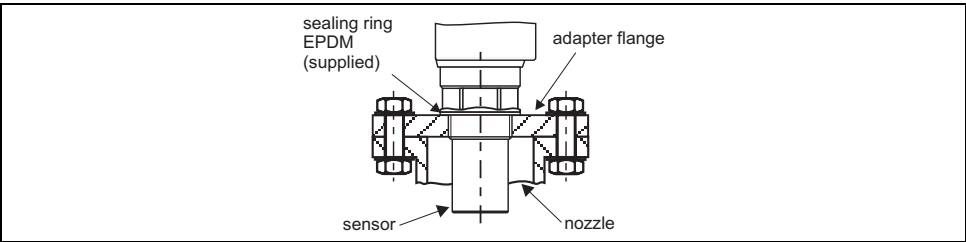
**Installation bracket for
FMU 40/41**



L00-FMU14x-00-00-00-de-001

- for FMU 40, G1½: Order No. 942669-0000
 - for FMU 41, G2: Order No. 942669-0001
- suited for NPT 1½" and 2" as well

Adapter flange



L00-FMU1X3XXX-00-00-00-en-001

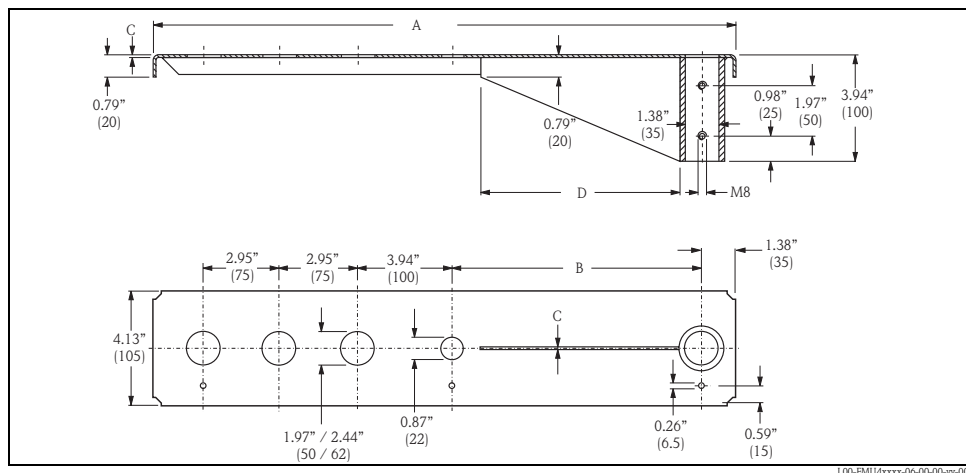
Version with metrical thread (FAU 70 E)

Process Connection			
12	DN 50	PN 16 A, flange EN1092-1 (DIN2527 B)	
14	DN 80	PN 16 A, flange EN1092-1 (DIN2527 B)	
15	DN 100	PN 16, A, flange EN1092-1 (DIN2527 B)	
Sensor Connection			
3	Thread ISO228	G1-1/2	
4	Thread ISO228	G2	
Flange Material			
2	316L		
7	Polypropylene		
FAU 70 E			Product designation

Version with conical thread(FAU 70 A)

Process Connection			
22	2"	150lbs FF, flange ANSI B16.5	
24	3"	150lbs FF, flange ANSI B16.5	
25	4"	150lbs FF, flange ANSI B16.5	
Sensor Connection			
5	Thread NPT1-1/2		
6	Thread NPT2		
Flange Material			
2	316L		
7	Polypropylene		
FAU 70 A			Product designation

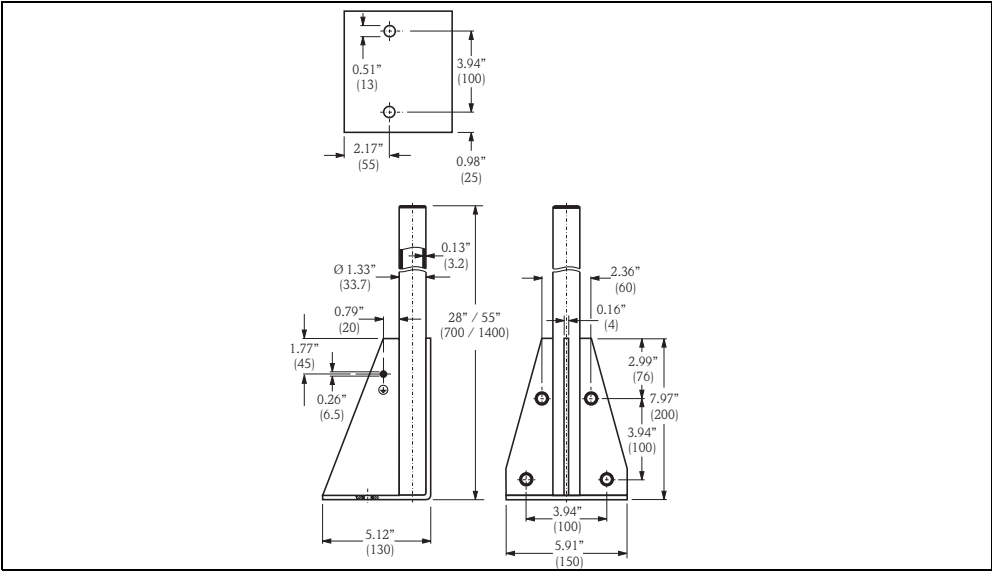
Cantilever



A	B	C	D	for Sensor	Material	Order Code
23" (585 mm)	9.83" (250 mm)	0.08" (2 mm)	7.87" (200 mm)	FMU 40	1.4301 (AISI 304)	52014132
					galv. steel	52014131
				FMU 41	1.4301 (AISI 304)	52014136
					galv. steel	52014135
42.7" (1085 mm)	29.5" (750 mm)	0.12" (3 mm)	11.8" (300 mm)	FMU 40	1.4301 (AISI 304)	52014134
					galv. steel	52014133
				FMU 41	1.4301 (AISI 304)	52014138
					galv. steel	52014137

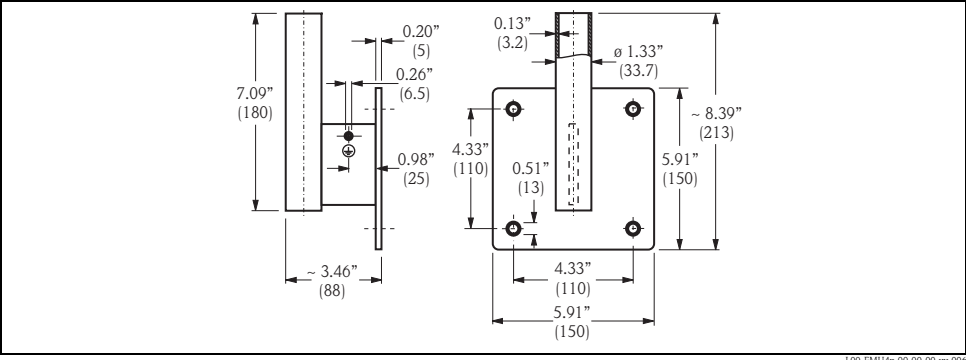
- The 1.97" (50 mm) or 2.44" (62 mm) orifices serve for the mounting of the FMU 40 or FMU 41 sensor, respectively.
- The 0.87" (22 mm) orifice may be used for an additional sensor.

Mounting Frame



Height	Material	Order Code
28" (700 mm)	galv. steel	919791-0000
28" (700 mm)	1.4301 (AISI 304)	919791-0001
55" (1400 mm)	galv. steel	919791-0002
55" (1400 mm)	1.4301 (AISI 304)	919791-0003

Wall Bracket



Material	Order Code
galv. steel	919792-0000
316Ti/1.4571	919792-0001

Commubox FXA191 HART For intrinsically safe communication with ToF Tool/FieldCare via the RS232C interface. For details refer to TI237F/00/en.

Commubox FXA195 HART For intrinsically safe communication with ToF Tool/FieldCare via the USB interface. For details refer to TI404F/00/en.

Service Interface FXA193

The Service-Interface connects the Service plug of Proline and ToF instruments with the 9 pin RS 232C interface of a PC. (USB connectors must be equipped with a usual commercial USB/Serial adapter.)

Product structure

Approvals		
	A	For use in non-hazardous areas
	B	ATEX II (1) GD
	C	CSA/FM Class I Div. 1
	D	ATEX, CSA, FM
	9	other
Connection cable		
	B	Connection cable for ToF devices
	E	Connection cable for Proline and ToF devices
	H	Connection cable for Proline and ToF devices and Connection cable for Ex two-wire devices
	X	without connection cable
	9	others
FXA193-		Complete product designation

Associated documentation

- Technical Information: TI063D
- Safety Instructions for ATEX II (1) GD: XA077D
- Supplementary information for the cable adapters: SD092D

Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field instruments with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI405C/07/en.



Note!

For the following Endress+Hauser instruments you need the "ToF Adapter FXA291" as an additional accessory:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70
- Gammapilot M FMG60
- Levelflex M FMP4x
- Micropilot FMR130/FMR131
- Micropilot M FMR2xx
- Micropilot S FMR53x, FMR540
- Prosonic FMU860/861/862
- Prosonic M FMU4x
- Tank Side Monitor NRF590 (with additional adapter cable)
- Prosonic S FMU9x

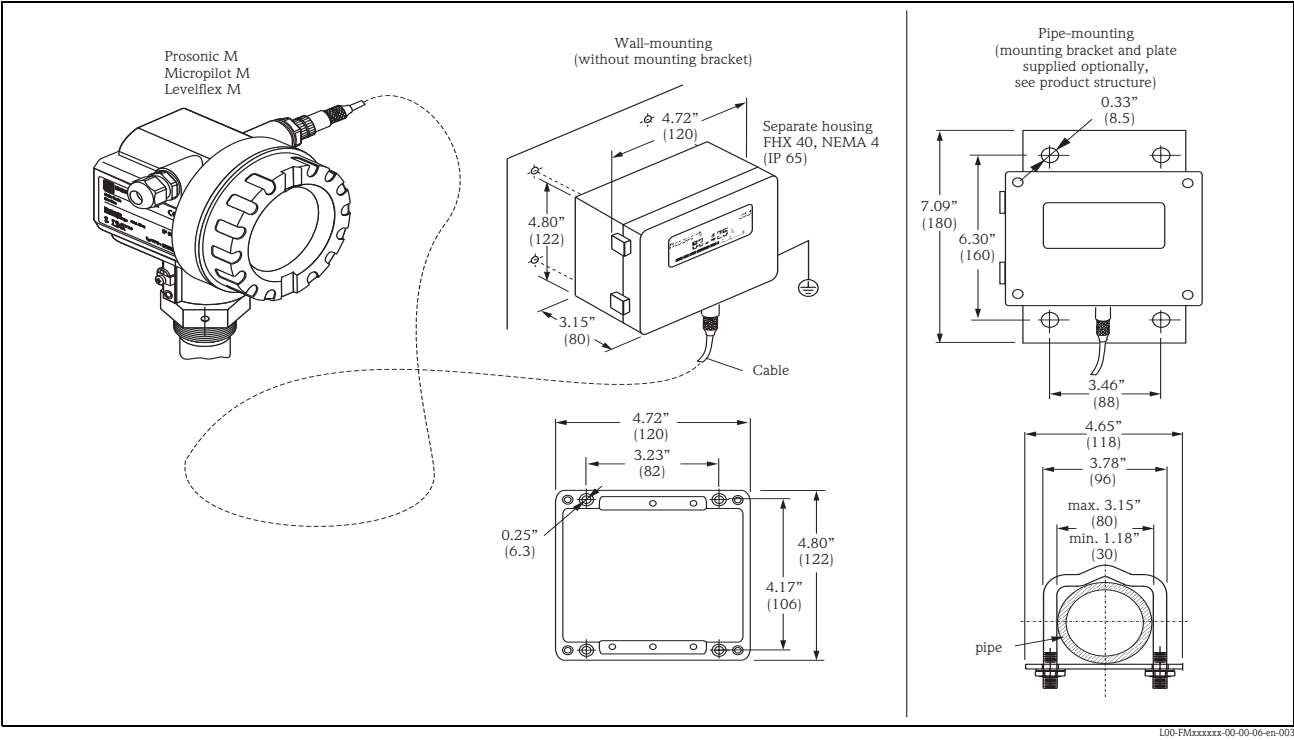
ToF Adapter FXA291

The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook to the following Endress+Hauser instruments:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70
- Gammapilot M FMG60
- Levelflex M FMP4x
- Micropilot FMR130/FMR131
- Micropilot M FMR2xx
- Micropilot S FMR53x, FMR540
- Prosonic FMU860/861/862
- Prosonic M FMU4x
- Tank Side Monitor NRF590 (with additional adapter cable)
- Prosonic S FMU9x

For details refer to KA271F/00/a2.

Remote display FHX40



Technical data (cable and housing) and product structure:

Max. cable length	65 ft (20 m)
Temperature range	-22°F to 158°F (-30°C to +70°C)
Degree of protection	Housing, IP65/67 (NEMA 4); cable, IP68 (NEMA 6), acc. to EN 60529
Materials	Housing: AlSi12; cable glands: nickle plated brass
Dimensions [mm] / [inch]	122x150x80 (HxWxD) / 4.8 x 5.9 x 3.2

		Approval:
	A	Nn-hazardous area
	I	ATEX II 2 G EEx ia IIC T6, ATEX II 3D
	S	FM IS Cl.I Div.1 Gr.A-D
	U	CSA IS Cl.I Div.1 Gr.A-D
	N	CSA General Purpose
	K	TIIS ia IIC T6 (in preparation)
		Cable:
	1	20m/65ft; for HART
	5	20m/65ft; for PROFIBUS PA/FOUNDATION Fieldbus
		Additional option:
	A	Basic version
	B	Mounting bracket, pipe 1" / 2"
FHX40 -		Complete product designation

For connection of the remote display FHX40 use the cable which fits the communication version of the respective instrument.

Supplementary documentation

System Information

SI 005F

Ultrasonic level measurement

Operating manual

Depending on the communication variant ordered, the following operating manuals are supplied with the device:

Communication	Operating manual
4 to 20mA, HART	BA 237F
Profibus PA	BA 238F
Foundation Fieldbus	BA 239F

These instructions describe the installation and first commissioning of the Prosonic M. From the operating menu, all functions are included, which are required for standard measurement tasks. Additional functions are **not** contained in the manual.

Description of device functions

BA 240F

This contains a detailed description of **all** the functions of the Prosonic M and is valid for all communication variants.

A pdf file of this document can be found

- in the supplied "ToF Tool - FieldTool Package" at "Help/ToF Tool Help/ Online Manual/ Operating Manual/Ultrasonic/Prosonic M FMU4x Functions"¹⁾.
- in the internet at "www.endress.com". Click "Download" and enter the product code "FMU4*" into the search form.

Short instructions

KA 183F

Can be found under the device housing cover.

The most important menu functions are summarised on this sheet. It is intended primarily as a memory jogger for users who are familiar with the operating concept of Endress+Hauser time-of-flight instruments.

Safety Instructions ATEX

The following safety instructions are supplied with ATEX-certified device versions. If the devices are used in explosive areas, comply with all the specifications in these safety instructions.

Instrument version	Certificate	Communication	Housing	Safety Instructions
<ul style="list-style-type: none"> ■ FMU40 - 1*B*A* ■ FMU41 - 1*B*A* ■ FMU42 - 1*B*A*** 	ATEX II 1/2 G or II 2 G EEx ia II C T6	HART (2-wire)	F12	XA 174F
<ul style="list-style-type: none"> ■ FMU40 - 1*B*D* ■ FMU41 - 1*B*D* ■ FMU42 - 1*B*D*** 	ATEX II 1/2 G or II 2 G EEx ia II C T6	HART (2-wire)	T12 with overvoltage protection	XA 224F
<ul style="list-style-type: none"> ■ FMU40 - 1*D*A* - 1*F*A* ■ FMU41 - 1*D*A* - 1*F*A* ■ FMU42 - 1*D*A*** - 1*F*A*** 	ATEX II 1/2 G or II 2 G EEx ia II C T6	<ul style="list-style-type: none"> ■ Profibus-PA ■ Foundation Fieldbus 	F12	XA 175F
<ul style="list-style-type: none"> ■ FMU40 - 1*D*D* - 1*F*D* ■ FMU41 - 1*D*D* - 1*F*D* ■ FMU42 - 1*D*D*** - 1*F*D*** 	ATEX II 1/2 G or II 2 G EEx ia II C T6	<ul style="list-style-type: none"> ■ Profibus-PA ■ Foundation Fieldbus 	T12 with overvoltage protection	XA 225F

1) If the Operating Instructions have not been installed together with the "ToF Tool - FieldTool Package", they can be added to the installation subsequently.

Instrument version	Certificate	Communication	Housing	Safety Instructions
<ul style="list-style-type: none"> ■ FMU40 - 4*B*C* - 4*D*C* - 4*F*C* ■ FMU41 - 4*B*C* - 4*D*C* - 4*F*C* ■ FMU42 - 4*B*C*** - 4*D*C*** - 4*F*C*** 	ATEX II 1/2 G or II 2 G EEx d [ia] II C T6	<ul style="list-style-type: none"> ■ HART (2-wire) ■ Profibus-PA ■ Foundation Fieldbus 	T12	XA 176F
<ul style="list-style-type: none"> ■ FMU40 - C***** ■ FMU41 - C***** ■ FMU42 - C***** 	ATEX II 3G EEx nA II T6	<ul style="list-style-type: none"> ■ HART (2-wire) ■ HART (4-wire, DC) ■ HART (4-wire, AC) ■ Profibus-PA ■ Foundation Fieldbus 	<ul style="list-style-type: none"> ■ F12 ■ T12 ■ T12 with overvoltage protection 	XA 179F
<ul style="list-style-type: none"> ■ FMU40 - 2*B*A* - 2*D*A* - 2*F*A* - 5*B*A* - 5*D*A* - 5*F*A* ■ FMU41 - 2*B*A* - 2*D*A* - 2*F*A* - 5*B*A* - 5*D*A* - 5*F*A* ■ FMU42 - 2*B*A*** - 2*D*A*** - 2*F*A*** - 5*B*A*** - 5*D*A*** - 5*F*A*** 	<ul style="list-style-type: none"> ■ ATEX II 1/2D ■ ATEX II 1/3D 	<ul style="list-style-type: none"> ■ HART (2-wire) ■ Profibus-PA ■ Foundation Fieldbus 	F12	XA 180F
<ul style="list-style-type: none"> ■ FMU40 - 2*G*A* - 2*H*A* - 5*G*A* - 5*H*A* ■ FMU41 - 2*G*A* - 2*H*A* - 5*G*A* - 5*H*A* ■ FMU42 - 2*G*A*** - 2*H*A*** - 5*G*A*** - 5*H*A*** 	<ul style="list-style-type: none"> ■ ATEX II 1/2D ■ ATEX II 1/3 D 	<ul style="list-style-type: none"> ■ HART (4-wire, DC) ■ HART (4-wire, AC) 	F12	XA 259
<ul style="list-style-type: none"> ■ FMU43 - 2*G*A* - 2*H*A* - 5*G*A* - 5*H*A* 	<ul style="list-style-type: none"> ■ ATEX II 1/2 D or II 2 D ■ ATEX II 1/3 D or II 3 D 	<ul style="list-style-type: none"> ■ HART (4-wire, DC) ■ HART (4-wire, AC) 	F12	XA 177F
<ul style="list-style-type: none"> ■ FMU43 - 2*D*A* - 2*F*A* - 5*D*A* - 5*F*A* 	<ul style="list-style-type: none"> ■ ATEX II 1/2 D or II 2 D ■ ATEX II 1/3 D or II 3 D 	<ul style="list-style-type: none"> ■ Profibus-PA ■ Foundation Fieldbus 	F12	XA 178F

Control drawings Installation drawings

The following control or installation drawings are supplied with the FM, CSA and TIIS-certified device versions:

Instrument version	Certificate	Communication	Housing	Control or Installation Drawing
<ul style="list-style-type: none"> ■ FMU40 - S*B*A* ■ FMU41 - S*B*A* ■ FMU42 - S*B*A*** 	FM IS	HART (2-wire)	F12	ZD 096F
<ul style="list-style-type: none"> ■ FMU40 - S*D*A* - S*F*A* ■ FMU41 - S*D*A* - S*F*A* ■ FMU42 - S*D*A*** - S*F*A*** 	FM IS	<ul style="list-style-type: none"> ■ Profibus-PA ■ Foundation Fieldbus 	F12	ZD 097F
<ul style="list-style-type: none"> ■ FMU40 - S*B*D* ■ FMU41 - S*B*D* ■ FMU42 - S*B*D*** 	FM IS	HART (2-wire)	T12 with overvoltage protection	ZD 139F
<ul style="list-style-type: none"> ■ FMU40 - S*D* D* - S*F*D* ■ FMU41 - S*D* D* - S*F*D* ■ FMU42 - S*D* D*** - S*F*D*** 	FM IS	<ul style="list-style-type: none"> ■ Profibus-PA ■ Foundation Fieldbus 	T12 with overvoltage protection	ZD 140F
<ul style="list-style-type: none"> ■ FMU40 - T*B*C* - T*D*C* - T*F*C* ■ FMU41 - T*B*C* - T*D*C* - T*F*C* ■ FMU42 - T*B*C*** - T*D*C*** - T*F*C*** 	FM XP	<ul style="list-style-type: none"> ■ HART (2-wire) ■ Profibus PA ■ Foundation Fieldbus 	T12	ZD 098F
<ul style="list-style-type: none"> ■ FMU40 - U*B*A* ■ FMU41 - U*B*A* ■ FMU42 - U*B*A*** ■ FMU44 - U*B*A*** 	CSA IS	HART (2-wire)	F12	ZD 088F
<ul style="list-style-type: none"> ■ FMU40 - U*D*A* - U*F*A* ■ FMU41 - U*D*A* - U*F*A* ■ FMU42 - U*D*A*** - U*F*A*** ■ FMU44 - U*D*A*** - U*F*A*** 	CSA IS	<ul style="list-style-type: none"> ■ Profibus-PA ■ Foundation Fieldbus 	F12	ZD 099F
<ul style="list-style-type: none"> ■ FMU40 - U*B* D* ■ FMU41 - U*B* D* ■ FMU42 - U*B* D*** ■ FMU44 - U*B* D*** 	CSA IS	HART (2-wire)	T12 with overvoltage protection	ZD 101F
<ul style="list-style-type: none"> ■ FMU40 - U*D*D* - U*F*D* ■ FMU41 - U*D*D* - U*F*D* ■ FMU42 - U*D*D*** - U*F*D*** ■ FMU44 - U*D*D*** - U*F*D*** 	CSA IS	<ul style="list-style-type: none"> ■ Profibus-PA ■ Foundation Fieldbus 	T12 with overvoltage protection	ZD 102F

Instrument version	Certificate	Communication	Housing	Control or Installation Drawing
<ul style="list-style-type: none"> ■ FMU40 - V*B*C* - V*D*C* - V*F*C* ■ FMU41 - V*B*C* - V*D*C* - V*F*C* ■ FMU42 - V*B*C*** - V*D*C*** - V*F*C*** ■ FMU44 - V*B*C*** - V*D*C*** - V*F*C*** 	CSA XP	<ul style="list-style-type: none"> ■ HART (2-wire) ■ Profibus PA ■ Foundation Fieldbus 	T12	ZD 100F
<ul style="list-style-type: none"> ■ FMU 40 - K***** ■ FMU 41 - K***** 	TIIS Ex ia IIC T6	HART	F12	ZD 138F

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Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Turbimax CUS31

Turbidity sensor

Installation and immersion sensor for drinking water and industrial water according to the 90° scattered light method



Application

- All phases of drinking water processing
- Coagulation and flocculation
- Filter rupture monitoring
- Filter backwash
- Control of clear rinsing cycles
- Monitoring of phase separation processes
- Boiler feedwater
- Monitoring of cooling water
- Monitoring of surface waters
- Outlet monitoring of sewage treatment plants
- Monitoring of industrial water discharge
- Recycling of industrial water

Your benefits

- All-purpose:
 - Direct installation in water pipes
 - Suitable as a drinking water sensor for every installation with a wall distance greater than 8 cm (3")
 - Measurement under pressure to avoid degassing
 - Integrated temperature measurement
 - Permissible distance between sensor and transmitter: 200 m (660 ft)
- Standardized and simple:
 - Measurement according to EN 27027 / ISO 7027
 - Commissioning without formazine
 - Factory calibration ("plug and play")
- Cost saving and safe:
 - Inclined plain sensor surface uses medium flow to increase the self-cleaning effect and repels air bubbles
 - Wiper unit can be retrofitted
 - Self-monitoring and plausibility check
 - Scratch-resistant sapphire glass measuring window

Function and system design

Measuring principle

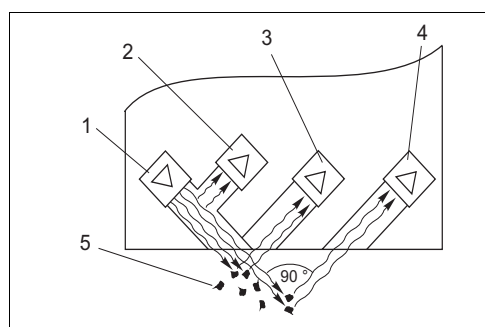
Turbidity measurement

For turbidity measurement a light beam is sent through the medium and is diverted from its original direction by optically denser particles, e.g. solid matter particles.

Function

Nephelometric measuring principle 90° NIR scattered light according to EN 27027

The 90° scattered light method with a wavelength in the near-infrared range (880 nm) according to ISO 7027 / EN 27027 records turbidity values under standardized, comparable conditions. A temperature signal is also recorded and transmitted in addition to the turbidity signal. The excitation radiation of an infrared transmitter (see below, item 1) strikes the medium at a defined angle of beam. The different refractions of light between the entrance window and the medium (water) are taken into account. Particles in the medium (item 5) create a scattered radiation which strikes the scattered light receivers (items 3, 4) at a defined angle of beam. The measurement in the medium is constantly compared with the values of a reference receiver (item 2). Digital filter functions with excellent interference signal suppression and sensor self-monitoring ensure additional measurement reliability.



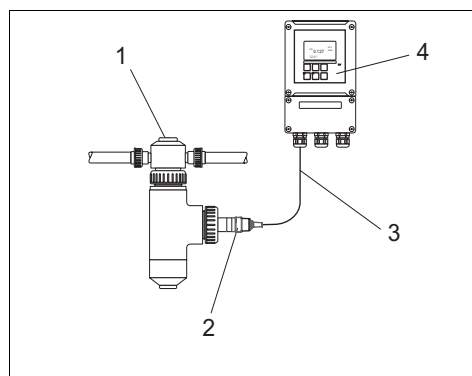
- 1 Infrared sender
- 2 Reference diode
- 3 Scattered light receiver 1
- 4 Scattered light receiver 2
- 5 Particle

Turbidity measurement acc. to ISO 7027 / EN 27027

Measuring system

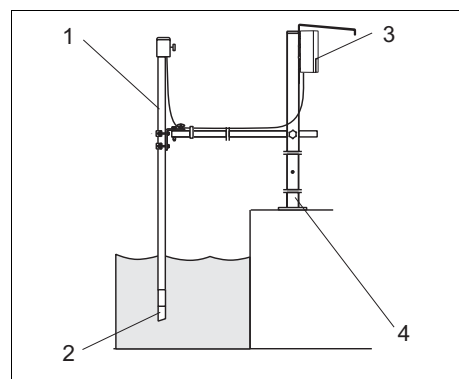
A complete measuring system comprises:

- Turbidity sensor CUS31
- Transmitter, e.g. Liquisys M CUM253
- Assembly:
 - Flow assembly E or S (each with installed, factory calibrated sensor) or
 - Immersion assembly, e.g. Dipfit W CYA611 or
 - Retractable assembly, e.g. Cleanfit W CUA451



Measuring system with flow assembly

- 1 Flow assembly S
- 2 CUS31-**S
- 3 Sensor cable
- 4 Transmitter Liquisys M CUM253



Measuring system with immersion assembly

- 1 Immersion assembly Dipfit W CYA611
- 2 CUS31-**A
- 3 Transmitter Liquisys M CUM253 (with weather protection cover CYY101)
- 4 Universal assembly holder CYH101

Input

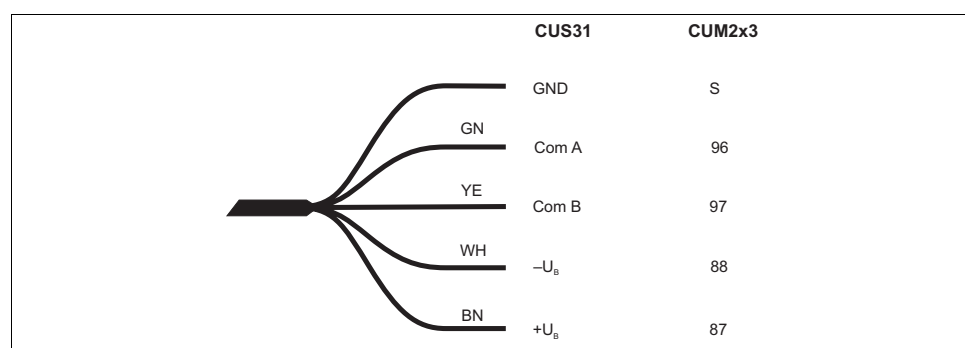
Measured variable	Turbidity
Measuring range	0.000 to 9999 FNU 0.00 to 3000 ppm 0.0 to 3.0 g/l 0.0 to 200 %

Power supply

Electrical connection

The sensor is connected to the transmitter by means of a multi-core, shielded measuring cable (fixed cable at the sensor).

To extend the measuring cable, a VBM or RM junction box and a CYK81 extension cable must be used.



Measuring cable (fixed cable) resp. extension cable (CYK81)



Note!

Please pay special attention to the instructions on sensor connection in the Operating Instructions of the transmitter.

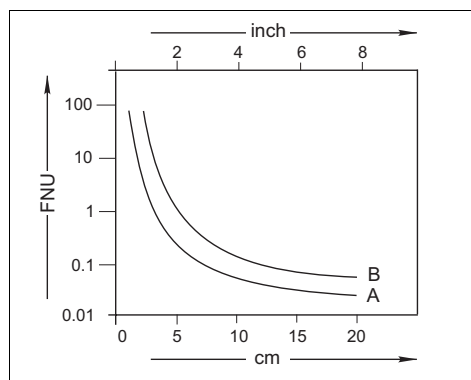
Performance characteristics

Maximum measured error	< 5 % (min. 0.02 FNU) of measured value (system measured error related to the primary formazine standard / tracing according to ISO 5725 and ISO 7027 / EN 27027)
Repeatability	< 1 % (min. 0.01 FNU) of measured value
Wavelength	880 nm
Factory calibration	traceable to formazine standard and SiO ₂

Installation

Wall distance

Installing the sensor in pipework or very close to the wall can cause backscatter which results in a higher sensor signal. The effective wall or bottom distance can be optimized by aligning the flat sensor side.



Effect of the distance from the wall or bottom

A Dark wall or bottom (non-reflective)

B Bright wall or bottom (reflective)



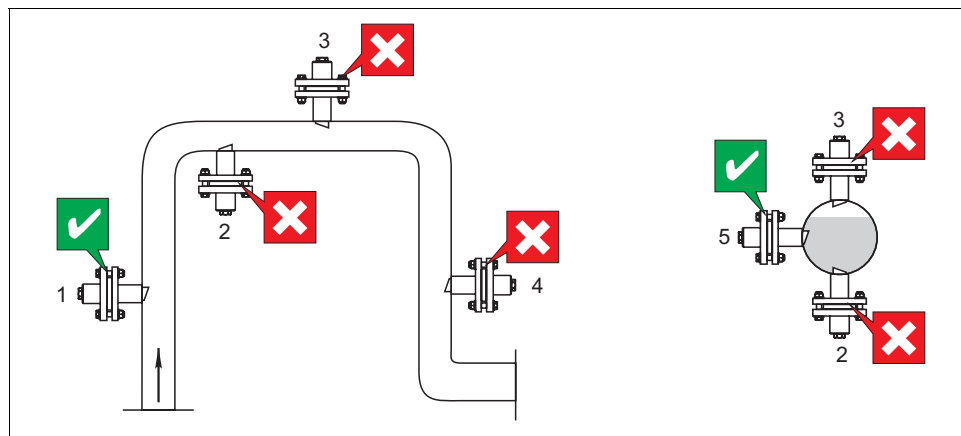
Note!

The following generally applies: The lower the turbidity to be measured, the darker the vessel walls should be and the greater the wall distance should also be.

When measuring in drinking water, the wall distance to a dark wall must be **at least 8 cm (3")**. Bright pipes are not suitable for the drinking water sector.

Pipe installation

The following figure illustrates various installation positions in pipes and indicates whether they are permitted or not.



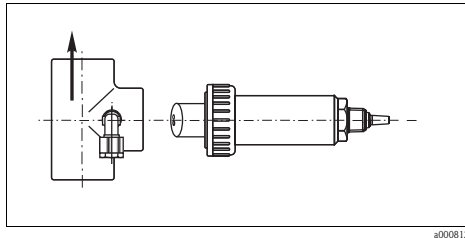
Orientation and installation positions (with adapter CUA120-A/B resp. retractable assembly CUA451)

- The pipeline diameter must be at least 100 mm (4") if reflective materials (e.g. stainless steel) are used.
- Install the sensor in places with uniform flow conditions.
- Orientate the sensor surface against the medium flow (self-cleaning effect).
- The best installation location is in the ascending pipe (see above, item 1). Installation is also possible in the horizontal pipe (item 5).
- Do not install the sensor in places where air may collect or foam bubbles form (item 3) or where suspended particles may settle (item 2).
- Avoid installation in the down pipe (item 4).

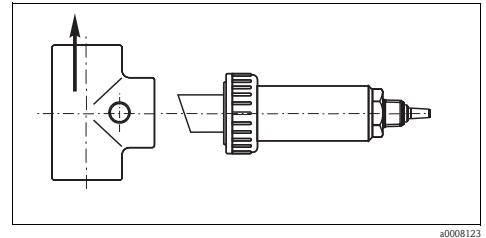
Flow operation

In general

- Install the flow assembly as vertical as possible so that the medium flows to the sensor from below.
- Two sensor orientations are possible for every installation:
 - Parallel to the medium flow
Orientation parallel to the medium flow is required when using the CUR 3 spray head.
 - Against the medium flow
Orientation against the medium flow is used to increase the self-cleaning effect in heavily-soiled media (> 15 FNU). The wall reflection is negligible here due to the high absorption.



Parallel to the medium flow



Against the medium flow



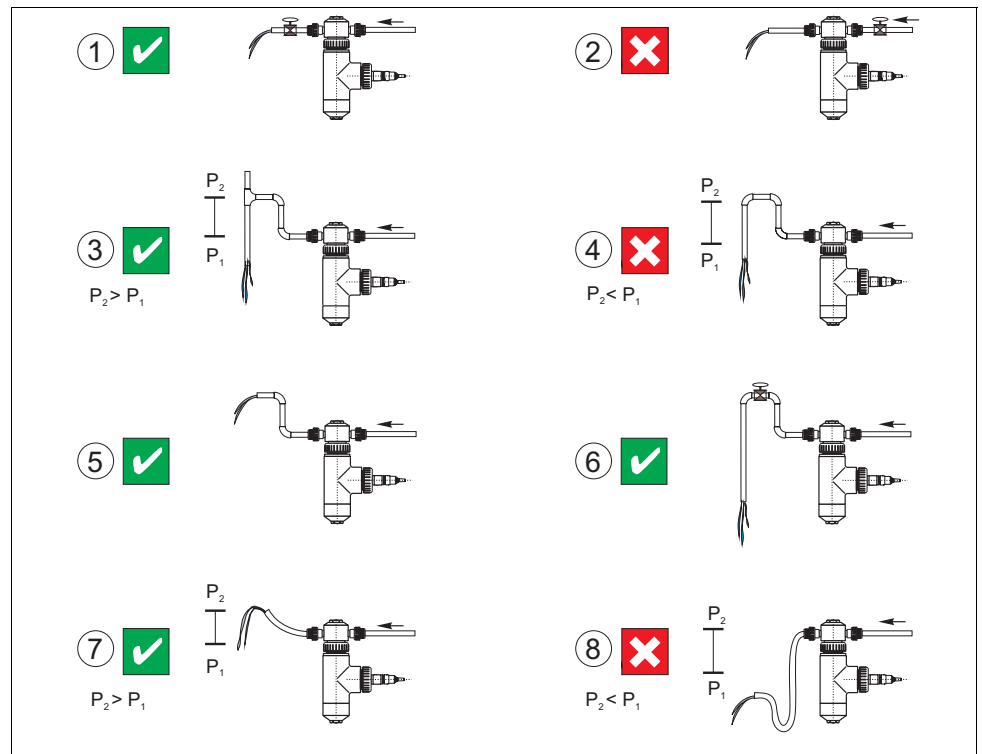
Note!

For turbidities < 5 FNU, use the sensor versions CUS31-**E or CUS31-**S.

Flow operation in the drinking water sector (with special calibration)


When the sensor is ordered with assembly E or S, the sensor is **individually calibrated** in the factory with the assembly ordered.

Therefore, no initial calibration on site is necessary.



Installation situations with flow assembly E resp. S

1. Correct: pressure reduction after measurement
Degassing is avoided. The gas in the water remains dissolved.
2. Incorrect: Pressure reduction before measurement
The pressure reduction creates favourable conditions for gas bubble formation.

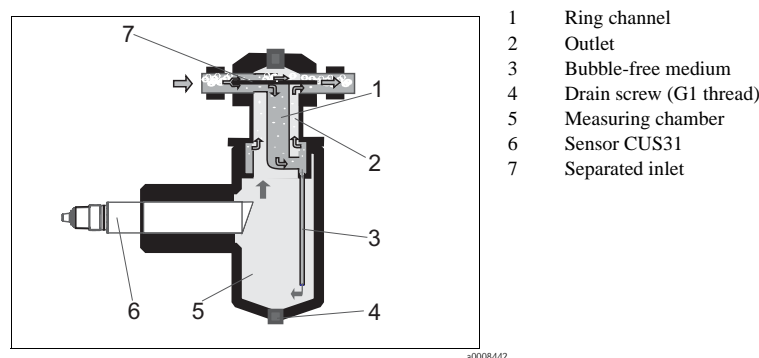
3. Correct: Outlet of the assembly raised and vented
Gas cannot collect in the upper section of the assembly. The outlet pipe is vented at the highest point. A slight overpressure forms in the assembly as a result of the height difference of the raised outlet.
4. Incorrect: Outlet raised but not vented
A low pressure forms in the assembly if venting via the downcomer outlet pipe does not take place due to too small a cross-section.
5. Correct: Standard application in event of little initial pressure
Slight overpressure due to raised outlet level, no gas collecting in the upper section of the assembly.
6. Limited application: The valve reduces the volume flow
 **Note!**
The outlet line may not be too thin or too long as otherwise a low pressure forms in the assembly. A vent for the drain line must be present. The outlet must be completely opened at regular intervals as otherwise the raising of the outlet level would not make any sense.
If using a tube as the drain line, avoid formation of siphon draw (low points in the tube)! Otherwise venting does not take place.
7. Correct: Tube as outlet line
Must be raised!
8. Incorrect: Tube not raised
A low pressure forms in the assembly which favors gas bubble formation. In addition, low points in the tube result in siphon draw and thereby prevent venting. This results in pressure changes in the assembly.

Gas bubble elimination

Conventional turbidity measurements are carried out in an unpressurized sample. When the pressure on a sample (which was pressurized beforehand) is released, fine bubbles are produced which distort the turbidity measurement.

There are several methods of eliminating these gas bubbles:

- Pressurized measurement in the bypass (pressure is not released until after the measurement).
- For measurements without overpressure or with slight overpressure: Free medium flow above the assembly level. The mounting location should be as low as possible to take advantage of the maximum possible pressure.
- Unpressurized measurement and gas bubble elimination using wiper cleaning. The wiping duration and interval can be programmed for optimum results.
- Reduction of the flow to the lowest possible value (50 l/h). Slight flow prolongs the period in which the medium is in the assembly. This means that gas bubbles have more time to rise to the top. The sensor response time increases slightly due to the lower flow.
- Flow assembly S with integrated gas bubble trap (CUS31-**S) Most of the gas bubbles are sent directly to the assembly outlet in the upper half of the separated inlet (7). The other half of the medium flows into a ring channel (1) by means of the central pipe. The remaining bubbles rise here and are conveyed out of the measuring chamber by means of holes in the outlet (2) located in the centre of the assembly. Bubble-free medium (3) is pushed down into the measuring chamber (5). This also leads to a high flow which results in a quick response time. In addition, this almost completely prevents dirt particles settling.



Flow assembly S with gas bubble trap

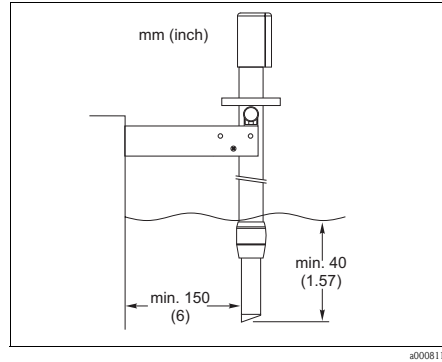
Immersion operation

When installing the sensor in immersion assemblies, please ensure that a sufficient wall distance is observed during operation.

- For this reason, select an installation location in which **a minimum wall distance of 150 mm (6")** is observed even with varying levels or altered flow profiles.

Mounting in a suspended assembly with chain must therefore be avoided.

- The sensor must immerse at least 40 mm (1.5") into the medium.



CYA611 with pendulum frame

Environment

Storage temperature

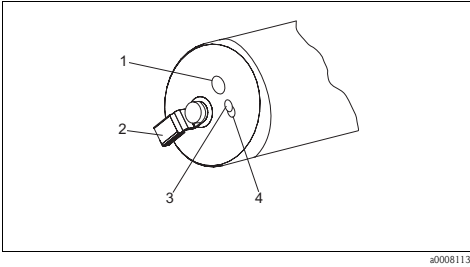
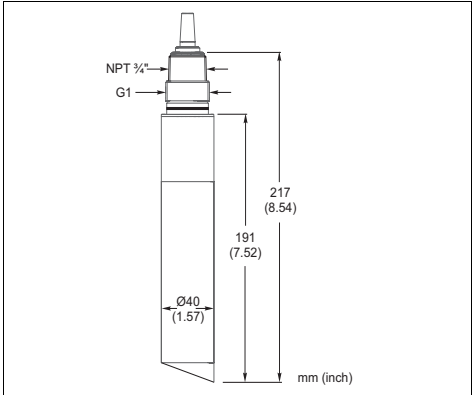
-20 to 60°C (-4 to 140°F)

Ingress protection

IP 68 (similar to NEMA 6P)

Mechanical construction

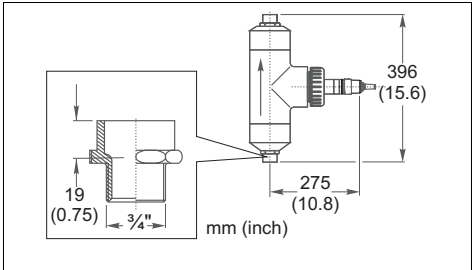
Dimensions



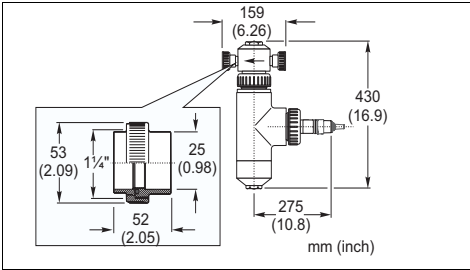
Sensor optics

- 1 Photodiode (receiver)
- 2 Wiper (optional)
- 3 Photodiode (receiver)
- 4 LED (IR transmitter)

CUS31



CUS31-**E (with assembly E)



CUS31-**S (with assembly S)

Weight

with cable length 7 m (23 ft): 0.7 kg (1.5 lbs.)
with cable length 15 m (49 ft): 1.1 kg (2.4 lbs.)

Material

Sensor carrier plate, shaft	PVC / PPS GF 40 (polyphenylene sulfide with 40% glass-fibre)
Optical windows	Sapphire
Flow assemblies E and S	PE
Wiper (CUS31-W** only)	Rubber
Cable	TPEO (polyolefine based elastomer), -40 to 130°C (-40 to 260°F)

Process connection

G1 and NPT 3/4"

Temperature sensor

NTC resistor 30K at 25°C (77°F)

Ordering information

Product structure

Sensor			
	A	Standard sensor	
	W	Sensor with integr. wiper	
Cable length			
	2	Connecting cable 7 m (23 ft)	
	4	Connecting cable 15 m (49 ft)	
	9	Special cable length	
Assembly			
	A	Without assembly	
	E	Assembly for bubblefree media	
	S	Assembly with integr. debubbling system	
CUS31-			complete order code

Scope of delivery

The scope of delivery comprises:

- Turbidity sensor acc. to the version:
 - CUS31-**A factory-calibrated sensor, without assembly
 - CUS31-**E installed and factory-calibrated in assembly for bubble-free media, with fixing bracket
 - CUS31-**S installed and factory-calibrated in assembly with gas bubble trap, with fixing bracket
- Operating Instructions BA176C/07/en

Certificates, approvals

Quality certificate

Each sensor has an individual quality certificate with information on the sensor identification and calibration according to ISO 7027 / EN 27027.

Accessories

Connection accessories	<p>CYK81 measuring cable</p> <ul style="list-style-type: none"> ■ Non-terminated measuring cable for extension of sensor cables of e.g. Memosens sensors, CUS31/CUS41 ■ 2 wires, twisted pair with shield and PVC-sheath (2 x 2 x 0.5 mm² + shield) ■ Sold by the meter, order no. 51502543 <p>Junction box VBM</p> <ul style="list-style-type: none"> ■ For cable extension ■ 10 terminals ■ Cable entries: 2 x Pg 13.5 or 2 x NPT ½" ■ Material: aluminum ■ Ingress protection: IP 65 (≅ NEMA 4X) ■ Order numbers: <ul style="list-style-type: none"> – cable entries Pg 13.5: 50003987 – cable entries NPT ½": 51500177 <p>Junction box RM</p> <ul style="list-style-type: none"> ■ For cable extension (e.g. for Memosens sensors or CUS31/CUS41) ■ 5 terminals ■ Cable entries: 2 x Pg 13.5 ■ Material: PC ■ Ingress protection: IP 65 (≅ NEMA 4X) ■ Order no.: 51500832
Installation accessories	<p>Immersion assembly holder CYH101</p> <ul style="list-style-type: none"> ■ For pH, ORP, oxygen, conductivity assemblies and for oxygen and turbidity sensors; ■ Ordering acc. to product structure (Technical Information TI092C/07/en) <p>Immersion assembly Dipfit W CYA611</p> <ul style="list-style-type: none"> ■ For sensor immersion in basins, open channels and tanks, PVC ■ Ordering acc. to product structure, see Technical Information TI166C/24/ae <p>Flange adapter CUA120</p> <ul style="list-style-type: none"> ■ for CUS31/CUS41 ■ Ordering information: <ul style="list-style-type: none"> – CUA120-A for welding flange, h=47 mm (1.85") – CUA120-B for welding flange, h=93 mm (3.66") <p>Flow assembly Flowfit CUA250</p> <ul style="list-style-type: none"> ■ for CUS31/CUS41 ■ ordering acc. to product structure (Technical Information TI096C/24/ae) <p>Retractable assembly Cleanfit CUA451</p> <ul style="list-style-type: none"> ■ retractable assembly with ball valve; for turbidity sensors; material: stainless steel ■ ordering acc. to product structure (Technical Information TI369C/24/ae) <p>Welding rinse socket DN 65</p> <ul style="list-style-type: none"> ■ order no. 51500912 <p>Welding rinse socket DN 50 / PN 16</p> <ul style="list-style-type: none"> ■ order no. 55001306
Transmitter	<p>Liquisys M CUM 223/253</p> <ul style="list-style-type: none"> ■ Turbidity transmitter ■ Panel mounting or field housing ■ Optional with Hart® or Profibus communication ■ Ordering acc. to product structure, see Technical Information TI200C/24/ae
Cleaning	<p>Chemoclean</p> <ul style="list-style-type: none"> ■ Injector CYR10 and program sequencer CYR20 ■ Ordering acc. to product structure, see Technical Information (TI046C/07/en) <p>Chemoclean CUR3</p> <ul style="list-style-type: none"> ■ Spray head for flow assemblies CUA250 and COA250 ■ order no. CUR3-1

**Monitoring, service kit,
recalibration**

CUY22

- Check unit for CUS31 for checking the sensor
- order no. 51504477

Service kit CUY31

- 3 spare wiper arms
- order no. 50089252

Recalibration CUS31

- Calibration as per ISO 7027 / EN 27027
- order no. 50081264

USA	Canada	México	Instruments International
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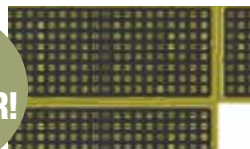
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NESTABLE 2-DRUM POLY-SPILLPALLET™

TO NEST IS BEST

Maximize space by minimizing storage! Capture drips and spills within the Nestable 2-Drum Poly-Spillpallet™ sump. The 20.75" height design and 2,000 lb. load capacity keep your drums at an easy reach and a secure level. The unit provides chemical, UV, rust and corrosion resistance while the textured removable grate keeps drums from sliding and provides unrestricted and hassle-free sump. Optional drain available.

LINK
TOGETHER!



Store multiple Poly-pallets in a minimal amount of space with a 4" nest height! Links together for customization and security.

SuperShipper™



*Patents Pending

NESTABLE 2-DRUM POLY-SPILLPALLET

Part #	Description	Ext. Dimensions L x W x H in. (cm)	Weight lb. (kg)	Spill Cap. gal. (L)	Load Cap. lb. (kg)
5222-YE	2-Drum	51 x 26 x 21 (130 x 66 x 53)	45 (20)	66 (250)	2,000 (907)
5222-YE-D	(w/Drain)				

Regulations: EPA 40 CFR 264.175, SPCC, UFC and NPDES



2-DRUM POLY-SPILLPALLET™ 2000

This secondary containment system is engineered to meet the rigors of today's regulatory environment. Made with 100% polyethylene, it provides excellent chemical resistance. Optional drain with plug.

- Meets EPA 40 CFR 264.175
- Holds up to 2,000 lb. Handling Capacity
- Forkliftable
- Removable grate for easy cleaning

Optional tarp available (Part # 5253-TARP, p. 13)



2-DRUM POLY-SPILLPALLET™ 2000

Part #	Description	Dimensions L x W x H in. (cm)	Weight lb. (kg)	Spill Cap. gal. (L)	Load Cap. lb. (kg)
5253-YE	2-Drum	53.5 x 29 x 17 (136 x 74 x 43)	55.5 (25.1)	58 (219.5)	2,000 (907)
5253-YE-D	(w/drain)				

Regulations: EPA 40 CFR 264.175, SPCC and NPDES

LOW-PROFILE IN-LINE POLY-SPILLPALLET™ 3000

WHERE NO DRUM STORAGE HAS GONE BEFORE.

Store drums in-line near a wall, between columns, and in all those spaces once thought to be unusable. Optional drain.

- Holds four (4) 55-gallon drums
- Low 12" profile
- Holds up to 3,000 lb Handling Capacity weight
- Raised edge on back and sides helps orient barrels on pallet
- Non-skid, removable grates
- 66-gallon sump capacity meets EPA 40 CFR 264.175
- 100% polyethylene

Optional tarp available (Part # 5102-TARP, p. 13)



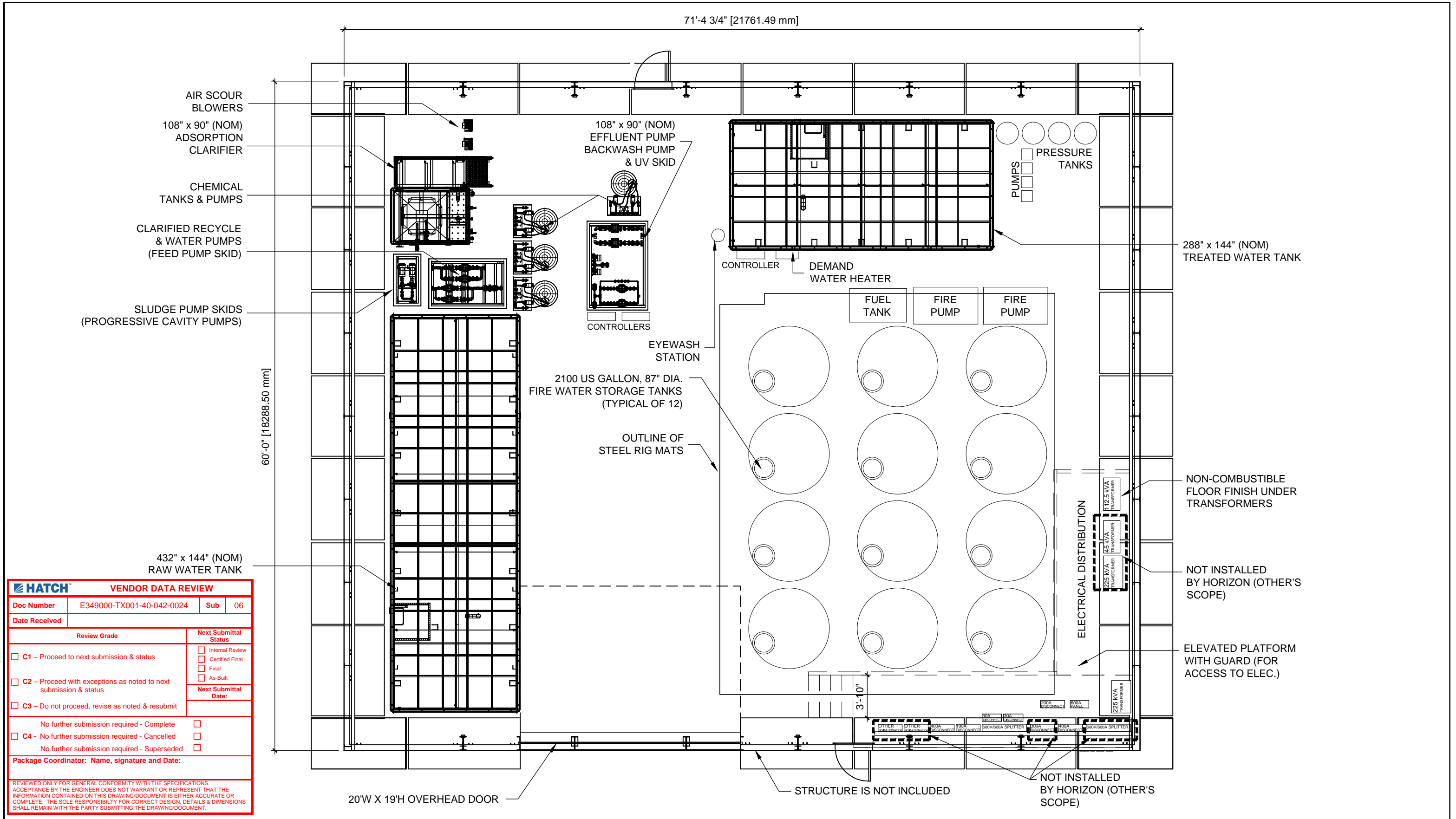
IN-LINE POLY-SPILLPALLET™ 3000


Part #	Description	Dimensions L x W x H in. (cm)	Weight lb. (kg)	Spill Cap. gal. (L)	Load Cap. lb. (kg)
5102-YE	4-Drum	98 x 25.25 x 12 (249 x 64 x 30)	83.7 (37.9)	66 (249.8)	3,000 (1,361)
5102-YE-D	(w/drain)				

Regulations: EPA 40 CFR 264.175, SPCC, NPDES and UFC

DID
YOU
KNOW?

Many establishments are required by government standards to have a 'Spill Plan' to help prevent toxic and hazardous materials from damaging the environment.



		<h2 style="text-align: center;">VENDOR DATA REVIEW</h2>		
Doc Number	E349000-TX001-40-042-0024	Sub	06	
Date Received				
Review Grade		Next Submittal Status		
<input type="checkbox"/> C1 - Proceed to next submission & status		<input type="checkbox"/> Internal Review <input type="checkbox"/> Certified Final <input type="checkbox"/> Final <input type="checkbox"/> As-Built		
<input type="checkbox"/> C2 - Proceed with exceptions as noted to next submission & status		Next Submittal Date:		
<input type="checkbox"/> C3 - Do not proceed, revise as noted & resubmit				
No further submission required - Complete		<input type="checkbox"/>		
<input type="checkbox"/> C4 - No further submission required - Cancelled		<input type="checkbox"/>		
No further submission required - Superseded		<input type="checkbox"/>		
Package Coordinator: Name, signature and Date:				
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3	14.10.30	UPDATED FOR AS-BUILT	CC	
2	13.08.28	RE-ISSUED FOR CLIENT ACCEPTANCE	CC	
1	13.06.19	ISSUED FOR CLIENT ACCEPTANCE	AM	AM
No.	DATE	DESCRIPTION	BY	CHKD
REVISIONS				



HORIZON NORTH
Camp & Catering Partnership

DATE :	13.03.21
PROP # :	P21163
JOB # :	J21163
TN # :	
SCALE :	1/8"=1'-0"
DRAWN BY :	AM
CHECKED :	JM

HATCH BAFFINLAND

MINE SITE - WATER BUILDING BAFFIN ISLAND, NUNAVUT FLOOR PLAN

DWG No.:

AF1700