



Weed
Instrument

Temperature, Pressure, and Fiber Optic Technology

Models 602, 612 and 615 Nuclear Qualified Spring Loaded RTDs

- Suitable for a Wide Range of Applications
- Thermowell Mounted
- 40 Year Qualified Life
- IEEE 323-1974, IEEE 323-1983, IEEE 344-1975, IEEE 344-1987, and NUREG 0588 Qualified
- Also Available for Non-Safety Related Applications
- Extended Recalibration Intervals (minimal drift)
- High Accuracy



Weed Instrument **Model 602, 612 and 615 Series** Platinum RTDs are Spring Loaded Temperature Sensors designed for a wide range of Nuclear applications. These sensors are intended to be used in a thermowell or protection tube. The spring loading action insures proper contact with the tip of the thermowell or protection tube for maximum heat transfer. The **Model 615** is designed for applications where a spring loaded threaded 1/2" NPT male fitting is required. The **Models 602, 612 and 615** have all been seismically and environmentally tested to IEEE standards, qualifying them for use as '1E' equipment for Nuclear Power Generating Stations. These same models can be ordered as Non-Safety Related. They will offer the same reliability and construction as the qualified versions except without the certification.

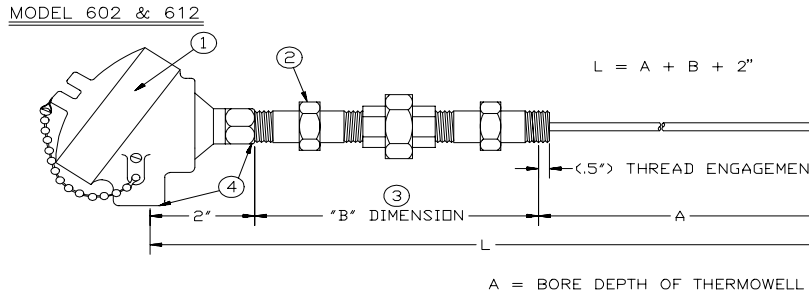
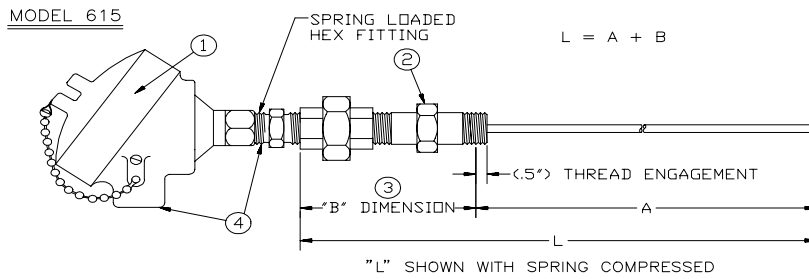
These RTDs can be configured for use with connection heads and/or Quick Disconnect Electrical Connectors. Custom configurations are available. Consult factory with details and requirements.

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Phone: (512) 434-2950, Fax: (512) 434-2951, E-Mail: nuclear@weedinstrument.com
Home Page: <http://www.weedinstrument.com>

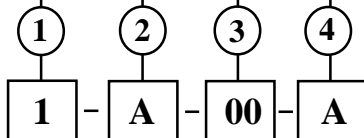
Specifications

<p>Accuracy:</p>	<p>Sensor Accuracy $\pm 0.5^{\circ}\text{F}$ inclusive of hysteresis and repeatability. Safety-related sensors will include specific calibration tables for each sensor in 10° increments. Consult factory if special accuracy and/or calibration tables are required for either safety or non-safety related sensors.</p>
<p>Self Heating:</p>	<p>In 20°C water flowing transverse to the sensor sheath at 3 fps, with a sheath diameter of 1/4" the self heating will be $50\text{mw}/^{\circ}\text{C}$.</p>
<p>Temperature Range:</p>	<p>Temperature range - 0°F to 900°F (-17.8°C to 482°C)</p>
<p>Insulation Resistance:</p>	<p>At $70^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($21^{\circ}\text{C} \pm 5.5^{\circ}\text{C}$) with dry external surfaces, the resistance between all lead wires and the sensor sheath is 100 Megohms or greater at 100 VDC.</p>
<p>Stability:</p>	<p>RTD drift to remain within $\pm 1^{\circ}\text{F}$ over a 40 year period exclusive of process induced drift.</p>
<p>Current:</p>	<p>A continuous current of 20 mA (RMS) and a short term pulsed current of 40 mA (RMS) shall not damage the sensor. Standard operating current is between 1 and 4 mA.</p>
<p>Time Response:</p>	<p>The RTD time constant to 63.2% of a step change in temperature from room temperature to water at 175°F to 180°F (79°C to 82°C) flowing transverse to the sensor sheath at approximately 3 fps to be 5.0 seconds or less.</p>
<p>Qualifications:</p>	<p>RTDs can be supplied qualified to IEEE 323-1974, 323-1983 and IEEE 344-1975, IEEE 344-1987 and NUREG 0588 for a design life of 40 years per Weed Test Report 060-8680-003 Rev: 1.</p>
<p>QA/QC:</p>	<p>RTDs are supplied in accordance with Weed Instrument's Quality Assurance and Quality Control Program 100-1. In addition, Safety Related RTDs are supplied in accordance with NRC 10 CFR 50 Appendix B, 10CFR21, ANSI N45.2, and NQA-1.</p>

Ordering Information - Head & Extension



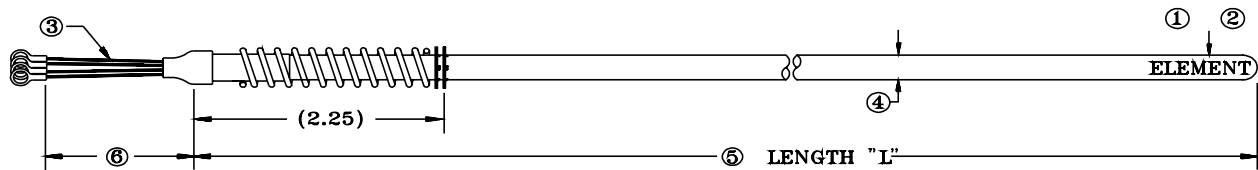
CODE Head Style & Material	
1	Cast Iron
2	Aluminum
8	Stainless Steel
CODE Extension Style & Material	
A	Direct Assembly - (615) only
D	Nipple/Union/Nipple Ext. - 316 Stainless Steel 3.5" min.
F	Nipple Ext. - 316 Stainless Steel (including Close Nipple) for 602 & 612
J	Union/Nipple Ext. - 316 Stainless Steel 3" min.
CODE Extension Length ("B" Dimension)	
00	0" (Direct Assembly & Close Nipple Only)
10	1" (Nipple Extension Only)
20	2" ↓
35	3.5"
40	4"
50	5" (Maximum with Qualified Assembly - Model 615)
60	6" (Maximum with Qualified Assembly - Models 602 & 612)
	Other - Specify Length
CODE Head Connection (Instr. x Conduit)	
A	1/2" NPT x 1/2" NPT
D	1/2" NPT x 3/4" NPT



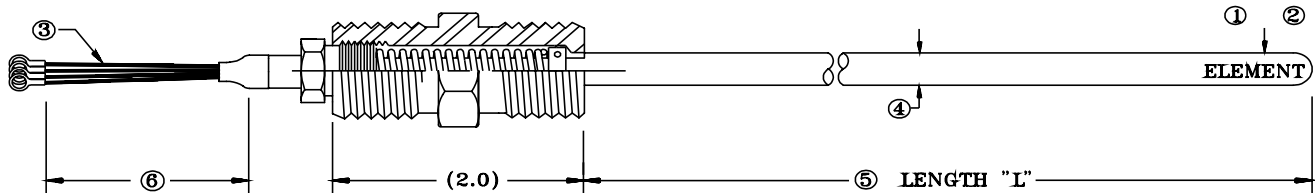
Sample Model Number

Ordering Information - Sensor

MODEL 602 AND 612



MODEL 615



"L" SHOWN WITH SPRING RELAXED

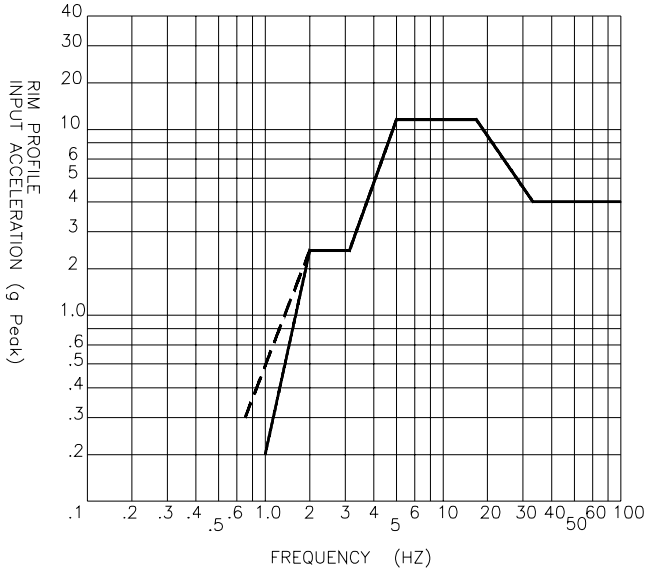
602	SPRING LOADED, Al₂O₃ SHEATH INSULATION (602D FOR DUAL ELEMENT)	
612	SPRING LOADED, MgO SHEATH INSULATION (612D FOR DUAL ELEMENT)	
615	SPRING LOADED RTD WITH 1/2" NPT HEX NIPPLE (615D FOR DUAL ELEMENT)	
CODE R₀ & TEMPERATURE COEFFICIENT		
1A	100 ohm Platinum .003902 TCR	(100 ohms @ 0°C)
2A	200 ohm Platinum ↓	(200 ohms @ 0°C)
1B	100 ohm Platinum .00385 TCR	(100 ohms @ 0°C)
2B	200 ohm Platinum ↓	(200 ohms @ 0°C)
Other - Consult Factory		
CODE TEMPERATURE RANGE		
A	500°F Maximum	
C	900°F Maximum	
CODE NUMBER OF LEAD WIRES		
4	4-Wire (Complete Compensation) - Can be used for 3 wire connection	
6	Dual 3-Wire (With Dual Element)	
8	Dual 4-Wire (With Dual Element)	
CODE SHEATH DIAMETER		
C	.250" Diameter	
Other - Consult Factory		
CODE SHEATH LENGTH		
xxx.x	Specify Length to Nearest .1"	
CODE LEAD LENGTH		
Z	Other - List to nearest Inch	
O	Standard with Head (Approximately 3")	

Head & Extension Code

1
2
3
4
5
6

612 - 1A - C - 4 - C - 012.0 - 0 - Z10 ——— **Sample Model Number**

Seismic Spectrum



Earthquake Response Spectra: OBE, H&V

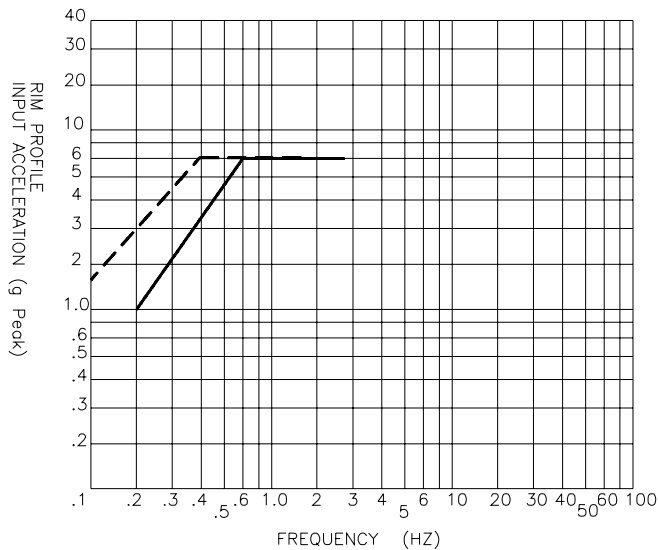
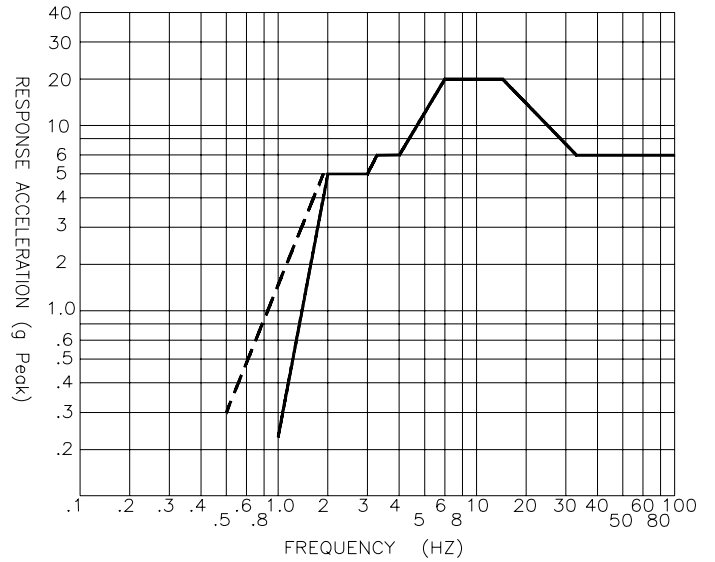
Damping: 1%

The dashed line of the profile represents regions to be tested analytically.

Earthquake Response Spectra: SSE, H&V

Damping: 1%

The dashed line of the profile represents regions to be tested analytically.

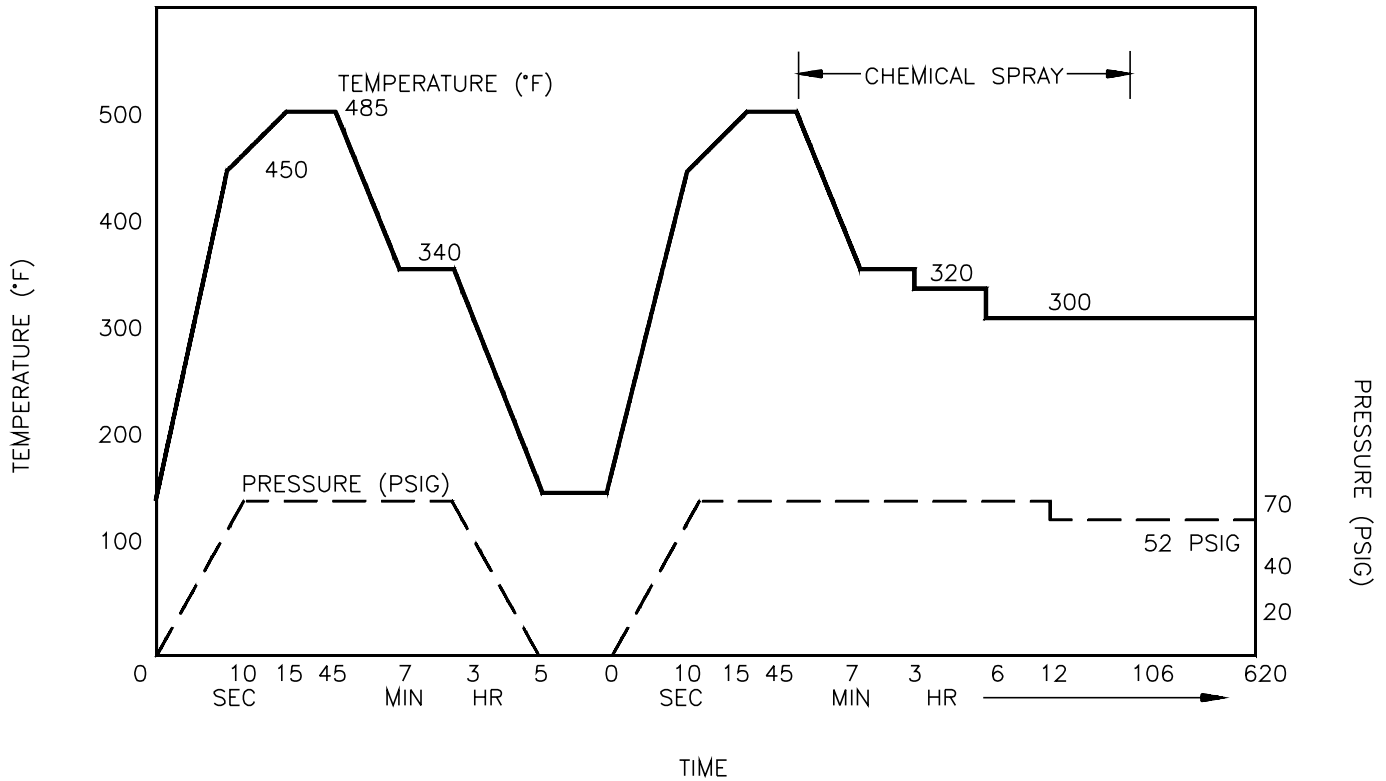


Required Input Motion (RIM)

The dashed line of the profile represents regions to be tested analytically.

LOCA Profile (In-Containment)

The **Safety-Related Temperature Sensors** described in this literature underwent Radiation Aging (300 Megarads T.I.D.), Thermal Aging, and Humidity Aging all of which simulated end-of-service-life condition of 40 years. Proceeding these tests was the Loss of Coolant Accident (LOCA) Simulation (see figure below). The LOCA Profile also simulates 2 years post-LOCA operational service condition. After completion of these tests the sensors were able to perform their safety-related functions.



RTD Platinum

Resistance vs. Temperature Tables

Curve A
100 ohm Platinum
(TCR = .003902 ohms/ohm/°C)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
0	100.00	96.03	92.05	88.06	84.05	80.04	76.00	71.96	67.91	63.84	59.76
°C	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100
0	100.00	103.96	107.90	111.83	115.75	119.66	123.55	127.44	131.31	135.17	139.02
+100	139.02	142.86	146.88	150.49	154.30	158.09	161.86	165.63	169.38	173.13	176.86
+200	176.86	180.58	184.29	187.98	191.67	195.34	199.00	202.65	206.29	209.92	213.53
+300	213.53	217.14	220.73	224.31	227.88	231.44	234.99	238.52	242.04	245.55	249.05
+400	249.05	252.54	256.02	259.48	262.94	266.38	269.81	273.22	276.63	280.02	283.41
+500	283.41	286.78	290.14	293.48	296.82	300.14	303.45	306.75	310.03	313.31	316.57
+600	316.57	319.82	323.06	326.28	329.50	332.70					
°F	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	-200
0	92.94	88.50	84.05	79.59	75.11	70.61	66.10	61.57	57.03	52.47	47.90
°F	0	+20	+40	+60	+80	+100	+120	+140	+160	+180	+200
0	92.84	97.36	101.76	106.15	110.52	114.88	119.23	123.56	127.87	132.17	136.46
+200	136.46	140.73	144.98	149.22	153.45	157.66	161.86	166.05	170.22	174.37	178.51
+400	178.51	182.64	186.75	190.85	194.93	199.00	203.06	207.10	211.13	215.14	219.14
+600	219.14	223.12	227.09	231.04	234.99	238.91	242.82	246.72	250.61	254.47	258.33
+800	258.33	262.17	266.00	269.81	273.60	277.39	281.15	284.91	288.64	292.37	296.08
+1000	296.08	299.77	303.45	307.11	310.76	314.40	318.02	321.62	325.21	328.78	332.34
+1200	332.34										

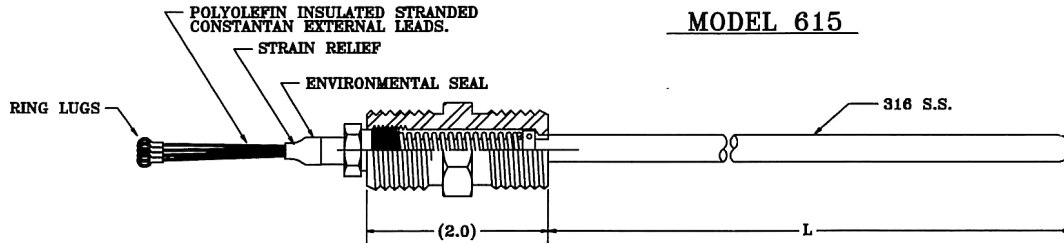
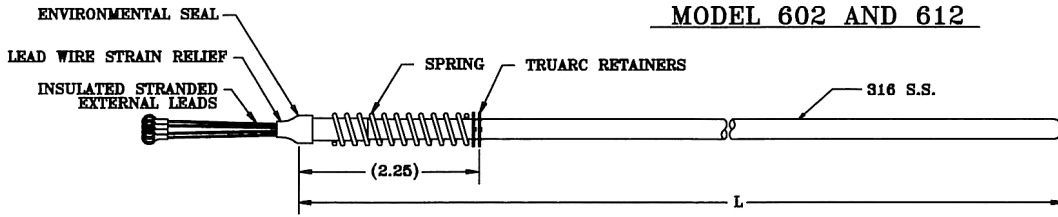
Curve B
100 ohm Platinum
(TCR = .003850 ohms/ohm/°C)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
0	100.00	96.09	92.16	88.22	84.27	80.31	76.33	72.33	68.33	64.30	60.25
°C	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100
0	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50
+100	138.50	142.29	146.06	149.82	153.58	157.31	161.04	164.76	168.46	172.16	175.84
+200	175.84	179.51	183.17	186.82	190.45	194.07	197.69	201.29	204.88	208.45	212.02
+300	212.02	215.57	219.12	222.65	226.17	229.67	233.17	236.65	240.13	243.59	247.04
+400	247.04	250.48	253.90	257.32	260.72	264.11	267.49	270.86	274.22	277.56	280.90
+500	280.90	284.22	287.53	290.83	294.11	297.39	300.65	303.91	307.15	310.38	313.59
+600	313.59	316.80	319.99	323.18	326.35	329.51	332.66				
°F	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	-200
0	93.03	88.65	84.21	79.85	75.42	70.98	66.52	62.04	57.52		
°F	0	+20	+40	+60	+80	+100	+120	+140	+160	+180	+200
0	93.03	97.39	101.74	106.07	110.38	114.68	118.97	123.24	127.50	131.74	135.97
+200	135.97	140.18	144.38	148.57	152.74	156.90	161.04	165.17	169.29	173.39	177.47
+400	177.47	181.54	185.60	189.64	193.67	197.69	201.69	205.67	209.64	213.60	217.54
+600	217.54	221.47	225.38	229.28	233.17	237.04	240.90	244.74	248.57	252.38	256.18
+800	256.18	259.97	263.74	267.49	271.23	274.96	278.68	282.37	286.06	289.73	293.39
+1000	293.39	297.03	300.65	304.27	307.87	311.45	315.02	318.58	322.12	325.64	329.16
+1200	329.16	332.66									

Note: For other platinum resistances multiply the above values by the following:

- 200 ohm platinum = value x 2
- 400 ohm platinum = value x 4
- 500 ohm platinum = value x 5
- 1000 ohm platinum = value x 10

Dimensional Drawing

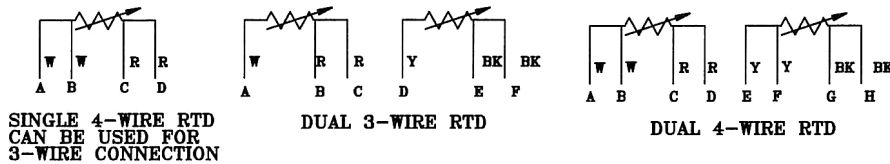


MODEL 602-LEAD WIRE 24 AWG TEFZEL INSULATION
 MODEL 612-615-LEAD WIRE 20 AWG POLYOLEFIN INSULATION

ALL MEASUREMENTS IN INCHES UNLESS OTHERWISE NOTED
 CONSULT FACTORY FOR CUSTOM DESIGN

THIS SENSOR IS DESIGNED FOR USE WITH WEED INSTRUMENT'S
 CONNECTION HEAD ASSEMBLY AND MAY NOT BE COMPATIBLE
 WITH OTHER MANUFACTURER'S HEAD ASSEMBLY.

WIRING DIAGRAMS



Weed Instrument

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S.S. Head Dimensions

