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M e a s u r e m e n t   &   C o n t r o l   I n s t r u m e n t s

4-CHANNEL GAS DETECTOR "GAS ALARM DG510/4W"

- 4 Independent Input Channels for Connection to Gas Detection Transmitters
- 2 Alarm Levels for Each Channel
- Each Channel Individually Programmable
- Alphanumeric LCD Display for Gas Concentration
- LED and Audible Indication for active alarms
- Configurable relay outputs SPDT 5A/250 VAC
- Back-up Power Supply (optional)
- RS485 (optional)

I. GENERAL DESCRIPTION

The 4-channel Gas Detector "GAS ALARM DG510/4W", to be used with up to 4 gas detecting transmitters (e.g. DGS510), is purposed for signaling at any time, when concentration of flammable, explosion-hazardous or toxic gases exceeds permissible limits. Its application includes mounting in gas stations, filling stations, dyeing chambers, gas distribution and transmission, power and water treatment plants and other areas, where gas-powered units and equipment are used, or where combustible or toxic vapors and gases are found. The device is a Control Unit, which is to be mounted in a non-hazardous area, and forms a set with up to four gas detection transmitters, which are placed in the hazardous zone(s). Each of the channels has two independently programmable levels: pre-alarm and alarm level. For each level there is LED indication (LEDs AL1 and AL2). Additionally an audible alarm triggers, if the gas concentration exceeds any of the alarm levels.

There are 2 output relays SPDT 5A/250 VAC – one for AL1 and one for AL2, to be used as common for all channels. The alarm trigger values (limits) for each channel are individually configurable, but the output relays are common. A relay output can be used to switch off a power supply, operate a shut-off valve for stopping the gas flow, switch on a siren, ventilation, etc. Each relay output can be programmed to trigger with some time delay after a (pre-)alarm level is reached.

The measured value of the gas concentration for every channel is visualized in individually specified units on the LCD display. In case of any sensor or cable fault from any

input channel, there is a third common relay output SPDT 5A/250 VAC, which gets triggered, also LED "FLT" for the corresponding channel is lit and the audible alarm is activated.

There is an optional backup power supply module, which in a combination with an additional accumulator battery can provide continuous power supply for the Gas Detector, as well as recharging of the accumulator, when there is mains power. Switching to the backup power supply is automatic in case the mains power gets interrupted. The accumulator must be 12 V, 6-8 Ah. While charging the accumulator, a LED "CHARGE" is lit, while using the accumulator – a LED "ACCU", and while using main power – a LED "PWR". While using power from the accumulator, if its capacity gets low the LED "ACCU" starts flashing. If the capacity falls too low, the gas detector will switch off.

Another option for this gas detection unit is an additional communication interface module RS485 with Modbus RTU protocol, as described towards the end of this document.

II. SPECIFICATIONS

Power Supply	230 VAC, 50Hz
Detected Gases (depending on the sensors of the connected gas detection transmitters)	Any gas, which can be detected by a transmitter. E.g.: methane (natural gas), propane-butane (LPG), gasoline or organic solvent vapors, oxygen, hydrogen, carbon oxides, nitrogen, nitric or sulfuric oxides, ammonia, ethylene, etc.
Pre-Alarm Level (AL1)	Programmable in the range 0 < AL1 < AL2
Alarm Level (AL2)	Programmable in the range AL1 < AL2 < the preset upper gas concentration range (e.g. 50% LEL)
Number of input channels	4
Pre-Alarm Levels Output (AL1)	SPDT Relay, 5A/250V – common to all channels
Alarm Levels Output (AL2)	SPDT Relay, 5A/250V - common to all channels
Faults Output (FLT)	SPDT Relay, 5A/250V - common to all channels
Signalization	LED and Audible
Display	Alphanumeric LCD
Sensors Operating Temperature	-20 to +50 °C
Control Block Operating Temperature	0 to 50 °C
Relative Humidity	up to 95% RH, without condensation
Dimensions	235 x 215 x 120 mm
Interface (optional)	RS485 with Modbus RTU protocol
Back-up Power Supply (optional)	12V DC
Protection class	IP 65

III. INSTALLATION AND CONNECTIONS

3.1 The Gas Detector Control Unit is to be installed in **non-hazardous** areas with normal risk of fire. It is to be mounted on its backside to a wall or another vertical surface.

CONNECTION TERMINALS (accessible under the protective cover lid)
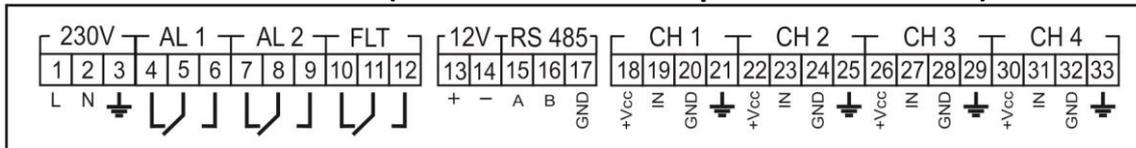
3.2 The cable connection between each detecting transmitter and the Control Unit is to be made through the cable plugs, into the terminals according to the connections diagram, after unscrewing and removing the protection lid located above the cable plugs. For these connections use 3- or 4-wire cables with cross section 0.5 to 1.0 mm^2. 4-wire cables are to be used when you intend to ground the transmitter through the Control Unit, otherwise the transmitter should be grounded via a separate wire.

3.3 For the wiring of the power supply and the relay outputs use cables with cross section 1-1.5 mm^2.

3.4 Mount the sensing transmitters vertically (the sintered filter of the sensor should face downwards) in the hazardous zone. When choosing the mounting position consider the following:

- **the specific gravity of the detected gas**

If the specific gravity of the detected gas is lower than the specific gravity of the air (natural gas) the mounting position of the sensor should be high (above the place where a leakage may occur) near the sealing.

If the specific gravity of the detected gas is greater than the specific gravity of the air (propane-butane) the mounting position of the sensor should be low (below the place where a leakage may occur) near the floor.

If there is a flow of air the mounting position of the sensor should be between the place where a leakage may occur and the place where the gas may explode.

- **presence of dust and water**

If the sensor should be mounted in a place with a lot of dust present it should be with a dust-protective filter. This filter should not prevent the gas flow from the sensor. Mounting places must exclude water drops on the sensor or the sensor should be protected.

- **presence of vibrations**

The sensor is sensible to vibrations. It should be mounted in a place with no vibrations or there should be taken some measures for reduction of the vibrations.

IV. GENERAL USE INSTRUCTIONS

4.1 The Gas Detector should be used only for the purpose given by the producer Delta Instruments Ltd. - only for detection of the predefined by you as a customer gas types and ranges, as configured in its factory settings. Reconfiguration of the detected gas types and ranges can be done only by authorized personnel or in our factory, because it requires recalibration.

4.2 The Gas Detector alarm levels could be preconfigured and calibrated in our factory based on your order requirements for specific alarm levels or based on the applicable safety standards. E.g. for explosive gases it is calibrated for 10% and 20% LEL of the detected explosive gas, unless you ordered otherwise. In such cases the detector does not have to be configured, if mounted correctly (plug and play). Such factory alarm settings, if performed, will be indicated in hand writing at the end of this document.

4.3 We recommend recalibration of the sensor of each connected gas detection transmitter in regular intervals, to guarantee accurate detection and safety. For most explosion-hazardous gases (catalytic sensors) the interval is 12 months, while for most toxic gases (electrochemical sensors) it is 6 months. The specific required interval for your application can be different and it is your responsibility to determine it. We recommend that the recalibration is performed only by trained and authorized professional personnel, using specialized for the purpose test gas mixtures. As manufacturer Delta Instruments Ltd do not bare any responsibility or liability in case of detection failures due to skipped or improper recalibration, which was not performed by our personnel.

V. OPERATION MODES

After powering on the gas detector unit automatically enters its normal operation mode, which is to scan all active input channels automatically.

Important! After a period of no power (turned off state) the control unit needs to go through a state of "warmup" for the connected gas transmitters. Depending on the specific type of detected gas and sensor of each connected transmitter, the input channels are assigned a common non-configurable "warmup" time interval, which may vary generally from 1 to 60s, but for specific gases can be up to 1h. If the channels detect different gases, then the longest gas sensor warmup interval will apply for all channels.

During the warmup period the display shows „Chx=Act" (x – number of the channel), without displaying any measurement values. Because the measurement signal from each channel during warmup is considered unreliable, the channel's measurement will be completely ignored – it will not trigger any signalization or relays, until the warmup interval passes.

5.1 Normal Mode: Automatic scanning of the channels

When powered on, the Gas detector unit enters this operating mode after the time for initial warmup of the sensors runs out. Every 5s the display rotates each channel by showing the number of the channel and the currently measured gas concentration value. The channels that are deactivated by the user (see below) are displayed with value "Off".

5.2 Manual scanning of the channels

From Normal Mode the user can switch to displaying specific channels by pressing the key "**MODE**". The options are "Info: Chans 1-2" for channels 1 and 2 and "Info: Chans 3-4" for channels 3 and 4. One more press of "MODE" leads back to "Normal Mode".

In both visualization modes 5.1 and 5.2 all alarm LEDs have the same meaning and functionality. **AL1** gets lit when a channel's gas concentration exceeds its configured pre-alarm level. **AL2** gets lit when a channel's gas concentration exceeds its configured alarm level. **FLT** gets lit in case of any cable or sensor fault on the channel.

5.3 Relay outputs and signalization test

A special button "**TEST**" is used for testing the alarm LEDs and relay outputs and the mechanisms connected to them. Press and hold "TEST" button to activate all relay outputs of all active channels and their alarm LEDs. The control unit switches to its normal mode of operation when the button is released.

5.4 Cutting off the audible alarm (siren)

If an alarm limit on any channel is exceeded, the operator may deactivate the siren temporarily by pressing the "**RESET**" button, in order to take measures of eliminating the gas leakage. The siren will be ready for activation again when the specific channel's gas concentration falls below the alarm limit. While the siren is cut off the LEDs (AL1 or AL2, or both) corresponding to the channel are still active. The relay outputs also remain active until the gas concentration falls below the alarm level.

VI. CONFIGURATION

6.1 Choosing a configuration menu and entering a password

To see the list of available configuration menus, hold down the "**MODE**" key (about 2 seconds) until the display shows "Entering menu". Then using keys "▼" and "▲" select the desired configuration menu, and press "**ENTER**". You can access any of the configuration menus of the device only after correct verification of the entered password. The display will show the prompt for entering a password in the form "000000". The least significant digit is blinking. Use keys "◄" and "►" to change the position of the blinking digit and keys "▼" and "▲" to change its value from 0 to 9. Press key "**ENTER**" to confirm the password. If the password is correct, you will get access to the desired configuration menu. If the password is not correct, the Gas Detector returns to its normal operating mode (described in 5.1).

6.2 Check / Change Parameters

Each configuration menu of the Gas Detector is organized in two levels. After the corresponding password is accepted the device enters the first level of the menu, showing available parameters for configuration and their respective values. The operator can go over the parameters with keys "▼" and "▲". To make changes, the operator should press "**ENTER**" while the parameter is selected and thus go into its submenu. Then the parameter value starts blinking. Using keys "▼" and "▲" this value can be changed. To save it, press "**ENTER**". To exit without saving, press "**MODE**". At any menu level pressing "**MODE**" exits to the upper level without saving.

6.3 Configuration Menus

A. Menu "Alarms" - Setting alarm limits

Enter a password 0001. After the password is accepted you can change the values of the configured alarm limits. The parameters that could be changed under this menu are:

№	Parameter Label	Description	Units (factory preset)
1	LL - Ch1, Ch2, Ch3, Ch4	Pre-alarm level for channel 1 to 4	Depending on the detected gas
2	HL - Ch1, Ch2, Ch3, Ch4	Alarm level for channel 1 to 4	Depending on the detected gas
3	LL All	Pre-alarm level for all channels	Depending on the detected gas
4	HL All	Alarm level for all channels	Depending on the detected gas

As shown above, you can configure either individual alarm levels for each channel (LL/HL - Chx) or common alarm levels to apply for all channels (LL/HL All). Valid will be the setting you **saved last** (after saving, 'All' overrides all individual settings, and 'Chx' overrides the setting only for its respective channel).

B. Menu "Chx On/Off" – Activation / Deactivation of input channels

Enter a password 0001. After the password is accepted you can activate or deactivate input channels. The parameters that could be changed under this menu are:

№	Parameter Label	Description	Selection
1	Ch1 On/OFF	Activation or deactivation of channel 1	On/OFF
2	Ch2 On/OFF	Activation or deactivation of channel 2	On/OFF
3	Ch3 On/OFF	Activation or deactivation of channel 3	On/OFF
4	Ch4 On/OFF	Activation or deactivation of channel 4	On/OFF

C. Menu "Others" – Logic, Delays, Audible Alarm

Enter a password 0001. After the password is accepted, the parameters that could be changed under this menu are:

№	Parameter Label	Description	Selection / Unit
1	Siren	Activation or Deactivation of the audible alarm (siren)	On/OFF
2	AL1 Delay	Time delay before triggering the pre-alarm relay output	seconds
3	Relays Logic	Normal – the relays are normally energized and in alarm state get deenergized. Inverse – the relays are normally deenergized and in alarm state get energized. This setting applies to all 3 output relays.	Normal / Inverse

D. Menu "Serial Interface" – RS485 settings

Enter a password 0001. After the password is accepted, the parameters that could be changed under this menu are:

№	Parameter Label	Description	Range
1	Adr	Address of the device	1 to 250
2	Baud	Speed (Baud rate) of the data transfer	9600, 19200, 115200

For description of the supported Modbus RTU protocol and specific device registers, please see Appendix A.

E. Menu "Factory Sett" – locked for configuration by the manufacturer.

VII. REPAIR

The repair of this device should be done only by the manufacturer Delta Instruments Ltd. or explicitly authorized by the manufacturer personnel.

In case of any issues, please contact us or send it back to us for inspection. Our contact details are available on our website https://www.deltainst.com/ .

VIII. FACTORY ALARM SETTINGS

Channel №	AL1 (pre-alarm)	AL2 (alarm)
1		
2		
3		
4		