gazex®

Warsaw

Digital Control Unit

MDD-256/T

[series W2]

USER MANUAL

Issue 1W21en

BEFORE installation, fully read the USER MANUAL.

Proceed with installation only after gaining a full understanding of this Manual.

⚠ For safety reasons during installation and use of the device, it is advisable to follow the recommendations and warnings included in this Manual and marked with the depicted symbol.

The Manual should be stored for the Digital Gas Detection Systems' User perusal.

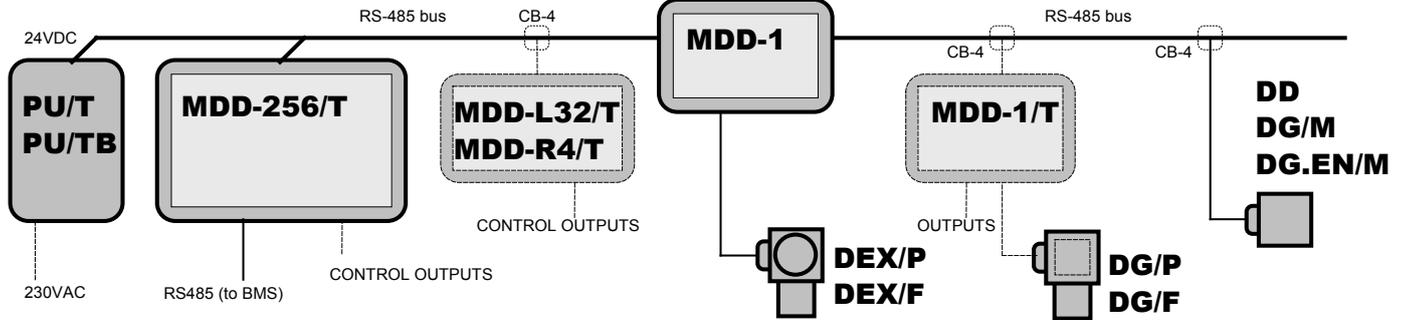**Work and live SAFER with us !**   ©gazex

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1. PURPOSE

The MDD-256/T Control Unit is designed for monitoring Digital Gas Detection System (DGDS) consisting of DG/M, DD or DG.EN/M digital detectors and MDD..., MDP-1.A/TM digital modules equipped with RS-485 digital communication port. Communication between the module and its components takes place in the RS-485 industrial standard according to the MODBUS RTU protocol. Supervision and control consists of cyclical polling of individual devices by the control module, and when certain specified alarm parameters are exceeded, optical alarm signalling is activated, module outputs are activated, and information is transmitted via digital network to another control/visualisation system. In next parts of this Manual, the MDD-256/T control module will be referred to as the "**MDD**" module.

Features and functions performed by the MDD:

- controls and manages the network of digital detectors and digital modules; controls the condition of the wired connection with the detectors (provides full emergency detection);
- galvanically isolated communication channel with RS-485 standard detectors (Modbus RTU);
- enables remote configuration of detector parameters connected to the bus, i.e. changing alarm thresholds, zeroing devices;
- enables built-in procedures to facilitate remote configuration of detector networks, i.e. scanning the existing network, addressing devices in a new and in the existing network, deleting device addresses
- enables operation in four modes: "MEMORY MODE" - indicates that alarms have occurred after the alarm has disappeared, "MAINTAINING MODE" - maintains active alarm states after the alarm source has disappeared, "NO-MEMORY MODE" - automatically zeroes out the status of inputs and outputs on the front panel after the alarm state has disappeared, "SERVICE MODE" - deactivates the module outputs for 1 hour;
- regardless of the above mentioned operation modes – it is possible switch on the following modes directly with the front panel buttons: "SILENT MODE" - mutes the inner siren, "A2 LOCK MODE" - deactivates the A2 voltage output for 15 minutes or until the next A2 Alarm occurs;
- visually displays alarm and emergency states of individual detectors (LED display) and OUT1, OUT2, OUT3, OUT4 control outputs, with simultaneous acoustic signalling (built-in siren);
- allows changing the screen message display modes, i.e. collective alarms or cyclic display of the individual detectors status;
- stores in a non-volatile, internal memory 3000 recent events with an assigned time of occurrence and a source of the event;
- enables diverse configuration of outputs with assignment of a given output to a specific alarm or to a selected zone;
- enables very precise determination of on/off delay times of the outputs and their stability in time thanks to microprocessor control;
- voltage alarm outputs = 12V configurable, OUT5 and OUT6 control additional acoustic and optical signalling devices;
- OUT1, OUT2, OUT3 and OUT4 contact outputs are configurable (galvanically separated) and control fans, motors, contactors, information boards, or connect with building's/facility's automation;
- configurable fault contact output (galvanically separated) informs about the module's alarm status, damage to the detectors' connection line, or power failure;
- the second isolated RS-485 communication channel (Modbus RTU) ensures cooperation with external monitoring modules or with "intelligent building" control systems;
- the casing is suitable for mounting on TS35 rail in standard electrical switchboards;
- configuration of module settings by means of a keyboard on the front panel;
- removable cable terminals on all outputs = improved start-up and servicing;
- possibility to display and configure the module on a PC and to read the internal event log using the "MDD256_View" software - available for download from www.gazex.pl or as a CDROM (*see MDD256_Visual set available from GAZEX*).
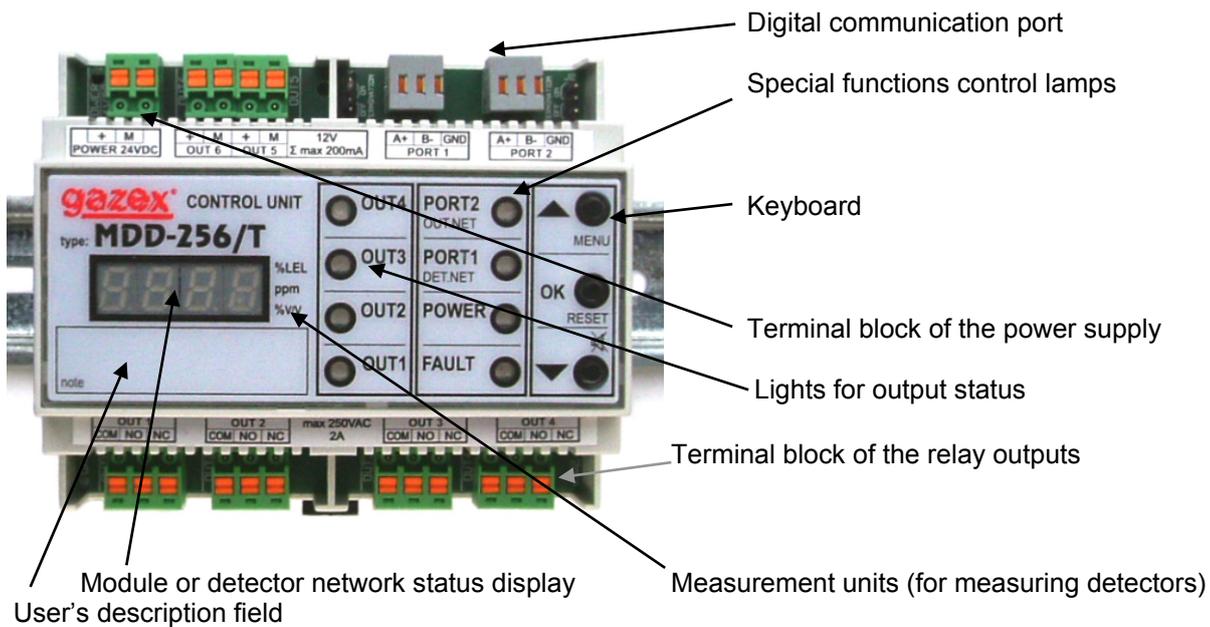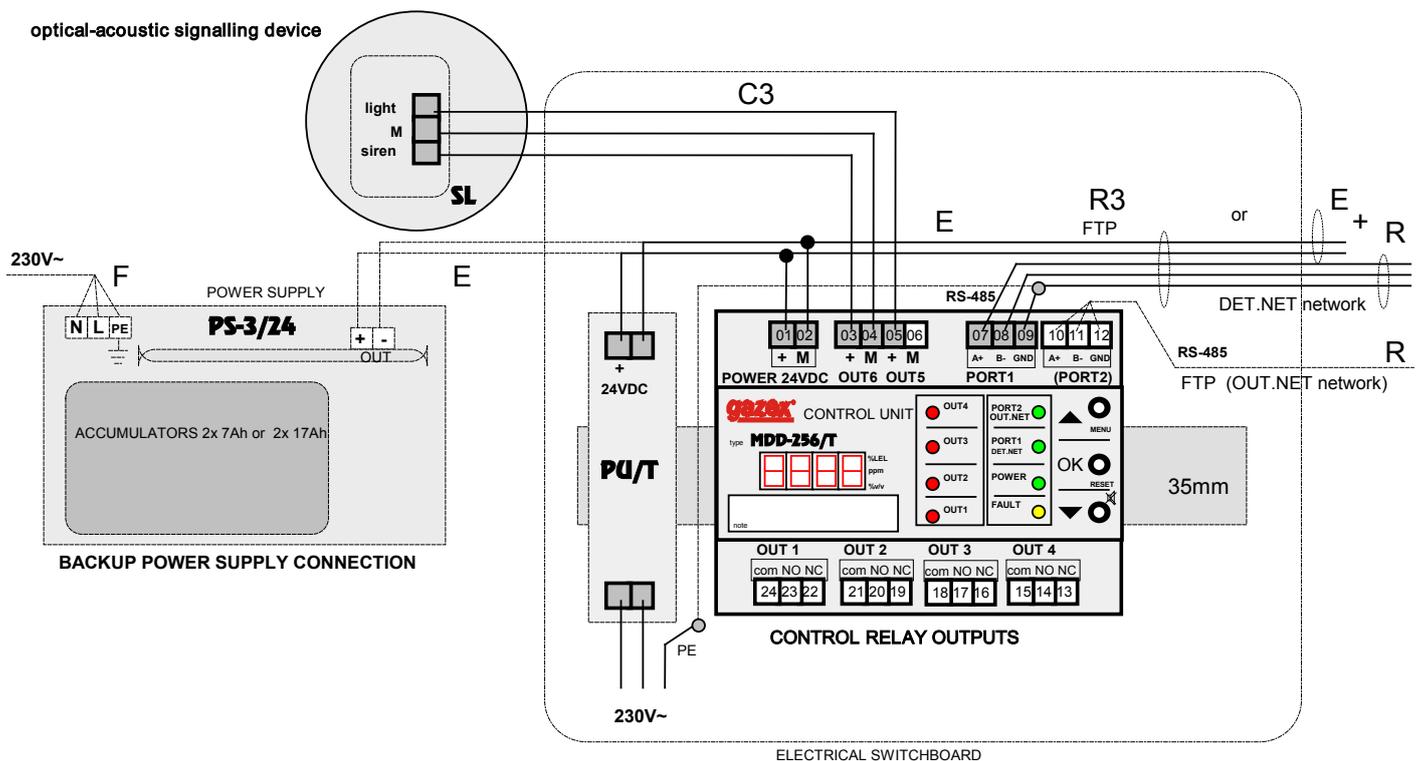
CONNECTION DIAGRAM

2. TECHNICAL SPECIFICATIONS

Model	MDD-256/T
Supply voltage	24V= (permissible range 15,0 ÷ 30V)
Power consumption	0,1A @24V= (without load on the 12V alarm outputs), max 0,3A @24V (with max load on the 12V alarm outputs)
Operating temperature	-10°C to +40°C recommended, -20°C to +45°C allowed periodically (<2h/24h)
Digital communication	PORT1 (network [DET.NET]): RS-485 standard, MODBUS RTU protocol, parameters: 9600bps (11-bit frame, parity check: even, 1 stop bit) galvanically isolated 1kV; PORT2 (network [OUT.NET]): RS-485 standard, Modbus RTU protocol, parameters: from 9600bps to 57600bps (11-bit frame, parity check: even or none, 1 or 2 stop bits) galvanically isolated 1kV;
Optical signalling of the DET.NET network status	LED display - collective alarms of a detector network or the status of individual detectors with indication of the measurement units: % of the range, %DGW, %v/v or ppm
Optical signalling	of alarm states or operating conditions: 8 LEDs;
Fault signalling	yellow LED + messages on the LED sectional display
Acoustic signalling	inner piezoceramic siren:, max 65dB/30cm; 1Hz intermittent signal - A1 alarm signal 5Hz intermittent signal – A2 alarm signal 10Hz intermittent signal - A3 alarm signal constant signal – FAULT signal; (optional: no signalling – „SLEEP MODE" set with the keyboard)
Zeroing the module	using the button on the front panel or remotely via PORT2
Event memory	internal, non-volatile, 3000 recent alarm or fault states or configuration changes; can be read from the „MDD256_View" PC software
Real-time clock	in-built, with battery support; setting date and time is possible via the „MDD256_View" PC software
Voltage alarm output	OUT5, OUT6 – 12V=, stabilised; total load = max 0,2A, to connect the SL-21, SL-32, S-3x, LD-2 signalling devices
Control outputs	OUT1, OUT2, OUT3, OUT4 – relay, type NO and NC, load capacity: max 4A (with resistive load) or max 2A (with inductive load - motors) or max 0,6A (with purely inductive load – fluorescent lamps); max 250V~ or max 30V=
Output delays adjustment	activating outputs: 10 sec. by default, regulation: 3 ÷ 300 sec.; deactivating outputs: 10 sec. by default, regulation 3 ÷ 900 sec.
Deactivating outputs	standard: **automatic** – alarm state deleted when the alarm source has disappeared with same delay as in output deactivating (alarm memory is signalled on the display), optional: **manual** – alarm state at the outputs maintained after the alarm source has disappeared until it's been manually deleted by the user (with the „OK./ Reset" key)
Module power supply control	green LED; also indicates the warm-up status of the MDD
Size, weight	106 x 90 x 65 mm, width x height x depth (width of 6 mod.); ca. 0,2kg
Casing	polystyrene, IP20; for installation in electrical switchboards on a 35 mm rail

3. DESCRIPTION AND ASSEMBLY

Digital communication port

Special functions control lamps

Keyboard

Terminal block of the power supply

Lights for output status

Terminal block of the relay outputs

Module or detector network status display

User's description field

Measurement units (for measuring detectors)

Pic.3.1 MDD-256/T front panel view (rail mounting position)

Pic. 3.1. View of terminal blocks - electrical connections

Table 3.1. *Functions realised at MDD outputs (standard - factory version):*

MODULE STATUS	RELAY OUTPUTS								12V ALARM OUTPUTS (*)	
	[OUT4] *FAULT*		[OUT1] *A1*		[OUT2] *A2*		[OUT3] *A3*		[OUT5] *A1*	[OUT6] *A2*
	Pair COM-NO	Pair COM-NC	Pair COM-NO	Pair COM-NC	Pair COM-NO	Pair COM-NC	Pair COM-NO	Pair COM NC		
NORMAL	CLOSE	OPEN	OPEN	CLOSE	OPEN	CLOSE	OPEN	CLOSE	no voltage	no voltage
A1	CLOSE	OPEN	CLOSE	OPEN	OPEN	CLOSE	OPEN	CLOSE	12V=	no voltage
A2	CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN	OPEN	CLOSE	12V=	12V=
A3	CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN	12V=	12V=
FAULT	OPEN	CLOSE	OPEN	CLOSE	OPEN	CLOSE	OPEN	CLOSE	no voltage	no voltage
FAULT (E.NET)	OPEN	CLOSE	x	x	x	x	x	x	x	x

(*) The outputs of the MDD module can be configured in various ways - the table shows factory settings of the functions in the standard version. The way of assigning a specific alarm to a specific output, and the allocation of outputs to zones can be defined by the user (see p.5.5.3.3).

 x – means the last correct state from before the fault;

NORMAL state - all DET.NET devices in normal state, no alarms or faults, only green lights are on;

A1 – (ALARM A1) at least one of the DET.NET bus devices indicates exceeded A1 concentration threshold, but not A2; inner siren pulsating tone is on;
 lights of the assigned outputs [OUT ...] are on;

2 **– (ALARM A2)** at least one of the DET.NET bus devices indicates exceeded A2 concentration threshold, but not A3; inner siren pulsating tone is on;
 red lights of the assigned outputs [OUT ...] are on;

A3 – (ALARM A3) at least one of the DET.NET bus devices indicates exceeded A3 concentration threshold – measurement range; inner siren pulsating tone is on;
 red lights of the assigned outputs [OUT ...] are on;

FAULT – MDD not powered or MDD internal circuits defective, all lights are off;
 – at least one of the DET.NET bus devices reports a fault [F.dEt.], yellow fault light is on [FAULT], red lights of the assigned outputs [OUT ...] are on;

FAULT (E.NET) – no communication with at least one DET.NET bus device, yellow fault light is on [FAULT], the last correct state of the outputs from before the fault is kept, red lights of the assigned outputs [OUT ...] are on;

4. MDD INSTALLATION WITHIN THE SYSTEM

The MDD installation can be begun after a period of time suitable for the temperature compensation of the MDD and the surrounding air. Especially in winter, at negative temperatures during transport or storage, wait approx. 20 minutes before removing the MDD from the foil packaging to prevent water condensation on the unit's inner circuits!

4.1 Mount the module in the switchboard box, on the TS35 rail, outside an explosion-endangered area, in a place free from strong electromagnetic interference, vibrations, strokes.

Caution! The setup can be carried out only when the power supply is off!!!

4.2 Connect the MDD module and the detectors and/or submodules to the common [DET.NET] bus.
 4.2.1 To the [DET.NET] bus terminals, PORT1 - terminals "A+". [07], „B-" [08], „GND" 09], connect the bus cable - shielded "twisted pair" of the FTP or STP type 4x2x0,5 cat.5e (recommended cables).
 **4.2.2** Prepare the bus cable as described in item 4.2.2.A, then insert the isolated wire ends into the appropriate PORT1 terminals.
 Caution: incorrect polarity of the cables may result in the inability to start the entire detector network.
 Caution: in order to remove the FTP and STP conductor insulation (the cables are actually very thin!), use **only dedicated tools** that will not "hurt" the conductors. Using a knife or other sharp tool for this purpose may result in a local reduction of the cable conductor cross-section, which when bent

or pressed in, breaks the conductor and causes communication fail of the entire detector bus (which is also optically difficult to locate quickly)!

4.2.2.A. Inserting the wire into the removable terminal designed for connecting FTP single wire cables (on RS-485 buses):
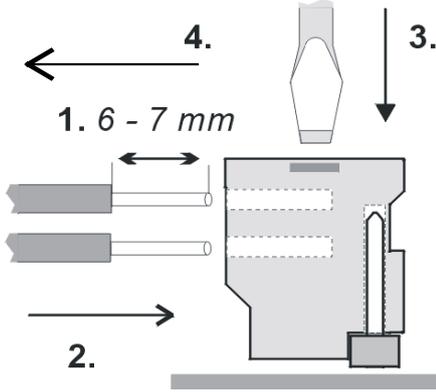
(1). remove the wire insulation at the height of <u>exactly</u> 6 to 7 mm;
(2). push (insert) the insulated conductor end into the round terminal hole with pliers as far as it will go; the terminals are closed in pairs vertically.

A properly inserted cable cannot be removed from the terminal. The cable can be removed by gently pressing the orange button with a flat screwdriver (according to arrow [3] and removed according to arrow [4]).

The terminal blocks can be removed from the module's connecting pins without disconnecting the bus cables.

4.2.3 Connect the other devices (detectors and/or submodules) to the [DET.NET] bus, following the suggested colour scheme when connecting the cables to the respective terminals. Connect the units successively by making any wiring connections in the doubled bus terminals of the individual units. Use one terminal to connect the current device to the end of the existing detector network, and the other one to connect the next device.

Star-shaped connections should be avoided. This type of connection is allowed conditionally, if the lengths of individual bus branches do not exceed approx. 15 m, and on condition that connection boxes type CB-4 are used to connect branches to the main bus. The CB-4 boxes have multiple bus connectors and can connect up to 4 bus branches.

Caution: No other connection of multiple bus lines by twisting the lines is permitted, as it is very likely that the lines will break off when twisted or loosened in the future.

TABLE 4.2.2. Suggested use of the FTP / STP cables
(colour scheme used on labels of all RS-485 ports made by GAZEX)

WIRE COLOUR	FUNCTION
Blue	Power supply weight (*)
brown	Power supply weight (*)
green	Power supply weight (*)
white and blue	+ power supply (*)
white and brown	+ power supply (*)
white and green	+ power supply (*)
FTP/STP cable shielding (grey on labels)	RS-485 – signalling mass (GND)
orange	RS-485 - signal B-
white and orange	RS-485 - signal A+
(*) – applies only to devices whose power supply and communication are provided via a single FTP/STP cable	

4.2.4 PORT1 of the MDD module is equipped with J1 connector "TERMINATION", which enables switching on the R=120Ω resistor terminating the [DET.NET] bus in order to eliminate reflections resulting from mismatch of bus impedance. It is recommended that the MDD module is always placed on one end of the bus (with terminating resistor switched on = jumper J1 in the ON position - factory position in the standard version). At the other end of the [DET.NET] bus (in the most distant device, i.e. connected with the wire of the highest total length), switch on the second terminating resistor of the bus using the appropriate jumper for this device.

Caution: Activating more terminating resistors increases the bus load and might lead to damage to the MDD's internal circuits which are responsible for data transmission. If only one terminating resistor is activated (or if none is activated), reflective impulses can be generated and digital communication between devices can be interrupted.

In order to disconnect the terminating resistor, switch the J1 jumper to the OFF position.

4.2.5 If shielded FTP/STP cables are used in installations with increased exposure to interference, it is essential to connect the signal masses of the [DET.NET] bus with the cable shield ("GND" terminal - [09] in the MDD) in all devices, and then connect one end of the shield (preferably from the MDD side) to the PE shield rail of the power supply.

Caution: Do not connect the signal masses of the bus only in some of the devices, as this may cause data transmission errors or complete bus failure. Connect the bus signal masses of all devices or do not connect the mass terminals anywhere.

4.2.6 If it is necessary to use additional devices inside the [DET.NET] bus, e.g. fiber optic converters, the choice of the device should be consulted with the GAZEX Technical Support Department.
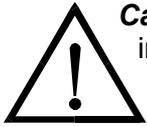
Caution: The use of an unverified device may cause data transmission errors (due to incorrect matching of receiver impedance, long response time) or eventually damage the internal systems of other bus devices (due to lack of galvanic isolation of the port).

4.2.7 A maximum of 247 devices can be connected in one [DET.NET] bus loop (applies to devices with an RS-485 port manufactured by GAZEX). The transmission port is isolated (1kV) from the MDD internal circuits and is protected against over-voltages. The longest wired connection between the most remote devices on the bus must not exceed 1200 m.

4.3 The MDD module can be connected via PORT2 to the external bus [OUT.NET] - to work with external monitoring modules or with "intelligent building" control systems (BMS).

4.3.1 As in section 4.2, connect PORT2 - terminals "A+". [10], „B-" [11], „GND" [12], connect the bus cable - shielded "twisted pair" type FTP or STP 4x2x0,5 cat.5e (recommended cables).

4.3.2 The same rules apply for connecting devices to the [OUT.NET] bus as for the [DET.NET] bus (see p.4.2.2, 4.2.3, 4.2.5, 4.2.7).

4.3.3 PORT2 of the MDD module is equipped with J2 connector "TERMINATION", which enables switching on an R=120Ω resistor terminating the bus in order to eliminate reflections resulting from the mismatch in the wavelength impedance of the bus. If the MDD is connected at the end of the bus [OUT.NET], switch jumper J2 to ON. If the MDD is placed in the middle of the bus, switch the jumper to OFF.

Caution: Leaving more terminating resistors increases the bus load and might lead to damage to the MDD's internal circuits which are responsible for data transmission.

4.3.4 The length of the [OUT.NET] bus must not exceed 1200m at a speed of 9600bps or 200m at a speed of 57600bps. The transmission port is isolated (1kV) from other MDD systems and is protected against over-voltages.

Specification of the MDD communication protocol is in a separate document.

4.4 Connect to the 12V alarm outputs ([OUT5] and [OUT6]) external cooperating devices, e.g. automation controllers, signalling devices, etc. In case of placing the optical and acoustic signalling devices in the same place, it is recommended to use an integrated acoustic-optical signalling device of SL-32 or SL-21 type, which can be connected to the MDD using a three-wire cable (2x2x0,5 is recommended).

4.4.1 Different phase voltage circuits or low voltage circuits can be connected to the contact outputs [OUT1], [OUT2], [OUT3], [OUT4].

4.4.2 Inserting conductors into the removable terminal designed to connect solid and fine-stranded conductors (connectors for contact, 12V alarm and 24V power supply outputs):
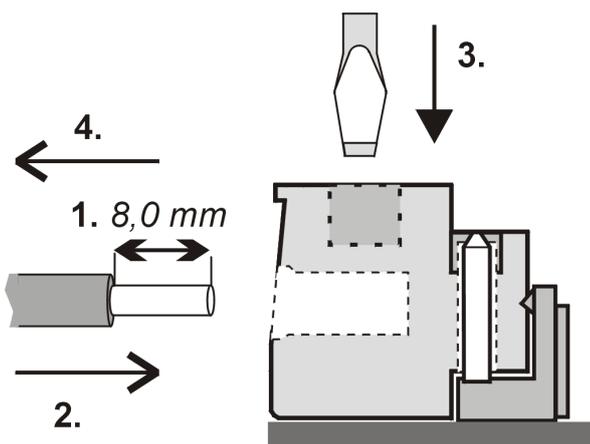
(1). remove the wire insulation at the height of 8 mm;

[*solid conductors*]: (2) push (insert) the isolated conductor end into the round terminal opening with pliers as far as it will go;

[*fine-stranded conductors*]: (3) press the orange button as depicted with the arrow, (2) push the isolated conductor end into the round terminal opening as far as it will go, then release the orange button.

A properly inserted cable cannot be removed from the terminal. The cable can be removed by gently pressing the orange button with a flat screwdriver (according to arrow [3] and removed according to arrow [4]).

3.
4.
1. *8,0 mm*
2.

The terminal blocks can be removed from the module's connecting pins without disconnecting the connected cables.
CAUTION: Removal may only be carried out with the power SWITCHED OFF - and in particular when the voltage in the disconnected circuits may exceed the safe voltage!!!

Cable ends must be prepared in a way which prevents the connectors from having to be wrapped round the module inside the box after they have been placed in the terminals. Solid or fine-stranded conductors (with or without ferrulas) may be used.
The cables must be laid in such a way that they do not transmit mechanical forces to the connection terminals.

4.5 Connect the 24V supply "E" lead from the PU.../T or the PS... power supply (with battery connected); maintain proper polarity (the module is protected against reverse polarity).
The conductor cross-section of a cable depends directly on its total length and the number of MDD modules and detectors powered from one PU/T or PS power supply. Choose the cross-section of wires in such a way that the supply voltage on the last in a row connected to the detector **is higher** than the minimum acceptable voltage level by **at least 2V** (in the conditions of maximum load, with the control outputs switched on).

5. MDD CONFIGURATION

BEFORE SWITCHING ON the bus and MDD power supply, make sure that all connections on the bus are made firmly and correctly in the correct sequence (any faulty connections will prevent correct digital communication!!!!).
Confirm that there are no short circuits in the power supply cables (when using FTP/STP cables with very thin conductors - possible short circuits in cables of long length do not have to automatically switch off the overload protection of the power supplies!!!!) This can lead to overheating and permanent damage to the cables!
It is also necessary to make sure that all wires of the single wire bus are connected - each unused wire increases voltage drops on the cable - which significantly limits the length of the bus (system size).

CAUTION: all described procedures and LED display messages refer to the standard version of the module. Custom version descriptions, changes and corrections can be found in any appended annexes to the user manual.

5.1 Pre-configuration of the module according to individual customer needs can be done by means of a keypad located on the front panel of the MDD.
CAUTION: press the keys gently in order not to damage the MDD internal circuits.

5.2 Turn on the MDD power supply (the module does not have a built-in power switch). After the power supply is turned on, an acoustic test of the internal siren is performed as well as an optical test of all display segments and signal lights. The following text appears on the segment display [**tESt**], and then information about the module version (e.g. "W21") and the date of compilation of the installed software (in the format [L.rmm], where "r" is the last digit of the year; "mm" - a month) - this information may be required when contacting the GAZEX Technical Support Department. The individual lamps light up and go out one after the other. During this time, the module settings are initialised.

5.3 After the testing phase, the module enters the normal operation mode - based on the configuration settings in the internal data memory (the letter "n" appears in the middle of the display). The user can change the configuration settings at any time, using the keyboard located on the front panel of the module. The special functions that can be activated using the keyboard keys are described in section 6.5.

5.4 In order to make changes, press and hold [▲] key for 3 seconds]. Correct pressing of the key will be confirmed by an intermittent acoustic signal, interruption of the warm-up mode and displaying on the LED screen a request to enter the user password: [**P.000**] (the factory password is: "P.001"). The password is entered by means of the keys [▲] and [▼], and confirmed by means of the key [**OK**]. Incorrect password causes exiting the menu and returning to the warm-up mode. In order to retry making changes to the controller repeat the above mentioned operations.

Caution!!! The above password is **the default one assigned to each MDD copy**. In order to prevent unauthorised access of outside persons to the controller settings, the password **must be changed individually** (see section 5.4.5). The new password should be remembered and stored in a safe place. Losing the password makes it impossible to make MDP configuration changes. Unlocking the password is possible only by the manufacturer (paid service).

5.5 Entering the correct password will be confirmed by an intermittent acoustic signal. The controller enters the setting mode. At this stage, all control and measurement procedures are suspended until the configuration of the device is completed. The first item from the user menu is displayed on the LED screen. The below list shows all available functions:

- [**d.nEt**] – DET.NET bus – configuration of the network of devices connected to the detector bus;
  - [**d.dEt.**] – manual configuration of parameters of individual devices, i.e. DD, MDP-1.A/T, … ;
  - [**d.out.**] – turning executive devices on/off, i.e. MDD-L32,… ;
  - [**d.Scn.**] – automatic scanning, refreshing of device addresses in the existing network;
  - [**d.Add.**] – adding new devices to the existing device network;
  - [**d.dEL.**] – deleting the DET.NET network device parameters stored in the MDD memory, together with zeroing out the addresses for all devices connected to the bus;
- [**o.nEt**] – OUT.NET bus - configuration of transmission parameters for an external bus;
- [**out.**] – module outputs – parameter settings;
  - [**o._|-|_.**] – defining the on/off delay of the outputs;
  - [**o.Fun.**] – defining the operating modes of the outputs;
  - [**o.Zon.**] – assigning outputs to zones;
- [**SErv.**] – service functions;
  - [**PASS.**] – password change;
  - [**tESt**] – testing the module outputs;
  - [**d.rSt.**] – setting the MDD zero mode, triggering detector bus zeroing;
  - [**FAcT.**] – restoring factory settings;
- [**dISP.**] – special functions of the LED display;
  - [**vAL.**] – defining the mode of displaying device parameters;
  - [**LooP**] – switching the cyclic mode on/off;
- [**....**] – automatic exit from the menu;

The LED screen displays only one function that is active at a time. In order to change the function to another one, use the keys [▲] or [▼]. Confirm the selection of the function with the [**OK**] key. To exit the menu, scroll through all available menu functions with [▼].

Pressing the [OK] key next to a specific function will enter the sub-menu. Moving in the sub-menu of the respective function is similar to moving in the main menu - selection of the parameter by means of the [▲] and [▼] keys, confirmation by means of the [**OK**] key.

The following sections provide a detailed description of the parameters of the individual MDD functions.

5.5.1 [d.nEt.] – Configuration of the DET.NET bus.

The first menu item groups all the functions required to configure the DET.NET bus, i.e. the detector (module) network, correctly. From this level, the user defines the parameters of the devices, assigns network addresses to the devices, refreshes the network content after changes, etc. The available functions are described below.

5.5.1.1 [d.dEt.] - Detector parameters – parameter list:

This function is recommended when the DET.NET bus has already been configured, the devices are working properly, and the parameters of the individual devices need only be manually changed. In this case, the user knowing the addresses of the detectors to be reconfigured, selects specific slaves from the range [d.001] ÷ [d.224], and then changes the settings of the specific detector. It should be remembered that after choosing the slave address, the MDD forces the user to correctly configure all parameters of a given detector (it is necessary to go through the full configuration path and reconfirm all parameters of the detector).

Changes in the detector settings are made in real time, i.e. correct communication between the MDD and the selected detector is required during parameter configuration.

If the MDD does not communicate with the detector, it signals this with a continuous acoustic signal and blocks the possibility of changing the detector's parameters. In this case, the detector can only be switched on/off and assigned to a specific zone.

If the MDD communicates correctly with the detector, this is indicated by an intermittent acoustic signal and enables full configuration of the parameters of the selected detector. The new parameters are stored in the MDD memory and in the detector memory.

The following are the configuration steps for a single detector. Always make changes by pressing the [▲] and [▼] keys, confirm the settings by pressing the [OK] key. When confirming the selection of a given option or group of options, the MDD sends a command to the detector. A correct change is indicated by an intermittent acoustic signal (new settings are stored in the MDD memory and in the detector memory). Lack of communication or failure to execute the command is signalled by a continuous signal (changes are not made). Once all required settings have been confirmed, the detector automatically returns to the detector list.

a) Selecting the detector number from **[d.001] ÷ [d.224]**.
   Select a number that matches the slave address of the detector. Any changes will only apply to the selected detector.

b) Switching detector operation on/off:
- [**d.YES**] – operation of the detector is on - in normal mode the module cyclically checks the status of the detector with the previously specified address;
- [**d.no**] – operation of the detector off (default setting) - the module bypasses the detector in normal operation mode, communication with the detector is off.

c) Assigning detector to zones:
- [**d.Zo.A**] – detector assigned to both ZONE1 and ZONE2 (default setting),
- [**d.Zo.1**] – detector assigned only to ZONE1,
- [**d.Zo.2**] – detector assigned only to ZONE2.
Assigning the detector to a selected zone determines the activation of selected MDD outputs in the event of an alarm or fault condition in the detector.
If there is no correct communication with the detector, return to point a).

d) Detector type and measurement unit:
- [**d.-P**] – measuring detector,
- [**d.-F**] – threshold detector.
The type of measurement unit is indicated by a horizontal line on the MDD screen. The information about the type of detector and measurement unit is read out automatically, it is not possible to change it.

e) Switch the detector on/off:
- [**d.On**] – sensor power supply in the detector switched on,
- [**d.OFF**] – (default setting) sensor power supply in the detector switched off.
When the sensor is switched off, the measuring functions of the sensor are blocked in the detector until the sensor is switched on again. The detector then reports no alarm or fault conditions. Switching off the sensor is justified in case of servicing, i.e. in case of replacement of the sensor in the detector, or in case of sensor damage.

f) A3 measuring range (for the measuring detector only):
The value is non-editable and reads automatically from the detector.

g) Alarm type (for measuring detector only):
- [**d.A12**] – momentary value alarms,
- [**d.t.Av.**] – alarms averaged over time;
Non-editable values read automatically from the detector.

The [**d.A12**] option means the activation of alarms if the momentary value of the detector signal exceeds the set thresholds A1 and A2. The [**d.t.Av**] option assigns a time average to the alert thresholds. The A1 threshold corresponds to the TWA - Time Weighted Average of harmful substances in the work environment (in Poland - in accordance with Regulation of the Minister of Family, Labour and Social Policy dated June 7th 2017, Journal of Law of 2017 pos. 1348 + changes), the A2 threshold corresponds to the STEL- Short-Term Exposure Limit to harmful substances in the work environment (in accordance with Regulation as above).The A3 threshold corresponding to the measuring range is always activated if the instantaneous value of the detector signal exceeds the A3 value (time averaging is deactivated).

h) Direction of alarms (for the measuring detector only):
- [**d._|‾**] – excess (default setting),
- [**d.‾|_**] – shortage.
Non-editable values read automatically from the detector.
Excess option [**d._|‾**] means activation of the alarm thresholds if the detector signal exceeds the value of the set alarm concentration thresholds A1 and A2, where A1 <= A2.
Defect option [**d.‾|_**] means activation of the thresholds after the detector signal drops below the set alarm thresholds A1 and A2, where A1 >= A2.

i) Determination of the A2 threshold value (for measuring detector only).
Adjustable value in the range from 5 ÷ 100% of the A3 measuring range (default setting is A2 = 30%).

j) Determination of the A1 threshold value (measuring detector only).
Adjustable value in the range from 5 ÷ 100% of the A3 measuring range (default setting is A1 = 10%).

5.5.1.2 **[d.out.]** - Settings of the executive devices:
Here, the user can configure the parameters of the executive devices, e.g. MDD-L32/T or MDD-R4/T modules, on a common DET.NET bus. These modules are controlled by the MDD-256/T (reserved network addresses above [A.224]). The MDD refreshes the register of executive devices each time it queries the entire detector network.
Each executive module can only be linked to a selected group of 32 detectors (see Table 5.5.1.2).
This way the user can divide the detector network into up to 7 groups of up to 32 detectors and control the facility automation locally using the contact and voltage alarm outputs of the executive modules.

TABLE 5.5.1.2

Identity number of the executive device in the MDD menu			Detector address range [A. …] (groups)
[d.o.0.1]	[d.o.1.1]	[d.o.2.1]	1 – 32
[d.o.0.2]	[d.o.1.2]	[d.o.2.2]	33 – 64
[d.o.0.3]	[d.o.1.3]	[d.o.2.3]	65 – 96
[d.o.0.4]	[d.o.1.4]	[d.o.2.4]	97 – 128
[d.o.0.5]	[d.o.1.5]	[d.o.2.5]	129 – 160
[d.o.0.6]	[d.o.1.6]	[d.o.2.6]	161 –192
[d.o.0.7]	[d.o.1.7]	[d.o.2.7]	193 – 224

The configuration of the executive modules is two-stage and does not require proper communication with the selected module.

The first step is to choose from the list of [**d.o.0.1**] ÷ [**d.o.2.7**] the correct device number. Then activate or deactivate the device by choosing:
- [**d.YES**] – device activated;
- [**d.no**] – device deactivated (default setting);

The next step is to define the operation mode of the executive device outputs (similar to the MDD) by choosing one of the following:
- **[Zo.31]**– three alarm levels A1, A2, A3 and FAULT   – no division into zones (default),
- [**Zo.22**]– two alarm levels A1 and A2, no FAULT   – in two zones: ZONE1 and ZONE2,
- **[Zo.12**]– one alarm level A1 and FAULT   – in two zones: ZONE1 and ZONE2,
- **[Zo.11]**– one alarm level A1 and FAULT   – no division into zones;
Detailed description of the zones is in section 5.5.3.3.

5.5.1.3 **[d.Scn.] –** Scanning, refreshing the existing detector network.
This function enables a simple and quick scanning of all slave addresses of the detector network within the range of **[A.001]** ÷ **[A.224]** and on this basis the recreation of the detector network. This procedure is particularly recommended when installing a new MDD module in an existing, operational detector network. The prerequisite for scanning is correct connection of all sensors with unique slave addresses to the DET.NET bus and correct communication.

The scanning of the detector networks that have set addresses goes as follows:
1) The MDD sends a query to the [A.001] slave and awaits a response.
2) If there is a detector with address [A.001], it can answer your query. The MDD receives a response from slave A.001, stores the slave settings and registers them in the detector network.
3) If there is no detector with an address [A.001], the MDD will skip it in the DET.NET detector network after the required response time.
4) The steps listed in points 1÷3 are repeated until all available detector network addresses have been scanned.

5.5.1.4 **[d.Add.] -** Addressing detectors on the bus - allows you to create a new detector network and add detectors to an existing network.
This feature allows you to quickly and easily set up a detector network and assign the required slave addresses to each detector. The prerequisite for the addressing procedure is that all detectors are correctly connected to the DET.NET bus.

When this option is selected, the module starts the addressing procedure for the detectors by sending a command to start addressing all detectors connected to the bus. The detectors go into the "addressing mode". The MDD displays the initial slave address [**A.001**] from which addressing will start. The initial address can be changed by the user using the keys [▲] and [▼], the selection can be confirmed by pressing the [**OK**] key.

The addressing procedure for the detectors that don't have set addresses goes as follows:
5) The MDD gives temporary slave address, e.g. A.001 to all detectors.
6) The MDD sends a query to the A.001 detector and awaits a response.
7) The user confirms that the A.001 address is assigned to a chosen detector by pressing the correct key (depending on the device type). After confirmation, the chosen detector assigns the A.001 address to itself permanently, it sends a response to the MDD and exits the registration procedure.
8) The MDD receives a response from the A.001 slave, saves the slave settings and registers it in the detector network.
9) The MDD confirms registering the detector by polling the detector.
10) The MDD automatically changes the slave address to the next one (A.002) and temporarily assigns it to the remaining detectors.
11) The steps listed in points 2÷6 are repeated.

If the user assigns addresses to all detectors connected to the DET.NET network, they confirm the end of the addressing process by pressing the **[OK]** key. The module completes the addressing procedure, saves the settings of the new detector network in a non-volatile memory and displays the number of stored detectors on the screen. The new settings remain active until you make new changes.

The addressing procedure for detectors with set addresses (adding a new, additional device or replacing a faulty device with a new one) is as follows:
1) The MDD polls further detectors from the existing network (the detectors exit the registration procedure after a response has been sent);
2) After polling the existing network, the MDD stops at the first available address, sends a query to the detector and awaits a response.
3) The user confirms assigning the displayed address to the added detector by pressing the correct key (depending on the device/detector type). After confirmation the chosen detector assigns the given address to itself permanently, it sends a response to the MDD and exits the registration procedure.
4) The MDD receives a response from the new detector and saves it by registering it in the DET.NET Network.
5) The steps in points 2 ÷ 4 are repeated for the rest of the new devices.

If the user assigns addresses to all detectors connected to the DET.NET network, they confirm the end of the addressing process by pressing the **[OK]** key. The module completes the addressing procedure, saves the settings of the new detector network in a non-volatile memory and displays the number of stored detectors on the screen. The new settings remain active until you make new changes.

⚠ **CAUTION:** If the user of an extensive Digital Gas Detection System envisages the use of multiple devices/controllers/executive devices - i.e. envisages more than two zones (subsystems) requiring independent control (max. 7 groups of up to 32 detectors, each group divided into 1 or 2 zones) - they should consider such a division into address groups when assigning addresses to individual detectors as per Table 5.5.1.2.

5.5.1.5 **[d.dEL.]** - Deleting the slave addresses of the detectors connected to the DET.NET bus.

This function allows you to delete all slave addresses assigned to the detectors. It is especially recommended before addressing an unknown detector network, or when some detectors may have the same slave addresses. In order to confirm deleting, select option **[d.YES]** with the **[▲]** key and confirm with the **[OK.]** key.

CAUTION!!! Deleting will reset the addresses of all devices connected to the DET.NET bus. After deletion, all detectors remain inactive and require the re-addressing procedure described in section 5.5.1.4 to be carried out correctly. In addition, the MDD will reset the stored detector network configuration, excluding the DET.NET bus operation.

5.5.2 **[o.nEt.]** – OUT.NET bus parameter settings.
The parameters of the external bus communication designed for the MDD communication with higher-level external devices or visualisation systems must be configured here.
Settings include parameters listed below:
- slave address assigned to the MDD: **[A.001]** (default setting) ÷ **[A.247]**;
- data transmission speed: **9600bps**, **19200bps**, **38400bps** or **57600bps** (default setting);
- parity check: **even** (default setting) or **none**;

5.5.3 **[out.]** - Output settings.
This item groups a set of functions used to configure the required functionality of the outputs. The properties of the individual functions are described in detail below.
The MDD has four relay outputs marked OUT1, OUT2, OUT3, OUT4 and two voltage outputs marked OUT5, OUT6.

5.5.3.1 **[o._|‾|_]** – Defining the on/off delay of the outputs.

In order to set time parameters:
a) choose the correct output number from the range [**out.1**] ÷ [**out.6**],
b) specify the on delay of the outputs, i.e. the time (default = 10 sec.) from the moment the MDD registers a given alarm state coming from at least one of the detectors connected to the bus, to the time the MDD activates the relevant output;
the delay can be set within the range: [⌐ **003**] ÷ [⌐ **300**] seconds.
c) specify the off delay of the outputs, i.e. the time (default = 10 sec.) from the moment the given alarm state coming from at least one of the detectors connected to the bus disappears, to the time the relevant output is activated;
the delay can be set within the range: [∟ **003**] ÷ [∟ **900**] seconds.

5.5.3.2 [o.Fun.] – Defining the operating modes of the outputs.

From the menu level the following operating modes of the module are available:
- **[F.h12]** – normal mode with ALARM MEMORY (default setting),
- [**F.A12]** – ALARM MAINTAINING mode,
- **[F. n]** – auto-zeroing mode, NO ALARM MEMORY,
- **[F.Ser]** – SERVICE mode with timed, 1-hour blockade of the module outputs.

The operating mode determines the specific control functionality of the MDD outputs. Depending on the set mode, the MDD leaves information on the front panel about alarm conditions that have ended (alarm memory), or clears messages (no alarm memory). Additionally, MDD outputs can be activated for the duration of the alarm or until the user manually deletes them (alarm maintaining mode). Details are provided in the table below.

Operation mode	Active alarm			Finished alarm		
	Optical visualisation of the output status	Inner acoustic signal	Alarm output status	Optical visualisation of the output status	Inner acoustic signal	Alarm output status
[F.h12]	Continuous	Pulsating cycle depends on alarm level	Active	Pulsating	Pulsating 1s/4s	Inactive
[F.A12]	Continuous	Pulsating cycle depends on alarm level	Active	Continuous	Pulsating cycle depends on alarm level	Active
[F. n]	Continuous	Pulsating cycle depends on alarm level	Active	None	None	Inactive
[F.Ser]	Continuous	Pulsating cycle depends on alarm level	Inactive	Pulsating	Pulsating 1s/4s	Inactive

Normal mode with ALARM MEMORY – activates alarm and fault signalling both during the event and after it has ceased. The pulsating signalling after an alarm has disappeared is maintained until the user consciously resets the MDD to zero. Alarm outputs are activated only for the duration of the alarm, while maintaining the delays of switching on and off the outputs. This mode can be activated indefinitely.

ALARM MAINTAINING mode – causes the alarm outputs to be activated both for the duration of the alarm and for this state to be maintained after the end of the event which caused the alarm. The output will be disabled ONLY after external user intervention (MDD zeroing with "OK" button). This mode can be activated indefinitely.

NO MEMORY mode – automatically resets the MDD after an alarm has been triggered, no user intervention is required. There is no message on the front panel about an alarm that has ended. The acoustic signals are also switched off. This mode can be activated indefinitely. Recommended especially for mechanical ventilation control systems.

SERVICE mode – enables the MDD outputs to be disabled for 60 minutes. Recommended for maintenance of gas detection system. In this mode, the MDD measurement activities are retained, i.e. the MDD controls the status of the connected detectors, displays alarm and fault information on the front panel, but does not activate the outputs. The mode can be switched off at any time before the end of the full time period from the user menu or by temporarily turning off the power supply to the module. When the service mode is activated, the POWER light flashes.

5.5.3.3 [o.Fun.] – Assigning the MDD outputs to zones.

From the menu level the following options are available on the MDD outputs (see Table 5.5.3.3):
- [**Zo.31**] – three alarm levels A1, A2, A3 and FAULT   – no division into zones (default),
- [**Zo.22**] – two alarm levels A1 i A2, no FAULT   – in two zones,
- [**Zo.12**] – one alarm level A1 and FAULT   – in two zones,
- [**Zo.11**] – one alarm level A1 and FAULT   – no division into zones;

Mode [**Zo.31**] is recommended when the MDD operates a network made up of MDP-1.A/T or MDD-1 measuring modules, in which every detector has three alarm thresholds assigned to it. It should also be used for a two-way detector network when using the Fault output is required.

Mode [**Zo.22**] is recommended for two-way detector networks if it's necessary to divide the detectors to two zones, but a fault relay output is not required (Fault status is available via PORT2 after polling by the control module).

Modes [**Zo.12**] **and** [**Zo.11**] are recommended in one-way detector networks, e.g. the DD detector type.

TABLE 5.5.3.3 – assigning zones and alarms to the MDD outputs.

Zone mode	Relay output OUT 1	Relay output OUT 2	Relay output OUT3	Relay output OUT4	Voltage output OUT5	Voltage output OUT6
[Zo.31]	ALARM A1	ALARM A2	ALARM A3	FAULT	ALARM A1	ALARM A2
[Zo.22]	ALARM A1 Zone 1	ALARM A2 Zone 1	ALARM A1 Zone 2	ALARM A2 Zone 2	ALARM A1 Zone 1+2	ALARM A2 Zone 1+2
[Zo.12]	ALARM A1 Zone 1	FAULT Zone 1	ALARM A1 Zone 2	FAULT Zone 2	ALARM A1 Zone 1	ALARM A1 Zone 2
[Zo.11]	ALARM A1	ALARM A1	ALARM A1	FAULT	ALARM A1	ALARM A1

5.5.4 [SErv.] – Service functions, special functions.

This item groups a set of service and special functions used when servicing the MDD. The available options are described below.

5.5.4.1 [PASS.] – Password change.
- [P.001] – default user password (default setting);
- [P.000] ÷ [P.999] – password regulation range.

Caution!!! In order to prevent unauthorised access of outside persons to the controller settings, the password must be changed individually. The new password should be remembered and stored in a safe place. Losing the password makes it impossible to make MDP configuration changes. Unlocking the password is possible only by the manufacturer (paid service).

5.5.4.2 [test] – MDD output test.
Module output test - allows all outputs to be checked for correct activation without the need for detectors connected to the bus to generate alarms.
Outputs are switched on sequentially for duration = 10 sec. The currently enabled outputs are signaled on the front panel by an appropriate LED light. After testing all outputs, the MDD automatically returns to the user menu. The outputs are switched on in the following order ("+" indicates the active output):

Duration [s]	Relay output OUT 1	Relay output OUT 2	Relay output OUT3	Relay output OUT4	Voltage output OUT5	Voltage output OUT6
0 – 10	+					
10 – 20		+				
20 – 30			+			
30 – 40				+		
40 – 50					+	
50 – 60						+

5.5.4.3 [d.rSt.] – Setting the zeroing of the device network connected to the DET.NET bus.

From the zeroing settings two options are available:
[r.SEt.] – determines how to reset the MDD and the detector network when the user presses the [OK] key on the MDD front panel. With the **[r.On]** setting selected - each time the MDD is reset with the button, all devices in the detector network are automatically reset to zero. When **[r.OFF]** is selected, only the MDD is reset, while the status of the devices in the detector network remains unchanged.
[r.run] – enables the reset command to be triggered from the menu for the entire detector network (independent of the "RESET" button on the front panel).

5.5.4.4 [FACt.] – Restoring MDD default settings.

This option restores the standard MDD configuration settings (specified in sections 5.5.1 to 5.5.5.) by cleaning the previously made changes. This option is particularly recommended in situations where not knowing the previous settings may unexpectedly trigger MDD control procedures unsuitable for the desired configuration.

5.5.5 [diSP.] – Switching special LED display functions on/off.

From the display settings level two options are available:
[vAL.] – setting it to [v.YES] additionally causes displaying the current detector status while browsing slave addresses is triggered (see section 6.3). Setting it to [v.no] disables displaying detector status.
[LooP] – setting it to [L.YES] loops the slave address browsing procedure. When the entire detector network is displayed, the MDD automatically restarts the display from the beginning. The display can be interrupted by pressing the [▼] key for approx. 2 seconds.

6. DIGITAL GAS DETECTION SYSTEM LAUNCH

All devices for the Digital Gas Detection System equipped with RS-485 communication ports are supplied by GAZEX with communication switched off as a default setting (set to "zero" address). In this state, the devices will not respond to the control module's queries until the control module has assigned an individual address to them. This is a safe setting because it ensures that there are no two (or more) devices with the same address in the same network, which would result in communication errors.

If a new device network is being created and it is not certain that all devices have a "zero" address, the device addresses must be reset before addressing can begin. This can be done manually on each device (according to the operating instructions of the respective device) or automatically from the MDD menu, option [d.dEL.], section 5.5.1.5.

> **Caution! Please note that starting the address zeroing procedure in the existing network will erase all addresses of the devices and you will need to repeat the addressing procedure for the entire network.**

If access to detectors or modules connected to the digital bus is difficult at the installation site, it is recommended to address these devices before installing them on site. This can be done by connecting the devices individually to the MDD and assigning consecutive addresses to them. Remember to label your device with an address label and a description of the physical location of the installation. In the network of devices installed in this way, it is enough to run the option of scanning the network from the MDD menu, option [**d.Scn**.], section 5.5.1.3. and check whether the number of found devices and their addresses are consistent with the actual state.

> **Caution! Please note that starting the network scan procedure will remove from the list of devices supported by the MDD those that will not respond to the query. Therefore, before starting the [d.Scn] function scan, make sure that all devices in the network are powered on and connected to the bus. Scanning only changes the MDD settings and does not erase, does not set slave addresses in devices connected to the bus.**

The addressing procedure, option [**d.Add**.], section 5.5.1.4, can be started when you are sure that the devices you configure have zeroed addresses, or to add new devices to an existing, properly functioning network. The required startup steps are described below.

6.1 Switch on the MDD power supply and the power supply for all devices connected to the DET.NET bus. Wait until the MDD module completes the initialisation procedure for the startup parameters (last settings loaded, display and light test) and displays the "n.OFF" symbol on the LED screen, which means that the DET.NET bus communication is disabled (no MDD-configured detector network).

6.2 Configure the new detector and/or sub-module network connected to the DET.NET bus as follows:
   a) Ensure that the electrical connections of the detector network and the MDD module are correct.
   b) Ensure that all components of the detection system are properly powered.
   c) Enter the MDD menu (see sections 5.4 and 5.5).
   d) From the main menu choose the option **[d.nEt]** (see section 5.5.1), confirm with the **[OK]** key.
   e) Activate addressing of the detector network, option [**d.Add.**] (see section 5.5.1.4), confirm with [**OK**].
   All devices connected to the DET.NET bus should signal entering the addressing mode. If this is not the case, finish the addressing procedure by pressing the [OK] key twice, locating and repairing the fault (description of typical digital bus faults and methods of solving them are described in section 6.9). After the repair, restart the addressing procedure by repeating steps from e).
   If there is an existing detector network, the MDD will automatically skip all busy addresses in the network (the devices of the existing network will exit the registration procedure) and stop at the first, smallest free address.
   f) Specify the starting address for addressing the devices (default: [A.001]) and confirm by pressing [**OK**]. From the moment of confirmation, the MDD waits for a response from the device with the indicated address, signalling this status with the "rotating" symbol "c" on the segment display.
   g) Go to the first device and confirm the new address by following the instructions in the manual for the selected device. The addressed device signals that the new address is stored and exits the reporting procedure starting with normal operation. (The exact algorithm of the addressing procedure implemented in the MDD is described in section 5.5.1.4).
   h) Wait a few seconds for the MDD to signal with an intermittent beep that the address is being confirmed and to display the next address value on the LED screen.
   Caution! If addressing is confirmed simultaneously on the next device before the MDD changes address to the next, the same address is assigned on the two devices, resulting in communication errors!!!
   i) If the user does not want to keep the addressing order, they can change the address to any value before confirming the next device with the use of [▲] and [▼] keys. Confirm your selection with [**OK**]. If the selected address is already occupied, the MDD will automatically increment it to the next free address.
   j) After confirming the addresses of all devices, complete the reporting procedure by pressing [**OK**]. The MDD indicates the end of the procedure by displaying the number of addressed devices. If this number is not consistent with the actual number of devices on your network, you may have omitted some devices when confirming addresses. In this case, you must redial the addressing procedure. Wait until the MDD scrolls through the stored addresses and then the DET.NET bus configuration. The detailed description of the procedure is described in section 6.7.

6.3 Configure the other MDD parameters as required (see section 5 for details). Exit the menu.

6.4 After exiting the configuration settings (or omitting the configuration stage by the user), the MDD switches to the normal operation mode, where it cyclically polls the configured network of detectors connected to PORT 1. Correct communication is signalled by the flashing green PORT1 light marked [DET.NET]. On the front panel are signaled in real time: collective status of detector network, states of outputs, correctness of power supply and RS-485 communication as well as possible activation of special MDD functions. The signalling method is described below.

a) The LED segment display is assigned to indicate the current status of the detector network connected to the MDD. The alarm or fault states displayed are collective states of the entire detector network that are triggered by one or more detectors. The symbols are explained below:

- alarm states:
  [**n.OFF**] – communication is off (no active detectors);
  [**n**]   – normal state of the detector network;
  [**A1**]   – active alarm of level 1 being exceeded;
  [**A2**]   – active alarm of level 2 being exceeded;
  [**A3**]   – active alarm of level 3 being exceeded;
  [**h1**]   – there was (historical) an alarm of level 1 being exceeded;
  [**h2**]   – there was an alarm of level 2 being exceeded;
  [**Er.03**] – short-circuit or overload of the MDD voltage outputs;
  [**Er.04**] – external power supply fault;
- fault states or special information of devices in the DET.NET detector network:
  [**E.nEt**] – no communication with a device in the DET.NET network,
  [**F.dEt**] – fault reported by a device in the DET.NET network;
  [**d.OFF**] – inactive device (with its sensor off);
  [**d.SEt**] – device in setting mode;
  [**hEAt.**] – device in warm-up mode;

b) Red lights [OUT1] ÷ [OUT4] indicate the status of the alarm outputs:
- continuous light - alarm output active;
- pulsating light – in the cycle (0,5s/0,5s) – SERVICE mode on (all outputs temporarily locked);
- pulsating light – in the cycle (1sec. on / 3sec. off) – inactive alarm output (historical memory of the active output);
- off – inactive alarm output;

b) Green [DET.NET] light indicates detector bus communication status:
- pulsating light in time intervals according to the polling frequency (ca.3÷30 sec.; depends on the number of detectors in the network) – correct communication;
- off – MDD communication off, no active detectors/devices in the DET.NET network;
- continuous light – the module sends queries to the bus but receives no response; this state may mean no power supply to the detectors, a faulty detector bus, no terminating resistors or a high level of interference in the bus;

c) Green [POWER] light indicates MDD power supply status:
- continuous light – power supply parameters normal;
- pulsating fades – for 1 sec. in a 4 sec. cycle – correct power supply, SILENT MODE on (no inner siren);
  - pulsating light – in the cycle (0,5s/0,5s) – correct power supply, SERVICE mode on (all outputs temporarily locked);
- pulsatingly faded light (3 fades, 0,5s each, within 4 sec) – correct power supply, A2 LOCK MODE on (temporary blockade of the A2 voltage output);
- off – no power supply to the module;

f) Yellow light [FAULT] – fault present in the system:
- continuous light – active fault state (including lack of power supply) coming from a detector/device connected to the bus, damaged digital bus, or MDD module fault;
- off – no fault;

g) Inner acoustic siren signals alarm and fault states in the MDD:
- continuous sound – any fault;
- sound pulsating in the cycle (0,1s on / 0,1s off) – active alarm A3;
- sound pulsating in the cycle (0,2s/0,2s) – active alarm A2;
- sound pulsating in the cycle (0,5s/0,5s) – active alarm A1;
- sound pulsating in the cycle (1s/4s) – alarm or fault state has ended (historical memory);
- no sound – normal state;

6.5 The MDD module is controlled with a keypad located on the front panel. During normal operation (not in the menu mode), additional functions are permanently assigned to the keypad keys. Pressing and holding the key for a certain time causes respectively:

- **key [▲]** (≥1 sec. but < 3 sec.) – Activating the procedure displaying the detector bus slave address configuration; the LED segment screen displays in turn the number of active detectors in the network and the subsequent slave addresses of the detectors. If the detector status display is enabled, the current device status is displayed when each slave address is displayed. When all addresses have been displayed, the MDD returns to normal operation.

- **key [▼]** ((≥1 sec. but < 3 sec.) – activating the procedure displaying current faults and alarms with assigning slave addresses to detectors that have reported given state; the LED segment screen displays the type of faults or alarms, followed by the slave addresses of the detectors. When all active events have been displayed, the module returns to normal operation.
- **key [OK]** (≥ 3 sec.) – zeroing the module, i.e. restoring initial settings of the MDD registers just as when the power supply has just been switched on. Zeroing deletes the signalling devices' memory of alarms or faults that have ended.
- **key [▲]** (≥ 3 sec.) – entering the user menu. Holding down this key at any time during module operation interrupts MDD control and measurement processes and enables the user to make required changes to the module settings.
- **key [▼]** (≥ 3 sec.) – switching the internal siren on and off. Switching off the siren (activating the "silent mode") is indicated by an intermittent acoustic signal and a pulsating green POWER light. This option is especially recommended when the controller is installed inside switch boxes and only functions as a ventilation controller, without the need to generate acoustic signals. Silent mode allows you to mute the internal siren for an indefinite period of time (also after a power break).
- **keys [▼]** and **[OK]** (≥ 3 sec.) – if the keys are pressed simultaneously with the A2 alarm active, the OUT6 voltage output is switched off for 15 minutes or until the next new A2 alarm is activated.

6.6 After correct installation and heating of the detectors in clean air, no acoustic or optical signals shall be generated and an 'n' symbol indicating the normal status of the detector network shall be displayed on the LED screen. If the "n.OFF" symbol is displayed on the screen, there are no active detectors in the network.
   If other symbols are visible on the LED screen, yellow or red lights are on, and an acoustic signal is heard, the detectors are incorrectly installed or the MDD configuration is faulty. Check the bus connections and the MDD settings.

6.7 The final stage of the **System** performance check is the generation of all alarm states **for all connected detectors**, and the performance check of external devices.
   PREREQUISITES FOR THE SYSTEM CHECK:
   - the **MDD** module is in a normal mode marked with the **[n]** symbol, the green **[POWER]** light is on;
   - active devices connected to the DET.NET network do not generate alarm or fault signals.
   6.7.1 Generate alarm conditions successively for **each** detector installed on the DET.NET network with a test gas of known concentration, according to the instructions in the detector's manual. After the gas has been fed to the sensor, the LED display of the MDD module shall show **[A1]**, **[A2]** or **[A3]**. Pressing the **[▼]** key for ca. 2 seconds displays the address of the detector that generated the alarm. The display of the alarm status and the correspondence of the address are sufficient proof of correct interaction between the detector and the module.
      If the detector's alarm signals last for at least the time corresponding to the **delay in activating the outputs**, an alarm signal shall be generated at the corresponding alarm outputs, the red lights [**OUT1**], [**OUT2**] or [**OUT3**] shall be lit, and the acoustic signal shall be activated. The outputs will be activated according to the set zoning modes.
   6.7.2 After the test gas has been removed, the gas concentration in the detector decreases, resulting in a change of the detector status on the LED display to [**A2**] or [**A1**] and a message [**h3**], [**h2**] or [**h1**] (depending on the generated alarm number) being shown. The control outputs return to their normal state (red LEDs go out), while the acoustic signal changes to intermittent in a 1s/4s cycle. The alarm information remains on the LED display until the user deletes it manually and consciously.
   6.7.3 The test procedure 6.5.1 shall be completed by an output test (outputs in normal mode and not in 'service' mode) conducted by the software from the user menu level described in point 5.5.4.2.

   Results of the control or the launch should be entered into Periodic Control Protocol

If the test result is positive, the Digital Gas Detection System may be considered as operational.

6.8. PROBLEM ?

Before you call the system Producer, check and compare the effect you observed with the below table

6.8 TABLE for exceptional states of the MDD module after switching on the power:

EFFECT	WHY	WHAT TO DO
All lights off	No power supply to the MDD or reverse polarisation	Turn off the power supply
Just the FAULT light on	MDD fault	Contact GAZEX service
[**E.nEt**] on MDD display	No communication between MDD and detector(s) in DET.NET bus	Due to the problem's complexity the exact procedure is described in section 6.9. The detailed way of installing the DET.NET bus connections is in section 4.2. of this manual
[**Er.04**] on MDD display	Power supply below allowed value	Check and correct power supply parameters of the MDD
During **A2** or **A1** state, [**Er.03**] shows on MDD display	Short-circuit or overload (I>200mA) of the outputsOUT5 and OUT6	Disconnect and check the devices/signalling devices connected to the OUT5 and OUT6 outputs; after disconnecting the devices, the message should disappear
No indication of alarms in the detector	Deactivated detector operation with this address, detector service mode activated	Check if the detector address is on the list of supported devices (press the **[▲] key** for approx. 2 sec.); check the detector settings
MDD signals the alarm from a detector on the LCD screen, does not activate the outputs	MDD service mode on, or long output activation delay time	Check the MDD parameter settings
MDD does not activate the outputs with the detector A2 alarm on	Other zone mode on MDD outputs enabled, e.g. assigning outputs to A1 alarm only	Check the current settings of the zones on the outputs, change the settings as needed
After the power supply is switched on, the segment display shows alarm messages of the devices for a few/a few dozen seconds, then the alarms disappear	If the detectors are stored for a long time or if the ambient temperature is low, the warm-up period was too short for the intended 1 minute (for low-calibration detectors)	Wait a few minutes after powering up the system. After completing the alarms, press the [**OK**] button for at least 3 seconds and clear the MDD display (restore the module to its normal state); correct the settings for the warm-up time of the DET.NET bus devices

If you notice effects other then the above mentioned contact an Authorised Service or the Producer.

6.9. INSTALLATION AND LAUNCH RECOMMENDATIONS

⚠ The MDD user and the INSTALLER must be aware of the special way in which the RS-485 bus was designed to digitally communicate with detectors.

This means that installation and maintenance must be done with THE HIGHEST CARE!!

Systems based on digital communication between the detectors and the MDD allow the transfer of an unlimited amount of data between devices, increasing their functionality, but require great care when wiring. The most common problems related to the lack of digital communication between MDD and devices in the DET.NET bus, or between MDD and the control system in the OUT.NET bus, are caused by errors in the installation of the bus cabling, the use of incorrect cabling, poor bus topology, or the use of untested additional devices in the network.
The following describes the recommended installation steps for connecting the bus cabling to the individual devices and the startup recommendations, which describe the typical procedures in the case of reporting by the MDD a lack of communication with a selected device, a group of devices or the entire bus (on the MDD screen the message "E.nEt" appears).

6.9.1 Preparation.
- Before wiring, the installer should familiarise themselves with the basic parameters of the RS-485 interface and observe the guidelines described in sections 4.2 and 4.3 of this manual when designing the topology of the digital bus.
- Please refer to the operating instructions of the equipment to be installed. In case of installing devices to which power supply and communication are to be provided by a common "twisted pair", it is necessary to use terminal boxes type CB-4 in places where local power supply for a selected group of devices is to be provided. CB-4 boxes are equipped with connectors (adequately internally connected) to connect power wires (maximum cross-section 2.5mm2) supplied from a local 24V= power supply, and bus connectors designed for connecting a twisted pair (device bus).
- The digital bus cable (twisted pair) should be distributed in series, starting from the MDD installation point (control module), then successively through the installation points of the individual devices, terminal boxes, up to the most remote device. Leave an excess of about 20-30cm of cable in the installation area for easier connection of the device.
- It is essential to avoid distributing the digital bus cables in parallel and in close proximity to other cables of the object, which may cause increased emission of interference (control of automation of the object, motors, inverters). The optimal solution to eliminate many problems during system startup and operation is to use shielded STP/FTP cables.
- All wiring connections must be made when the power supply is switched off..

6.9.2 MDD installation procedures.
- Connecting the twisted pair of the digital bus should be started with the first bus device, i.e. the MDD (control module).
- Prepare and press the cable ends (according to section 4.2.2.A) to the terminals of the PORT1 of the bus: "A+". - [07], „B-" [08] and 'GND' – [09], while maintaining the required conductor colour scheme (according to section 4.2).
- Unused twisted pair wires must be protected against short circuiting, as it is possible to supply 24V for other bus devices over these wires.
- If the digital bus cable runs through areas with expected electromagnetic interference, you must also connect the shield of the cable ("GND") to the PE terminal of the electrical system at only one point, preferably at the MDD module.
- Check that the wires are correctly connected to the terminals. Check that the colours of the conductors connected to the respective terminals are in accordance with Table 4.2.2.
- Set jumper J1 at PORT1 to ON, thus activating the R=120Ω terminating resistor between the signals "A+" [07] and "B-" [08] (default setting).
- After the MDD installation is complete, go to the next device in the bus.

6.9.3 Installation procedures for remaining devices.
- At the place of installation of the next bus device, cut the twisted pair cable and (according to section 4.2.2.A) prepare the ends of the cable coming from the connected devices (from the control module).
- Use an ohmmeter to check the resistance values between the individual wires of the twisted pair cable according to Table 6.9. The measurement should be carried out on a "hanging" wire (connecting the wire to the terminals connected to the current device before measuring, will cause the wires to short-circuit in this device and will make it impossible to check the correctness of earlier connections). It is essential to pay attention to the polarity of the cables.
- If the measured resistance values are different, it means that the wires of the cable are wrongly connected to the previous device, or that the last section of the cable is damaged. In this case, return to the previous device, check again and correct the connections of the cables coming out to the last device, or check the wiring status between the devices.

- If the resistance values are correct, press the wires into the appropriate terminals of the current device (according to the user's manual), keeping the required conductor colour scheme. For legibility of connections, it should be assumed that the wires coming to the device from the MDD side are connected to the lower openings of the port terminals.
- Prepare the conductor ends of the bus cable towards the next unit. Push it into the upper holes of the port terminals using the same rules as for the incoming cables.
- Repeat the installation steps described in section 6.9.3 for each device until the last one.
- Connect a terminating resistor R=120Ω on the last device between the "A+" terminals (orange) and 'B-' (white and orange). The resistance value measured between these terminals when the resistor is connected at the end of the bus should be about R=60Ω.

Table 6.9

MEASURED RESISTANCE BETWEEN TWISTED PAIR WIRES	FUNCTION (COLOUR)								
FUNCTION (COLOUR)	RS-485 - „A+" (white and orange)	RS-485 - „B-" (orange)	RS-485 – power supply weight (FTP screen)	+ power supply (white and green)	+ power supply (white and brown)	+ power supply (white and blue)	power supply weight (green)	power supply weight (brown)	power supply weight (blue)
Power supply weight (blue)	open			open			R (1)		
Power supply weight (brown)	open			open			R (1)		
Power supply weight (green)	open			open					
+ power supply (white and blue)	open			R (1)					
+ power supply (white and brown)	open			R (1)					
+ power suppply (white and green)	open								
RS-485 - weight (ekran FTP)	open								
RS-485 - „B-" (orange)	60÷300 [Ω] (2)								
RS-485 - „A+" (white and orange)									

Additional information:
(1) In the case of a short-circuit between the power wires, the readout value of R will correspond to the resistance resulting from the length of the wires between the measurement point and the nearest point of the short-circuit (the resistance of the wires of the twisted pair is about 200 Ω / km of the cable loop).
(2) In case of measurement between "A+" and "B-" lines, the value of the read resistance depends on the number of connected terminating resistors and the length of signal cables:
  - no resistors: open,
  - one resistor: R = ca. 120 + line resistance [Ω],
  - two resistors: R = ca. (120 / 2) + line resistance [Ω],
  - three and more (**not allowed!**): R = ca. (120 / n) + line resistance [Ω], where n – number of resistors

6.9.4 Checking the correct power supply for the devices.

After completion of installation of devices described in sections 6.9.2 and 6.9.3, power supply to the system should be switched on and optical signalling of devices connected to the common bus should be checked (according to dedicated manuals). If the observed signalling (or lack of it) indicates an incorrect voltage supply for the selected devices, the cause should be found and the fault corrected. Table 6.9.4 describes typical problems with powering the device bus.

TABLE 6.9.4 of unusual states of the digital bus after the power supply has been switched on

EFFECT	WHY	WHAT TO DO
all lights off	no power supply	Check that the system power supply is turned on. If not, turn on the power supply. Check the correct connection of the wires at the power supply output.
	overload of the power supply ($U_{min} > U_{wy} > 0$) caused by too many powered devices, too high an impact current when switched on	Measure the voltage at the output terminals of the power supply (voltage value below the permissible threshold, but not zero). Switch off the power supply. Check the number of devices on the bus. Disconnect some of the devices from the power supply and use an additional power supply for them.
	short-circuit at the power supply output	Measure the resistance between the power supply terminals (when the power supply is off). The measured value makes it possible to deduce the approximate short-circuit location - the resistance of the FTP "twisted pair" is about 200Ω /km/pair loop with one color.
	incorrect connection of cables to the power supply output	Check the correct connections, check the correct polarity of the power supply output. In case of discrepancy, correct.
deactivated or incorrect signalling of some devices after turning on the power supply	too low a supply voltage of the devices due to too long distance from the power source (too high a resistance of the wires)	The measured voltage at the supply terminals of the selected unit is below the minimum permitted value. The voltage value increases if the device is disconnected from the power supply (the connectors are removed from the pins). Use local power supply for some devices (reduce the distance between devices and the power supply) or reduce the resistance of supply wires (use wires with a larger cross-section).

If you notice effects other then the above mentioned contact an Authorised Service or the Producer.

6.9.5 Communication check between devices on the RS-485 digital bus.

Digital communication checks between the devices must be carried out by checking that the devices to be checked are correctly powered (see section 6.9.4) and that they are correctly connected to the digital bus (see sections 6.9.2 and 6.9.3).
The simplest and quickest way to check the correctness of the communication is to start the addressing procedure from the control module (described in detail in section 6 of this manual), which consists of triggering a special operating mode simultaneously for all devices connected to the common bus. After the addressing procedure is started, all devices should signalise activation of the addressing mode (the method of signalling depends on the device type and is described in the manual assigned to a given device). If the signalling of a group or all of the devices is not correct, abort the addressing procedure in the MDD control module, find and correct the digital bus fault, and restart addressing. Repeat this procedure until all devices have correctly signalled the addressing mode.

In the first stage, the steps described in sections 6.9.2 and 6.9.3 should be carried out in order to exclude installation errors, i.e:
-    devices connected incorrectly to the bus;
-    opening or closing in transmission lines;
-    incorrect bus topography;
-    absence or use of more than 2 terminating resistors in the network;
-    incorrectly connected signal masses between devices;
If only the selected device group does not signalise addressing, it is likely that an error occurred when connecting the cabling of the first device closest to the MDD side. It is also possible that in these devices there was a significant drop in the supply voltage and made it impossible to communicate correctly.

If **no** bus device indicates addressing, this may suggest a fault directly at the control module sending the digital frames or at the first bus device. This is where you should first look for damage.
If the connections are correct, the internal transmitter systems of the control module or one of the devices connected to the bus may be damaged. In this case, disconnect the devices from the digital bus (simply disconnect the terminals from the device ports without disconnecting the wiring), leaving only the MDD control module and one of the most remote devices (bus length test). Start the addressing. If the communication is correct, connect one device at a time and repeat the addressing procedure each time until you find the device that is faulty.
If the communication between two devices is still not working, perform a communication test on a very short connection (the MDD and one slave next to each other). If there is still no communication under these conditions, the MDD transmitter's circuitry will be damaged. However, if devices communicate with each other at short notice, this may result in strong interference in long bus cables, poor wiring, missing or incorrectly connected shields in bus devices. Check the routing of the bus cables to ensure that they are not routed in parallel with other cables that may have an increased risk of interference.
If you notice effects other then the above mentioned contact an Authorised Service or the Producer.

7. MAINTENANCE/OPERATION

The **MDD** module is an electronic device without working moving parts. It is based on semiconductor components that have a long service life. Therefore, maintenance is limited to the System Periodic Inspection.

7.1. System Periodic Inspection:
- ♦ dust the MDD
- ♦ notify all system users of the planned inspection
- ♦ **Test the System by section. 6.5** of this User Manual.

*RECOMMENDED FREQUENCY OF THE PERIODIC INSPECTION OF THE **MDD** AT LEAST **EVERY 3 MONTHS**; IT IS ENOUGH TO TEST THE SYSTEM'S ELECTRIC AND MEASUREMENT PROPERTIES.*

- ♦ The System Periodic Inspection should also be carried out EVERY TIME the system has worked in extraordinary conditions, i.e.:
  –extreme conditions, e.g. high gas concentration, high or very low temperature, high periodic dustiness or an increase in humidity,
  –presence of high concentrations of other gases not expected to be present in the monitored zone,
  –long-term operation with an alarm on,
  –after a power outage of more than 1 hour,
  –in the event of over-voltage or major disturbances to the electrical system,
  –after carrying out any maintenance or installation work likely to affect the operation of the system or its configuration, etc.

7.2. Avoid using mobile phones, radios or other sources of strong electromagnetic field in the immediate vicinity of MDD during operation, as their use may cause the MDD to malfunction and false alarms.

7.2.1 When operating MDD, avoid temperatures below the recommended limits (section 3).

CAUTION ! IMPORTANT !!

7.3. All:
- - results of each system inspection according to section 6.5 of this user manual,
- - situations in which alarm A2 or A3 has been generated together with actions taken by operators,
- - situations when the module is switched off for a period longer than 3 months,
- - unusual signs of system operation which have been observed

MUST be put down in the Periodic Inspection Protocol under loss of warranty for the elements of the system penalty and exemption from any liability of the Producer due to System use.

7.4. After 10 years from the production date, it is essential to replace the internal lithium battery with a new one. It is a paid service carried out by the Producer.

7.5. **CAUTION:** any attempt to interfere with MDD's internal circuits shall render the guarantee null and void.

7.6. According to the WEEE Directive 2012/19/EU on electrical and electronic equipment waste, a used unit cannot be placed together with other household waste. It must be handed over to a specialist collection point. This is why it is marked with a special symbol:
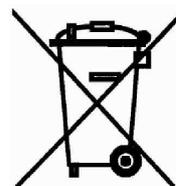
8. STORING THE MDD

It is recommended to store MDD in dry rooms with a temperature between +5°C and +35°C. Short term storage (<2h/8h) is permitted in the ambient temperature range -10°C to 45°C.

Guaranteed service life of internal battery supporting memory of real-time clock - 5 years from date of production (durability depends on length of storage time without power supply). After 10 years from the production date, it is recommended to replace the battery with a new one - replacement only by the Manufacturer.