INSTRUMENTE
AUTOMATISIERUNG
INNOVATIVE SYSTEMLÖSUNGEN

Operating instructions

ODOR on-line

Content

1 Foreword

Dear Customer,

By acquiring ODOR on-line you now have a versatile device for a range of applications. The ODOR on-line has been developed as a gas chromatograph to detect sulfur components in gases. Typical applications include odorization monitoring, and measuring of natural sulfur.

The ODOR on-line can be used in odorization monitoring to identify all sulfur containing odorants.
Typical odorants are:
Tetrahydrothiophene (THT)
Tertiary Butyl Mercaptan (TBM)
Mixtures of Mercaptan and/or Sulfides (Scentinel™ E, Spotleak™ 1004, Captan™)

The ODOR on-line can be used to measure concentrations of the following components:
Hydrogen Sulfide (H2S)
Natural Mercaptan (e.g. Ethylmercaptan, Methylmercaptan)
Natural Sulfide (DMS)
Carbonylsulfide (only in specific models of the unit)

The installation is usually stationary but for odorization monitoring it is also possible to have a mobile unit in the field in an appropriate vehicle.

Naturally an instruction book cannot describe all the possible applications in detail. The following pages, therefore, only describe the use of ODOR on-line to determine THT. Should the device be used for any other application then please take into consideration the fact that the following parameters may vary: calibration, gas, column type, column temperature, carrier gas flow.

This manual does not contain any description of ODOR control software. The software has its own online help, which can be accessed after the ODOR control has been installed.

We generally recommend using our Customer Service to install the device and to give instructions. We also offer routine appreciation training at our offices.

Yours AXEL SEMRAU GmbH & Co. KG

2 Initial Installation

2.1 Scope of Delivery for ODOR on-line:

1 funnel
2 small bottle with 450ml filling mark
3 large bottle filled with distilled water
4 spraying bottle attachment

Figure 1

5 open-end spanner 27/32 mm
6 CrO3 powder
7 screwdriver
8 mains cable
9 9-pin serial cable

Figure 2

10 25-pin Sub D socket and housing
11 9-pin DIN connector

Figure 3

12 cable with a motor vehicle cigarette lighter connection

Figure 4

13 detector
14 detector feed

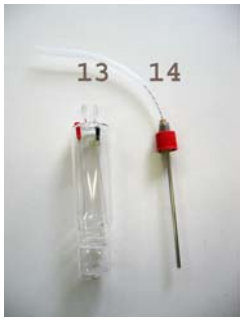


Figure 5

2.2 Other Accessories

Additional requirements are:
These items can be ordered direct from ODOR on-line or from AS.

Carrier gas: dry oil free compressed air
or
nitrogen

Pressure 2 bar, Flow 2 l/h to 60 l/h (depending on the application)

Calibration gas: The concentration of all substances to be measured in nitrogen should be close to the concentration in the sample gas to be analysed.
Low absorbtion pressure reducer
consumption ca 200ml per calibration

PC/Laptop: Minimum configuration:
500 MHz Intel Pentium
A free COM Port (RS232)
256 MB RAM
10 GB free hard disk space
Super VGA-Monitor/Display (800x600)
Keyboard, Mouse or other input peripheral
Disk drive, CD-ROM
Operating system Windows 2000, NT 4.0 or XP (recommended)

Recommended:
Back up facility
Network adapter
Modem and PC Anywhere™ (for remote maintenance)
Internet access (for Updates)

Please see the Installation Requirements (Chapter 19 Installation requirements, page 37) in the attachment for information on the installation location.

2.3 Gas Connections

The following connections are available on the back panel of the ODOR on-line.

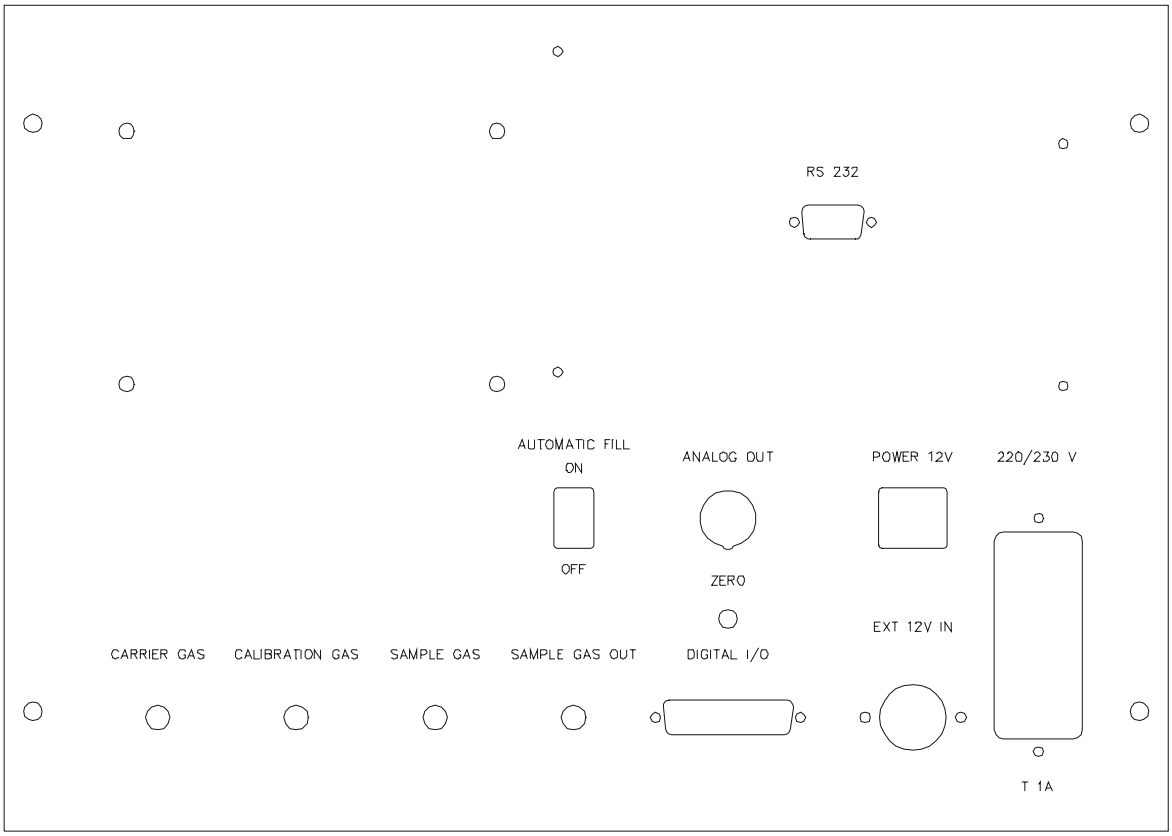


Figure 6

Make the following connections with a 1/8 in. PTFE tube.

1.) SAMPLE GAS OUT to exhaust line (throughput10 l/h)
2.) SAMPLE GAS to natural gas line (maximum pressure 1 bar)
3.) CALIBRATION GAS to the calibration gas cylinder regulator (maximum pressure 1 bar)
4.) connect the pressure reducer (Figure 7) located on the side of the device to the carrier gas source (pressure 2.5 bar)

Figure 7

2.4 Preparing a Chromium Trioxide Solution

Caution: We recommend that this operation is only carried out by our trained personnel. CrO3 powder can be a health hazard.
Please read the instructions in the attachment carefully.
Protective clothing (glasses, gloves,…) should be worn for all the following operations. Avoid any skin contact.

Pour the CrO3 powder into the small bottle (No. 2 Figure 1). Then fill the small bottle with distilled water from the large bottle (No. 3 Figure 1) up to the 450ml mark. Shake the bottle gently to dissolve the powder. Using the funnel (No. 1 Figure 1), the prepared solution is then poured into the tank (No. 1 Figure 8).

Caution: Do **not** pour the prepared solution into the distilled water reservoir. This would result in irreparable damage to the device.

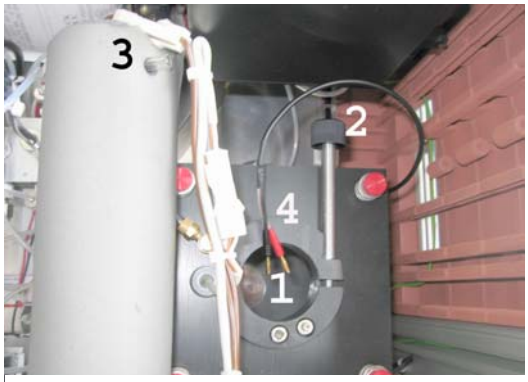


Figure 8

2.5 Fitting the Detector

Caution: The detector is made of glass and there is therefore a risk of breakage. Never touch the platinum mesh with the fingers.

Place the detector (without the detector feed) in the tank and slowly lower it until it rests on the bottom of the tank.

The detector should never be completely submerged if the feed is still in place.

The solution will only pass unhindered through the platinum mesh if the mesh is completely dry.

Now slowly lift the detector until the upper platinum mesh is ca. 1cm above the liquid level mark.

The CrO3 solution is lifted with it because of the surface tension.

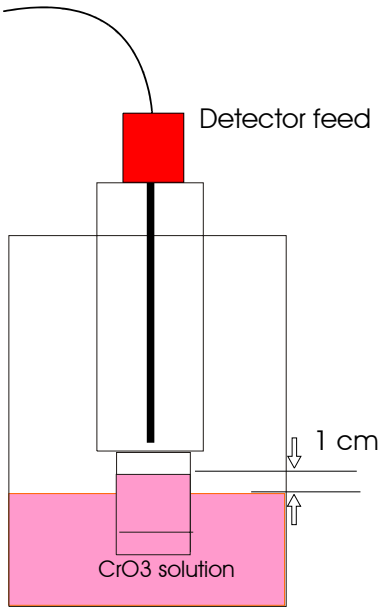


Figure 9

Lock the detector into place using the adjustment screw (No. 2 Figure 8) on the fixing ring.

The next step is to screw the detector feed firmly into the detector. The end of the flexible tube is simply fitted to the outlet on the separating column (No.3 Figure 8).

There should not be any large air bubbles under the platinum mesh. Should there be then the detector has to be taken out and cleaned (see Chapter 14 Cleaning the detector)

Now plug the red and black plugs (No. 1 Figure 8) into the detector.

Lastly fill the distilled water reservoir with distilled water.

2.6 Electrical Connections

2.6.1 Connecting PC/Laptop and ODOR on-line

Using the serial cable (No.9 Figure 2) as supplied, make a connection between the serial interface on the PC/Laptop and the RS232 connection on the back panel of the device.

2.6.2 Remote Transmission 4-20mA

Connect the remote transmission cable (4-20mA) as supplied to the plug (No. 11 Figure 3) also as supplied and connect this to the connection “ANALOG OUT” on the back of the device. There is an exact description of the plug arrangement in chapter “17.1 Analog outputs" on page 28.

2.6.3 MIN MAX Warning

An upper and lower limit for a substance can be set in the software.
If the minimum concentration level is not reached then relay 2 cuts in.
If the maximum level is exceeded then relay 3 cuts in.
The signal cable can be connected with the 25 pin Sub D connector (No.10 Figure 3) as supplied. There is an exact description of the plug arrangement in chapter “17.2 Relay outputs” on page 28.

2.6.4 General fault Relay

A common alarm is set off by relay 1. If the connection between ODOR on-line and the PC is interrupted then the corresponding alarm is set off.
The signal cable can be connected with the 25-pin Sub D connector (No.10 Figure 3) as supplied. There is an exact description of the plug arrangement in chapter “17.2 Relay outputs” on page 28.

2.6.5 Water Level Alarm

If the water level in the reservoir drops below a certain minimum then a red LED (LEVEL check) lights up on the front of the ODOR on-line. This signal can also be detected via the 25 pin Sub D connector. This is **not** a relay contact!
There is an exact description of the plug arrangement in chapter “17.3 Digital Inputs” on page 29.

2.6.6 External Start

If the ODOR on-line is to be synchronised with another device, then there is a facility to enable the ODOR on-line to wait for an external signal. This has to be programmed into the ODOR control software.
The signal cable can be connected with the 25-pin Sub D connector (No.10 Figure 3) as supplied. There is an exact description of the plug arrangement in chapter “17.3 Digital Inputs” on page 29.

2.6.7 Relays to control external devices

Relay 4 can be switched during a measurement or calibration. This enables the state of the ODOR on-line to be signalled to external devices. Relay 4 is programmed into the ODOR control software.
The signal cable can be connected with the 25-pin Sub D connector (No.10 Figure 3) as supplied. There is an exact description of the plug arrangement in chapter “17.2 Relay outputs” on page 28.

2.6.8 Mains Cable:

ODOR on-line can operate on AC or DC.
Before using AC the device should be checked to see whether it is set to operate at 230V or 115V.
Please check the legends on the back panel of the ODOR on-line before connecting to the power supply. Conversion from 230V to115V can only be carried out by qualified personnel.

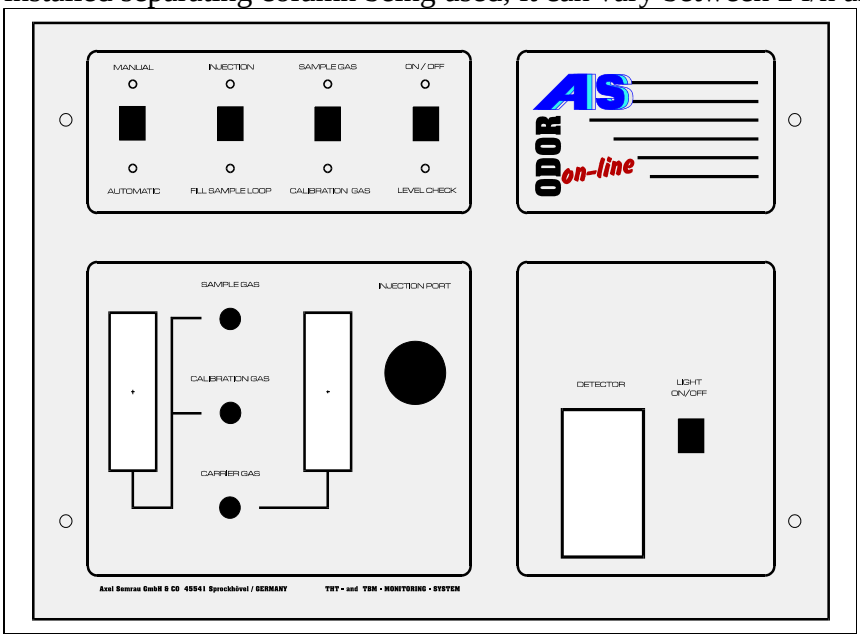
If the device is to be operated on 12V, then use the corresponding cable (No. 12 Figure 4). It should be connected on the back panel of the device to Ext. 12V in. The other end fits a motor vehicle cigarette lighter fitting.

3 Commissioning

Ensure that the detector is in the correct position. The distance between the upper platinum mesh and the CrO3 solution should be ca. 1cm. The detector feed must be inserted and connected to the separating column (see chapter 2.5 Fitting the Detector, page 8).).
All gases must be connected as described in chapter, page.

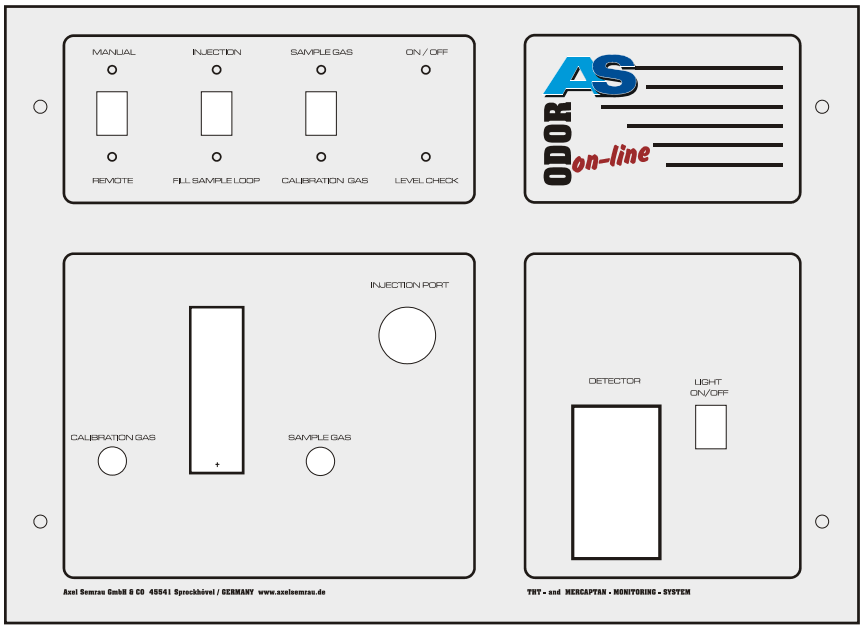
3.1 Regulating the Carrier Gas

There are two versions of the ODOR on-line. On the standard version the carrier gas (CARRIER GAS) is regulated manual using a needle valve. The current setting is read off the rotameter on the right. The reading is dependent on the measuring exercise and the type of installed separating column being used; it can vary between 2 l/h and 60 l/h.



Standard version ODOR on-line

On the version with electronic mass-flow controller, the carrier gas is set using the ODOR control software. The setting in this case is also dependent on the measuring exercise, the type of installed separating column and can vary from 2 l/h to 60 l/h.



Version with electronic mass-flow controller

If it is not possible to regulate a given carrier gas, there are two possible reasons.
Either the inlet pressure to the pressure reducer on the side of the device is too low or the separating column will not allow a greater flow.

3.2 Regulating Sample Gas

The natural gas (NATURAL GAS) flow should be set at 10l/h using the needle valve. Please use the scale calibrated for CH4 (methane)

3.3 Regulating Calibration Gas

The calibration gas (CALIBRATION GAS) flow should also be set at 10l/h. Proceed as follows:

Press the SAMPLE GAS/CALIBRATION GAS button and hold it down in the CALIBRATION GAS position.
Set a value of 10l/h using the needle valve. Use the rotameter scale calibrated for AIR to do this.

3.4 MANUAL/REMOTE Switch

Finally ensure that the MANUAL/REMOTE(Automatic) is set to REMOTE. This is the only way that the PC switch the valve on the ODOR on-line.

4 Starting an Automatic Measurement

To do this it is necessary that all settings are made as in Chapter “2 Initial Installation” and also as in Chapter “3 Commissioning”.

At this point this is only a basic description of using the software. Detailed help is available at any time in the ODOR control software by pressing the F1 key.

Open the ODOR control programme.
Press the Start Measurement button.
Fill in all fields in the new window. Our Customer service will have installed a suitable method when they made the installation. Select the method or choose another sample method from the CD.
Press the Start button.

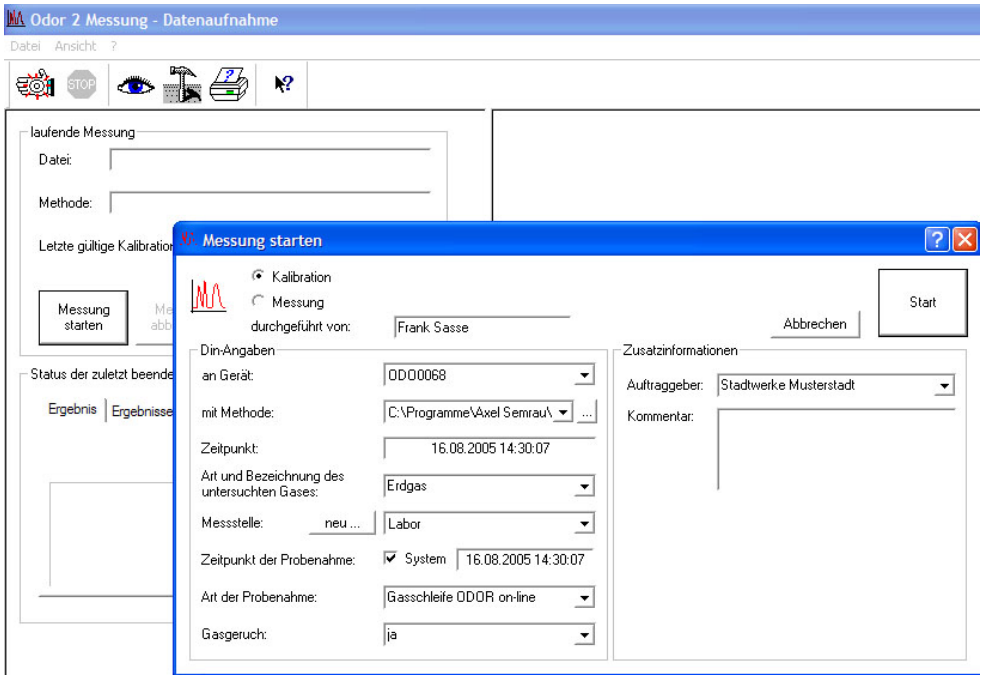


Figure 10

Calibration and measurement will now run according to the timetable and selected method. A typical sequence for an automatic operation is as follows:

Calibration:
- Rinse the calibration gas line for 45 seconds
- Fill the gas loop for 15 seconds.
- Analyse the calibration gas.

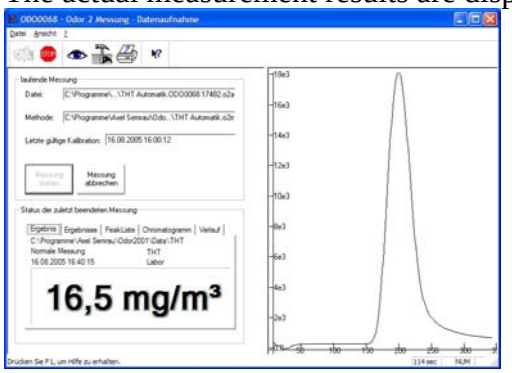
Measurement:
- Fill the gas loop for 15 seconds.
- Analyse the gas

Begin the next measurement

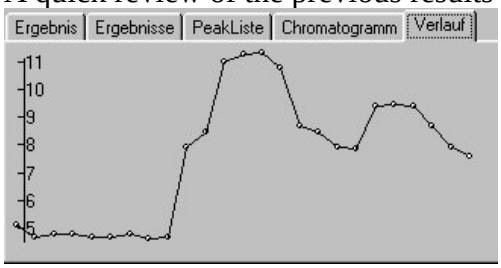
Repeat the calibration after an hour

5 Displaying Measurements

The actual measurement results are displayed on the main screen



A quick review of the previous results is available by selecting the “history” window.



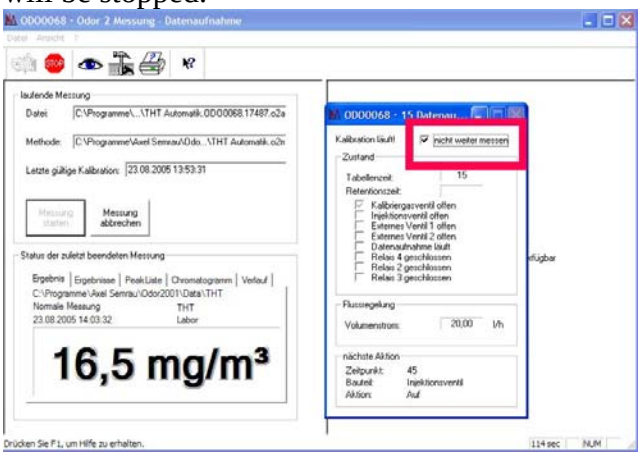
The Data Management is available to give a comprehensive review. There are also other functions (e.g. Export to Excel, Reprocessing..) The Data Management can be started using the “eye” symbol

6 Changing the Calibration Gas Cylinder

The calibration gas cylinder should be changed as soon as the **pressure drops below 10 bar**. When the pressure is too low there is no certainty that the calibration gas has the concentration shown.

The calibration gas cylinder should also be changed when the **use by date is exceeded.** Please find the use by date for the calibration gas on the Calibration Gas Certificate.

- Measurement should be stopped before changing the calibration gas cylinder. Terminate the measurement which is running by activating the function "*stop after this one*". When the active calibration or measurement is completed the programme will be stopped.



If the method being used involves a long waiting time then the measurement running can be terminated using *Stop measuring* or use the  symbol.

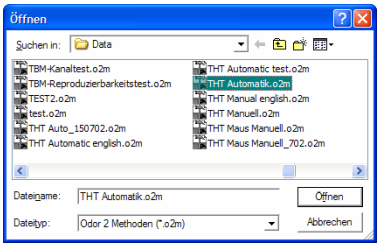
- Every time the calibration gas cylinder is changed check that the gasket on the pressure reducer is in perfect working order.

- After changing the calibration gas cylinder, check to ensure that the calibration gas flow is still correct. Proceed as follows:
  Press the SAMPLE GAS/CALIBRATION GAS button and hold it down in the CALIBRATION GAS position.
- Set a value of 10l/h using the needle valve. Use the rotameter scale calibrated for AIR to do this.

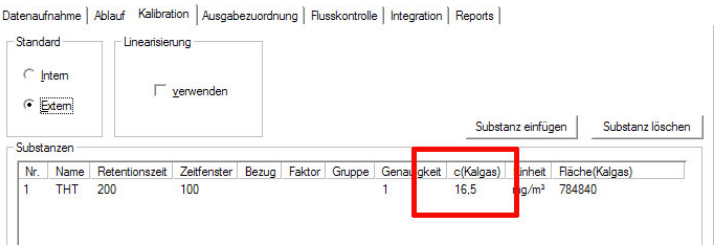
Finally the ODOR control software has to be told the actual current calibration gas concentration. This is done using the method on the “calibration” heading.

- To do this, open the method editor using the "hammer” symbol.

- Open the measurement method which is being used.



- Enter the new calibration gas concentration on the “calibration" heading. Having entered the value press ENTER several times until the whole line has a grey background.



- Save the changes by pressing the  symbol.

Start the measurement again.

7 Gas Mouse Measurement

ODOR on-line has the facility to inject samples using a gastight syringe. This method is used if samples are without pressure or little pressure in a transport container (gas-mouse).

Gas mice, carrying cases and gas proof syringes are available as accessories at AS.

When measuring using a gas mouse care must be taken to sample properly. The Gas mouse must be flushed with gas for a sufficiently long time.

7.1 Taking samples using a gas mouse

- Undo the screw cap 1 as well as the valves 2 and 3.
- Connect the gas mouse to the gas line with a non-adsorption tube and let the gas flow through for several minutes.
- When the pressure reaches 20 mbar close the gas mouse in the sequence: valve 3, valve 2, screw cap 1.
  Where higher pressure are involved, reverse the sequence to avoid any gas pressure building up in the gas mouse otherwise there is a danger of it bursting.

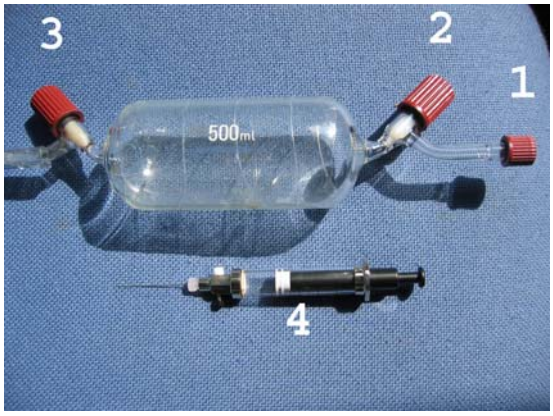


Figure 11

7.2 Taking Samples from a Gas Mouse

- Open valve 2
- Insert the gas proof syringe through the septum in screw cap 1.
- Draw the syringe full several times and release back into the gas mouse.
- Draw the syringe full for a last time and wait for 10 seconds until the pressure has equalised.
- Now withdraw the syringe from the gas mouse.
- Eject the access amount from the syringe.
- Close the small valve on the gas proof syringe.
- Close the gas mouse valve 2 again.

7.3 Injecting a Gas Mouse Sample

It is very important when taking a manual measurement to ensure that the same amount of gas is injected as when calibration is used. In principle there are two possibilities.

A *The calibration gas is also manually injected using a syringe.*
In calibrating, 10ml of gas are injected, when measuring subsequently also 10ml of natural gas are injected.
Care needs to be taken that in the method used the correct concentration of calibration gas is given.

B *The calibration gas is automatically injected.*
In this case, the quantity of gas which is injected by automatic calibration has to be determined. This quantity of gas is known as the equivalent volume and is usually between 7 ml and 11 ml. The equivalent volume has to be determined for each individual device (see chapter 8 Equivalent Volumes).

When injecting the natural gas sample the amount of equivalent volume is injected.
Care needs to be taken too that in the method used the correct concentration of calibration gas is given.

- Start the measurement method for the gas mouse measurement.
- Follow the instruction on the screen.
- Guide the syringe into the ODOR on-line injector as far as it will go, the needle then pierces the septum (3) in the injector.
- Open the small valve on the gas proof syringe.
  Caution: pressure now exists in the syringe of up to 2 bar. Hold the syringe pistol firmly to avoid it flying out of the syringe.
- Inject the volume of the syringe.
- Wait for 4 seconds before withdrawing the syringe.

1 gastight syringe
2 Injector
3 septum
4 syringe needle
5 separating column

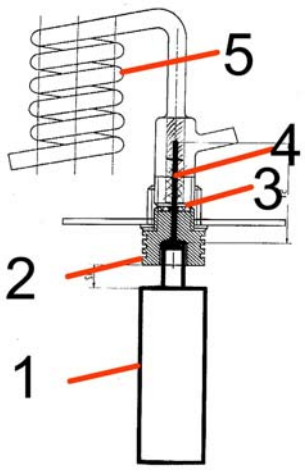


Figure 12

7.4 Changing Septum

The septum in the injector should be replaced after about 10 injections.

Caution: Before starting these tasks, the separating column has to be free of pressure otherwise serious damage could be caused to the device.

- Switch off the carrier gas source (compressor or nitrogen bottle)
- Wait until the control device (Figure 7) on the side shows 0 bar.
- Now unscrew the injector.
- Exchange the septum (1).
- Screw the injector back hand tight.
- Switch on the carrier gas source again.

1 septum

Figure 13

8 Equivalent Volumes

The use of equivalent volumes is necessary when taking manual injection samples, but the calibration takes place automatically from the calibration gas cylinder.

The equivalent volume is the quantity of gas which is injected by an automatic injection. The total volume includes the valves and the lines dead volume in addition to the volume of the gas loop.

The equivalent volume has to be determined for each individual device.

To determine the equivalent volume, calibration gas is repeatedly injected both manually and automatically. The equivalent volume is calculated from the areas of the peaks.

Example:	Automatic calibration gas injection	Result: Area	8,100
	Manual injection of 10ml of calibration gas	Result: Area	10,100
	Automatic calibration gas injection	Result: Area	8,000
	Manual injection of 10ml of calibration gas	Result: Area	10,000
	Automatic calibration gas injection	Result: Area	7,900
	Manual injection of 10ml of calibration gas	Result: Area	9,900

Average value

	Automatic calibration gas injection	Result: Area	8,000
	Manual injection of 10ml of calibration gas	Result: Area	10,000

$$\text{Equivalent Volume: } \frac{\text{Area automatic injection}}{\text{Area manual injection}} * 10 \text{ ml} = 8 \text{ ml}$$

9 Mobile use

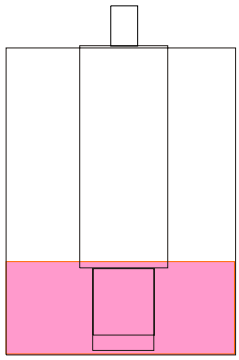
The ODOR on-line has been successfully employed for a long time as a mobile device in suitable vehicles. There are only a few points of which to be aware.

9.1 Lowering the detector

The detector has to be the “park position" to avoid the liquid film tearing while the vehicle is moving.

Proceed as follows:

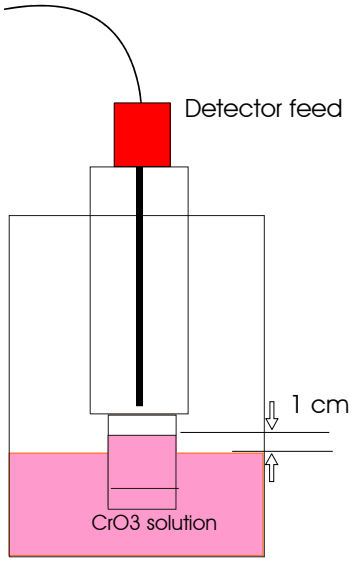
- Take the end of the detector feed off the separating column (No. 3 Figure 8).
- Unscrew the detector feed from the detector.
- Undo the fixing screw on the adjustment screw (No. 2 Figure 8) on the fixing ring.
- Lower the detector



The detector should never be completely submerged if the feed is still in place.

When the new location is reached the first action is to return the detector to its working position.
To do this:

- Lift the detector until the upper platinum mesh is ca 1cm above the fill level.
- The CrO3 is lifted with it as a result of the surface tension.
- Lock the detector into place using the adjustment screw (No. 2 Figure 8) on the fixing ring.
- The next step is to screw the detector feed firmly into the detector. The end of the flexible tube is simply fitted to the outlet on the separating column (No.3 Figure 8).



There should not be any large air bubbles under the platinum mesh. Should there be then the detector has to be taken out and cleaned (see Chapter 14 Cleaning the detector)

9.2 “Automatic Fill“ Switch

There is a fill level regulator in the ODOR on-line CrO3 tank. Should the fill level have fallen too far owing to evaporation of the distilled water, then distilled water is automatically added from the reservoir.
When the ODOR on-line is in a stationary installation the switch is always in the ON position.
The ODOR on-line is usually left switched on when travelling between sites to maintain the separating column temperature.

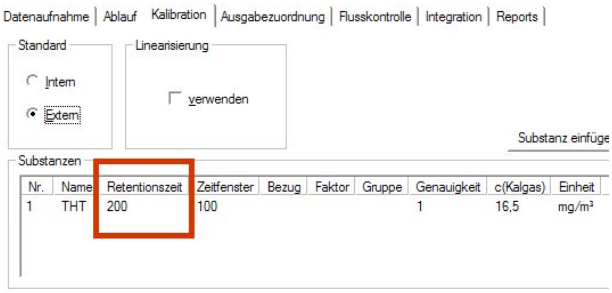
The “automatic fill” function on the other hand has to be switched of during journeys from site to site; otherwise the water would top up every time the vehicle turned a corner or when going round a bend.
It suffices to switch the switch on for a minute once or twice a week.

9.3 Temperatures

The ambient temperatures can vary greatly when a mobile device is in use. However this does not cause a problem. Should substantial delays in retention times arise they have to be adjusted to the new circumstances. The retention time is entered into the ODOR control software.

This is done using the method on the “calibration” heading.
To do this, open the method editor using the "hammer” symbol.

Select the measurement method which is being used and enter the new retention time on the “calibration” heading. Save the changes.



If the measurement method allows, then the column temperature should be 10 °C above the ambient temperature to contain the fluctuations in the retention times.

Caution: Please ensure that the ambient temperature does not fall to freezing point. The device contains water which could cause damage to the ODOR on-line if it freezes.

10 Double System

There is an ODOR on-line double system model to measure natural sulfur, hydrogen sulfide (H2S) mercaptan and sulfide substances can be measured on the first system.
The second system measures carbonyl sulfide (COS) and uses potassium hydroxide instead of CrO3 as the reagent. A filter is additionally built in.

The two systems are wired in a way that the first system gives a start signal to the second system.

The maintenance work and the maintenance intervals of the COS System differ from those of the CrO3 solution system.
Please discuss with our customer service if information is required.

11 Liquid Injections

The ODOR on-line is also suitable for liquid injection. Liquid injection is used as a reference standard in the production of calibration gas.

Liquid standards can be produced to a higher degree of accuracy than calibration gas bottles.

Calibration solution syringes and further information can be obtained from Axel Semrau GmbH & Co. KG

12 Power Failure

ODOR on-line and the ODOR control software are so designed that they start up automatically after a power failure. It starts up from calibration and carries on to the current measurement method
Please take note of the information about settings on the PC/Laptop which can be found on the on-line help of the ODOR control software.

13 Visual inspection/ Maintenance

The following visual inspections should be carried out regularly:

Calibration gas: Calibration gas cylinder pressure > 10 bar
Calibration gas flow 10 l/h (see chapter 3.3 Regulating Calibration Gas, page 12)

Natural Gas: Sample Gas Flow 10 l/h (see chapter 3.2 Regulating Sample Gas page 12)

Carrier gas: Pressure at the side mounted pressure reducer 2-2.5 bar (see Figure 7)
The flow has also to be checked on devices that do not have mass-flow controllers (See Chapter 3.1 Regulating the Carrier Gas page 11)

Condensation in the Pressure Reduction Device

If using ambient air as carrier gas, after some time water collects in the water separator of the pressure reduction device. This can be cleared by pressing on the outlet opening.

Distilled water reservoir fill level

The distilled water reservoir has a volume capacity of ca 1lt and is sufficient for several months under normal humidity conditions.
Should the fill level fall too low it is indicated by a light "Level Check" on the front of the ODOR on-line. If this is the case then top up the reservoir with distilled water.

Maintenance

The German gas regulatory body (DVGW) prescribes annual maintenance for gas chromatographs in a Work Sheet (G 465-4)
This maintenance work may only be carried out by properly qualified personnel.

The following work is carried out as the annual maintenance programme

- Adsorption test
- Reproducibility test
- Two channel test
- Visual inspection of the chromatographic separating column. If necessary change.
- Change of the chromium trioxide solution (if necessary).

14 Cleaning the detector

The detector should be cleaned as soon as large air bubbles appear under the platinum mesh or when there is any problem with the measurements.

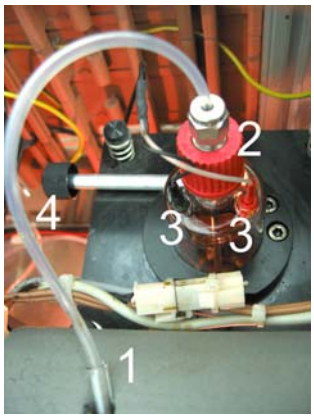
To clean the detector the following are required:

- Vessel (eg. measuring beaker)
- Spray bottle of distilled water
- Hair dryer
- Laboratory coat, gloves, protective glasses
- Cloth to wipe up CrO3 solution drops

Take note that CrO3 solution is hazardous to health. Avoid any skin contact.

14.1 Removing the Detector

- Switch of the device.
- Pull off the end of the detector feed (No. 1) from the separating column.
- Unscrew the detector feed (No. 2) from the detector.
- Remove the red and black plugs (No. 3) from the detector.
- Unscrew the adjusting screw (No. 4) from the fixing ring.
- Remove the detector and put it in the vessel provided as above.



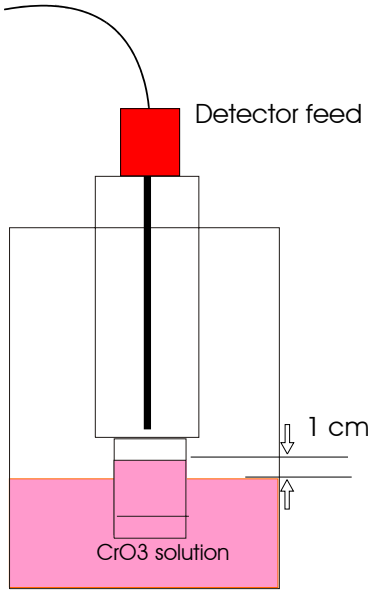
14.2 Rinsing and Drying the Detector

Rinse the detector well with distilled water both inside and outside

Caution: **The detector is made of glass and there is therefore a risk of breakage. Never touch the delicate platinum mesh and particularly not with the tip of the spray bottle.**

Dry the detector with a hair dryer. It is important that the platinum mesh is completely dry. It takes some minutes for the inner platinum mesh to dry.
Only a detector with dry platinum mesh can be properly re-installed.

14.3 Refitting the detector



- Place the detector (without the detector feed) in the tank and slowly lower it until it rests on the bottom of the tank.
  The solution will only pass unhindered through the platinum mesh if the mesh is completely dry.
- Now slowly lift the detector until the upper platinum mesh is ca. 1 cm above the fill level.
  The CrO3 solution is lifted with it because of the surface tension.
- Lock the detector into place using the adjustment screw on the fixing ring.
- The next step is to screw the detector feed firmly into the detector.
- Replace the end of the flexible tube on the separating column.
- Plug the red and black plugs back into the detector.

After cleaning the detector needs several hours before it reaches its full sensitivity again.

15 Fault Finding

No peaks
All electrical connections in order?
Manual/Remote switch switched to REMOTE?
Carrier gas pressure sufficient?
Carrier gas flow in order?
Calibration gas flow in order?
Sample gas flow in order?
Septum tight?
If necessary clean the detector.

Peak exists but zero result.
Look for reason for delay in retention time (temperature, carrier gas pressure….).
Adjust the retention time in the software.

Peak not through to the end of the measurement
Look for reason for delay in retention time (temperature, carrier gas pressure….).
Extend analysis time.

Unsteady zero line
Give the detector time to stabilise. Carry out several calibration.
THT in the ambient air?
Electromagnetic interference (other machinery, mobile telephone)?

16 Operating Principle:

The ODOR on-line is a gas chromatograph which conforms to the following standards: ISO 6323 T2, ISO 19379, DIN 51855 Part 7 and Reference method according to DVGW Work Sheet G280.

As soon as the device is connected to the natural gas there is a steady flow of 10 l/h of natural gas through the ODOR on-line. A regular automatic sample of 10ml is taken from this gas stream. This is affected by the electromagnetic valve and the gas loop.

The sample taken is separated in a packed and isothermally heated separating column.

An electrochemical detector is connected to the outlet of the separating column. This detector only reacts to sulfur combinations and not any other gas compounds. There is therefore a peak for each individual sulfur compound. The result is achieved by comparing the extent of the peak to the extent of the calibration gas peak.

The ODOR on-line calibrates itself automatically at set time intervals. To do this a sample is taken at each time from the connected calibration gas cylinder.

All data is saved on the PC/Laptop. ODOR control software runs on the PC and regulates all the ODOR on-line procedures. To operate the PC must be permanently connected. Communication is through the serial interface.

The ODOR on-line has remote transmission relay outputs and 4 to 2mA current loops.

The ODOR on-line has an injector for the manual injection of gas samples as well as an automatic sample feeder.

17 Technical Data

17.1 Analog outputs

The analog outputs can be found on the back panel of the device on the 5 pin DIN connector. Pin 1 is the common ground and Pin 2-5 are the output channels 1-4.
These are short circuit proof as they are 0-20 mA signals. The external impedance should not exceed 500 Ohm. The control is through the PC. A 4-20mA transmission can also be set on the PC. If there should be any break in communication with the PC for any reason all four channels are set to 0. The resolution of the channel is 12 bit.

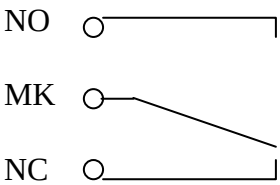
Function	5-pin. DIN-Socket Back panel ODOR on-line
Common ground	1
0-20 mA Channel 1	2
0-20 mA Channel 2	3
0-20 mA Channel 3	4
0-20 mA Channel 4 (used internally for mass flow regulator)	5

17.2 Relay outputs

There are 4 relay outputs available with part pre-defined functions.

- Relay 1 General fault relay, released if there is a fault.
- Relay 2 Alarm relay applied when there is a drop to below minimum concentration.
- Relay 3 Alarm relay when the maximum concentration is exceeded.
- Relay 4 Freely available in the software.

Each Relay has a normally closed and a normally opened contact (1 x um), which will take loads of 30 V and 1A.
The wiring of these outputs on an ODOR on-line is through a 25 pin Sub D connector.



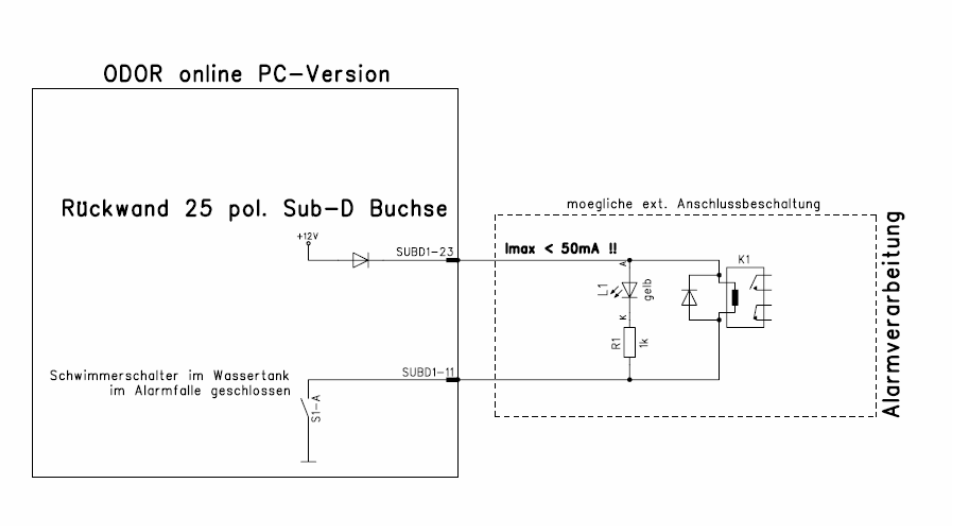
Function		25 pin. Sub D Plug Back panel
Relay 1 general fault	NO	1
Relay 1 general fault	MK	14
Relay 1	NC	2
Relay 2 Min Alarm	NO	15
Relay 2 Min Alarm	MK	3
Relay 2	NC	16
Relay 3 Max Alarm	NO	4
Relay 3 Max Alarm	MK	17
Relay 3	NC	5
Relay 4 Freely available	NO	18
Relay 4 Freely available	MK	6
Relay 4	NC	19

17.3 Digital Inputs

The state of the digital inputs are transmitted to the PC every millisecond and have then to be further processed. They can be tapped from the 25 pin Sub D on the back panel.
Input 6 is already reserved for an external start signal. (waits for the change of state of digital input No 6, Pin 22 and 10 on the 25 pin Sub D connector)
Input 7 and 8 are also assigned. 7 is for the alarm to top up water and 8 for the state of the auto/manual switch on the front of the device.
The logical state 1 is on inputs 1-6 and is produced by a connection of the input pins to the common earth (external potential-free contact).

Function		25 pin. Sub D Plug Back Panel
Input 1	ES	7
Input 2	ES	20
Input 3	ES	8
Input 4	ES	21
Input 5	ES	9
Input 6 [external start]	ES	22
Input mass		10
ext. +12 V		23
Input 7 [Level check alarm]	M	11
Input 8 [Auto/Man]	M	24

ES = external normally-open contact to the input mass, M = switched mass of the external 12 V for Input 7 and Input 8

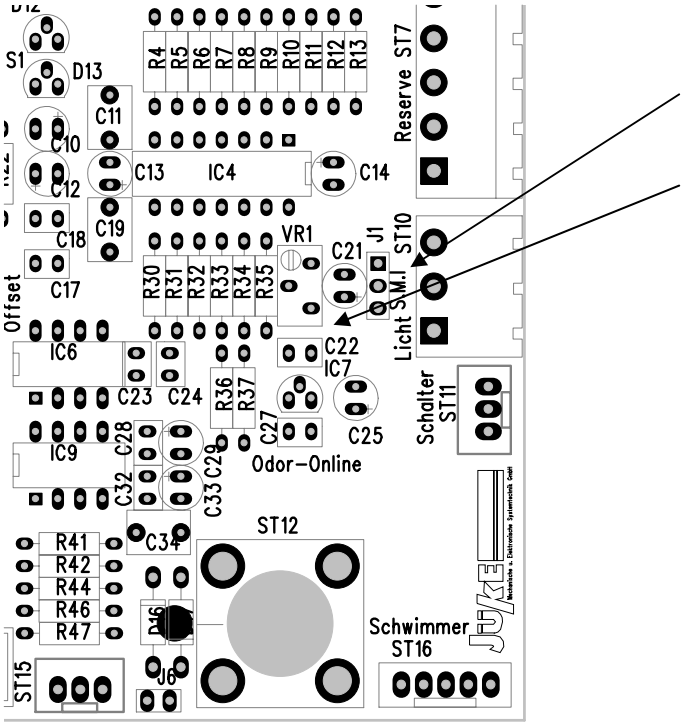


Possible wiring for water alarm.

17.4 Heating

The heating is exclusively to temper the separating column. Stable retention times are dependent on constant column temperature.
The separating column (glass tube) is spirally arranged on an aluminium cylinder. It is also enclosed by an insulation material to stabilize the temperature. There is an 8.2 Ohm resistance as heating element in the cylinder together with a temperature sensor.
Control is realised by an analog board. The post plug J1 (see board description) has three contacts “nominal temperature”, “ground” and “actual temperature”. These are shown on the PCB as “S.M.I.”. They are analog output quantities with 1 °C corresponding to 10mV. The nominal temperature is set through VR1.
The nominal temperature must be greater then the room temperature. When this temperature is reached a continually flashing red LED (LED1) can be seen. This is a sure sign of active control.

The nominal temperature is set according to the required seperation the ambient temperature and retention times.



Actual temperature
Ground
Nominal temperature

Potentiometer for nominal temperature setting.

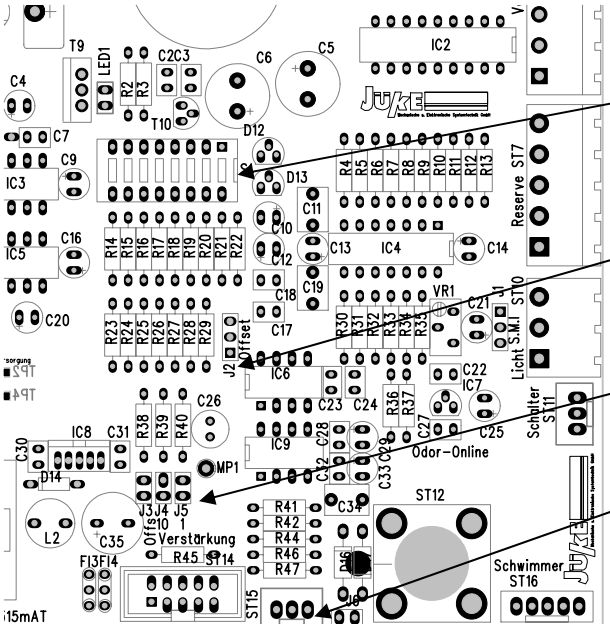
17.5 Amplifier

This is a two stage amplifier which needs to be matched to the relevant application. The input impedance of the amplifier can be reduced from 3K Ohm (open) to 560 Ohm (closed, default) using J6 (see board).
This first amplifier step has an amplification of V1=2000 which can be reduced using jumper J4 (V1=10) and J5 (V1=1).
The second amplifier can be adjusted by eight DIL switches. The total circuit amplification is the product of multiplying both amplifications (total amplification=V1 * V2). To obtain the following amplification the switch indicated has to be in the ON position.

Amplification:	**V1**	**J4**	**J5**
	2000	open	open
	10	closed	open
	1	xxx	closed

V2	**DIL-Switch S1 (on)**
1	1
2	2
3	4
4	6
5	8
6	10
7	15
8	20

The external offset potentiometer is on the back panel of the device and connected through J2. The range can be increased using J3 (close) if the offset is not sufficient.
The analog output signal should be normed to +/- 1V maximum amplitude. The signal is available on ST15 (Pin 3 plus Pin 2 minus). This level has to be maintained when connected to a processor board. Higher voltages lead to indefinite conditions in the AD transducer and possibly to permanent damage.


Dil-Switch S1
ext. Offset Potentiometer
J2, J4 and J5
J6 and ST15
IC2
IC3
IC4
IC5
IC6
IC7
IC8
IC9
T9
T10
D12
D13
D14
VR1
ST7
ST10
ST11
ST12
ST14
ST15
ST16
Reserve
Licht S.M.I
Schalter
Odor-Online
Schwimmer
Offset
Verstärkung
MP1
LED1

18 General Electrical Data

Main supply 230V AC:

Supply voltage:	230 V AC / +- 10% / 50 – 60 Hz		
Maximum current:	500mA		
Fuses:	Back Panel:		1 AT
	Processor board:	F1	2 AT
		F2	100 mAT
	Analog board:	F1	5 AT
		F2	315 mAT

Mains supply 115 V AC: **Conversion Necessary**

Supply voltage:	115 V AC / +- 10% / 50 – 60 Hz		
Maximum current:	1A		
Fuses:	Back Panel:		1 AT
	Processor board:	F1	2 AT
		F2	200 mAT
	Analog board:	F1	5 AT
		F2	630 mAT

Mobile use 12 V DC:

Supply voltage:	12 V DC / +- 10 %
Maximum current:	6 A
Fuses:	not internally fused, Fusing must be ensured externally

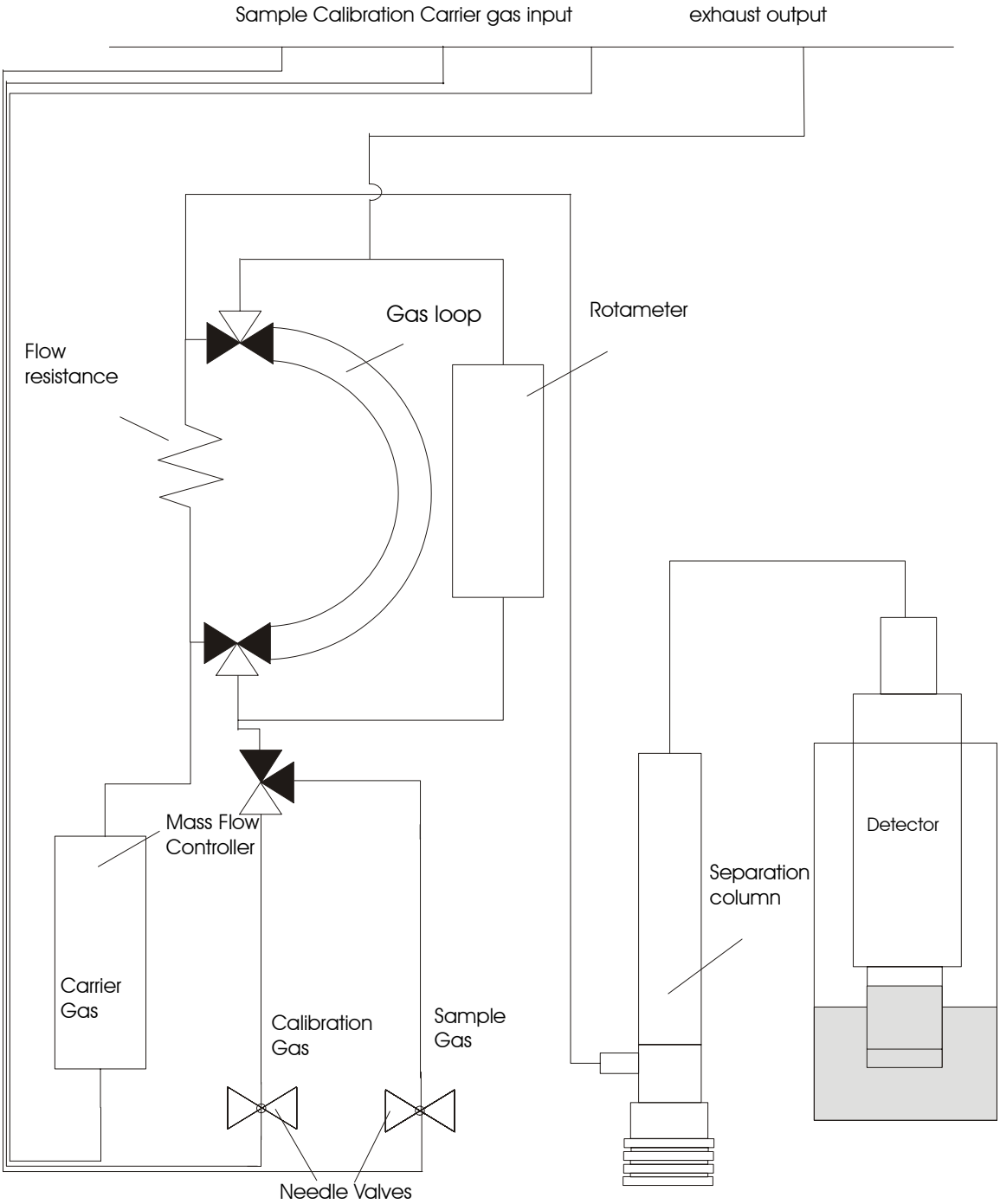
Relay outputs: 4 x UM
Per contact: max. 30V / 1A

Inputs: 6 x
Activated by external normally open contact,
5 V / 1 mA

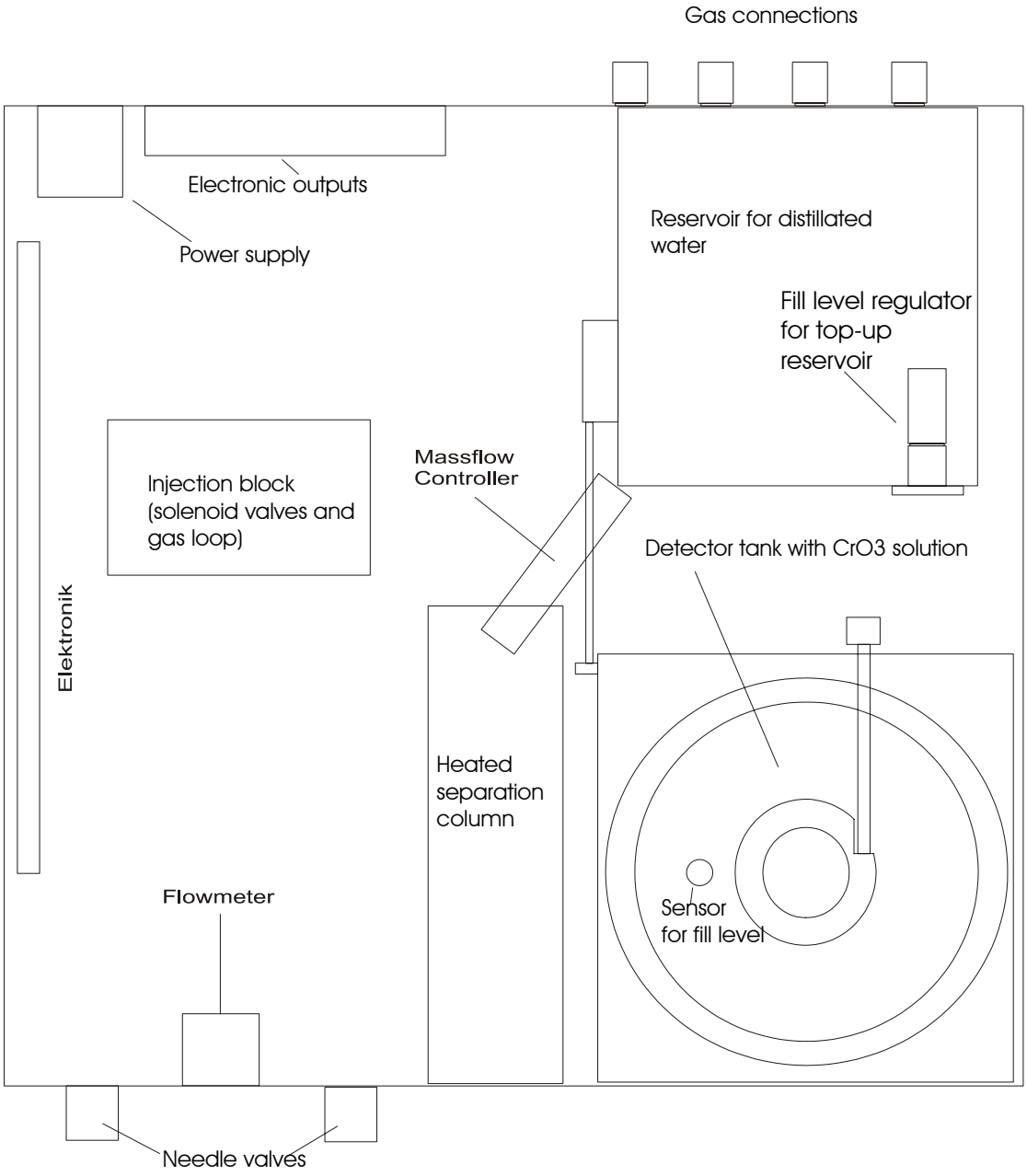
Current outputs : 3 x 0..20 mA
per 12 bit DA
galvanically separated
Max. external impedance 500 Ohm

Reserve valve: 12 V / 4 W suppressed (free wheeling diode directly on the valve)

18.1 Gas Paths



Schematic plan



19 Installation requirements

Installation requirements
ODOR on-line PC Version

Location:	heated room, ambient temperature (10 °C to 35 °C) vibration free location the exact dimensions of the device are: ODOR on-line W 56 cm x D 36 cm x H 36 cm ; weight 15 kg PC Midi Tower, 17 “monitor, keyboard, mouse. A work bench (stable table) is recommended: W160 cm D80 cm The device must be accessible from above. Holders for two calibration gas cylinders immediately next to the device (Height 110 cm; Diameter 16 cm; Width including pressure reducer: 30 cm)
Power supply:	5 sockets 230 V; Natural gas line with shut off valve (Pressure 20 mbar to 1 bar constant +/-10%) Exhaust line to open air (throughput 10 l/h)
Remote transmission:	upto 3 x 4-20 mA possible min alarm relay and max alarm relay for a substance, general fault relay, (plugs supplied) wire section: 0.5 mm²

A telephone jack point near to the PC is required for remote maintenance

The device is supplied with 1/8 inch Swagelok connections. Please have corresponding connections available with external treads.

Customer: .....

We confirm that we will comply with the above requirements.

Company stamp and signature: .....

20 Datasheet Chromium Solution

Detailed Safety Instructions

Chemical Reagent: Solution of CrO3 (Chromium VI oxide) 1:10 diluted with distilled water (aqueous solution of chromic acid), as used in the ODOR on-line detectors.

▪Physical/Chemical Properties

Clear, orange coloured odourless solution
Boiling point 101 °C
Negligible release of pure CrO3

▪Fire and Explosion Risk

No

▪Reaction details

Stable solution avoid temperatures above 80 °C.
Strong reaction with oxidisable substances.
Store away from organic materials.

▪Health Hazards:

Pure crystalline CrO3 is a carcinogenic substance; it should be handled with caution. There is no known danger from the aqueous solution but it is still a strong oxidising agent which can cause irritation or tissue damage when in contact with the skin or eyes. Direct contact should therefore be avoided. Follow the instructions in the manual.
If swallowed: do not induce vomiting. Seek immediate medical attention even if the symptoms reduce.
If in contact with the eyes: rinse out with water for at least 15minutes. Seek immediate medical attention.
If in contact with the skin: removed the soiled clothing and rinse the affected area thoroughly with water. Seek medical attention if there is ongoing skin irritation.

▪Provisions and Recommendations for Safe Handling

Inhalation protection is not necessary normal ventilation is sufficient. Wear protective glasses as well as plastic or rubber gloves which are suitable for use with strong oxidising agents.
Take care that clothing is not damaged by direct contact.
Should Chromium solution be spilt wipe it up with a suitable cloth or binding agent. Do not use any paper. Rinse thoroughly with water. Dispose of the rest professionally. Never pour down the drain.
Check compliance with national environmental regulations if necessary.

Axel Semrau GmbH & Co. KG, Stefansbecke 42, D45549 Sprockhövel
April 2003

21 EC certification of conformity

Axel Semrau GmbH & Co. KG

Stefansbecke 42
D - 45549 Sprockhövel
Tel.: 0 23 39 / 12 09 0
Fax: 0 23 39 / 60 30
E-Mail: info@axelsemrau.de
Internet: www.axelsemrau.de

EG-Konformitätserklärung

Hiermit erklären wir, dass die Bauart des nachfolgend bezeichneten Gerätes in der von uns in den Verkehr gebrachten Ausführung den unten genannten einschlägigen EG-Richtlinien entspricht.

Durch nicht mit uns abgestimmte Änderungen verliert diese Erklärung ihre Gültigkeit.

Bezeichnung: **ODOR on-line**
Gerätetyp: **ODO**

Einschlägige EG-Richtlinien:

Niederspannungsrichtlinie	72/23/EWG
geändert durch	93/68/EWG
EMV-Richtlinie	89/336/EWG
geändert durch	91/263/EWG;92/31/EWG;93/68/EWG

Angewendete harmonisierte Normen:

EN 61010-1 (VDE 0411)	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte
EN 50081-1	Fachgrundnorm Störaussendung
EN 50082-1	Fachgrundnorm Störfestigkeit

Frank Sasse
Produktmanger Odorierungskontrolle
Productmanager Odorization Control Systems

Axel Semrau
Geschäftsführer/Managing Director

10/2000

Kommanditgesellschaft
Amtsgericht Essen HRA 7474
pers. haft. Ges. Axel Semrau
Verwaltungsges. mbH, Sitz Sprockhövel
Amtsgericht Essen HRB 14484
USt. ID Nr. DE 253819280
Steuer-Nr. 350/5851/0048

Bankverbindungen
SSK Wuppertal 327 330 500 00, Konto 639 760
Swift-Code WELA DE 33
IBAN: DE 30 3305 0000 0000 6397 60
Postbank Köln BLZ 370 100 50, Konto 3580 07-501
Swift-Code: PBNKDEFF 370
IBAN: DE 15 3701 0050 0358 0750 1

Geschäftsführer:
Axel Semrau, Wuppertal
Gerd Pautsch, Hattingen

Axel Semrau GmbH & Co. KG

Stefansbecke 42
D - 45549 Sprockhövel
Tel.: 0 23 39 / 12 09 0
Fax: 0 23 39 / 60 30
E-Mail: info@axelsemrau.de
Internet: www.axelsemrau.de

EG Certification of Conformity

We hereby certify the conformity with EG directives of the following systems that have been put in circulation by us.

This declaration is not valid anymore when modifications are made without our agreement.

Name of type: **ODOR-Online**
Type of instrument: **ODO**

Relevant EG directives:

Low Voltage Directive	73/23/EWG
changed by	93/68/EWG
EMV-Directives	89/336/EWG
changed by	91/263/EWG; 92/31/EWG; 93/68/EWGG

Applied harmonised standards:

EN 61010-1 (VDE 0411)	safety requirements for electrical equipment for measurement-, control- and laboratory-systems
EN 50081-1	EM compatibility generic norm on emissions
EN 50082-1	EM compatibility generic norm on immunity

Frank Sasse
Produktmanger Odorierungskontrolle
Productmanager Odorization Control Systems

Axel Semrau
Geschäftsführer/Managing Director

10/2000

Kommanditgesellschaft
Amtsgericht Essen Nr. HRA 7474
pers. haft. Ges. Axel Semrau
Verwaltungsges. mbH, Sitz Sprockhövel
Amtsgericht Essen HRB 13484
USt. ID-Nr. DE 253819280
Finanz-Nr. 352/5721/0248

Bankverbindungen
SSK Wuppertal 327 030 500 00, Konto 629 760
Swift-Code: WELA DE 33
IBAN: DE 30370501980000629760
Postbank Köln 342 370 102 50, Konto 3589 07-501
Swift-Code: PBNKDEFF 370
IBAN: DE 19370100500358907501

Geschäftsführer:
Axel Semrau, Wuppertal
Gerald Bulla, Hattingen