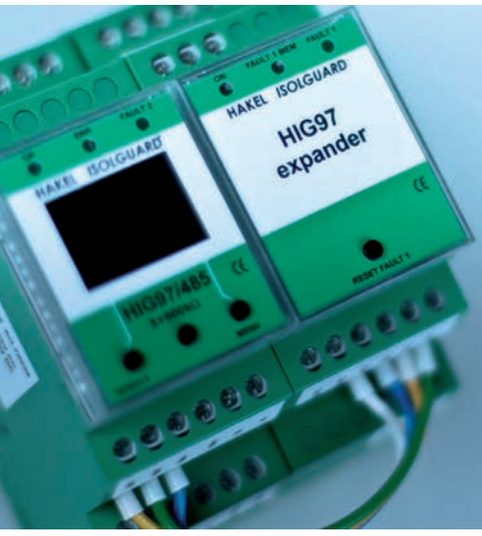
ISOLGUARD®
insulation monitoring device



overview catalogue

Insulation
Monitoring
Device

EUROPEAN UNION
European Regional Development Fund
Operational Programme Enterprise and Innovations for Competitiveness

hakel®
THE QUEEN OF POWER

ISOLGUARD®
insulation monitoring device

Hakel is a dynamic company which since foundation in 1994 has quickly developed in terms of turnover and the product assortment. This dynamism can also be observed in the approach to developing the quality of the manufacturing products.

Hakels experience in the use of power electronics in industry, is related to its leading position in the Czech Republic and Europe. Hakel produces and exports to all countries and all continents.

The insulation monitoring devices offered by the company are used for easy application in ungrounded IT power supply systems in metallurgy, civil engineering, shipbuilding, in hospitals and the transport environment.

CQS - Czech Association for Quality Certification
Pod Lisem 129, 171 02 Praha 8 - Troja
Czech Republic

CQS is the Certification Body accredited according to Standard EN ISO/IEC 17021:2011 by the Czech Institute for Accreditation under the registration No 3029 for the Certification of Quality Systems

CQS

CERTIFICATE

No.: CQS 2027/2016

CQS - Czech Association for Quality Certification - certifies that the Quality Management System of

HAKEL spol. s.r.o.
Bratří Štefanů 980, 500 03 Hradec Králové, Czech Republic

has been assessed and found to be in conformity with the requirements of

EN ISO 9001 : 2008

with respect to the following processes:

- **Design, development, production and sale of:**
  - **surge protection devices**
  - **insulation monitoring devices**
  - **railway voltage limiters**

******

The certificate is valid until: 14. 09. 2018
Certification decision: 09. 02. 2016
Date of issue: 09. 02. 2016
Date of granting the first certificate: 09. 03. 2001

Jana Olšanská
Managing Director

IQNet

CQS Members*:

Elektrotechnický zkušební ústav, s.p., Fyzikální a chemický zkušební ústav, s.p., Institut pro testování a certifikaci, a.s., Strojírenský zkušební ústav, s.p., Technický a zkušební ústav stavební Praha, s.p., Textilní zkušební ústav, s.p.

* A CQS member fail valid at the time of issue of the certificate. Current list is available at www.cqs.cz

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and CQS
hereby certify that the organization

HAKEL spol. s.r.o.
Bratří Štefanů 980, 500 03 Hradec Králové, Czech Republic

for the following processes

- **Design, development, production and sale of:**
  - **surge protection devices**
  - **insulation monitoring devices**
  - **railway voltage limiters**

has implemented and maintains a

Quality Management System

which fulfills the requirements of the following standard

ISO 9001 : 2008

Issued on: 2016 – 02 - 09
Validity date: 2018 – 09 - 14

Registration Number: **CZ – 2027/2016**

IQNet — Michael Drechsel, President of IQNet — Tomáš Hrnčíka, President of CQS — CQS

IQNet Partners*:

* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certifications.com

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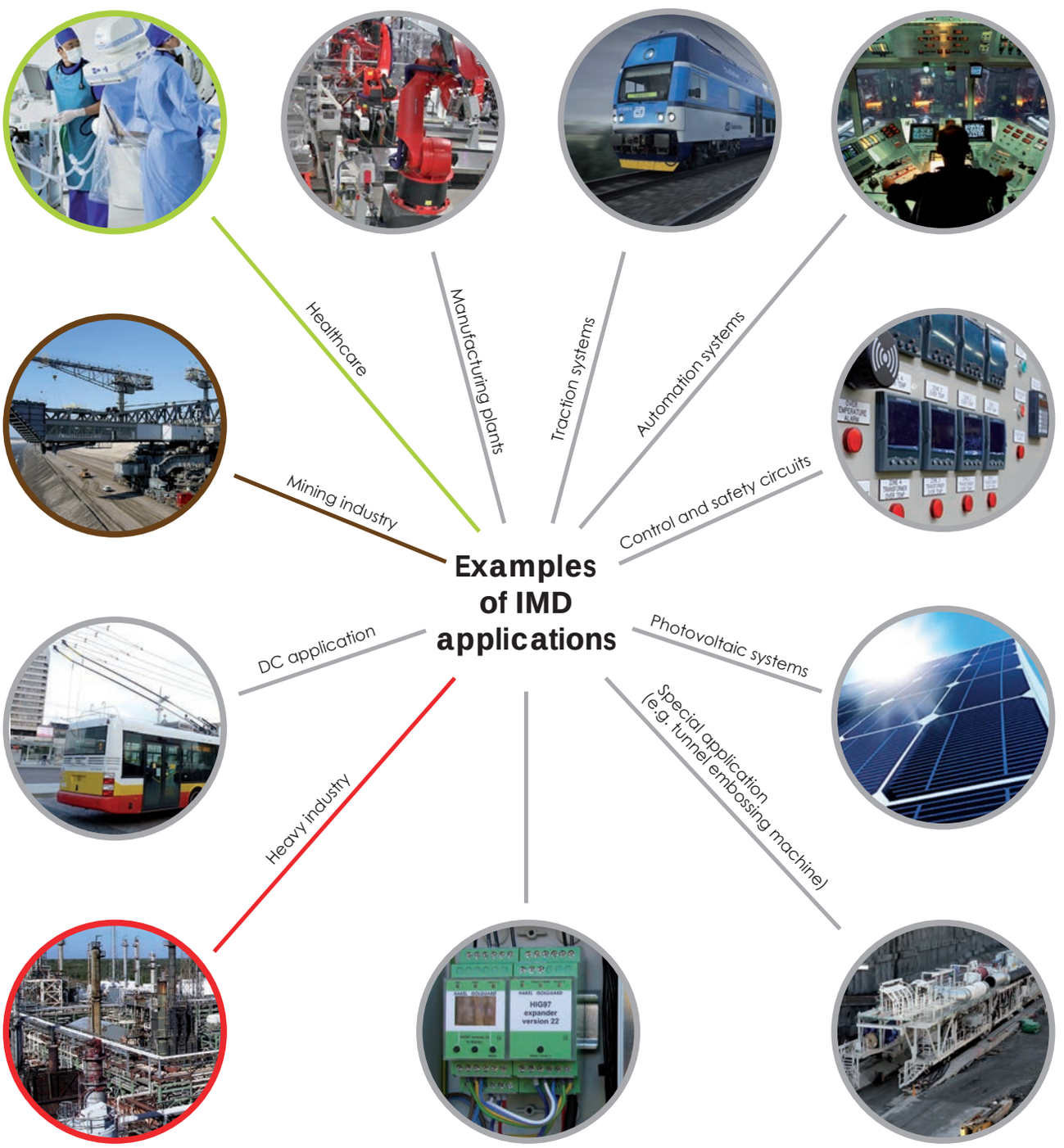
www.isolguard.com

IT power supply network

IT power supply system is an insulated system that has all active parts isolated from the earth or one point of the network grounded via high impedance. Inactive parts of the electrical installation are grounded. Ungrounded system increases the operational reliability and human safety. Therefore it is used in the metallurgy, mechanical engineering, shipbuilding, traction systems, public transport and hospitals. The advantage of the ungrounded system is that the device connected to this system can work continuously even in the case of first fault (so-called earth fault). The phase voltage of the undamaged phase (or phases in the three-phase system) is increased to the value of the delta voltage during the first fault. The system is safe if inactive parts are properly grounded. The reason is that there occur no bigger than safe current levels. The relevant responsible person must be informed about this failure and the first fault must be eliminated as soon as possible. However, the second fault (double earth fault) must result in immediate disconnection of the power supply system. The insulation monitoring devices or residual current relays are used for monitoring of the ungrounded system. These devices indicate the insulation level decrease below the set value.

IMD (Insulation Monitoring Device) utilization is at every IT power supply system.



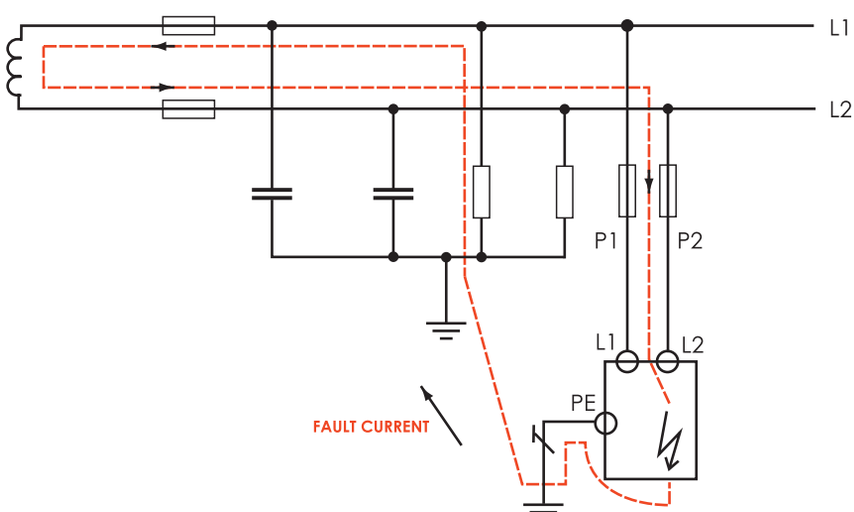
The main advantages of IT power supply system equipped with insulation monitoring devices:

- Operation continuity - in case of first fault (connection between IT power supply system and ground - earth fault) the network is still operational

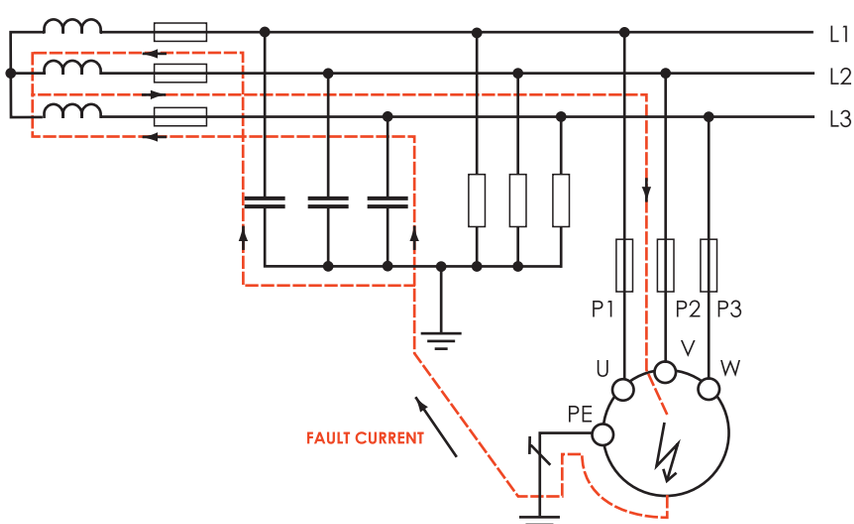
- Higher safety of operation
  - Immediate overview of network status, continuous monitoring of the insulation level to earth
  - Early detection of faulty devices by immediate signalisation by the insulation monitoring device
  - Less risk of electric shock for the operator and higher fire safety
  - Prevention of production losses and shutdowns, operations can continue in case of a first earth fault

- Practice shows that there is an obsolute minimum of the earth connections caused by a step change of insulation resistance. The vast majority of them is caused by gradual deterioration of insulation. HAKEL Insulation Monitoring Devices „ISOLGUARD" are therefore equipped with the display that shows exact numerical values of the insulation resistance and enable to monitor the changing status of the insulation before the origin of the first earth fault.

1-phase IT system



3-phase IT system



Healthcare

HEALTHCARE, COMMUNICATION VIA RS485

HIG95-DELTA

IMD intended for health sector. It enables to monitor the status of the isolation transformer of IT system and evaluates its heat and current load. HIG95 DELTA evaluates level of insulation in the range of 5 kΩ to 900 kΩ.

HIG95+, HIG95+/2T

IMD intended for health sector. It enables to monitor the status of the isolation transformer of IT system and evaluates its heat and current load. HIG95+ evaluates level of insulation in the range of 5 kΩ to 900 kΩ and allows to connect remote signalling module MDS10T.

IMD intended for health sector. It enables to monitor the status of the isolation transformer of IT system and evaluates its heat and current load. It is equipped with two independent channels for monitoring of two temperature sensors of isolation transformer. HIG95+/2T allows to connect remote signalling module MDS10T.

HIG-IFL1

HIG-IFL1 is designed for single-phase IT power supply systems in health sector. It enables to monitor the insulation resistance as well as heat and current load of the transformer. By the means of integrated insulation fault location system HIG-IFL1 can detect the channel of ungrounded power supply system, where the fault occured.

MDS-D

The remote monitoring module MDS-D is a device equipped with a touchscreen display showing the status of ungrounded IT power supply system(s), monitored by insulation monitoring device(s) HAKEL ISOLGUARD.

Heavy industry

HEAVY INDUSTRY

HIG93, HIG94

IMD intended for heavy industry. Its internal sophisticated filters enable to use this type for power supply systems with interference. HIG93 monitores insulation status in the range of 5 kΩ to 900 kΩ and evaluates two critical levels of insulation resistance.

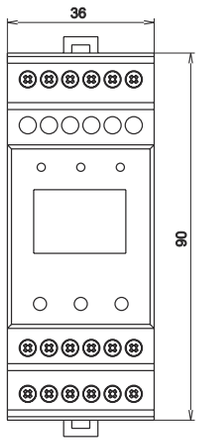
IMD intended for heavy industry with wider range of monitored insulation resistance. Its internal sophisticated filters enable to use this type for power supply systems with interference. HIG94 monitores insulation status in the range of 200 kΩ to 5 MΩ and evaluates two critical levels of insulation resistance.

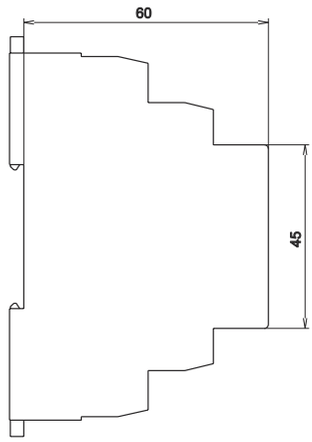
Mining industry

MINING INDUSTRY

HIG97

IMD intended for mining industry. It has a function of extremely fast response with the ability to evaluate the insulation fault within 80 ms. HIG97 can be also used for power supply systems with the interference. It monitores insulation status in the range of 5 kΩ to 900 kΩ and evaluates two critical levels of insulation resistance.





ISOLGUARD insulation monitoring device HIG95-DELTA

The insulation monitoring device HIG95-DELTA produced by HAKEL for the ISOLGUARD series is designed for monitoring the insulation status of single-phase ungrounded IT power supply systems in the health sector. The insulation monitoring device enables monitoring of the ungrounded IT power supply systems according to standards IEC 60364-7-710:2002 (requirements for medical location), IEC 61557-1 and IEC 61557-8 up to the maximum operating voltage 275V AC. It is also equipped with measuring circuits which ensure evaluation and failure signalling of the monitoring system originated due to thermal (ϑ) or current overloading of the medical transformer.

The insulation monitoring devices are equipped to display the numeric value of the measured insulation resistance. In addition, the control buttons for setting the parameters of insulation monitoring devices and signalling LED diodes can be used to display the status of the checked network.

It is possible to connect to the insulation monitoring device modules for remote signalling of the status MDS-DELTA or MDS-D produced by HAKEL.

Built-in alarm relay with a switching contact enables to connect devices for signalling the insulation status error and the thermal (ϑ) or current overloading error.

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

Basic characteristics

- The monitor for insulating statuses of AC networks with the voltage 0 to 275 V
- Measured value display of the R_{isol} insulation resistence, thermal (ϑ) and current overloading
- Temperature scan of the isolation transformer with one of three types of sensors
- Current overloading scan of the isolation transformer via measuring current transformer
- Signalling relay of the status of the insulating resistance with the switching contact
- Connection to the RS485 busbar, insulation strength 2500 V_{rms} against internal circuits and network circuits
- Option to connect the Hakel MDS-D remote monitoring panel equipped with a touch screen
- Connection for remote signalling MDS-DELTA or MDS-D modules produced by HAKEL.
- Option to set critical values, hysteresis values and other parameters via IMD's buttons
- Access to setting the insulation monitoring device can be locked, the insulation monitoring device is unlocked by a combination of buttons
- Separated supply voltage enables to also monitor a network which is not under voltage
- Module width 2M for mounting on DIN rail 35

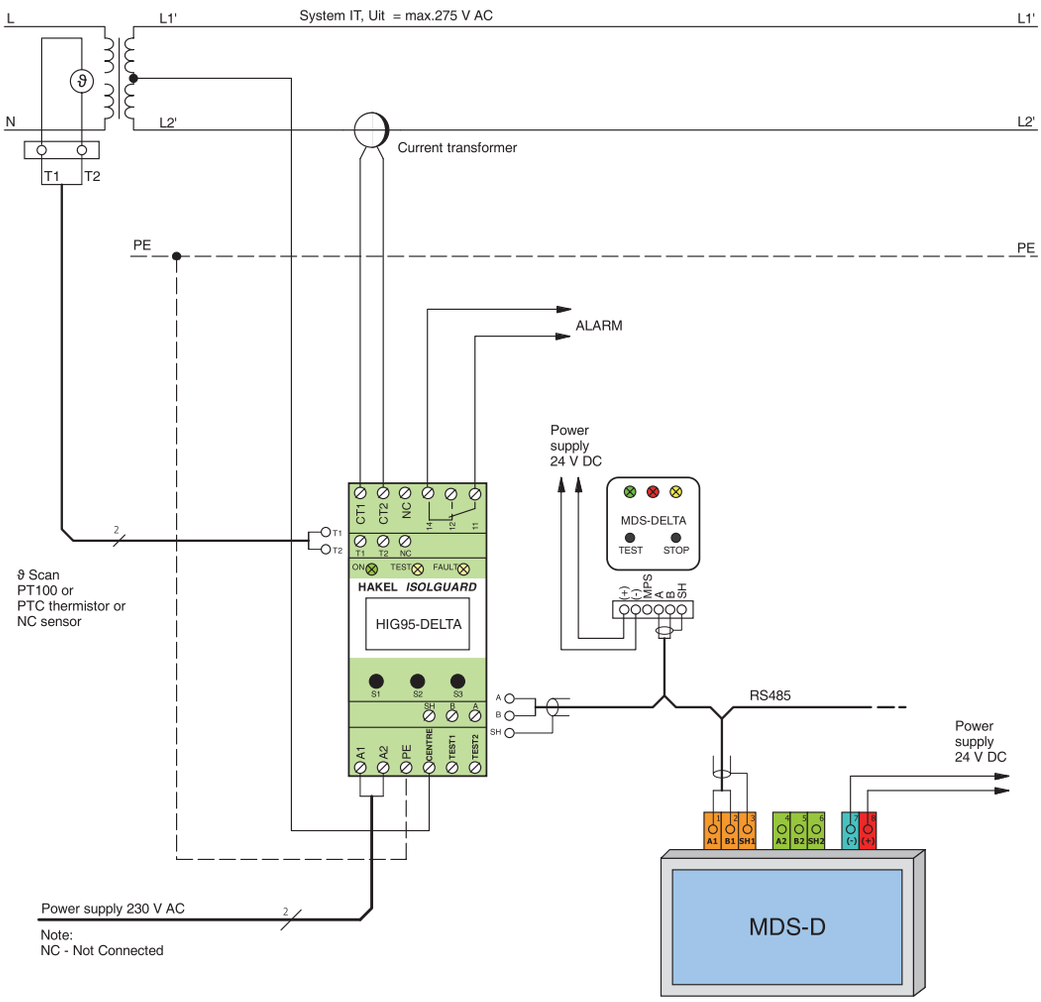
Type	Signalling relay	Range of displayed value	Critical insulation resistance	Current load sensor	Number of temperature sensors	Temperature sensor	Remote monitoring	RS485
HIG95-DELTA ✚	1x 1P	Adjustable 5 kΩ ÷ 900 kΩ	Adjustable 50 ÷ 200 kΩ	Measuring transformer of the current 25/5 up to 100/5.	1	Temperature sensor PT100 or PTC thermistor or thermal switching contact	MDS-D MDS-DELTA	Yes
Art. number 70 929								

Notes: 1P signalling relay with one switching contact

MDS-D remote monitoring module including a display

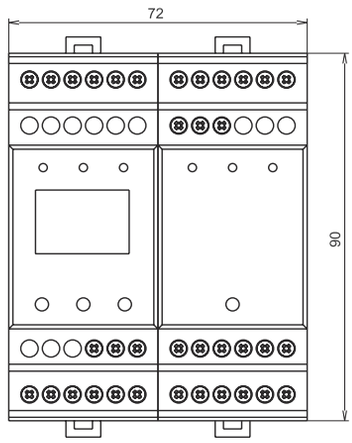
✚ Use in health sector in accordance with the requirements of standards IEC 60364-7-710, IEC 61557-1 and IEC 61557-8.

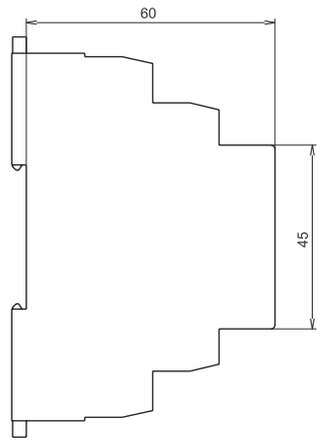
Recommended connection of HIG95-DELTA to monitored ungrounded IT power supply system



Notes:

1. Type of measuring transformer should be selected according to the power of chosen isolation transformer
2. Recommended types and values of cables for busbar RS485 are mentioned in the description of module MDS-D
3. When using shielded cable for the RS485 busbar, the busbar shielding has to be connected throughout the whole length and grounded in one point
4. It is necessary to follow the line wiring of busbar RS485, it is not allowed to make any taps.





ISOLGUARD insulation monitoring device HIG95+, HIG95+/2T

The insulation monitoring device HIG95+, HIG95+/2T produced by HAKEL for the ISOLGUARD series is designed for monitoring the insulation status of single-phase ungrounded IT power supply systems in the health sector. The insulation monitoring device enables monitoring of the ungrounded IT power supply systems according to standards IEC 60364-7-710:2002 (requirements for medical location), IEC 61557-1 and IEC 61557-8 up to the maximum operating voltage 275V AC. It is also equipped with measuring circuits which ensure evaluation and failure signalling of the monitoring system originated due to thermal (ϑ) or current overloading of the medical transformer.

The insulation monitoring devices are equipped to display the numeric value of the measured insulation resistance. In addition, the control buttons for setting the parameters of insulation monitoring devices and signalling LED diodes can be used to display the status of the checked network.

It is possible to connect to the insulation monitoring device modules for remote signalling of the status MDS10T, MDS-D or MDS-DELTA produced by HAKEL.

Built-in alarm relay with a switching contact enables to connect devices for signalling the insulation status error and the thermal (ϑ) or current overloading error.

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

Basic characteristics

- The monitor for insulating statuses of AC networks with the voltage 0 to 275 V
- Measured value display of the R_{isol} insulation resistence, thermal (ϑ) and current overloading
- Temperature scan of the isolation transformer with one of three types of sensors
- Current overloading scan of the isolation transformer via measuring current transformer
- Signalling relay of the status of the insulating resistance with the switching contact
- Connection to the RS485 busbar, insulation strength 2500 V_{rms} against internal circuits and network circuits
- Option to connect the Hakel MDS-D remote monitoring panel equipped with a touch screen
- Connection for remote signalling MDS10T, MDS-D or MDS-DELTA modules produced by HAKEL.
- Option to set critical values, hysteresis values and other parameters via IMD's buttons
- Access to setting the insulation monitoring device can be locked, the insulation monitoring device is unlocked by a combination of buttons
- Separated supply voltage enables to also monitor a network which is not under voltage
- Module width 4M (72mm) for mounting on DIN rail 35

Type	Signalling relay	Range of displayed value	Critical insulation resistance	Current load sensor	Number of temperature sensors	Temperature sensor	Remote monitoring	RS485
HIG95+ ✚	1x 1P	Adjustable 5 kΩ ÷ 900 kΩ	Adjustable 50 ÷ 200 kΩ	Measuring transformer of the current 25/5 up to 100/5.	1	Temperature sensor PT100 or PTC thermistor or thermal switching contact	MDS10T MDS-D MDS-DELTA	Yes
Art. number 70 929								
HIG95+/2T ✚					2			
Art. number 70 930								

Notes: 1P signalling relay with one switching contact

MDS10T remote monitoring module of the insulation monitoring device

MDS-D remote monitoring module including a display

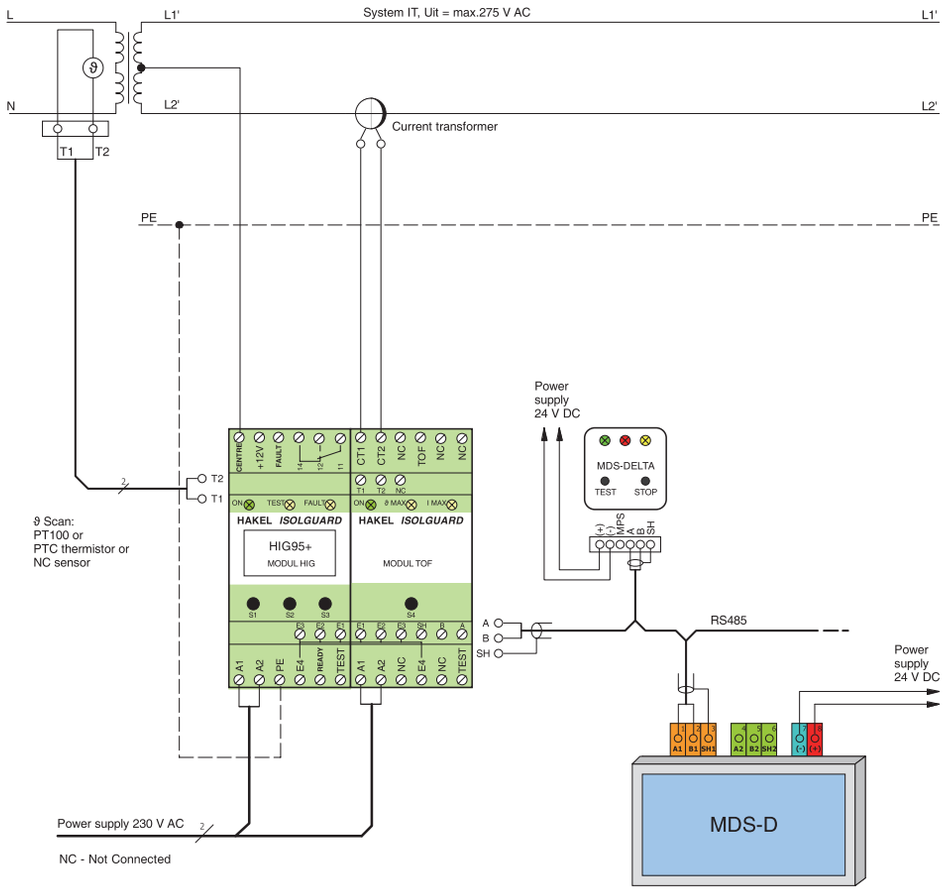
✚ Use in health sector in accordance with the requirements of standards IEC 60364-7-710, IEC 61557-1 and IEC 61557-8.

Technical data HIG95+, HIG95+/2T

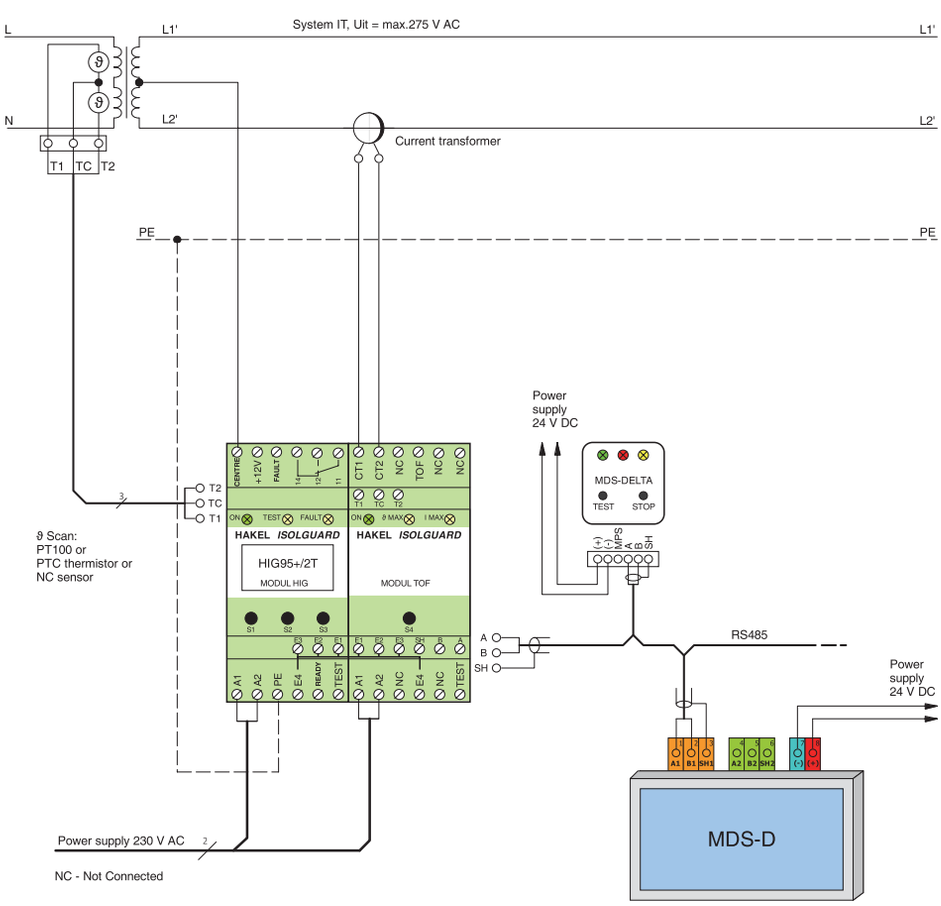
		Evaluation module of the insulation status (HIG module)	
Type		**HIG95+**	**HIG95+/2T**
Supply voltage	U_n	90 to 265 V AC(47÷440Hz) or 90 to 370 V DC	
Maximum operating voltage of the monitored IT power supply system	U_{it}	275 V AC	
Consumption	P	max. 5 VA	
Measuring voltage	U_M	12 V DC	
Measuring current	I_M	< 0,6 mA	
Alternate inside resistance of the measuring input	R_i	> 1 MΩ	
Range of the value shown on the display	R_{isol}	5 kΩ to 900 kΩ	
Precision of measurement 5 kΩ ... 10 kΩ 10 kΩ ... 900 kΩ		2 kΩ ± 10%	
Critical insulation resistence	R_{crit}	adjustable 50 kΩ to 200 kΩ	
Hysteresis of the monitored insulation resistance	R_{hyst}	adjustable 0 to +100% R_{crit}	
Delay in response of signalling the insulation status	t_{ON}	adjustable 0 to 60 sec, with the step 1 sec	
		Evaluation module of the thermal and current overload of the isolation transformer (TOF module)	
Supply voltage	U_n	90 to 265 V AC(47÷440Hz) or 90 to 370 V DC	
Possible type of the monitored IT power supply system		single-phase AC	
Consumption	P	max. 4 VA	
Current load scan		by measuring transformer with a transmission ratio (A):	
		25/5 | 30/5 | 40/5 | 50/5 | 60/5 | 80/5 | 100/5	
Range of the current load shown on the display	I tr	0,5 - 100A	
		(depending on the type of the measuring transformer)	
Critical current load value	I_{crit}	adjustable in the range I tr , with the step 1A	
Hysteresis of the current load	I_{hyst}	adjustable 0 to 20% I_{crit}	
Delay in response of signalling the temperature fault	t_{ON}	adjustable 0 to 60 sec, with the step1 sec	
Measurement precision of the current load		± 5%	
Number of temperature sensor		1	2
Thermal sensor of the isolation transformer		NC thermal sensor, PTC thermistor or PT100 sensor	
Thermal sensor selection		adjustable in the IMD menu	
Range of the isolation transformer temperature shown on the display	ϑ tr	5-190 ° C (only for PT100)	
Critical value of the isolation transformer temperature	ϑ_{crit}	for the PT100 adjustable in the range of 70 ÷ 130 ° C , for the PTC and the NC sensor solid 1.6 kΩ	
Hysteresis of the isolation transformer temperature	ϑ_{hyst}	adjustable from 0 to 20 % Icrit (only for PT100)	
Measurement precision of the isolation transformer temperature		± 5 % (excluding the sensor´s deviations)	
Delay in response of signalling the current fault	ϑ_{tON}	adjustable 0 to 60 sec, with the step1 sec	
Outputs			
Signalling potential-free switching contact relay 1 Electric strength against internal circuits Electric strength against supply circuits		250 V AC / 1A 3750 V_{rms} 3750 V_{rms}	
Remote signalling		Terminals for connection of the MDS10T(+MPS) module produced by Hakel max. 5 x MPS10T modules or max. 2 x MDS10T+MPS modules	
		Line RS485 and remote monitoring module MDS-D produced by Hakel	
Communication line: RS485 type MASTER-SLAVE,9600 Bd, even parity Insulating strength against internal circuits and network circuits		Yes 2500 V_{rms}	
General data			
Protection type according to IEC 60 529		IP20	
Weight	m	295 g	
Housing material		PA-UL94 V0	
Mounting on		DIN rail 35	
Cross-section of the connected conductors	S	1 mm^2	
Art. number		70 929	70 930

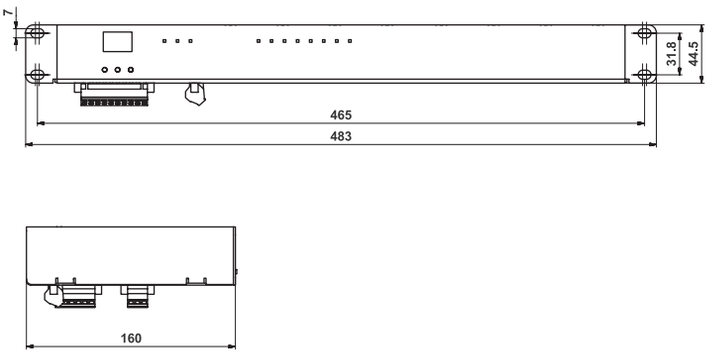
Operating conditions	
Working temperature	-10°C ~ +60°C
Relative moisture of the environment	28 g H_2O /kg of dry air
Atmospheric pressure	86 to 106 kPa
Working position	any
External magnetic and electric field	max. 400A/m
Category of over-voltage / testing voltage	III according IEC 60664-1:2007
Pollution degree	2 according IEC 60664-1:2007
Type of operation	permanent

Recommended connection of HIG95+ to monitored ungrounded IT power supply system



Recommended connection of HIG95+/2T to monitored ungrounded IT power supply system





HAKEL ISOLGUARD HIG-IFL1

Insulating monitoring device with fault location

HAKEL ISOLGUARD HIG-IFL1 insulating monitoring device with fault location is a system designed for comprehensive insulating status monitoring of single-phase insulated IT systems (e.g. in the health sector). The device allows systems designed and operated in accordance with standards IEC 60364-7-710:2002 (electrical installations at healthcare facilities), IEC 61010-1:2010, IEC 61557-1, IEC 61557-8, IEC 61557-9 up to 275 V AC maximum operating voltage to be monitored.

The device enables the thermal and current load of the isolation transformer to be evaluated. The HIG-IFL1 insulating monitoring device (IMD) is equipped with the fault location function (IFLS), owing to which the user can easily and precisely locate that segment of the system (channel) where the insulation resistance has dropped.

The device is equipped with a screen to display the numerical value of the observed insulation resistance and also the values of the isolation transformer's current and thermal load. Furthermore, the device has pushbuttons for IMD parameter setting and LED controls indicating the insulated system status, including the condition of the various segments (in the channels) of the system.

An MDS-D panel with a touch screen can be connected to the device via the RS485 busbar for displaying the currently observed values and the current IMD setting. Communication via the RS485 line uses a protocol which is based on the PROFIBUS protocol. Description of the communication protocol is available on request.

The built-in contacts enable remote signalling of insulation status faults in the system monitored and/or of thermal/current overload of the isolation transformer.

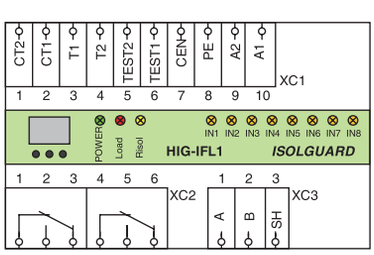
Only one insulation monitoring device can be connected to the same ungrounded IT power supply system.

Basic characteristics

- Insulation monitoring device for AC systems 0 to 275 V voltage
- Insulation fault evaluation in 8 independent circuits (channels) of the IT system, this number can be increased by using extension modules
- Display of the observed insulation resistance, current load and thermal load
- Isolation transformer temperature measurement by using one of 3 sensor types
- Isolation transformer current load measurement by means of a measuring current transformer
- Signalling contacts for IT system faults
- Connection to the RS485 busbar, insulation strength 2500 V_{rms} against the internal circuits and circuits of the system monitored
- Optional communication with a master system via the RS485 busbar
- Communication protocol description available on request
- Pushbuttons available for setting the critical values, hysteresis values and other parameters
- Access to the IMD parameter setting with the pushbuttons can be locked/ unlocked by a button combination
- Separate supply voltage allow also such IT systems as are not under voltage to be monitored
- Module of the *rack case 19"* standard 1U height

Type	Display range	Critical insulation resistance	Number of fault point evaluation channels	Current load measuring system	Temperature sensor	Remote monitoring	RS485
HIG-IFL1 ✚ Art. number 70 950	5 kΩ to 900 kΩ	Adjustable 50 to 200 kΩ	8 (without expander module)	TAR 25/5 to 100/5 measuring current transformer	Temperature sensor PT100 or PTC thermistor or thermal switching contact	MDS-D MDS-DELTA	Yes

Note: ✚ Use in health sector in accordance with the requirements of standards IEC 60364-7-710, IEC 61557-1 and IEC 61557-8.



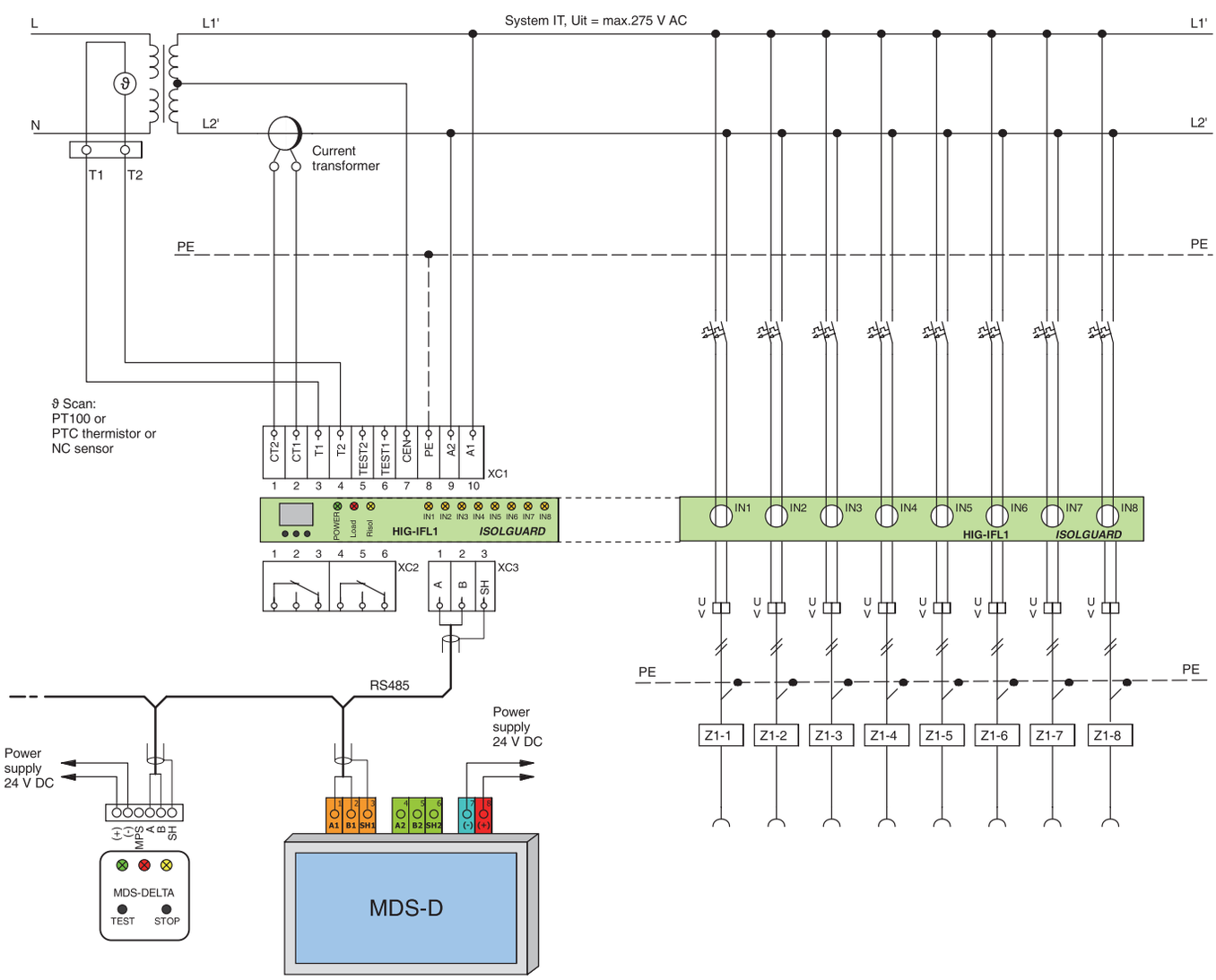
Installation

HAKEL ISOLGUARD HIG-IFL1 insulation monitoring device is designed to enable easy installation into a 19" rack. A reduction system allowing the product to be mounted to the rear panel of a distribution cabinet or to a wall is available in case the user application is not equipped for connection to the above rail system.

Mounting the product in to a 19" rack

Use of the reduction system and product mounting to the rear panel of a distribution cabinet

Recommended connection of HIG-IFL1 to monitored ungrounded IT power supply system



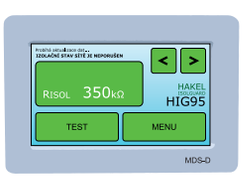
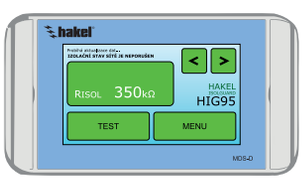
ISOLGUARD module for remote signalling MDS-D

The remote monitoring module including the display (MDS-D) from the ISOLGUARD range is a device equipped with a touchscreen display showing the status of ungrounded IT power supply systems, monitored by insulation monitoring device HAKEL ISOLGUARD from the HAKEL production. Communication with the insulation monitoring devices takes place via RS485 using the internal protocol.
The MDS-D panel further includes a second RS485 line (external busbar), which transfers the collected data to the user master system. The communication protocol on this line is derived from Profibus protocol.

MDS-D type devices are intended primarily for surveillance and monitoring sites to continuously display the status of ungrounded IT power supply systems guarded by insulation monitoring devices type HAKEL ISOLGUARD.

Basic characteristics

- Simultaneous status (isolation resistance, thermal and current overload) of up to 24 ungrounded IT power supply systems, monitored by HAKEL ISOLGUARD IMDs
- Allocating names to insulation monitoring devices for easier identification
- Two variants of MDS-D panel, depending on the panel target location and fitting method
- Sound and visual fault and failure signalization
- Display of the actual measured values from the insulation monitoring devices
- Touch screen control
- English menu - other languages can be added
- Protection type up to IP66
- Automatic searching for connected IMDs on the RS485 busbar
- External RS485 busbar, designed for communication with a master system
- Ability to perform the test of each connected insulation monitoring device
- General visual display of detailed settings of the Insulation Monitoring Devices
- Password-protected access to the panel setting

Type	MDS-D	MDS-D/IP66
Display	TFT LCD 4,3“	
Control method	Screen touching - resistive layer	
Acoustic signalization	Yes - Speaker	
Voltage supply	9-36V DC	
Maximum consumption	2W	
Communication busbar type	Internal RS485, External RS485	
Connectable devices	Internal busbar HAKEL ISOLGUARD IMDs	
	External busbar user system	
Max. connected insulation monitoring devices	24	
Panel location	On the wall, on the panel	
Dimensions (WxHxD mm)	125x84x26	200x110x60
Typical application	Nurses station, Supervisory workplace	Operating room
Assembling method	into round flush-mount box	wall plugs
Protection type	IP20	IP66
Illustrative image		
Art. number	70 060	70 061

MDS-D connection

For the MDS-D connection is necessary to bring 18-36 V DC power supply and twisted pair to the panel for internal RS485. External RS485 can be connected by applying another twisted pair.

It is recommended to use FTP cables for connecting the busbar in a noisy environment or as a protection against the electromagnetic radiation. The FTP cables contains not only twisted pairs but also the shielding. This shielding is connected to the SH clamps.

It is recommended to use the HAKEL ISOLGUARD Power Supply DC24V as a power supply.

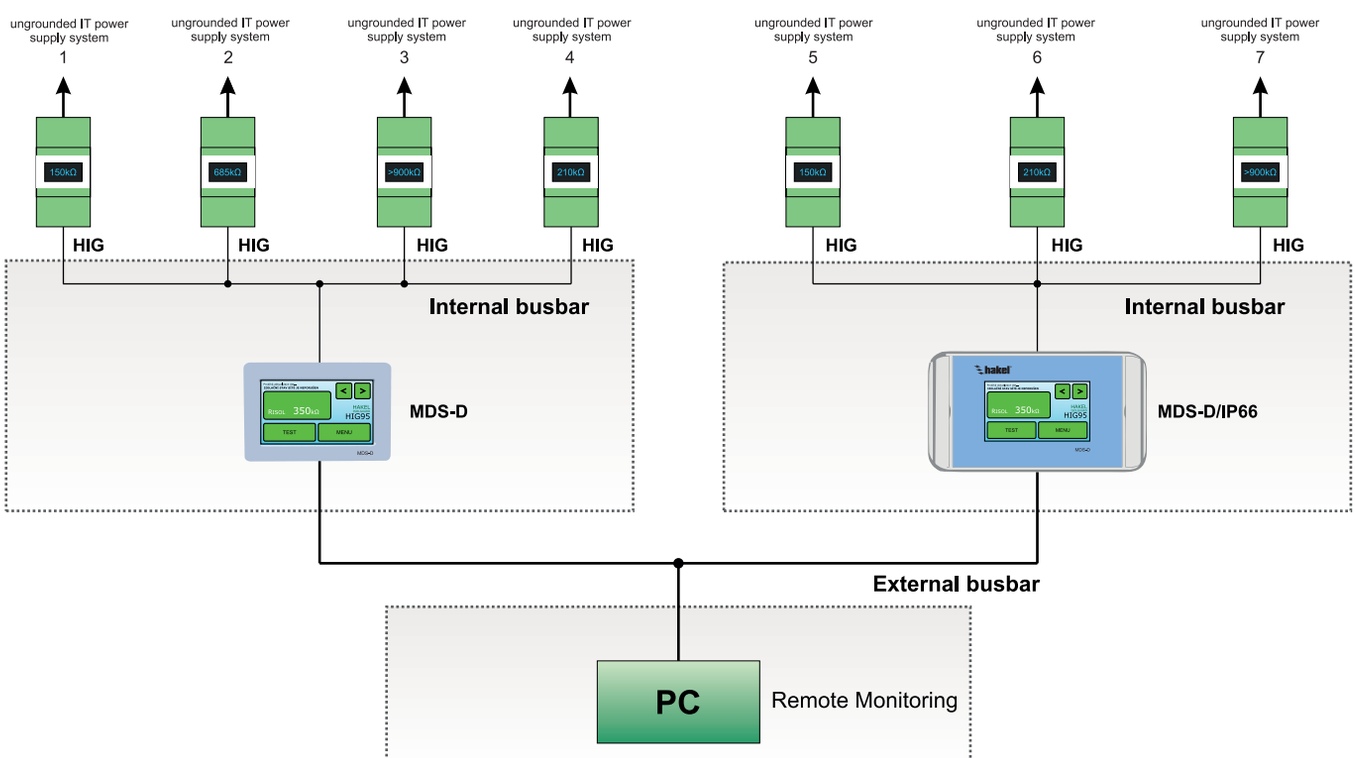
Communication levels of the ISOLGUARD system

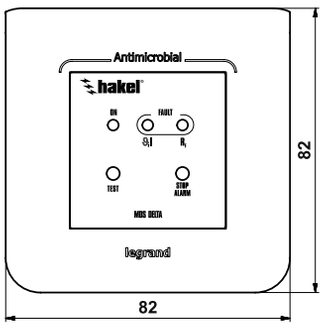
Communication levels of the ISOLGUARD system are divided into two:.

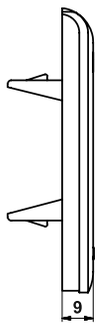
Internal busbar – Busbar used for collecting the data from individual devices produced by HAKEL, designed to monitor ungrounded IT power supply systems. Communication on this busbar is controlled by the MDS-D panel. It is forbidden to affix other devices or otherwise interfere with the prescribed configuration on this line.

External busbar – Busbar used for connecting the MDS-D panel to a superior system. The MDS-D panel is in the position of the slave station and responds to queries from the master unit. The master unit may be a PC, RS485 data recorder or another user system which is able to communicate via RS485 interface. A description of communication telegrams can be found in a separate External Line RS485 Programming Manual produced by HAKEL.

Connection example







HAKEL ISOLGUARD MDS-DELTA
Remote signalling module for ISOLGUARD series products

MDS-DELTA is a signalling module for HAKEL ISOLGUARD series insulation monitoring devices (IMDs). The module is fitted with a visual and acoustic signalling system, warning the user in the event of a fault detected by the ISOLGUARD device. The MDS-DELTA module is designed for supervisory/monitoring sites as a component of systems constantly informing the user of the status of an ungrounded IT power supply system.

The MDS-DELTA module signals the insulation status by means of a yellow control, any current and/or temperature overload, by means of a red control. The module's own function is signalled with a green control. If a fault occurs, the respective control will flash and the piezo siren will be sounded. Acoustic signalling can be stopped by using the "STOP ALARM" button on the device. Furthermore, the product is equipped with a "TEST" button to initiate remote testing of the IMD. In this manner the MDS-DELTA product meets the requirements for remote signalling of insulation monitoring devices as stipulated by IEC 61557-8. The module design is in a standard profile 45 mm x 45 mm from Legrand, suitable for installation in cable distribution troughs.

One IMD can be interfaced to as many as 10 MDS-DELTA modules. Communication with the IMD proceeds via RS485 line by means of an internal protocol.

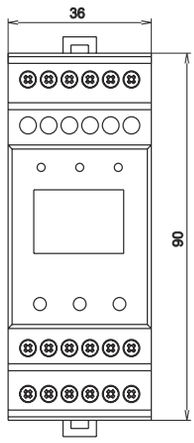
The MDS-DELTA modules can be combined with the MDS-D supervisory system.

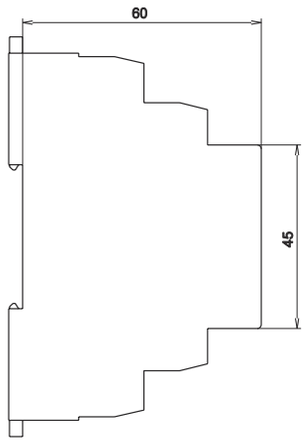
Basic characteristics

- Remote signalling module for HAKEL ISOLGUARD insulation monitoring devices
- Design in the Legrand 45 x 45 mm standard, for installation in cable troughs
- Antimicrobial surface for use in hospitals
- Protection type up to IP44, for use in harsh conditions
- Visual and acoustic signalling of insulation status faults
- Visual and acoustic signalling of isolating transformer overload
- Connection to the IMD via RS485 communication line
- Power supply 24 V DC
- Testing button to verify the function of both the IMD and the signalling module
- Button to deactivate sound
- MPS-DELTA can be connected in order to make the visual signalling more alerting
- Up to 10 MDS-DELTA modules can be connected to a one HAKEL ISOLGUARD IMD

MDS-DELTA module signalling

Type	Insulation fault signalling	Transformer overload signalling	Supported IMDs	Signalling means	Antimicrobial surface	Protection type
MDS-DELTA	Yes	Yes	HAKEL ISOLGUARD with the RS485 communication facility (SW version 5.5 or higher)	Visual (LED controls) Acoustic (piezo siren)	Yes, Legrand Antimicrobial technology	IP 20
Art. number 70 063						
MDS-DELTA/IP44						IP 44
Art. number 70 064						





ISOLGUARD insulation monitoring devices HIG93, HIG94

The insulation monitoring devices produced by HAKEL for the ISOLGUARD HIG93, HIG94 series are designed for monitoring the insulation status of single-phase and 3-phase ungrounded IT power supply systems designed and operated according to standards IEC 61010-1:2010, EN 50522, IEC 61936-1:2010.

Enable monitoring of single-phase and 3-phase ungrounded IT power supply systems up to the maximum operating voltage 275 V AC, or 3x275 V AC. If monitoring the insulation status of a single-phase or 3-phase ungrounded IT power supply system with higher operating voltage is required, it is necessary to create an artificial centre using TL400 (Art. number 70504), TL600 inductors (Art. number 70601), TL1600 (Art. number 71601) or TL6003 (Art. number 70603). Such a created centre is connected to the terminal of insulation monitoring device HIG93, HIG94.

The insulation monitoring devices are equipped to display the numeric value of the measured insulation resistance. In addition, the control buttons for setting the parameters of insulation monitoring devices and signalling LED diodes can be used to display the status of the checked network. According to the type, it is possible to connect to the insulation monitoring device modules for remote signalling of the status of the controlled MDS-DELTA or MDS-D network produced by HAKEL.

HIG93, HIG94 insulation monitoring devices communicate with the master computer via the RS485 busbar with the protocol derived from the PROFIBUS protocol.

One or two built-in signalling relays with a switch contact enable the connection of equipment for signalling of alarm. The insulation monitoring device has an optional alarm memory function with the option to cancel the alarm using the button on the insulation monitoring device. Local and remote testing of the function of the insulation monitoring device can also be conducted.

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

Basic characteristics

- The monitor for insulating statuses of AC networks with the voltage 0 to 275 V without additional equipment, higher voltages with additional inductor
- Display of measured value of the R_{isol} insulation resistance on the display within the range 5 kΩ to 900 kΩ or 200 kΩ to 5 MΩ
- Signalling relay of the status of the insulating resistance with the switching contact
- Connection to the RS485 busbar, insulation strength 2500 V_{rms} against internal circuits and network circuits
- Optional memory of the activated alarm with option unblocking by button on the insulation monitoring device
- Connection options for remote signalling MDS-DELTA or MDS-D modules produced by HAKEL.
- Option to set the monitored value of the insulating resistance R_{CRIT} using the display and buttons within the range according to the type insulation monitoring devices
- Adjustable hysteresis of the limit value of the insulating resistance within the range 0 to 100% using the display and buttons
- Adjustable delay t_{ON} response of signalling relay using the displays and buttons within the range 0 to 60 sec
- Access to setting the insulation monitoring device can be locked, the insulation monitoring device is unlocked by a combination of buttons
- Separated supply voltage enables to also monitor a network which is not under voltage
- Module width 2M for mounting on DIN rail 35

Type	Signalling relay 1	Signalling relay 2	Remote monitoring	Range of display	Critical insulation resistance
HIG93	1P	1P	MDS-D MDS-DELTA	5 kΩ ÷ 900 kΩ	Adjustable 5 kΩ÷300 kΩ
Art. number 70 915					
HIG94	1P	1P		200 kΩ ÷ 5 MΩ	Adjustable 200 kΩ÷900 kΩ
Art. number 70 917					

Note: 1P signalling relay with one switching contact

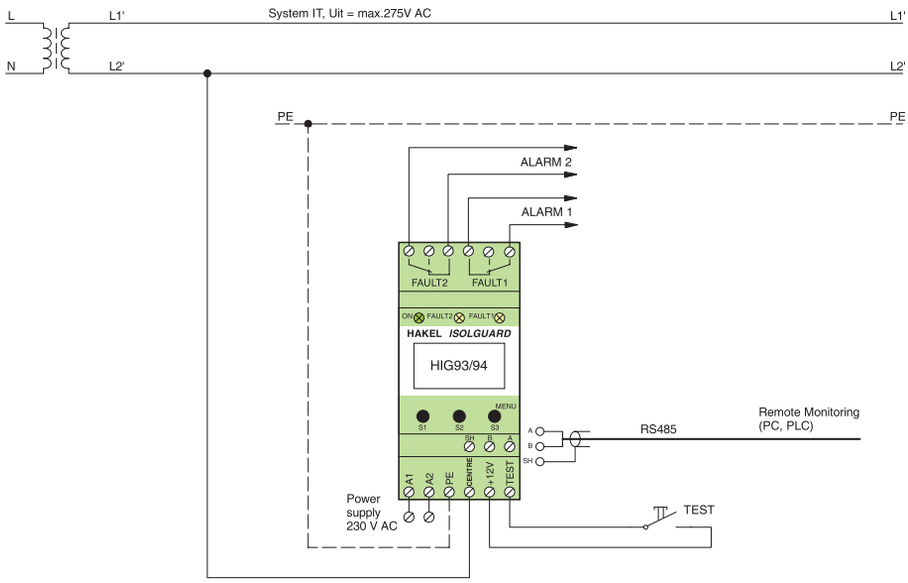
Technical data HIG93, HIG94

Type		HIG93	HIG94
Supply voltage	U_n	90 to 265 V AC or 90 to 370 V DC	
Maximum operating voltage of the monitored ungrounded IT power supply system	U_{it}	275 V AC	
Consumption	P	max. 5 VA	
Measuring voltage	U_M	12 V DC	
Measuring current	I_M	< 0,6 mA	
Alternate inside resistance of the measuring input	R_i	> 2 MΩ	
Range of the value shown on the display	R_{isol}	5 kΩ to 900 kΩ	200 kΩ to 5 MΩ
Precision of measurement 5 kΩ ... 10 kΩ		2 kΩ	
10 kΩ ... 900 kΩ		± 10%	
Precision of measurement 200 kΩ … 1 MΩ			± 10%
1 MΩ … 5 MΩ			± 15%
Critical insulation resistance	R_{crit}	adjustable 5 kΩ to 300 kΩ	adjustable 200 kΩ to 900 kΩ
Hysteresis of monitored insulation resistance	R_{hyst}	adjustable 0 to +100% R_{crit}	
Delay in response of signalling	t_{ON}	adjustable 0 to 60 sec.	
Outputs			
Signalling potential-free switching contact relay 1		250 V AC / 1A	
Electric strength against internal circuits		3750 V_{rms}	
Electric strength against supply circuits		3750 V_{rms}	
Signalling potential-free switching contact relay 2		250 V AC / 1A	
Electric strength against internal circuits		3750 V_{rms}	
Electric strength against supply circuits		3750 V_{rms}	
Remote signalling		Line RS485 and remote monitoring module MDS-D produced by Hakel	
Communication line: RS485 type MASTER-SLAVE, 9600 Bd, even parity		Yes	
Insulating strength against internal circuits and network circuits		2500 V_{rms}	
General data			
Protection type according to IEC 60 529		IP20	
Weight	m	160 g	
Housing material		PA-UL94 V0	
Mounting on		DIN rail 35 mm	
Recommended cross-section of connected conductors	S	1 mm^2	
Art. number		70 915	70 917

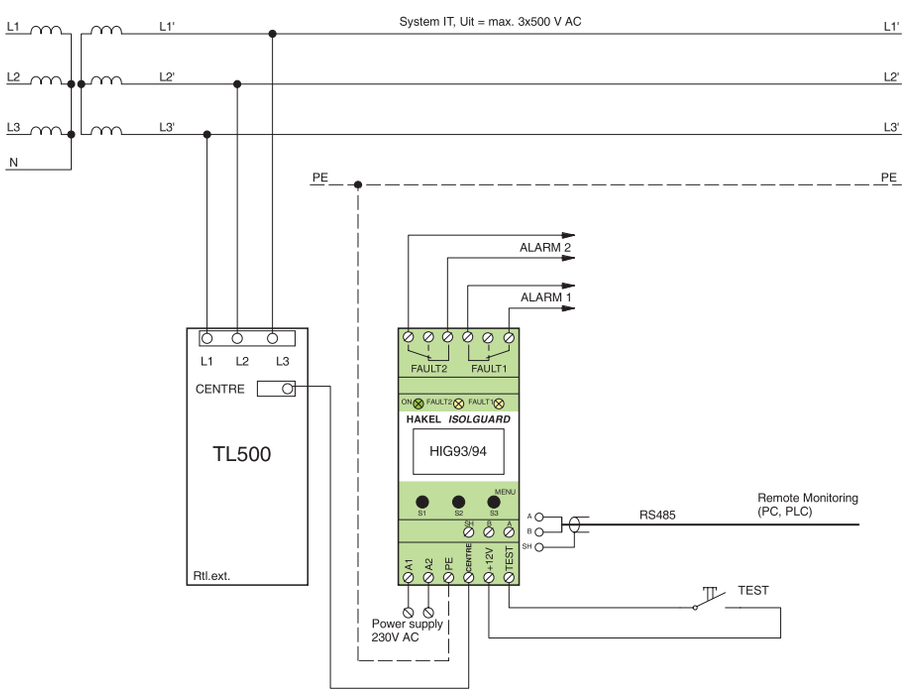
Operating conditions	
Working temperature	-10°C ~ +60°C
Relative moisture of the environment	28 g H_2O /kg of dry air
Atmospheric pressure	86 to 106 kPa
Working position	any
External magnetic and electric field	max. 400A/m
Category of over-voltage / testing voltage	III according IEC 60664-1:2007
Pollution degree	2 according IEC 60664-1:2007
Type of operation	permanent

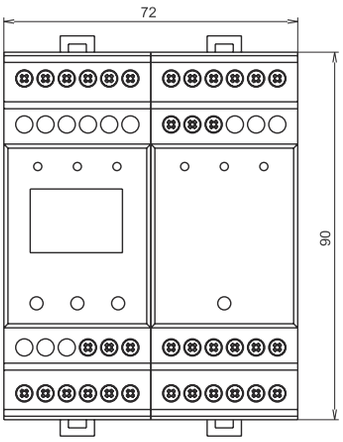
Recommended connection of HIG93, HIG94 to monitored ungrounded IT power supply system

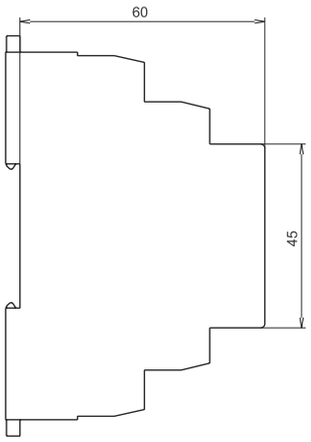
1-phase ungrounded IT power supply system, module HIG93, HIG94 with the signalling of the alarm and remote testing button



3-phase ungrounded IT power supply system (3x440 VAC), module HIG93, HIG94 with signalling of the alarm and remote testing button







ISOLGUARD insulation monitoring device HIG97

Insulation monitoring device HIG97 produced by HAKEL is designed for monitoring the insulation status of 3-phase insulated IT-systems with extremely fast evaluation and signalling of the status of the inspected network. With the use of external inductor TL1200 for the creation of the artificial centre, the insulation monitoring device enables to monitor 3-phase ungrounded IT power supply systems up to the maximum operating voltage of 3x1000V AC. Such created centre is connected to insulation monitoring device terminal HIG97.

The insulation monitoring devices display the value of the measured insulation resistance. In addition, the control buttons for setting the parameters of the insulation monitoring devices and signalling LED diodes display the status of the checked network and the insulation monitoring device.

HIG97 insulation monitoring devices communicate with the master computer via the RS485 industrial busbar with the protocol derived from the PROFIBUS protocol. The built-in signalling relay enables the connection of the equipment for the supervision and signalling of the status of the supervised ungrounded IT power supply system.

The insulation monitoring device contains four signalling relays.

The signalling relay with fast response FAULT1 signals the actual status of the inspected network.

Signalling relay with fast response and memory FAULT1 MEM, signals the origination of the first error of the inspected network. Operator action is required to remove the erroneous status. This signalling relay does not change the status even in the case of activation and deactivation of the insulation monitoring device supply.

The signalling relay with fast response FAULT2 signals the actual status of the inspected network. In the insulation monitoring device menu, it is possible to select the function of this relay with or without the memory If the operator selects the function with memory, operator intervention is required for the cancellation of the signalling. In the case of disconnection of the supply, the FAULT2 relay is set in the basic position.

The ERROR signalling relay signals the function of the insulation monitoring device. The relay is equipped if the insulation monitoring device is active and there is measurement of the inspected network.

Local and remote testing of the function of the insulation monitoring device can also be conducted.

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

Basic characteristics

- Monitor for insulating status of AC networks with the voltage 230 V AC/500 V AC or 1000 V AC with fast response.
- Signalling relay of the actual status of the insulating resistance with a fast response.
- The signalling relay of the insulation value with fast response and memory, de-blocking of the error status by the button on the insulation monitoring device or the remote button.
- Signalling relay of the status of insulating resistance with slow response and optional alarm memory. Unblocking of the button on the insulation monitoring device or by remote button.
- Signalling relay of the function of insulation monitoring device
- Display of the measured value of R_{isol} insulation resistance on the display within the range 5 kΩ to 900 kΩ.
- Connection to the busbar RS485, insulation strength 2500 V_{rms} against internal circuits and network circuits
- Option to set the monitored value of the insulating resistance R_{CRIT} use the display and buttons within the range 5 kΩ to 300 kΩ.
- Adjustable hysteresis of the limit value of the insulating resistance within the range 0 to 100% by means of the display and buttons
- Adjustable delay t_{ON} signalling relay response FAULT2 with slow response within the range 0 to 60 sec.
- Access to setting the insulation monitoring device can be locked, the insulation monitoring device is unlocked by a combination of buttons
- Separate supply voltage enables to also monitor the network which is not under voltage
- Two modules for assembly on the DIN 35 bar with the total width 4M (72mm).

Type	Signalling relay	Range of displayed value	Critical insulation resistance
HIG97	4 relay 1P	5 kΩ ÷ 900 kΩ	Adjustable 5 kΩ÷300 kΩ
Art. number 70 936			

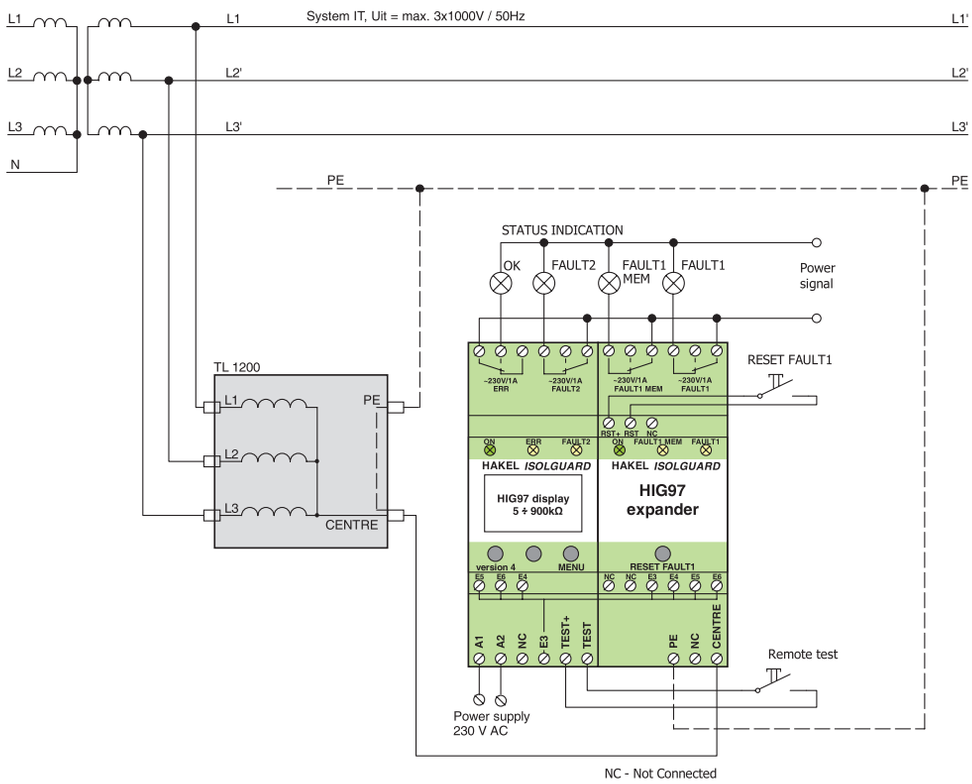
Technical data HIG97

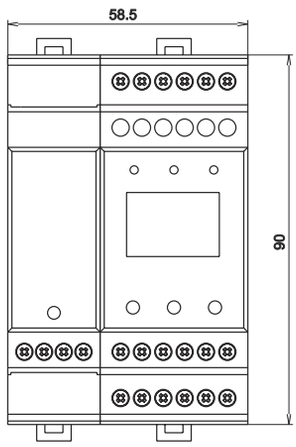
Type		HIG97
Supply voltage	U_n	80 to 305 V AC or 113 to 430 V DC
Maximum operating voltage of the monitored ungrounded IT power supply system (with external inductor)	U_{it}	optional 230 V AC/500 V AC/1000 V AC
Consumption	P	max. 5 VA
Measuring voltage	U_M	18 V DC
Measuring current	I_M	< 0,48 mA
Alternative internal resistance of the measuring input	R_i	> 100 kΩ
Range of the value shown on the display	R_{isol}	5 kΩ to 900 kΩ
Precision of measurement 5 kΩ ... 100 kΩ 100 kΩ ... 900 kΩ		10 kΩ ± 10%
Properties of signalling with fast response		
Critical insulation resistances with fast response	R_{crit1}	adjustable 5 kΩ to 300 kΩ
Basic time of response for signalling with fast response	t	(80 to 500 msec) According to the adjustment of service parameters
Basic time of delay for signalling with fast response	t_{ON1}	adjustable 0 to 9,99 sec. with the step 0,01 sec
Signalling properties with slow response		
Critical insulation resistances with slow response	R_{crit2}	adjustable 5 kΩ to 300 kΩ
Basic signalling response with slow response	t	< 3 sec
Additional time of delay of signalling with slow response	t_{ON2}	adjustable 0 sec to 60 sec. with the step 1 sec
Hysteresis of monitored insulation resistance	R_{hyst}	adjustable 0 to +100% R_{crit}
Outputs		
Signalling FAULT1 MEM with fast response and memory of the status potential-free switching contact: electric strength against internal circuits and against supply circuits		250 V AC / 1A 3750 V_{rms}
Signalling FAULT1 with fast response without memory of the status of potential-free switching contact:electric strength against internal circuits and against supply circuits		250 V AC / 1A 3750 V_{rms}
Signalling FAULT2 with slow response Potential-free switching contact:electric strength against internal circuits and against supply circuits		250 V AC / 1A 3750 V_{rms}
Signalling ERROR insulation monitoring device function Potential-free switching contact:electric strength against internal circuits and against supply circuits		250 V AC / 1A 3750 V_{rms}
Communication line: RS485 type MASTER-SLAVE, 9600 Bd, even parity Insulating strength against internal circuits and network circuits		Yes 2500 V_{rms}
General data		
Protection type according to IEC 60 529		IP20
Weight	m	290 g
Housing material		PA-UL94 V0
Mounting on		DIN rail 35 mm
Recommended cross-section of connected conductors	S	1 mm^2
Art. number		70 936

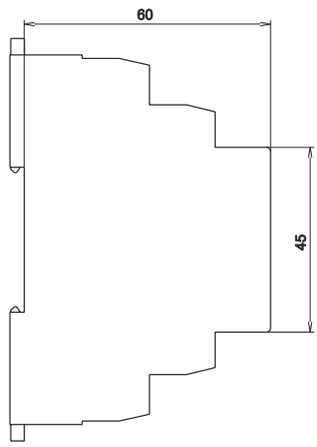
Operating conditions	
Working temperature	-10°C ~ +60°C
Relative moisture of the environment	28 g H_2O /kg of dry air
Atmospheric pressure	86 to 106 kPa
Working position	any
External magnetic and electric field	max. 400A/m
Category of over-voltage / testing voltage	III according IEC 60664-1:2007
Pollution degree	2 according IEC 60664-1:2007
Type of operation	permanent

Recommended connection of HIG97 to monitored ungrounded IT power supply system

3-phase ungrounded IT power supply system (max. 3x1000 VAC), module HIG97 in connection with inductor TL1200







ISOLGUARD insulation monitoring devices HIG93/E, HIG94/E

Insulation monitoring devices produced by HAKEL in the ISOLGUARD HIG93/E, HIG94/E4 series are designed for monitoring the insulating status of single-phase and 3-phase ungrounded IT power supply systems, designed and operated according to standards IEC 61010-1:2010, EN 50522, IEC 61936-1:2010.

Enable monitoring of single-phase and 3-phase ungrounded IT power supply systems up to the maximum operating voltage of 275V AC, or 3x275V AC. If monitoring the insulation status of a single-phase or 3-phase ungrounded IT power supply system with higher operating voltage is required, it is necessary to create an artificial centre using TL400 (Art. number 70504), TL600 inductor (Art. number 70601), TL1600 (Art. number 71601) or TL6003 (Art. number 70603). Such a created centre is connected to insulation monitoring device terminal HIG93/E, HIG94/E.

The insulation monitoring devices are equipped to display the numeric value of the measured insulation resistance. In addition, the control buttons for setting the parameters of the insulation monitoring devices and signalling LED diodes display the status of the checked network and the insulation monitoring device.

HIG93/E, HIG94E insulation monitoring devices are fitted with the HIG-ETH module, which enables direct connection of the insulation monitoring device to the ETHERNET computer network, on which it is possible to communicate with PC.

One or two built-in signalling relays with a switch contact enable the connection of equipment for signalling of alarm. The insulation monitoring device has an optional alarm memory function with the option to cancel the alarm using the button on the insulation monitoring device. Local and remote testing of the function of the insulation monitoring device can also be conducted.

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

Basic characteristics

- The monitor for insulating statuses of AC networks with the voltage 0 to 275 V without additional equipment, higher voltages with additional inductor
- Display of measured value of the R_{isol} insulation resistance on the display within the range 5 kΩ to 900 kΩ or 200 kΩ to 5 MΩ
- Signalling relay of the status of the insulating resistance with the switching contact
- Connection to the computer network ETHERNET 10Base-T or 100Base TX (automatic recognition), connector RJ45
- Communication protocols HTTP (WEB, XML), SNMP, MODBUS TCP
- Internal web pages for displaying actual values and configurations
- Optional memory of the alarm called with the option to unblock with the button on the insulation monitoring device
- Option to set the monitored value of insulating resistance R_{CRIT} by means of the display and buttons within the range 5 kΩ to 300 kΩ or 200 kΩ to 900 kΩ according to the type of insulation monitoring device
- Adjustable hysteresis of the limit value of the insulating resistance within the range 0 to 100% by means of the display and buttons
- Adjustable delay t_{ON} signalling relay response use the displays and buttons within the range 0 to 60 sec
- Access to setting the insulation monitoring device can be locked. The insulation monitoring device is unlocked by a combination of buttons.
- Separated supply voltage enables to also monitor a network which is not under voltage
- Modules for assembly on the DIN rail 35 mm, the total width of both modules is 59 mm

Type	Signalling relay 1	Signalling relay 2	Remote monitoring	Range of displayed value	Critical insulation resistance
HIG93/E Art. number 70 924	1P	1P	Ethernet	5 kΩ ÷ 900 kΩ	Adjustable 5 kΩ÷300 kΩ
HIG94/E Art. number 70 926	1P	1P	Ethernet	200 kΩ ÷ 5 MΩ	Adjustable 200 kΩ÷900 kΩ

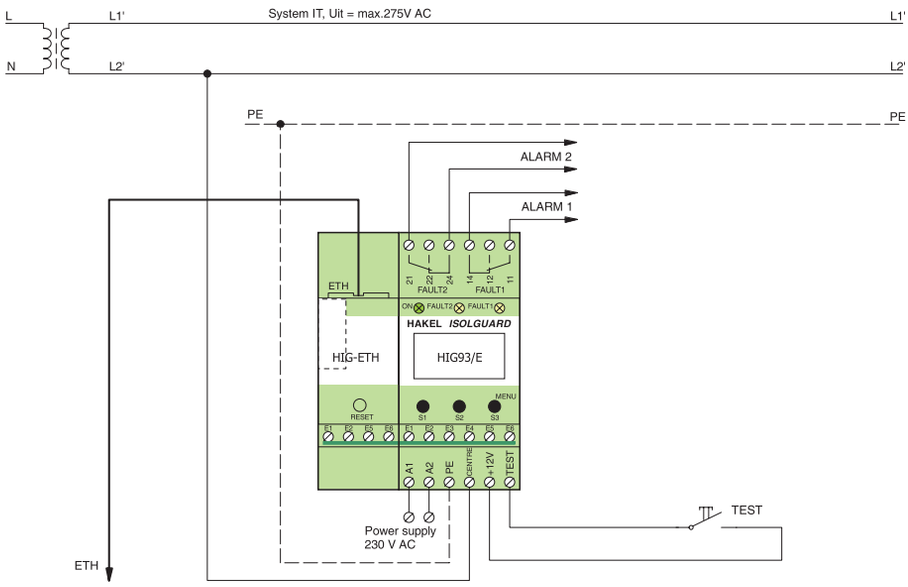
Note: 1P signalling relay with one switching contact.

Technical data HIG93/E, HIG94/E

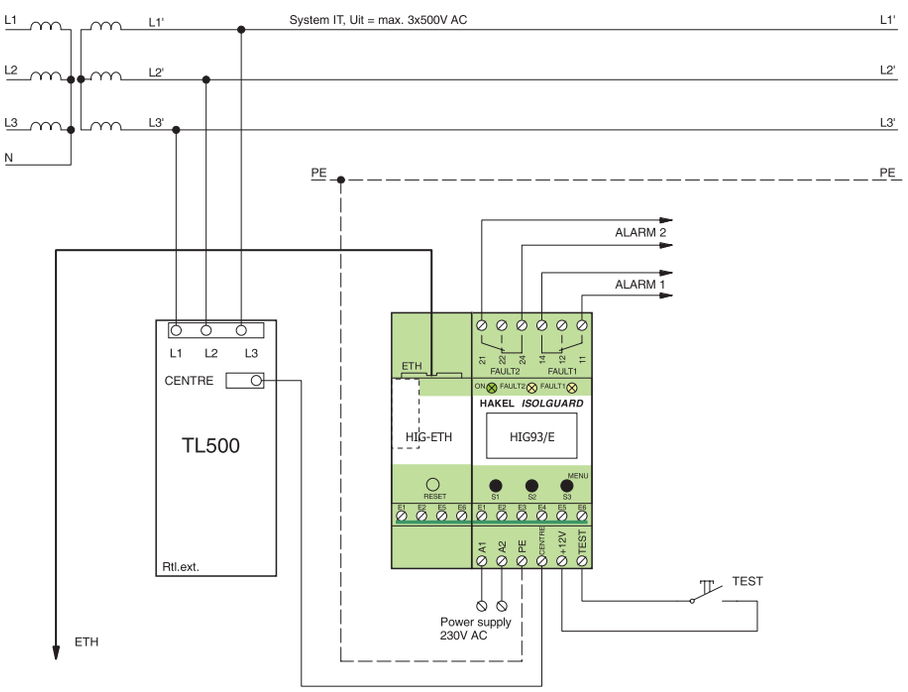
Type		HIG93/E	HIG94/E
Supply voltage	U_n	90 to 265 V AC or 90 to 370 V DC	
Maximum operating voltage of the monitored ungrounded IT power supply system	U_{it}	275 V AC	
Consumption	P	max. 5 VA	
Measuring voltage	U_M	12 V DC	
Measuring current	I_M	< 0,6 mA	
Alternative internal resistance of the measuring input	R_i	> 2 MΩ	
Range of the value shown on the display	R_{isol}	5 kΩ to 900 kΩ	200 kΩ to 5 MΩ
Precision of measurement 5 kΩ ... 10 kΩ 10 kΩ ... 900 kΩ		2 kΩ ± 10%	-
Precision of measurement 200 kΩ … 1 MΩ 1 MΩ … 5 MΩ		-	± 10% ± 15%
Critical insulation resistance	R_{crit}	adjustable 5 kΩ to 300 kΩ	adjustable 200 kΩ to 900 kΩ
Hysteresis of monitored insulation resistance	R_{hyst}	adjustable 0 to +100% R_{crit}	
Delay in response of signalling	t_{ON}	adjustable 0 to 60 sec.	
Outputs			
Signalling potential-free switching contact relay 1		250 V AC / 1A	
Electric strength against internal circuits		3750 V_{rms}	
Electric strength against supply circuits		3750 V_{rms}	
Signalling potential-free switching contact relay 2		250 V AC / 1A	
Electric strength against internal circuits		3750 V_{rms}	
Electric strength against supply circuits		3750 V_{rms}	
Remote monitoring		Ethernet interface	
Communication line: RJ45 Ethernet 10BASE-T/100BASE-TX Ethernet: Version 2.0/IEEE802.3 Insulating strength against internal circuits		Yes 3000 V_{rms}	
General data			
Protection type according to IEC 60 529		IP20	
Weight	m	220 g	
Housing material		PA-UL94 V0	
Mounting on		DIN rail 35 mm	
Recommended cross-section of connected conductors	S	1 mm^2	
Art. number		70 924	70 926
Operating conditions			
Working temperature		-10°C ~ +60°C	
Relative moisture of the environment		28 g H_2O /kg of dry air	
Atmospheric pressure		86 to 106 kPa	
Working position		any	
External magnetic and electric field		max. 400A/m	
Category of over-voltage / testing voltage		III according IEC 60664-1:2007	
Pollution degree		2 according IEC 60664-1:2007	
Type of operation		permanent	

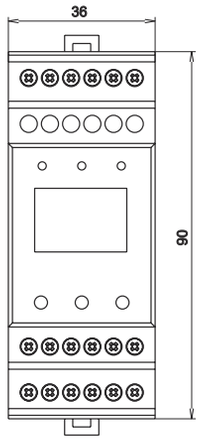
Recommended connection of HIG93/E, HIG94/E to monitored ungrounded IT power supply system

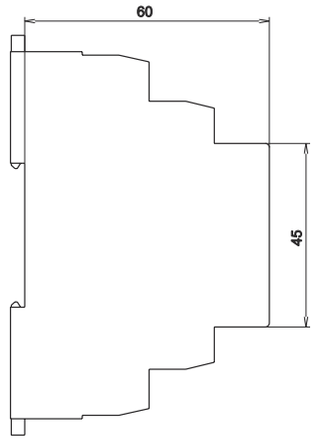
1-phase ungrounded IT power supply system, module HIG93/E, HIG94/E with the signalling of the alarm and remote testing button



3-phase ungrounded IT power supply system (3x440 VAC), module HIG93/E, HIG94/E module







ISOLGUARD insulation monitoring device HIG24VDC

The insulation monitoring device ISOLGUARD HIG24VDC produced by HAKEL is designed for monitoring the insulation status of direct current IT power supply systems with a nominal voltage of 24V DC. The device continuously monitors the insulation state of the positive and negative output of an insulation power supply system against the base point. For stationary devices it is usually PE conductor. The potential free switching contact of the signalization relay will switch during the insulation resistance decrease of + or – output. A fault is also indicated by LEDs on the front panel.

The insulation monitoring device is equipped to display the numeric values of the measured insulation resistance. The measured resistance value of the positive and negative output of a controlled network is displayed on the device´s screen. There are buttons for setting the parameters of the insulation monitoring device and signalling LEDs to display the status of the controlled network and the device itself.

It is possible to connect the insulation monitoring device to the panel MDS-D equipped with a touchscreen by means of the RS485 busbar. The MDS-D panel displays the actual measured values and the actual insulation monitoring device setting.

HIG24VDC can communicate with the master computer via the RS485 busbar with the protokol derived from the PROFIBUS protocol.

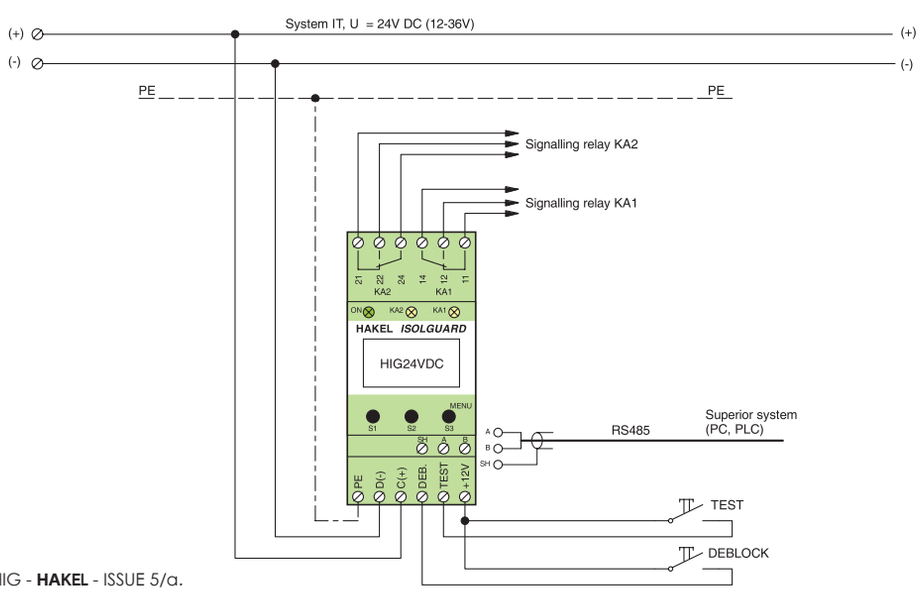
Only one insulation monitoring device can be connected to the same ungrounded IT power supply system.

Basic characteristics

- The monitor for insulating statuses of DC systems with the voltage 24 V DC
- Displaying the measured values of the positive and negative output of a controlled network on the device‘s screen
- Two signalling relays of the IMD status and status of monitored system
- Optional memory of the alarm called with the option to unblock with the button on the insulation monitoring device
- Connection to the RS485 busbar, insulation strengthe 2500 V against internal circuits and network circuits
- Option to set the critical values, hysteresis values and other parameters using the insulation monitoring device buttons
- Access to setting the insulation monitoring device by button can be locked, the insulation monitoring device is unlocked by a combination of buttons
- Module for assembly on the DIN rail 35 mm with the total width 2M (36 mm)

Type	Signalling relay	Range of displayed value	Critical insulation resistance	RS485
HIG24VDC	2 relays 1P	5 kΩ ÷ 990 kΩ	Adjustable 5 kΩ ÷ 500 kΩ	Yes
Art. number 70 933				

Recommended connection of HIG24VDC to monitored ungrounded IT power supply system

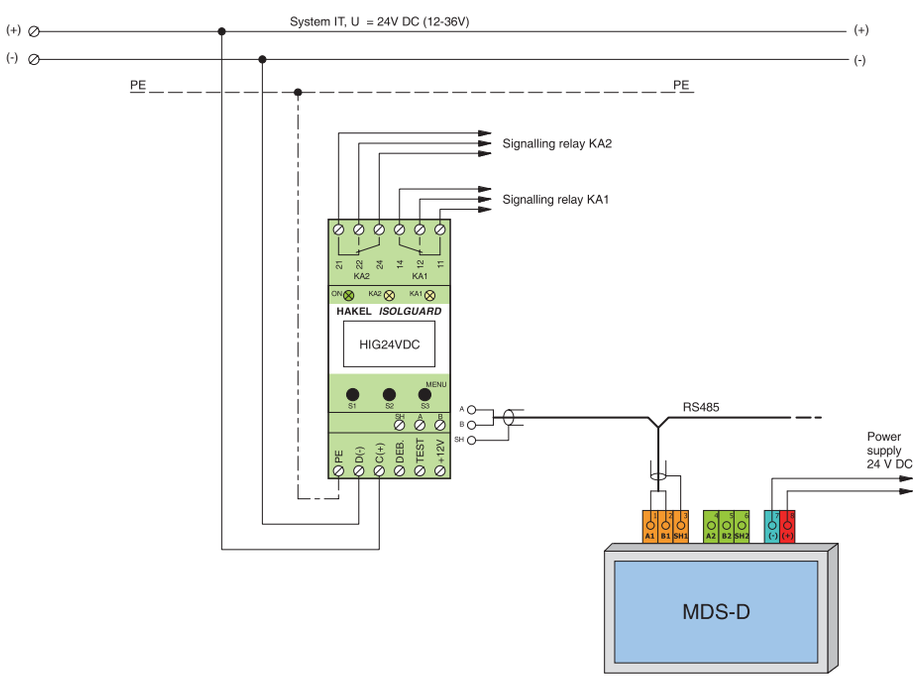


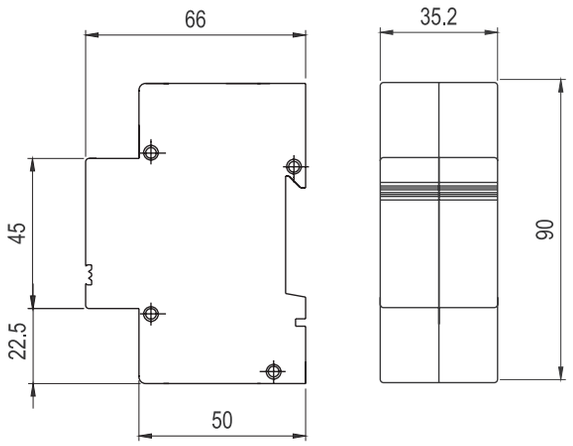
Technical data HIG24VDC

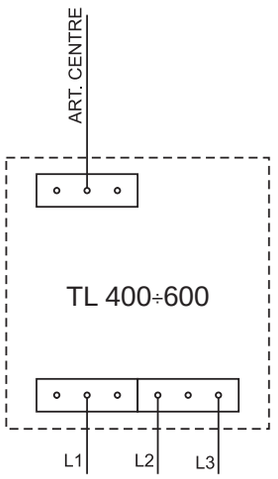
Type		HIG24VDC
Maximum operating voltage of the monitored ungrounded IT power supply system	U_{it}	12 to 36V DC
Consumption	P	max. 2 VA
Internal impedance of the measuring input	Rv	> 200kΩ
Range of the value shown on the display	R_{isol}	5 kΩ to 990 kΩ
Precision of measurement		± 10%
Critical insulation resistance	R_{crit}	adjustable 5 kΩ to 500 kΩ
Hysteresis of monitored insulation resistance	R_{hyst}	adjustable 0 to +100% R_{crit}
Additional time of delay of signalling the insulation status	t_{ON}	adjustable 0 to 60 sec, with the step 1 sec
Outputs		
Signalling of the insulation status FAULT Potential-free switching contact: Electric strength against internal circuits and supply circuits		250 V AC / 1A 3750 V_{rms}
Signalling of the insulation monitoring device function ERR Potential-free switching contact: Electric strength against internal circuits and supply circuits		250 V AC / 1A 3750 V_{rms}
Communication line: RS485 type MASTER-SLAVE, 9600 Bd, even parity Insulating strength against internal circuits		Yes 2500 V_{rms}
General data		
Protection type according to IEC 60 529		IP20
Weight	m	110 g
Housing material		PA-UL94 V0
Mounting on		DIN rail 35 mm
Recommended cross-section of connected conductors	S	1 mm^2

Operating conditions	
Working temperature	-10°C ~ +60°C
Relative moisture of the environment	28 g H_2O /kg of dry air
Atmospheric pressure	86 to 106 kPa
Working position	any
External magnetic and electric field	max. 400A/m
Category of over-voltage / testing voltage	III according IEC 60664-1:2007
Level of pollution	2 according IEC 60664-1:2007
Type of operation	permanent

Recommended connection of HIG24VDC to monitored ungrounded IT power supply system



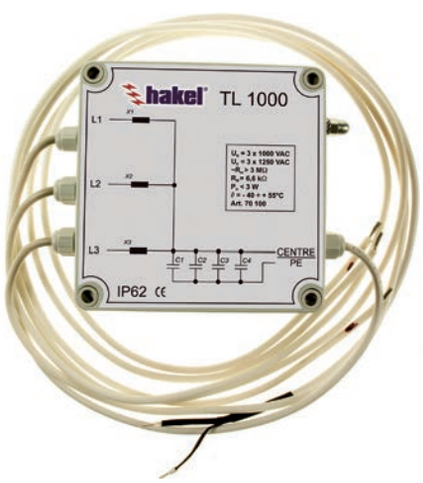


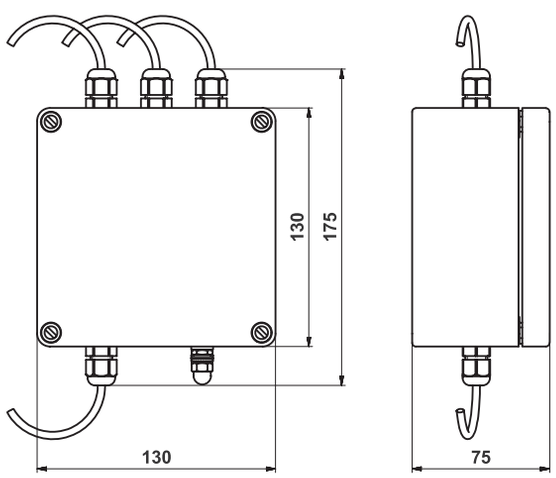


Inductors TL400, TL500, TL600

TL* serves for the adaption of IMD circuits to 3-phase ungrounded IT power supply system 3 x 400 V AC (or 500 ev. 600 V AC).

Type		TL 400	TL 500	TL 600
Nominal voltage	U_n	3 x 400 V	3 x 500 V	3 x 600 V
Max. continuous operating voltage	U_C	3 x 500 V	3 x 600 V	3 x 720 V
Art. number		70 504	70 501	70 601



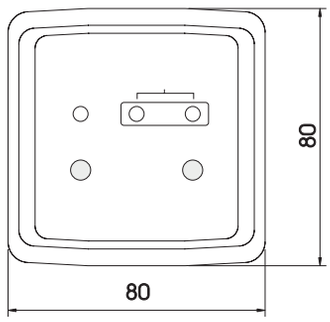


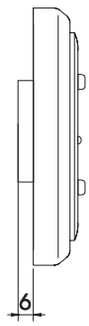
Inductors TL1000

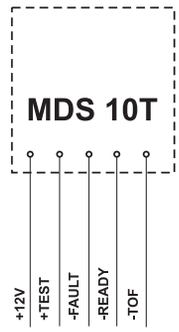
TL* serves for the adaption of IMD circuits to 3-phase ungrounded IT power supply system 3 x 1000 V AC.

Commonly, these 3-phase inductors are produced on the basis of special requirement up to the voltage U_C = 3 x 6000 V AC. These inductors are produced in different sizes.

Type		TL 1000
Nominal voltage	U_n	3 x 1000 V
Max. continuous operating voltage	U_C	3 x 1250 V
Art. number		70 100







Modules for remote signalling MDS10 and MDS10T

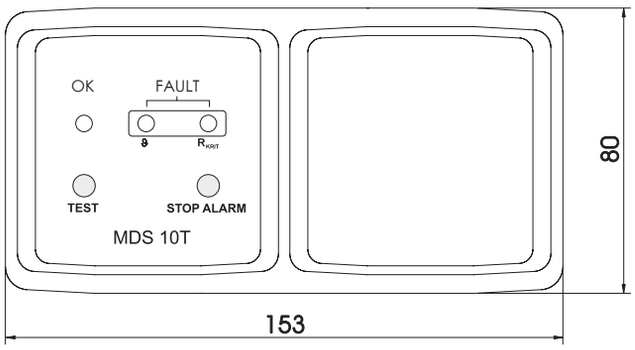
Modules MDS10/MDS10T for remote signalling are designed for checking the status of the monitored ungrounded IT power supply system in a distant place from the insulation monitoring device.
These modules are intended for locations remote from insulation monitoring device, e.g. supervising rooms or operating theatres.
In case of failure evaluated by the IMD sensor, on the module MDS10/MDS10T, yellow FAULT signal lamp starts to shine (insulation fault-R_{CRIT}) and, at the same time, the piezo siren is activated.
In case of error due to overheating or current overloading of the medical transformer, on the MDS10T series module, a red FAULT signal lamp starts to flash (ϑ,I) and the piezo siren is activated.
For selected types there is an additional module MPS, which ensures enhanced optical fault signalization.

MDS10 modules and IMD are to be interconnected by 4 conductors with maximum cross-section of 1,5mm2, MDS10T modules by 5 conductors.

Modules for remote signalling are designed to meet requirements of standard IEC 61557-8.
MDS10/MDS10T are compatible only with HAKEL IMDs.

Types of modules for remote signalling MDS10 and MDS10T

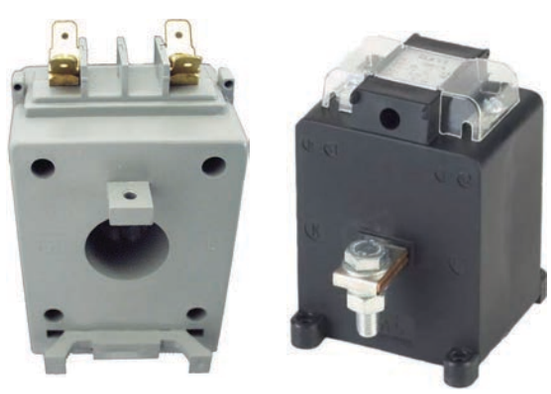
Type	**MDS10**		**MDS10T**		
Design	Classic	Tango	Classic	Tango	
Operation signalization	Yes	Yes	Yes	Yes	Yes
Acoustic signalization	Yes	Yes	Yes	Yes	Yes
Insulation fault signalization	Yes	Yes	Yes	Yes	Yes
Overheating/current overloading of transformer signalization	No	No	Yes	Yes	Yes
Additional module MPS	No	No	No	No	Yes
Nominal working voltage (supplied from the HIG module)	12 V DC	12 V DC	12 V DC	12 V DC	12 V DC
Number of modules	1	1	1	1	2
Max. number of modules connectable to one IMD	5	5	5	5	2
Working temperature	-25 ÷ 55°C		-25 ÷ 55°C		
Type of operation	permanent		permanent		
Working position	any		any		
Category of over-voltage / testing voltage	III according to IEC 60 664-1:2007		III according to IEC 60 664-1:2007		
Pollution degree	2 according to IEC 60 664-1:2007		2 according to IEC 60 664-1:2007		
Art. number	70050	70054	70053	70055	70056



Module for remote signalling MDS10T+MPS

Module for remote signalling MDS10T or set MDS10T+MPS (MPS... module for auxiliary signalling) are designed for inspection of the status of the monitored ungrounded IT power supply system in a distant place of the HIG insulation monitoring device. It is possible to connect 5 pcs MDS10T or 2 pcs sets MDS10T+MPS to one HIG91, 92 and 95. Interconnection HIG95+→MDS10T+(MPS) is performed by 5 conductors. Under normal conditions, on the front MDS10T panel, only a green READY/OPERATION signal lamp shines. In the case of the failure of the insulating status evaluated by the HIG insulation monitoring device on the module MDS10T yellow FAULT signal lamp starts to flash (R_{CRIT}). The built-in siren is activated and light signalling is activated MPS module. The operation of the health or supervising workplace has the option of acoustic warning and flashing of the module disconnect by pressing the STOP ALARM button. In the case that due to the overheating or current overloading of the medical transformer, on the MDS10T module a red signal lamp starts to flash FAILURE (ϑ,I). At the same time, the built in siren is activated and lighting signalling the MPS module is activated. The health operators or supervising workplace has the option to disconnect the acoustic warning and flashing of the MPs module by the STOP ALARM buttons.

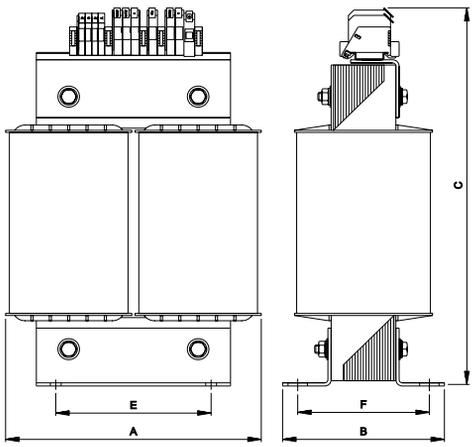
Type		**MDS10T + MPS**
Nominal working voltage (supplied from the HIG module)	U_n	12 V DC
Maximum consumption of fully activated module	I_C	33 mA
Max. number of modules connected to HIG91, 92 and 95		2
Working temperature		- 25 to + 55 °C
Mounting		into round flush-mount box
Art. number		70 056



Current transformer

Current transformers are designed for reading the values of off-taken current from the medical transformer. In the standard version it is provided in the ratio 100 A / 5 A / 3 VA / 1 % in the ring-type version with a cable. The current transformers with another ratio than 100 A / 5 A are supplied by the company on the **basis of the request of the client**.

Type		**25/5A**	**30/5A**	**40/5A**	**50/5A**	**60/5A**	**80/5A**	**100/5A**
Ratio		25 A / 5 A / 50 Hz	30 A / 5 A / 50 Hz	40 A / 5 A /50 HZ	50 A / 5 A / 50 Hz	60 A / 5 A / 50 Hz	80 A / 5 A / 50 Hz	100 A / 5 A / 50 Hz
Voltage monitored by IT - network	U_{IT}	max. 1200 V AC						
Consumption	P	3 W						
Measuring current	I_M	max. 5 A / 50 Hz						
Art. number		71 509	71 521	71 508	71 510	71 513	71 512	71 405



Insulating safety Transformer RJV 4 - 7,5 and RJN 608, 612

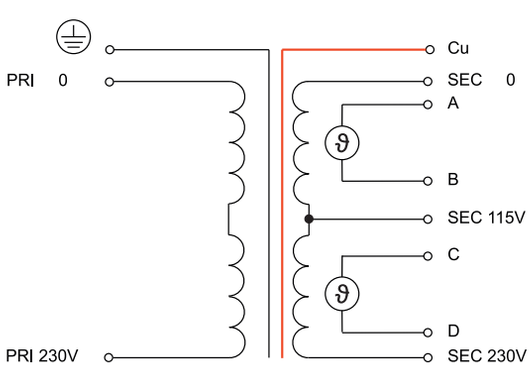
Isolation Transformer for Medical Applications

The transformer has the working shield between the input and output winding conducted to separate clamp. The output winding has the winding centre connected to separate clamp for the monitoring device connection. The transformer is equipped by built-in thermal protection on both spools conducted to separate clamps.

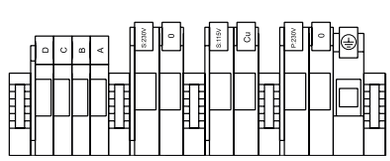
Type	Power rating [VA]	Dimensions [mm]						Weight [kg]
		A	B	C	D	E	F	
RJV 4	3 150	240	153	380	10	144	125	35
RJV 5	4 000	240	168	380	10	144	140	40
RJV 6,3	5 000	240	183	380	10	144	155	51
RJV 7,5	6 300	240	210	380	10	144	182	65
RJN 608	8 000	250	275	400	11	140	155	65
RJN 612	10 000	290	291	420	11	160	175	92

According to	IEC 61558 - 2 - 15:2011
Touch protection	I
Protection type	IP 00
Insulation class	B
Warming	40 °C
Frequency	50 Hz
Inrusch current	to 12 x In
No-load current	I_0 < 3%
Schort-circuit proof	non resistant
Input voltage	230 V - 500 V
Output voltage	230/115 V

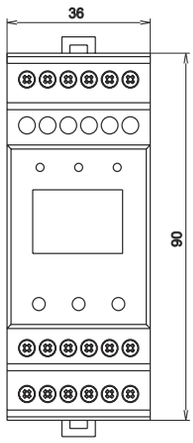
Winding circuit diagram

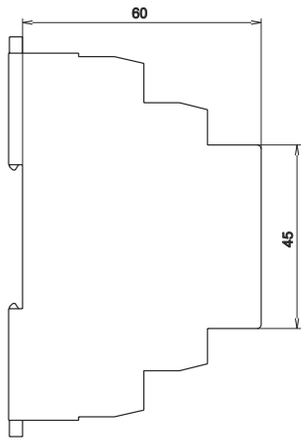


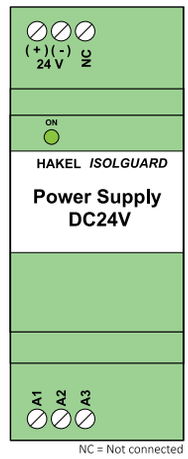
Involvement and identification clamps



Note: Temperature sensor of the isolation transformer:
NC temperature sensor
or PTC thermistor
or PT100 sensor







Power Supply DC24V

Power Supply DC24V, ISOLGUARD series is an universal power supply for mounting on the 35mm DIN rail. The product is primarily intended for powering the remote monitoring module MDS-D, MDS-DELTA produced by HAKEL company.

Output voltage is stabilized for 24 V DC. The supply voltage can be DC or AC in the ranges which are written below in the specification table.

This power supply source is also designed for industrial use such as current loop power supply of the two-wire transmitters, sensors power supply, indication devices power supply etc. For the safety viewpoints it meets the standard IEC 61010-1:2010 (Safety requirements for electrical equipment for measurement, control, and laboratory use).

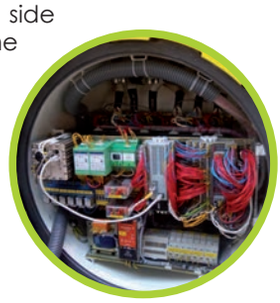
Connecting the Power Supply DC24V to the voltage is signalled by a green LED on the top of the product.

Type		**Power Supply DC24V**
Supply voltage AC	$U_{n\,AC}$	90 ÷ 265 V AC (47 ÷ 440 Hz)
Supply voltage DC	$U_{n\,DC}$	90 ÷ 370 V DC
Output voltage	U_o	24 V DC
Maximum output current	I_{max}	110 mA
Power	P	max. 2,5 VA
Operation signalling		green LED
Short-circuit protection		Yes, on the output, with an automatic renewal of the power supply after the fault
Thermal fuse		Yes, with an automatic renewal of the power supply after the fault
Isolation voltage input / output		4000 V AC
General data		
Protection type		IP20
Weight	m	95 g
Housing material		PA-UL94 V0
Mounting on		DIN rail 35 mm
Cross-section of the connected conductors	S	1 mm^2
Art. number		70 062
Operating conditions		
Working temperature		-10°C ÷ +65°C
Relative moisture of the environment		28 g H_2O /kg of dry air
Atmospheric pressure		86 to 106 kPa
Working position		any
Category of over-voltage / testing voltage		III according IEC 60664-1:2007
Pollution degree		2 according IEC 60664-1:2007
Type of operation		permanent

References

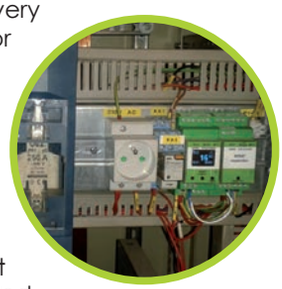
OKD coal mines - HIG97

Czech State Mining Administration Regulation No. 22/1989 stipulates that the low-voltage side of the mine transformer stations must be equipped with a monitoring system measuring the outlet cable insulation status both during operation and before switching-on. HIG97 insulation monitoring devices (IMDs) manufactured by HAKEL s.r.o. were for OKD coal mines chosen based on cooperation with REPOS TECHNIK s.r.o. and following successful tests. This device type not only meets the frequent requirement of response time <80 ms but also includes suitable signalling and control terminals, features reliable operation, is substantially smaller in size than other comparable devices, and offers convenient connection to the system monitored.



Steelmaking company Moravia Steel - HIG97

The HIG97 monitoring device was developed specifically to satisfy customers' demand for very rapid network status evaluation and signalling. In the this product, an additional microprocessor (in the expander module) is used in order to achieve a rapid response. This concept enabled the engineers to design a network status evaluation algorithm which is not only significantly faster but is also more precise and can be adjusted to suit the particular customer's application. As a result, the monitoring device's reaction time was suppressed to below 80 ms. Extremely rapid signalling at the output terminals is required, e.g., in some applications in the mining industry. The HIG 97 has been tested and then deployed in the heavy industry of continuous steel casting at Moravia Steel, where the previously used monitoring devices were unable to reliably measure the network insulation resistance because of frequent transients and interferences from frequency converters. The monitoring device is installed in the distribution box, where it is connected to a 3×500 VAC / IT power supply system via a TL 500 inductor.

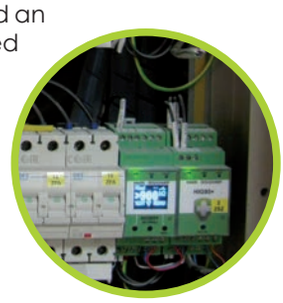


Railway tunnel under the hill Homolka and Chlum near Pilsen - HIG97

The largest railway tunnel in the Czech Republic started to be built at the Ejpovice site under the Homolka and Chlum hills in late January 2015. It is driven by using the biggest driving shield in the Czech Republic, TBM S-799, christened "Viktorie". HAKEL s.r.o. in cooperation with REPOS TECHNIK s.r.o. developed a solution for monitoring the 22 kV line insulation status within the segment from the isolation transformer to the transformers on the driving machine. The 22 kV / 22 kV isolation transformer has an outlet in the secondary winding junction to which a TL22001 HV inductor is connected through an HV cable. To the TL22001 inductor is connected an ISOLGUARD HIG97 version 22 insulation monitoring device (IMD), which is specifically modified and adjusted for this application.

Hospitals - HIG-IFL1, HIG95 or HIG95+

GENERAL UNIVERSITY HOSPITAL PRAGUE - Czech Republic
SILESIAN HOSPITAL OPAVA - Czech Republic
UNIVERSITY HOSPITAL OSTRAVA - Czech Republic
UNIVERSITY HOSPITAL BRATISLAVA - Slovakia
UNIVERSITY HOSPITAL OLOMOUC - Czech Republic
UNIVERSITY HOSPITAL PARDUBICE - Czech Republic
and more



PESA Bydgoszcz SA

Monitoring of internal 3x400 VAC and 3x500 VAC power supply systems used for air-conditioning, heating etc. of trams.

Insulation Monitoring Devices for AC IT power supply systems (AC IMD)

HIG91	Basic IMD type from the HAKEL ISOLGUARD series. It replaces HIS71 and HIS73 from HAKEL production range. HIG91 evaluates level of insulation in the range of 5 kΩ to 900 kΩ.
HIG91/E	Basic IMD type from the HAKEL ISOLGUARD series. It enables communication with master system via Ethernet.
HIG91/Q	Basic IMD type from the HAKEL ISOLGUARD series. It enables memory reset of insulation level fault by an external button.
HIG91/QL	IMD for low values of insulation resistance. It evaluates the insulation resistance in the range of 0.1 kΩ to 90 kΩ. HIG91/QL replaces HIS72 and HIS75 from HAKEL production range.
HIG92	IMD with wider range of monitored insulation resistance. It evaluates the insulation resistance in the range of 200 kΩ to 5 MΩ. HIG92 replaces HIS76 from the HAKEL production range.
HIG92/E	IMD with wider range of monitored insulation resistance. It enables communication with master system via Ethernet.
HIG93	IMD intended for heavy industry. Its internal sophisticated filters enable to use this type for power supply systems with interference. HIG93 monitores insulation status in the range of 5 kΩ to 900 kΩ and evaluates two critical levels of insulation resistance.
HIG93/E	IMD intended for heavy industry. Its internal sophisticated filters enable to use this type for power supply systems with interference. It enables communication with master system via Ethernet.
HIG94	IMD intended for heavy industry with wider range of monitored insulation resistance. Its internal sophisticated filters enable to use this type for power supply systems with interference. HIG94 monitores insulation status in the range of 200 kΩ to 5 MΩ and evaluates two critical levels of insulation resistance.
HIG94/E	IMD intended for heavy industry with wider range of monitored insulation resistance. Its internal sophisticated filters enable to use this type for power supply systems with interference. HIG94/E enables communication with master system via Ethernet.
HIG97	IMD intended for mining industry. It has a function of extremely fast response with the ability to evaluate the insulation fault within 80 ms. HIG97 can be also used for power supply systems with the interference. It monitores insulation level in the range of 5 kΩ to 900 kΩ and evaluates two critical levels of insulation resistance.
HIG935	IMD with a wide range of monitored insulation resistance. It is mainly intended for monitoring of insulation status of data links. HIG935 monitores insulation level in the range of 950 kΩ to 51 MΩ.

Insulation Monitoring Devices for AC IT power supply systems in health sector (MED IMD)

HIG95	Basic IMD type from the HAKEL ISOLGUARD series designed for health sector. It replaces HIS74 from HAKEL production range. HIG95 evaluates level of insulation in the range of 5 kΩ to 900 kΩ.
HIG95/E	Basic IMD type from the HAKEL ISOLGUARD series designed for health sector. It replaces HIS74 from HAKEL production range. HIG95/E enables communication with master system via Ethernet.
HIG95+	IMD intended for health sector. It enables to monitor the status of the isolation transformer of IT system and evaluates its heat and current load. HIG95+ evaluates level of insulation in the range of 5 kΩ to 900 kΩ and allows to connect remote signalling module MDS10.
HIG95+/2R	IMD intended for health sector. It enables to monitor the status of the isolation transformer of IT system and evaluates its heat and current load. It also enables to use the second potential-free switching contact for the signalling of isolation transformer fault. HIG95+/2R allows to connect remote signalling module MDS10.
HIG95+/2T	IMD intended for health sector. It enables to monitor the status of the isolation transformer of IT system and evaluates its heat and current load. It is equipped with two independent channels for monitoring of two temperature sensors of isolation transformer. HIG95+/2T allows to connect remote signalling module MDS10.
HIG95 DELTA	IMD intended for health sector. It enables to monitor the status of the isolation transformer of IT system and evaluates its heat and current load. HIG95 DELTA evaluates level of insulation in the range of 5 kΩ to 900 kΩ.

Insulation Monitoring Device equipped with a function of ground fault localization (IMD+IFLS)

HIG-IFL1	HIG-IFL1 is designed for single-phase IT power supply systems in health sector. It enables to monitor the insulation resistance as well as heat and current load of the transformer. By the means of integrated insulation fault location system HIG-IFL1 can detect the channel of ungrounded power supply system, where the fault occured.

Insulation Monitoring Device for DC IT power supply systems (DC IMD)

HIG24VDC	IMD intended for monitoring of insulation resistance of DC power supply systems with a supply voltage of 12 to 36 V DC. It replaces HIS24VDC from HAKEL production range. HIG24VDC evaluates level of insulation in the range of 5 kΩ to 990 kΩ.

Type	Art. number	Range of display R_{isol}	Critical insulation resistance R_{crit}	Number of critical levels	Number of signalling relays	Communication interface
HIG91	70911	5 kΩ ÷ 900 kΩ	5 kΩ ÷ 300 kΩ	1	1	RS485
HIG91/E	70920	5 kΩ ÷ 900 kΩ	5 kΩ ÷ 300 kΩ	1	1	Ethernet
HIG91/Q	70911Q	5 kΩ ÷ 900 kΩ	5 kΩ ÷ 300 kΩ	1	1	RS485
HIG91/QL	70911QL	0.1 kΩ ÷ 90 kΩ	0.1 kΩ ÷ 90 kΩ	1	1	RS485
HIG92	70913	200 kΩ ÷ 5 MΩ	200 kΩ ÷ 900 kΩ	1	1	RS485
HIG92/E	70922	200 kΩ ÷ 5 MΩ	200 kΩ ÷ 900 kΩ	1	1	Ethernet
HIG93	70915	5 kΩ ÷ 900 kΩ	5 kΩ ÷ 300 kΩ	2	2	RS485
HIG93/E	70924	5 kΩ ÷ 900 kΩ	5 kΩ ÷ 300 kΩ	2	2	Ethernet
HIG94	70917	200 kΩ ÷ 5 MΩ	200 kΩ ÷ 900 kΩ	2	2	RS485
HIG94/E	70926	200 kΩ ÷ 5 MΩ	200 kΩ ÷ 900 kΩ	2	2	Ethernet
HIG97	70936	5 kΩ ÷ 900 kΩ	5 kΩ ÷ 300 kΩ	2	4	RS485
HIG935	70921	950 kΩ ÷ 51 ΩM	1 MΩ ÷ 50 MΩ	2	2	RS485

Type	Art. number	Range of display R_{isol}	Critical insulation resistance R_{crit}	Transformer status monitoring	Number of signalling relays	Communication interface
HIG95	70919	5 kΩ ÷ 900 kΩ	50 kΩ ÷ 200 kΩ	-	1	RS485
HIG95/E	70928	5 kΩ ÷ 900 kΩ	50 kΩ ÷ 200 kΩ	-	1	Ethernet
HIG95+	70929	5 kΩ ÷ 900 kΩ	50 kΩ ÷ 200 kΩ	Current load Heat load	1	RS485
HIG95+/2R	70939	5 kΩ ÷ 900 kΩ	50 kΩ ÷ 200 kΩ	Current load Heat load	2	RS485
HIG95+/2T	70930	5 kΩ ÷ 900 kΩ	50 kΩ ÷ 200 kΩ	Current load 2x Heat load	1	RS485
HIG95 DELTA	70940	5 kΩ ÷ 900 kΩ	50 kΩ ÷ 200 kΩ	Current load Heat load	1	RS485

Type	Art. number	Range of display R_{isol}	Critical insulation resistance R_{crit}	Transformer status monitoring	Number of monitored circles (IFLS)	Communication interface
HIG-IFL1	70950	5 kΩ ÷ 900 kΩ	50 kΩ ÷ 200 kΩ	Current load Heat load	8	RS485

Type	Art. number	Range of display R_{isol}	Critical insulation resistance R_{crit}	Voltage of monitored IT system	Number of signalling relays	Communication interface
HIG24VDC	70933	5 kΩ ÷ 900 kΩ	5 kΩ ÷ 900 kΩ	12 ÷ 36 V DC	2	RS485

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