

## Applications

- Machinery industry
- General industrial services, especially surfaces of blocks and other construction elements

## Features

- Single thermocouple
- Sensing element according to (PN-EN 60584-1):
  - Type K (NiCr-NiAl),
  - Type J (Fe-CuNi),
  - Type N (NiCrSi-NiSi),
  - Type E (NiCr-CuNi),
  - Type T (Cu-CuNi)
- Non-standard sensor versions available upon customer's request:
  - thermocouple cable perpendicular to copper plate

Thermocouples TTE421 are designed for assembling directly onto machine parts or other construction elements.

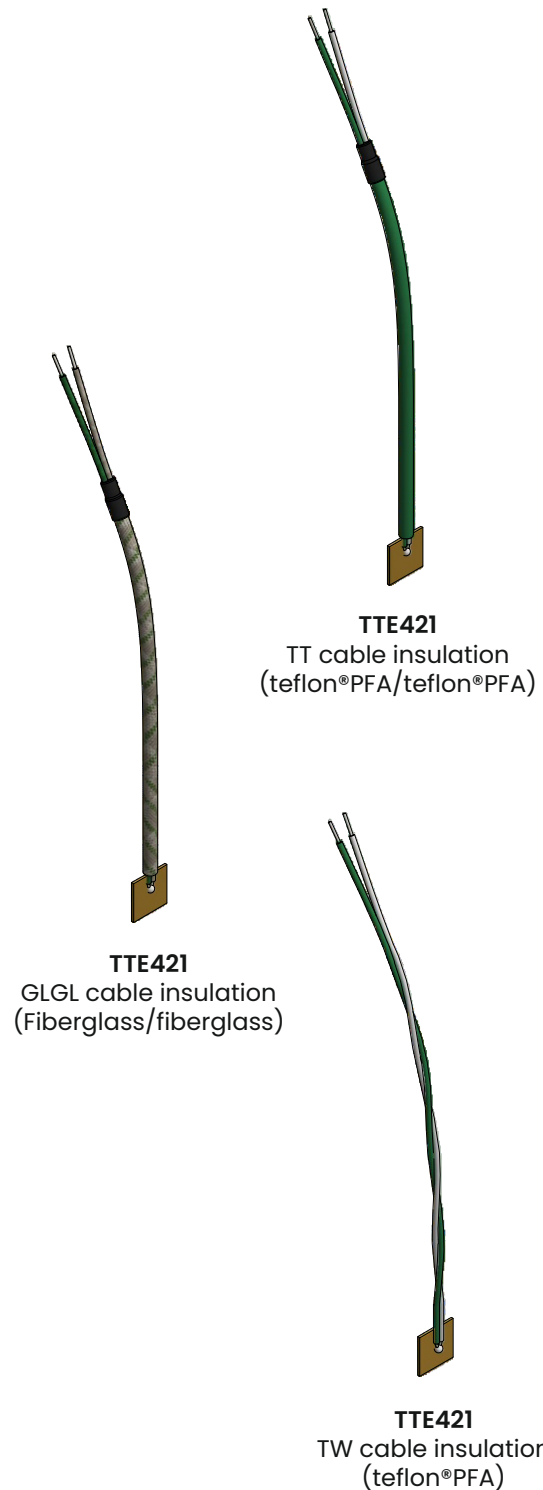
Copper plate allows to weld sensor to machine body or part.

The sensor consists of thermocouple cable and copper plate.

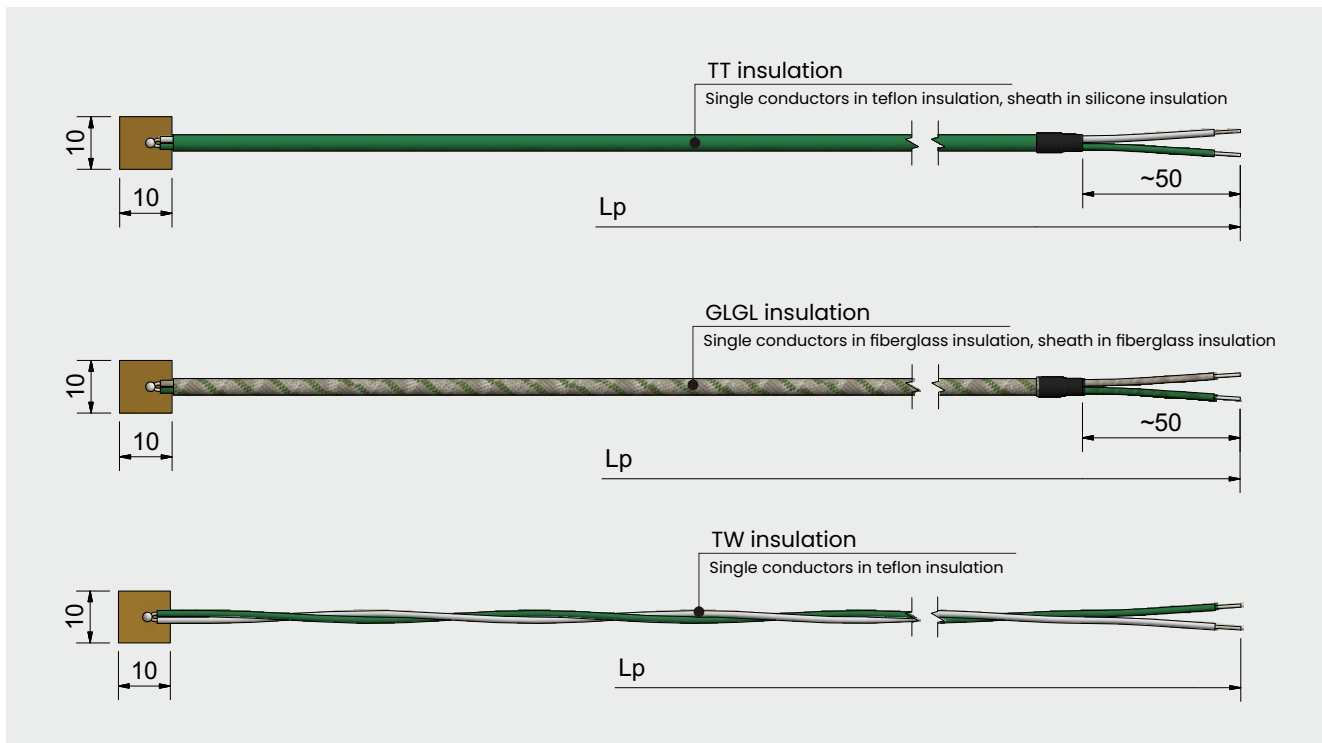
Thermocouple type, accuracy, cable length and insulation can be selected individually for the respective application.

## Temperature transmitter (Option)

There is possibility of using standard temperature transmitter (4÷20mA, 0÷10V) or temperature transmitter with HART®, Profibus® PA, Foundation Fieldbus communication protocol, mounted inside electrical control cabinet.



## Designs



## Basic values of thermocouples type J, K, N according to PN-EN 60584 / IEC 584

Temperature		°C	100	200	300	400	500	600
Nominal value	Type J	mV	5.27	10.78	16.33	21.85	27.39	33.10
	Type K	mV	4.10	8.14	12.21	16.40	20.64	24.91
	Type N	mV	2.77	5.91	9.34	12.97	16.75	20.61
Tolerance	Class 1	°C	±1.5	±1.5	±1.5	±1.6	±2.0	±2.4
	Class 2	°C	±2.5	±2.5	±2.5	±3.0	±3.7	±4.5

## Tolerance

The PN-EN 60584 Standard defines the formulas for calculating acceptable measure tolerance. More information available in the general thermocouple thermometer sheet.

### Type J (Fe-CuNi)

Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +750 °C	± 0.0040 x   t
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +750 °C	± 0.0075 x   t

### Type E (NiCr-CuNi)

Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +800 °C	± 0.0040 x   t
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +900 °C	± 0.0075 x   t

## Electrical parameters

Isolation resistance test dependings on cable insulation type

### Type K (NiCr-Ni), Type N (NiCrSi-NiSi)

Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +1000 °C	± 0.0040 x   t
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +1200 °C	± 0.0075 x   t

### Type T (Cu-CuNi)

Class	Temperature range	Tolerance
1	-40 °C .. +125 °C	± 0.5 °C
	+125 °C .. +350 °C	± 0.0040 x   t
2	-40 °C .. +133 °C	± 1.0 °C
	+133 °C .. +350 °C	± 0.0075 x   t

### Insulation types of connection cable

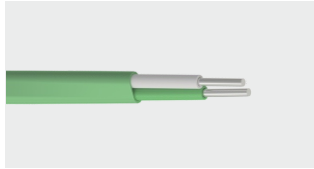
#### TW insulation (wire)

Conductor: Teflon® PFA



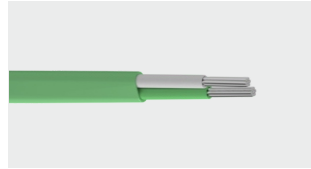
#### TT insulation (wire)

Conductor: Teflon® PFA  
Sheath: Teflon® PFA



#### TT insulation (stranded)

Conductor: Teflon® PFA  
Sheath: Teflon® PFA



#### GLGL insulation (wire)

Conductor: Fiberglass  
Sheath: Fiberglass



#### GHGH insulation (wire)

Conductor: Spec. Fiberglass  
Sheath: Spec. Fiberglass



#### GLP insulation (stranded)

Conductor: Fiberglass  
Sheath: Stainless steel braid



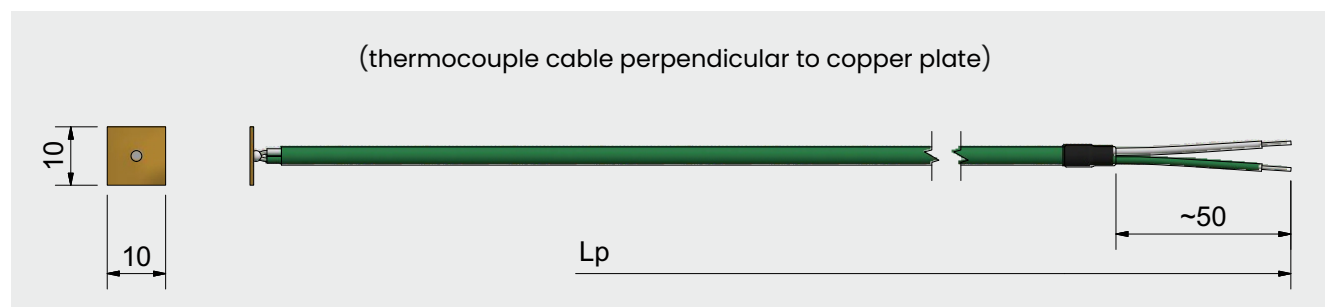
### Available measuring range

Measuring range	Insulation type	
-50 .. +260°C	TW, TT	teflon® PFA
-50 .. +400°C	GLGL, GLP	fiberglass
-50 .. +600°C	GHGH	spec. fiberglass

### Dimensions of thermocouples cables

Code	Cross section	Outer dimensions
TW	2 x 0.20 mm (wire)	Ø0.5 mm
TT	2 x 0.20 mm (wire)	0.6 x 1.0 mm
	2 x 0.22 mm <sup>2</sup> (stranded)	1.5 x 2.8 mm
GLGL	2 x 0.20 mm (wire)	0.9 x 1.4 mm
	2 x 0.50 mm (wire)	1.3 x 2.1 mm
GHGH	2 x 0.50 mm (wire)	1.5 x 2.4 mm
	2 x 1.00 mm (wire)	1.8 x 3.1 mm
GLP	2 x 0.22 mm <sup>2</sup> (stranded)	Ø2.6 mm

### Non-standard sensor versions



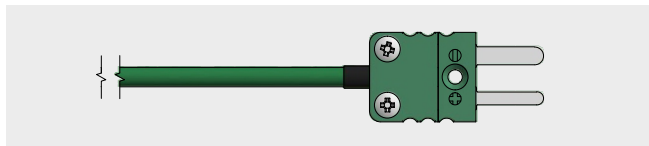
## Connectors (optional)

Sensors with connection cable can be equipped with connector.

Available options:

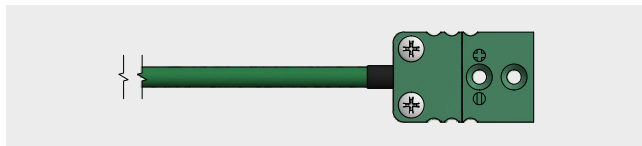
### Connector S-010-(thermocouple type)-W

Miniature plug, 2-pin.



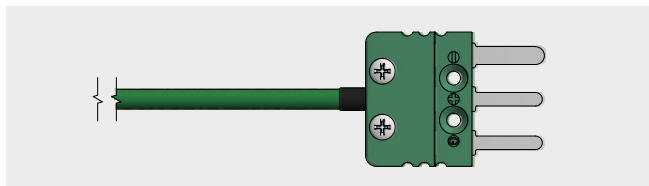
### Connector S-010-(thermocouple type)-G

Miniature socket, 2-pin.



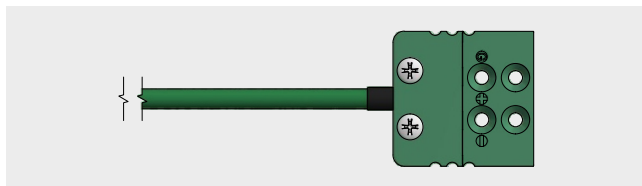
### Connector S-013-(thermocouple type)-W

Miniature plug, 3-pin.



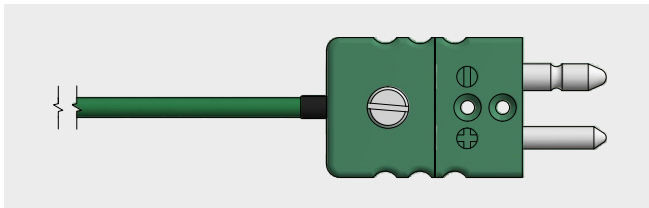
### Connector S-013-(thermocouple type)-G

Miniature socket, 3-pin.



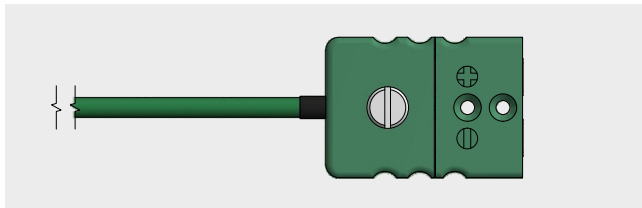
### Connector S-020-(thermocouple type)-W

Standard plug, 2-pin.



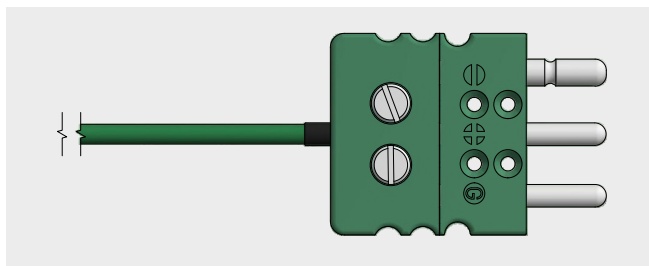
### Connector S-020-(thermocouple type)-G

Standard socket, 2-pin.



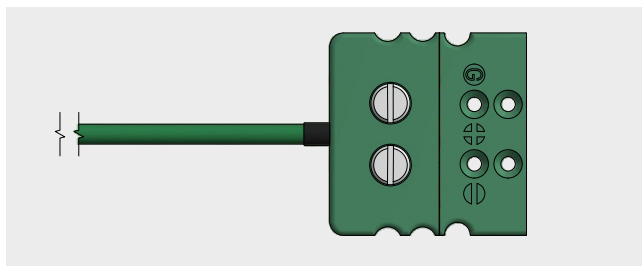
### Connector S-023-(thermocouple type)-W

Standard plug, 3-pin.



### Connector S-023-(thermocouple type)-G

Standard socket, 3-pin.



### Connector LEMO® FFA

Plug size from 0S to 3S. 2-, 3-, 4-, 6-pin.



### Connector LEMO® PCA

Plug size from 0S to 3S. 2-, 3-, 4-, 6-pin.



## Ordering code

TTE421 -  1 -  2 -  3 -  4 -  5 -  6

1	<input type="text"/>	<b>Thermocouple type</b>			
		J	Type J ( Fe-CuNi)		
		K	Type K ( NiCr-Ni)		
	xxx	other, please specify			
2	<input type="text"/>	<b>Cross section</b>			
		2x0.20	2 x 0.20 mm <i>wire</i>		
		2x0.50	2 x 0.50 mm <i>wire</i>		
		2x1.00	2 x 1.00 mm <i>wire</i>		
		2x0.22	2 x 0.22 mm <sup>2</sup> <i>stranded</i>		
	xxx	other, please specify			
3	<input type="text"/>	<b>Connecting cable length Lp</b>			
		1000	1000 mm		
		2500	2500 mm		
	xxx	other, please specify			
4	<input type="text"/>	<b>Tolerance class</b>			
		1	Class 1 according to PN-EN 60584-1		
	2	Class 2 according to PN-EN 60584-1			
5	<input type="text"/>	<b>Connecting cable type</b>		Temperature range of sensor	
		TW	Teflon® PFA	-50 .. +260°C	
		TT	Teflon® PFA / Teflon® PFA	-50 .. +260°C	
		GLGL	Włókno szklane / Włókno szklane	-50 .. +400°C	
		GLP	Fiberglass / Stainless steel	-50 .. +400°C	
		GHGH	Spec. fiberglass / Spec. fiberglass	-50 .. +600°C	
	xxx	other, please specify			
6	<input type="text"/>	<b>Connector (optional)</b>			
			without connector, free end conductors of connection cable		
		S-010-K-W	Miniature plug, 2-pin, type K		
		FFA.IS	Connector LEMO® FFA size IS		
	xxx	other, please specify			

## Example

TTE421-K-2x0.20-2000-GLGL

TC sensor type K, with copper plate, 2x0.20 mm cross section thermocouple wire cable, connection cable length Lp=2000 mm, tolerance class 1, single conductors in fiberglass insulation, sheath in fiberglass insulation.

TTE421-J-2x0.22-2500-2-TT-FFA.IS

TC sensor type J, with copper plate, 2x0.22 mm<sup>2</sup> cross section thermocouple stranded cable, connection cable length Lp=2500 mm, tolerance class 2, single conductors in teflon insulation, sheath in teflon insulation, connection cable equipped with LEMO® FFA plug size IS.