

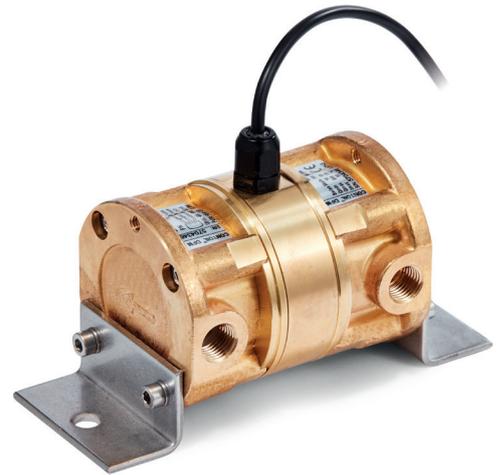
CONTOIL[®] **DN 4 - 8**

Measurement

CONTOIL®

Fuel oil meters DN 4 - 8 (12)

Fuel consumption measurement for trucks, buses, trains, construction and agricultural machinery, small boats and generators as well as for burners.



Features:

- » Supports most used models of vehicles
- » Proved and tested system
- » Easy and accurate reading of engine fuel consumption
- » No extra maintenance necessary
- » Tamper-proof measurement

Benefits:

- » Low installation costs
- » Quick and easy installation
- » Short down-time of vehicle
- » Quick pay-back period



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INTRODUCTION

Thank you for your decision to work with Aquametro Fuel Measurement Products. This technical specification describes the installation, commissioning and use of CONTOIL® fuel oil meters. For additional information please contact your local sales agent at: www.aquametro-oil-marine.com.

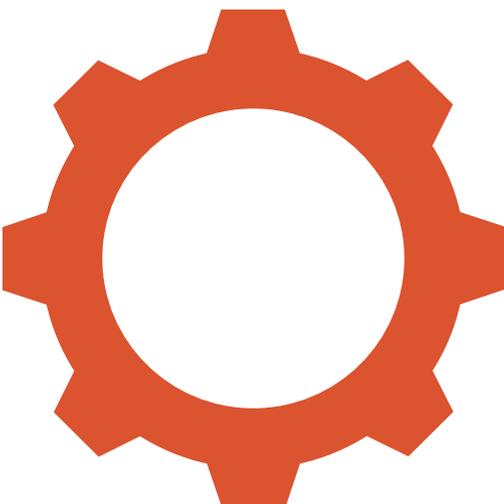
Liability Disclaimer

The manufacturer cannot monitor the compliance to this manual as well as the conditions and methods during the installation, operation, usage and maintenance of the system regulator. Improper installation can cause damage and endanger people. Therefore, we assume no responsibility and liability for losses, damage or costs that result due to incorrect installation, improper operation, usage and maintenance or in any manner associated therewith. Similarly, we assume no responsibility for patent right or other right infringements of third parties caused by usage of this system regulator. The manufacturer reserves the right, without prior notification, to make modifications concerning the product, technical data or installation and operating manual.

Safety precautions

CONTOIL® fuel oil meters must only be used for their intended purpose and comply with local and international safety regulations. All documentation is to be followed exactly. None of the information stated here or elsewhere releases planners, installers and operators from their own careful and comprehensive assessment of the respective plant configuration in terms of functional capability and operational safety.

- » Local applicable working regulations must be complied with, during all work on the plant and/or ship.
- » All safety, installation and operation instructions as described in this manual must be followed.
- » Sensors are sensitive measuring instruments and should be treated carefully.



OPERATING PRINCIPLE

Function

CONTOIL® fuel oil meters work on the volumetric principle of rotary piston meters (positive displacement meters). The main features of this measuring principle are large measuring ranges, high accuracy, suitability for high viscosities and independence from power supply; flow disturbances do not influence proper operation.



Leading manufacturers of oil burners and operators of heating systems, ships or diesel engines rely on CONTOIL® fuel oil meters - and with good reasons.

Advantages:

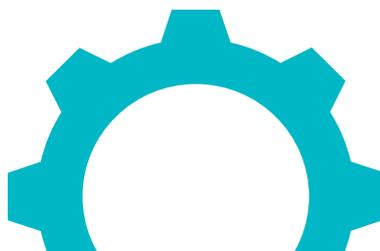
- » Optimal solution for every application
- » Can be mounted on the pressure or suction side of a pump
- » Space-saving installation, because no straight inlet / outlet sections are required
- » Flexible mounting of the meter in horizontal, vertical or inclined positions
- » Accurate measurement result, since the reading is independent of the temperature and viscosity of the fluid
- » Minimum failure costs due to simple function monitoring, rapid fault analysis and the possibility of simple repairs on site

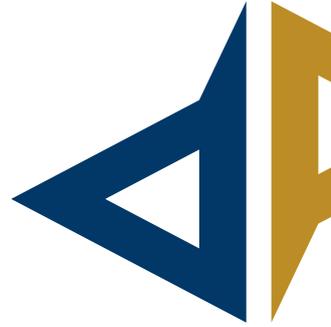
Areas of application:

- » To measure fuel consumption of oil burners (e. g. in heating boilers, industrial furnaces, tar processing plants)
- » Consumption monitoring and optimization (ships, generators, etc)
- » Flow measurement for mineral oils
- » Optional remote processing and integration into superior systems
- » Manual dosing / filling / batch processing

Fuel types:

- » Fluids according to ISO 8217-2010
- » Heating fuel extra light / light





PRODUCT RANGE

CONTOIL® fuel oil meters DN 4 - 8 (12)

Fuel oil meters for direct fuel measurement

Hydraulic

VZO 4 Qmin / VZO 4 + 8 / VZO 4 + 8 OEM

Hydraulic connections 1/8" and M14x1.5

Main characteristics:

- » Optimal flow range 0.5 - 200 l/h
- » Temperature ranges -30 to +80 °C
- » Nominal pressure PN 25



Electronic read out

VZO 4 + 8 RE / VZO 4 + 8 OEM

- » Output signals for: RE and VZO OEM

For more information, see page 8

Hydraulic

VZD2 4, 8 + 8E / VZP 4 + 8

Hydraulic connections 1/8" and M14x1.5

Main characteristics:

- » Optimal flow range 1 - 600 l/h
- » Temperature ranges -30 to +80 °C
- » Nominal pressure PN 25



Electronic read out

VZD2 / VZP 4 + 8

- » Electronic display of: VZD2
- » Output signals for: VZD2 / VZP
- » Pulse output signal for VZD2 / VZP

For more information, see page 12

Fuel oil meters for differential fuel measurement

Hydraulic

DFM 8ECO / DFM 12ECO

Hydraulic connections M14x1.5

Main characteristics:

- » Optimal flow range 10 - 600 l/h
- » Temperature ranges -30 to +80 °C
- » Nominal pressure PN 16 bar

Electronic read out

DFM 8ECO / DFM 12ECO

- » Output signals for: DFM 8 + 12

[For more information, see page 16](#)



TECHNICAL SPECIFICATIONS

Technical data CONTOIL® VZO 4 Hydraulic



| Hydraulic | | | VZO 4 | VZO 4 Qmin | VZO 4 OEM |
|--|-------------------------|-----------------|--------------------------------|-----------------------|-----------------------|
| Nominal diameter | DN | mm | 4 | 4 | 4 |
| | | inch | 1/8 | 1/8 | 1/8 |
| Hydraulic connection | G ¹⁾ | inch | 1/8 | 1/8 | 1/8 |
| Nominal pressure | PN | bar | 25 | 25 | 25 |
| Max. medium temperature | T _{max} | °C | -30 to +80 | -30 to +80 | -30 to +80 |
| Max. environmental temperature | | °C | -10 to + 60 | -10 to + 60 | -10 to + 60 |
| Max. storage temperature | | °C | -40 to +85 | -40 to +85 | -40 to +85 |
| Protection class | IP | | 50 | 50 | 65 |
| Maximum flow rate | Q _{max} | l/h | 80 | 40 | 80 |
| Continuous flow rate | Q_{cont} | l/h | 50 | 25 | 50 |
| Minimum flow rate | Q _{min} | l/h | 1 | 0.5 | 1 |
| Approx. starting flow rate | | l/h | 0.4 | 0.3 | 0.4 |
| Max. permissible error of actual value | | | <±1.0 % ²⁾ | <±1.0 % ²⁾ | <±1.0 % ²⁾ |
| Repeatability | | | <±0.2 % | <±0.2 % | <±0.2 % |
| Measuring chamber volume | | cm ³ | 5 | 5 | 5 |
| Fuel | | | diesel and low viscosity fuels | | |
| Max. viscosity | | cSt | 6 | 6 | 6 |
| Safety filter mesh size | | mm | 0.125 | 0.125 | - |
| Weight | | kg | 0.65 | 0.65 | 0.65 |
| Housing finish | | | brass gold color | | |

1) G-threads have a parallel shape in accordance with the DIN-EN-ISO 228-1 standard with flank angle 55°.

2) 0.5 - 1 l/h ±5 %; 1 - 2 l/h ±2.5 %

Technical data

CONTOIL® VZO 8

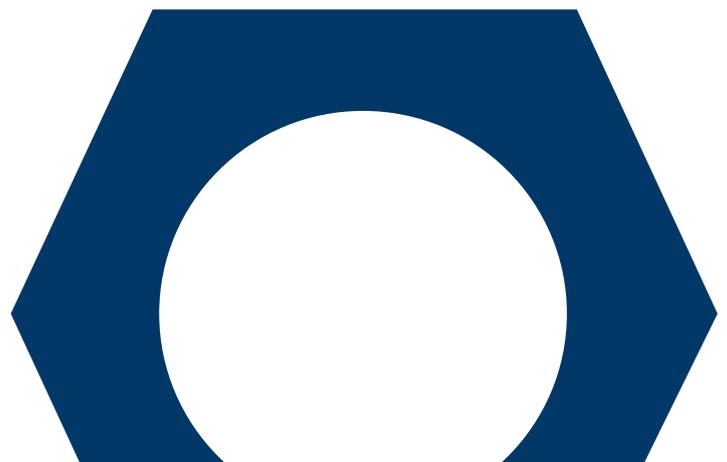
Hydraulic



| Hydraulic | | VZO 8 | | VZO 8 OEM |
|--|-------------------------|-----------------|--------------------------------|-----------------------|
| Nominal diameter | DN | mm | 8 | 8 |
| | | inch | 1/4 | 1/4 |
| Hydraulic connection | | | G ¹⁾ 1/4 inch | M14x1.5 mm |
| Nominal pressure | PN | bar | 25 | 25 |
| Max. medium temperature | T _{max} | °C | -30 to +80 | -30 to +80 |
| Max. environmental temperature | | °C | -10 to +60 | -10 to +60 |
| Max. storage temperature | | °C | -40 to +85 | -40 to +85 |
| Protection class | IP | | 50 | 65 |
| Maximum flow rate | Q _{max} | l/h | 200 | 200 |
| Continuous flow rate | Q_{cont} | l/h | 140 | 140 |
| Minimum flow rate | Q _{min} | l/h | 4 | 4 |
| Approx. starting flow rate | | l/h | 1.6 | 1.6 |
| Max. permissible error of actual value | | | <±1.0 ²⁾ | <±1.0 % ²⁾ |
| Repeatability | | | <±0.2 % | <±0.2 % |
| Measuring chamber volume | | cm ³ | 12.44 | 12.44 |
| Fuel | | | diesel and low viscosity fuels | |
| Max. viscosity | | cSt | 6 | 6 |
| Safety filter mesh size | | mm | 0.15 | 0.15 |
| Weight | | kg | 0.75 | 0.75 |
| Housing finish | | | brass gold color | |

1) G-threads have a parallel shape in accordance with the DIN-EN-ISO 228-1 standard with flank angle 55°.

2) 4 - 5 l/h ±2 %



Technical data

CONTOIL® VZO 4 + 8

Electrical and output specifications

| Electronic | | | VZO 4 | VZO 8 | VZO 4 OEM | VZO 8 OEM |
|--------------------|---------------------|---------|--------|--------|--------------|--------------|
| Reed pulser | | | | | | |
| RE 1 | | I/pulse | - | ◀▶ | - | - |
| RE 0.1 | | I/pulse | ◀▶ | - | - | - |
| RE 0.00125 | | I/pulse | ◀▶ | - | - | - |
| RE 0.00311 | | I/pulse | - | ◀▶ | - | - |
| Pulse frequency | | | | | | |
| RE 0.00125 | at Q _{max} | Hz | 17.777 | - | - | - |
| | at Q _{min} | Hz | 0.222 | - | - | - |
| RE 0.00311 | at Q _{max} | Hz | - | 17.864 | - | - |
| | at Q _{min} | Hz | - | 0.357 | - | - |
| Reed pulser RE | | I/pulse | | | 0.005 | 0.01244 |
| Pulse frequency RE | at Q _{max} | Hz | | | 4.444 | 4.444 |
| | at Q _{min} | Hz | | | 0.056 | 0.089 |

| Electronic | REED pulser | |
|---------------------------|---|-----------------------------------|
| CONTOIL® VZO 4 + 8 | | |
| Switching element | Reed switch with dry contact (inert gas) | |
| Switching voltage | Max. 48 VAC/DC, protection class III (SELV) | |
| Switching current | Max. 50 mA | |
| Quiescent current | Open contact | |
| Switching power | Max. 2 W | |
| ON-time | VZO 4-RE 0.00125: | 30 - 70 % (17 - 39 ms at 80 l/h) |
| | VZO 4-RE 0.1: | 40 - 60 % |
| | VZO 8-RE 0.00311: | 30 - 70 % (17 - 39 ms at 200 l/h) |
| | VZO 8-RE 1: | 40 - 60 % |
| Protection class | IP 50 (IEC 60529) against harmful dust deposits Option: IP 54 additional against splashing water | |
| Connections | Plug on connector with cable 3.5 - 5 mm Ø | |

| Electronic CONTOIL® VZO 4 + 8 OEM | REED pulser |
|--|---|
| Switching element | Reed switch with dry contact (inert gas) |
| Switching voltage | Max. 230 VAC/DC |
| Switching current | Max. 50 mA |
| Quiescent current | Open contact |
| Switching power | Max. 3 VA |
| ON-time | 40 - 55 % |
| Protection class | IP 65 (IEC 60529) against dust and water jets |
| Connections | Cable cross section 2 x 0.5 mm ² , length 480 mm |

Safety note

When connecting the Reed pulser to a low-voltage power source (50 - 250 VAC/DC), the specialist installing the equipment is responsible for ensuring that all local regulations are observed (e. g. regulations for electrical installations, personnel safety).

Avoid disturbance of electromagnetic fields.



Technical data

CONTOIL® VZD2 4 / VZP 4

Hydraulic



| Hydraulic | | VZD2 4 | VZP 4 |
|--|-------------------------|-----------------|--------------------------------|
| Nominal diameter | DN | mm | 4 |
| | | inch | 1/8 |
| Hydraulic connection | G ²⁾ | inch | 1/8 (14x1.5) ¹⁾ |
| Nominal pressure | PN | bar | 25 |
| Max. medium temperature | T _{max} | °C | -30 to +80 |
| Max. environmental temperature ³⁾ | | °C | -20 to +60 |
| Max. storage temperature | | °C | -40 to +85 |
| Protection class | IP | | 66 |
| Maximum flow rate | Q _{max} | l/h | 80 ⁴⁾ |
| Continuous flow rate | Q_{cont} | l/h | 50 |
| Minimum flow rate | Q _{min} | l/h | 1 |
| Approx. starting flow rate | | l/h | 0.4 |
| Max. permissible error of actual value | | | <±1.0 % ⁵⁾ |
| Repeatability | | | <±0.2 % |
| Measuring chamber volume | | cm ³ | 5 |
| Fuel | | | diesel and low viscosity fuels |
| Max. viscosity | | cSt | 6 |
| Safety filter mesh size | | mm | 0.125 |
| Weight | | kg | 0.65 |
| Housing finish | | | brass gold color |

1) Connection with adapter set VSR, part no.: 80630

2) G-threads have a parallel shape in accordance with the DIN-EN-ISO 228-1 standard with flank angle 55°.

3) If the device is used below or above stated temperature rating, the LCD can react slower and life time can be shortened.

4) Do not use for meter sizing.

5) 1- 2 l/h ±2.5 %

Technical data

CONTOIL® VZD2 8 + 8E / VZP 8

Hydraulic



| Hydraulic | | | VZD2 8 | VZD2 8E | VZP 8 |
|--|-------------------------|-----------------|--------------------------------|-------------------|-----------------------|
| Nominal diameter | DN | mm | 8 | 8 | 8 |
| | | inch | 1/4 | 1/4 | 1/4 |
| Hydraulic connection | | mm | M14x1.5 | M14x1.5 | M14x1.5 |
| Nominal pressure | PN | bar | 25 | 25 | 25 |
| Max. medium temperature | T _{max} | °C | -30 to +80 | -30 to +80 | -30 to +80 |
| Max. environmental temperature ¹⁾ | | °C | -20 to +60 | -20 to +60 | -20 to +60 |
| Max. storage temperature | | °C | -25 to +80 | -25 to +80 | -25 to +80 |
| Protection class | IP | | 66 | 66 | 66 |
| Maximum flow rate | Q _{max} | l/h | 200 ²⁾ | 600 ²⁾ | 200 ²⁾ |
| Continuous flow rate | Q_{cont} | l/h | 140 | 400 | 140 |
| Minimum flow rate | Q _{min} | l/h | 4 | 10 | 4 |
| Approx. starting flow rate | | l/h | 1.6 | 2 | 1.6 |
| Max. permissible error of actual value | | | <±1.0 % ³⁾ | <±1.0 % | <±1.0 % ³⁾ |
| Repeatability | | | <±0.2 % | <±0.2 % | <±0.2 % |
| Measuring chamber volume | | cm ³ | 12.44 | 12.44 | 12.44 |
| Fuel | | | diesel and low viscosity fuels | | |
| Max. viscosity | | cSt | 6 | 6 | 6 |
| Safety filter mesh size | | mm | 0.15 | 0.15 | 0.15 |
| Weight | | kg | 0.75 | 0.75 | 0.65 |
| Housing finish | | | brass gold color | | |

1) If the device is used below or above stated temperature rating, the LCD can react slower and life time can be shortened.

2) Do not use for meter sizing.

3) 4 - 5 l/h ±2 %

Technical data

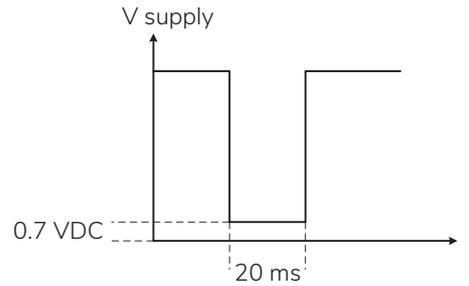
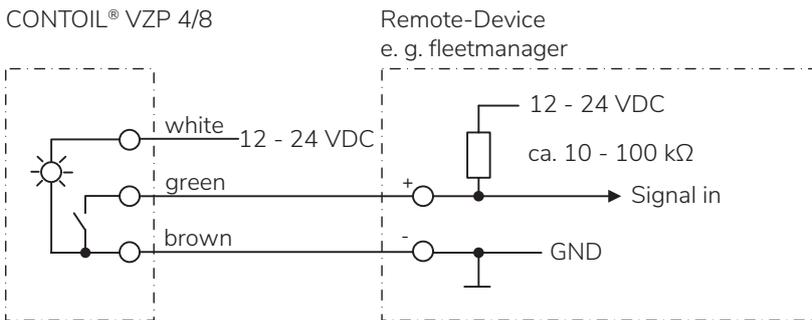
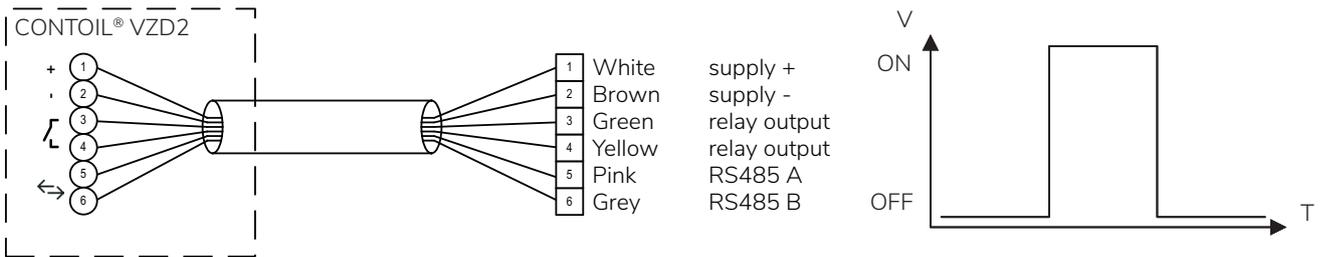
CONTOIL® VZD2 4, 8 + 8E / VZP 4 + 8

Electrical and output specifications

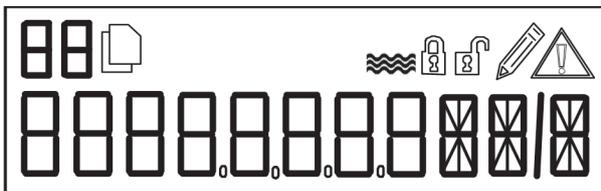
| Electronic | | VZD2 4, 8 + 8E | |
|---|----------|----------------|-------------------|
| Environment | | | |
| Maximum environment temperature | Tmax | °C | -20 to +60 |
| Maximum storage temperature | Tmax | °C | -25 to +80 |
| Maximum storage humidity, none condensing | Hmax | %h | 95 |
| Protection class | IEC60529 | | IP66 |
| Safety, vibration and shock | IEC68 | | IEC68 |
| Power supply | | | |
| Voltage range | U | VDC | 12 - 24 |
| Maximum power consumption | P | W | 0.4 |
| Update interval | | s | 1 |
| Data preservation | | | EEPROM |
| Relay output | | | |
| Switching element | | Ω | solid state relay |
| Resistance ON | | MΩ | ≤40 |
| Resistance OFF | | VDC | ≥10 |
| Max. supply voltage | | mA | ≤48 |
| Max. switching current | | ms | ≤50 |
| Pulse width | | Hz | 2 - 500 (dynamic) |
| Pulse frequency | | | 0 - 200 |
| Serial interface | | | |
| Isolation | | | galvanically |
| Typical output capacitance: | | pF | 100 |
| Type | | | RS485 2-wire |
| Protocol | | | Modbus |
| Max. speed Modbus | | kBaud | 38.4 |

| Electronic | | VZP 4 | VZP 8 |
|---------------------------------------|---------|-----------------------|---------|
| Pulse value (HI-Res) | I/pulse | 0.005 | 0.01244 |
| Pulse value (Param) | I/pulse | - | - |
| Pulse width (HI-Res) | ms | 20 | 20 |
| Pulse width (Param) | ms | - | - |
| Current load (open drain output) max. | mA | 50 | 50 |
| Output operational voltage max. | VDC | 48 | 48 |
| Output dropout voltage | | max. 2 VDC at 50 mA | |
| Power supply | VDC | 12 - 24 | 12 - 24 |
| Amplitude range | | equal to power supply | |

Functional diagram CONTOIL® VZD2 / VZP electrical and output specification



Short view of the menu



The complete menu is shown in the Mounting and operating instructions.



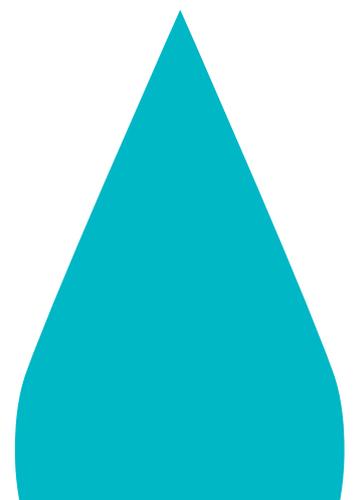
Technical data

CONTOIL® DFM 8 + 12

Hydraulic



| Hydraulic | | | DFM 8 ECO | DFM 12 ECO |
|--|-------------------------|-----------------|--------------------------------|---------------|
| Nominal diameter | DN | mm | 8 | 12 |
| | | inch | 1/4 | 1/4 |
| Hydraulic connection | | mm | M14x1.5 | M14x1.5 |
| Nominal pressure | PN | bar | 16 | 16 |
| Max. medium temperature | T _{max} | °C | -30 to +80 | -30 to +80 |
| Max. environmental temperature | | °C | -20 to +80 | -20 to +80 |
| Max. storage temperature | | °C | -40 to +85 | -40 to +85 |
| Protection class | IP | | 66 | 66 |
| Maximum flow rate | Q _{max} | l/h | 260 | 600 |
| Continuous flow rate | Q_{cont} | l/h | 200 | 400 |
| Minimum flow rate | Q _{min} | l/h | 10 | 10 |
| Approx. starting flow rate | | l/h | 0.4 | 0.4 |
| Max. permissible error of actual value | | | <±1.0 % | <±1.0 % |
| Repeatability | | | <±0.2 % | <±0.2 % |
| Measuring chamber volume | | cm ³ | 12.44 | 12.44 |
| Fuel | | | diesel and low viscosity fuels | |
| Max. viscosity | | cSt | 6 | 6 |
| Safety filter mesh size | | mm | 0.15 | 0.15 |
| Weight | | kg | 0.65 | 0.65 |
| Housing finish | | | brass gold color | |





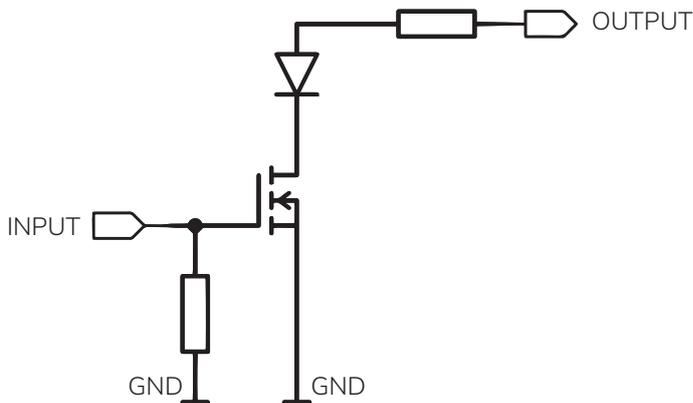
Technical data

CONTOIL® DFM 8 + 12

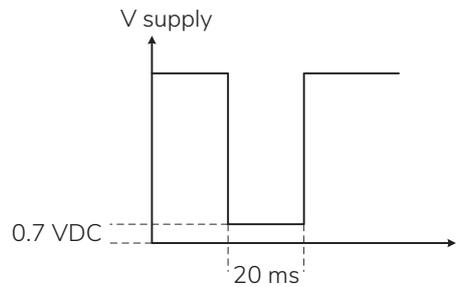
Electrical and output specifications

| Electronic | | DFM 8 ECO | DFM 12 ECO |
|---------------------------------------|---------|-----------------------|---------------|
| Pulse value | l/pulse | 0.01244 | 0.01244 |
| Frequency at Q _{cont} | Hz max | <4.5 | <9 |
| Pulse width | ms | 20 | 20 |
| Current load (open drain output) max. | mA | 50 | 50 |
| Power supply | VDC | 12 - 24 | 12 - 24 |
| Amplitude range | | equal to power supply | |

Functional diagram passive output

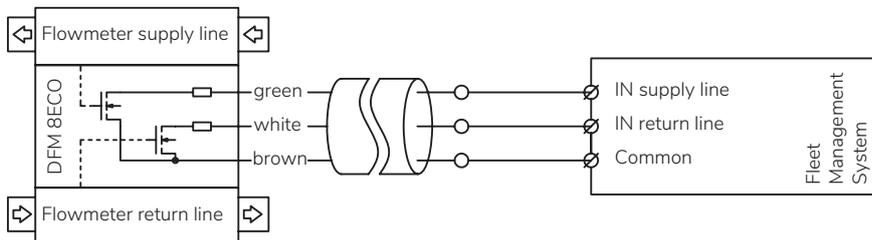


Output signal specification



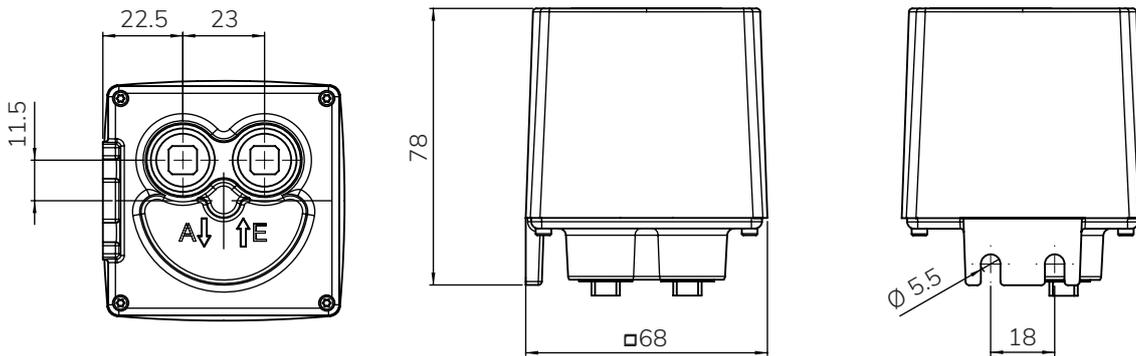
Functional diagram CONTOIL® DFM 8 / 12 ECO pulse specification; passive pulse

Whenever a pulse is generated, the electronic switch at the DFM 8 / 12 ECO will be closed and the incoming 12 - 24 VDC will be redirected to the external device.

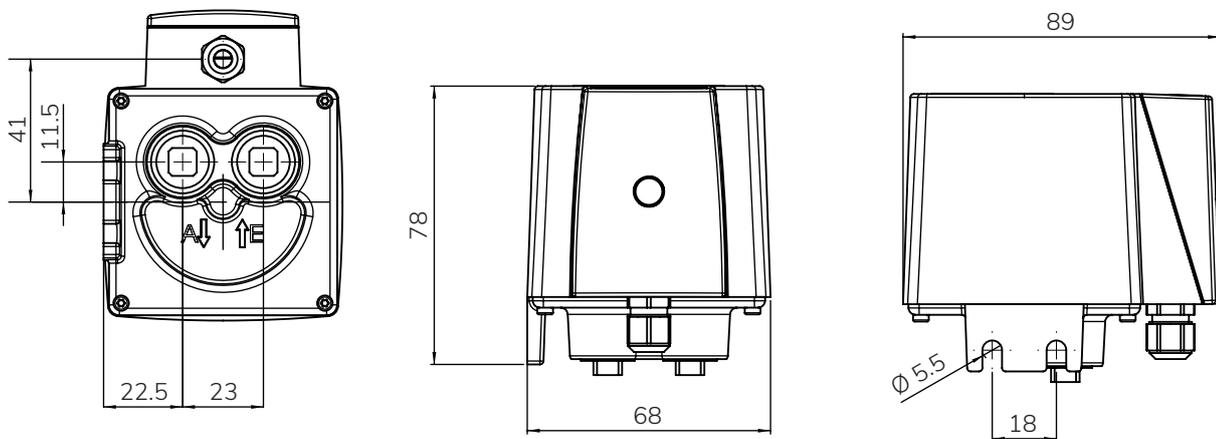


Dimensional drawings (all dimensions in mm)

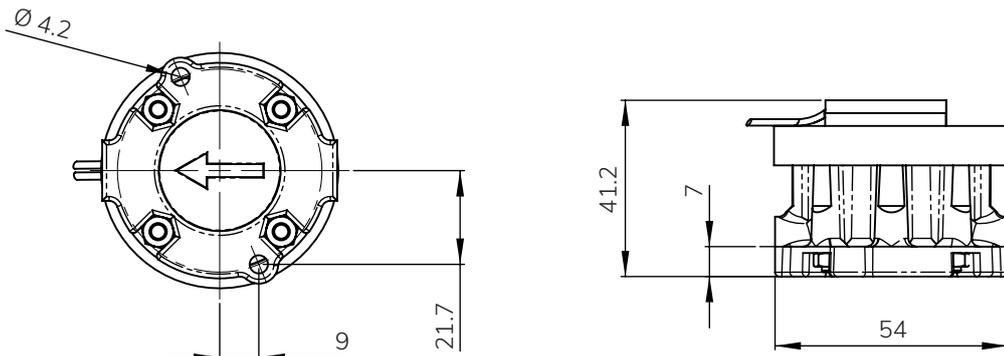
CONTOIL® VZO 4 + 8



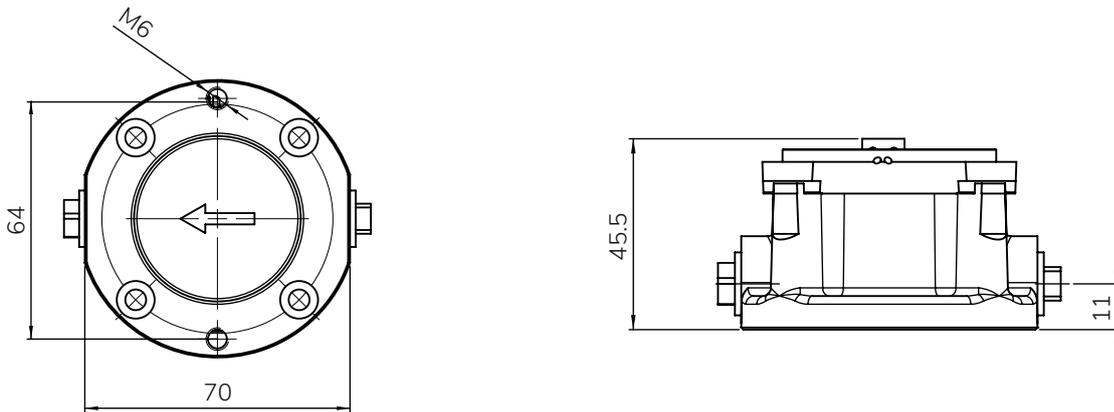
CONTOIL® VZO 4 + 8 RE



CONTOIL® VZO 4 OEM

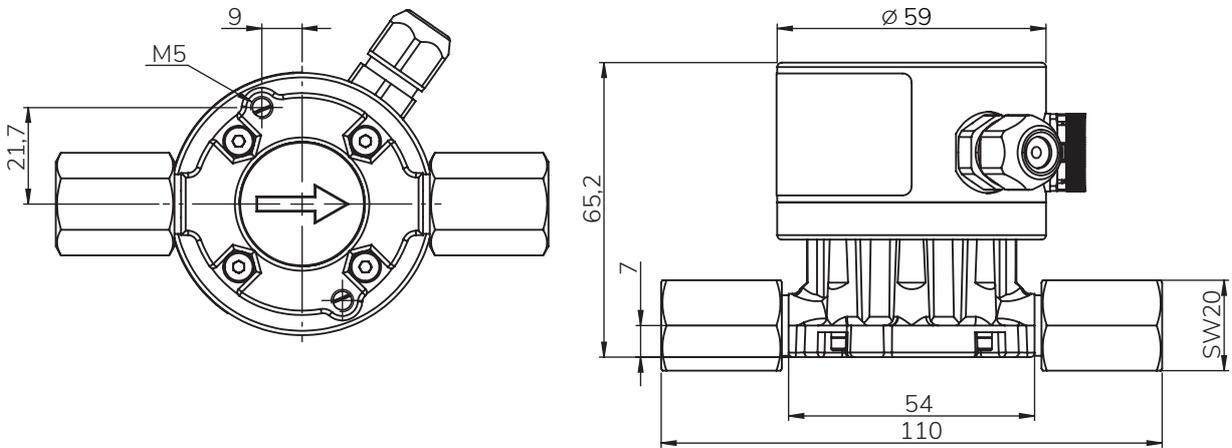


CONTOIL® VZO 8 OEM



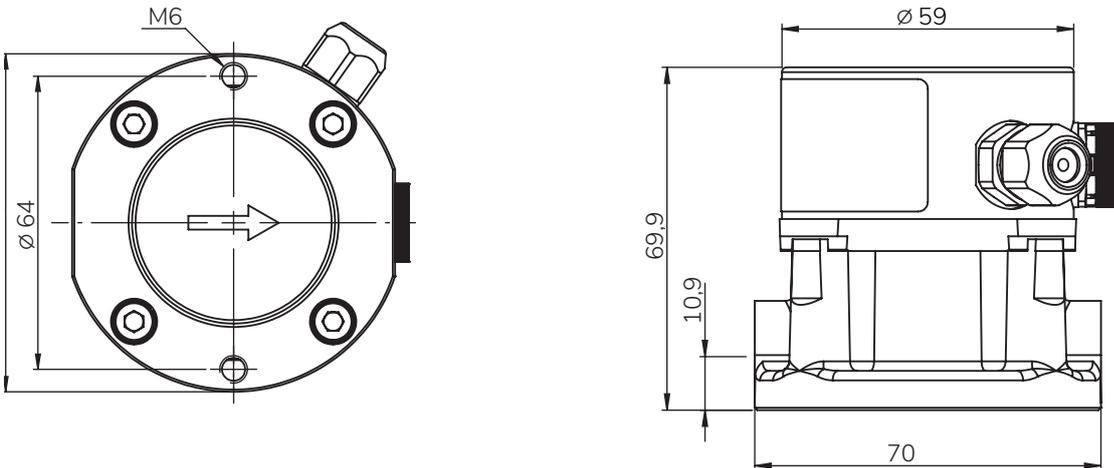
CONTOIL® VZD2 4 / VZP 4

G¹/₈" thread; with VSR adapter set (G¹/₈" to M14x1.5)¹⁾

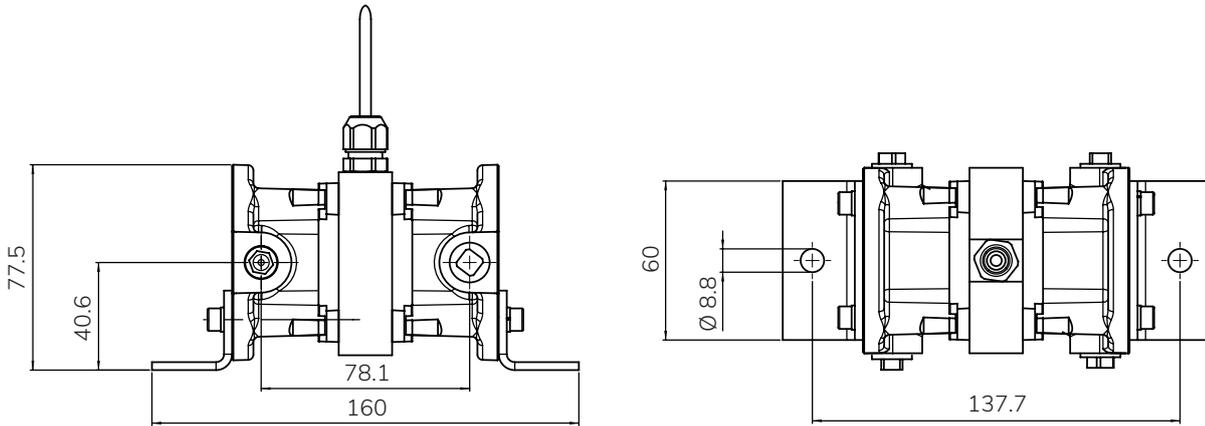


CONTOIL® VZD2 8 + 8E / VZP 8

M14x1.5 thread

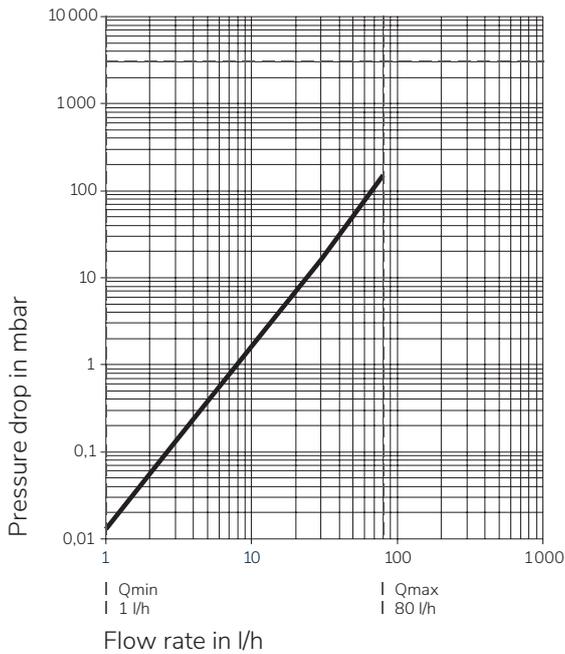


CONTOIL® DFM 8 ECO / DFM 12 ECO

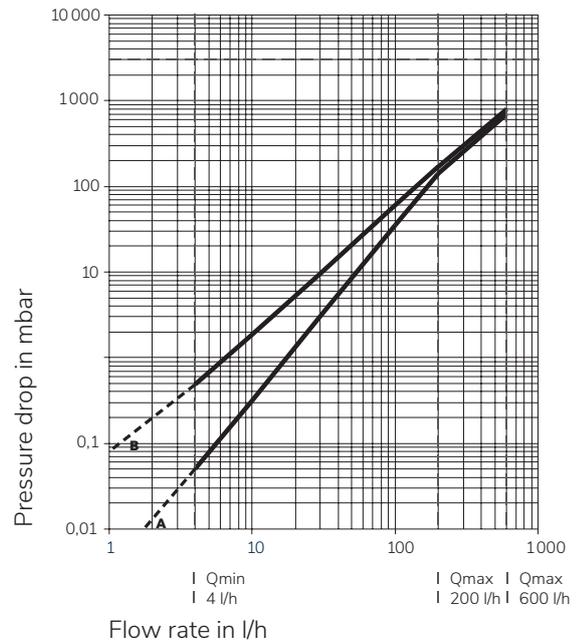


Pressure drop curves

CONTOIL® VZD2 4 / VZP 4, VZO 4 Q_{min}, VZO 4, VZO 4 OEM



CONTOIL® VZD2 8 + 8E / VZP 8, VZO 8, VZO 8 OEM, DFM 8 ECO, DFM 12 ECO



Viscosity diagrams:

- A = 5 mPas
- B = 50 mPas

For a pressure drop of more than 1 bar, it is recommended to use the next larger meter size.

Accessories

| VZO 4 + 8 | Description | Art. No. |
|---|---|----------|
|  | Threaded connections kit PS-Kit VZO 4 1/8" - 8 | 81583 |
|  | Mounting kit PS-Kit VZO 8 | 81130 |
|  | Mounting kit ¹⁾ VSR-SET VZD2 4 / VZP 4 1/8" to M14x1.5 | 80630 |
|  | Threaded connections to suit PS-Kit VZO 8 VSR 3/8" | 81156 |

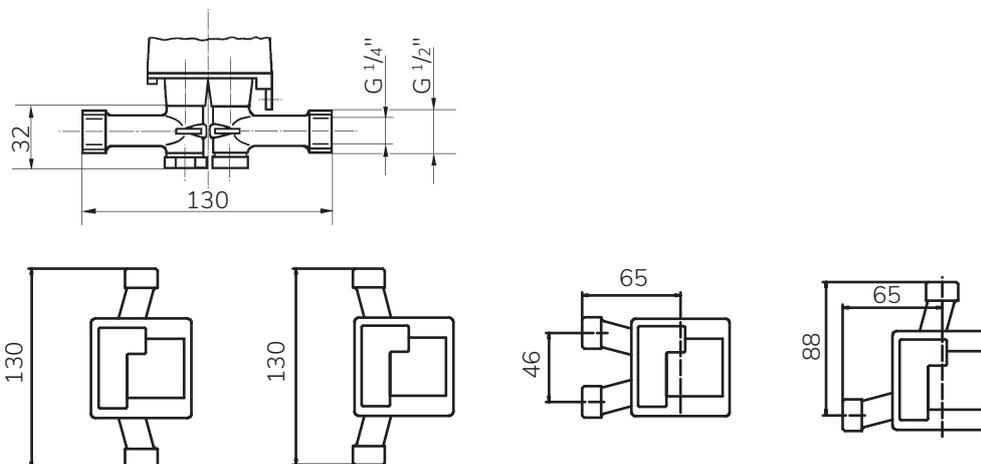
1) 2 sets needed for one flow meter.

| DFM | Description | Art. No. |
|---|---|----------|
|  | Hose connector ¹⁾ include 1 hollow union, 1 single banjo body, 2 copper seals DFM 8 ECO, DFM 12 ECO | 80447 |

1) 4 sets needed for one DFM 8 ECO, DFM 12 ECO.

Mounting kit for VZO 8 - dimensions and some possible mounting positions

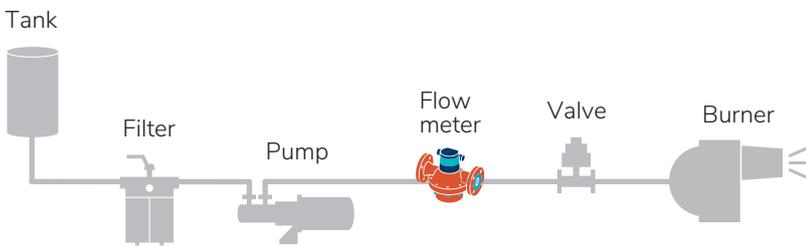
(all dimensions in mm)



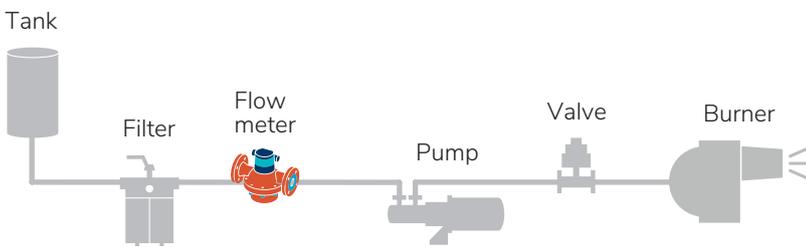
PROJECT PLANNING NOTES

Project Application - Burner

Mounting on pressure side of pump



Mounting on suction side of pump



Indicative values on power for burners

| Burner | | Flow meter | |
|----------|------------------------|---|------------------|
| Power | Flow rate heating fuel | Flow rate Q _{min} - Q _{cont} | Nominal diameter |
| up to kW | kg/h l/h | l/h | DN |
| 500 | 42 50 | 1 - 50 | 4 |
| 1300 | 113 135 | 4 - 140 | 8 |
| 4000 | 336 400 | 10 - 400 | 12 |

Formula for consumption in litres/hour:

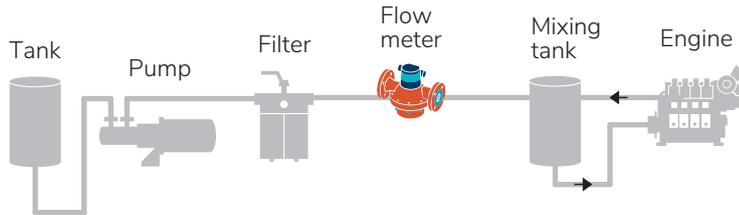
$$\frac{\text{Burner power in kW}}{\text{Energy value of fuel in kWh/kg} \times \text{density in kg/dm}^3}$$

Example:

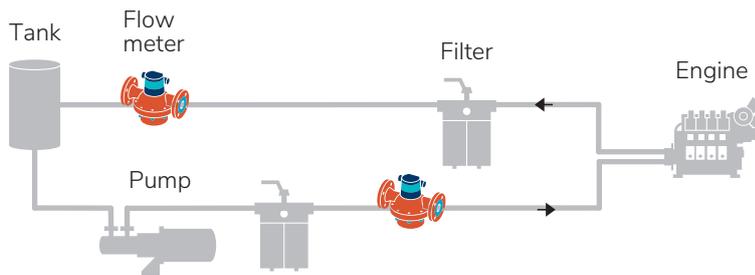
$$\frac{4000 \text{ kW}}{11.8 \text{ kWh/kg} \times 0.84 \text{ kg/dm}^3} = 4000 : 9.912 = 403 \text{ l/h}$$

Project Application - Engine

Direct measurement



Differential measurement



Indicative values on power for engines

| Engine | | Flow meter ¹⁾ | | |
|----------|-------------------------|--------------------------|----------------------|------------------|
| Power | Diesel fuel consumption | | Flow rate | Nominal diameter |
| | | | $Q_{min} - Q_{cont}$ | |
| up to HP | up to kW | l/h | l/h | DN |
| 250 | 184 | 50 | 1 - 50 | 4 |
| 680 | 500 | 135 | 4 - 140 | 8 |
| 2000 | 1470 | 400 | 10 - 400 | 12 |

1) For differential measurement the flow meter has to be selected according to the pump flow rate in supply and the flow in the return pipe.

Formula: $1 \text{ DIN-HP} = 0.736 \text{ kW}$ $1 \text{ kg Diesel at } 0.84 \text{ kg/dm}^3 = 1.19 \text{ l}$
 $1 \text{ kW} = 1.36 \text{ DIN-HP}$

Rule of thumb: approx. 190 g Diesel/kWh correspond to 0.226 l Diesel/kWh
 approx. 140 g Diesel/HP correspond to 0.167 l Diesel/HP

INSTALLATION

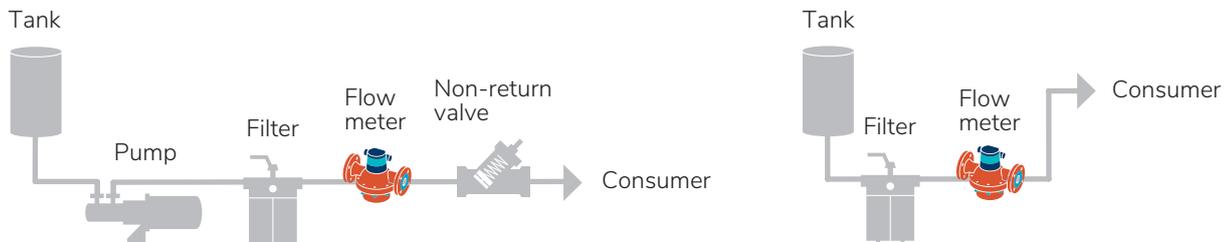
Planning

Flow meters are precision measuring instruments. They achieve optimal results if

- » a few important rules are observed during plant design,
- » mounting and commissioning are carried out with care,
- » the meters are used for their defined purpose only.

Layout of pipework

- » The quantities consumed by all consumers must be registered by the meter.
- » Rotary piston meters do not require flow conditioners or inlet runs (after bends, T-pieces or fittings). They may be mounted in horizontal, vertical or inclined position, except with the head pointing downwards.
- » The layout of piping must ensure that the meter is at all times filled with liquid and that no inclusions of air or gas may occur. Do not install the instrument at the highest point of the installation.
- » Meter and accessory equipment must be easily accessible.



Selection of the meter and ancillaries

To be considered when selecting the meter:

- » Operating temperature
- » Viscosity of the medium
- » Operating pressure
- » Flow rate
- » Resistance of the material against fuel to be metered and working conditions

The technical data are valid for the following reference conditions: EL heating fuel/diesel at 20 °C. For higher viscosities or if the meter is mounted on the suction side of a pump, it is necessary to determine the pressure drop and the flow rate that can still be attained by using the pressure loss curves. If the pressure drop is more than 1 bar, it is advised to use the next larger meter size.

Dirt filter, safety filter

Filters are any way required in the system to protect engines and pumps to keep their performance and live time. For fuel oil meters this is no different - that's why we recommend installing the fuel oil meters (in flow direction) always directly after the filter. Some particles in the fuel are also from engine's wear and tear, that's why we also recommend a filter in the fuel return line. Usually basket type filters are best choice for the return line and automatic filters in the supply line. Major engine producers recommend a mesh size of 5 - 10 μm (automatic filters), especially to filter out very abrasive cut fines. It is best for the flow meter to install it between this automatic filter and the engine. The maximum filter mesh size for a respective meter can be found in below table.

Examples of filter:

Maximum mesh width for filters

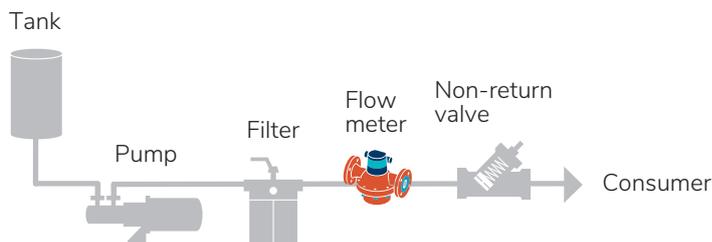
Nominal diameter

| | |
|------|---------|
| DN 4 | 0.08 mm |
| DN 8 | 0.1 mm |

- » The filter mounted in the meter inlet is only a safety filter and is too small to act as a dirt filter.
- » If a dirt filter with the given mesh size is used, the safety filter in the meter inlet may be removed.

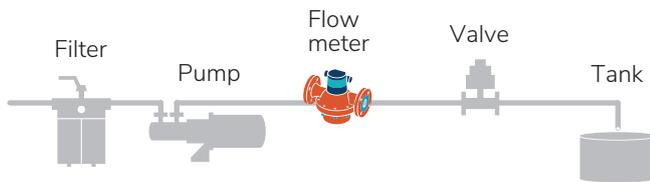
Stop valves or non-return valves

In order to avoid backflow and draining, stop valves have to be mounted after the meter. Backflow and draining cause measuring errors and can damage the meter.



Filling / Dosing

For filling and dosing the valve has to be mounted between meter and outlet. The shorter the pipe section between meter and outlet, the higher the accuracy. Fast opening and shutting of the valve should be avoided (pressure hammer!).



Remote Processing / Ancillaries

Any backflow must be avoided on meters equipped with pulser for remote processing. If this cannot be achieved by appropriate plant design, a non-return valve should be fitted.

Electrical wiring and installations

Electrical wiring and installations are subject to statutory regulations which must be taken into account when planning the system. For installations in zones subject to explosion hazards, consult an appropriate expert.

The following factors should be taken into account during plant design:

- » ancillaries connected to the meter
- » environmental interference
- » maximum permissible cable lengths (with or without amplifier)
- » junction boxes, cable guides



WARRANTY, SAFETY INSTRUCTIONS

Warranty Disclaimer

Aquametro guarantees the quality of the product in the context of its General Terms of Business. The owner, operator or installer will be liable for the correct installation as well as the appropriate handling of the equipment upon its receipt.

- » Please observe the application, mounting and operating instructions.
- » Use the unit exclusively for its designed purpose.
- » Maintain the unit and service it according to prescriptions.
- » Use accessories only if their applicability is technically safe.

Safety rules and precautionary measures

The manufacturer accepts no responsibility if the following safety rules and precautions are disregarded.

- » Modifications of the device implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- » Installation, operation, maintenance and decommissioning of this device must be carried out by trained, qualified specialists, authorized by the manufacturer, operator or owner of the facility. The specialist must have read and understood these mounting and operating instructions and must follow the instructions here in.
- » Check the voltage and the information on the type plate before installing the device.
- » Check all connections, settings and technical specifications of peripherals which may be present.
- » Open the housing or parts of housings, which electric or electronic components included, only when the electric power is turned off.
- » Do not touch any electronic components (ESD sensitivity).
- » Expose the system with respect to the mechanical load (pressure, temperature, IP protection, etc.), only to a maximum of the specified classifications.
- » During operations that involve mechanical components of the system, release the pressure in the pipe system or reduce the temperature of the medium to a safe level for humans.
- » None of the information stated here or elsewhere releases planners, installers and operators from their own careful and comprehensive assessment of the respective system configuration in terms of functional capability and operational safety.
- » The local labour and safety laws and regulations must be observed.



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