

EMOSAFE EN-20G

Product Datasheet

Gigabit Network Isolator in robust plastic housing



1 FEATURES AND ADVANTAGES

- Gigabit Ethernet
- Robust plastic housing for wall for wall mounting
- Optionally usable mounting brackets
- Conforms to IEC 60601-1
- UL Recognized Component
- RoHS compliant
- Suitable for devices with supply voltages up to 250 V AC or 300 V DC
- Dielectric strength 4.0 kV AC or 5.6 kV DC
- 100 % inspection by our Quality Control

2 GENERAL DESCRIPTION

EMOSAFE EN-20G Network Isolators disconnect every electrically conducting connection between devices connected via a copper-based Ethernet network. The Network Isolators prevent current flow resulting from differences in electrical potentials and 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.

Built into a medical electrical device, the EMOSAFE EN-20G Network Isolator facilitates the safe Ethernet connection of this product within the patient environment. The EN-20G fulfils all the constructional requirements of IEC 60601-1, and forms two Means Of Patient Protection (2 MOPP) within the network interface, as well as practically eliminating the risk to patients and operators arising from electrical shocks created by stray voltages present on the network connection.

The EN-20G has a robust plastic housing, suitable for wall mounting. Included with the EN-20G are four assembly brackets which can be used to mount the Network Isolator to a wall or to a device panel. Alternatively, the EN-20G housing can be simply glued to a flat surface with a suitable adhesive. The EN-20G is further distinguished by its gigabit Ethernet capability and by its robust construction.

As a UL Recognized Component, the EN-20G Network Isolator is also suitable for inclusion in systems destined for export in the North American markets.

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

- **Patient protection**
Electrical separation of Ethernet interfaces of medical electrical devices and systems, where patients 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.
- **Potential differences (Technical building systems)**
Computer systems, which are electrically connected with each other over significant distances via Ethernet cabling, where current flows caused by potential differences must be prevented.
- **Power over Ethernet (PoE)**
The Network isolators can be used in a PoE network without restrictions, but PoE end devices cannot be supplied with voltage behind the location of the galvanic isolation.
- **Audio**
Audio applications, in which the transmission of low frequency alternating current voltages (mains hum) over the network connection is to be reduced to an imperceptible level.

4 TECHNICAL DRAWINGS

All dimensions in millimetres

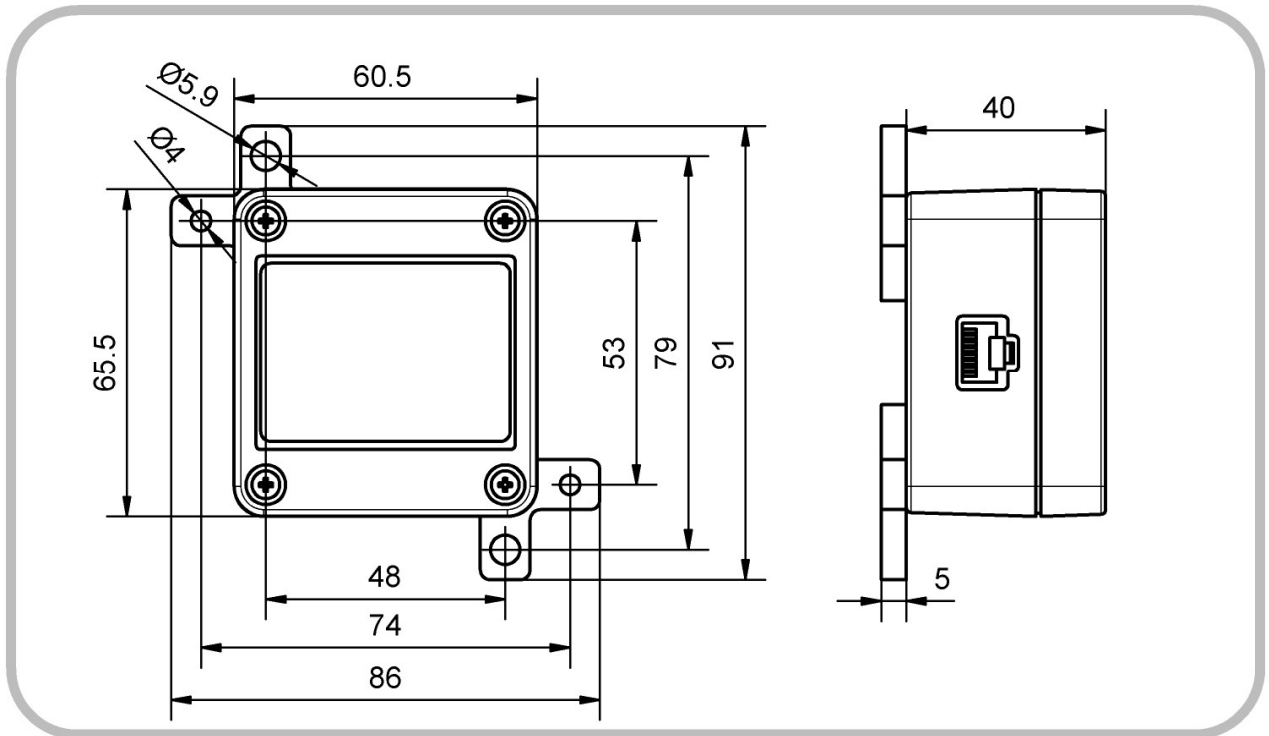


Figure 1. Physical dimensions of EN-20G with mounting brackets

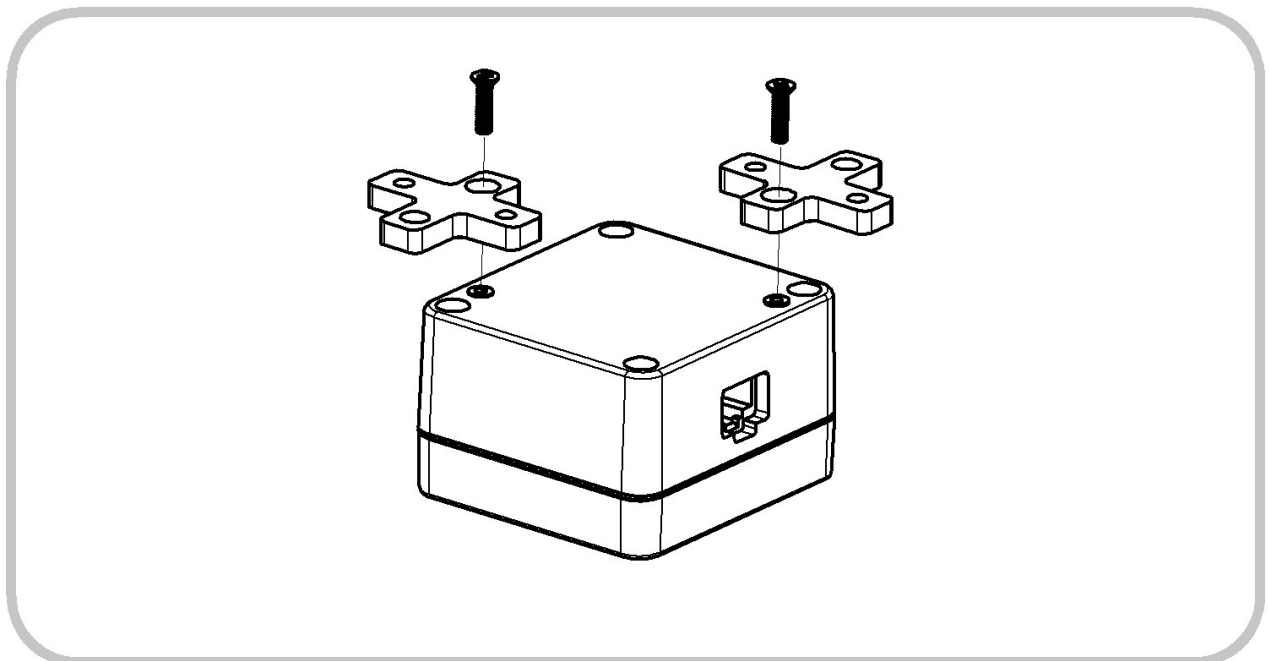


Figure 2. Assembly of the mounting brackets

5 INSTALLATION INFORMATION

5.1 GENERAL

EN-20G Network Isolators are designed for data transmission in the frequency range of 0.3 MHz to 100 MHz. Lower frequencies are strongly attenuated. For this reason, it is generally not possible to transmit signals from nurse call systems, telephone systems or analog audio or video signals over a Network Isolator.

The EN-20G Network Isolator can be used in a Power over Ethernet (PoE) network without restriction (however PoE devices downstream of the electrical isolation are not supplied with power). A PoE Injector can be installed to supply downstream devices; however it is critical that this power supply meets or exceeds all applicable medical electrical requirements, in order to maintain the effectivity of the Network Isolator.

5.2 EQUIPMENT INSTALLATION

When mounting Network Isolators into equipment or devices, it is essential that the manufacturer observes the applicable creepage and clearance distances. Specifically, the creepage and clearance distances between exposed metal surfaces of Ethernet patch cables plugged into the Network Isolator, and the next-closest electrically conducting components of the equipment or device to be protected. The requirements of IEC60601-1 are particularly relevant.

6 SAFETY NOTICE

During assembly, attention should be paid (when applicable) to ensure that the clearance and creepage distances required by IEC 60601-1 are met. The isolating effect of the Network Isolator must not be compromised by neighboring conductive components. If, for example, the installation of the Network Isolator is to be within a metal plate, this plate must be connected to the ground potential (protective earth).

As a matter of principle, Network Isolators should be mounted as close as possible to the equipment requiring protection.

Network Isolators which are damaged or which are contaminated by dust or liquids, are to be replaced.

7 FUNCTION AND SAFETY INSPECTIONS

7.1 FUNCTION AND COMPLIANCE TESTS

A cable route equipped with an EN-20G Network Isolator can be checked regarding its transmission characteristics using cable certification devices which are suitable for testing an electrically isolated cable route. To be able to conduct such an inspection, the test equipment must be configured in an AC wiremap mode. With the installed Network Isolator, the entire cable route can be approved according to EIA/TIA-568 Cat.5e or ISO 11801 Class D. Testing of the cable shielding and the individual conductor resistance is not possible in such an AC test mode.

7.2 SAFETY INSPECTIONS

Regular safety inspections and post-repair inspections are not prescribed for Network Isolators in medical use, as Network Isolators themselves are not classified as medical electrical (ME) devices. However, together with a connected ME device, Network Isolators form part of an ME system, which altogether may be subject to statutory inspection. The test interval, as well as the requirements to be met for both regular safety inspections and post-repair inspections will be specified by the responsible organization based upon the applicable standards for the entire ME system.

To simplify implementation, the individual components of the ME system (in this case, the Network Isolator) can be tested separately. The responsible organization specifies the test parameters, test interval and in the event of a failed test, the consequences. Depending on the requirement profile, the test can include one or more of the following individual tests:

7.2.1 VISUAL INSPECTION

Check for evidence of external damage and ingress of substances, dust or liquids for example.

7.2.2 LEAKAGE CURRENT TEST

It is to be checked if the measured leakage current is still within the prescribed limits. For this purpose, test equipment which can perform equipment leakage current measurements in accordance with IEC 62353 may be used. To perform a leakage current test, all conductors on the input side must be short-circuited together, and all the conductors on the output side must also be short-circuited together. The AC test voltage specified by the responsible organization is then applied across these two connections. Input and output sides are interchangeable. The expected current flow can be found in section [8 SPECIFICATIONS](#).

7.2.3 HIPOT TEST

To ensure that the device under test is not damaged, it is recommended that a DC voltage source is used and 1.5 times of the required AC voltage is applied. The test setup is essentially the same as the Leakage Current Test above. The expected dielectric strength can be found in section [8 SPECIFICATIONS](#).

7.2.4 FUNCTIONAL TEST

After conducting the tests above, and reconnecting the Network Isolator into the Ethernet network, it is recommended to check whether the signal transmission is still performing correctly. Such a functional test can be performed, for example, with a suitable Ethernet cable certification device. See also section [7.1 FUNCTION AND COMPLIANCE TESTS](#).

8 SPECIFICATIONS

8.1 GENERAL

Category	Explanation	Properties
Designation		EMOSAFE EN-20G
Housing color		Beige
Housing Material		Plastic
Construction		Self-Enclosed
Fastening type		Screws
Input Interface		RJ45 Jack, straight
Output Interface		RJ45 Jack, straight
Weight	approximately	95 g
Protection rating	Appropriate to EN 60529	IP40
Mating cycles	RJ45 plug into RJ45 socket	> 250
Mean Time To Failure (MTTF)	SN 29500 Standard, Temperature: 25 °C, Duty cycle: 100 %, (24 hours, 7 days)	4,590 years
	SN 29500 Standard, Temperature: 40 °C, Duty cycle: 100 %, (24 hours, 7 days)	4,260 years

8.2 ETHERNET PERFORMANCE

Category	Standards or Test Criteria	EN-20G
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.40)	✓
Performance Category	ISO 11801, Permanent Link (PL)	Class D
Insertion Loss (absolute)	Typical	1.5 dB @ 100 MHz
	Maximum	2.0 dB @ 100 MHz
Return Loss (absolute)	Typical	8.0 dB @ 100 MHz
	Minimum	6.0 dB @ 100 MHz

8.3 ELECTRICAL

Category	Explanation		EN-20G
AC Dielectric Strength	@ 50 Hz, for 60 s		4.0 kV
DC Dielectric Strength	for 60 s		5.6 kV
Reinforced Isolation	Appropriate to IEC 60601-1		✓
Coupling Capacitance per Channel			12 pF ±25 %
Total Coupling Capacitance			48 pF ±25 %
Total Leakage Current	275 V AC @ 50 Hz	Typical	3.0 µA
		Maximum	6.0 µA

8.4 OPERATING CONDITIONS AND AREA OF APPLICATION

Category	Explanation		EN-20G
Pollution Degree	Appropriate to IEC 61010		2 *
Overvoltage Category	Appropriate to IEC 60664-1		III
Maximum Working Voltage	Maximum mains voltage of the connected devices, appropriate to IEC 60601-1		250 V AC 300 V DC
Temperature		Minimum	+1 °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

* Normally only nonconductive pollution occurs. Temporary conductivity caused by condensation is to be expected.

8.5 ENVIRONMENTAL CONDITIONS: STORAGE AND TRANSPORTATION

Category	Explanation		EN-20G
Temperature		Minimum	-25 °C
		Maximum	+85 °C
Air Humidity	Non-condensing	Minimum	10 %
		Maximum	90 %
Air Pressure		Minimum	500 hPa
		Maximum	1,060 hPa

8.6 CERTIFICATES

Category	EN-20G
UL Recognized Component	✓
UL File No.	E362969
IEC 60601-1	✓
IEC 60601-1-2	✓
ANSI/AAMI ES 60601-1	✓
CAN/CSA-C22.2 No. 60601-1	✓
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 and our UL certificate on our website under "[Standard Conformity and Certificates](#)".

8.7 ISOLATION DIAGRAM

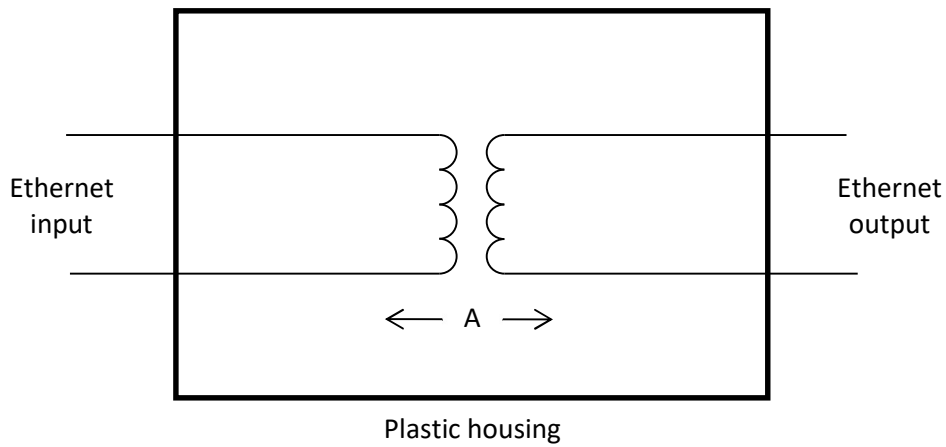


Figure 3. Isolation diagram for EN-20G

Area	Number and type of Means of Protection	Material Group (from CTI)	Maximum Operating Voltage		Required creepage distance (mm)	Required clearance distance (mm)	Measured creepage distance (mm)	Measured clearance distance (mm)
			V AC	V _{peak}				
A	2 MOPP *	IIIb †	250	353	8.0	5.0	9.0	9.0

8.8 FREQUENCY RESPONSE

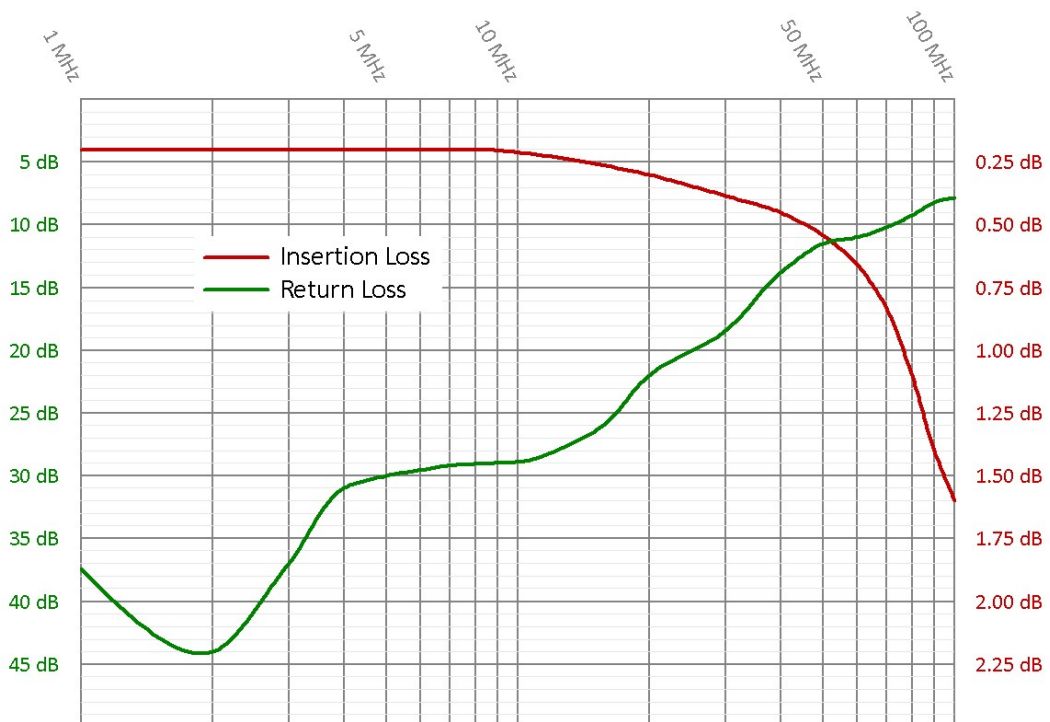


Figure 4. Typical frequency response for Insertion Loss and Return Loss of an EMOSAFE EN-20G Network Isolator.

* MOPP = Means of Patient Protection

† Materials in the Material Group IIIb have a Comparative Tracking Index (CTI) value between 100 and 175.

9 CIRCUIT DIAGRAM

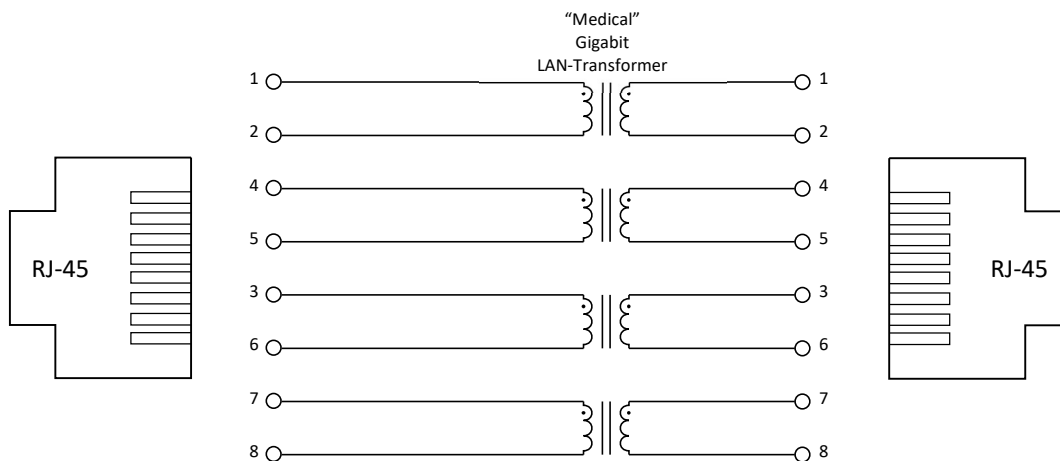






Figure 5. Circuit diagram for EN-20G

10 SCHEDULED MAINTENANCE

EMOSAFE network isolators are maintenance-free when used as intended.

11 PRODUCT MARKINGS

	<p>Through this mark, the conformity of the product with all applicable EU Directives is confirmed.</p>
	<p>Marks the product as a UL "Recognized Component"; File number E362969.</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>

12 ACCESSORIES

There are no accessories available for the EMOSAFE EN-20G network isolator.

13 QUALITY

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 extensive quality control before delivery. Among other things, it is checked whether the achieved values for leakage current, dielectric strength, insertion loss, return loss and near crosstalk (NEXT) correspond to the specifications.

You will also find a declaration of conformity on our website confirming that the EMOSAFE network isolators comply with the requirements of the Low Voltage Directive (2014/35/EU), the Electromagnetic Compatibility Directive (2014/30/EU) and the Restriction of Use Directive hazardous substances in electrical and electronic equipment (2011/65/EU, RoHS).

14 PACKAGING

The packaging label provides the following information:

- Article description
- Quantity
- Date of manufacture
- Ordering code (OC)
- Serial number as 1D- (Code 128) and a 2D barcode (Data Matrix)

Contents:

- A network isolator of type EN-20G
- 4 mounting brackets including screws
- 2 wall plugs \varnothing 6 mm and screws for wall mounting
- This data sheet

15 ENVIRONMENTAL PROTECTION INFORMATION

This device contains electronic components.

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

16 CONTACT AND SUPPORT

You can find the 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

17 LEGAL NOTICE

The information in this data sheet has been compiled to the best of our knowledge and with all 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 liability.

This data sheet is subject to change without prior notice.

