

# MACX MCR-EX-SL-RPSSI-I-SP - Repeater power supply



2924016

<https://www.phoenixcontact.com/us/products/2924016>

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Ex i repeater power supply and input signal conditioner, HART-transparent. Transmits supplied or active 0/4 ... 20 mA signals from the Ex area to a load (active or passive) in the safe area. 3-way electrical isolation, SIL 2 in accordance with IEC 61508, with Push-in connection

## Your advantages

- 0/4 mA ... 20 mA input, intrinsically safe, [Ex ia], powered and not powered
- Measuring transducer supply voltage > 16 V
- Output: 0/4 mA ... 20 mA, active up to 1000  $\Omega$  load or passive
- Bidirectional HART signal transmission
- Error indication according to NAMUR NE 43
- SIL 2 according to IEC/EN 61508
- Installation in Ex zone 2 permitted
- 3-way electrical isolation
- Power supply possible via DIN rail connector
- Plug-in connection terminals, push-in connection technology
- Housing width: 12.5 mm
- Minimal power dissipation
- High transmission accuracy

## Commercial data

|                                      |               |
|--------------------------------------|---------------|
| Item number                          | 2924016       |
| Packing unit                         | 1 pc          |
| Minimum order quantity               | 1 pc          |
| Sales key                            | C430          |
| Product key                          | DK1211        |
| GTIN                                 | 4046356338066 |
| Weight per piece (including packing) | 176 g         |
| Weight per piece (excluding packing) | 160 g         |
| Customs tariff number                | 85437090      |
| Country of origin                    | DE            |

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## Technical data

### Product properties

|                 |                       |
|-----------------|-----------------------|
| Product type    | Repeater power supply |
| Product family  | MACX Analog           |
| Application     | Analog IN             |
| No. of channels | 1                     |

### Electrical properties

|   |  |
|---|--|
| Electrical isolation                          | 3-way isolation  |
| Electrical isolation between input and output | yes  |
| Signal transmission behavior                  | In = Out   |
| Step response (10-90%)                        | < 200 $\mu$ s (for jump 4 mA ... 20 mA, load 600 $\Omega$ )<br>< 600 $\mu$ s (for jump 0 mA ... 20 mA, load 600 $\Omega$ ) |
| Maximum temperature coefficient               | < 0.01 %/K   |
| Temperature coefficient, typical              | < 0.004 %/K  |
| Maximum transmission error                    | < 0.1 % (of final value 20 mA)   |
| Transmission error, typical                   | < 0.05 % (of final value 20 mA)  |
| Reverse polarity protection                   | yes  |

### 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 <sub>rms</sub> |
| Insulation               | Safe isolation       |

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

|                          |                      |
|--------------------------|----------------------|
| Standards/regulations    | IEC/EN 60079-11      |
| Rated insulation voltage | 265 V <sub>rms</sub> |

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

|                          |                      |
|--------------------------|----------------------|
| Standards/regulations    | IEC/EN 60079-11      |
| Rated insulation voltage | 265 V <sub>rms</sub> |

### Electrical isolation Output/supply IEC/EN 60079-7

|                          |                      |
|--------------------------|----------------------|
| Standards/regulations    | IEC/EN 60079-7       |
| Rated insulation voltage | 265 V <sub>rms</sub> |

### Supply

|                        |                                 |
|------------------------|---------------------------------|
| Designation            | Repeater power supply operation |
| Nominal supply voltage | 24 V DC -20 % ... +25 %         |
| Supply voltage range   | 19.2 V DC ... 30 V DC           |

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|                                   |                                    |
|-----------------------------------|------------------------------------|
| Max. current consumption          | < 76 mA (24 V DC / 20 mA / 1000 Ω) |
|                                   | < 55 mA (24 V DC / 20 mA / 250 Ω)  |
| Power dissipation                 | < 1.1 W (24 V DC / 20 mA / 1000 Ω) |
|                                   | < 0.95 W (24 V DC / 20 mA / 250 Ω) |
|                                   | < 1.2 W (24 V DC / 20 mA / 0 Ω)    |
| Power consumption (Output active) | < 1.8 W (20 mA / 1000 Ω)           |
|                                   | < 1.3 W (20 mA / 250 Ω)            |

## Supply

|                          |                                     |
|--------------------------|-------------------------------------|
| Designation              | Signal conditioner operation        |
| Nominal supply voltage   | 24 V DC -20 % ... +25 %             |
| Supply voltage range     | 19.2 V DC ... 30 V DC               |
| Max. current consumption | < 44 mA (24 V DC / 20 mA / 1000 Ω)  |
|                          | < 27 mA (24 V DC / 20 mA / 250 Ω)   |
| Power dissipation        | < 0.75 W (24 V DC / 20 mA / 1000 Ω) |
|                          | < 0.65 W (24 V DC / 20 mA / 250 Ω)  |
|                          | < 0.95 W (24 V DC / 20 mA / 0 Ω)    |

## Input data

### Signal: Repeater power supply operation

|                                   |  |
|-----------------------------------|--|
| Description of the input          | Active current input, intrinsically safe                     |
| Number of inputs                  | 1  |
| Input signal                      | Current  |
| Current input signal              | 4 mA ... 20 mA   |
| Current limitation                | 25 mA  |
| Transmitter supply voltage        | > 16 V (20 mA)   |
|                                   | > 15.3 V (22.5 mA)   |
| Polarization and surge protection | Yes  |
| Underload/overload signal range   | 0 mA ... 24 mA (Extended transmission range for diagnostics) |

### Signal: Signal conditioner operation

|                                 |  |
|---------------------------------|--|
| Description of the input        | Passive current input, intrinsically safe                    |
| Current input signal            | 0 mA ... 20 mA   |
|                                 | 4 mA ... 20 mA   |
| Voltage drop                    | < 3.5 V (in input isolating amplifier operation)             |
| Underload/overload signal range | 0 mA ... 24 mA (Extended transmission range for diagnostics) |

## Output data

### Signal: Repeater power supply operation

|                                 |  |
|---------------------------------|--|
| Output description              | Current output (active and passive)              |
| Number of outputs               | 1  |
| Current output signal           | 4 mA ... 20 mA (active)                          |
|                                 | 4 mA ... 20 mA (14 ... 26 V ext. source voltage) |
| Load/output load current output | < 1000 Ω (20 mA)                                 |

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|  |  |
|--|--|
|  | < 825 $\Omega$ (24 mA)                                       |
| Output ripple                            | < 20 mV <sub>rms</sub>                                       |
| Output behavior in the event of an error | 0 mA (Cable break in the input)                              |
|  | $\geq$ 22.5 mA (Cable short-circuit in the input)            |
| Underload/overload signal range          | 0 mA ... 24 mA (Extended transmission range for diagnostics) |

## Signal: Signal conditioner operation

|  |  |
|--|--|
| Output description                       | Current output (active and passive)                          |
| Current output signal                    | 0 mA ... 20 mA (active)                                      |
|  | 4 mA ... 20 mA (active)                                      |
|  | 0 mA ... 20 mA (14 ... 26 V ext. source voltage)             |
|  | 4 mA ... 20 mA (14 ... 26 V ext. source voltage)             |
| Load/output load current output          | < 1000 $\Omega$ (20 mA)                                      |
|  | < 825 $\Omega$ (24 mA)                                       |
| Output ripple                            | < 20 mV <sub>rms</sub>                                       |
| Output behavior in the event of an error | 0 mA (Cable break in the input)                              |
|  | 0 mA (Cable short-circuit in the input)                      |
| Underload/overload signal range          | 0 mA ... 24 mA (Extended transmission range for diagnostics) |

## Connection data

|   |   |
|---|---|
| Connection method   | Push-in connection  |
| Stripping length  | 10 mm   |
| 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 flexible (2 conductors with same cross section) | 0.25 mm <sup>2</sup> ... 0.34 mm <sup>2</sup> (TWIN ferrule without plastic sleeve) |
|   | 0.5 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> (TWIN ferrule with plastic sleeve)      |
| Conductor cross-section AWG   | 24 ... 14   |
|   | 24 ... 22 (TWIN ferrule without plastic sleeve)                                     |
|   | 20 ... 16 (TWIN ferrule with plastic sleeve)  |

## Ex data

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

## Safety data: Repeater power supply operation

|   |          |
|---|----------|
| Max. output voltage U <sub>o</sub>            | 25.2 V   |
| Max. output current I <sub>o</sub>            | 93 mA    |
| Max. output power P <sub>o</sub>              | 587 mW   |
| Safety-related maximum voltage U <sub>m</sub> | 253 V AC |
|   | 125 V DC |

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|  |  |
|--|--|
| I (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$      | 40 mH / 4.8 $\mu$ F  |
| IIA (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$    | 26 mH / 2.9 $\mu$ F  |
| IIB (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$    | 14 mH / 820 nF   |
| IIC (simple circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$    | 3 mH / 107 nF  |
| IIA (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$     | 26 mH / 470 nF, 20 mH / 570 nF, 1 mH / 630 nF, 0.5 mH / 720 nF, 0.1 mH / 1.1 $\mu$ F, 0.005 mH / 2.9 $\mu$ F |
| IIB/III (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$ | 16 mH / 370 nF, 500 $\mu$ H / 510 nF, 200 $\mu$ H / 660 nF, 100 $\mu$ H / 820 nF                             |
| IIC (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$     | 2.2 mH / 47 nF, 2 mH / 49 nF, 1 mH / 63 nF, 500 $\mu$ H / 80 nF, 200 $\mu$ H / 107 nF                        |
| I (mixed circuit): Max. external inductivity $L_o$ / Max. external capacitance $C_o$       | 37 mH / 0.54 $\mu$ F, 0.35 mH / 1 $\mu$ F, 0.009 mH / 2.9 $\mu$ F, 0.001 mH / 4.15 $\mu$ F                   |

## Safety data: Signal conditioner operation

|                                      |               |
|--------------------------------------|---------------|
| Input voltage $U_i$                  | $\leq 30$ V   |
| Input current $I_i$                  | $\leq 150$ mA |
| Max. internal inductance $L_i$       | negligible    |
| Max. internal capacitance $C_i$      | negligible    |
| Safety-related maximum voltage $U_m$ | 253 V AC      |
|                                      | 125 V DC      |

## Interfaces

### Data communication (bypass)

|                     |                   |
|---------------------|-------------------|
| HART function       | HART transparency |
| Protocols supported | HART              |

## Signaling

|                |                            |
|----------------|----------------------------|
| Status display | Green LED (supply voltage) |
|----------------|----------------------------|

## Dimensions

|                     |  |
|---------------------|--|
| Dimensional drawing |  |
| Width               | 12.5 mm  |
| Height              | 107.9 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) |

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## 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 (not assessed by UL)   |
| Ambient temperature (operation)         | -40 °C ... 60 °C (Any mounting position)<br>-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<br>-40 °C ... 70 °C (Derating)  |
| Rated insulation voltage        | 375 V <sub>PP</sub> (Power supply, input / output)   |

### Altitude range (≤ 3000 m)

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

### Altitude range (≤ 4000 m)

|                                 |   |
|---------------------------------|---|
| Height range                    | > 3000 m ... 4000 m                             |
| Ambient temperature (operation) | -40 °C ... 48 °C<br>-40 °C ... 56 °C (Derating) |
| Rated insulation voltage        | 60 V AC/DC (Power supply, input / output)       |

### Altitude range (≤ 5000 m)

|                                 |   |
|---------------------------------|---|
| Height range                    | > 4000 m ... 5000 m                             |
| Ambient temperature (operation) | -40 °C ... 42 °C<br>-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 |

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## ATEX

|                |                                     |
|----------------|-------------------------------------|
| Identification | ⊕ II (1) G [Ex ia Ga] IIC           |
|                | ⊕ II (1) D [Ex ia Da] IIIC          |
|                | ⊕ II 3(1) G Ex ec [ia Ga] IIC T4 Gc |
|                | ⊕ I (M1) [Ex ia Ma] I               |
| Certificate    | BVS 08 ATEX E 054X                  |

## IECEX

|                |                         |
|----------------|-------------------------|
| Identification | [Ex ia Ga] IIC          |
|                | [Ex ia Da] IIIC         |
|                | Ex ec [ia Ga] IIC T4 Gc |
|                | [Ex ia Ma] I            |
| Certificate    | IECEX BVS 08.0016X      |

## CCC / China-Ex

|                |                         |
|----------------|-------------------------|
| Identification | [Ex ia Ga] IIC          |
|                | [Ex ia Da] IIIC         |
|                | Ex ec [ia Ga] IIC T4 Gc |
| Certificate    | 2022122316115973        |

## UL, USA/Canada

|                |   |
|----------------|---|
| Identification | UL 61010 Listed   |
|                | Class I, Div. 2, Groups A, B, C, D T4                                   |
|                | Class I, Div. 2, Groups IIC, IIB, IIA T4                                |
|                | Associated apparatus for use in Class I, Division 1, Groups A,B,C,D     |
|                | Associated apparatus for use in Class II, Div.1 Groups E,F,G            |
|                | Associated apparatus for use in Class III, Division 1                   |
|                | Associated apparatus for use in Class I, Zone 0,1,2, Groups IIC,IIB,IIA |
| Certificate    | Ⓢ C.D.-No 83104549  |

## Shipbuilding approval

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

## Safety Integrity Level (SIL, IEC 61508)

|                |                      |
|----------------|----------------------|
| Identification | 2                    |
| Certificate    | IN-AT-AS-MRL-2300149 |

## Systematic Capability

|                |   |
|----------------|---|
| Identification | 3 |
|----------------|---|

## KC-s

|                |                 |
|----------------|-----------------|
| Identification | [Ex ia] IIC/IIB |
| Certificate    | 17-KA4BO-0400X  |

## INMETRO

|  |                |
|--|----------------|
|  | [Ex ia Ga] IIC |
|--|----------------|

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|                |                         |
|----------------|-------------------------|
| Identification | [Ex ia Da] IIC          |
|                | Ex ec [ia Ga] IIC T4 Gc |
|                | [Ex ia Ma] I            |
| Certificate    | DNV 18.0136 X           |

## Shipbuilding 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

|                               |  |
|-------------------------------|--|
| 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 |
|----------------------|-----------------|

## GB Standard

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

## Mounting

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

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## Drawings

Dimensional drawing



Diagram



Signal transmission analog and digital at the same time



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## Approvals

To download certificates, visit the product detail page: <https://www.phoenixcontact.com/us/products/2924016>

### DNV

Approval ID: TAA000020C



### UL Listed

Approval ID: E330267



### cUL Listed

Approval ID: E330267

### TUEV Austria FS

Approval ID: IN-AT-AS-MRL-23-0149



### IECEx

Approval ID: IECEx BVS 08.0016X



### CCC

Approval ID: 2022122316115973



### cUL Listed

Approval ID: E199827



### UL Listed

Approval ID: E199827



### ATEX

Approval ID: BVS 08 ATEX E 054X

### INMETRO

Approval ID: DNV 18.0136 X



### KC-s

Approval ID: 17-KA4BO-0400X

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## Classifications

### ECLASS

|             |          |
|-------------|----------|
| ECLASS-13.0 | 27210120 |
| ECLASS-15.0 | 27210120 |

### ETIM

|           |          |
|-----------|----------|
| ETIM 10.0 | EC002653 |
|-----------|----------|

### UNSPSC

|             |          |
|-------------|----------|
| UNSPSC 21.0 | 39121000 |
|-------------|----------|

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## Environmental product compliance

### EU RoHS

|   |                    |
|---|--------------------|
| Fulfills EU RoHS substance requirements | Yes                |
| Exemption                               | 6(c), 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)   |
|                                     | 2,2',6,6'-tetrabromo-4,4'-isopropylidenediphenol(CAS: 79-94-7) |
| SCIP                                | 8681b086-bdb1-4186-9b6d-692b6a09dbe2                           |

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