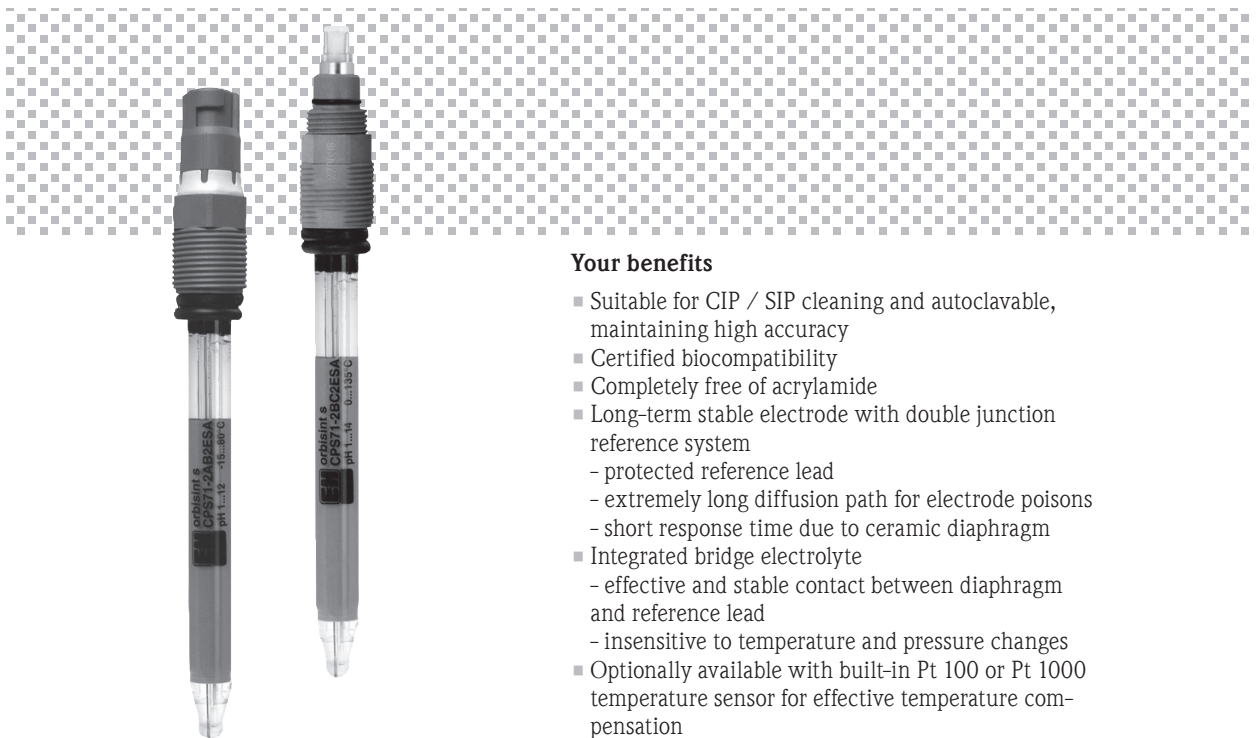


Technical Information

Ceragel CPS71 and CPS71D

pH electrodes, analog and digital with Memosens technology

For process technology, hygienic and sterile applications, with double junction reference system and integrated bridge electrolyte, and optional built-in temperature sensor



Your benefits

- Suitable for CIP / SIP cleaning and autoclavable, maintaining high accuracy
- Certified biocompatibility
- Completely free of acrylamide
- Long-term stable electrode with double junction reference system
 - protected reference lead
 - extremely long diffusion path for electrode poisons
 - short response time due to ceramic diaphragm
- Integrated bridge electrolyte
 - effective and stable contact between diaphragm and reference lead
 - insensitive to temperature and pressure changes
- Optionally available with built-in Pt 100 or Pt 1000 temperature sensor for effective temperature compensation

Benefits offered by Memosens technology

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

Applications

- Hygienic and sterile applications (sterilizable, autoclavable)
 - Fermenters
 - Biotechnology
 - Pharmaceutical industry
 - Food industry
- Process technology and monitoring of process with:
 - quickly changing pH values
 - high proportion of electrode poisons such as H₂S

FM and ATEX approvals for use in hazardous areas

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"> ■ Short response time The ceramic diaphragm allows sufficiently fast diffusion of the medium thus enabling short response times. ■ Insensitive to temperature and pressure changes Thanks to the composition of its integrated bridge electrolyte, the CPS71 is insensitive to temperature and pressure variation. ■ Sterilisable The electrode is sterilisable and autoclavable (max. 275°F / 135°C).
Important properties of CPS71D	<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 decoupled 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 carriers 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 CPS71D to a transmitter with Memosens technology. Data transmission to a standard transmitter is not possible.</p>

Data storage of CPS71D

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

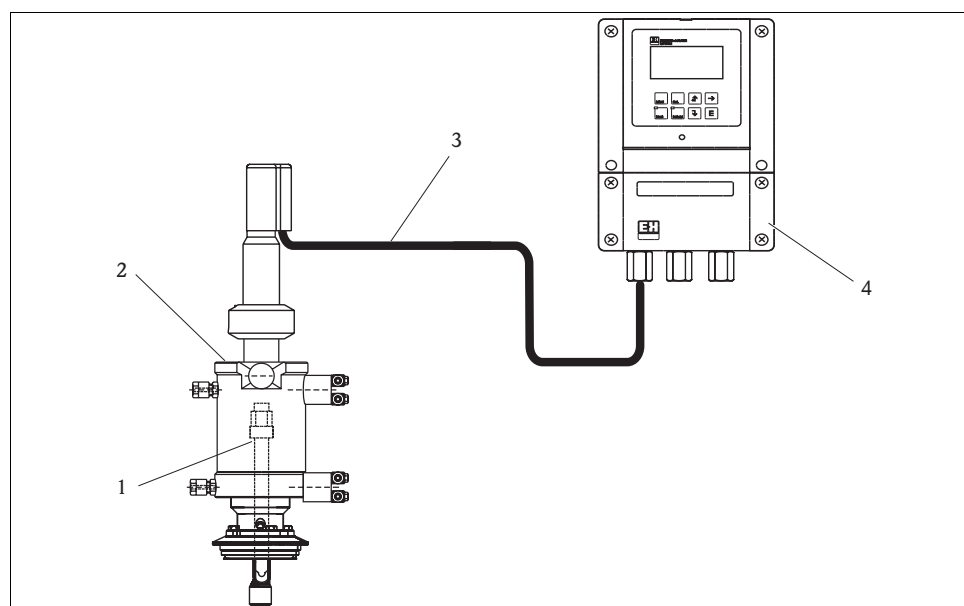
- Manufacturing data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Calibration date
 - Calibrated slope at 77°F (25°C)
 - Calibrated zero point at 77°F (25°C)
 - Temperature offset
 - Number of calibrations
 - Operator's signature for calibration or adjustment
- Application 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 sterilisations
 - Glass membrane impedance

These system data can be displayed with the Mycom S transmitter

Measuring system

A complete measuring system comprises:


- CPS71 pH electrode or CPS71D digital sensor
- Transmitter, e.g. Liquisys M CPM223/253 (with Memosens technology for CPS71D)
- CPK9 special measuring cable or CYK10 Memosens data cable for CPS71D
- Immersion, flow or retractable assembly sensor holder, e.g. Cleanfit H CPA475




Measuring system for pH measurement

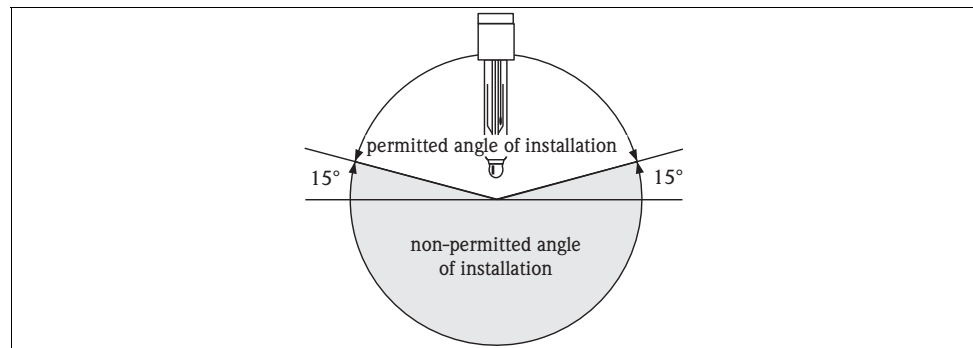
- 1 CPS71 pH electrode
- 2 CleanFit H CPA475 assembly
- 3 Special measuring cable CPK9 (for electrodes with TOP68 plug-in head / CYK10 for digital sensors)
- 4 Liquisys M CPM253 transmitter

Input

Measured variables	pH value Temperature
Measuring range	0 to 14 pH 32 to 275°F (0 to 135°C)
	 Caution! Please note the process operating conditions.

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> <p> Caution!</p> <ul style="list-style-type: none"> ■ 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

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Environment

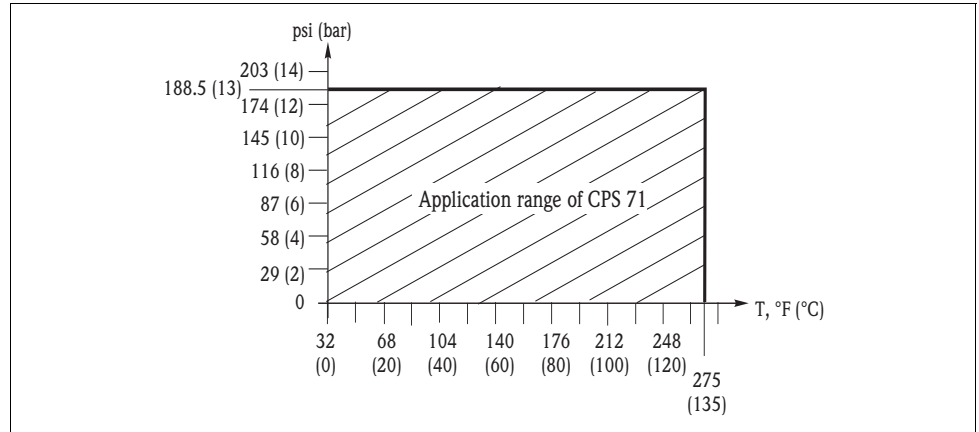
Ambient temperature	<p> Caution! Danger of frost damage Do not use the electrode at temperatures below 5°F (-15°C).</p>
Storage temperature	32 to 122°F (0 to 50°C)
Ingress protection	<p>NEMA 6 (IP 67) with GSA plug-in head (with closed plug-in connection) NEMA 6P (IP 68) with TOP68 plug-in head (33 ft / 10 m water column, 122°F / 50 °C, 168 h) NEMA 6P (IP 68) with Memosens plug-in head (33 ft / 10 m water column, 77°F / 25°C, 45 days, 1 M KCl)</p>

Process

Process temperature 32 to 275°F (0 to 135°C)

Process pressure 0 to 190 psi (0 to 13 bar)

Pressure temperature load curve



Conductivity Minimum 10 $\mu\text{S}/\text{cm}$

pH range

0 to 14 pH



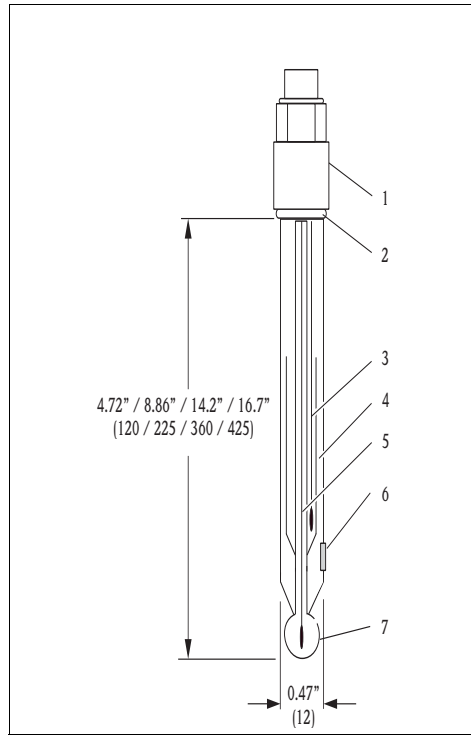
Caution!

Danger of damage to the electrode

Do not operate the electrode in applications outside the given specifications!

Mechanical construction

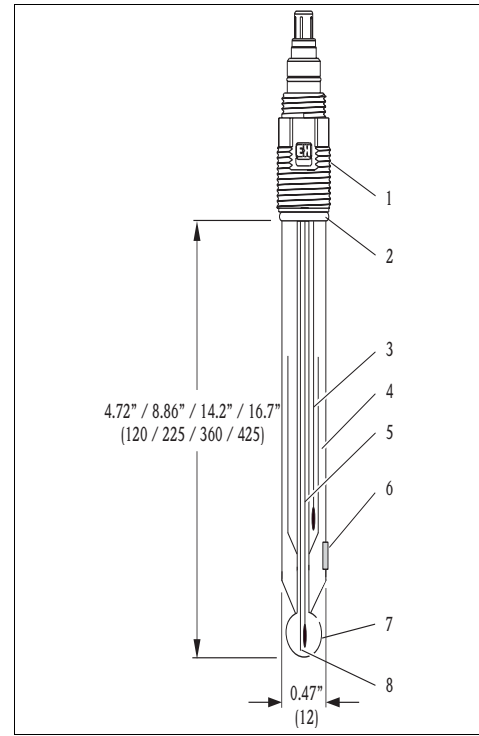
Design, dimensions CPS71



C07-CPS71xxx-06-05-00-en-002.eps

CPS71 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 Bridge electrolyte
- 5 Ag/AgCl metal lead
- 6 Diaphragm
- 7 pH membrane

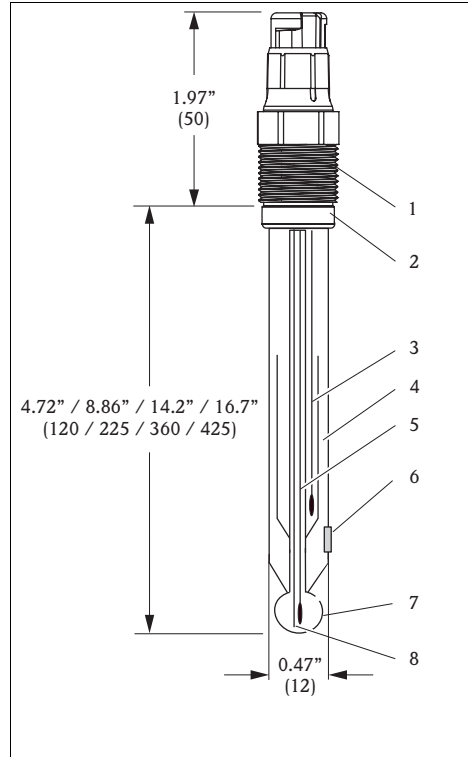


C07-CPS71xxx-06-05-00-en-001.eps

CPS71 with ESA plug-in head, temperature sensor

- 1 ESA plug-in head, Pg 13.5
- 2 EPDM O-ring with thrust collar
- 3 Ag/AgCl metal lead
- 4 Bridge electrolyte
- 5 Ag/AgCl metal lead
- 6 Diaphragm
- 7 pH membrane
- 8 Temperature sensor

Design, dimensions CPS71D



C07-CPS71xxx-06-05-00-en-003.eps

CPS71D 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 Bridge electrolyte
- 5 Ag/AgCl metal lead
- 6 Diaphragm
- 7 pH membrane
- 8 Temperature sensor

Weight	Approximately 0.2 lb. (0.1 kg)	
Material	Electrode shaft	process glass
	pH membrane glass	type B
	Metal lead	Ag/AgCl
	Diaphragm	ceramic diaphragm, sterilizable and autoclavable
Process connection	Pg 13.5	
Temperature sensor	CPS71:	Pt 100, Pt 1000
	CPS71D:	NTC
Plug-in heads	CPS71:	
	ESA	threaded plug-in head Pg 13.5, TOP68 for electrodes with and without temperature sensor, 232 psi (16 bar) triple overpressure safety, Hazardous areas
	GSA	threaded plug-in head Pg 13.5 for electrodes without temperature sensor
	CPS71D:	Memosens for digital contactless data transmission
Reference system	Ag/AgCl metal lead with Advanced Gel, 3 molar KCl, AgCl free Bridge electrolyte	

Certificates and approvals

Ex approval CPS71 (ESA) and CPS71D

- 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 (CPS71 only)

Biocompatibility

Biocompatibility validated according to:

- ISO 10993-5:1993
- USP, current revision

TÜV certificate TOP68 plug-in head

Pressure resistance 232 psi (16 bar), minimum triple overpressure safety

EMC compatibility of CPS71D

Interference emission and interference immunity complies with EN 61326: 1997 / A1: 1998

Ordering information

Product structure CPS71

Electrode type	
1	Without temperature sensor
2	With built-in Pt 100 (ESA plug-in head only)
3	With built-in Pt 1000 (ESA plug-in head only)
Application range	
BB	pH = 0 to 14, T = 32 to 275°F (0 to 135°C), 1 diaphragm, sterilizable
BC	pH = 0 to 14, T = 32 to 275°F (0 to 135°C), 3 diaphragms, sterilizable
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, TOP68, 232 psi (16 bar), Hazardous areas
GSA	Plug-in head Pg 13.5, DIN coax, nonhazardous areas
CPS71-	complete order code

Product structure CPS71D

Version	
7	Maximum 275°F (135°C), built-in temperature sensor
Application range	
BB	pH = 0 to 14, T = 32 to 275°F (0 to 135°C), 1 diaphragm, sterilizable
BC	pH = 0 to 14, T = 32 to 275°F (0 to 135°C), 3 diaphragms, sterilizable
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
CPS71D-	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

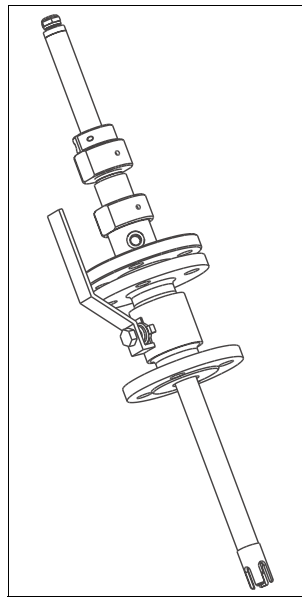
Retractable stainless steel process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment,

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

Cleanfit P CPA474

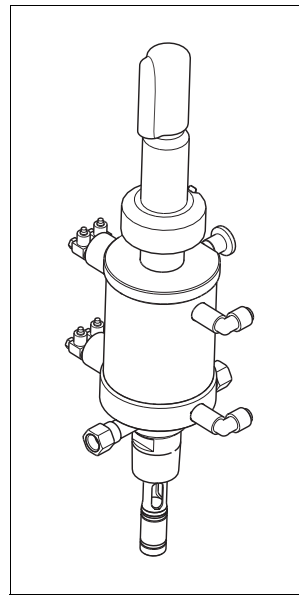
Retractable plastic process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment,

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



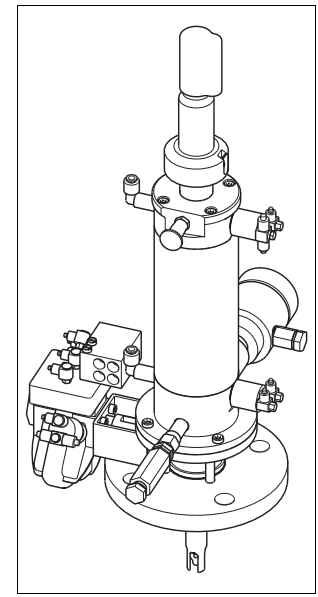
C07-CPA450xx-21-07-06-xx-001.eps

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

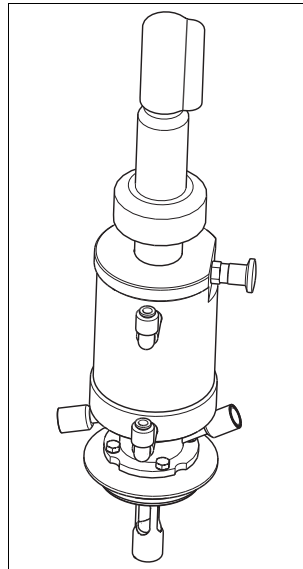
Process assembly for the food industry, biotechnology and pharmaceutical industry, with EHEDG and 3A certificates,

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

Dipfit W CPA111

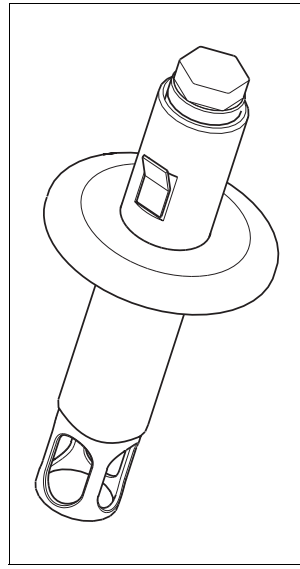
Plastic immersion and installation assembly for open and closed tanks,

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



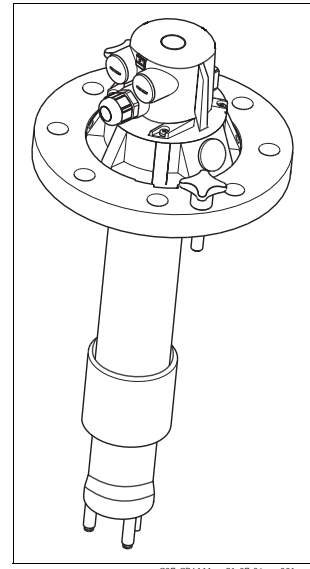
C07-CPA475FY-21-07-06-xx-001.eps

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

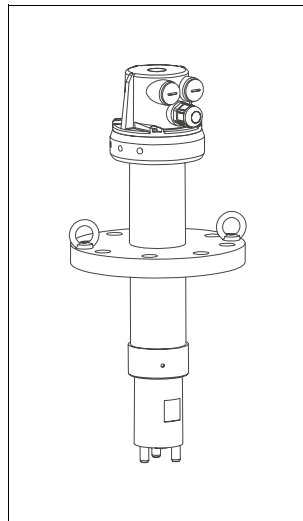
Immersion assembly for pH/ORP electrodes for demanding processes,
Ordering acc. to product structure, see Technical Information (TI 178C/24/ae)

Flowfit P CPA240

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

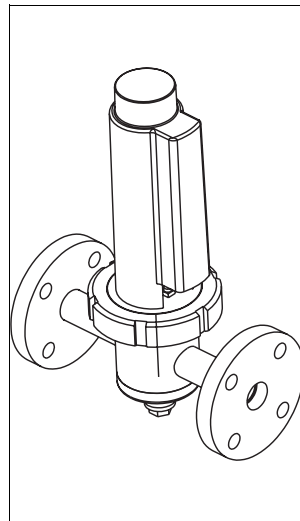
Flowfit W CPA250

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



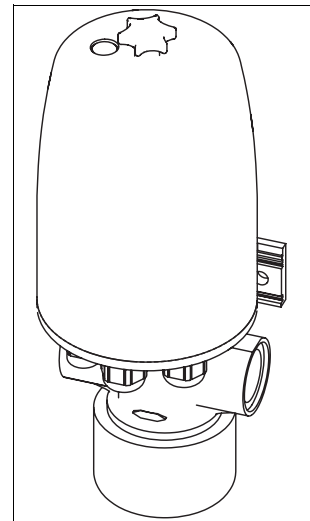
C07-CPA140xx-21-07-00-xx-001.eps

Dipfit P CPA140



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

Flowfit P CPA240



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

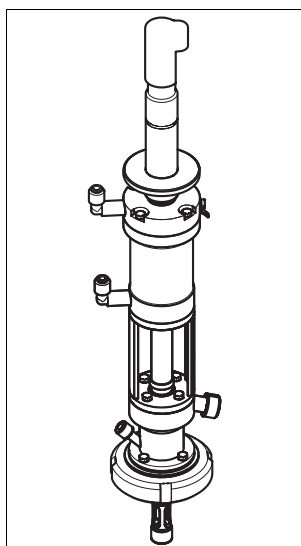
Flowfit W CPA250

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)

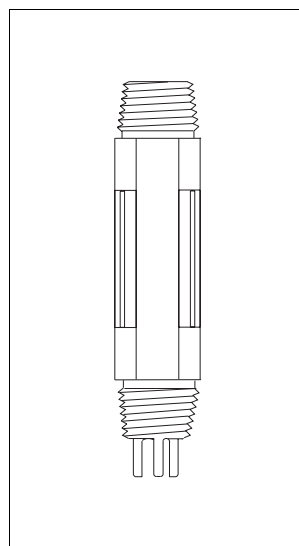
Ecofit CPA640

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 next page

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

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