

md3 – STATIONARY GAS DRYER

User guide

Version: 1.01
10/2022

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

1. Introduction	2
2. md3 – construction	3
2.1. Dimensions	4
2.2. md3 – key elements	5
3. Pneumatic Diagram	6
4. LED Status.....	7
5. Dual-mode gas port	8

1. INTRODUCTION

md3 gas dryer is the most crucial accessory for madur’s mamos gas analyser. Its main purpose is to condition the gas sample before it is fed to the analyser’s sensors. Conditioning means drying and cleaning the gas from dust, soot and other solid particles.

When we introduced mamos, md3 was integral part of the analyser. Over the years, and iterations of madur’s most popular CEMS, md3 dryer became an independent device – mainly in order to provide support for split, twin-split and multiplexed configurations of mamos (more about this is described in [this document](#)).

Thanks to, now stand-alone working principle, md3 dryer is suitable to be paired with any third-party gas analysers, or devices that require gas drying and filtering.

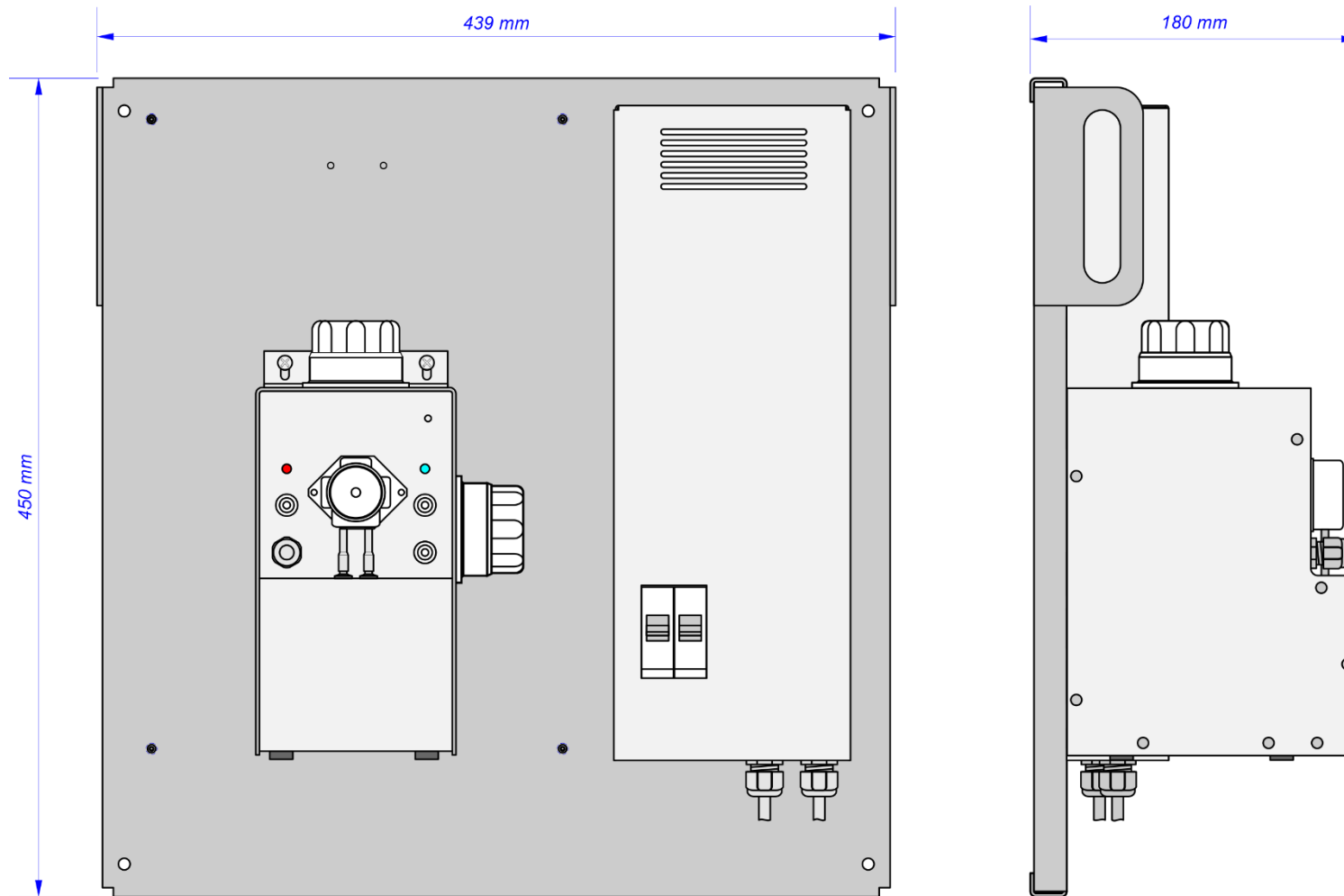
2. MD3 – CONSTRUCTION



md3 is, by default, delivered on a dedicated mounting plate with switch-mode power supply

1. md3 dryer, module with a single AGF-FE filter
2. Switch-mode power supply – this is a universal power-supply module with input voltage 100÷240V AC 50/60Hz, that converts it to the output 24V DC voltage accepted by md3 dryer
3. 2-litres condensate bag with release valve at the bottom. Bag should be emptied regularly! Otherwise, peristaltic pump will not be able to remove condensate from peltier chiller and water will get to the sensitive parts of the gas analyser.
4. Mounting plate for dryer, power supply and other accessories.
5. Hanger for wall-mounting – first mount this element at the desired location, then hang the mounting plate with md3 and power supply on a hanger. Mounting plate should be secured with the 2x plastic rivets.

2.1. Dimensions



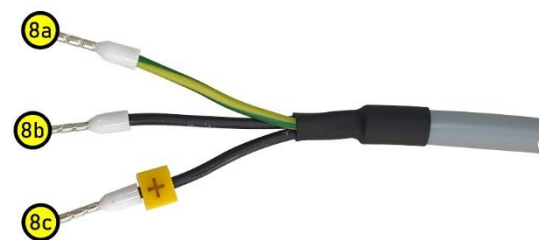
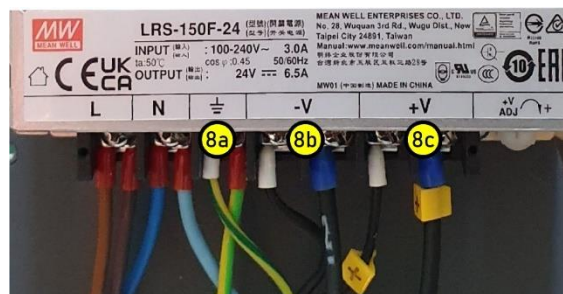
2.2. md3 – key elements



1a – Filter always present

1b – Optional filter yet, offered by default

1. AGF-FE filters. To replace fiberglass filter element unscrew (counter clockwise) filters housing.
2. Peristaltic pump that removes condensate form peristaltic chiller to PVC condensate bag
3. Power status LED
4. Cooling status LED
5. Gas outlet. Dry gas from md3 to the gas analyser
6. Gas inlet from gas source, e.g. gas probe, heated filter, or directly from process
7. Condensate port – by default connected to the 2litres PVC bag
8. 24VDC supply cable, connect to the Power supply as follows:

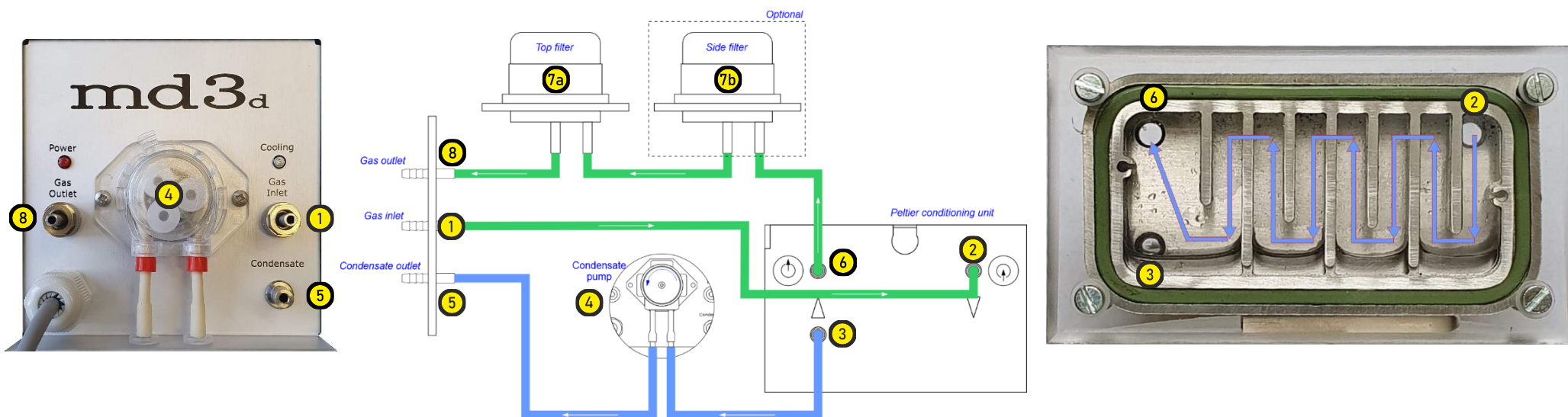


9. Electric connectors at the bottom part of the md3 dryer:



- a. 2x RS485 interface (5-pins) – to connect mamos analyser and other peripherals (e.g. another MD3 dryer)
- b. Stationary gas probe (7-pins) – Result of T_{gas} measurement is transmitted to the md3, and then to the mamos analyser. md3 sends trigger signal to stationary probe to enable purging (with compressed air) of its in-situ stainless steel filter.
- c. External devices – optional equipment that requires steering, e.g. heated line or heated filter

3. PNEUMATIC DIAGRAM



Unprocessed (i.e. humid and with solid particles) gas from the source (e.g. process via stationary probe) is delivered to the md3's gas inlet **1** port. At first, gas must be dried - therefore it gets to the cooler inlet **2**. Peltier cooler consists of two main components: stainless steel chiller and the Peltier element that is directly connected to chiller and cools it down to about 4°C. Humid gas must go through chiller's "maze", where it is slowed and have a chance to cool down. Due to chiller's very low temperature, cooling is rapid – to temperatures below gas dew point – and in consequence, condensation occurs and water droplets deposits at the bottom part of chiller. Water is constantly removed from chiller **3** with help of peristaltic pump **4**. Max efficiency of the pump is 38 ml/min. Water is removed via condensate port **5**.

****Remark:** As presented in the picture above in the right: peltier gas chiller is always filled with a small amount of water (peristaltic pump removes water to a certain level), therefore peltier type of gas dryers are not suitable for measurement of gases that very easily dissolves, or mix with water, e.g. NH₃, HCl, HF.

After the gas is dried, it then has to be filtered out from solid particles, dust and soot → dry gas leaves the chiller **6** and gets to the filters where dust, soot and other solid particles are removed. md3 dryer has one or two filter – top filter **7a** is always present, side filter **7b** is optional, though by default md3 dryer is offered with both filters present.

Gas prepared for analysis is available at outlet port **8**

4. LED STATUS

md3 has 2 LED lights – red LED “Power” and blue LED “Cooling”, each can inform about dryer status:

Power



LED is OFF
md3 dryer is powered off



LED blinks regularly with ~1s interval
Communication with mamos analyser is established



2 short LED blinks, ~5 seconds interval another 2 short blinks
md3 cannot communicate with mamos analyser.
Also default status for standalone dryers.

Cooling



LED is OFF.
Peltier module is not working (cooling is off).
When md3 is controlled by mamos, peltier is disabled by default in measurement phases where cooling is unwanted, e.g. warm-up and stand-by



LED is ON
Peltier module is powered ON and cooling down the md3's chiller



LED flashes – intervals depended on the chiller's temperature:
The closer it gets for the cooler to reach the target temperature, the more regular flashing intervals become. And when target temperature is reached, then peltier element is regularly powered off/on to maintain set temperature and hence making the flashes regular as well.



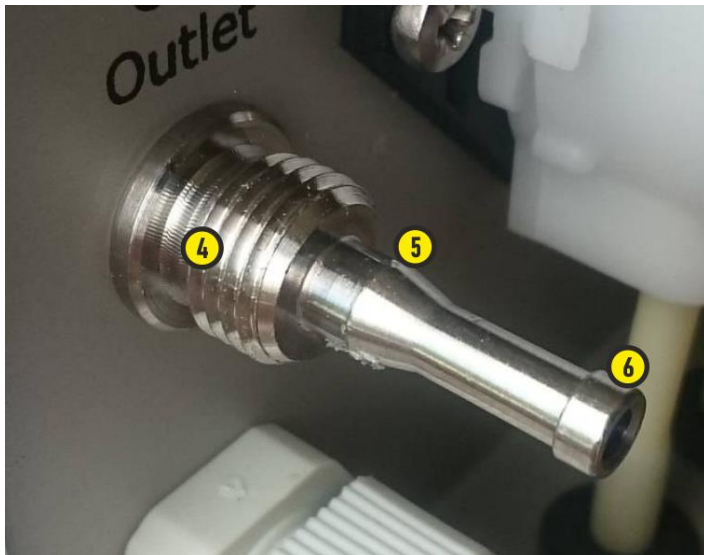
LED flashes rapidly
Peltier element is damaged or disconnected

5. DUAL-MODE GAS PORT



Gas ports in md3 gas dryer and analyser are dual-mode, i.e. user can establish

1. Standard gas connection using 3x2mm silicon tube or
2. Pressure secure connection using 4x2mm PTFE tube and secure it with provided nut [8
3. Nut to secure PTFE tube



4. Thread for secure nut
5. Barb for 4x2mm PTFE tube
6. Barb for 3x2mm silicone tube