

# Rosemount™ DIN-Style Temperature Sensors and Thermowells (Metric)



- RTDs (0065) and thermocouples (0185) available to meet any process requirement
- DIN-style for easy installation and replacement
- Integrated temperature assembly with Rosemount transmitters available

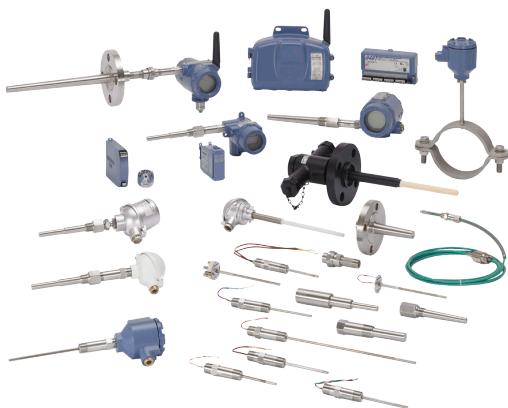
## Features and benefits

### Optimize plant efficiency and increase measurement reliability with industry-proven design and specifications

- Available in a wide variety of sensing technologies – RTD and thermocouples.
- All sensor styles and lengths are available in 6 mm diameter.
- State of the art manufacturing procedures provide robust element packaging and increasing reliability.
- Industry-leading calibration capabilities allow for Callendar-Van Dusen values to give increased accuracy when paired with Rosemount transmitters.
- Optional Class A accuracy for critical temperature measurement points.

### Streamline operations and maintenance with sensor and thermowell design

- DIN-style sensor uses connection heads that allow quick mounting and replacement while maintaining environmental integrity.
- Terminal block, flying leads, and spring loaded threaded adapter styles offer remote or integral transmitter mounting configuration.



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**Explore the benefits of Complete Point Solutions™ from Emerson**

- An “Assemble Sensor to Specific Transmitter” option enables Emerson to provide a complete point temperature solution, delivering an installation-ready transmitter and sensor assembly.
- Emerson has a complete portfolio of single point and high density temperature measurement solutions, allowing you to effectively measure and control your processes with the reliability you trust from Rosemount products.

**Experience global consistency and local support from numerous worldwide Rosemount Temperature manufacturing sites**

- World-class manufacturing provides globally consistent products from every factory and the capacity to fulfill the needs of any project, large or small.
- Experienced instrumentation consultants help select the right product for any temperature application and advise on best installation practices.
- An extensive global network of Emerson service and support personnel can be on-site when and where they are needed.

**Access information when you need it with asset tags**

Newly shipped devices include a unique QR code asset tag that enables you to access serialized information directly from the device. With this capability, you can:

- Access device drawings, diagrams, technical documentation, and troubleshooting information in your MyEmerson account
- Improve mean time to repair and maintain efficiency
- Ensure confidence that you have located the correct device
- Eliminate the time-consuming process of locating and transcribing nameplates to view asset information

## Rosemount DIN-Style Sensor and Thermowell



The Rosemount DIN-Style Sensor and Thermowell have designs that provide flexible and reliable temperature measurements in process environments.

Features include:

- Temperature range of  $-196$  to  $450$  °C for RTD,  $-40$  to  $1000$  °C for thermocouple
- Industry-standard sensor types, including RTD and thermocouple varieties
- DIN-style design for easy mounting and replacement
- Variety of enclosure and connection head options
- Global hazardous-location approvals available
- Calibration services available to give you insight to sensor performance
- MID calibration options for custody transfer
- Assemble to transmitter option

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## Online Product Configurator

Many products are configurable online using our Product Configurator. Select the **Configure** button or visit our [website](#) to start. With this tool's built-in logic and continuous validation, you can configure your products more quickly and accurately.

## Model codes

Model codes contain the details related to each product. Exact model codes will vary; an example of a typical model code is shown in [Figure 1](#).

**Figure 1: Model Code Example**

**3144P D1 A 1 NA M5 DA1 Q4**

**1                   2**

1. Required model components (choices available on most)
2. Additional options (variety of features and functions that may be added to products)

## Specifications and options

See the Specifications and options section for more details on each configuration. Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See the Material selection section for more information.

## Optimizing lead time

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

## Series 65 Platinum RTD and 185 Thermocouple without thermowell

### Required model components

#### Model

Code	Description	
0065	Pt 100 RTD (IEC 751) without thermowell	
0185	Thermocouple (IEC 584 Class 1) without thermowell	

#### Connection head

Code	Description	IP rating <sup>(1)</sup>	Conduit/cable entry	
C	Rosemount aluminum	66/68	M20 x 1.5	★
D	Rosemount aluminum	66/68	½-in. NPT	★
1	Rosemount aluminum with LCD display meter cover	66/68	M20 x 1.5	★
2	Rosemount aluminum with LCD display meter cover	66/68	½-in. NPT	★
N	No connection head	N/A	N/A	★
G	Rosemount stainless steel	66/68	M20 x 1.5	
H	Rosemount stainless steel	66/68	½-in. NPT	
J	GR-A/BL (BUZ) aluminum with cable gland	65	M20 x 1.5	
L	TZ-A/BL (BUZH) aluminum with cable gland	65	M20 x 1.5	
7	Aluminum dual entry head	66	2 x ¾-in. NPT	
8	Aluminum dual entry head	66	2 x M20 x 1.5	
9	Aluminum dual entry head	66	2 x ½-in. NPT	
K	Stainless steel dual entry head	66	2 x ¾-in. NPT	
R	Stainless steel dual entry head	66	2 x M20 x 1.5	
W	Stainless steel dual entry head	66	2 x ½-in. NPT	
A	TZ-A/BL (BUZH) aluminum coated	65	M20 x 1.5	
P	SD-BK	N/A	M20 x 1.5	

(1) To maintain IP rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

**Sensor lead wire termination**

Code	Description	
0	Flying leads (no springs on DIN plate)	★
2	Terminal block (DIN 43762)	★
3	Spring loaded adapter (1/2-in. NPT)	★

**Sensor type**

Code	Sensor	Description	Temperature range	
1	65 only	RTD, single element, 4-wire	-50 to 450 °C (-58 to 842 °F)	★
2		RTD, dual element, 3-wire	-50 to 450 °C (-58 to 842 °F)	★
3		RTD, single element, 4-wire	-196 to 300 °C (-321 to 572 °F)	★
4		RTD, dual element, 3-wire	-196 to 300 °C (-321 to 572 °F)	★
03J1	185 only	Thermocouple, Type J, single element, ungrounded	-40 to 750 °C (-40 to 1382 °F)	★
03K1		Thermocouple, Type K, single element, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	★
05J1		Thermocouple, Type J, dual element, isolated, ungrounded	-40 to 750 °C (-40 to 1382 °F)	★
05K1		Thermocouple, Type K, dual element, isolated, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	★
7	65 only	RTD, single element, 3-wire vibration resistance	-60 to 600 °C (-76 to 1112 °F)	
9		RTD, single element, 4-wire vibration resistance	-60 to 600 °C (-76 to 1112 °F)	
0		RTD, dual element, 3-wire vibration resistance	-60 to 600 °C (-76 to 1112 °F)	
03N1	185 only	Thermocouple, Type N, single element, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	
05N1		Thermocouple, Type N, dual element, isolated, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	

**Extension**

Code	Description	Head connection	Instrument connection	Material	
D	DIN Standard 12 x 1.5	M24 x 1.5	1/2-in. NPT	300 series stainless steel	★
T	DIN Standard 12 x 1.5	M24 x 1.5	M18 x 1.5	300 series stainless steel	★
F	Nipple-union-nipple	1/2-in. NPT	1/2-in. NPT	300 series stainless steel	★
J	Nipple-union (M/F)	N/A	1/2-in. NPT	300 series stainless steel	★
N	No extension (only available with connection head code N)				★
W	No extension head connection M24 x 1.5				★
L	No extension head connection 1/2-in. NPT				★

**Extension length (N) in millimeters**

Code	Description	
0000	No extension (use with extension code N, W, or L)	★

Code	Description	
0035	35 mm	★
0080	80 mm (standard for extension type code J)	★
0110	110 mm (standard for extension type codes F and J)	★
0135	135 mm (standard for DIN extension used with Rosemount connection head material codes C, D, G, H, 1, and 2)	★
0150	150 mm (standard for DIN extension used with form B connection head material codes J and L)	★
XXXX	Non-standard extension length (available from 35 to 500 mm in 5 mm increments)	

### Thermowell material

Code	Description	
N	No thermowell	★

### Sensor length (L) in millimeters

Code	Description	
0145	145 mm	★
0205	205 mm	★
0275	275 mm	★
0315	315 mm	★
0375	375 mm	★
0405	405 mm	★
0435	435 mm	★
0555	555 mm	★
XXXX	Non-standard sensor length (available from 100 to 9999 mm in 5-mm increments)	

### Additional options

#### Sensor options

Available with Series 65 Sensor only.

Code	Description	Temperature range	
A1	Single element class A sensor	–50 to 300 °C (–58 to 572 °F) (0–350 °C for sensor types 7, 9, 0)	★
A2	Dual element class A sensor	–50 to 300 °C (–58 to 572 °F) (0–350 °C for sensor types 7, 9, 0)	★

#### Product certifications

Refer to [Table 3](#) for limitation on options available with approvals.

Code	Description	
I1	ATEX Intrinsic Safety Approval	★
N1	ATEX Type n Approval	★

Code	Description	
E1	ATEX Flameproof Approval	★
ND	ATEX Dust Approval	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, and Dust Approval	★
E7	IECEx Flameproof Approval	★
E5	US Explosionproof Approval	★
E4	TIIS Flameproof Approval (consult factory for availability)	★
E6	Canada Explosionproof Approval	★
E2	Brazil Flameproof Approval	★
KD	US Explosionproof, Canada Explosionproof, and ATEX Flameproof Approval	★
KM	Technical Regulations Customs Union (EAC) Flameproof, Intrinsic Safety Approval	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety Approval	★
EM	Technical Regulations Customs Union (EAC) Flameproof Approval	★

#### Ground screw

Code	Description	
G1	External ground screw (only available with Rosemount connection head codes C, D, G, H, 1, and 2)	★

#### Cable glands

Code	Description	
G2	EEx d, brass, diameter 7.5–11.9 mm	
G4	M20 x 1.5 EMV, brass nickel coated, diameter 9–13 mm	
G5	M20 x 1.5 EMV, brass nickel coated, diameter 5–13 mm	
G7	M20 x 1.5, EEx e, blue, polyamide, diameter 5–9 mm	

#### Cover chain option

Code	Description	
G3	Cover chain (only available with Rosemount connection head codes C, D, G, and H)	★

#### Extension ring

Code	Description	
G6	Aluminum extension ring for dual transmitter mounting (use with Rosemount connection head codes C and D)	★

## Termination

Code	Description	
TB	Terminal block for use with sensor termination code 3	★

## Assemble-to option

If ordering Assemble-to option XA with a transmitter, specify the same option on the transmitter model number.

Code	Description	
XA	Assemble sensor to specific temperature transmitter (PTFE paste)	★

## Sensor calibration with works certificate

Available with Series 65 only.

Code	Description	
V10	Sensor calibration from –50 to 450 °C (–58 to 842 °F) with A, B, C, and Callendar-Van Dusen constants	★
V11	Sensor calibration from 0 to 100 °C (32 to 212 °F) with A, B, C, and Callendar-Van Dusen constants	★
X8	Sensor calibration over specified temperature range with A, B, C, and Callendar-Van Dusen constants	★

## VS system calibration

Available with Series 65 Sensor only.

Code	Description	
MD1	MID custody transfer, –196 to 0 °C (–321 to 32 °F)	★
MD2	MID custody transfer, –50 to 100 °C (–58 to 212 °F)	★
MD3	MID custody transfer, 50 to 200 °C (122 to 392 °F)	★

## GOST calibration certificate

Code	Description	
QG	Russian GOST Verification Certificate	★

## Temperature range option

Code	Description	
LT	Special materials to meet extended temperature range of –51 °C (–60 °F)	★

## Series 65 Platinum RTD and 185 Thermocouple with tubular thermowell

### Required model components

#### Model

Code	Description	
0065	Pt 100 RTD (IEC 751) without thermowell	
0185	Thermocouple (IEC 584 Class 1) without thermowell	

#### Connection head

Code	Description	IP rating <sup>(1)</sup>	Conduit/cable entry	
C	Rosemount aluminum	66/68	M20 x 1.5	★
D	Rosemount aluminum	66/68	½-in. NPT	★
1	Rosemount aluminum with LCD display meter cover	66/68	M20 x 1.5	★
2	Rosemount aluminum with LCD display meter cover	66/68	½-in. NPT	★
N	No connection head	N/A	N/A	★
G	Rosemount stainless steel	66/68	M20 x 1.5	
H	Rosemount stainless steel	66/68	½-in. NPT	
J	GR-A/BL (BUZ) aluminum with cable gland	65	M20 x 1.5	
L	TZ-A/BL (BUZH) aluminum with cable gland	65	M20 x 1.5	
7	Aluminum dual entry head	66	2 x ¾-in. NPT	
8	Aluminum dual entry head	66	2 x M20 x 1.5	
9	Aluminum dual entry head	66	2 x ½-in. NPT	
K	Stainless steel dual entry head	66	2 x ¾-in. NPT	
R	Stainless steel dual entry head	66	2 x M20 x 1.5	
W	Stainless steel dual entry head	66	2 x ½-in. NPT	
A	TZ-A/BL (BUZH) aluminum coated	65	M20 x 1.5	
P	SD-BK	N/A	M20 x 1.5	

(1) To maintain IP rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

#### Sensor lead wire termination

Code	Description	
0	Flying leads (no springs on DIN plate)	★
2	Terminal block (DIN 43762)	★

**Sensor type**

Code	Sensor	Description	Temperature range	
1	65 only	RTD, single element, 4-wire	-50 to 450 °C (-58 to 842 °F)	★
2		RTD, dual element, 3-wire	-50 to 450 °C (-58 to 842 °F)	★
3		RTD, single element, 4-wire	-196 to 300 °C (-321 to 572 °F)	★
4		RTD, dual element, 3-wire	-196 to 300 °C (-321 to 572 °F)	★
03J1	185 only	Thermocouple, Type J, single element, ungrounded	-40 to 750 °C (-40 to 1382 °F)	★
03K1		Thermocouple, Type K, single element, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	★
05J1		Thermocouple, Type J, dual element, isolated, ungrounded	-40 to 750 °C (-40 to 1382 °F)	★
05K1		Thermocouple, Type K, dual element, isolated, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	★
7	65 only	RTD, single element, 3-wire vibration resistance	-60 to 600 °C (-76 to 1112 °F)	
9		RTD, single element, 4-wire vibration resistance	-60 to 600 °C (-76 to 1112 °F)	
0		RTD, dual element, 3-wire vibration resistance	-60 to 600 °C (-76 to 1112 °F)	
03N1	185 only	Thermocouple, Type N, single element, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	
05N1		Thermocouple, Type N, dual element, isolated, ungrounded	-40 to 1000 °C (-40 to 1832 °F)	

**Extension**

Code	Description	
Y	Tubular, no extension (only available with form GN)	★
Z	Tubular, with extension (only available with form GB, NAMUR)	★

**Extension length (N) in millimeters**

Code	Description	
0000	No extension (use with extension code Y)	★
0050	50 mm	★
0065	65 mm	★
0105	105 mm	★
0115	115 mm	★
0130	130 mm	★
0200	200 mm	★
0250	250 mm	★
XXXX	Non-standard extension length (available from 50 to 500 mm in 5 mm increments)	

**Thermowell material**

Code	Description	
D	316L SST	★

Code	Description	
Y	316Ti SST	★

**Immersion length (U)**

Code	Description	
0050	50 mm	★
0075	75 mm	★
0100	100 mm	★
0115	115 mm	★
0130	130 mm	★
0150	150 mm	★
0160	160 mm	★
0200	200 mm	★
0220	220 mm	★
0225	225 mm	★
0250	250 mm	★
0280	280 mm	★
0300	300 mm	★
0345	345 mm	★
0400	400 mm	★
XXXX	Non-standard immersion length (available from 50 to 2500 mm in 5 mm increments)	

**Thermowell mounting style**

Code	Description	Process connections	Stem style	
G02 <sup>(1)</sup>	Threaded, tapered	R 1/2-in. (1/2-in. BSPT)	Stepped, NAMUR	★
G04 <sup>(1)</sup>	Threaded, tapered	R 3/4-in. (3/4-in. BSPT)	Stepped, NAMUR	★
G06 <sup>(1)</sup>	Threaded, tapered	R 1-in. (1-in. BSPT)	Stepped, NAMUR	★
G13 <sup>(1)</sup>	Threaded, parallel	M27 x 2	Stepped, NAMUR	★
G20 <sup>(1)</sup>	Threaded, parallel	G 1/2-in. (1/2-in. BSPF)	Stepped, NAMUR	★
G22 <sup>(1)</sup>	Threaded, parallel	G 3/4-in. (3/4-in. BSPF)	Stepped, NAMUR	★
G24 <sup>(1)</sup>	Threaded, parallel	G1 -in. (1-in. BSPF)	Stepped, NAMUR	★
G91 <sup>(1)</sup>	Threaded, parallel	M20 x 1.5	Stepped, NAMUR	★
G31 <sup>(1)</sup>	Threaded, parallel	M33 x 2	Stepped, NAMUR	★
G38 <sup>(1)</sup>	Threaded, tapered	1/2-in. NPT	Stepped, NAMUR	★
G40 <sup>(1)</sup>	Threaded, tapered	3/4-in. NPT	Stepped, NAMUR	★
G42 <sup>(1)</sup>	Threaded, tapered	1-in. NPT	Stepped, NAMUR	★

Code	Description	Process connections	Stem style	
G52 <sup>(2)</sup>	Threaded, parallel	G ½-in. (½-in. BSPF)	Straight, GN, D. 9 x 1 mm	★
G92 <sup>(2)</sup>	Threaded, parallel	M20 x 1.5	Straight, GN, D. 9 x 1 mm	★
G63 <sup>(2)</sup>	Threaded, parallel	G ½-in. (½-in. BSPF)	Straight, GN, D. 11x 2 mm	★
G94	Threaded, parallel	M20 x 1.5	Straight, GN, D. 11 x 2 mm	★
G72 <sup>(2)</sup>	Threaded, parallel	G ½-in. (½-in. BSPF)	Straight, GN, D. 9 x 1 mm	★
G95 <sup>(2)</sup>	Threaded, parallel	M20 x 1.5	Straight, GN, D. 9 x 1 mm	★
L02 <sup>(1)</sup>	Flanged, RF	1-in. 150 lb	Stepped, NAMUR	★
L08 <sup>(1)</sup>	Flanged, RF	1½-in. 150 lb	Stepped, NAMUR	★
L14 <sup>(1)</sup>	Flanged, RF	2-in. 150 lb	Stepped, NAMUR	★
L20 <sup>(1)</sup>	Flanged, RF	1-in. 300 lb	Stepped, NAMUR	★
L26 <sup>(1)</sup>	Flanged, RF	1½-in. 300 lb	Stepped, NAMUR	★
L32 <sup>(1)</sup>	Flanged, RF	2-in. 300 lb	Stepped, NAMUR	★
H02 <sup>(1)</sup>	Flange, Form B1 according to EN 1092-1	DN 25 PN 16	Stepped, NAMUR	★
H08 <sup>(1)</sup>	Flange, Form B1 according to EN 1092-1	DN 25 PN 25/40	Stepped, NAMUR	★
H14 <sup>(1)</sup>	Flange, Form B1 according to EN 1092-1	DN 40 PN 16	Stepped, NAMUR	★
H20 <sup>(1)</sup>	Flange, Form B1 according to EN 1092-1	DN 40 PN 25/40	Stepped, NAMUR	★
H26 <sup>(1)</sup>	Flange, Form B1 according to EN 1092-1	DN 50 PN 40	Stepped, NAMUR	★

(1) The NAMUR stepped profile is available in both thermowell material options, however to maintain NAMUR compliance material code Y is required. 115 mm is the minimum immersion length stepped thermowells are available and is the minimum requirement to maintain NAMUR compliance however for lengths shorter than 115 mm a straight thermowell with a 8 mm OD will be provided.

(2) Not available with thermowell Material code D.

## Additional options

### Sensor options

Available with Series 65 Sensor only.

Code	Description	Temperature range	
A1	Single element class A sensor	-50 to 300 °C (-58 to 572 °F) (0 –350 °C for sensor types 7, 9, 0)	★
A2	Dual element class A sensor	-50 to 300 °C (-58 to 572 °F) (0 –350 °C for sensor types 7, 9, 0)	★

### Product certifications

Refer to [Table 3](#) for limitation on options available with approvals.

Code	Description	
I1	ATEX Intrinsic Safety Approval	★
N1	ATEX Type n Approval	★
E1	ATEX Flameproof Approval	★
ND	ATEX Dust Approval	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, and Dust Approval	★

Code	Description	
E7	IECEx Flameproof Approval	★
E5	US Explosionproof Approval	★
E4	IIIS Flameproof Approval (consult factory for availability)	★
E6	Canada Explosionproof Approval	★
E2	Brazil Flameproof Approval	★
KD	US Explosionproof, Canada Explosionproof, and ATEX Flameproof Approval	★
KM	Technical Regulations Customs Union (EAC) Flameproof, Intrinsic Safety Approval	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety Approval	★
EM	Technical Regulations Customs Union (EAC) Flameproof Approval	★

#### Ground screw

Code	Description	
G1	External ground screw (only available with Rosemount connection head codes C, D, G, H, 1, and 2)	★

#### Cable glands

Code	Description	
G2	EEx d, brass, diameter 7.5–11.9 mm	
G4	M20 x 1.5 EMV, brass nickel coated, diameter 9–13 mm	
G5	M20 x 1.5 EMV, brass nickel coated, diameter 5–13 mm	
G7	M20 x 1.5, EEx e, blue, polyamide, diameter 5–9 mm	

#### Cover chain option

Code	Description	
G3	Cover chain (only available with Rosemount connection head codes C, D, G, and H)	★

#### Extension ring

Code	Description	
G6	Aluminum extension ring for dual transmitter mounting (use with Rosemount connection head codes C and D)	★

#### Material certification

Code	Description	
Q8	Thermowell material certification, DIN EN 10204 3.1	★

**External pressure test**

Code	Description	
R01	Thermowell external pressure testing	★

**Dye test**

Code	Description	
R03	Thermowell dye penetration testing	★

**Assemble-to option**

If ordering Assemble-to option XA with a transmitter, specify the same option on the transmitter model number.

Code	Description	
XA	Assemble sensor to specific temperature transmitter (PTFE paste)	★

**Sensor calibration with works certificate**

Available with Series 65 only.

Code	Description	
V10	Sensor calibration from -50 to 450 °C (-58 to 842 °F) with A, B, C, and Callendar-Van Dusen constants	★
V11	Sensor calibration from 0 to 100 °C (32 to 212 °F) with A, B, C, and Callendar-Van Dusen constants	★
X8	Sensor calibration over specified temperature range with A, B, C, and Callendar-Van Dusen constants	★

**Temperature range option**

Code	Description	
LT	Special materials to meet extended temperature range of -51 °C (-60 °F)	★

## Series 65 Platinum RTD and 185 Thermocouple with barstock thermowell

### Required model components

#### Model

Code	Description	
0065	Pt 100 RTD (IEC 751) without thermowell	
0185	Thermocouple (IEC 584 Class 1) without thermowell	

#### Connection head

Code	Description	IP rating <sup>(1)</sup>	Conduit/cable entry	
C	Rosemount aluminum	66/68	M20 x 1.5	★
D	Rosemount aluminum	66/68	½-in. NPT	★
1	Rosemount aluminum with LCD display meter cover	66/68	M20 x 1.5	★
2	Rosemount aluminum with LCD display meter cover	66/68	½-in. NPT	★
N	No connection head	N/A	N/A	★
G	Rosemount stainless steel	66/68	M20 x 1.5	
H	Rosemount stainless steel	66/68	½-in. NPT	
J	GR-A/BL (BUZ) aluminum with cable gland	65	M20 x 1.5	
L	TZ-A/BL (BUZH) aluminum with cable gland	65	M20 x 1.5	
7	Aluminum dual entry head	66	2 x ¾-in. NPT	
8	Aluminum dual entry head	66	2 x M20 x 1.5	
9	Aluminum dual entry head	66	2 x ½-in. NPT	
K	Stainless steel dual entry head	66	2 x ¾-in. NPT	
R	Stainless steel dual entry head	66	2 x M20 x 1.5	
W	Stainless steel dual entry head	66	2 x ½-in. NPT	
A	TZ-A/BL (BUZH) aluminum coated	65	M20 x 1.5	
P	SD-BK	N/A	M20 x 1.5	

(1) To maintain IP rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

#### Sensor lead wire termination

Code	Description	
0	Flying leads (no springs on DIN plate)	★
2	Terminal block (DIN 43762)	★
3	Spring loaded adapter (½-in. NPT)	★

**Sensor type**

Code	Sensor	Description	Temperature range	
1	65 only	RTD, single element, 4-wire	−50 to 450 °C (−58 to 842 °F)	★
2		RTD, dual element, 3-wire	−50 to 450 °C (−58 to 842 °F)	★
3		RTD, single element, 4-wire	−196 to 300 °C (−321 to 572 °F)	★
4		RTD, dual element, 3-wire	−196 to 300 °C (−321 to 572 °F)	★
03J1	185 only	Thermocouple, Type J, single element, ungrounded	−40 to 750 °C (−40 to 1382 °F)	★
03K1		Thermocouple, Type K, single element, ungrounded	−40 to 1000 °C (−40 to 1832 °F)	★
05J1		Thermocouple, Type J, dual element, isolated, ungrounded	−40 to 750 °C (−40 to 1382 °F)	★
05K1		Thermocouple, Type K, dual element, isolated, ungrounded	−40 to 1000 °C (−40 to 1832 °F)	★
7	65 only	RTD, single element, 3-wire vibration resistance	−60 to 600 °C (−76 to 1112 °F)	
9		RTD, single element, 4-wire vibration resistance	−60 to 600 °C (−76 to 1112 °F)	
0		RTD, dual element, 3-wire vibration resistance	−60 to 600 °C (−76 to 1112 °F)	
03N1	185 only	Thermocouple, Type N, single element, ungrounded	−40 to 1000 °C (−40 to 1832 °F)	
05N1		Thermocouple, Type N, dual element, isolated, ungrounded	−40 to 1000 °C (−40 to 1832 °F)	

**Extension**

Code	Description	Head connection	Instrument connection	Materials	
D	DIN standard 12 x 1.5	M24 x 1.5	½-in. NPT	300 SST	★
T	DIN standard 12 x 1.5	M24 x 1.5	M18 x 1.5	300 SST	★
F	Nipple-union-nipple	½-in. NPT	½-in. NPT	300 SST	★
J	Nipple-union (M/F)	None	½-in. NPT	300 SST	★
N	No extension (only available with connection head code N)				★

**Extension length (N) in millimeters**

Code	Description	
0000	No extension (use with extension code N, W, or L)	★
0035	35 mm	★
0080	80 mm (standard for extension type code J)	★
0110	110 mm (standard for extension type codes F and J)	★
0135	135 mm (standard for DIN extension used with Rosemount connection head material codes C, D, G, H, 1, and 2)	★
0150	150 mm (standard for DIN extension used with form B connection head material codes J and L)	★
XXXX	Non-standard extension length (available from 35 to 500 mm in 5 mm increments)	

**Thermowell material**

Code	Description	
D	316L SST	★
Y	316Ti SST	★
A	316 SST	
J	Alloy C-276	
K	A 204 Size A	
P	A 182-Grade F22	
Z	A 182-Grade F11	

**Immersion length**

Code	Description	
0065	65 mm	★
0075	75 mm	★
0115	115 mm	★
0125	125 mm	★
0150	150 mm	★
0225	225 mm	★
0300	300 mm	★
0450	450 mm	★
XXXX	Non-standard immersion length (available from 50 to 1000 mm in 5 mm increments)	

**Thermowell mounting style**

Code	Description	Process connection	Stem style	
T08	Threaded	R 1/2-in. (1/2-in. BSPT)	Tapered	★
T10	Threaded	R 3/4-in. (3/4-in. BSPT)	Tapered	★
T12	Threaded	R 1-in. (1-in. BSPT)	Tapered	★
T26 <sup>(1)</sup>	Threaded	G 1/2-in. (1/2-in. BSPF)	Tapered	★
T28 <sup>(1)</sup>	Threaded	G 3/4-in. (3/4-in. BSPF)	Tapered	★
T30 <sup>(1)</sup>	Threaded	G 1-in. (1-in. BSPF)	Tapered	★
T44	Threaded	1/2-in. NPT	Tapered	★
T46	Threaded	3/4-in. NPT	Tapered	★
T48	Threaded	1-in. NPT	Tapered	★
T93 <sup>(1)</sup>	Threaded	M27 x 2	Tapered	★
T95 <sup>(1)</sup>	Threaded	M33 x 2	Tapered	★
T98 <sup>(1)</sup>	Threaded	M20 x 1.5	Tapered	★

Code	Description	Process connection	Stem style	
F04	Flanged, RF	1-in. 150 lb	Tapered	★
F10	Flanged, RF	1½-in. 150 lb	Tapered	★
F16	Flanged, RF	2-in. 150 lb	Tapered	★
F22	Flanged, RF	1-in. 300 lb	Tapered	★
F28	Flanged, RF	1½-in. 300 lb	Tapered	★
F34	Flanged, RF	2-in. 300 lb	Tapered	★
F40	Flanged, RF	1-in. 600 lb	Tapered	★
F46	Flanged, RF	1½-in. 600 lb	Tapered	★
F52	Flanged, RF	2-in. 600 lb	Tapered	★
F58 <sup>(2)</sup>	Flanged, RF	1-in. 900/1500 lb	Tapered	★
F64 <sup>(2)</sup>	Flanged, RF	1½-in. 900/1500 lb	Tapered	★
F70 <sup>(2)(3)</sup>	Flanged, RF	2-in. 900/1500 lb	Tapered	★
F82 <sup>(2)(3)</sup>	Flanged, RF	1½-in. 2500 lb	Tapered	★
F88 <sup>(2)(3)</sup>	Flanged, RF	2-in. 2500 lb	Tapered	★
D04	Flange, Form B1 according to EN 1092-1	DN 25 PN 16	Tapered	★
D10	Flange, Form B1 according to EN 1092-1	DN 25 PN 25/40	Tapered	★
D16	Flange, Form B1 according to EN 1092-1	DN 40 PN 16	Tapered	★
D22	Flange, Form B1 according to EN 1092-1	DN 40 PN 25/40	Tapered	★
D28	Flange, Form B1 according to EN 1092-1	DN 50 PN 40	Tapered	★
W10	Welded	¾-in. pipe	Tapered	★
W12	Welded	1-in. pipe	Tapered	★
W14	Welded	1¼-in. pipe	Tapered	★
W16	Welded	1½-in. pipe	Tapered	★
E01 <sup>(4)(5)</sup>	D1 welded	24h7	Tapered	★
E02 <sup>(4)(5)</sup>	D2 welded	24h7	Tapered	★
E04 <sup>(4)(6)</sup>	D4 welded	24h7	Tapered	★
E05 <sup>(6)</sup>	D5 welded	24h7	Tapered	★

(1) This mounting style is only available with the lagging length code T040.

(2) Full penetration weld option R07 is required with this mounting style.

(3) This mounting style has a minimum lagging length of 80 mm.

(4) Only available with extension style T.

(5) This mounting style is only available with the lagging length code T075.

(6) This mounting style is only available with the lagging length code T135.

## Additional options

### Sensor options

Available with Series 65 Sensor only.

Code	Description	Temperature range	
A1	Single element class A sensor	–50 to 300 °C (–58 to 572 °F) (0–350 °C for sensor types 7, 9, 0)	★
A2	Dual element class A sensor	–50 to 300 °C (–58 to 572 °F) (0–350 °C for sensor types 7, 9, 0)	★

### Product certifications

Refer to [Table 3](#) for limitation on options available with approvals.

Code	Description	
I1	ATEX Intrinsic Safety Approval	★
N1	ATEX Type n Approval	★
E1	ATEX Flameproof Approval	★
ND	ATEX Dust Approval	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, and Dust Approval	★
E7	IECEx Flameproof Approval	★
E5	US Explosionproof Approval	★
E4	TIIS Flameproof Approval (consult factory for availability)	★
E6	Canada Explosionproof Approval	★
E2	Brazil Flameproof Approval	★
KD	US Explosionproof, Canada Explosionproof, and ATEX Flameproof Approval	★
KM	Technical Regulations Customs Union (EAC) Flameproof, Intrinsic Safety Approval	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety Approval	★
EM	Technical Regulations Customs Union (EAC) Flameproof Approval	★

### Ground screw

Code	Description	
G1	External ground screw (only available with Rosemount connection head codes C, D, G, H, 1, and 2)	★

### Cable glands

Code	Description	
G2	EEx d, brass, diameter 7.5–11.9 mm	
G4	M20 x 1.5 EMV, brass nickel coated, diameter 9–13 mm	
G5	M20 x 1.5 EMV, brass nickel coated, diameter 5–13 mm	
G7	M20 x 1.5, EEx e, blue, polyamide, diameter 5–9 mm	

**Cover chain option**

Code	Description	
G3	Cover chain (only available with Rosemount connection head codes C, D, G, and H)	★

**Extension ring**

Code	Description	
G6	Aluminum extension ring for dual transmitter mounting (use with Rosemount connection head codes C and D)	★

**Termination**

Code	Description	
TB	Terminal block for use with sensor termination code 3	★

**Material certification**

Code	Description	
Q8	Thermowell material certification, DIN EN 10204 3.1	★

**External pressure test**

Code	Description	
R01	Thermowell external pressure testing	★

**Internal pressure test**

Code	Description	
R22	Thermowell internal pressure testing	★

**Dye test**

Code	Description	
R03	Thermowell dye penetration testing	★

**NACE approval**

Only available with thermowell material codes D, J, and A.

Code	Description	
R05	Thermowell NACE approval	★

**Assemble-to option**

If ordering Assemble-to option XA with a transmitter, specify the same option on the transmitter model number.

Code	Description	
XA	Assemble sensor to specific temperature transmitter (PTFE paste)	★

**Sensor calibration with works certificate**

Available with Series 65 only.

Code	Description	
V10	Sensor calibration from –50 to 450 °C (–58 to 842 °F) with A, B, C, and Callendar-Van Dusen constants	★
V11	Sensor calibration from 0 to 100 °C (32 to 212 °F) with A, B, C, and Callendar-Van Dusen constants	★
X8	Sensor calibration over specified temperature range with A, B, C, and Callendar-Van Dusen constants	★

**VS system calibration**

Available with Series 65 Sensor only.

Code	Description	
MD1	MID custody transfer, –196 to 0 °C (–321 to 32 °F)	★
MD2	MID custody transfer, –50 to 100 °C (–58 to 212 °F)	★
MD3	MID custody transfer, 50 to 200 °C (122 to 392 °F)	★

**Temperature range option**

Code	Description	
LT	Special materials to meet extended temperature range of –51 °C (–60 °F)	★

# Rosemount Series 96 Barstock Thermowell



The Rosemount Series 96 Barstock Thermowell has designs that provide flexible and reliable temperature measurements in process environments.

### Features include:

- Threaded, flanged, and weld-in styles
- Wake frequency calculations conforming to ASME PTC 19.3
- NACE approval available
- Variety of testing and certification options available

[VIEW PRODUCT >](#)

## Online Product Configurator

Many products are configurable online using our Product Configurator. Select the **Configure** button or visit our [website](#) to start. With this tool's built-in logic and continuous validation, you can configure your products more quickly and accurately.

## Model codes

Model codes contain the details related to each product. Exact model codes will vary; an example of a typical model code is shown in [Figure 1](#).

**Figure 2: Model Code Example**

3144P D1 A 1 NA M5 DA1 04

1 2

1. Required model components (choices available on most)
2. Additional options (variety of features and functions that may be added to products)

## Specifications and options

See the Specifications and options section for more details on each configuration. Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See the Material selection section for more information.

## Optimizing lead time

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

## Required model components

### Model

Code	Description	
0096	Barstock thermowell	★

### Thermowell material

Additional materials are available upon request.

Code	Description	
D	1.4404 (316L SST)	★
Y	1.4571 (316Ti SST)	★
A	1.4401 (316 SST)	
J	2.4819 (Alloy C-276)	
K	1.5415 (204 Size A)	
P	1.7380 (182 Grade-F22)	
Z	1.7335 (182 Grade-F11)	

### Immersion length (L) in millimeters

Code	Description	
0065	65 mm (standard length for weld-in thermowells, E01 and E04)	★
0075	75 mm	★
0115	115 mm	★
0125	125 mm (standard length for weld-in thermowells, E02 and E05)	★
0150	150 mm	★
0225	225 mm	★
0300	300 mm	★
0450	450 mm	★
XXXX	Non-standard immersion length (available from 25 to 1000 mm in 5-mm increments)	

### Thermowell mounting style

Code	Description	Process connection	Stem style	
T08	Thread	R 1/2-in. (1/2-in. BSPT)	Tapered	★
T10	Thread	R 3/4-in. (3/4-in. BSPT)	Tapered	★
T12	Thread	R 1-in. (1-in. BSPT)	Tapered	★
T26 <sup>(1)</sup>	Thread	G 1/2-in. (1/2-in. BSPF)	Tapered	★
T28 <sup>(1)</sup>	Thread	G 3/4-in. (3/4-in. BSPF)	Tapered	★

Code	Description	Process connection	Stem style	
T30 <sup>(1)</sup>	Thread	G 1-in. (1-in. BSPF)	Tapered	★
T44	Thread	½-in. NPT	Tapered	★
T46	Thread	¾-in. NPT	Tapered	★
T48	Thread	1-in. NPT	Tapered	★
T93 <sup>(1)</sup>	Thread	M27 X 2	Tapered	★
T95 <sup>(1)</sup>	Thread	M33 X 2	Tapered	★
T98 <sup>(1)</sup>	Thread	M20 X 1.5	Tapered	★
F04	Flange, RF	1-in. 150 lb	Tapered	★
F10	Flange, RF	1½-in. 150 lb	Tapered	★
F16	Flange, RF	2-in. 150 lb	Tapered	★
F22	Flange, RF	1-in. 300 lb	Tapered	★
F28	Flange, RF	1½-in. 300 lb	Tapered	★
F34	Flange, RF	2-in. 300 lb	Tapered	★
F40	Flange, RF	1-in. 600 lb	Tapered	★
F46	Flange, RF	1½-in. 600 lb	Tapered	★
F52	Flange, RF	2-in. 600 lb	Tapered	★
F58 <sup>(2)</sup>	Flanged, RF	1-in. 900/1500 lb	Tapered	★
F64 <sup>(1)</sup>	Flanged, RF	1½-in. 900/1500 lb	Tapered	★
F70 <sup>(1)(3)</sup>	Flanged, RF	2-in. 900/1500 lb	Tapered	★
F82 <sup>(1)(3)</sup>	Flanged, RF	1½-in 2500 lb	Tapered	★
F88 <sup>(1)(3)</sup>	Flanged, RF	2-in. 2500 lb	Tapered	★
D04	Flange, Form B1 according to EN 1092-1	DN 25 PN 16	Tapered	★
D10	Flange, Form B1 according to EN 1092-1	DN 25 PN 25/40	Tapered	★
D16	Flange, Form B1 according to EN 1092-1	DN 40 PN 16	Tapered	★
D22	Flange, Form B1 according to EN 1092-1	DN 40 PN 25/40	Tapered	★
D28	Flange, Form B1 according to EN 1092-1	DN 50 PN 40	Tapered	★
W10	Welded	¾-in. pipe	Tapered	★
W12	Welded	1-in. pipe	Tapered	★
W14	Welded	1¼-in. pipe	Tapered	★
W16	Welded	1½-in. pipe	Tapered	★
E01 <sup>(4)</sup>	D1 welded, DIN	24h7	Tapered	★
E02 <sup>(4)</sup>	D2 welded, DIN	24h7	Tapered	★
E04 <sup>(5)</sup>	D4 welded, DIN	24h7	Tapered	★
E05 <sup>(5)</sup>	D5 welded, DIN	24h7	Tapered	★

(1) This mounting style is only available with the lagging length code T040.

(2) Full penetration weld option R07 is required with this mounting style.

(3) This mounting style has a minimum lagging length of 80 mm.

(4) This mounting style is only available with the lagging length code T075.  
 (5) This mounting style is only available with the lagging length code T135.

## Lagging length

Code	Description	
T040	40 mm	★
T060	60 mm	★
T075	75 mm	★
T080	80 mm	★
T135	135 mm	★
TXXX	Non standard lagging length	

## Instrument connection thread type

Code	Description	
A	M24 x 1.5	★
D	½-in. NPT	★
T	M18 x 1.5 (valid for weld-in thermowells codes E01, E02, E04, and E05)	★

## Additional options

### Material certification

Code	Description	
Q8	Thermowell material certification, DIN EN 10204 3.1	★

### External pressure test

Code	Description	
R01	Thermowell external pressure testing	★

### Internal pressure test

Code	Description	
R22	Thermowell internal pressure testing	★

### Dye test

Code	Description	
R03	Thermowell dye penetration testing	★

## NACE approval

Only available with thermowell material codes D, J, and A.

Code	Description	
R05	Thermowell NACE approval	★

## Plug/chain

Code	Description	
R06	Stainless steel plug and chain	★

## Weld option

Code	Description	
R07	Full penetration weld - for flanged thermowells only	★

## Flange type

Code	Description	
R16	Ring joint flange face	★

## Wake frequency calculation

Code	Description	
R21	Wake frequency (thermowell strength calculation)	★

# Sensor reference information

## Overview

Rosemount integral mount temperature sensors, accessory hardware, and assemblies constitute a complete line of industrial temperature-sensing instruments. A variety of RTD and thermocouple sensors are available alone, or as complete assemblies including connection heads, thermowells, and extension fittings. Emerson offers complete temperature measurement assemblies including Rosemount Smart and Programmable Temperature Transmitters. Ask your Emerson representative for details.

Series 65 Platinum RTD Temperature Sensors are highly linear and have a stable resistance versus temperature relationship. These sensors are used primarily in industrial environments where high accuracy, durability, and long-term stability are required. Series 65 Sensors are designed to meet the most critical parameters of international standards: IEC 751:1983, Amendment 1:1986 and 2:1995 and DIN EN 60751:1996. This standardization provides sensor interchangeability without the need for transmitter circuitry adjustment.

Enhanced performance and optimal temperature measurement accuracy is available for Series 65 Sensors coupled with a range of Rosemount Temperature Transmitters through calibration schedules and Callendar-Van Dusen constants.

Series 185 Thermocouple Temperature Sensors conform to IEC 584:1982, Amendment 1:1989 and are available in types J, K, and N. Series 185 Sensors are available single ungrounded, or dual ungrounded, isolated.

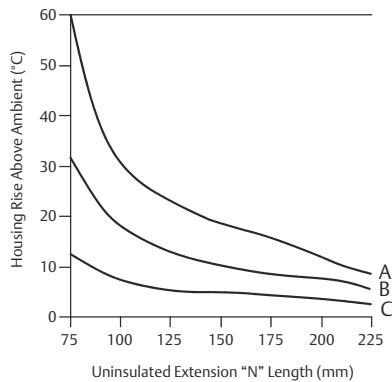
All sensors are available in a variety of lengths<sup>(1)</sup> and ranges with flying lead, terminal block, or ½-in. NPT spring-loaded adapter lead wire terminations.

In addition to complete assemblies, Emerson offers a selection of separate accessory hardware including connection heads and thermowells.

## Selecting an extension and thermowell

Aside from ambient temperature variations, heat from the process, in a direct mounting configuration, is transferred from the thermowell to the transmitter housing. If the expected process temperature is near or beyond the transmitter specification limits, consider the use of additional thermowell extension length, an extension nipple, or a remote mounting configuration to isolate the transmitter from these excessive temperatures. [Figure 3](#) provides an example of the relationship between transmitter housing temperature rise and extension length. Use [Figure 3](#) and the accompanying example as a guide for determining adequate thermowell extension length.

**Figure 3: Transmitter Housing Temperature Rise vs. Uninsulated Extension Length**



- A. 815 °C process temperature
- B. 540 °C process temperature
- C. 250 °C process temperature

### Example

The rated ambient temperature specification for the transmitter is 85 °C. If the maximum ambient temperature is 40 °C and the temperature to be measured is 540 °C, the maximum allowable housing temperature rise is the rated temperature specification limit minus the existing ambient temperature (85 – 40 °F), or 45 °C.

As shown in [Figure 3](#), an "N" dimension of 90 mm will result in a housing temperature rise of 22 °C. An "N" dimension of 100 mm would therefore be the minimum recommended length, and would provide a safety factor of about 25 °C. A longer "N" dimension, such as 150 mm, would be desirable in order to reduce errors caused by transmitter temperature effect, although in that case the transmitter may require extra support.

## Integral mount sensors and assemblies

Series 65 RTD and Series 185 Thermocouple Temperature Sensors may be ordered as complete assemblies, which provide a complete, yet simple, means of specifying the proper industrial hardware for most temperature measurements. One assembly model number, derived from one ordering table, completely defines the type of sensing element, as well as the material, length, and style of extension fittings and thermowells.

All sensor assemblies are sized and inspected by Emerson to ensure complete component compatibility and performance.

(1) Sensors over one meter long will be supplied coiled unless otherwise requested.

## Mounting configurations

### Series 65 Platinum RTDs and Series 185 Thermocouples

You may order the Series 65 RTDs and the Series 185 Thermocouples with flying leads, a terminal block, or a ½-in. NPT spring-loaded adapter.

Ordered with flying leads, the sensors are designed to be used with a head mount temperature transmitter attached directly to the sensor. The flying lead configuration allows the removal of the sensor and transmitter as one assembly.

The BUZH connection head allows terminal block style sensors and transmitters to be mounted together. The transmitters in these assemblies will be mounted in the cover of the BUZH connection head.

The sensors with a ½-in. NPT spring-loaded adapter are used with directly mounted Rosemount 3144P Field Mount Temperature Transmitters or through the use of Rosemount connection heads. This assembly requires a terminal block to be mounted inside the head.

Hazardous area approvals are available with all three types of sensors, but they are dependent on the configuration of the entire temperature measurement assembly (see [Product certifications](#)).

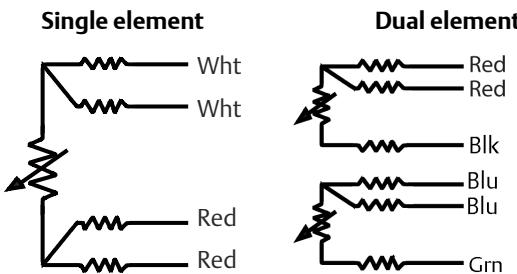
### Temperature considerations

Ambient temperature limits for the connection head are –40 °C to +85 °C. The LT option may be extended down to a range of –51 °C to +85 °C.

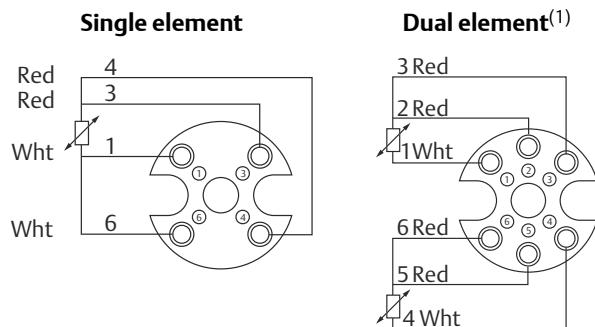
Ambient temperature range addresses the connection head only, and requires suitable cable glands and field wiring provisions to meet the temperature requirements below –40 °C.

**Figure 4: Series 65 RTD Lead Wire Configuration**

**Series 65 RTD flying leads and spring-loaded adapter-termination codes 0 or 3 only**



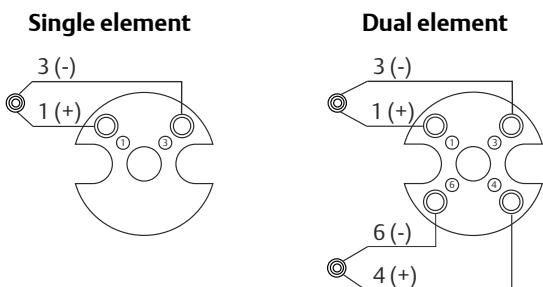
**Series 65 RTD terminal block termination code 2**



(1) The color of the terminal posts in the terminal block may not match the color of the lead wires connected to the capsule.

**Figure 5: Series 185 Lead Wire Configuration**

**Series 185 RTD thermocouple terminal block**



# Specifications

## Series 65 Platinum RTD

100  $\Omega$  RTD at 0  $^{\circ}\text{C}$ ,  $\alpha = 0.00385 \text{ } ^{\circ}\text{C}^{-1}$

### Temperature range

-50 to 450  $^{\circ}\text{C}$  or -196 to 300  $^{\circ}\text{C}$  depending on type

### Self heating

0.15  $^{\circ}\text{C}/\text{mW}$  when measured per method defined in IEC 751:1983, Amendments 1 and 2

### Thermal response time

Nine seconds maximum required to reach 50 percent sensor response when tested in flowing water according to IEC 751:1983, Amendments 1 and 2

### Immersion error

60 mm minimum usable depth of immersion when tested according to IEC 751:1983, Amendments 1 and 2

### Insulation resistance

1,000 M $\Omega$  minimum insulation resistance when measured at 500 Vdc and at room temperature

### Sheath material

316 SST sensor tip (hot end) with 321SST mineral insulated cable construction

### Lead wire

PTFE insulated, silver-coated, 0.21mm<sup>2</sup> (24 AWG) stranded copper wire. See [Figure 4](#) for wire configuration.

### Identification data

The model and serial numbers are marked on each sensor.

### Ingress protection (IP) ratings

The Rosemount connection head is rated to IP66/IP68 and NEMA<sup>®</sup> 4X. The BUZ and BUZH connection heads are rated to IP65. To maintain IP rating at installation, one of the following options must be used with the connection head:

- Extension and/or adapter and barstock thermowell
- Tubular thermowell
- Sensor and sealing screw (extension option "V")
- General purpose adapter

## Vibration limits

For sensor types option code “1”, “2”, and “5”, the vibration resistance is  $\pm 0.02$  percent ( $0.05$  °C) maximum ice-point resistance shift after 3 g vibration between 10 and 500 Hz for 150 hours according to IEC 751:1983, Amendments 1 and 2.

For sensor types option code “3”, “4”, and “6” the vibration resistance is  $0.1$  °C maximum ice-point resistance shift after 1 g vibration between 10 and 500 Hz for 150 hours according to IEC 60751:2008, Amendments 1 and 2.

For sensor types option code “7”, “9”, and “0”, the vibration resistance is  $\pm 0.02$  percent ( $0.05$  °C) maximum ice-point resistance shift after 10 g vibration between 10 and 500 Hz for 150 hours according to IEC 751:1983, Amendments 1 and 2.

**Table 1: Series 65 Interchangeability**

Standard series 65 IEC-751 class B	Temperature
$\pm 0.80$ °C ( $\pm 1.44$ °F)	$-100$ °C ( $-148$ °F)
$\pm 0.30$ °C ( $\pm 0.54$ °F)	$0$ °C ( $32$ °F)
$\pm 0.80$ °C ( $\pm 1.44$ °F)	$100$ °C ( $212$ °F)
$\pm 1.80$ °C ( $\pm 3.24$ °F)	$300$ °C ( $572$ °F)
$\pm 2.30$ °C ( $\pm 4.14$ °F)	$400$ °C ( $752$ °F)
Series 65 with IEC-751 class A option	Temperature
$\pm 0.35$ °C ( $\pm 0.63$ °F)	$-100$ °C ( $-148$ °F)
$\pm 0.15$ °C ( $\pm 0.27$ °F)	$0$ °C ( $32$ °F)
$\pm 0.35$ °C ( $\pm 0.63$ °F)	$100$ °C ( $212$ °F)
$\pm 0.75$ °C ( $\pm 1.35$ °F)	$300$ °C ( $572$ °F)

## Series 185 Thermocouple

### Construction

A thermocouple consists of a junction between two dissimilar metals that produces a change in thermoelectric emf in relationship to a change in temperature. Rosemount Series 185 thermocouple sensors are manufactured from selected materials to meet IEC 584 Tolerance Class 1. The junction of these wires is welded to form a pure joint, maintaining the integrity of the circuit and ensuring the highest accuracy. Ungrounded junctions are protected from the environment by the sensor sheath. The ungrounded and isolated junctions provide electrical isolation from the sensor sheath.

### Sheath material

Rosemount thermocouples are made of a mineral insulated cable design with a variety of sheath materials available to suit both the temperature and the environment. For temperatures up to  $800$  °C in air, 1.4541 (321 SST) is standard. For temperatures from  $800$  to  $1100$  °C in air, 2.4816 (Alloy 600) is standard. For temperatures above  $1100$  °C, precious metal or ceramic protective sheaths are available upon request. For strongly oxidising or reducing atmospheres, consult your local Emerson representative.

### Lead wires

PTFE insulated,  $0.52$  mm $^2$  (20 AWG) stranded thermocouple wire. Color coded per IEC 584. See [Figure 5](#) for wire configuration.

### Identification data

The model and serial numbers are marked on each sensor.

### Insulation resistance

$1,000$  M $\Omega$  minimum insulation resistance when measured at  $500$  Vdc and at room temperature.

### Ingress protection (IP) ratings

The Rosemount connection head is rated to IP66/IP68 and NEMA 4X. The BUZ and BUZH connection heads are rated to IP65. To maintain IP rating at installation, one of the following options must be used with the connection head:

- Extension and/or adapter and barstock thermowell
- Tubular thermowell
- Sensor and sealing screw (Extension option "V")
- General purpose adapter

**Table 2: Characteristics of Series 185 Thermocouples**

Type	Alloys (wire color)	Sheath material	Temperature range (°C)	Limits of error (°C) (whichever is greater)	Tolerance class
J	Fe (+ black), CuNi (– white)	1.4541 (321 SST)	–40 to 750	±1.5 or ±0.4%	1
K	NiCr (+ green), NiAl (– white)	2.4816 (Alloy 600)	–40 to 1000	±1.5 or ±0.4%	1
N	NiCrSi (+ pink), NiSi (– white)	2.4816 (Alloy 600)	–40 to 1000	±1.5 or ±0.4%	1

## Material selection

Emerson provides a variety of Rosemount product with various product options and configurations including materials of construction that can be expected to perform well in a wide range of applications. The product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options and components for the particular application. Emerson is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration or materials of construction selected.

# Product certifications

Rev 1.18

## European Directive information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at [Emerson.com/Rosemount](http://Emerson.com/Rosemount).

## Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

## North America

The US National Electrical Code® (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

## Hazardous locations certifications

### USA

#### E5 FM Explosion-proof and Dust-Ignition-proof

**Certificate** FM17US0170X

**Standards** FM Class 3600: 2011; FM Class 3611: 2004; FM Class 3615: 2006; FM Class 3810: 2005; ANSI/NEMA® 250: 1991

**Markings** XP CL I, Div 1, GP B, C, D; DIP CL II/III, Div 1, GP E, F, G; T5 ( $-50^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$ ); Type 4X

### Canada

#### E6 CSA Explosion-proof and Dust-Ignition-proof

**Certificate** 1063635

**Standards** CSA C22.2 No. 0-M91; CSA C22.2 No. 25-1966; CSA C22.2 No. 30-M1986; CSA C22.2 No. 94-M91; CSA C22.2 No. 142-M1987; CSA C22.2 No. 213-M1987

**Markings** XP CL I, Div 1, GP B, C, D; DIP CL II/III, Div 1, GP E, F, G; CL I, Div 2, GP A, B, C, D; ( $-50^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$ )

### Europe

#### E1 ATEX Flameproof

**Certificate** FM12ATEX0065X

**Standards** EN 60079-0:2012+A11:2013; EN 60079-1: 2014

**Markings** II 2 G Ex db IIC T6...T1 Gb, T6(-50 °C ≤ T<sub>a</sub> ≤ + 40 °C), T5...T1 (-50 °C ≤ T<sub>a</sub> ≤ + 60 °C)

See [Process temperature limits](#) for process temperatures.

### Special Conditions for Safe Use (X)

1. See certificate for ambient temperature range.
2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD display cover against impact energies greater than 4 joules.
4. Flameproof joints are not intended for repair.
5. A suitable certified Ex d or Ex tb enclosure is required to be connected to temperature probes with Enclosure option "N".
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of DIN Style Sensor probe does not exceed 130 °C.
7. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

### I1 ATEX Intrinsic Safety

**Certificate** Baseefa16ATEX0101X

**Standards** EN 60079-0:2012+A11:2013, EN 60079-11:2012

**Markings** II 1 G Ex ia IIC T5/T6 Ga (see certificate for schedule)

Thermocouples; P <sub>i</sub> = 500 mW	T6 -60 °C ≤ T <sub>a</sub> ≤ + 70 °C
RTDs; P <sub>i</sub> = 192 mW	T6 -60 °C ≤ T <sub>a</sub> ≤ + 70 °C
RTDs; P <sub>i</sub> = 290 mW	T6 -60 °C ≤ T <sub>a</sub> ≤ + 60 °C
	T5 -60 °C ≤ T <sub>a</sub> ≤ + 70 °C

### Special Condition for Safe Use (X)

1. The equipment must be installed in an enclosure which affords it a degree of ingress protection of at least IP20.

### N1 ATEX Type n

**Certificate** BAS00ATEX3145

**Standards** EN 60079-0:2012+A11:2013, EN 60079-15:2010

**Markings** II 3 G Ex nA IIC T5 Gc (-40 °C ≤ T<sub>a</sub> ≤ + 70 °C)

### ND ATEX Dust

**Certificate** FM12ATEX0065X

**Standards** EN 60079-0:2012+A11:2013; EN 60079-31: 2014

**Markings** II 2 D Ex tb IIIC T130 °C Db (-40 °C ≤ T<sub>a</sub> ≤ + 70 °C)

See [Process temperature limits](#) for process temperatures.

### Special Conditions for Safe Use (X)

1. See certificate for ambient temperature range.

2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD display cover against impact energies greater than 4 joules.
4. Flameproof joints are not intended for repair.
5. A suitable certified Ex d or Ex tb enclosure is required to be connected to temperature probes with Enclosure option "N".
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of DIN Style Sensor probe does not exceed 130 °C.
7. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

## International

### E7 IECEx Flameproof

**Certificate** IECEx FMG 12.0022X

**Standards** IEC60079-0:2011, IEC60079-1:2014-06

**Markings** Ex db IIC T6...T1 Gb, T6(-50 °C ≤ T<sub>a</sub> ≤ + 40 °C), T5...T1(-50 °C ≤ T<sub>a</sub> ≤ + 60 °C)

See [Process temperature limits](#) for process temperatures.

### Special Conditions for Safe Use (X)

1. See certificate for ambient temperature range.
2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD display cover against impact energies greater than 4 joules.
4. Flameproof joints are not intended for repair.
5. A suitable certified Ex d or Ex tb enclosure is required to be connected to temperature probes with Enclosure option "N".
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of DIN Style Sensor probe does not exceed 130 °C.
7. Non-Standard Paint options may cause risk from electrostatic discharge. Avoid installations that cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

## Brazil

### E2 INMETRO Flameproof

**Certificate** UL-BR 13.0535X

**Standards** ABNT NBR IEC 60079-0: 20013; ABNT NBR IEC 60079-1: 2016; ABNT NBR IEC 60079-31:2014

**Markings** Ex db IIC T6...T1 \* Gb T6...T1 \*:(-50 °C ≤ T<sub>a</sub> ≤ + 40 °C), T5...T1 \*:(-50 °C ≤ T<sub>a</sub> ≤ + 60 °C) Ex tb IIIC T130 °C Db (-40 °C ≤ T<sub>a</sub> ≤ + 70 °C)

### Special Conditions for Safe Use (X)

1. See product description for ambient temperature limits and process temperature limits.
2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD display cover against impact energies greater than 4 joules.
4. Consult the manufacturer if dimensional information on the flameproof joints is necessary.

5. A suitable certified Ex d or Ex tb enclosure is required to be connected to temperature probes with Enclosure option “N”.
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of DIN Style Sensor probe does not exceed 130 °C.

## Japan

### E4 Japan Flameproof (0065 only)

**Certificate** CML 17JPN1316X

**Markings** Ex d IIC T6...T1 Gb; T6(-50 °C ≤ T<sub>a</sub> ≤ +40 °C); T5...T1(-50 °C ≤ T<sub>a</sub> ≤ 60 °C)

### Special Conditions for Safe Use (X)

1. Flameproof joints are not intended for repair.
2. Models with LCD display cover shall have the display cover protected from impact energies greater than 4 Joules.
3. The user shall ensure the external surface temperature of the equipment and the neck of the DIN Style probe does not exceed 130 °C.
4. Non-standard paint options may cause risk from electrostatic discharge.
5. The wiring used shall be suitable for temperatures over 80 °C.

## EAC – Belarus, Kazakhstan, Russia

### EM Technical Regulation Customs Union (EAC) Flameproof

**Markings** 1Ex db IIC T6...T1 Gb X

### Special Condition for Safe Use (X)

1. See certificate for special conditions.

### IM Technical Regulation Customs Union (EAC) Intrinsic Safety

**Markings** 0Ex ia IIC T5, T6 Ga X

### Special Condition for Safe Use (X)

1. See certificate for special conditions.

### KM Technical Regulation Customs Union (EAC) Intrinsic Safety

**Markings** Ex tb IIIC T 130 °C Db X plus EM and IM markings above

### Special Condition for Safe Use (X)

1. See certificate for special conditions.

## Korea

### EP Korea Explosionproof/Flameproof

**Certificate** 13-KB4BO-0560X

**Markings** Ex d IIC T6...T1; T6 (-50 °C ≤ T<sub>amb</sub> ≤ + 40 °C), T5...T1 (-50 °C ≤ T<sub>amb</sub> ≤ + 60 °C)

### Special Condition for Safe Use (X)

1. See certificate.

## Combinations

**KD** Combination of E1, E5, and E6

**K1** Combination of E1, I1, N1, and ND

**KM** Combination of EM and IM

**Table 3: Available Safety Approvals with Model Code Options**

Code	Description	Conduit entry	Approval code									
			I1	N1	E1	E2	ND	E7	E5	E4	E6	KD
C	Rosemount aluminum	M20 x 1.5	Y	Y	Y	Y	Y	Y	Y	Y	N	N
D	Rosemount aluminum	½-in. NPT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1	Rosemount aluminum with LCD display meter cover	M20 x 1.5	Y	Y	Y	Y	Y	Y	Y	Y	N	N
2	Rosemount aluminum with LCD display meter cover	½-in. NPT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Rosemount Stainless Steel with LCD display meter cover	M20 x 1.5	Y	Y	Y	Y	Y	Y	Y	Y	N	N
4	Rosemount Stainless Steel with LCD display meter cover	½-in. NPT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	No connection head	N/A	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
G	Rosemount stainless steel	M20 x 1.5	Y	Y	Y	Y	Y	Y	Y	Y	N	N
H	Rosemount stainless steel	½-in. NPT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
J	GR-A/BL (BUZ) aluminum with cable gland	M20 x 1.5	Y	N	N	N	N	N	N	N	N	N
L	BL (BUZH) aluminum with cable gland	M20 x 1.5	Y	N	N	N	N	N	N	N	N	N
7	Aluminum dual entry head	2 x ¾-in. NPT	Y	N	Y	N	N	N	N	N	N	N
8	Aluminum dual entry head	2 x M20 x 1.5	Y	N	Y	N	N	N	N	N	N	N
9	Aluminum dual entry head	2 x ½-in. NPT	Y	N	Y	N	N	N	N	N	N	N
K	Stainless steel dual entry head	2 x ¾-in. NPT	Y	N	Y	N	N	N	N	N	N	N
R	Stainless steel dual entry head	2 x M20 x 1.5	Y	N	Y	N	N	N	N	N	N	N
W	Stainless steel dual entry head	2 x ½-in. NPT	Y	N	Y	N	N	N	N	N	N	N
A	TZ-A/BL (BUZH) aluminum coated	M20 x 1.5	Y	N	N	N	N	N	N	N	N	N
P	SD-BK	M20 x 1.5	Y	N	N	N	N	N	N	N	N	N
Z	ZW-BL	M20 x 1.5	Y	N	N	N	N	N	N	N	N	N
G1	External ground screw	N/A	Y	N	Y	N	N	N	Y	N	Y	N

**Table 3: Available Safety Approvals with Model Code Options (continued)**

Code	Description	Conduit entry	Approval code									
			I1	N1	E1	E2	ND	E7	E5	E4	E6	KD
G6	Aluminum extension ring for dual transmitter mounting	N/A	Y	N	Y	N	N	N	N	N	N	N

**Note**

Refer to [Table 3](#) to determine which approvals are available with each connection head option code.

## Process temperature limits

**Table 4: Sensor Only**

Extension length	Process temperature (°C)						
	Gas						Dust
	T6	T5	T4	T3	T2	T1	T130 °C
Any extension length	85	100	135	200	300	450	130

**Table 5: Transmitter**

Extension length	Process temperature (°C)						
	Gas						Dust
	T6	T5	T4	T3	T2	T1	T130 °C
No extension	55	70	100	170	280	440	100
3-in. extension	55	70	110	190	300	450	110
6-in extension	60	70	120	200	300	450	110
9-in extension	65	75	130	200	300	450	120

Adhering to the process temperature limitations of [Table 6](#) will ensure that the service temperature limitations of the LCD display cover are not exceeded. Process temperatures may exceed the limits defined in [Table 6](#) if the temperature of the LCD display cover is verified to not exceed the service temperatures in [Table 7](#) and the process temperatures do not exceed the values specified in [Table 5](#).

**Table 6: Transmitter with LCD Display Cover - Process Temperature (°C)**

Extension length	Process temperature (°C)			
	Gas			Dust
	T6	T5	T4...T1	T130 °C
No extension	55	70	95	95
3-in. extension	55	70	100	100
6-in extension	60	70	100	100
9-in extension	65	75	110	110

**Table 7: Transmitter with LCD Display Cover - Service Temperature (°C)**

Extension length	Service temperature (°C)			
	Gas			Dust
	T6	T5	T4...T1	T130 °C
	65	75	95	95

## Sensor-to-transmitter matching

Significant measurement accuracy improvements can be attained using a temperature sensor that is matched to a temperature transmitter. This process involves identifying the relationship between resistance and temperature for a specific RTD sensor. This relationship, approximated by the Callendar-Van Dusen equation, is described as:

$$R_t = R_o + R_o \alpha [t - \delta(0.01t - 1)(0.01t) - \beta(0.01t - 1)(0.01t)^3],$$

where:

$R_t$  = Resistance (ohms) at temperature  $t$  ( $^{\circ}$ C)

$R_o$  = Sensor-specific constant (resistance at  $t = 0$   $^{\circ}$ C)

$\alpha$  = Sensor-specific constant

$\delta$  = Sensor-specific constant

$\beta$  = Sensor-specific constant (0 at  $t > 0$   $^{\circ}$ C)

The exact values for the Callendar-Van Dusen constants ( $R_o, \alpha, \delta, \beta$ ) are specific to each RTD sensor and are established by testing each individual sensor at various temperatures.

Series 65 RTD sensors can be ordered with the Calibration Option codes V10 or V11, where the values of all four sensor-specific constants are supplied with each sensor.

The transmitter uses the Callendar-Van Dusen constants to generate a sensor curve that describes the relationship between resistance and temperature for this particular sensor and transmitter assembly. By using the sensor's actual resistance vs. temperature curve, there is a 3- or 4-fold improvement in temperature measurement accuracy for the total system.

Options V10 and V11 are specific to a particular temperature range. As with calibration schedules, the accuracies associated with each option code represent worst-case conditions when the sensor is used over the entire temperature range. The accuracy of Series 65 sensors with the "V" option will vary because they have different hysteresis and repeatability characteristics. To ensure optimal performance, select a "V" option where the sensor's range of actual operation is between the minimum and maximum calibration points. For applications requiring the use of a Resistance vs. Temperature Table, order a temperature range-specific characterization schedule.

## IEC 751 interpretation

The Callendar-Van Dusen equation is one method of describing the resistance versus temperature ( $R$  vs.  $T$ ) relationship for platinum RTDs. International standard IEC 751 interprets the  $R$  vs.  $T$  relationship using an approach similar to the Callendar-Van Dusen methodology. The IEC 751  $R$  vs.  $T$  relationship standard uses the following equation:

$$R_t = R_o[1 + At + Bt^2 + C(t - 100)t^3]$$

As in the Callendar-Van Dusen method,  $R_o, A, B, C$  are specific to each RTD and are established by testing each sensor at various temperatures. The actual values for  $A, B$ , and  $C$  differ in magnitude from the Callendar-Van Dusen constants ( $R_o, \alpha, \beta, \delta$ ), while  $R_o$  is the same in both equations. Either methodology yields the same result in any sensor-to-transmitter matching scenario, since one equation is a simple mathematical interpretation of the other.

## Typical sensor-to-transmitter matching accuracy improvements

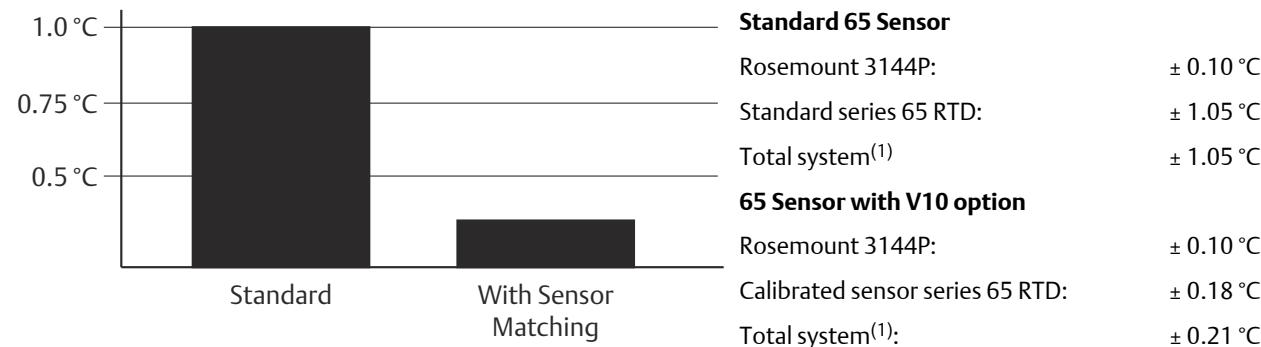
Transmitter: Rosemount 3144P (has built-in sensor matching capabilities), span of 0 to 200 °C, accuracy = 0.1 °C

Sensor: Series 65 RTD

Callendar-Van Dusen option: V10

Process temperature: 150 °C

**Figure 6: System Uncertainty Comparison at 150 °C**



(1) Calculated using RSS statistical method:

$$\text{System Accuracy} = \sqrt{(\text{Transmitter Accuracy})^2 + (\text{Sensor Accuracy})^2}$$

## Calibration

Sensor calibration may be required for input to quality systems, or for control system enhancement. More frequently, it is used to improve the overall temperature measurement performance by matching the sensor to a temperature transmitter. Sensor matching is available for RTD sensors used with Rosemount Smart transmitters where the inherent stability and repeatability of the RTD technology is well established.

### Ordering information

Use the formats presented below to order a calibrated series 65 RTD. If you fail to specify all of the necessary calibration-related information when you place your order, Emerson will contact you for the information and your order may be delayed slightly.

### Measurement instrument directive parts certification

The Rosemount 3144P Temperature Transmitter and Rosemount 0065 Temperature Sensor have been certified to meet the European Union measurement instrument directive (MID) for custody transfer metering of liquids and gases.<sup>(2)</sup> Choosing Rosemount temperature for a MID solution ensures that critical temperature measurement equipment will meet high expectations for unmatched system accuracy and reliability. For more information, contact your local Emerson Representative.

### Calibration options

The X8 option calibrates the sensor to a customer-specific temperature range. The Callendar-Van Dusen, and A, B, and C-constants are supplied with a works certificate.

#### Option X8: sensor calibrated to a customer-specified temperature range (see [Temperature range](#))

When you order an RTD with the X8 option, the temperature range the sensor needs to be calibrated must be specified. Take note of the sensor temperature limits as shown below:

(2) Calculated using RSS statistical method:

$$\text{System Accuracy} = \sqrt{(\text{Transmitter Accuracy})^2 + (\text{Sensor Accuracy})^2}$$

**Table 8: Typical Model Number**

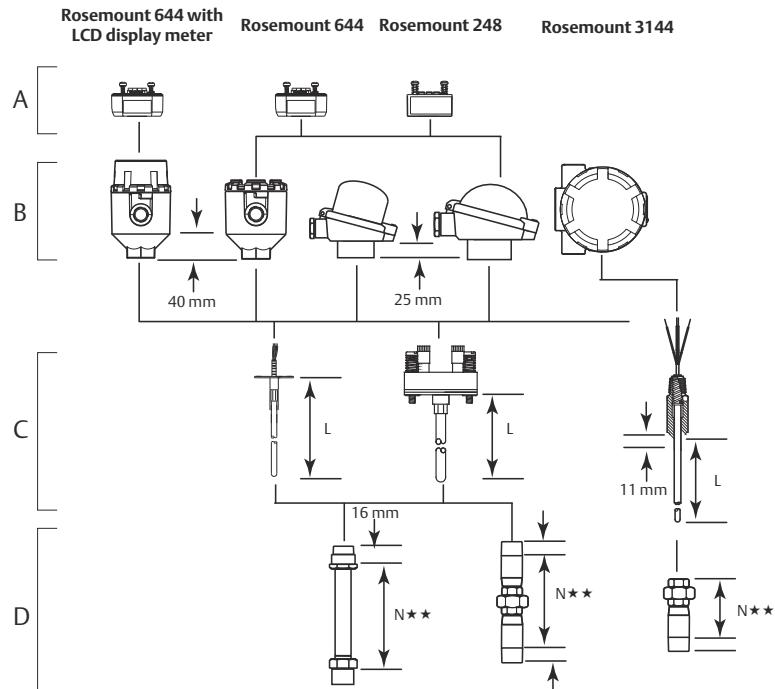
Model	Connection head	Lead wire termination	Sensor type	Extension type
0065	C	2	1	D
Extension length	Thermowell material	Immersion length	Mounting style	Additional options
0135	D	0225	T12	X8

**Note**

Calibrate from -10 to 120 °C.

**Table 9: Option V: Sensor Calibration with Works Certificate**

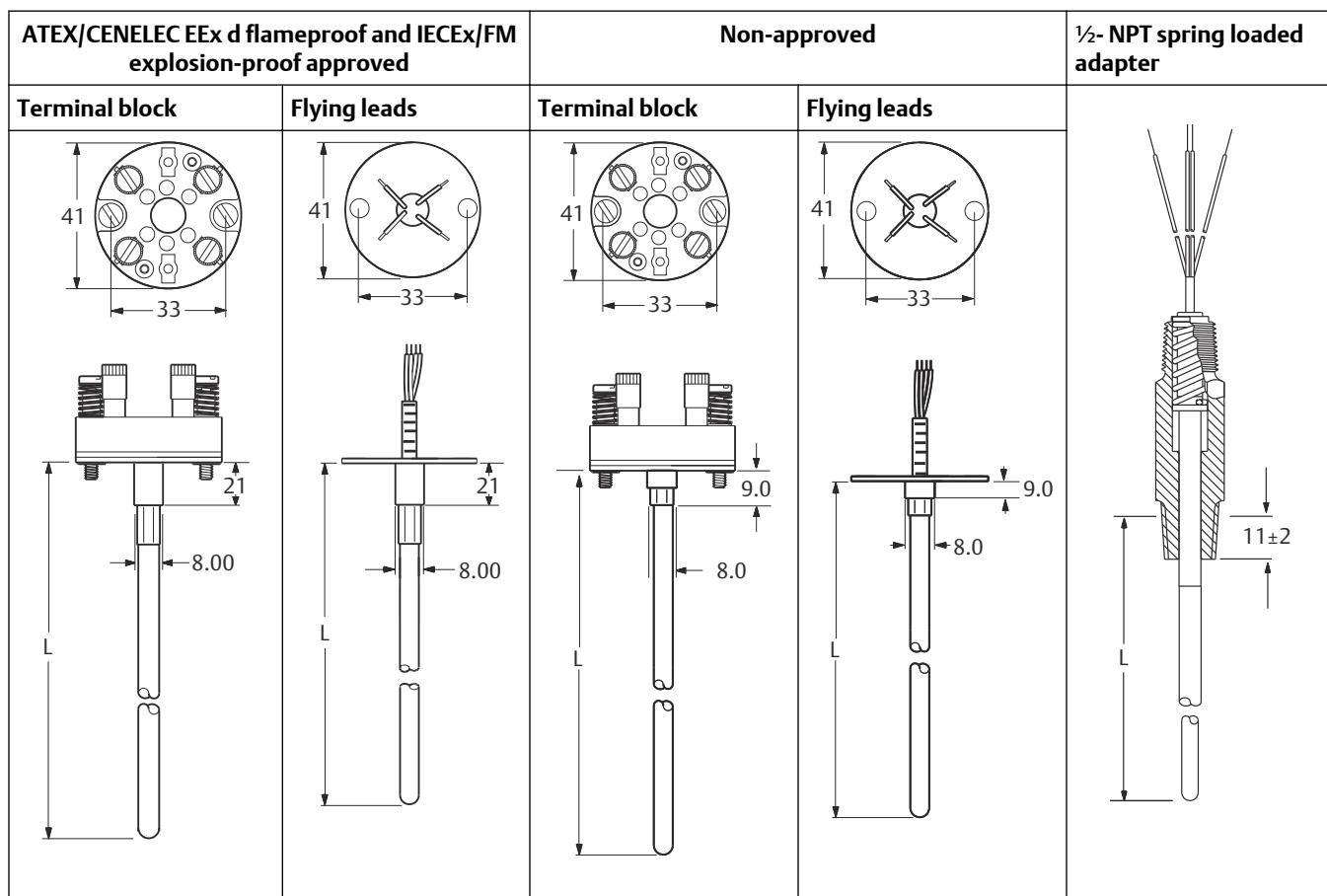
	V10	V11	V16
Temperature range (°C)	-50 to +450	0 to +100	-50 to +100
Calibration points (°C)	-50 0 +100 +450	0 +50 +100	-50 0 +50 +100

**Figure 7: Sensor Assembly Without Thermowell**

- A. Head or field mount transmitters
- B. IP68 or IP65 connection heads
- C. Sensor with flying leads, terminal block, or spring-loaded adapter
- D. Extensions

N★★ dimensions measures from thread engagement point

Figure 8: Series 65 RTD and Series 185 Thermocouple Dimensional Drawings

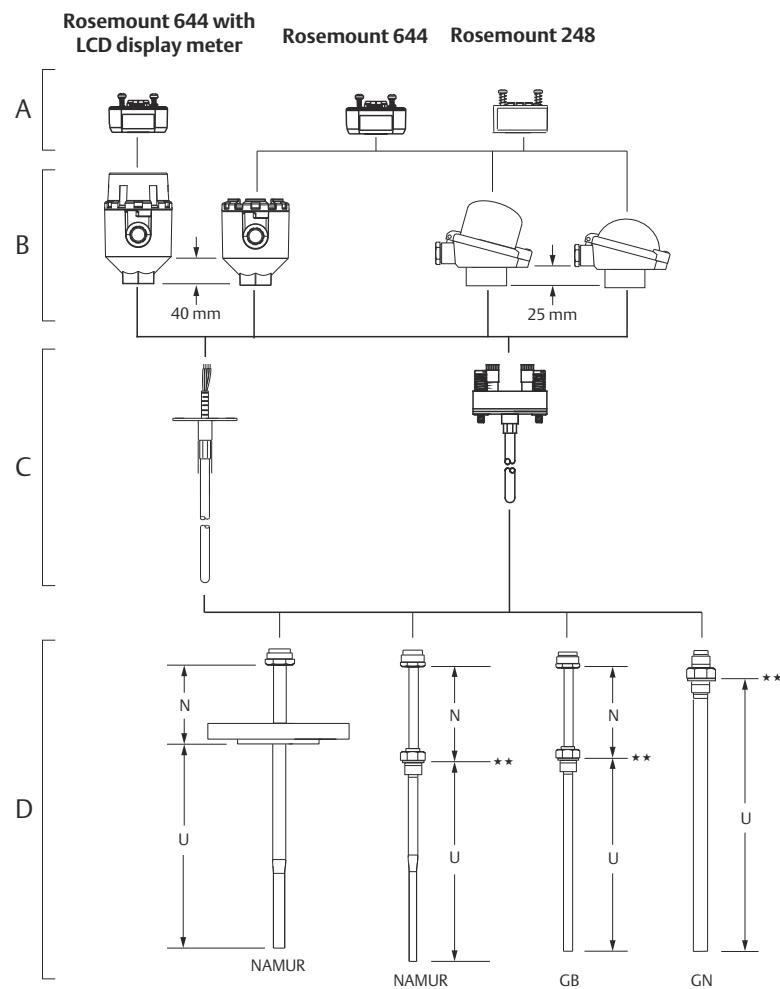


Dimensions are in millimeters.

Table 10: Additional Dimensions for Series 65 RTD and Series 185 Thermocouple

Series	Sensor diameter	Number of leads	Lead wire length (flying leads)		Lead wire length (spring loaded)	
			Element 1	Element 2	Element 1	Element 2
65 single element	6.0	4	150	N/A	150	N/A
65 dual element	6.0	6	150	200	150	200
185 single element	6.0	2	100	N/A	150	N/A
185 dual element	6.0	4	100	200	150	200

Figure 9: Tubular Thermowell Sensor Assemblies



- A. Head or field mount transmitter
- B. IP68 or IP65 connection heads
- C. Sensor with flying leads or terminal block
- D. Threaded and flanged tubular thermowells

★★ For straight threading, N dimension reference bottom of hex. For tapered threading, N dimension reference thread engagement point (bottom of thread).

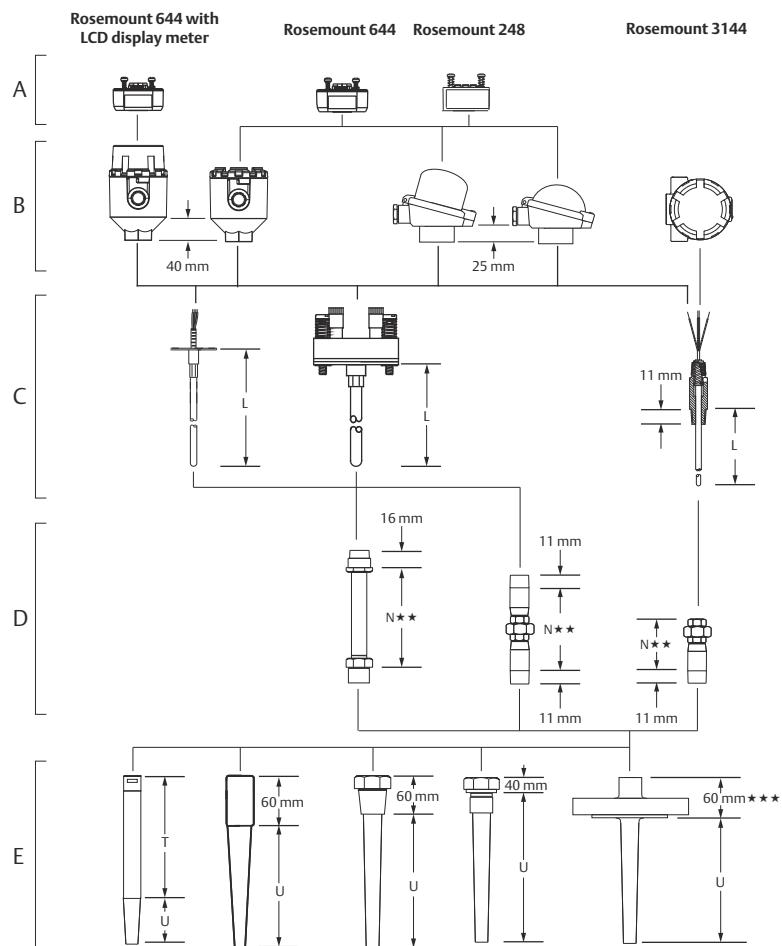
Table 11: Tubular Thermowell Ratings

Type	Dimensions	Process connection	Max. flow velocity (m/s)		Immersion length (mm)	Max. pressure (bar)	At temperature (°C)			
			Air	Water			At 0 °C	100	200	300
GN GB	9 x 1 mm 1.4571 (316 Ti)	Screw socket G $\frac{1}{2}$	25	3	160	50	48	44	40	36
					250	40	40	40	40	36
					400	18	18	18	18	18
GN	11 x 2 mm 1.4571 (316 Ti)	Screw socket G1	40	5	160	100	95	92	88	80
					250	50	50	50	50	50
					400	18	18	18	18	18

Table 11: Tubular Thermowell Ratings (continued)

Type	Dimensions	Process connection	Max. flow velocity (m/s)		Immersion length (mm)	Max. pressure (bar)	At temperature (°C)			
			Air	Water			At 0 °C	100	200	300
NAMUR	12 x 2.5 mm 1.4571 (316 Ti)	Screw socket G1	40	5	160	100	100	100	100	100
					220	100	100	100	78	78
					280	100	100	100	55	55

Figure 10: Barstock Thermowell Sensor Assemblies



- A. Head or field mount transmitter
- B. IP65 or IP65 connection heads
- C. Sensor with flying leads, terminal block, or spring-loaded adapter
- D. Stand-alone extensions
- E. Weld-in, threaded, or flanged barstock thermowells

★★ N dimension measures from thread engagement point.

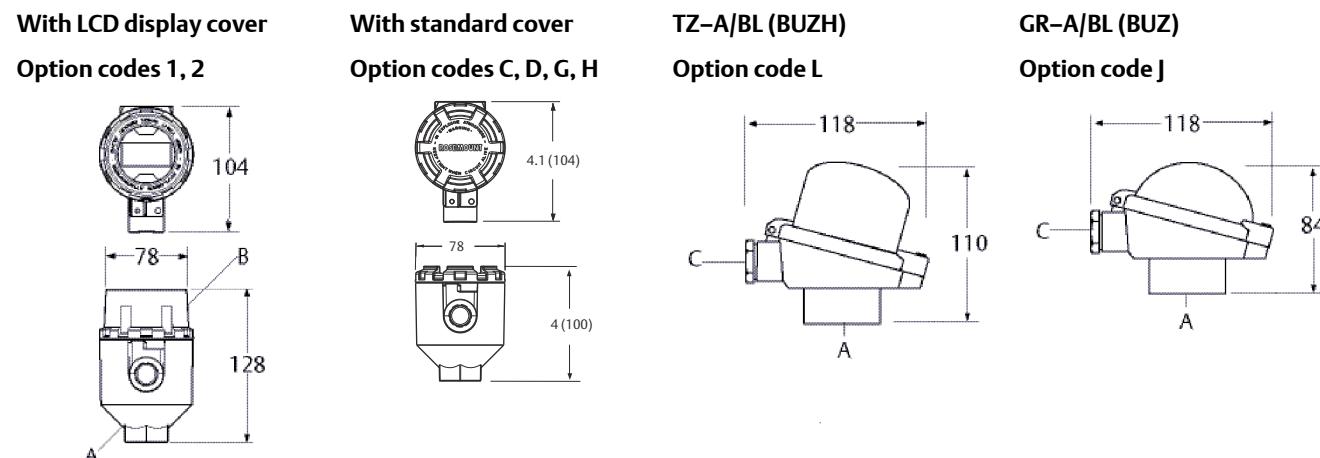
★★★ This dimension is 80 mm for Class 1500 and Class 2500 flanges

# Accessories

**Table 12: Connection Head**

Part number	Model/material	IP rating	Conduit connection	Process connection
00644-4410-0011	Rosemount aluminum	66/68	1/2-in. NPT	1/2-in. NPT
00644-4410-0013	Rosemount aluminum	66/68	1/2-in. NPT	M24 x 1.5
00644-4410-0021	Rosemount aluminum	66/68	M20 x 1.5	1/2-in. NPT
00644-4410-0023	Rosemount aluminum	66/68	M20 x 1.5	M24 x 1.5
00644-4410-0111	Rosemount aluminum with LCD display cover	66/68	1/2-in. NPT	1/2-in. NPT
00644-4410-0113	Rosemount aluminum with LCD display cover	66/68	1/2-in. NPT	M24 x 1.5
00644-4410-0121	Rosemount aluminum with LCD display cover	66/68	M20 x 1.5	1/2-in. NPT
00644-4410-0123	Rosemount aluminum with LCD display cover	66/68	M20 x 1.5	M24 x 1.5
00644-4411-0011	Rosemount stainless steel	66/68	1/2-in. NPT	1/2-in. NPT
00644-4411-0013	Rosemount stainless steel	66/68	1/2-in. NPT	M24 x 1.5
00644-4411-0021	Rosemount stainless steel	66/68	M20 x 1.5	1/2-in. NPT
00644-4411-0023	Rosemount stainless steel	66/68	M20 x 1.5	M24 x 1.5
00644-4196-0023	GR-A/BL (BUZ), aluminum	65	M20 x 1.5	M24 x 1.5
00644-4197-0023	TZ-A/BL (BUZH), aluminum	65	M20 x 1.5	M24 x 1.5

**Figure 11: Connection Head Dimensional Drawing**

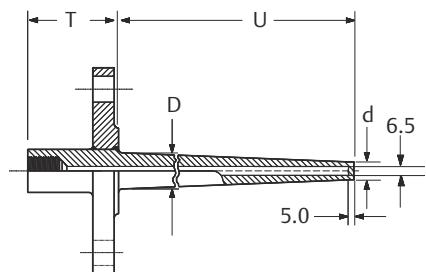


- A. Head connection
- B. LCD display
- C. Cable entry

Dimensions are in millimeters.

## Series 96 Barstock Thermowells

Figure 12: Flanged Barstock Thermowell – Tapered



**U** Immersion length  
**D** Stem diameter  
**T** Lagging length

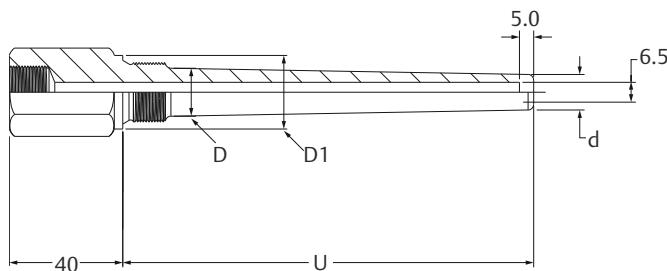
Dimensions are in millimeters.

Flange size	D	d	T
1-in. 150–1500 lb, DN 25	19	12.5	60
1½ to 2-in. 150–600 lb, DN40–50	26.5	18	60
1.5 to 2-in. 900/1500	26.5	18	80

### Note

Flanged thermowells generally conform to the specifications of ASME B 16.5 (ANSI) and DIN EN 1092-1.

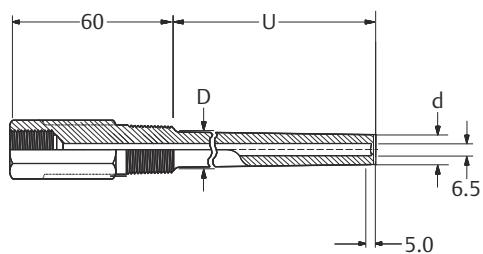
Figure 13: Threaded Barstock Thermowell – Parallel Thread



**U** Immersion length  
**D** Stem diameter

Dimensions are in millimeters.

Parallel thread size	D	D1	d
½-in. BSPF (G 1/2); M20 × 1.5	17	26	12.5
¾-in. BSPF (G 3/4)	19	32	12.5
1-in. BSPF (G1)	26.5	39	18
M24 × 1.5	19	29	12.5

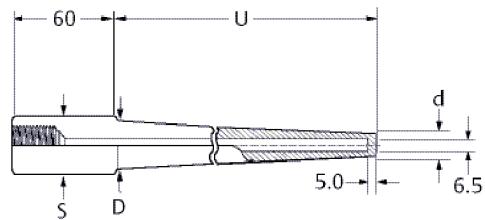
**Figure 14: Threaded Barstock Thermowell – Tapered Thread**

**U** Immersion length

**D** Stem diameter

Dimensions are in millimeters.

Tapered thread size	D	d
1/2-in. NPT; M20 x 1.5	17	12.5
3/4-in. NPT	19	12.5
1-in. NPT	26.5	18

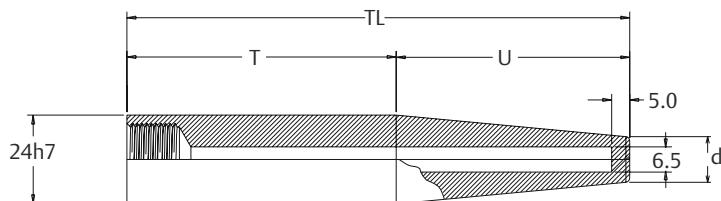
**Figure 15: Weld-In Barstock Thermowell (Codes W10, W12, W14, W16)**

**U** Immersion length

**D** Stem diameter

Dimensions are in millimeters.

Socket size	S	D	d
3/4-in.	26.7	19.0	12.5
1-in.	33.4	19.0	12.5
1 1/4-in.	42.2	19.0	12.5
1 1/2-in.	48.3	19.0	12.5

**Figure 16: Weld-in Barstock Thermowell (Codes E01, E02, E04, E05)**

**U** Immersion length

**TL** Total length

**T** Lagging length

Dimensions are in millimeters.

Previous DIN form	D1	D2	D4	D5	d
TL	140	200	200	260	12.5
U	65	125	65	125	12.5
T	75	75	135	135	12.5

## Wake frequency calculation

### Pressure and flow vibration

The strength of a thermowell depends on several parameters relating thermowell construction to the installation environment. For most industrial applications, standard Rosemount thermowells provide the necessary strength if the material, style, and length are correct for the application. The proper selection of a thermowell depends on fluid type, temperature, pressure, and fluid velocity. Most thermowell failures are caused by vibration that is induced by fluid flow.

Emerson has a design system for the correct selection of thermowells. This selection service is available for a nominal charge, and to take advantage of this service, complete and return the Configuration Data Sheet to your local Emerson representative.



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