Technical Information

Ceraliquid CPS42/CPS42D/CPS43
ORP electrodes, analog and digital with Memosens technology and reference electrode
Each with ceramic diaphragm and liquid KCl electrolyte

Application
Media with very low conductivities or a high percentage of organic solvents or alcohols:
- Food industry
- Biotechnology
- Laboratory measurements
- Power plants

Your benefits
- Liquid KCl electrolyte enabling use at very low conductivities
- Ceramic diaphragm with defined KCl flow
- Application under pressures of up to 10 bar / 145 psi with counter pressure
- Resistant to poisoning thanks to separate reference lead
- Suitable for CIP / SIP cleaning
- Three lengths available: 120, 225 and 425 mm / 4.72, 8.86 and 16.7 inches

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 thanks to registration of sensor load data

With ATEX, FM¹ and CSA¹ approval for application in hazardous areas

¹ approval for digital sensors pending
# Function and system design

<table>
<thead>
<tr>
<th>Measuring principle</th>
<th>ORP measurement</th>
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<tbody>
<tr>
<td></td>
<td>The ORP potential is a unit of measurement for the state of equilibria between oxidising and reducing components of a medium. ORP potential is measured similarly to the pH value. A platinum or gold electrode is used instead of pH-sensitive membrane glass. Analog to the pH measurement, an integrated Ag/AgCl reference system is used as a reference electrode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General properties</th>
<th>Application at low conductivity</th>
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<tbody>
<tr>
<td></td>
<td>Thanks to its liquid KCl electrolyte filling, the CPS42 can be applied at very low conductivities (≥ 5 μS/cm).</td>
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<tr>
<td>Sterilizable</td>
<td>The electrode can be used in applications with steam sterilization (max. 130 °C / 266 °F).</td>
</tr>
<tr>
<td>Durability</td>
<td>The electrode can be applied under pressures of up to 10 bar /145 psi with counter pressure.</td>
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<thead>
<tr>
<th>Important properties CPS42D</th>
<th>Maximum process safety</th>
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<tbody>
<tr>
<td></td>
<td>The inductive and non-contacting measured value transmission of Memosens guarantees maximum process safety and offers the following benefits:</td>
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<td></td>
<td>■ All problems caused by moisture are eliminated.</td>
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<td></td>
<td>– The plug-in connection is free from corrosion.</td>
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<tr>
<td></td>
<td>– Measured value distortion from moisture is not possible.</td>
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<td></td>
<td>– The plug-in system can even be connected under water.</td>
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<tr>
<td></td>
<td>■ The transmitter is galvanically decoupled from the medium. The result: No more need to ask about &quot;symmetrically high-impedance&quot; or &quot;unsymmetrical&quot; or an impedance converter.</td>
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<tr>
<td></td>
<td>■ EMC safety is guaranteed by screening measures for the digital measured value transmission.</td>
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<tr>
<th>Data safety through digital data transfer</th>
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<tr>
<td>The Memosens technology digitalizes the measured value in the sensor and transfers it to the transmitter via a contactless connection. The result:</td>
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<tr>
<td>■ An automatic error message is generated if the sensor fails or the connection between sensor and transmitter is interrupted.</td>
</tr>
<tr>
<td>■ The availability of the measuring point is dramatically increased by immediate error detection.</td>
</tr>
<tr>
<td>■ The digital signals are suitable for application in hazardous areas; the integrated electronics are intrinsically safe.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Easy handling</th>
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<tbody>
<tr>
<td>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 high temperatures. When the sensor is mounted, the calibration data are automatically transferred to the transmitter and used to calculate the current redox potential. Storing the calibration data in the sensor allows for calibration and adjustment away from the measuring point. The result:</td>
</tr>
<tr>
<td>■ The sensors can be calibrated under optimum external conditions in the measuring lab. Wind and weather do neither affect the calibration quality nor the operator.</td>
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<tr>
<td>■ The measuring point availability is dramatically increased by the quick and easy replacement of precalibrated sensors.</td>
</tr>
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<td>■ The transmitter does not need to be installed close to the measuring point but can be placed in the control room.</td>
</tr>
<tr>
<td>■ Maintenance intervals can be defined based on all stored sensor load and calibration data and predictive maintenance is possible.</td>
</tr>
<tr>
<td>■ 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication with the transmitter</th>
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<tbody>
<tr>
<td>Always connect the digital sensor to a digital transmitter with Memosens technology. Data transmission to an analog transmitter is not possible.</td>
</tr>
</tbody>
</table>
Data storage of the CPS42D

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 offset (operating mode "mV")
  - % slope (operating mode "%")
  - Number of calibrations
  - Serial number of the transmitter used for the last calibration

- **Application data**
  - Temperature application range
  - Redox application range
  - Date of first commissioning
  - Operating hours

These system data can be displayed with the Mycom S or the Liquiline M CM42 transmitter.

### Measuring system

A complete measuring system comprises:

- CPS42 or CPS42D ORP electrode
- Transmitter, e.g. Liquisys M CPM223/253 (with Memosens technology for CPS42D)
- Special measuring cable, e.g. CPK9 or CYK Memosens data cable for CPS42D
- Immersion, flow or retractable assembly, e.g. Unifit H CPA441

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**Input**

**Measured variables**

- ORP potential

**Measuring range**

-1500 to 1500 mV

*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. This might impair the contact of reference and metal lead.

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 [2.2 lbf ft / 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.

![Electrode installation; inclination angle min. 15° from the horizontal]

Environment

Ambient temperature

Caution!
Danger of frost damage
Never use the electrode at temperatures below -15 °C / 5 °F.

Storage temperature
0 to 50 °C / 32 to 122 °F

Ingress protection
IP 67 / NEMA4X: GSA/SSA plug-in head (with closed plug-in system)
IP 68 / NEMA6P: TOP68 plug-in head (1 m / 3.28 ft water column, 50°C / 122°F, 168 h)
IP 68 / NEMA6P: Memosens plug-in head (10 m / 32.8 ft water column, 25°C / 77°F, 45 days, 1 M KCl)

Process

Process temperature
CPS42, CPS43: -15 to 130 °C / 5 to 266 °F
CPS42D: -15 to 135 °C / 5 to 275 °F

Process pressure
0 to 10 bar / 0 to 145 psi with counter pressure via a separate KCl vessel

Application
CPS42, CPS42D: Reducing media, e.g. chromate reduction, chlorine dosing in swimming pools
CPS43: Single reference electrode, used in combination with the CPS64 single pH electrode
KCl consumption

KCl consumption dependent on medium temperature
A KCl consumption (ml/d)
B Temperature (°C)
C Temperature (°F)
1 800 mbar / 11.6 psi overpressure
2 400 mbar / 5.8 psi overpressure
3 100 mbar / 1.5 psi overpressure

KCl consumption dependent on process pressure
A KCl consumption (ml/d)
B Overpressure to process (mbar)
C Overpressure to process (psi)
1 Medium temperature 80 °C / 176 °F
2 Medium temperature 50 °C / 122 °F
3 Medium temperature 20 °C / 68 °F

Mechanical construction

Design, dimensions CPS42

Unifit H CPA441 with CPS42 with GSA plug-in head
1 KCl reservoir
2 Mounting device
3 CPS42 (shaft length: 225 mm / 8.86")

CPS42 with ESA plug-in head for CPA441
1 TOP68 plug-in head Pg 13.5
2 Viton O-ring with thrust collar
3 KCl refilling
4 Inner metal lead
5 Ag/AgCl lead for the reference
6 Liquid KCl electrolyte
7 Ceramic diaphragm
8 Platinum ring
Design, dimensions CPS42D

CPS42D with Memosens plug-in head
1 Memosens plug-in head
2 Viton O-ring with thrust collar
3 KCl refilling
4 Inner metal lead
5 Ag/AgCl lead for the reference
6 Liquid KCl electrolyte
7 NTC 30K temperature sensor
8 Ceramic diaphragm
9 Platinum ring

CPS42D with Memosens plug-in head and KCl connection
1 Memosens plug-in head
2 Hose connection for KCl refilling
3 Viton O-ring with thrust collar
4 Inner metal lead
5 Ag/AgCl lead for the reference
6 Liquid KCl electrolyte
7 NTC 30K temperature sensor
8 Ceramic diaphragm
9 Platinum ring
Design, dimensions CPS43

CPS43 with SSA plug-in head
1 SSA plug-in head, Pg 13.5
2 Hose connection for KCl refilling
3 Viton O-ring with thrust collar
4 Ag/AgCl reference lead
5 Liquid KCl electrolyte
6 Ceramic diaphragm

CPS43 with ESS plug-in head
1 ESS plug-in head, Pg 13.5
2 Hose connection for KCl refilling
3 Viton O-ring with thrust collar
4 Ag/AgCl reference lead
5 Liquid KCl electrolyte
6 Ceramic diaphragm

Weight
0.1 kg / 0.2 lb.

Material
- Electrode shaft: process glass
- Redox measuring element: platinum ring
- Diaphragm: ceramic diaphragm, sterilisable

Process connection
Pg 13.5

Plug-in heads
CPS42:
 ESA: threaded plug-in head Pg 13.5, TOP68, 16 bar / 232 psi, Ex
 ESS: hose connection Pg 13.5, TOP 68, 10 bar / 145 psi, Ex
 GSA: threaded plug-in head Pg 13.5
 SSA: hose connection Pg 13.5
CPS42D-****A*:
 Memosens plug-in head for digital, contactless data transmission, 16 bar / 232 psi,
 Ex and non-Ex
CPS42D-****B*:
 Memosens plug-in head with hose connection for KCl refilling, for digital,
 contactless data transmission, 10 bar / 145 psi, Ex and non-Ex

Reference system
Ag/AgCl metal lead with liquid KCl, 3 M, AgCl free
Certificates and approvals

**Ex approval CPS42 (ESA, ESS)**
- ATEX II 2G EEx ia IIC T3/T4/T6
- FM Class I Div. 2, in combination with the Mypro CPM431 and Mycom S CPM153 transmitters

**Ex approval CPS42D**
- ATEX II 2G EEx ia IIC T3/T4/T6
- FMa / CSAa I Div. 2, in combination with the Liquiline M CM42 and Mycom S CPM153 transmitters

Note!
Ex versions of digital sensors with Memosens technology are indicated by an orange-red ring in the plug-in head.

**Biocompatibility**
Biocompatibility validated according to:
- ISO 10993-5:1993
- USP, current revision

**TÜV certificate TOP68 and Memosens plug-in heads**
Pressure resistance 16 bar [232 psi], min. triple overpressure safety

**Electromagnetic compatibility of CPS42D**

Ordering information

**Product structure CPS42**

<table>
<thead>
<tr>
<th>Electrode type</th>
<th>Measuring element</th>
<th>Shaft length</th>
<th>Plug-in head</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Standard version</td>
<td>PB Platinum ring</td>
<td>2 120 mm / 4.72&quot; (ESS and SSA plug-in heads only)</td>
<td>ESA Plug-in head Pg 13.5, TOP68, 16 bar / 232 psi, Ex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 225 mm / 8.86&quot; (ESA and GSA plug-in heads only)</td>
<td>ESS Hose connection Pg 13.5, TOP68, 16 bar / 232 psi, Ex</td>
</tr>
</tbody>
</table>

**Product structure CPS42D**

<table>
<thead>
<tr>
<th>Version</th>
<th>Measuring element</th>
<th>Shaft length</th>
<th>Electrolyte supply</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Basic version, max. 135 °C / 275 °F</td>
<td>PB Platinum ring</td>
<td>2 120 mm / 4.72&quot; (versions with KCl hose connection only)</td>
<td>A Shaft hole KCl refilling, CPA441</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 225 mm / 8.86&quot;</td>
<td>B KCl hose connection, CPY7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 425 mm / 16.73&quot;</td>
<td>I Non-hazardous areas</td>
<td></td>
</tr>
</tbody>
</table>

**CPS42D-** complete order code

a) approval pending
Product structure CPS43 (for combination with single pH electrode CPS64)

<table>
<thead>
<tr>
<th>Electrode type</th>
<th>Reference type</th>
<th>Shaft length</th>
<th>Plug-in head</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Standard version</td>
<td>TB Liquid KCl</td>
<td>120 mm / 4.72</td>
<td>ESS Hose connection Pg 13.5, TOP68, 16 bar / 232 psi, Ex SSA Hose connection Pg 13.5</td>
</tr>
</tbody>
</table>

**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.

**Assemblies**

- **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/24/ae]

- **Cleanfit P CPA472**
  Compact retractable plastic assembly for installation in tanks or pipes, manual or pneumatic operation
  Ordering acc. to product structure, see Technical Information [TI223C/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 [TI344C/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 [TI345C/24/ae]

- **Cleanfit H CPA475**
  Retractable assembly for installation in tanks and pipes under sterile conditions
  Ordering acc. to product structure, see Technical Information [TI240C/24/ae]
- **Unifit H CPA441**
  Process assembly with integrated electrolyte vessel for installation of pH/ORP electrodes
  Ordering acc. to product structure, see Technical Information (TI026C/24/ae)

- **Unifit H CPA442**
  Process assembly for the food industry, biotechnology and pharmaceutical industry, complies with EHEDG criteria and 3-A standard 74-02
  Ordering acc. to product structure, see Technical Information (TI306C/24/ae)

- **Dipfit W CPA111**
  Immersion and installation assembly for open and closed tanks
  Ordering acc. to product structure, see Technical Information (TI112C/24/ae)

- **Dipfit P CPA140**
  Immersion assembly for pH/ORP electrodes, for demanding processes
  Ordering acc. to product structure, see Technical Information (TI178C/24/ae)

- **Flowfit P CPA240**
  Flow assembly for pH/ORP electrodes, for demanding processes
  Ordering acc. to product structure, see Technical Information (TI179C/24/ae)

- **Flowfit W CPA250**
  Flow assembly for pH/ORP electrodes
  Ordering acc. to product structure, see Technical Information (TI041C/24/ae)
• Probit H CPA465
  Retractable assembly for installation in tanks and pipes under sterile conditions
  Ordering acc. to product structure, see Technical Information [TI146C/24/ae]
• 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/24/ae]

Electrolyte vessel
  • CPY7 electrolyte vessel
    Reservoir for KCl electrolyte, 150 ml / 0.04 US.gal
    Ordering acc. to product structure, see Operating Instructions [BA 128C/07/en]

Electrolyte solutions
  KCl-electrolyte solutions for liquid filled electrodes
  • 3.0 mol, T = -10 to 100 °C [14 to 212 °F], 100 ml (3 oz), order no. CPY4-1
  • 3.0 mol, T = -10 to 100 °C [14 to 212 °F], 1000 ml (30 oz), order no. CPY4-2
  • 1.5 mol, T = -30 to 100 °C [-22 to 266 °F], 100 ml (3 oz), order no. CPY4-3
  • 1.5 mol, T = -30 to 100 °C [-22 to 266 °F], 1000 ml (30 oz), order no. CPY4-4

Buffer solutions
  Technical buffer solutions for ORP electrodes
  • +220 mV, pH 7.0, 100 ml (0.026 US gal.); order no. CPY3-0
  • +468 mV, pH 0.1, 100 ml (0.026 US gal.); order no. CPY3-1

Transmitters
  • Liquisys M CPM223/253
    Transmitter for pH and redox, field or panel-mounted housing,
    HART® or PROFIBUS available
    Ordering acc. to product structure, see Technical Information [TI194C/24/ae]
  • Mycom S CPM153
    Transmitter for pH and redox, one or two channel version, Ex or Non-Ex,
    HART® or PROFIBUS available
    Ordering acc. to product structure, see Technical Information [TI233C/24/ae]
  • Liquiline M CM42
    Modular two-wire transmitter for Ex and non-Ex areas
    HART®, PROFIBUS or FOUNDATION™ Fieldbus available
    Ordering acc. to product structure, see Technical Information [TI381C/24/ae]
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/redox electrodes with GSA 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

<table>
<thead>
<tr>
<th>Certificates</th>
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<tbody>
<tr>
<td>A</td>
<td>Standard, non Ex</td>
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<tr>
<td>G</td>
<td>ATEX II 1G EEx ia IIC T6/T4</td>
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<table>
<thead>
<tr>
<th>Cable length</th>
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<tbody>
<tr>
<td>03</td>
<td>Cable length: 3 m / 9.84 ft</td>
</tr>
<tr>
<td>05</td>
<td>Cable length: 5 m / 16.41 ft</td>
</tr>
<tr>
<td>10</td>
<td>Cable length: 10 m / 32.81 ft</td>
</tr>
<tr>
<td>15</td>
<td>Cable length: 15 m / 49.22 ft</td>
</tr>
<tr>
<td>20</td>
<td>Cable length: 20 m / 65.62 ft</td>
</tr>
<tr>
<td>25</td>
<td>Cable length: 25 m / 82.03 ft</td>
</tr>
<tr>
<td>88</td>
<td>... m length</td>
</tr>
<tr>
<td>89</td>
<td>... ft length</td>
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<table>
<thead>
<tr>
<th>Ready-made</th>
<th>Wire terminals</th>
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<tbody>
<tr>
<td>CTK10-</td>
<td>complete order code</td>
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</table>

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