

**MESS- UND REGELTECHNIK
MESURE ET RÉGLAGE**



SEV 04 ATEX 0124 X
SEV 04 ATEX 0151 X



Seit über 60 Jahren
**Innovativ
Kompetent
Präzis**

info@rothcoag.ch
www.rothcoag.ch

ROTH+CO. AG

Wiesentalstrasse 20
CH-9242 Oberuzwil

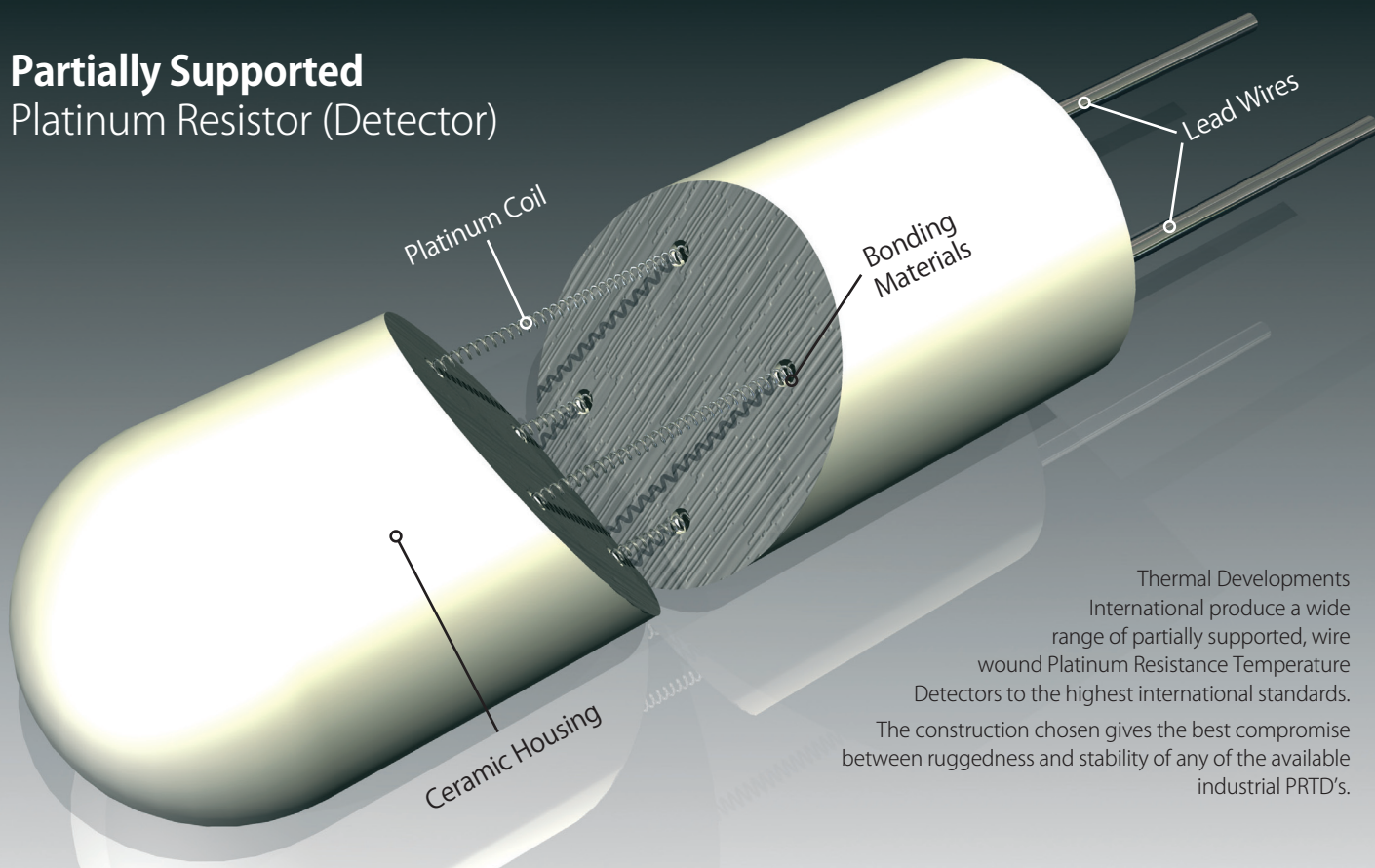
Tel. 071 955 02 02
Fax 071 955 02 00



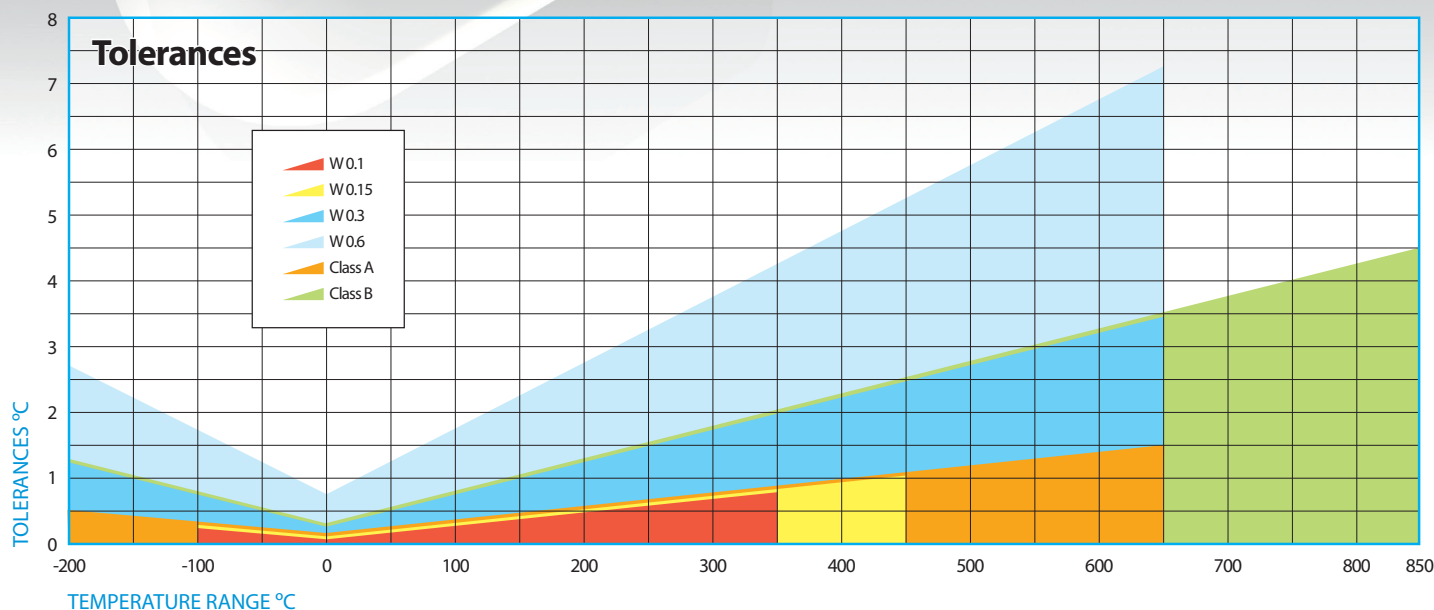
Thermal
Developments
International
Limited

HAND MADE PLATINUM RESISTANCE TEMPERATURE DETECTORS

Partially Supported Platinum Resistor (Detector)



Thermal Developments International produce a wide range of partially supported, wire wound Platinum Resistance Temperature Detectors to the highest international standards. The construction chosen gives the best compromise between ruggedness and stability of any of the available industrial PRTD's.



Tolerance Values as a Function of Temperature for 100Ω Sensors

Note: Class A and Class B relate to IEC 751 1983 / BS EN 60751 1996. The newer standard, IEC 60751 Edition 2.0 2008-07 introduces a new scheme of tolerance class.

For Wire wound resistors	Temperature Range °C	Tolerance, °C
W0.1	-100 to 350	$\pm(0.1 + 0.0017 t)$
W0.15	-100 to 450	$\pm(0.15 + 0.002 t)$
W0.3	-196 to 660	$\pm(0.3 + 0.005 t)$
W0.6	-196 to 660	$\pm(0.6 + 0.01 t)$

Note that W0.15 and W0.3 have a tolerance of the same magnitude as the earlier Class A & B but are valid over narrower temperature ranges.

The vast majority of TDI customers select tolerances tighter than the published standards.

Other Tolerances: These have been commonly specified as being a fraction of the Class B, now W0.3 tolerance, also known by many as DIN B from the earlier DIN 43760 standard.

Interchangeability at 0°C

$\pm 0.05\%$	1/2 Class B (or DIN B)
$\pm 0.03\%$	1/3 Class B (or DIN B)
$\pm 0.02\%$	1/5 Class B (or DIN B)
$\pm 0.01\%$	1/10 Class B (or DIN B)

As the sensor is used further away from 0°C these errors can be expected to rise in accordance with an alpha uncertainty of $\pm 3\text{ppm}$.

TDI Produce a wide range of Detectors - using wire conforming to IEC 60751 Ed2 2008

Images shown here are actual size. All measurements in millimeters. All tolerances 0.1% at 0°C.

Model Number		Ceramic Length	Ceramic Diameter	Sensing Length
P100/7040		70	4	65 ±1
P100/5024 P2100/5024		50	2.4	47 ±1
P100/5015 P2100/5015		50	1.5	47 ±1
P100/3045 P2100/3045		30	4.5	27 ±1
P100/3038 P2100/3038		30	3.8	27 ±1
P100/2532 P2100/2532		25	3.2	22 ±1
P100/2528 P2100/2528		25	2.8	22 ±1
P100/2524 P2100/2524		25	2.4	22 ±1
P100/2516 P2100/2516		25	1.6	22 ±1
P100/2515 P2100/2515		25	1.5	22 ±1
P100/2020 P2100/2020		20	2.0	17 ±1
P100/1545 P2100/1545		15	4.5	12 ±1
P100/1532 P2100/1532		15	3.2	12 ±1
P100/1530 P2100/1530		15	3.0	12 ±1
P100/1528 P2100/1528		15	2.8	12 ±1
P100/1524 P2100/1524		15	2.4	12 ±1
P100/1520 P2100/1520		15	2.0	12 ±1
P100/1516 P2100/1516		15	1.6	12 ±1
P100/1516/16 Square		15	1.6	12 ±1
P100/1515 P2100/1515		15	1.5	12 ±1
P100/1512		15	1.2	12 ±1
P100/1509		15	0.9	12 ±1
P100/1508		15	0.8	12 ±1
P100/1016		10	1.6	8 ±1
P100/1016/5 Flat		10	5(W) x 1.6 (H)	10 ±1
P100/1012		10	1.2	8 ±1
P100/1008		10	0.8	8 ±1
P100/0815		08	1.5	8 ±1
P100/0620		06	2.0	6 ±1
P100/0445		04	4.4	3 ±1

Guide only - other types available, call for details

Calibration

All Platinum Construction

To avoid contamination and errors caused by using dissimilar metals, only platinum is used in the construction of our PRTD's.

Lead Resistance Values

Ceramic Diameter mm	Lead Diameter mm	Lead Resistance Ω/mm
0.9	0.15	0.0063
1.2 to 2.0	0.265	0.002
2.4 to 4.5	0.4	0.0009

For all detectors the point of calibration is 5mm from the end of the ceramic. Each single detector has two leads of Pure Platinum with Duplex units having four leads of Pure Platinum.

The temperature to resistance relationship of IEC 60751 Ed2 2008 is unchanged from the earlier standard IEC 751 Amendment 2 1995.

TDI at a glance

TDI manufacture coil wound platinum resistance temperature detectors. These are purchased by sensor manufacturers who build complete resistance thermometers from our detectors. We do not produce complete thermometer assemblies. We produce a range of partially supported Platinum Resistance Temperature Detectors to the highest international standards.

Quality

The quality control is guaranteed by Isothermal Technology whose UKAS Laboratory provides comparisons to National Standards and indeed directly to ITS-90.

Stable Construction

The construction chosen gives the best compromise between ruggedness and stability of any of the industrially available Platinum Resistance Detectors.

Types Available

All TDI detectors are wire wound platinum resistance types, ceramic housed. Known by a variety of names and terms including temperature detectors, PRTD, (Platinum resistance temperature detectors) RTD or RTDS (resistance temperature detectors). Most PRTDs are constructed to have a nominal resistance of 100 Ohms at 0°C Pt100 but almost any value between 1 Ohm to 1000 Ohm can be made including 25 Ohm and 100 Ohm, Pt25 and Pt1000. - types include Pt25, Pt100 and Pt1000. TDI temperature detectors comply with the requirements of EN 60751

TDI Special Types

EN 60751 applies to sensors with an alpha value defined

$$\alpha = \frac{R_{100} - R_0}{100 \times R_0}$$

Commonly written as $\alpha = 3.851 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}$

Sensors can be constructed with wire of different alpha values with specification other standards including the Japanese JIS C1604 and US standard curve.

High Temperature Detectors

TDI have developed two types of temperature detector which are able to remain stable with continuous temperature cycling up to 700°C. However, they are also capable of measuring temperatures up to 1000°C with little or no drift.

High Vibration Detectors

These units have been developed to withstand very high vibration well above the IEC 751 requirements. High vibration detectors are suitable for use up to 300°C with high vibration without movement of the platinum coil.

TDI Detectors -
hand made from
beginning to end

Industrial Platinum Resistance Thermometer Tables - R(0) = 100.00Ω IEC 60751 Ed2 2008

°C ITS 90	0	1	2	3	4	5	6	7	8	9	10	°C ITS 90
-200	18.52											-200
-190	22.83	22.40	21.97	21.54	21.11	20.68	20.25	19.82	19.38	18.95	18.52	-190
-180	27.10	26.67	26.24	25.82	25.39	24.97	24.54	24.11	23.68	23.25	22.83	-180
-170	31.34	30.91	30.49	30.07	29.64	29.22	28.80	28.37	27.95	27.52	27.10	-170
-160	35.54	35.12	34.70	34.28	33.86	33.44	33.02	32.60	32.18	31.76	31.34	-160
-150	39.72	39.31	38.89	38.47	38.05	37.64	37.22	36.80	36.38	35.96	35.54	-150
-140	43.88	43.46	43.05	42.63	42.22	41.80	41.39	40.97	40.56	40.14	39.72	-140
-130	48.00	47.59	47.18	46.77	46.36	45.94	45.53	45.12	44.70	44.29	43.88	-130
-120	52.11	51.70	51.29	50.88	50.47	50.06	49.65	49.24	48.83	48.42	48.00	-120
-110	56.19	55.79	55.38	54.97	54.56	54.15	53.75	53.34	52.93	52.52	52.11	-110
-100	60.26	59.85	59.44	59.04	58.63	58.23	57.82	57.41	57.01	56.60	56.19	-100
-90	64.30	63.90	63.49	63.09	62.68	62.28	61.88	61.47	61.07	60.66	60.26	-90
-80	68.33	67.92	67.52	67.12	66.72	66.31	65.91	65.51	65.11	64.70	64.30	-80
-70	72.33	71.93	71.53	71.13	70.73	70.33	69.93	69.53	69.13	68.73	68.33	-70
-60	76.33	75.93	75.53	75.13	74.73	74.33	73.93	73.53	73.13	72.73	72.33	-60
-50	80.31	79.91	79.51	79.11	78.72	78.32	77.92	77.52	77.12	76.73	76.33	-50
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70	80.31	-40
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67	84.27	-30
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62	88.22	-20
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55	92.16	-10
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48	96.09	0
10	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51	103.90	10
20	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40	107.79	20
30	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29	111.67	30
40	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15	115.54	40
50	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01	119.40	50
60	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86	123.24	60
70	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69	127.08	70
80	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52	130.90	80
90	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33	134.71	90
100	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13	138.51	100
110	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91	142.29	110
120	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69	146.07	120
130	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46	149.83	130
140	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21	153.58	140
150	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95	157.33	150
160	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68	161.05	160
170	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40	164.77	170
180	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11	168.48	180
190	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80	172.17	190
200	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49	175.86	200
210	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16	179.53	210
220	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82	183.19	220
230	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47	186.84	230
240	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11	190.47	240
250	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74	194.10	250
260	194.10	194.46	194.82	195.18	195.55	195.91	196.27	196.63	196.99	197.35	197.71	260
270	197.71	198.07	198.43	198.79	199.15	199.51	199.87	200.23	200.59	200.95	201.31	270
280	201.31	201.67	202.03	202.39	202.75	203.11	203.47	203.83	204.19	204.55	204.90	280
290	204.90	205.26	205.62	205.98	206.34	206.70	207.05	207.41	207.77	208.13	208.48	290
300	208.48	208.84	209.20	209.56	209.91	210.27	210.63	210.98	211.34	211.70	212.05	300
310	212.05	212.41	212.76	213.12	213.48	213.83	214.19	214.54	214.90	215.25	215.61	310
320	215.61	215.96	216.32	216.67	217.03	217.38	217.74	218.09	218.44	218.80	219.15	320
330	219.15	219.51	219.86	220.21	220.57	220.92	221.27	221.63	221.98	222.33	222.68	330
340	222.68	223.04	223.39	223.74	224.09	224.45	224.80	225.15	225.50	225.85	226.21	340
350	226.21	226.56	226.91	227.26	227.61	227.96	228.31	228.66	229.02	229.37	229.72	350

°C ITS 90	0	1	2	3	4	5	6	7	8	9	10	°C ITS 90
350	229.72	230.07	230.42	230.77	231.12	231.47	231.82	232.17	232.52	232.87	233.21	350
360	233.21	233.56	233.91	234.26	234.61	234.96	235.31	235.66	236.00	236.35	236.70	360
370	236.70	237.05	237.40	237.74	238.09	238.44	238.79	239.13	239.48	239.83	240.18	370
380	240.18	240.52	240.87	241.22	241.56	241.91	242.26	242.60	242.95	243.29	243.64	380
390	243.64	243.99	244.33	244.68	245.02	245.37	245.71	246.06	246.40	246.75	247.09	390
400	247.09	247.44	247.78	248.13	248.47	248.81	249.16	249.50	249.85	250.19	250.53	400
410	250.53	250.88	251.22	251.56	251.91	252.25	252.59	252.93	253.28	253.62	253.96	410
420	253.96	254.30	254.65	254.99	255.33	255.67	256.01	256.35	256.70	257.04	257.38	420
430	257.38	257.72	258.06	258.40	258.74	259.08	259.42	259.76	260.10	260.44	260.78	430
440	260.78	261.12	261.46	261.80	262.14	262.48	262.82	263.16	263.50	263.84	264.18	440
450	264.18	264.52	264.86	265.20	265.53	265.87	266.21	266.55	266.89	267.22	267.56	450
460	267.56	267.90	268.24	268.57	268.91	269.25	269.59	269.92	270.26	270.60	270.93	460
470	270.93	271.27	271.61	271.94	272.28	272.61	272.95	273.28	273.62	273.96	274.29	470
480	274.29	274.63	274.96	275.30	275.63	275.97	276.30	276.64	276.97	277.31	277.64	480
490	277.64	277.98	278.31	278.64	278.98	279.31	279.64	279.98	280.31	280.64	280.98	490
500	280.98	281.31	281.64	281.98	282.31	282.64	282.97	283.31	283.64	283.97	284.30	500
510	284.30	284.63	284.97	285.30	285.63	285.96	286.29	286.62	286.95	287.29	287.62	510
520	287.62	287.95	288.28	288.61	288.94	289.27	289.60	289.93	290.26	290.59	290.92	520
530	290.92	291.25	291.58	291.91	292.24	292.56	292.89	293.22	293.55	293.88	294.21	530
540	294.21	294.54	294.86	295.19	295.52	295.85	296.18	296.50	296.83	297.16	297.49	540
550	297.49	297.81	298.14	298.47	298.80	299.12	299.45	299.78	300.10	300.43	300.75	550
560	300.75	301.08	301.41	301.73	302.06	302.38	302.71	303.03	303.36	303.69	304.01	560
570	304.01	304.34	304.66	304.98	305.31	305.63	305.96	306.28	306.61	306.93	307.25	570
580	307.25	307.58	307.90	308.23	308.55	308.87	309.20	309.52	309.84	310.16	310.49	580
590	310.49	310.81	311.13	311.45	311.78	312.10	312.42	312.74	313.06	313.39	313.71	590
600	313.71	314.03	314.35	314.67	314.99	315.31	315.64	315.96	316.28	316.60	316.92	600
610	316.92	317.24	317.56	317.88	318.20	318.52	318.84	319.16	319.48	319.80	320.12	610
620	320.12	320.43	320.75	321.07	321.39	321.71	322.03	322.35	322.67	322.98	323.30	620
630	323.30	323.62	323.94	324.26	324.57	324.89	325.21	325.53	325.84	326.16	326.48	630
640	326.48	326.79	327.11	327.43	327.74	328.06	328.38	328.69	329.01	329.32	329.64	640
650	329.64	329.96	330.27	330.59	330.90	331.22	331.53	331.85	332.16	332.48	332.79	650
660	332.79	333.11	333.42	333.74	334.05	334.36	334.68	334.99	335.31	335.62	335.93	660
670	335.93	336.25	336.56	336.87	337.18	337.50	337.81	338.12	338.44	338.75	339.06	670
680	339.06	339.37	339.69	340.00	340.31	340.62	340.93	341.24	341.56	341.87	342.18	680
690	342.18	342.49	342.80	343.11	343.42	343.73	344.04	344.35	344.66	344.97	345.28	690
700	345.28	345.59	345.90	346.21	346.52	346.83	347.14	347.45	347.76	348.07	348.38	700
710	348.38	348.69	349.00	349.31	349.61	349.92	350.23	350.54	350.84	351.15	351.46	710
720	351.46	351.77	352.08	352.38	352.69	353.00	353.30	353.61	353.92	354.22	354.53	720
730	354.53	354.84	355.14	355.45	355.76	356.06	356.37	356.67	356.98	357.28	357.59	730
740	357.59	357.90	358.20	358.51	358.81	359.12	359.42	359.72	360.03	360.33	360.64	740
750	360.64	360.94	361.25	361.55	361.85	362.16	362.46	362.76	363.07	363.37	363.67	750
760	363.67	363.98	364.28	364.58	364.89	365.19	365.49	365.79	366.10	366.40	366.70	760
770	366.70	367.00	367.30	367.60	367.91	368.21	368.51	368.81	369.11	369.41	369.71	770
780	369.71	370.01	370.31	370.61	370.91	371.21	371.51	371.81	372.11	372.41	372.71	780
790	372.71	373.01	373.31	373.61	373.91	374.21	374.51	374.81	375.11	375.41	375.71	790
800	375.70	376.00	376.30	376.60	376.90	377.19	377.49	377.79	378.09	378.39	378.68	800
810	378.68	378.98	379.28	379.57	379.87	380.17	380.46	380.76	381.06	381.35	381.65	810
820	381.65	381.95	382.24	382.54	382.83	383.13	383.42	383.72	384.01	384.31	384.60	820
830	384.60	384.90	385.19	385.49	385.78	386.08	386.37	386.67	386.96	387.25	387.55	830
840	387.55	387.84	388.14	388.43	388.72	389.02	389.31	389.60	389.90	390.19	390.48	840
850	390.48											850



TDI Facts

To get 100 Ohms of platinum wire inside TDI detectors means starting with a wire length of 250mm (10") the diameter of the wire is finer than that of a human hair.

The Alpha tolerance of the wire is just +/- 3 parts per million. For the detector to reach W0.3 (formerly Class B) the equivalent tolerance in length is equal to just 0.25mm (0.01").

A staggering 70% of TDI's detectors are to 1/5th of this tolerance, just 0.05mm (0.002")!

TDI leads the world in being able to produce in quantity to these tolerances.

TDI's production and checking tables have measuring performance similar to that used in a high quality secondary calibration laboratory.

All of TDI's are hand made from beginning to end.

Since the start in 1983 TDI has produced more than 6 million detectors.

TDI detectors find their way into space, have been used on Concorde, Formula One racing cars, nuclear submarines...

Applications are diverse from food testing, the brewing industry, textile production, pharmaceutical applications in fact every corner of science and industry.

When there is an application for high accuracy, high stability temperature measurement TDI detectors can be found.

TDI detectors are used in the worlds best Industrial Platinum Resistance Thermometers.

For further technical information, product details and special applications please contact us



FREE PRT Calc Software available to download

PRT Calc is a utility for those involved with PT100 platinum resistance thermometers. It allows for the accurate conversion of resistance to temperature or temperature to resistance.



Telephone +44 (0)1704 549291

Email info@t-d-i.co.uk Fax +44 (0)1704 530012 Website www.t-d-i.co.uk

Thermal Developments International Limited 39A Tithebarn Road, Southport, Merseyside PR8 6AB England