

## Technical Datasheet



### PolyGard®2

## MC2 Sensor

with Electrochemical Sensor Element  
for Toxic Gases  
with Analog Output

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Specifications subject to change without notice.  
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■ All Products  
■ Made  
■ in Germany

## DESCRIPTION

### **Exchangeable sensor unit including digital value processing, temperature compensation and self-control for the continuous monitoring of the ambient air.**

The sensor unit MC2 houses a module with  $\mu$ Controller, analog output and power supply in addition to the electrochemical sensor element including amplifier. The  $\mu$ Controller calculates a linear 4–0 mA (or 2–10 V) signal out of the measurement signal and also stores all relevant measured values and data of the sensor element.

Calibration is done either by simply replacing the sensor unit or by using the comfortable, integrated calibration routine directly at the system.

## APPLICATION

The PolyGard®2 Sensor MC2 is used for the detection of toxic gases or for oxygen monitoring when a typical 4–20 mA (or 2–10 V) signal is required.

## FEATURES

- Digital measurement value processing incl. temperature compensation
- Internal function control with integrated watchdog
- Data / measured values in  $\mu$ C of the sensor unit, therefore simple exchange uncalibrated <> calibrated
- High accuracy, selectivity and reliability
- Low zero-point drift
- Long sensor lifetime
- Hardware & software according to SIL compliant development process
- Easy maintenance and calibration by exchange of the sensor unit or by comfortable on-site calibration
- 4–20 mA (or 2–10 V) analog output with selectable signal output for special mode, fault etc.
- Reverse polarity protected, overload and short-circuit proof
- IP65 version
- Housing for integration of the sensor unit (option)
- Display (option)
- Display with 2 open-collector outputs for horn (resettable) and warning lamp (option)
- Conformity to:
  - EN 378
  - EN 45544-1, -3
  - EN 50104 (for O<sub>2</sub>)
  - EN 50271
  - EN 50545
  - EN 61010-1
  - ANSI/UL 61010 1
  - CAN/CSA-C22.2 No. 61010-1
- Duct mounting kit (accessory)

## SPECIFICATIONS

<b>ELECTRICAL</b>	
Power supply	18–29 V DC, reverse-polarity protect.; 18–27 V AC (only for output signal 2–10 V)
Power consumption	23 mA, max. (0.6 VA for 24 V)
Analog output signal	Proportional, overload and short-circuit proof, load $\leq$ 500 $\Omega$ for current signal, $\geq$ 50 k $\Omega$ for voltage signal 4–20 mA or 2–10 V = measuring range 3–4 mA or 1.5–2 V = underrange > 20–21.2 mA or 10–10.6 V = overrange 2 mA or 1 V = fault > 21.8 mA or 10.9 V = fault High
<b>SENSOR ELEMENT</b>	
Gas type and measuring range	See Ordering Information
Sensor element	Electrochemical
Pressure range	90–110 kPa or 80–120 kPa (NH <sub>3</sub> , O <sub>2</sub> , all CO except for 1110-A, all NO <sub>2</sub> except for 1130-F)
Storage temperature range <sup>1</sup>	+5 °C to +20 °C (+41°F to +68 °F) or 0 °C to +20 °C (+32°F to +68 °F) for NH <sub>3</sub> , CO, NO <sub>2</sub> , O <sub>2</sub> +10 °C to +30 °C (+50°F to +86 °F) for H <sub>2</sub> and CO 1110-A
Storage time <sup>2</sup>	Ca. 6 months
Poisoning	Electrochemical sensors are susceptible to poisoning by organic solvents and silicone vapours.
<b>PHYSICAL</b>	
Enclosure P (M25)	Polycarbonate UL 94 V2
Colour	RAL 7032 (light grey)
Dimensions (Ø x H)	24 x 22 mm (0.94 x 0.87 in.)
Weight	Ca. 30 g (0.066 lb)
Protection class	IP65 (only if mounted in housing type A, D)
Mounting	Screw mounting / M25
Wire connection	Screw-type terminal 0.25–1.3 mm <sup>2</sup> , 3-pin, 24–16 AWG
<b>REGULATIONS</b>	
Directives	EMC directives 2014/30/EU, CE Compliance with: EN 378 EN 45544-1, -3 EN 50104 (for O <sub>2</sub> ) EN 50271 EN 50545 EN 61010-1:2010 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
<b>OPTIONS</b>	
<b>ENCLOSURE A</b>	
Enclosure A for integration of sensor	Polycarbonate UL 94 V2
Enclosure colour	RAL 7032 (light grey)
Dimensions (B x H x D)	94 x 130 x 57 mm (3.7 x 5.1 x 2.2 in.)
Weight / package volume	Ca. 0,2 kg (0.4 lb) / ca. 4,5 l
Protection class	IP65
Mounting	Wall mounting
Pre-embossing for cable entry / sensor	6 x M20/M25
<b>LCD-DISPLAY</b>	
LCD	2 lines, 16 characters each, monochrome
<b>OPEN-COLLECTOR</b>	
Transistor output (2)	For horn (resettable) and warning lamp
Switching capacity	24 V DC / 50 mA (+ switching)

<sup>1</sup> A higher storage temperature can have a negative effect on sensitivity and service life.

<sup>2</sup> If stocked for a longer period, we recommend checking the zero point and recalibrating if necessary.

Gas type	Ordering No.	Measuring range <sup>1</sup>	Accuracy		Repeatability	t <sub>90</sub> time	Zero point variation	Drift in air		Temperature range	Humidity range (non-condensing)	Life time <sup>2</sup> in air	Relative gas density <sup>3</sup>	Calibration interval <sup>4</sup>
			± % sig.	ppm				Zero	Gain					
	MC2-	ppm	± % sig.	ppm	<± % sig.	≤ sec.	±ppm	< % signal/month		°C	% RH	> months	Air = 1	Month
CO	E1110-A	0-50	2	0.01	3	15	1	1	2	-20 / +50	15-90	24	0.97	12
CO	E1110-C	0-150	2	0.1	5	10	4	0.4	0.4	-20 / +50	10-95	72	0.97	12
CO	E1110-E	0-250	2	0.1	5	10	4	0.4	0.4	-20 / +50	10-95	72	0.97	12
CO	E1110-F	0-300	2	0.1	5	10	4	0.4	0.4	-20 / +50	10-95	72	0.97	12
CO	E1110-H	0-500	2	0.1	5	10	4	0.4	0.4	-20 / +50	10-95	72	0.97	12
NH <sub>3</sub>	E1125-A	0-100	5	0.1	10	120	5	1	2	-30 / +50	15-90	24	0.60	12
NH <sub>3</sub>	E1125-B	0-300	3	0.1	10	120	5	1	2	-30 / +50	15-90	24	0.60	12
NH <sub>3</sub>	E1125-C	0-500	3	0.1	10	120	5	1	2	-30 / +50	15-90	24	0.60	12
NH <sub>3</sub>	E1125-D	0-1000	3	1	10	120	10	1	2	-30 / +50	15-90	24	0.60	12
NH <sub>3</sub>	E1125-E	0-5000	2	1	10	40	100	1	2	-30 / +50	15-90	24	0.60	12
NO <sub>2</sub>	E1130-A	0-10	5	0.01	2	25	0.2	1	2	-30 / +50	15-90	24	2.80	12
NO <sub>2</sub>	E1130-B	0-20	5	0.01	2	25	0.2	1	2	-30 / +50	15-90	24	2.80	12
NO <sub>2</sub>	E1130-C	0-30	5	0.01	2	25	0.2	1	2	-30 / +50	15-90	24	2.80	12
NO <sub>2</sub>	E1130-E	0-100	5	0.1	2	25	2	1	2	-30 / +50	15-90	24	2.80	12
NO <sub>2</sub>	E1130-F	0-5	5	0.001	2	25	0.1	1	2	-20 / +50	15-90	24	2.80	12
HCN	E1183-B	0-50	5	0.01	5	30	2	1	2	-20 / +50	15-90	24	0.93	6
HCN	E1183-C	0-100	5	0.1	5	30	2	1	2	-20 / +50	15-90	24	0.93	6
CH <sub>2</sub> O	E1185-B	0-10	n.d.	0.01	5	60	0.2	1	2	-30 / +50	15-90	36	1.04	6
HCl	E1186-D	0-20	5	0.01	5	60	0.5	1	2	-20 / +50	15-90	24	1.27	6
C <sub>2</sub> H <sub>4</sub>	E1189-C	0-200	n.d.	0.1	5	120	5	2	5	-30 / +50	15-90	24	0.97	6
O <sub>3</sub>	E1190-A	0-5	n.d.	0.001	5	60	0.1	1	2	-30 / +50	15-90	24	1.66	6
O <sub>3</sub>	E1190-B	0-10	n.d.	0.01	5	60	0.2	1	2	-30 / +50	15-90	24	1.66	6
Cl <sub>2</sub>	E1193-C	0-10	n.d.	0.01	5	40	0.2	1	2	-30 / +50	15-90	24	2.48	6
Cl <sub>2</sub>	E1193-D	0-20	n.d.	0.01	5	40	0.2	1	2	-30 / +50	15-90	24	2.48	6
H <sub>2</sub>	E1194-A	0-1000	n.d.	1	5	70	10	1	2	-20 / +50	15-90	24	0.07	12
SO <sub>2</sub>	E1196-B	0-20	3	0.01	5	30	0.2	1	2	-20 / +50	15-90	24	2.73	6
H <sub>2</sub> S	E1197-A	0-50	3	0.01	5	30	1	1	2	-30 / +50	15-90	24	1.19	12
H <sub>2</sub> S	E1197-B	0-100	3	0.1	5	40	1	1	2	-30 / +50	15-90	24	1.19	12
H <sub>2</sub> S	E1197-C	0-200	3	0.1	5	40	2	1	2	-30 / +50	15-90	24	1.19	12
H <sub>2</sub> S	E1197-D	0-500	3	0.1	5	40	5	1	2	-30 / +50	15-90	24	1.19	12
H <sub>2</sub> S	E1197-E	0-1500	3	1	5	60	15	n.d.	n.d.	-30 / +50	15-90	24	1.19	12
ETO	E1199-A	0-10	n.d.	0.01	5	150	1	1	2	+10 / +30	15-90	24	1.56	12
		% vol												
O <sub>2</sub>	E1195-A2/3	0-25	2	0.01	n.d.	15	n.d.	n.d.	0.4/0.6	-40 / +50	5-95	24/36	1.11	6/6
O <sub>2</sub>	E1195-A5/7	0-25	2	0.01	n.d.	15	n.d.	n.d.	0.4	-40 / +50	15-90	60/84	1.11	12/12

<sup>1</sup> Exceeding the measuring range limit will include a risk of damaging the sensor element.

<sup>2</sup> Expected service life for normal ambient conditions

<sup>3</sup> The recommended mounting height depends on the relative gas density of the type of gas to be monitored. Depending on the relative gas density (d), the following recommendation therefore applies:

d < 0.90: mounting 0.3–0.5 m below the ceiling  
 0.90 < d < 1.10: mounting at 1.2–1.8 m height  
 d > 1.10: mounting 0.3–0.5 m above the floor

<sup>4</sup> Manufacturer-recommended calibration intervals for normal environmental conditions

## CROSS SENSITIVITY<sup>1</sup>

Gas concentration of cross gas / reaction of sensor

Gas type	Ordering No.	Chlorine, Cl <sub>2</sub>	Ethanol, C <sub>2</sub> H <sub>6</sub> O	Ethylene, C <sub>2</sub> H <sub>4</sub>	Carbon monoxide, CO	Carbon dioxide, CO <sub>2</sub>	Sulphur dioxide, SO <sub>2</sub>	Hydrogen sulphide, H <sub>2</sub> S	Nitrogen dioxide NO <sub>2</sub>	Nitrogen monoxide, NO	Hydrogen, H <sub>2</sub>
	MC2-	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
CO	E1110-X <sup>2</sup>	2/0.5	2000/5			5000/0	50/0,5	25/0	50/-1	50/10	100/20
NH <sub>3</sub>	E1125-A		100/0		500/0	5000/0	20/-6	25/30	5/-7.5	50/0	100/0
NH <sub>3</sub>	E1125-B		100/0		500/0	5000/0	20/-6	25/30	5/-5	50/0	100/0
NH <sub>3</sub>	E1125-C		100/0		500/0	5000/0	20/-6	25/35	5/-5	50/0	100/0
NH <sub>3</sub>	E1125-D		100/0		500/0	5000/0	20/-6	25/35	5/-5	50/0	100/0
NH <sub>3</sub>	E1125-E	0 %	0 %	0 %	0 %	0 %	<150 %	<70 %	10 %	0 %	<-10 %
NO <sub>2</sub>	E1130-X <sup>2</sup>	1/0.5			300/0	5000/0	20/0	15/<1		50/0	200/0
HCN	E1183-X <sup>2</sup>			100/0	100/2		20/38	15/25	5/-12	25/0	100/2
CH <sub>2</sub> O	E1185-B		30/1		100/<20			20/20			100/5
HCl	E1186-D	20/0	30/0	100/0	1000/0		100/0	20/31	20/-6	25/0	
C <sub>2</sub> H <sub>4</sub>	E1189-C				100/<60						
O <sub>3</sub>	E1190-X <sup>2</sup>	5/4	60/0	100/0	100/0		5/0	20/-20	5/5	50/0	100/0
Cl <sub>2</sub>	E1193-X <sup>2</sup>		60/0	100/0	300/0		5/0	20/-20	20/20	50/0	100/0
H <sub>2</sub>	E1194-A	10/0		100/80	50/200		5/0	25/0	5/0	35/<10	
O <sub>2</sub>	E1195-XX <sup>2</sup>										
SO <sub>2</sub>	E1196-B		100/0		100/<1			20/10	5/-4	100/0	100/<1
H <sub>2</sub> S	E1197-A				100/<1						300/1
H <sub>2</sub> S	E1197-B		40/0	20/0	100/<1		100/15				300/<3
H <sub>2</sub> S	E1197-C				300/<12						300/<12
H <sub>2</sub> S	E1197-D				300/<12						300/<12
H <sub>2</sub> S	E1197-E				<5 %		20 %				<5 %
ETO	E1199-A		30/21		100/20			20/40			

<sup>1</sup> The table does not claim to be complete. Other gases, too, can have an influence on the sensitivity. The mentioned cross sensitivity data are only reference values valid for new sensors.

<sup>2</sup> Cross sensitivity data valid for all measuring ranges of the sensor.

All specifications were collected under optimal test conditions.

We confirm compliance with the minimum requirements of the applicable standard.

## ORDERING INFORMATION

MC2-	X-	E11XX-X(X)-	X-	P	
				P	Sensor housing plastic <span style="float: right;">Sensor housing</span>
				0	Without display
				1	With display for indication of meas. values (only housing A or N)
				2	With display for values & operation, 2x open-collector for horn & warning lamp (only housing A / N) <span style="float: right;">Display</span>
					<b>Gas type</b> <span style="float: right;"><b>Measuring range</b></span>
		<b>E1110-A</b>			Carbon monoxide, CO <span style="float: right;">0–50 ppm</span>
		<b>E1110-C</b>			Carbon monoxide, CO <span style="float: right;">0–150 ppm</span>
		<b>E1110-E</b>			Carbon monoxide, CO <span style="float: right;">0–250 ppm</span>
		<b>E1110-F</b>			Carbon monoxide, CO <span style="float: right;">0–300 ppm</span>
		<b>E1110-H</b>			Carbon monoxide, CO <span style="float: right;">0–500 ppm</span>
		<b>E1125-A*</b>			Ammonia, NH <sub>3</sub> <span style="float: right;">0–100 ppm</span>
		<b>E1125-B*</b>			Ammonia, NH <sub>3</sub> <span style="float: right;">0–300 ppm</span>
		<b>E1125-C*</b>			Ammonia, NH <sub>3</sub> <span style="float: right;">0–500 ppm</span>
		<b>E1125-D*</b>			Ammonia, NH <sub>3</sub> <span style="float: right;">0–1000 ppm</span>
		<b>E1125-E*</b>			Ammonia, NH <sub>3</sub> <span style="float: right;">0–5000 ppm</span>
		<b>E1130-A</b>			Nitrogen dioxide, NO <sub>2</sub> <span style="float: right;">0–10 ppm</span>
		<b>E1130-B</b>			Nitrogen dioxide, NO <sub>2</sub> <span style="float: right;">0–20 ppm</span>
		<b>E1130-C</b>			Nitrogen dioxide, NO <sub>2</sub> <span style="float: right;">0–30 ppm</span>
		<b>E1130-E</b>			Nitrogen dioxide, NO <sub>2</sub> <span style="float: right;">0–100 ppm</span>
		<b>E1130-F</b>			Nitrogen dioxide, NO <sub>2</sub> <span style="float: right;">0–5 ppm</span>
		<b>E1183-B</b>			Hydrogen cyanide, HCN <span style="float: right;">0–50 ppm</span>
		<b>E1183-C</b>			Hydrogen cyanide, HCN <span style="float: right;">0–100 ppm</span>
		<b>E1185-B</b>			Formaldehyde, CH <sub>2</sub> O <span style="float: right;">0–10 ppm</span>
		<b>E1186-D</b>			Hydrogen chloride, HCl <span style="float: right;">0–20 ppm</span>
		<b>E1189-C</b>			Ethylene, C <sub>2</sub> H <sub>4</sub> <span style="float: right;">0–200 ppm</span>
		<b>E1190-A</b>			Ozone, O <sub>3</sub> <span style="float: right;">0–5 ppm</span>
		<b>E1190-B</b>			Ozone, O <sub>3</sub> <span style="float: right;">0–10 ppm</span>
		<b>E1193-C</b>			Chlorine, Cl <sub>2</sub> <span style="float: right;">0–10 ppm</span>
		<b>E1193-D</b>			Chlorine, Cl <sub>2</sub> <span style="float: right;">0–20 ppm</span>
		<b>E1194-A</b>			Hydrogen, H <sub>2</sub> <span style="float: right;">0–1000 ppm</span>
		<b>E1195-A2</b>			Oxygen, O <sub>2</sub> , 2 years <span style="float: right;">0–25 % vol</span>
		<b>E1195-A3</b>			Oxygen, O <sub>2</sub> , 3 years <span style="float: right;">0–25 % vol</span>
		<b>E1195-A5</b>			Oxygen, O <sub>2</sub> , 5 years <span style="float: right;">0–25 % vol</span>
		<b>E1195-A7</b>			Oxygen, O <sub>2</sub> , 7 years <span style="float: right;">0–25 % vol</span>
		<b>E1196-B</b>			Sulphur dioxide, SO <sub>2</sub> <span style="float: right;">0–20 ppm</span>
		<b>E1197-A</b>			Hydrogen sulphide, H <sub>2</sub> S <span style="float: right;">0–50 ppm</span>
		<b>E1197-B</b>			Hydrogen sulphide, H <sub>2</sub> S <span style="float: right;">0–100 ppm</span>
		<b>E1197-C</b>			Hydrogen sulphide, H <sub>2</sub> S <span style="float: right;">0–200 ppm</span>
		<b>E1197-D</b>			Hydrogen sulphide, H <sub>2</sub> S <span style="float: right;">0–500 ppm</span>
		<b>E1197-E</b>			Hydrogen sulphide, H <sub>2</sub> S <span style="float: right;">0–1500 ppm</span>
		<b>E1199-A</b>			Ethylene oxide, C <sub>2</sub> H <sub>4</sub> O <span style="float: right;">0–10 ppm</span>
					<b>Gas type/ Measuring range</b>
		<b>0</b>			Without housing
		<b>A</b>			Plastic housing type A, 94 x 130 x 57 mm
		<b>5*</b>			Stainless steel housing type 5, 110 x 132 x 42.5 mm
		<b>D</b>			Plastic housing type D, 94 x 65 x 57 mm
		<b>N</b>			Plastic housing type N, 80 x 82 x 55 mm <span style="float: right;"><b>Housing for the integration of the sensor</b></span>

\* On request

### EXAMPLE

CO sensor unit, measuring range 300 ppm, with plastic housing type A, without display, sensor unit in plastic housing P

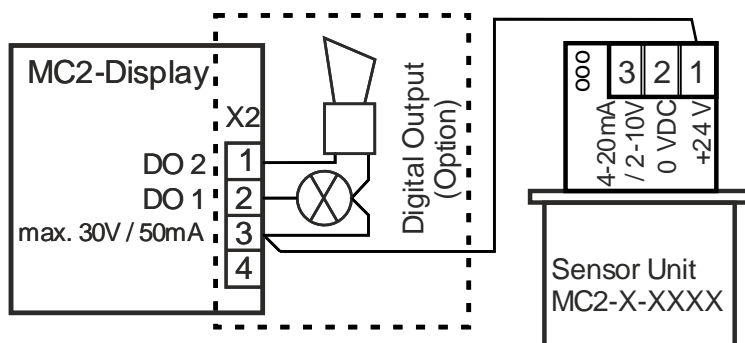
**Ordering number: MC2-A-E1110-F-0-P**

### ACCESSORY

Duct mounting kit

**Ordering number: C2-Z2**

### WIRING CONFIGURATION



### Note:

The installation of the sensor unit MC2 directly on the MSC2 or MSB2 housing isn't possible, only external connection with separate housing!

For 4–20 mA output signal you have to remove the resistor between pin 2 and pin 3.