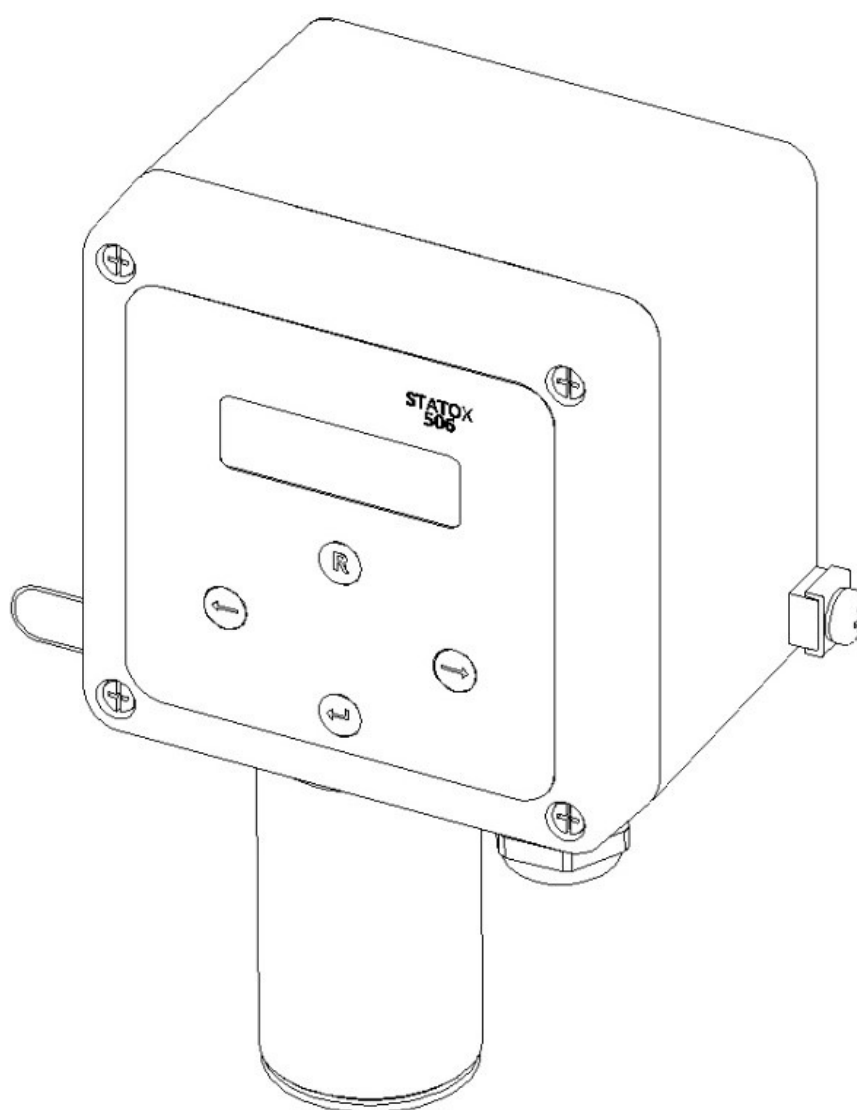


Statox 506 Sensor Head

Operations Manual



Stattox 506 Sensor Head

Operations Manual

| | Page |
|---|-----------|
| 1 SAFETY INSTRUCTIONS | 3 |
| 2 STATOX 506 CONSTRUCTION | 4 |
| 3 INSTALLATION AND CONNECTION | 5 |
| 3.1 Installation | 5 |
| 3.2 Electrical Connection | 6 |
| 3.2.1 Stattox 506 cable connection | 7 |
| 3.2.2 Connection diagram with Stattox 502/503 Control Module in the 2-wire mode | 9 |
| 3.2.3 Connection diagram with Stattox 502/503 Control Module in the 3-wire mode | 10 |
| 4 CONTROL ELEMENTS AND DISPLAY | 11 |
| 5 START UP | 11 |
| 6 MENU | 13 |
| 6.1 Main Menu | 13 |
| 6.2 Setting the Real Time Clock | 15 |
| 6.3 Current Output in the Service Mode | 16 |
| 6.4 Sensor Calibration | 17 |
| 6.5 Proof test | 19 |
| 6.6 Info Menu | 20 |
| 6.7 Test Menu | 22 |
| 7 SENSOR REPLACEMENT | 22 |
| 8 MAINTENANCE AND CLEANING | 24 |
| 9 ACCESSORIES AND SPARE PARTS | 24 |
| 10 STATUS- AND ERROR MESSAGES | 25 |
| 10.1 Status Messages | 25 |
| 10.2 Error Messages | 27 |
| 11 FUNCTIONAL SAFETY | 28 |
| 11.1 Safety Function | 28 |
| 11.2 Diagnostic Time and Measuring Cycle | 28 |
| 11.3 Installation and Parameter Settings | 28 |
| 11.4 Maintenance Schedule | 28 |
| 11.5 Repair and Spare Parts | 28 |
| 11.6 Failure Rates and Safe Failure Fraction | 29 |
| 11.7 Average Probability of Failure on Demand | 29 |
| 11.8 Classification of the Safety Integrity Level (SIL) | 29 |
| 11.9 Lifetime | 29 |
| 12 TECHNICAL DATA | 30 |
| 12.1 Transmitter General | 30 |
| 12.2 Sensor Data | 30 |
| 13 EU-DECLARATION OF CONFORMITY | 33 |

1 Safety Instructions

Statox 506 is a transmitter designed as an intrinsically safe device, group 2 category II. It measures the concentration of toxic gases and oxygen in ambient air. It is safe to be operated in classified areas zone 1 and zone 2.

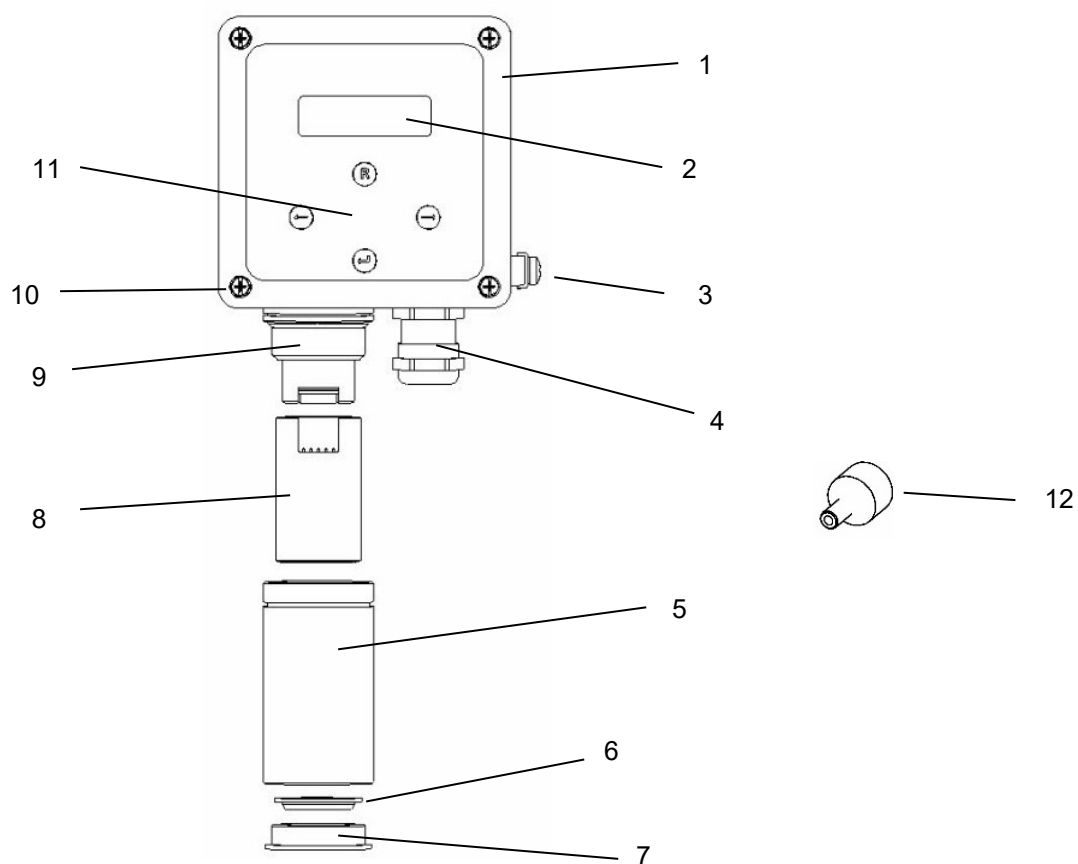
The gas specific parameters are stored in an F-Ram on board of the sensor. These will be downloaded into the sensor head electronics automatically as soon as the sensor is plugged in.

Safety advice:

- Read and observe this manual carefully. Keep it in a safe place.
- This transmitter must be installed and connected observing the regulations for operation in hazardous areas. It must be performed by authorized and trained personnel only. Respect the regulations for the operation of safety instrumented systems including standard DIN EN 60079-14.
- If operated in a hazardous area, the sensor head power supply must run through an intrinsically safe repeater or the loop itself must be intrinsically safe, see chapter 3.2 Electrical Connection. Potential equalization must be in place along the intrinsically safe circuit.
- Statox 506 must not be operated in an ambience outside the technical specifications, see chapter 12.
- Statox 506 must be operated and serviced by authorized and trained personnel only. Use only original Compur parts as spares and consumables.
- Do not operate uncomplete or damaged sensor heads.

All of the above warnings must be observed. Incorrect installation or connection will void the explosion proof rating and thus be dangerous to human life and assets.

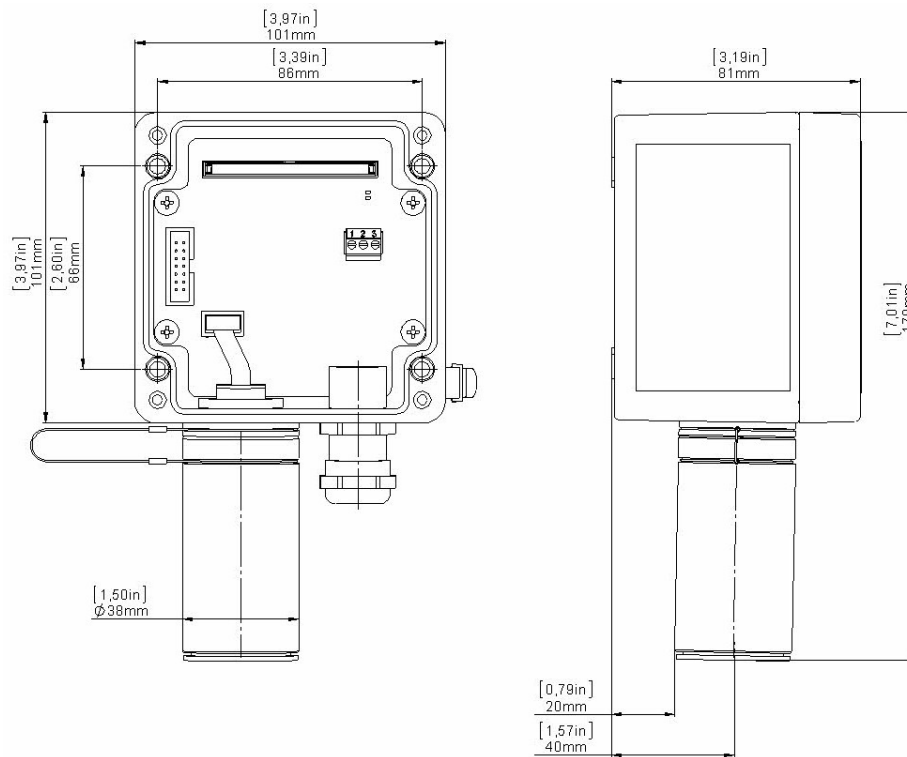
2 Statox 506 Construction



- 1 Aluminium housing
- 2 Display
- 3 Ground contact
- 4 Cable gland
- 5 Sensor cover
- 6 Dust filter (comes with the sensor)
- 7 Filter holder
- 8 Sensor (not part of the sensor head)
- 9 Sensor socket
- 10 Housing screws
- 11 Keyboard
- 12 Magnetic pin

3 Installation and Connection

3.1 Installation

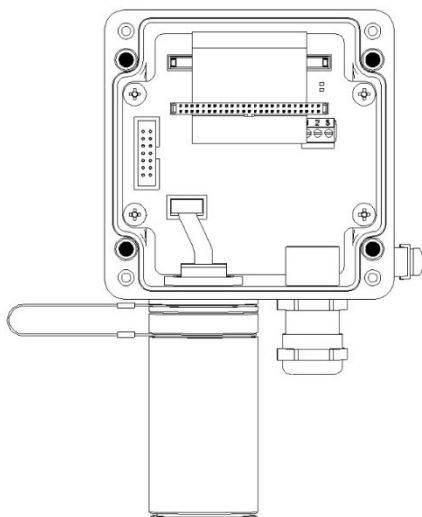


Drilling plan and dimensions Statox 506

Statox 506 should be installed close to a potentially dangerous location or in between a dangerous location and a workplace. Some parameters may have an impact on the measurement:

- Air flow (wind, ventilation, thermal impact)
- Specific gas properties such as density
- Protection from direct sunlight, splash water, dirt etc.
- Take care for good accessibility for maintenance and repair.

Loosen the 4 captive screws. Put the cover on a clean place. In order to ease installation, the flat cable is not connected ex works.



Fasten the housing to the wall.

Screw specs: $\varnothing \leq 4.5$ mm, head $\varnothing \leq 6.9$ mm.

Install in an upright position with the sensor downwards!

Avoid ingress of dust or humidity.

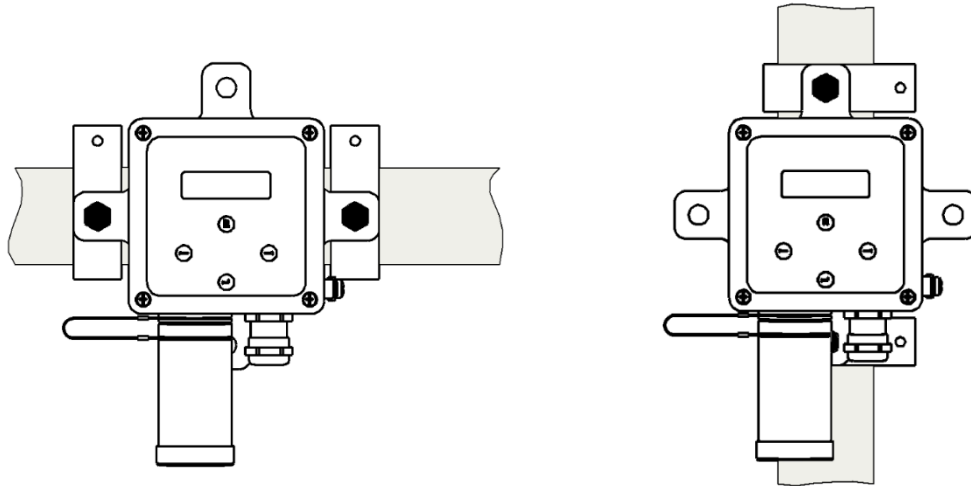
Connect the cable as shown in chapter 3.2.

Connect the cover to the pcb with the flat cable. The plug is mechanically coded.

Fasten the cover.

Connect the ground contact to ground. It can take cables up to 4 mm². Reassure proper grounding.

Use the optional pipe kit (see chapter 9) to install the sensor head to horizontal or vertical pipes.



3.2 Electrical Connection

If installed in a classified area, the power supply must run through an intrinsically safe repeater. The combination Sensor head / repeater / cable must be within these parameters:

Specifications:

$$\begin{aligned} U_o &\leq U_i \\ I_o &\leq I_i \\ C_o &\geq C_i + I \cdot C_L \\ L_o &\geq L_i + I \cdot L_L \end{aligned}$$

U_o, I_o, C_o, L_o : Approved repeater specifications.

U_i, I_i, C_i, L_i : Approved sensor head specifications (→ Technical data)

C_L = Cable capacity in nF/km

L_L = Cable inductivity in nH/m

I = Cable length in m

The allowable cable length must be calculated from the cable capacity and the inductivity of the sensor head with this formula:

$$I_{\max} = (C_o - C_i) / C_L$$

Example:

Cable type LiYCY 0,75mm² : $C_L = 150$ nF/km

Repeater: $C_o = 705$ nF

Sensor head: $C_i = 24$ nF

→ $I_{\max} = 4540$ m

Recommended cable:

2 x or 3 x ≥ 0.5 mm², preferably shielded (e.g. LiYCY).

Terminals: 0.25 – 2.5 mm² (AWG 24 - 12).

The cable gland can accept cables from 4 to 12 mm outer diameter.

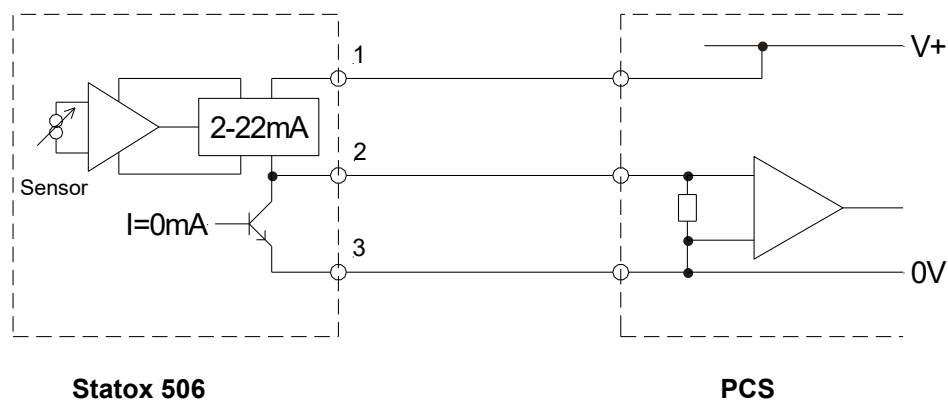
Advantage of 3 wire operation:

The signal in the error mode must always be 2 mA when operating in 2 wire installation in order to assure enough power for the operation.

If you install the sensor head with a 3 wire cable, you can set the current in the error mode to 0 mA. Then you can set the current in the service mode to 2 mA and thus differentiate between system failure (critical error) and service mode (non - critical error). This is essential if you operate the Statox 506 as a safety operated system (SIS). See also chapter 6.3!

If you operate the Statox 506 sensor head with a Statox 502 or 503 Control Module, use the schematics as shown in chapter 3.2.2 or 3.2.3.

If you operate the Statox 506 sensor head directly on a PCS, use the following diagram.
In case of 2 wire operation use terminal 1 and 2.



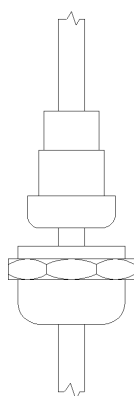
Caution:

First complete the electrical connections, then plug the sensor in.

3.2.1 Statox 506 cable connection

Cable specifications see above.

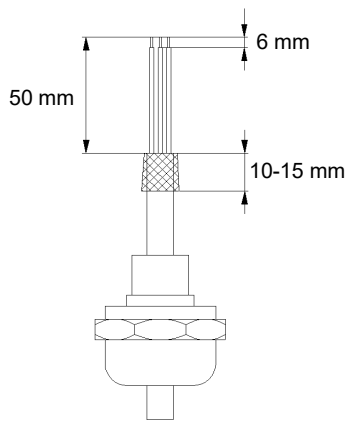
Make sure the sensor is not plugged in!



Remove the nut, the washer set and the metal spring from the cable gland.

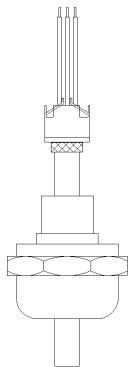
Push the nut and the washer set over the cable end.

The washers have lips which can be removed in order to widen the inner diameter.



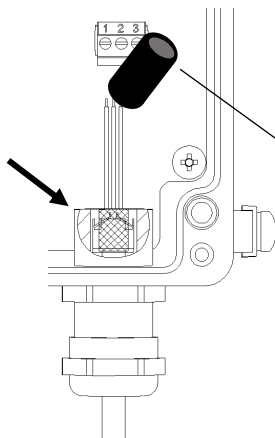
Strip the cable end as shown here.

Push the cable shield backwards and shorten it to 10-15 mm.



Push the metal spring onto the cable until it makes good contact with the shield.

Push the cable into the cable gland to the end stop of the metal spring.



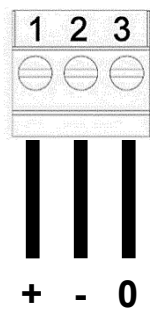
Fasten the nut slightly.

The cable isolation end shall match with the inner end of the cable gland. (Arrow)

Now fasten the nut.

The package includes a ferrite core which will help to avoid electromagnetic interferences. Push it over the connection cable before connecting it.

Connect the wires to the terminal plug. This plug can be removed, in order to ease installation. Terminal 3 must only be connected for 3 - wire operation. Then re-plug the terminal plug.



Connect the ground terminal to the ground of the building. In order to avoid ground loops only ground this end of the cable! If installed in a classified area, an equal potential all along the intrinsically safe circuit is required.

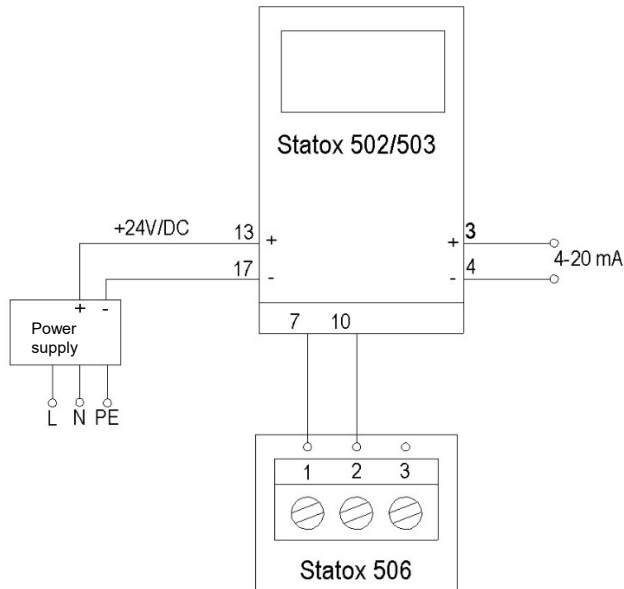
As soon as power is on, the sensor head performs a self-test and then displays its operating program index.

See chapter 5: Start up.

3.2.2 Connection diagram with Statox 502/503 Control Module in the 2-wire mode

Before connecting the Statox 506 to a Compur Statox 502 or Statox 503 Control Module, the appropriate program in the control module must be set. The programs are listed in the operation manual of the control module.

3.2.2.1 2-wire mode installation in non-hazardous areas



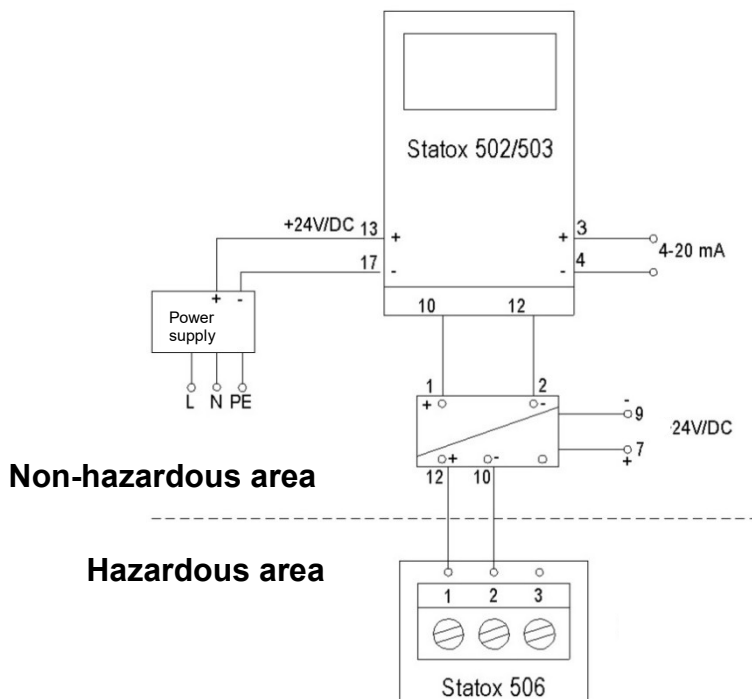
3.2.2.2 2-wire mode installation in hazardous areas

Caution:

The input / output terminals may be different for different intrinsically safe repeaters. Wrong connection might destroy the repeater and / or the control module. Avoid short-circuits and wrong polarity!

The terminal numbers at the repeater refer to model 9160/13-11-11 from R.Stahl, Waldenburg (Siemens 7NG4124-0AA00). It needs an own power supply and operates as current source at terminals 1 and 2.

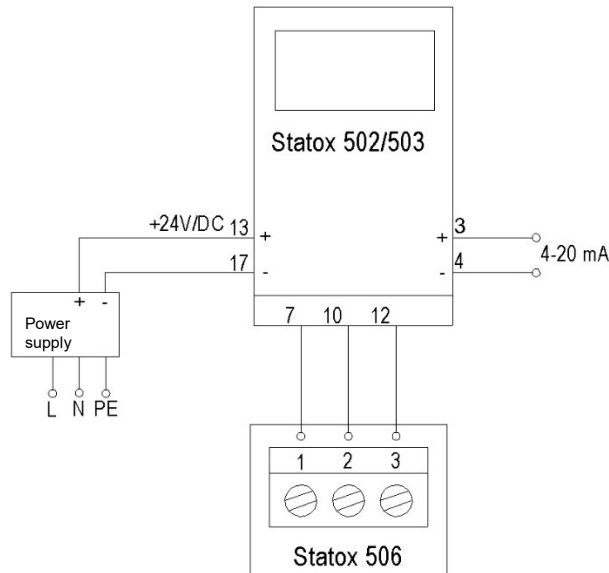
Do not operate control module and repeater on the same bus – the polarity is different!



3.2.3 Connection diagram with Statox 502/503 Control Module in the 3-wire mode

Before connecting the Statox 506 to a Compur Statox 502 or Statox 503 Control Module, the appropriate program in the control module must be set. The programs are listed in the operation manual of the control module.

3.2.3.1 3-wire mode installation in non-hazardous areas



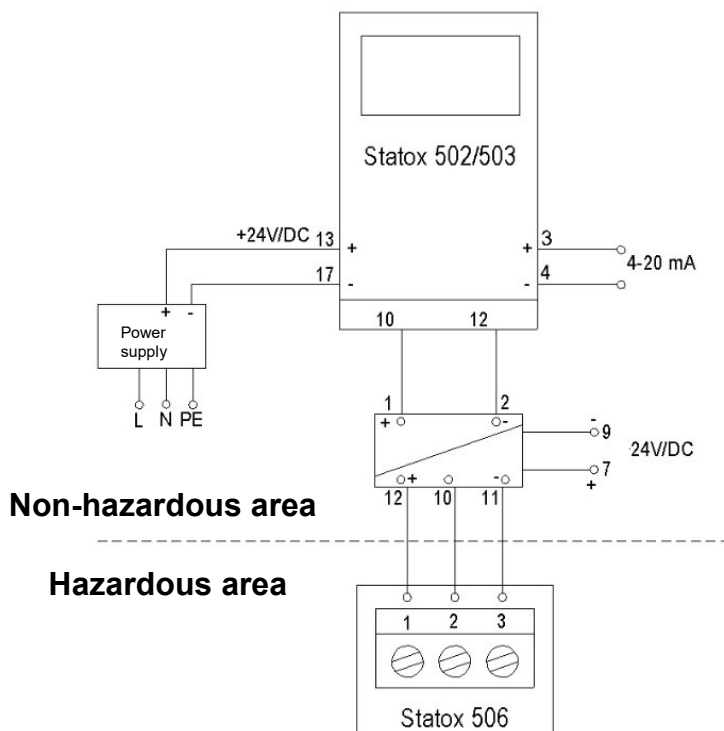
3.2.3.2 3-wire mode installation in hazardous areas

Caution:

The input / output terminals may be different for different intrinsically safe repeaters. Wrong connection might destroy the repeater and / or the control module. Avoid short-circuits and wrong polarity!

The terminal numbers at the repeater refer to model 9160/13-11-11 from R.Stahl, Waldenburg (Siemens 7NG4124-0AA00). It needs an own power supply and operates as current source at terminals 1 and 2.





Do not operate control module and repeater at the same bus – the polarity is different!



4 Control Elements and Display

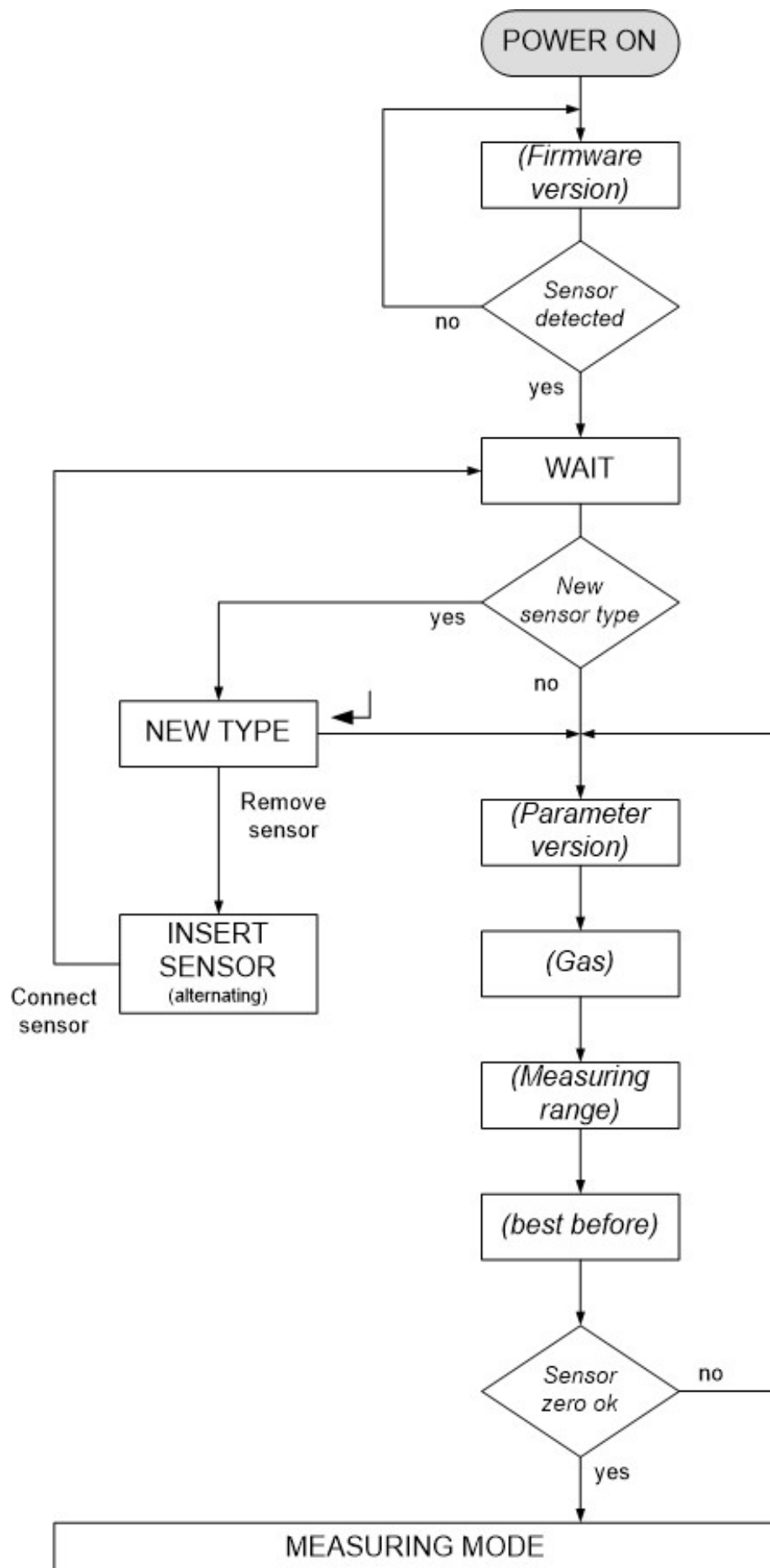
The display is an 8 digit 14-segment-LCD.

You can program the sensor head by holding the magnetic pin on the control buttons:

| Symbol | Name | Function |
|---|-------|--|
|  | Right | Increase value. Navigate to the right. Push and hold the contact for speed mode. |
|  | Left | Decrease value. Navigate to the left. Push and hold the contact for speed mode. |
|  | Reset | Navigate backwards. Change entry. |
|  | Enter | Main menu. Confirm. |

5 Start up

- After connecting the sensor head to power, it performs a self-test and after a few seconds displays the software index.
- Remove the yellow protection cap from the sensor cover.
- Install the sensor and the dust filter which is included in the sensor package. Find more details in chapter 7.
- After the sensor has been plugged in, the sensor head reads the sensor parameters and displays the parameter set index, the target gas, the measuring range and the best-before date of the sensor in the format week / year. After zero has stabilized, the sensor head goes into the measuring mode.
- If you plug in another sensor type as before, the display shows NEW TYPE. Confirm this with ENTER. Otherwise remove the sensor and plug in the right type.
- **As long as the sensor head has not gone into the measuring mode, it is in the ERROR mode. (0 mA signal in 3-wire operation, 2 mA in 2-wire operation)**
- Once the sensor head has started the measuring mode you can program the real time clock (chapter 6.2) and the service mode setting (chapter 6.3).
- Some sensors do require a certain warm-up time until zero has stabilized. If sensor and sensor head have different temperatures, allow enough time to equalize. 1 hour after installation a zero adjustment should be done (chapter 6.4).



6 Menu

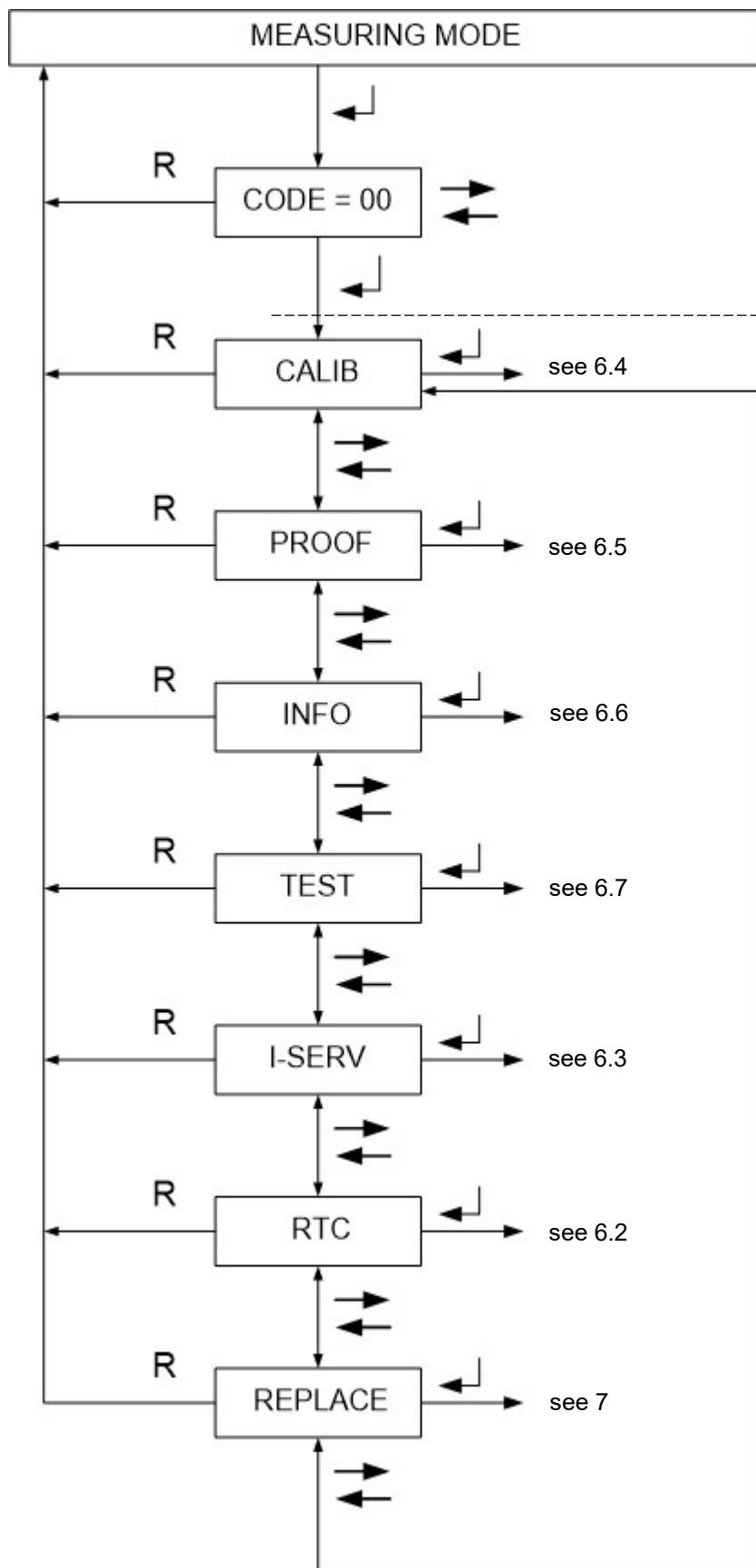
6.1 Main Menu

Push the ENTER – button in order to enter the main menu. Use the left / right – buttons to enter the password “94”. This password cannot be changed.

You can navigate in the main menu in either direction. Enter a sub menu by pushing the ENTER – button. RESET brings you step by step back into the measuring mode.

After you have entered the password, the sensor head is now in the service mode. The output is set to 2 or 4 mA. The measured value will not be transmitted.

If you do not operate a button for more than 5 minutes, the sensor head will return automatically into the measuring mode. Exceptions to this are listed in the relevant sub menus.

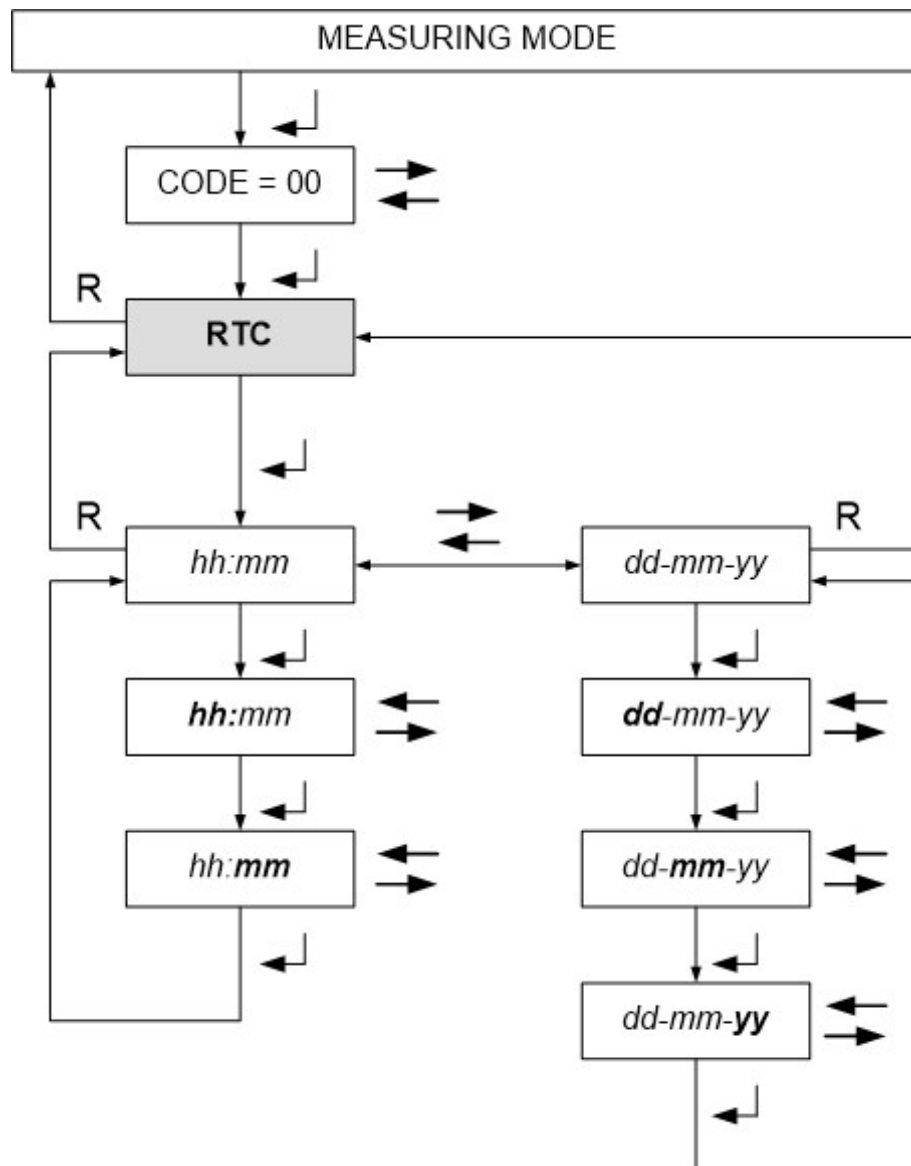


Dial Code 94.
If you enter a wrong
code, the sensor head
will return to the
measuring mode.

Now you are in the
service mode.

6.2 Setting the Real Time Clock

- The real time clock has been set ex-works. Probably you will have to adjust it to your local time. Only correct clock settings make sure that all alarm and calibration protocols are correct.
- The clock is buffered with a battery.
- All flashing display segments shown below in bold face are adjustable. Confirm with ENTER.
- Time (hour / minute) is displayed in the 24 hour format.
- Date is displayed in the format day / month / year.



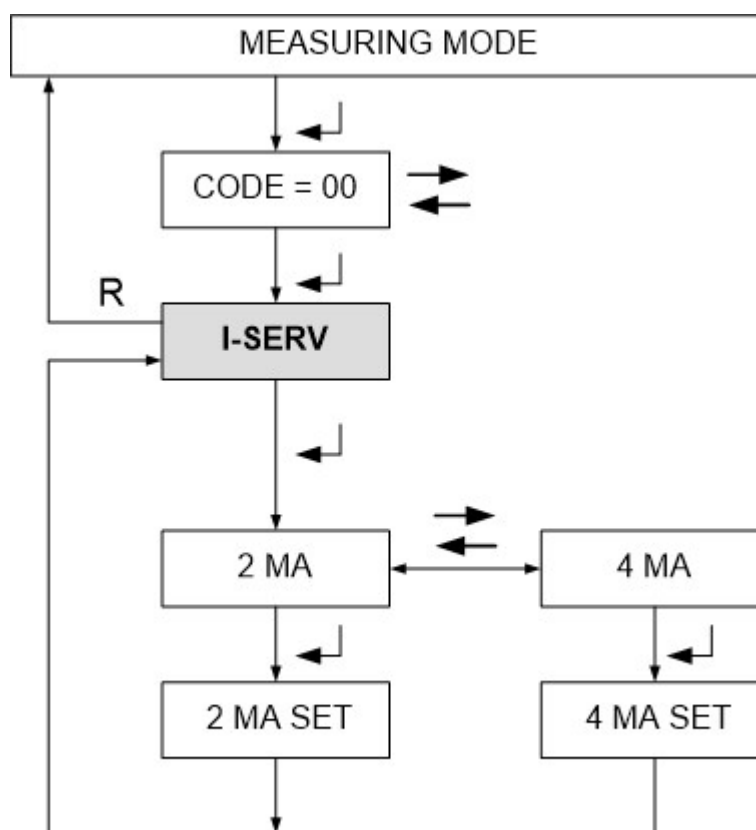
6.3 Current Output in the Service Mode

- The analog output can be set to 2 or 4 mA in the service mode. Here is a listing of all possible modes:

| | Error (critical error) | Service (non critical error) | Display at the Statox 503 Control Module |
|------------------|---------------------------|---------------------------------|---|
| 2-wire operation | 2 mA | 2 mA 4 mA | Service Mode „0“ |
| 3-wire operation | 0 mA | 2 mA 4 mA | Error 2 Service Mode „0“ |

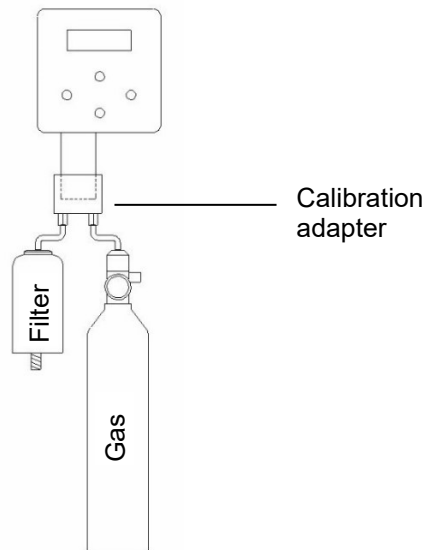
Caution: In the menu REPLACE the sensor head will always remain in the service mode, even if there is no sensor plugged in.

- If you operate the sensor head as a SIL - device EN 61508 (functional safety), the analog output must be programmed to 2 mA in the service mode!
- As soon as programmed, the output is active.



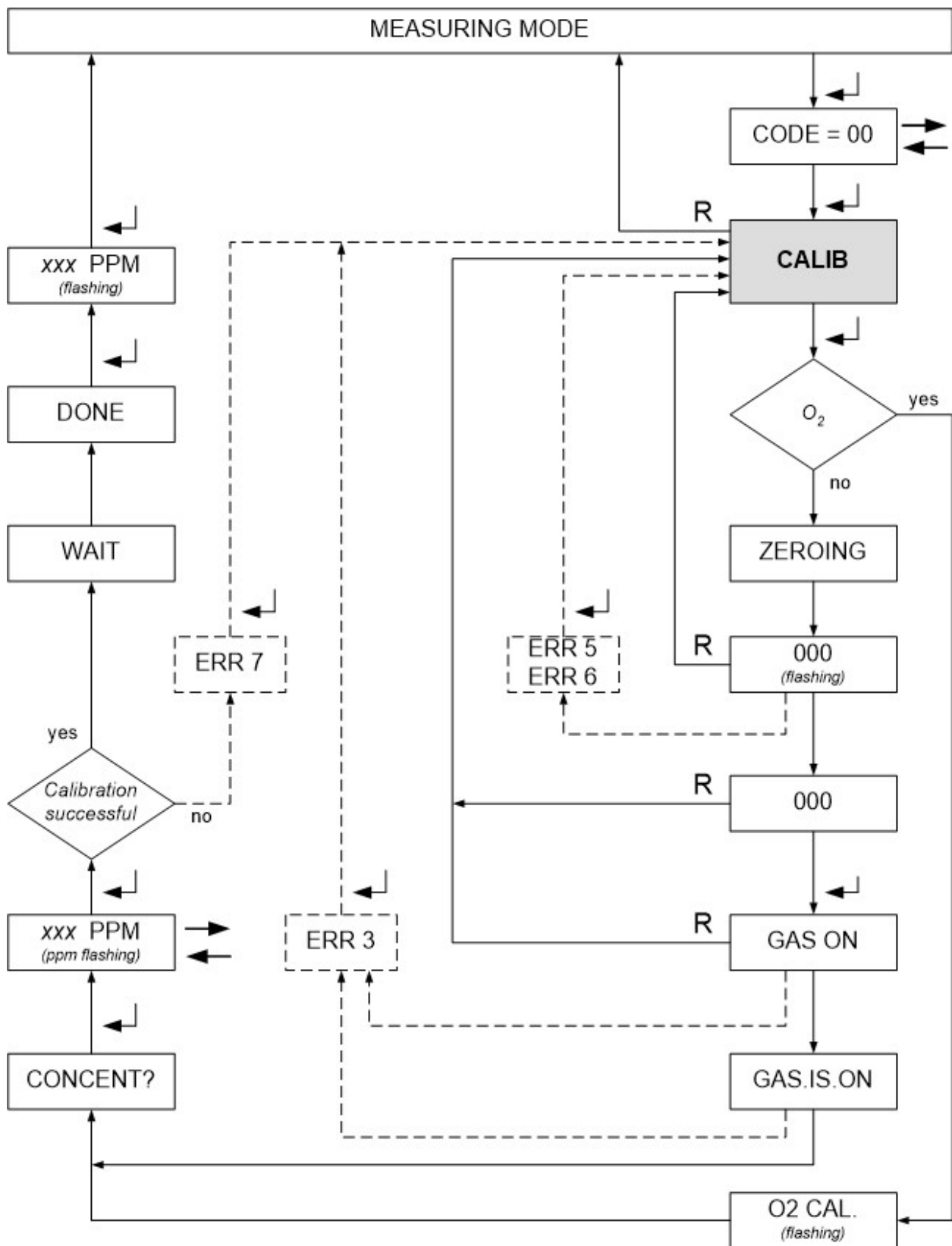
6.4 Sensor Calibration

- Sensor and sensor head must have the same temperature!
- For calibration you need the Statox 505/506 calibration adapter art # 570505, and an inert gas tube 4x1 mm (i.e. art. # 556710) and span gas (allowable concentration see chapter 12.2). If you are not sure that the ambient air is clean, you need synthetic air for zero adjustment.
- In case the calibration fails for whatever reason, the sensor head will continue to operate with the existing parameters, but the display will alternate showing the measured value and **ZERO ADJ** respectively **CALIB** until a calibration procedure has been completed.
- O₂ sensors do not require a zero adjustment, as their output in pure nitrogen is nearly zero. If you are not sure that the ambient air is clean and does have 20.9 % oxygen content, you should use synthetic air for the adjustment. Apply the synthetic air as soon as the CALIB menu has started.
- During calibration, the timeout is not active. The automatic return into the measuring mode is disabled!



Calibration procedure:

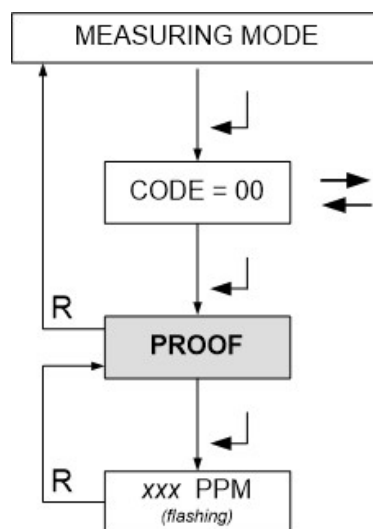
- Enter the CALIB menu and start the zero adjustment. As soon as „000“ is no longer flashing, zero has been adjusted successfully.
- Push the calibration adapter onto the sensor. Connect the span gas cylinder.
- Start the gas calibration with ENTER.
- As soon as **GAS ON** appears on the display, turn the gas on. Required flow is ca. 20 l/h (300 ml/min). If you have to follow a zero emission policy, you can connect an active carbon filter at the adapter outlet. Take care to avoid a stagnation pressure! The sensor head will detect the gas and confirm with: **GAS.IS.ON**.
- As soon as the measured value has stabilized, **CONCENT?** will appear in the display. Confirm with ENTER and enter the concentration of the span gas you are using in ppm (for O₂ in %Vol). Use the LEFT / RIGHT arrows to do this. Confirm with ENTER.
- The sensor head will confirm a successful calibration with **DONE**. Push ENTER. Now the display shows the actual detected concentration flashing. Check the reading.
- Remove the calibration adapter and shut the gas off. Let the reading decrease to zero, then push ENTER in order to enter the measuring mode. If you do nothing, the timeout feature will activate the measuring mode after 5 min.
- In the graph below potential errors are shown in dotted letters. You can find a complete error list in chapter 10.2!



Statox 506 Calibration procedure

6.5 Proof test

- The Proof test checks the proper function of sensor and sensor head on a regular schedule. It cannot be used to test the entire alarm chain, because the analog signal is set to 2 or 4 mA. If you want to proof test the entire alarm chain, this must be done in the measuring mode. You do have the capability to test connected devices in the TEST menu (see chapter 6.7).
- You need Stattox 505/506 calibration adapter art. #. 570505, an inert gas tube 4x1 mm (i.e. art. #. 556710) and span gas with a concentration within the measuring range, preferably close to the alarm threshold.
- Connect the gas adapter with a slight turn clockwise. Connect the gas tube (picture chapter 6.4). Required flow is ca. 20 l/h (300 ml/min).
- If you have to follow a zero emission policy, you can connect an active carbon filter at the adapter outlet. Take care to avoid stagnation pressure to build up.
- When the sensor head displays PROOF, confirm with ENTER and turn the gas on. The measured value will be flashing constantly. Wait until the signal is stable before reading the measured value.
- Remove the gas adapter and shut the gas off. Let the reading decrease to zero, then return to the measuring mode.
- If the measured value deviates too much, you should perform a calibration (see chapter 6.4). In many areas legislation allows $\pm 20\%$. Follow your local regulations.
- Special timeout: 30 minutes instead of 5 min.



6.6 Info Menu

Sub menu ALARM

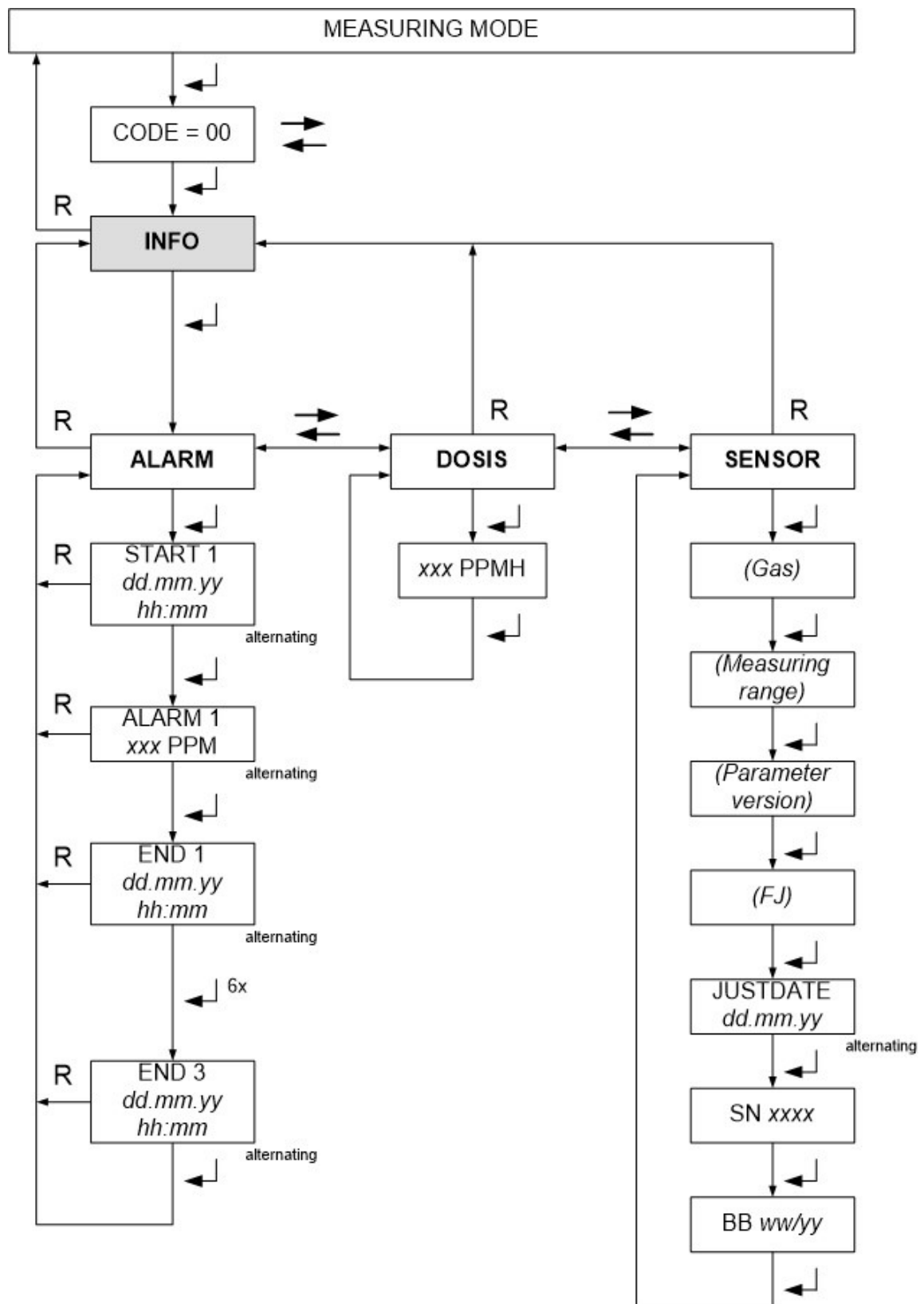
- An alarm protocol starts as soon as the internal alarm threshold is exceeded. This threshold is sensor specific. Find a listing in chapter 12.2.
- The memory can store only 3 alarm events. These parameters are stored: alarm start, concentration maximum, alarm end. The alarm events are not listed chronologically. If there was no alarm yet, the display shows zeros only.
- In order to achieve a meaningful protocol, the clock must be set correctly (see chapter 6.2).

Sub menu DOSIS

- The total exposure is the product of concentration multiplied by exposure time **ppm * h**. Exposure by calibration is neglected.
- The maximum exposure reading depends on the measuring range. It is either 9.99 or 99.9 or 999 ppm * h. If it is too high to be displayed, the display shows FF PPMH.
- Oxygen sensors do not have this feature.
- The total exposure provides information about the exposure history of the sensor, but it is not a direct quality criterion.

Sub menu SENSOR

- FJ is an internal factor, created during calibration. You cannot use this to calculate the sensor signal.
- JUSTDATE is the most recent calibration date.
- SN is the sensor serial number.
- BB is the best before date of the sensor in week / year.



6.7 Test Menu

The test menu helps you testing the sensor head itself and peripheral devices.

Sub menu I-TEST

You can set the analog output current to 4, 12 und 20 mA. **Caution: Peripheral alarm devices might be triggered. Do not create unintended alarms!**

Sub menu LCD-TEST

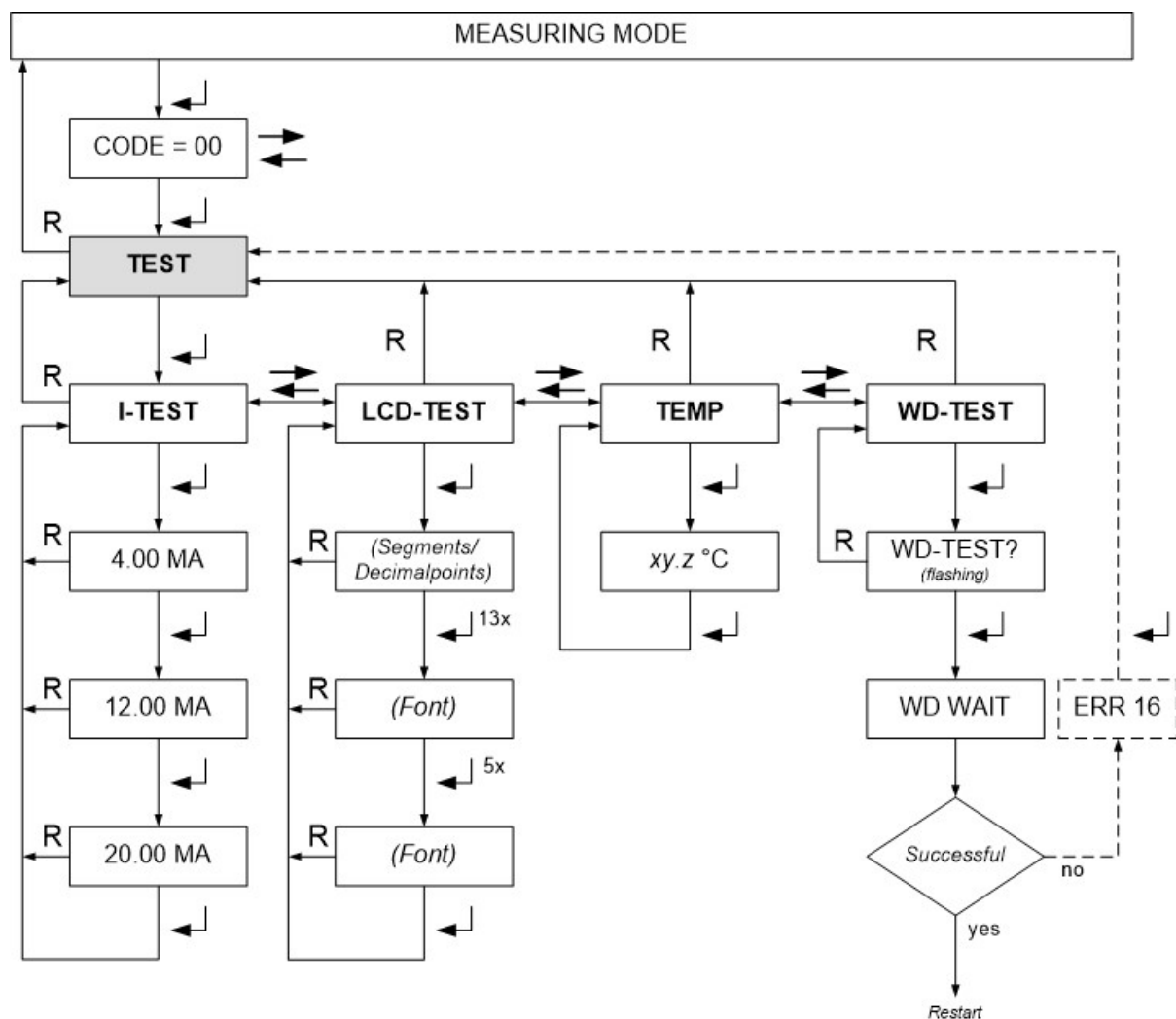
You can create different test - patterns on the display.

Sub menu TEMP

Here you can read the temperature inside the sensor head.

Sub menu WD-TEST

This interrupts the trigger signal for the watchdog. If the watchdog works correctly, it will initiate a restart of the sensor head. A potential error is shown in the graph below in dotted lines. Error 16 has no timeout, the service mode will not end.

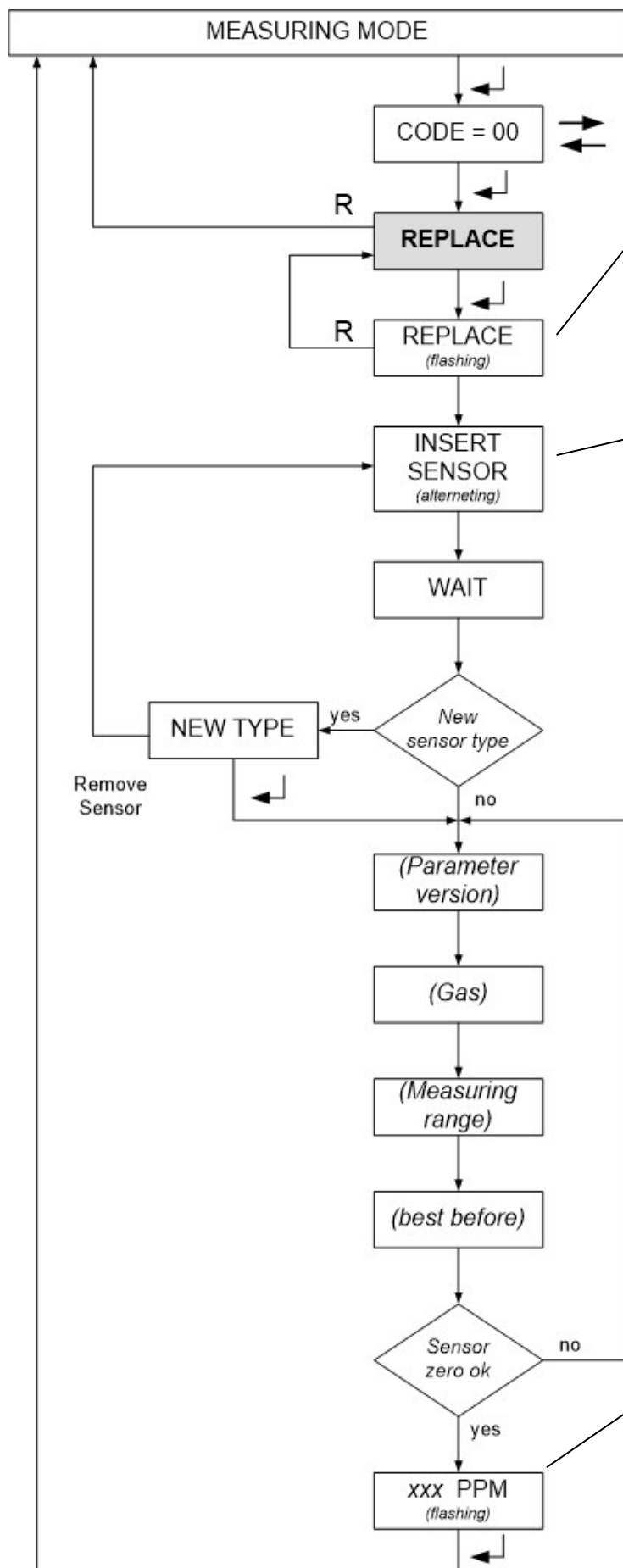


7 Sensor Replacement

Observe all safety precaution for the handling of electrostatic sensitive material. The sensor must be removed only in the service mode!

Enter the menu REPLACE.

The sensor head will remain in the service mode during the sensor replacement (see chapter 6.3).



Instructions:

Unscrew the sensor cover counter-clockwise.

Do not ravel the safety strap.

Unplug the old sensor.

Remove the short-circuit of the new sensor, if there is any.

Install the new sensor.

The booting process is described in chapter 5.

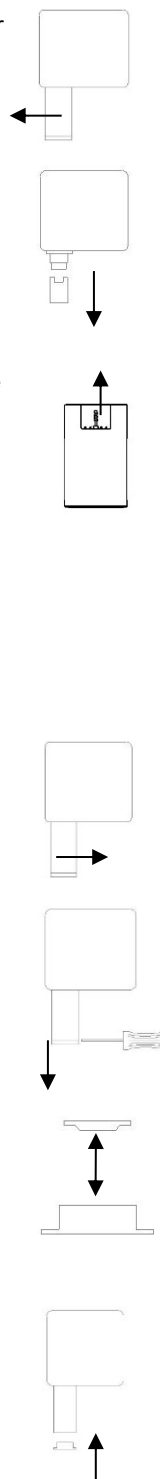
If you insert a different sensor type, confirm the message NEW TYPE with ENTER.

Fasten the sensor cover. Take care not to wedge the safety strap.

Loosen the filter holder with a small screw driver. Remove used dust filter. A fresh filter comes with the new sensor. Before installing the new filter clean the filter holder and the O-ring. Insert the filter as shown in the picture.

Re-install the filter holder.

The Stattox 506 displays the actual concentration, even when it is still in the service mode. Push ENTER to return into the measuring mode. Timeout is 30 min. 1 hour after installation a zero adjust should be done (chapter 6.4).



8 Maintenance and Cleaning

- Clean Statox 506 with a humid cloth. Do not apply detergents, solvents or pressure washers.
- Perform visual inspection on a regular schedule. Check for mechanical damage, intact washers and pollution. The gas access opening must be clean and free of obstacles.
- In harsh environment the installation of a splash guard might be recommendable. The instrument must be calibrated with the splash guard then. In case of doubt ask you local Compur representative.
- If you use Statox 506 as a SIL device according to standard DIN EN 61508, additional functional tests are required (see chapter 11).

9 Accessories and Spare Parts

| Description | Article number |
|---|----------------|
| Stattox 505/506 calibration adapter | 570505 |
| Stattox 505/506 calibration/diffusion adapter | 570547 |
| Stattox 505/506 splashguard | 570560 |
| Pipe kit 1" for clamping range 32-37 mm | 516464 |
| Pipe kit 1,5" for clamping range 48-53 mm | 516462 |
| Pipe kit 2" for clamping range 59-63 mm | 516460 |
| Intrinsically safe repeater (current source) for 2- and 3-wire connection (Stahl Type 9160/13-11-11s) | 803360 |
| Gas tube 1m | 556710 |
| Stattox 505/506 sensor head filter holder | 570510 |
| Stattox 505/506 O-ring set | 570598 |

Sensor details and technical data see chapter 12.2 !

10 Status- and Error Messages

10.1 Status Messages

| Anzeige | Meaning |
|----------------------|--|
| ALARM | Menu INFO most recent 3 alarms |
| BB WW/YY | Best before date sensor calendar week / year |
| CALI B | Calibration. If this message flashes alternatingly with the measured value, a new calibration is required, because the most recent calibration has failed. |
| CODE=00 | Enter password |
| CONCENT? | Menu CALIB: enter concentration |
| DONE | Menu CALIB: calibration finished |
| DOSI S | Menu INFO: sensor total exposure |
| ERR | Error message, see chapter 10.2 |
| FF PPMH | Menu INFO: total gas exposure exceeds indicating range |
| FJ = XXXX | Menu INFO: internal factor |
| GAS.1 S.ON | Menu CALIB: gas detected |
| GAS ON | Menu CALIB: apply gas |
| INFO | Menu INFO |
| INSERT SENSOR | (alternating) Menu REPLACE: connect sensor |
| I-SERV | Menu I-SERV: program the output current in the service mode |
| I-TEST | Menu TEST: test of the current output |
| JUST DATE | Menu INFO: date of the most recent calibration or sensor replacement, alternating with day / month / year |
| LCD-TEST | Menu TEST: display test |
| NEW TYPE | Menu REPLACE confirmation that a different sensor type has been connected |
| O2 CAL. | Menu CALIB: O ₂ sensor calibration (flashing) |
| XXX PPMH | Menu INFO: total sensor exposure in ppm * hours |
| PROOF | Menu PROOF: proof test |
| REPLACE | Steady: menu REPLACE Flashing: remove sensor |
| RTC | Menu RTC: real time clock setting |
| SENSOR | Menu INFO: sensor parameter information |
| SN XXXXX | Menu INFO: serial number of the sensor |
| TEMP | Menu TEST: sensor head temperature |
| TEST | Menu TEST |
| WAIT | Wait |
| WD-TEST | Menu TEST: watchdog test |

| | |
|-----------------|--|
| WD-TEST? | Menu TEST: watchdog test start? (flashing) |
| WD WAIT | Menu TEST: watchdog test running |
| ZERO ADJ | Flashing alternatingly with the measured value: most recent zero adjustment has failed. Retry. |
| ZEROING | Menu CALIB: zero adjustment |
| 000 | Menu CALIB: flashing: zero stabilizing. Steady: zero found. |
| 2 MA | Menu I-SERV: output current 2 mA in the service mode |
| 2 MA SET | Menu I-SERV: 2 mA in the service mode have been programmed. |
| 4 MA | Menu I-SERV: output current 4 mA in the service mode |
| 4 MA SET | Menu I-SERV: 4 mA in the service mode have been programmed. |
| BB-BB-BB | Menu RTC: realtime clock date: day / month / year |
| BB.BB.BB | Menu INFO: alarm date day / month / year |
| BB BB | Menu RTC or INFO: time: hour / minute |
| X.X | Mode without sensor: Instrument software index |
| XX.X.XX | Menu INFO: parameter index sensor |
| X.XX PPM | Measured concentration, with O ₂ sensor in VP (%Vol). Flashing: measured concentration during service mode (menus CALIB, REPLACE or PROOF). If only PPM is flashing: Menu CALIB: enter concentration. |

10.2 Error Messages

Any critical error reduces the output current to 2 mA (2-wire operation) or 0 mA (3-wire operation). Non critical errors may occur during maintenance procedures (e.g. calibration). They will not change the status.

| Error | Character | Reason | Measure to be taken |
|-------------------|--------------|--|--|
| No display | critical | Ribbon cable loose or damaged. If no current $\geq 2\text{mA}$ in 2-wire mode: Wrong polarity or blown fuse. | Check ribbon cable. Check polarity. The fuse must exclusively be replaced by authorized Compur representatives! |
| ERR 1 | critical | The sensor diagnostic system (heart beat) has detected a sensor defect. | Confirm with ENTER. If this does not help, replace sensor. |
| ERR 2 | critical | 4-20 mA output problem. Actual and nominal value do not match. | Confirm with ENTER. If problem persists contact your local Compur representative. |
| ERR 3 | non critical | Timeout during calibration. (Wrong or unstable gas, sensor has lost sensitivity or is too slow, adsorption effects) | Confirm with ENTER. Gas detection continues with the last valid calibration data. Display shows alternately measured value and CALIB. If calibration continues to fail, replace sensor. |
| ERR 4 | critical | Too much zero drift. Zero drifted negative <u>during the measuring mode</u> . As soon as the measured value goes up, the message will disappear. | Confirm with ENTER. Enter the password and adjust zero. If problem persists, replace sensor. |
| ERR 5 | non critical | Signal too high <u>during zero adjustment</u> . Maybe zero air was not clean. | Confirm with ENTER. System returns to CALIB. Start a new zero adjustment. Until a zero adjustment has been successful, the measured value and ZEROADJ are displayed alternately. If the problem persists, replace sensor. |
| ERR 6 | non critical | Timeout, no stable zero found. | Confirm with ENTER. The last valid zero value is used. Measured value is displayed alternatingly with ZEROADJ. Try synthetic air. If problem persists, replace sensor. |
| ERR 7 | non critical | <u>During calibration</u> : Sensor not sensitive enough or span gas is bad or wrong. | Confirm with ENTER. Gas detection continues with the last valid parameters. Display shows alternately the measured value and CALIB. If calibration continues to fail replace sensor. |
| ERR 8 | critical | Transmitter is operated out of the specified temperature range. | Confirm with ENTER to restart. Check temperature, see chapter 6.7 |
| ERR 10 | critical | Sensor FRAM problem. | Confirm with ENTER. If problem persists, replace sensor. |
| ERR 11 | critical | Hardware problem amplifier. | Confirm with ENTER, If problem persists contact your local Compur representative. |
| ERR 12 | critical | Hardware problem potentiostat | Confirm with ENTER, If problem persists contact your local Compur representative. |
| ERR 13 | critical | Hardware problem power supply | Confirm with ENTER, If problem persists contact your local Compur representative. |
| ERR 15 | critical | Flash problem | Confirm with ENTER, If problem persists contact your local Compur representative. |
| ERR 16 | non critical | Watchdog problem after user-initiated WD-test | Confirm with ENTER. Try again. If problem persists contact your local Compur representative. |

11 Functional Safety

Here is all information you need when you have to design a safety instrumented system (SIS) with safety integrity level 2. The user alone is responsible for the integration and the intended use of this system.

11.1 Safety Function

Stattox 506 detects toxic gases in the ppm range and oxygen in % volume range. It monitors the measured concentration also on an analog current output 0 – 22 mA:

- 0 mA signal system failure (3-wire operation)
- 2 mA signal service mode (and system failure 2-wire operation)
- 4 mA signal 0% of the measuring range
- 20 mA signal 100% of the measuring range
- 22 mA signal overrange

11.2 Diagnostic Time and Measuring Cycle

The maximum diagnose delay is 12 hours. Within this time interval all hardware- and sensor failures will be detected, and the sensor head will go into a safe mode of operation. The measuring cycle is 1 second. Within the same interval the analog output and the display are updated.

11.3 Installation and Parameter Settings

These parameter settings are mandatory in order to achieve the relevant failure rates and the SFF:

- The analog output current in the service mode must be set to 2 mA. Only with this setting measuring mode and service mode can be differentiated.
- The ambience must comply with specifications.

11.4 Maintenance Schedule

The following maintenance procedures are mandatory:

- Check housing and washers. Replace if damaged, corroded or missing.
- Check dust filter and sensor for pollution and damage. Replace if necessary. Check more often in harsh ambience.
- Check plausibility of temperature reading (see chapter 6.7).
- Check watchdog (see chapter 6.7).
- Check sensor with gas (see chapter 6.5). Check more often if installed in harsh environment.
- Replace or calibrate the sensor if the best before date has been exceeded. Depending on the environment a frequent sensor replacement might be necessary.

11.5 Repair and Spare Parts

Repair work on hardware and housing must exclusively be done by trained and authorized personnel. Use original parts only.

11.6 Failure Rates and Safe Failure Fraction

A FMEDA-Hardware-Assessment, performed by SGS-TÜV Saar GmbH, test report M2L50001, resulted in these performance data:

| | λ_s [FIT] | λ_{du} [FIT] | λ_{dd} [FIT] | $\lambda_{don't\ care}$ [FIT] | SFF [%] |
|---|-------------------|----------------------|----------------------|-------------------------------|---------|
| Stattox 506 transmitter without sensor | 304,64 | 42,38 | 271,31 | 21,00 | 93,1 |

Stattox 506 inclusive sensor resulted in these performance data:

| | λ_{du} [FIT] | SFF [%] |
|---|----------------------|---------|
| Stattox 506 Transmitter with Cl₂ Sensor | 70,95 | 97,8 |
| Stattox 506 Transmitter with HCN Sensor | 131,77 | 91,9 |
| Stattox 506 Transmitter with COCl₂ Sensor | 124,60 | 96,9 |
| Stattox 506 Transmitter with H₂S Sensor | 117,91 | 97,8 |
| Stattox 506 Transmitter with CO Sensor | 141,82 | 96,3 |

11.7 Average Probability of Failure on Demand

Stattox 506 has been designed and is classified to be a gas detector with low demand. Transmitter and sensor are considered as a complex system type B according to standard IEC 61508-2:2010.

The PFD_{avg}-values have been calculated with this formula: $PFD_{avg} = 0.5 \cdot T_{Proof} \cdot \lambda_{du}$.

Basic assumption is that the repair time is significantly shorter than the proof test interval.

The sensor operation time is 1 year (best before), for COCl₂ sensors ½ year. After this time interval the sensor must be replaced or calibrated.

| | PFD _{avg} for T _{Proof} = 6 months | PFD _{avg} for T _{Proof} = 12 months |
|---|---|--|
| Stattox 506 Transmitter with Cl₂ Sensor | | 3,11 x 10 ⁻⁴ |
| Stattox 506 Transmitter with HCN Sensor | | 5,77 x 10 ⁻⁴ |
| Stattox 506 Transmitter with COCl₂ Sensor | 2,73 x 10 ⁻⁴ | |
| Stattox 506 Transmitter with H₂S Sensor | | 5,16 x 10 ⁻⁴ |
| Stattox 506 Transmitter with CO Sensor | | 6,21 x 10 ⁻⁴ |

PFD_{avg}: Average Probability of Dangerous Failure on Demand

11.8 Classification of the Safety Integrity Level (SIL)

As specified in standard IEC 61508-2:2010 table 3, with a hardware failure tolerance (HFT) = 0 and a SFF of > 90 % the Stattox 506 inclusive sensor complies with the requirements for a SIL 2 rating.

11.9 Lifetime

The transmitter lifetime without sensor is determined to be 10 years. Within this lifetime period the above mentioned failure rates are valid without being too optimistic.

12 Technical Data

12.1 Transmitter General

| | |
|--|--|
| Instrument name, type: | Stattox 506 Transmitter Type 5376 |
| Manufacturer: | COMPUR Monitors GmbH & Co. KG, D-81539 München |
| Measuring principle: | electrochemical |
| Operation temperature: | -30°C to +60°C ambient air temperature |
| Storage temperature: | -30°C to +60°C |
| Humidity: | 0 to 99% r.F. (non condensing) |
| Pressure: | 900 to 1100 hPa |
| Accuracy at calibration concentration: | ± 10% |
| Power supply: | 24 VDC (12 -28 VDC) |
| Connections: | 2- or 3-wire operation |
| Terminal width: | 0.25 – 2.5 mm ² (AWG 24 – 12) |
| Output: | 0 - 22 mA, max. load 545 Ohm |
| • Service mode: | 2 or 4 mA adjustable |
| • System failure: | 0 mA 3-wire operation, 2 mA 2-wire operation |
| • Overrange: | 22 mA |
| Display: | 8-digits, 14 segments |
| Dimensions (HxWxD): | 180 x 111 x 81 mm |
| Weight: | ca. 1200 g |
| Housing material: | Cast aluminium, enameled / stainless steel |
| Ingress protection EN 60529: | IP 66 |
| Installation: | Sensor downwards |
| EMV: | EN 50270 |
| ATEX marking: | Ex ib IIB T4 Gb |
| Application: | II 2G |
| Approval: | BVS 18 ATEX E 066 X / N2 *) |
| Power supply U_i : | max. 28 VDC |
| Current I_i : | max. 93 mA |
| Power P_i : | max. 650 mW |
| Internal capacity C_i : | 24 nF |
| Internal Inductivity L_i : | neglectable |
| Functional safety: | SIL 2 compliant with IEC 61508 |

*) X- Marking: requires potential equalization along the intrinsically safe loop.

12.2 Sensor Data

Stattox 506 sensors are solely electrochemical 2- or 3-electrode sensors.

The listed parameters are typical data measured at 20°C, 50% r.F. and 1013 mbar.

Response time has been measured with Stattox 505/506 gas adapter at a flow of 20 l/h.

| Gas type, measuring range and resolution | Article number | Temperature range [°C] | Humidity range [% r.H.] (non condensing) | Typical response time t ₉₀ [s] at 20°C | Permitted span gas concentration [ppm] | Min. detectable concentration [ppm] | Sensitivity drift within 6 months | Zeropoint drift/ month [ppm] | Internal Alarm threshold [ppm] | Best before time [months] | Type | Remarks |
|---|-------------------|---------------------------|---|--|---|--|---|---------------------------------------|---|------------------------------------|------|-----------------------------------|
| H ₂ S 20.0 ppm | 515501 | -20 to +50 | 20 - 95 | < 5 | 1.7 – 20.0 | 0.3 | < -15 % | < 0.2 | 5.0 | 12 | 2 E | |
| H ₂ S 100 ppm | 515531 | -20 to +50 | 20 - 95 | < 5 | 9 – 100 | 2 | < -15 % | < 0.2 | 10 | 12 | 2 E | |
| HCN 10.0 ppm | 515536 | -20 to +50 | 20 - 95 | < 5 | 0.9 – 10.0 | 0.2 | < -15 % | < 0.1 | 0.9 | 12 | 2 E | Calibration only from 0°C to 50°C |
| HCN 20.0 ppm | 515503 | -20 to +50 | 20 - 95 | | | | | | | | | |
| HCN 100 ppm | 515533 | -20 to +50 | 20 - 95 | | | | | | | | | |
| COCl ₂ 0.50 ppm | 515502 | -20 to +50 | 20 - 95 | | | | | | | | | |
| COCl ₂ 0.50 ppm + H ₂ S Filter | 515514 | -20 to +50 | 20 - 95 | | | | | | | | | |
| COCl ₂ 1.00 ppm | 515532 | -20 to +50 | 20 - 95 | | | | | | | | | |
| COCl ₂ 20.0 ppm | 515542 | -20 to +50 | 20 - 95 | | | | | | | | | |
| COCl ₂ 100 ppm | 515562 | -20 to +50 | 20 - 95 | | | | | | | | | |
| NO ₂ 5.00 ppm | 515504 | -20 to +50 | 20 - 95 | | | | | | | | | |
| NO ₂ 10.0 ppm | 515534 | -20 to +50 | 20 - 95 | | | | | | | | | |
| CO 200 ppm | 515505 | -20 to +50 | 20 - 95 | < 10 | 18 – 200 | 3 | < -15 % | < 3 | 20 | 12 | 3 E | Warm-up time > 1h possible |
| Cl ₂ 5.00 ppm | 515507 | -20 to +50 | 20 - 95 | | | | | | | | | |
| Cl ₂ 100 ppm | 515537 | -20 to +50 | 20 - 95 | | | | | | | | | |
| O ₂ 35.0 Vol% | 515509 | -30 to +55 | 5 - 95 | < 5 | 19.0-23.0 %Vol. | 2 % Vol. | < -3 % | 0 | 18.0 % Vol | 18 | 2 E | Calibration with ambient air |
| HCl 50.0 ppm | 515511 | -20 to +50 | 20 - 95 | | | | | | | | | |
| HCl 100 ppm | 515541 | -20 to +50 | 20 - 95 | | | | | | | | | |
| NH ₃ 150 ppm | 515517 | -30 to +50 | 15 - 90 | | | | | | | | | |
| H ₂ 300 ppm | 515528 | -10 to +40 | 20 - 95 | | | | | | | | | |
| H ₂ 1000 ppm | 515550 | -10 to +40 | 20 - 95 | < 10 | 90 - 500 | 5 | < -15 % | < 3 | 100 | 12 | 2 E | |
| N ₂ H ₄ 1.00 ppm | 515506 | 0 to +50 | 30 - 95 | | | | | | | | | |
| SO ₂ 5.00 ppm | 515540 | -20 to +50 | 20 - 95 | | | | | | | | | |
| O ₃ 1.00 ppm | 515525 | -20 to +40 | 15 - 90 | | | | | | | | | |

13 EU-Declaration of Conformity

COMPUTER Monitors

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

erklärt in alleiniger Verantwortung, dass das Produkt
hereby declares in sole responsibility, that the product
déclare comme seul responsable, que le produit

Transmitter Statox 506 Typ 5376
Transmitter Statox 506 type 5376
Transmetteur Statox 506 type 5376

den folgenden EU-Richtlinien und den entsprechenden harmonisierten Normen entspricht.
complies with the following EU directives and corresponding harmonized standards.
correspond aux directives européennes suivantes et à leurs normes harmonisées.

Notified body: 0158
DEKRA Testing and Certification GmbH,
Dinnendahlstr. 9. D-44809 Bochum

Richtlinie/Directive 2014/30/EU: EN 61000-6-4:2007 +A1:2011
EN 50270:2015 (Typ 2 / type 2)

Richtlinie/Directive 2012/19/EU

Richtlinie/Directive 2011/65/EU

München, 14. 4. 2021
Munich, 2021-04-14

Dr. Hermann Schmidpott, Geschäftsführer

Geschäftsführer:
Dipl.-Ing. Bernd Rist
Dr. Hermann Schmidpott

Specifications are subject to change without notice, and are provided only for comparison of products. The conditions under which our products are used, are beyond our control. Therefore, the user must fully test our products and / or information to determine suitability for any intended use, application, condition or situation. All information is given without warranty or guarantee. Compur Monitors disclaims any liability, negligence or otherwise, incurred in connection with the use of the products and information. Any statement or recommendation not contained herein is unauthorized and shall not bind Compur Monitors. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or device or its use. No licence is implied or in fact granted under the claims of any patent. Instruments are manufactured by Compur Monitors GmbH & Co. KG, Munich. The General Conditions of Supply and Service of Compur Monitors GmbH & Co. KG, Munich, are applicable.



Compur Monitors GmbH & Co. KG
Weißenseestraße 101
D-81539 München
Tel.: ++49/89/ 6 20 38 268
Fax : ++49/89/ 6 20 38 184
<http://www.compur.com>
E-Mail: compur@compur.de