Operating instructions

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OIL CHECK 500

I. Foreword

This manual contains instructions and regulations for the installation, operation and maintenance of the Maintenance of the Oil Check 500, hereinafter also referred to as the INSTRUMENT, and applies from the delivery date March 31, 2024.

These operating instructions provide information on the function, installation, operation and maintenance of the INSTRUMENT. It must therefore be consulted for the operation and maintenance of the INSTRUMENT.
Read these operating instructions carefully before using the MESSGER for the first time to ensure proper handling, operation and maintenance from the outset.

Pay particular attention to all warnings and safety instructions.

Each INSTRUMENT has been checked at the factory before delivery.
It must be checked immediately upon receipt to ensure that it is complete and undamaged. Any missing parts and/or transport damage must be reported immediately.
A damaged INSTRUMENT must not be put into operation under any circumstances.

Always keep the operating instructions available for the operating personnel and ensure that operation and maintenance are carried out in accordance with the instructions. All instructions in this operating manual must be followed in the specified manner and sequence in order to avoid danger to persons and damage to the system.

The INSTRUMENT has been built in accordance with the state of the art and recognized safety regulations. Nevertheless, its use may present risks to users or third parties or to the system.

No warranty is given for malfunctions and damage resulting from failure to observe the operating instructions. CS INSTRUMENTS reserves the right to make technical improvements without prior notice.

Always quote the type OC500 and the complete serial number from the type plate in all correspondence.

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II. Table of contents

1 Scope of delivery

The online monitoring device for residual oil is supplied ready for operation. The scope of delivery includes

- a plug-in power supply unit (24Vdc)
- Connection hose PTFE OD:6mm
- A calibration certificate
- These detailed operating instructions.

You may also need:

- Mounting accessories such as screws and dowels.
- Reductions or transitions,
  required for installation in a compressed air line.
- Electrical accessories for connection to higher-level devices or data recorders

2 Device description

2.1 Measuring task

To ensure the quality of the compressed air, it is essential to monitor the key parameters precisely.
In addition to the critical pressure dew point, the residual oil content plays an important role.
In numerous production processes, such as in the pharmaceutical, chemical or semiconductor industries, clean and purified compressed air without any traces of hydrocarbons is of great importance.

The dispersion mechanism of the residual oil is of particular relevance.
If the oil content exceeds a critical level, the entire system can be contaminated within a very short time. Due to the low vapor pressure of the molecules forming the oil vapor and their adhesive properties, it takes a considerable amount of time before the system is completely free of oil residues again. Cleaning an oil-contaminated pipe network involves considerable effort and high costs.
A breakthrough of residual oil is often only recognized late, usually when quality problems have already occurred and considerable damage has been caused.

The high quality standards in the industry therefore require continuous and reliable monitoring of the residual oil content that remains stable over a longer period of time.
This is the only way to detect problems in good time before damage occurs.

The Oil Check 500, with its calibrated measuring range of
1ppb ... 1ppm (corresponds to approx. 0.003 to 3 mg/m³) is a highly sensitive measuring system for monitoring compressed air systems in order to detect any contamination, including shocks, as early as technically possible.

2.1 Gas sampling

The Oil Check 500 continuously extracts a sample volume of approx. 0.5 standard liters per minute from a gas under pressure without additional fittings and examines it for traces of organic compounds, here in particular hydrocarbons of the alkane and aromatic molecule groups with at least 6 or more carbon atoms.
The exact flow rate is shown in the diagram under 8.3.

The Oil Check 500 is specially designed to ensure the operational safety of your compressed air system between laboratory measurements, to warn you as early as possible if there is a risk of contamination and to avoid false positive alarms.

2.2 Device versions

Mobile version	Stationary variant
	
Carrying case variant, for mobile applications	Wall-mounted device for stationary use

2.2.1 Stationary and mobile measuring channels

The procedure for determining the measured value is identical for both device variants and the result is made available both digitally and analog at the corresponding interfaces with a frequency of 1/10s on the stationary measuring channel and 1/s on the mobile measuring channel.

➔ Both measuring channels are available for both variants.

The response time of the stationary measuring channel is designed for long-term sampling with gas sampling tubes, while the mobile measuring channel has been optimized for a portable setup with a sensor response time of a few minutes.

- Device version MOBILE - measuring channel mobile preset in the display
- Device version STATIONARY - measuring channel stationary preset.

2.2.2 Performance features of both device variants

- Photo-ionization detector (PID) adapted to the measuring task with a high measuring resolution of approx. 0.001 mg/m³ .
- Stable zero point, with tracking if required.
  No zero air, filters or other additional devices are required
- Non-specific monitoring for a variety of organic and inorganic components that meet the "oil vapor" criterion or are known as indicator molecules for oil vapors.
- Online measurement of the oil vapor content based on the specifications of ISO 8573-5. The residual oil content is displayed in mg/standard m³, the standard cubic meter is based on 1.0 bar absolute, +20°C, 0% relative humidity.
- Standard version 3 to 9 bar(a) for industrial compressed air systems without pressure reducer. <3bar(a) on request.
- Integrated digital output (Modbus RTU)
- Intuitive operation via capacitive touch interface.
- Clear and structured operating sequence.

2.2.3 Mobile device variant

- Splash-proof connectors and robust case
- Protected process connections

2.2.4 Stationary device variant

- Configurable alarm settings
- Adjustable pre-alarm and main alarm via two potential-free relay outputs
- Integrated, freely scalable, galvanically isolated analog output 4..20mA
  with the option 2x galvanically isolated 4..20mA output.
- Additional digital output (Modbus RTU) for service work without having to disconnect the existing device cabling.

3 Type plate

3.1 Type plate

The rating plate is located on the housing of the measuring device. This contains all the important data for the **Oil Check 500** measuring system and must be provided to the manufacturer or supplier on request.

Product name: OIL CHECK 500

Serial number: 15240001

Signal/Bus

Modbus RTU (2x), galvanically isolated 4..20mA interface, freely scalable, (second optional)

Alarm relay output (2x, maximum 50VAC)

Options

Z6990178 - Second galvanically isolated 4..20mA interface

Z6990077 - Alarm column

Z6990078 - Temperature control unit

Supply voltage

Typical 24V DC voltage (18V .. 36V)

Power consumption

Basic device without options maximum 5.4W (0.225A)

- With alarm option maximum 18W (0.75A)
- With temperature control option maximum 45W (1.875A)

Sample gas: **Air**

Working pressure: **3..9bar overpressure**

Maximum permissible pressure: **10 bar overpressure**

Working temperature: **+5°C ... +50°C**

Reference values: **20°C/1000hPa**

Typical gas flow: **0.5nl/min**

Protection class: **IP54**

Weight: **7.8kg**

NOTE	Handling the type plate
	Never damage, remove or make the rating plate illegible. For more information on the symbols used, see "Pictograms and symbols".

4 Intended use

4.1 Task of the Oil Check 500

Compressed air treatment for sensitive applications requires regular recording and monitoring of the required compressed air quality class in accordance with the latest edition of ISO standard 8573-1.

The Oil Check 500 is a measuring device which, when used as intended, is able to provide the operator of the compressed air system with the assurance that the compressed air quality class determined by the laboratory in accordance with ISO 8573-5 for oil vapor is permanently maintained between the cycles of a laboratory test. With a detection limit of better than 0.005mg/m^3 and a resolution of approx. 0.001mg/m^3 , i.e. approximately 1/10 of the transition from air class 1 to air class 2, the measuring device can generate indicative warnings or alarms if adjustable threshold values of oil vapor content in the compressed air are detected and exceeded.

4.2 Liquids

If the prescribed installation conditions are observed, no aerosols or liquid components of oils should be present at the inlet of the measuring device.
If this is the case, these can lead to permanent contamination of the device due to their physical properties and thus to a falsified measured value. If aerosols or liquid components are to be expected in your system, please use a two-layer coalescence filter or a comparable product upstream of the measuring device to keep solid and liquid components away.

4.3 Temperature influence/good practice

It is not recommended that the gas temperature in the Oil Check 500 falls below the temperature of the monitored compressed air at the measuring point.
The gas temperature in the measuring device and in the supply lines should always correspond to the temperature of the compressed air and its piping, or better still, be slightly higher.
The reason for this is the fact that the drop in temperature towards the measuring device can lead to the condensation of impurities in the compressed air, in this case the compressed air/oil vapor mixture.

➔ **Substances in liquid or solid phase can permanently falsify the measurement**

When directly transferring measured values recorded at different gas temperatures, in particular when comparing measurements at typical system temperatures with measurements at temperatures > 250°C, such as the results of gas chromatography, systematic deviations must be expected due to different physical conditions.

4.4 Pressure range

The Oil Check 500 is designed for a pressure range of 3bar ... 9bar absolute pressure. In this case, the flow rates specified in 8.3 occur during gas sampling. A lower flow rate usually means a lower response time of the set-up.

4.5 Light source

If used correctly, the measuring device can be used over a long period of time. The ageing of the light source is monitored by the device and a warning is automatically generated if it loses significant power.

4.6 Regular Calibration

To prevent possible faults, we also recommend carrying out a calibration every 12 months and having the proper function and condition of the device checked by a specialist.

5 Inappropriate use

5.1 Pressure too high

Operating the Oil Check 500 under pressure or flow conditions
that do not comply with the intended specifications can lead to considerable damage to the Oil Check 500 or your system.

5.2 Temperature too high

Please ensure that the permissible temperature range is adhered to, as exceeding the maximum permissible temperature can irrevocably impair the function of the internal device components, in particular their specified material properties, and the calibration therefore loses its validity.

5.3 Liquids

You should also avoid the ingress of liquids of any kind, especially liquid oil or water, into the MEASURING DEVICE, as this can also lead to damage.
Such damage can cause the MEASURING DEVICE to display the residual oil content incorrectly or no longer function properly.
Please note that such damage is not covered by product liability or warranty provisions and is therefore non-refundable.

5.4 Vapor/gas/hazardous substances

The measuring device was developed for the detection of low mass fractions of certain vaporous and gaseous hydrocarbons in clean carrier gases; the carrier gases must also be free of corrosive and aggressive components.
Some potential components of the gases to be monitored are classified as hazardous substances according to the current state of the art.

The substance quantities of the components contained in each case that are considered hazardous substances must under no circumstances exceed the permissible quantity specified for this component in the current Hazardous Substances Ordinance, i.e. the currently valid occupational exposure limit for the component.

According to the Hazardous Substances Ordinance (GefStoffV)1 , the occupational exposure limit is is the limit value for the time-weighted average concentration of a concentration of a substance in the air at the workplace in relation to a given reference period.

The AGW (formerly MAC) indicates the concentration of a substance at which acute or chronic harmful effects on health are generally not to be expected (§ 2 paragraph 7 GefStoffV).

The Technical Rules for Hazardous Substances (TRGS) reflect the state of the art,
occupational medicine and occupational hygiene as well as other established scientific findings for activities involving hazardous substances, including their classification and labeling.

The TRGS are published by the Federal Ministry of Labor and Social Affairs (BMAS) on behalf of the Federal Government.
The new regulations are published in the German Official Gazette (GMBl).

6 Safety regulations

6.1 Warning and information symbols used in these instructions

The safety instructions in these operating instructions are intended to avert danger. They can be found in the operating instructions before any action/work/activity is described, where a hazard may occur.

General danger symbol (danger, warning, caution).

Warning of electrical voltage.

General note.

Observe the installation and operating instructions.

Wear eye protection.

Wear safety shoes.

Wear protective clothing.

Environmentally friendly material.

The packaging material is recyclable and must be disposed of in accordance with the guidelines and regulations of the country of destination.

6.2 Warnings

Signal words according to ISO 3864 and ANSI Z.535

DANGER	**Imminent danger** Consequence of non-compliance: serious personal injury or death
WARNING	**Possible hazard** Consequence of non-compliance: possible serious personal injury or death
CAUTION	**Imminent danger** Consequence of non-compliance: possible personal injury or damage to property
NOTE	**Additional notes, information, tips** Consequence of non-compliance: Disadvantages in operation and maintenance.

6.3 General safety instructions

NOTE	Installation and operating instructions
	Before reading, check that these installation and operating instructions correspond to the device type. It contains important information and instructions for the safe operation of the meter. The installation and operating instructions must be read by the relevant specialist personnel[1] before starting any work. The operating instructions must be easily accessible at the installation site at all times. In addition to these installation and operating instructions, the national and company legal and safety regulations as well as accident prevention regulations required for the respective application must be observed. This also applies to the use of accessories and spare parts.

DANGER	Insufficient qualification
	Improper handling of the measuring device can lead to considerable personal injury and damage to property. All activities described in these operating instructions may only be carried out by qualified specialist personnel. These installation and operating instructions for the measuring device must be carefully read and understood by the responsible specialist personnel before starting any work (installation, commissioning and maintenance).

[1] **Qualified personnel -** Due to their specialist training, knowledge of measurement, control and compressed air technology as well as experience and knowledge of country-specific regulations, applicable standards and guidelines, qualified personnel are able to carry out the work described and recognize potential hazards independently. Special operating conditions require further knowledge, e.g. about aggressive media.

DANGER	Electrical voltage
	The measuring device is designed for a supply with low voltage (Extra Low Voltage) supply. The continuous permissible touch voltage for adults and normal applications, which is classified as life-threatening, is not reached. The low voltage of +24Vdc used here is not considered dangerous. It is essential to ensure that the power supply unit functions in accordance with the specifications and that it is in good condition and intact. In particular, if the power supply unit heats up abnormally, it must be repaired or replaced immediately by a specialist. If modifications, installations or attachments with higher voltages, in particular mains voltage, are carried out by the operator, this is done at the operator's own risk. and the electrical operational safety of the resulting system is entirely the responsibility of the operator.

WARNING	Operation outside the limit values
	If limit values are exceeded or not reached, there is a risk to people and material and malfunctions and operating faults may occur and measurement results may be falsified. The measuring device may only be operated as intended and within the permissible limit values specified on the type plate and in the technical data. The permissible storage and transportation conditions must be observed.

DANGER	Fire development
	A fire poses the greatest danger to people and material. Safety devices to prevent excess pressure due to fire are not included in the standard scope of delivery of the system. If there are potential sources of fire at the installation site, the operator must ensure that suitable protective measures are taken to prevent the permissible operating parameters from being exceeded.

DANGER	Exceeded pressure / temperature
	It must be ensured that the permissible operating pressures and operating temperatures in the appliance components are not exceeded under any circumstances. By default, the operator is responsible for protecting the device against excessive pressure and temperature. It must be ensured that the pressure-generating compressor and the compressed air network are appropriately protected. Suitable measures must be taken to ensure that the permissible operating temperatures are maintained under the ambient conditions prevailing at the installation site.

DANGER	Leakage of pressurized gas
	Due to contact with escaping pressurized gas or unsecured parts of the system may result in serious injury or death. • Installation and maintenance work only when depressurized carry out. • Only pressure-resistant installation material and suitable tools in perfect condition. • Check all system parts before pressurizing and follow suit. • Open valves slowly to avoid pressure surges in operating state. avoid. • Securely pipe compressed air lines. • Prevent persons or objects from escaping from the can be hit by soft compressed gas. • Transmission of vibrations, oscillations and impacts to avoid the measuring device. • Carry out a leak test.

CAUTION	**Malfunctions of the** measuring **device**
	Incorrect installation and inadequate maintenance can cause the meter to malfunction, which can affect the display and lead to misinterpretations. Observe the applicable national regulations and safety regulations during installation and operation.

6.4 Residual risk

The measuring device corresponds to the current state of safety technology. Nevertheless, certain residual risks remain:

- Hazard due to improper transportation and storage.
- Danger from electrical voltage when using incorrect electrical connection cables or touching live parts when the system is open.
- Danger due to improper commissioning or installation personnel who have not been trained.
- Danger due to disregarding the safety instructions.
- Danger due to bypassing or overriding the safety devices.
- Hazard due to operation outside permissible pressure and temperature limits.
- Hazard due to operation with a medium other than the approved medium.
- The safety stickers and safety instructions in these operating instructions indicate further residual risks. Always observe all safety instructions.

DANGER	**Wrong location**
	**The measuring device must not be used in potentially explosive atmospheres.**

6.5 Spare parts and options

The following spare parts and options are available for the Oilcheck 500:

Designation	Item number
Pre-calibrated sensor unit for the Oil Check 500, incl. certificate	0699 8080
Power supply unit 18W	0554 0115
Power supply unit 40W	0554 1115
Alarm column option	Z6990077
Temperature control unit option	Z6990078
Option Second galvanically isolated 4..20mA interface	Z6990178

6.6 Environmental protection

NOTE	Recycling of packaging material
	The packaging material is recyclable. The material must be disposed of in accordance with the guidelines and regulations of the country of destination.

7 Product information

7.1 Product features

Monitoring the system with the Oil Check 500 is designed for continuous and stable long-term operation over months and years. The innovative, patented "Forced Pressure Variation" process enables the sensor signal to be tracked in the field if required.

The measuring device has the following active components, which are controlled automatically.

- Valve I - Solenoid valve on input side
- Valve II - Solenoid valve between dosing chamber and measuring chamber
- Valve III - Solenoid valve on output side
- Pump - Vacuum diaphragm pump
- Pressure Sensor - Absolute pressure sensor
- PID Sensor - Photo Ionization Detector
- Humidity sensor - detector for internal humidity and gas temperature

The solenoid valves in the Oil Check 500 are open when de-energized; if the power supply is interrupted, the dosing chamber and measuring chamber are flushed. If there is no pressure on the inlet side, the chambers are open to the ambient air and a diffusion-based gas exchange takes place.

7.1.1 Inner structure

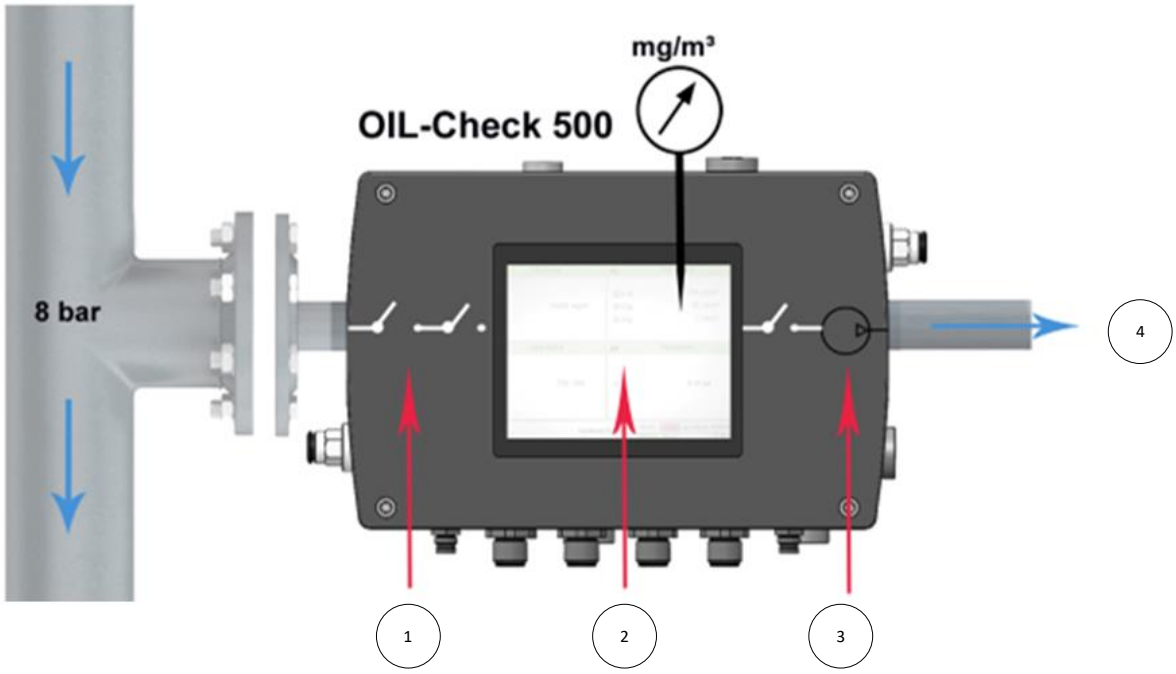
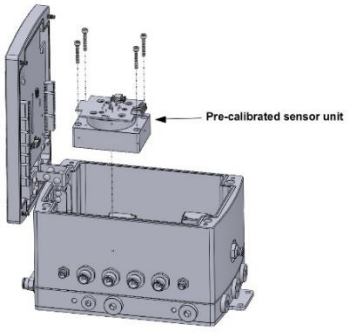
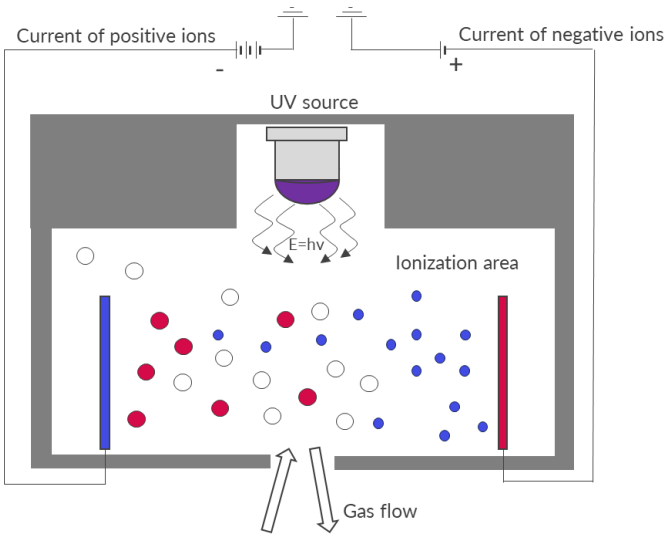


Illustration 1 -
(1) Dosing chamber
(2) Measuring chamber
(3) Vacuum pump
(4) Outlet to atmosphere 0bar(g)

7.1.2 Modular concept of the measuring device

	The sensor module in the Oil Check 500, which carries the PID sensor, can be replaced on site without having to send the device in. In particular, an additional pre-calibrated sensor module can be ordered and used on site in just a few simple steps.

7.1.3 Functional principle of the PID sensor

	The PID sensor detects vapours, i.e. freely moving molecules, which are present in the flowing gas stream. Their ionization energy must be lower than or equal to the energy of the UV light source used. The sensor technology is designed to be so sensitive that 1ppb, i.e. 1 ionized molecule among a billion neutral gas molecules, already leaves a detectable signature. A special feature of PID sensor technology is that the ionized molecules leave the sensor in an electrically neutral state and are therefore measured non-destructively. A series arrangement of several measuring devices therefore provides the same results.

7.1.4 Oil Vapour Resolution

This diagnostic value is the current resolution of the vaporous residual oil measurement. During operation, the Oil Check 500 calculates the actually achievable Oil Vapor Resolution in micrograms per cubic meter [µg/m^3] using the statistical noise component on the measurement signal and the stored calibration curve. 1000 micrograms = 1 milligram. For a brand new Oil Check 500, this value is approx. 1 µg per cubic meter or lower. If this value rises to >2.5 micrograms per cubic meter, reliable detection of the transition from air class I to air class II is no longer possible.
The device issues a corresponding fault message

The cause of an increased and therefore worsened oil vapor resolution may be a weak lamp (please check the relative lamp intensity) or EMC problems or other disturbance variables in the system.

7.1.5 Continuous operation

When measuring in ISO air class I (<0.01mg/m^3), distinguishing a system drift or an impending filter saturation from a possible drift of the sensor system has proven to be a particular challenge for smooth continuous operation.
The Oil Check 500 therefore has a new procedure for carrying out an on-site check of the device and the ongoing measurement for components that can be detected by the sensor, without the use of auxiliary gases or additional setups.
The test is independent of the calibration and checks for a correlation between the raw sensor signal and a variation in the number of molecules in the measuring chamber caused by a change in pressure.

7.1.6 Zero Check/ Forced Pressure Variation

Using the proprietary Forced Pressure Variation procedure, it is possible to set a new zero point for the sensor under the respective installation conditions. [Sensor Settings/Zero Check].

The device generates a negative pressure of approx. 500 mBar (absolute) in the measuring chamber and then fills it up to 1000 mBar (absolute) and 1500 mBar (absolute) with the homogeneous, connected gas. If there is no detectable increase in the sensor signal when doubling and tripling the pressure compared to the initial pressure in the temperature-stabilized measuring chamber, the Oil Check 500 allows to perform a zero adjustment (offset correction). Table 1 - Customer Adjustment) by the customer.

7.1.7 Readjustment on site

Before delivery, the measuring devices are subjected to an extensive calibration procedure in which they are adjusted and checked with reference systems at various concentrations.
A corresponding certificate is enclosed with each device.

Readjustment by the end user (Sensor Settings/Customer Adjustment) is possible and can be reversed at any time by resetting to factory values.

Table 1 - Customer Adjustment

Adjustable parameter	Factory setting
Offset [µV]	0.0
Response factor (amplification factor)	1.0

In particular using the method in 7.1.6 it is possible to track the offset in the field, which checks for possible residual oil content in advance.

Adjusting the parameters can lead to a considerable change in the measured values and may therefore only be carried out by specialist personnel with expert knowledge of the system and the monitored gases. If a corresponding adjustment is necessary at short intervals of a few days, we recommend servicing the Oil Check 500 and its process coupling and subjecting the gas or compressed air in the system to a laboratory test.

7.2 Unit conversion

Relative volume concentration and absolute mass concentration

Detected oil vapor is usually not a pure gas from a specific type of molecule but often a very complex mixture of different molecules with different physical properties. The conversion to the absolute concentration mg/m³ for the display and alarms is therefore based on the assumption of a typical average molar mass for mixtures whose components are considered oil vapour according to ISO 8573-5 and which are expected to be close to the normal conditions of pressure and temperature in the vapour phase.

The specified data, in particular the achievable resolution and the detection limit, refer to single-gas measurements with a certified test gas, as specified on the calibration certificate.

The fact that the actual molecular composition of the gas mixture detected in the field is individual and usually unknown even to the operator of the system results in a possible systematic deviation of the measured values. Unknown molecules -> unknown mass.

7.3 Measuring ranges/scaling

7.3.1 Calibrated measuring range

The Oil Check 500 has a calibrated measuring range of 1ppb ... 1ppm (corresponds to approx. 0.003 to 3 mg/m³ of a typical residual oil content).

7.3.2 Analog outputs

Measuring ranges can be freely scaled at the analog outputs (second output optional); the settings for this are called up via the menu via [Device Settings/4..20mA Settings].

Default setting 4..20mA

Output current (active)	4mA	20mA
Measured value	0.0 mg/m³	5mg/m³

7.3.3 Alarm relay

Threshold values and hysteresis can be freely set on the analog alarm relays, The settings for this are called up in the menu via [Device Settings/Alarm Settings].

Alarm relay default setting

	Alarm 1 - optical alarm	Alarm 2 - acoustical alarm
Measured value	>0.1 mg/m³	>0.1 mg/m³
Hysteresis	0.002 mg/m³	0.002 mg/m³

8 Technical data

8.1 Materials in contact with media

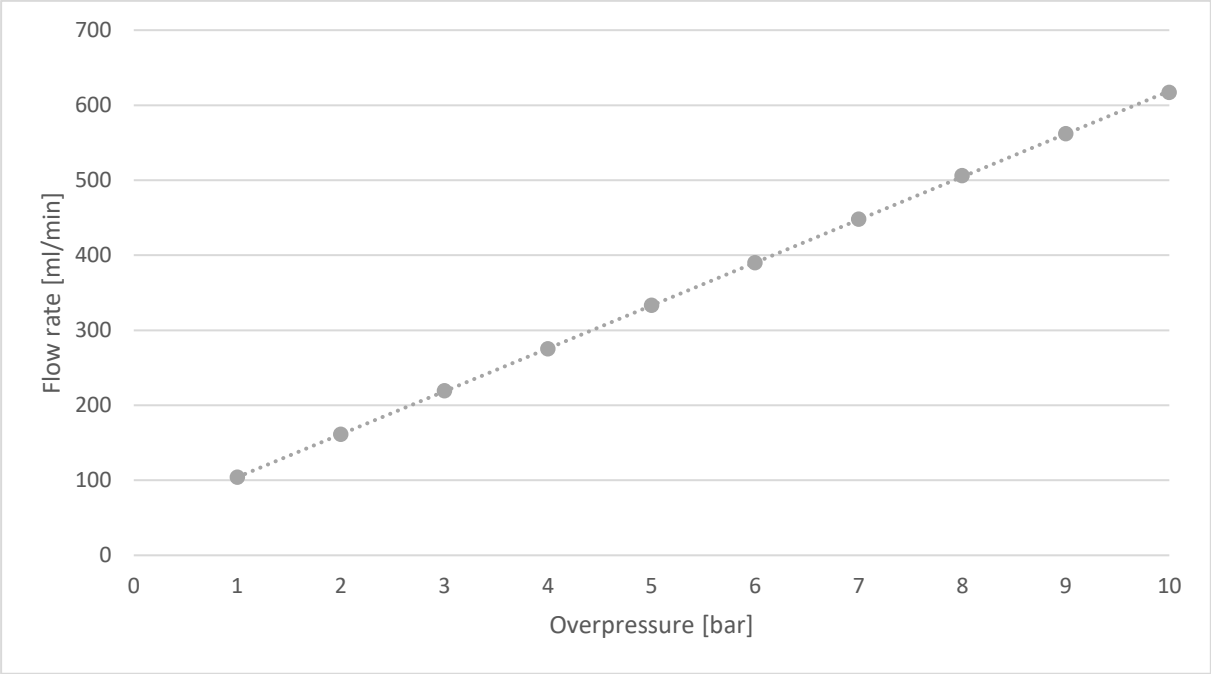
- Stainless steel 14404
- FKM
- PPSGF40

8.2 Dimensions

Mobile version (HxWxD) approx. 25cm x 30cm x 20cm	Stationary version (HxWxD) approx. 15cm x 22cm x 12cm
	

8.3 Expected flow rate n

The gas flow rate through the Oil Check 500 varies with the applied process pressure.
The following flow rates with an accuracy of approx. ±10% are expected



A flow rate of at least 200 ml/min to a maximum of 550 ml/min should be maintained. The PID measurement technology used by the Oil Check 500 is considered to be independent of the gas flow rate.
However, rapid or large pressure changes > 2 bar can have effects that lead to deviations in the measured value, especially when measuring in ISO air class I.

To ensure smooth operation, pressure surges and major pressure changes at the Oil Check 500 should be avoided.

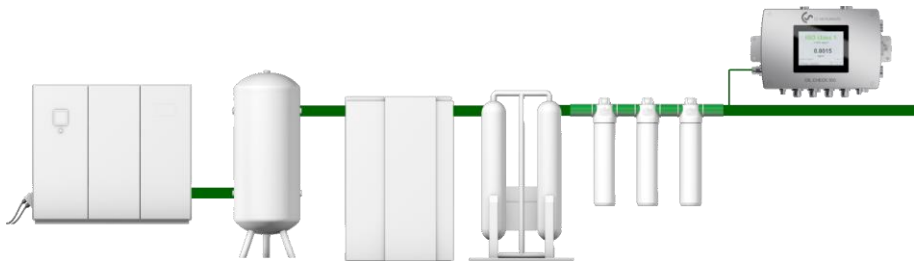
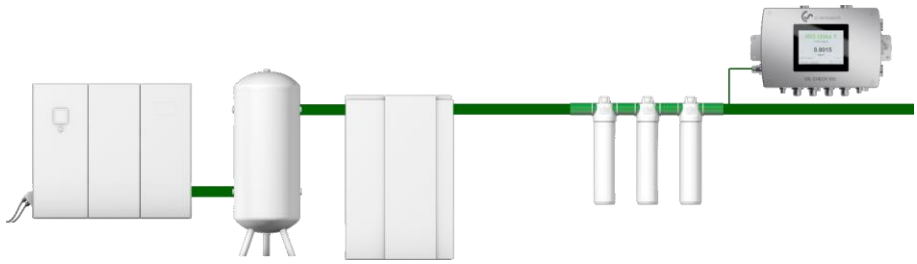
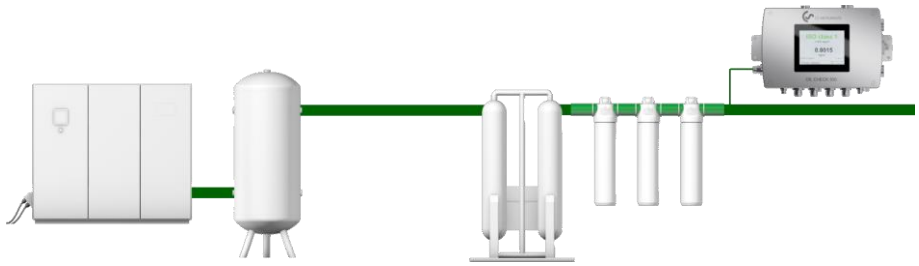
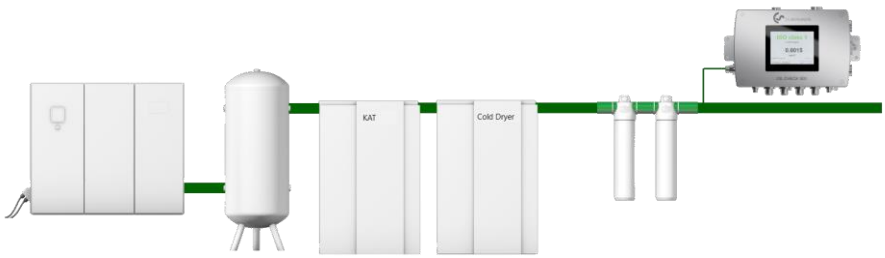
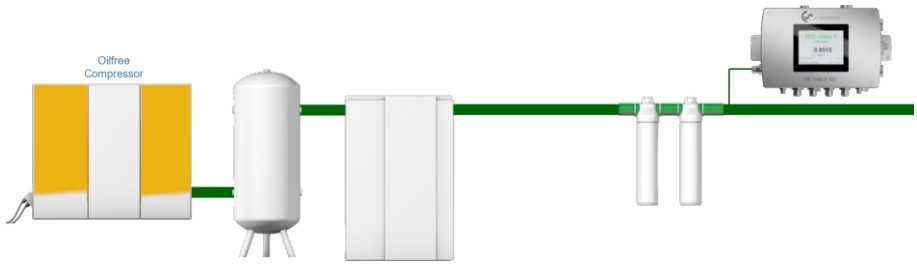
If the system is switched to a different average operating pressure, it is recommended that a Zero Check/ Forced Pressure Variation should be carried out.

9 Installation and use

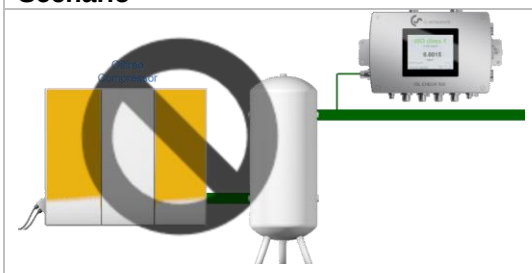
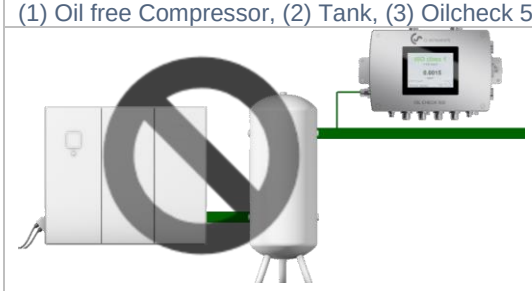
9.1 Process connection

- We recommend the process connection with stainless steel piping or PTFE hoses.
- It is recommended to provide an oil and grease-free shut-off valve between the Oil Check 500 and the process for maintenance work.
- We do not recommend mounting the Oilcheck 500 below the measuring point to prevent liquid components from flooding the measuring device in the event of a fault.
- The Oil Check 500 is intended for monitoring a system for vaporous residual oil content. ISO 8573-5 recommends installing a filter upstream to prevent aerosols or liquid components when measuring oil vapors.
- Unprotected installation can lead to permanent impairment of the measurement, as liquid or solid components can accumulate in the device.

9.2 Planned installation scenarios

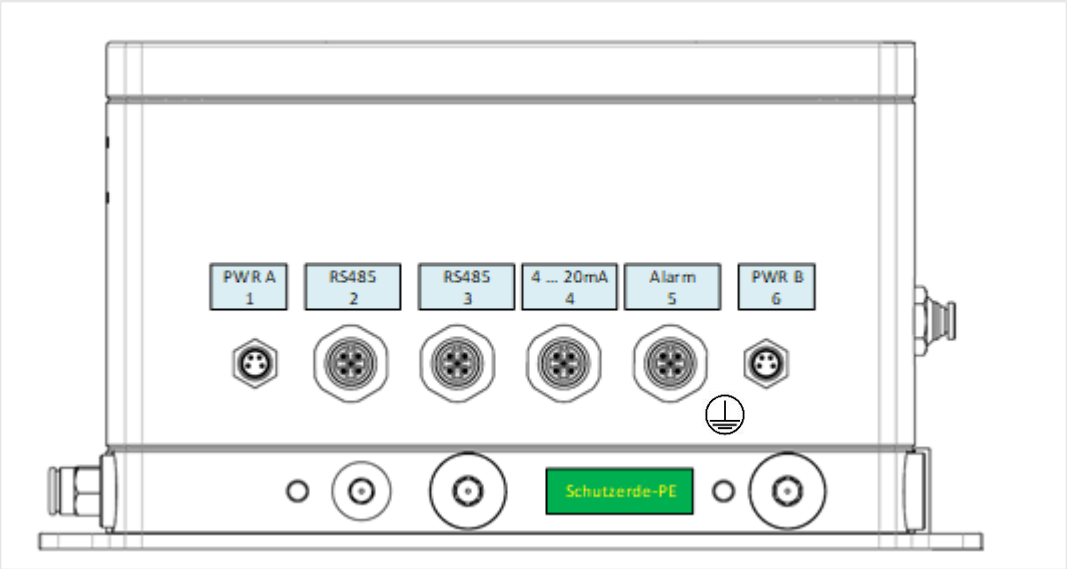
Scenario	Allowed
 (1) Compressor, (2) Tank, (3) Ref. Dryer,(4) Ad. Dryer,(5) Filter Stage **incl. Act. Carbon**	✓
 (1) Compressor, (2) Tank, (3) Ref. Dryer, (4) Filter Stage **including Activated Carbon**	✓
 (1) Compressor, (2) Tank, (3) Ad. Dryer, (4) Filter Stage **including Activated Carbon**	✓
 (1) Compressor, (2) Tank, (3) Catalytic Converter, (4) Ref. Dryer,(5) Filter Stage	✓
 (1) Oil free Compressor, (2) Tank, (3) Refrigeration Dryer, (4) Filter Stage	✓

9.3 Non-permitted installation scenarios

Scenario	NOT PERMITTED
	
(1) Oil free Compressor, (2) Tank, (3) Oilcheck 500	
	
(1) Compressor, (2) Tank, (3) Oilcheck 500	

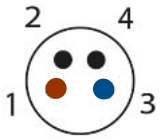
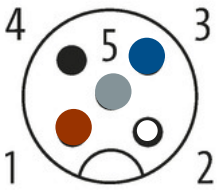
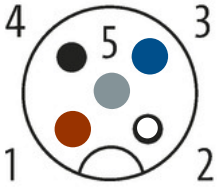
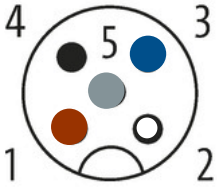
10 Electrical connection

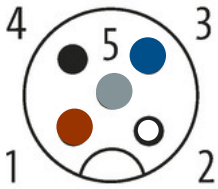
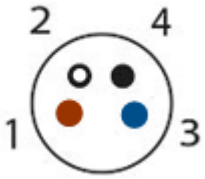
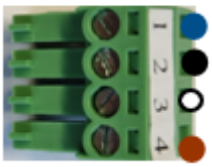
10.1 Connections on the housing



Output	Description
PWR A 1	Power supply connection
RS485 2	RS485 - Modbus RTU for data recorder or process control
RS485 3	RS485 - Service and diagnostics
4 ... 20mA 4	First and optional second 4..20mA output, active, galvanically isolated
Alarm 5	Auer alarm pillar or potential-free relay contacts for low voltages
PWR B 6	Power supply connection for temperature control
Schutzerde-PE	Connection for potential-free protective earth ⏚

10.2 Pin assignment

1	**PWR A** **Power Supply** 	Pin 1 (24Vdc) Pin 3 (GND)	Pin 1 + Pin 2 -	**K101** 
2	**RS485 (DS500)** **Modbus slave** 	Pin 1 (Vin_Detect) Pin 2 (Modbus A) Pin 3 (GND) Pin 4 (Modbus B) Pin 5 x	K601 Pin 1 Pin 2 Pin 3 Pin 4	**K601** 
3	**RS485 (diagnostics)** **Modbus slave** 	Pin 2 (Modbus A) Pin 3 (GND) Pin 4 (Modbus B)	K604 Pin 1 Pin 2 (GND) Pin 3	**K604** 
4	**4-20mA** **(+2nd 4..20mA)** 	Pin 1 X Pin 2 (4-20mA- 2nd) Pin 3 (4-20mA -) Pin 4 (4-20mA+ 2nd) Pin 5 (4-20mA +)	K301 Pin 1 Pin 2 Option Board Pin 1 Pin 2	**K301**  **Option Board** 

5	**Alarm** **Optional** 	**Pin 1 NO (Alarm1)** **Pin 2 NC (Alarm1)** **Pin 3 GND** **Pin 4 NO (Alarm2)** **Pin 5 NC (Alarm2)**	**K704** **Pin 1** Pin2 (COM) **Pin 3** **K703** **Pin 1** Pin2 (COM) **Pin 3**	**K704**  **K703** 
6	**PWR B** **Option Connector** 	**Pin 1 (24Vdc_Out)** **Pin 2 (Modbus A)** **Pin 3 (GND)** **Pin 4 (Modbus B)**	**Pin1** **Pin 2** **Pin 3** **Pin 4**	**K603** 

11 Modbus

11.1 Register assignment (both RS485 ports)

Register	Designation Value	Representation	Unit
1000	PID vapour stationary	Float32	[mg/m]^3
1002	PID vapour mobile	Float32	[mg/m]^3
1004	PID vapour stationary	Float32	[ppm]
1006	PID vapour mobile	Float32	[ppm]
1008	Gas Temperature	Float32	[°C]
1010	Gas Pressure	Float32	[mBar]
1012	internal relative humidity	Float32	[%]
1014	Lamp Intensity	Float32	[%]
1016	Pressure ambient (per Diagnostic Interval)	Float32	[mBar]
1018	Pressure process ((per Diagnostic Interval)	Float32	[mBar]

12 Commissioning

Once the installation is complete,
proceed as follows to commission the Oil Check 500:

- Check compliance with the general safety instructions.
- Check compliance with the instructions under Installation and use.
- Establish the process connection to the compressed air.
- Check the connections for leaks and measure the flow rate;
  this should be as shown in the diagram in 8.3 should be adjusted.
- Make the required electrical connections on the device side, especially with the power supply (M8 plug in PWR A).
- Make sure that the temperature equalization of the measuring device with the environment is complete, especially if the Oil Check 500 was stored at a cooler temperature than 20°C.
- Plug in the power supply unit or switch on the supply voltage.
- After switching on, the Oil Check 500 measures the process pressure and the ambient pressure and signals this with the message "Device Busy".
- When the indicators appear on the display, wait until the measured value has stabilized. Depending on the type of system and the storage or transportation conditions of the Oil Check 500, this can take up to 24 hours.
- Your Oil Check 500 is now ready for operation.

13 Operation

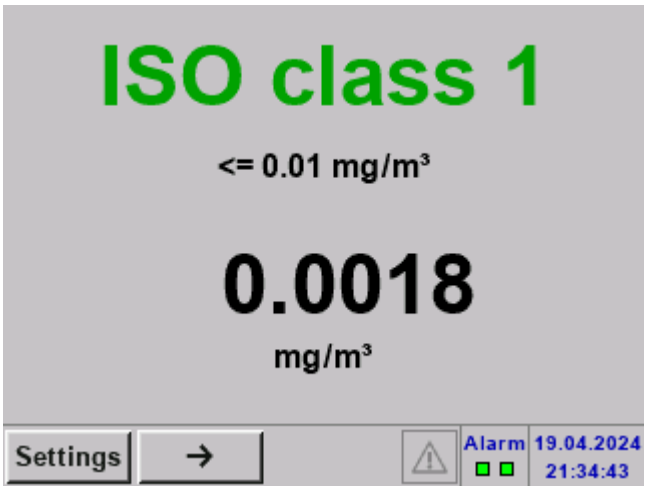
13.1 Initialization "Device Busy"

After switching on, the Oil Check 500 performs a diagnosis, during which the process pressure and ambient pressure are also determined.

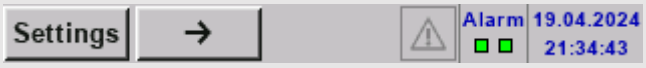
As soon as the display appears, the measuring device is ready for operation, although there may be considerable waiting times after connection until the piping and the measuring chamber have been flushed.

13.2 Main menu after switching on

The main menu shows the air class according to ISO 8573-1,
the concentration range for which this air class has been defined and the measured value in mg/m^3 are displayed. The operating buttons displayed in the status bar at the bottom of the screen can be used to switch to the menu navigation [Settings].

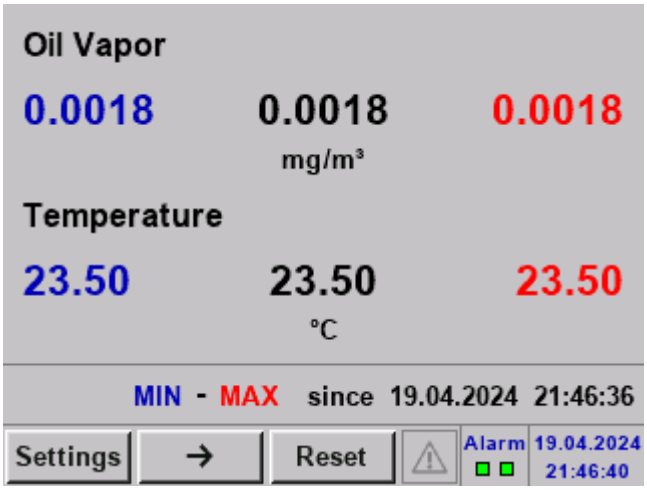
Main view	
	The following configurable display setting options are available: Display in volume PPM instead of mg/m3, no air classes are displayed. Display of the mobile measuring channel (instead of the stationary one), recognizable by the addition (mobile) after the measured value. The device now delivers the measured value at a higher interval and with a shorter response time, although the resolution decreases.

13.3 Status bar structure

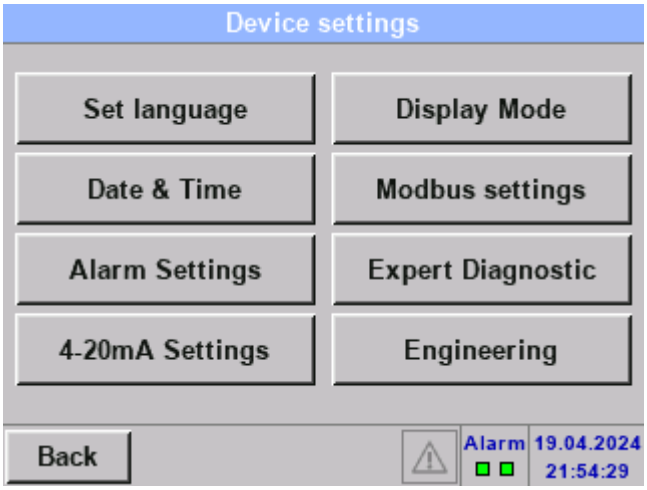


Settings	->	Warning symbol	Alarm	Time
Access operating menu	Switch to the next view	As soon as the warning symbol is not grayed out, there is diagnostic information from the device.	The two green or red squares symbolize the switching status of the alarm relays	A battery-backed real-time clock displays the date and time.

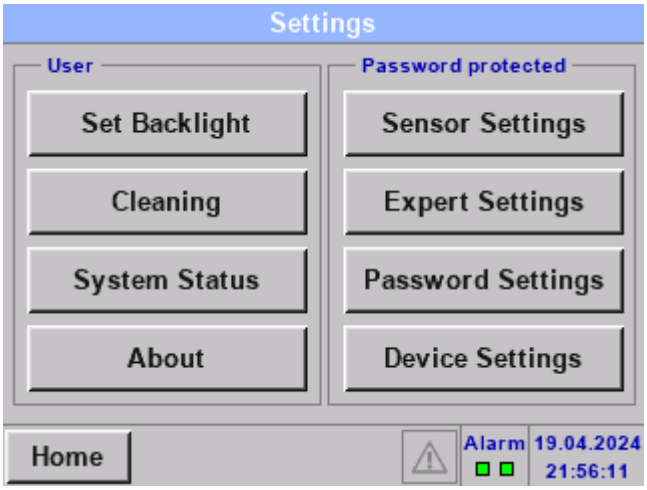
13.4 Display MIN/MAX values

Second view (MIN/MAX values)	
	In this view, the MIN and MAX values of gas temperature and residual oil concentration that have occurred since the last reset or device restart can be checked. Reset starts a new determination of the MIN/MAX values.

13.5 Device Settings

Settings for configuring the display (password protected)	
	The largely self-explanatory device settings can be called up here. Display Mode, switch between mobile and stationary measuring channel on the display and display the PPM value (instead of mg/m)³ Expert Diagnostic, detailed information on the device status. Engineering, special functions for device service

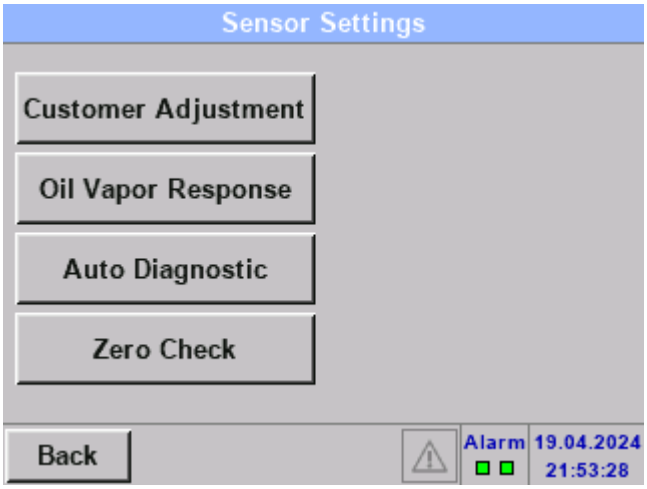
13.6 Main menu

Left block freely accessible without influencing the measured values Right block (Sensor, Expert, Password, Device Settings) can be protected with a password.	
	Set backlight, brightness and dimming delay Cleaning, touch interface deactivated for cleaning purposes System status, collection of various diagnostic values for technical service. About, collection of available information about the device such as versioning, serial number, etc.

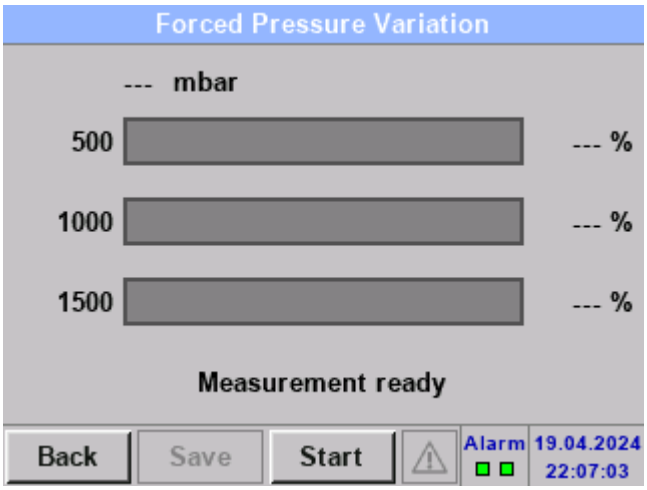
13.6.1 Password protection

To assign an individual password, the identical 4-digit numeric code you have defined must be entered twice in succession in the [Password Settings] dialog. Setting the password to "0000" deactivates the query (default setting). If you have forgotten your customer-specific password, please contact our service department.

13.7 Sensor Settings

Setting for configuring the sensor and the measuring channels (password protected)	
	Sensitive sensor settings can be made here, intended for use by specialist personnel or the technical service. Customer Adjustment, Offset and Response Factor of the measured value. Default setting: Offset=0.0, Response Factor=1.0 Auto Diagnostic, interval for Auto Diagnostic and pressure measurement for environment and process (0=deactivated) Zero Check, dialog for zero point tracking using the Forced Pressure Variation.

13.8 Dialog Forced Pressure Variation



Automatic zero point in the field.

[mbar] Display shows the current pressure in the measuring chamber after the start.

Bargraph 500 - Reference sensor value

Bargraph 1000 - Value double pressure

Bargraph 1500 - value triple pressure

Back - Cancel the process

Start - Start the process

Save - if not grayed out, the determined offset (zero offset) relative to the factory calibration is reversibly saved under Customer Adjustment/Offset.

14 Status / error messages

In principle, measurements can be taken for warnings, but no measurements are possible for faults.

14.1 Warnings implemented in the device

- Supply voltage (Supply Voltage)
- Sensor voltage (sensor supply)
- Gas temperature (Gas Temperature)
- Internal relative humidity (Humidity)
- Intensity of the light source relative to the calibration (Lamp Intensity)
- Increased sensor noise (oil vapor resolution)

14.2 Errors implemented in the device

- Sensor Element - PID Lamp or Stack failure
- Sensor Element - PID Oscillator failure
- Sensor Element - PID Power failure
- Sensor Element - PID unknown failure

15 Maintenance / cleaning

15.1 Expansion

- Switch off the operating voltage of the Oil Check 500 or pull out the mains plug.
- Close the compressed air supply.
- If available, insert the supplied sealing plugs into the gas inlets.

15.2 Maintenance

This maintenance schedule is a recommendation from the manufacturer. The operator must check the intervals depending on the operating conditions and shorten them if necessary.

Activity	week	month	Year
Check the outside of the measuring system for dirt, damage and corrosion, clean the pre-filter if necessary.		x	
Record the current operating parameters and compare them with the information under "Technical data".		x	
Check the electrical plug-in power supply unit for damage		x	
Check sensor sensitivity (oil vapor resolution) and service sensor module if necessary.		x	
Check safety devices.			x
Check pipe connections, hoses and all screw connections and tighten if necessary.			x
Check the terminal points of the electrical installation and tighten if necessary.			x
Carry out a leak test of the system.			x
Check fuses and replace if necessary.			x
Check the function and wear of the solenoid valves.			x
Check the function and condition of the vacuum pump.			x
Perform a function test of the operating messages.			x
Perform calibration/adjustment of the sensor module.			x

16 Calibration

16.1 Factory calibration

The following 12 points are calibrated in the factory in order to achieve the highest possible accuracy for the measurement in the sensitive ISO air quality classes I to IV.

Calibration point	PPB-Vol	mg/m³	ISO air class
1	Zero Air (0)	<0,003	I
2	1	0,0032	I
3	2	0,0064	I
4	4	0,0128	II
5	8	0,0256	II
6	16	0,0513	II
7	32	0,1025	III
8	64	0,2051	III
9	128	0,4102	III
10	256	0,8204	III
11	512	1,6408	IV
12	1000	3,2047	IV

16.2 Calibration intervals

In principle, the user is responsible for setting calibration intervals.

If there are specifications for recalibrations, e.g. in the quality management manual, these are the binding source for recalibration deadlines.

If the QM system has no specifications regarding calibration intervals, the decision must be based on a consideration of the costs of more frequent recalibration on the one hand and the costs of any invalid measurement results on the other.

Under certain measuring conditions, such as extreme temperature conditions, in particular low temperatures, persistently high oil vapor content or very high peak content, a higher maintenance effort is to be expected.

The importance of the operating conditions also means that a recalibration must always be carried out if the Oil Check 500 has been exposed to loads beyond its intended use. This ranges from major overloading, dropping, extreme temperature conditions, high humidity of the compressed air through to tampering with the device for repair purposes.

For very high demands on measuring accuracy (ISO air class I, oil vapor content < 0.01mg/m³), we recommend an initial recalibration interval of 6 months.
If it becomes apparent after the first or second recalibration that the measurement properties remain stable, the calibration interval can be extended to 12 months. A corresponding procedure for adjusting (extending or shortening) the calibration intervals should be part of the QM system.
The Oil Check 500 should be recalibrated no later than 12 months after delivery.

17 Guarantee

Defects that are demonstrably due to a factory defect will, of course, be rectified free of charge. The prerequisite is that you report this defect immediately after it is discovered and within the warranty period granted by us.
Damage caused by improper use or failure to observe the operating instructions is not covered by this guarantee.

The warranty is also void if the measuring device has been opened - unless this is expressly described in the operating instructions for maintenance purposes - or if serial numbers in the device have been changed, damaged or removed.

The warranty period for the Oil Check 500 is 12 months.
Unless otherwise defined, the warranty period for accessories is 6 months.
Warranty services do not extend the warranty period.
If necessary repairs, adjustments or the like are carried out in addition to the warranty service, the warranty services are free of charge, but the other services will be charged, as will transportation and packaging.

Further or other claims, in particular in the event of damage not affecting the appliance, are excluded unless liability is prescribed by law.

Services after the warranty period

Of course, we are also there for you after the warranty period has expired.
In the event of malfunctions, please send us your measuring device with a brief description of the fault. You can find
more details on our homepage https://www.cs-instruments.com/

18 Declaration of conformity

CS INSTRUMENTS GmbH & Co. KG

KONFORMITÄTSERKLÄRUNG

DECLARATION OF CONFORMITY

Wir / We — CS Instruments GmbH & Co.KG, Gewerbehof 14, 24955 Harrislee

Erklären in alleiniger Verantwortung, dass das Produkt
Declare under our sole responsibility that the product

Öldampf Überwachungsgerät Oil Check 500
Oil vapour monitoring device Oil Check 500

den Anforderungen folgender Richtlinien entsprechen:
We hereby declare that above mentioned components comply with requirements of the following EU directives:

Elektromagnetische Verträglichkeit Electromagntic compatibility	2014/30/EU 2014/30/EC
RoHS (Restriction of certain Hazardous Substances)	2011/65/EC & 2015/863/EC

Angewandte harmonisierte Normen:
Harmonised standards applied:

EMV-Anforderungen EMC requirements	**EN 55011:2016 + A1:2017** **EN 61326-1: 2013**

Das Produkt ist mit dem abgebildeten Zeichen gekennzeichnet.
The product is labelled with the indicated mark.

CE

Villingen-Schwenningen, den 16.01.2023

Wolfgang Blessing Geschäftsführer (CEO)

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Order processing and recalibration

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