

Function and system design

Measuring principle	<p>pH measurement</p> <p>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.</p> <p>The transmitter converts the measured voltage into the corresponding pH value using the Nernst equation.</p>
General properties	<ul style="list-style-type: none"> ■ 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 87 psi (6 bar) and can be applied with temperatures of up to 275°F (135°C).
Important properties of CPS11D	<p>Maximum process safety</p> <p>The inductive and non-contacting measured value transfer of Memosens guarantees maximum process safety and offers the following benefits:</p> <ul style="list-style-type: none"> ■ All problems caused by moisture are eliminated. <ul style="list-style-type: none"> – 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 separated from the medium. The result: No more need to ask about "symmetrically high-impedance" or "unsymmetrical" or an impedance converter. ■ The cable does not act like an antenna. Thus, EMC safety is guaranteed. <p>Data safety through digital data transfer</p> <p>The Memosens technology digitalizes the measured value in the sensor and transfers it to the transmitter via a contactless connection. The result:</p> <ul style="list-style-type: none"> ■ 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 ■ The digital signals are suitable for application in hazardous areas; the integrated electronics are intrinsically safe. <p>Easy handling</p> <p>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 at very low or very high pH values. When the sensor is mounted, the calibration data are automatically transferred to the transmitter and used to calculate the current pH value: Storing the calibration data in the sensor allows for calibration and adjustment away from the measuring point. The result:</p> <ul style="list-style-type: none"> ■ pH sensors can be calibrated under optimum external conditions in the measuring lab. Wind and weather do not affect the calibration quality or 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 data and calibration and predictive maintenance is possible. ■ The sensor history can be documented on external data recorders and evaluation programs at any time. Thus, the current application of the sensors can be made to depend on their previous history. <p>Communication with the transmitter</p> <p>Always connect the CPS11D to a transmitter with Memosens technology. Data transmission to a standard transmitter is not possible.</p>

Data storage of CPS11D

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

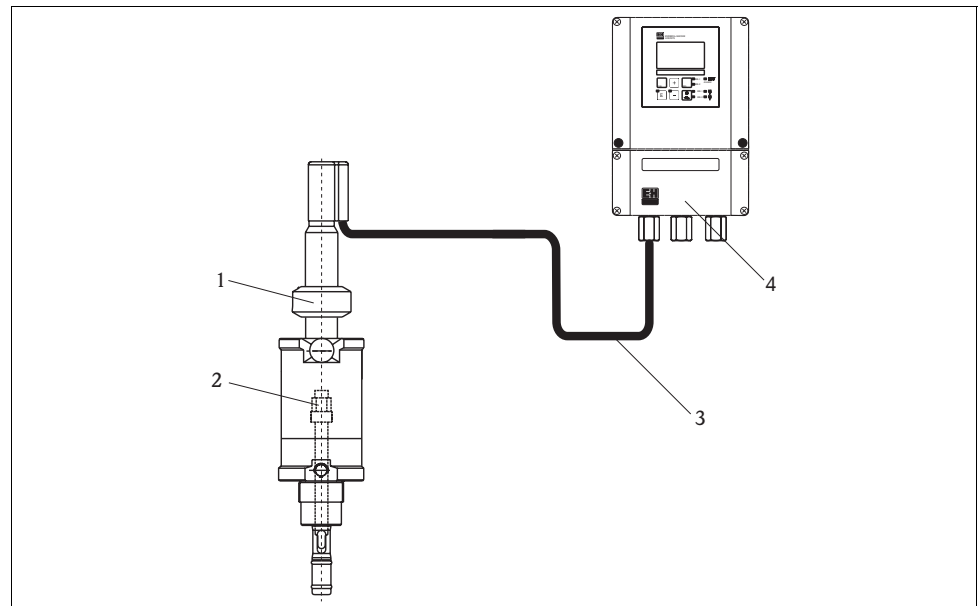
- Manufacturing data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Calibration date
 - Calibrated slope at 77°F (25°C)
 - Calibrated zero point at 77°F (25°C)
 - Temperature offset
 - Number of calibrations
 - Operator's signature for calibration or adjustment
- Application data
 - Temperature application range
 - pH application range
 - Date of first commissioning
 - Maximum temperature value
 - Operating hours at temperatures above 176°F (80°C) and 212°F (100°C)
 - 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 the Mycom S transmitter

Measuring system

A complete measuring system comprises:

- CPS11 pH electrode or CPS11D digital sensor
- Transmitter, e.g. Liquisys M CPM223/253 (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 pH electrode
- 3 Special measuring cable CPK9 (for electrodes with TOP68 plug-in head) / CYK10 for digital sensors
- 4 Liquisys M CPM253 transmitter

Input

Measured variables

pH value
Temperature

Measuring range

Electrode version AA (for water / wastewater):
 pH: 0 to 12 pH
 Temperature: 5 to 176°F (-15 to 80°C)
 Electrode version BA (for process applications, sterilizable)
 pH: 0 to 14 pH
 Temperature: 32 to 275°F (0 to 135°C)
 Electrode version FA (for hydrofluoric acid):
 pH: 0 to 10 pH
 Temperature: 32 to 158°F (0 to 70°C)



Caution!
Please note the process operating conditions.

Installation

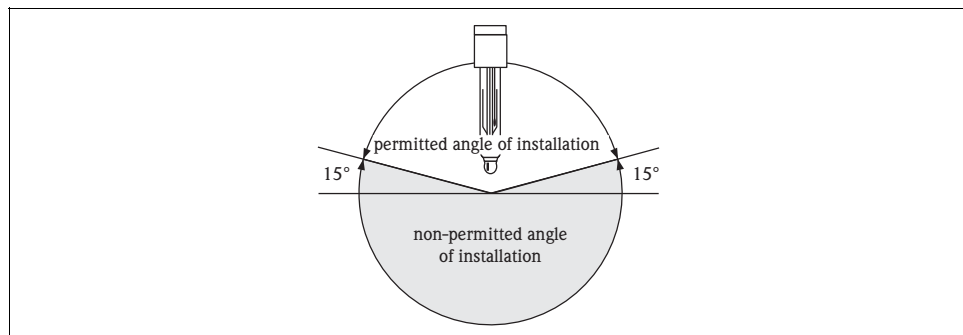
Installation instructions

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.



Caution!

- Make sure that the assembly's threaded connection for the electrode is clean and without burrs before installing the electrode.
- Hand tighten the electrode 2.2 ft lb force (3 Nm)! (Given value only applies to installation Endress+Hauser assemblies.)
- Make sure to follow the installation instructions in the operating instructions of the used assembly.



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Electrode installation; installation angle min. 15° from the horizontal

Environment

Ambient temperature



Caution!

Danger of frost damage

Do not use the electrode at temperatures below 5°F (-15°C).

Storage temperature

32 to 122°F (0 to 50°C)

Ingress protection

NEMA 6 (IP 67): GSA plug-in head (with closed plug-in connection)
 NEMA 6P (IP 68): TOP 68 plug-in head, autoclavable up to 275°F / 135°C (3.28 ft / 1 m water column, 122°F / 50°C, 168 hours)
 NEMA 6P (IP 68): Memosens plug-in head (33 ft / 10 m water column, 77°F / 25°C, 45 days, 1M KCl)

Process

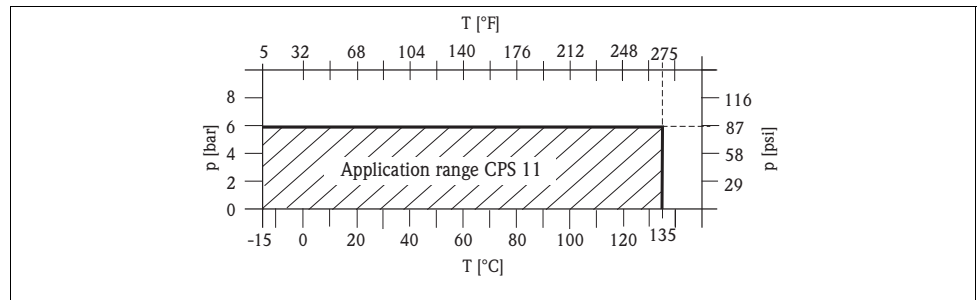
Process temperature

Version AA: 5 to 176°F (-15 to 80°C)
 Version BA: 32 to 275°F (0 to 135°C)
 Version FA: 32 to 158°F (0 to 70°C)

Process pressure

0 to 87 psi (0 to 6 bar)

Pressure temperature load curve



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Conductivity

min. 50 µS/cm

pH range

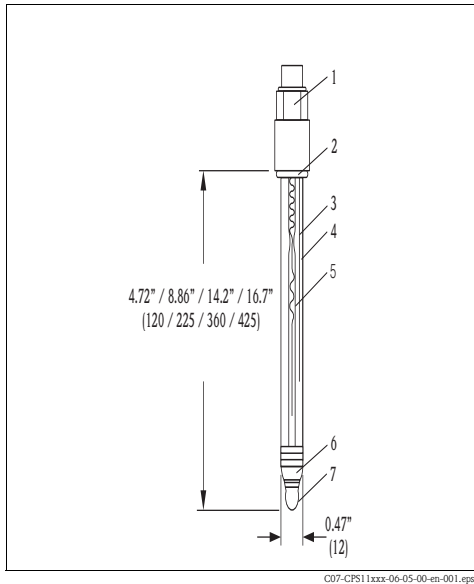
Version AA: 0 to 12 pH
 Version BA: 0 to 14 pH
 Version FA: 0 to 10 pH



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

Mechanical construction

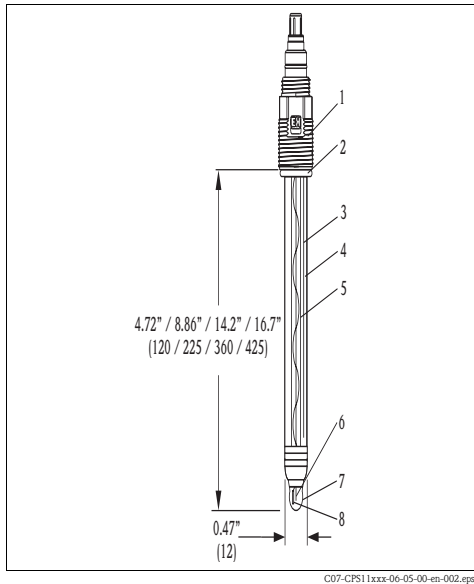
Design, dimensions



C07-CPS11 xxx-06-05-00-en-001.eps

CPS11 with GSA plug-in head

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

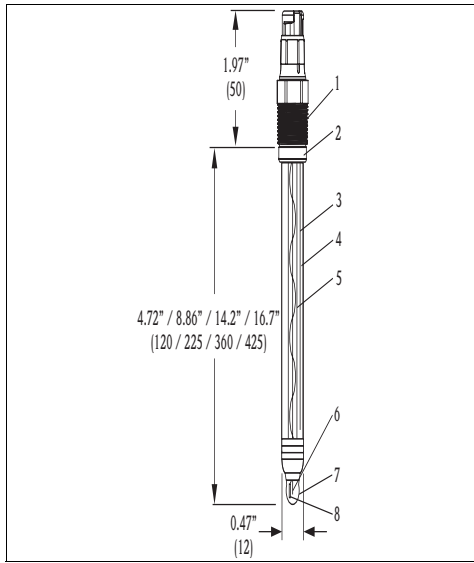


C07-CPS11 xxx-06-05-00-en-002.eps

CPS11 with ESA plug-in head, temperature sensor

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

Design, dimensions CPS11D



C07-CPS11 xxx-06-05-00-en-003.eps

CPS11D with Memosens plug-in head, temperature sensor

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

Weight	approx. 0.2 lb. (0.1 kg)	
Material	Electrode shaft	process glass
	pH membrane glasses	types A, B, F
	Metal lead	Ag/AgCl
	Diaphragm	ring-shaped Teflon® diaphragm, sterilisable
Process connection	Pg 13.5	
Temperature sensor	CPS11:	Pt 100, Pt 1000
	CPS11D:	NTC
Plug-in heads	CPS11:	
	ESA:	plug-in head Pg 13.5, TOP68 for electrodes with or without temperature sensor, 16 bar / 232 psi triple overpressure safety, Ex
	GSA:	plug-in head Pg 13.5 for electrodes without temperature sensor
	CPS11D:	Memosens plug-in head for digital, contactless data transmission
Reference system	Ag/AgCl metal lead with Advanced Gel 3 molar KCl, AgCl free	

Certificates and approvals

Ex approval CPS 11 (ESA) and CPS11D	<ul style="list-style-type: none"> ■ ATEX II 1G EEX ia IIC T3/T4/T6 ■ FM Class I Div. 2, in combination with the Mypro CPM431 and Mycom S CPM153 transmitters (CPS11 only)
Biocompatibility	Biocompatibility validated according to: <ul style="list-style-type: none"> ■ ISO 10993-5:1993 ■ USP, current revision
TÜV certificate TOP68 plug-in head	Pressure resistance 232 psi (16 bar), min. triple overpressure safety
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 = 0 to 12, T = 5 to 176°F (-15 to 80°C), 87 psi (6 bar)	
	BA	pH = 0 to 14, T = 32 to 275°F (0 to 135°C), sterilizable, 87 psi (6 bar)	
	FA	pH = 0 to 10, T = 32 to 158°F (0 to 70°C), HF resistant up to 1 g/l, 87 psi (6 bar)	
		Shaft length	
	2	120 mm / 4.7"	
	4	225 mm / 8.9"	
	5	360 mm / 14.2"	
	6	425 mm / 16.7"	
		Plug-in head	
	ESA	Plug-in head Pg 13.5, TOP 68, 232 psi (16 bar), Ex	
	GSA	Plug-in head Pg 13.5, DIN coax, nonhazardous	
CPS11-			complete order code

Product structure CPS11D

		Version	
	7	Maximum 275°F (135°C), built-in temperature sensor	
		Application range	
	AA	pH = 0 to 12, T = 5 to 176°F (-15 to 80°C), 87 psi (6 bar)	
	BA	pH = 0 to 14, T = 32 to 275°F (0 to 135°C), sterilizable, 87 psi (6 bar)	
	FA	pH = 0 to 10, T = 32 to 158°F (0 to 70°C), HF resistant up to 1 g/l, 87 psi (6 bar)	
		Shaft length	
	2	120 mm / 4.7"	
	4	225 mm / 8.9"	
	5	360 mm / 14.2"	
	6	425 mm / 16.7"	
		Options	
	1	Standard	
CPS11D-			complete order code

Accessories

Assemblies (selection)

Cleanfit W CPA450

Manually operated, retractable assembly for pH/ORP electrodes, for installation of 120 mm / 4.7" electrodes in tanks and pipes,

Ordering acc. to product structure, see Technical Information (TI 183C/24/ae)
(Make sure to order the correct inner tube for your electrode version.)

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 (TI 217C/24/ae)

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 (TI 223C/24/ae)

Cleanfit P CPA473

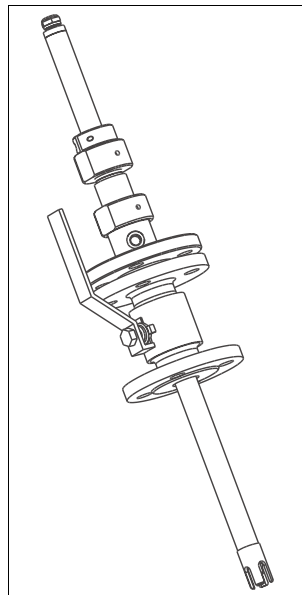
Retractable stainless steel process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment,

Ordering acc. to product structure, see Technical Information (TI 344C/24/ae)

Cleanfit P CPA474

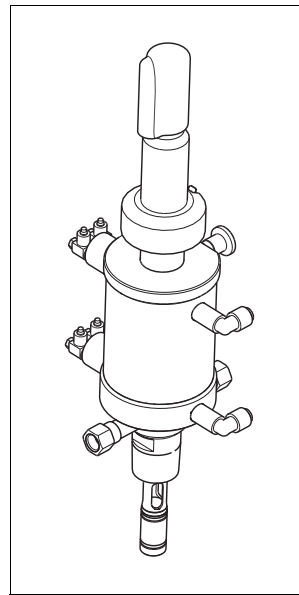
Retractable plastic process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment,

Ordering acc. to product structure, see Technical Information (TI 345C/24/ae)



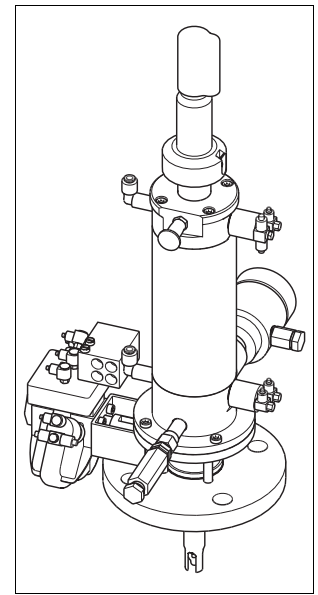
C07-CPA450xx-21-07-06-xx-001.eps

Cleanfit W CPA450



C07-CPA471ZY-21-07-06-xx-001.eps

Cleanfit P CPA471 or 472



C07-CPA473xx-21-07-06-xx-002.eps

Cleanfit P CPA473 or 474

Cleanfit H CPA475

Retractable assembly for installation in tanks and pipes under sterile conditions,

Ordering acc. to product structure, see Technical Information (TI 240C/24/ae)

Unifit H CPA442

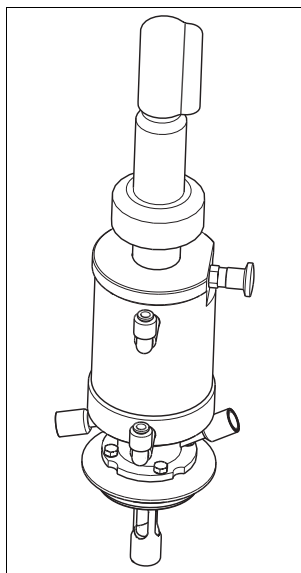
Process assembly for the food industry, biotechnology and pharmaceutical industry, with EHEDG and 3A certificates,

Ordering acc. to product structure, see Technical Information (TI 306C/24/ae)

Dipfit W CPA111

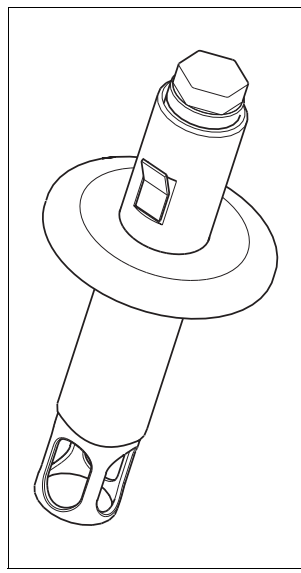
Plastic immersion and installation assembly for open and closed tanks,

Ordering acc. to product structure, see Technical Information (TI 112C/24/ae)



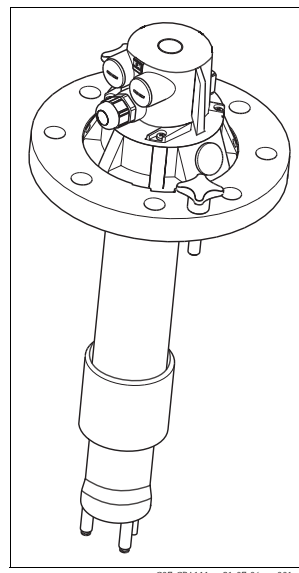
C07-CPA475FY-21-07-06-xx-001.eps

Cleanfit H CPA475



C07-CPA442FY-21-07-06-xx-001.eps

Unifit H CPA442



C07-CPA111xx-21-07-06-xx-001.eps

Dipfit W CPA111

Dipfit P CPA140

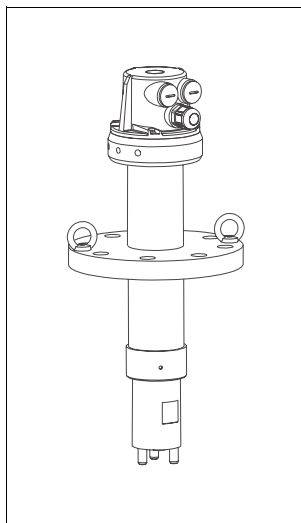
Immersion assembly for pH/ORP electrodes for demanding processes,
Ordering acc. to product structure, see Technical Information (TI 178C/24/ae)

Flowfit P CPA240

Flow assembly for pH/ORP electrodes, for demanding processes,
Ordering acc. to product structure, see Technical Information (TI 179C/24/ae)

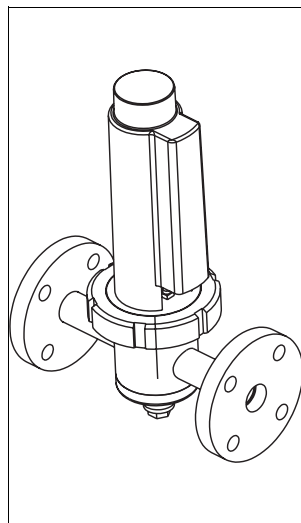
Flowfit W CPA250

Flow assembly for pH/ORP measurement,
Ordering acc. to product structure, see Technical Information (TI 041C/24/ae)



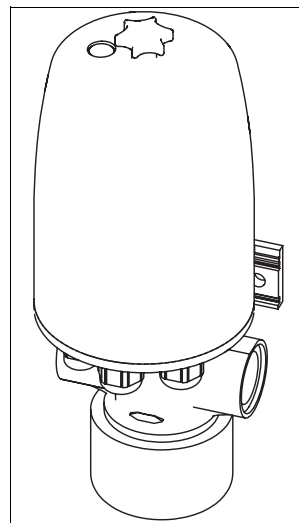
C07-CPA140xx-21-07-00-xx-001.eps

Dipfit P CPA140



C07-CPA240xx-21-07-06-xx-001.eps

Flowfit P CPA240



C07-CPA250xx-21-07-06-xx-002.eps

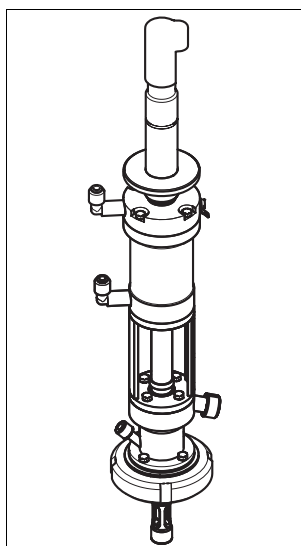
Flowfit W CPA250

Proffit H CPA465

Retractable assembly for installation in tanks and pipes under sterile conditions,
Ordering acc. to product structure, see Technical Information (TI 146C/24/ae)

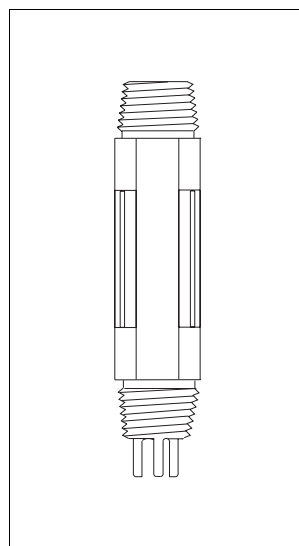
Ecofit CPA640

Process connection adapter and cable set for 120 mm (4.7") pH electrodes with TOP68 plug-in head,
Ordering acc. to product structure, see Technical Information (TI 264C/24/ae)



C07-CPA465xx-21-07-00-xx-002.eps

Probfit H CPA465



C07-CPA640xx-21-07-00-xx-001.eps

Ecofit CPA640

Buffer solutions

Technical buffer solutions, accuracy 0.02 pH, acc. to NIST/DIN

- pH 4.0 red, 100 ml (3 oz.), order no. CPY 2-0
- pH 4.0 red, 1000 ml (1 qt.), order no. CPY 2-1
- pH 7.0 green, 100 ml (3 oz.), order no. CPY 2-2
- pH 7.0 green, 1000 ml (1 qt.), order no. CPY 2-3

Technical buffer solutions for single use, accuracy 0.02 pH, acc. to NIST/DIN

- pH 4.0 20 x 20 ml (0.64 oz.), order no. CPY 2-D
- pH 7.0 20 x 20 ml (0.64 oz.), order no. CPY 2-E

Measuring cables

CPK9 special measuring cable

For electrodes with TOP 68 plug-in head, for high-temperature and high-pressure applications, NEMA 6P (IP 68)

Ordering acc. to product structure, see Technical Information (TI 118C/07/en)

CPK1 special measuring cable

For pH/ORP electrodes with GSA plug-in head

Ordering acc. to product structure, see Technical Information (TI 118C/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 (TI 118C/07/en)

CYK10 Memosens data cable
 For digital pH sensors with Memosens technology (CPSxxD)
 Ordering according to product structure, see below

Certificates	
A	Standard, non Ex
G	ATEX II 1G EEx ia IIC T6/T4
O	FM Cl.I Div. 1 AEx ia IIC T6/T4
S	CSA IS Cl.I Ex ia IIC T6/T4
Cable length	
03	Cable length: 10 ft (3 m)
05	Cable length: 16 ft (5 m)
10	Cable length: 33 ft (10 m)
15	Cable length: 50 ft (15 m)
20	Cable length: 66 ft (20 m)
25	Cable length: 82 ft (25 m)
Ready-made	
1	Wire terminals
CYK10-	complete order code

Documentation

Transmitters
 Liquisys M CPM223/253, Technical Information TI 194C/24/ae
 Mycom S CPM153, Technical Information TI 233C/24/ae
 Mypro CPM431, Technical Information TI 173C/24/ae

Measuring cables
 CPK1-12, Technical Information TI 118C/07/en

Memosens
 Memosens, Technical Information TI 376C/24/ae

07.04/SC USA

United States	Canada	Mexico
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	Endress+Hauser Canada 1075 Sutton Drive Burlington, ON L7L 5Z8 Tel. 905-681-9292 800-668-3199 Fax 905-681-9444 www.ca.endress.com	Endress+Hauser Paseo del Pedregal No. 610 Col. Jardines del Pedregal 01900, Mexico D.F. MEXICO Tel. 525-568-2405 Fax. 525-568-7459