DK DOOKWANG
MANUFACTURING COMPANY

RESISTANCE THERMOMETERS

SINCE 1993

DK

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RESISTANCE TEMPERATURE DETECTORS

What is Resistance Temperature Detector (RTD)?

Generally, electrical resistance of any metallic conductor varies according to temperature changes. The sensor for measurement of temperature by utilizing this phenomenon is called “Resistance Thermometer”or“RTD”and can measure temperatures more precisely than other temperature sensors.

Its Features

Resistance temperature detectors for industrial applications have the following features.

1. Good sensitivity.
2. Excellent stability and reproducibility.
3. High accuracy.

Structure and Measuring Methods

Structure:

Metal wire that changes its electric resistance to changes in temperature are utilized is called“Resistance Wire”. This resistance wire, normally of platinum, is used to manufacture a temperature sensor called“Resistance Temperature Detector(RTD)Element”. Generally speaking, RTD is composed of RTD element, lead wires, protection tube and terminals.

Measuring Methods:

2-Wires Connection: Type W

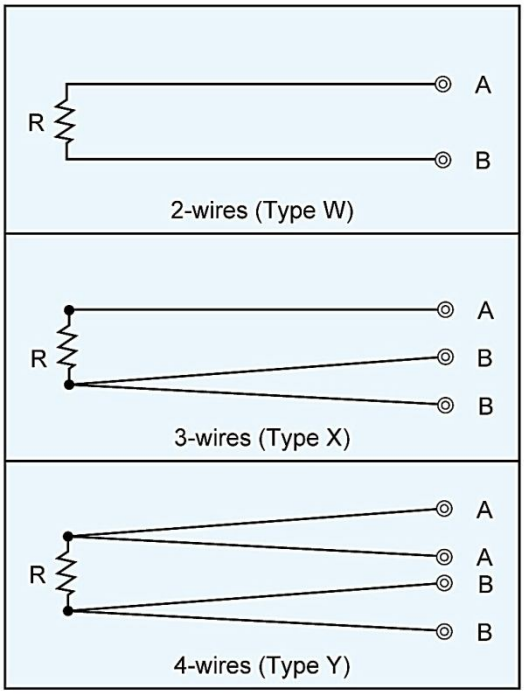
RTD element is connected to respective two wire leads. Although it is less expensive than other types, it is not recommendable for high precision measurement of temperature because it is susceptible to lead resistance and produces error.

3-Wires Connection: Type X

One end of RTD element is connected to two wire leads and the other end connected to single lead to eliminate the effect from lead resistance. This type is most widely used as a reliable method in industrial applications.

4-Wires Connection: Type Y

RTD element is connected to respective two wire leads to remove the effect from lead resistance. This connection cancels lead resistance effect and is especially recommendable for high precision measurement of temperature but somewhat expensive than other types.



R = RTD element. ◎= Terminal.
– = lead wire.
A or B = Code for terminal

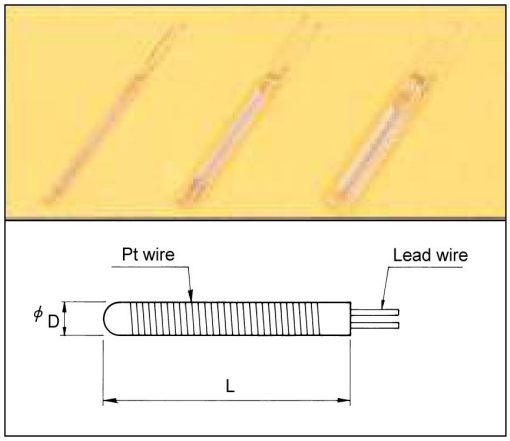
Precautions in Practical Applications

Selection of proper RTD suitable for the application is the most important factor. For precision measurement of temperature, consideration should be given to selection of RTD element, protection tube, structure and fitting (location) according to the respective resistance to heat, corrosion, mechanical shock and other environ- mental conditions.

Platinum-glass temperature sensors to EN 60 751

- **For temperatures from -200 to +400°C**
- **As single or twin temperature sensor**
- **Standard nominal values and tolerances**
- **Also suitable for measurement in liquids**
- **Highly resistant shock and vibration**

Glass sensors have a bifilar measurement winding on a glass carrier which is fused into the glass and provided with connecting wires. After the platinum winding has been calibrated, a sleeve is pushed over the glass carrier and both are then fused together. Since the measurement winding is fused into glass, these sensors are particularly insensitive to shock and vibration. They can also be used for direct measurement in various liquids, without the need for a protective fitting. Versions with glass extension can be fabricated into laboratory RTDs.



Type designation

P	platinum resistance material to EN 60 751
G	glass style
L	long version with glass extension
1.	1 measurement winding
2.	2 measurement windings
17	diameter D in 0.1mm (1.7mm)
20	length L in mm (20mm)
.1	nominal value 100Ω at 0°C
.5	nominal value 500Ω at 0°C
.10	nominal value 1000Ω at 0°C

Temperature sensors in miniature version with 100Ω nominal value at 0°C

Type	Senser body		Connecting wire				Sales No.
	D	L	D1	L1	R_L	Material	
Tolerance class B ±(0.3 + 0.005 • |t|) oC, alpha = 3.850 • 10^{-3}°C^{-1}							
PG 1.0910.1	0.9	10	0.15	10	5	Pt-Ni	90/00063057
PG 1.1308.1	1.3	8	0.15	10	5	Pt-Ni	90/00063055
PG 1.1720.1	1.7	20	0.20	10	12	Pt-NiFe	90/00034067
PG 1.1810.1	1.8	10	0.20	10	12	Pt-NiFe	90/00043804
Tolerance class A ±(0.15 + 0.002 • |t|) oC, alpha = 3.850 • 10^{-3}°C^{-1}							
PG 1.0910.1	0.9	10	0.15	10	5	Pt-Ni	90/00063058
PG 1.1308.1	1.3	8	0.15	10	5	Pt-Ni	90/00063056
PG 1.1720.1	1.7	20	0.20	10	12	Pt-NiFe	90/00066020
PG 1.1810.1	1.8	10	0.20	10	12	Pt-NiFe	90/00088708

Note:

The specified nominal value refers to the standard length L1 of the connecting wires, with the measurement point 2mm from the open end of the wires. A change in wire length may lead to appreciable changes in resistance. R_L = longitudinal resistance of a single connecting wire at 0°C in mΩ/mm.

All dimension in mm.

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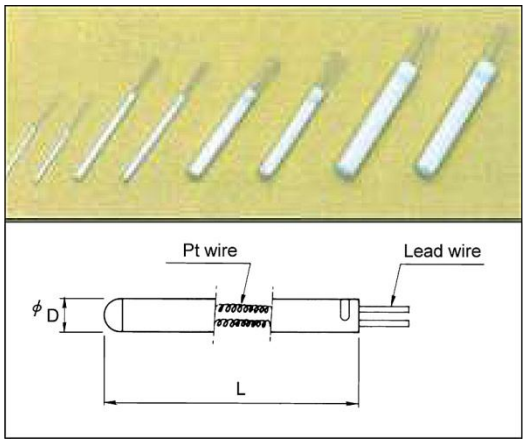
Platinum-ceramic temperature sensors to EN 60 751

- **For temperatures from -200 to +800°C**
- **As single or twin temperature sensor**
- **Standard nominal values and tolerances**
- **Excellent stability, even with fluctuating temperatures**
- **Highly resistant to temperature shock**

A ceramic tube has either two or four bores. A calibrated platinum coil with connecting wires is inserted into each of these bores. The bores are filled with alumina powder, to fix the coil and to improve heat transfer. After calibrated, the two ends of the ceramic tube are closed with a sealing material, which also secures the connecting wires. The internal construction of these temperature sensors prevents permanent resistance changes that may occur in other styles due to significant temperature fluctuations or shock-like temperature changes. In a dry atmosphere, ceramic temperature sensors can also be used without a protective fitting.



Type designation

P	platinum resistance material to EN 60 751
K	ceramic style
1.	1 measurement winding
2.	2 measurement windings
48	diameter D in 0.1mm (4.8 mm)
30	length L in mm (30mm)
.1	nominal value 100Ω at 0°C

Temperature sensors with 100Ω nominal value at 0°C

Type	Senser body		Connecting wire				Sales No.
	D	L	D1	L1	R_L	Material	
Tolerance class B ±(0.3 + 0.005 • |t|) oC, alpha = 3.850 • 10^{-3}°C^{-1}							
PK 1.0915.1	0.9	15	0.15	8	6	Pt	90/00038272
PK 1.1515.1	1.5	15	0.25	8	2	Pt	90/00038276
PK 1.1525.1	1.5	25	0.25	10	2	Pt	90/00038274
PK 1.2006.1	2.0	6	0.35	7	2	Pt	90/00038275
PK 1.2830.1	2.8	30	0.35	15	1	Pt	90/00038278
PK 1.2830.1	2.8	30	0.30	15	5	Pt-NiFe	90/00037986
PK 1.3830.1[1]	3.8	30	0.30	15	5	Pt-NiFe	90/00037987
PK 1.4830.1[1]	4.8	30	0.30	15	5	Pt-NiFe	90/00037988

Note:

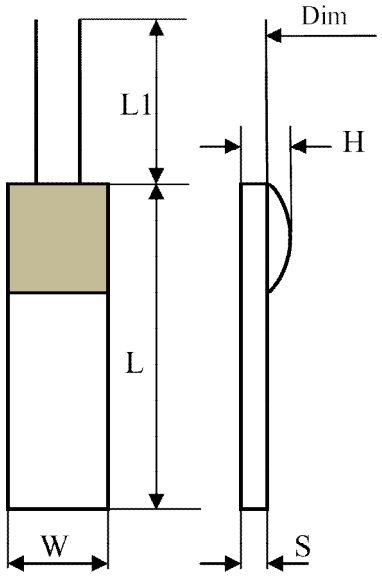
The specified nominal value refers to the standard length L1 of the connecting wires, with the measurement point 2mm from the open end of the wires. A change in wire length may lead to appreciable changes in resistance. R_L = longitudinal resistance of a single connecting wire at 0°C in mΩ/mm.

All dimension in mm.

Platinum-chip temperature sensors to EN 60 751

- **For temperatures from -50 to +600°C**
- **With nominal values of 100, 500 and 1000Ω**
- **Standard nominal values and tolerances**
- **Small sizes, from 2mm x 2.5mm**
- **Special selection available**

Small dimensions, fast response, high-resistance nominal values and considerable insensitivity to shock and vibration when fixed, as well as high measurement accuracy and long-term stability – these are advantages of this cost-effective style. Applications include many tasks in measurement and control engineering



Type designation

P	platinum resistance material to EN 60 751
C	chip style
A	connecting wire
1.	1 measurement winding
20	wide W in 0.1mm (2.0mm)
10	length L in mm (20mm)
.1	nominal value 100Ω at 0°C
.5	nominal value 500Ω at 0°C
.10	nominal value 1000Ω at 0°C
L	temperature range from -50 to +250°C
S	temperature range from -50 to +400°C
M	temperature range from -50 to +550°C
H	temperature range from -50 to +600°C

Temperature sensors up to 250°C with connecting wires and nominal value of 100, 500 and 1000Ω at 0°C

Type	Senser body				Connecting wire				Sales No.
	W	L	H	S	Dim.	L1	R_L	Material	
Tolerance class B ±(0.3 + 0.005 • |t|) oC, alpha = 3.850 • 10^{-3}°C^{-1}									
PCA 1.2003.1 L	2.0	2.5	1.3	0.6	Φ0.25	15	0.8	Ag/Pd	90/00047580
PCA 1.2005.1 L	2.0	5	1.3	0.6	0.2 x 0.3	10	0.3	Ag	90/00063260
PCA 1.2010.1 L	2.0	10	1.3	0.6	0.2 x 0.3	10	0.3	Ag	90/00044789
PCA 1.2005.5 L	2.0	5	1.3	0.6	0.2 x 0.3	10	0.3	Ag	90/00063261
PCA 1.2010.5 L	2.0	10	1.3	0.6	0.2 x 0.3	10	0.3	Ag	90/00048147
PCA 1.2010.10 L	2.0	10	1.3	0.6	0.2 x 0.3	10	0.3	Ag	90/00062565

Note:

The specified nominal value refers to the standard length L1 of the connecting wires, with the measurement point 2mm from the open end of the wires. A change in wire length may lead to appreciable changes in resistance. R_L = longitudinal resistance of a single connecting wire at 0°C in mΩ/mm.

All dimension in mm.

Characteristics and Standards

IEC 751-1986 (Amd. '95) BS EN60751-1996
DIN EN60751-1996

Nominal Resistance

Code	Resistance Value (Ωat 0℃)	Resistance Ratio R100/R0
Pt 100	100	1.3851
(JPt 100)	100	1.3916

R100 is resistance value at 100℃.
R0 is resistance value at 0℃.

Operating Temperature Range

Code	Application	Operating Temperature
L	low temperature	－200～＋100
M	medium temperature	0～350
H	high temperature	0～650*
S**	extra-high temperature	0～850

*This shall be 500℃for sheathed type RTD
**Not applicable for sheathed type RTD

Temperature Tolerance

Measuring Temp.(℃)		－200	±0.35	0	100	200	300	400	500	600	700
Tolerance (℃)	Class A	±0.55	±0.8	±0.15	±0.35	±0.55	±0.75	±0.95	±1.15	±1.35	±1.45
	Class B	±1.3	－100	±0.3	±0.8	±1.3	±1.8	±2.3	±2.8	±3.3	±3.6

Class and Rated Current

Code	Class	Tolerance(℃)	Rated Current(mA)
Pt 100 (JPt 100)	A	±(0.15＋0.002|t|)	0.5, 1, 2
	B	±(0.3 ＋0.005|t|)	0.5, 1, 2, (5)

|t| means the measurement temperature expressed by a temperature (℃) unrelated to signs ＋, －

Temperature/Resistance Table

Std. ℃	Pt100	JPt100	Std. ℃	Pt100	JPt100	Std. ℃	Pt100	JPt100	Std ℃	Pt100	JPt100	Std. ℃	Pt100
－200	18.52	17.14	0	100	100	200	175.86	177.13	400	247.09	249.56	600	313.71
－190	22.83	21.46	10	103.9	103.97	210	179.53	180.86	410	250.53	253.06	610	316.92
－180	27.1	25.8	20	107.79	107.93	220	183.19	184.58	420	253.96	256.55	620	320.12
－170	31.34	30.12	30	111.67	111.88	230	186.84	188.29	430	257.38	260.02	630	323.3
－160	35.54	34.42	40	115.54	115.81	240	190.47	191.99	440	260.78	263.49	640	326.48
－150	39.72	38.68	50	119.4	119.73	250	194.1	195.67	450	264.18	266.94	650	329.64
－140	43.88	42.91	60	123.24	123.64	260	197.71	199.35	460	267.56	270.38	660	332.79
－130	48	47.11	70	127.08	127.54	270	201.31	203.01	470	270.93	273.8		
－120	52.11	51.29	80	130.9	131.42	280	204.9	206.66	480	274.29	277.22		
－110	56.19	55.44	90	134.71	135.3	290	208.48	210.3	490	277.64	280.63		
－100	60.26	59.57	100	138.51	139.16	300	212.05	213.93	500	280.98	284.02		
－90	64.3	63.68	110	142.29	143.01	310	215.61	217.54	510	284.3	287.4		
－80	68.33	67.77	120	146.07	146.85	320	219.15	221.15	520	287.62			
－70	72.33	71.85	130	149.83	150.67	330	222.68	224.74	530	290.92			
－60	76.33	75.91	140	153.58	154.49	340	226.21	228.32	540	294.21			
－50	80.31	79.96	150	157.33	158.29	350	229.72	231.89	550	297.49			
－40	84.27	83.99	160	161.05	162.08	360	233.21	235.45	560	300.75			
－30	88.22	88.01	170	164.77	165.86	370	236.7	238.99	570	304.01			
－20	92.16	92.02	180	168.48	169.63	380	240.18	242.53	580	307.25			
－10	96.09	96.02	190	172.17	173.38	390	243.64	246.05	590	310.49			

Properties of lnsulating Tubes

Material	Code	Operating Te mp.	Operating Te mp.	Properties
Ceramic 1	PS1	1400℃	1600℃	Highest insulation among insulation materials. Solid.
Te fl o n	FEP	180℃	200℃	Excellent resistance to heat, chemicals, etc. Flexible.
Polyimid	PM	220℃	-	Characteristics similar to FEP but tougher and thin-wall thickness.

Properties of Metal Protection Tubes

Material	Code	Operating Temp.	Properties
Copper	CU	250℃	Good heat conductivity and excellent corrosion-resistance.
Brass	BS	Oxidizing400℃Reducing 150℃	Similar to Copper and good workability.
304S. S.	304	980℃	High resistance to heat and corrosion.
316S. S.	316	980℃	Excellent resistance to heat, acids and alkalis.
316L.S. S.	316L	980℃	Excellent resistance to grain boundary corrosion.
Titanium	TI	Oxidizing250℃Reducing1000℃	Excellent resistance to corrosion at low temp. but easily oxidized
Monel	MN	Oxidizing500℃Reducing 600℃	Excellent resistance to heat, high pressure and corrosion.

Other special tubes are also available. Operating and maximum temperatures vary depending on atmosheres

Standard Dimensions of Protection Tubes

	Regular Type single			Regular Type double			Shock Proof Type single			Regular Type double			○＝Available
Material / size(mm)	304	316	316L	304	316	316L	304	316	316L	304	316	316L	Remarks
7 × 5	○												
8 × 6	○	○											
9 × 7	○			○									
10 × 8	○	○	○	○	○	○	○	○	○				
11 × 9	○			○			○			○			
12 × 9	○	○	○	○	○	○	○	○	○	○	○	○	
13 × 9	○			○			○			○			
13.8×9.4	○	○	○	○	○	○	○	○	○	○	○	○	8A SCH.40
15 × 11	○	○	○	○	○	○	○	○	○	○	○	○	
16 × 12	○			○			○			○			
17.3×12.7	○	○	○	○	○	○	○	○	○	○	○	○	10A SCH.40
20 × 16	○			○			○			○			
21.7×16.1	○	○	○	○	○	○	○	○	○	○	○	○	15A SCH.40

Corrosion Resistant Lining & Coating

Coating Material	Thickness (mm)	Structure	Max Oper. Te mp.	Characteristics
Glass-lining	1～1.2	Steel＋Glass	450℃	Good protection against oxidation and gas penetration but poor thermal shock resistance.
Teflon(FEP)coating	0.3	Metal＋FEP	120℃	Suitable in concentrated 2HCl, H2SO4and HNO3and most of chemicals but depending on temperature conditions.

For Abrasion Resistance..... Stellite, Colmonoy, Tungstenand other materials can be processed to improve abrasion resistance of metal protection tubes. For further details, please consult factory.

Types and Codes

Nominal Resistance (at 0°C)	Code
Pt 100Ω	100
JPt 100Ω	J100

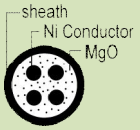
Number of Element	Code
1 (single)	S
2 (double)	D

Lead Connection	Code
3 wires	X
4 wires	Y

Rated Current	Code
0.5 mA	005
1 mA	01
2 mA	02
5 mA*	05

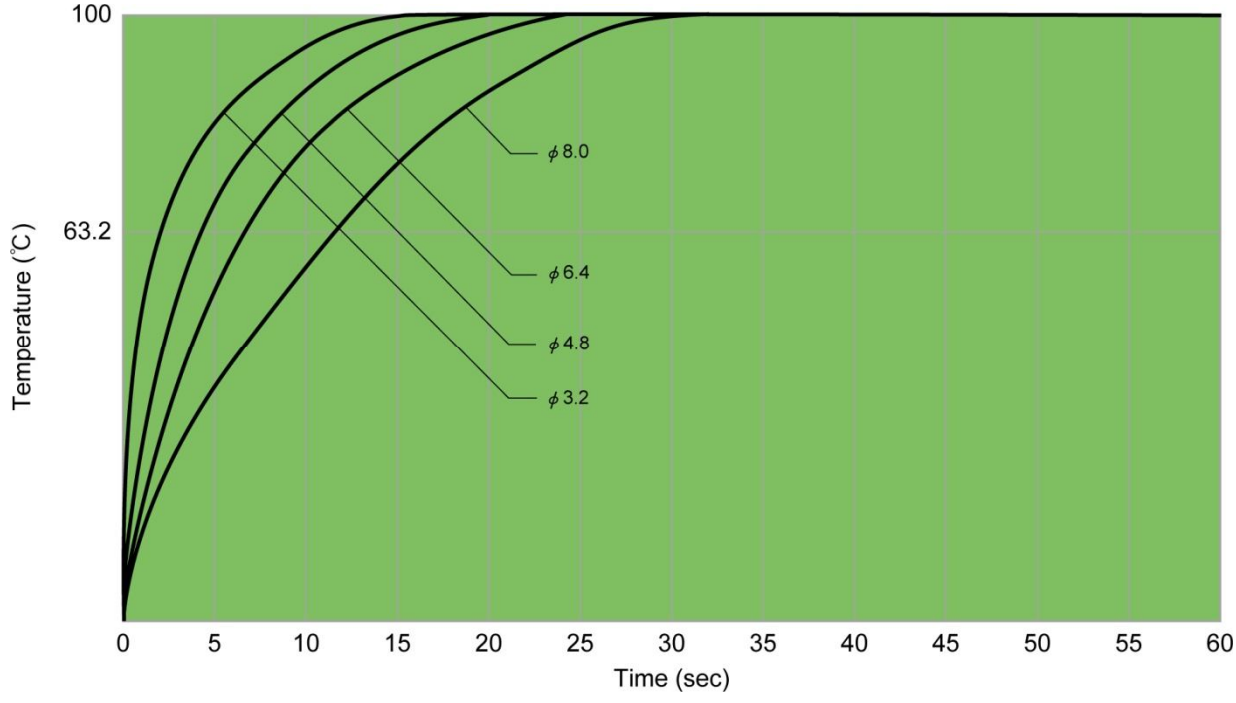
* 5 mA for JPt100

Sheathed Leads

	Sheath O. D. (mm)	Conductor Dia. (mm)	Lead Resistance (Ω/m at 20°C)	Sheath Wall(mm)	Sheath Material	Max Length (m)
	3.2	0.33	1.106	0.3	316 SS	150
	4.8	0.51	0.467	0.43	316 SS	60
	6.4	0.66	0.276	0.58	316 SS	30
	8	0.81	0.177	0.74	316 SS	15
	4.8	0.51	0.467	0.43	316 SS	60
	6.4	0.66	0.276	0.58	316 SS	30
	8	0.81	0.177	0.74	316 SS	15

Response Time

The“τ”Constants (63.2%) when RSI ® is immersed into 100℃(boiling water) from 0℃(ice bath).
φ3.2 less than sec. 2
φ4.8 less than sec. 4
φ6.4 less than sec. 6
φ8.0 less than sec. 11



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Chemical Resistance of Protection Tube Material

Corrosives	Concentration	Temp. (℃)	304SS	321SS	316SS	316LSS	316J1LSS	310S SS	347SS	Carpenter 20	Inconel 600	Nimonic	Hastelloy B	Hastelloy C-276	Hastelloy X	Titanium	Monel	Tantalum	Teflon	Copper	Zirconium	Nickel	PVC	Cupro-nickel	Aluminium	Brass	Lead	Common steel	50Co-30Cr	Haynes alloy 25
H_2SO_4	5%	30	B	B	B	B	B	B	B	A	B	B	A	A	One of the Hastelloy series and excellent in heat resistance.	B	B	A	A	B	A	B	A	B	C	C	A	C	Cobalt-base alloy and excellent in heat and abrasion resistance.	A
	〃	B.P	C	C	C	C	C	C	C	B	C	C	A	B		C	C	A		C	A	C		C	C	C	A	C		B
	10%	30	B	B	B	B	B	B	B	A	B	B	A	A		B	B	A	A	B		B	A	B	C	C	A	C		A
	〃	B.P	C	C	C	C	C	C	C	A	C	C	A	B		C	C	A		C		B		C	C	C	A	C		B
	50%	30	C	C	C	C	C	C	C	A	B	B	A	A		B	B	A	A	B		B	A	B	C	C	A	C		A
	〃	B.P	C	C	C	C	C	C	C	A	C	C	A	B		C	C	A		C		B		C	C	C	B	C		B
	90%	30	B	B	B	B	B	B	B	A	B	B	A	A		B	B	A	A	B	B	B	A	B	C	C	A	C		A
	〃	B.P	C	C	C	C	C	C	C	A	C	C	A			C	C	A		C	B	B		C	C	C	B	C		B
2HCl	5%	30	C	C	C	C	C	C	C	B	B	B	A	A		A	B	A	A	B	B		A	C	C	C	B	C		B
	〃	B.P	C	C	C	C	C	C	C	C	B	B	A	A		B	B	A						C	C	C	B	C		C
	10%	30	C	C	C	C	C	C	C	B	B	B	A	A		A	B	A	A	B	B		A	C	C	C	B	C		B
	〃	B.P	C	C	C	C	C	C	C	C	B	B	A	A		B	B	A						C	C	C	B	C		C
	20%	30	C	C	C	C	C	C	C	B	B	B	A	A		A	B	A	A	B	B		A	C	C	C	B	C		B
	〃	B.P	C	C	C	C	C	C	C	C	B	B	A	A		B	B	A						C	C	C	B	C		C
HNO_3	20%	30	A	A	A	A	A	A	A	A	A	A	C	A		A	C	A	B	C		C	B	C	B	C	C	C		B
	〃	B.P	A	A	A	A	A	A	A	A	A	A	C	A		A	C	A		C		C		C	C	C	C	C		C
	40%	30	A	A	A	A	A	A	A	A	A	A	C	A		A	C	A	A	C		C	B	C	B	C	C	C		B
	〃	B.P	A	A	A	A	A	A	A	A	A	A	C	A		A	C	A		C		C		C	C	C	C	C		C
	75%	30	A	A	A	A	A	A	A	A	A	A	C	A		A	C	A	A	C		C	B	C	B	C	C	C		B
	〃	B.P	A	A	A	A	A	A	A	A	A	A	C	A		A	C	A		C		C		C	C	C	C	C		C
CH_3CO_2H	10%	30	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	B	A	B	A	B	A	B	B	C		A
	〃	B.P	A	A	A	A	A	A	A	A	A	A	A	A		A	B	A	A	B	A	B		B	B	B	B	C		A
	50%	30	A	A	A	A	A	A	A	A	A	A	A	A		A	B	A	A	B	A	B	A	B	A	B	B	C		A
	〃	B.P	B	A	A	A	A	A	A	A	B	A	A	A		A	B	A	A	B	A	B		B	B	C	B	C		A
	80%	30	B	A	A	A	A	A	A	A	B	A	A	A		A	B	A	A	B	A	B	A	B	A	C	B	C		A
	〃	B.P	B	A	A	A	A	A	A	A	B	A	A	A		A	B	A	A	B	A	B		B	B	C	B	C		A
H_3PO_4	5%	30	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	B	A	B	A	B	C	C	B	A		A
	〃	B.P	B	B	A	A	A	A	A	A	B	A	A	A		A	A	A	A	B	A	B		B	C	C	B	A		A
	50%	30	B	B	B	B	B	B	B	A	A	A	A	A		A	A	A	A	B	A	B	A	B	C	C	B	A		A
	〃	B.P	B	B	B	B	B	B	B	A	B	B	A	A		A	B	A	A	B	A	B		C	C	C	B	A		B
	85%	30	B	B	B	B	B	B	B	A	B	B	A	A		A	A	A	A	B	A	B	A	B	C	C	B	A		B
	〃	B.P	B	B	B	B	B	B	B	A	B	B	A	A		A	B	A	A	B	A	B		C	C	C	B	A		B
H_2F_2	30%	30	C	C	C	C	C	C	C	C	A		A	A		C	A			A		A	A	C	C	B	B	C		C
	〃	B.P	C	C	C	C	C	C	C	C	B		C	C		C	B			C		C		C	C	C	B	C		C
	70%	B.P	C	C	C	C	C	C	C	C	B		C	C		C	B			C		C		C	C	C	C	C		C
HCl		30	B	B	B	B	B	B	B	B	B	B	A	A					A		A								A		A
		200	B	B	B	B	B	B	B	B	B	B	A	A					A		A								A		A
		400	B	B	B	B	B	B	B	B	B	B	A	A							A								A		B
NaOH	10%	30	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	B	A	A	A	A	B	B	B	B			
	〃	B.P	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A		B	A	A		A	B	B	B	B			
	50%	30	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	B	A	A	A	A	B	B	B	B			
	〃	B.P	B	B	B	B	B	B	B	A	A	A	A	A		A	A	A		B	A	A		B	B	B	B	B			
	70%	30	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	B	A	A	A	B	B	B	B	B			
	〃	B.P	B	B	B	B	B	B	B	A	A	A	A	A		A	A	A		B	A	A		B	B	B	B	B			
KOH	25%	B.P	A	A	A	A	A	A	A	A	A	A	A	A		C	A	C		C	A	B		B	C	C	B	B			
	50%	B.P	B	B	B	B	B	B	B	A	A	A	A	A		C	A	C		C	A	B		B	C	C	B	B			
HCl (dry)		30	C	C	C	C	C	C	C	A			A	A		A	A		A	A				A	A	C	B	C		A
〃 (wet)		30	C	C	C	C	C	C	C	C			C	C		A	A		A	C				C	C	C	B	C		A
HCl vapor			C	C	C	C	C	C	C	B									A						C	C	B	C		
HF			C	C	C	C	C	C	C	A	C						B	C	A			B	A	C	C	C	B	C		C
H_2 (SiF_6)	5%	20	C	C	C	C	C	C	C	A	A		A	A			B	C	A			C	A	C	C	C	B	C		
F	10%	30	C	C	C	C	C	C	C	A	A		A	A			B	C	A			C	A	C	C	C	B	C		
NaOH	10%	B.P	B	A	A	A	A	A	A	A									A					A	C	C	B	C		
	75%	100	B	A	A	A	A	A	A	A									A					A	C	C	B	C		
CO_2	10%	200	A	A	A	A	A	A	A	A			A	A			A	A	A											
SO_2			A	A	A	A	A	A	A	A						A	A	A	A			A		A		C		C		
$Na_5P_3O^{10}$	10%	30	B	B	B	B	B	B	B	B	C	C	C	A			C			C	B	C	C					C		
CHCl		30	C	C	C	C	C	C	C							C				C				B	C	C		C		
AlF_3	50%	30	B		B												B			A		B		A	C					
Fatty Acids		100	A	A	A	A	A	A	A	A	A		A	A		A	A	A				A		A						
NH_3			A	A	A	A	A	A	A	A									A											
NaCl			A	A	A	A	A	A	A	A	A									B		A		A	C	B		B		
CrO_4										A									A											
H_2O_4			A	A	A	A	A	A	A	A	A		A	A		A	A	A													
S (liguid)			A	A	A	A	A	A	A	A	A					A	A		A						A					
$CaCl_2$			A	A	A	A	A	A	A	A	A		A	A		A	A		A	B		A	A	A		B		B		

Note: A = Almost no corrosion in critical conditions. B = Small corrosion but permissible in general use other than specific parts.
C = Heavy corrosion and unsuitable.

Order code | DK-XXXX | - | 1 | - | 2 | - | 3 | - | 4 | - | 5 |

MODEL

1. ELEMENT TYPE

☐ **PT**

2. PROTECTION TUBE DIA. (mm)

☐ **3.2** ☐ **4** ☐ **4.8** ☐ **6.4**

☐ **4.8** ☐ **6.4** ☐ **8** ☐ **Others**

3. LENGTH (mm)

☐ **20** ☐ **30** ☐ **40** ☐ **50**

☐ **100** ☐ **150** ☐ **200** ☐ **Others**

4. THREAD

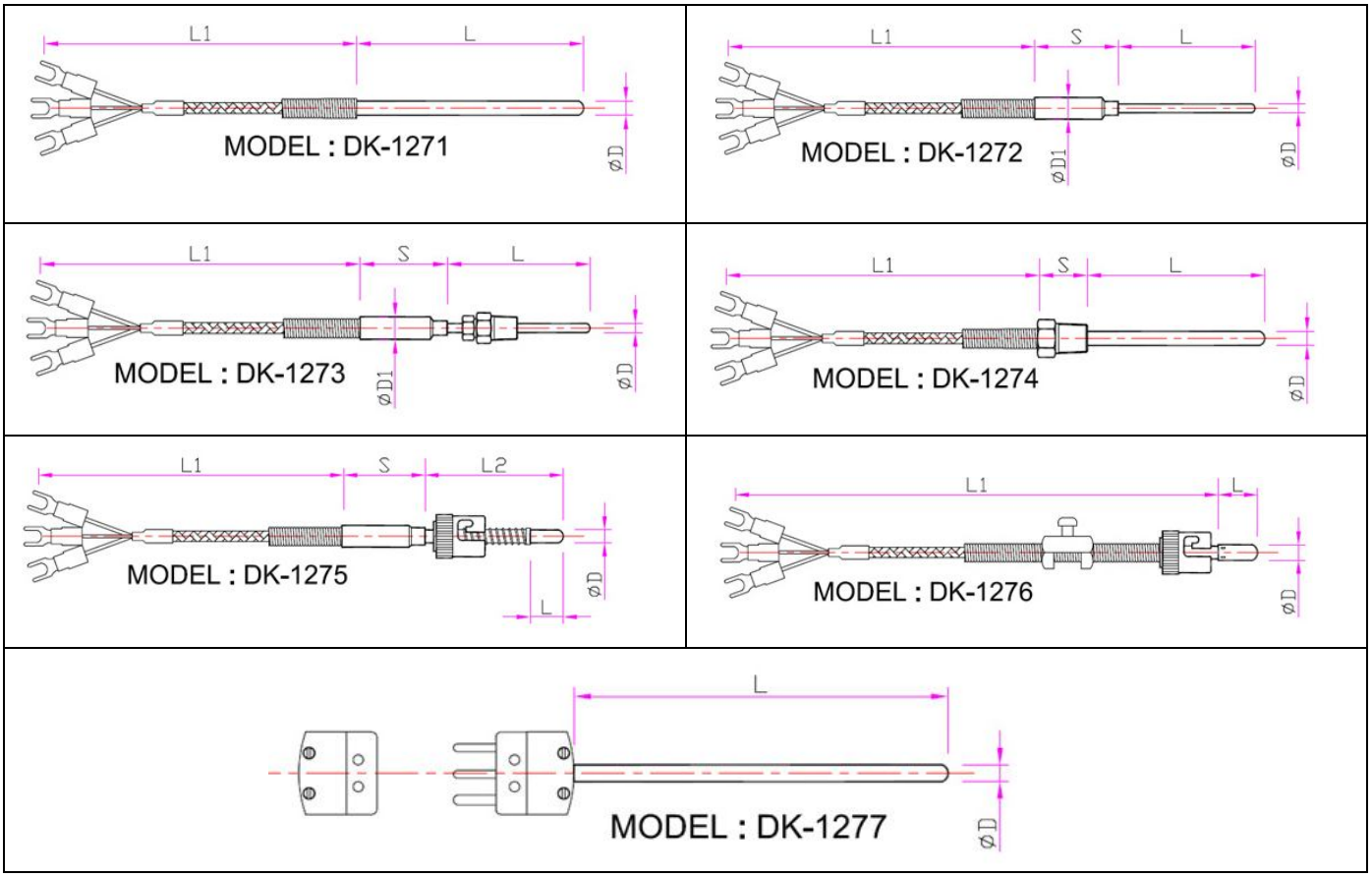
☐ **1/4** ☐ **1/8** ☐ **__**

☐ **3/8** ☐ **1/2** ☐ **Others**

5. CABLE (mm)

☐ **2000**

MODEL:



Order code | DK-XXXX | - | BDM | - | 1 | - | 2 | - | 3 | - | 4 | - | 5 |

MODEL

1. ELEMENT TYPE

☐ **PT** ☐ **PTx2**

☐ **PT50**

2. PROTECTION TUBE DIA. (mm)

☐ **3.2** ☐ **4** ☐ **6.4** ☐ **8**

☐ **10** ☐ **12** ☐ **15.8** ☐ **Others**

3. LENGTH (mm)

☐ **50** ☐ **100** ☐ **150** ☐ **200**

☐ **300** ☐ **400** ☐ **500** ☐ **Others**

4. THREAD

☐ **3/8** ☐ **1/2** ☐ **Others**

5. PROTECTION TUBE MAT'L

☐ **304 (default)** ☐ **316S** ☐ **316L**

MODEL: