

**Remote monitoring module, for ISOLGUARD series devices,  
MDS-DELTA**



**Operating instructions**

Document's name: DOK-70065-V1.8

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## Used symbols



### **Warning, caution**

This symbol informs about very important installation and operation instructions of the device or about hazardous situations that may happened during the installation and the operation.



### **Information**

This symbol highlights particularly important characteristics of the device.



### **Note**

This symbol indicates useful additional information.

## 1 MDS-DELTA remote monitoring module

MDS-DELTA is a signalling module for ISOLGUARD series insulation monitoring devices produced by HAKEL. The module is equipped with a visual and acoustic signalling system, warning the user in the event of a fault detected by the ISOLGUARD series devices. The MDS-DELTA module is designed for supervisory and monitoring sites for the purpose of continuous information about the ungrounded IT power supply system status.

Typical locations of these modules are medical facilities - operating rooms, nurses' rooms for medical insulated system (MIS) supervision.

The MDS-DELTA module signals the insulation status fault by a yellow indicator lamp, current or thermal overload of the isolation transformer by a red indicator lamp. Own module function is signalled with a green indicator lamp. When a fault occurs, the relevant control flashes and the piezo siren triggers. Acoustic signalling can be stopped by using the "STOP ALARM" push-button on the module. Visual signalling cannot be stopped. The module also contains a "TEST" push-button to invoke remote test of the insulation monitoring device.



Picture 1: MDS-DELTA/IP20

With these features, MDS-DELTA meets the requirements for remote signalling of insulation monitoring devices, MED type, according to standard IEC 61557-8:2014, including annexes. The module therefore complies with claims for use in healthcare and is in accordance with the standard HD 60364-7-710:2002.

The module design is in a standardized profile 45 mm x 45 mm, produced by Legrand, for installation into distribution cable trough. The module can be placed on a standard wiring box with 68 mm diameter (e.g. KU68 type) using a reduction frame.

Up to ten MDS-DELTA modules can be connected to one insulation monitoring device, see connection diagram. Communication with the insulation monitoring device proceeds via RS485 line using the internal protocol.

### MDS-DELTA remote monitoring module

Type	Supported insulation monitoring devices	Signalling	Signalling types	Auxiliary signalling module	Antimicrobial surface treatment	Protection type	Assembling
<b>MDS-DELTA</b>	HAKEL ISOLGUARD (For more details see chapter Supported devices)	Signalling of insulation status disruption Signalling of transformer overload Signalling of operation	Visual (LED indicator lamps) Acoustic (Piezo siren)	No	Yes, Legrand Antimicrobial technology	IP20	Into trough 45 x 45 mm
Art. no. 70 065							On wiring box ø 68 mm
<b>MDS-DELTA/IP20</b>						IP20	On wiring box ø 68 mm
Art. no. 70 063						On wiring box ø 68 mm	
<b>MDS-DELTA/IP44</b>				IP44		On wiring box ø 68 mm	
Art. no. 70 064	IP20	On a pair of wiring boxes ø 68 mm					
<b>MDS-DELTA/IP20+MPS</b>	Yes						
Art. no. 70 066							

Table 1: MDS-DELTA brief information

## 2 Basic characteristics

### MDS-DELTA module complies with standards:

- IEC 60664-1:2007 – Insulation coordination for equipment within low-voltage supply systems
- IEC 61000-6-2:2005 – Electromagnetic compatibility (EMC) - Immunity
- IEC 61000-6-3:2006 – Electromagnetic compatibility (EMC) - Emission

### MDS-DELTA meets the requirements for remote signalling of insulation monitoring devices according to standards:

- HD 60364-7-710:2002 – Low voltage electrical installations – Medical locations
- TNI 33 2140 – Electric installations in rooms for medical use
- IEC 61557-8:2014 – Insulation monitoring devices for IT systems
- IEC 61557-8:2014 annex A – Insulation monitoring devices for medical locations (MED-IMD)

### MDS-DELTA basic characteristics

- Remote monitoring module for HAKEL ISOLGUARD insulation monitoring devices, for more details see chapter 3, *Supported devices*
- Up to ten MDS-DELTA modules can be connected to a one HAKEL ISOLGUARD insulation monitoring device
- MDS-DELTA modules can be combined with MDS-D panels
- Power supply by external low voltage 24 V DC (SELF)
- Designed in Legrand standard 45 x 45 mm, for installation into cable troughs or on wiring box ø 68 mm (e.g. KU68)
- Antimicrobial surface for use in medical locations
- Protection type up to IP44, for use in difficult applications
- Visual and acoustic signalization of insulation status faults
- Visual and acoustic signalization of isolating transformer overload
- Connection to the insulation monitoring device via RS485 communication line
- “TEST” push-button to verify the function of the insulation monitoring device and the signalling module
- “STOP ALARM” push-button to deactivate acoustic signalization
- Available version MDS-DELTA/IP20+MPS to make the visual signalization more alerting

## 3 Supported devices

HAKEL MDS-DELTA remote monitoring modules are connected to HAKEL ISOLGUARD insulation monitoring devices via RS485 bus-bar.

They communicate using an ISOLGUARD protocol.

MDS-DELTA modules currently allow displaying statuses of devices:

Model	Device's firmware version	Note
HIG95-DELTA	Version 1.3 and higher	---
HIG95+	Version 5.7 and higher	Includes all HIG95+ variants
HIG91	Version 5.7 and higher	Includes all variants with RS485 bus-bar
HIG92	Version 5.7 and higher	Includes all variants with RS485 bus-bar
HIG93	Version 5.7 and higher	Includes all variants with RS485 bus-bar
HIG94	Version 5.7 and higher	Includes all variants with RS485 bus-bar
HIG95	Version 5.7 and higher	Includes all variants with RS485 bus-bar

Table 2: Supported devices

## 4 Technical characteristics

Type		MDS-DELTA	MDS-DELTA IP20	MDS-DELTA IP44	MDS-DELTA IP20+MPS
Required type of power supply		SELF			
Nominal supply voltage	$U_s$	24 V $\overline{=}$			
Supply voltage range		18 ÷ 28 V $\overline{=}$			
Consumption	P	max. 0,5 VA		max. 1,5 VA	
<b>Signalling features</b>					
Signalling of operation		Yes, visual green LED indicator lamp "POWER"			
Signalling of insulation status fault		Yes			
		Visual: yellow LED indicator lamp "FAULT – R" Acoustic, with possible deactivation: piezo siren			
Signalling of isolation transformer overload		Yes			
		Visual: red LED indicator lamp "FAULT – Ø, I" Acoustic, with possible deactivation: piezo siren			
Auxiliary signalling module		No		Yes	
<b>Controls</b>					
Device test invoking		Yes, "TEST" push-button			
Deactivation of acoustic signalization while fault		Yes, "STOP ALARM" push-button			

Table 3: Technical characteristics, basic parameters

General data		MDS-DELTA	MDS-DELTA IP20	MDS-DELTA IP44	MDS-DELTA IP20+MPS
Degree of protection by a front panel cover according to IEC 529		IP20	IP20	IP40	IP20
Weight	m	23 g	66 g	90 g	140 g
Surface treatment of the box		Made of antimicrobial material based on silver ions Ag+			
Method of assembly		Into troughs 45x45 mm	On wiring box ø 68 mm	On wiring box ø 68 mm	On a pair of wiring boxes ø 68 mm
Recommended section of the connected conductors	S	1 mm <sup>2</sup> (firm and stranded)			
Recommended connection cable		J-Y(St)Y 2 x 0,8 mm			
Recommended protection		6 A			
SW version		V1.8			
Article number		70 065	70 063	70 064	70 066

Table 4: Technical characteristics, general data

<b>Communication interface</b>	
Supported devices	HAKEL ISOLGUARD (see chapter 3)
Bus-bar type	RS485
Communication protocol type	ISOLGUARD
Maximum number of MDS-DELTA on the bus bar	10 (in a mode 1+9 = 1 x MASTER, 9 x SLAVE)
Terminating resistor	120 Ω / 0,6 W, is not a part of the product
Recommended connection cable of the bus-bar	J-Y(St)Y 4 x 2 x 0,8 mm
Maximum bus line length	1 000 m
Communication parameters settings	Using switches on the back of the product

Table 5: Technical characteristics, communication interface

Operating conditions	
Operating temperature	-5 °C ÷ +55 °C
Storage temperature	-25 °C ÷ +70 °C
Shipping temperature	-25 °C ÷ +70 °C
Altitude	Up to 2000 m a. s. l.
Working position	any
Type of operation	permanent

Table 6: Technical characteristics, operating conditions

## 5 Controls and connecting terminals of MDS-DELTA

### Green indicator lamp POWER

It lights up when the supply voltage is connected. It glimmers slightly if everything works fine, communication on the bus is in progress and insulation monitoring device communicates. Any other light indicates one of the system faults. System faults are described below in chapter 13 *Possible statuses* of , page 16.

### Red indicator lamp FAULT – *!*

It signals current or thermal overload of the IT power supply system's isolation transformer. It glimmers when piezo siren is active. It shines constantly after piezo siren is deactivated by STOP ALARM push-button.

The signal may also shine due to a system fault.

System faults are described below in chapter 13 *Possible statuses* of , page 16.

### Yellow indicator lamp FAULT – *R*

It signals disruption of the IT power supply system's insulation status. It glimmers when piezo siren is active. It shines constantly after piezo siren is deactivated by STOP ALARM push-button.

The signal may also shine due to a system fault.

System faults are described below in chapter 13 *Possible statuses* of , page 16.

### TEST push-button

It serves to remote test of the insulation monitoring device. Green signalization POWER starts flashing significantly when pressing the push-button. It means start of transmitting the request to provide the device test. The test will start in a few seconds and MDS-DELTA then starts signalling transformer fault and insulation status disruption. Also, acoustic signalling starts.

### STOP ALARM push-button

It serves to deactivate the acoustic signalling. The piezo siren sounds if a fault occurs during operation (transformer overload or insulation fault, but also MDS-DELTA system fault). Pressing the STOP ALARM push-button deactivates the acoustic signalling. Visual signalling will continue to signal the fault.

### M1 switch – placed on the back of the module

It serves to set MDS-DELTA address on the bus-bar. For more information see chapter 9.2 *M1 switch settings – communication mode and address of MDS-DELTA*.

### H10 a H1 switches – placed on the back of the product

They serve to set an address of monitored insulation monitoring device. H10 switch sets dozens of the address, H1 switch sets the units. Example of the setting: Device address is 29; set H10 switch to 2 and H1 switch to 9. For more information see chapter 9.3 *H10 and H1 switches settings* – .

### (+) a (-) terminals

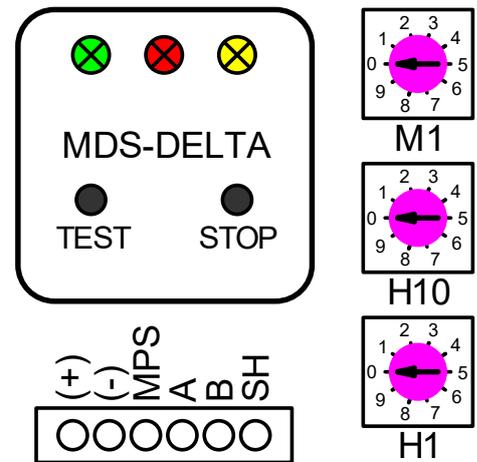
They serve to supply the voltage. Voltage has to be 24 V DC and SELF type.

### MPS terminal

It serves to connect the MPS module. So, it is only used with MDS-DELTA/IP20+MPS, it is not used with any other models. Any other use of the terminal is not allowed by the producer.

### A, B, SH terminals

They serve to connect the *ISOLGUARD RS485* bus-bar. Individual devices on the bus-bar are connected by twisted pair between A and B conductors. SH terminal is intended for signal grounds interconnecting using a connection cable, see recommended connections.



Picture 2: MDS-DELTA elements

## 6 Device installation



Operation, installation and maintenance can be done only by qualified personnel according to assembling and safety regulations. If the device is used in the way not specified by the producer, protection provided by the device could be disrupting.

MDS-DELTA module is intended for assembling according to product version. Correct assembly is described below. Working position must be maintained so that the signs are naturally readable in all circumstances for the operator.

## 7 MDS-DELTA versions and dimensions

The following table summarizes the form and differences between individual versions of MDS-DELTA.

MDS-DELTA	
Designed for installation in a cable trough, with 45 x 45 mm profile, produced by Legrand.	

Table 7: MDS-DELTA design, dimension sketch

MDS-DELTA/IP20	
MDS-DELTA in reduction frame, allowing installation on a standard switch box with $\varnothing$ 68 mm (KU68).	

Table 8: MDS-DELTA/IP20 design, dimension sketch

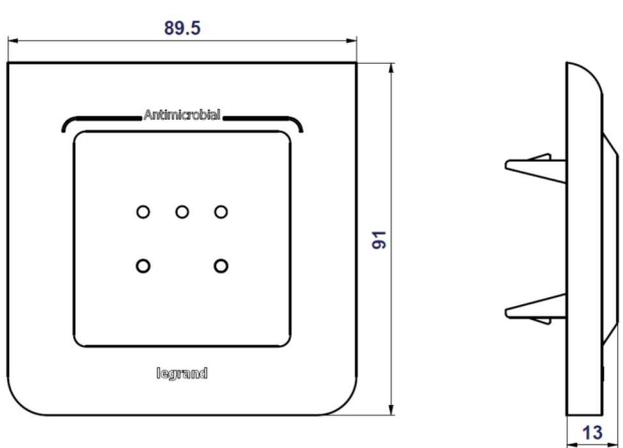
MDS-DELTA/IP44	
<p>MDS-DELTA in reduction frame, allowing installation on a standard wiring box with <math>\varnothing</math> 68 mm (KU68). With membrane and flap, increasing protection to IP44 level.</p>	
	

Table 9: MDS-DELTA/IP44 design, dimension sketch

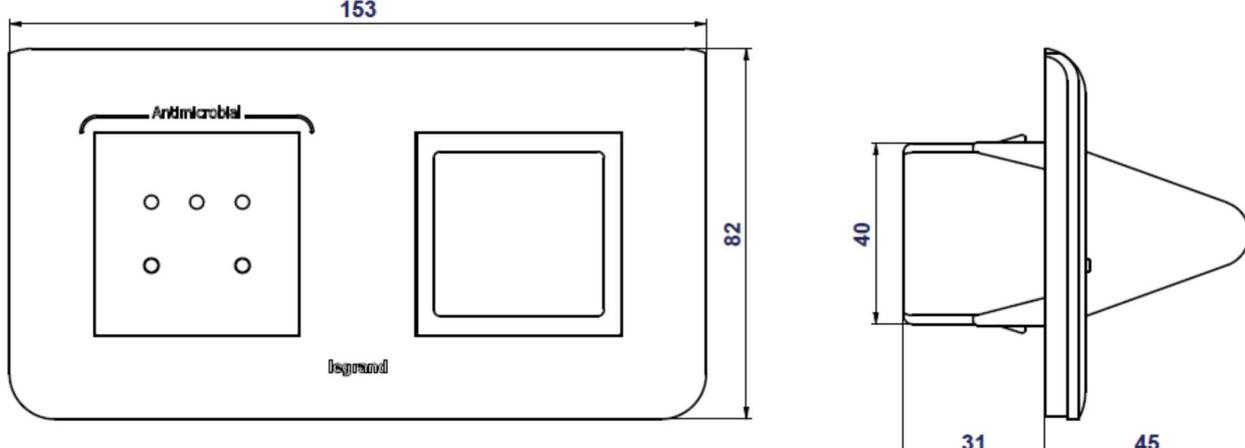
MDS-DELTA/IP20+MPS	
<p>MDS-DELTA in reduction frame, allowing installation on a pair of standard wiring boxes. Second module is <i>Auxiliary signalling module</i>, to increase visual signalling.</p>	
	
	

Table 10: MDS-DELTA/IP20+MPS design, dimension sketch

## 8 Recommended connection of MDS-DELTA into HAKEL ISOLGUARD MIS

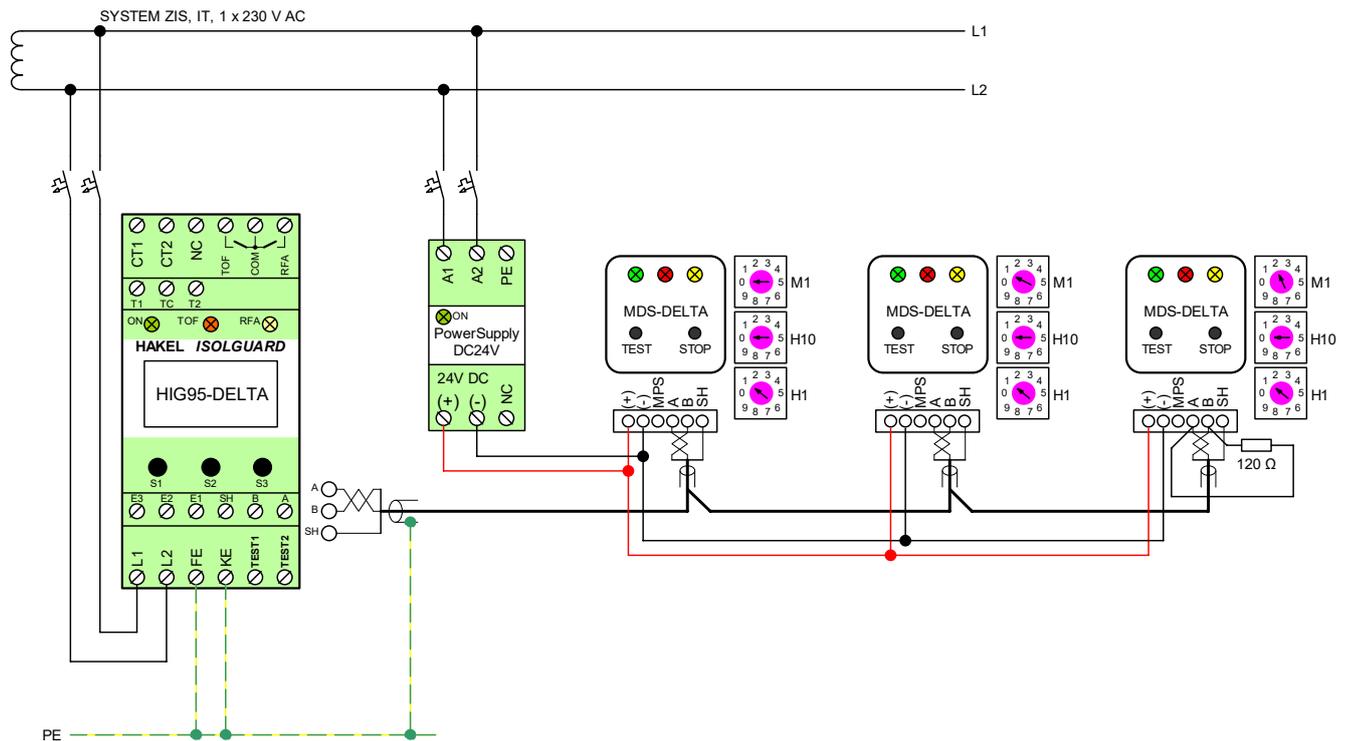
Operation, installation and maintenance can be done only by qualified personnel according to assembling and safety regulations. If the device is used in the way not specified by the producer, protection provided by the device could be disrupting.



### 8.1 Connection of three MDS-DELTA modules and one HIG95-DELTA device



It is possible to use MDS-DELTA as a MASTER (master station of communication on RS485 bus-bar) and also as a SLAVE (slave station). When MDS-DELTA is used as a master station (switch M1 = 0) than only one insulation monitoring device can be connected to the bus-bar and only MDS-DELTA modules can be connected as a signalization. Other combinations are excluded.



Picture 3: Recommended wiring 1

#### Notes:

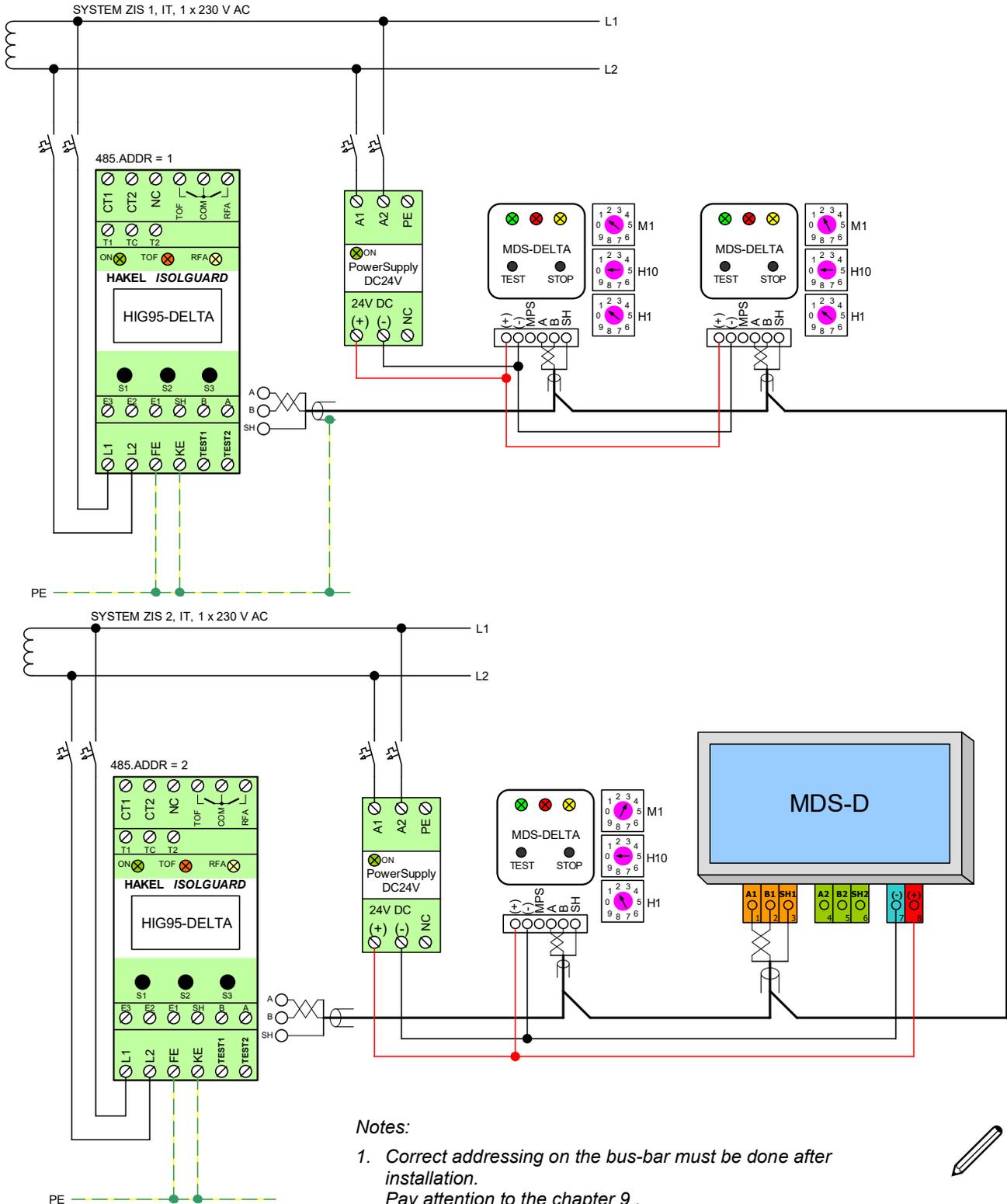
1. Correct addressing on the bus-bar must be done after installation. Pay attention to the chapter 9.
2. Correct termination by 120 Ω resistor must be done on the bus-bar. This resistor is connected between A and B terminals of the last (and first) device on the bus-bar. If the last device is HIG95-DELTA or MDS-D then termination by integrated switch SW1 (MDS-D) or by selecting 485Rte in the device menu (HIG95-DELTA) is possible.
3. This configuration (without MDS-D) requires that only one HIG95-DELTA is connected on the bus-bar.
4. Device connection is not drawn completely. Complete connection can be found in the operating instructions of HIG95-DELTA insulation monitoring device from HAKEL production.
5. NC (Not Connected) this terminal should not be connected.
6. Recommended type and values of the cable for RS485 bus bar are listed in the technical parameters table.
7. When using a shielded cable for the ISOLGUARD RS485 bus bar, bus bar shielding has to be connected across whole length and grounded at one point.
8. Follow a linear wiring of the RS485 bus bar, any taps are not allowed.
9. Install only one cable type along the whole length of the bus bar.



**8.2 Connection of three MDS-DELTA modules, one MDS-D module and two HIG95-DELTA devices**



If MDS-D signalling module is on the bus bar than it always must be MASTER (master station of communication on the RS485 bus bar), MDS-DELTA must always be SLAVE station. It is possible to connect and monitor maximum possible number of insulation monitoring devices (> 100) on the bus bar in this configuration. Each of these devices can be monitored by other MDS-DELTA signalling.



Picture 4: Recommended wiring 2

**Notes:**

1. Correct addressing on the bus-bar must be done after installation.  
Pay attention to the chapter 9.
2. Follow a linear wiring of the RS485 bus bar, any taps are not allowed.
3. Install only one cable type along the whole length of the bus bar.



## 9 Possible connection of the bus bar and its addressing

MDS-DELTA is connected into the communication on the RS485 bus bar with ISOLGUARD protocol. It is necessary to do correct communication parameters configuration of all devices on the bus bar because it is a serial data bus bar.



Two communication parameters are set for modules type MDS-DELTA:

- MDS-DELTA address  
It is set by M1 switch. It is used to make MDS-DELTA successfully found on the bus bar.
- Insulation monitoring device's address  
It is set by H10 and H1 switch. It specifies which insulation monitor will MDS-DELTA handle (status display).

### 9.1 Communication modes

On the RS485 bus bar are two basic modes in which the devices may be found:

#### 9.1.1 Device as a SLAVE station

Device on the bus bar is in a slave station position in this mode. It never transmits independently, waiting for the instruction of a MASTER station. All insulation monitoring devices are unconditionally always SLAVE station by the ISOLGUARD bus bar.

#### 9.1.2 Device as a MASTER station

Device on the bus bar control all communication in this mode. Other devices waiting for the instruction of a MASTER station.  
**Only one MASTER station can be on the bus bar.**

#### 9.1.3 MDS-DELTA as a SLAVE

MDS-DELTA must always be a SLAVE, when MASTER station is on the bus bar. In this case MDS-DELTA must have correct address set (see 9.2 M1 switch settings – communication mode and address of MDS-DELTA).

SLAVE MDS-DELTA addresses begin on address 131 and they must go upwards one after the other, without gaps.  
The address is set by the M1 switch.

#### 9.1.4 MDS-DELTA as a MASTER

MDS-DELTA can be MASTER only when:

- There is no other MASTER station on the bus bar
- There is no MDS-D signalling type on the bus bar (remote monitoring module with touch screen)

### 9.2 M1 switch settings – communication mode and address of MDS-DELTA

MDS-DELTA can work in both communication modes, SLAVE and MASTER.

When MDS-DELTA is in MASTER position, the address must be set to 0. When the module is in SLAVE position, it must have a communication address from the address segment for MDS panels. I.e. 131 address and higher. SLAVE addresses must go upwards one after the other, without gaps.

The communication mode is determined by the M1 switch settings:

Position M1	Communication mode	MDS-DELTA address on the bus bar
0	MASTER	0
1	SLAVE	131
2	SLAVE	132
3	SLAVE	133
4	SLAVE	134
5	SLAVE	135
6	SLAVE	136
7	SLAVE	137
8	SLAVE	138
9	SLAVE	139

Table 11: M1 switch settings

**9.3 H10 and H1 switches settings – Monitored device address**

Each MDS-DELTA must have correctly set which device to monitor. In other words, which insulation status it displays and which device allows to test. Therefore, it is necessary to enter insulation monitoring device's address into MDS-DELTA, on the RS485 bus bar.

This is done by a pair of H10 and H1 switch. H10 switch specifies the decimal part of the device address, H1 switch the unit address.

It is simply possible to write the behaviour of switches using a formula:

$$HIG\ 485\ ADDR = (H10 \times 10) + H1$$

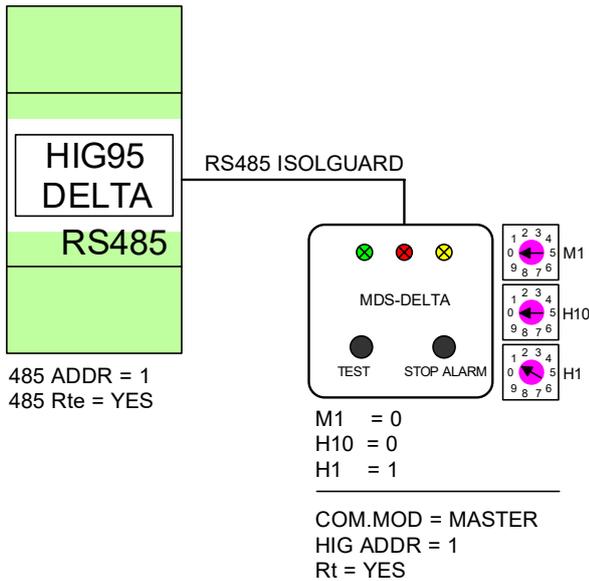
Some examples:

H10	H1	Address 485 IMD
0	1	<b>1</b>
0	2	<b>2</b>
...		
2	4	<b>24</b>
2	5	<b>25</b>
...		
7	0	<b>70</b>
7	1	<b>71</b>
...		
9	8	<b>98</b>
9	9	<b>99</b>
0	0	<b>Excluded</b>

Table 12: H10 and H1 switch settings

## 10 Specific cases of addressing and connection of MDS-DELTA

### 10.1 Connection of one insulation monitoring device and one MDS-DELTA module

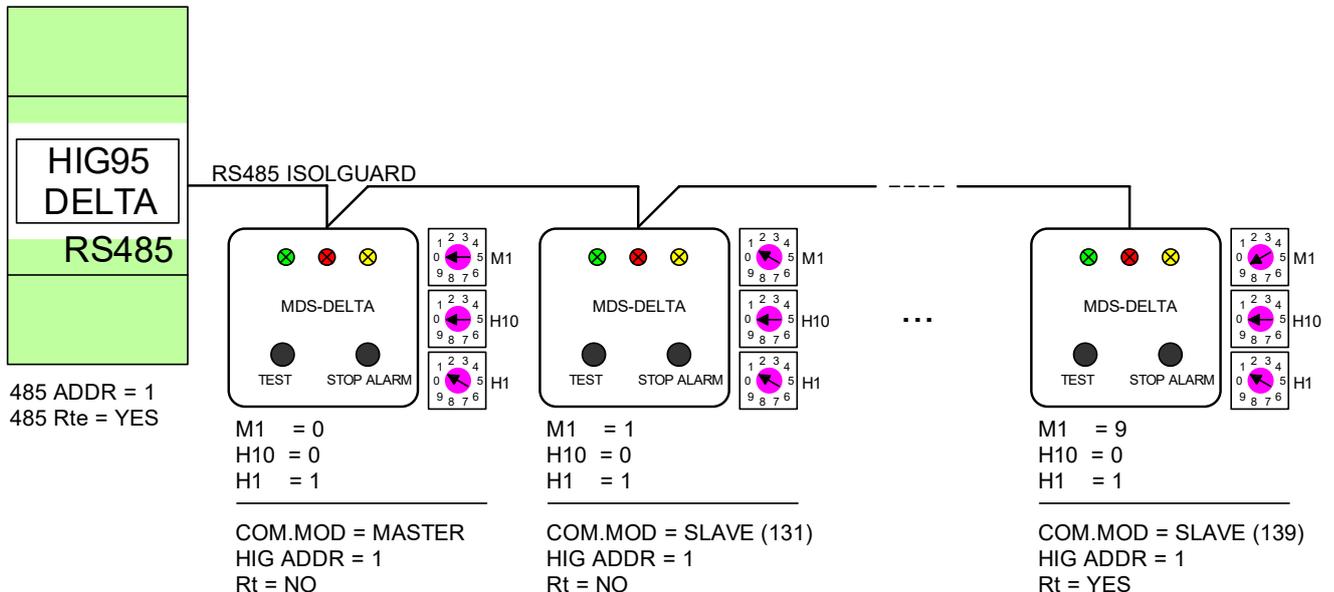


Picture 5: Connection of 1x insulation monitoring device and 1x MDS-DELTA module

#### Wiring notes:

1. Select address 1 for insulation monitoring device (485 ADDR parameter in device menu)
2. Allow terminating resistor (485 Rte parameter to YES in the menu), because the insulation monitoring device is placed at the end of the bus bar
3. Set MASTER mode (M1 = 0) on MDS-DELTA
4. Select insulation monitoring device's address to 1 on MDS-DELTA (HIG ADDR)
5. Connect terminating resistance 120 Ω between A and B terminals on MDS-DELTA

### 10.2 Connection of one insulation monitoring device and up to ten MDS-DELTA modules

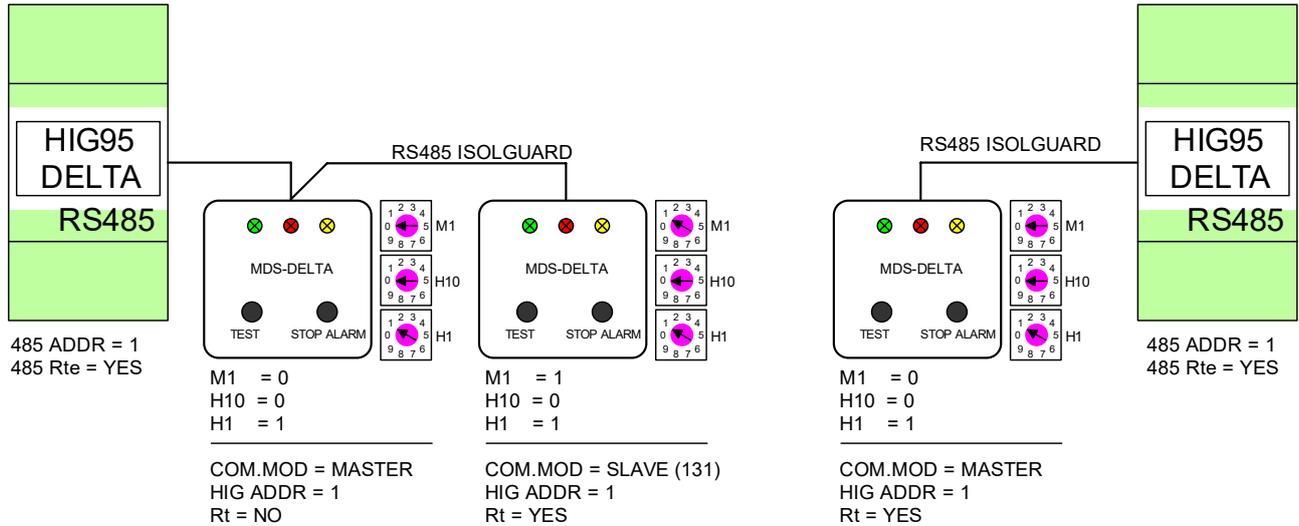


Picture 6: Connection of 1x insulation monitoring device and up to 10x MDS-DELTA modules

#### Wiring notes:

1. Select address 1 for insulation monitoring device (485 ADDR parameter in device menu)
2. Allow terminating resistor (485 Rte parameter to YES in the menu), because the insulation monitoring device is placed at the end of the bus bar
3. Set MASTER mode (M1 = 0) on one MDS-DELTA, for others then SLAVE with addresses 131, 132, 133...
4. Select insulation monitoring device's address to 1 (HIG ADDR) for all MDS-DELTA
5. Connect terminating resistance 120 Ω between A and B terminals on last MDS-DELTA
6. Up to ten pieces of MDS-DELTA can be connected to one insulation monitoring device

**10.3 Connection of ore insulation monitoring devices and more MDS-DELTA modules**

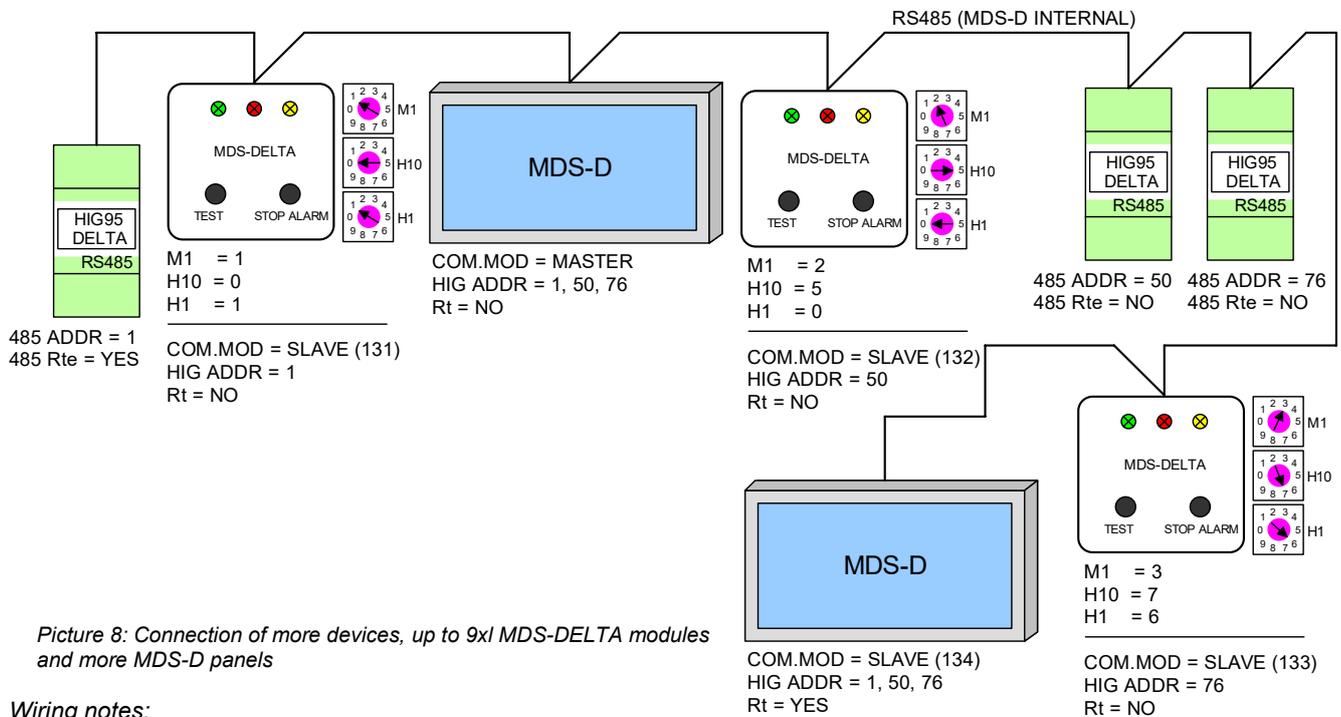


Picture 7: Connection of more devices and more MDS-DELTA modules

**Wiring notes:**

1. Principle of ISLAND SYSTEMS is selected for this configuration. I.e. each device with relevant MDS-DELTA is designed as an isolated RS485 bus bar. Bus bars are completely independent of each other
2. Select address 1 for both insulation monitoring device (485 ADDR parameter in device menu)
3. Allow terminating resistor (485 Rte parameter to YES in the menu), because the insulation monitoring devices are placed at the end of the bus bar
4. One MDS-DELTA must be set to MASTER mode (M1 = 0) on bot bus bars
5. Select insulation monitoring device's address to 1 (HIG ADDR) for all MDS-DELTA
6. Connect terminating resistance 120 Ω between A and B terminals on last MDS-DELTA

**10.4 Connection of any number of insulation monitoring devices, up to nine MDS-DELTA modules and more MDS-D panels**



Picture 8: Connection of more devices, up to 9xI MDS-DELTA modules and more MDS-D panels

**Wiring notes:**

1. Just one MDS-D module must be MASTER in this configuration
2. MDS-DELTA modules can monitor any addresses of insulation monitoring devices (MDS-D is MASTER here)
3. Additional MDS-D may also be present, but as a SLAVE
4. Each MDS-D can monitor and signal up to 24 devices' addresses at one time
5. Insulation monitoring devices' addresses don't have to go upwards, they can be random
6. MDS-DELTA SLAVE addresses must go upwards one after the other and without gaps
7. First and last device on the bus bar must have a terminating resistor connected

## 11 Terminating resistor

A terminating resistor must be used on RS485 bus bar to eliminate reflection on the wiring. This resistor is used only on first and last topological device, i.e. on terminal devices of the bus bar.

On the insulation monitoring device is this resistor set in device menu by 485 Rte option. If 485 Rte is set to "YES", resistor is connected, if is set to "NO", resistor is not connected.

The user must insert the resistor under the terminals in the form of an external component on terminal device type MDS-DELTA. This resistor has a 120  $\Omega$  value, power should be dimensioned to 0,6 W and is inserted between the terminals A and B.

## 12 Final testing of the MDS-DELTA connection

Indicator lamp ON flashes slightly on the module when MDS-DELTA is installed properly. The functionality of the product is verified by a TEST push-button and the siren will sound within a few seconds after its pressing. Acoustic signalling is deactivated after pressing a STOP ALARM push-button. After about five seconds, the test is completed and the device automatically returns to its original status.

## 13 Possible statuses of MDS-DELTA

### 13.1 Correct operating status

MDS-DELTA works fine when green indicator lamp POWER flashes slightly. No system fault occurred.



Yellow indicator lamp reflects real insulation resistance status and red indicator lamp reflects real status of isolation transformer in this mode. It is possible to start TEST of the insulation monitoring device.

### 13.2 Wrong addressing MDS-DELTA

Fault status.

M1 switch is set incorrectly when green indicator lamp POWER flashes fast, at a rate of 10 times per second. MDS-DELTA is not requested by MASTER station in this case.

Yellow indicator lamp reflects real insulation resistance status and red indicator lamp reflects real status of isolation transformer. It is not possible to start TEST of the insulation monitoring device.

Solution:

1. Check the M1 switch settings
2. Verify, that all the MDS addresses go upwards and without gaps (131, 132, 133...)

### 13.3 Unreachable insulation monitoring device or outage of a MASTER station

Fault status.

Communication bus bar is misconfigured when green indicator lamp flashes at a rate of 1 sec shines / 1 sec off. There are two possible causes for this problem:

- a. Insulation monitoring device is not found at that address (see 9.3 H10 and H1 switches settings – )
- b. MASTER station is not present on the bus bar

Yellow and red indicator lamps do not reflect status of the device and isolated system in this mode. It is not possible to start TEST of the insulation monitoring device.

Solution:

1. Verify M1, H10 and H1 switches settings
2. Verify MASTER station's presence on the bus bar
3. Verify proper communication parameters settings in device menu
4. Verify proper RS485 bus bar termination

## 14 Maintenance and service



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

Only qualified personnel are allowed to install and set up the device. Only the producer provides repairs of the device.

## 15 Producer

Producer of MDS-DELTA remote monitoring module is

*HAKEL spol. s r. o.,*

*Bratří Štefanů 980, 500 03 Hradec Králové*

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