

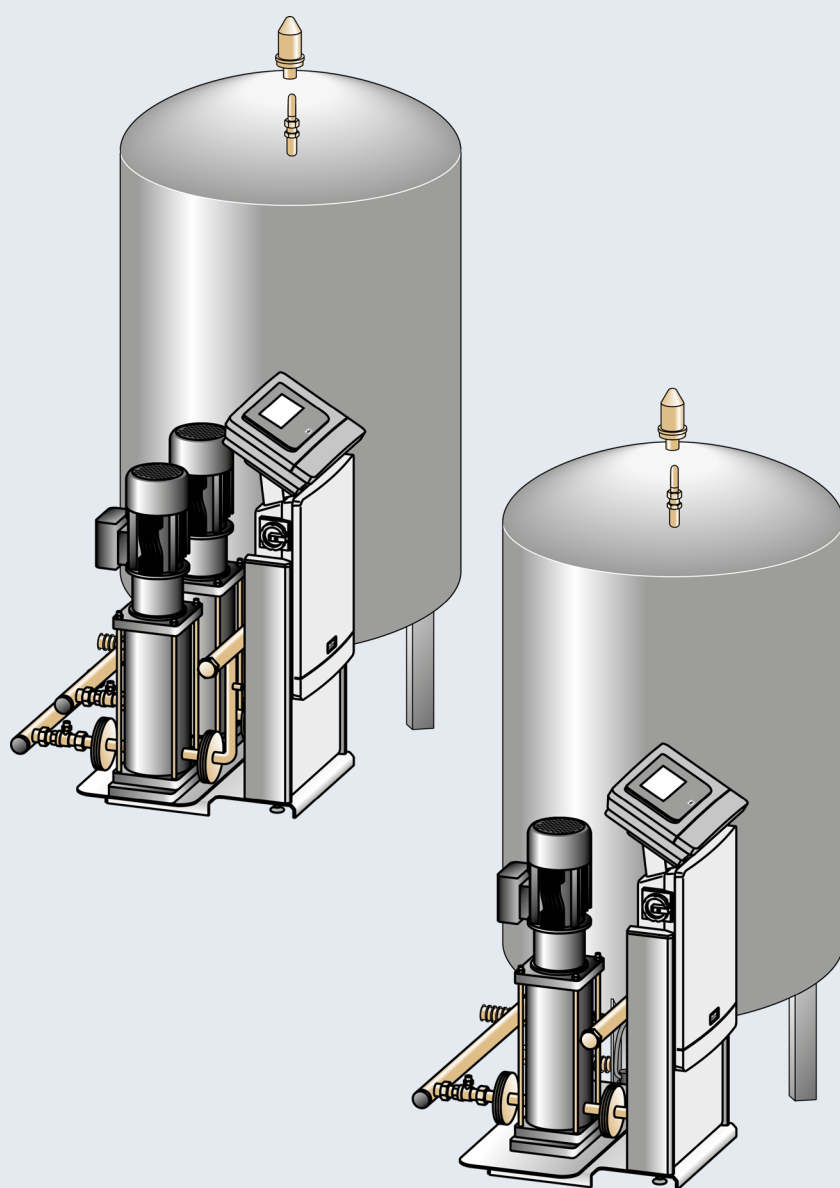
# Variomat 140

Variomat VS 1-1 / 140

Variomat VS 1-2 / 140

## GB Operating manual

Original operating manual



<b>1</b>	<b>Notes on the operating manual.....</b>	<b>3</b>
<b>2</b>	<b>Liability and guarantee .....</b>	<b>3</b>
<b>3</b>	<b>Safety.....</b>	<b>3</b>
3.1	Explanation of symbols.....	3
3.1.1	Symbols and notes used.....	3
3.2	Personnel requirements.....	3
3.3	Personal protective equipment .....	3
3.4	Intended use.....	3
3.5	Inadmissible operating conditions .....	3
3.6	Residual risks.....	3
<b>4</b>	<b>Description of the device.....</b>	<b>4</b>
4.1	Description.....	4
4.2	Overview .....	4
4.3	Identification.....	4
4.3.1	Nameplate .....	4
4.3.2	Type code .....	4
4.4	Function .....	4
4.5	Scope of delivery .....	5
4.6	Optional equipment and accessories.....	5
<b>5</b>	<b>I/O module (optional expansion module).....</b>	<b>5</b>
5.1	Technical data .....	5
5.2	Settings .....	6
5.2.1	Terminator settings in RS-485 networks .....	6
5.2.2	Setting the module address.....	6
5.2.3	I/O module default settings .....	7
5.3	Replacing the fuses .....	8
<b>6</b>	<b>Technical data.....</b>	<b>8</b>
6.1	Control unit.....	8
6.2	Tanks .....	8
<b>7</b>	<b>Installation .....</b>	<b>8</b>
7.1	Installation conditions .....	9
7.1.1	Incoming inspection.....	9
7.2	Preparatory work .....	9
7.3	Execution .....	9
7.3.1	Positioning.....	9
7.3.2	Installation of add-on components for the tanks.....	9
7.3.3	Tank installation.....	9
7.3.4	Hydraulic connection .....	10
7.3.5	Fitting the thermal insulation .....	11
7.3.6	Fitting the level sensor .....	12
7.4	Switching and make-up variants .....	12
7.4.1	Function .....	12
7.5	Electrical connection .....	13
7.5.1	Terminal plan, connection component.....	14
7.5.2	Terminal plan, operating unit .....	15
7.5.3	RS-485 interface.....	15
7.6	Installation and commissioning certificate .....	15
<b>8</b>	<b>Commissioning .....</b>	<b>15</b>
8.1	Checking the requirements for commissioning .....	15
8.2	Variomat switching points .....	16
8.3	Modifying the controller's start routine .....	16
8.4	Filling the tanks with water.....	17
8.4.1	Filling with a hose.....	17
8.4.2	Filling with the solenoid valve in the make-up .....	17
8.5	Venting the pump .....	17
8.6	Parametrising the controller in the Customer menu.....	18
8.7	Starting Automatic mode.....	18
<b>9</b>	<b>Operation .....</b>	<b>18</b>
9.1.1	Automatic mode.....	18
9.1.2	Manual mode.....	18
9.1.3	Stop mode .....	18
9.1.4	Summer operation.....	19
9.2	Restarting .....	19
<b>10</b>	<b>Controller .....</b>	<b>19</b>
10.1	Operator panel .....	19
10.2	Calibrating the touch screen .....	19
10.3	Configuring settings in the controller .....	20
10.3.1	Customer menu .....	20
10.3.2	Service menu .....	20
10.3.3	Default settings .....	21
10.3.4	Setting degassing programmes .....	21
10.3.5	Degassing programmes – overview .....	22
10.4	Messages22	
<b>11</b>	<b>Maintenance.....</b>	<b>23</b>
11.1	Maintenance schedule .....	24
11.1.1	Cleaning the dirt trap.....	24
11.1.2	Cleaning the tanks.....	24
11.2	Checking switching points .....	24
11.3	Inspection.....	25
11.3.1	Pressure-bearing components .....	25
11.3.2	Inspection prior to commissioning.....	25
11.3.3	Inspection intervals .....	25
<b>12</b>	<b>Disassembly.....</b>	<b>25</b>
<b>13</b>	<b>Annex .....</b>	<b>25</b>
13.1	Reflex Customer Service .....	25
13.2	Conformity and standards.....	25
13.3	Guarantee.....	25

## 1 Notes on the operating manual

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

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.

### ► **Note!**

Every person installing this equipment or performing any other work at the equipment is required to carefully read this operating manual prior to commencing work and to comply with its instructions. The manual is to be provided to the product operator and must be stored near the product 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 13.1 "Reflex Customer Service" on page 25.

## 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

Assembly, commissioning and maintenance as well as connection of the electrical components may only be carried out by knowledgeable and appropriately qualified electricians.

### 3.3 Personal protective equipment



Use the prescribed personal protective equipment as required (e.g. ear protection, eye protection, safety shoes, helmet, protective clothing, protective gloves) when working on the system.

Information on personal protective equipment requirements is set out in the relevant national regulations of the respective country of operation.

### 3.4 Intended use

The device is a pressure maintaining station for heating and cooling water systems. It is used 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 minimized 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

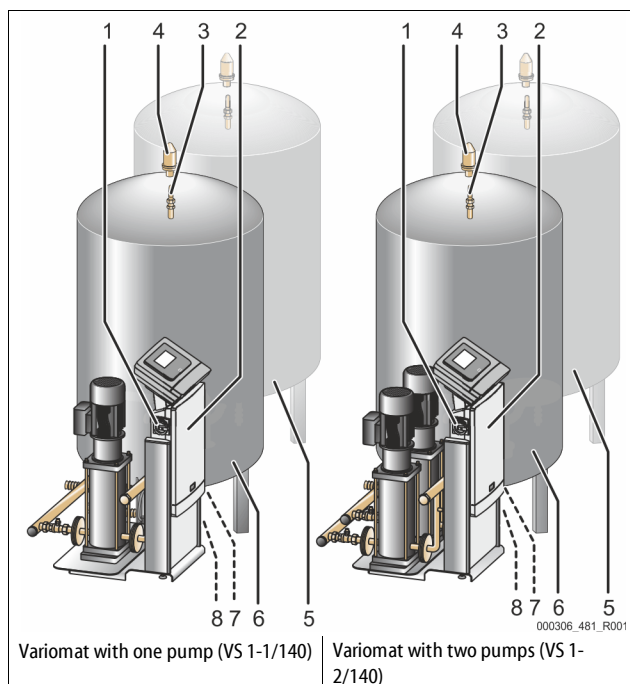
### 4.1 Description

The Variomat VS 1-1/140 and VS 1-2/140 is a pump-controlled pressure maintaining, make-up and degassing station for heating and cooling water systems. The Variomat is essentially a controller with pumps and at least one expansion tank. The expansion tank is fitted with a diaphragm to divide the tank into an air space and a water space, preventing the ingress of atmospheric oxygen into the expansion water.

The Variomat VS 1-1/140 and VS 1-2/140 provides the following safety features:

- Optimisation of all pressure maintaining, degassing and make-up processes.
  - No direct intake of air thanks to a regulation of the pressure maintenance with automatic make-up.
  - No circulation issues caused by free bubbles in the circuit water.
  - Reduced corrosion damage due to oxygen removal from fill and make-up water.

### 4.2 Overview



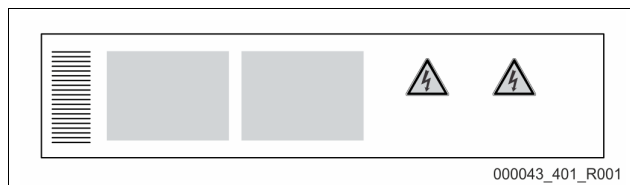
1	Main switch
2	Control unit <ul style="list-style-type: none"> <li>• Connecting unit for pump(s)</li> <li>• Operating unit for "Reflex Control Touch" controller</li> </ul>
3	"VE" equalisation elbow

4	Degassing valve "DV"
5	"VF" secondary vessel
6	"VF" primary vessel
7	Feed and drain cock "FD"
8	"LIS" level sensor

### 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.



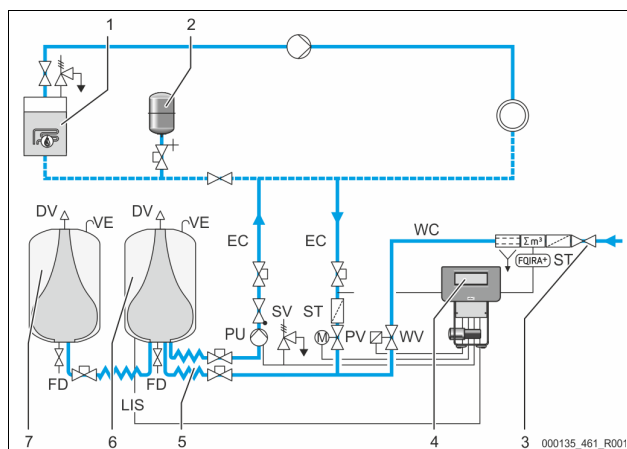
Information on the type plate	Meaning
Type	Device name
Serial No.	Serial number

Information on the type plate	Meaning
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 safety valve factory - align	Factory set actuating pressure of the safety valve
at site	Set actuating pressure of the safety valve

### 4.3.2 Type code

No.	Type code (example)
1	Control unit designation
2	Number of pumps
3	"VG" primary vessel
4	Nominal volume
5	"VF" secondary vessel
6	Nominal volume

### 4.4 Function



1	Heating system
2	"MAG" expansion vessel
3	Reflex Fillset Impulse
4	Control unit
5	Hydraulic inlets
6	Primary vessel air space
7	Secondary vessel air space
ST	Dirt trap
FQIRA+	Contact water meter
WC	Make-up pipe

WV	Make-up valve
PIS	Pressure sensor
PV	Overflow valve (motor ball valve)
PU	Pump (pressurisation)
SV	Safety valve
EC	Expansion pipe
FD	Feed and drain cock
LIS	Pressure load cell
DV	Degassing valve
VE	Ventilation

#### Expansion vessel

One primary vessel and multiple optional secondary vessels may be connected. A membrane separates the vessels into an air and a water space, preventing the penetration of atmospheric oxygen into the expansion water. The "VE" line connects the air space with the atmosphere. The primary vessel is hydraulically flexibly connected to the control unit. The function of the "LIS" level measuring using a pressure pick-up is thus ensured.

### Control unit

The control unit contains the hydraulic system and the controller. The "PIS" pressure transducer records the pressure and the "LIS" pressure pick-up registers the level; both values are displayed at the controller.

### Pressurisation

The pressure in the system rises when the water is heated. When the pressure set at the controller is exceeded, the "PV" overflow valve opens and drains water from the system into the primary vessel, using the "EC" expansion line. The pressure within the system drops. The pressure in the facility system drops when the water cools. When the pressure drops below the set value, the "PU" pump is activated and uses the "EC" expansion pipe to transport water from the primary vessel back into the system. The pressure in the facility system rises. The controller ensures that the pressure is maintained, further supported by the stabilisation provided by the "MAG" pressure expansion vessel.

### Degassing

Two "EC" expansion lines are required to degas the system water. One pipe is intended for gas-rich water from the system, while one return pipe returns the degassed water to the system. During the degassing action, the "PU" pump and the "PV" overflow valve are in operation. This transports a gas-rich partial flow of the system water V through the de-pressurised primary vessel. Atmospheric pressure is used to separate the free and dissolved gases and to discharge them through the "DV" degassing valve. The controller ensures the hydraulic equalisation by regulating the stroke of the "PV" overflow valve (motor ball valve). This process can be applied in three different variants (continuous, interval or run-on degassing).

### Make-up

When the water level in the primary vessel falls below the minimum, the "WV" make-up valve opens until the set level is again reached. During the make-up process, the number of requests, the time and the make-up time within a cycle are monitored. Using a FQIRA+ contact water meter, the system monitors each individual make-up quantity and the overall make-up quantity.

## 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 pressurisation equipment:

- The device on a pallet.
  - Control unit and "VG" primary tank.
  - Primary tank with accessories are packed on the tank base.
    - "VE" aeration and de-aeration
    - "DV" degassing valve
    - Reducing sleeve
    - "LIS" pressure pick-up
  - Plastic sleeve with operating manual.

## 4.6 Optional equipment and accessories

The following optional equipment and accessories are available for this device:

- Heat insulation for the primary vessel
- Secondary vessels
  - Accessories are packed on the vessel mounting
    - "VE" ventilation
    - "DV" degassing valve
    - Reducing coupling
- Additional equipment with unsupervised-operation BOB-pipe for "TAZ+" temperature limiter
- Fillset for make-up with water.
  - Fillset with integrated system isolator, water meter, dirt trap, and locking mechanisms for the "WC" make-up pipe.
- Fillset Impulse with FQIRA+ contact water meter for make-up with water.
- Servitec for make-up and degassing.
- Fillsoft for softening the make-up water from the potable water supply system.
  - The Fillsoft is installed between the Fillset and the device. The device controller evaluates the make-up quantities and signals the required replacement of the softening cartridges.

- Enhancements for the device controller:
  - I/O modules for standard communication, see chapter 5 "I/O module (optional expansion module)" on page 5.
  - Communication module for external operation of the controller
  - Master-Slave-Connect for master controllers for maximum 10 devices.
  - Combined switching to increase capacity and parallel switching of 2 hydraulically directly connected systems
  - Bus modules:
    - Profibus DP
    - Ethernet
    - Modbus RTU
    - BACnet-IP
    - BACnet MS/TP
- Diaphragm rupture monitor.



### Note!

Separate operating instructions are supplied with accessories.

## 5 I/O module (optional expansion module)

The I/O module is connected and wired in the factory.

It is used to expand the inputs and outputs Control Touch controller.

Six digital inputs and six digital outputs are used to process messages and alarms:

Inputs
Three inputs, N.C. with 24 V self potential for standard settings.
<ul style="list-style-type: none"> <li>• External temperature monitoring</li> <li>• Minimum pressure signal</li> <li>• Manual make-up of water</li> </ul>
Three inputs, N.O. with 230 V self potential for standard settings.
<ul style="list-style-type: none"> <li>• Emergency-Off</li> <li>• Manual operation (e.g. for pump or compressor)</li> <li>• Manual operation for the overflow</li> </ul>

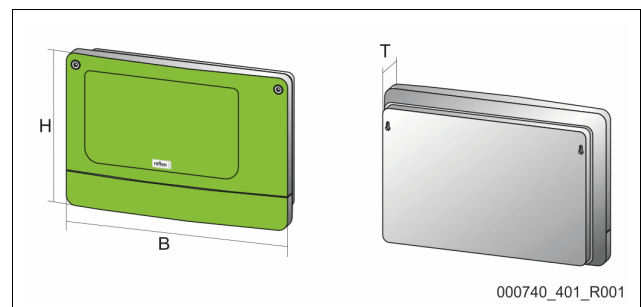
Outputs
Potential-free as changeover contacts. Default settings for messages:
<ul style="list-style-type: none"> <li>• Make-up fault</li> <li>• Below minimum pressure</li> <li>• Above maximum pressure</li> <li>• Manual or Stop operation</li> </ul>



### Note!

- For the default settings of the I/O modules, see Chapter 5.2.3 "I/O module default settings" page 7
- All digital inputs and outputs can be set freely as option. Settings to be made by Reflex Customer Service, see chapter 13.1 "Reflex Customer Service" on page 25

## 5.1 Technical data



Housing	Plastic housing
Width (W):	340 mm
Height (H):	233.6 mm
Depth (D):	77 mm
Weight:	2.0 kg
Permissible operating temperature:	-5 °C – 55 °C
Permissible storage temperature:	-40 °C – 70 °C
Degree of protection IP:	IP 64
Power supply:	230 V AC, 50 – 60 Hz (IEC 38)
Fuse (primary):	0.16 A time-lag

**Inputs, outputs**

- 6 floating relay outputs (changeover)
- 3 digital inputs 230 V AC
- 3 digital inputs 24 V AC
- 2 Analogue outputs (these are not required, because they are already contained in the Control Touch controller).

**Interfaces to the controller**

- RS-485
- 19.2 kbit/s
- Floating
- connection with plug or screw terminals
- RSI-specific protocol

**5.2 Settings**

Danger to life from electric shock!

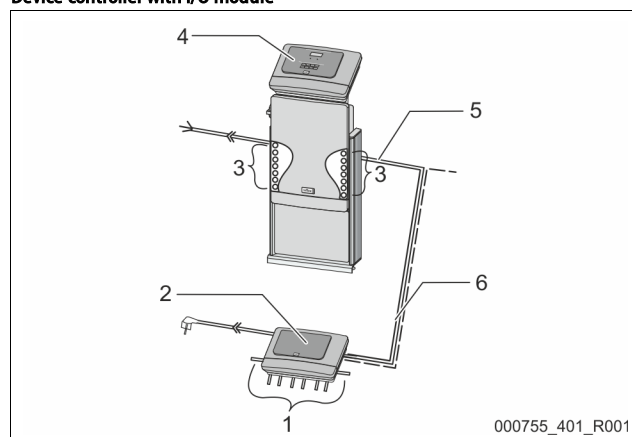
Risk of serious injury or death due to electric shock. Some parts of the main board may still carry 230 V voltage even with the device physically isolated from the 230 V power supply.

- Before you remove the covers, completely isolate the device controller from the power supply.
- Verify that the main circuit board is voltage-free.

**5.2.1 Terminator settings in RS-485 networks**

Examples for the activation and deactivation of terminators in RS-485 networks.

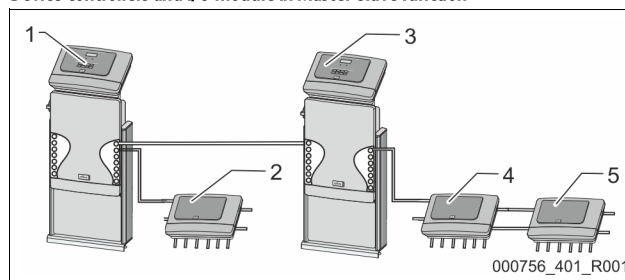
- DIP switches 1 and 2 are located on the main board of the controller.
- Maximum length for an RS-485 connection is 1000 metres

**Device controller with I/O module**

1	Relay outputs of the I/O module* • 6 digital outputs	4	"Control Touch" controller
2	I/O module	5	RS-485 connection
3	Connections of the I/O conductors	6	Optional RS-485 connection • Master - Slave • Field bus

\* The 2 analogue outputs are not required because the Control Touch controller already has two analogue outputs for pressure and level measurement.

	Terminator settings		
Jumper/switch	Settings	I/O module	Control Touch
Jumper J10 and J11	Activated	X	---
	Deactivated	---	---
DIP switch 1 and 2	Activated	---	X
	Deactivated	---	---

**Device controllers and I/O module in Master-Slave function**

1	Control Touch controller in Master function	4	I/O module for the Slave function
2	I/O module for the Master function	5	I/O module for expansion
3	Control Touch controller in Slave function		

**Master function**

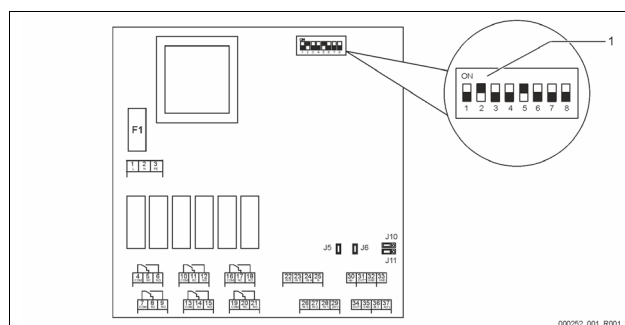
	Terminator settings		
Jumper/switch	Settings	I/O module	Control Touch
Jumper J10 and J11	Activated	X	---
	Deactivated	---	---
DIP switch 1 and 2	Activated	---	X
	Deactivated	---	---

**Slave function**

	Terminator settings			
Jumper / Switch	Settings	I/O module	I/O module for expansion	Control Touch
Jumper J10 and J11	Activated	---	X	---
	Deactivated	X	---	---
DIP switch 1 and 2	Activated	---	---	X
	Deactivated	---	---	---

**5.2.2 Setting the module address**

Setting of the module address on the I/O module's main circuit board



1	DIP switch
---	------------

**DIP-switch position**

- DIP switch 1 – 4:
  - For setting the module address
  - Variable setting to ON or OFF
- DIP switch 5:
  - Permanently to position ON
- DIP switch 6 – 8:
  - For internal testing
  - To position OFF during operation

Use DIP switches 1 – 4 to set the module address.

Proceed as follows:

1. Pull out the mains plug of the I/O module.
2. Open the housing cover.
3. Set DIP switches 1 – 4 to position ON or OFF.

Module address	DIP switch								Used for the modules
	1	2	3	4	5	6	7	8	
1	1	0	0	0	1	0	0	0	1
2	0	1	0	0	1	0	0	0	2
3	1	1	0	0	1	0	0	0	3
4	0	0	1	0	1	0	0	0	4
5	1	0	1	0	1	0	0	0	5
6	0	1	1	0	1	0	0	0	6
7	1	1	1	0	1	0	0	0	7
8	0	0	0	1	1	0	0	0	8
9	1	0	0	1	1	0	0	0	9
10	0	1	0	1	1	0	0	0	10

### 5.2.3 I/O module default settings

The inputs and outputs of the I/O module each have default settings. These default settings can be changed, if required, and adjusted to local conditions.

Responses by the inputs 1 – 6 of the I/O module are recorded and displayed in the device controller's fault memory.



#### Note!

- Default settings apply to software version V1.10 and higher.
- All digital inputs and outputs can be set freely as option. The setting is carried out by Reflex Customer Service, see chapter 13.1 "Reflex Customer Service" on page 25

Location	Signal evaluation	Message text	Fault memory entry	Priority	Signal on the input triggers the following action
<b>INPUTS</b>					
1	N.C.	External temperature monitoring	Yes	Yes	<ul style="list-style-type: none"> <li>• Solenoid valves are closed.</li> <li>• Solenoid valve (2) in overflow line (1)</li> <li>• Solenoid valve (3) in overflow line (2)</li> <li>• Output relay (1) is switched.</li> </ul>
2	N.C.	External signal, Minimum pressure	Yes	No	<ul style="list-style-type: none"> <li>• Solenoid valves are closed.</li> <li>• Solenoid valve (2) in overflow line (1)</li> <li>• Solenoid valve (3) in overflow line (2)</li> <li>• Output relay (2) is switched.</li> </ul>
3	N.C.	Manual make-up	Yes	Yes	<ul style="list-style-type: none"> <li>• Solenoid valve (1) in make-up line is manually opened.</li> <li>• Output relay (5) is switched.</li> </ul>
4	N.O.	Emergency-Off	Yes	Yes	<ul style="list-style-type: none"> <li>• Pumps (1) and (2) are switched off.</li> <li>• Solenoid valves (2) and (3) in the overflow lines are closed.</li> <li>• Solenoid valve (1) in the make-up line is closed.</li> <li>• Switches "Group alarm" in the device controller.</li> </ul>
5	N.O.	Manual pump 1	Yes	Yes	<ul style="list-style-type: none"> <li>• Pump (1) is manually switched on.</li> <li>• Output relay (5) is switched.</li> </ul>
6	N.O.	Manual OF-1	Yes	Yes	Solenoid valve (1) is opened.
<b>OUTPUTS</b>					
1	Changeover contact	---	---	---	See input 1
2	Changeover contact	---	---	---	See input 2
3	Changeover contact	---	---	---	<ul style="list-style-type: none"> <li>• Below minimum pressure.</li> <li>• "ER 01" message in the controller</li> </ul>
4	Changeover contact	---	---	---	<ul style="list-style-type: none"> <li>• Maximum pressure exceeded</li> <li>• "ER 10" message in the controller</li> </ul>
5	Changeover contact	---	---	---	Switches in manual mode Switches in stop mode Switches with inputs 3,5,6 active
6	Changeover contact	Make-up fault	---	---	<ul style="list-style-type: none"> <li>• Make-up setting values exceeded.</li> <li>• Switches the following messages in the device controller:               <ul style="list-style-type: none"> <li>• "ER 06", Make-up time</li> <li>• "ER 07", Make-up cycles</li> <li>• "ER 11", Make-up quantity</li> <li>• "ER 15", Make-up valve</li> <li>• "ER 20", Maximum make-up quantity</li> </ul> </li> </ul>

## 5.3 Replacing the fuses

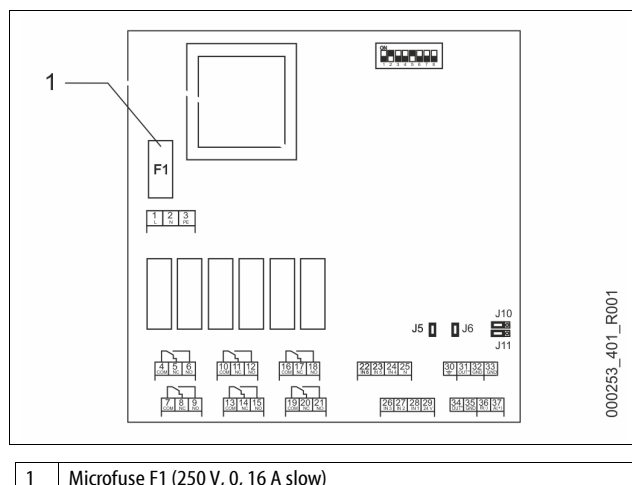
### **⚠ DANGER**

Risk of electric shock!

Risk of serious injury or death due to electric shock. Some parts of the main board may still carry 230 V voltage even with the device physically isolated from the 230 V 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.

Fusing is provided on the I/O module's main circuit board.



1 Microfuse F1 (250 V, 0, 16 A slow)

Proceed as follows:

1. Disconnect the I/O module from the power supply.
  - Pull the power plug from the bus module.
2. Open the terminal space cover.
3. Remove the housing cover.
4. Replace the defective fuse.
5. Re-attach the housing cover.
6. Close the terminal space cover.
7. Reconnect the power supply for the module.

The fuse replacement is completed.

## 6 Technical data

### 6.1 Control unit

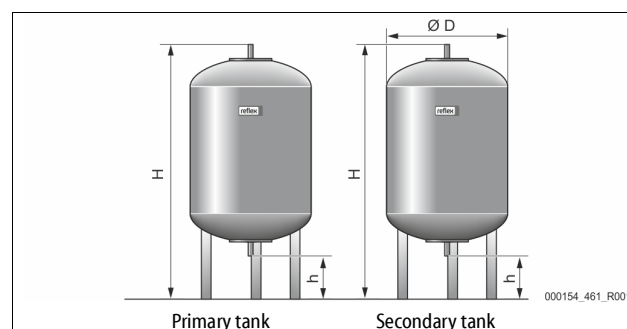
#### **Note!**

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
- Degree of protection: IP 54
- Number of RS-485 interfaces: 1
- IO module: Optional
- Electrical voltage control unit: 230 V; 2 A
- Noise level: 55 db

Type	Power output (kW)	Power supply (V / Hz; A)	Weight (kg)
VS 1-1/140	3.3	400 / 50; 20	47
VS 1-2/140	6.6	400 / 50; 20	99

## 6.2 Tanks



#### **Note!**

Optional heat insulation is available for primary tanks, see chapter 4.6 "Optional equipment and accessories" on page 5 .

#### **Note!**

The following values apply for all vessels:

- Operating pressure: 6 bar
- Connection: G1 "

Type	Diameter Ø "D" [mm]	Weight [kg]	Height "H" [mm]	Height "h" [mm]
200	634	37	1060	146
300	634	54	1360	146
400	740	65	1345	133
500	740	78	1560	133
600	740	94	1810	133
800	740	149	2275	133
1000/740	740	156	2685	133
1000/1000	1000	320	2130	350
1500	1200	465	2130	350
2000	1200	565	2590	350
3000	1500	795	2590	380
4000	1500	1080	3160	380
5000	1500	1115	3695	380

## 7 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).

### Note!

Confirm that installation and start-up have been carried out correctly using the installation and commissioning 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 Installation conditions

### 7.1.1 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.

## 7.2 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 6 "Technical data" on page 8.
- Use only approved transport and lifting equipment.
  - The load fastening points at the tanks must be used only as installation resources.

## 7.3 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 them being stressed or strained.
- If necessary, provide support structures for the pipes or equipment.

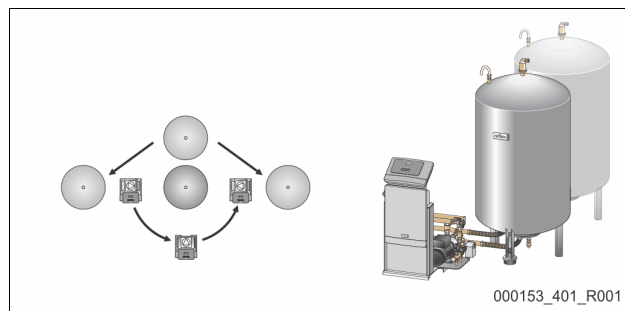
For installation, proceed as follows:

- 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.

## 7.3.1 Positioning



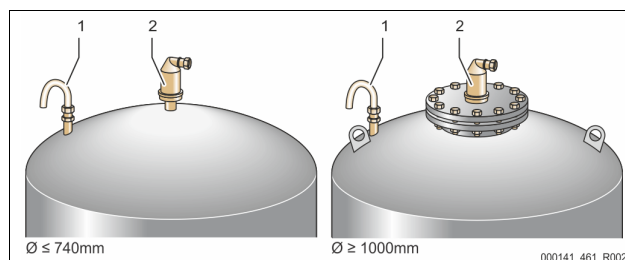
Determine the positions for the control unit, primary vessels and secondary vessels (if used). The distance of the control unit to the primary vessel results from the connection set supplied.

- Variomat VS 1-1:
  - The control unit can be installed on either side or in front of the primary vessel.
- Variomat VS 1-2:
  - The control unit can be installed on either side or in front of the primary vessel.

## 7.3.2 Installation of add-on components for the tanks

The add-on components are packed in plastic bags and attached to the base of the vessels.

- Pressure compensation elbow (1).
- Reflex Exvoid with pre-fitted check valve (2)
- "LIS" pressure pick-up



For add-on components, proceed as follows:

1. Install the Reflex Exvoid (2) at the connection of the corresponding vessel.
2. Remove the protective cap from the degassing valve.
3. Use the compression fitting to install the pressure compensation elbow (1) for ventilation at the vessels.

### Note!

Install the "LIS" pressure pick-up only after finalising the installation of the primary vessel, see chapter 7.3.3 "Tank installation" on page 9.

### Note!

To ensure fault-free operation, do not seal off the aeration and ventilation.

## 7.3.3 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 them being stressed or strained.
- If necessary, provide support structures for the pipes or equipment.

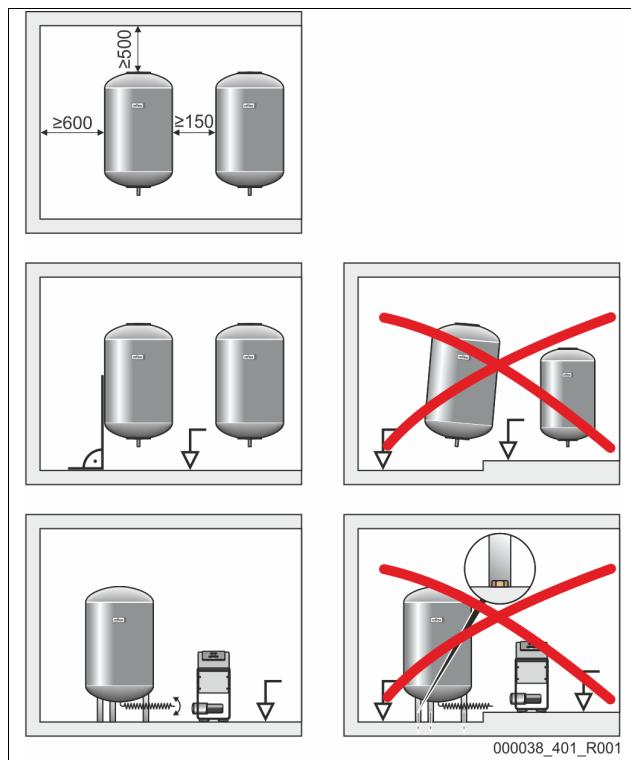
## ATTENTION

### Device damage resulting from dry running of the pump

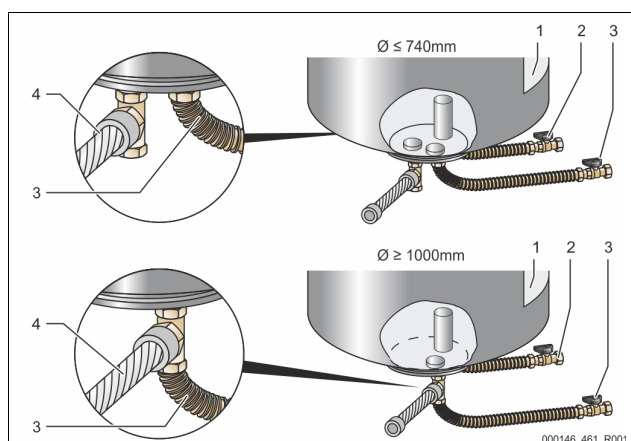
If the pump is incorrectly connected, there is a risk of dry-running.

- Ensure that the connections for the overflow collector and the pump are not interchanged.
- Ensure correct connection of the pump to the primary tank.

Comply with the following notes regarding the installation of the primary vessel and the secondary vessels:



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



1	Adhesive label	3	"Pump" connection set
2	"Overflow collector" connection set	4	Secondary vessel connection set

- Align the primary vessel, see chapter 7.3.1 "Positioning" on page 9.
- Connect the connection set (2) and (3) with the screw fittings and gaskets to the connections at the lower vessel flange of the primary vessel.
  - Ensure that you connect the connection set for the overflow collector to the connection (2) below the label (1). If you interchange the connections, there is a risk that the pump may run dry.
  - For vessels up to 740 mm Ø:
    - Connect the connection set (2) and (3) to the two free 1-inch barrel nipples at the vessel flange.
    - Connect the connection set (4) of the secondary vessel to the T-joint at the outlet of the vessel flange.
  - For vessels from 1000 mm Ø:
    - Connect the connection set (2) to the 1-inch barrel nipple of the vessel flange.
    - Connect the connection sets (3) and (4) to the T-joint at the 1-inch barrel nipple of the vessel flange.

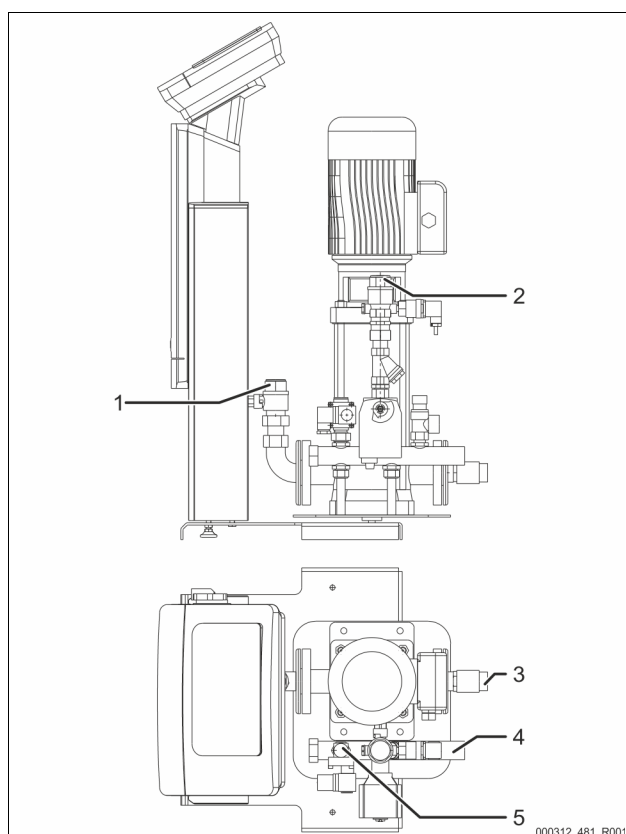
#### ► Note!

If necessary, install the supplied connection set (4) at the optional secondary vessel. Connect the connection set (4) with a user-supplied flexible pipeline to the primary vessel.

### 7.3.4 Hydraulic connection

#### 7.3.4.1 Overview

Overview of hydraulic connections, Variomat VS 1-1/140 as example



1	Degassing line (pump line) <ul style="list-style-type: none"> <li>• Degassed water outlet to the system</li> <li>• Connection, female thread Rp 1 inch</li> </ul>
2	Overflow line Rp 1 inch <ul style="list-style-type: none"> <li>• Gas-rich water inlet from the system</li> <li>• Connection, female thread Rp 1 inch</li> </ul>
3	Primary vessel connection <ul style="list-style-type: none"> <li>• Pump connection set</li> <li>• Male thread 1 inch</li> </ul>
4	Primary vessel connection G 1 inch <ul style="list-style-type: none"> <li>• Overflow collector connection set</li> <li>• Connection, male thread 1 inch</li> </ul>
5	Connection, make-up line <ul style="list-style-type: none"> <li>• Connection, female thread Rp ½ inch</li> </ul>

### 7.3.4.2 Connection to the facility system

#### CAUTION

Hot water vapour can cause burns to skin and eyes.

Hot steam can escape from the safety valve. The hot steam will cause scalding of the skin and eyes.

- Ensure that the blow-off line of the safety valve is routed so that injuries are not possible.

#### 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 them being stressed or strained.
- If necessary, provide support structures for the pipes or equipment.

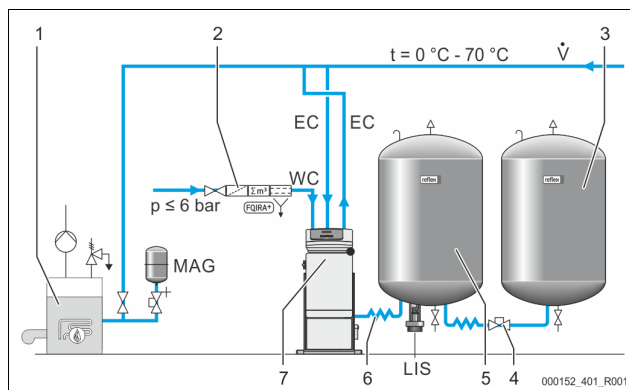
#### Connection to the primary vessel

The control unit is positioned to the primary vessel as determined by the selected installation variant, and is connected to the vessel using its connection set.

The connections to the system are identified by adhesive labels on the control unit:

Pumpen Zur Anlage	Überströmung Zur Anlage	Nachspeisung Zum Behälter
Pump to system connection	Overflow valve to system connection	Make-up to system connection

#### Connection to the system



1	Heat generator
2	Optional equipment and accessories
3	Secondary vessel
4	Reflex rapid-action coupling R 1 x 1
5	Primary vessel
6	Primary vessel connection set
7	Typical representation of the control unit
EC	Degassing line <ul style="list-style-type: none"> <li>• Gas-rich water from the system</li> <li>• Degassed water to the system</li> </ul>
LIS	"LIS" level sensor
WC	Make-up pipe
MAG	Pressure expansion vessel

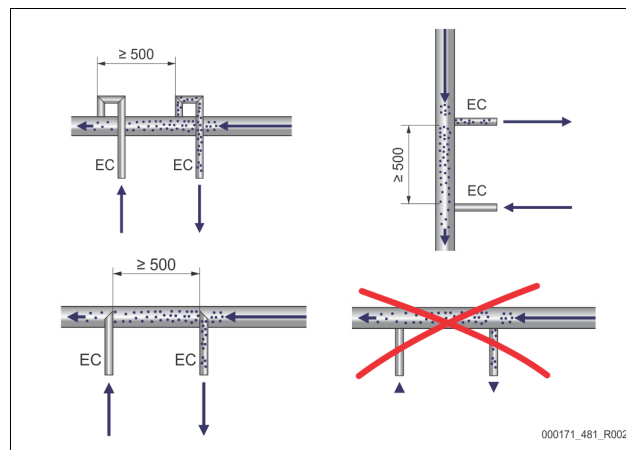
If required, install a diaphragm expansion vessel MAG ≥ 35 litres (Reflex N, for example). It reduces the switching frequency and can be also used in the individual protection of the heat generators. According to DIN / EN 12828, the installation of valves between the device and the heat generator is required for heating systems. Otherwise secure locking mechanisms must be fitted.

#### "EC" expansion lines

Because of the degassing function, you must install two "EC" expansion lines.

- One line to the system for the gas-rich water.
- One line to the system for the degassed water.

The "DN" nominal connection diameter for the "EC" expansion lines must be designed for the "P<sub>0</sub>" minimum operating pressure.



Calculation P<sub>0</sub> see chapter 8.2 "Variomat switching points" on page 16.

The "DN" nominal connection diameter applies to an expansion line length of up to 10 m. Beyond this length, select the next larger dimension. Integrate with the "V" main flow volume of the system. Viewed in the system flow direction, the gas-rich expansion line must be connected upstream of the expansion line transporting the degassed water.

Ensure that particulate dirt cannot enter and thus creating an overload of the "ST" dirt trap. Connect the "EC" expansion lines according to the following installation variants.

Connection nominal diameter: DN 32

#### Note!

The water temperature at the connection point of the "EC" expansion lines must be in the range of 0 °C to 70 °C. The use of auxiliary vessels does not increase the range of use. Because the thermal protection is not ensured due to the flow during the degassing phase.

#### CAUTION

Hot water vapour can cause burns to skin and eyes.

Hot steam can escape from the safety valve. The hot steam will cause scalding of the skin and eyes.

- Ensure that the blow-off line of the safety valve is routed so that injuries are not possible.

### 7.3.4.3 Make-up line

If you don't connect the automatic water make-up, you must close the connection of the "WC" make-up line with a R 1/2 " blind plug.

- Prevent a potential device fault by ensuring manual water make-up.
- Install at least one "ST" dirt trap with a mesh size ≤ 0.25 mm close upstream to the make-up solenoid valve.
  - Install a short line between the "ST" dirt trap and the solenoid valve.

#### Note!

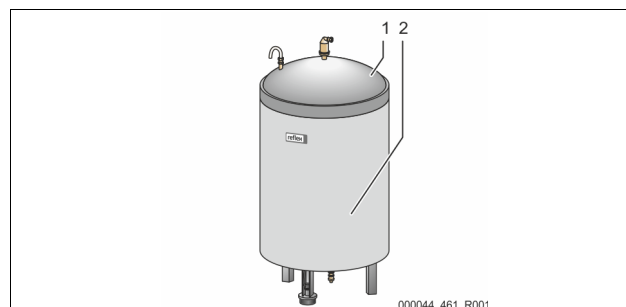
Use a pressure reducer in the "WC" make-up line if the idle pressure exceeds 6 bar.

#### Note!

If you use make-up water from the potable water system, you may need the Reflex Fillset for the "WC" make-up line, see chapter 4.6 "Optional equipment and accessories" on page 5.

- Reflex make-up systems such as Reflex Fillset are designed for make-up lines with a flow rate < 1 m<sup>3</sup>/h.

### 7.3.5 Fitting the thermal insulation



Install the optional thermal insulation (2) around the primary tank (1) and close the insulation with the zip fastener.

**Note!**

For heating systems, insulate the primary tank and the "EC" expansion lines against heat loss.

- Thermal insulation is not required for either the primary tank top or the secondary tank.

**Note!**

On-site, install thermal insulation when condensate forms.

### 7.3.6 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 vessel has been placed at its final position, see chapter 7.3.3 "Tank installation" on page 9. Comply with the following instructions:

- Remove the transport securing device (squared timber) at the vessel base of the primary vessel.
- Replace this transport securing device with the pressure load cell.
  - In the case of a vessel 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 vessel.
- Avoid shock-type loading of the pressure load cell by, for example, subsequent alignment of the vessel.
- Use flexible hoses to connect the primary vessel and the first secondary vessel.
  - Use only the supplied connection sets, see chapter 7.3.3 "Tank installation" on page 9.
- Perform a null balancing of the filling level when the primary vessel is aligned and fully emptied, see chapter 8.6 "Parametrising the controller in the Customer menu" on page 18.

#### 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

## 7.4 Switching and make-up variants

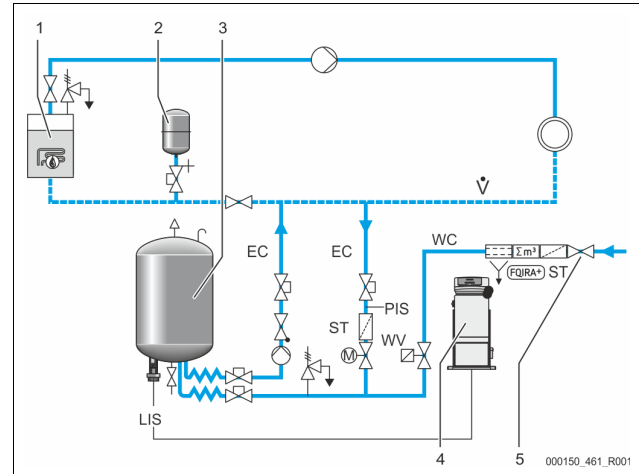
### 7.4.1 Function

The current filling level is recorded in the primary tank by the "LIS" level sensor and evaluated in the controller. The value for the minimum filling level is specified in the controller's Customer menu. If the level drops below the defined minimum, the "WV" make-up valve opens and fills the primary tank.

**Note!**

To complete the make-up function from the drinking water system, Reflex offers the Fillset with integrated system separator and Fillsoft softening equipment, see chapter 4.6 "Optional equipment and accessories" on page 5.

### 7.4.1.1 Using a single-tank system



1	Heat generator
2	"MAG" expansion vessel
3	Primary vessel
4	Control unit
5	Reflex Fillset
ST	Dirt trap
WC	Make-up pipe
PIS	Pressure transducer
WV	Make-up solenoid valve
EC	Degassing line <ul style="list-style-type: none"> <li>For gas-rich water from the system.</li> <li>For degassed water into the system.</li> </ul>
LIS	Level sensor

Single boiler system ≤ 350 kW, water temperature < 100 °C.

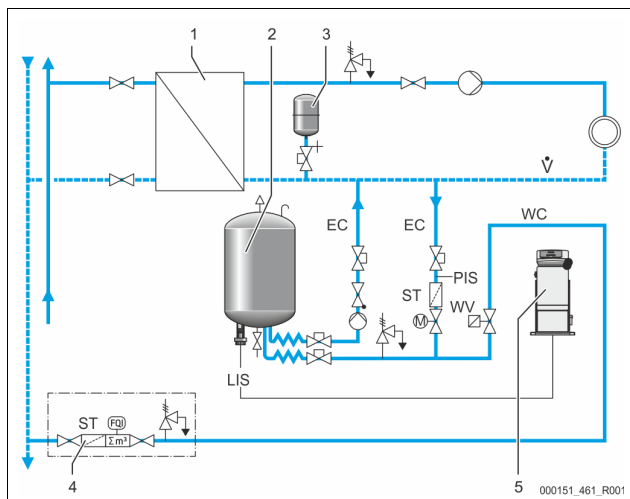
- Connect the Reflex Fillset with integrated system separator upstream when using mains water for make-up.
- If you don't connect a Reflex Fillset upstream, use an "ST" dirt trap with a mesh size ≥ 0.25 mm for the make-up.

**Note!**

The quality of the make-up water must comply with the applicable standards such as VDI 2035.

- If you cannot achieve this quality, use the Reflex Fillsoft to soften the make-up water from the mains water network.

### 7.4.1.2 Using a district heating substation



1	District heating house substation
2	Primary vessel
3	"MAG" expansion vessel
4	Site-provided make-up unit
5	Control unit
WC	Make-up pipe
PIS	Pressure transducer
WV	Make-up solenoid valve
ST	Dirt trap
EC	Degassing line <ul style="list-style-type: none"> <li>For gas-rich water from the system.</li> <li>For degassed water into the system.</li> </ul>
LIS	Level sensor

District heating water is particularly suitable as make-up water.

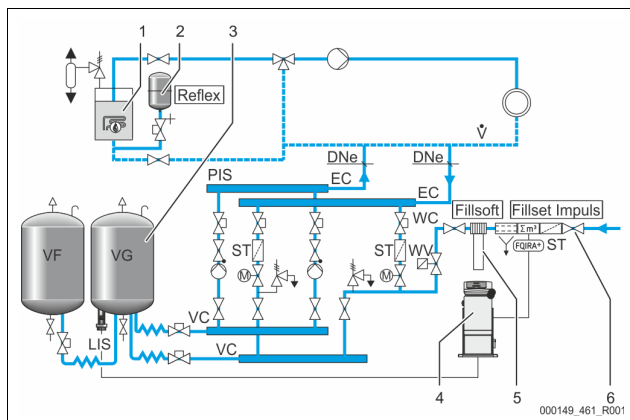
- Water treatment is not necessary.
- Use an "ST" dirt trap with a mesh size  $\geq 0.25$  mm for the make-up.



#### Note!

You require the approval of the district heating water supplier.

### 7.4.1.3 Use in a system with central return flow admixture



1	Heat generator
2	"MAG" expansion vessel
3	Primary vessel
4	Control unit
5	Reflex Fillsoft
6	Fillset Impuls
WC	Make-up pipe
PIS	Pressure transducer
WV	Make-up solenoid valve
ST	Dirt trap
EC	Degassing line <ul style="list-style-type: none"> <li>For gas-rich water from the system.</li> <li>For degassed water into the system.</li> </ul>
LIS	Level sensor

Make-up with water via a softening system.

- Always integrate the device in the "V" main volume flow to ensure degassing the system water. It is the system side in systems with central return flow admixture or hydraulic switching points. The vessel of the heat generator must be fitted with an individual protective device.
- When using Reflex Fillsoft softening systems, always install the Fillset Impuls.
  - The device controller evaluates the make-up quantities and signals a required replacement of the softening cartridges.



#### Note!

The quality of the make-up water must comply with the applicable standards such as VDI 2035.

## 7.5 Electrical connection

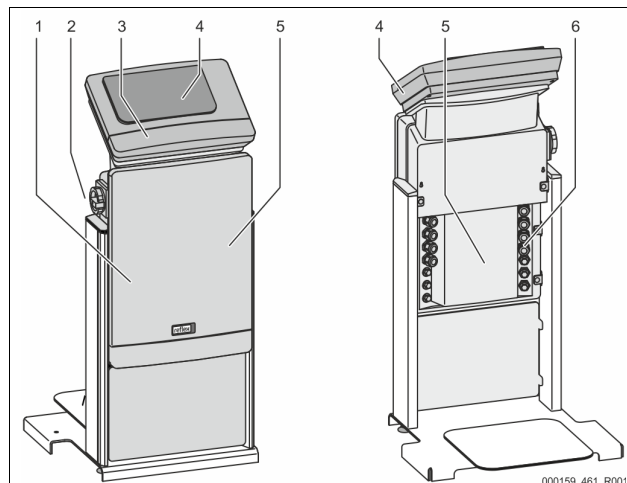


### Risk of serious injury or death due to electric shock.

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.

For the electrical connection, you must differentiate between a connection component and an operating component.

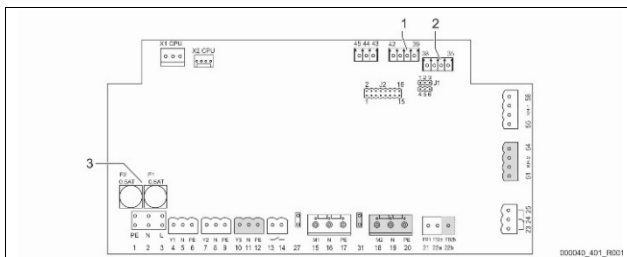


1	Connection component cover (hinged)	4	Touch control
2	Main switch	5	Connection component rear
3	Operating unit cover (hinged) <ul style="list-style-type: none"> <li>RS-485 interfaces</li> <li>Pressure and Level outputs</li> </ul>	6	Cable bushings <ul style="list-style-type: none"> <li>Supply and fusing</li> <li>Floating contacts</li> <li>Pump connection "PU"</li> </ul>

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 covers.  
**⚠ DANGER** Risk of serious injury or death due to electric shock. Some parts of the device's circuit board may still be live with 230 V even after the device has been physically isolated from the power supply by pulling out of the mains plug. Before you remove the covers, completely isolate the device controller from the power supply. Verify that the main circuit board is voltage-free.
  3. Insert a suitable screwed cable gland for the cable bushing at the rear of the connection component. M16 or M20, for example.
  4. Thread all cables to be connected through the cable glands.
  5. Connect all cables as shown in the terminal diagrams.  
 – For installer supplied fusing, comply with the connected loads of the device, see chapter 6 "Technical data" on page 8.
  6. Install the cover.
  7. Connect the mains plug to the 230 V power supply.
  8. Activate the system.
- The electrical connection is completed.

### 7.5.1 Terminal plan, connection component

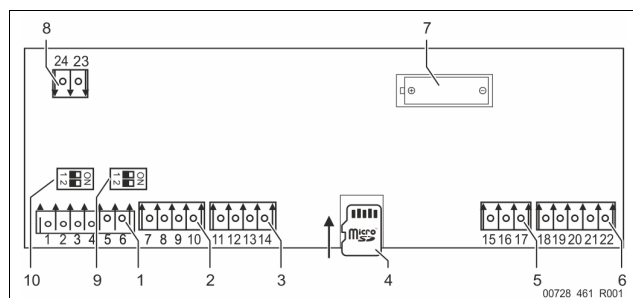


1	Pressure	3	Fuses
2	Level		

Terminal number	Signal	Function	Wiring
Supply			
X0/1	L	Supply 230 V, maximal 16 A	User supplied
X0/2	N		
X0/3	PE		
X0/1	L1	Supply 400 V, maximal 20 A	User supplied
X0/2	L2		
X0/3	L3		
X0/4	N		
X0/5	PE		
Circuit board			
1	PE	Voltage supply	Factory-provided
2	N		
3	L		
4	Y1	Make-up solenoid valve WV	User, optional
5	N		
6	PE		
7	Y2	PV 1 overflow valve (motor ball valve or solenoid valve)	--
8	N		
9	PE		
10	Y3	PV 2 overflow valve (motor ball valve or solenoid valve)	---
11	N		
12	PE		
13		Dry-run protection message (floating)	User, optional
14			
15	M1	PU 1 pump	Factory-provided
16	N		
17	PE		

Terminal number	Signal	Function	Wiring
18	M2	PU 2 pump	Factory-provided
19	N		
20	PE		
21	FB1	Pump 1 voltage monitoring	Factory-provided
22a	FB2a	Pump 2 voltage monitoring	Factory-provided
22b	FB2b	External make-up request together with 22a	Factory-provided
23	NC	Group message (floating)	User, optional
24	COM		
25	NO		
27	M1	Flat plug for supply, pump 1	Factory-provided
31	M2	Flat plug for supply, pump 2	Factory-provided
35	+18 V (blue)	Analogue input, LIS level measuring at the primary vessel	User supplied
36	GND		
37	AE (brown)		
38	PE (shield)	Analogue input, "PIS" pressure measuring at the primary vessel	User, optional
39	+18 V (blue)		
40	GND		
41	AE (brown)	Digital inputs	User, optional
42	PE (shield)		
43	+24 V		
44	E1	E1: Contact water meter	Factory-provided
45	E2	E2: Insufficient water switch	---
51	GND	PV 2 overflow valve (motor ball valve), only for VS 1-2	Factory-provided
52	+24 V (supply)		
53	0 – 10 V (correcting variable)		
54	0 – 10 V (feedback)	PV 1 overflow valve (motor ball valve)	Factory-provided
55	GND		
56	+24 V (supply)		
57	0 – 10 V (correcting variable)		
58	0 – 10 V (feedback)		

## 7.5.2 Terminal plan, operating unit



1	RS-485 interfaces	6	Analogue outputs for Pressure and Level
2	I/O interface	7	Battery compartment
3	I/O interface (reserve)	8	Bus module supply voltage
4	Micro-SD card	9	DIP switch 2
5	10 V supply	10	DIP switch 1

Terminal number	Signal	Function	Wiring
1	A	RS-485 interface S1 networking	User supplied
2	B		
3	GND S1		
4	A	RS-485 interface S2 modules: Expansion or communication module	User supplied
5	B		
6	GND S2		
7	+5 V	I/O interface: Interface to the main board	Factory
8	R × D		
9	T × D		
10	GND IO1		
11	+5 V	I/O interface: Interface to the main board (reserve)	---
12	R × D		
13	T × D		
14	GND IO2		
15	10 V~	10 V supply	Factory
16	FE		
17	Y2PE (shielding)	Analogue outputs: Pressure and Level Standard 4 – 20 mA	User supplied
18	Pressure		
19	GNDA		
20	Level		
21	GNDA		
22	GNDA		

## 7.5.3 RS-485 interface

Use the S1 and S2 RS-485 interfaces to retrieve all controller data and to enable the communication with control centres or other devices.

- S1 interface
  - A maximum 10 devices can be used in a master-slave linked circuit via the this interface.
- S2 interface
  - "PIS" pressure and "LIS" level.
  - Operating modes of the "PU" pumps.
  - Operating states of the motorised ball valve/solenoid valve.
  - Values of the "FQIRA +" contact water meter.
  - All messages.
  - All entries in the fault memory.

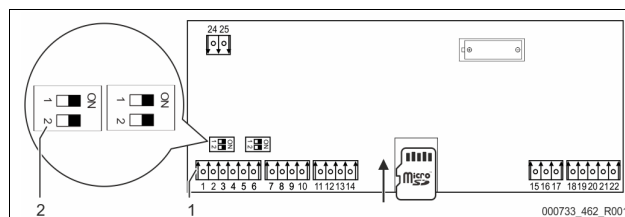
The following bus modules form part of the optional accessories available for interface communication.

### Note!

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.

### 7.5.3.1 Connecting the RS-485 interface

Main circuit board of the Control Touch controller.



1	Connection terminals for RS-485 connection
2	Dip switch 1

Proceed as follows:

1. Use a screened cable to connect the RS-485 interface to the main circuit board.
  - S1
    - Terminal 1 (A+)
    - Terminal 2 (B-)
    - Terminal 3 (GND)
2. Connect the cable screen at one side.
  - Terminal 18
3. Activate the terminator on the main circuit board.
  - Dip switch 1

### Note!

Activate the terminator when the device is at the beginning or the end of an RS-485 network.

## 7.6 Installation and commissioning certificate

### Note!

The installation and commissioning certificate can be found at the end of the operating manual.

## 8 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.

### 8.1 Checking the requirements for commissioning

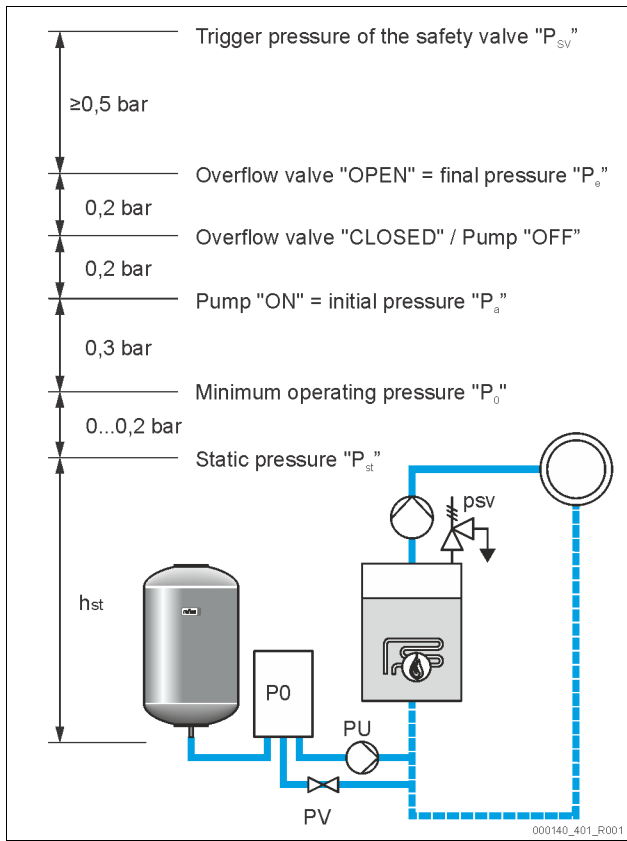
The device will be ready for commissioning when the tasks described in the "Installation" chapter have been completed. The system designer or an assigned expert is responsible for carrying out the commissioning. Commission the storage tank according to the information in the corresponding installation manual. Note the following information on 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.



## 8.2 Variomat switching points

The "P<sub>0</sub>" minimum operating pressure is determined by the location of the pressurisation. The controller calculates the switching points for the solenoid valve "PV" and the pump "PU" from the "P<sub>0</sub>" minimum operating pressure.



The "P<sub>0</sub>" minimum operating pressure is calculated as follows:

$P_0 = P_{st} + P_D + 0.2 \text{ bar}^*$  Enter the calculated value in the start routine of the controller, see chapter 8.3 "Modifying the controller's start routine" on page 16.

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

$P_D = 0.0 \text{ bar}$  for safety temperatures  $\leq 100^\circ\text{C}$

$P_D = 0.5 \text{ bar}$  for safety temperatures  $= 110^\circ\text{C}$

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

### Note!

Avoid dropping below the "P<sub>0</sub>" minimum operating pressure. Vacuum, vaporisation and cavitation are thus excluded.

## 8.3 Modifying the controller's start routine

### Note!

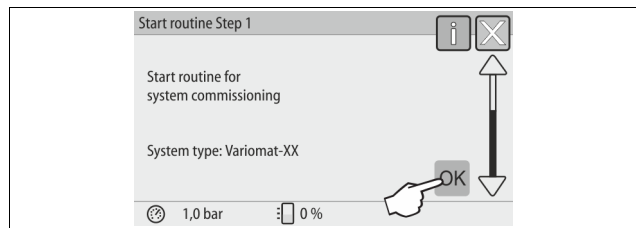
For handling the operator panel see chapter 10.1 "Operator panel" on page 19

The start routine is used to set the parameters for device commissioning. It commences with the first switching on of the controller and can only be set once. The following parameter changes or checks are carried out from the customer menu, see chapter 10.3.1 "Customer menu" on page 20.

A three-digit PM code is assigned to the setting options.

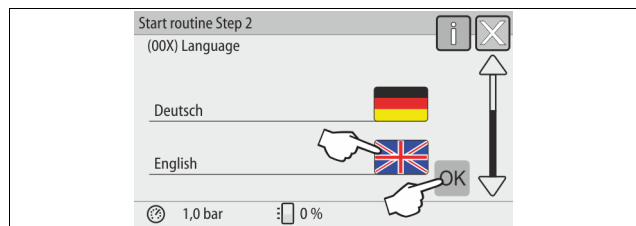
Step	PM Code	Description
1		Start of the start routine
2	001	Select the language
3		Remember: Prior to installation and commissioning, read the operating manual!
4	005	Set the minimum operating pressure P <sub>0</sub> , see chapter 8.2 "Variomat switching points" on page 16.
5	002	Set the time
6	003	Set the date

Step	PM Code	Description
7	121	Select the primary vessel nominal volume
8		Null balancing: The primary vessel must be empty! The system checks whether the signal from the level sensor matches the selected primary vessel
9		End of the start routine. The stop mode is active.

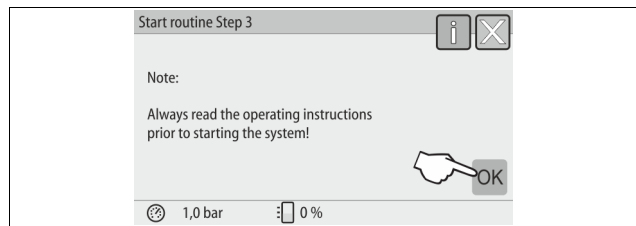


The system automatically displays the first page of the start routine when you switch on the device for the first time:

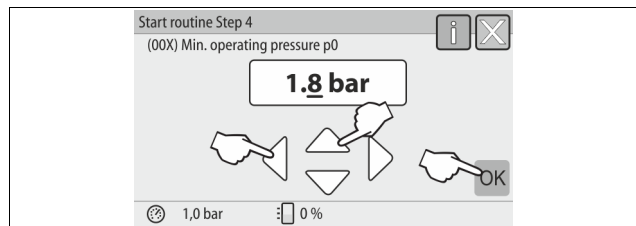
- Press "OK".
  - The start routine moves to the next page.



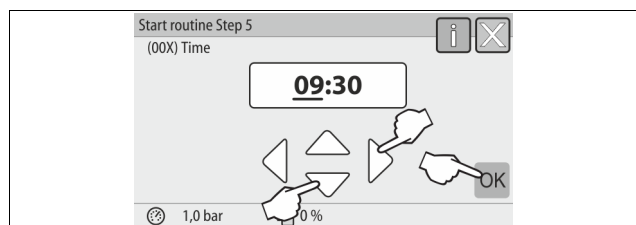
- Select the required language and confirm your entry with "OK".



- Prior to commissioning, read the operating manual in full and check for proper assembly.

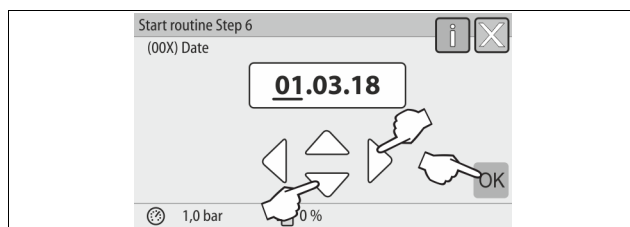


- Select the calculated minimum operating pressure and confirm with "OK".
  - For calculation of the minimum operating pressure, see chapter 8.2 "Variomat switching points" on page 16.

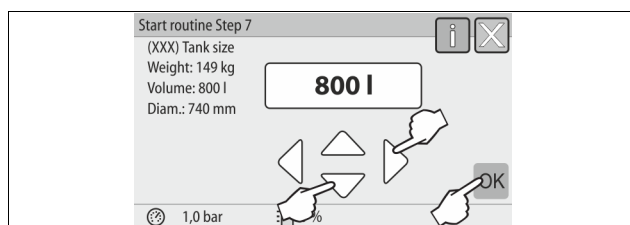


- Set the time. The time of an alarm will be stored in the controller's fault memory.
  - Use the "Left" and "Right" buttons to select the display value.
  - Use the "Up" and "Down" buttons to change the display value.
  - Confirm your entries with "OK".

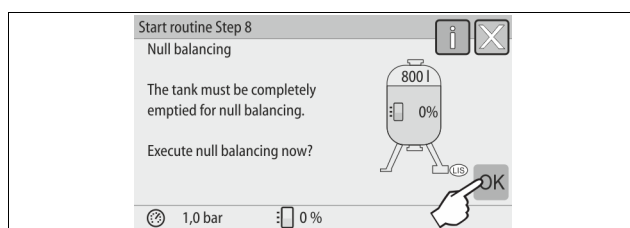




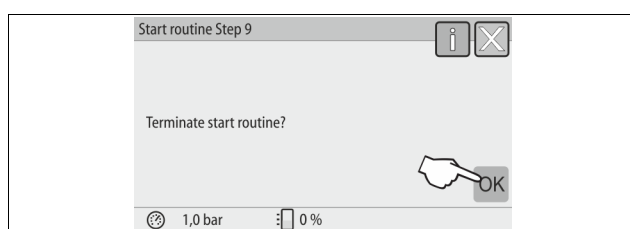
6. Set the date. The date of an alarm will be stored in the controller's fault memory.
  - Use the "Left" and "Right" buttons to select the display value.
  - Use the "Up" and "Down" buttons to change the display value.
  - Confirm your entries with "OK".



7. Select the size of the primary vessel.
  - Use the "Up" and "Down" buttons to change the display value.
  - Confirm your entries with "OK".
  - For the primary vessel data, see the name plate or see chapter 6 "Technical data" on page 8.



- The controller checks whether the level measuring signal matches the dimensional data of the primary vessel. The primary vessel must be fully emptied, see chapter 7.3.6 "Fitting the level sensor" on page 12.
8. Press "OK".
    - Null balancing is executed.
    - If null balancing is not successfully completed, you cannot commission the device. In this case, please contact Customer Service, see chapter 13.1 "Reflex Customer Service" on page 25.



9. Press "OK" to conclude the start routine.

**Note**

After successful conclusion of the start routine, you are in Stop mode. Do not yet switch to Automatic mode.

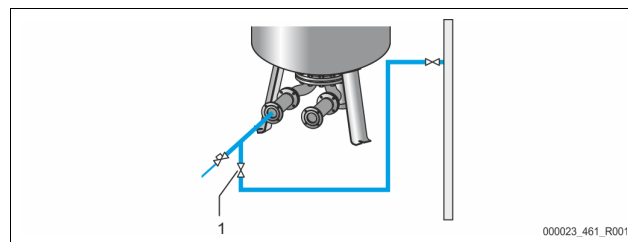
## 8.4 Filling the tanks with water

The following information applies to the devices:

- Control unit and primary tank.
- Control unit and primary tank and one secondary tank.
- Control unit and primary tank and more than one secondary tanks.

Facility system	System temperature	Filling level of primary tank
Heating system	≥ 50 °C (122° F)	Approx. 30 %
Cooling system	< 50 °C (122° F)	Approx. 50 %

### 8.4.1 Filling with a hose

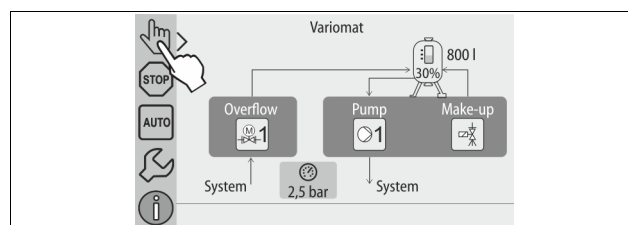


Preferably use a water hose to fill the primary vessel with water when the automatic make-up device is not yet connected.

- Use a vented water hose filled with water.
- Connect the water hose to the external water supply and the "FD" feed and drain cock (1) at the primary vessel.
- Check whether the shut-off valves between control unit and primary vessel are open (supplied pre-wired in open position).
- Fill the primary vessel with water until the filling level has been reached.

### 8.4.2 Filling with the solenoid valve in the make-up

1. Use the "Manual mode" button to switch to "Manual" mode.



2. Open the "WV make-up valve" via the corresponding button until the specified filling level is reached.
  - Continuously monitor this process.
  - If a high-water alarm is generated, the make-up valve "WV make-up valve" is automatically closed.

## 8.5 Venting the pump

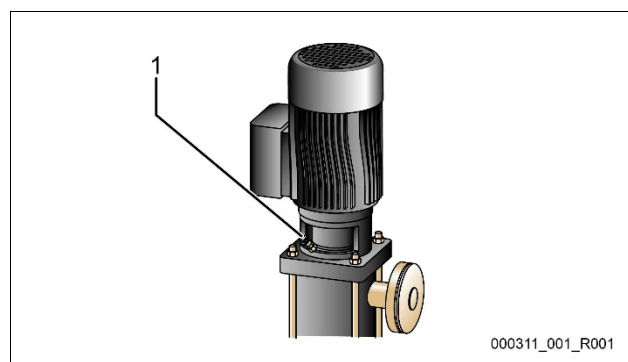
### CAUTION

**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).

Vent the "PU" pumps as follows:



1 Vent screw

- Remove the vent screws from the pumps and vent the pumps until bubble-free water escapes.
- Screw the vent screws back in and tighten.
- Check the vent screws for leaks.

**Note!**

- Repeat venting after the first starting of the pump. It is possible that downstream air cannot escape with the pumps stationary.
- Repeat the venting process, if the delivery rates of the pumps remain at zero.

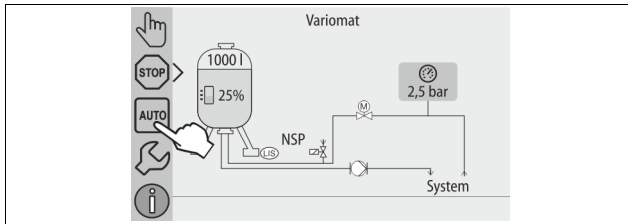
## 8.6 Parametrising the controller in the Customer menu

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.

- For adjusting the default settings, see chapter 10.3 "Configuring settings in the controller" on page 20.
- For information about controller operation, see chapter 10.1 "Operator panel" on page 19.

## 8.7 Starting Automatic mode

Automatic mode can be started as soon as the system is filled with water and the gases contained have been vented.



- Press button "AUTO".
  - During commissioning, continuous degassing is automatically activated to remove any residual free or dissolved gases from the system. This time can be set in the Customer menu as required by the system conditions. The default setting is 12 hours. Subsequent to the continuous degassing, the device automatically switches to interval degassing.

**Note!**

The commissioning process is now concluded.

**Notice!**

The "ST" dirt trap in the "DC" degassing line must be cleaned after the expiry of the continuous degassing time at the latest, see chapter 11.1.1 "Cleaning the dirt trap" on page 24.

## 9 Operation

### 9.1.1 Automatic mode

**Use:**

After initial commissioning has been successfully completed

**Start:**

Press "AUTO".

**Functions:**

- Automatic mode is suitable for continuous device operation and the controller monitors the following functions:
  - Pressurisation
  - Expansion volume compensation
  - Degassing
  - Automatic make-up.
- The "PU" pump and the "PV1" motor ball valve of the overflow line are regulated by the controller so that the pressure that is being regulated remains constant to within  $\pm 0.2$  bar.
- Faults are indicated and evaluated in the display.
- The "PV1" motor ball valve of the overflow line remains open during the adjustable degassing time as long as the pump "PU" continues to run.
- In the de-pressurised "VG" primary vessel, the system water is expanded and in this way degassed.
- For Automatic mode, you can set various degassing programmes in the Customer menu, see chapter 8.6 "Parametrising the controller in the Customer menu" on page 18. The controller display supplies the necessary information.

### Continuous degassing

After commissioning and repairs to the connected system, select the continuous degassing program.

The device will continuously degas for a set period of time. Free and dissolved gases are quickly removed.

- Automatic start after execution of the start routine during commissioning.
- Activated from the Customer menu.
- The degassing time can be set in the Customer menu, dependent on the actual system.
  - The default setting is 12 hours. After expiry of the set time, the device automatically switches to interval degassing.

### Interval degassing

For continuous operation, select the interval degassing program. As the default it is set in the Customer menu.

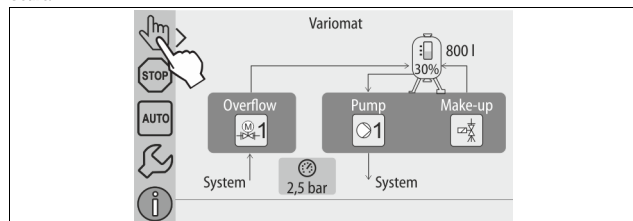
Degassing is continuous during an interval. An idling time follows an interval. The interval degassing mode can be limited to an adjustable time period. Time settings can be made in the Service menu.

- Automatic activation upon expiry of continuous degassing.
- Degassing interval (default 90 s)
- Break time (default: 120 min)
- Start / end (8:00 a.m. - 6:00 p.m.)

### 9.1.2 Manual mode

**Use:**

For testing and maintenance tasks.

**Start:**

1. Press "Manual mode".
2. Select the desired function.

**Functions:**

Manual mode allows you to select the following functions and to perform a test run:

- "PU" pump.
- "Motor ball valve in the "PV1" overflow line.
- The solenoid valve "WV1" for makeup.

You have the option to simultaneously switch multiple functions and to test them in parallel. Switch the function on and off by touching the corresponding button:

- The button is highlighted green. The function is switched off.

Press the desired button:

- The button is highlighted blue. The function is switched on.

The change in the filling level and the vessel pressure are indicated on the display.

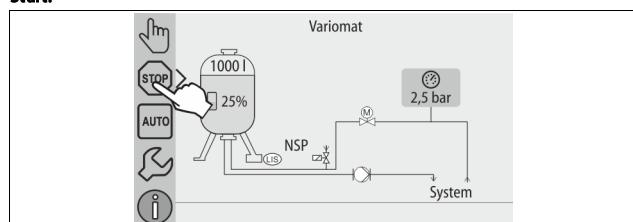
**Note!**

Manual operations cannot be performed if safety-relevant parameters would be exceeded. Switching is then disabled.

### 9.1.3 Stop mode

**Use:**

For device commissioning

**Start:**

Press "STOP".

**Functions:**

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

The following functions are deactivated:

- The "PU" pump is switched off.
- The "PV" motor ball valve in the "PV" overflow line is closed.
- The solenoid valve in the "WV" make-up line is closed.

**Note!**

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.

**9.1.4 Summer operation****Use:**

In summer

**Start:**

Switch off degassing via the customer menu.

**Functions:**

The degassing of the network water is not necessary if the circulating pumps of the system are shut down during Summer because gas-rich water cannot reach the device. Energy is saved.

After Summer, select the "Interval degassing" degassing programme in the Customer menu or "Continuous degassing", if required.

For a detailed description of the selection of degassing programmes, see chapter 9.1.1 "Automatic mode" on page 18.

**Note!**

The pressurisation feature of the device must remain operative in Summer.

- Automatic mode remains active.

**9.2 Restarting****CAUTION****Risk of injury due to pump start-up**

Hand injuries may occur when the pump starts up if you turn the pump motor at the impeller using a screwdriver.

- Switch the pump to a zero-volts state before turning the pump at the fan wheel with a screwdriver.

**ATTENTION****Device damage due to pump start-up**

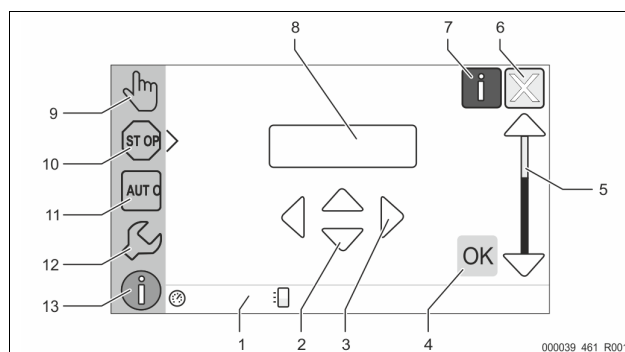
Pump damage may occur when the pump starts up if you turn the pump motor at the impeller using a screwdriver.

- Switch the pump to a zero-volts state before turning the pump at the fan wheel with a screwdriver.

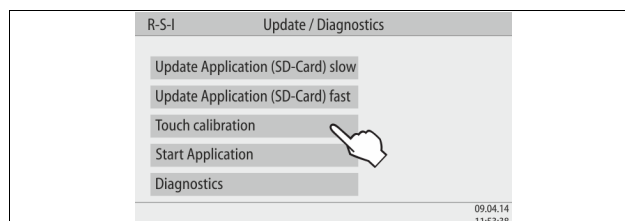
After an extended standstill time (the device is de-energised or in Stop mode), the pumps may jam. For this reason, use a screwdriver to rotate the pumps at the fan wheel of the pump motors before restarting.

**Note!**

A jamming of the pumps is prevented during operation thanks to forced starting action (after 24 hours).

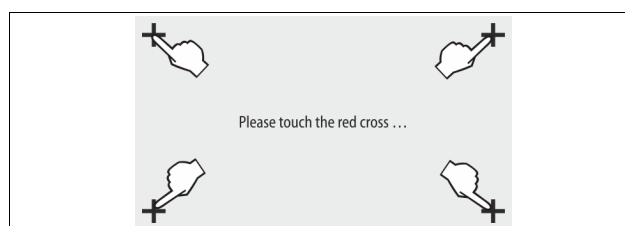
**10 Controller****10.1 Operator panel**

1	Message line	8	Display value
2	"▼"/"▲" buttons • Set digits.	9	"Manual mode" button • For function tests.
3	"◀"/"▶" buttons • Select digits.	10	"Stop mode" button • For commissioning.
4	"OK" button • Confirm/acknowledge input. • Browse in the menu.	11	"Automatic mode" button • For continuous operation.
5	"Up" and "Down" scroll bar • "Scroll" in the menu.	12	"Set-up menu" button • For setting parameters. • Fault memory. • Parameter memory. • Display settings. • Primary vessel information. • Software version information.
6	"Scroll back" button • Cancel. • Page back to the main menu.	13	"Info menu" button • Displays general information.
7	"Display help texts" button • Opens help texts.		

**10.2 Calibrating the touch screen**

You can calibrate the touch screen when touching the desired buttons does not work satisfactorily.

1. Switch the device off at the main switch.
2. Touch and hold the touch field with your finger.
3. Switch on the main switch while touching the touch field.
  - When starting the program, the controller automatically switches to the "Update/Diagnostics" function.
4. Touch the "Touch calibration" button.



5. Touch the displayed crosses on the touch screen after each other.
6. Switch the device off and on again at the main switch.

The touch screen is fully calibrated.

### 10.3 Configuring settings in the controller

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

#### 10.3.1 Customer menu

##### 10.3.1.1 Customer menu – overview

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



**Note!**

For a description of the operation, see chapter 10.1 "Operator panel" on page 19.

##### A three-digit PM code is assigned to the setting options

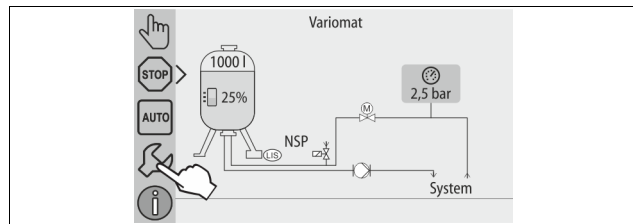
PM Code	Description
001	Select the language
002	Set the time
003	Set the date
	Execute null balancing <ul style="list-style-type: none"> <li>– The primary vessel must be empty</li> <li>– The system checks whether the signal from the level sensor matches the selected primary vessel.</li> </ul>
005	Set the minimum operating pressure $P_0$ , see chapter 8.2 "Variomat switching points" on page 16.
010	Degassing > <ul style="list-style-type: none"> <li>• Degassing programme               <ul style="list-style-type: none"> <li>– No degassing</li> <li>– Continuous degassing</li> <li>– Interval degassing</li> <li>– Run-on degassing</li> </ul> </li> </ul>
011	• Continuous degassing time
	Make-up > <ul style="list-style-type: none"> <li>• Maximum make-up time ... min</li> <li>• Maximum make-up cycles ... /2 h</li> <li>• With water meter "Yes/No"               <ul style="list-style-type: none"> <li>– If "Yes", continue with 028</li> <li>– If "No", continue with 007</li> </ul> </li> </ul>
023	
024	
027	
028	• Make-up quantity (Reset) "Yes/No" <ul style="list-style-type: none"> <li>– If "Yes", reset to "0"</li> </ul>
029	• Maximum make-up quantity ... l
030	• Softening "Yes/No" <ul style="list-style-type: none"> <li>– If "Yes", continue with 031</li> <li>– If "No", continue with 007</li> </ul>
007	Maintenance interval... months
008	Floating contact <ul style="list-style-type: none"> <li>• Message selection &gt;               <ul style="list-style-type: none"> <li>– Message selection: only messages marked with "✓" are output.</li> <li>– All messages: All messages are output.</li> </ul> </li> </ul>
015	Change remote data "Yes/No"
	Fault memory > History of all messages
	Parameter memory > History of parameter input
	Display settings > Brightness, screen saver <ul style="list-style-type: none"> <li>• Brightness ... %</li> <li>• Screen saver brightness ... %</li> <li>• Screen saver delay ... min</li> <li>• Secure access "Yes/No"</li> </ul>
009	
010	
011	
018	

PM Code	Description
	Information > <ul style="list-style-type: none"> <li>• Vessel               <ul style="list-style-type: none"> <li>• Volume</li> <li>• Weight</li> <li>• Diameter</li> </ul> </li> <li>• Position               <ul style="list-style-type: none"> <li>– Position in %</li> </ul> </li> <li>• Software version</li> </ul>

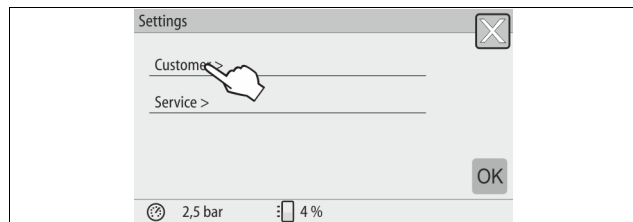
##### 10.3.1.2 Setting the customer menu - "Time" example

The setting of system-specific values is explained below using the setting of the time as example.

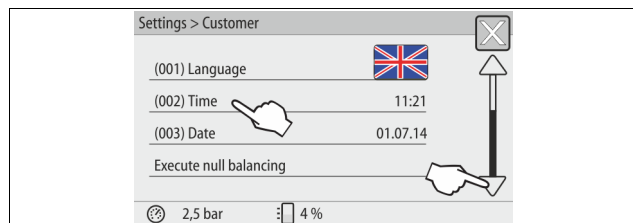
To adjust the system-specific values, proceed as follows:



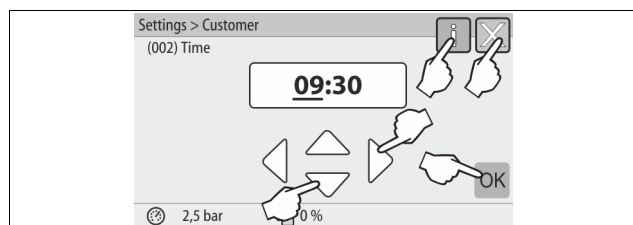
1. Press "Settings".
  - The controller switches to the setting area.



2. Press "Customer >".
  - The controller opens the Customer menu.



3. Press the required area.
  - The controller switches to the selected area.
  - Use the scroll bar to navigate through the list.



4. Set the system-specific values for the individual areas.
    - Use the "Left" and "Right" buttons to select the display value.
    - Use the "Up" and "Down" buttons to change the display value.
    - Confirm your entries with "OK".
- Press "i" to display a help text for the selected area.
- Press "X" to cancel your input without saving the new settings. The controller automatically opens again the list.

#### 10.3.2 Service menu

This menu is protected with a password. It can be accessed only by the Reflex Customer Service.

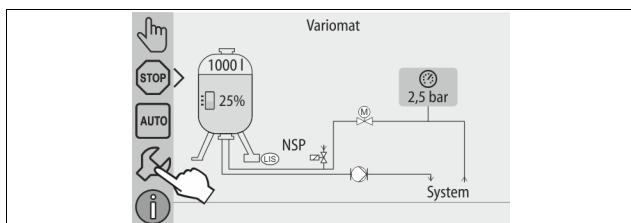
### 10.3.3 Default settings

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.

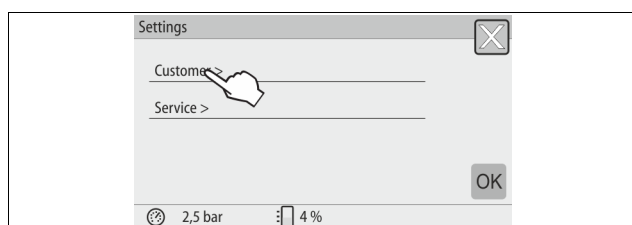
#### Customer menu

Parameter	Setting	Comment
Language	DE	Display language.
Minimum operating pressure "P <sub>0</sub> "	1.8 bar	see chapter 8.2 "Variomat switching points" on page 16.
Next maintenance	12 months	Time left to the next due maintenance.
Volt-free contact	All	
Make-up		
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	20 minutes	
Maximum make-up cycles	3 cycles within 2 hours	
Degassing		
Degassing programme	Continuous degassing	
Continuous degassing time	12 hours	Default setting
Softening (Only if "With softening Yes")		
Shut off 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.

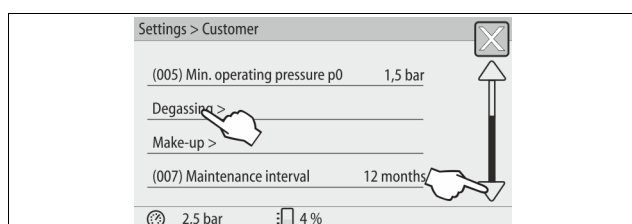
### 10.3.4 Setting degassing programmes



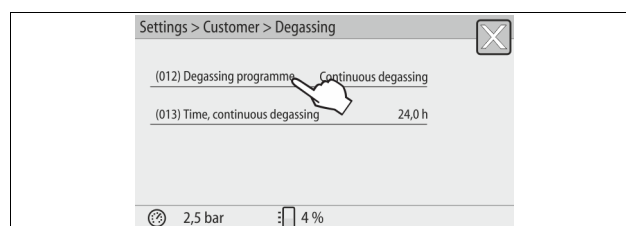
1. Press "Settings".
  - The controller switches to the setting area.



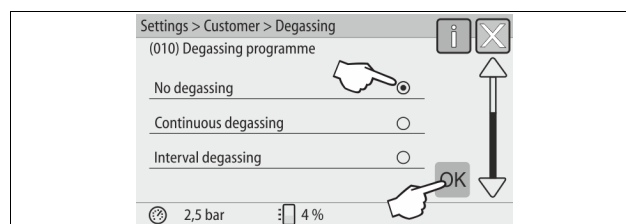
2. Press "Customer >".
  - The controller opens the Customer menu.



3. Press "Degassing >".
  - The controller switches to the selected area.
  - Use the scroll bar to navigate "up" and "down" through the list.

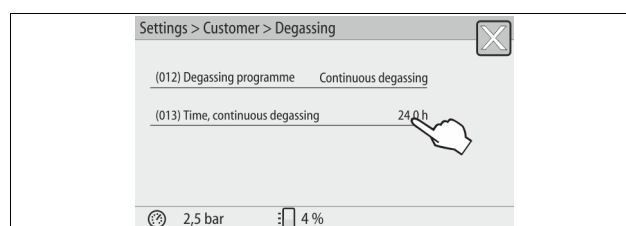


4. Press "(012) Degassing programme".
  - The controller opens the list of degassing programmes.

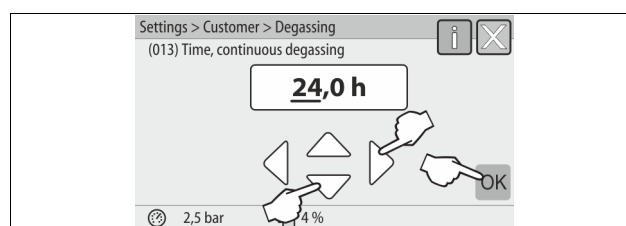


5. To select a menu item, press the "Up" or "Down" scroll bar until this menu item is displayed.
  - Press the desired button.
    - "Continuous degassing" is selected in this example.
    - Interval degassing is deactivated.
    - Make-up degassing is deactivated.
  - Confirm your selection with "OK".

Continuous degassing is activated.



6. Press "(013) Time, continuous degassing".



7. Set the time for continuous degassing.
  - Use the "Left" and "Right" buttons to select the display value.
  - Use the "Up" and "Down" buttons to change the display value.
  - Confirm your entries with "OK".

The time for continuous degassing is set.

  - Press "i" to display a help text for the selected area.
  - Press "X" to cancel your input without saving the new settings. The controller automatically opens again the list.

### 10.3.5 Degassing programmes – overview

#### No degassing

This programme is selected when the temperatures of the media to be degassed exceed the permissible Variomat temperature of 70° C (158° F) or the Variomat is combined with a Servitec vacuum degassing system.

#### Continuous degassing

This programme is selected after commissioning and repairs of the connected system. The device will continuously degas for a set period of time. Air bubbles within the system are quickly removed.

Start/setting:

- Automatic start after execution of the start routine during commissioning.
- Activated from the Customer menu.
- The degassing time can be set in the Customer menu, dependent on the actual system.
  - The default setting is 12 hours. Subsequently, the system automatically switches to "Interval degassing" mode.

#### Interval degassing

The interval degassing is stored for continuous operation as default setting in the Customer menu. Degassing is continuous during an interval. An idling time follows an interval. You have the option to limit the interval degassing to a specified time window. You can set the times only in the Service menu.

Start/setting:

- Automatic activation upon expiry of continuous degassing.
- Degassing interval, the default setting is 90 seconds.
- Pause, the default setting is 120 minutes
- Start/End, 8:00 – 18:00 hours.

### 10.4 Messages

The messages are impermissible deviations from the normal state. They can be output either via the RS-485 interface or via two floating message contacts. The controller displays the messages with a help text.

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

#### Note!

When the cause for the message is eliminated, you must acknowledge the fault with "OK" at the controller's operator panel.

#### Note!

Floating contacts, setting in the Customer menu, see chapter 8.6 "Parametrising the controller in the Customer menu" on page 18.

To reset a fault message, proceed as follows:

1. Touch the display.
  - The current fault messages are displayed.
2. Touch a fault message.
  - The system displays the possible causes for the fault.
3. When the fault is eliminated, confirm the fault with "OK".

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
01	Minimum pressure	YES	<ul style="list-style-type: none"> <li>• Set value not reached.</li> <li>• Water loss in the system.</li> <li>• Pump fault.</li> <li>• Controller in Manual mode</li> </ul>	<ul style="list-style-type: none"> <li>• Check set value in the Customer or Service menu.</li> <li>• Check water level.</li> <li>• Check pump.</li> <li>• Set the controller to Automatic mode.</li> </ul>	"Quit"
02.1	Insufficient water	-	<ul style="list-style-type: none"> <li>• Set value not reached.</li> <li>• Make-up disabled.</li> <li>• Air in the system.</li> <li>• Dirt trap clogged.</li> </ul>	<ul style="list-style-type: none"> <li>• Check set value in the Customer or Service menu.</li> <li>• Clean the dirt trap.</li> <li>• Check functioning of the "PV1" solenoid valve.</li> <li>• If necessary, manually add water.</li> </ul>	-
03	High water	YES	<ul style="list-style-type: none"> <li>• Set value exceeded.</li> <li>• Make-up disabled.</li> <li>• Water intake through a leak in a thermal transfer medium of the user.</li> <li>• "VG" and "VF" tanks too small.</li> </ul>	<ul style="list-style-type: none"> <li>• Check set value in the Customer or Service menu.</li> <li>• Check functioning of the "WV1" solenoid valve.</li> <li>• Drain water from the "VG" tank.</li> <li>• Check site heat transfer medium for leaks.</li> </ul>	-
04.1	Pump	YES	<ul style="list-style-type: none"> <li>• Pump disabled.</li> <li>• Pump jammed.</li> <li>• Pump motor defective.</li> <li>• Pump motor contactor tripped.</li> <li>• Fuse defective.</li> </ul>	<ul style="list-style-type: none"> <li>• Rotate the pump with screwdriver.</li> <li>• Replace the pump motor.</li> <li>• Electrically test the pump motor.</li> <li>• Replace the fuse.</li> </ul>	"Quit"
05	Pump run time	-	<ul style="list-style-type: none"> <li>• Set value exceeded.</li> <li>• Severe water loss in the system.</li> <li>• Cap valve at the intake side closed.</li> <li>• Air in the pump.</li> <li>• Solenoid valve in the overflow line does not close.</li> </ul>	<ul style="list-style-type: none"> <li>• Check set value in the Customer or Service menu.</li> <li>• Check the water loss and correct, if necessary.</li> <li>• Open the cap valve.</li> <li>• Vent the pump.</li> <li>• Check functioning of the "PV1" solenoid valve.</li> </ul>	-
06	Make-up time	-	<ul style="list-style-type: none"> <li>• Set value exceeded.</li> <li>• Water loss in the system.</li> <li>• Make-up line not connected.</li> <li>• Make-up rate insufficient.</li> <li>• Make-up hysteresis too low.</li> </ul>	<ul style="list-style-type: none"> <li>• Check set value in the Customer or Service menu.</li> <li>• Check water level.</li> <li>• Connect make-up pipe</li> </ul>	"Quit"
07	Make-up cycles	-	Set value exceeded.	<ul style="list-style-type: none"> <li>• Check set value in the Customer or Service menu.</li> <li>• Seal any leak in the system.</li> </ul>	"Quit"
08	Pressure measurement	YES	Controller receives incorrect signal.	<ul style="list-style-type: none"> <li>• Connect the plug.</li> <li>• Check functioning of the pressure sensor.</li> <li>• Check the cable for damage.</li> <li>• Check the pressure sensor.</li> </ul>	"Quit"
09	Level sensor	YES	Controller receives incorrect signal.	<ul style="list-style-type: none"> <li>• Check functioning of the load cell.</li> <li>• Check the cable for damage.</li> <li>• Connect the plug.</li> </ul>	"Quit"

ER Code	Alarm	Floating contact	Causes	Remedy	Alarm reset
10	Maximum pressure	-	<ul style="list-style-type: none"> <li>Set value exceeded.</li> <li>Pressure relief pipe not functioning.</li> <li>Dirt trap clogged.</li> </ul>	<ul style="list-style-type: none"> <li>Check set value in the Customer or Service menu.</li> <li>Check functioning of the pressure relief pipe.</li> <li>Clean the dirt trap.</li> </ul>	"Quit"
11	Make-up quantity	-	"With water meter" must be activated in the Customer menu. <ul style="list-style-type: none"> <li>Set value exceeded.</li> <li>Severe water loss in the system.</li> </ul>	<ul style="list-style-type: none"> <li>Check set value in the Customer or Service menu.</li> <li>Check water loss in the system and repair, if necessary.</li> </ul>	"Quit"
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	-	<ul style="list-style-type: none"> <li>Set value for soft water capacity exceeded.</li> <li>Time interval for replacement of the softening cartridge exceeded.</li> </ul>	Replace the softening cartridges.	"Quit"
30	I/O module fault	-	<ul style="list-style-type: none"> <li>I/O module defective.</li> <li>Connection between option card and controller faulty.</li> <li>Option card defective.</li> </ul>	Inform Reflex Customer Service.	-
31	EEPROM defective	YES	<ul style="list-style-type: none"> <li>EEPROM defective.</li> <li>Internal calculation error.</li> </ul>	Inform Reflex Customer Service.	"Quit"
32	Undervoltage	YES	Supply voltage not achieved.	Check power supply.	-
33	Adjustment parameter faulty	YES	EEPROM parameter memory defective.	Inform Reflex Customer Service.	-
34	Communication Main board faulty	-	<ul style="list-style-type: none"> <li>Connecting cable defective.</li> <li>Main board defective.</li> </ul>	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).	-
37	Input voltage Ball valve missing	-	Short-circuit of input voltage.	Check wiring of the ball valve.	-

## 11 Maintenance

### 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.

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 "OK" to acknowledge the "Maintenance recommended" message. Reset the maintenance counter in the Customer menu.



#### Note!

The maintenance intervals of the secondary vessels can be extended up to 5 years, if no abnormalities have been detected during operation.



#### Note!

Arrange for maintenance tasks must be carried out only by specialist personnel or Reflex Customer Service.

## 11.1 Maintenance schedule

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

Activity	Check	Wait	Clean	Interval
Check for leaks. • "PU" pump. • Screw connections. • Check valve downstream of "PU" pump.	x	x		Annually
Clean "ST" dirt trap. – see chapter 11.1.1 "Cleaning the dirt trap" on page 24 .	x	x	x	Depending on the operating conditions
Clear sludge from the primary tank and the secondary tanks. – see chapter 11.1.2 "Cleaning the tanks" on page 24 .	x	x	x	Depending on the operating conditions
Check the make-up switching points. – see chapter 11.2 "Checking switching points" on page 24 .	x			Annually
Check the Automatic mode switching points. – see chapter 11.2 "Checking switching points" on page 24 .	x			Annually

### 11.1.1 Cleaning the dirt trap

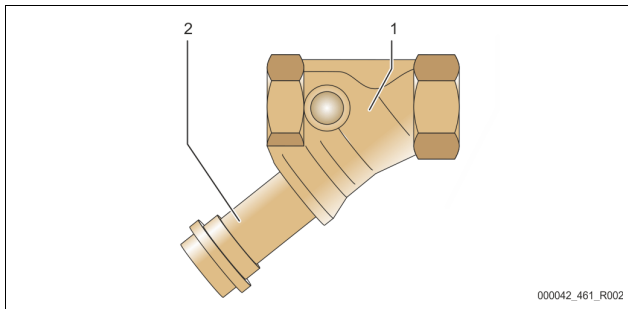
#### CAUTION

##### 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.

The "ST" dirt trap must be cleaned after the expiry of the continuous degassing time at the latest. An inspection is also required after longer lasting operation.



1	"ST" dirt trap	2	Dirt trap insert
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1. Switch to Stop mode.
2. Close the ball valves upstream of the "ST" dirt trap (1) and the primary vessel.
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. Open the ball valve upstream of the "ST" dirt trap (1) and ball valve to the primary vessel.
7. Vent the "PU" pump, see chapter 8.5 "Venting the pump" on page 17 .
8. Switch to Automatic mode.

#### Note!

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

### 11.1.2 Cleaning the tanks

#### 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.

Clean the primary tank and the secondary tanks from sludge deposits.

1. Switch to Stop mode.
2. Empty the tanks.
  - Open the "FD" feed and drain cocks and empty the tanks completely from water.
3. Remove the hose connection between the primary tank and the device and the secondary tank, if provided.
4. Remove the lower vessel covers from the tanks.
5. Remove any sludge from the covers and the spaces between the diaphragms and the tanks.
  - Check the diaphragms for tearing.
  - Check the tank interior walls for corrosion.
6. Reinstall the covers on the tanks.
7. Reinstall the flange connection between the primary tank and the device and the secondary tank, if provided.
8. Close the "FD" feed and drain cocks at the tanks.
9. Use the "FD" feed and drain cock to fill the primary tank with water, see chapter 8.4 "Filling the tanks with water" on page 17 .
10. Switch to Automatic mode.

### 11.2 Checking switching points

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

- Minimum operating pressure  $P_0$ , see chapter 8.2 "Variomat switching points" on page 16 .
- Level sensor at the primary tank.

Preparation

1. Switch to Automatic mode.
2. Close the cap valves upstream of the tanks and the "EC" expansion lines.
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 "PU" pump.
  - The pump cuts in at  $P_0 + 0.3$  bar.
  - The pump cuts out at  $P_0 + 0.5$  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 20 %.

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 11.1.2 "Cleaning the tanks" on page 24 .

Activating the device

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



## Checking Insufficient water "Off"

15. 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 7 %.

## Checking Make-up "Off"

16. If necessary, check the make-up value displayed at the controller.
- Automatic make-up is deactivated at a level display of 25 %.

Maintenance is completed.

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

► **Note!**  
The setting values for pressure maintenance, filling levels and make-up are provided in the chapter Standard settings, see chapter 10.3.3 "Default settings" on page 21.

## 11.3 Inspection

### 11.3.1 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).

### 11.3.2 Inspection prior to commissioning

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

### 11.3.3 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).

#### Strength 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 specified by the operating company based on a safety evaluation taking into consideration the actual operating conditions, experience with the mode of operation and charging material and the applicable national regulations for the operation of pressure equipment.

## 12 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

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

### ! 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 dismantling, block off all "water"-side connections to the device.
- Vent the device to de-pressurise 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 all cables from the terminals of the device control unit and remove them.

! **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 "FD" feed and drain cocks at the tanks until they are completely empty and de-pressurised.
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.

## 13 Annex

### 13.1 Reflex Customer Service

#### Central customer service

Central telephone number: +49 (0)2382 7069 - 0  
Customer Service extension: +49 (0)2382 7069 - 9505  
Fax: +49 (0)2382 7069 - 9523  
E-mail: [service@reflex.de](mailto:service@reflex.de)

#### Technical Hotline

For questions about our products  
Telephone number: +49 (0)2382 7069-9546  
Monday to Friday 8:00 to 16:30

### 13.2 Conformity and standards

Device conformity declarations are available on the Reflex homepage.  
[www.reflex-winkelmann.com/konformitaetserklaerungen](http://www.reflex-winkelmann.com/konformitaetserklaerungen)

Alternatively, scan the QR code:



### 13.3 Guarantee

The respective statutory guarantee regulations apply.

**EN**    **Installation and commissioning certificate** - This device has been installed and commissioned in accordance with the instructions provided in the operating manual. The settings in the controller match the local conditions.



Typ / Type:	
P <sub>0</sub>	
P <sub>SV</sub>	
Fabr. Nr. / Serial-No.	









Thinking solutions.

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