

Gas Detection.



Technical Datasheet



PolyGard®

MC2 Sensor

with Electrochemical Sensor Element
for Toxic Gases or Oxygen
with Analog Output

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DESCRIPTION

Electrochemical sensor including digital value processing and integrated self-diagnosis, for the continuous monitoring of the ambient air to detect toxic gases or oxygen.

The intelligent MC2 Sensor for detection of toxic gases or oxygen monitoring includes an electrochemical cell and electronics with a measuring amplifier and a μ Controller as well as a module with a terminal for the analog output and the external power supply. The μ Processor converts the sensor's measuring signal into a linear 4–20 mA signal (or 2–10 V). All relevant data and measured values of the sensor are stored fail-safe in the internal memory of the μ Processor.

The maintenance of the device can be done either by simply exchanging the sensor or by using the integrated, comfortable calibration routine directly at the system.

APPLICATION

The PolyGard® MC2 Sensor used to detect toxic gases or to monitor the oxygen content in the ambient air when an analog 4–20 mA (or 2–10 V) signal is required.



Garage



Tunnel



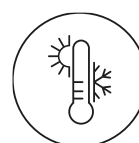
Food



Beverage
dispensing



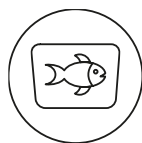
Laboratory



Climate



Water



Aquaculture



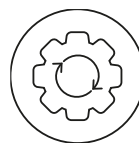
Hydrogen



Battery



Waste



Process



Gas storage

FEATURES

- Internal functional control with integrated Watchdog
- Easy maintenance and calibration by exchange of the sensor or by comfortable on-site calibration
- High accuracy, selectivity and reliability
- Low zero-point drift
- Sensor with long life expectancy (depending on gas type)
- Hardware and software according to SIL compliant development process
- 4–20 mA (or 2–10 V) analog output with selectable signal output for Special Mode (fault, maintenance, service etc.)
- Reverse polarity protected, overload and short-circuit proof
- IP65 protection (when installed)

SPECIFICATIONS

ELECTRICAL	
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, $\geq 50 \text{ k}\Omega$ 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
SENSOR ELEMENT	
Gas type and measuring range	See Ordering Information
Measuring principle	Electrochemical
Poisoning	Electrochemical sensor elements are susceptible to poisoning by organic solvents.
RECOMMENDED STORAGE CONDITIONS	
Storage temperature range ¹	See following tables
Storage time ¹	Ca. 6 months
Humidity range / pressure range	See following tables
PHYSICAL	
Housing type P	Polycarbonate UL 94 V2
Housing colour	Similar to RAL 7035 (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
Mounting	Screw mounting, external thread M25 x 1.5 mm
Wire connection	Screw-type terminal, 0.25–1.3 mm ² , 3-pin
REGULATIONS	
Directives	EMC directives 2014/30/EU, UL2075 (only for sensor MC2-X-E1110-E-X-P) CE Compliance with: EN 378 EN IEC 62990-1 Type SM EN 50104 (for O ₂) EN 50271, EN 50545 EN 61010-1:2010 ANSI/UL 61010-1 CAN/CSA-C22.2 No. 61010-1
Warranty	1 year on sensors (not if poisoned or overloaded)
OPTIONS	
HOUSING TYPE A	
Material / flammability classification	Polycarbonate / UL 94 V2
Housing colour	Similar to RAL 7035 (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
DISPLAY	
LC Display	2 lines, 16 characters each, monochrome
Temperature range	-20 °C to +60 °C (-4 °F to 140 °F)
OPEN-COLLECTOR	
Transistor output (2)	For horn (resettable) and warning lamp
Switching capacity	24 V DC / 50 mA (+ switching)

¹ If stocked for a longer period, we recommend checking the zero point and recalibrating if necessary.

Gas type	Order No.	Measuring range ¹	Accuracy	Display resolution	Repeatability	t ₉₀ time	Reaction time	Zero-point variation	Drift in air
	MC2-X-	ppm	± % sig.	ppm	< ± % sig.	≤ sec.	≤ sec.	± ppm	< % / month
CO	E1110-A	0-50	2	0.01	3	15	5	1	2
CO	E1110-C	0-150	2	0.1	5	10	5	4	0.4
CO	E1110-E	0-250	2	0.1	5	10	5	4	0.4
CO	E1110-F	0-300	2	0.1	5	10	5	4	0.4
CO	E1110-H	0-500	2	0.1	5	10	5	4	0.4
NH ₃	E1125-A	0-100	5	0.1	10	120	5	5	2
NH ₃	E1125-B	0-300	3	0.1	10	120	5	5	2
NH ₃	E1125-C	0-500	3	0.1	10	120	5	5	2
NH ₃	E1125-D	0-1000	3	1	10	120	5	10	2
NH ₃	E1125-E	0-5000	2	1	5	30	5	100	2
NO	E1129-C	0-100	2	0.1	5	20	5	3	2
NO ₂	E1130-A	0-10	5	0.01	2	25	5	0.2	2
NO ₂	E1130-B	0-20	5	0.01	2	25	5	0.2	2
NO ₂	E1130-C	0-30	5	0.01	2	25	5	0.2	2
NO ₂	E1130-E	0-100	5	0.1	2	25	5	2	2
NO ₂	E1130-F	0-5	5	0.001	2	25	5	0.1	2
CH ₃ OH	E1150-A	0-250	5	0.1	5	80	5	5	2
VOC	E1160-A	0-10	5	0.01	5	70	5	0.5	1
VOC	E1160-B	0-5	5	0.001	5	70	5	0.5	1
VOC	E1160-C	0-200	5	0.1	5	45	5	5	1
HCN	E1183-B	0-50	5	0.01	5	30	5	2	2
HCN	E1183-C	0-100	5	0.1	5	30	5	2	2
CH ₂ O	E1185-B	0-10	n.d.	0.01	5	60	5	0.2	2
HCl	E1186-D	0-20	5	0.01	5	60	5	0.5	2
C ₂ H ₄	E1189-B	0-10	n.d.	0.01	5	150	5	0.5	5
C ₂ H ₄	E1189-C	0-200	n.d.	0.1	5	120	5	5	5
O ₃	E1190-A	0-5	n.d.	0.001	5	60	5	0.1	2
O ₃	E1190-B	0-10	n.d.	0.01	5	60	5	0.2	2
O ₃	E1190-C	0-1	n.d.	0.001	5	30	5	0.05	2
H ₂ O ₂	E1191-A	0-10	n.d.	0.01	2	40	5	0.2	2
H ₂ O ₂	E1191-B	0-1500	n.d.	1	2	40	5	15	2
Cl ₂	E1193-C	0-10	n.d.	0.01	5	40	5	0.2	2
Cl ₂	E1193-D	0-20	n.d.	0.01	5	40	5	0.2	2
H ₂	E1194-A	0-1000	n.d.	1	5	70	5	10	2
SO ₂	E1196-B	0-20	3	0.01	2	20	5	0.2	2
H ₂ S	E1197-A	0-50	3	0.01	2	25	5	1	2
H ₂ S	E1197-B	0-100	3	0.1	2	25	5	1	2
H ₂ S	E1197-C	0-200	3	0.1	2	30	5	2	2
H ₂ S	E1197-D	0-500	3	0.1	2	30	5	5	2
H ₂ S	E1197-E	0-1500	3	1	5	60	5	15	-
ETO	E1199-A	0-10	n.d.	0.01	5	150	10	1	2

¹ Exceeding the measuring range limit will include a risk of damaging the sensor element.

Gas type	Order No.	Measuring range ¹	Temperature range	Humidity range non-condensing	Pressure range	Storage temperature range ²	Life time ³ in air	Relative gas density ⁴	Calibration interval ⁵
	MC2-X-	ppm	°C	% RH	kPa	°C	> years	Air = 1	Months
CO	E1110-A	0-50	-20 / +50	15-90	90-110	10-30	2	0.97	12
CO	E1110-C	0-150	-20 / +50	10-95	80-120	0-20	6	0.97	12
CO	E1110-E	0-250	-20 / +50	10-95	80-120	0-20	6	0.97	12
CO	E1110-F	0-300	-20 / +50	10-95	80-120	0-20	6	0.97	12
CO	E1110-H	0-500	-20 / +50	10-95	80-120	0-20	6	0.97	12
NH ₃	E1125-A	0-100	-30 / +50	15-90	80-120	0-20	2	0.60	12
NH ₃	E1125-B	0-300	-30 / +50	15-90	80-120	0-20	2	0.60	12
NH ₃	E1125-C	0-500	-30 / +50	15-90	80-120	0-20	2	0.60	12
NH ₃	E1125-D	0-1000	-30 / +50	15-90	80-120	0-20	2	0.60	12
NH ₃	E1125-E	0-5000	-30 / +50	15-90	80-120	0-20	2	0.60	12
NO	E1129-C	0-100	-30 / +50	15-90	80-120	0-20	2	1.04	12
NO ₂	E1130-A	0-10	-30 / +50	15-90	80-120	0-20	2	2.80	12
NO ₂	E1130-B	0-20	-30 / +50	15-90	80-120	0-20	2	2.80	12
NO ₂	E1130-C	0-30	-30 / +50	15-90	80-120	0-20	2	2.80	12
NO ₂	E1130-E	0-100	-30 / +50	15-90	80-120	0-20	2	2.80	12
NO ₂	E1130-F	0-5	-20 / +50	15-90	80-120	0-20	2	2.80	12
CH ₃ OH	E1150-A	0-250	-20 / +50	15-90	80-120	0-20	2	1.10	6
VOC	E1160-A	0-10	-40 / +55	15-95	80-120	0-20	3	-	12
VOC	E1160-B	0-5	-40 / +55	15-95	80-120	0-20	3	-	12
VOC	E1160-C	0-200	-40 / +55	15-95	80-120	0-20	3	-	12
HCN	E1183-B	0-50	-20 / +50	15-90	90-110	5-20	2	0.93	6
HCN	E1183-C	0-100	-20 / +50	15-90	90-110	5-20	2	0.93	6
CH ₂ O	E1185-B	0-10	-30 / +50	15-90	90-110	5-20	3	1.04	6
HCl	E1186-D	0-20	-20 / +50	15-90	90-110	5-20	2	1.27	6
C ₂ H ₄	E1189-B	0-10	-40 / +50	15-90	90-110	5-20	2	0.97	6
C ₂ H ₄	E1189-C	0-200	-30 / +50	15-90	90-110	5-20	2	0.97	6
O ₃	E1190-A	0-5	-30 / +50	15-90	90-110	5-20	2	1.66	6
O ₃	E1190-B	0-10	-30 / +50	15-90	90-110	5-20	2	1.66	6
O ₃	E1190-B	0-1	-20 / +40	15-90	80-120	5-20	2	1.66	6
H ₂ O ₂	E1191-A	0-10	-20 / +40	15-90	80-120	0-20	2	1.00 ⁶	6
H ₂ O ₂	E1191-B	0-1500	-20 / +40	15-90	80-120	0-20	2	1.00 ⁶	6
Cl ₂	E1193-C	0-10	-30 / +50	15-90	90-110	5-20	2	2.48	6
Cl ₂	E1193-D	0-20	-30 / +50	15-90	90-110	5-20	2	2.48	6
H ₂	E1194-A	0-1000	-20 / +50	15-90	90-110	10-30	2	0.07	12
SO ₂	E1196-B	0-20	-30 / +50	15-90	80-120	0-20	2	2.73	6
H ₂ S	E1197-A	0-50	-30 / +50	15-90	80-120	0-20	2	1.19	6
H ₂ S	E1197-B	0-100	-30 / +50	15-90	80-120	0-20	2	1.19	6
H ₂ S	E1197-C	0-200	-30 / +50	15-90	80-120	0-20	2	1.19	6
H ₂ S	E1197-D	0-500	-30 / +50	15-90	80-120	0-20	2	1.19	6
H ₂ S	E1197-E	0-1500	-30 / +50	15-90	90-110	5-20	2	1.19	6
ETO	E1199-A	0-10	+10 / +30	15-90	90-110	5-20	2	1.56	12

¹ Exceeding the measuring range limit will include a risk of damaging the sensor element.

² A deviating storage temperature can have a negative effect on sensitivity and service life.

³ Expected service life for normal ambient conditions

⁴ 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 ≤ 0.85: Mounting 0.3–0.5 m below the ceiling

0.85 < d < 1.15: Mounting at 1.2–1.8 m height

d ≥ 1.15: Mounting 0.3–0.5 m above the floor

⁵ Manufacturer-recommended calibration intervals for normal environmental conditions

⁶ Relative vapour density

Gas type	Order No.	Measuring range ¹	Accuracy	Display resolution	Repeatability	t ₉₀ time	Reaction time	Zero-point variation	Drift in air
	MC2-X-	% vol	± % sig.	ppm	< ± % sig.	≤ sec.	≤ sec.	± ppm	< % / month
O ₂	E1195-A2	0–25	2	0.01	2	15	5	n.d.	0.4
O ₂	E1195-A3	0–25	2	0.01	2	15	5	n.d.	0.4
O ₂	E1195-A5	0–25	2	0.01	2	15	5	n.d.	0.4
O ₂	E1195-A7	0–25	2	0.01	2	15	5	n.d.	0.4

Gas type	Order No.	Measuring range ¹	Temperature range	Humidity range non-condensing	Pressure range	Storage temperature range ²	Life time ³ in air	Relative gas density ⁴	Calibration interval ⁵
	MC2-X-	% vol	°C	% RH	kPa	°C	> years	Air = 1	Months
O ₂	E1195-A2	0–25	-40 / +50	5–95	80-120	0-20	2	1.11	6
O ₂	E1195-A3	0–25	-40 / +50	5–95	80-120	0-20	3	1.11	6
O ₂	E1195-A5	0–25	-40 / +50	15–90	80-120	0-20	5	1.11	12
O ₂	E1195-A7	0–25	-40 / +50	15–90	80-120	0-20	7	1.11	12

¹ Exceeding the measuring range limit will include a risk of damaging the sensor element.

² A deviating storage temperature can have a negative effect on sensitivity and service life.

³ Expected service life for normal ambient conditions

⁴ 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 ≤ 0.85: Mounting 0.3–0.5 m below the ceiling

0.85 < d < 1.15: Mounting at 1.2–1.8 m height

d ≥ 1.15: Mounting 0.3–0.5 m above the floor

⁵ Manufacturer-recommended calibration intervals for normal environmental conditions

CROSS SENSITIVITY¹ – SENSOR ELEMENT

Gas concentration of cross gas / reaction of sensor

Gas type	Order No.	Ammonia, NH ₃	Chlorine, Cl ₂	Ethanol, C ₂ H ₆ O	Ethylene, C ₂ H ₄	Carbon dioxide, CO ₂	Carbon monoxide, CO	Sulphur dioxide, SO ₂	Hydrogen sulphide, H ₂ S	Nitrogen dioxide NO ₂	Nitrogen monoxide, NO	Hydrogen, H ₂
	MC2-X-		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
CO	E1110-A	50/-0.5	15/0.0	200/<1.0	100/11.5	-	-	10/-0.1	15/0.5	10/-0.3	50/-3.0	100/8.5
CO	E1110-C	-	2/<0.5	-	-	-	-	-	25/0	20/<0.5	50/<10	100/<20
CO	E1110-E	-	2/<0.5	-	-	-	-	-	25/0	20/<0.5	50/<10	100/<20
CO	E1110-F	-	2/<0.5	-	-	-	-	-	25/0	20/<0.5	50/<10	100/<20
CO	E1110-H	-	2/<0.5	-	-	-	-	-	25/0	20/<0.5	50/<10	100/<20
NH ₃	E1125-A	-	-	100/0	-	5000/0	500/0	20/-6	25/30	5/-7.5	50/0	100/0
NH ₃	E1125-B	-	-	100/0	-	5000/0	500/0	20/-6	25/30	5/-5	50/0	100/0
NH ₃	E1125-C	-	-	100/0	-	5000/0	500/0	20/-6	25/35	5/-5	50/0	100/0
NH ₃	E1125-D	-	-	100/0	-	5000/0	500/0	20/-6	25/35	5/-5	50/0	100/0
NH ₃	E1125-E	-	-	100/0	-	5000/0	500/0	20/-6	25/35	5/-5	50/0	100/0
NO	E1129-C	-	-	-	-	-	200/0	20/0	25/<10	20/0	-	-
NO ₂	E1130-A	50/0	1/0.5	-	-	5000/0	300/0	20/0	15/<1	-	50/<-1	200/0
NO ₂	E1130-B	50/0	1/0.5	-	-	5000/0	300/0	20/0	15/<1	-	50/<-1	200/0
NO ₂	E1130-C	50/0	1/0.5	-	-	5000/0	300/0	20/0	15/<1	-	50/<-1	200/0
NO ₂	E1130-E	50/0	1/0.5	-	-	5000/0	300/0	20/0	15/<1	-	50/<-1	200/0
NO ₂	E1130-F	100/0	1/1	100/0	-	5000/0	300/0	20/0	10/-7-0	10/10	30/0	1000/0
CH ₃ OH	E1150-A	50/-4.6	100/-5.8	-	-	1000/0	20/8.5	20/6.7	20/12.3	10/4.8	10/11.8	1000/2.6
HCN	E1183-X ²	-	-	-	100/0	-	100/~2	20/~38	15/~25	5/~12	25/0	100/~2
CH ₂ O	E1185-B	-	-	30/1	-	-	100/<20	-	20/~20	-	-	100/5
HCl	E1186-D	80/0	20/<0.5	30/<0.3	100/0	-	1000/0	100/0	20/<40	20/-6	25/0	-
C ₂ H ₄	E1189-B	-	-	30/21	-	-	10/6	-	-	-	-	-
C ₂ H ₄	E1189-C	-	-	-	-	-	100/<60	-	-	-	-	-
O ₃	E1190-X ²	80/0	5/4	60/0	100/0	-	100/0	5/0	20/<-20	5/~5	50/0	100/0
O ₃	E1190-C	-	1/1.2	-	-	-	100/0	4/-0.2	1/-0.2	8/4	-	300/0
H ₂ O ₂	E1191-A	-	-	-	-	-	20/0,2	10/7.5	-	-	2/-0.5	-
H ₂ O ₂	E1191-B	-	-	-	-	-	200/3	20/15	-	-	20/25	-
Cl ₂	E1193-X ²	80/0	-	60/0	100/0	-	300/0	5/0	20/<-20	20/~20	50/0	100/0
H ₂	E1194-A	-	10/0	-	100/80	-	50/200	5/0	25/0	5/0	35/<10	-
O ₂	E1195-XX ²	-	-	-	-	-	-	-	-	-	-	-
SO ₂	E1196-B	20/0	15/<1	-	50/<45	-	300/<1	-	25/<0.5	20/<-20	50/0-5	400/<1
H ₂ S	E1197-A	50/0	15/0	-	100/0	5000/0	100/<2	20/0	-	5/<0.5	50/<0.5	-
H ₂ S	E1197-B	50/0	15/0	-	100/0	5000/0	100/<2	20/0	-	5/<0.5	50/<0.5	-
H ₂ S	E1197-C	50/0	15/0	-	100/0	5000/0	100/<2	20/0	-	5/<0.5	50/<0.5	-
H ₂ S	E1197-D	50/0	15/0	-	100/0	5000/0	100/<2	20/0	-	5/<0.5	50/<0.5	-
H ₂ S	E1197-E	-	-	-	-	-	100/<5	20/4	-	-	-	100/<5
ETO	E1199-A	-	-	30/21	-	-	100/~20	-	20/~40	-	-	-

¹ 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.

² Cross sensitivity data valid for all measuring ranges of the sensor.

CROSS SENSITIVITY¹ – SENSOR ELEMENT (VOC Sensor)

Approximate reaction of sensor to cross gas in percentage

Gas type	Order No.	Ammonia, NH ₃	Arsine, AsH ₃	Hydrogen cyanide, HCN	Ethanol, C ₂ H ₆ O	Ethylene, C ₂ H ₄	Ethylene oxide, C ₂ H ₄ O	Carbon dioxide, CO ₂	Carbon monoxide, CO	Methane, CH ₄	Ozone, O ₃	Phosphine, PH ₃	Sulphur dioxide, SO ₂	Nitrogen dioxide, NO ₂	Hydrogen, H ₂
	MC2-X	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm
VOC	E1160-X ²	1/0	1/4	1/0.8	1/0.5	1/0	1/0.35	10/0	100/105	1/0	1/-0.5	1/3.75	1/0.6	1/-1.2	2000/625

¹ 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.

² 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.

The T 021 (DGVU-I-213-056) and T 023 (DGVU-I-213-057) as well as T 055 leaflets must be observed.

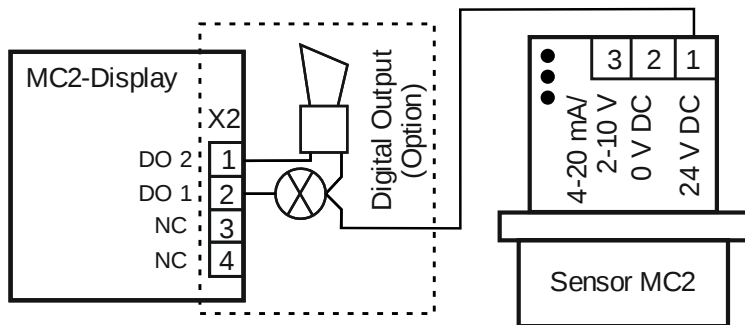
EXAMPLE

CO sensor, measuring range 0–300 ppm, with plastic housing type A without display
(order number: MC2-A-E1110-F-O-P)

ACCESSORY

Sensor protection cap (order number: C2-Z1)
Duct mounting kit (order number: C2-Z2)
Calibration adapter (order number: C2-Z4, C2-Z4-A, C2-Z4-B, C2-Z4-C)
Splash protection SplashGuard (order number: C2-Z5)

WIRING CONFIGURATION



Note:

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

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

FURTHER MEASURING PRINCIPLES



MPS™:

Ammonia (NH₃), Hydrogen (H₂)

→ See data sheet DB_MC2_MPS



Semiconductor:

Ammonia (NH₃), Ethylene (C₂H₄)

→ See data sheet DB_MC2_HL



Catalytic:

Ammonia (NH₃), Ethylene (C₂H₄), Hydrogen (H₂), Methanol (CH₃OH)

→ See data sheet DB_MC2_Ex



Documents



Catalog



YouTube