

GAS MIXING SYSTEM

GMS 150

GMS 150-MICRO

Manual and User Guide

Please read this manual before operating this product



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The contents of this manual have been verified to correspond to the specifications of the device. However, deviations cannot be ruled out. Therefore, a complete correspondence between the manual and the real device cannot be guaranteed. The information in this manual is regularly checked, and corrections may be made in subsequent versions.

The visualizations shown in this manual are only illustrative.

This manual is an integral part of the purchase and delivery of equipment and its accessories and both Parties must abide by it.

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2 TECHNICAL SPECIFICATION

VERSION GMS 150

Measuring Principle:

Thermal mass flow measurement

Accuracy (Incl. Linearity):

$\pm 0,5 \% \text{ Rd}$ plus $\pm 0,1 \% \text{ FS}$ ($\pm 1 \% \text{ FS}$ for ranges 3 – 5 ml/min; $\pm 2 \% \text{ FS}$ for ranges $< 3 \text{ ml/min}$)

Turndown:

1:187

Flow Ranges:

Max. total flow rate: 2 or 20 l/min typically (customized max. flow rate between 1 ml/min – 1 000 l/min)

Min. flow rate: 2% of the max. flow rate

Repeatability:

$< 0,2 \% \text{ Rd}$

Control Stability:

$< \pm 0,1 \% \text{ FS}$ (typical for 1 l/min N₂)

Settling Time:

1 – 2 seconds

Warm-Up Time:

30 min for optimum accuracy, 2 min for accuracy $\pm 2 \% \text{ FS}$

Temperature Sensitivity:

zero: $< 0,05 \% \text{ FS}/^{\circ}\text{C}$; span: $< 0,05 \% \text{ FS}/^{\circ}\text{C}$

Pressure Sensitivity:

0,1 %/bar typical N₂

Attitude Sensitivity:

max. error at 90° off horizontal 0,2 % at 1 bar, typical N₂

Input Pressure:

3 -5 bars

Operating Temperature:

15 – 50 °C

Input / Output Connectors:

Parker Prestolok (6 mm)

Seals:

Viton

Display:

8 x 21 characters LC display

Dimensions:

37 cm x 28 cm x 15 cm

Weight:

7 kg

VERSION GMS 150-MICRO

Measuring Principle:

Thermal mass flow measurement

Accuracy (Incl. Linearity):

$\pm 1,5 \% \text{ Rd}$ plus $\pm 0,5 \% \text{ FS}$

Minimum Possible Flow for Each Channel:

1/50 of maximum total flow

Flow Ranges:

Max. total flow rate: 2 l/min typically (customized max. flow rate between 10 ml/min – 2,5 l/min)

Min. flow rate: 2% of the max. flow rate

Media:

Dry, clean, non-explosive and non-corrosive gasses

Repeatability:

For flows < 20ml/min: $\pm 0,5 \% \text{ FS}$; for flows > 20 ml/min: $\pm 0,5 \% \text{ RD}$

Settling Time:

700 msec

Temperature Sensitivity:

zero: < 0,01 % FS/°C; span: < 0,02 % FS/°C

Attitude Sensitivity:

Max. error at 90° off horizontal 0,5 % ml/min at 1 bar, typical N₂

Input Pressure:

3 – 5 bar (maximum operation pressure 10 bar)

Operating Temperature:

15 – 30 °C

Input / Output Connectors:

Parker Prestolok (6 mm)

Seals:

Viton

Display:

8 x 21 characters LC display

Dimensions:

37 cm x 28 cm x 15 cm

Weight:

5 kg

Power Supply:

115 – 230 VAC

3 GENERAL DESCRIPTION

GMS 150 can produce precise mixtures of up to 4 different gasses. The flows of the individual input gases are measured by thermal mass flow meters and adjusted by integrated mass flow controllers. Before the exit connector, the gas mixture is thoroughly homogenized. The input and output gas connectors are of Prestolok type allowing fast and secure connection to a variety of tubes.

The GMS 150 mass flow meters and controllers can operate gas flows ranging from ml/min to tens of l/min. GMS 150 is typically used to control flow of air, carbon dioxide, and nitrogen. Additional gases like nitrogen dioxide, ammonia and others can also be added to simulate various technological mixtures or smokestack gasses.

GMS 150 is available in two versions: standard **GMS 150** and **GMS 150-MICRO**. GMS 150-MICRO retains all features of the GMS 150; the only difference is lower total flow and lower accuracy of mixing (for more technical specifications see page 5).

The typical GMS 150 and GMS 150-MICRO versions include 2 channels:

Channel 1 for air or N₂: 40 - 2 000 ml/min

Channel 2 for CO₂: 0.8 - 40 ml/min

The typical GMS 150 version for large-scale photobioreactors includes 2 channels (not available for GMS 150-micro):

Channel 1 for air or N₂: 400 - 20 000 ml/min

Channel 2 for CO₂: 8 - 400 ml/min

The GMS 150 can be used as a stand-alone instrument or in a system with the Photobioreactors, Multi-Cultivators and FytoScopes. It can be controlled locally from its front panel or by software (in systems with Photobioreactor). The user can define the required gas mixture either by setting the flows of the individual gasses (e.g., 980 ml/min of N₂ and 20 ml/min of CO₂) or by setting the required relative composition of the gas mixture (2 % CO₂) and the total mixture gas flow (1000 ml/min).

The side installation requirements for the proper operation of the GMS are pressurized air supply and supply of the desired gas (CO₂, N., etc.). Pressurized air used for the GMS must be dry and oil free. The inlet pressure should be in range of 3 – 5 bars.

Note: If you want to use GMS 150 in system with Photobioreactor, Multi-Cultivator or FytoScope read also instruction manual for these instruments for correct connection of the GMS with these devices.

4 COMPONENTS OF THE GMS 150 DEVICE

Carefully unpack the carton, which contains:

- **Gas Mixing System GMS 150** (Fig. 1)
- **Cables and Connectors** – Power cable, 5 m of Parker Prestolok tubing \varnothing 6 mm, 3 pieces of blinding plugs (Fig. 2)
- **This Operation Manual** (*printed version*)
- **Optional Accessories** (*according to your specific order*)



Fig. 1 GMS 150



Fig. 2 Cables and blinding plugs

Note:

If any item is missing, please, contact the manufacturer. Also check the carton for any visible external damage. If you find any damage, notify the carrier and the manufacturer immediately. The carton and all packing materials should be retained for inspection by the carrier or insurer.

For customer support, please write to: support@psi.cz

5 SAFETY PRECAUTIONS

THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY DAMAGE DUE TO IMPROPER OR INCOMPETENT OPERATION.

THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY DAMAGE DUE TO GAS LEAK FROM ANY AUXILIARY UNITS (GAS CONTAINERS, DEFECTIVE VALVES, ETC.).

BEFORE OPERATING THE GMS 150 READ THE FOLLOWING INSTRUCTIONS AND WARNING CAREFULLY:

- **To operate a gas handling equipment, you should be trained in its proper use or be under competent supervision.**
- **The device is primarily intended to mix CO₂, N₂ and air. Mixing of other gasses must be always consulted with manufacturer.**
- **Pressure regulator must be always used when connecting the GMS 150 with the gas tank! Never connect the gas tank directly to the GMS 150.**
- **Gas input pressure should be 3 – 5 bars. Gas input pressure cannot exceed 8 bars! Do not subject the regulator to an inlet pressure greater than is recommended**
- **Input gas must be free of oil, water or any other foreign substances.**
- **If working in wet conditions, dehumidifier must be used to prevent condensation of water in tubes and the system.**
- **Avoid flooding of the GMS 150 valves by proper device installation and operation.**
- **Follow the basic safety rules for work with CO₂ and other hazardous gases**
- **Never heat or expose a gas tank or gas handling equipment to temperatures above 50 C (120 °F)**

GENERAL ELECTRICAL SAFETY GUIDELINES:

- Connect all peripheral units when the device is switched off!
- First connect all peripheral units (pumps, control valves), then switch on the device.
- Routinely check the devices and their wiring.
- Replace worn or damaged cords immediately.
- Use electrical extension cords wisely and do not overload them.
- Place the devices on a flat and firm surface. Keep them away from wet floors and counters.
- Avoid touching the device, socket outlet or switch if your hands are wet.
- Do not perform any alterations to the electrical part of the devices or its components.

6 DESCRIPTION OF THE GMS 150 DEVICE

FRONT PANEL:

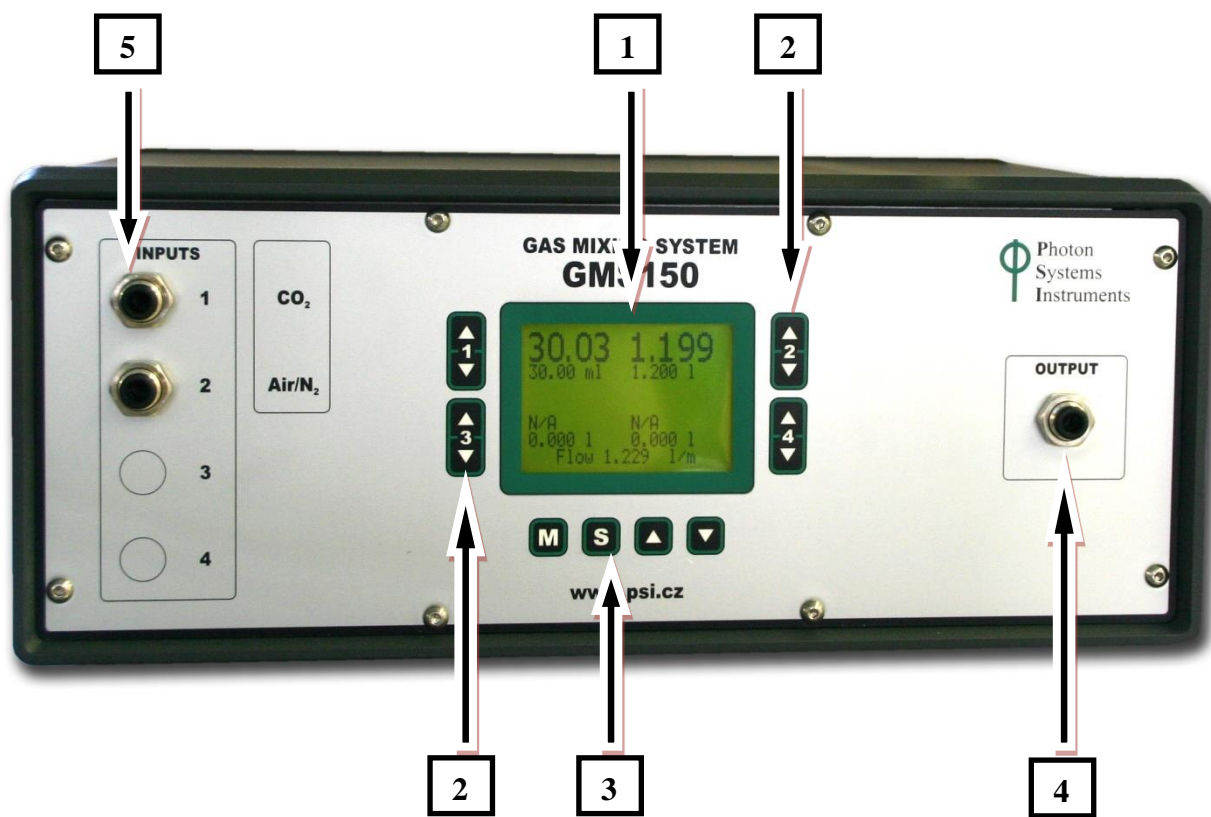


Fig. 3 Front panel

[1] – Display.

[2] – Four “UP/DOWN” keys. Each “UP/DOWN” key controls one particular valve (more on valve control in Chapter 8. – Display & Control Screen).

[3] – Four control keys for the device setting (more on device setting in Chapter 8 – Setting Screen).

[4] – Gas output.

[5] – Two gas inputs. When switched on, the device detects and displays automatically all connected valves.

CO₂ input is connected to valve 1.

Air/N₂ input is connected valve 2.

Note: GMS 150 can produce precise mixtures of up to 4 different gasses, but standardly there are only two gas inputs.

REAR PANEL:

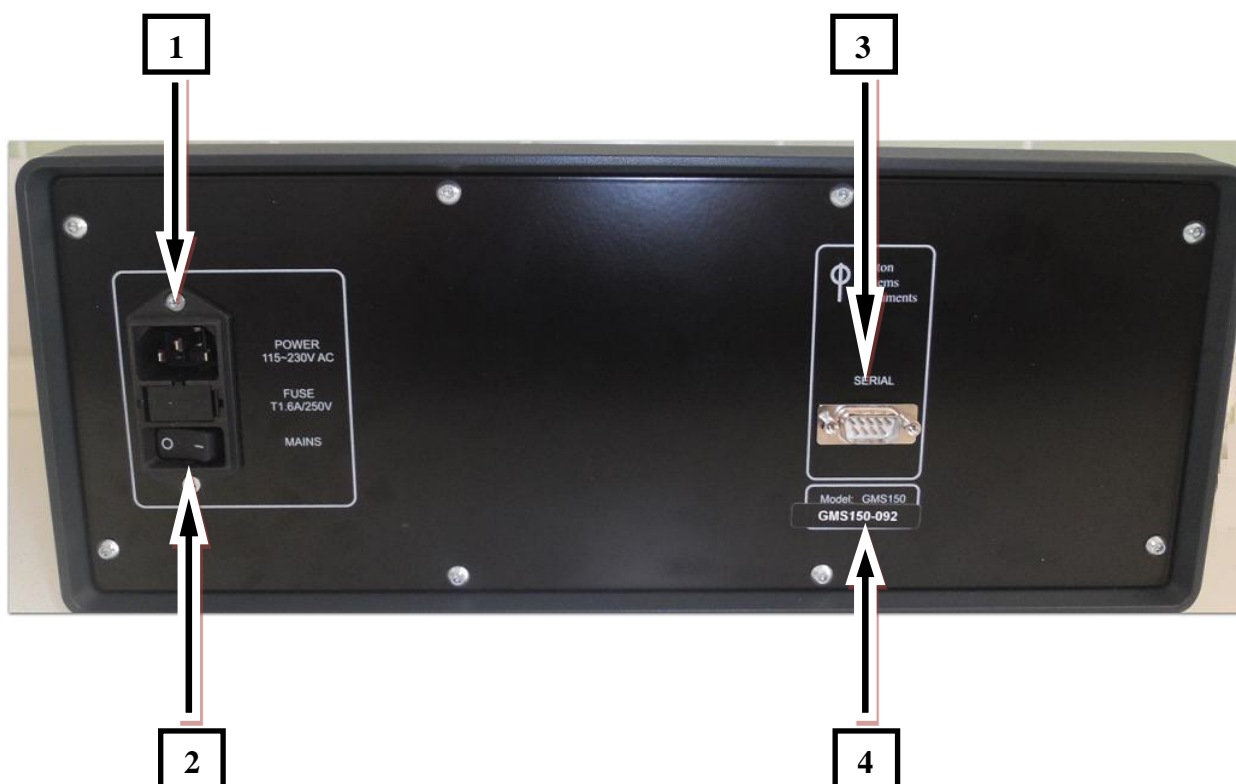


Fig. 4 Rear panel

- [1] – Power connector.
- [2] – ON/OFF Mains switch.
- [3] – Serial connector.
- [4] – Device serial number.

7 INSTALLATION

- Connect all peripheral units when the device is switched off.
- First connect all peripheral units (pumps, control valves), then switch on the device.
- Use Parker Prestolok tubing for gas inputs and gas output.
- Connect the GMS 150 with the gas sources and set the desired composition of the gas via the front panel display of the GMS 150. For detail instruction please go to chapter: 8.Operation
- Gas input pressure should be 3 – 5 bars. Gas input pressure cannot exceed 8 bars.

Note: If you want to remove Parker tubing from gas output or input, switch off device and hold the rim of connectors for save removal of the tubing.

If you want to use GMS 150 in system with Photobioreactor, Multi-Cultivator or FytoScope read instruction manual for these instruments for correct connection of the GMS with these devices.

IMPORTANT REMARK

It is necessary to avoid flooding of the GMS 150 valves. The warranty doesn't cover any damage of the valves caused by water or moisture. Please, pay attention to this fact as the cleaning, repair and recalibration of the valves are expensive and won't be covered by warranty.

It is recommended to place the GMS 150 on the shelf above the associated equipment (for example Photobioreactor, Multi-Cultivator) and to switch off and disconnect the GMS 150 from the cultivation devices while not working.

Example: Connection GMS 150 with Photobioreactor FMT 150 - Fig. 1

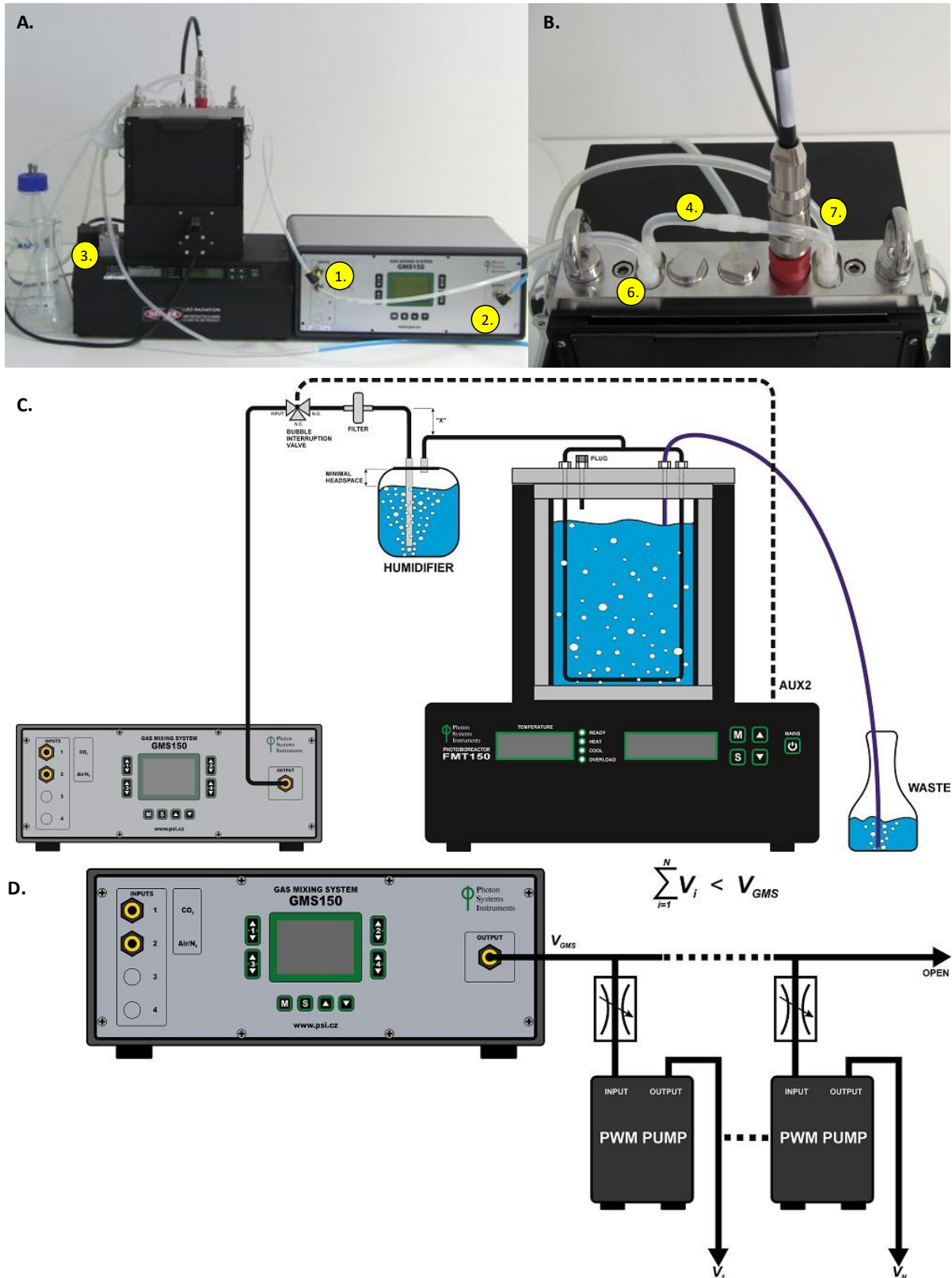


Fig. 5 GM system connection with the PBR FMT150.

A) Mixed gas of given composition (1) is pumped from GM System via (2) to the PBR FMT150 via air interruption valve (3). B) Vessel lid assembly. (4) Air distribution tube, (7) Medium outlet, (6) Sampling tube. C) Scheme for the connection of GM with PBR FMT150. D) Scheme for connecting more PBR FMT150 units to one GM System. V_i refers to air flow to one PBR unit. V_{GMS} refers to total air flow output of GM unit.

8 OPERATION

The device is operated and controlled via two different modes of the digital display:

1. **Display & Control Screen** – values for actual flow, target flow and output mixture flow of the gases are shown
2. **Setting Screen** - menu tree is shown

To change between these two modes:

- Use the “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**.
- Use the “M” key (below the digital display) to return from the **Setting Screen** to the **Display & Control Screen**.

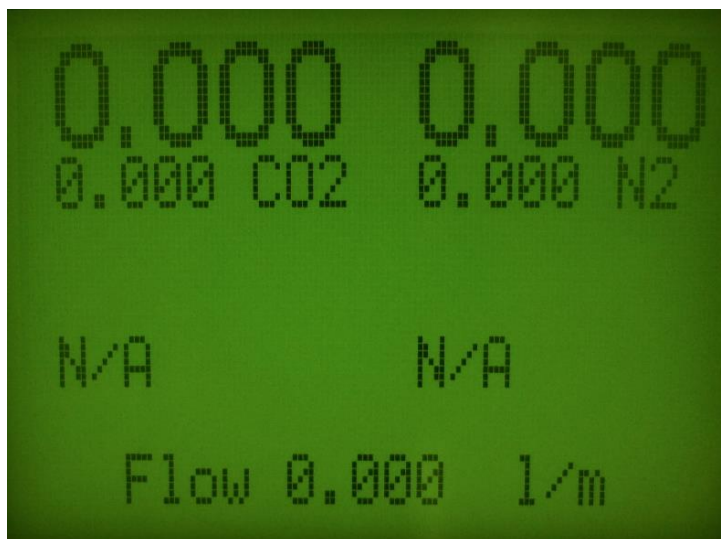


Fig. 6 Display & Control Screen

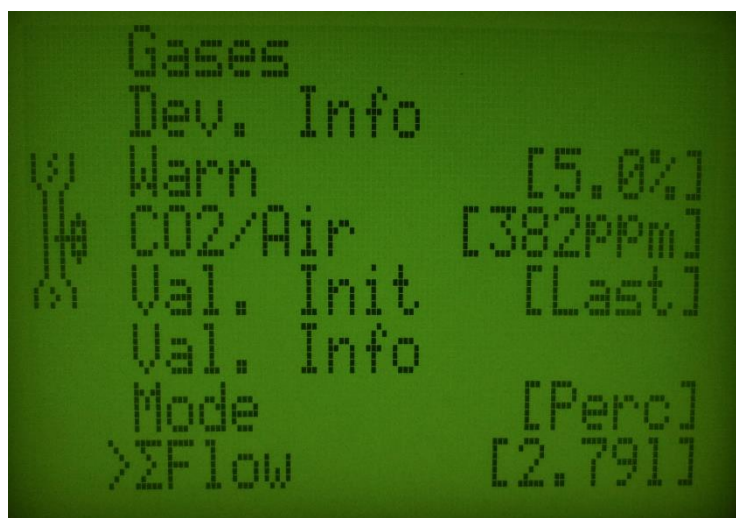


Fig. 7 Setting Screen

8.1 DISPLAY & CONTROL MENU SCREEN

- Use the “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**.
- Use the “M” key (below the digital display) to return from the **Setting Screen** to the **Display & Control Screen**.
- The Display & Control Screen shows the actual, current gas flow as well as the target flow values for each installed valve. These values can be displayed either in **absolute gas flow units** (ml/min or l_n/min) or in **relative units** (% or ppm) which specifies relative contents of the given gas in the output gas mixture.
- The **absolute** or **relative units** can be selected in the Setting Screen → Use the “S” key to **switch from Display & Control Screen** to the **Setting Screen**. Use **UP/DOWN** keys situated below the screen and select **Mode** in the menu tree. Use the “S” key again to switch between absolute mode a relative mode.
- The target values for the single valves are set by four “UP/DOWN” keys situated at both sides of the screen. The keys are used to change actual gas flow in corresponding valves (UP/DOWN = add/subtract). The keys are numbered 1 – 4 (see the picture below – Fig. 8).



Fig. 8 Four “UP/DOWN” keys

[1] – Four “UP/DOWN” keys on the right and left side of the screen.

Keys are used to change actual gas flow in corresponding valves.

(A) Display with Absolute Flow Units

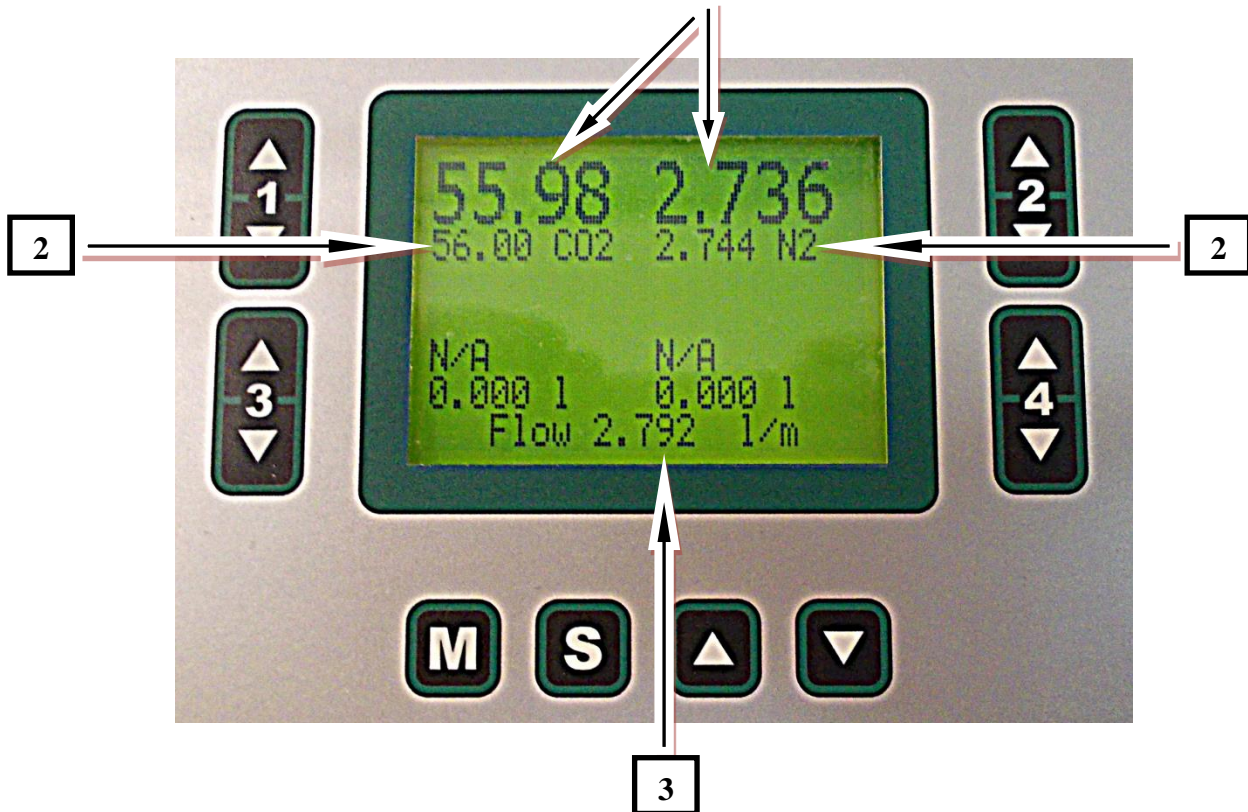


Fig. 9 Display with Absolute Flow Units

[1] – Values for Current Flow

- The current flow values for gases used are shown on the top of the display, on left side is usually current gas flow for CO₂, on the right side is usually current gas flow for Air/N₂ (Fig. 9).
- N/A means that this gas is not available.

Note: If the current value is different from the target value in range larger than set tolerance value (“Tol”.) the number of current gas flow is flickering. “Tol” is user-defined tolerance. You can set this tolerance value in menu → Press “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use ↑↓ keys for moving in menu and press “S” key on option **Warn**. Use ↑↓ keys to the required value (for example 10 %) a press “S” key to confirm.

[2] – Value for Target Flow

- The target flow value can be adjusted by using the corresponding “UP/DOWN” key (numbered 1, 2, 3, 4 on sides of display). The maximum setting range is limited by used valve (usually 2000 ml). Information about valve you can find in menu → Press “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use ↑↓ keys for moving in menu and press “S” key on option **Val. info**.
- The absolute gas flow units are either liters per minute (l/min) or milliliters per minute (ml/min). You cannot set the flow rate below 2 % of maximum valve.

- In some Gas Mixing Units, the valve control keys on the front panel are not labelled with the particular gas type. Instead, labels Valve 1 – 4 are used and gas type can be shown on display (see the picture below, Fig. 10). To display the gas type on the screen → Press “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use \updownarrow keys for moving in menu and press “S” key on option **Gases** → **ValveX**.
- **Warning: The mass flow meters are calibrated for a particular gas type. The reading may be incorrect if a different, non-compatible gas is used.**

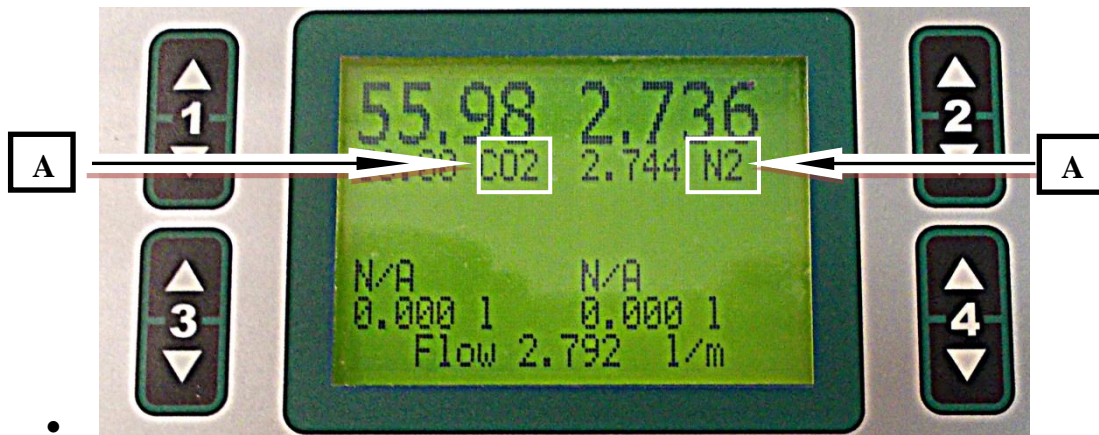


Fig. 10 Gas Type

[A] – Gas Type on display

[3] – Output Mixture Flow

- It shows absolute air flow on the valves used. The absolute target flow is computed as a sum of flow on each individual valve (Fig. 9).

Example from Fig. 9 – 56 ml/min of CO₂ + 2736 ml/min N₂ = 2792 ml/min = 2,792 l/min.

(B) Display with Relative Gas Flow Units

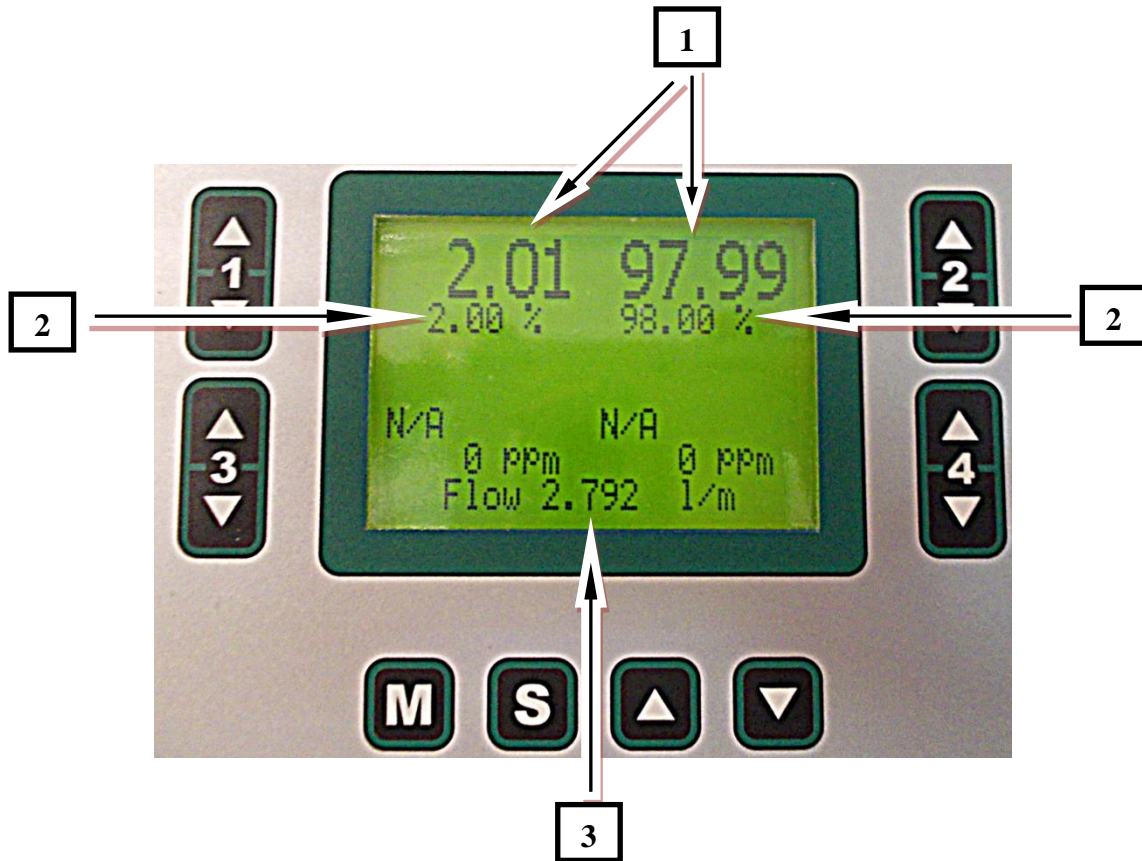


Fig. 11 Display with Relative Gas Flow Units

[1] – Current Relative Content

- The current flow values for gases used are shown on the top of the display, on left side is usually current gas flow for CO₂, on the right side is usually current gas flow for Air/N₂. (Fig. 11)
- N/A means that this gas is not available.

Note: If the current value is different from the target value in range larger than set tolerance value (“*Tol*.”) the number of current gas flow is flickering. “*Tol*” is user-defined tolerance. You can set this tolerance value in menu → Press “**S**” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use “**UP/DOWN**” keys for moving in menu and press “**S**” key on option **Warn**. Use “**UP/DOWN**” keys to set the required value (for example 10 %) a press “**S**” key to confirm.

[2] – Target Relative Content

- The target flow value can be adjusted by using the corresponding “**UP/DOWN**” key (numbered 1, 2, 3, 4 on sides of display). The maximum setting range is limited by used valve (usually 2 l). Information about valve you can find in menu → Press “**S**” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use “**UP/DOWN**” keys for moving in menu and press “**S**” key on option **Val. Info**.

- The relative gas content units are either parts per million (ppm) or percents (%). Sum of percent has to be 100 % (for example 2 % CO₂ and 98 % Air). You cannot set the ratio, which corresponds to the minimal flow rate to 2 % of maximum valve – an error message appears (see picture below Fig. 12).

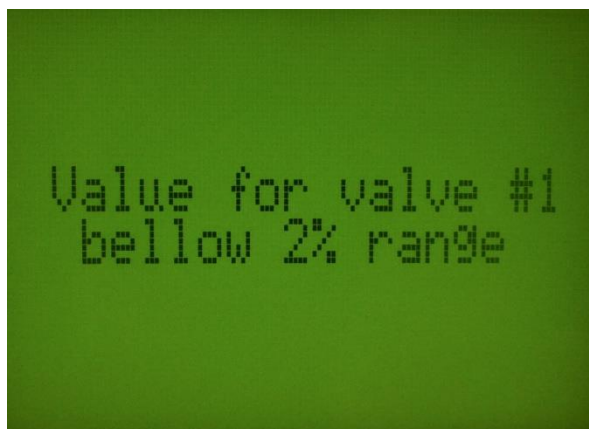


Fig. 12 Error Message

- In some Gas Mixing Units, the valve control keys on the front panel are not labeled with the particular gas type. Instead, labels Valve 1 – 4 are used and the gas type can be shown on display (see the above picture). Displaying the gas type can be achieved through the Setting Screen → Gases option → ValveX.
- **Warning: The mass flow meters are calibrated for a particular gas type. The reading may be incorrect if another gas is used.**

[3] – Output Mixture Flow

The total flow of the gas mixture is determined by the instrument so that the relative gas content is adjusted with a maximum accuracy. The user can optimize gas mixture flow using the Setting Screen → Press “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use “UP/DOWN” keys for moving in menu and press “S” key on option **ΣFlow**. Use “UP/DOWN” keys to set the required value (for example 2,792 l/min – see Fig. 18) a press “S” key to confirm. This function is available only for Relative Gas Flow Units (not for Absolute Gas Flow Units)

- If the gas flow is too low (for example blocked tubes or source of gas is empty) the display shows an exclamation mark ! (see picture below Fig. 13) Be aware that in this case optimal gas mixing precision cannot be granted!

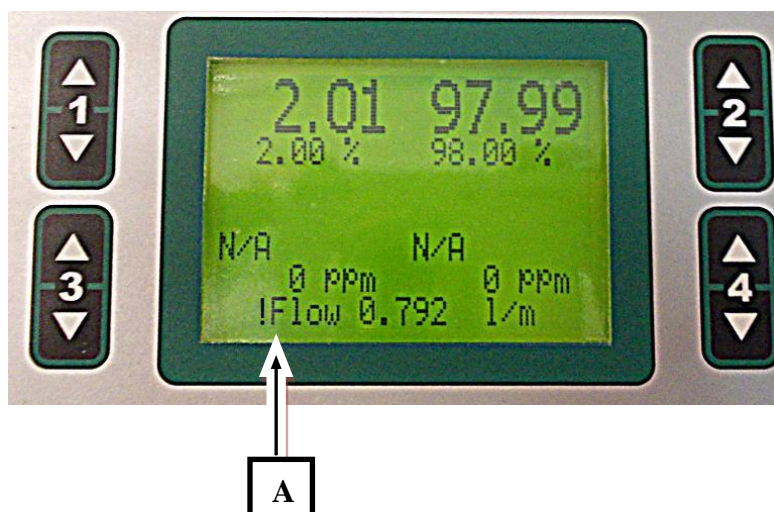


Fig. 13 Exclamation mark

[A] – Exclamation mark – total gas flow is too low

IMPORTANT REMARKS:

- The relative content of CO₂ in the output mixture is set as described above when mixed with N₂. However, when CO₂ is added to air that contains, for example, 380 ppm of CO₂, the target value is added to the offset of 380 ppm. The offset CO₂ concentration in the air can vary depending on the air source and, also, some of the air sources can have changing CO₂ content, e.g., during the day and night.
- The correction for the CO₂ concentration in the air can also be done automatically by the GMS 150 provided that the user specifies the local CO₂ level in the Setting Screen → CO₂/Air.

8.2 SETTING MENU SCREEN

- Use the “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**.
- Use the “M” key (below the digital display) to return from the **Setting Screen** to the **Display & Control Screen**.
- **The Setting Screen** is operated by the “M”, “S” and “UP/DOWN” keys situated below the screen (see the picture below, Fig. 15).
- “M” key: Use it to move back in the main menu (shown and explained on page 24) or to exit.
- “S” key: Use it to confirm change in the menu tree or to save the selected value (parameter).
- “UP/DOWN” key: Use it to add/subtract the desired value or to move up/down in the menu tree.

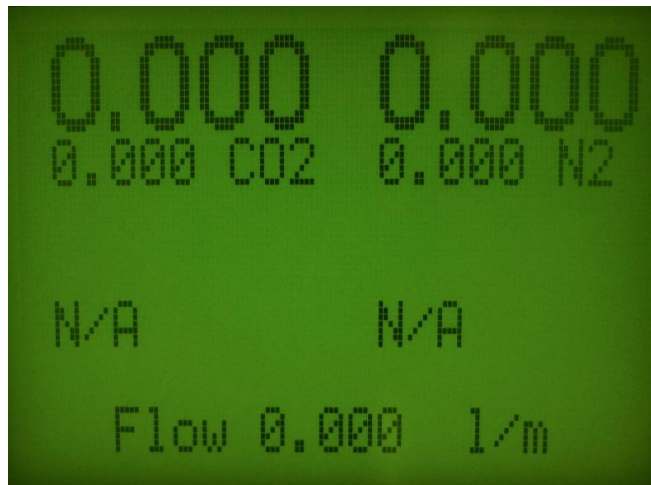


Fig. 13 Display & Control Screen

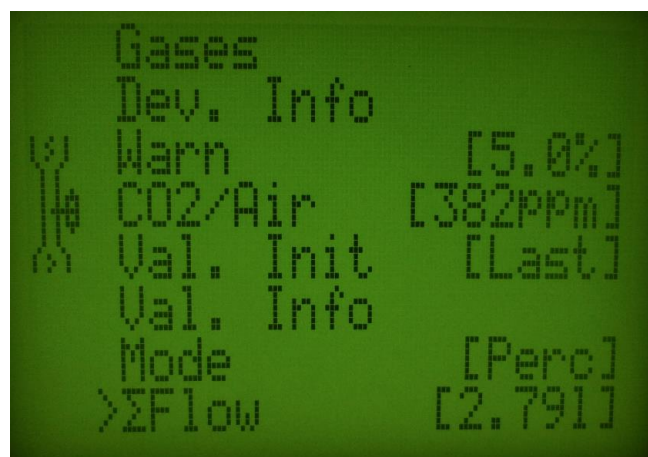


Fig. 14 Setting Screen (Main menu)



Fig. 15 Keys for operation with Menu

The Setting Screen is operated by the “M”, “S” and “UP/DOWN” keys situated below the screen.

EXPLANATION OF THE MENU TREE (Fig. 19):

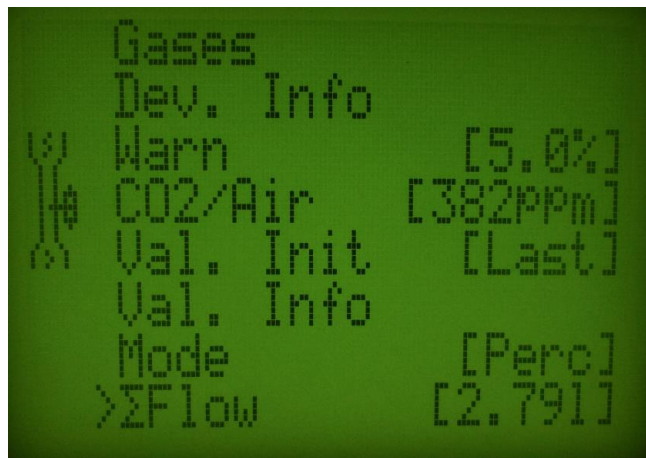


Fig. 16 Percent flow mode

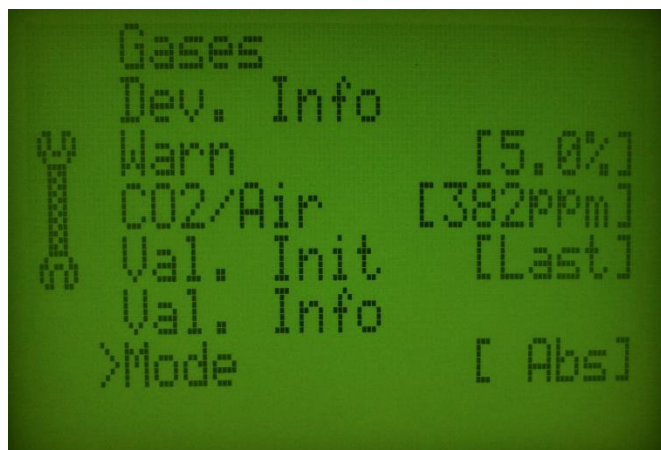


Fig. 17 Absolute mode

Gases > ValveX

Use this option to change the gas type for selected valve. Only compatible gases are shown in selection. Usually you see valve 1 (CO₂) and valve 2 (Air).

Dev.Info

This option specifies the device type, firmware version, firmware date, name and build number. Press **"S"** key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use **"UP/DOWN"** keys for moving in menu and press **"S"** key on option **Device info**.

Example:	Device type
	GMS 150
	FW version
	1.0.2.3
	FW Date
	March 14, 2014
	Build Nr
	842
	Device name
	GMS Lab
	Device ID
	1073741824

Warn

Use this option to set tolerance range (tolerated difference between the target and actual values). Use **"UP/DOWN"** key to set the required value. If the current value is different from the target value in range larger than set tolerance value ("*Tol*".) the number of current gas flow is flickering. "*Tol*" is user-defined tolerance. You can set this tolerance value in menu → Press **"S"** key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use **"UP/DOWN"** keys for moving in menu and press **"S"** key on option **Warn**. Use **"UP/DOWN"** keys to the required value (for example 10 %) a press **"S"** key to confirm.

CO₂/Air

Use this option to define the CO₂ concentration in air source used for the CO₂/air gas mixture. Press **"S"** key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use **"UP/DOWN"** keys for moving in menu and press **"S"** key on option **CO₂/Air**. Use **"UP/DOWN"** key to set the required CO₂ concentration and hold **"S"** key to confirm.

Val. Init.

Use this option to specify whether valves are initialized to last known target flow or shut (zero flow). Use **"UP/DOWN"** key to set the **LAST** or **SHUT** option and confirm by **"S"** key.

Val. Info

This option displays information about the installed valves (number of input, condition, valve type, maximum flow).

Example: Valve info:

NR	Cond.	Type	Max
1	Ok	CO2	400.0 ml
2	Ok	N2	20.0 l
3	N/A		
4	N/A		

Mode

This option is used to switch between **absolute** and **percent** flow mode. Press “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use “UP/DOWN” keys for moving in menu and press “S” key on option **Mode**. Use “UP/DOWN” key to set the absolute or relative mode and press “S” key to confirm.

ΣFlow

This option is active only when the relative mode for gas mixture flow is used. It is used to modify the **total output flow** of the gas mixture. The user can optimize gas mixture flow using the **Setting Screen** → Press “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use “UP/DOWN” keys for moving in menu and press “S” key on option **ΣFlow**. Use “UP/DOWN” keys to set the required flow value, and press “S” key to confirm. This function is available only for relative mode (not for absolute mode!). You cannot set the total output flow, which for some valve means < 2 % or > 100 % flow – error message appears (Fig. 12). During setting before value the exclamation mark appears (Fig. 18).

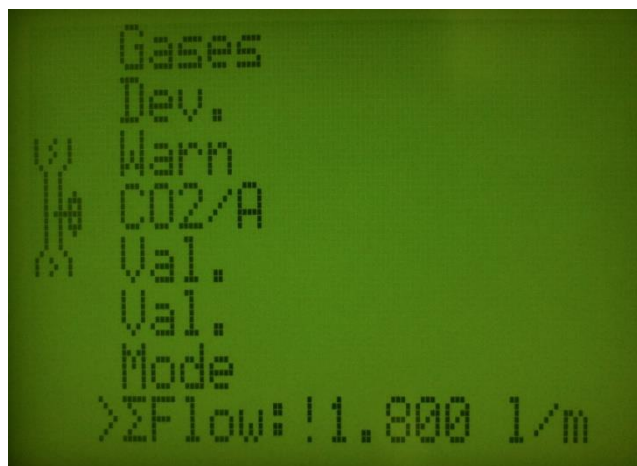


Fig. 18 Exclamation mark during setting the total output flow

Main Menu

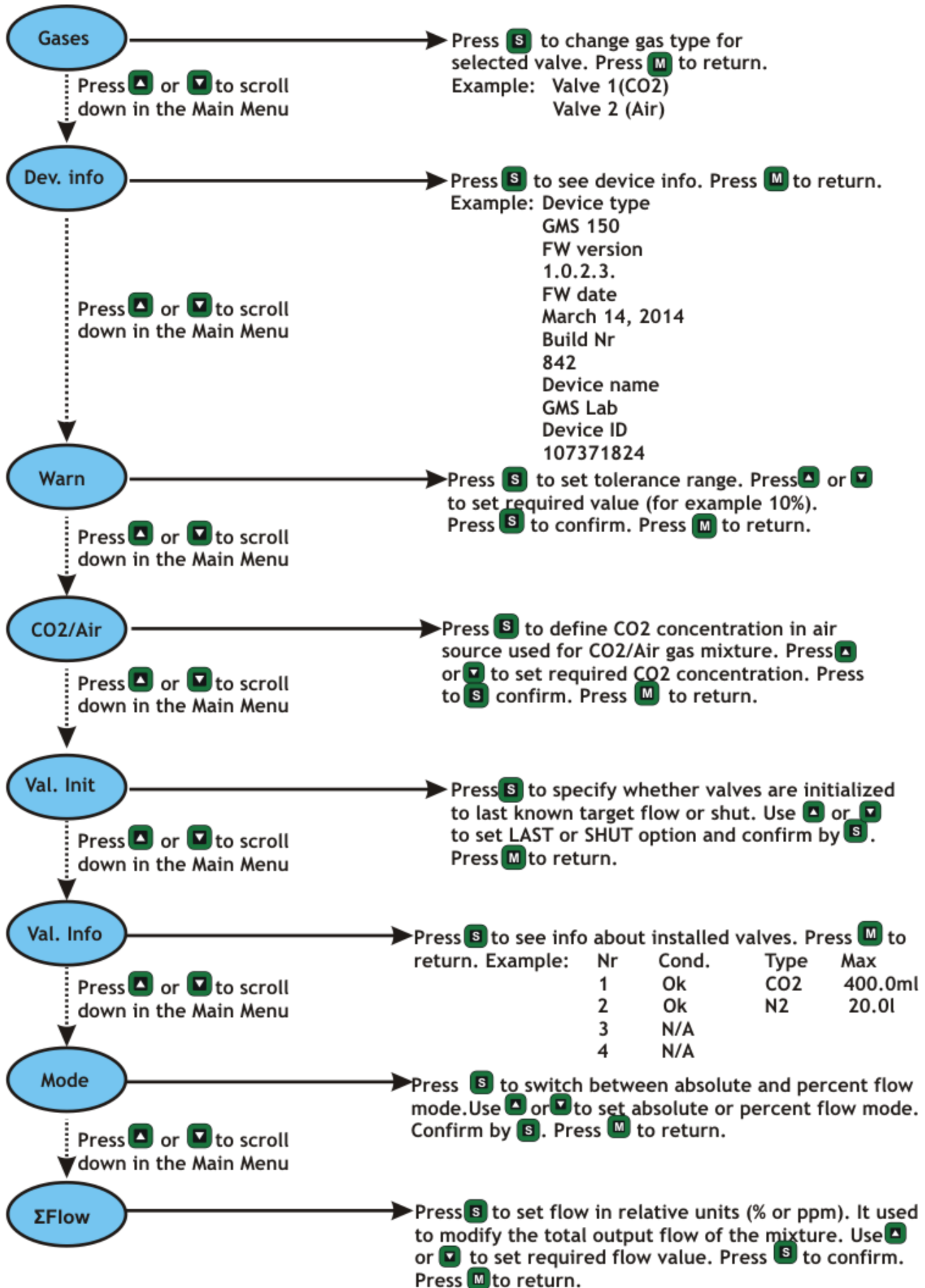


Fig. 19 Main Menu

9 QUICK GUIDE

9.1 HOW TO SET GMS 150 IN ABSOLUTE MODE

- Press “**S**” key to switch from the **Display & Control Screen** to the **Setting Screen**.
- Use “**UP/DOWN**” keys for moving in menu and press “**S**” key on option **Mode**. Use “**UP/DOWN**” key to set the **absolute mode** and press “**S**” key to confirm.
- Use the “**M**” key to return from the **Setting Screen** to the **Display & Control Screen**.
- The target values for the single valves are set by four “**UP/DOWN**” keys situated at both sides of the screen. The keys are used to change actual gas flow in corresponding valves (UP/DOWN = add/subtract). The keys are numbered 1 – 4 (see the picture below Fig. 20).

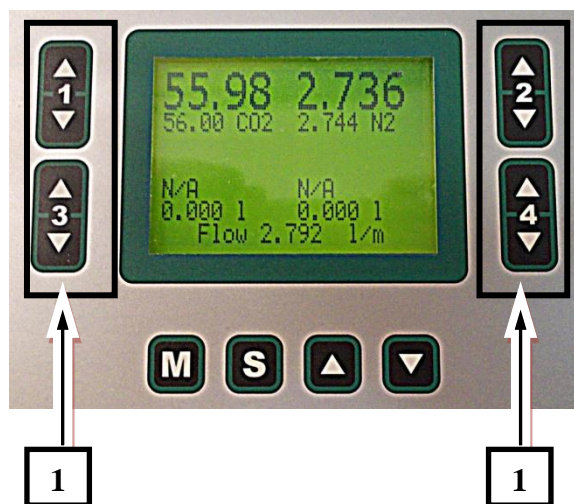


Fig. 20 Display Absolute Mode

[1] – Four “**UP/DOWN**” keys on the right and left side of the screen. Keys are used to change actual gas flow in corresponding valves.

Example from Fig. 20 –

Valve 1 – CO₂ – 56 ml/min

Valve 2 – N₂ – 2744 ml/min

The absolute target flow is computed as a sum of valves flow (Fig. 20).

55.98 ml/min of CO₂ + 2736 ml/min N₂ = 2792 ml/min = 2.792 l/min.

9.2 HOW TO SET GMS 150 IN RELATIVE MODE

- Press “S” key to switch from the **Display & Control Screen** to the **Setting Screen**.
- Use “UP/DOWN” keys for moving in menu and press “S” key on option **Mode**. Use “UP/DOWN” key to set the **relative (percent) mode** and press “S” key to confirm.
- Use the “M” key to return from the **Setting Screen** to the **Display & Control Screen**.
- The target values for the single valves are set by four “UP/DOWN” keys situated at both sides of the screen. The keys are used to change actual gas flow in corresponding valves (UP/DOWN = add/subtract). The keys are numbered 1 – 4 (see the picture below Fig. 21).
- The total flow of the gas mixture is determined by the instrument so that the relative gas content is adjusted with a maximum accuracy. The user can optimize gas mixture flow using the **Setting Screen** → Press “S” key (below the digital display) to switch from the **Display & Control Screen** to the **Setting Screen**. Use “UP/DOWN” keys for moving in menu and press “S” key on option Σ Flow. Use “UP/DOWN” keys to set the required value (for example 2,792 l/min – see Fig. 21) a press “S” key to confirm. This function is available only for Relative Gas Flow Units (not for Absolute Gas Flow Units)



Fig. 21 Display Relative Mode

[1] – Four “UP/DOWN” keys on the right and left side of the screen. Keys are used to change actual gas flow in corresponding valves. The relative gas content units are either parts per million (ppm) or percents (%). Sum of percent has to be 100 %.

Example from Fig. 21:

Valve 1 – CO₂ – 2 %

Valve 2 – 98 %

The flow is set in menu: 2792 ml/min

10 WARRANTY TERMS AND CONDITIONS

- This Limited Warranty applies only to the Gas Mixing System GMS 150. It is valid one year from the date of shipment.
- If at any time within this warranty period the instrument does not function as warranted, return it and the manufacturer will repair or replace it at no charge. The customer is responsible for shipping and insurance charges (for the full product value) to PSI. The manufacturer is responsible for shipping and insurance on return of the instrument to the customer.
- No warranty will apply to any instrument that has been (i) modified, altered, or repaired by persons unauthorized by the manufacturer; (ii) subjected to misuse, negligence, or accident; (iii) connected, installed, adjusted, or used otherwise than in accordance with the instructions supplied by the manufacturer.
- The warranty is return-to-base only, and does not include on-site repair charges such as labor, travel, or other expenses associated with the repair or installation of replacement parts at the customer's site.
- The manufacturer repairs or replaces faulty instruments as quickly as possible; the maximum time is one month.
- The manufacturer will keep spare parts or their adequate substitutes for a period of at least five years.
- Returned instruments must be packaged sufficiently so as not to assume any transit damage. If damage is caused due to insufficient packaging, the instrument will be treated as an out-of-warranty repair and charged as such.
- PSI also offers out-of-warranty repairs. These are usually returned to the customer on a cash-on-delivery basis.
- *Wear & Tear Items* (such as sealing, tubing, padding, etc.) are excluded from this warranty. The term *Wear & Tear* denotes the damage that naturally and inevitably occurs as a result of normal use or aging even when an item is used competently and with care and proper maintenance.

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12 TROUBLESHOOTING AND CUSTOMER SUPPORT

In case of troubles and for customer support, please, write to support@psi.cz or contact your local distributor.