PolyGard®2 Multi-Sensor-Controller MSC2

Controller for Analog and Digital Sensor Cartridges
Serial No.

User Manual

Version 19.06 2019 en

Up-to-date data sheets and user manuals can be found in the download area of www.msr-24.com.

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1 Intended Use

The PolyGard®2 MSC2 is designed for detection and warning of toxic, combustible or dangerous atmosphere in many commercial and industrial applications.

The intended sites are all areas being directly connected to the public low voltage supply, e.g. residential, commercial and industrial ranges as well as small enterprises (according to EN50 082).

The PolyGard®2 Multi Sensor Controller MSC2 must not be used in potentially explosive atmospheres. The sensor must only be employed in areas within the environmental conditions specified in the Technical Data.

2 Functional Description

2.1 General

The Multi-Sensor-Controller is designed for the connection of max. three sensors, two of them may be different cartridges of the SC2 series via local bus and/or two of them analog sensors with 4-20 mA signal of the MC2 series. The function of the sensor series SC2 or MC2 is not the subject of this User Manual but can be found in the User Manual of the SC2 / MC2.

The controller monitors the measured values and activates the alarm relays if the set alarm thresholds for pre-alarm and main alert are exceeded. In addition, the values are provided for direct connection to the BMS via an RS-485 interface and also as 4-20 mA output.

The SIL 2 compliant self-monitoring function in the MSC2 and in the connected Sensor Cartridge activates the fault message in case of an internal error as well as in case of a fault in the local bus communication (SC2) and/or at the 4-20 mA input / output current signals.

Other options such as LCD display, three-color status LED, buzzer, digital input for acknowledgment or test function, various communication protocols ensure proper adaptation to the wide range of applications in gas detection technology. For convenient commissioning the MSC2 can be pre-configured and parametrised with factory-set defaults.

2.2 Function Outputs

SHORT DESCRIPTION OF THE FUNCTION: DIGITAL OUTPUTS WITH THREE RELAYS

Action	Reaction Relay 1 (Alarm1)	Reaction Relay 2 (Alarm2)	Reaction Warning light (Alarm 2)	Reaction Horn (Alarm 2)	Reaction Relay 3 (Alarm2 + fault)	Reaction LED
Sensor signal < alarm threshold 1	OFF	OFF	OFF	OFF	ON	GREEN
Sensor signal > alarm threshold 1	ON	OFF	OFF	OFF	OFF	RED
Sensor signal > alarm threshold 2	ON	ON	ON	ON	ON	RED
Sensor signal ≥ alarm threshold 2, but button Horn OFF activated	OFF		ON	OFF after delay ON		RED
Measuring signal < (alarm threshold 2 - hysteresis) but >= alarm threshold 1	ON	OFF	OFF	OFF	OFF	RED
No alarm, no fault	OFF	OFF	OFF	OFF	ON	GREEN
No fault, but maintenance due	OFF	OFF	OFF	OFF	ON	GREEN flashing
Internal error	OFF	OFF	ON	OFF	OFF	YELLOW

Note 1: Status OFF = Relay is configured “Alarm ON = Relay“ or the MSC is free from tension.
Note 2: Alarm thresholds can have the same value, therefore the relays and/or the horn and flashlight can be triggered together.

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2.3 Relay Mode

Definition of the relay operation mode: The terms energized / de-energized come from the terms energized / de-energized to trip principle (open-circuit / closed circuit principle) used for safety circuits. The terms refer to the activation of the relay coil, not to the relay contacts (as they are executed as a changeover contact and available in both principles).

The LEDs attached to the modules show the two states in analogy. (LED off -> relay de-energized)

2.4 Relay Function Static / Flash

Definition of the relay function: The function "flashing" represents a connection option for warning devices to improve visibility. If" flashing" is set, this must not be used as a safe output circuit any more.

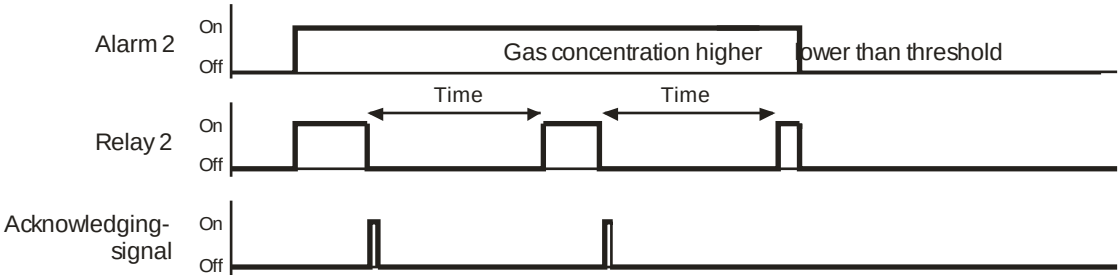
A combination of relay mode energized with flashing operation makes no sense and is therefore suppressed.

2.5 Horn Function (not safe output circuit because resettable)

The horn function is considered active if at least one of the two parameters (time or assignment to digital input) is set. The horn function retains its functionality even for alarms in latching mode.

Special function: Recurrence of the horn relay

After an alarm has been triggered, the horn will remain active until it is acknowledged. After acknowledgment of the horn relay/s (clicking a button or via external input) a timer starts. When this time has run out and the alarm is still acting, the relay is set again. This process is repeated endlessly as long as the associated alarm remains active.



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3 Installation

Electronics can be destroyed by electrostatic discharge (ESD). Therefore, the installation work should be done only by persons connected to ground, e. g. with a wrist strap connected to ground or by standing on a conductive floor (acc. to DIN EN 100015).

3.1 Mounting Instructions

When choosing the mounting site please pay attention to the following:

- The mounting height depends on the relative density of the gas type to be monitored (see User Manual of Sensor Cartridge).
- Choose mounting location of the sensor according to the local regulations.
- Consider ventilation conditions! Do not mount the sensor near the airflow (air passages, suction holes etc.).
- Mount the sensor at a location with minimum vibration and minimum variation in temperature (avoid direct sunlight).
- Avoid locations where water, oil etc. may influence proper operation and where mechanical damage might be possible.
- Provide adequate space around the sensor for maintenance and calibration work.
- Observe possible constructor's instructions.

3.2 Installation Work

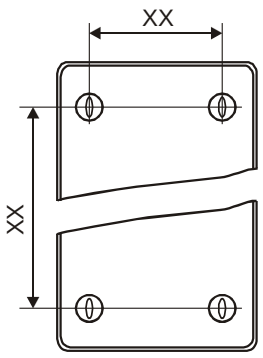
Assembly work must only be carried out under gas-free conditions.

The housing must neither be spot-drilled nor drilled through outside the knockouts.

The installation position of the gas detector is always with the sensor head downwards.

- Open housing cover.
- Break out the required pre-embossed knockouts on the housing for cable glands and Sensor Cartridge.
- Cables are introduced from above, the sensor head SC2 / MC2 downwards.
- The MSC2 Controller is fixed to the wall through the four marked mounting points at the back side of the housing. These mounting points are accessible after opening the housing. See figure below.
- The dimensions XX depend on the type and can be read on the back of the housing, in the housing version of CX, it is115 mm.
- The mounting points are covered by closing the cover at the end of the assembly.
- Close the cover.

Installation of Controller:



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4 Electrical Connection

Assembly work must only be carried out under gas-free conditions!
Consider static electricity instructions (ESD)!

4.1 Wiring

- The technical requirements and regulations for wiring, electrical security, as well as project specific and environmental and local conditions etc. must be observed when mounting.
- We recommend the following cable types[1]:

	Europe	**USA / Canada**
Power supply 230 V	NYM-J 3 x 1.5 mm²	14 AWG / 300 V
Alarm message 230 V (also possible together with power supply)	NYM-J X x 1.5 mm²	14 AWG / 300 V
Signal message, bus connection to DGC06, warning devices 24 V	J-Y(St)Y 2x2 x 0.8 mm²	min. 300 V
Possibly connected external analog transmitters	J-Y(St)Y 2x2 x 0.8 mm²	min. 300 V

[1] The recommendation does not consider local conditions such as fire protection etc.

- Use copper conductors only for the terminal is only for connection to copper wire.
- Avoid any influence of external interferences by using shielded cables for the bus line, but do not connect the shield.
- Strip the cables as short as possible. It is important to ensure that bare wires, e.g. wire shields, do not come into contact with the mounted PCB (risk of short-circuit).
- Low voltage wire and mains connected wire must be fixed separately by cable ties or similar, to secure against looseness.
- When choosing the option “Power Supply ≥ 90 VAC” you must make sure that a switch or a circuit breaker is provided in the building automation especially for the Unit. It must be installed easily accessible near the Unit. It has to be marked as a disconnecting device for the Unit and shall meet the relevant requirements of UL/IEC 60947 and UL/IEC 60947-3
- Analog sensors are connected directly to the spring type terminals of the module. The correct polarity must be observed.
- Digital sensors are connected directly to the local bus socket.
- The alarm signals are available as potential-free change-over contacts.

The exact position of the terminals for the sensors and alarm relays is shown in the connection diagrams.

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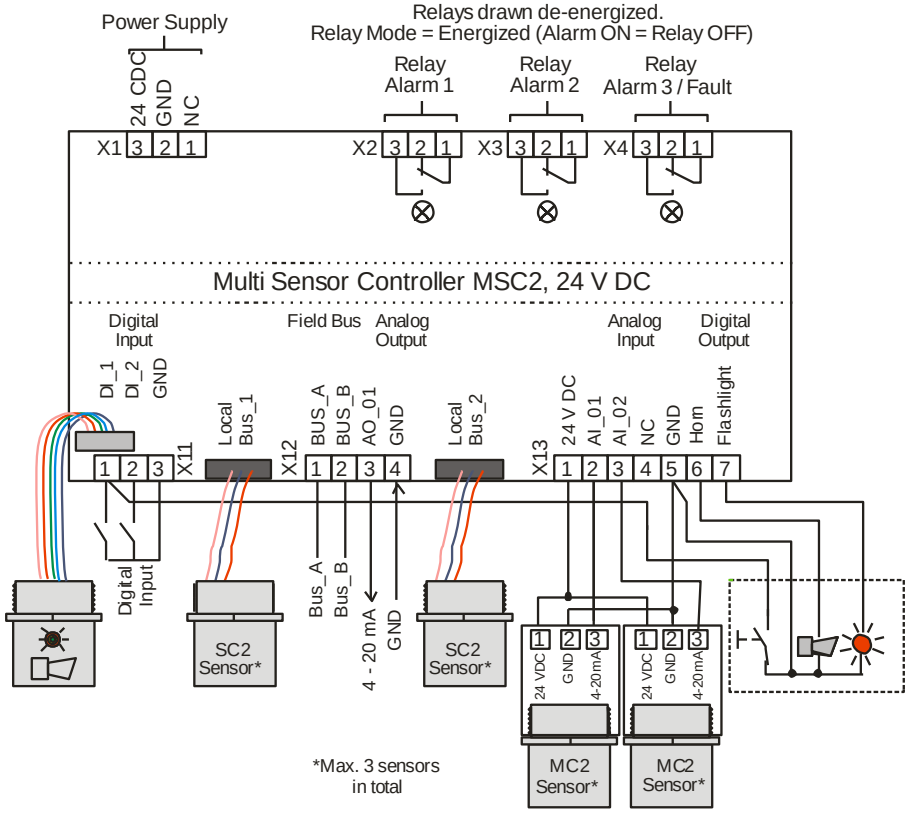
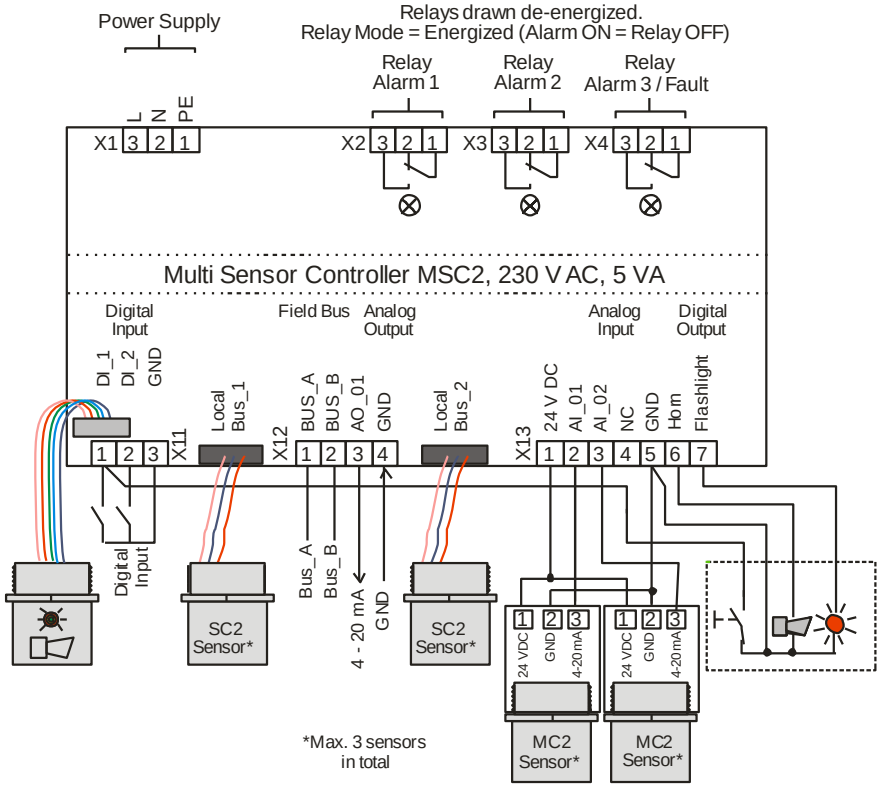
4.2 Wiring Diagrams

Wiring Diagram, 24 VDC Type



Wiring Diagram 230 VAC, 5 VA Type



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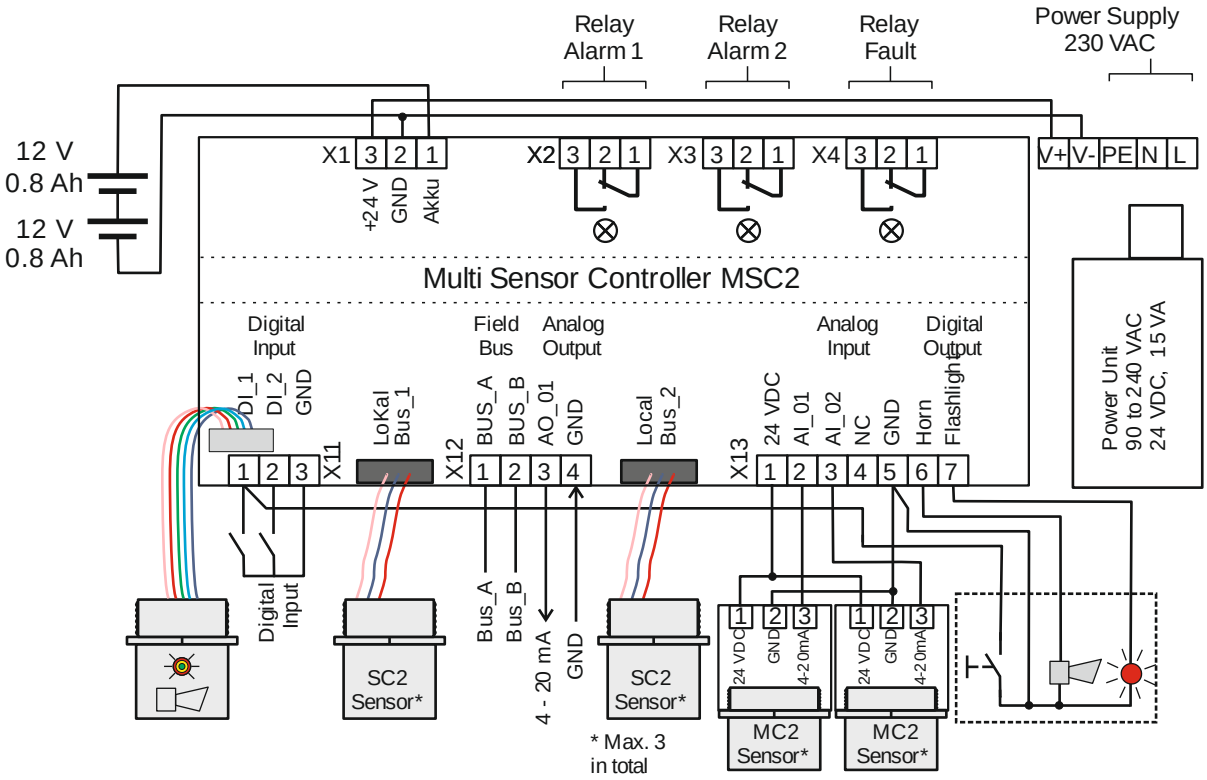
Wiring Diagram 230 VAC, 15 VA Type



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5 Commissioning

5.1 General Notes

Only trained technicians should perform the following when commissioning:

- Install the Sensor Cartridge(s) if not already installed ex works.
- Check for correct mounting location.
- Check if connection is correct according to connection diagram.
- Check power voltage.
- Calibrate (if not already factory-calibrated).

Required instruments for commissioning (calibration):

- Service Tool DGC-06 STL or
- DGC-06 EasyConf Software incl. USB/RS-485 communication set:
- Calibration: See user manual Sensor Cartridge.

For sensors that e.g. can be poisoned by silicones like all semiconductor and catalytic bead sensors, it is imperative to remove the protective cap supplied only after all silicones are dry, and then energize the device.

For fast and comfortable commissioning, we recommend proceeding as follows. For digital devices with self-monitoring all internal errors are visible via the LED. All other error sources often have their origins in the field, because it is here where most of the causes for problems in the field bus communication appear.

5.2 Optical Check

- Right cable type used.
- Correct mounting height according to definition in Mounting.
- Led status

5.3 Selection Gas Type with Unit

The selection of the desired and connected gas sensor type is made by pre-set values.

If other gas sensor types are connected, you have to adjust them with the configuration tool, because otherwise the device will respond with an error message.

The selection contains all necessary information for the controller and is also used for comparing the real digital data with the settings.

This feature increases the user and operating security. There is an entry available per gas type for each unit; at the moment, there are 100 selection options.

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6 Configuration and Parameter Cards

Commission:		**Order number:**	
Customer:		Service technician:	
Commissioning - company:		Date	

6.1 Configuration Card System Parameters

Serial No.	Date of Production	Mainten. interval	Mainten. Password	AV Overlay		AV Time	Power On Time	Error Time	CFM dupl.
Note	Note down	1900	****	V-time	ppm				0
				0	0	90	30	30	

Analog Output 1		
Outp.	source	Oper.
Signa		Mode
100%	CV	AV

6.2 Configuration Card Alarm Relays / Signal Outputs

Relay No.	Active inactive	Mode	Stat. Flash	Reset	Horn		Extern. On	Extern. Off	Delay at ON	Delay at OFF	Fault ORed	Maint. ORed
				Time	Recur.	DI	DI	DI	sec	sec		
Default	inactive	de-en	Stat.	0	no	0	0	0	0	0	OFF	OFF
R 01	active	energ.										
R 02	active	energ.										
R 03	active	de-en										
Horn	active	de-en										
LED	active	de-en	flash			1						

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6.3 Configuration Card SC2 devices (digital measuring points)

Data depending on the sensor used

DP Nr.	MP Status	Locked	Gas type		Range	Alarm Thresholds				Hyst	CV- Delay Alarm (Sec)		CV-AV	Assignment Latching				Assignment Fault <>Alarm				Assignment Alarm <> Alarm Relay				Ao1
			Gas	unit		A1	A2	A3	A4		at ON	at OFF		A1	A2	A3	A 4	A1	A2	A3	A4	A1	A2	A3	A4	
01																										
02																										

6.4 Configuration Card MC2 (analog measuring points)

Data depending on the sensor used

AP Nr.	MP Status	Locked	Gas type		Range	Alarm Thresholds				Hyst	AV- Delay Alarm (Sec)		CV-AV	Assignment Latching				Assignment Fault <>Alarm				Assignment Alarm <> Alarm Relay				Ao1
			Gas	unit		A1	A2	A3	A4		at ON	at OFF		A1	A2	A3	A 4	A1	A2	A3	A4	A1	A2	A3	A4	
01																										
02																										

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7 Inspection and Service

For regular maintenance und calibration by trained technicians we recommend concluding a service contract with MSR or one of their authorized partners.

According to EN 45544-4, inspection and service must be executed at regular intervals. The maximum intervals have to be determined and observed by the person responsible for the gas warning system according to the legal requirements. MSR-E recommends applying the inspection and maintenance intervals as prescribed in the general regulations of the gas measuring technique like VDI-2053, EN 60079-29-1 etc. The inspection interval normally is three months. The recommended service intervals are depended from the connected Sensor Cartridges. If different intervals are valid, always consider the shortest one.

Inspections and services must be documented. The date for the next maintenance has to be affixed to the sensor.

7.1 Functional Tests (for Initial Operation and Maintenance)

Gas sensors should be controlled regularly by a competent person according to EN 45544-4. The functional test should be carried out during each service, but at least once a year. The following has to be checked in particular:

- Maintenance / calibration interval not exceeded.
- Check the Unit including measuring head for mechanical damage.
- Remove dust deposits, especially at the gas inlet.
- Check the Unit including measuring head for dust, dirt and moisture deposits and clean it with a dry cloth if necessary.
- The filter at the gas inlet has to be replaced if extremely dirty.

7.2 Trip Test with Reference Gas

When applying a reference gas with a concentration > alarm threshold 2, the set alarm thresholds are exceeded, and all output functions are activated. It is necessary to check if the connected output functions are working correctly (e.g. the horn sounds, the fan switches on, devices shut down). By pressing the push-button on the horn, the horn acknowledgment must be checked. After removal of the reference gas, all outputs must automatically return to its initial position.

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7.3 Calibration

New SC2 / MC2 Sensor Heads are always delivered factory-calibrated by MSR-E. This is documented by the calibration label indicating date and calibration gas. A repeated calibration is not necessary during commissioning if the device is still in its original packaging (air-tight protection by the red protective cap) and the calibration doesn't date back more than 12 months for CO2 sensors and 3 months for all other gases.

The calibration of the sensor head is done on the display; for versions without display, you need a PC tool or the STL-06 Service Tool. There is an automatic routine in the calibration menu of the Service Tool STL.

As long as the calibration menu is open and the sensor is gassed with test gas, the alarm release is blocked.

Prior to calibration the sensor must be connected continuously to the power supply for stabilization for a running-in period (see User Manual of Sensor Cartridge).

8 Project protection

To prevent access to the sensitive calibration data by third parties, every customer receives his own internal project key. All projects of the customer are delivered with this key. The key is also stored in each STL-06 tool that the respective customer buys.

If the keys do not match, the following message appears

NO ACCESS AUTHORIZATION

The calibration is documented in the User Manual of the Service Tool.

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9 Technical Data MSC2

Electrical	
Power supply	24 V DC ± 20 %, reverse-polarity protected 24 V AC ± 15 % (only one SC2 connected)
Overvoltage category	I
Power consumption (24 V DC) - Control Board - per sensor (SC2 or MC2) - horn / warning light	 Max. 60 mA (1.5 VA), w/o sensor, w/o horn, w/o warning light Max. 85 mA (2.1 VA) Max. 40 mA (1.0 VA)
Alarm relays (3)	240 V AC, 5 A, potential-free, change-over contact (SPDT)
Transistor output (2)	24 V DC / 0.1 A (switching to plus) (only at 24 V DC power supply)
Digital input (2)	Potential-free
Analog input (2)	4 – 20 mA overload and short-circuit proof, input resistance 200 Ω
Analog output signal (1)	Proportional, overload and short-circuit proof, load ≤ 500 Ohm 4 - 20 mA = measuring range 3.0 < 4 mA = underrange > 20 - 21.2 mA = overrange 2.0 mA = fault
Outgoing line for local bus	5 V DC, 250 mA max. Overload, short-circuit and reverse-polarity protected
Ambient conditions	
Temperature range	-25 °C to +60 °C (-13 °F to +140 °F)
Humidity range	15 - 95 % RH not-condensing
Storage temperature	+5 °C to +40 °C (+41 °F to +104 °F)
Storage time	6 months
Serial interface	
Local bus	1-wire / 19200 Baud
Field bus	RS 485 / 19200 Baud
Tool bus	2-wire / 19200 Baud
Physical	
Housing type A, C, E	Polycarbonate
Combustion	UL 94 V2
Housing colour	RAL 7032 (light grey)
Dimension housing (W x H x D) Type C	 130 x 130 x 75 mm (5.12 x 5.12 x 2.95 in.)
Weight	ca. 0.6 kg (1.32 lb.)
Protection class (delivery status*)	NEMA 4X (IP 65)
Installation	Wall mounting
Knockouts for cable and sensor entry	Standard 6 x M20/25
Wire connection: Local bus (SC2) Digital input, analog output Power supply, relay	3-pin connector Screw-type terminal min. 0.25 mm^2, max. 1.3 mm^2 (24 to 16 AWG) Screw-type terminal min. 0.25 mm^2, max. 2.5 mm^2 (24 to 10 AWG)
Directives	
	EMC directives 2014/30/EU Low voltage directive 2014/35/EU CE EN 61010-1:2010 Conformity to: EN 50271 IEC/EN 61508-1-3 EN 60079-29-1 Option: ANSI/UL 61010-1 CAN/CSA-C22.2 No. 61010-1
Warranty	1 year on sensor (not if poisoned or overloaded) 2 years on device

*If there are changes on the housing it has to be re-evaluated.

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Options	
LCD Display	
LCD	Two lines, 16 characters each, background highlighted in two colours
Operation	Menu driven via six pushbuttons
Power consumption	5 V, 60 mA, 0.3 VA
Status LED	
Colour / mode	Red / yellow / green (alarm – fault – operation - service)
Protection class	IP 65
Warning buzzer	
Acoustic pressure	> 85 dB (A) (distance 0.1 m)
Frequency	2300 Hz
Protection class	IP 65
Power supply 110 / 230 V AC	
Wide range input	100 -240 V AC - 50/60 Hz
Output rating type 5	5 VA
Output rating type 7	15 VA
UPS	
Power unit with wide range input	100 -240 V AC - 50/60 Hz
Output rating	15 VA
Rechargeable battery	12 V, 0.8 Ah
Operating time	> 60 min
Power supply 12 V DC	12 V DC reverse-polarity protected
Power consumption (12 V DC) - Control Board - per sensor (SC2 or MC2) - horn / warning light	 Max. 120 mA (1.5 VA), w/o sensor, w/o WAO Max. 170 mA (2.1 VA) Max. 80 mA (1.0 VA)

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10 EC – Declaration of Conformity

PERFECT SOLUTIONS IN GAS ALARM SYSTEMS www.msr-electronic.de

EG - Konformitätserklärung
EC - Declaration of Conformity

Wir erklären in alleiniger Verantwortung, dass die bezeichneten Produkte mit den folgenden Normen und Richtlinien übereinstimmen.

We declare under our sole responsibility that the products to which this declaration relates are in conformity with the following standards and directives.

Dokument-Nr. / Document-No. **CE_MSC2 & MGC2_0416**

Hersteller / Manufacturer: **MSR - Electronic - GmbH**
Würdinger Str. 27
D-94060 Pocking

Produktbezeichnung / Name: **PolyGard®2 Multi Sensor Controller Series MSC2 & MGC2**

Richtlinie / Directive: **2014 / 30 / EU**
Elektromagnetische Verträglichkeit. / Electromagnetic compatibility

2014 / 35 / EU
Niederspannungsrichtlinie / Low voltage Directive

Norm / Standard: **EN 61010-1-2010+Cor. 2011**
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel-, und Laborgeräte.

Norm / Standard: **EN 50 271 (IEC-61508)**
Elektrische Geräte für die Detektion und Messung von brennbaren Gasen, giftigen Gasen oder Sauerstoff - Anforderungen und Prüfungen für Warngeräte, die Software und/oder Digitaltechnik nutzen; Deutsche Fassung EN50271:2010

Für die funktionale Sicherheit entspricht der komplette Entwicklungsprozess für Hard- und Software Sicherheitslevel SIL2, Low Demand.

Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for apparatus using software and/or digital technologies; German version EN50271:2010

Full Development process for hard- and software is designed according safety requirement SIL2 –low demand

Aussteller/ Issued by: **MSR - Electronic - GmbH**
Datum / Date: **Pocking, 19.04.16**

Rechtsverbindliche Unterschrift/ binding signature:

.....
Dipl.-Ing. Wolfgang Schmitt

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the conformity to the mentioned directives. It does not confirm any attributes. The security hints of the specific instruction manuals have to be followed

MSR SAFETY FIRST

ISO9001 CERTIFIED

MSR-Electronic GmbH ::: Würdinger Str. 27 & 27A ::: 94060 Pocking ::: Germany
Technische Änderungen vorbehalten
PolyGard® ist ein eingetragenes Warenzeichen von MSR-Electronic GmbH

11 Part Disposal

Since August 2005 there are EC-wide directives defined in the EC Directive 2002/96/EC and in national codes concerning the waste electrical and electronic equipment and also regarding this device.

For private households there are special collecting and recycling possibilities. For this device isn't registered for the use in private households, it mustn't be disposed this way. You can send it back to your national sales organisation for disposal. If there are any questions concerning disposal please contact your national sales organisation.

Outside the EC, you have to consider the corresponding directives.

12 Notes and General Information

It is important to read this user manual thoroughly and clearly in order to understand the information and instructions. The PolyGard®2 devices must be used within product specification capabilities. The appropriate operating and maintenance instructions and recommendations must be followed.

Due to on-going product development, MSR-Electronic GmbH reserves the right to change specifications without notice. The information contained herein is based upon data considered to be accurate. However, no guarantee is expressed or implied regarding the accuracy of these data.

12.1 Intended Product Application

The PolyGard®2 devices are designed and manufactured for control applications and air quality compliance in commercial buildings and manufacturing plants.

12.2 Installers' Responsibilities

It is the installer's responsibility to ensure that all PolyGard®2I devices are installed in compliance with all national and local codes and OSHA requirements. Installation should be implemented only by technicians familiar with proper installation techniques and with codes, standards and proper safety procedures for control installations and the latest edition of the National Electrical Code (ANSI/NFPA70).
The equipotential bonding required (also e.g. secondary potential to earth) or grounding measures must be carried out in accordance with the respective project requirements. It is important to ensure that no ground loops are formed to avoid unwanted interference in the electronic measuring equipment.
It is also essential to follow strictly all instructions as provided in the user manual.

12.3 Maintenance

It is recommended checking the PolyGard®2 device regularly. Due to regular maintenance any performance deviations may easily be corrected. Re-calibration and part replacement in the field may be implemented by a qualified technician and with the appropriate tools. Alternatively, the easily removable plug-in Sensor Cartridge with the sensor element may be returned for service to MSR-Electronic GmbH.

12.4 Limited Warranty

MSR-Electronic GmbH warrants the PolyGard®2 devices for a period of one (1) year from the date of shipment against defects in material or workmanship. Should any evidence of defects in material or workmanship occur during the warranty period, MSR-Electronic GmbH will repair or replace the product at their own discretion, without charge.

This warranty does not apply to units that have been altered, had attempted repair, or been subject to abuse, accidental or otherwise. The warranty also does not apply to units in which the sensor element has been overexposed or gas poisoned. The above warranty is in lieu of all other express warranties, obligations or liabilities.

This warranty applies only to the PolyGard®2 devices. MSR-Electronic GmbH shall not be liable for any incidental or consequential damages arising out of or related to the use of the PolyGard®2 devices.

Phone 0049(0)8531/9004-0 Fax: 0049(0)8531/9004-54 Specification subject to change without notice
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