RTD ELEMENTS

This Section Contains

RTD Style Selection Pages

RTD Thermocouple Reference Data

RTD Lead Wire Configuration

Please CALL for Quote!!

If you can't find what you need

Call

From Illinois 618-465-7623

From St. Louis 314-231-0752

info@ipscustom.com

RTD ELEMENTS

1 **Construction**
M = MgO G = General

2-3 **Style**
10 = Sealed with leads
80 = With 1/2" x 1/2" Stainless fitting
90 = With self gripping spring
91 = With 1/2" x 1/2" Spring loaded fitting
92 = With 1/2" x 1/2" Spring loaded fitting and oil seal

4 **Type**
P = Platinum 100 Ohm (other types available)
C = Copper 10 Ohm

5 **Class**
B, A (B is standard)

6 **Leads (24 gauge stranded)**

	2-wire	3-wire	4-wire
Single	A	B	C
Dual	D	E	

7 **Sheath Alloy**
6 = 316 Stainless Steel (Standard)
I = Inconel 600

8 **Sheath Diameter**
1 = 1/16" 2 = 1/8" (other sizes available)
3 = 3/16" 4 = 1/4"

9-10 **Sheath Length in Inches**

11 **Sheath Length Fraction**
A = 1/8" D = 1/2" G = 7/8"
B = 1/4" E = 5/8" 0 = None
C = 3/8" F = 3/4"

12-13 **Lead Length in Inches**

14 **Lead Insulation**
T = Teflon (500°F)
F = Fiberglass (750°F)

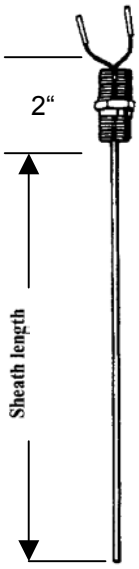
15 **Fitting**
See Page 5 (None = 0)

16-17 **Immersion Length in Inches**
Length required with fixed fittings (None = 00)

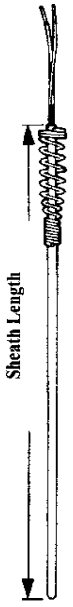
18 **Immersion Length Fraction**
A = 1/8" D = 1/2" G = 7/8"
B = 1/4" E = 5/8" None = 0
C = 3/8" F = 3/4"

19 **Special Features**
S = Special (List special features)
0 = No

STYLE 10



STYLE 80



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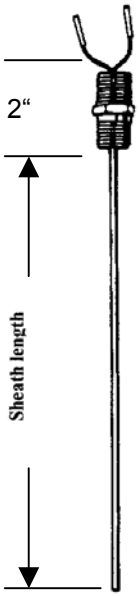

STYLE 91& 92

Part No. R 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

INDUSTRIAL PROCESS AND SENSO ALTON, ILLINOIS, USA
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RTD with Plugs and Jacks

1 Construction
M = MgO G = General

2-3 Style
20 = Standard plug with crimping insert
21 = Standard plug with tube adapter
22 = Standard jack with crimping insert
23 = Standard jack with tube adapter

4 Type
P = Platinum 100 Ohm (Other types available)
C = Copper 10 Ohm

5 Class
B, A (B is standard)

6 Leads (24 ga stranded)

	2-wire	3-wire	4-wire
Single	A	B	C
Dual	D	E	

7 Sheath Alloy
6 = 316 Stainless Steel
I = Inconel 600

8 Sheath Diameter
1 = 1/16” 2 = 1/8” (other sizes available)
3 = 3/16” 4 = 1/4”

9-10 Sheath Length in Inches

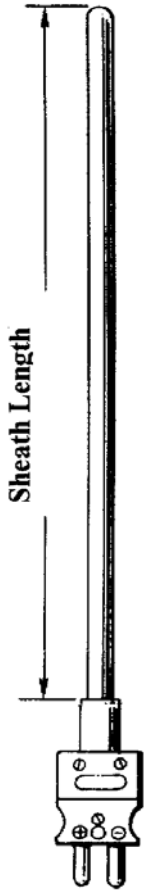
11 Sheath Length Fraction
A = 1/8” D = 1/2” G = 7/8”
B = 1/4” E = 5/8” 0 = None
C = 3/8” F = 3/4”

12 Fitting
See Page 5 (None – 0)

13-14 Immersion Length in Inches
Length required with fixed fittings only. (None = 00)

15 Immersion Length Fraction
A = 1/8” D = 1/2” G = 7/8”
B = 1/4” E = 5/8” 0 = None
C = 3/8” F = 3/4”

16 Special Features
S = Special (List special features)
0 = No



STYLE 20

STYLE 22

Part No. R 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

RTD with Extension

1 **Construction**
M = MgO G = General

2-3 **Style**
30 = with extension
31 = with extension and strain relief spring

4 **Type**
P = Platinum 100 Ohm (Other types available)
C = Copper 10 Ohm

5 **Class**
B, A (B is standard)

6 **Leads (24 gauge stranded)**

	2-wire	3-wire	4-wire
Single	A	B	C
Dual	D	E	

7 **Sheath Alloy**
6 = 316 Stainless Steel (Standard)
I = Inconel 600

8 **Sheath Diameter**
1 = 1/16" 2 = 1/8" (Other sizes available)
3 = 3/16" 4 = 1/4"

9-10 **Sheath Length in Inches**

11 **Sheath Length Fraction**
A = 1/8" D = 1/2" G = 7/8"
B = 1/4" E = 5/8" 0 = None
C = 3/8" F = 3/4"

12-14 **Extension Length in Inches**

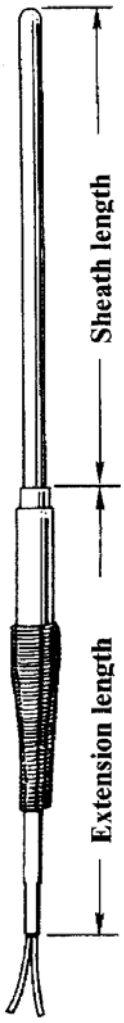
15 **Lead Insulation**

	Standard	SS Overbraid	Flex Armor
Teflon	A	B	C
Fiberglass	D	E	F

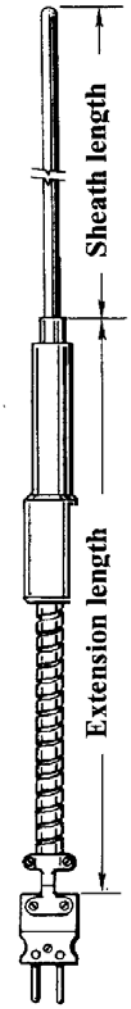
16 **Fitting**
See Page 5 (None = 0)

17 **Termination**
A = Standard Plug B = Standard Jack C = Standard Plug and Jack
D = Mini Plug E = Mini Jack F = Mini Plug and Jack
G = Spade lugs H = Stripped 1/2" J = None

18 **Special Features**
S = Special (List special features)
0 = No



Style 31



Style 30

Part # R 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

RTD with Heads

1 Construction
M = Mgo G = General

2-3 Style
70 = Head with fixed fitting
71 = Head with compression fitting
72 = Head with nipple –union-nipple
73 = Head with nipple-union
74 = Head with Nipple
75 = Head only
76 = Head with 1/2" x 1/2" Hex Fitting

4 Type
P = Platinum 100 Ohm (Other types available)
C = Copper 10 Ohm

5 Class
B, A (B is standard)

6 Leads (24 gauge stranded)

	2-wire	3-wire	4-wire
Single	A	B	C
Dual	D	E	

7 Sheath Alloy
4 = 304 Stainless Steel
6 = 316 Stainless Steel
I = Inconel 600

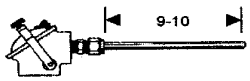
8 Sheath Diameter
1 = 1/16" 3 = 3/16" (Other sizes available)
2 = 1/8" 4 = 1/4"

9-10 Sheath Length in Inches

11 Sheath Length Fraction
A = 1/8" D = 1/2" G = 7/8"
B = 1/4" E = 5/8" 0 = None
C = 3/8" F = 3/4"

Style 70

Style 71



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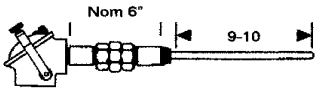

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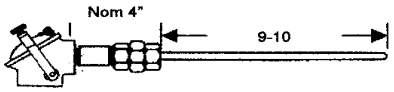

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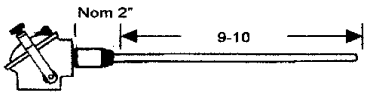
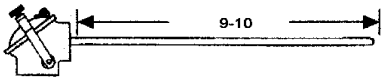
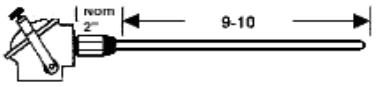


Style 75



Style 76



12 Head
A = IPS Alum. Head D = Alum, snap lever head
B = Stan. Alum head E = Large Cast iron head
C = Cast Iron

13 Size
1 = 1/2" x 1/2" 4 = 1/2" x 3/4"
2 = 3/4" x 1/2" 5 = 3/4" x 3/4"
3 = 1" x 1/2" 6 = 1" x 3/4"

Process connection is first digit, second is conduit

Nipple-union-nipple supplied with 3" nipples and malleable union.
Nipple–union supplied with 3" nipple and malleable union.
Nipple supplied with 3" nipple.
All fittings galvanized unless specified differently.

Other sizes available upon request

14 Spring Load
0 = No
1 = Self gripping spring
2 = Adjustable 1/2" x 1/2" spring loaded fitting (IF selected it replaces first nipple and reduces nom length by 1")

15 Special Features
S = Special (List special features)
0 = No

Part # R 1 23 4 5 6 7 8 910 11 1213 14 15

RTD Reference Data

RTD Assemblies

Resistance temperature detectors (RTD's) are used for temperature measurements in the range of -328°F to 1166°F (-200°C to 630°C). The electrical resistance of the wire utilized is proportional to the temperature variation. The electrical resistance in the RTD, is measured by an indicating instrument, which converts the reading into temperature. RTD's provide electrical and mechanical stability with negligible drift and error.

Selecting the RTD Element

The selection of an element to be used, in a system to control, measure or monitor temperature depends on many factors. Listed below are factors comparing the three standard element materials.

	Platinum	Nickel	Copper
Maximum Operating Temperature	630°C	300°C	316°C
Accuracy	±.1%	±.5%	±.2%
Cost	High	Medium	Low
Linearity	Nearly	Non	Most
Resistance	High	High	Low
R/T Characteristic Reproducibility	Excellent	Good	Poor

Tolerance Classes for Finished RTD's

Tolerance Class	Tolerance Values (°C)	
AA (Research)	±(0.1°C + 0.0017 [t])	-50°C to 250°C
A	±(0.13°C + 0.0017 [t])	-100°C to 450°C
B (Standard)	±(0.25°C + 0.0042 [t])	-196°C to 600°C
C	±(0.6°C + 0.01 [t])	-196°C to 600°C

These tolerances meet or exceed ASTM/IEC thermometer class. They do not necessarily Determine the working range of the thermometer.

	Thermocouple	RTD
Accuracy	Limits of error wider than RTD	Limits of error smaller than thermocouples
Ruggedness	Excellent	Sensitive to strain, shock and pressure.
Temperature	-400° to 4200°F	-200° to 1500°F
Size	Can be as small as .01" sheath material tip sensitive.	Size limited to min /16",temperature sensitive for length of bulb.
Drift	Should be checked periodically, higher than RTD's.	0.01 to 0.1°C per year, less drift than thermocouple.
Resolution	Must resolve millivolts per degree, lower signal to noise ratio.	Ohms per degree, much higher signsl to noise ratio than thermocouple
Cold Junction Reference	Required	Not required
Lead Wire	Must match lead wire calibration to thermocouple calibration.	Can use copper lead wire for extension wire.
Response	Can be made small enough for millisecond response time	Thermal mass restricts time to seconds or more.
Cost	Low	Higher than thermocouples.

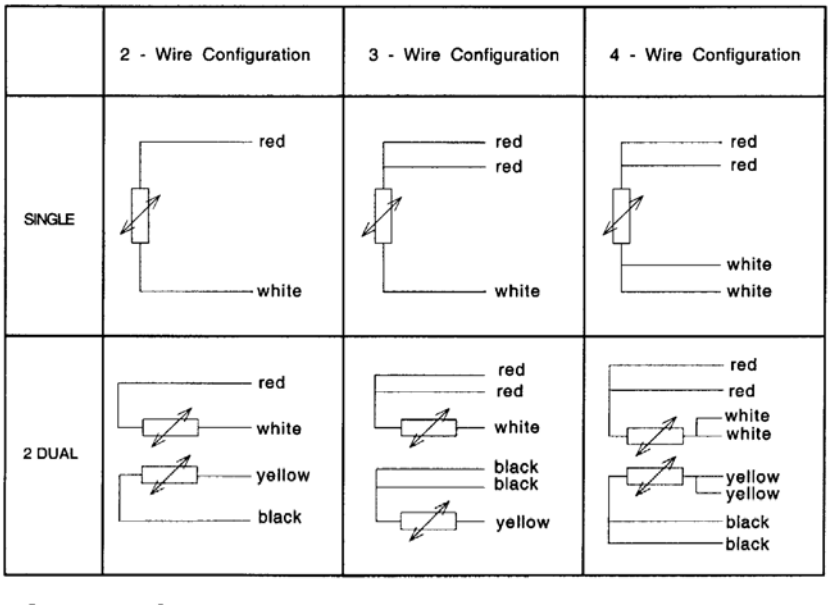
RTD Reference Data continued,

Leadwire configuration

A temperature temperature detector determines the temperature by measuring resistance. The sensing element is usually a small diameter wire manufactured so that its resistance will change in a known and consistent manner. To measure the resistance accurately and consistently, other extraneous resistances must be compensated for or minimized. A major cause of extraneous resistance is lead wire in series with the RTD. The readout is the sum of the bulb resistance and the leadwire resistances. The leadwire resistance can be minimized by a three wire RTD configuration.

In the three wire configuration the power supply is taken to one side of the RTD. This puts the other two leadwires in opposite arms of the Wheatstone bridge so that they cancel each other out and have little effect on the bridge output voltage. In the 3 wire configuration, the resistance of the lead wire length is compensated for in the Wheatstone bridge. This design is recommended for most industrial applications.

An even more accurate wire configuration is the 4 wire design. In this design, leadwires #1 and#2 are on one side of the power supply while leadwires #3 and #4 are on the other side of the power supply. All 4 leadwire resistances are negated and the bulb resistance stands as the resistance input alone.



IPS Type B RTD (standard)

Temperature (°F)	-200	-100	0	32	100	200	300	400	500	600
Tolerance (±°F)	1.8	1.1	.7	.6	.7	.9	1.5	2.0	2.7	3.3
(± Ω)		0.3	0.2	0.1	0.2	0.2	.03	0.4	0.6	0.7

Temperature (°F)	700	800	900	1000	1100	1200	1300	1400	1500	1560
Tolerance (±°F)	3.9	4.5	504	6.0	6.5	7.0	7.6	8.4	9.0	9.4
(± Ω)	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.4	1.5	1.5

This chart is based on a Class B standard platinum industrial RTD with a base resistance of 100 Ω at 0°C.
Temperature coefficient = 0.00385/Ω/Ω/°C

Other charts available upon request