



# Gas Mixing System GMS 150

**Gas Mixing System GMS 150** can produce precise mixtures of up to 4 different gases. 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.

GMS 150 is typically used to control flow of air, carbon dioxide, and nitrogen. Additional gases like nitrogen dioxide, carbon monoxide, methane, ammonia, helium and others can also be added to simulate various technological mixtures or smokestack gases.

GMS 150 mass flow meters and controllers can operate gas flows ranging from 1 ml/min to 1,000 l/min. Flow ranges are controllable from 2 % to 100 % of total flow value. The controllers of GMS 150 can be calibrated on maximum flow range according to customer requirements.

GMS 150 can be used as a stand-alone instrument and operated locally via front panel display. The required gas mixture can be defined either by setting the absolute flows of individual gasses (e.g. 980 ml/min of air and 20 ml/min of

CO<sub>2</sub>) or by setting the required relative composition of the final gas mixture (2 % CO<sub>2</sub> in air) and the total gas flow (1,000 ml/min).

GMS 150 can also be coupled with the PSI Photobioreactors, Multi-Cultivators, or FytoScopes. Standard version of the device designed for laboratory scale systems (PBR FMT 150 and MC-1000-OD) enables the maximum total flow of 2 l/min and maximum CO<sub>2</sub> flow rate 40 ml/min. The typical GMS version designed for large-scale facilities (e.g. PSI large-scale Photobioreactors and FytoScopes) allows the maximum total flow 20 l/min for channel 1 and 400 ml/min for channel 2.

Newly, PSI introduces Gas Mixing System GMS 150-MICRO - friendly-priced basic version of the GMS 150. It retains all features of the GMS 150 and the major difference is the limited choice of gas flow meters restricted to

maximum total flow of 5 l/min and lower accuracy of mixing.

Standard version of the GMS 150-MICRO is equipped with two channels (channel 1 for Air-N<sub>2</sub>; channel 2 for CO<sub>2</sub>); the maximum total flow is 2 l/min (channel 1), flow rate of channel 2...40 ml/min. Optionally the system can be upgraded to four channels version according to customer requirements. Preferably, the GMS 150-MICRO is intended for use with Multi-Cultivators and standard laboratory versions of Photobioreactors (FMT 150/400 and FMT 150/1000).

## KEY FEATURES

- Automatic mixing of up to 4 gases
- Independent regulation of each gas component
- High accuracy for generating precise gas mixtures
- Rapid gas blending to generate homogeneous mixtures
- Operation in two modes:
  - absolute mode: defined as absolute flows of individual gases
  - relative mode: defined as relative gas concentration in % and total flow of a mixture
- Short target gas value setting time

## APPLICATIONS

- Research and industry
- Algae biotechnology
- Mixing of gases for analytical research
- Preparation of gas mixtures for production purposes

## ▼ TECHNICAL SPECIFICATION OF GMS 150

- **Measuring Principle:** Thermal mass flow measurement
- **Accuracy (Incl. Linearity):**  $\pm 0.5\%$  Rd plus  $\pm 0.1\%$  FS ( $\pm 1\%$  FS for ranges 3–5 ml/min;  $\pm 2\%$  FS for ranges < 3 ml/min)
- **Minimum Possible Flow for Each Channel:** 2% of total flow
- **Flow Ranges:** min. 0.02–1 ml/min / max. 20–1,000 l/min (maximum flow range of controllers calibrated according to customer requirements)
- **Media:** Dry, clean, non-explosive and non-corrosive gasses
- **Control Stability:**  $< \pm 0.1\%$  FS (typical for 1 l/min  $N_2$ )
- **Setting Time:** 1–2 seconds
- **Warm-Up Time:** 30 min for optimum accuracy, 2 min for accuracy  $\pm 2\%$  FS
- **Temperature Sensitivity:** zero:  $< 0.05\%$  FS/ $^{\circ}C$ ; span:  $< 0.05\%$  FS/ $^{\circ}C$
- **Pressure Sensitivity:** 0.1%/bar typical  $N_2$
- **Attitude Sensitivity:** max. error at  $90^{\circ}$  off horizontal 0.2 % at 1 bar, typical  $N_2$
- **Input Pressure:** 3 bar–5 bar
- **Operating Temperature:** 15–50  $^{\circ}C$
- **Input / Output Connectors:** Parker Prestolok (6 mm)
- **Seals:** Viton
- **Display:** 8×21 characters LC display
- **Dimension:** 37×28×15 cm
- **Weight:** 7 kg
- **Power Supply:** 115–230 VAC

## ▼ TECHNICAL SPECIFICATION OF GMS 150 MICRO

- **Measuring Principle:** Thermal mass flow measurement
- **Accuracy (Incl. Linearity):**  $\pm 1.5\%$  Rd plus  $\pm 0.5\%$  FS
- **Minimum Possible Flow for Each Channel:** 2 % of total flow
- **Flow Ranges:** min. 0.2–10 ml/min max. 0.1–5 l/min (maximum flow range of controllers calibrated according to customer requirements)
- **Media:** Dry, clean, non-explosive and non-corrosive gasses
- **Repeatability:** For flows  $< 20$  ml/min:  $\pm 0.5\%$  FS; for flows  $> 20$  ml/min:  $\pm 0.5\%$  RD
- **Setting Time:** 1 second
- **Temperature Sensitivity:** zero:  $< 0.01\%$  FS/ $^{\circ}C$ ; span:  $< 0.02\%$  FS/ $^{\circ}C$
- **Attitude Sensitivity:** max. error at  $90^{\circ}$  off horizontal 0.5 % at 1 bar, typical  $N_2$
- **Input Pressure:** 3...5 bar (maximum operation pressure 8 bar)
- **Operating Temperature:** 15 - 30  $^{\circ}C$
- **Input / Output Connectors:** Parker Prestolok (6 mm)
- **Seals:** Viton
- **Display:** 8×21 characters LC display
- **Dimension:** 37 cm×28 cm×5 cm
- **Weight:** 5 kg
- **Power Supply:** 115...230 VAC

## ▼ REFERENCES

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