



Instruction Manual
ExTox Transmitter
ExSens(-I) and Sens(-I)

Foreword

We thank you very much for your confidence in our products and us, the ExTox Gasmess-Systeme GmbH.

The Transmitters of the ExSens(-I) and Sens(-I) Series as well as all other ExTox-Products and services stand for our high quality targets. Our business is the health protection of mankind, protection of the environment and installations. We are glad to take this responsibility. Our Quality Management System therefore follows ISO 9001 and our Production Monitoring is to keep the European Directives 2014/34/EU ("ATEX").

With the Transmitter of the ExSens(-I) or Sens(-I) Series you have chosen a concept which offers an optimum solution for nearly all thinkable tasks when monitoring flammable and/or toxic gases and vapours as well as oxygen. You profit of the high reliability due to modern sensor techniques and consequent interpretation acc. to the requirements of the regulations and standards valid for industrial application.

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1 Introduction

This Instruction Manual generally describes operation, installation and maintenance of the following ExTox-Products:

- Transmitter of the ExSens Series Article-No. 251...
- Transmitter of the Sens Series Article-No. 211...
- Transmitter of the ExSens-I Series Article-No. 253...
- Transmitter of the Sens-I Series Article-No. 213...

The transmitter types ExSens/Sens-*I*(*nterface*) dispose of a RS 485-Interface for communication for the purpose of external calibration, adjustment and fault diagnosis. If you use the configuration and diagnosis software ExTox Com-Sens, which is separately available, in combination with these types, please pay also attention to the corresponding Instruction Manual. The Software offers additional possibilities regarding configuration, maintenance and diagnosis. References within this text are marked with  ComSens.

Type specific data for each transmitter, such as for example measuring range, measuring principle and operation conditions, should be taken from a corresponding separate and specific Data Sheet. This Data Sheet forms consequently part of this Instruction Manual. References on the Data Sheet within this text are marked with  DB.

Hints referring to the use of the transmitter in hazardous areas are marked with .

Please read this Instruction Manual carefully before installation and initial operation of the control unit. We kindly ask you to pay attention to all details and cross-references.

We kindly ask you not to repair the transmitter or to perform any changes which go beyond the measures described herein. Otherwise you endanger your own safety and your warranty claims of merchantability. In such cases please contact ExTox or authorised ExTox Service Partner. Third parties take the responsibility for correct performance of work when maintenance and repairs are done by them.

On receipt of goods please take care that packing and consignment are not damaged and the goods supplied correspond to the articles described in the delivery note. Please do also compare with your order. In case of any damage please inform your forwarding agent and your supplier. Please keep the damaged packing.

Please keep in mind that transmitters are sensitive measuring devices and take special care when unpacking and installing them.

2 Features of the Transmitter ExSens(-I) and Sens(-I)

There are multiple tasks which need to be fulfilled when monitoring gases and vapours. The range covers the opportune warning before it comes to the release of flammable substances, monitoring of concentrations of toxic gases at working places as well as controlling of production processes.

Due to modern sensor technique the ExTox-Transmitters of the Series ExSens(-I) and Sens(-I) offer excellent solutions for nearly all thinkable applications. You find our wide range of measuring gas and corresponding measuring ranges in the *Transmitter and Gas List* on our Homepage www.ExTox.de.

All transmitters could be combined. Due to their modular construction accessories and spare parts are mutually extensively interchangeable, which facilitates and enables installation, adjustment and maintenance at low cost.

The transmitters issue the measuring signal via a 4-20 mA-output with linear curve. The types ExSens-I and Sens-I also dispose of a digital RS-485 communication interface. This offers the possibility of an automatic single man calibration of these transmitters as well as further comfortable functions for configuration and monitoring of the sensor functionality.

ExSens(-I)



The Transmitters of the *ExSens(-I)* Series are suitable for use in hazardous areas of Zones 1 and 2.

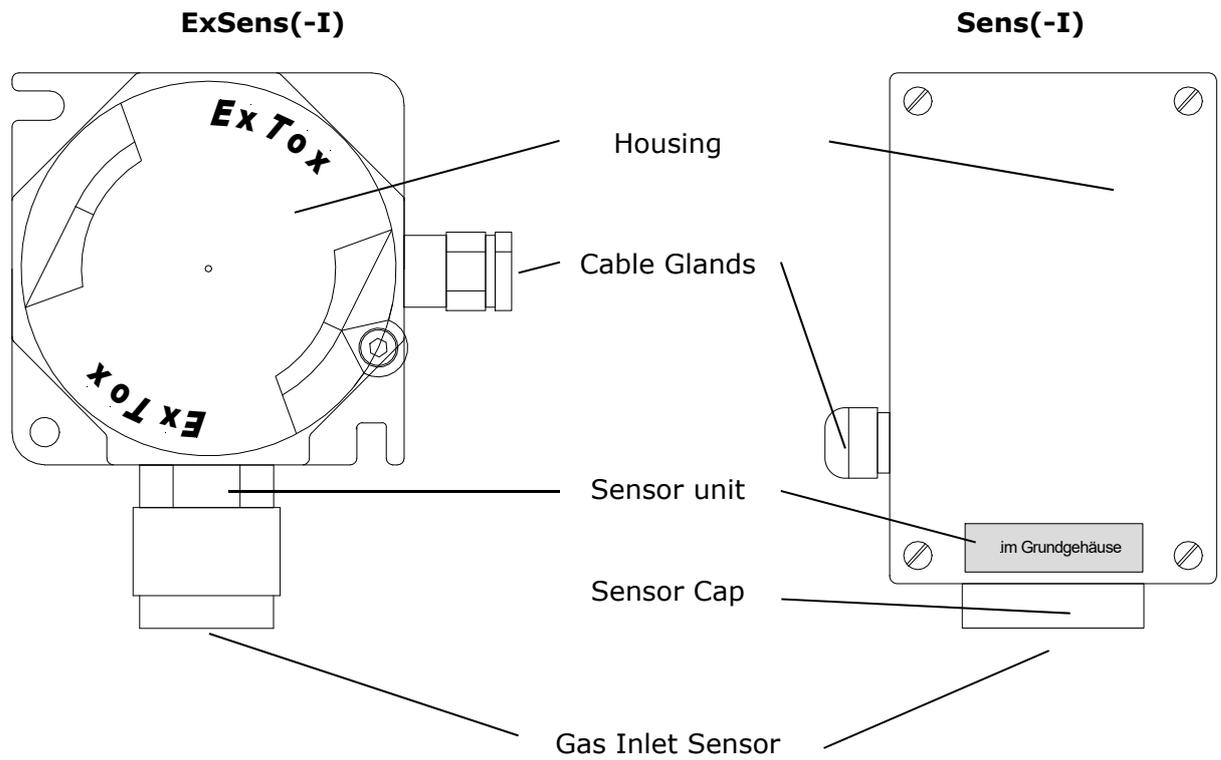
Sens(-I)



The Transmitters of the *Sens(-I)* Series are suitable for use under normal industrial conditions – mainly outside hazardous areas.

Survey on the Transmitters:

- available measuring principles
 - Catalytic Combustion (Type designation: ...-WT)
 - Infrared-Absorption (Type designation: ...-IR)
 - Electrochemical Sensor Element (Type designation: ...-EC)
 - Galvanic Oxygen Sensor (Type designation: ...-KE)
 - Metal Oxide Semiconductor (Type designation: ...-HL)
 - Robust, corrosion proof type for industrial application
(Sens version are available in stainless steel housing on request.)
 - Interfaces
 - 4-20 mA
 - RS 485-Interface for calibration and maintenance (only types ExSens-I and Sens-I)
 - Maximum distance to the control unit 1000 m, for transmitters with electrochemical sensor element 2000 m (when using ExTox Transmitter Cable)
 - Power Supply 18 to 30 V DC
 - External maintenance via ExTox-Software ☞ ComSens (only types ExSens-I and Sens-I)
 - Sensor Element can easily be changed
 - Extensive self monitoring and diagnosis functions
 - Use in hazardous areas (☞ DB)
 - ExSens(-I)
 - Ignition protection: in conformity with ATEX, Category 2 (suitable for Zone 1 and 2)
 - Measuring function for explosion protection: BAM 07 ATEX 0301 X, Measuring gases: Methane to Hexane (ExSens-I BG-WT)
 - Sens(-I) (only types EC/KE with electrochemical sensor element)
 - Ignition protection: in conformity with ATEX, Category 3 (suitable for Zone 2)
- (Please pay attention to the specific information on the enclosed EU-declaration of conformity)
- Measuring Function designed according to EN 60079-29-1, EN IEC62990-1 or EN 50104



3 Operation of Transmitter

3.1 Measuring Mode and Special Modes

Normal operation for a transmitter means measuring mode during which the concentrations of measured gas are monitored and transferred to the control unit. Furthermore the transmitter is able enter additional so-called special modes due to user operation or faults. Under these conditions the measuring functionality is no longer given or not to the full extent.

Please consider that a connected control unit has to interpret the transmitter signals correctly to recognize the special modes and to arrange for suitable safety measures. This is ensured when using ExTox-Control Units.

All special modes are non-latching.

3.2 Description of Transmitter Modes

3.2.1 Measuring Operation

In measuring mode the transmitter issues the measured concentration via the 4-20 mA Interface. 4 mA corresponds to the zero point, 20 mA to the end value of measuring range of the transmitter. The calibration curve is linear.

The range of output currents covers 2 to 22 mA for measuring mode

3.2.2 Under-Scale of Measuring Range

The output current is between 4 and 2 mA, corresponding to the concentration range 0 to -12.5 % of end value of measuring range. Still smaller measured values are indicated on the lower limit 2 mA.

Slight (reversible) deviations cannot be excluded due to climatic and other influences at the place of installation. If the deviations are permanently higher than allowed, calibration and adjustment are necessary. Fixation of allowed deviations can depend on the range of application and measured gas or it can be determined by regulations. Please contact ExTox where necessary. In general deviations should not exceed 5 % of end value of measuring range (3.2 mA).

3.2.3 Over-Scale of Measuring Range

The output current is between 20 and 20.4 / 22 mA, corresponding to the concentration range 100 to 102.5 / 112.5 % of end value of measuring range. Still higher measured values are indicated on the upper limit 22 mA.

The curve is at first linear up to 20.4 mA and goes then directly to 22 mA.

The measured value has over-run the end value of measuring range and so left the specification range. Please pay attention to the fact that defects or permanent changes of the measuring signal due to overload cannot be excluded for some sensor elements. In general we recommend checking the sensor element after such overloads occurred.

On some measuring principles, for example catalytic combustion, the measuring signal could drop back into the measuring range in case of very high concentrations above the upper limit of measuring range. To avoid misinterpretation the downstream Control Unit should display the over-run of measuring range as latching. To facilitate this the transmitter types ...-WT issue a value of 22 mA for ca. 30 s in case of an over-scale of measuring range, even if the sensor already indicates a value within the measuring range.

3.2.4 Start-up Phase

When over-plugging the power supply at initial operation or after a power failure the transmitter has to stabilise itself. During this start-up phase invalid measuring signals could trigger false alarms. To avoid this, a constant current of 0.8 mA is issued during this start-up phase. The red LED on the electronic PCB inside the housing of the transmitter is blinking during this period. The duration of the start-up phase is approx. 1 minute.

Please consider that stabilisation time of the transmitter can even be longer (☞DB).

3.2.5 Self monitoring Transmitter

The transmitters dispose of large self monitoring functions. In case a fault is recognized during the automatically running controls, an output current of 1.1 mA is issued.

3.2.6 Cable Break and Short Circuit

Interruptions or short circuits in the lines of the transmitter cable as well as the failure of the transmitter power supply lead to a current around 0 mA or above 22 mA. Please pay attention to the fact that also other modes can be adopted in case the cable is not completely damaged. These would under unfavourable circumstances only be recognized at regularly calibration. Please also consider the specifications for maximum cable lengths and wire resistances (☞DB).

3.3 Diagnosis and Measures

 The 4-20 mA current output is to enable a diagnosis. To be able to observe the current output you have to countersink a current measuring device into the 4-20 mA line. This should preferably be done outside hazardous areas, for example at the control unit. Alle ExTox control units provide an indication of the current on their displays. The functions are described in the instruction manuals.

Please pay attention to the hints in Chapter 0 when working in hazardous areas. Maybe it is necessary to uninstall the transmitter for diagnosis and removal of defects and to perform the measures outside hazardous areas, for example in an electro workshop.

The table mentioned below contains all transmitter modes as well as all measures to restore the measuring function.

Current Output ($I_{out} \pm 0.1 \text{ mA}$)	Mode	LEDs		Measures
		green	red	
0 mA	Cable Break (3.2.6)	on	off	<ul style="list-style-type: none"> ▪ Check electrical connection ▪ Repair cable
	Power Failure (3.2.6)	off	off	<ul style="list-style-type: none"> ▪ Check power supply ▪ Repair cable
0.8 mA	Start-up Phase (3.2.4)	on	blink- ing	This mode is automatically left after the start-up phase (3.2.4) has been passed
1.1 mA	Hardware Fault (3.2.5)	on	on	Power supply < 15 V or check hardware and repair if necessary.

2 to 20.4 mA (22 mA)	Measuring Mode (3.2.1)	on	off	-
> 22 mA	Short Circuit of Cable (3.2.6)	on	off	<ul style="list-style-type: none"> ▪ Check electrical connection ▪ Repair cable

3.4 Change of Sensor Element

ExTox recommends the use of factory-proven replacement transmitters.

The concept of the Transmitter Series ExSens(-I) and Sens(-I) renders possible to change the sensor element, too. You have to inform us on the serial number of the transmitter and we will send you a replacement sensor element. Exception: Sensor elements of IR-versions -IR shall be replaced at ExTox only.

 Please keep in mind the details in Chapter 4.2 when working in hazardous areas.

To change the sensor element you have to separate the transmitter from power supply (U+) and ground (GND) (☞DB, Clamp Connection). This could also be done at the control unit or – if danger of explosion can safely be excluded – at the transmitter itself. Please keep the connection to ground.

After opening the cover remove the flat cable plug which connects the sensor element with the transmitter electronics in the housing.

 You have to loosen the two grub screws which serve as protection against twisting first – for working on the ExSens(-I). Then you have to turn off the sensor element from the housing. To loosen the bolted connection use an open-ended wrench size 41 mm. Be careful not to destroy the flat cable. Assembly of the sensor element is done the other way round. The sensor element has to be screwed in completely and has to be fixed with the open-ended wrench. Do not forget to screw in the two grub screws as protection against twisting again.

For working on the Sens(-I) you have to loosen the three bolted connections, which connect the sensor cap, the housing and the sensor element. Exchange the sensor element and assemble the transmitter again. Please pay attention to the correct re-placing of maybe existing seals.

Close the housing and connect the power supply.

On the types ExSens-I and Sens-I you have to close the jumper contact JP3 on the electronic PCB for a short time and then open it again. By doing this the settings for zero point, sensitivity and drift are reset to the value at factory setting.

You could return the exchanged sensor element to ExTox for disposal.

 The sensor element is factory-made pre-adjusted. After passing the stabilisation time calibration has to be done anyway according to Chapter 6.5.1.

4 Operation Hints

4.1 Measuring Function

The use of Gas Detection Systems for explosion and health protection requires special care. Besides qualified support of ExTox and the detailed information in the Transmitter Data Sheets (DB) there are several guides to assist you for the safe use and operation of Gas Detection Systems. These guides deal with the selection, installation, initial operation and regular maintenance.

Furthermore there could be national regulations. In Germany there are for example the rules DGUV¹-Information 213-056 (Merkblatt T021) and 213-057 (Merkblatt T023) obligatory for certain applications.

Denomination	Title
EN 60079-29-2	Explosive atmospheres – Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen
DGUV-I 213-057, Merkblatt T023	Gas Detection Equipment for Explosion Protection – Use and Operation (English version)
Merkblatt T055	Mess- und Warngeräte für den Explosionsschutz – Antworten auf häufig gestellte Fragen (available in German only)
EN IEC 62990-2	Workplace atmospheres - Part 2: Gas detectors - Selection, installation, use and maintenance of detectors for toxic gases and vapours
DGUV-I 213-056, Merkblatt T021	Gas Detection Equipment for Toxic Gases/Vapours and Oxygen – Use and Operation (English version)

DIN-Standards available at VDE-Verlag, Frankfurt or Beuth-Verlag, Berlin
DGUV-I available at Jedermann-Verlag, Heidelberg

4.2 Application in Hazardous Areas



If the transmitter is installed in hazardous areas please pay attention to the valid regulations. Do not open the energised device and do not perform any installation work in hazardous areas as long as it is not ensured that there are no flammable gases or vapours in the air. Apply for the corresponding authorisation to perform the works first. If necessary please call in qualified staff for electrical equipment in hazardous areas (in Germany: qualified staff according to the Betriebs-Sicherheits-Verordnung - BetrSichV).

When closing the device please make sure that there are no cables clamped inside. Check that all bolted connections are screwed in as far as they will go and the measures for protection against loosening work.

You should only use transmitter cable being suitable for the use in hazardous areas, for example as far as firing behaviour is concerned. The ExTox-Transmitter-Cable meets these requirements.

¹ DGUV: Deutsche Gesetzliche Unfallversicherung ("German Statutory Accident Insurance")

Please bear in mind that it is necessary to check clamping and sealing sets after loosening the cable glands. Please change the defective parts in case of permanent deformation which might affect the sealing function.

The Transmitters of the ExSens(-I) Series are suitable for use in hazardous areas of Zone 1 and 2. You will find all details regarding ignition protection and EU-Type Examination Certificate BVS 04 ATEX 066 X on the ExSens Data Sheet (☞DB). The limitation X refers to the types for measurement of flammable gases if these should perform a measuring function for the explosion protection in terms of regulation 2014/34/EU ("ATEX"). Please consider the hints in the EU-declaration of conformity.

Transmitters of the Sens(-I) Series are mainly used outside hazardous areas. Only transmitters with electrochemical sensor element are suitable for use in Zone 2. You will find all details on ignition protection in the Sens Data Sheet (☞DB). The limitation X refers to measures which avoid any exceeding of power supply due to temporary annoyances (transients) by more than 40 %. This condition is kept when using ExTox Control Units. When using the transmitter in combination with other electrical equipment this condition has to be kept by means of external circuits.

Please note that all information regarding operation temperature (☞DB, Operation Temperature) concerns the technical measurement function. On use in hazardous areas the selected temperature class and the corresponding ranges for the environmental temperature have to be considered additionally (☞DB, Ignition Protection).

We would like your attention to the fact that the determined frame conditions for hazardous areas are no more valid for oxygen concentrations above 25 % (v/v). This is also valid if the monitored atmosphere is no mixture of flammable gases with air. Protection of the transmitter according to the EU- Type Examination Certificate is no longer ensured in this case.

5 Installation and Initial Operation

5.1 Mechanical Installation

The ExSens(-I) is mounted with in maximum three screws (max. \varnothing 8 mm) on the wall whereas the Sens(-I) is mounted with only two screws (max. \varnothing 4 mm). Screws and wall plugs for fixing Sens(-I) are part of delivery. The fixing screws for the Sens(-I) are only accessible when the cover is opened. A drilling jig for all transmitter types is available on the Internet Homepage for download.

By means of a fixing square – being available as accessory – the transmitter could be mounted on the ceiling. An adapter for measurement in pipes is also available.

When mounting the transmitter it has to be ensured that the transmitter remains accessible for maintenance. Especially the calibration adapter has to be put upon the sensor element. Therefore it is necessary to keep a distance of min. 10 cm between sensor gas inlet and other fixtures.

Please protect the gas inlet of the transmitter against direct shower and beam water, for example by means of a weather proof housing.

 In both Transmitter Series the housing can be opened by removing the cover. If the transmitter is mounted in hazardous areas please follow the instructions in Chapter 4.2.

For opening the ExSens(-I) the interlock of the cover has to be loosened first by unscrewing the hexagon socket screw. Then the cover could be opened. The two elevations support the use of an open-ended wrench or a screw driver shaft to open the housing. When closing the housing the cover simply has to be turned off by hand as far as it will go. Then the cover is turned back only as far as the interlock screw fits in one of the depressions of the housing.

The cover of the Sens(-I) can be taken off after loosening the four screws of the cover.

5.2 Electrical Installation

 Installation is only to be done by qualified personnel keeping the respective installation regulations. For use in hazardous areas the hints in Chapter 4.2 and the requirements of EN 60079-14: *Explosive atmospheres – Part 14: Electrical installations design, selection and erection* have to be kept additionally.

5.2.1 Selection of Cable and Wiring

 The connection of the transmitter is done via a double shielded line. For the ExSens and Sens it has to be a 3- or 4-wire line, for the ExSens-I and Sens-I it has to be a 5- or 6-wire line. The 6-wire and 4-wire line respectively are necessary in case the connection to ground cannot be done directly at place of installation of the transmitter. The sixth and fourth wire of the line have to be worked out as PE.

The types ExSens-I and Sens-I can if necessary also be used with 3- or 4-wire line. The RS 485-Interface remains in this case disconnected. The features and the operation correspond then to the types ExSens and Sens.

The ExTox-Transmitter-Cable disposes of the described features and is suitable for use in hazardous areas.

The wire cross-section and the corresponding line resistance determine the maximum distance between transmitter and control unit (\varnothing DB). The outer diameter of the cable has to be between 6 und 12 mm for the cable gland of the ExSens-I, between 4 and 8.5 mm for the ExSens and between 5 und 9 mm for the Sens(-I).

The cable has to be passed protected against mechanical damage. This could be done by passing the cable through suitable areas, in tubular cable protection or on cable platforms. A strain relief close to the cable gland has to be ensured (if necessary use ExTox Accessories).

5.2.2 Cable Gland and Shield

The cable is lead through the supplied cable gland into the transmitter housing. The cable gland consists of a flange, which is screwed into and adhered in the housing, the clamp / sealing set and the thread bush.

You have to lead the cable now successively through the thread bush, clamp / sealing set and the flange. It is very important that the clamp / sealing set are assembled correctly. Please make sure that the end of cable is long enough for a later assignment of connection clamps in the transmitter. You now have to assemble the cable shield at the flange and fix the cable fastener by seizing the thread bush.



Transmitters ExSens-I and Sens-I will be delivered with cable glands as standard which will ensure the explosion protection in conjunction with the specified cable. In case of need it is possible to use other cable glands or blank plugs of dimension M16. These shall be appropriate and approved, see certificate as component and technical specification of its manufacturer.

5.2.3 Connection to Ground

For both transmitter series connection to ground can be done both inside the housing (PE in transmitter cable) and outside the housing (PE externally) for both transmitter series. The connections are marked with the earthing symbol. Only for the Sens(-I) the outer connection to ground has to be done at one fixing screws when installing. There is no marking.

Connection of the ExSens-I and Sens-I is possible for line cross-sections up to 1 mm (cross-section 1.5 mm²). The outer connection of the ExSens-I is designed for line cross-sections up to 2 mm (cross-section 4 mm²).

5.2.4 Clamp Connection

The clamp connection is described in the Transmitter Data Sheets (DB).

The connections are plug clamps. Remove the plug before connecting the cable to avoid mechanical damage. After the assembly is done you could connect the plug again.

5.3 Initial Operation

On termination of the installation work the transmitter can be put into operation. This is automatically done by over-plugging the power supply. The transmitter now passes through the start-up phase according to Chapter 3.2.4 (Current interface issues 0.8 mA for ca. 1 minute).



Please check the power supply at the transmitter. It should not be less than 18 V DC. Please consider the voltage drop on the transmitter cable occurring from the control unit to the transmitter. If the transmitter is mounted in hazardous areas please follow the instructions in Chapter 0 before performing any measurements.

To check the measuring function, please perform a calibration according to Chapter 6.5.1. Please pay attention to the hints on how to avoid false alarms.

In case the transmitter behaviour does not correspond to that in normal measuring operation (Chapter 3.2.1), please make use of the hints in Chapter 3.3 for diagnosis and removal of annoyances.

6 Maintenance

The following descriptions are generally valid for Gas Detection Systems of the company Ex-Tox GmbH consisting of the herein described control units and connected transmitters.

6.1 Basic Information

Maintenance done by specialists is an indispensable measure for checking and keeping the functionality of gas detection systems. Maintenance comprises inspection, calibration and adjustment as well as functional test of the complete system.

You as user of the gas detection system bear the responsibility for the correct performance of the maintenance. ExTox as manufacturer can only place all necessary details to build up your specific maintenance concept at your disposal. We are glad to support you with this task and to submit a maintenance quotation acc. to your special requirements.

National valid regulations to define maintenance intervals may exist. In Germany it is for example necessary in certain applications to keep Betriebssicherheitsverordnung (BetrSichV) and the rules DGUV²-Information 213-056 (Merkblatt T021) and 213-057 (Merkblatt T023)³ (see 4.1). ExTox recommends generally speaking the application of the measures described in this rules as well as the maximum calibration intervals even if the application does not fit into their scope.

Maximum Intervals			
Explosion Protection (DGUV-I 213-057, T 023)		Toxic Gases/Vapours and Oxygen (DGUV-I 213-056, T 021)	
1 Month	(Visual Check)	1 Month	(Visual Check)
4 Months	(Functional Check)	4 Months	(Functional Check)
1 Year	(System Check)	1 Year	(System Check)

Independently ExTox recommends maintenance with the extent of functional and system checks in intervals of 6 months in maximum. Please see also the details in the corresponding Technical Data Sheets (DB). An extension up to 12 months might only be possible in special cases of existing experiences of the user on similar applications.

The result of each maintenance should be documented even if it is not specifically required.

Hereafter the main contents of the intended checks are described. You will find details in the above mentioned bulletins.

Most important is the testing of the connected transmitters. Control of the gas detection system and its correct functionality are also checked.

6.2 Visual Check

You have to check your system on mechanical damages, dust, dirt, state of a sampling system if included. Furthermore indications and status messages have to be checked.

² DGUV: Deutsche Gesetzliche Unfallversicherung ("German Statutory Accident Insurance")

³ English versions available as T021e and T023e

6.3 Functional Check

The functional check also comprises calibration by means of application of test gases and a suitable system for application of test gas. When calibrating the indication of measured values at application of test gas is determined and compared with the nominal values. In case the settings are corrected additionally the process is called adjustment. In case of combination with sampling systems their correct function has also to be checked. It is not necessary to trigger the switching functions.

A functional check should only be done, if there is no alarm present. You should ensure the same environmental conditions during this process as valid for the measuring process. For example a transmitter used in cold storage houses should not be adjusted under normal ambient temperatures, as there might be more or less remarkable deviations depending on sensor type.

Make sure that measures have been taken to avoid unintended triggering and transmission of alarms before applying test gas. Activate the alarm bypass in service mode at your ExTox Control Unit, deactivate automatically triggering protection measures or inform the responsible maintenance personnel. The measures corresponding to your application have to be determined and the person in charge for maintenance has to be familiar with all details.

6.4 System Check

The system check additionally comprises the triggering of switching functions; check of system parameters and of indication and recording facilities.

6.5 Calibration and Adjustment

Calibration and Adjustment are done by means of test gases and a suitable system for application of test gas. When calibrating the indication of measured values at application of test gas is determined and compared with the nominal values. In case the settings are corrected additionally the process is called adjustment.

Calibration or adjustment should only be done, if an alarm is not present. You should ensure the same environmental conditions during this process as valid for the measuring process. For example a transmitter used in cold storage houses should not be adjusted under normal ambient temperatures, as there might be more or less remarkable deviations depending on sensor type.

Make sure that measures have been taken to avoid unintended triggering and transmission of alarms before applying test gas. Activate the alarm bypass in service mode at your ExTox Control Unit, deactivate automatically triggering protection measures or inform the responsible maintenance personnel. The measures corresponding to your application have to be determined and the person in charge for maintenance has to be familiar with all details.

6.5.1 Performance of Calibration

The necessary test gases (☞DB), the system for application of test gas as well as the ExTox Calibration Adapter have to be prepared.

It has to be ensured that all used material is compatible with the measured gas and that substances to contaminate the sensor element are not available. For example, you should not use tubes containing silicone for transmitters working on the principle of catalytic combustion. ExTox offers you suitable equipment if requested.

The use of the ExTox Calibration Adapter ensures that the measuring results when applying test gas correspond to those in normal measuring operation of the transmitter.

The calibration adapter has to be put onto the sensor element as far as it will go. The adapter should not be canted and it should lock leak-proof with the sensor element. Connect the hose of your calibration device with the gas inlet of the adapter. The small openings of the calibration adapter serve as gas outlet. It might be necessary for toxic gases to lead the test gas safely away via a connected hose pipe. Please ensure that the flow resistance remains low enough to avoid a pressure build-up inside the adapter.

Now apply zero gas and test gas one after another. Duration and flow rate for your transmitter as per Data Sheet (☞DB). Please keep an eye on the start-up phase of the measuring signal. A stable value should appear till the end of the particular test gas application. Read then the measured value out of the display of the control unit or by measuring the 4-20 mA Signal.

The 4-20 mA Signal could also be converted into the measured value acc. to the following formula:

$$\text{Measured Value} = \frac{\text{Measured Current} - 4 \text{ mA}}{16 \text{ mA}} \cdot \text{Upper Limit Value of Measuring Range}$$

For some transmitters calibration is not performed with the proper measured gas but with replacement test gases. In this case please take the remarks for conversion on the Transmitter Test Certificate into consideration.

Before using replacement test gases please contact ExTox definitely.

It is only then necessary to do an adjustment when the defined tolerances are exceeded. The tolerances depend on your own specifications or might be determined by mandatory regulations such as for example official approbations.

Should you require assistance to determine these tolerances, please do not hesitate to contact ExTox.

6.5.2 Performance of Adjustment

6.5.2.1 ExSens-I and Sens-I (with RS 485-Communication)

Adjustment of the transmitters is done via PC-Software ComSens (☞ComSens). You only need a suitable interface converter for using the RS 485-interface with your PC. Suitable converters are available in the ExTox delivery programme (see Chapter 8). The interface converter can on the one hand be connected to the clamps inside the transmitter or on the other hand if correspondingly wired at the clamps of the control unit.

Please pay also attention to the remarks for calibration in Chapter 6.5.1 when performing the adjustment.

Adjustment for ExSens and Sens can also be done without RS 485-Communication as per description in Chapter 6.5.2.2. But the drift values evaluated by the Software ComSens will be invalid. To make such intervention visible, the potentiometer for zero point and sensitivity adjustment are sealed with lacquer on delivery of the types ExSens-I and Sens-I.

6.5.2.2 ExSens and Sens (without RS 485-Communication)

Adjustment is done via potentiometer on the electronic PCBs inside the housing. In both Transmitter Series the housing can be opened by removing the cover. If the transmitter is mounted in hazardous areas please follow the instructions in Chapter 4.2.

The potentiometer to adjust the zero point is marked with "Zero", the one to adjust the sensitivity is marked with "Sens". All other potentiometer are adjusted and sealed factory-sided. It is not allowed to adjust them.

You always have to adjust the zero point at first before you adjust the sensitivity by applying test gas. If you do it the other way round the setting of the sensitivity of the transmitter may be wrong.

We recommend checking the zero point finally again. This is to ensure that the transmitter is not by mistake in alarm mode at the end of the calibration and adjustment process.

7 Technical Data

Please see separate Transmitter Data Sheet including operating guide and Gas- / Transmitterlist for all technical details (☞DB).

8 Accessories, Spares and Return of Old Devices

Article-Number	Description
type specific	Replacement Sensor Element
830013/830014	Calibration Adapter for standard gases/aggressive gases
830015	Standard Remote Calibration Adapter
830016/830017	Standard Flow Adapter for standard gases/aggressive gases, e. g. used in ExTox IMC
840000	PC-Software ComSens
type specific	Fixing Angle 90° for installation at the ceiling
type specific	Adapter for pipe installation (ExSens-I)
type specific	Weather proof housing Stainless Steel (incl. heating/Ex-heating)
861000	Transmitter-Cable 3 x 2 x 0.8 mm
861001	Transmitter-Cable 3 x 0.8 mm
861017	Transmitter-Cable 4 x 0.8 mm

Return of old devices:

Old devices can be returned free of charge to ExTox, for example in our ExTox head office. In this case the cost for transport or dispatch has to borne by the user. Smaller units can also be handed over to the ExTox-Service or Sales personnel, who will collect and transport them to the head office.

9 EU-Declaration of Conformity

EU-Declaration of Conformity is added to the documentation separately.