Lutz®
The Fluid Managers

GB

Operating Instructions 2–71

MODULAR
FLOW METER SYSTEM TS
with and without volume preselection

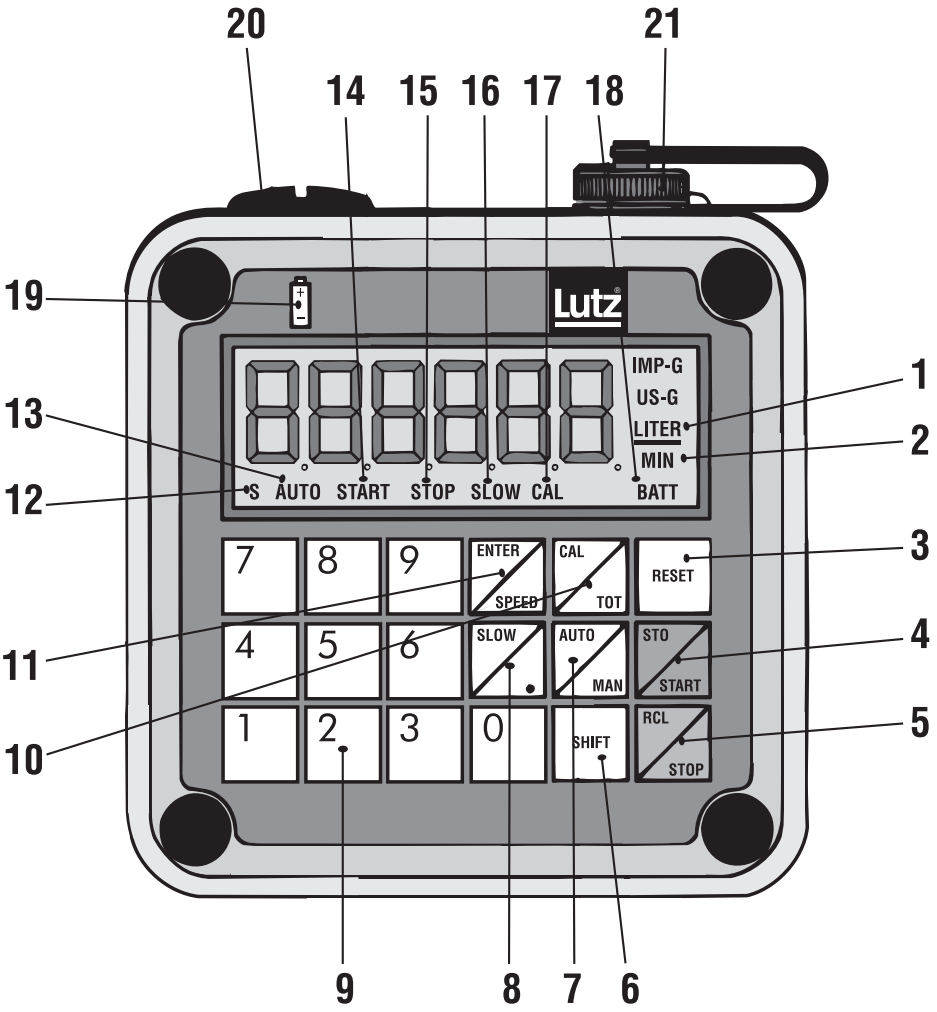
Type

ST
SL
LM
UN
VA I

Read this operating instructions before start up!

To be retained for future reference.

Ex CE AtEx100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Lutz
IMP-G
US-G
LITER
MIN
S AUTO START STOP SLOW CAL BATT
7 8 9 ENTER SPEED CAL TOT RESET
4 5 6 SLOW AUTO MAN STO START
1 2 3 0 SHIFT RCL STOP

Explanation of the operating unit

1 Unit of measurement used for flow volume (litres, US-gallons, IMP-gallons).
2 Unit of measurement used for flow rate (l/min, US-G/min, IMP-G/min).
3 Reset key for the displayed flow volume.
4 Start key for filling operation in the automatic mode.
Store key to transfer correction factors in the addressable memory.
5 Stop key to interrupt filling operation in the automatic mode.
Recall key to display calibration factors from addressable memories.
6 Changeover switch to access the higher-level function in dual-function keys.
S **12** is indicated in the display.
7 Switching between manual and automatic mode.
In the automatic mode, the word „AUTO“ **13** is indicated in the display.
8 Reduced flow rate. „SLOW“ **16** is indicated in the display.
9 Numerical keypad 0-9.
10 Display of total volume as long as key remains depressed.
Activation of calibration mode. „CAL“ **17** is indicated in the display.
11 Display of flow volume in the selected unit of measurement as long as key remains depressed.
Key for confirming values (e.g. correction factor, preselected volume).
12 „S“ indicates that the SHIFT key has been pressed, making the higher-level function
(in keys no. **4,5,7,8,10,11**) effective.
13 „AUTO“ indicates that the flow meter is operating in the automatic mode.
14 „START“ indicates that an automatic filling sequence has been started.
15 „STOP“ indicates that an automatic filling sequence has been interrupted.
16 „SLOW“ indicates that a step-by-step flow reduction has been activated.
17 „CAL“ indicates that the flow meter currently is in the calibration mode.
18 „BATT“ indicates that the batteries require changing.
19 Battery arrangement when changing the batteries.
20 Battery compartment lid.
21 Terminal socket for data line.

General safety information

The operator must read the operating instructions before starting the flow meter and follow these instructions during operation.

1. **Note the temperature and pressure limits. The pressure surges produced when closing shutoff valves (valves, slides, etc.) must not exceed the maximum operating pressure.**
2. **Disconnect the mains power supply and batteries before assembling and dismantling the various modules and the data line.**
3. **Ensure that all connections and fittings are tight and free from tension.**
4. **Only alkaline-manganese batteries may be used.**
5. **Repairs may only be carried out by the manufacturer.**

The national accident prevention regulations must be observed without fail!

When metering flammable liquids of danger classes AI, AII and B, the following must be additionally observed:

1. **Only use explosion proof flow meter modules.**
2. **Before operation, ensure equipotential bonding of the delivery system.**
3. **Use conductive hoses or pipes.**
4. **Only use explosion proof relay modules.**
5. **In explosion hazard areas only use explosion proof plugs.**
6. **Electrostatic danger due to friction - to be wiped with wet cloth only. Do not use solvents for cleaning.**
7. **Change of battery only outside of hazardous location with appropriate tools. Only use approved battery types.**

The national explosion protection regulations must be observed without fail.

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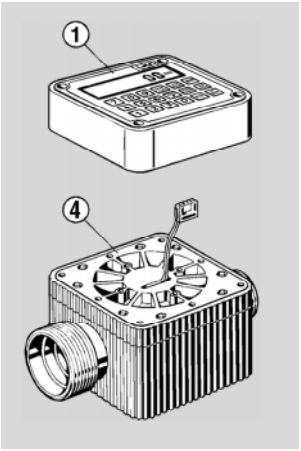
A. General

The flow meter operates according to the positive displacement principle. In a housing fitted with inlet and outlet is a measuring chamber through which the fluid is forced to flow on its way through the housing. In the measuring chamber, a nutating disc blocks the fluid's clear path. As it flows through the measuring chamber, the fluid pushes the nutating disc to one side. It is the action of displacing the impediment which produces the wobble movement of the disc and circular motion of the nutating disc shaft. By means of a driver, a magnet with several poles is set into rotation, which is able to activate a magnetically switched contact through the lid of the housing. Every revolution of the nutating disc is assigned to a constant volume and a fixed number of pulses, so permitting the electonic evaluating system to determine the volumetric flow through the number of received pulses.

For practically-orientated application, the flow meter system is made up of various modules:



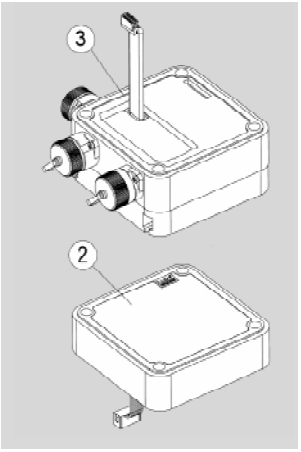
Operating unit and basic flow meter

① **Operating unit**
Electronic evaluating unit with keypad and LCD display for operation of the flow meter.

② **Protection cap**
Protects the modules basic flow meter, relay module or mains unit when the operating unit is decentrally installed.

③ **Relay module**
Switches the external electrical appliances such as pump motor and solenoid valve and is controlled by the evaluating electronics of the operating unit.

Mains unit
Supplies power to the operating unit when battery-powered operation is not desired and when no relay module is needed.



Relay module and protection cap

④ **Basic flow meter**
Housing and measuring chamber with all components for volumetric measurement which come into contact with the transported medium.

The flow meter can be used in two different operating modes:

Manual mode: For filling using a manually operated nozzle. The part volume meter is reset to zero and the required volume is metered while the nozzle is being operated.

Automatic mode: The preselected volume is filled by pressing a key. Automatic mode is possible only when relay module is connected.

1. Hazard

The modular flow meter system is developed and built in compliance with the relevant fundamental health- and safety requirements and important EG directives. Nevertheless, this product can cause danger if it is not used as advised.

In case of maloperation or improper use guarantee is excluded and there is danger for

- life and health of the user,
- the flow meter and other material assets of the user,
- the efficiency with the flow meter.

All persons who are dealing with the installation/assembly, starting, operation, servicing and maintenance of the flow meter have

- to be accordingly qualified,
- to observe the local safety and accident preventive rules,
- to exactly follow these operating instructions.

It is your safety!

2. Safety information

In these operating instructions the following symbols are used:

Danger!
Refers to a direct danger.
Non-observance of the precaution will cause death or extremely serious injury.

Warning!
Defines a possibly dangerous situation.
Non-observance of the precaution can cause death or extremely serious injury.

Caution!
Defines a possibly harmful situation.
The product or something in its environment may be damaged if this instruction is not observed.

3. Scope of supply

When unpacking the goods, check the articles that:

- there is no visible damage from transporting,
- the shipped articles, including accessories, are the articles you ordered,
- no screws have loosened during transportation.

B. Basic flow meter

1. Proper use

The basic flow meter is used for measuring liquid volumes where gauging metering is not required. The basic flow meter is precalibrated for the use of water. The measurement of other media is also possible. To do this, a different user-specific calibration factor is entered at the operating unit.

Warning!
The metering of non-compatible liquids damages the flow meter.
Splashing liquid or flying parts can cause injury.
Check by means of the materials indicated in the technical data and a resistance table (e. g. Lutz resistance table) whether the basic flow meter is suitable for the delivered liquid.

Warning!
Exceeding the temperature range and the operating pressure causes damage to the basic flow meter.
Splashing liquid or flying parts can cause injury.
The ranges indicated in the technical data for temperature of liquid and operating pressure have to be observed.

Danger!
Fire and explosion hazard due to delivered liquid!
Combustion hazard. Blast wave: Flying parts can cause death.
For measuring inflammable liquids of danger classes AI, AII and B use conductive basic flow meter types LM, UN and VA I only.

Any other use as well as any modifications of the product have to be considered as improper use. The manufacturer will not be held responsable for any damages resulting from such improper use, the risk lies solely with the user.

1.1 Technical data

Type	ST	SL	LM	UN	VA I
Flow rate	min. 10 l/min max. 120 l/min	min. 10 l/min max. 120 l/min	min. 10 l/min max. 120 l/min	min. 10 l/min max. 120 l/min	min. 10 l/min max. 100 l/min
Temperature	60 °C	60 °C	60 °C	60 °C	80 °C
Viscosity	2000 mPas	2000 mPas	2000 mPas	2000 mPas	50000 mPas*
Operating pressure	4 bar	4 bar	4 bar	4 bar	10 bar
Accuracy	± 1% standard ≤ 1% with adjustment to application conditions	± 1% standard ≤ 1% with adjustment to application conditions	± 1% standard ≤ 1% with adjustment to application conditions	± 1% standard ≤ 1% with adjustment to application conditions	± 1%
Inlet port	G 2 male thread to fit connector with union nut	G 2 male thread to fit connector with union nut	G 2 male thread to fit connector with union nut	G 2 male thread to fit connector with union nut	G 1 1/4 male thread
Outlet port	G 1 1/4 male thread	G 1 1/4 male thread	G 1 1/4 male thread	G 1 1/4 male thread	G 1 1/4 male thread
Weight	745 g	780 g	900 g	900 g	3,240 g
Materials: **Housing** **Measuring chamber** **Seals** **Magnet**	 PPO PPO/PPS Viton® BaFe, PA, SS (1.4401)	 PPO PPO/PPS Viton® PPS encapsulated	 PPS LCP FEP BaFe, brass, SS	 PPS LCP FEP PPS encapsulated	 SS (1.4581) SS/ETFE/ETFE FEP ETFE encapsulated
Suitable for Ex-application	no	no	yes conductive	yes conductive	yes conductive
Order No.	**0212-100**	**0212-200**	**0212-300**	**0212-400**	**0212-500**

Description of material

* depending on the application

PPO = Polyphenylene Oxide
PPS = Polyphenylene Sulfide
SS = Stainless steel
Viton® = Fluoro Elastomer
BaFe = Barium-Ferrite
LCP = Liquid Cristalline Polymere
PA = Polyamide
FEP = Tetrafluoro Ethylene/ Hexafluoro Propylene

Viton® is a registered Trademark of DuPont Dow Elastomers.

1.2 Maximum pressure depending on temperature of the medium

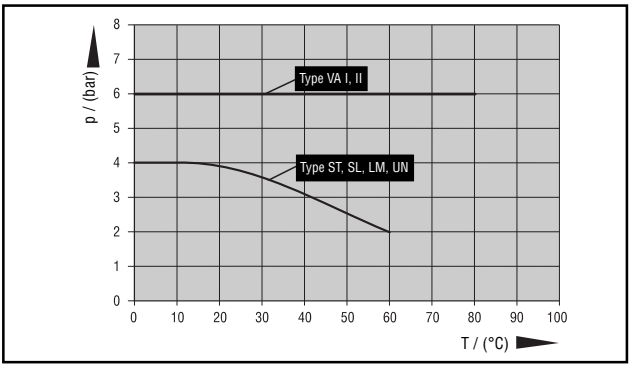


Diagram 1
Maximum pressure depending on temperature of the medium

1.3 Complete hose system

Before initial starting of the flow meter, the entire piping system must be vented from the pump through to the shutoff element (nozzle, solenoid valve or similar). During operation, care must be taken to ensure that the complete system is filled with liquid.

1.4 Pressure surges (water hammer)

Considerable pressure fluctuations with so-called water hammer can build up in the system as a result of delays (disconnection/shutoff) or acceleration of the flowing liquid column when using long delivery lines or when using solenoid valves with short opening and closing times.

Warning!
The brief pressure peaks or surges due to water hammer can cause serious damage and destroy the flow meter, pump or other components in the system!
Damage by uncontrolled splashing liquid. Depending on the medium concerned, this can lead to caustic burns, explosion hazards, toxic vapours, electric shocks, danger of slipping and other dangers!

Example: A valve closing time of 20 ms can cause a pressure surge of up to 10 bar in a 10 metres long 1" pipe at a flow rate of 50 l/min.

Pressure surges can be prevented as follows:
- Use a larger nominal diameter (DN) to reduce the flow speed in the delivery line.
- Filling with step-by-step interruption (SLOW mode, see chapter C 3.2.9).
- Use relief valves and pressure limiting valves to eliminate impermissible pressure peaks.

1.5 Pressure drop

Diagram 2 indicates the pressure drop relative to flow. The solid line is applicable for aqueous liquids ($\rho \approx 1$ kg/dm³, $\eta \approx 1$ mPas).

In case of media with different density ($\rho \neq 1$ kg/dm³) the pressure drop values have to be taken from the solid line in diagram 2 and multiplied by the density value of the liquid.

Media with a high dynamic viscosity ($\eta >> 1$ mPas) like high-density media, cause a higher pressure drop. The limiting curve for permissible viscosity at $\rho = 1$ kg/dm³ is depicted in diagram 2 as a dotted line. If the density ρ is greater than 1 kg/dm³, the pressure drops in the diagram must be multiplied by the actual density.

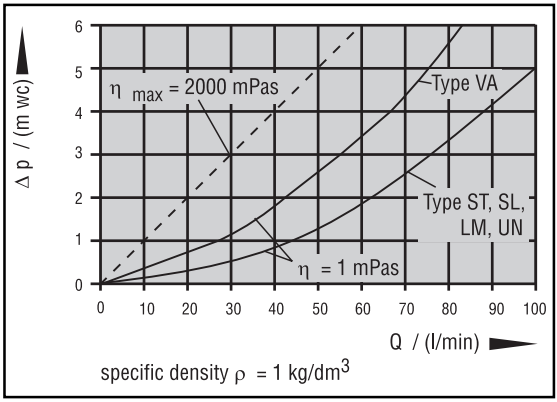
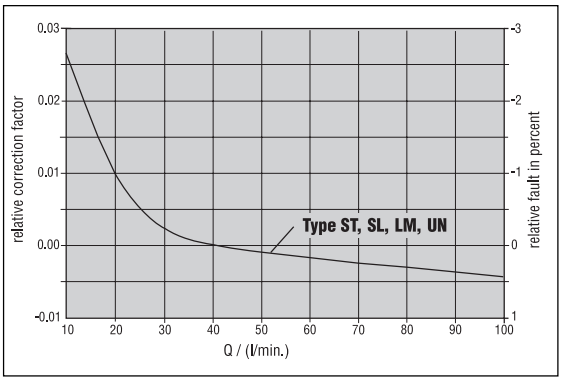


Diagram 2
Pressure drop depending on flow rate.

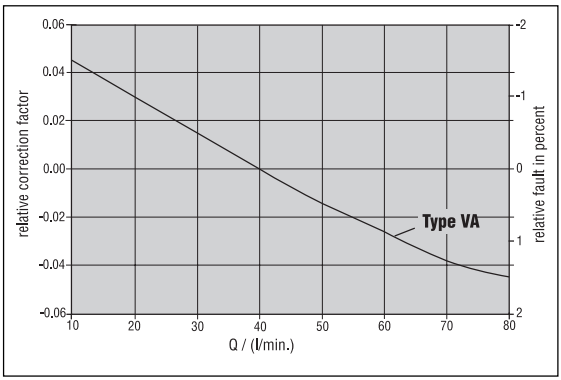
1.6 Accuracy of measurement and flow

In the factory the meter is calibrated for a flow rate of 40 l/min. Other flow rates affect the measurement accuracy of the flow meter (see diagram 3). The flow rate may be determined via the SPEED key **11** during the filling process.
For adjusting the measuring result to the determined flow rate, the recent correction factor must be called in from the main memory (see chapter C 3.3.3). The recent correction factor then is set off against the volume out of diagram 3 related to the flow rate. Then the new correction factor is entered (see chapter C 3.3.2).



Example for type ST, SL, LM, UN

Q = 20 l/min ➜ $\mathbf{K_{rel}}$ = 0.01
$\mathbf{K_1}$ = 1.028
$\mathbf{K_2} = K_1 + K_{rel}$
$\mathbf{K_2}$ = 1.028 + 0.01
$\mathbf{K_2}$ = 1.038



Example for type VA I:

Q = 20 l/min ➜ $\mathbf{K_{rel}}$ = 0.03
$\mathbf{K_1}$ = 3.37
$\mathbf{K_2} = K_1 + K_{rel}$
$\mathbf{K_2}$ = 1.028 + 0.03
$\mathbf{K_2}$ = 3.4

Q: Flow rate
$\mathbf{K_{rel}}$**:** Relative correction factor out of diagram 3
$\mathbf{K_1}$**:** Recent correction factor out of main memory
$\mathbf{K_2}$**:** New correction factor

Diagram 3
Correction factor depending on flow rate

1.7 Optimization of measurement accuracy by calibration

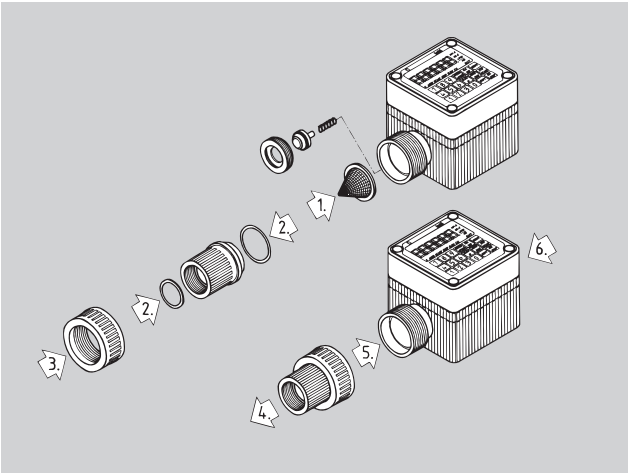
When using a flow meter as an automatic batch meter (frequent handling of the same volume), the meter should be calibrated to the operating point. By comparative measurement, the displayed volume is coordinated to the actual volume (see chapter C 3.3.1). For this operating point, the measurement accuracy is 1 digit (corresponding to ± 0.1 litres, ± 0.01 US-G, ± 0.01 IMP-G).

2. Installation

2.1 Connection for drum pump operation

Mounting steps flow meter type ST, SL, LM and UN:

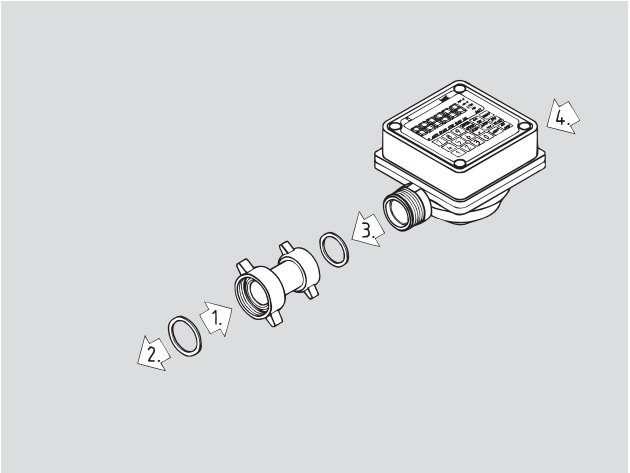
1. Mount the check valve (option) and filter screen into the inlet (arrow)
2. Insert the o-rings into the collar bush
3. Place the wing nut onto the collar bush
4. Screw the collar bush onto the outlet of the pump tube
5. Screw the wing nut with the flow meter
6. Screw the hose fitting onto the flow meter outlet G 1 1/4



Connection for drum pump operation type ST, SL, LM and UN

Mounting steps flow meter type VA I:

1. Insert the seal into the wing nut
2. Screw the drum pump connection onto the outlet of the pump tube
3. Insert the seal into the wing nut and screw it with the flow meter
4. Screw the hose fitting onto the flow meter outlet G 1 1/4



Connection for drum pump operation type VA I

2.2 Connection to the piping system – Flange connection

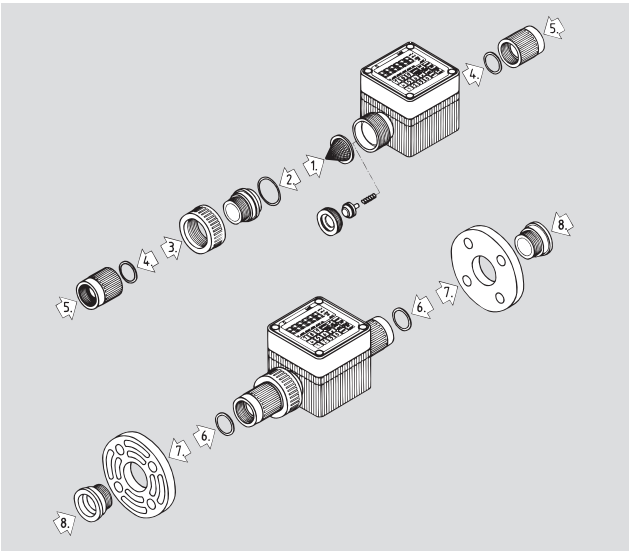
Caution!

For connecting the flow meter to the piping system, the following must be observed:

- Pipes, fittings, etc. must be suitably supported so that additional weight and vibrations are not transmitted to the flow meter!
- Suction and discharge lines must always be connected without tension. The piping must be rerouted if an offset cannot be compensated by appropriate means!

Mounting steps flow meter type ST, SL, LM and UN

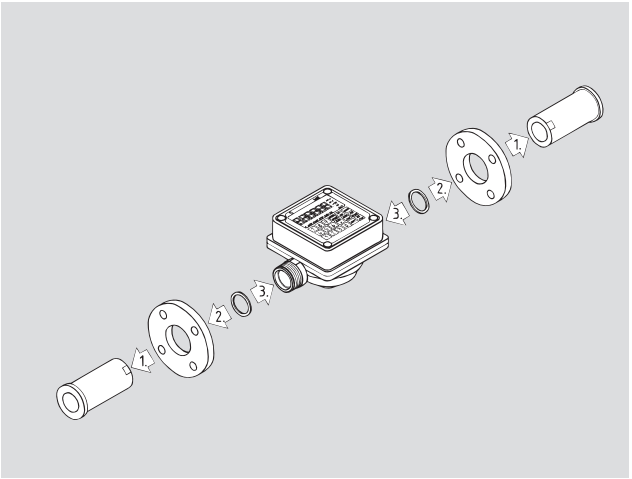
1. Mount the check valve (option) and filter screen into the inlet (arrow)
2. Push the o-ring onto the collar bush
3. Place the wing nut onto the collar bush and screw it with the flow meter
4. Insert the seals into the screw sockets
5. Screw the screw sockets onto the flow meter and collar bush
6. Insert the seals into the screw sockets
7. Mount the flange
8. Screw on the flanged bush



Flange connection type ST, SL, LM and UN

Mounting steps flow meter type VA I:

1. Place the flange plate onto the collar bush
2. Insert the seal into the collar bush
3. Screw on the collar bush to the flow meter



Flange connection type VA I

2.3 Valve connection

Mounting steps:

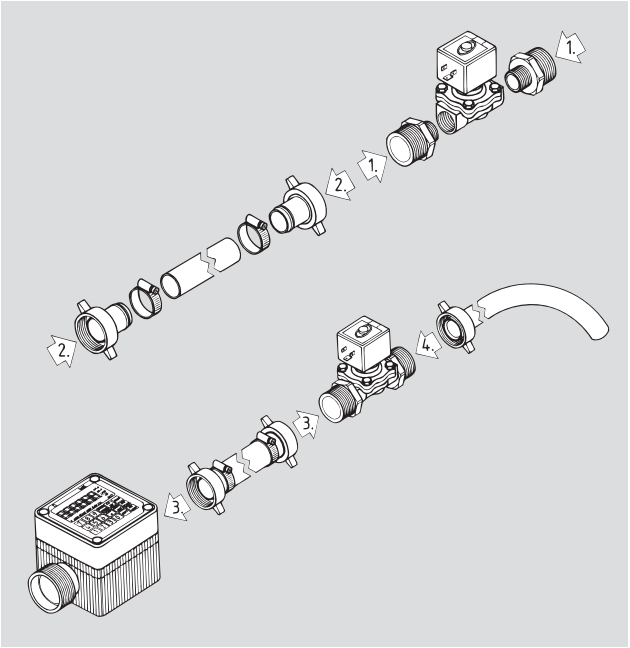
1. Screw the double nipple G 3/4 – G 1 1/4 into the inlet and outlet side of the solenoid valve

2. Mount the hose connection G 1 1/4 on both sides of the hose

3. Connect the hose with the flow meter outlet and the solenoid valve inlet

   Note flow direction of the solenoid valve!

4. Screw the discharge bend onto the outlet side of the solenoid valve



Valve connection

3. Maintenance and servicing

3.1 Cleaning the filter and check valve

It is advisable to flush and clean the basic flow meter after handling aggressive, tacky, crystallizing or very contaminating liquids.

Procedure type ST, SL, LM and UN
1. Empty the flow meter
2. Release the wing nut
3. Remove the filter and clean with a paintbrush or blow through with compressed air
4. Press in the check valve manually and blow through with compressed air

3.2 Dismantling the basic flow meter

The basic flow meter can be dismantled for cleaning the measuring chamber or for troubleshooting.

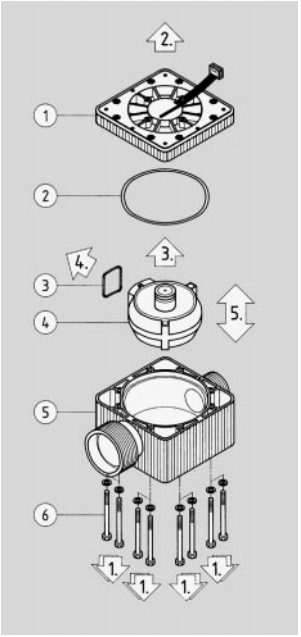
Warning!
The basic flow meter can still contain liquid during dismantling!
In case of aggressive liquids, this can lead to burns, poisoning, irritation of the skin etc.
Wear appropriate protective clothing when handling aggressive liquids.
Basic flow meter must be emptied before dismantling. Despite of previous emptying, residual liquid can still be in the flow meter housing during dismantling process. Therefore always remove the cover ① upwards.

☞ When dismantling the basic flow meters of type LM, UN and VA it is recommended to replace the o-ring ②.

Dismantling the basic flow meters type ST, SL, LM and UN:

1. Release the screws ⑥ on the bottom side of the flow meter.
2. Remove the cover ① upwards.
3. Lift the measuring chamber ④ out of the basic body ⑤.
4. Remove the o-ring ③ of the measuring chamber.
5. Carefully open the measuring chamber.

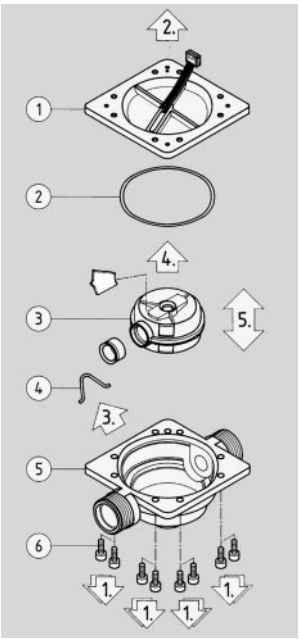
The assembly is effected in reverse order.
When mounting the cover ① take care of the right position to the basic body ⑤.



Dismantling the basic flow meter type VA I:

1. Release the screws ⑥ on the bottom side of the meter.
2. Remove the cover ① upwards.
3. Remove the clamp ④.
4. Lift the measuring chamber ③ out of the basic body.
5. Carefully open the measuring chamber.

The assembly is effected in reverse order.
When mounting the cover ① take care of the right position to the basic body ⑤.



Dismantling the basic flow meter

C. Operating unit

1. Proper use

Caution!
Device failure by corrosion!
Use the operating unit BE1 V or Ex-BE1 V for applications in aggressive environments.

Caution!
The electromagnetic compatibility of the device is compatible with the radiated interference and interference immunity for residential and industrial areas. To avoid interfering influences in a decentralised installation of individual modules, only use data cables from the Lutz company and route the data cables separate from low-voltage lines.

1.1 Technical data

Type	**BE1**	**BE1 V**	**Ex-BE1**	**Ex-BE1 V**
Display	6-digit LCD-display, 19 mm character height Quantity l, US-G, IMP-G Flow rate l/min, US-G/min, IMP-G/min Change battery, function mode, individual quantity, total quantity, number of filling processes			
Functions	• Reset partial quantity and total quantity • Automatic calibration • Storing differing calibration factors • Lock keys against unauthorised access • Changeover to manual or autmatic mode with relay module (optional) • Cycle counter • System protection through detection of faults • Advance cut-out			
Type of protection	IP 54 in combination with flow meter or optional modules			
Power supply	3 x 1.5 V alkaline manganese batteries or by relay module, mains unit			
Explosion protection class	-	-	EEx ib IIC T4	EEx ib IIC T4
Use in aggressive areas	not recommended	suitable	not recommended	suitable
Electronics	replaceable	completely potted	replaceable	completely potted
Repairs	yes	no	yes	no
Weight	200 g	300 g	220 g	310 g
Order No.	**0212-001**	**0212-003**	**0212-002**	**0212-004**

1.2 Application in explosion hazard areas

Danger!
Fire and explosion hazard due to delivered liquid!
Combustion hazard. Blast wave: Flying parts can cause death.
For measuring inflammable liquids of danger classes AI, AII and B use operating unit Ex-BE1 or Ex-BE1 V only.

Danger!
Danger of explosion! Friction causes electrostatic charges!
Blast wave: Flying parts can cause death.
Operating unit to be wiped with wet cloth only.

Danger!
Danger of explosion due to inadmissible warming up!
Blast wave: Flying parts can cause death.
Following electrical data and terminal assignment must be observed.

1.2.1 Electrical data

Internal power supply

4.5 V (DC); Approved battery types for the power supply:

- VARTA Alkaline, No.4001, Size LR1, 1.5V
- DURACELL Alkaline, Type MN9100, Size N, 1.5V
- Energizer Alkaline; Type E90, LR1, 1.5V

Change only outside of hazardous location.

Module input
[Socket 1(+), 3(-), 4, 6 **or** internal plug St1 or St2]

Explosion protection class intrinsic safety EEx ib IIB;
Max. values:

U_o = 5 V
I_o = 55 mA
P_o = 68 mW
Characteristic curve: linear
C_i = 1.1 µF
L_i unconsidered small
Max. admissible outer values for:
(following values correspond to the computer program for PTB report ThEx-10)

L_o (mH)	**IIB**
	C_o (µF)
2	16
1	19
0.5	24

when connecting with an active module output in explosion protection class intrinsic safety with max. admissible values:

U_o = 6.5 V
I_o = 162 mA
P_o = 265 mW
Characteristic curve: linear
following max. admissible outer values are valid for the connection with the module: (these values correspond to the computer program for PTB report ThEx-10)

L_o (mH)	**IIB**
	C_o (µF)
2	6.9
1	9.9
0.5	12

2. Installation

2.1 Insert the batteries

Mounting steps:

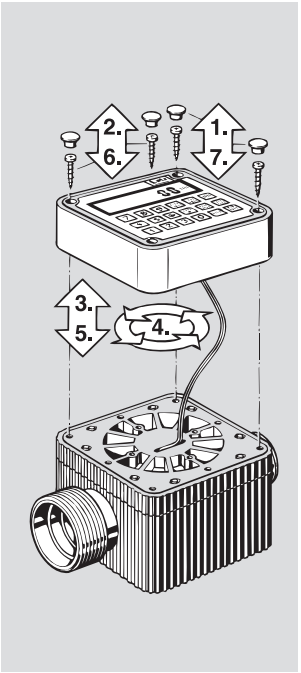
1. Unscrew the battery compartment lid **20**
2. Remove batteries from styrofoam buffer of packaging
3. Insert batteries, checking for correct polarity **19**
4. Screw on the battery compartment lid **20**

2.2 Turning the operating unit

The operating unit can be turned to the required position in 90°-steps.

Mounting steps:

1. Remove cap
2. Release screws
3. Carefully lift the operating unit, paying attention to cable length!
4. Turn the operating unit to the required position
5. Mount the operating unit
6. Tighten the screws
7. Mount the cap



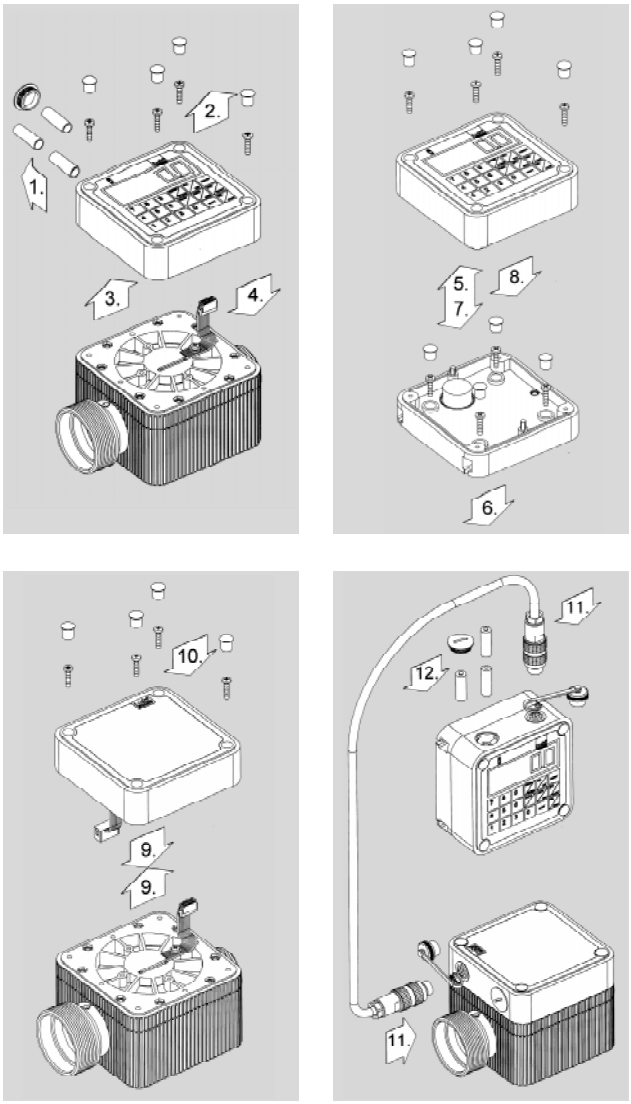
Turning the operating unit

2.3 Separate installation of the operating unit

Due to the modular construction of the flow meter system, it is possible to install the operating unit with or without relay module separately to the flow meter itself. For separate installation, a protection cap, an intermediate plate and a data line are required.

Mounting steps:

1. Remove batteries out of the operating unit
2. Remove the cap and release the screws
3. Carefully lift the operating unit, paying attention to cable length!
4. Release the plug
5. Remove the cap from the intermediate plate
6. Screw the intermediate plate onto a base (screws not included in the scope of supply)
7. Mount the cap
8. Screw the operating unit onto the intermediate plate and mount the cap
9. Connect the ribbon cable to the plug in the protection cap
10. Screw the protection cap onto the flow meter and mount the cap
11. Connect the operating unit and protection cap using the data line
12. Insert the batteries

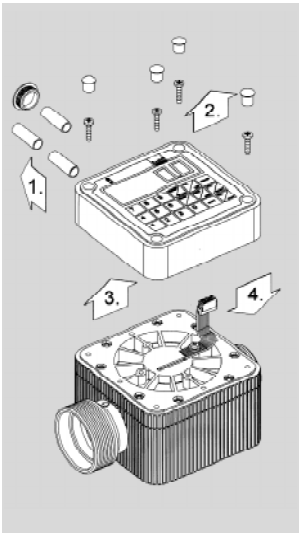


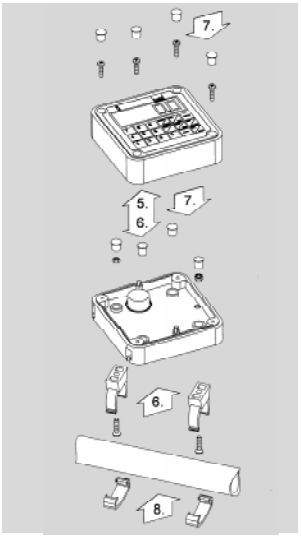
Separate installation of the operating unit

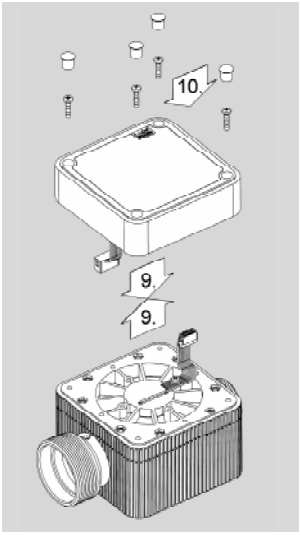
2.4 Hose installation of the operating unit

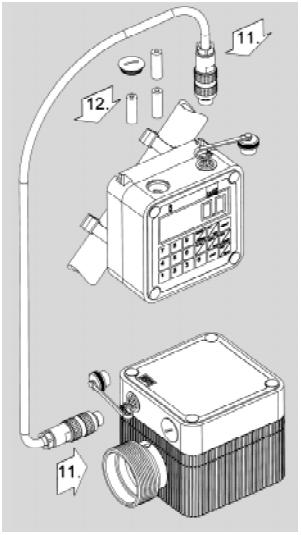
Mounting steps:

1. Remove the batteries out of the operating unit
2. Remove the cap and release the screws
3. Carefully lift the operating unit, paying attention to cable length!
4. Release the plug
5. Remove the cap from the intermediate plate
6. Screw the hose clamps under the intermediate plate and mount the cap
7. Screw the operating unit onto the intermediate plate and mount the cap
8. Press the hose into the hose clamps. Snap the clamp into place
9. Connect the ribbon cable to the plug in the protection cap
10. Screw the protection cap onto the flow meter and mount the cap
11. Connect the operating unit and protection cap using the data line
12. Insert the batteries









Assembly of the operating unit at the hose

3. Operation

☞ Following described key sequences must be pressed step by step.

3.1 Manual mode

In manual mode, the filling process is carried out using a manually operated nozzle. The part volume meter is reset to zero and the required volume is metered.

3.1.1 Resetting the part volume meter

Operation

Display

☞ Only possible in manual mode

3.1.2 Displaying totalizer

The totalizer adds all individual metering processes carried out in the manual or automatic mode.

Operation

Display

☞ The total volume appears as long as the key is depressed.

3.1.3 Displaying flow rate

Operation

Display

☞ The total flow rate appears as long as the key SPEED is depressed. The flow rate is displayed in the selected volume unit per minute.

3.1.4 Key lock in manual mode

Avoiding maloperations – as inadvertent calibration – all keys, except RESET, SPEED and TOT can be locked.

Operation **Display**

SHIFT

0 1 5 9

☞ The key lock appears in the display L. The key lock also remains if there is no power supply (battery). Releasing the key lock, press the key RESET and repeat the combination above.

3.2 Automatic mode

In automatic mode, a preselected volume can be repeatedly filled by pressing a key. To permit this function a relay module and a solenoid valve are required in addition to the flow meter (for installation see chapter D 2.2).

3.2.1 Switching between manual and automatic mode

Operation **Display**

SHIFT

AUTO / MAN

☞ Switching from automatic to manual mode is carried out in the same way. The display AUTO disappears.
☞ Switching between manual and automatic mode is only possible if a relay module is connected.

3.2.2 Entering the filling volume

Operation

Enter filling volume e.g. 50 LITRES

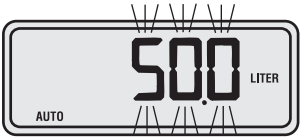
Display

5 0

SHIFT

ENTER / SPEED

The entered filling volume flashes



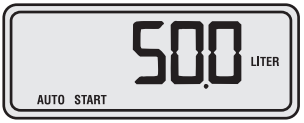
☞ Complete the input by pressing the ENTER key. To correct the filling volume, the input must have been completed (by pressing ENTER). It is then possible to enter a new filling volume.

3.2.3 Starting the filling process

Operation

Display

STO / START



☞ The process runs through to the end.
It can be interrupted at will and restarted.
0.0 appears on the display when the process has been completed correctly.

3.2.4 Interrupting the filling process

Operation

Display

RCL / STOP

☞ The filling process is resumed by pressing START (see chapter C 3.2.3).

☞ If the filling process is interrupted by the system without any apparent reason, there is a fault in the system and the self-protection device has been activated (remedy the fault).

3.2.5 Correcting the filling process

During the filling process, it is possible to correct the filling volume.
In this case, the already transported volume is offset against the new filling volume.

Operation

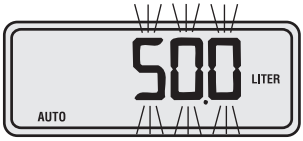
Display

Enter filling volume e.g. 50 LITRES

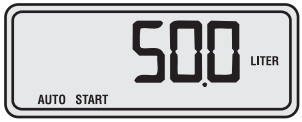
5 0

SHIFT

ENTER / SPEED — The entered filling volume flashes



STO / START



RCL / STOP — Display static

Enter filling volume e.g. 30 LITRES

3 0

SHIFT

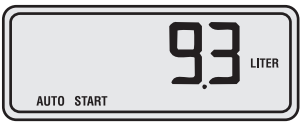
continued on next page

Operation **Display**

ENTER / SPEED

The entered filling volume flashes

STO / START



☞ The correction process is only successful if the new filling volume is greater than the volume which has already been transported.

3.2.6 Stopping filling process

Operation **Display**

RCL / STOP

SHIFT

RESET

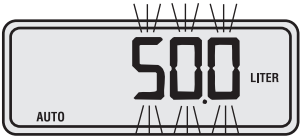
☞ It is possible to make a new input (see chapter C 3.2.2) or to repeat the current filling volume using the RESET key **(3)**.

3.2.7 Repeating a preselected volume

Operation **Display**

RESET

Filling volume flashes



☞ The entered filling volume flashes The filling process can be started (see chapter C 3.2.3).

3.2.8 Cycle counter

The cycle counter registers the number of filling cycles with the same volume filled. This means that the user does not have to count the cycles, e.g. when 100 containers have to be filled with the same volume. The cycle counter starts at zero again when a new filling volume is entered. Interrupted filling processes are not counted. Changing the SLOW quantity has no effect on the cycle counter.

Operation

Display

☞ The cycle counter is displayed as long as the key is depressed. It cannot be displayed while filling is in process.

3.2.9 Filling with step-by-step interruption (SLOW mode)

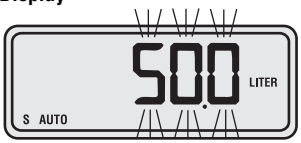
In the automatic mode, it is possible to carry out the filling process using two different flow volumes. This is particularly useful for fast, precise filling of large quantities, or when transporting a foaming medium.
Two solenoid valves arranged in parallel are required for this process. The valves are closed at different times, so reducing pressure surges in the system, and helping to avoid overflowing when transporting foam-forming media. A throttle element, such as a ball valve in line with the valve disconnected last, to regulate the flow volume is beneficial. The reduced flow speed volume is entered using the SLOW function.

3.2.9.1 Entering/deleting the SLOW volume

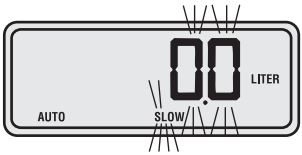
Operation

Display

Filling volume flashes



Actual SLOW volume flashes



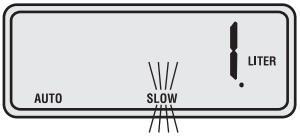
continued on next page

Operation

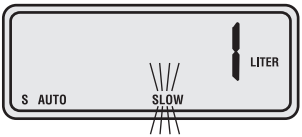
Enter slow volume, e.g. 1 litre (for deleting enter 0)

Display

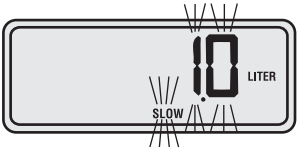
1



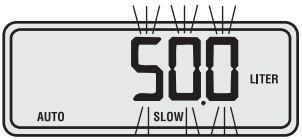
SHIFT



ENTER / SPEED



RESET



☞ If the SLOW volume is greater than the intended filling volume, the main valve remains closed during the entire filling process.

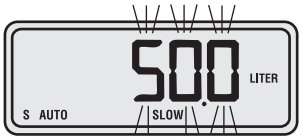
☞ Only possible in the automatic mode

3.2.9.2 Displaying the SLOW volume

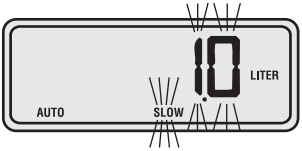
Operation

Display

SHIFT



SLOW / •



RESET

☞ Only possible in the automatic mode

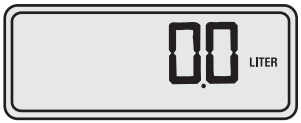
3.2.10 System protection through detection of faults

The filling process can be controlled automatically by the flow meter, since faults may develop in the connecting lines, such as running dry, blockages, defective solenoid valves, etc.

When the START key is pressed, the flow meter monitors the time during which no liquid is registered. The flow meter switches off when a certain time limit is exceeded. STOP appears on the display. The interruped filling process can be resumed by pressing START again when the fault has been remedied.

The monitoring time can be freely selected between 1 and 999 seconds. A time of 3 seconds is set by the manufacturer. The monitoring function is deactivated by entering 0.

☞ The monitoring time can only be changed in manual mode.

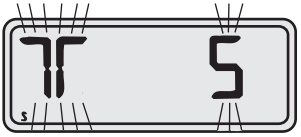
Operation	**Display**
RCL / STOP	
STO / START	
SLOW / .	
Enter the monitoring time, e.g. 5 seconds (enter 0 to deactivate the function)	
5	
SHIFT	

continued on next page

Operation **Display**

ENTER / SPEED

The new monitoring time flashes



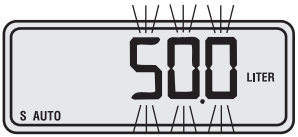
STO / START

3.2.11 Locking function automatic mode

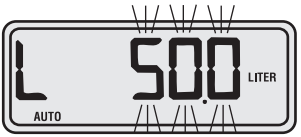
The locking function in automatic mode makes it impossible to change over to manual mode and prevents inadvertent input of a new filling volume. This helps to prevent operator errors when filling always the same volumes.
The following functions remain active even when the keypad is locked: RESET, START, STOP, totalizer (TOT), display flow rate (SPEED) and cycle counter (see chapter C 3.2.8).

Operation **Display**

SHIFT



CAL / TOT 1 5 9



☞ The key lock appears in the display L. The key lock also remains if there is no power supply.
The above combination must be entered again in order to deactivate the locking function.

3.3 Calibration

In the factory the meter is calibrated for the medium water transported at a mean flow rate of 40 l/min. Various operating conditions such as slower flow rates or the transportation of media with greater viscosity can result in measurement inaccuracy (see chapter B 1.6).

To adjust to these operating conditions, a changeable correction factor can be used to recalibrate the flow meter in manual mode. The correction factor is either entered directly or the electronic evaluating unit calculates the right correction factor according to a comparative measurement between the displayed and the actual filled volume.

The flow meter is also equipped with nine addressable memory locations (memory numbers 1-9), in which already ascertained correction factors can be stored and copied to the main memory (memory number 0) if required.

3.3.1 Calibration through comparative measurement

Operation **Display**

SHIFT

CAL / TOT

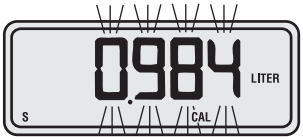
Fill the volume into a measurement vessel

Read the value on the measurement vessel and enter at numerical keypad

3 2

ENTER / SPEED

Calculated correction factor flashes



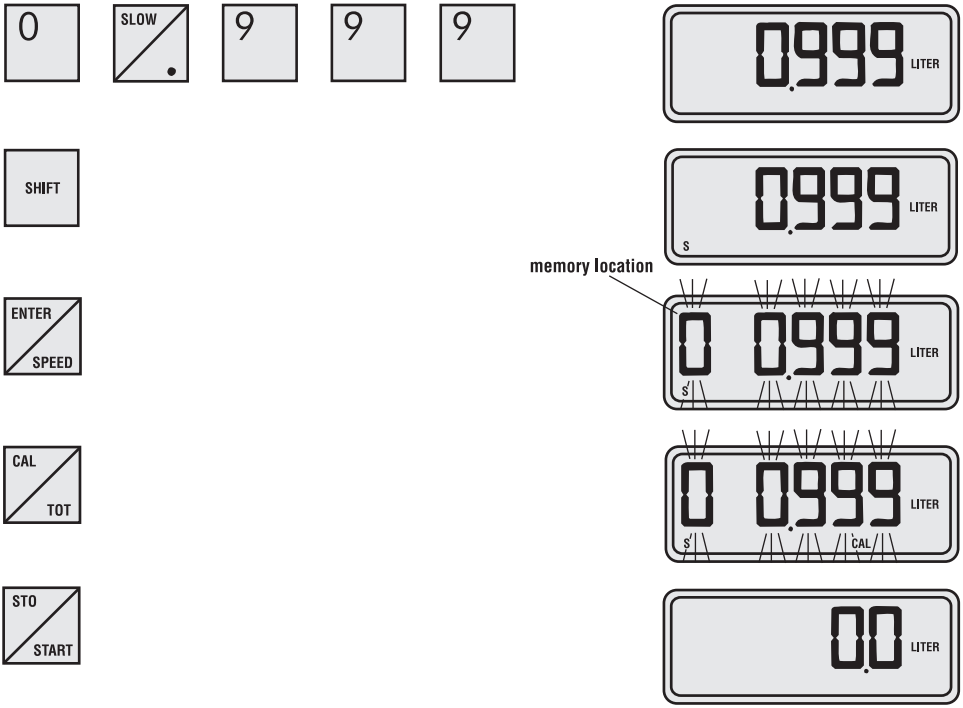
STO / START

☞ In automatic mode input is not possible (see chapter C 3.2.1).

3.3.2 Changing the correction factor in the main memory

Operation
Entering the correction factor

Display



☞ In automatic mode input is not possible (see chapter C 3.2.1).

3.3.3 Displaying the correction factor from the main memory

Operation

Display

continued on next page

Operation **Display**

CAL / TOT

RESET

☞ In automatic mode input is not possible (see chapter C 3.2.1).

3.3.4 Entering the correction factor into an addressable memory location

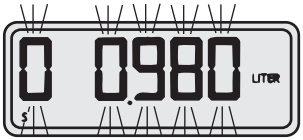
Operation **Display**

Entering the correction factor

0 SLOW / . 9 8

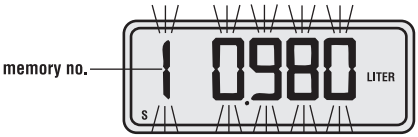
SHIFT

ENTER / SPEED



Entering the memory number

1



STO / START

☞ In automatic mode input is not possible (see chapter C 3.2.1).

3.3.5 Displaying the correction factor from an addressable memory location

Operation **Display**

SHIFT

RCL / STOP

Entering the memory number

1

RESET

☞ In automatic mode input is not possible (see chapter C 3.2.1).

3.3.6 Copying the correction factor from the main memory into the addressable memory location

Operation **Display**

SHIFT

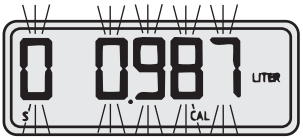
RCL / STOP

continued on next page

Operation **Display**

CAL / TOT

ENTER / SPEED



Entering the memory number

5

STO / START

☞ In automatic mode input is not possible (see chapter C 3.2.1).

3.3.7 Copying the correction factor from an addressable memory location into the main memory

Operation **Display**

SHIFT

RCL / STOP

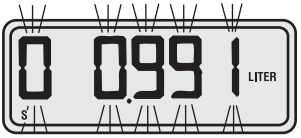
Entering the memory number

9

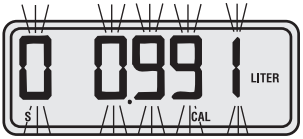
continued on next page

Operation **Display**

ENTER / SPEED



CAL / TOT



STO / START

☞ In automatic mode input is not possible (see chapter C 3.2.1).

3.3.8 Calculation of the correction factor in automatic mode

In the automatic mode direct calibration is not possible. However, the possibility of filling a preselected quantity into a measuring vessel and calculating the new correction factor then is given. Following steps are required:

- Enter filling volume (see chapter C 3.2.2)
- Start filling process (see chapter C 3.2.2)
- Change into manual mode at the end of filling process (see chapter C 3.2.1)
- Have correction factor displayed from the main memory (see chapter C 3.3.3)
- Calculate new correction factor according to the below formula

$$k_2 = \frac{V_M \cdot k_1}{V_V}$$

k_1 : Correction factor from the main memory
k_2 : New correction factor
V_V : Preselected volume
V_M : Read volume in measuring vessel

- Enter calculated correction factor into the main memory (see chapter C 3.3.2)

3.4 Special functions

3.4.1 Changing the unit of measurement

In manual mode the flow meter can be switched between the units of measurement litres, US-gallons and IMP-gallons without altering the calibration.

3.4.1.1 Unit of measurement litres

Operation

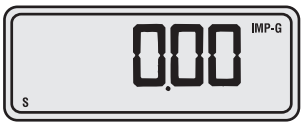
SHIFT

Number sequence 0123

0 1 2 3

☞ Only possible in manual mode

Display



3.4.1.2 Unit of measurement US-gallons

Operation

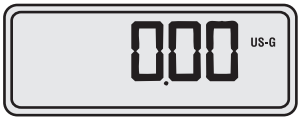
SHIFT

Number sequence 0456

0 4 5 6

☞ Only possible in manual mode

Display



3.4.1.3 Unit of measurement IMP-gallons

Operation

SHIFT

Number sequence 0789

0 7 8 9

☞ Only possible in manual mode

Display

3.4.1.4 Conversion of the flow volume in kilograms via the correction factor

For special applications, the flow meter is able to display the measured volume in a unit of mass such as kilograms. The correlation between volume V and mass m is ascertained using density ρ.

$$m = \rho \cdot V$$

If the correction factor for volume measurement is known (see chapter C 3.3.1 or correction factor diagram 3), this is offset with the density ρ. Convert the correction factor according to the below formula

$$k_2 = \rho \cdot k_1$$

k_1 : Correction factor after calibration
k_2 : Correction factor for display of the unit of mass
ρ : Fluid density

Example

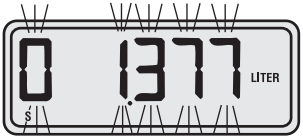
Operation
Enter the calculated correction factor k_2

Display

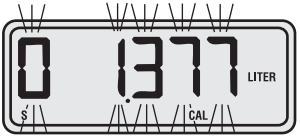
1 | SLOW / . | 3 | 7 | 7

SHIFT

ENTER / SPEED — The entered correction factor flashes



CAL / TOT — The entered correction factor flashes



STO / START

☞ The unit of volume (litres or gallons) displayed on the flow meter is now no longer valid.
Recommendation: Cover over the displayed unit of volume using a foil indicating the valid unit of mass.

3.4.2 Deleting totalizer

Operation **Display**

SHIFT

Number sequence 0357

0 3 5 7

CAL / TOT

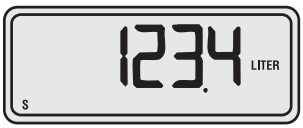
☞ Only possible in manual mode

3.4.3 Correcting operation errors

Using the key combination SHIFT + RESET, the flow meter is reset to the starting status of the manual or automatic mode.
This function is useful if the operating status of the meter is unclear, or when it does not respond to commands, or if the display does not indicate the desired result when making an input.

Operation **Display**

SHIFT



RESET

4. Maintenance and servicing
4.1 Changing the batteries

The flow meter is run on 3 alkaline manganese batteries LR 1, SIZE N. The LCD display indicates the approaching end of the battery life with the word „BATT“ **18**.

☞ If the „BATT“ display flashes, the batteries must be changed within 1-2 weeks.
Once the „BATT“ display is indicated permanently, the batteries require immediate changing.

Danger!
When changing the batteries in explosion hazard areas danger of explosion occurs!
Blast wave: Flying parts can cause death.
Change of battery only outside of hazardous location with appropriate tools. Only following battery types are approved:

- VARTA Electronic Alkaline; No. 4001; LR1; LADY; N; AM5
- DURACELL ALKALINE; SIZE N; MN9100; LR1
- Energizer Alkaline; E90; LR1; N

Mounting steps:
1. Unscrew the battery compartment lid **20**
2. Remove the batteries
3. Insert new batteries, checking for correct polarity **19**
4. Screw the battery compartment lid **20**
5. Press key RESET

☞ If the flow meter is not used for longer periods, the batteries must be removed!

D. Relay module RM1/RM3 and mains unit NG1

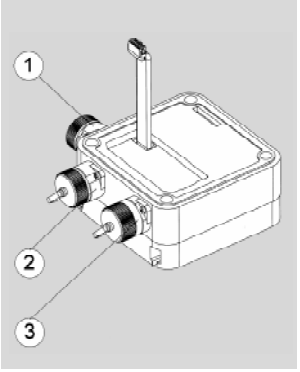
1. Proper use

For automatic mode (preselected volume), the relay module is required alongside the basic flow meter and operating unit modules. The relay module is controlled by the evaluating electronics of the operating unit and switches the external electrical appliances such as pump motor and solenoid valve. The electrical connection between the operating unit and relay module is effected by means of a 10-core ribbon cable.

The relay module RM1/RM3 or the mains unit NG1 includes a power supply for the operating unit. The batteries only then have a buffer function in the event of a power failure.

The relay module RM1 and RM3 are fitted with three sockets permitting the connection of external appliances ①,② and the power supply ③.

The mains unit NG1 is fitted only with a connection for the power supply ③.



Relay module

Danger!
Live mains connection!
Electric shocks can cause death.
An operating unit or a protection cap must be mounted to the relay modules RM1, RM3 or to the mains unit NG1 as protection against touching and contact with water.

Caution!
The electromagnetic compatibility of the device is compatible with the emitted interference and interference immunity for residential and industrial areas. To avoid interfering influences in a decentralised installation of individual modules, only use data cables from the Lutz company and route the data cables separate from low-voltage lines.

1.1 Technical data

Type	RM1 230 V	RM1 120 V	RM3 400/230 V	NG1 230 V
Voltage	220-240 V	110-125 V	230/400 V	220-240 V
Frequency	50 – 60 Hz			
Switching outputs	2 switching outputs (potentially bound)			–
Pump switching current	4 A, cosφ > 0.7	8.5 A, cosφ > 0.7	16 A, cosφ > 0.7	–
Solenoid valve switching current	0.5 A			–
Typ of protection	IP 44			
Explosion protection class	[EEx ib]	–	–	–
Connections	round connector			
Weight	440 g	430 g	634 g	290 g
Order No.	**0212-020**	**0212-030**	**0212-060**	**0212-090**

1.2 Application in explosion hazard areas

Danger!
Danger of explosion!
Combustion hazard. Blast wave: Flying parts can cause death.
The relay module RM1, the mains unit NG1 and the connecting cables are not suitable for use in explosion hazard areas!
If the relay module itself is not located in an explosion hazard area the relay module RM1 230 V may supply the power and signals to the operating unit in zone 1.
For this application the relay module must be used with an ambient temperature of -20 up to +40°C. This temperature range is also applied to the measured liquid when the relay module is mounted on the basic flow meter.

1.2.1 Electrical data

Input:
(ST3)

U = 220 - 240 V ~
I_{max} = 8 A
cos φ > 0.7
P_{max} = 1760-1920 W

Outputs:
Output 1 (Pump):
(ST4 and ST5)

U = 220 - 240 V ~
I_{max} = 4 A
cos φ > 0.7
P_{max} = 880 - 960 W

Output 2 (Valve):
(ST4 and ST5)

U = 220 - 240 V ~
I_{max} = 0.5 A
cos φ > 0.7
P_{max} = 77 - 84 W

Output intrinsic safety
(ST1 or ST2)

U = 6.6 V =
I = 165 mA
P = 272 mW

Max. admissible outer values for:

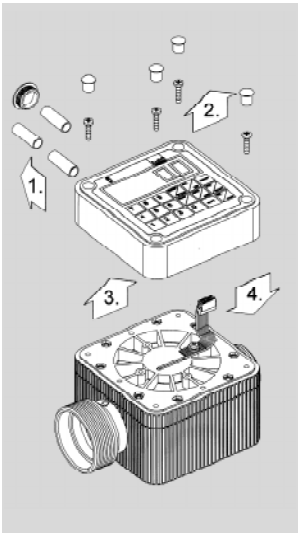
L (mH) 2	C (mF) 1
1	1.6
0.5	2.2
0.2	3
0.1	3.8

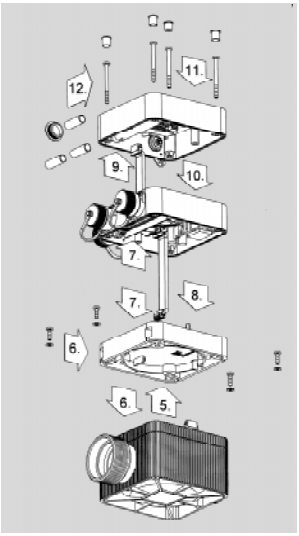
2. Installation

2.1 Retrofitting the relay module/mains unit

Mounting steps:

1. Remove batteries out of the operating unit
2. Remove the cap and release the screws
3. Carefully lift the operating unit, paying attention to cable length!
4. Release the plug
5. Plug the connector in the socket on the underside of the intermediate plate
6. Carefully mount the intermediate plate in the desired position and tighten up the screws
7. Plug the connecting cable in the socket on the topside of the intermediate plate and on the circuit board of the relay module/ mains unit
8. Mount the relay module/mains unit onto the intermediate plate
9. Plug the ribbon cable of the relay module/mains unit into the socket on the circuit board of the operating unit
10. Mount the relay module/mains unit onto the intermediate plate
11. Tighten the screws and replace the cap
12. Insert the batteries





Retrofitting of the relay module

2.2 Connection for automatic mode

A number of ready-configured cables are available for connecting up external units:

① Power supply cable relay module RM1/mains unit NG1, 5 m long (Order No. 0211-155)

② Connecting cable main valve, 5 m long (Order No. 0211-150)
For actuation of a solenoid valve via the relay module RM1or RM3.

③ Connecting cable SLOW-valve, 5 m long (Order No. 0211-151)
Using this cable, a second solenoid valve can be actuated in conjunction with the cable set motor/SLOW, 3-way.

④ Connecting cable motor/SLOW 1-way, 0.5 m long (Order No. 0211-153)
To actuate a pump motor or second solenoid valve via the relay module RM1.

⑤ Connecting cable motor/SLOW 3-way, 0.5 m long (Order No. 0211-154)
This cable is required for connection of 3 external appliances such as motor and two solenoid valves.

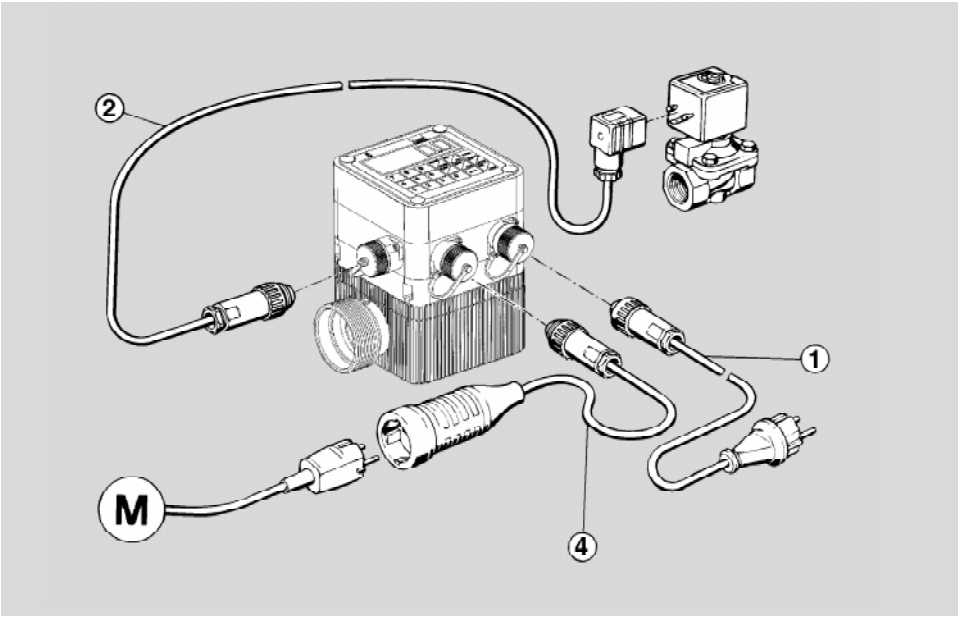
⑥ Power supply cable RM3 230 V, 5 m long (Order No. 0211-387)
For A.C. power supply of the relay module RM3.

⑦ Connecting cable motor 230 V, 0.5 m long (Order No. 0211-385)
For actuation of an A.C. driven pump motor via the relay module RM3.

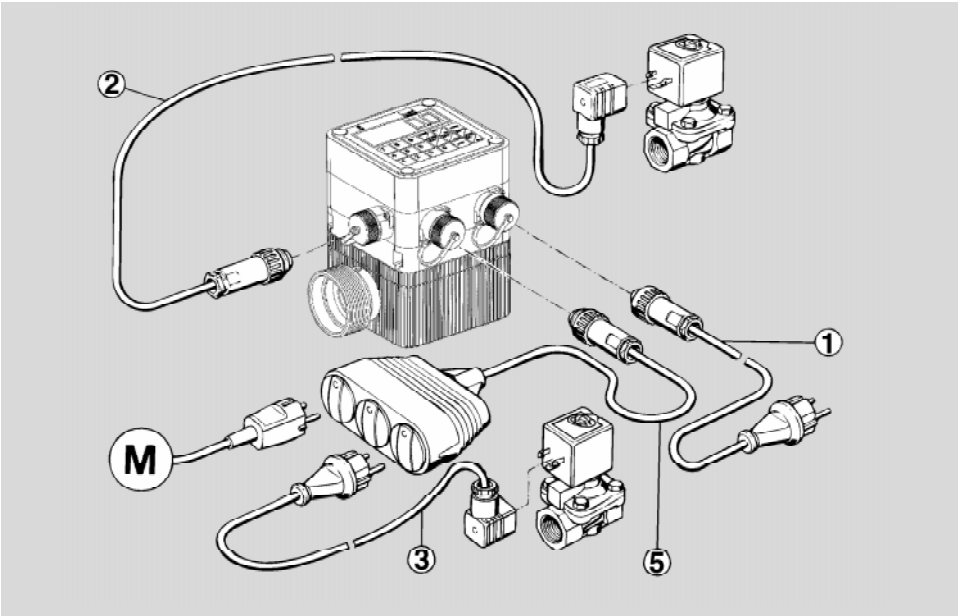
⑧ Power supply cable RM3 400 V, 5 m long (Order No. 0211-388)
For 3-phase current power supply of the relay module RM3.

⑨ Connecting cable motor 400 V, 0.5 m long (Order No. 0211-286)
For actuation of a 3-phase current driven pump motor via the relay module RM3

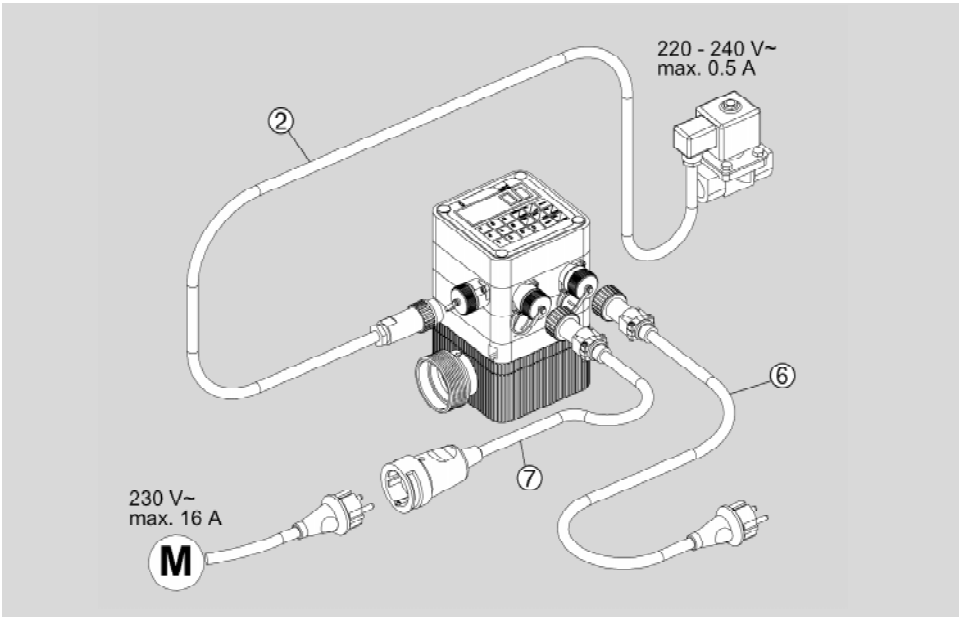
● Extension cable, 5 m long (Order No. 0211-152) (without illustration.)
For extension of the connecting cables ①,②,④,⑤.



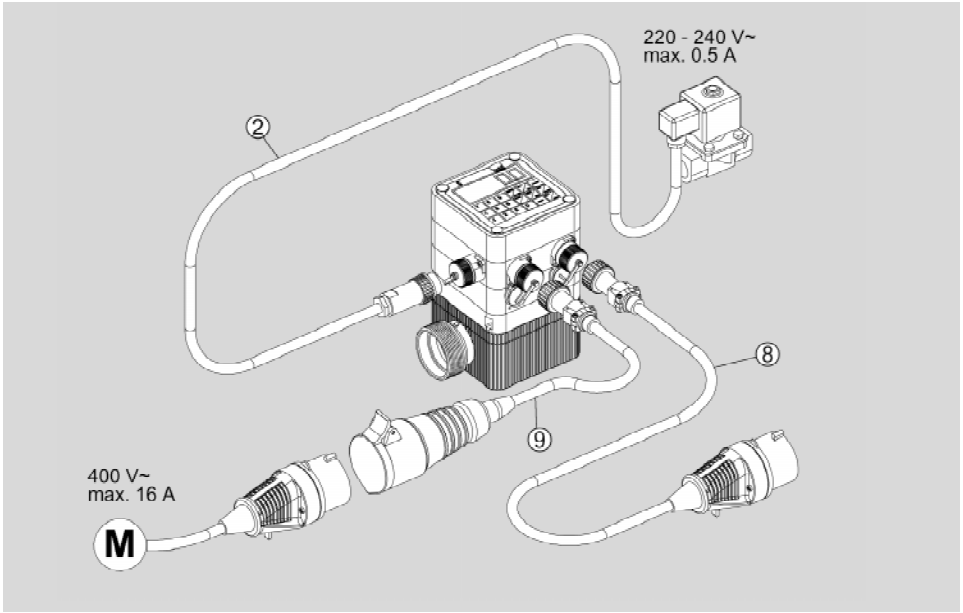
Relay module RM1: Connection of pump motor and solenoid valve



Relay module RM1: Connection of pump motor, main valve and SLOW valve



Relay module RM3: Connection of pump motor (AC) and solenoid valve



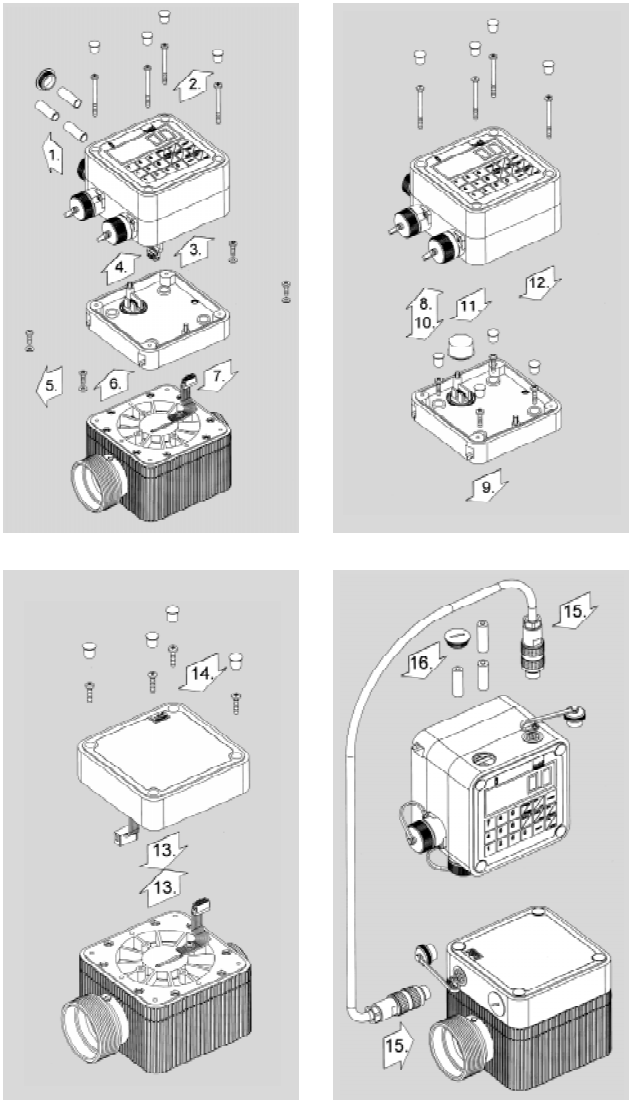
Relay module RM3: Connection of pump motor (3-phase current) and solenoid valve

2.3 Flow meter with separate installation of relay module/mains unit and operating unit

Danger:
Live mains connection!
Electric shocks can kill you.
Disconnect the relay module/mains unit by pulling the plug from the power supply before dismantling!

Mounting steps:

1. Remove batteries out of the operating unit
2. Remove the cap and release the screws
3. Carefully lift the operating unit and relay module/mains unit, paying attention to cable length!
4. Loosen the connector from the intermediate plate
5. Unscrew the intermediate plate
6. Carefully remove the intermediate plate, paying attention to cable length!
7. Loosen the connector from the intermediate plate
8. Remove the cap from the intermediate plate
9. Screw the intermediate plate onto a base (screws not included in the scope of supply)
10. Mount the cap
11. Insulate the intermediate plate using the cap
12. Screw the operating unit and relay module/mains unit onto the intermediate plate and mount the cap
13. Connect the ribbon cable to the plug in the protection cap
14. Screw the protection cap onto the flow meter and mount the cap
15. Connect the operating unit and protection cap using the data line
16. Insert the batteries

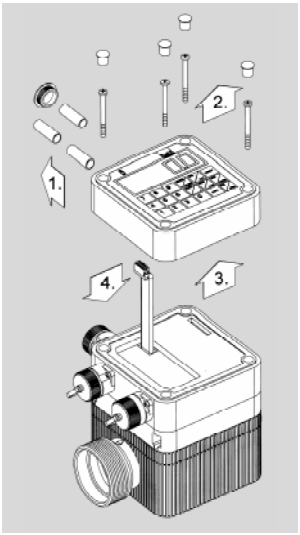


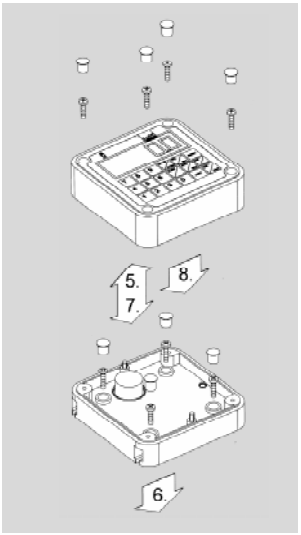
Separate installation of relay module/mains unit and operating unit

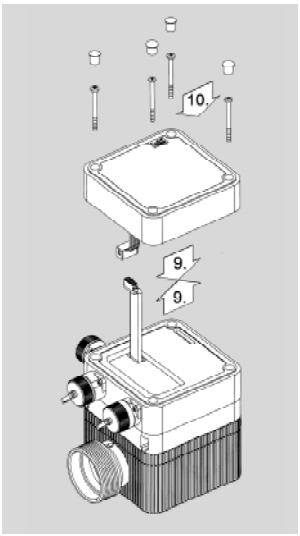
2.4 Flow meter with relay module/mains unit and separate installation of operating unit

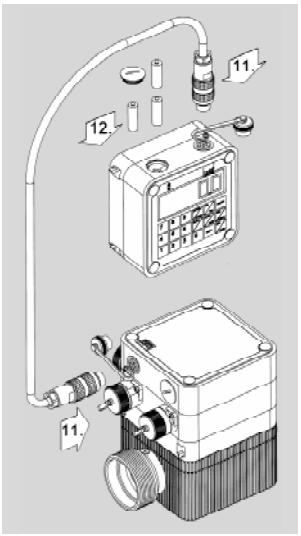
Danger!
Live mains connection!
Electric shocks can kill you.
Disconnect the relay module/mains unit by pulling the plug from the power supply before dismantling!

Mounting steps:
1. Remove batteries out of the operating unit
2. Remove the cap and release the screws
3. Carefully lift the operating unit, paying attention to cable length!
4. Loosen the connector from the circuit board of the operating unit
5. Remove the cap from the intermediate plate
6. Screw the intermediate plate onto a base (screws not included in the scope of supply)
7. Mount the cap
8. Mount the operating unit on the intermediate plate using the short screws supplied with the protection cap, and then mount the cap
9. Connect up the cable between the relay module/mains unit and the protection cap
10. Screw the protection cap and relay module/mains unit onto the flow meter using the long screws and replace the cap
11. Connect the operating unit and protection cap using the data line
12. Insert the batteries









Separate installation of the operating unit

3. Maintenance and servicing

3.1 Changing the fuse in the relay module/mains unit

Danger!
Live mains connection!
Electric shocks can kill you.
Disconnect the relay module / mains unit by pulling the plug from the power supply before dismantling!

Danger!
Danger of explosion from short circuit!
Combustion hazard. Blast wave: Flying parts can kill you.
Only use the types of fuses listed below. The unit can be damaged and the explosion protection is at risk if higher fusing ratings are used.

As the blowing of a fuse generally precedes a fault, have the unit checked by an electrical specialist before changing a fuse.

The units are adequately protected when 5 x 20 mm IEC 127 finewire fuses are used:

	RM1 230 V	RM1 120 V	RM3	NG1 230 V
Power supply SI3:	0.1 A semi time-lag (mT)	0.1 A semi time-lag (mT)	0.1 A semi time-lag (mT)	0.1 A semi time-lag (mT)
Motor connection SI1:	4 A time-lag (T)	6.3 A time-lag (T)	fuse protection by mains supply with max. 16 A	–
Valve output SI2:	0.5 A semi time-lag (mT)	0.5 A semi time-lag (mT)	0.5 A semi time-lag (mT)	–

1. Pull out the plug of the relay module/mains unit
2. Remove the cap and release the screws
3. Carefully lift the operating unit/protection cap and relay module/mains unit, paying attention to cable length!
4. Release the reed contact plug
5. Check the finewire fuses and replace if necessary
6. Connect the reed contact plug
7. Mount the relay module/mains unit with operating unit/protection cap onto the flow meter
8. Tighten the screws and replace the cap

E. Relay module Ex-RM1m

1. Proper use

For automatic mode (preselected volume), the relay module is required alongside the basic flow meter and operating unit modules. The relay module is controlled by the evaluating electronics of the operating unit and switches the external electrical appliances such as pump motor and solenoid valve. The electrical connection between the operating unit and relay module is effected by means of a 10-core ribbon cable.

The relay module Ex-RM1m includes a power supply for the operating unit. The batteries only then have a buffer function in the event of a power failure.

The relay module Ex-RM1m is supplied in two versions.

- The basic version of the Ex-RM1m B 230 V is without fuses, cable glands or cabling for customer-specific applications. Particular attention shall be paid in the following chapters to the requirements on components not included in the scope of supply.
- The full version Ex-RM1mK 230 V includes cable glands, 5 m power supply cable with Ex-plug, fusing elements with 0.5 m connecting cable and Ex-couplings for pump and valve.

The relay module Ex-RM1m consists of three housing parts. The upper section houses the potted electronics. The lower section is designed as the connection compartment in the method of explosion protection „e“ for increased safety. The connections are made here for the power supply, pump and the solenoid valve. The lower housing connection constitutes an intermediate plate so that it can be mounted to the lower body of the flow meter or to any permanent base (e.g. wall, mounting plate). The upper connection of the relay module forms part of a further module from the system.

1.1 Technical data

Danger!
Fire and explosion hazard due to electric current.
Combustion hazard. Blast wave: Flying parts can cause death.
Compliance with the following electrical characteristics is required.

Type	**Ex-RM1m B 230 V**	**Ex-RM1m K 230 V**
Voltage	220 - 240 V, 50 – 60 Hz	
Input supply terminals 1+2	max. 8 A, cosφ > 0.7 max. 1760-1920 W	
Switching outputs	2 switching outputs (potentially bound)	
Output 1 (Pump) terminals 3+5	max. 4 A fuse on construction side, cosφ > 0.7, max. 880-960 W	4 A fuse, cosφ > 0,7 max. 880-960 W
Output 2 (Valve) terminals 4+5	max. 4 A fuse on construction side, cosφ > 0.7, max. 880-960 W	0.5 A fuse max. 110–120 W
Type of protection	IP 54	
Explosion protection class	EEx me[ib] IIC T4	
Connections	terminal block, no screw	
Electronics	completely potted	
Accessories	Basic version without fuses, cable glands and cables. For customer-specific applications.	Full version with fuses, cable glands, 5 m mains connecting cable with Ex-plug, 0.5 m connecting cable with Ex-coupling for pump and valve.
Weight	1000 g	3000 g
Order No.	**0212-040**	**0212-050**

1.1.1 Special conditions (Ex-RM1m B 230 V)

As a protection against short circuits, a fusing of appropriate rating (max. 3 x I_B according to DIN 41571 or IEC 127) for the designed current rating, or a starting circuit-breaker with short-circuit and instantaneous thermal (set to the design current) release, must be connected in series for each relay module Ex-RM1. This fuse either can be positioned in the appropriate power supply or has to be connected before the device. The fuse-design current must be equal to or greater than the given voltage rating for the relay module. The breaking capacity of the fuse used must be equal to or greater than the maximum short-circuit current (normally 1500 A) that can be assumed for the location of installation.

If the pump and the valve are protected in the connecting compartment of the relay module from short circuits, then the design voltage for the fuse must be equal to or greater than the given voltage rating for the pump or valve. The breaking capacity of the fuse used must be equal to or greater than the maximum short-circuit current (normally 1500 A) that can be assumed for the location of installation. If the breaking capacity of the installed fuse differs from this, then the value for the maximum admissible short-circuit current shall be indicated on the relay module.

2. Installation

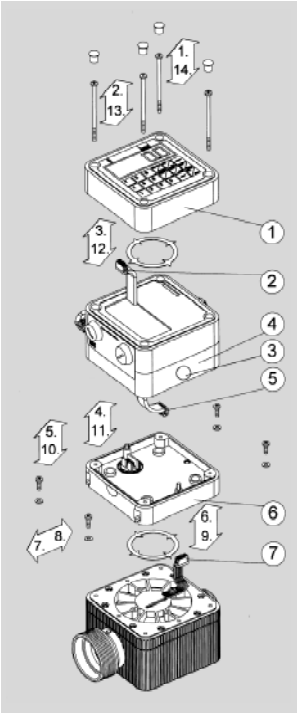
2.1 Installation location

The relay module Ex-RM1m can be mounted to the lower body of the flow meter or to any permanent base (e.g. wall, mounting plate). The upper connection of the relay module forms part of a further module from the system. The completely mounted system meets the requirements of protection class IP 54.

Caution!
The electromagnetic compatibility of the device is compatible with the emitted interference and interference immunity for residential and industrial areas. To avoid interfering influences in a decentralised installation of individual modules, only use data cables from the Lutz company and route the data cables separate from low-voltage lines.

2.2 Dismantling/Assembly

2.2.1 Dismantling



1. Remove the cap
2. Release the screws
3. Carefully lift off the top module ① and pull off the connector ②
4. Cut through the transportation protection ③ carefully lift off the relay module ④ and pull off the connector ⑤
5. Release the screws
6. Carefully lift off the intermediate plate ⑥ and pull off the connector ⑦
7. Take out the screws with washers from the groove in the intermediate plate ⑥

2.2.2 Assembly

Caution!
Pinching the electrical leads can damage the unit.
When assembling the unit, do not route electrical connections at points where these can be pinched.

8. Insert the screws and washers in the groove of the intermediate plate ⑥. Screws to be used: Stainless steel flow meter – screws with metric threads / plastic flow meter – screws with cutting threads
9. Plug in the connector ⑦ and carefully mount the intermediate plate ⑥ such that the points ③ on the intermediate plate coincide with the points on the relay module ④
10. Tighten the screws
11. Insert the connector ⑤ and carefully mount the relay module ④
12. Insert the connector ② and carefully mount the top module ① in the desired position
13. Tighten the screws
14. Insert the cap

2.3 Electrical connection

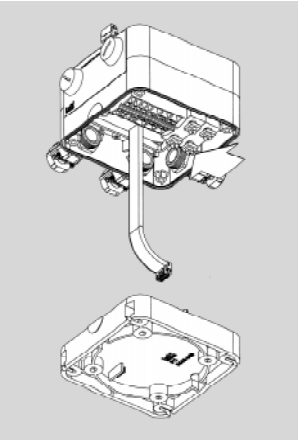
Danger!
Live mains connection!
Electric shocks can kill you.
The electrical connections may only be carried out by qualified personnel – a trained electrician. The power supply shall be disconnected and prevented from accidental re-connection throughout duration of the work.

Ensure before connecting the relay module that:

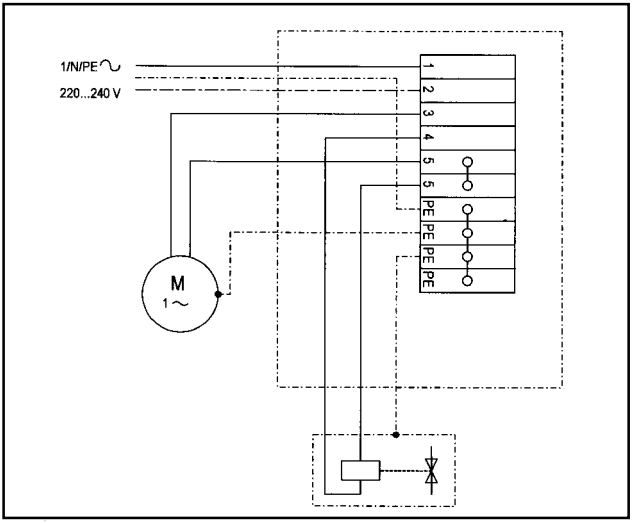
- The values for voltage and frequency given on the nameplate agree with the data for the mains.
- The mains connection is fused in accordance with chapter E 1.1 and 1.1.1
- All poles of the mains connection have been disconnected when permanently connecting the relay module.
- Atex-approved cable protection covers are used.
- Metal cable entries with grounding tongues connected to the protective conductor.
- Cables of the design HO7RN-F 3G1.5 are used.

2.3.1 Connecting the basic version Ex-RM1m B 230 V

The electrical connection between the mains, the pump and solenoid valve is made in the connecting compartment on the underside of the relay module.



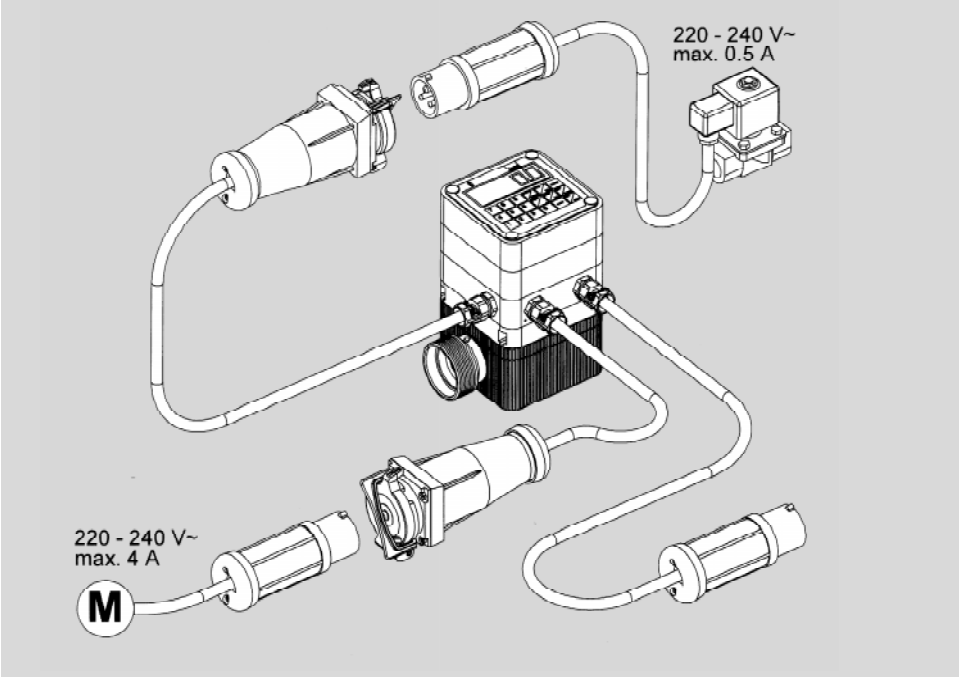
The relay module Ex-RM1m must be dismantled in accordance with steps 1-4 of chapter E 2.2.1 when the flow meter system is mounted. The electrical connection is made in accordance with the following circuit diagram:



Refer to chapter E 1.1 (Technical data) when making electrical connections

2.3.2 Connecting the complete version Ex-RM1m K 230 V

The electrical connection is made using explosion proof plug-in connections from the CEAG system. The mains is connected to the explosion proof plug. The maximum rating of the fuse for mains outlet socket shall be 16 A. Pump and solenoid valve are connected to the two explosion proof couplings of the relay module. Maximum load: Pump 4 A, solenoild valve 0.5 A.

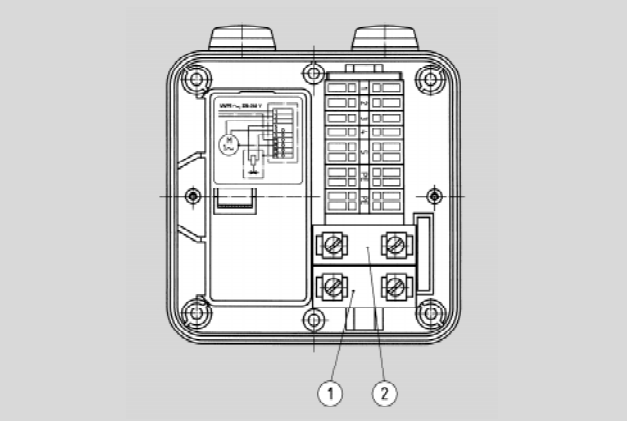


3. Maintenance and servicing

3.1 Changing the fuse

The relay module Ex-RM1m in the full version Ex-RM1m K 230 V includes two fusing elements to protect the outputs for pump and solenoid valve in the connecting compartment.

① **Pump:**
Fusing element Ex 4 A
semi time-lag
③ **Solenoid valve:**
Fusing element Ex 500 mA
semi time-lag



Danger!
Live mains connection!
Electric shocks can kill you.
Replacing the fuse may only be carried out by qualified personnel – a trained electrician. The power supply shall be disconnected and prevented from accidental re-connection throughout duration of the work. As the blowing of a fuse generally precedes a fault, have the unit checked before changing the fusing elements.

Danger!
Fire and explosion hazard due to electric current.
Combustion hazard. Blast wave: Flying parts can kill you.
Use only original fusing elements.

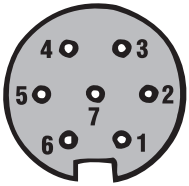
1. To replace the fuses, dismantle the relay module in accordance with steps 1-4 of chapter E 2.2.1
2. Disconnect the defective fusing element and remove from the top hat rail.
3. Snap a new fusing element onto the top hat rail and connect.
4. Mount the relay module in accordance with steps 11-14 of chapter E 2.2.2

F. Repairs

Repairs should only be made by the manufacturer or authorized Lutz-dealers.
Only use genuine Lutz spare parts.

G. Annex

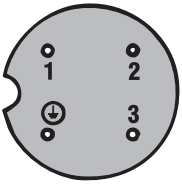
1. Terminal assignment of cables and connectors



1 Plus (Battery approx. 4.5 V, Relay module approx. 5 V)
2 Counting impulse
3 Minus
4 Relay pump
5 Not in use
6 Relay valve
7 Not in use

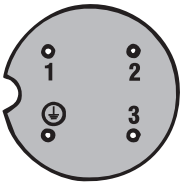
Data outlet operating unit

Terminal assignment of data line



1 + 2 ~ 110-230V / 50-60 Hz
3 Not in use
⏚ Earth conductor

Relay module – mains connection



1 Neutral conductor
2 Pump motor / SLOW valve
3 Main valve
⏚ Earth conductor

Relay module – connection of external electrical appliances

Operating mode	Fault	Cause	Remedy
General	No liquid registered	Correction factor 0 in the main memory	Calibrate flow meter (chapter C 3.3)
	Measured quantity differs significantly from the actual quantity	Correction factor does not match operating conditions	Calibrate flow meter (chapter C 3.3)
		Wrong unit of measure set	Set correct unit of measure (chapter C 3.4.1)
		Leaks in hose system	Install check valve if necessary
		Radio interference on the data line	Place data line separate from low-voltage conduits
	Liquid leaks from the housing	Seal defective	Replace seal
		Hairline cracks in housing and/or on screw connection due to mechanical influences	Check installation conditions for mechanical stresses and correct them
		Screw connection not tightened securely	Check that screw connections are secure
		Operating pressure exceeded, pressure surges e.g. due to water hammer	Check pressure conditions
		Inadequate chemical resistance	Contact manufacturer
	Throughput decreases	Filter screen soiled	Remove and clean filter screen
		Measuring chamber soiled	Flow meter must be flushed and cleaned regularly after handling aggressive, tacky, crystallizing or very contaminating liquids
Manual mode	„Batt“ indication flashes or remains permanently on	End of battery service life	Replace batteries (chapter C 4.1)
	No indication after changing batteries	Batteries fitted incorrectly	Open battery compartment and check polarity
		Battery contacts corroded	Clean contacts
Automatic mode	No liquid registered Filling process interrupted by flow meter	Dry running	Prevent air pockets in connecting lines, use a solid hose system
	„STOP“ appears on display	Solenoid valve does not open	Check solenoid valve
		Time required to fill the connecting lines exceeds the set monitoring time	Increase monitoring time (chapter C 3.2.10)

Operating mode	Fault	Cause	Remedy
Automatic mode		Swash plate blocked	Clean flow meter, check resistance
		Fuse in relay module defective	Check fuses (chapter D or E 3.1)
	No liquid delivered after starting, 0.0 appears on display	Correction factor too high	Reduce correction factor, recalibrate flow meter
	Solenoid valve does not operate, pump is running	Cable connection interrupted	Check connecting cable and secure fit of plug connections (chapter D 2.2)
		Fuse in relay module defective	Check fuses (chapter D or E 3.1)
		Solenoid valve blocked	Check solenoid valve and clean if necessary
		SLOW value exceeds entered filling volume	Reduce SLOW value (chapter C 3.2.9)
	Pump motor will not start, solenoid valve switches	Motor switched off	Switch on motor
		Pump motor with low-voltage release switches off automatically	Use pump motor without low-voltage release
		Cable connection interrupted	Check connecting cable and secure fit of plug connections (chapter D 2.2)
Separate installation of control unit and/or relay module	Occasional transmission errors Display OK, but operator inputs impossibe	Data line exposed to strong electromagnetic fields (large machines, power cables, etc.)	Data line must be shielded against electromagnetic interference
		Data line defective	Check data line for damage and secure fit of plug connection (chapter D 2.3 and 2.4)

Lutz - Pumpen
GmbH & Co. KG
Erlenstraße 5-7
D-97877 Wertheim

Declaration of Conformity

Herewith we declare that the below-mentioned machine in it's conception and design and in the execution marketed by us fully complies with the EC directives.

This declaration ceases to be valid if the machine is modified in any way without prior consultation with us.

Type of device: **Modular Flow Meter System**

Types:

Operating unit BE1	**Relay module RM1 230V**
Operating unit Ex-BE1	**Relay module RM1 120V**
Operating unit BE1 V	**Relay module Ex-RM1m 230 V**
Operating unit Ex-BE1 V	**Relay module RM3 400/230 V**
	Mains unit NG1 230V

Applicable EC directives:

EC Directive on low voltage installations (73/23/EEC) (only RM1 120 V, RM3, NG1)
EC Directive on electromagnetic compatibility (89/336/EEC) as amended by 93/31/EEC
Equipment and protective systems intended for use in potentially explosive atmospheres 94/9/EC (only Ex-BE1, Ex-BE1 V, RM1 230V, Ex-RM1m)

EC-Type examination:

Physikalisch-Technische Bundesanstalt 0102, Bundesallee 100, 38116 Braunschweig,
PTB 01 ATEX 2204 (Operating unit Ex-BE1, Ex-BE1V)
PTB 00 ATEX 2135 X (Relay module Ex-RM1m)
PTB 03 ATEX 2093 (Relay module RM1 230V)

Applicable harmonized standards, in particular

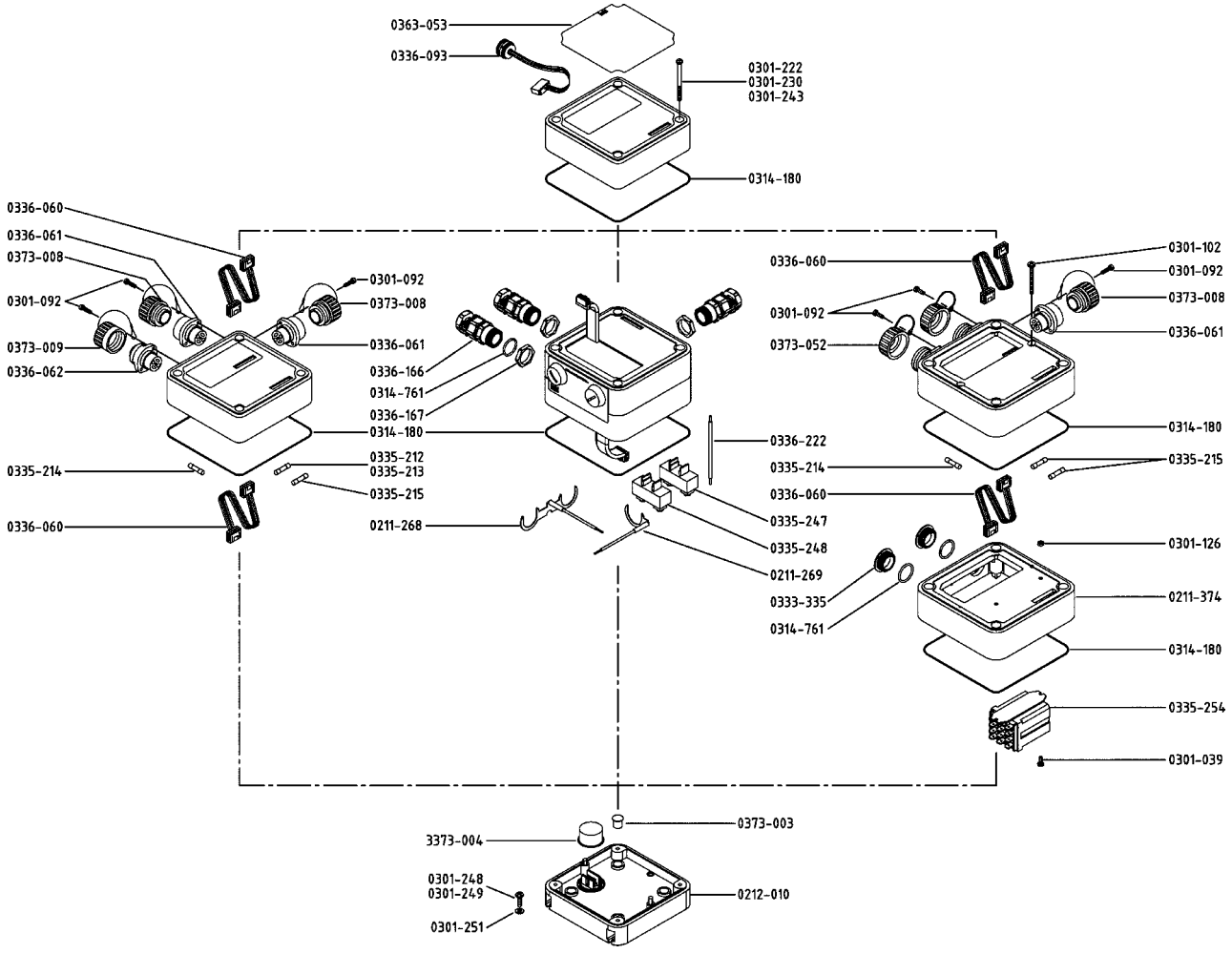
EN 50014	(Ex-BE1, Ex-BE1 V, RM1 230V, Ex-RM1m)
EN 50019	(Ex-RM1m)
EN 50020	(Ex-BE1, Ex-BE1 V, Ex-RM1m, RM1 230V)
EN 50028	(Ex-RM1m)
EN 55014	
EN 61000-3-2	(RM1)
EN 50082-2	

Wertheim, 28.01.04

Jürgen Lutz, Managing Director

Spare Part List
Accessories for Modular Flow Meter System

Order No.		Description		Qty.
0211-225		PE transformer cpl.		1
0211-235		impulse adapter 1/4" NPT cpl.		1
0211-236		impulse adapter 3/8" NPT cpl.		1
0211-237		impulse adapter 1/2" NPT cpl.		1
0211-238		impulse adapter 3/4" NPT cpl.		1
0211-239		impulse adapter 1" NPT cpl.		1
0211-268		grounding plate 2-fould		1
0211-269		grounding plate 1-fould		1
0211-374	+	cover for relay		1
0212-010		intermediate plate	consisting of: 0301-248, 0301-249, 0301-251, 0373-003, 3373-004	1
0300-065		screw		2
0301-039	+	phillips screw		2
0301-092		ejot-PT-screw		12
0301-102	+	ejot-PT-screw		2
0301-126	+	hexagon nut		2
0301-222		ejot-PT-screw	(for relay module RM1)	4
0301-243		ejot-PT-screw	(for relay module Ex-RM1m and RM3)	4
0301-248		ejot-PT-screw	(for types ST, SL, LM, UN)	4
0301-249		screw	(for type VA I)	4
0301-251		washer		4
0302-150		quick change screw		3
0302-151		hose connector		1
0303-153		plastic hose		3
0314-180		o-ring NBR		5
0314-761		o-ring Perbunan		3
0333-335	+	locking screw		2
0335-212		finewire fuse 6.3A, time-lag	(for relay module 120V)	1
0335-213		finewire fuse 4 A, time-lag	(for relay module 230V)	1
0335-214		finewire fuse 0.1 A, semi time-lag	(for relay module RM1)	1
0335-214	+	finewire fuse 0.1 A, semi time-lag	(for relay module RM3)	1
0335-215		finewire fuse 0.5 A, semi time-lag	(for relay module RM1)	1
0335-215	+	finewire fuse 0.5 A, semi time-lag	(for relay module RM3)	2
0335-247		fuse Ex, 4A		1
0335-248		fuse Ex, 500mA		1
0335-254	+	relay		1
0336-060		connecting cable relay module		4
0336-061		socket		3
0336-062		plug		1
0336-093		flange box cpl.		1
0336-095		plug		1
0336-096		angle coupling		1
0336-099		coupling		1
0336-106		coupling plug		4
0336-162		power cable relay module Ex-RM1m	consisting of: 0336-536	1
0336-164		connecting cable, valve	consisting of: 0336-533	1
0336-165		connecting cable, pump	consisting of: 0336-533	1
0336-166		cable protect. cov. Ex, PG 13.5		3
0336-167		nut, PG 13.5		3
0336-222		connecting wire	fuse - strip terminal	2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0336-062
0335-214
0336-060
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0335-212
0335-213
0335-215
0336-166
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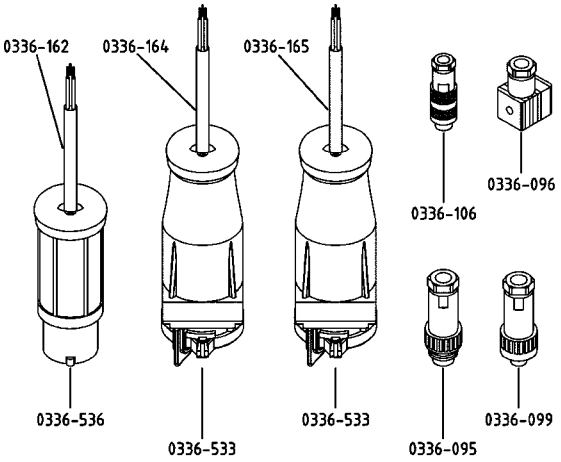
0211-269
0336-060
0301-102
0301-092
0373-008
0301-092
0373-052
0336-061
0314-180
0335-214
0335-215
0336-060
0301-126
0211-374
0333-335
0314-761
0314-180
0335-254
0301-039
0373-003
3373-004
0301-248
0301-249
0301-251
0212-010

Order No.		Description		Qty.
0336-533		explosion proof coupling 3-pole		2
0336-536		explosion proof plug 3-pole		1
0363-053		protection foil		1
0373-003		cap		4
0373-008		protection cap for socket		3
0373-009		protection cap for plug		1
0373-052	+	sealing cover		2
3373-004		cap		1
5000-270	+	air valve spool with magnet	(for double diaphragm pump 1/2" and 1")	1
5000-274	+	clip with magnet	(for double diaphragm pump 1/4")	1
5000-278	+	air valve body with magnet	(for double diaphragm pump 1 1/2" and 2")	1
5000-280	+	air valve spool with magnet	(for double diaphragm pump 3")	1
0301-230		lens head screw	(for mounting two modules without intermediate plate on type VA I)	4

State of art 07/03

• wearing part + new part

When ordering spare-parts always indicate the corresponding order No. and production No. or order No. of the unit to be repaired.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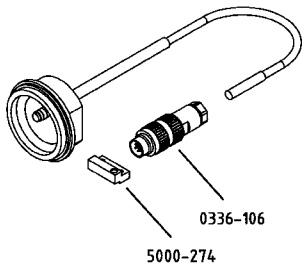
0336-099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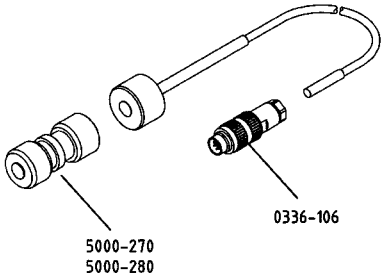
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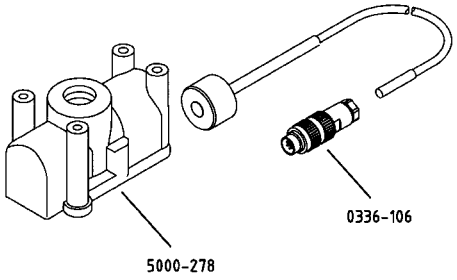
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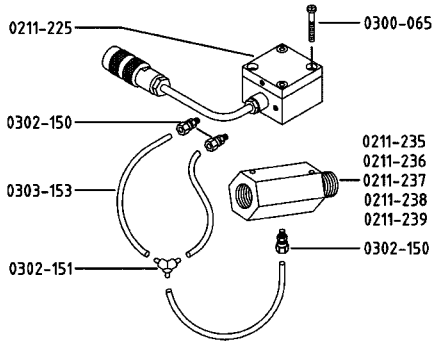
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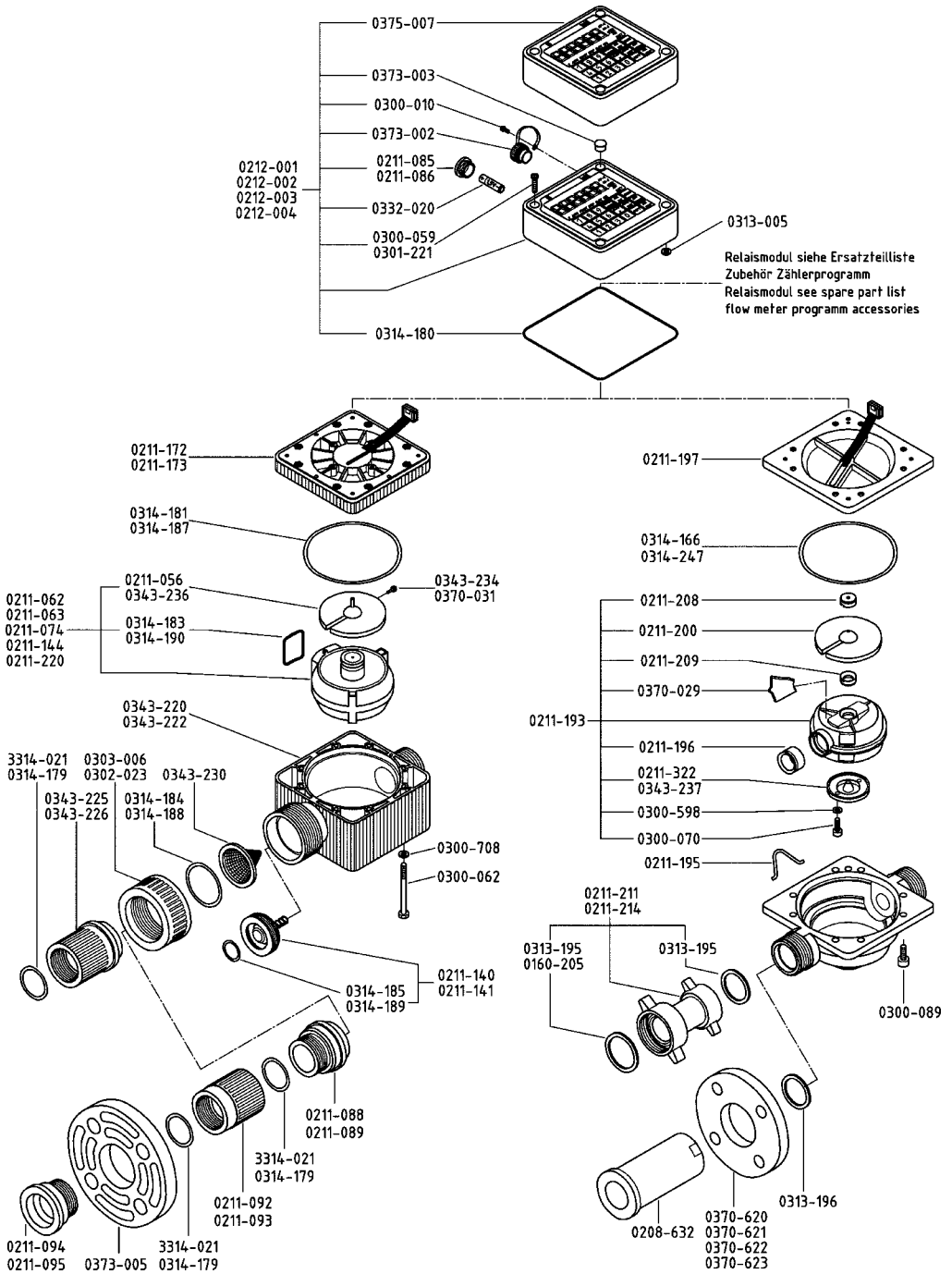
0300-065
0302-150
0211-235
0211-236
0211-237
0211-238
0211-239
0303-153
0302-150
0302-151

GB

Spare Part List
Flow Meter Program Types ST, SL, LM, UN, VA I

Order No.	Description		Qty.
0160-205	seal PTFE	(for type VA I with connection G 1 1/2)	1
0208-632	collar bush		2
0211-056	swash plate PVDF	(for measuring chamber 0211-220)	1
0211-062	measuring chamber cpl.encapsulated	(for type SL), consisting of: 0314-183, 0343-236, 0343-234	1
0211-063	measuring chamber cpl. encapsulated	(for type UN), consisting of: 0314-190, 0343-234	1
0211-074	measuring chamber cpl.	(for type LM), consisting of: 0314-190	1
0211-085	battery closing cap Ex	(for types LM, UN, VA I)	1
0211-086	battery closing cap	(for types ST, SL)	1
0211-088	headed liner R 1 1/4" OT	(for types ST, SL)	1
0211-089	headed liner R 1 1/4" OT	(for types LM, UN)	1
0211-092	screw socket R 1 1/4"	(for types ST, SL)	2
0211-093	screw socket R 1 1/4"	(for types LM, UN)	2
0211-094	flanged bush R 1 1/4" OT	(for types ST, SL)	2
0211-095	flanged bush R 1 1/4" OT	(for types LM, UN)	2
0211-140	check valve PTFE/Viton	(for types ST, SL), consisting of: 0314-185	1
0211-141	check valve PTFE/Viton-FEP	(for types LM, UN), consisting of: 0314-189	1
0211-144	measuring chamber cpl.	(for type ST) consisting of: 0343-236	1
0211-172	cover cpl.	(for type ST, SL)	1
0211-173	cover cpl.	(for type LM, UN)	1
0211-193	measuring chamber cpl.	consisting of: 0211-208, 0211-200, 0211-209, 0370-029, 0211-196, 0343-237, 0300-598, 0300-070	1
0211-195	clamp		2
0211-196	sealing sleeve		1
0211-197	cover cpl.		1
0211-200	swash plate cpl.		1
0211-208	base support		1
0211-209	top support		1
0211-211	connector VA I G 1 1/4	consisting of: 0313-195	1
0211-214	connector VA I G 1 1/2	consisting of: 0160-205, 0313-195	1
0211-220	measuring chamber cpl. encapsulated	for nitric acid and sulphuric acid (for types ST, SL) consisting of: 0314-190, 0211-056, 0370-031	1
0212-001	operating unit BE1	not Ex, (for types ST, SL) consisting of: 0211-086, 0300-010, 0300-059, 0300-221, 0314-180, 0332-020, 0373-002, 0373-003, 0375-007	1
0212-002	operating unit Ex-BE1	(for types LM, UN, VA I) consisting of: 0211-085, 0300-010, 0300-059, 0300-221, 0314-180, 0332-020, 0373-002, 0373-003, 0375-007	1
0212-003	operating unit BE1 V	electronics spilled, not Ex, (for types ST, SL) consisting of: 0211-086, 0300-010, 0300-059, 0300-221, 0314-180, 0332-020, 0373-002, 0373-003, 0375-007	1
0212-004	operating unit Ex-BE1 V	electronics spilled, (for types LM, UN, VA I) consisting of: 0211-085, 0300-010, 0300-059, 0300-221, 0314-180, 0332-020, 0373-002, 0373-003, 0375-007	1
0300-010	screw		1
0300-059	phillips screw	(for type VA I)	4
0300-062	hexagon screw		8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0300-010
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0211-086
0332-020
0300-059
0301-221
0313-005
Relaismodul siehe Ersatzteilliste
Zubehör Zählerprogramm
Relaismodul see spare part list
flow meter programm accessories
0314-180
0211-172
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0314-181
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0343-234
0370-031
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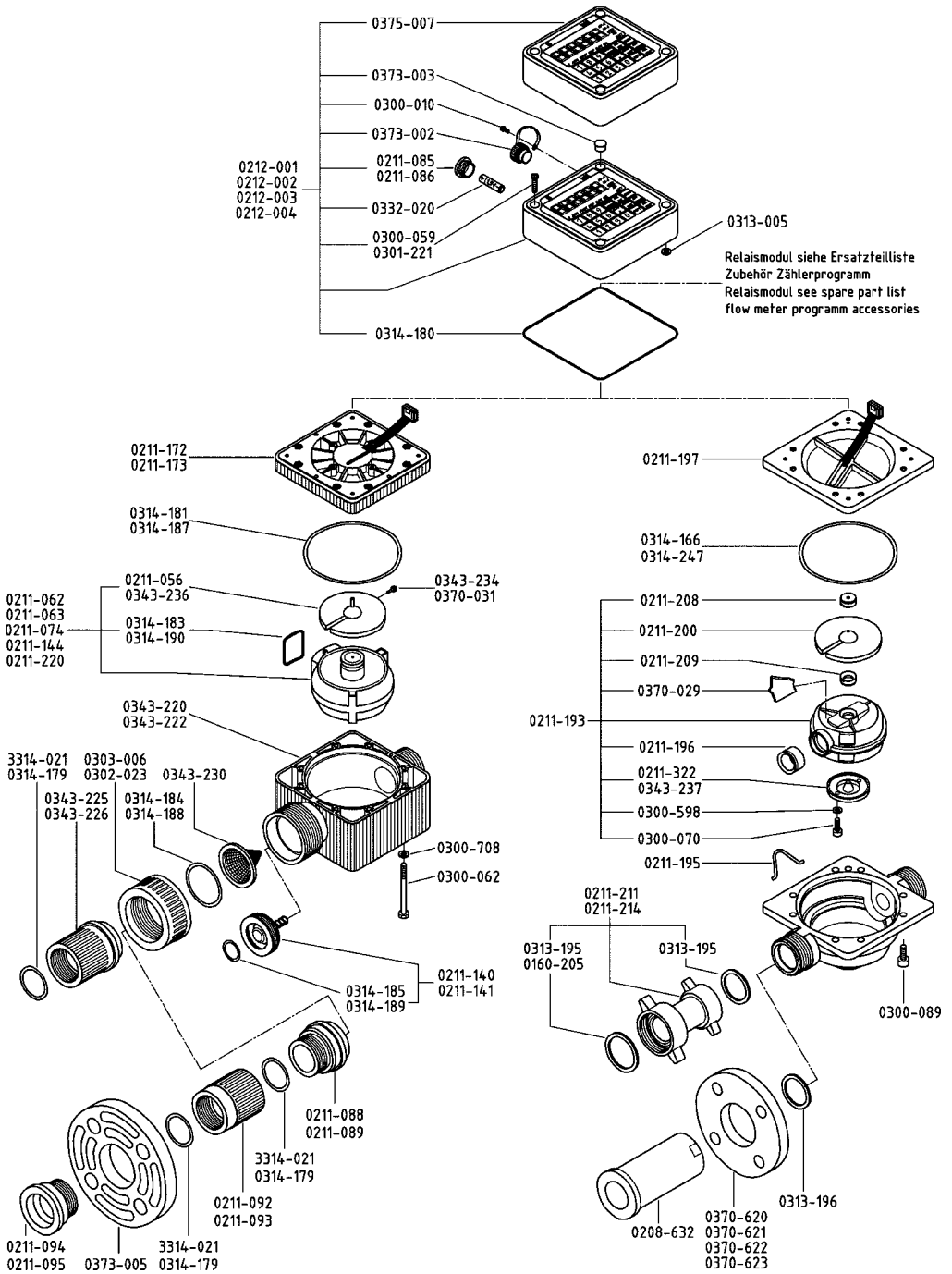
0313-195
0300-089
0313-196
0208-632
0370-620
0370-621
0370-622
0370-623

Order No.		Description		Qty.
0300-070		cylinder head screw		2
0300-089		cylinder head screw		8
0300-598		sping washer		2
0300-708		washer		8
0301-221		ejot-PT-screw	(for types ST, SL, LM, UN)	4
0302-023		wing nut G 2	(for types LM, UN)	1
0303-006		wing nut G 2	(for types ST, SL)	1
0313-005		distance washer	(for type VA I)	4
0313-195		seal PTFE	(for type VA I with connector G 1 1/4)	2
0313-195		seal PTFE	(for type VA I with connector G 1 1/2)	1
0313-196		seal PTFE	(for type VA I with flange connection)	2
0314-166		o-ring Viton/FEP		1
0314-179		o-ring Viton-FEP	(for types LM,UN with flange connection)	4
0314-179		o-ring Viton-FEP	(for types LM, UN with drum pump adapter)	1
0314-180		o-ring NBR		1
0314-181		o-ring Viton	(for types ST, SL)	1
0314-183		o-ring Viton	(for types ST, SL)	1
0314-184		o-ring Viton	(for types ST, SL)	1
0314-185		o-ring Viton	for check valve (for types ST, SL)	1
0314-187		o-ring Viton-FEP	(for types LM, UN)	1
0314-188		o-ring Viton-FEP	(for types LM, UN)	1
0314-189		o-ring Viton-FEP	for check valve (for types LM, UN)	1
0314-190		o-ring Viton-FEP	(for types LM, UN)	1
0332-020		battery		3
0343-220		basic body	(for types ST, SL)	1
0343-222		basic body	(for types LM, UN)	1
0343-225		bush R 1 1/4" internal thread	(for types ST, SL)	1
0343-226		bush G 1 1/4" internal thread	(for types LM, UN)	1
0343-230		filter		1
0343-234	•	guide pin	(for types ST, SL, LM, UN)	1
0343-236		swash plate	PPS (for types ST, SL, LM, UN)	1
0343-237		bearing washer		1
0370-029		measuring chambers plate		1
0370-031	•	guide pin	(for measuring chamber 0211-220)	1
0370-620		flange plate	NW 25, ND 6	2
0370-621		flange plate	NW 32, ND 6	2
0370-622		flange plate	NW 32, ND 10	2
0370-623		flange plate	NW 40, ND 10	2
0373-002		protection cap		1
0373-003		cap		4
0373-005		flange		2
0375-007		key board with cover		1
3314-021		o-ring Viton	(for types ST, SL with flange connection)	4
3314-021		o-ring Viton	(for types ST, SL)	1
	+	**spare parts for special models**		
0211-322		bearing washer	(for type PU)	1
0314-247		o-ring EPDM	(for type PU)	1

State of art 12/02

• wearing part + new part

When ordering spare parts always indicate the correspondending order No. and production No. or order No. of the unit to be repaired.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