DOC023.53.90746

TMS-C filter system with automatic backwashing

User manual

06/2021, Edition 2

Distributed by Hach Lange GmbH.
Manufactured by ETL Verfahrenstechnik GmbH.
The manufacturer approved the translation of this manual.

Table of contents

Table of contents

Section 1 Technical data

Subject to change without notice.

Standard TMS-C system		
Power supply		230 V/50 Hz (or 115 V/50 Hz version)
System power, complete	Without cabinet heater and heating strips	250 W
Permissible ambient temperature without heating		5 °C to 40 °C (41 °F to 104 °F)
Switch cabinet fan	Switch-on temperature (factory setting)	35 °C (95 °F)
Compressed air supply	Oil-free, particle-free and condensate-free	4 bar maximum
Active membrane surface		220 cm^2 (34.1 in^2)
Pore size		Depends on membrane type
Permeate performance in standard operation		0.2 to 0.5 L/h depending on membrane type and length of the suction line
Delivery height		With 5 m suction line: 4 m With 8 m suction line: 3 m
Permeate pump		230 V/50 Hz (or 115 V/50 Hz version), 38 W
Chemical cleans per 24 hours	Default settings	1
Intermediate cleans per 24 hours	Default settings	5
Contents of cleaning canister		2.0 liters
Contents of overflow vessel		Top chamber 20 mL (single analyzer supply) or 40 mL (optional, dual analyzer supply) Bottom chamber 100 mL (backwashing)
pH of the raw fluid to be filtered		pH 2 to 10
Cabinet dimensions	(W x H x D)	600 x 600 x 200 mm (23.62 x 23.62 x 7.87 in.)
Weight of control cabinet without tubes		30.5 kg (76.24 lb)
Compressor, oil-free	Power supply (by customer)	230 V/50 Hz (or 115 V/50 Hz version)
	Motor power	150 W
	Sound power level	47 dB
	Delivery amount (standard amount)	20 to 23 L/min
	Pressure	4 bar maximum
Warranty		1 year (EU: 2 years)
Options		
Mini pump	Power supply (internal wiring)	230 V/50 Hz, 4 W (or 115 V/50 Hz version)
	Delivery amount	220 mL/min

Heater of TMS-C cabinet	Power supply (internal wiring)	230 V/50 Hz (or 115 V/50 Hz version)
	Heating power	100 W
	Switch-on temperature of heater (Default settings)	25 °C (77 °F)
	Heating strips for external permeate tubes and drain tube	15 W/m
	Permissible ambient temperature with heating	–25 °C to +40 °C (–13 °F to +104 °F)

⚠WARNING

It is forbidden to remove, bypass or override safety devices, safety functions and monitoring devices.

⚠WARNING

The manufacturer and the dealer are not responsible for any damage that may occur through incorrect use or misuse of this product, and decline to settle any such damage, including direct, indirect and consequential damage — to the extent that this is permitted by the applicable law.

The user is solely responsible for the identification of critical application issues and risks and for the installation of appropriate mechanisms to protect processes during a possible equipment malfunction.

2.1 Safety information

Please read this entire manual before unpacking, setting up, or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To prevent damage to or impairment of the device's protection equipment, the device may only be used or installed as described in this manual.

2.1.1 Danger information in this manual

⚠DANGER

Indicates a potentially or imminently hazardous situation that, if not avoided, can result in death or serious injury.

⚠WARNING

Indicates a potentially or imminently dangerous situation that, if it is not avoided, can lead to death or to serious injuries.

⚠CAUTION

Indicates a possible dangerous situation that can have minor or moderate injuries as the result.

NOTICE

Indicates a situation that, if it is not avoided, can lead to damage to the device. Information that requires special emphasis.

Note: *Information that supplements points in the main text.*

2.1.2 Warning labels

Read all labels and tags attached to the instrument. Failure to do so could results in personal injury or damage to the instrument.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.

	This symbol may be found on an enclosure or barrier within the product and indicates a risk of electric shock and/or death by electrocution.
	This symbol indicates that the marked item can be hot and should not be touched without care.
	This symbol can be attached to the instrument and references a general prohibition.
	This symbol identifies the presence of a strong corrosive or other hazardous substance and a risk of chemical harm. Only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	This symbol indicates the presence of a harmful irritant.
	This symbol requires the wearing of protective gloves.
	This symbol requires the wearing of eye protection.
	This symbol requires the wearing of protective clothing.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.
	When carrying or transporting the instrument components or instrument and if the total weight is more than 18 kg, make sure that suitable lifting equipment is used and/or that the instrument components or instrument are/is carried by two people.

2.2 Chemical and biological safety

⚠DANGER

Potential danger with contact with chemical/biological substances.

Working with chemical samples, standards and reagents can be dangerous. Make yourself familiar with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.

Normal operation of this instrument may involve the use of hazardous chemicals or biologically harmful samples.

- Before handling these substances observe all danger notes and safety information printed on the containers of the original solutions and in the safety data sheet.

- Dispose of all consumed solutions in accordance with the national regulations and laws.
- Select the type of protective equipment suitable to the concentration and quantity of the dangerous material being used.

2.3 Overview of product

The TMS-C system, consisting of control cabinet and filter probe, is designed for sample preparation for online analysis instruments.

With an automatic backwashing of the filter probe and various membrane materials, this sample preparation system is particularly suitable for use in the supply of wastewater treatment plants and industry.

The filter probe (Figure 1, item 7) is immersed via a basin edge holder directly in the fluid to be measured and only removed for maintenance work. The raw fluid to be filtered flows around the filter probe without pressure. A permeate pump (Figure 1, item 4) in the control cabinet generates a negative pressure in the filter probe in order to suck in permeate (filtrate).

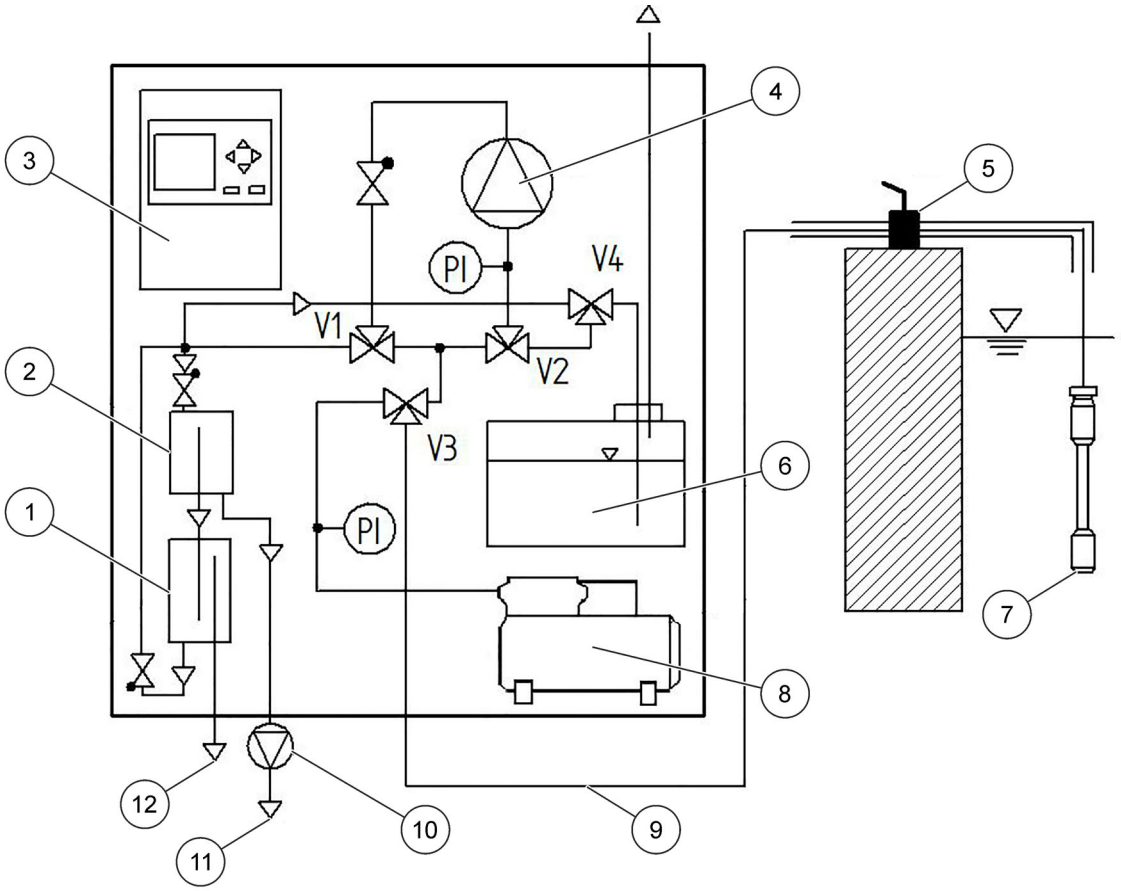
In the control cabinet, the permeate is delivered to the overflow vessel (Figure 1, item 1 and 2). From the drain of the overflow vessels (Figure 1, item 11), filtered sample is made available to the connected analyzer. The capacity of the overflow vessel is designed so that there is enough permeate available to the analyzers for a measurement, including during the backwash time of the filter probe.

Cleaning of the filter probe is automatically performed with cleaning solution and compressed air. The open-loop control times for cleaning, backwashing, pauses and displacing with permeate can be individually adjusted for each application.

The cabinet fans and the heater for the control cabinet, permeate lines and drain line of the overflow vessel are switched on and off depending on temperature. The preset temperatures can be individually adjusted.

An optional mini pump is necessary for analyzers that do not suck in the sample independently (for example, NITRATAX in a flowthrough cell).

Figure 1 Procedure schematic



1	Overflow vessel, bottom chamber (100 mL)	**7**	TMS-C probe
2	Overflow vessel, top chamber (20/40 mL)	**8**	Compressor
3	Control unit	**9**	Filtrate/compressed air
4	Permeat pump	**10**	Mini pump (optional)
5	Basin fixing	**11**	Filtrate
6	Cleaning canister	**12**	Overflow

2.4 Scope of delivery

- Filter probe
- Special brush for cleaning the filter probe
- Ventilated and heated control cabinet completely assembled from glass-fiber reinforced plastic and wiring with
  - Open-loop control unit with permeate pump, Siemens LOGO!open-loop control, non-return valve, optical negative pressure monitoring, solenoid valves, cleaning container, overflow vessel, compressor and visual pressure monitor for compressed air
- Permeate line (connection of filter probe - permeate pump), PE tube (OD=4 mm (0.16 in.)), blue, completely installed in protection tube (OD=25 mm (0.98 in.)) with heating strip
- Permeate line (connection of permeate pump - overflow vessel), PE tube (OD=4 mm (0.16 in.))

- Permeate line (connection of overflow vessel - analyzer), PE tube (OD=4 mm (0.16 in.)), blue, length 1.5 m (4.92 ft)
- 60 mL suction syringe with tube piece (OD=6 mm (0.24 in.)) and tube piece (OD=6 mm (0.24 in.)) with transition (to OD=4 mm (0.16 in.))

2.4.1 Optional scope of delivery

- Mini pump for the active delivery of the sample to the analyzer, installed in control cabinet
- Adapter for the grid assembly of the filter probe

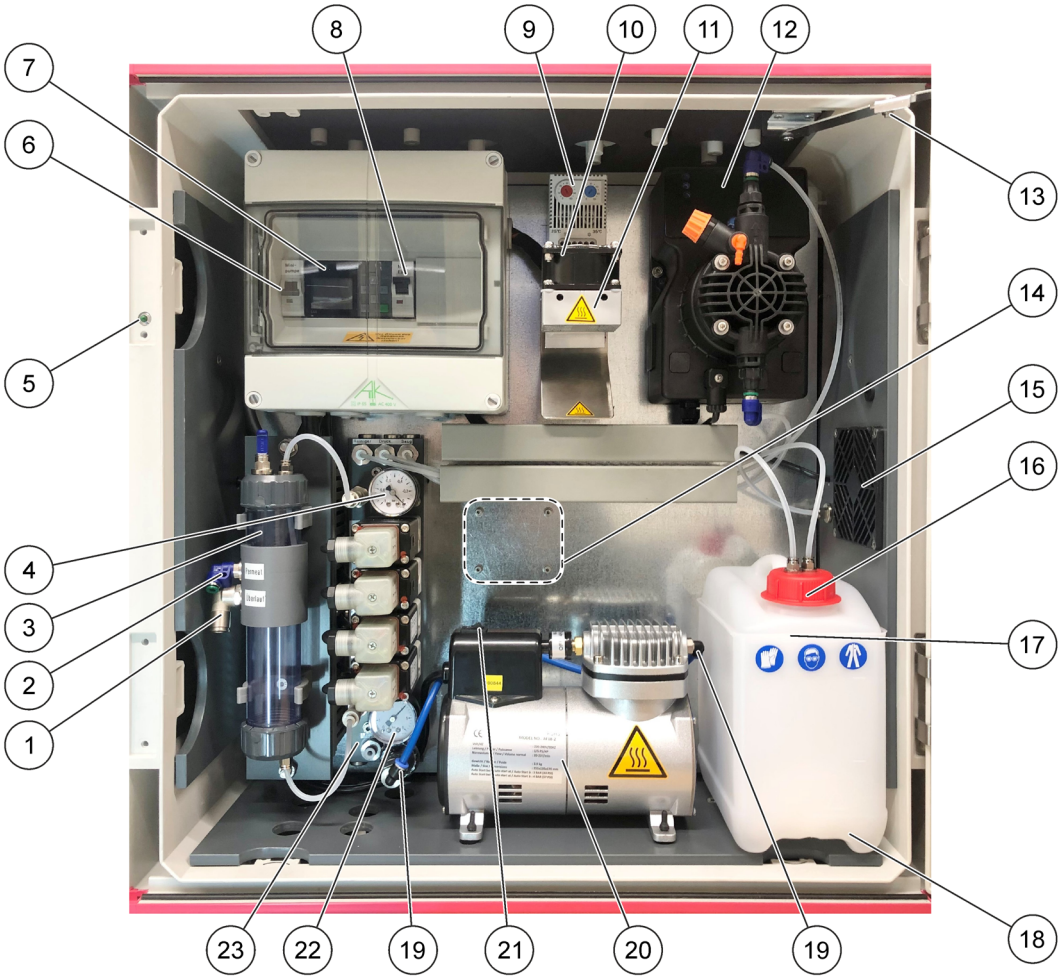
2.4.2 Indoor variants

The indoor variants are installed in a heatable instrument housing.

- Ventilated control cabinet completely assembled from glass-fiber reinforced plastic and wiring, open-loop control unit with permeate pump, Siemens LOGO!open-loop control, non-return valve, optical negative pressure monitoring, solenoid valves, cleaning container, overflow vessel and compressor

2.5 Front view

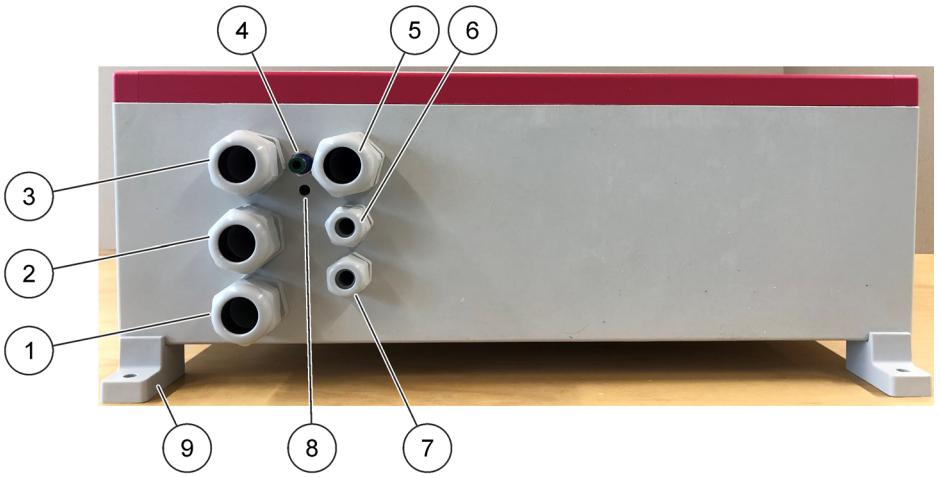
Figure 2 Inside view of control cabinet [1]



1	Overflow	**13**	Door fixing
2	Tube connection (OD=4 mm) for analyzer (plug connection)	**14**	Place to install mini pump (optional)
3	Overflow vessel, top chamber 20/40 mL, bottom chamber 100 mL.	**15**	Housing fan
4	Negative pressure display	**16**	Canister cap
5	LED status (power ON/OFF)	**17**	Cleaning canister, 2.0 L
6	Mini pump switch	**18**	Tray for cleaning canister
7	Open-loop control	**19**	Blue tube for compressed air
8	System switch ON/OFF	**20**	Compressor
9	Thermostats for heater with heater fan (red) and housing fan (blue)	**21**	Compressor power ON/OFF
10	Heater fan (outdoor)	**22**	Compressed air display
11	Cabinet heater (outdoor)	**23**	Valve block
12	Permeate pump		

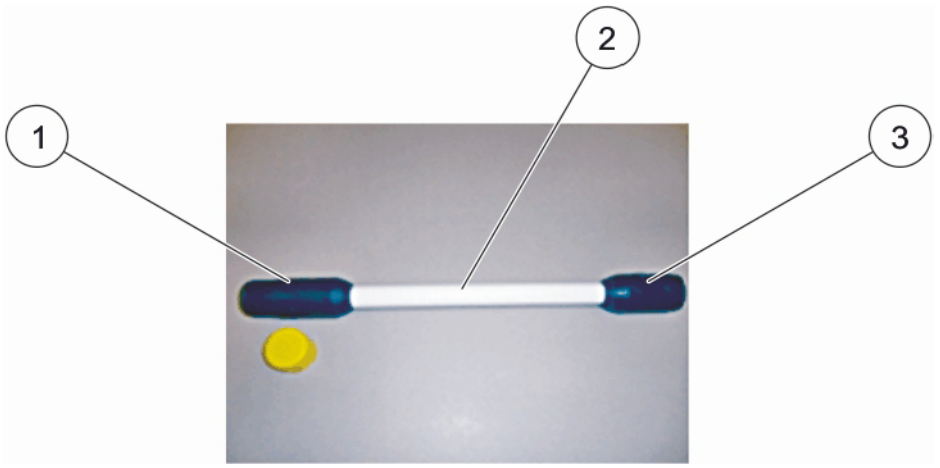
[1]The control cabinet is available as a 115 V version.

Figure 3 Bottom view of control cabinet



1	Free connection (for example, for 2nd analyzer)	**6**	Free out-/input, for example for data line
2	Hose feed for overflow vessel drain	**7**	Power supply 230 V/50 Hz (or 115 V/50 Hz version)
3	Hose feed on suction side	**8**	Cabinet ventilation
4	Connection for customer compressed air (optional)	**9**	Wall mount
5	Hose feed on pressure side (to the analyzer)		

Figure 4 Filter probe



1	Probe head	**3**	End cap
2	Probe body		

⚠ DANGER

The installation described in this section of the user manual should only be performed by qualified specialized personnel.

⚠ WARNING

The instrument may not be used in dangerous environments.

The manufacturer and its suppliers reject any express or indirect guarantee for use with high-risk activities.

NOTICE

Any use other than use in accordance with the defined intended purpose in the user manual will result in any warranty claims being rendered invalid and may lead to personal injury and property damage, for which the manufacturer and its suppliers assumes no liability.

Unpack all supplied parts carefully, as they are highly sensitive in part to shock and impact. Read the user manual prior to installation and proceed exactly as described.

3.1 Installation of the probe

⚠ CAUTION

Always lay cables and hoses so that they are straight and do not pose a tripping hazard.

NOTICE

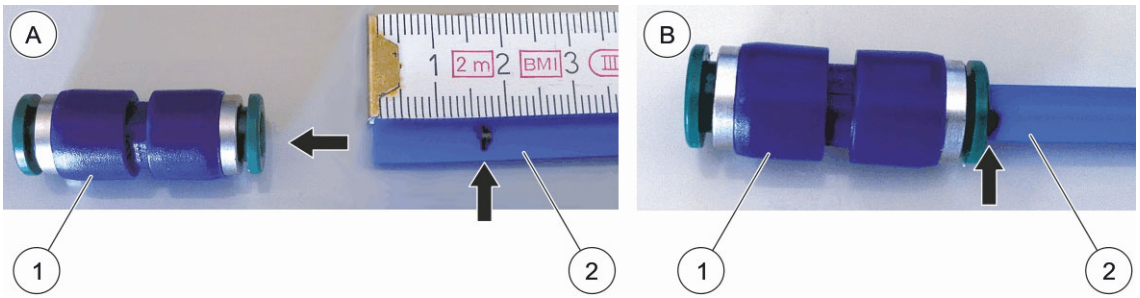
The membrane surface of the filter probe is very sensitive to mechanical effects and therefore is to be handled with utmost care.

The filter probe is installed with a basin edge mount. The installation of the basin edge mount is self-explanatory and is delivered without an additional user manual.

Always observe the following prior to installation:

- Place the probe at a distance of at least 200 mm (7.87 in.) from the tank wall.
- Make sure that the probe can swing freely and there are no fittings or basin wall in the movement range of the probe.
- The permeate output of the probe is always at the top due to the design.
- Make sure that the probe is fully immersed.
- With a probe installation through a grid, use angle adapters to ensure secure tube laying.
- Make sure of a secure assembly of all tube connections by inserting the tube until it stops due to resistance from the coupling. The insertion depth is approximately 15 mm (0.59 in.) (refer to Figure 5).

Figure 5 Tube connection



A	Mark the tube at 15 mm (0.59in.)	**B**	Insert the tube into the coupling part against any resistance until the mark is met.
1	Coupling part	**2**	Tube

1. Install the basin holder or channel holder (stainless steel) at a suitable point.
2. Install the clamp connectors at a suitable point on the basin edge.
3. Guide the pre-assembled protection tube (OD=25 mm (0.98 in.)) from the raw water side into the stainless steel tube (OD=42 mm (1.65 in.)).
4. Connect the permeate line (blue, OD=4 mm (0.16 in.)) approximately 15 mm (0.59 in.) into the tube coupling of the probe (Figure 5). Shorten the line if necessary.
5. Connect the probe to the protection tube until hand-tight by use of a union nut (OD=25 mm (0.98 in.)).
6. Connect the free end of the permeate line (blue, OD=4 mm (0.16 in.)) with the suction side connection of the control cabinet (Figure 3, page 13).
7. Immerse the probe in the raw water. We recommend to secure the tube with a tube clamp (not included in the scope of delivery).

   Note: *The screw connection of the probe should be immersed approximately 100 mm (3.94 in.) deep.*

   Note: *The probe should be at least 100 mm (3.94 in.) away from the basin floor.*

3.2 Installation of the control cabinet

⚠DANGER

Danger of an electric shock.
Make sure that the supply voltage for the control cabinet is 230 V/50 Hz (or 115 V/50 Hz version), FI-secured by customer.

⚠CAUTION

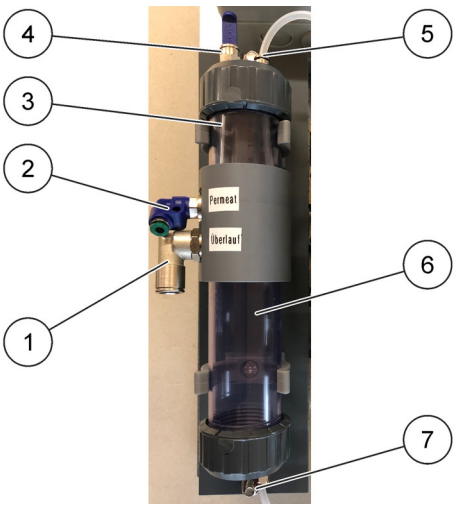
Always lay cables and hoses so that they are straight and do not pose a tripping hazard.

1. Install the control cabinet in the immediate proximity of the basin holder or in an instrument housing next to the analyzers.
2. Select the installation height of the control cabinet so that the drain of the overflow vessel lies either at the same level or above the supply of the analyzer provided by the customer.

3. Connect the already installed mains cable (length 2 m (6.56 ft)) of the control cabinet to an existing customer socket (230 V/50 Hz or 115 V/50 Hz, FI-secured by customer.).

Note: *For installation in an instrument housing, an indoor variant is also available.*

Figure 6 Installation of the overflow vessel



1	Overflow (OD=10 mm (0.39 in.))	**5**	Permeate line pressure-side supply (OD=4 mm (0.16 in.))
2	Permeate for analyzer[1] (OD=4 mm (0.16 in.))	**6**	Overflow vessel, bottom chamber 100 mL.
3	Overflow vessel, top chamber 20/40 mL	**7**	Connection for cleaning and displacing solution (OD=4 mm (0.16 in.))
4	Connection to fill (OD=6 mm (0.23 in.)) and for mini pump (optional)		

[1] As a standard the overflow vessel gives a volume of 20 mL in the top chamber for the measurement. This is sufficient for one analyzer. If two analyzers are connected to the filter system, a volume of 40 mL is necessary in the top chamber. Insert the supplied plastic tube as an adapter and upgrade the filter system for a 40-mL volume.

3.2.1 Installation of the tube heating

1. In the control cabinet, remove the overflow vessel and the cover of the cable channel lying underneath.
2. Connect the heating strips via the connection as follows:
   - Heating strip 1 with suction side
   - Heating strip 2 with pressure side
   - Heating strip 3 with drain overflow
3. Use the cover to close the cable channel.
4. Install the overflow vessel with screws in the control cabinet.

The cabinet heating including heater fan and the housing fan are switched on and off depending on temperature. The heating strips of the tubes are self-regulating and switch on and off as required.

3.2.2 Installation of the compressor

1. In the control cabinet, remove the overflow vessel and the cover of the cable channel lying underneath.

2. Put the compressor on the bottom of the control cabinet in the recesses supplied. Make sure that the feet of the compressor have rubber protectors.
3. Connect the compressor strip with the compressor connector.
4. Connect the blue tube on the right side to the compressor. Refer to Figure 2, page 12, item 19.
5. Use the cover to close the cable channel.
6. Install the overflow vessel with screws in the control cabinet.
7. Set the compressor to on. Refer to Figure 2, page 12, item 21.

3.2.3 Installation of user-supplied compressed air

1. Connect the user-supplied compressed air supply with a coupling connection for the tube (OD=6 mm (0.23 in.)) to the bottom of the cabinet from the exterior.
2. Disconnect the tube from the supplied compressor. Connect the tube with the coupling connection on the bottom side in the cabinet.
   Make sure that the pressure regulator installed in the control cabinet is set to approximately 4 bar.

Note: *Make sure that the compressed air is particle-free, condensate-free and oil-free and is available at 4 bar (58 psi) minimum.*

3.2.4 Installation of the mini pump

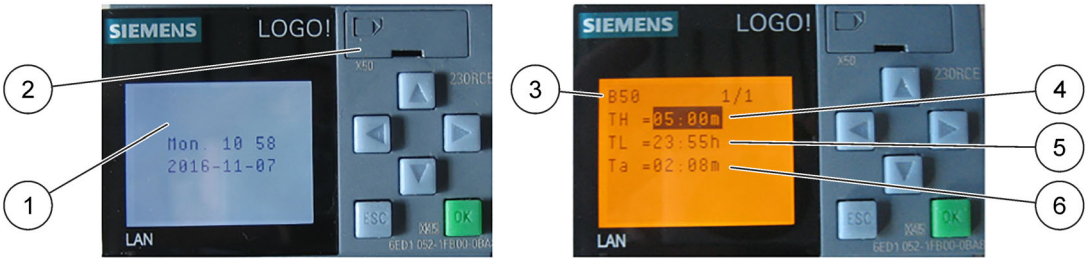
For non-sucking analyzers (for example, NITRATAX in flowthrough cell) an optional mini pump is necessary, which supplies the analyzer with enough permeate.

1. Use four screws to attach the mini pump to the rear wall of the control cabinet. Refer to Figure 2 Inside view of control cabinet, page 12, item 14.
2. Connect the output of the mini pump with the input of the analyzer overflow vessel.
3. Connect the output of the analyzer overflow vessel with the upper input of the overflow vessel (return) (Figure 2 Inside view of control cabinet, page 12, item 2).
4. Make the electical connections. Refer to Figure 11 Assignment plan, page 37.

3.3 Open-loop control of the TMS-C system

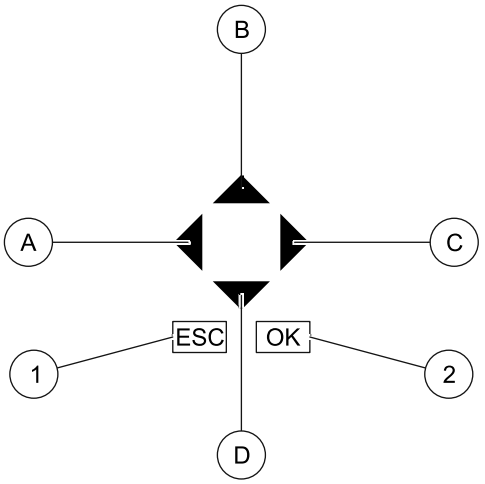
The TMS-C system is operated via the LOGO!open-loop control unit.

Figure 7 Display of the open-loop control unit



1	Display	**4**	TH: Membrane cleaning time with cleaning solution (5 min)
2	Interface cover	**5**	TL: Cycle time of the membrane cleaning with cleaning solution (23 h : 55 min)
3	Example: block number 50	**6**	Ta: Current time until the next membrane cleaning with cleaning solution (2 min : 8 sec)

Figure 8 Keypad of the open-loop control unit



1	ESC: back, change, cancel	**2**	OK: advance, confirm
A	Left	**C**	Right
B	Up	**D**	Down

The display shows the operating status of the system.

Table 1 Displays

Operating status	Display
Normal operation	Weekday, time, date
Sample delivery	Sample delivery
Cleaning	Membrane cleaning or compressed air flushing

3.3.1 Factory settings of the operating times

NOTICE

The operating times cannot be changed by the user. If you need to change the operating times, contact the supplier's service team.

Table 2 Factory settings of the operating times

Operating status	Display	Default settings
Total cycle time		24 h
Backwashing with cleaning solution	Membrane cleaning	1x daily
Intermediate cleaning with compressed air	Compressed air flushing	every 4 h

3.4 Cleaning solution

⚠ DANGER

Potential danger with contact with chemical/biological substances.

Working with chemical samples, standards and reagents can be dangerous. Make yourself familiar with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.

NOTICE

Observe the specified concentrations exactly. Stronger concentrations of solution can cause damage to the analyzers and faulty measurements.

NOTICE

The finished cleaning solutions must have a pH value of 1 to 13.

For the automatic membrane cleaning, the cleaning canister (Figure 2, page 12, item 16) must be filled with cleaning solution.

1. Remove the empty cleaning canister from the control cabinet.
2. Pour the necessary amount of the cleaning concentrate corresponding to the use instruction into the cleaning canister.
3. Top up the canister with distilled water.
4. Close the cleaning canister and mix the cleaning solution.
5. Check the pH value of the finished solution.
6. Insert the cleaning canister back into the control cabinet.
7. Connect the tubes with the closure lid of the canister.

Note: *Alternatively, chlorine bleach (NaOCl) diluted with distilled water with a maximum free chlorine proportion of 0.5% (for PHOSPHAX sc) or 0.3% hydrochloric acid (HCl) (for Amtax SC) can also be used as a cleaning solution.*

3.5 Filling of the overflow vessel

Before the first use, the overflow vessel must be filled by hand with the supplied syringe.

1. Fill the syringe with distilled water.
2. Remove the upper closure of the overflow vessel (Figure 2, page 12, item 3).

3. Guide the tube of the syringe into the overflow vessel.
4. Fill the overflow vessel (20-mL and 100-mL volume) until water comes out at the overflow of the bottom chamber (100 mL) (Figure 3, page 13, item 2).
5. Put back on the upper closure of the overflow vessel.
6. Repeat this procedure if in later operation, after renewed switch-on, the overflow vessel is not completely filled.

Section 4 Start up

4.1 Switch-on

Switch on the system at the system switch (Figure 2, page 12, item 8).

A cleaning cycle (7:30 min) is started. The cleaning cycle is composed of:

- Backwashing with cleaning solution
- Compressed air flushing
- Displacement of the cleaning solution and compressed air

Then the filter system switches into normal operation and the filtration process begins. Permeate is delivered into the overflow vessel.

Note: *The cleaning cycle always starts when the system was powered off and is switched back on with the system switch.*

4.2 Valve settings

Red light-emitting diodes on the valves show their operation in the program sequence, refer to Table 3.

Table 3 Valve position in the program sequence

	V3	V1	V2	V4
Permeate delivery cycle	-	-	-	-
Cleaning cycle (chemicals)	-	+	+	+
Cleaning cycle (compressed air)	+	-	-	-
Displacement cycle (permeate)	-	+	+	-

(-) Power off (light-emitting diode off)
(+) Power on (light-emitting diode on (red))

Section 5 Maintenance

5.1 Maintenance schedule

Table 4 Maintenance schedule

Maintenance measure	Time interval				
	Every week	Every month	Every 6 months	Every year	Every 2 years
Manual cleaning of the probe (application-dependent)	X				
Check probe for damage			X		
Probe change[1]					X
Filling of the cleaning canister (application-dependent)		X			
Sealing check		X			
Check automatic membrane cleaning			X		
Cleaning of the permeate tubing				X	
Check assembly			X		
General function check of the system			X		
Check tubes			X		
Exchange connection tube to the analyzer			X		
Exchange overflow vessel drain tube			X		
Check permeate pump function			X		
Exchange permeate pump head				X	
Check cabinet fan			X		
Check cabinet heater			X		
Check tube heating strips			X		
Check compressor			X		
Replace compressor[2]					X

[1] In typical operating conditions, a different interval may be required depending on the specific application and local conditions.

[2] Compressors are wearing parts and are not covered by the instrument warranty.

5.2 Manual cleaning of the probe

NOTICE

The membrane surface of the filter probe is very sensitive to mechanical effects and therefore is to be handled with utmost care.

If the negative pressure gauge shows -0.8 bar during normal operation, clean the probe mechanically and/or chemically in the laboratory. Use the cleaning set to clean the probe. Refer to Section 7 Replacement parts and accessories, page 33.

Note: *In the case of application in the wastewater treatment plant supply, the probe must be cleaned at a negative pressure of -0.7 bar to -0.9 bar (approximately 1x per week).*

A pulsing of the negative pressure gauge indicates a normal operating state of the system.

Note: *If after cleaning there is still a high negative pressure, check whether the suction line is dirty.*

5.2.1 Mechanical cleaning

1. Switch off the system at the system switch.

2. Pull the probe out of the raw water.
3. Rinse away coarse impurities with low pressured water.
4. Carefully clean the membrane with the supplied brush until the light membrane surface is visible.

   Note: *Do not press the brush too hard on the membrane surface and do not change the movement direction.*

5. Check the membrane for damage.
6. Immerse the probe back in the raw water.
7. Clean the brush thoroughly under running water. Let the brush dry and store it dust-free.
8. Switch on the system at the system switch.

5.2.2 Chemical cleaning

⚠ DANGER

Potential danger with contact with chemical/biological substances.

Working with chemical samples, standards and reagents can be dangerous. Make yourself familiar with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.

NOTICE

The cleaning causes a shift of the pH value in the raw water. This can cause loosened components to be settled.

Be aware that after the cleaning, short-term measurement value disruptions can occur.

1. Switch off the system at the system switch.
2. Pull the probe out of the raw water.
3. Rinse away coarse impurities with low pressured water.
4. Carefully clean the membrane with the supplied brush until the light membrane surface is visible.

   Note: *Do not press the brush too hard on the membrane surface and do not change the movement direction.*

5. Unscrew the end cap from the probe.
6. Pull the probe body from the headpiece of the probe.

   Note: *Be aware of both sealing rings and lift these off.*

7. Clean and grease the screw connections and gaskets.
8. Insert the probe body carefully into the supplied cleaning container installed to floor stand.
9. Fill the cleaning container in the laboratory with cleaning solution.

10. Close the cleaning container and leave the probe body for up to a week in the cleaning bath.

    Note: *Then rinse the probe body with drinking water.*

    Note: *If impurities continue to be on the membrane surface, repeat the chemical cleaning.*

11. Insert a new or already chemically cleaned probe body with the gaskets between head- and end cap.
12. Screw the probe together hand-tight.
13. Check the membrane for damage.
14. Immerse the probe back in the raw water.
15. Switch on the system at the system switch.

5.2.2.1 Suitable cleaning solutions for manual cleaning tasks

NOTICE

The finished cleaning solutions must have a pH value of 1 to 13.

NOTICE

After each chemical cleaning, the probe body must be rinsed with drinking water.

Note: *The chemical cleaning of the probe body can be improved and the time taken can be shortened with the cleaning set LZH235.*

Depending on the membrane type and type of the impurity, another cleaning solution is required.

Table 5 Suitable cleaning solutions for the standard membrane type porospoly

Cleaning solution[1]	Concentration	Type of impurity
MemClean-Cl	50 %	Organic impurities
Chlorine bleach NaOCl, 13 % Cl	Maximum 10 %	Organic impurities
Caustic soda NaOH	0.5 %	Organic impurities
Hydrochloric acid HCl	0.3 %	Inorganic impurities
Citric acid	10 % to 25 %	Inorganic impurities

[1] Make sure that you use phosphate-free cleaning solutions if a phosphate analyser is connected.

If two cleaning steps are required, first perform cleaning with an alkaline solution and then a cleaning with an acidic solution.

5.3 Probe change

NOTICE

The membrane surface of the filter probe is very sensitive to mechanical effects and therefore is to be handled with utmost care.

5.3.1 Change of the probe body

1. Switch off the system at the system switch.

2. Pull the probe out of the raw water.
3. Rinse away coarse impurities with low pressured water.
4. Carefully clean the membrane with the supplied brush until the light membrane surface is visible.

   Note: *Do not press the brush too hard on the membrane surface and do not change the movement direction.*

5. Unscrew the end cap from the probe.
6. Pull the probe body from the headpiece of the probe.
7. Clean and grease the screw connections and gaskets.
8. Insert a new or already chemically cleaned probe body.
9. Screw the probe together hand-tight.
10. Check the membrane for damage.
11. Immerse the probe back in the raw water.
12. Switch on the system at the system switch.

5.3.2 Change of the probe

1. Switch off the system at the system switch.
2. Pull the probe out of the raw water.
3. Rinse away coarse impurities with low pressured water.
4. Loosen the union nut on the protection tube (OD=25 mm (0.98 in.)).
5. Disconnect the permeate line (blue, OD=4 mm (0.16 in.)).
6. Clean and grease the screw connections and gaskets.
7. Connect the permeate line (blue, OD=4 mm (0.16 in.)) approximately 15 mm (0.59 in.) to the tube coupling of the new or already chemically cleaned probe (Figure 5, page 16).
8. Connect the probe to the protection tube until hand-tight by use of a union nut (OD=25 mm (0.98 in.)).
9. Immerse the probe in the raw water.

5.4 Storage of the membrane inserts and the complete probes

Used and cleaned membrane inserts are stored in approved cleaning solutions, for example, diluted chlorine bleach (NaOCl, approximately pH 11).

Probes and probe bodies of the "porospoly" membrane type are stored dry and dust-free at ambient temperature.

New probes are stored dry.

5.5 Topping up of the cleaning canister

⚠DANGER

Potential danger with contact with chemical/biological substances.

Working with chemical samples, standards and reagents can be dangerous. Make yourself familiar with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.

NOTICE

Observe the specified concentrations exactly. Stronger concentrations of solution can cause damage to the analyzers and faulty measurements.

NOTICE

The finished cleaning solutions must have a pH value of 1 to 13.

For the automatic membrane cleaning, the cleaning canister (Figure 2, page 12, item 16) must be filled with cleaning solution.

1. Switch off the permeate pump (Figure 2, page 12, item 12).
2. Remove the empty cleaning canister out of the control cabinet.
3. Pour the necessary amount of the cleaning concentrate corresponding to the use instruction into the cleaning canister.
4. Top up the canister with distilled water.
5. Close the cleaning canister and mix the cleaning solution.
6. Check the pH value of the finished solution.
7. Insert the cleaning canister back into the control cabinet.
8. Connect the tubes with the closure lid of the canister.
9. Switch on the permeate pump.

Note: *Alternatively, chlorine bleach (NaOCl) diluted with distilled water with a maximum free chlorine proportion of 0.5% or 0.3% hydrochloric acid (HCl) can also be used as a cleaning solution.*

5.6 Cleaning of the permeate tubes

NOTICE

Make sure that all connected analyzers are running in the service mode. Observe the respective user manuals of the analyzers.

NOTICE

The cleaning causes a shift of the pH value in the raw water. This can cause loosened components to be settled.

Be aware that after the cleaning, short-term measurement value disruptions can occur.

All tubes that deliver permeate are rinsed with cleaning solution.

1. Switch all analyzers to service mode. Observe the respective specifications in the corresponding user manuals.
2. Check the remaining runtime of the cleaning cycle. If the system is in the cleaning cycle, wait until this is complete.
3. Switch off the permeate pump (Figure 2, page 12, item 12).
4. Pull the probe out of the raw water.
5. Rinse away coarse impurities with low pressured water.
6. Fill a container with cleaning solution.
7. Immerse the probe completely in the cleaning solution.
8. Switch on the permeate pump.

Cleaning solution is sucked in via the probe and rinses all permeate delivery tubes.

9. Switch off the permeate pump after 30 minutes and leave the cleaning solution 1–2 hours to take effect.
10. Immerse the probe completely in a container with distilled water.
11. Switch on the permeate pump.

    Distilled water is sucked in via the probe and rinses all permeate-delivery tubes.
12. Switch off the permeate pump after 30 minutes.
13. Check the membrane for damage.
14. Immerse the probe back in the raw water.
15. Switch on the permeate pump.

5.7 Manual deaeration of the permeate pump

If no permeate is delivered into the overflow vessel, perform a manual deaeration of the permeate pump.

1. Loosen the orange rotary knob.

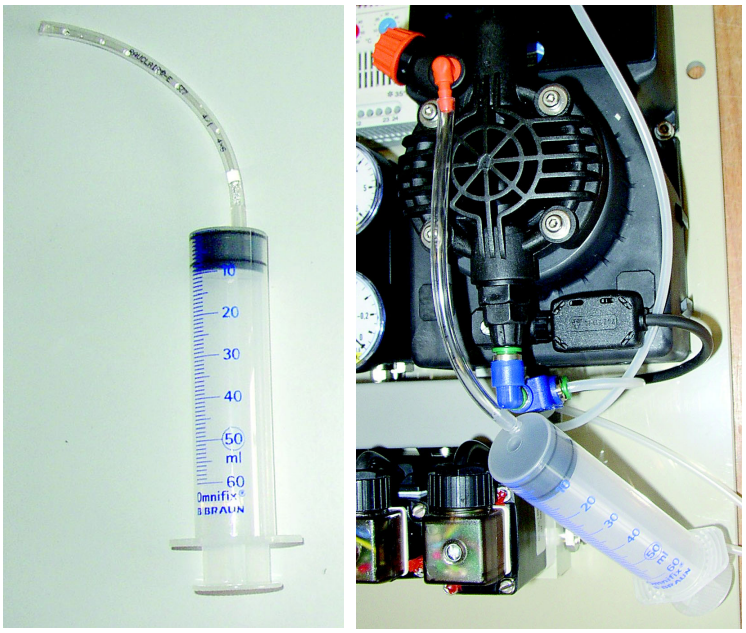
   Air comes out of the orange bleed nipple.
2. Turn the orange rotary knob closed as soon as permeate comes out of the orange bleed nipple.

If no permeate comes out:

1. Connect the tube of the syringe with the orange bleed nipple (Figure 9, page 30).
2. Suck air with the syringe until permeate comes out.
3. Turn the orange rotary knob closed.

Note: *It may take a few minutes until permeate is transported bubble-free into the overflow vessel.*

Figure 9 Manual deaeration of the permeate pump



Section 6 Troubleshooting

Problem	Definition	Solution
System does not work	Power supply interrupted	Actuate system switch (Figure 2, page 12, item 8)
Permeate pump is at a standstill but has voltage	Permeate pump switched off	Actuate permeate pump switch (Figure 2, page 12, item 12)
Permeate pump is running but is not delivering	Various causes, depending on negative pressure display	Check negative pressure display (Figure 2, page 12, item 4)
Negative pressure display (0 bar)	Permeate pump filled with air	Manual deaeration of the permeate pump (section 5.7, page 30)
Negative pressure display high (greater than -0.8 bar)	Probe body blocked	Exchange and clean probe body (section 5.2, page 25)
	Permeate tubes kinked or blocked	Immerse cleaned probe in drinking water and switch on permeate pump. If negative pressure is still too high: Remove probe and immerse loose tube end in drinking water. Switch on permeate pump
		Remove permeate pump head and check non-return valves on suction side and pressure side
Negative pressure too high, delivery amount too small	Probe contaminated	Exchange and clean probe (section 5.2, page 25)
		Switch system switch off and back on: manual starting of the cleaning cycle
	Suction line leaky	Remove probe and immerse loose tube end in drinking water. Switch on permeate pump
Service life of the probe too short	Cleaning of the probe insufficient	Perform chemical cleaning: acid, alkali or a combination of both. Check cleaning cycle (steps and times) Change cleaning solution (other cleaner type) Check location; are, for example, precipitants or flocculation agents added in the surroundings of the sampling
Permeate pump is running but sometimes does not deliver	Cleaning cycle defective	When was the last cleaning (current drain time of block 50 should be at least 30 min)
	Floating of the probe (at high flow speed)	Select another location
System is running, analyzer shows malfunction	Overflow vessel empty	Check delivery amount of the permeate pump Install optional mini pump
	Overflow empty or insufficiently filled at restart	Manual filling of the overflow vessel (section 3.5, page 20), then start cleaning cycle
	Tube connection between overflow vessel and analyzer defective	Check tube connection for blockages or kinks
Air ingress in the overflow vessel	Probe blocked, negative pressure too high	Exchange and clean probe (section 5.2, page 25)
	Compressed air cannot ease via the membrane probe	Compressed air goes after valve switching into the pump head and then into the overflow vessel
Analyzer shows malfunction	Mini pump defective	Check mini pump
Peaks in the measurement values after cleaning interval	Concentration of the cleaning solution too high	Dilute cleaning solution

Section 7 Replacement parts and accessories

7.1 Accessories

Description	Cat. No
Cleaning container and storage container for probe body (membrane insert)	LZH212
Cleaning set for laboratory cleaning of the probe body (membrane insert), complete, includes floor stand with clamping tool, syringe with quick coupling and glass cylinder	LZH235
Collecting tray for canister, TMS-C system, 2 L	LZH453
Cleaning canister with suction set, TMS-C system, 2 L	LZH454

Appendix A Installation of the overflow vessel outside of the control cabinet

The overflow vessel is installed by the factory in the control cabinet, however you can also remove it from the control cabinet and secure it next to the analyzer.

⚠CAUTION

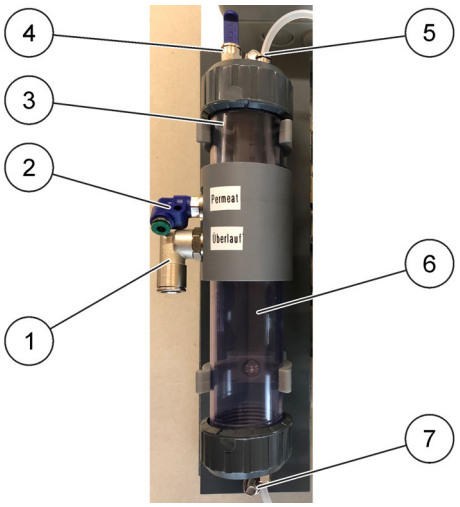
The pressure line must be no longer than 2 m. A 1.51.5 m line is supplied as standard.

1. Connect the pressure-side permeate line (OD=4 mm (0.16 in.)) to the left top-side plug connection (Figure 10, item 5).
2. Connect the side connected overflow pipe (100 mL chamber) to an overflow tube (OD=10 mm (0.39 in.)) (Figure 10 item 1). Connect the overflow tube bottom-side of the control cabinet to a heated (optional) drain tube, ensure the tube leads to an open drain.

   Note: *The overflow tube (OD=10 mm (0.39 in.)) and the drain tube (OD=25 mm (0.98 in.)) must not be submerged.*

3. Connect the side connected overflow pipe (20 mL area) to the analyzer (tube OD=6 mm (0.24 in.)) (Figure 10, item 2).
4. Select the installation height of the overflow vessel so that the drain of the overflow vessel lies either at the same level or above the supply of the analyzer provided by the customer.
5. The optional mini pump for the permeate line makes sure that the analyzer is reliably supplied with sufficient permeate when the difference is small in height between the analyzer inlet and the TMS-C overflow vessel.
6. Connect the output of the mini pump to the inlet of the internal overflow vessel of the analyzer. Connect the outlet of this overflow vessel to the second upper inlet of the overflow vessel of the TMS-C-System (plug connection 6 mm).
   The construction creates a permeate circuit between the TMS-C-System and the analyzer.

Figure 10 Overflow vessel



1	Overflow (OD=10 mm (0.39 in.))	**5**	Permeate line pressure-side supply (OD=4 mm (0.16 in.))
2	Permeate for analyzer[1] (OD=4 mm (0.16 in.))	**6**	Overflow vessel, bottom chamber 100 mL.
3	Overflow vessel, top chamber 20/40 mL	**7**	Connection for cleaning and displacing solution (OD=4 mm (0.16 in.))
4	Connection to fill (OD=6 mm (0.23 in.)) and for mini pump (optional)		

[1] As a standard the overflow vessel gives a volume of 20 mL in the top chamber for the measurement. This is sufficient for one analyzer. If two analyzers are connected to the filter system, a volume of 40 mL is necessary in the top chamber. Insert the supplied plastic tube as an adapter and upgrade the filter system for a 40-mL volume.

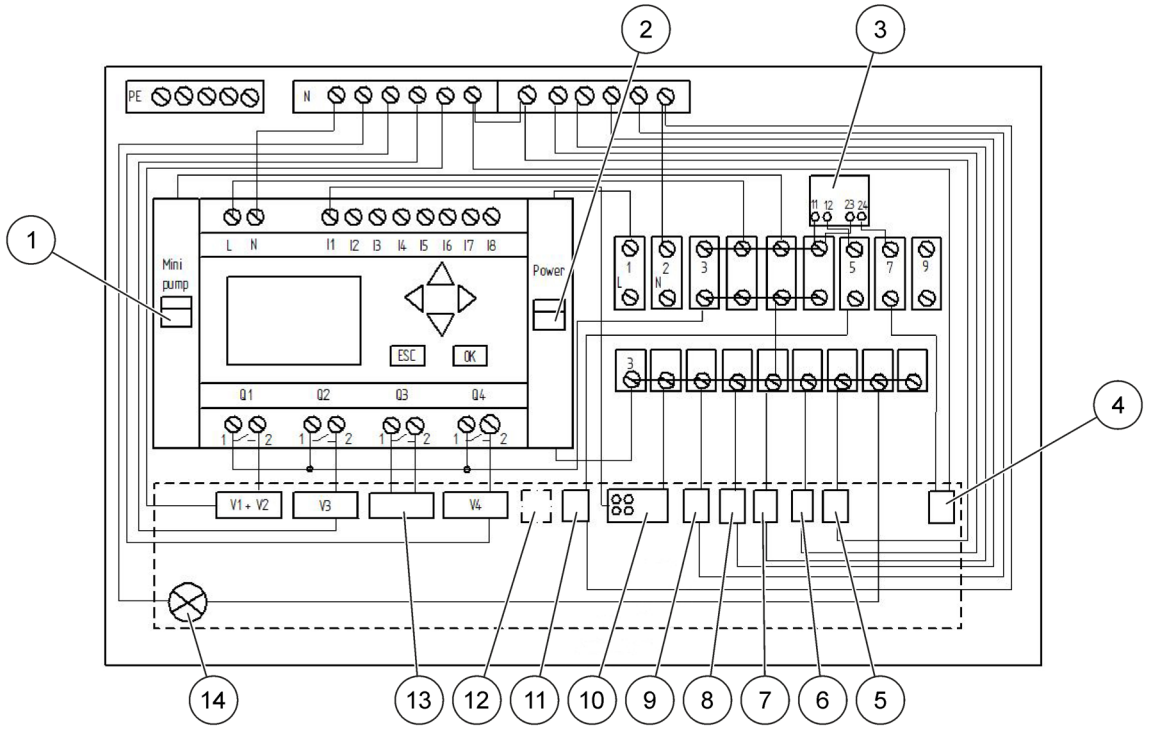
Appendix B Assignment plan of the open-loop control system

⚠ DANGER

Risk of electric shock!

When performing maintenance work, always switch off the main switch (Figure 11, item 2) and pull out the power plug.

Figure 11 Assignment plan



1	Mini pump switch (optional)	**8**	Heating strip pressure side
2	System switch ON / OFF	**9**	Heating strip drain-overflow
3	Thermostat	**10**	Signal
4	Cabinet fan	**11**	Cabinet heater
5	Compressor	**12**	Mini pump (optional)
6	Permeate pump	**13**	Permeate pump pulse sender
7	Heating strip suction side	**14**	LED operating light

HACH COMPANY World Headquarters
P.O. Box 389, Loveland, CO 80539-0389 U.S.A.
Tel. (970) 669-3050
(800) 227-4224 (U.S.A. only)
Fax (970) 669-2932
orders@hach.com
www.hach.com

HACH LANGE GMBH
Willstätterstraße 11
D-40549 Düsseldorf, Germany
Tel. +49 (0) 2 11 52 88-320
Fax +49 (0) 2 11 52 88-210
info-de@hach.com
www.de.hach.com

HACH LANGE Sàrl
6, route de Compois
1222 Vésenaz
SWITZERLAND
Tel. +41 22 594 6400
Fax +41 22 594 6499

06/2021 Edition 2