User Manual

PolyGard®2 MGC6 3-Channel Controller

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1 General

It is important to read this user manual thoroughly and clearly in order to understand the information and instructions. The PolyGard®2 devices must be used within product specification capabilities. Due to on-going product development, MSR-Electronic GmbH | INTEC Controls reserves the right to change specifications without notice. The information contained herein is based upon data considered to be accurate. However, no guarantee is expressed or implied regarding the accuracy of these data.

1.1 Applicability

PolyGard®2-Serie:

- 3-Channel Controller MGC6

1.2 Intended Use

The PolyGard®2 devices must not be used in potentially explosive atmospheres.
The device must only be employed in areas within the environmental conditions as specified in the Technical Data (indoor application). The intended sites are all areas being directly connected to the public low voltage supply, e.g. residential, commercial and industrial environments as well as small enterprises.

1.2.1 3-Channel Controller MGC6

The 3-Channel Controller MGC6 is designed for the connection of max. 3 analog sensors with 4-20 mA signal. The controller monitors the measured values and activates the alarm relays if the set alarm thresholds for pre-alarm and main alert are exceeded. In addition, the values are also provided as 4-20 mA output.

1.3 Safety

The operating instructions must be carefully read and followed by all persons who install, use, maintain and check the product.
The product can only fulfil its intended functions if it is installed, used, maintained, serviced and checked in accordance with the instructions provided by MSR-Electronic GmbH | INTEC Controls.

1.4 Responsibilities of Installers and Operators

It is the installer's responsibility to ensure that all PolyGard®2 devices are installed in compliance with all national and local codes and OSHA requirements. The device must be checked for correct installation and functionality by a qualified person before measurement operation is started.
The PolyGard®2 devices are tested for function by the manufacturer before delivery. The installation should only be carried out by trained installation technicians, taking into account the current safety procedures for control installations.
The equipotential bonding required (also e.g. secondary potential to earth) or grounding measures must be carried out in accordance with the respective project requirements. It is important to ensure that no ground loops are formed to avoid unwanted interference in the electronic measuring equipment.
It is also essential to follow strictly all instructions as provided in the user manual.

1.5 Services

It is recommended to check the PolyGard®2 devices regularly. Due to regular maintenance any performance deviations may easily be corrected. Recalibration and part replacement in the field may be implemented by a qualified technician and with the appropriate tools.
Alternatively, the easily removable plug-in sensor with the sensor element may be returned for service to INTEC Controls.
Regular maintenance must be carried out in accordance with the instructions provided herein.

If the MGC6 needs to be returned, an authorized RMA number issued by INTEC Controls is required.

1.6 Limited Warranty

MSR-Electronic GmbH | INTEC Controls does not assume any liability in case of improper or incorrect use of the device. The installer and operator are exclusively responsible for the design and use of the product. If the product is not used, maintained or repaired in accordance with the instructions for use, warranty and product liability claims as well as claims arising from any guarantees assumed by MSR-Electronic GmbH | INTEC Controls for the product will be forfeited.
MSR-Electronic GmbH | INTEC Controls warrants the PolyGard®2 devices for a period of 2 years (1 year for sensors) from the date of shipment against defects in material or workmanship. Should any evidence of defects in material or workmanship occur during the warranty period, MSR-Electronic GmbH | INTEC Controls will repair or replace the product at their own discretion. This warranty does not apply to units that have been altered, had attempted repair, or been subject to abuse, accidental or other-wise. The warranty also does not apply to units in which the sensor element has been overexposed or gas poisoned. The above warranty is in lieu of all other express warranties, obligations or liabilities.
This warranty applies only to the PolyGard®2 devices. MSR-Electronic GmbH | INTEC Controls shall not be liable for any incidental or consequential damages arising out of or related to the use of the PolyGard®2 devices.

1.7 Part Disposal

In accordance with Directive 2012/19/EU, the device must not be disposed of as municipal waste. Return the device for disposal to your national sales organization, which you can contact if you have any questions about disposal.
Outside the EU, you have to consider the corresponding directives.

2 Functional Description

2.1 General

The function of the sensor series AT6 is not subject of this manual but can be read in the User Manual of AT6.

Connection Options for Sensors	AT6 Sensors with 4–20 mA Signal
MGC6 **Standard** Max. 3	1–3

Table 1: Overview of the Connection Options for Sensors

2.1.1 3-Channel Controller MGC6

The 3-Channel Controller MGC6 is designed for the connection of max. 3 sensors in total, AT6 series or other 4–20 mA signal devices. The connected sensors are monitored in the MGC6 for plausibility within the defined measurement, temperature and voltage range, etc.

Stand-Alone Mode

The unit monitors the measured values, compares them to the 2 alarm thresholds and if exceeded activates the 2 alarm relays as well as a visual and an acknowledgeable, acoustic alarm. A fault occurred activates the fault relay and is signaled visually and acoustically.

2.2 Function Output

Action Reaction (GS = Gas Signal) (AT =Alarm Threshold) (CFM = Collective Fault Message)	**Alarm LED Display / WAO**	**Alarm 1 Relay 1**	**Alarm 2 Relay 2**	**Alarm 3 Relay 5 Warning Light/Flash**	**Alarm 4 Relay 4 Horn**	**Relay 3 (CFM)**
GS < AT 1	**GREEN**	Inactive	Inactive	**OFF**	**OFF**	Inactive
GS ≥ AT 1	**RED** slowly flashing	Active	Inactive	**OFF**	**OFF**	Inactive
GS ≥ AT 2	**RED** fast flashing	Active	Active	**OFF**	**OFF**	Inactive
GS ≥ AT 3	**RED** fast flashing	Active	Active	**ON**	**OFF**	Inactive
GS ≥ AT 4	**RED** fast flashing	Active	Active	**ON**	**ON**	Inactive
GS ≥ AT 4 + horn acknowledged (+ recurrence function)	**RED** fast flashing	Active	Active	**OFF** after delay **ON**	**OFF**	Inactive
Maintenance due (no alarm or fault)	**GREEN** flashing	Inactive	Inactive	**OFF**	**OFF**	Inactive
Internal error / fault	**YELLOW**	Inactive	Inactive	**OFF**	**OFF**	Active

Table 2: Function Digital-Output with Relays

Note 1: Relay 1 and 2: Operation mode Energized
Status Inactive: Alarm OFF = Relay coil is powered
Status Active: Alarm ON or device tension-free = Relay coil is current-free

Relay 3: Operation mode Energized
Status Inactive: No fault = Relay coil is powered
Status Active: Fault or device tension-free = Relay coil is current-free

Relay 4 und 5: Open-Collector / transistor output, operation mode De-energized
Status OFF: Alarm OFF or device tension-free
Status ON: Alarm ON

Note 2: Alarm thresholds can have the same value, therefore the relays and/or the horn and flashlight can be triggered together.

2.3 Relay Mode

Definition of the relay operation mode: The terms energized/de-energized come from the terms energized/de-energized to trip principle (open-circuit/closed-circuit principle) used for safety circuits. The terms refer to the activation of the relay coil, not to the relay contacts (as they are executed as a changeover contact and available in both principles).
The LEDs attached to the modules show the 2 states in analogy (LED off -> relay current-free).

2.4 Relay Function Static/Flash

Definition of the relay function: The function "flashing" represents a connection option for warning devices to improve visibility. If" flashing" is set, this must not be used as a safe output circuit any more. A combination of relay mode energized with flashing operation makes no sense and is therefore suppressed.

2.5 Horn Function (not safe output circuit because resettable)

The horn function is considered to be active if at least one of the 2 parameters (time or assignment to digital input) is set. The horn function retains its functionality even for alarms in latching mode.

Special function: Recurrence of the horn relay

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

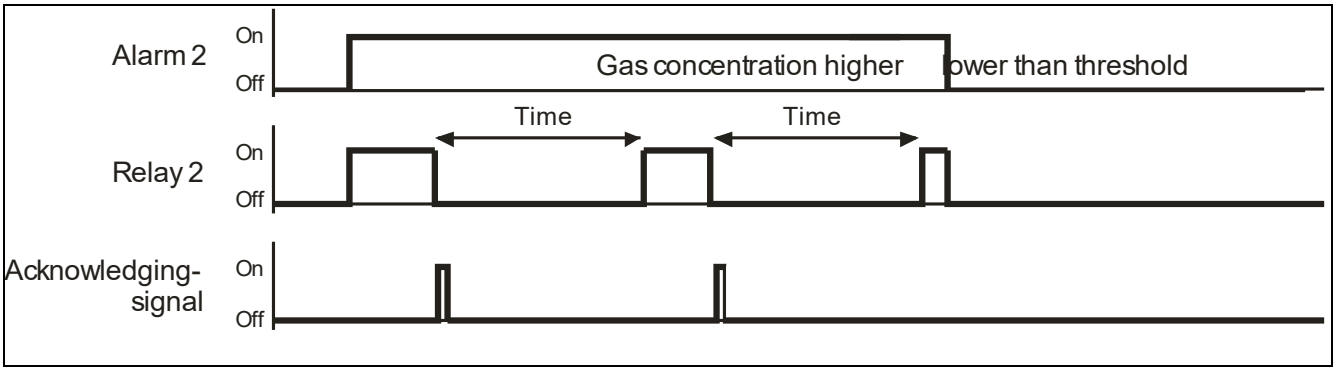


Figure 1: Horn Function

3 Installation

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

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

3.1 Mounting Instructions

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 according to the local regulations.
- Consider ventilation conditions! Do not mount 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 device at a location with minimum vibration and minimum variation in temperature
- Avoid locations where water, oil etc. may influence proper operation and where mechanical damage might be possible.
- Provide adequate space around the sensor for maintenance and calibration work.
- Observe possible constructor's instructions
- **The installation height depends on the relative gas density of the monitored gas type and can be read in the User Manual of the AT6 Sensors.**

3.2 Installation Work

Assembly work must only be carried out under gas-free conditions.
The housing must neither be spot-drilled nor drilled through outside the knockouts.
The installation position of the gas detector is always with the sensor head downwards, cables are introduced from above.

The housing is delivered in closed condition. Before breaking out the knockouts, the exact position and size of the sensors and cable entries must be determined.
The enclosures type A, C and E offer different mounting options depending on the number and types of sensors due to a variety of pre-stampings.
The sensor is supplied in separate packaging and should only be mounted on the enclosure during commissioning to protect it from dirt and damage. For sensors that can be poisoned by silicones, such as all semiconductor and heat tone sensors, it is imperative to use a protective cap (C2-Z1) and to remove it only after the silicones have dried and the unit is energized.

Mounting Procedure:

- Open housing cover.
- Determine mounting location for AT6 and cable entries on housing.
- Break out the required knockouts on the housing bottom part.
- Fix the unit to the wall at the 4 marked fixing points on the back of the housing (see Figure 2) so that the sensor is always directed vertically to the ground.
- The dimensions XX depend on the type and can be read on the back of the housing, in the housing version C, it is 115 mm.
- Check sensor for gas type, measuring range and calibration date.
- Insert sensor and tighten it with M25 hexagon nut.
- Close and screw the cover.

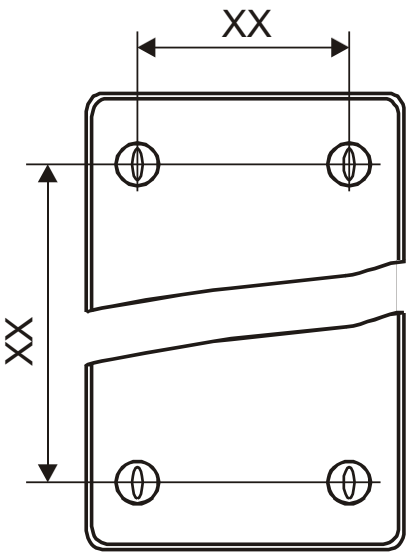


Figure 2: Mounting of Controller

4 Electrical Connection

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

4.1 General Notes

- Installation and connection of the electrical installation should only be performed by a professional when de-energized, according to the connection diagram and in accordance with the relevant regulations.
- The technical requirements and regulations for wiring, electrical security, as well as project specific and environmental and local conditions etc. must be observed when mounting.
- All terminals are screw type. The permissible conductor cross section can be read from the Technical Data.
- Avoid any influence of external interferences by using a shielded cable for the 4–20 mA signal, but do not connect the shield.
- Strip the wires as shortly as possible. It is important to ensure that bare wires, e.g. wire shields do not come into contact with the mounted PCB (risk of short-circuit).
- Low voltage wire and mains connected wire must be fixed separately by cable ties or similar, to secure against looseness.
- The alarm signals are available as potential-free change-over contacts. If required, the power supply is available at the L1 socket.
- Use copper conductors only, for the terminal is only for connection to copper wire.
- Analog transmitters are connected directly to the spring type terminals of the module. The correct polarity must be observed.
- Recommend (min. 300 V) wires for external analog transmitters.

- When choosing the option "Power Supply ≥ 90 VAC" you must make sure that a switch or a circuit breaker is provided in the building automation especially for the unit. It must be installed easily accessible near the unit. It has to be marked as a disconnecting device for the unit and shall meet the relevant requirements of UL/IEC 60947 and UL/IEC 60947-3.
- The exact position of the terminals for the transmitters and alarm relays is shown in the connection diagrams.

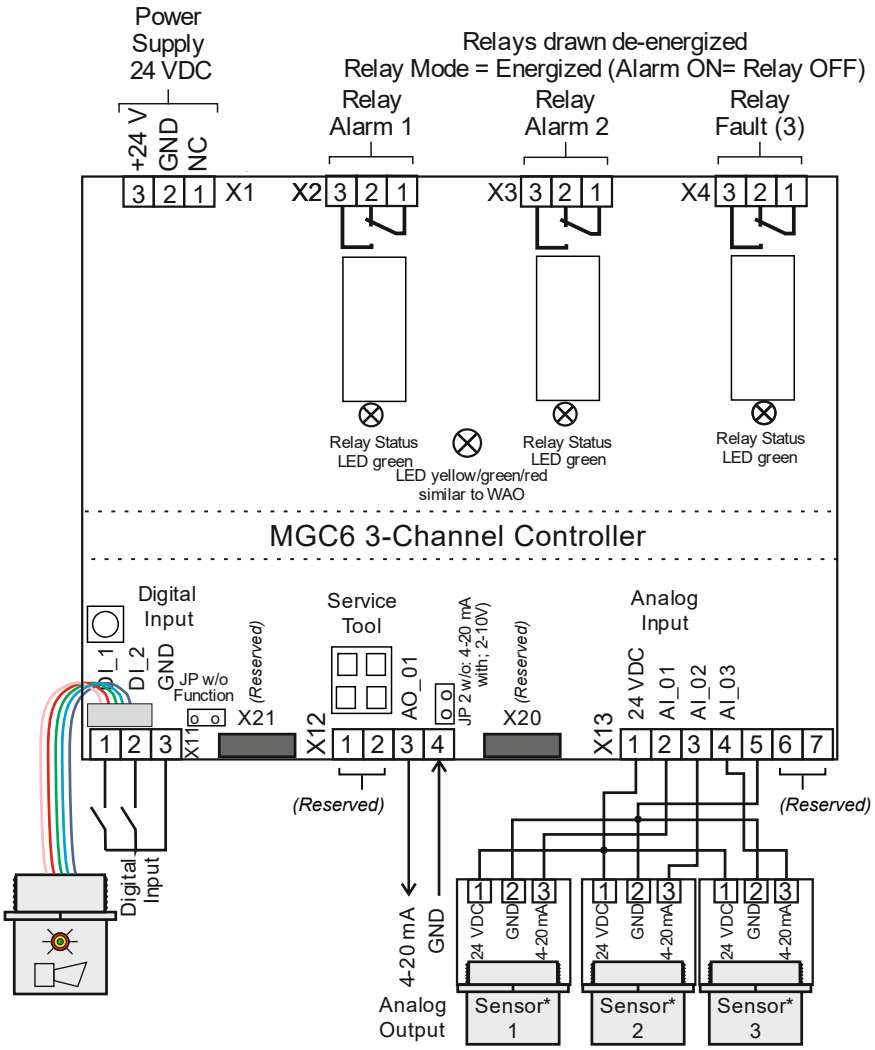
4.2 Terminal Connection

Attention:
Connecting the 24 V field bus voltage to the field bus terminals BUS_A / BUS_B can destroy the Board completely!

- Open the cover. Insert the cable from above and strip it.
- Remove terminal blocks from Board, connect cable according to connection diagram chapter 4.3.
- **AT6 Sensor:** Connect to analog input AI_01, AI_02, AI_03 (X13). The correct polarity must be observed.

  Pin 1 = +24 V
  Pin 2 = AI_01 Signal
  Pin 3 = AI_02 Signal
  Pin 4 = AI_03 Signal
  Pin 5 = GND
- Replug terminal carefully on the Board.
- Close cover.

4.3 Connection Diagrams



Notes:

- *Relay Fault (3) is always energized.*
- *The connection of 2x AT6 sensor heads with IR sensor is not allowed.*
- *When connecting 2x AT6 sensors, at least 1x must be an electrochemical sensor from the AT6-E11XX series.*
- *When connecting 3x AT6 sensors, at least 2x must be electrochemical sensors from the AT6-E11XX series.*
- *Max. 3 sensors in total.*

5 Commissioning

5.1 General Notes

All devices without exception run through a complete functional test before delivery.
However, transportation, storage, installation or special 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.

Only trained technicians should perform the following when commissioning:

- Check for correct mounting location.
- Check if connection is correct according to connection diagram.
- Check power voltage.
- Register AT6.
- Adjust application parameters.
- Calibrate (if not already factory-calibrated).
- For sensors that can be poisoned by silicones, such as all semiconductor and catalytic bead sensors, it is imperative to use a protective cap (C2-Z1) and to remove it only after the silicones have dried and then energize the unit.
- Required instruments for commissioning (calibration):
  - Calibration: see User Manual AT6.

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

5.2 Visual Check

- Right cable type used.
- Correct mounting height according to gas type.
- Led status

5.3 Selection Gas Type with Unit

- The selection of the desired and connected gas sensor type is made by pre-set values.
- If other gas sensor types are connected, you have to adjust them with the configuration tool, because otherwise the device will respond with an error message.
- The selection contains all necessary information for the controller and is also used for comparing the real digital data with the settings.
- There is an entry available per gas type for each unit.

5.4 Registration/Assignment of AT6

The AT6 4–20 mA signal series sensors is detected/monitored. By selecting the signal type (analog or bus), the gas type and the measuring range, the input is activated. The instructions can be found in the User Manual of the Service-Tool STL6. **MGC6:** Up to 3 different sensors can be connected to the MGC6 (max. 3x AT6). The AT6 must be connected to input 1 (address 1)
The position of the AI determines the position of the measuring point in the parameterization (AI1 = MP1, AI2 = MP2, AI3 = MP3).

Example MGC6 with 1x AT6 for CO, 1x AT6 for NO_2 and 1x AT6 for C_3H_4 with base address 01

Input	Mode	Field Bus Address	Gas Type	Measuring Range	Result
1	AT6	DP 01	CO	300 ppm	CO AT6 assigned to input 1 und thus field bus address DP01
2	AT6	DP 02	NO_2	30 ppm	NO_2 AT6 assigned to input 2 und thus field bus address DP02
3	AT6	DP 03	C_3H_4	100 % LEL	C_3H_4 AT6 assigned to input 3 und thus field bus address DP03

Mode: AT6 = AT6 with 4–20 mA signal, assignment to Input 1
AT6 = AT6 with 4–20 mA signal, assignment to Input 2
AT6 = AT6 with 4–20 mA signal, assignment to Input 3

Gas type and meas. range: Selection of gas type and range of the AT6 connected

The registration is only accepted if the assigned gas type/measuring range are identical in the MGC6 and in the AT6. Gas type and measuring range of the MGC6 are checked for identity by the built-in GC-06 programming module, too.

5.5 Checking / Changing Operating Parameters

The base parameter set is stored in the unit in a fail-safe manner and documented in the enclosed calibration and test protocol. Necessary changes of parameters for adaptation to the application are to be carried out only by experts with the Service-Tool STL6 or, if available, on the display. The parameter functions as well as the menu navigation and operation can be found in the User Manual of the Service-Tool STL6.

Note:
High gas concentrations can use up the oxygen in sensors working according to the catalytic bead measuring principle. The result is a falling measurement signal because of the reduced gas combustion in the sensor although gas may still be present. In this case it cannot be ensured that the measured signal is still correct, the sensor signal is unprecise. Therefore, the latching function must be active in catalytic bead sensors for combustible gases.

5.6 Stand-Alone-Operation

In stand-alone operation, monitoring, evaluation and warning are carried out directly on the unit. For this purpose, the alarm thresholds as well as the assignment of the alarms to the local alarm relays and outputs for a visual and acoustic warning must be parameterised directly on the unit.
Alarm 1 = Relay 1
Alarm 2 = Relay 2
Fault = Relay 3

5.7 Running-in Characteristics

After switching on or after an internal reset of the microcontroller, the device 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, field bus and signal LEDs for all operating stages are shown in the following table.

Start	LED on Display			Analog Output	Relays		Field Bus	LED Board 3-colour
	Power	Alarm	Fault		Alarm	Fault		
Diagnosis (ca. 0.5 sec.)				< 2 mA	OFF	Error[4]	Communication STOP	
OK								
Warm-up period			2s 2s 2s	< 2 mA	OFF	Error[4]	Communication STOP	2s 2s 2s
OK								
Measuring mode	[6]	[2]		4–20 mA[1]	[3]	OK[5]	Communication OK	
Maintenance message		[2]		4–20 mA[1]	[3]	OK[5]	Communication OK	2s 2s 2s
Special mode	[6]	[7]		2 mA[8]	[7]	Error[4]	Communication OK	
Detected fault	[6]	[7]		2 mA	[7]	Error[4]	Communication OK	
Processor failure				< 1 mA	OFF	Error[4]	Communication STOP	

Table 4: Status of Operating Modes

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

5.8 Functional Test

The functional test has to be carried out and documented in accordance with chapter 8.

5.9 Calibration AT6

Calibration of the AT6 during commissioning is only necessary if the calibration date is no longer up to date (see User Manual AT6).

6 Operating Modes

During operation, the unit can assume different operating modes. A distinction is made between the warm-up phase, measuring mode and special mode, whereby special mode is divided into 2 different subcategories.

6.1 Restart (Diagnostic and Warm-up Stage)

The device is designed in a way that it generally runs through all internal device tests (diagnostics) in the Board and in the connected sensor head(s) 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 warm-up phase of the sensor element starts.
The warm-up is necessary for the sensor 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 User Manual of the AT6. If several sensors are connected, the duration of the warm-up phase depends on the sensor head with the longest warm-up phase.

When using a display or a Service-Tool STL-06:
During the warm-up phase, the yellow LED flashes every 2 seconds and "Power ON Time" appears in the display.
Subsequently, the display shows

- the current bus address at the top left,
- the gas type in the top centre and
- the unit at the top right.

"Warm-up Time" appears in the lower section of the display. Further information can be found in the User Manual "Service-Tool and Display for PolyGard®2 and PolyXeta®2".

The status of the unit during the warm-up period is shown in Table 4.

After the end of the warm-up phase, measurement operation starts and 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 (if available) and provided on the field 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 it is ≥ alarm threshold (alarm evaluation for increasing concentration) respectively ≤ alarm threshold (alarm evaluation for falling concentration) and if exceeding respectively falling below, the alarm LED and the optional alarm relay are triggered. If the value falls below / exceeds the alarm threshold minus / plus the set hysteresis again, the alarm is automatically cancelled.
The gas detector continuously monitors itself, the measurement signal, the analog output, the alarm relay and the communication to the sensor head.
The device 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

- for combustible gases with catalytic bead sensor element (Pellistor) up to a limit of - 10 % of the measuring range (- 10 % LEL), the analog output signal drops down to 2.4 mA and within this range no error is generated,
- for toxic gases with electrochemical sensor element and gases with IR-Premium sensor element up to a limit of – 4.5 % of the measuring range (- 1.125 % vol for O_2), the analog output signal drops down to 3.3 mA and within this range no error is generated.

Active dead band suppresses the 4–20 mA signal around the zero point (see STL6 User Manual).

If the measurement signal exceeds the full-scale value, this will be tolerated up to a limit of + 6 % of the measuring range, the analog output signal increases up to ≥ 21.2 mA and there will be still no error generated.

6.3 Special Mode

6.3.1 Maintenance and Calibration Mode

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

While the Board is in maintenance/calibration mode (manual Special Mode), the status "Special Mode" is displayed and/or sent to the GC-06 Controller.
In Special Mode operation the query of the gas concentrations is slightly delayed, but there is no alarm evaluation. The fault relay switches to status "Error". The flashing yellow LED and the optional display indicate the Special Mode. A fault overlays the LED display by continuous operation of the yellow LED.
The operator can activate the Special Mode on the internal (optional) display or via the external Service-Tool STL6. This mode includes commissioning, calibration, testing, 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.

6.3.2 Faults

The Board 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 Board into the safe mode "Fault" in case of an internal or external error. The fault is indicated by the statically lit yellow LED and in the optional display. The fault signal relay goes into the "Fault" status, the analog output gives ≤ 2 mA. In addition, the fault message is sent to the GC-06 Controller.
The following Table 5 shows all possible errors, possible causes, the related troubleshooting and the resulting device status.
When the cause of the error has been eliminated, the Board changes into the measuring mode on its own. It isn't necessary to acknowledge the error message. If an error occurs, it is output in the option with display 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. If the error directly affects the measured value, the error is also displayed instead of the measured value.

	Cause	Remedy	Fault Relay	Analog Output	Field Bus	Display	
						Error Code	Text Mess.
Sensor Head (AT6)			**Reaction on Board**				**DP1-**
Sensor element defective	Internal	Replace AT6	Error	< 2 mA	Error code is sent	0x8001h	Sensor
Temperature < -35 °C, > +60 °C						0x8040h	Overtemp.
Measured value processing						0x8002h	ADC Error
System voltages <>						0x8004h	Voltage
RAM / ROM / µC error						0x8008h	CPU Error
EEPROM error						0x8010h	EE Error
Measuring value < - 4.5 % (-10 % Pell.) of measuring range	Sensor drift, calibration not correct	Perform calibration				0x8100h	Underrange
Measuring value > 106 % of measuring range				> 21,2 mA		0x8200h	Overrange
	Gas concentration > meas. range						
Analog input (AT6) > 21,6 mA	AT6 error or incorrect calibration, AT6 not connected	Perform calibration / replace sensor				0x8200h	Overrange
Analog input (AT6) < 3 mA				< 2 mA		0x8100h	Underrange
Maintenance due	Maintenance date reached	Perform maintenance	No effect		Maintenance message	0x0080h	Maintenance
MGC6							MGC6
Temperature < -35 °C, > +60 °C with display: < -20 °C, > +60 °C	Ambient temp.	Temp.!	Error	< 2 mA	Error code is sent	0x8040h	Overtemp.
	Internal	Replace device					
Measured value processing.						0x8002h	ADC Error
RAM / ROM / µC error						0x8008h	CPU Error
EEPROM error						0x8010h	EE Error
No response alarm relay						0x8020h	I/O Error
Configuration error	Measuring range AT6 ≠ I/O unit	Adjust meas. range				0x8010h	EE Error
Deviation of analog output signal < 5 % >	Short-circuit or Interruption at the analog output	Check wiring / load		X mA		0x8020h	I/O Error
	Internal	Replace device					
Communication error to sensor head	Sensor head not fitted correctly / wrong gas type	Check it, set correct gas type		< 2 mA		0x9000h / 0xB000h	Communication Error
	Internal	Replace sensor head					
Hardware Watch Dog triggered	Internal, < system voltage, µC defect.	Replace device		< 1 mA	Comm. STOP	Reset	Reset
Operating voltage limits exceeded too high / too low	External	Check voltage		< 2 mA		0x8008h	Voltage
	Internal	Replace device					
Maintenance due (concerns analog input only)	Maintenance date reached	Perform maintenance	No effect			0x0080h	Maintenance
Manual Special Mode	See chapter 7.3.1	Exit Special Mode	Error			0x0800h	

Table 5: Error Messages MGC6

7 Maintenance and Service

It is obligatory to perform maintenance regularly in order to maintain safety, measuring and warning functions of the gas alarm device. 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 GmbH | INTEC Controls. Repairs or changes of the 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 the test certificate. For regular maintenance and calibration by trained technicians we recommend concluding a service contract with MSR-Electronic GmbH | INTEC Controls or one of their authorized partners.
According to EN 45544-4, inspection and service must be executed at regular intervals. The maximum intervals have to be determined and observed by the person responsible for the gas warning system according to the legal requirements. MSR-Electronic GmbH | INTEC Controls recommends applying the inspection and maintenance intervals as prescribed in the general regulations of the gas measuring technique like EN 50545, VDI-2053, EN 60079-29-2 etc. The inspection interval normally is 3 months. The recommended service interval depends on the connected sensor and can be read from the User Manual AT6. If different intervals are valid, always consider the shortest one.
Inspections and services must be documented. The date for the next maintenance has to be affixed to the sensor.

7.1 Inspection

Gas sensors should be controlled regularly by a competent person according to EN 45544-4.
The following has to be checked in particular:

- Maintenance/calibration interval not exceeded.
- Visual check of the unit including sensor head and cables for mechanical damage, vandalism etc.
- Check the unit including sensor head for dust, dirt and moisture deposits and clean it with a dry cloth if necessary.
- The filter at the gas inlet has to be replaced if extremely dirty.

7.2 Functional Test

The functional test should be carried out during commissioning, during each maintenance or sensor replacement, but at least once a year.

Trip Test with Reference Gas

- Check alarm relays (only necessary if the alarm relay is used):
  - Apply test gas with a concentration ≥ of the set alarm threshold. The alarm relay must change into the alarm status and the actuated device goes into alarm.
    When applying a reference gas with a concentration > alarm threshold 2, the set alarm thresholds are exceeded, and all output functions are activated. It is necessary to check if the connected output functions are working correctly (e.g. the horn sounds, the fan switches on, devices shut down). By pressing the push-button on the horn, the horn acknowledgment must be checked. After removal of the reference gas, all outputs must automatically return to its initial position.

- Check analog output (only necessary if the analog output is used):
  - Apply test gas. Check the proper reaction of the connected actuator(s).

- Check field bus (only necessary if field bus is used):
  - Apply test gas. Read the concentration of the test gas on the controller and check the corresponding reactions.

7.3 Maintenance and Calibration

New AT6 sensor heads are always delivered factory-calibrated by MSR-Electronic GmbH | INTEC Controls. This is documented by the laser engraving indicating the calibration gas. A repeated calibration is not necessary during commissioning if the device is still in its original packaging (air-tight protection by the red protective cap) and the calibration doesn't date back more than 12 months for CO_2 sensors and 3 months for all other gases.
When performing maintenance, you have to do the calibration and the functional test in addition to the inspection.
The procedure for calibration and test gas application can be found in the User Manual AT6.

As long as the calibration menu is open and the sensor is gassed with test gas, the alarm release is blocked.
Prior to calibration the sensor must be connected continuously to the power supply for stabilization for a running-in period (see User Manual AT6).

The function control/calibration must be documented by a protocol stating at least:

- Identification of the gas warning device
- 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.

7.4 Repairs

Please always apply the user manual 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.

7.5 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.

Sensor Head AT6

- Disconnect the old AT6 sensor → actual value shows underrange.
- Loosen the locknut.
- Remove used AT6.
- Take calibrated AT6 out of the original packaging, check for gas type, measuring range and valid calibration date.
- Insert the new AT6 and retighten with lock nut.
- Connect the sensor via terminals.
- Perform functional test according to chapter 8.2.

8 Project protection

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

If the keys do not match, the following message appears
NO ACCESS AUTHORIZATION

9 Configuration and Parameter Cards

Commission:		Order Number:	
Customer:		Service Technician:	
Commissioning Company:		Date:	

9.1 Configuration Card System Parameters

Serial No.	Date of Production	Mainten. Interval	Mainten. Password	AV Overlay		AV Time	Power On Time	Error Time	Collect. Fault Message Dupl.
Note down	Note down	1900	****	V time	ppm				0
				0	0	90	30	30	

Analog Output 1		
Output Signal	Source	Operating Mode
100 %	CV	Average

9.2 Configuration Card Alarm Relays / Signal Outputs

Relay No.	Active Inactive	Mode	Static Flash	Reset	Horn		Extern. ON	Extern. OFF	Delay at ON	Delay at OFF	Fault ORed	Maint. ORed
				Time	Recurrence	DI	DI	DI	s	s		
Default	Inactive	De-en.	Stat.	0	No	0	0	0	0	0	OFF	OFF
R 01	Active	Energ.										
R 02	Active	Energ										
R 03	Active	De-en.										
Horn	Active	De-en.										
LED red	Active	De-en.	Flash			1						

9.3 Configuration Card AT6 (Analog Measuring Points)

Data depending on the sensor used

AP No.	MP Status	Locked	Gas Type		Measuring Range	Alarm Thresholds				Hysteresis	CV Delay Alarm (s)		CV-AV	Assignment Latching				Assignment Fault <> Alarm				Assignment Alarm <> Alarm Relay				AO1
			Gas	Unit		A1	A2	A3	A4		At ON	At OFF		A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	
	Inactive	No	CO2	ppm	300	30	60	120	120	15	0	0	MW	0	0	0	0	1	1	0	0	R1	R2	R3	R4	0
01																										
02																										

10 Technical Data

SPECIFICATIONS

Electrical	
Power supply	24 VDC ±20%, reverse polarity protected;
Power consumption	24 VDC
- base	160 mA
- sensors	*See AT6 or other datasheets*
Alarm relays	Two (2)
- relays 1 & 2	250 VAC, 5 A; 30 VDC, 2 A, potential-free, contacts (SPDT)
Fault relay	One (1)
- relay 3	Factory set; always energized
Transistor outputs	Two (2), 24 VDC/0, 1 A (switching to plus) only at 24 VDC power supply
Digital inputs	Two (2), potential-free
Analog inputs	Three (3), 4-20 mA, overload and short-circuit proof, input resistance 130 Ω
Analog output signal	One (1), selectable, proportional, overload and short-circuit proof, load ≤ 500 Ω
- measuring range	4-20 mA / 2-10 VDC
- tolerable under range	2.4-4 mA / 1.2-2.0 VDC
- tolerable over range	> 20-21.2 mA / > 10.0-10.6 VDC
- error over range	≥ 21.2 mA / ≥ 10.6 VDC
- fault	≤ 2.0 mA / ≤ 1.0 VDC
Sensors	AT6 Series, or 4-20 mA sensors
- performance	*See AT6 or other datasheets for specific gases*
- coverage	*See AT6 or other datasheets for specific gases*
- storage time	6 months (for sensor elements)
Serial interface	
- field bus	RS-485 / 19200 Baud
- tool bus	2-wire / 19200 Baud
Environmental	
Permissible ambient	*See AT6 or other datasheets for specific gases*
Temperature range	-4°F to 140°F (-20°C to +60°C)
Humidity range	15-95% RH, non-condensing
Storage temperature	-4°F to 149°F (-20°C to +65°C)
Horn & Status LED	
Horn	
- acoustic pressure	> 85 dB (A) (dist. 0.1 m / 0.3 ft)
- frequency	2300 Hz
- protection class	NEMA 4X (IP65)
Status LED	
- color / mode	Red = Alarm; Yellow = Fault; Green = Power (Normal); Green (flashing) = Service
- protection class	NEMA 4X (IP65)

Liquid Crystal Display	
LCD	Two lines, 16 characters each, illuminated
Operation	Menu driven via 6 pushbuttons
Physical	
Enclosure “C”, standard	
- material	Polycarbonate, UL94 V-2, fire retardant
- color	Light gray
- protection	NEMA 4X (IP65)
- installation	Wall (surface) mounted, or single gang electrical box
Dimensions (H x W x D)	
- base unit	5.12 x 5.12 x 2.95 in (130 x 130 x 75 mm)
Cable entry, knock outs	3 holes for 1/2 in. conduit, closed with silver “plugs”
Wire connection	
- analog output	Screw-type terminal; 24 AWG (0.25 mm^2), min. 16 AWG (1.3 mm^2), max.
- power supply, relays	Screw-type terminal; 24 AWG (0.25 mm^2), min. 14 AWG (2.5 mm^2), max.
Weight	1.32 lb (0.6 kg)
Regulations	
Directives	EMC Directives 2014/30/EU Low Voltage Directive 2014/35/EU CE, UKCA EN 61010-1:2010
Conformity	EN 50271, EN 50270 Type I, IEC/EN 61508-1-3, EN 45544-1, -3, EN 14624, EN 60335, EN 378 ANSI/UL 61010-1 CAN/CSA-C22.2 No. 61010-1
Warranty	Two years material and workmanship