

Stattox 501 PID Sensor Head



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Operation Instructions

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1 Safety advice

The interface is an explosion-proof device certified for group II category 2. Its intended use is to operate a Photo - Ionisation - Sensor (PID) for the detection of volatile organic compounds (VOC). Designed to provide increased safety it is applicable in zone 1 and zone 2.

The following safety guidelines must be followed in particular:

- Observe the safety guidelines applicable for electronic components sensitive to electrostatic voltage.
- The retaining nut must be tightened at all time. It may only be removed for sensor replacement or maintenance. Do not operate the sensor head without sensor or retaining nut.
- The interface may be exclusively used to operate the certified sensor MiniPID (Baseefa 07ATEX0060U).
- The interface may only be installed by trained and authorised personnel. The protection class Ex e [ib] mb IIC T4 Gb must not be compromised.
- When connecting cables in the junction box of the sensor head housing, the power supply must be disconnected.
- The interface may be connected to housings rated increased safety “Ex e”. Installation must comply with EN 60079-7. Cable and its termination must be protected from mechanical damage and must stay within the temperature specifications (80°C) of the cable.
- The interface and the sensor must be operated within ambient conditions as specified in the technical data. Operating the sensor head outside the specified ambient conditions might damage the sensor or interface, lead to malfunction and compromise safety.
Avoid:
 - Temperatures > + 60°C
 - Temperatures < - 30°C
 - Wetness and dust. Maintain ingress protection IP54.

In case the interface is integrated into any housing, rated to provide increased safety “Ex e”, observe the following:

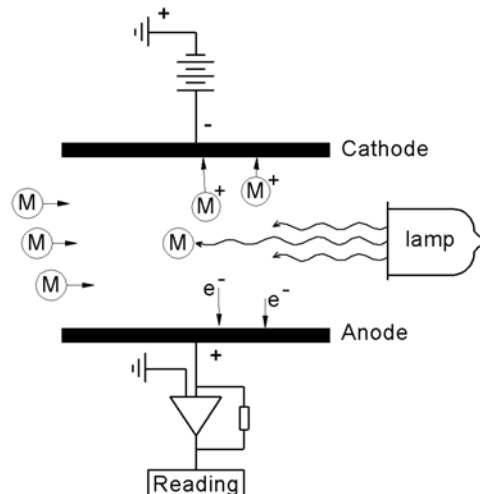
- Interface and housing must be protected from mechanical damage and environmental conditions out of specifications.
- During installation the power supply must be disconnected.
- Protect cables from mechanical damage, corrosion and heat. Wherever such impact cannot be avoided, extra protection as specified in DIN EN 60079-14 must be provided, or install conduits.
- Ingress protection rating IP54 must be maintained in any case. To achieve sufficient sealing, use a washer, for instance a Viton- O-ring 20x2,5 mm between interface and housing. Fasten the interface to flush with the housing.

2 Introduction

The intended use is the measurement of VOC (Volatile Organic Compounds).

2.1 Measuring principle

The target gas passes a membrane and enters the measuring chamber, where it is ionised by a high – energy UV lamp. This produces ions, which are discharged at the electrodes. The discharge current produced depends on the number of molecules entering, i. e. the concentration.



A PID will detect all substances with an ionisation potential smaller than < 10.6 eV. Non detectable, and also not interfering are O₂, N₂, CO, CO₂ and CH₄. Very high humidity will quench the signal.

For calibration use Isobutene as reference gas (see chapter 6).

2.2 Operation mode

The Statox 501 PID sensor head operates in the diffusion mode.

If you want to operate the Statox 501 PID in the flow mode, please contact your Compur Monitors expert.

2.3 Different models

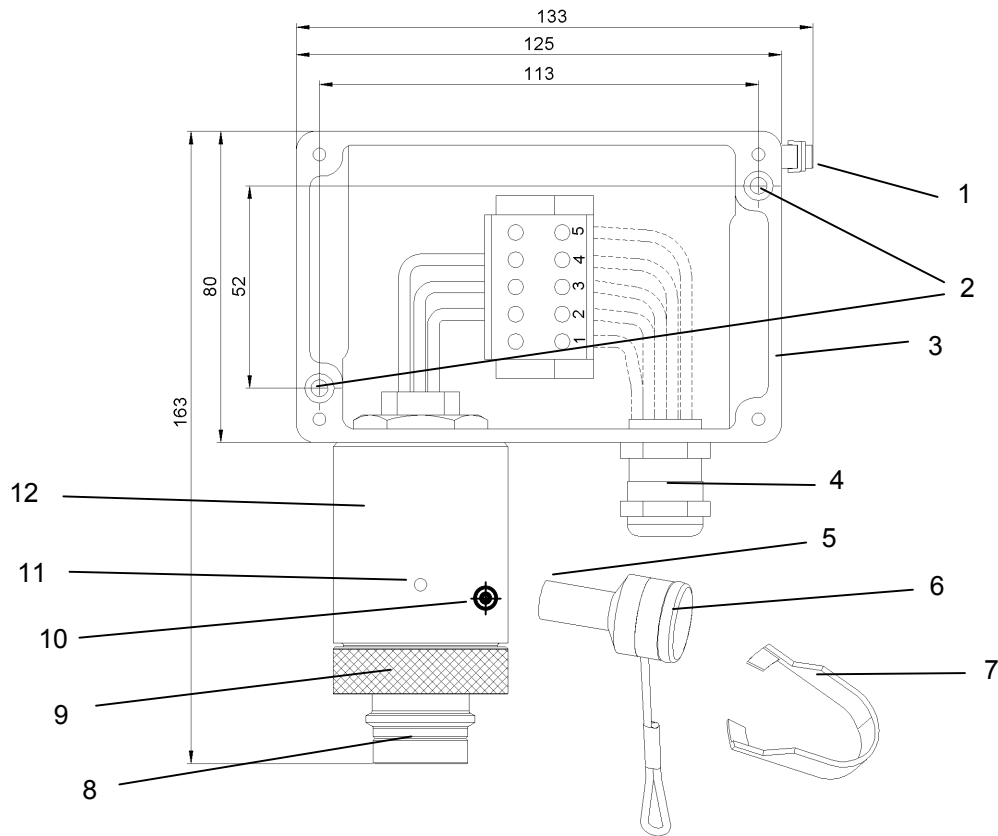
The parameters of the Statox 501 PID interface are set ex works to the requirements of your application. Target gas, sensor type and measuring range are hardware programmed.

The sensor type is labeled on the sensor:

MP3SM6FC = ppm Sensor, MP3SB6FC = ppb Sensor.

It is important to know which sensor is in use, in case you need to order spare parts or consumables (see chapter 9).

3 Drilling plan, dimensions, construction, scope of delivery



- 1 Grounding contact
- 2 Mounting drill holes for Φ 4 mm bolts
- 3 Aluminum housing
- 4 Cable gland for cable Φ 6-11 mm
- 5 Magnetic pin
- 6 Blind plug
- 7 Plastic tool to open sensor
- 8 Sensor protection cap with gas access through filter membrane
- 9 Nut holding the protection cap
- 10 Hall sensor, contact area for the magnetic pin
- 11 LED
- 12 Interface

Function of the blind plug:

- The thinner end is a magnetic pin, triggering the internal hall sensor. Hold it close to the contact area on the interface housing to enter the calibration routine.
- The bigger end can be used to seal the sensor head, once the sensor has been removed for service.

4 Installation and electrical connection

4.1 Caution

The sensor head must be protected from mechanical damage and from ambient conditions outside its specifications. Mount it to the wall at a location where it is easily accessible for service. Use a shielded cable to transmit the signal to the Statox 501 control module.

Observe local regulations for electrical installations.

Position: gas access downwards (+ / - 15°).

Place the sensor head close to potential gas leaks considering the specific gravity of the target gas, when selecting the installation level.

4.2 Installation

The housing has two pocket holes for wall installation. You need two screws Ø 4mm.

4.3 Electrical connection

Recommended cable: 3 x or 5 x $\geq 0,75$ mm², with dense- mached shield. Outer diameter 6 mm (e.g. Type Oelflex 415 CP3 X 0,75).

The Statox 501 PID sensor head can be operated in the 3 – wire or 5 – wire mode.

Select **3 wire mode** if the electrical resistance of the cable loop is $< 5 \Omega$.

Select **5 wire mode** if the electrical resistance of the cable loop is $\geq 5 \Omega$. In this mode the two additional „sense“ leads measure the voltage directly on the sensor head and the control module compensates for the voltage drop in the cable.

The Statox 501 PID needs a Statox 501 Control Module (software index 2.1 and higher) for operation. Select the appropriate program prior to connecting the sensor head. (Programs 80 - 83). Selecting the wrong program might destroy the sensor or cause malfunction!

If there are high potential differences in your plant, ground the shield only on the Control Module side.

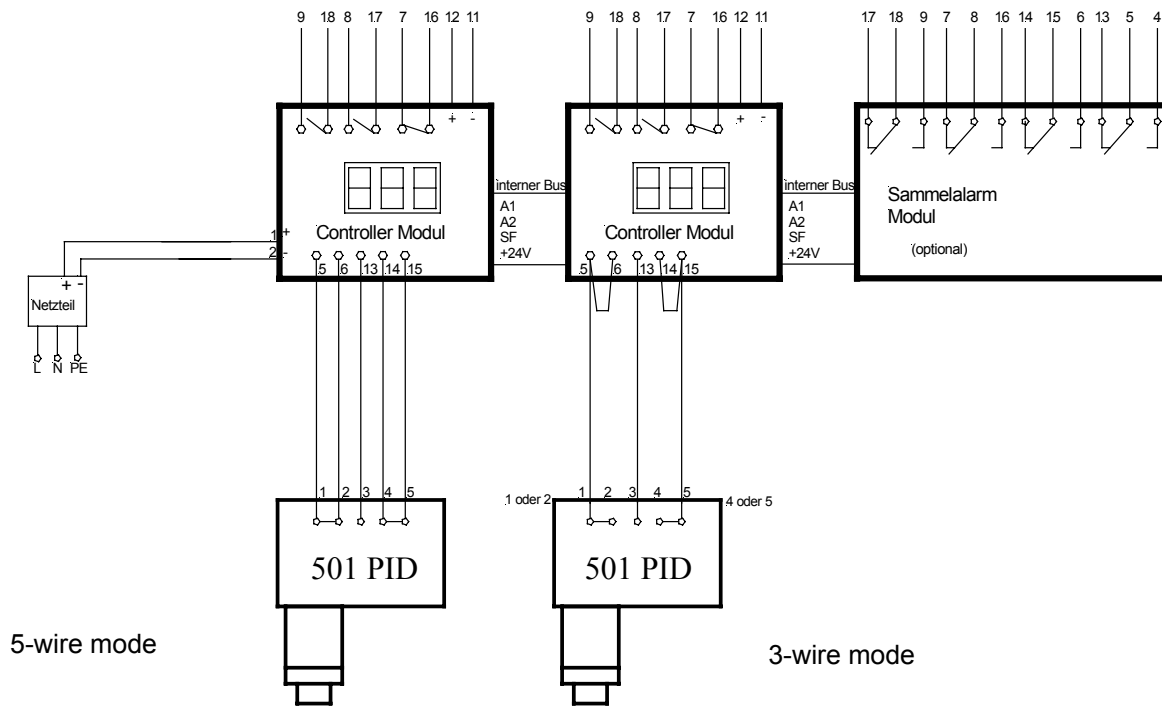
After start up, allow 30 min warm up time. Then perform a calibration. The calibration can be neglected if you have purchased an ex works calibration sensor head plus Control Module. In this case do not change the program of the control module. Otherwise the calibration parameters will be lost! Ex - works - calibrated components have labels with all relevant information on them.

After any change of program a calibration is mandatory.

If you want to form group alarms, you can use the optional common alarm module (Art. No. 557 387).

Connecting the interface:

Terminal	Wire	Contact
4 or 5	blue	Power supply negative
3	black	Signal
1 or 2	red	Power supply positive



Electrical connections for Stattox 501 PID sensor heads. Faulty connection may destroy the interface!

5 Start up and measuring mode

- When connected to power, the LED is flashing green / red alternatingly.
- Steady green light indicates the sensor head is in the measuring mode.
- To enter or exit the calibration mode hold the magnetic pin on to the contact area on the type plate.

Different modes of operation:

LED	mode	Control Module display	activity
LED flashing green / red alternatingly	initial phase	first ----, then 0	---
green	measuring mode	actual concentration	---
flashing green	calibration mode	see Control Module display	Calibrate or return to measuring mode
short red flash, then off	Error: sensor defective or missing	Er 5	see chapter 7
off	Error: power supply voltage too low	Er 5	see chapter 7
red	Error: wrong program	0	select appropriate program

6 Calibration with gas

A calibration is due after installation, sensor replacement or in time intervals as required by local regulations. Allow 30 min warm up time.

Calibration to liquid substances in the field is labor intensive and prone to error. Use Isobutene as reference gas and apply the response factors provided by Compur Monitors.

The tools required for calibration are: Span gas in appropriate concentration, a regulator and a gas adapter.

The interface will accept set points between 10 and 100 % of the end of scale value.

To achieve best accuracy Compur Monitors recommends to calibrate at the desired alarm threshold value. Calculate the most suitable span gas concentration with this formula:

$$C_{\text{Isobutene}} = \frac{\text{Alarm threshold}}{\text{Response factor}}$$

Example: Measuring range 0 - 1000 ppm Methylmethacrylate, Response factor = 1,6

minimal Isobutene concentration: $100 \text{ ppm} / 1,6 = 62,5 \text{ ppm}$ Isobutene
maximum Isobutene concentration : $1000 \text{ ppm} / 1,6 = 625 \text{ ppm}$ Isobutene

Procedure:

- Hold the magnetic pin on to the contact area to start the calibration routine. The green LED will start flashing. If there is no further activity, the sensor head will automatically return to the measuring mode after 30 minutes.
- Enter the calibration menu on the Control Module. Adjust zero.
- Connect the gas tube to one of the fittings of the gas adapter. If you want to avoid gas emissions, you may connect an active carbon filter to the outlet. (Art.No. 806 488) Do not bend or twist the tube to avoid overpressure in the gas adapter.
- As soon as the Control Module displays „GAS“, connect the gas adapter to the sensor and open the valve. Press „Enter“ . The recommend flow is 20 l/h (300 ml/min). As soon as „CAL“ is flashing, press „Enter“ again.
- Now enter the product of span gas concentration multiplied by the response factor.

Example: Calibration to methyl methacrylate with 100 ppm Isobutene.
You have to enter $100 \text{ ppm} * 1,6 = 160$ (The reponse factor of methyl metacrylate is 1,6)

In case the sensor signal is too low, you will get the message „SenS“ on the Control Module. Proceed as described in the next chapter.

- Remove the gas adapter and switch the gas off.
- Push the „Reset“ button on the Control Module to leave the calibration menu.
- Touch the contact area on the PID with the magnetic pin to enter the measuring mode. The LED should be green then.

7 Troubleshooting

The LED going off and the Control Module displaying Err 5, may have the following reasons:

- Sensor missing
- Incorrect wiring
- The voltage at the terminals 1/2 and 4/5 is < 4,6 V. Check the program.
- Sensor defective
- Interface defective.

If calibration is not possible (Control Module displays „SenS“ after entering the gas concentration), follow this procedure:

- Check if there is enough gas in the cylinder? Is the regulator open? Is the tube free?
- Check the filter membrane for proper gas access.
- Polish the sensor lamp (see 8.1).
- Replace the lamp (see 8.1).
- Replace the electrode pack (see 8.1).
- Check the voltage at the terminals 1/2 and 4/5. It must be > 4,6 V.
- Replace the sensor (see 8.2).

If all this does not help, call Compur Monitors technical service.

8 Maintenance / Replacement of consumables

A PID sensor will gradually lose sensitivity over time. This process depends on the ambient conditions and the target gas. Therefore regular calibration, lamp cleaning and replacement of consumables is necessary to guarantee accurate measurement. Compur Monitors recommends to hold stock of consumables.

Terms of warranty

PID sensor electronics: 12 months after delivery date. The delivery date is declared as “QC week/year” on the sensor label.

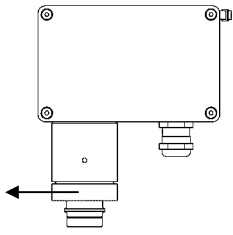
No warranty on consumables such as sensor lamps and electrodes.

Observe the general precautions for handling electrostatic voltage sensitive electronic components and breakable glass.

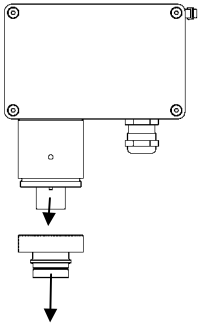
It is safe to install and remove the sensor while the sensor head is connected to the control module.

8.1 Lamp cleaning / replacement of consumables

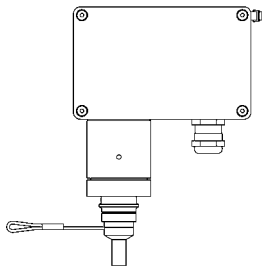
8.1.1 Removing the sensor



Open the retaining nut counter clockwise until you can remove it, by pulling it downwards.



Unplug the sensor pulling it downwards. Work on the sensor should be performed in a clean environment.



Protect the sensor slot by re - installing the retaining nut (see chapter 8.1.4) and closing it with the blind plug.



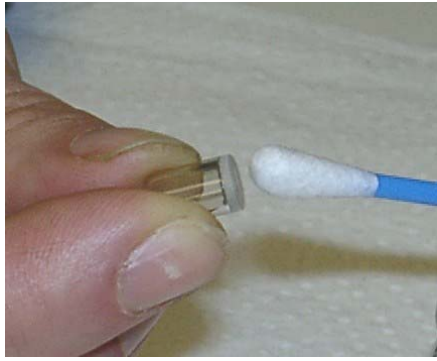
Place the sensor on clean soft cloth, pins upward.

Insert the plastic pliers into the two ports on the sensor and press until you hear a click.



Carefully lift the sensor. If the electrode stack and lamp do not come loose easily, apply the pliers again.

8.1.2 Polishing the lamp



Pull the lamp carefully out of the electrode stack. Never touch its polished front side.

Polish the front side with a cotton swap and the polishing powder. Apply tender pressure until you hear a silent squeak. Remove loose polish particles with a fresh swap until the lamp front is absolutely clean.

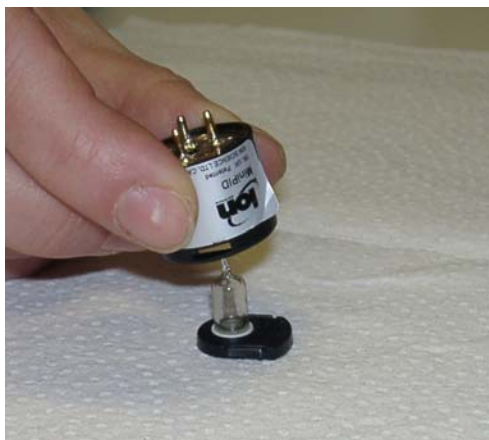
8.1.3 Elektrode stack and lamp replacement

- Make sure to select the correct spare parts (ppm- or ppb-version)!
The ppb - elektrode stack is white, the ppm - elektrode stack is black.
- Do not touch the front side of the lamp or the metallic parts of the electrodes.

8.1.4 Assembly and installation of the sensor



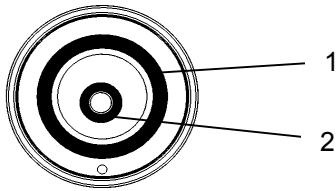
Push the lamp slightly rotating into the O - ring up to the stop.
The lamp must flush with the electrode.



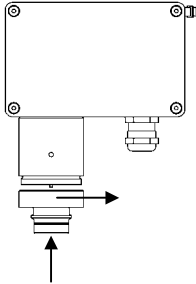
Place the electrode stack with the lamps front side downwards on the table. Now place the sensor on it. Make sure the two parts match in correct position.

Push the sensor downwards until the springs snap in.
Check for tight and flushing assembly.

The sensor is now ready to be connected to the interface.



Installation of the sensor protection cap: The O-Rings (1+2) must be properly positioned in their seats on the sensor protection cap.



Take the sensor protection cap in one hand, make the positioning pin of the interface match its rest in the cap, press it upwards and tighten the nut hand tight.

Incorrect positioning may affect the sensors protection from dirt and humidity!

- To restart the sensor head push the „Enter“ - button on the Control Module.
- After any opening of the sensor, a calibration is mandatory.

8.2 Sensor replacement

- **Observe the general precautions for handling electrostatic voltage sensitive electronic components.**
- Make sure to select the correct spare parts. The sensor article codes are marked on its type plate: **MP3SM6FC = ppm sensor, MP3SB6FC = ppb sensor.**

8.3 Replacing the filter membrane inside the sensor protection cap

- The gas access opening is protected from dust and humidity intrusion by a Teflon membrane. Whenever the membrane has been damaged or polluted, it must be replaced. (Art. No. 511206).
- Remove the clamping ring using a small screw driver. Install a new membrane and clamp ring by pressing both in their position.

8.4 Maintenance and cleaning of the sensor head housing

- Clean the sensor head with a damp cloth. Do not use detergents or solvents. No high pressure cleaning!
- Perform visual inspections on a regular basis. Check the gas access for pollution and damage.

9 Spare parts and accessories

Description	Article number
STATOX 501 Sensor head PID flow adapter	511101
STATOX 501 Spare sensor PID ppm	511214
STATOX 501 Spare sensor PID ppb	511215
STATOX 501 Sensor head PID interface (Atex)	511201
STATOX 501 Sensor head PID sensor blind plug	511205
STATOX 501 Sensor head PID filter set	511206
STATOX 501 Sensor PID spare lamp ppm	511218
STATOX 501 Sensor PID spare lamp ppb	511219
STATOX 501 Sensor PID spare electrodes ppm	511223
STATOX 501 Sensor PID spare electrodes ppb	511224
STATOX 501 Sensor PID polishing set	511207
Statox 501 Control Module	556959
Statox 501 Common Alarm Module	557387
Span gas 58l Isobutene 10 ppm in air	556508
Span gas 58l Isobutene 100 ppm in air	569406
Kalgas 58l regulator 715 flow = 300 ml/min	556637
Gas tube 1 m	556710
Active carbon filter	806488

10 Technical data

- Instrument: Statox 501 PID Sensor head
- Type: 5366
- Manufacturer: COMPUR Monitors, München
- Operation temperature: -30° - +60°C
- Protection class: min. IP54
- Humidity: 0-95 %, non condensing
- Accuracy at the calibration concentration: ± 10 % at constant temperature and humidity

Explosion protection Parameters

- ATEX: Ex e [ib] mb IIC T4 Gb
- Application: II 2 G
- EC type examination certificate: BVS 12 ATEX E 014
- Un: 5,2 VDC
- In: 50 mA
- Um: 29 Vp

Use exclusively MiniPID MP3SM6FC or MP3SB6FC (Baseefa 07 ATEX0060U / 3) sensors!

Signal interferences

- **Pressure:** Ambient pressure variations are neglectible. In the flow mode calibration under flow conditions is recommended.
- **Temperature:** Variations within specifications are neglectible.
- **Absolute humidity:** Humidity itself is not detected, but it may quench the signal.
- **Gas concentration:** Very high concentrations may partly absorb ionisation energy and thus also quench the signal. Calibration at the alarm threshold will guaranty maximum accuracy.

11 Declaration of Conformity

DECLARATION OF CONFORMITY

COMPUR
Monitors

Compur Monitors GmbH & Co.KG
Weißenseestraße 101
D 81539 München

as the manufacturer hereby declares that the

Sensor Head Statox 501 PID Type 5366

complies with the essential requirements of the following directives and has been tested according to the European standards:

1. Directive **2004/108/EC** ¹⁾
EN 50270: 2006 (Type 2 device)

¹⁾ in connection with Statox 501 Controller (Art. # 556959)

2. Directive **94/9/EC**
EN 60079-0 :2009
EN 60079-7 :2007
EN 60079-11 :2007
EN 60079-18 :2009

EC Type Examination Certificate: BVS 12 ATEX E014
Notified Body: 0158 / DEKRA EXAM Bochum, Germany

Munich, 02-20-2012



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