

# For the plastics machinery industry Under the band thermocouple Model TC47-UB

WIKA data sheet TE 67.25

## Applications

- Plastics and rubber industry
- Pulp and paper industry
- Packaging
- Surface temperature detection

## Special features

- The sensor has a pre-determined shape for surface temperature detection
- The shim material can be modified in a specific shape, to be held in position
- The thin pad is constructed from stainless steel
- Interchangeable and easily replaceable
- Low profile in design



Under the band thermocouple, model TC47-UB

## Description

The TC47-UB under the band thermocouple is a general purpose temperature sensor designed to suit all applications where low profile, surface detection is required. An extensive range of elements and process connections can be individually selected for the appropriate application. The formable shim pad allows the sensor to be secured under any type of strapping device.

This surface temperature device can be modified to suit the desired shape.

The under the band thermocouple is a low profile design typically used on the nozzle extensions of the injection mould machines.

## Sensor

### Sensor type

- Type J (Fe-CuNi)
- Type L (Fe-CuNi)
- Type K (NiCr-Ni)
- Type T (CuNi)
- Others on request

### Number of sensors

- 2-wire single circuit
- 4-wire dual circuit

### Classification tolerance

- European Class 1 and 2 per DIN EN 60584-2  
DIN 43714 and DIN 43713: 1991  
International (IEC) DIN 43722: 1994  
JISC 1610: 1981  
NFC 4232  
BS 1843
- North American Class 1 and 2  
ISA standard and special per ANSI MC 96.1 - 1982

### Measuring point

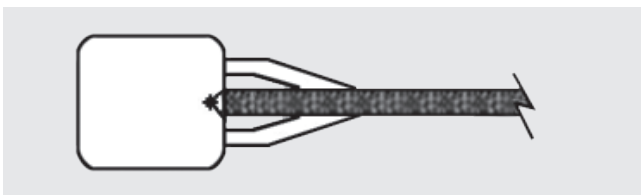
- Non isolated (grounded)

## Options

- Lead lengths are customer specified
- Calibration classifications are customer specified
- Tag identification (customer specific identification number)

## Sensor tip designs

Typically grounded junction.



## Basic values and limiting errors

A cold junction temperature of 0 °C is taken as the basis for the definition of the thermocouple's sensor limiting error.

Temperature (ITS 90) °C	Limiting error DIN EN 60584	
	Type J °C	Type K °C
0	± 2.5	± 2.5
200	± 2.5	± 2.5
400	± 3.0	± 3.0
600	± 4.5	± 4.5
800	not defined	± 6.0

### Types J, L DIN EN 60584, ANSI MC 96.1

Class	Temperature range	Limiting error
1	-40 ... +375 °C	± 1.5 °C
1	+375 ... +750 °C	± 0.0040 ·  t  <sup>1)</sup>
2	-40 ... +333 °C	± 2.5 °C
2	+333 ... +750 °C	± 0.0075 ·  t  <sup>1)</sup>

### Type K DIN EN 60584, ANSI MC 96.1

Class	Temperature range	Limiting error
1	-40 ... +375 °C	± 1.5 °C
1	+375 ... +750 °C	± 0.0040 ·  t  <sup>1)</sup>
2	-40 ... +333 °C	± 2.5 °C
2	+333 ... +750 °C	± 0.0075 ·  t  <sup>1)</sup>

### Type T DIN EN 60584, ANSI MC 96.1

Class	Temperature range	Limiting error
1	-40 ... +125 °C	± 0.5 °C
1	+125 ... +350 °C	± 0.0040 ·  t  <sup>1)</sup>
2	-40 ... +133 °C	± 1.0 °C
2	+133 ... +350 °C	± 0.0075 ·  t  <sup>1)</sup>

1) |t| is the value of the temperature in °C without consideration of the sign.

## Sheath material

- Stainless steel
- Others on request

## Lead wire

A variety of insulating materials are available to adapt to different prevailing process conditions.

The lead wire termination end can be supplied ready for connection or fitted with a plug as an option.

- Thermocouple, fit to process connection
- Lead extension cross section: min. 0.22 mm<sup>2</sup> (24 awg)
- Insulation material: fibreglass, Kapton, PTFE or PVC
- Other options available

## Operating temperatures

The following temperatures limits apply to the conventional connecting lead wire.

- Fibreglass -50 ... +482 °C
- Kapton -25 ... +260 °C
- PTFE -50 ... +260 °C
- PVC -20 ... +105 °C

### Kapton / Kapton

500 °F (260 °C)  
Polyimide tape insulation for improved electrical properties and high temperature applications.



500 °F (260 °C)  
Polyimide tape jacket for excellent abrasion and cut through properties and very high resistance to moisture and chemicals.

### Fibreglass / Fibreglass

900 °F (482 °C)  
Wrapped fibreglass insulation for improved moisture and abrasion resistance at high temperatures.



900 °F (482 °C)  
Braided fibreglass for additional flexibility and abrasion resistance at high temperatures.

### PVC / PVC

221 °F (105 °C)  
PVC insulation for economy, durability and mechanical strength



221 °F (105 °C)  
PVC jacket for economy, durability and mechanical strength. It is also tough and resistant to flame, abrasion and moisture.

### PTFE / PTFE

500 °F (260 °C)  
PFA insulation for improved electrical properties and high temperature applications.



500 °F (260 °C)  
PFA jacket for chemical inertness to solvents, acids and oils.

## Process connections

The under the band thermocouple is held in place typically by the heater band or hose clamp.

## Lead wire coverings

### ■ Stainless steel overbraid (no tracer)

Stainless steel overbraid is by far the most common of the overbraids and is available on almost all thermocouples and extension duplex wire constructions. While highly resistant to corrosion, stainless steel is able to maintain a continuous operating temperature of 1400 °F (760 °C).



### ■ Stainless steel overbraid (with tracer)

Resembles stainless steel with a colour coded fibre tracer identifying the calibration type with minimum braid coverage of 85 %.



### ■ Tinned copper overbraid

Although similar in some characteristics to stainless steel, is a more economical alternative. This product offers an improved feature of shielding against static noise (if it is properly insulated and grounded) with a continuous operating temperature of 400 °F (204 °C).



## Plug (option)

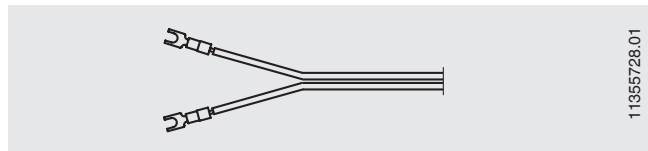
TC47-UB thermocouple can be supplied with plugs attached to the conductors.

The maximum permissible temperature at the plug is 85 °C.

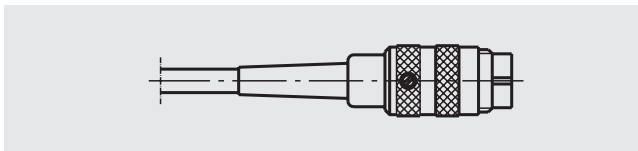
The following options are available:

### ■ Spade lugs

(not suitable for versions with bare connecting wires)

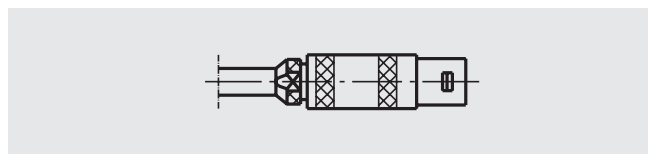


### ■ Screw-in-plug, Binder (male)

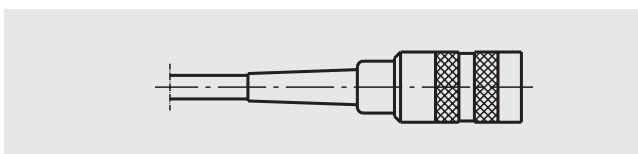


### ■ Lemosia plug size 1 S (male)

### ■ Lemosia plug size 2 S (male)

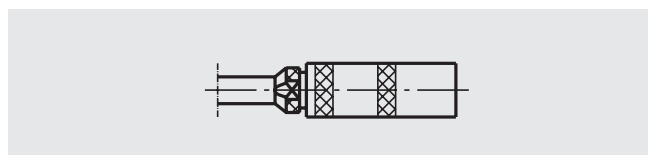


### ■ Screw-in-plug, Binder (female)



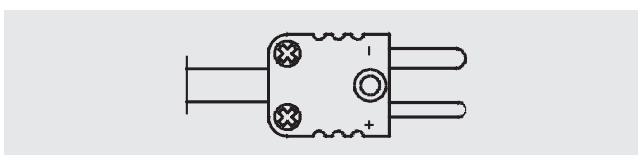
### ■ Lemosia plug size 1 S (female)

### ■ Lemosia plug size 2 S (female)



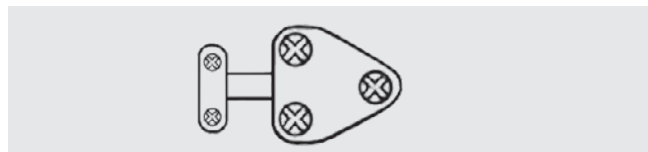
### ■ Standard thermo plug 2-pin (male)

### ■ Miniature thermo plug 2-pin (male)



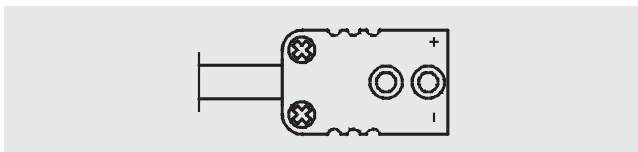
### ■ Standard cable clamp (option with thermo plug)

### ■ Miniature cable clamp (option with thermo plug)



### ■ Standard thermo plug 2-pin (female)

### ■ Miniature thermo plug 2-pin (female)



# Electrical connection

	Cable 3171966.01	Lemosa plug, (male) on cable 3374896.01	Binder plug (series 680), (male) on cable (screw-in-plug) 3374900.02
	Colour codes of the wire ends see table below		
Single thermocouple			
Dual thermocouple			
Thermo plug		Positive and negative terminal are marked. Two thermo connectors are used with dual thermocouples.	

Other connector plugs and pin assignments on request.

## Thermocouple and extension wire colour codes

National Standard	ANSI MC 96.1 T/C Grade	ANSI MC 96.1 Extension Grade	BS 1843	DIN 43714	ISC1610-198	NF C42-323	IEC 584-3 T/C Grade	IEC 584-3 Intrinsically Safe
N				No Standard Use ANSI Colour Codes	No Standard Use ANSI Colour Codes	No Standard Use ANSI Colour Codes		
J								
K								
E								
T								
R	None Established							
S	None Established							
B	None Established		No Standard Use Copper Wire			No Standard Use Copper Wire		

## Thermocouple tolerances (cold junction temperature at 0 °C)

IEC tolerance values per EN 60584-2				
Thermocouple type		Tolerance class 1	Tolerance class 2	Tolerance class 3
T	Temperature range	-40 ... +125 °C	-40 ... +133 °C	-67 ... +40 °C
	Tolerance value	±0.5 °C	±1.0 °C	±1.0 °C
	Temperature range	+125 ... +350 °C	+133 ... +350 °C	-200 ... -67 °C
	Tolerance value	±0.004 ltl	±0.0075 ltl	±0.015 ltl
J	Temperature range	-40 ... +375 °C	-40 ... +333 °C	-
	Tolerance value	±1.5 °C	±2.5 °C	-
	Temperature range	+375 ... +750 °C	+333 ... +750 °C	-
	Tolerance value	±0.004 ltl	±0.0075 ltl	-
E	Temperature range	-40 ... +375 °C	-40 ... +333 °C	-167 ... +40 °C
	Tolerance value	±1.5 °C	±2.5 °C	±2.5 °C
	Temperature range	+375 ... +800 °C	+333 ... +900 °C	-200 ... -167 °C
	Tolerance value	±0.004 ltl	±0.0075 ltl	±0.015 ltl
K or N	Temperature range	-40 ... +375 °C	+40 ... +333 °C	-167 ... +40 °C
	Tolerance value	±1.5 °C	±2.5 °C	±2.5 °C
	Temperature range	+375 ... +1000 °C	+333 ... +1200 °C	-200 ... -167 °C
	Tolerance value	±0.004 ltl	±0.0075 ltl	±0.015 ltl
R or S	Temperature range	0 ... +1100 °C	0 ... +600 °C	-
	Tolerance value	±1.0 °C	±1.5 °C	-
	Temperature range	+1100 ... +1600 °C	+600 ... +1600 °C	-
	Tolerance value	±[1 + 0.003 (t-1100)]	±0.0025 ltl	-
B	Temperature range	-	-	+600 ... +800 °C
	Tolerance value	-	-	+4.0 °C
	Temperature range	-	+600 ... +1700 °C	+800 ... +1700 °C
	Tolerance value	-	±0.0025 ltl	+0.005 ltl

ASTM tolerance values (ASTM E230)					
Thermocouple type		Standard limits (whichever value is greater)		Special limits (whichever value is greater)	
T	Temperature range	0 ... +370 °C	+32 ... +700 °F	0 ... +370 °C	+32 ... +700 °F
	Tolerance value	±1 °C or ±0.75 %	±1.8 °F or ±0.75 %	±0.5 °C or 0.4 %	±0.9 °F or 0.4 %
	Temperature range	-200 ... 0 °C	-328 ... 32 °F	-	-
	Tolerance value	±1.0 °C or ±1.5 %	±1.8 °F or ±1.5 %	-	-
J	Temperature range	0 ... +760 °C	+32 ... +1400 °F	0 ... +760 °C	+32 ... +1400 °F
	Tolerance value	±2.2 °C or ±0.75 %	±4.0 °F or ±0.75 %	±1.1 °C or 0.4 %	±2.0 °F or 0.4 %
E	Temperature range	0 ... +870 °C	+32 ... +1600 °F	0 ... +870 °C	+32 ... +1600 °F
	Tolerance value	±1.7 °C or ±0.5 %	±3.1 °F or ±0.5 %	±1.0 °C or ±0.4 %	±1.8 °F or ±0.4 %
	Temperature range	-200 ... 0 °C	-328 ... 32 °F	-	-
	Tolerance value	±1.7 °C or ±1.0 %	±3.1 °F or ±1.0 %	-	-
K	Temperature range	0 ... +1260 °C	+32 ... +2300 °F	0 ... +1260 °C	+32 ... +2300 °F
	Tolerance value	±2.2 °C or ±0.75 %	±4.0 °F or ±0.75 %	±1.1 °C or ±0.4 %	±2.0 °F or ±0.4 %
	Temperature range	-200 ... 0 °C	-328 ... +32 °F	-	-
	Tolerance value	±2.2 °C or ±2.0 %	±4.0 °F or ±2.0 %	-	-
N	Temperature range	0 ... +1260 °C	+32 ... +2300 °F	0 ... +1260 °C	+32 ... +2300 °F
	Tolerance value	±2.2 °C or ±0.75 %	±4.0 °F or ±0.75 %	±1.1 °C or ±0.4 %	±2.0 °F or ±0.4 %
R or S	Temperature range	0 ... +1480 °C	+32 ... +2700 °F	0 ... +1480 °C	+32 ... +2700 °F
	Tolerance value	±1.5 °C or ±0.25 %	±2.7 °F or ±0.25 %	±0.6 °C or ±0.1 %	±1.1 °F or ±0.1 %
B	Temperature range	+870 ... +1700 °C	+1600 ... +3100 °F	+870 ... +1700 °C	+1600 ... +3100 °F
	Tolerance value	±0.5 %	±0.5 %	±0.25 %	±0.25 %

## Ordering information

The under the band thermocouple is secured in place by clamping the shim tab under any device (heater band or clamp). This sensor style is surface mounted and can be modified to suit the specific application as required. Under the band thermocouple is a low profile sensor that is used in applications where spacing is critical.

When ordering choose from each category.

### Under the band

- Stainless steel

### Junction

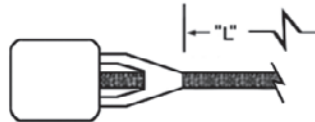
- Grounded (unisolated)

### Shim tab size

- 3/4" x 3/4" (0.020" thickness) (19 x 19 mm)

### Lead length

- 500 mm
- 1000 mm
- 1500 mm
- 2000 mm
- 2500 mm
- Others on request



### Lead wire

- Fibreglass / fibreglass
- PTFE / PTFE
- PVC / PVC
- Kapton / Kapton
- Others on request

### Lead wire covering

- None
- Stainless steel overbraid (no tracer)
- Stainless steel overbraid (with tracer)
- Tin copper overbraid

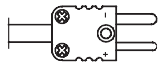


### Termination at lead end

- Bare ends



- Standard thermo plug 2-pin (male)



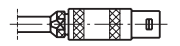
- Miniature thermo plug 2-pin (male)

- Standard plug with cable clamp (male)



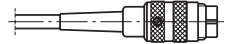
- Miniature plug with cable clamp (male)

- Lemoso plug size 1S (male)



- Lemoso plug size 2S (male)

- Screw-in plug, Binder (male)



- Others on request

### Calibration type

- J ANSI MC96.1 red ⊖ white ⊕
- K ANSI MC96.1 red ⊖ yellow ⊕
- T ANSI MC96.1 red ⊖ blue ⊕
- J IEC 584-3 white ⊖ black ⊕
- K IEC 584-3 white ⊖ green ⊕
- T IEC 584-3 white ⊖ brown ⊕
- J DIN 43714 blue ⊖ red ⊕
- K DIN 43714 green ⊖ red ⊕
- T DIN 43714 brown ⊖ red ⊕
- Others on request

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