



Instruction Manual

DTH04

Calorimetric flow sensor in 12 mm housing



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Safety Information

General Instructions

To ensure safe operation, the device should only be operated according to the specifications in the instruction manual. The requisite Health & Safety regulations for a given application must also be observed. This statement also applies to the use of accessories. Every person who is commissioned with the initiation or operation of this device must have read and understood the operating instructions and in particular the safety instructions!

The liability of the manufacturer expires in the event of damage due to improper use, non-observance of this operating manual, use of insufficiently qualified personnel and unauthorized modification of the device.

Proper Usage

The flow sensor of the DTH04 series are designed to measure the flow of aqueous and water-like liquids which do not attack the materials used. Any other use of the device is prohibited and outside the scope of application.

In particular, applications in which shock loads occur (for example, pulsed operation) should be discussed and checked in advance with our technical staff.

The series DTH04 flow sensor devices should not be deployed as the sole agents to prevent dangerous conditions occurring in plant or machinery. Machinery and plant need to be designed in such a manner that faulty conditions and malfunctions do not arise that could pose a safety risk for operators.

Dangerous substances

For dangerous media such as e.g. Oxygen, Acetylene, flammable or toxic substances as well as refrigeration systems, compressors, etc. must comply with the relevant regulations beyond the general rules.

Qualified Personnel

The DTH04 devices may only be installed by trained, qualified personnel who are able to mount the devices correctly. Qualified personnel are persons, who are familiar with assembling, installation, placing in service and operating these devices and who are suitably trained and qualified.

Inward Monitoring

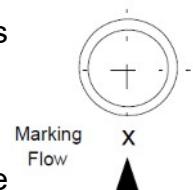
Please check directly after delivery the device for any transport damages and deficiencies. Additional with reference to the accompanying delivery note the number of parts must be checked.

Claims for replacement or goods which relate to transport damage can only be considered valid if the delivery company is notified without delay.

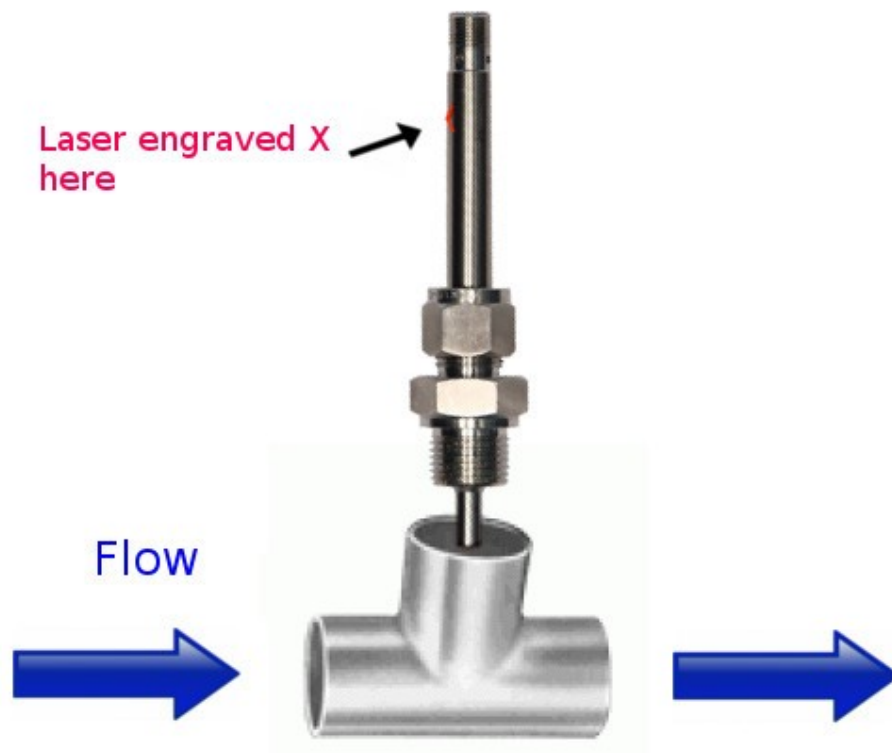
Installation

The flow sensor can be installed in any position. If it is installed in vertical pipes, the flow direction from bottom to top is preferred. You must avoid a free outlet. The formation of gas bubbles in the medium and cavitation must be prevented by suitable measures.

The sensors must always be mounted in such a way that the flow reaches the side marked with an X.



In general, the immersion depth should be selected so that the sensitive area of the sensor (approx. 5 mm from the sensor tip) is at a depth of approx. $\frac{1}{3}$ of its original... $\frac{1}{2}$ of the pipe diameter.



Installation options:

- stainless steel compression fitting
- plug-in sensors with measuring section (T-piece)

The stainless steel compression fitting is screwed into a G ½ threaded hole. A G ½ welding socket is also available for this purpose. If a suitable seal is used, this arrangement can withstand pressures of up to 25 bar. The stainless steel screw connection is first tightened by hand and then tightened ¼ turn with the aid of a wrench. The clamping ring of the screw connection can then no longer be removed from the sensor, i.e. the immersion depth can no longer be changed!

Plug-in sensor with measuring section (process connection TM, TV) are supplied mounted in a measuring section. Since the adjustment is carried out in the factory in this measuring section, this version offers the lowest measurement uncertainty (typically ±5 %).

The measuring sections are available in different nominal sizes (DN 15... DN 50). They have an external thread on both sides for installation in the application.

The sensor and the measuring section can be separated from each other e.g. for cleaning. To do this, loosen the union nut (only if the pipeline is free of pressure!) and pull the sensor out of the bore.

The sensor has a fixed plastic cone with an O-ring and a groove in which a pin on the opposite side engages. This prevents twisting and the sensor can only be inserted into the measuring section in one position. Max pressure for this version is PN 10.

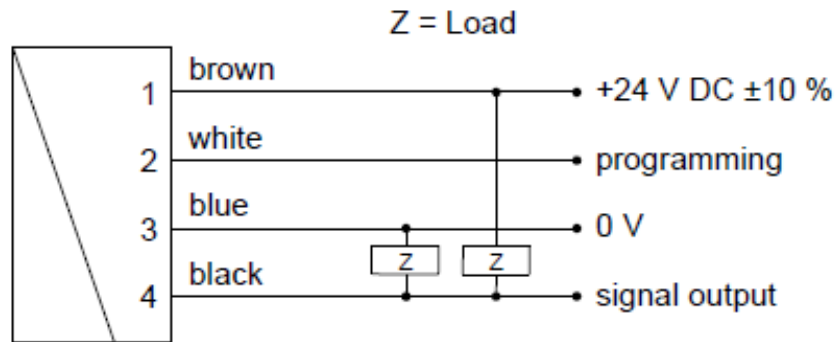
Electrical Connection

Attention: We recommend to use only shielded connection cables.

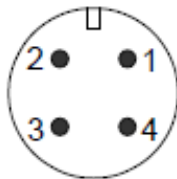
The devices are equipped with an integrated electronic unit and are ready for operation immediately after installation.

- Before the electrical connection of the device, it must be ensured that the supply voltage corresponds to the required one: 24 VDC.
- Before the electrical connection of the device, the supply voltage must be switched off.
- The analogue output is set at the factory, see nameplate for value.

Pin Assignment



Connection example: PNP NPN



Operation and Programming of Sensors with Switching Output

The switching value can be set by the user via teach-in. Proceed as follows to do this.

- Apply the flow rate to be adjusted to the device.
- Apply a pulse of at least 0.5 seconds and max. 2 seconds duration to pin 2 (e.g. by bridge to supply voltage or pulse from PLC) in order to accept the measured value.
- After successful teach-in, pin 2 should be connected to 0 V to prevent accidental programming.

The device has a yellow LED that flashes during the programming pulse. During operation, the LED serves as a status indicator for the switching output.

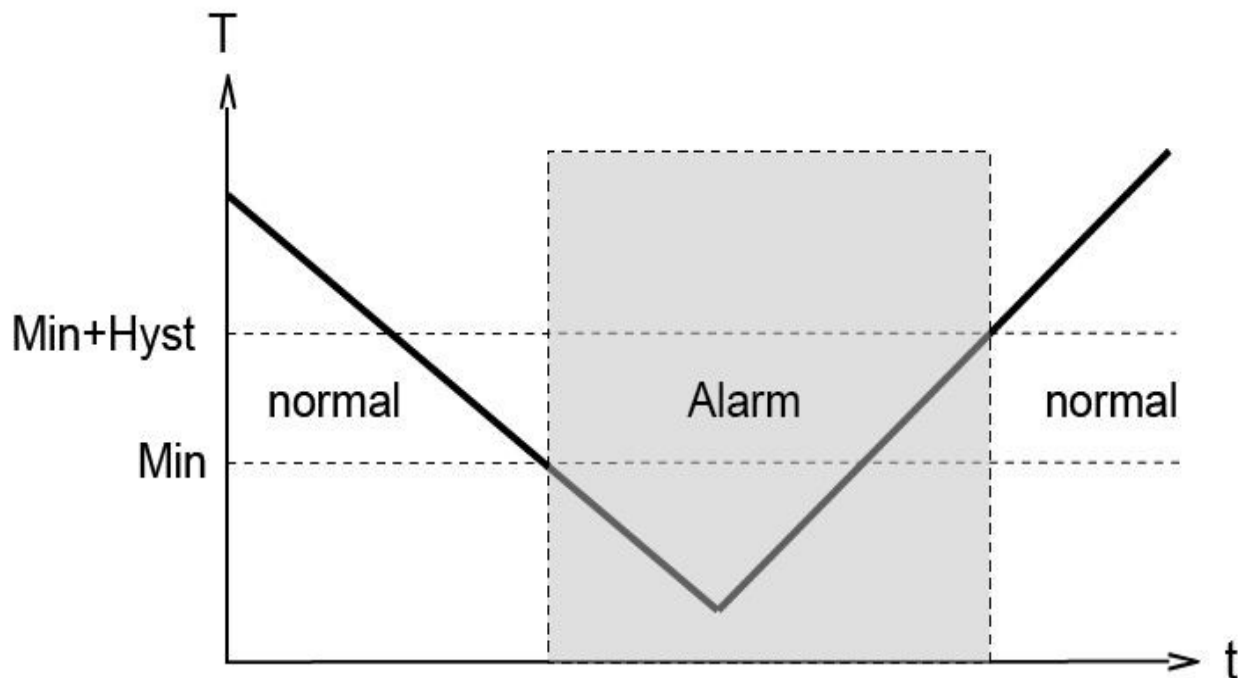
In order to avoid that an undesired operating state has to be started for the teach-in, the device can be equipped with a teach offset ex works. The teach offset value is added to the current measured value before it is saved.

Example:

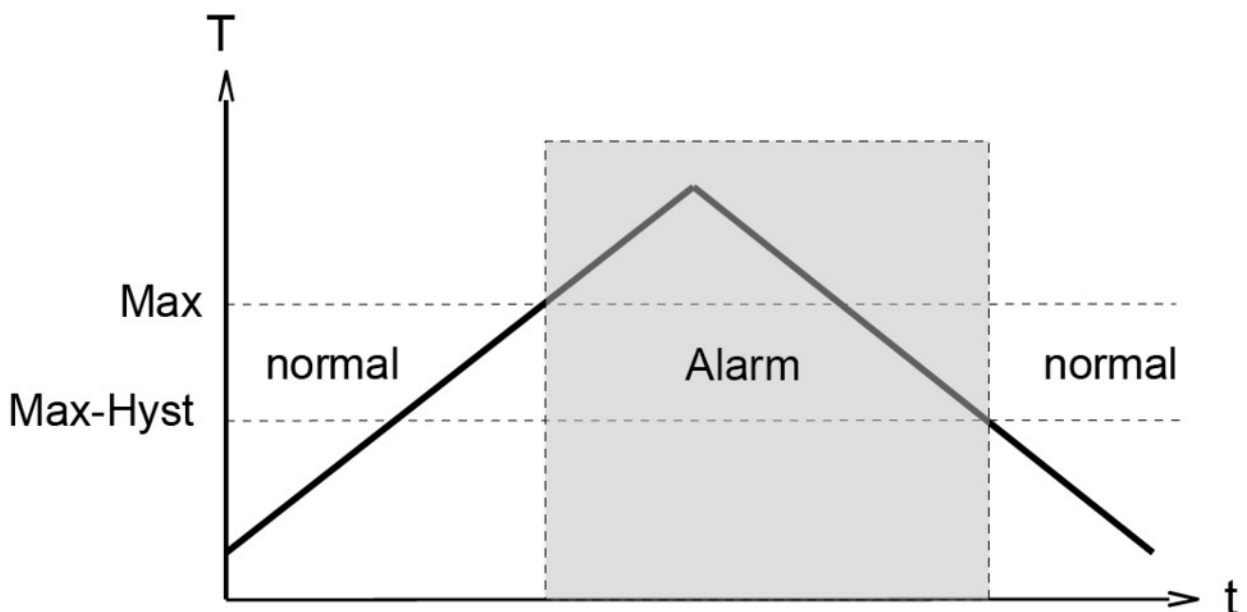
The switching value is to be set to 80 cm/s, as a critical state in the process is to be reported at this flow rate. However only 60 cm/s can be achieved without danger. In this case, the device would be operated with a teach offset of +20 cm/s. At 60 cm/s in the process, a switching value of 80 cm/s would then be stored during teaching.

Minimum or maximum monitoring:

With a minimum switch, falling below the limit value leads to a changeover to the alarm state. The return to the normal state occurs when the limit value plus the set hysteresis is exceeded again.

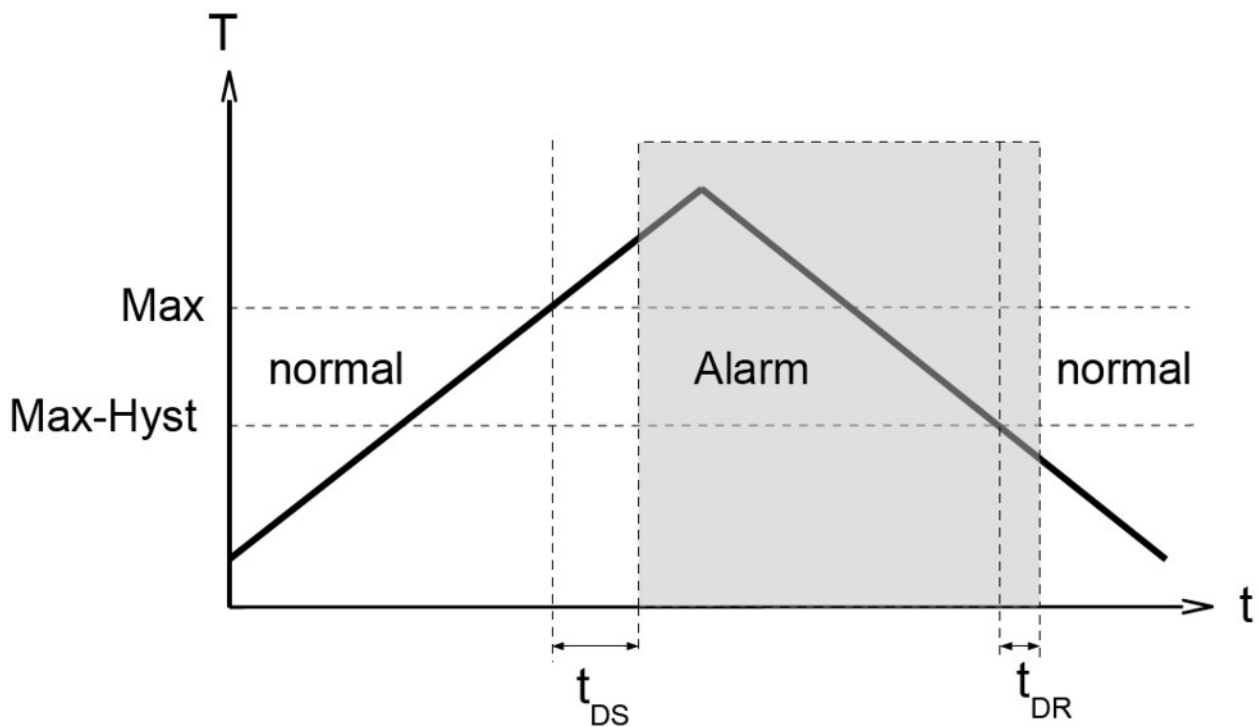


With a maximum switch, exceeding the limit value leads to switching over to the alarm state. The return to the normal state occurs when the value falls below the limit value minus the set hysteresis.



Switching delay:

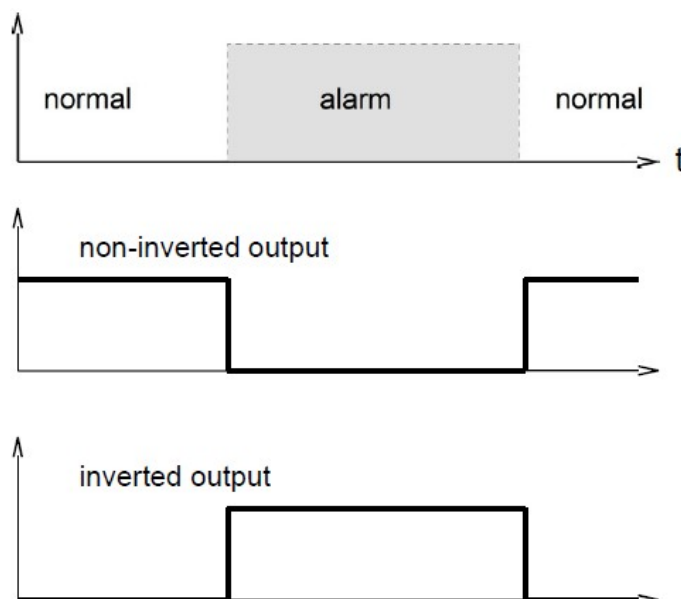
Switching to the alarm state can be provided with a switching delay time (t_{DS}). The switch-back to the normal state can also be provided with a different switch-back delay time (t_{DR}).



LED status display:

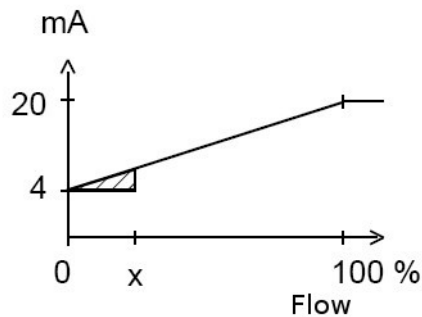
In the normal state the integrated LED is on, in the alarm state it is off, which corresponds to the state when there is no supply voltage.

The switching output is at supply voltage level in the normal state with non-inverted version (standard), at 0 V in alarm state, so that a cable break at the signal receiver would also indicate alarm state. Optionally, the switching output can be inverted, i.e. 0 V is applied to the output in the normal state and supply voltage level in the alarm state.

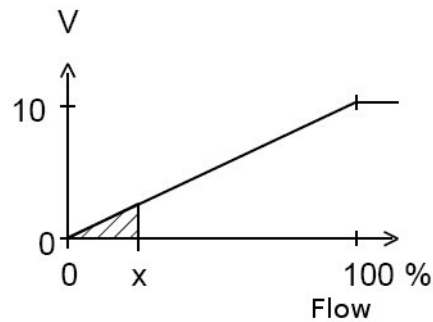


Characteristics

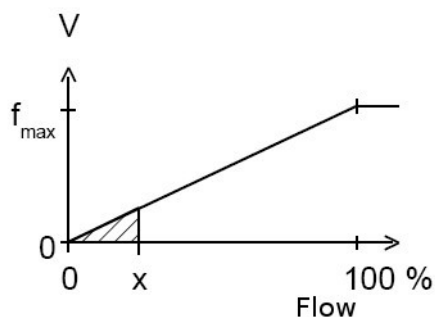
Current output



Power supply



Frequency output



f_{\max} selectable in the range up to 2000 Hz

Operation and Programming of Sensors with Analogue, Frequency or Pulse Output

The end of the measuring range can be set by the user via teach-in on request.
Proceed as follows:

- Apply flow end range to device
- Apply a pulse of at least 0.5 seconds and max. 2 seconds duration to pin 2 (e.g. by bridge to supply voltage or pulse from PLC) in order to accept the measured value.
- After successful teach-in, pin 2 should be connected to 0 V to prevent accidental programming.

The devices have a yellow LED that flashes during the programming pulse. During operation, the LED serves as an operating voltage indicator.

Notice:

Programmability must be specified as an option when ordering, otherwise the device is not programmable.

DTH04

Calorimetric Flow Transmitter and Switch in Ø 12mm Housing

- for liquids
- short response time
- no moving parts
- independent of nominal sizes
- high temperature gradient
- insignificant pressure loss
- reliable monitoring in two measuring ranges of 2...150 cm/s and 3...300 cm/s
- PN 25, T_{max}: 100 °C



Description:

The calorimetric measuring technology is based on the fact, that heat energy is transferred from the surface of the probe to the medium. The higher the velocity of the medium, the more heat energy is taken away by the medium. An unheated Pt100 resistance temperature detector (RTD) embedded in the stainless steel sensor tip serves to record the medium temperature. A second RTD is electrically heated and exposed to the flow. The temperature difference of these two RTDs is proportional to the flow velocity and therefore to the flow volume. For range two, when a value of about 300 cm/s is reached there is so much heat absorbed by the medium that both RTDs have almost the same temperature, and hence the upper limit of the measuring range is reached.

The DTH04 is a compact device and consists of a stainless steel sensor and an integral electrical unit as standard. This can be configured as a switch-, voltage-, electrical-, frequency- or counting pulse output version.

Typical Applications:

The DTH04 units are designed for effective monitoring of liquid media. Because of the low flow resistance and their relative insensitivity to contamination by solids they offer a good alternative to paddle type devices. Because of their structural shape the flow switches are suitable for every pipe diameter.

Just a minimal flow velocity is required at the sensor tip. Calorimetric flow switches are widely used in the steel and metal working industries. As well as throughout the chemical and beverage sector. Typical applications are coolant monitoring for welding robots, plasma-pumps or cooling units, dry run protection for pumps, and water monitoring in sprinkler systems.

Models:

Process connection:

The universally popular and versatile compression fitting has been adopted as standard. The connection is available in brass or stainless steel. It is equipped with a metal ferrule or PTFE compression gland. It is also possible to deliver the devices ready mounted in a T-piece made of brass or stainless steel (with plastic cone, PN 10). In this case the calibration in l/min can be done directly. As an option there is also an integrated inlet and outlet pipe available. The calibration can be done in l/min directly, too.

Sensors:

The sensors are integrated into the complete device, available lengths are: 123, 175 and 223 mm.

Output:

In the switch, frequency- and pulse output versions, the devices are equipped with a push-pull transistor output. The analogue output version provides 0...10 V, or 4...20 mA signals. The switch output is programmable through a "teach-in" function on site.

Electrical connection:

The DTH04 is equipped with an M12 x 1, 4-pole plug system.

Electrical Data:

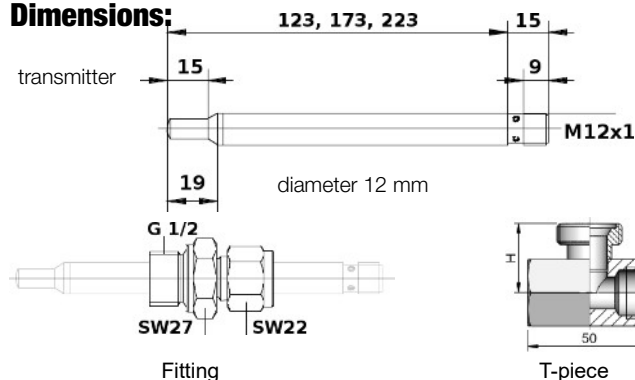
Voltage supply:	24 V _{DC} ± 10 %
Power consumption:	50 mA no-load condition
Connection:	M12x1, 4-pole plug
Protection system:	IP67, reverse polarity protected, and short-circuit proof
Output:	switch, frequency, pulse output: push-pull transistor, max 50 mA pulse output with 50 ms width analogue output: 0...10 V, min 1 kOhm 4...20 mA, max 500 Ohm

With an analogue or pulse output signal, the nominal pipe bore has to be specified.

Technical Data:

Max. pressure:	PN 25 with compression fitting PN 10 with T-piece
Media temp. range:	-20 °C to 70 °C, optional 100 °C
Ambient temperature:	0 °C to 70 °C (32 °F to 158 °F)
Housing:	stainless steel 1.4571 T-piece st. steel. or brass, POM seal
Connection:	G1/2 male thread compression fitting
Measuring ranges:	2 to 150 cm/s and 3 to 300 cm/s
Accuracy:	+/- 10% F.S., when calibrated in T-piece: 5%, repeatability: 1% temperature gradient: +/- 0,01 %/K
Response time:	< 3 seconds
Weight:	about 50 g without fittings

Dimensions:



Size	G 1/2	G 3/4	G 1	G 1 1/4	G 1 1/2	G 2
H [mm]	28	29	33	37	40	49

Model Code:

Order Number: DTH04. 1. U. 1. 1. GF. 15. 0

Calorimetric Flow Transmitter and Switch

Measuring range:

1 = 2...150 cm/s (standard)
3 = 3...300 cm/s

Output signal for flow:

SL = 1 switching output, minimum switch
SH = 1 switching output, maximum switch
I = 4...20 mA analogue output
U = 0...10 V analogue output
F = frequency output, please specify desired f_{max} value (2000 Hz max)
Z = counting pulse, please specify pulse valence, (only in combination with T-piece or inlet pipe)

Electrical connection:

1 = M12x1 plug, 4 pole

Sensor length:

1 = 123 mm
2 = 173 mm
3 = 223 mm

Process connection:

GF = plain pipe without thread
TM = with T-piece of brass, POM-GF-cone, PN10 calibration in l/min
TV = with T-piece of stainless steel, POM-GF-cone, PN10 calibration in l/min

Connection size:

00 = without thread
15 = G ½ female
20 = G ¾ female
25 = G 1 female
32 = G 1 ¼ female
40 = G 1 ½ female
50 = G 2 female

Options:

0 = none
HT = T_{max} (medium) 100 °C

Accessories:

Compression fitting SVQ.V.15.P.12, G ½ female

material: stainless steel 1.4571, PTFE ring
PN 25, T_{max}: 100 °C



M12x1 plug with PVC cable SM12.4 (4-pole)

straight or angled
different lengths
(please see data sheet SM12)

