Compensation Wire

▣ What is Compensation Wire

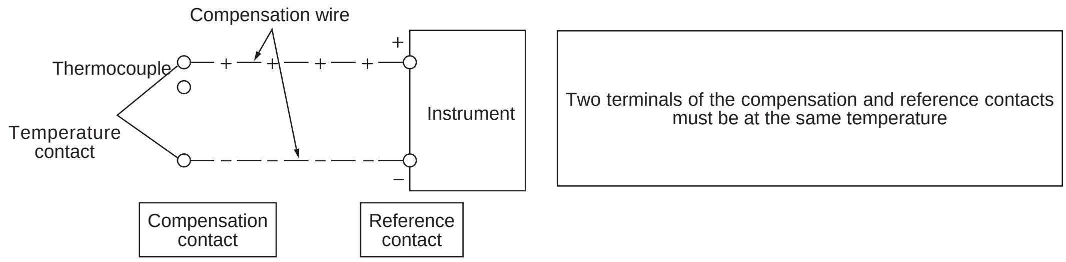
■ Compensation wire(extension & compensating wires)

When measuring temperature using a thermocouple, it is common for the distance from the thermocouple terminal (compensation contact) to the reference contact of the instrument.

If a copper conductor is connected to this and there is a temperature difference between both contacts, a new thermocouple circuit is formed and an error occurs.

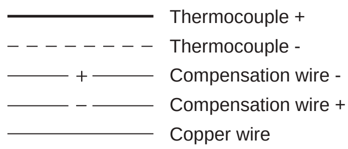
Therefore, to compensate for the temperature fluctuations between the compensation and reference contacts, wires are made using conductors with thermoelectric properties nearly identical to those of thermocouples in a certain temperature range. This is called a "compression wire".

Using a compensation wire is equivalent to extending the thermocouple from the thermocouple to the reference junction.

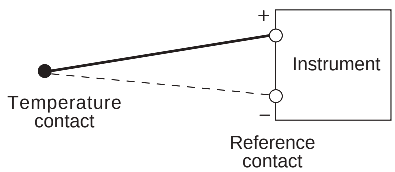


■ Connecting Thermocouple

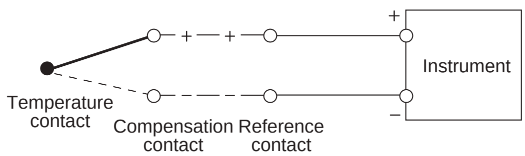
Thermocouple connection methods are six types according to KS by thermoelectric converter, copper conductors and compensation wires.



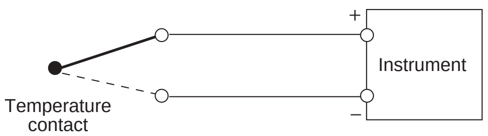
• A connection



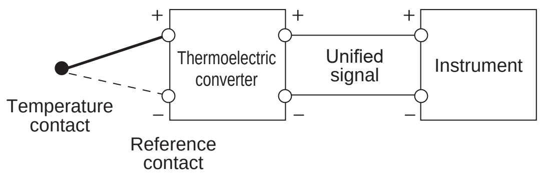
• D connection



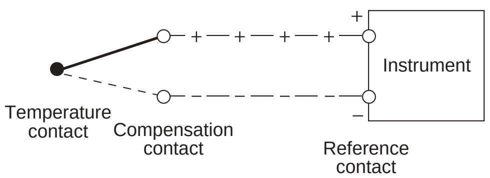
• B connection



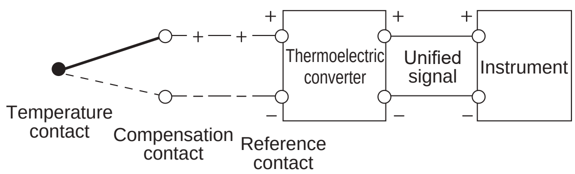
• E connection



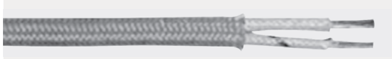
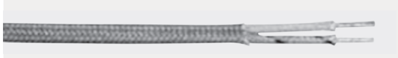
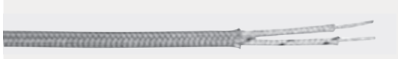
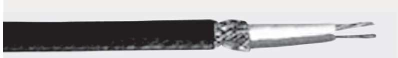
• C connection



• F connection



■ **Compensation wire standard (sample)**

Compensation wire	Model	Conductor		Coated materials		Shield
		Type	Size	Insulator	Outer	
	VX-G-VVF	K(C)	2.0SQ (7/0.60)	PVC	PVC	—
	VX-G-VVF	K(C)	1.25SQ (7/0.45)	PVC	PVC	—
	VX-G-VVF	K(C)	0.5SQ (7/0.30)	PVC	PVC	—
	VX-G-VVSBF	K(C)	2.0SQ (7/0.60)	PVC	PVC	Copper braided shield
	VX-G-VVSBF	K(C)	1.25SQ (7/0.45)	PVC	PVC	Copper braided shield
	VX-G-VVSBF	K(C)	0.5SQ (7/0.30)	PVC	PVC	Copper braided shield
	WX-H-GGF	K(B)	2.0SQ (7/0.60)	Glass wool	Glass wool	—
	WX-H-GGF	K(B)	1.25SQ (7/0.45)	Glass wool	Glass wool	—
	WX-H-GGF	K(B)	0.5SQ (7/0.30)	Glass wool	Glass wool	—
	WX-H-GGSBF	K(B)	2.0SQ (7/0.60)	Glass wool	Glass wool	Copper braided shield
	WX-H-GGSBF	K(B)	1.25SQ (7/0.45)	Glass wool	Glass wool	Copper braided shield
	WX-H-GGSBF	K(B)	0.5SQ (7/0.30)	PVC	PVC	Copper braided shield
	JX-G-VVF	J	2.0SQ (7/0.60)	PVC	PVC	—
	JX-G-VVF	J	2.0SQ (7/0.60)	PVC	PVC	Copper braided shield
	EX-G-VVF	E	2.0SQ (7/0.60)	PVC	PVC	—
	EX-G-VVSBF	E	2.0SQ (7/0.60)	PVC	PVC	Copper braided shield
	RX-G-VVF	R	2.0SQ (7/0.60)	PVC	PVC	—
	RX-H-GGF	R	2.0SQ (7/0.60)	Glass wool	Glass wool	—
	TX-G-VVF	T	2.0SQ (7/0.60)	PVC	PVC	—
	TX-G-VVSBF	T	2.0SQ (7/0.60)	PVC	PVC	Copper braided shield

Compensation Wire

▣ Compensation Wire Characteristic Table

■ KS C - 1609(JIS C - 1610)

Compensation wire type			Thermocouple sign and material	Compensation wire conductor temperature and error		Reciprocating conductor resistance (Max. Ω/m)	Compensation wire conductor material	
Sign	Previous sign	Type		Temp. of thermocouple and junction(℃)	Tolerance errors(℃)		+ (PX)	- (NX)
BX-G	—	General	B Platinum 30%, rhodium Platinum 6%, rhodium	0 to 100	—	0.05	Copper	Copper
RX-G	WPR-G	General	R Platinum 13% rhodium Platinum	0 to 150	+3 -7	0.1	Copper	Copper Nickel Alloy
RX-H	WPR-H	General for heat resistance						
SX-G	—	General	S Platinum 10% rhodium Platinum	0 to 150				
SX-H	—	General for heat resistance						
KX-G	WCA-G	General	K Chromel Alume	-20 to +150	±2.5	1.5	Chromel	Alumel
KX-GS	WCA-GS	General			±1.5			
KX-H	WCA-H	General for heat resistance			±2.5			
KX-HS	WCA-HS	General for heat resistance			±1.5			
WX-G	WCA-G	General			±3.0	0.5	Iron	Constantan
WX-H	WCA-H	General for heat resistance						
VX-G	WCA-G	General		-20 to +100	±2.5	0.8	Copper	Constantan
EX-G	WCRC-G	General	E Chromel Constantan	-20 to +150	±2.5	1.5	Chromel	Constantan
EX-H	WCRC-H	General for heat resistance						
JX-G	WIC-G	General	J Iron Constantan	-20 to +150	±2.5	0.8	Iron	Constantan
JX-H	WIC-H	General for heat resistance						
TX-G	WCC-G	General	T Copper Constantan	-20 to +150	±2.0	0.8	Copper	Constantan
TX-GS	—	General			±1.0			
TX-H	WCC-H	General for heat resistance			±2.0			
TX-HS	—	General for heat resistance			±1.0			

Compensation wire sign	Thermocouple sign	Thermocouple material		Type by Tolerance errors	Temperature of thermocouple and junction(℃)	Tolerance errors(℃)	Compensation wire material	
		+ (pos)	- (neg)				+ (pos)	- (neg)
BX	B	Platinum 30% rhodium	Platinum 6% rhodium	—	0 to 100	mv +0.00(+0℃) +0.033 (-3.7℃)	Copper	Copper
RX	R	Platinum 13% rhodium	Platinum	—	0 to 200	mv ±0.057 (±5℃)	Copper	Copper Nickel Alloy
SX	S	Platinum 10% rhodium	Platinum	—				
KX	K	Chromel	Alumel		0 to 200	±2.2	Chromel	Alumel
EX	E	Chromel	Constantan		0 to 200	±1.7	Chromel	Constantan
JX	J	Iron	Constantan	Standard	0 to 200	±2.2	Iron	Constantan
				Special		±1.1		
TX	T	Copper	Constantan	Standard	-60 to +100	±1.0	Copper	Constantan
				Special		±0.5		

▣ Compensation wire Coated materials

- **PVC coated**
  PVC is widely used as a substitute for rubber materials. PVC compensation wire is used for heat resistance of 105 ℃.
- **Asbestos coated**
  Asbestos coated has poor insulation in high humidity areas, but has excellent high temperature insulation performance, such as glass fiber. Therefore, use it in dry places or at high temperatures.
- **Glass fiber coated**
  Glass fiber is used as a high temperature insulator due to its excellent heat and chemical resistance.

  Although it is weak in moisture, it is moisture resistant when other coated is added. Therefore, heat treatment or silicone or moisture resistant resin may be added to prevent moisture.
- **Silicon rubber coated**
  Silicone is similar to natural rubber and has a very strong property against chemicals, oil, temperature and air, so it is widely used as an excellent coat.
- **Teflon coated**
  Teflon is the best insulator among organic materials related to heat resistance, chemical resistance, electrical insulation, frequent resistance and temperature change.

  It is also resistant to large physical forces, high voltages and currents.

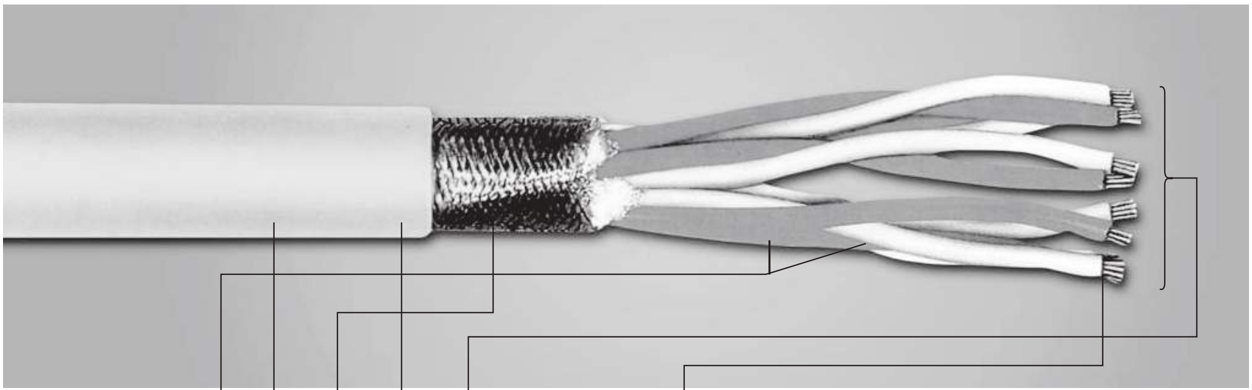
■ Performance Comparison by Coated Materials

Coated materials	Highest temp. (℃)	Lowest temp. (℃)	Wear resistance	Environmental resistance	Heat resistance	Water resistance	Chemical resistance	Oil resistance
Glass fiber	300	-20	△	△	◎	×	○	△
Asbestos	500	-20	△	△	◎	×	○	△
Teflon	260	-100	◎	◎	○	◎	◎	◎
PVC	80	-20	○	○	×	◎	△	△
Silicon	200	-60	○	◎	○	○	○	×

※ Symbols : Symbols: ◎ (very good), ○ (excellent), △ (normal), × (bad)

Compensation Wire

▣ Compensation Wire Structure



JX	–	G	–	V	V	SB	R	6P	×	2.3SQ	(7/0.65)
①		②		③	④	⑤	⑥	⑦		⑧	⑨

There are various types of compensation wires depending on the purpose of use, but they are indicated as follows according to the insulator, sheath type, shielding and core type.

Item	Descriptions			
① Compensation wire type		BX, RX, SX, KX, WX, VX, EX, JX, TX, NX		
② Purpose of use	G	General class	H	General class for heat resistance
	GS	Precision class for General	HS	Precision class for heat resistance
Insulation and sheath material of ③ inner and ④ outer	V	Vinyl	F	Teflon (FEP)
	HV	Heat resistant vinyl	K	Silicone rubber
	E	Polyethylene	G	Glass Yarn Braiding
⑤ Shielding	N	No shielding	SB	Tin Plating
	S	Copper tape	AMS	Aluminum mylar tape
⑥ Type	F	Flat	R	Round
⑦ Core ※1	1P	1-Pair	3P	3-Pair
	2P	2-Pair	4P	4-Pair
⑧ Conductor standard ※2	□SQ	Unit: mm^2		
⑨ Conductor composition ※2		Wires/Wire diameter (mmØ)		

※1. For the other than 1 to 4P, contact Autonics.

※2. Conductor standard and composition is decided by "⑦ Core".

■ Thermocouple wire

Compensation wire	Type	Model	Conductor material		Color	Standard	Coated materials
			+	-			
	K	PSC-K1-S	Chromel	Alumel	Blue	Core single 0.65	Glass yarn braid-covered with outer
	E	PSC-E1-S	Chromel	Constantan	Purple		
	J	PSC-J1-S	Iron	Constantan	Yellow		
	T	PSC-T1-S	Copper	Constantan	Brown		
	K	PSC-K1-H	Chromel	Alumel	Blue	Core single 0.65	Glass yarn insulating sheath
	E	PSC-E1-H	Chromel	Constantan	Purple		
	J	PSC-J1-H	Iron	Constantan	Yellow		
	T	PSC-T1-H	Copper	Constantan	Brown		
	K	PSC-K2-T	Chromel	Alumel	Blue	Core single 0.32	Teflon insulated and jacketed
	E	PSC-K2-T	Chromel	Constantan	Purple		
	J	PSC-K2-T	Iron	Constantan	Yellow		
	T	PSC-K2-T	Copper	Constantan	Brown		

※ The other duplex thermocouples are produced by additional order.

Compensation Wire

■ General purpose moisture proof and waterproof type Compensation wire(1)

Type	Conductor			Insulator		Shield		Outer coated		Electrical properties		Standard length (m)	Weight (kg/km)
	Nominal cross-sectional area (mm^2)	Element structure (Count/mm)	Outer diameter (mm)	Thickness (mm)	Outer diameter (mm)	Thickness (mm)	Ground wire (mm)	Thickness (mm)	Outer diameter (mm)	Withstand voltage (DCV/min)	Insulation resistance (Mln. MΩ·km)		
Parallel/Flat	0.5	7/0.32	0.96	0.4	1.76	-	-	0.5	2.8×4.6	1,000	PVC 50	300	23
	1.25	7/0.45	1.35	0.6	2.55	-	-	1.0	4.6×7.1	〃	〃	〃	54
	1.3	4/0.65	1.57	〃	2.77	-	-	〃	4.8×7.6	〃	〃	〃	61
	2.0	7/0.60	1.80	〃	3.0	-	-	〃	5.0×8.0	〃	〃	〃	76
	2.3	7/0.65	1.95	〃	3.15	-	-	〃	5.2×8.3	〃	〃	〃	84
	0.75	24/0.2	1.20	0.5	2.20	-	-	0.8	3.8×6.0	〃	〃	〃	37
	1.25	40/0.2	1.46	0.6	2.66	-	-	1.0	4.7×7.4	〃	〃	〃	58
	2.0	63/0.2	1.88	〃	3.08	-	-	〃	2.7×4.3	〃	〃	〃	73
	BS14	1/1.63	1.63	〃	2.83	-	-	0.8	4.5×7.3	〃	〃	〃	68
	BS16	1/1.29	1.29	0.5	2.29	-	-	〃	3.7×5.8	〃	〃	〃	42
	BS20	1/0.81	0.81	0.4	1.61	-	-	0.5	2.7×4.3	〃	〃	〃	20
Parallel/Flat copper braided shield	0.5	7/0.32	0.96	0.4	1.76	0.3	-	0.8	4.0×5.8	1,000	PVC 50	300	40
	1.25	7/0.45	1.35	0.6	2.55	〃	-	1.0	5.2×7.7	〃	〃	〃	70
	1.3	4/0.65	1.57	〃	2.77	〃	-	〃	5.4×8.2	〃	〃	〃	78
	2.0	7/0.60	1.80	〃	3.0	〃	-	〃	5.6×8.6	〃	〃	〃	94
	2.3	7/0.65	1.95	〃	3.15	〃	-	〃	5.8×8.9	〃	〃	〃	103
	0.75	24/0.2	1.20	0.5	2.20	〃	-	0.8	4.4×6.8	〃	〃	〃	51
	1.25	40/0.2	1.46	0.6	2.66	〃	-	1.0	5.3×7.7	〃	〃	〃	75
	2.0	63/0.2	1.88	〃	3.08	〃	-	〃	5.7×8.8	〃	〃	〃	95
	BS14	1/1.63	1.63	〃	2.83	〃	-	0.8	5.1×7.9	〃	〃	〃	84
	BS16	1/1.29	1.29	0.5	2.29	〃	-	〃	4.5×6.8	〃	〃	〃	62
	BS20	1/0.81	0.81	0.4	1.61	〃	-	0.5	3.9×5.5	〃	〃	〃	36
Twist	0.5	7/0.32	0.96	0.6	1.76	-	-	1.0	6.5	1,000	PVC 50	300	50
	1.25	7/0.45	1.35	〃	2.55	-	-	〃	7.2	〃	〃	〃	68
	1.3	4/0.65	1.57	〃	2.77	-	-	〃	7.7	〃	〃	〃	76
	2.0	7/0.60	1.80	〃	3.0	-	-	〃	8.1	〃	〃	〃	93
	2.3	7/0.65	1.95	〃	3.15	-	-	1.1	8.6	〃	〃	〃	106
	0.75	24/0.2	1.20	0.5	2.20	-	-	1.0	6.5	〃	〃	〃	53
	1.25	40/0.2	1.46	0.6	2.66	-	-	〃	7.5	〃	〃	〃	72
	2.0	63/0.2	1.88	〃	3.08	-	-	〃	8.2	〃	〃	〃	94
	BS14	1/1.63	1.63	〃	2.83	-	-	1.0	7.8	〃	〃	〃	89
	BS16	1/1.29	1.29	0.5	2.29	-	-	〃	6.7	〃	〃	〃	63
	BS20	1/0.81	0.81	0.4	1.61	-	-	〃	5.4	〃	〃	〃	36
Twist・copper braided shield	0.5	7/0.32	0.96	0.6	1.76	0.3	-	1.0	7.1	1,000	PVC 50	300	66
	1.25	7/0.45	1.35	〃	2.55	〃	-	〃	7.8	〃	〃	〃	86
	1.3	4/0.65	1.57	〃	2.77	〃	-	1.0	8.3	〃	〃	〃	96
	2.0	7/0.60	1.80	〃	3.0	〃	-	1.1	8.9	〃	〃	〃	118
	2.3	7/0.65	1.95	〃	3.15	〃	-	1.1	9.2	〃	〃	〃	129
	0.75	24/0.2	1.20	0.5	2.20	〃	-	1.0	7.1	〃	〃	〃	69
	1.25	40/0.2	1.46	0.6	2.66	〃	-	〃	8.1	〃	〃	〃	91
	2.0	63/0.2	1.88	〃	3.08	〃	-	1.1	9.1	〃	〃	〃	120
	BS14	1/1.63	1.63	〃	2.83	〃	-	1.1	8.6	〃	〃	〃	114
	BS16	1/1.29	1.29	0.5	2.29	〃	-	1.0	7.3	〃	〃	〃	81
	BS20	1/0.81	0.81	0.4	1.61	〃	-	〃	6.0	〃	〃	〃	49
Twist・Al/Mylar tape shield	0.5	7/0.32	0.96	0.6	1.76	0.04	0.93	1.0	7.5	1,000	PVC 50	300	61
	1.25	7/0.45	1.35	〃	2.55	〃	〃	〃	8.2	〃	〃	〃	80
	1.3	4/0.65	1.57	〃	2.77	〃	〃	〃	8.9	〃	〃	〃	92
	2.0	7/0.60	1.80	〃	3.0	〃	〃	1.1	9.3	〃	〃	〃	109
	2.3	7/0.65	1.95	〃	3.15	〃	〃	〃	9.6	〃	〃	〃	119
	0.75	24/0.2	1.20	0.5	2.20	〃	〃	1.0	7.5	〃	〃	〃	64
	1.25	40/0.2	1.46	〃	2.66	〃	〃	1.1	8.7	〃	〃	〃	88
	2.0	63/0.2	1.88	〃	3.08	〃	〃	〃	9.5	〃	〃	〃	111
	BS14	1/1.63	1.63	0.6	2.83	〃	〃	1.1	9.0	〃	〃	〃	105
	BS16	1/1.29	1.29	0.5	2.29	〃	〃	1.0	7.7	〃	〃	〃	75
	BS20	1/0.81	0.81	0.4	1.61	〃	〃	〃	6.4	〃	〃	〃	47
Twist・Copper tape shield	0.5	7/0.32	0.96	0.6	1.76	0.07	-	1.0	7.2	1,000	PVC 50	300	72
	1.25	7/0.45	1.35	〃	2.55	〃	-	〃	8.0	〃	〃	〃	93
	1.3	4/0.65	1.57	〃	2.77	〃	-	〃	8.7	〃	〃	〃	107
	2.0	7/0.60	1.80	〃	3.0	〃	-	1.1	9.1	〃	〃	〃	126
	2.3	7/0.65	1.95	〃	3.15	〃	-	〃	9.4	〃	〃	〃	137
	BS14	1/1.63	1.63	0.6	2.83	〃	-	1.1	8.8	〃	〃	〃	121
	BS16	1/1.29	1.29	0.5	2.29	〃	-	1.0	7.5	〃	〃	〃	87
Twist・Wrought iron tape shield	0.5	7/0.32	0.96	0.6	1.76	0.07+0.1	-	1.0	8.0	1,000	PVC 50	300	98
	1.25	7/0.45	1.35	〃	2.55	〃	-	1.1	8.9	〃	〃	〃	122
	1.3	4/0.65	1.57	〃	2.77	〃	-	〃	9.4	〃	〃	〃	133
	2.0	7/0.60	1.80	〃	3.0	〃	-	〃	9.8	〃	〃	〃	154
	2.3	7/0.65	1.95	〃	3.15	〃	-	〃	10.1	〃	〃	〃	166
	BS14	1/1.63	1.63	〃	2.83	〃	-	〃	9.5	〃	〃	〃	148
	BS16	1/1.29	1.29	0.5	2.29	〃	-	〃	8.4	〃	〃	〃	113

■ General purpose moisture proof and waterproof type Compensation wire

Number of pairs	Conductor			Insulator		Association		Sheath		Standard length (m)	Weight (kg/km)
	Nominal cross-sectional area (mm^2)	Element structure (Count/mm)	Outer diameter (mm)	Thickness (mm)	Outer diameter (mm)	Thickness (mm)	Ground wire (mm)	Thickness (mm)	Outer diameter (mm)		
2	0.5	7/0.32	0.96	0.6	2.16	0.12	7.8	1.1	10.0	1000	107
3	〃	〃	〃	〃	〃	〃	8.4	〃	10.6	〃	135
4	〃	〃	〃	〃	〃	〃	9.3	〃	11.5	〃	163
5	〃	〃	〃	〃	〃	〃	11.0	1.2	13.4	〃	191
6	〃	〃	〃	〃	〃	〃	11.4	〃	13.8	〃	235
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	251
10	〃	〃	〃	〃	〃	〃	15.1	1.4	17.9	〃	375
12	〃	〃	〃	〃	〃	〃	15.7	〃	18.5	〃	421
15	〃	〃	〃	〃	〃	〃	〃	1.5	20.7	〃	521
18	〃	〃	〃	〃	〃	〃	19.4	〃	22.4	〃	620
20	〃	〃	〃	〃	〃	〃	20.5	1.6	23.7	〃	681
24	〃	〃	〃	〃	〃	〃	22.2	1.7	25.6	〃	803
26	〃	〃	〃	〃	〃	〃	23.1	〃	26.5	〃	862
30	〃	〃	〃	〃	〃	〃	24.8	1.8	28.4	〃	990
2	1.25	7/0.45	1.35	0.6	2.55	0.12	9.1	1.1	11.3	1000	150
3	〃	〃	〃	〃	〃	〃	9.9	1.2	12.3	〃	188
4	〃	〃	〃	〃	〃	〃	10.9	〃	13.3	〃	236
5	〃	〃	〃	〃	〃	〃	12.9	1.3	15.5	〃	298
6	〃	〃	〃	〃	〃	〃	13.4	〃	16.0	〃	341
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	366
10	〃	〃	〃	〃	〃	〃	17.7	1.5	20.7	〃	550
12	〃	〃	〃	〃	〃	〃	18.5	〃	21.5	〃	619
15	〃	〃	〃	〃	〃	〃	20.8	1.6	24.0	〃	769
18	〃	〃	〃	〃	〃	〃	22.8	1.7	26.2	〃	917
20	〃	〃	〃	〃	〃	〃	24.1	〃	27.5	〃	1022
24	〃	〃	〃	〃	〃	〃	26.2	1.8	29.8	〃	1206
26	〃	〃	〃	〃	〃	〃	27.2	1.9	31.0	〃	1297
30	〃	〃	〃	〃	〃	〃	29.2	〃	33.0	〃	1489
2	1.3	4/0.65	1.57	0.6	2.77	0.12	9.8	1.2	12.2	1000	168
3	〃	〃	〃	〃	〃	〃	10.6	〃	13.0	〃	213
4	〃	〃	〃	〃	〃	〃	11.8	〃	14.2	〃	268
5	〃	〃	〃	〃	〃	〃	14.0	1.3	16.6	〃	347
6	〃	〃	〃	〃	〃	〃	14.5	1.4	17.3	〃	387
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	417
10	〃	〃	〃	〃	〃	〃	19.2	1.5	22.2	500	636
12	〃	〃	〃	〃	〃	〃	20.1	1.6	23.3	〃	734
15	〃	〃	〃	〃	〃	〃	22.6	1.7	26.0	〃	894
18	〃	〃	〃	〃	〃	〃	24.8	1.8	28.6	〃	1066
20	〃	〃	〃	〃	〃	〃	26.2	〃	29.8	〃	1187
24	〃	〃	〃	〃	〃	〃	28.4	1.9	32.2	〃	1400
26	〃	〃	〃	〃	〃	〃	29.5	2.0	33.5	〃	1498
30	〃	〃	〃	〃	〃	〃	31.7	〃	35.7	〃	1726
2	2.0	7/0.6	1.8	0.6	3.0	0.12	10.6	1.2	13.0	1000	205
3	〃	〃	〃	〃	〃	〃	11.6	〃	13.9	〃	269
4	〃	〃	〃	〃	〃	〃	12.7	1.3	15.3	〃	332
5	〃	〃	〃	〃	〃	〃	15.1	1.4	17.9	〃	430
6	〃	〃	〃	〃	〃	〃	15.7	〃	18.5	〃	485
7	〃	〃	〃	〃	〃	〃	〃	〃	18.5	〃	555
10	〃	〃	〃	〃	〃	〃	20.8	1.6	24.0	500	801
12	〃	〃	〃	〃	〃	〃	21.7	〃	〃	〃	922
15	〃	〃	〃	〃	〃	〃	24.4	1.7	27.8	〃	1144
18	〃	〃	〃	〃	〃	〃	26.8	1.8	30.4	〃	1365
20	〃	〃	〃	〃	〃	〃	28.3	1.9	32.1	〃	1504
24	〃	〃	〃	〃	〃	〃	30.7	2.0	34.7	〃	1779
26	〃	〃	〃	〃	〃	〃	31.9	〃	35.9	〃	1928
30	〃	〃	〃	〃	〃	〃	34.3	2.1	38.5	〃	2217
2	2.3	7/0.65	1.95	0.5	3.15	0.12	11.1	1.2	13.3	1000	232
3	〃	〃	〃	〃	〃	〃	12.1	1.3	14.7	〃	298
4	〃	〃	〃	〃	〃	〃	13.3	〃	15.9	〃	368
5	〃	〃	〃	〃	〃	〃	15.8	1.4	18.6	〃	476
6	〃	〃	〃	〃	〃	〃	16.5	〃	19.3	〃	549
7	〃	〃	〃	〃	〃	〃	〃	〃	19.3	〃	597
10	〃	〃	〃	〃	〃	〃	21.8	1.6	25.0	500	903
12	〃	〃	〃	〃	〃	〃	22.8	1.7	26.2	〃	1029
15	〃	〃	〃	〃	〃	〃	25.6	1.8	29.2	〃	1276
18	〃	〃	〃	〃	〃	〃	28.1	1.9	31.9	〃	1523
20	〃	〃	〃	〃	〃	〃	29.7	2.0	33.7	〃	1696
24	〃	〃	〃	〃	〃	〃	32.2	2.1	36.4	〃	2005
26	〃	〃	〃	〃	〃	〃	33.5	〃	37.7	〃	2169
30	〃	〃	〃	〃	〃	〃	36.4	2.2	40.6	〃	2497

Compensation Wire

■ Heat Resistant Glass Braiding Compensation wire (1)

Type	Conductor			Glass braided Insulator		Copper wire braiding		Glass braided sheath		Electrical properties		Standard length (m)	Weight (kg/km)
	Nominal cross-sectional area (mm²)	Element structure (Count/mm)	Outer diameter (mm)	Thickness (mm)	Outer diameter (mm)	Thickness (mm)	Outer diameter (mm)	Thickness (mm)	Complete outer diameter (mm)	Withstand voltage (DCV/min)	Insulation resistance (Mln. MΩ · km)		
Parallel/Flat	0.5	7/0.32	0.96	0.32	1.6	-	-	0.25	2.1×3.7	500	0.1	300	20
	1.25	7/0.45	1.35	0.37	2.1	-	-	0.5	3.1×5.2	〃	〃	〃	47
	1.3	4/0.65	1.57	〃	2.3	-	-	〃	3.3×5.6	〃	〃	〃	53
	2.0	7/0.60	1.80	〃	2.5	-	-	〃	3.5×6.1	〃	〃	〃	66
	2.3	7/0.65	1.95	〃	2.7	-	-	〃	3.7×6.4	〃	〃	〃	75
	0.75	24/0.2	1.20	〃	2.4	-	-	〃	3.0×5.0	〃	〃	〃	37
	1.25	40/0.2	1.50	〃	2.3	-	-	〃	3.3×5.6	〃	〃	〃	45
	2.0	63/0.2	1.90	〃	2.7	-	-	〃	3.7×5.4	〃	〃	〃	68
	BS14	1/1.63	1.63	〃	2.4	-	-	〃	3.4×5.8	〃	〃	〃	63
	BS16	1/1.29	1.29	〃	2.1	-	-	〃	3.1×5.2	〃	〃	〃	50
	BS20	1/0.81	0.81	0.32	1.5	-	-	0.25	2.0×3.5	〃	〃	〃	18
Parallel/Flat copper braided shield	0.5	7/0.32	0.96	0.32	1.6	0.3	2.2×3.8	0.25	2.7×4.3	500	0.1	300	34
	1.25	7/0.45	1.35	0.37	2.1	〃	2.7×4.8	0.5	3.7×5.8	〃	〃	〃	56
	1.3	4/0.65	1.57	〃	2.3	〃	2.9×5.2	〃	3.9×6.2	〃	〃	〃	67
	2.0	7/0.60	1.80	〃	2.5	〃	3.1×5.7	〃	4.1×6.7	〃	〃	〃	78
	2.3	7/0.65	1.95	〃	2.7	〃	3.3×6.0	〃	4.3×7.0	〃	〃	〃	92
	0.75	24/0.2	1.20	〃	2.0	〃	2.6×4.6	〃	3.6×5.6	〃	〃	〃	49
	1.25	40/0.2	1.50	〃	2.3	〃	2.9×5.2	〃	3.9×6.2	〃	〃	〃	63
	2.0	63/0.2	1.90	〃	2.7	〃	3.3×6.0	〃	4.3×7.0	〃	〃	〃	79
	BS14	1/1.63	1.63	〃	2.4	〃	3.0×5.4	〃	4.0×6.4	〃	〃	〃	75
	BS16	1/1.29	1.29	〃	2.1	〃	2.7×4.8	〃	3.7×5.8	〃	〃	〃	62
	BS20	1/0.81	0.81	0.32	1.5	〃	2.1×3.6	0.25	2.6×4.1	〃	〃	〃	31
Twist	0.5	7/0.32	0.96	0.32	1.6	-	-	0.25	3.8	500	0.1	300	34
	1.25	7/0.45	1.35	0.37	2.1	-	-	0.5	5.3	〃	〃	〃	60
	1.3	4/0.65	1.57	〃	2.3	-	-	〃	5.7	〃	〃	〃	75
	2.0	7/0.60	1.80	〃	2.5	-	-	〃	6.2	〃	〃	〃	97
	2.3	7/0.65	1.95	〃	2.7	-	-	〃	6.5	〃	〃	〃	110
	BS14	1/1.63	1.63	〃	2.4	-	-	〃	5.9	〃	〃	〃	95
	BS16	1/1.29	1.29	〃	2.1	-	-	〃	7.1	〃	〃	〃	72
	BS20	1/0.81	0.81	0.32	1.5	-	-	0.25	3.6	〃	〃	〃	31
Twist copper braided shield	0.5	7/0.32	0.96	0.37	1.6	0.3	3.9	0.25	4.4	500	0.1	300	47
	1.25	7/0.45	1.35	0.32	2.1	〃	4.9	0.5	5.9	〃	〃	〃	75
	1.3	4/0.65	1.57	〃	2.3	〃	6.3	〃	5.3	〃	〃	〃	100
	2.0	7/0.60	1.80	〃	2.5	〃	6.8	〃	5.8	〃	〃	〃	115
	2.3	7/0.65	1.95	〃	2.7	〃	7.1	〃	6.1	〃	〃	〃	130
	BS14	1/1.63	1.63	0.37	2.4	〃	6.6	〃	5.5	〃	〃	〃	110
	BS16	1/1.29	1.29	〃	2.1	〃	7.8	〃	6.7	〃	〃	〃	95
	BS20	1/0.81	0.81	0.32	1.5	〃	4.3	0.25	3.7	〃	〃	〃	45

■ Aluminum Mylar Tape (Drain Wire) Shield Compensation wire

Number of pairs	Conductor			Insulator		Each shield				Association		Sheath		Standard length (m)
	Nominal cross-sectional area (mm^2)	Element structure (Count/mm)	Outer diameter (mm)	Thickness (mm)	Outer diameter (mm)	Polyester (mm)	Ground wire (mm)	Al-Mylar (mm)	Outer diameter (mm)	Round tape (mm)	Outer diameter (mm)	Thickness (mm)	Complete outer diameter (mm)	
2	0.5	7/0.32	0.96	0.6	2.16	0.025	20/0.18	0.04	4.5	0.12	9.1	1.2	11.5	1000
3	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	9.7	〃	12.1	〃
4	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	10.8	〃	13.2	〃
5	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	12	1.3	14.6	〃
6	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	13.4	〃	16	〃
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
10	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	17.6	1.5	20.6	500
12	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	18.3	〃	21.3	〃
15	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	19.9	1.6	23.1	〃
18	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	21.9	1.7	25.3	〃
20	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	22.6	〃	26	〃
24	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	26.2	1.8	29.8	〃
26	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
30	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	27.9	1.9	31.7	〃
2	1.25	7/0.45	1.35	0.6	2.55	0.025	20/0.18	0.04	5.3	0.12	10.6	1.2	13	1000
3	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	11.4	1.3	14	〃
4	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	12.7	〃	15.3	〃
5	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	13.1	1.4	16.9	〃
6	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	15.6	〃	18.4	〃
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
10	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	20.6	1.6	23.8	500
12	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	21.4	1.7	24.8	〃
15	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	23.4	〃	26.8	〃
18	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	25.7	1.8	29.3	〃
20	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	26.6	1.9	30.4	〃
24	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	30.7	2.0	34.7	250
26	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
30	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	32.8	2.1	37	〃
2	1.3	4/0.65	1.57	0.6	2.77	0.025	20/0.18	0.04	5.8	0.12	11.5	1.3	14.1	1000
3	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	12.4	〃	15	〃
4	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	13.8	1.4	16.6	〃
5	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	15.4	〃	18.2	〃
6	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	17	1.5	20	500
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
10	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	22.5	1.7	25.9	〃
12	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	23.4	〃	26.8	〃
15	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	25.6	1.8	29.2	〃
18	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	28.1	1.9	31.9	〃
20	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	29	2.0	33	〃
24	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	33.5	2.1	37.7	〃
26	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
30	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	35.8	2.2	40.2	〃
2	2.0	7/0.6	1.8	0.6	3	0.025	20/0.18	0.04	6.1	0.12	12.3	1.3	14.9	1000
3	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	13.2	〃	15.8	〃
4	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	14.7	1.4	17.5	〃
5	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	16.4	1.5	19.4	500
6	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	18.2	〃	21.2	〃
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
10	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	24	1.8	27.6	〃
12	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	25	〃	28.6	〃
15	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	27.3	1.9	31.1	〃
18	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	30	2.0	34	〃
20	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	31	〃	35	〃
24	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	35.8	2.2	40.2	250
26	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
30	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	38.3	2.3	42.9	〃
2	2.3	7/0.65	1.95	0.6	3.15	0.025	20/0.18	0.04	6.4	0.12	12.9	1.3	15.5	1000
3	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	13.8	1.4	16.6	〃
4	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	15.4	〃	18.2	〃
5	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	17.2	1.5	20.2	500
6	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	19	1.6	22.2	〃
7	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
10	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	25.2	1.8	28.8	〃
12	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	26.2	〃	29.8	〃
15	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	28.6	2.9	32.4	〃
18	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	31.4	2.0	35.4	〃
20	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	32.5	2.1	36.7	〃
24	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	37.6	2.3	42.2	250
26	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃
30	〃	〃	〃	〃	〃	〃	〃	〃	〃	〃	39.6	2.4	44.4	〃

▣ Reciprocating conductor resistance for each size

Standard	Conductor			BX	RX·SX	KX	WX	VX	EX	JX	TX
	Conductor form	Element structure/ Standard	Type (mm^2)								
JIS	Standard type	7/0.65	2.3	0.0148	0.0311	0.4219	0.2627	0.2312	0.5166	0.2669	0.2312
		7/0.60	2.0	0.0174	0.0323	0.4951	0.3082	0.2714	0.6063	0.3124	0.2714
		4/0.65	1.3	0.0259	0.0544	0.7383	0.4596	0.4047	0.9041	0.4671	0.4047
		(7/0.5)	1.3	0.0250	0.0525	0.7133	0.4440	0.3910	0.8734	0.4513	0.3910
		7/0.45	1.25	0.0309	0.0648	0.8803	0.5479	0.4072	1.0779	0.5569	0.4072
		(7/0.40)	0.9	0.0392	0.0821	1.1142	0.6935	0.6107	1.3643	0.7049	0.6107
		7/0.32	0.5	0.0612	0.1283	1.7408	1.0836	0.9542	2.1316	1.1013	0.9542
	Bundle type	63/0.2	2.0	0.0174	0.0365	0.4750	0.3082	0.2714	0.5861	0.3133	0.2714
		40/0.2	1.25	0.0274	0.0574	0.7799	0.4855	0.4275	0.9550	0.4934	0.4275
		24/0.2	0.75	0.0457	0.0958	1.3000	0.8092	0.7126	1.5918	0.8224	0.7126
		(30/0.18)	0.75	0.0451	0.0946	1.2838	0.7991	0.7037	1.5719	0.8122	0.7037
		(20/0.18)	0.5	0.0677	0.1419	1.9256	1.1986	1.0556	2.3579	1.2183	1.0556
	Solid type	1.6	2.0	0.0171	0.0359	0.4875	0.4034	0.2672	0.5969	0.3084	0.2672
		1.3	1.3	0.0259	0.0544	0.7384	0.4596	0.4047	0.9041	0.4671	0.4047
		(1.2)	1.1	0.0304	0.0638	0.8666	0.5394	0.4750	1.0611	0.5482	0.4750
		1.0	0.78	0.0439	0.0919	1.2478	0.7767	0.6840	1.5279	0.7894	0.6840
		(0.8)	0.5	0.0685	0.1437	1.9227	1.2136	1.0688	2.3874	1.2335	1.0688
		0.65	0.33	0.1039	0.2177	2.9534	1.8383	1.6190	3.6163	1.8685	1.6190
		(0.5)	0.2	0.1756	0.2535	4.9911	2.7361	6.1116	3.1577	2.7361	
		0.32	0.08	0.4287	0.8982	12.1853	7.5848	6.6800	14.9208	7.7091	6.6800
		0.2	0.03	0.0975	2.2995	31.1944	19.4169	17.1009	38.1972	19.7353	17.1009
ANSI	Solid type	1.63	BS 14	0.0165	0.0346	0.4696	0.2924	0.2574	0.5750	0.2972	0.2574
		1.29	BS 16	0.0263	0.0552	0.7498	0.4668	0.4110	0.9181	0.4744	0.4110
		0.81	BS 20	0.0669	0.1401	1.9011	1.1838	1.0425	2.3287	1.2032	1.0425
	Twist type	7/0.61	BS 14	0.0168	0.0353	0.4790	0.2982	0.2626	0.5865	0.3031	0.2626
		7/0.5	BS 16	0.0258	0.0525	0.7130	0.4439	0.3908	0.8730	0.4511	0.3908
		7/0.32	BS 20	0.1283	0.1283	1.7408	1.0836	0.9542	2.1316	1.1013	0.9542

※ Reciprocating conductor resistance of the configuration commonly used in JIS and ANSI.

▣ Continuous use temperature of coated material and Insulation resistance

Cold limit(℃) -200 -100	Insulation material	Water resistance	Oil resistance	Chemical resistance	Insulation resistance	Heat resistance limits(℃) 100 200 300 400
-20	Cold-resistant vinyl	○	△	△	60	
-60	Polyethylene	○	△	○	2,500	
-10	General vinyl	○	△	△	60	
-10	Heat resistant vinyl	○	△	△	60	
-10	Special Heat Resistant Vinyl	○	△	△	60	
-60	Crosslinked polyethylene	○	△	○	2,500	
-40	nylon	◎	◎	◎	1,500	
-60	Polyester	◎	◎	◎	1,500	
-80	Teflon 6-fluoride	◎	◎	◎	1,500	
-80	Teflon 4-fluoride	◎	◎	◎	1,500	
-250	Polyimide	◎	◎	◎	1,500	
-40	Natural rubber	○	○	○	50	
-40	Chloroprene Rubber	○	○	○	50	
-40	Ethylene propylene	△	×	△	80	
-60	Silicone rubber	○	×	○	80	
	Silica fiber	×	△	○	0.1	
	Semi-silica fiber	×	△	○	0.1	
	Fiberglass	×	△	○	0.1	
	Asbestos 1A	×	△	○	0.1	
	Asbestos 2A	×	△	○	0.1	
	Asbestos 3A	×	△	○	0.1	
	Asbestos 4A	×	△	○	0.1	

※ Symbols : Symbols: ◎ (very good), ○ (excellent), △ (normal), × (bad)

※ Insulation resistance value of Compensation Wire is defined as 5MΩ / 10m or higher in KS (JIS) standard, but the above table shows Insulation resistance value and continuous use temperature of various coated materials.

▣ Compensation wire Polarity identification and external identification

Thermocouple symbol	Compensation wire symbol	Compensation wire material +/-	Color code				
			Korean standard KSC 1609 to 1981 (JIS C 1610 to 1981)	American standard ANSI MC96.1	British standard BS 1843 · 1952	German standard DIN 43714	French standard NF NF C42 to 323
B	BX	Copper/Copper Lead wire	+ − Red White Gray	+ − Gray Red Gray		+ − Gray Red Gray	
S&R	SX RX	Copper/Copper Nickel Compensating for Type S & R	+ − Red White Black	+ − Black Red Green	+ − White Blue Green	+ − Red White White	+ − Yellow Green Green
K	KX	Nickel /Nickel Chromium Aluminum Extension for Type K	+ − Red White Blue	+ − Yellow Red Yellow	+ − Brown Blue Red	+ − Red Green Green	+ − Yellow Purple Yellow
	WX	Nickel /Nickel Chromium Aluminum Extension for Type K	+ − Red White Blue				+ − Yellow White White
	VX	Iron/Copper Nickel Compensation for Type K	+ − Red White Blue		+ − White Blue Red		+ − Yellow Brown Red
E	EX	Nickel/ Constantan Chromum Extension for Type E	+ − Red White Purple	+ − Purple Red Purple	+ − Brown Blue Brown	+ − Red Black Black	
J	JX	Iron/ Constantan Extension for Type J	+ − Red White Yellow	+ − White Red Black	+ − Yellow Blue Black	+ − Red Blue Blue	+ − Yellow Black Black
T	TX	Copper/ Constantan Extension for Type T	+ − Red White Brown	+ − Blue Red Blue	+ − White Blue Blue	+ − Red Brown Brown	+ − Yellow Blue Blue