H. HERMANN EHLERS GMBH

FLOWMETERS · BATCH CONTROLLERS · CONTROL VALVES · FITTINGS

SINCE 1865

Mounting and operating instructions

CONTOIL®

VZF3 / VZFA3, DN 15 - 50

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About this Operating Manual

The manufacturer reserves the right to make changes to technical data without prior notice. The latest information and versions of this operating manual can be obtained from your local dealer or found on our website: https://www.aquametro.com

For smart devices, scan the QR code on the following page.



WARNING

The manufacturer assumes no liability if the instructions and procedures described in this manual are not followed!



NOTICE

This installation manual is intended for qualified personnel and therefore does not include basic working steps. Before operating the equipment or system, this installation and operating manual must be completely read and understood. Please retain this manual for future reference!



NOTE

This manual is valid for CONTOIL® VZF3
Hardware-Version: 01.03
Firmware Version: 01.00.00
Manual: 4355e_contoil_vzf3_2608.docm
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1 Safety

1.1 Intended use

The device CONTOIL® VZF3 is designed and intended exclusively for the measurement of flow and consumption of diesel, heavy oil, and lubrication oil.
Any improper or non-intended use may compromise operational reliability. The manufacturer accepts no liability for personal injury or material damage resulting from such use.

1.2 Safety information and symbols

The device is designed to meet the latest safety requirements. It has been tested and delivered in a condition that ensures safe operation. Improper or non-intended use of the device may, however, pose a risk. Therefore, pay particular attention to the safety instructions in this manual. These instructions are identified by the following symbols:



WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE

NOTICE indicates a hazardous situation which, if not avoided, could result in property damage.



NOTE

NOTE indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

1.3 Safety rules and precautions

The manufacturer accepts no liability if the following safety rules and precautions are disregarded:

- Any modifications to the device carried out without the prior written consent of the manufacturer shall result in the immediate termination of product liability and warranty.
- Installation, operation, maintenance, and decommissioning of this device must be carried out only by trained and qualified specialists authorized by the manufacturer, operator, or owner of the facility. Such specialists must have read and understood this entire installation and operating manual and must comply with all instructions contained herein.
- Check the supply voltage and the information on the type plate before installing the device.
- Check all connections, settings, and technical specifications of any peripheral devices.
- Do not open the housing or any parts of the housing containing electrical or electronic components before the electrical power supply has been switched off.
- Do not touch any electronic components (ESD-sensitive components).
- Never exceed the specified classifications for mechanical and electrical loads (e.g. pressure, temperature, ingress protection (IP), voltage).
- Before carrying out any work on mechanical components of the system, release the pressure in the piping system and reduce the temperature of the medium to a level that is safe for humans.
- None of the information contained in this manual or in any other documents shall relieve planners, engineers, installers, or operators of their responsibility to carry out a careful and comprehensive assessment of the respective system configuration with regard to functional capability and operational safety.
- Local labor, safety, and accident-prevention laws and regulations must be observed.

2 Scope of delivery and accessories

The scope of delivery is specified in the delivery note. Please check all delivered components and parts immediately upon receipt of the goods. Any transport damage must be reported immediately upon receipt.

- CONTOIL® VZF3 flow measuring system
- Quick instructions - full Mounting and Operating instructions as download (this document)

3 Product description

This manual describes a high-quality flow measuring system designed for reliable operation in demanding environments.

3.1 Application

The CONTOIL® VZF3 is designed for fuel flow and consumption measurement in industrial and marine applications. It can be used either as a single unit for direct measurement or as part of a differential measurement system.

3.2 Device components

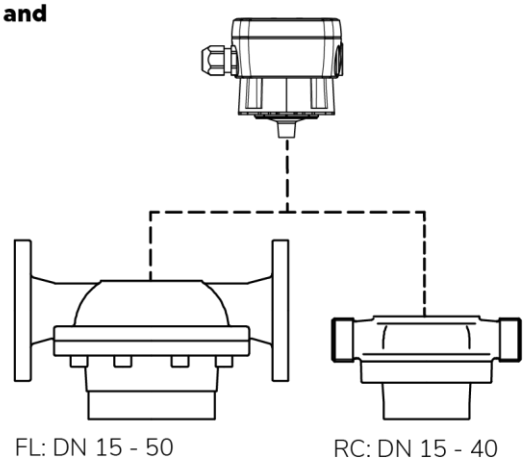
CONTOIL® VZF3 consists of a long-proven hydraulic unit, a coupling with an integrated temperature sensor, and a state-of-the-art electronic display unit with advanced sensor technology.

The hydraulic unit determines the nominal size of the flow meter.

All flow meters are calibrated before leaving the factory. However, for optimal accuracy in differential measurement applications, it is recommended to use CONTOIL® VZFA3 flow meters that are factory-paired or provided with special linearized calibration.

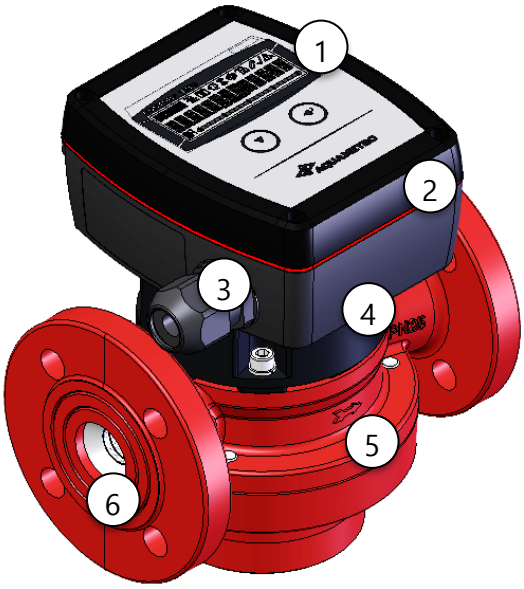
Display unit with coupling and temperature sensor

Hydraulic



For details, see the dimensional drawings in section 10.1 on page 46.

CONTOIL® flow measuring system VZF3



1. Display with operating elements
2. Electronic housing
3. Cable entry (switchable left /right)
4. Coupling with temperature sensor
5. Hydraulic part with flow direction
6. Pipe connection flange or thread

4 Installation

CAUTION



Material damage caused by neglected ambient/environment conditions.

Danger of malfunction or damage!

Assuring accessibility for installation, operation, and maintenance.
Mount to rigid object to avoid excessive vibrations.

CAUTION



The surfaces of the device and the medium may be hot.

Risk of burns!

Carry out work only on cooled systems.
Work may only be performed by authorized specialists in accordance with the applicable regulations.
Use appropriate protective equipment.

WARNING



The pipe and the device may be under pressure.

Risk of severe injury!

Carry out work only on non-pressurized systems.
When working on the device watch out for leaking medium.
Work may only be performed by authorized specialists in accordance with the applicable regulations.
Use appropriate protective equipment, particularly safety goggles.

4.1 Mechanical Installation

Identify the flow measuring system and ensure that it is suitable for the intended process conditions. Easy access for reading the flow measuring system and for controlling ancillary equipment must be ensured.

4.1.1 Correct layout of flow measuring system and accessories

If the flow measuring system is used with media viscosities higher than 5 mPa·s, or if it is installed on the suction side of a pump, the resulting pressure loss and the achievable flow rate must be determined using the pressure loss curves provided in the CONTOIL® Technical Information. In addition, any pressure loss caused by installed filters must be taken into consideration.

Select the flow meter and ancillary equipment according to the following operating conditions:

- Flow meters must be selected based on the maximum flow rate, not on the pipe diameter. If necessary, adapt the pipeline accordingly.
- Flow rate: maximum expected application flow rate (= maximum continuous flow rate of the flow meter, Qcont).
- Material compatibility with the medium.
- Operating pressure and operating temperature.
- Ambient temperature.

NOTE

Magnetic fields

Keep away from magnetic disturbances.

NOTE

Inclusions of air, foam or gas

Check piping layout.
Avoid installation in the highest point of the piping system.
Ensure that the measuring system is always filled with liquid.
Installation of bypass recommended.

Make sure that no hazardous fumes can accumulate in the piping or in the flow measuring system during commissioning, decommissioning, or dismantling.
During operation, the flow measuring system must always be completely filled with liquid.
Check the flow measuring system periodically for tightness of all connections and for proper functioning.
Before carrying out any work on the installation, observe the following safety measures:

- Release the pressure in the installation if hazardous liquids are used.
- Wear suitable protective clothing and safety goggles.
- Place a collecting tray underneath the installation.

4.2 Preparing for installation

Check the flow measuring system and all installation materials before installation.
Compare the data on the flow measuring system name plate with the expected maximum operating conditions of the installation. These values must not exceed the specifications of the flow measuring system:

- Maximum flow rate (Qmax, l/h) – recommended maximum continuous flow rate (Qcont)
- Maximum operating pressure (PN, bar)
- Maximum operating temperature (°C)
- Suitable connections and seals (gaskets)
- Fasteners for mounting the flow measuring system
- Material compatibility and temperature resistance of the flow measuring system with respect to the measured liquid

Required Tools



Torx T15
Flat screwdriver 3.5 mm
Allen keys 3 – 14 mm
Wrench 10 – 30 mm

NOTE

Select the flow measuring system and ancillary equipment according to the operating conditions listed below:

Flow rate: maximum expected application flow rate = maximum continuous flow rate of the flow measuring system (Qcont). Qcont must not be exceeded.
Material compatibility with the medium.
Operating pressure and operating temperature.
Ambient temperature.
The flow measuring system must be selected based on the maximum application flow rate and not on the pipe diameter. If necessary, adapt the pipework accordingly.
Install non-return valves downstream of the flow measuring system if reverse flow may occur.

NOTICE

Pulsations / contamination

Risk of damage or malfunction of the flow measuring system.

Avoid flow pulsations.
Install a suitable pulsation reducer if required.
Prevent contamination by dirt particles or welding spatter.
Install a sufficiently fine filter upstream of the flow measuring system.

CAUTION

Risk of injury!

Unauthorized start-up during mounting.

Ensure that unauthorized start-up is not possible during mounting.
Comply with all applicable work safety regulations when carrying out any work on the system.

NOTE

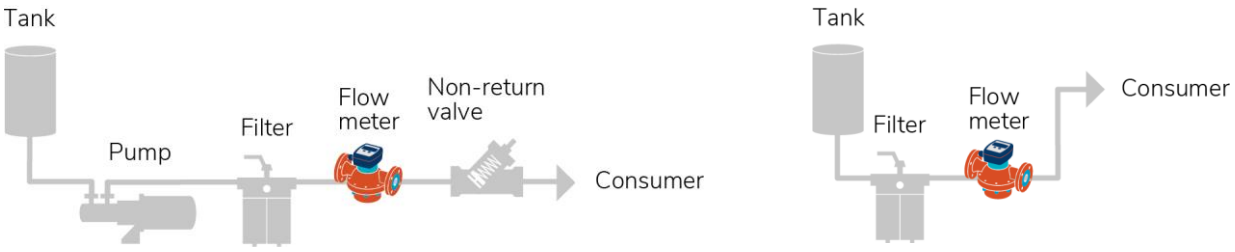
Modifying an existing system

Take the flow measuring system out of operation before flushing the system to remove debris.
Refer to the flushing instructions on page 11.

NOTE

The piping layout must ensure that the flow meter is always completely filled with liquid and that no inclusions of air, foam, or gas can occur.

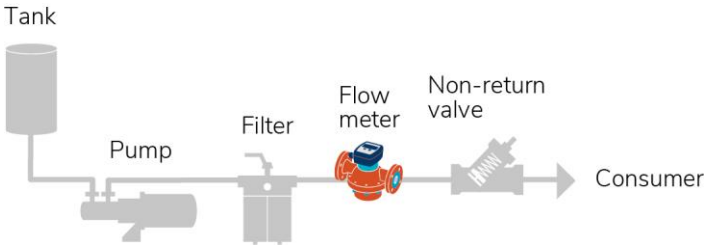
Aquametro recommends installing bypass valves.



The flow meter must register the quantities of all consumers.

4.2.1 Non-Return-Valves

To prevent backflow and draining, non-return valves must be installed downstream of the flow meter. Backflow and draining can lead to incorrect measurements and may damage the flow meter.



Pressure shocks during operation of the flow meter must be avoided.

4.2.2 Dirt filter, Safety filter

Install suitable filters upstream of the flow meter to protect it from damage caused by impurities in the oil.

Maximum mesh width for filters		
Size	**Flow meter type**	
	VZx	**VZxA**
DN 15	0.250 mm	0.100 mm
DN 20	0.400 mm	0.100 mm
DN 25	0.400 mm	0.250 mm
DN 40	0.600 mm	0.250 mm
DN 50	0.600 mm	0.250 mm

NOTICE

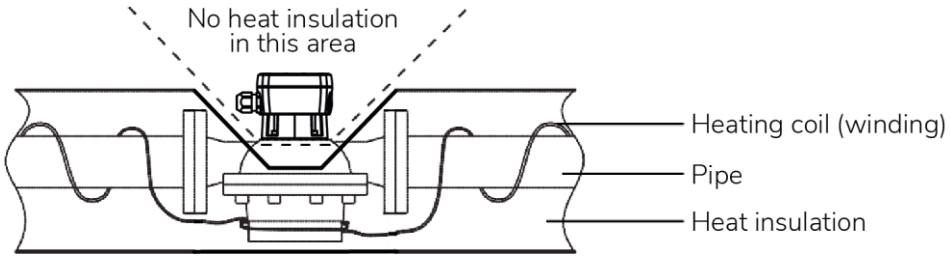
The filter mounted in the flow meter inlet is only a safety filter and cannot act as a dirt filter.

Risk of malfunction or damage.

If the medium contains dirt, always have a dirt filter installed upstream of the flow meter.

4.2.3 Heat insulation

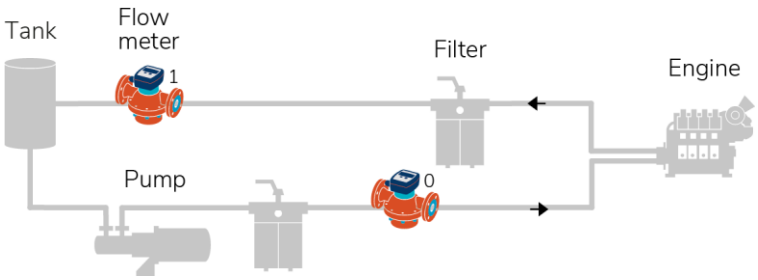
The display unit must not be insulated. Insulation may cause the permitted temperature range to be exceeded.



The permitted temperature ranges for the flow meter must be observed!

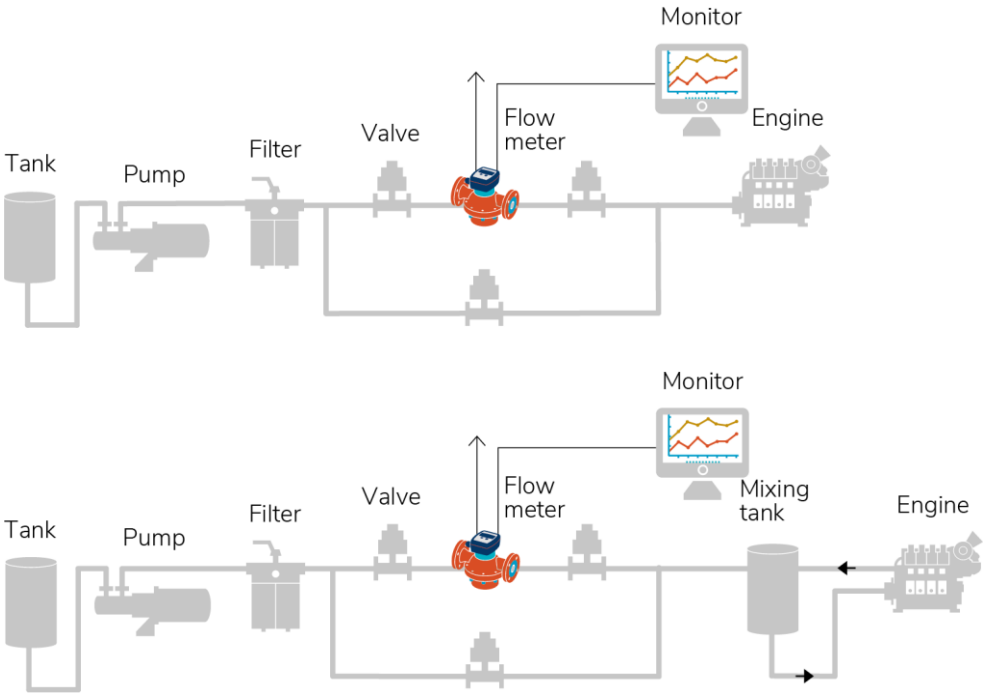
4.2.4 Special requirements - differential measurements

For differential measurements, one flow meter is installed in the supply line and one in the return line. The difference between the measured flow rates determines the consumption.
If ordered with the "differential measurement" option, CONTOIL® VZFA3 flow meters are factory-calibrated according to the specified supply and return flow volumes. The flow meters are labeled "SUPPLY" (0) and "RETURN" (1).
Ensure that each flow meter is installed in the correct pipeline: the SUPPLY flow meter must be installed in the supply line, and the RETURN flow meter must be installed in the return line.



4.2.5 Special requirements - ships

On ships, it is important to ensure that the engine can continue to operate at full power even in the event of heavy filter contamination or flow meter failure.
A pressure switch can be used to activate the bypass and signal the need for maintenance. The engine will continue to operate, but consumption measurements will not be recorded while the bypass is active.

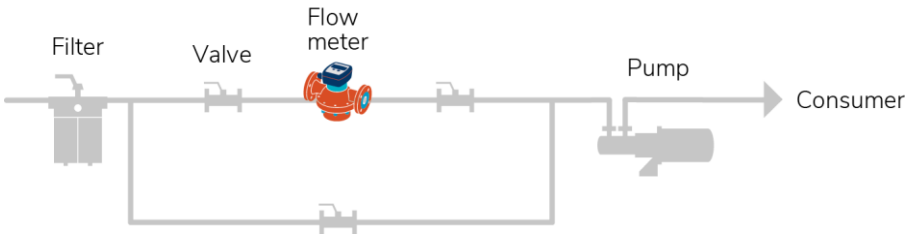


NOTICE

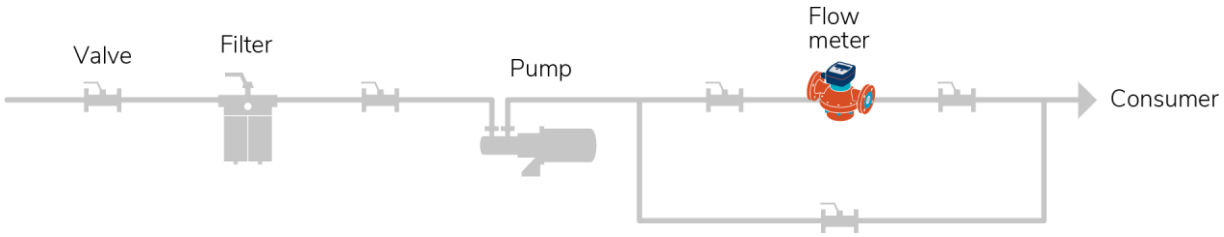
Ship classification societies require the installation of bypass pipes.
The relevant regulations must be followed.

4.2.6 Installation of the flow meter on the suction side of a pump

If the flow meter is installed on the suction side of a pump, precautions must be taken to prevent air intake or foam formation.

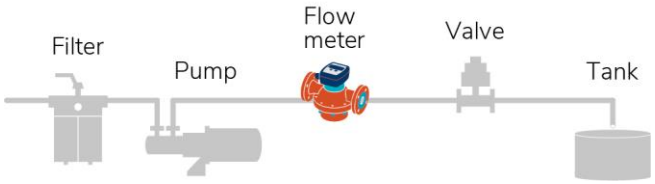


4.2.7 Installation of the flow meter on the pressure side of a pump



4.2.8 Special requirements - filling and dosing units

For filling and dosing, the valve must be fitted between flow meter and discharge.
The shorter the pipe section between valve and discharge, the higher the accuracy.
Avoid water hammer if fast closing valve is installed.



4.2.9 Flushing of pipes

If the pipes are to be flushed at a later stage, stop valves shall be provided on both sides of the flow measuring system.

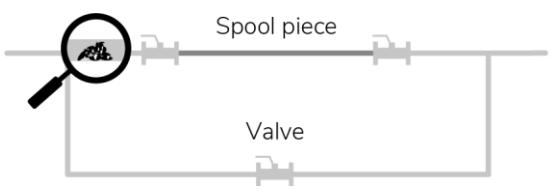
NOTICE

Damage or malfunction of flow measuring system.

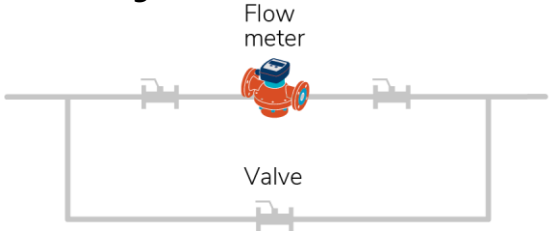
Accumulation of debris.

Replace the flow measuring system with a spool piece.
Ensure of no dirt accumulation in front of the valve.

Flushing



Measuring



4.2.10 Trial operation

Start trial operation without the flow measuring system installed. Open the stop valves slowly during this process.

- Carry out a pressure test prior to installing the flow measuring system.
- Check all bolts and connections for leaks and tightness.
- Flush the pipework until it is clean (flow measuring system must be out of the pipeline).
- Release the pressure and stop the system.

This trial operation ensures that all pipework is tight, clean, and free of foreign matter that could damage the flow measuring system.

4.3 Installing the measuring system in the pipe

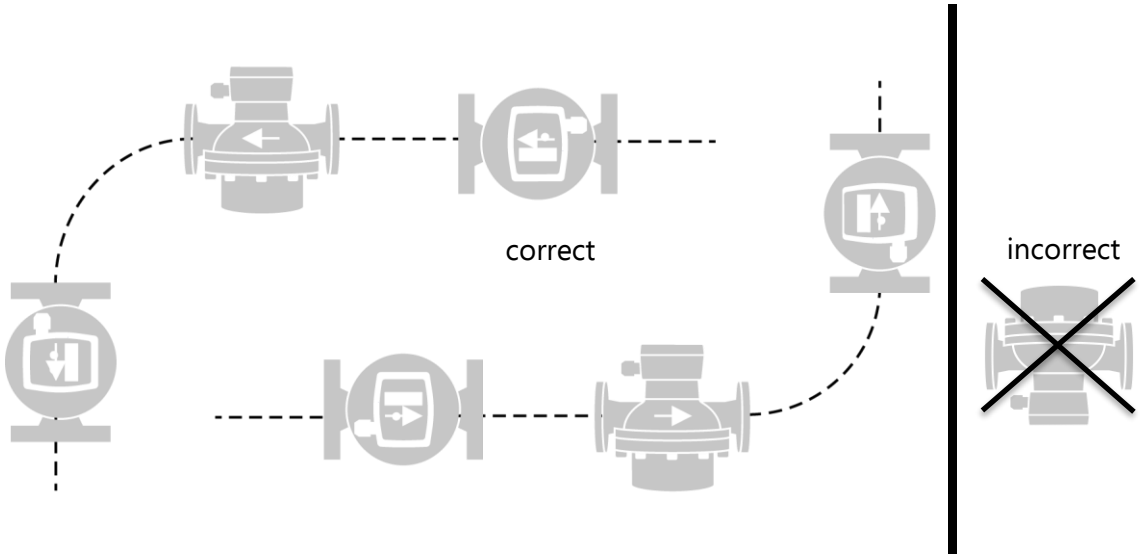
- Remove the protective plugs or caps from the flow meter (inlet and outlet).
- Insert the flow measuring system into the pipeline in the prescribed position, ensuring that the arrow on the housing aligns with the direction of flow.
- Install mating flanges parallel to the pipe and without introducing any tension.

Provided that the arrow on the housing is aligned with the flow direction, the flow measuring system can be installed in any orientation without special modifications.
Flow conditioners are not required.

NOTE

Exception

Do not install it upside down.



NOTE

The electronic display unit can be rotated in 90 degrees steps (90° CCW and 90°/180° CW), to the installed position. See Electrical Installation, page 14.

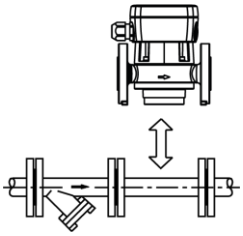
NOTICE

Mechanical connection of flow meter into the pipe systems.

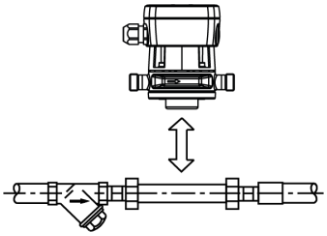
Risk of leakage!

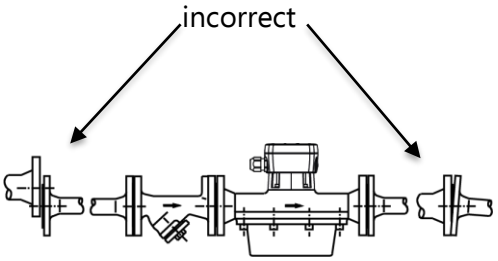
Always use appropriate sealing material as per connection type.

Meter with flanged ends



Meter with threaded ends





For pipes made of copper or thin-walled steel pipes, the flow meter requires additional fastening. Use appropriate fasteners.

WARNING

Risk of severe injury!

Risk of substantial property damage!

Leakage or rupture due to connections being made using force.

Never attempt to overcome misalignments (lateral, angular, longitudinal, torsional) using force.
Make sure the piping are flexible enough, if not: use compensators.
Consider the effects of thermal contraction and expansion.

NOTICE

Risk of leakage

Fuel sprays!

Always use appropriate sealing materials as per connection type.

4.4 Electrical Installation

WARNING

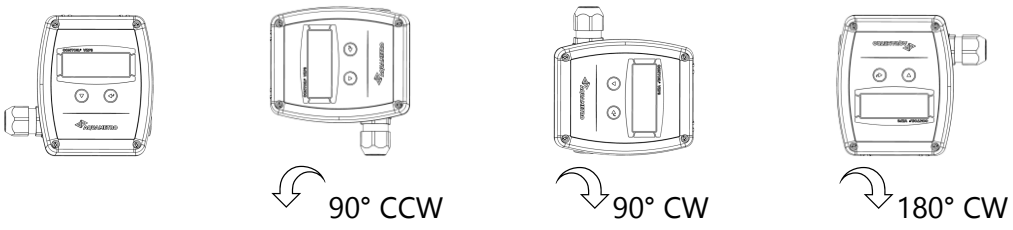
Risk of malfunction or damage

Injuries due to electrical power or systems!

Ensure that the system is safe to work.
Follow local safety guidelines.
Review of technical data, chapter 9.

NOTE

The electronic display unit can be rotated in 90° steps (90° ccw and 90°/180° cw), to the installed position.
Loosen the screws until the unit can be rotated.
The housing does NOT need to be removed (lifted off).



4.4.1 Cable connection

NOTE

Power supply

Wire size for terminal 1-6 is: 0.75...1.5 mm^2 / 20...16 AWG.
Supply voltage: VDC 12 - 24; check polarity
Connection to an uninterruptable power supply is recommended.
» Use an uninterruptable power supply for CE-MID applications.

NOTE

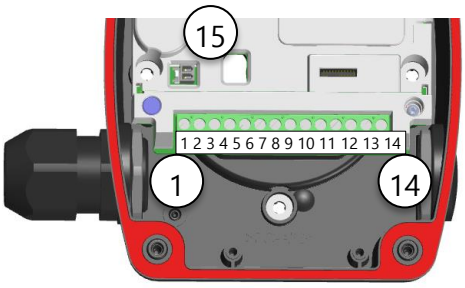
Cable and cable entries

Up to two cable entries may be used if required.
Use a suitable cable gland.
Recommended max. cable length for power and communication: ≤500 m.
For cable lengths exceeding this value, use a larger conductor cross-section.

Cable gland

» Strain relief: Type A according to EN 62444
» Thread: M25x1.5
» Clamping range: 10 - 17 mm
» Key width: 29 mm

4.4.2 Cabel terminals



1. Supply -
2. Supply +
3. RS485 a
4. RS485 b
5. Relay output 1
6. Relay output 1
7. Relay output 2
8. Relay output 2
9. Analog output +
10. Analog output -
11. Plug-in module CH1
12. Plug-in module CH1
13. Plug-in module CH2
14. Plug-in module CH2
15. Temperature sensor

» No shield connection available

NOTICE

Electrical connection of the Pt1000 temperature sensor.

Risk of malfunction or damage!

Route the cable through the designated opening and ensure that the cable is not pinched when mounting the electronic display unit onto the coupling.

NOTE

Tighten bolts of electronic display housing with 2 Nm of torque to the coupling.

4.4.3 Interfaces

The device provides multiple configurable output functions:

Relay outputs (potential-free)

Two relay outputs are available and can be configured as follows:
Pulse output for connection to external totalizers or monitoring systems.
Frequency output for flow rate indication.
Limit switch with programmable high and low flow rate thresholds (NO / NC).
Status output for signaling errors, alarms, or supply voltage status (NO / NC).

Analog output

One electrically isolated, passive 4–20 mA current output.

Serial communication

One electrically isolated RS-485 serial interface (Modbus RTU).

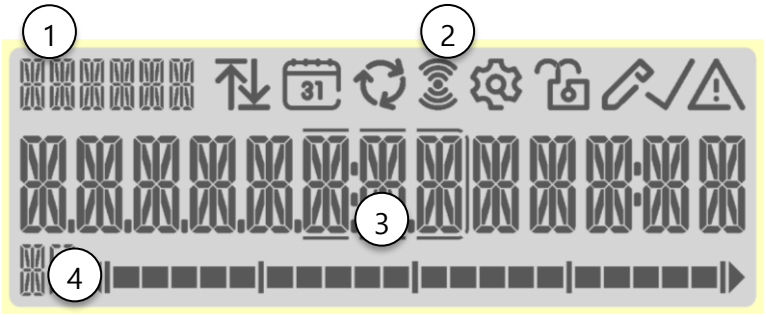
Expansion

One spare plug-in board slot.

For details on interface types see technical data, section 9.4 on page 42.

5 Commissioning

5.1 Display



1. Menu identification info (level 2 and 3)
2. Status indication symbols
3. Main display with units
4. Bar graph and identifier

Symbols of status display

	Arrow up / down	Limit switch, min/max Event in / event out
	Calendar icon	Visible at log data display and with option CE-MID
	Rotating arrows	Indicates flow
	Radio signal	Communication active
	Settings	Indicates in settings mode
	Editing locked / unlocked	Indicates lock status
	Pencil	Indicates field editing mode
	Checkmark	Confirmation of editing
	Caution	Alarm or Error indication
	Flow bar	Indicates % of signal incl min/max value

In the event of an alarm or error, the display flashes red.
The flashing pattern identifies the active condition.

Alarm pattern: 

Error pattern: 

5.2 Adjustment of settings



NOTE

Modification of settings

Changing operating settings may lead to incorrect or invalid measurement results.
Always consult and follow this manual when adjusting operating parameters.

5.3 Compensation to Standard Volume and Mass Flow Calculation

Temperature compensation for standard volume and mass flow calculation can be enabled or disabled via the configuration menu. When compensation is enabled, additional display and output parameters become available.
When compensation is active, the measured liquid volume is corrected for thermal expansion using the actual measured temperature and normalized to the reference temperature of 15 °C (base condition). The standardized volume at 15 °C is used as the basis for mass and mass flow calculation. Compensation calculations are performed in accordance with DIN 51757.

Menu: CONFIG > COMP > DOUBLE OIL or SINGLE OIL see section 5.15 on page 28.

Effect on Outputs:
When compensation is enabled, additional calculated process variables, including standardized volume and mass, become available.

The following output functions are available:

Pulse output

Provides pulses proportional to either measured volume, standardized volume, or mass for external totalizers.

Frequency output

Output frequency is proportional to the selected flow variable, such as measured volume flow, standardized volume flow, or mass flow.

Analog current output

Output current is proportional to the selected process variable, such as measured volume flow, standardized volume flow, mass flow, or measured liquid temperature.



NOTE

Visibility of Counters and Settings

Counters, parameters, and settings related to temperature compensation and mass calculation are only visible and active when compensation is enabled.

5.4 Counter values for CE-MID



NOTICE

For measurements subject to CE-MID (2014/32/EU)

Only the volume counter values shall be used.
All other displayed or transmitted values are not CE-MID compliant.

5.5 Engineering notes

Parameterizing ancillary devices.

Some ancillary devices require the configuration of pulse values or frequency parameters (refer to the relevant operating instructions).

The maximum permissible frequency is calculated using the following formula:

$$\frac{max.\,flow\,rate\,in\,liters/hour}{pulse\,value\,in\,liters\,x\,3600} = frequency\,in\,Hz\ \leq 200Hz$$

Examples:

$$\frac{140\ l/h}{0.01\ l/p\ x\ 3600} = 3.88\ Hz \qquad \frac{400\ l/h}{0.05\ l/p\ x\ 3600} = 2.22\ Hz$$

NOTICE

GND to PE fault



May lead to malfunction or damage!

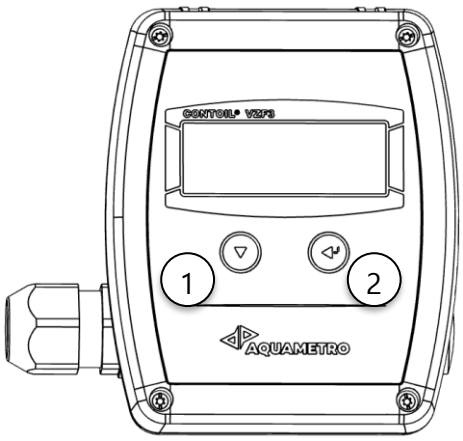
The device is not protected against GND to PE fault connections.
Incorrect grounding may lead to malfunction or damage.

5.6 Factory settings

Type				**VZF3 DN15**	**VZF3 DN20-50**
Output1&2:	Function	FCT		IMPULSE	IMPULSE
	Signal	SIGNAL		VOLUME	VOLUME
	Pulse value	UPP	ltr/p	0.1	1
	Pulse width	MS	ms	20	20
Analog	Function	Fct		4-20mA	4-20mA
RS485:	Modbus RTU	Address		1	
		Baud rate		38400	
		Parity		EVEN	
		Stop bit		1	

5.7 Menu and setting navigation

1. Scroll button
2. Enter button



Menu level 1	Menu level 2	Menu level 3
COUNTER	◄-	◄-
	Volume	

◄- Enter to next Menu level.

▼ Scroll to next Menu item.

At the end of the menu items, the display returns to the previous (upper) menu level.
Menu items are dynamic and may vary depending on the device configuration.

Use Scroll button to navigate through the menu and change field values.
Use Enter button to enter submenus and to edit or confirm field entries.

» **Backwards scroll**: Press and hold the Enter button, then use the Scroll button to navigate backwards.
» **Return to "home" screen** (totalizer volume): Press and hold the Scroll button, then press the Enter button once.

All menus and parameters can be viewed without entering a user code. To modify parameters, the device must first be unlocked using the user code.

Unlock procedure:
1. Scroll to the menu item "UNLOCK" and press Enter to select.
2. Press Enter again to edit; the pencil icon ( ) will appear, and the first digit will start flashing. This indicates the device is ready for user code entry (default: 00001111).
3. Enter each digit using the Scroll button and confirm each with the Enter button. Continue until all code digits are entered. At the end of the procedure, a confirmation icon ( ) will be displayed. The flow measuring system is now unlocked and in edit mode.

» If no button is pressed within 15 minutes, the device returns to the home screen and relocks. Any incomplete entries that were not confirmed with the Enter button are rejected.

Reset of sub totalizers [TRIP-COUNTER]
To reset all trip counters, the device must be unlocked.
Navigate to "TRIP COUNTER", scroll to "CANCEL" press Enter, scroll to select "RESET", and press Enter. All trip counters will be reset.

Changing the decimal point is performed as the last character in the entry sequence. It is indicated by a flashing underline, the same as all other characters.

Factory calibration:
To guarantee accurate measurement, the electronic module of the flow measuring system is calibrated at the factory. The nominal size and the exact correction factor for the measuring chamber volume are entered during calibration. These parameters are generally not editable after factory calibration.
These parameters usually cannot be changed again.

At the end of the menu items, the display returns to the previous (upper) menu level.
Menu items are dynamic and may vary depending on the device configuration.

5.8 General overview of Menu structure

Menu level 1	Menu level 2	Menu level 3	Description	el
COUNTER			Counter values (totalizers)	
TRIP-COUNTER			Trip counter (subtotals)	
INSTANT			Instantaneous values	
INFO			Only visible if an alarm or error is active	
OP-HOURS			Operating hour information	
BILLING	**option -xx-xC**		Only visible with option CE-MID005	
LOGGER			Logger values	
UNLOCK			Code to unlock and edit values	
LOG-BOOK			Only visible with user code	
P-OUT			Digital pulse outputs (counting signal)	
F-OUT			Digital frequency outputs (flow signal)	
S-OUT			Status outputs (limits & alarms)	
I-OUT			Analog outputs	
MODBUS			Serial bus communication	
Option Card			Plug-in card	
UNITS			Units	
CONFIG			System configuration	
SYSTEM			System settings	
SYSTEM-INFO			System information	
DISPLAYTEST			Displays all characters on the display	

Some menu items are only visible depending on preset conditions (e.g. compensation enabled or disabled).
These menu items are only available if option CE-MID005 has been ordered.

Access / edit level	el
None	0
User	1
User (without option “C” MID)	2
Supervisor / manager	3
Service technician	4
Production	5
No edit, read only	

5.9 Counters and instant values

Menu level 1	Menu level 2	Menu level 3	Description	el
COUNTER			Counter values (totalizers)	
	VOLUME		Measured volume at operating conditions	4
	VOL		Volume (fuel) converted to 15 °C	4
	H VOL		Volume (heavy fuel) converted to 15 °C	4
	MASS		Mass (fuel) calculated	4
	H MASS		Mass (heavy fuel) calculated	4
	CO2		CO_2 emissions (fuel) calculated	4
	H CO2		CO_2 emissions (heavy fuel) calculated	4
TRIP-COUNTER			Trip counter (subtotals)	
	RESET		Reset trip counter	1
	VOLUME		Measured volume at operating conditions	
	VOL		Volume (fuel) converted to 15 °C	
	H VOL		Volume (heavy fuel) converted to 15 °C	
	MASS		Mass (fuel) calculated	
	H MASS		Mass (heavy fuel) calculated	
	CO2		CO_2 emissions (fuel) calculated	
	H CO2		CO_2 emissions (heavy fuel) calculated	
INSTANT			Instantaneous values	
	Q VOL		Volume flowrate at operating conditions	
	Q STD		Volume flowrate at reference conditions (15 °C)	
	Q MASS		Mass flowrate calculated	
	TEMP		Fuel temperature	
	DENS		Density calculated	

5.10 Information, operating hours and billing

Menu level 1	Menu level 2	Menu level 3	Description	el
INFO			Only visible if an alarm or error is active	
	A-TEMP		Temperature alarm T > T-MAX	
	A-FLOW		Flow alarm, exceeds limits or reverse flow	
	A-OUTPUT 1		Output 1 out of range, adjust settings	
	A-OUTPUT 2		Output 2 out of range, adjust settings	
	A-MANIP		Tampering detected (external)	
	A-SIM-P		Simulation active (P-Out), switch simulation off	
	A-SIM-SYSTEM		Simulation active (System), switch simulation off	
	A-SIM-F		Simulation active (F-Out), switch simulation off	
	A-SIM-I		Simulation active (I-Out), switch simulation off	
	A-I-OUT		Analog output out of range, adjust settings	
	E-SYSTEM		System fault, reset System (call for service)	
	E-LOG-BOOK		Log-Book fault, reset System (call for service)	
	E-POWER		Power supply fault, ensure power is available	
	E-TEMP		Temperature fault (hardware)	
	E-EEPROM		EEPROM fault, reset System (call for service)	
	E-FLOW		Flow measurement fault (hardware)	
	E-OPTION		Optional module fault	
	E-SENSOR		Sensor fault, reset System (call for service)	
	E-HW-RTC		RTC / EEPROM HW fault (call for service)	
OP-HOURS			Operating hour information	
	TIME 0		Total operating hours	5
	TIME 1		Hours in rated operating range (Qmin – Qcont)	5
	TIME 2		Hours in upper operating range (Qcont – Qmax)	5
	TIME 3		Hours above maximum flowrate (Qmax)	5
	TIME A		Hours in alarm condition	4
	TIME E		Hours in error / fault condition	4
	Q MAX		Maximum flowrate recorded (>20 s)	4
	T MAX		Maximum temperature recorded	4
BILLING	**option -xx-xC**		**Only visible with option CE-MID005**	
	NR		Billing period selection nr.	0
	SETDAT		Set date (dd.mm.yy)	1
	EXEDAT		Execution date (dd.mm.yy)	
	VOLUME		Measured volume at operating conditions	
	VOL		Volume (fuel) converted to 15 °C	
	H VOL		Volume (heavy fuel) converted to 15 °C	
	MASS		Mass (fuel) calculated	
	H MASS		Mass (heavy fuel) calculated	
	CO2		CO_2 emissions (fuel) calculated	
	H CO2		CO_2 emissions (heavy fuel) calculated	
	TIME A		Hours in alarm condition (h)	
	TIME E		Hours in error / fault condition (h)	

5.11 Loggers, unlock and logbook

Menu level 1	Menu level 2	Menu level 3	Description	el
LOGGER			Logger values	
	LOGGER		Logger selection	0
	MONTH		Log data of every end of the month	0
	DAY		Log data of every end of the day	0
	NOON2NOON		Log data of every noon	0
	HOUR		Log data of every end of the hour	0
	MINUTE		Log data of every end of the minute	0
		NR	Select Log nr.	0
		DATE	Date of log entry (dd.mm.yy)	
		TIME	Time of log entry (hh:mm)	
		VOLUME	Measured volume at operating conditions	
		VOL	Volume (fuel) converted to 15 °C	
		H VOL	Volume (heavy fuel) converted to 15 °C	
		MASS	Mass (fuel) calculated	
		H MASS	Mass (heavy fuel) calculated	
		CO2	CO_2 emissions (fuel) calculated	
		H CO2	CO_2 emissions (heavy fuel) calculated	
		TIME A	Hours in alarm condition (h)	
		TIME E	Hours in error / fault condition (h)	
		Q VOL t̄	Maximum volume flowrate (period)	
		Q MASS t̄	Maximum mass flowrate (period)	
		T MAX t̄	Maximum temperature (period)	
UNLOCK			Code to unlock and edit values	
	CODE		Code to unlock the device for editing	0
LOG-BOOK			Only visible with user code	
	NR		Log entry selection nr. from now to 100	1
	EVENT		Event information	
	TIME		Time and Date of log entry (dd.mm.yyyy hh:mm)	
	STATUS		Status information	

5.12 Output settings: Pulse; frequency and status

Two relays are available. Each relay can be assigned to one output function. Select the output number (channel) to configure it. Only one output function can be active for each channel.

Menu level 1	Menu level 2	Menu level 3	Description	el
P-OUT			Digital pulse outputs (counting signal)	
	NR		Output channel selection	0
	FCT		Select function	1
	OFF		Pulse output disabled (OFF)	1
	IMPULSE		Pulse output signal	1
		SIGNAL	Output signal selection	1
		VOLUME	Measured volume at operating conditions	
		STD VOLUME	Volume (fuel) converted to 15 °C	
		H STD VOLUME	Volume (heavy fuel) converted to 15 °C	
		MASS	Mass (fuel) calculated	
		H MASS	Mass (heavy fuel) calculated	
		CO2	CO_2 emissions (fuel) calculated	
		H CO2	CO_2 emissions (heavy fuel) calculated	
		UPP	Pulse value (quantity per pulse) (**1** / **0.1**, 0.001-1000)	1
		MS	Pulse duration (**20 ms**, 2-500)	1
		SIMVAL	Output simulation value	1
		SIMACT	Simulation enable / disable (ON / OFF)	1
F-OUT			Digital frequency outputs (flow signal)	
	NR		Output channel selection	0
	FCT		Select function	1
	OFF		Frequency output disabled (OFF)	1
	0-200Hz		Frequency output signal enabled	1
		SIGNAL	Output signal value selection	1
		VOLUME FLOW	Volume flowrate at operating conditions	
		STD VOL FLOW	Volume flowrate at reference conditions (15 °C)	
		MASS FLOW	Mass flowrate calculated	
		TEMPERATURE	Fuel temperature	
		DENSITY	Density calculated	
		LO VAL	Lower range value (0; 0-Qmax)	1
		HI VAL	Upper range value (Qmax; 0-Qmax)	1
		LO Hz	Lower frequency value (0 Hz; 0-200)	1
		HI Hz	Upper frequency value (200 Hz; 0-200)	1
		SIMVAL	Output simulation value	1
		SIMACT	Simulation enable / disable (ON / OFF)	1
		ERROR	Fail-safe behavior (cont / high / low)	1
		CONT Hz	Continuous signal	1
		HIGH Hz	High frequency signal (200Hz)	1
		LOW Hz	Low frequency signal (0Hz)	1
		STATUS	Actual output frequency	1

Menu level 1	Menu level 2	Menu level 3	Description	el
S-OUT			Status outputs (limits & alarms)	
	NR		Output channel selection	0
	FCT		Select function	1
	OFF		Status output disabled (OFF)	1
		STATE	Active logic function (NO/NC)	1
		STATUS	Status of function, active/inactive on/off	1
	LIMIT 1		1 point limit switch	1
		SIGNAL	Limit signal selection	1
		VOLUME FLOW	Volume flowrate at operating conditions	
		STD VOL FLOW	Volume flowrate at reference conditions (15 °C)	
		MASS FLOW	Mass flowrate calculated	
		TEMPERATURE	Fuel temperature	
		DENSITY	Density calculated	
		LIMIT1 ↧↥	Limit value; (Qcont, 0 to full range of size)	1
		HYST (+/-%)	Hysteresis of value (5 %, 0.0-99.9)	1
		STATE	Logic function (NO/NC)	1
		STATUS	Status of function, active/inactive on/off	1
	LIMIT 2		2 point limit switch (min/max)	1
		SIGNAL	Limit signal selection	1
		VOLUME FLOW	Volume flowrate at operating conditions	
		STD VOL FLOW	Volume flowrate at reference conditions (15 °C)	
		MASS FLOW	Mass flowrate, calculated	
		TEMPERATURE	Fuel temperature	
		DENSITY	Density calculated	
		LIMIT1 ↧	Limit value min. (Qmin, 0 to full range of size)	1
		LIMIT2 ↥	Limit value max. (Qcont, 0 to full range of size)	1
		HYST (+/-%)	Hysteresis of value min. / max. (5 %, 0.0-99.9)	1
		STATE	Logic function (NO/NC)	1
		STATUS	Status of function, active/inactive on/off	1
	STATUS		Action on alarm or fault/error	1
		STATE	Logic function (NO/NC)	1
		STATUS	Status of function, active/inactive on/off	1

5.13 Output settings: Analog and Modbus communication

Menu level 1	Menu level 2	Menu level 3	Description	el
I-OUT			Analog outputs	
	FCT		Select function	1
	OFF		Current output disabled (OFF)	1
	4-20 mA		Current output signal	
		SIGNAL	Output signal selection	1
		VOLUME FLOW	2 point limit switch (min/max)	
		STD VOL FLOW	Limit signal selection	
		MASS FLOW	Volume flowrate at operating conditions	
		TEMPERATURE	Volume flowrate at reference conditions (15 °C)	
		DENSITY	Mass flowrate calculated	
		MIN mA	Lower range value (0; 0-Qmax)	1
		MAX mA	Upper range value (Qmax; 0-Qmax)	1
		ERROR	Fail-safe behavior (cont / high / low)	1
		CONT mA	Continuous signal	
		HIGH mA	High current signal (21.8 mA)	
		LOW mA	Low current signal (3.8 mA)	
		SIMVAL	Output simulation value	1
		SIMACT	Simulation enable / disable (OFF / ON)	1
		STATUS	Actual output current	1
MODBUS			Serial bus communication	
	ADR		Device address (**1**, 1-247)	1
	BAUD		Baud rate	1
	9600			
	19200			
	38400			
	PARITY		Parity	1
	ODD		Odd	
	NONE		None	
	EVEN		Even	

5.14 Units

Menu level 1	Menu level 2	Menu level 3	Description	el
UNITS			Units	
	VOLUME		Unit of volume	2
		L	Liter	
		m3	Cubic meter	
		GAL	US gallon	
	V DEC		Decimals of volume value	2
		0.001		
		0.01		
		0.1		
		1		
	MASS		Unit of mass	2
		Kg	Kilogram	
		T	Tonne (metric ton)	
		LBS	Pound (US Pounds)	
	M DEC		Decimals of mass value	2
		0.001		
		0.01		
		0.1		
		1		
	V FLOW		Unit of volume flowrate	1
		L/s	Liter per second	
		L/m	Liter per minute	
		L/h	Liter per hour	
		m3/h	Cubic meter per hour	
		GA/h	Gallon per hour	
	M FLOW		Unit of mass flowrate	1
		Kg/h	Kilogram per hour	
		t/h	Tonne (metric ton) per hour	
		LB/h	Pound per hour	
	DENS	**Kg/m3**	Unit of density	1
	TEMP		Unit of temperature	1
		°C	Degrees Celsius	
		°F	Degree Fahrenheit	
	VPULSE		Pulse unit of volume	1
		mL	Milliliter	
		L	Liter	
		m3	Cubic meter	
		GAL	US gallon	
	MPULSE		Pulse unit of mass	1
		Kg	Kilogram	
		t	Tonne (metric ton)	
		LBS	Pound	

5.15 Configuration

Menu level 1	Menu level 2	Menu level 3	Description	el
CONFIG			System configuration	
	COMP		Enables Volume conv. to reference cond. (15 °C)	2
	OFF		Compensation disabled (OFF)	2
	DOUBLE OIL		Double fuel compensation (e.g. Diesel / HFO)	2
		DFO-HFO	Medium/Fuel selection for compensation	1
		T REF	Temperature reference (15 °C)	
		T THR	Temperature threshold (60 °C, 20-90)	2
		DENS	Fuel density (830 kg/m³, 800-1200)	2
		H DENS	Heavy fuel density (998 kg/m³, 800-1200)	2
		FCI	Fuel carbon index (3.206, 0-4)	2
		H FCI	Heavy fuel carbon index (3.1144, 0-4)	2
	SINGLE OIL		Single fuel compensation (e.g. Diesel or Lube)	2
		FLUID	Medium/Fuel 1 selection for compensation	1
		DISTILLATE FO	Distillate fuel oil	
		HEAVY FO	Heavy fuel oil	
		LUBE OIL	Lube oil	
		T REF	Temperature reference (15 °C)	
		DENS	Fuel density (830 kg/m³, 800-1200)	2
		FCI	Fuel carbon index (3.206, 0-4)	2
		LFC	Low flow cut off (Qstart/2 of DN, Qstart/2-Qmin)	2
		DQ	Damping of flow values (10 %, 0-99)	1
		DT	Damping of temperature values (10 %, 0-99)	1

5.16 System settings and System information

Menu level 1	Menu level 2	Menu level 3	Description	el
SYSTEM			System settings	
	DATE		System date (dd.mm.yy)	1
	TIME		System time (hh:mm)	1
	DAY		Weekday	
	DST		Daylight saving time: oFF / Add 1h	1
	FLOBAR		Select flow bar signal	
		FLOW	Display flow signal in %	
		CURRENT	Display current signal in %	
	CODE	**00001111**	Edit user access code, reset with manager code only	1
	RESET		System reset	0
		CANCEL	Cancel reset	0
		ALARM	Reset all alarms	4
		COUNTER	Reset all counters	4
		LOGGER	Reset all loggers	4
		DEFAULT	Reset to default values	4
		FI RESET	Reset manufacturing initializing date	4
	F-RES		System reset	5
		CANCEL	Cancel reset	5
		FACTORY	Reset all settings to factory default	5
		RTC RESET	Reset RTC clock	5
	SIM		Simulation of complete system	4
	SIMVAL	#.###	Value to be simulated for complete system	4
	SIMACT	**OFF**	Simulation action off / on	4
SYSTEM-INFO			System information	
	SNR	########	Serial number	5
	TYPE		Device type designation and size	5
	TAG	########	Customer ID tag	1
	VC		Measuring chamber volume	
	CF	0.0000	Correction factor (K-factor)	4
	Q MIN		Minimum flowrate	
	Q MAX		Maximum flowrate	
	T MIN		Minimum temperature	
	T MAX		Maximum temperature	
	F INIT	dd.mm.yy	Manufacturing date (Factory/Customer Initializing date)	5
	FW	00.00.00	Firmware version	
	HW	00.00.00	Hardware version	
	CS	ABCDE	Checksum	
	CE-MID	YYYY	Metrological conformity year	5
	CE-MID	NB-0102	Notified body	
DisplayTest			Displays all characters on the display	
			Displays empty display	

5.17 Startup and commissioning of mechanical part of the flow measuring system:

Open the valves slowly and fill the pipework gradually. Vent the installation thoroughly.



NOTICE

Pressure surges, air inclusion

Risk of damage or malfunction of the flow measuring system!

Avoid pressure surges, open valves slowly.
Air causes measurement errors; ensure that no air is present in the system during Operation.

Check all connections for tightness and monitor the system for leaks.

Perform a functional check using the electronic display by reading the instantaneous flow value.

If the measured flow rate exceeds the specification of the flow measuring system (Qcont), either install a flow control valve (throttle) downstream of the flow sensor or use a flow measuring system with a larger nominal size.

6 Maintenance and Repair

6.1 Calibration

All flow measuring systems are factory-calibrated.

An accuracy check and recalibration service is available from Aquametro. The recalibration interval is typically defined by customer, operator, or regulatory requirements and depends largely on the operating conditions, the process liquid, and the application in which the flow measuring system is installed.

6.2 Service maintenance



WARNING

The device/system may be under pressure.

Risk of severe injury!

Carry out work only on non-pressurized systems.
When working on the device/system, watch for leaking medium.
Work may only be performed by authorized specialists in accordance with applicable regulations.
Use appropriate personal protective equipment, particularly safety goggles.



CAUTION

The surfaces of the device/system and the medium may be hot.

Risk of burns!

Carry out work only on cooled devices/systems.
Work may only be performed by authorized specialists in accordance with applicable regulations.
Use appropriate personal protective equipment.



NOTICE

Use of unsuitable cleaning agents and procedures.

Risk of malfunction or damage to the flow measuring system!

Follow the cleaning instructions on the next page.



NOTICE

Warranty will be void, if the flow meter is being opened during the warranty period by a non Aquametro certified person.

Before working on the hydraulics:
- put the system or section out of operation
- close the stop valves
- release the pressure
- put a suitable tray underneath the connection to be worked on
- be prepared for spillage, have absorbent at hand

Cleaning of flow meter:
- do not use any aggressive solvents
- rinse hydraulic part of flow meter thoroughly

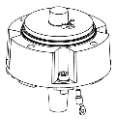
Aquametro recommends to use the following cleaning solvents:
- Gasoline used for cleaning purposes
- Cleaner's naphtha
- Petroleum ether

Dirt filter (not safety filter of flow meter)**:**
- Dirt filters must be cleaned periodically, initially at short intervals to keep fuel system free of dirt and debris.

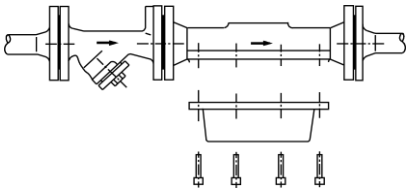
To restart the system:
- slowly open the stop valves, avoiding pressure surges ("water hammer")
- vent the pipe well
- check tightness

Check connections periodically for tightness and if necessary, retighten.

(1) 

(2) 

Torque values of screws		
Flow meter	**Screws**	**Torque**
Electronic unit (1)	M 4	2 Nm
Coupling (2)	M 6	4.5 Nm



Torque of measuring chamber screws		
Size	**Screws**	**Torque**
DN 15, 20	M 6	6 Nm
DN 25	M 8	16 Nm
DN 40	M 12	47 Nm
DN 50	M 16	100 Nm

The cleaning and revision cycle depends largely on the conditions of operation. Under favorable conditions 5 - 10 years suffice. Check the devices for corrosion.

Recommended revision cycle		
Size	**Totalizer volume**	**Time**
DN 15	20'000 m^3	7 years
DN 20	50'000 m^3	7 years
DN 25	100'000 m^3	7 years
DN 40	300'000 m^3	7 years
DN 50	1'000'000 m^3	7 years

The responsibility of the revision cycles lies with the operator.

NOTICE

If opening is necessary:

Risk of malfunction!



Observe positions during disassembly.
Follow assembly instructions.
Check proper function at start up.
Recalibration is recommended after service.
For more information about maintenance, see Spare part list and Maintenance instructions.

Opening and closing

For instructions on opening and closing the flow meter please refer to separate manual.



See Spare part list and Maintenance instructions.

6.3 Spare parts

NOTICE



Use of wrong spare parts:

Risk of malfunction or damage!

Use only original spare parts, supplied by Aquametro.



Spare part list and Maintenance instructions may be requested from Aquametro.

7 Troubleshooting and error messages

7.1 Troubleshooting

Fault symptoms	Possible causes	Procedures
• No reading / blank display	• No power supply	• Check wiring, polarity
	• Electronic counter defective	• Replace complete device
• Totalizer not running • No flow rate indicated • Indicated quantity or flow rate too small	• Flow rate outside allowed range (below Q_{min} or above Q_{max} of measuring system)	• Check flow rate (reverse flow) totalizer "0" • If too high, reduce flow or install larger measuring system • If too low, increase flow or install smaller measuring system • Reduce LFC to 0.1
	• Moving parts heavily worn out due to continuous overload	• Install new larger measuring system
	• Dirt trap / filter heavily soiled	• Clean dirt trap, replace filter
	• Safety filter in measuring system intake clogged	• Replace safety filter • Install dirt trap / filter with correct mesh size
	• Moving parts jammed	• clean measuring chamber, replace defective parts / measuring system
• Totalizer(s) run backwards	• Measuring system mounted in wrong direction	• Install measuring system with arrow pointing in flow direction
• Indicated quantity or flow rate too high	• Measuring system positioned wrongly (e.g. at highest point) • Gas or air inclusion in fluid	• Check and rectify operating conditions and measuring system position • De-aerate pipes carefully
• pressure drop at measuring system too high	• Dirt trap or filter heavily soiled	• Clean dirt trap, replace filter
	• Flow measuring system's safety filter heavily soiled	• Clean safety filter of flow measuring system
• No signal • No communication • No pulse output signal	• No flow	• Check flow using indication
	• Wrong parameterization	• Set correct parameters for outputs/communication
	• Polarity of communication connection	• Connect with correct polarity
	• Transducer defective	• Replace transducer/no repair

7.2 Alarm messages

A-TEMP Temperature alarm
- Cause: Temperature outside the defined temperature range. The fluid and density values are not recalculated.
- Action: Adjust temperature to be in normal range defined in technical specification.

A-FLOW Flow alarm
- Cause: Flow range exceeded: Q < 0 (back flow) or Q > Qmax (overflow).
- Action: Check flow direction or reduce flow to max continuous flow as specified.

A-OUTPUT 1/2 Output settings out of limits
- Cause: The configured pulse scaling exceeds the maximum permissible output capacity, resulting in buffer overflow.
- Action: Reduce pulse frequency, adjust scaling factors, and verify output load specifications according to device limits.

A-ANALOG Output settings out of limits
- Cause: Measured process value exceeds the configured analog output limits, or output scaling parameters are incorrectly set.
- Action: Check output scaling, lower/upper range values, and process limits: Adjust configuration or correct process conditions as required.

A-SIM-P Alarm when pulse output simulation is on
- Cause: Pulse output simulation is active.
- Action: Turn pulse output simulation off.

A-SIM-F Alarm when frequency output simulation is on
- Cause: Frequency output simulation is active.
- Action: Turn frequency output simulation off.

A-SIM-I Alarm when analog output simulation is on
- Cause: Analog output simulation is active.
- Action: Turn analog output simulation off.

A_MANIP Alarm when device is being manipulated
- Cause: External magnetic manipulation detected.
- Action: Remove any magnetic sources or disturbances in the vicinity of the flow measuring system.

A-SIM-SYSTEM Alarm when system simulation is on
- Cause: System simulation is active.
- Action: Turn system simulation off.

7.3 Error messages

E-TEMP Temperature error

Cause: Temperature measurement error: Measured value outside the range.

Action: Ensure that the flow measuring system is used within the temperature specifications, ensure the temperature sensor is connected or replace flow measuring system, please contact the supplier.

E-FLOW Flow error

Cause: Magnetic field sensor defective: no flow can be detected.

Action: Ensure to have flow or replace flow measuring system, please contact the supplier.

E-LOG-BOOK Log backup is faulty

Cause: The log backup of the counter readings is faulty.

Action: Reset the device. If the malfunction continues, replacement of the electronic module is required. Contact the supplier.

E-OPTION Optional Plug-In module error

Cause: The Plug-In module generates an error.

Action: Dependent on the Plug-In module, replace or contact the supplier.

E-SYSTEM System error

Cause: Hardware error of the EEPROM: the initialization of the EEPROM is faulty.

Action: Reset the device. If the malfunction continues, replacement of the electronic module is required. Contact the supplier.

E-POWER Power supply failure

Cause: The power supply is unstable or defective.

Action: Ensure that the device is connected to an uninterruptable power source.

E-EEPROM EEprom error

Cause: Error of the EEPROM handling: loading or saving of data into EEPROM faulty.

Action: Please contact the supplier.

E-SENSOR System error

Cause: Hardware error of the EEPROM: the initialization of the EEPROM is faulty.

Action: Reset the device. If the malfunction continues, replacement of the electronic module is required. Contact the supplier.

E-RTC System error

Cause: Hardware error of the EEPROM: the initialization of the EEPROM is faulty.

Action: Reset the device. If the malfunction continues, replacement of the electronic module is required. Contact the supplier.

8 Decommissioning, dismantling and disposal

CAUTION

The surfaces of the device/system and the medium may be hot.



Risk of burns!

Carry out work only on cooled devices/systems.
Work may only be performed by authorized specialists in accordance with the applicable regulations.
Use appropriate protective equipment.

WARNING

The device/system may be under pressure.



Risk of severe injury!

Carry out work only on non-pressurized systems.
When working on the device/system watch out for leaking medium.
Work may only be performed by authorized personnel in accordance with the applicable regulations.
Use appropriate protective equipment, particularly safety goggles.

8.1 Decommissioning

Disconnect all sources of energy.
Drain the system and remove the device from the installation.
Pay particular attention to the disposal instructions in section 8.3.

8.2 Dismantling

Not required.

8.3 Disposal



At the end of its life cycle, this product must be disposed of according to local regulations regarding waste management and recycling.

Electronic components, batteries, and rechargeable batteries must be collected and recycled separately in accordance with local regulations.



Any residual liquids or contaminants must be handled in compliance with local environmental and occupational health regulations.

Proper separate collection and recycling conserve natural resources and prevent environmental damage.

8.4 Returning devices / decontamination

Never send a device or system back unless you are absolutely certain that all traces of hazardous substances have been removed, including substances that may have penetrated crevices or diffused through plastic.

Any costs incurred for waste disposal or personal injury (e.g., burns) due to inadequate declaration or cleaning will be charged to the delivery company or operator.

When returning a device to Aquametro for repair or calibration, the following points are mandatory:

- Always quote the type and serial number when contacting a service or repair office.
- Always enclose a duly completed "Declaration of Decontamination" form (VD_FO0302e).
- Equipment may only be returned in an unpurified state in exceptional cases (e.g., for the investigation of errors) and only with prior written consent from Aquametro. In such cases, the contact person at Aquametro who granted approval must be clearly stated.



Use forms
«VD_FO0301e_Return Form» and
«VD_FO0302e_Declaration of Decontamination».

9 Technical Data

9.1 Model code

VZF	A	3	25	-	FL	180/	25	-	S

Calibration
- **S** standard
- **C** EU Type certificate MI005
- **L** linearized with hi accuracy

Plug-in board
- **-** none

Nominal pressure
- **16** max. 16 bar
- **25** max. 25 bar
- **40** max. 40 bar
- **5 K** JIS
- **10-20** JIS
- **150** ASME
- **300** ASME

Temperature
- **90** max. 90
- **130** max. 130 °C
- **180** max. 180 °C

Connection
- **RC** thread
- **FL** flange
- **AW** wafer

Optional hydraulic modification
- **-** none
- **B** bio-fuels
- **E** extended flow
- **P** PEEK

Nominal Size
- **15** 15 mm / 1/2"
- **20** 20 mm / 3/4"
- **25** 25 mm / 1"
- **40** 40 mm / 1 1/2"
- **50** 50 mm / 2"

Version
- **1** previous (not marked)
- **2** previous (marked II)
- **3** new

Class
- **S** standard (not marked)
- **A** higher accuracy

Type
- **VZF** electronic display unit

Not all combinations are technically possible

9.2 Hydraulic characteristics

Hydraulics			**Size**						
Nominal diameter		**DN**	**15P**	**15**	**15E**	**20**	**25**	**40**	**50**
		mm							
		inch	1/2	1/2	1/2	3/4	1	1 1/2	2
Installation length		mm	165	165	165	165	190	300	350
Connection thread on meter		inch	3/4	3/4	3/4	1	1 1/4	2	N/A
Nominal pressure threaded ends	PN	bar	16						N/A
Nominal pressure flanges	PN	bar	25 / 40						
Maximum medium temperature	T_{max}	°C	130, 180						
Maximum flow rate	Q_{max}[1]	l/h	200	600	1500	1500	3000	9000	30000
Continuous flow rate	**Q_{cont}[2]**	**l/h**	**100**	**400**	**1000**	**1000**	**2000**	**6000**	**20000**
Minimum flow rate	Q_{min}	l/h	5	10	30	30	60	180	750
Approx. starting flow rate		l/h	2	4	12	12	30	90	300
Max. permissible error of actual value	VZF3		±1.0 %	±1.0 %	±1.0 %	±1.0 %	±1.0 %	±1.0 %	±1.0 %
	VZFA3		-	±0.5 %	±0.5 %	±0.5 %	±0.5 %	±0.5 %	±0.5 %
	VZFA3 lin		-	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %
Repeatability			-	±0.1 %	±0.1 %	±0.1 %	±0.1 %	±0.1 %	±0.1 %
Measuring chamber volume		cm^3	12	12	36	36	100	330	1200
Safety filter mesh size		mm	0.400	0.400	0.400	0.400	0.400	0.800	0.800
Weight with threaded ends[3]		kg	2.2	2.2	2.5	2.5	4.2	17.3	-
Weight with flanges PN 25		kg	3.8	3.8	4.5	4.5	7.5	20.3	41.0
Weight with flanges PN 40		kg	4.4	4.4	5.5	5.5	7.8	20.5	42.0

1) Manufacturer's specification, valid for the reference conditions as specified under reference conditions. Do not use this value for the design.
2) For burners and engines or motors, the fuel oil meter must be selected on the basis of the permanent flow rate. For higher viscosities, or if the meter is installed on the suction side, the pressure drop and any reduction in the measuring range must be taken into consideration.
3) Weight without couplings.

9.3 Electronic characteristics

Electronic VZF3			
Environment			
Maximum environment temperature	Tmax	°C	-20 to +60
Maximum storage temperature	Tmax	°C	-25 to +85
Maximum storage humidity, none condensing	Hmax	%h	95
Protection class	IEC60529		IP66
Safety, vibration and shock	IEC68		
Classification	OIML R 117:2019		H3 / M2 / E1 / E2 / E3
Power supply			
Voltage range	U	VDC	12 - 24
Maximum power consumption	P	W	0.4
Update interval		s	1
Data preservation			Flash Memory
Relay output			
Switching element			solid state relay
Resistance ON		Ω	≤40
Resistance OFF		MΩ	≥10
Max. supply voltage		VDC	≤48
Max. switching current		mA	≤50
Pulse width		ms	2 - 500 (dynamic)
Pulse frequency		Hz	0 - 200
Current output			
Analog output	U	VDC	6 - 32
Resolution			16 bit
Max. error		s	<0.15% of value
Update interval		s	1
Maximum Load (RL)		Ω	0 to 1209, depending on external supply voltage of the power supply unit
		U-6 / 0.0215 Ω	(e.g.: 1209Ω@32V)
Serial interface			
Isolation			Galvanically (max 48V)
Typical output capacitance:		pF	100
Type			RS485 2-wire
Protocol			Modbus RTU
Max. speed Modbus		kBaud	38.4
Unit load			1/8
Internal Termination			none
Internal Bias Network			none

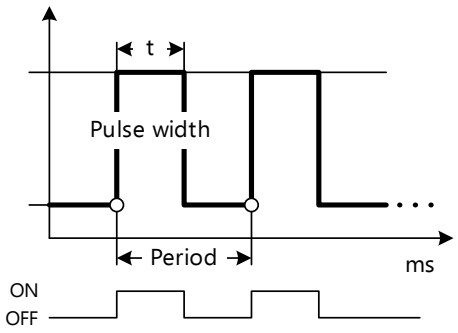
Outputs VZF3			
3 (2 pulse / frequency, 1 analog 4 - 20 mA)			freely selectable, totally independent of each other
Pulse output			volume or mass pulse 0 - 200 pulse/sec. (50 % duty cycle)
Current 4 - 20 mA			volume flow, mass flow or temperature signal
Frequency		Qmin, Qmax	volume flow, mass flow or temperature minimum, maximum and hysteresis parameterized
Limit switch		$QLim_{max}$, $QLim_{min}$	allows you to set an alert whenever predefined flow rates are exceeded (NC / NO)
Flow meter state switch	Alarm, Error		state and on/off parameterized (NC / NO)

9.4 Output and communication types

Digital outputs
The digital output has multiple functions, these and their characteristics are described hereafter.
In order to set the parameters, the device must be unlocked with the user code.

9.4.1 Function: P-Out; Pulse output (counting signal)

Digital pulse output (counting signal) for counting / totalizing the flow volume, compensated volume, mass or CO2.



Pulse width (t):
The pulse width limit can be set between 2...500 ms (example: 20 ms).
The actual pulse width is dynamically adjusted based on the current flow, but at least the set value.
The duty cycle is min. 50 %. The off cycle can be bigger.

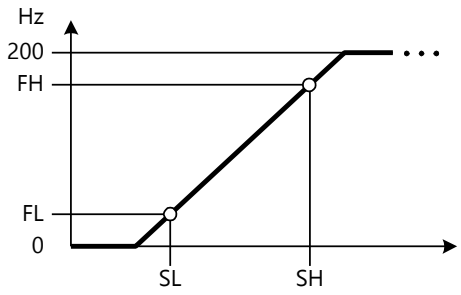
Signal behavior:
The signal is defined as: t = ON and (Period – t) = OFF:

Parameters that can be set and Factory setting:

Pulse value (UPP):	0.001 - 1000 units per pulse	**(factory setting DN15: 0.1 ltr/p)**
Pulse value (UPP):	0.001 - 1000 units per pulse	**(factory setting DN20-50: 1 ltr/p)**
Pulse width (t):	2 - 500 ms	**(factory setting: 20 ms)**

9.4.2 Function: F-Out; Frequency output (flow signal)

The flow meter provides digital frequency outputs for continuous measurement of flow, compensated flow, mass flow, temperature, or density.



The frequency output is proportional to the measured value across the selected flow rate measurement range (SL - SH).

Signal behavior:
The output signal begins generating a frequency as soon as the flow exceeds Qstart, or approximately >1 Hz under factory default settings.
Accuracy of the frequency output is ±1% of the actual value.

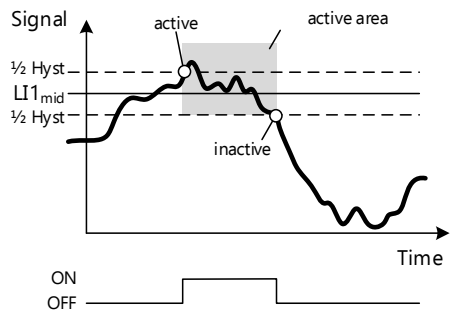
Parameters that can be set and factory setting:

Signal Low **[SL]**:	0 – Qmax	**(factory setting: 0 ltr/h)**
Signal Hi **[SH]**:	0 – Qmax	**(factory setting: Qmax)**
Frequency Low **[FL]**:	0 – 200 Hz	**(factory setting: 0 Hz)**
Frequency Hi **[FH]**:	0 – 200 Hz	**(factory setting: 200 Hz)**
Error **[Er]**:	cont; Hi; Lo	**(factory setting: cont)**

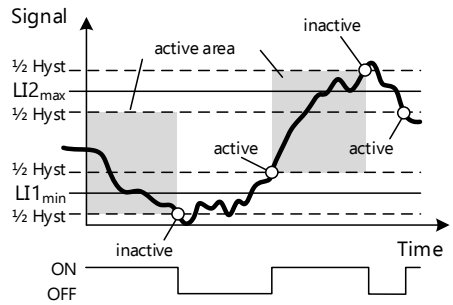
9.4.3 Function: S-Out; Limiting output (1 or 2 point)

The limit switch function can be used for remote control or alarm systems.

1 Point



2 Point



Work State

	NC	NO
inactive	⌐	¬
active	¬	⌐

The Limit function allows you to set an alert whenever predefined values (e.g., flow rate) are exceeded.

It defines upper (Limit2) and lower (Limit1) threshold values. When these thresholds are exceeded, a switch (alert) is activated.

To prevent oscillation between active and inactive states when the measured value fluctuates around a threshold, a hysteresis band (see adjacent diagram) can be defined. Within this band, the switch remains in the active state once triggered. The switch is deactivated only when the measured value moves outside the hysteresis band. Hysteresis bands are calculated as a percentage of the threshold values (Limit).

Signal behavior:
1-Point (Balanced)
Setpoints (Limit1) and reset points (½ Hyst) are calculated by expanding the setpoint values upward and downward by half the hysteresis value.
2-Point (Balanced)
Setpoints (Limit1 / Limit2) and reset points (½ Hyst) are calculated by expanding the setpoints upward or downward by half the hysteresis value.

Parameters that can be set:

Lower value **[Li1$_{min}$]**:	≥0	**(factory setting: Qmin)**
Upper value **[Li2$_{max}$]**:	≤Q_{max}	**(factory setting: Qmax)**
Hysteresis **[HYST]**:	0...99.9 %	**(factory setting: 5 %)**

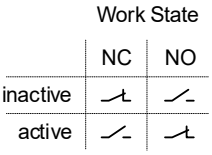
The switches activated by the Limit function can be configured as NO (Normally Open) or NC (Normally Closed), depending on your requirements.

Limit switch [NO]: Contact is open in the inactive state and closes when triggered (active).

Limit switch [NC]: Contact is closed in the inactive state and opens when triggered (active).

9.4.4 Function: S-Out; Status output

According to signal faults.



Whenever an error or an alarm occurs, the signal can be sent with this output selected.
Any fault (Error, Alarm or power loss) can be sent to a remote control or alarm system.

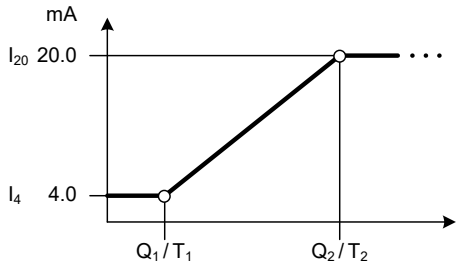
Parameters that can be set:

Trigger:	[any status (Error, Alarm or power loss)]	
Select contact logic:	[NO] or [NC]	**(factory setting: NO)**

Analog communication outputs

9.4.5 Function: I-Out; Passive analog current loop 4 - 20mA (flow/temp signal)

The analog current loop signal is suitable for integration into control loop systems.



I_4 : current 4mA
I_{20} : current 20mA
Q_1 : chosen min. flow rate
T_1 : chosen min. temperature
Q_2 : chosen max. flow rate
T_2 : chosen max. temperature

The current output is proportional to the measured flow rate or temperature over the range Q1/T1 to Q2/T2.

Signal behavior:

- If the measured value falls below the lower limit (Q1/T1), the current decreases proportionally to 3.8 mA and remains at this value.
- If the measured value exceeds the upper limit (Q2/T2), the current increases proportionally to 20.8 mA and remains at this value.
- Within the normal range, the output corresponds continuously to the measured value (3.8–20.8 mA).

Error signals:

For measurement-relevant errors (e.g., sensor failure, ROM error, supply voltage issue):

- **HIGH mA** error: output 21.5 mA
- **LOW mA** error: output 3.5 mA
- **CONT mA** error: no error signal is generated

Parameters that can be set:

Lower value **[MIN]**:	Q1/T1 ≥0	***(factory setting: 0 / 0 °C)***
Lower current **[mA]**:	I_4 = 4 mA	
Upper value **[MAX]**:	Q2/T2 ≤ Q/Tmax	***(factory setting: Qmax / 200 °C)***
Upper current **[mA]**:	I_{20} = 20 mA	
Error **[Err]**		***(factory setting: CONT mA)***

Notice: **Qmin**, **Qcont** and **Qmax** are dependent on the nominal size of the flow meter.

Example:
Q_1 is 50 l/h and Q_2 is 500 l/h
By 50 l/h a signal of 4 mA is being sent
By 275 l/h a signal of 12 mA is being sent
By 500 l/h a signal of 20 mA is being sent
The flow range of 450 l/h, will be distributed across the range of 16 mA (20 mA - 4 mA).

Serial communication outputs

9.4.6 Modbus RTU

For a list of main communication parameters see Appendix 10.2, page 47.

Factory settings and supported functions:

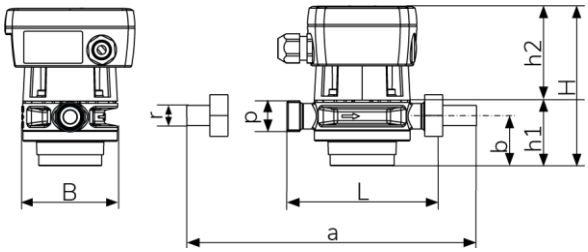
RS485: Modbus RTU:		Factory	Parameter range
Addressing range	Slave ID	1	1 - 247
	Baud rate	38400	9600 - 38400
	Parity	EVEN	None - Odd
	Stop bit	1	1
Function code		03 (4x)	Reading Holding Register Reads one or more registers of the Modbus slave (1 Register = 2 Byte)
	All other commands result in an error return		
Modbus-units	The units are transferred as set in the device		
Example:	ID 1; 03 (4x); Address 40; Quantity 2 (4Byte/32bit)		

10 Appendix

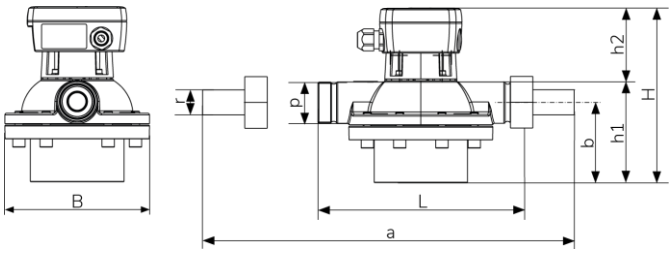
10.1 Dimensional drawings

All flow meters with threaded ends are according to ISO 228-1.

DN 15, 20, 25: with threaded ends

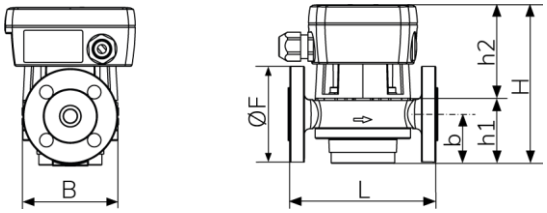


DN 40: with threaded ends

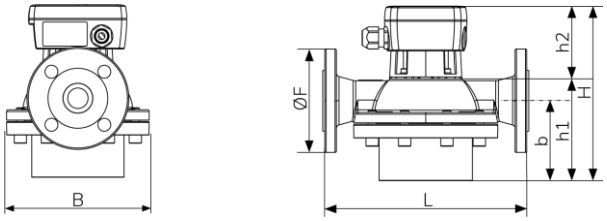


All flow meters with flanges are according to EN 1092-2, ASME B16.5 or JIS B2239.

DN 15, 20, 25: with flanged ends

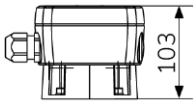


DN 40, 50: with flanged ends

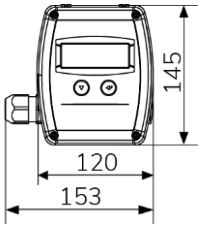


Electronic counter

Module; dimensions h2



Digital display



Size	L	B	a*	Ø F	b	h1	p	r
DN 15	165	105	240	95	45	65	G 3/4″	G 1/2″
DN 20	165	105	260	105	54	74	G 1″	G 3/4″
DN 25	190	130	305	115	77	101	G 1 1/4″	G 1″
DN 40	300	210	435	150	116	153	G 2″	G 1 1/2″
DN 50	350	280	–	165	166	209	-	-

Dimensions in mm
a* = without gaskets (2x ~2 mm)
H = h1 + h2

10.2 Modbus address list

Menu level 1	Menu level 2	Menu level 3	Description	el	Address (dec)	Reg / Value / Bit	Data Type
COUNTER			Counter values (totalizers)		**40**	**14**	Float32 BE
	VOLUME		Measured volume at operating conditions	4	40	2	Float32 BE
	VOL		Volume (fuel) converted to 15 °C	4	42	2	Float32 BE
	H VOL		Volume (heavy fuel) converted to 15 °C	4	44	2	Float32 BE
	MASS		Mass (fuel) calculated	4	46	2	Float32 BE
	H MASS		Mass (heavy fuel) calculated	4	48	2	Float32 BE
	CO2		CO_2 emissions (fuel) calculated	4	50	2	Float32 BE
	H CO2		CO_2 emissions (heavy fuel) calculated	4	52	2	Float32 BE
INSTANT			Instantaneous values		**70**	**10**	Float32 BE
	Q VOL		Volume flowrate at operating conditions		70	2	Float32 BE
	Q STD		Volume flowrate at reference conditions (15 °C)		72	2	Float32 BE
	Q MASS		Mass flowrate calculated		74	2	Float32 BE
	TEMP		Fuel temperature		78	2	Float32 BE
	DENS		Density calculated		76	2	Float32 BE
INFO			Only visible if an alarm or error is active		**100**		Binary
	A-TEMP		Temperature alarm T > TMAX			Bit1	
	A-FLOW		Flow alarm, exceeds limits or reverse flow			Bit2	
	A-OUTPUT 1		Output 1 out of range, adjust settings			Bit3	
	A-OUTPUT 2		Output 2 out of range, adjust settings			Bit4	
	A-MANIP		Tampering detected (external)			Bit5	
	A-SIM-P		Simulation active (P-Out), switch simulation off			Bit6	
	A-SIM-SYSTEM		Simulation active (System), switch simulation off			Bit7	
	A-SIM-F		Simulation active (F-Out), switch simulation off			Bit8	
	A-SIM-I		Simulation active (I-Out), switch simulation off			Bit9	
	A-I-OUT		Analog output out of range, adjust settings			Bit10	
	E-SYSTEM		System fault, reset System (call for service)			Bit11	
	E-LOG-BOOK		Log-Book fault, reset System (call for service)			Bit12	
	E-POWER		Power supply fault, ensure power is available			Bit13	
	E-TEMP		Temperature fault (hardware)			Bit14	
	E-EEPROM		EEPROM fault, reset System (call for service)			Bit15	

Menu level 1	Menu level 2	Menu level 3	Description	el	Address (dec)	Reg / Value / Bit	Data Type
	E-FLOW		Flow measurement fault (hardware)			Bit16	
	E-OPTION		Optional module fault			Bit17	
	E-SENSOR		Sensor fault, reset System (call for service)			Bit18	
	E-HW-RTC		RTC / EEPROM HW fault (call for service)			Bit19	
OP-HOURS			Operating hour information		**20**	**12**	uInt32 BE
	TIME 0		Total operating hours	5	20	2	uInt32 BE
	TIME 1		Hours in rated operating range (Qmin – Qcont)	5	22	2	uInt32 BE
	TIME 2		Hours in upper operating range (Qcont – Qmax)	5	24	2	uInt32 BE
	TIME 3		Hours above maximum flowrate (Qmax)	5	26	2	uInt32 BE
	TIME A		Hours in alarm condition	4	28	2	uInt32 BE
	TIME E		Hours in error / fault condition	4	30	2	uInt32 BE
UNLOCK			Code to unlock and edit values		**102**	**1**	uInt16
	CODE		Lock level information	0	102	1	uInt16
UNITS			Units		**90**	**6**	uInt16
	VOLUME		Unit of volume	2	90	0-11	uInt16
		L	Liter	2		0-3	lowest = 3 decimals 3.333
		m3	Cubic meter	2		4-7	(0.001, 0.01, 0.1, 1)
		GAL	US gallon	2		8-11	highest = 0 decimals 0
	V DEC		Decimals of volume value	2		0-11	uInt16
		0.001		2		0, 4, 8	
		0.01		2		1, 5, 9	
		0.1		2		2, 6, 10	
		1		2		3, 7, 11	
	MASS		Unit of mass	2	91	12-23	uInt16
		Kg	Kilogram	2		12-15	lowest = 3 decimals 3.333
		T	Tonne	2		16-19	highest = 0 decimals 0
		LBS	Pound	2		20-23	(0.001, 0.01, 0.1, 1)
	M DEC		Decimals of mass value	2		12-23	uInt16
		0.001		2		12, 16, 20	
		0.01		2		13, 17, 21	

Menu level 1	Menu level 2	Menu level 3	Description	el	Address (dec)	Reg / Value / Bit	Data Type
		0.1		2		14, 18, 22	
		1		2		15, 19, 23	
	V FLOW		Unit of volume flowrate	1	92	0-4	uInt16
		L/s	Liter per second	1		32	
		L/m	Liter per minute	1		33	
		L/h	Liter per hour	1		**34**	
		m3/h	Cubic meter per hour	1		35	
		GA/h	Gallon per hour	1		36	
	M FLOW		Unit of mass flowrate	1	93	0-2	uInt16
		Kg/h	Kilogram per hour	1		**37**	
		t/h	Tonne per hour	1		38	
		LB/h	Pound per hour	1		39	
	DENS	**Kg/m3**	Unit of density	1	94	**43**	uInt16
	TEMP		Unit of temperature	1	95	41-42	uInt16
		°C	Degrees Celsius	1		**41**	
		°F	Degree Fahrenheit	1		42	
SYSTEM			System settings		**10**	**5**	uInt
	DATE		System date (dd.mm.yy)	1	10		uInt48 (mm,hh,TT,MM,JJJJ)
	TIME		System time (hh:mm)	1	10		uInt48 (mm,hh,TT,MM,JJJJ)
SYSTEM-INFO			System information		**1800**	**16**	
	SNR	########	Serial number	5	1800	2	uInt32
	TYPE		Device type designation and size	5	1802	1-7	ASCII
	TAG	########	Customer ID tag	1	1809	9-16	ASCII

10.3 Default Settings list

Menu level 1	Menu level 2	Menu level 3	Description	Default Value
P-OUT			Digital pulse outputs (counting signal)	
	NR		Output channel selection	1
	FCT		Select function	IMPULSE
	IMPULSE	0	Pulse output signal	
		SIGNAL	Output signal selection	VOLUME
		UPP	Pulse value (quantity per pulse) (1 / 0.1, 0.001-1000)	0.1 / 1
		MS	Pulse duration (20, 2-500 ms)	20
P-OUT2			Digital pulse outputs (counting signal)	
	NR		Output channel selection	2
	FCT		Select function	IMPULSE
	IMPULSE	0	Pulse output signal	
		SIGNAL	Output signal selection	VOLUME
		UPP	Pulse value (quantity per pulse) (1 / 0.1, 0.001-1000)	0.1 / 1
		MS	Pulse duration (20, 2-500 ms)	20
F-OUT			Digital frequency outputs (flow signal)	
	NR		Output channel selection	1
	FCT		Select function	OFF
	0-200Hz	0	Frequency output signal enabled	
		SIGNAL	Output signal value selection	VOLUME FLOW
		LO VAL	Lower range value (0; 0-Qmax)	Qmin
		HI VAL	Upper range value (Qmax; 0-Qmax)	Qmax
		LO Hz	Lower frequency value (0 Hz; 0-200 Hz)	0
		HI Hz	Upper frequency value (200 Hz; 0-200 Hz)	200
		ERROR	Fail-safe behavior (cont / high / low)	CONT Hz
F-OUT2			Digital frequency outputs (flow signal)	
	NR		Output channel selection	2
	FCT		Select function	OFF
	0-200Hz	0	Frequency output signal enabled	
		SIGNAL	Output signal value selection	VOLUME FLOW
		LO VAL	Lower range value (0; 0-Qmax)	Qmin
		HI VAL	Upper range value (Qmax; 0-Qmax)	Qmax
		LO Hz	Lower frequency value (0Hz; 0-200Hz)	0
		HI Hz	Upper frequency value (200Hz; 0-200Hz)	200
		ERROR	Fail-safe behavior (cont / high / low)	CONT Hz
S-OUT			Status outputs (limits & alarms)	
	NR		Output channel selection	1
	FCT		Select function	OFF
	LIMIT 1	0	1 point limit switch	
		SIGNAL	Limit signal selection	VOLUME FLOW
		LIMIT1 ,+	Limit value; (Qcont, 0 to full range of size)	Qcont
		HYST (+/-%)	Hysteresis of value (5, 0.0-99.9 %)	5
		STATE	Logic function (NO/NC)	NO
	LIMIT 2	0	2 point limit switch (min/max)	
		SIGNAL	Limit signal selection	VOLUME FLOW

Menu level 1	Menu level 2	Menu level 3	Description	Default Value
		LIMIT1 ,	Limit value min. (Qmin, 0 to full range of size)	Qmin
		LIMIT2 +	Limit value max. (Qcont, 0 to full range of size)	Qcont
		HYST (+/-%)	Hysteresis of value min. / max. (5, 0.0-99.9 %)	5
		STATE	Logic function (NO/NC)	NO
	STATUS	0	Action on alarm or fault/error	
		STATE	Logic function (NO/NC)	NO
	OFF	0	Status output disabled (OFF)	
		STATE	Active logic function (NO/NC)	NO
S-OUT2			Status outputs (limits & alarms)	
	NR		Output channel selection	2
	FCT		Select function	OFF
	LIMIT 1	0	1 point limit switch	
		SIGNAL	Limit signal selection	VOLUME FLOW
		LIMIT1 ,+	Limit value; (Qcont, 0 to full range of size)	Qcont
		HYST (+/-%)	Hysteresis of value (5, 0.0-99.9 %)	5
		STATE	Logic function (NO/NC)	NO
	LIMIT 2	0	2 point limit switch (min/max)	
		SIGNAL	Limit signal selection	VOLUME FLOW
		LIMIT1 ,	Limit value min. (Qmin, 0 to full range of size)	Qmin
		LIMIT2 +	Limit value max. (Qcont, 0 to full range of size)	Qcont
		HYST (+/-%)	Hysteresis of value min. / max. (5, 0.0-99.9 %)	5
		STATE	Logic function (NO/NC)	NO
	STATUS	0	Action on alarm or fault/error	
		STATE	Logic function (NO/NC)	NO
	OFF	0	Status output disabled (OFF)	
		STATE	Active logic function (NO/NC)	NO
I-OUT			Analog outputs	
	FCT		Select function	4-20Ma
		SIGNAL	Output signal selection	VOLUME FLOW
		MIN mA	Lower range value (0; 0-Qmax)	0
		MAX mA	Upper range value (Qmax; 0-Qmax)	Qmax
		ERROR	Fail-safe behavior (cont / high / low)	CONT Ma
MODBUS			Serial bus communication	
	ADR		Device address (1, 1-247)	1
	BAUD		Baud rate	38400
	PARITY		Parity	EVEN
UNITS			Units	
	VOLUME		Unit of volume	L
	V DEC		Decimals of volume value	0.1 / 1
	MASS		Unit of mass	KG
	M DEC		Decimals of mass value	0.1 / 1
	V FLOW		Unit of volume flowrate	L/H
	M FLOW		Unit of mass flowrate	KG/H
	DENS	**Kg/m3**	Unit of density	KG/m^3
	TEMP		Unit of temperature	°C

Menu level 1	Menu level 2	Menu level 3	Description	Default Value
	VPULSE		Pulse unit of volume	L
	MPULSE		Pulse unit of mass	KG
CONFIG			System configuration	
	COMP		Enables Volume conversion to reference cond. (15 °C)	OFF
		FLUID	Medium/Fuel 1 selection for compensation	DISTILLATE
		T THR	Temperature threshold (60 °C, 20-90)	60°C
		DENS	Fuel density (830 kg/m³, 800-1200)	830 KG/m³
		H DENS	Heavy fuel density (998 kg/m³, 800-1200)	998 KG/m³
		FCI	Fuel carbon index (3.206, 0-4)	3.206
		H FCI	Heavy fuel carbon index (3.1144, 0-4)	3.1144
SYSTEM-INFO			System Information	
	SNR	########	Serial number	
	TYPE		Device type designation and size	
	TAG	########	Customer ID tag	
	CF	0.0000	Correction factor (K-factor)	
	F INIT	dd.mm.yy	Manufacturing date (Factory/Customer initializing date)	
	FW	00.00.00	Firmware version	
	CE-MID	YYYY	Metrological conformity year	

Notes:

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11 Certificates

All certificates / approvals, can be found on our website www.aquametro.com

Class approvals		
DNV Det Norske Veritas	Norway	
LR Lloyds Register	United Kingdom	
CCS China Classification Society	China	

Approvals in process

11.1 EU Type examination certificate MI005

Approval in process

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