

EMOSAFE EN-96

Datasheet

Network Isolator for Industrial and Railway Applications



EN-96

1 FEATURES AND ADVANTAGES

- Heavy duty housing (IP65)
- M12 X-coded connectors (IEC 61076-2-109)
- Suitable for application in railway systems in accordance with DIN EN 50155 and IEC 61373
- 10-Gigabit Ethernet (Class E_A und Cat 6A)
- Dielectric strength of 4.0 kV AC or 5.6 kV DC
- ESD protection: transient voltage suppression on signal lines
- Suitable for devices with supply voltages up to 250 V AC
- UL 94 flammability rating of V-0
- RoHS compliant
- DIN rail adapter available as accessory

2 GENERAL DESCRIPTION

EMOSAFE EN-96 Network Isolators disconnect every electrically conducting connection (specifically the data and shield conductors) between devices connected together via a copper-based Ethernet network. Network Isolators prevent current flow resulting from differences in electrical potentials, and also protect connected devices and their users from stray external voltages and power surges which may be directly or

inductively coupled onto the network lines by causes such as installation errors, lightning, switching operations, and electrostatic discharge.

Regarding Ethernet network connections, EN-96 provides the conditions for safe operation of electronic equipment within railway vehicles. The EN-96 fulfils all design requirements of DIN EN 50155 and IEC 61373.

The EN-96 is equipped with transient voltage suppression (TVS) diode circuitry, which effectively limits the differential interference voltages on each wire pair. Such differential voltage spikes can arise from malfunctioning devices connected to the Ethernet, or also from electrostatic discharge (ESD) events during the plugging processes.

EMOSAFE Network Isolators transmit high-frequency signals through the principle of electromagnetic induction. Because of this, they do not require their own power supplies. There are no software drivers to be installed.

3 APPLICATIONS

- **Potential difference situations (industrial plants, buildings, and railway systems)**
Prevention of potential equalisation currents within computer systems that are electrically connected to each other over significant distances via Ethernet cabling.
- **User protection**
Electrical separation of Ethernet interfaces of electrical devices or systems, where users must be protected from dangerous leakage currents, in conformity with applicable standards.
- **Equipment protection**
Applications, in which valuable devices or those requiring special protection need to be protected against ripple, mains hum, and surge voltages from the network periphery.
- **Measurement technology**
Electrical measuring and monitoring equipment, which needs to be protected against external voltages and interference voltages arising from the Ethernet periphery.

4 DRAWINGS

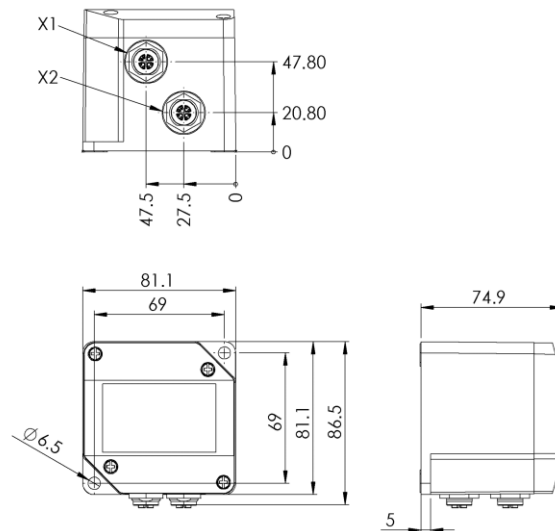


Figure 1: EN-96 dimensions (all dimensions in millimetres)

5 MOUNTING AND SAFETY INSTRUCTIONS

Tightening torque for mounting screws: 2.0 Nm

Tightening torque of the M12 connectors: 0.6 Nm to 1.0 Nm (max.)

5.1 DEVICE INSTALLATION

During installation, it is necessary to ensure that creepage and clearance distances between the M12 sockets and the nearest electrically conductive system components meet or exceed the specified requirements for the protected system. The isolating function of the Network Isolator must not be impaired by neighbouring conductive components.

5.2 HOUSING AND CONNECTOR ENVIRONMENT

The metallic conductive parts of the M12 sockets and any attached connectors are freely accessible to the user, and thereby offer no electrical protection. During operation, maintenance work may therefore only be performed with suitable protective measures. If the organisation responsible for risk management determines that unacceptable risks may be present when operators come into contact with the housing or the exposed metallic conductive parts, suitable mitigating action must be taken. For example, enshrouding the Network Isolator and all exposed metallic conductive parts with a suitably isolating housing.

5.3 CABLE SHIELD

EMOSAFE EN-96 possesses additional circuitry between the shield connections of the M12 sockets (please refer to figure 3). The built-in resistor provides a safe, high-resistance dissipation of static charges. The built-in safety capacitor improves the electromagnetic compliance (EMC) properties of the system, allowing high-frequency energies to be safely dissipated.

5.4 POWER OVER ETHERNET

EN-96 can be safely connected to Power over Ethernet (PoE) networks without restriction; however downstream devices will remain unpowered, as the electrical isolation of the EN-96 prevents the transfer of PoE energy.

6 SPECIFICATIONS

6.1 GENERAL

Category	Standards or Criteria	Properties
Designation		EMOSAFE EN-96
Article number		A10320
Construction		Standalone
Housing colour		Black
Housing material		Fibreglass-reinforced polyester, with graphite additive
Printed Circuit Board (PCB)	EN 45545-2	FR4 with anti-corrosion conformal coating
Interfaces (X1 and X2)	IEC 61076-2-109	M12 sockets, X-coded, female, straight
Weight		347 g
Protection rating (when correctly plugged in)	EN 60529	IP65
Flammability rating	UL 94	V-0
Approval for railway vehicle operating equipment	EN 50155 & IEC 61373	✓
Mating cycles		> 1000
Mean Time To Failure (MTTF)	SN 29500 Standard: Temperature: 25°C Duty cycle: 100% (24 hours, 7 days)	2400 years

6.2 ETHERNET PERFORMANCE

Category	Standards or Criteria	Properties
Supported Ethernet speeds and protocols*	IEEE 802.3	100BASE-TX 1000BASE-T 2.5GBASE-T 5GBASE-T 10GBASE-T
	ISO/IEC 11801	Class D (CH & PL) Class E (CH & PL) Class Ea (CH)
	TIA/EIA-568	Cat 5e (CH & PL) Cat 6 (CH & PL) Cat 6A (CH)

* Where CH refers to Channel, and PL refers to Permanent Link.

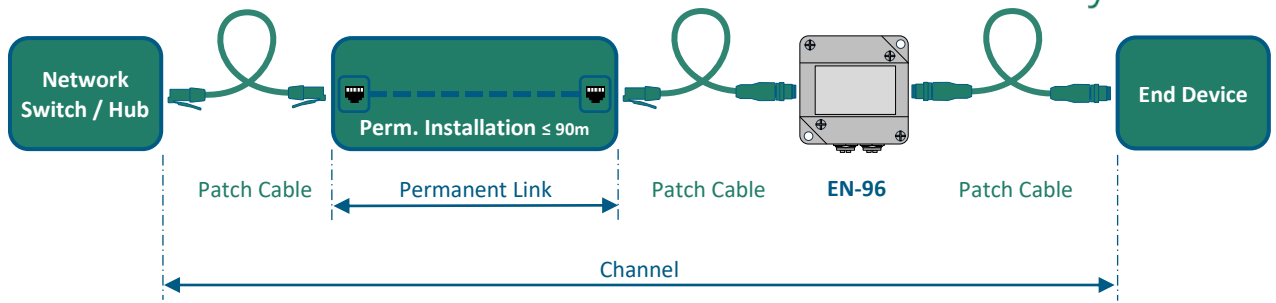


Figure 2: Recommended incorporation of a Network Isolator into an Ethernet system

The classification of the Ethernet transfer speed is determined (amongst other attributes) by the system’s adherence to standard-defined limits for Insertion Loss (IL), Return Loss (RL), and Near-End Crosstalk (NEXT).

Further information pertaining to Ethernet system construction, classification, performance, as well as the basics of Ethernet parameters are found in our white paper “Ethernet Performance of Network Isolators”.

6.3 ELECTRICAL

Category	Standards or Criteria	Property
AC dielectric strength	@ 50 Hz for 60 s	4.0 kV
DC dielectric strength	for 60 s	5.6 kV
Coupling capacitance channel		37.5 pF ±25%
Total coupling capacitance		150 pF ±25%
TVS diode circuitry	transient voltage suppression (TVS) on signal lines	✓

6.4 OPERATING CONDITIONS AND AREA OF APPLICATION

Category	Standards or Criteria	Properties
Overvoltage category	IEC 60664-1	III
Maximum working voltage*	maximum mains voltage of the connected devices, in accordance with DIN EN 50155	250 V AC 350 V DC
Temperature	Non-condensing	Minimum.: -40°C
		Maximum.: +70°C
Air humidity	Non-condensing	Minimum.: 10%
		Maximum.: 90%
Air pressure	Non-condensing	Minimum.: 700 hPa
		Maximum.: 1060 hPa
Altitude	Non-condensing	Maximum.: 3200 m

* The Network Isolator can be permanently exposed to this voltage level.

6.5 ENVIRONMENTAL CONDITIONS: STORAGE AND TRANSPORTATION

Category	Standards or Criteria		Properties
Temperature		Minimum.:	-40°C
		Maximum.:	+85°C
Air humidity	Non-condensing	Minimum.:	10%
		Maximum.:	95%
Air pressure		Minimum.:	500 hPa
		Maximum.:	1060 hPa

6.6 STANDARDS AND CERTIFICATES

Current revision numbers of the standards and guidelines pertaining to our products can be found in our declaration of conformity on our website under “[Standard Conformity and Certificates](#)”.

7 SCHEMATIC DIAGRAM

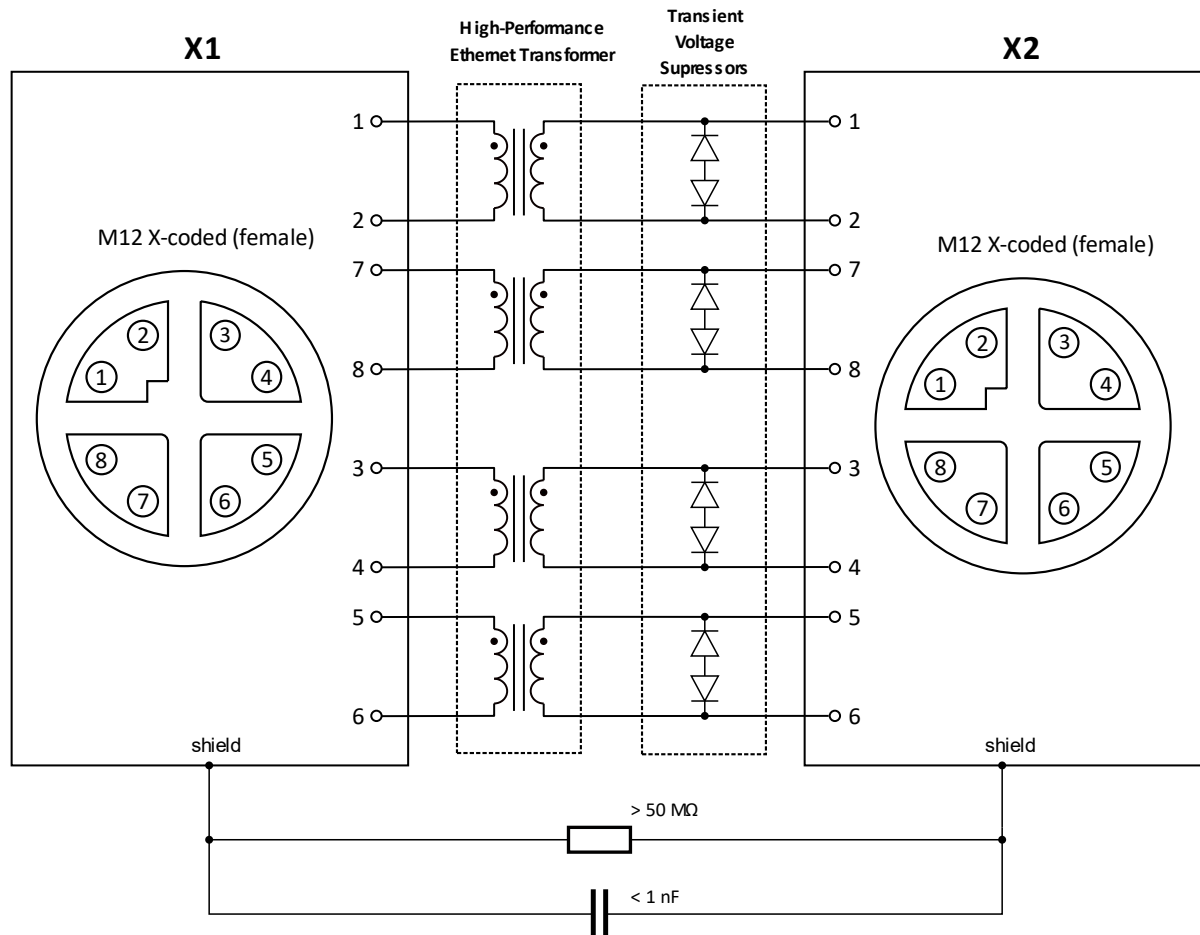





Figure 3: Circuit diagram of the EN-96.

8 MAINTENANCE

When used as intended, EMOSAFE Network Isolators are maintenance-free.

9 PRODUCT MARKINGS

	<p>Through this mark, the conformity of the product with all applicable EU Directives is confirmed.</p>
	<p>The product may not be disposed of in domestic rubbish.</p>
	<p>This product meets the requirements of EU Directive concerning the limitation of the use of certain hazardous substances in electric and electronic equipment</p>

10 QUALITÄT

EMO Systems GmbH maintains a certified quality management system for development and production in accordance with ISO 9001 and ISO 13485. Every Network Isolator is subjected to an extensive quality control before delivery. Among other things, measurements of leakage current, dielectric strength, insertion loss, return loss, and near-end crosstalk are performed to ensure full compliance with requirements.

11 ENVIRONMENTAL PROTECTION INFORMATION

This device contains electronic components.

It must be returned to the manufacturer for proper disposal after use.

12 CONTACT AND SUPPORT

Please find our current contact details on our website:

<https://emosystems.de/en/contact/>

Or you can reach us by email at the following address:

support@emosystems.de

13 LEGAL NOTICE

The information in this data sheet has been compiled to the best of our knowledge and with all due care. However, we cannot guarantee that they are complete and error-free.

The user is responsible and liable for the correct use of this product. Neither EMO Systems GmbH nor EMO Systems Inc. assume any liability.

This data sheet is subject to change without prior notice.