Operation Manual

Compur Statox 4120

COMPUR Monitors

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Contents

1. Important notice

Statox 4120 is an explosion proof system for the detection of toxic gases. It can be operated in hazardous areas classified division 1 and 2.

Before installing and putting Statox into operation read and observe this manual!

To operate the system safely, observe this manual carefully. It must be operated and maintained by qualified and authorised personnel. No other application than ambient air monitoring of the gas specified is authorised by the manufacturer.

Safety guidelines

- **Prior to connecting and installing the Statox 4120 system check if all any safety – relevant parameters of the system and its environment are in accordance with specifications and local regulations.**
- **If the Statox sensor head is installed in a potentially hazardous atmosphere the safety relevant parameters of the sensor head and the control module must be observed. Please use cable specified as recommended in this operation manual.**
- **Operating conditions must not exceed the specifications.**
- **The alarm relays of Statox 4120 are only safe to operate 24 V DC. Do not connect to mains.**
- **Maintenance work must be carried out by trained personnel only.**
- **Use exclusively original spare parts, accessories and consumables.**

If the safety guidelines are not observed, the Ex approval will be void!

The instrument has to be inspected and serviced in regular intervals by trained personnel. For service or training contact your local Compur Monitors representative. The maximum maintenance interval should be 6 months.

2. The Statox 4120 system: Purpose of use and description

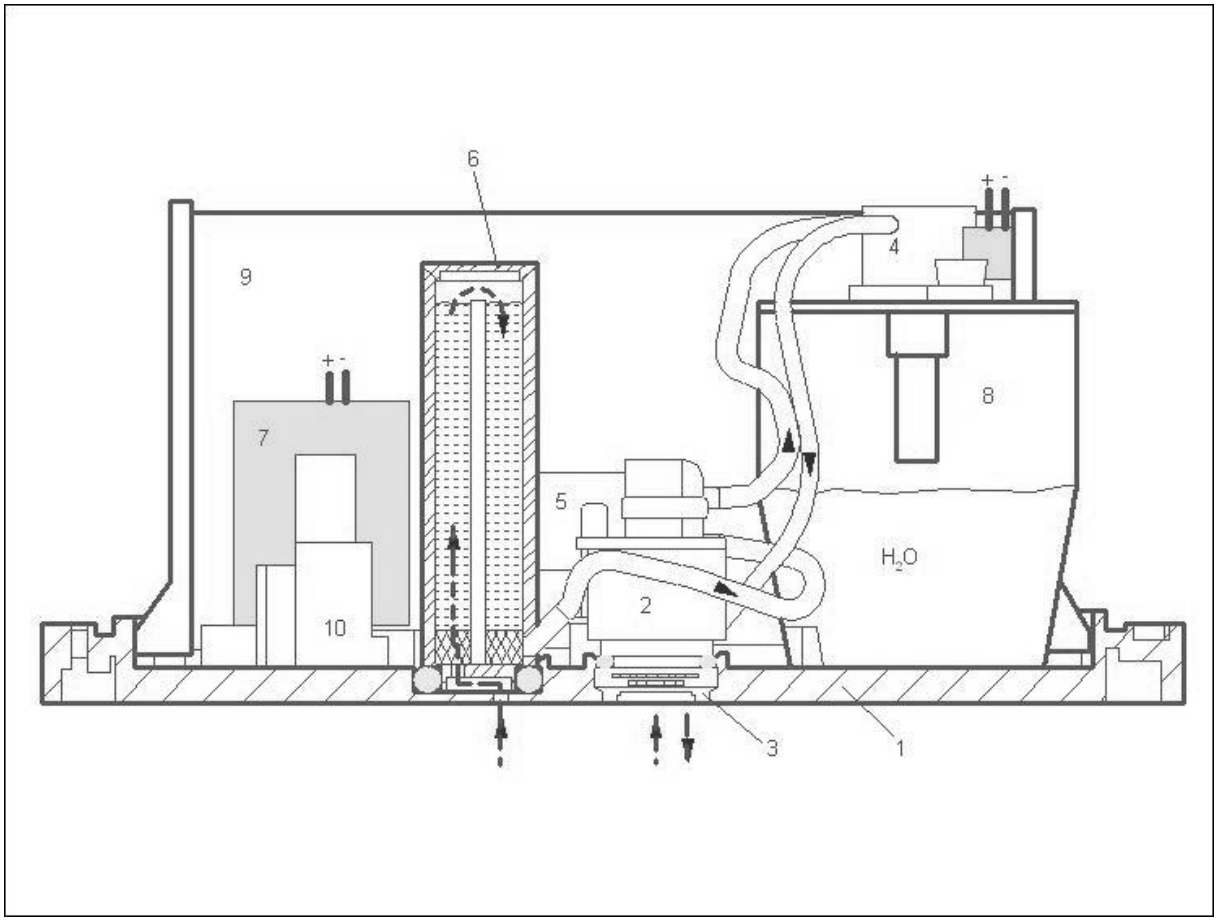
Compur Statox 4120 is a stationary toxic gas detection system. It monitors continuously ambient atmosphere indoor and outdoor. It`s integrated self test provides maximum safety of operation.
Two user - adjustable alarm thresholds A1 und A2 can be set to any value within the measuring range.

It consists of these components:

- Statox 4120 sensor head
- Statox 4120 rack
- Statox 4120 control module
- Diagnostic box

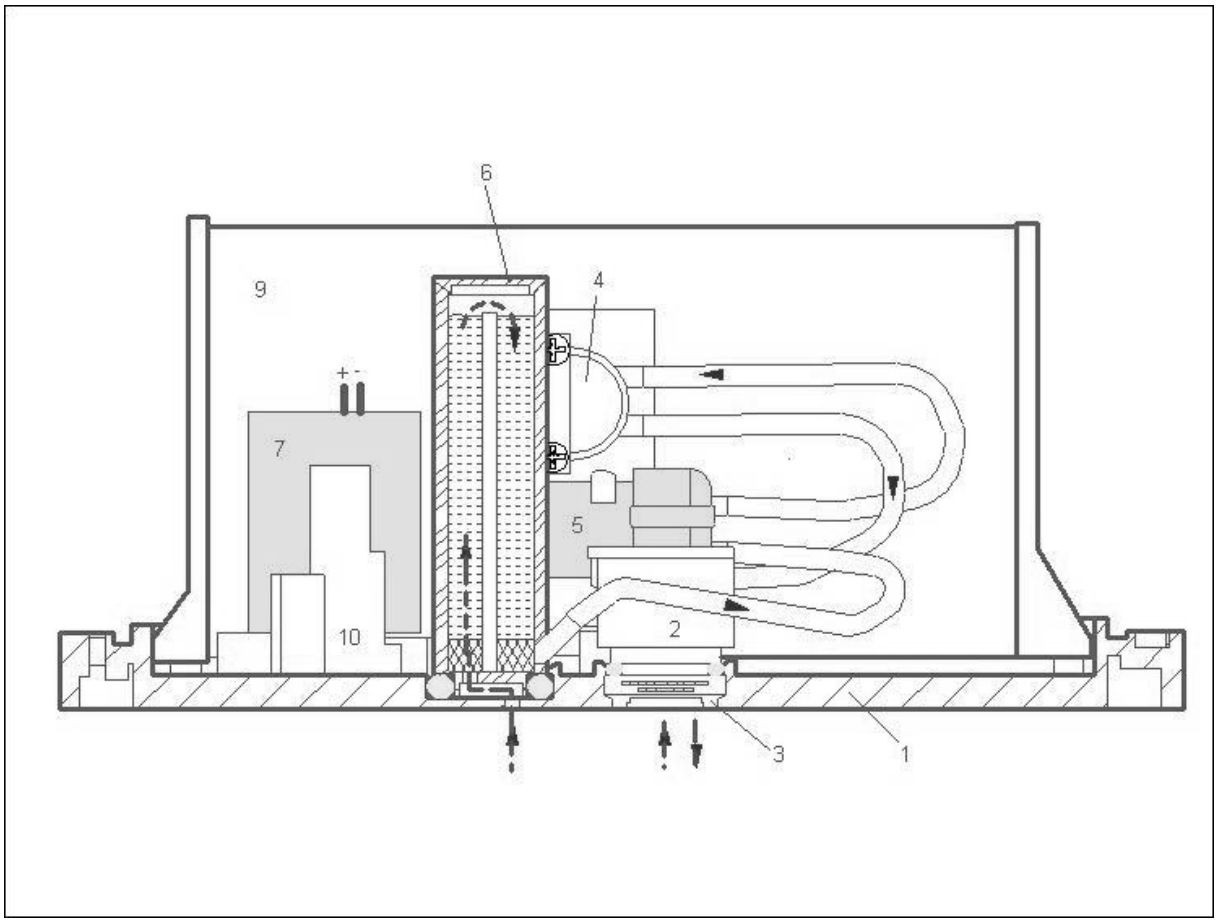
The Statox 4120 control module communicates a digital signal via a two-wire cable with the sensor head. It operates as power supply, alarm device and signal display. The system permanently checks itself for proper function and will alarm if any parameter is geting out of specifications. Sensor calibration and system fault diagnosis is easily achieved using the Statox portable diagnostic box.

2.1 Statox 4120 sensor head



pic. 1: Statox 4120 sensor head

1 Bottom part
2 Statox 4120 sensor
3 Statox 4120 dust filter
4 Gas generator
5 Statox 4120 pump
6 Statox 4120 filter cartridge
7 Buffer battery for pump operation
8 Water container
9 Electronics
10 Opto - coupler for communication with the diagnostic box



pic. 2: Statox 4120 sensor head for Cl_2 und ClO_2

Operation principle

Ambient air enters the sensor (2) by diffusion through an opening at the bottom. The sensor creates a current - signal proportional to the gas concentration. This signal is amplified, temperature compensated and linearised. As a digital signal it is transmitted to the control module.

To protect the sensor from being poisoned by a high gas concentration, the Statox features a built – in air purge. This is activated when the gas concentration exceeds 95 % of the measuring range and stops when it has dropped below 80 %.

The battery pack (**7**) buffers the energy demand of the built – in pump (5). It is on permanent trickle charge. The pump is activated in the protection mode and during the self test to purge the sensor and provide test gas from the gas generator (4) to the sensor.

2.2 Statox 4120 rack

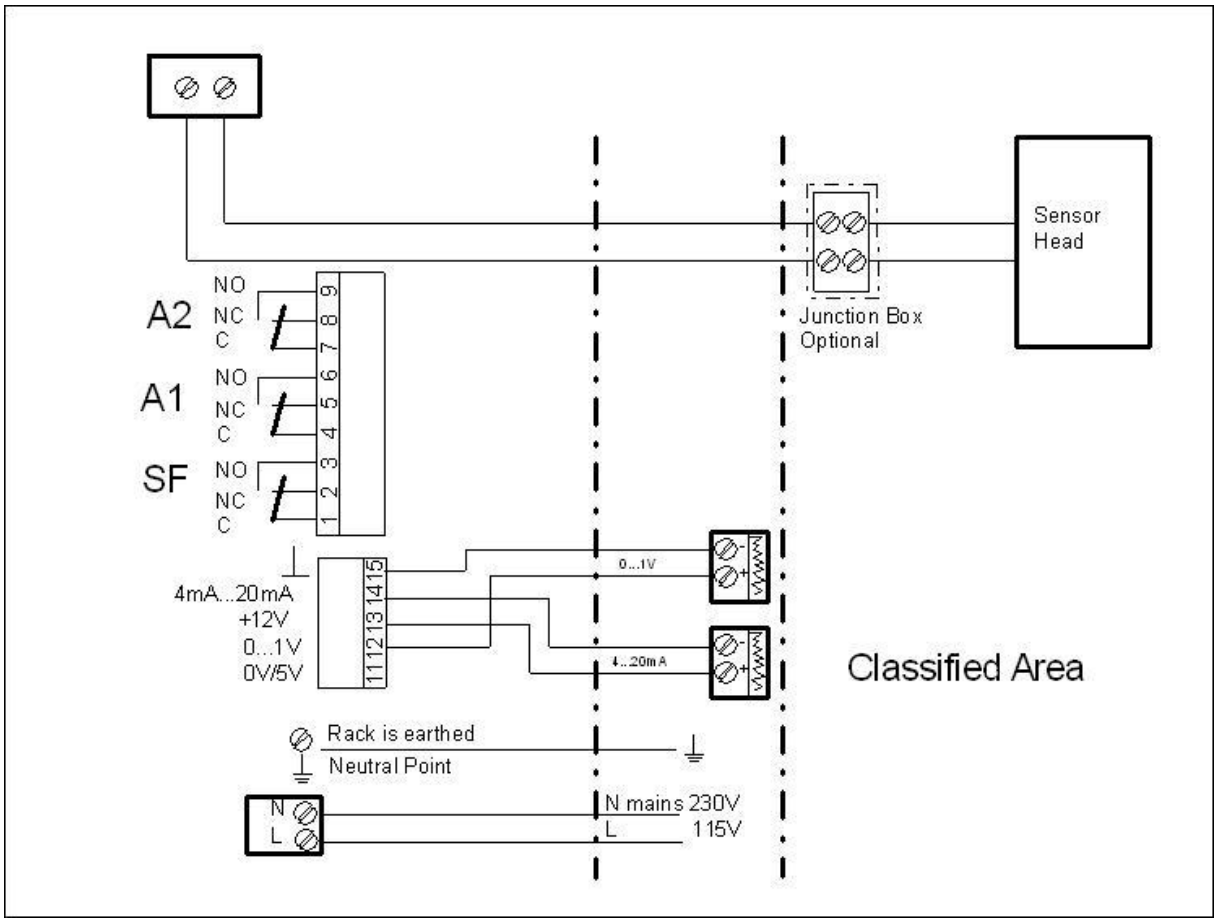
The Statox 4120 rack and the Statox 4120 control module provide the power supply for the sensor head. They are certified explosion proof [EEx ib] IIC. **The rack must not be installed in certified areas!**

Construction:
The system consists of a 19“-4-HE rack with backplane and up to nine Statox 4120 control modules. Each Statox 4120 sensor head is communicating with one control module. The Statox 4120 rack is available in following designs:

STATOX 4120 Rack ½ x 19“ for 4 Control modules
STATOX 4120 Rack 19“ for 9 Control modules
STATOX 4120 Rack 19“ for 9 Control modules / RFI shielded
STATOX 4120 Desk case for 4 Control modules
STATOX 4120 Desk case for 19“ Rack with 9 Control modules

Connections:
On the backplane (pic. 3) you find the following terminals:

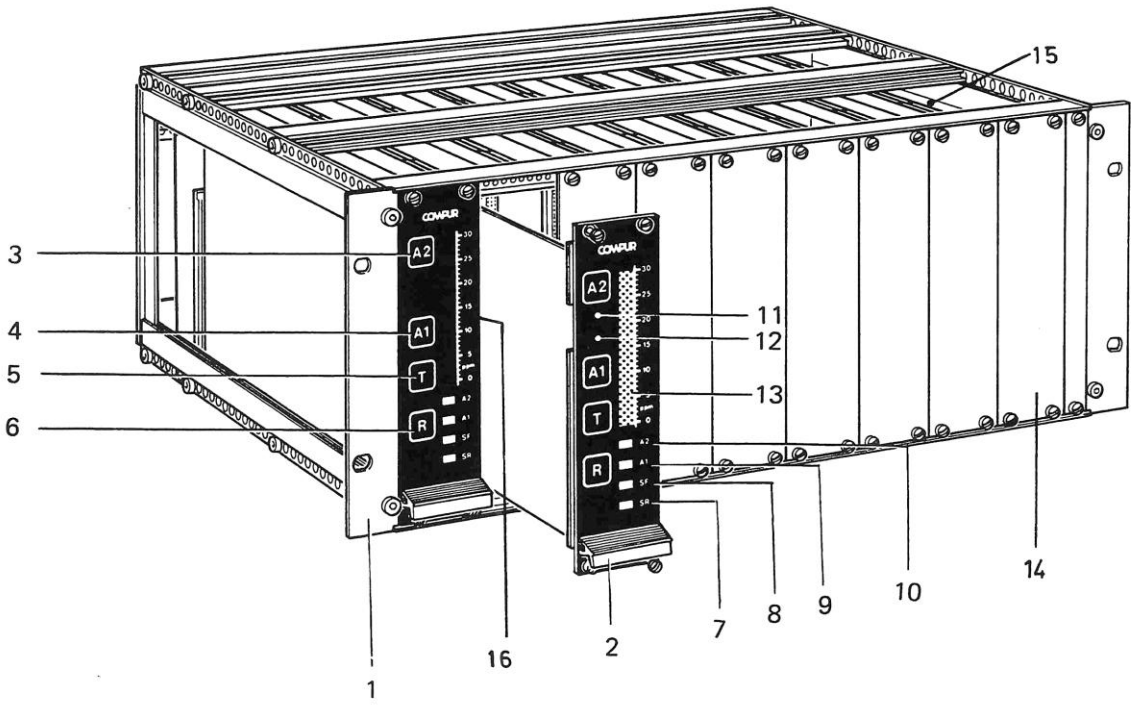
- power supply 230 V/AC (115V/AC)
- Intrinsically safe terminals (signal cable, 22V/DC, 50mA) for data transmission and sensor head power supply.
- Analog outputs: 0-1V
  4-20 mA
- Potential free relays: Pre-alarm A1
  Main alarm A2
  System alarm SF
- The A1 and A2 relay signal of the Statox 4120 control module is programmable.



pic.3: Electrical connections

2.3 Statox 4120 control module

Each Statox 4120 Control module has its own power supply. The intrinsically safe sensor head supply circuit is supplied by a separate secondary winding.



pic.4: Statox 4120 Rack

1 19“ Rack
2 Statox 4120 control module
3 Button A2
4 Button A1
5 Button T
6 Button R
7 LED SR
8 LED SF
9 LED A1
10 LED A2
11 Potentiometer for A2
12 Potentiometer A1
13 Bar graph display
14 Blind panel
15 Rail
16 ppm Scale

➲ **Bargraph display (13)**
- Actual measured concentration value.
- Flashing when measuring range is exceeded and pump is on.

➲ **LED SR (7) „System ready“**
- On if system is working properly.
- Flashing after power up until system is communicating fault - free.
- Flashing while diagnostic box is connected.

➲ **LED SF (8) „System Fail“**
- On if a system failure has occurred. (Self test not passed, communication error, cable interrupted).

- **LED A1 (9)**
  - On if pre - alarm threshold is exceeded

- **Display A2 (10)**
  - On if main alarm threshold is exceeded

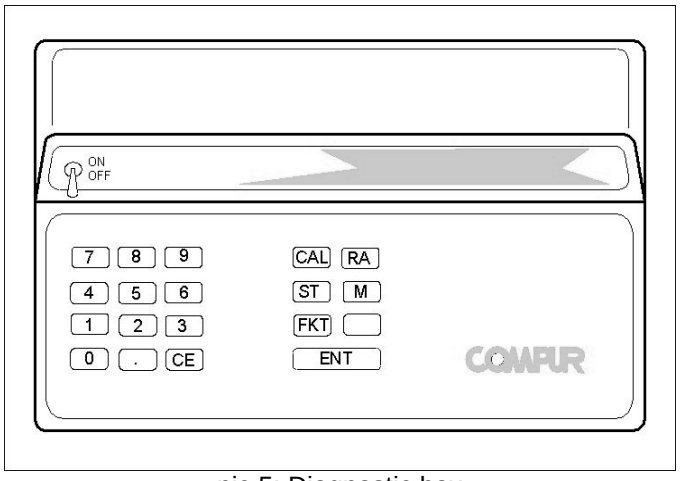
- **Button A1 (4)**
  - Press and hold button A1 to display A1 threshold. Adjust with Pot. (12). A1 must be < A2.

- **Button A2 (3)**
  - Press and hold button A2 to display A2 threshold. Adjust with Pot. (11).

- **Button T (5) „Test“**
  - Initiates self test.

- **Button R (6) „Reset“**
  - Rests Alarms A1, A2 und SF provided the reason for the alarm has disappeared. (If SF has been triggered by a not passed self test, only a successful self test will reset it).

2.4 Diagnostic box



pic.5: Diagnostic box

The diagnostic box must not be charged in classified areas or with other than charger Art.# 518850. It has the following purposes:

- Calibration
- Fault diagnosis
- On site display
- Function test

3. Installation and electrical connections

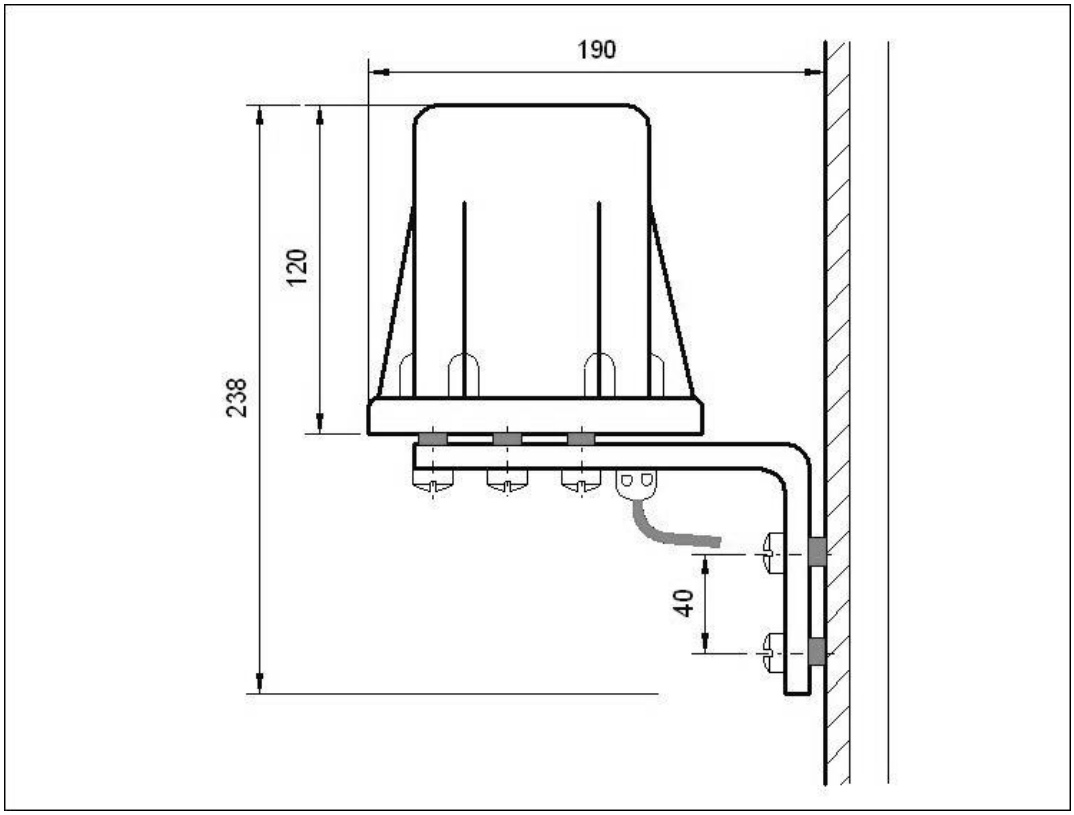
3.1. Statox 4120 sensor head

3.1.1. Mounting

The sensor head should be installed as close as possible to potential leaks. If it is used as industrial hygiene device it should be located between a potential leak and personnel working in the area. Parameters such as:

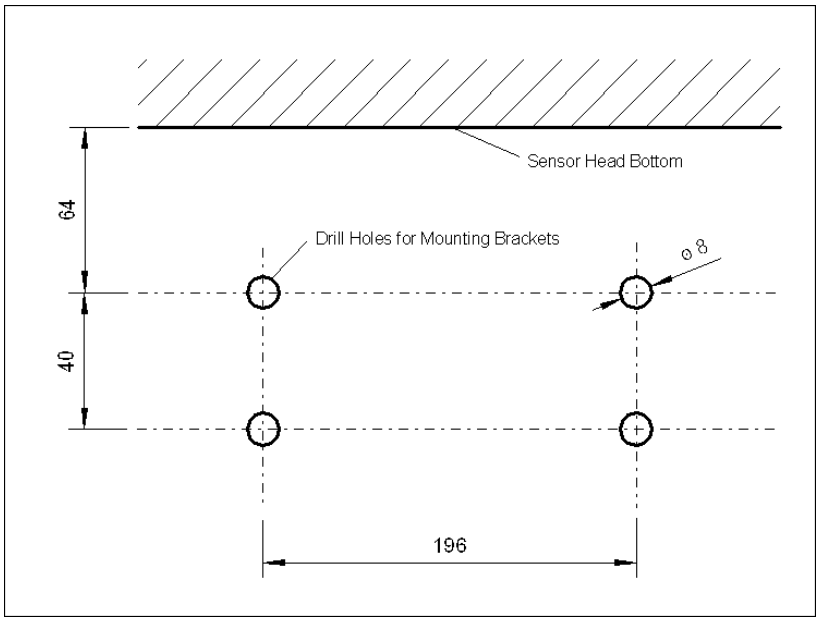
- Air flow (wind, ventilation, thermal conditions)
- Access from top (removing the cover) and bottom (loosening the screws)
- Specifications of the gas to be detected (specific weight)
- Protection from direct sunlight, splash water and dust must be taken care of.

Fasten the sensor head with three nylon screws on the mounting brackets using the rubber bearings as electrical isolation (these accessories are included).



pic.6: Mounting the sensor head

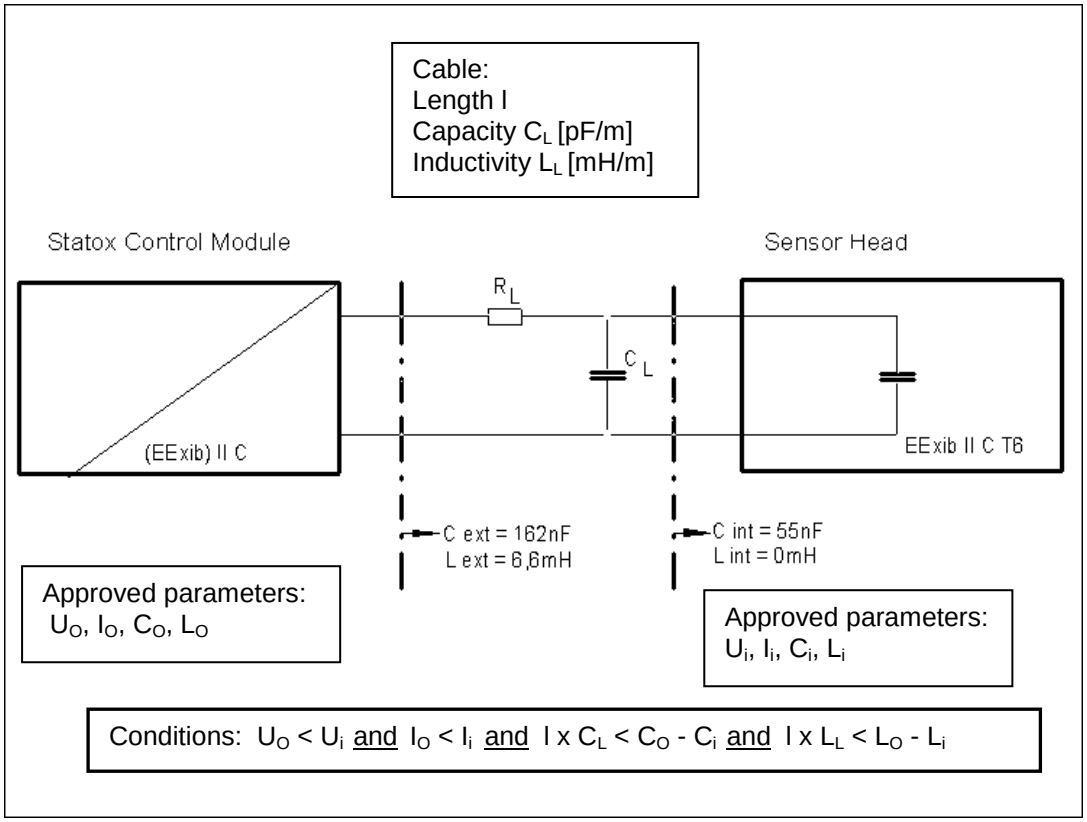
Mount the sensor head in horizontal position +/ 15%. Assure there is free gas access to the sensor.



pic.7: Drilling plan for the mounting brackets

3.1.2. Connecting the signal cable

The signal cable connects sensor head and control module. Use only shielded cable. The maximum cable length depends on the cable specifications.



pic.8: Two wire signal cable

Example of cable specifications:

Max. cable capacity: $I \times C_L = C_o - C_i = 107$ nF
Max. cable inductivity: $I \times L_L = L_o - L_i = 6{,}6$ mH
Diameter: $> 0{,}75\ mm^2$
The Statox 4120 Systems will work reliably if the electrical resistance is : $R_L < 50\ \Omega$.
Most commonly the maximum length is limited by the cable capacity.

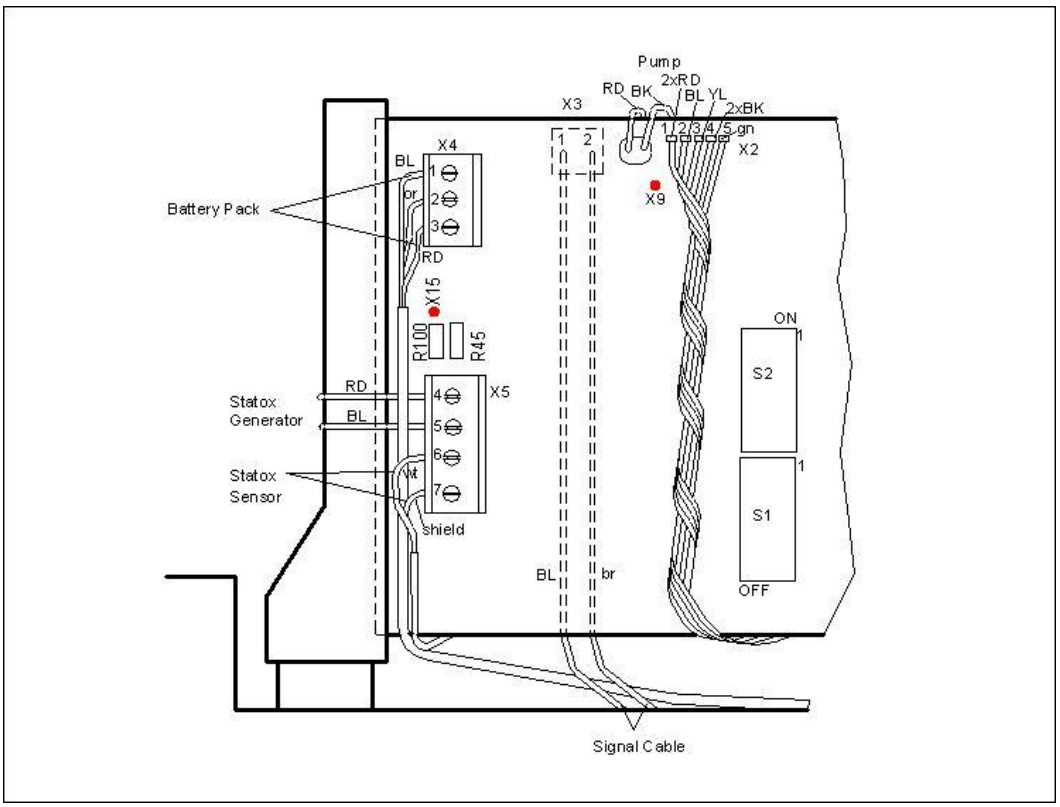
Example: Cable diameter is 1,0 mm^2 (0,04 in), C_L = 90 pF/m, L_L = 0.7mH/km, R_L / km = 19,5 Ω.
The maximum cable length results to be

$I = \frac{Co - Ci}{90\,pF/m}$ = 1189 m (3900 ft), the electrical resistance is

R_L = 2 x 1.189km (0,738 miles) x 19,5 Ω/km = 46,4Ω. So $R_L < 50\Omega$ is OK.

Sensor head connection procedure:

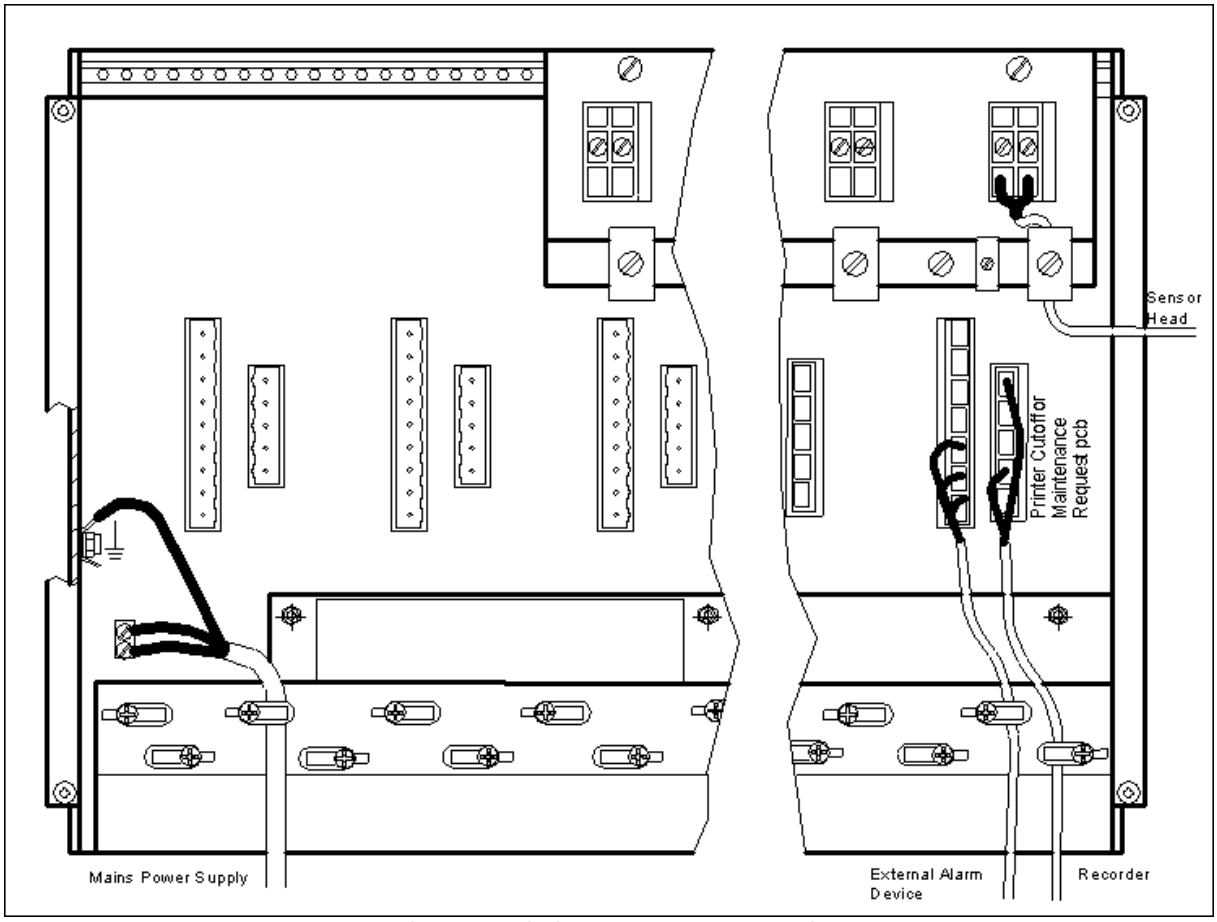
- Open sensor head, remove cable gland.
- Connect signal cable to terminals X3/1 und X3/2, polarity does not matter. (DIN EN 60079-14 chapter 12 is applicable)
- Fasten cable gland.
- Connect battery pack: - Blue to terminal X4/1
  - Orange to terminal X4/2
  - Red to terminal X4/3
- Connect signal cable to backplane of the rack. (See chapter 3.2)



pic.9: Sensor head pcb terminals

3.2 Statox 4120 rack

Statox 4120 Rack must not be installed in hazardous areas. Observe local safety- and installation regulations.
Protect any cable from tensile strain. The five - and the nine - contact terminals are plugged in. They can be removed to ease wire connection.



pic.10: Backplane Statox 4120 Rack

Installation instructions:

- The signal cable from sensor head to backplane must be shielded. The shield must make good contact to the ground contact on the backplane as well as to the sensor head metal shield.
- Do not remove the conductive silicon bearing of the sensor head housing.
- The sensor head housing must be installed isolated from ground to avoid ground loops.
- The entire system must only be grounded by the mains ground wire.
- All control modules must be well connected and secured with the screws.

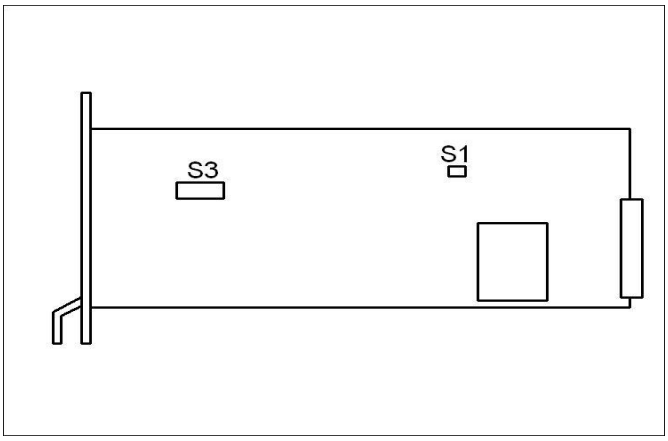
Connecting the mains cable initiates the system.

Installation instructions for the RFI-shielded Statox 4120 rack:

- Use well shielded signal cable. The shield must make good contact with the RFI resistant cable glands. It must not be interrupted by connection boxes. If the signal cable is run through such, these must also be equipped with RFI resistant cable glands. They must be installed isolated from ground, and the shield must make good contact with the metal housing of the box.
- Do not remove the conductive silicon bearing of the sensor head housing.
- The sensor head housing must be installed isolated from ground to avoid ground loops.
- The entire system must only be grounded by the mains ground wire.
- All control modules must be well connected and secured with the screws.
- Empty rack positions must be closed with blind panels.

3.3 Statox 4120 control module

- Control module Circuit board includes power supply, fuses, relays, microprocessor control electronics, DIP switches and a terminal connecting with the backplane.
- Front pcb with bar graph display.
- Foil keyboard.



pic.11: Control module Statox 4120

Each sensor head requires one control module. Before starting the system please check the DIP switch position. The following list comprises all possible DIP switch positions:

Slide switch S1:

S1	ON	OFF
1	Relay active during alarm A2	Relay inactive at alarm A2
2	Relay active during alarm A1	Relay inactive at alarm A1

Toggle switch S3:

S3	ON	OFF
1	Detection mode	-
2	Rest Alarm by resetbutton R	auto - reset
3	Detection mode	-
4	Detection mode	-
5	Measured value accepted if logic signal is 0V	-
6	Detection mode	-
7	Detection mode	Modem - and analog signal adjustment for service only!
8	Detection mode	Delete EPROM for service only!

Ex works settings

3.4 Switch positions of the sensor head pcb

DIP switch S2 (see pic. 9) programs the following parameters:

S2	ON	OFF
1	-	Detection mode
2	Measured value in ppm	Measured value in TLV
3	No self test after “power on“	Self test after “power on“
4	Cal. Factor =1	Factor information from control module
5	No self test	Self test in a 24 h interval
6	-	-
7	Detection mode	-
8	Detection mode	Modem “On” for service

Ex works setting

DIP switch S1 (see pic. 8) programs gas and measuring range. If you change your Statox to another gas or measuring range, a hardware modification may be required and the electronics must be re - adjusted. This must be done by authorised personnel.

Table 1: Switch position for H_2S

Measuring range:	0-30 ppm	0-50 ppm	0-100 ppm
S1/1	ON	OFF	OFF
S1/2	ON	ON	ON
S1/3	ON	ON	ON
S1/4	ON	ON	OFF
S1/5	ON	ON	OFF
S1/6	ON	OFF	ON
S1/7	ON	ON	OFF
S1/8	ON	ON	ON
E-PROM Index sensor head	12, 13, 14	12, 13, 14	12, 13, 14
E-PROM Index control module	≥ 02	≥ 02	≥ 02

Table 2: Switch position for HCN

Measuring range:	0-15 ppm	0-30 ppm	0-50 ppm	0-100 ppm
S1/1	ON	ON	OFF	OFF
S1/2	ON	ON	ON	ON
S1/3	ON	ON	ON	ON
S1/4	OFF	OFF	OFF	ON
S1/5	OFF	ON	ON	ON
S1/6	OFF	ON	OFF	ON
S1/7	OFF	ON	ON	ON
S1/8	ON	ON	ON	ON
E-PROM Index sensor head	13	12, 13, 14	12, 13, 14	15
E-PROM Index control module	≥ 02	≥ 02	≥ 02	≥ 02

Table 3: Switch position for $COCl_2$

Measuring range:	0-0,1 ppm	0-0,3 ppm	0-0,3 ppm	0-0,5 ppm	0-1,5 ppm	0-15 ppm	0-100 ppm
S1/1	OFF	ON	ON	OFF	OFF	OFF	OFF
S1/2	ON	ON	ON	ON	ON	ON	ON
S1/3	ON	ON	ON	ON	ON	ON	ON
S1/4	OFF	ON	ON	ON	OFF	ON	ON
S1/5	ON	OFF	ON	OFF	ON	OFF	OFF
S1/6	ON	ON	ON	OFF	OFF	OFF	ON
S1/7	ON	ON	ON	ON	OFF	OFF	ON
S1/8	ON	ON	ON	ON	ON	ON	ON
E-PROM Index sensor head	20	12, 13, 14	18	12, 13, 14	12, 13, 14	12, 13, 14	17
E-PROM Index control module	04	≥ 02	≥ 02	≥ 02	≥ 02	≥ 02	≥ 02

Table 4: Switch position for Cl_2

Measuring range:	0-1,5 ppm	0-3 ppm	0-10 ppm
S1/1	ON	ON	OFF
S1/2	ON	ON	ON
S1/3	ON	ON	ON
S1/4	ON	OFF	ON
S1/5	ON	ON	OFF
S1/6	ON	ON	ON
S1/7	OFF	OFF	OFF
S1/8	ON	ON	ON
E-PROM Index sensor head	12, 13, 14	12, 13, 14	12, 13, 14
E-PROM Index control module	02, 03	≥ 02	02, 03

Table 5: Switch position for CO

Measuring range:	0-150 ppm
S1/1	ON
S1/2	ON
S1/3	ON
S1/4	ON
S1/5	ON
S1/6	OFF
S1/7	OFF
S1/8	ON
E-PROM Index sensor head	12, 13, 14
E-PROM Index control module	≥ 02

Table 6: Switch position for HCl

Measuring range:	0-100 ppm
S1/1	OFF
S1/2	ON
S1/3	ON
S1/4	ON
S1/5	ON
S1/6	ON
S1/7	ON
S1/8	ON
E-PROM Index sensor head	19
E-PROM Index control module	≥ 02

Table 7: Switch position for ClO_2

Measuring range:	0-0,5 ppm
S1/1	OFF
S1/2	ON
S1/3	ON
S1/4	OFF
S1/5	ON
S1/6	ON
S1/7	ON
S1/8	ON
E-PROM Index sensor head	17
E-PROM Index control module	≥ 02

Table 8: Switch position for SO_2

Measuring range:	0-0,5 ppm
S1/1	OFF
S1/2	ON
S1/3	ON
S1/4	OFF
S1/5	ON
S1/6	ON
S1/7	ON
S1/8	ON
E-PROM Index sensor head	21
E-PROM Index control module	04

Table 9: Switch position for NO_2

Measuring range:	0-15 ppm
S1/1	ON
S1/2	ON
S1/3	ON
S1/4	ON
S1/5	ON
S1/6	ON
S1/7	ON
S1/8	ON
E-PROM Index sensor head	21
E-PROM Index control module	04

4. Compur Statox 4120 operation

4.1 Start - up

Connecting the Statox 4120 rack to mains (230 V/ 50 Hz or 115 V 60 Hz) activates the system.

- ➲ The green LED will be flashing until the initial data exchange with the sensor head has been finalised. It flashes also if the calibration box is connected.
- ➲ The green LED stays on as soon as the system is in the detection mode.

4.2 Alarm thresholds

A1: Push and hold button A1 for 5 s to obtain a display of the alarm threshold on the bar graph.
A2: Push and hold button A2 for 5 s to obtain a display of the alarm threshold on the bar graph.

4.3 Detection mode

The green SR LED is on and the actual measured value is displayed on the bar graph.

4.4 Self test of the system

Every 24 hours the entire system tests itself. During the test all LED`s are on and the bar graph dispays full scale. The analog output goes to full scale. (How to avoid this see chapter 7 and 8).
If an error is detected, the red LED SF goes on.
At temperatures below –20°C (-4°F) the self test can not be activated.

4.5 Manually triggered self test of the system

Push and hold button T for 2 s to initiate a self test.
The next self test will start automatically after 24 h.

4.6 System failure

As soon as the Statox detects a faulty system condition the LED SF goes on and relay SF is activated. This will be the case if:

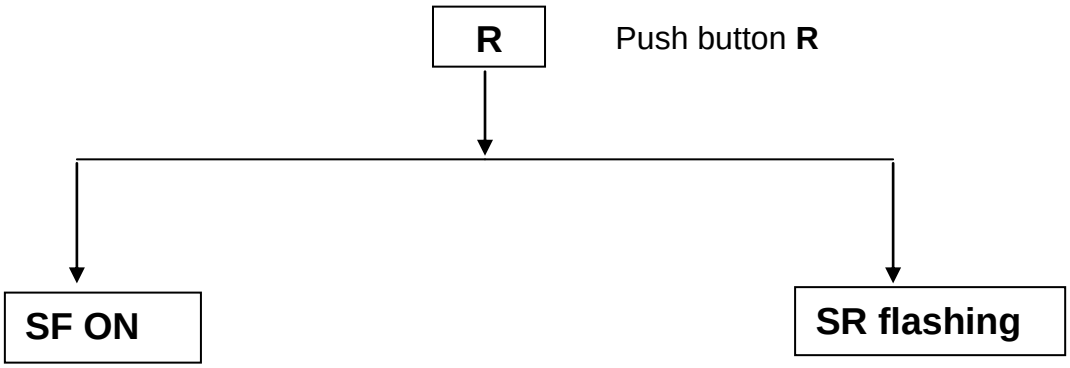
- Self test not passed
- Data transmission faulty
- No signal

5. Trouble shooting

As soon as the Statox detects a faulty system condition the LED SF goes on and relay SF is activated. To locate the problem follow this procedure:

Push the reset button **R** on the control module.

- If the green LED starts flashing now, there is a data transmission problem.
- If there is no reaction, there is a hardware problem in the sensor head (f. i. pump, sensor, gas generator, battery).
- Now push button **T** to initiate a new self test. If **SF** goes off, the system is now ready again. If SF stays on, the sensor head must be checked with the diagnostic box.



Connect diagnostic box to sensor head. Potential errors:

- Sensor defective
- Pump defective
- Battery defective
- Amplifier defective

Data transmission problem.
Potential errors:

- Signal cable interrupted
- Wrong connection(SF goes on again after 4 min)
- Data transmission faulty
- Duty cycle needs adjustment

5.1 Using the diagnostic box

Switch the diagnostic box on. Then connect it to the opto- coupler receptacle on sensor head bottom. Keep the LED`s and the phototransistors of the opto- coupler clean for proper data transmission.

5.1.1 Operation and error codes of the diagnostic box

Note: If a combination of push button operations is requested (f. i. ST + ENT), the buttons must be operated in a short time distance.
Example: ST + ENT initiates a self test. The display says „WAIT-TEST RUN“ until the self test is finished.

Diagnostic box queries:

Button	**Display**
M	Measured value in ppm
M + ENT	WAIT; after a while reading of actual measured value in ppm
RA	Sensor head measuring range
RA + ENT	Gas
ST	Status passed (System OK) or error message (see 5.1.2)
ST + ENT	(initiates self test), TEST Run
FKT	Calibration factor
ZERO + ENT *	ZERO RUN (start zero adjustment)

* only available with systems with zero adjustment

Diagnostic box error messages:

ERR INPU	⇨	Faulty or too slow input. Repeat.
ERR KONZ	⇨	Calibration gas concentration out of range.
ERR FACT	⇨	Calibration factor is out of range.
DS.W.POS	⇨	Measuring range or gas not correctly programmed.
WARN TIM	⇨	Time error during data transmission.
WARN DTE	⇨	Faulty data transmission.
WARN CHE	⇨	No self test due to too low temperature.
TEMP.OU	⇨	Temperature out of the admissible range.
TEMP.IN	⇨	Temperature is back in the admissible range.
CH.BATT (audible alarm)	⇨	Charge calibration box battery.
NO ZERO	⇨	Zero adjustment not possible. Wrong EPROM in sensor head and control module.
PUMP RUN	⇨	Sensor is flushed with air because the gas concentration is too high.
CAL END	⇨	Calibration routine has been cancelled with CE button.
NO CALIB	⇨	Calibration not possible within the time limit.

5.1.2 Status messages of the sensor head

Button **ST** scans the system status:

Code		Status and action required
Passed	⇨	System OK.
Error A1	⇨	Amplifier defective: Repeat adjustment or replace pcb.
Error B1	⇨	Check battery pack connection. Battery pack discharged or defective, replace. If battery pack discharges frequently, check charging circuit.
Error B2	⇨	Battery pack voltage drops under load.
Error PU	⇨	Pump energy consumption too high. Replace.
Error T2	⇨	Temperature is out of compensation range. Measured values are corrected with the end of range - value.
Error C1	⇨	Zero not found at start of self test (or sensor signal is too high for zero adjustment). - check filter cartridge: Fresh? Tight? - Filter cartridge gas intake at the bottom of the sensor head dirty - Filter cartridge exhausted - Dust filter dirty - Sensor too slow
Error C2	⇨	Zero not found at end of self test: Sensor too slow, replace.
Error C3	⇨	Test peak not achieved: - Sensor too slow - Sensor lost sensitivity - Gas generator expired - Sensor too slow - Pump defective - Filter cartridge polluted
Error C4	⇨	Zero not found at end of self test: - Sensor too slow, replace. - Filter cartridge polluted - Pump defective

Caution:

Disconnect the diagnostic box first and then switch it off. Don not forget to protect the opto - coupler with the plug. To preserve battery power, the diagnostic box display goes off after 2 minutes. Operate any key to switch it on again.

6. Maintenance and calibration

6.1 Inspection Statox 4120 Sensor head

The following maintenance intervals are general recommendations. Specific applications may request different intervals.

- Splash guard, visual inspection every 4 weeks
- Dust filter, visual inspection every 4 weeks
- Statox 4120 sensor, replace after expiration of the „best before“ – date (calendar week / year)
- Statox 4120 generator, replace after expiration of the „best before“ – date (calendar week / year)
- Filter cartridge replace after 6 months
- Water container visual inspection of liquid level every 6 months
- Battery pack, replace after 18 months

Information on sensor and generator labels:
- Serial No.
- Gas
- Current output at test gas concentration (sensor only)
- Test gas concentration (sensor only)
- Calibration factor (sensor only)
- Best before (week / year)
- Initial quality control personnel

Water container
Remove container. Fill level up to the marking. Non - foaming anti - freeze agents are OK to be used.

Statox 4120 dust filter
This filter protects the sensor from dirt. It must be in proper condition to allow the target gas to enter the sensor. It must be replaced whenever it is dirty.

Splash guard
The splash guard at the sensor head bottom protects the dust filter from particles and water. It is fastened with two screws.
Caution! The type plate must be next to the dust filter to allow gas access to the filter cartridge.

Sensor replacement
- Disconnect old sensor
- Remove tube and sensor by turning it sideward
- Replace dust filter
- Replace bearing
- Replace sensor
- Connect new tube
- Connect cable
- Proceed factor calibration, see 6.2.2

Filter cartridge replacement

- Remove tube
- Remove filter cartridge and bearing
- Clean air access opening
- Replace filter cartridge and bearing
- Replace tube

Generator cell replacement

- Disconnect generator cell, remove tube to pump
- Remove generator cell
- Replace generator cell
- Replace tube
- Connect generator cell

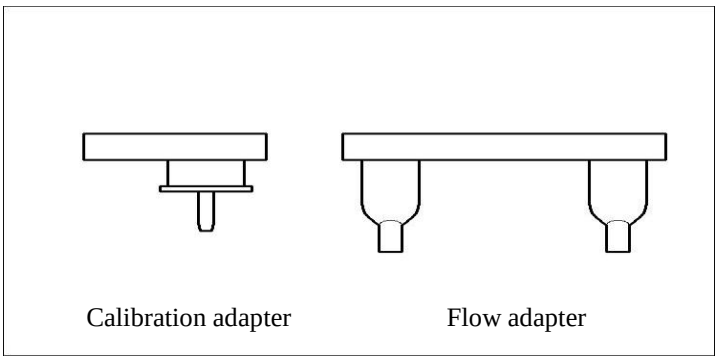
6.2 Sensor head calibration

6.2.1 Using span gas

What you need:
-Span gas
-Regulator
-Flow meter
-Gas calibration adapter
-Gas tube (clean, dry, chemical resistant)
-Diagnostic box

Caution:

- The test gas adapter is not part of the ex-certified sensor head.
- The gas flow should be adjusted to 500 ml/min (30 l/h).
- Statox sensor heads working in the flow mode can be calibrated with the mounted flow adapter. Keep the working mode gas flow.



Procedure:

- Remove splash guard and replace it by test gas adapter.
- Connect span gas cylinder. **Do not open regulator yet!**
- Connect diagnostic box to sensor head.
  ➔Reading diagnostic box: Red LED flashing; - "ready" – "x.xxx ppm"
- Push CAL button ➔Reading diagnostic box: "CALIBR"
- Push ENT button ➔Reading diagnostic box: "ppm = ?"
- Enter span gas concentration in ppm. ➔ Reading diagnostic box: ppm = „value".
  If you have entered a wrong value push button CE and repeat.
  If you have entered an invalid concentration, the reading is "ERR KONZ": Push button CAL again and repeat.
- Now push button ENT ➔ Reading diagnostic box: "GAS ON!"
  This is the last opportunity to abort the procedure!
- Open span gas regulator
- Push button ENT ➔Reading diagnostic box: "WAIT"
  Reading of a measured value after 2 minutes. ➔Display diagnostic box: "x.xx ppm" (this not a calibration value yet).
- Wait 1 minute to obtain second measured value from sensor head. ➔ Reading diagnostic box: "x.xx ppm" (this not a calibration value yet).
- Wait 1 minute
  This procedure will repeat until the difference between two measured values is within the specified range. Then the new calibration factor will be displayed for 10 seconds.
- Reading diagnostic box: "FKT = x.xx"; "GAS OFF!"
- Close span gas regulator
- Confirm gas is off by pushing ENT ➔Display diagnostic box: "READY"
  Disconnect diagnostic box and switch it off. Close receptacle for opto coupler with the plug. Mount splash guard.

6.2.2 Use ex – works calibration

Each sensor carries a calibration factor. This factor indicates how far its individual sensitivity differs from a theoretical value (=1). Values between 0.60 and 2.00 will be accepted by the system. The lower the factor, the higher its sensitivity. The sensor head microprocessor corrects the sensor signal with this factor to obtain the correct measured value.

Programming the calibration factor:

Action	Reading Diagnostic box
Switch diagnostic box on	
Connect diagnostic box to sensor head	Red LED flashing; READY-x.xxx ppm
Push FKT	FCT x.xx
Push FKT + ENT (no long break!)	FCT = ? ERR INPU
Enter factor If you have entered a wrong factor, push CE and repeat.	FCT = 1.20 (example FCT = ?
Now push ENT twice immediately	Red LED flashing READY
Switch diagnostic box off, Factor will be transmitted.	
Disconnect diagnostic box	

7. The maintenace request option

Purpose:

This option can differentiate between fatal errors in the sensor head and maintenance requirements. It requires a Statox 4120 control module equipped with EPROM Index ≥ 03. It also sets the analog output to 4 mA during the self test, if required.

Operation modes:

The Statox 4120 can operate in 9 different modes. The relevant mode can be seen by the control module LED`s and relays.

Operation mode Statox	Analog output	SR-LED Control module	SF-LED Control module	SF-Relay	MR-Relay	PCS-* Relay
● Self test	0mA / 4mA / 0V	„on“	„on“	active	passive	active
● Diagnostic box connected:	0mA / 4mA / 0V	flashing	„off“	active	passive	active
● Alarm threshold adjustment:	0mA / 4mA / 0V	„on“	„off“	active	passive	active
● Start-mode	4mA / 0V	flashing	„off“	active	passive	passive
● Detection mode:	Analog signal	„on“	„off“	active	passive	passive
● Maintenance request: B1 Battery Low B2 Battery low under load C1 Purge before test C2 Purge between test peaks C3 Sensitivity (programmable by S3) C4 Purge PU Pump current too high T2 Temperature out of specs	Analog signal	flashing	„off“	active	active	passive
● System failure: A1 Amplifier C3 Sensitivity (programmable by S3)	4mA / 0V	„off“	„on“	open	passive	passive
● Data transmission error	4mA/0V	„off“	„on“	open	passive	passive
● Power failure	0mA/0V	„off“	„off“	open	passive	passive

*(PCS=Process control system)

Error C3 (Too low sensitivity during self test):

S3/3 on the control module offers the option to choose if C3 shall be a maintenance request (position ON) or system failure (position OFF).

The system failure messages A1 and C3 (both defined as SF):
The sensor head still transmits measured values to the control module, but these measured values will not be displayed on the bar graph display nor be transmitted to the analog output. For safety reasons they will still be compared to the alarm thresholds and an alarm will be activated if they are exceeded. Also the sensor protection feature will be activated if the measuring range is exceeded.

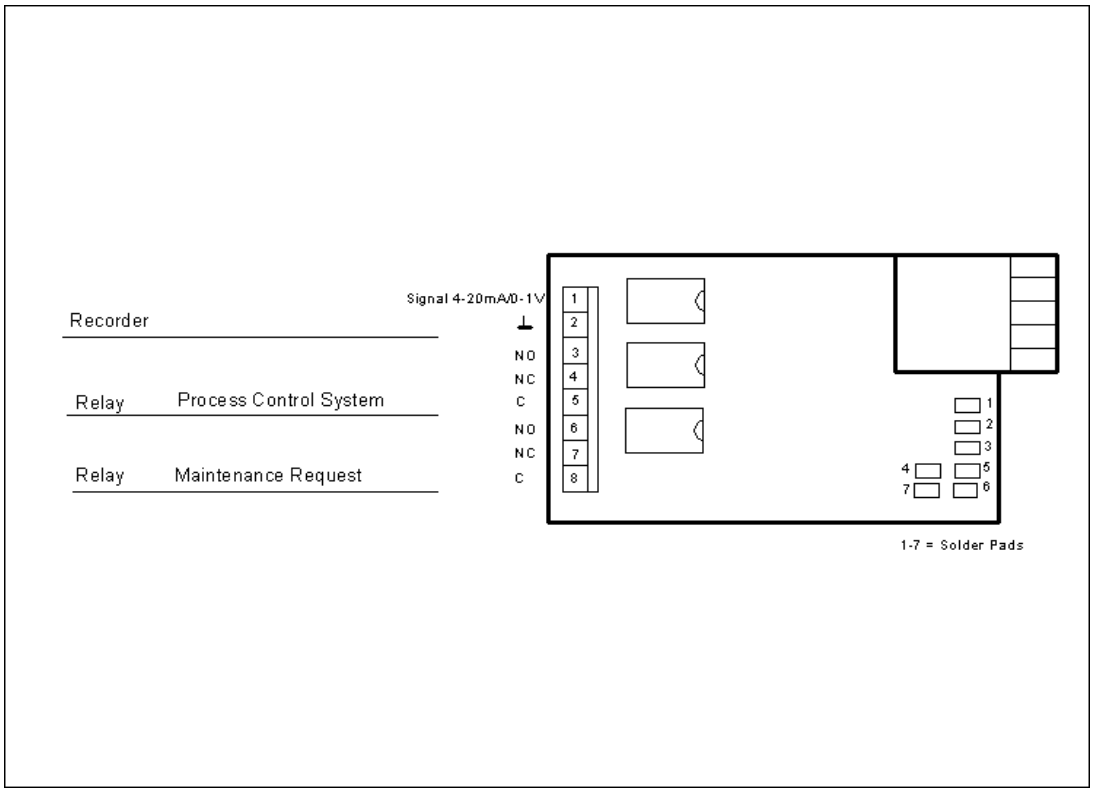
Mounting the maintenance request pcb

Connect the the pcb to the 5 contact terminal on the Statox 4120 rack backplane. (see pic. 10).
Shorting plugs program the analog output to 4-20 mA or 0-1V (see pic.12). Ex works setting is 4-20 mA.
As an option the 4-20 mA output can be set to 0 mA during the self test, the alarm threshold programming and when the diagnostic box is connected (measured value not valid).
On the terminals 1 to 8 the relays MR and PCS as well as the analog signal can be accessed. The maximum load of the relays is 24V/100mA.

Service mode control module

Set the service switch on the control module (S3/7) to „OFF“ to simulate the mode „normal“, „WB“ and „PCS”. Select by the following keys:

Key	mode	Relay PCS	Relay WB	Analog signal	Reading
T	Detection mode	passive	passive	4 mA / 0V	0%
A1	Self test/Maintenance, Adjusting A1 und A2	active	passive	4 mA / 0V	50%
A2	Maintenance request	passive	active	20 mA / 0V	100%



pic.12: Electrical connections and short circuit contacts

Short circuit contacts on the maintenance request pcb:

Bridge	Analog 0-1V	Analog 4-20 mA	Analog 4(0)-20mA*
1		●	
2		●	●
3	●		
4		●	●
5	●		
6		●	●
7	●		

* Analog output 0 mA, if PCS-relay active, f. i. during self test, alarm threshold adjustment and if the diagnostic box is connected. In any other case 4-20 mA.

8. The option analog output inhibition

This option inhibits the analog output if the logic signal of the control module (see pic. 3, terminal 11) is set to 5 V instead of 0 V. This is the case if the system is unable to provide a valid measured value, for instance if:

- Alarm thresholds are adjusted or displayed
- During self test
- During the diagnostic box is connected
- During system start.

As soon as the sensor head provides the next valid data telegram, the analog output is activated again. This option will work with control module equipped with EPROM 02!

The analog output is programmed by solder straps. The terminals 23 and 24 provide an additional relay, closing when the analog signal is switched off.

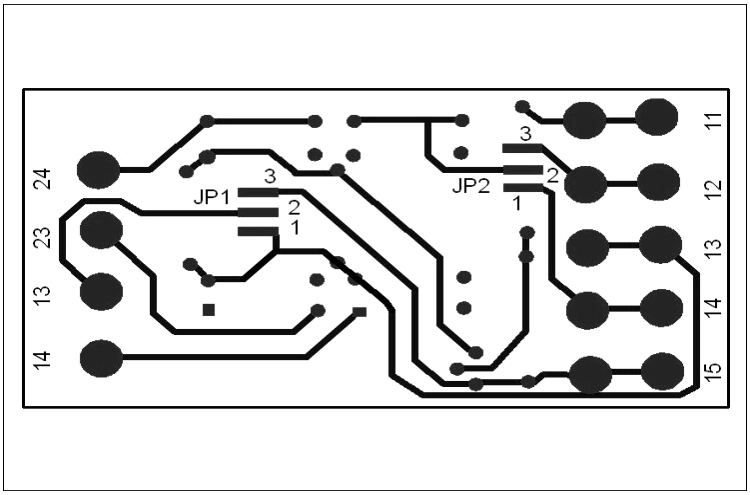


Abb. 13: Solder straps on the pcb analog output inhibitor

Analog	Terminal		Solder straps		Analog	
	13	**14**	**JP1**	**JP2**	**23**	**24**
4-20 mA	+	-	1-2	1-2	NO	
0 – 1 V	Gnd	+	2-3	2-3		

9. The option zero adjustment

This option is available for $COCl_2$ sensor heads with measuring range 0.3 ppm only. The zero adjustment of the sensor is started via diagnostic box.

System requirements:
Sensor head EPROM index 18c, control module EPROM index 03a, diagnostic box EPROM index 02.

- A zero adjustment must only be done in clean air. It is started with the buttons ZERO + ENT. It should be done **before** starting a calibration.
- The set zero value is not visible.
- If no zero adjustment has been done ever, the default value is 0.
- After replacing a control module, a new zero setting has to be carried out. The zero value is stored in the control module and is transmitted to the sensor head.
- An error message C1 caused by a too high sensor zero current will only be cancelled after a successful self test.

10. Technical data

General:

Gas	Measuring range
Cl_2	0-1.5 ppm, 0-3 ppm, 0-10 ppm
CO	0-150 ppm
$COCl_2$	0-0.1 ppm, 0-0.3 ppm, 0-0.5 ppm, 0-1.5 ppm, 0-15 ppm, 0-100 ppm
HCN	0-15 ppm, 0-30 ppm, 0-50 ppm, 0-100 ppm
HCl	0-100 ppm
H_2S	0-30 ppm, 0-50 ppm, 0-100 ppm
ClO_2	0-0.5 ppm
NO_2	0-15 ppm
SO_2	0-5 ppm

Accuracy at TLV:	+/- 10 %
Alarms:	2 adjustable alarm thresholds, system alarm
RFI:	CE conform
Manufacturer:	Compur Monitors, Munich

Sensor head:

Type:	5330 xxx (xxx: measuring range / gas)
Weight:	1.9 kg
Dimensions (mm, HxBxT):	180x300x180
Operating temperature:	-20 to +40 ^{o}C
Storage temperature:	-30 to +50^{o}C
Humidity:	20-95 % r.H. (not condensing)
Pressure:	800-1200 hPa
Protection class:	IP53
Approvals (div.countries):	Cl_2, $COCl_2$, H_2S
Explosion protection:	EEx ib IIC T6
Operating environment :	II 2 G
Operating voltage U_i:	max. 22 VDC
Operating current I_i:	max. 50 mADC
Internal capacity C_i:	55 nF
Internal inductivity L_i:	0 mH

Control module:

Type:	5331 0x0 (115 / 230 VAC)
Operating temperature:	-20 to +40 ^{o}C
Storage temperature:	-30 to +60^{o}C
Explosion protection :	[EEx ib] IIC
Operating environment:	II 2 G
power:	15 W per control module
Supply voltage:	115 / 230 VAC
Max. operating voltage U_o:	22 V DC
Max. operating current I_o:	50 mA DC
Max. external capacity C_o:	162 nF
Max. external inductivity L_o:	6.6 mH
Display:	Bargraph
Analog output:	4-20 mA / 400 Ω max. 0-1 V / R_i = 1k Ω
Relays:	24 V 100 mA

Rack:

Type:	5332 xxx (xxx: ½ 19" and 19" , 115 / 230 V AC)
Explosion protection:	[EEx ib] IIC
Operating environment:	II 2 G
Dimensions (HxBxT)	½ x 19": 180x270x420 mm 19": 180x485x420 mm RFI : 180x485x505 mm

Diagnostic box:

Temperature range:	-20 to +40 ^{o}C
Weight:	0,9 kg
Dimensions (HxBxT)	50x190x160 mm
Explosion protection:	EEx ib IIC T6
Protection class:	IP30
Operation time:	max. 3 h
Charging time:	max. 14 h

11. Accessories and spare parts

Art. Nr.	STATOX 4120 ACCESSORIES
508885	STATOX Diagnostic box
518876	STATOX Diagnostic box charger 115 V
518850	STATOX Diagnostic box charger 230 V
509115	STATOX Control module service adapter
508588	STATOX Sensor head flow adapter
500223	STATOX Head Splash guard plug
500224	STATOX Head Calibration gas adapter plug
500225	STATOX Head plug adapter
508638	STATOX Sensor head rain shield
508539	STATOX Sensor head splash guard stainless
507283	STATOX Sensor head Splash guard PTFE
551869	STATOX Analog output inhibitor (for EPROM 02)
551703	STATOX Maintenance request (for EPROM ≥ 03)
561165	STATOX Upgrade COCl2 0,1 ppm

Art.Nr.	STATOX 4120 SPARE PARTS
508950	STATOX Diagnostic box battery
508778	STATOX Diagnostic box Lpcb inkl.LED
508836	STATOX Diagnostic box opto- coupler
509000	STATOX Diagnostic box mould
508415	STATOX Diagnostic box EPROM “02”
553030	STATOX Control module EPROM "02"
551711	STATOX Control module EPROM "03"
508410	STATOX Control module EPROM "03a"
561207	STATOX Control module EPROM "04"
505550	STATOX Control module front plate incl.LED
505543	STATOX Control module pcb
821155	STATOX Control module quartz 1,0 MHZ
508075	STATOX Control module scale 3 PPM
508083	STATOX Control module scale 5 PPM
508067	STATOX Control module scale 10 PPM
507994	STATOX Control module scale 15 PPM
508000	STATOX Control module scale 30 PPM
508018	STATOX Control module scale 50 PPM
507978	STATOX Control module scale 0,3 PPM
508042	STATOX Control module scale 0,5 PPM
507986	STATOX Control module scale 1,5 PPM
508059	STATOX Control module scale 100 PPM
508091	STATOX Control module scale 150 PPM
561215	STATOX Control module scale 0,1 PPM
507820	STATOX Control module T1 power supply
507804	STATOX Control module T2 transducer
505931	STATOX Control module alarm relay
534295	STATOX Manual -D-

558435	STATOX Manual -E-
518330	STATOX Sensor head battery
506947	STATOX Sensor head bearing 236 mm
557874	STATOX Sensor head EPROM "12"
562197	STATOX Sensor head EPROM "13"
502052	STATOX Sensor head EPROM "14"
550700	STATOX Sensor head EPROM "15"
551695	STATOX Sensor head EPROM "17"
554483	STATOX Sensor head EPROM "18"
508413	STATOX Sensor head EPROM "18c"
558856	STATOX Sensor head EPROM "19"
561199	STATOX Sensor head EPROM "20"
562544	STATOX Sensor head EPROM "21"
506921	STATOX Sensor head mould upper part
506897	STATOX Sensor head mould bottom
551976	STATOX Sensor head hybrid A 525 -ICL 8022-
503845	STATOX Sensor head hybrid A 526 -ICL 8023-
577849	STATOX Sensor head pcb
505311	STATOX Sensor head plug opto coupler opening
507036	STATOX Sensor head water container
532828	STATOX TRITOX M pump

Art. Nr.	**SENSORS & GENERATOR CELLS**
507770	STATOX Generator cell ClO2
517084	STATOX Generator cell Cl2
532570	STATOX Generator cell COCl2
516961	STATOX Generator cell H2S/HCN/CO/HCl/SO2
562379	STATOX Generator cell NO2
538791	STATOX Sensor Cl2 10 PPM
516201	STATOX Sensor Cl2 1,5/3 PPM
507630	STATOX Sensor ClO2 0,5 PPM
516128	STATOX Sensor CO 150 PPM
533719	STATOX Sensor COCl2 15 PPM
531200	STATOX Sensor COCl2 1,5 PPM
516060	STATOX Sensor COCl2 0,3/0,5 PPM
551687	STATOX Sensor COCl2 100 PPM
560845	STATOX Sensor COCl2 0,1 PPM
516003	STATOX Sensor H2S 30/50/100 PPM
558849	STATOX Sensor HCl 100 PPM
562106	STATOX Sensor HCN 15 PPM
504918	STATOX Sensor HCN 100 PPM
516086	STATOX Sensor HCN 30/50 PPM
562361	STATOX Sensor NO2 15 PPM
562411	STATOX Sensor SO2 5 PPM

Declaration of Conformity

Compur Monitors GmbH & Co.KG

Weißenseestraße 101

D 81539 München

as the manufacturer hereby declares, that the

Sensor Head

Statox 4120 Type 5330

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

1. Directive **89/336/EC** [1)]

   EN 50081-1

   EN 55011

   EN 50082-2

   EN 55024

   [1)] in connection with Statox 4120 plug in unit type 5331 0x0 and EMC-rack type 5332 200

2. Directive **94/9/EC**

   EN 50014 : 1997+A1+A2

   EN 50020 : 1994

   EC Type Examination Certificate: DMT 02 ATEX E 216

   Notified Body: DMT / 0158

   Munich, 03-20-2003

Dr. H. Schmidtpott

Declaration of Conformity

Compur Monitors GmbH & Co.KG

Weißenseestraße 101

D 81539 München

as the manufacturer hereby declares, that the

Racks **Statox 4120 Type 5332 xxx**

and the Plug In Unit **Statox 4120 Type 5331 0x0**

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

3. Directive **89/336/EC** [1)]

   EN 50081-1 **EN 55011**

   EN 50082-2 **EN 55024**

   [1)] in connection with Statox 4120 sensor head type 5330 and EMC-rack type 5332 200

4. Directive **94/9/EC**

   EN 50014 : 1997+A1+A2

   EN 50020 : 1994

   EC Type Examination Certificate: DMT 02 ATEX E 238

   Notified Body: DMT / 0158

5. Directive **73/23/EC**

   EN 61010-1

Munich, 03-20-2003

Dr. H. Schmidtpott

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