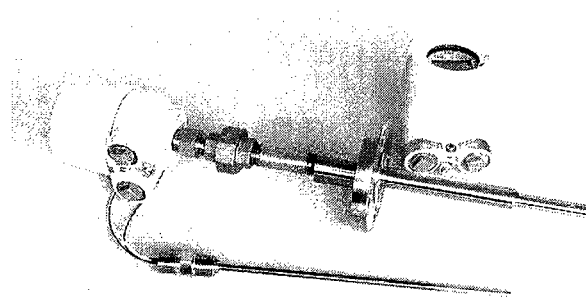


Temperature Measurement Products Heavy Duty Spring Loaded Sensor Assembly with Transmitter - Series V10186

■ Design

- Can be build from standardized components
- Standard lengths for fewer spare parts on stock
- Immersion lengths can be selected individually
- Spring loaded sensor can be replaced during operation
- No welding seams coming into contact with media



■ Technical features

- Approvals acc. to FM, ATEX and CSA for intrinsically safe installation of the transmitter
- Thermowell materials and designs adapted to operating conditions
- Installation of a transmitter in the connection head eliminates the need for multi-wire circuit
- Interference-immune standard output signal 4...20 mA

Heavy Duty Spring Loaded Sensor
Assembly with Transmitter
Series V10186

■ Applications

- Chemical process engineering
 - Petroleum/natural gas supply and processing
 - Power generation and heat distribution
-

Description

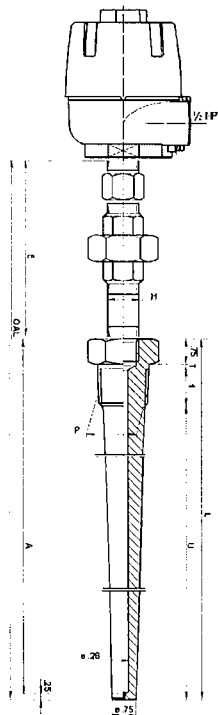
The thermocouple thermometers are used primarily for measuring temperatures in process systems which have corrosive media in the operating range up to 1832 °F (800 °C). RTD thermometers have an operating range up to 752 °F (400 °C).

They are composed of a thermowell made from bar stock material, with an extension and a connection head with a spring loaded exchangeable sensor inset. The design of the thermowell matches the mechanical requirements in both measurement and mechanical terms, thus enabling it to withstand high levels of stress caused by pressure (up to 10,000 psi), flow and vibration.

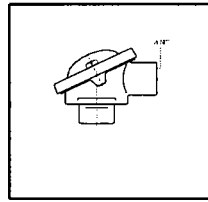
This self-contained spring design is ideal for mating sensors to virtually any enclosure and assembly. The sensor:

- can be removed while the system is running without dismantling the entire sensor,
- can be calibrated in the standard test facilities,
- can be stocked as a universal standard component in order to assure availability of the system during replacement.

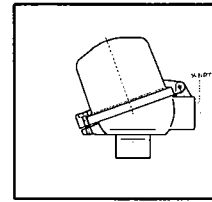
Sensor Design



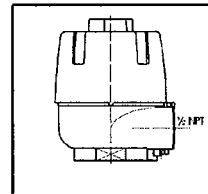
Connection heads



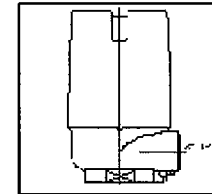
Type B, Aluminum, epoxy painted



Type BUZH, Aluminum, epoxy p.

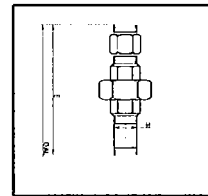


Type AGL, Aluminum, epoxy painted



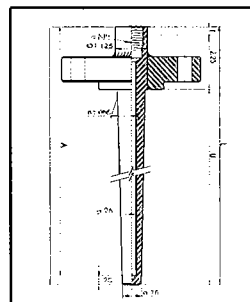
Type AGLHD, Aluminum, epoxy p

Extension

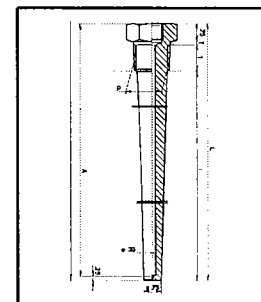


Nipple

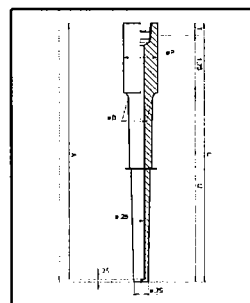
Thermowells



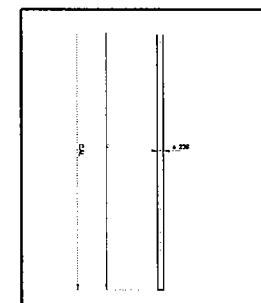
Flanged



Threaded



Socket weld



Without Thermowell

Captions

- A = Well Bore depth
- B = Thermowell stem diameter
- E = Extension length (nominal)
- H = Extension tube diameter
- L = Thermowell length
- P = Process Connection
- T = Lag Extension length
- U = Immersion length
- X = Sensor length with compressed spring

Transmitter options

General Purpose

- TS 02 programmable
- TH 02 HART™ programmable
- TF 12 PROFIBUS PA

Hazardous Areas (intrinsically safe)

- TS 02-Ex programmable
- TH 02-Ex HART™ programmable
- TF 12-Ex PROFIBUS PA

Material options

- Brass
- Carbon Steel
- 304 and 304/L Stainless Steel
- 316 and 316/L Stainless Steel (standard)
- Inconel 600
- Incoloy 800
- Monel 400
- Titanium GR2
- Hastelloy C276 and Hastelloy B
- Teflon

All thermowells in this Data Sheet are drilled from bar stock material and their outside shape machined. The thermowell designs represent common models conforming to US standards. Custom designed Thermowells can also be supplied to any specification.

Operational data

The permissible stress depends on medium and installation related data:
General application specifications cannot be given in view of manifold range of versions. If values are needed a stress analysis acc. Murdock is recommended.

Medium related	Installation related
- Medium	- Material
- Viscosity	- Thermowell design
- Flow velocity	- Immersion length
- Pressure	- Pressure at process connection
- Temperature	- Vibration

Model Number V10186

07 08 09 10 11 12 13 14 15 ---

Material

304 Stainless Steel	H
304/L Stainless Steel	
316 Stainless Steel (standard)	L
316/L Stainless Steel	M

Process connection P

Process connection P	Size [“]	Rating [Lbs.]	
Flange	1	150	F1
Flange	1.5	150	F2
Flange	2	150	F5
Flange	1.0	300	F8
Flange	1.5	300	F3
Flange	2.0	300	F4
Threaded (standard)	1/2	N/A	T1
Threaded (standard)	3/4	N/A	T2
Threaded (standard)	1	N/A	T3
Socket Weld	3/4	N/A	W2
Socket Weld	1	N/A	W3

Tip Design

Tapered (standard)	T
Reduced tip (standard)	R
Straight (standard)	S

Thermowell Dimensions (inches)¹⁾

<u>(U) Length</u>	<u>(T) Lag Length</u>	
2.0	0	020
2.5 (standard)	0	025
4.0 (standard)	0	040
4.5 (standard)	0	045
7.0 (standard)	0	070
7.5 (standard)	0	075
10.0 (standard)	0	100
10.5 (standard)	0	105
13.5 (standard)	0	135
16.0	0	160
16.5	0	165
19.5	0	195
22.5	0	225

Thermowell Lag Length T [“]

No Lag	0.00	(Standard)	0
	0.00		0
	6.00		6

Extension Type Length E Material

Union-Nipple (standard)	3 inches	316SS	S
Union-Nipple	6 inches	316SS	U
Without			N

Model Number V10186

				16	17	18	19
Sensor	Sheath Material	Style					
1 x Pt 100, 2-wire	AISI 316 Ti	Single (standard)		2			
1 x Pt 100, 3-wire	AISI 316 Ti	Single (standard)		3			
1 x Pt 100, 4-wire	AISI 316 Ti	Single (standard)		4			
2 x Pt 100, 3-wire	AISI 316 Ti	Duplex		6			
1 x Type K	INCONEL 600	Ungrounded, Single (standard)		H			
1 x Type J	AISI 316 Ti	Ungrounded, Single (standard)		G			
1 x Type E	INCONEL 600	Ungrounded, Single		E			
1 x Type T	AISI 316 Ti	Ungrounded, Single		T			
2 x Type K	INCONEL 600	Ungrounded, Duplex		J			
2 x Type J	AISI 316 Ti	Ungrounded, Duplex		I			
2 x Type E	INCONEL 600	Ungrounded, Duplex		F			
2 x Type T	AISI 321 Ti	Ungrounded, Duplex		U			
Accuracy According to IEC 60 751 & IEC 60 584							
Class B	(Standard)	RTD only		A			
Class 2	(Standard)	T/C only		C			
Class A (from ? to ?)	Special	RTD only		E			
Class 1	Thermocouples only	Special		H			
Connection Head⁵⁾	Material	Cable Entry	Class of Prot.				
Without							0
B ⁴⁾	aluminum	1/2" NPT	NEMA 4				1
BUZH (standard)	aluminum	1/2" NPT	NEMA 4				5
AGL	aluminum	1/2" NPT	NEMA 4X				B
AGLHD ⁴⁾	aluminum	1/2" NPT	Digital Display				D
AGLHD ⁴⁾ (standard)	aluminum	1/2" NPT	CoMeter				C
Head Mounted Transmitter³⁾							
Without							
TS 02	programmable, General Purpose						6
TH 02 (standard)	HART protocol, General Purpose						9
TF 12	PROFIBUS PA only with BUZH						K
TS 02-Ex	programmable, Intrinsically Safe						F
TH 02-Ex (standard)	HART protocol, Intrinsically Safe						J
TF 12-Ex	PROFIBUS PA only with BUZH						L

- 1) Minimum Length U = 2.0"
- 2) Operating range various between the thermocouples
- 3) Specify min. value (LRV for 4mA signal), max. value (URV for 20 mA signal) and °C or °F
- 4) Not with TF 12 xmt.
- 5) AG-Connection heads are epoxy

Order number example **V10186-LT1T0450U3AB9-SL**
Thermowell 316 Stainless Steel (standard)
 Threated 1/2" Process Connection
 Tapered Tip Design

SensyTemp TW Heavy Duty Spring Loaded Sensor Assembly

Response times

Apart from the thermowell mass at the measuring point, the factors governing the heat transfers, which are the chief determinants for the response time, are the heat capacity, pressure, density, moisture and flow velocity of the medium. The following table features approximate values, referring to water or air.

Greater flow velocities and heat capacities considerably reduce the time intervals. The values T0.5 and T0.9 give information on the time period after which 50 % or 90 % of a sudden temperature change is displayed.

Type	U-length	In water 0.4 m/s		In air 3 m/s	
		T 0.5	T 0.9	T 0.5	T 0.9
Resistance thermometer RTD					
Tapered	2.5 inch	20	63	300	900
Tapered	5 inch	14	44	235	706
Thermocouple					
Tapered	2.5 inch	16	50	235	705
Tapered	5 inch	10	40	150	500

Resistance thermometers

Nominal resistance/Standard/Tolerance

Resistance elements with platinum measurement windings are used. In accordance with DIN EN 60 751 the nominal resistance is defined as follows:

- 100 ohms = at 0 °C
- Temperature coefficient $3.85 \cdot 10^{-3} (K^{-1})$ - averaged between 0 °C and 100 °C.

For your quick reference some typical permissible values are shown in the below table for Class A and B.

For practical reasons we recommend a maximum long-term operating temperature of max. 400 °C for Class A tolerance.

Operational temperature

The temperature range is from -392...+1110°F (-200...+600 °C)

Sheath material

The standard material used for all resistance thermometer measuring insets is 316 Ti.

Number of lead wires/measuring circuits/sheath diameters

Sensors can be supplied with:

- 1 or 2 measurement RTD's and
- in 2, 3 and 4-wire circuits.

However, in some particular case the combinations are restricted.

Resistance of platinum RTD acco. To IEC 60 751							
Temperature	0°C	100°C	200°C	300°C	400°C	500°C	600°C
Temperature	32°F	212°F	392°F	572°F	752°F	932°F	1112°F
Ω	100	138.51	175.86	212.05	247.09	280.98	313.71
Allowed Deviation for platinum RTD acc. To IEC 60 751							
Class 2 (K)	0.3	0.8	1.3	1.8	2.3	2.8	3.3
Class 1 (K)	0.15	0.35	0.55	0.75	0.95	1.15	N/A

Thermocouple thermometers

Standard/Tolerance

For thermocouples conforming to DIN EN 60 584 various different classes are defined for the permissible deviation from the e.m.f. reference table.

The measured thermoelectric emf. corresponds to the temperature difference between hot junction and reference junction. The reference table conforming to DIN EN 60 584 relates to a reference temperature at 0 °C.

Because of the fact that, as the temperature rises, the effects of oxidation can have significant adverse effects on the characteristics and service life of a measuring inset, the specified operating temperatures (dependent on thermocouple type, tolerance class and sheath diameter) should never be exceeded.

Accessories, components

Many of the components of the models listed in the catalog can be ordered as separate components or modules. In this respect, please consult your closest representative.

Thermoelectric Voltage (mV) acc. to IEC 60584						
Temperature	200°C	350°C	500°C	700°C	900°C	1100° C
Temperature	392°F	662°F	932°F	1292°F	1652°F	1832° F
Type J (mV)	10.78	19.09	27.39	39.13	51.88	63.79
Type K (mV)	8.14	14.29	20.64	29.13	37.33	45.12
Type N (mV)	5.91	11.14	16.75	24.53	32.37	40.09
Allowed Deviation for Type K thermocouple acc. to IEC 60584						
Class 2 (K)	2.5	2.6	3.8	5.3	6.8	8.3
Class 1 (K)	1.5	1.5	2.0	2.8	3.6	N/A

Standard and special combinations					
Type of thermocouple		Standards		Tolerance	
Type	Special	Standard Type	Special Type	Standard Type	Special Type
J (Fe-CuNi)	E (NiCr-CuNi)	IEC 60584		Class 2	Class 1
K (NiCr-Ni)	T (Cu-CuNi)	IEC 60584	ANSI MC96.1	Standard	Special
N (NiCrSi-NiSi)	R (Pt13Rh-Pt)	IEC 60584	National std	See Std	See Std
S (Pt10Rh-Pt)	L (Fe-CuNi)	DIN43 710		DIN	½ DIN
B (Pt30Rh-Pt6Rh)	U (Cu-CuNi)				

Operating temperature, lead resistance, sheath material				
Type	Measuring inset 6 mm Ø			Sheath material
	Long-term temperature for tolerance		Lead resistance Ω/m with Rt	
	Class 1	Class 2		
T	-	500°C / 932°F	0.7	321
E	-	800°C / 1472°F	1.8	316 Ti
J	600°C / 1112°F	700°C / 1292°F	0.9	316 Ti
K	800°C / 1472°F	1000°C / 1832°F	1.5	INCONEL 600
N	800°C / 1472°F	1000°C / 1832°F	1.5	INCONEL 600
L	600°C / 1112°F	700°C / 1292°F	0.9	321
U	-	400°C / 752°F	0.7	321

Other versions

This data sheet contains only a small selection of our range of thermometers with thermowells and transmitter. Please consult your closest representative for other models.

Other options:

- Special Insertion Length
- Special process connection
- Thermowell material
- Design style of thermowell
- Conduit connections
- Connection head painting
- Tests and certificate

Notes

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