

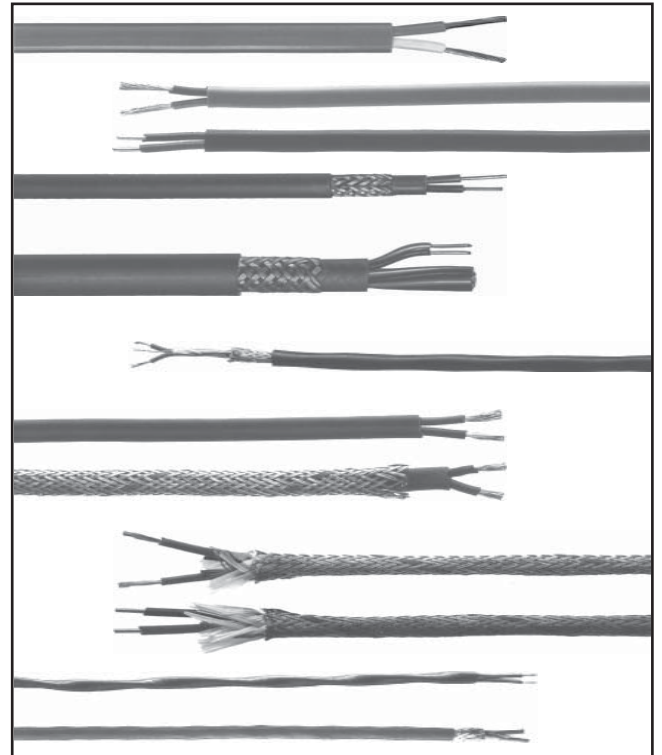
# Connecting Cables for Thermocouples

## Extension Cables, Compensating Cables, Insulated Thermocouple Wires

In most cases thermocouples are connected to other process instrumentation by connecting cables. Connecting cables are divided into compensating cables and extension cables. These can again be divided into solid and stranded conductors. Extension cables are connecting cables with conductors made of thermocouple material, i.e. of the same material as the thermocouple itself. Extension cables therefore are subject to the same accuracy limits as the thermocouples. Extension cables are marked with an „X“ behind the identification letter for the thermocouple. For example, „KX“ means that the cable is an extension cable / insulated thermocouple wire for the thermocouple type K (NiCr-Ni).

Compensation cables are connecting cables with conductors made of materials which only in a limited temperature range have the same thermoelectric properties as the thermocouple itself. Compensating cables are marked with a „C“ behind the identification letter for the thermocouple. For example, „KC“ means that the cable is a compensating cable for the thermocouple type K.

The insulation of the conductors as well as of the sheaths can be made of a variety of materials. The following criteria must be taken into consideration when selecting the appropriate material: chemical and mechanical resistance against the ambient conditions, temperature range, insulation resistance, flexibility, outside diameter, screening etc. Apart from that there is a great number of cable types available as compensating cables or extension cables as well as those with more than two inner conductors. Many special designs are available upon request, some of them on a short term basis.



### Special advantages:

- Connecting cables are available for almost all kinds of thermocouples
- Mechanically rugged
- A great variety of types for almost any application
- Highly flexible
- Resistant against most chemicals
- Special cables available upon request



## Material, Color Code, Permitted Deviation

### Properties of Insulation Material

	PVC	Silicon	Chlorop. Rubber	Glasfibre		Teflon FEP/PFA	Teflon PTFE	Kapton	Cerafi	Refrasil
				E-Glass	R-Glass					
<b>Max. Temp. °C</b>	105	200	80	400	600	210	260	320	1200	900
<b>Inflammability</b>	A	A	A	B	B	C	C	C	B	B
<b>Water absorbtion</b>	marginal			none						
<b>Abbrasion rest.</b>	good			marginal		very good			marginal	
<b>Flexibility</b>	very good			good		very good			good	
<b>Suitable for:</b>										
<b>Water vapor</b>	good	limited	conditio- nally	not suitable		very good		conditio- nally	not suitable	
<b>Weak base</b>	+	+	+	+	+	+	+	+	+	+
<b>Weak acid</b>	+	+	+	+	+	+	+	+	+	+
<b>Alcohol</b>	+	+	+	+	+	+	+	+	+	+
<b>Gasoline</b>	+	-	0	+	+	+	+	+	+	+
<b>Benzol</b>	-	-	-	+	+	+	+	+	+	+
<b>Mineral oil</b>	+	-	0	+	+	+	+	+	+	+

+ = durable; 0 = limited durability; - = not suitable

A = self extinguishing; B = not burnable; C = not flammable

### Color code for extension and compensating cables acc. to IEC 60 584-3

Material	Fe-CuNi	Fe-CuNi	NiCr-Ni	Cu-CuNi	NiCr-CuNi	NiCrSi-NiSi	Pt10%Rh-Pt	Pt13%Rh-Pt	Pt30%Rh-Pt6%Rh
Ident. letter	L*	J	K	T	E	N	S	R	B
Color Plus-Pole	---	black	green	brown	purple	pink	orange	orange	No color defined. Normally copper- wires are used. grey (+) white (-)
	(red)	---	(red)	(red)	---	---	(red)	(red)	
Color Minus-Pole	---	white	white	white	white	white	white	white	
	(blue)	---	(green)	(brown)	---	---	(white)	(white)	
Color sheath	---	black	green	brown	purple	pink	orange	orange	
	(blue)	---	(green)	(brown)	---	---	(white)	(white)	

Identification letter acc. to IEC 60 584-1 ( DIN 43 710 )

Type L acc. to DIN 43 710 (Standard withdrawn)

Colour code acc. to DIN 43 714 (Standard withdrawn)

### Permitted deviation of extension and compensating cables According to IEC 60 584-3:2009

Thermocouple cable type	Permitted Deviation		Temperature range	Measuring temperature
	Class 1	Class, e 2		
JX (LX)	± 85 µV (± 1,5 °C)	± 140 µV (± 2,5 °C)	-25 to +200 °C	500 °C
TX	± 30 µV (± 0,5 °C)	± 60 µV (± 1,0 °C)	-25 to +100 °C	300 °C
EX	± 120 µV (± 1,5 °C)	± 140 µV (± 2,5 °C)	-25 to +200 °C	500 °C
KX	± 60 µV (± 1,5 °C)	± 100 µV (± 2,5 °C)	-25 to +200 °C	900 °C
NX	± 60 µV (± 1,5 °C)	± 100 µV (± 2,5 °C)	-25 to +200 °C	900 °C
KCA		± 100 µV (± 2,5 °C)	0 to +150 °C	900 °C
KCB		± 100 µV (± 2,5 °C)	0 to +100 °C	900 °C
NC		± 100 µV (± 2,5 °C)	0 to +150 °C	900 °C
SCA/RCA		± 30 µV (± 2,5 °C)	0 to +100 °C	1000 °C
SCB/RCB		± 60 µV (± 5,0 °C)	0 to +200 °C	1000 °C

Due to the non-linear correlation between thermoelectric voltage and temperature the data of the accuracy in °C (i.e. the values in brackets) refer to the measuring temperature shown in the last column. In the measuring range 0°C to 100°C copper conductors are used as extension cables for the thermocouple type B ( Pt30%Rh - Pt6%Rh ).

**Ordering Code: Sheath/Wire - Internal Number - No. of Cond./TC-Type/Cable Type - Cross Section or Diameter - Wire Type**

For versions which are not shown on the following pages, please use the ordering code below. However, we have to point out that not all theoretically possible combinations can be delivered. Please do not hesitate to contact us - we will be glad to help you find the optimum solution for your particular application.

Example:

You need a thermocouple cable type K, with two conductors and 0.22 mm<sup>2</sup> cross section, conductors and cable teflon-insulated, with screening braid, accuracy class 1 (IEC 60 584-3:2009).

Please indicate separately whether a screening braid is needed or not and the accuracy class (see page 2).

Example: T T - 465 - 2 K X - 0.22 L

Insulation Single Conductor

- C = Cerafi ( Ceramic fibre )
- G = Glass fibre
- K = Kapton ( Polyimid )
- P = PVC ( Polyvinyl Chloride )
- R = Refrasil ( Quartz fibre )
- S = Silicon
- T = Teflon

Outer Sheath

- C = Cerafi ( Ceramic fibre )
- G = Glass fibre
- K = Kapton ( Polyimid )
- P = PVC ( Polyvinyl Chloride )
- R = Refrasil ( Quartz fibre )
- S = Silicon
- T = Teflon

Internal Number

Number of Conductors

Thermocouple Types

- J, K, T, E, N, S, R, B acc. to IEC 60 584 or
- L = Fe-CuNi ( DIN 43710, withdrawn)
- A = W5%Re - W20%Re (IEC 60 584)
- D (AE) = W3%Re - W25%Re (ASTM E 988)
- C (AO) = W5%Re - W26%Re (IEC 60 584)

Cable Type

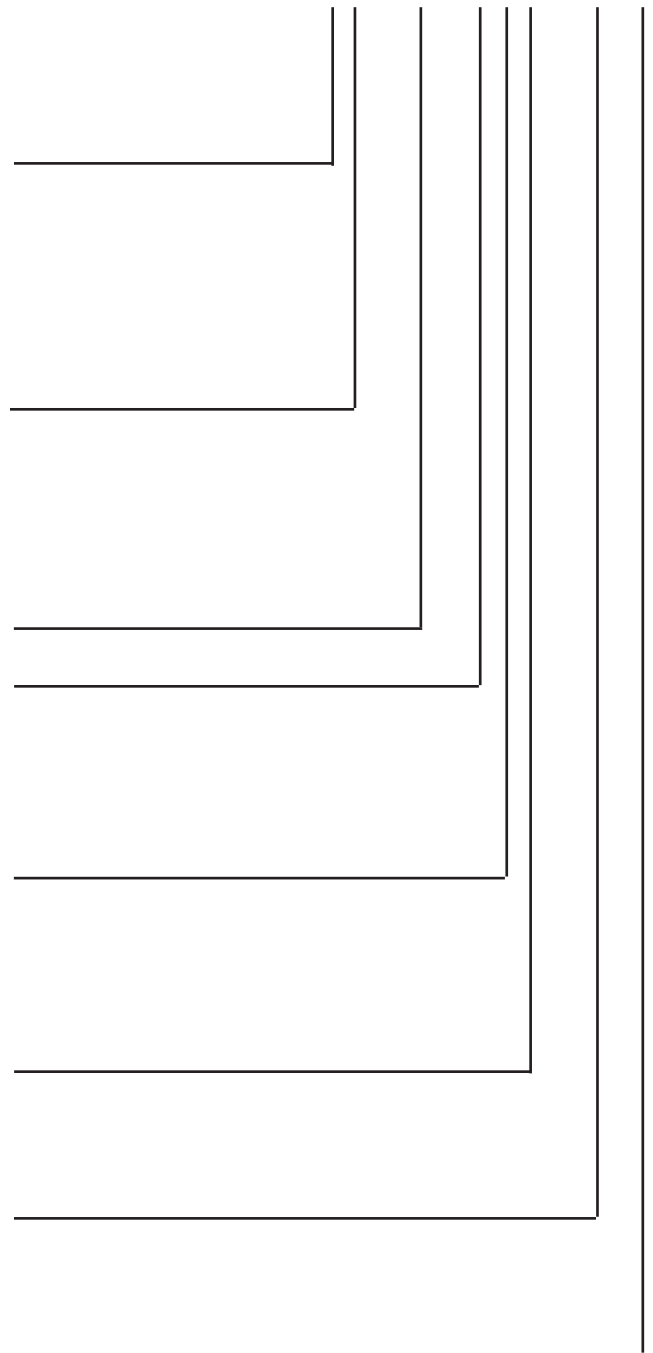
- C = Compensating Cable
- X = Extension Cable

Cross section/diameter

Cross section in mm<sup>2</sup> for stranded conductors  
 Diameter in mm for solid conductors

Wire Type

- L = Stranded conductors
- M = Solid conductors



## Insulated Thermocouple Cables and Wires

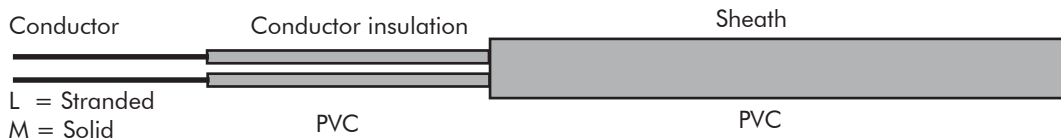
### TT - 465 - Number of conductors / TC ident letter - Cross section / L (stranded wire)



Description	TC Type	Item Number
TT-465-2J-0.22L	Fe-CuNi(DIN)	2-2202-00005
TT-465-2J-0.22L	Fe-CuNi(IEC)	2-2202-00007
TT-465-2J-1.5L	Fe-CuNi	2-2302-00016
TT-465-2K-0.22L	NiCr-Ni	<b>2-2200-00043</b>
TT-465-2L-0.22L	Fe-CuNi	2-2201-00023
TT-465-2L-0.5L	Fe-CuNi	2-2201-00025
TT-465-2L-1.5L	Fe-CuNi	2-2301-00049

Description	TC Type	Item Number
TT-465-2N-0,5L	NiCrSi-NiSi	2-2206-00004
TT-465-2T-0,22L	Cu-CuNi	2-2204-00007
TT-465-4K-0,25L	NiCr-Ni	2-2200-00063
TT-465-4L-0,25L	Fe-CuNi	2-2301-00051
TT-465-6K-0,25L	NiCr-Ni	2-2200-00025
TT-465-24K-,025L	NiCr-Ni	2-2200-00026

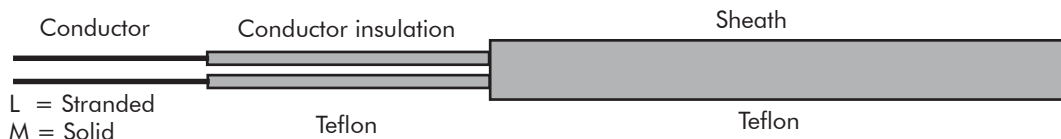
### PP - 520 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)



Description	TC Type	Item Number
PP-520-2J-0.22L	Fe-CuNi(DIN)	2-2302-00019
PP-520-2J-0.25L	Fe-CuNi(IEC)	2-2302-00008
PP-520-2K-0.25L	NiCr-Ni	2-2200-00040
PP-520-2K-0.5M	NiCr-Ni	2-2200-00015
PP-520-2K-1.0M	NiCr-Ni	2-2200-00016
PP-520-2L-0.25L	Fe-CuNi	2-2301-00010
PP-520-2L-0.5L	Fe-CuNi	2-2201-00008
PP-520-2L-0.5M	Fe-CuNi	2-2201-00010
PP-520-2L-1.0M	Fe-CuNi	2-2201-00011

Description	TC Type	Item Number
PP-520-2L-1.38M	Fe-CuNi	2-2301-00011
PP-520-2L-1.5L	Fe-CuNi	2-2301-00012
PP-520-2N-0.22L	NiCrSi-NiSi	2-2206-00001
PP-520-2T-0.5M	Cu-CuNi	2-2204-00001
PP-520-2T-0.8M	Cu-CuNi	2-2204-00005
PP-520-2T-1.0M	Cu-CuNi	2-2204-00002
PP-520-4K-0.25L	Fe-CuNi	2-2200-00045
PP-520-6L-1.5L	Fe-CuNi	2-2301-00063

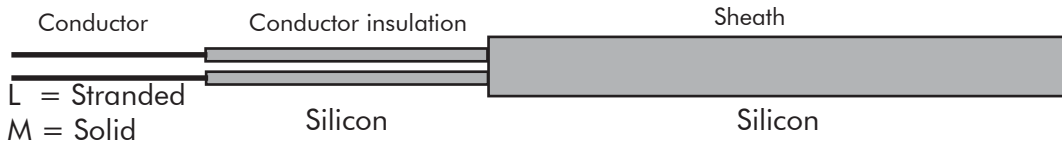
### TT - 460 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)



Description	TC Type	Item Number
TT-460-12L-0.5L	Fe-CuNi	2-2201-00022
TT-460-2J-0.22L	Fe-CuNi	2-2202-00007
TT-460-2K-0.22L	NiCr-Ni	2-2200-00067
TT-460-2K-0.2M	NiCr-Ni	2-2200-00042
TT-460-2K-0.3M	NiCr-Ni	2-2200-00066
TT-460-2K-0.5L	NiCr-Ni	2-2200-00021
TT-460-2K-0.5M	NiCr-Ni	2-2200-00022

Description	TC Type	Item Number
TT-460-2L-0.25L	Fe-CuNi	2-2301-00043
TT-460-2L-0.2M	Fe-CuNi	2-2201-00009
TT-460-2L-0.5M	Fe-CuNi	2-2301-00018
TT-460-2N-0.2LM	NiCrSi-NiSi	2-2206-00003
TT-460-2U-0.5M	Cu-CuNi	2-2203-00005
TT-460-4K-0.22	NiCr-Ni	2-2200-00068
TT-460-4L-0.75L	Fe-CuNi	2-2301-00045

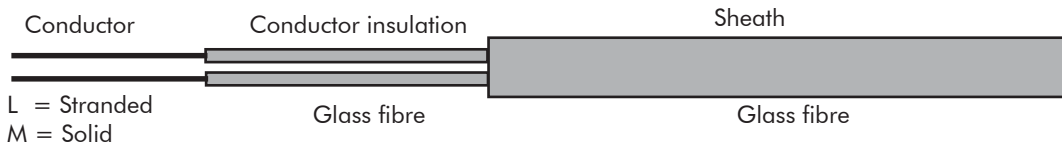
**SS - 350 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**



Description	TC Type	Item Number
SS-350-2J-0.22L	Fe-CuNi	2-2302-00018
SS-350-2J-1.5L	Fe-CuNi	2-2302-00022
SS-350-2K-0.25L	NiCr-Ni	2-2200-00037
SS-350-2K-0.5M	NiCr-Ni	2-2200-00018
SS-350-2L-0.5M	Fe-CuNi	2-2201-00016

Description	TC Type	Item Number
SS-350-2L-1.0M	Fe-CuNi	2-2201-00017
SS-350-2L-0.25L	Fe-CuNi	2-2301-00029
SS-350-2L-1.5L	Fe-CuNi	2-2301-00030
SS-350-2U-0.5L	Cu-CuNi	2-2203-00004
SS-350-4L-0.25L	Fe-CuNi	2-2301-00032

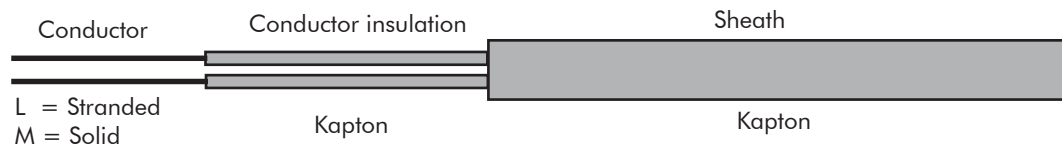
**GG - 220 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**



Description	TC Type	Item Number
GG-220-2J-0.22L	Fe-CuNi	2-2202-00006
GG-220-2J-0.2M	Fe-CuNi	2-2202-00009
GG-220-2J-0.5M	Fe-CuNi	2-2202-00003
GG-220-2J-0.1M	Fe-CuNi	2-2201-00003
GG-220-2K-0.22L	NiCr-Ni	2-2200-00060
GG-220-2K-0.2M	NiCr-Ni	2-2200-00005

Description	TC Type	Item Number
GG-220-2K-0.5M	NiCr-Ni	2-2200-00007
GG-220-2K-1.0M	NiCr-Ni	2-2200-00010
GG-220-2L-0.1M	Fe-CuNi	2-2201-00003
GG-220-2L-0.2M	Fe-CuNi	2-2201-00004
GG-220-2L-0.5M	Fe-CuNi	2-2201-00006
GG-220-2L-1.0M	Fe-CuNi	2-2201-00007

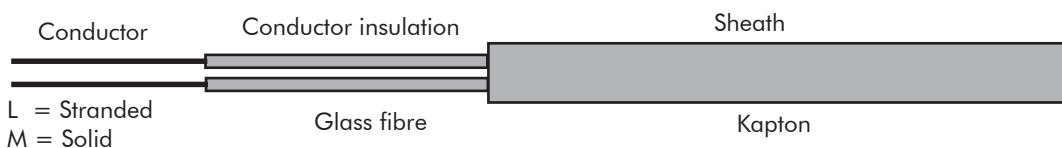
**KK - 610 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**



Description	TC Type	Item Number
KK-610-2E-0.5M	NiCr-CuNi	2-2205-00001
KK-610-2J-0.8ML	Fe-CuNi	2-2202-00002
KK-610-2K-0.2M	NiCr-Ni	2-2200-00012

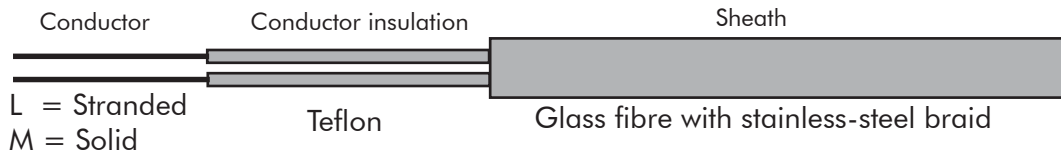
Description	TC Type	Item Number
KK-610-2K-0.32M	NiCr-Ni	2-2200-00055
KK-610-2K-0.5M	NiCr-Ni	2-2200-00013
KK-610-2L-0.25M	Fe-CuNi	2-2201-00031

**GK - 270 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**



Description	TC Type	Item Number
GK-270-2J-0.22L	Fe-CuNi	2-2202-00008

**TG - 412 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**



Description	TC Type	Item Number
TG-412-2J-0.25L	Fe-CuNi	2-2302-00020
TG-412-2L-0.25L	Fe-CuNi	2-2301-00038
TG-412-2L-0.5L	Fe-CuNi	2-2301-00067
TG-412-2L-0.75L	Fe-CuNi	2-2301-00077

Description	TC Type	Item Number
TG-412-2L-1.0L	Fe-CuNi	2-2301-00071
TG-412-4J-0.22L	Fe-CuNi	2-2302-00060
TG-412-4L-0.25L	Fe-CuNi	2-2301-00023
TG-412-4L-0.5L	Fe-CuNi	2-2201-00039

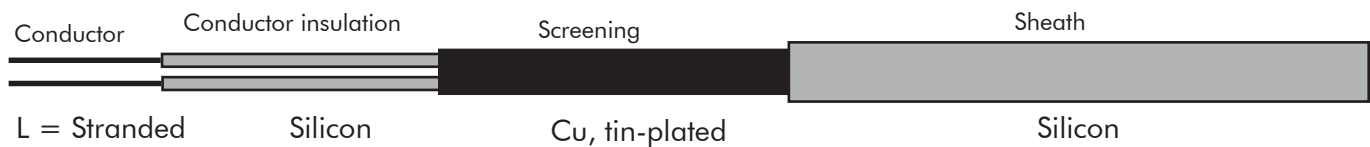
**TP - 440 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**



Description	TC Type	Item Number
TP-440-2J-0.25L	Fe-CuNi	2-2302-00006
TP-440-2L-0.25L	Fe-CuNi	2-2301-00040
TP-440-2L-0.5L	Fe-CuNi	2-2301-00058

Description	TC Type	Item Number
TP-440-2T-0.25L	Cu-CuNi	2-2304-00006
TP-440-4L-0.25L	Fe-CuNi	2-2301-00055

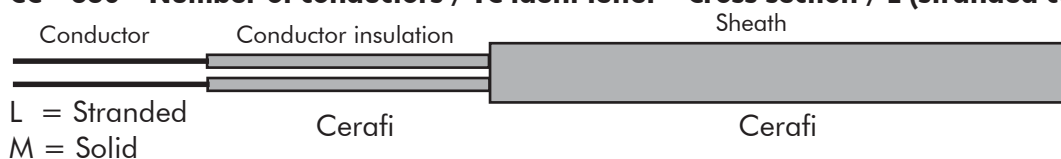
**SS - 354 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**



Description	TE - Type	Item Number
SS-354-2J-0,25L	Fe-CuNi	2-2302-00004
SS-354-2L-0,25L	Fe-CuNi	2-2301-00035

Description	TE - Type	Item Number
SS-354-4L-0,25L	Fe-CuNi	2-2301-00036
SS-354-4L-1,5L	Fe-CuNi	2-2301-00054

**CC - 630 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)**

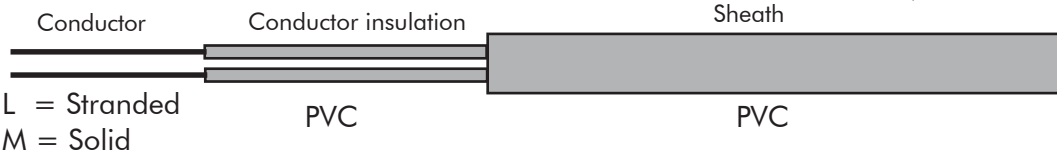


Description	TC Type	Item Number
CC-630-2K-0.8M	NiCr-Ni	2-2200-00065

Description	TC Type	Item Number
CC-630-2K-1.0M	NiCr-Ni	2-2200-00038

## Compensating Cables

### PP - 520 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)

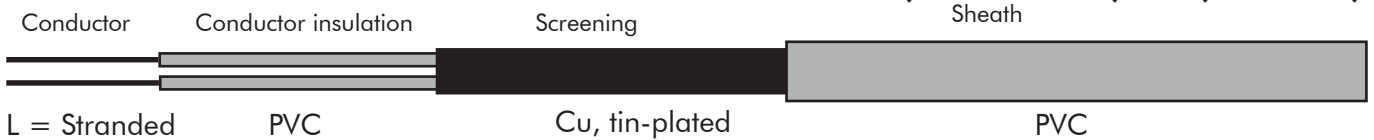


Description	TC Type	Item Number
PP-520-2KC-0.22L	NiCr-Ni(IEC)	2-2300-00172
PP-520-2KC-0.22L	NiCr-Ni(DIN)	2-2300-00007
PP-520-2KC-0.75L	NiCr-Ni	2-2300-00009
PP-520-2KC-1.5L	NiCr-Ni	2-2300-00011
PP-520-4KC-0.22L	NiCr-Ni	2-2300-00173

Description	TC Type	Item Number
PP-520-2NC-0.25L	NiCrSi-NiSi	2-2314-00001
PP-520-2NC-0.5L	NiCrSi-NiSi	2-2314-00002
PP-520-2SC-0.25L	Pt10%Rh-Pt	2-2305-00004
PP-520-2SC-1.5L	Pt10%Rh-Pt	2-2305-00005
PP-520-2RC-1.5L	Pt13%Rh-Pt	2-2307-00001

EN=Colour acc. to EN 60 584      DIN=Colour acc. to DIN 43 714

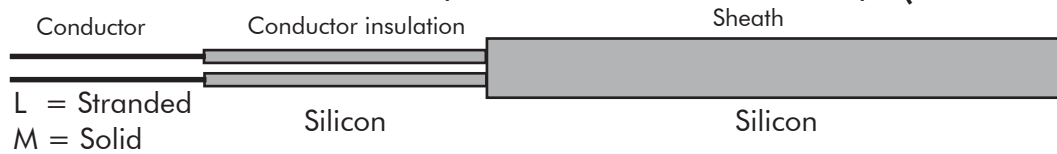
### PP - 526- Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)



Description	TC Type	Item Number
PP-526-2KC-0.25L	NiCr-Ni	2-2300-00135
PP-526-2KC-0.75L	NiCr-Ni	2-2300-00177

Description	TC Type	Item Number
PP-526-2KC-1.0L	NiCr-Ni	2-2300-00115
PP-526-2KC-1.5L	NiCr-Ni	2-2300-00097

### SS - 350 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)



Description	TC Type	Item Number
SS-350-2KC-0.22L	NiCr-Ni(IEC)	2-2300-00160
SS-350-2KC-0.25L	NiCr-Ni(DIN)	2-2300-00029
SS-350-2KC-0.5L	NiCr-Ni	2-2300-00126

Description	TC Type	Item Number
SS-350-2KC-1.5L	NiCr-Ni	2-2300-00031
SS-350-2SC-0.25L	Pt10%Rh-Pt	2-2305-00028
SS-350-2SC-1.5L	Pt10%Rh-Pt	2-2305-00014

EN=Colour acc. to EN 60 584      DIN=Colour acc. to DIN 43 714

### SS - 354 - Number of conductors / TC ident letter - Cross section / L (stranded cond.) or M (solid cond.)



Description	TC Type	Item Number
SS-354-2KC-0.25L	NiCr-Ni	2-2300-00035
SS-354-2KC-1.5L	NiCr-Ni	2-2300-00129

Description	TC Type	Item Number
SS-350-4KC-0.25L	NiCr-Ni	2-2300-00036
SS-350-4KC-1.5L	NiCr-Ni	2-2300-00175

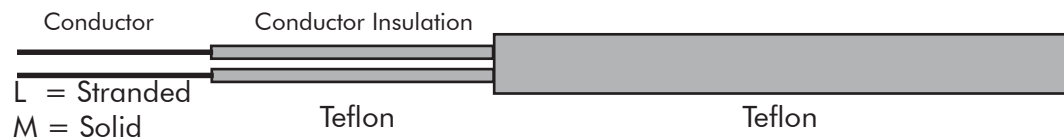
**TT - 465 - Number of conductors / TC ident letter - Cross section / L (stranded cond.)**



Description	TC Type	Item Number
TT-465-2KC-0.25L	NiCr-Ni	2-2300-00056
TT-465-2KC-1.5L	NiCr-Ni	2-2300-00118
TT-465-2KC-0.5L	NiCr-Ni	2-2300-00063
TT-465-4KC-0.25L	NiCr-Ni	2-2300-00058

Description	TC Type	Item Number
TT-465-2NC-0.25L	NiCrSi-NiSi	2-2314-00003
TT-465-2SC-0.25L	Pt10%Rh-Pt	2-2305-00016
TT-465-4SC-0.5L	Pt10%Rh-Pt	2-2305-00027

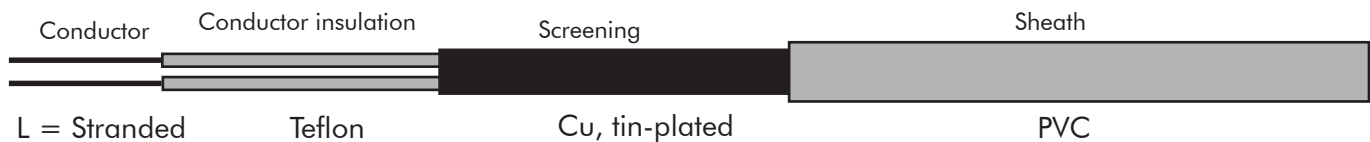
**TT - 460 - Number of conductors / TC ident letter - Cross section / L (stranded cond.)**



Description	TC Type	Item Number
TT-460-2KC-0.25L	NiCr-Ni	2-2300-00048
TT-460-2KC-0.5L	NiCr-Ni	2-2300-00049

Description	TC Type	Item Number
TT-460-2KC-0.75L	NiCr-Ni	2-2300-00086
TT-460-4KC-0.75L	NiCr-Ni	2-2300-00050

**TP - 440 - Number of conductors / TC ident letter - Cross section / L (stranded cond.)**

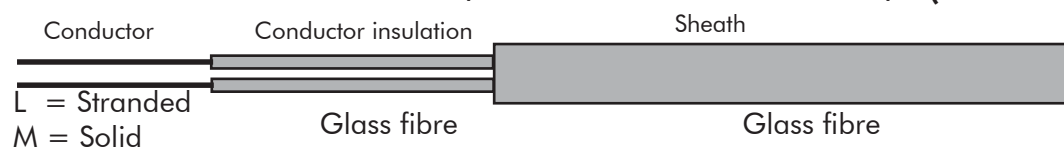


Description	TC Type	Item Number
TP-440-2KC-0.25L	NiCr-Ni(EN)	2-2300-00044
TP-440-2KC-0.25L	NiCr-Ni(DIN)	2-2300-00174
TP-440-2KC-0.5L	NiCr-Ni	2-2300-00046

Description	TC Type	Item Number
TP-440-4KC-0.25L	NiCr-Ni	2-2300-00047
TP-440-2SC-0.25L	Pt10%Rh-Pt	2-2305-00015
TP-440-2RC-0.25L	Pt10%Rh-Pt	2-2307-00002

EN=Colour acc. to EN 60 584      DIN=Colour acc. to DIN 43 714

**GG - 220 - Number of conductors / TC ident letter - Cross section / L (stranded cond.)**

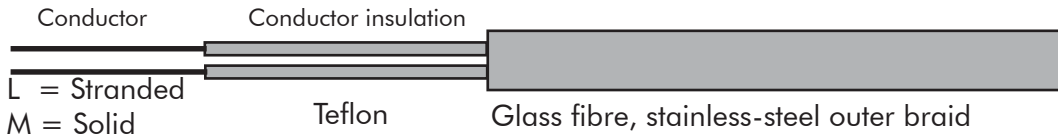


Description	TC Type	Item Number
GG-220-2KC-1.0L	NiCr-Ni	2-2300-00122

Description	TC Type	Item Number
GG-220-2KC-1.5L	NiCr-Ni	2-2300-00088



**TG - 412- Number of conductors / TC ident letter - Cross section / L (stranded cond.)**



Description	TC Type	Item Number
TG-412-2KC-0.22L	NiCr-Ni	2-2300-00040
TG-412-2KC-0.5L	NiCr-Ni	2-2300-00102
TG-412-2KC-0.75L	NiCr-Ni	2-2300-00041
TG-412-2KC-1.5L	NiCr-Ni	2-2300-00042

Description	TC Type	Item Number
TG-412-4KC-0.25L	NiCr-Ni	2-2300-00043
TG-412-4KC-0.5L	NiCr-Ni	2-2300-00140
TG-412-4KC-1.5L	NiCr-Ni	2-2300-00066
TG-412-2SC-0.25L	Pt10%Rh-Pt	2-2305-00029

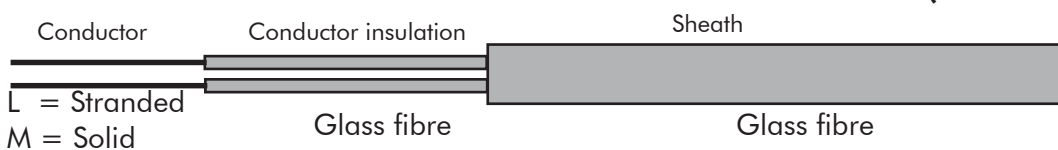
**Compensating Cables for High-Temperature Thermocouples**

Due to the extreme brittleness of the thermocouple conductors, no extension cables are available for the high-temperature thermocouples made from tungsten/rhenium alloys. Compensating cables are therefore always used. For these special cables no standards regarding the permissible deviations are available. The cables offered by us have a permissible deviation of +/- 50 µV (this corresponds to +/- 3.5 K at a measuring temperature of 2000°C) at an ambient temperature between 0 and 100°C. Our company has determined the following colour code:

Colour plus pole	Colour minus pole	Colour sheath	Color ident line
GG - 220 : black PP - 526 : yellow	GG - 220 : white PP - 526 : white	GG - 220 : white PP - 526 : white	GG - 220 : black PP - 526 : yellow

TC ident letter:      AO = W 3 % Re - W 25 % Re      AE = W 5 % Re - W 26 % Re

**GG - 220 - Number of conductors / TC ident letter - Cross section / L (stranded conductor)**



Description	TC Type	Item Number
GG-220-2AOC-0.5M	W3%Re -W25%Re	2-2310-00001

Description	TC Type	Item Number
GG-220-2AEC-0.5M	W5%Re - W26%Re	2-2308-00001

**PP - 526 - Number of conductors / TC ident letter - Cross section / L (stranded conductor)**



Description	TC Type	Item Number
PP-526-2AOC-0.5M	W3%Re -W25%Re	2-2310-00002

Description	TC Type	Item Number
PP-526-2AEC-0.22L	W5%Re - W26%Re	2-2308-00003

## Guidelines for use

### PVC-insulated compensating and extension cables

Cables with a PVC-insulation can be used in dry, moist and also wet rooms. They are suited for an average mechanical strain and can be laid firmly or flexibly. In the case of flexible laying tensile stress must be avoided. PVC-insulated cables can be run forcibly. A recurrent bending stress, however, should be avoided. When used outdoors, cables with a PVC-insulation must be UV-protected. Furthermore they must be used only within the indicated temperature range.

Temperature range: laid firmly -40 ... +105 °C  
laid flexibly +5 ... +70 °C

Burning properties: flame - inhibiting and  
self - extinguishing

It is recommended to obey the following minimum bending radius:

Flexible laying: 12 x outside diameter

Firm laying: 4 x outside diameter

### Silicon-insulated compensating and extension cables

Silicon-insulated cables are used when high ambient temperatures or the effects of high temperature differences make the cable insulation brittle and fragile after a short time. They are suited for dry, moist and wet rooms and a low mechanical strain. Silicon insulated cables can be laid firmly or flexibly. In the case of flexible laying tensile stress must be avoided. Silicon-insulated cables are highly flexible and resistant to numerous low concentrated acids and bases. The resistance against fuels and mineral oils, however, is low. Silicon-insulated cables are halogen-free according to IEC 754-1.

Temperature range: laid firmly -50 ... +200 °C  
laid flexibly -25 ... +180 °C  
short-term +250 °C

Burning properties: flame-inhibiting and  
self-extinguishing, no  
corrosive gases

Min. bending radius: 12 x outside diameter

### Teflon-insulated compensating and extension cables

Cables with a Teflon insulation are suited for dry, moist and wet rooms and high mechanical strain at high ambient temperatures. Teflon-insulated cables can be laid outdoors without any problems. They can be laid firmly or flexibly. In the case of flexible laying tensile stress must be avoided. Teflon insulated cables have the following properties::

- \*- flameproof
- \*- high insulation resistance > 2 TOhm x cm
- \*- high abrasion resistance
- \*- extremely low dielectric losses
- \*- water absorption < 0.01 %
- \*- resistant to all ambient conditions
- \*- resistant to acids and bases, solvents,  
fuels, mineral oils, synthetic liquids etc.
- \*- high elasticity and tensile strength
- \*- resistant to soldering temperatures

The tin-plated copper screening braid of the cable TT-465 gives it an excellent electromagnetic immunity. Cables without screening resp. with electroplated screening foil and additional wire are available upon request.

FEP insulation (fluorethylene-propylene)  
Temperature range: laid firmly -100 ... +205 °C  
laid flexible -100 ... +205 °C

PFA (polyfluorethylene-acetate) and PTFE  
(polytetra-fluorethylene) insulation  
Temperature range: laid firmly -190 ... +260 °C  
laid flexible -100 ... +260 °C

Burning properties: flame-inhibiting and  
self-extinguishing

It is recommended to obey the following minimum bending radius:

Flexible laying: 10 x outside diameter

Firm laying: 4 x outside diameter

### **Compensating and extension cables insulated with glass fibres**

Glass fibre-insulated cables are suited for high temperatures in a dry environment. They can be laid firmly or flexibly. If the temperature exceeds 180 °C, cables should be laid firmly as a rule and flexibly as an exception. In the case of flexible laying tensile stress must be avoided. Glass silk-insulated cables are not suited for permanent bending and kinks must be avoided during installation.

Temperature range: laid firmly -25...+400 °C  
laid flexibly -25...+180 °C  
short-term up to +600 °C

Burning properties: flameproof, no corrosive gases

It is recommended to obey the following minimum bending radius (temperature < 180 °C):  
Flexible laying: 10 x outside diameter  
Firm laying: 4 x outside diameter  
After a temperature load exceeding 200 °C, the cable should not be bent any more.

### **Compensating and extension cables insulated with mineral fibres**

Application conditions and recommendations for use are the same as for glass silk-insulated cables. Thermocouple and extension cables insulated with mineral fibres, however, are suited for considerable higher temperatures:

REFRASIL up to 900 °C  
CERAFI up to 1200 °C

Burning properties: flameproof, no corrosive gases

It is recommended to obey the following minimum bending radius (temperature < 180 °C):  
Flexible laying: 10 x outside diameter  
Firm laying: 4 x outside diameter  
After a temperature load exceeding 200 °C, the cable should not be bent any more.

### **Kapton-insulated compensating and extension cables**

Kapton, a kind of polyimide material, has very similar chemical properties like Teflon. Unlike Teflon, Kapton can be processed to very thin foils of very high tensile strength. It has almost no fluidity, but a high elasticity. Kapton can practically not be glued to other materials. Like glass fibre-insulated cables Kapton-insulated cables are mainly used for high temperatures in a dry environment. They have excellent electrical and mechanical properties. Cables should be laid firmly as a standard and flexibly as an exception. Tensile stress cannot be tolerated. They are not suited for permanent bending and kinks must be avoided during installation.

Temperature range: laid firmly -40... +320 °C  
laid flexibly -25... +220 °C  
short-term up to +380 °C

Burning properties: flameproof, no corrosive gases

It is recommended to obey the following minimum bending radii:  
Flexible laying: 10 x outside diameter  
Firm laying: 6 x outside diameter

### **Kapton-and glass fibre-insulated cables**

Each conductor is glass fibre-insulated while the cable as a whole is surrounded by a Kapton film. The positive properties of both materials are combined to an optimum. Application conditions as well as recommendations for use can be taken from the descriptions for each material.

The most important advantage is that the cable can be bent to a certain degree at temperatures above 180 °C without damage to the glass fibre insulation.

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All data given in this data sheet are typical but do not constitute binding and/or guaranteed characteristics. Any data needs to be verified in detail by the customer in relation to any specific application. We reserve the right to change any specification without prior notice in line with our policy of continuous technical improvement.

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