

# Temperature Sensor G1/2" Standard

## Application / Specified Usage

- Temperature measurement in vessels and pipes
- No product contacting of the sensor if using the weld-in thermowell ESH
- Demounting the sensor without opening the process if using the weld-in thermowell ESH

## Application Examples

- Temperature measurement in pressure pipes
- Measurement of paste products in pipes
- Temperature monitoring in UHT-plants

## Hygienic Design / Process Connection

- Hygienic and easy sterilizable installation by using thermowell ESH
- Product contacting materials compliant to FDA
- Sensor and thermowell completely made of stainless steel

## Features

- Integrated transmitter optional
- Different types of electrical connections possible
- Protection class is IP 69 K with electrical connection M12-plug

## Options / Accessories

- 2 x Pt100 (not retrofittable)
- 2 x Pt100 with two transmitters (not retrofittable)
- Programmable transmitters MPU-4 as well as MPU-M with output 4...20 mA, 2-wire
- Integrated transmitters for Profibus PA and HART-protocol
- Programming adapter MPU-P 9701
- Integrated transmitter MPU-LCD with display in connecting head
- Pt100 chip with other classes of accuracy (1/3B, 1/10B)
- Fast response sensor tip 3 mm and 4 mm
- Spacer for high temperature up to 250 °C  
permanent temperature up to 600 °C (on request)
- Pre-assembled connecting cable for M12-plug
- Fixed cable in other lengths and material available

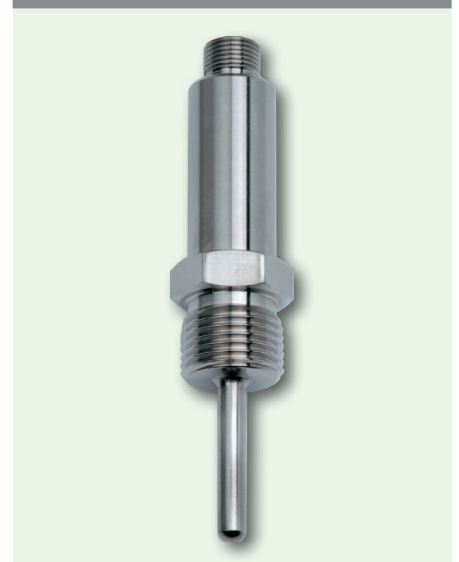
## Authorizations



## Temperature sensor TFP-40



## Temperature sensor TFP-160 / ... / MPU-M



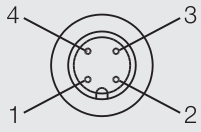
Temperature Sensor		
Process connection	thread G1/2"	gap-free with weld-in thermowell, e.g. ESH-G1/2"/050
Insertion length EL	standard	35...500 mm (inclusive thread)
Materials	connecting head thermowell	stainless steel 1.4305 stainless steel 1.4404
Operating pressure	without weld-in thermowell with weld-in thermowell	10 bar maximum 50 bar maximum
Temperature ranges	ambient sensor tip	-50...+80 °C -50...+250 °C
Sensing resistor	acc. to DIN EN 60751	Pt100
Electrical connection	cable gland cable connection fixed cable 2,5 m fixed cable 2,5 m (> 90 °C)	M16 x 1,5 M12-plug 1.4305, 4-pins LIYY 4 x 0,25 mm <sup>2</sup> PTFE 4 x 0,14 mm <sup>2</sup>
Protection class		IP 69 K (with electrical connection M12-plug)

Transmitter MPU-4, MPU-10, MPU-H, MPU-M		
Temperature ranges	ambient storage	-40...+85 °C -55...+90 °C
Measuring ranges	MPU-4, MPU-H, MPU-M  MPU-10	standard: -10...40 °C, 0...50 / 100 / 150 / 200 °C special ranges free programmable standard -200...850 °C configuration occurs with Profibus
Accuracy	input	< ±0,25 °C
Temperature drift	zero, span	< 0,01 % / K
Supply	MPU-M, MPU-4 MPU-10 accuracy	8...35 V DC 9...32 V DC 0,01 % / V (reference: 12 V DC)
Output	signal accuracy burden	analog 4...20 mA (not for MPU-10) < ±0,1 % of measurement range < 600 Ω (at UB = 24 V)
Humidity	without condensation	0...98 %

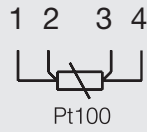
Accuracy classes of temperature sensors   Tolerances for Pt100 acc. to DIN EN 60751			
Pt100	A	1/3 B	1/10 B
0 °C / 100 Ω	±0,15 K / ±0,06 Ω	±0,10 K / ±0,04 Ω	±0,03 K / ±0,01 Ω
100 °C / 138,5 Ω	±0,35 K / ±0,13 Ω	±0,27 K / ±0,10 Ω	±0,08 K / ±0,03 Ω

Electrical connection without transmitter

With 1 x M12 plug

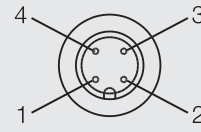


Configuration 1st M12 plug



Electrical connection with transmitter

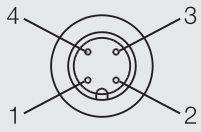
With M12 plug



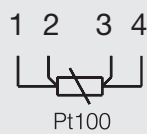
Configuration M12 plug

- 1: + supply
- 2: - supply 4...20 mA
- 3: not connected
- 4: not connected

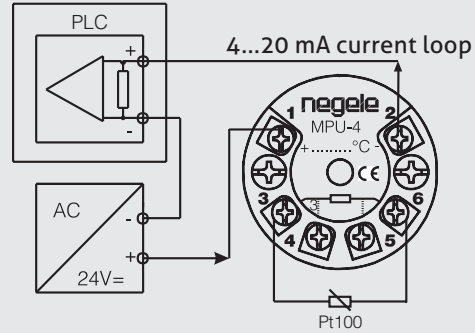
With 2 x M12 plug



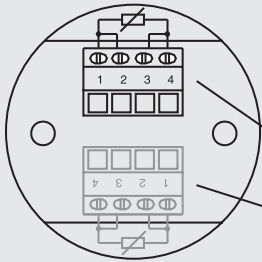
Configuration 2nd M12 plug



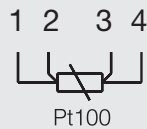
With cable gland



With cable gland



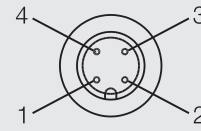
Configuration strip terminal



- clamps for 1st Pt100
- clamps for 2nd Pt100 (at version 2 x Pt100)

Electrical connection with two transmitter (TFP-60)

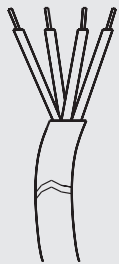
With 1 x M12-plug (sensor 1 + sensor 2)



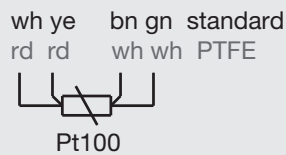
Configuration M12-plug

- 1: + supply (sensor 1)
- 2: - supply 4...20 mA (sensor 1)
- 3: - supply 4...20 mA (sensor 2)
- 4: + supply (sensor 2)

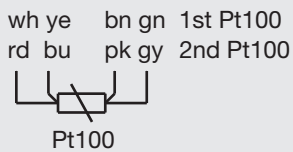
With fixed cable



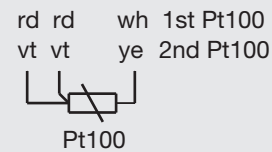
Fixed cable connection with 1 x Pt100



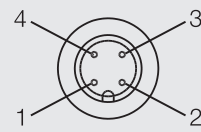
Fixed cable connection with 2 x Pt100 (LIYY)



Fixed cable connection with 2 x Pt100 (PTFE)



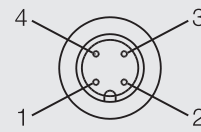
With 2 x M12-plug (sensor 1)



Configuration M12-plug

- 1: + supply (sensor 1)
- 2: - supply 4...20 mA (sensor 1)
- 3: not connected
- 4: not connected

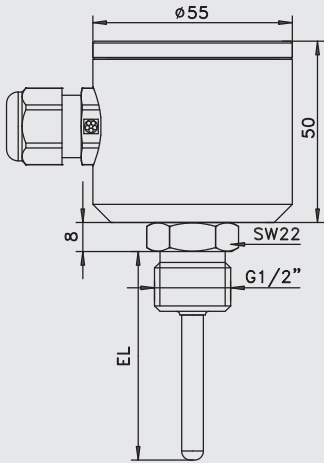
With 2 x M12-plug (sensor 2)



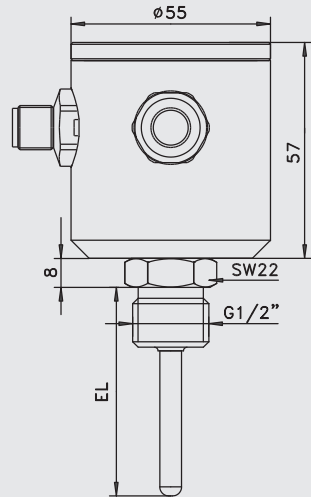
Configuration M12-plug

- 1: + supply (sensor 2)
- 2: - supply 4...20 mA (sensor 2)
- 3: not connected
- 4: not connected

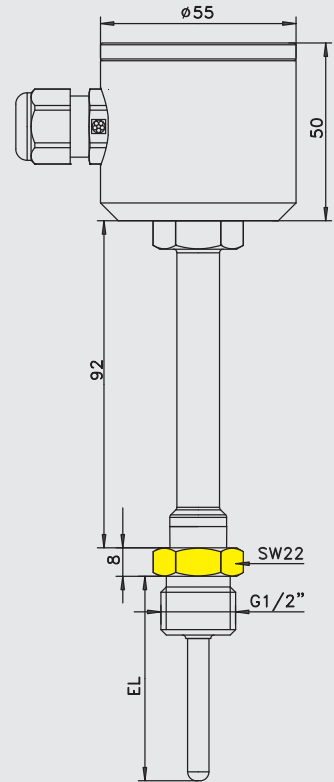
TFP-40 | TFP-40.2



TFP-60



TFP-50 | TFP-50.2

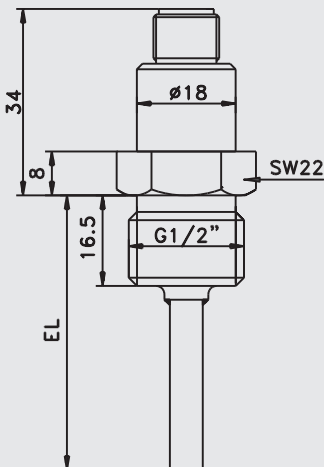


Important installation advice

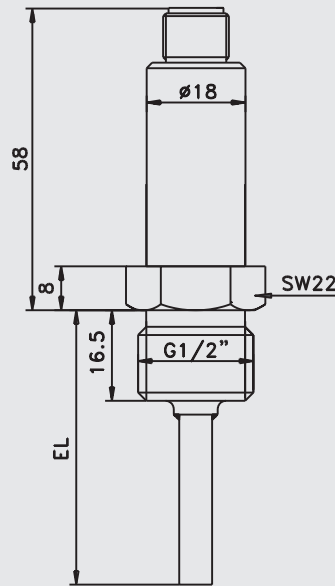


Tighten the sensor only at the lower spanner flat (BE = 22 mm)!

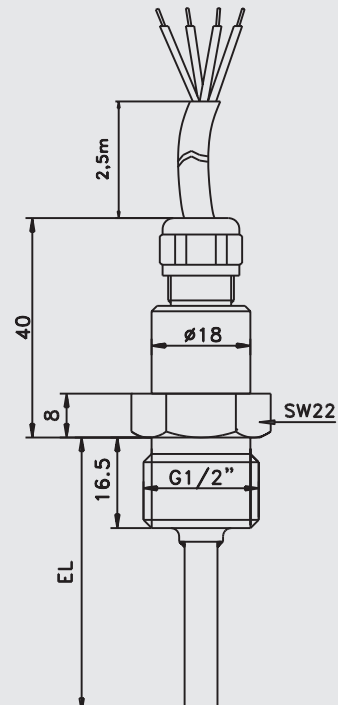
TFP-160



TFP-160 / ... / MPU-M



TFP-180 | TFP-180.2

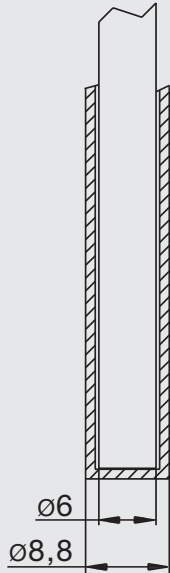


## Sensor tip diameter and response time

All temperature sensors are available with smaller sensor tips, to ensure a shorter response time. The below-mentioned times were measured by immersing a temperature sensor from room temperature into boiling water.

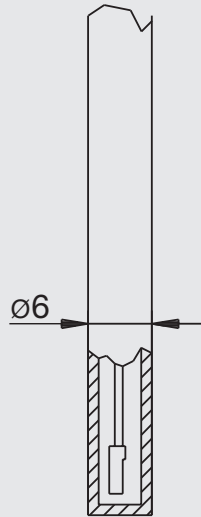
## Sensor tip Ø 6 mm with thermowell

Response time:  $t_{50} \leq 8,8 \text{ s}$   
90 %-time:  $t_{90} \leq 24,5 \text{ s}$



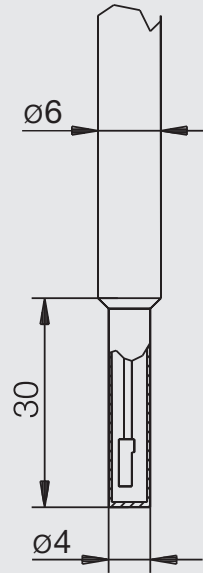
## Sensor tip Ø 6 mm

Response time:  $t_{50} \leq 3,0 \text{ s}$   
90 %-time:  $t_{90} \leq 8,0 \text{ s}$



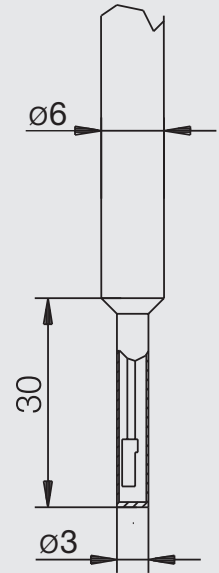
## Sensor tip Ø 4 mm

Response time:  $t_{50} \leq 2,4 \text{ s}$   
90 %-time:  $t_{90} \leq 6,5 \text{ s}$

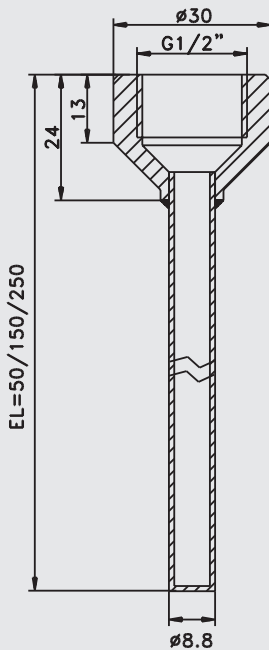


## Sensor tip Ø 3 mm

Response time:  $t_{50} \leq 0,5 \text{ s}$   
90 %-time:  $t_{90} \leq 1,5 \text{ s}$



## Thermowell ESH-G1/2"



## Note



- When using weld-in thermowells we recommend to use heat-conductive paste too. This can reduce the response time up to 50 %.
- Detailed Information to Thermowell ESH you will find in product information CLEANadapt.

**Mechanical Connection / Installation**

- Check the compatibility of the sensor length to the used thermowell.

**Conventional Usage**

- Not suitable for applications in explosive areas.
- Not suitable for applications in security-relevant equipments (SIL).

**Transport / Storage**

- No outdoor storage
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration
- Storage temperature -55...+90 °C
- Relative humidity maximum 98 %

**Reshipment**

- Sensors shall be clean and free of media or heat-conductive paste and must not be contaminated with dangerous media!
- Use suitable transport packaging only to avoid damage of the equipment!

**Cleaning / Maintenance**

- In case of using pressure washers, don't point nozzle directly to electrical connections!

**Standards and Guidelines**

- You have to comply with applicable regulations and directives.

**Disposal**

- This instrument is not subject to the WEEE directive 2002/96/EC and the respective national laws.
- Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points.

**Advice to EMC**

- The device agrees to following standards: EMC directive 2004/108/EC.
- You have to guarantee the EMC directives for the entire equipment.

## Temperature Transmitter MPU-LCD with Display

**Application / Specified Usage**

- 4...20mA transmitter with LCD for Pt100 temperature sensor
- For installation in temperature sensor
- Sensor monitoring

**Features**

- 4-digit display with green backlight
- Temperature measurement in °C and °F
- Easy range select by one button
- Lower costs for wiring because of 2-wire technology

**Note**

See product information „MPU-LCD“ for details.

**Option MPU-LCD  
(display in the connection head)**

## Order code for version with 1 x Pt100

**TFP-40** (connecting head Ø 55 mm)  
**TFP-50** (connecting head Ø 55 with spacer)  
**TFP-160** (connecting head Ø 18 mm, electrical connection via M12-plug)  
**TFP-180** (connecting head Ø 18 mm, electrical connection via 2,5 m PVC-cable; other lengths: see accessories; no transmitter possible)

## Sensor Length EL in mm incl. thread connection 16,5 mm!

**035...500** (in steps of 5 mm)  
**xxx** (special length)

## Diameter thermowell in mm

**6**  
**8**  
**10**  
**12**

## Diameter sensor tip in mm

**X** (no reduction)  
**3** (only with thermowell 6 mm)  
**4** (only with thermowell 6 mm and 8 mm)  
**6** (only with thermowell 8 mm and 10 mm)  
**8** (only with thermowell 12 mm)

## Accuracy class Pt100

**A**  
**1/3B**  
**1/10B**

Electrical connection  
(not selectable at TFP-160 and -180)

**PG** (cable gland M16x1,5)  
**M12** (M12 plug, standard with MPU-LCD)

## Transmitter

**X** (without)

## for TFP-40 and -50

**MPU-4** (programmable)  
**MPU-10** (Profibus PA)  
**MPU-H** (HART-protocol)  
**MPU-LCD** (with display)

## only for TFP-160 (not for TFP-180)

**MPU-M** (programmable)

Measuring range MPU  
(only for types with transmitter;  
not for MPU-LCD)

**-10...40 °C**  
**0...50 °C**  
**0...100 °C**  
**0...150 °C**  
**0...200 °C**

**xx...yy** (special range)

TFP-40 / 100 / 6 / 6 / A / M12 MPU-4 / 0...100 °C

## Accessories

**PVC-cable with M12-connection made of 1.4305, IP 69 K, unshielded**  
**M12-PVC / 4-5 m** PVC-cable 4-pin, length 5 m  
**M12-PVC / 4-10 m** PVC-cable 4-pin, length 10 m  
**M12-PVC / 4-25 m** PVC-cable 4-pin, length 25 m

## PVC-cable with M12-connection



## Order code for version with 2 x Pt100

- TFP-40.2** (connecting head Ø 55 mm, 2 x Pt100, no transmitter possible!)
- TFP-50.2** (connecting head Ø 55 mm, 2 x Pt100, with spacer, no transmitter possible!)
- TFP-60** (higher connecting head Ø 55 mm, 2 x Pt100, prepared for 2 x transmitter)
- TFP-60-H** (like TFP-60, but with spacer)
- TFP-180.2** (connecting head Ø 18 mm, electrical connection 2,5 m PTFE-cable; other lengths: see at accessories)

## Sensor Length in mm, incl. thread connection piece 16,5 mm!

**035...500** (in steps of 5 mm)

**xxx** (special length)

## Diameter thermowell in mm

**6**

**8**

**10**

**12**

## Diameter sensor tip in mm

**X** (no reduction)

**3** (only with thermowell 6 mm)

**4** (only with thermowell 6 mm and 8 mm)

**6** (only with thermowell 8 mm and 10 mm)

**8** (only with thermowell 12 mm)

## Accuracy class Pt100

**A**

**1/3B**

**1/10B**

## Electrical connection (only for TFP-40.2 and TFP-50.2)

**PG** (cable gland M16x1,5)

**2 x PG** (2 x cable gland M16x1,5)

**2 x M12** (2 x M12-plug)

## Electrical connection (only for TFP-60 and TFP-60-H)

**M12** (M12-plug)

**2 x M12** (2 x M12-plug)

## Continue if TFP-60 oder TFP-60-H is selected!

No further options for TFP-40.2, -50.2, -180.2!

## 1. Transmitter

**MPU-4** (programmable)

## Measuring Range 1. MPU

**-10...40** (measuring range -10...40 °C)

**0...50** (measuring range 0...+50 °C)

**0...100** (measuring range 0...+100 °C)

**0...150** (measuring range 0...+150 °C)

**0...200** (measuring range 0...+200 °C)

**xx...yy** (special range)

## 2. Transmitter

**MPU-4** (programmable)

## Measuring Range 2. MPU

**-10...40** (-10...40 °C)

**0...50** (0...+50 °C)

**0...100** (0...+100 °C)

**0...150** (0...+150 °C)

**0...200** (0...+200 °C)

**xx...yy** (special)

TFP-60 / 100 / 6 / X / A / M12 / MPU-4 / 0...50 / MPU-4 / 0...50