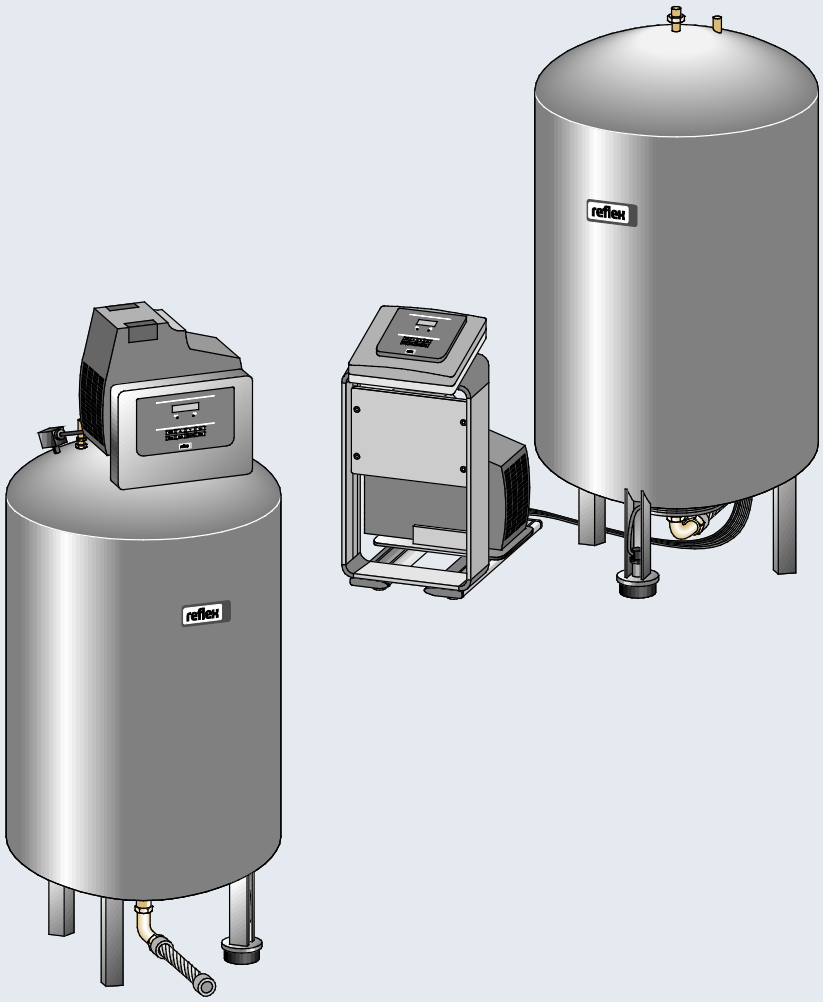
Thinking solutions.

Reflexomat with Basic controller

Reflexomat RS 90 / 1
Reflexomat Compact RC
Refexomat RSC

GB Operating manual



1 Notes on the operating manual

This operating manual is an important aid for ensuring the safe and reliable functioning of the device.

The operating manual will help you to:

- avoid any risks to personnel.
- become acquainted with the device.
- achieve optimal functioning.
- identify and rectify faults in good time.
- avoid any faults due to improper operation.
- cut down on repair costs and reduce the number of downtimes.
- improve the reliability and increase the service life of the device.
- avoid causing harm to the environment.

Reflex Winkelmann GmbH accepts no liability for any damage resulting from failure to observe the information in this operating manual. In addition to the requirements set out in this operating manual, national statutory regulations and provisions in the country of installation must also be complied with (concerning accident prevention, environment protection, safe and professional work practices, etc.).

This operating manual describes the device with basic equipment and interfaces for optional equipment with additional functions. For optional equipment and accessories, see chapter 4.6 "Optional equipment and accessories" on page 14 .

Note!

Every person installing this equipment or performing any other work at the equipment is required to carefully read this manual prior to commencing work and to comply with its instructions. The manual is to be provided to the device operator and must be stored near the device for access at any time.

2 Liability and guarantee

The device has been built according to the state of the art and recognised safety rules. Nevertheless, its use can pose a risk to life and limb of personnel or third persons as well as cause damage to the system or other property.

It is not permitted to make any modifications at the device, such as to the hydraulic system or the circuitry.

The manufacturer shall not be liable nor shall any warranty be honoured if the cause of any claim results from one or more of the following causes:

- Improper use of the device.
- Unprofessional commissioning, operation, service, maintenance, repair or installation of the device.
- Failure to observe the safety information in this operating manual.
- Operation of the device with defective or improperly installed safety/protective equipment.
- Failure to perform maintenance and inspection work according to schedule.
- Use of unapproved spare parts or accessories.

Prerequisite for any warranty claims is the professional installation and commissioning of the device.

Note!

Arrange for Reflex Customer Service to carry out commissioning and annual maintenance, see chapter 12.1 "Reflex Customer Service" on page 55 .

3 Safety

3.1 Explanation of symbols

3.1.1 Symbols and notes used

The following symbols and signal words are used in this operating manual.

⚠ DANGER

- Danger of death and/or serious damage to health
- The sign, in combination with the signal word 'Danger', indicates imminent danger; failure to observe the safety information will result in death or severe (irreversible) injuries.

⚠ WARNING

Serious damage to health

- The sign, in combination with the signal word 'Warning', indicates imminent danger; failure to observe the safety information can result in death or severe (irreversible) injuries.

⚠ CAUTION

Damage to health

- The sign, in combination with the signal word 'Caution', indicates danger; failure to observe the safety information can result in minor (reversible) injuries.

ATTENTION

Damage to property

- The sign, in combination with the signal word 'Attention', indicates a situation where damage to the product itself or objects within its vicinity can occur.

▶ **Note!**

This symbol, in combination with the signal word 'Note', indicates useful tips and recommendations for efficient handling of the product.

3.2 Personnel requirements

Only specialist personnel or specifically trained personnel may install and operate the equipment.

The electric connections and the wiring of the device must be executed by a specialist in accordance with all applicable national and local regulations.

3.3 Personal protective equipment

When working at the system, wear the stipulated personal equipment such as hearing and eye protection, safety boots, helmet, protective clothing, protective gloves.

See the national regulation of your country for personal protective equipment required.

3.4 Intended use

The device is a pressure maintaining station for heating and cooling water systems. It is intended to maintain the water pressure and to add water within a system. The devices may be used only in systems that are sealed against corrosion and with the following water types:

- Non-corrosive
- Chemically non-aggressive
- Non-toxic

The ingress of atmospheric oxygen by permeation into the entire heating and cooling water system, make-up water and similar must be reliably minimised during operation.

3.5 Inadmissible operating conditions

The device is not suitable for the following applications:

- Mobile system operation.
- Outdoor operation.
- For use with mineral oils.
- For use with flammable media.
- For use with distilled water.

Note!

It is not permitted to make any modifications to the hydraulic system or the circuitry.

3.6 Residual risks

This device has been manufactured to the current state of the art. However, some residual risk cannot be excluded.

⚠ CAUTION

Risk of burns on hot surfaces

Hot surfaces in heating systems can cause burns to the skin.

- Wear protective gloves.
- Please place appropriate warning signs in the vicinity of the device.

⚠ CAUTION

Risk of injury due to pressurised liquid

If installation, removal or maintenance work is not carried out correctly, there is a risk of burns and other injuries at the connection points, if pressurised hot water or hot steam suddenly escapes.

- Ensure proper installation, removal or maintenance work.
- Ensure that the system is de-pressurised before performing installation, removal or maintenance work at the connection points.

⚠ WARNING

Risk of injury due to heavy weight

The devices are heavy. Consequently, there is a risk of physical injury and accidents.

- Use suitable lifting equipment for transportation and installation.

4 Description of the device

4.1 Description

Reflexomat Compact RC

- One "RG" primary tank as an expansion tank with up to 600 litres nominal volume.
- The compact control unit is factory-installed on the primary tank.
- All electric and air connections between control unit and expansion tank are pre-installed.

Note!

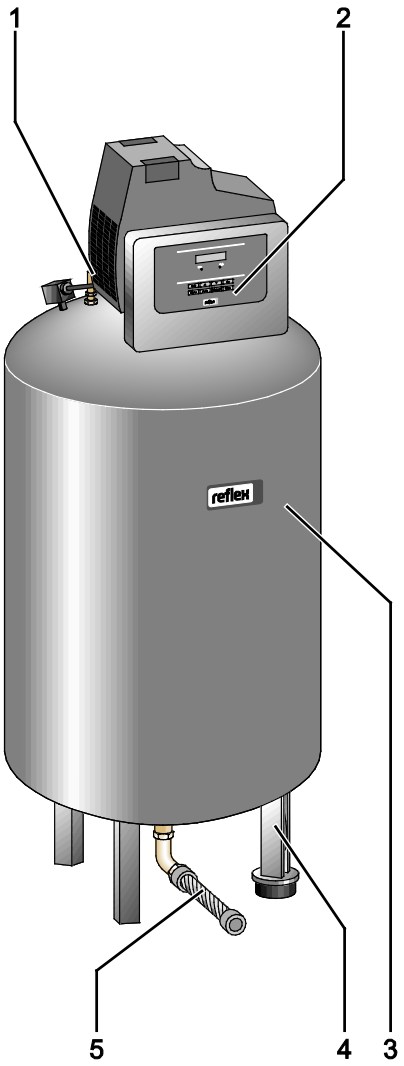
It is not possible to connect secondary tanks to the Reflexomat Compact "RC".

Reflexomat RS 90 / 1

- One "RG" primary tank as an expansion tank with up to 600 litres nominal volume.
  - The RS 90 / 1 compact control unit is factory-installed on the primary tank.
  - All electric and air connections between control unit and expansion tank are pre-installed.
- "RG" primary tank with a nominal volume from 800 litres.
  - The RS 90 / 1 control unit as stand-alone console.
- The connection of "RF" secondary tanks to the primary tank is available as an option

4.2 Overview

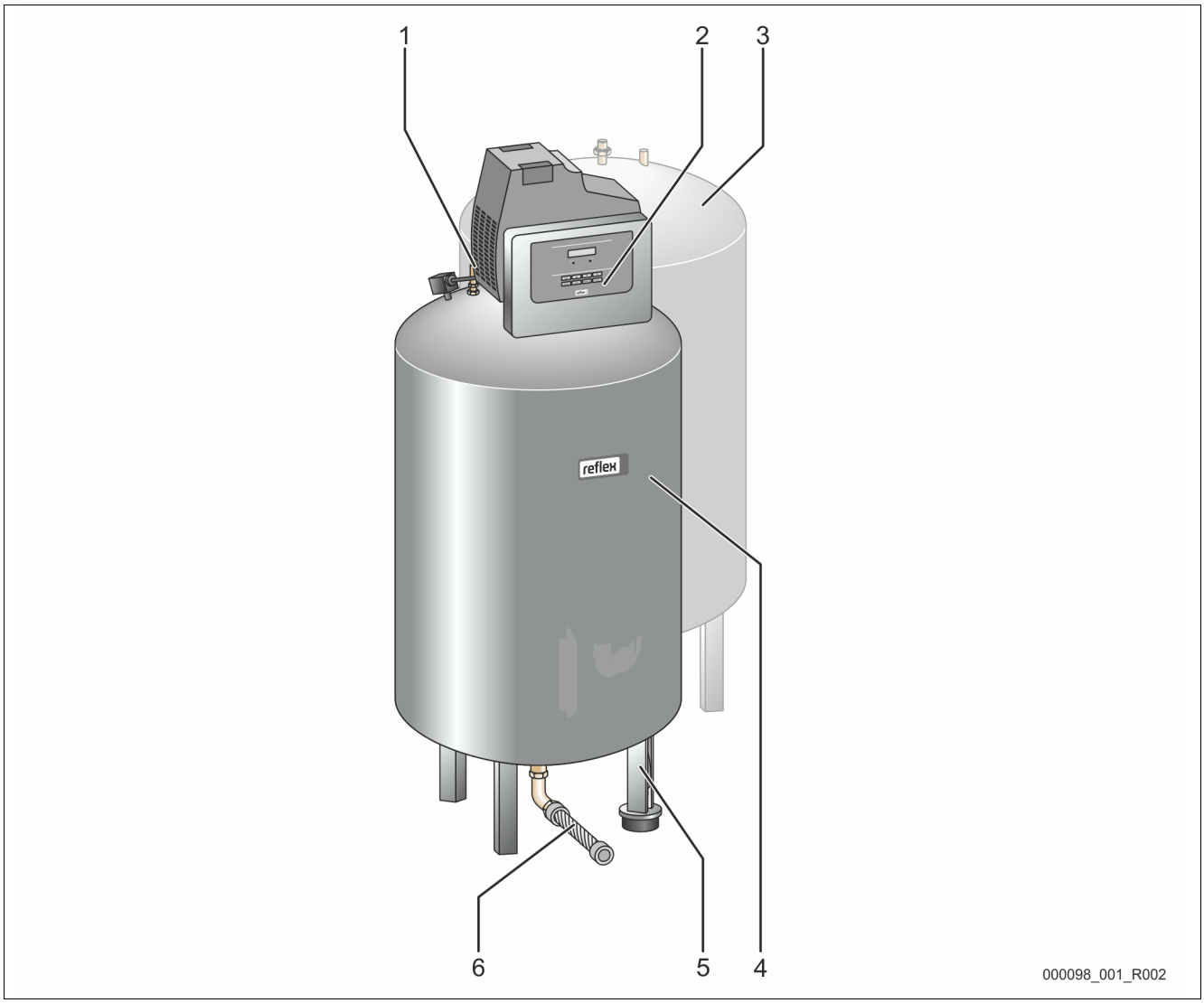
Reflexomat Compact RC / Relfexomat RSC



1	"SV" safety valve
2	"RC" control unit • Compressor • "Reflex Control Basic" controller
3	"RG" primary tank

4	"LIS" level sensor
5	"EC" expansion line

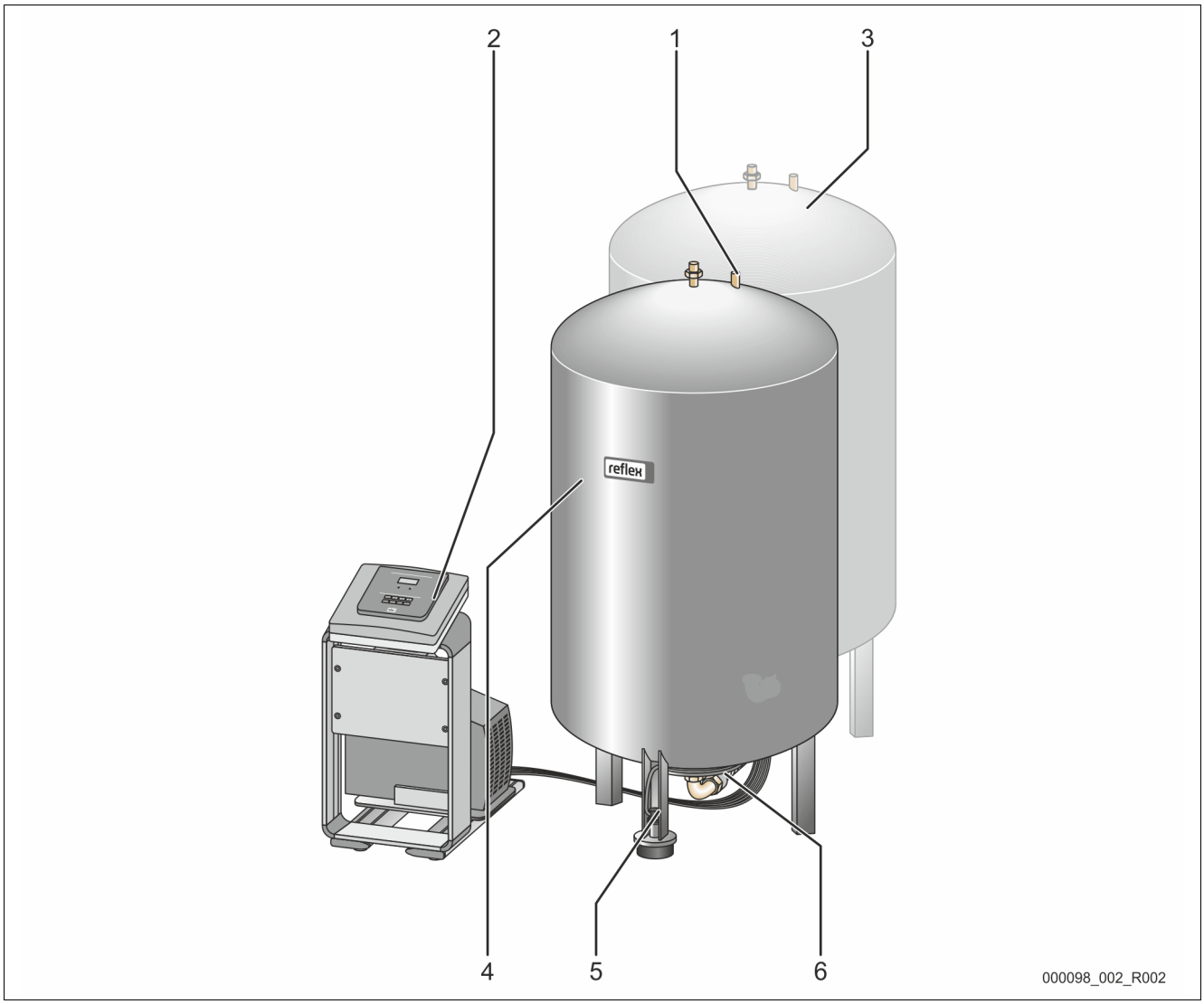
Reflexomat RS 90 / 1 in compact design



1	"SV" safety valve
2	"RS 90 / 1" control unit • Compressor • "Reflex Control Basic" controller

3	"RF" secondary tank (optional)
4	"RG" primary tank
5	"LIS" level sensor
6	"EC" expansion line

Reflexomat RS 90 / 1 adjoining



1	"SV" safety valve
2	"RS 90 / 1" control unit • Compressor • "Reflex Control Basic" controller

3	"RF" secondary tank (optional)
4	"RG" primary tank
5	"LIS" level sensor
6	"EC" expansion line

4.3 Identification

4.3.1 Nameplate

The nameplate provides information about the manufacturer, the year of manufacture, the manufacturing number and the technical data.

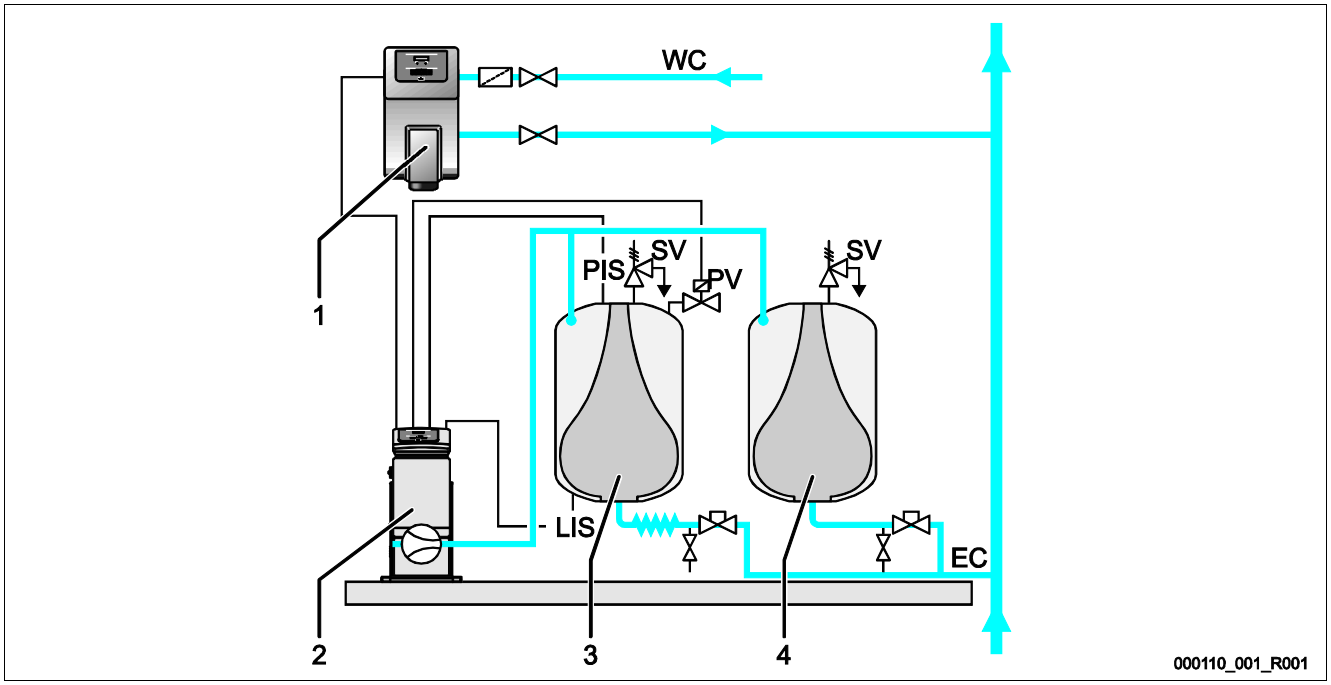
Information on nameplate	Meaning
Type	Device name
Serial No.	Serial number
min. / max. allowable pressure P	Minimum/maximum permissible pressure
max. continuous operating temperature	Maximum temperature for continuous operation
min. / max. allowable temperature / flow temperature TS	Minimum / maximum permissible temperature / TS flow temperature
Year built	Year of manufacture
min. operating pressure set up on shop floor	Factory-set minimum operating pressure
at site	Set minimum operating pressure
max. pressure saftey valve factory - aline	Factory-set opening pressure of the safety valve
at site	Set opening pressure of the safety valve

000043_001_R001

4.3.2 Type code

No.		Reflexomat RC type key
1	"RC" control unit	
2	Primary tank nominal volume	Reflexomat RC 500 1 2

4.4 Function



1	Water make-up with "Fillcontroll Auto"
2	Control unit
3	Primary tank as expansion tank
4	Secondary tank as additional expansion tank
WC	Make-up line

PIS	Pressure sensor
SV	Safety valve
PV	Solenoid valve
LIS	Pressure load cell
EC	Expansion line

Expansion tanks

One primary tank and multiple optional secondary tanks may be connected. A diaphragm separates the tanks' interiors into an air and a water space. preventing the ingress of atmospheric oxygen into the expansion water. The primary tank is connected to the control unit downstream and connected hydraulically to the plant system. The pressure is protected at the air side by the "SV" safety valves of the tanks.

Control unit

The control unit comprises one or – optionally – two "CO" compressor(s) and the "Reflex Control Touch" controller. Via the primary tank, the pressure is measured with the “PIS" pressure sensor and the water level with the “LIS" pressure load cell and the values then displayed in the controller display.

Maintaining pressure

- If the water is heated, it expands and the pressure increases in the plant system. If the pressure set at the controller is exceeded, the "PV" solenoid valve opens and discharges air from the primary tank. Water flows from the system into the primary tank and the pressure drops in the plant system until the pressure in the plant system and the primary tank is equalised.
- The pressure in the plant system drops when the water cools. When the pressure drops below the set value, the "CO" compressor cuts in and delivers compressed air into the primary tank. This displaces water out of the primary tank into the plant system. The pressure in the system rises.

Make-up

The addition of more water is controlled within the controller. The "LIS“ pressure load cell determines the water level and sends this value to the controller of the pressure maintaining station. The controller actuates an external make-up device. Water is directly added into the system in a controlled manner by monitoring the make-up time and the make-up cycles.

If the water level in the primary tank falls below minimum, a fault message is output from the controller and shown in the display.

Note!

For optional equipment for water make-up, see chapter 4.6 "Optional equipment and accessories" on page 14 .

4.5 Scope of delivery

The scope of delivery is described in the shipping document and the content is shown on the packaging.

Immediately after receipt of the goods, please check the shipment for completeness and damage. Please notify us immediately of any transport damage.

Basic pressure-maintaining equipment:

- Reflexomat Compact RC
  - One primary tank and one compact control unit.
- Reflexomat RS 90 / 1
  - One primary tank up to 600 litres and one compact control unit.
  - One primary tank from 800 litres and one stand-alone control unit.
- "LIS" pressure load cell for level sensing.

4.6 Optional equipment and accessories

- Secondary tanks with connection sets for the primary tank.
- For make-up with water
  - Make-up without pump:
    - Solenoid “Fillvalve” with ball valve and Reflex Fillset for make-up with drinking water.
  - Make-up with pump:
    - Reflex Fillcontrol Auto, with integrated pump and a system separation vessel or Auto Compact
- For water make-up and degassing:
  - Reflex Servitec 30 (25)
  - Reflex Servitec 35-95
- Fillset for make-up with drinking water.
  - With integrated system separator, water meter, dirt trap and locking mechanisms for the "WC" make-up line.
- Fillset Impulse with FQIRA+ contact water meter for make-up with drinking water.
- Fillsoft for softening or desalination of the make-up water from the drinking water network.
  - Fillsoft is installed between Fillset and the device. The device controller evaluates the make-up quantities and signals a required replacement of the softening cartridges.
- Optional expansions for Reflex controllers:
  - I/O module for standard communication.
  - Master-Slave-Connect for master controllers for maximum 10 devices.
  - Bus modules:
    - Lonworks Digital
    - Lonworks
    - Profibus DP
    - Ethernet
- Diaphragm rupture monitor

Note!

Separate operating instructions are supplied with accessories.

5 Technical data

5.1 Control unit

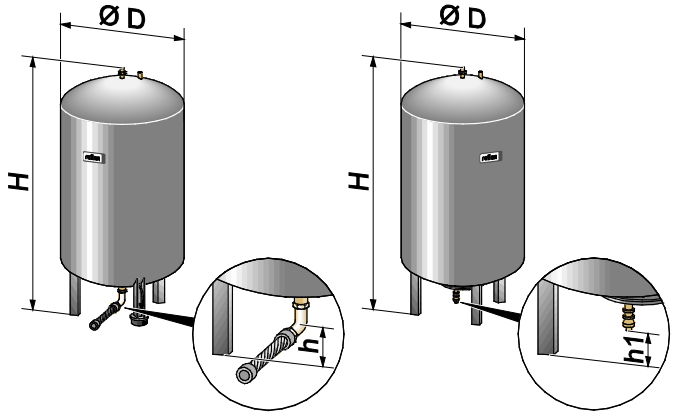
Note!

The following values apply for all control units:

- Permissible flow temperature: 120 °C
- Permissible operating temperature: 70 °C
- Permissible ambient temperature: 0 °C – 45 °C

Type	Power output (kW)	Power supply (V / Hz , A)	Degree of protection	Number of RS-485 interfaces	I/O module	Electrical voltage control unit (V, A)	Noise level (dB)	Weight (kg)
RC 200	0.75	230 / 50, 3	IP 54	1	No	230, 2	72	52
RSC 200	0.75	230 / 50, 3	IP 54	1	No	230, 2	< 59	52
RC 300	0.75	230 / 50, 3	IP 54	1	No	230, 2	72	69
RSC 300	0.75	230 / 50, 3	IP 54	1	No	230, 2	< 59	69
RC 400	0.75	230 / 50, 3	IP 54	1	No	230, 2	72	80
RSC 400	0.75	230 / 50, 3	IP 54	1	No	230, 2	< 59	80
RC 500	0.75	230 / 50, 3	IP 54	1	No	230, 2	72	93
RSC 500	0.75	230 / 50, 3	IP 54	1	No	230, 2	< 59	93
RS 90/1 individual	0.75	230 / 50, 3	IP 54	1	No	230, 2	72	25
RS 90/1 firmly fitted	0.75	230 / 50, 3	IP 54	1	No	230, 2	72	21

5.2 Tanks



Primary vessel Secondary tank

Type	Diameter Ø "D" (mm)	Weight (kg)	Connection (inches)	Height "H" (mm)	Height "h" (mm)	Height "h1" (mm)
6 bar - 200	634	37	R1	970	115	155
6 bar - 300	634	54	R1	1270	115	155
6 bar - 400	740	65	R1	1255	100	140
6 bar - 500	740	78	R1	1475	100	140
6 bar - 600	740	94	R1	1720	100	140
6 bar - 800	740	149	R1	2185	100	140
6 bar - 1000	1000	156	DN65	2025	195	305
6 bar - 1500	1200	465	DN65	2025	185	305
6 bar - 2000	1200	565	DN65	2480	185	305
6 bar - 3000	1500	795	DN65	2480	220	334
6 bar - 4000	1500	1080	DN65	3065	220	334
6 bar - 5000	1500	1115	DN65	3590	220	334
10 bar - 350	750	230	DN40	1340	190	190
10 bar - 500	750	275	DN40	1600	190	190
10 bar - 750	750	345	DN50	2185	180	180
10 bar - 1000	1000	580	DN65	2065	165	285
10 bar - 1500	1200	800	DN65	2055	165	285
10 bar - 2000	1200	960	DN65	2515	165	285
10 bar - 3000	1500	1425	DN65	2520	195	310
10 bar - 4000	1500	1950	DN65	3100	195	310
10 bar - 5000	1500	2035	DN65	3630	195	310

6 Installation

⚠ DANGER

Risk of serious injury or death due to electric shock.

If live parts are touched, there is risk of life-threatening injuries.

- Ensure that the system is voltage-free before installing the device.
- Ensure that the system is secured and cannot be reactivated by other persons.
- Ensure that installation work for the electric connection of the device is carried out by an electrician, and in compliance with electrical engineering regulations.

⚠ CAUTION

Risk of injury due to pressurised liquid

If installation, removal or maintenance work is not carried out correctly, there is a risk of burns and other injuries at the connection points, if pressurised hot water or hot steam suddenly escapes.

- Ensure proper installation, removal or maintenance work.
- Ensure that the system is de-pressurised before performing installation, removal or maintenance work at the connection points.

⚠ CAUTION

Risk of burns on hot surfaces

Hot surfaces in heating systems can cause burns to the skin.

- Wear protective gloves.
- Please place appropriate warning signs in the vicinity of the device.

⚠ CAUTION

Risk of injury due to falls or bumps

Bruising from falls or bumps on system components during installation.

- Wear personal protective equipment (helmet, protective clothing, gloves, safety boots).

⚠ WARNING

Risk of injury due to heavy weight

The devices are heavy. Consequently, there is a risk of physical injury and accidents.

- Use suitable lifting equipment for transportation and installation.

▶ **Note!**

Confirm that installation and start-up have been carried out correctly using the installation, start-up and maintenance certificate. This action is a prerequisite for the making of warranty claims.

– Have the Reflex Customer Service carry out commissioning and the annual maintenance.

6.1 Installation conditions

6.1.1 Incoming inspection

Prior to shipping, this device was carefully inspected and packed. Damages during transport cannot be excluded.

Proceed as follows:

1. Upon receipt of the goods, check the shipment for
   - completeness and
   - possible transport damage.
2. Document any damage.
3. Contact the forwarding agent to register your complaint.

6.2 Preparatory work

Condition of the delivered device:

- Check all screw connections of the device for tight seating. Tighten the screws as necessary.

Preparing the device installation:

- No access by unauthorised personnel.
- Frost-free, well-ventilated room.
  - Room temperature 0 °C to 45 °C (32 °F to 113 °F).
- Level, stable flooring.
  - Ensure sufficient bearing strength of the flooring before filling the tanks.
  - Ensure that the control unit and the tanks are installed on the same level.
- Filling and dewatering option.
  - Provide a DN 15 filling connection according to DIN 1988 - 100 and En 1717.
  - Provide an optional cold water inlet.
  - Prepare a drain for the drain water.
- Electric connection, see chapter 5 "Technical data" on page 15 .
- Use only approved transport and lifting equipment.
  - The load fastening points at the tanks must be used only as installation resources.

6.3 Execution

ATTENTION

Damage due to improper installation

Additional device stresses may arise due to the connection of pipes or system equipment.

- Ensure that pipes are connected from the device to the system without stresses being induced.
- If necessary, provide support structures for the pipes or equipment.

For installation, proceed as follows:

- Position the device.
- Complete the primary tank and the optional secondary tanks.
- Create the water-side connections of the control unit to the system.
- Create the interfaces according to the terminal plan.
- Install the water connections between optional secondary tanks to each other and to the primary tank.

Notice!

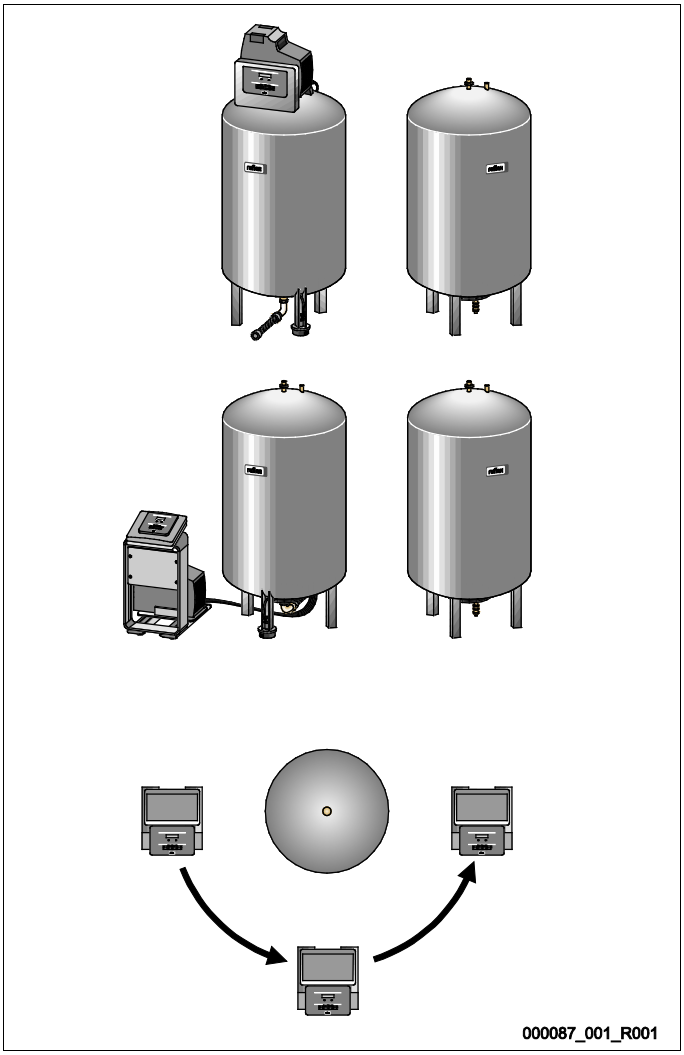
For installation, note the operability of the valves and the inlet options of the connecting lines.

6.3.1 Positioning

Determine the device position.

- Control unit
- Primary tank
- Optional secondary tank

– The control unit can be installed on either side or in front of the primary tank. The distance of the control unit to the primary tank results from the connection set supplied.



Notice!

Connecting secondary tanks is not possible with the Reflexomat Compact RC.

6.3.2 Tank installation

ATTENTION

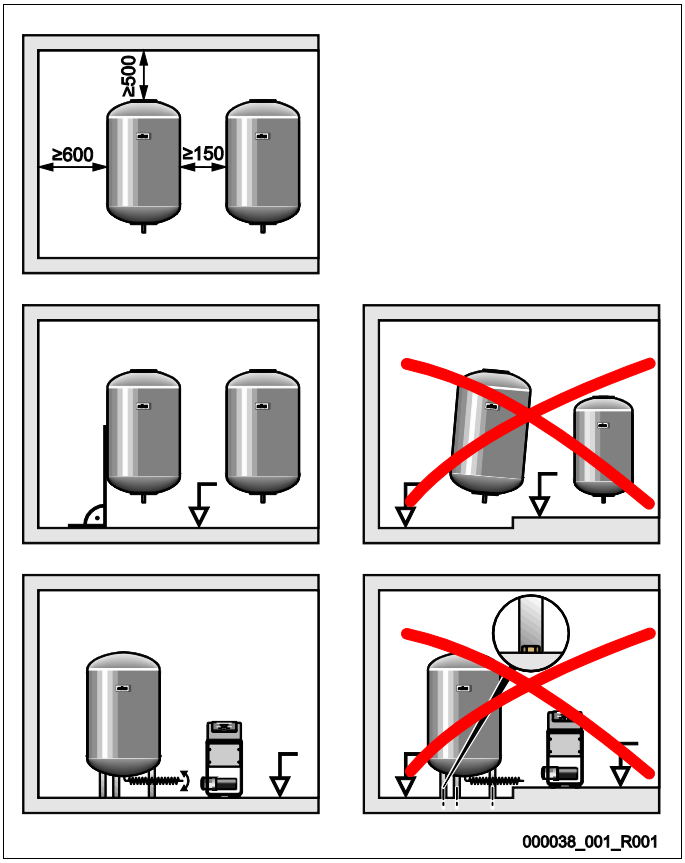
Damage due to improper installation

Additional device stresses may arise due to the connection of pipes or system equipment.

- Ensure that pipes are connected from the device to the system without stresses being induced.
- If necessary, provide support structures for the pipes or equipment.

Comply with the following notes regarding the installation of the primary tank and the secondary tanks:

- All flange openings at the tanks are viewing and maintenance openings.
  - Place the tanks with sufficient distances to sides and ceiling.
- Install the tanks on a level surface.
- Ensure rectangular and free-standing position of the tanks.
- Use only tanks of the same type and dimensions when using secondary tanks.
- Ensure proper functioning of the "LIS" level sensor.
  ATTENTION Property damage caused by overpressure. Do not attach the tanks firmly to the floor.
- Install the control unit on the same level as the tanks.



6.3.3 Connection to the facility system

⚠ CAUTION

Risk of injury due to falls or stumbling

Bruising caused by falls or stumbling over cables or pipes during installation.

- Wear personal protective equipment (helmet, protective clothing, gloves, safety boots).
- Ensure proper installation of cables and pipes between the control unit and the tanks.

ATTENTION

Damage due to improper installation

Additional device stresses may arise due to the connection of pipes or system equipment.

- Ensure that pipes are connected from the device to the system without stresses being induced.
- If necessary, provide support structures for the pipes or equipment.

ATTENTION

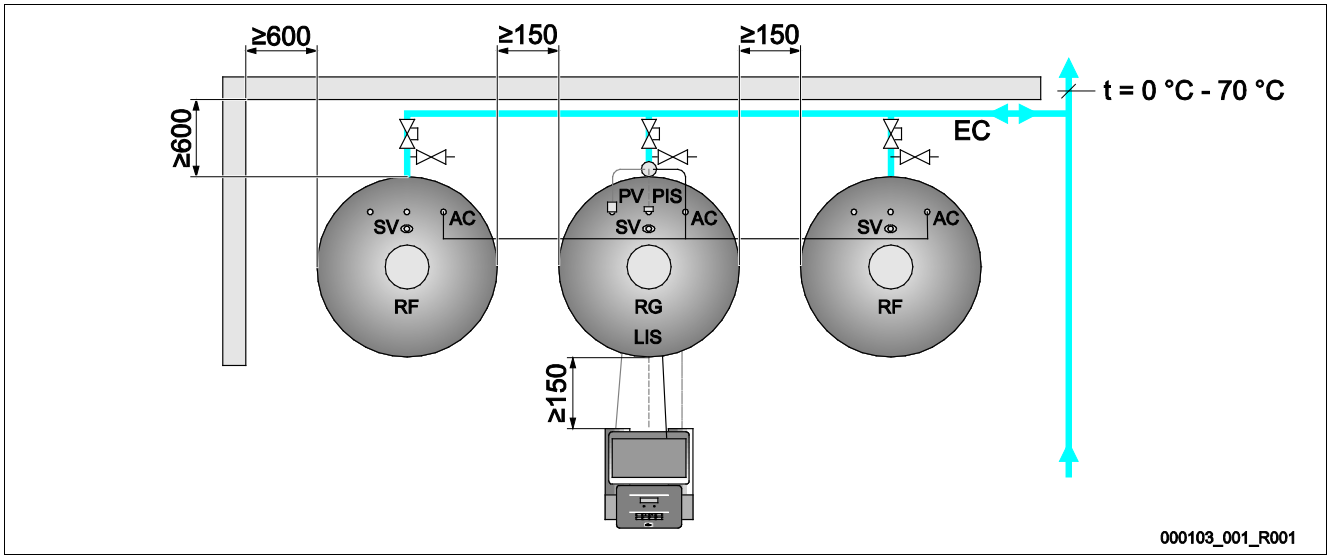
Damage to cables and pipes

If cables and pipes are not routed professionally between tanks and the control unit, they may become damaged.

- Route cables and pipes in a professional manner over the flooring.

6.3.3.1 Water-side connection

The following describes the exemplary installation of the control unit before the primary tank and the connection of two secondary tanks. Proceed accordingly for other installation variants.



RF	Secondary tank
RG	Primary tank
SV	Safety valve
PV	Solenoid valve

PIS	Pressure sensor
AC	Compressed air line
EC	Expansion line

To ensure the proper function of the "LIS" level sensor, you must use the supplied hose to flexibly connect the primary tank to the system.

The "EC" expansion line provides secure locking and emptying for primary tank and the optional secondary tanks. If more than one tank is used, a collective line to the system is installed.

Use points with temperatures between 0 °C and 70 °C to connect to the system. This is the return of the generator in heating systems and the flow in refrigeration systems.

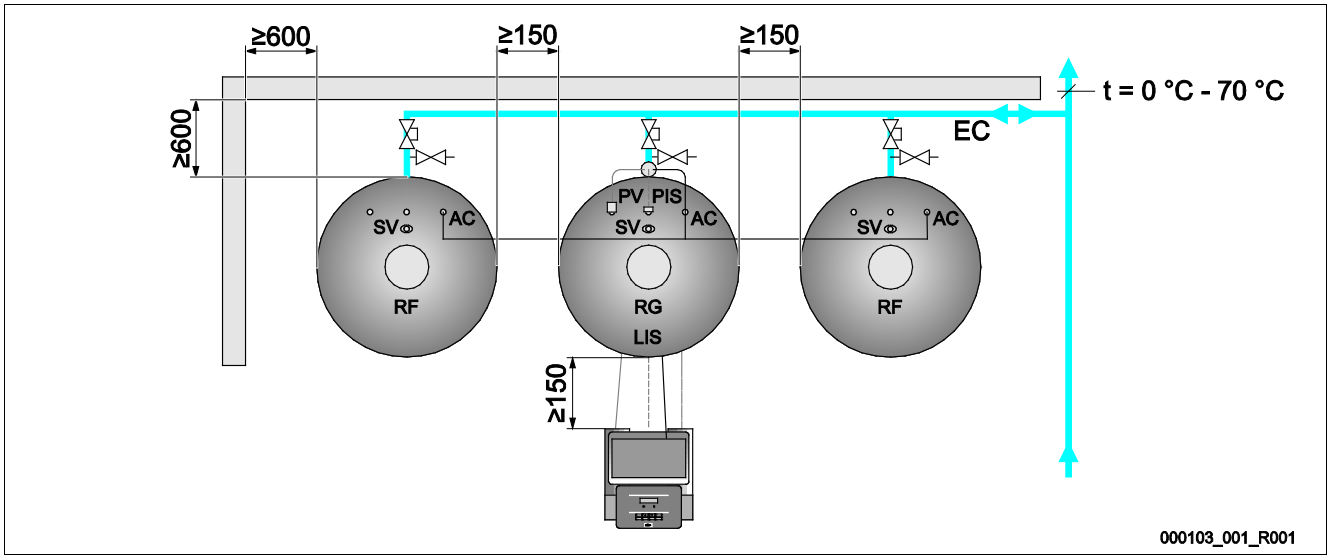
At temperatures below or above 0 °C – 70 °C, you must install in-line vessels between the system and the Reflexomat.

Notice!

For details regarding the switching of Reflexomats or in-line vessels and the dimensions of the expansion lines, please see the planning documents. More information is also provided in the Reflex Planning Guide.

6.3.3.2 Control unit connection

The following describes the exemplary installation of the control unit before the primary tank and the connection of two secondary tanks. Proceed accordingly for other installation variants.



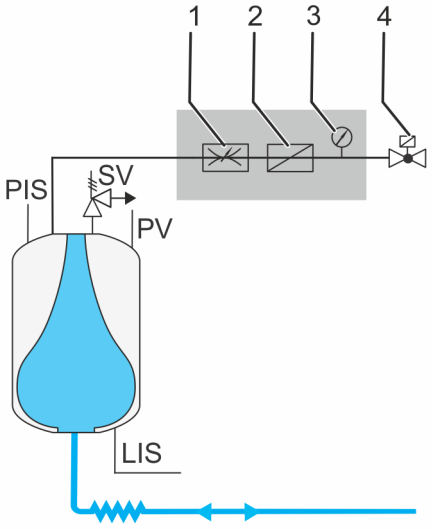
RF	Secondary tank
RG	Primary tank
SV	Safety valve
PV	Overflow solenoid valve

PIS	Pressure sensor
AC	Compressed air line
EC	Expansion line

- The "PV" overflow solenoid valve, the "PIS“ pressure transducer and the corresponding cables are factory-installed on the primary tank.
  - Run the cable through the assembly pipe on the rear of the primary tank to the control unit.
    - Cables are factory-installed in compact models.
- Subsequently install the level sensor at the primary tank, see chapter 6.3.5 "Fitting the level sensor" on page 25 .
  - Attach the cable to the "LIS" pressure pick-up of the level sensor and run the cable to the control unit.
    - For compact models, run the cable through the assembly pipe on the rear of the primary tank if it has not been factory-installed.
- The flexible compressed air hose is connected with the control unit. Run the compressed air hose through the assembly pipe as well.
  - If you install only the primary tank, you must connect the compressed air hose directly to the "AC" compressed air connection of the primary tank.
  - If you install secondary tanks, you install first the supplied distributor at the compressed air connection of the primary tank.
    - Use the supplied connection sets to connect the secondary tanks.

6.3.4 Connection to an external compressed air line

An external pressure supply can optionally be connected to the Reflexomat. When doing so it must be ensured that a pressure reducer is fitted in the external pressure line. The minimum pressure to be set depends on the relevant pressure rating of the tank.



1	Pressure reducer, site attachment
2	Dirt trap, site attachment
3	Pressure gauge, site attachment
4	Solenoid valve, supplied by Reflex

PIS	Pressure sensor
SV	Safety valve
PV	Overflow solenoid valve
LIS	Level sensor

Instead of the compressor, a solenoid valve is actuated in the external compressed air line, which releases the compressed air for the vessel. The solenoid valve is activated by the controller. The electrical connection of the solenoid valve is made via the terminal for the compressor in the respective controller.

Properties of the external compressed air:

- Quality
  - Fluid group 2 according to the Pressure Equipment Directive 2014 / 68 EU.
  - DIN ISO 8573-1 Class 1.
- Oil-free
  - **ATTENTION** Diaphragm damage caused by oil-containing compressed air. Keep the compressed air free of oil.
- Compressed air
  - **ATTENTION** Damage to the tank. The compressed air must be reduced to the respective tank pressure rating.

Note!

See chapter “Terminal plan” for the solenoid valve electrical connection.

6.3.5 Fitting the level sensor

ATTENTION

Damage to the pressure load cell due to unprofessional installation

Incorrect installation may result in damage to the "LIS" level sensor, malfunctioning and incorrect measurements from the pressure load cell.

- Comply with the instructions regarding the installation of the pressure load cell.

The "LIS" level sensor uses a pressure load cell. This pressure pick-up is to be installed after the primary tank has been placed at its final position, see chapter 6.3.2 "Tank installation" on page 20 . Comply with the following instructions:

- Remove the transport securing device (squared timber) at the vessel base of the primary tank.
- Replace this transport securing device with the pressure load cell.
  - In the case of a tank volume of 1000 l (Ø 1000 mm) or more, use the supplied screws to attach the pressure load cell at the vessel base of the primary tank.
- Avoid shock-type loading of the pressure load cell by, for example, subsequent alignment of the vessel.
- Use flexible hoses to connect the primary tank and the first secondary tank.
  - Use only the supplied connection sets, see chapter 9.2 "Configuring settings in the controller" on page 39 .
- Perform a null balancing of the filling level when the primary tank is aligned and fully emptied, .

Standard values for level measurements:

Primary vessel	Measuring range
200 l	0 – 4 bar
300 – 500 l	0 – 10 bar
600 – 1000 l	0 – 25 bar
1500 – 2000 l	0 – 60 bar
3000 – 5000 l	0 – 100 bar

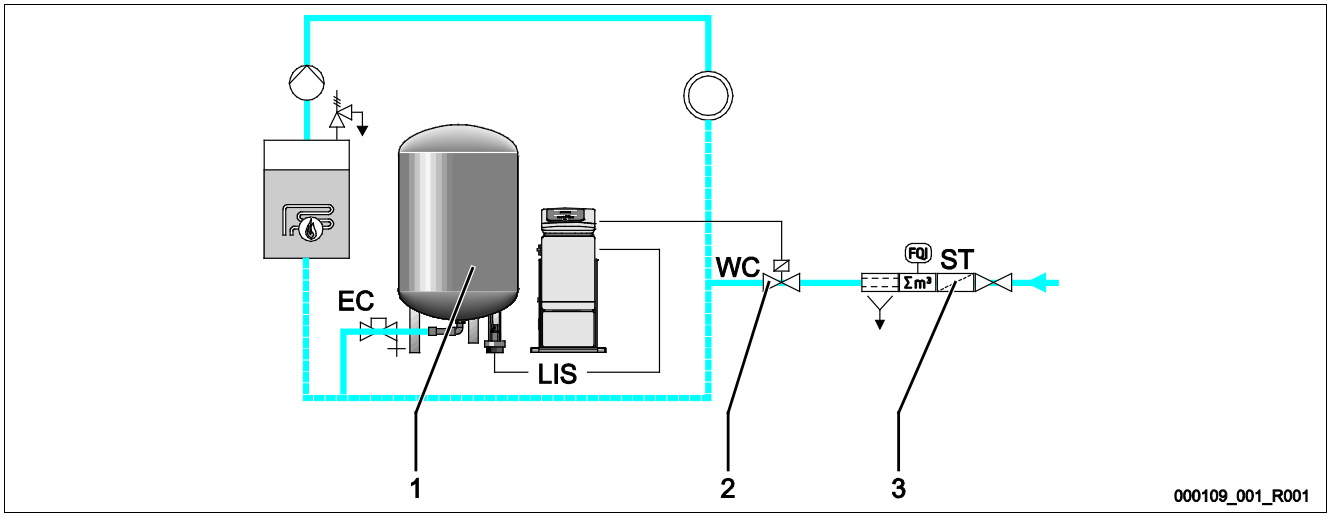
6.4 Make-up and degassing variants

6.4.1 Function

The filling level is recorded in the primary tank by the "LIS" level sensor and evaluated in the controller. When the water level falls below the value specified in the controller's customer menu, the external make-up is activated.

6.4.1.1 Make-up without pump

Reflexomat RS with solenoid valve and ball valve.



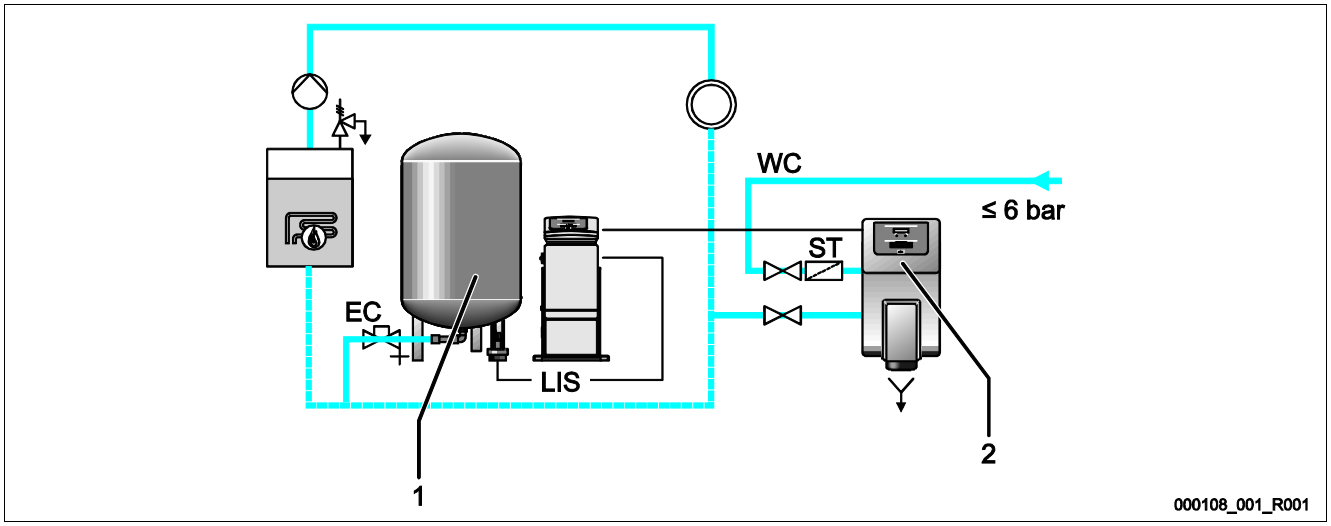
1	Reflexomat RS
2	Solenoid valve “Fillvalve” with ball valve
3	Reflex Fillset
ST	Dirt trap

WC	Make-up line
LIS	Level sensor
EC	Expansion line

Preferably, you should use the Reflex Fillset with integrated system separator when using drinking water for make-up, see chapter 4.6 "Optional equipment and accessories" on page 14 . If you don't use a Reflex Fillset, you must use an "ST" dirt trap with a mesh size ≥ 0.25 mm for the make-up.

6.4.1.2 Make-up with pump

Reflexomat RS with Reflex Fillcontrol Auto



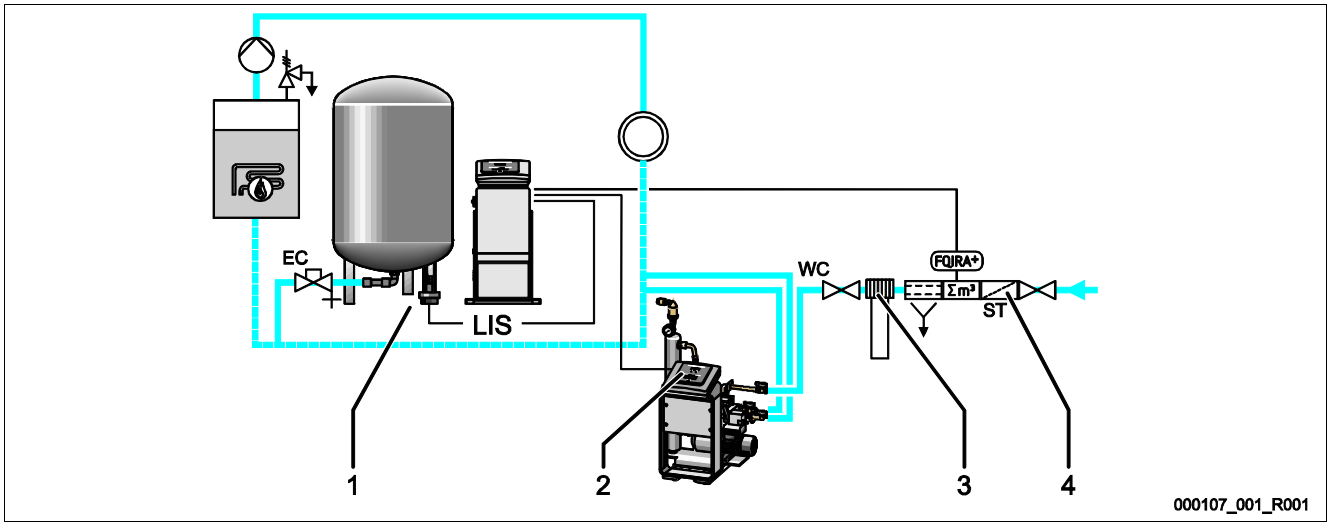
1	Reflexomat RS
2	Fillcontrol Auto
WC	Make-up line

ST	Dirt trap
EC	Expansion line
LIS	Level sensor

Water make-up with Fillcontrol Auto is suitable for make-up at high system pressures of up to 8.5 bar, see chapter 4.6 "Optional equipment and accessories" on page 14 . The "ST" dirt trap is part of the deliverables.

6.4.1.3 Make-up with softening and degassing

Reflexomat RS and Reflex Servitec.



1	Reflexomat RS
2	Reflex Servitec
3	Reflex Fillsoft
4	Reflex Fillset Impulse

ST	Dirt trap
WC	Make-up line
LIS	Level sensor
EC	Expansion line

The Reflex Servitec degassing and make-up station degasses the water from the facility system and the make-up water. The automatic water make-up for the facility system is controlled by the pressure maintenance system. Reflex Fillsoft additionally softens the make-up water.

- Reflex Servitec degassing and make-up station, see chapter 4.6 "Optional equipment and accessories" on page 14 .
- Reflex Fillsoft softening systems and Reflex Fillset Impulse, see chapter 4.6 "Optional equipment and accessories" on page 14 .

Notice!

When using Reflex Fillsoft softening systems, always install the Reflex Fillset Impulse.

- The controller evaluates the make-up quantities and signals a required replacement of the softening cartridges.

6.5 Electrical connection

⚠ DANGER

Risk of serious injury or death due to electric shock.

If live parts are touched, there is risk of life-threatening injuries.

- Ensure that the system is voltage-free before installing the device.
- Ensure that the system is secured and cannot be reactivated by other persons.
- Ensure that installation work for the electric connection of the device is carried out by an electrician, and in compliance with electrical engineering regulations.

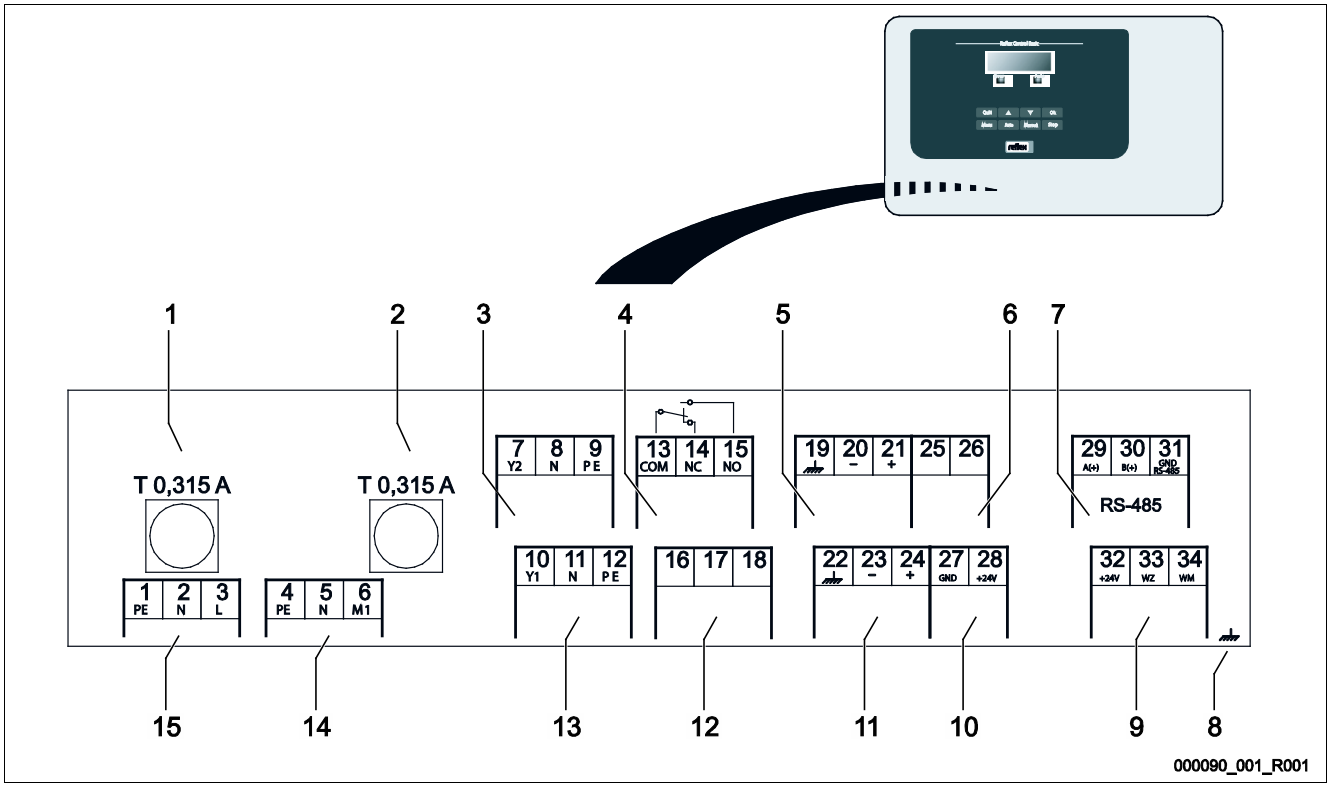
The following descriptions apply to standard systems and are limited to the necessary user-provided connections.

1. Disconnect the system from the power source and secure it against unintentional reactivation.
2. Remove the cover.

   ⚠ **DANGER** Risk of serious injury or death due to electric shock. Some parts of the device's circuit board may still carry 230 V voltage even with the device physically isolated from the power supply. Before you remove the covers, completely isolate the device controller from the power supply. Verify that the main circuit board is voltage-free.
3. Install a screwed cable gland suitable for the respective cable. M16 or M20, for example.
4. Thread all cables to be connected through the cable gland.
5. Connect all cables as shown in the terminal diagram.
   – Note that the fusing for the device connection is to be provided by the user, see chapter 6.5.1 "Terminal diagram" on page 29 .
6. Install the cover.
7. Connect the mains plug to the 230 V power supply.
8. Activate the system.

The electrical connection is completed.

6.5.1 Terminal diagram



1	"L" fuse for electronics and solenoid valves
2	"N" fuse for solenoid valves
3	Overflow valve (not for motor ball valve)
4	Group message
5	Optional for second pressure value
6	Motor ball valve (control connection)
7	RS-485 interface
8	Shielding

9	Digital inputs • Water meter • Insufficient water
10	Motor ball valve (energy connection)
11	Pressure analogue input
12	External make-up request
13	Make-up valve
14	"CO" compressor
15	Mains supply

Terminal number	Signal	Function	Wiring
1	PE	230 V power supply via mains cable and plug.	Factory
2	N		
3	L		
4	PE	Compressor for maintaining the pressure.	Factory
5N	N		
6 M1	M 1		
7	Y2	Overflow solenoid valve. • For controlling pressure maintenance in the overflow line.	Factory
8	N		
9	PE		
10	Y 1	230 V output for make-up. • To control a Reflex Fillcontrol, for example.	User, optional
11	N		
12	PE		
13	COM	Group message (floating).	User, optional
14	NC		
15	N.O.		
16	Not assigned	External make-up request. • Not used with the Reflexomat.	---
17	Make-up (230 V)		
18	Make-up (230 V)		
19	PE shield	Level analogue input. • Display at the controller. • Activation of the make-up.	Pre-wired, sensor plug must be attached on-site
20	- Level (signal)		
21	+ Level (+ 18 V)		
22	PE (shield)	Pressure analogue input. • Display at the controller. • Control of pressure maintenance.	Factory
23	- Pressure (signal)		
24	+ Pressure (+ 18 V)		
25	0 – 10 V (correcting variable)	Motor ball valve • Not used with the Reflexomat.	---
26	0 – 10 V (feedback)		
27	GND		
28	+ 24 V (supply)		
29	A	RS-485 interface.	User, optional
30	B		
31	GND		
32	+ 24 V (supply) E1	Supply for E1 and E2.	Factory
33	E1	Contact water meter (in Fillset, for example), see chapter 4.6 "Optional equipment and accessories" on page 14 . • Evaluation of the make-up. – If contact 32/33 is closed = meter pulse.	User, optional
34	E2	Insufficient water switch. • Not used with the Reflexomat. – If contact 32/34 is closed = OK.	---

6.5.2 RS-485 interface

Use this interface to retrieve all controller data and to enable the communication with control centres or other devices.

The following data can be requested:

- Pressure and level.
- Compressor operating states.
- Operating states of the ball valve in the overflow line.
- Operating states of make-up via solenoid valve.
- Cumulated quantity of the FQIRA + contact water meter.
- All messages, see chapter 9.2.2 "Messages" on page 44 .
- All entries in the fault memory.

Notice!

If required, please contact the Reflex Customer Service for the protocol of the RS-485 interface, details of the connections and information about the accessories offered.

6.5.2.1 Connecting the RS-485 interface

- Use a shielded cable to connect the interface to terminals 1 – 6 of the main board in the control cabinet.
  - For connecting the interface, see chapter 6.5 "Electrical connection" on page 28 .
- When using the device with a control centre not supporting an RS-485 interface (RS-232, for example), you must use a corresponding adapter.

Note!

- For connecting the interface use only a cable with these properties.
  - LJYCY (TP), 4 × 2 × 0.8, maximum overall bus length 1000 m.

6.6 Installation and commissioning certificate

Data shown on the nameplate:	P_0
Type:	P_{SV}
Serial number:	

This device has been installed and commissioned in accordance to the instructions provided in the Operating Manual. The settings in the controller match the local conditions.

Note!

When any factory-set values of the device are changed, you must enter this information in the Maintenance certificate, see chapter 10.4 "Maintenance certificate " on page 52 .

For the installation

Place, date	Company	Signature

For the commissioning

Place, date	Company	Signature

7 Commissioning

Note!

Confirm that installation and start-up have been carried out correctly using the installation, start-up and maintenance certificate. This action is a prerequisite for the making of warranty claims.

– Have the Reflex Customer Service carry out commissioning and the annual maintenance.

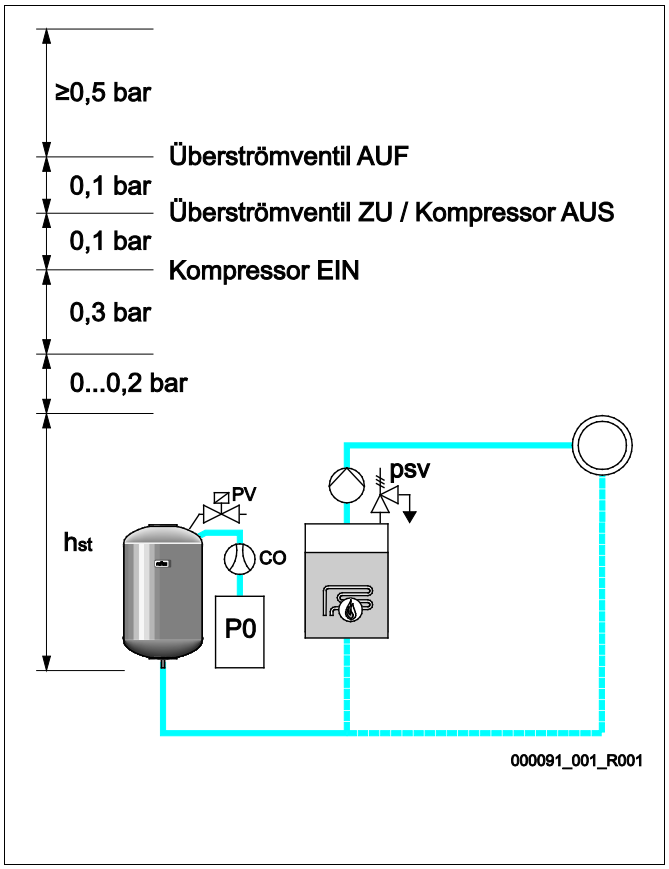
7.1 Checking the requirements for commissioning

The device is ready for commissioning when the tasks described in Chapter Installation have been concluded. Comply with the following instructions for commissioning:

- The control unit is connected to the primary tank and the secondary tanks, if provided.
- The water connections of the tanks to the facility system are established.
- The tanks are not filled with water.
- The valves for emptying the tanks are open.
- The facility system is filled with water and gas-vented.
- The electrical connection has been created according to applicable national and local regulations.

7.2 Determining the P_0 minimum operating pressure for the controller

The "P_0" minimum operating pressure is determined by the location of the pressure maintaining device. The controller calculates the switching points for the "PV" solenoid valve and the "CO" compressor from the "P_0" minimum operating pressure.



The "P_0" minimum operating pressure is calculated as follows:

$P_0 = P_{st} + P_D + 0.2$ bar*	Enter the calculated value in the start routine of the controller, see chapter 7.3 "Modifying the controller's start routine" on page 34 .
$P_{st} = h_{st}/10$	h_{st} in metres
$P_D = 0.0$ bar	for safety temperatures ≤ 100 °C
$P_D = 0.5$ bar	for safety temperatures = 110 °C

*Addition of 0.2 bar recommended, no addition in extreme cases

Calculation example for "P_0" minimum operating pressure:

Heating system: Static height 18 m, run-on temperature 70 °C, safety temperature 100 °C.

Calculation example:

$P_0 = P_{st} + P_D + 0.2$ bar*

$P_{st} = h_{st}/10$

P_{st}=18 m/10

$P_{st} = 1.8$ bar

$P_D = 0.0$ bar at a safety temperature of 100 °C

$P_0 = 1.8$ bar + 0 bar + 0.2 bar

$P_0 = 2.0$ bar

Notice!

Avoid dropping below the "P_0"minimum operating pressure. Vacuum, vaporisation and cavitation are thus excluded.

7.3 Modifying the controller's start routine

Note!

During commissioning, you must once execute the start routine.

- For information about controller operation, see chapter 9.1 "Operator panel" on page 38 .

The start routine is used to set the required parameters for the device commissioning. It commences with the first activation of the controller and can be run only once. Parameters can be changed or checked in the customer menu after the start routine has terminated.

Notice!

Plug in the contact plug to provide power (230 V) to the controller.

You are now in Stop mode. The "Auto" LED on the operator panel has extinguished.

Device name	Reflexomat
Standard software with various languages.	Language
Prior to commissioning, read the entire operating manual and verify the proper assembly.	Read the operating manual!
Enter the value for the minimum operating pressure. • Calculating the minimum operating pressure, see chapter 7.2 "Determining the P_0 minimum operating pressure for the controller" on page 33 .	Min. op. pressure
Change the flashing display items for "Hour", "Minute", and "Seconds" to the current time. • The time of an alarm will be stored in the fault memory.	Time
Change the flashing display items for "Day", "Month", and "Year" to the current date. • The date of an alarm will be stored in the fault memory.	Date
Select the size of the primary tank. • For the primary tank data, see the name plate or see chapter 5 "Technical data" on page 15 .	00500 l 740 mm GB = 0093 kg

Null balancing of the level sensor.

- The controller checks whether the level measuring signal matches the dimensional data of the primary tank. The primary tank must be fully emptied, see chapter 6.3.5 "Fitting the level sensor" on page 25 .

1 %	1.7 bar
Null balancing!	

Upon successful conclusion of the null balancing, confirm with "OK" on the controller operator panel.

0 %	1.0 bar
Null balancing concluded successfully	

Select "Yes" or "No" on the controller display and confirm with "OK" on the controller operator panel.

Cancel null balancing?
No

yes: The primary tank is fully emptied and the device is installed as per the instructions.

- If null balancing is still not possible, confirm with "Yes". The start routine is terminated. Use the customer menu to repeat the null balancing.
- Subsequently contact your Reflex Customer Service, see chapter 12.1 "Reflex Customer Service" on page 55 .

no: The start routine restarts.

- Check the prerequisites for the commissioning, see chapter 7.1 "Checking the requirements for commissioning" on page 32 .

This message appears on the display only after null balancing has been successful.
Select "Yes" or "No" on the controller display and confirm with "OK" on the controller operator panel.

Terminate routine?
No

yes: The start routine is terminated, the device automatically switches to Stop mode.

no: The start routine restarts.

The level indication is at 0 %.

0 %	2.0 bar
STOP	

Notice!

After successful conclusion of the start routine, you are in Stop mode.

7.4 Tank venting

⚠ CAUTION

Risk of burns on hot surfaces

Excessive surface temperatures on the compressor can result in skin burns.

- Wear suitable personal protective equipment (safety gloves, for example).

Upon completion of the start routine, you must vent the primary tank and the secondary tanks, if applicable.

- Open the tanks' discharge ports to permit the air to escape.
- Select Automatic mode on the controller's operator panel, see chapter 8.1.1 "Automatic mode" on page 37 .

The "CO" compressor builds up the pressure required venting. This pressure is 0.4 bar above the set minimum operating pressure. The tanks' diaphragms are pressurised to this level and the water side in the tanks is vented. Close the discharge ports of all tanks after the compressor has automatically shut down.

Notice!

Inspect all compressed air connections between the control unit and the tanks for leaks. Subsequently, slowly open all cap valves at the tanks to create the water-side connection to the facility system.

7.5 Filling the tanks with water

Prerequisite for fault-free filling is a make-up pressure at least 1.3 bar above the set minimum pressure "P_0".

- Without automatic make-up:
  - Use the discharge ports or the facility system to manually fill the individual tank to approximately 30 % of the tank volume, see chapter 6.4 "Make-up and degassing variants" on page 25 .
- With automatic make-up:
  - The tanks are automatically filled to approximately 12 % of the tank volume, see chapter 6.4 "Make-up and degassing variants" on page 25 .

7.6 Starting Automatic mode

Automatic operation can be set after initial commissioning. Start the automatic mode at the operator panel of the controller.

The following prerequisites must be met for automatic operation:

- The device is filled with compressed air and water.
- All required parameters are defined in the controller.

Press "Auto" for automatic mode at the controller operator panel.

- The "Auto" LED at the operator panel illuminates to visually signal automatic mode.

Notice!

Initial commissioning is completed and the device is in continuous operation.

8 Operation

8.1 Operating modes

8.1.1 Automatic mode

After successful commissioning, start the Automatic mode from the device. The Automatic mode is suitable for continuous device operation and the controller monitors the following functions:

- Maintain pressure
- Compensate expansion volume
- Automatic make-up

To start automatic operation, press "Auto" at the controller operator panel. The "CO" compressor and the "PV1" solenoid valve are regulated by the controller so that the pressure remains constant at a regulation range of ± 0.1 bar. Faults are displayed and evaluated.

8.1.2 Manual mode

The manual mode is intended for test and service tasks.

Press "Manual" on the controller. The "Auto" LED at the operator panel flashes to visually indicate that Manual mode is active. Manual mode enables you to select the following functions and to perform a test run:

- "CO" compressor.
- "PV1" overflow solenoid valve.
- The solenoid valve of the "WV1" make-up.

You can switch several functions after each other and test them at the same time.

- Use the "Switch up/down" keys to select the function.
  - "CO1" = Compressor
  - "PV1" = Solenoid valve in the overflow line
  - "WV1" = Make-up solenoid valve
- Press "OK".
  - Confirm the selection or shut-down of the individual functions.
- "Quit" button
  - Shut-down of the individual functions in reverse order.
  - Press "Quit" for the last time and the system moves in Stop mode.
- "Auto" button
  - Return to Automatic mode.

30%			2.5 bar
CO1!*	PV1	WV1	

* Units with "!“ are selected and active.

Notice!

Manual operation can not be performed if safety-relevant parameters are exceeded.

- Switching is blocked if safety-relevant parameters are exceeded.

8.1.3 Stop mode

The Stop mode is intended for the device commissioning.

Press "Stop" on the controller. The "Auto" LED at the operator panel extinguishes.

Except for the display of information, the device is non-functional in Stop mode. Function monitoring is stopped.

The following functions are deactivated:

- The "CO" compressor (shut off in Stop mode).
- The solenoid valve in the "PV" overflow line (closed in Stop mode).
- The solenoid valve in the "WV" make-up line (closed in Stop mode).

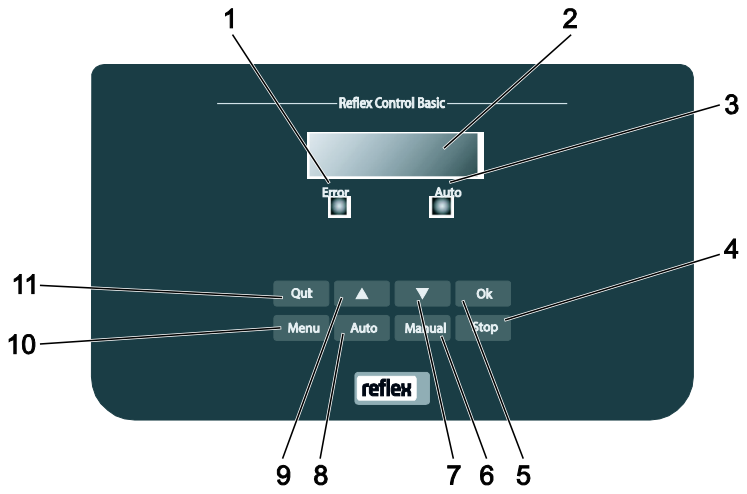
Notice!

The system returns an alarm if the Stop mode is activated for more than 4 hours.

- If "Floating alarm contact?" in the Customer menu is set to "Yes", the system outputs the alarm to the group alarm contact.

9 Controller

9.1 Operator panel



1	Error LED • The Error LED illuminates in the event of a fault
2	Display
3	Auto LED • The Auto LED illuminates green in Automatic mode • The Auto LED flashes green in Manual mode • The Auto LED is not illuminated when the system is stopped
4	Stop • For commissioning and entry of new values in the controller
5	OK • Confirm actions
6	Manual • For tests and maintenance tasks

7	"Back" to the previous menu
8	Auto • For continuous operation
9	"Forward" to the next menu
10	Menu • Call up the Customer menu
11	Quit • Acknowledge messages

Selecting and changing parameters

1. Use "OK" (5) to select the parameter.
2. Use the "▼" (7) or "▲" (9) arrow keys to change the parameter.
3. Use "OK" (5) to confirm the parameter.
4. Use the "▼" (7) or "▲" (9) arrow keys to switch to a different menu option.
5. Use "Quit" (11) to switch to a different menu level.

9.2 Configuring settings in the controller

You can configure the controller settings regardless of the currently selected and active operating mode.

Use the Customer menu to display or correct system-specific values. In the course of commissioning, the factory settings must be adjusted for the system-specific conditions.

Notice!

Operation description, see chapter 9.1 "Operator panel" on page 38 .

All grey marked menu items must be reviewed during commissioning.

Press "Manual" to switch to manual operation.

Press "Menu" to display the first main menu option "Customer menu".

Switch to the next main menu option.

Customer menu

Standard software with various languages.

Language

Adjust the "Hour", "Minute", and "Second" display when each begins to flash.
This time is used for entries in the fault memory.

Time:

Adjust the "Day", "Month", and "Year" display when each begins to flash.
This date is used for entries in the fault memory.

Date:

The controller checks whether the level sensor signal matches the value entered for the "RG" primary tank in the controller, see chapter 7.3 "Modifying the controller's start routine" on page 34 .

1 %	1.7 bar
Null balancing?	

Notice!

The "RG" primary tank must be completely empty.

One of the following messages appears on the display:

- Null balancing concluded successfully.
  - Confirm with the "▼" button.
- Empty the tank and repeat the process.
  - Confirm with "OK".

0 %	0 bar
Null balancing concluded successfully!	

This message appears when null balancing has failed. Select "Yes" or "No" on the display.

0 %	0 bar
Cancel null balancing	No

Yes: The "RG" primary tank is empty and the device is installed as per the instructions. If null balancing is still not possible, cancel with "Yes". Contact your Reflex Customer Service.

No: Check the prerequisites for the commissioning, see chapter 7.1 "Checking the requirements for commissioning" on page 32 .

The controller's start routine is restarted.

Confirm the selection of "Yes" or "No" with "OK".

Enter the value for the minimum operating pressure.

Min.op.pressure
01.8 bar

Notice!

Calculation of minimum operating pressure, see chapter 7.2 "Determining the P_0 minimum operating pressure for the controller" on page 33 .

Switch to the "Make-up" main menu.

Make-up

- Press "OK" to open the menu.
- Use the "▼ ▲" buttons to open the sub-menu.

If the water content is below the specified tank size, add water, see chapter 7.3 "Modifying the controller's start routine" on page 34 .

Make-up: ON
at: 08 %

- If an automatic make-up device (Fillcontrol for example) is installed, make-up will be actuated automatically; otherwise the make-up must be manually activated.

Terminate the water make-up when the specified tank size is exceeded.

Make-up: OFF
at: 12 %

- If an automatic make-up device is installed, make-up will be shut off automatically; otherwise the make-up must be manually deactivated.
- If you have selected "No" for automatic make-up, the system will not return any further queries about the make-up.

Pre-selected time for a make-up cycle. Upon expiry of this set time, the system interrupts the make-up and returns the "Make-up time" fault message.

Max. make-up time
010 min.

If the set number of make-up cycles is exceeded within two hours, the system interrupts the make-up and returns the "Make-up cycles" fault message.

Max. make-up cycl.
003 / 2 h

yes: FQIRA+ contact water meter is installed, see chapter 4.6 "Optional equipment and accessories" on page 14 .
This is the prerequisite for the make-up quantity monitoring and the operation of a softening system.

With water meter
YES

no: A contact water meter is not installed (standard model).

Only displayed if "YES" has been set in the "With water meter" menu option.

Make-up quantity
000020 l

- Use "OK" to delete the counter.
  - Press "YES" to reset the value displayed to "0".
  - Press "No" to retain the displayed value.

This value is only displayed if "YES" has been set in the "With water meter" menu option.

- When the set quantity is exceeded, the system interrupts the make-up process and returns the error message "Max. make-up quantity exceeded".

Max. make-up qty.
000100 l

This value is only displayed if "YES" has been set in the "With water meter" menu option.

With softening
YES

yes: The system offers more queries regarding the softening process.

no: The system does not offer more queries regarding the softening process.

This value is only displayed if "YES" has been set in the "With softening" menu option.

Lock make-up?
YES

yes: The system stops the make-up process when the set soft water capacity is exceeded.

no: The system does not stop the make-up process. The system displays the "Softening" message.

This value is only displayed if "YES" has been set in the "With softening" menu option.

- Hardness reduction is calculated from the difference of the overall water hardness of the raw water GH_{actual} and the target water hardness GH_{target}.
  - Hardness reduction = GH_{actual}-GH_{target}l °dH

Enter the value in the controller. Consult the manufacturer information for third-party products.

Hardness reduction
10 °dH

This value is only displayed if "YES" has been set in the "With softening" menu option.

The attainable soft water capacity is calculated from the type of softening used and the specified hardness reduction.

- Fillsoft I, soft water capacity ≤ 6000/hardness red. l
- Fillsoft II, soft water capacity ≤ 12000/hardness red. l

Enter the value in the controller. Consult the manufacturer information for the values of third-party products.

Cap. soft water
05000 l

This value is only displayed if "YES" has been set in the "With softening" menu option. It indicates the still remaining soft water capacity. The soft ware capacity cannot be set and is calculated from the hardness reduction and the soft water capacity.

Remaining cap. soft w.
000020 l

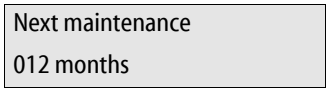
This value is only displayed if "YES" has been set in the "With softening" menu option.

- Manufacturer specification for the replacement interval of the softening cartridges, regardless of the calculated soft water capacity. The system displays the "Softening" message.

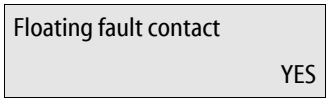
Recommended maintenance messages.

Off: Without maintenance recommendation.

001 – 060: Maintenance recommendation in months.



For the output of messages to the floating contact, see chapter 9.2.2 "Messages" on page 44 .

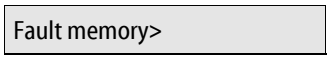


yes: Output of all messages.

no: Output of all messages identified with "xxx" ("05", for example).

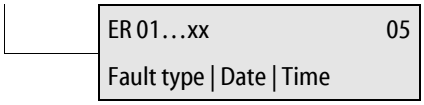
Switch to the "Fault memory" main menu.

- Press "OK" to open the menu.
- Use the "▼ ▲" buttons to open the sub-menu.



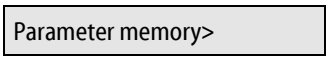
The last 20 alarms are stored with fault type, date, time, and fault code.

See the chapter "Messages" for more information about the ER... messages.

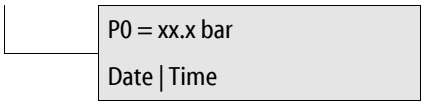


Switch to the "Parameter memory" main menu.

- Press "OK" to open the menu.
- Use the "▼ ▲" buttons to open the sub-menu.



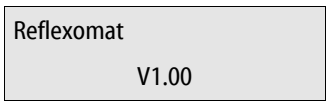
The last 10 entries of the minimum working pressure are stored with date and time.



The system displays the values for the volume and the diameter of the "RG" primary tank.

- If you identify differences to the information provided on the primary tank's nameplate, please contact the Reflex Customer Service.

Information about the software version



9.2.1 Default settings

The device controller is shipped with the following default settings. Use the Customer menu to adjust these values to local conditions. In specific cases, it is possible to further adjust the values in the Service menu.

Customer menu

Parameter	Setting	Remarks
Language	EN	Display language.
Minimum operating pressure "P_0"	1.8 bar	see chapter 7.2 "Determining the P_0 minimum operating pressure for the controller" on page 33 .
Next maintenance	12 months	Time left to the next due maintenance.
Floating alarm contact	YES	see chapter 9.2.2 "Messages" on page 44 .
Make-up		
Make-up “ON”	8 %	
Make-up “OFF”	12 %	
Maximum make-up quantity	0 Litres	Only if make-up has been selected in the customer menu with “With water meter Yes”.
Maximum make-up time	30 minutes	
Maximum make-up cycles	6 cycles within 2 hours	
Softening (Only if "With softening Yes")		
Lock make-up	No	In the case of soft water residual capacity = 0
Hardness reduction	8°dH	= Target – Actual
Maximum make-up quantity	0 Litres	
Soft water capacity	0 Litres	
Cartridge replacement	18 months	Replace cartridge.

Service menu

Parameter	Setting	Remarks
Pressurisation		
Compressor "ON"	P_0 + 0.3 bar	Differential pressured added to the "P_0" minimum operating pressure.
Compressor "OFF"	P_0 + 0.4 bar	Differential pressured added to the "P_0" minimum operating pressure.
"Compressor run time exceeded" message	240 minutes	The message is displayed after the compressor runs for 240 minutes.
Overflow line "CLOSED"	P_0 + 0.4 bar	Differential pressured added to the "P_0" minimum operating pressure.
Overflow line "OPEN"	P_0 + 0.5 bar	Differential pressured added to the "P_0" minimum operating pressure.
Maximum pressure	P_0 + 3 bar	Differential pressured added to the "P_0" minimum operating pressure.
Filling levels		
Insufficient water "ON"	5 %	
Insufficient water "OFF"	12 %	
Solenoid valve in overflow line "CLOSED"	90 %	

9.2.2 Messages

The display provides alarms in plain text and the ER codes shown in the list. Use the arrow buttons to scroll through multiple alarms displayed at the same time, see chapter 9.1 "Operator panel" on page 38 .

The fault memory stores the last 20 alarms for review, see chapter 9.2 "Configuring settings in the controller" on page 39 .

Alarm causes can be eliminated by the operator or a specialist workshop. If this is not possible, contact the Reflex Customer Service.

Note!

Clearing of the cause must be confirmed by pressing the “Ack” button on the operator panel. All other alarms are automatically reset as soon as the cause has been eliminated.

Note!

Floating contacts, setting in the Customer menu, see chapter 9.2 "Configuring settings in the controller" on page 39 .

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
01	Minimum pressure	YES	• Set value not reached. • Water loss in the system. • Compressor fault. • Controller in Manual mode.	• Check set value in the Customer or Service menu. • Check water level. • Check compressor. • Set the controller to Automatic mode.	"Quit"
02.1	Insufficient water	-	• Set value not reached. • Make-up disabled. • Air in the system. • Dirt trap clogged.	• Check set value in the Customer or Service menu. • Clean the dirt trap. • Check functioning of the "PV1" solenoid valve. • If necessary, manually add water.	-
03	High water	YES	• Set value exceeded. • Make-up disabled. • Water intake through a leak in a thermal transfer medium of the user. • "RG" and "RG" tanks too small.	• Check set value in the Customer or Service menu. • Check functioning of the "WV1" solenoid valve. • Drain water from the "VG" tank. • Check user's thermal transfer medium for leaks.	-
04.1	Compressor	YES	• Compressor disabled. • Fuse defective.	• Check set values in the Customer or Service menu. • Replace the fuse.	"Quit"

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
05	Compressor run time	-	• Set value exceeded. • Severe water loss in the system. • Air lines leaking. • Solenoid valve in the overflow line does not close.	• Check set value in the Customer or Service menu. • Check the water loss and correct, if necessary. • Seal any leak in the air system. • Check functioning of the "PV1" solenoid valve.	-
06	Make-up time	-	• Set value exceeded. • Water loss in the system. • Make-up line not connected. • Make-up rate insufficient. • Make-up hysteresis too low.	• Check set value in the Customer or Service menu. • Check water level. • Connect make-up line	"Quit"
07	Make-up cycles	-	Set value exceeded.	• Check set value in the Customer or Service menu. • Seal any leak in the system.	"Quit"
08	Pressure measurement	YES	Controller receives incorrect signal.	• Connect the plug. • Check functioning of the pressure sensor. • Check the cable for damage. • Check the pressure sensor.	"Quit"
09	Level sensor	YES	Controller receives incorrect signal.	• Check functioning of the load cell. • Check the cable for damage. • Connect the plug.	"Quit"
10	Maximum pressure	-	• Set value exceeded. • Overflow line disabled. • Dirt trap clogged.	• Check set value in the Customer or Service menu. • Check functioning of the overflow line. • Clean the dirt trap.	"Quit"
11	Make-up quantity	-	"With water meter" must be activated in the Customer menu. • Set value exceeded. • Severe water loss in the system.	• Check set value in the Customer or Service menu. • Check water loss in the system and repair, if necessary.	"Quit"

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
15	Make-up valve	-	Contact water meter measures without make-up request.	Check the make-up valve for leaks.	"Quit"
16	Power failure	-	No power.	Connect to power supply.	-
19	Stop ≥4 hours	-	Device is in Stop mode for more than 4 hours.	Set the controller to Automatic mode.	-
20	Max. Make-up volume	-	Set value exceeded.	Reset the "Make-up quantity" meter in the Customer menu.	"Quit"
21	Maintenance recommended	-	Set value exceeded.	Perform maintenance and reset the maintenance counter upon completion.	"Quit"
24	Softening	-	• Set value for soft water capacity exceeded. • Time interval for replacement of the softening cartridge exceeded.	Replace the softening cartridges.	"Quit"
30	I/O module fault	-	• I/O module defective. • Connection between option card and controller faulty. • Option card defective.	Inform Reflex Customer Service.	-
31	EEPROM defective	YES	• EEPROM defective. • Internal calculation error.	Inform Reflex Customer Service.	"Quit"
32	Undervoltage	YES	Supply voltage not achieved.	Check power supply.	-
33	Adjustment parameters faulty	-	EPROM parameter memory defective.	Inform Reflex Customer Service.	-
34	Communication Main board faulty	-	• Connecting cable defective. • Main board defective.	Inform Reflex Customer Service.	-
35	Digital input voltage faulty	-	Short-circuit of input voltage.	Check the wiring at the digital inputs (water meter, for example).	-
36	Analogue input voltage faulty	-	Short-circuit of input voltage.	Check the wiring at the analogue inputs (pressure/level).	-

10 Maintenance

⚠ CAUTION

Risk of burns

Escaping hot medium can cause burns.

- Maintain a sufficient distance from the escaping medium.
- Wear suitable personal protective equipment (safety gloves and goggles).

⚠ DANGER

Risk of serious injury or death due to electric shock.

If live parts are touched, there is risk of life-threatening injuries.

- Ensure that the system is voltage-free before installing the device.
- Ensure that the system is secured and cannot be reactivated by other persons.
- Ensure that installation work for the electric connection of the device is carried out by an electrician, and in compliance with electrical engineering regulations.

The device is to be maintained annually.

– The maintenance intervals depend on the operating conditions and the degassing times.

The annual maintenance is displayed upon expiry of the set operating time. Use "Quit" to acknowledge the "Maintenance recommended" message. Reset the maintenance counter in the Customer menu.

▶ **Notice!**

Maintenance work must be carried out and confirmed by specialist personnel or the Reflex Customer Service, see chapter 10.4 "Maintenance certificate " on page 52 .

10.1 Maintenance schedule

The maintenance schedule is a summary of maintenance tasks to be carried out regularly.

Maintenance task	Conditions			Interval
▲ = Check, ■ = Service, ● = Clean				
Check for leaks. • "CO" compressor. • Screw connections of the compressed air connections.	▲	■		Annually
Check switching points. • "CO" compressor cut-in pressure. • Insufficient water. • Make-up with water.	▲			Annually
Clean "ST" dirt trap. – see chapter 10.3.2 "Cleaning the dirt trap" on page 51 .	▲	■	●	Depending on the operating conditions
Remove condensate from the primary tank and the secondary tanks, if applicable. – see chapter 10.3.1 "Cleaning the tanks" on page 50 .	▲	■	●	Annually

10.2 Checking switching points

Prerequisite for checking the switching points are the following correct settings:

- Minimum operating pressure P_0, see chapter 7.2 "Determining the P_0 minimum operating pressure for the controller" on page 33 .
- Level sensor at the primary tank.

Preparation

1. Switch to Automatic mode.
2. Close the cap valves upstream of the tanks.
3. Record the displayed filling level (value in %).
4. Drain the water from the tanks.

Checking the cut-in pressure

5. Check the cut-in and cut-out pressure of the "CO" compressor.
   - The compressor cuts in at $P_0 + 0.3$ bar.
   - The compressor cuts out at $P_0 + 0.4$ bar.

Checking the Make-up "On"

6. If necessary, check the make-up value displayed at the controller.
   - The automatic make-up is activated at a level display of 8 %.

Checking Insufficient water "On"

7. Switch off the make-up and continue to drain water from the tanks.
8. Check the displayed value for the "Insufficient water" filling level message.
   - Insufficient water "On" is displayed at the controller at a minimum filling level of 5 %.
9. Switch to Stop mode.
10. Switch off the main switch.

Cleaning the tanks

If necessary, remove condensate from the tanks, see chapter 10.3.1 "Cleaning the tanks" on page 50 .

Activating the device

11. Switch on the main switch.
12. Switch to Automatic mode.
    – Depending on the filling level and pressure, the "CO" compressor and the automatic make-up will be switched on.
13. Slowly open the cap valves upstream of the tanks and secure them against unintended closing.

Checking Insufficient water "Off"

14. Check the displayed value for the Insufficient water "OFF" filling level message.
    – Insufficient water "Off" is displayed at the controller at a minimum filling level of 8 %.

Checking Make-up "Off"

15. If necessary, check the make-up value displayed at the controller.
    – The automatic make-up is deactivated at a level display of 12 %.

Maintenance is completed.

Notice!

If automatic make-up is not connected, you must manually fill the tanks with water to the recorded filling level.

Notice!

The setting values for pressure maintenance, filling levels and make-up are provided in the chapter Standard settings, see chapter 9.2.1 "Default settings" on page 43 .

10.3 Cleaning

10.3.1 Cleaning the tanks

⚠ CAUTION

Risk of injury due to pressurised liquid

Injuries can occur during maintenance work if the connections have been installed incorrectly because condensate under pressure can suddenly escape.

- Ensure proper connections for the draining of condensate.
- Wear suitable personal protective equipment (safety gloves and safety goggles, for example).

Regularly clean the tanks from condensate. The cleaning intervals depend on the local operational conditions.

Tanks with permanently installed diaphragm

1 Record the level value displayed at the controller.
2. Press "Manual" at the operator panel to switch the controller into Manual mode.
3. Remove the silencer from the "PV" overflow solenoid valve.
4. Install a suitable hose in the "PV" overflow solenoid valve to drain condensate.

   ⚠ CAUTION – Risk of injury caused by escaping pressurised liquid. Injuries can occur during maintenance work if the connections have been installed incorrectly because condensate under pressure can suddenly escape.

- Ensure proper connections for the draining of condensate.
- Wear suitable personal protective equipment (safety gloves and safety goggles, for example).

5. Slowly open the "PV" overflow solenoid valve.
   – Manually add water if the pressure in the system drops significantly.
   – If the "PV" overflow solenoid valve discharges more than 5 litres of water or condensate, you must check the diaphragm for rupture.
     • The tank must be replaced if the diaphragm has ruptured.
6. Close the "PV" overflow solenoid valve when the display indicates a 100% level.
7. Start the "CO" compressor to build up pressure.
   – If you had to add water during draining the condensate, you must monitor the pressure build up. At excessive pressure rise, drain water from the system accordingly.
8. Switch the controller into Automatic mode when the recorded level is displayed at the controller.
9. Remove the hose from the "PV" overflow solenoid valve and re-install the silencer.
10. Maintenance is completed.

Regularly clean the primary tank and the secondary tanks from condensate. The cleaning intervals depend on the local operational conditions.

Tanks with replaceable diaphragm

1. Close the cap valves upstream of the tanks.
2. Record the displayed level value at the controller and empty the tank of water and compressed air.
3. Switch off the main switch and withdraw the mains plug.
4. Open the drain taps at the tanks and drain the condensate.
   – If more than 5 litres of water or condensate are discharged, you must check the tank.
     • Check the diaphragm for rupture.
     • Check the tank interior walls for corrosion damage.

   ⚠ **CAUTION** – Risk of injury caused by escaping pressurised liquid. Injuries can occur during maintenance work if the connections have been installed incorrectly because condensate under pressure can suddenly escape.
5. Close the tanks' drain taps.
6. Connect the mains plug and switch on the main switch.
7. Open the cap valves of the tanks and secure against unauthorised "closing".
8. Fill water and compressed air into the tanks until the recorded level value is reached.

Maintenance is completed.

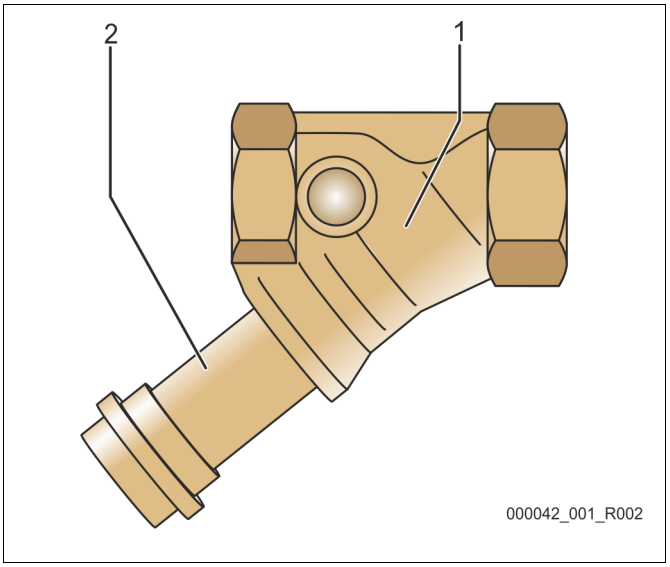
Note!

Check the installation location of the tanks for sufficient ventilation if the tank interior wall are damaged by corrosion, see chapter 6.2 "Preparatory work" on page 18 .

10.3.2 Cleaning the dirt trap

Regularly clean the "ST" dirt trap. The cleaning intervals depend on the local operational conditions.

1. Switch to Stop mode.
   – Press "Stop" on the controller's operator panel.
2. Close the ball valves upstream and downstream of the "ST" (1) dirt trap.
3. Slowly unscrew the dirt trap insert (2) from the dirt trap in order for the residual pressure to escape from the pipeline segment.
4. Pull the mesh from the dirt trap insert and rinse it with clear water. Use a soft brush for cleaning.
5. Re-insert the mesh into the dirt trap insert, check the gasket for damage, and screw the dirt trap insert back into the housing of the "ST" (1) dirt trap.
6. Re-open the ball valves upstream and downstream of the "ST" (1) dirt trap.
7. Switch to Automatic mode.
   – Press "Auto" on the controller's operator panel.



1	"ST" dirt trap	2	Dirt trap insert

Note!

Clean all other installed dirt traps (in the Reflex Fillset, for example).

10.4 Maintenance certificate

All maintenance tasks have been completed according to the Reflex Installation, Operating and Maintenance Manual.

Date	Service organisation	Signature	Remarks

10.5 Inspection

10.5.1 Pressure-bearing components

Comply with all applicable national regulations for the operation of pressure equipment. De-pressurise all pressurised components prior to inspection (see disassembly information).

10.5.2 Inspection prior to commissioning

In Germany, follow the Industrial Safety Regulation [Betriebssicherheitsverordnung] Section 15 and Section 15 (3) in particular.

10.5.3 Inspection intervals

Recommended maximum inspection intervals for operation in Germany pursuant to Section 16 of the Industrial Safety Regulation [Betriebssicherheitsverordnung] and the vessel classification of the device in diagram 2 of the Directive 2014/68/EC, applicable in strict compliance with the Reflex Installation, Operation and Maintenance Manual.

External inspection:

No requirement according to Annex 2, Section 4, 5.8.

Internal inspection:

Maximum interval according to Annex 2, Section 4, 5 and 6; if necessary, suitable replacement actions are to be taken (such as wall thickness measurement and comparison with the design specification which may be requested from the manufacturer).

Tightness test:

Maximum interval according to Annex 2, Section 4, 5 and 6.

Furthermore, compliance with Section 16 of the Industrial Safety Regulation and Section 16 (1) in particular, in conjunction with Annex 2, Section 4, 6.6 and Annex 2, Section 4, 5.8, must be ensured.

The actual intervals must be determined by the user on the basis of a safety-technical assessment taking into account the real operational conditions, the experience with the operation and the charging material, and the national regulations for the operation of pressure equipment.

11 Disassembly

⚠ DANGER

Risk of serious injury or death due to electric shock.

If live parts are touched, there is risk of life-threatening injuries.

- Ensure that the system is voltage-free before installing the device.
- Ensure that the system is secured and cannot be reactivated by other persons.
- Ensure that installation work for the electric connection of the device is carried out by an electrician, and in compliance with electrical engineering regulations.

⚠ CAUTION

Risk of burns on hot surfaces

Hot surfaces in heating systems can cause burns to the skin.

- Wait until hot surfaces have cooled down or wear protective safety gloves.
- The operating authority is required to place appropriate warning signs in the vicinity of the device.

⚠ CAUTION

Risk of injury due to pressurised liquid

If installation or maintenance work is not carried out correctly, there is a risk of burns and other injuries at the connection points, if pressurised hot water or steam suddenly escapes.

- Ensure proper disassembly.
- Ensure that the system is de-pressurised before performing the disassembly.

- Prior to disassembly, disconnect all water-sided connections from the device.
- De-pressurise the device by venting it.

1. Disconnect the system from the power supply and secure it against unintended reactivation.
2. Disconnect the power cable of the device from the power supply.
3. Disconnect and remove all cables from the terminals of the device controller.
   ⚠ **DANGER** – Risk of serious injury or death due to electric shock. Some parts of the device's circuit board may still carry 230 V voltage even with the device physically isolated from the power supply. Before you remove the covers, completely isolate the device controller from the power supply. Verify that the main circuit board is voltage-free.
4. Disconnect the secondary tank (if provided) on the water side from the system and the primary tank.
5. Open the discharge ports at the tanks until water and compressed air are completely removed.
6. Undo all hose and pipe connections to the tanks and the control unit of the device to the system and remove them completely.
7. If necessary, remove the tanks and the control unit from the system area.

12 Annex

12.1 Reflex Customer Service

Central customer service

Switchboard: Telephone number: +49 (0)2382 7069 - 0
Customer Service extension: +49 (0)2382 7069 - 9505
Fax: +49 (0)2382 7069 - 523
E-mail: service@reflex.de

Technical hotline

For questions about our products
Telephone number: +49 (0)2382 7069-9546
Monday to Friday, 8:00 a.m. – 4:30 p.m.

12.2 Conformity and standards

EU-Declaration of conformity for the electrical devices in pressure maintenance, make-up and degassing systems

1. This is to certify that the products conform with the most important protection requirements set forth in the Council Directives on the harmonization of the laws of the member states relating to electromagnetic compatibility (2014/30/EU).
   The following standards were used to evaluate the products: DIN EN 61326 – 1:2013-07
   DIN EN 61439 – 1:2012-06
2. This is to certify that the control boxes conform with the most important requirements of the low voltage directive (2014/35/EU).
   The following standards were used to evaluate the products: DIN EN 61010 – 1:2011-07
   BGV A2

EU-Declaration of conformity of a pressure equipment (a vessel / an assembly) Design – Manufacturing – Product Verification

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Pressure expansion vessels / pressure maintenance systems:
Reflexomat, Reflexomat Compact
universally applicable in heating, solar and cooling systems

type	according to name plate of vessel / assembly	
Serial no.	according to name plate of vessel / assembly	
Year of manufacture	according to name plate of vessel / assembly	
max. allowable pressure (PS)	according to name plate of vessel / assembly	
Test pressure (PT)	according to name plate of vessel	
min. / max. allowable temperature (TS)	according to name plate of vessel / assembly	
max. continious operating temperature membrane / diaphragm	according to name plate of vessel / assembly	
Operating medium	Water / dry air	
The conformity of the product described above with the provisions of the applied Directive(s) is demonstrated by compliance with the following standards / regulations:	Pressure Equipment Directive, prEN 13831:2000 or EN 13831:2007 or AD 2000 according to name plate of vessel	
Pressure equipment	**Assembly** article 4 (2) b) consisting of: **Vessel** article 4 paragraph (1) a) i) 2. indent (Annex II table 2) with • **accessories** article 4 (1) d): membrane (Reflexomat) respectively diaphragm (Minimat, Reflexomat Compact), system connection and safety valve (air side) and optionally • **accessories** article 4 (1) d): control unit	
Fluid group	2	
Conformity assessment acc. to module	B + D	Reflexomat, Reflexomat Compact
Labelling acc. to Directive 2014/68/EU	CE 0045	
Safety valve (air side) (category IV)	Confirmed and signed by the manufacturer of the safety valve according to the requirements of directive 2014/68/EU.	
Certificate-No. of EU Type Approval	see annex	
Certificate-No. QA System (module D)	07 202 1403 Z 0780/15/D/1045	
Notified Body for certification of QA System	TÜV Nord Systems GmbH & Co. KG Große Bahnstraße 31, D - 22525 Hamburg	
Registration-No. of the Notified Body	0045	

Signed for and on behalf of

reflex

Manufacturer
Reflex Winkelmann GmbH
Gersteinstraße 19
59227 Ahlen - Germany
Telefon: +49 (0)2382 7069 -0
Telefax: +49 (0)2382 7069 -588
E-Mail: info@reflex.de

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation - Pressure Equipment Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014.

Ahlen, 19.07.2016

Norbert Hülsmann Volker Mauel
Members of the Management

12.3 Certificate No. of the CE type test

Type			Certificate number
Reflexomat Compact RC	200 – 500 litres	6 bar – 120 °C	07 202 1403 Z 0368/13/D0045

You will find an up-to-date list under www.reflex.de/zertifikate.

Type			Certificate number
Reflexomat RS	200 – 800 litres	6 bar – 120 °C	07 202 1403 Z 0622/1/D0045
	1000 – 5000 litres	6 bar – 120 °C	07 202 1403 Z 0011/2/D0045
	300 – 800 litres	10 bar – 120 °C	07 202 1403 Z 0413/2/D0045_Rev.1
	350 – 5000 litres	10 bar – 120 °C	07 202 1403 Z 0411/2/D0045

You will find an up-to-date list under www.reflex.de/zertifikate.

12.4 Guarantee

The respective statutory guarantee regulations apply.

SI1421enC / 9125092 / 11-17

Thinking solutions.

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