Technical information
Easytemp® TMR31, TMR35

Compact thermometer, Pt100, Class A

Optionally with integrated 4 to 20 mA transmitter, programmable via PC



Application

The Easytemp® TMR31 and TMR35 compact thermometers are used to measure temperatures from -50 °C to 150 °C (-58 °F to 302 °F), or up to 200 °C (392 °F) with neck. The most common installation locations are tanks and pipes.

- TMR31 with process connections for general applications.
- TMR35 with process connections for hygienic applications.

Benefits at a glance

Quick installation and easy commissioning:
- Small, compact design made entirely of stainless steel
- M12 connector with IP69K for an easy electrical connection
- 4-wire, Pt100 or PC-programmable transmitter with 4 to 20 mA output
- Configuration and visualization with ReadWin® 2000 PC operating software, which is free of charge
- Preset measuring range is available for order
- Variable insertion lengths from 40 mm to 600 mm (1.6 to 23.6 in)

Outstanding metrological properties thanks to innovative sensor technology:
- Extremely short response times
- Highly accurate even with short insertion lengths
- Thin film sensor element Pt100, accuracy class A (IEC 60751)

Safe operation with approvals and certificates:
- UL recognized component to UL 61010B-1
- Meets all EMC requirements according to NAMUR NE21
- Breakdown information in event of sensor break or sensor short-circuit, adjustable as per NAMUR NE43
- TMR35: Hygienic compatible design with 3-A marking and EHEDG certification
- GL (Germanischer Lloyd) ship building approval

Endress+Hauser
People for Process Automation

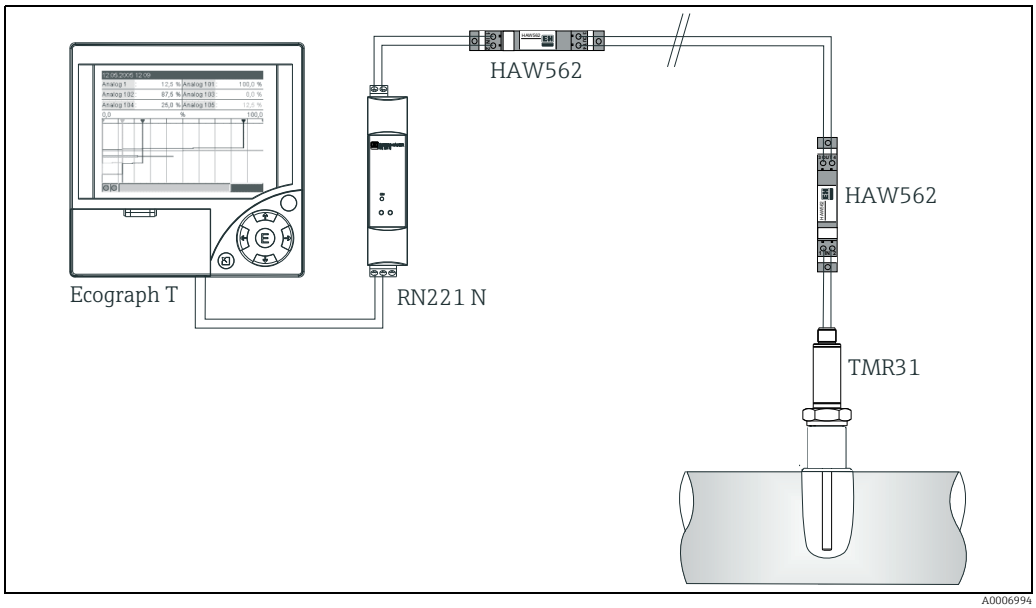
Function and system design

Measuring principle

Electronic recording and conversion of Pt100 input signals in industrial temperature measurement.

Measuring system

The compact thermometer uses a Pt100 (Class A) sensor element for measurement. The device is available with a Pt100 4-wire connection or, optionally, with an analog, temperature-linear 4 to 20 mA output signal. A built-in transmitter in the device converts the Pt100 input signal into the 4 to 20 mA signal and can be programmed using a PC via the M12 connector. The compact thermometer has different process connections for general (TMR31) and hygienic applications (TMR35).
The Easytemp® TMR31, TMR35 has a new kind of thin film sensor element that is soldered directly into the sensor tip. This innovative sensor design ensures ideal heat transfer from the process to the sensor element. This means that extremely fast response times and high levels of accuracy can be achieved even with short insertion lengths.



Measuring point layout (example) for Easytemp® compact thermometer TMR31 with additional Endress+Hauser components Ecograph T, active barrier RN221 N and HAW562 surge arrester

Multi Channel Recorder Ecograph T

Multi-channel recorder Ecograph T in 144x144 mm (5.7 x 5.7 in) panel-mounted housing for the electronic detection, display, recording, analysis, remote transmission and archiving of analog and digital input signals. Data recording system on CompactFlash card, multi-colored LCD display, 120 mm (4.72 in) screen size. Configuration and measured value display via interfaces (USB, Ethernet, RS232/485) and ReadWin® 2000 PC operating software.

Active barrier RN221 N

Active barrier with power supply for the safe separation of 4 to 20 mA standard signal circuits with optional intrinsically safe input. The current applied by the transmitter of the compact thermometer in the input circuit (4 to 20 mA) is transmitted linearly to the output.

Surge arrester HAW562

Protects consumer installations or measuring devices as well as signal lines and components against overvoltage which is induced by lightning striking in the distance or through switching operations. The HAW562 module acts as an overvoltage protection system in terminal block systems to protect signal lines and components and is installed on a module carrier (HAW560).

Input

Measuring principle

Temperature (temperature-linear transmission behavior)

Measuring range

Designation	Measuring range limits	Min. span
Pt100 as per IEC 60751	-50 to 150 °C (-58 to 302 °F) without neck -50 to 200 °C (-58 to 392 °F) with neck	10 K (18 °F)

Output

Output signal

- Standard: Pt100, Class A, 4-wire
- Optional: 4 to 20 mA or 20 to 4 mA

Signal on alarm

Signal on alarm as per NAMUR NE43
- Underranging: Linear drop to 3.8 mA
- Overranging: Linear rise to 20.5 mA
- Sensor break; sensor short-circuit:
  ≤ 3.6 mA or ≥ 21.0 mA (at settings ≥ 21.0 mA, 21.5 mA output is guaranteed)

Maximum load

($U_{power\ supply}$ - 10 V) / 0.023 A (current output)

Min. current consumption

≤ 3.5 mA

Current limit

≤ 23 mA

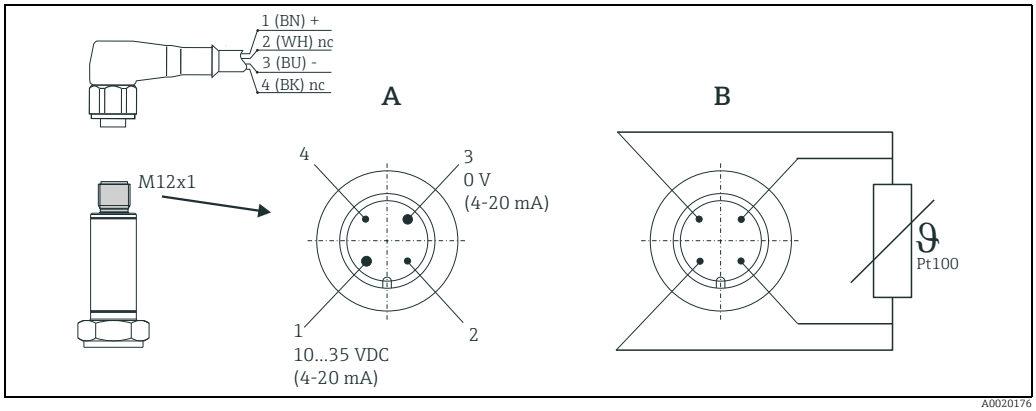
Switch-on delay

2 s

Power supply

Electrical connection cables must comply with 3-A® standard, must be smooth, corrosion resistant and cleanable.

Electrical connection



A: with electronics, M12 plug, 4-pin
Pin 1: power supply 10 to 35 V DC; current output 4 to 20 mA (cable connection, wire color brown = BN)
Pin 2: connection of PC configuration cable - shortened pin (cable connection, wire color white = WH)
Pin 3: power supply 0 V DC; current output 4 to 20 mA (cable connection, wire color blue = BU)
Pin 4: connection of PC configuration cable - shortened pin (cable connection, wire color black = BK)

B: without electronics, Pt100, 4-wire connection

Supply voltage

U_b= 10 to 35 V DC

Residual ripple

Permitted residual ripple $U_{ss} \leq 3$ V at $U_b \geq 13$ V, $f_{max.} = 1$ kHz

Performance characteristics

Response time

≤ 3 s with transmitter

Reference operating conditions

- Calibration temperature (ice bath) 0 °C (32 °F) for Pt100 sensor[1)]
- Ambient temperature 25 °C ± 5 °C (77 °F ± 9 °F) for transmitter

Maximum measured error

Electronics

0.1 K (0.18 °F) or 0.08%. % relates to the set span. The larger value applies.

Sensor (Pt100) for version without transmitter

- Tolerance class A as per IEC 60751, operating temperature range -50 to 200 °C (-58 to 392 °F) with neck
- Maximum measured error in °C = 0.15 + 0.002 · |T|

|T| = Numerical value of the temperature in °C without regard to the leading sign.

Total deviation of electronics + sensor

- Operating temperature range:
  -50 to 150 °C (-58 to 302 °F) without neck
  -50 to 200 °C (-58 to 392 °F) with neck
- 0.25 K + 0.002 · |T|

Long-term stability of electronics

≤ 0.1 K (0.18 °F)/year or ≤ 0.05%/year
Data under reference conditions. % relates to the set span. The larger value applies.

Influence of ambient temperature (temperature drift)

- Pt100 resistance thermometer:
  T_d= ±(15 ppm/K * (full scale value of measuring range + 200) + 50 ppm/K * set measuring range) * $\Delta\vartheta$

$\Delta\vartheta$ = deviation of ambient temperature from the reference operating condition.

Influence of load

± 0.02%/100 Ω
Specifications refer to the full scale value of the measuring range.

Transmitter response time

1 s

Sensor response time

Measured as per IEC 60751, in water flowing at 0.4 m/s (1.3 ft/s)

t_{50}	t_{90}
< 1.0 s	< 2.0 s

Influence of supply voltage

≤ ±0.01%/V deviation from 24 V
Specifications in percent refer to the full scale value of the measuring range.

Self-heating

Negligible small

Sensor current

≤ 0.6 mA

1) Note: For calibration of the compact thermometer a minimum insertion length of 40 mm (1.57 in) is required.

Installation conditions

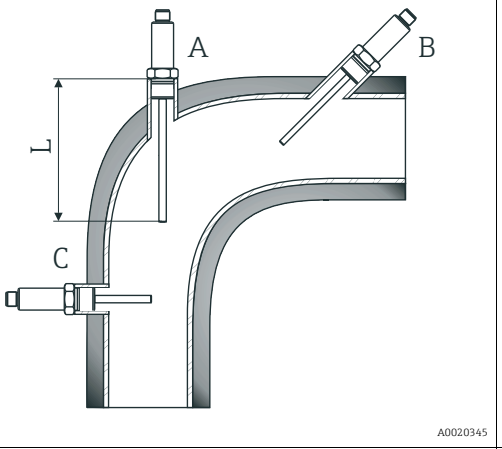
Orientation

No restrictions, but self draining. If applicable leak detection hole must be at the lowest point.

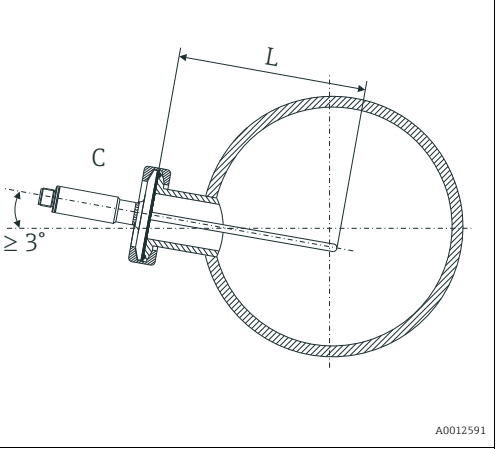
Installation instructions

Mounting location

The insertion length of the compact thermometer can have a substantial influence on the accuracy. If the insertion length is insufficient, heat dissipation via the process connection and the container wall can cause measurement errors. To minimize errors caused by heat dissipation, a minimum insertion length of L_{min} = 40 mm (1.6 in) is recommended.



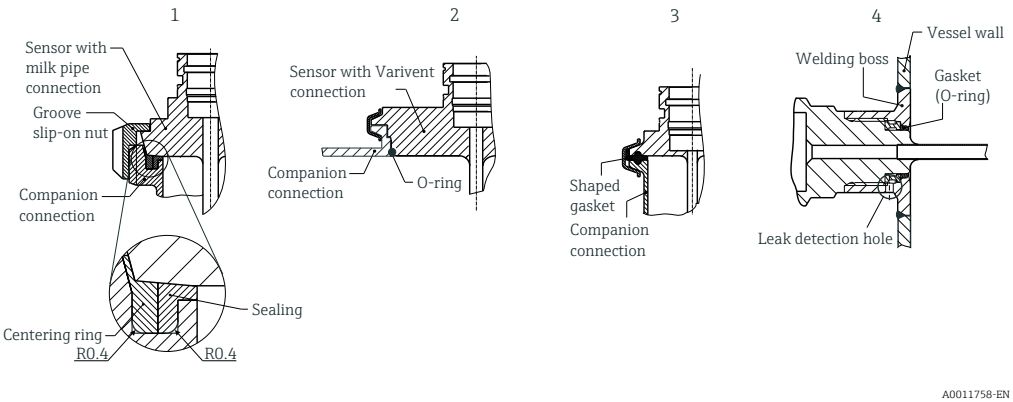
TMR31 - general applications



TMR35 - hygienic applications

Pipe installation of the compact thermometer:

- A: On angle brackets
- B: In smaller pipes, inclined
- C: Perpendicular to the direction of flow, TMR35 with minimal 3° inclination because of self draining
- L = Insertion length



Mounting instructions for installation in various hygienic processes

1	Milk pipe connection as per DIN 11851 only in linkage EHEDG certified and self centering ring
2	Varivent® - process connection
3	Clamp as per ISO 2852
4	Liquiphant-M G1" process connection, horizontal installation

The matches for the process connections as well as the gaskets are not included in the scope of delivery of this assembly. Welding adapter for process connections with associated O-ring sets are available as accessories, → 14.

Care should be taken by the user in the execution of the welding on the process side:

- Suitable weld material.
- Flush welding or with welding radius > 3.2 mm.
- Absence of pits, folds, crevices.
- Ground and polished surface ($R_a \leq 0.8$ µm).

As a general rule, the thermometers should be installed in such a way that does not adversely affect their cleanability (3-A® requirements must be adhered to). The required flush-mounting can be achieved by the connection Varivent®, Liquiphant (+ weld-in adapter).

Environment conditions

Ambient temperature limits

-40 to +85 °C (-40 to 185 °F)

Storage temperature

-40 to +85 °C (-40 to 185 °F)

Climate class

As per IEC 60654-1, Class C

Degree of protection

IP66/67 with coupling and connecting cable (not evaluated by UL) → 14
IP69K with cordset (not evaluated by UL) → 14

Shock resistance

4g / 2 to 150 Hz as per DIN EN60068-2-6

Vibration resistance

Refer to 'Shock resistance'

Electromagnetic compatibility (EMC)

CE Electromagnetic Compatibility Compliance
EMC meets all relevant requirements listed under IEC 61326 Series and NAMUR NE21. Details as per declaration of conformity.

This recommendation is a uniform and practical way of determining whether the devices used in laboratories and process control are immune to interference with an objective to increase its functional safety.

ESD (Electrostatic discharge)	IEC 61000-4-2	6 kV cont., 8 kV air	
Electromagnetic fields	IEC 61000-4-3	0.08 to 2 GHz	10 V/m
Burst (fast transient)	IEC 61000-4-4	2 kV	
Surge	IEC 61000-4-5	0.5 kV sym.	
Conducted RF	IEC 61000-4-6	0.01 to 80 MHz	10 V

Condensation

Permitted

Process conditions

Process temperature limits

The electronics of the TMR31 and TMR35 must be protected from temperatures above 85 °C (185 °F) by a neck of appropriate length. TMR31 and TMR35 compact thermometers without electronics (Pt100, 4-wire) do not require a neck.

- -50 to 150 °C (-58 to 302 °F) without neck
- -50 to 200 °C (-58 to 392 °F) with neck
- -50 to 200 °C (-58 to 392 °F) without electronics

Restrictions depending on process connection and ambient temperature:

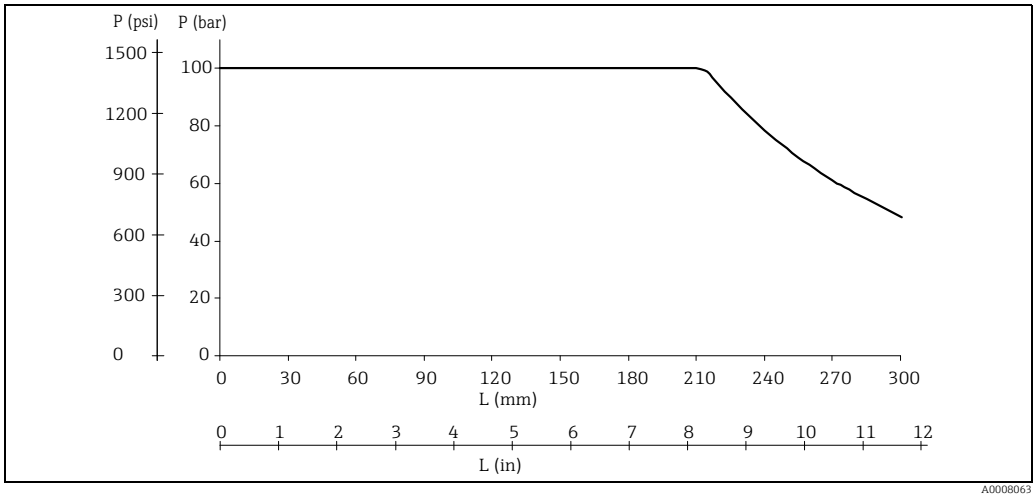
- For installation with adjustable insertion length (welding boss with sealing taper, Order No. **51004751**; collar welding boss Order No. **51004752**; compression fitting with sealing taper, Order No. **51004753**) provide a neck with an appropriate length.

- For TMR31 with process connection:

Max. ambient temperature	Max. process temperature	
	Without neck	With neck
Up to 25 °C (77 °F)	150 °C (302 °F)	200 °C (392 °F)
Up to 40 °C (104 °F)	135 °C (275 °F)	180 °C (356 °F)
Up to 60 °C (140 °F)	120 °C (248 °F)	160 °C (320 °F)
Up to 85 °C (185 °F)	100 °C (212 °F)	133 °C (271 °F)

Process pressure limits

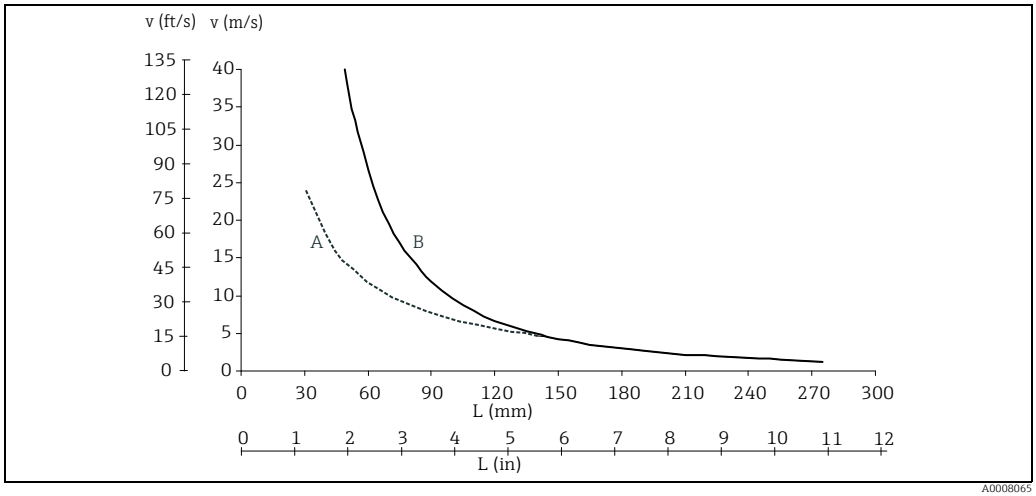
Maximum permitted process pressure depending on the insertion length. It is limited further by the process connection in question. Follow the designs of process connection in section "Mechanical construction" and section "Accessories".



Maximum permitted process pressure
L Insertion length
p Process pressure

The diagram takes into consideration not only the overpressure but also the pressure load caused by the flow, whereby a safety factor of 1.9 has been specified for operation with flow. The maximum permitted static operating pressure is lower at greater insertion lenghts due to the increased bending load caused by the flow. The calculation assumes the maximum permitted medium velocity for the respective insertion length (see diagram below).

Permitted flow velocity depending on the insertion length



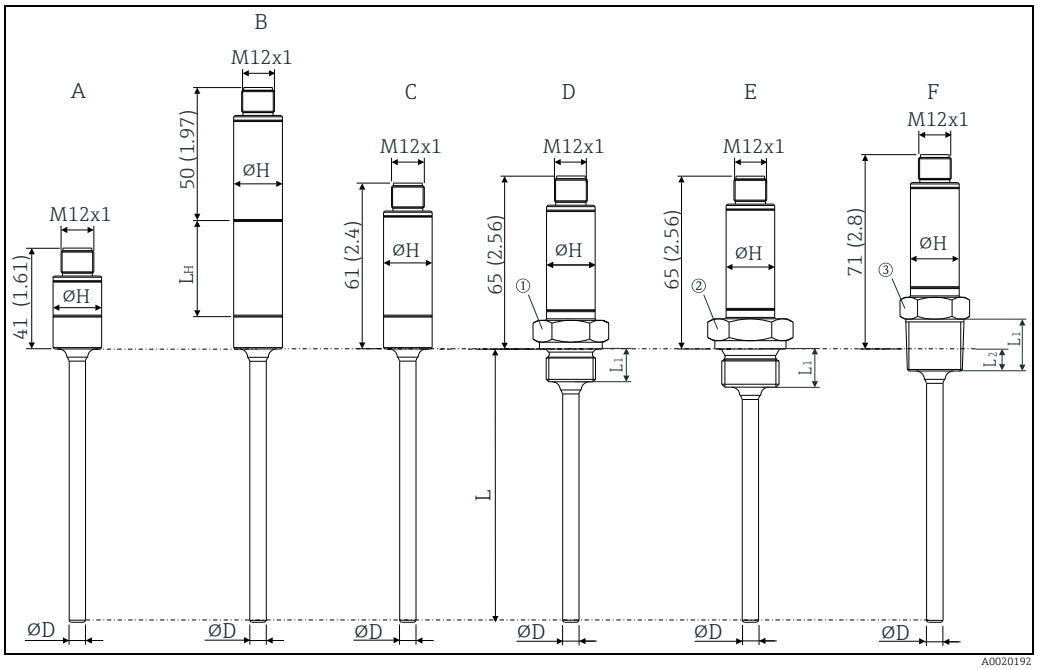
Permitted flow velocity

L *Insertion length, during flow*
v *Flow velocity*
A *Medium water at T = 50 °C (122 °F)*
B *Medium superheated steam at T = 200 °C (392 °F)*

The permitted flow velocity is the minimum from resonance velocity (resonance distance 80%) and load or buckling caused by flow, which would lead to failure of the thermometer tube or to exceedance of the safety factor (1.9). Calculation was performed for the specified limit operating conditions of 200 °C (392 °F) and ≤ bar (1450 psi) process pressure.

Mechanical construction

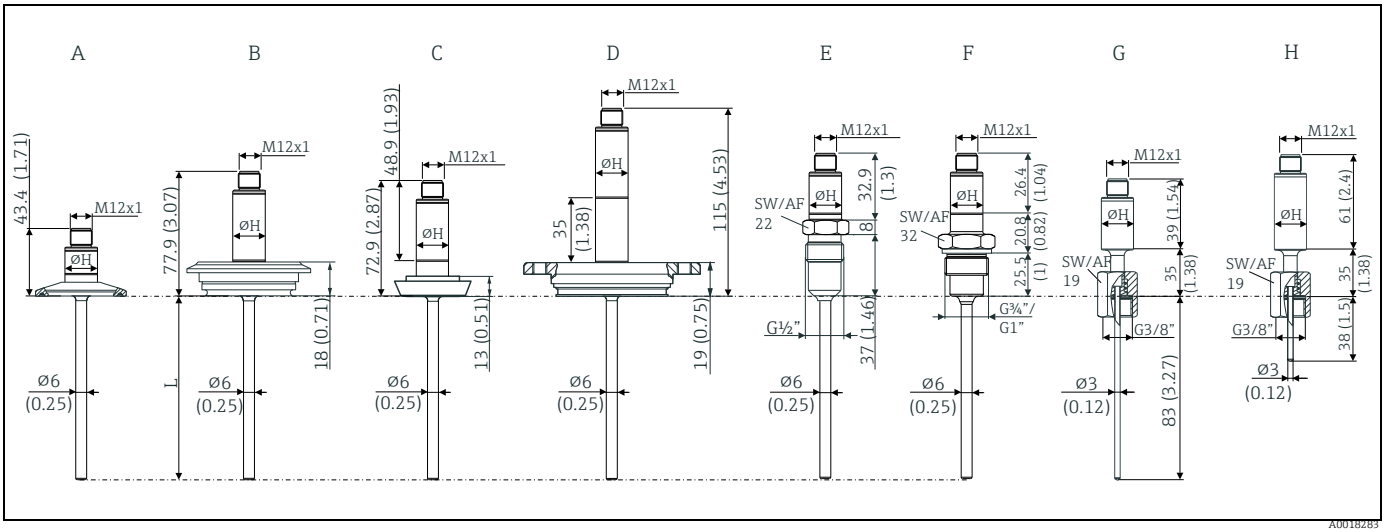
TMR31 design, dimensions



TMR31 - dimensions in mm (in)
L = Insertion length L variable from 40 to 600 mm (1.6 to 23.6 in)
ØD = Diameter D = 6 mm (0.25 in) or 3 mm (0.12 in)
ØH = Sleeve diameter 18 mm (0.71 in)

Item No.	TMR31 version	Thread length L_1	Thread length L_2	$P_{max.}$
A	Short sleeve (without built-in transmitter, without neck, without process connection). Refer to chapter 'accessories' for matching welding bosses and compression fittings.	-	-	-
B	With neck; L_H = neck length 35 mm or 50 mm (1.38 in or 1.97 in), without process connection. Refer to chapter 'accessories' for matching welding bosses and compression fittings.	-	-	-
C	Without neck, without process connection. Refer to chapter 'accessories' for matching welding bosses and compression fittings.	-	-	-
D	Without neck; Metric thread process connection: M14x1.5 (① = AF19) M18x1.5 (① = AF24)	 12 mm (0.47 in)	 -	100 bar (1450 psi), → 🖹 7
E	Without neck; Inch thread process connection, cylindrical, as per ISO 228: G ¼" (② = AF19) G ½" (② = AF27)	 12 mm (0.47 in) 14 mm (0.55 in)	 - -	
F	Without neck; Inch thread process connection, conical: ANSI NPT ¼" (③ = AF19) ANSI NPT ½" (③ = AF27) BSPT R ½" (③ = AF22)	 14.3 mm (0.56 in) 19 mm (0.75 in) 19 mm (0.75 in)	 5.8 mm (0.23 in) 8.1 mm (0.32 in) 8.1 mm (0.32 in)	

TMR35 design, dimensions



TMR35 - dimensions in mm (in)
L = Insertion length L variable from 40 to 600 mm (1.6 in to 23.6 in)
ØH = Sleeve diameter 18 mm (0.71 in)

Item No.	TMR35 version
A	Short sleeve (without built-in transmitter, without neck), with 1" process connection (exemplarily for minimum length)
B	Without neck; Process connection Varivent F
C	Without neck; Process connection to DIN 11851
D	With neck 35 mm (1.38 in), with APV-INLINE process connection (exemplarily for maximum length)
E	Short sleeve (without built-in transmitter, without neck); Conical metal-metal for hygienic processes, G½" thread. Suitable welding boss available as accessory (→ 14).
F	Short sleeve (without built-in transmitter, without neck); Process connection for hygienic processes, G¾" or G1" thread, material SS316L (1.4404). Suitable Liquiphant process fitting available as accessory (→ 14).
G	Short sleeve (without built-in transmitter), with neck, Insertion length = 83 mm (3.27 in)
H	With neck; Insertion length = 38 mm (1.5 in)

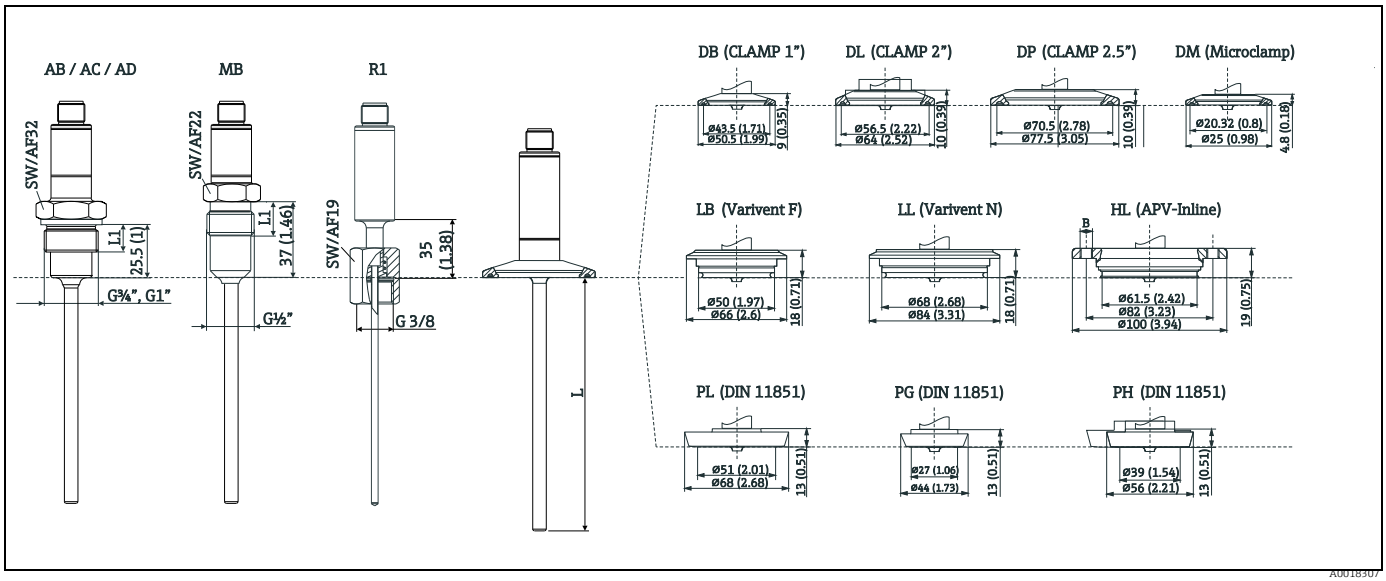
Weight

Version with L = 100 mm (3.94 in)	Weight
TMR31 with G½", ISO 228 process connection	116 g (4.1 oz)
TMR35 with ISO2852 DN25-38, with clamp process connection (DB) 1 to 1½"	305 g (10.76 oz)

Material

- Transmitter housing: SS 304
- Parts in contact with process and process connection: SS 316L, $R_a \leq 0.8$ µm (31.5 µin). Optionally for TMR35 $R_a \leq 0.4$ µm (15.74 µin), electro-polished.

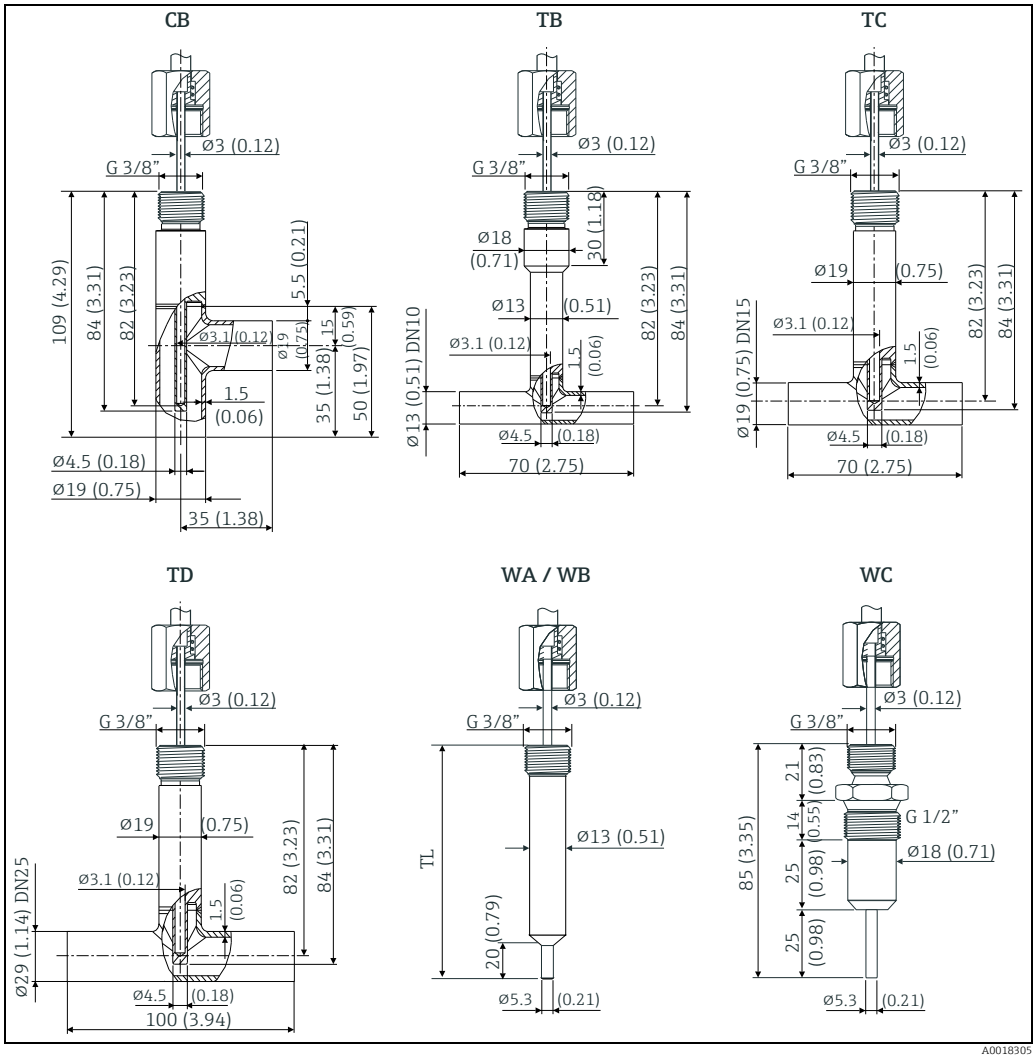
TMR35 design, dimensions for process connections



L = Insertion length L
All dimensions in mm (in).

Item No.	Process connection versions TMR35		$P_{max.}$
AB	Weld-in for Liquiphant FTL50, thread G ¾"/D6, thread length L1 = 14.6 mm (0.6 in)	3-A® marked and EHEDG certified	See section 'Accessories', → 🖹 14
AC	Weld-in for Liquiphant FTL20, thread G ¾"/D6, thread length L1 = 14.6 mm (0.6 in)		
AD	Weld-in for Liquiphant FTL50, thread G 1"/D6, thread length L1 = 18.7 mm (0.78 in)		
MB	Conical metal to metal, thread G 1/2", thread length L1 = 14 mm (0.55 in)	-	16 bar (232 psi)
R1	Spring loaded cap-nut for mounting in thermowell, thread G 3/8"	-	-
DB	Clamp 1"...1½" (ISO 2852) or DN 25...DN 40 (DIN 32676)	3-A® marked and EHEDG certified (in combination with with the Hyjoin PEEK/ stainless steel gasket or Dupont de Nemours Kalrez/ stainless steel gasket)	16 bar (232 psi)
DL	Clamp 2" (ISO 2852) or DN 50 (DIN 32676)		
DM	Microclamp ½"...¾", 316L		
DP	Clamp 2½" (ISO 2852)		
LB	Varivent F DN25-32, PN40	3-A® marked and EHEDG certified	40 bar (580 psi)
LL	Varivent N DN40-162, PN40		
HL	APV inline, DN50, PN40, 316L, (B = 6 x Ø8.6 (0.34") bores + 2 x M8 thread)		
PL	DIN 11851, DN50, PN40 (including cap-nut)	3-A® marked and EHEDG certified (in combination with Siersema gasket)	
PG	DIN 11851, DN25, PN40 (including cap-nut)		
PH	DIN 11851, DN40, PN40 (including cap-nut)		

TMR35 design, dimensions thermowells



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TMR35 thermowells - All dimensions in mm (in)

Item No.	TMR35 version			$P_{max.}$
CB	Version with spring-loaded cap-nut G3/8"	Thermowell version corner piece DN15	-	25 bar (363 psi)
TB		Thermowell version T-piece DN10	-	
TC		Thermowell version T-piece DN15	-	
TD		Thermowell version T-piece DN25	-	
WA		Thermowell cylindric, TL = 70 mm (2.76 in)	3-A® marked	250 bar (3626 psi)[1]
WB		Thermowell cylindric, TL = 85 mm (3.35 in)		
WC		Thermowell metal to metal	-	16 bar (232 psi)

1) Permitted flow velocity = 40 m/s (131 ft/s)

Human interface

Display elements

No display elements are present directly on the device.
The measured value and other displays can be called up using the ReadWin® 2000 PC software.

Operating elements

No operating elements are present directly on the display. The temperature transmitter is configured by remote operation, without an additional power supply using the ReadWin® 2000 PC software.

Remote operation

Configuration
Configuration kit TXU10-BA with PC operating program (ReadWin® 2000).

Interface
PC interface: TTL/USB connecting cable with plug connector.

Configurable parameters
Measurement dimension (°C/°F), Measuring range, fail-safe mode, output signal (4 to 20 mA / 20 to 4 mA), filter, offset, tag name (8 characters), output simulation.

Certificates and approvals

CE-Mark

The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Hygiene standard

- EHEDG Type EL CLASS I certification (TNO report n. 207/20.08.2009).
  EHEDG accepted process connections are: Varivent®, APV-Inline, DIN 11851, ISO 2852
- 3-A® authorization no. 1354 for the declaration of compliance with sanitary standard 74-05
- 3-A® accepted process connections → 11

GL

Ship building approval (Germanischer Lloyd) to maximum insertion length of 300 mm (11.81 in)

Other standards and guidelines

- IEC 60751: Industrial platinum resistance thermometers
- IEC 60529: Degree of protection provided by housing (IP code)
- IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC 61326 Series: Electromagnetic compatibility (EMC requirements)
- NAMUR: Standards working group for measurement and control technology in the chemical industry

UL

UL recognized component to UL 61010B-1

The UL applies only for the compact thermometers TMR31, TMR35 with electronics and 4 to 20 mA output signal.

Ordering information

Detailed ordering information is available from the following sources:
- In the **Product Configurator** on the Endress+Hauser website:
  www.endress.com → Select country → Instruments → Select device → Product page function:
  Configure this product
- From your Endress+Hauser Sales Center:
  www.endress.com/worldwide

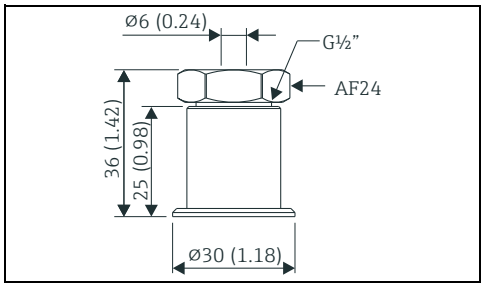
Product Configurator - the tool for individual product configuration:
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Accessories

All dimensions in mm (in).
EN10204-3.1 = Material certificate (melt analysis)

Welding boss with sealing taper for TMR31

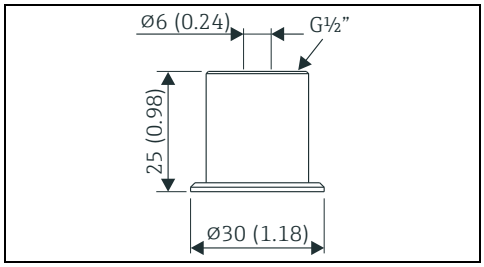
Collar welding boss moveable with sealing taper and pressure screw;
material of parts in contact with the process: 316L, PEEK
max. process pressure 10 bar (145 psi)
Order number: 51004751



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Collar welding boss for TMR31

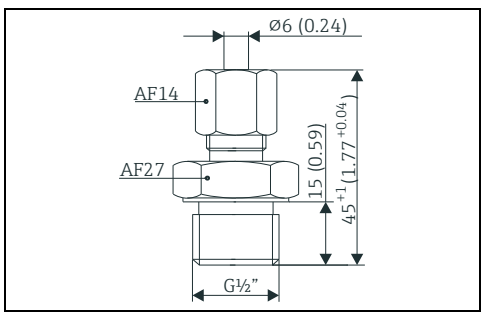
Material of parts in contact with process: 316L
Order number: 51004752



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Coupling for TMR31

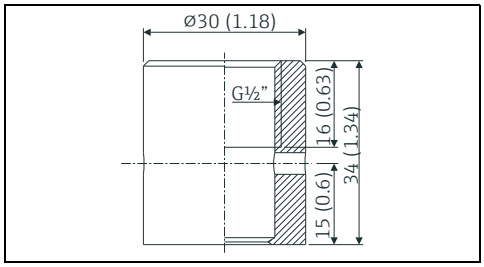
Moveable coupling, G½" process connection, coupling and parts in contact with process: 316L
Max. process pressure 40 bar (580 psi)
Order number: 51004753



A0020174-EN

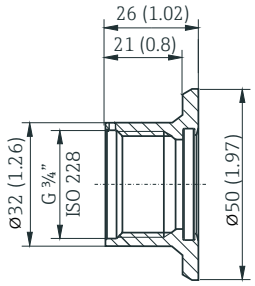
Welding boss with sealing taper (metal-metal) for TMR35

Welding boss for G½" thread
Seal, metal-metal,
Material of parts in contact with process: 316L/ 1.4435
Max. process pressure 16 bar (232 psi)
Order no. 60021387



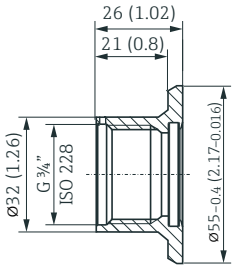
A0006621

Weld-in adapter for TMR35 Liquiphant FTL20 process connection

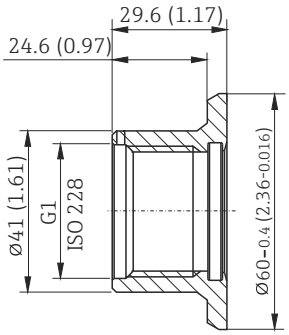
Dimensions	Version	Order number
 A0012605 ▪ max. 25 bar (362 psi) / max. 150 °C (302 °F) ▪ max. 40 bar (580 psi) / max. 100 °C (212 °F)	AISI 316L (1.4435) with inspection certificate EN10204-3.1 material	52018765
	Silicone O-ring Ø14.9 x 2.7 mm (0.59 x 0.11 in), material: VMQ75, FDA ▪ For this version a simple replacement of the seal is possible.	52021717 (5 pieces)
	FDA approved materials according to 21 CFR Part 175-178 3-A® and EHEDG marked	
	Alternative seals	**Order number**
	Ø15.08 x 2.62 mm (0.62 x 0.1 in) Material: EPDM, FDA	MVT2L1934 (5 pieces)
	Ø15.08 x 2.62 mm (0.62 x 0.1 in) Material: Viton, FDA	MVT2L1942 (5 pieces)
	Ø14.9 x 2.7 mm (0.59 x 0.11 in) Material: Silicone, VMQ80, FDA, USP Class VI	71086117 (3 pieces)
	Pressure ring, material: 316L ▪ The seal with pressure ring enables easy exchange of defective sealing rings.	52027421

Weld-in adapter for TMR35 Liquiphant FTL50 process connection

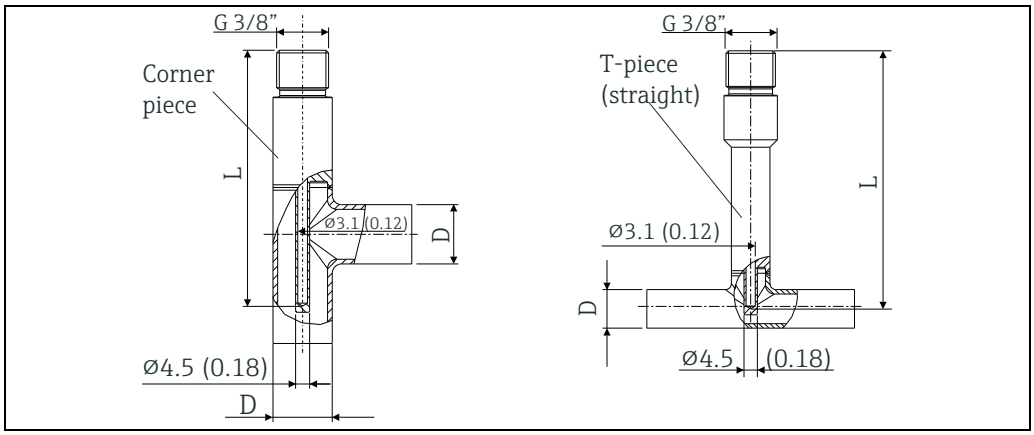
Welding boss G¾", d=55 with flange for flush-mounted installation for sealing surface.

Dimensions	Version	Order number
 A0012603 ▪ max. 25 bar (362 psi) / max. 150 °C (302 °F) ▪ max. 40 bar (580 psi) / max. 100 °C (212 °F)	AISI 316L (1.4435)	52001052
	AISI 316L (1.4435) with inspection certificate EN10204-3.1 material	52011897
	Silicone O-ring, Ø21.89 x 2.62 mm (0.86 x 0.10 in) Material: VMQ70, FDA	52014473 (5 pieces)
	Sensor dummy for welding the welding boss	MVT2L0692
	FDA approved materials according to 21 CFR Part 177.1550/2600, 3-A® and EHEDG marked	
	Alternative seals Ø21.89 x 2.62 mm (0.86 x 0.1 in)	**Order number**
	Material: EPDM, FDA	MVT2L1148
	Material: Kalrez Comp. 2035	MVT2L0666
	Material: Viton	MVT2L0655
	Material: Viton/FEP-FEK 75 Shore	MVT2L1748
	Material: Silicone, VMQ23-70, FDA, USP Class VI	71086100 (3 pieces)

Welding boss G1", d=60 with flange for flush-mounted installation with sealing surface.

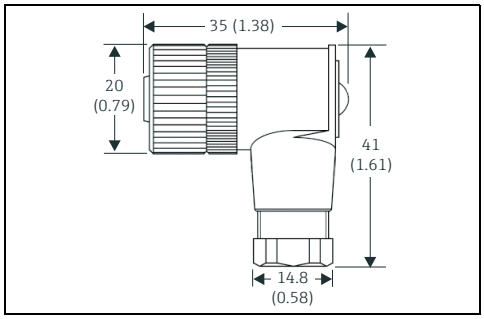
Dimensions	Version	Order number
 A0008957 ▪ max. 25 bar (363 psi) / max. 150 °C (302 °F) ▪ max. 40 bar (580 psi) / max. 100 °C (212 °F)	AISI 316L (1.4435)	52001051
	AISI 316L (1.4435) with inspection certificate EN10204-3.1 material	52011896
	Silicone O-ring, Ø28.17 x 3.53 (1.11 x 0.14"), material: VMQ70, FDA	52014472 (5 pieces)
	Sensor dummy for welding the welding boss	MVT2L0691
	FDA approved materials according to 21 CFR Part 177.1550/2600; EHEDG, 3-A® marked	
	Alternative seals Ø28.17 x 3.53 (1.11 x 0.14")	**Order number**
	Material: EPDM70, FDA	MVT2L0920
	Material: Viton665, FDA	MVT2L0705 (5 pieces)
	Material: Viton971, V, FDA	MVT2L1682
	Material: Kalrez comp. 4079	MVT2L0567
	Material: Silicone, VMQ23-70, FDA, USP Class VI	71086102 (3 pieces)

Weld-in pipe + thermowell TT411



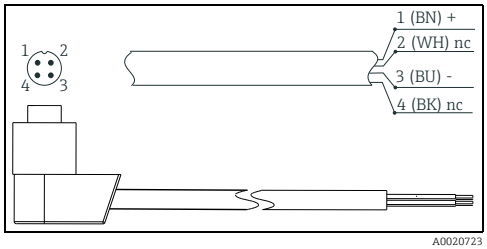
Coupling

Coupling M12x1 for simple user installable assembly of the connecting cable; elbowed; connection to M12x1 housing connector IP67, PG7
Order number: 51006327



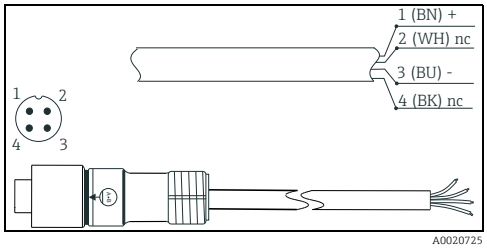
Connecting cable (pre-assembled)

PVC cable, 4 x 0.34 mm² (22 AWG) with M12x1 coupling; elbowed; screw plug;
length 5 m (16.4 ft); IP67
Order number: 51005148
Core colours:
- 1 = BN brown
- 2 = WH white
- 3 = BU blue
- 4 = BK black



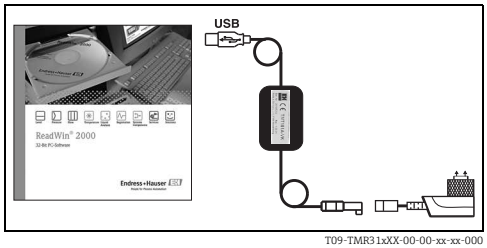
Cordset

PVC cable, 4 x 0.34 mm² (22 AWG) with M12x1 coupling nut from stainless steel; straight female connector type; screw plug;
length 5 m (16.4 ft); IP69K
Order number: 71217708
Core colours:
- 1 = BN brown
- 2 = WH white
- 3 = BU blue
- 4 = BK black



Configuration kit

- Configuration kit for PC-programmable transmitters - ReadWin® 2000 setup program and interface cable (4 pin plug) for PCs with USB port; with adapter for compact thermometers with M12x1 thread;
  Order code: TXU10-BA
- ReadWin® 2000 can be downloaded free of charge directly from the internet at the following address: **www.endress.com/readwin**



Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections. ▪ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://wapps.endress.com/applicator ▪ On CD-ROM for local PC installation.
Konfigurator$^{+temperature}$	Software for selecting and configuring the product depending on the measuring task, supported by graphics. Includes a comprehensive knowledge database and calculation tools: ▪ For temperature competence ▪ Quick and easy design and sizing of temperature measuring points ▪ Ideal measuring point design and sizing to suit the processes and needs of a wide range of industries The Konfigurator is available: On request from your Endress+Hauser sales office on a CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. For details: see Operating Instructions BA00027S and BA00059S

System components

Accessories	Description
Field display unit RIA16	The display unit records the analog measuring signal from the head transmitter and shows this on the display. The LC display shows the current measured value in digital form and as a bar graph indicating a limit value violation. The display unit is looped into the 4 to 20 mA circuit and gets the required energy from there. For details: see the Technical Information document TI00144R/09/en
Field indicator RIA15	Loop-powered field indicator for 4 to 20 mA circuit, panel mounting. For details: see the Technical Information document TI01043K/09/en

RN221N	Active barrier with power supply for safe separation of 4 to 20 mA standard signal circuits. Offers bidirectional HART® transmission.  For details: see the Technical Information document TI0073R and Operating Instructions BA00202R

RNS221	Supply unit for powering two 2-wire measuring devices solely in the non-Ex area. Bidirectional communication is possible via the HART® communication jacks.  For details: see the Technical Information document TI0081R and Brief Operating Instructions KA00110R

Documentation

- Operating manual "Easytemp® TMR31, TMR35" (BA00215R/09)

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