

NORECS AS Gaustadalleen 21 NO-0349 Oslo Norway

# HumiStat – gas mixer and humidifier

**HumiStat** mixer is small-footprint laboratory gas mixer with large dynamic mixing range and dynamic humidification of gas or gas mixture.

This mixer is suitable for low-flow laboratory use such as materials science and button fuel cell research, where large dynamic dilution range, accuracy, and automated stepprograms are important.

Accompanying software is simple and guides the user step-by-step through the definition of mixtures and describes the mixture in all typical units.

#### Highlights:

- HumiStat has fully continuous, truly dynamic range, allowing accurate dilutions all the way from 2<sup>.</sup>10<sup>-5</sup> (20 ppm) to 100%.

- Continuous range of water vapour levels from bottle dry gas to pure steam.

- The mixer is not limited only to  $H_2O$  as the evaporating fluid.

- The operating cycle is perpetual; gas mixture production can run while more water (or other fluid) is being added.

- Flow of the gases are typically < 100  $\mbox{ml}_{n}/\mbox{min}$ , but can be adjusted per request.

- Control pH<sub>2</sub>O independent of pO<sub>2</sub>.



#### **Specifications:**

- \* Dynamic mixing of two input gases and one input fluid.
- \* Each mass flow controller can hold up to 10 gas calibrations.
- \* Fluid refill during continuous operation.
- \* Suitable for 0-100% absolute humidity of gas 100 ml<sub>n</sub>/min, atmospheric pressure.
- \* Partial pressures are calculated from input amounts.
- High performance input gas controllers, accuracy 0.3% full scale & 0.5% Measured value, real gas calibrated.
- \* High performance input fluid pump, accuracy 0.4% pumped volume. Pump resolution 0.26 nL.
- \* Control through customer PC; software & USB cable are included.
- \* PID-regulated gas line heating for 1.2 m gas line, up to 150°C Standard model is for near atmospheric pressures, but it can be customized to operate up to 8 bars on request.
- \* Including power supply.
- \* Available gas calibrations: Air, Ar, C<sub>3</sub>H<sub>8</sub>, CH<sub>4</sub>, CO<sub>2</sub>, D<sub>2</sub>, H<sub>2</sub>, He, Kr, N<sub>2</sub>, O<sub>2</sub>. With reservations: C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>6</sub>, C<sub>4</sub>H<sub>10</sub>, CHClF<sub>2</sub>, CF<sub>4</sub>, CO, N<sub>2</sub>O, Ne, SF<sub>6</sub>, Xe, i-C<sub>4</sub>H<sub>10</sub>



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rating,	step: 1/	2, time le
A-component: Air	Operation	Mixture under design Mixture being sent Performance log Pump log
Minimum	Once satisfied with the mixture design, start the pump here	Machine recipe CON24:0:Air bottled 0.000 020 g/min pulsed: 3.7 % CON21:1:Argon 0.089 742 g/min
Flow ug/min 20 = 0.000 02 g/min	Start with current design	
- order of Start	Stop	Components Argon 39.948 g/mol
8-component: Ar		Oxygen 31.999 g/mol Nitrogen 20.013 g/mol
Minimum Maximum Maximum	Segment program 1 Flush 1h 00 mm 0:13351 1:54438 2 Law content 1 1h 30 mm 0:13351 1:19135	Flow Ar gram/min: 0.089 742 (100.0%) Oz gram/min: 0.000 005 (0.0%) M2 gram/min: 0.000 015 (0.0%)
Flow µg/min 89742 = 0.089 742 g/min		
C-component: Pure water		Total gram/min: 0.089 762
Minimum		mln/min: 50.4 ( 0°C, 1013.25 mBar) ml/min: 59.6 ( 50°C, 1013.25 mBar) ml/min: 69.8 (100°C, 1013.25 mBar) ml/min: 79.0 ( 150°C, 1013.25 mBar)
Flow 0 ualmin		Concentration
the particular		Ar mol/min: 0.002 246 ( 999 692 ppm)
Achievable 0 µg/min Pump command: /IT		02 mnl/min: 0.000 000 ( 64 ppm) N2 mol/min: 0.000 001 ( 244 ppm)
Provide and a second seco		
Duration 1.5 Hours		
Comments Low content 1		
Add or Save Segment		
Delete last Segment		
	All flow will automatically stop after the last segment duration	

## Software mixture design

User sets desired amount of components A, B and C, and duration for single segment. Mixture composition as mass, partial pressure and normalized volume are also shown.

### Front side

- A To be diluted gas
- B Diluting gas
- C Fluid

PID controller to set heated gas line temperature. Current temperature (23°C) in green, setpoint (0°C) in orange.



## Back side

- OUT Connection for heated gas line
- TCK Thermocouple from heated gas line
- HEAT Power outlet for heated gas line, 24 VDC.
- USB Connection from computer or master mixer
- DCIN Main power in, 24 VDC.

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