

# MACX MCR-EX-SL-2NAM-R-UP - Isolation amplifier



2865984

<https://www.phoenixcontact.com/us/products/2865984>

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2-channel Ex i NAMUR signal conditioner with wide range power supply for proximity sensors and switches. In terms of signal output, for each channel there is a relay with a changeover contact available. Fault detection (LFD), 3-way isolation, SIL 2.

## Your advantages

- Up to SIL 2 in accordance with EN 61508
- Installation in zone 2, protection type "n" (EN 60079-15) permitted
- Line fault detection (LFD), can be activated/deactivated, error indicated by flashing red LED with de-excitation of output relay
- Signal output relay (changeover contact)
- 3-way electrical isolation
- LED indicators for supply voltage, switching state, and malfunction in accordance with NAMUR NE 44
- Direction of operation can be selected (operating or closed circuit current behavior)
- Wide-range power supply of 19.2 ... 253 V AC/DC
- 2-channel
- Input for NAMUR proximity sensors (EN 60947-5-6), floating contacts or contacts with resistance circuit, [Ex ia] IIC

## Commercial data

|                                      |                     |
|--------------------------------------|---------------------|
| Item number                          | 2865984             |
| Packing unit                         | 1 pc                |
| Sales key                            | C430                |
| Product key                          | CK3141              |
| Catalog page                         | Page 157 (C-5-2019) |
| GTIN                                 | 4046356462532       |
| Weight per piece (including packing) | 209.6 g             |
| Weight per piece (excluding packing) | 100 g               |
| Customs tariff number                | 85365019            |
| Country of origin                    | DE                  |

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## Technical data

### Product properties

|                 |                                                     |
|-----------------|-----------------------------------------------------|
| Product type    | Isolating switch transf.                            |
| Product family  | MACX Analog                                         |
| No. of channels | 2                                                   |
| Type            | Ex i signal conditioners with SIL functional safety |
| Configuration   | DIP switches                                        |

### System properties

#### Functionality

|               |              |
|---------------|--------------|
| Configuration | DIP switches |
|---------------|--------------|

### Electrical properties

|                                                 |                                  |
|-------------------------------------------------|----------------------------------|
| No. of channels                                 | 2                                |
| Electrical isolation                            | 3-way isolation                  |
| Electrical isolation between input and output   | yes                              |
| Maximum power dissipation for nominal condition | $\leq 1.3 \text{ W}$             |
| Step response (10-90%)                          | typ. 6 ms (N/O contact: OFF/ON)  |
|                                                 | typ. 6 ms (N/O contact: ON/OFF)  |
|                                                 | typ. 4 ms (N/C contact: ON/OFF)  |
|                                                 | typ. 10 ms (N/C contact: OFF/ON) |

#### Electrical isolation

|              |                         |
|--------------|-------------------------|
| Test voltage | 2.5 kV AC (50 Hz, 60 s) |
|--------------|-------------------------|

#### Electrical isolation Input/output IEC/EN 60079-11

|                          |                     |
|--------------------------|---------------------|
| Standards/regulations    | IEC/EN 60079-11     |
| Rated insulation voltage | 375 V <sub>PP</sub> |
| Overvoltage category     | III                 |
| Pollution degree         | 2                   |

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

|                          |                     |
|--------------------------|---------------------|
| Standards/regulations    | IEC/EN 60079-11     |
| Rated insulation voltage | 375 V <sub>PP</sub> |
| Overvoltage category     | II                  |
| Pollution degree         | 2                   |

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

|                          |                      |
|--------------------------|----------------------|
| Standards/regulations    | IEC/EN 61010-1       |
| Rated insulation voltage | 300 V <sub>rms</sub> |
| Overvoltage category     | II                   |
| Pollution degree         | 2                    |
| Insulation               | Safe isolation       |

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Electrical isolation Output 1/output 2/input, power supply IEC/EN 61010-1

|                          |                      |
|--------------------------|----------------------|
| Standards/regulations    | IEC/EN 61010-1       |
| Rated insulation voltage | 300 V <sub>rms</sub> |
| Overvoltage category     | III                  |
| Pollution degree         | 2                    |
| Insulation               | Safe isolation       |

Supply

|                              |                                                       |
|------------------------------|-------------------------------------------------------|
| Nominal supply voltage range | 24 V AC/DC ... 230 V AC/DC -20 % ... +10 % (50/60 Hz) |
| Supply voltage range         | 19.2 V AC/DC ... 253 V AC/DC (50/60 Hz)               |
| Max. current consumption     | < 80 mA<br>< 42 mA (24 V DC)                          |
| Power dissipation            | < 1.1 W                                               |
| Power consumption            | < 1.1 W                                               |

Input data

Signal: NAMUR

|                                         |                                                                                                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Description of the input                | Intrinsically safe                                                                                                |
| Number of inputs                        | 2                                                                                                                 |
| Available input sources                 | NAMUR proximity sensors (IEC/EN 60947-5-6)<br>Floating switch contacts<br>Switch contacts with resistance circuit |
| Switching threshold "0" signal current  | < 1.2 mA (blocking)                                                                                               |
| Switching threshold "1" signal, current | > 2.1 mA (conductive)                                                                                             |
| Short-circuit current                   | 8 mA                                                                                                              |
| Switching hysteresis                    | < 0.2 mA                                                                                                          |
| Line fault detection                    | < 0.05 mA ... 0.35 mA (Line break)<br>< 100 Ω ... 360 Ω (Short circuit)<br>Activated /deactivated via DIP switch  |
| Non-load voltage                        | 8 V DC                                                                                                            |

Output data

Switching: Relay

|                            |                                                            |
|----------------------------|------------------------------------------------------------|
| Contact switching type     | 1 changeover contact per channel                           |
| Contact material           | AgSnO <sub>2</sub> , hard gold-plated                      |
| Maximum switching voltage  | 250 V AC (2 A, 60 Hz)<br>120 V DC (0.2 A)<br>30 V DC (2 A) |
| Maximum switching capacity | 500 VA                                                     |
| Recommended minimum load   | 5 V / 10 mA                                                |

Signal

|                   |   |
|-------------------|---|
| Number of outputs | 2 |
|-------------------|---|

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## Connection data

|                                  |                                             |
|----------------------------------|---------------------------------------------|
| Connection method                | Screw connection                            |
| Stripping length                 | 7 mm                                        |
| Screw thread                     | M3                                          |
| Conductor cross section rigid    | 0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> |
| Conductor cross section flexible | 0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> |
| 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

|                                                                                              |                                                                                    |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Max. internal inductance $L_i$                                                               | negligible                                                                         |
| Max. internal capacitance $C_i$                                                              | negligible                                                                         |
| Max. output voltage $U_o$                                                                    | 9.56 V                                                                             |
| Max. output current $I_o$                                                                    | 10.3 mA                                                                            |
| Max. output power $P_o$                                                                      | 25 mW                                                                              |
| Safety-related maximum voltage $U_m$                                                         | 253 V AC/DC (Supply terminals)                                                     |
|                                                                                              | 250 V AC (Output terminals)                                                        |
|                                                                                              | 120 V DC (Output terminals)                                                        |
| IIB/IIIC (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 1000 mH / 26 $\mu$ F                                                               |
| IIC (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$      | 300 mH / 3.6 $\mu$ F                                                               |
| IIB/IIA/I (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 100 mH / 1 $\mu$ F, 5 mH / 1 $\mu$ F, 1 mH / 1 $\mu$ F, 10 $\mu$ H / 1 $\mu$ F     |
| IIC (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$       | 100 mH / 510 nF, 50 mH / 580 nF, 5 mH / 600 nF, 1 mH / 600 nF, 10 $\mu$ H / 600 nF |

## Signaling

|                |                              |
|----------------|------------------------------|
| Status display | Green LED (supply voltage)   |
|                | LED yellow (switching state) |
|                | Red LED (line errors)        |

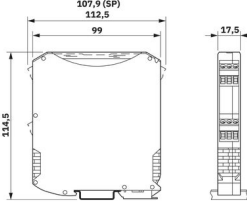
## Dimensions

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|                     |  |                                                                                    |
|---------------------|--|------------------------------------------------------------------------------------|
| Dimensional drawing |  |  |
| Width               |  | 17.5 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 | V0 (Housing)    |
| Housing material                       | PA 6.6-FR       |

## Environmental and real-life conditions

### Ambient conditions

|                                         |                                          |
|-----------------------------------------|------------------------------------------|
| Degree of protection                    | IP20 (not assessed by UL)                |
| Ambient temperature (operation)         | -40 °C ... 60 °C (Any mounting position) |
|                                         | -40 °C ... 70 °C (Derating)              |
| Ambient temperature (storage/transport) | -40 °C ... 80 °C                         |
| Permissible humidity (operation)        | 10 % ... 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 ... 60 °C                                                                                                                                     |
|                                 | -40 °C ... 70 °C (Derating)                                                                                                                          |
| Rated insulation voltage        | 253 V AC (Power supply, input / output)                                                                                                              |
|                                 | 125 V DC (Power supply, input / output)                                                                                                              |

### Altitude range (≤ 3000 m)

|                                 |                                         |
|---------------------------------|-----------------------------------------|
| Height range                    | > 2000 m ... 3000 m                     |
| Ambient temperature (operation) | -40 °C ... 54 °C                        |
|                                 | -40 °C ... 63 °C (Derating)             |
| Rated insulation voltage        | 190 V AC (Power supply, input / output) |
|                                 | 110 V DC (Power supply, input / output) |

### Altitude range (≤ 4000 m)

|                                 |                             |
|---------------------------------|-----------------------------|
| Height range                    | > 3000 m ... 4000 m         |
| Ambient temperature (operation) | -40 °C ... 48 °C            |
|                                 | -40 °C ... 56 °C (Derating) |

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|                                 |                                           |
|---------------------------------|-------------------------------------------|
| Rated insulation voltage        | 60 V AC/DC (Power supply, input / output) |
| Altitude range ( $\leq 5000$ m) |                                           |
| Height range                    | > 4000 m ... 5000 m                       |
| Ambient temperature (operation) | -40 °C ... 42 °C                          |
|                                 | -40 °C ... 49 °C (Derating)               |
| Rated insulation voltage        | 60 V AC/DC (Power supply, input / output) |

## Approvals

### CE

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

### ATEX

|                |                                         |
|----------------|-----------------------------------------|
| Identification | ⚡ II (1) G [Ex ia Ga] IIC               |
|                | ⚡ II (1) D [Ex ia Da] IIIC              |
|                | ⚡ II 3 (1) G Ex ec [ia Ga] nC IIC T4 Gc |
|                | ⚡ I (M1) [Ex ia Ma] I                   |
| Certificate    | IBExU 10 ATEX 1005                      |

### UKCA Ex (UKEX)

|                |                                         |
|----------------|-----------------------------------------|
| Identification | ⚡ I (M1) [Ex ia Ma] I                   |
|                | ⚡ II (1) G [Ex ia Ga] IIC               |
|                | ⚡ II (1) D [Ex ia Da] IIIC              |
|                | ⚡ II 3 (1) G Ex ec [ia Ga] nC IIC T4 Gc |
| Certificate    | CML 22UKEX3528X                         |

### IECEX

|                |                            |
|----------------|----------------------------|
| Identification | [Ex ia Ga] IIC             |
|                | [Ex ia Da] IIIC            |
|                | Ex ec [ia Ga] nC IIC T4 Gc |
|                | [Ex ia Ma] I               |
| Certificate    | IECEX IBE 10.0002X         |

### CCC / China-Ex

|                |                            |
|----------------|----------------------------|
| Identification | [Ex ia Ga] IIC             |
|                | [Ex ia Da] IIIC            |
|                | Ex ec nC [ia Ga] IIC T4 Gc |
| Certificate    | 2022122316115976           |

### UL, USA/Canada

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

### Shipbuilding approval

|             |                   |
|-------------|-------------------|
| Certificate | DNV GL TAA000020C |
|-------------|-------------------|

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## Safety Integrity Level (SIL, IEC 61508)

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

## INMETRO

|                |                            |
|----------------|----------------------------|
| Identification | [Ex ia Ga] IIC             |
|                | [Ex ia Da] IIIC            |
|                | Ex ec nC [ia Ga] IIC T4 Gc |
|                | [Ex ia Ma] I               |
| Certificate    | DNV 18.0116 X              |

## DNV GL data

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

## EMC data

|                               |                                |
|-------------------------------|--------------------------------|
| Noise immunity                | EN 61000-6-2                   |
| Electromagnetic compatibility | Conformance with EMC directive |
| Noise emission                | EN 61000-6-4                   |

## Electromagnetic HF field

|                       |                          |
|-----------------------|--------------------------|
| Designation           | Electromagnetic RF field |
| Standards/regulations | EN 61000-4-3             |
| Evaluation criterion  | A                        |

## Fast transients (burst)

|                       |                         |
|-----------------------|-------------------------|
| Designation           | Fast transients (burst) |
| Standards/regulations | EN 61000-4-4            |
| Evaluation criterion  | A                       |

## Conducted interference

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

## Standards and regulations

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

## GB Standard

|                       |             |
|-----------------------|-------------|
| Standards/regulations | GB/T 3836.1 |
|                       | GB/T 3836.3 |
|                       | GB/T 3836.4 |
|                       | GB/T 3836.8 |

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## Mounting

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

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