

## Application

- General industrial services
- Temperature measurement on flat surfaces

## Features

- Single or double 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)
- Versions with/without connector
- Cable from PVC, silicone, PFA or other materials

## Options

- Cable material according to customer's specification
- Customized tip of sensor
- Spring protection at cable relief
- ATEX, IECEx certification

## Description

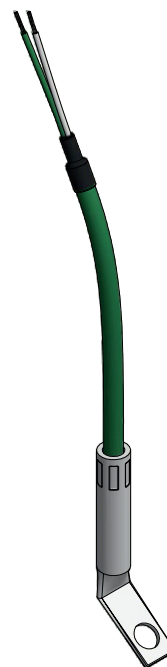
Thermocouples TTE416 are designed for assembling directly onto machine parts or other construction elements.

Assembly screw hole in protection tube allows to mount sensor with standard fasteners e.g. bolts and rivets. The sensor consists of thermocouple cable and protection tube made out of stainless steel.

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

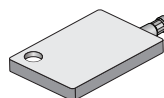
## Temperature transmitter (Option)

It is possible to use a temperature transmitter with signal output 4÷20mA or 0÷10V in the control cabinet. Transmitters with communication protocol HART®, Profibus® are also available. More details in "Temperature transmitters" section.

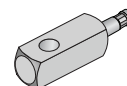


**TTE416**  
TSL cable insulation  
(teflon®/FEP/silicone)

### Optional versions



**TTE416F**  
Metal contact block



**TTE416R**  
Rectangular shape block

## ATEX, IECEx, EAC Ex versions

Intrinsically safe designs are available for applications in hazardous areas. These models are provided with certificate for „intrinsically safe“ type of protection according to Directive 2014/34/UE (ATEX), IECEx scheme and EAC Ex TR-CU 012/2011 (Eurasian Economic Union).

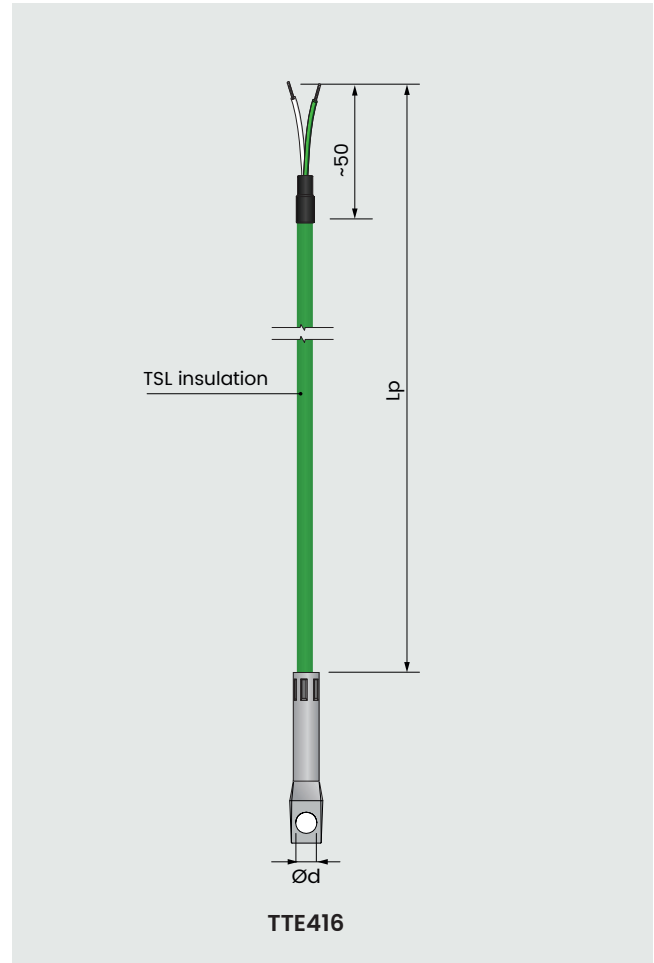
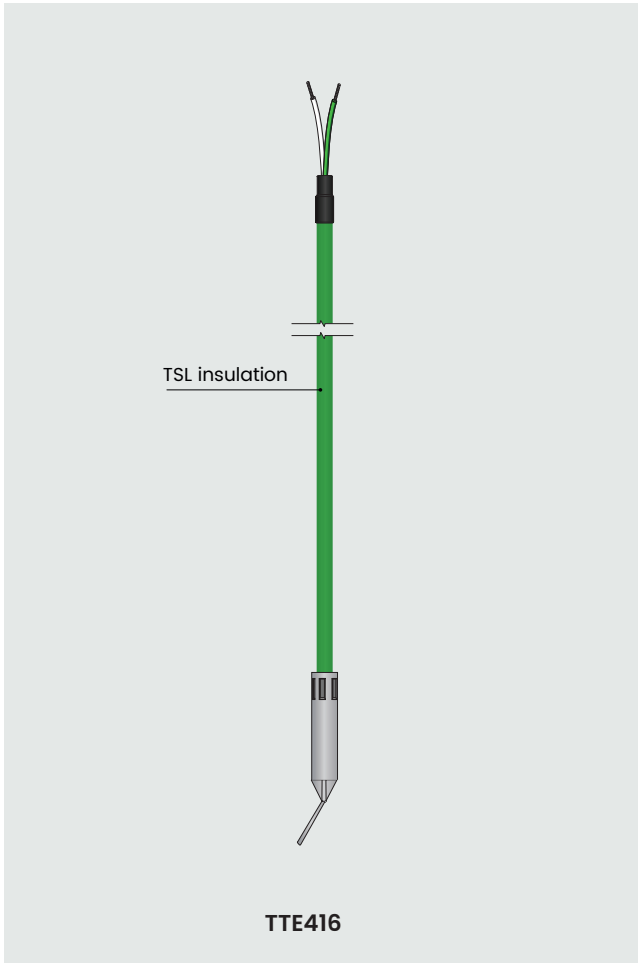
Intrinsically safe (Exi)

XI-TTE416

# CABLE THERMOCOUPLE

WITH ASSEMBLY SCREW HOLE, TYPE TTE416

## Construction



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

Temperature		°C	100	200	300	400
Basic value	Type J	mV	5.27	10.78	16.33	21.85
	Type K	mV	4.10	8.14	12.21	16.40
	Type N	mV	2.77	5.91	9.34	12.97
Tolerance	Class 1	°C	±1.5	±1.5	±1.5	±1.6
	Class 2	°C	±2.5	±2.5	±2.5	±3.0

## Tolerances

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

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

Tolerance Class	Temperature Range (°C)	Permissible error
1	-40°C ... +375°C	± 1.5°C
	+375°C ... +1000°C	± 0.0040 ×   t
2	-40°C ... +333°C	± 2.5°C
	+333°C ... +1200°C	± 0.0075 ×   t

### Type J ( Fe-CuNi )

Tolerance Class	Temperature Range (°C)	Permissible error
1	-40°C ... +375°C	± 1.5°C
	+375°C ... +750°C	± 0.0040 ×   t
2	-40°C ... +333°C	± 2.5°C
	+333°C ... +750°C	± 0.0075 ×   t

### Measuring ranges

Measuring range of the sensor depends on selected cable insulation material. Below table presents standard cable types .

Measuring range	Code	Insulation material
-10 .. +105°C	JJ	PVC
-40 .. +180°C	SLSL, TSL, TPSL	silicone
-40 .. +260°C	TT, TP, TCuT	teflon® PFA
-40 .. +400°C	GLGLP	fiberglass

### Electrical parameters

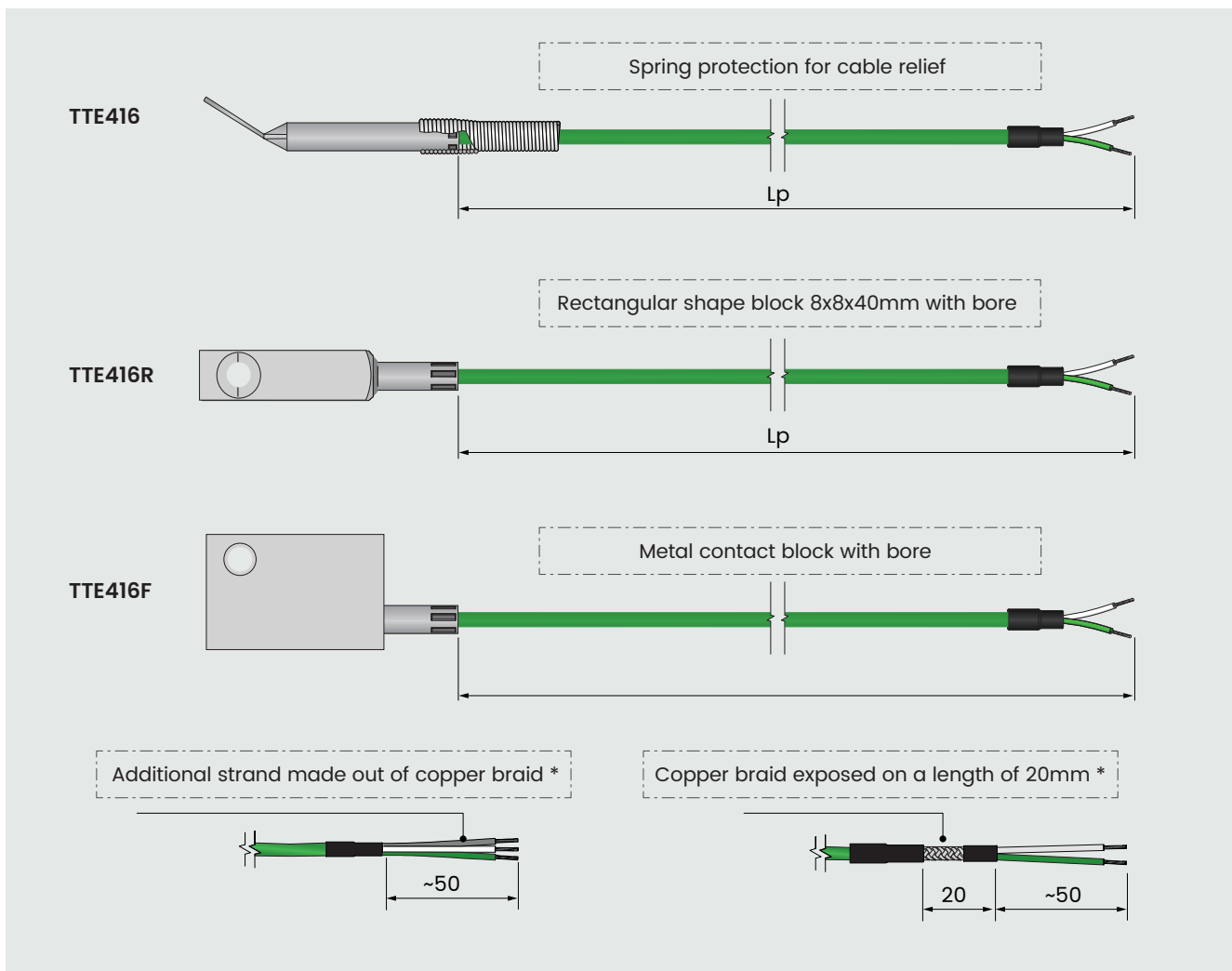
Isolation resistance >10 GΩ (test 500 VDC)

### Housing material

Stainless steel 1.4541 ( AISI321 )

### Non-standard sensor versions

This data sheet contains only a small portion of our program of supplying cable thermocouple. Other versions can be supplied upon customer's request. Below presented examples of customized versions.



\* Available only for TCuT and TPSL cable insulation

# CABLE THERMOCOUPLE

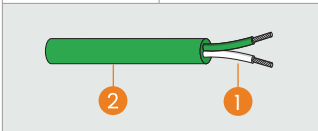
WITH ASSEMBLY SCREW HOLE, TYPE TTE416

## Insulation types of connection cable

### Type K (NiCr-Ni), color coding according to EN 60584-3

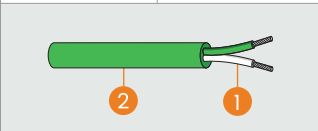
#### JJ insulation

① Conductor	PVC
② Sheath	PVC



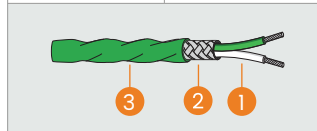
#### TSL insulation

① Conductor	Teflon® FEP
② Sheath	Silicone



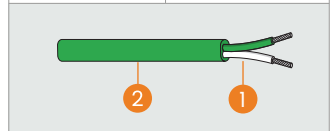
#### TCuT insulation

① Conductor	Teflon® FEP
② Screen	Copper braid
③ Sheath	Teflon® FEP



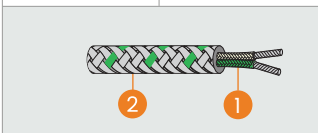
#### TT insulation

① Conductor	Teflon® PFA
② Sheath	Teflon® PFA



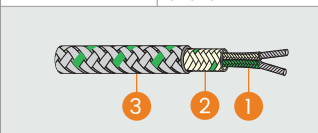
#### GLP insulation

① Conductor	Fiberglass
② Braid	Stainless steel braid



#### GLGLP insulation

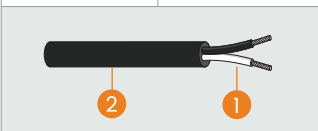
① Conductor	Fiberglass
② Sheath	Fiberglass
③ Braid	Stainless steel braid



### Type J (Fe-CuNi), color coding according to EN 60584-3

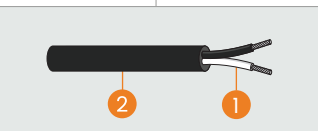
#### JJ insulation

① Conductor	PVC
② Sheath	PVC



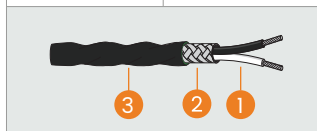
#### TSL insulation

① Conductor	Teflon® FEP
② Sheath	Silicone



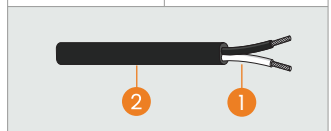
#### TCuT insulation

① Conductor	Teflon® FEP
② Screen	Copper braid
③ Sheath	Teflon® FEP



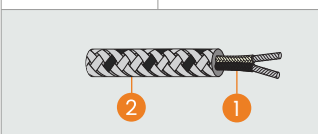
#### TT insulation

① Conductor	Teflon® PFA
② Sheath	Teflon® PFA



#### GLP insulation

① Conductor	Fiberglass
② Braid	Stainless steel braid



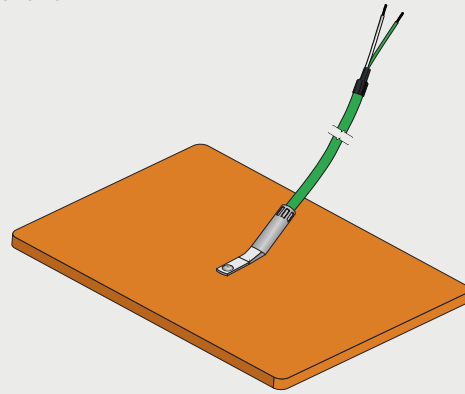
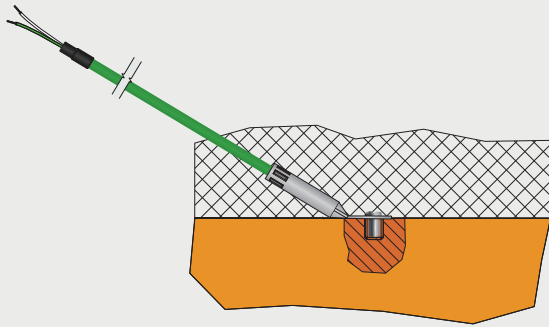
#### GLGLP insulation

① Conductor	Fiberglass
② Sheath	Fiberglass
③ Braid	Stainless steel braid

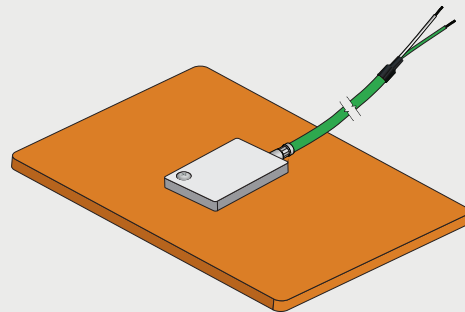
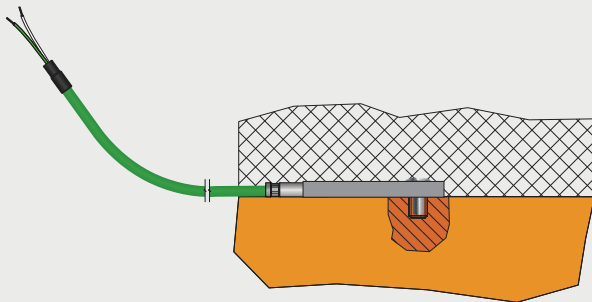


**Installation examples**

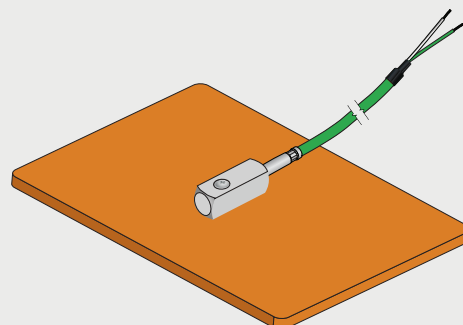
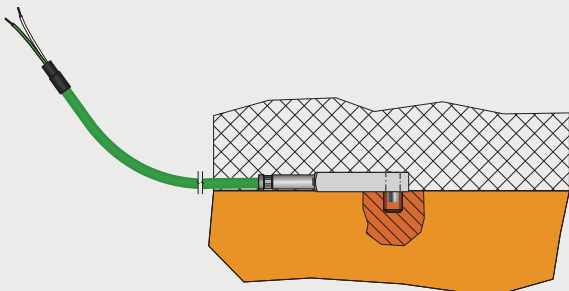
**TTE416**  
Solid installation



**TTE416F**  
Flat plate (metal contact block with bore)



**TTE416R**  
Rectangular shape block 8x8x40mm with bore



# CABLE THERMOCOUPLE

WITH ASSEMBLY SCREW HOLE, TYPE TTE416

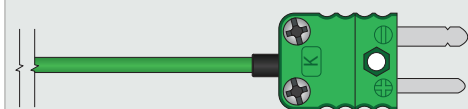
## Connectors (Optional)

Sensors with connection cable can be equipped with connector.

Available options:

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

Miniature plug, 2-pin.



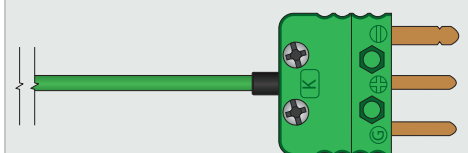
### Connector S-010-(thermocouple type)-G

Miniature socket, 2-pin.



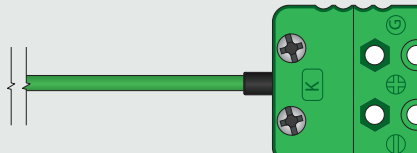
### Connector S-013-(thermocouple type)-W

Miniature plug, 3-pin.



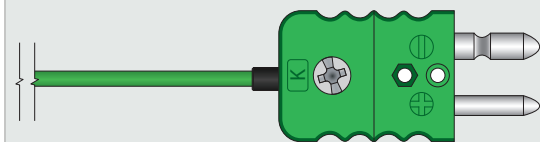
### Connector S-013-(thermocouple type)-G

Miniature socket, 3-pin.



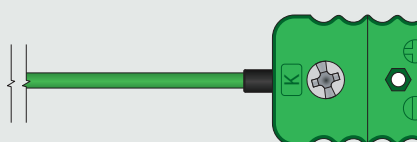
### Connector S-020-(thermocouple type)-W

Standard plug, 2-pin.



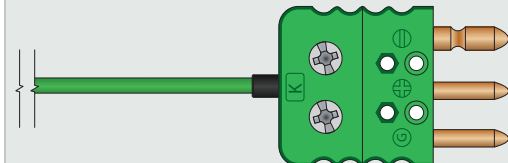
### Connector S-020-(thermocouple type)-G

Standard socket, 2-pin.



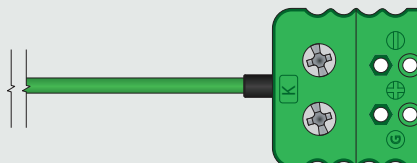
### Connector S-023-(thermocouple type)-W

Standard plug, 3-pin.



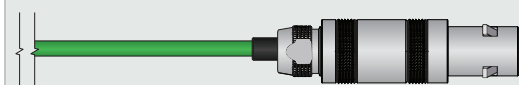
### Connector S-023-(thermocouple type)-G

Standard socket, 3-pin.



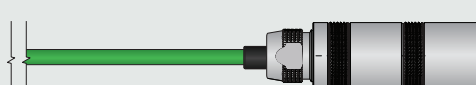
### Connector LEMO® FFA

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

TTE4  <sup>1</sup> -  <sup>2</sup> -  <sup>3</sup> -  <sup>4</sup> -  <sup>5</sup> -  <sup>6</sup> -  <sup>7</sup> -  <sup>8</sup>

Order	Parameter	Code	<input checked="checked" type="checkbox"/>	Description
1	Model type	16	<input type="checkbox"/>	Standard version
		16F	<input type="checkbox"/>	Flat plate (metal contact block with bore)
		16R	<input type="checkbox"/>	Rectangular shape block 8x8x40mm with bore
2	Type of sensing element	J	<input type="checkbox"/>	Type J ( Fe-CuNi)
		K	<input type="checkbox"/>	Type K ( NiCr-Ni)
3	Assembly screw hole diameter Ød	xxx	<input type="checkbox"/>	Other, please specify
		4.2	<input type="checkbox"/>	Ø4,2 mm
		6.2	<input type="checkbox"/>	Ø6,2 mm
		8.2	<input type="checkbox"/>	Ø8,2 mm
4	Connecting cable length Lp	xxx	<input type="checkbox"/>	Other, please specify
		1000	<input type="checkbox"/>	1000mm
		2500	<input type="checkbox"/>	2500mm
5	Tolerance class	1	<input type="checkbox"/>	Class 1 according to PN-EN 60584-1
		2	<input type="checkbox"/>	Class 2 according to PN-EN 60584-1
7	Connecting cable type	JJ	<input type="checkbox"/>	PVC / PVC -10 .. +105°C
		TSL	<input type="checkbox"/>	Teflon® FEP / Silicone -40 .. +180°C
		TT	<input type="checkbox"/>	Teflon® PFA / Teflon® PFA -40 .. +260°C
		TCuT	<input type="checkbox"/>	Teflon® PFA / Cu braid / Teflon® PFA -40 .. +205°C
		GLGLP	<input type="checkbox"/>	Fiberglass / Fiber glass / Stainless steel -40 .. +400°C
		<input type="checkbox"/>	without connector, free end conductors of connection cable	
8	Connector (optional)	S-010-K-W	<input type="checkbox"/>	Miniature plug, 2-pin, type K
		FFA.1S	<input type="checkbox"/>	Connector LEMO® FFA size 1S
		xxx	<input type="checkbox"/>	Other, please specify

### Example

#### TTE416-K-6.2-2000-1-TSL

TC sensor type K, assembly screw hole diameter Ø6,2 mm, connection cable length Lp=2000 mm, tolerance class 1, single conductors in teflon insulation, sheath in silicone insulation.

#### TTE416-J-4.2-2500-2-TT-FFA.1S

TC sensor type J, assembly screw hole diameter Ø4,2 mm, 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 1S.