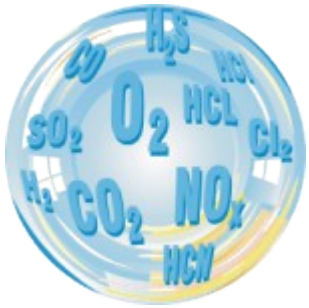

STATIONARY GAS PROBE
WITH AUTOMATIC FILTER CLEANING

User guide
Version: 1.1
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madur
ELECTRONICS

Content

1. INTRODUCTION

Stationary gas probe with automatic filter cleaning is the newest product of madur. It is an improved and perfected version of the standard stationary gas probe.

The biggest addition to the design is the automatic cleaning function. Classic stationary gas probe allows for continuous measurements from single, immobile locations for any time period without the necessity of constant human presence. This probe was designed with CEMS maMoS modular analyser in mind (but it can cooperate with most madur stationary devices).

Drawing 1. Complete stationary gas probe with pneumatic valve for automatic filter cleaning.

2. PACKAGE CONTENT

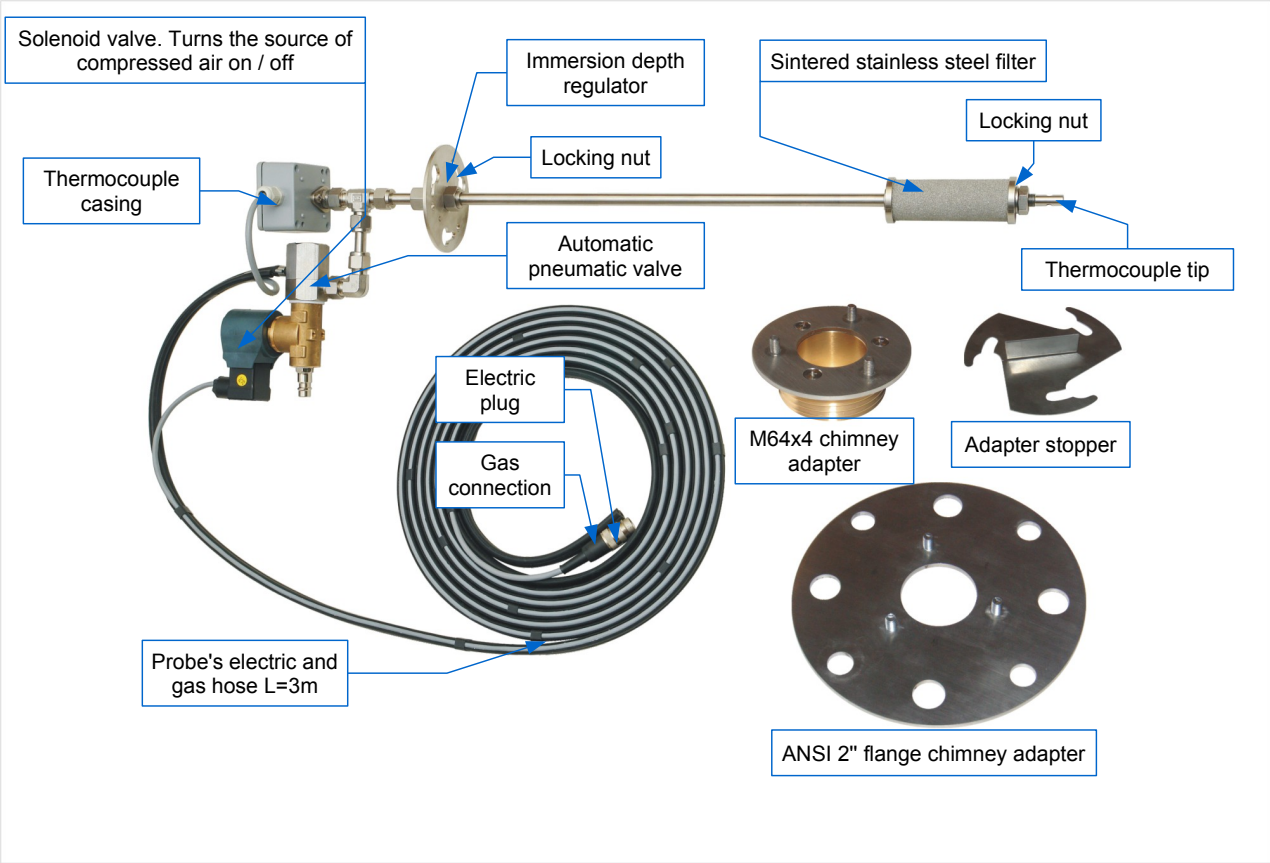
- Fully assembled gas probe with 3m gas-electric hose pneumatic and solenoid valves and depth regulator (and optionally thermocouple)
- Adapter ANSI or M64x4
- Adapter stopper
- Sintered stainless steel filter (optional)

3. GENERAL INFORMATION

Stationary gas probe allows continuous measurements from immobile locations. It periodically extracts gas samples from high temperature environment (the highest possible temperature up to 1150°C). Thanks to the special Siperm filter made of sintered

stainless steel, the probe can continuously work with highly polluted air (i.e. dust and soot particles). Pneumatic valve and self cleaning module were added as an additional innovation to provide longer maintenance-free work. Apart from providing gas for the analyser (maMoS or other) probe can measure temperature inside the chimney if equipped with the thermocouple sensor.

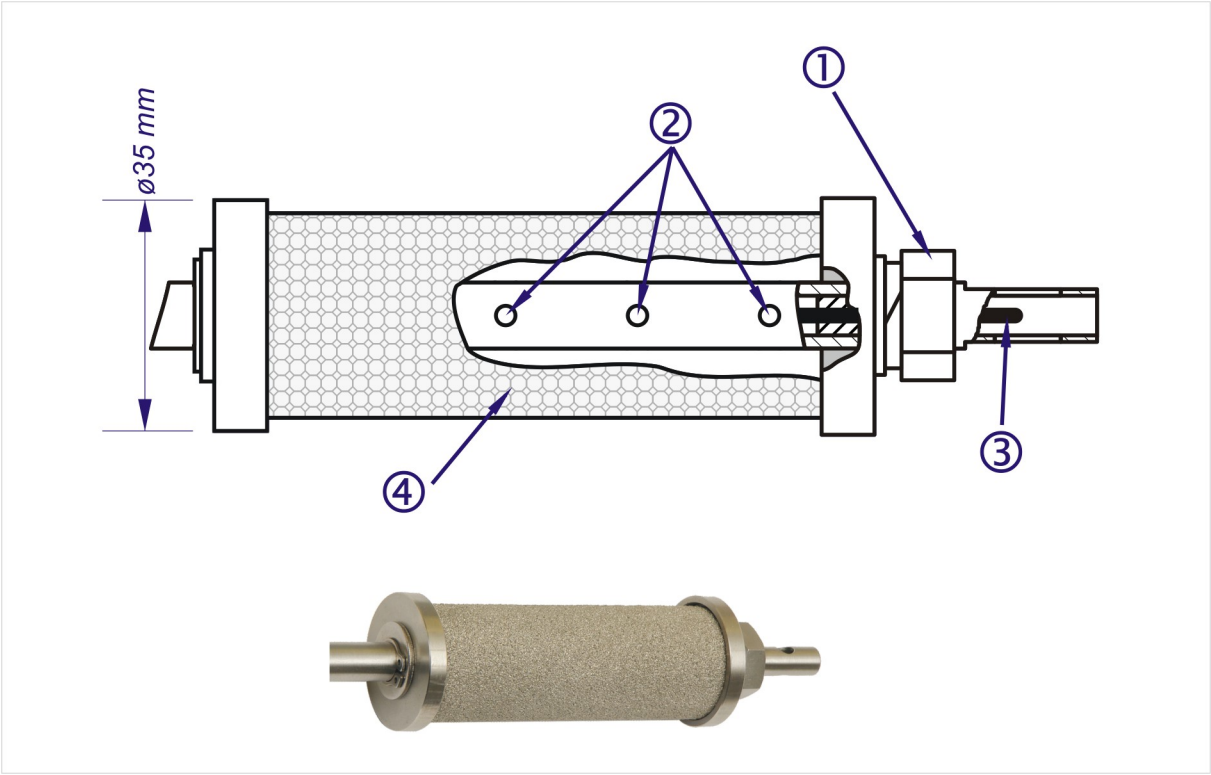
4. CONSTRUCTION



Complete probe with automatic cleaning module and thermocouple sensor

4.1. Sintered stainless steel filter

Stainless steel filter was especially designed for prolonged work with highly polluted air. It is made of sintered steel and in consequence can be not only cleaned with pressurised air but also washed if necessary. It is an option that allows longer maintenance free work of the probe and the analyser.



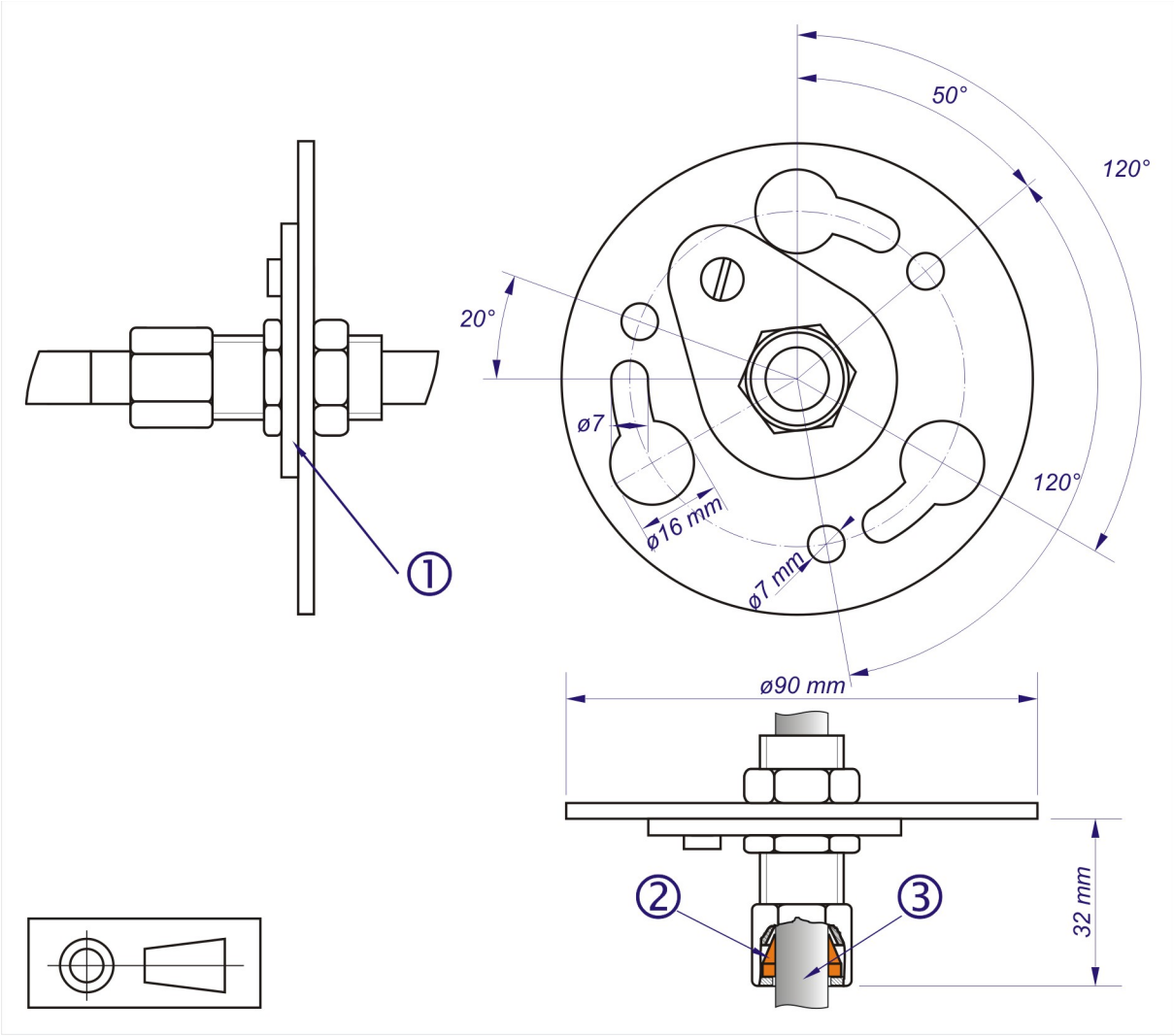
1. **M10x1 locking nut**
2. **Gas inlet holes**
3. **Thermocouple tip**
4. **Filter**

Drawing 2. Schematics of sintered stainless steel filter:

ATTENTION!

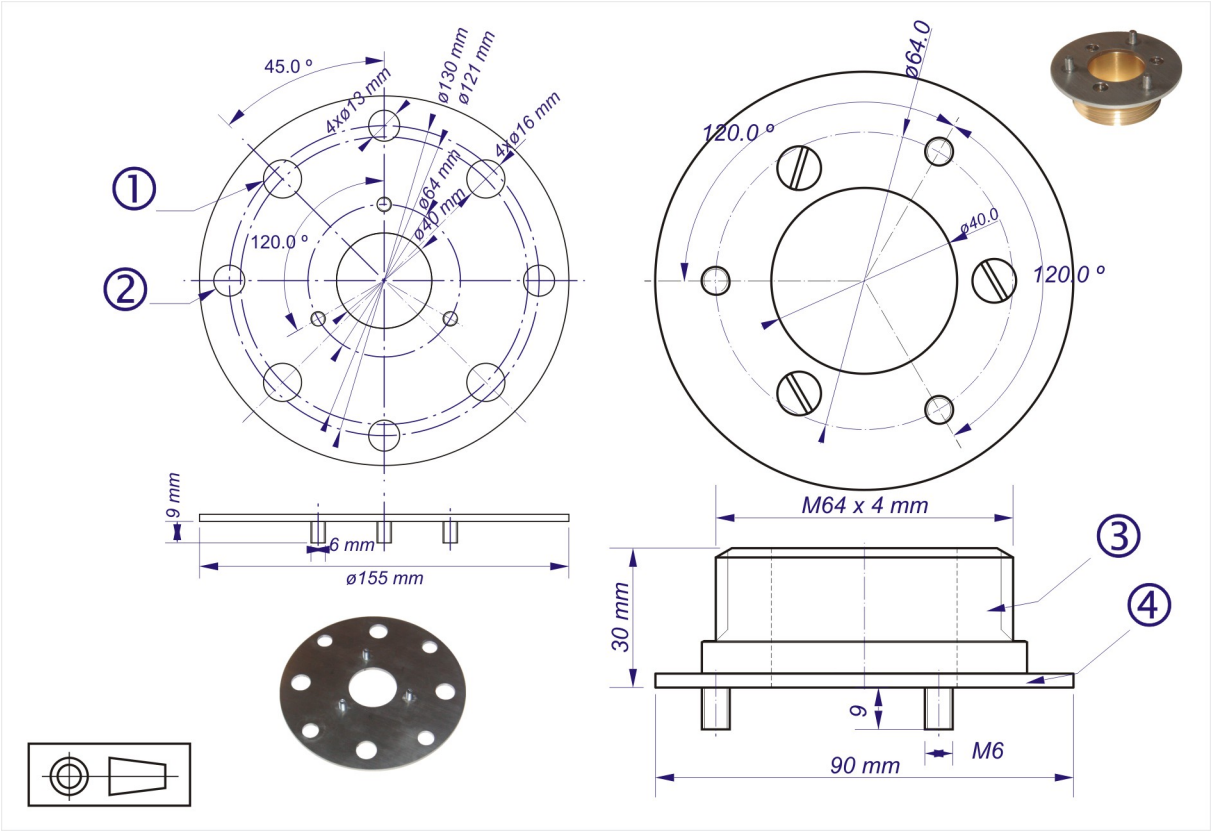
Please note that 650°C is the maximum working temperature for sintered filters regardless the chosen probe type.

4.2. Immersion depth regulator and chimney adapters: ANSI, M64x4



1. **Probe holder**
2. **PTFE gasket**
3. **Gas probe**

Drawing 3. Schematics of immersion depth regulator



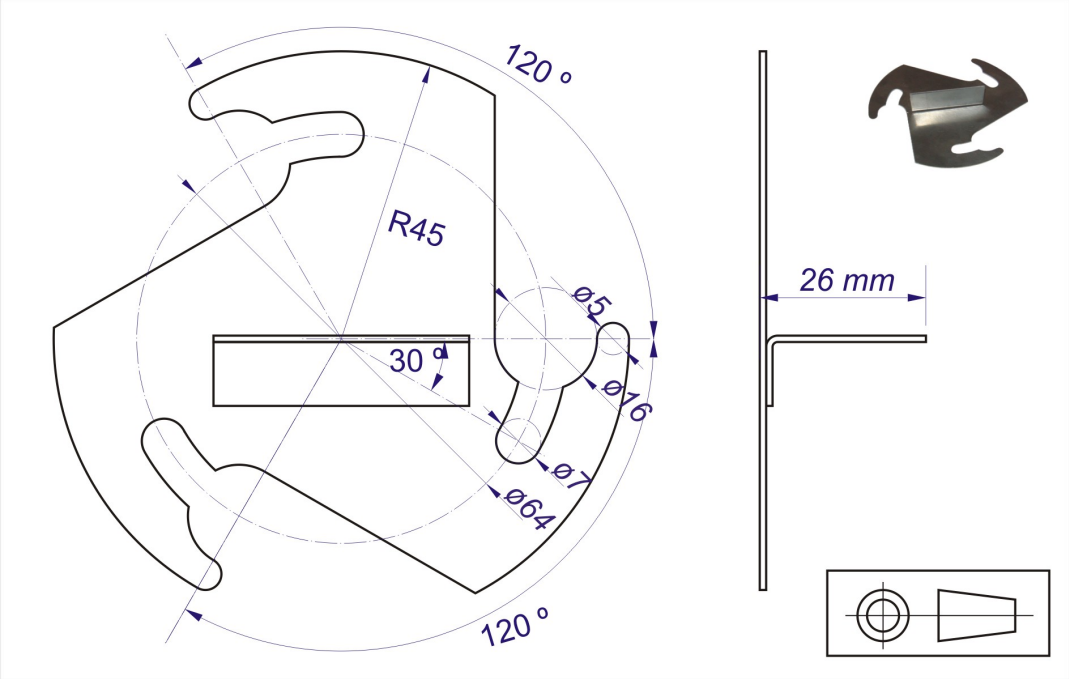
1. **4 holes for ANSI 2" flange**
2. **4 holes for DN50 flange**
3. **Brass**
4. **Stainless steel**

Drawing 4. Schematics of ANSI and M64x4 adapters

Probe immersion depth regulator is mounted on the probe pipe and equipped with a locking nut.

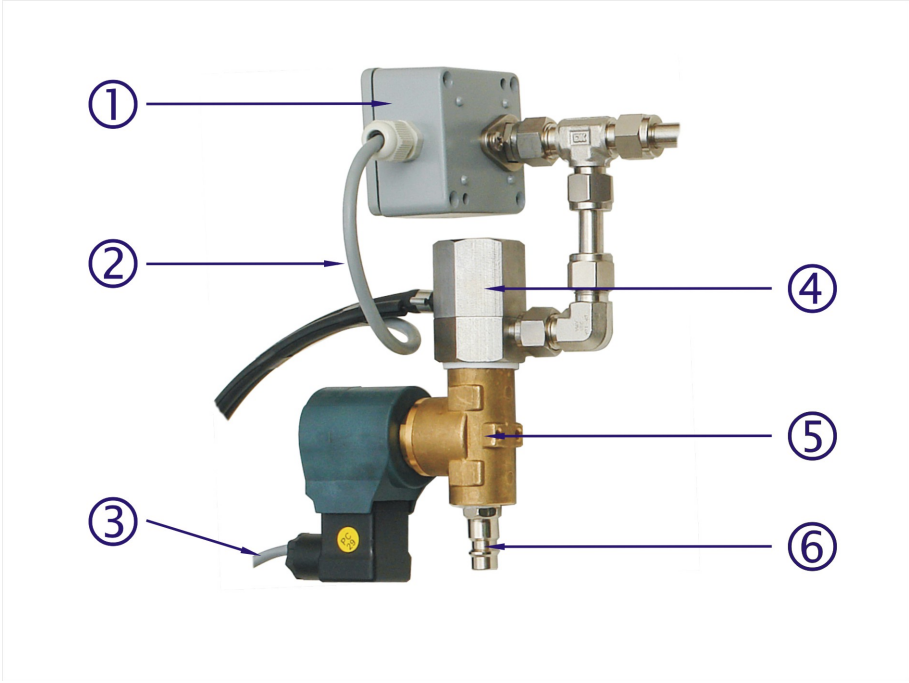
There are two chimney adapters available for the regulator, ANSI 2” adapter and M64x4 thread adapter. Each of these two is permanently fixed to the chimney. If there is a need to remove the probe from the stack, then the depth regulator is detached from the chimney adapter. Adapter is always delivered with an adapter stopper, that is installed for the time when probe is removed from the stack.

Depth regulator allows fast and easy insertion of the probe inside the chimney, so its tip is positioned in the middle of the draft.



Drawing 5. Schematics of Chimney adapter stopper (stainless steel 1mm)

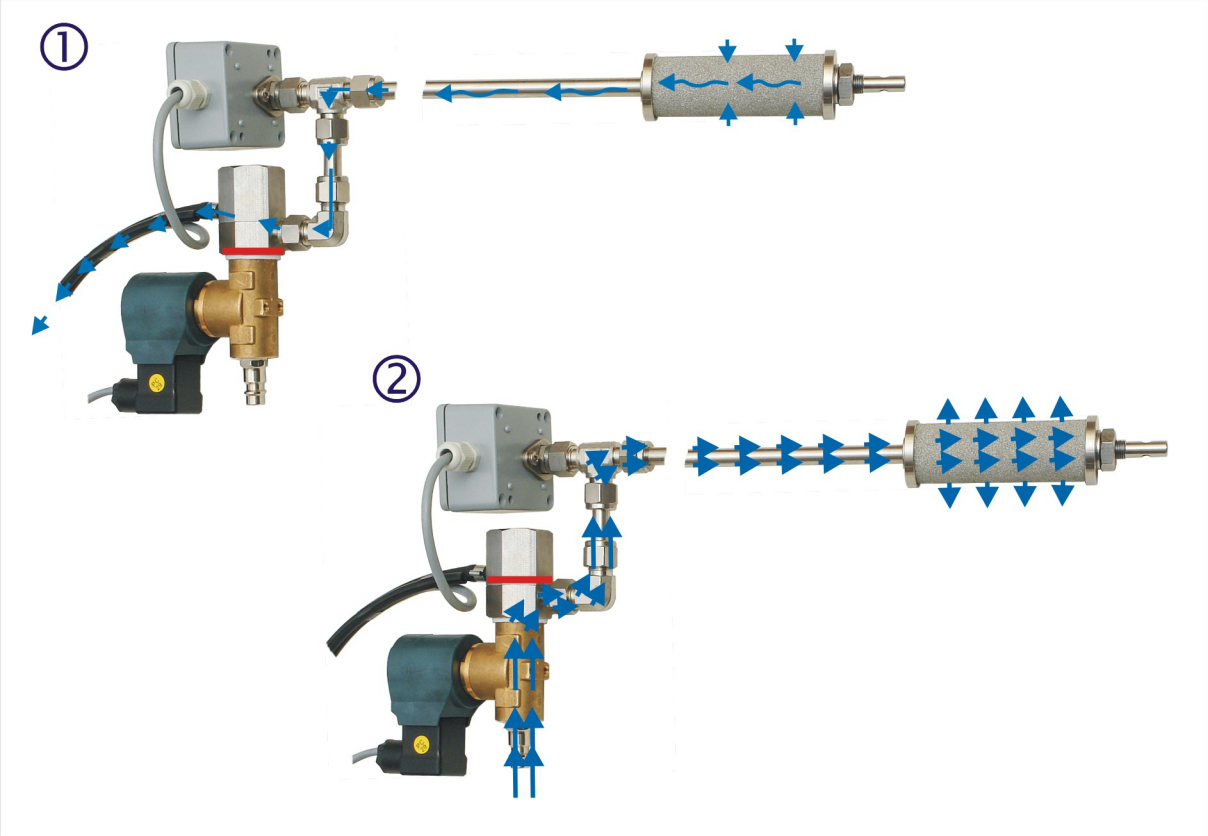
4.3. Pneumatic valve module



1. **Thermocouple casing**
2. **Thermocouple electric cable**
3. **Solenoid valve control cable**
4. **Automatic pneumatic valve**
5. **Solenoid valve (turns the compressed air on / off)**
6. **Quick coupler, type 26 NW 7.2**

Drawing 6. Pneumatic valve and an automated pneumatic switch

Solenoid valve was added to the design to allow automatic cleaning of the sintered filter with fresh pressurised air. This periodical action prolongs time of maintenance-free work. When the analyser opens the solenoid valve, a sudden change of air pressure activates the automatic pneumatic valve. Then, this valve closes the air channel to the analyser and opens the sintered filter to the compressed air. With this action the analyser is protected and high pressurised air can cleans the filter.



1. **Solenoid valve is off. Pneuatic valve is set to pass the gas from the probe to the analyser.**
2. **Solenoid valve is turned on by the analyser. Compressed air switches the position of the pneumatic valve to close the gas channel and to allow the compressed air to clean the sintered filter.**

Drawing 7. Cleaning of sintered stainless steel filter – diagram.

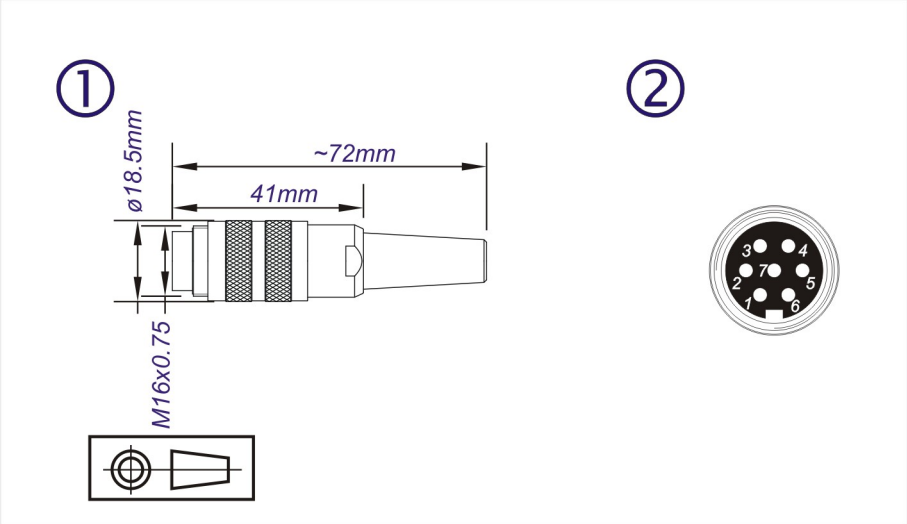
ATTENTION!

Pressure of the air supplied to the probe through the gas pneumatic connection must be high enough to allow correct switch work and so should oscillate around 5 bars (72.5 PSI).

4.4. Thermocouple

Thermocouple is an optional equipment for stationary gas probe that allows temperature measurements of the gas inside the stack. Temperature results are used, e.g. for stack loss calculations. Few types of thermocouples are available, K-type is chosen by default as it is the most versatile one. If installed in the probe, sensors tip should be visible inside the probes tip.

4.5. Gas hose's connectors



1. 581 male plug – side view **2. 581 male plug – view at pins**

Pin connectors:

1.	Pneumatic valve	2.	Thermocouple “+”	3.	PT500
4.	PT500	5.	Thermocouple “-”	6.	Pneumatic valve
7.	GND				

Drawing 8. Schematics of hose electric connection (581 type plug, 7-pin, male)

Probe is equipped with 3m gas housing with electric and gas connections.

Probe's connectors:

- 7-pin male plug (Drawing 8.) - electric connection with the analyser or gas dryer,
- rubber hoses tip – gaseous connection with the analyser or gas dryer.

5. WORKING WITH THE PROBE

5.1. Chimney adapter ANSI and M64

Two adapters for the chimney are available, ANSI 2” adapter and M64x4 adapter. ANSI adapter can be attached when ANSI 2” standard mounting is present in the chimney. For brass chimneys M64x4 adapter would be the best solution. Each adapter is provided with stopper that should be used to seal the adapter when the probe is detached.

5.1.1. ANSI 2” adapter

This adapter is suited not only for ANSI 2" size but also for DN50 flanges. Adapter has holes for both metric and imperial units and 3 built-in screws to attach probe's depth regulator. It comes with a chimney adapter stopper that allows sealing the hole in the adapter when the probe is disconnected.

5.1.2. M64x4 adapter

This adapter was is destined to work with smaller installations like household heating systems and chimneys made of brass. Adapter is equipped with a M64x4 thread that allows simple screwing the adapter to the wall of a chimney. It comes with a chimney adapter stopper that allows closing the hole in the adapter when the probe is not connected or removed for cleaning / service.

5.2. Probe immersion depth regulator

The immersion regulator is mounted on the probe pipe and can slide on it, between sintered filter on one end of the probe and the tee on the other side. The regulator is equipped with a locking nut so the probe's position can be fixed in the chimney.

5.3. Mounting the probe in the chimney

Before installation of the probe, please make sure that:

- The stove / furnace connected to the chimney is not working
- The chimney is cooled down and there is no hazard of skin burns or gas poisoning

To install the probe please follow the steps below:

- Loosen the locking nut on the probe immersion depth regulator and make sure it slides easily on the probes pipe.
- Loosen 3 nuts that lock the adapter stopper to the adapter (if your adapter is equipped with wing nuts instead of classic M6 nuts unscrew them).
- Rotate the adapter stopper clockwise until it separates from the adapter, then remove it.
- Push the probe carefully through the hole in the adapter until the filter immerse in the chimney.
- Slide the regulator in the direction of the adapter until it meets with the adapters nuts, then allow 3 nuts to pass through the holes in the regulator.
- Rotate the regulator clockwise until all the screws slide into the tighter parts of the regulators mounting holes.
- Screw 3 nuts firmly back, until there is no loose between the depth regulator and the adapter.
- Carefully position the probe, so the probe's filter is in the middle of the chimney (avoid hitting the opposite side of the chimney with the probes tip).
- Make sure all of the probes wires are hanging down comfortably and are not bend.
- Screw back the locking nut on the depth regulator.

5.4. Sintered filter

5.4.1. Removing the filter from the probe

Filter can be removed from the probe for replacement or cleaning purposes.
Unmounting the probe, sequence of necessary steps:

- **Make sure** that probe cools down after the last measurement and that there is no smoke coming out of the chimney.
- Loosen 3 nuts that hold the probe immersion depth regulator together with the adapter on the chimney wall, (if your probe is equipped with wing nuts instead of classic M6 nuts unscrew them)
- Rotate the probe clockwise until the screws will get to the wider holes in the regulator.
- Pull the probe out, through the adapter in the chimney
- Close the adapters hole with provided adapter stopper, and **screw it firmly** with all 3 nuts.
- Removing the filter from the probe:
  - Unscrew the locking nut closest to the probes tip.
  - Remove the gasket and gently pull the filter's positioning plate out through the probes thread.
  - Remove the sintered filter.

Filter is machine washable and can be cleaned with household detergents, pressurised water or a brush. Be aware of filters sharp edges.

5.5. Solenoid and pneumatic valves

Automatic, pneumatic valve allows the analyser to clean the sintered filter before every measurement session, during the ventilation time. Pneumatic valve is switched with the burst of the compressed air. When compressed air is provided, the gas channel (stack → probe → analyser) is cut off in order to direct the pressurised air to the sintered filter to clean it, and to make sure that the pressurised air is kept away from the analyser's delicate parts. Solenoid valve is controlled by the analyser and is used for turning the source of compressed air on.

For correct work, the valves must be provided with:

- electric connection with the analyser,
- clean air under pressure of around 5 bars (72.5 PSI).

The valve is controlled by the analyser, but some settings can be changed through computer software. For more details please refer to a user guide for your analyser's computer software.

ATTENTION!

When working with the probe equipped with pneumatic valve please make sure that heavy end of the probe with gas hose and electric cables do not overweight and bend the probes pipe when it is mounted to the chimney.

5.6. Thermocouple

The probe can be equipped with a thermocouple sensor for gas temperature measurements. In this case the sensor's tip should be visible inside the tip of the probe's pipe. Please be aware of this fact and be extra careful while positioning the probe in the chimney. Try to avoid hitting the inside opposite wall of the chimney, what could cause damage to the thermocouple sensor.

5.7. Gas hose and connectors

Standard length of the gas-electric cable is 3m. It is attached to the probe on one side and should be connected to the analyser with a 7-pin plug and hoses end. The hose provides gas sample to the analyser, while the electric connection can transport information about thermocouple measurements from the probe and control signals to the solenoid valve.

6. TECHNICAL DATA

Maximum operating temperature of the probe depends on its type (normal temperature – 800°C, high temperature – 1150°C) and presence or absence of sintered filter – if used maximum temperature drops to 650°C.

Pressure of air supplied to the electric valve should oscillate around 5 bars (72.5 PSI).