Toxic (E-), Combustible (P-) and Infrared (I-$CO_2$) Gases

# PolyGard®2 SC2 & AT6 Sensors

# User Manual

May 2022

September 14, 2023 – *Revision*

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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 Intended Use

The PolyGard®2 sensors are designed for the measurement of combustible, toxic gases and oxygen as well as of refrigerants.

The digital PolyGard®2 SC2 sensor can only be operated in conjunction with the sensor boards on DT6, DC6, SGC6, and SCM6 of the PolyGard®2 series, as the SC2 sensor is supplied with 5 V DC by the sensor board and the data is transmitted digitally to the sensor boards via the local bus. The SC2 is mounted on the housing of the sensor board.

The analog PolyGard®2 AT6 sensor is operated with 24 V DC and outputs an analog 4–20 mA standard signal. The individual AT6 sensor head can be mounted on all sensor boards with analog input, or remotely on its own housing.

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

## 1.2 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.

## 1.3 Installers‘ and Operators‘ Responsibilities

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

### 1.4 Services
It is recommended to check the PolyGard®2 devices regularly. Due to regular maintenance any performance deviations may easily be corrected. Re-calibration and part replacement in the field may be implemented by a qualified technician and with the appropriate tools. Alternatively, the easily removable plug-in sensor with the sensor element may be returned for service to INTEC Controls.

### 1.5 Limited Warranty
MSR-Electronic GmbH | INTEC Controls warrants the PolyGard®2 sensors for a period of one (1) year from the date of shipment against defects in material or workmanship. Should any evidence of defects in material or workmanship occur during the warranty period, MSR-Electronic GmbH | INTEC Controls will repair or replace the product at their own discretion, without charge. This warranty does not apply to units that have been altered, had attempted repair, or been subject to abuse, accidental or otherwise. The warranty also does not apply to units in which the sensor element has been overexposed or gas poisoned. The above warranty is in lieu of all other express warranties, obligations or liabilities.
This warranty applies only to the PolyGard®2 devices. MSR-Electronic GmbH | 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.

### 1.6 Part Disposal


Within the EU, 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 Sensor includes a µController for measurement value processing in addition to the gas sensor element and the measuring amplifier. All data and measured values of the sensor element are stored in a fail-safe way in the µController and are transferred via the digital interface to the sensor board. The calibration management is also integrated in the µController (microprocessor) of the sensor.
The sensor SC2 is connected to DT6, DC6, SGC6, or SCM6.
The sensor AT6 works according to the same principle as the SC2 series with the exception that the AT6 outputs an analog signal of 4–20 mA (2–10 V as an option).

### 2.2 Measuring Mode
See description of the DT6, DC6, SGC6, SCM6 devices

### 2.3 Special Mode
See description of the DT6, DC6, SGC6, SCM6 devices

## 2.4 Sensor Element

**A: Catalytic Sensor Element (Pellistor) for Combustible Gases**

The integrated sensor works according to the catalytic bead principle. The ambient air to be monitored diffuses through the opening into the sensor. Here the combustible gases and vapours are burned catalytically at a heated detector (Pellistor). The resulting combustion heat also heats up the detector. This heating changes the resistance of the detector which is proportional to the concentration of the combustible gases.
In addition to the catalytic detector, the sensor also has a similarly heated inactive compensator. Both components are part of a Wheatstone measuring bridge. Environmental influences such as temperature, air humidity or thermal conductivity of the ambient air to be monitored affect both components to the same extent so that these influences have no significant effect on the measuring signal.
The ageing process is accelerated by the high temperatures that occur during the combustion of the measuring gas. Therefore, a calibration of Zero and Gain must be carried out at regular intervals (see chapter 6).

For testing the sensor, **do not use** a lighter. If gassed with a lighter the sensor is unusable for measurement. The warranty expires by gassing with a lighter.

**B: Electrochemical Sensor Element for Toxic Gases and Oxygen**

The sensor element is a sealed electro-chemical cell with 3 electrodes, sensing, reference and counter or with 2 electrodes, sensing and reference. The ambient air to be monitored diffuses through a membrane filter into the sensor element. The chemical process of the measurement is based on a redox reaction creating a flow of electrons that leads to a DC microampere signal between the sensing and reference electrodes. This signal is linear to the volume concentration of the sensed gas. The signal is evaluated by the connected amplifier and transformed into a linear output signal.
Electrochemical processes always lead by-and-by to a loss of sensitivity. Therefore, regular calibration of zero-point and gain is necessary. See chapter 6.

There is a small quantity of corrosive liquid in the sensor element. If in case of damage persons or objects touch the liquid, you have to clean the affected areas as fast and carefully as possible with tap water. Out of use sensors must be disposed in the same way as batteries.

**C: Semiconductor Sensor Element for Freon Gases, Ethylene and Ammonia**
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 (572°F) and 900°C (1652°F). The signal is double 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 chapter 6).

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 elements may be very different, it must be normalized. This can be done via the potentiometer on the PCB. Thus, the different output signals can be changed accordingly and adjusted appropriately.

**D: Infrared Sensor Element for Methane, Propane and Carbon Dioxide**
The integrated sensor is based on the principle of the infrared absorption of gases and accomplishes highest requirements concerning accuracy, reliability and economy. The Premium IR Sensor head is gold-plated inside in addition and therefore offers best performance characteristics in terms of drift, stability and reproducibility. The sensor technology uses the individual absorption spectrum of the infrared-active molecule and determines its exact concentration through its accurate, quantitative analysis. The infrared principle nearly eliminates the cross-sensitivity to other gases.
Due to the measuring principle, these sensors require little maintenance, but MSR | INTEC Controls recommends regular calibration of the sensors.

**For all sensor elements:**

Certain substances and gases in the ambient air to be monitored 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 and silicone vapours.
- Corrosive substances, such as halogenated hydrocarbons.
- Catalytic poisons, such as sulphur and phosphor compounds, silicon compounds, metal vapours.
- Organic solvents
- Oils and lubricants

# 3 Installation

Check the order for completeness and correctness using the delivery papers and unit labels.
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

See description of the DT6, DC6, SGC6, SCM6 devices. When choosing the mounting site please pay attention to the following:

- It is mandatory to comply with the legal requirements for the installation of gas detectors.
- The optimum mounting location may vary depending on the area of application.
- **The recommended mounting height depends on the relative gas density of the type of gas to be monitored.**
  Depending on the relative gas density (d), the following recommendation applies:
  d < 0.90: Mount 0.3–0.5 m (about 1 ft) below the ceiling
  0.90 < d < 1.10: Mount at a height of 1.2–1.8 m (5-6 ft) above floor
  d > 1.10: Mount at a height of 0.3–0.5 m (about 1 ft) above floor

| Combustible Gases | Chemical Formula | LEL (EU) / % vol | Sensitivity % EU % (Factor) /Methane | Rel. Gas Density (Air= 1) |
|---|---|---|---|---|
| Acetone | $(CH_3)_2CO$ | 2.5 | 40 | 2.00 |
| Ammonia | $NH_3$ | 14 | | 0.60 |
| Petrol Vapours | | | | n.d. |
| Benzene | $C_6H_6$ | 1.2 | 35 | 2.70 |
| Butadiene | $C_4H_6$ | 1.4 | 50 | 1.92 |
| Butyl acetate | $C_6H_{12}O_2$ | 1.2 | 25 | 4.01 |
| Cyclohexane | $C_6H_{12}$ | 1.0 | 50 | 2.90 |
| Cyclopentane | $C_5H_{10}$ | 1.4 | 65 | 2.42 |
| Ethane | $C_2H_6$ | 2.4 | 60 | 1.05 |
| Ethyl acetate | $CH_3COOC_2H_5$ | 2.0 | 40 | 3.04 |
| Ethanol (Ethyl alcohol) | $C_2H_5OH$ | 3.1 | 45 | 1.59 |
| Ethylene | $C_2H_4$ | 2.4 | 70 | 0.97 |
| Iso/n-Butane | $C_4H_{10}$ | 1.4 | 50 | 2.08 |
| Iso/n-Pentane | $C_5H_{12}$ | 1.1 | 45 | 2.49 |
| Isobutyl alcohol | $C_4H_{10}O$ | 1.4 | 35 | 2.55 |
| Isopropyl alcohol | $(CH_3)_2CHOH$ | 2.0 | 35 | 2.07 |
| LPG | | | 55 | n.d. |
| **Methane** | **$CH_4$** | **4.4** | **100** | **0.56** |
| Methanol | $CH_3OH$ | 6.0 | 75 | 1.10 |
| Methyl acetate | $C_3H_6O_2$ | 3.1 | 50 | 2.56 |
| Methyl ethyl ketone | $CH_3COCH_2CH_3$ | 1.5 | 40 | 2.48 |
| n-Heptane | $C_7H_{16}$ | 0.84 | 35 | 3.46 |
| n-Hexane | $C_6H_{14}$ | 1.0 | 40 | 2.97 |
| Nonane | $C_9H_{20}$ | 0.7 | 25 | 4.43 |
| Octane | $C_8H_{18}$ | 0.8 | 30 | 3.94 |
| Propane | $C_3H_8$ | 1.7 | 55 | 1.55 |
| Propene | $C_3H_6$ | 1.8 | | 1.48 |
| Toluene | $C_6H_5CH_3$ | 1.0 | 30 | 3.18 |
| Hydrogen | $H_2$ | 4.0 | 110 | 0.07 |

Table 1: Combustible Gases

| Toxic Gases | Chemical Formula | Rel. Gas Density (air= 1) |
|---|---|---|
| Ammonia | $NH_3$ | 0.60 |
| Chlorine | $Cl_2$ | 2.48 |
| Hydrogen chloride | HCl | 1.27 |
| Hydrogen cyanide | HCN | 0.93 |
| Ethylene | $C_2H_4$ | 0.97 |
| Ethylene oxide ETO | $C_2H_4O$ | 1.56 |
| Formaldehyde | $CH_2O$ | 1.04 |
| Carbon dioxide | $CO_2$ | 1.53 |
| Carbon monoxide | CO | 0.97 |
| Ozone | $O_3$ | 1.66 |
| Oxygen | $O_2$ | 1.11 |
| Sulphur dioxide | $SO_2$ | 2.73 |
| Hydrogen sulphide | $H_2S$ | 1.19 |
| Nitrogen dioxide | $NO_2$ | 2.80 |
| Hydrogen | $H_2$ | 0.07 |

Table 2: Toxic Gases

| Freon Gases Group | Product Code | Calibration Gas | Rel. Gas Density (air= 1) |
|---|---|---|---|
| FR % LFL | S2020 | Respective Gas | > 1 |
| FR02 | S2061 | R23 | > 1 |
| FR03 | S2063 | R1234yf | > 1 |
| FR04 | S2064 | R123 | > 1 |
| FR06 | S2070 | R22 | > 1 |
| FR07 | S2077 | R134a | > 1 |
| FR08 | S2080 | R407c | > 1 |

Table 3: Freon Gases

- Choose mounting location of the sensor according to the local regulations.
- Consider ventilation conditions! Do not mount the sensor near the airflow (air passages, suction holes etc.).
- Mount the sensor at a location with minimum vibration and minimum variation in temperature (avoid direct sunlight).
- Avoid locations where water, oil etc. may influence proper operation and where mechanical damage might be possible.
- Provide adequate space around the sensor for maintenance and calibration work.

## 3.2 Mounting of Sensors

The Sensor is supplied in a separate package and should be installed on the housing only during commissioning to protect it against dirt and damage.

- Check gas type, range and calibration date of the sensor.
- Define installation place on the housing and break out knockouts.
- Tighten the Sensor with M25 hexagon lock nut.

# 4 Electrical Connection

## 4.1 Plug Connection (SC2) in DT6, DC6, SGC6, SCM6

SC2 sensors are equipped with a reverse polarity protected connector (3-pin). It must not be plugged in the wrong position by force.

- Plug in the Sensor SC2 at the designated plug-in terminal. Observe plug polarity, the plug must engage.

The local bus sockets on the sensor boards are connected in parallel, so it is irrelevant to which socket the SC2 is connected (exception: SGC6, SCM6).

## 4.2 Terminal Connection (AT6)

- Open cover.
- Insert cable from above, cut and strip it.
- Connect it to the terminal (only 3-wire connection possible).
- For the 4–20 mA mode, please remove the built-in 500 Ω resistor between terminals 2 and 3.

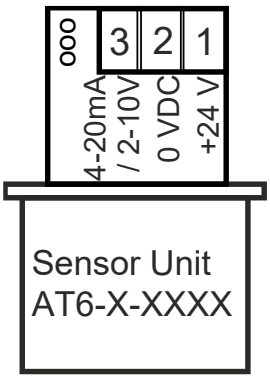



Figure 1: Terminal connections AT6

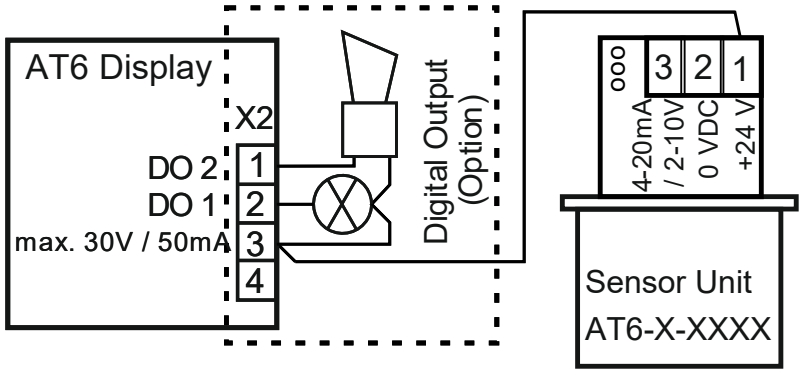



Figure 2: Terminal connections AT6 with options

## 4.3 Registration of the Sensors SC2/AT6

Registration (SC2/AT6) and addressing of the field bus address (only SC2): See description of the DT6, DC6, SGC6, and SCM6.

# 5 Commissioning

## 5.1 General

Only trained technicians should perform the following when commissioning:

- Check for correct mounting location.
- Check for correct connection.
- Install the Sensor(s) if not already installed ex works.
- Check Sensor SC2 connector for correct engagement.
- Check power voltage (AT6).
- Check if connection is correct (AT6).
- Calibrate (if not already factory-calibrated).

Within the first weeks after commissioning, there may be a deviation in the sensor behaviour.

## 5.2 Required Instruments for commissioning (calibration)

- Service-Tool STL6 or
- DPT6 EasyConfig Software incl. USB/RS-485 communication set
- For AT6, in addition to tool or software, adapter CONKIT-AT6-CalCable
- Calibration:
  - Zero calibration: Test gas bottle with synthetic air (21 % O2. 79 % $N_2$) or clean ambient air
  - Zero calibration for carbon dioxide / oxygen: Test gas cylinder with pure nitrogen 5.0
  - Gain calibration: Test gas bottle with test gas in the range 30–90 % of the measuring range. The rest is synthetic air.
  - Gain calibration for semiconductor sensors: The concentration of the test gas must be 50 % of the measuring range. The rest is synthetic air.
  - Extraction set consisting of gas pressure regulator and flow controller
  - Calibration adapter with tube: Type CONKIT-PG2.
  - Calibration adapter with tube for IR sensors with lateral 2nd gas inlet: Consult INTEC Controls.

# 6 Calibration

The STL6 Service-Tool or DPT6 EasyConfig Software are available for convenient on-site calibration. See description of STL6 Service-Tool or DPT6 EasyConfig Software.
There is also the possibility to exchange the sensor against a calibrated one on site. The used sensor can then be calibrated directly in the office or at INTEC Controls and then reused again.

Please observe proper handling procedures for compressed gas and test gas bottles (regulations TRGS 220)!

Test gas can be toxic, so never inhale it!
Symptoms: Dizziness, headache and nausea.
Procedure if exposed: Remove victim to fresh air, seek medical attention.

## 6.1 Run-in Time

Prior to calibration, the sensors must be supplied with power voltage without interruption for run-in and stabilisation. The run-in time depends on the sensor element and is shown in the following tables.

| A: Catalytic Sensor Element (Pellistor) for Combustible Gases | Run-in time calibration (h) | Warm-up time (s) | Flow rate[1] (ml/min) | Gas application time (s) |
|---|---|---|---|---|
| All Pellistor sensors | 24 | 300 | 150 | 120 |

Table 4: Calibration Pellistor Sensor Element

| B: Electrochemical Sensor Element for Toxic Gases and Oxygen | Formula | Calibration with surrogate gas (ratio surrogate gas : gas) | Run-in time calibration (h) | Warm-up time (s) | Flow rate (ml/min) | Gas application time[2] (s) |
|---|---|---|---|---|---|---|
| Ammonia | $NH_3$ | - | 24 | 300 | 500 | 180 |
| Chlorine | $Cl_2$ | $NO_2$ 1:1 $CL_2$ | 24 | 30 | 500 | 180 |
| Hydrogen chloride | HCl | $H_2S$ 20:31 HCl | 24 | 30 | 500 | 120 |
| Hydrogen cyanide | HCN | $H_2S$ 15:25 HCN | 24 | 30 | 500 | 120 |
| Ethylene | $C_2H_4$ | | 24 | 30 | 500 | 180 |
| Ethylene oxide | ETO | - | 24 | 30 | 500 | 180 |
| Formaldehyde | $CH_2O$ | CO 7:1 $CH_2O$ | 24 | 30 | 500 | 120 |
| Carbon monoxide | CO | - | 24 | 10 | 500 | 120 |
| Ozone | $O_3$ | $NO_2$ 1:1 $O_3$ | 24 | 30 | 500 | 180 |
| Oxygen | $O_2$ | - | 24 | 10 | 500 | 180 |
| Sulphur dioxide | $SO_2$ | - | 24 | 30 | 500 | 120 |
| Hydrogen sulphide | $H_2S$ | - | 24 | 30 | 500 | 120 |
| Nitrogen dioxide | $NO_2$ | - | 24 | 60 | 500 | 180 |
| Wasserstoff | $H_2$ | - | 24 | 30 | 500 | 180 |

Table 5: Calibration Electrochemical Sensor Element

| C: Semiconductor Sensor Element | Stabilisation time until specification (min) | Run-in time calibration (h) | Warm-up time (s) | Flow rate[1] (ml/min) | Gas application time (s) |
|---|---|---|---|---|---|
| All Freon gases | 60 | 24 | 300 | 150 | 180 |
| $NH_3$ / $C_2H_4$ | | 24 | 300 | 150 | Max. 90 |

Table 6: Calibration Semi-Conductor Sensor Element

* A run-in time of 168 h is recommended for initial commissioning.

| D: Infrared-Sensor Element | Run-in time calibration (h) | Warm-up time (s) | Flow rate[1] (ml/min) | Gas application time[2] (s) |
|---|---|---|---|---|
| Methane, propane, carbon dioxide (Premium sensor) | 1 | 30 | 150 | 180 |
| Methane, propane, carbon dioxide | 1 | 30 | 1500 | 180 |

Table 7: Calibration Infrared Sensor Element

[1] Stainless steel housing option requires a flow rate of 500 ml/min.
[2] Stainless steel housing option requires longer gas application times.

## 6.2 Calibration Work

Prior to calibration you have to activate the mode "Special Mode" at the basic device, only then the calibration menu is enabled. During the special mode, the basic device does not issue alerts.

- Connect calibration adapter carefully to the sensor.
- Connect calibration tool you want to use to the sensor board.
- Open calibration mode in the dialog.
- Select the sensor to be calibrated by selecting the gas type.
- Wait for warm-up time to elapse (see Table 4 to Table 7 Calibration).

### 6.2.1 Zero Calibration

- Open Zero Calibration dialog.
- The current zero offset and the offset value of the first calibration is read by displaying.
- Apply synthetic air to the sensor head with a flow rate according to Table 4 to Table 7 Calibration, 1 bar ± 10 %, for 3 minutes (for $CO_2$ and $O_2$ sensors min. 5 minutes with nitrogen).
- After the application time has elapsed, the new zero-offset factor is calculated by confirming. The new offset factor is checked for plausibility and stored in the buffer memory. The current measured value is output with the new offset factor and the offset display is updated.
- With "Save" the new offset factor is written, only then the Zero calibration has been successfully completed. If you exit the menu without pressing "Save", the original offset data for the measured value calculation will continue to be used.

With a reading > 10 % of measuring range during the zero calibration, zero calibration is not possible.

### 6.2.2 Gain Calibration

- Open Test Gas dialog and enter test gas concentration (value between 30–90 % of the measuring range, for semiconductor sensors 50 %)
- Open Gain Calibration dialog.
- The current sensor element sensitivity is read by displaying.
- Apply test gas (flow rate and application time according to Table 4 bis Table 7 Calibration, 1 bar ± 10 %) to the sensor head.
- After the application time has elapsed, the new gain factor is calculated by confirming.
  The new gain factor is checked for plausibility and stored in the buffer memory. The current measured value is output with the new gain factor and the sensor element sensibility is updated.
- With "Save" the new gain factor is written in the memory, only then the gain calibration has been successfully completed. If you exit the menu without pressing "Save", the original gain data for the measured value calculation will continue to be used.

By limiting the gain factor, calibration will not be possible anymore when the sensitivity of the sensor reaches a residual sensitivity of 30 %. Then the sensor has to be replaced.
It is required to document the successful calibration with a protocol and to attach a label to the sensor board containing the date for the next calibration.
For more information, see the user manual of the corresponding sensor boards and tools.

### 6.2.3 Calibration (Gain) with Surrogate Gas for Catalytic Sensor Element (Pellistor)

For certain gases it is possible to perform a cross calibration with methane (see Table 1: Combustible Gases). The concentration of the calibration gas is calculated according to the following formula:

$$\text{Calibration gas} = \frac{\text{Gas concentration x 100}}{\text{Factor}}$$

### 6.2.4 Extended Calibration for Semiconductor Sensor Element

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

**Extended Zero Calibration**

- Apply test gas to the sensor (see Table 4 to Table 7 Calibration)
- The processor input voltage must be measured against ground (gas-dependent) at the pin led out.
- Set the voltage 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 Zero Calibration dialog.
- Perform zero-point calibration (Display → Calculate → Save)

**Gain Calibration:**

- Open the test gas dialog and enter the concentration of the test gas used.
- Open the Gain Calibration dialog.
- Apply the test gas (see Table 4 to Table 7 Calibration)
- Perform gain calibration.
- Save the new values after successful gain calibration.

## 6.3 Calibration Analog Output

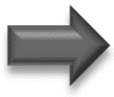
When recalibrating an AT6 series sensor, you have to recalibrate the analog output for the new sensor, too. Otherwise, deviation between the digital display and the output current at the AO is to be expected.

Measure the analog output (AT6) in relation to the calibration value.
(2 % tolerance of the measured value); to 100 0.1 % resistance.
If there is a higher deviation, calibrate the analog output according to the DPT6 EasyConf Software or STL6 User Manual.

## 6.4 Exchange of Sensors

Instead of the on-site calibration, the used sensor can be replaced simply and conveniently by a calibrated one.

### 6.4.1 Sensor SC2



The communication of the local bus (SC2 <> Sensor Board) is continuously monitored during operation and results in an immediate error message on the gas controller in case of fault or interruption. When replacing the sensor unit, the communication of the local bus is interrupted when unplugging the SC2 connector which leads to an immediate triggering of the error message.

- Disconnect the SC2 connector from the sensor board or the remote board (error message will be activated).
- Loosen the locknut.
- Remove used SC2.
- Take calibrated SC2 out of the original packaging, check for gas type, measuring range and valid calibration date.
- Insert the SC2 and retighten with lock nut.
- Insert the SC2 plug into the socket at the sensor board or remote board. Check plug for proper engagement.

The local bus communication is automatically established and tested. At the same time, the gas type and the measuring range of the "new" SC2 are compared with the data stored in the sensor board. If they match and the communication is correct, the error message will be automatically acknowledged in the sensor board.
The yellow LED of the sensor board is continuously lit as long as the SC2 connector is disconnected (communication error). After the local bus communication has been re-established and the conformity test has been successful, the board stays in the error stat until the sensor's warm-up time is over.

### 6.4.2 Sensor AT6

- Disconnect the used AT6 sensor head.
- Loosen the lock nut. Remove the used AT6 sensor head.
- Take calibrated AT6 sensor head out of the original packaging, check for gas type, measuring range and valid calibration date.
- Insert AT6 sensor head and tighten with locknut.
- Reconnect the new AT6 sensor head.

### 6.4.3 Perform Function Test

The sensor is gassed with a defined concentration, the measurement signal at the analog output, the relay outputs or the digital display is to be checked.
With this test, the complete function chain "Sensor Element > Sensor > Local Bus (SC2) or Analog Output Signal (AT6) > Sensor Board > Field Bus > Evaluation Unit" is tested.

# 7 Inspection and Service

Inspection. service and calibration of the sensor should be done by trained technicians at regular intervals. We therefore recommend concluding a service contract with INTEC Controls or one of their authorized partners.
According to EN 45544-4, inspection and service have to be executed at regular intervals. The maximum intervals have to be determined and respected by the person responsible for the gas warning system according to the legal requirements. MSR-E | INTEC Controls recommends employing the common inspection and service intervals as specified in the general regulations of the gas measuring technique. We recommend an inspection interval of 3 months. The recommended calibration intervals depend on the sensor element and can be found in the Technical Data. If different intervals are valid, always observe 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 inspection of the sensor including cable for damage, vandalism etc.
- Remove dust deposits, especially at the gas inlet.
- The filter at the gas inlet has to be replaced if extremely dirty.

## 7.2 Service and Calibration

When performing the maintenance you have to do the calibration and the functional test, see chapter 6, in addition to the inspection.
A fixed calibration interval is stored for each sensor type.

**SC2 Sensors:**
If this interval is exceeded, a digital maintenance message is generated and forwarded.
Performing the calibration automatically deletes this message.

**AT6 Sensors:**
If this interval is exceeded, the current output of the AT6 goes to a fixed 19 mA signal. For new devices (factory calibration), the interval may be exceeded by a factor of 1.5.
After voltage recovery, there is a defined interruption of this message. This can be of use in order to employ the device without the maintenance message for a few days (adjustable in system parameters -> error time, value range > 0) until the recalibration is performed.
Performing the calibration automatically deletes this message.

**Note**: With AT62 sensor head software version 1.02.11 and higher (can be read out under Operating data -> Software version), this function is switched off ex works (System parameters -> Error time, value range = 0). The AT6 error time can be set with STL6 (from software version 1.02.09) and with DPT6 EasyConfig (from version 1.2.3.5, with CONKIT-AT6-CalCable adapter).

# 8 Troubleshooting

## 8.1 Indications for the SC2

There are no diagnostic indicators on the SC2 sensor modules; they are only available on the DT6, DC6, SGC6, or SCM6.

## 8.2 Indications for the AT6

The 4–20 mA output of the AT6 can be used as diagnostic indicators.

| | **Output current** |
|---|---|
| Device error: | 2 mA |
| Tolerable negative sensor drift: | 3–4 mA |
| Normal measurement mode: | 4–20 mA |
| Tolerable overrange: | 20–21.2 mA |
| Overrange error: | > 21.8 mA |
| Maintenance message: | 19 mA |

# 9 Specifications

## 9.1 General

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

| **REGULATIONS** | |
|---|---|
| Certified to | UL 2075 Listed, NRTL performance tested for models SC2-E1110-E & AT6-E1110-E |
| Directives (only in connection with sensor boards from INTEC Controls) | EMC Directives 2014/30/EU<br>CE<br><br>Compliance with: (see corresponding datasheet)<br>EN 378<br>EN 14624<br>EN 45544-1, -3<br>EN 50104 (for O2)<br>EN 50271 EN 50545-1<br>EN 61508-1-3<br>EN 61010-1:2010<br>ANSI/UL 61010-1<br>CAN/CSA-C22.2 No. 61010-1 |
| Warranty | 1 year on sensor (not if poisoned or overloaded),<br>2 years on device |

## 9.2 Digital Sensor SC2

| | |
|---|---|
| **ELECTRICAL** | |
| Power supply | 5 V DC from sensor board (e.g. DT6), reverse polarity protected |
| Power consumption | |
| • Catalytic (Pellistor) | 200 mA, max. (1.0 VA) |
| • Electrochemical | 10 mA, max. (0.05 VA) |
| • Semiconductor | 160 mA, max. (0.8 VA) |
| • Infrared Premium | 60 mA, max. (0.3 VA) |
| • Infrared | 50 mA, max. (0.25 VA) |
| Serial interface local bus | 1-wire / 19200 Baud |
| **PHYSICAL** | |
| Housing in plastic | Polycarbonate |
| Combustion | UL 94 V2 |
| Housing colour | RAL 7032 (light grey) |
| Dimensions: Housing type P | (D x H) 24 x 22 mm (0.94 x 0.87 in.) |
| Housing type L | (D x H) 24 x 30 mm (0.94 x 1.18 in.) |
| Weight | Approx. 30 g (0.07 lb) |
| Protection class | IP65 |
| Mounting | Screw mounting |
| Connection type | 3-pin connector |
| Cable length | Approx. 150 mm (5.91 in.) standard w/o cable extension |

## 9.3 Analog Sensor AT6

| | |
|---|---|
| **ELECTRICAL** | |
| Power supply | 18–29 V DC, reverse-polarity protected;<br>18–27 V AC (only for output signal 2–10 V) |
| Power consumption | |
| • Catalytic (Pellistor) | 75 mA, max. (1.8 VA at 24 V) |
| • Electrochemical | 23 mA, max. (0.6 VA at 24 V) |
| • Semiconductor | 75 mA, max. (1.8 VA at 24 V) |
| • Infrared Premium | 75 mA, max. (1.8 VA at 24 V) |
| • Infrared | 40 mA, max. (1.0 VA at 24 V) |
| Analog output signal | Proportional, overload and short-circuit proof,<br>load ≤ 500 Ω for current signal, ≥ 50 kΩ for voltage signal<br>4–20 mA or 2–10 V = measuring range<br>3–4 mA or 1.5–2 V = underrange<br>> 20–21.2 mA or 10–10.6 V = overrange<br>2 mA or 1 V = fault<br>> 21.8 mA or 10.9 V = fault High |
| **PHYSICAL** | |
| Housing plastic | Polycarbonate; UL 94 V2 |
| Housing colour | RAL 7032 (light grey) |
| Dimensions: Type P | (D x H) 24 x 22 mm (0.94 x 0.87 in.) |
| Weight | Approx. 30 g (0.066 lb) |
| Protection class | IP65 (only if mounted in housing type A, D) |
| Mounting | Screw mounting / M25 |
| Wire connection | Screw-type terminal 0.25–1.3 $mm^2$ ,3-pin, 24 to 16 AWG |

## 9.4 Sensor Element

### A: Catalytic Sensor Element (Pellistor) for Combustible Gases

| SENSOR ELEMENT | |
|---|---|
| Gas type and measuring range | Combustible gases, see Ordering Information on Datasheet |
| Sensor element | Pellistor (catalytic bead) sensor |
| Temperature range | -30 °C to +60 °C (-22 °F to 140 °F) |
| Humidity range | 0–95 % RH not condensing |
| Pressure range | 90–110 kPa |
| Oxygen concentration | 21 % (standard) 18 % minimum level |
| Storage temperature range | 0 °C to +20 °C (32 °F to 68 °F) |
| Storage time[1] | Approx. 6 months |
| Sensor lifetime | 5 years / normal ambient conditions |

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

| Gas type | Ordering No. | Measuring range | Accuracy | Display resolution | Repeatability | t90 time | Zero-point variation | Drift in air | | Calibration interval[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Zero | Gain | |
| | SC2-/ AT6- | % LEL/ ppm | ± % sig. | % LEL / ppm | < ± % sig. | ≤ sec. | ± % LEL | < % signal/ month | | Months |
| $CH_4$ | P3400-A | 0–100 % LEL | 1 ($CH_4$) | 0.1 | 2 ($CH_4$) | 15 | 0.5 ($CH_4$) | 0.5 ($CH_4$) | 2 ($CH_4$) | 6 |
| $NH_3$ | P3408-A | 0–100 % LEL | 1 ($CH_4$) | 0.1 | 2 ($CH_4$) | 20 | 0.5 ($CH_4$) | 0.5 ($CH_4$) | 2 ($CH_4$) | 6 |
| $NH_3$ | P3408-B | 0–20 % LEL | 1 ($CH_4$) | 0.1 | 2 ($CH_4$) | 10 | 0.5 ($CH_4$) | 0.5 ($CH_4$) | 2 ($CH_4$) | 6 |
| $H_2$ | P3440-A | 0–100 % LEL | 1 ($CH_4$) | 0.1 | 1 ($CH_4$) | 10 | 0.5 ($CH_4$) | 0.5 ($CH_4$) | 2 ($CH_4$) | 6 |
| $C_3H_8$ | P3480-A | 0–100 % LEL | 1 ($CH_4$) | 0.1 | 2 ($CH_4$) | 20 | 0.5 ($CH_4$) | 0.5 ($CH_4$) | 2 ($CH_4$) | 6 |
| $C_3H_8$ | P3480-B | 0–30 % LEL | 2 ($C_3H_8$) | 0.01 | 2 ($C_3H_8$) | 15 | 0.5 ($C_3H_8$) | n.d. | 2 ($C_3H_8$) | 6 |
| $C_3H_8$ | P3480-C | 0–5000 ppm | 2 ($C_3H_8$) | 1 (ppm) | 2 ($C_3H_8$) | 15 | 0.5 ($C_3H_8$) | n.d. | 2 ($C_3H_8$) | 6 |
| $C_3H_6$ | P3481-B | 0–30 % LEL | 2 ($C_3H_6$) | 0.01 | 5 ($C_3H_6$) | 15 | 1.0 ($C_3H_6$) | n.d. | 2 ($C_3H_6$) | 6 |
| All others | PXXXX-A | 0–100 % LEL | 1 ($CH_4$) | 0.1 | 2 ($CH_4$) | n.d. | 0.5 ($CH_4$) | 0.5 ($CH_4$) | 2 ($CH_4$) | 6 |

[1] Manufacturer-recommended calibration interval for normal environmental conditions.

### B: Electrochemical Sensor Element for Toxic Gases and Oxygen

| SENSOR ELEMENT | |
|---|---|
| Gas type | Toxic gases, see Ordering Information on Datasheet |
| Sensor element | Electrochemical |
| Pressure range | 90–110 kPa or<br>80–120 kPa ($NH_3$, CO, $O_2$ all $NO_2$ except for 1130-F) |
| Storage temperature range[1] | 5 °C to 20 °C (41°F to 68 °F) or<br>0 °C to 20 °C (32°F to 68 °F) for $NH_3$, CO, $NO_2$, $O_2$<br>10 °C a 30 °C (50 °F to 86 °F) for $H_2$ |
| Storage time[2] | Approx. 6 months |

[1] A higher storage temperature can have a negative effect on sensitivity and service life.
[2] If stocked for a longer period, we recommend checking the zero point and recalibrating if necessary.

## SPECIFICATIONS – SENSOR ELEMENT (SC2/AT6)

| Gas type | Ordering No. | Measuring range[1] | Accuracy | Display resolution | Repeatability | $t_{90}$ time | Zero-point variation | Drift in air | | Temperature range | Humidity range (non-condensing) | Life time[2] in air | Relative gas density | Calibration interval[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Zero | Gain | | | | | |
| | SC2-/ AT6- | ppm | ± % sig. | ppm | <± % sig. | ≤ sec. | ± ppm | < % signal/ month | | °C | % RH | > months | Air = 1 | Month |
| **CO** | E1110-C | 0–150 | 2 | 0.1 | 5 | 10 | 4 | 0.4 | 0.4 | -20 / +50 | 10–95 | 72 | 0.97 | 12 |
| **CO** | E1110-E | 0–250 | 2 | 0.1 | 5 | 10 | 4 | 0.4 | 0.4 | -20 / +50 | 10–95 | 72 | 0.97 | 12 |
| **CO** | E1110-F | 0–300 | 2 | 0.1 | 5 | 10 | 4 | 0.4 | 0.4 | -20 / +50 | 10–95 | 72 | 0.97 | 12 |
| **CO** | E1110-H | 0–500 | 2 | 0.1 | 5 | 10 | 4 | 0.4 | 0.4 | -20 / +50 | 10–95 | 72 | 0.97 | 12 |
| **$NH_3$** | E1125-A | 0–100 | 5 | 0.1 | 10 | 120 | 5 | 1 | 2 | -30 / +50 | 15–90 | 24 | 0.60 | 12 |
| **$NH_3$** | E1125-B | 0–300 | 3 | 0.1 | 10 | 120 | 5 | 1 | 2 | -30 / +50 | 15–90 | 24 | 0.60 | 12 |
| **$NH_3$** | E1125-C | 0–500 | 3 | 0.1 | 10 | 120 | 5 | 1 | 2 | -30 / +50 | 15–90 | 24 | 0.60 | 12 |
| **$NH_3$** | E1125-D | 0–1000 | 3 | 1 | 10 | 120 | 10 | 1 | 2 | -30 / +50 | 15–90 | 24 | 0.60 | 12 |
| **$NH_3$** | E1125-E | 0–5000 | 2 | 1 | 10 | 40 | 100 | 1 | 2 | -30 / +50 | 15–90 | 24 | 0.60 | 12 |
| **$NO_2$** | E1130-A | 0–10 | 5 | 0.01 | 2 | 25 | 0.2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 2.80 | 12 |
| **$NO_2$** | E1130-B | 0–20 | 5 | 0.01 | 2 | 25 | 0.2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 2.80 | 12 |
| **$NO_2$** | E1130-C | 0–30 | 5 | 0.01 | 2 | 25 | 0.2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 2.80 | 12 |
| **$NO_2$** | E1130-E | 0–100 | 5 | 0.1 | 2 | 25 | 2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 2.80 | 12 |
| **$NO_2$** | E1130-F | 0–5 | 5 | 0.001 | 2 | 25 | 0.1 | 1 | 2 | -20 / +50 | 15–90 | 24 | 2.80 | 12 |
| **HCN** | E1183-B | 0–50 | 5 | 0.01 | 5 | 30 | 2 | 1 | 2 | -20 / +50 | 15–90 | 24 | 0.93 | 6 |
| **HCN** | E1183-C | 0–100 | 5 | 0.1 | 5 | 30 | 2 | 1 | 2 | -20 / +50 | 15–90 | 24 | 0.93 | 6 |
| **$CH_2O$** | E1185-B | 0–10 | n.d. | 0.01 | 5 | 60 | 0.2 | 1 | 2 | -30 / +50 | 15–90 | 36 | 1.04 | 6 |
| **HCl** | E1186-D | 0–20 | 5 | 0.01 | 5 | 60 | 0.5 | 1 | 2 | -20 / +50 | 15–90 | 24 | 1.27 | 6 |
| **$C_2H_4$** | E1189-C | 0–200 | n.d. | 0.1 | 5 | 120 | 5 | 2 | 5 | -30 / +50 | 15–90 | 24 | 0.97 | 6 |
| **$O_3$** | E1190-A | 0–5 | n.d. | 0.001 | 5 | 60 | 0.1 | 1 | 2 | -30 / +50 | 15–90 | 24 | 1.66 | 6 |
| **$O_3$** | E1190-B | 0–10 | n.d. | 0.01 | 5 | 60 | 0.2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 1.66 | 6 |
| **$Cl_2$** | E1193-C | 0–10 | n.d. | 0.01 | 5 | 40 | 0.2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 2.48 | 6 |
| **$Cl_2$** | E1193-D | 0–20 | n.d. | 0.01 | 5 | 40 | 0.2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 2.48 | 6 |
| **$H_2$** | E1194-A | 0–1000 | n.d. | 1 | 5 | 70 | 10 | 1 | 2 | -20 / +50 | 15–90 | 24 | 0.07 | 12 |
| **$SO_2$** | E1196-B | 0–20 | 3 | 0.01 | 5 | 30 | 0.2 | 1 | 2 | -20 / +50 | 15–90 | 24 | 2.73 | 6 |
| **$H_2S$** | E1197-A | 0–50 | 3 | 0.01 | 5 | 30 | 1 | 1 | 2 | -30 / +50 | 15–90 | 24 | 1.19 | 12 |
| **$H_2S$** | E1197-B | 0–100 | 3 | 0.1 | 5 | 40 | 1 | 1 | 2 | -30 / +50 | 15–90 | 24 | 1.19 | 12 |
| **$H_2S$** | E1197-C | 0–200 | 3 | 0.1 | 5 | 40 | 2 | 1 | 2 | -30 / +50 | 15–90 | 24 | 1.19 | 12 |
| **$H_2S$** | E1197-D | 0–500 | 3 | 0.1 | 5 | 40 | 5 | 1 | 2 | -30 / +50 | 15–90 | 24 | 1.19 | 12 |
| **$H_2S$** | E1197-E | 0–1500 | 3 | 1 | 5 | 60 | 15 | n.d. | n.d. | -30 / +50 | 15–90 | 24 | 1.19 | 12 |
| **ETO** | E1199-A | 0–10 | n.d. | 0.01 | 5 | 150 | 1 | 1 | 2 | +10 / +30 | 15–90 | 24 | 1.56 | 12 |
| | | % vol | | | | | | | | | | | | |
| **$O_2$** | E1195-A2/3 | 0–25 | 2 | 0.01 | n.d. | 15 | n.d. | n.d. | 0.4/0.6 | -40 / +50 | 5–95 | 24/36 | 1.11 | 6/6 |
| **$O_2$** | E1195-A5/7 | 0–25 | 2 | 0.01 | n.d. | 15 | n.d. | n.d. | 0.4 | -40 / +50 | 15–90 | 60/84 | 1.11 | 12/12 |

[1] Exceeding the measuring range limit will include a risk of damaging the sensor element.
[2] Expected service life for normal ambient conditions
[3] Manufacturer-recommended calibration interval for normal environmental conditions

## CROSS SENSITIVITY[1] - SENSOR ELEMENT (SC2/AT6)

Illustration: Gas concentration of interference gas / reaction of sensor

| Gas type | Ordering No. | Chlorine, $Cl_2$ | Ethanol, $C_2H_6O$ | Ethylene, $C_2H_4$ | Carbon monoxide, CO | Carbon dioxide, $CO_2$ | Sulphur dioxide, $SO_2$ | Hydrogen sulphide, $H_2S$ | Nitrogen dioxide $NO_2$ | Nitrogen monoxide, NO | Hydrogen, $H_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SC2-/ AT6- | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **CO** | E1110-X[2] | 2/0.5 | 2000/5 | | | 5000/0 | 50/0.5 | 25/0 | 50/-1 | 50/10 | 100/20 |
| **$NH_3$** | E1125-A | | 100/0 | | 500/0 | 5000/0 | 20/-6 | 25/30 | 5/-7,5 | 50/0 | 100/0 |
| **$NH_3$** | E1125-B | | 100/0 | | 500/0 | 5000/0 | 20/-6 | 25/30 | 5/-5 | 50/0 | 100/0 |
| **$NH_3$** | E1125-C | | 100/0 | | 500/0 | 5000/0 | 20/-6 | 25/35 | 5/-5 | 50/0 | 100/0 |
| **$NH_3$** | E1125-D | | 100/0 | | 500/0 | 5000/0 | 20/-6 | 25/35 | 5/-5 | 50/0 | 100/0 |
| **$NH_3$** | E1125-E | 0 % | 0 % | 0 % | 0 % | 0 % | <150 % | <70 % | 10 % | 0 % | <-10 % |
| **$NO_2$** | E1130-X[2] | 1/0,5 | | | 300/0 | 5000/0 | 20/0 | 15/<1 | | 50/0 | 200/0 |
| **HCN** | E1183-X[2] | | | 100/0 | 100/2 | | 20/38 | 15/25 | 5/-12 | 25/0 | 100/2 |
| **$CH_2O$** | E1185-B | | 30/1 | | 100/<20 | | | 20/20 | | | 100/5 |
| **HCl** | E1186-D | 20/0 | 30/0 | 100/0 | 1000/0 | | 100/0 | 20/31 | 20/-6 | 25/0 | |
| **$C_2H_4$** | E1189-C | | | | 100/<60 | | | | | | |
| **$O_3$** | E1190-X[2] | 5/4 | 60/0 | 100/0 | 100/0 | | 5/0 | 20/-20 | 5/5 | 50/0 | 100/0 |
| **$Cl_2$** | E1193-X[2] | | 60/0 | 100/0 | 300/0 | | 5/0 | 20/-20 | 20/20 | 50/0 | 100/0 |
| **$H_2$** | E1194-A | 10/0 | | 100/80 | 50/200 | | 5/0 | 25/0 | 5/0 | 35/<10 | |
| **$O_2$** | E1195-XX[2] | | | | | | | | | | |
| **$SO_2$** | E1196-B | | 100/0 | | 100/<1 | | | 20/10 | 5/-4 | 100/0 | 100/<1 |
| **$H_2S$** | E1197-A | | | | 100/<1 | | | | | | 300/1 |
| **$H_2S$** | E1197-B | | 40/0 | 20/0 | 100/<1 | | 100/15 | | | | 300/<3 |
| **$H_2S$** | E1197-C | | | | 300/<12 | | | | | | 300/<12 |
| **$H_2S$** | E1197-D | | | | 300/<12 | | | | | | 300/<12 |
| **$H_2S$** | E1197-E | | | | <5 % | | 20 % | | | | <5 % |
| **ETO** | E1199-A | | 30/21 | | 100/20 | | | 20/40 | | | |

[1] The table does not claim to be complete. Other gases, too, can have an influence on the sensitivity. The mentioned cross sensitivity data are only reference values valid for new sensors.
[2] Cross sensitivity data valid for all measuring ranges of the sensor.

## C: Semiconductor Sensor Element for Freon Gases, Ethylene and Ammonia

| SENSOR ELEMENT | |
|---|---|
| Gas type | Refrigerants, See Ordering Information on Datasheet |
| Sensor element | Semiconductor sensor |
| Pressure range | 90–110 kPa |
| Oxygen concentration | 21 % (standard) 18 % minimum level |
| Storage temperature range | 0 °C to +50 °C (32 °F to 122 °F) |
| Storage time[1] | Approx. 12 months |

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

| Gas type | Ordering No. | Measuring range | Repeatability | $t_{90}$ time | Temperature range | Humidity range (non-condensing) | Lifetime[1] in air | Relative gas density | Mounting height | Calibration interval[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | SC2-/ AT6- | ppm | < ± % sig. | ≤ sec. | °C | % RH | > months | Air = 1 | (m) | Months |
| LFL | S2020-0X-A | 0–50 % LEL | 20 | 150 | -30 / +60 | 15-90 | 60 | > 1 | 0.3 | 12 |
| FR | S20XX-XX-A | 20–2000 | 20 | 150 (R134a) | -30 / +60 | 15-90 | 60 | > 1 | 0.3 | 12 |
| $NH_3$ | S2125-C | 0–1000 | 20 | 30 | -30 / +60 | 15-90 | 60 | 0.60 | Ceiling | 12 |
| $NH_3$ | S2125-F | 0–10000 | 20 | 30 | -30 / +60 | 15-90 | 60 | 0.60 | Ceiling | 12 |
| $C_2H_4$ | S2189-A | 20–2000 | 20 | 10 | -30 / +60 | 15-90 | 60 | 0.97 | 1.5–1.8 | 12 |

[1] Expected service life for normal ambient conditions.
[2] Manufacturer-recommended calibration interval for normal ambient conditions.

No cross-sensitivity data is available for these sensors. It is well known that all semiconductor sensors are also sensitive to combustible gases, e.g. alcohols, etc.

## D: Infrared Sensor Element for Methane, Propane and Carbon Dioxide

### Sensor Element SC2/AT6 Methane/Propane/Carbon Dioxide – Premium

| SENSOR ELEMENT | |
|---|---|
| Gas type | See Ordering Information on Datasheet |
| Sensor element | Infrared sensor |
| Accuracy | ± 3 % of range for < 50 % of range<br>± 5 % of range for > 50 % of range |
| Pressure range | 70–130 kPa |
| Storage temperature range | -40 °C to +80 °C (-40 °F to 176 °F) |
| Storage time[1] | Approx. 6 months |

| Gas type | Ordering No. | Measuring range | Display resolution | Repeatability | $t_{90}$ time | Zero-point variation | Temperature range | Humidity range (non-condensing) | Life time[2] in air | Relative Gas density | Calibration interval[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SC2-/ AT6 | | % / ppm | < ± % Sig. | ≤ sec. | ± % LEL / % vol | °C | % RH | > years | Air = 1 | Months |
| $CH_4$ | I400-A | 0–100 % LEL | 0.1 | 2 | 20 | 4 | -30 / +60 | 0–95 | 5 | 0.56 | 12 |
| $CH_4$ | I400-B | 0–100 % vol | 0.1 | 5 | 30 | 4 | -30 / +60 | 0–95 | 5 | 0.56 | 12 |
| $C_3H_8$ | I480-A | 0–100 % LEL | 0.1 | 2 | 70 | 4 | -30 / +60 | 0–95 | 5 | 1.55 | 12 |
| $CO_2$ | I464-B | 0–5 % vol | 0.001 | 5 | 50 | n.d. | -30 / +60 | 0–95 | 5 | 1.53 | 12 |
| $CO_2$ | I464-D | 0–5000 ppm | 1 | 5 | 25 | n.d. | -30 / +60 | 0–95 | 5 | 1.53 | 12 |
| $CO_2$ | I464-F | 0–10 % vol | 0.01 | 5 | 60 | n.d. | -30 / +60 | 0–95 | 5 | 1.53 | 12 |

### Sensor Element SC2/AT6 Methane/Propane/Carbon Dioxide

| SENSOR ELEMENT | |
|---|---|
| Gas type | See Ordering Information on Datasheet |
| Sensor element | Infrared sensor |
| Pressure range | 90–110 kPa (influence + 1.6 % on measured value per kPa) |
| Storage temperature range | -40 °C to +70 °C (-40 °F to 158 °F) |
| Storage time[1] | Approx. 6 months |

| Gas type | Ordering No. | Measuring range | Display resolution | Accuracy - gain | Repeatability | $t_{90}$ time | Zero-point variation | Drift per year[4] | | Temperature range | Humidity range (non-condensing) | Life time[2] in air | Relative Gas density | Calibration interval[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Fresh air | Gain | | | | | |
| | SC2-/ AT6 | | % | ±% sig. | <± % sig. | ≤ sec. | ± % LEL | ±% sig. | ±% sig. | °C | % RH | > years | Air = 1 | Months |
| $CH_4$ | S400-A | 0–100 % LEL | 0.1 | 4 | 5 | 90 | 4 | n.d. | n.d. | -30 / +60 | 0–95 | 5 | 0.56 | 12 |
| $C_3H_8$ | S480-A | 0–100 % LEL | 0.1 | 4 | 5 | 90 | 4 | n.d. | n.d. | -30 / +60 | 0–95 | 5 | 1.55 | 12 |
| $CO_2$ | I-S1164-B | 0–5 % vol | 0.001 | 10 | 5 | 90 | n.d. | 10 | 3 | -35 / +50 | 0–85 | 15 | 1.53 | 60 |
| $CO_2$ | I-S1164-C | 0–2 % vol | 0.001 | 10 | 5 | 90 | n.d. | 10 | 3 | -35 / +50 | 0–85 | 15 | 1.53 | 60 |
| $CO_2$ | I-S1164-E | 0–20,000 ppm | 10 | 10 | 5 | 90 | n.d. | 10 | 3 | -35 / +50 | 0–85 | 15 | 1.53 | 60 |

[1] If stocked for a longer period, we recommend checking the zero point and recalibrating if necessary.
[2] Expected service life for normal ambient conditions.
[3] Calibration interval recommended by the manufacturer for normal ambient conditions.
[4] Measured under laboratory conditions (constant environmental influences). Deviations may occur depending on the application.

# 10 Figures

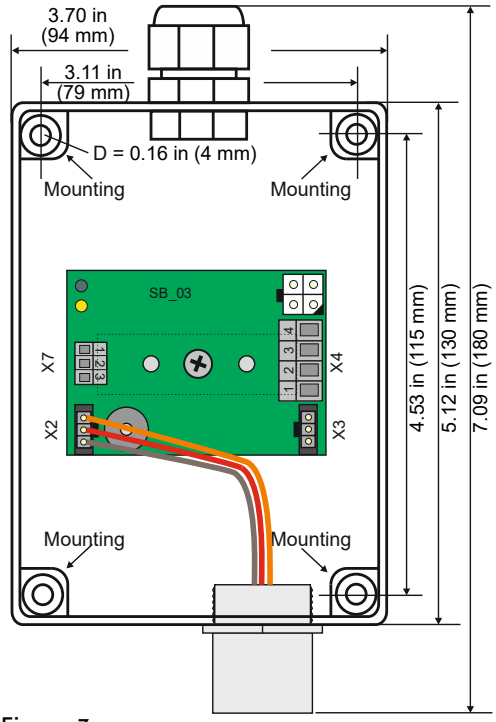



Figure 3:
DT6 with SC2 sensor

Figure 4:
DT6 with SC2 snesor

Figure 5:
Calibration adapter CONKIT-PG2

Figure 6:
Calibration adapter for IR sensors with 2nd gas inlet
(Consult INTEC Controls)

## List of abbreviations

Units

| | |
|---|---|
| h | hour |
| kPA | Kilopascal |
| in. | Inch |
| m | Metre |
| mA | Milliampere |
| min | Minute |
| ml | Millilitre |
| $mm^2$ | Square millimetre |
| mV | Millivolt |
| nA | Nanoampere |
| ppm | Parts per million |
| s, sec. | Second |
| VA | Voltampere |
| V AC | Volt for Alternating Current |
| V DC | Volt for Direct Current |
| % vol | Volume percent |
| °C | Degree Celsius |
| °F | Degree Fahrenheit |

Products from INTEC Controls

| | |
|---|---|
| DGC6 | PolyGard®2 Digital Gas Controller DGC6 |
| GC-06 | PolyGard®2 Gas Controller Module GC-06 |
| DC6 | PolyGard®2 Multi-Sensor Controller DC6 |
| AT6 | PolyGard®2 Sensor AT6 with Analog Output |
| DPT6 EasyConfig | DPT6 EasyConfig PC-Software |
| DT6 | PolyGard®2 DT6 Module |
| SC2 | PolyGard®2 Sensor SC2 with digital transmission |
| STL6 | Hand-Held Service Tool STL6 |
| SGC6 | PolyGard®2 Standalone Gas Controller SGC6 |
| SCM6 | PolyGard®2 Sensor and Control Module SCM6 |

Others

| | |
|---|---|
| DIN | Deutsches Institut für Normung (German standard) |
| EN | Europäische Norm (European standard) |
| EU | European Union |
| ESD | Electrostatic Discharge |
| LED | Light-emitting diode |
| LFL | Lower Flammability Limit |
| LEL | Lower Explosion Limit |
| max. | Maximum |
| min. | Minimum |
| n.d. | Non defined |
| RH | Relative Humidity |
| RS-485 | Standard defining electrical characteristics of interfaces for serial data transfer |
| sig. | Signal |
| e.g. | Example given |

## Glossary

**Gas application time**
Time period during which test gas must be supplied to the sensor.

**Run-in time**
Time the sensor needs to be continuously supplied 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 %.

**Test gas**
Gas mixture of known composition used for testing and calibrating the sensor

**Warm-up Time (stabilisation time)**
Time span from switching on the device in a specific atmosphere to the moment when the measured value reaches the specified deviations and is stable.

## Revision List

| Version | Date | Chapter | Reason for change / Notes |
|---|---|---|---|
| 1.0 | | | New format, list of abbreviations, glossary, revision list |
| 1.1 | 17.11.2021 | | µGard removed, Disposal update, Chap. Calibration AO new, $NO_2$ 5 ppm and $CO_2$ 20,000 ppm added, Data Cross Sensitivities updated, Data IR Sensor updated |
| 1.2 | 08.03.2022 | | Sensor $H_2$ 0–1000 ppm added, flow rate for toxic gases 500 ml/min<br>Update of ratio (surrogate gas : gas) for ozone |
| 2022-05 | 31.05.2022 | 3.1<br>6.1<br>9.3<br>9.4 A + 3.1 | Update mounting height<br>Update flow rate for IR sensors<br>Semiconductor sensors: consumption 75 mA<br>Sensor $C_3H_6$ 0–30 % LEL added |
| | | | |
| | | | |
| | | | |

| | |
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