

## Vaisala CARBOCAP® Carbon Dioxide Probe GMP231 for CO<sub>2</sub> Incubators



*The Vaisala CARBOCAP® Carbon Dioxide Probe GMP231 withstands high temperature sterilization.*

The Vaisala CARBOCAP® Carbon Dioxide Probe GMP231 is designed to provide incubator manufacturers with accurate and reliable carbon dioxide measurements and sterilization durability at high temperatures. The probe is based on Vaisala's patented CARBOCAP® technology and a new type of infrared (IR) light source. These technologies allow for sterilization temperatures of up to 180 °C, enabling easier and more complete sterilization without the risk of cross contamination.

The probe is installed through the incubator wall, ensuring that only the IR sensor and optical components are exposed to the incubation environment. This allows the incubator to be sterilized with the

probe in place, removing the need to decontaminate the probe separately. This saves time and reduces the risk of contamination.

The probe's sensor performance is optimized at 5 % CO<sub>2</sub> but the sensor measures CO<sub>2</sub> up to 20 % with high accuracy. In addition, the GMP231 can measure pressure and temperature for CO<sub>2</sub> measurement compensation purposes, ensuring the product remains stable and accurate in all CO<sub>2</sub> incubation conditions. The sensor is made of highly durable materials to achieve outstanding stability over both time and temperature. Since water vapor, dust, and most chemicals do not affect measurements, the GMP231 module is ideal for CO<sub>2</sub> incubator environments.

### Features/Benefits

- Probe durable during heat sterilization up to +180 °C (+356 °F)
- Incubator can be sterilized with probe in place – saving time and reducing risk of cross-contamination
- Heat durability and superior long-term stability with next generation CARBOCAP® sensor
- Designed for OEM use in CO<sub>2</sub> incubators – installation options available
- CO<sub>2</sub> sensor measurement optimized for 5 %CO<sub>2</sub>, measurement range up to 20 %CO<sub>2</sub>
- 4-point NIST traceable calibration (certificate included) for CO<sub>2</sub>
- Internal pressure and temperature measurement improves accuracy and stability
- Full temperature and pressure compensations available
- Sensor head heating for condensation prevention

# Technical Data

## Performance

Measurement range	0 ... 20 %CO <sub>2</sub>
Accuracy at 37 °C, 1013 hPa:	
Repeatability at	
0 ... 8 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
8 ... 12 %CO <sub>2</sub>	±0.2 %CO <sub>2</sub>
12 ... 20 %CO <sub>2</sub>	±0.4 %CO <sub>2</sub>
Non-linearity at 0 ... 20 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
Calibration uncertainty at 5 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
Temperature dependence	
with compensation at	
3 ... 12 %CO <sub>2</sub> , 20 ... 60 °C	±0.1 %CO <sub>2</sub>
without compensation (typical)	-0.4 % of reading / °C
Pressure dependence	
with compensation at	
3 ... 12 %CO <sub>2</sub> , 700 ... 1100 hPa	±0.015 % of reading / hPa
without compensation (typical)	+0.15 % of reading / hPa
Humidity dependence	
with compensation at	
0 ... 20 %CO <sub>2</sub> , 0 ... 100 %RH	±0.9 % of reading (at 37 °C)
without compensation (typical)	+0.05 % of reading / %RH
O <sub>2</sub> dependence	
with compensation at	
0 ... 20 %CO <sub>2</sub> , 0 ... 90 %O <sub>2</sub>	±0.6 % of reading
without compensation (typical)	-0.08 % of reading / %O <sub>2</sub>
Start-up time	10 s
Warm-up time for full spec.	1 min
Response time	
T63	< 30 s
T90	< 50 s
Long-term stability	
0 ... 8 %CO <sub>2</sub>	<±0.2 %CO <sub>2</sub> / year
8 % ... 12 %CO <sub>2</sub>	<±0.5 %CO <sub>2</sub> / year
12 % ... 20 %CO <sub>2</sub>	<±1.0 %CO <sub>2</sub> / year

## Operating Environment

Operating temperature for CO <sub>2</sub> measurement	0 ... 70 °C
Max. temperature durability in standby-mode (sensor head only)	up to +195 °C
Heat sterilization +180 °C durability	at least 120 cycles
Storage temperature	-40 ... +75 °C
Pressure (compensated)	500 ... 1100 hPa
operating	<1500 hPa
Humidity	0 ... 100 %, non-condensing
Condensation prevention	sensor head heating, when power on

## Chemical tolerance

DMSO
IPA (70 % isopropyl alcohol, 30 % water)
H <sub>2</sub> O <sub>2</sub> (2000 ppm), non-condensing
Ethanol
Acetic acid

Electromagnetic compatibility EN61326-1, Generic Environment

## Inputs and Outputs

Operating voltage	11 ... 30 VDC
when analog output in use	20 ... 30 VDC
Digital outputs	I <sup>2</sup> C 5 V, RS-485 (2-wire with Vaisala industrial protocol)
Analog output	0 ... 20 mA (scalable) max. load 600 Ω
Power consumption	< 1 W (pulsed)

## Mechanics

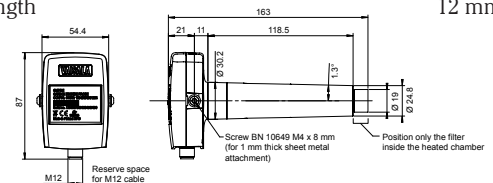
Probe housing material	
Housing	Metal coated plastic ABS+PC
Inner tube	Aluminum
Probe tube	PPSU
Filter	PTFE
Housing classifications	
sensor head	IP54
electronics housing	IP20
Connector	M12 / 8 pin
Weight	
probe (without cable)	150 g
probe (with cable)	200 g

## Accessories

M12 Connection Cable 0.9m w/ open ends	DRW240977SP
M12 Connection Cable 0.6m w/ Milli-Grid connector	ASM210903SP
Service cable for MI70	221801
Silicone plug	DRW240015SP
Attachment Bracket	DRW240247SP
PTFE filter	DRW240494SP
USB PC connection cable	221040
Calibration adapter for GMP231	239523

## Dimensions

Probe tube max. diameter	30.2 mm
Probe tube min. diameter	24.8 mm
Probe tube length	118.5 mm
Sensor filter diameter	19 mm
Sensor filter length	12 mm



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