Heavy Duty Handheld PT100 Temperature Sensors

This series of temperature sensor has been engineered and designed to withstand the harshest of environments and allow for product core temperature measurement whilst the product is undergoing the cooking process. It consists of a Pt100 temperature sensor housed in a 316 L Stainless Steel probe, both the handle & the heavy duty flexible conduit are also stainless steel. It has a 6mm diameter stem with choice of probe length 100mm or 150mm. The probe is completely hermetically sealed from tip to tails with an inner lined welded PFA tube preventing moisture or steam ingress into the sensor eliminating errors and breakdowns. These probes can be used as stand-alone sensors, or they can be combined with controllers, indicators, or temperature transmitter to create complete measurement systems.

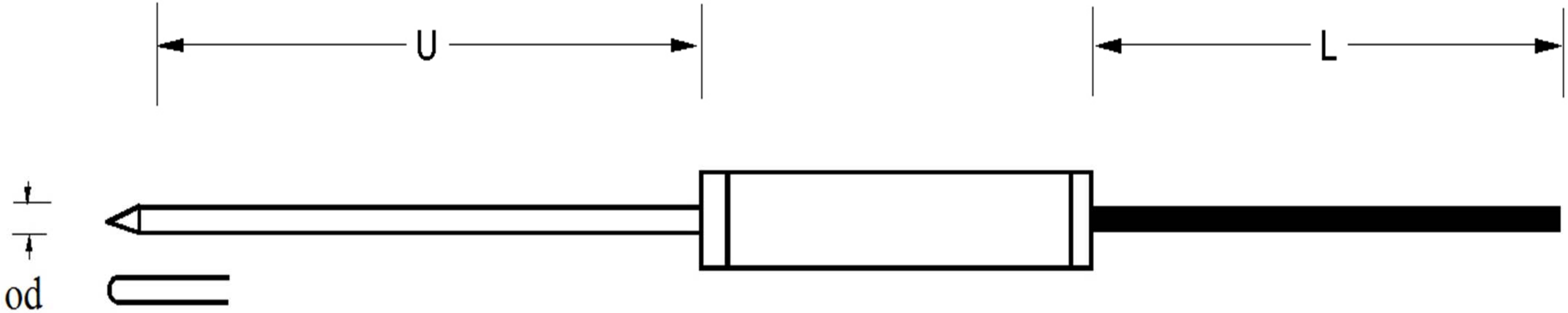
Specification
Wetted Material : Stainless steel AISI 316L (1.4404)
Sensing Elements: PT100 Platinum Elements per IEC751 (alpha = 0.00385 Ω/Ω/°C)
Wiring: 2, 3 or 4 wire
Configuration: Single or Duplex Element
Accuracy : ±0.15ºC
Operating Temperature: from -50 to + 200ºC
Output: Pt100
Protection: IP67

Accessories

Enclosures

4/20mA Transmitters

Controllers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Model	Product Discription
RTHH	RTD PT100 Handheld
Code	**Maximum Operating Temperature °C**
250C	250°C
350C	350°C
650C	650°C
Code	**Sensor Wiring**
3W	3 Wire
4W	4 Wire
Code	**Sensor Configuration & Class**
SA	Single Element Class A (±0.15°C @ 0°C)
DA	Dual Element Class A (±0.15°C @ 0°C)
S10	Single Element Class 1/10th Din (±0.03°C @ 0°C)
D10	Dual Element Class 1/10th Din (±0.03°C @ 0°C)
Code	**Sensor Sheath Diameter**
3	3mm Diameter Stainless Steel 1.4404 (316L)
4	4mm Diameter Stainless Steel 1.4404 (316L)
6	6mm Diameter Stainless Steel 1.4404 (316L)
XX	Specify in mm
Code	**Sensor Sheath Length**
XXX	Specify in mm
Code	**Tip Style**
ST	Rounded Tip
PT	Pointed Tip
Code	**Handle Material**
PH	Plastic Handle
AH	Aluminium Handle
SS	Stainless Steel Handle
Code	**Cable Length in Meters**
XXX	Specify in Meters
Code	**Cable Material**
PVC	PVC Cable (Suitable for temperatures up to 105°C)
PTFE	PTFE Cable (Suitable for temperatures up to 250°C)
SR	Silicone Rubber (Suitable for temperatures up to 200°C)
SSFC	Stainless Steel Flex Conduit
Code	**Termination**
FL	Flying Leads
PLG	Specify Plug Model

Sensor Configuration/Assembly

Termination Heads

Type: 5333A

2-wire programmable transmitter
5333A
– RTD or Ohm input
– High measurement accuracy
– 3-wire connection
– Programmable sensor error value
– For DIN form B sensor head mounting

Type: 5333D

2-wire programmable transmitter
5333D
– RTD or Ohm input
– High measurement accuracy
– 3-wire connection
– Programmable sensor error value
– For DIN form B sensor head mounting

Type: 5331A3B

2-wire programmable transmitter
5331A
– RTD, TC, Ohm, or mV input
– Extremely high measurement accuracy
– 1.5 kVAC galvanic isolation
– Programmable sensor error value
– For DIN form B sensor head mounting

Type: 5331D

2-wire programmable transmitter
5331D
– RTD, TC, Ohm, or mV input
– Extremely high measurement accuracy
– 1.5 kVAC galvanic isolation
– Programmable sensor error value
– For DIN form B sensor head mounting

Type: 5337D

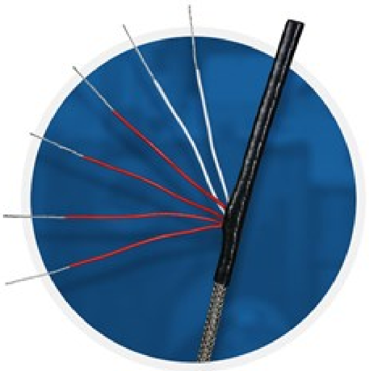
2-wire transmitter with HART protocol
5337A
– RTD, TC, Ohm, and bipolar mV input
– 2 analog inputs and 5 device variables with status available
– HART protocol revision selectable from HART 5 or HART 7
– Hardware assessed for use in SIL applications
– Mounting in Safe area or Zone 2/22

Type: 7501

Field mounted HART temperature transmitter
7501
– RTD, TC, Ohm, and bipolar mV input and analog output
– High definition local operator interface (LOI) with 3 optical buttons
– Selectable red or white backlight
– Ex d explosion proof / flame proof
– HART 7 functionality with HART 5 compatibility

Full Transmitter Specification Can Be Viewed Via Transmitter Datasheet

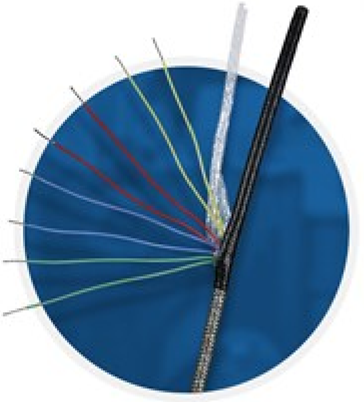
Termination Heads



PVC

-10C to 105C

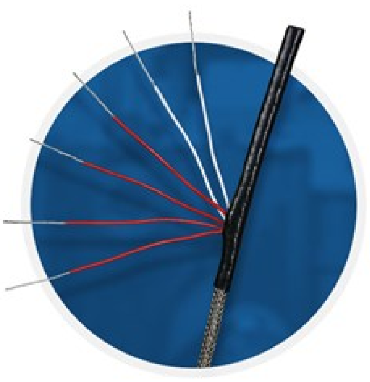
Good general purpose insulation for medium temperature environments. Waterproof and very flexible.



PTFE

-260C to +260C

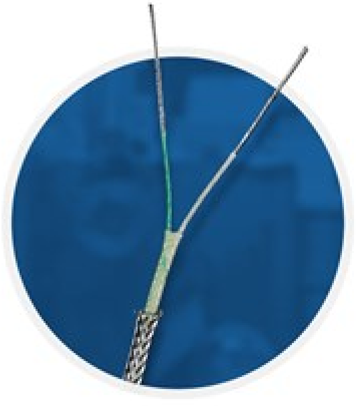
Resistant to oils, acids, other adverse agents and fluids. Good mechanical strength and flexibility.



Silicone Rubber

-50 to +200

Offers excellent dielectric strength and flexibility. Operation over a wide temperature range and ease of silastic bonding are other outstanding characteristics of silicone rubber cable.



Glass fibre

(Varnished)

-60C to 350C

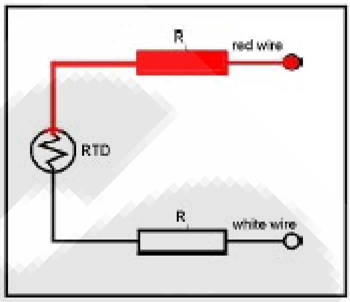
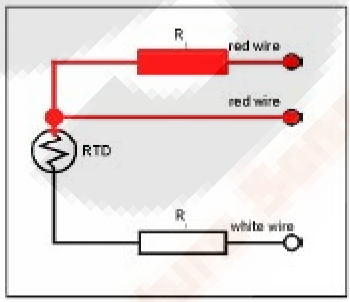
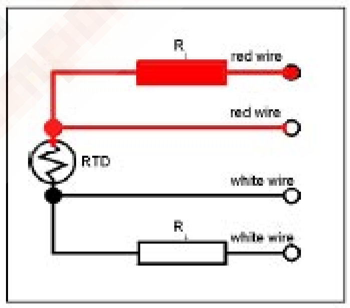
Good temperature range but will not prevent ingress of fluids. Fairly flexible but does not provide good mechanical protection.

Stainless Steel Flexible Conduit

withstands high temperatures

- Durable crush-proof construction
- Corrosion and rust resistant

Wiring Configuration.

Two Wire When accuracy is not critical, a two-wire RTD is the least expensive; offering. Using lead wires to place any distance between a two wire RTD and a receiving device will further compromise its accuracy. The potential for poor accuracy from a two-wire RTD stems from its inability to compensate for lead length, resistance that changes the ohm value of the original signal. A two-wire RTD should be used only in applications where the receiving device connects directly to the sensor	
Three Wire RTD Three-wire RTD's compensate for resistance resulting from length differences by adding a third lead to the RTD. To accomplish this requires that the wires match exactly. Any difference in resistance between the lead wires will cause an imbalance, which will compromise the accuracy of the RTD. Lead length variance, work hardening or corrosion, and manufacturing irregularities are errors to avoid. Quality manufacturing is critical to insure balance of all three leads.	
Four Wire RTD Errors caused by resistance imbalance between leads are cancelled out in a four-wire RTD circuit. Four-wire RTD's are used where superior accuracy is critical or if the sensor is installed far from the receiving device. In a four-wire RTD one pair of wires carries the current through the RTD the other pair senses the voltage across the RTD. 2- and three-wire RTD's require heavier lead wire because thicker wire, by creating less resistance to the measured signal, reduces measurement distortion. Therefore lighter gauge wire, less expensive, may be used in four-wire RTD applications. RTD's are limited to temperatures of 1200 ° F and because of the construction of the sensing element, RTD's do not do well in high-vibration and severe mechanical shock environments. When selecting a temperature sensor for an application you should consult your temperature sensor manufacturer for recommendations.	

Accuracy, Stability, and Repeatability.

Tolerance/Accuracy is calculated as:	
Class B	change in t=+/- (0.3+0.005|t|)
Class A	change in t=+/- (0.15+0.002|t|)
1/3 Class B	change in t=+/- 1/3 x (0.3+0.005|t|)
1/5 Class B	change in t=+/- 1/5 x (0.3+0.005|t|)
1/10 Class B	change in t=+/- 1/10 x (0.3+0.005|t|)
|t| = absolute temperature in °C. Where elements have a resistance of n x 100 Ohms then the basic values and tolerances also have to be multiplied by n	

These three terms are often confused, but it is important to understand the difference.

- Accuracy. IEC standard 751 sets two tolerance classes for the accuracy of RTDs: Class A and Class B:

Class A: $\Delta t = \pm(0.15 + 0.002 \cdot | t |)$

Class B: $\Delta t = \pm(0.30 + 0.005 \cdot | t |)$

where:

$| t |$ = absolute value of temperature in °C

Class A applies to temperatures from –200°C to 650°C, and only for RTDs with three- or four-wire configurations. Class B covers the entire range from –200°C to 850°C.

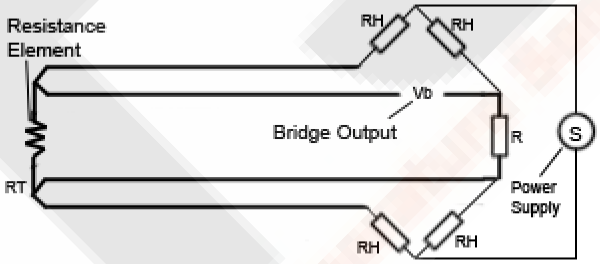


Figure 3. Lead wires have resistance that is a function of the material used, wire size, and lead length. This resistance can add to the measured RTD resistance, and improper wire compensation can result in significant errors. The common configurations of RTDs are two (A), three (B), or four wires (C).

- Stability. This is the sensor's ability to maintain a consistent output when a constant input is applied. Physical or chemical changes can cause calibration drift. The material that the platinum is adhered to, whether wound on a mandrel or on a substrate, can expand and contract, straining the wire. Drift rates conservatively specified by manufacturers are typically 0.05°C/yr.
- Repeatability. Repeatability is the sensor's ability to give the same output or reading under repeated identical conditions.

Absolute accuracy is not necessary in most applications. The focus should be on the stability and repeatability of the sensor. If an RTD in a 100.00°C bath consistently reads 100.06°C, the electronics can easily compensate for this error. The stability of RTDs is exceptional, with most experiencing drift rates of 0.05°C over a five-year period.

Response Time.

Response time varies according to the application. It is the sensor's ability to react to a change in temperature, and depends on the sensor's thermal mass and proximity to the material being tested. For instance, an RTD sensor in a thermowell will react more slowly than the same sensor immersed directly into a process. RTD specifications will list the sensor's time constant, which is the time it takes for an RTD to respond to a step change in temperature and come to 63% of its final equilibrium value. Response times are calculated in water flowing at 0.2 m/s and in air flowing at 1 m/s. This gives a useful comparison of RTD sensor configurations.

RTD accuracy – Class A, Class B, 1/3 DIN, 1/10 DIN

ACTUAL	**RTD ACCURACY +/- °C PT100 Ω ALPHA 0.003850 to DIN 43760 IEC751 DIN EN 60 751**			
	B GRADE	A GRADE	BAND 3 (1/3 DIN)	BAND 5 (1/10 DIN)
-200 °C	1.30 °C	0.55 °C	0.39 °C	0.38 °C
-150 °C	1.05 °C	0.45 °C	0.23 °C	0.21 °C
-100 °C	0.80 °C	0.35 °C	0.15 °C	0.12 °C
-90 °C	0.75 °C	0.33 °C	0.14 °C	0.10 °C
-80 °C	0.70 °C	0.31 °C	0.13 °C	0.09 °C
-70 °C	0.65 °C	0.29 °C	0.12 °C	0.08 °C
-60 °C	0.60 °C	0.27 °C	0.11 °C	0.07 °C
-50 °C	0.55 °C	0.25 °C	0.10 °C	0.06 °C
-40 °C	0.50 °C	0.23 °C	0.10 °C	0.06 °C
-30 °C	0.45 °C	0.21 °C	0.09 °C	0.05 °C
-20 °C	0.40 °C	0.19 °C	0.09 °C	0.04 °C
-10 °C	0.37 °C	0.17 °C	0.08 °C	0.03 °C
0 °C	0.30 °C	0.15 °C	0.08 °C	0.03 °C
10 °C	0.35 °C	0.17 °C	0.09 °C	0.04 °C
20 °C	0.40 °C	0.19 °C	0.10 °C	0.04 °C
30 °C	0.45 °C	0.21 °C	0.11 °C	0.05 °C
40 °C	0.50 °C	0.23 °C	0.12 °C	0.06 °C
50 °C	0.55 °C	0.25 °C	0.13 °C	0.07 °C
60 °C	0.60 °C	0.27 °C	0.14 °C	0.08 °C
70 °C	0.65 °C	0.29 °C	0.16 °C	0.09 °C
80 °C	0.70 °C	0.31 °C	0.17 °C	0.10 °C
90 °C	0.75 °C	0.33 °C	0.18 °C	0.11 °C
100 °C	0.80 °C	0.35 °C	0.19 °C	0.12 °C
110 °C	0.85 °C	0.37 °C	0.20 °C	0.13 °C
120 °C	0.90 °C	0.39 °C	0.21 °C	0.14 °C
130 °C	0.95 °C	0.41 °C	0.22 °C	0.15 °C
140 °C	1.00 °C	0.43 °C	0.24 °C	0.15 °C
150 °C	1.05 °C	0.45 °C	0.25 °C	0.16 °C
160 °C	1.10 °C	0.47 °C	0.26 °C	0.17 °C
170 °C	1.15 °C	0.49 °C	0.27 °C	0.18 °C
180 °C	1.20 °C	0.51 °C	0.29 °C	0.19 °C
190 °C	1.25 °C	0.53 °C	0.30 °C	0.21 °C
200 °C	1.30 °C	0.55 °C	0.31 °C	0.22 °C

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PT100 TEMPERATURE / RESISTANCE TABLE

°C	0	1	2	3	4	5	6	7	8	9	°C
-200	18.4932										-200
-190	22.8031	22.3737	21.9439	21.5139	21.0834	20.6526	20.2215	19.7899	19.3580	18.9258	-190
-180	27.0779	26.6520	26.2257	25.7990	25.3720	24.9447	24.5171	24.0891	23.6608	23.2321	-180
-170	31.3200	30.8972	30.4741	30.0507	29.6270	29.2029	28.7786	28.3539	27.9289	27.5036	-170
-160	35.5313	35.1115	34.6914	34.2710	33.8503	33.4294	33.0081	32.5865	32.1646	31.7425	-160
-150	39.7137	39.2967	38.8794	38.4619	38.0440	37.6260	37.2076	36.7889	36.3700	35.9508	-150
-140	43.8691	43.4547	43.0401	42.6252	42.2101	41.7946	41.3790	40.9631	40.5469	40.1304	-140
-130	47.9993	47.5873	47.1752	46.7628	46.3501	45.9372	45.5241	45.1107	44.6971	44.2832	-130
-120	52.1058	51.6962	51.2863	50.8762	50.4659	50.0554	49.6446	49.2336	48.8224	48.4109	-120
-110	56.1903	55.7828	55.3751	54.9672	54.5591	54.1507	53.7422	53.3334	52.9244	52.5152	-110
-100	60.2541	59.8486	59.4429	59.0371	58.6310	58.2247	57.8182	57.4115	57.0047	56.5976	-100
-90	64.2987	63.8950	63.4912	63.0873	62.6831	62.2787	61.8742	61.4695	61.0645	60.6594	-90
-80	68.3251	67.9233	67.5212	67.1190	66.7166	66.3141	65.9114	65.5084	65.1054	64.7021	-80
-70	72.3346	71.9344	71.5340	71.1335	70.7328	70.3319	69.9309	69.5297	69.1284	68.7268	-70
-60	76.3282	75.9296	75.5307	75.1318	74.7326	74.3334	73.9339	73.5343	73.1346	72.7347	-60
-50	80.3068	79.9096	79.5123	79.1148	78.7171	78.3194	77.9214	77.5234	77.1251	76.7268	-50
-40	84.2713	83.8754	83.4795	83.0834	82.6871	82.2908	81.8943	81.4976	81.1008	80.7039	-40
-30	88.2222	87.8277	87.4331	87.0383	86.6434	86.2484	85.8532	85.4579	85.0625	84.6669	-30
-20	92.1603	91.7671	91.3737	90.9802	90.5866	90.1929	89.7990	89.4050	89.0109	88.6166	-20
-10	96.0861	95.6941	95.3019	94.9097	94.5173	94.1247	93.7321	93.3394	92.9465	92.5535	-10
0	100.0000	99.6091	99.2182	98.8271	98.4359	98.0445	97.6531	97.2615	96.8698	96.4780	0
0	100.0000	100.3907	100.7814	101.1719	101.5623	101.9526	102.3427	102.7328	103.1227	103.5125	0
10	103.9022	104.2918	104.6813	105.0706	105.4599	105.8490	106.2380	106.6269	107.0156	107.4043	10
20	107.7928	108.1813	108.5696	108.9578	109.3458	109.7338	110.1216	110.5094	110.8970	111.2845	20
30	111.6718	112.0591	112.4463	112.8333	113.2202	113.6070	113.9937	114.3802	114.7667	115.1530	30
40	115.5392	115.9254	116.3113	116.6972	117.0830	117.4686	117.8541	118.2395	118.6248	119.0100	40
50	119.3951	119.7800	120.1648	120.5495	120.9341	121.3186	121.7030	122.0872	122.4713	122.8554	50
60	123.2392	123.6230	124.0067	124.3902	124.7737	125.1570	125.5402	125.9233	126.3063	126.6891	60
70	127.0718	127.4545	127.8370	128.2194	128.6016	128.9838	129.3658	129.7478	130.1296	130.5113	70
80	130.8928	131.2743	131.6556	132.0369	132.4180	132.7990	133.1799	133.5606	133.9413	134.3218	80
90	134.7022	135.0825	135.4627	135.8428	136.2227	136.6026	136.9823	137.3619	137.7414	138.1207	90
100	138.5000	138.8791	139.2582	139.6371	140.0159	140.3945	140.7731	141.1515	141.5299	141.9081	100
110	142.2862	142.6642	143.0420	143.4198	143.7974	144.1749	144.5523	144.9296	145.3068	145.6838	110
120	146.0608	146.4376	146.8143	147.1909	147.5673	147.9437	148.3199	148.6960	149.0721	149.4479	120
130	149.8237	150.1994	150.5749	150.9504	151.3257	151.7009	152.0759	152.4509	152.8257	153.2005	130
140	153.5751	153.9496	154.3240	154.6982	155.0724	155.4464	155.8203	156.1941	156.5678	156.9414	140
150	157.3149	157.6882	158.0614	158.4345	158.8075	159.1804	159.5531	159.9258	160.2983	160.6707	150
160	161.0430	161.4152	161.7872	162.1592	162.5310	162.9027	163.2743	163.6458	164.0172	164.3884	160
170	164.7596	165.1306	165.5015	165.8723	166.2429	166.6135	166.9839	167.3542	167.7245	168.0945	170
180	168.4645	168.8344	169.2041	169.5737	169.9432	170.3126	170.6819	171.0511	171.4201	171.7890	180
190	172.1579	172.5266	172.8951	173.2636	173.6319	174.0002	174.3683	174.7363	175.1042	175.4719	190
200	175.8396	176.2071	176.5746	176.9419	177.3090	177.6761	178.0431	178.4099	178.7766	179.1432	200
210	179.5097	179.8761	180.2424	180.6085	180.9745	181.3405	181.7063	182.0719	182.4375	182.8029	210
220	183.1683	183.5335	183.8986	184.2636	184.6284	184.9932	185.3578	185.7223	186.0867	186.4510	220
230	186.8152	187.1793	187.5432	187.9070	188.2707	188.6343	188.9978	189.3611	189.7244	190.0875	230
240	190.4505	190.8134	191.1762	191.5389	191.9014	192.2638	192.6262	192.9884	193.3504	193.7124	240
250	194.0743	194.4360	194.7976	195.1591	195.5205	195.8818	196.2429	196.6040	196.9649	197.3257	250
260	197.6864	198.0469	198.4074	198.7677	199.1280	199.4881	199.8481	200.2079	200.5677	200.9274	260
270	201.2869	201.6463	202.0056	202.3648	202.7238	203.0828	203.4416	203.8003	204.1589	204.5174	270
280	204.8758	205.2340	205.5922	205.9502	206.3081	206.6659	207.0236	207.3811	207.7386	208.0959	280
290	208.4531	208.8102	209.1672	209.5240	209.8808	210.2374	210.5939	210.9503	211.3066	211.6628	290
300	212.0188	212.3747	212.7305	213.0862	213.4418	213.7973	214.1527	214.5079	214.8630	215.2180	300
310	215.5729	215.9277	216.2823	216.6369	216.9913	217.3456	217.6998	218.0539	218.4078	218.7617	310
320	219.1154	219.4690	219.8225	220.1759	220.5291	220.8823	221.2353	221.5882	221.9410	222.2937	320
330	222.6463	222.9987	223.3511	223.7033	224.0554	224.4074	224.7592	225.1110	225.4626	225.8142	330
340	226.1656	226.5169	226.8680	227.2191	227.5700	227.9209	228.2716	228.6222	228.9726	229.3230	340
350	229.6733	230.0234	230.3734	230.7233	231.0731	231.4227	231.7723	232.1217	232.4710	232.8202	350

PT100 TEMPERATURE / RESISTANCE TABLE

°C	0	1	2	3	4	5	6	7	8	9	°C
360	233.1693	233.5183	233.8672	234.2159	234.5645	234.9130	235.2614	235.6097	235.9578	236.3059	360
370	236.6538	237.0016	237.3493	237.6969	238.0443	238.3917	238.7389	239.0860	239.4330	239.7799	370
380	240.1267	240.4733	240.8199	241.1663	241.5126	241.8588	242.2048	242.5508	242.8966	243.2423	380
390	243.5879	243.9334	244.2788	244.6241	244.9692	245.3142	245.6591	246.0039	246.3486	246.6932	390
400	247.0376	247.3819	247.7261	248.0702	248.4142	248.7581	249.1018	249.4455	249.7890	250.1324	400
410	250.4757	250.8188	251.1619	251.5048	251.8476	252.1903	252.5329	252.8754	253.2177	253.5600	410
420	253.9021	254.2441	254.5860	254.9278	255.2694	255.6110	255.9524	256.2937	256.6349	256.9760	420
430	257.3170	257.6578	257.9985	258.3392	258.6797	259.0200	259.3603	259.7005	260.0405	260.3804	430
440	260.7202	261.0599	261.3995	261.7389	262.0783	262.4175	262.7566	263.0956	263.4344	263.7732	440
450	264.1119	264.4504	264.7888	265.1271	265.4653	265.8033	266.1413	266.4791	266.8168	267.1544	450
460	267.4919	267.8293	268.1665	268.5036	268.8407	269.1776	269.5143	269.8510	270.1876	270.5240	460
470	270.8603	271.1965	271.5326	271.8686	272.2044	272.5402	272.8758	273.2113	273.5467	273.8820	470
480	274.2172	274.5522	274.8871	275.2219	275.5566	275.8912	276.2257	276.5600	276.8943	277.2284	480
490	277.5624	277.8963	278.2300	278.5637	278.8972	279.2306	279.5639	279.8971	280.2302	280.5632	490
500	280.8960	281.2287	281.5613	281.8938	282.2262	282.5585	282.8906	283.2226	283.5545	283.8863	500
510	284.2180	284.5496	284.8810	285.2124	285.5436	285.8747	286.2057	286.5365	286.8673	287.1979	510
520	287.5284	287.8588	288.1891	288.5193	288.8493	289.1793	289.5091	289.8388	290.1684	290.4979	520
530	290.8272	291.1565	291.4856	291.8146	292.1435	292.4723	292.8010	293.1295	293.4579	293.7862	530
540	294.1144	294.4425	294.7705	295.0983	295.4261	295.7537	296.0812	296.4086	296.7359	297.0630	540
550	297.3901	297.7170	298.0438	298.3705	298.6970	299.0235	299.3498	299.6761	300.0022	300.3282	550
560	300.6540	300.9798	301.3055	301.6310	301.9564	302.2817	302.6069	302.9319	303.2569	303.5817	560
570	303.9064	304.2310	304.5555	304.8799	305.2042	305.5283	305.8523	306.1762	306.5000	306.8237	570
580	307.1472	307.4707	307.7940	308.1172	308.4403	308.7633	309.0861	309.4089	309.7315	310.0540	580
590	310.3764	310.6987	311.0209	311.3429	311.6648	311.9867	312.3084	312.6299	312.9514	313.2728	590
600	313.5940	313.9151	314.2361	314.5570	314.8778	315.1984	315.5190	315.8394	316.1597	316.4799	600
610	316.8000	317.1199	317.4398	317.7595	318.0791	318.3986	318.7180	319.0373	319.3564	319.6754	610
620	319.9944	320.3132	320.6318	320.9504	321.2689	321.5872	321.9054	322.2235	322.5415	322.8594	620
630	323.1771	323.4948	323.8123	324.1297	324.4470	324.7642	325.0812	325.3982	325.7150	326.0317	630
640	326.3483	326.6648	326.9811	327.2974	327.6135	327.9295	328.2454	328.5612	328.8769	329.1924	640
650	329.5079	329.8232	330.1384	330.4535	330.7684	331.0833	331.3980	331.7126	332.0271	332.3415	650
660	332.6558	332.9700	333.2840	333.5979	333.9117	334.2254	334.5390	334.8525	335.1658	335.4790	660
670	335.7922	336.1052	336.4180	336.7308	337.0435	337.3560	337.6684	337.9807	338.2929	338.6050	670
680	338.9169	339.2287	339.5405	339.8521	340.1636	340.4749	340.7862	341.0973	341.4084	341.7193	680
690	342.0301	342.3407	342.6513	342.9617	343.2721	343.5823	343.8924	344.2024	344.5122	344.8220	690
700	345.1316	345.4411	345.7505	346.0598	346.3690	346.6780	346.9870	347.2958	347.6045	347.9131	700
710	348.2215	348.5299	348.8381	349.1463	349.4543	349.7622	350.0699	350.3776	350.6851	350.9926	710
720	351.2999	351.6071	351.9141	352.2211	352.5280	352.8347	353.1413	353.4478	353.7542	354.0605	720
730	354.3666	354.6726	354.9786	355.2844	355.5900	355.8956	356.2011	356.5064	356.8116	357.1167	730
740	357.4217	357.7266	358.0314	358.3360	358.6405	358.9449	359.2492	359.5534	359.8575	360.1614	740
750	360.4653	360.7690	361.0726	361.3760	361.6794	361.9827	362.2858	362.5888	362.8917	363.1945	750
760	363.4972	363.7997	364.1022	364.4045	364.7067	365.0088	365.3107	365.6126	365.9143	366.2160	760
770	366.5175	366.8189	367.1202	367.4213	367.7224	368.0233	368.3241	368.6248	368.9254	369.2258	770
780	369.5262	369.8264	370.1265	370.4265	370.7264	371.0262	371.3258	371.6254	371.9248	372.2241	780
790	372.5233	372.8224	373.1213	373.4202	373.7189	374.0175	374.3160	374.6144	374.9126	375.2108	790
800	375.5088	375.8067	376.1045	376.4022	376.6998	376.9972	377.2945	377.5917	377.8888	378.1858	800
810	378.4827	378.7794	379.0761	379.3726	379.6690	379.9653	380.2615	380.5575	380.8535	381.1493	810
820	381.4450	381.7406	382.0361	382.3314	382.6267	382.9218	383.2168	383.5117	383.8065	384.1011	820
830	384.3957	384.6901	384.9844	385.2786	385.5727	385.8667	386.1605	386.4543	386.7479	387.0414	830
840	387.3348	387.6280	387.9212	388.2142	388.5072	388.8000	389.0926	389.3852	389.6777	389.9700	840
850	390.2623										850