



Warsaw

Control Unit

MDP-1.A/ T

USER MANUAL

Issue 4W32en

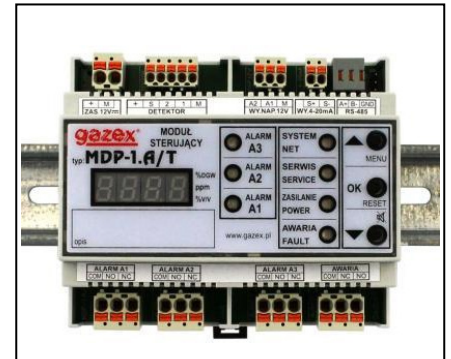
[series W3]

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 Gas Detection Systems' User perusal.

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1. PURPOSE

The MDP-1.A/T digital measurement module is designed for use with one of GAZEX gas detector types DEX/F, DEX/A or DEX/P (for operation in explosive gas atmospheres of temperature class T4) or type DG/F, DG/P or DG.EN (for operation outside potentially explosive atmospheres) - see Compatibility Table 1.2.

The cooperation consists of cyclical measurement and control of detector signals. When the specified concentration values are exceeded, the optical alarm signaling is activated, the module outputs are activated and information is transmitted to the monitoring module (e.g. MDD-256/T) or any visualisation system via the RS-485 industrial standard network in accordance with the MODBUS RTU protocol (in the MDP-1.A/TM option).

In the further part of this manual, any MDP-1.A/T... module will be referred to as the "**MDP**" module. - unless the description is model-specific.

In the later part of this manual, the term "detector" or "DEX" will refer to a DEX/F, DEX/A, DEX/P, DG/F, DG/P or DG.EN detector of all types of gases, unless a specific type/model is described.

Features and functions realised by the MDP:

- it powers and controls one measuring detector of the DEX/P or DG/P type or a double threshold detector of the DEX/A, DEX/F, DG/F or DG.EN type; it controls the status of the wired connection to the detector (it provides full detection of fault states);
- it assigns - three alarm levels to the measuring detector: A1, A2 and A3, adjustable by the user to any value within the full measuring range;
 - two alarm levels A1 and A2 (according to the detector's factory settings) for the threshold detector;
- allows the calculation of the weighted average (TWA) and the short-time exposure limit STEL for the toxic gas concentration detectors;
- allows you to specify the type of measuring units displayed for the detector: [%] of the measuring range, [%LEL], [ppm] or [%V/V];
- allows five modes of operation: "MEMORY MODE". Indicates that an alarm has occurred after the alarm has disappeared, "WITH UPHOLDING MODE" - maintains active alarm conditions after the alarm source disappears, "MODE A3" - turns off the power supply of the detector with the catalytic sensor, which protects against overload, "NO MEMORY MODE" - automatically resets the states of inputs and outputs on the front panel after the alarm states disappear, "SERVICE MODE" - deactivates the module outputs for 1 hour;
- "SILENT MODE" - independent from the above - mutes the inner siren;
- visually signals the signal value and the alarm and fault states of the detector (LED display) as well as the states of the control outputs A1, A2, A3 and the detector fault (LED display) with the simultaneous acoustic signaling (built-in siren);
- stores in a non-volatile internal memory the 200 most recent events with the assigned start and end times and the source of the event;
- enables very precise setting of alarm delay times and unchangeability of these parameters in time thanks to microprocessor control;
- 12V alarm outputs (one for each threshold A1 and A2) control additional acoustic and optical signaling devices;
- the relay outputs (galvanically separated, one for each A1, A2, A3 and fault) control the fans, motors, contactors, information boards, or connect to the building/facility automation;
- the "FAULT" relay output (galvanically separated from the system) informs about the module's fault state, damage to the connection line to the detector or power failure;
- optionally, the MDP-1.A/TM model with isolated RS-485 (MODBUS RTU) port provides remote control, identification and diagnostics of the module together with the detectors and cooperation with the control module or with "intelligent building" control systems;
- optional isolated analog output $I_0=4-20\text{mA}$ (model MDP-1.A/T/420) or $U_0=2-10\text{V}$ (model MDP-1.A/T/V10) for inverter control;
- the case is suitable for installation on a TS 35mm rail in standard electrical switchboards;
- the outputs are compatible with the MD(P)-2(4,8,16)... module outputs;
- all electrical terminals are removable (for disconnecting without voltage);
- configuration of module settings by means of a keyboard on the front panel.

1.1. MDP MATCHING TABLE

MODEL	Analog output 4-20mA	Analog output 2-10V	Digital output RS-485
MDP-1.A/T (<i>standard</i>)	–	–	–
MDP-1.A/TM	–	–	+
MDP-1.A/T/420	+	–	–
MDP-1.A/T/V10	–	+	–
MDP-1.A/TM/420	+	–	+
MDP-1.A/TM/V10	–	+	+

1.2. COMPATIBILITY TABLE

Detector/version (series)	Model <i>version</i>	MDP-1.A/T...	
		W22	W21, U1
operation in explosive gas atmosphere of temperature class T4			
DEX/P4...	DEX-P n , DEX-P n E/N, DEX-P n R	+	+
DEX/F4...	DEX- nn , DEX- nn /N, DEX- n E/N, DEX- n R	+	+
DEX/A4...	DEX- Ann /N	+	–
operation in explosive gas atmosphere of temperature class T6			
DEX/P6... older versions: DEX/P, DEX/P-C, C2		–	–
DEX/F6... older versions: DEX/FA..., DEX/F		–	–
DEX/A6...		–	–
work outside explosive zones			
DG/P	DG-P n E/N, DG-P n R	+	+
DG/F	DG- nn , DG- nn /N, DG- n E/N ,DG- n R	+	+
DG.EN	DG- nn .EN	+	+

Symbols:

n = gas code number,

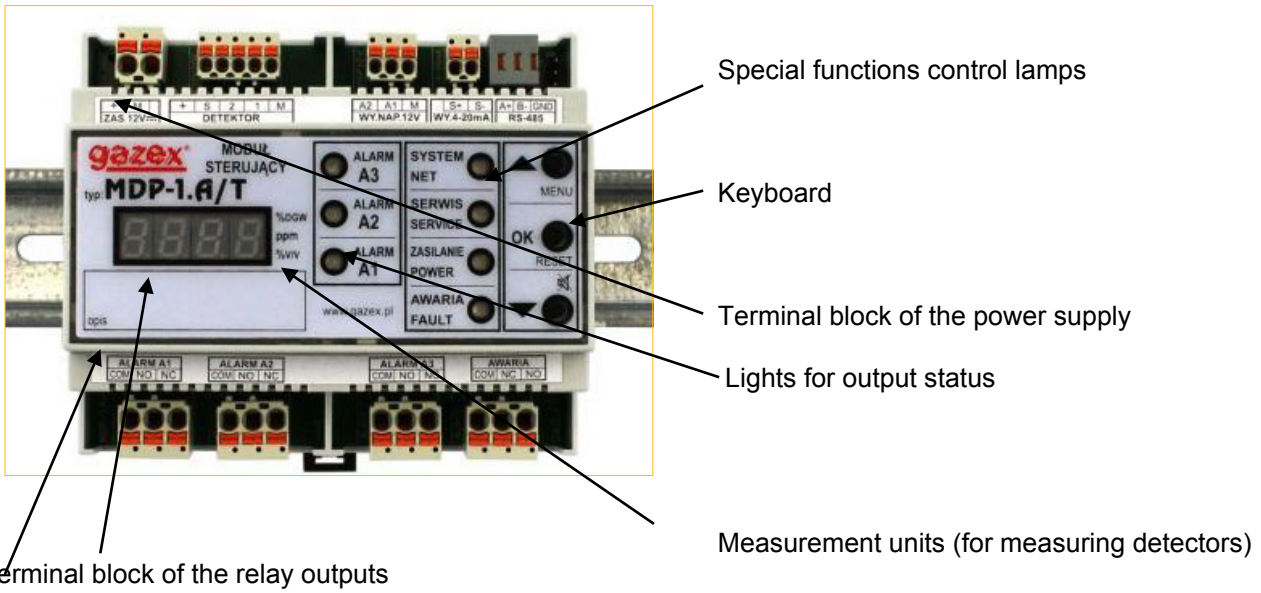
+

– = cooperation not permitted

2. TECHNICAL SPECIFICATIONS

Model	MDP-1.A/TM
Power supply voltage	12V= (permitted range 10,5 ÷ 15V); (limited range 10,5 ÷ 12V in cooperation with DEX in versions P4-HT...,P4-S-C, F4-HT..., F4-S-C, A4-HT..., A4-S-C)
Power consumption	max 0,2A (without detector or voltage alarm outputs) for 12V=, max 0,8A (with detector and voltage alarm outputs)
Operating temperature	-10°C to +40°C recommended, -20°C to +45°C allowed periodically (<2h/24h); 0°C to +40°C limited in cooperation with DEX in versions P4-HT...,P4-S-C, F4-HT..., F4-S-C, A4-HT..., A4-S-C
Communication with the detector	DEX/P, DG/P - measurement detector – 3-wire connection, 4-20mA current loop; DEX/F, DG/F - threshold detector – 4-wire connection, alarm thresholds A1 and A2; DEX/A – threshold detector – 3-wire connection, 4-20mA current loop; type selection – from the menu
Measuring precision of the detector	better than ±3% of the measurement range
Detector power supply	9÷12V=, protected against short-circuiting and over-voltage of 250mA with a resettable fuse, switching on the detector power supply – with software using the keyboard (available from the user menu)
Alarm levels for DEX/P	warning - ALARM1 (A1) , adjustable* alarm - ALARM2 (A2) , adjustable * alarm - ALARM3 (A3) , adjustable * * - the range of alarm threshold regulation depends on the activation of additional MDP functions, e.g. excess, shortage (see section 5.5.1)
Alarm levels for threshold detectors	warning - ALARM 1 (A1) alarm/shutting-off - ALARM 2 (A2)
Fault levels of the detector's measuring signal	signal line opening – („Er.00”) for I < 2mA short-circuit of the signal line – („Er.01”) for I >22mA
Optical signaling of the measurement results	LED display of the current measurement value of the detector signal scaled in selected measurement units: % range, %LEL, %v/v or ppm
Optical signaling of alarm states	optical: 7 LEDs; acoustic – inner siren
Fault signaling	yellow LED, messages on graphic display
Acoustic signaling	Inner buzzer 1Hz intermittent signal - A1 alarm signal 5Hz intermittent signal - A2 alarm signal 10Hz intermittent signal - A3 alarm signal constant signal – fault signal; (optional: no signaling – "SILENT MODE" set with the keyboard)
Zeroing the module	using the button on the front panel
Event memory	internal, non-volatile, 200 recent alarm or fault states or configuration changes
Signal blockade	warming up of the detector (after power supply is switched on): default: 1 minute, adjustment: 1÷ 15 min
Digital output (optional)	(model MDP-1.A/TM): RS-485, MODBUS RTU protocol, galvanically isolated, parameters: 9600bps (11-bit frame, parity control: even, 1 stop bit) ;
Analog output (optional)	current 4-20mA (model MDP-1.A/T/420): active, galvanically isolated, 1mA – fault signaling; precision ±3% of measured value, R _{Omax} = 300 Ω; or voltage 2-10V (model MDP-1.A/T/V10): galvanically isolated, 0,5V – fault signaling; precision ±3% of measured value, R _{Omin} = 100 kΩ
Voltage output	12V=, non-stabilised, for states A1 and A2; total load = max 0,2A, for connecting SL-21, SL-32, S-3x, LD-2 signaling devices
Relay outputs	ALARM 1, ALARM 2, ALARM3, FAULT – relay, type NO and NC, max load: max 4A (with resistive load) or max 2A (with inductive load- engines) or max 0,6A (with purely inductive load – fluorescent lamps); max 230V~ or 24V=
Output control	delay of switching on the output: default 10sec., regulation: 3 ÷ 300 sec., delay of switching off the output: default 10 sec., regulation 3 sec. ÷ 900 sec.; automatic control (default) – alarm state deleted after the alarm source has disappeared, or manual – alarm state maintained after the alarm source has disappeared until the user manually deletes it (by means of the "OK" button on the keyboard)
Electrical terminals	removable, self-springing (screwless), possibility of mounting solid and fine-stranded conductors (without using clamping ferrulas) with cross-section of 0.2 ÷ 2.5 mm ² (with ferrulas: 0,25 ÷ 1 mm ²)
Module power supply control	LED, green; also indicates MDP warm-up state
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 TH35 rail

3. DESCRIPTION AND ASSEMBLY



Pic.3.1 MDP-1.A/T front panel view (rail mounting position)

WIRING DIAGRAM

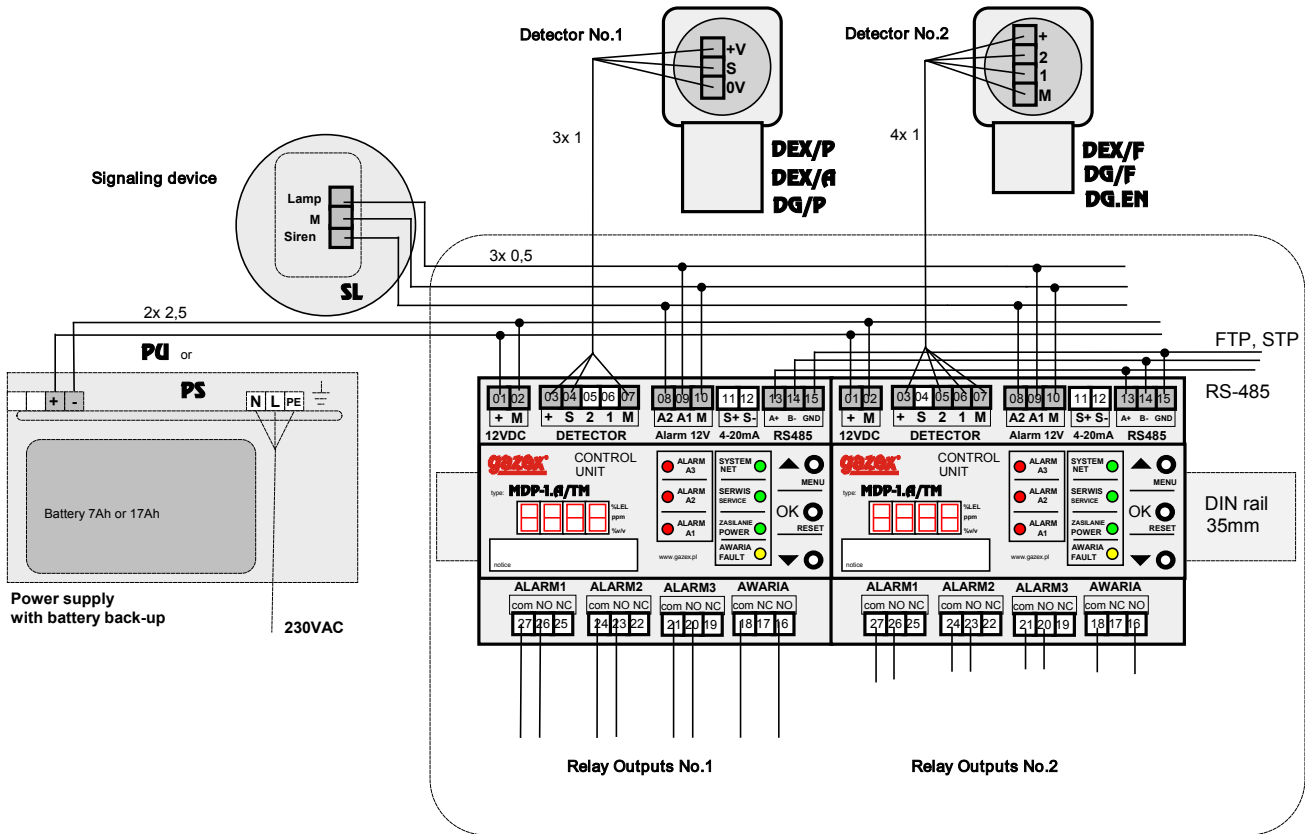


Table 3.1. Functions performed on outputs:

MODULE STATUS [Terminal no.]	RELAY OUTPUTS								12V VOLT. OUTPUTS	
	FAULT		A1		A2		A3		A1	A2
	Pair COM-NO [18] [16]	Pair COM- NC [18] [17]	Pair COM-NO [27] [26]	Pair COM- NC [27] [25]	Pair COM-NO [24] [23]	Pair COM- NC [24] [22]	Pair COM-NO [21] [20]	Pair COM- NC [21] [19]	[09] [10]	[08] [10]
NORMAL	OPEN	CLOSED	OPEN	CLOSED	OPEN	CLOSED	OPEN	CLOSED	no voltage	no voltage
A1	OPEN	CLOSED	CLOSED	OPEN	OPEN	CLOSED	OPEN	CLOSED	12V=	no voltage
only A2	OPEN	CLOSED	OPEN	CLOSED	CLOSED	OPEN	OPEN	CLOSED	no voltage	12V=
A1+A2	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	OPEN	CLOSED	12V=	12V=
only A3	OPEN	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	OPEN	no voltage	no voltage
A1+A2+A3	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	OPEN	12V=	12V=
FAULT of MDP pow. sup.	CLOSED	OPEN	OPEN	CLOSED	OPEN	CLOSED	OPEN	CLOSED	no voltage	no voltage
FAULT DEX	CLOSED	OPEN	X	X	X.	X	X.	X	X	X

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

NORMAL state

only the green light is on;
possible information displayed on the LED screen [**CAL.**] - i.e. exceeded recommended detector calibration period;

A1 – (ALARM A1)

[ALARM A1] output light is on;
pulsating tone of the inner siren is on;

A2 – (ALARM A2)

red [ALARM A1] and [ALARM A2] alarm outputs lights are on;
only the red [ALARM A2] output light is on (window detector);
pulsating tone of the inner siren is on;

A3 – (ALARM A3) the detector indicates that the A3 concentration threshold has been exceeded,

red [ALARM A1], [ALARM A2] and [ALARM A3] alarm output lights are on;
only the red [ALARM A3] output light is on (window detector or shortage function is active)
pulsating tone of the inner siren is on;

FAULT of the MDP power supply – no power supply or damaged internal systems of the module, all lights are off;

DEX FAULT – appropriate fault code on the LED screen, yellow FAULT light is on; active relay output [FAULT];

4. MDP INSTALLATION WITHIN THE SYSTEM

The MDP installation can be started after a period of time suitable for the evening out of temperatures of the MDP and the ambient air. Especially in winter, at negative temperatures during transport or storage, wait approx. 20 minutes before removing the MDP from the foil packaging to prevent condensation on the inner circuits of the device!

4.1 Mount the module in the switchboard box, on a 35mm rail, outside an explosive 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 Lead the connection cables "A" from the DEX detector (necessarily of circular cross-section).

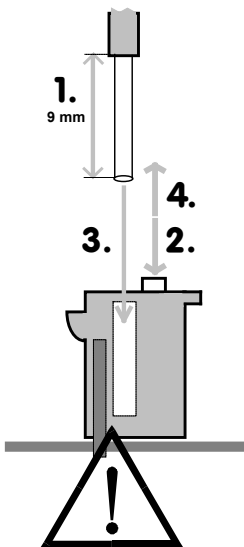
The measurement detectors and the DEX/A threshold detector require a 3-wire cable (e.g. of the YDY 3x1 type) - terminals "+" [03], "S" [04] and "M" [07], other threshold detectors of the 4-wire cable (e.g. of the YDY 4x1 type) - "+" terminals [03], "2" [05], "1" [06] and "M" [07].

The cross-section of wires of the "A**" cable should be selected as shown here, depending on the length L of the connection:

L	L < 150m	L < 300m
A:	0,5 mm²	1 mm²

4.2.1 Keep the correct sequence of connection wires to the detector - improper sequence will cause the alarm status of the module, malfunction of the system or damage to the detector.

4.2.2. The module is delivered with pre-assembled connection terminals on all inputs/outputs. The terminal blocks can be removed from the connection pins for easy connection/removal. In accordance with good installation practice, all terminal blocks must be marked (e.g. numbered) before they can be removed, which makes them easy to reinstall and prevents connection errors. Solid or fine-stranded conductors (without clamping sleeves) may be used. Mechanical parameters of power supply connectors and alarm relay outputs (A1, A2, A3, Fault) allow to install cables with wires of 0,2 ÷ 2,5 mm² cross-section, for other connectors - of 0,2 ÷ 1,5 mm² cross-section.



4.2.2.A Inserting wires into self-reclosing terminals:

- [1.] remove the wire insulation at the height of 9 mm (as shown on the picture);
- [2.] in case of fine-stranded conductors – slightly twist the wire ends,
- [3.] press the orange blockade button and insert the isolated wire ends into the opening as far as it will go, [4.] release the button;
- [3.] in case of solid conductors - with pliers or manually insert (push) the isolated wire ends into the round opening as far as it will go.

A properly inserted cable cannot be removed from the terminal.

The cable can be removed by gently pressing the orange button [2].

4.3. 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 clamping sleeves) may be used. The cables must be laid in such a way that they do not transmit mechanical forces to the connection terminals.

4.4. Connect external cooperating devices, e.g. automatics control, S-3x external siren, LD-2 warning lamp (recommended wire cross-section 0.5 mm²), etc. In case of placing the optical and acoustic signaling devices in the same place it is recommended to use an integrated acoustic-optical signaling device of SL-32 or SL-21 type. Having separate functions, the siren and the lamps can be connected to the MDP using a C3 3-wire cable (the recommended wire cross section is 0.5 mm²). The A1, A2, A3 and FAULT relay outputs can be connected to different phases or to low voltage circuits.

4.5. **MDP-1.A/TM version:** connect shielded twisted pair FTP or STP 4x2x0.5 cat.5e type cable to the terminals of digital bus in standard RS485 "A+"-[13], "B"-[14], "GND"-[15]. The terminals are doubled for easy connection of the bus cables in the module. The terminals can be removed from the module pins without disconnecting the bus connections.

A maximum of 224 MDP modules can be connected in one bus loop and the length of the bus must not exceed 1200m. The transmission port is isolated (1kV) from the MDP internal circuits. The specification of the communication protocol and the parameters of the port settings are described in a separate attachment. The configuration settings are described in section 5.5.3.

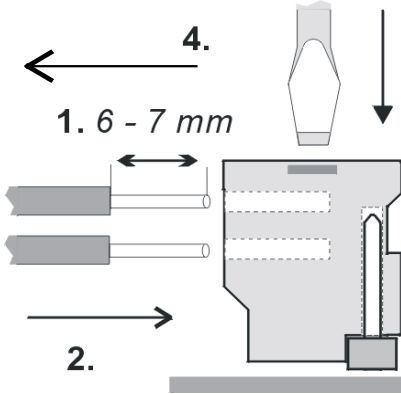


4.5.1. Prepare the bus cable as described in section 4.4.2, then insert the isolated wire ends into the corresponding bus terminals.

Caution : incorrect cable polarity may result in an inability to start up the entire network of digital bus devices.

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)!



4.5.2. 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 exactly 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.

4.5.3. Each module is equipped with a "TERMINATOR" connector, which enables switching (jumper in ON position) an $R=120\Omega$ resistor terminating the bus in order to eliminate reflections resulting from the mismatch of bus impedance. By default, the resistor is disconnected (jumper in OFF position).



CAUTION: Only the resistors in the two extreme modules at the opposite ends of the bus must be switched on. Leaving more resistors in place increases the load on the bus and may damage the MDP internal systems responsible for data transmission.

4.6. **MDP-1. A/T/420 (or .../V10) version:** connect to the "S+" terminals [11] and "S-" [12] 4-20mA current output or 2-10V voltage output (optional outputs) the signal cable. The output is isolated (1kV) from MDP internal systems. The maximum load resistance value for the current output is $R_o = 300 \Omega$.

When a measurement detector is connected, the output value of current $I_o=4mA$ or voltage $U_o=1V$ means zero gas concentration, while $I_o=20mA$ or $U_o=10V$ means concentration equal to the measurement range. Detector fault is signaled by the value of current $I_o=1mA$ or voltage $U_o=0.5V$. When the DEX/A threshold detector is connected, the output values are in the normal state respectively: $I_o=4mA$ or $U_o=1V$, in A1 state: $I_o=8mA$ or $U_o=3.25V$, in A2 state: $I_o=12mA$ or $U_o=5.5V$.

4.7. Connect the "E" cable of the 12V= power supply from the PS... power supply unit (with battery connected); keep proper polarity (the module is protected against reverse polarity). Positive terminal "+" [1], negative terminal "M" [2].

5. MDP INITIAL CONFIGURATION



CAUTION: all described procedures and LCD display messages refer to the standard version of the module. Any descriptions of non-standard versions, changes and corrections can be found in the annex to the operating manual, if provided.

CAUTION: Press the keys gently to avoid damaging the MDP mounting plates and internal circuits.

- 5.1 The next stage of the **System** start-up is to configure the module according to the Customer's individual needs. It is carried out by means of a keyboard located on the front panel of the module.
- 5.2 Turn on the module power supply. After the power supply is turned on, an acoustic test of the internal siren and an optical test of the LED display and signal lights are carried out. The individual lights are cyclically lit and extinguished. The LED display shows [**tEst**] followed by information about the version of the module and the date of compilation of the installed software (this information may be required when contacting the GAZEX service department). During this time, the module settings are initialised.
- 5.3 After the test phase, the module enters the sensor warm-up mode, signalling on the LED display the time left until the end of this phase. The green power LED flashes. During this time, the measurement parameters of the detector are stabilized, which is necessary for its proper functioning. After counting down the warm-up time, the module will enter the measurement mode by loading the last saved configuration parameters. The user can change its settings at any time during the warm-up or in the normal operation of the module by entering the MDP menu.
- 5.4 In order to make changes in the MDP menu press and hold [**▲** menu] key for 3 seconds. Correct pressing of the key will be confirmed by an intermittent acoustic signal and a request to enter the user's password on the LED screen: [**h.000**] (factory password is "h.001"). The password is entered by means of the keys [**▲**] and [**▼**], and confirmed by means of the key [**OK**]. Entering an incorrect password will exit the menu settings and return the detector to the warm-up mode. Repeat the steps described in this section to attempt to change the module settings again.

Caution!!! The above password is the default one assigned to each MDP copy. In order to prevent unauthorised access of outside persons to the controller settings, the password must be changed individually (see section 5.5.5). 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 GAZEX (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:

- [**dEt.**] – detector parameter settings;
- [**out.**] – module output parameter settings;
- [**nEt**] – RS485 network parameter settings;
- [**tryb**] – module operating mode settings;
- [**hAS.**] – user's password change;
- [**tEst**] – module output test;
- [**FAbr.**] – restoring factory settings;
- exiting the menu;

The LED screen displays only one function that is active at the 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 [**▼**].

Selecting a specific function from the menu makes it necessary to set a number of parameters assigned to a given function. The return to the main menu takes place after all required parameters have been confirmed.

Moving in the submenu of the respective function is similar to moving in the main menu: selection of the parameter by means of the [**▲**] and [**▼**] buttons, confirmation by means of the [**OK**] button.

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

5.5.1 [**dEt.**] - Detector settings – list of parameters:

- a) Turning the detector power supply on or off:

- [**d.On**] – detector is on,
- [**d.OFF**] – detector is off (default setting).

When the detector is switched off, the measuring functions of the module are blocked until it is switched on again.

- b) Determination of the type of the detector:

- [**d.P**] – measuring detector of the type DEX/P or DG/P (default setting),

- [**d.Fn**] – threshold detector of the type DEX/F or DG/F (if only the A2 state is present, it is interpreted as a detector failure.),

Threshold detector [d.Fn]		"1" input status		
		normal	alarm	
"2" input status	normal	normal status	alarm A1	Module outputs status
	alarm	fault	alarm A1+A2	

- [**d.F**] – threshold detector of the type DEX/F or DG/F with independent A1 and A2 thresholds,

Threshold detector [d.F]		"1" input status		
		normal	alarm	
"2" input status	normal	normal status	alarm A1	Module outputs status
	alarm	alarm A2	alarm A1+A2	

- [**d.A**] – threshold detector of the type DEX/A.

Depending on the selected detector type, the module launches specific control and measurement procedures. In the case of the measuring detector and the threshold detector of the type DEX/A, the concentration value is represented by an analog signal connected to the "S" terminal of the DETECTOR input. For the other types of threshold detectors, the indication of specific alarm states is dependent on the values of the digital signals connected to the detector inputs marked "1" and "2". In case of an incorrect setting, the module will indicate a failure of the detector or alarm conditions.

- c) Determination of the warm-up time of the detector each time the module is turned on.

During warm-up, the detector's operating point is stabilised. Any alarms or faults reported by the detector are ignored by the module. Warm-up time adjustment is available from 60 seconds - [**d.060**] to 900 seconds - [**d.900**] in intervals of 60 seconds (default setting 60 seconds - [**d.060**]).

- d) Determination of the detector measuring unit.

The appropriate measuring unit must be read from the Calibration Certificate of the connected measuring detector. Then the blinking indicator next to the corresponding unit on the MDP front panel to the right side of the LED display must be set. The selected unit will be displayed together with the concentration value while the module is in measurement mode. If you do not have a suitable unit, select the option with three active indicators (default setting). In this case, the unit indicator will not be displayed during measurements.

- e) Determination of the measuring range (for the measuring detector only).

The value of the measuring range must be read from the Calibration Certificate of the connected measuring detector. The concentration value displayed on the LED screen is scaled from 0 (which corresponds to the IS=4mA current value) to the measurement range value (which corresponds to the IS=20mA current value).

- f) Determination of the A3 threshold value (for the measuring detector only).

Adjustable value in the range of 2 ÷ 100% of the measuring range value (default setting is A3 = 50).

- g) Determination of the alarm threshold activation mode (for the measuring detector only).

- [**d. A12**] – thresholds of momentary values (default setting),
- [**d. ndS**] – time-averaged thresholds.

When [**d.A12**] is selected, the alarms are triggered if the momentary value of the detector signal exceeds the set thresholds of A1 and A2 that can be adjusted in the full measuring range.

The [**d.ndS**] option assigns time averaging to alarm thresholds. The A1 threshold corresponds to the TWA (time-weighted average) value, the A2 threshold corresponds to the STEL (short-term exposure limits) value, calculated according to Regulation of the Minister of Labour and Social Policy (Rozp. Ministra Pracy i Polityki Społecznej) from 6.06.2014, Journal of Laws of the Republic of Poland (Dziennik Ustaw) 2014, position 817.

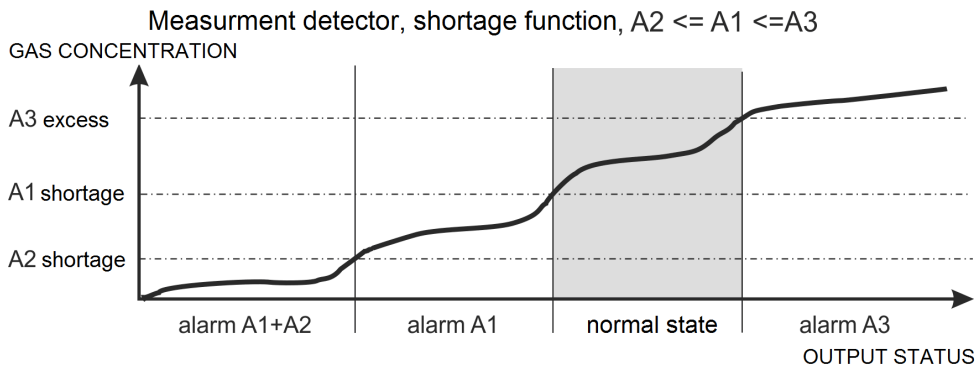
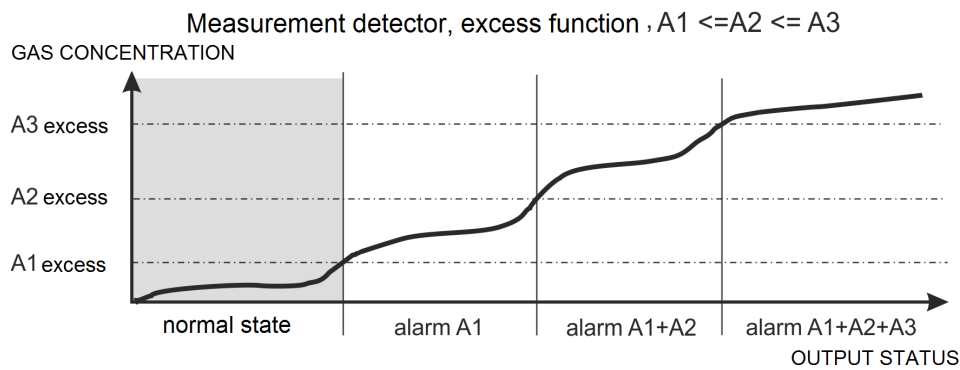
The relevant values of the TWA and STEL concentrations should be read from the above mentioned Regulation and entered in the settings of the threshold values A1 and A2.

At the A3 threshold, time averaging is disabled. The alarm is activated if the momentary gas concentration exceeds the A3 value.

- h) Determination of the direction of activation of the alarm thresholds (for the measuring detector only):

- [**d. □**] – excess (default setting),
- [**d. □**] – shortage.

The [**d. □**] excess option activates the alarm thresholds when the detector signal value exceeds the value of the set alarm thresholds A1 and A2, where A1 ≤ A2. The [**d. □**] shortage option activates the thresholds after the detector signal drops below the set alarm thresholds A1 and A2, where A1 ≤ A2. The A3 alarm is only activated if the gas concentration value exceeds the A3 value (excess only).



- i) Determination of the A2 threshold value (for measuring detector only).
The value is adjustable from 2% of the measuring range value to threshold value A3 (default setting is A2 = 30).
- j) Determination of the A1 threshold value (for the measuring detector only).
Adjustable value in the range from 2% of the measuring range value to the A3 threshold value (default setting is A1 = 10).

5.5.2 [out.] - Outputs settings – list of parameters:

- a) Determination of the delay of switching on the outputs.
- [\lrcorner 003] ÷ [\lrcorner 300]
It is the time (standard = 10 sec.) from the moment when the MDP records the alarm status at the detector input until the moment when the MDP activates the appropriate outputs depending on where the alarm has occurred. This delay can be set in range: 3 ÷ 300 seconds.
- b) Determination of the delay of switching off the outputs.
- [\llcorner 003] ÷ [\llcorner 900]
It is the time (standard = 10 sec.) from the moment the alarm disappears to the moment the outputs are switched off. This delay can be set in range: 3 ÷ 900 sec. (option not available when the mode with alarm retention at the outputs is active).

5.5.3 [nEt.] - Setting the RS485 network parameters.

- a) Setting the slave address.
 - **A.000** – zero address – means that the communication is off (default setting);
 - **A.001 ÷ A.224** – correct slave address, the communication is on.

The unique slave address identifies the MDP module in the RS485 industrial network and allows the module to be polled by a supervisory device, e.g. MDD-256/T. The communication protocol is in accordance with the MODBUS RTU standard. The protocol specification is a separate annex to this User Manual.

After confirming the non-zero address, the MDP automatically starts communication, i.e. sends answers to correct queries from the supervisory module. The green NET light blinks to confirm that the query frame has been correctly received and sent by the MDP.

5.5.4 [trYb] - Settings of module operation modes.

- [**t.b12**] – normal mode with alarm memory (default, factory setting),
- [**t.A12**] – mode with alarm maintenance,
- [**t.A3**] – A3 alarm maintenance mode with turning off the detector power supply,
- [**t.n**] – auto-zeroing mode without alarm memory,
- [**t.SEr.**] – service mode with 1-hour long blockade of the module outputs.

The operating mode determines the specific control functionality of the module. Depending on the set mode, the module leaves information on the front panel about alarm states that have ended (alarm memory), or clears messages (no alarm memory). Additionally, activation of the module outputs can be carried out for the duration of the alarm or until manual reset by the user (maintenance of the alarms). Details are provided in the table below.

Operating mode	Active alarm			Finished alarm		
	Optical signalling of the output status	Inner acoustic signal	Alarm outputs status	Optical signalling of the output status	Inner acoustic signal	Alarm outputs status
t.b12	Continuous	Pulsating cycle depends on alarm level	Active	Pulsating	Pulsating 1s/4s	Inactive
t.A12	Continuous	Pulsating cycle depends on alarm level	Active	Continuous	Pulsating cycle depends on alarm level	Active
t.A3	Continuous	Pulsating cycle depends on alarm level	Active	Pulsating (after exceeding A3 threshold - continuous)	Pulsating cycle depends on alarm level	Inactive (after exceeding A3 threshold - active)
t. n	Continuous	Pulsating cycle depends on alarm level	Active	None	None	Inactive
t.SEr.	Continuous	Pulsating cycle depends on alarm level	Inactive	Pulsating	Pulsating 1s/3s	Inactive

Normal mode with alarm memory – activates alarm and fault signaling both during the event and after it has ended. The pulsating signal is maintained after the alarm has disappeared until the user consciously clears the MDP. 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.

Mode with alarm maintenance – 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 (resetting the module with "OK" button). This mode can be activated indefinitely.

A3 alarm maintenance mode with turning off the detector power supply – is dedicated only for cooperation between MDP and a measuring detector equipped with a catalytic sensor. This mode retains normal mode functionality with alarm memory for concentrations below A3 threshold value. If the A3 threshold value is exceeded, the alarm maintenance at the module outputs is activated and the detector power supply is switched off to prevent the catalytic sensor from being overloaded. The detector power supply is switched on again and the alarms are switched off ONLY after external user intervention (resetting the module with the "OK" button). This mode can be activated indefinitely. This mode is only active if you specify the measurement units as %LEL in the detector menu at the same time.

Auto-zeroing mode without alarm memory – automatically resets the module after an alarm has been triggered, no user intervention is required. There is no information 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 ventilation control systems.

Service mode – allows the module outputs to be blocked for 60 minutes. Recommended for maintenance of gas detection system. In this mode, the measurement activities of the module are kept, i.e. the module controls the status of the connected detectors, displays information about alarms and faults on the front panel, but does not activate the outputs. The mode can be switched off at any time before the time has fully passed from the user menu or by temporarily turning off the power supply to the module. Activation of the service mode is signalled by switching on the SERVICE light.

5.5.5 [hAS.] – User password change.

- [h.001] – default user password (default setting);
- [h.000] ÷ [h.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 configuration changes to the module. Unlocking the password is possible only by GAZEX (paid service).

5.5.6 [tESt] – MDP outputs test.

Module outputs test - enables verification of the correctness of switching on all outputs without the need to generate alarms at the module inputs.

Outputs are switched on sequentially for time = 10 sec. The currently enabled outputs are signaled on the front panel by an appropriate LED. After testing all outputs, MDP automatically returns to the user menu. The outputs are switched on in the following order ("+" means active output):

Time [s]	Relay output A1	Relay output A2	Relay output A3	Relay output FAULT	Current output A1	Current output A2	Output 4-20mA [mA]
0 – 10							4
10 – 20	+				+		8
20 – 30		+				+	12
30 – 40			+				20
40 – 50				+			1
50 – 60							4
60 – 70	+				+		8
70 – 80	+	+			+	+	12
80 – 90	+	+	+		+	+	20
							4

5.5.7 [FAbr.] – Restoring MDP factory settings.

This option restores the standard MDP configuration settings (specified in sections 5.5.1 to 5.5.5) by clearing the previously made changes. This option is especially recommended in situations when not knowing the previous settings may unexpectedly start MDP control procedures unsuitable for the desired configuration.

6. LAUNCHING OF THE MDP IN THE SYSTEM

6.1 After the configuration settings have been exited (or the configuration stage has been omitted by the user), the MDP switches to the sensor warm-up mode, signalling this by a flashing green power light and counting down the remaining time on the LED screen.

During warm-up, the time of which is defined in the user's menu, the detector's operating point is stabilized, which is necessary for its proper operation. In this phase, all alarms and faults of the detector are blocked.

6.2 After the warm-up the MDP switches to the normal operation mode. On the front panel are signaled in real time: detector status, output status, correctness of power supply and RS485 communication as well as possible activation of special MDP functions.

a) The LED segment display is assigned to indicate the current status of the detector connected to the MDP. With the measuring detector connected, the current gas concentration value calibrated within the set measuring range is displayed on the screen, as well as the fault conditions. With a connected threshold detector, symbols indicating the respective alarm and fault conditions are displayed on the LED display. The delay in signalling the detector status is constant and is about 5 seconds. This delay is due to the time taken for the detector output signals to be processed by the module's input systems.

The following are possible alarm state symbols for the threshold detector and emergency state symbols:

- alarm states (ONLY for the threshold detector),

- [n] – normal state;
- [d.OFF] – detector is off;
- [A1] – level 1 alarm in progress;
- [A2] – level 2 alarm in progress;
- [b 1] – there was a level 1 alarm;
- [b 2] – there was a level 2 alarm;

- fault states or special information,

- [CAL.] – information that the detector needs to be re-calibrated;
- [Er.00] – detector line opening, insufficient I_{zas} detector current <10mA, signal line fault (interruption, short circuit),
- [Er.01] – short-circuit of the detector power supply line or short-circuit of the detector's internal circuits;
- [Er.02] – detector fault reported by the detector;
- [Er.03] – internal V_{dd} voltage outside the range of 4.8V ÷ 5.2V;
- [Er.04] – external supply voltage of 12V outside the range of 10.5V ÷ 15V.

b) Red LEDs indicate the status of alarm outputs, yellow LED - the status of fault outputs:

- continuous light - alarm output active
- Pulsating light - the output was active, currently inactive,
- off - the output was and is inactive.

c) Green NET light signals RS485 communication status:

- light pulsating in time intervals according to the frequency of polling - correct communication;
 - off - communication off, MDP did not receive the correct enquiry frame;
- d) The green SERVICE light indicates that the special functions are activated:
- continuous light - the service mode is on;
 - pulsating light - silent mode is on;
 - off - no active output or acoustic signalling blockades.
- e) Green POWER light indicates MDP power supply status:
- continuous light - power supply parameters within the norm;
 - pulsating light - power supply parameters outside the permissible range;
 - off - the module is switched off.
- f) The internal siren signals the MDP alarm and fault states acoustically:
- continuous sound - any fault state;
 - pulsating sound in cycle (0.1 sec on/0.1 sec off) - active alarm A3;
 - pulsating sound in cycle (0.2s/0.2s) - active alarm A2;
 - pulsating sound in cycle (0.5s/0.5s) - active alarm A1;
 - pulsating sound in cycle (1s/3s) - alarm or fault state is over;
 - no sound - normal state.

6.3 Once the detector has been properly installed and warmed up, no acoustic or optical signals should be generated and the detector should be marked on the LED screen with an 'n'. (threshold detector) or a value compatible with the 'zero level' should be displayed (measuring detector).

If other signs are visible on the LED screen, the yellow or red lights are on, and an acoustic signal is heard, the detector has not been installed correctly. Check the connections of the detector and correct the faults.

The detector input circuits are equipped with a self-return fuse that limits the detector power supply current. In case of short circuit of the detector's power supply wires, overloading of the power supply line or incorrect polarity of the "+" and "M" wires, the power supply is automatically cut off from the detector (the state is indicated on the LED screen by the "Er.01" symbol and a continuous acoustic signal). After removing a short circuit or overload, the MDP resumes the power supply to the given track only after manual resetting of the MDP. Overloading or short circuit of one of the voltage outputs "12V AC OUTLET" during the active state A1 or A2 causes automatic switching off of the self-return fuse. Once the overload or short-circuit is removed, the internal fuse automatically resumes normal operation within seconds.

6.4 The MDP module operation is done by means of a keyboard located on the front panel. During normal operation, additional functions are permanently assigned to the keys. Pressing and holding for approx. 3 seconds causes, respectively:

- [**OK**] **key** – resetting the module, i.e. restoring the initial settings of MDP registers, as in the state after turning on the power supply. Resetting deletes the signalling memory of discontinued alarm or emergency states.
- [**▼**] **key** – 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 SERVICE light. This option is especially recommended when the controller is installed inside control cabinets 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.
- [**▲**] – **key** – entering the user menu. Holding down this key at any time during MDP operation interrupts the measurement and control processes, and enables the user to make the required changes to the module settings.

6.5 The final stage of the system operation check is to check the measurement accuracy of the MDP controller and the generation of all alarm conditions for the connected detector, and to check the performance of external devices.

CONDITIONS REQUIRED FOR SYSTEM CONTROL:

- The MDP is in the normal mode (after a warming up), the light [POWER] is on, the concentration value displayed on the LED screen is in accordance with the 'zero level' specified in the user's manual of the respective measuring detector or the threshold detector marked with the 'n' symbol .
 - The **DEX/DG** detector does not generate alarm signals (the output current value is in accordance with the "zero level" specified in the detector's user's manual).
 - To obtain the measurement accuracy of the system as specified in the measuring system manual, the additional conditions specified in the manual for each DG/P detector must be fulfilled during the inspection of the detectors.
- 6.5.1 Generate the detector alarm conditions with a test gas of known concentration value according to the instructions in the detector's user manual. After the gas has been fed to the threshold detector, the indication on the LED screen shall change to "A1" or "A2", which is sufficient to confirm that the detector-module set interacts correctly. In the case of a measuring detector, check that the displayed measured gas concentration value matches the test gas concentration (the measurement accuracy of

the controller, the detector and the accuracy of the test mixture must be taken into account when making the comparison).

If the alarm signals A1 and A2 of the threshold detector, or the measurement signal of the measurement detector (greater than A1 and A2) lasts for at least the time corresponding to the **delay in switching on the outputs**, an alarm signal will be generated at the corresponding alarm outputs (in normal mode), the red "**ALARM1**" and "**ALARM2**" lights shall be on and the modulated acoustic signal will be activated.

- 6.5.2 After the test gas has been removed, the gas concentration in the detector decreases, which results in a change on the LED screen of the detector status to " b 2" and/or " b 1" or a decrease of the displayed concentration value depending on the completed alarm status. The control outputs return to their normal state (red LEDs are pulsating), while the acoustic signal changes to intermittent in a 1s/3s cycle. The alarm information remains on the LED screen (for the threshold detector) until the user consciously deletes it. The concentration values of the measurement detectors displayed on the measurement screen will aim to reach 0.
- 6.5.3 Control procedure 6.5.1 should be supplemented by an outputs test carried out by software on the user menu level described in section 5.5.6.
Results of the control or the launch should be entered into Periodic Control Protocol.

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

PROBLEM?

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

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

EFFECT	WHY	WHAT TO DO
After warming up, the detector's alarm messages appear on the LED screen for several/a few tens of seconds, after which the alarms disappear.	If the DEX is stored for a long time or if the ambient temperature is low, the warm-up period was shorter than the intended 1 minute (for low-calibration detectors).	Press the [OK] button for a short time while the lamps are pulsating (it should bring the module back to its normal state); enter the menu and extend the warm-up time of the detector.
Er.01 message on LED screen, continuous acoustic signal, fault light on.	Overloading or short-circuit of the detector power supply.	Remove the cause of a short circuit or line overload; switch off the MD power supply for 5 seconds.
The alarm device(s) connected to the NAP.12V outputs is (are) not working in A2 or A1 state.	Short-circuit in the connection line; or a defective signaling device (self-returning fuses have activated); or the service mode is on.	Switch off the MDP power supply. Remove the short circuit from the cable or repair the signaling device. Turn on the power supply; trigger "TEST" of the outputs from the menu, check the signaling devices.
All lights are off.	No power supply.	Turn on the power supply.
<i>Version MDP-1.A/TM</i> : no communication with the module via the RS485 bus.	Incorrect configuration of transmission parameters, transmission off - slave address A.000, defective transmission cables.	Check communication parameters, set the correct slave address from the menu, repair transmission cables, check that the terminating resistor is connected correctly.
Analog output current efficiency too low (during test sequence).	Load resistance too high, which causes the output transistor to saturate at higher current values.	Shorten connections, reduce resistance of the receiver.

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

7. MAINTENANCE / OPERATION

The MDP module and the DEX detectors are electronic devices without moving parts. They are 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 perforated MDP cover;
- inform all system users about the planned inspection;
- **system test according to section 6.5.** of the Manual.

RECOMMENDED FREQUENCY OF THE PERIODIC INSPECTION OF THE MDP 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 room,
 - long-term operation with an alarm on,
 - after a power outage longer 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 MDP during operation, as their use may cause the controller to malfunction and false alarms.
- 7.2.1 When operating the MDP, avoid temperatures below the recommended limits (section 2).

CAUTION! IMPORTANT!!

7.3. All:

- results of each system inspection according to section 6.5. of this manual,
- situations in which the A2 or A3 alarm 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

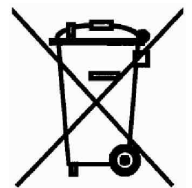
MUST be put down in the enclosed Periodic Inspection Protocol under loss of warranty for the elements of the system penalty and exemption from any liability of the Producer due to System use.

7.4. After 10 years from the MDP 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 MDP's internal circuits shall render the guarantee null and void.**

7.6. According to the Law from 11 September 2015 on electrical and electronic waste, a used module 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:

Correct disposal protects against the negative impact of waste on human health and the environment.



CAUTION:

In view of the continuous process of product improvement and the desire to provide as complete and detailed information as possible on these products, as well as to provide the knowledge necessary for the proper operation of the products, based on the experience of our Customers to date, GAZEX reserves the right to make minor changes to the technical specifications of the products supplied and not included in this User Manual, and to change its content. Therefore, please verify and confirm the validity of your version of the User Manual with the Producer (please specify the type and series of devices used and the issue number of the manual - from the footer of the document).

8. STORING THE MDP



It is recommended to store the MDP in dry rooms whose temperature is within the +5°C to 40°C range. For short time periods (<2h/8h) it is allowed to store it in an environment whose temperatures range from -10 °C to 45°C.

Internal memory battery life (with no power supply) - 5 years from the production date. After this period, the battery should be replaced with a new one - only by the Producer.