cmc Instruments GmbH

USER MANUAL

TRACE-MOISTURE-ANALYZER

0 - 2500 ppm/v H_2O

MODEL TMA

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1. ABOUT THIS MANUAL

This analyzer was designed for simple use, according to the „Plug and play“ principle and so was this manual. For the benefits of clarity, all electronics, sofwares and physical details not necessary for the operation of the unit are omitted. It is the way we want it.

We understand that you want to put your new analyzer to use as soon as possible. To achieve this goal, take the time to read **all this manual in its entirety**. Every section is based on the assumption that you have read and understood the preceding one, and every section has important comments for the user. This analyzer is very simple to install and to use; also, it is maintenance-free. No special technical knowledge is required to operate the unit.

We hope that you will enjoy working with the **TMA Trace-Moisture-Analyzer**. In the spirit of progress and continuous improvement, we would appreciate any comments you may have, negative or positive- as long they are constructive.

cmc Instruments GmbH believes that the information in this manual is accurate. The document has been carefully reviewed for technical accuracy. If there should be any error, cmc Instruments GmbH reserves the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should contact
cmc Instruments GmbH if errors are suspected. In no event shall cmc Instruments GmbH be liable for any damages arising out of or related to this document or the information contained in it.

THANK YOU FOR BUYING CMC INSTRUMENTS !

Unpacking the instrument

To provide appropriate protection during shipping the analyzer comes in a sturdy packaging.

IMPORTANT:

Should the packaging show visible signes of abuse or open damages the analyzer is to be unpacked immediately with extra care to check for eventual damage. If any indication for a defective instrument is given it should under no circumstance be placed into service.
Immediately contact your sales representative or cmc Instruments GmbH directly for further advice.
After the instrument is unpacked make sure to check the packaging for additional parts and manuals.
Should the analyzer be stored again before it is being placed into service it has to be done so in the original shipping container.

2.WARRANTY; SERVICE POLICY, REPAIR SERVICE

Goods and part(s) (excluding consumable) manufactured by Seller are warranted to be free from defects in workmanship and material under normal use and service for a period of twelve (12) months from the date of shipment by Seller. Consumable, glass-holder, O-rings, etc. are warranted to be free from defects in workmanship and material under normal use and service for a period of ninety (90) days from date of shipment by Seller. Goods, part(s) and consumable proven by Seller to be defective in workmanship and /or material shall be replaced or repaired, free of charge, F.O.B. Seller's factory provided that the goods, part(s) or consumable are returned to Seller's designated factory, transportation charges prepaid, within the twelve (12) months period of warranty in the case of goods and part(s), and in the case of consumable, within the ninety (90) days period of warranty. This warranty shall be in effect for replacement or repaired goods, part(s) and the remaining portion of the ninety (90) days warranty in the case of consumable. A defect in goods, part(s) and consumable of the commercial unit shall not operate to condemn such commercial unit when such goods, part(s) and consumable are capable of being renewed, repaired or replaced.

The Seller shall not be liable to the Buyer, or to any other person, for the loss or damage directly or indirectly, arising from the use of the equipment of goods, from breach of any warranty, or from any other cause.
All other warranties, expressed or implied are hereby excluded.

IN CONSIDERATION OF THE HEREIN STATED PURCHASE PRICE OF THE GOODS, SELLER GRANTS ONLY THE ABOVE STATED EXPRESS WARRABTY. NO OTHER WARRANTIES ARE GRANTED INCLUDING, BUT NOT LIMITED, EXPRESS AND IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

THIS WARRANTY IS THE ONLY WARRANTY MADE BY cmc Instruments GmbH WITH RESPECT TO THE GOODS DELIVERED HEREUNDER, AND NO EMPLOYEE, REPRESENTATIVE OR OTHER PERSON OR ENTITY IS AUTHORIZED TO ASSUME FOR cmc Instruments GmbH ANY OBLIGATION OR LIABILITY BEYOUND OR AT VARIANCE WITH THIS WARRANTY IN CONNECTION WITH THE SALE OF cmc Instruments PRODUCTS:

Limitations of Remedy:

SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE. THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OR WARRANTY SHALL BE LIMMITED TO REPAIR OR REPLAYCEMENT UNDER THE STANDARD WARRANTY CLAUSE. IN NO CASE, REGARDLESS OF THE FORM OF THE CAUSE OF ACTION, SHALL SELLER'S LIABILITY EXCEED THE PRICE TO BUYER OF THE SPECIFIC GOODS MANUFACTURED BY SELLER GIVING RISE TO THE CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILITYEXTEND TO INCLUDE INCIDENTAL OR CONSEQUENTIAL DAMAGES. CONSEQUENTIAL DAMAGES SHALL INCLUDE BUT ARE NOT LIMITED TO; LOSS OF ANTICIPATED PROFITS, LOSS OF USE, LOSS OF REVENUE, COST OF CAPITAL AND DAMAGE OR LOSS OF OTHER PROPERTY OR EQUIPMENT. IN NO EVENT SHALL SELLER BE LIABLE FOR PROPERTY DAMAGE AND/OR THIRD PARTY CLAIMS COVERED BY UMBRELLA INSURANCE AND/OR INDEMNITY COVERAGE PROVIDED TO BUYER, IST ASSIGNS, AND EACH SUCCESSOR INTEREST TO THE GOODS PROVIDED HERE UNDER.

Major force. Seller not be liable for failure to perform due to labor strikes or acts beyond Seller's direct control.

3.1 SERVICE POLICY

1. If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rate.

2. Customers who return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.

2. For parts replacement, the original part must be returned within serial and model numbers of the analyzer. No part will be shipped if theoriginal is not sent back to cmc Instrumets GmbH.

3.2 PROPRIETARY RIGHTS

Buyer agrees that any cmc Instruments software, firmware and hardware products ordered or included in the goods ordered are proprietary to cmc Instruments GmbH. No change, modification, defacement, alteration, reverse engineering, software decompilatios nor reproduction of such software or hardware products or disclosures of programming content to other parties is authorized without the express written consent of cmc Instruments GmbH.

To maintain cmc Instrumets GmbH trade sectret and other proprietary protection of such software and firmware, such items are not sold hereunder but are licensed to buyer.

4.SPECIFICATIONS

Amplifier	TMA-202 (20 l/h), **TMA-204 (20 l/h)**, TMA-210 (100 l/h)
Ranges:	0- 10 ppm/v 0- 100 ppm/v 0- 1000 ppm/v 0- 2500 ppm/v service-menu to regenerate the sensor
Accuracy:	better than +/- 1 % of full scale
Sensitivity:	+/- 0,1 % of full scale
Operation:	manually, remote-control, auto-ranging, RS 232
Digital outputs:	- 2 potentialfree relais for alarm (**alternate contact**) (300 VA, max. 230 V) - 5 potentialfree relais for range identification (**closing contact**), (max. 10 W/10 VA, max.100 V)
Analog outputs (either/or): with range identification	0-20 mA (< 500 Ohm) 4-20 mA (< 500 Ohm) (isolated output on request) 0-10 V (> 100 kOhm)
Display:	LC- multifunctional
Serial port (option):	RS 232 –Modem (24 V)
Digital inputs:	remote control (EXT) over 5 relais for range switching
Calibration:	Auto-zero/ Auto – span –calibration (self-check)
Supply:	230 VAC-50-60 Hz or 115 VAC-50-60 Hz (on order)
Fuse:	200 mA (MT)
Power consumption:	8 W
Operating temperature:	-10 °C to +50 °C
Enclosure protection:	IP 20
Dimensions:	Length: 257 mm Height: 160 mm (3U) Depth: 316 mm
Weight:	6 kg

Sensor

Sample flow-rate:	**20 Sl/h** optional 100 Sl/h
Recommended gas-pressure:	0,1 barg to 1,5 barg
Ambient temperature:	+5 °C to +50 °C
Sample temperature:	+5 °C to max. +150 °C
Response time:	< 1 sec.
Rising time T_{50}:	< 8 sec.
Accuracy:	+/- 1 % of full scale (with cmc- amplifier)
Detectability:	0,1 ppm/v H2O (with cmc- amplifier)
Sensor-cable:	2 mtr. (other length on request) -shielded cable with high quality water proof connections (LEMO)
Dimensions:	High: 120 mm, Diameter: 43 mm, Weight: 300 g
Gas-Connections:	6 mm pipe fitting (Swagelok®) for metal-bodies 6 mm tube-connection for glass-body
Sensor-rod made in glass:	electrodes made in platinum, **optional** rhodium
O-Rings:	Viton, optional PTFE
Sensor body:	TMS-SS **stainless steel 316 SS** testing-pressure: 10 barg
	TMS-M **monell 400** testing-pressure: 10 barg
	TMS-H **Hastelloy** testing-pressure: 10 barg
	TMS-G **glass** testing-pressure: 1,5 barg

5. DESCRIPTION

The TMA trace moisture analyzer is an instrument for measuring 0 to 2500 ppm/v moisture in gases.

It consists out of three basic modules: **moisture- sensor**
power supply
amplifier

These modules can be mounted in 19“ table top cases, portable cases, wall mounted cases or 19“ instrument racks.

PLEASE READ THE ENTIRE MANUAL BEFORE OPERATING THE ANALYZER.

Analyzer

The trace moisture analyzer TMA is fully microprocessor controlled and is designed to operate in the rough field service. The amplifier is a high technology, solid state unit which is available as a base- and also as a portable version.

2 Alarmlevels can be set, 5 potentialfree relais for range identification, one analog output and one serial port RS 232 (optional) are integrated.

For remote control there are 5 isolated input contacts to switch the ranges externally.
The system can be set in 4 modes: manual, external, auto range and via RS 232 (optional).
The high quality LC- display shows the measuring result in ppm/v, the alarm levels which are set and also the mode (for example: auto ranging).
The connections of the sensor are of special high quality water proof connectors (MIL-STD-1344 A).
After switching on the unit, the instrument automatically is doing a self-check.

To measure in explosive hazardous areas the unit can be fitted with safety barrieres **Ex(i)**.
Portable unit with reachargable battery and built in charger on request.

5.1 PRINCIPLE OF OPERATION

The P_2O_5- sensor uses the principle of dissociation of water to hydrogen and oxygen. The sensor element itself consits out of a round glass body on which two electrodes are wounded at constant distance. Depending on the sensor-type these electrodes are either made out of platinum or rhodium wire. Between these electrodes a thin film of phosphoric-acid (H_3PO_4) is applied. The sensor-current causes the water contained in the acid to dissociate to hydrogen and oxygen.
The result of this process is P_2O_5 (diphosphorous-pentoxyde). P_2O_5 is a highly hygroscopic substance which absorbs the water from the sample gas. Through continuous dissociation of the water a balance between the water content of the sample gas and the water which is beeing dissociated builds up. The electrolysis current is proportional to the water content in

the sample gas (FARADAY's LAW). It is displayed on the instrument readout after it is beeing processed by the instruments signal amplifier. This principle of measurement can be used on all gases except those which chemically react with phosphoric-acid or do polymerisate.
The sensor works reliable in all corrosive gases like Cl_2, HCl, H_2S, HBr,HF or CO_2.
Also in combustible-gases like H_2, CH_4 and other carbons.

The sensor can not work in ammonia (NH_4).

5.2 SAFETY INSTRUCTIONS

Do comply with these safety precautions under any circumstances. Failure to comply with these regulations may be hazardous to the health of the operating personnel and/or cause damage to the instrument.

This analyzer is not to be operated in an explosive environment without additional protective measures.
The analyzer has to be operated in a dry and frost-free environment. Avoid exposure to direct sun-light and other sources of extensive heat. The analyzer is only to be operated between -10°C and +50°C ambient temperature. If the instrument is operated outside we recommend to install it in a weather-proof enclosure.

Gas-inlet and gas-outlet should under no circumstances be confound with each other !

Only conditioned sample gases are to be used with this analyzer ! If used with corrosive sample gases make sure to check that no components are present that might damage the sample carrying parts of the analyzer.

Always observe all current safety regulations for handling sample- and calibration gases and pressurized gas cylinders !

Flammable and/or explosive gases are not to be measured by the instrument without the appropriate safety precautions !

5.3 POWER SUPPLY

Before placing the unit into service do always cross-check the required voltage given on the data-plate with your local mains power voltage!

The power-plug is only to be connected to a grounded receptacle. The protective measures are not to be by-passed by using an ungrounded extension cord !

Every interruption or disconnection of the protective grounding inside or outside of the instrument can cause the instrument to become a safety hazard. Deliberate disruptions are not tolerable !

Before any attempt to open, service or repair the analyzer, the instrument is to be disconnected from any power source !

If working on an opend and fully connected instrument is unavoidable it is only to be done by authorized and trained personnel who are fully aware of all eventual hazards that are associated with this kind of work !

If any fuse is to be replaced it is the operators responsibility to ensure that only the same type of fuse with the exact same electrical specifications is used !

The use of repaired fuses or the short circuiting of the fuses is not admissible !

5.4 ELECTROSTATIC ELECTRICITY

Handling electronic components is a relatively easy task, but the following should be considered:

The electronic components used in this instrument might be permanently damaged by electrostatic discharge (ESD).

These discharges can be avoid by following these precautions:

Electricity should be discharged prior to opening the instrument. Make sure that there is no charge build-up during working on the open instrument.

The best possible protection would be achieved if all work on the instrument is done at an ESD-safe work place where you wear an antistatic wristband.

Should such a workplace not be available the following guidlines are to be strictly followed:

Any electrostatic electricity is to be discharged by touching the metal case of a protected instrument which is connected to an appropriate power receptacle.

Do not plug in the instrument you are working on to provide discharge capability !

This procedure is to be repeated several times during working on the instrument.

6. INSTALLATION OF THE SENSOR

The sensor can be mounted on a special mounting bracket via three M-4 screws. If necessary the sensor can be mounted in various positions using the mounting bracket available as additional accessories (see also drawing). As a matter of principle the connector receptacle should point upward but however horizontal installation is also possible.

The lower gas-connector has to be used as sample-in ! The upper connector is sample-out ! If the sensor is mounted horizontally sample-in and sample-out connectors are optional. But sample supply then has to occur from below !

Sample conditioning

To ensure proper functioning of the sensor the sample gas has to be conditioned if necessary.

The input pressure is not to exceed 1,5 barg (22 psig). Sample output has to occur against ambient pressure. Sample flow has to be adjusted to **20** (100) Sl/h. We recommend installing a precision valve to the inlet and a flow- meter without needle valve to the outlet of the sensor (see also drawing). Other possibillity is to use a flow-meter with needle-valve at the inlet. To prevent re-diffusion of moisture into the system a tube of at least 1 m (3 ft.) in length has to be connected to the sample output.
Generally, stainless steel has to be used as tubing material. If used on highly corrosive sample gases PFA-tubing may be used. Other plastic materials must not be used as their diffusion rate for water is to large !

If the sample gas contains mechanical impurities a special particle filter has to be used. This special filter has to feature only a very small surface area. Larger filter surfaces would create a water trap and thus lead to false sample results (**MEMORY-EFFECT**).

For selection and design of the appropriate sample conditioning and sample handling please contact **cmc Instruments GmbH, Tel: (49) 06173-320078**

7. PLACING THE ANALYZER INTO SERVICE

Connect your trace moisture analyzer Model TMA to mains power using the include power cord. Do also connect the sensor to the analyzer using the included sensor cord.
Please make sure that mains voltage and instrument voltage correspond.

The instrument is activated bey pushing the power-switch at the rear of the unit.
On the front panel of the power supply module two green LED‘s will light up.
This indicates that the voltage for the amplifier and the power supply module is present.
The two red coloured LED’s indicates the pre-set low-/high alarm.

All analyzer functions are controlled through different menu options. The following figures in this section show the overall menu structure. You must become familiar with it.

7.1 At power on, the analyzer displays the **SYSTEM CHECK MENU.**

TMA-X Version X.Y
Systemcheck
Systemcheck: ok
SENSOR : 20 Nl/h
Exi- BARRIERES : NO

This test is checking automatically for a few second the electronic unit of the system, which means the electronically zero and the electronic gain of the system.

7.2 After the system-check the analzer displays the **MAIN MENU**.

Range: 0 . . 10 AUTO
0,00 ppm
ALARM 1 : > 500 ppm
ALARM 2 : < 50 ppm

Now the analyzer is ready for measurement !

At the beginning the analyzer displays you moisture contents of more than 5000 ppm/v.
First all upstream pipes, valves and flow-meters must be purged and dry-out from ambient humidity.
Moreover the moisture in the phosphoric-acid must be dry-out before the proper hygroscopic reaction could start on the sensor-rods surface.
This means that after switching on the analyzer it could takes some minutes before the whole system get purged.

7.3 OPERATION MODE

Pressing ENTER will give you the possibility to choose the operation mode.

You can choose by pressing the up/down (↑ /↓) buttons the following operation mode:

AUTO / EXT / RS 232 / MAN

7.4 ALARM 1

After adjustment you can press again ENTER for setting ALARM 1.
With the up/down (↑ /↓) buttons you can select whether the ALARM 1 should release

as a high or as a low alarm (< / >).

Press again ENTER and you can set by the up/down (↑ /↓) buttons the required alarm-value in ppm.

7.5 ALARM 2

After adjustment you can press again ENTER for setting ALARM 2.

With the up/down (↑ /↓) buttons you can select whether the ALARM 2 should release as a high or low alarm (< / >).

Press again ENTER and you can set by the up/down (↑ /↓) buttons the required alarm-value in ppm.

7.6 MAN (manual) MENU

With the up/down (↑ /↓) buttons you can pre-adjust the following ranges:

0 . . 10 / 0 . . 100 / 0 . . 1000 / 0 . . 2500 ppm plus service (up to max. 5000 ppm)

Exmpl.1: If your expexted moisture-value will be 700 ppm please adjust range 0 . . 1000 ppm

Exmpl.2: If your expexted moisture-value will be 70 ppm please adjust range 0 . . 100 ppm

Over range

If your selected range is 0 . . 100 ppm and the actual moisture-value in the sample gas will increase to 110 ppm the display will show you 100 ppm plus a over-range-sign (D **100 ppm**). In this case please adjust range 0 . . 1000 ppm to read the correct moisture-value.
Over the sector 0 . . 2500 ppm the measured accuracy is +/- 1 % of actual range (f.s.)

Additionally you can read moisture-levels up to 5000 ppm **(service-range)** but here the accuracy will be max. +/- 5 % of full scale.
This „range“ **shouldn’t** be used for correct useage, only for better orientation to indicates you where is the actual moisture level.

7.7 AUTO (auto ranging) MENU

Please choose this mode if you are expecting fluctuate or discontinuous moisture-values.
The display shows you all values over the full sector 0 . . 5000 ppm.
Over the sector 0 . . 2500 ppm the measured accuracy is +/- 1 % of actual range (f.s.)

Additionally you can read moisture-levels up to 5000 ppm (service-range) but here the accuracy will be max. +/- 5 % of full scale.
This „range“ **shouldn't** be used for correct useage, only for better orientation to indicates you where is the actual moisture level.

7.8 EXT (external/ remote control) MENU

For remote control you can switch the ranges over **SIGNAL INPUT**
(25 pin SUB-D-connector) on the rear of the unit.

The pins at the 25 pin SUB-D **signal-in**–**plug** are as follows:

	Remote range
pin 1:	0 .. 10 ppm/v
pin 14:	+12 Vdc
pin 2:	0 .. 100 ppm/v
pin 15:	+ 12 Vdc
pin 3:	0 .. 1000 ppm/v
pin 16:	+ 12 Vdc
pin 4:	0 .. 2500 ppm/v
pin 17:	+ 12 Vdc
pin 5:	service up to 5000 ppm/v
pin 18:	+ 12 Vdc

Pins: 6,19,7,20,8,21,9,22,10,23,11,24,12,25 and 13 are **not** connected.

7.9 RS 232 (serial communication) MENU

With this option installed, this analyzer retransmits the operating parameters and process values to a remote computer through a serial link.The computer is connected to the analyzer by the mean of a shielded cable. The computer must have an appropriate software to read the date transmitted by the analyzer.

A communication software could be supplied with the analyzer (option). You can use either free software supplied by cmc Instruments GmbH or any other commercially available software.

You need a DB-9 cable. This allows direct connection to a personal computer serial port.

The communication parameters of the analyzer are:

- Baud rate: 9600 Baud
- Parity bits: none
- Data bits: 8
- Stop bits: 1

The pins at the 9 pin SUB-D **RS 232 socket** are as follows:

pin 1: shortcut with 4,6
pin 6: shortcut with 1,4
pin 2: TXD (transmission data)
pin 7: shortcut with 8
pin 3: RXD (receiving data)
pin 8: shortcut with 7
pin 4: shortcut with 1,6
pin 9: not connected
pin 5: GNDEXT (ground)

8. SIGNAL OUTPUTS:

Digital outputs:
- 2 potentialfree relais for alarm 1,2 (**alternate contact**) (300 VA, max. 230 V)
- 5 potentialfree relais for range identification (**closing contact**), (max. 10 W/10 VA, max.100 V)

Analog outputs (either/or):	0-20 mA	(< 500 Ohm)	
with range identification	4-20 mA	(< 500 Ohm)	(isolated output on
	0-10 V	(> 100 kOhm)	request)

The pins at the 25 pin SUB-D **signal-output-socket** are as follows:

Analog outputs:

pin1: 0 .. 10 V +
pin 14: 0 .. 10 V –
pin 2: 0 .. 20 mA + **or** 4 .. 20 mA +
pin 15: 0 .. 20 mA – **or** 4 .. 20 mA –

Alarm 1, Alarm 2:

pin 3: alarm 1- opening contact
pin 16: alarm 1- common
pin 4: alarm 1- closing contact
pin 17: not connected
pin 5: alarm 2- opening contact
pin 18: alarm 2-common
pin 6: alarm 2- closing contact
pin 19: ready for measurement
pin 7: ready for measurement
pin 20: not connected
pin 8: not connected

Range identification:

pin 21:	service (0..5000 ppm/v) –identification
pin 9:	service (0..5000 ppm/v)-identification
pin 22:	0 .. 2500 ppm-identification
pin 10:	0 .. 2500 ppm-identification
pin 23:	0 .. 1000 ppm identification
pin 11:	0 .. 1000 ppm identification
pin 24:	0 .. 100 ppm- identification
pin 12:	0 .. 100 ppm- identification
pin 25:	0 .. 10 ppm- identification
pin 13:	0 .. 10 ppm- identification

8.1 SYSTEM RESET / SERVICE

To bring you into the SEVICE-MENU please proceed as follows (**2 possibilities**) :

1. When you are switching on the power-button, simultaneous hold the ENTER-button for about 3 sec.
   Now you place the analyzer into the SERVICE-MENU.

2. If the analyzer is already measuring and the OPERATION MODE is adjusted (AUTO, RS 232 or EXT) you can bring the unit into the SERRVICE-MENU by pressing simultaneously the up (↑) **and** the down (↓) buttons (more than 3 sec.)

After switching on the **SERVICE-MENU** displays you:

```
SERVICEMENU
0        0 ppm        X          (this line is only for cmc Instruments service engineers)
ZERO                             electrical zero-point-check of amplifier
ENDPOINT (SPAN)                  electrical endpoint-check of amplifier
OFFSET/SPAN
→ANALOG OUT        : 4/20 mA
MENUE 2                          (choose language)
EXIT
```

If you are not using the SERVICE-MENU after 30 sec. the analyzer will be switched back automatically into the MAIN-MENU.

If you'll check the ENDPOINT the instrument has to display 1395 ppm/v. After this check please press again ENTER and wait 2 sec., now you can go by the cursor-key downstairs and leave the service-menu by EXIT.

In this SERVICE-MENU you can pre-adjust the following parameters:

With the up (↑)/down(↓) button and then ENTER you can select:

- 0 0 ppm 3 :only for cmc Instruments service ingenieurs

- NULLPUNKT (zero): only for cmc Instruments service engineers

- ENDPUNKT (end point): only for cmc Instruments service engineers

- DELAY: (transmission interval for RS 232) 1 sec, 2, sec, 3 sec.,....99 sec.

- OFFSET: correction of actual ppm value +/- 1 ppm, 2 ppm, 3 ppm, 4 ppm, 5 ppm

- ANALOG OUTPUTS: either/or 0-20 mA or 4-20 mA or 0-10 V

- EXIT: back to the MAIN-MENU

For **SYSTEMRESET** please press also the up (↑)/down(↓) button.
The system will be reset back to the basic parameters.

9. REGENERATION OF THE SENSOR

IMPORTANT !

Phosphoric acid is a highly corrosive substance ! All safety regulations concerning storage, handling and working with the substances valid in your area must under all circumstances be strictly observed !
Always wear protective gear and safety googles when performing this task !

If the displayed moisture value seems to be to high or moves sluggishly it may indicate that the sample cell has to be recovered.

To remove the sensor from it's housing disconnect the sensor cord and carefully unscrew the sensor-head. Now the glass-rod with the electrodes made in platinum (or rhodium) can be cleaned. Use great care while doing so !
Rinse the glas-rod thoroughly with running water and carefully wipe dry. If necessary remove any mechanical impurites with a soft laboratory cleaning brush and rinse thoroughly once-more with water.
Now rinse with acetone or a hot-fan to evaporate rest watertraces between the electrodes.
Now reconnect the sensor cord with the sensor-head.
The display must read 0,00 in the 0 .. 10 ppm range with a max. discrepancy of 0,05 ppm.
This action verifies that all impurities have been removed. If a value greater than 0,05 ppm is displayed the cleaning process has to be repeated until the required zero-value is achieved.

Please choose the **service-range** for the next step.
Apply a 50 % phosphoric acid solution to the glass-rod using a pipette while slowly turning the sensor to allow even distribution of the acid around the whole circumference. This is indicated by a foaming action of the phosphoric acid. The sensor has to be evently coverd with foam in the area between and around the two electrodes. The foam disappears after 1 min. Now any excess acid can be dabbed off using a paper towel.

IMPORTANT !: Never touch the electrodes with the paper towel !
During the recovering process with new phosphoric acid the glass-rod should show downstairs (↓) to avoid that droplets of the phosphoric-acid touch the sensor head made in metal (not guilty for glass sensors).

Now disconnect the sensor cord. Before re-installing the sensor-head into the sensor-bowl please check the O-ring for impurities and damage. Clean the O-ring or use a new one if necessary.
Now the sensor is ready to be placed again into service.

REGENERATION IN SHORT STEPS

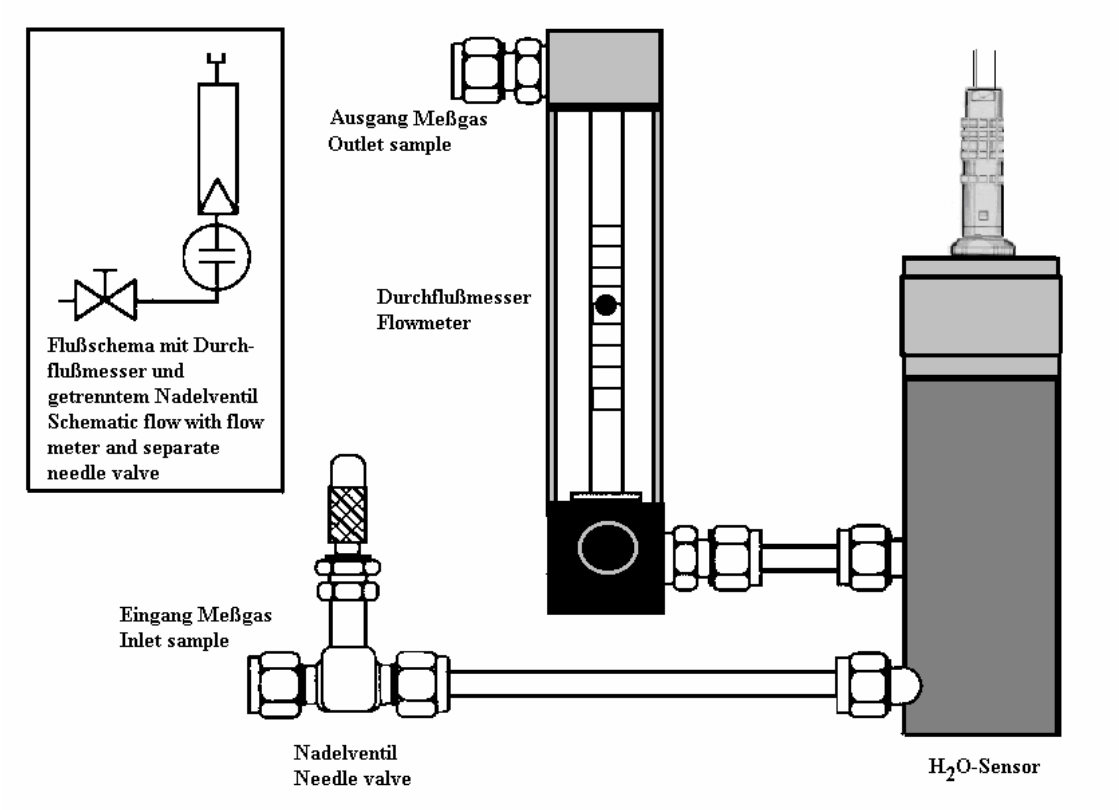
For regular regeneration of sensor we are recommending our **SERVICE-KIT**.
All parts and tools you need for easy regeneration contain in a stable suitcase made in plastic.
It consists off: de-ionized water, acetone, phosphoric-acid (50 %), safety gloves, safety glasses, spanner and brush.

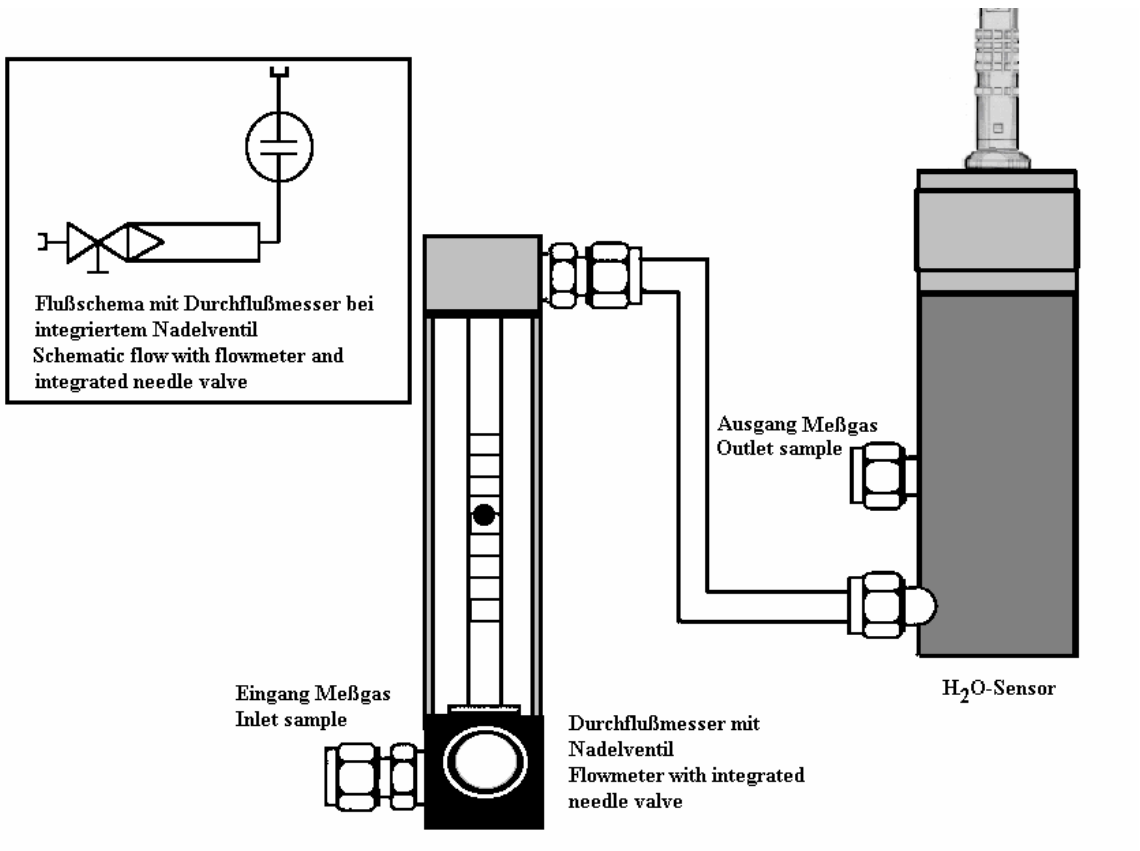
Unscrew carefully the sensor-head and clean the glass-rod under running water. Use a clean brush to remove any mechanical impurities and rinse oncemore with de-ionized water.
NOTE: During this process please hold the sensor-head/ glass-rod **downstairs** (see picture).

Now rinse with acetone or use a hot-fan to evaporate the rest of watertraces.
Reconnect the sensor-cord to the head. Display must read 0,00 in the 0-10 ppm range. If not, some small particles are still between the electrodes and the cleaning process has to be repeated until the required zero-value is achieved. Otherwise you will measure offset.

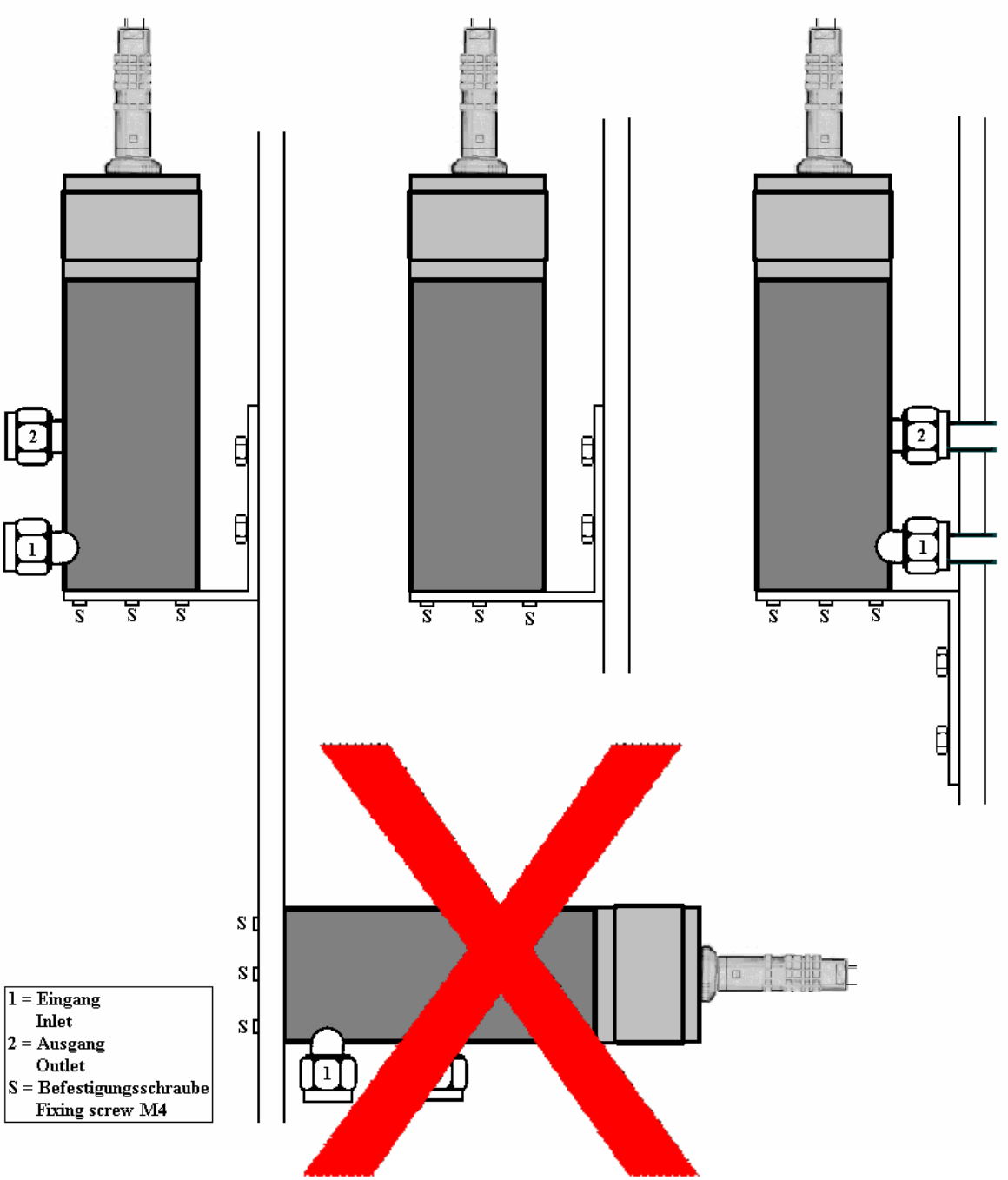
Please choose service-range (0...5000 ppm) for the next step.
Apply the 50 % phosphoric-acid solution to the glass-rod while slowly turning the sensor to allow even distribution of the acid around the whole circumference. The glass-rod has to be evently covered with foam in the area between and around the electrodes. Now the sensor-head is ready to be re-installed into the sensor-bowl.

To select the service-range please change the instruments MODE and go to MAN-Menu (chapter 7.6)





Flowscheme of the TMS-sensor



Various mountings of the stainless steel sensor