# MACX MCR-EX-TC-I - Temperature measuring transducer

1050233

https://www.phoenixcontact.com/us/products/1050233

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Ex i temperature transducer: converts signals from thermocouples installed in Ex areas and mV sources and transmits a 0/4…20 mA signal to a load in the safe area. Freely programmable. 3-way isolation, screw connection, SIL.

## Your advantages

- Input for thermocouples and mV sources
- Power supply possible via DIN rail connector
- Programming during operation with Ex measuring circuit connected and also voltage-free using IFS-USB-PROG-ADAPTER programming adapter
- Installation in zone 2, protection type "ec" (EN 60079-7) permitted
- 3-way electrical isolation
- Status indicator for supply voltage, cable, sensor, and module errors
- Configuration via software (FDT/DTM): sensor type, connection technology, measuring range, measuring unit, filter, alarm signal, and output range
- Output: 0 mA ... 20 mA or 4 mA ... 20 mA

## Commercial data

| | |
|---|---|
| Item number | 1050233 |
| Packing unit | 1 pc |
| Minimum order quantity | 1 pc |
| Sales key | C430 |
| Product key | DK1215 |
| GTIN | 4055626663463 |
| Weight per piece (including packing) | 174.1 g |
| Weight per piece (excluding packing) | 150 g |
| Customs tariff number | 85437090 |
| Country of origin | DE |

# Technical data

## Notes

Utilization restriction

| | |
|---|---|
| EMC note | EMC: class A product, see manufacturer's declaration in the download area |

## Product properties

| | |
|---|---|
| Product type | Temperature transmitter |
| Product family | MACX Analog |
| Application | Temperature |
| No. of channels | 1 |
| Configuration | Software |

## System properties

Functionality

| | |
|---|---|
| Configuration | Software |

## Electrical properties

| | |
|---|---|
| Electrical isolation | 3-way isolation |
| Electrical isolation between input and output | yes |
| Cold point error, max. | ± 2 K |
| Step response (0–99%) | ≤ 1.7 s |
| Temperature coefficient, typical | 0.01 %/K |
| Transmission error, typical | 0.1 % (For full identification of transmission errors, see the data sheet) |

Electrical isolation

| | |
|---|---|
| Test voltage | 2.5 kV AC (50 Hz, 60 s) |
| Overvoltage category | II |
| Pollution degree | 2 |

Electrical isolation Input/output/power supply IEC/EN 61010-1

| | |
|---|---|
| Standards/regulations | IEC/EN 61010-1 |
| Rated insulation voltage | 300 $V_{rms}$ |
| Insulation | Safe isolation |

Electrical isolation Input/output IEC/EN 60079-11

| | |
|---|---|
| Standards/regulations | IEC/EN 60079-11 |
| Rated insulation voltage | 375 $V_{PP}$ |

Electrical isolation Input/power supply IEC/EN 60079-11

| | |
|---|---|
| Standards/regulations | IEC/EN 60079-11 |
| Rated insulation voltage | 375 $V_{PP}$ |

Supply

| | |
|---|---|
| Nominal supply voltage | 24 V DC -20 % ... +25 % |
| Supply voltage range | 19.2 V DC ... 30 V DC |
| Max. current consumption | < 40 mA (24 V DC) |
| Power dissipation | ≤ 0.76 W |
| Power consumption | ≤ 1 W |

## Input data

Signal

| | |
|---|---|
| Number of inputs | 1 |
| Input signal | Temperature |
| | Voltage |

Measurement

| | |
|---|---|
| Description of the input | intrinsically safe |
| Sensor types that can be used (TC) | B, E, J, K, N, R, S, T, L, U, C, D, A-1, A-2, A-3, M, Lr |
| Temperature measuring range | -250 °C ... 2500 °C (Range depending on the sensor type) |
| Temperature measuring range: Thermoelement Typ B | 500 °C ... 1820 °C |
| Temperature measuring range: Thermoelement Typ E | -230 °C ... 1000 °C |
| Temperature measuring range: Thermoelement Typ J | -210 °C ... 1200 °C |
| Temperature measuring range: Thermoelement Typ K | -250 °C ... 1372 °C |
| Temperature measuring range: Thermoelement Typ N | -200 °C ... 1300 °C |
| Temperature measuring range: Thermoelement Typ R | -50 °C ... 1768 °C |
| Temperature measuring range: Thermoelement Typ S | -50 °C ... 1768 °C |
| Temperature measuring range: Thermoelement Typ T | -200 °C ... 400 °C |
| Temperature measuring range: Thermoelement Typ L | -200 °C ... 900 °C |
| Temperature measuring range: Thermoelement Typ U | -200 °C ... 600 °C |
| Temperature measuring range: Thermoelement Typ C | 0 °C ... 2315 °C |
| Temperature measuring range: Thermoelement Typ D | 0 °C ... 2315 °C |
| Temperature measuring range: Thermoelement Typ A1 GOST | 0 °C ... 2500 °C |
| Temperature measuring range: Thermoelement Typ A2 GOST | 0 °C ... 1800 °C |
| Temperature measuring range: Thermoelement Typ A3 GOST | 0 °C ... 1800 °C |
| Temperature measuring range: Thermoelement Typ M GOST | -200 °C ... 100 °C |
| Temperature measuring range: Thermoelement Typ L GOST | -200 °C ... 800 °C |
| Linear mV signal range | -1000 mV ... 1000 mV |
| Temperature measuring range | Min. 50 K with thermocouple, 10% of the nominal span of the respective range with mV sources |

## Output data

Signal: Current

| | |
|---|---|
| Number of outputs | 1 |
| Configurable/programmable | Yes |
| Current output signal | 0 mA ... 20 mA |

| | |
|---|---|
| | 4 mA ... 20 mA (SIL) |
| Load/output load current output | ≤ 600 Ω |
| Output ripple (current) | < 15 $\mu A_{PP}$ |
| | < 10 $\mu A_{rms}$ |
| Behavior in the event of a sensor error | Freely definable |

## Connection data

| | |
|---|---|
| Connection method | Screw connection |
| Stripping length | 7 mm |
| Screw thread | M3 |
| Conductor cross-section rigid | 0.2 mm² ... 2.5 mm² |
| Conductor cross-section flexible | 0.2 mm² ... 2.5 mm² |
| Conductor cross-section AWG | 24 ... 14 |
| Tightening torque | 0.5 Nm ... 0.6 Nm |

Test socket

| | |
|---|---|
| Max. diameter | 2 mm |

## Ex data

| | |
|---|---|
| Ex installation (EPL) | Gc |
| | Div. 2 |
| Ex i circuits (EPL) | Ga |
| | Da |
| | Ma |
| | Div. 1 |

Safety data: Terminals: 4.1, 4.2, 5.1, 5.2

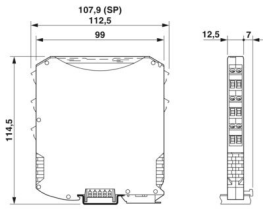
| | |
|---|---|
| Max. internal capacitance $C_i$ | 44 nF |
| Max. output voltage $U_o$ | 6 V |
| Max. output current $I_o$ | 4.3 mA (mV) |
| | 7.1 mA (TC with internal cold junction compensation) |
| | 16.8 mA (TC with external cold junction, TC and cold junction connected) |
| Max. output power $P_o$ | 25.2 mW (Linear) |
| Safety-related maximum voltage $U_m$ | 253 V AC |
| | 125 V DC |
| | 30 V DC (Zone 2: 3.1, 3.2) |
| IIA/I (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 850 mH / 1000 µF |
| IIB/IIIC (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 460 mH / 1000 µF |
| IIC (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 100 mH / 40 µF |
| IIB/IIA (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 100 mH / 950 nF |
| IIIC/I (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 100 mH / 950 nF |

| | |
|---|---|
| IIC (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 100 mH / 555 nF |

## Signaling

| | |
|---|---|
| Status display | Green LED (supply voltage) |
| | Red LED, flashing 2.8 Hz (cable error, sensor error on input or output, ERR) |
| | Red LED, flashing 1.2 Hz (simulation mode, ERR) |
| | Red LED, permanently on (module error, ERR) |

## Dimensions

| | |
|---|---|
| Dimensional drawing |  |
| Width | 12.5 mm |
| Height | 112.5 mm |
| Depth | 113.7 mm |
| Depth NS 35/7,5 | 114.5 mm (Snapped onto DIN rail NS 35/7,5 in accordance with EN 60715) |

## Material specifications

| | |
|---|---|
| Color | gray (RAL 7042) |
| Flammability rating according to UL 94 (Housing) | V0 (Housing) |
| Housing material | PA 6.6-FR |

## Environmental and real-life conditions

### Ambient conditions

| | |
|---|---|
| Degree of protection | IP20 |
| Ambient temperature (operation) | -40 °C ... 70 °C (Any mounting position) |
| Ambient temperature (storage/transport) | -40 °C ... 80 °C |
| Permissible humidity (operation) | 5 % ... 95 % (non-condensing) |

### Altitude range (≤ 2000 m)

| | |
|---|---|
| Altitude | ≤ 2000 m (The technical data refers to altitudes ≤2000 m above mean sea level. For altitudes >2000 m above mean sea level, refer to the data sheet.) |
| Ambient temperature (operation) | -40 °C ... 70 °C |
| Test voltage | 2.5 kV |
| Rated insulation voltage | 300 $V_{rms}$ (IEC/EN 60079-11) |
| | 375 $V_{PP}$ (IEC/EN 60079-11) |

### Altitude range (≤ 3000 m)

| | |
|---|---|
| Height range | > 2000 m ... 3000 m |

| | |
|---|---|
| Ambient temperature (operation) | -40 °C ... 60 °C |
| Test voltage | 2.25 kV |
| Safety-related maximum voltage $U_m$ | 190 V AC |
| | 110 V DC |
| Rated insulation voltage | 190 $V_{rms}$ (IEC/EN 60079-11) |

Altitude range (≤ 4000 m)

| | |
|---|---|
| Height range | > 3000 m ... 4000 m |
| Ambient temperature (operation) | -40 °C ... 55 °C |
| Test voltage | 2 kV |
| Safety-related maximum voltage $U_m$ | 60 V AC/DC |
| Rated insulation voltage | 60 $V_{rms}$ (IEC/EN 60079-11) |

Altitude range (≤ 5000 m)

| | |
|---|---|
| Height range | > 4000 m ... 5000 m |
| Ambient temperature (operation) | -40 °C ... 49 °C |
| Test voltage | 1.75 kV |
| Safety-related maximum voltage $U_m$ | 60 V AC/DC |
| Rated insulation voltage | 60 $V_{rms}$ (IEC/EN 60079-11) |

## Approvals

CE

| | |
|---|---|
| Certificate | CE-compliant |
| Note | and EN 61326 |

ATEX

| | |
|---|---|
| Identification | Ⓔx I (M1) [Ex ia Ma] I |
| | Ⓔx II (1) G [Ex ia Ga] IIC |
| | Ⓔx II (1) D [Ex ia Da] IIIC |
| | Ⓔx II 3(1) G Ex ec ic [ia Ga] IIC T4 Gc |
| Certificate | IBExU19ATEX1006 X |

IECEx

| | |
|---|---|
| Identification | [Ex ia Ma] I |
| | [Ex ia Ga] IIC |
| | [Ex ia Da] IIIC |
| | Ex ec ic [ia Ga] IIC T4 Gc |
| Certificate | IECEx IBE 19.0001 X |

UL, USA/Canada

| | |
|---|---|
| Identification | UL 61010 Listed |
| | Class I Div 2; IS for Class I, II, III Div 1 |
| Certificate | cULus C.D.-No 83104549 |

Shipbuilding approval

| | |
|---|---|
| Certificate | DNV GL TAA00000AG |

Safety Integrity Level (SIL, IEC 61508)

| | |
|---|---|
| Identification | 2 |
| Certificate | SEBS-A.150520/17, V2.0 |

Systematic Capability

| | |
|---|---|
| Identification | 2 |

INMETRO

| | |
|---|---|
| Identification | [Ex ia Ma] I |
| | [Ex ia Ga] IIC |
| | [Ex ia Da] IIIC |
| | Ex ec ic [ia Ga] IIC T4 Gc |
| Certificate | DNV 21.0064 X |

EAC Ex

| | |
|---|---|
| Identification | Ex ec ic [ia Ga] IIC T4 Gc |
| Certificate | BY/112 02.01 TP012 103.01 00082 |

Shipbuilding data

| | |
|---|---|
| Temperature | B |
| Humidity | B |
| Vibration | A |
| EMC | B |
| Enclosure | Required protection according to the Rules shall be provided upon installation on board |

## EMC data

| | |
|---|---|
| Electromagnetic compatibility | Conformance with EMC directive |
| Noise immunity | EN 61000-6-2 |
| Note | When being exposed to interference, there may be minimal deviations. |

Noise emission

| | |
|---|---|
| Standards/regulations | EN 61000-6-4 |

Electromagnetic HF field

| | |
|---|---|
| Designation | Electromagnetic RF field |
| Standards/regulations | EN 61000-4-3 |
| Typical deviation from the measuring range final value | 1 % |

Fast transients (burst)

| | |
|---|---|
| Designation | Fast transients (burst) |
| Standards/regulations | EN 61000-4-4 |
| Typical deviation from the measuring range final value | 1 % |

Conducted interference

| | |
|---|---|
| Designation | Conducted interferences |
| Standards/regulations | EN 61000-4-6 |

| | |
|---|---|
| Typical deviation from the measuring range final value | 1 % |

## Standards and regulations

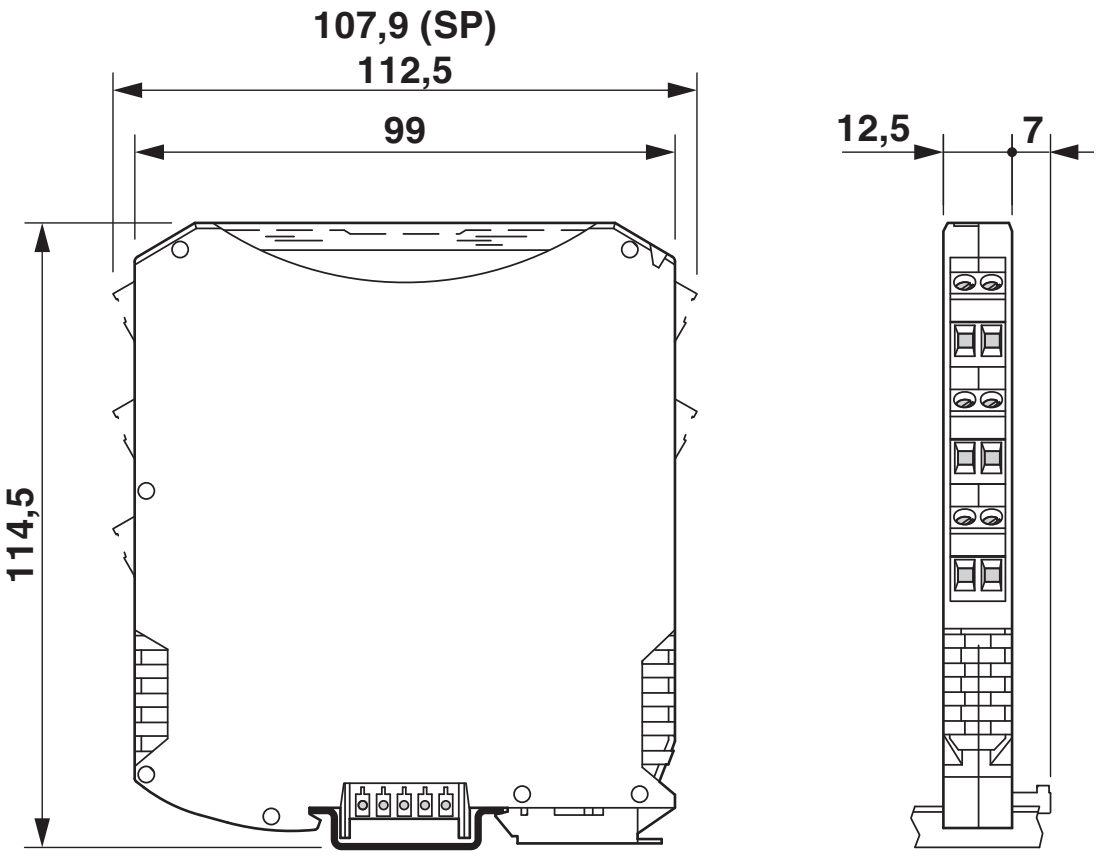
| | |
|---|---|
| Electrical isolation | 3-way isolation |

## Mounting

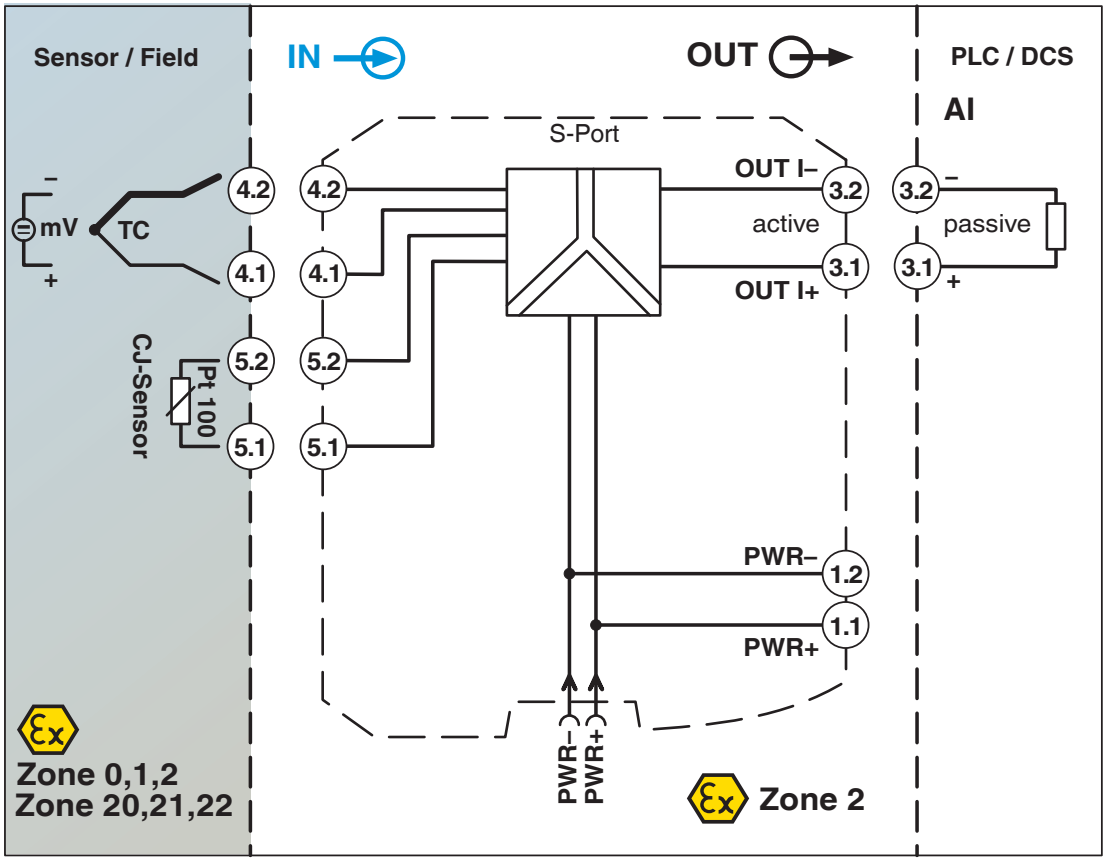
| | |
|---|---|
| Mounting type | DIN rail mounting |

## Drawings

Dimensional drawing



Block diagram



## Approvals

To download certificates, visit the product detail page: https://www.phoenixcontact.com/us/products/1050233

**UL Listed**
Approval ID: E330267

**cUL Listed**
Approval ID: FILE E 330267

**Functional Safety**
Approval ID: SEBS-A.20170608

**DNV**
Approval ID: TAA00000AG

**EAC Ex**
Approval ID: RU C-DE.AB72.B.00093

**IECEx**
Approval ID: IECEx IBE 19.0001X

**cUL Listed**
Approval ID: FILE E 199827

**UL Listed**
Approval ID: E199827

**ATEX**
Approval ID: IBExU 19 ATEX 1006 X

**INMETRO**
Approval ID: DNV 21.0064 X

## Classifications

### ECLASS

| | |
|---|---|
| ECLASS-13.0 | 27210129 |
| ECLASS-15.0 | 27210129 |

### ETIM

| | |
|---|---|
| ETIM 9.0 | EC002919 |

### UNSPSC

| | |
|---|---|
| UNSPSC 21.0 | 41112100 |

## Environmental product compliance

EU RoHS

| | |
|---|---|
| Fulfills EU RoHS substance requirements | Yes |
| Exemption | 7(a), 7(c)-I |

China RoHS

| | |
|---|---|
| Environment friendly use period (EFUP) | EFUP-50 |
| | An article-related China RoHS declaration table can be found in the download area for the respective article under "Manufacturer declaration". For all articles with EFUP-E, no China RoHS declaration table issued and required. |

EU REACH SVHC

| | |
|---|---|
| REACH candidate substance (CAS No.) | Lead(CAS: 7439-92-1) |
| SCIP | e6205f68-5fb9-4366-99e3-d0cfedac9708 |




Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com