# TEMPERATURE SENSORS



Sensys 주식회사 센서시스템기술
SENSOR SYSTEM TECHNOLOGY CO., LTD

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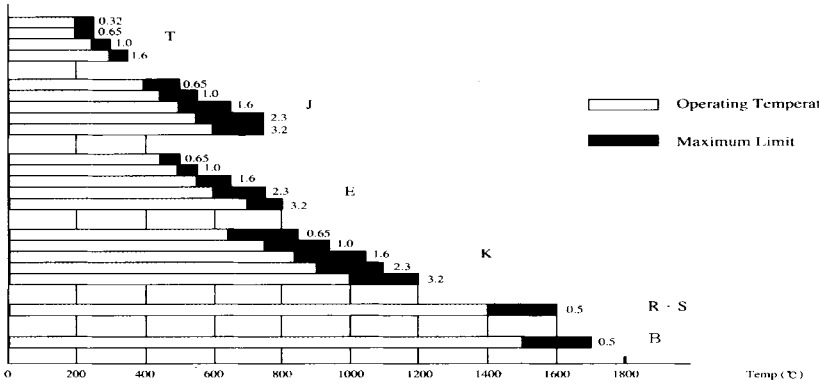
# Model TC

*Thermocouple*

## Operating and Maximum Temperature Limits




| Type | Old JIS Type | Wire Dia. (mm) | Operating Temp. Limit(℃) (1) | Maximum Limit (℃) (2) |
|---|---|---|---|---|
| **B** | — | 0.50 | 1,500 | 1,700 |
| **R** | **PR** | 0.50 | 1,400 | 1,600 |
| **S** | — | | | |
| **K** | **CA** | 0.65 | 650 | 850 |
| | | 1.00 | 750 | 950 |
| | | 1.60 | 850 | 1,050 |
| | | 2.30 | 900 | 1,100 |
| | | 3.20 | 1,000 | 1,200 |
| **E** | **CRC** | 0.65 | 450 | 500 |
| | | 1.00 | 500 | 550 |
| | | 1.60 | 550 | 650 |
| | | 2.30 | 600 | 750 |
| | | 3.20 | 700 | 800 |
| **J** | **IC** | 0.65 | 400 | 500 |
| | | 1.00 | 450 | 550 |
| | | 1.60 | 500 | 650 |
| | | 2.30 | 550 | 750 |
| | | 3.20 | 600 | 750 |
| **T** | **CC** | 0.32 | 200 | 250 |
| | | 0.65 | 200 | 250 |
| | | 1.00 | 250 | 300 |
| | | 1.60 | 300 | 350 |

Note : (1) Operating temperature limits means the upper temp. where thermocouple can be used continuously in air.
(2) Maximum limits means the upper temp. where thermocouple can be used temporarily owing the inventable circumstances.

| Code | No. of Conductors |
|---|---|
| S | Single pair, 2 conductors |
| D | Dual pair, 4 conductors |
| T | Triple pair, 6 conductors |

## Tolerance for temperature Reading

Ref : JIS C 1602-1981

| Type | Old JIS Type | Temperature Range | Class | Tolerance * |
|---|---|---|---|---|
| B | — | 600℃ ~ 1,700℃ | 0.5 | ±4℃ or ±0.5% of Reading |
| R | | 0℃ ~ 1,600℃ | 0.25 | ±1.5℃ or ±0.25% of Reading |
| S | | | | |
| K | CA | 0℃ ~ 1,000℃ | 0.4 | ±1.5℃ or ±0.4% of Reading |
| | | 0℃ ~ 1,200℃ | 0.75 | ±2.5℃ or ±1.5% of Reading |
| | | -200℃ ~ 0℃ | 1.5 | ±2.5℃ or ±0.75% of Reading |
| E | CRC | 0℃ ~ 800℃ | 0.4 | ±1.5℃ or ±0.4% of Reading |
| | | 0℃ ~ 800℃ | 0.75 | ±2.5℃ or ±0.75% of Reading |
| | | -200℃ ~ 0℃ | 1.5 | ±2.5℃ or ±1.5% of Reading |
| J | IC | 0℃ ~ 750℃ | 0.4 | ±1.5% or ±0.4% of Reading |
| | | 0℃ ~ 750℃ | 0.75 | ±2.5℃ or ±0.75% of Reading |
| T | CC | 0℃ ~ 350℃ | 0.4 | ±0.5℃ or ±0.4% of Reading |
| | | 0℃ ~ 350℃ | 0.75 | ±1℃ or ±0.75% of Reading |
| | | -200℃ ~ 0℃ | 1.5 | ±1℃ or ±1.5% of Reading |

Note : (*)Tolerance means maximum allowable limit calculated by deducting the temperature at hot junction from the temperature value converted from EMF Table. The tolerance shall be expressed in either ℃ or % whichever larger.

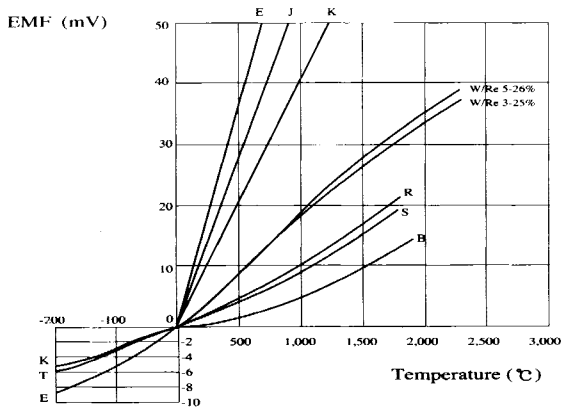
## Typical Resistance of Standard Thermocouples

Ref : JIS C 1602-1981
Unit : Ω /m

| Type / Wire Dia(mm) / Old JIS Type | B | R | S | K | E | J | T |
|---|---|---|---|---|---|---|---|
| | — | PR | — | CA | CRC | IC | CC |
| 0.32 | — | — | — | — | — | — | 6.17 |
| 0.50 | 1.75 | 1.47 | 1.43 | — | — | — | — |
| 0.65 | — | — | — | 2.95 | 3.56 | 1.70 | 1.50 |
| 1.00 | — | — | — | 1.25 | 1.50 | 0.72 | 0.63 |
| 1.60 | — | — | — | 0.49 | 0.59 | 0.28 | 0.25 |
| 2.30 | — | — | — | 0.24 | 0.28 | 0.14 | — |
| 3.20 | — | — | — | 0.12 | 0.15 | 0.07 | — |

Note : Resistance at 0℃(Ro) measured between (+) and (-) legs.

## EMF Chart for Typical Thermocouples




## Combination of Thermoelement Wire

Ref : JIS C 1602-1981

| Type | Old JIS Type | Combination of Element Wires | |
|---|---|---|---|
| | | Positive (+)Leg | Negative (−)Leg |
| B | | Platinum · 30%Rhodium | Platinum · 6%Rhodium |
| R | PR* | Platinum · 13%Rhodium | Platinum |
| S | | Platinum · 10%Rhodium | Platinum |
| K | CA | Chromel** | Alumel** |
| E | CRC | Chromel** | Constantan |
| J | IC | Iron | Constantan |
| T | CC | Copper | Constantan |

Note:(*)Old type PR does not correspond to the present type R because of different content of Rhodium in positive (+) leg.
** Chromel and Alumel are the registered trade marks by Hoskins Mfg, Co., U. S. A.

# Insulating Tubes

## ▶Characteristics

Temperature : ℃

| Type | Code | Operat Temp. | Maximum Temp. | Features |
|---|---|---|---|---|
| Ceramic Grade 2 | PS2 | 1,400 | 1,500 | Gas tight structure with less heat load softening and good resistance to thermal shock. |
| Ceramic Grade 1 | PS1 | 1,500 | 1,600 | Gas tight structure with less heat load softening. Better than PS-2. |
| Recrystallized Alumina | PS0 | 1,600 | 1,800 | Gas tight structure with excellent resistance to corrosion. Highest purity among alumina ceramics. |
| Magnesia Ceramic | MG | 1,800 | 2,200 | Porous structure but excellent resistance to corrosion. |

Note : Operating and maximum temperatures vary depending on the atmospheres.

## ▶Dimensions

Unit : mm

| Model | Code | Nom.O.D. | Nom.I.D. | Length | T/C wire | Material |
|---|---|---|---|---|---|---|
|  Round 1 bore | SH-1 | 1 | 0.4 | 100 | 0.3 | PS1 |
| | SH-2 | 2 | 1 | 100 | 0.5 0.65 | PS1 PS0 |
| | SH-3 | 3 | 2 | 100 | 1.0 1.6 | PS1 |
| | SH-5 | 5 | 3 | 100 | 2.3 | PS1 |
| | SH-6 | 6 | 4 | 100 | 3.2 | PS1 |
|  Round 2 bores | DH-3 | 3 | 0.8 | 100 | 0.5 | PS1 PS0 |
| | DH-4 | 4 | 1 | 100 | 0.5 0.65 | PS1 PS0 |
| | DH-6 | 6 | 1.5 | 100 | 0.65 1.0 | PS2 |
| | DH-8 | 8 | 2 | 100 | 0.65 1.0 1.6 | PS2 |
|  Round 3 bores | TH-4 | 4 | 1 | 100 | 0.5 0.65 | PS1 PS0 |
| | TH-6 | 6 | 1.5 | 100 | 0.65 1.0 | PS1 |
|  Round 4 bores | QH-3 | 3 | 0.8 | 100 | 0.5 | PS1 |
| | QH-8 | 8 | 2 | 100 | 0.65 1.0 1.6 | PS2 |
| | QH-12 | 12 | 3 | 50 | 1.0 1.6 2.3 | PS2 |
| | QH-14 | 14 | 4 | 50 | 2.3 3.2 | PS2 |
|  Round 6 bores | HH-6 | 6 | 1 | 100 | 0.5 0.65 | PS2 |
|  Oval 2 bores | DE-10 | 10×7.5 | 3 | 34 | 1.0 1.6 2.3 | PS1 PS0 |
| | DE-12 | 12×7.5 | 4 | 34 | 2.3 3.2 | PS1 |

Note : Insulaters are available in longer length up to 2,000mm. Consult factory.

# Protection Tubes

## ▶ Metallic Protection Tubes

| Material | Operating Temp. (℃) | Maximum Temp. (℃) |
|---|---|---|
| Plain Steel | 800 | 900 |
| 304 S.S. | 900 | 1,000 |
| 304LS.S. | 900 | 1,000 |
| 321 S.S. | 900 | 1,000 |
| 316 S.S. | 900 | 1,000 |
| 316LS.S. | 900 | 1,000 |
| 310S S.S. | 950 | 1,050 |
| 347 S.S. | 900 | 1,000 |
| 446 S.S. | 1,050 | 1,125 |
| 50Co-30Cr | 1,100 | 1,200 |
| Inconel 600 | 1,180 | 1,250 |
| Incoloy 800 | 870 | 1,000 |
| Kanthal Al | Oxi. 1,000<br>Red. 1,000 | —<br>— |
| 80Ni · 20Cr | 1,100 | 1,250 |
| Kurimax * | 1,200 | 1,400 |
| Hastelloy B | 800 | 1,100 |
| Hastelloy C | 1,000 | 1,100 |
| Hastelloy X | 1,175 | 1,260 |
| Haynes Alloy 25 | 980 | 1,100 |
| Titanium | Oxi. 250<br>Red. 1,000 | —<br>— |
| Monel | 500 | 600 |
| Tantalum | Oxi. 300<br>Red. 2,200 | —<br>— |

## ▶ Non-Metallic Protection Tubes

| Material | Code No. | Operating Temp.(℃) | Maximum Temp.(℃) |
|---|---|---|---|
| Translucent Quartz Transparent Quartz | QT | 1,000 | 1,100 |
| Mullite | PT 2 | 1,400 | 1,500 |
| | PT 1 | 1,500 | 1,600 |
| Recrystal-lized Alumina | PTO | 1,600 | 1,800 |
| Cermet (Chrome-Alumina) | LT-1 | 1,300 | 1,400 |
| Cermet (Cermo-therm) | 2040 | 1,600 | 2,200 |
| Recrystallized Silicon Carbide | Y 1 SiC | 1,650 | —— |
| Self-bonded Silicon Carbide | Y 2 SiC | 1,650 | 2,300 |
| Clay-bonded Silicon Carbide | Y 3 SiC | 1,500 | 1,700 |
| Nitride Bonded Silicon Carbide | Y 4 SiC | 1,550 | 1,750 |
| Zirconia | ZR 1706 | 1,900 | 2,400 |

Note : Operating and maximum temperatures vary depending on the atmospheres.
Other special protection tubes are also available upon repuest.

# Standard Dimension of Protection Tubes

## ▶ Metallic Tubes

Unit : mm

| Material | Nominal O.D. | Nominal I.D. | Length |
|---|---|---|---|
| 304 S.S.<br>316 S.S.<br>310 S.S.<br>446 S.S.<br>50Co-30Cr<br>Inconel 600<br>80Ni 20Cr | 10 | 8 | 500 ~ 1,000 |
| | ※13.8 | | 500 ~ 1,500 |
| | 15 | 11 | 500 ~ 1,500 |
| | ※17.3 | | 500 ~ 4,000 |
| | 22 | 16 | 500 ~ 4,000 |
| | 27 | 21 | 500 ~ 4,000 |

Note : *Scheduled tubes.
Only 22mm and 27mm O.D. tubes are available for 446 S. S., 50C0~30Cr, Inconel 600 and 80Ni 20Cr.

## ▶ Non-Metallic Tubes

Unit : mm

| Material | Nominal O.D. | Nominal I.D. | Length |
|---|---|---|---|
| PT1<br>PT2 | 6 | 4 | 150 ~ 1,400 |
| | 8 | 5 | 300 ~ 3,000 |
| | 10 | 6 | 300 ~ 3,000 |
| | 13 | 9 | 500 ~ 3,000 |
| | 15 | 11 | 500 ~ 3,000 |
| | 17 | 13 | 500 ~ 3,000 |
| | 21 | 16 | 500 ~ 3,000 |
| | 25 | 20 | 500 ~ 3,000 |
| PT0<br>(Alumina coated type also available) | 6 | 4 | 300 ~ 1,400 |
| | 8 | 5 | 300 ~ 3,000 |
| | 10 | 6 | 300 ~ 3,000 |
| | 13 | 9 | 500 ~ 3,000 |
| | 15 | 10 | 500 ~ 3,000 |
| | 17 | 12 | 500 ~ 3,000 |
| | 21 | 16 | 500 ~ 3,000 |
| | 25 | 20 | 500 ~ 3,000 |

| Material | Nominal O.D. | Nominal I.D. | Length |
|---|---|---|---|
| Q T | 7 | 5 | 100 |
| | 7 | 5 | 120 |
| | 10 | 8 | 60 |
| LT-1 | 22 | 15 | 500 ~ 900 |
| Y1 SiC | 25 | 17 | 1,000 ~ 1,400 |
| | 30 | 15 | 1,000 ~ 1,700 |
| | 35 | 25 | 1,000 ~ 1,800 |
| Y2 SiC | 25 | 12 | 150 ~ 900 |
| Y3 SiC | 40 | 20 | 400 ~ 1,000 |
| Y4 SiC | 40 | 20 | 400 ~ 1,000 |

## ▶ Surface Coatings

### For Corrosion Resistance

| Treatment | Thickness (mm) | Composition | Maximum Temp.(℃) | Features |
|---|---|---|---|---|
| Glass Lining | 1 ~1.2 | Borosilicate glass over common steel | 450 | Suitable for protection against oxidation and gas peneration. Poor thermal shock resistance. |
| Teflon | 0.1~0.7 | FEP over metals | 250 | Usable in concentrated hydrochloric, sulphuric and nitric acids depending on temperatures. |

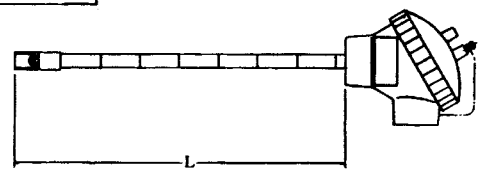
### For Abrasion Resistance

For metallic protection tubes, coatings or linings with **Stellive, Colmonoy, Tungsten** or other abrasion resistant materials are also available. When ordering, please consult us.

# Standard Models of TC Assembly

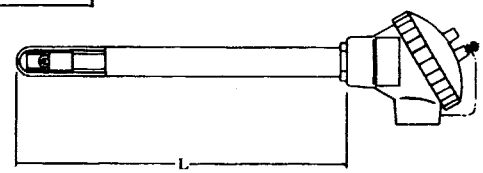
Unit : mm

## TC-01 Basic Type with Bead Insulators




Order Code : TC-01 — K | S | 32 — L — KN
Model No. | Type | No. of Conductors | Dia. | Total Length | Terminal box

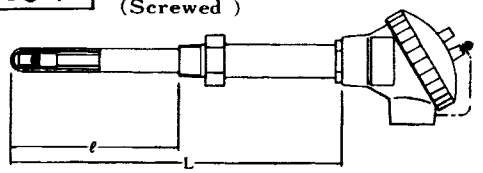
## TC-02 Metallic Protection Tube Type




Order Code : TC-02 — K | D | 32 — L — KN —
Model No. | Type | No. of Conductors | Dia. | Total Length | Terminal box

22×16 / 304
Prot. Tube Dim. | Material

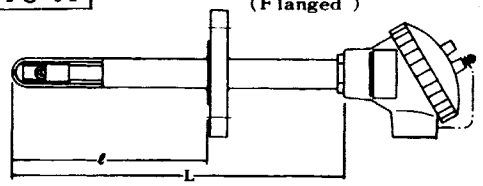
## TC-03 Metallic Protection Tube Type (Screwed )




Order Code : TC-03 — K | S | 16 — L / ℓ — KN —
Model No. | Type | No. of Conductors | Dia. | Total Length | Insertion Length | Terminal box

15×11 / 304 + PT½ / 304
Prot. Tube Dim. | Material | Thread | Material

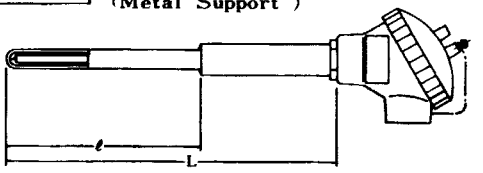
## TC-04 Metallic Protection Tube Type (Flanged )




Order Code : TC-04 — K | D | 32 — L / ℓ — KN —
Model No. | Type | No. of Conductors | Dia. | Total Length | Insertion Length | Terminal box

22×16 / 304 + JIS10K25ARF / 304
Prot. Tube Dim. | Material | Flange Rating | Material

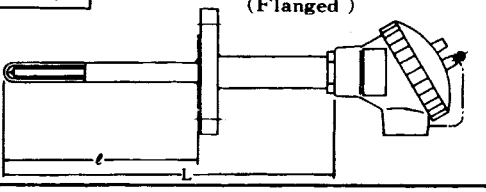
## TC-05 Ceramic Protection Tube Type (Metal Support )




Order Code : TC-05 — R | S | 05 — L / ℓ — KN —
Model No. | Type | No. of Conductors | Dia. | Total Length | Insertion Length | Terminal box

15×10 / PTO — 22 / 304
Prot. Tube Dim. | Material | Support Dia. | Material

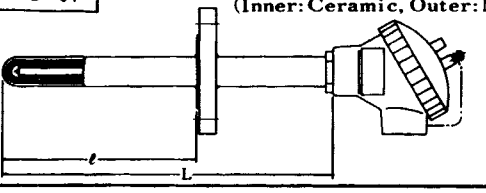
## TC-06 Ceramic Protection Tube Type (Flanged )




Order Code : TC-06 — R | S | 05 — L / ℓ — KN —
Model No. | Type | No. of Conductors | Dia. | Total Length | Insertion Length | Terminal box

15×10 / PTO + JIS10K25ARF / 304
Prot. Tube Dim. | Material | Flange Rating | Material

## TC-07 Dual Protection Tube Type (Inner: Ceramic, Outer: Metal)

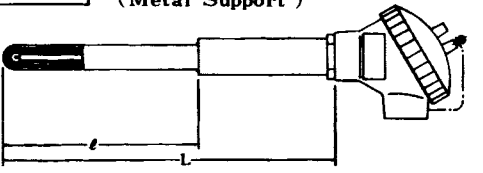



Order Code : TC-07 — R | S | 05 — L / ℓ — KN —
Model No. | Type | No. of Conductors | Dia. | Total Length | Insertion Length | Terminal box

( 13× 9 / PTO — 22×16 / 310S ) +
Inner Tube Dim. | Material | Outer Tube Dim. | Material

JIS10K25ARF / 304
Flange Rating | Material

## TC-08 Dual Ceramic Protection Tube Type (Metal Support )

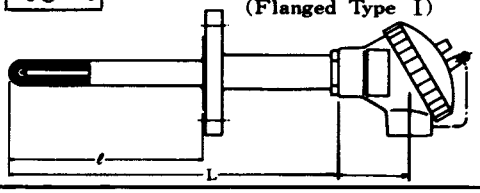



Order Code : TC-08 — R | S | 05 — L / ℓ — KN —
Model No. | Type | No. of Conductors | Dia. | Total Length | Insertion Length | Terminal box

( 13× 9 / PTO — 21×16 / PT1 ) —
Inner Tube Dim. | Material | Outer Tube Dim. | Material

27 / 304
Support Dia. | Material

**TC·09** Dual Ceramic Protection Tube、Type (Flanged Type Ⅰ)

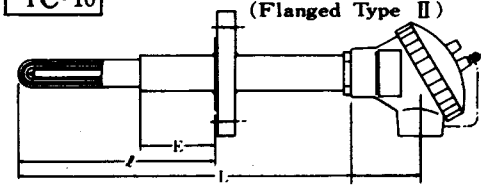



Order Code : TC·09 — R | S | 05 — L / ℓ — KN —
(Model No. / Type / No. of Conductors / Dia. / Total Length / Insertion Length / Terminal box)

( 13×9 / PTO — 21×16 / PTO ) —
(Inner Tube Dim. / Material / Outer Tube Dim. / Material)

27 / 304 + JIS10K32ARF / 304
(Support Dia. / Material / Flange Rating / Material)

**TC·10** Dual Ceramic Protection Tube、Type (Flanged Type Ⅱ)

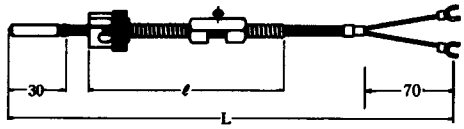



Order Code : TC·10 — R | S | 05 — L / ℓ / E — KN —
(Model No. / Type / No. of Conductors / Dia. / Total Length / Insertion Length / Terminal box)

( 13×9 / PTO — 21×16 / PTO )
(Inner Tube Dim. / Material / Outer Tube Dim. / Material)

+ JIS10K32ARF / 304 — 27 / 304
(Flange Rating / Material / Support Dia. / Material)

**TC·11** YBS Thermocouple, Adjustable Bayonet Spring Load Type.




Order Code : TC·11 — K | S | 10 — L / ℓ
(Model No. / Type / No. of Conductors / Dia. / Total Length / Insertion Length)

# Model STC

*Sheathed Thermocouple*

## Type and Sizes

| | Nom. O. D.(mm) | Wire Dia.(mm) | Wall Thick.(mm) | Type | Sheath Material | Max. Length(m) | Weight (g/m) |
|---|---|---|---|---|---|---|---|
| Single Pair<br>Sheath<br>Wire<br>MgO<br> | **0.25** | 0.04 | 0.05 | **K** | INCONEL600 | 5 | 0.4 |
| | **0.5** | 0.09 | 0.09 | **K · E · J** | INCONEL600<br>304SS,321SS, 316SS, 310SS | 50 | 1.3 |
| | **1.0** | 0.18 | 0.15 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS | 100 | 5 |
| | **1.6** | 0.28 | 0.23 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS | 300 | 13 |
| | **2.2** | 0.40 | 0.33 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS | 300 | 24 |
| | **3.2** | 0.58 | 0.48 | **K · E · J · T** | INCONEL600, Cupro-nickel<br>304SS,321SS, 316SS, 310SS | 157 | 51 |
| | **4.8** | 0.84 | 0.71 | **K · E · J · T** | INCONEL600, Cupro-nickel,Hastelloy X.<br>304SS,321SS, 316SS, 310SS, 446SS | 60 | 115 |
| | **6.4** | 1.12 | 0.94 | **K · E · J · T** | INCONEL600, Cupro-nickel,Hastelloy X.<br>304SS,321SS, 316SS, 310SS, 446SS | 39 | 193 |
| | **8.0** | 1.37 | 1.17 | **K · E · J · T** | INCONEL600, Cupro-nickel,Hastelloy X.<br>304SS,321SS, 316SS, 310SS, 446SS | 25 | 300 |
| Dual Pair<br> | **1.6** | 0.23 | 0.23 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS | 300 | 13 |
| | **2.2** | 0.33 | 0.33 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS | 300 | 22 |
| | **3.2** | 0.46 | 0.48 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS | 157 | 45 |
| | **4.8** | 0.71 | 0.74 | **K · E · J · T** | INCONEL600, Cupro-nickel,Hastelloy X.<br>304SS,321SS, 316SS, 310SS, 446SS | 68 | 102 |
| | **6.4** | 0.94 | 1.02 | **K · E · J · T** | INCONEL600, Cupro-nickel,Hastelloy X.<br>304SS,321SS, 316SS, 310SS, 446SS | 38 | 222 |
| | **8.0** | 1.24 | 1.24 | **K · E · J · T** | INCONEL600, Cupro-nickel,Hastelloy X.<br>304SS,321SS, 316SS, 310SS, 446SS | 24 | 350 |
| Triple Pair<br> | **3.2** | 0.28 | 0.33 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS, 446SS | 160 | 33 |
| | **4.8** | 0.38 | 0.46 | **K · E · J · T** | INCONEL600<br>304SS,321SS, 316SS, 310SS, 446SS | 70 | 80 |
| | **6.4** | 0.48 | 0.64 | **K · E · J · T** | INCONEL600<br>304SS, 316SS, 310SS, 446SS | 41 | 130 |
| | **8.0** | 0.61 | 0.79 | **K · E · J · T** | INCONEL600<br>304SS, 316SS, 310SS, 446SS | 24 | 210 |

Note : Other special type STCs or those having O. D. of 1.5, 2.0, 3.0, 4.5, 6.0, 9.5, 10.5 and 12.7mm are also available upon request.

## Nominal Loop Resistance

Unit : Ω/m at 20℃

| | Nom. O. D.(mm) | Wire Dia.(mm) | K | E | J | T |
|---|---|---|---|---|---|---|
|  | **0.25** | 0.04 | 600.0 | — | — | — |
| | **0.5** | 0.09 | 152.5 | 191.9 | 106.3 | — |
| | **1.0** | 0.18 | 38.6 | 48.6 | 26.4 | 22.2 |
| | **1.6** | 0.28 | 15.5 | 19.6 | 10.7 | 9.1 |
| | **2.2** | 0.40 | 8.1 | 10.5 | 5.6 | 4.7 |
| | **3.2** | 0.58 | 3.9 | 5.5 | 2.7 | 2.3 |
| | **4.8** | 0.84 | 1.8 | 2.3 | 1.3 | 1.0 |
| | **6.4** | 1.12 | 1.1 | 1.3 | — | — |
| | **8.0** | 1.37 | 0.7 | 0.8 | 0.5 | 0.4 |
|  | **1.6** | 0.23 | 21.0 | 28.7 | 14.11 | 12.3 |
| | **2.2** | 0.33 | 10.7 | — | 7.4 | 6.3 |
| | **3.2** | 0.46 | 5.9 | 7.2 | 3.8 | 2.8 |
| | **4.8** | 0.71 | 2.5 | 2.9 | 1.5 | 1.1 |
| | **6.4** | 0.94 | 1.6 | 1.7 | 1.0 | 0.7 |
| | **8.0** | 1.24 | 1.0 | 1.1 | 0.6 | 0.5 |
|  | **3.2** | 0.28 | 26.8 | — | — | — |
| | **4.8** | 0.38 | 11.9 | — | — | — |
| | **6.4** | 0.48 | 6.7 | — | — | — |
| | **8.0** | 0.61 | 4.3 | — | — | — |

## Insulating Material

### Purity

Unit : %

| Grade \ Composit | MgO | $SiO_2$ | CaO | $Fe_2O_3$ | $Al_2O_3$ | B | Cd | S | C |
|---|---|---|---|---|---|---|---|---|---|
| Standard | 96.3~97.3 | 1.45~2.06 | 0.73~1.25 | 0.16~0.30 | 0.06~0.30 | 85~1,000 ppm | <10ppm | <50ppm | <200ppm |
| High Purity | 99.47~99.72 | 0.042~0.14 | 0.14~0.21 | 0.034~0.104 | 0.30~0.08 | 10~20ppm | <10ppm | <50ppm | <200ppm |

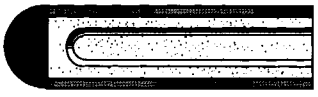
### Physical Properties

| Insulating Material | Melting Point (℃) | Resistivity | | Coeff. of thermal expansion (E) $℃^{-1}$ | | Thermal Conductivity (℃) $Cal \cdot sec^{-1} \cdot cm^{-2} \cdot cm℃^{-1}$ | | | Moh's Hardness | Density $g \cdot cm^{-3}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ℃ | Ω·cm | ℃ | $E \times 10^{-7}$ | ℃ | Porosity | $C \times 10^{4}$ | | |
| MgO | 2,800 | 980 | $3 \times 10^{7}$ | 20~1,400 | 140 | 1,200 | 22 | 61 | 6 | 3.58 |

## Hot Junctions



Type Ⅰ (Grounded)



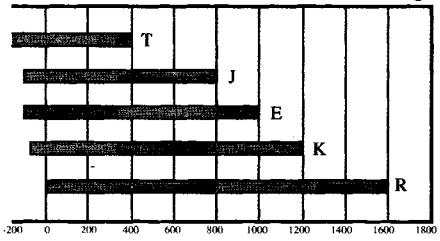
Type Ⅱ (Ungrounded)



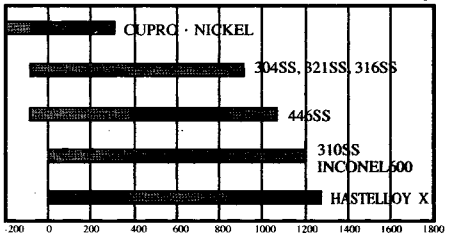
Type Ⅲ (Exposed)

## Measuring Range

Thermoelement Wires Unit : ℃




Sheath Material Unit : ℃



# Standard Models of STC Assembly

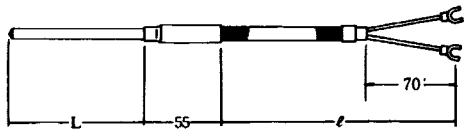
Unit : mm

## STC·A Basic Type, Projecting Conductors




Order Code : STC·A — K | S | 32 | Ⅱ / 321 — L
(Model No. · Type · No. of Conductors · Dia. · H.J. · Sheath · Length)

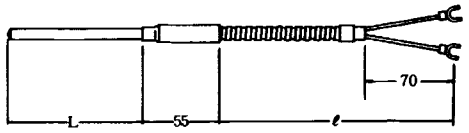
## STC·B Flexible Lead Type




Order Code : STC·B — K | D | 48 | Ⅱ / 321 — L /
(Model No. · Type · No. of Conductors · Dia. · H.J. · Sheath · Length)

VX—13D ( ℓ )
(Lead · Lead Length)

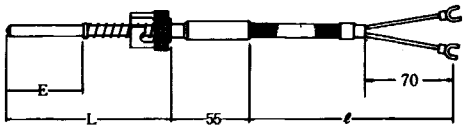
## STC·BF Armoured Lead Type




Order Code : STC·BF — K | S | 48 | Ⅱ / 321 — L /
(Model No. · Type · No. of Conductors · Dia. · H.J. · Sheath · Length)

DK30-3 ( ℓ )
(Lead · Lead Length)

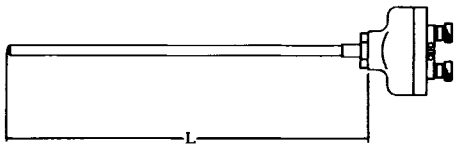
## STC·BY Bayonet Spring Load Type




Order Code : STC·BY — K | S | 48 | Ⅱ / 321 — L /
(Model No. · Type · No. of Conductors · Dia. · H.J. · Sheath · Length)

E / DK30-3 ( ℓ )
(Lead · Lead Length)

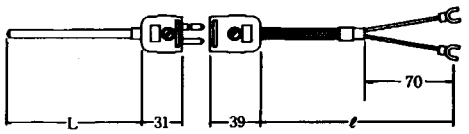
## STC·C Exposed Terminal Type




Order Code : STC·CS — K | S | 48 | Ⅱ / 321 — L
(Model No. · Type · No. of Conductors · Dia. · H.J. · Sheath · Length)

TM·CL……TL
TM·CS……TS

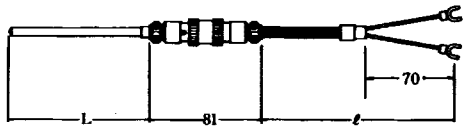
## STC·D Quick Connector Type (Compensated Contact pins)




Order Code : STC·D — K | S | 48 | Ⅱ / 321 — L /
(Model No. · Type · No. of Conductors · Dia. · H.J. · Sheath · Length)

DK30-3 ( ℓ )
(Lead · Lead Length)

## STC·E Metal Connector Type

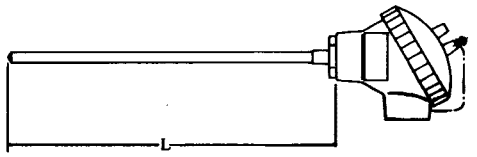



Order Code : STC·E — K | S | 48 | Ⅱ / 321 — L /
(Model No. · Type · No. of Conductors · Dia. · H.J. · Sheath · Length)

VX-13 ( ℓ )
(Lead · Lead Length)

Nos. of Conductors : S-Single Pair(2 Conductors), D-Dual Pair(4 Conductors), T-Triple Pair (6 Conductors)

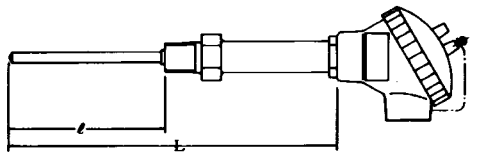
## STC·H Basic Type with Terminal Head




Order Code : STC·H – K | S | 32 | Ⅱ / 321 – L – KN

Model No. | Type | No. of Conductors | Dia. | H.J. | Sheath | Length | Terminal box

## STC·NB Screwed-in Type



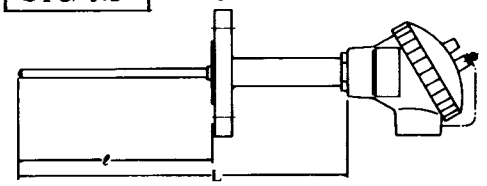

Order Code : STC·NB – K | D | 48 | Ⅱ / 321 – L / ℓ – KN –

Model No. | Type | No. of Conductors | Dia. | H.J. | Sheath | Total Length | Insertion Length | Terminal box

PT½ / 304

Thread | Material

## STC·NF Flanged Type



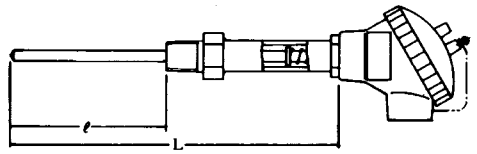

Order Code : STC·NF – K | D | 48 | Ⅱ / 321 – L / ℓ – KN –

Model No. | Type | No. of Conductors | Dia. | H.J. | Sheath | Total Length | Insertion Length | Terminal box

JIS10K25ARF / 304

Flange Rating | Material

## STC·NS Spring-Loaded Type (Screwed)




Order Code : STC·NS – K | D | 48 | Ⅱ / 321 – L / ℓ – KN –

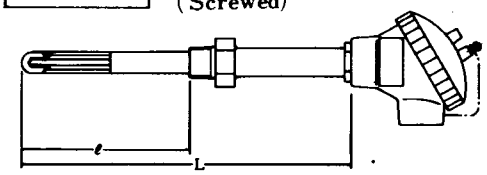
Model No. | Type | No. of Conductors | Dia. | H.J. | Sheath | Total Length | Insertion Length | Terminal box

PT½ / 304

Thread | Material

Max. stroke of spring 10mm.

## STC·PB Metal Protection Tube Type (Screwed)



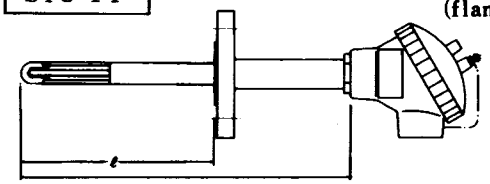

Order Code : STC·PB – K | D | 48 | Ⅱ / 321 – L / ℓ – KN –

Model No. | Type | No. of Conductors | Dia. | H.J. | Sheath | Total Length | Insertion Length | Terminal box

15×11 / 304 + PT½ / 304

Prot. Tube Dim. | Material | Thread | Material

## STC·PF Metal Protection Tube Type (flanged)



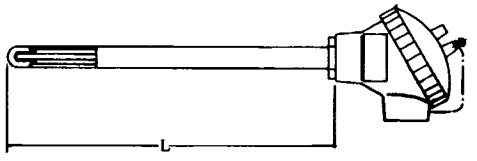

Order Code : STC·PF – K | D | 48 | Ⅱ / 321 – L / ℓ – KN –

Model No. | Type | No. of Conductors | Dia. | H.J. | Sheath | Total Length | Insertion Length | Terminal box

15×11 / 304 + JIS10K25ARF / 304

Prot. Tube Dim. | Material | Flange Rating | Material

## STC·P Metal Protection Tube Type




Order Code : STC·P – K | D | 48 | Ⅱ / 321 – L / ℓ – KN –

Model No. | Type | No. of Conductors | Dia. | H.J. | Sheath | Total Length | Insertion Length | Terminal box

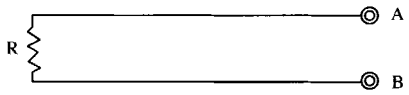
15×11 / 304

Prot. Tube Dim. | Material

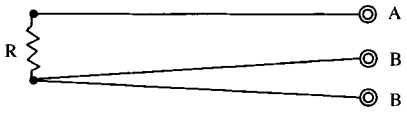
# Model RT

*Platinum Resistance Temperature Detectors (RTD)*

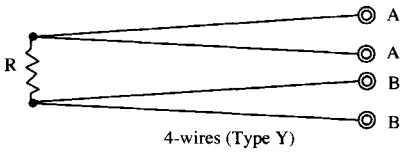
## Measuring Methods




2-wires (Type W)



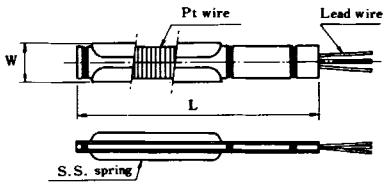

3-wires (Type X)



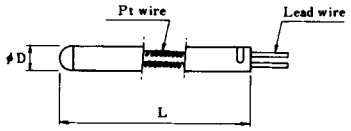

4-wires (Type Y)

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

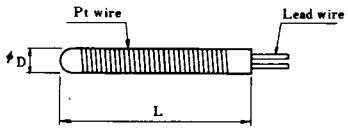
## Type of RTD Element




Mica Type(0.15, 0.2, 0.5 Class)




Ceramic Type(0.15, 0.2, 0.5 Class)




Glass-Sealed Type(0.2, 0.5 Class)

## Specifications

| Standard Resistance | Code |
|---|---|
| Pt100 Ω at 0 ℃ | 100 |
| Pt 50 Ω at 0 ℃ | 50 |

| No. of Element | Code |
|---|---|
| 1 (Single) | S |
| 2 (Double) | D |

| Lead Connection | Code |
|---|---|
| 2-wires | W |
| 3-wires | X |
| 4-wires | Y |

| Rated Curtent | Code |
|---|---|
| 2 m A | 02 |
| 5 m A | 05 |
| 10 m A | 10 |

Standard resistivity to JIS and American Curve ($\alpha$ = 0.003916). BS and DIN ($\alpha$ = 0.00385) also available.

## Lead Wires to Applications

| Application | Code | Operating Temperature | Inner Lead Wires |
|---|---|---|---|
| Low Temperature | L | – 200 ~ 50℃ | Ag ( φ 0.5) |
| Mid. Temperature | M | 20 ~ 250℃ | Ag ( φ 0.5) |
| High. Temperature | H | 250 ~ 400℃ | Ni ( φ 0.5) |

## Characteristics of Insulating Tubes

| Material | Code | Operating Temp. | Maximum Temp. | Characteristics |
|---|---|---|---|---|
| Ceramic I | PS 1 | 1500℃ | 1600℃ | Highest insulation among insulation materials. Solid. |
| Teflon | FEP | 200℃ | 260℃ | Excellent resistance to heat, chemicals, etc. Flexible. |
| Polyimid | PM | 200℃ | 400℃ | Characteristics similar to FEP but tougher and thin-wall thickness. |

## Characteristics of Metal Protection Tubes

| Material | Code | Operating Temp. | Maximum Temp. | Characteristics |
|---|---|---|---|---|
| Copper | CU | 250℃ | 300℃ | Good heat conductivity and excellent corrosion-resistance. |
| Brass | BS | 250℃ | 300℃ | Similar to Copper and good workability. |
| 304 S. S. | 304 | 900℃ | 1000℃ | High resistance to heat and corrosion. |
| 316 S. S. | 316 | 900℃ | 1000℃ | Excellent resistance to heat, acids and alkalis. |
| 316L. S. S. | 316L | 900℃ | 1000℃ | Excellent resistance to grain boundary corrosion. |
| Titanium | TI | Oxidizing250℃ | Reducing1000℃ | Excellent resistance to corrosion at low temp. but easily oxidized and embrittled at high temperature. |
| Monel | ML | 200℃ | 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

○ = (Available)

| | Regular Type single | | | Regular Type double | | | Shock Proof Type single | | | Shock Proof Type double | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |

Tube Tolerances: Within ± 0.1 up to 10mm O.D., ± 0.2 up to 13mm O.D., ± 0.5 up to 21.7mm O.D.

## Surface Coatings

### ▶ For Corrosion Resistance

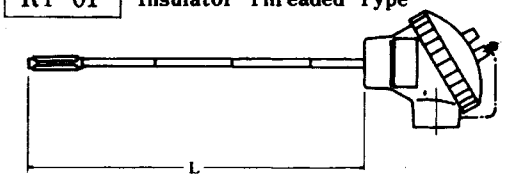
| Treatment | Thickness (mm) | Composition | Maximum Temp.(℃) | Features |
|---|---|---|---|---|
| Glass Lining | 1 ~ 1.2 | Borosilicate glass over common steel | 450 | Suitable for protection against oxidation and gas peneration. Poor thermal shock resistance. |
| Teflon | 0.1 ~ 0.7 | FEP over metals | 250 | Usable in concentrated hydrochloric, sulphuric and nitric acids depending on temperatures. |

### ▶ For Abrasion Resistance

For metallic protection tubes, coatings or linings with **Stellite, Colmonoy, Tungsten** or ther abrasion resistant materials are also available. When ordering, please consult us.

# Standard Models of RT Assembly

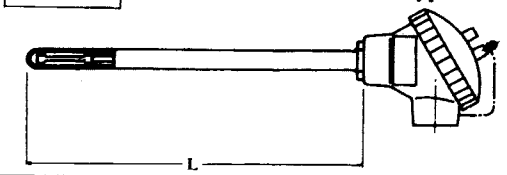
**RT·01** Insulator Threaded Type




Order Code : RT·01 | M | – | 100 | S | X | 05 | – | L | – | KN

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Term. Box

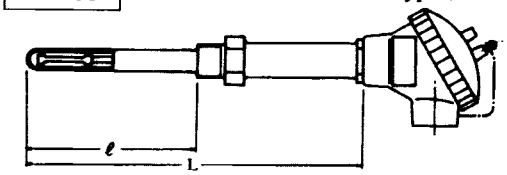
**RT·02** Metal Protection Tube Type




Order Code : RT·02 | M | – | 50 | S | X | 05 | – | L | – | KN | – | 15×11 / 316

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Term. Box | Dimensions of Prot. Tube / Material

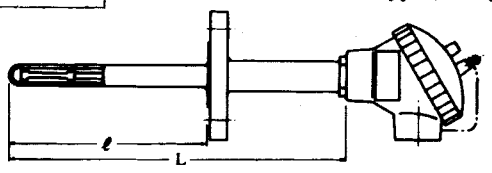
**RT·03** Metal Protection Tube Type (Screwed)




Order Code : RT·03 | M | – | 100 | S | X | 05 | – | L | / | ℓ | – | KN | – | 15×11 / 316 + PT½ / 316

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Insert Length | Term. Box | Dimensions of Prot. Tube / Material + Thread Std / Material

**RT·04** Metal Protection Tube Type (Flanged)

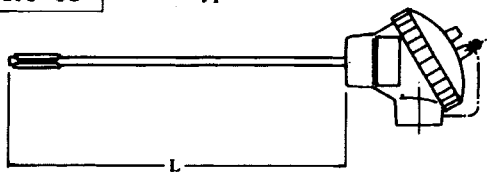



Order Code : RT·04 | M | – | 100 | S | X | 05 | – | L | / | ℓ | – | KN | – | 15×11 / 316 + JIS10K25ARF / 316

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Insert Length | Term. Box | Dimensions of Prot. Tube / Material + Flange Rating / Material

## ▶ Shock Proof Models

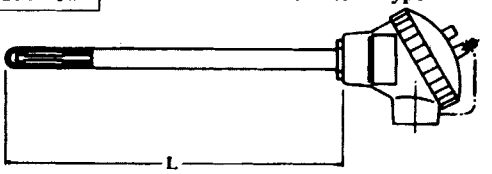
**RT·51** Basic Type without Protection Tube




Order Code : RT·51 | M | – | 100 | S | X | 05 | – | L | – | KN

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Term. Box

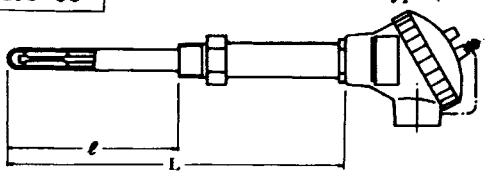
**RT·52** Metal Protection Tube Type




Order Code : RT·52 | M | – | 100 | S | X | 05 | – | L | – | KN | – | 15×11 / 316

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Term. Box | Dimensions of Prot. Tube / Material

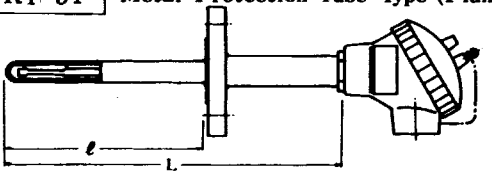
**RT·53** Metal Protection Tube Type (Screwed)




Order Code : RT·53 | M | – | 100 | S | X | 05 | – | L | / | ℓ | KN | – | 15×11 / 316 + PT½ / 316

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Insert Length | Term. Box | Dimensions of Prot. Tube / Material + Thread Std / Material

**RT·54** Metal Protection Tube Type (Flanged)



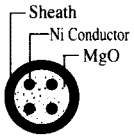

Order Code : RT·54 | M | – | 50 | S | X | 05 | – | L | / | ℓ | – | KN | – | 15×11 / 316 + JIS10K25ARF / 316

Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | Length | Insert Length | Term. Box | Dimensions of Prot. Tube / Material + Flange Rating / Material

# Model SRT

*Sheathed Platinum Resistance Temperature Detectors (Sheathed RTD)*

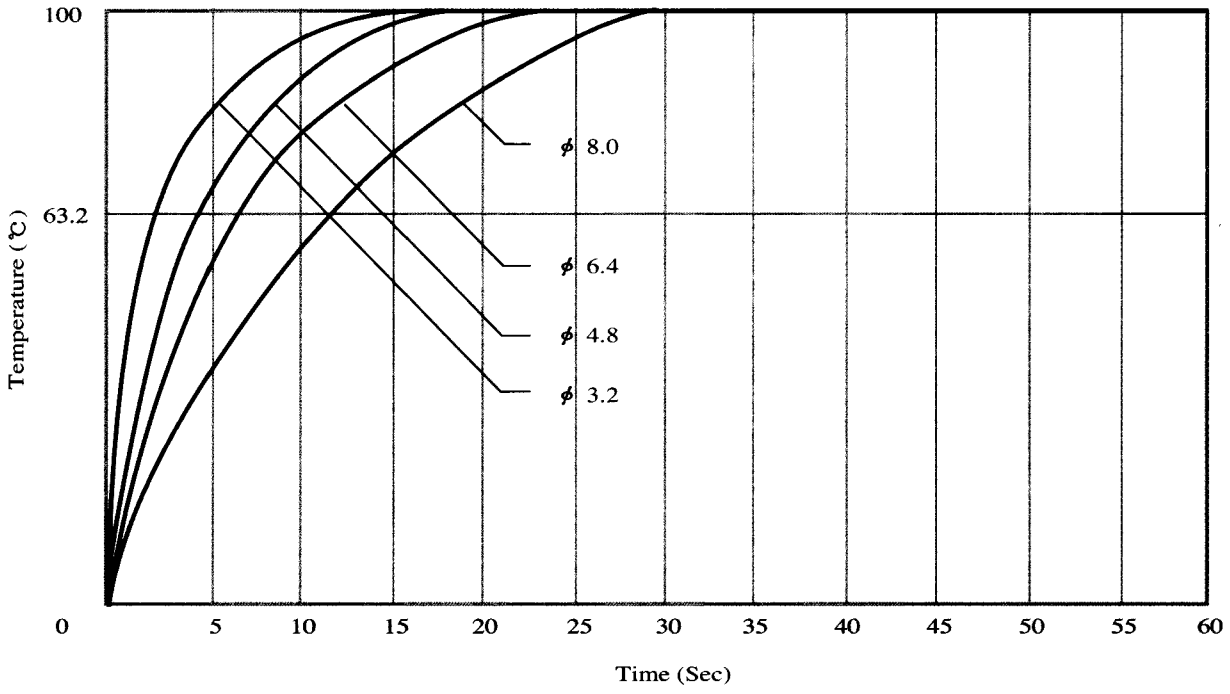
## Sheathed Leads

| | Sheath O.D. (mm) | Conductor Dia. (mm) | Lead Resistance ( Ω /m at 20℃) | Sheath Wall (mm) | Sheath Material | Max Length (m) |
|---|---|---|---|---|---|---|
|  | **3.2** | 0.45 | 0.627 | 0.48 | 316SS | 150 |
| | **4.8** | 0.70 | 0.248 | 0.73 | 316SS | 60 |
| | **6.4** | 0.93 | 0.15 | 1.02 | 316SS | 30 |
| | **8.0** | 1.14 | 0.099 | 1.27 | 316SS | 15 |
|  | **4.8** | 0.38 | 0.881 | 0.457 | 316SS | 60 |
| | **6.4** | 0.48 | 0.55 | 0.63 | 316SS | 30 |
| | **8.0** | 0.63 | 0.31 | 0.78 | 316SS | 15 |

## Response Time

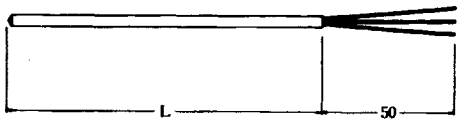
The "t" Constants (63.2%) when SRT is immersed into 100℃ (boiling water) form 0℃ (ice bath).

- ϕ 3.2 less than 2 sec.
- ϕ 4.8 less than 4 sec.
- ϕ 6.4 less than 6 sec.
- ϕ 8.0 less than 11 sec.



# Standard Models of SRT Assembly

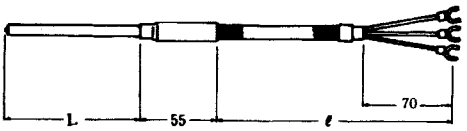
## SRT· A Basic Type




Order Code : SRT·A | M | – | 100 | S | X | 05 | / | 32 | –
Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | O.D.

L
Length

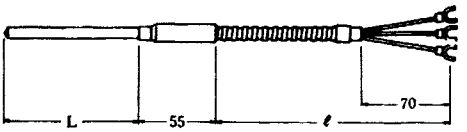
## SRT· B Flexible Lead Type




Order Code : SRT·B | M | – | 100 | S | X | 05 | / | 32 | –
Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | O.D.

L | / | WR–13 | ( | ℓ | )
Length | Lead | Lead Length

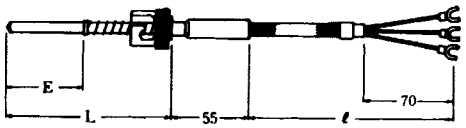
## SRT·BF Armoured Lead Type




Order Code : SRT·BF | M | – | 100 | S | X | 05 | /
Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current

48 | – | L | / | WR–13 | ( | ℓ | )
O.D. | Length | Lead | Insert Length

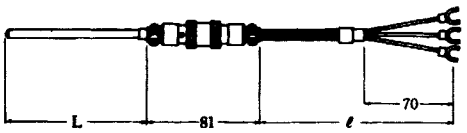
## SRT·BY Bayonet Mount Type




Order Code : SRT·BY | M | – | 100 | S | X | 05 | /
Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current

48 | – | L | / | WR–13 | ( | ℓ | )
O.D. | Length | Lead | Insert Length

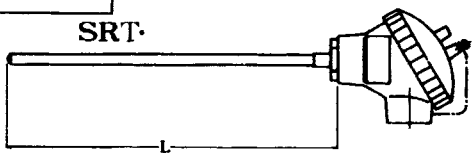
## SRT· E Metal Connector Type




Order Code : SRT·E | M | – | 100 | S | X | 05 | /
Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current

48 | – | L | / | WR–13 | ( | ℓ | )
O.D. | Length | Lead | Insert Length

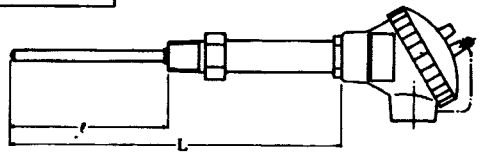
## SRT·H Basic Type with Terminal Box




Order Code : SRT·H | M | – | 100 | S | X | 05 | / | 48 | –
Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | O.D.

SRT· L | Length | – | KN | Term. Box

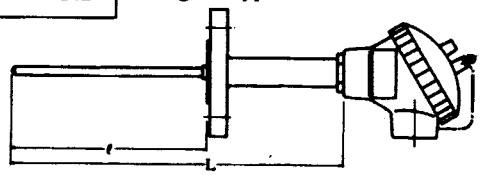
## SRT·NB Screwed Type




Order Code : SRT·NB | M | – | 100 | S | X | 05 | / | 48 | –
Type | Inner Leads | Resistance | No. of Element | Type of Lead | Rated Current | O.D.

L | / | ℓ | – | KN | – | PT½ | / | 304
Length | Insert Length | Term. Box | Thread Std | Material

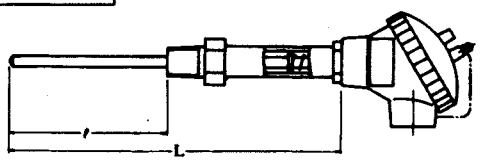
## SRT·NF Flanged Type




Order Code : SRT·NF | M | – | 100 | S | X | 05 | / | 48 | –
Inner Leads · Resistance · No. of Element · Type of Lead · Rated Current · O.D.

L | / | ℓ | – | KN | – | JIS10K25ARF | / | 304
Length · Insert Length · Term. Box · Flange Rating · Material

## SRT·NS Spring-Loaded Type (Screwed)

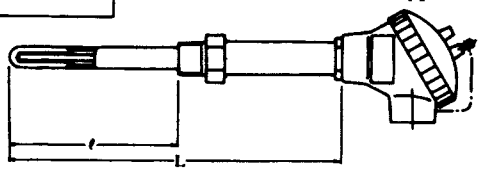



Order Code : SRT·NS | M | – | 50 | S | X | 05 | / | 48 | –
Type · Inner Leads · Resistance · No. of Element · Type of Lead · Rated Current · O.D.

L | / | ℓ | – | KN | – | PT½ | / | 304
Length · Insert Length · Term. Box · Thread Std · Material

Stroke of Spring 10mm

## SRT·PB Metal Protection Tube Type (Screwed)

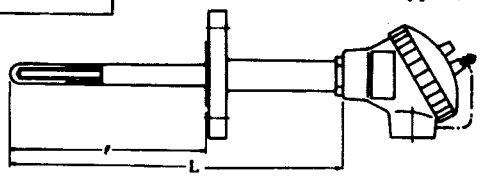



Order Code : SRT·PB | H | – | 100 | S | X | 05 | / | 48 | –
Type · Inner Leads · Resistance · No. of Element · Type of Lead · Rated Current · O.D.

L | / | ℓ | – | KN | – | 15×11 | / | 304 | +
Length · Insert Length · Term. Box · Dimensions of Prot. Tube · Material

PT½ | / | 304
Thread Std · Material

## SRT·PF Metal Protection Tube Type (Flanged)

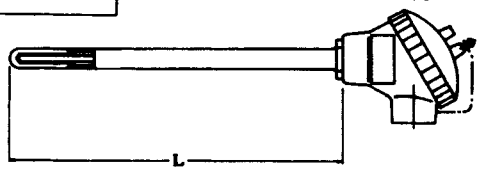



Order Code : SRT·PF | M | – | 100 | S | X | 05 | / | 48 | –
Inner Leads · Resistance · No. of Element · Type of Lead · Rated Current · O.D.

L | / | ℓ | – | KN | – | 15×11 | / | 304 | +
Length · Insert Length · Term. Box · Dimensions of Prot. Tube · Material

JIS10K25ARF | / | 304
Flange Rating · Material

## SRT·P Metal Protection Tube Type




Order Code : SRT·P | M | – | 100 | S | X | 05 | / | 48 | –
Type · Inner Leads · Resistance · No. of Element · Type of Lead · Rated Current · O.D.

L | / | – | KN | – | 15×11 | / | 304
Length · Term. Box · Dimensions of Prot. Tube · Material

# Extension & Compensating Cables

*For Thermocouples*

## Description

Nowadays, thermocouples are being widely used in every industrial field from chemicals, petrochemicals, metals, ceramics and electronics to aerospace. Although it is theoretically ideal to have thermocouple connected directly to instrument, long distance between them often makes the cost prohibitive and causes some troubles in the circuit. Therefore, it is desirable to use extension or compensating cables that have same or similar EMF characteristics to those of thermocouples. It is also necessary to change insulation cover materials according to the operating conditions.

## Types

Ref : JIS C 1610-1981

| Thermocouple | Extension and Compensating Cable | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type & Composition | Code | Class | Operating Temp. (℃) | Tolerance (℃) | Color Code [4] | Material +leg | Material −leg | Loop Resistance( Ω /m) [3] |
| B(Pt30%Rh/Pt6%Rh) | BX − G | Gen/Com | 0~100 | — [1] | Grey | Cu | Cu | 0.05 |
| R(Pt13%Rh/Pt6%Rh) S(Pt10%Rh/Pt6%Rh) | RX − G | Gen/Com | 0~ 90 | + 3 - 7 [2] | Black | Cu | Cu · Ni base alloy | 0.1 |
| | SX − G | | | | | | | |
| | RX − H | Heat/Com | 0~150 | | | | | |
| | SX − H | | | | | | | |
| K(Chromel/Alumel) | KX − G | Gen/Com | -20~ 90 | ±2.5 | Blue | Ni · Cr base alloy | Ni base alloy | 1.5 |
| | KX − GS | Gen/Com | | ±2.5 | | | | |
| | KX − H | Heat/Com | 0~150 | ±2.5 | | | | |
| | KX − HS | Heat/Prec | | ±1.5 | | | | |
| | WX − G | Gen/Com | -20~ 90 | ±3.0 | | Iron | Cu · Ni base alloy | 0.5 |
| | WX − H | Heat/Com | 0~150 | | | | | |
| | VX − G | Gen/Com | -20~ 90 | ±2.5 | | Cu | 〃 | 0.8 |
| E(Chromel/Constantan) | EX − G | Gen/Com | -20~ 90 | ±2.5 | Purple | Ni · Cr base alloy | 〃 | 1.5 |
| | EX − H | Heat/Com | 0~150 | | | | | |
| J(Iron/Constantan) | JX − G | Gen/Com | -20~ 90 | ±2.5 | Yellow | Iron | 〃 | 0.8 |
| | JX − H | Heat/Com | 0~150 | | | | | |
| T(Copper/Constantan) | TX − G | Gen/Com | 0~150 | ±2.0 | Brown | Cu | 〃 | 0.8 |
| | TX − GS | Gen/Prec | | ±1.0 | | | | |
| | TX − H | Heat/Com | 0~150 | ±2.0 | | | | |
| | TX − HS | Heat/Prec | | ±1.0 | | | | |

Insulation Resistance shall be more than 5 M Ω /10m

Notes : (1) BX-G has positive leg of same material (Cu), so no tolearance is stipulated.
(2) These figures do not represent actual measuring error because Types R and S have non-linear EMF characteristics.
(3) These figures apply to the nominal cross-sectional area of more than 1.25㎟.
(4) Types are represented by colors of overall cover ; polarity by the colors of conductor insulation in general, red for positive leg and white for negative leg. Other color codings to ANSI, BS and DIN can be supplied.

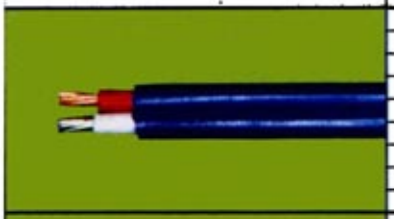
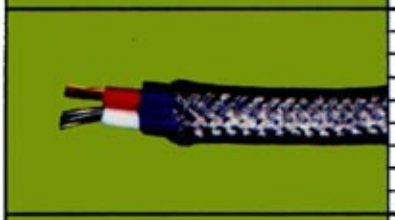
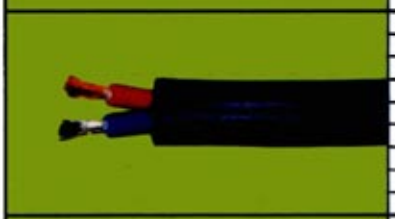
## Electrical Resistance

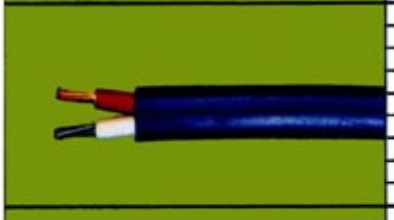
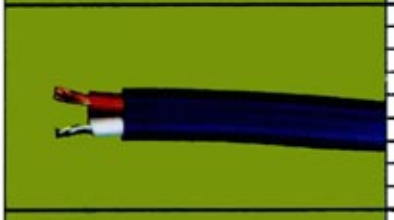
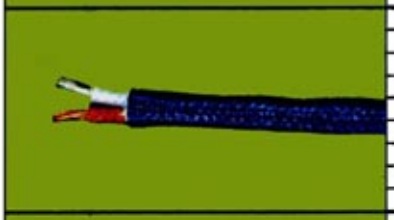
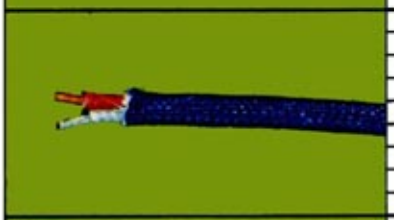
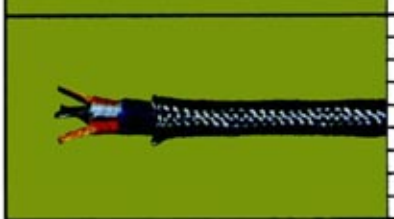
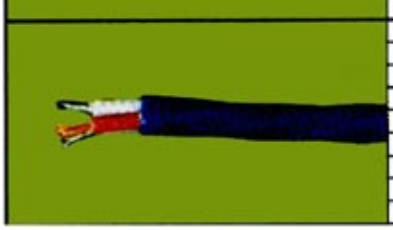
Unit: Ω/m

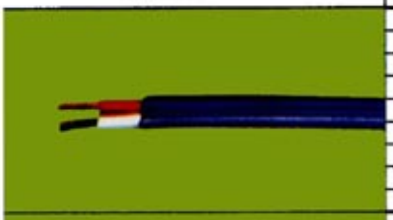
| Nom. cross-sec. area A(㎟) | Core No. / Dia. | BX | RX SX | KX | WX | VX | EX | JX | TX |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 20 / 0.18 | 0.034 | 0.034 | 1.38 | 0.24 | 0.034 | 1.38 | 0.24 | 0.034 |
| | | 0.034 | 0.10 | 0.56 | 0.46 | 0.98 | 0.98 | 0.98 | 0.98 |
| | | 0.068 | 0.13 | 1.94 | 0.70 | 1.01 | 2.36 | 1.22 | 1.01 |
| 0.75 | 30 / 0.18 | 0.023 | 0.023 | 0.92 | 0.16 | 0.023 | 0.92 | 0.16 | 0.023 |
| | | 0.023 | 0.067 | 0.37 | 0.31 | 0.65 | 0.65 | 0.65 | 0.65 |
| | | 0.046 | 0.090 | 1.29 | 0.47 | 0.67 | 1.57 | 0.81 | 0.67 |
| 1.25 | 7 / 0.45 | 0.014 | 0.014 | 0.55 | 0.096 | 0.014 | 0.55 | 0.096 | 0.014 |
| | | 0.014 | 0.040 | 0.22 | 0.18 | 0.39 | 0.39 | 0.39 | 0.39 |
| | | 0.028 | 0.054 | 0.77 | 0.28 | 0.40 | 0.94 | 0.49 | 0.40 |
| 1.3 | 4 / 0.65 or 1 / 1.3 | 0.013 | 0.013 | 0.53 | 0.092 | 0.013 | 0.53 | 0.092 | 0.013 |
| | | 0.013 | 0.038 | 0.22 | 0.18 | 0.38 | 0.38 | 0.38 | 0.38 |
| | | 0.026 | 0.051 | 0.75 | 0.27 | 0.39 | 0.91 | 0.47 | 0.39 |
| 2.0 | 7 / 0.6 or 1 / 1.6 | 0.0085 | 0.0085 | 0.35 | 0.060 | 0.0085 | 0.35 | 0.060 | 0.0085 |
| | | 0.0085 | 0.025 | 0.14 | 0.12 | 0.25 | 0.25 | 0.25 | 0.25 |
| | | 0.017 | 0.034 | 0.49 | 0.18 | 0.26 | 0.60 | 0.31 | 0.26 |
| 2.3 | 7 / 0.65 | 0.0074 | 0.0074 | 0.30 | 0.052 | 0.0074 | 0.30 | 0.052 | 0.0074 |
| | | 0.0074 | 0.022 | 0.12 | 0.10 | 0.21 | 0.21 | 0.21 | 0.21 |
| | | 0.015 | 0.029 | 0.42 | 0.15 | 0.22 | 0.51 | 0.26 | 0.22 |

Note : Upper column represent positive leg resistivity ; middle column for negative leg resistivity ; and lower column for loop resistivity.

# Standard Extension & Compensating Cables

| Appearance | Type | Color Coding | Dimensions (mm) | Covering | Application |
|---|---|---|---|---|---|
|  | BX−1 | Grey | Core 0.65/7 Nom. finish 8×5.2 | Heat-resistant PVC insulating sheath. | General (JIS "G") |
| | RX−1 | Black | | | |
| | SX−1 | | | | |
| | KX−1 | Blue | | | |
| | WX−1 | | | | |
| | VX−1 | | | | |
| | EX−1 | Purple | | | |
| | JX−1 | Yellow | | | |
| | TX−1 | Brown | | | |
|  | BX−1A | Grey | Core 0.65/7 Nom. finish 8.6×5.8 | Outer: heat-resistant PVC sheath. Inner: Copper shield. | • |
| | RX−1A | Black | | | |
| | SX−1A | | | | |
| | KX−1A | Blue | | | |
| | WX−1A | | | | |
| | VX−1A | | | | |
| | EX−1A | Purple | | | |
| | JX−1A | Yellow | | | |
| | TX−1A | Brown | | | |
|  | BX−1B | Grey | Core 0.65/7 Nom. finish 8.5×5.35 | Inner: Heat-resistant PVC sheath. Outer: Copper shield. | • |
| | RX−1B | Black | | | |
| | SX−1B | | | | |
| | KX−1B | Blue | | | |
| | WX−1B | | | | |
| | VX−1B | | | | |
| | EX−1B | Purple | | | |
| | JX−1B | Yellow | | | |
| | TX−1B | Brown | | | |
|  | BX−2 | Grey | Core 6.5/7 Nom. finish 11.2×6.3 | Asbestos yarn braided insulating sheath. | High Temp. |
| | RX−2 | Black | | | |
| | SX−2 | | | | |
| | KX−2 | Blue | | | |
| | WX−2 | | | | |
| | VX−2 | | | | |
| | EX−2 | Purple | | | |
| | JX−2 | Yellow | | | |
| | TX−2 | Brown | | | |
|  | BX−3 | Grey | Core 0.65/7 Nom. finish 6.5×3.4 | Glass braided insulating sheath. | High Temp. (JIS "H") |
| | RX−3 | Black | | | |
| | SX−3 | | | | |
| | KX−3 | Blue | | | |
| | WX−3 | | | | |
| | VX−3 | | | | |
| | EX−3 | Purple | | | |
| | JX−3 | Yellow | | | |
| | TX−3 | Brown | | | |
|  | BX−3A | Grey | Core 0.65/7 Nom. finish 7.1×4.0 | Outer: Glass braided insulating sheath. Inner: Copper shield. | • |
| | RX−3A | Black | | | |
| | SX−3A | | | | |
| | KX−3A | Blue | | | |
| | WX−3A | | | | |
| | VX−3A | | | | |
| | EX−3A | Purple | | | |
| | JX−3A | Yellow | | | |
| | TX−3A | Brown | | | |
|  | BX−3B | Grey | Core 0.65/7 Nom. finish 6.8×4.3 | Inner: Glass braided insulating sheath. Outer: Copper shield. | • |
| | RX−3B | Black | | | |
| | SX−3B | | | | |
| | KX−3B | Blue | | | |
| | WX−3B | | | | |
| | VX−3B | | | | |
| | EX−3B | Purple | | | |
| | JX−3B | Yellow | | | |
| | TX−3B | Brown | | | |
|  | BX−4 | Grey | Core 0.2/40 Nom. finish ϕ9.8 | Heat-resistant rubber insulating sheath. | General |
| | RX−4 | Black | | | |
| | SX−4 | | | | |
| | KX−4 | Blue | | | |
| | WX−4 | | | | |
| | VX−4 | | | | |
| | EX−4 | Purple | | | |
| | JX−4 | Yellow | | | |
| | TX−4 | Brown | | | |
|  | BX−4A | Grey | Core 0.2/40 Nom. finish ϕ11.4 | Outer: Heat-resistant rubber insulating sheath. | • |
| | RX−4A | Black | | | |
| | SX−4A | | | | |
| | KX−4A | Blue | | | |
| | WX−4A | | | | |
| | VX−4A | | | | |
| | EX−4A | Purple | | | |
| | JX−4A | Yellow | | | |
| | TX−4A | Brown | | | |

| Appearance | Type | Color Coding | Dimensions (mm) | Covering | Application |
|---|---|---|---|---|---|
|  | BX－4B | Grey | Core 0.2/40 Nom. finish φ11.2 | Inner: Heat-resistant rubber sheath. Outer: Copper shield. | General |
| | RX－4B | Black | | | |
| | SX－4B | | | | |
| | KX－4B | Blue | | | |
| | WX－4B | | | | |
| | VX－4B | | | | |
| | EX－4B | Purple | | | |
| | JX－4B | Yellow | | | |
| | TX－4B | Brown | | | |
|  | BX－5 | Grey | Core 0.65/7 Nom. finish 4.8×7.5 | Heat-resistant PVC insulating sheath. | 〃 |
| | RX－5 | Black | | | |
| | SX－5 | | | | |
| | KX－5 | Blue | | | |
| | WX－5 | | | | |
| | VX－5 | | | | |
| | EX－5 | Purple | | | |
| | JX－5 | Yellow | | | |
| | TX－5 | Brown | | | |
|  | BX－6 | Grey | Core 0.45/7 Nom. finish 4.6×7.1 | 〃 | 〃 |
| | RX－6 | Black | | | |
| | SX－6 | | | | |
| | KX－6 | Blue | | | |
| | WX－6 | | | | |
| | VX－6 | | | | |
| | EX－6 | Purple | | | |
| | JX－6 | Yellow | | | |
| | TX－6 | Brown | | | |
|  | BX－7 | Grey | Core 0.65/4 Nom. finish 5.6×3.3 | Glass braided insulating sheath. | High Temp. (JIS "H") |
| | RX－7 | Black | | | |
| | SX－7 | | | | |
| | KX－7 | Blue | | | |
| | WX－7 | | | | |
| | VX－7 | | | | |
| | EX－7 | Purple | | | |
| | JX－7 | Yellow | | | |
| | TX－7 | Brown | | | |
|  | BX－8 | Grey | Core 0.45/7 Nom. finish 5.0×3.0 | 〃 | 〃 |
| | RX－8 | Black | | | |
| | SX－8 | | | | |
| | KX－8 | Blue | | | |
| | WX－8 | | | | |
| | VX－8 | | | | |
| | EX－8 | Purple | | | |
| | JX－8 | Yellow | | | |
| | TX－8 | Brown | | | |
|  | BX－13 | Grey | Core 0.3/7 Nom. finish 4.6×2.8 | Inner: Glass braided insulating sheath. Outer: stainless steel shield. | High Temp. |
| | RX－13 | Black | | | |
| | SX－13 | | | | |
| | KX－13 | Blue | | | |
| | WX－13 | | | | |
| | VX－13 | | | | |
| | EX－13 | Purple | | | |
| | JX－13 | Yellow | | | |
| | TX－13 | Brown | | | |
|  | BX－13D) | Grey | Core 0.3/7 Nom. finish φ5.3 | 〃 | 〃 |
| | RX－13D) | Black | | | |
| | SX－13D) | | | | |
| | KX－13D) | Blue | | | |
| | WX－13D) | | | | |
| | VX－13D) | | | | |
| | EX－13D) | Purple | | | |
| | JX－13D) | Yellow | | | |
| | TX－13D) | Brown | | | |
|  | BX－14 | Grey | Core 0.3/7 Nom. finish 4.0×2.3 | Glass braided insulating sheath. | 〃 |
| | RX－14 | Black | | | |
| | SX－14 | | | | |
| | KX－14 | Blue | | | |
| | WX－14 | | | | |
| | VX－14 | | | | |
| | EX－14 | Purple | | | |
| | JX－14 | Yellow | | | |
| | TX－14 | Brown | | | |
|  | BX－14D) | Grey | Core 0.3/7 Nom. finish φ4.5 | 〃 | 〃 |
| | RX－14D) | Black | | | |
| | SX－14D) | | | | |
| | KX－14D) | Blue | | | |
| | WX－14D) | | | | |
| | VX－14D) | | | | |
| | EX－14D) | Purple | | | |
| | JX－14D) | Yellow | | | |
| | TX－14D) | Brown | | | |

| Appearance | Type | Color Coding | Dimensions (mm) | Covering | Application |
|---|---|---|---|---|---|
|  | BX−15 | Grey | Core 0.3/7 Nom.finish 4.1×2.4 | Heat-resistant PVC insulating sheath. | General |
| | RX−15 | Black | | | |
| | SX−15 | | | | |
| | KX−15 | Blue | | | |
| | WX−15 | | | | |
| | VX−15 | | | | |
| | EX−15 | Purple | | | |
| | JX−15 | Yellow | | | |
| | TX−15 | Brown | | | |
|  | BX−15(D) | Grey | Core 0.3/7 Nom.finish ϕ5 | 〃 | 〃 |
| | RX−15(D) | Black | | | |
| | SX−15(D) | | | | |
| | KX−15(D) | Blue | | | |
| | WX−15(D) | | | | |
| | VX−15(D) | | | | |
| | EX−15(D) | Purple | | | |
| | JX−15(D) | Yellow | | | |
| | TX−15(D) | Brown | | | |
|  | BX−15A | Grey | Core 0.3/7 Nom.finish 5×3.6 | Outer: Heat resistant insulating sheath. Inner: Copper shield. | 〃 |
| | RX−15A | Black | | | |
| | SX−15A | | | | |
| | KX−15A | Blue | | | |
| | WX−15A | | | | |
| | VX−15A | | | | |
| | EX−15A | Purple | | | |
| | JX−15A | Yellow | | | |
| | TX−15A | Brown | | | |
|  | BX−15A(D) | Grey | Core 0.3/7 Nom.finish ϕ5.5 | 〃 | 〃 |
| | RX−15A(D) | Black | | | |
| | SX−15A(D) | | | | |
| | KX−15A(D) | Blue | | | |
| | WX−15A(D) | | | | |
| | VX−15A(D) | | | | |
| | EX−15A(D) | Purple | | | |
| | JX−15A(D) | Yellow | | | |
| | TX−15A(D) | Brown | | | |

Note : Other Color codings to ANSI or BS are available. Consult factory.

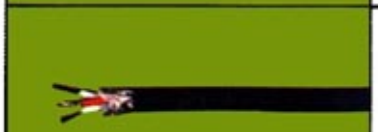
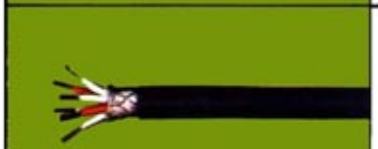
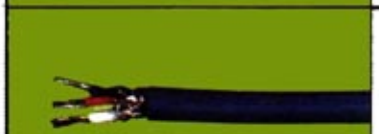
## Duplex Wire Thermocouples

| Appearance | Type | Conductor Material +leg | Conductor Material −leg | Color Coding | Dimensions (mm) | Covering |
|---|---|---|---|---|---|---|
|  | DK30−1 | Chromel | Alumel | Blue | Core single0.3 Nom.finish 3.3×2.2 | Heat-Resistant PVC insulating sheath. |
| | DE30−1 | Chromel | Constantan | Purple | | |
| | DJ30−1 | Iron | Constantan | Yellow | | |
| | DT30−1 | Copper | Constantan | Brown | | |
|  | DK65−1 | Chromel | Alumel | Blue | Core single0.65 Nom.finish 4.2×2.6 | 〃 |
| | DE65−1 | Chromel | Constantan | Purple | | |
| | DJ65−1 | Iron | Constantan | Yellow | | |
| | DT65−1 | Copper | Constantan | Brown | | |
|  | DK30−3 | Chromel | Alumel | Blue | Core single0.3 Nom.finish 2.3×1.6 | Glass braided insulating sheath. |
| | DE30−3 | Chromel | Constantan | Purple | | |
| | DJ30−3 | Iron | Constantan | Yellow | | |
| | DT30−3 | Copper | Constantan | Brown | | |
|  | DK65−3 | Chromel | Alumel | Blue | Core single0.65 Nom.finish 3.4×2.1 | 〃 |
| | DE65−3 | Chromel | Constantan | Purple | | |
| | DJ65−3 | Iron | Constantan | Yellow | | |
| | DT65−3 | Copper | Constantan | Brown | | |
|  | DK80−3 | Chromel | Alumel | Blue | Core single0.8 Nom.finish 3×1.7 | 〃 |

Note : Other special Duplex wire thermocouples are also available upon request.

# Extension Cables

For RTDs

| Appearance | Type | Color Coding | Dimensions | Covering | Application |
|---|---|---|---|---|---|
|  | WR-12 | Black (Red, White, Blue) | Conductor 0.4/7<br>Nom. O.D. φ9.0mm | Outer: PVC insulating sheath.<br>Inner: Copper shield. | General |
|  | WR-13 | Grey (Red, White, White) | Conductor 0.18/20<br>Nom. O.D. φ5.0mm | Outer: Stainless Steel shield.<br>Inner: Glass braided insulating sheath. | High Temp. |
|  | WR-13(D) | Grey (R,W,W) (R,W,W) | Conductor 0.18/20<br>Nom. O.D. φ6.6mm | " | " |
|  | WR-15 | Grey (R,W,W) | Conductor 0.18/20<br>Nom. O.D. φ5.0mm | Outer: Heat-resistant PVC insulating sheath.<br>Inner: Copper shield. | General |
|  | WR-15(D) | Grey (R,W,W) (R,W,W) | Conductor 0.18/20<br>Nom. O.D. φ6.8mm | " | " |
|  | WR-16 | Grey (R,W,B) | Conductor 0.18/20<br>Nom. O.D. φ5.8mm | Outer: Silicon insulating sheath.<br>Inner: Copper shield. | High Temp. |
|  | WR-17 | White (R,W,W) | Conductor 0.18/12<br>Nom. O.D. φ4.0mm | Outer: Stainless Steel shield.<br>Inner: Glass insulating sheath. | " |
|  | WR-17(D) | White (R,W,B) (R,W,B) | Conductor 0.18/12<br>Nom. O.D. φ5.0mm | " | " |
|  | WR-18 | Grey (R,W,W) | Conductor 0.18/7<br>Nom. O.D. φ3.5mm | Heat-resistant PVC insulating sheath. | General |

Other special Types are also available (R=Red, W=White, B=Black)

# Model TW

*THERMOWELL (Drilled Bar Stock Protection Tube)*

## Description

THERMOWELL (Drilled Bar Stock Type Protection Tube) is usually being used to ensure longer longer service life under critical conditions such as very corrosive gases or liquids, high temperature, high pressure, vibration, shock or high flow velocity.

## Bores & Depths

| Bore (mm) | Max. Depth(mm) |
|---|---|
| 4.0 | 500 |
| 5.5 | 700 |
| 7.0 | 800 |
| 8.5 | 1,000 |
| 10.0 | 1,200 |
| 11.0 | 1,200 |
| 12.0 | 1,200 |
| 16.0 | 1,200 |

## Raw Material Sizes

**Round Bar (O.D.) : mm**

25, 26, 28, 30, 32, 36, 38, 40, 42, 44, 46, 48,50,55

**Hexagonal Bar : mm**

26, 29, 32, 35, 38, 41

## Standard Materials

304 SS, 316 SS, 316L SS, 3100 SS, Hastelloy B, Hastelloy C, Hstelloy X, Monel, Nickel and its alloys, 50Co-30cr, titanium and its alloys, Inconel. Other special materials are also available upon request.

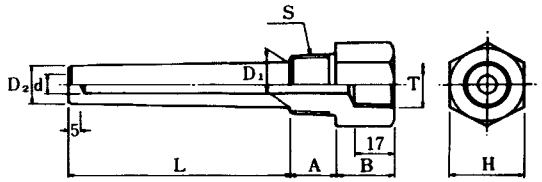
## Dimension of THERMOWELL

Unit: mm

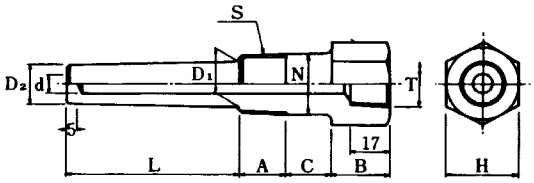
| Dimensions to measure | Nominal Dimensions | Tolerance | Applicable Standards |
|---|---|---|---|
| Length | Under 6 | ±0.2 | JIS B 0405, Normal Tolerence (Equiv. to ISO 2768, Coarse Series Machining) |
| | 6~ 30 | ±0.5 | |
| | 30~ 120 | ±0.8 | |
| | 120~ 315 | ±1.2 | |
| | 315~1000 | ±2.0 | |
| | 1000~1500 | ±3.0 | |
| Outer Diameter | Under 6 | ±0.1 | JIS B 0405, Normal Tolerance (Equiv. to ISO 2768, Medium Series Machining) |
| | 6~ 30 | ±0.2 | |
| | 30~ 120 | ±0.3 | |
| Bore Diameter | Under 6 | ±0.2 | — |
| | 6~ 10 | ±0.3 | |
| | 10~ 20 | ±0.5 | |

# Standard Models of TW

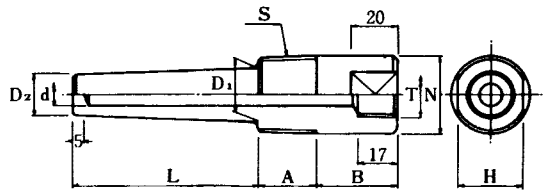
**TW·01** Hexagonal Screwed-in Type



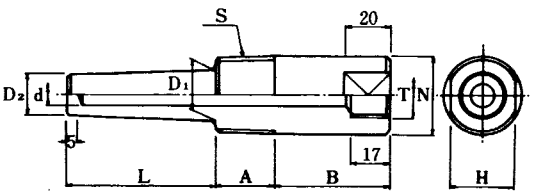

**TW·02** Hexagonal Screwed-in Type



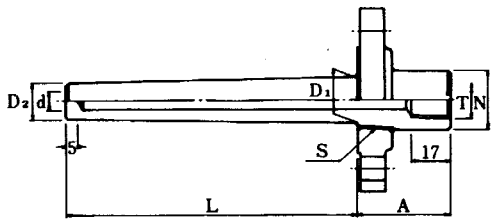

**TW·03** Screwed-in Weld Type



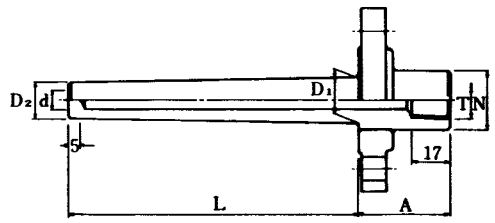

**TW·04** Screwed-in Weld Type



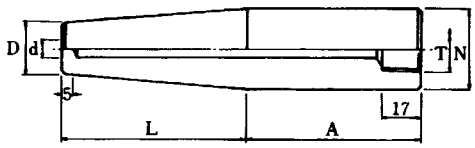

**TW·05** Flanged (Screwed-in) Type



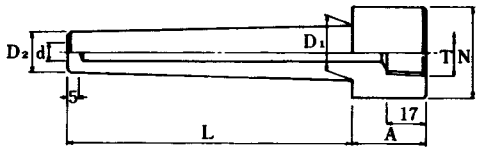

**TW·06** Flanged (Weld) Type



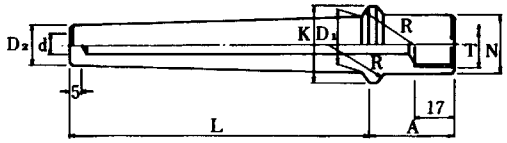

**TW·07** Plain Weld Type



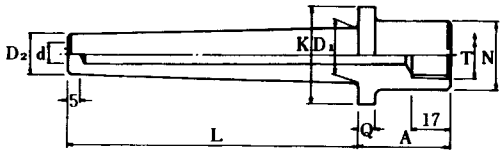

**TW·08** Weld Type




**TW·09** Ball Joint Type




**TW·10** Van Stone Type



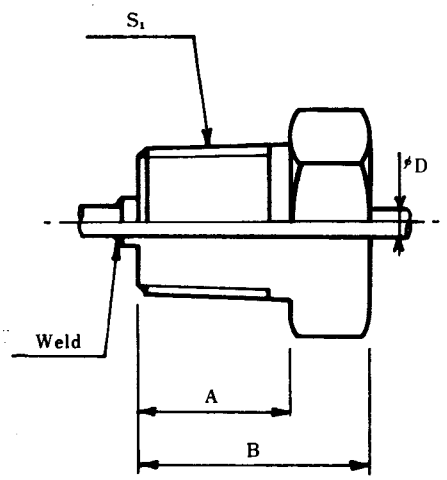

Straight or other special types are also available upon request.

# Standard Accessories

## Fitting & Bushing

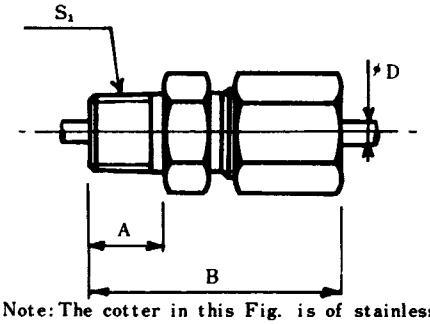
Unit: mm

### 1. Bushing (fixed) 304S.S.




| ϕ D | TYPE | $S_1$ | $S_2$ | A | B |
|---|---|---|---|---|---|
| 1.0 | BN101 | PT1/8 | — | 10 | 16 |
| 1.6 | BN161 | PT1/8 | — | 10 | 16 |
| 2.2 | BN221 | PT1/8 | — | 10 | 16 |
| 3.2 | BN321 | PT1/8 | — | 10 | 16 |
| | BN322 | PT1/4 | — | 12 | 20 |
| | BN324 | PT1/2 | — | 20 | 30 |
| 4.8 | BN481 | PT1/8 | — | 10 | 16 |
| | BN482 | PT1/4 | — | 12 | 20 |
| | BN484 | PT1/2 | — | 20 | 30 |
| | BN486 | PT3/4 | — | 20 | 30 |
| 6.4 | BN642 | PT1/4 | — | 12 | 20 |
| | BN644 | PT1/2 | — | 20 | 30 |
| | BN646 | PT3/4 | — | 20 | 30 |
| 8.0 | BN802 | PT1/4 | — | 12 | 20 |
| | BN804 | PT1/2 | — | 20 | 30 |
| | BN806 | PT3/4 | — | 20 | 30 |

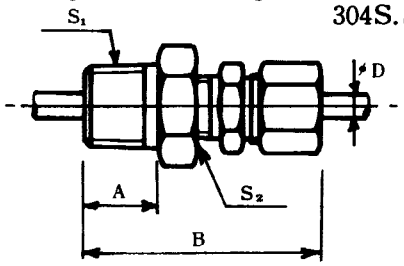
### 2. Compression Fitting 304S.S.




Note: The cotter in this Fig. is of stainless steel but Teflon cotter (Type TCF) is also available.

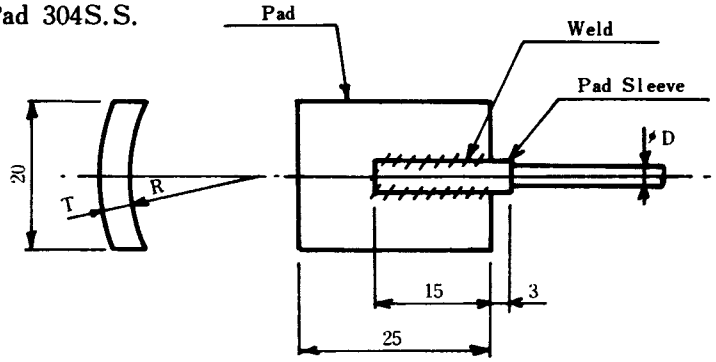
| ϕ D | TYPE | $S_1$ | $S_2$ | A | B |
|---|---|---|---|---|---|
| 1.0 | CF101 | PT1/8 | — | 10 | 33 |
| 1.6 | CF161 | PT1/8 | — | 10 | 33 |
| | CF162 | PT1/4 | — | 10 | 35 |
| 2.2 | CF221 | PT1/8 | — | 10 | 33 |
| | CF222 | PT1/4 | — | 10 | 35 |
| 3.2 | CF321 | PT1/8 | — | 10 | 33 |
| | CF322 | PT1/4 | — | 12 | 35 |
| 4.8 | CF481 | PT1/8 | — | 10 | 33 |
| | CF482 | PT1/4 | — | 12 | 35 |
| 6.4 | CF642 | PT1/4 | — | 12 | 35 |
| 8.0 | CF802 | PT1/4 | — | 12 | 35 |

### 3. Compression Fitting with Bushing 304S.S.




| ϕ D | TYPE | $S_1$ | $S_2$ | A | B |
|---|---|---|---|---|---|
| 3.2 | CF324 | PT1/2 | PT1/8 | 20 | 59 |
| | CF326 | PT3/4 | PT1/8 | 20 | 59 |
| 4.8 | CF484 | PT1/2 | PT1/8 | 20 | 59 |
| | CF486 | PT3/4 | PT1/8 | 20 | 59 |
| 6.4 | CF644 | PT1/2 | PT1/4 | 20 | 59 |
| | CF646 | PT3/4 | PT1/4 | 20 | 59 |
| 8.0 | CF804 | PT1/2 | PT1/4 | 20 | 59 |
| | CF806 | PT3/4 | PT1/4 | 20 | 59 |

### 4. Pad 304S.S.

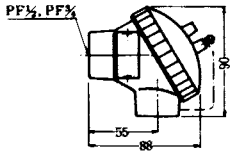
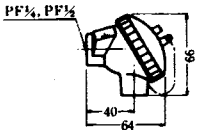
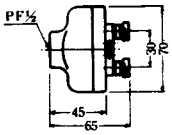
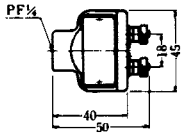


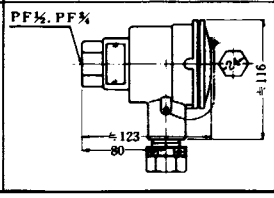
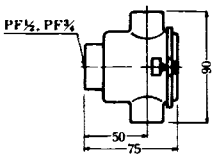
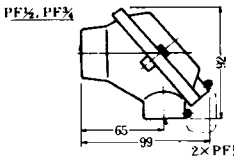
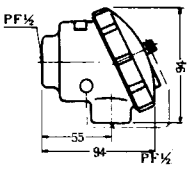

| ϕ D | T |
|---|---|
| 3.2 | 4 |
| 4.8 | 5 |

Note: Specify "R" when ordering. However, in case R≧50mm, it will be made as "flat."

# Terminal Boxes

Other entry threads of NPT , PT and Metric's can be specified

| Type | K N | K S | T L | T S |
|---|---|---|---|---|
| Material<br>Conduit Dia.<br>No. of Terminal | Al-alloy diecast, Cast Iron<br>PF½ · PF¾<br>2 · 3 · 4 · 6 | Al-alloy diecast, Phenol Resin<br>PF⅜<br>2 · 3 | Al-alloy diecast<br>——<br>2 | Al-alloy diecast<br>——<br>2 |
| Terminal Block | Bakelite, Ceramic | Bakelite, Ceramic | Bakelite, Ceramic | Bakelite, Ceramic |
| Surface Finish<br>Surface Color | Melamine baked<br>Metallic silver | Melamine baked<br>Metallic silver | Melamine baked<br>Metallic silver | Melamine baked<br>Metallic silver |
| Dimensions |  |  |  |  |

| Type | Flame Proof KG ($d_2G_4$) | K R | K F | K P |
|---|---|---|---|---|
| Material<br>Conduit Dia.<br>No. of Terminal | Al-alloy diecast, Cast Iron<br>Stainless Steel<br>M16, 20, 25<br>2 · 3 · 4 · 6 | Al-alloy diecast<br>PF½ × 2<br>4 · 6 | Al-alloy diecast<br>PF½ × 2<br>4 · 6 | Phenol Resin<br>PF½<br>2 · 3 · 4 |
| Terminal Block | Bakelite(Ceramic) | Bakelite, Ceramic | Bakelite, Ceramic | Bakelite, Ceramic |
| Surface Finish<br>Surface Color | Melamine baked<br>Metllic silver | Melamine, baked<br>Metallic silver | Melamine baked<br>Metllic silver | ——<br>Black |
| Dimensions |  |  |  |  |

* Approved by BASEEFA for "Exd IIC T6" to BS 4683. Part 2 and BS 5501. Part 1.4.5(EN 50014-18).
Two-entry model also available.

# Reference

## Chemical Resistance of Protection Tubes

| Corrosives | Concent. | Temp. (℃) | 304SS | 321SS | 316SS | 316LSS | 316JILSS | 310S SS | 347SS | Carpenter 20 | Inconel 600 | Nimonic | Hastelloy B | Hastelloy C | 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 | B | 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 | C | 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 | B | A | 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 | B | A | 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 | B | A | A | A | A | | A | B | A | A | B | A | B | | B | B | C | B | C | | B |
| $H_3PO_4$ | 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 | 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 | | | | | | | | | | | |
| $H_2O_2$ | | | 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.

# Model TC230

*Digital Temperature Indicator (for RTDs)*

## Description

The Model TC230 is a 1/8DIN temperature controller. This control may be configured with dual control output.



## Features

- For RTD. PT100Ω
- 1/8DIN Size
- High, Low Relay Output
- Hysteresis Adjustment

## Specifications

| | |
|---|---|
| **DISPLAY TYPE** | LED(Red Color) |
| **Max Readout** | 1999.9 |
| **Height of Digits** | 14mm(0.55inch) |
| **PHYSICAL** | |
| **Operating temperature** | 0~50℃ |
| **Storage Temperature** | -40~85℃ |
| **Weight** | Approx. 500g(Unit Only) |
| **CONTROL SYSTEM** | |
| | 8bit Micro Computer |
| **DIMENSIONS** | |
| **Panel Cutout Dimensions** | 1/8DIN : 92 × 45mm |
| **Front Panel** | 96mm(W) ×48mm×144mm(D) |
| **ELECTRICAL DATA** | |
| **Power** | 110VAC 50/60Hz, 220VAC 50/60Hz |
| **Temperature Sensor** | PT100Ω |
| **ACCURACY (Readout Only)** | |
| **23℃** | ±0.01%R ±1digit |
| **0~50℃** | ±0.02%R ±1digit |
| **ANALOG OUTPUT** | |
| **Standard** | Relay Contact(High, Low) |
| **COMPATIVE CONDITION** | |
| | High, Low, Hysteresis Setpoint |

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· Specifications are subject to change without notice.

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