

Ultrasonic flow measuring/ dosing unit

Original operating manual

Pump series
USF R / C4 / MD



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We reserve the right to make technical changes.

Read carefully before use.
Save for future use.

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1 About this document

This manual

- is part of the equipment
- applies to all series referred to
- describes safe and proper operation during all operating phases

1.1 Target groups

Operating company

- Responsibilities:
 - Always keep this manual accessible where the device is used on the system.
 - Ensure that employees read and observe this document, particularly the safety instructions and warnings, and the documents which also apply.
 - Observe any additional country-specific rules and regulations that relate to the system.

Qualified personnel, fitter








- Mechanics qualification:
 - Qualified employees with additional training for fitting the respective pipework.
- Electrical qualification:
 - Qualified electrician
- Transport qualification:
 - Qualified transport specialist
- Responsibility:
 - Read, observe and follow this manual and the other applicable documents, especially all safety instructions and warnings.

1.2 Other applicable documents

To download: Resistance lists Resistance of materials used to chemicals www.asv-stuebbe.de/pdf_resistance/300051.pdf	
 To download: Data sheet Technical specifications, conditions of operation www.asv-stuebbe.de/pdf_datasheets/300856.pdf	
To download: CE declaration of conformity Conformity with standards www.asv-stuebbe.de/pdf_DOC/300868.pdf	


Tab. 1 Other application documents, purpose and where found

1.3 Warnings and symbols

Symbol	Meaning
	<ul style="list-style-type: none"> • Immediate acute risk • Death, serious bodily harm
	<ul style="list-style-type: none"> • Potentially acute risk • Death, serious bodily harm
	<ul style="list-style-type: none"> • Potentially hazardous situation • Minor injury
	<ul style="list-style-type: none"> • Potentially hazardous situation • Material damage
	Safety warning sign ► Take note of all information highlighted by the safety warning sign and follow the instructions to avoid injury or death.
	Instruction
1., 2., ...	Multiple-step instructions
✓	Precondition
→	Cross reference
	Information, notes

Tab. 2 Warnings and symbols

2 General safety instructions


 The manufacturer accepts no liability for damages caused by disregarding any of the documentation.

2.1 Intended use

This device measures the flow of liquid media free of any solids. The version with relay or Modbus switches off a consuming unit (e.g. pump) if limit values are exceeded or not achieved. The limit values are adjustable.

- The device is only to be used in liquid media free of any solids.
- Only use the device with suitable media (→ resistance lists).
- Adhere to the operating limits (→ Data sheet).
- Working in accordance with DIN EN 61326-1, the immunity against interference was tested according to table 1 for use in an essentially electromagnetic environment.

2.2 General safety instructions

 Observe the following regulations before carrying out any work.

2.2.1 Obligations of the operating company

Safety-conscious operation

- Only operate the device if it is in perfect technical condition and only use it as intended, staying aware of safety and risks, and in adherence to the instructions in this manual.
- Ensure that the following safety aspects are observed and monitored:
 - Intended use
 - Statutory or other safety and accident-prevention regulations
 - Safety regulations governing the handling of hazardous substances
 - Applicable standards and guidelines in the country where the pump is operated
- Make personal protective equipment available.

Qualified personnel

- Make sure all personnel tasked with work on the device have read and understood this manual and all other applicable documents, especially the safety, maintenance and repair information, before they start any work.
- Organize responsibilities, areas of competence and the supervision of personnel.
- The following work should be carried out by specialist technicians only:
 - Installation, repair and maintenance work
 - Work on the electrical system
- Make sure that trainee personnel only work on the device under supervision of specialist technicians.

2.2.2 Obligations of personnel

Only complete work on the device if the following requirements are met:

- System is empty
- System has been flushed
- System is depressurized
- System has cooled down
- System is secured against being switched back on again
- Do not make any modifications to the device.

2.3 Specific hazards

2.3.1 Hazardous media

- When handling hazardous media, observe the safety regulations for the handling of hazardous substances.
- Use personal protective equipment when carrying out any work on the device.
- Collect leaking pumped liquid and residues in a safe manner and dispose of in accordance with environmental regulations.

3 Layout and Function

3.1 Type plate

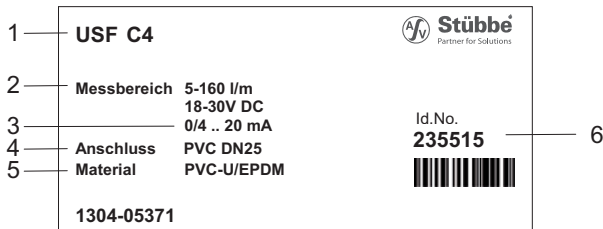


Fig. 1 Type plate

- 1 Device type
- 2 Flow measurement range
- 3 Outlet
- 4 Connection (material and nominal diameter)
- 5 Gasket material
- 6 ID number

Device types

- USF R – relay output
- USF C4 – current output
- USF MD – Modbus®

3.2 Description

The device measures the flow velocity and calculates the flow volume.

Start-/Stop buttons can be connected to the device. This permits additional applications, e.g.

- the dosing or mixing of up to 4 subsets
- Pump monitoring

The device contains simple 3-point flow regulation. This can be used to control the actuator of a proportional ball valve.

The device is integrated within the control of the consuming unit using the following inputs and outputs:

- USF R
 - 4 relay outputs
 - 2 switching inputs
- USF C4
 - 1 current output (0/4–20 mA)
- USF MD
 - 2 relay outputs (changeover contact, SPDT)
Control via limit values or modbus
 - 2 optically isolated inputs (optocoupler) for starting applications
reading the status of the inputs via the Modbus
- Modbus RS485 interface
The Modbus RTU is a popular data exchange format.
Devices with an RTU RS485 interface can be connected to one another and communicate with a master device.

The UNI display (optional) shows measured value. It can be used for all measuring instruments of the UNI display device platform PTM, HFT and UFM. The UNI display offers the following additional functions:

- Status display of the relay outputs (versions R and MD only)
- Status display of the inputs (version MD only)
- Menu-guided device setting
- Data logger function with date stamp
- Saving and transfer of parameter settings to other devices
- Memory function on microSD card
- Firmware update

3.3 Layout

3.3.1 Device



Fig. 2 Layout

- 1 Insert
- 2 Union nut
- 3 Sensor housing
- 4 Fastening clamp
- 5 Spacer
- 6 Connection housing
- 7 Pressure compensation valve
- 8 Connectible sensor cable
- 9 elect. Connection

3.3.2 UNI display

The UNI display is fitted on to the connection housing (remove housing cover). The transparent cover supplied allows the measured values to be read during operation.

The device can be adjusted and put into operation using the UNI display.

The UNI display can be removed again once it has been put into operation. The UNI display remains attached if the intention is to display measured values permanently.

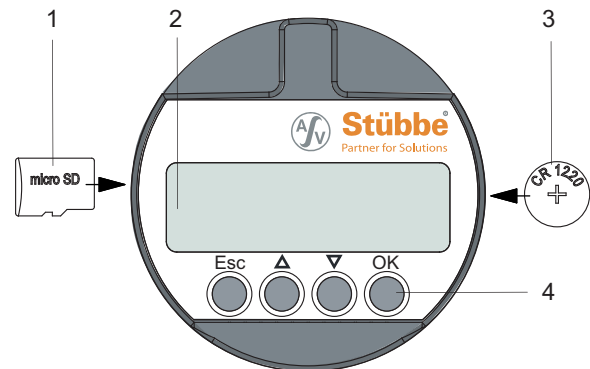


Fig. 3 UNI display layout

- 1 microSD card (with spring ejection)
- 2 Display
- 3 Battery
- 4 Operating buttons

3.3.3 Measured value display

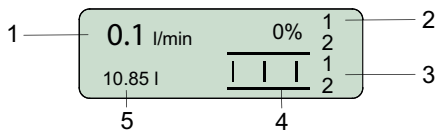


Fig. 4 Display of measured values

- 1 Flow
- 2 Relay status display
 Display normal = contact open
 Display inverted = contact closed
 1, 2 with Modbus version
 1 .. 4, with relay version
- 3 Input status display (only with Modbus version)
 Display normal = switch on input open
 Inverted display = switch on input closed
- 4 Flow direction (progress bar)
 Progress direction = direction of flow
- 5 Flow volume

Indication of the flow direction:

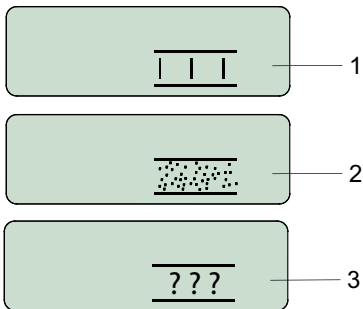


Fig. 5 Display of flow

- 1 Normal flow forward / backwards
 (progress bar with direction recognition)
- 2 Air bubbles in flow (measured value inexact)
- 3 No flow (or sensor not connected)

4 Transport, Storage and Disposal

4.1 Unpacking and inspection on delivery

1. Unpack the device when received and inspect it for transport damage and completeness.
2. Check that the information on the type plate agrees with the order/design data.
3. Report any transport damage to the manufacturer immediately.
4. If fitted immediately: Dispose of packaging material according to local regulations.
 - If fitted at a later point: leave device in its original packaging.

4.2 Transportation

- ▶ Device should preferably be transported in the original packaging.


4.3 Storage

NOTE

Material damage due to inappropriate storage!

- ▶ Store the device properly.
1. Make sure the storage room meets the following conditions:
 - Dry
 - Frost-free
 - Vibration-free
 - Not in direct sunlight
 - Storage temperature +10 °C to +60 °C
 2. Device should preferably be stored in the original packaging.

4.4 Disposal

- 
 Plastic parts can be contaminated by poisonous or radioactive media to such an extent that cleaning will not be sufficient.


WARNING

Risk of poisoning and environmental damage from medium.

- ▶ Use personal protective equipment when carrying out any work on the device.
- ▶ Prior to the disposal of the device: Neutralize residues of medium in the device.


-
1. Remove battery and dispose of in accordance with local regulations.
 2. Remove electronic parts and dispose of in accordance with local regulations.
 3. Dispose of plastic parts in accordance with local regulations.


5 Installation and connection

5.1 Check operating conditions

1. Ensure the design of the fitting is consistent with the purpose intended:
 - Materials used (→ [3.1 Type plate, Page 6](#)).
 - Medium (→ order and design data).
2. Ensure the required operating conditions are met:
 - Resistance of body and seal material to the medium (→ resistance lists).
 - Temperature and pressure (→ Data sheet).
3. Consult with the manufacturer regarding any other use of the device.

5.2 Installing device in the process pipework

 Avoidance of medium buildup.
 Select installation location so that no build-up or crystallization is possible.

 When used as pump protection, select installation location as follows:

- On the pressure side
- Close to the pump
- Before the first valve

WARNING

Risk of injury and poisoning due to medium spraying out.

- ▶ Use personal protective equipment when carrying out any work on the fitting.

- ✓ Process pipework has been properly prepared.
- ✓ Process pipework has been secured against unintentional opening with shut-off valves.


5.2.2 Connection with union nut

1. Unscrew union nut.
2. Insert union nut on to the spool piece of the process pipework.
Check mounting direction.
3. Weld device insert to the process pipework spool piece.
4. Check O-ring fitting.
5. Connect device to the process pipework. Tighten union nut by hand only.

5.2.3 Connection with solvent welding/butt-weld spigot ends

1. Prepare pipe ends according to connection type.
2. Adhesively apply or weld fitting with solvent welding/butt-weld socket ends (→ manufacturer specifications).


5.3 Performing the hydrostatic test

 Perform hydrostatic test using neutral medium, e.g. water.

1. Pressurize the device, ensuring
 - Test pressure $< 1.5 \times P_N$ (Nominal pressure)
 - Test pressure $< P_N + 5$ bar
 - Test pressure $<$ permissible system pressure
2. Check that the device is not leaking.

5.4 Electrical connection of device

- ✓ Device is connected to the process pipework.
- ✓ Power supply is switched off and secured against being switched back on again.

 Cable without shielding can be used to connect the device. If electromagnetic interference is anticipated, then use shielded cable.

Terminal strips are pluggable.

DANGER

Risk of electrocution

- ▶ All electrical work must be carried out by qualified electricians only.
- ▶ Switch off system power supply and secure it against being switched back on again.

1. Unscrew the housing cover from the connection housing, remove UNI display if required.
2. Guide the connection cable through the cable glands and connect:
 - Cables (→ Data sheet).
 - Connection diagram (→ [10.5 Connection diagrams, Page 26](#)).
3. Tighten the cable glands securely.
4. Connect jumper (only Modbus version):
 - If the bus cable ends at this device, plug jumper on to “ON”
 - If the bus cable does not end at this device or is extended, plug jumper on to “OFF”
 - (→ [10.5.4 Modbus RTU termination, Page 28](#)).
5. Screw on the housing cover.

6 Operation

NOTE

Changing parameters affects the switching outputs immediately.

- ▶ Make sure that changing a parameter does not trigger a malfunction (e.g. a pump running dry).

i When switching on the device, all relay contacts are open for 3 s (NO).

After this the relay contacts assume the status which corresponds with the setting and the measured values.

6.1 Basic operation using the UNI display

i Description of menus and functions
(→ 7.2 Main menu, Page 13).

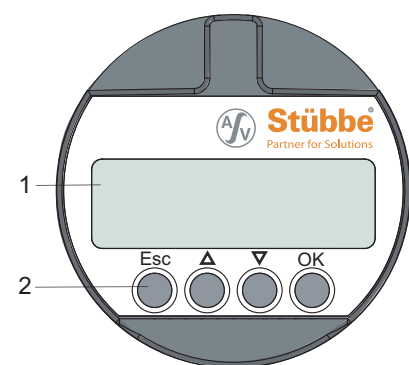


Fig. 6 UNI display

- 1 Display
- 2 Operating buttons

6.1.1 Measured value display

The display shows the measured value.

Button	Function
OK	Main menu
Esc	Switches measured value display to time and date view.
▲ ▼ simultaneously	Changes the display direction.


Tab. 3 Button functions with measured value display

6.1.2 Parameterizing

Button	Functions
Esc	<ul style="list-style-type: none"> • Cancels input and switches to the higher-level menu. • Changes will not be saved.
▲	<ul style="list-style-type: none"> • Increases parameter value. • Previous menu/submenu • Press and hold to increase parameter value quickly. • Press ▼ at the same time to increase parameter value very quickly.
▼	<ul style="list-style-type: none"> • Reduces parameter value. • Previous menu/submenu. • Press and hold to reduce parameter value quickly. • Press ▲ at the same time to reduce parameter value very quickly.
OK	<ul style="list-style-type: none"> • Switches to the menu overview. • Switches to the menu/submenu selected. • Confirms parameter and saves value.
If no button is pressed	<ul style="list-style-type: none"> • The measured values are displayed after 2 minutes. • Changes will not be saved.

Tab. 4 Button functions when parameterizing


6.2 Initial start-up with UNI display


 The UNI display can be removed again once it has been put into operation.

The UNI display remains attached if the intention is to display measured values permanently.

- ✓ Device is connected properly to the process pipework.
 - ✓ Device is connected properly with the power supply and ready for operation.
1. Unscrew the housing cover.
 2. Insert UNI display on to the electronic equipment (white plug-in location).
 3. Check settings of Modbus interface and adjust if necessary (→ 7.3 Basic settings menu, Page 13).
 4. Configure device (→ 7.2 Main menu, Page 13).
 5. Remove UNI display if necessary.
 6. Screw on housing cover or transparent cover.

6.3 Managing several devices

 Using the UNI display and microSD card, parameter sets can be transferred between devices or archived on a PC.

 All microSD cards or microSDHC cards with FAT32 formatting are supported. Files must be maintained in the master directory.

Files should be named in Format 8.3 (e.g. PARA_1.ASV), otherwise only an abbreviated file name is displayed.

The memory function always names the files STUEBBE.ASV. If a STUEBBE.ASV file already exists on the microSD card, then this file is overwritten.


6.3.1 Backing up parameter sets

1. Save the parameter set from the device on to the microSD card (→ 7.8 Service menu, Page 18).
2. Insert the microSD card into the PC, then transfer and archive the STUEBBE.ASV file.

6.3.2 Parameterizing several devices


1. Parameterize the first device (→ 7.2 Main menu, Page 13).
2. Save the parameter set from the device on to the microSD card (→ 7.8 Service menu, Page 18).
3. Attach the UNI display, with the microSD cards inserted, on to the next device.
4. Save the parameter set from the microSD card on to the device (→ 7.8 Service menu, Page 18).

6.4 Reading the data logger

 Series of measurements can be created and read using the UNI display and microSD card.

1. Insert the microSD card in a UNI display and attach the UNI display to the device.
2. Set up the data logger function (→ 7.7 Diagnostics menu, Page 17).
3. Remove the microSD card and read the log file (csv format) on the PC.

6.5 Updating firmware

 The latest sensor firmware or UNI display firmware is available on the Internet (→ www.asv-stuebbe.com/service/downloads).



In the event that the updating is interrupted (→ 9.1.1 Fixing software loading errors, Page 21).

1. Download the latest version of the sensor firmware (e. g. USF_Vxxx..HEX) and UNI display firmware (UNI_Vxxx.HEX) from the Internet and save on the microSD card.
2. Insert the microSD card in a UNI display and attach the UNI display to the device.
3. Save sensor firmware or UNI display firmware from the microSD card on to the device (→ 7.8 Service menu, Page 18).
4. Observe release notes. If “reset factory settings” is necessary:
 - Note all parameters.
 - Perform “reset factory settings” (→ 7.2 Main menu, Page 13).
 - Reset the device (→ 7.8 Service menu, Page 18).
5. Check date and time, and reset if necessary (→ 7.3 Basic settings menu, Page 13).

7 Menus and functions

7.1 Measured value display

The display shows the measured value.

Button	Function
OK	Main menu
Esc	Switches measured value display to time and date view.
▲ ▼ simultaneously	Changes the display direction.

Tab. 5 Button function with measured value display

7.2 Main menu

Main menu	Function
Basic settings	Performs basic settings (→ 7.3 Basic settings menu, Page 13).
Outlet	Adjusts the behavior of the outputs: <ul style="list-style-type: none"> (→ 7.4 Menu output, relay and Modbus version, Page 14). (→ 7.5 Output menu (current version), Page 17).
Display	Sets the display options (→ 7.6 Display menu, Page 17).
Diagnostics	Checks the diagnostics functions (→ 7.7 Diagnostics menu, Page 17).
Service	Performs the service functions (→ 7.8 Service menu, Page 18).

Tab. 6 Main menu

7.3 Basic settings menu

Submenu values	Function
Language	
German English	Sets the operating language
Lighting	
Automatic	The display lighting switches on automatically for 15 seconds: <ul style="list-style-type: none"> If the display value of the flow volume changes by 5 %
using any button	The display lighting switches on for 15 s each time a button is pressed.
off	Display lighting is always off.
on	Display lighting is always on.
Integration time	
0 ... 6000 ms	Setting the measurement interval for the flow sensor. An average is calculated and displayed using the measurement interval. This removes the effect of short-term pressure fluctuations. A long integration time delays the reaction to flow fluctuations.
Calibration	
Basic calibration	Setting the zero indication: <ul style="list-style-type: none"> ▶ Close the valve (no flow in the flow sensor) ▶ Wait until the display "please wait" is not longer shown. ▶ OK – display is set to "0".
Per cent value min. calibration	Setting % display flow. The value set is displayed as "0 %": <ul style="list-style-type: none"> ▶ ▲ ▼ – sets flow for 0 %. ▶ OK – accepts setting
Per cent value max. calibration	Setting % display flow. The value set is displayed as "100 %": <ul style="list-style-type: none"> ▶ ▲ ▼ – sets flow for 100 %. ▶ OK – accepts setting
Media temperature	Setting the middle media temperature (to minimize measurement deviation) <ul style="list-style-type: none"> ▶ ▲ ▼ – adjust the media temperature. ▶ OK – accepts setting
Leak flow volume	


Submenu values	Function
"0"	Setting the leak flow volume (suppresses minimal flows e.g. Through convection): <ul style="list-style-type: none"> ▶ ▲▼ – sets the leak flow volume. ▶ OK – accepts setting
Time	
DD.MM.YYYY HH:MM	Display/setting of date and time. The first position in the date is underlined. <ul style="list-style-type: none"> ▶ ▲▼ – adjusts value. ▶ OK – accept value and set next position. ▶ After setting minutes, OK returns you to the basic settings menu.
Modbus settings (only with Modbus version)	
Interface All bus participants must have the same settings for baud rate / parity	Setting baud rate. <ul style="list-style-type: none"> ▶ ▲▼ – selects value between 2400 and 38400. ▶ OK – accepts setting Setting parity Same parity 1 stop bit No parity 2 stop bits <ul style="list-style-type: none"> ▶ ▲▼ – adjusts value. ▶ OK – accepts setting
Address All bus participants must have different addresses	Setting slave address The first position in the address is underlined. <ul style="list-style-type: none"> ▶ ▲▼ – selects value between 1 and 247. ▶ OK – accept value and set next position. ▶ After setting the last number, OK returns you to the basic settings menu.

Tab. 7 Basic settings menu

7.4 Menu output, relay and Modbus version

7.4.1 Menu relay

Selecting relay output

 The relay output is set first, and then the switch type. The switch behavior can then be set depending on the switch type selected.
 All 4 relay outputs are set in the same way.

Submenu values	Function
Relay 1 Relay 2 Relay 3 Relay 4	▶ ▲▼ – select relay to be set. The set values are displayed. Relays 3 and 4 only settable with version R.

Tab. 8 Output menu (relay)

Setting switch type

Submenu values	Function
Switch type	
Flow Dosing Pump monitoring Fixed value control Modbus controlled	Sets switch type: <ul style="list-style-type: none"> • Flow (→ 7.4.2 Menu switch type flow, Page 15). • Dosing (→ 7.4.3 Menu switch type dosing, Page 15). • Pump monitoring (→ 7.4.4 Menu switch type pump monitoring, Page 16). • Fixed value control (→ 7.4.5 Menu switch type fixed value control, Page 16). • Modbus controlled: <ul style="list-style-type: none"> – Relays are switched on and off via Modbus (only MD version)


Tab. 9 Menu setting the switch type

7.4.2 Menu switch type flow

Submenu values	Function
Switching point 1	
0 ... 160 l/min	Sets switching point 1. In window mode, the value for switching point 1 must always be above the value for switching point 2.
Switch delay 1	
0 ... 300 s	Setting switch delay 1. The switch delay is the period after which the relay switches once a switching point has been reached. The switch delay prevents, for example, the relay from rattling in hysteresis mode.
Switching point 2 as switching point 1	
Switch delay 2 as switch delay 1	
Opener/Closer	
NO NC	Sets switch function: <ul style="list-style-type: none"> • NO – closer • NC – opener <p>The relay outputs do not assume the switch function set here until approximately 3 seconds after switching on.</p>
Mode	
Hysteresis Window	Sets mode: <ul style="list-style-type: none"> • Hysteresis <ul style="list-style-type: none"> – Switches on when value increases (pressure/temperature) at switch 1 – Switches off when value falls (pressure/temperature) at switch 2 • Window <ul style="list-style-type: none"> – Switches on between switching point 1 and switching point 2 – Switches off under switching point 1 or over switching point 2

Tab. 10 Menu switch type flow

7.4.3 Menu switch type dosing

 1- 2/4 subsets can be dosed one after each other in the switch type dosing (MD version only 2 subsets).

The dosing procedure can be started or stopped via the inputs IN 1/2. Pressing the Stop button for longer than 3 seconds starts the dosing procedure afresh.

From 2 subsets, the “to” value is accepted by the previous relay as the “from” value for the next relay. Ensure that no gaps are programmed in which the flow does not take place.

The display will show the total volume.

Submenu values	Function
Dosing volume relays 1/2/3/4	
from ... to 0 ... 9999 l	Setting the dosing volume. <ul style="list-style-type: none"> ▶ ▲▼ – sets the “from” value. ▶ OK – accepts value. ▶ ▲▼ – sets the “to” value. ▶ OK – accepts value.
Relay	
On Off	Setting the switching state. <ul style="list-style-type: none"> ▶ ▲▼ – adjusts value. ▶ OK – accepts value.

Tab. 11 Menu switch type dosing

7.4.4 Menu switch type pump monitoring

NOTE

Material damage due to dry running of the pump!

- ▶ Set the pump run time as short as possible. The pump is not monitored during this time.

i In the switch type pump monitoring, the device protects a pump from running dry. The pump can be switched on and off via inputs IN1/2

As the full flow is not pending upon pump start, undercutting the minimum volume can be determined within a particular time interval.

Working in dosing operation, it is possible to determine multiple undercuttings, so that switching over the valves does not result in deactivation of the pump.

Submenu values	Function
Permitted flow	
MIN ... MAX 0 ... 160 l/min	Setting the permissible range for flow. ▶ ▲▼ – sets MIN value. ▶ OK – accepts value. ▶ ▲▼ – sets MAX value. ▶ OK – accepts value.
Permitted exceptions (undercutting)	
0 ... 30 times for 0 ... 30 s	Setting exceptions. ▶ ▲▼ – sets the number. ▶ OK – accepts value. ▶ ▲▼ – sets the time. ▶ OK – accepts value.

Tab. 12 Menu switch type pump monitoring

7.4.5 Menu switch type fixed value control

i In the switch type fixed value control, the device controls a flow via an electrically-driven proportional ball valve. The control function corresponds to a 3-point control.


The control direction, target and rate can be set.

The dead time determines the time between two actual value recordings. This means that the setting speed of the valve drive can be taken into account.

Submenu values	Function
Direction of control	
Valve open Valve closed	Setting the control direction ▶ ▲▼ – adjusts value. ▶ OK – accepts value.
Target value	
0 ... 160 l/min	Setting the target value for the flow volume. ▶ ▲▼ – adjusts value. ▶ OK – accepts value.
Control rate	
Fast Medium Slow	Setting the control rate. ▶ ▲▼ – adjusts value. ▶ OK – accepts value.
Dead time	
1... 10 s	Setting the dead time. ▶ ▲▼ – adjusts value. ▶ OK – accepts value.

Tab. 13 Menu switch type fixed value control

7.5 Output menu (current version)

 The reference for the current output can be set independently of the display from UNI-Display firmware V3.21. Query the UNI-display firmware version ([→ 7.8 Service menu, Page 18](#)). Updating firmware ([→ 6.5 Updating firmware, Page 12](#)).

Submenu values	Function
min. current	▶ ▲▼ – sets the value which should be read out at the current output with 0 (4) mA.
max. current	▶ ▲▼ – sets the value which should be read out at the current output with 20mA.
Adjustment by ...	
Potentiometer	Adjustment without UNI display via potentiometers.
Display	Adjustment via the UNI display. If the setting has been selected, the device can no longer be adjusted via the potentiometer.
Reference	▶ ▲▼ – sets the reference value for the current output. Adjustable values: <ul style="list-style-type: none"> • Flow • Flow volume


Tab. 14 Output menu (current)

7.6 Display menu

Submenu values	Function
Flow	
l/min ml/s m ³ /h l/h Gal/min	Setting the unit for the flow: ▶ ▲▼ – adjusts value. ▶ OK – accepts value.
Volume at start (only with switching type dosing)	
l m ³ Gal	Setting the unit for the dosing volume: ▶ ▲▼ – adjusts value. ▶ OK – accepts value.

Tab. 15 Display menu

7.7 Diagnostics menu

 The data logger functions requires a microSD card. The data logger function saves the data in CSV format on the microSD card. After the adjustable recording duration (per file) has expired, a new file is written until the microSD card is full or the data logger function is deactivated.


Submenu values	Function
Slave pointer	
Flow per day	Display volume within 24 h
Total flow	Display total volume
Status	
Sensor OK	No error message, device functions normally.
Exxx	Error message (→ Table 20 Troubleshooting, Page 20).
Data logger	
off	Data logger function switched off.
Hour, day, month, year	Sets the recording duration for the data logger function. Measurement interval and file name correspond to the following table.
values	
Sound run time [ns]	Runtime of the measuring signal.
Runtime difference [ns]	Runtime difference between the two measurement directions,
Sensors clearance [mm]	Measurement clearance between the sensors
Sound velocity [m/s]	Sound velocity in the medium. This depends to a great extent from the density and temperature.
Flow velocity [m/s]	Flow velocity of the medium.
Signal strength	Signal strength measurement (0 ... 1).

Tab. 16 Diagnostics menu

Recording duration (per file)	Measurement interval	File name
Hour	5 s	monthdayhour.csv e.g 061814.csv
Day	2 min	yearmonthday e.g 20140618.csv
Month	1 h	yearmonth.csv e.g 201406.csv
Year	1.8 h	year.csv e.g 2014.csv

Tab. 17 Data logger settings

7.8 Service menu

-  The UNI display supports all microSD or microSDHC cards with FAT32 formatting. Relevant file must be maintained in the master directory.
- If transmission errors occur when loading a parameter set, then the UNI display will restore its factory settings.
- The UNI display only displays files in 8.3 format.

Submenu values	Function
Reset	
Factory settings	Resets all parameters to the delivery state: ▶ OK – Delivery state is set.
Slave pointer	Resets slave pointer for filling level.
Info	
	Displays version of sensor firmware and UNI display firmware.
Memory	
to intermediate memory	Saves all parameters from the device on to the intermediate memory.
from intermediate memory	Saves all parameters from the intermediate memory on to the device.
to microSD card	Saves all parameters from the device on to the microSD card.
from the microSD card	Saves all parameters from the microSD card on to the device.
Update firmware	
firmware update for device	Load sensor firmware from the microSD card: ▶ Press and hold OK until “Bootloader” is displayed. ▶ Press OK - to list the existing files on the microSD card. ▶ ▲▼ – Selects file (e. g. USF_Vxxx.HEX). ▶ OK – the new firmware is loaded into the device and immediately started.
UniDisplay	Load UNI display firmware from the microSD card: ▶ Press and hold OK + Esc until “UNIBOOT” is displayed. ▶ Press OK - to list the existing files on the microSD card. ▶ ▲▼ – Selects file (UNI_Vxxx.HEX). ▶ OK – the new firmware is loaded into the device and immediately started.

Tab. 18 Service menu

8 Maintenance

⚠ DANGER

Risk of electrocution!

- ▶ All electrical work must be carried out by qualified electricians only.

⚠ WARNING

Risk of injury and poisoning due to hazardous or hot media.

- ▶ Use personal protective equipment when carrying out any work on the device.
- ▶ Allow device to cool.
- ▶ Make sure the device is depressurized.
- ▶ Block the media supply to the device.
- ▶ Empty the pipe and safely collect the media. Dispose of it in accordance with environmental regulations.
- ▶ Switch off the power supply to the system.
- ▶ Secure power supply against being switched back on again.
- ▶ Provide warning of maintenance and repair work and set up warning signs.

8.1 Servicing

Interval	Action
As necessary	<ul style="list-style-type: none"> • Clean device with a damp cloth.
Six-monthly	Visual and function check: <ul style="list-style-type: none"> • Normal operating conditions unchanged • No leaks • No unusual operating noises or vibrations
Yearly	<ul style="list-style-type: none"> • Replace UNI display battery.

Tab. 19 Servicing activities

- ▶ Perform maintenance tasks according to the table.

8.2 Maintenance

8.2.1 Removing the device

- ✓ System is empty.
 - ✓ System has been flushed.
 - ✓ System is depressurized.
 - ✓ System has cooled down.
 - ✓ System is secured against being switched back on again.
1. Unscrew the housing cover from the connection housing, remove UNI display if required.
 2. Disconnect connection cable.
 3. Screw on the housing cover.
 4. Disassemble device from the process pipework.
 5. Decontaminate device if required.

8.2.2 Replacement parts and return

1. Have the following information ready to hand when ordering spare parts (→ 3.1 Type plate, Page 6).
 - Device type
 - ID number
 - Nominal pressure and diameter
 - Connection and gasket material
2. Please complete and enclose the document of compliance for returns (→ www.asv-stuebbe.com/service/downloads).



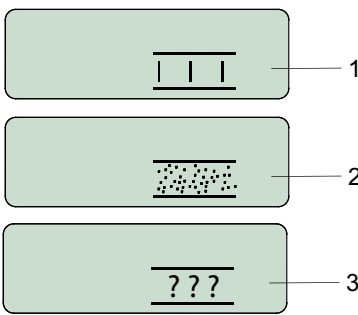
3. Only use spare parts from ASV Stübbe.

9 Troubleshooting

⚠ WARNING

Risk of injury and poisoning due to hazardous media liquids!

- ▶ Use personal protective equipment when carrying out any work on the device.

Error	Possible cause	Corrective action
Medium leaks out at screw connection	Pre-tension of the O-ring too small	▶ Retighten union nut by hand.
“Display Vx.yy UNI” displayed	Error occurred when updating firmware	▶ Reload firmware (→ 9.1.1 Fixingsoftware loading errors, Page 21).
 <p>1 display “direction of flow” 2 display “air bubbles” 3 display “empty pipe”</p>	The direction of flow (1) is displayed incorrectly	▶ Replace the sensor cable(→ 10.5 Connection diagrams, Page 26).
	Too much air or gas (2) in the medium	▶ Reduce the air inflow into the medium(→ 10.5 Connection diagrams, Page 26).
	Too much air or gas (3) in the medium	▶ Reduce the air inflow into the medium(→ 10.5 Connection diagrams, Page 26).
	Sensor cable defective	▶ Check sensor cable.
Display remains dark	Faulty power supply	▶ Ensure power supply is present.
	Wrong version of UNI display firmware	▶ Reload firmware (→ 9.1.1 Fixingsoftware loading errors, Page 21).
Display is upside down	Wrong display direction	▶ Press ▲ ▼ buttons simultaneously to change display direction.


Tab. 20 Troubleshooting


Modbus errors	Possible cause	Corrective action
Faulty/instable data transfer	Bus participants have the same address	▶ Specify different addresses for each bus participant (→ 7.3 Basic settings menu, Page 13).
	Bus participants have different baud rates/parities	▶ Set the same baud rate and parity for all bus participants (→ 7.3 Basic settings menu, Page 13).
	Modbus is incorrectly terminated	▶ Terminate Modbus correctly with jumper (→ 10.5.4 Modbus RTU termination, Page 28).

Tab. 21 Troubleshooting Modbus errors

9.1 Troubleshooting

9.1.1 Fixingsoftware loading errors

 If an error occurs when updating the sensor firmware or the UNI display firmware (e.g. power failure), it may not be possible to call up the “Update firmware” menu.

 The latest sensor firmware or UNI display firmware is available on the Internet


(→ www.asv-stuebbe.com/service/downloads).




1. Save the latest sensor firmware (e. g. USF_Vxxx.HEX) or UNI display firmware (UNI_Vxxx.HEX) on a microSD card.
2. Disconnect device from the power supply.
3. Insert UNI display and microSD card with current firmware where necessary.
4. Press hold OK in order to load the sensor firmware.
5. Press hold OK and ESC in order to load the UNI display firmware.
6. Switch on power supply.
7. OK, ▲▼ – Selects file.
8. Press OK.
The latest firmware is loaded.
9. Press “OK” again.
The latest firmware is launched.
10. Set the device again (→ [7.2 Main menu, Page 13](#)).

10 Appendix

10.1 Technical specifications

 Technical data (→ Data sheet).

10.2 Dimensions

 Dimensions (→ Data sheet).

10.3 Application examples

10.3.1 Pump monitoring

Function

Pump monitoring via relay output 1

Display operating state of the pump via the lamps H1 and H2.

Possible wiring of relay 2:

- Output of an internal fault or service message dependent on sensor signal limit values.
- Control via Modbus (master device) as feedback to the control room via signal lamps H3 and H4 (→ [Figure Connection plan fixed value control with Modbus, Page 25](#)).
- Accepting additional functions (e.g. switching on a fan or switching over a valve.)

Inputs 1 and input 2 (IN1/IN2) can only be used with switch type pump monitoring and dosing. The pump can be switched off using buttons T1 and T2.

After switching on the pump (releasing T1) the minimum pressure must be reached within the set pump-running time, otherwise the pump will stop.

Relay 1 stops the pump with a flow of < 10 l/min or > 50 l/min. Restarting is possible using the start button.

Setting (example)

Parameter	Relay 1
Switch type	Pump monitoring
Permitted flow	10 ... 50 l/min
Permitted exceptions	1 times for 10 s

Tab. 22 Pump monitoring setting

Pump monitoring connection diagram with Modbus version

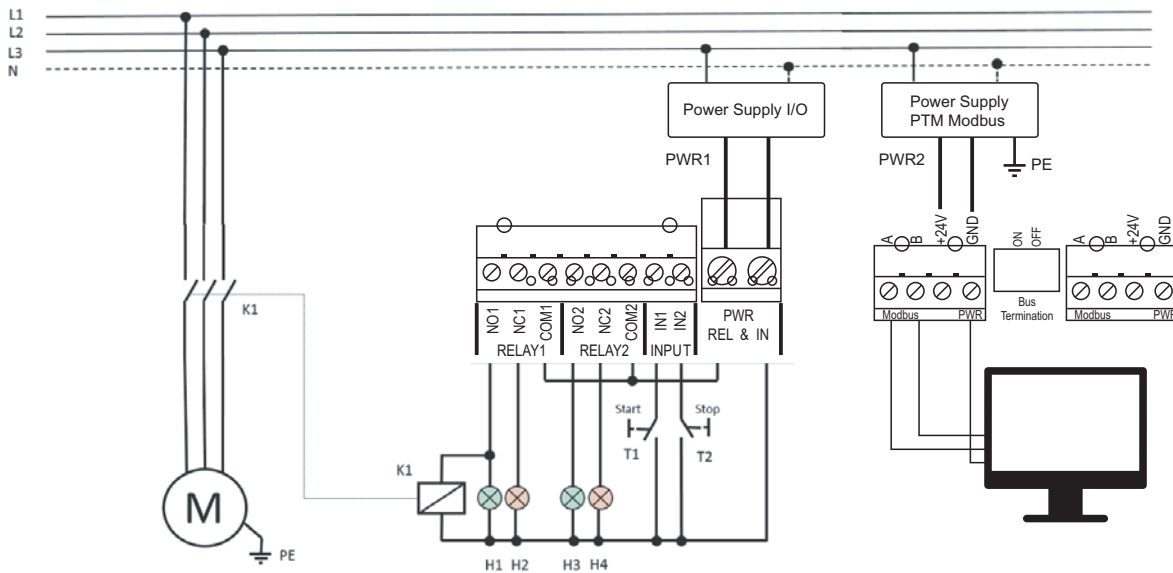



Fig. 7 Pump monitoring connection diagram with Modbus

- F1 Motor protection relay
- H1 Pump indicator lamp
- H2 Indicator lamp
- H3 Indicator lamp
- H4 Indicator lamp
- K1 Motor protection
- M Pump motor
- PWR1 Supply voltage 1
- PWR2 Supply voltage 2
- T1 Start button
- T2 Stop button

10.3.2 Dosing

 Only possible with the versions R or MD

Function

Providing or filling a pre-determined fluid volume.

The volume to be dosed is set in the “switch type dosing” menu ([→ 7.4.3 Menu switch type dosing, Page 15](#)).

1- 2/4 subsets can be dosed one after each other in the switch type dosing (MD version only 2 subsets).

The dosing procedure can be started or stopped via the inputs IN 1/2. Pressing the Stop button for longer than 3 seconds starts the dosing procedure afresh.

From 2 subsets, the “to” value is accepted by the previous relay as the “from” value for the next relay. Ensure that no gaps are programmed in which the flow does not take place.

The display will show the total volume.

Possible circuits (a dosing volume)

- Start-/Stop buttons on IN1/ IN2
- Relay 1 switches the pump
- Relay 2 switches the valve

Setting (example)

Parameter	Relay 1
Relay 1	Switching type, pump monitoring
Relay 2	Switch type dosing
Dosing volume	0 ... 9999 l
Switching state	On/off

Tab. 23 Setting dosing

Connection plan dosing

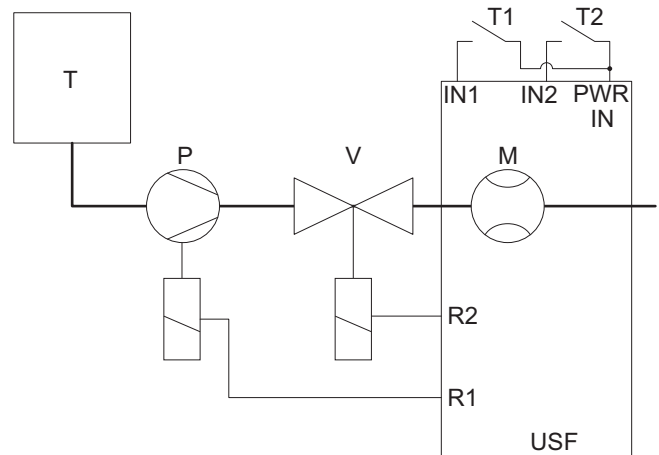



Fig. 8 Connection plan dosing with Modbus

- T Tank 7 inflow
- P pump
- V Valve
- M Flowmeter USF
- R1 Relay output 1
- R2 Relay output 2

10.3.3 Fixed value control

 Only possible with the versions R or MD

Function

Controlling a pre-set flow.

The setting is performed in the “switch type fixed value control” menu (→ 7.4.5 Menu switch type fixed value control, Page 16).

In the switch type fixed value control, the device controls a flow via an electrically-driven proportional ball valve. The control function corresponds to a 3-point control.

The control direction, target and rate can be set.

The dead time determines the time between two actual value recordings. This means that the setting speed of the valve drive can be taken into account.

Possible switching:

- Relay 1 switches the ball valve drive open
- Relay 2 switches the ball valve drive closed

Setting (example)

Parameter	Setting
Relay 1	Valve open
Relay 2	Valve closed
Target value	0 ... 160 l/min
Control rate	Medium
Dead time	1... 10 s

Tab. 24 Setting fixed value control

Connection plan fixed value control

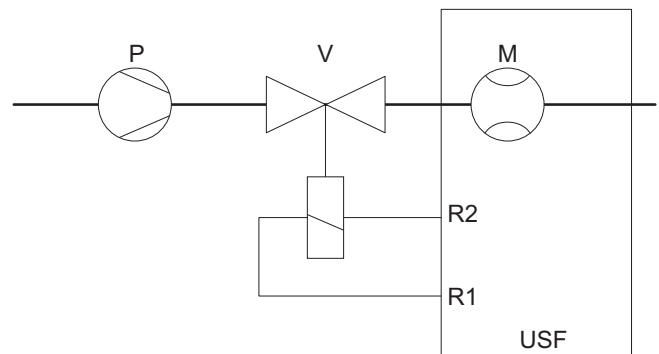


Fig. 9 Connection plan fixed value control with Modbus

P pump

V Valve

M Flowmeter USF

R1 Relay output 1

R2 Relay output 2

10.4 Accessories

Description	Ident. number
UNI display	144153
<ul style="list-style-type: none"> • Display and control unit • with PA transparent cover for the connector head 	
Battery, CR1220, 3 V	144328
Memory card, microSD	144329

Tab. 25 Accessories

10.5 Connection diagrams

10.5.1 Relay connection plan

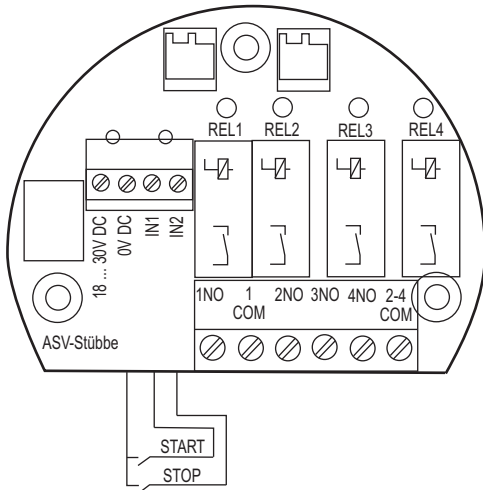


Fig. 10 Relay connection plan

Terminal	Connection
18 ... 30 VDC	Power supply (18 ... 30 VDC)
0 VDC	Power supply (-)
IN1	Start button
IN2	Stop button
1NO	Relay 1 switch output
1COM	Relay 1 COM
2NO	Relay 2 switch output
3NO	Relay 3 switch output
4NO	Relay 4 switch output
2 - 4 COM	Relay 2 - 4 COM

Tab. 26 Relay terminal allocation

10.5.2 Current connection diagram

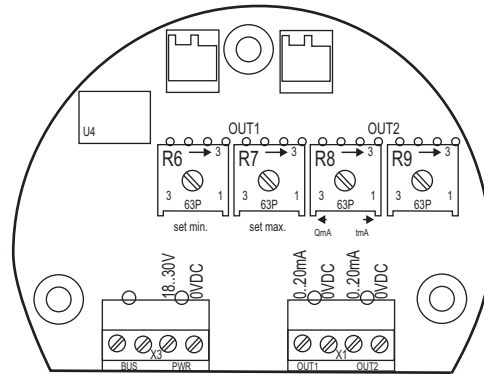


Fig. 11 Current connection diagram

Terminal	Connection
X3	
PWR: 18 ... 30 V DC	Power supply (18 ... 30 V DC)
PWR: 0 V DC	Power supply (-)
X1	
OUT1: 0 ... 20 mA	0/4 ... 20 mA signal
OUT1: 0 V DC	Earth
OUT2: 0 ... 20 mA	-
OUT2: 0 V DC	-

Tab. 27 Current terminal allocation

10.5.3 Modbus RTU connection plan

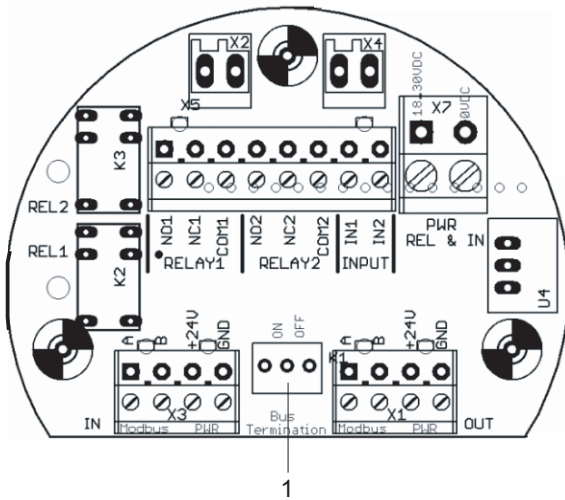


Fig. 12 Modbus RTU connection plan


1 Bus termination

Terminal allocation

Terminal strip	Terminal	Connection
X 1	A	RS485 A
	B	RS485 B
	+24 V	Modus power supply
	GND	Power supply earth
X 3	A	RS485 A
	B	RS485 B
	+24 V	Modus power supply
	GND	Power supply earth
X5	NO1	Relay 1 switch output closer
	NC1	Relay 1 switch output opener
	COM1	Relay 1 COM
	NO2	Relay 2 switch output closer
	NC2	Relay 2 switch output opener
	COM2	Relay 2 COM
	IN1	Start button
	IN2	Stop button
X7	18 ... 30 VDC	Power supply (18 ... 30 VDC)
	0 VDC	Reference potential for the inputs

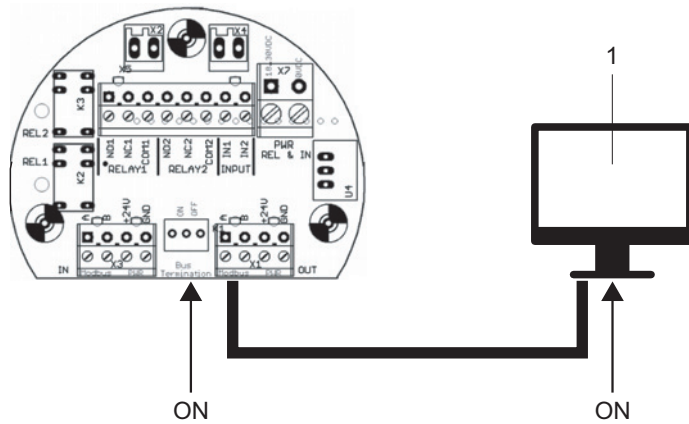
Tab. 28 Modbus RTU terminal allocation

10.5.4 Modbus RTU termination

 The Modbus RS485 must be terminated for devices which are at the end of the bus cable.

Termination for one device

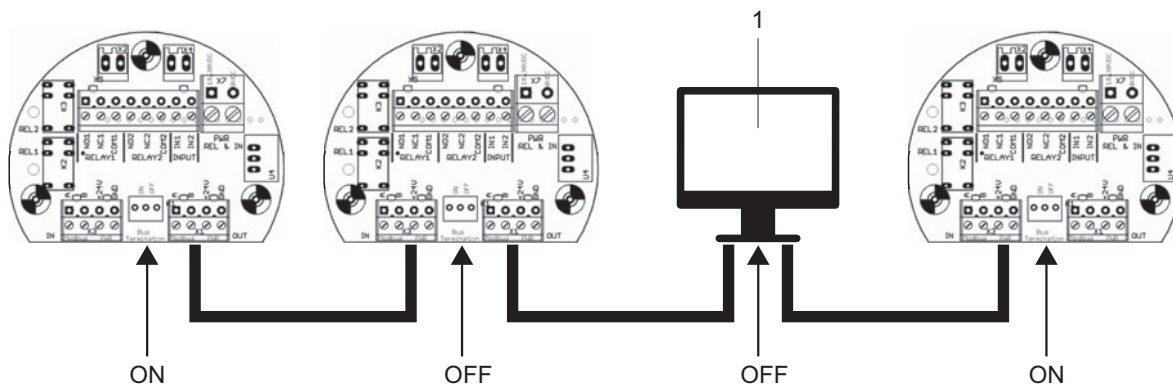
Plug the jumper on to the left and center pin (Position ON).



1 Master device/PWR

Termination for several devices

Plug the jumper on to the center and right pin (Position OFF).



1 Master device/PWR

10.5.5 Modbus functions

Function Code	Name	Address ¹⁾	Data type	Comment
01	Read Coil Status	0x00 → RELAY1 0x01 → RELAY2	Bit	Read relay status.
02	Read Input Status	0x00 → INPUT1 0x01 → INPUT2	Bit	Read input status. A "TRUE" logic level on the inputs are extended to minimum 5 seconds.
03	Read Holding Registers	0x00 → USF version	Unsigned Integer	Value = 310 → V3.10
		0x01 → flow [l/h]	Signed Integer	Value = -14400 ... +14400 → -14400 ... +14400 l/h
		0x02 →	Signed Integer	-
		0x02 → total flow [1/100 l]	Signed Integer	Value = 1 → 0.01 l
		0x08 → Error	Unsigned Integer	TRUE → Sensor error FALSE → Sensor OK
		0x09 → device ID [USF]	Unsigned Integer	Value = 39 → Device ID = 39
		0x0A → flow [l/min]	Float_ABCD	IEEE 32-bit floating-point
		0x0C → total flow[l]	Float_ABCD	IEEE 32-bit floating-point
		0x0E → TOF-DIF [ns]	Float_ABCD	IEEE 32-bit floating-point
		0x10 → sensor distance [mm]	Float_ABCD	IEEE 32-bit floating-point
		0x12 → speed of sound [m/s]	Float_ABCD	IEEE 32-bit floating-point
		0x14 → -	Float_ABCD	IEEE 32-bit floating-point
		0x16 → speed of fluid [m/s]	Float_ABCD	IEEE 32-bit floating-point
		0x18 → signal strength	Float_ABCD	IEEE 32-bit floating-point
04	Read Input Registers	-	-	-
05	Force Single Coil	0x00 → RELAY1 0x01 → RELAY2	Bit	Write relay status, if it is released to Modbus control value = 0x0000 → Relay off value = 0xFF00 → Relay on

Tab. 29 Modbus functions

1) The designation of the relay (coils), inputs and register starts with "1" (physical address "0").

10.5.6 Modbus RTU message formats

Formats	Data																						
Coding System	8 bit binary																						
Number of data bits per character	<div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <p style="text-align: center;">With Parity Checking</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Start</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">3</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">5</td> <td style="padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">7</td> <td style="padding: 2px 5px;">8</td> <td style="padding: 2px 5px;">Par</td> <td style="padding: 2px 5px;">Stop</td> </tr> </table> </div> <div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Without Parity Checking</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Start</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">3</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">5</td> <td style="padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">7</td> <td style="padding: 2px 5px;">8</td> <td style="padding: 2px 5px;">Stop</td> <td style="padding: 2px 5px;">Stop</td> </tr> </table> </div>	Start	1	2	3	4	5	6	7	8	Par	Stop	Start	1	2	3	4	5	6	7	8	Stop	Stop
Start	1	2	3	4	5	6	7	8	Par	Stop													
Start	1	2	3	4	5	6	7	8	Stop	Stop													
Parity	Even or No																						
Bit transfer rate	2400, 4800, 9600, 19200, 38400 Selectable																						
Duplex	Half duplex Transceiver with Failsafe																						
Error checking	CRC (cyclic redundancy check)																						
Polynomial	(CRC-16 10100000000001)																						
Bit transfer order	LSB first																						
End of message	Idle line for 3.5 or more characters (>1.75 msec for >19200 Bps)																						

Tab. 30 Modbus RTU Message Formats

Pre-set values

- Address: 39
- Transfer rate: 9600 bps
- Interface:
 - 8 data bits
 - Straight parity
 - 1 stop bit