

OPA 473

Retractable Process Assembly

Operating Instructions

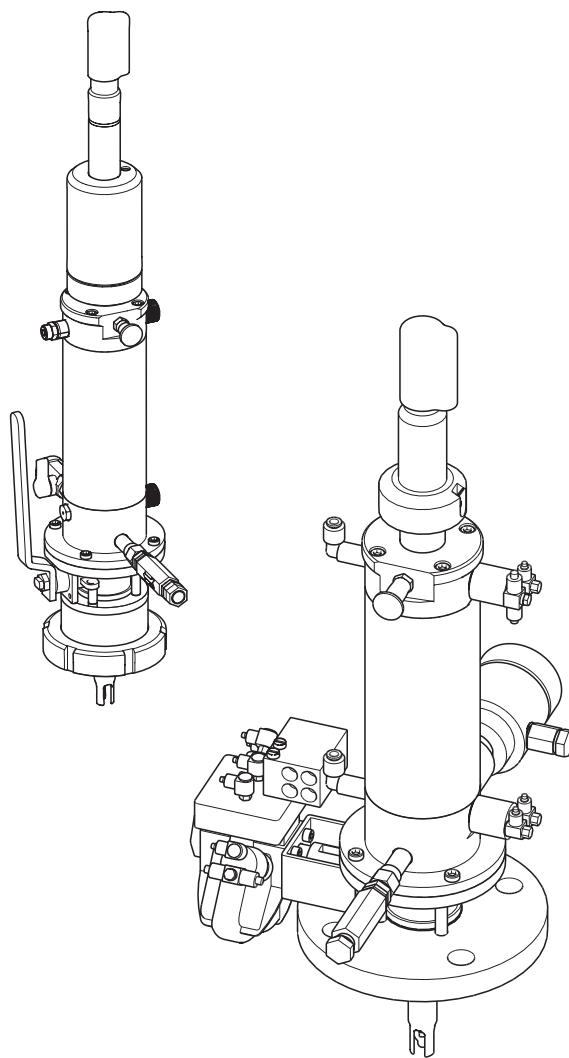


Table of contents

1	Safety instructions	4	7	Trouble-shooting	29
1.1	Designated use	4	7.1	Replacing damaged parts	29
1.2	Installation, commissioning and operation	4	7.2	Replacing seals	29
1.3	Operational safety	4	7.3	Spare part kits	32
1.4	Return	4	7.4	Return	35
1.5	Notes on safety icons and symbols	5	7.5	Disposal	35
2	Identification	6	8	Technical data	36
2.1	Nameplate	6	8.1	Environment	36
2.2	Scope of delivery	6	8.2	Process	36
2.3	Certificates and approvals	6	8.3	Mechanical construction	37
2.4	Product structure	7			
3	Installation	8		Index	38
3.1	Incoming acceptance, transport, storage	8			
3.2	Installation conditions	8			
3.3	Measuring system	11			
3.4	Installing the assembly into the process	11			
3.5	Compressed air connection	12			
3.6	Rinse water connection	14			
3.7	Sensor installation	16			
3.8	Post-installation check	18			
4	Operation	19			
4.1	First commissioning	19			
4.2	Operating elements	19			
4.3	Manual operation	19			
4.4	Pneumatic operation	20			
5	Maintenance	23			
5.1	Cleaning the assembly	23			
5.2	Cleaning the sensor	23			
5.3	Cleaning agents	24			
5.4	Notes on calibration	24			
6	Accessories	25			
6.1	Water filter and pressure reducer	25			
6.2	Rinse connection adapter	25			
6.3	Flow assembly	25			
6.4	Pneumatic throttle	25			
6.5	Hose connectors for rinse chamber	26			
6.6	Limit position switches	26			
6.7	Inlet and outlet safety seal	26			
6.8	Sensors	27			
6.9	Buffer solutions	27			
6.10	Measuring cables	28			
6.11	Transmitters	28			
6.12	Measuring, cleaning and calibration systems	28			

1 Safety instructions

1.1 Designated use

The manually or pneumatically operated retractable assembly OPA 473 is designed for installing pH/redox sensors in tanks and pipes.

Its mechanical design permits its use in pressurised systems (see "Technical data").

Any other use than the one described here compromises the safety of persons and the entire measuring system and is, therefore, not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

1.2 Installation, commissioning and operation

Please note the following items:

- Installation, electrical connection, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel. The technical personnel must be authorised for the specified activities by the system operator.
- Technical personnel must have read and understood these Operating Instructions and must adhere to them.
- Before commissioning the entire measuring point, check all the connections for correctness. Ensure that electrical cables and hose connections are not damaged.
- Do not operate damaged products and secure them against unintentional commissioning. Mark the damaged product as being defective.
- Measuring point faults may only be rectified by authorised and specially trained personnel.
- If faults can not be rectified, the products must be taken out of service and secured against unintentional commissioning.
- Repairs not described in these Operating Instructions may only be carried out at the manufacturer's or by the service organisation.

1.3 Operational safety

The assembly has been designed and tested according to the state of the art and left the factory in perfect functioning order.

Relevant regulations and European standards have been met.

As the user, you are responsible for complying with the following safety conditions:

- Installation instructions
- Local prevailing standards and regulations.

1.4 Return

If the assembly has to be repaired, please return it *cleaned* to the sales centre responsible. Please use the original packaging, if possible.

Please enclose the completed Dangerous Goods sheet (copy the second last page of these Operating Instructions) with the packaging and also the shipping documents.

No repair without completed Dangerous Goods sheet!

1.5 Notes on safety icons and symbols



Warning!

This symbol alerts you to hazards. They can cause serious damage to the instrument or to persons if ignored.



Caution!

This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



Note!

This symbol indicates important items of information.

2 Identification

2.1 Nameplate

You can identify the assembly version by the order code on the nameplate. Please compare this code with your order.

OPA 473	
order code:	OPA473-E2A2A1H4
serial no.:	2 14439 05P09
spec.	
pressure: PN=10bar	T=140°C

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Fig. 1: Example of a nameplate

You can find possible assembly versions and the resulting order codes in the product structure.

2.2 Scope of delivery

The scope of delivery comprises:

- Assembly (ordered version)
- Operating Instructions (English).

If you have any questions, please contact your supplier or your sales centre responsible.

2.3 Certificates and approvals

Test certificate 3.1B acc. to EN 10204 on demand.

2.4 Product structure

Assembly drive, ball valve	
A	Assembly and ball valve manual (convertable to pneumatic)
B	Assembly: pneumatic, ball valve: manual, without limit position switches (retrofitable)
C	Assembly: pneumatic, ball valve: manual, with pneumatic limit position switches
D	Assembly: pneumatic, ball valve: manual, with electric limit position switches (Ex and Non-Ex)
E	Assembly + ball valve: pneumatic, with pneumatic limit position switches
F	Assembly + ball valve: pneumatic, with electric limit position switches (Ex and Non-Ex)
Y	Special version acc. to customers specification
Assembly version	
1	Standard version: max. 80 °C (176 °F), max. 6 bar (87 psi), with moulded seal (PA cylinder)
2	Heavy duty version: max. 140 °C (284 °F), max. 10 bar (145 psi), with moulded seal (SS cylinder)
3	Standard version: max. 80 °C (176 °F), max. 6 bar (87 psi), without moulded seal, i.e. the rinse chamber is not sealed off the medium! (PA cylinder)
4	Heavy duty version: max. 140 °C (284 °F), max. 10 bar (145 psi), without moulded seal, i.e. the rinse chamber is not sealed off the medium! (SS cylinder)
9	Special version acc. to customers specification
Electrode type	
A	For gel electrodes and pH ISFET sensors with Pg 13.5
B	For liquid KCl electrodes and ISFET sensors with Pg 13.5 and hose connection head (type ESS)
Y	Special version acc. to customers specification
Immersion depth	
1	Short version up to 100 mm (3.94 inch) with PA cylinder (possible sensor lengths: type A = 225 mm (8.9 inch), type B = 425 mm (16.7 inch)) Assembly versions 1 and 3 only!
2	Short version up to 100 mm (3.94 inch) with stainless steel 1.4404 (AISI 316L) cylinder (possible sensor lengths: type A = 225 mm (8.9 inch), type B = 425 mm (16.7 inch)) Assembly versions 2 and 4 only!
3	Long version up to 235 mm (9.25 inch) with PA cylinder (possible sensor lengths: type A = 360 mm (14.2 inch)) Assembly versions 1 and 3 only!
4	Long version up to 235 mm (9.25 inch) with stainless steel 1.4404 (AISI 316L) cylinder (possible sensor lengths: type A = 360 mm (14.2 inch)) Assembly versions 2 and 4 only!
9	Special version acc. to customers specification
Assembly material (in contact with medium)	
A	Stainless steel 1.4404 (AISI 316L)
B	Stainless steel 1.4404 (AISI 316L) with test certificate 3.1B acc. to EN 10204
Y	Special version acc. to customers specification
Seal material (in contact with medium)	
1	EPDM (for food applications preferred)
2	FPM (Viton®, for process applications preferred)
3	Perfluoroelastomer
9	Special version acc. to customers specification
Process connection	
A	Internal thread G 1¼ with thread adapter nut
D	Dairy fitting DN 65 (DIN 11851) For flow assembly CPA 240 (immersion depths 1 and 2 only!)
G	Flange DN 50, PN 16
H	Flange ANSI 2", 150 lbs
Y	Special version acc. to customers specification
Optional equipment	
3	With pneumatic inlet/outlet safety seal (2 x G ¼ internal thread / PVDF safety plug)
4	With pneumatic inlet/outlet safety seal (2 x NPT ¼" internal thread / PVDF safety plug)
5	With manual inlet/outlet safety seal (2 x G ¼ internal thread / PVDF safety plug)
6	With manual inlet/outlet safety seal (2 x NPT ¼" internal thread / PVDF safety plug)
7	With rinse connection sockets, 2 x G ¼ internal thread (version 1, 2 only!) (with PVDF safety plug)
8	With rinse connection sockets 2 x NPT ¼" internal thread (version 1, 2 only!) (with PVDF safety plug)
9	Special version acc. to customers specification
OPA 473-	complete order code

3 Installation

3.1 Incoming acceptance, transport, storage

- Make sure the packaging is undamaged!
Inform the supplier about damage to the packaging.
Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
Inform the supplier about damage to the delivery contents.
Keep the damaged products until the matter has been settled.
- Check that the scope of delivery is complete and agrees with your order and the shipping documents.
- The packaging material used to store or to transport the product must provide shock protection and humidity protection. The original packaging offers the best protection. Also, keep to the approved ambient conditions (see "Technical data").
- If you have any questions, please contact your supplier or your Sales Center responsible.

3.2 Installation conditions

3.2.1 Notes on installation

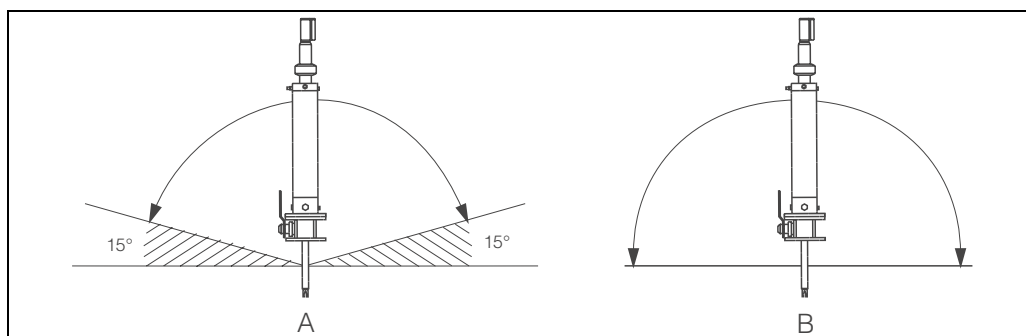
The assembly is designed for installation on tanks and pipes. Suitable nozzles must be available for this.



Note!

- When using standard glass electrodes, only installation positions are permitted in which the middle axis of the assembly lies at least at an angle of 15° from the horizontal (see diagram). Otherwise, there will not be a reliable contact between the inner side of the pH membrane and the inner terminal leads via the electrolytes.
- When using an ISFET sensor, there are, in principle, no restrictions for the installation position. An installation angle of 0 to 180° is, however, recommended.

- A Glass electrode: Installation angle of at least 15° from the horizontal
- B ISFET pH sensor: No restrictions, recommended 0 ... 180°



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Fig. 2: Permitted orientations depending on the sensor used



Caution!

- For all assemblies with stainless steel pressure cylinders, we recommend to use a flanged version when installing with inclined orientation. Otherwise, the weight of the assembly could affect the safety of the process connection.
- Avoid a siphon effect¹ at the rinse chamber outlet when installing with inclined orientation. The inlet to the rinse chamber must be from below.



Note!

- The minimum diameter for direct installation in pipework is DN 50. This diameter is required so that the assembly has sufficient distance from the pipe wall when brought into the "Measuring" position.
- Use the OPA 240 flow assembly to install the assembly in smaller pipe diameters (see Accessories).
- When designing the installation nozzle, please observe the total immersion depth in operation (sensor holder not inserted). Ensure that the sensor is always immersed in the medium in operation (see "Dimensions").

3.2.2 Dimensions

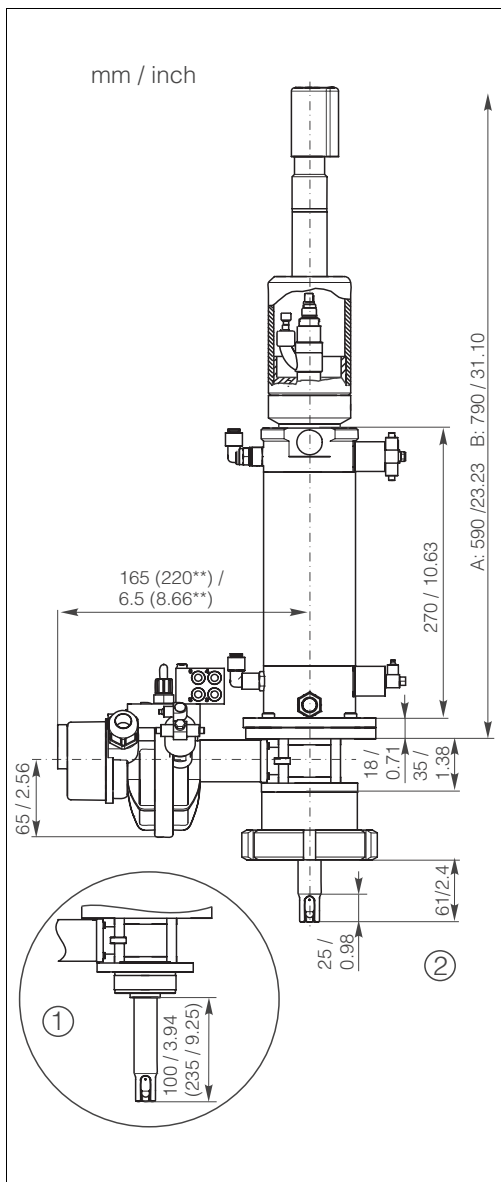


Fig. 3: Assembly version;: pneumatic, short, for KCl sensors

- ① G1¼, long version dimensions in brackets
- ② Dairy fitting: there is only a short version!
- ** version with electric limit position switches

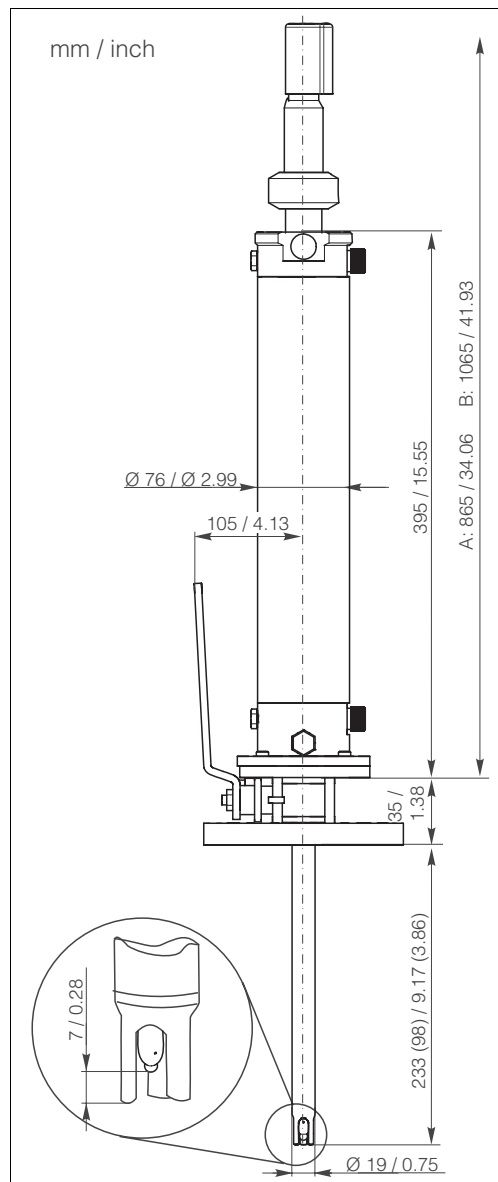
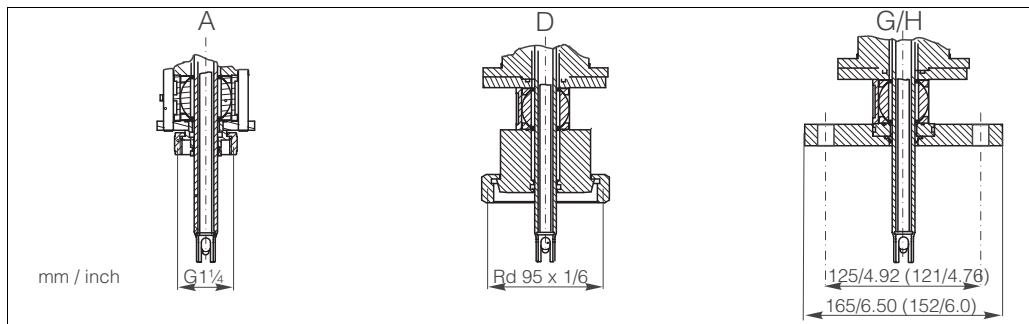


Fig. 4: Assembly version: manual, long, for gel sensors, flange

- in brackets: short version
- A Length when extended
- B Required mounting clearance

1) Siphon effect: line emptied by vacuum

3.2.3 Process connections



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Fig. 5: Process connections OPA 473 (dimensions in brackets: ANSI flange)

A G1 1/4 internal thread with thread adapter nut

D Dairy fitting DN 65 (short version only)

G/H Flange DN 50 / PN 16 and flange ANSI 2" / 150 lbs

3.2.4 Scraper function

The assembly is optionally supplied with a moulded seal with scraper function on the process side of the ball valve.

This is especially recommended in the following cases:

- If the rinse chamber, otherwise open to the process, should be protected during operation.
- If material sticking to the electrode holder (caused by the medium)¹ should be scraped off when moving to service mode.



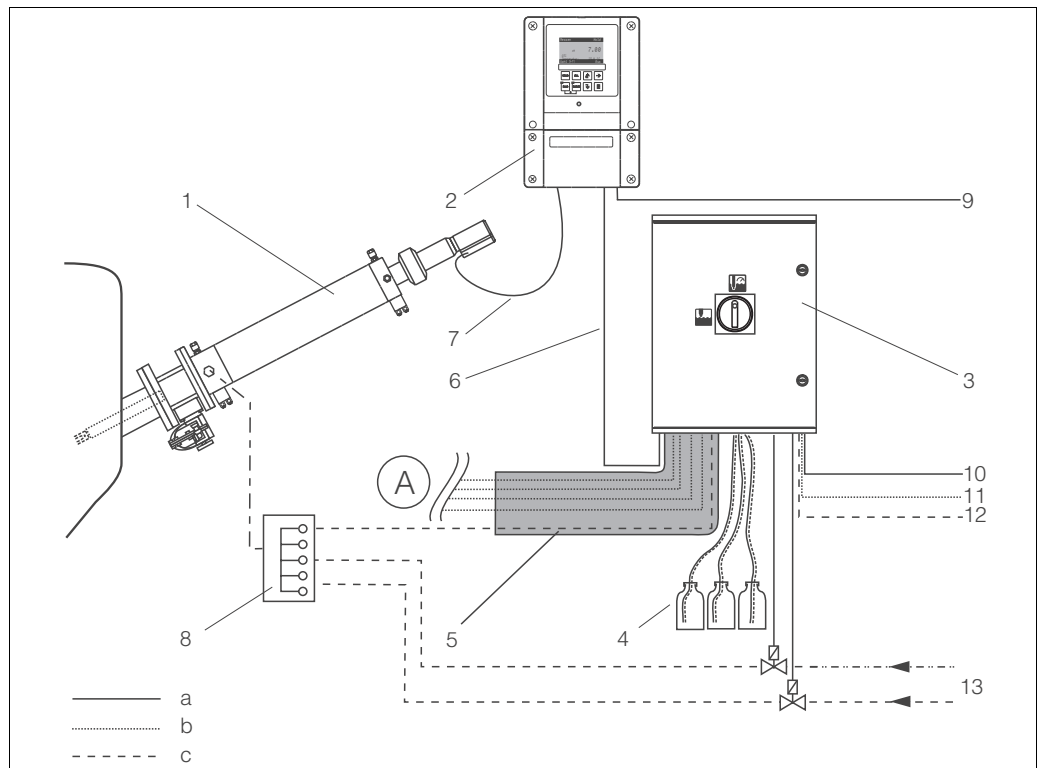
Caution!

The rinse chamber and the internal volume of the ball valve are always filled with medium. At least in the short period between opening the ball valve and moving the electrode holder out of the service position there is open contact to the medium.

In that period the full process pressure is on the rinse connections.

1) fibres, lime etc.

3.3 Measuring system



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Fig. 6: Fully automatic measuring system (example)

A For information on function and connection of the pneumatics and the limit position switches to the assembly, please refer to the related chapters of the Operating Instructions.

- | | | | |
|---|---|---|---------------------------------|
| 1 | Assembly | a | Electric line |
| 7 | Special measuring cable, e.g. OPK 9, OPK 12 | b | Compressed air line |
| 8 | Rinse block OPR 40 (optionally) | c | Water / cleaning agent / buffer |

OPC 300:¹

- | | | | |
|---|---|------------------------------------|---|
| 2 | Transmitter OPM 153 | To be supplied by customer: | |
| 3 | Control unit OPG 300 | 9 | Power supply for OPM 153 |
| 4 | Vessel for cleaning agents and buffer solutions | 10 | Power supply for OPG 300 |
| 5 | Multi hose | 11 | Compressed air |
| 6 | Supply / control cable | 12 | Water supply |
| | | 13 | Steam / water / cleaning agent (optionally) |

- 1) Fully automatic calibration and cleaning system

3.4 Installing the assembly into the process



Note!

Depending on the process connection, please observe the following:

- Check the flange seal between the flanges before installing the assembly.
 - The thread adapter nut of thread G 1 1/4 does not function as a seal. Therefore, simply tighten the thread adapter nut by hand.
1. Move the assembly into the "Service" position (electrode holder inserted in the assembly).
 2. Secure the assembly to the tank or the piping using your selected process connection.
 3. Follow the instructions for compressed air and rinse water connection (if used) given in the following chapters.

3.5 Compressed air connection

Requirements:

- air pressure of 4 to 8 bar (58 to 116 psi)
- air must be filtered (40 µm) and be free of water and oil
- no continuous air consumption
- minimum nominal diameter of the air lines: 4 mm (0.16 inch).



Caution!

There must be a pressure-reducing valve upstream if the air pressure can increase to above 8 bar (116 psi) (including any short pressure surges).

We recommend you also use a pneumatic throttle for lower pressures. This results in a smoother assembly operation. Your supplier offers such a throttle as an accessory (see chapter "Accessories").

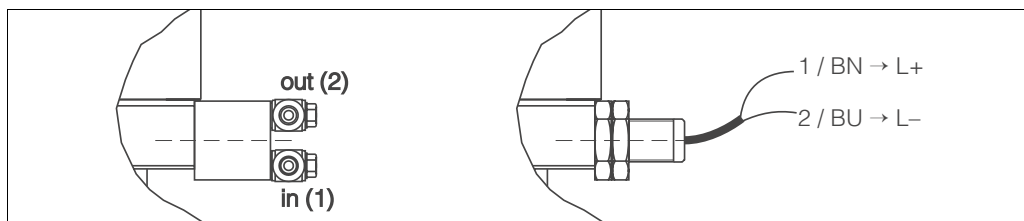
3.5.1 Limit position switches

The pneumatic limit position switches serve as control elements and determine the sequence of the individual steps.

The following types of limit position switches are available depending on the order version (product structure, "Assembly operation, ball valve"):

- "Pneumatic limit position switch" version: 4 pneumatic switches (see Fig. 10)
- "Electric limit position switch" version: 3 pneumatic and 2 inductive switches (see Fig. 13)

Pneumatic: 3/2 way valve
 Electric: inductive (NAMUR type)



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Fig. 7: Limit position switches, left: pneumatic (1 = compressed air inlet, 2 = compressed air outlet) right: electric (NAMUR)



Note!

The position of the input resp. the output may be different from the figure. Please, refer to the marks at the limit position switch: "1" is the input (in), "2" is the output (out).

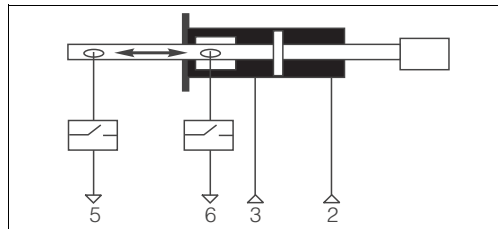
3.5.2 Connections



Note!

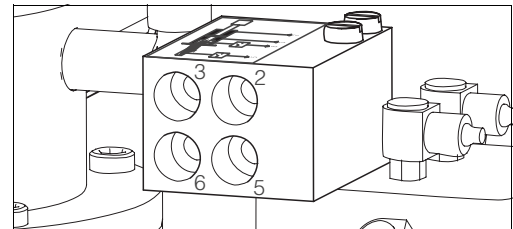
The assembly is delivered completely hosed-up. All you have to do is connect the compressed air for pneumatic operation of the ball valve and the outputs for pneumatic feedback signal to the pneumatic terminal block.

1. Please, refer to the sticker on the pneumatic terminal block to connect the compressed air hoses (Fig. 8).
2. Plug-in the compressed air hoses into the corresponding fittings. Refer also to the identical numbers engraved directly on the corresponding input (resp. output) on the terminal block (Fig. 9).



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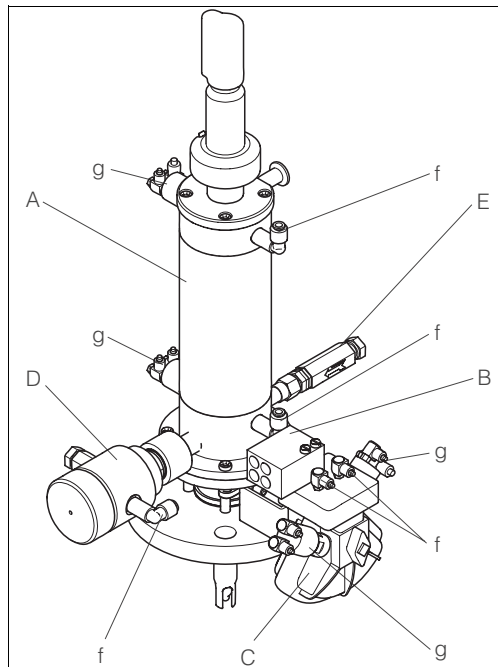
- Fig. 8: Pneumatic terminal block sticker**
- 2 Compressed air input "Start Measuring" (Pneumatics "Open ball valve")
 - 3 Compressed air input "Start Service" (Pneumatics "Close ball valve")



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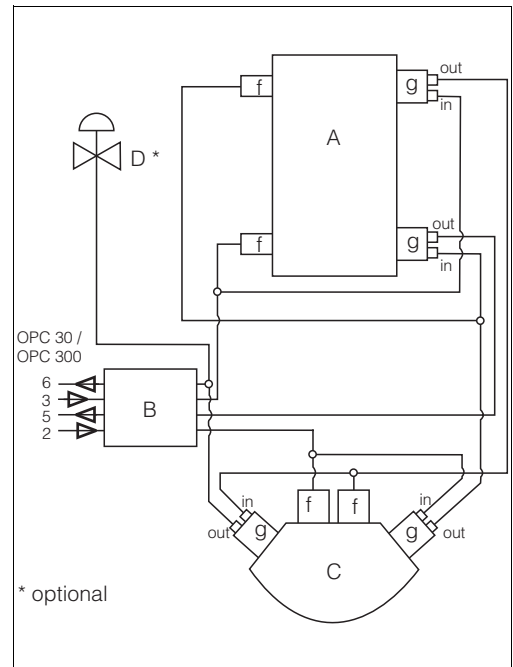
- Fig. 9: Pneumatic terminal block**
- 5 Feedback signal "Assembly Measuring" (Limit position switch "Ball valve open")
 - 6 Feedback signal "Assembly Service" (Limit position switch "Ball valve closed")

Assembly version with pneumatic limit position switches



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- Fig. 10: Overview**
- A Assembly cylinder
 - B Pneumatic connection block
 - C Ball valve drive
 - D Pneumatic outlet safety seal (optional)



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- Fig. 11: Hosing**
- E Check valve (inlet safety seal, optional)
 - f Pneumatic fitting G1/8
 - g Pneumatic limit position switches

Assembly version with electrical limit position switches

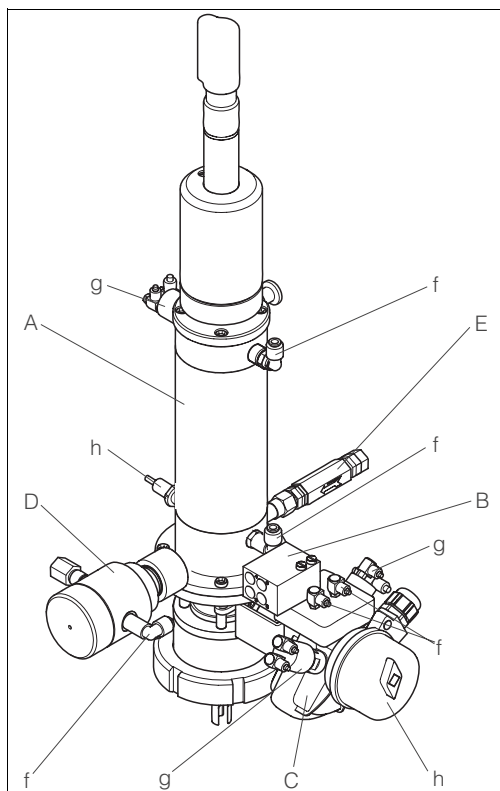


Fig. 12: Overview

- A Assembly cylinder
- B Pneumatic connection block
- C Ball valve drive
- D Pneumatic outlet safety seal (optional)

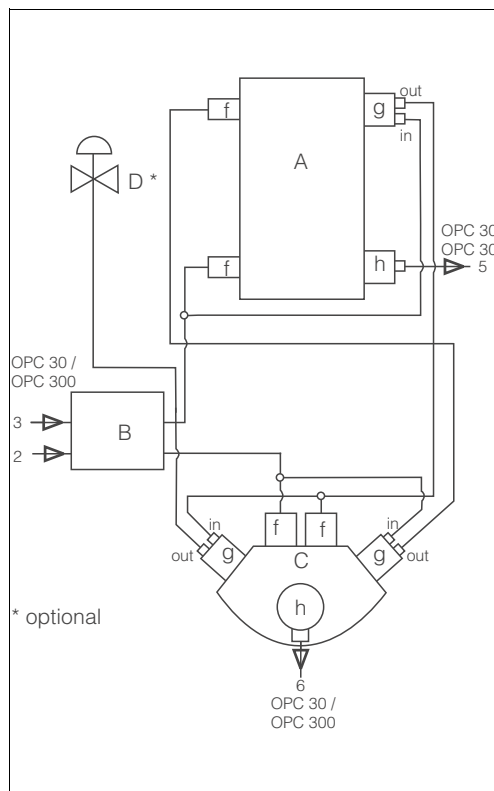


Fig. 13: Hosing

- E Check valve (inlet safety seal, optional)
- f Pneumatic fitting G1/8
- g Pneumatic limit position switches
- h Electrical limit position switches

3.6 Rinse water connection

1. Connect the rinse water pipe to the designated rinse nozzle. Both rinse nozzles on the assembly are identical. Use one as an inlet and the other as an outlet.
2. Operate the rinse water connection of the assembly with a water pressure of 2 to max. 6 bar (29 to 87 psi).
3. In addition, install a non-return valve and a dirt trap (100 µm) in the water supply line (at the inlet to the assembly).

Besides water, other or additional cleaning solutions may be used in the rinse chamber. Pay attention to the material resistance of the assembly and comply with the maximum permitted temperatures and pressures.

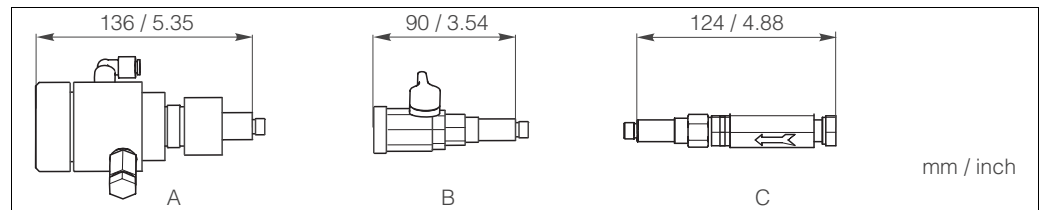


Caution!

If it is possible for the water pressure to rise above 6 bar (87 psi, including any transient pressure surges), install a pressure reducing valve upstream. Otherwise the assembly may be damaged.

3.6.1 Optional inlet and outlet safety seals

Optionally the assembly is supplied with a non-return valve on the inlet side of the rinse chamber (inlet safety seal) and an outlet valve (pneumatic outlet safety seal) resp. a ball valve (manual outlet safety seal, see product structure).



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Fig. 14: Inlet / outlet safety seals for rinse chamber

- A Pneumatic outlet safety seal
- B Manual outlet safety seal
- C Non-return valve (inlet safety seal)



Caution!

An outlet safety seal is definitely required if the rinse chamber does not remain sealed with the drain plug¹.

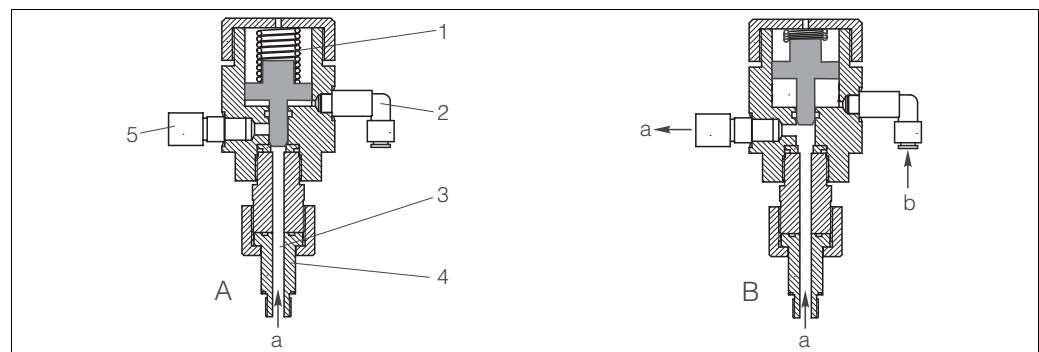
Inlet safety seal

The non-return valve prevents medium from penetrating from the rinse chamber into the rinse water inlet.

Manual outlet safety seal

The manual safety seal is a ball valve made of PVDF. You have to drive it manually.

Pneumatic outlet safety seal



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Fig. 15: Functional diagram of the pneumatic valve on the outlet side of the rinse chamber

- A: Valve closed (no connection between rinse water and rinse chamber)
- B: Valve open (rinse water can enter rinse chamber)
- 1 Compression spring
- 2 Compressed air input
- 3 Inlet from the rinse chamber outlet
- 4 Rinse connection socket
- 5 Rinse water outlet
- a Rinse water
- b Compressed air

1) also applies in "Measure" position

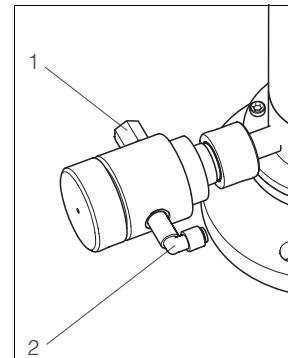
Installation of the pneumatic outlet safety seal



Note!

When ordering an assembly with pneumatic outlet safety seal, you get this valve separately, not installed into the assembly.

1. Unscrew the dummy plug from the rinse chamber outlet.
2. Mount the delivered pneumatic outlet safety seal (Fig. 16).
3. Cut the following compressed air hose (see Fig. 11, Fig. 13):
from pneumatic connection block, input 6 to the corresponding pneumatic limit position switch on the ball valve drive.
4. Connect each end of the cutted hose to the delivered Y-piece.
5. Connect the third fitting of the Y-piece to the compressed air connector of the outlet safety seal (Fig. 16, pos. 2).
6. Connect the rinse water outlet hose to the valve connector (pos. 1, G $\frac{1}{4}$ or NPT $\frac{1}{4}$ ", acc. to ordered version).



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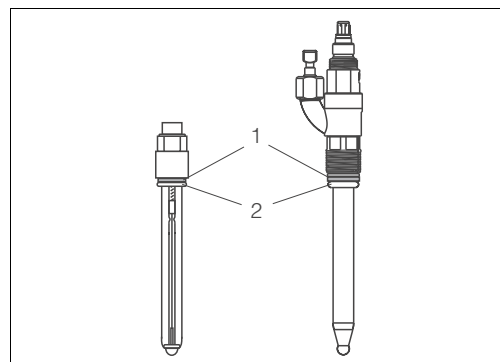
Fig. 16: Outlet safety seal

- 1 Rinse water outlet
- 2 Compressed air

3.7 Sensor installation

3.7.1 Preparing sensor and assembly

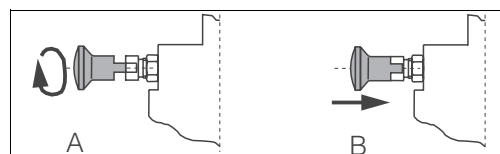
1. Remove the protection cap of the sensor.
Make sure the sensor shaft is fitted with the O-ring and the thrust collar (Fig. 17).
2. Moisten the sensor shaft before installing the sensor.
3. Acc. to the assembly version:
 - a. *Manually driven assembly:*
Pull the retractable pipe as far as possible out of the assembly.
 - b. *Pneumatically driven assembly:*
Move the assembly into the "Service" position.
4. Turn the stop lock bolt through 90° so that the plastic grooves are located above the recesses (Fig. 18, A).
5. Turn the retractable pipe **clockwise** until the stop lock bolt engages (B).
6. *Manually driven assembly:*
Close the ball valve!



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Fig. 17: Sensor installation

- 1 O-ring
- 2 Thrust collar



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Fig. 18: Stop bolt

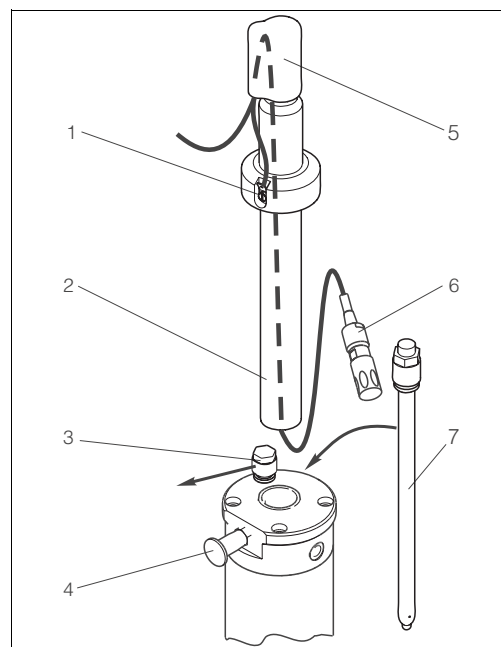


Caution!

If turned in the opposite direction, the stop lock bolt does not engage. This could, however, loosen the sensor holder. The reason for this is adhesions on the lower part of the sensor holder. These can cause the sensor holder to get stuck, producing a counterforce when unscrewing the sensor holder.

3.7.2 Gel sensor installation

1. Remove the splash protection cap (Fig. 19, position 5) from the assembly.
2. Then loosen the retractable pipe (position 2) by turning it anticlockwise.
3. Install the sensor (position 7) instead the dummy plug (position 3):
 - first screw by hand
 - then tighten the sensor using a socket wrench (AF 17) by approx. $\frac{1}{4}$ turn.
4. Insert the measuring cable through the retractable pipe (pos. 2):
 - Fixed cable:
from the bottom through the retractable pipe, from the sensor to the transmitter
 - Plug-in head sensor:
from the top to the sensor head
5. *Plug-in head sensor only:*
Connect sensor and cable.
6. Screw the retractable pipe back onto the pressure cylinder (clockwise, by hand).
7. Place the measuring cable in the splash protection cap and place it on the retractable pipe.



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Fig. 19: Sensor installation

- | | |
|---|--|
| 1 | PML connection |
| 2 | Retractable pipe |
| 3 | Dummy plug (a=inserted and b=not inserted) |
| 4 | Stop lock bolt |
| 5 | Splash protection cap |
| 6 | Measuring cable with cable plug |
| 7 | Sensor or electrode |

Remove the sensor in the reverse sequence of operations.

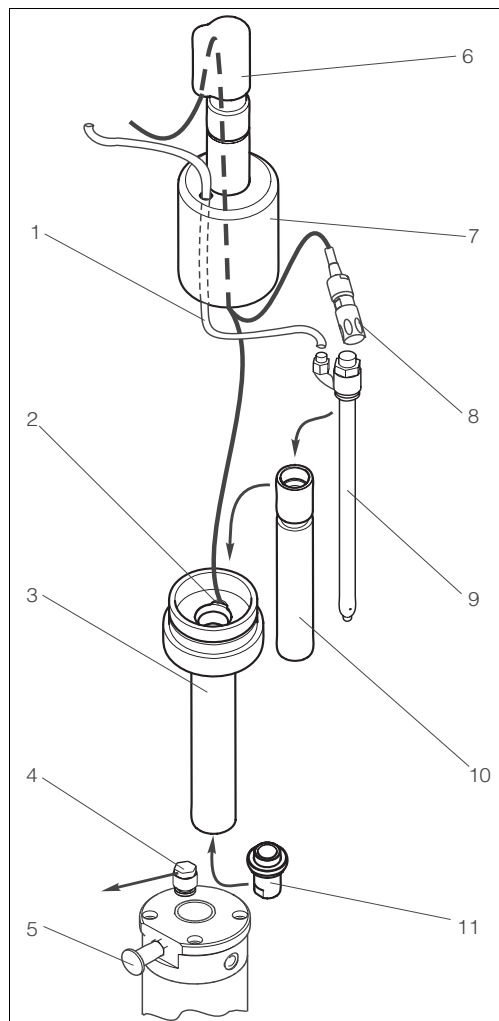


Note!

In case of symmetrical pH measurement, you must push the PML connector onto the PML connection (PML = potential matching line, position 1). Please, read the Operating Instructions of the transmitter.

3.7.3 Sensor with liquid KCl electrolyte

1. Remove the splash protection cap (Fig. 20, position 6) and the KCl hood (position 7) from the assembly.
2. Then slacken the retractable pipe by turning it anticlockwise.
3. Screw in the sensor:
 - a. Unscrew the tension sleeve (position 11) from the inner pipe (position 10).
 - b. Install the sensor (position 9) into the inner pipe:
 - first screw by hand
 - then tighten the sensor using a socket wrench (AF 17) by approx. ¼ turn.
 - c. Push the inner pipe with the sensor into the retractable pipe and screw the tension sleeve to the inner pipe.
4. Screw the retractable pipe with the sensor onto the assembly (clockwise, by hand).
5. Insert the measuring cable through the protective tube and the KCl hood (position 7):
6. *Plug-in head sensor only:*
Connect sensor and cable.
7. Insert the electrolyte supply tube (position 1) through the KCl hood and connect it to the electrolyte connection of the sensor.
8. Attach the KCl hood to the retractable pipe.
9. Place the measuring cable in the splash protection cap and place it on the protective tube of the KCl hood.



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Fig. 20: Liquid KCl electrolyte sensor installation

- | | |
|----|-----------------------------------|
| 1 | Liquid KCl supply tube |
| 2 | PML connection |
| 3 | Retractable pipe |
| 4 | Dummy plug |
| 5 | Stop lock bolt |
| 6 | Splash protection cap |
| 7 | KCl hood |
| 8 | Plug-in head cable |
| 9 | Sensor with liquid KCl connection |
| 10 | Inner pipe |
| 11 | Tension sleeve |

Remove the sensor in the reverse sequence of operations.



Note!

In case of symmetrical pH measurement, you must push the PML connector onto the PML connection (PML = potential matching line, position 2). Please, read the Operating Instructions of the transmitter.

3.8 Post-installation check

- After installation, check that all connections are firmly in position and leak-tight.
- Ensure that the hoses cannot be removed without force.
- Check all hoses for damage.

4 Operation

4.1 First commissioning

Before the first commissioning, make sure of the following items:

- all seals are correctly seated (on the assembly and process connection)
- the sensor is correctly installed and connected
- the water supply line is correctly connected to the rinse connections (if fitted)
- the limit position switches (according to assembly version) are correctly connected



Warning!

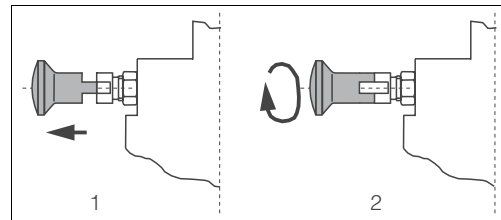
Danger of squirting medium.

Before applying compressed air to the pneumatic assembly, make sure the connections are correctly fitted with either rinsing hoses or dummy plugs. Otherwise the assembly may **not** be put into the process!

4.2 Operating elements

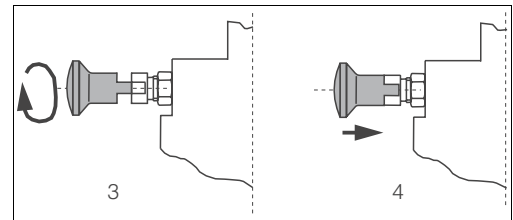
Use the stop lock bolt to lock or release the retractable pipe (Fig. 21, Fig. 22).

When using manually operated assemblies, the retractable pipe can be locked in both the "Measuring" position and the "Service" position. When using pneumatically operated assemblies, this can only be done in the "Service" position.



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Fig. 21: Releasing the stop lock bolt



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Fig. 22: Locking the stop lock bolt

Releasing the stop lock bolt:

1. Pull the bolt out.
2. Turn the bolt by 90° so that the plastic grooves rest on the metal edge.

Locking the stop lock bolt:

3. Turn the stop lock bolt through 90° so that the plastic grooves are located above the recesses.
4. When the retractable pipe is turned clockwise, the bolt engages.

4.3 Manual operation

Moving the assembly from the "Service" position to the "Measuring" position

1. Open the ball valve.
2. Release the stop lock bolt catch.
3. Push the lifting tube so that the sensor holder is inserted fully into the process.
4. Lock the sensor holder with the stop lock bolt. This prevents the lifting tube from returning inadvertently into the "Service" position.

**Warning!****Risk of injury!**

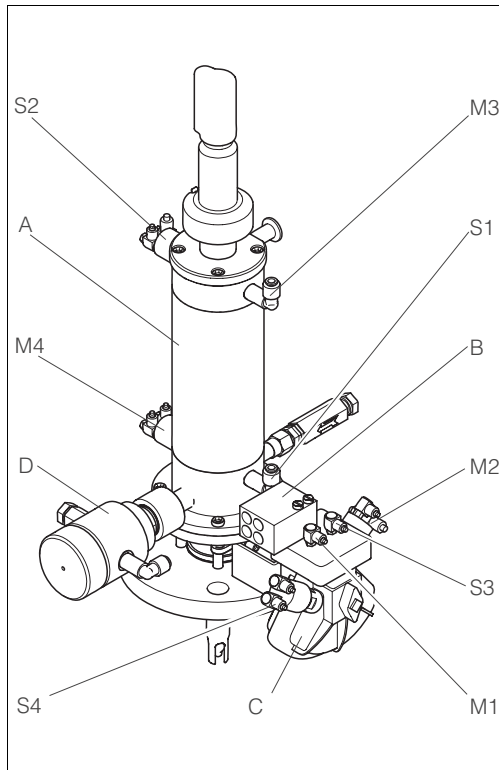
Always lock the sensor holder. Otherwise, the lifting tube may exit uncontrolled as a result of the process pressure and injure somebody.

Moving the assembly from the "Measuring" position to the "Service" position

1. Release the stop lock bolt catch.
2. Pull the lifting tube out as far as possible ("Service" position).
3. Close the ball valve.
4. Lock the sensor holder with the stop lock bolt.
5. Complete the necessary service tasks.

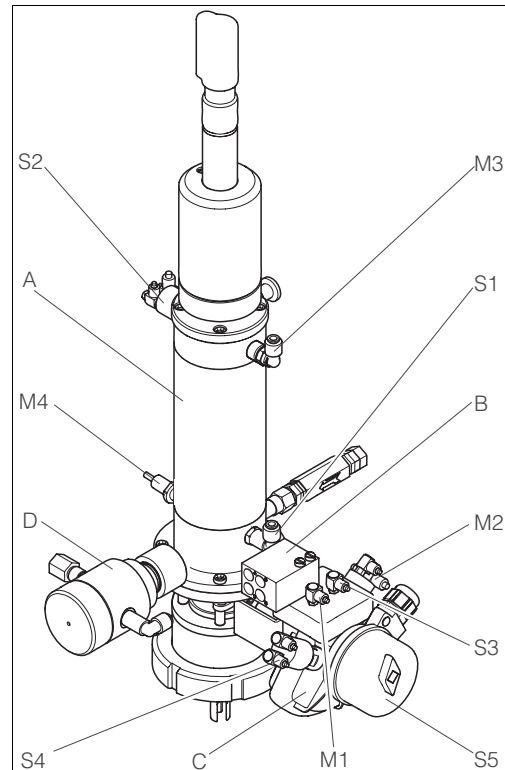
4.4 Pneumatic operation

4.4.1 Connections and limit position switches overview



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Fig. 23: Pneumatic limit position switches



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Fig. 24: Electrical limit position switches

A Assembly cylinder

B Pneumatic connection block

Measuring:

M1 Pneumatics "Open ball valve"

M2 Limit position switch "Ball valve open"

M3 Pneumatics "Assembly Measuring"

M4 Limit position switch "Assembly Measuring"

C Ball valve drive

D Rinsing input / output

Service:

S1 Pneumatics "Assembly Service"

S2 Limit position switch "Assembly Service"

S3 Pneumatics "Close ball valve"

S4 Limit position switch (pneu.) "Ball valve closed"

S5 Limit position switch (el.) "Ball valve closed"

**Note!**

The following chapters describe the **principle** of assembly moving. The figures show **only the details necessary** to explain this principle.

Please, refer to the chapter "Installation" / "Installation instructions" and the figures there for assembly hoses and installation into the process!

4.4.2 Moving from "Service" position into "Measuring" position

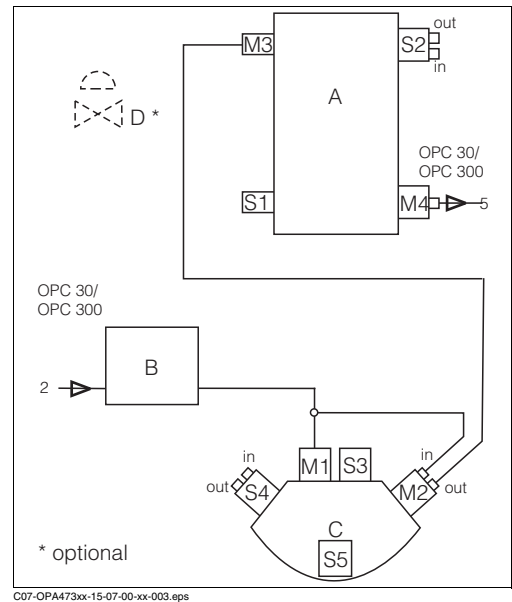
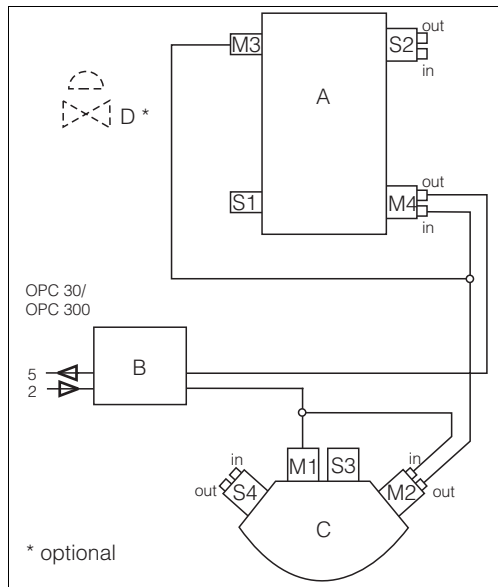


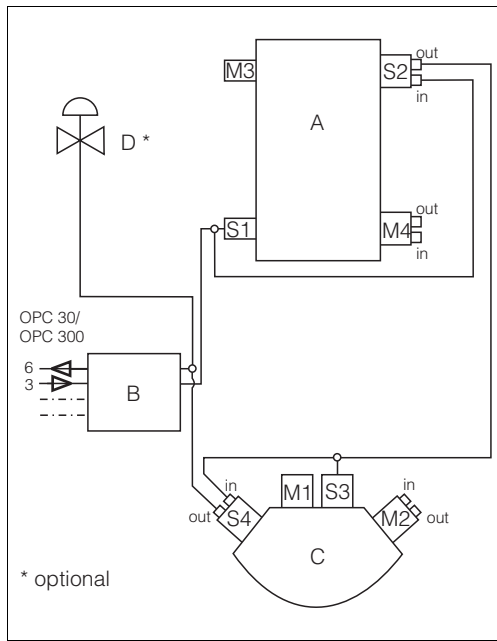
Fig. 25: Move to "Measuring" position with version with pneumatic limit position switches

Fig. 26: Move to "Measuring" position with version with electric limit position switches

- | | | | |
|---|---|---|--------------------------------------|
| 1 | Pneumatic input, limit position switch | A | Assembly cylinder |
| 2 | Pneumatic output, limit position switch | B | Pneumatics connection block |
| 5 | Feedback signal "Assembly measuring" | C | Ball valve drive |
| 2 | Compressed air input "Start measuring" | D | Outlet safety seal for rinse chamber |

- Compressed air is provided at position M1 (pneumatic "Open ball valve"). At the same time, compressed air is applied to M2 (limit position switch "Ball valve open"). The ball valve (C) opens. **The rinse chamber outlet valve (D) must be closed.**
- When the ball valve is completely open, the limit position switch M2 forwards compressed air to the pneumatics of the pressure cylinder, input "Assembly measuring" (M3) and simultaneously to the limit position switch "Assembly measuring" (M4). The electrode holder moves out of the assembly into the medium.
- Once the limit position is reached, the limit position switch M4 sends a signal (5, "Assembly measuring" feedback signal) to the transmitter / DCS or to OPC 300 / OPC 30.

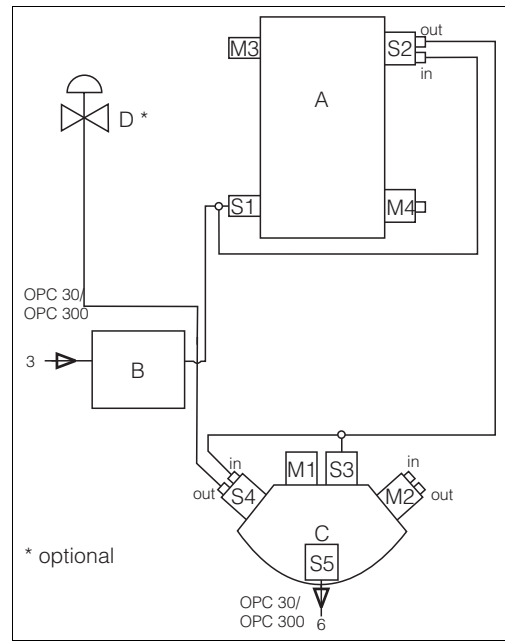
4.4.3 Moving from "Measuring" position into "Service" position



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Fig. 27: Move to "Service" position with version with pneumatic limit position switches

- 1 Pneumatic input, limit position switch
- 2 Pneumatic output, limit position switch
- 6 Feedback signal "Assembly service"
- 3 Compressed air input "Start service"



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Fig. 28: Move to "Service" position with version with electric limit position switches

- A Assembly cylinder
- B Pneumatics connection block
- C Ball valve drive
- D Outlet safety seal for rinse chamber

1. Compressed air is simultaneously provided at the pneumatics of the pressure cylinder, input "Assembly service" (S1) and at the limit position switch "Assembly service" (S2). The electrode holder moves from the medium into the assembly.
2. When the limit position is reached, the limit position switch S2 forwards pressure to position S3 (close ball valve) and position S4 (limit position switch "Ball valve closed") simultaneously. The ball valve (C) closes.
3. Once the ball valve is completely closed, a signal (6, "Assembly service" feedback signal) is sent from the limit position switch S4 (or the limit position switch S5 in case of the version with electric limit position switches) to the transmitter / DCS or to OPC 300 / OPC 30. At the same time, pressure is applied to the rinse chamber outlet valve (D). Valve D opens as long as the pressure is applied. Any drop in pressure causes this valve to close.

5 Maintenance



Warning!

Risk of injury!

Before starting maintenance work on the assembly, make sure that the process line and the tank are depressurised, empty and rinsed.

Move the assembly to the "Service" position and lock the retractable pipe by the stop lock bolt.

5.1 Cleaning the assembly

To ensure a reliable measurement, the assembly and the sensor must be cleaned at regular intervals. The frequency and intensity of the cleaning operation depend on the process medium.

5.1.1 Manually operated assembly

All parts in contact with the medium, e.g. the sensor and the sensor holder, must be cleaned at regular intervals. Remove the sensor¹.

- Remove light dirt using suitable cleaning agents (see chapter "Cleaning agents").
- Remove severe fouling with a soft brush and a suitable cleaning agent.
- Remove persistent fouling by soaking in a liquid cleaner and if necessary by cleaning with a soft brush.

5.1.2 Pneumatically operated assembly

Pneumatically-controlled cleaning can be carried out regularly via the rinse connection and the corresponding equipment, e.g. with the fully automatic cleaning and calibration system OPC 300.

5.2 Cleaning the sensor

You have to clean the sensor:

- before every calibration
- regularly during operation
- before being returned for repair

You can remove and clean the sensor manually or perform cleaning in automatic operation² via the rinse connection.



Note!

- Clean redox electrodes only mechanically and with water, do not use any chemical cleaning agents. These cleaning agents apply a potential to the electrode that takes several hours to decay. This potential causes measuring errors.
- Do not use any abrasive cleaning agents. This can lead to irreparable damage of the sensor.
- After cleaning the sensor, rinse the rinse chamber of the assembly with copious amounts of water (possibly distilled or de-ionised). Otherwise, remaining residues of cleaning agent can corrupt measurement.
- If required, re-calibrate after cleaning.

1) in reverse sequence of operations to the installation procedure

2) with the corresponding assembly equipment only

5.3 Cleaning agents

The selection of the cleaning agent is dependent on the degree and type of contamination. The most common contaminations and the suitable cleaning agents are listed in the following table.

Type of contamination	Cleaning agent
Greases and oils	Substances containing tensides (alkaline) ¹ or water-soluble organic solvents (e.g. Ethanol)
Calciferous deposits, metal hydroxide deposits, lyophobic biological deposits	approx. 3% hydrochloric acid
Sulphide deposits	Mixture of 3% hydrochloric acid and thiocarbamide (commercially available)
Protein deposits	Mixture of 3% hydrochloric acid and pepsin (commercially available)
Fibres, suspended substances	Water under pressure, poss. with surface-active agents
Light biological deposits	Water under pressure

1) do not use for the ISFET sensor! Instead, use commercially available acidic cleaning agents for the food industry (e.g. P3-horolith CIP, P3-horolith FL, P3-oxonia active).



Caution!

Do not use organic solvents containing halogen or acetone. These solvents could destroy plastic components of the assembly or the sensor and it is also partly suspected that they cause cancer (e.g. Chloroform).

5.4 Notes on calibration

Regular sensor calibration is vital for reliable measurement. The calibration cycles depend on the range of applications and the desired accuracy.

You have to define the calibration cycles separately for each application. At the start, perform calibration frequently (e.g. weekly) to determine the operating characteristics of the sensor. Follow the corresponding instructions for calibration in the Operating Instructions of the transmitter used.



Note!

- The calibration cycles depend on the process conditions and the medium.
- When using a symmetrical connection, there must be an electrical connection between the potential matching (PML) and the buffer solution.
- Do not allow a glass electrode to stand dry or pH sensors (including ISFET) to stand in distilled water.
- Do not use compressed air to blow clear automatic calibration systems with ISFET sensors.

6 Accessories

6.1 Water filter and pressure reducer

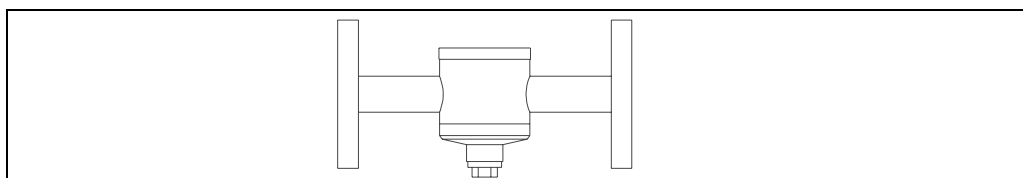
- Filter set
Water filter (dirt trap) 100 µm, complete, incl. angle bracket;
order no. 51511336
- Pressure reducer kit
complete, incl. manometer and angle bracket;
order no. 51505755

6.2 Rinse connection adapter

- Rinse connection adapter OPR 40 for connecting 2 or 4 different media.
Order acc. to product structure, see Technical Information (342C/07/en).

6.3 Flow assembly

- Flow vessel OPA 240 (product structure, see below)



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Fig. 29: Flow vessel OPA 240 (horizontal flow version, with dairy fitting DN 65)

Material	
30	Stainless steel 1.4404 (AISI 316L) (dairy fitting DN 65, DIN 11851) (flow vessel only, for CPA 473)
Flow direction	
A	Vessel, horizontal flow
B	Vessel with inlet below
Process connection	
A	Welding socket for DN 25 pipe connection
B	Flange DN 25 PN 16
C	Flange ANSI 1" 150 lbs
D	Flange JIS 10K 25A
E	Threaded connection NPT ½ internal thread
Seal material	
1	EPDM
2	FPM (Viton®)
3	Chemraz
Additional equipment	
10	Basic version
30	With test certificate 3.1B to EN 10204
OPA 240-	complete order code

6.4 Pneumatic throttle

- Pneumatic throttle for the reduction of the assembly moving speed,
order no. 51511990

6.5 Hose connectors for rinse chamber

- Hose connection set,
for assemblies, PVDF, G ¼", D12
order no. 51511724
- Hose connection set,
for assemblies, stainless steel 1.4404 (AISI 316L), NPT ¼", D12
order no. 51511725
- Hose connection set,
for assemblies, PVDF, NPT ¼", D12
order no. 51511726
- Hose connection set,
for assemblies, stainless steel 1.4404 (AISI 316L), NPT ¼", D16
order no. 51511722
- Hose connection set,
for assemblies, PVDF, NPT ¼", D16
order no. 51511723
- Hose connection set,
for assemblies, stainless steel 1.4404 (AISI 316L), G ¼", D16
order no. 51511590
- Hose connection set,
for assemblies, PVDF, G ¼", D16
order no. 51511591

6.6 Limit position switches

- Set of pneumatic limit position switches (2 pieces);
order no. 51502874
- Set of electric limit position switches, Ex and Non-Ex (2 pieces);
order no. 51502873

6.7 Inlet and outlet safety seal

- Pneumatic outlet safety seal for rinse chamber outlet:
G ¼", order no. 51511935
NPT ¼", order no. 51511936
- Manual outlet safety seal for rinse chamber outlet,
G ¼", order no. 51511937
NPT ¼", order no. 51511938
- Non-return valve (inlet safety seal) for rinse chamber inlet,
G ¼", order no. 51511939
NPT ¼", order no. 51511940

6.8 Sensors

6.8.1 Glass electrodes

- OPS 11
pH electrode for process applications, with PTFE diaphragm
- OPS 12
ORP electrode for process applications, with PTFE diaphragm
- OPS 41
pH electrode with ceramics diaphragm and KCl liquid electrolyte
- OPS 42
ORP electrode with ceramics diaphragm and KCl liquid electrolyte
- OPS 71
pH electrode with double chamber reference system and integrated bridge electrolyte
- OPS 72
ORP electrode with double chamber reference system and integrated bridge electrolyte
- OPS 91
pH electrode with double chamber reference system and open aperture

6.8.2 ISFET sensors

- OPS 471
Sterilisable and autoclavable ISFET sensor for food and pharmaceuticals, process technology, water treatment and biotechnology
- OPS 441
Sterilisable ISFET sensor for media with low conductivity, with liquid KCl electrolyte
- OPS 491
ISFET sensor with open aperture for media with high dirt load

6.9 Buffer solutions

6.9.1 pH

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

6.9.2 ORP

- +225 mV, pH 7, 100 ml (0.026 US gal.); order no. CPY 3-0
- +468 mV, pH 0, 100 ml (0.026 US gal.); order no. CPY 3-1

6.10 Measuring cables

- OPK 9 special measuring cable
For pH-/redox electrodes with TOP 68 plug-in head
- OPK 1 special measuring cable
For pH-/redox electrodes with GSA plug-in head
- OPK 12 special measuring cable
For pH-/redox glass electrodes and ISFET sensors,

6.11 Transmitters

- OPM 223/253
Transmitter for pH and ORP, field or panel-mounted housing,
Hart® or PROFIBUS available
- OPM 153
Transmitter for pH and ORP, one or two channel version, Ex or Non-Ex,
Hart® or PROFIBUS available

6.12 Measuring, cleaning and calibration systems

- OPC 300
Fully automatic measuring, cleaning and calibration system; Ex or Non-Ex,
In-situ cleaning and calibration, automatic sensor monitoring
- OPC 30
Fully automatic measuring and cleaning system; Ex or Non-Ex,
In-situ cleaning, automatic sensor monitoring

7 Trouble-shooting

7.1 Replacing damaged parts



Warning!

Damage to the assembly which affects the pressure safety must **only** be repaired by authorised technical personnel.

After every repair and maintenance activity, suitable measures must be taken to test whether the assembly shows any signs of leaking. The assembly must then correspond to the specifications stated in the technical data.

Replace all other damaged components immediately. To order accessories and spare parts, please use the "Accessories" and "Spare parts" chapters or contact your Sales Center.

7.2 Replacing seals

- Keep the sealing surfaces of the assembly free of dirt.
- Remove deposits clinging to the assembly from time to time.
- In the event of leakages, contact your Sales Center.



Warning!

Risk of medium leaking out!

Seals must **only** be replaced by authorised technical personnel.

7.2.1 Replacing seals without process interrupt

When the ball valve is closed ("Assembly service"), you can completely remove the assembly body and replace components. You don't have to interrupt the process for this.



Warning!

Never remove the assembly body when the process is running with an open ball valve ("Assembly measuring")! Also ensure that the ball valve cannot be opened automatically (pneumatic control).

Otherwise, there is a risk of injury through escaping medium.

The manufacturer is not liable for damage caused by improper or non-designated use.

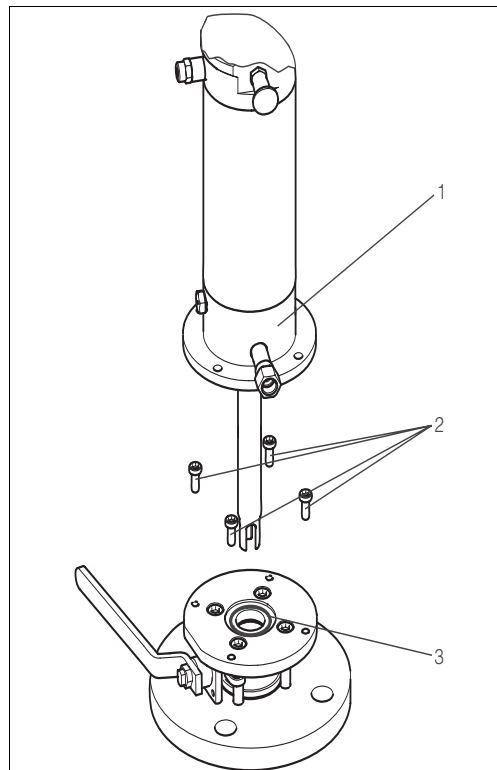
Beware of medium residues and higher temperatures when handling components that were in contact with medium. Wear protection gloves and protection glasses.

You can replace the following seals after the assembly body has been removed:

- 1 O-ring on the separating disc
- 2 O-rings on the rinse chamber
- 2 O-rings on the sensor

Proceed as follows:

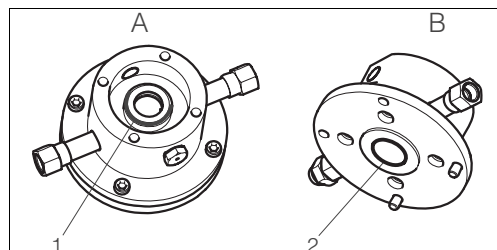
1. Loosen the screws between the separating disc for the ball valve / assembly and the rinse chamber (Fig. 30, position 2).
2. Remove the assembly body above the separating disc.
3. Replace the O-ring, position 3.
4. Loosen the screws that connect the rinse chamber to the pressure cylinder (not shown in the diagram because this is underneath the rinse chamber).
5. Remove the rinse chamber and replace the O-rings (Fig. 31).
6. If necessary, remove the sensor and replace the O-rings on the sensor.
7. Insert the sensor again and screw the rinse chamber back onto the pressure cylinder.
8. Screw the assembly body including the sensor and the rinse chamber back onto the separating disc for the ball valve / assembly and tighten all screws.
9. Move the assembly into the "Measuring" position and **check the leak-tightness**.



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Fig. 30: Removing without process interrupt

- 1 Rinse chamber
- 2 Screws separating disc ball valve/assembly
- 3 O-ring



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Fig. 31: Rinse chamber removed,
A inner side, B from below

- 1, 2 O-rings

7.2.2 Replacing seals with process interrupt

You can only replace the following seals when the process is interrupted and the assembly is completely removed:

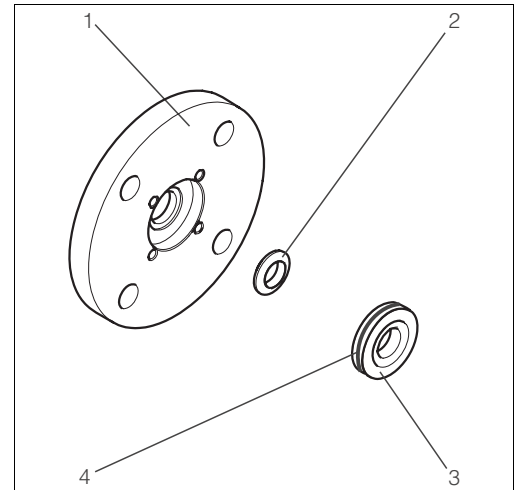
- Moulded seal
- O-ring seal disc



Warning!

Beware of medium residues and higher temperatures when handling components that were in contact with medium. Wear protection gloves and protection glasses.

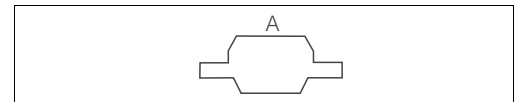
1. Interrupt the process. Beware of remains of medium, remaining pressure and increased temperatures.
2. Remove the assembly completely.
3. Loosen the connecting screws between the ball valve and the process flange of the assembly.
4. Remove flange (Fig. 32, position 1).
5. Press the seal disc out of the flange (press from opposite side).
6. Replace the moulded seal (position 2). Ensure that the new moulded seal is inserted the right way round. The side with the larger diameter must point in the direction of the ball valve (Fig. 33).
7. Replace the O-ring of the seal disc (position 4).
8. If necessary, also replace the seals above the ball valve (see previous chapter).
9. Screw the assembly back together.
10. Reinstall the assembly into the process via the corresponding connection.
11. Restart the process and move the assembly into the "Measuring" position.
12. **Check the leak-tightness.**



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Fig. 32: Seal replacing with process interrupt

- | | |
|---|----------------|
| 1 | Process flange |
| 2 | Moulded seal |
| 3 | Seal disc |
| 4 | O-ring |

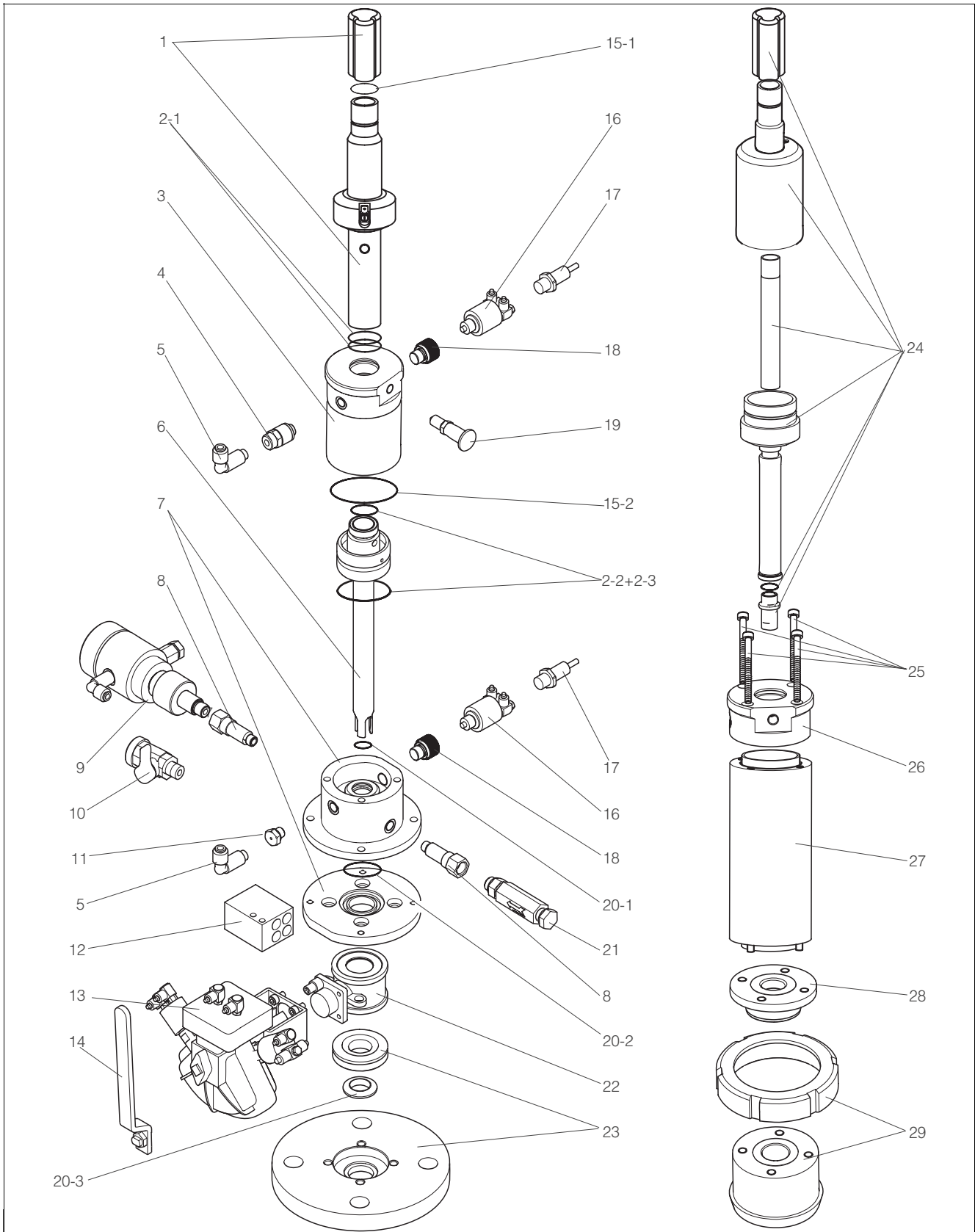


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Fig. 33: Side view of the moulded seal

- | | |
|---|-------------------------|
| A | Direction of ball valve |
|---|-------------------------|

7.3 Spare part kits



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Fig. 34: Spare parts (all assembly versions)

**Note!**

Please, refer to the following table for the spare part kits ordering numbers acc. to the positions in Fig. 34.

Position	Description and kit content	Spare part kit order no.
1	Retractable pipe for gel electrodes, length 360 mm (14.17 inch) For assembly version: – pneumatic	51513005
	Retractable pipe for gel electrodes, length 360 mm (14.17 inch) For assembly version: – manual	51513006
2-1, 2-2, 2-3	Set of gaskets, not dynamically loaded	51503728
3	PA cylinder, with O-ring For assembly version: – short, immersion depth up to 100 mm (3.94 inch)	51503773
	SS 1.4404 (AISI 316L) cylinder, with O-ring For assembly version: – short, immersion depth up to 100 mm (3.94 inch)	51503775
4, 11	Exhaust air restrictor (4) and SS 1.4404 (AISI 316L) dummy plug (11) For assembly version: – manual 5 pieces each	51503732
5	G1/8 pneumatic connections For assembly version: – pneumatic 10 pieces	51503730
6	Sensor guide, SS 1.4404 (AISI 316L), complete For assembly version: – short, immersion depth up to 100 mm (3.94 inch)	51512677
	Sensor guide, SS 1.4404 (AISI 316L), complete For assembly version: – long, immersion depth up to 235 mm (9.25 inch)	51512678
7	Rinse chamber complete, SS 1.4404 (AISI 316L)	51512689
8	Set of G $\frac{1}{4}$ rinse connectors, complete	51503771
	Set of NPT $\frac{1}{4}$ " rinse connectors, complete	51503772
9	Pneumatic outlet safety seal for G $\frac{1}{4}$ rinse chamber connections	51511929
	Pneumatic outlet safety seal for NPT $\frac{1}{4}$ " rinse chamber connections	51511934
10	Manual outlet safety seal for G $\frac{1}{4}$ rinse chamber connections	51511937
	Manual outlet safety seal for NPT $\frac{1}{4}$ " rinse chamber connections	51511938
12, 13, 16	Pneumatic drive complete: Ball valve drive (pos. 13) + pneumatic terminal block (pos. 12), with pneumatic limit position switches (pos. 16)	51512707
	Pneumatic drive complete: Ball valve drive (pos. 13) + pneumatic terminal block (pos. 12), with electric limit position switches (pos. 17 + an additional electric limit position switch at the ball valve drive)	51512708
14	Manual ball valve drive	51512698
15-1, 15-2	Set of gaskets, not dynamically loaded	51503729

Position	Description and kit content	Spare part kit order no.
16	Set of pneumatic limit switches For assembly version: – pneumatic 2 pieces	51502874
17	Set of electric limit switches, Ex and Non-Ex For assembly version: – pneumatic 2 pieces	51502873
18	M12x1 stopper For assembly version: – pneumatic, without limit switch 10 pieces	51503733
19	Stop bolt	51503731
20-1, 20-2, 20-3	Set of gaskets, in contact with medium EPDM, for food applications	51511871
	Set of gaskets, in contact with medium VITON, for process applications	51511872
	Set of gaskets, in contact with medium Perfluoro elastomer, for special applications	51511873
21	Check valve (inlet safety seal) for G $\frac{1}{4}$ rinse chamber connection	51511939
	Check valve (inlet safety seal) for NPT $\frac{1}{4}$ " rinse chamber connection	51511940
22	Ball valve, without drive, SS 1.4404 (AISI 316L)	51512698
23	Flange DN 50 (DIN 1092-1), with sealing disc and moulded seal (Pos. 20-3)	on request
	Flange ANSI 2", with sealing disc and moulded seal (Pos. 20-3)	on request
24	Retractable pipe for liquid KCl electrodes, length 425 mm (16.73 inch) For assembly version: – pneumatic	51513001
	Retractable pipe for liquid KCl electrodes, length 425 mm (16.73 inch) For assembly version: – manual	51513002
25	M6x45 screws, DIN 69612 For assembly version: – long, immersion depth up to 235 mm (9.25 inch) 20 pieces	51503738
25-27	PA cylinder (pos. 27), with O-ring (pos. 15-2), cylinder head (pos. 26), screws (Pos. 25) For assembly version: – long, immersion depth up to 235 mm (9.25 inch)	51503774
	SS 1.4404 (AISI 316L) cylinder (pos. 27), with O-ring (pos. 15-2), cylinder head (pos. 26), screws (Pos. 25) For assembly version: – long, immersion depth up to 235 mm (9.25 inch)	51503776
28	G $\frac{1}{4}$ internal thread with thread adapter nut	on request
29	Dairy fitting DN 65 (DIN 11851)	on request

7.4 Return

If the assembly has to be repaired, please return it *cleaned* to the sales centre responsible. Please use the original packaging, if possible.

Please enclose the completed Dangerous Goods sheet (copy the second last page of these Operating Instructions) with the packaging and also the shipping documents.
No repair without completed Dangerous Goods sheet!

7.5 Disposal

Remove electronic components, e.g. electric limit position switches. Dispose of these components in accordance with regulations on the disposal of electronic waste. You have to separately dispose of pressure cylinder, sensor holder and other components according to their material.
Please observe local regulations.

8 Technical data

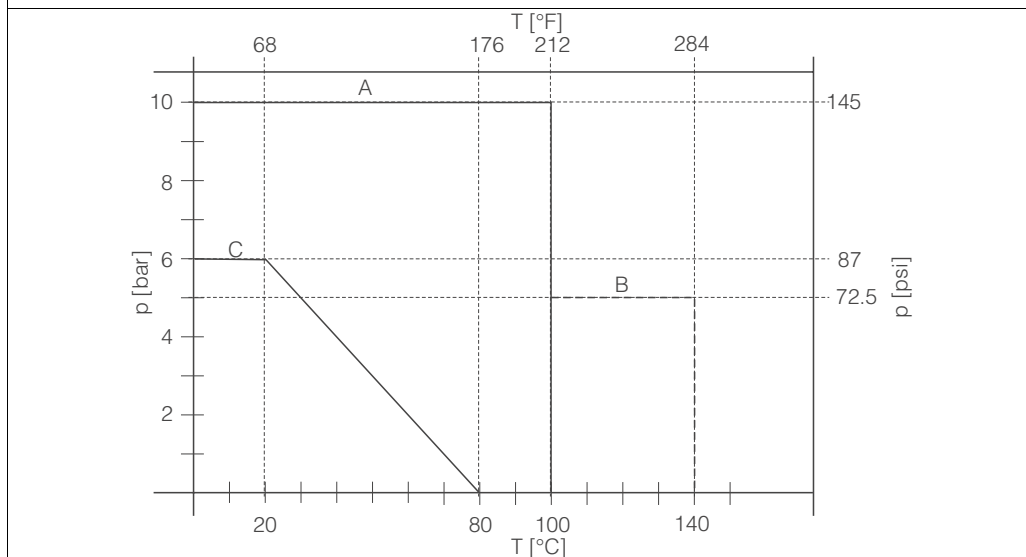
8.1 Environment

Ambient temperature	Ambient temperature not below 0 °C (32 °F). With an optional inlet/outlet safety seal the ambient temperature may not exceed 50 °C (122 °F).
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8.2 Process

Process pressure	PA pressure cylinder:	Max. 6 bar (87 psi)
	Stainless steel pressure cylinder:	Max. 10 bar (145 psi)
	Pneumatic outlet safety seal:	Continuous operation: 10 bar (145 psi) / 100 °C (212 °F), short-term (max. 1 h): 5 bar (72.5 psi) / 140 °C (264 °F)
	Manual outlet safety seal:	10 bar (145 psi) / 20 °C (68 °F), 2 bar (29 psi) / 130 °C (265 °F)
Process temperature	PA pressure cylinder:	Max. 80 °C (176 °F)
	Stainless steel pressure cylinder:	Up to 100°C (21 °F) with continuous operation up to 10 bar (145 psi); short-term (max. 1 h): max. 140 °C (264 °F) at 5 bar (72.5 psi)

Pressure temperature diagram



C07-CPA473xx-05-07-00-en-001.eps

Fig. 35: Pressure temperature diagram

- A Pressure cylinder (assembly) stainless steel 1.4404 (AISI 316L)
- B Pressure cylinder (assembly) stainless steel 1.4404 (AISI 316L) short-term (max. 1h)
- C Pressure cylinder (assembly) PA

Fluid velocity	Max. 3 m/s (9 ft/s) <p> Note!</p> <ul style="list-style-type: none"> • A flow of 2-3 m/s (6-9 ft/s) should not be exceeded as otherwise measurable potentials can develop at the electrode. • Within the permitted limits, mechanical stability does not depend on temperature and immersion depth.
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Caution!
The process pressure may not exceed 4 bar (58 psi) with manually actuated assemblies!

8.3 Mechanical construction

Design, dimensions	see chapter "Installation"	
Sensors	Short version	pH glass electrodes, Gel 225 mm (8.9 inch) pH glass electrodes, KCl 425 mm (16.7 inch) pH ISFET sensors, Gel, 225 mm (8.9 inch) pH ISFET sensors, KCl, 425 mm (16.7 inch)
	Long version	pH glass electrodes, Gel, 360 mm (14.2 inch) pH ISFET sensors, Gel, 360 mm (14.2 inch)
Weight	4 - 15 kg (8.8 - 33.1 lb), depending on the pressure cylinder material, the process connection, the drive and additional equipment, see product structure.	
Material (in contact with medium)	Seals Electrode holder Ball valve Inlet safety seal Outlet safety seal Rinse connection socket	EPDM / FPM / perfluoroelastomer Stainless steel 1.4404 (AISI 316L) Stainless steel 1.4404 (AISI 316L) PVDF, PTFE, Viton®, Hastelloy C4 PVDF, Stainless steel 1.4404 (AISI 316L) Stainless steel 1.4404 (AISI 316L)
Material (not in contact with medium)	Pressure cylinder El. limit position switch	PA / stainless steel 1.4404 (AISI 316 L) fore-part PBT, cable PVC
Rinse fittings	2 x G $\frac{1}{4}$ (internal) or 2 x NPT $\frac{1}{4}$ " (internal)	

Index

A

Accessories

- Buffer solutions 27
- Cables 28
- Flow assembly 25
- Hose connectors 26
- Inlet and outlet safety seal 26
- Limit position switches 26
- Pneumatic throttle 25
- Pressure reducer 25
- Rinse connection adapter 25
- Sensors 27
- TopCal 28
- Transmitters 28
- Water filter 25

Assembly

- Cleaning 23

B

- Buffer solutions 27

C

- Cables 28
- Calibration 24
- Certificates 6
- Checking
 - Installation 18
- Cleaning
 - Agents 24
 - Assembly 23
 - Sensor 23
- Commissioning 4, 19
- Compressed air connection 12
- Connection
 - Compressed air 12–13
 - Rinse water 14

D

- Designated use 4
- Dimensions 9
- Dirt trap 25
- Disposal 35

E

- Environment 36

F

- Flow assembly 25

G

- Gel sensors 17

I

- Icons 5
 - safety symbols 5
- Immersion depth 9
- Incoming acceptance 8
- Inlet safety seal 15, 26
- Installation 4, 8, 11
 - Immersion depth 9
- IsFET sensor 8

L

- Limit position switch 12
- Limit position switches 26
- Liquid KCl sensor 18

M

- Maintenance 23
- Manual operation 19
- Measuring 19, 21
- Measuring system 11
- Mechanical construction 37
- Medium 10

N

- Nameplate 6

O

- Operating elements 19
- Operation 4
 - Manually 19
 - Pneumatically 20
- Operational safety 4
- Ordering information 7
- Outlet safety seal 15–16, 26

P

Parts

- Replacing 29
- Pneumatic connection 12
- Pneumatic operation 20
- Pneumatic terminal block 13
- Pneumatic throttle 12, 25
- Pressure reducer 25
- Pressure surges 12, 14
- Process 36
- Process connection 10
- Process interrupt 30
- Process pressure 10
- Product structure 7

R

Replacing

- Parts 29
- Seals 29
- Retractable pipe 16
- Return 4, 35
- Rinse chamber 16
 - Inlet safety seal 15
 - Outlet safety seal 15
- Rinse connection adapter 25
- Rinse water connection 14

S

- Safety icons 5
- Scope of delivery 6
- Scraper function 10
- Seals 29
- Sensor
 - Cleaning 23
- Sensor holder 16
- Sensors 27
- Service 19, 22
- Spare parts 32
- Splash protection cap 16
- Stop lock bolt 16, 19
- Storage 8
- Symbols 5

T

- TopCal 28
- Transmitters 28
- Transport 8

U

- Use 4

W

- Wall spacing 9
- Water filter 25

