

# Head mounting type temperature transmitter (RTD only)

## Model : R912 (with T990)

Spec. sheet no. RD09-02

### Service intended

These transmitters are recommended be used in the situation where the application of RTD signals to carry to a long distance or to guard against the heavy electrical field noise. The transmitters convert RTD inputs to an analog signal for a direct interface with indicators, recorders, controllers, PLC, DCS systems, and these can be used for a wide range of applications in process control, automatic machinery and hydraulic or pneumatic system design.

### Advantages

- Two wire 4 - 20 mA current output signal
- RTD input
- Measuring range from -50~400 °C
- Fixed range
- Excellent accuracy and long term stability
- Low - cost
- Miniature design

### Max. allowable pressure at stem

- Standard RTD/TC Sensor (Welded Type)  
Usable up to 18 MPa (180 bar) under static conditions.  
For vibration, flow, or fluctuating pressure conditions, Thermowell is recommended.
- Spring-Loaded Sensors  
These sensors do not have external pressure sealing capabilities and must always be used in conjunction with a thermowell.



Model : T990



EAC KCS

## Specification

### Electrical specification

Excitation voltage : 18~30 V  
Load resistance : Max. 500  $\Omega$  at 24 V  
Influence of excitation : 0.01 % FSO/V  
Burnout : Upscale (Approx. 23 mA DC) or  
Down scale (Approx. 4 mA DC)  
Reverse polarity : Protected  
Shock resistance : No change in performance after  
10Gs for 11ms  
Vibration : 5g (10~2,000 Hz)  
Response time (10~90 %) :  $\pm 0.5$  seconds  
Adjustment range :  $\pm 15$  % of full scale / Zero and span

### Performance specification

Accuracy :  $\pm 0.2$  % of full scale  
Non - linearity : Better than 0.10 % of full scale  
Repeatability : Better than 0.05 % of full scale  
Long term stability : Better than 0.05 % of full scale per month  
Ambient temperature limits : -40~65 °C  
Ambient humidity limits : 5~95 % R.H

### Input

Measuring element : Pt 100  $\Omega$  at 0 °C

### Output

Current output  
Electrical connection type : 2-wire technique  
Full scale output signal : 20 mA  $\pm 0.2$  %  
Zero measured output : 4 mA  $\pm 0.03$  %  
Other output signals available on request

### Certificates

KCS Ex d IIC T6  
KCS Ex tD A21 T85

°C

**WISE**

## Main order

## Ordering information

### 1. Base model

**R912** Temperature transmitter (RTD only)

### 2. Head and tip shape type

- F** Explosion proof and ungrounded
- G** Explosion proof and spring - loaded
- P** Explosion proof (Double conduit) and ungrounded
- S** Explosion proof (Double conduit) and spring - loaded

### 3. Element

- Q** Pt 100 Ω(B)
- 9** Pt 100 Ω(A)

### 4. Sheath or tube material

- 0** 304SS
- 1** 316SS
- 7** 316L SS
- 9** Other

### 5. Sheath or tube outer diameter (mm)

| Sheath type   | Tube type      |
|---------------|----------------|
| <b>D9</b> 3.2 | <b>E8</b> 4.8  |
| <b>E9</b> 4.8 | <b>F8</b> 6.4  |
| <b>F9</b> 6.4 | <b>G8</b> 8.0  |
| <b>G9</b> 8.0 | <b>J0</b> 10.0 |
| <b>N9</b> 6.0 |                |

### 6. Conduit connection

- 3** ½" NPT
- 6** ¾" NPT
- 7** None
- 8** M20 x 1.5P
- 9** Other

### 7. Mounting type

- X** Refer to mounting table (11<sup>th</sup> character)

### 8. Connection type

- XX** Refer to Connection table (12<sup>th</sup> and 13<sup>th</sup> character)

### 9. Insert length

- X** Refer to insert length table (14<sup>th</sup> character)

### 10. Option

- 0** None
- 1** Accessories
- 4** Epoxy coated ALDC head
- 6** Head material : 316SS
- 7** Accessories and epoxy coated ALDC head
- 9** Accessories and head material : 316SS
- A** Ex tD Certi.
- B** Accessories and Ex tD Certi.
- C** Epoxy coated and Ex tD Certi.
- D** Head material : 316SS and Ex tD Certi.
- E** Accessories, Epoxy coated and Ex tD Certi.
- F** Accessories and Head material : 316SS and Ex tD Certi.

### Sample ordering code

|      |   |   |   |    |   |   |    |   |    |
|------|---|---|---|----|---|---|----|---|----|
| 1    | 2 | 3 | 4 | 5  | 6 | 7 | 8  | 9 | 10 |
| R912 | F | Q | 7 | F9 | 3 | X | XX | X | 4  |



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**1. Base model****T990** Temperature transmitter**2. Input type****RJ** Pt 100  $\Omega$ **3. Measuring range (°C)**

**05** 0 ~ 50  
**10** 0 ~ 100  
**15** 0 ~ 150  
**20** 0 ~ 200  
**25** 0 ~ 250  
**30** 0 ~ 300  
**40** 0 ~ 400  
**50** 0 ~ 500  
**51** 50 ~ 150  
**55** 50 ~ 150  
**12** 100 ~ 200  
**13** 100 ~ 300  
**N0** -50 ~ 50  
**N1** -50 ~ 100  
**N5** -50 ~ 150  
**N2** -50 ~ 200  
**ZZ** Special

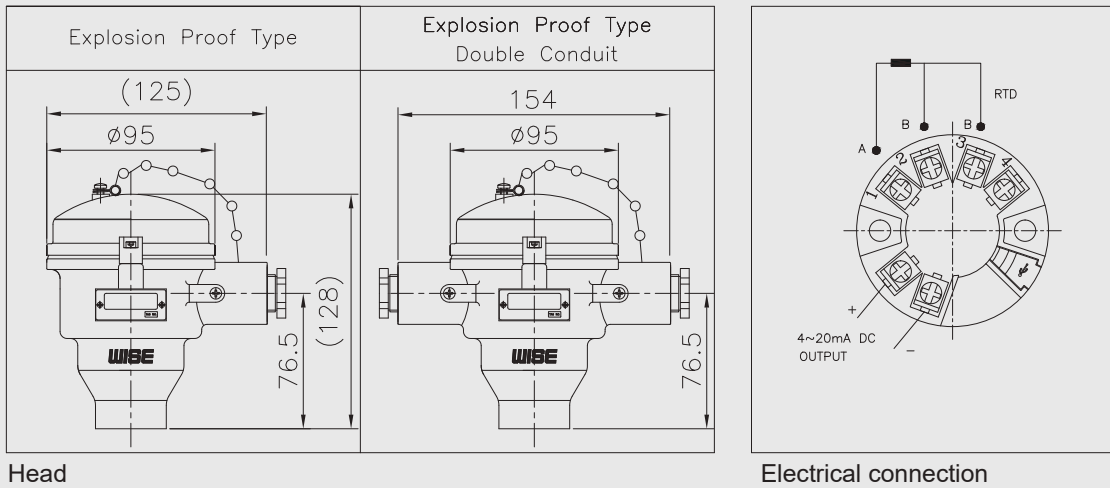
**4. Burn-out**

**U** Up scale  
**D** Down scale

**Sample ordering code**

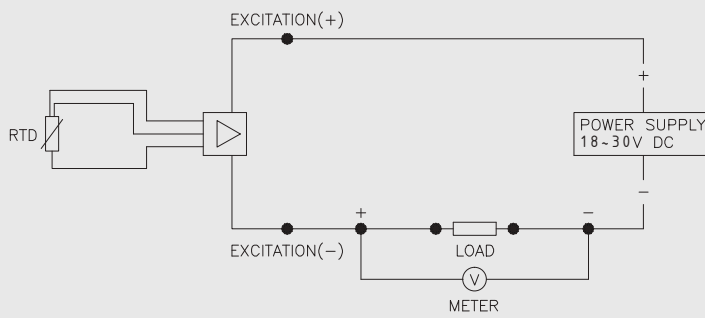
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|-------------|-----------|-----------|----------|
| 1           | 2         | 3         | 4        |
| <b>T990</b> | <b>RJ</b> | <b>05</b> | <b>U</b> |

## R912 : Type of mounting

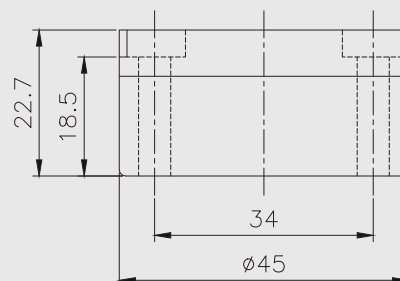
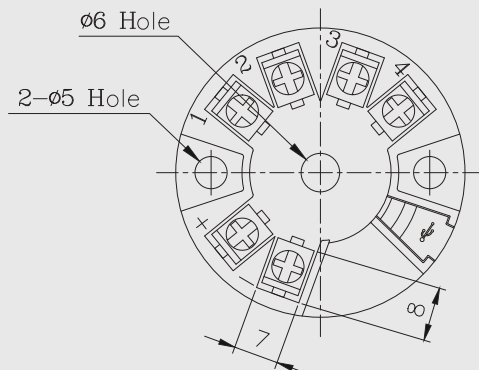


Head

Electrical connection



System connection for 2 - wire transmitter



## Mounting, connection type and insert length table - 11<sup>th</sup> thru 14<sup>th</sup> characters

| 11 <sup>th</sup> character |                         | 12 <sup>th</sup> character |  | 13 <sup>th</sup> character |                      | 14 <sup>th</sup> character |                    |
|----------------------------|-------------------------|----------------------------|--|----------------------------|----------------------|----------------------------|--------------------|
| Code                       | Mounting                | Code                       | Connection size and connector material | Code                       | Connection type      | Code                       | Insert length (mm) |
| A                          | None                    | A                          | None                                   | A                          | None                 | A                          | 100                |
|                            | Fixed thread lag length | B                          | 1/8" and 304SS                         | B                          | PT                   | B                          | 200                |
| B                          | 80 mm                   | C                          | 1/4" and 304SS                         | C                          | NPT                  | C                          | 300                |
| C                          | 100 mm                  | D                          | 3/8" and 304SS                         | D                          | PF                   | D                          | 400                |
| D                          | 150 mm                  | E                          | 1/2" and 304SS                         | E                          | NPS                  | E                          | 500                |
| E                          | 200 mm                  | F                          | 3/4" and 304SS                         | F                          | UNF                  | F                          | 600                |
| F                          | Other                   | G                          | 1" and 304SS                           | G                          | BSPT                 | G                          | 700                |
|                            | Fixed flange lag length | H                          | 1 1/4" and 304SS                       | H                          | BSPF                 | H                          | 800                |
| G                          | 80 mm                   | J                          | 1 1/2" and 304SS                       | J                          | MM                   | J                          | 900                |
| H                          | 100 mm                  | K                          | 2" and 304SS                           | K                          | B16.5 Class 150 RF   | K                          | 1,000              |
| J                          | 150 mm                  | L                          | 3" and 304SS                           | L                          | B16.5 Class 150 FF   | L                          | 1,500              |
| K                          | 200 mm                  | M                          | 7/8" and 304SS                         | M                          | B16.5 Class 300 RF   | M                          | 2,000              |
| L                          | Other                   | N                          | 1 1/8" and 316SS                       | N                          | B16.5 Class 300 FF   | N                          | 2,500              |
| M                          | Movable thread          | P                          | 1/4" and 316SS                         | O                          | Sanitary             | P                          | 3,000              |
| N                          | Movable flange          | Q                          | 3/8" and 316SS                         | P                          | B16.5 Class 600 RF   | Q                          | 3,500              |
| P                          | Compression fitting     | R                          | 1/2" and 316SS                         | Q                          | B16.5 Class 600 FF   | R                          | 4,000              |
|                            | Union and nipple length | S                          | 3/4" and 316SS                         | R                          | JIS 5K RF            | S                          | 4,500              |
| Q                          | 100 mm length           | T                          | 1" and 316SS                           | S                          | JIS 5K FF            | T                          | 5,000              |
| R                          | 150 mm length           | U                          | 1 1/4" and 316SS                       | T                          | JIS 10K RF           | U                          | 6,000              |
| S                          | Other                   | V                          | 1 1/2" and 316SS                       | U                          | JIS 10K FF           | V                          | 7,000              |
|                            | Nipple length           | W                          | 2" and 316SS                           | V                          | JIS 20K RF           | W                          | 8,000              |
| T                          | 50 mm                   | X                          | 3" and 316SS                           | W                          | JIS 20K FF           | X                          | 9,000              |
| U                          | 100 mm                  | Y                          | 7/8" and 316SS                         | X                          | B16.5 Class 1500 RTJ | Y                          | 10,000             |
| V                          | 150 mm                  | Z                          | Other                                  | Y                          | B16.5 Class 2500 RTJ | Z                          | Other              |
| W                          | Other                   |                            |  | Z                          | Other                |                            |                    |
| X                          | Fixed thread            |                            |  |                            |                      |                            |                    |
| Z                          | Other                   |                            |  |                            |                      |                            |                    |

■ Note for 14<sup>th</sup> character, please choose a code of next higher length if applicable length is not.

Actual length shall be specified.

■ Note for \*Y code (Oil sealing type), only available with spring-loaded head type.

## Other option codes

This catalog provides additional optional information beyond the main ordering information for the basic models of thermocouple and RTD.

### 1. Select option code for Head type Conduit adapter

When using the Conduit adapter, the code selection for the material is as follows.

| Base Model   | Code | Code Name                                  | Remark  |
|--|------|--|---|
| R110, R120, R200,<br>R210, R220, R300,<br>R600, R700, R911,<br>R912, R920, R940,<br>R950, R960, R970 | M6   | General (Weather-proof) Brass + Ni Plating | The size of the conduit connection is selected in the main order of the base model. |
|  | M7   | Ex-proof Brass + Ni Plating                |   |
|  | M8   | General (Weather-proof) 304SS              |   |
|  | MA   | General (Weather-proof) 316SS              |   |
|  | MB   | Ex-proof 316SS                             |   |
|  | AD   | Other (Contact the head office)            |   |

Note.

1. See the <Table: Head information> below for the types of cable conduit that may be connected.
2. For sizes other than the conduit of the head itself, an adapter must be used.
3. Certified explosion proof cable glands must be used when installing in hazardous areas.
4. For other inquiries, please contact the head office.

<Table: Head information>

| Head Type                    | Head Material | Head thread<br>(Cable entry size)   | Conduit Adapter   |   |
|------------------------------|---------------|---|---|---|
|                              |               |   | Size  | Material  |
| Ex-proof<br>(Single Conduit) | ALDC          | PF $\frac{1}{2}$ "(F), PF $\frac{3}{4}$ "(F),<br>NPT $\frac{1}{2}$ "(F), NPT $\frac{3}{4}$ "(F) | NPT $\frac{1}{2}$ "(F), NPT $\frac{3}{4}$ "(F)<br>M20X1.5P(F)<br>PT (Unavailable)                             | Brass + Ni Plating<br>316SS   |
|                              | 316SS         | PF $\frac{1}{2}$ "(F)   |   |   |
| Ex-proof<br>(Double Conduit) | AC4C          | PF $\frac{1}{2}$ "(F)   |   |   |
| General<br>(Weather-Proof)   | ALDC          | PF $\frac{1}{2}$ "(F), PF $\frac{3}{4}$ "(F)  | PT $\frac{1}{2}$ "(F), PT $\frac{3}{4}$ "(F)<br>NPT $\frac{1}{2}$ "(F), NPT $\frac{3}{4}$ "(F)<br>M20X1.5P(F) | Brass + Ni Plating<br>(Only PT $\frac{1}{2}$ "(F), PT $\frac{3}{4}$ "(F))<br>316SS, 304SS |
|                              | 316SS         | PF $\frac{3}{4}$ "(F)   |   |   |
|                              | 304SS         | PF $\frac{3}{4}$ "(F)   |   |   |
| Compact (Small)              | ALDC          | PF $\frac{1}{2}$ "(F)   |   |   |

## 2. Lead wire type

If the WISE standard Lead wire type is not applied, the option code below can be selected.

| Base Model                | Code | Code Name                                    | Remark   |
|---------------------------|------|--|--|
| R200, R300, R600,<br>R950 | E1   | Only Extended lead wire                      | 1) "E1": Lead wire disconnection<br>2) "E2": Use only armored tube type code for R330.<br>3) "E4", "E9": Only to Extension lead type<br>4) 316SS armored tube type (Contact the head office) |
|                           | E2   | 304SS armored tube type                      |  |
|                           | E3   | Shrinkable tube with 304SS armored tube type |  |
|                           | E4   | Outer shield                                 |  |
|                           | E8   | PVC Coating with 304SS armored tube type     |  |
|                           | E9   | Shrinkable tube type                         |  |
|                           | EA   | 316SS armored tube type                      |  |
|                           | EB   | Shrinkable tube with 316SS armored tube type |  |
|                           | EC   | PVC Coating with 316SS armored tube type     |  |

## 3. Insulation material for lead wire

If the WISE standard Insulation material for Lead wire is not applied, the option code below can be selected.

| Base Model                | Code | Code Name     | Remark  |
|---------------------------|------|---------------|---|
| R200, R300, R600,<br>R950 | FB   | Silicon       | Other materials are selected after consulting the head office |
|                           | MC   | PVC           |   |
|                           | MD   | Teflon        |   |
|                           | ME   | Non-asbestos  |   |
|                           | MG   | Teflon (Grey) |   |
|                           | AD   | Other         |   |

Note.

Extension & compensation wire (WISE Standard)

Composed of a combination of 2-item. Lead wire type and 3-item. Insulation material for lead wire.

### 1. Thermocouple

1.1) E4ME: Outer shield (tinned copper) + Non asbestos (200°C) (STD) - Omit code selection

1.2) MD (Teflon), MC (PVC): Single only (Excluding shield). In the case of Double, it is produced with 2 single wires.

1.3) E4MD: Outer shield (tinned copper) + Teflon (Contact the head office)

1.4) ME: Element B, R, S type - Non asbestos only (Excluding shield) - Omit code selection

### 2. RTD

2.1) E4MD: Outer shield (tinned copper) + Teflon (100~120°C) (STD) - Omit code selection

2.2) E4ME: Outer shield (tinned copper) + Non asbestos

2.3) MD (Teflon), MC (PVC): Single only (excluding shield). In the case of Double, it is produced with 2 single wires.

For other inquiries, please contact the head office.

#### 4. Lead wire color

| Base Model   | Code | Code Name     | Remark  |
|--|------|---------------|---|
| R110, R120, R200,<br>R210, R220, R300,<br>R600, R700, R911,<br>R912, R920, R940,<br>R950, R960, R970 | A0   | ANSI Code     | Thermocouple ANSI (ISA MC96.1) Code   |
|  | E0   | EN (IEC) Code | Thermocouple EN (IEC 60584-3) Code<br>RTD EN (IEC 60751) and JIS C 1605-2013 Code |
|  | K0   | KS Code       | Thermocouple JIS C 1610 (KS C 1609) Code<br>RTD JIS (Old), KS C 1603 Code         |
|  | Z0   | Other         | For other materials, contact the head office.                                     |

Note.

1. Add code when requesting lead wire standard designation. (Use WISE STD when option code is not selected)  
WISE standard Thermocouple JIS C 1610 (KS C 1609) "K0", RTD EN (IEC 60751) "E0" Omit code selection.
2. If you are using a version prior to JIS C 1604-2013, select option code "K0".  
If the "K0" option code is not selected, WISE standard EN (IEC 60751) colors are used.
3. RTD lead wire material (Teflon + Outer Teflon) is only available with KS C 1603 "K0" option code.
4. If the lead wire material is PVC, the standard size cannot be applied to the lead wire color.  
Available in PVC manufacturer specified colors only.
5. For other inquiries, please contact the head office.

#### <International color code table>

(Differential colors may be used according to customer requirements.)

#### ■ Thermocouple (TC)

| Type | EN (IEC 60584-3) |       | ANSI (ISA MC96.1) |     | JIS C 1610 (KS C 1609) |       |
|------|------------------|-------|-------------------|-----|------------------------|-------|
|      | (+)              | (-)   | (+)               | (-) | (+)                    | (-)   |
| T    | Brown            | White | Blue              | Red | Red                    | White |
| E    | Violet (Purple)  | White | Purple            | Red | Red                    | White |
| J    | Black            | White | White             | Red | Red                    | White |
| K    | Green            | White | Yellow            | Red | Red                    | White |
| N    | Pink             | White | Orange            | Red | Red                    | White |
| B    | Grey             | White | Grey              | Red | Red                    | White |
| R    | Orange           | White | Black             | Red | Red                    | White |
| S    | Orange           | White | Black             | Red | Red                    | White |

#### ■ Resistance thermometer detector (RTD)

IEC/EN 60751 standard applied (See applicable colors for the KS C 1603 standard)

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
|                 |                 |                 |                 |
| Single (3-Wire) | Double (6-Wire) | Single (4-Wire) | Double (8-Wire) |

## 5. Lead Wire Terminal

| Base Model   | Code | Code Name                 | Remark  |
|--|------|---------------------------|---|
| R200, R300, R600, R950   | E5   | Jack Connector (2P)       | Shape reference for each type   |
|  | E6   | Quick Connector           |   |
|  | E7   | Small Jack Connector (2P) |   |
| R110, R120, R200, R210, R220, R230, R600, R700, R911, R912, R920, R940, R950, R960, R970 | Y0   | Except Terminal Lug       | WISE Standard<br>(The specifications produced without selecting other option codes are as follows.)<br>Head type: Except Terminal Lug (STD)<br>Non Head type: "Y" type Terminal Lug (STD) |
|  | Y1   | "O" type Terminal Lug     |   |
|  | Y2   | "I" type Terminal Lug     |   |
|  | Y3   | "Y" type Terminal Lug     |   |

Note.

1. The shape of each type is as follows.

|  |  |   |  |
|--|--|---|--|
| <p>Jack connector</p> <p>(Male) (Female)</p> |  | <p>Quick connector</p> <p>(Male) (Female)</p> |  |
| <b>"E5", "E7" (Jack Connector)</b>           |  | <b>"E6" (Quick Connector)</b>                 |  |
|  |  |   |  |
| <b>"Y1" ("O" type Terminal Lug)</b>          |  | <b>"Y2" ("I" type Terminal Lug)</b>           |  |
|  |  |   |  |
|  |  | <b>"Y3" ("Y" type Terminal Lug)</b>           |  |

## 6. Element type option (for RTD Element type)

| Base Model                                     | Code | Code Name       | Remark   |
|--|------|-----------------|--|
| R220, R300, R600, R911, R912, R920, R940, R950 | S0   | Silicon Molding | Option applied to models except model R200 (Sheath outer diameter: 6, 6.4, 8 mm) |
|  | Z1   | Element (Other) | Cryogenic sensor   |

## 7. Terminal for Thermocouple (Head type)

| Base Model   | Code | Code Name     | Remark  |
|--|------|---------------|---|
| R110, R120, R300, R600, R700, R920, R940, R950, R960, R970 | TK   | "K" type only | If the terminal block terminal material is the same material request as the thermocouple (TC) inner conductor |
|  | TE   | "E" type only |   |

## 8. Mounting Bracket

| Base Model  | Code | Code Name                                 | Remark  |
|---|------|---|---|
| R120, R200, R220,<br>R300, R600, R911,<br>R912, R920, R940,<br>R950 | R1   | 2" Mounting bracket (304SS)               | For dimensions and shapes other than the mounting bracket, select other "R0" and contact the head office. |
|   | R2   | 2" Mounting bracket (316L SS)             |   |
|   | R6   | Wall Mounting bracket STD (304SS)         |   |
|   | R7   | Wall Mounting bracket STD (316L SS)       |   |
|   | RA   | Wall Mounting bracket open type (304SS)   |   |
|   | RB   | Wall Mounting bracket open type (316L SS) |   |
|   | RC   | Wall Mounting bracket vertical (304SS)    |   |
|   | RD   | Wall Mounting bracket vertical (316L SS)  |   |
|   | R0   | Other                                     |   |

Note.

Mounting Bracket shape reference.

|   |  |
|---|--|
|   |  |
| <p>"R1", "R2" (2" Mounting Bracket)</p>             | <p>"R6", "R7" (Wall Mounting Bracket)</p>          |
|   |  |
| <p>"RA", "RB" (Wall Mounting Bracket Open type)</p> | <p>"RC", "RD" (Wall Mounting Bracket Vertical)</p> |

## 9. Element post-processing

| Base Model   | Code | Code Name            | Remark |
|--|------|----------------------|--------|
| R110, R120, R200,<br>R210, R220, R300,<br>R600, R911, R912,<br>R920, R940, R950,<br>R960 | P4   | Buffing (#300)       |        |
|  | P6   | Electrical Polishing |        |
|  | PA   | Teflon Coating       |        |
|  | PB   | Teflon Lining        |        |

## 10. Mounting type Option

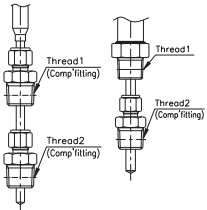
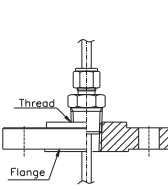
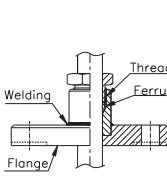
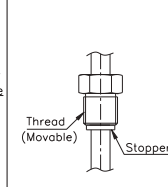
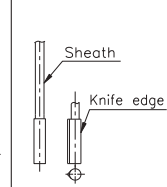
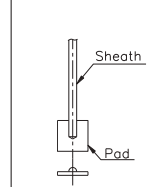
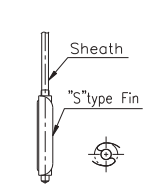
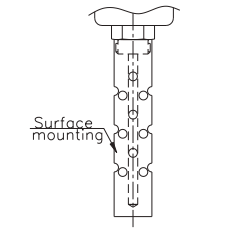
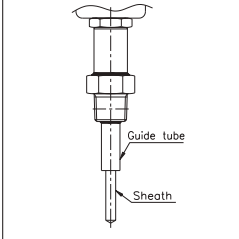
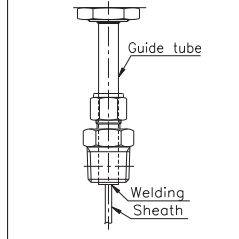
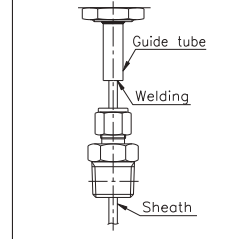
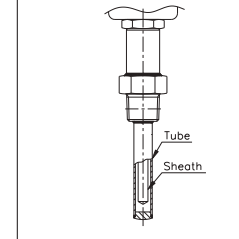
| Base Model   | Code                  | Code Name                           | Remark  |
|--|-----------------------|-------------------------------------|---|
| R110, R120, R200, R210, R200, R300, R600, R700, R911, R912, R920, R940, R950, R960, R970 | AM                    | AVL Maker                           | 1) AVL Maker: Corresponds to the use of flange or compression fitting by designated manufacturers.<br>2) "CF", "FT" codes are additional mounting options to the basic mounting type options.<br>3) "KE", "PD" applies to models R940, R950 series.<br>4) See other mounting type shapes. |
|  | CF                    | With Compression Fitting            |   |
|  | FT                    | With Flange (Thread type)           |   |
|  | FW                    | With Flange (Welding type)          |   |
|  | KE                    | With Knife Edge (Only Thermocouple) |   |
|  | MF                    | Movable (Ferrule type)              |   |
|  | MS                    | Movable (Stopper type)              |   |
|  | PD                    | With Pad                            |   |
|  | SF                    | With S-Fin                          |   |
|  | ST                    | With Shroud tube                    |   |
|  | T0                    | With Guide tube                     |   |
|  | T1                    | Above Guide tube                    |   |
|  | T2                    | Below Guide tube                    |   |
|  | T3                    | Outer protection tube               |   |
| ZZ   | Mounting type (Other) |                                     |   |

### Note.

Please select an option other than the mounting type option ordering information in the main order.

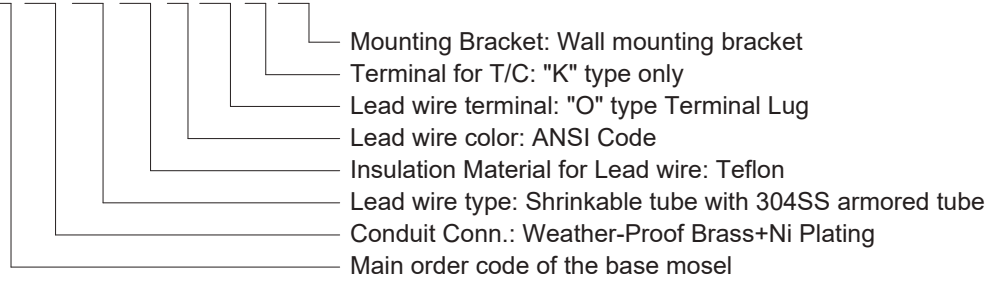
Of there is no mounting type option to select in the other option code, select mounting type (other) code "ZZ" and contact the head office.

### < Other mounting type shape reference >

|   |   |   |  |   |   |   |
|---|---|---|--|---|---|---|
|  |  |  |   |   |  |  |
| <b>"CF"</b><br>With Compression Fitting   | <b>"FT"</b><br>With Flange (Thread type)  | <b>"MF"</b><br>Movable (Ferrule type)   | <b>"MS"</b><br>Movable (Stopper type)  | <b>"KE"</b><br>With Knife Edge  | <b>"PD"</b><br>With Pad   | <b>"SF"</b><br>With S-Fin   |
|  |  |  |  |  |   |   |
| <b>"ST"</b><br>With Shroud tube   | <b>"T0"</b><br>With Guide tube  | <b>"T1"</b><br>Above Guide tube   | <b>"T2"</b><br>Below Guide tube  | <b>"T3"</b><br>Outer Protection tube  |   |   |

**< Example >**

R321 X X X XX X X X X X X **M8 E3 MD A Y1 K R6**



\* The above example is a thermocouple specification, and if other option codes are not selected, the code digits are not displayed.

\* The above other option codes do not apply to all models, so please inquire at the head office before selecting.

\* For order specifications or other inquiries other than the above other option codes, please contact the head office.