

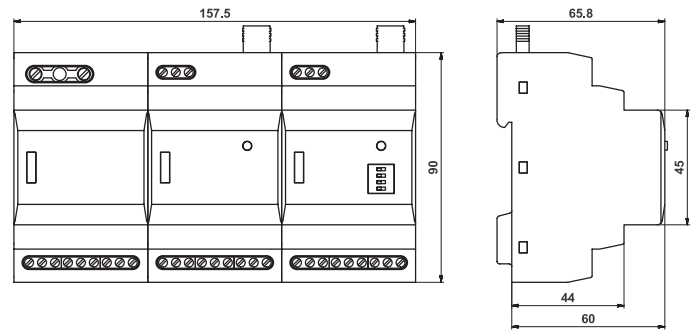


**hakes**<sup>®</sup>

Hz in Hearts

**Insulation Monitoring Device  
for rail vehicles**

**ISOLGUARD HIG99**  
meets the requirements of EN 50155



## HAKEL ISOLGUARD HIG99

The insulation monitoring device produced by HAKEL, type ISOLGUARD HIG99, is designed for monitoring the insulation status of single-phase, multiphase and direct ungrounded IT power supply systems. Device is also able to monitor combined IT power supply systems, type AC/DC according to standard IEC 61557-8. HIG99 is mainly designed for use on rail vehicles and industrial systems containing rectifiers, inverters and frequency converters.

Maximum operating voltage of monitored IT power supply system is 1 000 V DC / 710 V AC. Device is directly connected to the monitored IT power supply system, no additional inductor is needed.

HIG99 monitors two insulation status's critical levels, it is equipped with signalling diodes for local status of the device and IT power supply system signalization. Local signalization is complemented by a pair of switching relays for IT power supply fault status signalization. It is possible to realize remote signalization using communication module type HIG99 KM by CAN interface with CAN OPEN protocol.

Using the CAN communication module, numerical information on the status and value of the insulation resistance can be read, the device's settings can be checked and changed or test cycles can be performed.

This device is also equipped with a blocking function thanks to which it is possible to disconnect HIG99 from the monitored system if necessary.

**Only one insulation monitoring device can be connected to the same ungrounded IT power supply system.**

### Basic characteristics

#### HIG99 module complies with standard:

- IEC 61557-8:2014 - Insulation monitoring devices for IT systems
- IEC 61557-1:2007 - Equipment for testing measuring or monitoring of protective measures
- IEC 61010-1:2010 - Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 50155:2017 - Rolling stock – Electronic equipment
- EN 45545-2:2013 - Railway applications – Fire protection on railway vehicles
- EN 50121-3-2:2016 - Railway applications – Electromagnetic compatibility
- EN 50125-1:2014 - Railway applications – Environmental conditions for equipment
- IEC 61373:2010 - Railway applications – Rolling stock equipment – Shock and vibration tests

#### HIG99 basic characteristics

- Insulation monitoring device for AC, DC, AC/DC systems with 9 to 1 000 V DC / 710 V AC voltage, direct or with 10 – 440 Hz frequency.
- Device is designed for use on rail vehicles and industrial systems containing rectifiers, inverters and frequency converters.
- Device is powered from an independent 24 V DC power supply.
- Loss of connection indication with the measured power supply system and the ground.
- Automatic internal test for unfunctional device detection.
- Device evaluates two insulation resistance critical limits.
- Two monitored power supply system's insulation resistance status signalling relays with switching contact for two insulation resistance critical limits.
- Option to start device test by push-button on the module.
- Option to connect communication module, type HIG99 KM, for device's connection to master bus-bar system.
- Option to set critical values, hysteresis values and other parameters by KM type module.
- HIG99, in connection with any HIG99 KM module, is 9M (158 mm) wide and is designed for assembling on 35 DIN rail.

#### HIG99 KM CAN basic characteristics

- Communication module for HIG99 device.
- Enables HIG99 device connection on CAN industrial bus-bar.
- Module is equipped with CAN OPEN protocol according to EN 50325-4.
- Basic communication speed is 250 kbit/s, can be modified after agreement.
- Enables information forwarding about insulation resistance value and its faults as PDO/SDO information.
- Enables to read and change device's settings as SDO command.
- Enables CAN bus-bar termination by integrated switch in four different modes.
- Enables device functions block and device disconnection from monitored power supply system by external input.
- Enables device test using external input.
- Module is powered from the device.

**HAKEL ISOLGUARD HIG99**

Model	Display menu	Signalling relay	Range of displayed value	Critical insulation resistance	Remote signalization	Device type according to IEC 61557-8
<b>HIG99</b>	No	2x SPST	1 kΩ to 1 MΩ	Adjustable 1 to 500 kΩ	Communication modules type HIG99 KM	AC/DC
Art. no. 70 970						

Notes: SPST – signalling relay with one switching contact (type NO)

**Communication modules ISOLGUARD HIG99**

Model	Communication interface type	Protocol	Insulation voltage	Other features		
<b>HIG99 KM CAN</b>	CAN	CAN OPEN	3 kV <sub>rms</sub>	Bus-bar communication speed 250 kbit/s	Possible bus-bar termination by switch	The node address number is assigned via the bus
Art. no. 70 972						

**Technical characteristics**

Type		ISOLGUARD HIG99
Monitored IT power supply system type		AC, DC, AC/DC
Supply voltage range	U <sub>n</sub>	9 ÷ 1 000 V DC / 9 ÷ 710 V AC (10 ÷ 440 Hz)
Nominal supply voltage	U <sub>s</sub>	24 V DC
Supply voltage range		9 ÷ 36 V DC
Power consumption	P	max. 5 VA
<b>Measuring circuit</b>		
Measuring voltage	U <sub>m</sub>	40 V=
Measuring current	I <sub>m</sub>	< 0,5 mA
Measuring input's internal impedance	Z <sub>i</sub>	> 1 MΩ
Internal direct resistance	R <sub>i</sub>	> 1 MΩ
Permissible system leakage capacitance	C <sub>e</sub>	10 μF
Measuring range	R <sub>F</sub>	1 kΩ ÷ 1 MΩ
Measuring accuracy		± 15 %
Reaction value's setting range R <sub>an</sub>	R <sub>an</sub>	adjustable 1 kΩ ÷ 500 kΩ
Insulation resistance hysteresis	R <sub>hyst</sub>	adjustable 0 ÷ +100 % R <sub>an</sub>
<b>Outputs</b>		
Two signalling switching contacts with optional position NO or NC		24 V~ / 1 A 24 V= / 1 A
Electrical strength to the internal circuits and supply circuits		3000 V~ 3000 V=
Remote signalization		Using communication modules type HIG99 KM.

Communication module		ISOLGUARD HIG99 KM CAN
Module supply		Provided by HIG99
Communication interface for user		CAN bus-bar
Communication protocol		CAN OPEN
Communication speed		250 kbit/s (can be modified after agreement)
Bus-bar termination		Can be realized by integrated switch Rte
Bus-bar's electrical strength to internal module circuits, operational inputs		3 kV DC
Operational inputs		E.Black for remote device's disconnection from monitored power supply system E.Test for remote device test
Voltage for operational inputs logical 1		9 ÷ 36 V DC
Operational inputs electrical strength to internal module circuits, CAN bus-bar and HIG99		5 kV~

General data		HIG99	HIG99 KM CAN
Degree of protection according to IEC 60529		front panel IP40 protection except front panel IP20	
Weight	m	154 g	
Housing material		PA - UL 94 V0	
Method of assembly		On the 35 DIN rail	
Recommended section of the connected conductors	S	Terminal box X1: 2,5 mm <sup>2</sup> Other: 1 mm <sup>2</sup>	1 mm <sup>2</sup>
Recommended protection		6 A	-
Article number		70 970	70 972

Operating conditions	HIG99, HIG99 KM CAN	
Operating temperature	-40 °C ÷ +70 °C (OT4 according to EN 50155)	
Storage temperature	-40 °C ÷ +70 °C	
Transport temperature	-40 °C ÷ +70 °C	
Altitude	up to 2000 meters above sea level	
Operating position	any	
Duty type	permanent	

### Recommended connection of HIG99 and HIG99 KM CAN to the monitored It power supply system

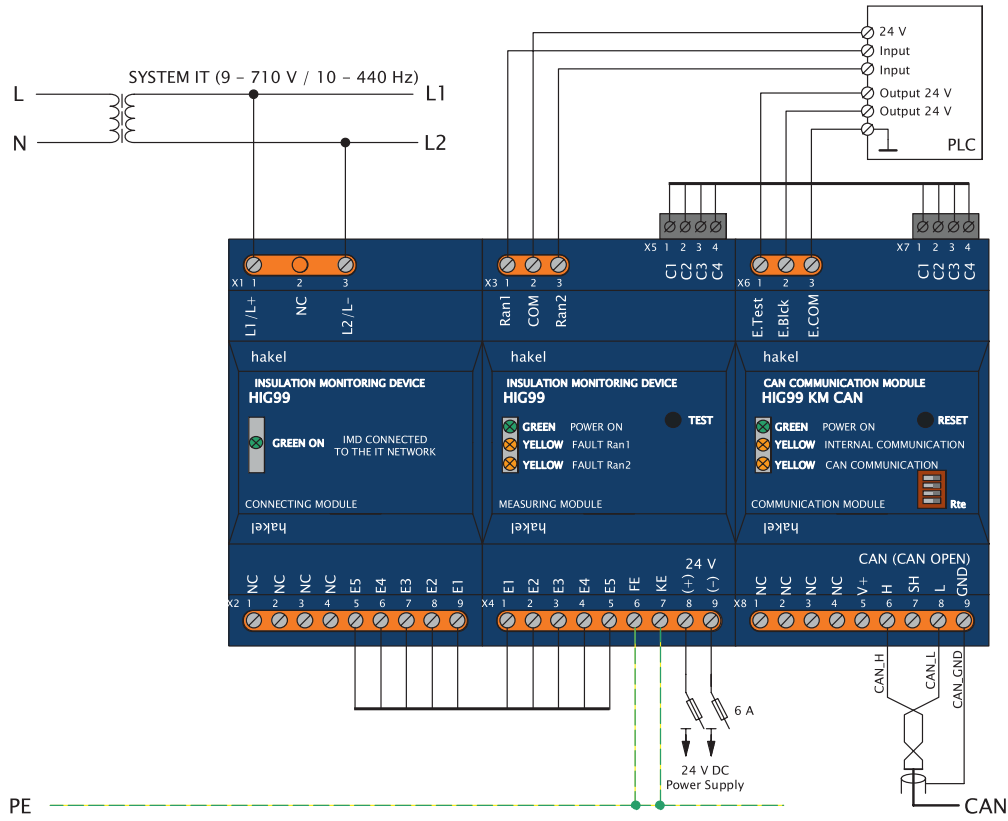
#### HIG99 and HIG99 KM CAN terminals meaning

- Terminals X1: Used to device's connection to monitored power supply system.
- Terminals X2: Used to connect connection module to monitoring module.
- Terminals X3: Two potential free relays with switching contact and COM common pole. Serves to forward information about insulation resistance status.
- Terminals X4: Used to connect the connection module to the monitoring module. Furthermore, it is used to supply a low voltage for HIG device and to provide functional and control grounding.
- Terminals X5, X7: Serves to HIG99 and HIG99 KM CAN connection. Other uses are excluded.
- Terminals X6: Galvanically separated inputs for device commanding. Used for device test and device's disconnection and connection from monitored power supply system. The inputs have a common ground potential – terminal E.COM.
- Terminals X8: CAN bus-bar's output. NC terminals are not used, V+ and SH terminals are not internally connected, they can be used for bus-bar connection.

#### Installation instructions

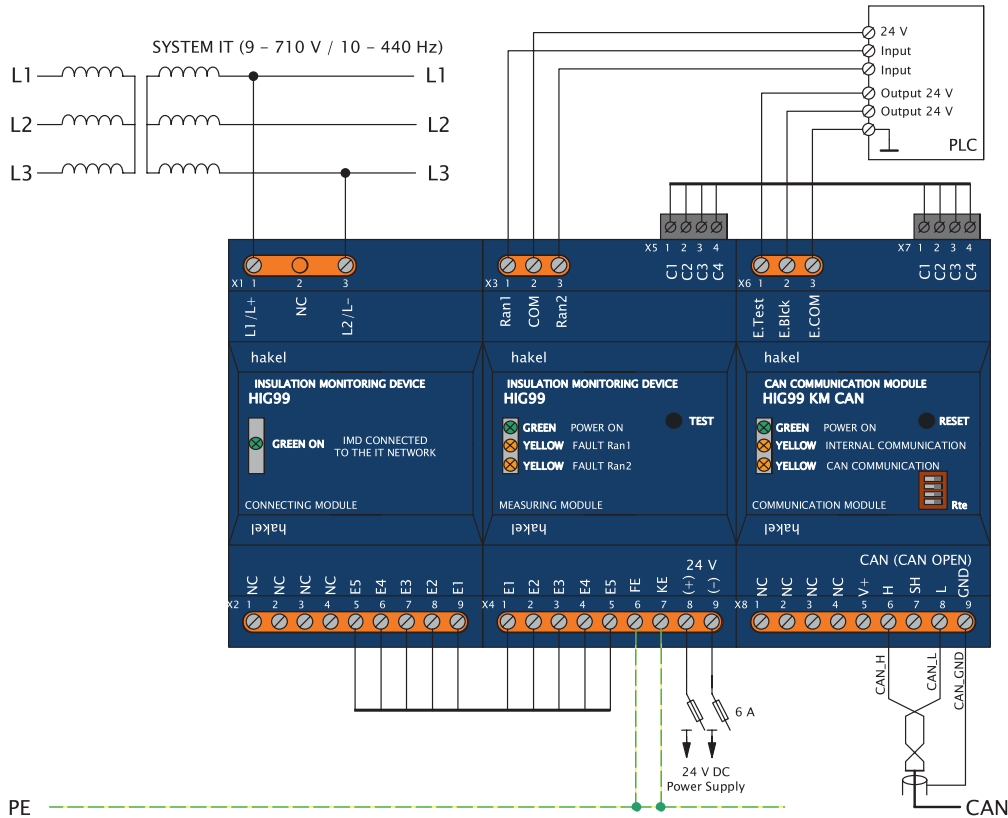
- NC terminals (Not Connected) are not connected, it is forbidden to connect them.
- FE and KE terminals are necessary to connect by separate conductors to PE bridge.
- It is possible to use Rte switch for CAN bus-bar termination.
- Keep linear CAN bus-bar connection, turns cannot be created.
- Install only one cable type along the CAN bus-bar entire length.

Connection for monitoring of single-phase IT power supply system



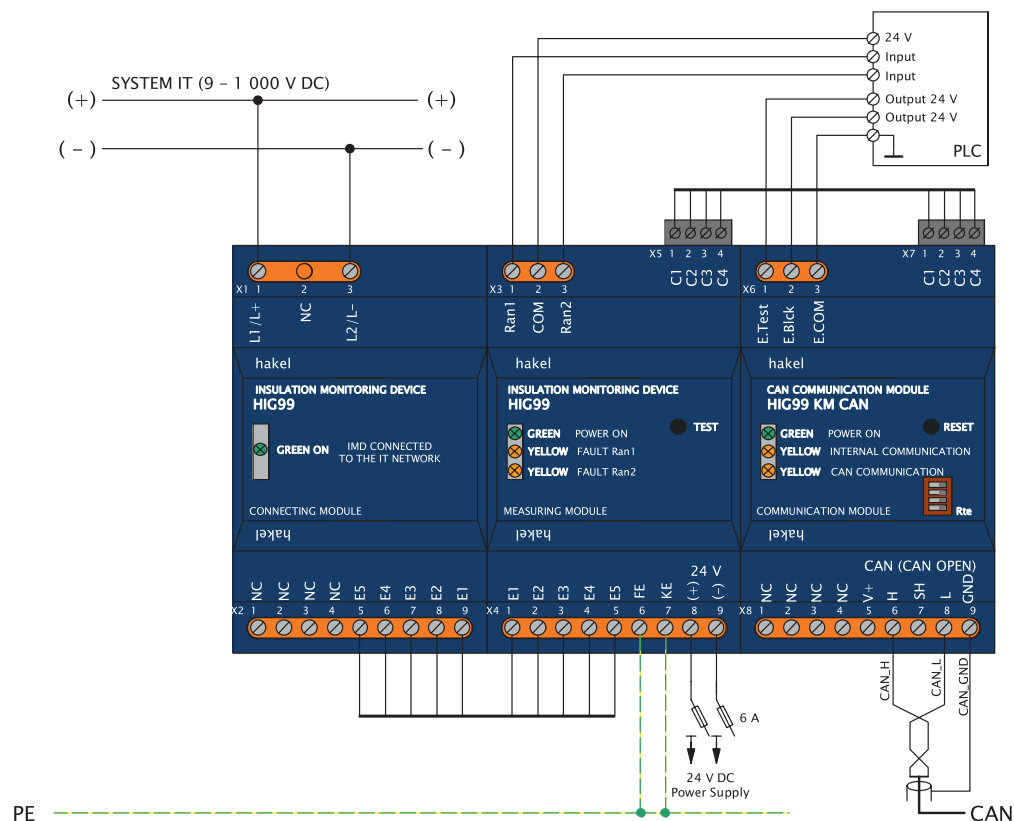
Picture 3, Single-phase IT power supply system's connection diagram

Connection for monitoring of 3-phase/multiphase IT power supply system



Picture 4, Multiphase IT power supply system's connection diagram

Connection for monitoring of DC IT power supply system



Picture 5. DC IT power supply system's connection diagram

**Maintenance and service**

It is necessary to follow specified conditions for reliable operation, do not expose the device to rough handling, keep it clean and ensure maximum admissible temperature of environment.

Only qualified personnel are allowed to install and set up the device. Only the producer provides repairs of the device. No personnel are needed to operate the insulation monitoring device. Technology service is during the operation informed by local and remote signalization about the monitored power supply.

