



**STANDARD
PRODUCT
GUIDE**

 **YUCHANG E&C CO.,LTD.**

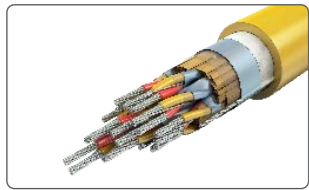
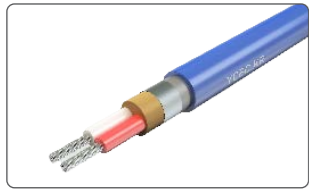
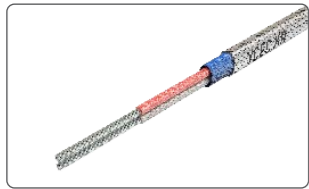
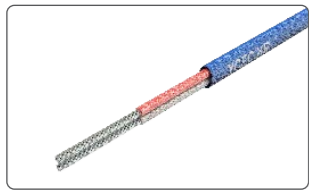
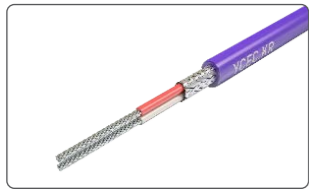
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**With customer value
The best product
The better future**

 **YUCHANG E&C CO.,LTD.**
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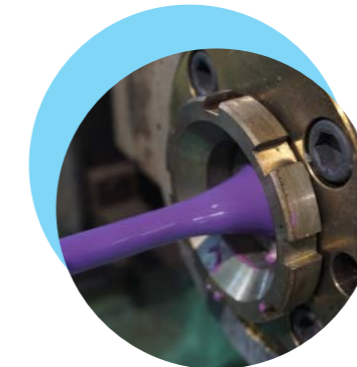
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Company History



- 1988 Established 'Yuchang Electrics'
- 1995 Factory located at Bong- dam eup, Hwaseong si, Kyung-gi do
- 1996 Renamed as 'Yuchang Instruments and Electrics'
- 2001 Certified ISO 9001
- 2002 Converted to 'Yuchang E&C Co., LTD.'
- 2002 Factory located at Hyangnam-eup, Hwaseong si, Kyung-gi do
- 2006 Certified ISO 14001
- 2008 Certified Korea Standard (KS C1609)
- 2008 Acquired Electrical Appliances Safety Certificate on FR-CVV
- 2010 New factory built at Bal-An Industrial Complex
- 2011 New R&D division (approved by Koita) built
- 2011 Certified 'Innovation-driven enterprise' by Mainbiz
- 2012 Certified UL 1330, 1331, 1332, etc (Fluoropolymer wire)
- 2014 Selected as 'Outstanding company' (by Ministry of Employment & Labor)
- 2015 Enterprise Specializing in Materials & Parts (by Ministry of Trade, Industry and Energy)
- 2017 Certified UL 13(PLTC)
- 2018 Certified UL 1726, 1727
- 2021 Certified UL 4648, 4649
- 2021 Wire Harness Business Started
- 2023 YAGEO Nexensos distributor
- 2024 Awarded the 3 Million Dollar Export Tower



GREETINGS

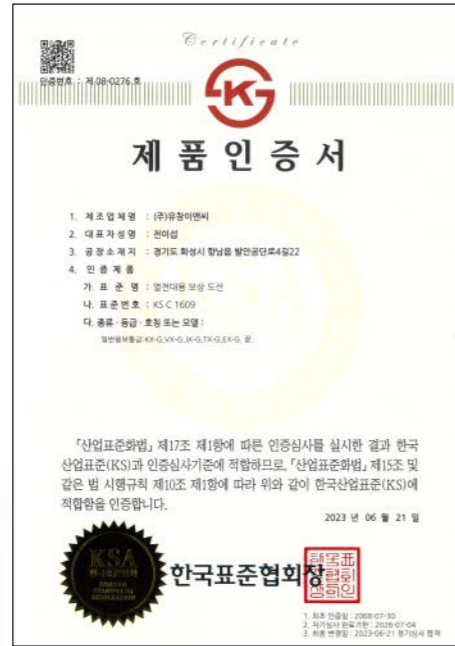
Over the 35 years, Yuchang E&C. has been providing the highest quality T/C extension and compensating cables to customers of various fields.

From plant industries (iron manufacture, chemical fibers, petroleum)to shipping and automobiles industries, Yuchang E&C. has made every effort to ensure the best flow of the heat and automatic controls. As robotics and auto-controls marked major milestones in industrial growth, the importance of accurate temperature control has never been so emphasized. Thus, Yuchang E&C. promises to continue providing the best quality products as well as the best follow-up services to each customer



Certificate

Product Domestic(KS, KC)



Korean Industrial Standard

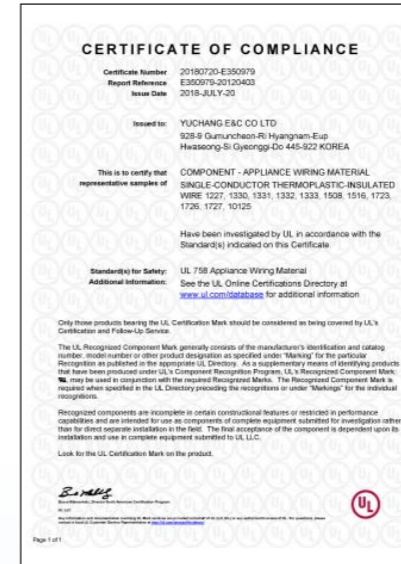


Certificate

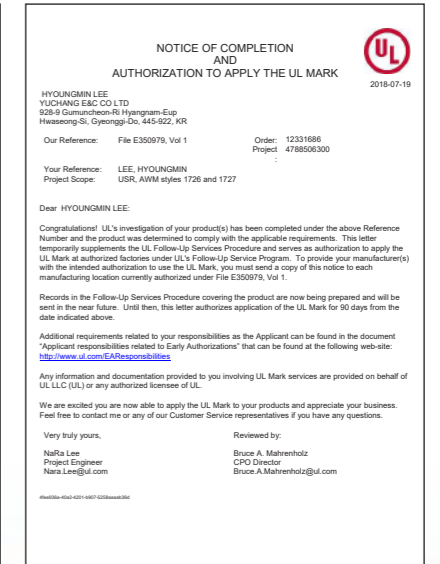
Product International(UL)



UL AWM
2464(2919,21974,20276)



UL 1330, 1331



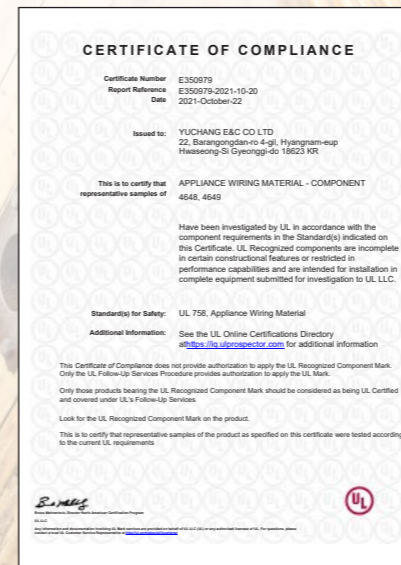
UL 1726,1727



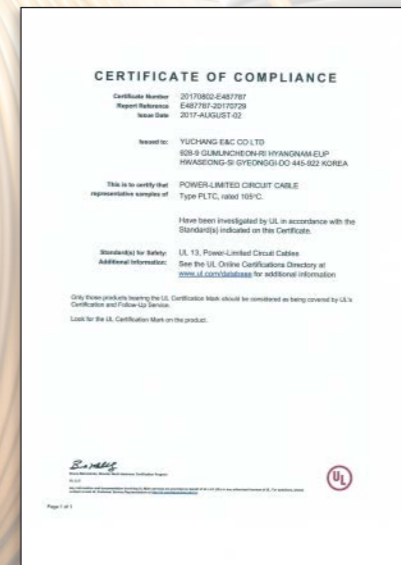
Electrical Equipment Safety Certificate(FR)



Electrical Equipment Safety Certificate(TFR)



AWM 4648, 4649



UL PLTC PVC 105°C

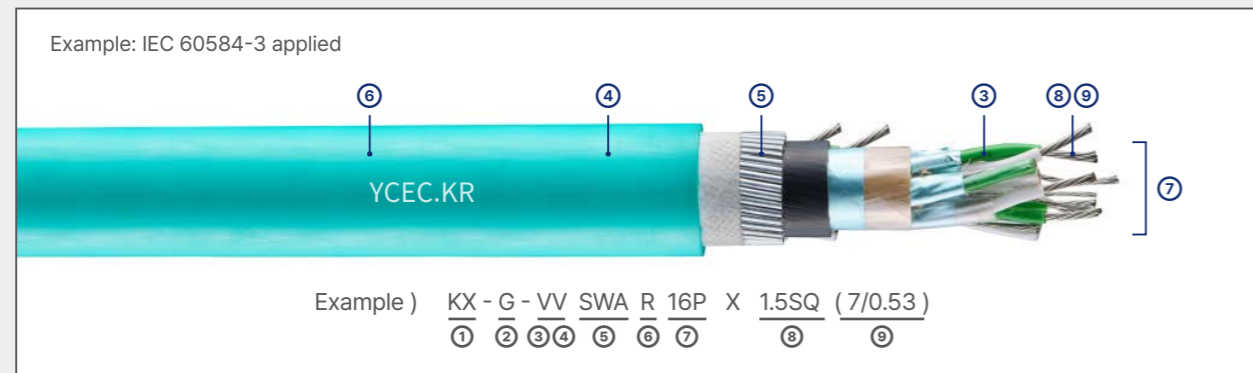


UL PLTC FEP 200°C

What is T/C Extension and Compensating wire?

A thermocouple is a self-powered device that are used to measure wide range of temperature. It consists of two different conductors that contact each other at one or more spots where temperature difference is experienced. Then, two conductors create voltage that are converted to temperature readings in the control box. Thermocouple utilizes 'extension wires' to measure temperature from its body to the control box, where the measurements are calculated. Since extension cables are made of the same exact material as thermocouples, they yield accurate reading results. However, extension wires are fairly expensive and new cables were invented to 'compensate' the cost; they are called 'compensating wires'. Compensating wires are made of materials that easily and quickly transfer temperatures. Copper, iron and constantan are main materials used to make compensating wire. Though there are some limitations on accuracy, the range of errors is definitely not that significant. Places (such as plants) that require very accurate temperature readings tend to use extension cable; while others look for compensating cables for cost efficiencies.

Symbols for T/C Extension & Compensating Wire



① Type of T/C Extension & Compensating cable

Extension : KX, EX, JX, TX, NX
 Compensation : BX, RX, SX, WX, VX

③④ The material of Insulation & Jacket

V : PVC
 HV : Heat-resistant PVC
 E(C) : Polyethylene (XLPE)
 F : Fluoropolymer (FEP,ETFE,PFA)
 K : Silicone Rubber
 G : Glass Fiber

⑥ Shape

F : Flat Type
 R : Round Type

⑧ Conductor Size

SQ : mm²

② Classification

G : General Standard
 GS : General High accuracy
 H : Heat resistant Standard
 HS : Heat resistant High accuracy

⑤ Shield / Armor

N : None
 S : Copper Tape
 SB : Tinned Copper Braid
 AMS : Aluminum Mylar Tape Shield
 SWA : Steel Wire Armor

⑦ Inner Configuration

P : Pair

⑨ Conductor Construction

Number of strands / dia.(mm)
 (Solid or stranded)

Limits of Error : Conforms to ASTM E230, IEC 60584 and ANSI MC 96.1

Color Code : Conforms to ASTM E230 and ANSI MC96.1 (International Color Codes Available)

Type and Color Code for Extension & Compensating Wire

① Type of Extension & Compensating cable

| Type | Symbol | Conductor Composition | | KS C 1609 | ISA(ANSI)-MC96.1 (ASTM E230) | IEC60584-3 |
|------|----------|--|------------------------------|-----------------------|------------------------------|--------------------------|
| | | Positive (+) | Negative (-) | | | |
| K | KX | Chromel | Alumel | Red + White Blue | Yellow + Red Yellow | Green + White Green |
| | WX (KCA) | Iron | Constantan | Red + White Blue | | Green + White Green |
| | VX (KCB) | Copper | Constantan | Red + White Blue | | Green + White Green |
| E | EX | Chromel | Constantan | Red + White Purple | Purple + Red Purple | Purple + White Purple |
| J | JX | Iron | Constantan | Red + White Yellow | White + Red Black | Black + White Black |
| T | TX | Copper | Constantan | Red + White Brown | Blue + Red Blue | Brown + White Brown |
| R | RX (RCB) | Copper | Copper Nickel Alloy | Red + White Black | Black + Red Green | Orange + White Orange |
| S | SX (SCB) | Copper | Copper Nickel Alloy | Red + White Black | Black + Red Green | Orange + White Orange |
| B | BX (BC) | Copper | Copper | Red + White Gray | Gray + Red Gray | Gray + White Gray |
| N | NX | Nickel Chromium Silicon (Ni-Cr-Si Alloy) | Nickel Silicon (Ni-Si Alloy) | | Orange + Red Orange | Pink + White Pink |
| C | CX (CC) | CPC | CNC | | Green + Red Red | |

*JIS C 1610 was replaced by IEC 60584-3 starting from 2014.

Characteristics Table

② Classification

| Code and Material of Thermocouple wire | Kinds and classes of thermocouple extension wire | | Temperature range of validity | | | | | | | |
|--|--|------------------------------|-------------------------------|---------------------|------------------------------|---|-----------------|---------------------|---------|------|
| | | | KS C 1609 | | ISA(ANSI)-MC96.1 (ASTM E230) | | IEC60584-3 | | | |
| | Symbols | Classification | Temp. Range(°C) | Limits of error(°C) | Temp. Range(°C) | Limits of error(°C) | Temp. Range(°C) | Limits of error(°C) | | |
| K Chromel Alumel | KX-G | General Standard | -20 ~ 150 | ±2.5 | 0 ~ 200 | ±2.2 | -25~200 | ±2.5 | | |
| | KX-GS | General High accuracy | | ±1.5 | | - | | ±1.5 | | |
| | KX-H | Heat resistant Standard | | ±2.5 | | ±2.2 | | ±2.5 | | |
| | KX-HS | Heat resistant High accuracy | | ±1.5 | | - | | ±1.5 | | |
| | WX-G | General Standard | -20~100 | ±3.0 | - | 0~150 | ±2.5 | | | |
| | WX-H | Heat resistant Standard | | - | - | - | | | | |
| | VX-G | General Standard | | ±2.5 | - | 0~100 | ±2.5 | | | |
| E Chromel Constantan | EX-G | General Standard | -20~150 | ±2.5 | 0 ~ 200 | ±1.7 | -25~200 | ±2.5 | | |
| | EX-H | Heat resistant Standard | | ±2.5 | | | | ±2.2 | ±2.5 | |
| J Iron Constantan | JX-G | General Standard | | ±2.0 | | | | ±1.0 | -25~100 | ±1.0 |
| | JX-H | Heat resistant Standard | | ±1.0 | | | | ±0.5 | | ±0.5 |
| T Copper Constantan | TX-G | General Standard | ±2.0 | ±1.0 | -25~100 | ±1.0 | | | | |
| | TX-GS | General High accuracy | ±1.0 | ±0.5 | | ±0.5 | | | | |
| | TX-H | Heat resistant Standard | ±2.0 | ±1.0 | | ±1.0 | | | | |
| | TX-HS | Heat resistant High accuracy | ±1.0 | ±0.5 | | ±0.5 | | | | |
| R Platinum- 13% Rhodium Platinum | RX-G | General Standard | 0~150 | +3 -7 | 0 ~ 200 | ±0.057mv (±5°C) | 0~200 | ±5.0 | | |
| | RX-H | Heat resistant Standard | | | | | 0~200 | ±5.0 | | |
| S Platinum- 10% Rhodium Platinum | SX-G | General Standard | 0~100 | - | 0~100 | ±0.000mv (0°C) ±0.033mv (-3.7°C) | 0~100 | ±3.5 | | |
| | SX-H | Heat resistant Standard | | | | | 0~100 | ±3.5 | | |
| B Platinum- 30% Rhodium Platinum- 6% Rhodium | BX-G | General Standard | 0~100 | - | 0~100 | ±0.000mv (0°C) ±0.033mv (-3.7°C) | 0~100 | ±3.5 | | |
| | | | | | | | | | | |
| N Nickel- 14% Chromium- 1.5% Silicon Nickel- 4.5% Silicon- 0.1% Magnesium | NX-G | General Standard | - | - | 0~200 | ±2.2 | 0~150 | ±2.5 | | |
| | NX-H | Heat resistant Standard | - | - | 0~200 | ±2.2 | 0~150 | ±2.5 | | |
| C Tungsten- 5% Rhenium Tungsten- 26% Rhenium | CX-G | General Standard | - | - | 0~200 | ±4.4 | - | - | | |
| | CX-H | Heat resistant Standard | - | - | 0~200 | ±4.4 | - | - | | |

IEC60584-3 : Tolerance Class 1 : ±1.5°C
Class 2 : ±2.5°C

Material of Insulation and Jacket

③④ The material of Insulation & Jacket

Insulation Materials for Various Compensating Wires

| | |
|------------------------|---|
| PVC | Widely used in general environments due to its cost-effectiveness and ease of installation, making it a suitable alternative to rubber materials. |
| PE / XLPE | Provides excellent electrical insulation, weather, chemical resistance; XLPE maintains stable performance even at high temperatures up to 90°C through cross-linking. |
| Glass Fiber | Known for excellent heat and chemical resistance, commonly used in high-temperature heating applications. |
| Silicone Rubber | Provides excellent flexibility, heat and chemical resistance, making it ideal for environments with temperature fluctuations, oils, or air exposure. |
| Fluoropolymer | Provides excellent heat, chemical, and electrical insulation performance, ensuring reliable use in high-voltage and high-temperature conditions. |
| PEEK | Maintains stable properties at temperatures up to around 260°C and offers excellent resistance to abrasion, chemicals, and radiation as a high-performance halogen-free material. |
| Polyimide (PI) | Withstands extreme temperatures above 300°C while offering excellent electrical insulation and chemical resistance, making it suitable for high-reliability applications. |

◎ Excellent ○ Good △ Normal X Weak

| Material of Insulation & Sheath | Symbols | Temperature Range(°C) | Insulation resistance (MΩ/Km) | Abrasion resistance | Heat resistance | Water proof | Chemical resistance | Oil proof |
|---------------------------------|---------|-----------------------|-------------------------------|---------------------|-----------------|-------------|---------------------|-----------|
| PVC | V | -10~70 | 500 | ○ | X | ◎ | △ | △ |
| HR-PVC | HV | -10~105 | 500 | ○ | △ | ◎ | △ | △ |
| PE | PE | -60~75 | 1,000 | ○ | △ | ◎ | ○ | △ |
| XLPE | C | -50~90 | 1,000 | ○ | ○ | ◎ | ○ | △ |
| Glass Fiber | G | 0~200 | 10 | △ | ◎ | X | ○ | △ |
| Silicone Rubber | K | -55~180 | 100 | ○ | ○ | ○ | ○ | X |
| FEP | F | -80~200 | 1,500 | ◎ | ○ | ◎ | ◎ | ◎ |
| ETFE | ETFE | -80~150 | 1,500 | ◎ | ○ | ◎ | ◎ | ◎ |
| PFA | PFA | -80~260 | 1,500 | ◎ | ○ | ◎ | ◎ | ◎ |
| PTFE | PTFE | -80~260 | 1,600 | ◎ | ○ | ◎ | ◎ | ◎ |
| PEEK | PEEK | -60~260 | 1,600 | ◎ | ○ | ◎ | ◎ | ◎ |
| Polyimide | PI | -40~300 | 1,700 | ◎ | ○ | ◎ | ◎ | ◎ |
| HG | HG | -30~400 | 5 | △ | ◎ | X | ○ | △ |
| SHG | SHG | -30~700 | 5 | △ | ◎ | X | ○ | △ |
| Silica | S | -30~1000 | 1,600 | △ | ◎ | X | ○ | △ |

Material of Insulation & Jacket

③④ The material of Insulation & Jacket

Temperature Range & Characteristic table

◎ Excellent ○ Good △ Normal X Weak

| Material of Insulation | Water proof | Oil proof | Chemical resistance | Insulation resistance | Cold resistance | Heat resistance |
|---------------------------|-------------|-----------|---------------------|-----------------------|-----------------|-----------------|
| Cold Resistant PVC | ○ | △ | △ | ○ | -20 | 50 |
| Polyethylene | ○ | △ | ○ | ◎ | -60 | 75 |
| General PVC | ○ | △ | △ | ○ | -10 | 70 |
| Heat resistant PVC | ○ | △ | △ | ○ | -10 | 105 |
| Natural Rubber | ○ | ○ | ○ | ○ | -40 | 60 |
| Urethane Rubber | ○ | ○ | ○ | ○ | -20 | 70 |
| Cross-linked Polyethylene | ○ | △ | ○ | ◎ | -50 | 90 |
| Silicone | ○ | △ | ○ | ○ | -55 | 180 |
| Nylon | ◎ | ◎ | ◎ | ○ | -40 | 120 |
| FEP | ◎ | ◎ | ◎ | ◎ | -80 | 200 |
| ETFE | ◎ | ◎ | ◎ | ◎ | -80 | 150 |
| PFA | ◎ | ◎ | ◎ | ◎ | -80 | 260 |
| PEEK | ◎ | ◎ | ◎ | ◎ | -60 | 260 |
| Polyimide | ◎ | ◎ | ◎ | ◎ | -40 | 300 |
| Glass Fiber | X | △ | ○ | - | | 200 |
| Silica | X | △ | ○ | - | -30 | 1000 |

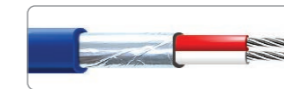
Other Options

⑤ Shield / Armor

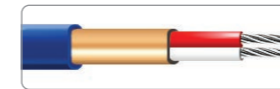
SB: Tinned Copper Braid



AMS: Aluminum Mylar Tape Shield



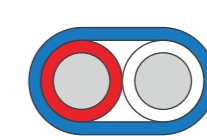
S: Copper Tape



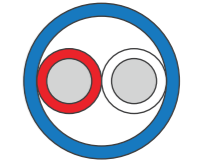
SWA: Steel Wire Armor



⑥ Shape



Flat(F)

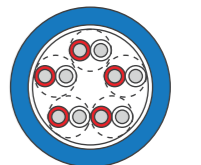


Round(R)

⑦ Inner Configuration

Thermocouple Extension & Compensating wire consists of a pair(s) which is composed of a Positive and a Negative.

| Pair | 1Pair | 2Pair | 8Pair | 10Pair | 30Pair |
|--------|-------|-------|-------|--------|--------|
| Symbol | 1P | 2P | 8P | 10P | 30P |



Multi - Pair

⑧⑨ Conductor Size & Construction

Compensating wires send tiny mV-level currents to measuring devices, so conductor size has little effect on the measurement. The below tables show typical conductor sizes for thermocouple Extension & Compensating wire.

| Sectional Area (mm ²) | Conductor Construction (No./mm) |
|-----------------------------------|---------------------------------|
| 0.5 | 7/0.30 |
| 0.75 | 7/0.37 |
| 1.0 | 7/0.43 |
| | 1/1.13 |
| 1.25 | 7/0.45 |
| 1.5 | 7/0.53 |
| | 1/1.38 |
| 2.0 | 7/0.60 |
| 2.5 | 7/0.67 |

| AWG | Conductor Construction (No./mm) |
|-----|---------------------------------|
| #24 | 7/0.203 |
| #22 | 7/0.254 |
| | 1/0.65 |
| #20 | 7/0.32 |
| | 1/0.81 |
| #18 | 7/0.386 |
| | 1/1.02 |
| #16 | 7/0.488 |
| | 1/1.29 |

INTRODUCTION-THERMOCOUPLE WIRE

Glass Fiber Braid Type | -GGF



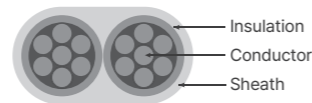
Materials & Construction

Conductor : Depends on Thermocouple Types
 Insulation : Glass Fiber Braid
 Sheath : Glass Fiber Braid

Applicable Standard KS C 1609/ ASTM E230/ IEC 60584-3

Operating Temperature 0~200°C

Cross-sectional View



Features

- Glass fiber braided insulation and sheath
- Excellent heat resistance maintains insulation performance in high-temperature environments
- Superior chemical resistance protects against common chemicals and contaminants
- Not waterproof — prolonged exposure to humidity may reduce insulation effectiveness

Applications

- Automation, control, and heat management in industrial equipment (plants, power stations, steelworks, petrochemical facilities)
- High-temperature applications such as blast furnaces, heating furnaces, and heat treatment processes
- Temperature monitoring of high-temperature components like boilers and turbines

Specification Table

| Product | Conductor | | | Thickness of Insulation (mm) | Thickness of Sheath (mm) | Overall Diameter (mm) | Insulation resistance (MΩ/km) | Weight (kg/300M) |
|------------|-----------------------------------|-----------------------|---------------|------------------------------|--------------------------|-----------------------|-------------------------------|------------------|
| | Sectional Area (mm ²) | Construction (No./mm) | Diameter (mm) | | | | | |
| (Type)X1-H | 2.0 | 7/0.6 | 1.8 | 0.32 | 0.35 | 3.14 X 5.58 | Min. 5 | 15 |
| (Type)X2-H | 1.25 | 7/0.45 | 1.35 | 0.32 | 0.35 | 2.69 X 4.68 | Min. 5 | 9 |
| (Type)X3-H | 0.5 | 7/0.3 | 0.9 | 0.32 | 0.35 | 2.24 X 3.78 | Min. 5 | 5.5 |

INTRODUCTION-THERMOCOUPLE WIRE

Glass Fiber Braid Type | -GGSBF



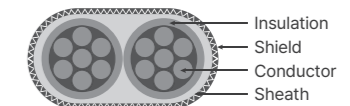
Materials & Construction

Conductor : Depends on Thermocouple Types
 Insulation : Glass Fiber Braid
 Sheath : Glass Fiber Braid
 Shield : Tinned Copper Braid

Applicable Standard KS C 1609/ ASTM E230/ IEC 60584-3

Operating Temperature 0~200°C

Cross-sectional View



Features

- Glass fiber braided insulation and sheath with a metallic shielding layer applied inside or outside
- Shielding reduces EMI, RFI, and electrostatic interference for stable temperature measurement
- Excellent heat resistance ensures insulation stability in high-temperature environments
- Superior chemical resistance protects against common chemicals and contaminants
- Not waterproof — prolonged humidity exposure may degrade insulation performance

Applications

- Automation, control, and heat management in industrial equipment (plants, power stations, steelworks, petrochemical facilities)
- Signal transmission in environments with strong electromagnetic interference (large motors, electric furnaces, generators, high-power equipment)
- High-temperature areas such as blast furnaces, heating furnaces, and heat treatment line
- Temperature monitoring of boilers, turbines, and other high-heat components

Specification Table

| Product | Conductor | | | Thickness of Insulation (mm) | Thickness of Sheath (mm) | Thickness of Shield (mm) | Overall Diameter (mm) | Insulation resistance (MΩ/km) | Weight (kg/300M) |
|-------------|-----------------------------------|-----------------------|---------------|------------------------------|--------------------------|--------------------------|-----------------------|-------------------------------|------------------|
| | Sectional Area (mm ²) | Construction (No./mm) | Diameter (mm) | | | | | | |
| (Type)X1-HS | 2.0 | 7/0.6 | 1.8 | 0.32 | 0.35 | 0.3 | 3.74 X 6.18 | Min. 5 | 20 |
| (Type)X2-HS | 1.25 | 7/0.45 | 1.35 | 0.32 | 0.35 | 0.3 | 3.29 X 5.28 | Min. 5 | 13.7 |
| (Type)X3-HS | 0.5 | 7/0.3 | 0.9 | 0.32 | 0.35 | 0.3 | 2.84 X 4.38 | Min. 5 | 9.3 |