Explosion proof
Thermocouple and resistance temperature detector
Model : R940 series (ETR series)

Spec. sheet no. RS09-05

Service intended
Measuring the temperature in the area where combustible gas, particles and flammable liquid exist can be a very dangerous task. The electrical energy of measuring instrument is lower than electric motor, however, the malfunction of the instrument or the accident can cause to start the explosion. Therefore, ETR series is explosion proof type product which is designed to be used in a critical danger Zone 1 by acquiring IECEx and ATEX certification.

Sheath type

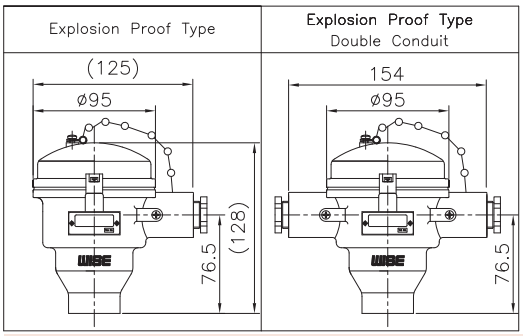
Non-metallic protection tube type

Certificates
ATEX II 2G Ex d IIC T6 Gb
IECEx Ex d IIC T6 Gb

Ambient temperature
-40 ~ +65 ºC

Degree of protection
EN60529/IEC529/IP67

Head type



Standard features

Element
■ **Sheath type**
Thermocouple : K, E, J, T, N
RTD : Pt 100 Ω at 0 ℃

■ **Non-metallic protection tube type**
Type R (87 % Pt, 13 % Rh/Pt)
Type S (90 % Pt, 10 % Rh/Pt)
Type B (70 % Pt, 30 % Rh / 94 % Pt, 6 % Rh)
Type K

Head material
ALDC (Standard)
316SS

Tolerances on temperature reading
■ **Sheath type**
- Thermocouple
Class 1, Class 2 (DIN/IEC584-2, BS/EN60584-2, JIS C1602)
Special, Standard (ASTM E230, E988, ISA-MC96.1)

- R.T.D.
Class A : ± (0.15 + 0.002 l t l)
Class B : ± (0.3 + 0.005 l t l)

■ **Non-metallic protection tube type**
"K" type : Class 2 (0.75 %)
Standard (0.75 %)
"R", "S" type : Class 2 (0.25 %)
Standard (0.5 %)
"B" type : Class 3 (0.5 %)
Standard (0.5 %)

Main order - Sheath type — Ordering information

1. Base model

R941	Single element
R942	Double (Duplex) element
R943	Single element with spring load type
R944	Double (Duplex) element with spring load type

2. Head and tip shape type

A	ALDC head and ungrounded
B	ALDC head and grounded
C	ALDC head(Double conduit) and ungrounded
D	ALDC head(Double conduit) and grounded
E	316SS head and ungrounded
F	316SS head and grounded
G	316SS head(Double conduit) and ungrounded
H	316SS head(Double conduit) and grounded

3. Element

K	K (0.75)	**1**	K (0.4)
J	J (0.75)	**2**	J (0.4)
T	T (0.75)	**3**	T (0.4)
E	E (0.5)	**4**	E (0.4)
N	N (0.75)	**5**	N (0.4)
Q	Pt 100 Ω (B), 3 wire	**9**	Pt 100 Ω (A), 3 wire
U	JPt 100 Ω (B), 3 wire	**0**	JPt 100 Ω (A), 3 wire
A	Pt 100 Ω (B), 4 wire	**C**	Pt 100 Ω (A), 4 wire
B	JPt 100 Ω (B), 4 wire	**D**	JPt 100 Ω (A), 4 wire
Z	Other		

4. Sheath material (RTD. is only 316SS and 316L SS)

1	316SS
2	Inconel 600
3	310SS
4	446SS
5	347SS
6	321SS
7	316L SS
9	Other

5. Sheath outer diameter (mm)

A9	1.0 (Thermocouple only)
B9	1.6 (Thermocouple only)
C9	2.3 (Thermocouple only)
D9	3.2
E9	4.8
F9	6.4
G9	8.0
H9	9.5 (Thermocouple only)
J9	10
L9	12.7 (Thermocouple only)

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 (11th character)

8. Connection type

XX	Refer to mounting table (12th and 13th character)

9. Insert length

X	Refer to insert length table (14th character)

10. Integral transmitter (See note 1.)

0	None
1	T900
2	T990 (RTD only)
3	TH300 (SIEMENS)
4	TTH300 (ABB)
5	YTA70 (YOKOGAWA)
6	644H (ROSEMOUNT)
7	Other

11. Option

0	None
1	Accessories
3	IECEx certificate
5	Accessories and IECEx certificate

** Note 1. Although temperature element is selected double(Duplex) type, output of integral transmitter is single.

Sample ordering code

1	2	3	4	5	6	7	8	9	10	11
R941	**A**	**K**	**1**	**F9**	**3**	**X**	**XX**	**X**	**0**	**0**

Main order - Non-metallic protection tube type Ordering information

1. Base model

R947	Single element
R948	Double (Duplex) element

2. Head and tip shape type

A	ALDC head and ungrounded
C	ALDC head(Double conduit) and ungrounded
E	316SS head and ungrounded
G	316SS head(Double conduit) and ungrounded

3. Element

K	K (0.75)
B	B (0.5)
1	K (0.4)
R	R (0.25)
S	S (0.25)

4. Mounting type and extension length (mm)

A	None	**K**	Fixed flange (300)
B	Support tube (100)	**L**	Movable thread (100)
C	Support tube (150)	**M**	Movable thread (150)
D	Support tube (300)	**N**	Movable thread (300)
E	Fixed thread (100)	**P**	Movable flange (100)
F	Fixed thread (150)	**Q**	Movable flange (150)
G	Fixed thread (300)	**R**	Movable flange (300)
H	Fixed flange (100)	**Z**	Other
J	Fixed flange (150)		

5. Outer protection tube diameter (mm)

00	8	**40**	21
10	10	**50**	25
20	13	**60**	30
25	15	**70**	40
30	17		

6. Outer protection tube material

0	316SS	**5**	Inconel
1	SSA-S (8~25 mm)	**6**	446SS
3	HB (8~21 mm)	**7**	Other
4	GK-SiC (25~40 mm)	**8**	310SS

7. Inner tube material

0	None
1	SSA-S
3	HB
5	Inconel
9	Other

8. Connection type

XX	Refer to connection type table (12^{th} and 13^{th} character)

9. Insert length

X	Refer to insert length table (14^{th} character)

10. Integral transmitter (See note 1.)

0	None
1	T900
2	T990 (RTD only)
3	TH300 (SIEMENS)
4	TTH300 (ABB)
5	YTA70 (YOKOGAWA)
6	644H (ROSEMOUNT)
7	Other

11. Option

0	None
1	Accessories
3	IECEx certificate
5	Accessories and IECEx certificate

** Note 1. Although temperature element is selected double(Duplex) type, output of integral transmitter is single.

Sample ordering code

1	2	3	4	5	6	7	8	9	10	11
R947	**A**	**K**	**A**	**00**	**0**	**0**	**XX**	**X**	**0**	**0**

Sheath type

Mounting, connection type and insert length table - 11th thru 14th characters

11th character		12th character		13th character		14th 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	⅛" and 304SS	B	PT	B	200
B	80 mm	C	¼" and 304SS	C	NPT	C	300
C	100 mm	D	⅜" and 304SS	D	PF	D	400
D	150 mm	E	½" and 304SS	E	NPS	E	500
E	200 mm	F	¾" and 304SS	F	UNF	F	600
F	Other	G	1" and 304SS	G	BSPT	G	700
	Fixed flange lag length	H	1¼" and 304SS	H	BSPF	H	800
G	80 mm	J	1½" 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	7/16" and 304SS	M	B16.5 Class 300 RF	M	2,000
L	Other	N	⅛" and 316SS	N	B16.5 Class 300 FF	N	2,500
M	Movable thread	P	¼" and 316SS	O	Sanitary	P	3,000
N	Movable flange	Q	⅜" and 316SS	P	B16.5 Class 600 RF	Q	3,500
P	Compression fitting	R	½" and 316SS	Q	B16.5 Class 600 FF	R	4,000
	Union and nipple length	S	¾" 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	1¼" and 316SS	T	JIS 10K RF	U	6,000
S	Other	V	1½" 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	7/16" and 316SS	X	B16.5 Class 1,500 RTJ	Y	10,000
V	150 mm	Z	Other	Y	B16.5 Class 2,500 RTJ	Z	Other
W	Other			Z	Other		
X	Fixed thread						
Z	Other						

■ Note for 14th character, please choose a code of next higher length if applicable length is not. Actual length shall be specified.

Non-metallic protection tube type

Mounting, connection type and insert length table - 12th thru 14th characters

12th character		13th character		14th character	
Code	Connection size	Code	Connection type	Code	Insertion length (mm)
A	None	A	None	A	100
E	½" (15A)	B	PT	B	200
F	¾" (20A)	C	NPT	C	300
G	1" (25A)	D	PF	D	400
H	1¼" (32A)	K	B16.5 Class 150 RF	E	500
J	1½" (40A)	L	B16.5 Class 150 FF	F	600
K	2" (50A)	M	B16.5 Class 300 RF	G	700
L	2½" (65A)	N	B16.5 Class 300 FF	H	800
M	3" (80A)	P	B16.5 Class 600 RF	J	900
Z	Other	Q	B16.5 Class 600 FF	K	1,000
		R	JIS 5K RF	L	1,500
		S	JIS 5K FF	M	2,000
		T	JIS 10K RF	Z	Other
		U	JIS 10K FF		
		V	JIS 20K RF		
		W	JIS 20K FF		
		Z	Other		

Note : Please choose a code of next higher length if applicable length is not. Actual length shall be specified.

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, R210, R220, R300, R600, R700, R911, R912, R920, R940, 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 (Cable entry size)	Conduit Adapter	
			Size	Material
Ex-proof (Single Conduit)	ALDC	PF½"(F), PF¾"(F), NPT½"(F), NPT¾"(F)	NPT½"(F), NPT¾"(F) M20X1.5P(F) PT (Unavailable)	Brass + Ni Plating 316SS
	316SS	PF½"(F)		
Ex-proof (Double Conduit)	AC4C	PF½"(F)		
General (Weather-Proof)	ALDC	PF½"(F), PF¾"(F)		
	316SS 304SS	PF¾"(F)	PT½"(F), PT¾"(F) NPT½"(F), NPT¾"(F) M20X1.5P(F)	Brass + Ni Plating (Only PT½"(F), PT¾"(F)) 316SS, 304SS
Compact (Small)	ALDC	PF½"(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, R950	E1	Only Extended lead wire	1) "E1": Lead wire disconnection 2) "E2": Use only armored tube type code for R330. 3) "E4", "E9": Only to Extension lead type 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 aemored tube type	
	E9	Shrinkable tube type	
	EA	316SS armored tube type	
	EB	Shrinkable tube with 316SS armored tube type	
	EC	PVC Coating with 316SS aemored 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, 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, R210, R220, R300, R600, R700, R911, R912, R920, R940, R950, R960, R970	A0	ANSI Code	Thermocouple ANSI (ISA MC96.1) Code
	E0	EN (IEC) Code	Thermocouple EN (IEC 60584-3) Code RTD EN (IEC 60751) and JIS C 1605-2013 Code
	K0	KS Code	Thermocouple JIS C 1610 (KS C 1609) Code 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 connot 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>

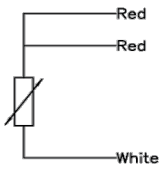
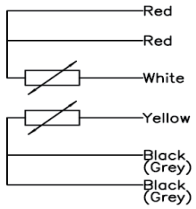
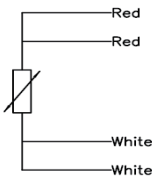
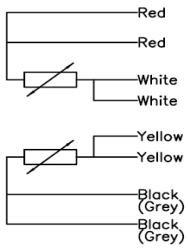
(Differential colors may be used according to customer requirements.)

■ **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)**

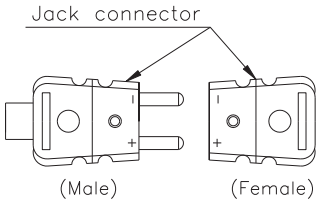
IEC/EN 60751 standard applied (See applicable colors for the KS C 1603 standard)

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

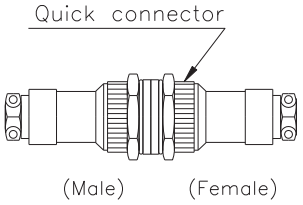
5. Lead Wire Terminal

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 (The specifications produced without selecting other option codes are as follows.) Head type: Except Terminal Lug (STD) Non Head type: "Y" type Terminal Lug (STD)
	Y1	"O" type Terminal Lug	
	Y2	"I" type Terminal Lug	
	Y3	"Y" type Terminal Lug	

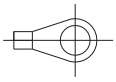
Note.
1. The shape of each type is as follows.



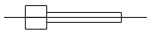
"E5", "E7" (Jack Connector)



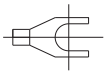
"E6" (Quick Connector)



"Y1" ("O" type Terminal Lug)



"Y2" ("I" type Terminal Lug)



"Y3" ("Y" type Terminal Lug)

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

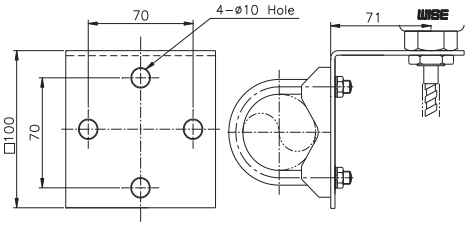
7. Terminal for Thermocouple (Head type)

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	

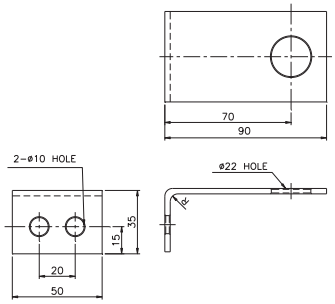
8. Mounting Bracket

Base Model	Code	Code Name	Remark
R120, R200, R220, R300, R600, R911, R912, R920, R940, 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	

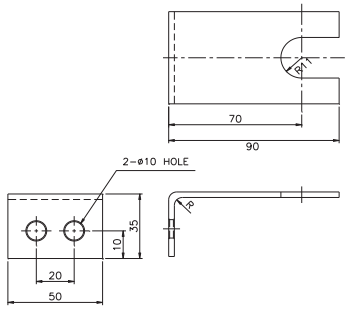
Note.
Mounting Bracket shape reference.



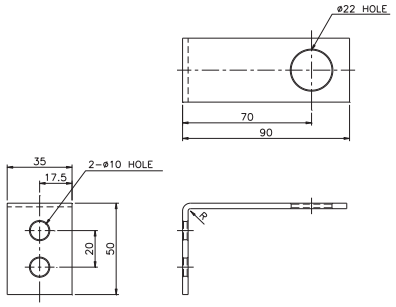
"R1", "R2" (2" Mounting Bracket)



"R6", "R7" (Wall Mounting Bracket)



"RA", "RB" (Wall Mounting Bracket Open type)



"RC", "RD" (Wall Mounting Bracket Vertical)

9. Element post-processing

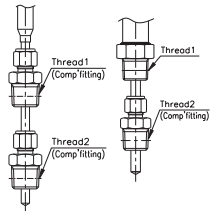
Base Model	Code	Code Name	Remark
R110, R120, R200, R210, R220, R300, R600, R911, R912, R920, R940, R950, R960	P4	Buffing (#300)	
	P6	Electrical Polishing	
	PA	Teflon Coating	
	PB	Teflon Lining	

10. Mounting type Option

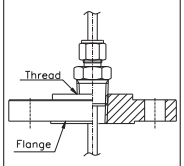
Base Model	Code	Code Name	Remark
R110, R120, R200, R210, R200, R300, R600, R700, R911, R912, R920, R940, R950, R960, R970	AM	AVL Maker	1) AVL Maker: Corresponds to the use of flange or compression fitting by designated manufacturers. 2) "CF", "FT" codes are additional mounting options to the basic mounting type options. 3) "KE", "PD" applies to models R940, R950 series. 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 mointing type option to select in the other option code, select mounting type (other) code "ZZ" and contact the head office.

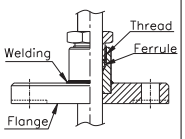
< Other mounting type shape reference >



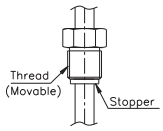
"CF"
With Compression Fitting



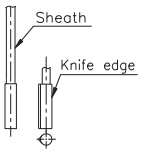
"FT"
With Flange (Thread type)



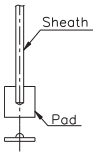
"MF"
Movable (Ferrule type)



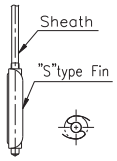
"MS"
Movable (Stopper type)



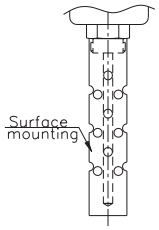
"KE"
With Knife Edge



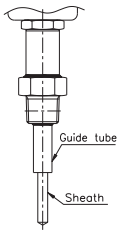
"PD"
With Pad



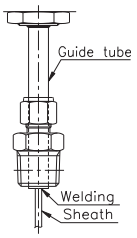
"SF"
With S-Fin



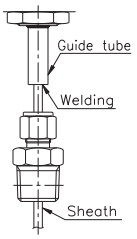
"ST"
With Shroud tube



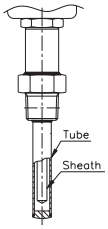
"T0"
With Guide tube



"T1"
Above Guide tube



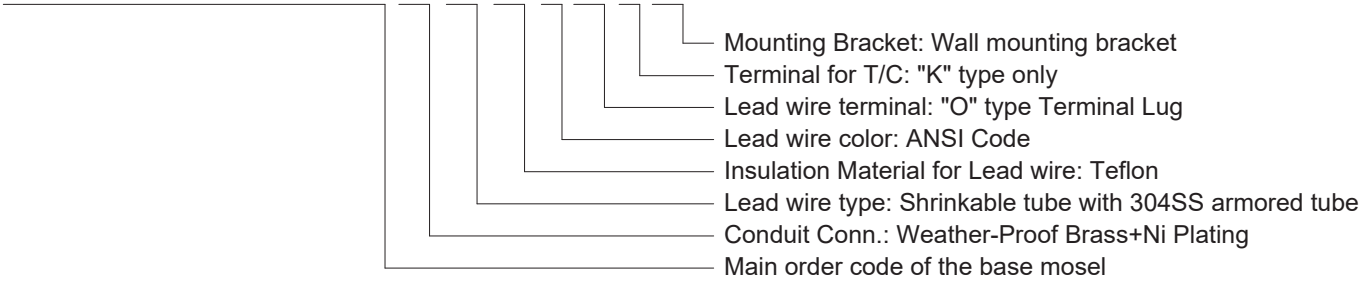
"T2"
Below Guide tube



"T3"
Outer Protection tube

< 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 ofiice.