Product Data Sheet
00813-0200-2654, Rev HC
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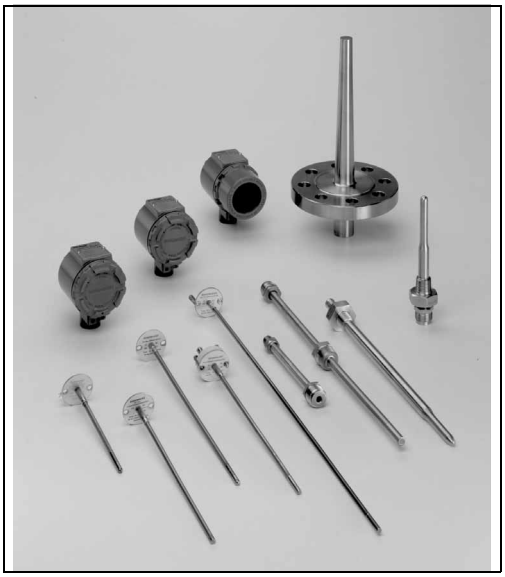
Rosemount DIN-Style Temperature Sensors and Thermowells (Metric)

- *RTDs (0065) and Thermocouples (0185) available to meet any process requirement*
- *DIN-style for easy installation and replacement*
- *Integrated temperature assembly with 3144P, 644, or 248 available*



Content

Rosemount DIN-Style Temperature Sensor and Thermowells

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, 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
- Tubular thermowell designs offers faster response time

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

Explore the benefits of a Complete Point Solution from Rosemount Temperature Measurement

- 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 product 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.

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:

- 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 (Option Codes I1, N1, E1, ND, E5, E7)
- Calibration services to give you insight to sensor performance (Option Codes V10, V11)
- MID calibration for custody transfer (Option Codes MD1, MD2, MD3)
- Assemble to Transmitter option (Option Code XA)

Table 1. Series 65 Platinum RTD and 185 Thermocouple Without Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Model		Product Description			
0065		Resistance Thermometer, Pt 100 Ohm RTD Standard without Thermowell			
0185		Thermocouples, DIN EN 60584 (IEC 584), Class 1, suitable for transmitter mounting			
Connection Head			**IP Rating(1)**	**Connection Thread**	
Standard					**Standard**
C		Rosemount Aluminum	68	M20 x 1.5	★
D		Rosemount Aluminum	68	1/2-in. NPT	★
1		Rosemount Aluminum with LCD Meter cover	68	M20 x 1.5	★
2		Rosemount Aluminum with LCD Meter cover	68	1/2-in. NPT	★
N		No Connection head			★
Expanded					
G		Rosemount Stainless steel	68	M20 x 1.5	
H		Rosemount Stainless steel	68	1/2-in. NPT	
J		GR–A/BL (BUZ) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
L		TZ–A/BL (BUZH) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination					
Standard					**Standard**
0		Flying leads – No springs on DIN plate			★
2		Terminal block – DIN 43762			★
3		Spring loaded adapter – 1/2-in. NPT			★
Sensor Type			**Temperature Range**		
Standard					**Standard**
65 Only	1	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 600 °C (–321 to 1112 °F)		★
	4	RTD, Dual Element, 3-wire	–196 to 600 °C (–321 to 1112 °F)		★

Sensors and Thermowells (Metric)

Table 1. Series 65 Platinum RTD and 185 Thermocouple Without Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

185 Only	03J1	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)	★
Expanded				
	03N1	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		**Head Connection**	**Instrument Connection**	**Material**	
Standard					**Standard**
D	DIN Standard 12 x 1.5	M24 x 1.5	1/2-in NPT	Stainless Steel	★
T	DIN Standard 12 x 1.5	M24 x 1.5	M18 x 1.5	Stainless Steel	★
F	Nipple Union Nipple	1/2-in NPT	1/2-in NPT	Stainless Steel	★
J	Nipple Union (M/F)	no head	1/2-in NPT	Stainless Steel	★
N	No Extension (use when ordering the sensor alone, only available with Extension Length (N) code 0000)				★
W	No Extension Head Connection M24 x 1.5				★
L	No Extension Head Connection 1/2-in. NPT				★

Extension Length (N) in Millimeters		
Standard		**Standard**
0000	No extension – use with Extension Type code N	★
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	★
Expanded		
XXXX	Non-standard extension length – available from 35 to 500 mm	

Thermowell Material		
Standard		**Standard**
N	No thermowell	★

Sensor Length (L) in Millimeters		
Standard		**Standard**
0145	145 mm	★
0205	205 mm	★
0275	275 mm	★
0315	315 mm	★
0375	375 mm	★
0405	405 mm	★
0435	435 mm	★
0555	555 mm	★
Expanded		
XXXX	Non-standard sensor length – available from min. 100 mm, max. 9999 mm	

Options (Include with selected model number)

Sensor Options (available with 65 only)		
Standard		**Standard**
A1	Single Element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7,9,0)	★
A2	Dual element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7,9,0)	★
Product Certifications		
Standard		**Standard**
I1	EEx ia – ATEX/IBExU Intrinsic Safety Approval	★

Table 1. Series 65 Platinum RTD and 185 Thermocouple Without Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

N1[2][3]	EEx n – ATEX/CENELEC Type n Approval	★
E1[3]	EEx d – ATEX/CENELEC Flameproof Approval	★
ND[3]	ATEX Dust Ignition-proof Approval	★
E7[3]	IECEx Flameproof Approval	★
E5[3]	FM Explosion-proof Approval	★
Ground Screw		
Standard		**Standard**
G1	External ground screw – only available with Rosemount Connection Head Material codes C, D, G, H, 1, and 2	★
Cover Chain Option		
Standard		**Standard**
G3	Cover Chain – only available with Rosemount Connection Head Material codes C, D, G, and H.	★
Extension Ring		
Standard		**Standard**
G6[4]	Aluminum Extension Ring for Dual Transmitter Mounting – use with Rosemount Connection Head Material Codes C and D.	★
Termination		
Standard		**Standard**
TB	Terminal Block for use with sensor termination code 3 and Rosemount Heads C, D, G, and H	★
Assemble To Option		
Standard		**Standard**
XA[5]	Assemble Sensor to Specific Temperature Transmitter (PTFE paste)	★
V Options (available with 65 only)		
Standard		**Standard**
V10	Works Certificate – Sensor Calibration from –50 to 450 °C (–58 to 842 °F) with A, B, C, and Callendar-Van Dusen Constants	★
V11	Works Certificate – Sensor Calibration from 0 to 100 °C (–32 to 212 °F) with A, B, C, and Callendar-Van Dusen Constants	★
VS System Calibration		
Standard		**Standard**
MD1	MID Custody Transfer (-196 °C to 0 °C)	★
MD2	MID Custody Transfer (-50 °C to 100 °C)	★
MD3	MID Custody Transfer (50 °C to 200 °C)	★
Temperature Range (available with 65 only)		
Standard		**Standard**
X8	Works Certificate – Sensor Calibration Over Specified Temperature Range with A, B, C, and Callendar-Van Dusen Constants	★
Temperature Range Option		
Standard		**Standard**
LT	Special materials to meet extended temperature range of -51 °C	★
Typical Model Number: 0065 C 2 3 D 0150 N 0315 A1		

(1) To maintain IP 68 rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

(2) For complete assemblies or as replacement sensor for N-series, component parts are not approved. If the transmitter is mounted in a connection head, the Sensor Lead Wire Termination code 0 (flying leads) is required.

(3) Not available with Connection Head Material Codes J and L.

(4) Not valid with E5, E7, ND, or E1 Approval.

(5) If ordering Assemble To Option XA with a transmitter, specify the same option on the transmitter model number.

Table 2. Series 65 Platinum RTD and 185 Thermocouple With Tubular Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Model		Product Description			
0065		Resistance Thermometer, Pt 100 Ohm RTD Standard with Tubular Thermowell			
0185		Thermocouples, DIN EN 60584 (IEC 584) Class 1 with Tubular Thermowell			
Connection Head			**IP Rating(1)**	**Conduit / Cable Entry**	
Standard					**Standard**
C		Rosemount Aluminum	68	M20 x 1.5	★
D		Rosemount Aluminum	68	1/2-in. NPT	★
1		Rosemount Aluminum with LCD Meter Cover	68	M20 x 1.5	★
2		Rosemount Aluminum with LCD Meter Cover	68	1/2-in. NPT	★
N		No Connection Head			
Expanded					
G		Rosemount Stainless Steel	68	M20 x 1.5	
H		Rosemount Stainless Steel	68	1/2-in. NPT	
J		GR –A/BL (BUZ) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
L		TZ–A/BL (BUZH) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination					
Standard					**Standard**
0		Flying Leads – No Springs on DIN plate			★
2		Terminal block – DIN 43762			★
3		Spring Loaded Adapter - 1/2-in. NPT (available with 185 only)			★
Sensor Type				**Temperature Range –valid for tolerance Class B Pt 100 only**	
Standard					**Standard**
65 Only	1	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 600 °C (–321 to 1112 °F)	★
	4	RTD, Dual Element, 3-wire		–196 to 600 °C (–321 to 1112 °F)	★
185 Only	03J1	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)	★
Expanded					
	03N1	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					
Standard					**Standard**
Y		Tubular, no Extension – form GN			★
Z		Tubular, with Extension – form GB, NAMUR, GC, FC			★
Extension Length (N) in Millimeters					
Standard					**Standard**
0000		No extension – use with Extension Type code Y			★
0050		50 mm			★
0065		65 mm			★
0105		105 mm			★
0115		115 mm			★
0130		130 mm			★
0200		200 mm			★
0250		250 mm			★
Expanded					
XXXX		Non-standard extension length – available from 35 to 500 mm			

Table 2. Series 65 Platinum RTD and 185 Thermocouple With Tubular Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Thermowell Material				
Standard				**Standard**
D[2]	1.4404 (AISI 316L)			★
Y	1.4571 (AISI 316Ti)			★
Immersion Length (U) in Millimeters				
Standard				**Standard**
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			★
Expanded				
XXXX	Non-standard Immersion Length – available from 50 to 2500 mm			
Mounting Style		**Process Connections**	**Stem Style**	
Standard				**Standard**
G02	Thread, Tapered	R 1/2-in. (1/2-in. BSPT)	Stepped, NAMUR[3]	★
G04	Thread, Tapered	R 3/4-in. (3/4-in.BSPT)	Stepped, NAMUR[3]	★
G06	Thread, Tapered	R 1-in. (1-in. BSPT)	Stepped, NAMUR[3]	★
G13	Thread, Parallel	M27 x 2	Stepped, NAMUR[3]	★
G20	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Stepped, NAMUR[3]	★
G22	Thread, Parallel	G 3/4-in. (3/4-in.BSPF)	Stepped, NAMUR[3]	★
G24	Thread, Parallel	G 1-in. (1-in. BSPF)	Stepped, NAMUR[3]	★
G91	Thread, Parallel	M20 x 1.5	Stepped, NAMUR[3]	★
G31	Thread, Parallel	M33 x 2	Stepped, NAMUR[3]	★
G38	Thread, Tapered	1/2-in. NPT	Stepped, NAMUR[3]	★
G40	Thread, Tapered	3/4-in. NPT	Stepped, NAMUR[3]	★
G42	Thread, Tapered	1-in. NPT	Stepped, NAMUR[3]	★
G52	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Straight, GN, D. 9 x 1 mm[4]	★
G92	Thread, Parallel	M20 x 1.5	Straight, GN, D. 9 x 1 mm[4]	★
G63	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Straight, GN, D. 11 x 2 mm[4]	★
G94	Thread, Parallel	M20 x 1.5	Straight, GN, D. 11 x 2 mm[4]	★
G72	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Straight, GB, D. 9 x 1 mm[4]	★
G95	Thread, Parallel	M20 x 1.5	Straight, GB, D. 9 x 1 mm[4]	★
L02	Flange, RF	1-in. 150 lbs	Stepped, NAMUR[3]	★
L08	Flange, RF	1.5-in. 150 lbs	Stepped, NAMUR[3]	★
L14	Flange, RF	2-in. 150 lbs	Stepped, NAMUR[3]	★
L20	Flange, RF	1-in. 300 lbs	Stepped, NAMUR[3]	★
L26	Flange, RF	1.5-in. 300 lbs	Stepped, NAMUR[3]	★
L32	Flange, RF	2-in. 300 lbs	Stepped, NAMUR[3]	★
H02	Flange, Form B1 according to EN 1092-1	DN 25 PN 16	Stepped, NAMUR[3]	★

Table 2. Series 65 Platinum RTD and 185 Thermocouple With Tubular Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

H08	Flange, Form B1 according to EN 1092-1	DN 25 PN 25/40	Stepped, NAMUR[3]	★
H14	Flange, Form B1 according to EN 1092-1	DN 40 PN 16	Stepped, NAMUR[3]	★
H20	Flange, Form B1 according to EN 1092-1	DN 40 PN 25/40	Stepped, NAMUR[3]	★
H26	Flange, Form B1 according to EN 1092-1	DN 50 PN 40	Stepped, NAMUR[3]	★

Options (Include with selected model number)

Sensor Options (available with 65 only)		
Standard		**Standard**
A1	Single Element Class A Sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
A2	Dual Element Class A Sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
Product Certifications		
Standard		**Standard**
I1	EEx ia – ATEX / IBExU Intrinsic Safety Approval	★
N1[5][6]	EEx n – ATEX/CENELEC Type n Approval	★
E1[6]	EEx d – ATEX/CENELEC Flameproof Approval	★
ND[6]	ATEX Dust Ignition-proof	★
E7[6]	IECEx Flameproof Approval	★
E5[6]	FM Explosion-proof Approval (consult factory for availability)	★
Ground Screw		
Standard		**Standard**
G1	External ground screws – only available with Rosemount Connection Head Material codes C, D, G, H, 1, and 2	★
Cover Chain Option		
Standard		**Standard**
G3	Cover Chain – only available with Rosemount Connection Head Material codes C, D, G, and H.	★
Extension Ring		
Standard		**Standard**
G6[7]	Aluminum Extension Ring for Dual Transmitter Mounting – use with Rosemount Connection Head Material Codes C and D.	★
Material Certification		
Standard		**Standard**
Q8	Thermowell Material Certification	★
External Pressure Test		
Standard		**Standard**
R01[8]	Thermowell External Pressure Testing	★
Dye Test		
Standard		**Standard**
R03	Thermowell Dye Penetration Testing	★
Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
Assemble To Options		
Standard		**Standard**
XA[9]	Assemble Sensor to Specific Temperature Transmitter (PTFE paste)	★
V Options (available with 65 only)		
Standard		**Standard**
V10	Works Certificate – Sensor Calibration from –50 to 450 °C (–58 to 842 °F) with A, B, C, and Callendar-Van Dusen Constants	★
V11	Works Certificate – Sensor Calibration from 0 to 100 °C (–32 to 212 °F) with A, B, C, and Callendar-Van Dusen Constants	★
Temperature Range (available with 65 only)		
Standard		**Standard**
X8	Works Certificate – Sensor Calibration Over Specified Temperature Range with A, B, C, and Callendar-Van Dusen Constants	★

Table 2. Series 65 Platinum RTD and 185 Thermocouple With Tubular Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Temperature Range Option		
Standard		**Standard**
LT	Special Materials to meet extended Temperature range of -51 °C	★
Typical Model Number: 0065 L 2 1 Z 0115 Y 0375 G20 XA		

(1) To maintain IP 68 rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.
(2) Process thread or process flange to be 316L material with a stem material of 316Ti. Not NAMUR compliant.
(3) NAMUR compliance only applicable with 316Ti material code "Y". Minimum immersion length of 115 mm. For u < 115 mm, use straight thermowell, 8 mm Diameter.
(4) Not available with Thermowell Material code D.
(5) For complete assemblies or as replacement sensor for type N-series, component parts are not approved. If the transmitter is mounted in a connection head, the Sensor Lead Wire Termination code 0 (flying leads) is requested.
(6) Not available with Connection Head Material codes J and L.
(7) Not valid with E5, E7, ND, or E1 Approval.
(8) Not available with welded connection.
(9) If ordering Assemble To Option XA with a transmitter, specify the same option on the transmitter model number.

Table 3. Series 65 Platinum RTD and 185 Thermocouple With Barstock Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Model	Product Description			
0065	Resistance Thermometer, Pt 100 Ohm Standard with Barstock Thermowell			
0185	Thermocouples, DIN EN 60584 (IEC 584) Class 1 with Barstock Thermowell			
Connection Head Material		**IP Rating(1)**	**Conduit / Cable Entry**	
Standard				**Standard**
C	Rosemount Aluminum	68	M20 x 1.5	★
D	Rosemount Aluminum	68	1/2-in. NPT (cable entry)	★
1	Rosemount Aluminum with LCD Meter Cover	68	M20 x 1.5	★
2	Rosemount Aluminum with LCD Meter Cover	68	1/2-in. NPT	★
N	No Connection head			★
Expanded				
G	Rosemount Stainless Steel	68	M20 x 1.5 (cable entry)	
H	Rosemount Stainless steel	68	1/2-in. NPT (cable entry)	
J	GR –A/BL (BUZ) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
L	TZ–A/BL (BUZH) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination				
Standard				**Standard**
0	Flying Leads – No Springs on DIN plate			★
2	Terminal Block – DIN 43762			★
3	Spring Loaded Adapter – 1/2-in. NPT – use with Extension Type codes J and N			★

	Sensor Type		Temperature Range –valid for tolerance Class B Pt 100 only	
Standard				**Standard**
65 Only	1	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 600 °C (–321 to 1112 °F)	★
	4	RTD, Dual Element, 3-wire	–196 to 600 °C (–321 to 1112 °F)	★
185 Only	03J1	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)	★
Expanded				
	03N1	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		Head Connection	Instrument Connection	Materials	
Standard					**Standard**
D	DIN Standard 12 x 1.5	M24 x 1.5	1/2-in NPT	Stainless Steel	★
T(2)	DIN Standard 12 x 1.5	M24 x 1.5	M18 x 1.5	Stainless Steel	★
F	Nipple Union Nipple	1/2-in NPT	1/2-in NPT	Stainless Steel	★
J	Nipple Union (MF)	(No Head)	1/2-in NPT	Stainless Steel	★
N	No Extension (only available with Extension length (N) code 0000)				★
Extension Length (N) in Millimeters					
Standard					**Standard**
0000	No extension – use with Extension Type code N				★
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				★

Table 3. Series 65 Platinum RTD and 185 Thermocouple With Barstock Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Expanded				
XXXX	Non-standard extension length – available from 35 to 500 mm			
Thermowell Material				
Standard				**Standard**
D	1.4404 (AISI 316L)			★
Y	1.4571 (AISI 316Ti)			★
Code	**Immersion Length (U)**			
Standard				**Standard**
0065	65 mm			★
0075	75 mm			★
0115	115 mm			★
0125	125 mm			★
0150	150 mm			★
0225	225 mm			★
0300	300 mm			★
0450	450 mm			★
Expanded				
XXXX	Non-standard immersion length – available from 80 to 1000 mm in 5 mm increments			
Code	**Thermowell Mounting Style**	**Process Connections**	**Stem Style**	
Standard				**Standard**
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	Threaded	G 1/2-in. (1/2-in. BSPF)	Tapered	★
T28	Threaded	G 3/4-in. (3/4-in.BSPF)	Tapered	★
T30	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	Threaded	M27 x 2	Tapered	★
T95	Threaded	M33 x 2	Tapered	★
T98	Threaded	M20 x 1.5	Tapered	★
F04	Flanged, RF	1-in. 150 lbs	Tapered	★
F10	Flanged, RF	1.5-in. 150 lbs	Tapered	★
F16	Flanged, RF	2-in. 150 lbs	Tapered	★
F22	Flanged, RF	1-in. 300 lbs	Tapered	★
F28	Flanged, RF	1.5-in. 300 lbs	Tapered	★
F34	Flanged, RF	2-in. 300 lbs	Tapered	★
F40	Flanged, RF	1-in. 600 lbs	Tapered	★
F46	Flanged, RF	1.5-in. 600 lbs	Tapered	★
F52	Flanged, RF	2-in. 600 lbs	Tapered	★
F58(3)	Flanged, RF	1-in. 900/1500 lbs	Tapered	★
F64(3)	Flanged, RF	1.5-in. 900/1500 lbs	Tapered	★
F70(3)	Flanged, RF	2-in. 900/1500 lbs	Tapered	★
F82	Flanged, RF	1.5 in., 2500 lbs.	Tapered	★
F88	Flanged, RF	2 in. 2500 lbs.	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	3/4-in. pipe	Tapered	★

Table 3. Series 65 Platinum RTD and 185 Thermocouple With Barstock Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

W12	Welded	1-in. pipe	Tapered	★
W14	Welded	1 1/4-in. pipe	Tapered	★
W16	Welded	1 1/2-in. pipe	Tapered	★
E01	D1 welded	24h7	Tapered	★
E02	D2 welded	24h7	Tapered	★
E04	D4 welded	24h7	Tapered	★
E05	D5 welded	24h7	Tapered	★

Options (Include with selected model number)

Sensor Options (available with 65 only)		
Standard		**Standard**
A1	Single Element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
A2	Dual element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
Product Certifications		
Standard		**Standard**
I1	EEx ia – ATEX/IBExU Intrinsic Safety Approval	★
N1[4][5]	EEx n – ATEX/CENELEC Type n Approval	★
E1[5]	EEx d – ATEX/CENELEC Flameproof Approval	★
ND[5]	ATEX Dust Ignition-proof Approval	★
E7[5]	IECEx Flameproof Approval	★
E5[5]	FM Explosion-proof Approval (consult factory for availability)	★
Ground Screw		
Standard		**Standard**
G1	External Ground Screw – only available with Rosemount Connection Head Material codes C, D, G, H, 1, and 2	★
Cover Chain Option		
Standard		**Standard**
G3	Cover Chain – only available with Rosemount Connection Head Material codes C, D, G, and H.	★
Extension Ring		
Standard		**Standard**
G6[6]	Aluminum Extension Ring for Dual Transmitter Mounting – use with Rosemount Connection Head Material Codes C and D.	★
Termination		
Standard		**Standard**
TB	Terminal Block for use with sensor termination code 3 and Connection Heads C, D, G, and H	★
Material Certification		
Standard		**Standard**
Q8	Thermowell material certification, DIN EN 10204 3.1	★
External Pressure Test		
Standard		**Standard**
R01	Thermowell External Pressure Testing	★
Internal Pressure Test		
Standard		**Standard**
R22	Thermowell Internal Pressure Testing	★
Dye Test		
Standard		**Standard**
R03	Thermowell Dye Penetration Testing	★
Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05[7]	Thermowell NACE Approval	★

Table 3. Series 65 Platinum RTD and 185 Thermocouple With Barstock Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Plug/Chain		
Standard		**Standard**
R06	Stainless Steel Plug and Chain	★
Weld Options		
Standard		**Standard**
R07	Full Penetration Weld - for flanged thermowells only	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency – Thermowell Strength Calculation	★
Assemble To Options		
Standard		**Standard**
XA(8)	Assemble Sensor to Specific Temperature Transmitter (PTFE paste)	★
Temperature Range Option		
Standard		**Standard**
LT	Special Material to meet extended Temperature range of -51 °C	★
Typical Model Number: 0065 G 2 2 D 0135 D 0225 F70 Q8 R01 R07		

(1) To maintain IP 68 rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.
(2) Only available with Thermowell Mounting Style codes E01, E02, E04, and E05.
(3) Standard T-length is 80 mm, full penetration option R07 must be ordered.
(4) For complete assemblies or as replacement sensor for type N-series, component parts are not approved. If the transmitter is mounted in a connection head, the Sensor Lead Wire Termination code 0 (flying leads) is requested.
(5) Not available with Connection Head Material codes J and L.
(6) Not valid with E5, E7, ND, or E1 Approval
(7) Valid for thermowell material code D AISI 316L (1.4404) only.
(8) If ordering Assemble To Option XA with a transmitter, specify the same option on the transmitter model number.

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:

- Threaded, Flanged, and Weld-in Styles
- Wake Frequency Calculations conforming to ASME PTC 19.3 (Option Code R21)
- NACE Approval (Option Code R05)
- Internal Pressure Test (Option Code R22)
- External Pressure Test (Option Code R01)

Table 4. Series 96 Barstock Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Model	**Product Description**			
0096	Barstock Thermowell			
Thermowell Material(1)				
Standard				**Standard**
D	1.4404 (AISI 316L)			★
Y	1.4571 (AISI 316Ti)			★
Immersion Length (L) in Millimeters				
Standard				**Standard**
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			★
Expanded				
XXXX	Non-standard immersion length			
Thermowell Mounting Style		**Process Connections**	**Stem Style**	
Standard				**Standard**
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	Thread	G 1/2-in. (1/2-in. BSPF)	Tapered	★
T28	Thread	G 3/4-in. (3/4-in.BSPF)	Tapered	★
T30	Thread	G 1-in. (1-in. BSPF)	Tapered	★
T44	Thread	1/2-in. NPT	Tapered	★
T46	Thread	3/4-in. NPT	Tapered	★
T48	Thread	1-in. NPT	Tapered	★
T93	Thread	M27 x 2	Tapered	★
T95	Thread	M33 x 2	Tapered	★
T98	Thread	M20 x 1.5	Tapered	★
F04	Flange, RF	1-in. 150 lbs	Tapered	★

Table 4. Series 96 Barstock Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

F10	Flange, RF	1.5-in. 150 lbs	Tapered	★
F16	Flange, RF	2-in. 150 lbs	Tapered	★
F22	Flange, RF	1-in. 300 lbs	Tapered	★
F28	Flange, RF	1.5-in. 300 lbs	Tapered	★
F34	Flange, RF	2-in. 300 lbs	Tapered	★
F40	Flange, RF	1-in. 600 lbs	Tapered	★
F46	Flange, RF	1.5-in. 600 lbs	Tapered	★
F52	Flange, RF	2-in. 600 lbs	Tapered	★
F58(2)	Flanged, RF	1-in. 900/1500 lbs	Tapered	★
F64(2)	Flanged, RF	1.5-in. 900/1500 lbs	Tapered	★
F70(2)	Flanged, RF	2-in. 900/1500 lbs	Tapered	★
F82	Flanged, RF	1.5 in 2500 lbs	Tapered	★
F88	Flanged, RF	2 in. 2500 lbs	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	3/4-in. pipe	Tapered	★
W12	Welded	1-in. pipe	Tapered	★
W14	Welded	1 1/4-in. pipe	Tapered	★
W16	Welded	1 1/2-in. pipe	Tapered	★
E01	D1 welded, DIN	24h7	Tapered	★
E02	D2 welded, DIN	24h7	Tapered	★
E04	D4 welded, DIN	24h7	Tapered	★
E05	D5 welded, DIN	24h7	Tapered	★
Lagging Length				
Standard				**Standard**
T040	40 mm – valid for Mounting style codes T26, T28, T30, T93, T95, and T98			★
T060	60 mm			★
T075	75 mm – valid for weld-in thermowells codes E01 and E02			★
T080	80 mm – valid for flanged thermowells codes F58, F64, F70			★
T135	135 mm – valid for weld-in thermowells codes E04 and E05			★
Expanded				
TXXX	Non Standard Lagging Length			
Instrument Connection Thread Type				
Standard				**Standard**
A	M24 x 1.5			★
D	1/2-in. NPT			★
T	M18 x 1.5 – valid for weld-in thermowells codes E01, E02, E04, and E05			★

Options (Include with selected model number)

Material Certification		
Standard		**Standard**
Q8	Thermowell Material Certification	★
External Pressure Test		
Standard		**Standard**
R01	Thermowell External Pressure Testing (flanged thermowells only)	★
Internal Pressure Test		
Standard		**Standard**
R22	Thermowell Internal Pressure Test	★
Dye Test		
Standard		**Standard**
R03	Thermowell Dye Penetration Testing	★

Table 4. Series 96 Barstock Thermowell

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05(3)	Thermowell NACE Approval	★
Plug/Chain		
Standard		**Standard**
R06	Stainless Steel Plug and Chain	★
Weld Options		
Standard		**Standard**
R07	Full Penetration Weld - for flanged thermowells only	★
Flange Type		
Standard		**Standard**
R16	Ring Joint Flange Face	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency – Thermowell Strength Calculation	★
Typical Model Number: 0096 D 0300 F04 T060 D Q8 R01		

(1) Additional materials are available upon request.
(2) Standard T-length is 80 mm, full penetration option R07 must be ordered.
(3) Not available with Thermowell Material code Y.

Introduction

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 Process Management (“Emerson”) offers complete temperature measurement assemblies including Rosemount Smart and Programmable Temperature Transmitters. Please 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: DIN EN 60751 incorporating Amendments 1 and 2, DIN 43760, and BS 1904.(1) 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 smart temperature transmitters through calibration schedules and Callendar van Dusen constants.

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

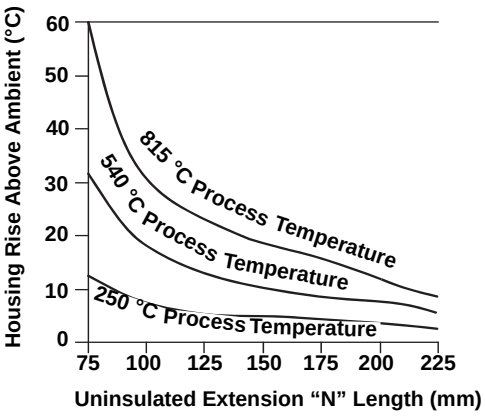
All sensors are available in a variety of lengths(2) and ranges with flying lead, terminal block, or 1/2-inch ANPT spring-loaded adapter lead wire terminations.

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

Choosing 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 1 provides an example of the relationship between transmitter housing temperature rise and extension length. Use Figure 1 and the accompanying example as a guide for determining adequate thermowell extension length.

Figure 1. Transmitter Housing Temperature Rise vs. Uninsulated Extension Length



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), or 45 °C.

As shown in Figure 1, 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.

(1) 100 Ω at 0 °C, α = 0.00385 Ω x °C/Ω
(2) Sensors over two meters long will be supplied coiled unless otherwise requested.

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.

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-inch ANPT 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-inch ANPT spring-loaded adapter are used with directly mounted 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 “Hazardous Locations Certification” on page 20).

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 2. Series 65 RTD Lead Wire Configuration

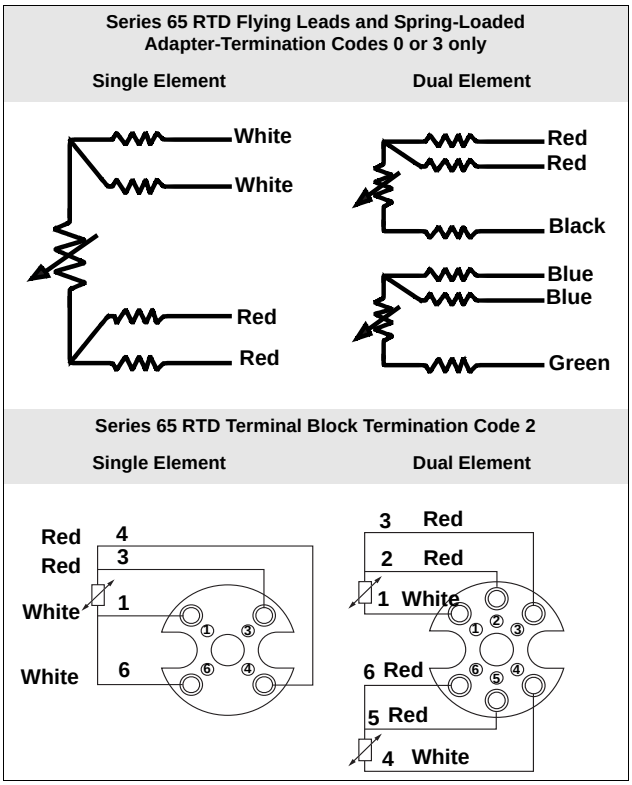
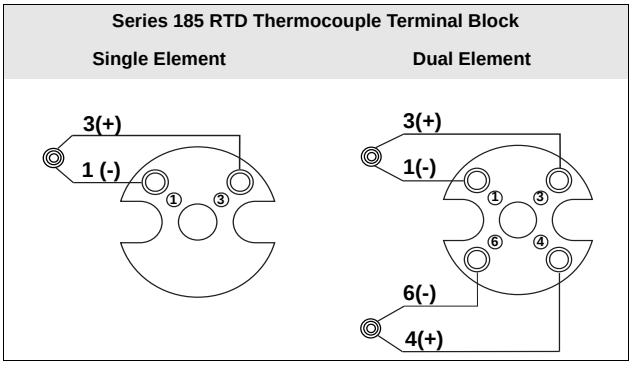


Figure 3. Series 185 Lead Wire Configuration



SPECIFICATIONS

Series 65 Platinum RTD

100 Ω RTD at 0 °C,
α = 0.00385 Ω x °C/Ω.

Temperature Range

–50 to 450 °C or –196 to 600 °C depending on type

Self Heating

0.15 K/mW when measured per method defined in DIN EN 60751:1996

Thermal Response Time

9 seconds maximum required to reach 50% sensor response when tested in flowing water according to IEC 751

Immersion Error

60 mm minimum usable depth of immersion when tested according to IEC 751

Insulation Resistance

1,000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature

Sheath Material

316 SST / 321 SST with mineral-insulated cable construction

Lead Wire

PTFE insulated, silver-coated copper wire. See Figure 3 for wire configuration

Identification Data

The model and serial numbers are marked on each sensor

Ingress Protection (IP) Ratings

Rosemount Series 65 sensor assemblies are IP65 / IP68 and NEMA 4X. This rating is applicable only for complete assemblies including either:

- a connection head, extension, and barstock thermowell
- a connection head and tubular thermowell
- a connection head, extension, and sensor

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 temperature up to 800 °C in air, AISI 321 is standard. For temperatures from 800 to 1100 °C in air, Inconel 600 is standard. For temperatures above 1100 °C, precious metal or ceramic protective sheaths are available upon request. For strongly oxidising or reducing atmospheres, please consult your local Emerson representative.

Lead Wires

Thermocouple, internal – 18 SWG (16 AWG) solid wire (max), 19 SWG (18 AWG) solid wire (min.). External extension leads, Type J and K – 0.8 mm minimum stranded wire, PTFE insulated. Color coded per IEC 584. See Figure 3 for wire configuration.

Identification Data

The model and serial numbers are marked on each sensor.

Insulation Resistance

1 000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature.

Ingress Protection (IP) Ratings

Rosemount Series 65 sensor assemblies are IP65 / IP68 and NEMA 4X. This rating is applicable only for complete assemblies including either:

- a connection head, extension, and barstock thermowell
- a connection head and tubular thermowell
- a connection head, extension, and sensor

Table 5. Characteristics of Series 185 Thermocouples

Type	Alloys (wire colour)	Sheath Material	Temp. Range (°C)	Limits of Error Interchangeability DIN EN 60584-2	Tolerance Class
J	Fe (+ black), CuNi (– white)	1.4541 (AISI 321)	– 40 to 375, 375 to 750	1.5 °C, 0.004 t	1
K	NiCr (+ green), NiAl (– white)	Inconel 600	– 40 to 375, 375 to 1000	1.5 °C, 0.004 t	1
N	NiCrSi (+ rose), NiSi (- white)	Nicrobell B	– 40 to 375, 375 to 1000	1.5 °C, 0.004 t	1

HAZARDOUS LOCATIONS CERTIFICATION

E1 ATEX/CENELEC Flameproof Approval
ATEX Marking ⟨Ex⟩ II 2 G
Certification Number. KEMA99ATEX8715X
Ex d IIC T6 (T_{amb} = –50 to 65 °C).

The ATEX/CENELEC Flameproof approval is dependent on the Rosemount Integral Sensor Connection Head assembled with a Rosemount RTD or thermocouple temperature sensor (see Figure 4). The captive flame arrestor insert must be fully engaged into the connection head for compliance with this approval.

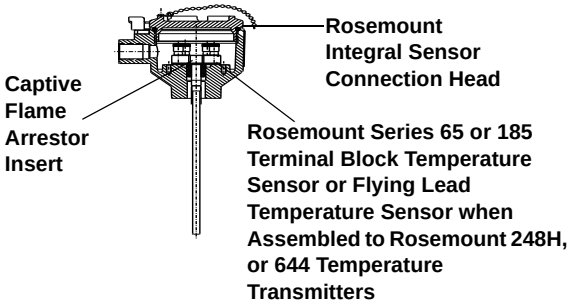
ATEX Flameproof Approval
ATEX Marking ⟨Ex⟩ II 2 G
Certification Number. KEMA01ATEX2181.
Ex d IIC T5 (–50 ≤ T_{amb} ≤ 80 °C)
Ex d IIC T6 (–50 ≤ T_{amb} ≤ 70 °C)

Special conditions for safe use (X)

For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

The Rosemount Series 65 RTD and 185 Thermocouple Temperature Sensors with $^1/_2$-inch ANPT Spring Loaded Adapters are approved for direct mount to the Rosemount 3144P Smart Temperature Transmitters. Refer to the Rosemount Temperature Transmitter Reference Manuals for installation details.

Figure 4. ATEX/CENELEC Flameproof Configuration.



ND ATEX / CENELEC Dust Ignition-Proof
Certification Number: KEMA99ATEX8715
ATEX Marking: ⟨Ex⟩ II 1 D
CE 1180
T95 °C (-40 °C ≤ T_{amb} ≤ 85 °C)
IP66
The ATEX/CENELEC Dust Ignition-Proof approval is dependent on the Rosemount Integral Sensor Connection Head assembled with a Rosemount RTD or thermocouple temperature sensor (see Figure 4). The captive flame arrestor insert must be fully engaged into the connection head for compliance with this approval.

Special conditions for safe use (X)
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

N1 ATEX/CENELEC Type “n” Approval
ATEX Marking ⟨Ex⟩ II 3 G
Certification Number BAS00ATEX3145
[EEx nL II T5 (T_{amb} = – 40 to 70 °C)]
The ATEX/CENELEC EExn Approval allows equipment, which under normal conditions does not emit sparks or produce hot surfaces, to be installed in Zone 2 areas. The EEx n integrity is achieved by the design and construction that maintains a minimum of IP 54 protection. Individual items are not approved. The Rosemount type n approval applies to complete assemblies only. This approval applies to every combination of thermowell, connection head, extension, and sensor detailed in this Product Data Sheet, except the $^1/_2$-inch ANPT spring-loaded style. In addition, certain thermowells, not designed by Rosemount Inc., are acceptable for the EEx n assembly provided they conform exactly to Rosemount specifications.

I1 ATEX/IBExU Intrinsic Safety Approval
ATEX Marking ⟨Ex⟩ II 2 G
Ex ia IIC T6 (T_{amb} = – 51 to 60 °C)
The Intrinsically Safety Approval is valid for Series 65 RTD Sensors and Series 185 thermocouples.
These certified sensors can only be applied in Zone 1. The marking of intrinsically safe circuits is affected by color codes or print, Ex i. A mounted-on connection head is provided with a ground screw for earth connection and a blue painted cable gland.

E5 FM Explosion-Proof
Explosion-Proof for Class I, Division 1, Groups B, C, D.
Dust-Ignition Proof for Class I, III, Division 1, Groups E, F, G.
Ambient temperature Limits: -40 to 245 °C
When installed per Rosemount Drawing 000068-0013
NEMA Enclosure Type 4X.

E7 IECEx Flameproof Approval
Ex d IIC T6 (T_{amb} = –40 to 65 °C)

The Rosemount Series 65 RTD and Series 185 Thermocouple Temperature Sensors are approved for direct mount to the Rosemount 248H, 644, and 3144P Smart Temperature Transmitters. To ensure approval compliance, specify the E7 option of both the sensor and the transmitter at the time of ordering.

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 (°C)

R_o = Sensor-Specific Constant (Resistance at t = 0 °C)

α =Sensor-Specific Constant

δ =Sensor-Specific Constant

β =Sensor-Specific Constant (0 at t > 0 °C)

The exact values for the Callendar-van Dusen constants (Ro, α, δ, β) 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. To utilize the unique, built-in sensor-matching capability of the Rosemount 644, and 3144P transmitters, the Callendar-van Dusen constants can be programmed into the transmitter at the factory or in the field using a Field Communicator.

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 sensors 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, α, β, δ), 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.

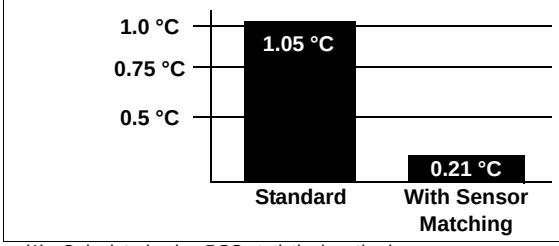
Table 6. Series 65 Interchangeability

Standard Series 65 IEC-751 Class B	Temperature
±0.80 °C (±1.44 °F)	-100 °C (-148 °F)
±0.30 °C (±0.54 °F)	0 °C (32 °F)
±0.80 °C (±1.44 °F)	100 °C (212 °F)
±1.80 °C (±3.24 °F)	300 °C (572 °F)
±2.30 °C (±4.14 °F)	400 °C (752 °F)
Series 65 with IEC-751 Class A Option	**Temperature**
±0.35 °C (±0.63 °F)	-100 °C (-148 °F)
±0.15 °C (±0.27 °F)	0 °C (32 °F)
±0.35 °C (±0.63 °F)	100 °C (212 °F)
±0.75 °C (±1.35 °F)	300 °C (572 °F)
±0.95 °C (±1.71 °F)	400 °C (752 °F)

Typical Sensor–to–Transmitter Matching Accuracy Improvements

Transmitter: Rosemount 3144 (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

System Uncertainty Comparison at 150 °C:



Standard 65 Sensor	
Rosemount 3144P:	± 0.10 °C
Standard Series 65 RTD:	± 1.05 °C
Total System(1):	± 1.05 °C
65 Sensor with V10 Option	
Rosemount 3144P:	± 0.10 °C
Calibrated Sensor Series 65 RTD:	± 0.18°C
Total System(1):	± 0.21 °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(1). 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, please contact your local Emerson Process Management Representative.

(1) Limited global availability. Consult factory for available ordering locations.

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.

	Model	Connection Head	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Thermowell Material	Immersion Length	Mounting Style	Additional Options
Typical Model Number	0065	C	2	1	D	0135	D	0225	T12	X8

Calibrate from –10 to 120 °C

Option V: Sensor Calibration with Works Certificate

	Code	
	V10	**V11**
Temperature Range (°C)	– 50 to 450	0 to 100
Calibration Points (°C)	–50 0 100 450	0 50 100

Sensors and Thermowells (Metric)

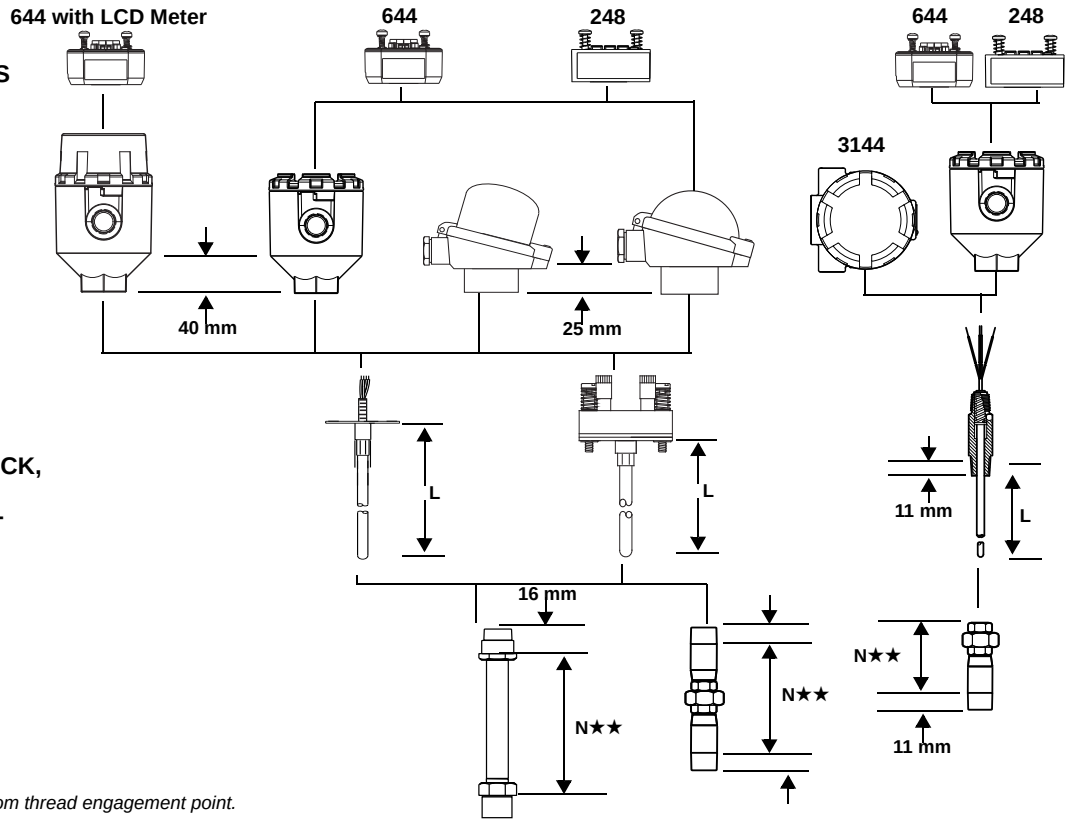
Sensor Assembly without Thermowell

HEAD OR FIELD MOUNT TRANSMITTERS

IP68 OR IP65 CONNECTION HEADS

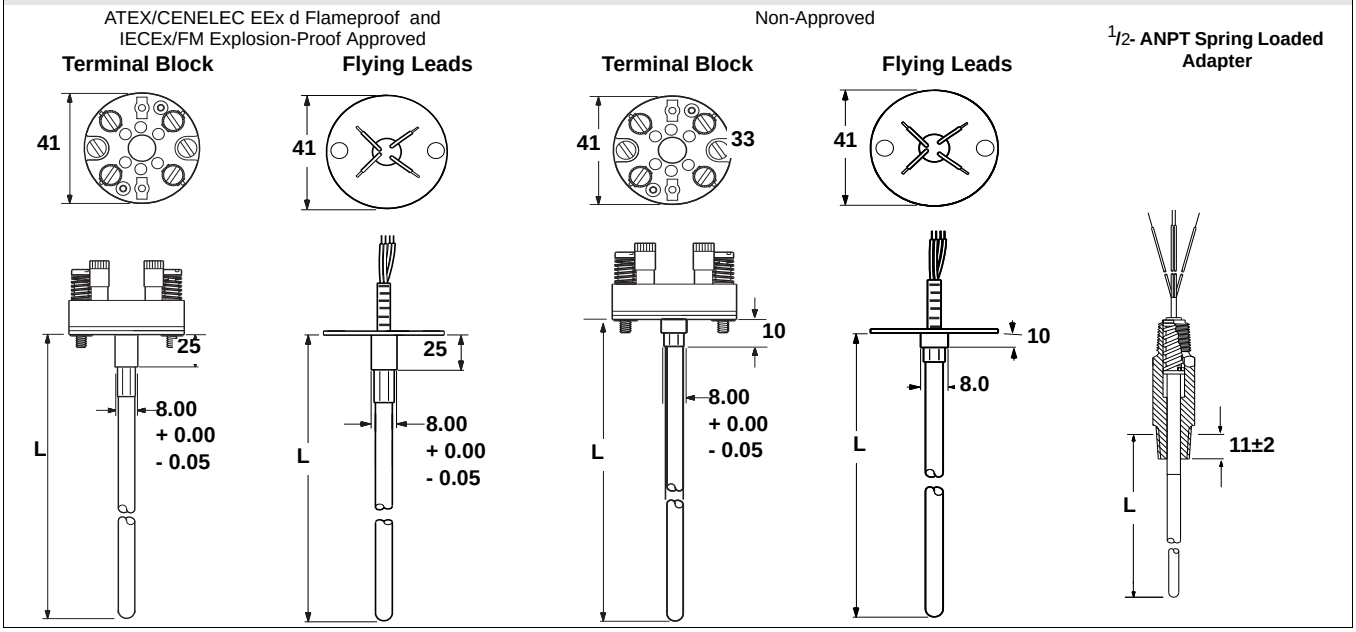
SENSOR WITH FLYING LEADS, TERMINAL BLOCK, OR SPRING-LOADED ADAPTER 2 x 1/2-in. NPT

EXTENSIONS



★★ *N dimension measures from thread engagement point.*

Series 65 RTD and Series 185 Thermocouple Dimensional Drawings



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	100	—	150	—
65 Dual Element	6.0	6	100	200	150	200
185 Single Element	6.0	2	100	—	150	—
185 Dual Element	6.0	4	100	200	150	200

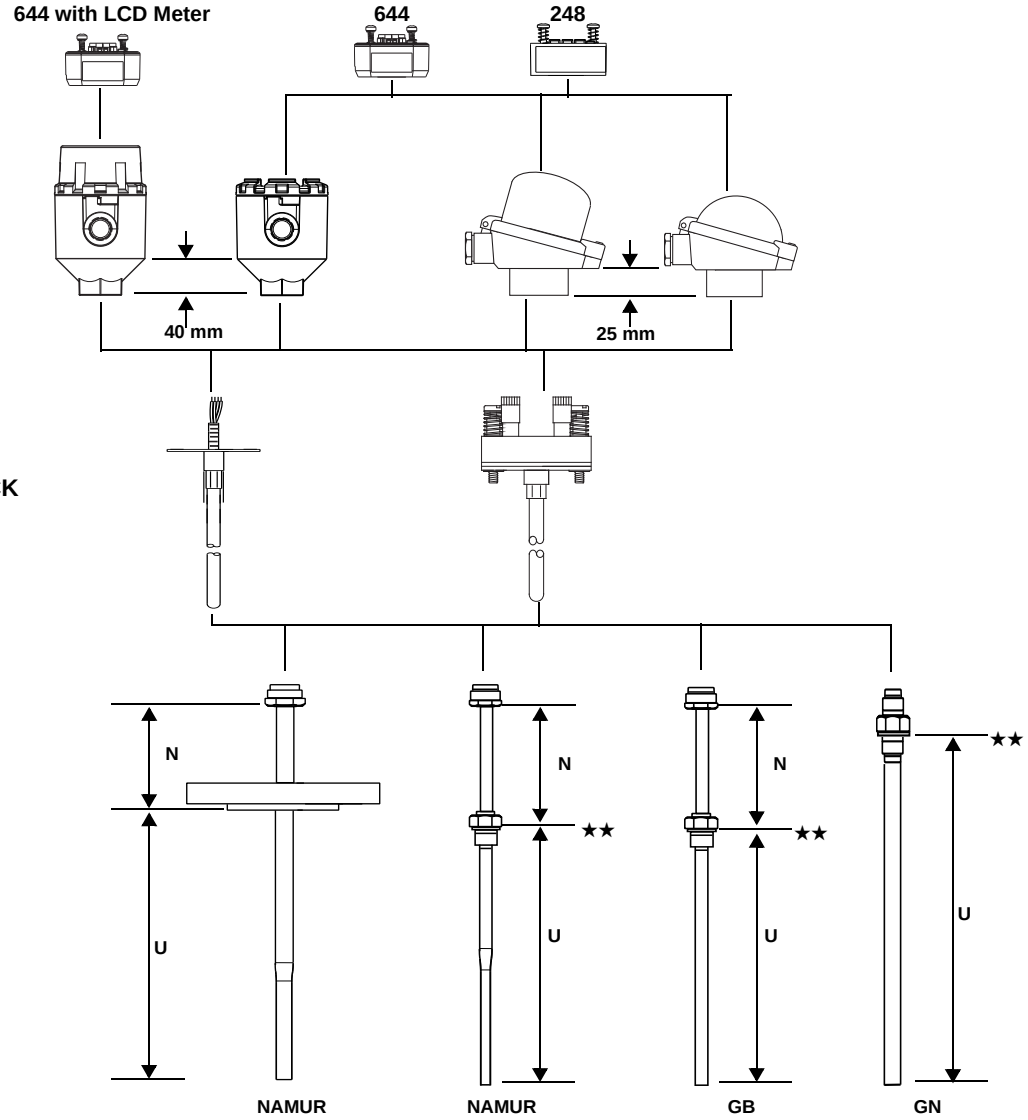
Tubular Thermowell Sensor Assemblies

HEAD OR FIELD MOUNT TRANSMITTERS

IP68 OR IP65, CONNECTION HEADS

SENSOR WITH FLYING LEADS OR TERMINAL BLOCK

THREADED AND FLANGED TUBULAR THERMOWELLS



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

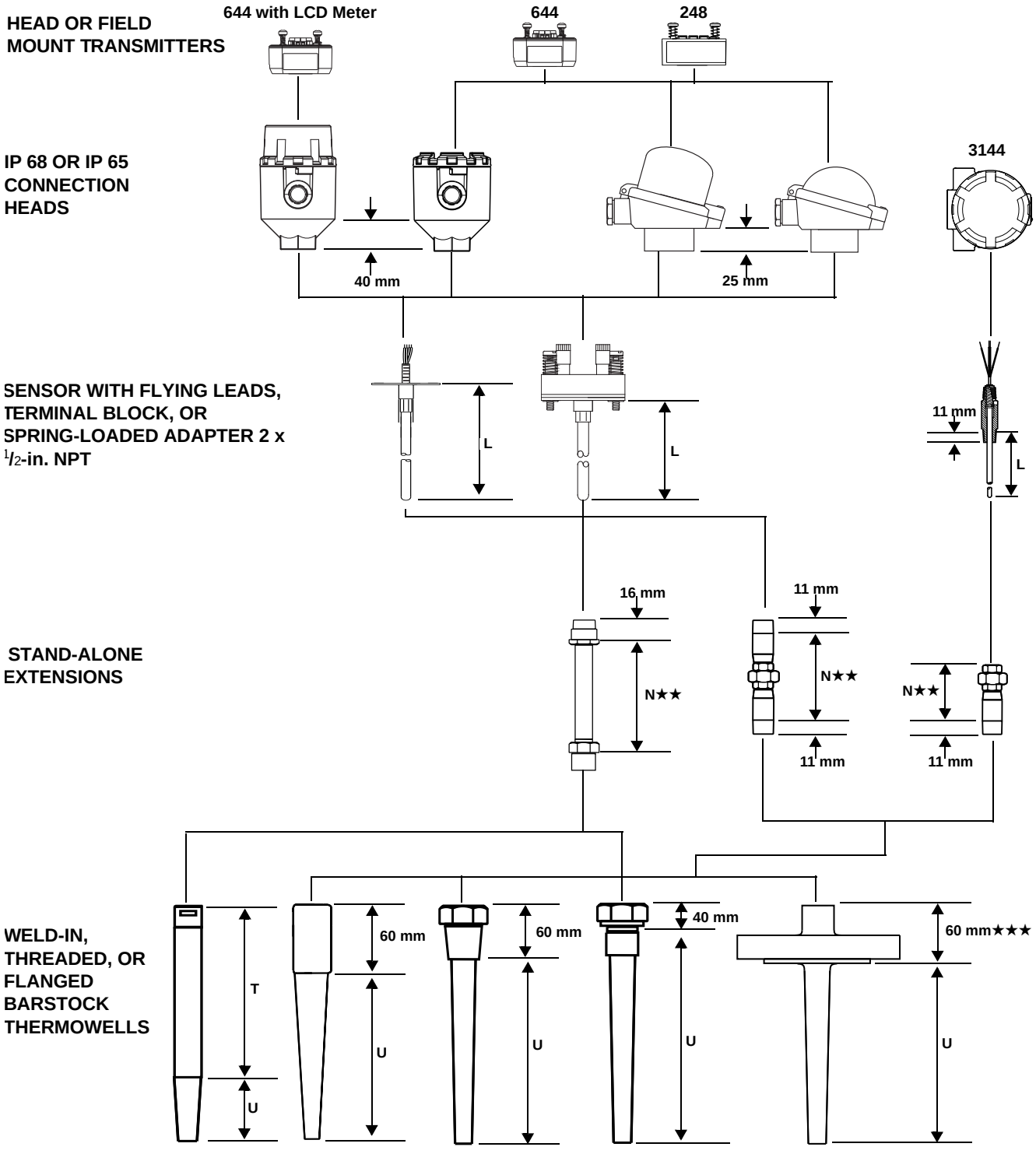
Table 7. Tubular Thermowell Ratings

Type	Dimensions	Process Connection	Max. Flow Velocity (m/s)		Immersion length (mm)	Max. Pressure (bar)(1)	At Temperature (°C)			
			Air	Water		0	100	200	300	400
GN, GB	9 x 1 mm 1.4571 (316 Ti)	Screw Socket $G^1/2$	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
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

(1) For immersion "U" length (mm)

Sensors and Thermowells (Metric)

Barstock Thermowell Sensor Assemblies



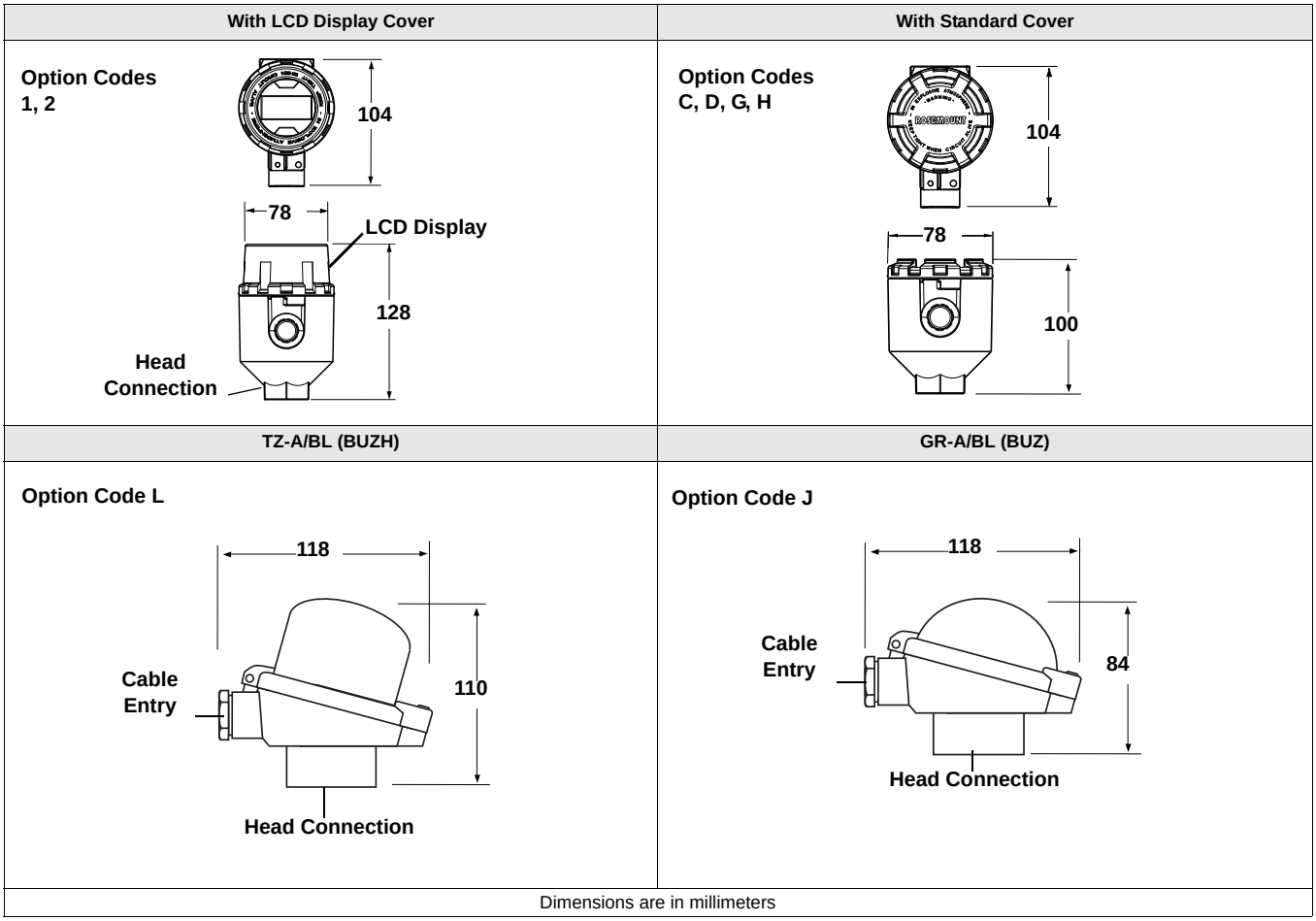
★★ *N dimension measures from thread engagement point.*
★★★ *This dimension is 80 mm for 1500# and 2500# flanges.*

Accessories

Table 8. Connection Head

Part Number	Model/Material	IP Rating	Conduit Connection	Process Connection
00644-4410-0011	Rosemount, Aluminium	68	1/2-inch NPT	1/2-inch NPT
00644-4410-0013	Rosemount, Aluminium	68	1/2-inch NPT	M24 x 1.5
00644-4410-0021	Rosemount, Aluminium	68	M20 x 1.5	1/2-inch NPT
00644-4410-0023	Rosemount, Aluminium	68	M20 x 1.5	M24 x 1.5
00644-4410-0111	Rosemount, Aluminium with LCD Display Cover	68	1/2-inch NPT	1/2-inch NPT
00644-4410-0113	Rosemount, Aluminium with LCD Display Cover	68	1/2-inch NPT	M24 x 1.5
00644-4410-0121	Rosemount, Aluminium with LCD Display Cover	68	M20 x 1.5	1/2-inch NPT
00644-4410-0123	Rosemount, Aluminium with LCD Display Cover	68	M20 x 1.5	M24 x 1.5
00644-4411-0011	Rosemount, Stainless Steel	68	1/2-inch NPT	1/2-inch NPT
00644-4411-0013	Rosemount, Stainless Steel	68	1/2-inch NPT	M24 x 1.5
00644-4411-0021	Rosemount, Stainless Steel	68	M20 x 1.5	1/2-inch NPT
00644-4411-0023	Rosemount, Stainless Steel	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 5. Connection Head Dimensional Drawing



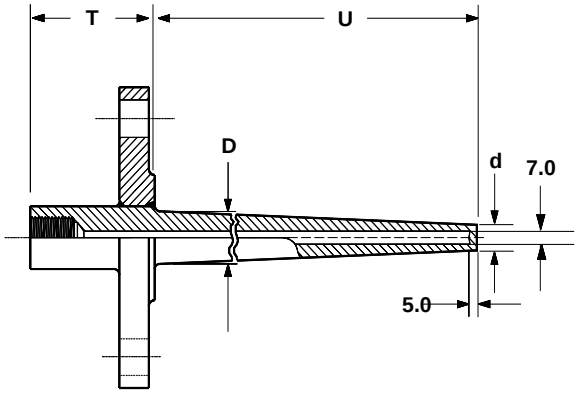
Sensors and Thermowells (Metric)

Series 96 Barstock Thermowells

U = Immersion Length D = Stem Diameter TL = Total Length T = Lagging Length

Dimensions in millimeters

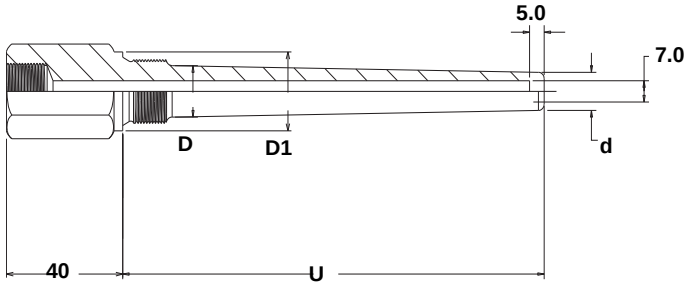
Flanged Barstock Thermowell – Tapered



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

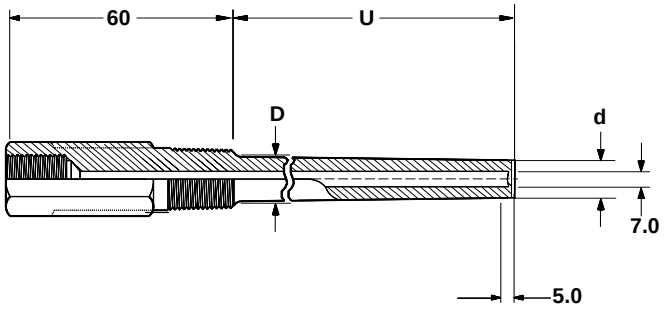
Note: Flanged thermowells generally conform to the specifications of ASME B 16.5 (ANSI) and DIN EN 1092-1.

Threaded Barstock Thermowell – Parallel Thread



Parallel Thread Size	D	D1	d
1/2-in. BSPF (G1/2); M20 x 1.5	17	26	12.5
3/4-in. BSPF (G3/4)	19	32	12.5
1-in. BSPF (G1)	26.5	39	18
M24 x 1.5	19	29	12.5

Threaded Barstock Thermowell – Tapered Thread



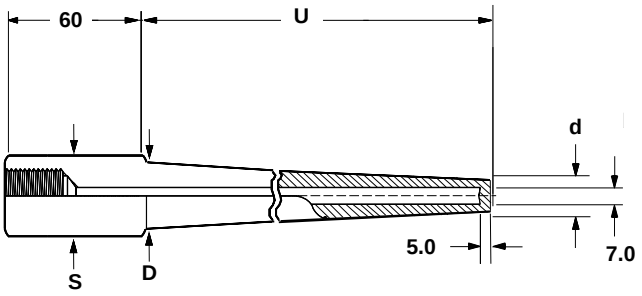
Tapered Thread Size	D	d
1/2-in. NPT ; M20 x 1.5	17	12.5
3/4-in. NPT	19	12.5
1-in. NPT	26.5	18

--

U = Immersion Length D = Stem Diameter TL = Total Length T = Lagging Length

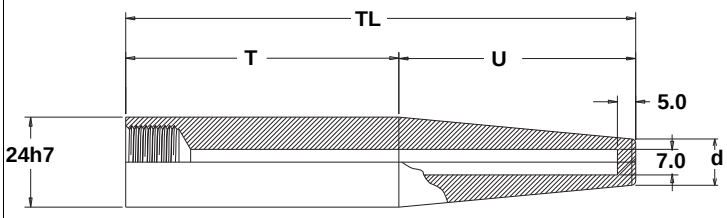
Dimensions in millimeters

Weld-in Barstock Thermowell (codes W10, W12, W14, W16)



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

Weld-in Barstock Thermowell (codes E01, E02, E04, E05)



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

Thermowell Strength 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 Thermowell Strength Calculation to your local Emerson Process Management representative.

Emerson includes three possible failure modes in conjunction with thermowell analysis:

Flow-Induced Vibration

Fluid flow past a thermowell causes vortices to be shed from the well at a wake frequency proportional to the flow velocity. If the wake frequency is at or near the natural frequency of a given thermowell, a resonance condition may cause massive amounts of energy to be absorbed by the thermowell. This results in very high stresses and possible failures. Even if the thermowell does not fail, the sensor capsule may be subjected to severe levels of shock and vibration, resulting in erroneous readings or total sensor failure.

The ASME technique requires that the ratio of wake frequency to the natural frequency of a thermowell be less than 0.8. If the ratio is greater than 0.8, a user has two options:

1. Reducing the flow velocity or use a larger diameter thermowell; or
2. Use a stronger thermowell configuration (a different thermowell type or material, or a shorter length thermowell).

Flow-Induced Stress

Fluid flow, a function of flow velocity and density, causes force to be exerted on the thermowell. The flow-induced stress is calculated and compared with the material strength of the thermowell.

Process Pressure

The maximum static pressure that a thermowell stem can undergo is calculated.

NOTE
The thermowell analysis process is an aid in choosing thermowells for specific applications. It is based upon accepted theoretical methods and not meant to be a guarantee against thermowell failure.

Application Data Sheet

Calculations conducted per ASME/ANSI PTC 19.3 but with Strouhal number varying with Reynolds number. Please complete and fax to appropriate locations at the bottom of this form.

Company Information

Requesting Company:	Phone:	Fax:
Contact	Tag Number	
End Customer	Date of Request:	

Thermowell Information (Information for either (a), (b), (c), or (d) required)

a) Rosemount Thermowell Part Number (example 0096D0300F04T060DQ8R01):

b) Rosemount Sensor Model Number (example 0065C21D0135D0300T12):

c) Customer Drawing Number

d) Generic Thermowell Information:

Thermowell Material:

Stem Style: ❒ Straight ❒ Stepped ❒ Tapered

Mounting Style: ❒ Threaded ❒ Welded ❒ Flanged

If flanged, specify: ❒ ANSI/ASME ❒ DIN

Size: Class:

Thermowell Immersion Length (U):

Thermowell Bore Diameter (D):

Thermowell Lagging Length (T):

Tip Diameter (A):

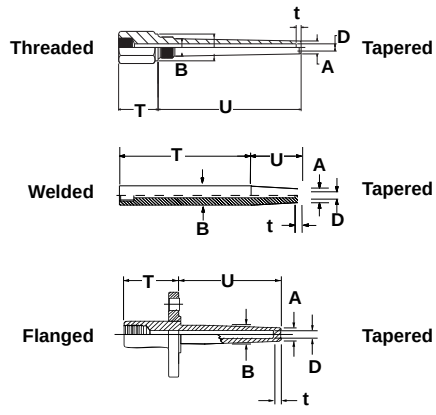
Tip Thickness (t):

Length from Tip to Support (U):

Root Diameter (B)(1):

Length of Tip Diameter (Z):

Mounting Style **Stem Style**



Service: ❒ Liquid	❒ Gas	❒ Steam	Fluid Description:				
Operating Fluid Flow Rate: Maximum							
Operating Fluid Flow Rate Units:							
❒ gal/s	❒ gal/min	❒ gal/hr	❒ l/s	❒ l/min	❒ l/hr	❒ ft/s	❒ ft^3/min
❒ ft^3/hr	❒ bbl/hr	❒ impgal/s	❒ impgal/min	❒ impgal/hr	❒ m/s	❒ m^3/min	❒ m^3/hr
❒ shton/hr	❒ lb/hr	❒ kg/s	❒ kg/hr	❒ other:			

Operating Max. Fluid Pressure:	❒Gauge ❒Absolute	Operating Min. Fluid Pressure:	❒Gauge ❒Absolute
Pressure Units:		Pressure Units:	
Operating Fluid Temperature:	❒°F ❒°C	**Viscosity:**	❒kg/m●s (Pa●s) ❒Centipoise
Operating Fluid Density:	❒ kg/m^3 ❒ lbm/ft^3	**or Specific Volume/Density:**	❒at process conditions ❒at standard conditions (STP)

Process Pipe Size:		Pipe Standoff Height:	
Process Pipe Size:		Standoff Schedule:	
		or Standoff Internal Diameter:	

For Rosemount Internal Use Only

Rosemount Order/Quotation #	Line Item #	Ship Set #	ID #
Customer Order/Item #	Salesperson:		
Cont. Admin.	Tech. Specialist:		

(1) Same as A for straight thermowells.

Sensors and Thermowells (Metric)

Product Data Sheet
00813-0200-2654, Rev HC
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Emerson Process Management

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA
T (U.S.) 1-800-999-9307
T (International) (952) 906-8888
F (952) 949-7001

www.rosemount.com

Emerson Process Management
Heath Place
Bognor Regis
West Sussex PO22 9SH
England
Tel 44 (1243) 863 121
Fax 44 (1243) 867 554

Emerson Process Management Asia Pacific Private Limited
1 Pandan Crescent
Singapore 128461
T (65) 6777 8211
F (65) 6777 0947
Enquiries@AP.emersonprocess.com

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