

Rosemount™ 114C Thermowells



- Wide variety of industry standard process connections including flanged, threaded, welded, and Van Stone.
- Large selection of thermowell materials to ensure proper process compatibility from stainless steel to exotic materials such as duplex and alloy C-276.
- Additional thermowell options and certificates available.

Rosemount 114C Thermowell

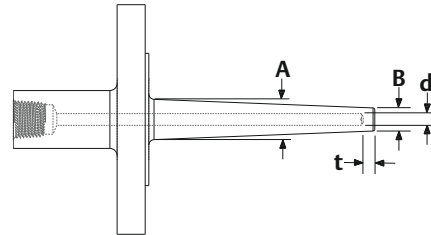
Product overview

Temperature sensors are rarely inserted directly into an industrial process. They are installed into a thermowell to isolate them from the potentially damaging process conditions of flow-induced stresses, high pressure, and corrosive chemical effects. Thermowells are closed-end metal tubes or barstock installed into the process vessel or piping and become an integral pressure-tight part of the process vessel or pipe. They permit the sensor to be quickly and easily removed from the process for calibration or replacement without requiring a process shutdown and possible drainage of the pipe or vessel.

The Rosemount 114C Thermowell is made from solid barstock to ensure strength and integrity. The Rosemount 114C was designed to accommodate a host of industry standard configurations, but has the flexibility to adapt to special configurations for different types of applications.

Flexible design modifiers accommodate many process requirements

- Different sizes of root (A), tip (B), and bore (d) diameters
- Different tip (t) thickness as required
- Numerous combinations for various industrial applications
- Meet ASME PTC 19.3 TW standard with flexible design



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Perform thermowell calculations using Rosemount's Thermowell Design Accelerator



Save design time and resources

- Performs automatic re-calculations of failed tags
- Performs batch calculations of 500 plus thermowells

Solutions for difficult applications

- Suggests alternate technologies if a calculation fails, such as Rosemount X-well Technology or Twisted Square

Assurance of quality and compliance

- Ensure design meets latest ASME PTC 19.3 TW standards
- Efficiently guides you to the best product for your application

Easy-to-use, intuitive user experience

- Automated troubleshooting assistance
- Generates Emerson thermowell and sensor models

Wide range of thermowell options and certificates for any application

- Options for special testing requirements, such as External Hydrostatic Pressure Test (Q5) and Dye Penetration Test (Q73)
- Options to ensure material traceability or compatibility, including Positive Material Identification or PMI (Q76), Material Certification (Q8), Thermowell X-ray/Radiograph (Q81), and NACE® Approval (Q35)
- Options for special processing requirements such as Electropolishing (R20)

Experience global consistency and local support from numerous worldwide Emerson 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 offer advice on best installation practices.
- An extensive global network of Emerson service and support personnel can be on-site when and where they are needed.



Explore the benefits of a Complete Point Solution™ from Emerson

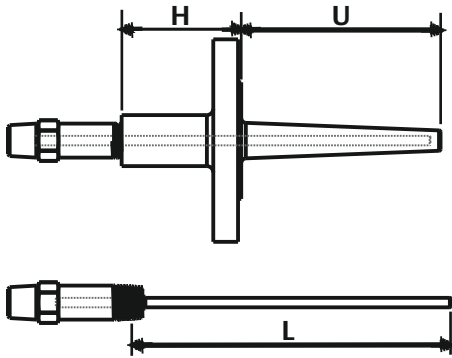
- An “Assemble Sensor to Specific Transmitter” and “Assemble Sensor to Specific Thermowell” option enables Emerson to provide a Complete Point Solution for measuring temperature, delivering an installation-ready transmitter, sensor, and thermowell assembly.

- Emerson has a complete portfolio of single-point and multi-input temperature measurement solutions, allowing effective measurement and process control with reliable Rosemount products.

Selection guide

Ensure sensor fits thermowell

Rosemount 114C Head length (H) + Immersion length (U) = Rosemount 214C Sensor insertion length (L).



Basic selection guide

Selecting the proper thermowell for an application is an important activity as it impacts plant safety and measurement efficiency. Thermowells are considered a wetted part; they physically become part of the pressure retaining system.

The four major factors to consider when selecting a thermowell for an application are described below:

Thermowell length

There is no standard formula to determine thermowell immersion length. However, there are a few common practices that the process industry follows along with good engineering judgment. Ideally, the thermowell tip should be located near the centerline in turbulent flow conditions, because this represents the most accurate process temperature.

To ensure optimal performance, a general guideline for immersion length into a pipe is as follows:

- 10× the thermowell root diameter for air or gas
- 5× the thermowell root diameter for liquids

Another guideline is at least one-third the way into the pipe for any measurement. The American Petroleum Institute (API) has a specific recommendation of using an immersion length of the sensing element plus 2-in. (50 mm).

Mounting configuration

Consider how the thermowell is mounted on the pipe or tank. The process designer typically specifies what mating connection will be used and the thermowell selected should match that connection. Temperature, pressure, and material are usually taken into consideration to ensure the process connection will be adequate for the application. Welded, threaded, flanged, and Van Stone are standard mounting configuration options.

Thermowell stem profile

Factors to be considered when selecting a stem style include the process pressure, required response speed of the measurement, drag force of the fluid flow on the well, and the wake frequency. The stem or shank is the part of a thermowell inserted into the process piping or vessel. Straight, stepped, and tapered stem styles are available. Each profile has its advantages depending on the need and situation.

Thermowell material

Rosemount Thermowells are supplied in most materials required for industrial applications. Standard materials are 316/316L Stainless Steel, 304/304L Stainless Steel, and A105 Carbon Steel. For corrosive environments, special materials such as Alloy C-276 and Alloy 600 are also available. See the ordering table for a complete listing of standard materials. Contact your local Emerson representative for additional material availability.

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.

Online product configuration

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.

[CONFIGURE >](#)[VIEW PRODUCT >](#)

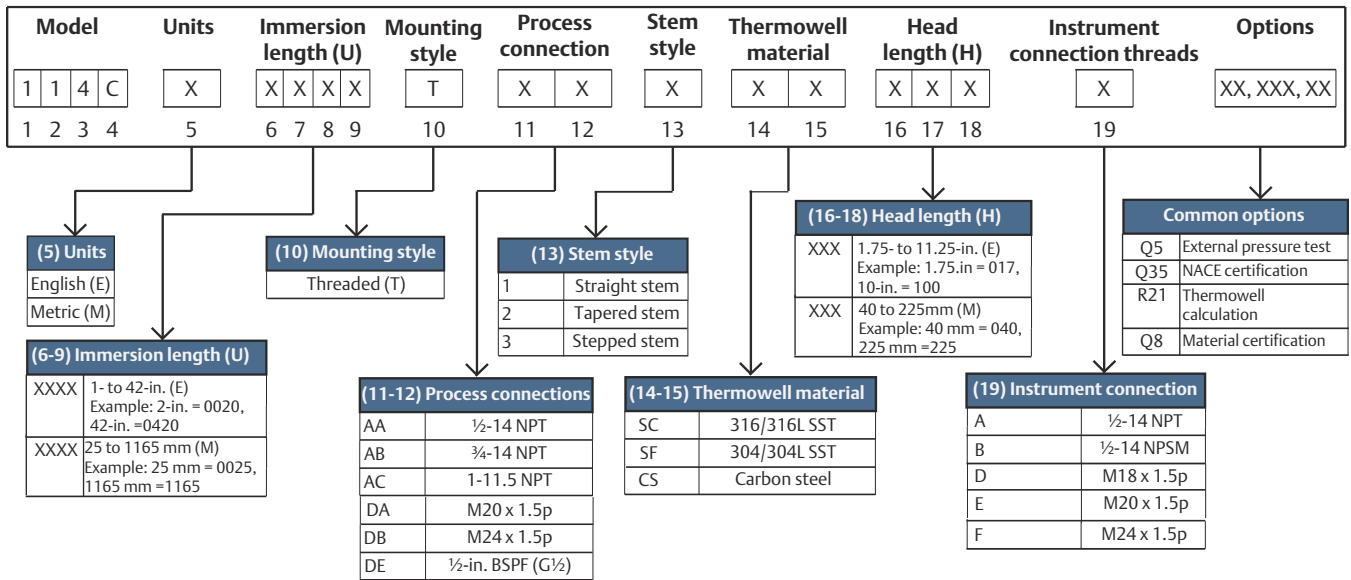
Rosemount 114C Threaded Thermowell



Threaded thermowell overview

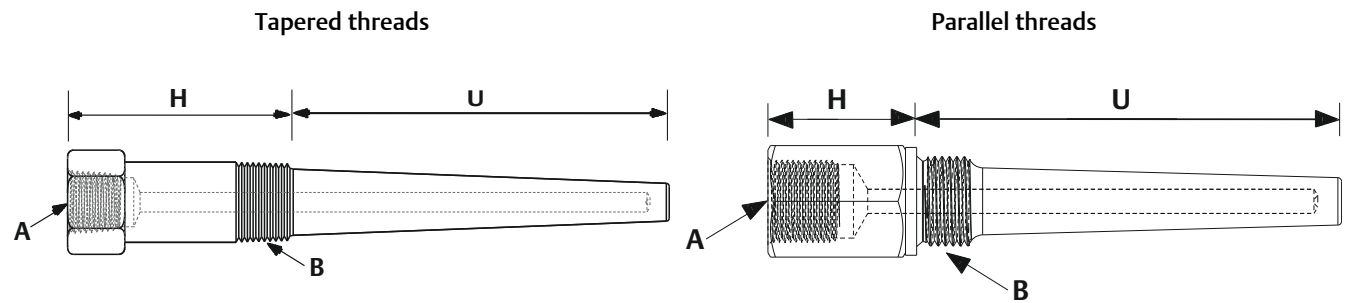
Threaded thermowells are threaded into a process pipe or tank, allowing for easy installation and removal when necessary. While this is a common mounting method, it has the lowest pressure rating of all mounting configuration options.

Figure 1: Standard Offering–Threaded



The common options shown in Figure 1 represent a partial offering; reference the [Threaded ordering information](#) for a full list of available options.

Figure 2: Threaded Thermowell Components



- A. Instrument connection
- B. Process connection
- H. Head length
- U. Immersion length

Note

Wetted surface includes engaged threads and immersion length (U).

Threaded ordering information

Figure 3: Model Number Ordering Example

Model				Units	Immersion length (U)				Mounting style	Process connection		Stem style	Thermowell material		Head length (H)			Instrument connection	Options
1	1	4	C	E	0	0	6	0	T	A	A	1	S	C	0	5	0	A	WR5, Q76...
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	XXXXX

The numbers below the model number ordering example correlate to the character place numbers in the second column of the ordering table.

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

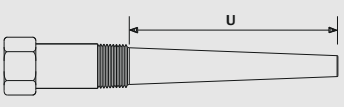
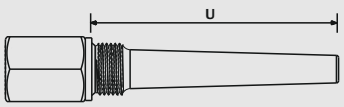
Model

Place #s 1-4		Description	Ref. page
★	114C	Barstock temperature thermowell	Made with a standard bore diameter of 0.26-in. (6.6 mm) and tip wall thickness of 0.25-in. (6.4 mm) N/A

Dimension units

Place # 5	Description	Details	Ref. page
★	E	English units (in.)	Specifies whether length units will be in inches (in.) or millimeters (mm) page 80
★	M	Metric units (mm)	

Immersion length (U)

Place #s 6-9	Description	Tapered threads	Parallel threads	Ref. page
				
★	xxxx	xxx.x-in., 1.00 to 100-in. in ¼-in. increments (when ordered with dimension units code E) Example of a 6.25-in. length where the second decimal is dropped off: 0062		page 80
★	xxxx	xxxx mm, 25 to 2500 mm in 5 mm increments (when ordered with dimension units code M) Example of a 50 mm length: 0050		page 80

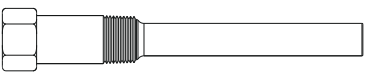


Mounting style

Place # 10		Description	Ref. page
★	T	Threaded	N/A

Process connection

Places # 11-12		Description	Thread type	Ref. page
★	AA	½-14 NPT	Tapered threads	N/A
★	AB	¾-14 NPT	Tapered threads	N/A
★	AC	1-11.5 NPT	Tapered threads	N/A
★	AD	1½-11.5 NPT	Tapered threads	N/A
★	AE	½-in. BSPT	Tapered threads	N/A
★	AF	¾-in. BSPT	Tapered threads	N/A
★	AG	1-in. BSPT	Tapered threads	N/A
★	DA	M20 × 1.5p	Parallel threads	N/A
★	DB	M24 × 1.5p	Parallel threads	N/A
★	DC	M27 × 2p	Parallel threads	N/A
	DD	M33 × 2p	Parallel threads	N/A
★	DE	½-in. BSPF (G½)	Parallel threads	N/A
★	DF	¾-in. BSPF (G¾)	Parallel threads	N/A
★	DG	1-in. BSPF (G1)	Parallel threads	N/A

Stem style

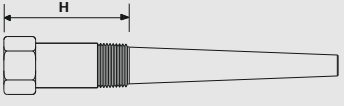
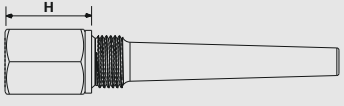
Place # 13		Description	Details	Image	Ref. page
★	1	Straight	Minimum immersion length 1-in. (25 mm) - Tapered threads 1.75-in. (45 mm) - Parallel threads		page 81
★	2	Tapered	Minimum immersion length 1-in. (25 mm) - Tapered threads 1.75-in. (45 mm) - Parallel threads		page 81
★	3	Stepped	Minimum immersion length 3-in. (75 mm) - Tapered threads 3.75-in. (95 mm) - Parallel threads		page 81

Thermowell material

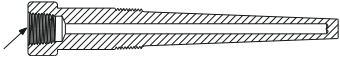
Place # 14-15		Description	Details	Ref. page
★	SC	316/316L dual rated		page 82
	SD	316/316L dual rated (NORSOK)	Must order the Q8 Material Certificate to get NORSOK documentation	page 82
★	SF	304/304L dual rated		page 82
★	CS	Carbon steel (A-105)		page 82
	MO	Molybdenum		page 82
	SG	316Ti SST		page 82
	SL	310 SST		page 82
	SM	321 SST		page 82
	SN	321H SST		page 82
	SR	904L SST		page 82
	SP	347 SST		page 82
	AB	Alloy B3		page 82
	AC	Alloy C-276		page 82
	AG	Alloy 20		page 82
	AH	Alloy 400		page 82
	AK	Alloy 600		page 82
	AM	Alloy 601		page 82
	AN	Alloy 625		page 82
	AP	Alloy 800		page 82
	AQ	Alloy 800H/HT		page 82
	AR	Alloy 825		page 82

Place # 14-15		Description	Details	Ref. page
	AU	Alloy C-20		page 82
	AS	Alloy F44 Mo6		page 82
	CA	Chrome-Moly Grade B-11/F-11 Class II		page 82
	CB	Chrome-Moly Grade B-22/ F-22 Class III		page 82
	CC	Chrome-Moly Grade F-91		page 82
	NK	Nickel 200		page 82
	TT	Titanium Grade 2		page 82
	DS	Super duplex SST		page 82
	DT	Super duplex SST – Norsok	Must order the Q8 Material Certificate to get Norsok documentation	page 82
	DU	Duplex 2205		page 82
	DV	Duplex 2205 – Norsok	Must order the Q8 Material Certificate to get Norsok documentation	page 82

Head length (H)

Place #s 16-18	Description	Tapered threads	Parallel threads	Ref. page
				
★	xxx	xx.x-in., 1.75 to 11.25-in. in ¼-in. increments (when ordered with dimension units code E) Example of a 6.25-in. length where the second decimal is dropped off: 062 (default head length = 1.75-in.)		page 85
★	xxx	xxx mm, 40 to 225 mm in 5 mm increments (when ordered with dimension units code M) Example of a 50 mm length: 050 (default head length = 45 mm)		page 85

Instrument connection

Place # 19		Description	Details	Image	Ref. page
★	A	½-14 NPT	Female threads		page 87
★	B	½-14 NPSM			page 87
	C	¾-14 NPT			page 87
	D	M18 × 1.5p			page 87
	E	M20 × 1.5p			page 87
	F	M24 × 1.5p			page 87
	G	G ½-in. (BSPF)			page 87
	H	G ¾-in. (BSPF)			page 87
	J	M27 × 2p			page 87
	K	M14 × 1.5p			page 87

Additional options

Sensor/thermowell assemble to options

Code	Description	Details	Ref. page
★ XT	Hand tight assembly of sensor and thermowell	Ensures sensor is threaded into thermowell but only hand tightened	page 87
★ XW	Process-ready assembly of sensor and thermowell	Ensures sensor is threaded into thermowell and torqued for process-ready installation	page 87

Extended product warranty

Code	Description	Details	Ref. pages
★ WR3	3-year limited warranty	This warranty option extends manufacturer’s warranty to three or five years for manufacturer related defects	page 87
★ WR5	5-year limited warranty		page 87

Thermowell calculation

Code		Description	Details	Ref. page
★	R21	Thermowell calculation	Set of calculations to ensure thermowells are safe in certain process conditions	page 88

NACE certification

Code		Description	Details	Ref. page
★	Q35	NACE approval	Meets MR0175/ISO 15156 and MR0103 requirements	page 89

PMI testing

Code		Description	Details	Ref. page
	Q76	PMI testing	Verifies chemical composition of material	page 89

Material certification

Code		Description	Details	Ref. page
★	Q8	Material certification	Certificate for material conformance and traceability in accordance with EN 10204 type 3.1	page 90

Material test

Code		Description	Details	Ref. page
	M01	Low temperature Charpy Test	Measures the low temperature ductility of the material	page 90
	M02	Ultrasonic examination of thermowell material	Examination of steel forgings for flaws and inclusions	page 90

Surface finish

Code		Description	Details	Ref. page
	Q16	Certification	Certificate showing measured surface finish values	page 91
	R14	Finish < Ra 0.3 μm (12 μin)	Improves surface roughness of thermowell	page 91

Electropolish

Code		Description	Details	Ref. page
	R20	Electropolish	Improve smoothness and surface quality	page 91

Hydrostatic external pressure test

Code		Description	Details	Ref. page
★	Q5	Standard external pressure test	Verifies structural quality and checks for leaks at thermowell process connection and stem	page 92
★	Q9	Extended external pressure test	Same as standard external pressure test but tested twice as long	page 93

Hydrostatic internal pressure test

Code		Description	Details	Ref. page
★	Q85	Standard internal pressure test	Verify internal structural integrity of thermowell	page 93
★	Q86	Extended internal pressure test	Same as standard internal pressure test but tested twice as long	page 93

Canadian registration number

Code		Description	Details	Ref. page
	Q17	Canadian Registration Number	Canadian approvals for all provinces (Approved materials in reference section)	page 94

Dye penetration test

Code		Description	Details	Ref. page
★	Q73	Dye penetration test	Checks quality of material	page 94

Wall thickness test

Code		Description	Details	Ref. page
	Q83	Ultrasonic test	Checks the bore concentricity of the thermowell	page 95
	Q84	Radiography (X-ray) test	Checks the bore concentricity of the thermowell	page 95

Special cleaning

Code		Description	Details	Ref. page
	Q6	Special cleaning	Oxygen enriched environment cleaning per ASTM G93	page 95

Thermowell markings

Code		Description	Details	Ref. page
	R40	Test markings on thermowell	External marking of the thermowell for specific tests (see reference page for list of tests)	page 96

Spherical tip

Code		Description	Details	Ref. page
	R60	Spherical tip	Changes the flat tip to spherical	page 97

Thermowell stem coating

Code		Description	Details	Ref. page
	R63	Alloy 6 stem coating	An alloy-based coating over the thermowell stem to prevent or slow down wear due to process media in erosive applications.	page 97

Plug and chain

Code		Description	Details	Ref. page
	R06	Stainless steel	Protects thermowell threads when sensor is not installed	page 98
	R23	Brass	Protects thermowell threads when sensor is not installed	page 98

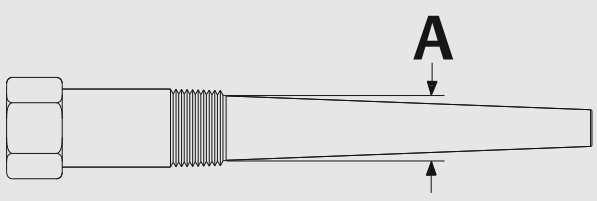
Vent hole

Code		Description	Details	Ref. page
	R11	Vent hole	Allows for the venting of a thermowell and for indication that thermowell structural integrity has been compromised	page 98

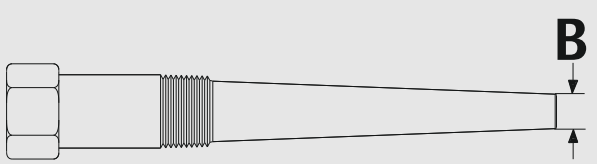
Thermowells with wrench flats

Code		Description	Details	Ref. Page
	R37	Thermowells with wrench flats	Converts the two wrench flats to hex wrench flats; only applies to exotic materials	page 107

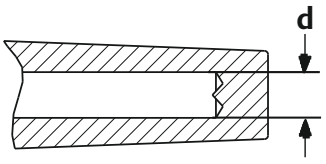
Root diameter (A)

Code		Description		Ref. Page
	Axxx	x.xx-in., 0.36 to 3.15-in. in 0.01-in. increments (when ordered with dimension units code E) Examples: Code A040 = 0.4-in., Code A315 = 3.15-in.		page 107
	Axxx	xx.xx mm, 10 to 80 mm in 0.5 mm increments (when ordered with dimension units code M) Examples: Code A100 = 10.0 mm, Code A755 = 75.5 mm		page 107

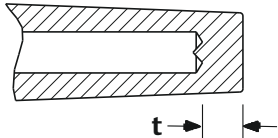
Tip diameter (B)

Code		Description		Ref. page
	Bxxx	x.xx-in., 0.36 to 1.83-in. in 0.01-in. increments (when ordered with dimension units code E) Examples: Code B040 = 0.4-in., Code B180 = 1.80-in.		page 108
	Bxxx	xx.xx mm, 10 to 46 mm in 0.5-mm. increments (when ordered with dimension units code M) Examples: Code B100 = 10.0 mm, Code B455 = 45.5 mm		page 108

Non-standard bore diameter (d)

Code		Description	Details	Image	Ref. page
	D01	0.276-in./7.0 mm	Default = 0.26-in. (6.6 mm)		page 109
	D03	0.138-in./3.5 mm			page 109
	D04	0.386-in./9.8 mm			page 109
	D05	0.354-in./9.0 mm			page 109
	D06	0.433-in./11.0 mm			page 109

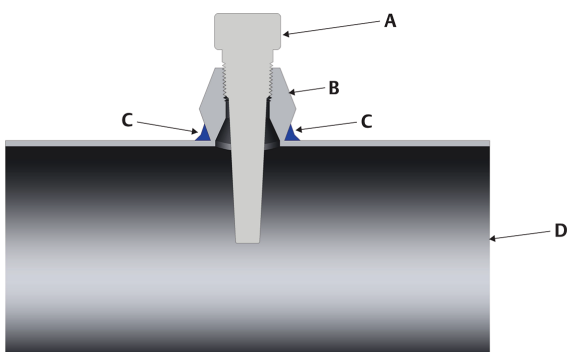
Non-standard tip thickness (t)

Code		Description	Details	Image	Ref. page
	T01	0.197-in./5.0 mm	Default = 0.25-in. (6.4 mm)		page 109
	T02	0.236-in./6.0 mm			page 109

Threaded installation

Threaded thermowells are screwed into the process using a threaded fitting or directly into a tapped pipe if there is sufficient wall thickness. Tapered threads will deform to each other to create a seal. Thread sealant and appropriate torque should be applied to reduce risk of leaks.

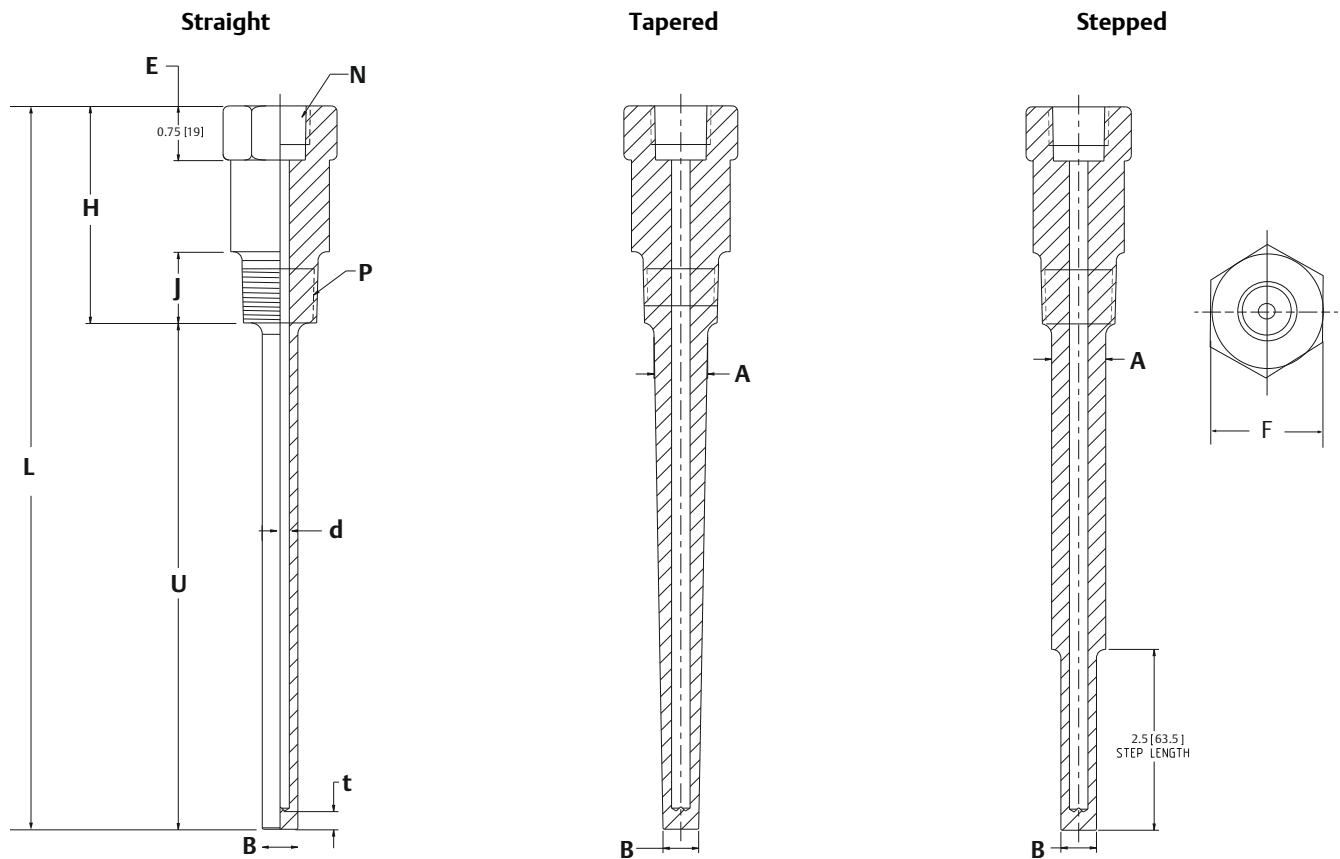
Figure 4: Installation Components



- A. Thermowell
- B. Threaded fitting
- C. Weld
- D. Process

Threaded thermowell drawings

Figure 5: Thread Mount Thermowell Drawings (Tapered Thread)



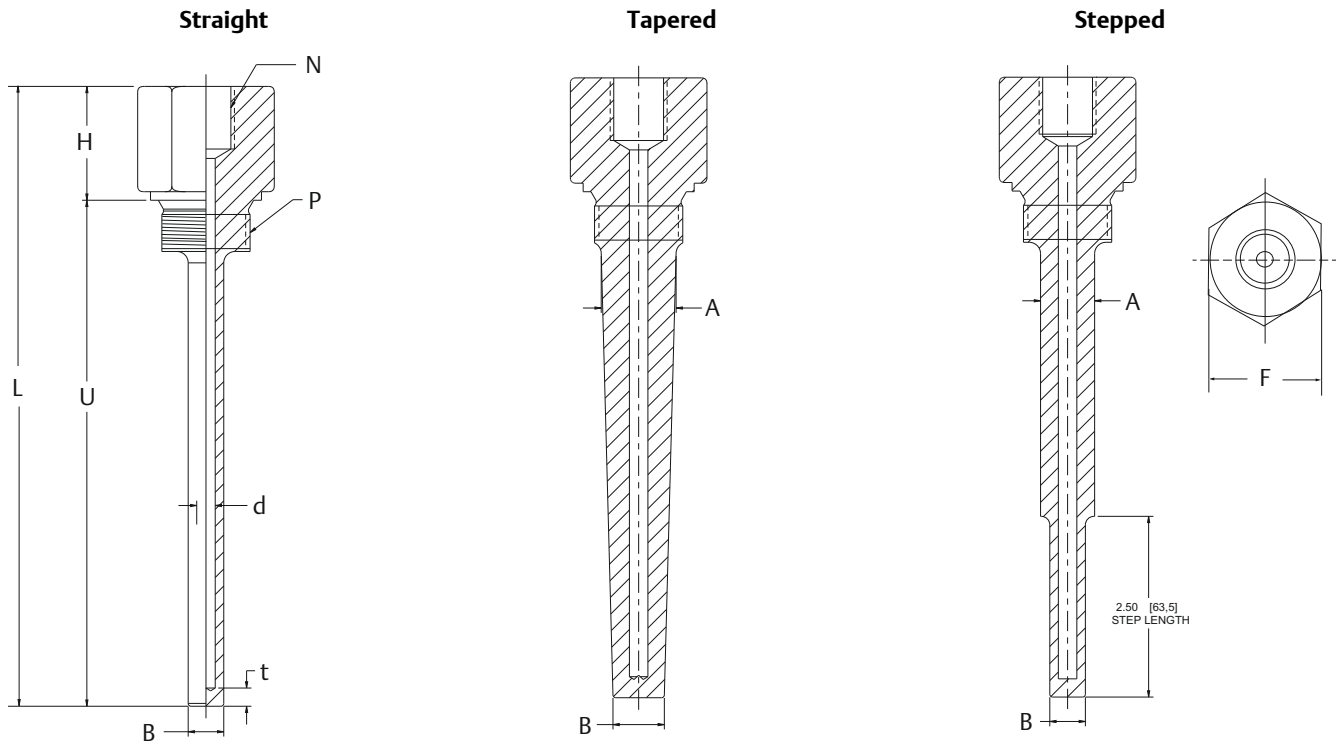
- A. Root diameter
- B. Tip diameter
- E. Wrench allowance
- H. Head length
- J. Thread allowance
- L. Total length (U + H)
- N. Instrument connection
- P. Process connection
- U. Immersion length
- d. Bore diameter
- t. Tip thickness

Table 1: Thread Mount Thermowells (Tapered Thread)

Dimensions are in inches (millimeter)

Code	Code T, threaded mounting style	Hex size "F"		Wrench flat size "G"		Root diameter stepped stem	Root diameter tapered stem	Tip diameter tapered stem	Root diameter straight stem	Thread specification
	Process connection "P"	Metric units (code M)	English units (code E)	Metric units (code M)	English units (code E)					
AA	½-14 NPT	1.18 (30)	1 1/8 (28.6)	1.18 (30)	1 1/8 (28.6)	0.67 (17)	0.67 (17)	0.50 (12.7)	0.669 (17)	NPT per SAE - AS 71051 (reference PS-71)
AB	¾-14 NPT	1.18 (30)	1 1/8 (28.6)	1.18 (30)	1 1/8 (28.6)	0.75 (19)	0.89 (22.5)	0.63 (16)	0.71 (18)	
AC	1-11.5 NPT	1.42 (36)	1 3/8 (34.9)	1.34 (34)	1 1/4 (31.8)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	0.71 (18)	
AD	1½-11.5 NPT	1.97 (50)	2 (50.8)	1.89 (48)	1 3/4 (44.5)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	0.71 (18)	
AE	½-in. BSPT	1.18 (30)	1 1/8 (28.6)	1.18 (30)	1 1/8 (28.6)	0.67 (17)	0.67 (17)	0.50 (12.7)	0.669 (17)	THD per ISO 7/1 (BS 21)
AF	¾-in. BSPT	1.18 (30)	1 1/8 (28.6)	1.18 (30)	1 1/8 (28.6)	0.75 (19)	0.89 (22.5)	0.63 (16)	0.71 (18)	
AG	1-in. BSPT	1.42 (36)	1 3/8 (34.9)	1.34 (34)	1 1/4 (31.8)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	0.71 (18)	

Figure 6: Thread Mount Thermowell Drawings (Parallel Thread)



- A. Root diameter
- B. Tip diameter
- F. Hex size
- H. Head length
- L. Total length (U + H)
- N. Instrument connection
- P. Process connection
- U. Immersion length
- d. Bore diameter
- t. Tip thickness

Table 2: Thread Mount Thermowells (Parallel Thread)

Dimensions are in inches (millimeter)

Code	Code T, threaded mounting style	Hex size "F"	Wrench flat size "G"	Root diameter stepped stem	Root diameter tapered stem	Tip diameter tapered stem and straight stem	Thread specification
	Process connection "P"						
DA	M20 × 1.5	1.18 (30)	1.18 (30)	0.67 (17)	0.67 (17)	0.5 (12.7)	Thread per BS3643
DB	M24 × 1.5	1.18 (30)	1.18 (30)	0.75 (19)	0.75 (19)	0.5 (12.7)	
DC	M27 × 2	1.26 or 1.42 (32 or 36)	1.34 (34)	0.75 (19)	0.75 (19)	0.5 (12.7)	
DD	M33 × 2	1.61 (41)	1.58 (40)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	
DE	½-in. BSPF (G½)	1.06 (27)	1.18 (30)	0.67 (17)	0.67 (17)	0.5 (12.7)	Thread per ISO 228/1 (BS 2779)
DF	¾-in. BSPF (G¾)	1.26 (32)	1.34 (34)	0.75 (19)	0.75 (19)	0.5 (12.7)	
DG	1-in. BSPF (G1)	1.61 (41)	1.58 (40)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	

Note

Hex size will be different depending on units selected (english and metric). Wrench flats are used on exotic materials instead of hex flats. For hex flats on exotic materials, select option R37. Additional root and tip diameters available.

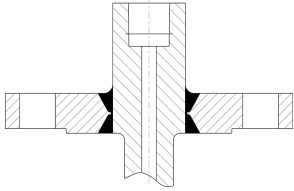
Rosemount 114C Flanged Thermowells



Flanged thermowell overview

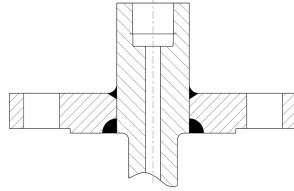
All Rosemount flanged thermowells are manufactured in accordance with ANSI B16.5. The flange to stem weld is in accordance to ASME Section IX. There is also full traceability with material certifications available on request. Rosemount flanged thermowells are available in two manufacturing configurations: full and partial penetration welds.

Full penetration weld (F)



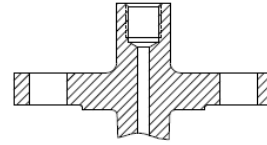
- Stronger weld joint per ASME PTC 19.3 TW
- Used for heavy duty applications
- Emerson recommended option

Partial penetration weld (P)



- Adequate for most process applications
- Weld withstands same pressure and temperature rating as flange
- Lower cost than full penetration weld

Forged, no welds (G)

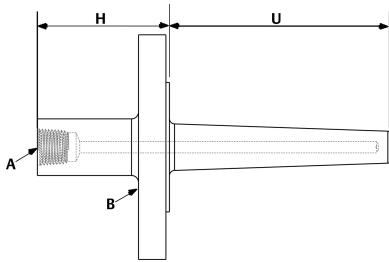


- Highest fatigue resistance per ASME PTC 19.3 TW
- Eliminates weld qualifications and failures
- Used in extreme process applications

Figure 7: Standard Offering–Flanged

Model	Units	Immersion length (U)	Mounting style	Process connection	Stem style	Thermowell material	Head length (H)	Instrument connection threads	Options									
1 1 4 C	X	X X X X	X	X X	X	X X	X X X	X	XX, XXX, XX									
1 2 3 4	5	6 7 8 9	10	11 12	13	14 15	16 17 18	19										
<table border="0"> <tr> <td style="vertical-align: top;"> (5) Units English (E) Metric (M) </td> <td style="vertical-align: top;"> (6-9) Immersion length (U) XXXX 1-in to 42-in (E) E.g: 0.5-in=0005, 42-in=0420 XXXX 25 mm to 1165 mm (M) E.g: 25 mm=0025, 1165 mm=1165 </td> <td style="vertical-align: top;"> (10) Mounting style F Full penetration weld P Partial penetration weld G Forged, no welds </td> <td style="vertical-align: top;"> (11-12) Process connections AA 1-in. Class 150 AB 1½-in. Class 150 AC 2-in. Class 150 AH 1-in. Class 300 AJ 1½-in. Class 300 AK 2-in. Class 300 </td> <td style="vertical-align: top;"> (13) Stem style 1 Straight stem 2 Tapered stem 3 Stepped stem </td> <td style="vertical-align: top;"> (14-15) Thermowell material SC 316/316L SST SF 304/304L SST CS Carbon steel </td> <td style="vertical-align: top;"> (16-18) Head length (H) XXX 2.25-in to 11.25-in (E) E.g: 2.25-in=022, 10-in=100 XXX 40 mm to 225 mm (M) E.g: 40 mm=040, 225 mm=225 </td> <td style="vertical-align: top;"> (19) Instrument connection A ½-14 NPT B ½-14 NPSM D M18 x 1.5p E M20 x 1.5p F M24 x 1.5p </td> <td style="vertical-align: top;"> Common options Q5 External pressure test Q35 NACE certification R21 Wake frequency calculation Q8 Material certification Q73 Dye penetration test </td> </tr> </table>										(5) Units English (E) Metric (M)	(6-9) Immersion length (U) XXXX 1-in to 42-in (E) E.g: 0.5-in=0005, 42-in=0420 XXXX 25 mm to 1165 mm (M) E.g: 25 mm=0025, 1165 mm=1165	(10) Mounting style F Full penetration weld P Partial penetration weld G Forged, no welds	(11-12) Process connections AA 1-in. Class 150 AB 1½-in. Class 150 AC 2-in. Class 150 AH 1-in. Class 300 AJ 1½-in. Class 300 AK 2-in. Class 300	(13) Stem style 1 Straight stem 2 Tapered stem 3 Stepped stem	(14-15) Thermowell material SC 316/316L SST SF 304/304L SST CS Carbon steel	(16-18) Head length (H) XXX 2.25-in to 11.25-in (E) E.g: 2.25-in=022, 10-in=100 XXX 40 mm to 225 mm (M) E.g: 40 mm=040, 225 mm=225	(19) Instrument connection A ½-14 NPT B ½-14 NPSM D M18 x 1.5p E M20 x 1.5p F M24 x 1.5p	Common options Q5 External pressure test Q35 NACE certification R21 Wake frequency calculation Q8 Material certification Q73 Dye penetration test
(5) Units English (E) Metric (M)	(6-9) Immersion length (U) XXXX 1-in to 42-in (E) E.g: 0.5-in=0005, 42-in=0420 XXXX 25 mm to 1165 mm (M) E.g: 25 mm=0025, 1165 mm=1165	(10) Mounting style F Full penetration weld P Partial penetration weld G Forged, no welds	(11-12) Process connections AA 1-in. Class 150 AB 1½-in. Class 150 AC 2-in. Class 150 AH 1-in. Class 300 AJ 1½-in. Class 300 AK 2-in. Class 300	(13) Stem style 1 Straight stem 2 Tapered stem 3 Stepped stem	(14-15) Thermowell material SC 316/316L SST SF 304/304L SST CS Carbon steel	(16-18) Head length (H) XXX 2.25-in to 11.25-in (E) E.g: 2.25-in=022, 10-in=100 XXX 40 mm to 225 mm (M) E.g: 40 mm=040, 225 mm=225	(19) Instrument connection A ½-14 NPT B ½-14 NPSM D M18 x 1.5p E M20 x 1.5p F M24 x 1.5p	Common options Q5 External pressure test Q35 NACE certification R21 Wake frequency calculation Q8 Material certification Q73 Dye penetration test										

The common options shown in Figure 7 represent a partial offering; reference the [Flanged ordering information](#) for a full list of available options.

Figure 8: Flanged Thermowell Components

- A. Instrument connection
- B. Process connection
- H. Head length
- U. Immersion length

Note

Wetted surface includes flange face and immersion length (U).

Flanged ordering information

Figure 9: Model Number Ordering Example

Model				Units	Immersion length (U)				Mounting style	Process connection		Stem style	Thermowell material		Head length (H)			Instrument connection	Options
1	1	4	C	E	0	1	5	0	F	A	C	1	S	C	0	5	0	A	WR5, Q76...
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	XXXXX

The numbers below the model number ordering example correlate to the character place numbers in the second column of the ordering table.

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

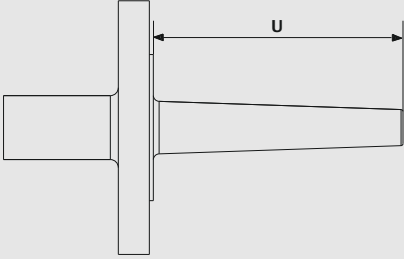
Model

Place # 1-4		Description	Details	Ref. page
★	114C	Barstock temperature thermowell	Made with a standard bore diameter of 0.26-in. (6.6 mm) and tip wall thickness of 0.25-in. (6.4 mm). Default ASME flange facing is raised face with spiral serrations. Default EN 1092-1 flange facing is raised face Type B1.	N/A

Dimension units

Place # 5		Description	Details	Ref. page
★	E	English units (in.)	Specifies whether length units will be in inches (in.) or millimeters (mm)	page 80
★	M	Metric units (mm)		page 80

Immersion length (U)

Place # 6-9	Description		Ref. page
★	xxxx	xxx.x-in., 1.00 to 100-in. in ¼-in. increments (when ordered with dimension units code E) Example of a 6.25-in. length where the second decimal is dropped off: 0062	page 80
★	xxxx	xxxx mm, 25 to 2500 mm in 5 mm increments (when ordered with dimension units code M) Example of a 50 mm length: 0050	page 80

Mounting style

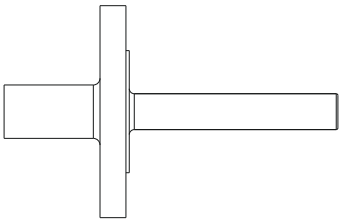
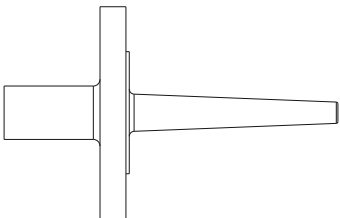
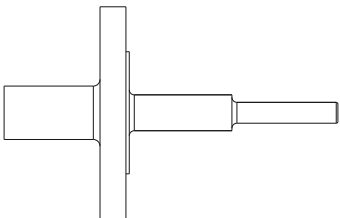
Place # 10		Description	Details	Ref. page
★	P	Flange, partial penetration weld	Weld refers to welding of the flange to thermowell stem	N/A
★	F	Flange, full penetration weld		N/A
★	G	Flange, forged	Single piece forging, no welds	N/A

Process connection

Place # 11-12		Partial weld (P)	Full penetration weld (F)	Forged, no welds (G)	Ref. page
★	AA	1-in. Class 150	1-in. Class 150	1-in. Class 150	N/A
★	AB	1½-in. Class 150	1½-in. Class 150	1½-in. Class 150	N/A
★	AC	2-in. Class 150	2-in. Class 150	2-in. Class 150	N/A
★	AD	3-in. Class 150	3-in. Class 150	3-in. Class 150	N/A
★	AE	4-in. Class 150	4-in. Class 150	4-in. Class 150	N/A
★	AF	6-in. Class 150	6-in. Class 150	6-in. Class 150	N/A
★	AG	¾-in. Class 300	¾-in. Class 300	¾-in. Class 300	N/A
★	AH	1-in. Class 300	1-in. Class 300	1-in. Class 300	N/A
★	AJ	1½-in. Class 300	1½-in. Class 300	1½-in. Class 300	N/A
★	AK	2-in. Class 300	2-in. Class 300	2-in. Class 300	N/A
	AL	1-in. Class 400/600	1-in. Class 400/600	1-in. Class 400/600	N/A
	AM	1½-in. Class 400/600	1½-in. Class 400/600	1½-in. Class 400/600	N/A
	AN	2-in. Class 400/600	2-in. Class 400/600	2-in. Class 400/600	N/A
	AP	N/A	1-in. Class 900/1500	1-in. Class 900/1500	N/A
	AQ	N/A	1½-in. Class 900/1500	1½-in. Class 900/1500	N/A
	AR	N/A	2-in. Class 900/1500	2-in. Class 900/1500	N/A
	AS	N/A	1-in. Class 2500	1-in. Class 2500	N/A
	AT	N/A	1½-in. Class 2500	1½-in. Class 2500	N/A
	AU	N/A	2-in. Class 2500	2-in. Class 2500	N/A
	AV	3-in. Class 300	3-in. Class 300	3-in. Class 300	N/A
	AW	3-in. Class 400/600	3-in. Class 400/600	3-in. Class 400/600	N/A
	AX	N/A	3-in. Class 900	3-in. Class 900	N/A
	AY	N/A	3-in. Class 1500	3-in. Class 1500	N/A
	AZ	N/A	3-in Class 2500	3-in Class 2500	N/A
	FA	DN 20/PN 2.5/6	DN 20/PN 2.5/6	DN 20/PN 2.5/6	N/A
	FE	DN 20/PN 10/16/25/40	DN 20/PN 10/16/25/40	DN 20/PN 10/16/25/40	N/A
	FG	DN 20/PN 63/100	DN 20/PN 63/100	DN 20/PN 63/100	N/A

Place # 11-12	Partial weld (P)	Full penetration weld (F)	Forged, no welds (G)	Ref. page
GA	DN 25/PN 2.5/6	DN 25/PN 2.5/6	DN 25/PN 2.5/6	N/A
GE	DN 25/PN 10/16/25/40	DN 25/PN 10/16/25/40	DN 25/PN 10/16/25/40	N/A
GG	DN 25 PN 63/100	DN 25/PN 63/100	DN 25/PN 63/100	N/A
JA	DN 40/PN 2.5/6	DN 40/PN 2.5/6	DN 40/PN 2.5/6	N/A
JE	DN 40/PN 10/16/25/40	DN 40/PN 10/16/25/40	DN 40/PN 10/16/25/40	N/A
JG	DN 40/PN 63/100	DN 40/PN 63/100	DN 40/PN 63/100	N/A
KA	DN 50/PN 2.5/6	DN 50/PN 2.5/6	DN 50/PN 2.5/6	N/A
KC	DN 50/PN 10/16	DN 50/PN 10/16	DN 50/PN 10/16	N/A
KE	DN 50/PN 25/40	DN 50/PN 25/40	DN 50/PN 25/40	N/A
KF	DN 50/PN 63	DN 50/PN 63	DN 50/PN 63	N/A
KG	DN 50/PN 100	DN 50/PN 100	DN 50/PN 100	N/A
LA	DN 65/PN 2.5/6	DN 65/PN 2.5/6	DN 65/PN 2.5/6	N/A
LC	DN 65/PN 10/16	DN 65/PN 10/16	DN 65/PN 10/16	N/A
LE	DN 65/PN 24/40	DN 65/PN 24/40	DN 65/PN 24/40	N/A
LF	DN 65/PN 63	DN 65/PN 63	DN 65/PN 63	N/A
LG	DN 65/PN 100	DN 65/PN 100	DN 65/PN 100	N/A
MA	DN 80/PN 2.5/6	DN 80/PN 2.5/6	DN 80/PN 2.5/6	N/A
MC	DN 80/PN 10/16	DN 80/PN 10/16	DN 80/PN 10/16	N/A
ME	DN 80/PN 25/40	DN 80/PN 25/40	DN 80/PN 25/40	N/A
MF	DN 80/PN 63	DN 80/PN 63	DN 80/PN 63	N/A
MG	DN 80/PN 100	DN 80/PN 100	DN 80/PN 100	N/A
NA	DN 100/PN 2.5/6	DN 100/PN 2.5/6	DN 100/PN 2.5/6	N/A
NC	DN 100/PN 10/16	DN 100/PN 10/16	DN 100/PN 10/16	N/A
NE	DN 100/PN 25/40	DN 100/PN 25/40	DN 100/PN 25/40	N/A
NF	DN 100/PN 63	DN 100/PN 63	DN 100/PN 63	N/A
NG	DN 100/PN 100	DN 100/PN 100	DN 100/PN 100	N/A

Stem style

Place # 13		Description	Details	Image	Ref. page
★	1	Straight	Minimum immersion length = 1-in. (25 mm)		page 81
★	2	Tapered	Minimum immersion length = 1-in. (25 mm)		page 81
★	3	Stepped	Minimum immersion length = 3-in. (75 mm)		page 81

Thermowell material

Place # 14-15		Description	Details	Ref. page
★	SC	316/316L dual rated		page 82
	SD	316/316L dual rated (NORSOK)	Must order the Q8 Material Certificate to get NORSOK documentation	page 82
★	SF	304/304L dual rated		page 82
★	CS	Carbon steel (A-105)		page 82
	SG	316Ti SST		page 82
	SH	316/316L SST with tantalum sheath	Only available as a straight stem profile with a 0.75 diameter thus requires option A075 for English units	page 82
	SJ	316/316L SST with PFA coating		page 82
	SK	304/304L SST with PTFE coating		page 82

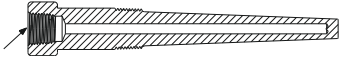
Place # 14-15		Description	Details	Ref. page
	SL	310 SST		page 82
	SM	321 SST		page 82
	SN	321H SST		page 82
	SR	904L SST		page 82
	SP	347 SST		page 82
	AB	Alloy B3		page 82
	AC	Alloy C-276		page 82
	AD	Alloy C-4 (with 304/304L SST flange)	Not available with G (Fully forged) mounting style	page 82
	AE	Alloy C-22 (with 304/304L SST flange)	Not available with G (Fully forged) mounting style	page 82
	AF	Alloy C-22 (with 316/316L SST flange)	Not available with G (Fully forged) mounting style	page 82
	AG	Alloy 20		page 82
	AH	Alloy 400		page 82
	AK	Alloy 600		page 82
	AL	Alloy 600 (with 304/304L SST flange)	Not available with G (Fully forged) mounting style	page 82
	AM	Alloy 601		page 82
	AN	Alloy 625		page 82
	AP	Alloy 800		page 82
	AQ	Alloy 800H/HT		page 82
	AR	Alloy 825		page 82
	AU	Alloy C-20		page 82
	AS	Alloy F44 Mo6		page 82

Place # 14-15		Description	Details	Ref. page
	CA	Chrome-Moly Grade B-11/F-11 Class II		page 82
	CB	Chrome-Moly Grade B-22/ F-22 Class III		page 82
	CC	Chrome-Moly Grade F-91		page 82
	NK	Nickel 200		page 82
	TT	Titanium Grade 2		page 82
	DS	Super duplex SST		page 82
	DT	Super duplex – NORSOK	Must order the Q8 Material Certificate to get NORSOK documentation	page 82
	DU	Duplex 2205		page 82
	DV	Duplex 2205 – NORSOK	Must order the Q8 Material Certificate to get NORSOK documentation	page 82

Head length (H)

Place # 16-18		Description	Ref. page
★	xxx	xx.x-in., 2.25 to 11.25-in. in ¼-in. increments (when ordered with dimension units code E)	page 85
		Example of a 6.25-in. length where the second decimal is dropped off: 062 (default head length = 2.25-in. for flanges under Class 900)	
★	xxx	xxx mm, 45 to 225 mm in 5 mm increments (when ordered with dimension units code M)	page 85
		Example of a 50 mm length: 050 (default head length = 60 mm for flanges under Class 900)	

Instrument connection

Place # 19		Description	Details	Image	Ref. page
★	A	½-14 NPT	Female threads		page 87
★	B	½-14 NPSM			page 87
	C	¾-14 NPT			page 87
	D	M18 × 1.5p			page 87
	E	M20 × 1.5p			page 87
	F	M24 × 1.5p			page 87
	G	G ½-in. (BSPF)			page 87
	H	G ¾-in. (BSPF)			page 87
	J	M27 × 2p			page 87
	K	M14 × 1.5p			page 87

Additional options

Sensor/thermowell assemble to options

Code	Description	Details	Ref. page
★ XT	Hand tight assembly of sensor and thermowell	Ensures sensor is threaded into thermowell but only hand tightened	page 87
★ XW	Process-ready assembly of sensor and thermowell	Ensures sensor is threaded into thermowell and torqued for process-ready installation	page 87

Extended product warranty

Code	Description	Details	Ref. pages
★ WR3	3-year limited warranty	This warranty option extends manufacturer’s warranty to three or five years for manufacturer related defects	page 87
★ WR5	5-year limited warranty		page 87

Thermowell calculation

Note

If your chosen mounting style is flange with full penetration weld (F) then you must choose dye penetration option (Q73) to meet the ASME PTC 19.3 TW standard requirements.

Code		Description	Details	Ref. page
★	R21	Thermowell calculation	Set of calculations to ensure thermowells are safe in certain process conditions	page 88

NACE certification

Code		Description	Details	Ref. page
★	Q35	NACE approval	Meets MR0175/ISO 15156 and MR0103 requirements	page 89

PMI testing

Code		Description	Details	Ref. page
	Q76	PMI testing	Verifies chemical composition of material	page 89

Material certification

Code		Description	Details	Ref. page
★	Q8	Material certification	Certificate for material conformance and traceability in accordance with EN 10204 type 3.1	page 90

Material test

Code		Description	Details	Ref. page
	M01	Low temperature Charpy Test	Measures the low temperature ductility of the material	page 90
	M02	Ultrasonic examination of thermowell material	Examination of steel forgings for flaws and inclusions	page 90

Surface finish

Code		Description	Details	Ref. page
	Q16	Certification	Certificate showing measured surface finish values	page 91

Code		Description	Details	Ref. page
	R14	Finish < Ra 0.3 μm (12 μin)	Improves surface roughness of thermowell	page 91

Electropolish

Code		Description	Details	Ref. page
	R20	Electropolish	Improve smoothness and surface quality	page 91

Hydrostatic external pressure test

Code		Description	Details	Ref. page
★	Q5	Standard external pressure test	Verifies structural quality and checks for leaks at thermowell process connection and stem	page 92
★	Q9	Extended external pressure test	Same as standard external pressure test but tested twice as long	page 93

Hydrostatic internal pressure test

Code		Description	Details	Ref. page
★	Q85	Standard internal pressure test	Verify internal structural integrity of thermowell	page 93
★	Q86	Extended internal pressure test	Same as standard internal pressure test but tested twice as long	page 93

Canadian registration number

Code		Description	Details	Ref. page
	Q17	Canadian Registration Number	Canadian approvals for all provinces (Approved materials in reference section)	page 94

Dye penetration test

Code		Description	Details	Ref. page
★	Q73	Dye penetration test	Checks quality of material	page 94

Wall thickness test

Code		Description	Details	Ref. page
★	Q83	Ultrasonic test	Checks the bore concentricity of the thermowell	page 95
★	Q84	Radiography (X-ray) test	Checks the bore concentricity of the thermowell	

Special cleaning

Code		Description	Details	Ref. page
	Q6	Special cleaning	Oxygen enriched environment cleaning per ASTM G93	page 95

Thermowell markings

Code		Description	Details	Ref. page
	R40	Test markings on thermowell	External marking of the thermowell for specific tests (see reference page for list of tests)	page 96

Phased array test

Code		Description	Details	Ref. page
	Q80	Phased array test	Verifies the quality of full penetration flange welds using ultrasonic technology	page 97

X-ray/radiograph Test

Code		Description	Details	Ref. page
	Q81	X-ray/radiograph	Verifies quality of full penetration flange welds	page 97

Flange welding documentation

Code		Description	Details	Ref. page
	Q66	Procedure Qualification Records (PQR)	A record of a test weld performed and tested rigorously to ensure that the procedure will produce good weld.	page 96
	Q67	Welder Performance Qualifications (WPQ)	A test certificate that shows whether a welder possesses the necessary experience and knowledge to perform the specifications of a particular weld procedure.	page 97

Code		Description	Details	Ref. page
	Q68	Welding Procedure Specifications (WPS)	A formal written document that describes and provides direction to a welder or welding operator for making sound and quality production welds per code requirement.	page 97

Plug and chain

Code		Description	Details	Ref. page
	R06	Stainless steel	Protects thermowell threads when sensor is not installed	page 98
	R23	Brass	Protects thermowell threads when sensor is not installed	page 98

Spherical tip

Code		Description	Details	Ref. page
	R60	Spherical tip	Changes the flat tip to spherical	page 97

Thermowell stem coating

Code		Description	Details	Ref. page
	R63	Alloy 6 stem coating	An alloy-based coating over the thermowell stem to prevent or slow down wear due to process media in erosive applications.	page 97

Vent hole

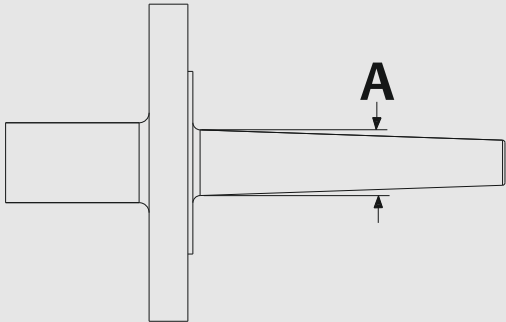
Code		Description	Details	Ref. page
	R11	Vent hole	Allows for the venting of a thermowell and for indication that thermowell structural integrity has been compromised	page 98

Flange face

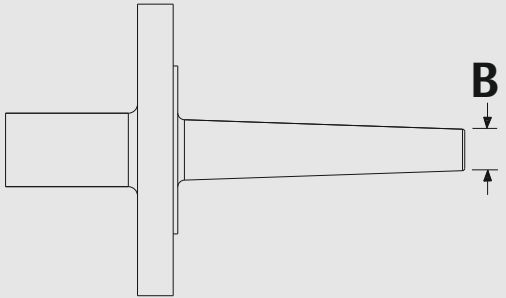
Code		Description	Details	Ref. page
	R09	Concentric serrations	Concentric serrations in the flange face per ASME B16.5	page 98
	R10	Flat	Flat flange face per ASME B16.5 or EN 1092-1 facing Type A	page 100

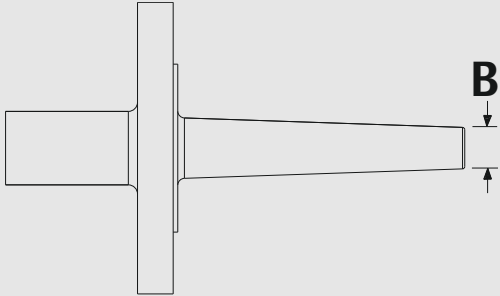
Code	Description	Details	Ref. page
R15	Raised face, Type B2	Raisce face per EN 1092-1 facing Type B2	page 101
R16	RTJ	Ring type joint flange face per ASME B16.5	page 101
R18	Groove, Type D	Groove, Type D per EN 1092-1	page 103
R19	Tongue, Type C	Tongue, Type C per EN 1092-1	page 104
R24	Spigot, Type E	Spigot, Type E per EN 1092-1	page 105
R25	Recess, Type F	Recess, Type F per EN 1092-1	page 106

Root diameter (A)

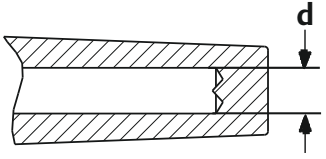
Code	Description		Ref. page
Axxx	x.xx-in., 0.36 to 3.15-in. in 0.01-in. increments (when ordered with dimension units code E) Examples: Code A040 = 0.4-in., Code A315 = 3.15-in.		page 107
Axxx	xx.xx mm, 10 to 80 mm in 0.5 mm increments (when ordered with dimension units code M) Examples: Code A100 = 10.0 mm, Code A755 = 75.5 mm		page 107

Tip diameter (B)

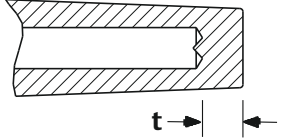
Code	Description		Ref. page
Bxxx	x.xx-in., 0.36 to 1.83-in. in 0.01-in. increments (when ordered with dimension units code E) Examples: Code B040 = 0.4-in, Code B180 = 1.80-in.		page 108

Code	Description		Ref. page
Bxxx	xx.x mm, 10 to 46 mm in 0.5 mm. increments (when ordered with dimension units code M) Examples: Code B100 = 10.0 mm, Code B455 = 45.5 mm		page 108

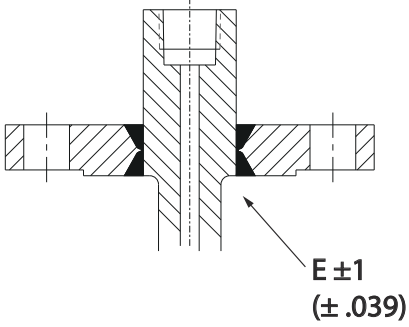
Non-standard bore diameter (d)

Code	Description	Details	Image	Ref. page
D01	0.276-in./7.0 mm	Default = 0.26-in. (6.6 mm)		page 109
D03	0.138-in./3.5 mm			page 109
D04	0.386-in./9.8 mm			page 109
D05	0.354-in./9.0 mm			page 109
D06	0.433-in./11.0 mm			page 109

Non-standard tip thickness (t)

Code	Description	Details	Image	Ref. page
T01	0.197-in./5.0 mm	Default = 0.25-in. (6.4 mm)		page 109
T02	0.236-in./6.0 mm			page 109

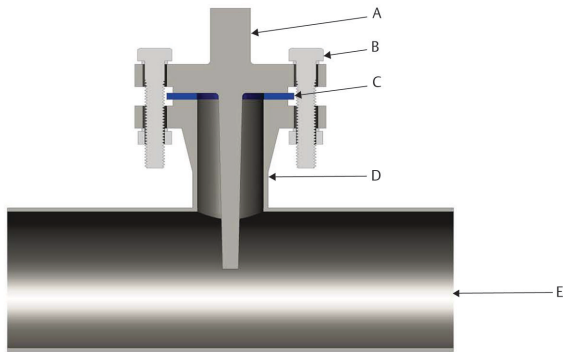
Fillet radius (e)

Code		Description	Details	Image	Ref. page
	E01	0.039-in./1 mm	Standard = 0.157-in. (4 mm)		page 110
	E02	0.079-in./ 2 mm			
	E03	0.118-in./3 mm			
	E05	0.197-in./5 mm			
	E06	0.236-in./6 mm			

Flanged installation

Flanged thermowells are bolted to a mating flange which protrudes from the process. It is important to select appropriate gasket for the process conditions, to provide a seal between the flange faces. The Rosemount 114C Thermowells come standard with a raised face and spiral serrations designed per the ASME B16.5 standard. These should be installed with an inside bolt circle (IBC) gasket/ring gasket, which extends to and is centered by the bolts. Other flange face options are available.

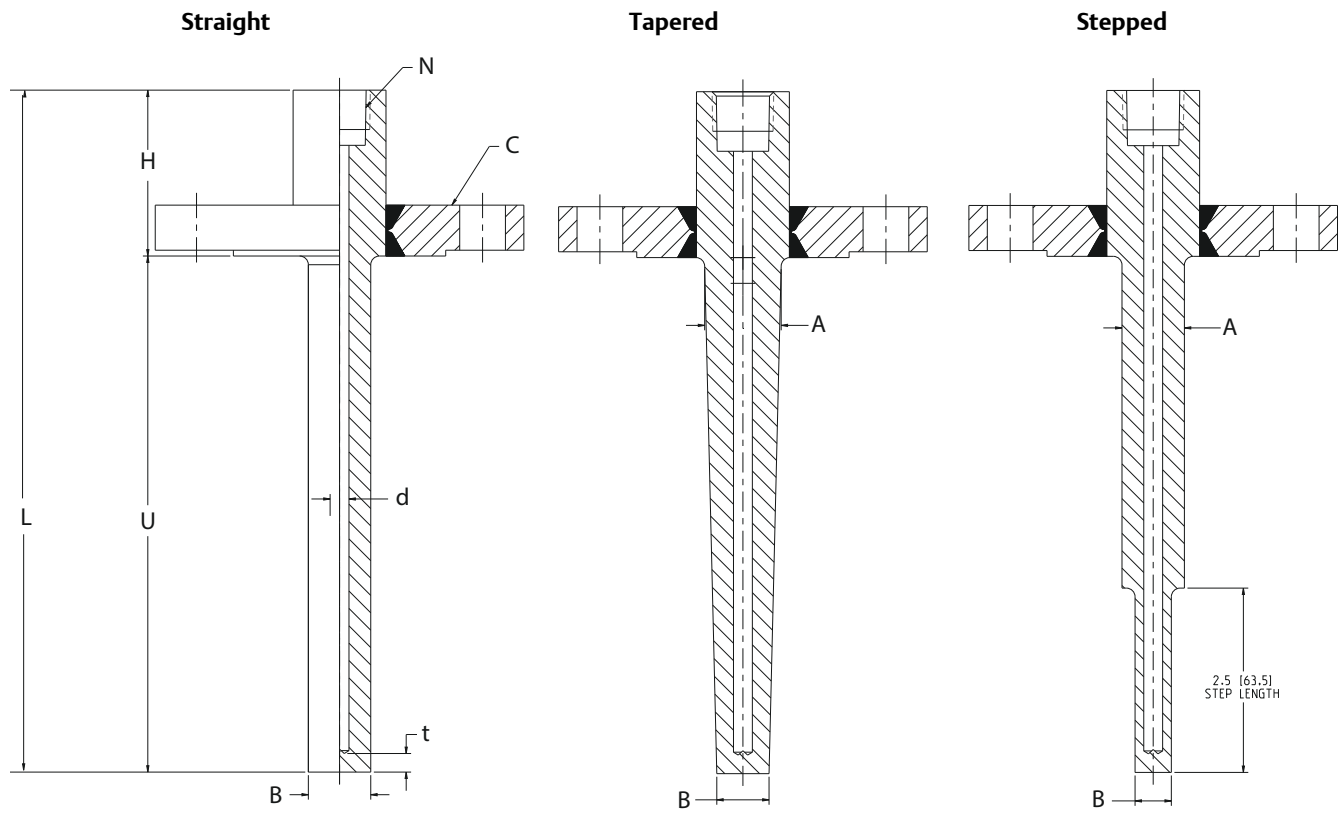
Figure 10: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Flanged thermowell drawings

Figure 11: Flange Mounted Thermowell Drawings



- A. Root diameter
- B. Tip diameter
- C. ASME B16.5 flange
- L. Total length (U + H)
- H. Head length
- N. Instrument connection
- U. Immersion length
- d. Bore diameter
- t. Tip thickness

Table 3: Flange Mounted Thermowells

Dimensions are in inches (mm).

Code	Process connection			Root diameter stepped stem	Root diameter tapered stem	Tip diameter tapered stem	Tip diameter straight stem	Flanges per specification
	Code P, flanged, partial penetration weld	Code F, flanged, full penetration weld	Code G, flanged, forged/no welds					
AA	1-in. Class 150	1-in. Class 150	1-in. Class 150	.748 (19)	.886 (22.5)	.630 (16)	.748 (19)	ASME B16.5
AB	1½-in. Class 150	1½-in. Class 150	1½-in. Class 150	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AC	2-in. Class 150	2-in. Class 150	2-in. Class 150	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AD	3-in. Class 150	3-in. Class 150	3-in. Class 150	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AE	4-in. Class 150	4-in. Class 150	4-in. Class 150	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AF	6-in. Class 150	6-in. Class 150	6-in. Class 150	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AG	¾-in. Class 300	¾-in. Class 300	¾-in. Class 300	.669 (17)	.669 (17)	.495 (12.5)	.669 (17)	
AH	1-in. Class 300	1-in. Class 300	1-in. Class 300	.748 (19)	.886 (.22.5)	.630 (16)	.748 (19)	
AJ	1½-in. Class 300	1½-in. Class 300	1½-in. Class 300	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AK	2-in. Class 300	2-in. Class 300	2-in. Class 300	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AL	1-in. Class 400/600	1-in. Class 400/600	1-in. Class 400/600	.748 (19)	.886 (.22.5)	.630 (16)	.748 (19)	
AM	1½-in. Class 400/600	1½-in. Class 400/600	1½-in. Class 400/600	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AN	2-in. Class 400/600	2-in. Class 400/600	2-in. Class 400/600	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AP	N/A	1-in. Class 900/1500	1-in. Class 900/1500	.748 (19)	.886 (.22.5)	.630 (16)	.748 (19)	
AQ	N/A	1½-in. Class 900/1500	1½-in. Class 900/1500	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AR	N/A	2-in. Class 900/1500	2-in. Class 900/1500	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AT	N/A	1½-in. Class 2500	1½-in. Class 2500	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AU	N/A	2-in. Class 2500	2-in. Class 2500	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AV	3-in. Class 300	3-in. Class 300	3-in. Class 300	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	

Table 3: Flange Mounted Thermowells (continued)

Code	Process connection			Root diameter stepped stem	Root diameter tapered stem	Tip diameter tapered stem	Tip diameter straight stem	Flanges per specification
	Code P, flanged, partial penetration weld	Code F, flanged, full penetration weld	Code G, flanged, forged/no welds					
AX	N/A	3-in. Class 900	N/A	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AY	N/A	3-in. Class 1500	N/A	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
AZ	N/A	3-in. Class 2500	N/A	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
FA	DN 20/PN 2.5/6	DN 20/PN 2.5/6	DN 20/PN 2.5/6	.669 (17)	.669 (17)	.500 (12.7)	.669 (17)	EN 1092-1
FE	DN 20/PN 10/16/25/40	DN 20/PN 10/16/25/40	DN 20/PN 10/16/25/40	.669 (17)	.669 (17)	.500 (12.7)	.669 (17)	
FG	DN 20/PN 63/100	DN 20/PN 63/100	DN 20/PN 63/100	.669 (17)	.669 (17)	.500 (12.7)	.669 (17)	
GA	DN 25/PN 2.5/6	DN 25/PN 2.5/6	DN 25/PN 2.5/6	.748 (19)	.748 (19)	.500 (12.7)	.748 (19)	
GE	DN 25/PN 10/16/25/40	DN 25/PN 10/16/25/40	DN 25/PN 10/16/25/40	.748 (19)	.748 (19)	.500 (12.7)	.748 (19)	
GG	DN 25/PN 63/100	DN 25/PN 63/100	DN 25/PN 63/100	.748 (19)	.748 (19)	.500 (12.7)	.748 (19)	
JA	DN 40/PN 2.5/6	DN 40/PN 2.5/6	DN 40/PN 2.5/6	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
JE	DN 40/PN 10/16/25/40	DN 40/PN 10/16/25/40	DN 40/PN 10/16/25/40	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
JG	DN 40/PN 63/100	DN 40/PN 63/100	DN 40/PN 63/100	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
JH	DN 40/PN 160	DN 40/PN 160	DN 40/PN 160	.846 (21.5)	1.043 (26.5)	.630 (16)	.846 (21.5)	
JJ	DN 40/PN 250	DN 40/PN 250	DN 40/PN 250	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
JK	DN 40/PN 320	DN 40/PN 320	DN 40/PN 320	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
JL	DN 40/PN 400	DN 40/PN 400	DN 40/PN 400	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
KA	DN 50/PN 2.5/6	DN 50/PN 2.5/6	DN 50/PN 2.5/6	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
KC	DN 50/PN 10/16	DN 50/PN 10/16	DN 50/PN 10/16	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
KE	DN 50/PN 25/40	DN 50/PN 25/40	DN 50/PN 25/40	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
KF	DN 50/PN 63	DN 50/PN 63	DN 50/PN 63	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	

Table 3: Flange Mounted Thermowells (continued)

Code	Process connection			Root diameter stepped stem	Root diameter tapered stem	Tip diameter tapered stem	Tip diameter straight stem	Flanges per specification
	Code P, flanged, partial penetration weld	Code F, flanged, full penetration weld	Code G, flanged, forged/no welds					
KG	DN 50/PN 100	DN 50/PN 100	DN 50/PN 100	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
LA	DN 65/PN 2.5/6	DN 65/PN 2.5/6	DN 65/PN 2.5/6	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	EN 1092-1
LC	DN 65/PN 10/16	DN 65/PN 10/16	DN 65/PN 10/16	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
LE	DN 65/PN 24/40	DN 65/PN 24/40	DN 65/PN 24/40	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
LF	DN 65/PN 63	DN 65/PN 63	DN 65/PN 63	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
LG	DN 65/PN 100	DN 65/PN 100	DN 65/PN 100	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
MA	DN 80/PN 2.5/6	DN 80/PN 2.5/6	DN 80/PN 2.5/6	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
MC	DN 80/PN 10/16	DN 80/PN 10/16	DN 80/PN 10/16	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
ME	DN 80/PN 25/40	DN 80/PN 25/40	DN 80/PN 25/40	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
MF	DN 80/PN 63	DN 80/PN 63	DN 80/PN 63	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
MG	DN 80/PN 100	DN 80/PN 100	DN 80/PN 100	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
NA	DN 100/PN 2.5/6	DN 100/PN 2.5/6	DN 100/PN 2.5/6	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
NC	DN 100/PN 10/16	DN 100/PN 10/16	DN 100/PN 10/16	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
NE	DN 100/PN 25/40	DN 100/PN 25/40	DN 100/PN 25/40	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
NF	DN 100/PN 63	DN 100/PN 63	DN 100/PN 63	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	
NG	DN 100/PN 100	DN 100/PN 100	DN 100/PN 100	.846 (21.5)	1.043 (26.5)	.709 (18)	.846 (21.5)	

Rosemount 114C Van Stone Thermowells



Van Stone thermowell overview

Van Stone/lap joint thermowells are mounted between the mating flange and lap joint flange. This unique design enables thermowell designers to specify thermowell flange materials different than the thermowell stem material; flanges are easily replaceable. These thermowells allow use of different thermowell materials for the flange contacting the process and overlaying flange which can save material and manufacturing costs. They are a good choice for corrosive applications, because there are no welds so weld-joint corrosion is eliminated. The Emerson standard for the Van Stone thermowell is a raised face style made of carbon steel. Other styles and flange materials are also available.

The standard offering figure below shows the thermowell configurations that can typically be shipped in two weeks or less.

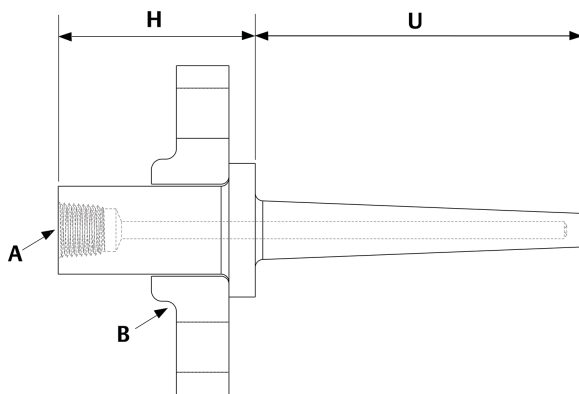
Figure 12: Standard Offering–Van Stone

Model				Units	Immersion length (U)				Mounting style	Process connection		Stem style	Thermowell material		Head length (H)			Instrument connection threads	Options
1	1	4	C	X	X	X	X	X	V	X	X	T	X	X	X	X	X	X	XX, XXX, XX
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	

(5) Units		(10) Mounting style		(13) Stem style		(16-18) Head length (H)			(19) Instrument connection		
English (E)	Metric (M)	Van Stone (V)		T Twisted Stem		XXX	2.25- to 11.25-in. (E) Example: 2.25-in. = 022, 10-in. = 100		A	½-14 NPT	
(6-9) Immersion length (U)		(11-12) Process connections		(14-15) Thermowell material		Common options		B		½-14 NPSM	
XXXX	1- to 40-in. (E) Example: 2-in. = 0020, 40-in. = 0400		AA	1-in. Class 150		SC	316/316L SST		Sxxx	Shielded length	
XXXX	50 to 1000 mm (M) Example: 50 mm = 0050, 1000 mm = 1000		AB	1½-in. Class 150		SF	304/304L SST		Q35	NACE certification	
			AC	2-in. Class 150		CS	Carbon steel		R21	Thermowell calculation	
									Q8	Material certification	
									C01	Van Stone w/no cover flange	
									C02	Van Stone w/SST cover flange	

The common options shown in Figure 12 represent a partial offering; reference the [Van Stone ordering information](#) for a full list of available options.

Figure 13: Van Stone Thermowell Components



- A. Instrument connection
- B. Process connection
- H. Head length
- U. Immersion length

Note

Wetted surface includes flange face and immersion length (U).

Van Stone ordering information

Figure 14: Model Number Ordering Example

Model				Units	Immersion length (U)				Mounting style	Process connection		Stem style	Thermowell material		Head length (H)			Instrument connection	Options
1	1	4	C	M	0	1	5	0	V	A	B	1	S	C	0	5	0	A	WR5, Q76...
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	XXXXX

The numbers below the model number ordering example correlate to the character place numbers in the second column of the ordering table.

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

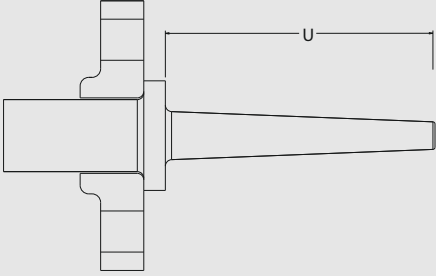
Model

Place # 1-4		Description	Details	Ref. page
★	114C	Barstock temperature thermowell	Made with a standard bore diameter of 0.26-in. (6.6 mm) and tip wall thickness of 0.25-in. (6.4 mm). Default cover flange material is carbon steel.	N/A

Dimension units

Place # 5		Description	Details	Ref. page
★	E	English units (in.)	Specifies whether length units will be in inches (in.) or millimeters (mm)	page 80
★	M	Metric units (mm)		page 80

Immersion length (U)

Place # 6-9		Description		Ref. page
★	xxxx	xxx.x-in., 1.00 to 100-in. in ¼-in. increments (when ordered with dimension units code E)		page 80
		Example of a 6.25-in. length where the second decimal is dropped off: 0062		
★	xxxx	xxxx mm, 25 to 2500 mm in 5 mm increments (when ordered with dimension units code M)		page 80
		Example of a 50 mm length: 0050		

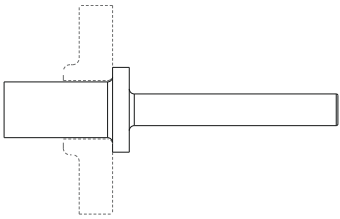
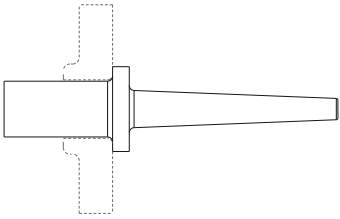
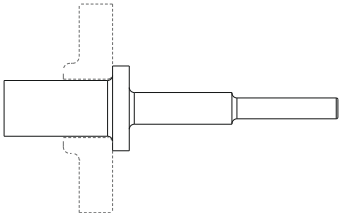
Mounting style

Place # 10		Description	Details	Ref. page
★	V	Van Stone, lap flange	Default cover flange material is carbon steel	N/A

Process connection

Place # 11-12		Description	Ref. page
★	AA	1-in. Class 150	N/A
★	AB	1½-in. Class 150	N/A
★	AC	2-in. Class 150	N/A
★	AH	1-in. Class 300	N/A
★	AJ	1½-in. Class 300	N/A
★	AK	2-in. Class 300	N/A
★	AL	1-in. Class 400/600	N/A
★	AM	1½-in. Class 400/600	N/A
★	AN	2-in. Class 400/600	N/A
	AP	1-in. Class 900/1500	N/A
	AQ	1½-in. Class 900/1500	N/A
	AR	2-in. Class 900/1500	N/A
	AS	1-in. Class 2500	N/A
	AT	1½-in. Class 2500	N/A
	AU	2-in. Class 2500	N/A

Stem style

Place # 13		Description	Details	Image	Ref. page
★	1	Straight	Minimum immersion length = 1-in. (25 mm)		page 81
★	2	Tapered	Minimum immersion length = 1-in. (25 mm)		page 81
★	3	Stepped	Minimum immersion length = 3-in. (75 mm)		page 81

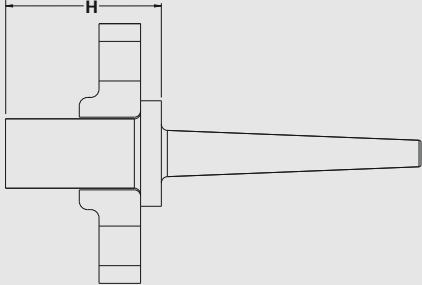
Thermowell material

Place # 14-15		Description	Details	Ref. page
★	SC	316/316L dual rated		page 82
	SD	316/316L dual rated (NORSOK)	Must order the Q8 Material Certificate to get NORSOK documentation	page 82
★	SF	304/304L dual rated		page 82
★	CS	Carbon steel (A-105)		page 82
	MO	Molybdenum		page 82
	SG	316Ti SST		page 82
	SH	316/316L SST with tantalum sheath		page 82
	SJ	316/316L SST with PFA coating		page 82

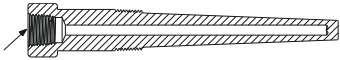
Place # 14-15		Description	Details	Ref. page
	SK	304/304L SST with PTFE coating		page 82
	SL	310 SST		page 82
	SM	321 SST		page 82
	SN	321H SST		page 82
	SR	904L SST		page 82
	SP	347 SST		page 82
	AB	Alloy B3		page 82
	AC	Alloy C-276		page 82
	AG	Alloy 20		page 82
	AH	Alloy 400		page 82
	AK	Alloy 600		page 82
	AM	Alloy 601		page 82
	AN	Alloy 625		page 82
	AP	Alloy 800		page 82
	AQ	Alloy 800H/HT		page 82
	AR	Alloy 825		page 82
	AU	Alloy C-20		page 82
	CA	Chrome-Moly Grade B-11/F-11 Class II		page 82
	CB	Chrome-Moly Grade B-22/ F-22 Class III		page 82
	CC	Chrome-Moly Grade F-91		page 82
	NK	Nickel 200		page 82

Place # 14-15		Description	Details	Ref. page
	TT	Titanium Grade 2		page 82
	DS	Super duplex SST		page 82
	DT	Super duplex – NORSOK	Must order the Q8 Material Certificate to get NORSOK documentation	page 82
	DU	Duplex 2205		page 82
	DV	Duplex 2205 – NORSOK	Must order the Q8 Material Certificate to get NORSOK documentation	page 82

Head length (H)

Place # 16-18		Description		Ref. page
★	xxx	xx.x-in., 1.75to 11.25-in. in ¼-in. increments (when ordered with Dimension units code E) Example of a 6.25-in. length where the second decimal is dropped off: 062 (default head length = 2.25-in. for flanges under Class 900)		Head length (H)
★	xxx	xxx mm, 40 to 225 mm in 5 mm increments (when ordered with Dimension units code M) Example of a 50 mm length: 050 (default head length = 60 mm for flanges under Class 900)		Head length (H)

Instrument connection

Place # 19		Description	Details	Image	Ref. page
★	A	½–14 NPT	Female threads		page 87
★	B	½–14 NPSM			page 87
	C	¾–14 NPT			page 87
	D	M18 × 1.5p			page 87
	E	M20 × 1.5p			page 87

Place # 19		Description	Details	Image	Ref. page
	F	M24 × 1.5p			page 87
	G	G ½-in. (BSPF)			page 87
	H	G ¾-in. (BSPF)			page 87
	J	M27 × 2p			page 87
	K	M14 × 1.5p			page 87

Additional options

Sensor/thermowell assemble to options

Code		Description	Details	Ref. page
★	XT	Hand tight assembly of sensor and thermowell	Ensures sensor is threaded into thermowell but only hand tightened	page 87
★	XW	Process-ready assembly of sensor and thermowell	Ensures sensor is threaded into thermowell and torqued for process-ready installation	page 87

Extended product warranty

Code		Description	Details	Ref. pages
★	WR3	3-year limited warranty	This warranty option extends manufacturer's warranty to three or five years for manufacturer related defects	page 87
★	WR5	5-year limited warranty		page 87

Thermowell calculation

Code		Description	Details	Ref. page
★	R21	Thermowell calculation	Set of calculations to ensure thermowells are safe in certain process conditions	page 88

NACE certification

Code		Description	Details	Ref. page
★	Q35	NACE approval	Meets MR0175/ISO 15156 and MR0103 requirements	page 89

PMI testing

Code		Description	Details	Ref. page
	Q76	PMI testing	Verifies chemical composition of material	page 89

Material certification

Code		Description	Details	Ref. page
★	Q8	Material certification	Certificate for material conformance and traceability in accordance with EN 10204 type 3.1	page 90

Material test

Code		Description	Details	Ref. page
	M01	Low temperature Charpy Test	Measures the low temperature ductility of the material	page 90
	M02	Ultrasonic examination of thermowell material	Examination of steel forgings for flaws and inclusions	page 90

Surface finish

Code		Description	Details	Ref. page
	Q16	Certification	Certificate showing measured surface finish values	page 91
	R14	Finish < Ra 0.3 μm (12 μin)	Improves surface roughness of thermowell	page 91

Electropolish

Code		Description	Details	Ref. page
	R20	Electropolish	Improve smoothness and surface quality	page 91

Stepped instrument threads

Code		Description	Image	Ref. page
	R61	Stepped instrument threads		page 92

Roughened stem

Code		Description	Details	Image	Ref. page
	R62	Roughened stem	Roughens the last 4.7-in. (120 mm) of the stem		N/A

Hydrostatic external pressure test

Code		Description	Details	Ref. page
★	Q5	Standard external pressure test	Verifies structural quality and checks for leaks at thermowell process connection and stem	page 92
★	Q9	Extended external pressure test	Same as standard external pressure test but tested twice as long	page 93

Hydrostatic internal pressure test

Code		Description	Details	Ref. page
★	Q85	Standard internal pressure test	Verify internal structural integrity of thermowell	page 93
★	Q86	Extended internal pressure test	Same as standard internal pressure test but tested twice as long	page 93

Canadian registration number

Code		Description	Details	Ref. page
	Q17	Canadian Registration Number	Canadian approvals for all provinces (Approved materials in reference section)	page 94

Dye penetration test

Code		Description	Details	Ref. page
★	Q73	Dye penetration test	Checks quality of material	page 94

Wall thickness test

Code		Description	Details	Ref. page
★	Q83	Ultrasonic test	Checks the bore concentricity of the thermowell	page 95
★	Q84	Radiography (X-ray) test	Checks the bore concentricity of the thermowell	

Special cleaning

Code		Description	Details	Ref. page
	Q6	Special cleaning	Oxygen enriched environment cleaning per ASTM G93	page 95

Thermowell markings

Code		Description	Details	Ref. page
	R40	Test markings on thermowell	External marking of the thermowell for specific tests (see reference page for list of tests)	page 96

Spherical tip

Code		Description	Details	Ref. page
	R60	Spherical tip	Changes the flat tip to spherical	page 97

Thermowell stem coating

Code		Description	Details	Ref. page
	R63	Alloy 6 stem coating	An alloy-based coating over the thermowell stem to prevent or slow down wear due to process media in erosive applications.	N/A

Plug and chain

Code		Description	Details	Ref. page
	R06	Stainless steel	Protects thermowell threads when sensor is not installed	page 98
	R23	Brass	Protects thermowell threads when sensor is not installed	page 98

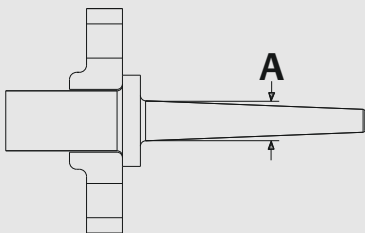
Vent hole

Code		Description	Details	Ref. page
	R11	Vent hole	Allows for the venting of a thermowell and for indication that thermowell structural integrity has been compromised	page 98

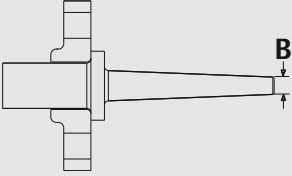
Flange face

Code		Description	Details	Ref. page
	R09	Concentric serrations	Concentric serration on flange face per ASME B16.5	page 98
	R16	RTJ	Ring type joint flange face per ASME B16.5	page 101

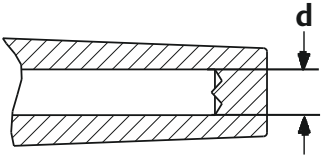
Root diameter (A)

Code		Description		Ref. page
	Axxx	xx.xx-in., 0.36 to 3.15-in. in 0.01-in. increments (when ordered with dimension units code E) Examples: Code A040 = 0.4-in, Code A315 = 3.15-in.		page 107
	Axxx	xx.x mm, 10 to 80 mm in 0.5 mm increments (when ordered with dimension units code M) Examples: Code A100 = 10.0 mm, Code A755 = 75.5 mm		page 107

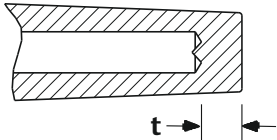
Tip diameter (B)

Code		Description		Ref. page
	Bxxx	x.xx-in., 0.36 to 1.83-in. in 0.01-in. increments (when ordered with dimension units code E)		page 108
		Examples: Code B040 = 0.4-in, Code B180 = 1.80-in.		
	Bxxx	xx.x mm, 10 to 46 mm in 0.5 mm. increments (when ordered with dimension units code M)		page 108
		Examples: Code B100 = 10.0 mm, Code B455 = 45.5 mm		

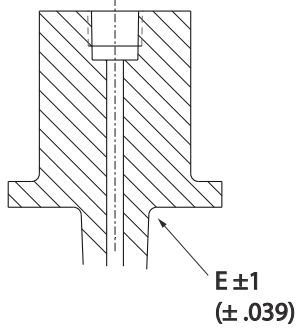
Non-standard bore diameter (d)

Code	Description	Details	Image	Ref. page
D01	0.276-in./7.0 mm	Default = 0.26-in. (6.6 mm)		page 109
D03	0.138-in./3.5 mm			page 109
D04	0.386-in./9.8 mm			page 109
D05	0.354-in./9.0 mm			page 109
D06	0.433-in./11.0 mm			page 109

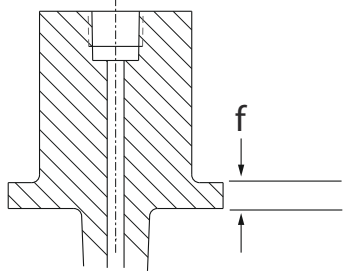
Non-standard tip thickness (t)

Code	Description	Details	Image	Ref. page
T01	0.197-in./5.0 mm	Default = 0.25-in. (6.4 mm)		page 109
T02	0.236-in./6.0 mm			page 109

Fillet radius (e)

Code		Description	Details	Image	Ref. page
	E01	0.039-in./1 mm	Standard = 0.157-in. (4 mm)		page 110
	E02	0.079-in./2 mm			
	E03	0.118-in./3 mm			
	E05	0.197-in./5 mm			
	E06	0.236-in./6 mm			

Van stone stub thickness

Code		Description	Details	Image	Ref. page
	F01	0.591-in. (15 mm)	Standard = 0.394-in. (10 mm)		page 110
	F02	0.787-in. (20 mm)			

Lap flange material for Van Stone design

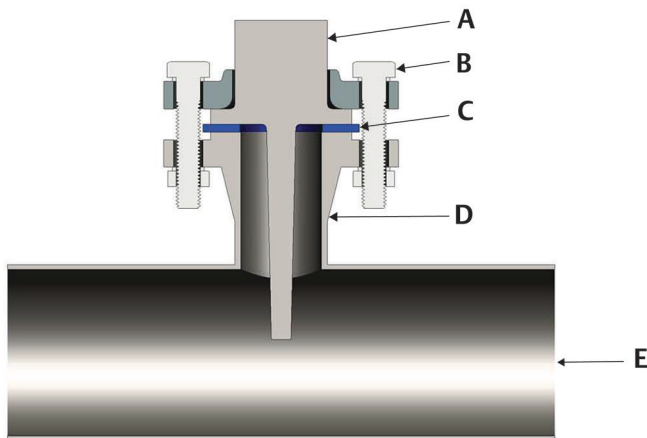
If no option is selected, the default lap flange material will be carbon steel.

Code	Description	Details	Ref. page
C01	No flange	Provides a Van Stone stem without a lap flange.	page 111
C02	316/316LSST flange	Provides a Van Stone stem with a 316/316LSST lap flange.	page 111
C03	Flange per stem material	Provides a Van Stone stem with a matching lap flange per stem material. Coatings do not apply to lap flange.	page 111

Van Stone installation

Van Stone thermowells are installed using a lap joint flange which slips over the stub end of the thermowell. The lap joint flange has no flange face. Instead the flange is bolted over the stub end which acts as the flange face and compresses the gasket. The Rosemount 114C Thermowells come standard with spiral serrations on the stub end designed per the ASME B16.5 standard. These should be installed with an inside bolt circle (IBC) gasket/ring gasket, which extends to and is centered by the bolts. Other flange face options are available.

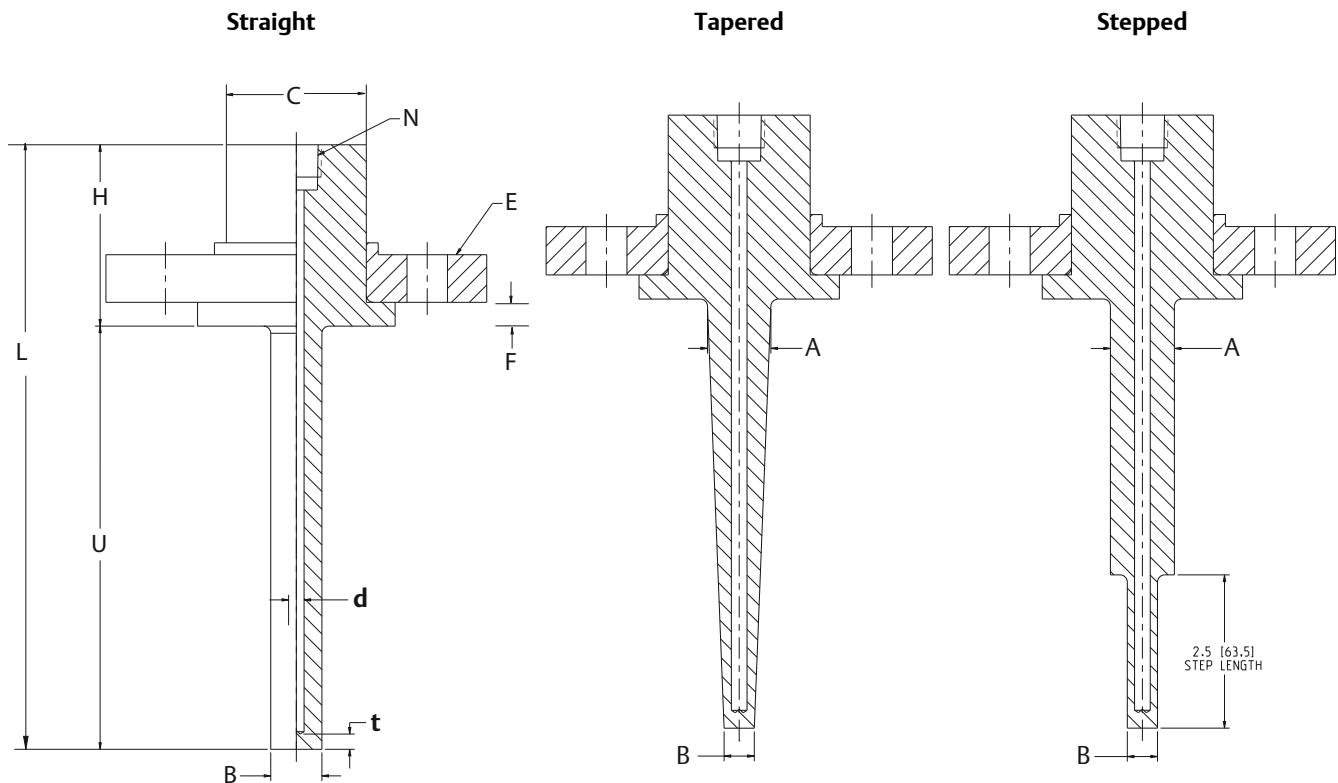
Figure 15: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Van Stone thermowell drawings

Figure 16: Van Stone/Lap Flanged Mounted Thermowell Drawings Total length = U + H.



- A. Root diameter
- B. Tip diameter
- C. Head diameter
- d. Bore diameter
- E. ASME B16.5 lap flange
- F. Stub thickness
- L. Total thermowell length
- H. Head length
- N. Instrument connection (1/2-in. NPT)
- t. Tip thickness
- U. Immersion length

Table 4: Van Stone/Lap Flanged Mounted Thermowells

Dimensions are in inches (millimeters).

Code	Code V, Van Stone lap flange mounting style	Lagging diameter "C"	Stub diam. K standard raised face	Stub diam. K ring type joint option R16	Stub thickness "F" standard raised face	Stub thickness "F" ring type joint option R16	Root diam. stepped stem	Root diam. tapered stem	Tip diam. tapered stem	Tip diam. straight stem
	Process connection									
AA	1-in. Class 150	1.31 (33.4)	1.99 (50.8)	2.50 (63.5)	.394 (10)	0.644 (16.35)	0.75 (19)	0.89 (22.5)	0.63 (16)	.75 (19)
AB	1½-in. Class 150	1.90 (48.3)	2.87 (73)	3.25 (82.5)		0.644 (16.35)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AC	2-in. Class 150	2.37 (60.3)	3.62 (92.1)	4 (102)		0.644 (16.35)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)

Table 4: Van Stone/Lap Flanged Mounted Thermowells (continued)

Code	Code V, Van Stone lap flange mounting style	Lagging diameter "C"	Stub diam. K standard raised face	Stub diam. K ring type joint option R16	Stub thickness "F" standard raised face	Stub thickness "F" ring type joint option R16	Root diam. stepped stem	Root diam. tapered stem	Tip diam. tapered stem	Tip diam. straight stem
	Process connection									
AH	1-in. Class 300	1.31 (33.4)	1.99 (50.8)	2.75 (70)		0.644 (16.35)	0.75 (19)	0.89 (22.5)	0.63 (16)	.75 (19)
AJ	1½-in. Class 300	1.90 (48.3)	2.87 (73)	3.56 (90.5)		0.644 (16.35)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AK	2-in. Class 300	2.37 (60.3)	3.62 (92.1)	4.25 (108)		0.707 (17.92)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AL	1-in. Class 400/600	1.31 (33.4)	1.99 (50.8)	2.75 (70)		0.644 (16.35)	0.75 (19)	0.89 (22.5)	0.63 (16)	.75 (19)
AM	1½-in. Class 400/600	1.90 (48.3)	2.87 (73)	3.56 (90.5)		0.644 (16.35)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AN	2-in. Class 400/600	2.37 (60.3)	3.62 (92.1)	4.25 (108)		0.707 (17.92)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AP	1-in. Class 900/1500	1.31 (33.4)	1.99 (50.8)	2.81 (71.5)		0.644 (16.35)	0.75 (19)	0.89 (22.5)	0.63 (16)	.75 (19)
AQ	1½-in. Class 900/1500	1.90 (48.3)	2.87 (73)	3.62 (92)		0.644 (16.35)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AR	2-in. Class 900/1500	2.37 (60.3)	3.62 (92.1)	4.88 (124)		0.707 (17.92)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AS	1-in. Class 2500	1.31 (33.4)	1.99 (50.8)	3.25 (82.5)		0.644 (16.35)	0.75 (19)	0.89 (22.5)	0.63 (16)	.75 (19)
AT	1½-in. Class 2500	1.90 (48.3)	2.87 (73)	4.50 (114)		0.707 (17.92)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)
AU	2-in. Class 2500	2.37 (60.3)	3.62 (92.1)	5.25 (133)		0.707 (17.92)	0.85 (21.5)	1.04 (26.5)	0.71 (18)	.85 (21.5)

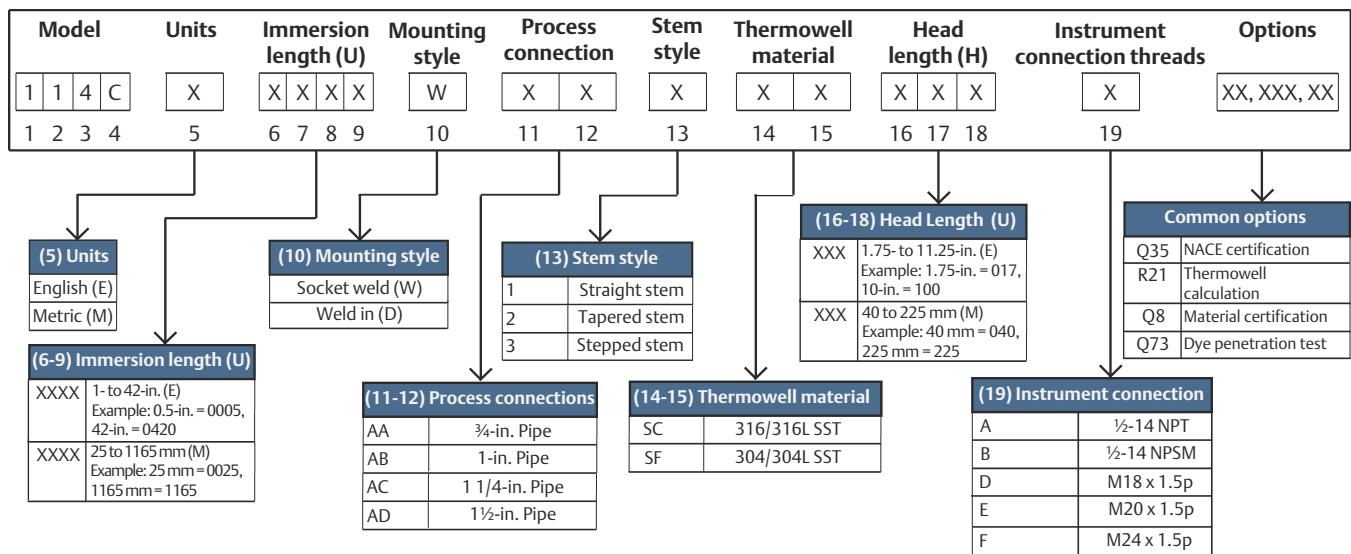
Rosemount 114C Welded Thermowells

Welded thermowell overview

Welded thermowells are permanently welded to process pipes or tanks. Welded thermowells have the highest pressure rating and are generally used in applications with high velocity flow, high temperature, or extremely high pressure. They are necessary where a leak-proof seal is required.

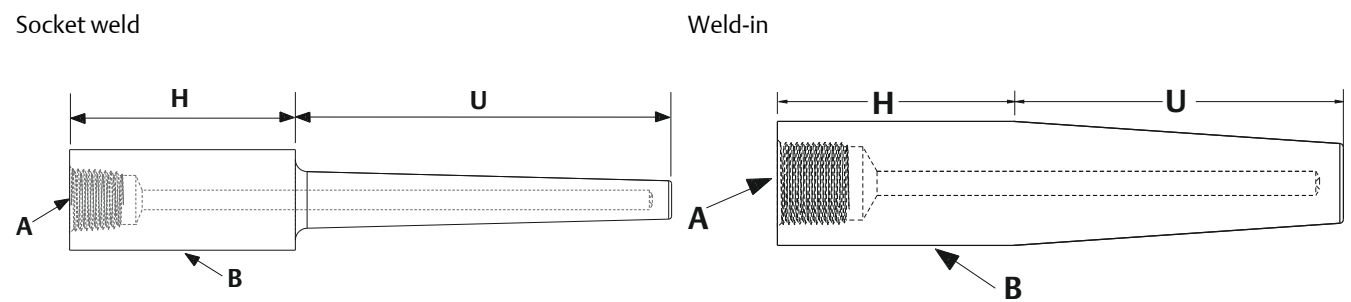
The standard offering figure below shows the thermowell configurations that can typically be shipped in two weeks or less.

Figure 17: Standard Offering—Welded



The common options shown in Figure 17 represent a partial offering; reference the [Welded ordering information](#) for a full list of available options.

Table 5: Welded Thermowell Components



- A. Instrument connection
- B. Process connection (dependent on weld point)
- U. Immersion length
- H. Head length

Note

Actual wetted surface varies; it is measured from the weld point to the thermowell tip.

Welded ordering information

Figure 18: Model Number Ordering Example

Model				Units	Immersion length (U)				Mounting style	Process connection		Stem style	Thermowell material		Head length (H)			Instrument connection	Options
1	1	4	C	E	0	0	6	0	W	A	B	1	S	C	0	5	0	A	WR5, Q76...
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	XXXXX

The numbers below the model number ordering example correlate to the character place numbers in the second column of the ordering table.

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

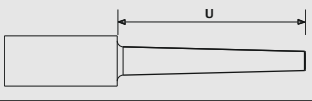
Model

Code		Description	Details	Ref. page
★	114C	Barstock temperature thermowell	Made with a standard bore diameter of 0.26-in. (6.6 mm) and tip wall thickness of 0.25-in. (6.4 mm)	N/A

Dimension units

Place # 5		Description	Details	Ref. page
★	E	English units (in.)	Specifies whether length units will be in inches (in.) or millimeters (mm)	page 80
★	M	Metric units (mm)		page 80

Immersion length (U)

Place # 6-9		Description		Ref. page
★	xxx	xxx-in., 1 to 100-in. in ¼-in. increments (when ordered with dimension units code E)		page 80
		Example of a 6.25-in. length where the second decimal is dropped off: 0062		
★	xxxx	xxxx mm, 25 to 2540 mm in 5 mm increments (when ordered with dimension units code M)		page 80
		Example of a 50 mm length: 0050		

Mounting style

Place # 10		Description	Ref. page
★	W	Welded-socket weld	N/A
★	D	Welded-weld-in (only available in tapered stem profile)	N/A

Process connection

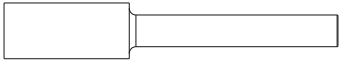
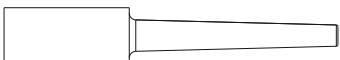
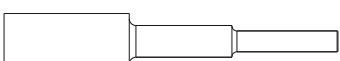
Place # 11-12		Welded-socket weld (W)	Welded-weld-in (D) ⁽¹⁾	Ref. page
★	AA	¾-in. pipe	¾-in. pipe	N/A
★	AB	1-in. pipe	1-in. pipe	N/A
★	AC	1 ¼-in pipe	1 ¼-in pipe	N/A
★	AD	1 ½-in. pipe	1 ½-in. pipe	N/A
	AE	N/A	Custom diameters ⁽²⁾	N/A
	DA	N/A	DIN 43772-4-7 (18 h7/3.5 mm bore/M14)	N/A
	DB	N/A	DIN 43772-4-7 (24 h7/7.0 mm bore/M18)	N/A
	DC	N/A	DIN 43772-4-7 (26 h7/7.0 mm bore/G½ or M20)	N/A
	DD	N/A	DIN 43772-4-7 (26 h7/9.0 mm bore/G½ or M20)	N/A
	DE	N/A	DIN 43772-4-7 (32 h11/11.0 mm bore/G¾ or M27)	N/A
	DH	N/A	Custom diameters ⁽²⁾	N/A

(1) Only available in tapered stem profile.

(2) Required for Root [Axxx] and tip [Bxxx] modifications.

Stem style

The stem styles available for socket weld (W) are straight, tapered, and stepped. And the stem style available for weld-in (D) is tapered only.

Place # 13	Description	Details	Image	Ref. page
★	1	Straight	Minimum immersion length = 1-in. (25 mm)	 page 81
★	2	Tapered	Minimum immersion length = 1-in. (25 mm)	 page 81
★	3	Stepped	Minimum immersion length = 3-in. (75 mm)	 page 81

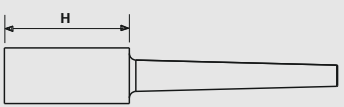
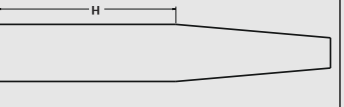
Thermowell material

Place # 14-15	Description	Details	Ref. page
★	SC	316/316L dual rated	page 82
	SD	316/316L dual rated (NORSOK)	Must order the Q8 Material Certificate to get NORSOK documentation page 82
★	SF	304/304L dual rated	page 82

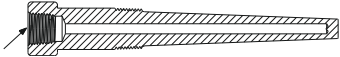
Place # 14-15		Description	Details	Ref. page
★	CS	Carbon steel (A-105)		page 82
	MO	Molybdenum		page 82
	SG	316Ti SST		page 82
	SL	310 SST		page 82
	SM	321 SST		page 82
	SN	321H SST		page 82
	SR	904L SST		page 82
	SP	347 SST		page 82
	AB	Alloy B3		page 82
	AC	Alloy C-276		page 82
	AG	Alloy 20		page 82
	AH	Alloy 400		page 82
	AK	Alloy 600		page 82
	AM	Alloy 601		page 82
	AN	Alloy 625		page 82
	AP	Alloy 800		page 82
	AQ	Alloy 800H/HT		page 82
	AR	Alloy 825		page 82
	AU	Alloy C-20		page 82
	AS	Alloy F44 Mo6		page 82
	CA	Chrome-Moly Grade B-11/F-11 Class II		page 82

Place # 14-15		Description	Details	Ref. page
	CB	Chrome-Moly Grade B-22/ F-22 Class III		page 82
	CC	Chrome-Moly Grade F-91		page 82
	NK	Nickel 200		page 82
	TT	Titanium Grade 2		page 82
	DS	Super duplex SST		page 82
	DT	Super duplex SST – NORSOK	Must order the Q8 Material Certificate to get NORSOK documentation	page 82
	DU	Duplex 2205		page 82
	DV	Duplex 2205 – NORSOK	Must order the Q8 Material Certificate to get NORSOK documentation	page 82

Head length (H)

Place # 16-18		Description			Ref. page
★	xxx	xx.x-in., 1.75 to 11.25-in. in ¼-in. increments (when ordered with dimension units code E)			page 85
		Example of a 6.25-in. length where the second decimal is dropped off: 062 (default head length = 1.75-in.)			
★	xxx	xxx mm, 40 to 225 mm in 5 mm increments (when ordered with dimension units code M)			page 85
		Example of a 50 mm length: 050 (default head length = 45 mm)			

Instrument connection

Place # 19		Description	Details	Image	Ref. page
★	A	½-14 NPT	Female threads		page 87
★	B	½-14 NPSM			page 87
	C	¾-14 NPT			page 87
	D	M18 × 1.5p			page 87
	E	M20 × 1.5p			page 87
	F	M24 × 1.5p			page 87
	G	G ½-in. (BSPF)			page 87
	H	G ¾-in. (BSPF)			page 87
	J	M27 × 2p			page 87
	K	M14 × 1.5p			page 87

Additional options

Sensor/thermowell assemble to options

Code	Description	Details	Ref. page
★ XT	Hand tight assembly of sensor and thermowell	Ensures sensor is threaded into thermowell but only hand tightened	page 87
★ XW	Process-ready assembly of sensor and thermowell	Ensures sensor is threaded into thermowell and torqued for process-ready installation	page 87

Extended product warranty

Code	Description	Details	Ref. pages
★ WR3	3-year limited warranty	This warranty option extends manufacturer’s warranty to three or five years for manufacturer related defects	page 87
★ WR5	5-year limited warranty		page 87

Thermowell calculation

Code		Description	Details	Ref. page
★	R21	Thermowell calculation	Set of calculations to ensure thermowells are safe in certain process conditions	page 88

NACE certification

Code		Description	Details	Ref. page
★	Q35	NACE approval	Meets MR0175/ISO 15156 and MR0103 requirements	page 89

PMI testing

Code		Description	Details	Ref. page
	Q76	PMI testing	Verifies chemical composition of material	page 89

Material certification

Code		Description	Details	Ref. page
★	Q8	Material certification	Certificate for material conformance and traceability in accordance with EN 10204 type 3.1	page 90

Material test

Code		Description	Details	Ref. page
	M01	Low temperature Charpy Test	Measures the low temperature ductility of the material	page 90
	M02	Ultrasonic examination of thermowell material	Examination of steel forgings for flaws and inclusions	page 90

Surface finish

Code		Description	Details	Ref. page
	Q16	Certification	Certificate showing measured surface finish values	page 91
	R14	Finish < Ra 0.3 μm (12 μin)	Improves surface roughness of thermowell	page 91

Electropolish

Code		Description	Details	Ref. page
	R20	Electropolish	Improve smoothness and surface quality	page 91

Hydrostatic internal pressure test

Code		Description	Details	Ref. page
★	Q85	Standard internal pressure test	Verify internal structural integrity of thermowell	page 93
★	Q86	Extended internal pressure test	Same as standard internal pressure test but tested twice as long	page 93

Canadian registration number

Code		Description	Details	Ref. page
	Q17	Canadian Registration Number	Canadian approvals for all provinces (Approved materials in reference section)	page 94

Dye penetration test

Code		Description	Details	Ref. page
★	Q73	Dye penetration test	Checks quality of material	page 94

Wall thickness test

Code		Description	Details	Ref. page
★	Q83	Ultrasonic test	Checks the bore concentricity of the thermowell	page 95
★	Q84	Radiography (X-ray) test	Checks the bore concentricity of the thermowell	

Special cleaning

Code		Description	Details	Ref. page
	Q6	Special cleaning	Oxygen enriched environment cleaning per ASTM G93	page 95

Thermowell markings

Code		Description	Details	Ref. page
	R40	Test markings on thermowell	External marking of the thermowell for specific tests (see reference page for list of tests)	page 96

Spherical tip

Code		Description	Details	Ref. page
	R60	Spherical tip	Changes the flat tip to spherical	page 97

Thermowell stem coating

Code		Description	Details	Ref. page
	R63	Alloy 6 stem coating	An alloy-based coating over the thermowell stem to prevent or slow down wear due to process media in erosive applications.	N/A

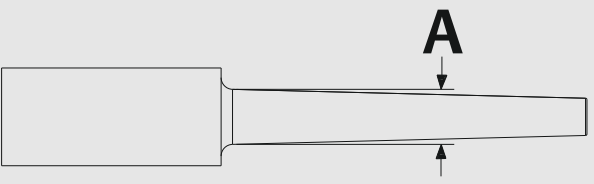
Plug and chain

Code		Description	Details	Ref. page
	R06	Stainless steel	Protects thermowell threads when sensor is not installed	page 98
	R23	Brass	Protects thermowell threads when sensor is not installed	page 98

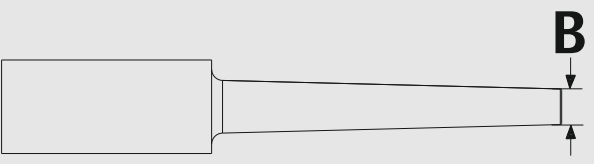
Vent hole

Code		Description	Details	Ref. page
	R11	Vent hole	Allows for the venting of a thermowell and for indication that thermowell structural integrity has been compromised	page 98

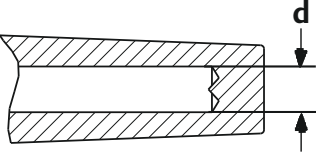
Root diameter (A)

Code	Description		Ref. page
Axxx	x.xx-in., 0.36 to 3.15-in. in 0.01-in. increments (when ordered with dimension units code E) Examples: Code A040 = 0.4-in., Code A315 = 3.15-in.		page 107
Axxx	xx.xx mm, 10 to 80 mm in 0.5 mm increments (when ordered with dimension units code M) Examples: Code A100 = 10.0 mm, Code A755 = 75.5 mm		page 107

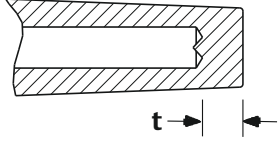
Tip diameter (B)

Code	Description		Ref. page
Bxxx	x.xx-in., 0.36 to 1.83-in. in 0.01-in. increments (when ordered with dimension units code E) Examples: Code B040 = 0.4-in., Code B180 = 1.80-in.		page 108
Bxxx	xx.xx mm, 10 to 46 mm in 0.5-mm. increments (when ordered with dimension units code M) Examples: Code B100 = 10.0 mm, Code B455 = 45.5 mm		page 108

Non-standard bore diameter (d)

Code	Description	Details	Image	Ref. page
D01	0.276-in./7.0 mm	Default = 0.26-in. (6.6 mm)		page 109
D03	0.138-in./3.5 mm			page 109
D04	0.386-in./9.8 mm			page 109
D05	0.354-in./9.0 mm			page 109
D06	0.433-in./11.0 mm			page 109

Non-standard tip thickness (t)

Code		Description	Details	Image	Ref. page
	T01	0.197-in./5.0 mm	Default = 0.25-in. (6.4 mm)		page 109
	T02	0.236-in./6.0 mm			page 109

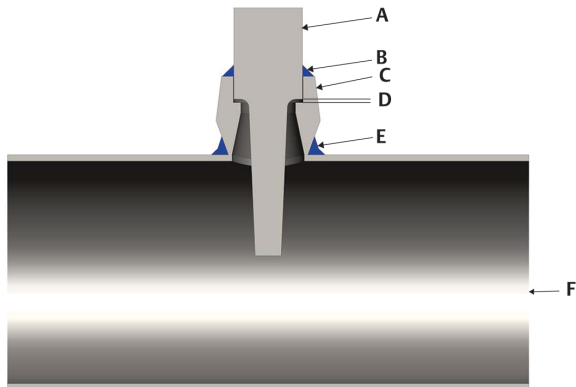
Socket weld installation

Socket weld thermowells are typically welded into a socket weld fitting. Welds should be designed according to the appropriate standards. It is important to order a head length (H) that leaves enough space so the instrument threads will not be deformed by welding at installation. The customer should also make sure the root diameter of the thermowell will fit through the inner diameter of the weld fitting.

Note

When specified in a thermowell calculation, the unsupported length for a socket weld thermowell is from the point of weld (B shown on Figure 19) to the thermowell tip.

Figure 19: Installation Components

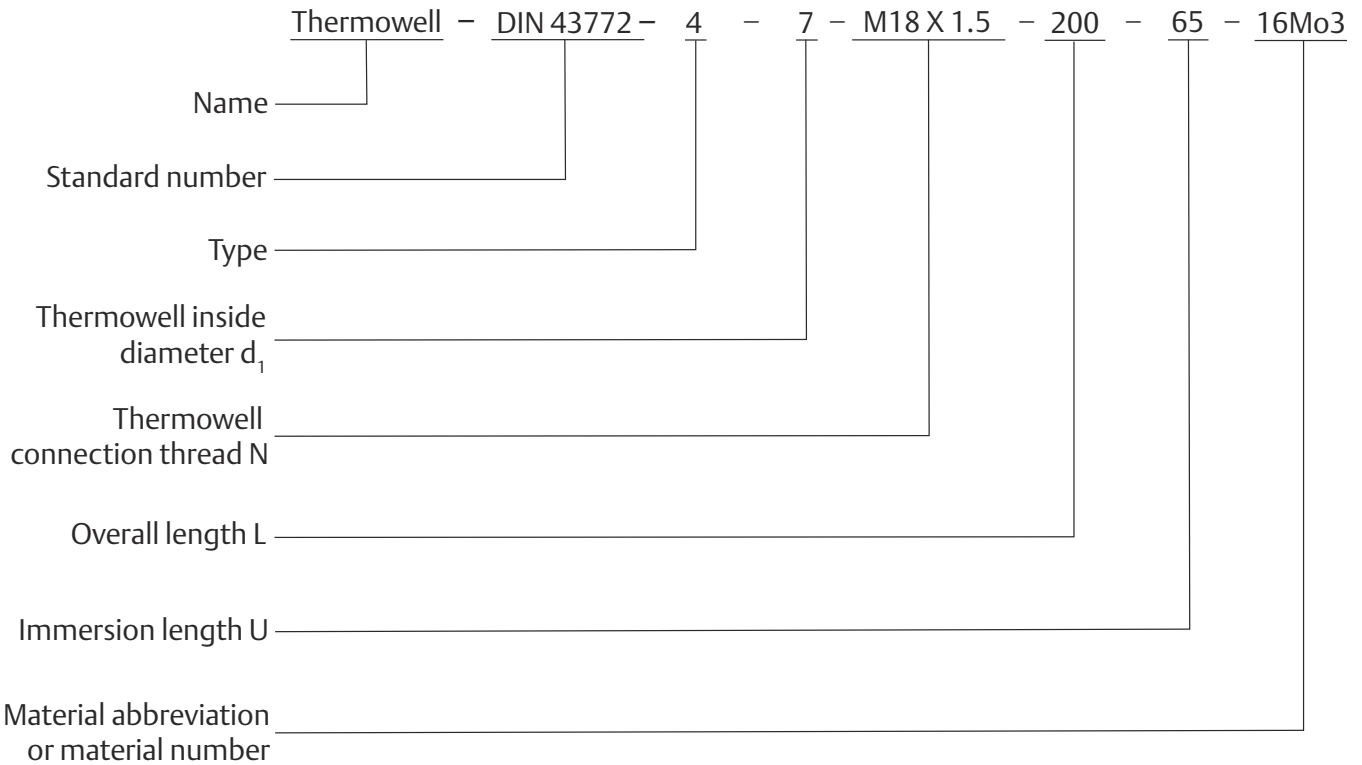


- A. Thermowell
- B. Weld
- C. Socket weld fitting
- D. 1/16-in. gap
- E. Weld
- F. Process

Weld-in Type 4 thermowells according to DIN 43772

This section only defines the requirement necessary to provide a Type 4 thermowell according to the DIN 43772 Standard (for ordering information on weld-in thermowells outside the DIN Standard, see [Welded ordering information](#)).

The illustration below shows the breakdown of a model according to the DIN Standard:



[Table 6](#), [Table 7](#), and show all required thermowell dimensions necessary to conform to DIN 43772 Type 4 and the relationship to the Rosemount 114C Thermowell.

Procedure

1. Select overall length (L) and immersion length (U) from [Table 10](#).

U = 65 mm

L = 200 mm

H = L - U = 133 mm

Rosemount 114C = U = **0065**

Rosemount 114C = H = **135**

Table 6: DIN Required Lengths

Immersion length		Overall length (L) (U+H)	Head length	
mm	Code		mm	Code
65	0065	110	45	045
65	0065	140	75	075
65	0065	200	135	135
125	0125	160	135	135
275	0275	410	135	135

2. Select process connection (PC), instrument connection (IC), and bore diameter (BD) from [Table 11](#).

PC = 18 h7/3.5 mm

IC = M14 × 1.5

BD = 3.5 mm

Rosemount 114C = 18 h7/3.5 mm = **DA**

Rosemount 114C = M14 × 1.5 = **K**

Rosemount 114C = 3.5 mm = **D03**

Table 7: DIN Connection Information

Process connection (PC)		Instrument connection (IC)		Bore diameter (BD)	
Type	Code	Internal thread	Code	mm	Code
18 h7	DA	M14 × 1.5	K	3.5	D03
24h7	DB	M18 × 1.5	D	7.0	D01
26h7	DC	G½ (BSPF)	G	7.0	D01
26h7	DD	M20 × 1.5	E	9.0	D05
32h11	DE	G¾ (BSPF)	H	11.0	D06
32h11	DE	M27 × 2	J	11.0	D06

- Determine thermowell material from [Table 12](#).

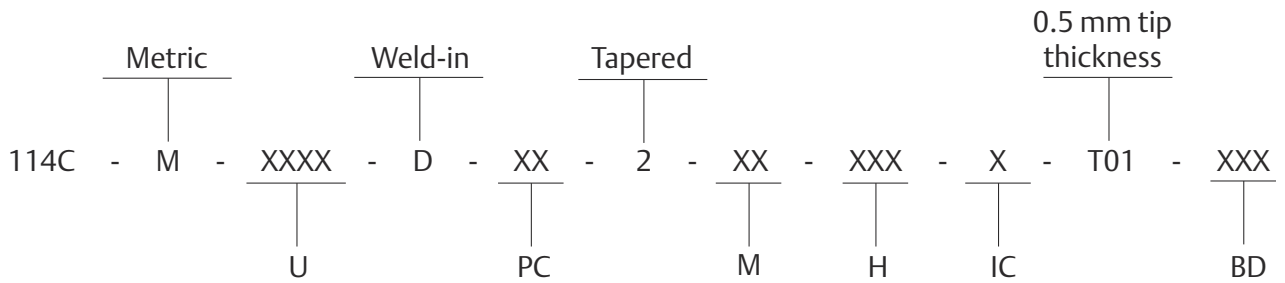
Material = 316 Ti SST

Rosemount 114C = 316 Ti SST= **SG**

Table 8: DIN Material

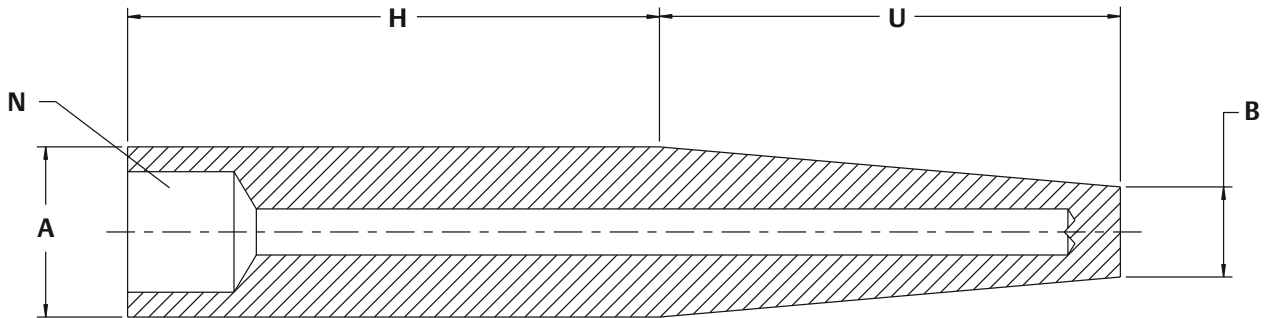
Thermowell material (M)	Material code
Chrome-Moly B-11 DIN 1.7335 EN 10273	CA
Chrome-Moly B-22 DIN 1.7380 EN 10273	CB
316 Ti SST DIN 1.4571 EN 10272	SG

- Apply to Rosemount 114C model as shown below:



Resulting model code example: 114C-M-0065-D-DA-2-SG-135-K-T01-D03

Figure 20: Weld Mounted Thermowell Drawings (Weld-in)



H. Head length

U. Immersion length

ϕF_2 , ϕF_3 , and H₁, refer to Table 9.

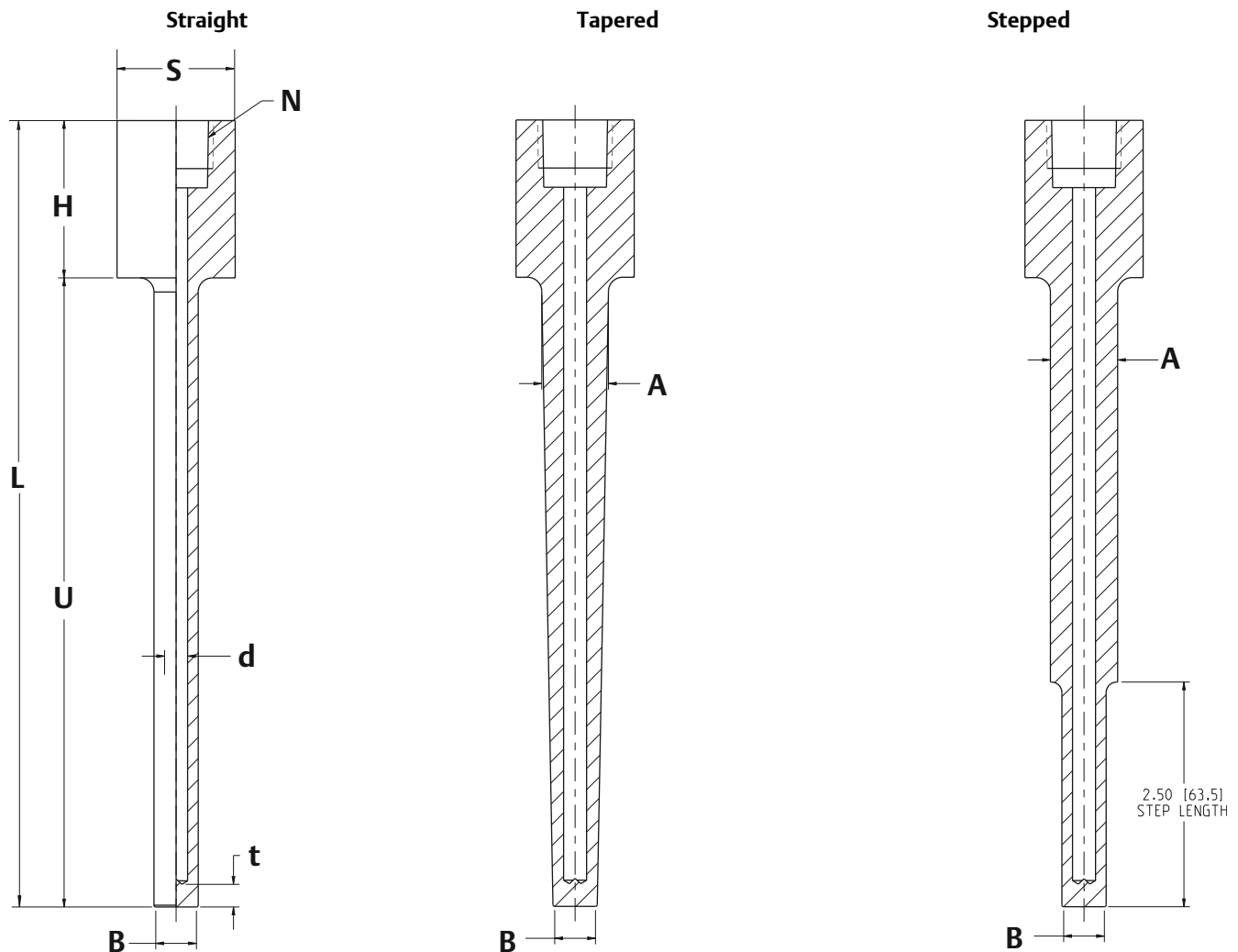
Table 9: DIN Weld Mounted Thermowells (Weld-in)

Dimensions are in millimeters.

Code	Code D, welded (weld-in) style	Head diameter “ ϕF_2 ”	Tip diameter “ ϕF_3 ”	Thread length “H ₁ ”
	Process connection			
DA	DIN 43772-4-7 (18 h7/3.5 mm bore/M14)	18 h7 (+0.000/-0.018 mm)	9 ±0.27	16
DB	DIN 43772-4-7 (24 h7/7 mm bore/M18)	24 h7 (+0.000/-0.021 mm)	12.5 ±0.38	16
DC	DIN 43772-4-7 (26 h7/7 mm bore/G½ or M20)	26 h7 (+0.000/-0.021 mm)	12.5 ±0.38	19
DD	DIN 43772-4-7 (26 h7/9 mm bore/G½ or M20)	26 h7 (+0.000/-0.021 mm)	15 ±0.38	19
DE	DIN 43772-4-7 (32 h11/11 mm bore/G¾ or M27)	32 h11 (+0.000/-0.160 mm)	17 ±0.38	22
DH	Custom	Specified by design modifier "AXXX"	Specified by design modifier "BXXX"	19

Welded thermowell drawings

Figure 21: Weld Mounted Thermowell Drawings (Socket Weld) Total Length = U + H.



- A. Root diameter
- B. Tip diameter
- H. Head length
- N. Instrument connection
- S. Socket size

- U. Immersion length
- d. Bore diameter
- t. Tip thickness

Table 10: Sample Root Diameters

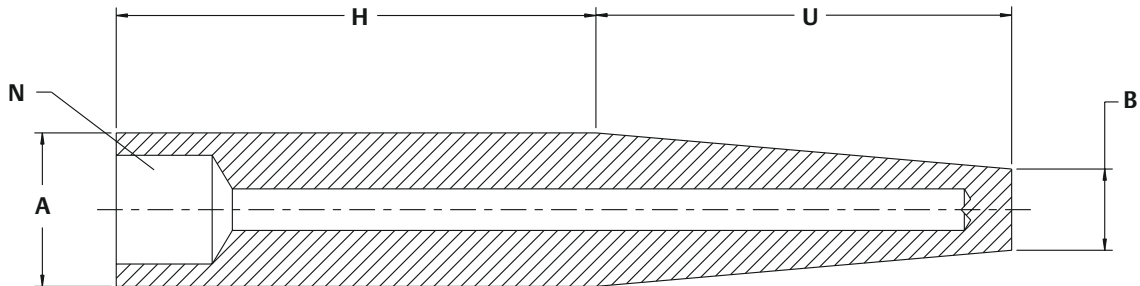
Dimensions are in inches (millimeters).

Code	Code W, welded mounting style	Socket size S	Root diameter A	Tip diameter B
	Process connection			
AA	¾-in. pipe	1.05 (26.67)	0.75 (19)	0.50 (12.7)
AB	1-in. pipe	1.32 (33.4)	0.75 (19)	0.50 (12.7)

Table 10: Sample Root Diameters (continued)

Code	Code W, welded mounting style	Socket size S	Root diameter A	Tip diameter B
	Process connection			
AC	1¼-in. pipe	1.66 (42.16)	0.75 (19)	0.50 (12.7)
AD	1½-in. pipe	1.90 (48.26)	0.75 (19)	0.50 (12.7)

Figure 22: Weld Mounted Thermowell Drawings (Weld-in) Total length = U + H.



- A. Root diameter
- B. Tip diameter
- H. Head length
- N. Instrument connection
- U. Immersion length

Table 11: Weld Mounted Thermowells (Weld-in)

Dimensions are in inches (millimeters).

Code	Code D, welded mounting style	Root diameter "A"	Tip diameter "B"
	Process connection		
AA	¾-in. pipe	1.050 (26.67)	.748 (19)
AB	1-in. pipe	1.315 (33.40)	.846 (21.5)
AC	1¼-in. pipe	1.660 (42.16)	1.043 (26.5)
AD	1½-in. pipe	1.900 (48.26)	1.250 (31.75)
AE	Custom	Specified by design modifier "AXXX"	Specified by design modifier "BXXX"

Ordering information detail

Dimension units

Back to Threaded ordering information: [Dimension units](#)

Back to Flanged ordering information: [Dimension units](#)

Back to Van Stone ordering information: [Dimension units](#)

Back to Welded ordering information: [Dimension units](#)

The Rosemount 114C Thermowell has the flexibility to be specified in either inches (E) or millimeters (M).

English units (inches)

If English is selected, all lengths will be in inches.

Metric

If metric is selected, all lengths will be in millimeters.

Immersion length (U)

Back to Threaded ordering information: [Immersion length \(U\)](#)

Back to Flanged ordering information: [Immersion length \(U\)](#)

Back to Van Stone ordering information: [Immersion length \(U\)](#)

Back to Welded ordering information: [Immersion length \(U\)](#)

The immersion length normally refers to the length of the thermowell stem beginning underneath the process connection to the tip of the thermowell. This length is typically specified by the process designer but the general rule is at least one-third or one-half the pipe diameter. Thermowells longer than 42-in. will be required to have an internal pressure test (Q85) performed to ensure the internal cavity integrity has not been compromised. Parallel thread thermowells have a U length that actually includes the process threads thus requiring an extra 1-in. (25 mm) for min. U length.

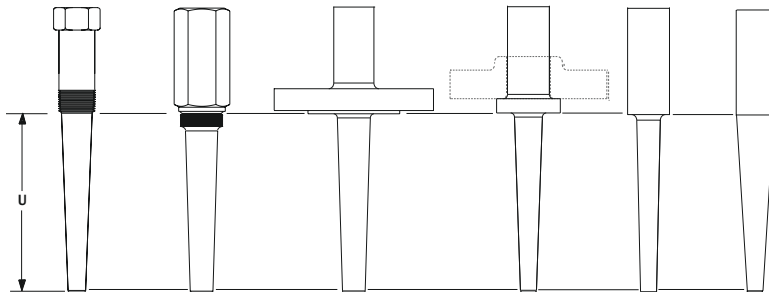


Table 12: Minimum Immersion Length by Profile Style

Profile	Minimum length	Min. length for parallel thread thermowells
Straight	1-in. (25 mm)	2-in. (50 mm)
Tapered	1-in. (25 mm)	2-in. (50 mm)
Stepped	3-in. (80 mm)	4-in. (100 mm)

Stem style

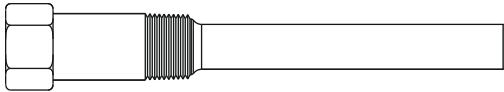
Back to Threaded ordering information: [Stem style](#)

Back to Flanged ordering information: [Stem style](#)

Back to Van Stone ordering information: [Stem style](#)

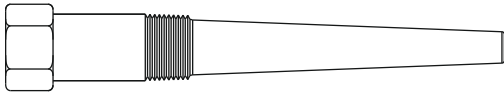
Back to Welded ordering information: [Stem style](#)

Straight style thermowells (1)



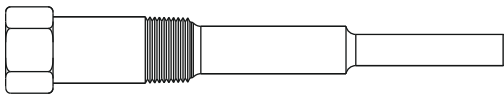
Straight style thermowells have the same diameter along the entire immersion length. They present the largest profile to the process medium and have the highest drag force compared to other styles with the same root diameter. Because of the large tip diameter, there is more mass to heat which slows the thermal response of the measurement assembly. The minimum immersion length (U) allowed with this profile is 1-in. (25 mm) except for parallel threaded thermowells that have a minimum immersion of 2-in. (50 mm).

Tapered style thermowells (2)



Tapered style thermowells have an outside diameter that decreases uniformly from root to tip. For the same root diameter, this design represents a good compromise between straight and stepped thermowells. Its drag will be less than a straight style, but greater than a stepped style. The response time will be faster than a straight style and slower than a stepped style. The two general forms of a tapered stem are uniform (tapered from root to tip) and non-uniform (straight portion followed by tapered portion). Because of its profile shape, it is a good compromise for strength between the two other styles. It is the common choice for high velocity flow applications where the flow forces typically are too great to use a stepped well. The tapered design has faster response than the straight style offering an optimal balance of strength and response time factors. The minimum immersion length (U) allowed with this profile is 1-in. (25 mm) except for parallel threaded thermowells that have a minimum immersion of 2-in. (50 mm). The longest tapered thermowell must have an over length less than 42-in (1067 mm), that is immersion length (U) + Head length (H) must be less than 42-in. (1067 mm)

Stepped style thermowells (3)



Stepped style thermowells have two straight sections with the smaller diameter straight section at the tip. For the same root diameter as a straight profile thermowell, this design has less profile exposure to the flowing process and exhibits less drag force and quicker response time due to the smaller mass at the tip. In general, stepped thermowells will have thinner walls. By the geometry of its design, the stepped well has a higher natural frequency than the other styles with the same root diameter, and is less susceptible to vibration induced failure. Since this design has less material at the tip, its considered the best thermowell for fast time response. The minimum immersion length (U) allowed with this profile is 3-in. (75 mm) except for parallel threaded thermowells that have a minimum immersion of 4-in. (100 mm).

Thermowell material

Back to Threaded ordering information: [Thermowell material](#)

Back to Flanged ordering information: [Thermowell material](#)

Back to Van Stone ordering information: [Thermowell material](#)

Back to Welded ordering information: [Thermowell material](#)

The material of construction is typically the first consideration in choosing a thermowell for any given application. Three factors affect the choice of material:

1. Chemical compatibility with the process media to which the thermowell will be exposed.
2. Temperature limits of the material.
3. Compatibility with the process piping material to ensure solid, non-corroding welds and junctions.

It is important the thermowell conforms to the design specs of the pipe or vessel it will be inserted into to ensure structural and material compatibility. The original process design most likely included temperature, pressure, and corrosive considerations as well as cleaning procedures, agency approvals required, and conformance with codes or standards. Since an installed thermowell essentially becomes part of the process, these original design considerations also apply to the thermowell and will drive the thermowell material of construction and mounting type selection. International pressure vessel codes are explicit about the types of materials and methods of construction allowed.

Table 13: Thermowell Materials

Code	Thermowell material	Flange material	Code	Thermowell material	Flange material
SC	316/316L SST UNS S31600/S31603 ASTM A479 DIN 1.4401/1.4404 EN 10272	316/316L SST UNS S31600/S31603 ASTM A182 or A240 DIN 1.4401/1.4404 EN 10222-5	DS	Super duplex UNS S32750 ASTM A479 DIN 1.4410 EN 10272	Super duplex UNS S32750 ASTM A182 GR F53 or A240 DIN 1.4410 EN 10222-5
SD ⁽¹⁾	316/316L SST dual rated (NORSOK) UNS S31600/S31603 ASTM A479 NORSOK M-630 MDS S01	316/316L SST dual rated (NORSOK) ⁽¹⁾ UNS S31600/S31603 ASTM A182 NORSOK M-630 MDS S01	SP	347 SST UNS S34700 ASTM A479 DIN 1.4550	347 SST UNS S34700 ASTM A182 or A240 DIN 1.4550
SF	304/304L SST UNS S30400/S30403 ASTM A479 DIN 1.4301/1.4306 EN 10272	304/304L SST UNS S30400/S30403 ASTM A182 or A240 DIN 1.4301/1.4306 EN 10222-5	AB	Alloy B3 UNS N10675 ASTM B335 DIN 2.4600	Alloy B3 UNS N10675 ASTM B333 or ASTM B462 DIN 2.4600
SG	316Ti SST UNS S31635 ASTM A479 DIN 1.4571 EN 10272	316Ti SST UNS S31635 ASTM A182 DIN 1.4571 EN 10222-5	AC	Alloy C-276 UNS N10276 ASTM B574 DIN 2.4600	Alloy C-276 UNS N10276 ASTM B462 or B575 DIN 2.4600
SH ⁽²⁾	316/316L SST with TANTALUM sheath UNS S31600/S31603 ASTM A479 DIN 1.4401/1.4404 EN 10272	316/316L SST with TANTALUM sheath UNS S31600/S31603 ASTM A182 or A240 DIN 1.4401/1.4404 EN 10222-5	AD	Alloy C-4 UNS N06455 ASTM B574 DIN 2.4819	304/304L SST UNS S30400/S30403 ASTM A182 or A240 DIN 1.4301/1.4306

Table 13: Thermowell Materials (continued)

Code	Thermowell material	Flange material	Code	Thermowell material	Flange material
	Tantalum sheath UNS R05252		AE	Alloy C-22 UNS N06022 ASTM B574 DIN 2.4602	304/304L SST UNS S30400/S30403 ASTM A182 or A240 DIN 1.4301/1.4306
SJ	316/316L SST with PFA coating UNS S31600/ S31603 ASTM A479 DIN 1.4401/1.4404 EN 10272	316/ 316L SST with PFA coating UNS S31600/ S31603 ASTM A182 or A240 DIN 1.4401/1.4404 EN 10222-5	AF	Alloy C-22 UNS N06022 ASTM B574 DIN 2.4602	316/316L SST UNS S31600/S31603 ASTM A182 or A240 DIN 1.4401/1.4404
SK	304/304L SST with PTFE coating UNS S30400/ S30403 ASTM A479 DIN 1.4301/1.4306 EN 10272	304/304L SST with PTFE coating UNS S30400/ S30403 ASTM A182 or A240 DIN 1.4301/1.4306 EN 10222-5	AG	Alloy 20 UNS N08020 ASTM B473 DIN 2.4660	Alloy 20 UNS N08020 ASTM B462 or B463 DIN 2.4660
SL	310 SST UNS S31008 ASTM A479 DIN 1.4845	310 SST UNS S31008 ASTM A182 or A240 DIN 1.4845	AH	Alloy 400 UNS N04400 ASTM B164 DIN 2.4360	Alloy 400 UNS N04400 ASTM B564 or B127 DIN 2.4360
SM	321 SST UNS S32100 ASTM A479 DIN 1.4541 EN 10272	321 SST UNS S32100 ASTM A182 or A240 DIN 1.4541 EN 10222-5	AJ	Alloy 400 UNS N04400 ASTM B164 DIN 2.4360	304/304L SST UNS S30400/S30403 ASTM A182 or A240 DIN 1.4301/1.4306
SN	321H SST UNS S32109 ASTM A479 DIN 1.4878	321H SST UNS S32109 ASTM A182 or A240 DIN 1.4878	AK	Alloy 600 UNS N06600 ASTM B166 DIN 2.4816	Alloy 600 UNS N06600 ASTM B564 or B168 DIN 2.4816
SR	904L SST UNS N08904 ASTM A479 DIN 1.4539	904L SST UNS N08904 ASTM or A240 DIN 1.4539	AL	Alloy 600 UNS N06600 ASTM B166 DIN 2.4816	304/304L SST UNS S30400/S30403 ASTM A182 or A240 DIN 1.4301/ 1.4306
AN	Alloy 625 UNS N06625 ASTM B446 DIN 2.4856	Alloy 625 UNS N06625 ASTM B443 or B564 DIN 2.4856	AM	Alloy 601 UNS N06601 ASTM B166 DIN 2.4851	Alloy 601 UNS N06601 ASTM B168 or B564 DIN 2.4851
AP	Alloy 800 UNS N08800 ASTM B408 DIN 1.4876	Alloy 800 UNS N08800 ASTM B409 or B564 DIN 1.4876	DU	Duplex 2205 UNS S31803 ASTM A479 DIN 1.4462 EN 10272	Duplex 2205 UNS S31803 ASTM A182 GR F51 or A240 DIN 1.4462 EN 10222-5

Table 13: Thermowell Materials (continued)

Code	Thermowell material	Flange material	Code	Thermowell material	Flange material
MO	Molybdenum 16 MO 3 DIN 1.5415 EN 10273	Molybdenum 16 MO 3 DIN 1.5415 EN 10273	CC	Chrome-Moly Grade F-91 UNS K90901 ASTM A182 DIN 1.4903	Chrome-Moly Grade F-91 UNS K90901 ASTM A182 GR F-9, A217 GR C12A, or A387 GR 91 CL2 DIN 1.4903 EN 10222-2
AQ	Alloy 800H/HT UNS N08810/N08811 ASTM B408 DIN 1.4959	Alloy 800H/HT UNS N08810/N08811 ASTM B409 or B564 DIN 1.4959	NK	Nickel 200 UNS N02200 ASTM B160 DIN 2.4066	Nickel 200 UNS N02200 ASTM B162 or B564 DIN 2.4066
AR	Alloy 825 UNS N08825 ASTM B425 DIN 2.4858	Alloy 825 UNS N08825 ASTM B424 or B564 DIN 2.4858	CA	Chrome-Moly Grade B-11 UNS K11797 ASTM A739 GR B-11 DIN 1.7335 EN 10273	Chrome-Moly Grade F-11 UNS K11572 ASTM A182 GR F-11 CL2 or A387 GR11 CL2 DIN 1.7335 EN 10222-2
AU	Alloy C-22 UNS N06022 ASTM B574 DIN 2.4602	Alloy C-22 UNS N06022 ASTM B567 or B575 DIN 2.4602	CB	Chrome-Moly Grade B-22 UNS K21390 ASTM A739 GR B-22 DIN 1.7380 EN 10273	Chrome-Moly Grade F-22 UNS K21590 ASTM A182 GR F-22 CL3, A217 GR WC9, or A387 GR22 CL2 DIN 1.7380
AS	Alloy F44 Mo6 UNS S31254 ASTM A479 DIN 1.4547	Alloy F44 Mo6 UNS S31254 ASTM A182 or A240 DIN 1.4547	DT ⁽¹⁾	Super duplex (NORSOK) UNS S32750 ASTM A479 NORSOK M-630 MDS D57	Super duplex (NORSOK) UNS S32750 ASTM A182 GR F53 NORSOK M-630 MDS D54
CS	Carbon steel UNS K03504 ASTM A105 DIN 1.0402	Carbon steel UNS K03504 ASTM A105, A216 GR WCB, or A515 GR 70 DIN 1.0402	DV ⁽¹⁾	Duplex 2205 (NORSOK) UNS S31803 ASTM A479 NORSOK M-630 MDS D47	Duplex 2205 (NORSOK) UNS S31803 ASTM A182 GR F51 NORSOK M-630 MDS D44
TT	Titanium grade 2 UNS R50400 ASTM B348 GR 2 DIN 3.7035	Titanium grade 2 UNS R50400 ASTM B381 GR 2 DIN 3.7035			

(1) Material supplier qualified per NORSOK M-650; material qualified per NORSOK M-630.

(2) Sheath thickness = 0.01-in. (0.38 mm).

NORSOK

Rosemount 114 Thermowell ordered with NORSOK will have raw material from a NORSOK M-650 approved supplier, material approved per NORSOK M-630 datasheet, and flange welding qualified to NORSOK M-601. The NORSOK material will also meet requirements of NACE MR0175/ISO 15156.

Q8 should be ordered to receive the MTR. The MTR will come with an M-650 Qualification Test Record (QTR) cover sheet. Additional testing required by the M-630 datasheet will be included in the MTR.

Some of the required testing for NORSOK Duplex in addition to ASTM requirements;

- Micrographic examination at 400 to 500× magnification
- Ferrite content analysis according to ASTM E 562 or by image analysis according to ASTM E 1245. Ferrite content shall be within 35–55 percent.
- Charpy V-notch testing according to ASTM A 370 at –46 °C. Minimum absorbed energy shall be 45 J average and 35 J single.
- Corrosion testing according to ASTM G 48 Method A. No pitting at 20× magnification; Weight loss shall be less than 4 g/m².

Full details of the material requirements can be found in the ASTM and NORSOK M-630 standards.

Head length (H)

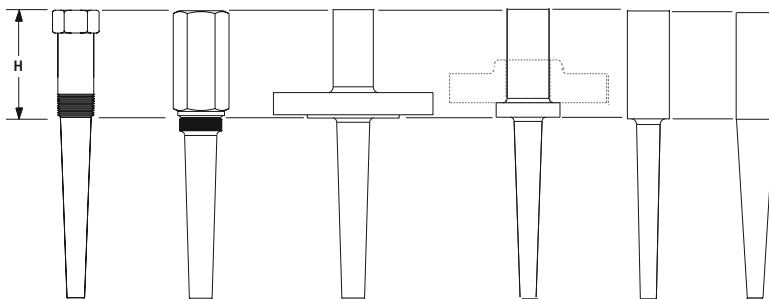
Back to Threaded ordering information: [Head length \(H\)](#)

Back to Flanged ordering information: [Head length \(H\)](#)

Back to Van Stone ordering information: [Head length \(H\)](#)

Back to Welded ordering information: [Head length \(H\)](#)

Head length is the distance from the bottom of the process connection to the top of the thermowell. Each style has a minimum head length; the length specified must meet or exceed that minimum. It is shown below for all process connection styles.



Note

The industry standard minimum head length for flanged and Van Stone thermowells with connections under Class 900 (ASME B16.5) is 2.25-in. (60 mm).

Table 14: Recommended Minimum Head Length

Dimensions are in inches (millimeters).

Process connection	Minimum head length (H)
Threaded	1.75 (45)
Welded	

Table 15: Recommended Minimum Head Length by Connection Class for ASME B16.5

Dimensions are in inches (millimeters).

Connection size	Connection class				
	150	300	400/600	900/1500	2500
Flanged					
¾	N/A	1.75 (45)	N/A	N/A	N/A
1	1.75 (45)	1.75 (45)	1.75 (45)	2.00 (50)	2.55 (57)
1 ½	1.75 (45)	1.75 (45)	1.75 (45)	2.00 (50)	2.50 (65)
2	1.75 (45)	1.75 (45))	1.75 (45)	2.25 (57)	2.75 (70)
3	1.75 (45)	2.25 (57)	2.25 (57)	3.00 (75)	3.75 (96)
4	1.75 (45)	N/A	N/A	N/A	N/A
6	1.75 (45)	N/A	N/A	N/A	N/A
Flanged with RTJ					
¾	N/A	2.00 (50)	N/A	N/A	N/A
1	1.75 (45)	2.00 (50)	2.00 (50)	2.50 (65)	N/A
1 ½	2.00 (50)	2.00 (50)	2.00 (50)	2.50 (65)	3.25 (80)
2	2.00 (50)	2.00 (50)	2.00 (50)	2.75 (70)	3.50 (85)
3	2.25 (60)	N/A	N/A	N/A	N/A
4	2.25 (60)	N/A	N/A	N/A	N/A
6	2.25 (60)	N/A	N/A	N/A	N/A
Van Stone					
1	1.75 (45)	1.75 (45)	1.75 (45)	2.00 (50)	2.25 (60)
1 ½	1.75 (45)	1.75 (45)	1.75 (45)	2.25 (60)	2.75 (70)
2	1.75 (45)	1.75 (45)	2.00 (50)	2.75 (70)	3.25 (80)
Van Stone with RTJ					
1	1.75 (45)	1.75 (45)	2.25 (60)	2.25 (60)	2.50 (65)
1 ½	1.75 (45)	2.00 (50)	2.00 (50)	2.50 (65)	3.00 (75)
2	1.75 (45)	2.00 (50)	2.25 (60)	3.00 (75)	3.50 (90)

Table 16: Recommended Minimum Head Length by Connection Class for EN 1092-1

Dimensions are in millimeters.

Connection size	Connection class				
	PN 2.5/6	PN 10/16	PN 25/40	PN 63	PN 100
DN 20	40	45		50	
DN 25	40	45		50	
DN 40	40	45		50	
DN 50	40	45		55	60
DN 65	40	45	50	55	60

Table 16: Recommended Minimum Head Length by Connection Class for EN 1092-1 (continued)

Connection size	Connection class				
DN 80	40	45	50	55	60
DN 100	40	45	50	55	60

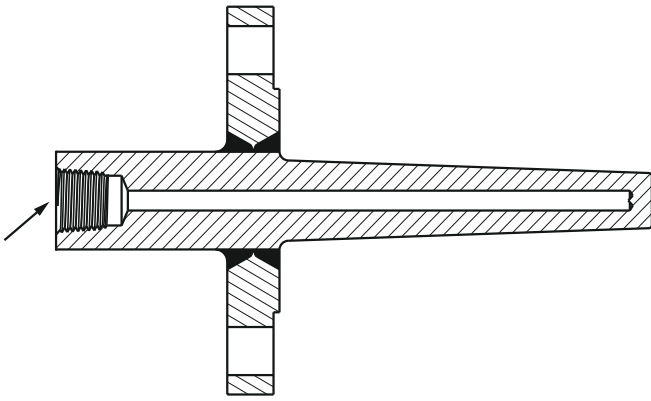
Instrument connection

Back to Threaded ordering information: [Instrument connection](#)

Back to Flanged ordering information: [Instrument connection](#)

Back to Van Stone ordering information: [Instrument connection](#)

Back to Welded ordering information: [Instrument connection](#)

Thread	Specification	Internal thread
½-14 NPT	SAE-AS 71051	
½-14 NPSM	ASME B1.20.1, 8 threads minimum	
¾-14 NPT	SAE-AS 71051	
M18 × 1.5p	BS 3643	
M20 × 1.5p		
M24 × 1.5p		
M27 × 2p		
M14 × 1.5p		
G½-in. (BSPF)	ISO 228/1 (BS 2779)	
G¾-in. (BSPF)	ISO 228/1 (BS 2779)	

Sensor/thermowell assemble to options (XT, XW)

Back to Threaded ordering information: [Sensor/thermowell assemble to options](#)

Back to Flanged ordering information: [Sensor/thermowell assemble to options](#)

Back to Van Stone ordering information: [Sensor/thermowell assemble to options](#)

Back to Welded ordering information: [Sensor/thermowell assemble to options](#)

XT

This option is selected when a Rosemount 214C Sensor is ordered with the Rosemount 114C Thermowell. This ensures the sensor is threaded into the thermowell, but only hand tightened.

XW

This option is selected when a Rosemount 214C Sensor is ordered with the Rosemount 114C Thermowell. This ensures the sensor is threaded into the thermowell and torqued for a process-ready installation.

Extended product warranty (WR3, WR5)

Back to Threaded ordering information: [Extended product warranty](#)

Back to Flanged ordering information: [Extended product warranty](#)

Back to Van Stone ordering information: [Extended product warranty](#)

Back to Welded ordering information: [Extended product warranty](#)

The extended product warranty options are available in three or five year coverage plans. In the model string, order option codes WR3 for a three year extended warranty or WR5 for a five year warranty. This coverage is an extension of the manufacturer's limited warranty and states that the goods manufactured or services provided by seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period.

Thermowell calculation (R21)

Back to Threaded ordering information: [Thermowell calculation](#)

Back to Flanged ordering information: [Thermowell calculation](#)

Back to Van Stone ordering information: [Thermowell calculation](#)

Back to Welded ordering information: [Thermowell calculation](#)

The ASME PTC 19.3TW is internationally recognized as a mechanical design standard yielding reliable thermowell service in a wide range of temperature measurement applications. It includes evaluation of stresses applied to a barstock thermowell as installed in a process based on the design, material, mounting method, and process conditions. The documentation provided will detail the process information, thermowell geometry, and comprehensive calculation analysis. It will also provide an acceptable or unacceptable statement based on the analysis.

There are four quantitative criteria in ASME PTC 19.3 TW for a thermowell to be found acceptable for a particular set of process conditions:

Frequency Limit:	the resonant frequency of the thermowell must be sufficiently high so that destructive oscillations are not excited by the fluid flow.
Dynamic Stress Limit:	the maximum primary dynamic stress must not exceed the allowable fatigue stress limit. If the design requires that the thermowell pass through the in-line resonance to get to the operating conditions, there is an additional fatigue check at resonance.
Static Stress Limit:	the maximum steady-state stress on the thermowell must not exceed the allowable stress, as determined by the Von Mises criteria.
Hydrostatic Pressure Limit:	the external pressure must not exceed the pressure ratings of the thermowell tip, shank, and flange (or threads).

In addition, the suitability of the thermowell material for the process environment must be considered. This means the designer must evaluate how corrosion and erosion affects the thermowell as well as how exposure to the process conditions affects material properties.

For detailed information about this standard, refer to the Thermowell Calculations [White Paper](#). Emerson advises that all thermowells should have a wake frequency calculation performed to ensure they are suitable for the process conditions in their application. Emerson assumes that the customer has either done their own calculations or understands the risks of not having calculations done if this option is not requested.

Emerson provides a free online software called the Thermowell Design Accelerator, which provides access for designers to perform thermowell calculations. It is automated to re-calculate failed calculations until it finds a valid result. It will then suggest a Rosemount 114 Thermowell and 214 Sensor model code to match. It is designed to simplify the calculation process. The software allows mass uploads of tags using an excel sheet template. This template allows you to upload over 500 tags at once. The template also lets you list multiple process conditions per tag with the ability to perform mixed flow calculations. The ASME PTC 19.3TW doesn't provide guidance on mixed flow, only on gas or liquid. The designer must specify the mix flow conditions and choose whether they are more of a gas or a liquid. The software will perform these calculations and select a thermowell that will pass both conditions.

NACE certification (Q35)

Back to Threaded ordering information: [NACE certification](#)

Back to Flanged ordering information: [NACE certification](#)

Back to Van Stone ordering information: [NACE certification](#)

Back to Welded ordering information: [NACE certification](#)

This option certifies that thermowell materials used are compliant to NACE MR0175/ISO 15156 and NACE MR0103. The material certification provided will list compliance to the referenced standard.

Material code	Certified material
SC	316/316L Dual Rated SST
SF	304/304L Dual Rated SST
SD	316/316L Dual Rated SST NORSOK
SJ	316/316L SST with PFA Coating
SK	304/304L SST with PTFE Coating
DT	Super Duplex NORSOK
DV	Duplex 2205 NORSOK
SL	310 SST
SM	321 SST
AB	Alloy B3
AC	Alloy C-276
AG	Alloy 20
AH	Alloy 400
AK	Alloy 600
CA	Chrome-Moly Grade B-11/F-11 Class II
CB	Chrome-Moly Grade B-22/ F-22 Class III

PMI testing (Q76)

Back to Threaded ordering information: [PMI testing](#)

Back to Flanged ordering information: [PMI testing](#)

Back to Van Stone ordering information: [PMI testing](#)

Back to Welded ordering information: [PMI testing](#)

Positive Material Identification (PMI) is a test that verifies the thermowell material is as specified by the Rosemount 114C model code. X-ray/radiograph fluorescence (XRF) is used to provide elemental analysis in a nondestructive manner. The certificate will provide PMI results in comparison with the applicable material standards for each individual thermowell and state the reference standard. Two points are provided on flanges. All other thermowell components (including welds) will have a single point. XRF will not detect carbon in steels. PMI can be marked on the thermowell by choosing option R40. Due to type of technology used carbon steel material is exempt from this testing.

Material certification (Q8)

Back to Threaded ordering information: [Material certification](#)

Back to Flanged ordering information: [Material certification](#)

Back to Van Stone ordering information: [Material certification](#)

Back to Welded ordering information: [Material certification](#)

Material certificate and traceability in accordance with EN 10204 Type 3.1 Inspection Certificate. The certificate provided will document the heat code, chemical analysis, and testing required by material standards.

Low temperature Charpy test (M01)

Back to Threaded ordering information: [Material test](#)

Back to Flanged ordering information: [Material test](#)

Back to Van Stone ordering information: [Material test](#)

Back to Welded ordering information: [Material test](#)

Test is performed in accordance with ASTM A370 and report will be include in the Material Traceability Report (Q8). This report must be ordered if any documentation is required. Charpy test will be done to check toughness of the raw bar and flange material used for the construction of the thermowell. The table below shows the material available with the option, test temperature, and acceptance criteria.

Material	Material codes	Charpy temperature	Acceptance impact value
Duplex	DS – Super duplex DT – Super duplex (NORSOK) DU – Duplex DV – Duplex (NORSOK)	–58 °F (–50 °C)	Average: 45 J (33 ft-lb) Minimum: 35 J (26 ft-lb)
300 Series SST	SC – 316/316L SST SD – 316/316L SST (NORSOK) SF – 304/304L SG – 316 Ti SH – 316/316L with tantalum sheath SJ – 316/316L with PFA coating SK – 304/304L with PTFE coating SM – 321 SST	–321 °F (–196 °C)	Average: 60 J (44 ft-lb) Minimum: 55 J (41 ft-lb)

Ultrasonic examination of thermowell material (M02)

Back to Threaded ordering information: [Material test](#)

Back to Flanged ordering information: [Material test](#)

Back to Van Stone ordering information: [Material test](#)

Back to Welded ordering information: [Material test](#)

Ultrasonic examination will be done to check quality of the raw bar and flange material used for thermowell construction. The testing shall be performed in accordance with procedures specified in ASTM A388 by a Level 2 inspector. Calibration and acceptance criteria shall be per API 6A.

Surface finish certification (Q16)

Back to Threaded ordering information: [Surface finish](#)

Back to Flanged ordering information: [Surface finish](#)

Back to Van Stone ordering information: [Surface finish](#)

Back to Welded ordering information: [Surface finish](#)

Thermowell surface finish is typically done to remove all the burrs and sharp edges which smooths the thermowell stem surface. The Rosemount 114C comes with a standard surface finish of T32 in. CLA N6 (0.8 μm Ra) or better. This option provides a certificate that documents the maximum surface finish reading for stem and flange (when applicable) and a pass/fail statement. Improved surface finish options are also available for the Rosemount 114C (see options R14).

Surface finish $<Ra\ 0.3\ \mu\text{m}$ (12 μin) (R14)

Back to Threaded ordering information: [Surface finish](#)

Back to Flanged ordering information: [Surface finish](#)

Back to Van Stone ordering information: [Surface finish](#)

Back to Welded ordering information: [Surface finish](#)

Improves surface finish to be less than Ra 0.3 μm . An improved surface finish will increase corrosion resistance and make the thermowell easier to clean. This is common in sanitary applications.

Electropolish (R20)

Back to Threaded ordering information: [Electropolish](#)

Back to Flanged ordering information: [Electropolish](#)

Back to Van Stone ordering information: [Electropolish](#)

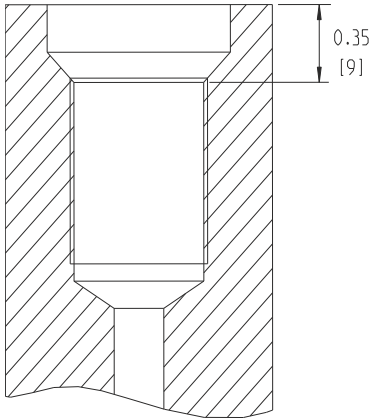
Back to Welded ordering information: [Electropolish](#)

The electropolish process uses a combination of electrical current and chemicals to improve the surface finish. The surface will appear shiny and polished. It can have an advantage over mechanical polishing because there is no cold work involved that can lead to scratches, strains, metal debris, and embedded abrasives on the surface. An improved surface finish will increase corrosion resistance and make the thermowell easier to clean. This is common in sanitary applications. This only applies to wetted surfaces.

Stepped instrument threads (R61)

Back to Van Stone ordering information: [Stepped instrument threads](#)

Threads are recessed and begin 0.35-in. (9 mm) from the top of the face of the thermowell's instrument connection entry as shown below:



Standard external hydrostatic pressure test (Q5)

Back to Threaded ordering information: [Hydrostatic external pressure test](#)

Back to Flanged ordering information: [Hydrostatic external pressure test](#)

Back to Van Stone ordering information: [Hydrostatic external pressure test](#)

Thermowells are tested at room temperature for 10 minutes. Water is certified to have a chlorine content of less than 30 ppm. The certificate will document the chlorine content, hydrostatic test pressure level, duration, and test results. The pressure rating (in psi) for the different thermowell mounting styles is given below.

Flanged and Van Stone

Hydrostatic pressure test levels are in accordance with ASME B16.5. When the table below and the standard conflict, the standard shall govern.

Flange class (lb)	Thermowell material (psi)					
	NK	AH, AQ, TT	SC, SD, SF, SG, SH, SJ, SK, SL, SM, SN, SP, AP, AM, AD, AE, AF, AJ, AL	CS	SR	AG, AK, CA, AB, AC, CB, CC, DU, DT, DV, AN, AR, AU, AS, MO, DS
150	300	350	425	450	450	450
300	725	900	1100	1125	1125	1125
600	1450	1800	2175	2225	2250	2250
1500 (900)	3600	4500	5400	5575	5600	5625
2500	6000	7500	9000	9275	9300	9375

Table 17: External Pressure Test-DIN

DIN flanged thermowell	
Nominal pressure (bar)	Test pressure (bar)
16	40
40	100
100	250
Test to 2.5× nominal pressure rating	

Threaded thermowells

1500 psi

Extended external pressure test (Q9)

Back to Threaded ordering information: [Hydrostatic external pressure test](#)

Back to Flanged ordering information: [Hydrostatic external pressure test](#)

Back to Van Stone ordering information: [Hydrostatic external pressure test](#)

Thermowells are tested at room temperature for 20 minutes. Water is certified to have a chlorine content of less than 30 ppm. The certificate will document the chlorine content, hydrostatic test pressure level, duration, and test results. The pressure rating (in psi) for the different thermowell mounting styles are the same as the standard external pressure test.

Standard internal hydrostatic pressure test (Q85)

Back to Threaded ordering information: [Hydrostatic internal pressure test](#)

Back to Flanged ordering information: [Hydrostatic internal pressure test](#)

Back to Van Stone ordering information: [Hydrostatic internal pressure test](#)

Back to Welded ordering information: [Hydrostatic internal pressure test](#)

This test is performed at room temperature for a minimum of 10 minutes to 3000 psi. The water used here is certified to ensure a chloride content of less than 30 ppm. The certificate provided will document the chloride content, hydrostatic test level, duration, and results. Thermowells longer than 42-in. will be required to have an internal pressure test (Q85) performed to ensure the internal cavity integrity has not been compromised.

Extended internal hydrostatic pressure test (Q86)

Back to Threaded ordering information: [Hydrostatic internal pressure test](#)

Back to Flanged ordering information: [Hydrostatic internal pressure test](#)

Back to Van Stone ordering information: [Hydrostatic internal pressure test](#)

Back to Welded ordering information: [Hydrostatic internal pressure test](#)

This test is performed at room temperature for a minimum of 20 minutes to 3000 PSI. The water used here is certified to ensure a chloride content of less than 30 PPM. The certificate provided will document the chloride content, hydrostatic test level, duration, and results. Thermowells longer than 42-in. will be required to have an standard internal pressure test (Q85) performed to ensure the internal cavity integrity has not been compromised.

Canadian registration number (Q17)

Back to Threaded ordering information: [Canadian registration number](#)

Back to Flanged ordering information: [Canadian registration number](#)

Back to Van Stone ordering information: [Canadian registration number](#)

Back to Welded ordering information: [Canadian registration number](#)

Any pressure vessel, piping system, or fitting used in Canada is required by law to have a CRN (Canadian Registration Number). This ensures all pressure vessels, piping systems, and fittings are built under appropriate quality control programs. This CRN is for all Canadian provinces but the end destination province still needs to be known during the order process.

Material code	CRN approved material
SC	316/316L Dual Rated
SF	304/304L Dual Rated
SH	316 SST with Tantalum Sheath
SJ	316L SST with PFA Coating
SK	304 SST with PTFE Coating
SL	310 SST
SM	321 SST
AB	Alloy B3
AC	Alloy C-276
AG	Alloy 20
AH	Alloy 400
AJ	Alloy 400 (with 304 SST Flange)
AK	Alloy 600
AL	Alloy 600(with 304 SST Flange)
CA	Chrome-Moly Grade B-11/F-11 Class II
CB	Chrome-Moly Grade B-22/F-22 Class III
CC	Chrome-Moly Grade F-91
CS	Carbon Steel (A-105)
TT	Titanium Grade 2
DU	Duplex 2205 Grade F51

Dye penetration test (Q73)

Back to Threaded ordering information: [Dye penetration test](#)

Back to Flanged ordering information: [Dye penetration test](#)

Back to Van Stone ordering information: [Dye penetration test](#)

Back to Welded ordering information: [Dye penetration test](#)

Dye or liquid penetration testings are performed by ASME Level II or III trained inspectors. These tests are all done in accordance to ASME Section V, Article 6 with an acceptance criteria per ASME Section III, Div 1 NB-2546. The certificate will document the inspectors name, dye penetration acceptance criteria, and test result.

Ultrasonic wall thickness test (Q83)

Back to Threaded ordering information: [Wall thickness test](#)

Back to Flanged ordering information: [Wall thickness test](#)

Back to Van Stone ordering information: [Wall thickness test](#)

Back to Welded ordering information: [Wall thickness test](#)

Ultrasonic examination performed to check stem wall thickness. Min and max wall thickness measurements shall be recorded 25 mm or 1-in. from the thermowell tip. Bore position should be 10 percent of minimum stem wall thickness at nominal dimensions.

Radiographic (X-ray) Wall thickness test (Q84)

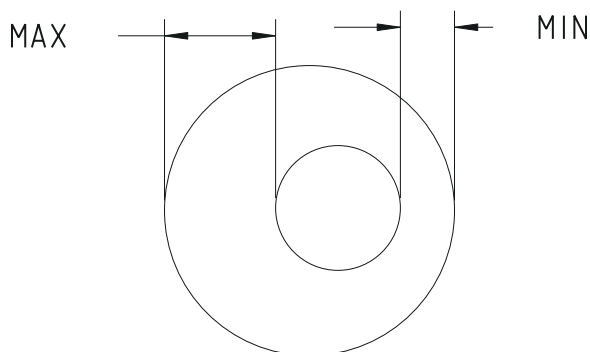
Back to Threaded ordering information: [Hydrostatic internal pressure test](#)

Back to Flanged ordering information: [Hydrostatic internal pressure test](#)

Back to Van Stone ordering information: [Hydrostatic internal pressure test](#)

Back to Welded ordering information: [Hydrostatic internal pressure test](#)

Radiographic examination performed in accordance with ASME Section V Article 2 by a level 2 inspector to be performed to check bore position. Two images shall be taken at 90 degrees to check wall thickness. Two wall thickness measurements shall be recorded 25 mm. or 1 in. from the thermowell tip for each image (four total measurements). The position shall meet the criteria of a minimum wall thickness of 2.7 mm.



Special cleaning (Q6)

Back to Threaded ordering information: [Special cleaning](#)

Back to Flanged ordering information: [Special cleaning](#)

Back to Van Stone ordering information: [Special cleaning](#)

Back to Welded ordering information: [Special cleaning](#)

Special cleaning for oxygen/special service to be performed in accordance to ASTM G93. The procedure to be qualified using ASTM G93 Type II quantitative tests. The documentation provided for this test will have a compliance statement to ASTM G93. All cleaned thermowells will come in a sealed plastic bag to prevent contamination. Not available with carbon steel or any coated material.

Thermowell markings (R40)

Back to Threaded ordering information: [Thermowell markings](#)

Back to Flanged ordering information: [Thermowell markings](#)

Back to Van Stone ordering information: [Thermowell markings](#)

Back to Welded ordering information: [Thermowell markings](#)

These options provide the ability to have certain test markings on the thermowell. Below are the tests available for this option. When R40 is ordered, either Q5, Q76, or Q9 must also be ordered.

- Q5 – standard external pressure tests the values and units
- Q76 – PMI will be marked on the head length portion of the thermowell and on the top of the flange if applicable
- Q9 – extended External pressure test values and units

Welding Procedure Qualification Record (Q66)

Back to Flanged ordering information: [Flange welding documentation](#)

A record of a test performed and tested to ensure that the procedure will produce a good weld. Documentation to be supplied in accordance with QW-200.2 ASME Section IX.

The records for thermowells with option M01 (low temperature charpy) are different and are highlighted when choosing to ensure the right documents are submitted to the customer.

Welder Performance Qualifications (Q67)

Back to Flanged ordering information: [Flange welding documentation](#)

A test certificate that shows whether a welder possesses the necessary experience and knowledge to perform the specifications of a particular weld procedure. Documentation to be supplied in accordance with QW-301.4 ASME Section IX.

Welding Procedure Specification (Q68)

Back to Flanged ordering information: [Flange welding documentation](#)

A formal written document that describes and provides direction to a welder or welding operator for making sound and quality production welds per code requirements. Documentation to be supplied in accordance with Article V, ASME Section IX.

Phased array ultrasonic test (Q80)

Back to Flanged ordering information: [Phased array test](#)

This test is only available on the full penetration weld flanged thermowells. Testing shall be performed in accordance with ASME section V article 4. Inspection criteria shall be per ASME Section VIII Div 1 per UW3 and conducted by a Level 2 Inspector. The certificate provided with this option will document the results and the inspectors acceptance criteria .

X-ray/radiograph test (Q81)

Back to Flanged ordering information: [X-ray/radiograph Test](#)

This test involves performing an X-ray/radiograph on the weld joints to examine for any internal imperfections and is only available on full penetration flanged thermowells. Testing is done in accordance to ASME Section VIII Div 1 per UW51 and conducted by a Level 2 Inspector. The certificate provided with this option will document the results.

Spherical tip (R60)

Back to Threaded ordering information: [Spherical tip](#)

Back to Flanged ordering information: [Spherical tip](#)

Back to Van Stone ordering information: [Spherical tip](#)

Back to Welded ordering information: [Spherical tip](#)

Radius of spherical tip (B) is the same as the specified thermowell tip radius. Thermowell will still maintain specified "U" length.

Alloy 6 Thermowell stem coating (R63)

Back to Threaded ordering information: [Thermowell stem coating](#)

Back to Flanged ordering information: [Thermowell stem coating](#)

Back to Van stone ordering information: [Thermowell stem coating](#)

Back to Welded ordering information: [Thermowell stem coating](#)

Alloy coating can only be used on straight or tapered stem profiles. It is applied to the thermowell stem by either laser cladding or weld overlay cladding. Coating is applied around the entire tip and stem leaving 0.8-in. (20 mm) distance from the process connection. Coating material used is powder Stellite™ 6, it will have a final minimum hardness of 40 HRC and the thickness of the coating will be 0.04 ± 0.02-in. (1.0 ± 0.5 mm).

Stainless steel plug and chain (R06)

Back to Threaded ordering information: [Plug and chain](#)

Back to Flanged ordering information: [Plug and chain](#)

Back to Van Stone ordering information: [Plug and chain](#)

Back to Welded ordering information: [Plug and chain](#)

The plug and chain are made from stainless steel. This plug is used to protect the thermowell threads when a sensor isn't installed. It also keeps elements such as rain, dust, and dirt out of the thermowell.

Brass plug and chain (R23)

Back to Threaded ordering information: [Plug and chain](#)

Back to Flanged ordering information: [Plug and chain](#)

Back to Van Stone ordering information: [Plug and chain](#)

Back to Welded ordering information: [Plug and chain](#)

The plug and chain are made from brass. This plug is used to protect the thermowell threads when a sensor isn't installed. It also keeps elements such as rain, dust, and dirt out of the thermowell.

Vent hole (R11)

Back to Threaded ordering information: [Vent hole](#)

Back to Flanged ordering information: [Vent hole](#)

Back to Van Stone ordering information: [Vent hole](#)

Back to Welded ordering information: [Vent hole](#)

The vent hole allows for the venting of a thermowell. Vent or weep holes are often used to prevent gas buildup in certain applications. This option is useful in applications where gas build up is a concern. Process fluid leakage from the vent hole is an indicator of thermowell failure. Must have at least 1.02-in (26 mm) of extra head length (from the required minimum head length for that mounting type) to allow for space to drill the vent hole.

Flange face – concentric serrations (R09)

Back to Flanged ordering information: [Flange face](#)

Back to Van Stone ordering information: [Flange face](#)

This option changes the flange face so it has concentric serrations covering the wetted portion of the flange raised face. It is installed with an inside bolt circle (IBC) gasket/ring gasket, which extends to and is centered by the bolts. This flange face is designed per the ASME B16.5 standard.

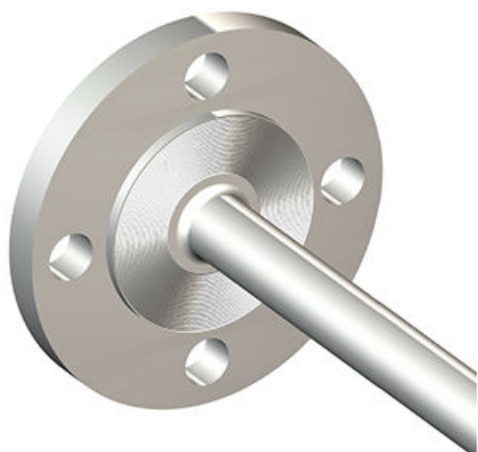
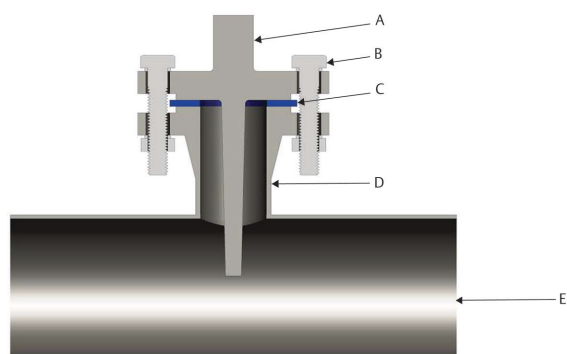


Figure 23: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Flange face – flat (R10)

Back to Flange ordering information: [Flange face](#)

This option changes the flange face so it has no raised section on the wetted portion of the flange face. The flat face is finished with spiral serrations. This style is frequently used where the mating flange is made from a casting or fragile material. It can be installed with ring gaskets or full face gaskets that extend past the bolt holes. This flange face is designed per the ASME B16.5 standard.

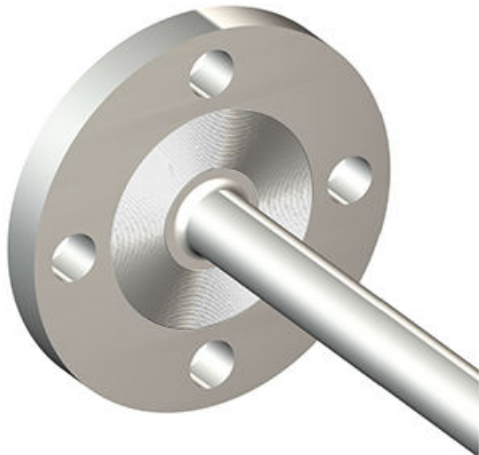
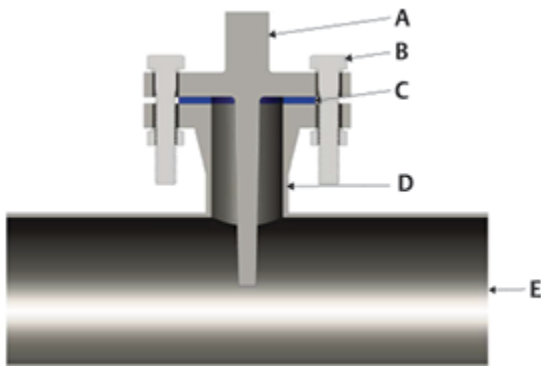


Figure 24: Installation Component



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Raised face – Type B2 (R15)

Back to Flanged ordering information: [Flange face](#)

This option provides a smoother finish to the flange face compared to the standard Type B1 flange face.

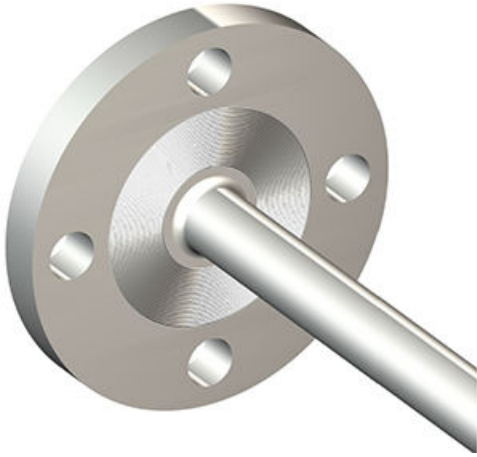
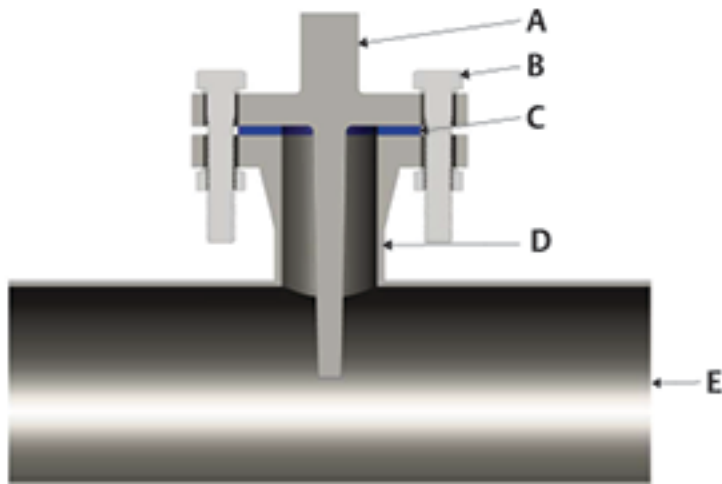


Figure 25: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Flange face – RTJ (R16)

Back to Flanged ordering information: [Flange face](#)

Back to Van Stone ordering information: [Flange face](#)

This option changes the flange face so it has a ring type joint (RTJ). The RTJ flange face is common for high pressure applications using Class 600 flanges or higher. Both mating flanges have grooves that can accept a RTJ gasket which is usually made of solid metal. This flange face is designed per the ASME B16.5 standard.

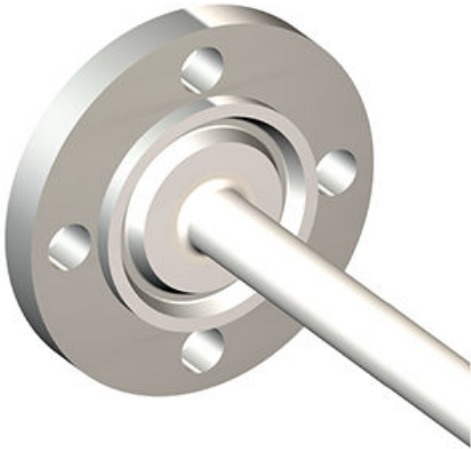
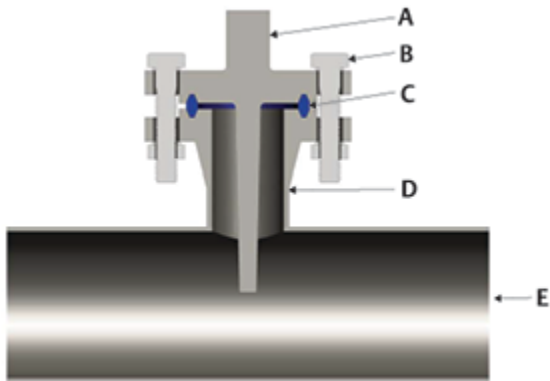


Figure 26: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Flange face – groove, Type D (R18)

Back to Flanged ordering information: [Flange face](#)

Back to Van Stone ordering information: [Flange face](#)

Type C “tongue” will mount to Type D “groove”.

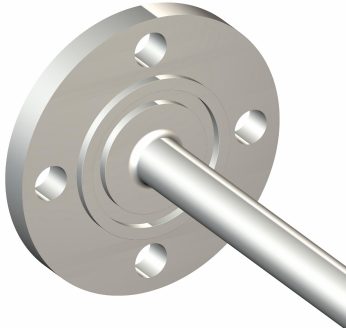
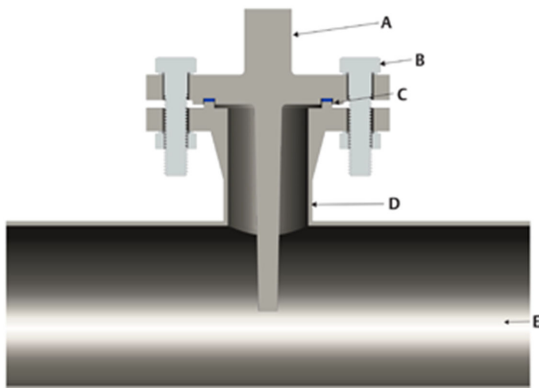


Figure 27: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Flange face – tongue, Type C (R19)

Back to Flanged ordering information: [Flange face](#)

Back to Van Stone ordering information: [Flange face](#)

Type C “tongue” will mount to Type D “groove”.

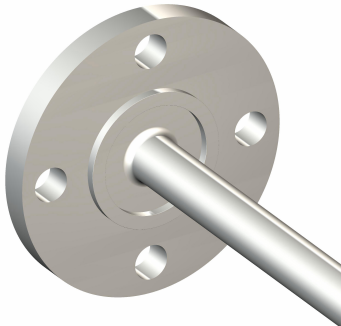
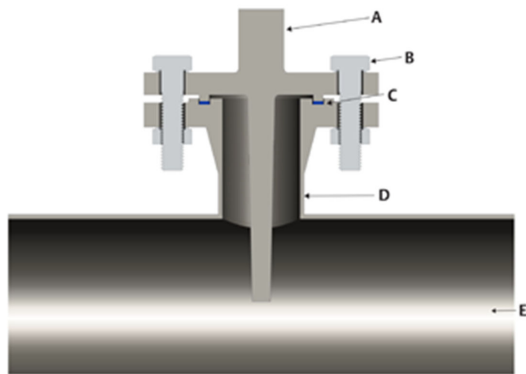


Figure 28: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Flange face – spigot, Type E (R24)

Back to Flanged ordering information: [Flange face](#)

Back to Van Stone ordering information: [Flange face](#)

Type E “spigot” will mount to type F “recess”.

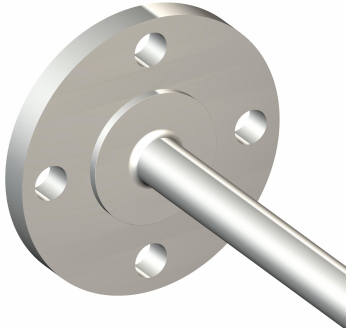
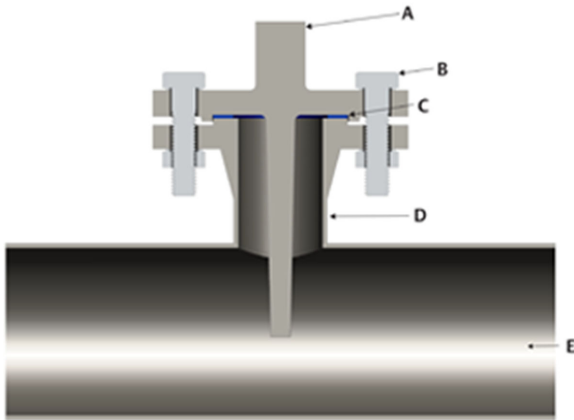


Figure 29: Installation Components



- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Flange face – recess, Type F (R25)

Back to Flanged ordering information: [Flange face](#)

Back to Van Stone ordering information: [Flange face](#)

Type E “spigot” will mount to type F “recess”.

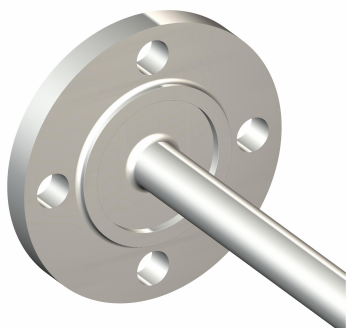
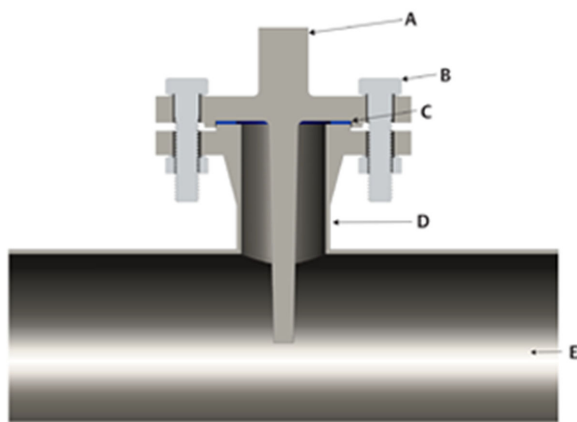


Figure 30: Installation Components



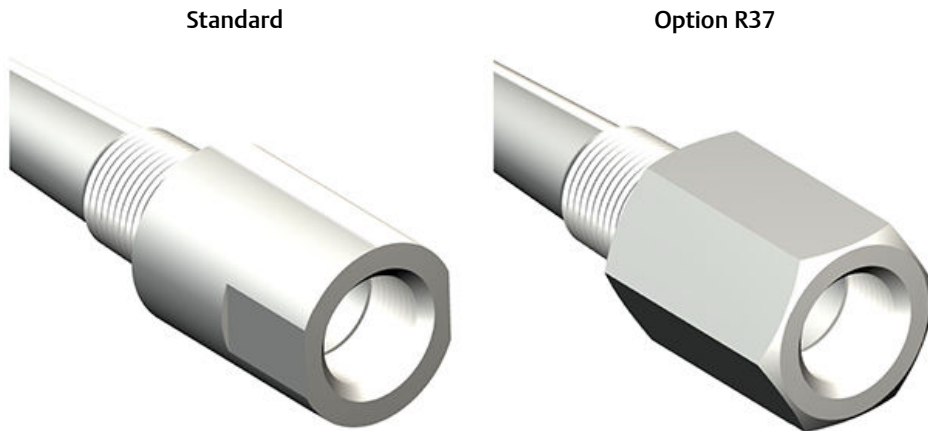
- A. Thermowell
- B. Bolt/washers
- C. Ring gasket
- D. Nozzle and mating flange
- E. Process

Thermowells with wrench flats (R37)

Back to Threaded ordering information: [Thermowells with wrench flats](#)

This option only applies to threaded thermowells made from exotic materials. By default, these thermowells are made with two wrench flats; this option must be selected to get hex (6) wrench flats.

Figure 31: Wrench Flats



Root diameter (Axxx)

Back to Threaded ordering information: [Root diameter \(A\)](#)

Back to Flanged ordering information: [Root diameter \(A\)](#)

Back to Van Stone ordering information: [Root diameter \(A\)](#)

Back to Welded ordering information: [Root diameter \(A\)](#)

Larger root diameters will provide greater strength. Changing the root diameter is helpful when designing a thermowell to pass wake frequency calculations.

Guidelines on specifying design modifiers based on the stem profile are as follows:

- Straight – only root diameter (Axxx) should be specified
- Tapered – both root (Axxx) and tip diameter (Bxxx) must be specified
- Stepped – if root diameter (Axxx) only is specified, the tip will be standard 0.5-in diameter; if tip diameter (Bxxx) is ordered, root diameter (Axxx) must also be specified

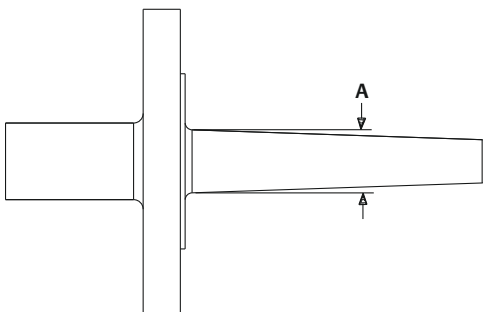


Table 18: Sample Root Diameters

Code	Dimension (E)	Code	Dimension (M)
A040	0.4-in.	A100	10 mm
A045	0.45-in.	A110	11 mm
A100	1.00-in.	A205	20.5 mm
A310	3.10-in.	A790	79 mm
A315	3.15-in.	A800	80 mm

Tip diameter (BXXX)

Back to Threaded ordering information: [Tip diameter \(B\)](#)

Back to Flanged ordering information: [Tip diameter \(B\)](#)

Back to Van Stone ordering information: [Tip diameter \(B\)](#)

Back to Welded ordering information: [Tip diameter \(B\)](#)

Smaller tip diameters will improve time response. Changing the tip diameter is helpful when designing a thermowell to pass wake frequency calculations.

Guidelines on specifying design modifiers based on the stem profile are as follows:

- Straight – only root diameter (Axxx) should be specified
- Tapered – both root (Axxx) and tip diameter (Bxxx) must be specified
- Stepped – if root diameter (Axxx) only is specified, the tip will be standard 0.5-in. diameter; if tip diameter (Bxxx) is ordered, root diameter (Axxx) must also be specified

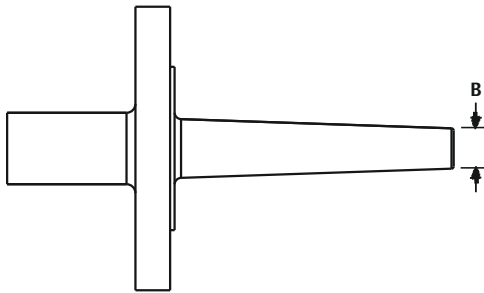


Table 19: Sample Tip Diameters

Code	Dimension (E)	Code	Dimension (M)
B040	0.4-in.	B120	12 mm
B045	0.45-in.	B130	13 mm
B100	1.00-in.	B205	20.5 mm
B175	1.75-in.	B450	45 mm
B180	1.80-in.	B460	46 mm

Bore diameter (D0X)

Back to Threaded ordering information: [Non-standard bore diameter \(d\)](#)

Back to Flanged ordering information: [Non-standard bore diameter \(d\)](#)

Back to Van Stone ordering information: [Non-standard bore diameter \(d\)](#)

Back to Welded ordering information: [Non-standard bore diameter \(d\)](#)

Bore diameter (d) can be selected to accommodate different temperature sensor sizes. Time response is improved when the sensor and thermowells have a tighter fit.

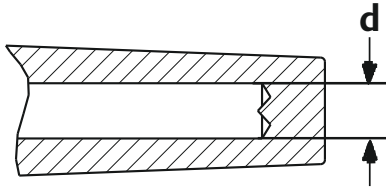


Table 20: Sample Bore Diameters

Code	Dimension
D01	0.276-in./7.0 mm
D03	0.138-in./3.5 mm
D04	0.386-in./9.8 mm
D05	0.354-in./9 mm
D06	0.433-in./11 mm

Tip thickness (T0X)

Back to Threaded ordering information: [Non-standard tip thickness \(t\)](#)

Back to Flanged ordering information: [Non-standard tip thickness \(t\)](#)

Back to Van Stone ordering information: [Non-standard tip thickness \(t\)](#)

Back to Welded ordering information: [Non-standard tip thickness \(t\)](#)

Tip thickness (t) is specified as the minimum thickness and measured from the top of the gun drill web as shown in the figure below:

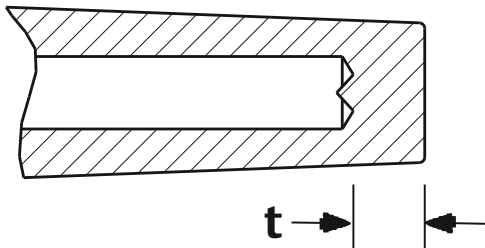


Table 21: Available Tip Thicknesses

Code	Dimension
T01	0.197-in./5.0 mm
T02	0.236-in./6.0 mm

Van Stone stub thickness (FOX)

Back to Van Stone ordering information: [Van stone stub thickness](#)

Van Stone stub thickness is the thickness of the surface on which the flange lies as shown in the figure below.

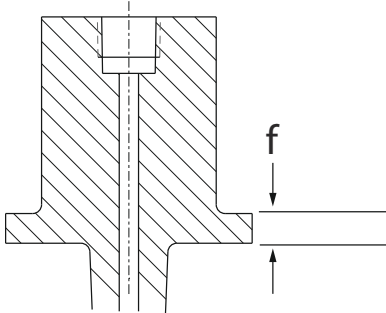


Table 22: Available Stub Thicknesses

Code	Dimension
F01	0.591-in. (15 mm)
F02	0.787-in. (20 mm)

Fillet radius (EOX)

Back to Flanged ordering information: [Fillet radius \(e\)](#)

Back to Van Stone ordering information: [Fillet radius \(e\)](#)

Lap Joint flanges are machined with a flat face and a fillet radius to accommodate the stub end or pipe lap as shown in image below.

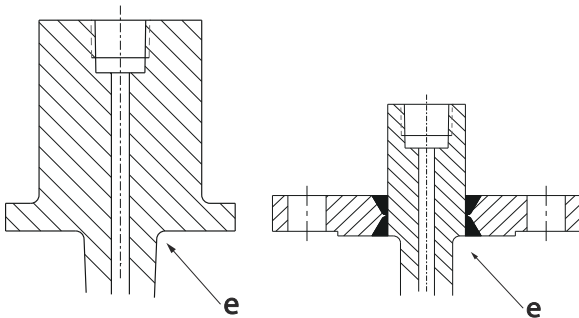


Table 23: Available Fillet Radius

Code	Dimension
E01	0.039-in. (1.0 mm)
E02	0.079-in. (2.0 mm)
E03	0.118-in. (3.0 mm)
E05	0.197-in. (5.0 mm)
E06	0.236-in. (6.0 mm)

Lap flange material for Van Stone design (C0X)

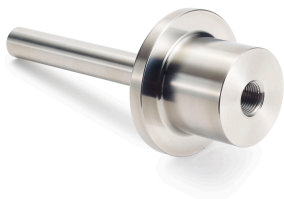
Back to Van Stone ordering information: [Lap flange material for Van Stone design](#)

This option is only available when the Van Stone (V) mounting configuration is selected. By default, a Van Stone thermowell comes with a carbon steel A105 lap flange. These options give the choice of having the thermowell ordered without a flange, with a 316/316LSST flange, or with a flange of similar material as the thermowell stem. Below are some model string examples of the standard offering and options for reference:

Example model: 114CE0030VAATSC032A – carbon steel A105 lap flange with 316/316L SST thermowell stem provided (standard)



Example model: 114CE0030VAATSC032AC01 – no lap flange, only thermowell stem provided



Example model: 114CE0030VAATSC032AC02 – changes default carbon steel A105 lap cover flange to 316/316LSST flange



Example model: 114CE0030VAATSC032AC03 – changes default cover flange to match thermowell stem material



Note

Coatings do not apply to lap flange.

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