

# CHILLGARD® M-100

## Refrigerant Sensor



Operating Manual



Order No.: 10086391/02

For the Declaration of Conformity, please visit the product page on ***MSAsafety.com***.

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## 1. Safety Regulations

### 1.1. Correct Use

MSA's CHILLGARD® M-100 Refrigerant Sensor – hereinafter referred to as sensor – is designed to detect the present of the most common halogenated refrigerants in cold storage facilities, mechanical equipment rooms and other refrigerant applications.

It is imperative that this operating manual be read and observed when using the sensor. In particular, the safety instructions, as well as the information for the use and operation of the apparatus, must be carefully read and observed. Furthermore, the national regulations applicable in the user's country must be taken into account for a safe use.



#### **Danger!**

This product is supporting life and health. Inappropriate use, maintenance or servicing may affect the function of the device and thereby seriously compromise the user's life.

Before use, the product operability must be verified. The product must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been made, genuine MSA spare parts have not been used.

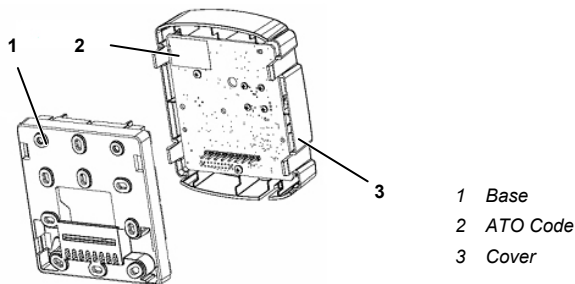
Alternative use, or use outside this specification will be considered as non-compliance. This also applies especially to unauthorised alterations to the apparatus and to commissioning work that has not been carried out by MSA or authorised persons.

### 1.2. Liability Information

MSA accepts no liability in cases where the product has been used inappropriately or not as intended. The selection and use of the product are the exclusive responsibility of the individual operator.

Product liability claims, warranties also as guarantees made by MSA with respect to the product are voided, if it is not used, serviced or maintained in accordance with the instructions in this manual.

## 2. Description



**Fig. 1 Sensor Base and Cover**

Check the label provided on the printed circuit board (→ Fig. 1) to identify the assemble to order (ATO) code.



**ATTENTION!**

The sensor is set at the factory to detect only one defined type of gases (→ ATO code).  
This setting can not be changed during use.

The sensor is available with a number of options including:

- Refrigerant gas detected
- Temperature and Relative Humidity sensors
- Output – current or voltage analogue output or RS-485 ModBUS digital output
- De-icer option – for low temperature applications.

### 2.1. Locating the Sensor

Proper sensor location is necessary to ensure accurate measurement of representative air samples.

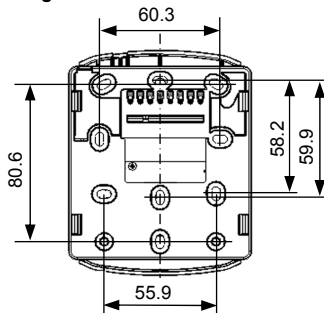
**Locate** the sensor:

- Indoors in a room area where air circulates freely
- On a flat, interior surface
- Approximately 30 - 45 cm from floor.

Do **not locate** the sensor:

- Near heat sources, such as appliances, direct sunlight or concealed pipes or chimneys
- On walls or structures subject to excessive vibration
- In areas where air does not circulate freely, such as behind doors or in corners.

### 2.2. Mounting the Sensor



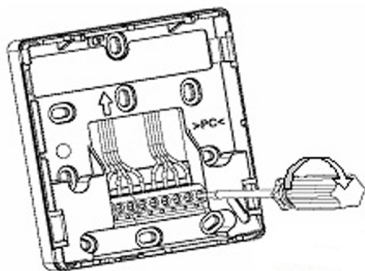
**Fig. 2 Installation Dimensions**

**WARNING!**

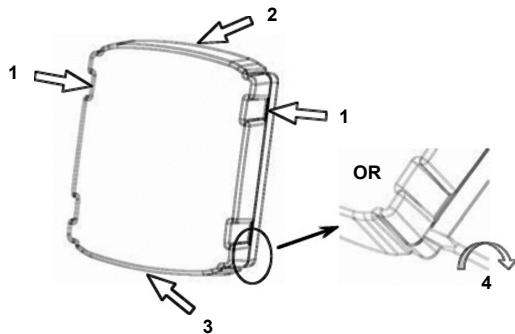
The unit must always be powered by either a suitable **UL 60950/CSA** Certified power supply which is isolated from line voltage by double insulation, or an appropriately rated UL listed/CSA Certified Class 2 transformer. Failure to follow the above can result in serious injury or loss of life.

The sensor consists of two basic parts, the base and the cover (→ Fig. 1). The cover incorporates the electronics with the sensing elements.

- (1) Mark four holes as shown in Fig. 2.
- (2) Drill holes of appropriate diameter for wall plugs.
- (3) Remove the cover from the base and
- (4) Attach base with screws of appropriate diameter.
- (5) Fasten the base to a junction box or other support.
  - The base has a number of openings to allow for mounting to various junction boxes.
- (6) Feed the power and signal wires through the rectangular opening in the base.
- (7) Connect the wires to the terminal connector located in the base, as indicated in Fig. 3.  
See also Wiring Connections in Fig. 5.
- (8) If RS-485 sensors are being tied into a control device, insert a two-position jumper into J6 on the sensor board that is wired farthest from the controller. This enables the RS-485 termination resistor.
- (9) Align the two side tabs of the cover with the base and snap the cover onto the base.
- (10) Verify cover is securely attached to base by pulling on the top and bottom of the cover as shown in Fig. 4.
  - To remove the cover, grasp it along the recesses and pull it away from the base (→ Fig. 4).
  - **Alternatively**, place a screwdriver into the slots indicated in Fig. 4 and twist.



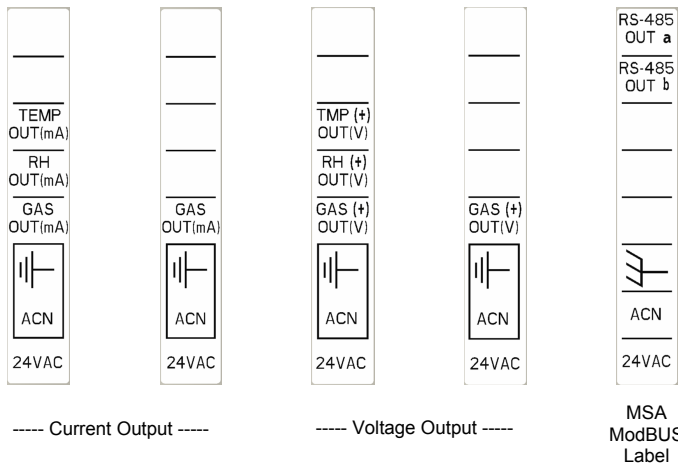
**Fig. 3 Connecting Wires to Terminal Connector**





**Fig. 4 Attaching or Removing the Cover**

- (1) Grasp here to release (4 places)
- (2) Pull on top to verify attachment
- (3) Pull on bottom to verify attachment
- (4) Twist to release (4 places)





**Fig. 5 Wiring Connections**

24 VAC	24 V AC line or 24 V DC+
ACN	24 V AC Neutral 24 V DC-
	Circuit common/analog signal reference (internally tied to ACN)
	Earth ground (tie to user earth connection)
Gas out (mA)	Gas reading as current (4 – 20 mA = 0 – 1000 ppm)
Gas (+) out (V)	Gas reading as voltage (2 – 10 V = 0 – 1000 ppm)
RH out (mA)	Relative humidity as current (4 – 20 mA = 0 – 100 % RH)
RH (+) out (V)	Relative humidity as voltage (2 – 10 V = 0 – 100 % RH)
Temp out (mA)	Temperature as current (4 – 20 mA = -30 °C to +70 °C)
Temp (+) out (v)	Temperature as voltage (2 – 10 V = -30 °C to +70 °C)
RS-485 out b	RS-485 ModBUS (b)
RS-485 out a	RS-485 ModBUS (a)

### 3. Calibration

#### 3.1. Calibration Check

The sensor is designed to operate for long periods of time with no zero drift. However, the sensor should be checked periodically to verify that the unit detects refrigerant gas. The calibration check can be done with the use of the following MSA equipment:

- (P/N 603806) Polyurethane Tubing
- (P/N 467896) 1.5 LPM regulator.

A calibration check of the sensor requires a supply of:

- ZERO GAS (air or nitrogen) - Ambient air may be used if it does not contain refrigerant gas or an interfering component
- SPAN GAS Cylinder comprised of 100 ppm of the refrigerant gas of interest.

#### 3.2. Calibration Gases

Description	Concentration
R-123 in Nitrogen	100 ppm
R-134a in Nitrogen	100 ppm
R-22 in Nitrogen	100 ppm
R-404a in Nitrogen	100 ppm

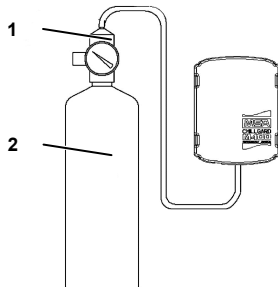
## 3.3. Calibration Procedure

**CAUTION!**

If any control instruments connected sensor are wired to external devices (e.g., horns, exhaust fans, and fire suppression systems), these devices may activate during the following procedures. To prevent activating these devices while adjusting the sensor, disconnect the wiring to the control device. Return all wiring to the control device when the calibration procedure is completed.

To verify that the sensor is operating properly:

- (1) Deactivate any equipment connected to the outputs, or disconnect the wiring of the outputs.
- (2) With the tubing connected to the regulator and cylinder, place tubing in the opening at the bottom of the sensor (→ Fig. 6).
- (3) Open the regulator and apply gas for a minimum of five minutes.
- (4) If the unit is operating properly, the red LED:
  - illuminates when concentration level is > 50 ppm
  - is visible through the calibration check opening.
- (5) Turn OFF regulator and remove tubing from opening.
- (6) Allow gas level to return to normal.
- (7) Reactivate any equipment connected to the outputs or reconnect the wiring to the outputs.



**Fig. 6 Applying Calibration Gas**

- 1 Regulator 1.5 LPM (P/N 467896)
- 2 Span Or Zero Gas Cylinder

## 4. Operation

### 4.1. Optical Indication

The sensor has three LEDs located at the bottom-left for quick unit status indication:

LED	Indication
<b>Green</b>	Lights during normal operation
<b>Red</b>	Flashes at 0.5 Hz during start-up. Turns ON solid when concentration reading exceeds 50 ppm
<b>Yellow</b>	Flashes at 0.5 Hz when power supplied is outside limits. Turns ON solid during other fault condition

### 4.2. Control Modules

The sensor output can be connected with a control module providing a complete monitoring system (→ Operating Manual of the control module).

During a fault, the:

- current output drops to 2 mA or
- voltage output drops to 1 V.

## 4.3. RS-485 Output Specifications

Register Name	PDU Address	LOGICAL Address	Range	
<b>Fault and Module State</b>	0x0000	1	Under Range	2 (msb)
			Under Voltage	8 (msb)
			Temperature	10 (msb)
			Lamp Fail	40 (msb)
			Test Mode	80 (msb)
			Warm Up Complete	0 (lsb)
			Cal/Setup	2 (lsb)
			Factory Mode	4 (lsb)
			Trouble Mode	8 (lsb)
<b>Gas Number</b>	0x0001	2	0 to 40 (see below)	
<b>Gas Concentration</b>	0x0002	3	-20 to 1050 (ppm)	
<b>Temperature</b>	0x002C	45	-300 to +650 (°C * 10)	
<b>Humidity</b>	0x002D	46	0 to 100 (%RH)	
<b>Gas Numbers</b>	R-22 = 6, R-123 = 12	R-404a = 27	R-134a = 15	

Baud rate: 19,200; each byte is eight bits with no parity and two stop bits.

#### 4.4. RS-485 Addressing (if applicable)

In Fig. 7 are shown the jumper settings for the 12 user configurable RS-485 addresses.

MODBUS ADDRESS JUMPER SETTINGS											
J5 J4 J3			J5 J4 J3			J5 J4 J3					
100	○	○	○	104	■	○	○	108	○	■	○
101	○	○	■	105	■	○	■	109	■	■	○
102	■	○	○	106	■	■	○	110	■	○	○
103	■	■	○	107	■	■	■	111	○	○	■

**Fig. 7 Jumper Settings for the RS-485-Addresses**

#### 4.5. Gas Selection Jumpers

On R-22, R-404A and R-134A the gas of interest can be changed by altering the Position of jumpers J1 and J2 as shown in Fig. 8.

GAS SELECT JUMPER SETTINGS	
	J2 J1
R-22	○ ■
R-404A	■ ○
R-134a	■ ■

GAS SELECT JUMPER SETTINGS	
	J2 J1
R-123	○ ■

**Fig. 8 Gas Selection Jumper Settings**

## 5. Technical Specifications

<b>Size</b>	115.06 mm x 90,93 mm x 36.07 mm
<b>Weight</b>	160 g
<b>Power Requirements</b>	24 V DC, +20%, 24 V AC +20%, 50/60 Hz, Class 2, UL 60950/CSA certified
<b>Power Consumption</b>	< 2.7 watts
<b>Wiring</b>	up to 2,5 mm <sup>2</sup> , Class 2 copper wiring
<b>Output Options</b>	4 to 20 mA sourcing, <500 Ohm load 2 - 10 V, 10 kOhm load RS-485 ModBUS RTU
<b>Operating Temperature</b>	0 to 65°C (-30 degrees lower temp specification with de-icer option)
<b>Relative Humidity (RH)</b>	0 to 99% non-condensing
<b>Pressure</b>	Operating 700 -1080 hPa
<b>Warm-up time</b>	30 minutes
<b>Pollution Degree</b>	2
<b>Installation Category</b>	II
<b>Operating Range</b>	0 to 1000 ppm
<b>Limit of Detection</b>	20 ppm
<b>Minimum Alarm</b>	50 ppm



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<b>Response Time</b>	t50 < 270 seconds
<b>Repeatability</b>	±10 ppm at 50 ppm
<b>Linearity</b>	±10 ppm from 25-50 ppm, +20% of reading from 50 to 1000 ppm
<b>Temperature Sensor</b>	±0.4°C at 25°C
<b>Humidity Sensor</b>	±3% RH at 50% RH and 25°C
<b>Standard Gases *)</b>	R22, R123, R134a, R404a
<b>Approvals</b>	<ul style="list-style-type: none"><li>▪ CE approval, complies with the applicable LVD and EMC directives (see also Declaration of Conformity)</li><li>▪ Certified to UL Std 61010-1 and CSA 61010</li><li>▪ Complies with ASHRAE 15-2004</li></ul>

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\*) Other gases are available. Please check with factory for availability.

## 6. Ordering Information

Description	Part No.
R-22 in Nitrogen	10086542
R-123 in Nitrogen	10086543
R-134a in Nitrogen	10086544
R-404A in Nitrogen	10086545



*For local MSA contacts, please visit us at **MSAsafety.com***