

EMOSAFE EN-95

Product Datasheet

Network Isolator for Industrial Applications



1 FEATURES AND ADVANTAGES

- High-Performance Gigabit Ethernet Network Isolator
- 4.0 kV AC dielectric strength
- 5.6 kV DC dielectric strength
- DIN EN 50155 compliant
- ISO 11801 Class D Ethernet performance
- Extremely low insertion loss
- ESD protection: suppression of transient over voltages on the signal lines
- Suitable for devices with a supply voltage of up to 250 VAC
- RoHS compliant
- Socket and DIN rail adapter available as accessories

2 GENERAL DESCRIPTION

EMOSAFE EN-95 network isolators interrupt the electrically conductive connection (wires and shield) between devices that are connected to each other via copper-guided Ethernet cabling. They prevent equipotential bonding currents and protect connected devices and their users from transient over voltages that

have been directly or inductively coupled into the network cable because of installation errors, lightning, switching operations, or electrostatic discharges.

The EMOSAFE EN-95 network isolator protects connected terminal devices against the hazards described in section 3. The EN-95 fulfils all design requirements of DIN EN 50155.

The EMOSAFE EN-95 is a powerful and compact Gigabit network isolator characterised by outstanding Ethernet performance and very high dielectric strength.

The EN-95 is equipped with a TVS diode circuit that effectively limits the differential interference signal level on a wire pair. Differential voltage peaks can be caused by malfunctions of connected devices or by electrostatic discharges during the plugging process.

The network isolator EMOSAFE EN-95 passes high-frequency alternating signals according to the principle of electromagnetic induction in the frequency range used for data transmission. Because of this transmission principle, the EN-95 does not require its own power supply. Driver installation is not required.

3 APPLICATIONS

3.1 USER PROTECTION

Galvanic isolation of the Ethernet interfaces of electrical devices or systems where users must be protected against dangerous leakage currents in accordance with standards.

3.2 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.

3.3 MEASUREMENT EQUIPMENT

Electrical measuring and monitoring equipment, which needs to be protected against external voltages and interference voltages arising from the Ethernet periphery.

3.4 POTENTIAL DIFFERENCES (INDUSTRIAL PLANTS, BUILDING AND RAILWAY SYSTEMS)

Prevention of equipotential bonding currents in computer systems that are galvanically connected to each other via Ethernet cabling over greater distances.

4 DRAWINGS

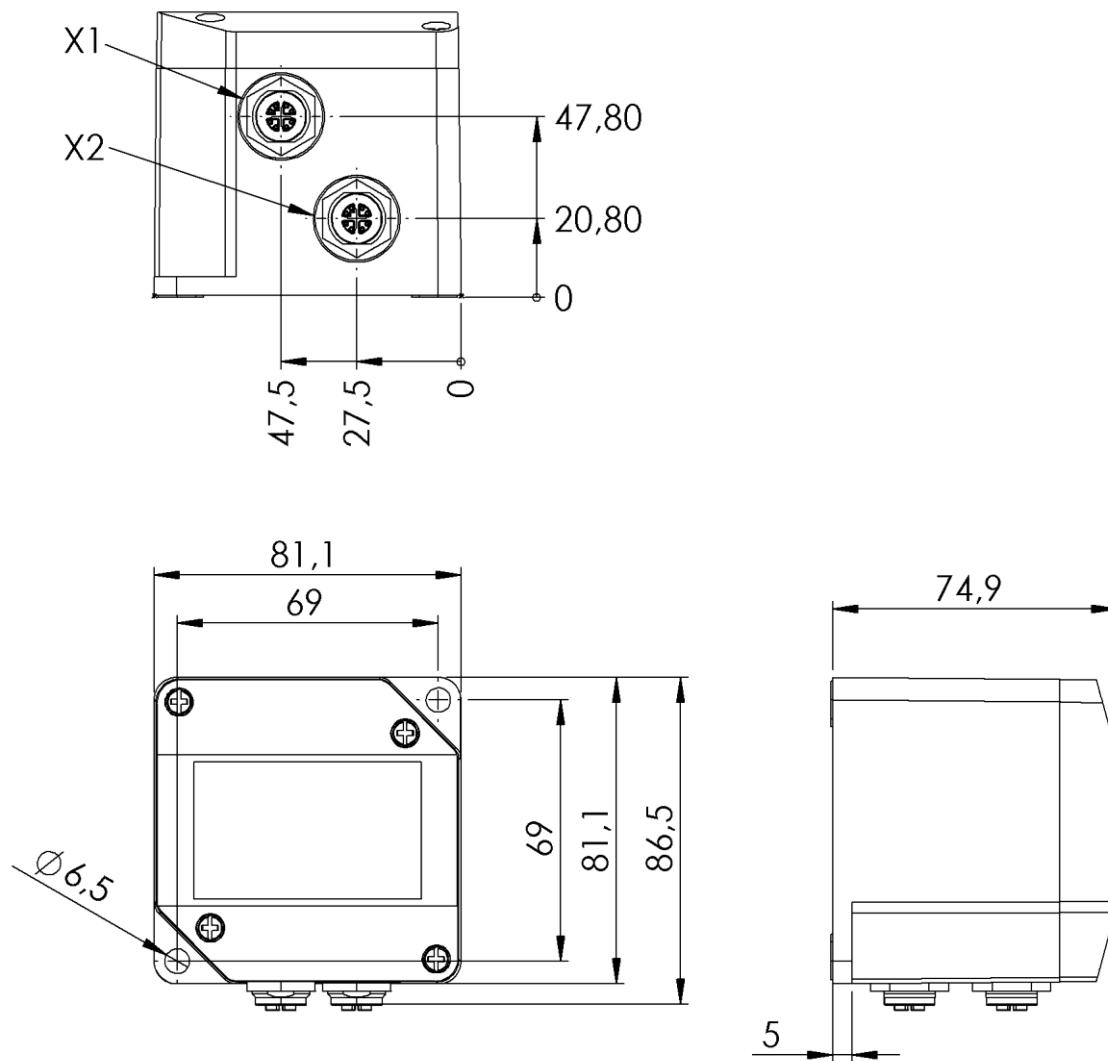


Figure 1 EN-95 - all dimensions in mm

5 MOUNTING INSTRUCTIONS

5.1 GENERAL

Type EN-95 network isolators are intended as a retrofit solution for unprotected terminal devices. It is essential to ensure that the conductive parts of the network isolator or the network cable plugged into the network isolator do not come into contact with conductive parts of the terminal device to be protected. In order to guarantee this permanently, a fixation of the network isolator is strongly recommended.

5.2 FREQUENCY RANGE

Type EN-95 network isolators are designed for data transmission in the frequency range of 0.3 to 100 MHz. As a rule, it is not possible to transmit signals from telecommunications systems or analogue audio or video signals via a network isolator.

5.3 POWER OVER ETHERNET

Type EN-95 network isolators can be used in a PoE network without restriction. However, PoE terminals cannot be supplied with power after galvanic isolation.

5.4 INSTALLATION OF DEVICES

When installing the device, the manufacturer must ensure that the clearance and creepage distances between the shielding plates of the M12 sockets as well as the M12 plug inserted into the network insulator and the nearest conductive components of the device to be protected are designed to meet the requirements.

5.5 CABLE SHIELD

Type EMOSAFE EN-95 network isolators interrupt the shield connection. If the cable shield of the incoming data cable is to be connected to the room or device potential, such a connection must be implemented separately upstream of the network isolator.

5.6 QUALITY REQUIREMENTS FOR CABLING

If an EN-95 is part of a cabling path that is to meet the requirements for a Class D or Cat.5e channel, the channel must provide a performance reserve without a network isolator in use. The following distances to the Class D or Cat.5e limit curves must be observed when measuring the cabling section without a network isolator:

NEXT:	4.0 dB
Return loss:	4.0 dB
Insertion loss:	1.5 dB

If a cabling section that meets these requirements is terminated with an EN-95 network insulator, it meets all of the above requirements. If necessary, this can be verified with a cable certification device. See also 7.1 Functional and verification tests.

6 SAFETY INSTRUCTIONS

6.1 ASSEMBLY

During installation, it may be necessary to ensure that the clearance and creepage distances required by DIN EN-50155 are adhered to. The insulation effect of the network insulator must not be impaired by adjacent conductive components.

The EN-95 network isolator should always be mounted close to the device to be protected because the manufacturer only ensures the protective properties of the network isolator directly at its own outputs.

6.2 HOUSING AND PLUG ENVIRONMENT

The EN-95 network insulator provides excellent isolation between input and output. However, the plastic housing of the network insulator provides only basic isolation. The metal conductive parts of the M12 sockets and the connected plugs are freely accessible to the user and offer no protection. If the risk management process of the organisation responsible shows unacceptable risks in the event that operators could touch the enclosure or exposed conductive parts, the network isolator and exposed conductive surfaces can be surrounded with a suitable enclosure.

7 FUNCTIONAL AND SAFETY TESTS

7.1 FUNCTIONAL AND VERIFICATION TESTS

A cable section equipped with the EN-95 network insulator can be tested with regard to its transmission characteristics with cable certification devices that are suitable for testing an electrically isolated cable section. The prerequisite for the test is that the test device can be set to a test mode that does not require a galvanic connection ("AC Wire map" mode). With the network isolator used, the cable section can be removed according to EIA/TIA 568 Cat.5e or ISO 11801 Class D. It is not possible to check the shielding and the cable resistance in this operating mode.

7.2 SAFETY CHECKS

The requirements to be fulfilled within the framework of repeat tests, tests after repairs, and the test interval are then determined for the overall system by the organisation responsible based on the applicable standards for this electrical system.

In order to simplify the implementation, individual parts of the electrical system – in this case the network insulator – can be tested separately. The organisation responsible also specifies the test parameters and the test interval for this. Depending on the requirements profile, such an examination may include the following individual examinations:

7.2.1 VISUAL INSPECTION

Inspection for externally visible damage.

7.2.2 HIGH VOLTAGE TEST

To avoid damaging the test specimen, it is recommended to use a DC voltage source and set 1.5 times the required AC test voltage. The achievable values can be found in Section 8 Specifications.

8 SPECIFICATIONS

8.1 GENERAL

Category	Standards or Test Criteria	Properties
Designation		EMOSAFE EN-95
Partnumber		A10302
Housing Color		Black
Housing Material		Plastic
Construction		Standalone
Input Interface		M12X-Jack, 8-pole, straight
Output Interface		M12X-Jack, 8-pole, straight
Weight		347 g
Protection Rating	connected	IP65
Mating Cycles	M12X-Jack into M12X-connector	> 1000
MTTF (25°C)	SN 29500 Standard, Temperature 25°C, Working Cycles 100 % (7 days, 24 hr)	3.230 years
MTTF (40°C)	SN 29500 Standard, Temperature 40°C, Working Cycles 100 % (7 days, 24 hr)	3.060 years

8.2 ETHERNET PERFORMANCE

Category	Standards or Test Criteria		EN-95
Transmission Speeds and Supported Network Protocols	10 Mbit/s 10Base-T (IEEE802.3 Cl.14)		✓
	100 Mbit/s 100Base-Tx (IEEE802.3 Cl.25)		✓
	1000 Mbit/s 1000Base-T (IEEE802.3 Cl.25)		✓
Performance Category	ISO 11801 Channel (CH)		Class D
Insertion Loss (absolute)		Typical	0,7 dB @ 100 MHz
		Maximum	1,0 dB @ 100 MHz
Return Loss (absolute)		Typical	20,0 dB @ 100 MHz
		Maximum	16,0 dB @ 100 MHz

8.3 ELECTRICAL

Category	Standards or Test Criteria	EN-95
AC Dielectric Strength	@ 50 Hz, for 1 second	4.0 kV
DC Dielectric Strength	for 1 second	5.6 kV
Coupling Capacitance per Channel		37,5 pF $\pm 25\%$
Total Coupling Capacitance		150 pF $\pm 25\%$
Total Leakage Current	275 V AC at 50 Hz	Typical:
TVS diode circuitry	suppression of transient over voltages on signal lines	✓

8.4 OPERATING CONDITIONS AND AREA OF APPLICATION

Category	Standards or Test Criteria	EN-95
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 300 V DC
Temperature		Minimum: -40°C
		Maximum: +70°C
Air Humidity	Non-condensing	Minimum: 10%
		Maximum: 90%
Air Pressure		Minimum: 700 hPa
		Maximum: 1,060 hPa
Altitude		Maximum: 3,200 m

8.5 ENVIRONMENTAL CONDITIONS: STORAGE AND TRANSPORTATION

Category	Standards or Test Criteria	EN-95
Temperature		Minimum: -40°C
		Maximum: +85°C
Air Humidity	Non-condensing	Minimum: 10%
		Maximum: 95%
Air Pressure		Minimum: 500 hPa
		Maximum: 1,060 hPa

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

8.6 CERTIFICATES

Category	EN-95
IEC 61373	✓
DIN EN 50155:2017	✓
Low Voltage Directive	✓
EMC Directive	✓
RoHS Directive	✓
Lead-free	✓

The versions of the cited standards and directives to which our products comply with can be found in our Declaration of Conformity on our website under "[Standard Conformity and Certificates](#)".

8.7 ISOLATION DIAGRAM

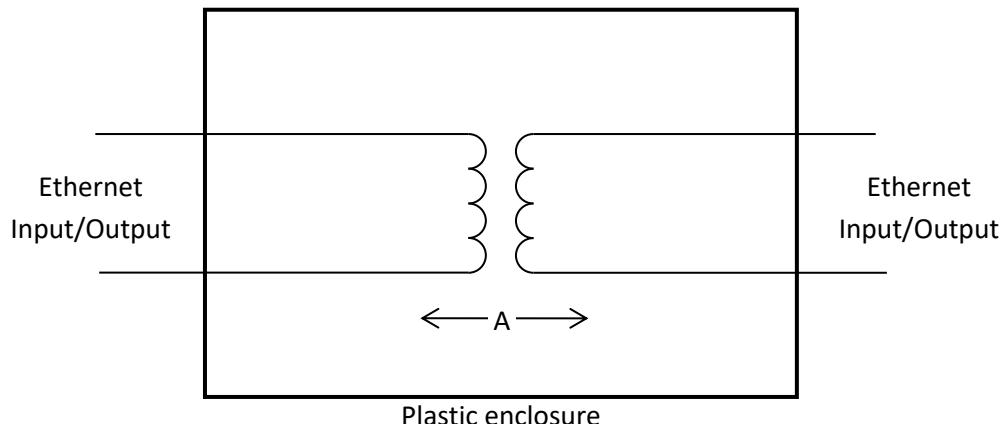


Figure 2 Isolation Diagram for EN-95

Area	Max. Operating Voltage		Required creepage distance (mm)	Required clearance distance (mm)	Measured creepage distance (mm)	Measured clearance distance (mm)
	V AC	V _{Max}				
A	250	350	8,0	5,0	12,4	12,4

8.8 FREQUENCY RESPONSE

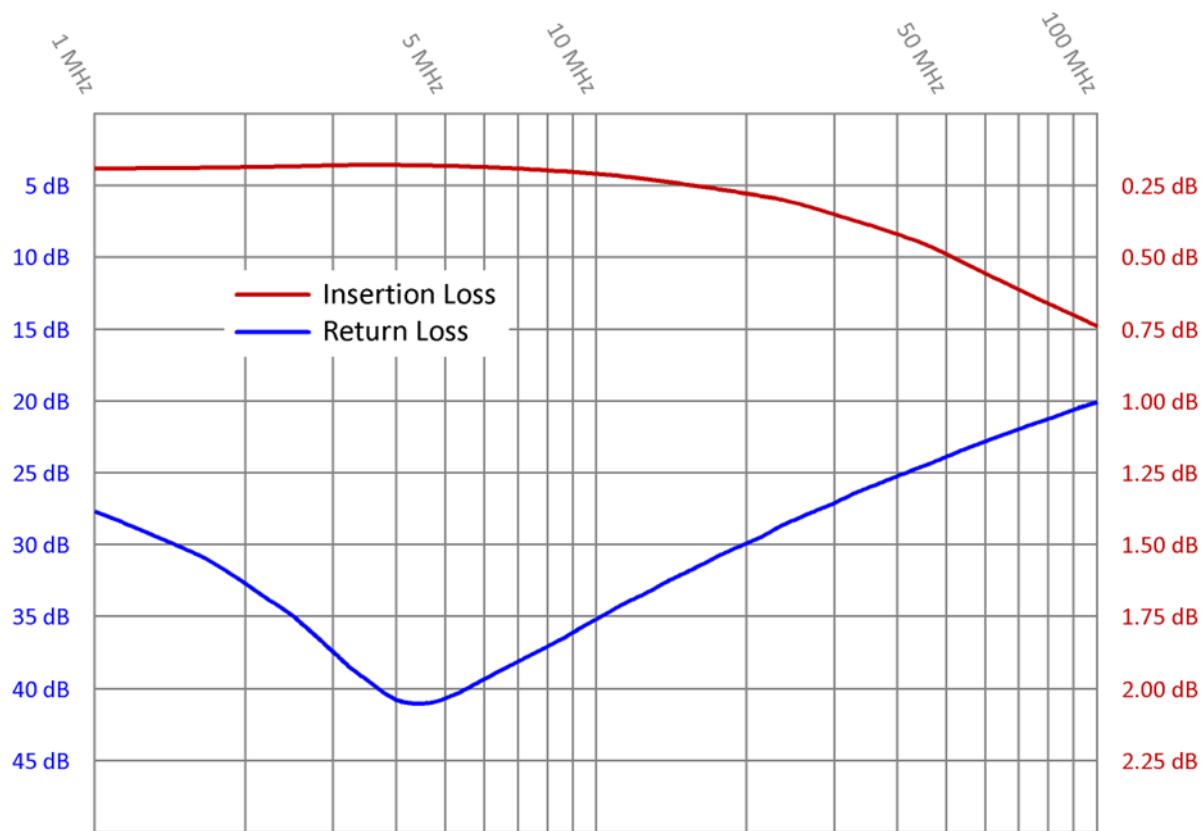


Figure 3 Typical frequency response for Insertion Loss and Return Loss of EN-95

9 CIRCUIT DIAGRAM

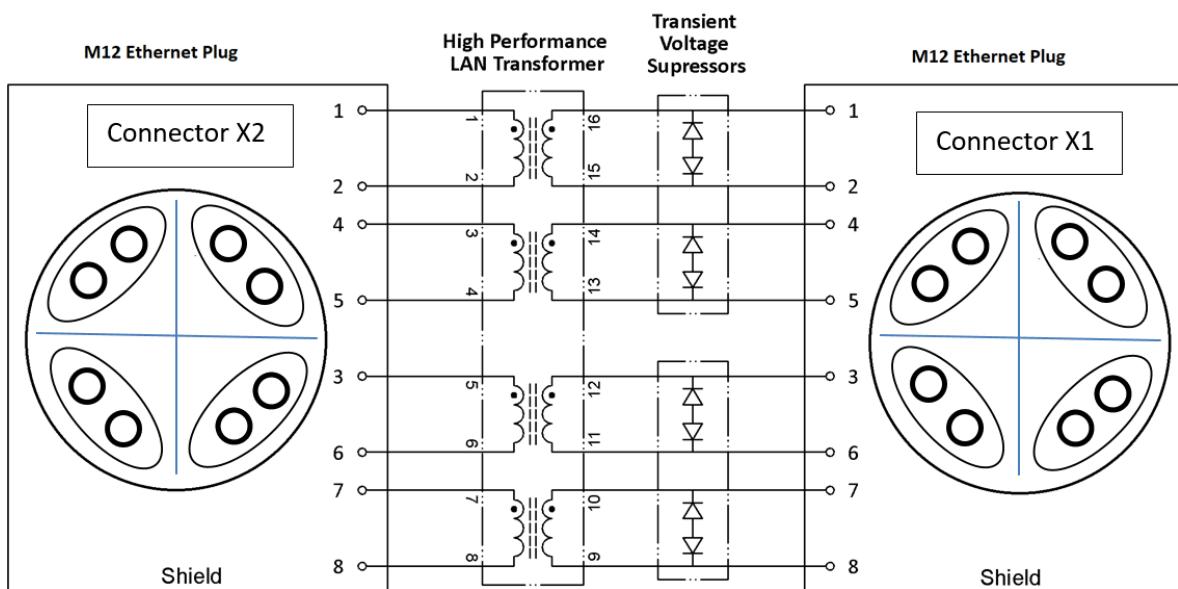


Figure 4 Circuit Diagram of EN-95 with transformer and Supression-Diodes

10 PRODUCT MARKINGS

	Through this mark, the conformity of the product with all applicable EU Directives is confirmed.
	The product may not be disposed of in domestic rubbish.
	This product contains no substances containing lead and is manufactured using lead-free solder.
	This product meets the requirements of EU Directive concerning the limitation of the use of certain hazardous substances in electric and electronic equipment.

11 SCHEDULED MAINTENANCE

When used as directed, EN-95 Network Isolator is maintenance-free.

12 ENVIRONMENTAL PROTECTION INFORMATION

This device contains electronic components. At the end of its service life it is to be returned to the manufacturer for disposal.

13 QUALITY

EMO Systems operates a certified quality management system for development and production in accordance with ISO 9001 and ISO 13485. Prior to delivery, each Network Isolator is subjected to a comprehensive quality inspection. This inspection ensures, among other factors, that the attained values for leakage currents, dielectric withstand strengths, insertion losses, return losses, and near end crosstalk values all meet the specified requirements.

14 CONTACT AND SUPPORT

Please find our up-to-date contact details on our website: <http://www.emosystems.de/en/contact>

Or send us an e-mail at the following address: support@emosystems.de

15 LEGAL NOTIFICATION

The information provided above in this datasheet has been compiled with all due care, and is believed to be accurate and reliable. However, we cannot guarantee that the information contained is completely free from error. The end user is responsible and liable for the proper use of this product; EMO Systems assume no liability. We reserve the right to make changes to this datasheet without notice.