

Data Sheet

S50 Industrial RTDs & Thermocouples with NPT Connections

TYPICAL USES

- Industrial process, petrochemical, oil and gas applications
- Process temperature measurements for oil, gas and power generation systems
- Process control, monitoring asset protection
- General purpose or hazardous area
- Available with DIN mounting plate or spring loaded fitting designs

DESCRIPTION

Ashcroft® S50 temperature sensor assemblies provide accurate temperature measurements. Each temperature sensor assembly consists of a spring-loaded temperature sensor, magnesium oxide (MgO), insulated insert, connection head and lag extension. The assembly may also include an optional terminal block and/or transmitters. Thermocouple assemblies are manufactured to IEC 60584-2 or ASTM E230 and RTDs assemblies are manufactured to IEC 60751.



SPECIFICATIONS

Ashcroft Series:	S50
Sheath Diameter:	1/8", 3/16", 1/4", 3 mm, 4.5 mm, 6 mm, 8 mm
Stem Length:	Minimum: 50 mm/2 in Maximum: 3 m/120 in
Sensor Type & Measuring Range	RTDs Platinum 385 Pt 100 -196 to 600 °C Pt 1000 -40 to 600 °C Thermocouples* Type J -40 to 750 °C Type E -200 to 800 °C Type K -200 to 1200 °C Type N 0 to 1200 °C Type T -200 to 350 °C
Wiring Configuration:	RTDs - single or dual 2 Wire 3 Wire 4 Wire Thermocouples - single or dual
Accuracy Class	RTDs - (IEC 60751) Class A: $\pm(0.15 + 0.0020 * t ^{(1)})$ Class B: $\pm(0.30 + 0.0050 * t ^{(1)})$ Class AA:

(1) Absolute temperature in °C

* Consult factory for design configurations needed for using thermocouples in high temperatures

KEY BENEFITS

- Industrial process applications.
- Designs for hazardous locations.

Thermocouples (ASTM E230)

	Type J	Type K	Type E	Type N	Type T
Standard	$\pm 2.2\text{ °C or } \pm 0.0075 * t ^{(1)}$	$\pm 2.2\text{ °C or } \pm 0.0075 * t ^{(1)}$	$\pm 1.7\text{ °C or } \pm 0.0050 * t ^{(1)}$	$\pm 2.2\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 1.0\text{ °C or } \pm 0.0075 * t ^{(1)}$
Special	$\pm 1.1\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 1.1\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 1.0\text{ °C or } \pm 0.0075 * t ^{(1)}$	$\pm 1.1\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 0.5\text{ °C or } \pm 0.0040 * t ^{(1)}$

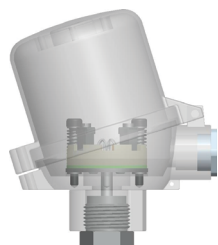
Thermocouples (IEC 60584-2)

	Type J	Type K	Type E	Type N	Type T
Class 1	$\pm 1.5\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 1.5\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 1.5\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 1.5\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 0.5\text{ °C or } \pm 0.0040 * t ^{(1)}$
Class 2	$\pm 2.5\text{ °C or } \pm 0.0075 * t ^{(1)}$	$\pm 2.5\text{ °C or } \pm 0.0075 * t ^{(1)}$	$\pm 2.5\text{ °C or } \pm 0.0075 * t ^{(1)}$	$\pm 2.5\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 1.0\text{ °C or } \pm 0.0075 * t ^{(1)}$
Class 3	N/A	$\pm 2.5\text{ °C or } \pm 0.0040 * t ^{(1)}$	$\pm 2.5\text{ °C or } \pm 0.0150 * t ^{(1)}$	$\pm 2.5\text{ °C or } \pm 0.0150 * t ^{(1)}$	$\pm 1.0\text{ °C or } \pm 0.0150 * t ^{(1)}$

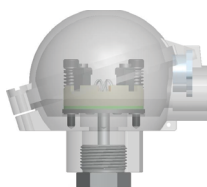
Data Sheet

S50 Industrial RTDs & Thermocouples with NPT Connections

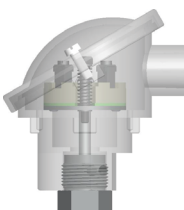
OPTIONAL S50 HEADS



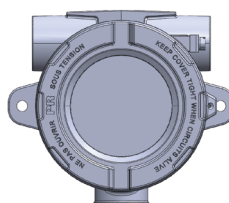
BUZH-AL
Type E



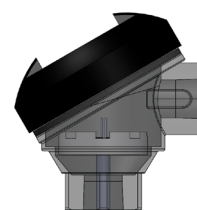
BUZH-AL
Type D



DIN B
Type B



PR 7501 with display
Type P



Cast Iron
Type Y

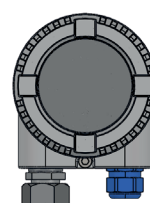
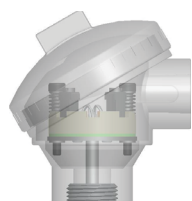
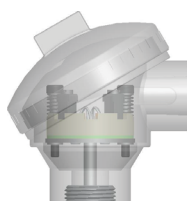


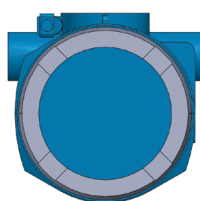
ABB Housing
Type V



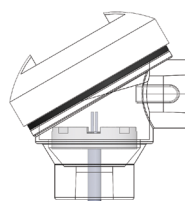
SCCA-AL
Type N



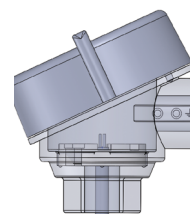
SCCI-Stainless Steel
Type G



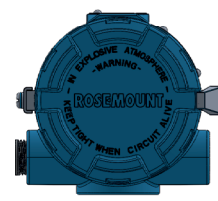
E&H Display Housing
Type H



Polypropylene
Type A



Type F Ex d - AL
Type S Ex d Stainless Steel



Rosemount Housing
Type R

OPTIONAL APPROVALS

FM Explosion Proof: Class I, Division 1, Groups A, B, C, D
 T4 for $-40\text{ °C} \leq T_a \leq 80\text{ °C}$
 T6 for $-40\text{ °C} \leq T_a \leq 60\text{ °C}$

FM Intrinsically Safe: Class I, Division 1, Groups A, B, C, D
 T4 for $-55\text{ °C} \leq T_a \leq 80\text{ °C}$
 T5 for $-55\text{ °C} \leq T_a \leq 55\text{ °C}$
 T6 for $-55\text{ °C} \leq T_a \leq 40\text{ °C}$

FM Non-Incendive: Class I, Division 2, Groups A, B, C, D
 T4 for $-55\text{ °C} \leq T_a \leq 80\text{ °C}$
 T5 for $-55\text{ °C} \leq T_a \leq 55\text{ °C}$
 T6 for $-55\text{ °C} \leq T_a \leq 40\text{ °C}$

ATEX or IECEx: ATEX or IECEx
 II 1 G Ex ia IIC T6 Ga -50 °C to 60 °C
 II 2 G Ex ib IIC T6 Gb -50 °C to 60 °C
 II 2 G Ex e IIC T6 Gb -55 °C to 60 °C
 II 2 G Ex d IIC T6 Gb -55 °C to 60 °C

Data Sheet

S50 Industrial RTDs

S50 RTD ORDERING CODE	Example:	S50	1	T	1	A	A	B	A	D	2
Area Classification											
1 - Standard - General purpose			1								
2 - Explosion proof (must order head type F, S, P, H, R, V, 2 or 3)											
3 - Intrinsic Safety - ia											
B - Intrinsic Safety - ib, ATEX & IECEx Certifications only											
E - Increased Safety, ATEX & IECEx Certifications only											
N - Non-Incendive, FM Certification only											
Sheath Diameter											
R - 1/8" Ø3.18 mm											
S - 3/16" Ø4.76 mm											
T - 1/4" Ø6.35 mm				T							
U - 5/8" Ø9.53 mm											
V - 1/2" Ø12.70 mm											
W - 10 mm											
3 - 3 mm											
4 - 4.5 mm											
6 - 6 mm											
8 - 8 mm											
RTD Type											
1 - Pt 100 Platinum 385 temperature coefficient				1							
2 - Ni 120											
3 - Pt 1000 Platinum 385 temperature coefficient											
Accuracy or Class (IEC 60751)											
A - Class A (-100 to 450 °C wire wound RTD)(-30 to 300 °C thin film RTD)						A					
B - Class B (-196 to 600 °C wire wound RTD)(-50 to 500 °C thin film RTD)											
D - Class AA - 1/3 DIN (-50 to 250 °C wire wound RTD)(0 to 150 °C thin film)											
RTD Element/Range											
A - -50 to 500 °C Thin film RTD						A					
B - -196 to 600 °C Wire wound RTD											
D - Vibration-proof											
Electrical Circuit											
A - Single 2-wire											
B - Single 3-wire								B			
C - Single 4-wire											
D - Dual 2-wire											
E - Dual 3-wire											
F - Dual 4-wire											
Sheath Material											
A - 316 Stainless steel - AISI 316/1.4404											
Head Type											
F - Ex d Aluminum											
S - Ex d Stainless steel											
G - SCCI Stainless steel											
N - SCCA Aluminum											
B - DIN B Aluminum											
D - BUZ Aluminum										D	
E - BUZH Aluminum											
P - PR 7501											
Y - Cast iron (N/A with FM approval)											
A - Polypropylene (N/A with FM approval)											
H - E&H Housing											
R - Rosemount housing Ex d											
V - ABB Housing Ex d											
2 - Ex d Aluminum with dual conduits											
3 - Ex d Stainless Steelwith dual conduits											
Instrument Connection and 1/2 Conduit Connection											
2 - 1/2 NPT Head mounting with 1/2 NPT Conduit Connection											2
N - 1/2 NPT Head mounting with 3/4 NPT Conduit Connection											
M - 1/2 NPT Head mounting with M20 x 1.5 Conduit Connection											
A - 1/2 NPT Head mounting with Adapter M20 x 1.5 Conduit Connection											
P - 1/2 NPT Head mounting with Pg 16 Conduit Connection											
3 - 3/4 NPT Head mounting with 1/2 NPT Conduit Connection											
4 - 3/4 NPT Head mounting with 3/4 NPT Conduit Connection											
5 - 3/4 NPT Head mounting with M20 x 1.5 Head Conduit Connection											

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Data Sheet

S50 Industrial RTDs

S50 RDT ORDERING CODE Example: (Cont'd)	-	X	N-H9	R3	-	-	3P	T	N=60	LN=400
Head Conduit Gland									Lag length in mm	Nominal length in mm
- - Without	-									
P - Polyamide PA, for unarmored cable										
L - Nickel plated brass, for unarmored cable										
M - Nickel plated brass, single seal for braided cable										
N - Nickel plated brass, double seal for braided cable										
S - Stainless steel, for unarmored cable										
T - Stainless steel, single seal for braided cable										
U - Stainless steel, double seal for braided cable										
Inset Nominal Length										
X - LN= (min=50, max=100000). Add actual nominal length in mm at end of ordering code LN=??		X								
Lag Extension and Length										
Lag length (add actual length N=?? At the end of code in mm)										
For DIN Mounting Plate										
0--- - Without lag extension, without plug										
0-4 - Without lag extension, with plug lag length (add actual length N=?? At the end of code in mm)										
B-H6 - Nipple AISI 316, N=40										
M-H7 - Nipple AISI 316, N=100 (4")										
N-H9 - Nipple AISI 316, N= non std			N-H9							
U-J7 - Nipple-Union-Nipple AISI 316, N=120										
R-J9 - Nipple-Union-Nipple AISI 316 N=153										
N-J9 - Nipple-Union-Nipple AISI 316, N= not std										
For Spring-loaded Mounting										
N-S1 - Spring-loaded Nipple AISI 316 N=30 (not available with FM Ex d approval)										
N-S3 - Spring-loaded Hex Fitting (not available with FM Ex d approval)										
M-S4 - Spring-loaded Nipple-Union-Nipple 4" AISI 316, N=100										
R-S6 - Spring-loaded Nipple-Union-Nipple 6" AISI 316, N=153										
N-S9 - Spring-loaded Nipple-Union-Nipple AISI 316, N= not std										
For Spring-loaded Mounting with oil seal										
N-O1 - Spring-loaded Nipple AISI 316 N=30 (not available with FM Ex d approval)										
N-O1 - Spring-loaded Nipple AISI 316 N=30 (not available with FM Ex d approval)										
M-O4 - Spring-loaded Nipple-Union-Nipple 4" AISI 316, N=100										
R-O6 - Spring-loaded Nipple-Union-Nipple 6" AISI 316, N=153										
N-O9 - Spring-loaded Nipple-Union-Nipple AISI 316, N= not std										
For Spring-loaded Mounting										
N-W1 - Welded nipple N=40										
N-W9 - Welded nipple N= not std										
Process Connection										
R3 - Thread 1/2 NPT				R3						
R4 - Thread 3/4 NPT										
C3 - Compression fitting 1/2 NPT, AISI 316										
A3 - Compression fitting G, AISI 316 (N/A with FM approval)										
-- - Without connection										
Electrical Connection										
For DIN Mounting Plate										
-- - With DIN terminal block										
1 - With transmitter										
3 - Without terminal block, with flying leads										
For Spring-loaded Mounting										
B - With terminal block										
T - With transmitter										
F - Without terminal block, with flying leads										
Certifications										
-- - None required										
F - FM										
A - ATEX										
X - IECEx										
S - SIL 2 + ATEX										
I - INMETRO										
D - ATEX + IECEx										
2 - SIL 2										
Calibration Report										
-- - Without										
3P - 3 points single							3P			
5P - 5 points single										
3D - 3 points dual										
5D - 5 points dual										
XC - Custom calibration report										
Tagging										
-- - Without										
T - Label in stainless steel with tag								T		
Consult factory for additional configurations.										

Data Sheet

S50 Thermocouples

 Continued on
 next page

S50 TC ORDERING CODE	Example:	S50	S	T	K	N	1	1	3	D	2
Area Classification											
S - Standard - General purpose			S								
D - Explosion proof (must order head type F, S, P, H, R, V, 2 or 3)											
J - Intrinsic Safety - ia											
B - Intrinsic Safety - ib, ATEX & IECEx Certifications only											
E - Increased Safety, ATEX & IECEx Certifications only											
N - Non-Incendive, FM Certification only											
Sheath Diameter											
R - 1/8" Ø3.18 mm											
S - 3/16" Ø4.76 mm											
T - 1/4" Ø6.35 mm				T							
U - 1/2" Ø9.53 mm											
V - 1/2" Ø12.70 mm											
W - 10 mm											
3 - 3 mm											
4 - 4.5 mm											
6 - 6 mm											
8 - 8 mm											
Thermocouple Type											
E - Temperature range: -200 to 800 °C											
J - Temperature range: -40 to 750 °C											
K - Temperature range: -200 to 1,200 °C					K						
N - Temperature range: 0 to 1,200 °C											
T - Temperature range: -200 to 350 °C											
Accuracy or Class											
N - ASTM E230: Standard limits						N					
S - ASTM E230: Special limits											
1 - IEC 60584-2: Class 1											
2 - IEC 60584-2: Class 2											
3 - IEC 60584-2: Class 3											
Junction											
1 - Ungrounded							1				
2 - Grounded											
3 - Ungrounded, vibration-proof											
4 - Grounded, vibration-proof											
Electrical Circuit											
1 - Single								1			
2 - Dual											
Sheath Material											
1 - AISI 316 / 1.4401											
3 - Inconel® 600 / 2.4816									3		
Head Type											
F - Ex d Aluminum											
S - Ex d Stainless steel											
G - SCCI Stainless steel											
N - SCCA Aluminum											
B - DIN B Aluminum											
D - BUZ Aluminum										D	
E - BUZH Aluminum											
P - PR 7501											
Y - Cast iron (N/A with FM approval)											
A - Polypropylene (N/A with FM approval)											
H - E&H Housing											
R - Rosemount housing Ex d											
V - ABB Housing Ex d											
2 - Ex d Aluminum with dual conduits											
3 - Ex d Stainless Steel with dual conduits											
Instrument Connection and 1/2 NPT Conduit Connection											
2 - 1/2 NPT Head mounting with 1/2 NPT Conduit Connection										2	
N - 1/2 NPT Head mounting with 3/4 NPT Conduit Connection											
M - 1/2 NPT Head mounting with M20 x 1.5 Conduit Connection											
A - 1/2 NPT Head mounting with Adapter M20 x 1.5 Conduit Connection											
P - 1/2 NPT Head mounting with Pg 16 Conduit Connection											
3 - 3/4 NPT Head mounting with 1/2 NPT Conduit Connection											
4 - 3/4 NPT Head mounting with 3/4 NPT Conduit Connection											
5 - 3/4 NPT Head mounting with M20 x 1.5 Head Conduit Connection											

S50 Thermocouples

S50 TC ORDERING CODE	Example: (Cont'd)	-	X	N-H9	R3	-	-	3P	T	N=60	LN=400
Head Conduit Gland											
- - Without		-								Lag length in mm	Nominal length in mm
P - Polyamide PA, for unarmored cable											
L - Nickel plated brass, for unarmored cable											
M - Nickel plated brass, single seal for braided cable											
N - Nickel plated brass, double seal for braided cable											
S - Stainless steel, for unarmored cable											
T - Stainless steel, single seal for braided cable											
U - Stainless steel, double seal for braided cable											
Inset Nominal Length											
X - LN= (min=50, max=100000) (add actual length LN=?? At the end of ordering code in mm)			X								
Lag Extension and Length											
Lag length (add actual length N=?? At the end of code in mm)											
For DIN Mounting Plate											
0--- - Without lag extension, without plug (select 0 lag length above)											
0-4 - Without lag extension, with plug											
B-H6 - Nipple AISI 316, N=40											
M-H7 - Nipple AISI 316, N=100 (4")											
N-H9 - Nipple AISI 316, N= non std				N-H9							
U-J7 - Nipple-Union-Nipple AISI 316, N=120											
R-J9 - Nipple-Union-Nipple AISI 316 N=153											
N-J9 - Nipple-Union-Nipple AISI 316, N= not std											
For Spring-loaded Mounting (N/A with FM approval)											
N-S1 - Spring-loaded Nipple AISI 316 N=30 (not available with FM Ex d)											
N-S3 - Spring-loaded Hex Fitting (not available with FM Ex d approval)											
M-S4 - Spring-loaded Nipple-Union-Nipple 4" AISI 316, N=100											
R-S6 - Spring-loaded Nipple-Union-Nipple 6" AISI 316, N=153											
N-S9 - Spring-loaded Nipple-Union-Nipple AISI 316, N= not std											
For Spring-loaded Mounting with oil seal											
N-O1 - Spring-loaded Nipple AISI 316 N=30 (not available with FM Ex d)											
M-O4 - Spring-loaded Nipple-Union-Nipple 4" AISI 316, N=100											
R-O6 - Spring-loaded Nipple-Union-Nipple 6" AISI 316, N=153											
N-O9 - Spring-loaded Nipple-Union-Nipple AISI 316, N= not std											
For Welded Fitting											
N-W1 - Welded nipple N=40											
N-W9 - Welded nipple N= not std											
Process Connection											
R3 - Thread 1/2 NPT					R3						
R4 - Thread 3/4 NPT											
C3 - Compression fitting 1/2 NPT, AISI 316											
A3 - Compression fitting G, AISI 316 (N/A with FM approval)											
-- - Without connection											
Electrical Connection											
For DIN Mounting Plate											
- With DIN terminal block											
1 - With transmitter											
3 - Without terminal block, with flying leads											
For Spring-loaded Mounting											
B - With terminal block											
T - With transmitter											
F - Without terminal block, with flying leads											
Certifications											
- - None											
F - FM											
2 - SIL 2											
A - ATEX											
S - SIL 2 + ATEX											
I - INMETRO											
X - IECEX											
D - ATEX + IECEX											
P - EAC (Gost R) + Metrological Russia											
Calibration Report											
-- - Without											
3P - 3 points single								3P			
5P - 5 points single											
3D - 3 points dual											
5D - 5 points dual											
XC - Custom calibration report											
Tagging											
- - Without											
T - Label in stainless steel with tag									T		
Consult factory for additional configurations.											

Lag length in mm

Nominal length in mm

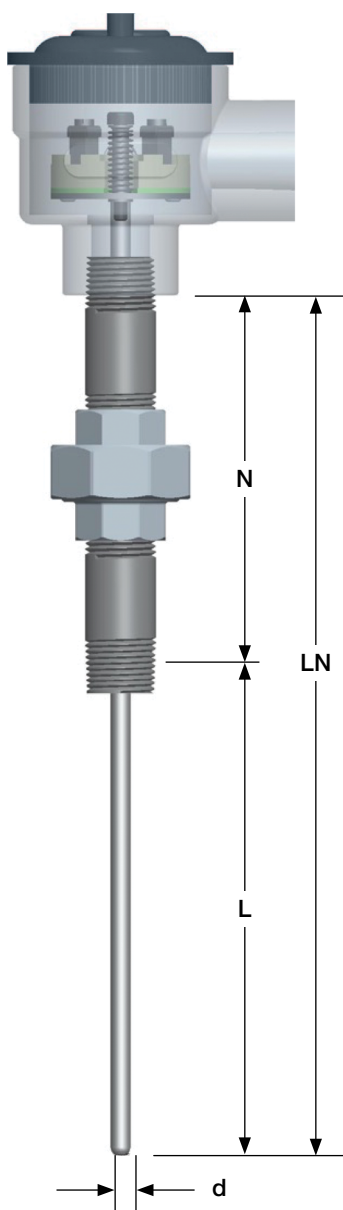
mm = inches x 25.4

Data Sheet

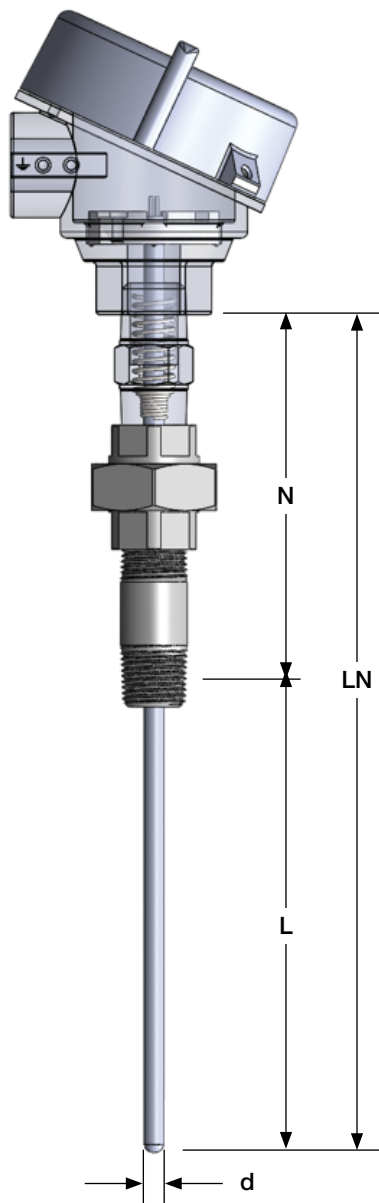
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DIMENSIONS in [] are millimeters

For reference only, consult Ashcroft for specific dimensional drawings.



DIN Mounting Plate Design



Spring-loaded Mounting Design

HOW TO ORDER S50 TEMPERATURE PROBES:

- The ordering code is built by selecting the appropriate configuration for the various sections.
- The insert nominal length LN is measured from base of the head to the tip of the probe.
- The lag extension length N is measured from the base of the head to the center of the threads on the lag extension.
- LN can be calculated by adding the lag extension length N to the probe insertion length L.
- The N length and the LN length are added to the end of the ordering code in millimeters.
- To convert inches to millimeters multiply by 25.4.
 $\text{mm} = \text{inches} \times 25.4$

d = Stem diameter
N = Lag extension length
L = Insertion length
LN = Insert nominal length
 $\text{LN} = \text{N} + \text{L}$