Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Orbipore CPS91 and CPS91D

pH electrodes, analogue and digital with Memosens technology With open aperture for heavily soiled media, optional built-in temperature sensor

Application

- Chemical processes
- Heavily soiled media:
  - Solids
  - Emulsions
  - Precipitation

With ATEX and FM approval for application in hazardous areas

Your benefits

- Low maintenance due to gel filling
- Open aperture for application in heavily soiled media
- Built-in temperature sensor for effective temperature compensation (optional)
- Long service life due to new stabilised gel
- Extremely insensitive to pressure and temperature variation
- Short response time

Further 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

TI375C/07/en/03.04
51513127

Endress+Hauser
People for Process Automation

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

- **Open aperture**
  Due to its open aperture, the CPS91 electrode can be applied in heavily soiled media.
- **Temperature compensation**
  Depending on the ordered version, a Pt 100 or Pt 1000 temperature sensor is integrated in the electrode to measure the medium temperature.
- **Durability**
  The electrode is pressure-proof up to 13 bar / 188.5 psi and can be applied with temperatures of up to 110 °C / 230 °F.

Important properties of CPS91D

Maximum process safety
The inductive and non-contacting measured value transfer 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" or an impedance converter.
- The cable does not act like an antenna. Thus, EMC safety is guaranteed.

Data safety through digital data transfer
The Memosens technology digitalises the measured value in the sensor and transfers it to the transmitter via a contactless connection. 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
- The digital signals are suitable for application in hazardous areas; the integrated electronics are intrinsically safe.

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 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:

- pH sensors can be calibrated unter 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 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.

Communication with the transmitter
Always connect the CPS91D to a transmitter with Memosens technology. Data transmission to a standard transmitter is not possible.

Data storage of CPS91D

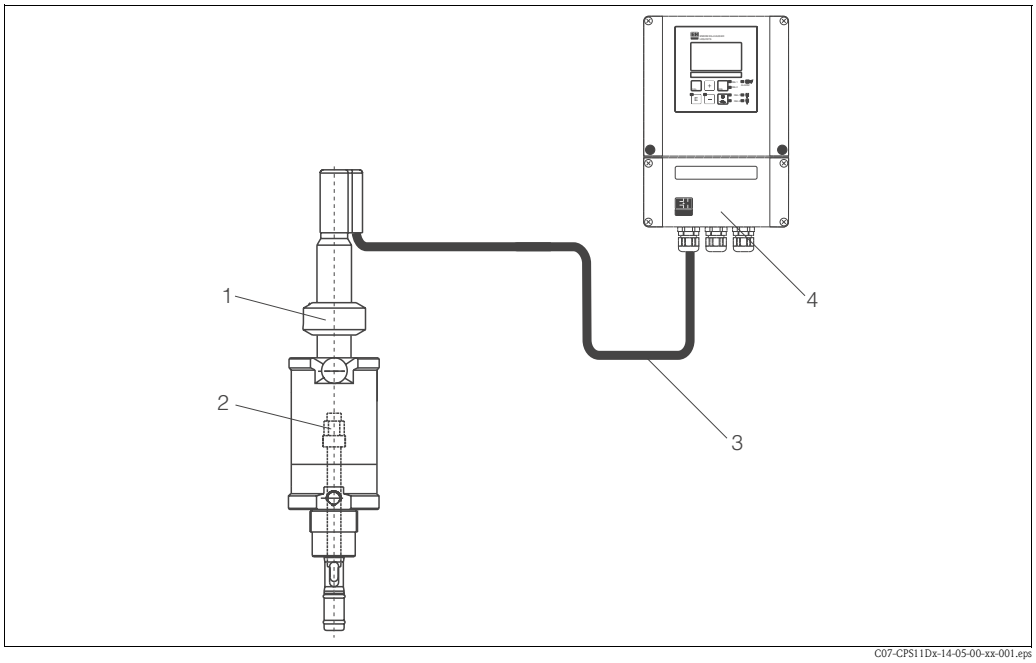
Digital sensors are able to store the following system data in the sensor.

- 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
  - 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 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 sterilisations
  - Glass membrane impedance

These system data can be displayed with the Mycom S transmitter

Measuring system

A complete measuring system comprises:
- CPS91 pH electrode or CPS91D digital sensor
- Transmitter, e.g. Liquisys M CPM223/253 (with Memosens technology for CPS91D)
- Special measuring cable, e.g. CPK9 or Memosens data cable CYK10 for CPS91D
- Immersion, flow or retractable assembly, e.g. Cleanfit P CPA472



Measuring system for pH measurement

1 Cleanfit P CPA472 retractable assembly
2 CPS91 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

0 ... 14 pH
0 ... 110 °C / 32 ... 230 °F

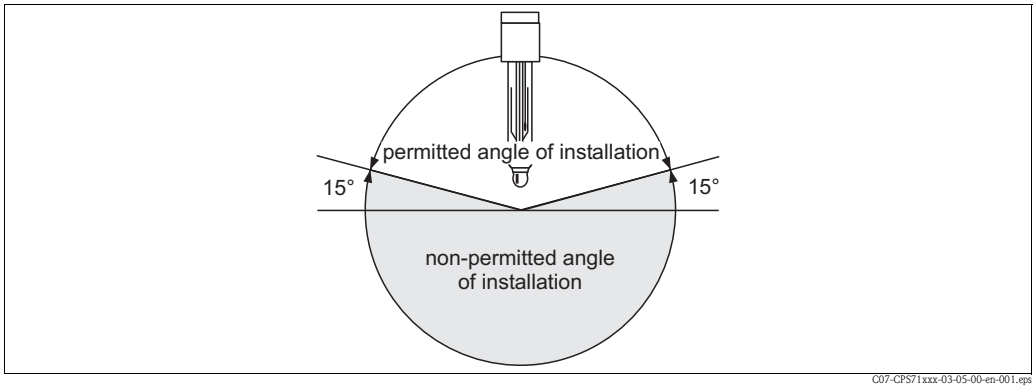
Caution!
Please note the process operating conditions.

Installation

Installation instructions

Do not install the electrode overhead. The angle of inclination must be at least 15° from the horizontal. A smaller installation angle is not allowed since such an angle results in air cushion forming in the glass sphere. This may impair full wetting of the pH membrane with the inner electrolyte.

Caution!
- 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 for the used assembly.



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

Environment

Ambient temperature

Caution!
Danger of frost damage
Do not operate the sensor at temperatures below –15 °C / 5 °F.

Storage temperature

0 ... 50 °C / 32 ... 122 °F

Ingress protection

IP 67 with GSA plug-in head (with closed plug-in connection)
IP 68 with TOP68 plug-in head (1 m / 3.28 ft water column, 50 °C / 122 °F, 168 h)
IP 68 with Memosens plug-in head (10 m / 32.81 ft water column, 25 °C /77 °F, 45 days, 1 M KCl)

Process

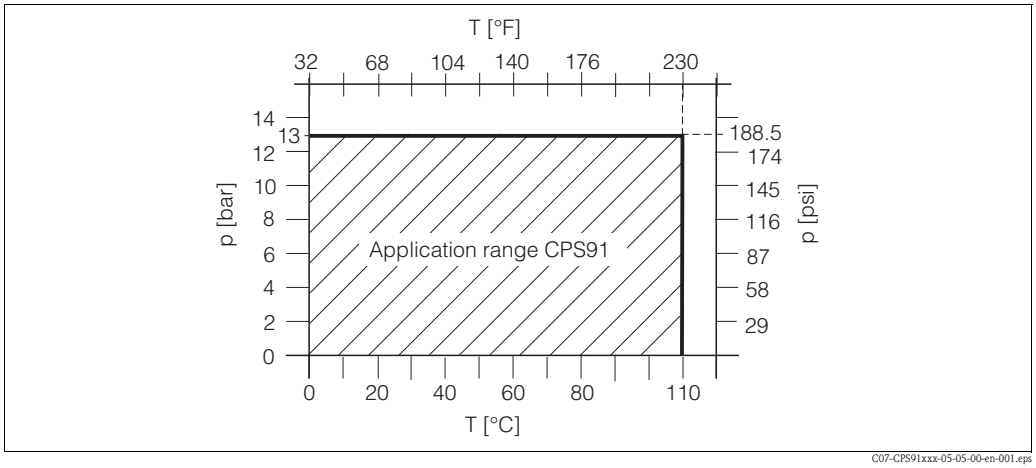
Process temperature

0 ... 110 °C / 32 ... 230 °F

Process pressure

0 ... 13 bar / 188.5 psi

Pressure-temperature load curve



Pressure-temperature load curve of CPS 91

Conductivity

min. 500 µS/cm

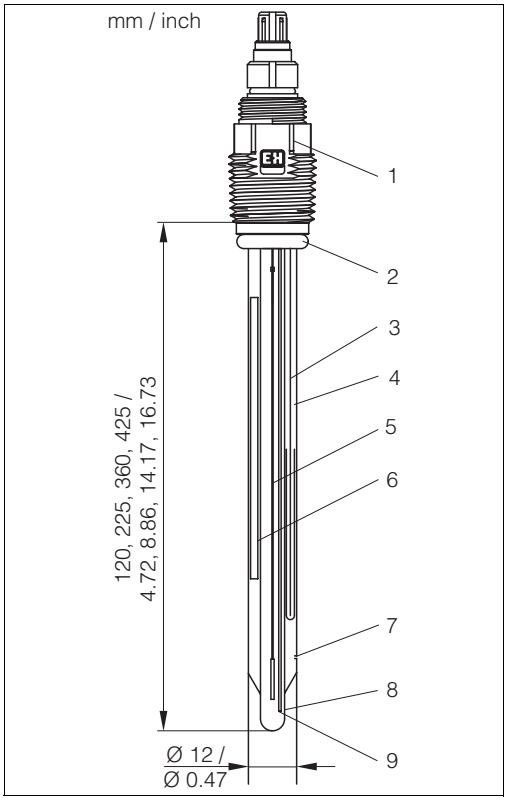
pH range

0 ... 14 pH

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

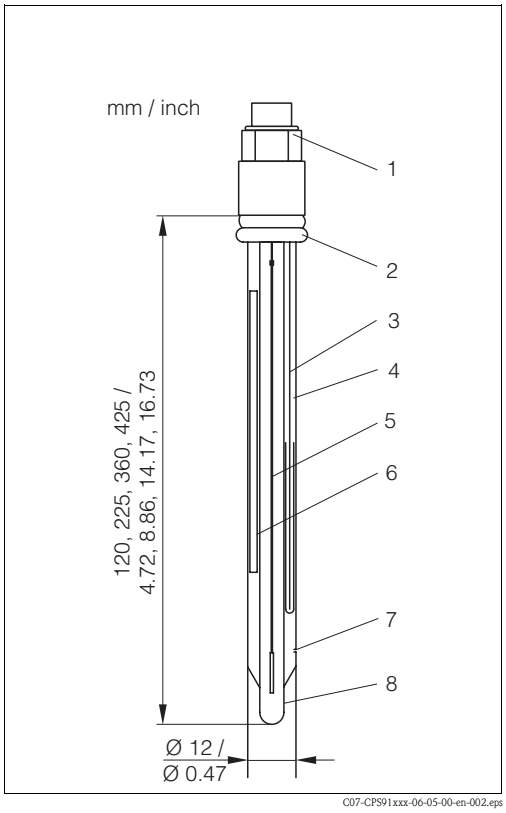
Mechanical construction

Design, dimensions CPS91



CPS91 with ESA plug-in head, temperature sensor

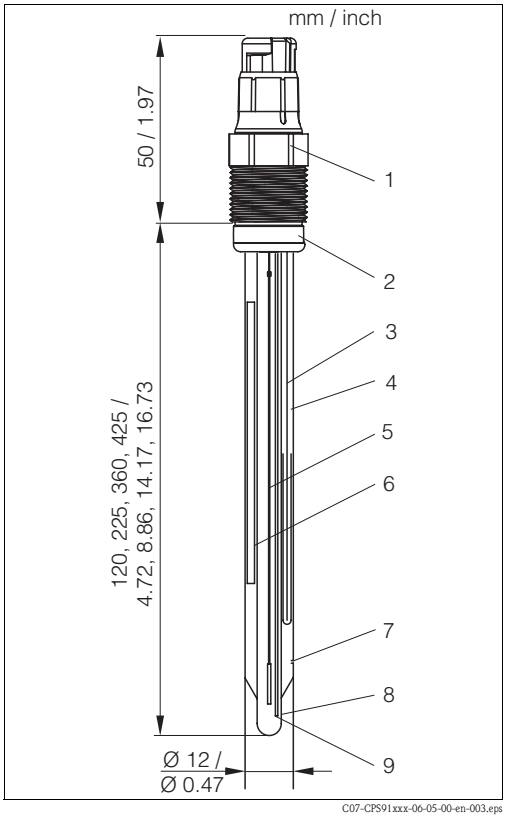
1 TOP68 plug-in head, Pg 13.5
2 EPDM O-ring with thrust collar
3 Ag/AgCl metal lead
4 Bridge electrolyte
5 Ag/AgCl metal lead
6 Compensator
7 Open aperture
8 pH membrane
9 Temperature sensor



CPS91 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 Compensator
7 Open aperture
8 pH membrane

Design, dimensions CPS91D



CPS91D 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 - reference chamber
4 Bridge electrolyte
5 Ag/AgCl metal lead
6 Compensator
7 Open aperture
8 pH membrane
9 Temperature sensor

Weight

approx. 0.1 kg / 0.2 lb.

Material

Electrode shaft	glass, suitable for processes
pH membrane glass	type B
Metal lead	Ag/AgCl
Diaphragm	open aperture

Process connection

Pg 13.5

Temperature sensor

CPS91:	Pt 100, Pt 1000
CPS91D:	NTC

Plug-in heads

CPS91:
- ESA: plug-in head Pg 13.5, TOP 68 for electrodes with or without temperature sensor, 16 bar / 232 psi triple safety overpressure, Ex
- GSA: plug-in head Pg 13.5 for electrodes without temperature sensor

CPS91D: Memosens for digital, contactless data transmission

Reference system

Ag/AgCl metal lead with reference electrolyte

Certificates and approvals

Ex approval CPS91 (ESA) and CPS91D

- ATEX II 1G EEX ia IIC T4/T6
- FM Class I Div. 2, in combination with the Mypro CPM431 and Mycom S CPM153 transmitters (CPS91 only)

TÜV certificate TOP68 plug-in head

Pressure resistance 16 bar, min. triple overpressure safety

EMC compatibility of CPS91D

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

Ordering information

Product structure CPS91

	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	
		BO	pH = 0 ... 14, T = 0 ... 110 °C / 32 ... 230 °F

			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, Ex
				GSA	Plug-in head Pg 13.5, DIN coax, non Ex

CPS91-						complete order code

Product structure CPS91D

	Version	
	7	max. 110 °C / 230 °F with built-in temperature sensor

		Application range	
		BO	pH = 0 ... 14, T = 0 ... 110 °C / 32 ... 230 °F

			Shaft length	
			2	120 mm / 4.72"
			4	225 mm / 8.86"
			5	360 mm / 14.17"
			6	425 mm / 16.73"

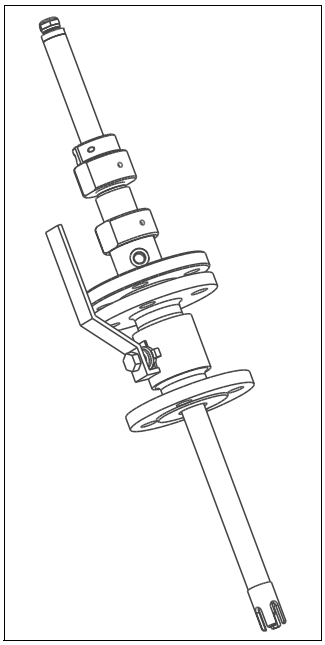
				Options	
				1	Standard

CPS91D-						complete order code

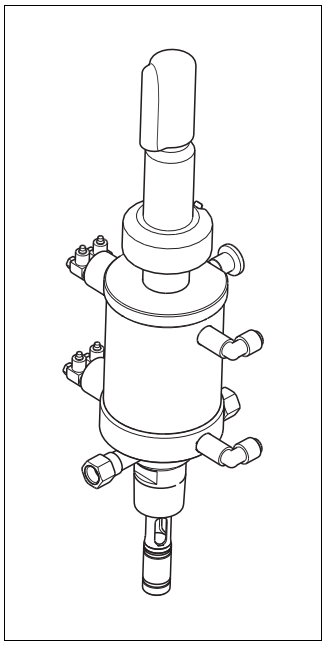
Accessories

Assemblies (selection)

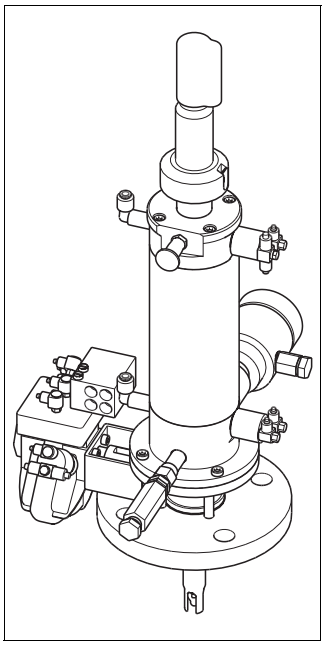
- ❑ Cleanfit W CPA450
  Manually operated retractable assembly for pH/redox electrodes, for installation of 120 mm / 4.72" electrodes in tanks and pipes,
  Ordering acc. to product structure, see Technical Information (TI 183C/07/en, order no. 50090677)
  (Make sure to order the correct inner tube for your electrode version.)
- ❑ Cleanfit P CPA471
  Compact retractable stainless steel assembly, for the installation in tanks and pipes, manual or pneumatic operation;
  Ordering acc. to product structure, see Technical Information (TI 217C/07/en, order no. 51502596)
- ❑ Cleanfit P CPA472
  Compact retractable plastic assembly, for the installation in tanks and pipes, manual or pneumatic operation;
  Ordering acc. to product structure, see Technical Information (TI 223C/07/en, order no. 51502645)
- ❑ 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/07/en, order no. 51510923)
- ❑ 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/07/en, order no. 51510925)



Cleanfit W CPA450

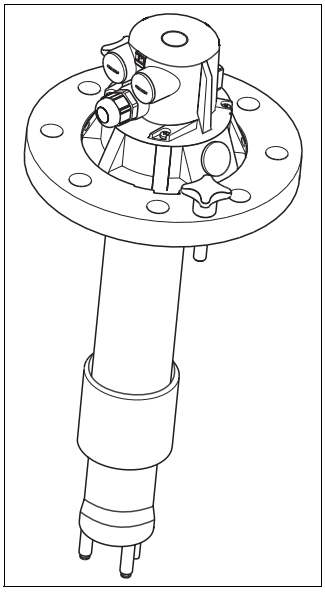


Cleanfit P CPA471 or 472

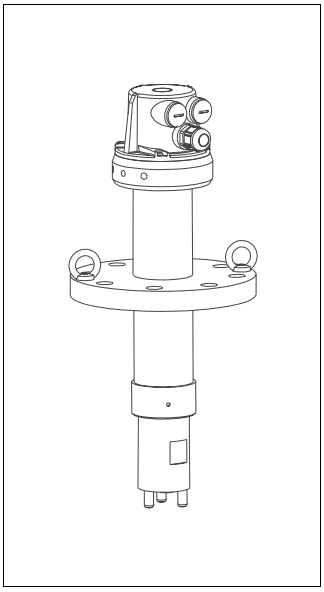


Cleanfit P CPA473 or 474

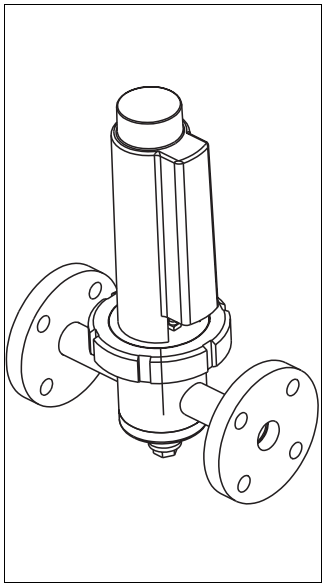
❑ Dipfit W CPA111
Plastic immersion and installation assembly, for open and closed tanks;
Ordering acc. to product structure, see Technical Information (TI 112C/07/en, order no. 50066450)
❑ Dipfit P CPA140
Immersion assembly for pH/redox electrodes for demanding processes;
Ordering acc. to product structure, see Technical Information (TI178C/07/en, order no. 50088968)
❑ Flowfit P CPA240
Flow assembly for pH/redox, for demanding processes;
Ordering acc. to product structure, see Technical Information (TI 179C/07/en, order no. 50088970)



Dipfit W CPA111

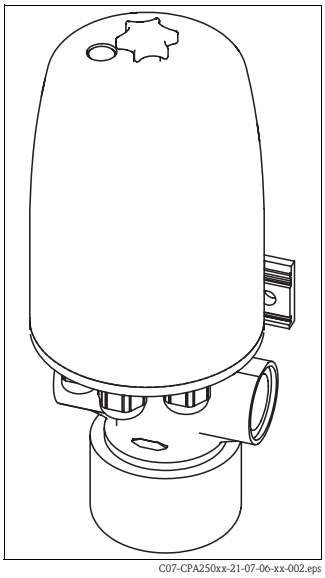


Dipfit P CPA140

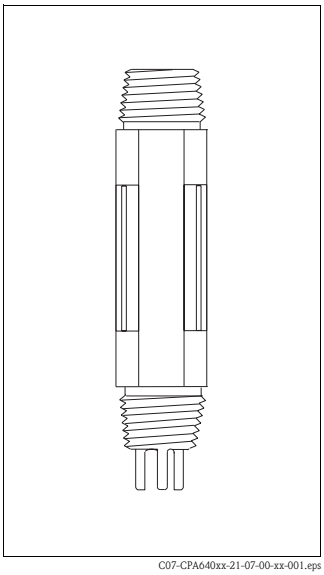


Flowfit P CPA240

- Flowfit W CPA250
  Flow assembly for pH and redox measurement
  Ordering acc. to product structure, see Technical Information (TI 041C/07/en, order no. 50036058)
- Ecofit CPA640
  Process connection adapter and cable set for 120 mm / 4.72" pH/redox electrodes with TOP68 plug-in head;
  Ordering acc. to product structure, see Technical Information (TI 264C/07/en, order no. 51506405)



Flowfit W CPA250



Ecofit CPA640

Buffer solutions

Technical buffer solutions, accuracy 0.02 pH, acc. to NIST/DIN
❑ pH 4.0 red, 100 ml (0.026 US gal.), order no. CPY 2-0
❑ pH 4.0 red, 1000 ml (0.264 US gal.), order no. CPY 2-1
❑ pH 7.0 green, 100 ml (0.026 US gal.), order no. CPY 2-2
❑ pH 7.0 green, 1000 ml (0.264 US gal.), 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 (0.005 US gal.), order no. CPY 2-D
❑ pH 7.0 20 x 20 ml (0.005 US gal.), 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, IP 68
Ordering acc. to product structure, see Technical Information (TI 118C/07/en)

❑ CPK1 special measuring cable
For pH/redox electrodes with GSA plug-in head
Ordering acc. to product structure, see Technical Information (TI 118C/07/en)

❑ CPK12 special measuring cable
For pH/redox 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 CI.I Div. 1 AEx ia IIC T6/T4			
	S	CSA IS CI.I Ex ia IIC T6/T4			
		Cable length			
		03	Cable length: 3 m / 9.84 ft		
		05	Cable length: 5 m / 16.41 ft		
		10	Cable length: 10 m / 32.81 ft		
		15	Cable length: 15 m / 49.22 ft		
		20	Cable length: 20 m / 65.62 ft		
		25	Cable length: 25 m / 82.03 ft		
			Ready-made		
			1	Wire terminals	
CYK10-					complete order code

Documentation

Transmitters

❑ Liquisys M CPM223/253, Technical Information TI 194C/07/en; order no. 51500277
❑ Mycom S CPM153, Technical Information TI 233C/07/en; order no. 51503788
❑ Mypro CPM431, Technical Information TI 173C/07/en; order no. 50088309

Measuring cables

❑ CPK1-12, Technical Information TI 118C/07/en; order no. 50068526

Memosens

❑ Memosens, Technical Information TI 376C/07/en; order no. 51513172

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