

# Isolation amplifier - MACX MCR-EX-SL-NAM-R - 2865434

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Ex i NAMUR isolating amplifier For operating proximity sensors and switches in Ex areas. The signals are transmitted via a relay output (PDT contact) to the safe area. Line fault detection (LFD), 3-way isolation, SIL 2.

## Your advantages

- ✓ Power supply and error indication possible via DIN rail connector
- ✓ Installation in zone 2, protection type "n" (EN 60079-15) permitted
- ✓ Up to SIL 2 according to EN 61508
- ✓ Line fault detection (LFD), can be activated/deactivated, error indicated by red flashing LED with de-excitation of output relay
- ✓ 3-way electrical isolation
- ✓ LED indicators for supply voltage, switching state, and malfunction according to NAMUR NE 44
- ✓ Relay signal output (PDT)
- ✓ Input for NAMUR proximity sensors (EN 60947-5-6), floating contacts or contacts with resistance circuit, [Ex ia] IIC
- ✓ Direction of operation can be selected (operating or closed circuit current behavior)



## Key Commercial Data

Packing unit	1 pc
GTIN	 4 046356 160445
GTIN	4046356160445

## Technical data

### Note

Utilization restriction	EMC: class A product, see manufacturer's declaration in the download area
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### Dimensions

Width	12.5 mm
Height	99 mm
Depth	114.5 mm

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## Technical data

### Ambient conditions

Ambient temperature (operation)	-20 °C ... 60 °C (Any mounting position)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Maximum altitude	≤ 2000 m
Permissible humidity (operation)	10 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Degree of protection	IP20
Noise immunity	EN 61000-6-2 EN 61326

### Input data

Non-load voltage	~ 8 V DC
Switching points (attenuated)	< 1.2 mA (blocking)
Switching points (unattenuated)	> 2.1 mA (conductive)
Signal input	Intrinsically safe
Available input sources	NAMUR proximity sensors (IEC/EN 60947-5-6)
Short-circuit current	~ 8 mA
Switching hysteresis	< 0.2 mA
Line fault detection	Break 0.05 mA < IIN < 0.35 mA
	Short circuit 100 Ω < RSensor < 360 Ω

### Output data

Switching output	Relay output
Contact type	1 PDT
Contact material	AgSnO <sub>2</sub> , hard gold-plated
Maximum switching voltage	250 V AC (2 A) 120 V DC (0.2 A) 30 V DC (2 A)
Maximum switching capacity	500 VA
Mechanical service life	10 <sup>7</sup> cycles
Switching frequency	≤ 20 Hz (without load)

### Power supply

Nominal supply voltage	24 V DC -20 % ... +25 %
Supply voltage range	19.2 V DC ... 30 V DC (24 V DC -20%...+25%)
Max. current consumption	21 mA (24 V DC)
Power dissipation	< 650 mW
Power consumption	< 650 mW

### Connection data

Connection method	Screw connection
Stripping length	7 mm
Screw thread	M3
Conductor cross section solid	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>

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## Technical data

### Connection data

Conductor cross section AWG	24 ... 14
Torque	0.5 Nm ... 0.6 Nm

### General

No. of channels	1
Status display	Green LED (supply voltage) LED yellow (switching state) Red LED (line errors)
Flammability rating according to UL 94	V0
Degree of pollution	2
Overvoltage category	II
Electromagnetic compatibility	Conformance with EMC directive
Interference emission	EN 61000-6-4
Housing material	PA 6.6-FR
Color	gray
Designation	Input/output
Electrical isolation	375 V (Peak value in accordance with EN 60079-11)
Designation	Input/output/supply, DIN rail connector
Electrical isolation	300 V <sub>rms</sub> (Rated insulation voltage (overvoltage category II; degree of pollution 2, safe isolation as per EN 61010-1)) 2.5 kV (50 Hz, 1 min., test voltage)
Designation	Output/input, supply, TBUS
Electrical isolation	300 V <sub>rms</sub> (Rated insulation voltage (overvoltage category III; degree of pollution 2, safe isolation as per EN 61010-1)) 2.5 kV (50 Hz, 1 min., test voltage)
Designation	Input/supply, DIN rail connector
Electrical isolation	375 V (Peak value in accordance with EN 60079-11)
Conformance	CE-compliant, additionally EN 61326
ATEX	# II (1) G [Ex ia Ga] IIC # II (1) D [Ex ia Da] IIIC # II 3 (1) G Ex nA nC [ia Ga] IIC T4 Gc
IECEX	[Ex ia Ga] IIC [Ex ia Da] IIIC Ex nA nC [ia Ga] IIC T4 Gc
UL, USA/Canada	Class I Div 2; IS for Class I, II, III Div 1 UL 61010 Listed
SIL	2

### Safety characteristic data

Integrity requirement	IEC 61508 - Low demand
Designation	Non-inverted operation
Equipment type	Type A

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## Technical data

### Safety characteristic data

Safety Integrity Level (SIL)	2
Safe Failure Fraction (SFF)	78 %
$\lambda_{SU}$	$2.49 \times 10^{-7}$ (249 FIT)
$\lambda_{SD}$	$6 \times 10^{-9}$ (6 FIT)
$\lambda_{DU}$	$6.4 \times 10^{-8}$ (64 FIT)
$\lambda_{DD}$	$7 \times 10^{-9}$ (7 FIT)
Probability of a hazardous failure on demand (PFD <sub>AVG</sub> )	$3.09 \times 10^{-4}$ (1 year)
	$6.17 \times 10^{-4}$ (2 years)
	$1.54 \times 10^{-3}$ (5 years)
Diagnostic coverage (DC)	DC <sub>S</sub> = 2.4 %, DC <sub>D</sub> = 9 %
Integrity requirement	IEC 61508 - Low demand
Designation	Inverted operation
Equipment type	Type A
Safety Integrity Level (SIL)	2
Safe Failure Fraction (SFF)	78 %
$\lambda_{SU}$	$2.48 \times 10^{-7}$ (248 FIT)
$\lambda_{SD}$	$1 \times 10^{-9}$ (1 FIT)
$\lambda_{DU}$	$6.2 \times 10^{-8}$ (62 FIT)
$\lambda_{DD}$	$6 \times 10^{-9}$ (6 FIT)
Probability of a hazardous failure on demand (PFD <sub>AVG</sub> )	$3.01 \times 10^{-4}$ (1 year)
	$6.02 \times 10^{-4}$ (2 years)
	$1.5 \times 10^{-3}$ (5 years)
Diagnostic coverage (DC)	DC <sub>S</sub> = 0.4 %, DC <sub>D</sub> = 8 %
Safety Integrity Level (SIL)	1

### Safety data

Max. internal inductance L <sub>i</sub>	negligible
Max. internal capacitance C <sub>i</sub>	11 nF
Max. output voltage U <sub>o</sub>	9.6 V
Max. output current I <sub>o</sub>	10 mA
Max. output power P <sub>o</sub>	25 mW
Group	IIC
Max. external inductivity L <sub>o</sub>	300 mH
Max. external capacity C <sub>o</sub>	3.6 µF
Group	IIB/IIIC
Max. external inductivity L <sub>o</sub>	1000 mH
Max. external capacity C <sub>o</sub>	26 µF
Safety-related maximum voltage U <sub>m</sub>	253 V AC (125 V DC)

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## Technical data

### Standards and Regulations

Electromagnetic compatibility	Conformance with EMC directive
Noise emission	EN 61000-6-4
Flammability rating according to UL 94	V0
Conformance	CE-compliant, additionally EN 61326
ATEX	# II (1) G [Ex ia Ga] IIC
	# II (1) D [Ex ia Da] IIIC
	# II 3 (1) G Ex nA nC [ia Ga] IIC T4 Gc
IECEX	[Ex ia Ga] IIC
	[Ex ia Da] IIIC
	Ex nA nC [ia Ga] IIC T4 Gc
UL, USA/Canada	Class I Div 2; IS for Class I, II, III Div 1
	UL 61010 Listed
DNV GL-Temperature	B
DNV GL-Humidity	B
DNV GL-Vibration	A
DNV GL-EMC	B
DNV GL-Enclosure	Required protection according to the Rules shall be provided upon installation on board
Group	IIC
	IIB/IIIC

### Environmental Product Compliance

China RoHS	Environmentally Friendly Use Period = 50
	For details about hazardous substances go to tab "Downloads", Category "Manufacturer's declaration"

## Approvals

### Approvals

#### Approvals

DNV GL / UL Listed / cUL Listed / Functional Safety / cULus Listed

#### Ex Approvals


KC-s / IECEx / ATEX / UL Listed / cUL Listed / EAC Ex / cULus Listed


### Approval details

DNV GL		<a href="https://approvalfinder.dnvgl.com/">https://approvalfinder.dnvgl.com/</a>	TAA00000AG
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## Approvals

UL Listed		<a href="http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm">http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm</a>	FILE E 330267
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cUL Listed		<a href="http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm">http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm</a>	FILE E 330267
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Functional Safety			07-06-39 R005 V2R2
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cULus Listed			
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