

For flow monitoring rates of liquids media and for monitoring of their temperature

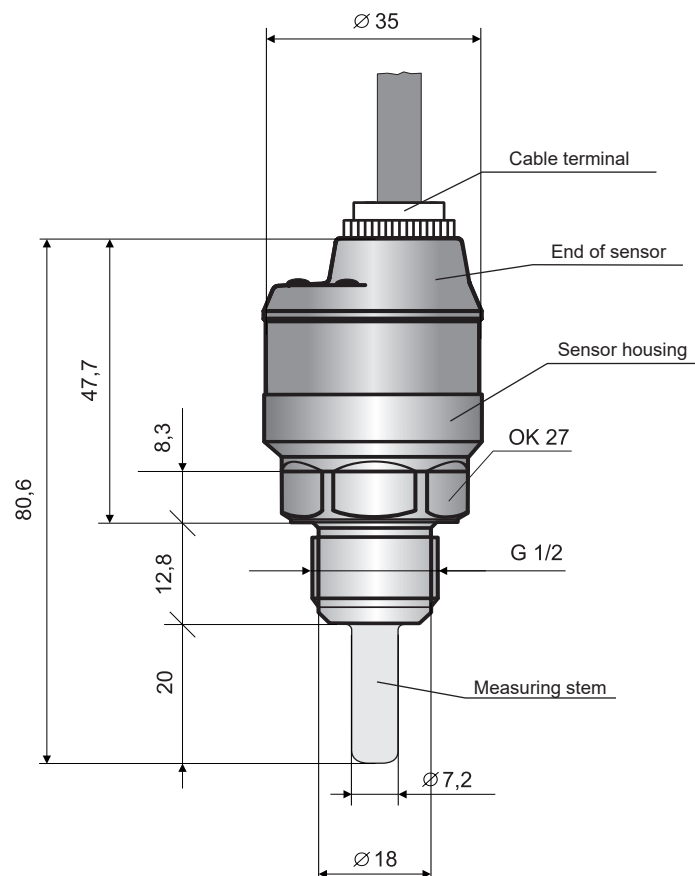
- These sensors are intended for installation in pipes, in which the actual flow rate and temperature occurs
- Flow rate measurement is shown in a bar graph by five green LED diodes and in the same graduation it is possible to select the limit for output switching (unswitching)
- Optical indication of the flow rate and temperature status via two LEDs
- Settings provided by magnetic pen
- Stainless steel case



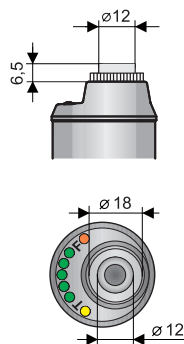
**Thermal flow sensor - TFS-35** is a compact measuring device intended for industrial use for flow monitoring of liquids media and for monitoring of their temperature when installed in a pipe. The sensor may be installed in plastic or metal pipes. Suitable for monitoring filling, cooling or lubricating media and their temperatures. Flow rate is indicated by means of a bar graph (5 green LEDs). Output (flow rate and temperature) switching indicator by means of LED (orange and yellow).

Simple configuration using a magnetic pen. Sensor is made in a stainless steel design. Quick and simple installation thanks to simple construction.

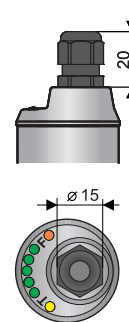
### DIMENSIONAL DRAWING



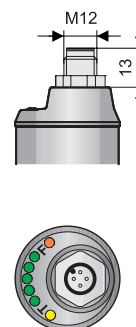
Variant "A" with short stainless steel terminal



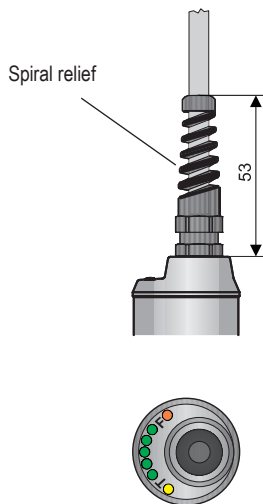
Variant "B" with plastic threaded terminal



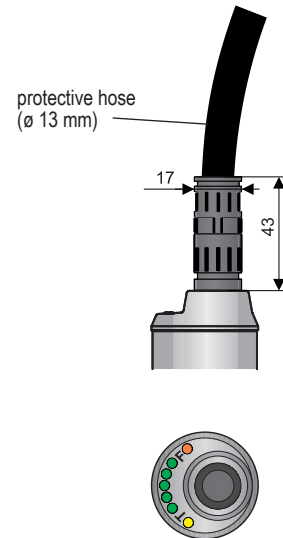
Variant "C" with connector M12



**Variant "V" with plastic terminal with spiral relief** – in case of increased mechanical strain on the cable.



**Variant "V" with plastic terminal with spiral relief** – in case of increased mechanical strain on the cable.



## TECHNICAL SPECIFICATIONS

BASIC TECHNICAL DATA		
Working area (EN 60079-10-1)		no explosive hazard area
Supply voltage		12...34 V DC
Power consumption	for power voltage	12 V DC 15 V DC 18 V DC 24 V DC
		max. 100 mA DC max. 80 mA DC max. 70 mA DC max. 60 mA DC
Output	flow rate temperatures	PNP PNP
Maximum switching current		300 mA
Maximum residual voltage in ON state		1,5 V
Temperature output - switching points		15 °C; 30 °C; 45 °C; 60 °C; 75 °C
Flow rate range		1 to 150 cm/s (for water)
Temperature gradient		< 250 K/min
Isolating capacity (housing - inputs) / electrical strength		4 nF / 350 V AC
Protection		IP67 (variant C) IP68 (variant A, B, V, H)
Ambient working temperature range (ta)		-20 ... +80°C

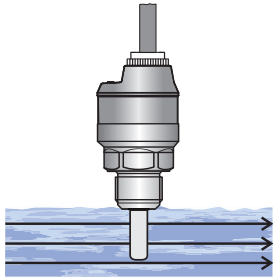
BASIC TECHNICAL DATA		PROCESS CONNECTION		
Cable	PVC 4x0,5 mm <sup>2</sup>	<b>name</b>	<b>dimensions</b>	<b>marking</b>
Heat up time after start	10s	pipe thread	G 1/2"	G 1/2
Response time	2 to 15s *1)			
Pressure strength	10 MPa (100 bar ) over full temperature range			
Weight of sensor (without cable)	150g			

\*1) Depending on the flow rate and setting of the sensor.

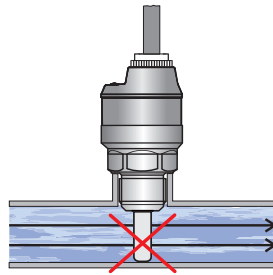
USED MATERIALS		
part of the sensor	type	standard material
Housing (including measur. stem)	all	stainless steel W.Nr. 1.4404 (AISI 316L)
End of sensor	all	stainless steel W.Nr. 1.4301 (AISI 304)
Cable terminal	TFS-35 _ _ _ _ _ - A- L _ _	stainless steel W.Nr. 1.4571 / NBR
	TFS-35 _ _ _ _ _ - B- L _ _	plastic PA / NBR
	TFS-35 _ _ _ _ _ - V- L _ _	plastic PA / NBR
	TFS-35 _ _ _ _ _ - H- L _ _	plastic PA / NBR
Connector M12	TFS-35 _ _ _ _ _ - C- L _ _	nickel-plated brass

## INSTALLATION INSTRUCTIONS

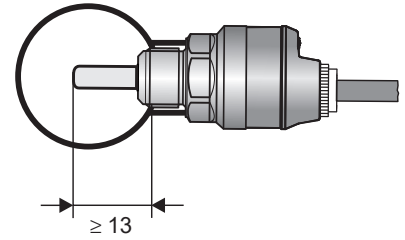
The sensor must be installed with the sensor stem completely flooded.



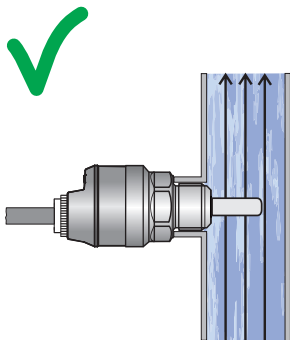
The tip of the sensor stem must not touch the pipe wall.



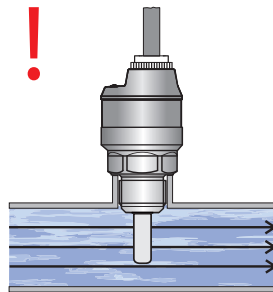
The sensor must be located in such a way that the tip of the sensor stem is at least 13 mm away from the pipe wall.



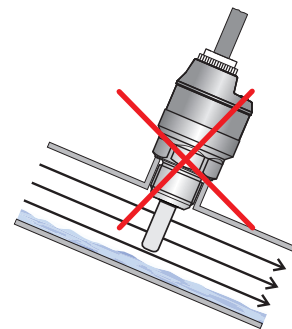
The recommended installation location is in the rising parts of the pipe system.



The sensor is installed on a horizontal pipe from above when the pipe is completely flooded.



**Installation is not recommended in parts of the pipe system that may become aerated** (highest parts of the pipe system, horizontal areas with open ends).

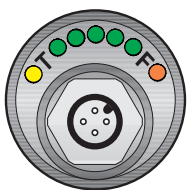


When measuring very low flow rates in water pipe systems, where there is a risk of dirt accumulating on the stem of the sensor, it is recommended to install it from the side of the pipe.

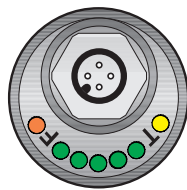
Disruptive elements cause the media to swirl, which reduces measuring accuracy. For this reason, the sensor installation location is selected so that there are calming direct pipe segments before and after the sensor. A direct segment of length 5...10 DN is recommended before the sensor and a direct segment of length 3...5 DN behind it. Disruptive elements are understood to mean bends, elbows, valves, reductions, other sensors, etc.

The sensor is screwed into a threaded sleeve in the pipe. For tightening, a 27 mm open end wrench must be used. The tightening torque must be selected respecting the used seal and the working overpressure in the pipe system.

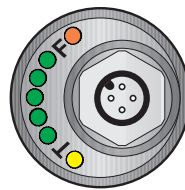
### Positions relative to the flow direction:



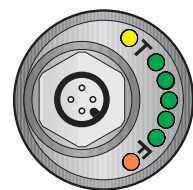
1



2



3



4

The sensitivity of the sensor depends on its position relative to the flow direction. Optimal positions are no. 1 and no. 2. In these positions, the signal from the sensor is not dependent on the flow direction and sensitivity corresponds to factory settings. The lighting up of individual LED diodes on the bar graph is practically linear relative to the flow rate.

In position 3, the sensor is more sensitive to small flow rates, the ability to differentiate large flow rates is limited.

In position no. 4, the sensor is able to detect larger flow rates well, the sensitivity to small flow rates is limited.

## ELECTRICAL CONNECTION



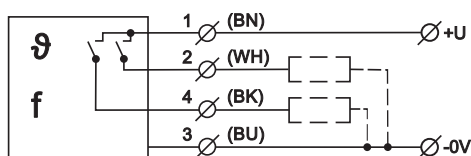
Electrical connection can only be made in a voltage-free state!

A sensor with PNP type of outputs can be loaded only by resistive or inductive loads. The positive pole of the supply voltage (+U) is connected to the brown wire *BN* or *pin connector no.1*, the negative pole (0 V) is connected to the blue wire *BU* or *pin connector no.3*. Flow rate load on the black wire *BK* or *pin connector no.4* and temperature load on the white wire *WH* or *pin connector no.2*. The capacitive loads and low resistance loads (e.g. bulb) are evaluated by the sensor as a short circuit.

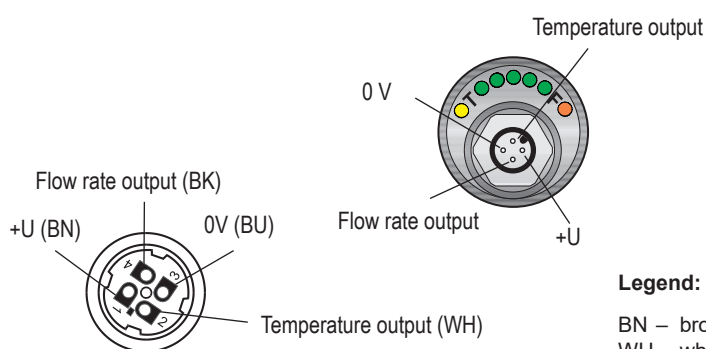
Wiring diagrams are provided in the figures below.

Flow sensor TFS-35 with a type A, B, V or H cable terminal, is connected to the assessment units permanently by a connection cable, see. Dimensional drawings.

The TFS-35 flow sensor with connection method type C (see Dimensional drawings) is connected to the assessment units by means of a connector socket with a pressed-in cable, or by means of a detachable connector socket without a cable (e.g. ELWIKA), see accessories. In this case the cable is connected to the inside pins of the socket according to the figure below. The recommended diameter of this cable when using ELWIKA connectors is 4 to 6 mm (the recommended wire cross-sectional area is 0.5 to 0.75 mm<sup>2</sup>).



Connection of flow sensor TFS-35



Inside view of the connector socket (variant "C")

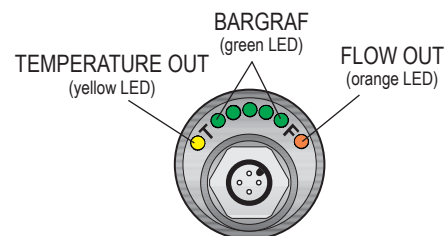
### Legend:

BN – brown  
WH – white  
BK – black  
BU – blue

## SETTINGS

Settings are performed by placing the magnetic pen on to the sensitive spot marked "T" or "F" located between the LEDs. In this way, the minimum and maximum flow rate, flow rate switching point, temperature switching point, switching modes (O, C) are set or the factory setting are restored. An incorrect setting is indicated by the green LEDs gradually turning on and off, going from the centre to the edges.

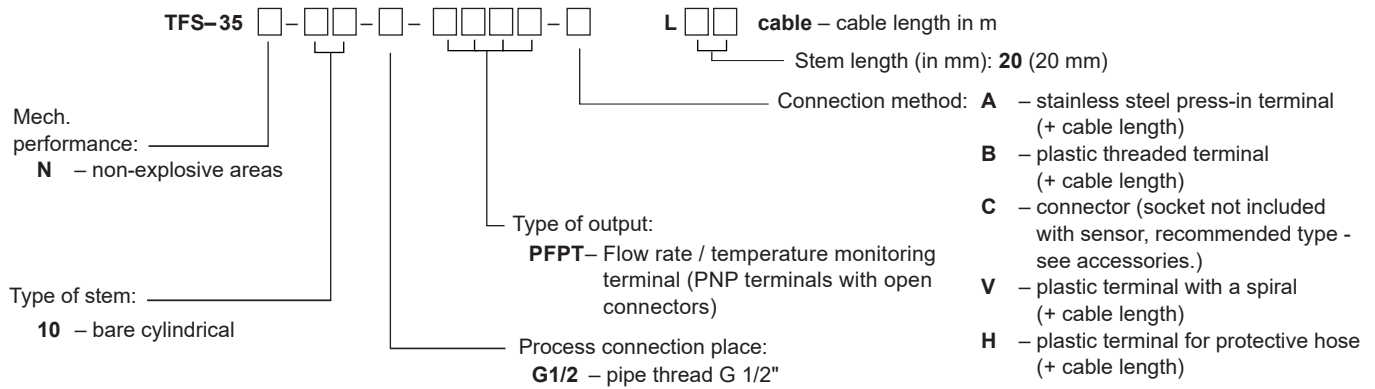
Information on settings of the sensor is provided in the user's manual.



## FUNCTION AND STATUS INDICATION

signal	colour	function
"FLOW OUTPUT"	orange	<p><b>Flow rate output status indicator</b>                      permanently shine - output is switched                      dark - output is unswitched  <b>Maximum flow rate setting</b>                      light with gradual lighting of green LEDs - maximum flow rate is being set                      3 flashes - confirmation that settings are saved</p>
"BARGRAF" (5 LED)	green	<p><b>Flow rate indicator</b>                      gradual lighting up of LEDs from left to right - depending on the flow rate range settings                      incorrect setting - gradual turning on and off, going from the centre to the edges  <b>Flow rate / temperature switching point settings</b>                      one LED is permanently shine - when this point is reached, the flow rate / temperature output is switched / unswitched</p>
"TEMPERATURE OUTPUT"	yellow	<p><b>Temperature output status indicator</b>                      permanently shine - output is switched                      dark - output is unswitched  <b>Minimum flow rate setting</b>                      light with gradual lighting of green LEDs - maximum flow rate is being set                      3 flashes - confirmation that settings are saved</p>

## ORDER CODE



## CORRECT SPECIFICATION EXAMPLES

TFS-35N-10-G1/2-PFPT-A-L20 cable 2 m

(**N**) configuration for normal areas; (**10**) non-insulated cylindrical; (**G1/2**) process connection with thread G1/2"; (**PFPT**) PNP type flow rate and temperature sensing terminals; (**A**) stainless steel cable terminal; (**L20**) length of stem 20mm; cable 2 m.

TFS-35N-10-G1/2-PFPT-C-L20

(**N**) configuration for normal areas; (**10**) non-insulated cylindrical; (**G1/2**) process connection with thread G1/2"; (**PFPT**) PNP type flow rate and temperature sensing terminals; (**C**) M12 connector; (**L20**) length of stem 20mm.

TFS-35N-10-G1/2-PFPT-B-L20 cable 12 m

(**N**) configuration for normal areas; (**10**) non-insulated cylindrical; (**G1/2**) process connection with thread G1/2"; (**PFPT**) PNP type flow rate and temperature sensing terminals; (**B**) plastic cable terminal; (**L20**) length of stem 20mm; cable 12 m.

## ACCESSORIES

**standard** - included in the flow sensor price

- 1 pcs. magnetic pen MP-8

**optional – for a surcharge** (see catalogue sheet of accessories)

- cable (over the standard 2m length)
- connector socket (type ELWIKa or ELKA)
- standard steel or stainless steel welding flange
- protective hose (for type of cable terminal H)
- stainless steel fixing nut
- various types of seals (PTFE, Al, etc.)

## SAFETY, PROTECTION AND COMPATIBILITY

The flow sensor TFS-35 is equipped with protection against voltage polarity reversal, protection against current overload and protection against short term overvoltage.

Protection against dangerous contact is provided by low safety voltage according to 33 2000-4-41.

Electromagnetic compatibility is provided by conformity with standards EN 55011 / B, EN 61326-1, EN 61000-4-2 (8 kV), -4-3 (10 V/m), -4-4 (2 kV), -4-5 (1 kV) and -4-6 (10 V).

## PACKAGING, SHIPPING AND STORAGE

The TFS-35 device is supplied packaged in a cardboard box that protects it against mechanical damage.

When handling and during transport, it is necessary to prevent impacts and falls.

The TFS-35 electrical device must be stored in dry enclosed areas with humidity up to 85%, free of aggressive vapours at temperatures between -10°C and 50°C, and must be protected against the effects of weather.

version 07/2018



QMS  
ISO 9001

**Dinel, s.r.o.**  
U Tescomy 249  
760 01 Zlín, Czech Republic

Phone: +420 577 002 003  
Fax: +420 577 002 007

TFS-35-dat-5.9  
sale@dinel.cz  
www.dinel.cz