1. Vortex flow sensors

Introduction

This data booklet comprises an overview of the Grundfos vortex flow sensor range and related products.

TM04 7362 1610, TM05 4739 2412 & TM05 4746 2412

Fig. 1 Grundfos vortex flow sensors

The trademark Grundfos Direct Sensors™ is owned and controlled by the Grundfos group.

The Grundfos vortex flow sensor is an integrated flow and temperature measurement system designed and validated for harsh aqueous environments. The flow measurement is based on the vortex principle. The system elements include a flow pipe with an integrated bluff body and a differential pressure detector.

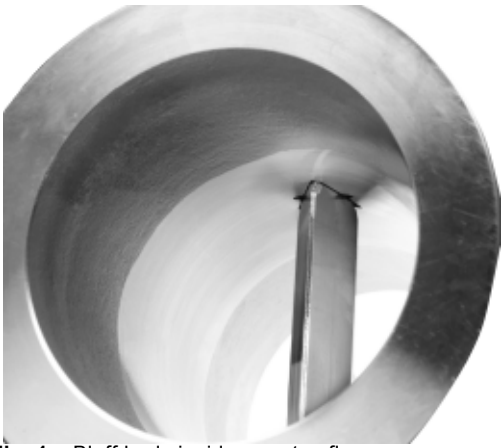

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Fig. 1 Bluff body inside a vortex flow sensor

When a bluff body is placed in a flow inside a pipe, a series of vortices will be generated periodically on each side of the bluff body. These vortices propagate down stream giving rise to periodic pressure variations, which can be detected by the differential pressure detector. The frequency of the pressure variations is proportional to the volume flow through the pipe.

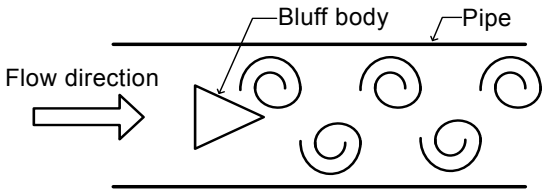

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Fig. 2 Operating principle

The bluff body is designed to optimise the pulse strength of the pressure variations at the position of the differential pressure detector. The bluff body is an integrated part of the injection moulded flow pipe, or supplied as a composite insert solution.

Flow ranges are determined by the pipe diameter and the signal processing parameters. The differential pressure detector key elements are a bulk micromachined silicon chip and a microprocessor-based signal-conditioning circuit, both on the same PCB. The conditioning circuit converts the pressure reading to a signal proportional to the flow through the pipe.

The electronics are protected by an IP44 composite housing.

The chip has a square membrane, which deflects due to pressure. Strain gauges are incorporated in a Wheatstone bridge configuration on stress intensive positions on the membrane. The pressure and temperature sensitive area (the membrane region) is coated on both sides by an extremely corrosion and diffusion resistive thin film (Silicoat®). The coating provides direct environmental robustness of the chip. The separation of the media and media-free zones is provided by O-ring sealing.

2. Vortex flow sensor, industry (VFI)

VFI general data

Vortex flow sensor, industry

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Fig. 3 VFI sensor

Technical overview

The VFI is the industrial version of the Grundfos vortex flowmeter range. The VFI is based on the principle of vortex shedding behind a bluff body. The VFI has no moving parts and is built into a stainless steel pipe. The rugged design allows the VFI to be used in a wide range of applications as a cost-effective and accurate flow sensor.
The flow sensors are supplied with flanges or with threaded ends for use with union nuts.

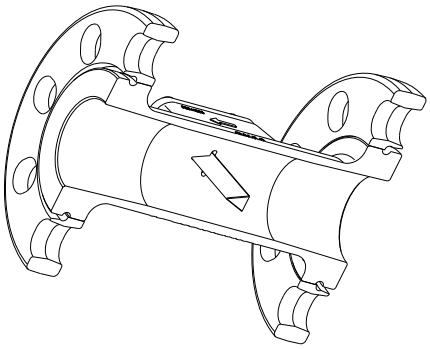

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Fig. 4 Bluff body in a VFI sensor

Applications

- Water treatment and distribution
- light chemical industry
- water management
- pool and water resorts
- heating
- air-conditioning
- cooling towers
- condensing units
- solar collectors.

Features

- Flow range from 0.3 to 240 $m^{3/}h$
- based on the vortex principle
- compact and well-proven design
- approved for drinking water
- wide temperature range.

Benefits

- No moving parts
- compatible with wet, aggressive media
- cost-effective and robust design
- system solution with Grundfos pumps.

Approvals

- WRAS
- KTW
- ACS
- NSF 61.

Markings

CE	c, CSA, us	C-Tick

Electrical connections

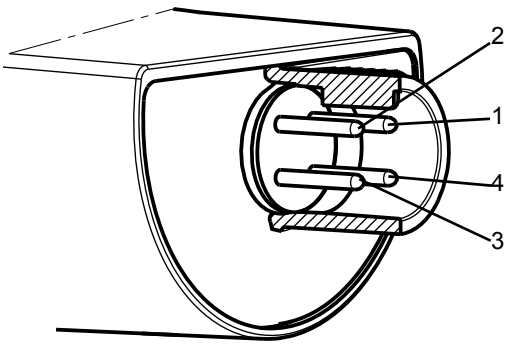

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Fig. 5 Electrical connections

PIN	1	2	3	4
Wire colour	Brown	White	Blue	Black
Output 4-20 mA	+		-	

Power supply: 12.5 - 30 V (screened cable)
Type: Loop-powered, 2-wire

Type key

Type designation	VFI	-··0.3-6	m	-1	-C	-M	5.000	X	-FG6	-SG	-30	F	-A··1

Product group:
VFI: Vortex flow sensor, industry

Range:
0.3-6

Unit:
m: m^3/h

Generation:
1: 1st generation

Electrical output type:
C: 4-20 mA, 2-wire

Sensor connector or cable type and cable connector in sensor end:
M: M12x1, female straight, screened 4-wire cable

Cable length5.000= 5 m

Cable connector opposite sensor:
X: Open-ended

Sealing material and class:
First letter:
E: EPDM (drinking-water approved)
F: FKM (for use in oily media)
Second letter:
G: Gel-filled
Third letter:
6: IP67

Material:
B: Brass
C: Composite
G: Cast iron
Q: Stainless steel flow pipe with composite insert (QT)
S: Stainless steel

Dimension of mechanical connection:
30: DIN PN25/40 DN18/25/32, ANSI B16.5 Class 300 - 1¼"

Mechanical connection type:
F: Flange

Packaging:
A: Set with pre-assembled components
1: 1 piece

VFI 12-240 DN 100, technical data

Vortex flow sensor, industry, 12 - 240 m³/h

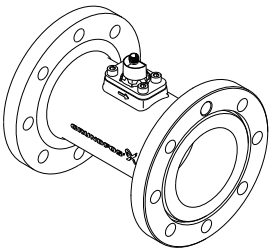

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Fig. 30 VFI 12 - 240 sensor

Dimensions

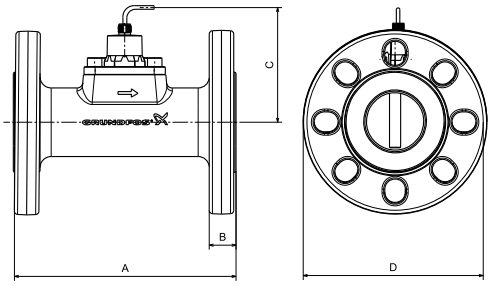

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Fig. 31 Dimensions VFI sensor with flanges

Flange material	Flange size	A [mm]	B [mm]	C [mm]	D [mm]	Weight [kg]
Cast iron	DN 100 (PN 16)	250	25	163	220	13.56
Stainless steel						14.00

Flanges are compatible with DN 100 flanges sizes.

Specifications

Flow	
Measuring range	12 - 240 m³/h*
Accuracy (±1σ), 0 - 100 °C	± 1.5 % FS*
Response time	< 1 s
Resolution	0.30 m³/h
Media and environment	
Liquid types	See appendix *Minimum flow rate*
Liquid max. pressure	16 bar
Liquid temperature (operation)	-30 - 120 °C, non-freezing
Liquid temperature	-30 - 120 °C, non-freezing
Ambient air temperature (operation)	–25 - 60 °C
Ambient air temperature	–55 - 70 °C
Storage temperature	–55 - 70 °C
Humidity	0 - 95 % RH, non-condensing
System burst pressure	60 bar
Electrical data	
Power supply	12.5 - 30 VDC (± 5 %)
Output signals - cut off	4 - 20 mA 21 mA
Power consumption	Max. 660 mW
Load impedance	Max. 60 Ω at 12.5 VDC Max. 100 Ω at 13.3 VDC Max. 600 Ω at 24 VDC Max. 900 Ω at 30 VDC
Sensor materials	
Measurement element	Silicon-based MEMS sensor
Packing material	EPDM or FKM rubber
Sensor housing	Stainless steel 1.4404
Flow pipe	Stainless steel 1.4408
Bluff body	Stainless steel 1.4401
Wetted materials	Corrosion-resistant coating EPDM or FKM rubber Stainless steel 1.4401/04/08
Environmental standards	
Enclosure class	IP67
Temperature cycling	IEC 68-2-14
Vibration (non-destructive)	20 - 2000 Hz, 10G, 4h
Electromagnetic compatibility	EN 61326-1

*Reference condition:
- Liquids at 20 °C, 1013 mbar, ρ = 998 kg/m^3, v = 1 x 10^{-6} m^2/s

Sensor output signals

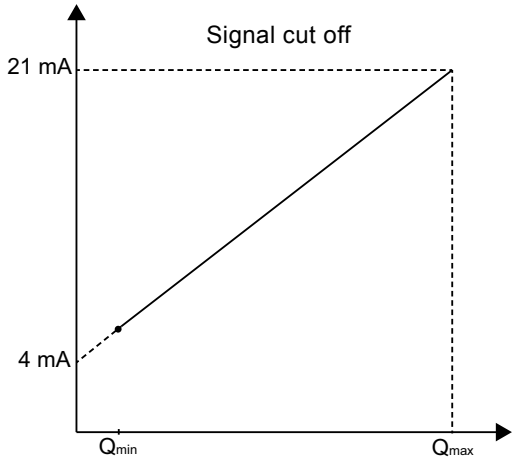

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Fig. 32 Flow response