

GAS SAMPLE CONDITIONER

PGD-100

Manual

Version: 0.2
01/2010

madur
E L E C T R O N I C S

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1. INTRODUCTION

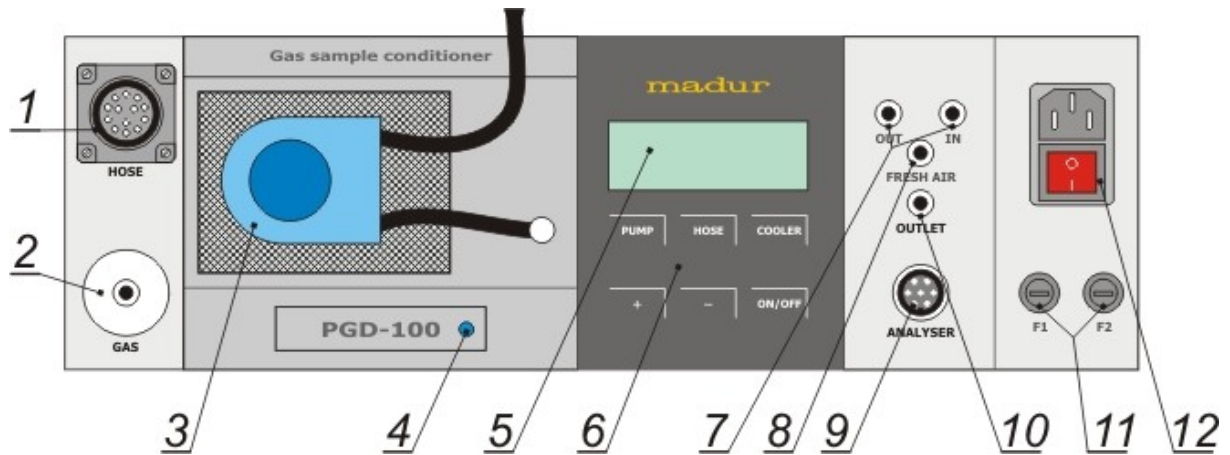
The **PGD-100** gas sample conditioners are used for the appropriate preparation of the gas sample which means drying and removing the molecules of solids out of the sample. The drying process proceeds as the water vapour condensate in low temperatures and the filtration is performed with use of the mechanical gas filter.

The **PGD-100** conditioner is used for the preparation of the gas sample for the **PHOTON** analyser which is equipped with IR sensors. The measurement procedure carried out by the PHOTON analyser requires that the sample humidity stays at a low, stable level. This can be secured with the help of two condensing coolers and a highly precise temperature stabilization algorithm. The humidity content of the gas sample dried by **PGD-100** relates to the 1°C dew point.

The main element of the gas sample conditioner is the cooler in which, with the help of the Peltier module, the temperature is kept on the low stable level enabling the water vapour to condensate. The cooling process is rapid enough not to let the flue gases dissolve in the condensing water vapour

2. GAS SAMPLE CONDITIONER OPERATION

2.1. Description of the device



Rysunek 1. The appearance of the PDG100/GD10 front panel.

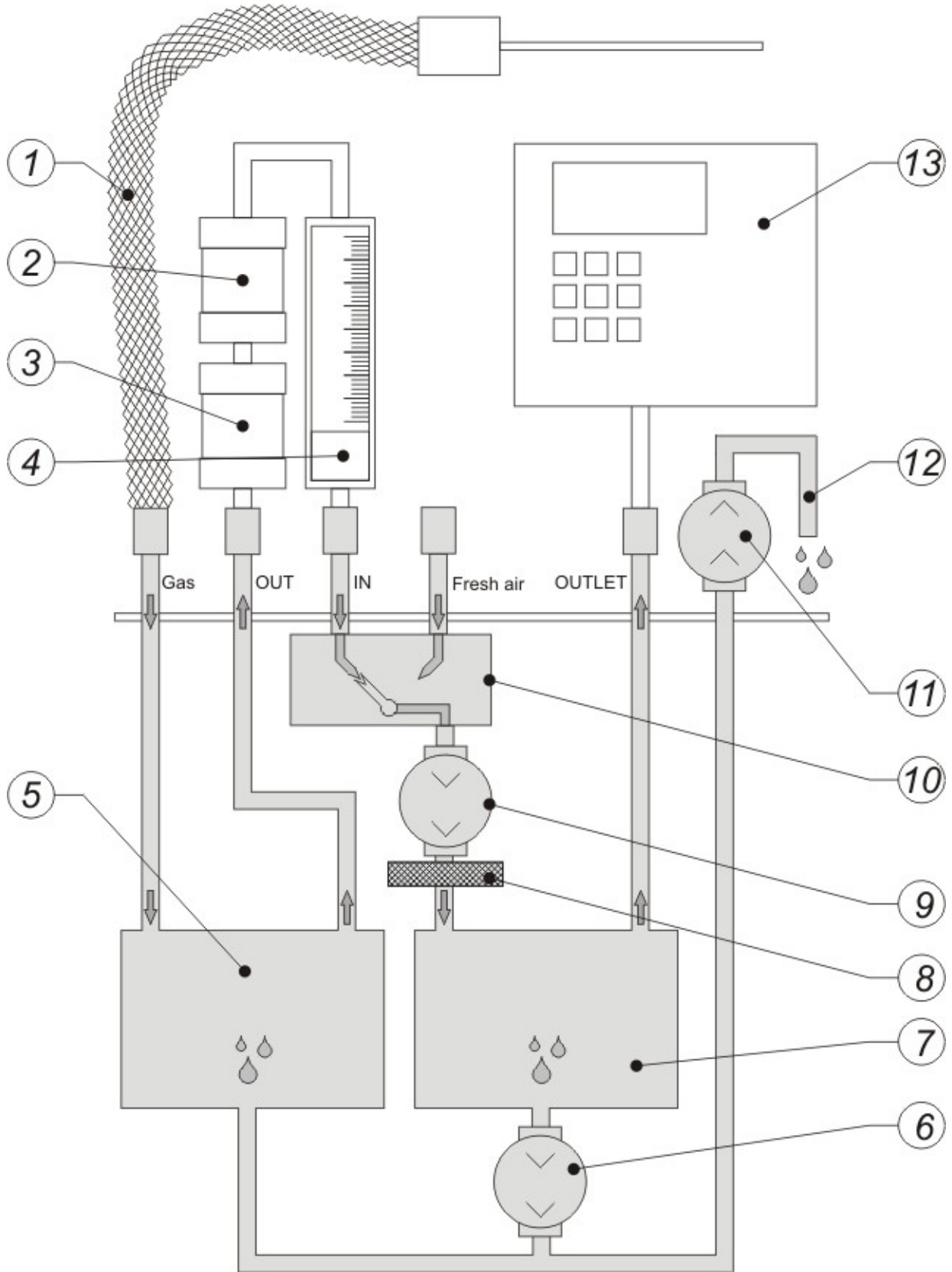
1. The heated hose power cable socket.
2. The heated hose magnetic couple.
3. The water pump.
4. Diode indicating the work of cooler II.
5. The device's display.
6. The keyboard.
7. The external filters couples.
8. Fresh air inlet.
9. The socket of the communication with the analyser cable.
10. The dried gases outlet.
11. The fuses.
12. The device's on/off switch and the power cable socket.

2.2. Additional equipment

The **PGD-100** dryer is equipped with the additional elements listed below:

1. The heated hose (\varnothing 6cm, the length of 3m, the maximum temperature of 200°C).
2. The communication with the analyser cable (the length of 1m).
3. The gas duct for the analyser – conditioner connection (the length of 1m).
4. The power cable.

2.3. The gas course of the PGD-100 conditioner



Rysunek 2. Schematic of the gas channel in PGD-100 gas dryer.

1. The heated hose.
2. The external gas filter (the permeability of 20um).
3. The external gas filter (the permeability of 5um).
4. The flow-meter
5. The cooler #1.
6. The internal peristaltic pump (transporting the condensate from the cooler #2).
7. The cooler #2.
8. Inner gas filter.
9. The gas pump.
10. Electromagnetic valve.
11. The external peristaltic pump (transporting the condensate out of the device).
12. The duct for the water disposal.
13. The flue gas analyser.

The flue gases are supplied to the conditioner with the help of the heated hose (1), which prevents the water vapour from condensing prematurely and beyond control. The hose is also equipped with the heated filter which removes the molecules of solids from the sample. The hose temperature can be adjusted to the needs of the drying process.

The hose is connected to the **PGD-100** gas inlet. The gas is transported to the cooler #1 in which the initial drying process is performed. The working temperature can be set by the operator with use of the device's keyboard.

The condensed water is later transported from the cooler to the main outlet channel. The gas sample is pumped (with the help of the internal gas pump – 9) through the external filters (2, 3) located in the device's casing cover. The flow-meter (4) whose readings are given in l/h is situated next to the set of filters.

Later the gas is transported to the cooler #2, whose temperature is about 1°C (the operator has no influence on the value of this temperature). The prepared gas sample is carried out of the device, to the analyser (13). The condensate from the cooler #2 is transported with the help of the pump (6) to the main outlet channel from where the external pump (11) takes it outside the device (through the duct for the water disposal – 12).

During ventilation the analyser (13) switches the electromagnetic valve (10) and starts sucking the fresh air through the *Fresh air* inlet. If there is uncertainty that ambient air does not meet the fresh air requirements, provide the fresh air via a tube connected to the *Fresh air* inlet. After the ventilation process is done the valve is switched back to collect gas samples.

3. USAGE OF THE CONDITIONER

3.1. *Preparing the conditioner to work*

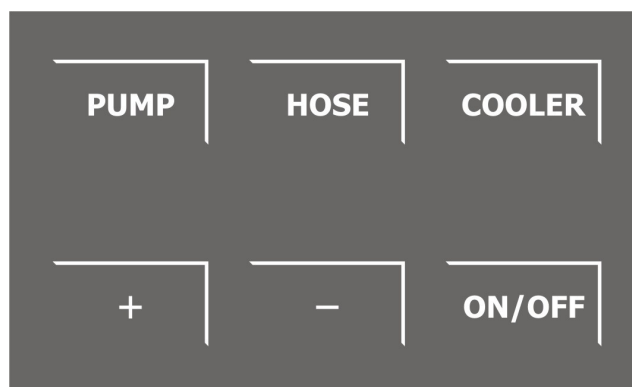
After the conditioner has been brought to the measurement area it is necessary to perform the following actions:

1. Control the condition of the filters (replace if seriously dirty).
2. Connect the power cable.
3. Connect the heated hose and the probe.
4. Switch the device on.
5. Make sure that the end of the duct for the water disposal is held in a distance from the device.
6. Set the hose temperature.
7. Set the cooler temperature.
8. Connect the conditioner to the analyser.
9. Switch the analyser on.
10. Wait until the device declares readiness for work.

Attention!

During the procedure of cooling of the conditioner and zeroing the analyser the gas probe must be removed from the stack.

3.2. *The display and the keyboard of the device*



Rysunek 3. PGD-100 dryer's keyboard

The lines of the display refer to the pump settings (Pump), the heated hose (Hose) and the cooler (Cool.). In the column on the left-hand side the current values of the appropriate parameters are shown. In the right column the target values of the parameters are displayed.

To change the particular setting the user should press the appropriate key:

- **PUMP** – enables the user to switch the pump on and off and define its efficiency in the 30÷100% range (30%, 32%, ..., 100%).
- **HOSE** – the temperature of the heated hose can be set in the 100÷195°C range. The heating of the hose is performed after the **ON/OFF** key has been pressed.
- **COOLER** – The user can set the cooler temperature in the 1÷30°C range. The cooling process starts/stops after the **ON/OFF** key has been pressed.

Attention!

In the PGD-100 conditioner the option of setting the cooler temperature refers only to the parameters of the cooler #1. The temperature of the cooler #2 is set at the factory and the user is unable to change it.

Choosing the particular module displays in the bottom line of the screen the note informing the user the parameters of which element can be changed at the moment. The operations carried out with the help of the keys are then assigned to the parameters of the selected module.

Increasing and decreasing the values of the parameters can be performed with use of the +/- keys. The working of the module can be stopped with the **ON/OFF** key.

The additional option enables the user to change the display contrast and can be called up by pressing the **PUMP** and **HOSE** keys simultaneously. Changes to the contrast level can be then made with use of the +/- keys.

In the bottom line of the display the status bar is shown. The following information can be displayed:

- ***PGD 100 READY*** – signalizes the proper working of the device

- *COOLING* – the information is displayed when the device is working in the cooling mode, which means when the target temperature of the cooler is lower than the current temperature value; during the cooling process the gas pump is switched off.
- *CLEANING* – the message appears when the conditioner's cooler reaches the target temperature; the gas course is then ventilated.
- *pump setting* – signalizes setting the parameters of the pump
- *hose temp. setting* – signalizes setting the parameters of the hose
- *cooler setting* – signalizes setting the parameters of the cooler #1
- *contr. setting* – signalizes setting the parameters of the contrast

The information signaling setting the parameters of the particular module appears for three seconds. If the user manages to make all the desired changes within that time the device switches to the usual working mode and the changes made to the parameters values are stored. The edition of the parameters can be always lengthened by three seconds.

3.3. *Signalizing the errors*

The user may encounter the following notes informing of the error in the usual working mode of the device:

- *hose conn. error!* – appears when the hose thermistor has been damaged or short-circuited or if the hose has not been connected to the device in a proper way.
- *WET OUTGOING GAS!* – appears when moisture is detected in the gas sample at the outlet (only applies when optional moisture sensor is fitted).
- *COOLER FAULT!* – appears when the target temperature of the cooler cannot be reached despite the constant cooling process (the cooler might be damaged or the fan might be defective).

- **HOSE OVERHEATED!** – if this message appears, then the gas dryer must be immediately switched off. The information means that the hose temperature has exceeded 200°C, which could be due to a temperature control failure.

The error messages always have priority over other messages. The appearance of the error note automatically holds usual working of the gas conditioner until the problem has been solved or the dryer has been restarted.

4. PRINCIPLES OF THE CHOICE OF THE HOSE AND COOLER TEMPERATURES

The heating of the hose prevents the water vapour from condensing before they reach the cooler. If the measurement concerns the gases with the high content of the sulphur it is advised to set the hose temperature in the 180÷195°C range. In all the other cases the temperature of 150°C is suitable.

The minimum cooler temperature depends on the external temperature and the gas sample moisture level. If the external temperature is in the 20÷25°C range the cooler temperature of 4°C is suitable.