

Electronic gas volume corrector model DGVC-04



1. Introduction

The following user's manual gives information about the installation, configuration, usage and storage of the electronic gas volume corrector model DGVC-04.

2. Function

The electronic gas volume corrector DGVC-04 is purposed for measurement of natural gas volume flow. The device measures impulses sent from natural gas volume flowmeter. DGVC-04 corrects the flow with accordance to basic temperature and pressure on the territory where the device is used.

3. Set

The electronic corrector DGVC-04 is an automatic device for natural gas flow measurement. The set of the device includes transmitter for absolute pressure and RTD sensor for gas temperature measurement. The box of the device is suitable for wall mounting or as a stand-alone device mounted on a metal plate.

4. Technical specifications

DGVC-04 has the following specifications:

1. Dimensions: 120 x 80 x 55 mm
2. Mounting: wall or panel mountable, protection IP 65
3. Power supply: 3,6 V, Li battery
4. Ambient temperature: - 25 to + 40 °C
5. Ambient barometrical pressure: from 86 kPa to 106 kPa

Input channels

1. Gas pressure range: up to 16 bar
2. Temperature range: from – 20 °C to + 50 °C
3. Pressure measurement accuracy: 0.25 % F.S.
4. Temperature measurement accuracy: 0.5 % F.S.
5. Maximal impulse frequency: 10 Hz

NOTE: The pressure transmitter is suitable ONLY for gas pressure measurement.

The multifunctional LCD display of DGVC-04 is used to visualize the following:

1. Total corrected flow (m³) – shown with eight digits
2. Temperature value (°C): X X . X
3. Absolute pressure value (bar): X X . X X X
4. Non corrected flow (m³) – 8 decimal digits format X X X X X X X X
5. Flowmeter constant (m³ for 1 impulse):
X X . X X X
6. Real time clock. Visualized in two parts:
Y Y Y Y . M M . D D and h h . m m
7. Error codes:
LoBat – low battery

Message **Err** is visualized on the display while visualizing the temperature or the pressure in case of break or short circuit of the corresponding circuit.

In error message display mode: prompt (-----) is visualized if the voltage of the battery is within the limits; prompt (**LoBat**) is visualized if the battery voltage falls below the limit.

8. Device serial number

The electronic gas volume corrector model DGVC-04 has the following options:

- Interface RS232 for connection to PC
- Archive for corrected and non corrected flow – values saved each hour for a week
- Indication for unauthorized lid removal
- Explosion-proof - (EX) ia IIc T5
- Battery power supply (up to 10 years)
- Programmable parameters accessible for authorized personnel:
 - Flowmeter constant
 - Nominal temperature
 - Nominal pressure
 - Nominal super-compression coefficient
 - Temperature input type (Pt 100, Pt 1000, Pt 500, Cu)
 - Serial number
 - Gas properties

5. Operating principle

DGVC-04 is a microprocessor device for gas quantity measurement. This quantity could be corrected using different parameters. The measured values are saved and are accessible through the digital display or the serial interface. The gas correction is carried out in accordance to the formula:

$$V_c = V \frac{P \cdot T_b \cdot Z_b}{P_b \cdot T \cdot Z}$$

where:

V_c(m³) – corrected flow

V(m³) - non corrected flow

T_b(k) – basic temperature (20°C for Bulgaria, 15°C for Romania);

P_b(bar) – basic gas absolute pressure (1.01325bar for Bulgaria and Romania);

Z_b(-) – compression factor while in basic conditions;

P(bar) – gas absolute pressure;

T(K) – gas absolute temperature;

Z(-) – gas compression factor at current pressure and temperature

The analogue signals – temperature and pressure – are sent to the device from the special sensors. DGVC-04 converts the signals to digital ones and all following calculations (data saving and other) are performed digitally.

The signal for the non corrected gas volume is received from the volume flowmeter (usually reed-contact).

6. Technical maintenance and setting-up

DGVC-04 is a programmable device ready for use. The build-in interface allows the construction of a network of data collecting devices. It also provides easy configuration and setup of the device. The corrector consists of battery powered unit mounted in a special box, pressure sensor and temperature sensor. The visualization of the measured values on the LCD display is performed automatically. The device does not have control buttons. The reading on the display is changed every 5 seconds. There is additional indication about the units and the meaning of the value that is visualized on the LCD display.

The maintenance of DGVC-04 consists of data download (visual or through the interface) and scanning of the input values and the calculated ones. The setting-up of DGVC-04 is performed through the serial channel. The settings and the parameters, as less as the error messages, could be accessed only by authorized personnel.

7. Instructions for initial setting-up

DGVC-04 is mounted in a plastic box with IP65 protection. The screw-terminals are placed in the lower part of the box. The box could be mounted on a metal plate using 4 screws. The plate could be mounted on a wall or panel using 2 screws. Mounting the device this way excludes the unauthorized box opening. The cables from the pressure transmitter, temperature sensor and flowmeter reed-contact are connected to DGVC-04 through the mounted on the box cable glands.

The cables could be connected to the device only by authorized personnel in accordance to a previously approved connection diagram. The connection diagram is shown on fig.1.

The correct exploitation of the device is determined by its configuration. That is why the configuration should be performed only by previously trained personnel.

The configuration mode could be entered by:

- Password
- Editing

8. Safety instruction

DGVC-04 is mounted in a special sealed box. The seal prevents the unauthorized access in it. A message appears on the display if the box has been opened.

Box lid removal is prohibited! Changes in the schematics and the software of the device are forbidden!

The battery could be changed only by authorized and trained personnel. The device has to be sealed after this. The battery has to be changed periodically (every 10 years) or when prompt “LoBat” appears on the display.

DGVC-04 has no control buttons. It is with protection IP65. The device could be cleaned with soapy water. Do not clean the box with dissolvent, benzene or other because they could damage the signs on the lid.

CAUTION! The dust has to be removed from the device using wet cloth. This prevents the appearance of electrical charges.

9. Storage and transportation

The device could be transported by car, train or airplane. DGVC-04 has to be wrapped up in a box. The corrector should be stored in the box in a dry room.

10. Operation instruction

The electronic gas volume corrector model DGVC-04 is packed and programmed by the producer. The wiring and the initial setting-up could be performed only by authorized personnel (with certificate from the producer).

The wiring of the temperature sensor, absolute pressure sensor and the inputs from the flowmeter reed-contact is shown on **fig.1**.

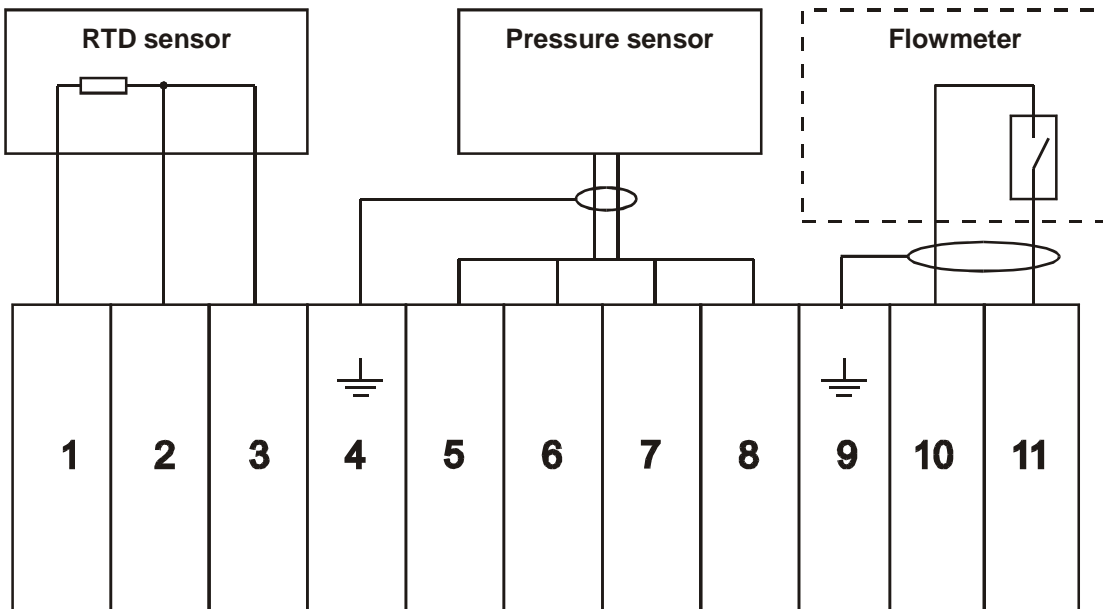


Fig.1

The meaning of the terminals is specified in **table 1**.

Temperature sensor 3-wire connection	
1	Terminal 1 – separate end of the temperature sensor Terminal 2 and 3 – common end
2	
3	
Pressure sensor	
4	- GND – cable shield
5 (blue)	- sensor power supply
6 (white)	- sensor output
7 (green)	- sensor output
8 (red)	- sensor power supply
Flowmeter impulse input	
9	- GND – cable shield
10	- input dry contact
11	- input dry contact

Table 1

NOTE: The serial number of the connected to DGVC-04 pressure sensor model SPG01-Ex must be **identical** with the serial number of the corrector.

11. Mounting

DGVC-04 is for wall or panel mounting (see **fig.2**).

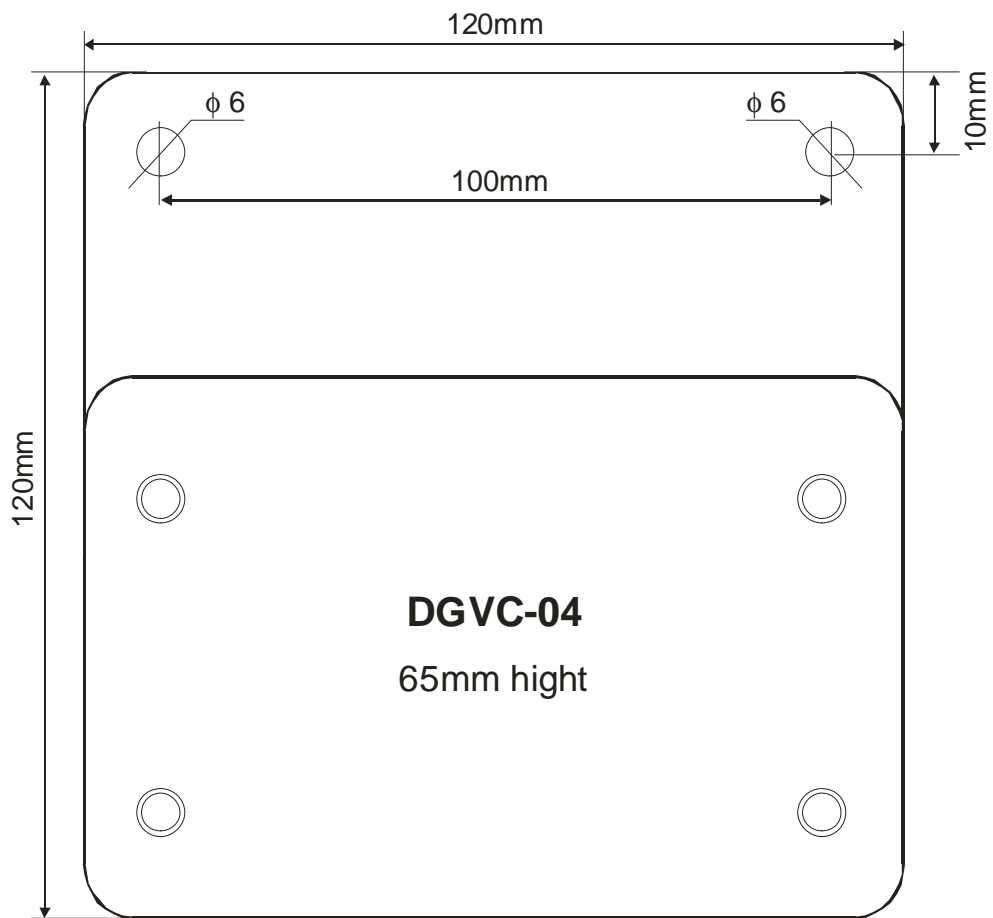


Fig. 2

12. Repair

The repair of the electronic gas volume corrector model DGVC-04 could be performed only in Delta Instruments' laboratory.

PRESSURE SENSOR model SPG01 - Ex

- *Stainless steel case*
- *For use only with gas volume corrector model DGVC-04*
- *Mounting G 1/4"*
- *Explosion-proof - (Ex) ia IIC T5*



TECHNICAL SPECIFICATION AND USER MANUAL

DESCRIPTION

The pressure sensor SPG01-Ex transmits the pressure applied to it into electrical output signal. It could be used **ONLY** with Electrical gas volume corrector model DGVC-04 **ONLY** for gas pressure measurement.

The construction of the sensor permits easy mounting and connection to the pressure through nipple G 1/4". The electrical connection is through PG7 cable gland using 4-wire shielded cable with $\phi 5\div 7$ mm.

OPERATING PRINCIPLE

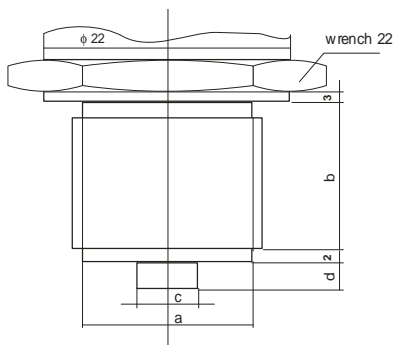
SPG01-Ex sensor uses a piezo-element for pressure measurement. A special micro-power electrical amplifier is build-in the Electrical gas volume corrector model DGVC-04. Precise temperature compensation of the zero and span is provided.

TECHNICAL SPECIFICATIONS

Working media	gas
Ranges	on request – from 0÷1bar to 0÷16bar absolute pressure
Accuracy	0.25% F.S.
Nonlinearity error	< 0.15% F.S.
Additional temperature error	< 0.05%/°C
Ambient temperature	0 ... 23°C ... 55°C
Overload	up to 150% F.S.
Protection	IP65
Electrical connection	4-wire shielded cable 1.5m length
Electrical isolation between the body and the terminals	> 20MΩ - voltage up to 50V DC
Mounting	G 1/4" x 18 thread
Working position	random
Dimensions	φ 27, maximal length 70mm (without the output cable gland)
Maximal weight	< 0.2 kg

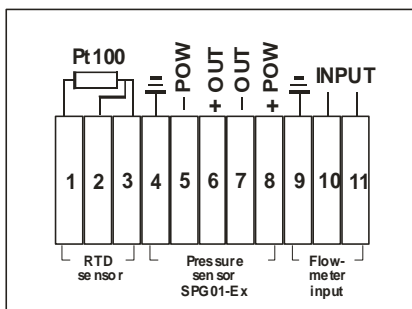
CONNECTION DIAGRAM

Pressure connection



a	b	c	d
1/4"	12	φ 5	3

Electrical connections



DGVC-04

Terminal No.: 4 – shield
 5 – blue
 6 – white
 7 – green
 8 – red

NOTE: The serial number of the connected to DGVC-04 pressure sensor model SPG01-Ex must be **identical** with the serial number of the corrector.