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GRUNDFOS DIRECT SENSORS<sup>TM</sup>

## VFS QT Vortex Flow Sensor



## VFS 1-12 QT

Vortex Flowsensor Standard, 1-12 l/min



TMO3 8211 0808

Fig. 1 VFS 1-12 sensor

### Technical overview

VFS is a series of combined flow and temperature sensors (two-in-one) based on the principle of vortex shedding behind a bluff body. The VFS sensors are designed for high-volume production and are fully compatible with wet, aggressive media. The VFS sensor utilises MEMS sensing technology in combination with a novel packaging concept using corrosion-resistant coating on the MEMS sensing element. This makes the VFS sensor very robust and ideal for high-volume OEM applications. QT™ is a special version of the VFS sensors, where a composite insert for the flow ranges of 1-12 and 2-40 l/min, creates a compact and cost-effective flow and temperature measuring system which can be integrated closely into the customer's own pipework.

### Applications

- thermal management in solar heating systems
- cooling and temperature control (e.g. manifold systems within machine tools)
- floor heating/radiant and valvesystems
- monitoring of pumps, valves and filters
- flow rate detection for pump controls
- industrial process flow control
- burner control in domestic gas boilers
- heat metering (solar - heat pumps).

### Features

- flow range: 1-12 l/min in 42 % glycol mixture at 30 °C
- designed for harsh environments
- based on vortex shedding
- voltage output (ratiometric, ideal for use with microprocessor and PLC)
- compact and well-proven design
- MEMS sensing technology
- approved for potable water: WRAS, KTW, W270, ACS.

### Benefits

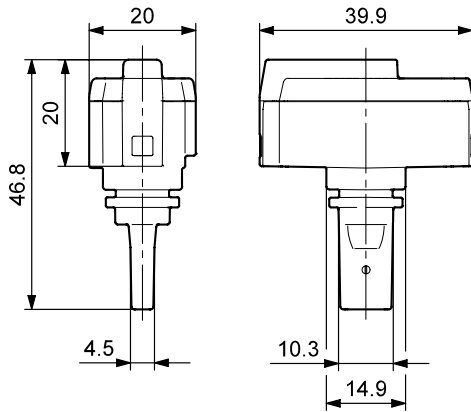
- no moving parts
- flow and temperature sensor in one package (two in-one sensor)
- fast temperature response (direct media contact)
- compatible with wet, aggressive media
- cost-effective and robust construction.

### Specifications

Flow	
In water / tyfocur LS (30 - 100 °C)	1 to 12 l/min
Measuring range	1 to 12 l/min
Accuracy ( $\pm 1\sigma$ ) (0 to 100 °C)	1.5 % / 5 % FS (typical 3 %)
Response time (63.2 %)	< 3 sec.
Resolution	0.06 l/min
Temperature	
Measuring range	0 to 100 °C
Accuracy ( $\pm 1\sigma$ ), 25 to 80 °C	$\pm 1$ °C
Accuracy ( $\pm 1\sigma$ ), 0 to 100 °C	$\pm 2$ °C
Response time (63.2 % at 50 % FS flow)	appr. 1/4 sec.
Resolution	0.4 °C
Media and environment	
Media types	The sensor is compatible with liquids (kinematic viscosity $\leq 4$ mm <sup>2</sup> /s)
Media temperature (operation)	0 to 100 °C
Media temperature (peak)	-25 to 120 °C, non-freezing
Ambient air temp. (operation)	-25 to 60 °C
Ambient air temp. (peak)	-55 to 90 °C
Humidity	0 - 95 % (relative), non-condensing
System burst pressure	> 16 bar
Electrical data	
Power supply	5 V DC ( $\pm 5$ %). Grounding of the sensor supply is required (PELV)
Output signals	Ratiometric
Flow signal	0.5 - 3.5 V (Zero at 0.25 V)
Temperature signal	0.5 - 3.5 V
Power consumption	< 50 mW
Load impedance	> 10 k $\Omega$
Sensor materials	
Sensing element	Silicon-based MEMS sensor
Seal (sensor to housing)	EPDM rubber
Housing	Composites (PPS, PA66)
Vortex tube	1.4408
Insert	PPA 40 GF
Wetted materials	Corrosion-resistant coating EPDM, PPS, PPA 40-GF
Environmental standards	
Enclosure class	IP44 (Non overmolded IP20)
Temperature cycling	IEC 68-2-14
Vibration (non-destructive)	20 - 2000 Hz, 10G, 4h
Electromagnetic compatibility	EN 61326-1
Dimensions	
Sensing element	47 x 40 x 20 mm, see drawing
Vortex tube	110 x 29.8 x 31.5 mm
Insert	63.9 x 16 x 15.4 mm

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

**Dimensions (in mm)**



**Fig. 2** Dimensional sketches of sensing element

TM003 8136 0607



**Fig. 3** VFS 1-12 sensor components

TM03 2017 1808

**Type key**

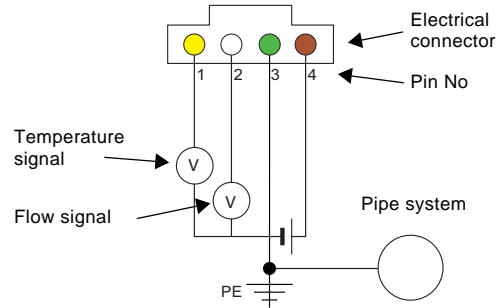
The sensor is labelled with a type designation.

	96	- XX	- XXX	XXXXX
Product number				
Revision				
Production year and week				
Consecutive number				

For more information, see  
<http://www.grundfos.com/directsensors>.

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**Electrical connections**



**Fig. 4** Electrical connections

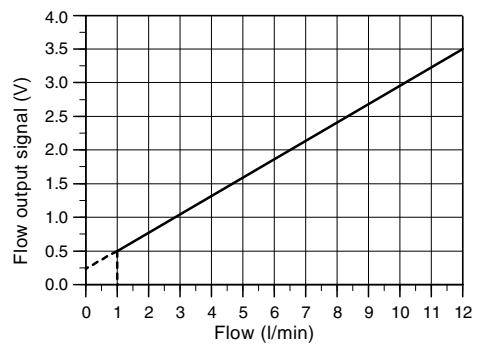
TM03 8203 1908

Pin configuration	Colour
1 Temperature signal (0.5 to 3.5 V relative to pin 3)	Yellow
2 Flow signal (0.5 to 3.5 V relative to pin 3)	White
3 GND (0 V)	Green
4 Power supply (+5 VDC), PELV	Brown

**Power supply requirements**

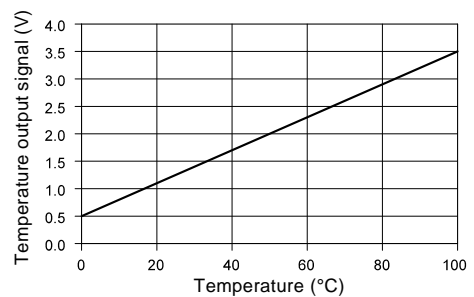
- 5 VDC
- separated from hazardous live circuitry by double or reinforced insulation
- power limitation: 150 VA; current limitation: 8 A.

**Sensor output signals**



**Fig. 5** Flow response

TM03 2465 2108



**Fig. 6** Temperature response

TM03 8149 0607

Subject to alterations.

## VFS 2-40 QT

Vortex Flowsensor Standard, 2-40 l/min



TM03 8211 0808

Fig. 1 VFS 2-40 QT sensor

### Technical overview

VFS is a series of combined flow and temperature sensors (two-in-one) based on the principle of vortex shedding behind a bluff body. The VFS sensors are designed for high-volume production and are fully compatible with wet, aggressive media. The VFS sensor utilises MEMS sensing technology in combination with a novel packaging concept using corrosion-resistant coating on the MEMS sensor element. This makes the VFS sensor very robust and ideal for high-volume OEM applications. QT™ is a special version of the VFS sensors where a composite insert for the flow ranges of 1-12 and 2-40 l/min creates a compact and cost-effective flow and temperature measuring system, which can be integrated closely into the customer's own pipework.

### Applications

- thermal management in solar heating systems
- cooling and temperature control (ex. manifold systems within machine tools)
- floor heating/radiant and valvesystems
- monitoring of pumps, valves and filters
- flow rate detection for pump controls
- industrial process flow control
- heat metering (solar - heat pumps).

### Features

- flow range: 1-12 and 2-40 l/min in 42 % glykole mixture
- designed for harsh environments
- based on vortex shedding
- voltage output (ratiometric, ideal for use with microprocessor and PLC)
- compact and well-proven design
- MEMS sensing technology
- approved for potable water: WRAS, KTW, W270, ACS.

### Benefits

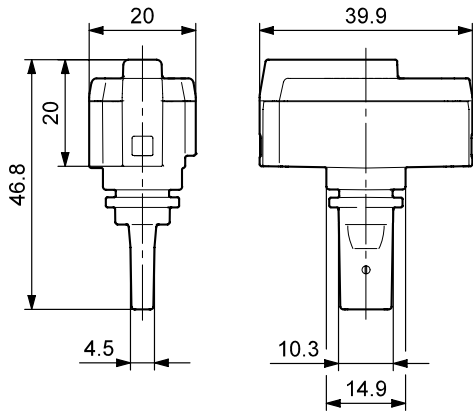
- no moving parts
- flow and temperature sensor in one package (two in-one sensor)
- fast temperature response (direct media contact)
- compatible with wet, aggressive media
- cost-effective and robust construction.

### Specifications

Flow	
In water/tyfocur LS (30 - 100 °C)	2 to 40 l/min
Measuring range	
Accuracy ( $\pm 1\sigma$ ), (0 to 100 °C)	1.5 % / 5 % FS (typical 3 %)
Response time (63.2 %)	< 1 sec.
Resolution	0.2 l/min
Temperature	
Measuring range	0 to 100 °C
Accuracy ( $\pm 1\sigma$ ), 25 to 80 °C	$\pm 1$ °C
Accuracy ( $\pm 1\sigma$ ), 0 to 100 °C	$\pm 2$ °C
Response time (63.2 % at 50 % FS flow)	appr. 1/4 sec.
Resolution	0.4 °C
Media and environment	
Media types	The sensor is compatible with liquids (kinematic viscosity $\leq 4$ mm <sup>2</sup> /s).
Media temperature (operation)	0 to 100 °C
Media temperature (peak)	-25 to 120 °C, non-freezing
Ambient air temp. (operation)	-25 to 60 °C
Ambient air temp. (peak)	-55 to 90 °C
Humidity	0 - 95 % (relative), non-condensing
System burst pressure	> 16 bar
Electrical data	
Power supply	5 V DC ( $\pm 5$ %). Grounding of the sensor supply is required (PELV)
Output signals	Ratiometric
Flow signal	0.5 - 3.5 V (zero at 0.35 V)
Temperature signal	0.5 - 3.5 V
Power consumption	< 50 mW
Load impedance	> 10 k $\Omega$
Sensor materials	
Sensing element	Silicon-based MEMS sensor
Seal (sensor to housing)	EPDM rubber
Housing	Composites (PPS, PA66)
Vortex tube	1.4408
Insert	PPA 40 GF
Wetted materials	Corrosion-resistant coating EPDM, PPS, PPA 40-GF
Environmental standards	
Enclosure class	IP44 (Non overmolded IP20)
Temperature cycling	IEC 68-2-14
Vibration (non-destructive)	20 - 2000 Hz, 10G, 4h
Electromagnetic compatibility	EN 61326-1
Dimensions	
Sensing element	47 x 40 x 20 mm, see drawing
Vortex tube	110 x 29.8 x 31.5 mm
Insert	63.9 x 16 x 15.4 mm

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

**Dimensions (in mm)**



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**Fig. 2** Dimensional sketches of sensing element



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**Fig. 3** VFS 2-40 sensor components

**Type key**

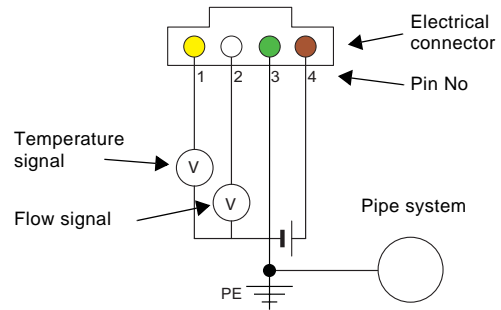
The sensor is labelled with a type designation.

	96	- XX	- XXX	XXXXX
Product number				
Revision				
Production year and week				
Consecutive number				

For more information, see  
<http://www.grundfos.com/directsensors>.

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**Electrical connections**



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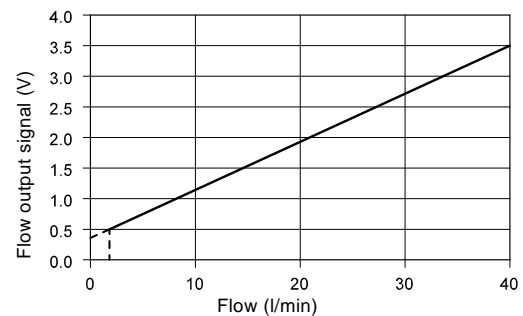
**Fig. 4** Electrical connections

Pin configuration	Colour
1 Temperature signal (0.5 to 3.5 V relative to pin 3)	Yellow
2 Flow signal (0.5 to 3.5 V relative to pin 3)	White
3 GND (0 V)	Green
4 Power supply (+5 VDC), PELV	Brown

**Power supply requirements.**

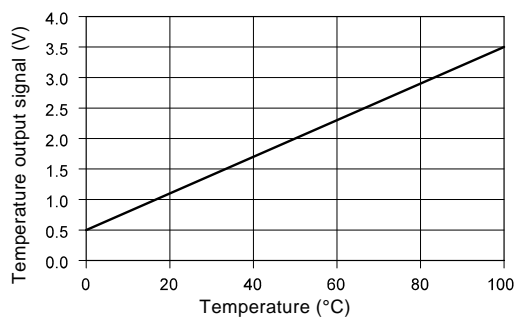
- 5 VDC
- separated from hazardous live circuitry by double or reinforced insulation
- power limitation: 150 VA; current limitation: 8 A.

**Sensor output signals**



TM03 8216 0807

**Fig. 5** Flow response



TM03 8149 0607

**Fig. 6** Temperature response

Subject to alterations.

## VFS 5-100 QT

Vortex Flowsensor Standard, 5-100 l/min



TM04 6749 0810

Fig. 1 VFS 5-100 sensor

### Technical overview

VFS is a series of combined flow and temperature sensors (two-in-one) based on the principle of vortex shedding behind a bluff body. The VFS sensors are designed for high-volume production and are fully compatible with wet, aggressive media. The VFS sensor utilises MEMS sensing technology in combination with a novel packaging concept using corrosion-resistant coating on the MEMS sensing element. This makes the VFS sensor very robust and ideal for high-volume OEM applications. QT™ is a special version of the VFS sensors, where a composite insert creates a compact and cost-effective flow and temperature measuring system which can be integrated closely into the customer's own pipework.

### Applications

- thermal management in solar heating systems
- cooling and temperature control (e.g. manifold systems within machine tools)
- floor heating/radiant and valve systems
- monitoring of pumps, valves and filters
- flow rate detection for pump controls
- industrial process flow control
- burner control in domestic gas boilers
- heat metering (solar thermal / heat pumps etc.).

### Features

- flow range: 5-100 l/min in 42 % glycol mixtures at 30 °C
- designed for harsh environments
- based on vortex shedding
- voltage output (ratiometric, ideal for use with microprocessor and PLC)
- compact and well-proven design
- MEMS sensing technology
- approved for potable water: WRAS, KTW, W270, ACS
- NPSM and BSPP threads.

### Benefits

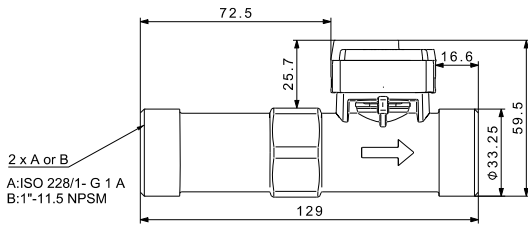
- no moving parts
- flow and temperature sensor in one package (two-in-one sensor)
- quick temperature response (direct media contact)
- compatible with wet, aggressive media
- cost-effective and robust construction.

### Specifications

Flow	
In water (0 - 100 °C) tyfocur LS (30 - 100 °C)	5 to 100 l/min
Measuring range	
Accuracy ( $\pm 1\sigma$ ), 0 to 100 °C	$\pm 1.5$ % FS
Response time (63.2 %)	< 1 s
Resolution	0.5 l/min
Temperature	
Measuring range	0 to 100 °C
Accuracy ( $\pm 1\sigma$ ), 25 to 80 °C	$\pm 1$ °C
Accuracy ( $\pm 1\sigma$ ), 0 to 100 °C	$\pm 2$ °C
Response time (63.2 % at 50 % FS flow)	< 1 s
Resolution	0.5 °C
Media and environment	
Media types	The sensor is compatible with liquids (kinematic viscosity $\leq 2$ mm <sup>2</sup> /s)
Media temperature (operation)	0 to 100 °C
Media temperature (peak)	-25 to 120 °C, non-freezing
Ambient air temp. (operation)	-25 to 60 °C
Ambient air temp. (peak)	-55 to 90 °C
Humidity	0 - 95 % (relative), non-condensing
System burst pressure	> 16 bar
Electrical data	
Power supply	5 V DC ( $\pm 5$ %). Grounding of the sensor supply is required (PELV)
Output signals	Ratiometric
Flow signal	0.5 - 3.5 V (Zero at 0.35 V)
Temperature signal	0.5 - 3.5 V
Power consumption	< 50 mW
Load impedance	> 10 k $\Omega$
Sensor materials	
Sensing element	Silicon-based MEMS sensor
Seal (sensor to housing)	EPDM rubber
Vortex tube	1.4408
Insert	PPA 40-GF
Wetted materials	Corrosion-resistant coating, EPDM, PPS, PPA 40-GF
Environmental standards	
Enclosure class	IP44 (Non overmoulded IP20)
Temperature cycling	IEC 68-2-14
Vibration (non-destructive)	20 - 2000 Hz, 10G, 4h
Electromagnetic compatibility	EN 61326-1
Dimensions	
Sensing element	47 x 40 x 20 mm, see drawing
Vortex tube	129 x 37 x 32 mm
Insert	99,2 x 23,4x 21,9 mm

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

**Dimensions (in mm)**



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**Fig. 2** Dimensional sketches of VFS QT



TM04 6750 0810

**Fig. 3** VFS 5-100 QT sensor components

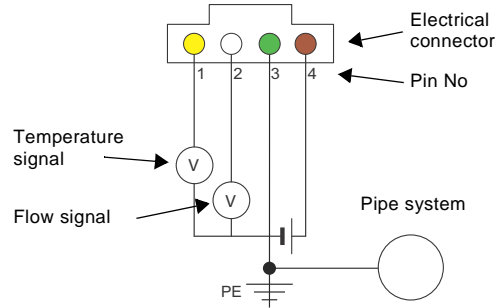
**Type key**

The sensor is labelled with a type designation.

	96	- XX	- XXX	XXXXX
Product number				
Revision				
Production year and week				
Consecutive number				

For more information, see  
<http://www.grundfos.com/directsensors>.

**Electrical connections**



TM03 8203 1908

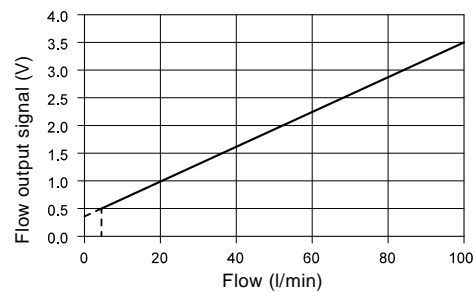
**Fig. 4** Electrical connections

Pin configuration	Colour
1 Temperature signal (0.5 to 3.5 V relative to pin 3)	Yellow
2 Flow signal (0.5 to 3.5 V relative to pin 3)	White
3 GND (0 V)	Green
4 Power supply (+ 5 VDC), PELV	Brown

**Power supply requirements**

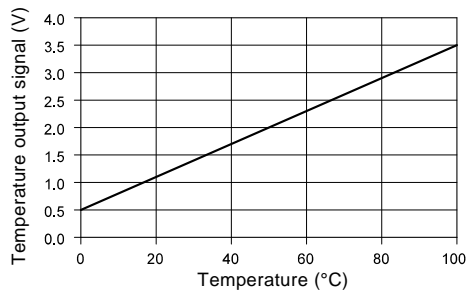
- 5 VDC
- separated from hazardous live circuitry by double or reinforced insulation
- power limitation: 150 VA; current limitation: 8 A.

**Sensor output signals**



TM03 8217 0807

**Fig. 5** Flow response



TM03 8149 0607

**Fig. 6** Temperature response

<b>97648723</b> 0610	<b>GB</b>
Repl. 97648723 0210	

Subject to alterations.

## VFS 10-200 QT

Vortex Flowsensor Standard, 10-200 l/min



TM04 6752 0810

Fig. 1 VFS 10-200 sensor

### Technical overview

VFS is a series of combined flow and temperature sensors (two-in-one) based on the principle of vortex shedding behind a bluff body. The VFS sensors are designed for high-volume production and are fully compatible with wet, aggressive media. The VFS sensor utilises MEMS sensing technology in combination with a novel packaging concept using corrosion-resistant coating on the MEMS sensing element. This makes the VFS sensor very robust and ideal for high-volume OEM applications. QT™ is a special version of the VFS sensors, where a composite insert creates a compact and cost-effective flow and temperature measuring system which can be integrated closely into the customer's own pipework.

### Applications

- thermal management in solar heating systems
- cooling and temperature control (e.g. manifold systems within machine tools)
- floor heating/radiant and valve systems
- monitoring of pumps, valves and filters
- flow rate detection for pump controls
- industrial process flow control
- burner control in domestic gas boilers
- heat metering (solar thermal / heat pumps etc.).

### Features

- flow range: 10-200 l/min in 42 % glycol mixtures at 30 °C
- designed for harsh environments
- based on vortex shedding
- voltage output (ratiometric, ideal for use with microprocessor and PLC)
- compact and well-proven design
- MEMS sensing technology
- approved for potable water: WRAS, KTW, W270, ACS
- NPSM and BSPP threads.

### Benefits

- no moving parts
- flow and temperature sensor in one package (two-in-one sensor)
- quick temperature response (direct media contact)
- compatible with wet, aggressive media
- cost-effective and robust construction.

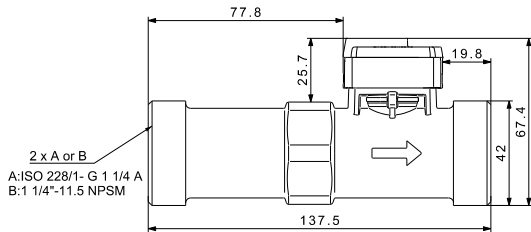
### Specifications

Flow	
In water (0 - 100 °C) tyfocur LS (30 - 100 °C) Measuring range	10 to 200 l/min
Accuracy ( $\pm 1\sigma$ ), 0 to 100 °C	$\pm 1.5$ % FS
Response time start-up flow / no flow (90 %)	< 1.0 s
Resolution	1.0 l/min
Temperature	
Measuring range	0 to 100 °C
Accuracy ( $\pm 1\sigma$ ), 25 to 80 °C	$\pm 1$ °C
Accuracy ( $\pm 1\sigma$ ), 0 to 100 °C	$\pm 2$ °C
Response time (63.2 % at 50 % FS flow)	< 1.0 s
Resolution	0.5 °C
Media and environment	
Media types	The sensor is compatible with liquids (kinematic viscosity $\leq 2$ mm <sup>2</sup> /s)
Media temperature (operation)	0 to 100 °C
Media temperature (peak)	-25 to 120 °C, non-freezing
Ambient air temp. (operation)	-25 to 60 °C
Ambient air temp. (peak)	-55 to 90 °C
Humidity	0 - 95 % RH, non-condensing
System burst pressure	> 16 bar
Electrical data	
Power supply	5 VDC ( $\pm 5$ %). Grounding of the sensor supply is required (PELV)
Output signals	Ratiometric
Flow signal	0.5 - 3.5 V (Zero at 0.35 V)
Temperature signal	0.5 - 3.5 V
Power consumption	< 50 mW
Load impedance	> 10 k $\Omega$
Sensor materials	
Sensing element	Silicon-based MEMS sensor
Seal (sensor to housing)	EPDM rubber
Vortex tube	1.4408
Insert	PPA 40-GF
Wetted materials	Corrosion-resistant coating, EPDM, PPS, PPA 40-GF
Environmental standards	
Enclosure class	IP44 (Non overmoulded IP20)
Temperature cycling	IEC 68-2-14
Vibration (non-destructive)	20 - 2000 Hz, 10G, 4h
Electromagnetic compatibility	EN 61326-1
Dimensions	
Sensing element	47 x 40 x 20 mm, see drawings
Vortex tube	137 x 45 x 41 mm
Insert	104,2 x 30,4 x 28,9 mm

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



**Dimensions (mm)**



TM047247 1810

**Fig. 2** Dimensional sketches of sensing element



TM04 6753 0810

**Fig. 3** VFS 10-200 QT sensor components

**Type key**

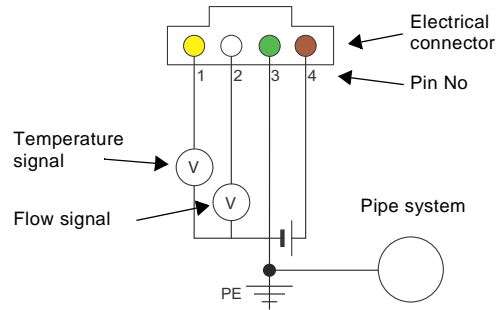
The sensor is labelled with a type designation.

96	- XX	- XXX	XXXXX
Product number			
Revision			
Production year and week			
Consecutive number			

For more information, see  
<http://www.grundfos.com/directsensors>.

<b>97648724</b> 0610	<b>GB</b>
Repl. 97648724 0210	

**Electrical connections**



TM03 8203 1908

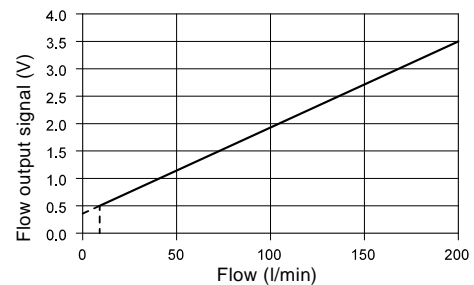
**Fig. 4** Electrical connections

Pin configuration	Colour
1 Temperature signal (0.5 to 3.5 V relative to pin 3)	Yellow
2 Flow signal (0.5 to 3.5 V relative to pin 3)	White
3 GND (0 V)	Green
4 Power supply (+ 5 VDC), PELV	Brown

**Power supply requirements**

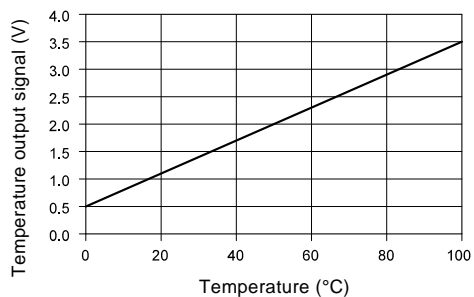
- 5 VDC
- separated from hazardous live circuitry by double or reinforced insulation
- power limitation: 150 VA; current limitation: 8 A.

**Sensor output signals**



TM03 8218 0807

**Fig. 5** Flow response



TM03 8149 0607

**Fig. 6** Temperature response

Subject to alterations.