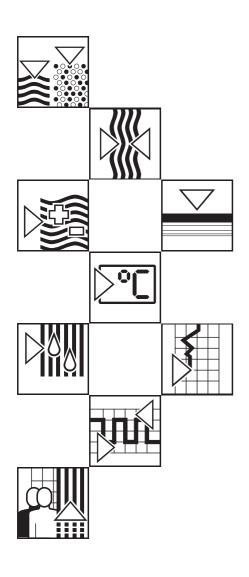
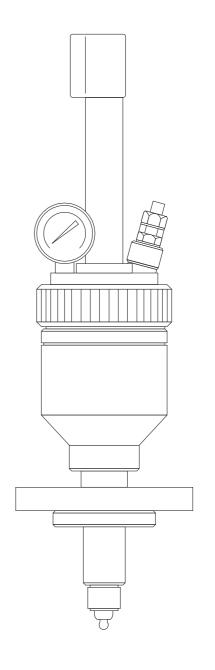
BA 026C/07/en/06.99 No. 51500738

# UniFit H CPA 441 Process Assembly for pH/Redox Measurement

**Operating Instructions** 









UniFit H CPA 441 Table of contents

#### PA441E00.CHP

# **Table of contents**

1	General information	2
1.1	Symbols used	2
1.2	Storage and transport	2
1.3	Unpacking	2
1.4	Packaging and disposal	2
1.5	Product structure	3
2	Safety	4
2.1	Intended use	4
2.2	General safety notes	4
2.3	Installation, start-up, operation	4
2.4	Safety features	
2.5	Notes for installation in pressurised systems	5
3	Installation	6
3.1	Measuring system	
3.2	Dimensions	
3.3	Mounting positions and mounting versions	
3.4	Installation or replacement of electrode and mounting of measuring cable	
3.5	Filling with electrolyte	10
4	Maintenance	12
4.1	Assembly cleaning	
4.2	Electrode cleaning	12
4.3	Calibration	13
4.4	O-ring replacement	14
5	Accessories and spare parts	15
6	Technical data	16
7	Index	17



#### 1 General information

#### 1.1 Symbols used



#### Warning:

This symbol alerts to hazards. Failure to observe these warnings may result in injury or damage to equipment.



#### Note:

This symbol indicates important items of information. Ignoring this information may result in malfunction.

#### 1.2 Storage and transport

The packaging material used to store or transport the assembly must provide shock protection. Optimal protection is provided by the original packaging materials.

The ambient conditions also have to meet the requirements (see Technical data).

## 1.3 Unpacking

Verify that the packaging and contents are undamaged! Inform the post office or freight carrier of any damage. Damaged merchandise must be retained until the matter has been settled.

Check that the delivery is complete and agrees with the shipping documents and your order (refer to nameplate for type and version).

The delivery comprises:

- Assembly UniFit H CPA 441
- Size 17 socket wrench
- Built-in adapter, as per your order already mounted or separate
- Operating instructions BA 026C/07/en.

Keep the original packaging materials for future storage or shipping of the assembly.

If you have any questions, consult your supplier or the Endress+Hauser sales agency in your area (see back cover of these operating instructions for addresses).

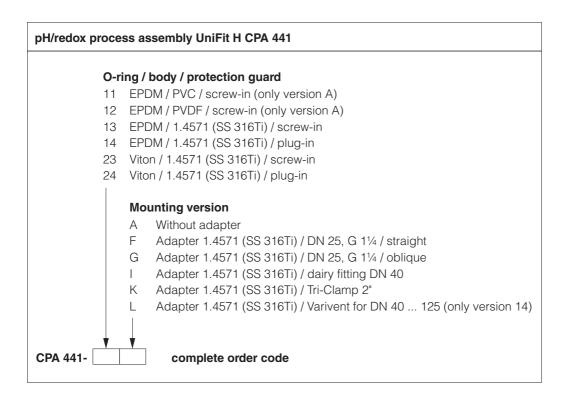
#### 1.4 Packaging and disposal

Package the assembly properly for reuse at a later point in time. Optimal protection is provided by the original packaging materials.

Observe local regulations for disposal.

PA441E01.CHP

#### 1.5 Product structure



# 2 Safety

#### 2.1 Intended use

The pH/redox process assembly UniFit H CPA 441 is intended for applications where the components in contact with medium must be steam-sterilised. Typical areas of application are fermenters, food industry, highly pasty media and media with very low conductivity.

The assembly consists of a built-in part and a vessel filled with liquid electrolyte. The cap of the electrolyte vessel contains the thread which will hold the electrode, a manometer and a screw coupling for the compressed-air connection. This quick-release coupling also serves as opening for refilling the electrolyte.

It is not necessary to remove the assembly or the electrode to refill. The pressure may be applied by compressed air or a manual pump.

It is the operator's responsibility to assure that the following safety regulations are observed:

- Regulations for explosion protection
- Regulations for installation
- Operating conditions for the device and its materials
- Local standards and regulations.

## 2.2 General safety notes

The assembly CPA 441 has been designed for safe operation according to the state of the art in engineering and according to current regulations and European standards (see Technical data).

However, if used improperly or other than for the intended purpose, it may be dangerous, e.g. due to incorrect installation or incorrect operating conditions.



#### Warning:

- Operating this assembly in any way other than described in these instructions may compromise the safety and function of the measuring system.
- The notes and warnings in these operating instructions must be strictly adhered to.

#### 2.3 Installation, start-up, operation



#### Warning:

- This device may only be installed, connected electrically, commissioned, operated and serviced by properly trained personnel authorised by the system operator.
- The personnel must be familiar with these operating instructions and must adhere to the instructions contained therein.
- When this assembly is used in an explosive atmosphere, adherence to the applicable regulations is mandatory.
- Check that all connections have been properly made before powering up the system.

- Damaged assemblies that may be dangerous must not be operated and should be clearly identified as being defective.
- Any troubleshooting of the measuring system must be performed exclusively by authorised, trained personnel.
- If faults cannot be remedied, the assembly must be removed from service and secured to prevent accidental start-up.
- Repairs not described in these operating instructions may only be performed directly at the manufacturer's works or by the Endress+Hauser service organisation.

# 2.4 Safety features

#### Safety devices

The assembly is protected against external influences and damage by media-resistant materials.

# 2.5 Notes for installation in pressurised systems



#### Warning:

- The maximum operating pressure of the assembly must not be exceeded.
- The system must be depressurised before installation or removal of the assembly.
- Couplings, cocks and lines must be checked for leakage and damage at regular intervals.

## 3 Installation

## 3.1 Measuring system

A complete measuring system comprises:

- the UniFit H CPA 441 assembly
- a combined pH/redox electrode, length 225 mm
- a measuring cable CPK 1 or CPK 7 (terminated)
- a pH/redox measuring instrument

and optionally

 a junction box VBA and a measuring cable (not terminated) for measuring cable extension.

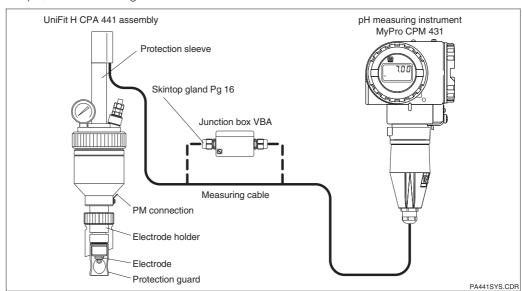
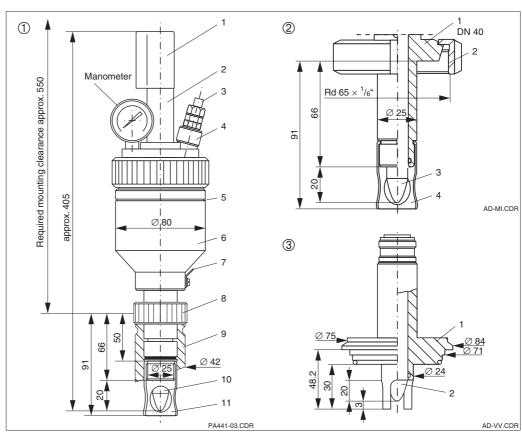


Fig. 3.1 Example of a complete measuring system

#### 3.2 Dimensions

- - 1 Splash protection cap with cable entry
  - 2 Protection sleeve
  - 3 Connection for compressed-air tube ID 6 / OD 8 or Ø 5 mm connection for air pump, max. 8 bar
  - 4 KCI refilling
  - 5 Filling mark6 Pressure vessel,
  - Pressure vessel transparent
  - 7 PM connection
  - 8 Coupling nut G 11/4 Material: 1.4571 (SS 316Ti)
  - 9 Built-in adapter, straight or oblique
  - 10 Electrode, shaft length 225 mm
  - 11 Protection guard
  - Mounting version: Dairy fitting DN 40
  - 1 Taper fitting
  - 2 Coupling nut F 40, DIN 11851
  - 3 Electrode
  - 4 Protection guard
  - (3) Mounting version: Varivent adapter
  - 1 Clamp fitting
  - 2 Electrode



PA441E03.CHP

# 3.3 Mounting positions and mounting versions

The UniFit H CPA 441 assembly is installed with the selected adapter.



#### Note:

- The permissible range of mounting positions comprises inclinations of the central axis of the assembly that do not fall below 15° from the horizontal (see Fig. 3.3). Ensure that the electrode contacts the medium to be measured. With inclined mounting, the change in the usable electrolyte volume must be considered (see chapter 3.5).
- The assembly must always be installed in such a way that the manometer and the compressed-air connection are located at the highest point and do not contact the electrolyte. Select an installation site that will allow easy removal of the quick-release coupling and will facilitate pressure readings. Ensure adequate mounting clearances for removal, installation, cleaning and maintenance.

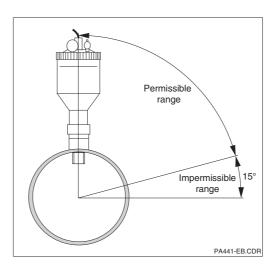


Fig. 3.3 Permissible mounting positions for CPA 441

#### **Built-in adapter**

The UniFit H CPA 441 assembly is introduced into the adapter – which may be welded on or glued on – and hand-tightened with the coupling nut. During installation, ensure that the O-ring is properly seated and clean.

The sealing surface of the built-in adapter must be protected against mechanical damage. To permit use in food applications, an Endress+Hauser built-in adapter should be used (see Fig. 3.4 and Fig. 3.5).

However, adapters from other manufacturers are basically usable as well. When installing the assembly in built-in adapters of less than 50 mm in length, the O-ring must be inserted in the second O-ring seat located further up. You should therefore avoid using pointed or sharp tools to change the O-rings.

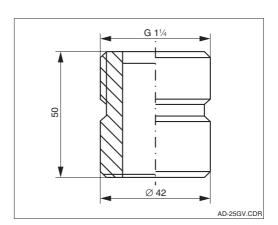


Fig. 3.4 Built-in adapter, straight

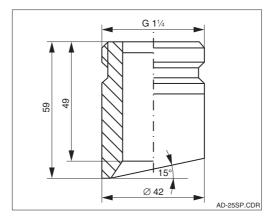


Fig. 3.5 Built-in adapter, oblique

#### Varivent adapter and dairy fitting

The versions of the UniFit H CPA 441 with Varivent adapter or dairy pipe fitting meet the requirements of the corresponding DIN standards, which must also be fulfilled by the counterparts. Observe the relevant regulations for installation. As a general rule, always ensure that the sealing elements are properly seated, clean and intact.

#### **Protection guard**

- The UniFit H CPA 441 assembly can be equipped with a protection guard (see Fig. 3.2) if desired.
- All versions are screwed in.
- Stainless steel versions are optionally plugged in.
- With the protection guard screwed in, even the stainless steel versions are no longer suitable for food applications.

# 3.4 Installation or replacement of electrode and mounting of measuring cable

pH/redox electrodes with a Pg 13.5 threaded plug-in head, a shaft length of 225 mm and a shaft diameter of 12 mm can be fitted into the assembly.

The sealing of the electrode is provided

- at the threaded plug-in head by an O-ring and a clamping ring
- at the lower shaft end via the O-ring in the hole of the assembly.



#### Warning:

- Always depressurise the assembly before removing the electrode (see chapter 3.5.2).
- Electrolyte present in the electrolyte vessel must be emptied out first, or it drains from the assembly through the built-in part.
- With installed assembly, by all means note the medium pressure!



#### Note:

- Make the electrode slidable before screwing in. Wetting with water is sufficient.
- During electrode installation, ensure that both O-rings are properly seated and clean.
- The rubber hoses above the electrode holes must be removed prior to installation. No air bubbles must be visible in the lower part of the electrode shaft. Shake the electrode several times if required.
- Should the assembly remain dry for an extended period after electrode installation, then the electrode tip must be kept moist, e.g. in KCl solution (3 mol/l).

PA441E03.CHP

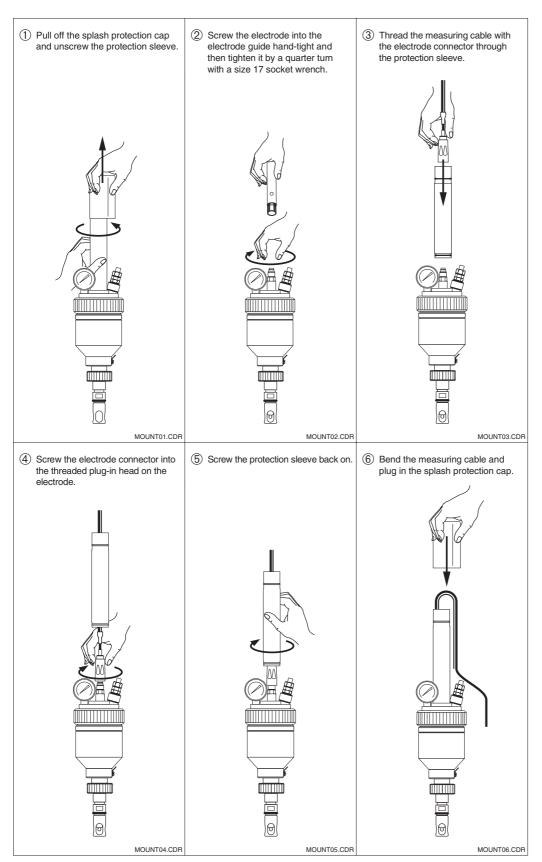


Fig. 3.6 Electrode installation and mounting of measuring cable

# <u>ა</u>

# 3.5 Filling with electrolyte

Filling the electrolyte vessel is only possible with installed electrode. The coupling of the compressed-air connection serves as the filling hole.

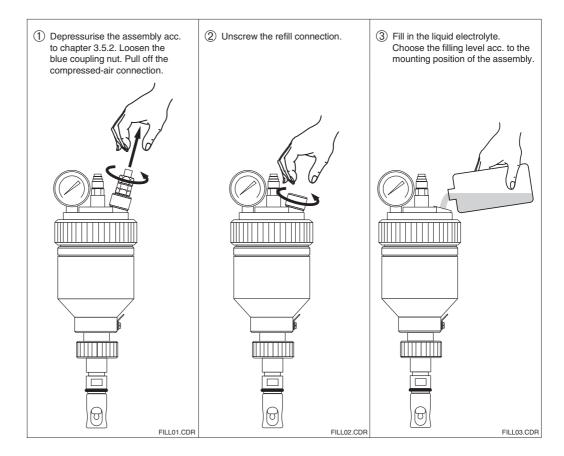
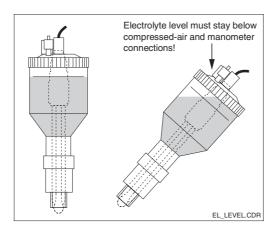


Fig. 3.7 Filling with electrolyte



Note:

- If the electrolyte vessel is pressurised, then the pressure will escape after the first half turn of the refill connection.
- Ensure by all means that no electrolyte penetrates the electrode head or the cable plug.
- The compressed-air and manometer connections must not be flooded with electrolyte (see Fig. 3.8).

Fig. 3.8 Electrolyte filling level

PA441E03.CHP

#### 3.5.1 Pressurisation

There must always be a differential pressure between the electrolyte vessel and the medium to be measured in order to prevent a penetration of the medium into the electrode.

There are two ways to pressurise the electrolyte:

- via an existing compressed-air ductwork system with screw coupling
- via a hand pump with hand pump adapter.

Both the sealing socket integrated into the assembly cover and the quick-release coupling are self-locking, i.e. the connections can be interrupted without pressure loss. If compressed air is not continuously supplied, then an appropriate air cushion must be present above the electrolyte to maintain the pressure as the quantity of electrolyte decreases.

#### 3.5.2 Depressurisation

Replacement of the electrode, refilling electrolyte and opening the assembly require by all means to depressurise the assembly before:

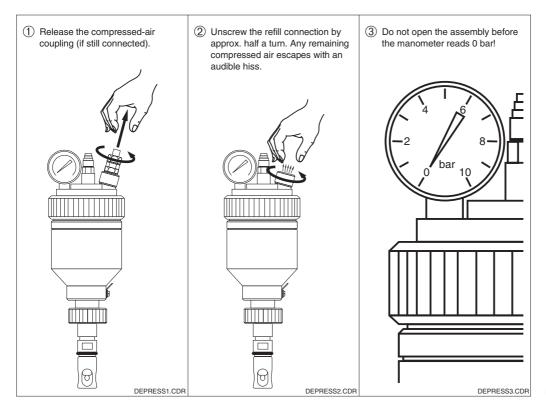


Fig. 3.9 Depressurisation

#### Differential pressure electrolyte / medium

The quantity of electrolyte flowing out of the electrode depends on the differential pressure between electrolyte vessel and medium. To prevent a penetration of medium into the electrode, the electrolyte pressure must always exceed the medium pressure. Fig. 3.10 shows the electrolyte flow for various diaphragm types.

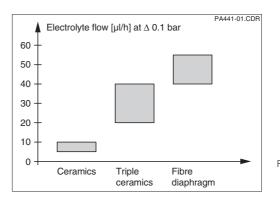


Fig. 3.10 Dependance of the electrolyte flow on the diaphragm type

#### 4 Maintenance

#### 4.1 Assembly cleaning

The assembly must be removed at intervals dependent on the medium. The sealing O-rings must then be visually inspected and replaced if necessary. Complete cleaning of the side in contact with medium may be required.

## 4.2 Electrode cleaning

Soiling may impair the function of the electrode to such an extent that it ceases to work. For example, coatings on the pH sensitive glass membrane may cause poor response, low sensitivity/slope and unstable measured values. Therefore all parts of the electrode in contact with medium must be cleaned regularly. The frequency and intensity of cleaning depend on the medium to be measured.



#### Note:

Do not use abrasive cleaning agents! These may cause irreparable damage to the glass membrane.

- Remove light soiling and coatings by rinsing with a suitable cleaning solution (see table below).
- Remove adhering coatings by a soft brush and a suitable cleaning solution. Soak in cleaning solution beforehand if necessary.
- Rinse the electrode with distilled water after cleaning! Cleaning agent residue not removed may impair the measurement.
- By all means recalibrate the measuring system after cleaning!

Soiling, coating	Cleaning agent
Grease and oil	(Alkaline) agents containing surfactants or water-soluble organic solvents (e.g. alcohol)
Limestone deposits, cyanide deposits, heavy biological and metal hydroxide coatings	Hydrochloric acid (10%), diluted to approx. 3% in the injector
Sulfide deposits	Mixture of hydrochloric acid (3%) and thiourea (saturated)
Protein coatings	Mixture of hydrochloric acid (3%) and pepsin (saturated)
Fibres, suspended substances	Pressure water, possibly containing wetting agents
Light biological coatings	Pressure water

04 CHP

PA441E04.CHP

#### 4.3 Calibration

The pH/redox measuring system must be calibrated regularly and carefully to maintain accuracy.

The periods between the calibrations depend on the operating conditions and the desired accuracy. They must be determined individually for each application. More frequent calibration, e.g. once a week, is recommended at the beginning to study the performance in service.

#### Clean the electrode before each calibration!



#### Warning:

In case of a symmetrical highimpedance electrode connection, establish by all means an electrical connection between the buffer solution and the PM connection.



#### Note:

- Do not leave the electrode in distilled water.
- Do not allow the electrode to stand dry. Keep the electrode tip moist, e.g. in KCl solution (3 mol/l).

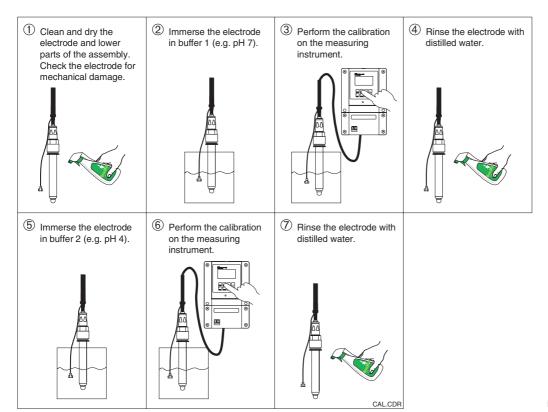
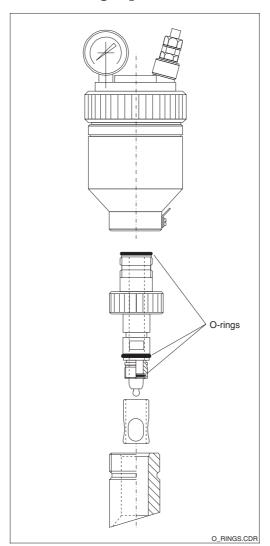


Fig. 4.1 Calibration



## 4.4 O-ring replacement



All O-rings in the assembly (see Fig. 4.2) should be examined for damage from time to time. The standard material for O-rings in contact with medium is EPDM.



#### Note:

- Should an O-ring replacement become necessary, then avoid any damage to the new O-rings and to the O-ring seat. Ensure that a special O-ring material is used if required by the medium.
- To grease polycarbonate parts (e.g. couplings), only use lubricants approved for this plastic material. Otherwise there is a risk of stress cracks on the polycarbonate parts. Observe by all means the instructions of the lubricant manufacturer.

#### Example of a suitable lubricant:

ISOFLEX Topas AK 50 (art. no. 004151) Manufacturer: Klüber Lubrication KG, Munich

 Any other interventions in and modifications of the assembly are impermissible and will void the warranty.

Fig. 4.2 O-rings in the CPA 441

5

PA441E05.CHP

# 5 Accessories and spare parts

The following spare parts may be ordered separately:

#### Combined pH electrodes

Electrode type	Temperature	pH range
CPS 41-1 AB4 GSA	−15 80 °C	1 12
CPS 41-2 AB4 TSA with Pt 100	−15 80 °C	1 12
CPS 41-1 DB4 GSA	0 80 °C	1 12
CPS 41-2 DB4 TSA with Pt 100	0 80 °C	1 12

#### **Combined redox electrode**

CPS 42-0 PB4 GSA with platinum ring	−15 130 °C	0 14
-------------------------------------	------------	------

#### **Built-in adapter**

Material, version	Order no.
PVDF, straight	50005194
PVDF, oblique	50029768
PVC, straight	50005193
PVC, oblique	50047270
1.4571 (SS 316Ti), straight	50005192
1.4571 (SS 316Ti), oblique	50028446

#### **Protection guard**

PVC, screw-in	50029764
1.4571 (SS 316Ti), plug-in	50028445
1.4571 (SS 316Ti), screw-in	50038929

#### O-ring set

EPDM	50029766
Viton	50043956

#### **Dummy plug**

1.4571 (SS 316Ti), DN 25	50028491
--------------------------	----------

# Measuring cable CPK 1 for combined pH/redox electrodes

Cable length	Order code
5 m	CPK 1-050A
10 m	CPK 1-100A
15 m	CPK 1-150A
20 m	CPK 1-200A
25 m	CPK 1-250A
30 m	CPK 1-300A
40 m	CPK 1-400A

# Measuring cable CPK 7 for combined pH/redox electrodes with Pt 100

5 m	CPK 7-05A
10 m	CPK 7-10A
15 m	CPK 7-15A
20 m	CPK 7-20A
25 m	CPK 7-25A

#### **Junction box VBA**

Features	Order no.
For extension of measuring cable connection between assembly and measuring instrument; ingress protection IP 65	50005276

# KCI-electrolyte solutions CPY 4 for Ceraliquid electrodes

Concentration, temp. range	Volume	Order code
3.0 mol,	100 ml	CPY 4-1
−10 100 °C	1000 ml	CPY 4-2
1.5 mol, –30 100 °C	100 ml	CPY 4-3
	1000 ml	CPY 4-4

## 6 Technical data

en			

Manufacturer	Endress+Hauser
Product designation	UniFit H CPA 441

#### Materials in contact with medium

Electrode holder	stainless steel 1.4571 (SS 316Ti)
O-rings	EPDM, Viton

#### Materials not in contact with medium

O-rings	silicone, EPDM
Electrolyte vessel	PC (polycarbonate)
Electrolyte vessel cap	PC (polycarbonate)
Coupling nut (built-in adapter version)	stainless steel 1.4571 (SS 316Ti)

#### Mounting versions

Without adapter	PVC / PVDF / stainless steel 1.4571 (SS 316Ti)
Built-in adapter, straight or oblique	stainless steel 1.4571 (SS 316Ti)
Dairy fitting	stainless steel 1.4571 (SS 316Ti)
Tri-Clamp 2"	stainless steel 1.4571 (SS 316Ti)

#### Operating pressure and temperature

PVC version	8 bar at 20 °C, 0 bar at 50 °C	
PVDF version	8 bar at 20 °C, 0 bar at 115 °C	
Stainless steel version	8 bar at 90 °C, 0 bar at 130 °C	
Electrolyte vessel	80 °C	

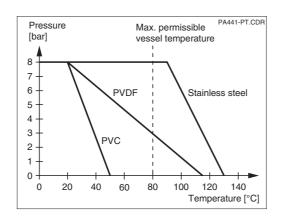
#### Measures and weight

Total volume	220 ml
Payload volume	150 ml
Electrode installation	via Pg 13.5 thread
Shaft length	225 mm
Shaft diameter	12 mm
Weight	approx. 2 kg

#### Supplementary documentation

Technical Information	order no. 50059346
Ceraliquid CPS 41/42/43	

Subject to modifications.





#### Note:

The operating limits of the entire system are determined by the operating limits of the individual components used (assembly, sensors, cables, accessories, etc.).

Fig. 6.1 Pressure-temperature diagram

PA441E07.CHP



# 7 Index

A         Accessories       15         Accuracy       13         Assembly cleaning       12         B       Buffer solution       13         Built-in adapter       7, 15	Material3Measuring cable6, 15Measuring system6Mounting clearance6Mounting of measuring cable8
Calibration13Cleaning solution12Coatings12Combined pH electrodes15Combined redox electrode15CPY 415	O-ring material       3         O-ring replacement       14         O-ring set       15
D         Dairy fitting       8         Damage       2         Delivery       2         Depressurisation       11         Differential pressure       11         Dimensions       6         Disposal       2         Dummy plug       15	Product structure
<b>E</b> Electrode cleaning	Regulations 4
Electrode connection, symmetrical high-impedance 13 Electrode installation 8 Electrode replacement 8 Electrolyte filling level 10 Electrolyte solutions 15  F Filling level 10 Filling with electrolyte 10	Safety.4-5Socket wrench.2, 9Soiling.12Spare parts.15Storage.2Symbols.2Symmetrical high-impedance
G General information 2-3	TTechnical data
Hazards	
Installation	Varivent adapter 8
Junction box	

#### Europe

Austria

☐ Endress+Hauser Ges.m.b.H. Wien Tel. (01) 880 56-0, Fax (01) 880 56-35

Belarus Belorgsintez Minsk

Tel. (01 72) 26 31 66, Fax (01 72) 26 31 11

Belgium / Luxembourg
☐ Endress+Hauser S.A./N.V. Brussels Tel. (02) 248 06 00, Fax (02) 248 05 53

Bulgaria INTERTECH-AUTOMATION

Tel. (02) 65 28 09, Fax (02) 65 28 09

Croatia
☐ Endress+Hauser GmbH+Co.
Zagreb
Tel. (01) 6601418, Fax (01) 6601418

Cyprus I+G Electrical Services Co. Ltd. Nicosia Tel. (02) 48 47 88, Fax (02) 48 46 90

Czech Republic ☐ Endress+Hauser GmbH+Co.

Tel. (026) 6784200, Fax (026) 6784179 Denmark
☐ Endress+Hauser A/S

Søborg Tel. (31) 67 31 22, Fax (31) 67 30 45 Estonia

Elvi-Aqua Tartu Tel. (7) 42 27 26, Fax (7) 42 27 27

Finland ☐ Endress+Hauser Oy Espoo Tel. (90) 8596155, Fax (90) 8596055

Huningue Tel. 89 69 67 68, Fax 89 69 48 02

☐ Endress+Hauser Meßtechnik GmbH+Co. Weil am Rhein Tel. (07621) 975-01, Fax (07621) 975-555

Great Britain

□ Endress+Hauser Ltd.
Manchester
Tel. (01 61) 286 50 00, Fax (01 61) 998 1841

Greece
I & G Building Services Automation S.A.

Athens Tel. (01) 9241500, Fax (01) 9221714 Hungary Mile Ipari-Elektro

Budapest Tel. (01) 261 55 35, Fax (01) 261 55 35 Iceland Vatnshreinsun HF

Reykjavik Tel. (05) 88 96 16, Fax (05) 88 96 13 Ireland Flomeaco Company Ltd.

Kildare Tel. (045) 868615, Fax (045) 868182 Italy

☐ Endress+Hauser Italia S.p.A.

Cernusco s/N Milano Tel. (02) 92106421, Fax (02) 92107153 Latvia Raita Ltd.

Riga Tel. (02) 254795, Fax (02) 7258933

Lithuania Agava Ltd. Kaunas Tel. (07) 202410, Fax (07) 207414 Netherlands

☐ Endress+Hauser B.V. Naarden Tel. (035) 6958611, Fax (035) 6958825 Norway
☐ Endress+Hauser A/S
Tranby Tel. (032) 85 10 85, Fax (032) 85 11 12

☐ Endress+Hauser Polska Sp. z o.o.
Warszawy
Tel. (022) 7201090, Fax (022) 7201085

Portugal
Tecnisis - Tecnica de Sistemas Industriais Linda-a-Velha
Tel. (01) 4172637, Fax (01) 4185278 Romania

Romconseng SRL Bucharest Tel. (01) 4101634, Fax (01) 4101634

Endress+Hauser Moscow Office Tel., Fax: see Endress+Hauser GmbH+Co.

Slovak Republic Transcom Technik s.r.o. Bratislava Tel. (7) 521 31 61, Fax (7) 521 31 81

Slovenia

Endress+Hauser D.O.O. Tel. (061) 1592217, Fax (061) 1592298

**Spain**☐ Endress+Hauser S.A.
Barcelona
Tel. (93) 4803366, Fax (93) 4733839

Sweden
☐ Endress+Hauser AB Tel. (08) 6261600, Fax (08) 6269477

Switzerland

Endress+Hauser AG Reinach/BL 1 Tel. (061) 7157575, Fax (061) 7111650

Turkey Intek Endüstriyel Ölcü ve Kontrol Sistemleri Tel. (02 12) 2 75 13 55, Fax (02 12) 2 66 27 75

Industria Ukraïna Kiev

Tel. (44) 2685213, Fax (44) 2685213

Yugoslavia Beograd Tel. (11) 4442966, Fax (11) 43 00 43

Africa

Egypt Anasia Heliopolis/Cairo Tel. (02) 4179007, Fax (02) 4179008

Morocco Oussama S A Casablanca Tel. (02) 24 13 38, Fax (02) 40 26 57

Nigeria J F Technical Invest. Nig. Ltd. Lagos Tel. (1) 62234546, Fax (1) 62234548

South Africa

Endress+Hauser Pty. Ltd. Guin F...

Endress+Hauser Pty. Ltc.
Sandton
Tel. (011) 4441386, Fax (011) 4441977

Controle, Maintenance et Regulation Tunis Tel. (01) 793077, Fax (01) 788595

America

☐ Endress+Hauser Argentina S.A Buenos Aires Tel. (01) 541145227970, Fax (01) 541145227909

Bolivia Tritec S.R.L.

Cochabamba Tel. (042) 56993, Fax (042) 50981

☐ Samson Endress+Hauser Ltda. Sao Paulo Tel. (011) 5363455, Fax (011) 5363067

Canada ☐ Endress+Hauser Ltd.
Burlington, Ontario
Tel. (9 05) 681 92 92, Fax (9 05) 681 94 44

Chile
DIN Instrumentos Ltda. Santiago Tel. (02) 2 05 01 00, Fax (02) 2 25 81 39 Colombia

Colsein Ltd.
Bogota D.C.
Tel. (01) 2367659, Fax (01) 6107868

Costa Rica EURO-TEC S.A. Tel. 2961542, Fax 2961542

Ecuador Insetec Cia. Ltda.

Quito

Tel. (02) 25 12 42, Fax (02) 46 18 33 Guatemala ACISA Automatizacion Y Control Industrial S.A.

Ciudad de Guatemala, C.A. Tel. (02) 34 59 85, Fax (02) 32 74 31 Mexico

☐ Endress+Hauser I.I. Mexico City Tel. (5) 568 96 58, Fax (5) 5 68 41 83

Paraguay Incoel S.R.L. Asuncion Tel. (021) 213989, Fax (021) 26583

Uruguay Circular S.A. Montevideo Tel. (02) 92 57 85, Fax (02) 92 91 51

USA
☐ Endress+Hauser Inc.
Greenwood, Indiana
Tel. (317) 535-7138, Fax (317) 535-1489

H 7 Instrumentos C A Caracas Tel. (02) 9798813, Fax (02) 9799608

Asia

China
☐ Endress+Hauser Shanghai Instrumentation Co. Ltd.

Shanghai Tel. (021) 64646700, Fax (021) 64747860 ☐ Endress+Hauser Beijing Office

Tel. (010) 68344058, Fax: (010) 68344068

Hong Kong
☐ Endress+Hauser (H.K.) Ltd.
Hong Kong
Tel. 25283120, Fax 28654171

India
☐ Endress+Hauser India Branch Office

Tel. (022) 6045578, Fax (022) 6040211 Indonesia PT Grama Bazita

Tel. (21) 7975083, Fax (21) 7975089

Gastura Endress Co., Ltd.
Tokyo
Tel. (0422) 540611, Fax (0422) 550275 Sakura Endress Co., Ltd.

Malaysia
☐ Endress+Hauser (M) Sdn. Bhd.
Petaling Jaya, Selangor Darul Ehsan
Tel. (03) 7334848, Fax (03) 7338800

Pakistan Speedy Automation Karachi Tel. (021) 7722953, Fax (021) 7736884 Papua New Guinea SBS Electrical Pty Limited Port Moresby Tel. 53 25 11 88, Fax 53 25 95 56

Brenton Industries Inc. Makati Metro Manila Tel. (2) 843 06 61-5, Fax (2) 8 17 57 39

Singapore
☐ Endress+Hauser (S.E.A.) Pte., Ltd. Singapore Tel. 468 82 22, Fax 466 68 48

South Korea

Endress+Hauser (Korea) Co., Ltd. Seoul Tel. (02) 6587200, Fax (02) 6592838

Taiwan Taiwan Kingjarl Corporation Taipei R.O.C. Tel. (02) 7183938, Fax (02) 7134190

Thailand

☐ Endress+Hauser Ltd.
Bangkok
Tel. (2) 9967811-20, Fax (2) 9967810

Vietnam Tan Viet Bao Co. Ltd. Ho Chi Minh City Tel. (08) 8335225, Fax (08) 8335227

Telephone Technical Services Co. Ltd. Tel. (021) 874 67 50, Fax(021) 873 72 95

Israel
Instrumetrics Industrial Control Ltd. Tel-Aviv Tel. (03) 6 48 02 05. Fax (03) 6 47 19 92

**Jordan** A.P. Parpas Engineering S.A. Amman Tel. (06) 5 53 92 83, Fax (06) 5 53 92 05

Kingdom of Saudi Arabia

Tel. (02) 671 00 14, Fax (02) 672 59 29 Kuwait Maritime & Mercantile Co K S C Safat Tel. 2 43 47 52, Fax 2 44 14 86

**Lebanon** Nabil Ibrahim Jheil Tel. (3) 25 40 51, Fax (9) 94 40 80

Sultanate of Oman Mustafa & Jawad Science & Industry Co.

L.L.C. Ruwi Tel. 60 20 09, Fax 60 70 66

United Arab Emirates Descon Trading EST. Dubai Tel. (04) 35 95 22, Fax (04) 35 96 17

Yemen
Yemen Company for Ghee and Soap Industry Tel. (04) 23 06 64, Fax (04) 21 23 38

Australia + New Zealand

Australia GEC Alsthom LTD. Sydney Tel. (02) 96 45 07 77, Fax (02) 97 43 70 35

New Zealand EMC Industrial Instrumentation Auckland Tel. (09) 444 92 29, Fax (09) 444 11 45

All other countries

☐ Endress+Hauser GmbH+Co. Instruments International D-Weil am Rhein Germany Tel. (07621) 975-02, Fax (07621) 975345

☐ Members of the Endress+Hauser group



Endress+Hauser Nothing beats know-how