HAKEL ISOLGUARD MDS-D

HAKEL ISOLGUARD remote signalling module with display (MDS-D and MDS-D / IP66) is a device equipped with a touch screen displaying the status of insulated IT power supply systems, monitored by insulation monitoring devices HIG9x made by HAKEL. Communication is done via RS485 line.

MDS-D panel also offers another line RS485 (*External bus*), which is used to transfer actual data to the user's master system. Communication on this line is done by telegrams based on Profibus protocol. Description of this protocol is available on request.

MDS-D devices are primarily designed for supervising and monitoring workplaces requiring continuous displaying of the status of IT power supply systems monitored by insulation monitoring devices type HIG9x/485.

Remote signalling panel, type MDS-D

HAKEL ISOLGUARD MDS-D remote signalling modules

Model	Display	Control	Fault and incident signalling	Transferring data to a master system	Degree of protection
MDS-D *Art. no. 70 060*	4.3" LCD	By touch, Resistance layer	Visual and audio	Yes, by using additional line RS485 (*External bus*)	IP20
MDS-D/IP66 *Art. no. 70 061*					IP66

Panel ISOLGUARD MDS-D is designed to comply with requirements of IEC 61557-8:2007 and it is used for IT power supply system fault signalling, monitored by insulation monitoring devices *ISOLGUARD* HIG9x.

Basic characteristics

- Simultaneously displays status of up to 24 IT power supply systems monitored by insulation monitoring devices HIG9x with RS485 line
- Insulation monitoring devices titling for easier identification
- Two options of the MDS-D panel based on the final location of the panel
- Fault and incident audio and visual signalling
- Display of currently measured values by insulation monitoring devices HIG9x/485
- Touchscreen control
- Easy installation
- Czech or English language menu
- Degree of protection up to IP66
- Automatic search for insulation monitoring devices connected to the bus
- External bus RS485 designed for communication with master system
- Optional remote test of each connected insulation monitoring device
- Clear display of detailed configuration parameters of insulation monitoring devices
- Password protected access to panel setting

Technical characteristics - MDS-D

Type			MDS-D	MDS-D/IP66
Supply voltage range	U_n		9 ÷ 36 V DC	
Power consumption	P		max. 2 VA	
Control method			Touch screen control - resistance touch screen layer	
Number of displayed devices			1 ÷ 24	
Displayable devices			ISOLGUARD HIG9x designed with communication line RS485 in any combination	
Lockable settings			Yes, four-digit PIN may be set to protect access to setting and to advance panel functions	
Outputs				
Visual fault signalling			Display colour change, flashing	
Audio fault signalling			Acoustic siren	
Termination of fault signalling			By touching the screen	
Option to invoke a remote test of the connected insulation monitoring device			After unlocking advance functions by the PIN code	
Data transfer to the master system			Via external bus	
External bus				
Communication busbar type			RS485 MASTER-SLAVE type	
Data rate			9600 Bd	
Parity			Even	
MDS-D panel position on the line			Slave	
MDS-D panel default address on the line			1	
Insulation strength against internal circuits and IT network circuits			2500 Vrms	
Installation				
Method of assembly			To electrical installation box KU68	Anchors / Self-cutting screws
Typical application			Nurses' room, monitoring station	Operating room
Terminals used to connect the conductors			Spring terminals	
Sections of solid connected conductors	S		0.2 ÷ 0.75 mm^2	
Sections of flexible connected conductors	S		0.25 ÷ 0.34 mm^2	
Recommended section of the connected conductors	S		Solid wire 0.5 mm^2	
Recommended cable type			STP / UTP	
General data				
Degree of protection according to IEC 60529			IP20	IP66
Weight	m		170 g	500 g
Article number			70 060	70 061

Product dimensions

MDS-D

MDS-D/IP66
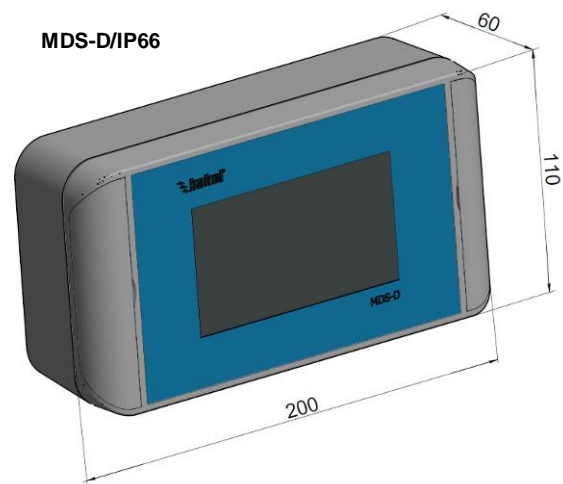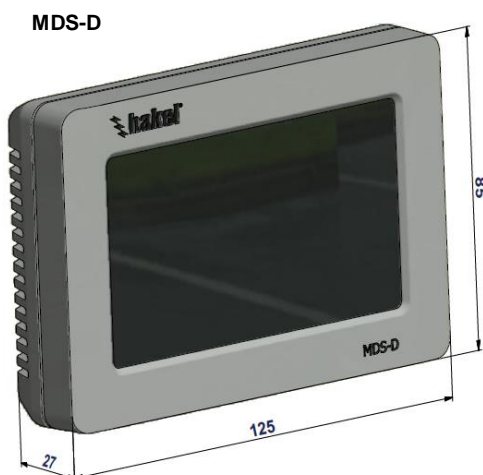
MDS-D connection

Panel power supply

MDS-D panel is powered with direct voltage 9 - 36 V.

It is recommended to use **PowerSupply DC24V** made by HAKEL (catalogue no. 70 062) to supply MDS-D panel. This power source is rated so that its input side complies with the same operating conditions as actual supply for Insulation monitoring devices belonging to the *ISOLGUARD* HIG9x series. The output voltage is 24 V DC.

This power supply was specially designed to be used with MDS-D panel.

After the power supply is connected, MDS-D is automatically activated and the panel begins its regular operation.

Communication bus – physical layer

MDS-D panel contains two communication lines. Both of these lines are equipped with RS485 buses and the same physical and application layers apply to them.

Internal bus

The bus is used to collect data from independent HAKEL devices. Communication on this bus is controlled by MDS-D panel and it is done via internal protocol.

It is not allowed to connect any foreign devices to this line or to interfere with the prescribed configuration and communication occurring on this bus.

External bus

It is used to connect MDS-D panel or eventually several panels with the master system. MDS-D panel acts here as a slave station and responds to queries of the control unit. The control unit may be PC or any other user system able to communicate on RS485 levels.

The description of communication telegrams is available in a separate description - *Programming manual for External bus MDS-D* made by HAKEL. The communication protocol of this bus is based on Profibus protocol. Connection to this bus is fully optional. MDS-D panel may be operated even without using *External bus.*

Communication bus connections

When connecting RS485 the following requirements must be observed. Individual stations are interconnected with twisted pair (TWISTED PAIR-TP). One conductor is labelled A and the second one B. Logical 1 (respectively 0) is determined by the voltage between these conductors. During an idle state (logical 1) the A conductor is more positive than B conductor (at least by 200 mV).

Communication bus terminals

Each communication bus is fitted with A, B and SH terminals. Signals A and B are data cables. The SH terminal serves for connection of shielded interconnecting cable. If shielding is used, it is necessary that it is properly connected to all division points of the bus and grounded at a suitable position. Shielding is connected only within one bus – shielding of *Internal and External buses* is never interconnected in order to maintain galvanic separation between buses. RS485 bus may be operated even without connected shielding.

Type of used cable

UTP cable types are recommended wires for buses interconnection. One type of cable must be used along the entire length of the bus. This will ensure a uniform impedance of the cable and if the bus is properly termination no reflections will occur.

In order to connect the bus in interfering environments or as a protection against electromagnetic radiation, cables STP / FTP may be used, which in addition to twisted pair, also contain extra shielding. This shielding must be connected to SH terminals on both cable ends.

Bus stations interconnection

The maximum length of the line is 1,200 m and it is necessary to follow a linear wiring. Linear wiring of RS485 bus means that individual stations are connected in raw, one by one, from the first one to the last station and without any taps. Position of MASTER station is optional.

Bus ending

The ending of RS485 line is achieved by terminating resistors (Rt). The value of these resistors has been established at 120 Ω. As for insulation monitoring devices HIG9x with communication line RS485, the terminating resistor is connected using the device setting menu option. As for the MDS-D panel, the terminating resistance is connected via DIP switch (SW1, SW2) located above the communication line terminal box. For correct function of the bus it is necessary to connect the terminating resistor to the first and last bus station. Terminating resistors cannot be on other stations.

Internal bus connection diagram
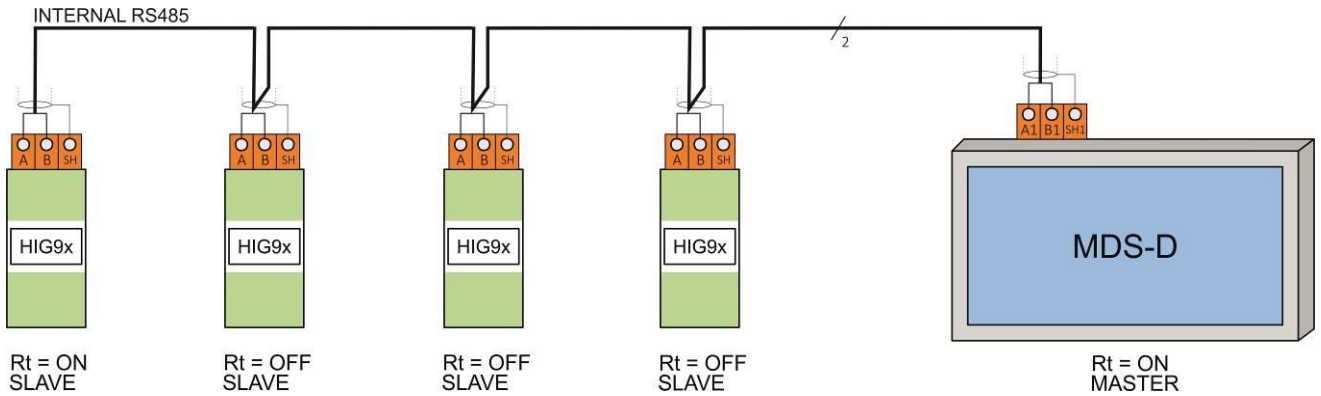
Protection of communication line against overvoltage

If the bus RS485 goes outside of the inner spaces or if it is located (or its part) outside of the joint spark system, it is necessary to protect the communication bus against overvoltage. For this situation HAKEL has developed two lines of overvoltage protection systems. It is an overvoltage protection line HAKEL DTE 485, or possibly DTE 1/6.

These two lines of overvoltage protection systems may be used at the interface of protection zones ZBO 0A(B) - 1 according to IEC 62305:2013. All types provide an efficient protection of connected devices against cross and longitudinal overvoltage according to IEC 61643-21:2000.

Recommended connection of the MDS-D panel
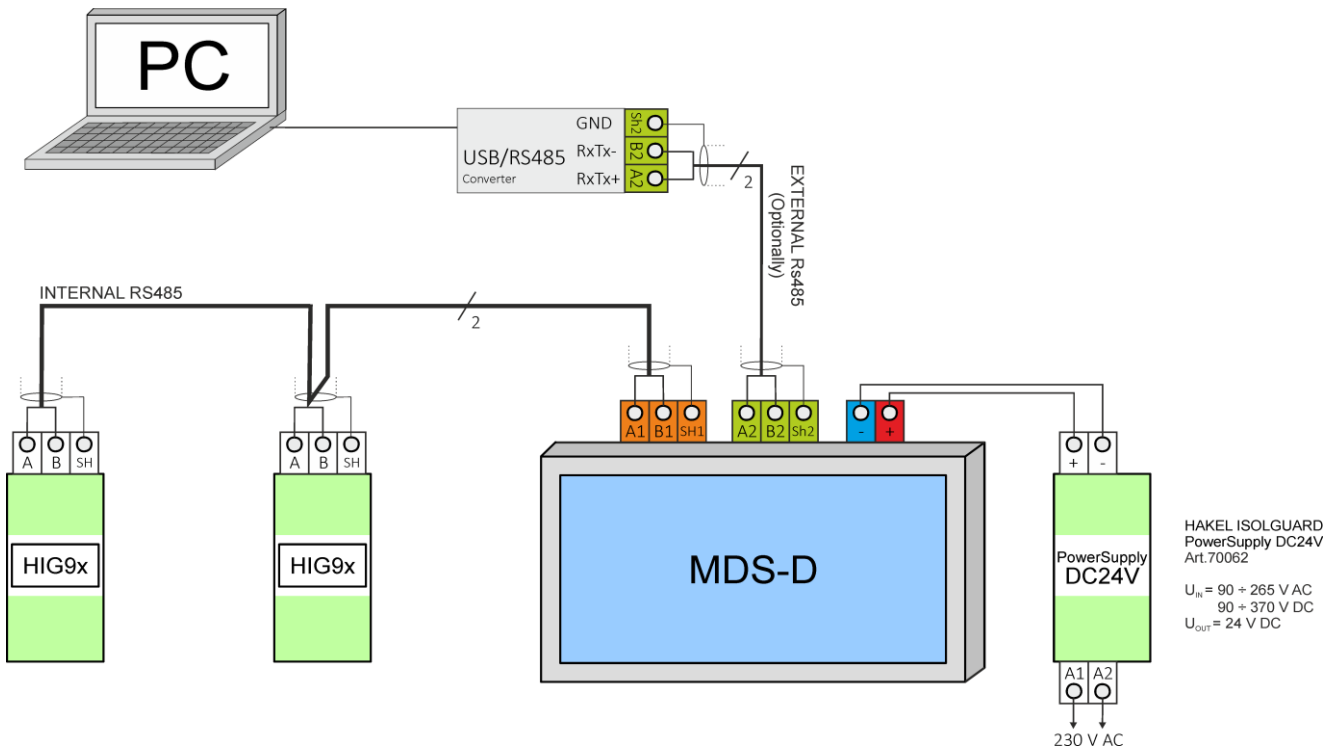
Communication bus – application layer

The communication in the "query - answer" mode occurs on the *Internal and External bus.* This communication mode is called a half-duplex communication and several rules must be observed to ensure proper function.

The MASTER station, which controls the communication, must always be on the bus. MASTER transmits requirements to subordinated stations called SLAVE. SLAVE stations always respond to the request of the MASTER station and will never start transmitting without previous order.

In order to ensure correct communication correct addresses of stations on the bus must be ensured. Each unit connected to the bus must have a preset address and the address must be unique along the bus – no address may be repeated. Address 0 is reserved for the MASTER unit and SLAVE units may have any address from 1 to 126.

MDS-D in MASTER position / in SLAVE position

By the software version 5.3 in specific cases is possible to connect multiple MDS-D panels to one *Internal bus* and monitor more insulation monitoring devices at several locations in one time. **To achieve this objective, it is necessary when ordering to require the MDS-D software version 5.3s (SLAVE).** This panel operates in the interception of communications mode and does not transmit any requirements on the line. Panel MDS-D 5.3s (SLAVE) must be connected to the bus where also MDS-D 5.3m (MASTER) panel occurs – common design.

In practice, the panel, which is in the MASTER position must connect and display all the slave units (insulation monitoring devices). Each SLAVE panel can display random combination of devices which are addressed to the MASTER station. Measurement display and devices setting is identical in both software versions. The only exception is remote TEST of insulation monitoring devices, which can only be done from a MASTER station. SLAVE panels do not have possibility of remote testing.

Communication rules on Internal bus

The MDS-D panel has the position of MASTER on the internal bus and ensures communication with stations on the bus.

Stations on *Internal bus* may only be devices belonging to the *ISOLGUARD* line made by HAKEL. This primarily concerns insulation monitoring devices belonging to the HIG9x series with communication line RS485. The MDS-D panel has been assigned a permanent address 0 on this bus. Subordinate stations may have any address.

As for insulation monitoring devices HIG9x, this address is set in the device menu as the parameter 485ADDR. Each device connected to the same *Internal bus* must have its own address which cannot be repeated on this bus.

Communication rules on External bus

MDS-D panel has the position of SLAVE on the *External bus.* As a SLAVE unit awaits the order from the superior user system.

The setting menu in the MDS-D panel allows you to set the address of the panel on the external line. The default address is 1.

Communication protocol used by the *External bus* is based on Profibus protocol. Description of the *External bus* protocol is available to the user as a *Programming manual for External bus MDS-D.*

The following data may be obtained through the *External bus*:

- Status of the MDS-D panel (number of monitored devices and their communication status)
- Information about fault signalling on MDS-D panel
- Insulation monitoring device status
- Current measured values of insulation monitoring devices
- Current configuration of insulation monitoring devices

MDS-D installation

Remote signalling module MDS-D with a display was designed to allow the user to install the entire device comfortably. After connecting the necessary cables (see the previous chapter) a regular electrical installation box KU68 built into the panel or into the wall is sufficient.

The next procedure goes as follows:

1) Layout of MDS-D panel on the installation part and the electronic section

     a. Using a flat screwdriver apply pressure to the designated spots on the box

     b. The box lid will open and the box will unfold
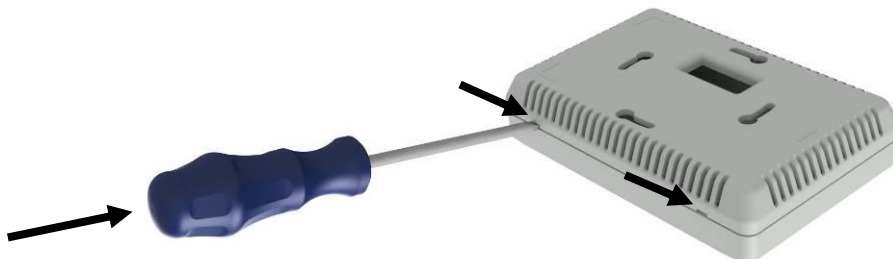
2) Attaching the assembly section with screws to the electrical installation box KU68
     a. Running wires through the opening in the assembling (back) part of the MDS-D
     b. Attaching the assembling (back) part of the panel MDS-D to the electrical installation box
     c. Inserting and fastening mounting screws
     d. Alignment and final screw fastening

3) Cutting wires and their connection
     a. Wires are to be cut to the required length and the necessary insulation section must be removed
     b. Wires are to be connected according the wiring diagram to the electronic board of the MDS-D panel
     c. The upper electronic part must be carefully aligned with the lower installation part
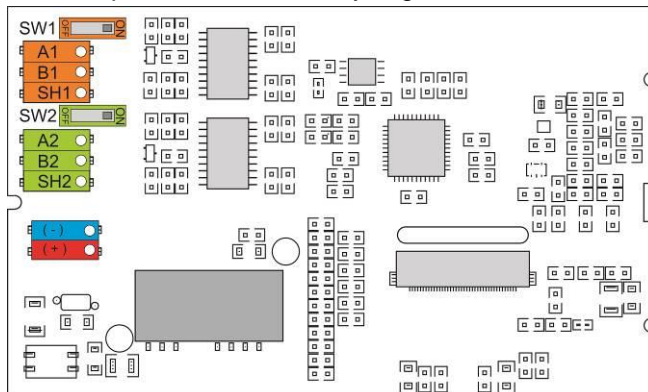
4) MDS-D start-up
     a. After the MDS-D is connected and assembled it may be connected to the power supply panel
     b. The MDS-D panel will turn On automaticity
     c. If the panel was turned On in the default status and without any configuration changes, please follow the chapter First start-up

First start-up

When voltage is connected to the power terminals of the MDS-D panel, the panel will turn On automatically.

The panel initialization phase proceeds during the start-up phase. The MDS-D panel begins its operation. The logo HAKEL is displayed during this phase. In the upper left corner you may observe the current status of the initialization phase and the firmware version in the upper right corner.

After the initialization phase is complete, during the first start-up, the system automatically begins searching for devices on the *Internal bus*. This process is fully automatic and may be interrupted, repeated or the result of this process may be saved. At this moment all stations must be connected to the *Internal bus* and their unique addresses must be set.

In addition to functional pushbuttons, the unit search screen also displays what address the system currently communicates with and the number of found units on the *Internal bus.*

After pressing the "save" button the system goes automatically back to the regular operation mode. Data are permanently saved in the MDS-D panel memory and when the system is activated again, the data are read automatically without the need to search for devices again.

The option to automatically search for units on the Internal bus may be called again using the MDS-D panel *Settings menu*.

Configuration change, units remote testing

Panel MDS-D is designed as a two-level user system. At the first access level the MDS-D panel may also be used by any person untrained how to use its function and functions of insulation monitoring devices. At this level nothing can be changed, set or influenced.

Configuration of the panel MDS-D and remote test of units connected to the *Internal bus*, the second level of the user access to the MDS-D panel, is locked with a four-digit PIN code. This PIN code is set by default to "**1234**" and may be changed in the MDS-D panel *Settings menu*. Only a person familiar with the functions of the MDS-D panel, insulation monitoring devices ISOLGUARD HIG9x and with IT power supply systems shall intervene with this level.

When the PIN code is forgotten, the access to the MDS-D panel Setting may be re-established using a special combination. It is necessary to enter the *Info* screen, which is in the *Main menu.* The HAKEL logo is found in the *Info* screen. Pressing this logo will activate an audio signal. When the HAKEL company logo is pressed six times the *Settings menu* is automatically displayed and you may detect the existing PIN or set a new PIN code even without knowing the original PIN.