



## **Gas Detector Series PolyXeta® 2 with Semi-conductor Sensor for Freon Gases and Refrigerants for Zone1 and Zone 2**

### **User Manual**

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PX2 YouTube Video

Up-to-date data sheets and user manuals can be found in the download area on [www.msr-24.com](http://www.msr-24.com).



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## **1 Notes and General Information**

### **1.1 Applicability**

1. PolyXeta®2 gas warning device with semi-conductor sensor for Freon gases and Ammonia,  
series PX2-1...with Ex db protection, for zone 1 and 2  
series PX2-2...with Ex nA protection, for zone 1 and 2
2. PolyXeta®2 sensor head with semi-conductor sensor for Freon gases and Ammonia,  
series SX1... with Ex db protection, for zone 1 and 2

### **1.2 Intended Use**

The PolyXeta®2 fixed gas detectors of the **PX2-1** series are designed to detect and warn of Freon refrigerant gases and Ammonia in the hazardous areas of zones 1 and 2 according to Directive 2014/34/EU.  
The PolyXeta®2 fixed gas detectors of the **PX2-2** series are designed to detect and warn of Freon refrigerant gases and Ammonia in the hazardous areas of zone 2 according to Directive 2014/34/EU.  
The gas detectors are e.g. suitable for use in the chemical, petrochemical and offshore industry, etc. for indoor and outdoor applications within the environmental conditions specified in the technical data.

### **1.3 For Your Safety**

These operating instructions must be read and strictly followed by all persons installing, using, servicing and inspecting the product. Furthermore, the operating instructions "Service Tool and Display for µGard®2, PolyGard®2, PolyXeta®2" must be read and obeyed if the PolyXeta®2 has a display or if the Service Tool is used. The product can only fulfil its intended functions if installed, used, serviced, maintained and controlled according to the specifications of MSR-Electronic GmbH.

The factory settings of the measuring point, relay and system parameters and the device address are documented in the configuration card supplied with each device on delivery.

### **1.4 Installer's and Operator's Responsibilities**

It is the installer's and operator's responsibility to ensure that all PolyXeta®2 devices are installed and used in compliance with all national and local regulations and requirements. The gas warning device must be checked by an expert for correct installation and functioning before starting the measuring operation.

BGR 500 chapter 2.33 has to be applied in Germany.

The PolyXeta®2 gas detector has been calibrated and tested for functionality at the factory before delivery. When starting up, however, you have to perform and document a function testing using test gas.

### **1.5 Maintenance**

Regular maintenance has to be performed according to the instructions in chapter 8.

### **1.6 Liability**

MSR-Electronic GmbH will assume no liability if the device is not used properly or as intended. The installer and operator are solely responsible for the interpretation and the use of the product.  
If the product is not used, maintained or repaired according to the specifications in the user manual, warranty and product liability claims as well as claims arising from any guarantees that MSR-Electronic GmbH assumes for the product will lapse.



## 1.7 Approvals

The PolyXeta®2 gas warning device PX2-1 is approved for use in potentially explosive atmospheres of zone 1 and 2 by DEKRA Testing and Certification GmbH.

The PolyXeta®2 gas warning device PX2-2 is certified for use in zone 2 by the conformity declaration of the manufacturer.

### 1.7.1 Marking and Certificates according to ATEX Directive 2014/34/EU

	PX2-1 (Zone 1 und 2) Sensorkopf SX1	PX2-2 (Zone 2)
<b>Marking</b>	II 2G Ex db IIC T4 Gb ⊕ Ex CE 0158 -25 °C < Ta < +60 °C	II 3G Ex nA IIC T4 Gb ⊕ Ex CE -25 °C < Ta < +60 °C
<b>EC Type Examination Certificate</b>	BVS 15 ATEX E 129 X	--
<b>EG Konformitäts- erklärung für Zone 2</b>	--	CE_PX2_2_Zone2_1808
<b>Protections</b>	EN 60079-0: 2012 & EN 60079-1: 2014 (Ex-db)	EN 60079-0: 2012 & EN 60079-15: 2011 (Ex-nA)

### 1.7.2 Marking and Certificates according to IECEx **only for PX2-1**

Marking: Ex db IIC T4 Gb  
-25 °C < Ta < +60 °C

IECEx Certificate Conformity: IECEx BVS 16.0038X

Protections: IEC 60079-0: 2011 & IEC 60079-1: 2014 (Ex-db)

### 1.7.3 Terms and Conditions for Safe Use

Temperature range -25 °C < Ta < +60 °C

Mounting position: wall mounting with the sensor head downwards

1.7.4 Listing of Freon Gases

MSR Freon group	MSR code	Freon type	Calibration gas	Group	Measuring range	Relative gas density (air =1)
<b>FR02</b>	2061-01	R23	R23	HFC	2000 ppm	2.4
	2061-02	R508b	R23	HFC	2000 ppm	> Air
<b>FR03</b>	2063-01	R1234yf	R1234yf	HFO	2000 ppm	> Air
	2063-02	R452a	R1234yf	HFO	2000 ppm	> 1
	2063-05	R455a	R1234yf	HFO	2000 ppm	> Air
	2063-06	R454b	R1234yf	HFO	2000 ppm	> Air
	2063-07	R1234ze	R1234yf	HFO	2000 ppm	> Air
<b>FR04</b>	2064-01	R123	R123	HCFC	2000 ppm	> Air
<b>FR06</b>	2070-01	R22	R22	HCFC	2000 ppm	3
	2070-02	R401a	R22	HCFC	2000 ppm	> Air
	2070-03	R401b	R22	HCFC	2000 ppm	> Air
	2070-04	R402a	R22	HCFC	2000 ppm	> Air
	2070-05	R402b	R22	HCFC	2000 ppm	> Air
	2070-06	R403a	R22	HCFC	2000 ppm	> Air
	2070-07	R408a	R22	HCFC	2000 ppm	> Air
	2070-08	R409a	R22	HCFC	2000 ppm	> Air
	2070-09	R411a	R22	HFC	2000 ppm	> Air
<b>FR07</b>	2077-01	R134a	R134a	HFC	2000 ppm	> Air
	2077-02	R407a	R134a	HFC	2000 ppm	> Air
	2077-03	R416a	R134a	HFC	2000 ppm	> Air
	2077-04	R417a	R134a	HFC	2000 ppm	> Air
	2077-05	R422a	R134a	HFC	2000 ppm	> Air
	2077-06	R422d	R134a	HFC	2000 ppm	> Air
	2077-07	R427a	R134a	HFC	2000 ppm	> Air
	2077-08	R437a	R134a	HFC	2000 ppm	> Air
	2077-09	R438a	R134a	HFC	2000 ppm	> Air
	2077-10	R449a	R134a	HFC	2000 ppm	> Air
	2077-11	R407f	R134a	HFC	2000 ppm	> Air
<b>FR08</b>	2080-01	R125	R407c	HFC	2000 ppm	4.2
	2080-02	R32	R407c	CFC	2000 ppm	1.8
	2080-03	R404a	R407c	HFC	2000 ppm	3.45
	2080-04	R407c	R407c	HFC	2000 ppm	> 1
	2080-05	R410a	R407c	HFC	2000 ppm	2.3
	2080-06	R434a	R407c	HFC	2000 ppm	> Air
	2080-07	R507a	R407c	HFC	2000 ppm	3.45
	2080-08	R448a	R407c	HFC	2000 ppm	1.55
	2080-09	R452b	R407c	HFO	2000 ppm	> Air
	2080-10	R143b	R407c	HFO	2000 ppm	> Air
<b>%LFL</b>	2020-01	R32	R32	CFC	0-50 % LEL	1.8
	2020-02	R455a	R455a	HFO	0-50 % LEL	> Air
	2020-03	R454b	R454b	HFO	0-50 % LEL	> Air
	2020-04	R1234yf	R1234yf	HFO	0-50 % LEL	> Air
	2020-05	R1234ze	R1234ze	HFO	0-50 % LEL	> Air

Table 1.1: Available sensor heads for Freon gases



### 1.7.5 Listing of Ammonia

MSR code	Freon type	Calibration gas	Measuring range	Relative gas density (air =1)
S2125-C	R717	NH <sub>3</sub>	1000 ppm	0,59
S2125-F	R717	NH <sub>3</sub>	10.000 ppm	0,59

Table 1.2: Available sensor heads for Ammonia

## 2 General Description

### 2.1 Device Description

The fixed gas detector type "PX2" consists of a sensor head and an I/O unit.

The series **PX2-1** is approved according to ATEX and IECEx certified for zone 1 and 2.

The series **PX2-2** is certified by the manufacturer's ATEX declaration conformity for zone 2.

The sensor head consisting of the gas sensor and the evaluation, calibration and diagnostic electronics is an independent unit in flameproof stainless-steel housing (Ex d) with an external thread NPT ¾ ". All sensor data are stored in the sensor head. After the end of the calibration period or at the end of the sensor lifetime, the sensor can easily be replaced by a calibrated or a new sensor head.

The I/O unit including the operating power supply communicates with the sensor head via the internal local bus, monitors the communication and translates the measured value of the sensor head into a 4-20 mA signal. The value of the gas concentration and other relevant data and status messages are available on the central bus. The alarm relay is activated when the alarm threshold is exceeded. In case of a fault the fault relay and the analog output change into fault state and the fault message is transmitted via the central bus. An optional display unit with indication of the measurement values and status LEDs can be integrated behind a viewing window. The I/O unit is installed in a flameproof (Ex db for PX2-1, Ex nA for PX2-2) die-cast housing with up to four openings with NPT ¾ " female threads according to standard ANSI B1.20.1 for receiving sensor head and cable glands.

### 2.2 Measurement Principles

See chapter 10 "Sensor Specification".

### 3 Mounting Instructions



Check for completeness and accuracy using the delivery documents and the identification label on the device.

#### 3.1 Site of Installation

When choosing the mounting location, you have to consider the ambient conditions in order to get representative measurement results. Please pay special attention to the following factors:

- External heat sources are not allowed on the installation site.
- Choose mounting location of the sensor according to the local regulations.
- Consider ventilation conditions! Do not mount the transmitter next to air passages or suction holes.
- The sample gas must pass the sensor even under adverse flow conditions. A flow test can be performed for instance with smoke tubes.
- If the flow conditions are > 6 m/s, it is advisable to use a wind shield.
- Mount the transmitter at a location with minimum vibration and minimum variation in temperature
- In case of very difficult environmental conditions caused by dripping, splash, rain, condenser water or dusts in the atmosphere, which are above the IP 65 dust and water protection, additional accessories may be necessary to enable the use of the device. Please contact the manufacturer in such cases.
- Provide adequate space around the sensor for maintenance and calibration work.
- The installation height depends on the relative gas density of the monitored gas type.

Freon group	Gas type	Relative density (air = 1)	Recommended mounting height	Calibraton interval
FR02	R23	2.4	0.3 m above floor	12 months
FR03	R1234yf	4	0.3 m above floor	12 months
FR04	R123	> Luft	0.3 m above floor	12 months
FR06	R22	3	0.3 m above floor	12 months
FR07	R134a	>1	<b>0.5 m</b> above floor	12 months
FR08	R407c	2.3	0.3 m above floor	12 months
%LFL	R32	1.8	0.3 m above floor	12 months
	R717 (NH <sub>3</sub> )	0.59	Ceiling	12 months

Table 3.1: Mounting heights

#### 3.2 Installation Work



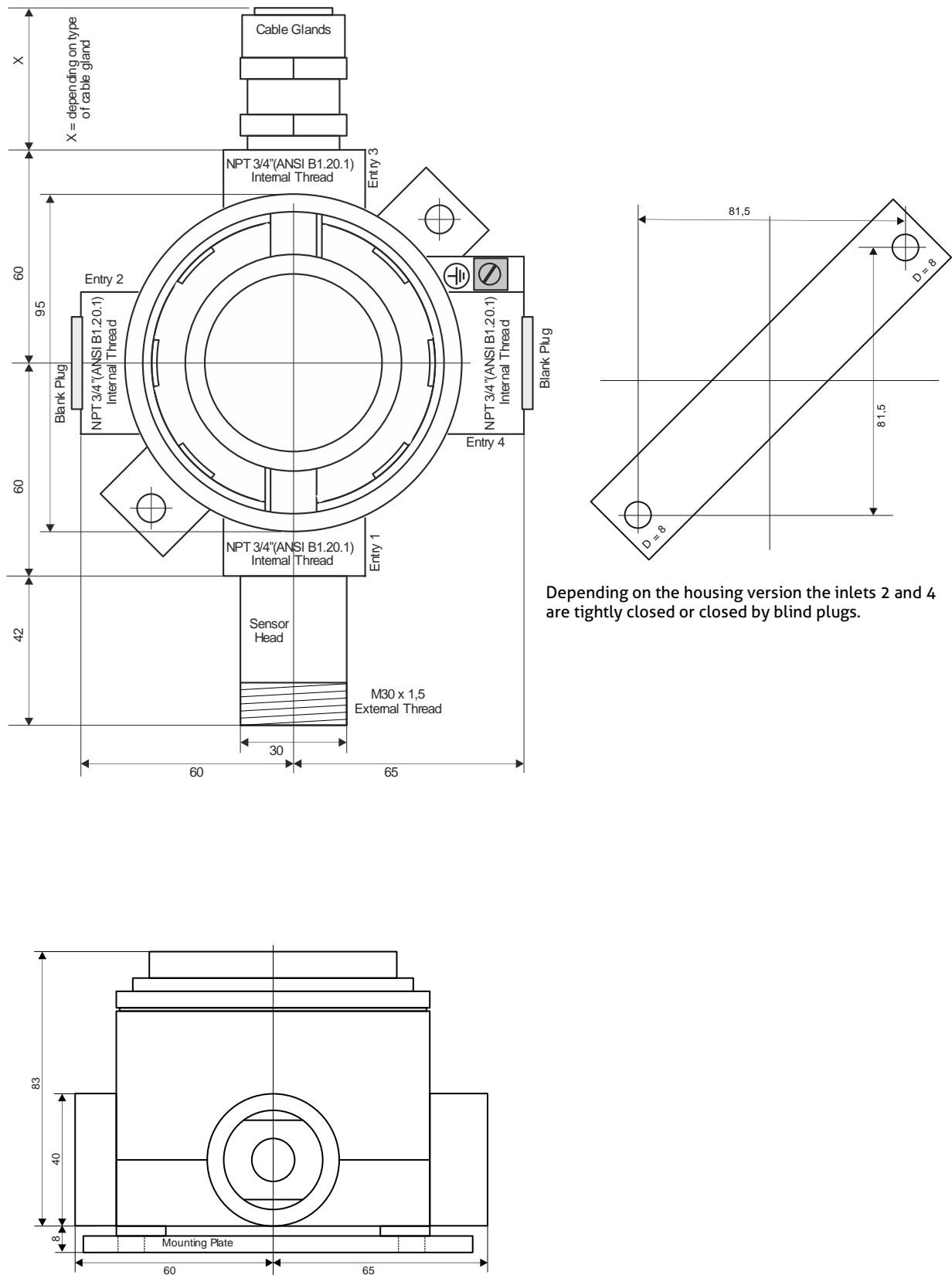
Assembly work must only be carried out under gas-free conditions.

The housing must neither be drilled nor be drilled through.

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

The mounting is done without opening the housing by using the two holes (D = 8 mm) of the fastening strap with suitable screws. The exact dimensions are shown in the drawing "Dimensions and Mounting", fig. 3.1.





Depending on the housing version the inlets 2 and 4 are tightly closed or closed by blind plugs.

Fig.3.1: Dimensions and Mounting

## 4 Electrical Installation



The instrument PX2-1 must only be opened under gas-free and voltage-free conditions.

The instrument PX2-2 should only be opened under gas-free and voltage-free conditions.

The enclosed cable gland has to be checked for admissibility for the requested requirements before installation in position "Entry 3". If the instrument is supplied without cable gland, a special cable gland approved for Ex protection class Ex db (PX2-1) or nA (PX2-2) and for the requirements of the application has to be mounted there.

When inserting the cables, you have to strictly follow the instructions enclosed to the cable glands.

No insulating sealing material must be poured into the NPT ¾ "threads of the cable gland and blanking plugs because the potential equalization between housing and cable gland / blind plugs is via the thread.

The cable gland / blind plugs must be tightened with a torque key with 15 Nm. Only when doing so you can ensure the required tightness.

After completion of work, the instrument must be closed again. The cover has to be completely screwed in and secured with the locking screw against inadvertent loosening.

### 4.1 General Notes

- In the version with display, the terminals are located behind the display. The required disassembly and subsequent assembly of the display is described in chapter 11.
- Only a professional should perform the wiring and the connection of the electrical installation according to the wiring diagram in compliance with the relevant regulations and only when de-energized!
- When connecting cables and conductors, please observe minimum length of 3 m according to EN 60079-14.
- Connect the housing to the equipotential bonding via the external ground terminal.
- Depending on the model there are female threads NPT ¾ inch on the housing at the positions "Entry 2 and 4" for placing additional cable glands. These inlets are factory sealed with original plugs. After completing the installation work, make sure that all unused entries are closed with blind plugs approved for Ex db (PX2-1) or nA (PX2-2) and for the requirements of the application. Thread adapters for reducing the cable glands or dummy plugs are not admitted.
- All terminals are Ex e type with spring contact and push actuation. The permissible conductor cross section is 0.2 to 2.5 mm<sup>2</sup> for single wires and multi-wire cables.
- Use cables with a braided shield with > 95 % coverage for compliance with the interference immunity. The shield must be connected to the inside connection of the housing with a maximum length of about 35 mm.
- For the recommended cross sections and lengths please refer to the table 4.1 "Cables".
- The analog output signal of warning devices without display can be used for the measurement control. To carry out these regular checks with the housing closed it is recommended to lead the analog signal out to the safe area via a cable.
- To comply with the requirements of servicing or operating the device without opening it, it is possible to calibrate or operate the device remotely via the central bus. For this it is necessary to lead the central bus out to the safe area via a cable.

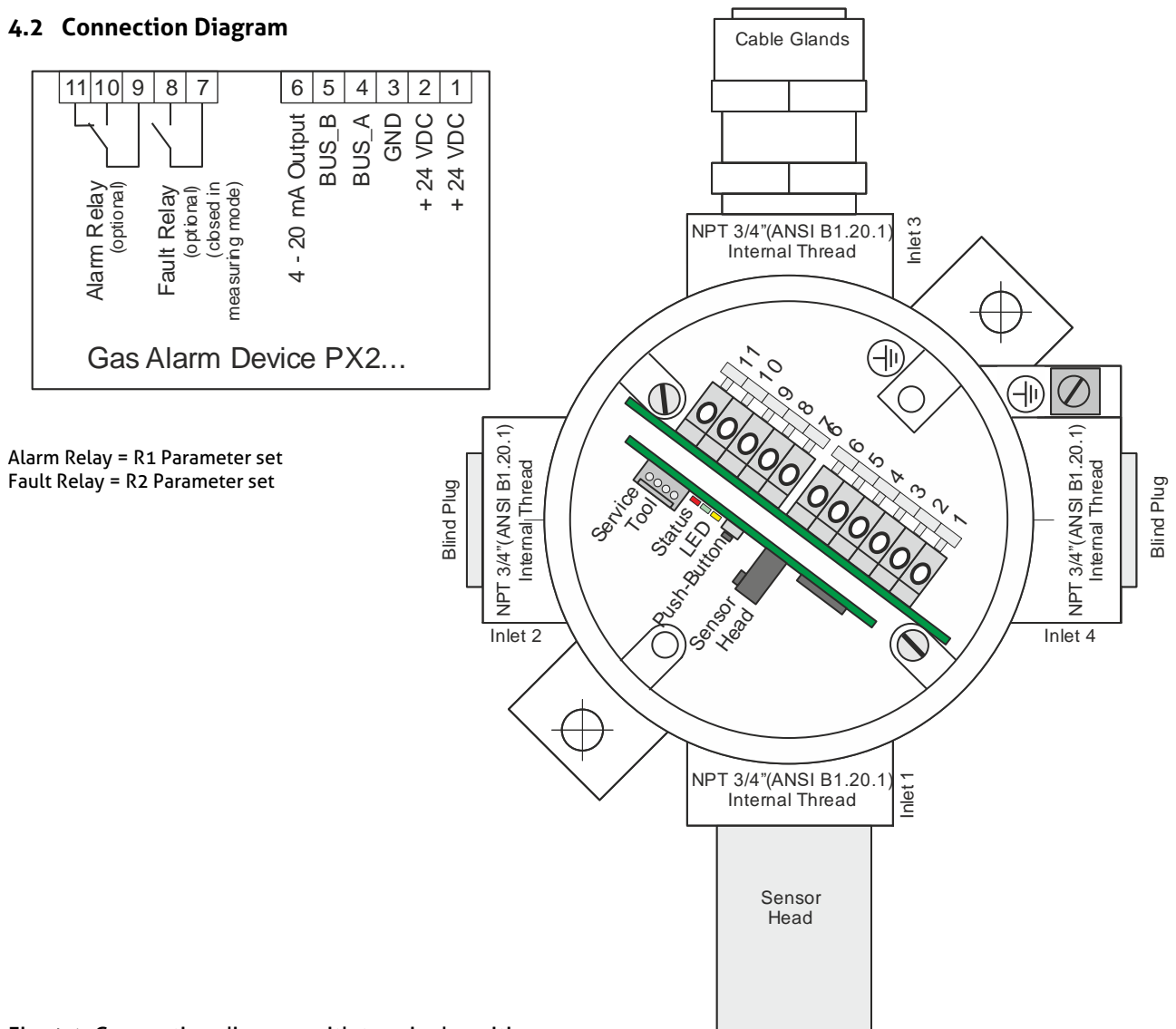
The enclosed cable gland has a feed-through range of 9 to 16 mm.  
The minimum diameter of the cable used must therefore be > 9 mm.

	Cross-section (mm <sup>2</sup> )	Max. length (m) for 24 V DC <sup>1</sup>			
			With display	With relay	Relay & display
With sensor head for combustibile gases (type PX2-X20...)					
Operating voltage with 4-20 mA signal	0.5	600	500	400	250
	1.0	1000	800	700	500
Operating voltage with central bus	0.5	900	500	400	300
	1.0	900	900	800	700

Table 4.1: Cables

<sup>1</sup> The max. cable lengths and our recommendation don't consider any local conditions, like fire protection, national regulations etc.

### 4.2 Connection Diagram



Alarm Relay = R1 Parameter set  
Fault Relay = R2 Parameter set

Fig. 4.1: Connection diagram with terminal positions

## 5 Commissioning

### 5.1 General Notes

Before delivery all PX2 gas detectors without exception run through a complete functional test with an initial calibration of the sensors as documented in the enclosed calibration protocol.

However, transportation, storage, installation or other environmental conditions may lead to (mostly small) deviations. It is therefore necessary that a person authorized by the manufacturer or alternatively an expert puts the device properly into operation and performs a functional test.

### 5.2 Check / Change of Operating Parameters

The complete parameter set is stored in the PX2 gas detector in a fail-safe way and documented in the enclosed calibration and test record as well as in the PolyXeta®2 configuration card. Necessary changes of parameters for adaptation to the application can be done by qualified persons only in the display and if not available by means of the service tool.

The parameter functions as well as the menu navigation and operation are described in the User Manuals of "Service Tool and Display" for PolyXeta®2.

Relevant standard parameters	Freon measuring range 2000 ppm	Freon measuring range 50 % LEL
Meas. range	20–2000 ppm	0–50 % LEL
Alarm threshold 1	700 ppm	10 % LEL ↑
Alarm threshold 2	1000 ppm	20 % LEL ↑
Hysteresis	50 ppm	2 % LEL
Alarm 1	Not latching	Not latching
Alarm 2	Latching	Latching
Alarm relay 1	Assigned to 1 and 2, energized, (Alarm OFF = Relay ON)	Assigned to 1 and 2, energized, (Alarm OFF = Relay ON)

Table 5.1: Relevant Standard Parameters

### 5.3 Running-in Characteristics

After switching on or after an internal reset of the microcontroller, the PX2 detector always runs through a start routine with defined status of the outputs. The start always begins with the diagnosis and warm-up stages. When they have succeeded and finished, the measurement operation starts. External intervention is not possible during this start routine.

The states of analog output, relays, central bus and signal LEDs for all operating stages are shown in the following table.

Start ↓	Status LED			Analog Output	Relays		Central Bus
	Power	Alarm	Fault		Alarm	Fault	
Diagnosis (~ 0,5 sec)				< 2 mA	OFF	Error <sup>4</sup>	Communication STOP
OK ↓							
Warm-up period				< 2 mA	OFF	Error <sup>4</sup>	Communication STOP
OK ↓							
Measuring mode				4-20 mA <sup>1</sup>	<sup>3</sup>	OK <sup>5</sup>	Communication OK
Maintenance mess.				4-20 mA <sup>1</sup>	<sup>3</sup>	OK <sup>5</sup>	Communication OK
Special mode				2 mA <sup>8</sup>	<sup>7</sup>	Error <sup>4</sup>	Communication OK
Detected fault				2 mA	<sup>7</sup>	Error <sup>4</sup>	Communication OK
Processor failure				< 1 mA	OFF	Error <sup>4</sup>	Communication STOP

Table 5.2: Status operating modes

- <sup>1</sup> Depends on the measured gas concentration
- <sup>2</sup> Status depends on the gas concentration and the alarm threshold
- <sup>3</sup> Status depends on the gas concentration, the alarm threshold and the operating mode
- <sup>4</sup> Relay de-energized, contact open
- <sup>5</sup> Relay energized, contact closed (OK state)
- <sup>6</sup> Brightness cyclically flashing when message to central bus
- <sup>7</sup> Previous status doesn't change.
- <sup>8</sup> No influence on the analog signal if the Special Mode was triggered by the operator.

## 5.4 Functional Test

The functional test has to be carried out and documented in accordance with chapter 8.2 "Functional Control / Calibration and Adjustment".

## 6 Operating Modes



The instrument PX2-1 must only be opened under gas-free and voltage-free conditions.

The instrument PX2-2 should only be opened under gas-free and voltage-free conditions.

After completion of work, the instrument must be closed again. The cover has to be completely screwed in and secured with the locking screw against inadvertent loosening.

### 6.1 Restart (Diagnostic and Warm-up Stage)

The device is designed so as to generally run through all internal device tests (diagnostics) in the PX2 module or in the sensor head after each power-up or processor reset before the measuring operation starts.

That means that the processor's internal components and the associated program and working memories as well as the other components of the input and output units are tested. This process takes approximately 0.5 seconds.

When all diagnostics have been successful, the sensor element starts the warm-up phase.

The warm-up is necessary for the gas sensing element in the sensor head to assume a stable state after return of the voltage without triggering a pseudo alarm. The duration of the warm-up phase depends on the type of sensor used and can be read from the table 10.2, "Sensor Specification" from the column "Warm-up periods".

During warm-up, the yellow LED flashes every 2 seconds and "Power ON" appears in the display. The device status during warm-up is given in Table 5.2 "Status operating modes".

The measuring operation starts after the end of the warm-up phase; the necessary diagnostic functions continue to run in the background.

### 6.2 Measuring Mode

In normal operating mode = **measuring mode** there are no faults present, the gas concentration of the sensor is continuously polled, checked for plausibility, output on the analog output and provided on the central bus. The gas concentration is displayed on the built-in display, if available.

When the alarm evaluation is activated, only with alarm threshold > 0, the gas signal is checked with each measurement cycle, if  $\geq$  alarm threshold and if exceeding, the alarm LED and the optional alarm relay are triggered. If the value falls below the alarm threshold minus the set hysteresis again, the alarm is automatically cancelled. With programmed self-hold function the alarm remains active until manual acknowledgment.

The instrument continuously monitors itself, the measurement signal, the analog output, the alarm relay and the communication to the sensor head.

If the measurement signal falls below the zero point, this will be tolerated up to a limit of minus 6 % of the measuring range, the analog output signal drops down to 3 mA and there will be still no error generated. Active dead band suppresses the 4-20 mA signal around the zero point. See chapter 11.5 "Deadband".

If the measurement signal exceeds the zero point, this will be tolerated up to a limit of plus 6 % of the measuring range, the analog output signal increases up to 21 mA and there will be still no error generated.

In case of overrange, the gas warning device adopts the special mode until acknowledgment with the following states:

- Alarm relay message: Relay in alarm status (if assigned)
- Fault signal relay: Relay in the error status
- Analog output: > 21.2 mA
- Indication on display: Overage / status LED red
- Field bus: Overage

When a very high gas concentration has occurred, the sensitivity and zero point of the sensor head may be different even days later. Therefore in this case, you have to check the zero point and the sensitivity of the sensor immediately after the event as well as a few days later and, if necessary, to recalibrate them.

### 6.2.1 Alarm Acknowledgement

The acknowledgement of the function "Latching" requires that after the alarm has been triggered, the gas-free state has to be ensured with additional measures (for example, portable handset that has already been turned on outside the danger zone). Only after having ascertained that there is no more gas present, you are allowed to reset the pending alarm only locally on the device having released the alarm by manually pressing (5 sec.) the internal button (fig. 4.1) or by activating the "ESCAPE" button on the optional display or the external service tool. The reset may also be made on the optional remote control unit.

### 6.3 Special Mode



The operator may set the instrument in the special mode only when gas-free state is ensured (no alarm), because the alarm function is not available in this mode.

The special mode includes all operating conditions outside the measuring operation.

In special mode operation the query of the gas concentrations is slightly delayed, but there is no alarm evaluation. The fault relay switches to error status and the analog output delivers 2 mA. The flashing yellow LED and the optional display indicate the special mode.

The PX2 gas detector takes the special mode in the following cases:

- Internal device fault
- Measurement signal exceeds or falls below limit < 6 % > of reading signal
- Diagnostic and warming-up phase after the return of voltage (Power On Status)
- Service mode activated by the operator.

The operator can activate the special mode on the internal (optional) display or via an external service tool or the PC software EasyConfig. This mode includes commissioning, calibration, inspection, repair and decommissioning.

Pending alarms are held in active special mode, but new alarms are not generated.

The operator can exit the special mode after completion of work; if there are no further entries or operations, the unit will automatically return to the measurement mode after 15 minutes.

## 6.4 Faults

The PX2 detector includes a diagnostic module for the continuous monitoring of the relevant functions and parameters as well as a processor-independent watchdog. These features set the PX2 device into the safe mode "Fault" in case of an internal or external error. The following table 6.1 shows all possible errors, possible causes, the related troubleshooting and the resulting device status.

When the cause of the error has been eliminated, the PX2 gas detector restarts with the diagnostic mode on its own. It is not necessary to acknowledge the error message.

If an error occurs, it is output in the option with display instead of the measured value and in the menu error status in plain text. If there is more than one error, it is output with a cumulative, bit-coded error code.

Error type	Cause	Remedy	Fault Relay	Analog Output	Centr. Bus	Display	
						Error Code	Text Mess.
<b>Sensor Head (SX1)</b>							DP1-
Sensor element defective	Internal	Replace SX1 sensor head	Error	< 2 mA	Error code is sent	0x8 001 h	Sensor
Temperature < -25 °C > +60 °C						0x8 002 h	Overtemp.
Measured value processing						0x8 002 h	ADC error
System voltages <>						0x8 004 h	Voltage
Operating volt.< 18.5 V> 36.5 V						0x8 004 h	Voltage
RAM / ROM / µC error						0x8 008 h	CPU error
EEPROM error						0x8 010 h	EE error
Meas. value < -6 % of range	Sensor drift, calibration not correct	Perform calibration				0x8 100 h	Underrange
Meas. value > 106 % of range	Gas concentration > meas. range	See 6.2		> 21.2 mA		0x8 200 h	Overrange
	Maintenance due	Maintenance date reached	Perform maintenance	No effect	Mainten. message	0x8 080 h*	Maintenance
<b>I / O Unit (PX2)</b>							EP1-
Temperature < -25 °C > +60 °C	Ambient temp.	Temp.!	Error	< 2 mA	Error code is sent	0x8 040 h	Overtemp.
Measured value processing	Internal	Replace PX2 device				0x8 002 h	ADC error
RAM / ROM / µC error						0x8 008 h	CPU error
EEPROM error						0x8 010 h	EE error
No response alarm relay						0x8 020 h	I/O error
Configuration error	Meas. range SX1 ≠ I/O unit	Adjust meas. range				0x8 010 h	EE error
Deviation of analog output signal < 5 % >	Short-circuit or Interruption at the analog output	Check wiring / load	Error	X mA		0x8 020 h	I/O error
	Internal	Replace PX2 device					
Communication error to sensor head	Sensor head not fitted correctly / wrong gas type	Check it , set correct gas type	Error	< 2 mA		0x9 000 h	Communic. error
	Internal	Replace SX1 sensor head					
Hardware Watch Dog triggered	Internal, < system voltage, µC defect.	Replace PX2 device	Error	< 1 mA	Comm. STOP	Reset	Reset
Operating voltage limits exceeded too high / too low	External	Check voltage	Error	< 2 mA	Comm. STOP	0x8 008 h	Voltage
	Internal	Replace PX2 device					
Maintenance due	Maintenance date reached	Perform maintenance	No effect			0x8 080 h*	Maintenance
Special Mode	See chapter "Special Mode"	Cancel cause of Special Mode	Error	< 2 mA**	Comm. STOP	0x8 000 h	

Table 6.1: Error messages

\* Is only faded in if an error code is pending.

\*\* No influence on the analog signal if the Special Mode was triggered by the operator.





## 7 Notes on Usage

### 7.1 Ambient Conditions

The PX2 gas detector series is intended for continuous, fixed monitoring of gas-air mixtures under atmospheric conditions.

The **PX2-1** gas detector series is marked with the device category II 2 G and thus approved for use in hazardous areas of zones 1 and 2. The **PX2-2** gas detector series is marked with the device category II 3 G and thus approved for use in hazardous areas of zone 2.

The PX2 gas detector series is approved for an oxygen-enriched atmosphere of maximum 25% vol. oxygen.

Permitted ambient temperature range for version without display:  $-25\text{ °C} < T_a < +60\text{ °C}$

Permitted ambient temperature with display:  $-20\text{ °C} < T_a < +60\text{ °C}$

Permitted ambient humidity range: 20 to 90 % RH non-condensing. With a humidity level above this limit, reliable gas detection is no longer guaranteed. A functional test according to Chapter 8.2 has to be carried out then.

Operating pressure range: 800 to 1200 mbar "

Flow speed: 0 to 6 m/s. Use a special wind screen for stronger air flow.

Mounting position: wall mounting with the sensor downwards to prevent dust and liquids from clogging the gas inlet.

The PX2 gas detector must not be exposed to direct sunlight to avoid overheating.

High concentrations of certain compounds may contaminate the sensor when used for a longer period. In environments contaminated with such substances, calibration has to be performed more frequently to ensure reliable operation.

Dust deposits at the gas inlet can significantly extend the response time. Therefore check the device regularly for dust deposits and clean it, if necessary. In addition, a functional test according to Chapter 8.2 should be carried out after cleaning.

During painting, care should be taken that the gas inlet is not clogged with paint deposits. Emissions of colours, such as solvents, etc. can affect the performance of the sensor or damage the sensor completely. Therefore, we recommend sealing the gas inlet when painting.

Certain substances and gases in the monitored ambient can affect the sensitivity of the sensor element or destroy the sensor completely. This is called poisoning. The following are currently known:

- Polymerizing substances, such as ethylene oxide, acrylonitrile, butadiene, styrene, silicone.
- Corrosive substances, such as halogenated hydrocarbons.
- Catalytic poisons, such as sulphur and phosphor compounds, silicon compounds, metal vapours.

Depending on the type of built-in sensor head the PX2 gas warning device is used for:

- Monitoring of the ambient air to detect Freon refrigerant gases according to the built-in sensor head.

Series PX2-X-X-X2XXX-X

### 7.2 Further Notes and Restrictions

The maximum operating voltage and the terminal voltage of the relays have to be limited to 30 V by adequate measures. The maximum switching current of the two relay contacts should be limited to 1 A by appropriate external measures.

Concerning the cable specification, the details of the cross-sections and lengths in the table 4.1 Cables must strictly be followed.

Repairs to pressure-resistant slits are not intended and lead to the immediate loss of the type approval for the pressure-resistant casing.

## 8 Maintenance and Service

It is obligatory to perform maintenance regularly in order to maintain safety, measuring and warning functions of the PX2 gas detector. The maintenance includes visual, functional and system inspections and must only be carried out by appropriately qualified personnel.

When carrying out maintenance and repair work according to the user manual, only use original spare parts from MSR-Electronic. Repairs or changes of the PX2 warning devices not complying with the maintenance manual or carried out by unauthorized persons can affect proper equipment and safety features and always result in a termination of the manufacturer's warranty and certificate.

The opening of the gas warning device results in the cancellation of the explosion protection. In the case of calibration, the general instructions in chapter 4.1 must be strictly followed.

### 8.1 Visual Inspection

A trained person may carry out the visual inspection which includes at least the following activities:

- Check the PX2 gas detector including the gas inlet for mechanical damage.
- Check the gas inlet of the measuring head for dust, dirt and moisture deposits.
- Check the locking screw of the cover if placed firmly and correctly.
- Check the operational and status messages of the gas warning devices with displays.
  - Operation indication: green LED = ON
  - Alarm indication: red LED = OFF (no alarm)
  - Fault indication: yellow LED = OFF (no fault)

Keep a report about the visual inspection, containing the identification of the gas detector, any defects found and measures taken as well as the date and the name of the person responsible for the visual inspection.

### 8.2 Functional Control / Calibration and Adjustment

Only a qualified technician must perform the functional tests containing at least the following activities:



Applying the test gas causes the adjustment of the current signal at the analog output and the triggering of the alarm relay. Connected actuators are put on alert.

- Visual inspection according to chapter 8.1
- Check zero-point<sup>1</sup>:
  - o Apply zero gas. If the measured value on the display or - for versions without display - on the service tool is outside the permissible range<sup>2</sup>, you have to perform the zero calibration.
- Check sensor sensitivity<sup>1</sup>:
  - o Apply test gas. If the measured value on the display or - for versions without display - on the service tool is outside the permissible range<sup>2</sup>, you have to perform the gain calibration.
- Check response time:
  - o Apply test gas. Check the reaction time until the alarm is triggered. If the response time is longer than specified in the table Sensor Specification in the column "Response Time", the sensor head must be replaced.

<sup>1</sup> For warning devices without display, the analog output can alternatively be used for the control of the measured values. The determination of the current signal in relation to the test gas concentration used must be according to the formula [1]. If the measured value (current signal) is outside the permissible range<sup>2</sup>, calibration is required.

<sup>2</sup> See Table 10.1 "Max. Ambient Conditions"



- Check alarm relay: (Only necessary if the alarm relay is used)
  - o Apply test gas with a concentration  $\geq$  of the set alarm threshold. The alarm relay must change into the alarm status and the actuated device goes into alarm.
- Check analog output: (Only necessary if the analog output is used)
  - o Apply test gas. Check the proper reaction of the connected actuator.
- Check central bus: (Only necessary if the central bus is used)
  - o Apply test gas. Read the concentration of the test gas on the controller and check the corresponding reactions.

The functional control must be documented by a protocol stating at least:

Identification of the gas detector, type and concentration of the zero gas and test gases used, display before and after calibration with zero and test gas, response time, deficiencies fixed and measures started with the date and name of the person responsible for the functional check.

### **8.3 System Check / Proof Test**

Measuring and testing equipment used within of the proof test (multimeters, etc.), must be in a proper state. To meet this requirement, the measuring devices have to be calibrated at regular intervals.

The system control has to be carried out by a qualified person at least every 12 months and includes at least the following activities:

- Visual inspection according to chapter 8.1
- Functional check according to chapter 8.2
- Check the relevant parameters for deviations:
  - o Alarm threshold(s)
  - o Assignment and activation of alarm relays
  - o Gas type
  - o Measuring range
- Check 4-20 mA output signal: only when current signal is used in the application.
  - o Status Fault = < 2 mA:  
Activate the special mode on the display or service tool. The connected evaluation unit must recognize and output the error status.
  - o Linearity and accuracy:  
The set value of the analog output signal is determined in dependence of the test gas concentration and the measurement range according to the formula [1].  
  
Apply test gas: The connected evaluation unit must react according to the current signal calculated with the formula [1].
- Check fault relay:
  - o Activate the special mode on the display or service tool. The fault relay changes into the alarm status and the connected fault indication unit must report an alarm.

The system check must be documented by a protocol stating at least:

Identification of the gas detector and the downstream safety equipment, type and concentration of the zero gas and test gases used, display before and after calibration with zero and test gas, parameter deviations from the set values, response time, deficiencies fixed and measures started, as well as the date and name of the person responsible for the system check.



Calculation of current signal at analog output, depending on the test gas concentration for Freon gases:

Set-point of current signal:  $(16 \text{ mA} / \text{measurement range} * \text{test gas concentration}) + 4 \text{ mA}$  [1]

If the current signal differs by  $\pm 0.2 \text{ mA}$  from the calculated set point [1], calibration is required.

Test gas concentration - actual concentration of the test gas

### 8.3.1 Necessary Equipment and Gases

Gas application kit: Cal01\_PX2

Magnetic pen for menu operation: MSR\_Pen\_PX2, for version with display

Service Tool STLO6\_PX2 or Software PCE06-PX2, for version without display

Kit for withdrawal of gas consisting of flow meter/indicator and pressure regulator/indicator

Calibration of Freon gases

Zero gas: Synthetic air (20 % O<sub>2</sub>, 80 % N, < 10 % RH)

Test gas: Concentration depending on gas type according to table 10.2, column Calibration gas.

Relative measurement inaccuracy  $\pm 2 \%$ , rest is synthetic air < 10 % RH.

## 8.4 Calibration

A routine for comfortable zero and gain calibration is integrated in the PX2 gas detector. In the version with built-in display the dialog takes place directly on the display surface. In the version without display the dialog is done via service tool or PC software.

The dialog management on the screen and on the Service Tool are identical and shown in the description PolyXeta 2 STL-06; the dialog management of the PC software can be read in the user manual DGC06\_EasyConf.

The test gas is applied until the display indicates a stable value.

The actual calibration process is identical for all three versions.

The zero point and gain calibration do not affect each other.

### 8.4.1 Preliminaries

The PX 2 warning device including the sensor head has to be continuously powered with the operating voltage before calibration in order to get stable conditions. The run-in period depends on the type of sensor and is 168 hours for Freon sensors.

You have to activate the special mode before calibration.

In special mode new alarms are suppressed and there is no gas monitoring.

If there are no operating commands for more than 15 minutes, the PX2 unit exits the special mode automatically.



#### 8.4.2 Procedure for Calibration with Tool or Display

- Screw the calibration adapter onto the sensor head as far as it will go.
- Open the calibration mode in the dialog.
- Wait until warm-up time has finished (300s)

Zero calibration with tool or display:

- Open the zero-calibration dialog.
- Perform zero-point calibration (Display → Calculate → Save)

Gain calibration with tool or display:

- Open the test gas dialog and enter the concentration of the test gas depending on gas type according to table 10.2.
- Open the gain calibration dialog.
- Apply the test gas. Pressure 1000 hPa (1000 mbar) ± 10%, flow rate 500 ml/min
- Perform the gain calibration.
- Save the new values after successful gain calibration.

If the set test gas has not been reached in the display, an extended calibration must be carried out.

#### 8.4.3 Extended Calibration:

Extended zero calibration

- Apply the test gas, concentration depending on gas type according to table 10.2, pressure 1000 hPa (1000 mBar) ± 10 %, flow rate 500 ml/min
- The processor input voltage must be measured against ground at the test pin led out and if stable (180 s), then set to 1650 mV using the potentiometer.
- Stop and remove gassing and wait until the sensor has stabilized (wait at least **6 hours** - stable zero point).
- Open the zero-calibration dialog.
- Perform zero-point calibration (Display → Calculate → Save)

Extended gain calibration:

- Open the test gas dialog and enter the concentration of the test gas used depending on gas type according to table 10.2 ppm.
- Open the gain calibration dialog.
- Apply the test gas. Pressure 1000 hPa (1000 mbar) ± 10%, flow rate 500 ml/min
- Perform the gain calibration.
- Save the new values after successful gain calibration.

It is required to document the successful calibration with a protocol and to attach a label to the detector containing the date for the next calibration.

### 8.5 Repairs

Please always apply the operating and maintenance instructions when repairing and replacing parts of the gas warning device. For safety reasons replace parts only by original spare parts from the manufacturer.

Appropriate technical qualification is necessary for further repair work, which may only be carried out by the manufacturer or by trained and authorized service partners.

The responsibility for proper operation and condition of the gas detection device after repair lies with the technician who has done the work and/or with the entrepreneur.

After repair before restarting you have to check the function and the system depending on the type of repair.

## 9 Exchange of Sensor Head

Instead of performing a field calibration you can simply and comfortably replace the sensor head in the field by a calibrated one. At the end of sensor lifetime, it is the same procedure.

### 9.1 General Notes



The instrument PX2-1 must only be opened under gas-free and voltage-free conditions.

The instrument PX2-2 should only be opened under gas-free and voltage-free conditions.

No insulating sealing material must be poured into the NPT  $\frac{3}{4}$  "threads of the cable glands because the potential equalization between housing and cable gland is via the thread.

The sensor head must be tightened with 15 Nm using a M24 wrench. Only when doing so you can ensure the required tightness.

After completion of work, the gas warning device must be closed again. The cover has to be completely screwed in and secured with the locking screw against inadvertent loosening.

### 9.2 Exchange of Sensor Head

- Select Special Mode.
- Disconnect the sensor head plug in the housing and stretch the cord so that it can follow the rotation of the sensor head.
- Loosen the sensor head with a wrench (M24).
- Unscrew the sensor head carefully; stretch the cable slightly at the same time so that it can follow the rotation.
- Take the new sensor head out of the original packaging.
- Check gas type and measuring range for conformance.
- Check calibration protocol and date for validity.
- Insert the cable of the sensor head into the housing and stretch it slightly.
- Screw the sensor head carefully in; stretch the cable slightly at the same time so that it can follow the rotation.
- The sensor head must be tightened with a torque key with 15 Nm. Only when doing so you can ensure the required tightness.
- Plug the sensor head in again; the communication of sensor head <> I/O board then will start automatically and will be checked for validity.
- Exit special mode.
- The internal diagnostic checks the new sensor head for gas type, measuring range and valid calibration status. If they match, the measurement mode will start automatically.

The replacement of the sensor head is a security relevant intervention requiring the recommissioning of the gas detector.

### 9.3 Recommissioning

You have to perform the recommissioning after a safety-related intervention, e.g. exchange of the sensor head.

During recommissioning you have to carry out and document all steps according to the chapters 5.1 to 5.4 incl. a functional test.

### 9.4 Send Sensor Head Back for Calibration

## 10 Sensor Specification of Semi-conductors for Freon Gases

Semiconductor gas sensors (metal oxide sensors) are electrical conductivity sensors. The resistance of its sensitive layer changes upon contact with the gas to be detected. The gas then reacts with the sensor surface. This reaction is reversible in the ideal case. Due to their chemical properties metal oxide gas sensors are suitable for a wide range of applications and the detection of all reactive gases. Depending on the materials used and the gases to be detected, common operating temperatures in the semiconductor sensor are between 300 °C and 900 °C. The signal is logarithmic to the gas concentration – not linear. The current is evaluated by the subsequent measuring amplifier and converted into a linear output signal.

Oxidation processes lead by-and-by to an unwanted influence on the alteration of the conductivity. Therefore, regular calibrations of zero-point (Zero) and gain are necessary (see section 8.4).



Certain substances and gases in the monitored ambient can affect the sensitivity of the sensor element or destroy the sensor completely. This is called poisoning.

The following are currently known:

- Polymerising substances, such as ethylene oxide, acrylonitrile, butadiene, styrene, silicone.
- Catalytic poisons, such as sulphur and phosphor compounds, silicon compounds, metal vapours.
- Organic solvents.

Semiconductor sensors are not linear on principle. This means that the sensor would only measure accurately on the calibrated point and not over the entire measuring range. Therefore, a linearization is included in our software to improve this behaviour. But since the sensor resistance of a semiconductor may be very different (between 4 - 40 kOhm), it must be normalized. This can be done via the potentiometer. Thus, the different output signals can be changed accordingly and adjusted appropriately.

Gas measured	Refrigerant & Freon Gases
Sensor element	Semi-conductor
Measuring range	See table 10.2
Temperature range	-25 °C to +60 °C
max. signal change (basis 20 °C)	± 5 % of range or ± 15 % of reading
Humidity range	20 to 90 % RH (not condensing)
max. signal change (basis 50 % RH)	± 5 % of range or ± 30 % of reading
Pressure range	80 to 120 k Pa
max. signal change (basis 100 h Pa)	± 5 % of range or ± 30 % of reading
Flow speed:	0 to 3 m /s
Incl. wind shield	Up to 6 m/s
max. signal change	± 5 % of range or ± 10 % of reading

Table 10.1: Maximum ambient conditions of sensors



Sensor head	Target gas		Test gas		Admissible range for calibration				Reaction time	Response time ↑ t <sub>90</sub>	Response time ↓ t <sub>90</sub>	Run-in time	Flow rate	Warm-up time
	Meas. range	Gas type		Range	Value indication		4–20 mA signal							
		Freon group	Gas		Zero	Gain	Zero	Gain						
SX1-					Test gas	(mA)		Sec.	Sec	Sec	h	ml/min	Sec.	
S2061	20–2000 ppm	FR02	R23	1000 ppm	0–100 ppm	800–1200 ppm	3.8–4.2	± 0.2 mA of set-point value	180	> 120	> 120	168	500	300
S2063		FR03	R1234yf											
S2064		FR04	R123											
S2070		FR06	R22											
S2077		FR07	R134a											
S2080		FR08	R407c											
S2020-01	0–50 % LEL		R32	25 % LEL	0–2 % LEL	23–27 % LEL								
S2020-02			R455a	25 % LEL										
S2020-03			R455b	25 % LEL										
S2020-04			R1234yf	25 % LEL										
S2020-05			R1234ze	25 % LEL										
S2125-C	0–1000 ppm		NH <sub>3</sub>									168	500	Max. 90
S2125-F	0–10,000ppm		NH <sub>3</sub>									168	500	Max. 90

Table 10.2: Sensor specifications for refrigerant & Freon gases



## 11 Display

### 11.1 Assembly, Disassembly

For terminal connection and exchange of sensor head you have to dismount the display. This work may be carried out only when the device is voltage-free.

#### Disassembly

- Open cover.
- Push the white retaining bracket upwards (arrow 1, red) and lift the display board slightly.
- Take the board left and right (arrow 2, blue) with two fingers (NOT BY THE FOIL) and pull it carefully to the front.
- Put the display board in a dry, clean and protected place.

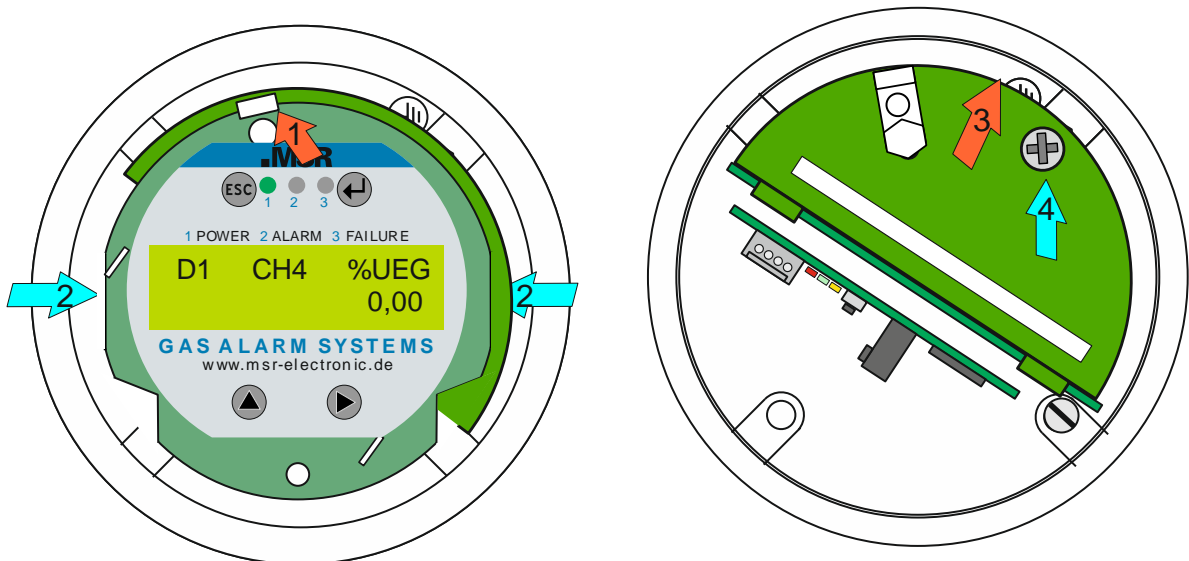
Now you have access to the connector of the sensor head and can exchange it.

It is still necessary to dismount the cover and the mounting plate in order to connect the terminals.

- Unscrew the mounting screw (arrow 4, blue).
- Take cover plate by the retaining brackets, pull it a bit to the front and then push it to the top (arrow 3, red) until the plate leaves the two retaining slots.
- Put the plate in a safe place.

#### Assembly

- Hold cover plate to the front in a slight angle and insert the two brackets into the retaining slots above the terminals of the board as far as it goes.
- Push the board carefully inwards until it rests on the mounting bolt.
- Secure it with the screw (arrow 1 blue).
- Hold the display PCB horizontally above the transmitter circuit board, so that it fits with the hole in the mandrel of the white retaining bracket and with the two slots in the guide brackets.
- Press evenly and gently until the retaining bracket clicks into place.





## **11.2 Status LED**

The status LEDs indicate the operating state. See also section 5.3 Running-in characteristics.

Green:	Continuous:	= Operating voltage
	Flashing:	= Maintenance message
Yellow:	Continuous:	= Failure
	Slowly flashing:	= Warming-up
	Fast flashing:	= Special mode
Red:		= Alarm

The backlight of the display changes from green to red when an alarm is active.

## **11.3 Operation**

Operation is done from the outside without opening the housing cover via the four control icons by moving the Magnet\_Pen briefly over the respective control icon.

## **11.4 Menu**

The device parameters and measured values can be read in the menu. Parameter changes and interventions are password protected and thus not possible for unauthorized persons. The menu navigation and functions are described in the User Manual PolyXeta®2 STL-06.

## **11.5 Deadband**

The unwanted noise of the measured value around the zero point, caused by the basic drift of the sensor, can be suppressed by activating a deadband with a range of max.  $\pm 5\%$  of the measuring range.

The suppression also affects the analog output because the measured value must not assume a different display depending on the output.

When opening the calibration mode, the deadband function switches automatically off.

The deadband can be set in the System Parameters Menu in the range from 0 (dead band off) to max. 5. See User Manual of PolyXeta®2 STL-06.

## 12 List of Spare Parts, Accessories

### 12.1 List of Spare Parts

Item	Sensor Head	Measuring Range	Order No.	Covered by test certificate
01	R23	20–2000 ppm	S2061-01-A	Yes
02	R508b	20–2000 ppm	S2061-02-A	Yes
03	R1234yf	20–2000 ppm	S2063-01-A	Yes
04	R452a	20–2000 ppm	S2063-02-A	Yes
07	R455a	20–2000 ppm	S2063-05-A	Yes
08	R454b	20–2000 ppm	S2063-06-A	Yes
09	R1234ze	20–2000 ppm	S2063-07-A	Yes
10	R123	20–2000 ppm	S2064-01-A	Yes
11	R22	20–2000 ppm	S2070-01-A	Yes
12	R401a	20–2000 ppm	S2070-02-A	Yes
13	R401b	20–2000 ppm	S2070-03-A	Yes
14	R402a	20–2000 ppm	S2070-04-A	Yes
15	R402b	20–2000 ppm	S2070-05-A	Yes
16	R403a	20–2000 ppm	S2070-06-A	Yes
17	R408a	20–2000 ppm	S2070-07-A	Yes
18	R409a	20–2000 ppm	S2070-08-A	Yes
19	R411a	20–2000 ppm	S2070-09-A	Yes
20	R134a	20–2000 ppm	S2077-01-A	Yes
21	R407a	20–2000 ppm	S2077-02-A	Yes
22	R416a	20–2000 ppm	S2077-03-A	Yes
23	R417a	20–2000 ppm	S2077-04-A	Yes
24	R422a	20–2000 ppm	S2077-05-A	Yes
25	R422d	20–2000 ppm	S2077-06-A	Yes
26	R427a	20–2000 ppm	S2077-07-A	Yes
27	R437a	20–2000 ppm	S2077-08-A	Yes
28	R438a	20–2000 ppm	S2077-09-A	Yes
29	R449a	20–2000 ppm	S2077-10-A	Yes
30	R407f	20–2000 ppm	S2077-11-A	Yes
32	R125	20–2000 ppm	S2080-01-A	Yes
33	R32	20–2000 ppm	S2080-02-A	Yes
34	R404a	20–2000 ppm	S2080-03-A	Yes
35	R407c	20–2000 ppm	S2080-04-A	Yes
36	R410a	20–2000 ppm	S2080-05-A	Yes
37	R434a	20–2000 ppm	S2080-06-A	Yes
38	R507a	20–2000 ppm	S2080-07-A	Yes
39	R448a	20–2000 ppm	S2080-08-A	Yes
40	R452b	20–2000 ppm	S2080-09-A	Yes
41	R143b	20–2000 ppm	S2080-10-A	Yes
42	R32	0–50 % LEL	2020-01	Ja
43	R455a	0–50 % LEL	2020-02	Ja
44	R454b	0–50 % LEL	2020-03	Ja
45	R1234yf	0–50 % LEL	2020-04	Ja
46	R1234ze	0–50 % LEL	2020-05	Ja

Table 12.1: Sensor heads for Freon gases

Item	Sensor Head	Measuring Range	Order No.	Covered by test certificate
01	NH <sub>3</sub> (R717)	0 – 1000 ppm	S2125-C	Yes
02	NH <sub>3</sub> (R717)	0 – 10,000 ppm	S2125-F	Yes

Table 12.2: Sensor heads for für Ammonia

Pos.	Display	Order Number	Covered by test certificate
01		PX2-X-2-XXXXX-X	Yes

Table 12.2 Display

## 12.2 Accessories

Item	Description	Order No.	Covered by test certificate
01	Gas application kit for PolyXeta®2 sensor head series SX1, consisting of stainless-steel adapter and Viton hose	Cal01_PX2	No
02	Magnetic Pen for contactless menu operation	MSR_Pen_PX2	Yes
03	Portable Service Tool for display, calibration and parameter changes	STL06-PX2-X7	No
04	PC Software Set for display, calibration, addressing and parameter changes	PCE06-PX2-XF	No
05	Cable gland for ATEX / IECEx protection type Ex db, zone 1, out of brass, with certificate	ZU-PX2-CG-SS	Yes
06	Cable gland for ATEX / IECEx protection type Ex nA, zone 2, out of plastic PA	ZU-PX2-CG-PL	No
07	Dummy plugs PT 3/4" female thread, (ANSI B1.20.1) for closing not needed inlet holes, protection Ex db	ZU-PX2-CG-SP	Yes
08	Weather protection	On request	No
09	Calibration gases: Gas type and concentration in dependence of the sensor head type	On request, please specify the sensor head type	No
10	Gas withdrawal kit with flowmeter and pressure regulator Type depends on the bottle type and size	On request	No
11	Housing cover closed for enclosure type XD-JB85	On request	Yes
12	Housing cover with viewing window for enclosure type XD-JB85	On request	Yes

Table 12.3: Accessories

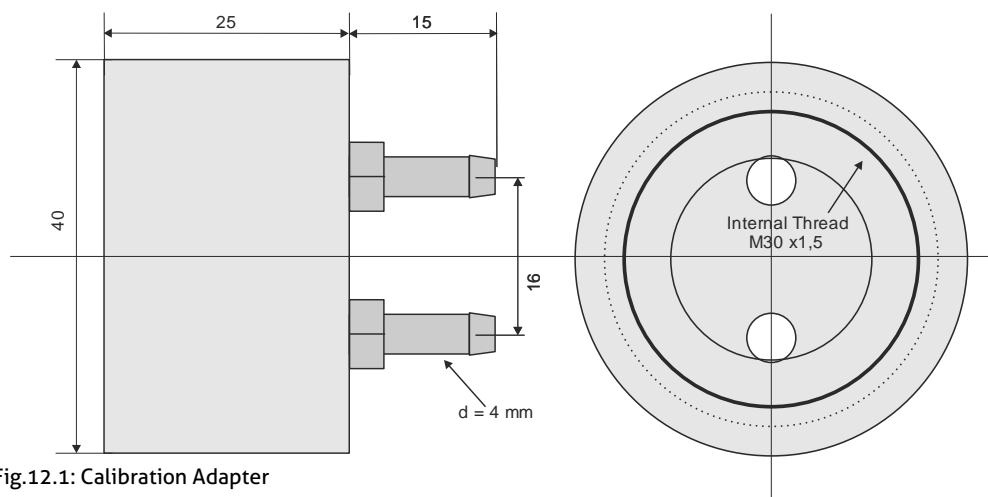


Fig.12.1: Calibration Adapter



## 13 Specifications

<b>Electrical</b>	
Power supply	20–28 V DC. reverse polarity protected 24 V AC ± 10 % (21,6–26,4 V AC)
Maximum supply current (for 24 V DC)	Max. 130 mA
Power consumption max.	3.3 W
Analog output signal 4-20 mA	Proportional, overload and short-circuit protected, max. load 500 Ohm. The max. load is the sum of the cable loop resistance and the input resistance of the actuator. Range limits: see table 8.1
Fault message relay (SPNC) Alarm relay (SPDT)	Max. 30 V AC / DC, 1 A Min. 12 V AC /DC, 0.1A
<b>General (operation and explosion protection)</b>	
Temperature range	-25 °C to +60 °C (-13 °F to 140 °F) -20 °C to +60 °C (-4 °F to 140 °F) (display version)
Humidity range	20–90 % RH not condensing
Pressure range	800 to 1200 mbar (80 to 120 kPa)
<b>Storage conditions, also for spare parts and accessories</b>	
Temperature range	-10 °C to +40 °C (14 °F to 104 °F)
Humidity range	40–70 % RH not condensing
Pressure range	800 to 1200 mbar (80 to 120 kPa)
Storage time <sup>1</sup>	Max. 6 months
<b>Serial interface central bus</b>	
Transceiver	19200 Baud
<b>Physical</b>	
<b>Gas warning device</b>	
Housing / colour (Standard)	Aluminum die-cast / RAL 7032, epoxy coating
Dimensions (W x H x D)	125 x 162 x 83 mm (4.92 x 6.38 x 3.27 in.)
Weight	Ca. 1.3 kg (2.87 lb.)
Protection class	Housing IP66 to 68 (depending on used cable glands)
Cable gland	Standard 1 x, option 2 or 3 x NPT ¾"
Option: Housing / colour	Stainless steel 1.4401 / natural
Dimensions (W x H x D)	145 x 166 x 107 mm (5.71 x 6.54 x 4.21 in.)
Weight	Ca. 2.5 kg (5.51 lb.)
Protection class	IP 67
Cable entry	Standard 2 x NPT ¾"
Installation	Wall mounting
Terminal connection	Spring-type terminals 0.08 to 2.5 mm <sup>2</sup> AWG 28 - 12 (Ex e)
<b>Sensor head</b>	
Housing / colour	Stainless steel 1.44004 / natural
Dimensions (D x T)	30 x 56 mm (1.18 x 2.20 in.)
Weight	Ca. 0.15 kg (0.33 lb.)
Protection class	IP 64, with option splash guard IP 65 (on request)
Sinter Element Material: Min. density Dimensions (D x T) Max. pore size	Stainless steel 1.4404 4.15 g/cm <sup>3</sup> acc. to ISO 2738 18 x 6 mm 125 µm

<sup>1</sup> If the devices are stored for longer periods (> 8 weeks), we recommend recalibrating the devices.



<b>Approvals and certificates PX2-1 and SX1</b>	
EC type examination certificates (electrical explosion protection)	BVS 15 ATEX E 129 X IECEX BVS 16 0038X
Ignition protection type	Ex db II C T4 -25 °C < Ta < +60 °C
Marking	II 2G Ex db IIC T4 Gb
EMC testing	EN 50270-2015" interference immunity & interference emission: Type 2 (industrial use)
<b>Approvals and certificates PX2-2</b>	
EC Declaration of Conformity for zone 2	CE_PX2_2_Zone2_1808
Ignition protection type	Ex nA IIC T4 Gb -25 °C < Ta < + 60 °C
Marking	II 3G Ex nA IIC T4 Gb
EMC testing	EN 50270-2015" interference immunity & interference emission: Type 2 (industrial use)
<b>Warranty</b>	1 year on sensor (not if poisoned or overloaded), 2 years on device

All specifications were collected under optimal test conditions.  
We confirm compliance with the minimum requirements of the applicable standard.



## 14 Type Examinations, Declarations of Conformity




Translation

# EU-Type Examination Certificate Supplement 1

Change to Directive 2014/34/EU

- 1
- 2 Equipment intended for use in potentially explosive atmospheres  
Directive 2014/34/EU
- 3 EU-Type Examination Certificate Number: **BVS 15 ATEX E 129 X**
- 4 Product: **Gas detector type PX2-1-... with sensor head type SX1-1**
- 5 Manufacturer: **MSR-Electronic GmbH**
- 6 Address: **Würdingerstraße 27a, 94060 Pocking, Germany**
- 7 This supplementary certificate extends EC-Type Examination Certificate No. BVS 15 ATEX E 129 X to apply to products designed and constructed in accordance with the specification set out in the appendix of the said certificate but having any acceptable variations specified in the appendix to this certificate and the documents referred to therein.
- 8 DEKRA EXAM GmbH, Notified Body number 0158, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.  
The examination and test results are recorded in the confidential Report No. PP 15.2221 EU.
- 9 The Essential Health and Safety Requirements are assured in consideration of:  
**EN 60079-0:2012 + A11:2013 General requirements**  
**EN 60079-1:2014 Flameproof enclosure "d"**
- 10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Special Conditions for Use specified in the appendix to this certificate.
- 11 This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.
- 12 The marking of the product shall include the following:

 **II 2G Ex db IIC T4 Gb**

DEKRA EXAM GmbH  
Böchum, 2018-06-25

Signed: Dr Franz Eickhoff

Certifier

Signed: Dr Michael Wittler

Approver

Page 1 of 3 of BVS 15 ATEX E 129 X / N1

This certificate may only be reproduced in its entirety and without any change.

DEKRA EXAM GmbH, Dinnrodtstraße 9, 44800 Bochum, Germany.  
telephone +49.234.3696-105, fax +49.234.3696-110, zs\_exam@dekra.com





13 **Appendix**

14 **EU-Type Examination Certificate**

**BVS 15 ATEX E 129 X  
Supplement 1**

15 **Product description**

15.1 **Subject and type**

**Gas detector of type PX2-1-..... with sensor head type SX1-1**

The dots in the type designation refer to type definitions that do not impact the explosion protection.

15.2 **Description**

With this supplement the certificate is changed to Directive 2014/34/EU.  
{Annotation: In accordance with Article 41 of Directive 2014/34/EU, EC-Type Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Supplementary Certificates to such EC-Type Examination Certificates, and new issues of such certificates, may continue to bear the original certificate number issued prior to 20 April 2016.}

Reason for the supplement:

- Change to directive 2014/34/EU
- Updating to current version of standard IEC 60079-1
- Change of sensor type code
- Adjustment of parameters
- Slight modifications

Description of Product:

The gas detector and its sensor consist of a sensor head with a sintered metal element and an equipment enclosure, both designed for the type of protection Flameproof Enclosure 'd'. The detector is used for detecting and warning of flammable and toxic gases in hazardous areas of temperature class T4.  
The sensor head consists of a stainless steel enclosure with a built-in electronic unit and a Pellistor, electro-chemical, semi-conductor or infrared sensor behind a 6 mm wide sintered metal element. The sintered metal element ensures the flameproof enclosure and simultaneously the supply of measuring gas. On the opposite side of the enclosure the requirements for flameproof enclosure 'd' are met by a potted wire bushing. The sensor head is screwed in to a flameproof enclosure by means of a thread NPT 3/4"; this enables the accommodation of the electronic evaluation unit and the terminals which are used to connect the supply voltage and the field devices.

15.3 **Parameters**

**Electrical data**

Rated voltage	DC 20 - 28 V
Rated current	DC 130 mA
Rated power of enclosure	3.7 W
Rated power of sensor head	1 W
Ambient temperature range	-25 °C to +60 °C

Page 2 of 3 of BVS 15 ATEX E 129 X / N1  
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telephone +49 234 3656-105, fax +49 234 3656-110, zs-exam@dekra.com





**16 Report Number**

BVS PP 15.2221 EU, as of 2018-06-25

**17 Special Conditions for Use**

The measuring function for explosion protection according to Annex II, paragraph 1.5.5, of Directive 2014/34/EU is not part of this EU type examination.

The widths and gaps of the flameproof joints of this apparatus are not identical with the respective minimum or maximum values required by Table 3 of EN 60079-1:2014. If the joint-forming parts have to be repaired, the dimensions of the type as defined in the EC-Type Examination Certificates FTZU 05 ATEX 0262U (incl. supplements 1-6) and FTZU 07 ATEX 0002U (incl. supplements 1-3) are to be adhered to.

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

**18 Essential Health and Safety Requirements**

The Essential Health and Safety Requirements are covered by the standards listed under item 9.

**19 Drawings and Documents**

Drawings and documents are listed in the confidential report.

We confirm the correctness of the translation from the German original.  
In the case of arbitration only the German wording shall be valid and binding.

DEKRA EXAM GmbH  
Bochum, dated 2018-06-25  
BVS-Hor/Ld/Mu A 20180182

  
\_\_\_\_\_  
Certifier

  
\_\_\_\_\_  
Approver



Page 3 of 3 of BVS 15 ATEX E 129 X / N1  
This certificate may only be reproduced in its entirety and without any change.

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44909 Bochum, Germany,  
telephone +49 234 3698-105, fax +49 234 3698-110, zs-exam@dekra.com



		<b>IECEX Certificate of Conformity</b>	
<b>INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres</b> <small>for rules and details of the IECEX Scheme visit <a href="http://www.iecex.com">www.iecex.com</a></small>			
Certificate No.:	IECEX BVS 16.0038X	Issue No: 1	Certificate history: Issue No. 1 (2018-07-12) Issue No. 0 (2016-06-08)
Status:	Current	Page 1 of 5	
Date of Issue:	2018-07-12		
Applicant:	MSR-Electronic GmbH Würdingerstraße 27a 94060 Pocking Germany		
Equipment:	Gas detector with sensor head type PX2-1-....., sensor head type SX1-1		
Optional accessory:			
Type of Protection:	Equipment protection by flameproof enclosures "d"		
Marking:	Ex db IIC T4 Gb		
Approved for issue on behalf of the IECEX Certification Body:	Dr Franz Eickhoff		
Position:	Deputy Head of Certification Body		
Signature: (for printed version)			
Date:	2018-07-12		
<p>1. This certificate and schedule may only be reproduced in full. 2. This certificate is not transferable and remains the property of the issuing body. 3. The Status and authenticity of this certificate may be verified by visiting the Official IECEX Website.</p>			
Certificate issued by:			
	DEKRA EXAM GmbH Dinnendahlstrasse 9 44809 Bochum Germany		
	On the safe side.		



## EG - Konformitätserklärung EC - Declaration of Conformity

Nach ATEX Richtlinie / in accordance with ATEX Directive 2014/34/EU

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\_PX2\_2\_Zone2\_1808  
**Hersteller / Manufacturer:** MSR-Electronic GmbH  
Würdinger Str. 27, D-94060 Pocking  
**Produktbezeichnung / Name:** PolyXeta®2 PX2-2..  
Gasmessgerät, Zone 2, mit Sensorkopf SX-1  
Gas measuring Unit, Zone 2, with Sensor Head SX1

**Norm / Standard:** EN 60079-0:2012+A11:2013  
Explosionsgefährdete Bereiche - Teil 0: Betriebsmittel - Allgemeine Anforderungen.  
Explosive atmospheres - Part 0: Equipment - General requirements.

**Norm / Standard:** EN-60079-15:2011  
Explosionsfähige Atmosphäre - Teil 15: Geräteschutz durch Zündschutzart „n“.  
Explosive atmospheres - Part 15: Equipment protection by type of protection "n".

**Kennzeichnung / Ex marking:** Ⓜ II 3 G Ex nA IIC T4 Gc  
**Einsatzbereich / Field of use:** Zone 2 Ex- Bereich / Hazardous areas  
**Gerätegruppe / Equipment group:** II  
**Kategorie / Category:** 3  
**Gruppe / Group:** IIC  
**Atmosphäre / Atmosphere:** G

**Norm / Standard:** EN-61508-1:2011 / IEC 61508-1:2010  
EN-61508-2:2011 / IEC 61508-2:2010  
EN-61508-3:2011 / IEC 61508-3:2010

Funktionale Sicherheit sicherheitsbezogener elektrischer / elektronischer / programmierbarer elektronischer Systeme.  
Functional safety of electrical / electronic / programmable electronic safety-related systems.

Teil 1: Allgemeine Anforderungen.

Part 1: General requirements.

Teil 2: Anforderungen an sicherheitsbezogene elektrische / elektronische / programmierbare elektronische Systeme.

Part 2: Requirements for electrical / electronic / programmable electronic safety-related systems.

Teil 3: Anforderungen an Software.

Part 3: Software requirements.



MSR-Electronic GmbH :: Würdinger Str. 27 & 27A :: 94060 Pocking :: Germany  
Technische Änderungen vorbehalten  
PolyGard® / PolyXeta® / µGard® sind ein eingetragene Warenzeichen von MSR-Electronic GmbH



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Gasmessgerät, Zone 2, mit Sensorkopf SX-1  
Gas measuring Unit, Zone 2, with Sensor Head SX1

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Explosionsgefährdete Bereiche - Teil 0: Betriebsmittel - Allgemeine Anforderungen.  
Explosive atmospheres - Part 0: Equipment - General requirements.

**Norm / Standard:** EN-60079-15:2011  
Explosionsfähige Atmosphäre - Teil 15: Geräteschutz durch Zündschutzart „n“.  
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**Atmosphäre / Atmosphere:** G

**Norm / Standard:** EN-61508-1:2011 / IEC 61508-1:2010  
EN-61508-2:2011 / IEC 61508-2:2010  
EN-61508-3:2011 / IEC 61508-3:2010

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Part 2: Requirements for electrical / electronic / programmable electronic safety-related systems.

Teil 3: Anforderungen an Software.

Part 3: Software requirements.



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PolyGard® / PolyXeta® / µGard® sind ein eingetragene Warenzeichen von MSR-Electronic GmbH

## 15 Decommissioning



A used sintered element must not be reused.

Impacts of decommissioning on the plant to be monitored are not part of this description.

The decommissioning is done by switching off the operating voltage. Programmed data and parameters are not lost. If the gas detector is set into operation again after a prolonged shutdown, it will be necessary to perform recommissioning according to chapter 5.

## 16 Device Disposal

This device is not registered for use in private households. Therefore, it mustn't be disposed of with the household waste. It can be sent back for disposal to your national distribution organization. Don't hesitate to contact them if there are any questions on disposal.

## 17 Definitions

### Warm-up time (stabilization time)

Time span from switching on the device PX2 in a specific atmosphere to the moment when the measured value reaches the specified deviations and is stable.

### Reaction time

Time up to which a predetermined reaction (display of reading or alarm) of the gas warning device can be observed.

### Run-in time

Time the sensor head needs to be supplied continuously with the operating voltage for stabilisation before calibration.

### Response time $t_{90}$

Time span from the occurrence of a gas mixture at the gas inlet to the moment when the display shows 90 %.

### Zero gas

Test gas containing neither the target gas nor troublesome impurities (synthetic air: 20% O<sub>2</sub>, rest N).

### Target gas

Gaseous substance to be determined in the measurement gas and to be warned against.

### Test gas

Gas mixture of known composition used for testing and calibrating the PX 2 sensor head.



## 18 History of Document Versions

Version	Date	Author	Reason for change / Comments
1.0	17.12.2018	G. Niedermeier	Basic version
1.1	13.03.2019	G. Danner	R1233zd removed
1.2	27.05.2019	G. Danner	Calibration process corrected
1.3	11.06.2019	G. Danner	Correction: R455a instead of R454a
1.4	18.05.2020	G. Niedermeier/ G.Danner	Update gas list, combination of GA PX2-1 and PX2-2