



PARTICLE COUNTER R-PC300

Equipment Manual

Version 002

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EN

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Note: This manual refers to a specific regulation.

Ryme Worldwide, S.A., is not responsible for any changes that may be made to these regulations. The software may be modified without prior notice due to the constant evolution and development of the software.

Ryme Worldwide GmbH

Observe protection notice according to DIN ISO 16016!

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Document version

DATE	VERSION	DOCUMENT NUMBER	DESIGNATION
05.07.2023	v.0.3	DOK1	Instructions for use

LANGUAGE VERSION	SOFTWARE
Instruction manual, German	xxx

About this documentation

- ✔ This documentation applies exclusively to the product designated on the cover sheet.
- ✔ This documentation is an integral part of the product and a prerequisite for safe and successful operation. It must be kept throughout the life of the product and passed on to any subsequent owner or user.
- ✔ Failure to observe this documentation, in particular the warning and safety instructions, may result in personal injury and damage to property.
- ✔ Always keep this documentation handy at the product's place of use.
- ✔ Protect this documentation from dirt and moisture.
- ✔ The product equipment and the presence of the components described in this documentation are basically dependent on the ordered scope of delivery.
- ✔ We reserve the right to make changes to all contents of this documentation at any time due to technical changes without prior notice.
- ✔ The content of this documentation has been carefully checked for accuracy. Nevertheless, errors cannot be completely ruled out. Please notify us if you find any errors.
- ✔ The company Ryme Worldwide GmbH is referred to as Ryme in the following document.

Target group of this documentation

The target group of this documentation is instructed, qualified technical personnel from the automotive industry who are entrusted with any work on this product.

Further Documentation

The following additional documentation must be observed for safe and proper use of the product:

- ✔ Documentation of the control software

The following documentation must be observed for all operating phases that go beyond normal operation:

- ✔ Electrical and mechanical plans of the designated product

Liability and Warranty

- ✔ Ryme Worldwide GmbH accepts no liability for personal injury, property damage, operational disruptions and service costs resulting from:
 - ✔ Improper use, incorrect operation
 - ✔ Non-compliance with the contents of this documentation
 - ✔ Failure to comply with the maintenance instructions specified in this documentation.
 - ✔ Use of accessories, spare parts and operating materials that have not been offered or approved by the company offered, approved or authorized by Ryme Worldwide GmbH. This also applies accordingly to assemblies used by other manufacturers.
 - ✔ Unauthorized structural changes, additions and conversions to this product as well as unauthorized work on the regulation and control technology, insofar as this has not been approved by Ryme Worldwide GmbH.
 - ✔ Installation of programs on computers in the Ryme Worldwide scope of delivery unless these have been approved by Ryme Worldwide GmbH.
 - ✔ Improper and/or unauthorized repairs

All obligations of Ryme result from our General Terms and Conditions or the respective contract, which also contains the complete and solely valid warranty provisions. These contractual warranty provisions are also neither extended nor limited by the explanations

in this documentation. However, the warranty shall expire as a consequence of the above-mentioned points.

Typographic Awards

The following typographical distinctions are used in this documentation:

DESIGNATION	SYMBOL
Step by step working instruction	1, 2, 3...
Result of an action	→
Menus and menu items	a, b, c...
Designation of controls / buttons	<XYZ...>

List of Abbreviations / Glossary

Fig. (Figure)

Tab. (Table)



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1. GENERAL PRODUCT DESCRIPTION

1.1 USE AND FUNCTION

The R-PC300 is used to determine the particle number concentrations in the exhaust gas of combustion engines.

1.2 WORKPLACES OF THE OPERATING PERSONNEL


On the unit in workshops and laboratories

1.3 NOISE EMISSION

Measuring point	<p>< 75 dB(A)</p> <p>1 meter radius of the unit</p>
------------------------	--

1.4 LABELLING OF THE PRODUCT / NAMEPLATE ER

A type of plate with the following information is located on the unit

R-PC300	 <p>Hersteller: Ryme Worldwide GmbH Gewerbestraße 8c D-87787 Wolfertschwenden e-mail: info@ryme-worldwide.de</p>
SNr: 100791174/04.2022	<p>Messbereich: 5.000 - 500.000 cm³ Wertebereich: 0 - 10.000.000 cm³ Fehlergrenze: ± 75% v. Messwert</p>
DE-22-M-PTB-0031	<p>Temperaturbereich: 5 - 40°C Druckbereich: 860 - 1060 hPa Feuchtebereich: < 95% r.F. (nicht kond.) Messprinzip: Diffusion Charger</p>
CE DE-M 22 XXX	<p>Aufwärmzeit: < 5 min bei 20°C</p>

1 Type Plate (example)

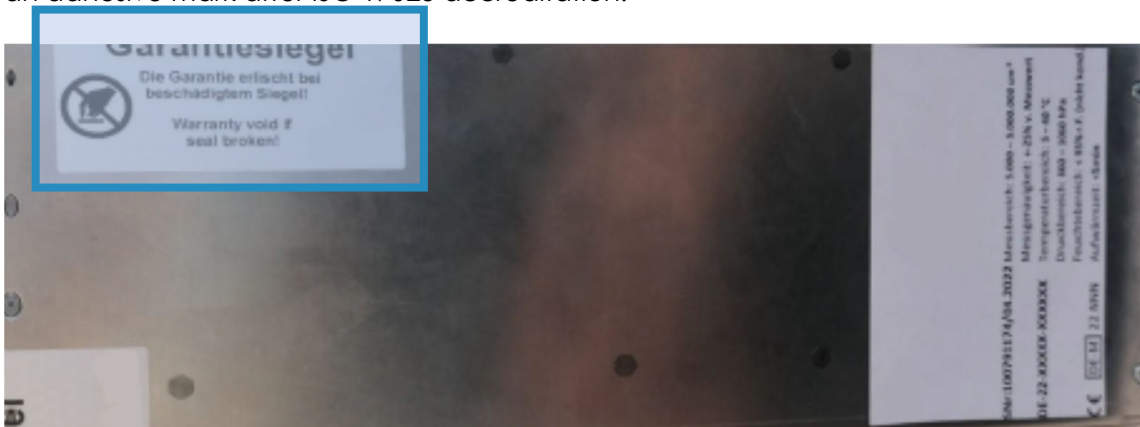
1.5 SEALS ON THE APPLIANCE

There are three mechanical seals on the unit to be able to prove that the unit has been tampered with. Two seals are located on the cover plate so that unauthorized opening of the unit can be detected. Another seal is located on the side of the R-PC300. This seal covers the service button, which must be activated for calibrations, software updates and changes to legally relevant software or parameters.



2 Sealing the lid (unit lying down)

(Since these interventions must be verified, this service button is also mechanically sealed. This prevents an unauthorized change. The seal above the service button is replaced by an adhesive mark after ISO 17025 accreditation.



3 Sealing the service button (back of the unit)

1.6 CONFORMITY

This product is CE compliant. You will find an example of a declaration of conformity in the appendix of this documentation.

2. FOR YOUR SAFETY

The R-PC300 has been developed and manufactured according to the current state of the art and the recognized safety standards and guidelines.

Nevertheless, in the event of non-observance of this documentation and in particular of the safety instructions, unavoidable residual hazards may emanate from the unit which may result in personal injury or damage to property of the user or third parties.



Avoid injuries and damage to property! Therefore:

- ✔ Read this documentation carefully before operating the unit. Make sure that you have understood the contents.
- ✔ Follow all safety and warning instructions in this chapter "For your safety" as well as in all other chapters of this documentation unconditionally and without exception and follow the instructions.
- ✔ Observe all technical descriptions of the respective technical components. Follow the safety and warning instructions.
- ✔ Follow the instructions on safety and warning signs attached to the unit and in the associated plant area.
- ✔ Follow the relevant national accident prevention regulations and safety regulations for occupational health and safety as well as the legal environmental protection requirements of the country of use.
- ✔ Follow any internal working, operating and safety regulations of the operator.

2.1 WARNING WORDS AND PICTOGRAMS USED

This documentation contains safety and warning notices that warn you of dangers in certain situations or in connection with certain behavior.

These are marked as follows:






WARNING WORDS

DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
ATTENTION	CAUTION indicates possible damage to property.

PICTOGRAMS

The safety instructions and warnings contained in this documentation are marked with the following pictograms:

	Warning of a hazard or danger point.
	Warning of dangerous electrical voltage.
	Warning of toxic vehicle exhaust fumes.
	Warning against hot surfaces.
	Warning of property damage.

2.2 INTENSED YSE

NOMINAL OPERATING CONDITIONS

The R-PC300 is used exclusively for measuring the number concentration of solid particles in motor vehicle exhaust gases.

- ✔ Only use the R-PC300 in accordance with its intended purpose and within its performance limits as specified in this documentation!
- ✔ Any use beyond this or any other use is considered improper and may result in personal injury and property damage to the user or third parties!
- ✔ Intended use also includes compliance with the specified maintenance instructions and observance of this documentation.
- ✔ The operator is responsible for the safe operation of the unit.

The R-PC300 is not suitable for use in an explosive environment!

OPERATING REQUIREMENTS

The R-PC300 may only be operated if the following requirements are met on the building side:

- ✔ The electrical installation of the premises where the R-PC300 is installed complies with national standards.
- ✔ The premises in which the R-PC300 is installed have adequate flue gas extraction, ventilation and exhaust systems and the associated gas warning equipment.
- ✔ The premises in which the R-PC300 is installed have adequate fire and explosion protection in accordance with the applicable regulations.

2.3 INITIAL INSTALLATION, INTIAL COMMISSIONING

- ✔ The initial installation and initial commissioning of the R-PC300 is carried out exclusively by service technicians from Ryme Worldwide GmbH.
- ✔ Re-installation is to be carried out exclusively by service technicians from Ryme Worldwide GmbH or by appropriately qualified specialists. These are fully responsible for observing the applicable protection and safety regulations.



2.4 DUTIES OF THE OPERATOR

The following requirements must be met by the operator of the R-PC300:

- ✔ Always keep this documentation handy, in legible condition and complete near the R-PC300. Make sure that all safety instructions contained in it are observed.
- ✔ Ensure that the R-PC300 is only used for its intended purpose in a safety-conscious and hazard-conscious manner in compliance with this documentation and that this is checked regularly.
- ✔ Only use instructed and sufficiently qualified personnel.
- ✔ See paragraph "Qualification and training of personnel" in this chapter.
- ✔ Ensure that required personal protective equipment is available and used by personnel. See paragraph "Personal protective equipment" in this chapter.
- ✔ Follow legal and other binding regulations for accident prevention and environmental protection as well as basic safety and health requirements.
- ✔ Ensure that first aid materials and equipment (first aid kit, eye wash bottles etc.) are available in the test room.

- ✔ Ensure that the fire protection systems on the building side, as well as flue gas extraction, ventilation systems and associated gas warning devices are always fully functional.
- ✔ Ensure that fire extinguishers are available in the test room and that escape routes are in place and always accessible.

OPERATING INSTRUCTIONS OF THE OPERATOR

The operator must draw up operating instructions in accordance with the applicable accident prevention regulations in a comprehensible form and language. They must be made known to the operating personnel and be always accessible. The operating instructions must contain, among other things:

- ✔ Instruction on putting out of service in emergencies.
- ✔ Notes on the use of personal protective equipment.
- ✔ Notes on the safe handling of the R-PC300.
- ✔ Information on the safe handling of operating materials (especially gases).
- ✔ Advice on what to do in case of injuries (first aid) and emergencies.
- ✔ Alarm plan. The alarm plan regulates the sequence of measures to be taken and the deployment of persons and resources and, if necessary, considers additional hazards that must be considered in aggravated circumstances.

2.5 QUALIFICATION AND TRAINING OF THE STAFF

- ✔ Any work on and with the R-PC300 must be carried out exclusively by personnel who are trained, sufficiently qualified and authorized for the corresponding work tasks.
- ✔ The personnel must be able to assess the work assigned to them and evaluate possible hazards based on their professional training, knowledge and experience.
- ✔ If the personnel do not have the necessary knowledge, appropriate instruction must be given. If necessary, this can be done by the manufacturer on behalf of the operator. Proof must be provided that the personnel have been instructed. A corresponding form can be found in the appendix of this documentation.
- ✔ Personnel to be trained may only work with the R-PC300 under the constant supervision and guidance of a person authorized and experienced for this purpose.
- ✔ Staff must be regularly instructed in all applicable matters of occupational safety and environmental protection.

- ✔ The area of responsibility, authority and supervision of staff must be clearly defined.
- ✔ Every person involved with the R-PC300 must have read and understood the complete contents of this documentation and be familiar with the position and function of all controls before starting work.
- ✔ The R-PC300 may only be operated by persons who have reached the minimum legal age and who are physically and mentally fit to do so (rested and not under the influence of alcohol, drugs or medication).
- ✔ Work on the electrical system of the R-PC300 may only be carried out by trained, authorized electricians.

QUALIFICATION REQUIREMENTS FOR THE OPERATING PERSONNEL

Assembly, installation, connection, and trial operation	Employee or on behalf of Ryme Worldwide GmbH
Normal Operation	Semiskilled workers
Cleaning	Semiskilled workers
Maintenance, troubleshooting	Trainer specialists
Repair	Employee or on behalf of Ryme Worldwide GmbH
Work on the electrics	Qualified electricians
Work on the regulation and control technology	Employee or on behalf of Ryme Worldwide GmbH
Dismantling, disposal	Trained specialists
Transport	Semiskilled workers

In exceptional cases, the operator's personnel may be authorised by Ryme for activities outside Ryme's area of responsibility. Approval to this effect must be obtained in writing from Ryme.

2.6 PERSONAL PROTECTIVE EQUIP

- ✔ Wear personal protective equipment as necessary or required by regulations.
- ✔ The personal protective equipment must meet the safety requirements for the respective work assignment.
- ✔ Respiratory protection / protective gloves: Wear suitable respiratory protection and protective gloves when handling contaminated filters.
- ✔ Hand and skin protection when working with isopropanol - Avoid skin contact - suitable protective gloves must be worn.

2.7 OPERATIONAL SAFETY OF THE R-PC300

- ✔ Only operate the R-PC300 if it is in perfect technical condition.
- ✔ Immediately eliminate any faults that may affect safety.
- ✔ Observe the prescribed intervals for recurring tests, inspections and maintenance work specified in this documentation.
- ✔ Protect all parts of the electrical system from moisture and humidity.
- ✔ Exclusively accessories and spare parts that have been offered, approved or authorized by Ryme. The use of other accessories and spare parts may impair the function and safety of the R-PC300.
- ✔ Do not make any unauthorized structural changes, additions or conversions to the R-PC300 without the approval of Ryme.

2.8 MAINTENANCE, TROUBLESHOOTING AND FAULT ELIMINATION, REPAIR, INSTALLATION OF SPARE PARTS

- ✔ Maintenance, repair, investigation and rectification of faults and deviations from normal operating conditions as well as the installation of spare parts only by personnel who are sufficiently qualified, instructed and authorized for the corresponding work tasks.
- ✔ Work on the electrical system of the R-PC300 may only be carried out by trained, authorized electricians.
- ✔ If it is necessary to dismantle protective coverings as part of maintenance or repair work, they must be refitted and put back into operation immediately after the work has been completed.
- ✔ Follow the warnings and instructions in the "Maintenance" and "Malfunctions" chapters of this documentation.

2.9 NOT USING THE R-PC300

Switch off the R-PC300 and secure it against unauthorized switching on.

2.10 TRANSPORT, STORAGE, DISPOSAL

Follow warnings and instructions in chapter "Transport, storage, disposal" of this documentation.

2.11 WARNING SIGNS

Warning signs are attached to the R-PC300 to warn you of dangers.

- ✔ Follow all instructions on warning signs.
- ✔ Do not alter or remove warning signs.
- ✔ Keep warning signs in fully legible condition.
- ✔ Replace defective or poorly legible warning signs.

2.12 SPECIFIC SOURCES OF DANGER

2.12.1 ELECTRICAL ENERGY

WARNING

Risk of electric shock



- Work on the electrical part of the R-PC300 may only be carried out by authorized electricians in accordance with the applicable electrotechnical rules and regulations.
- Before any maintenance work, disconnect the R-PC300 from the power supply and secure it against being switched on again!
- Observe the electrical circuit diagrams.

2.12.2 VEHICLE EXHAUST FUMES

WARNING

Danger of poisoning by toxic vehicle exhaust fumes!



- Ensure sufficient ventilation of the rooms in which the R-PC300 is operated.
- Do not operate the R-PC300 if the building's exhaust extraction system and the associated warning devices are out of order or not fully functional.
- If symptoms of poisoning occur, leave the toxic danger area immediately and move outdoors.
- Ventilate people with symptoms of poisoning with oxygen.
- Call an emergency doctor immediately.

2.12.3 POLLUTED FILTERS / POLLUTING WASTE MATERIALS

WARNING


Danger to health and environment due to contaminated filters!



- Wear appropriate protective equipment (respiratory protection, gloves) when handling contaminated filters.
- Dispose of the filter properly in accordance with the applicable regulations.

2.12.4 PETROL AND PETROL VAPOURS IN EXHAUST GAS AND CONDESATE


WARNING **Exhaust gas and condensate contain petrol and petrol vapours!**



- Dispose of exhaust gas and condensate drain only in places where there is no source of ignition!
- Collect condensate in a safe container for disposal.

2.12.5 ELECTROMAGNETIC FIELDS

WARNING **Health hazard for persons with pacemakers and metallic implants due to operationally occurring electric, magnetic and electromagnetic fields!**



- In the immediate vicinity of electrical equipment (converters, etc.) there may be a serious health hazard for persons with pacemakers and metallic implants or similar.
- Observe relevant directives and standards regarding electromagnetic fields!
- The operator must carry out a risk assessment for each workplace and derive and apply appropriate health protection measures.

2.13 PROTECTIVE COVERS AND CLADDINGS

The R-PC300 has protective covers and panels that are firmly screwed on.

These must not be removed!

Covers prevent contact with live parts. Removing covers during operation can result in death, serious bodily injury or damage to property.


WARNING **Risk of injury if protective covers are missing!**



- Do not remove protective covers! Live parts can be life-threatening.
- If it is necessary to dismantle safety devices and/or protective coverings as part of maintenance or repair work, they must be refitted and put back into operation immediately after the work has been completed.

2.14 NOTES ON AVOIDING DAMAGE TO THE R-PC300

WARNING **Avoid damage to the R-PC300**



- Always switch off the R-PC300 correctly. Always close the control software as described in the corresponding software documentation. Then shut down the PC properly. Improper termination of the software and uncontrolled switching off can lead to a system crash, loss of data and damage to the unit.
- Observe maintenance intervals.
- Do not use metallic tools to clean the R-PC300.
- Only use suitable, non-aggressive, grease- and hydrocarbon-free cleaning agents.

- Parameter settings in the control software of the R-PC300 may only be made by experts. Incorrect settings in the control software can cause damage or impair the measuring accuracy.
- Do not install any programs on the control computer that have not been authorised by Ryme.

Damage and/or service costs caused by failure to observe these instructions are not covered by the warranty.

3. TECHNICAL DESCRIPTION

3.1 COMPONENT OVERVIEW

The particle counter R-PC300 enables the determination of the particle number concentration (PN) in exhaust gases of combustion engines according to the specifications of the MessEV. The design and technical specification of the device follows the requirements of PTB requirement 12.16 for particle counters. The suitability of the device for the field of application is confirmed by a type examination of the Physikalisch-Technische Bundesanstalt (PTB). For the type examination, proof of immunity to interference (climatic, EMC, mechanical) as well as a test on a real engine certified by DEKRA or TÜV is also required.

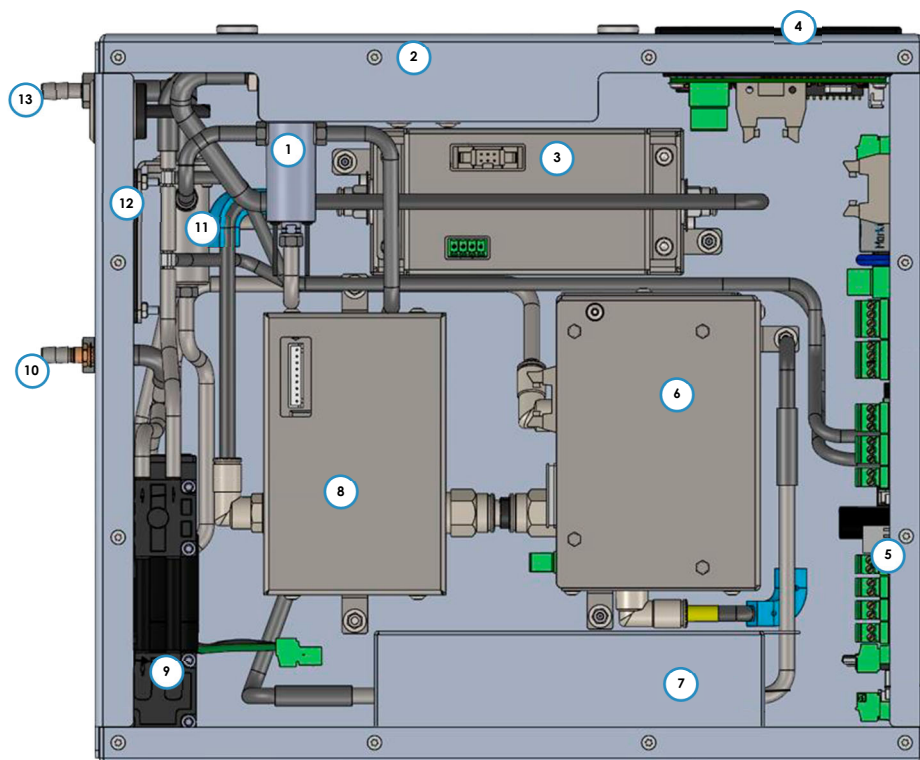
The R-PC300 works according to the measuring principle of a diffusion charger particle counter. The measuring principle is based on the attachment of ions to the particles by diffusion. The number of particles can be determined by diffusion charging of the particles and subsequent measurement of the electrical current caused by the charged particles.

Sampling is carried out via a probe with a hose. Upstream of the sensor, a water separator and a Volatile Particle Remover (VPR) remove excess water and volatile particles from the aerosol and ensure defined measurement conditions upstream of the sensor.

The measured values are displayed on a display integrated in the unit, which shows the metrologically relevant display. The R-PC300 in connection with a PC incl. AU software complies with the AU device guide version 6.



3-1 Component overview (operating mode standing only with display facing upwards)



3.2 Arrangement of modules

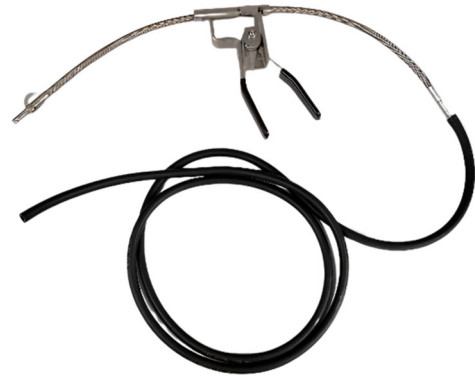


1. Nullluftventil
2. HEPA Filter
3. Faraday-Cup
4. Display
5. Steuerplatine
6. Diffusion Charger
7. Volatile Particle Remover
8. Precipitator
9. Pumpe
10. Aerosol-Auslass
11. Wasserabscheider
12. Lüfer
13. Aerosol-Einlass

3.2 COMPONENT DESCRIPTION

3.2.1 SAMPLING DEVICE

The sampling device consists of the sampling probe version 1 and a hose version 1, which feeds the taken sample to the measuring device. The exhaust gas sampling probe consists of a flexible hose with stainless steel braiding. For better guidance, spacers are attached to the tip of the probe to ensure reliable insertion even in narrow (90°) curved exhaust tailpipes.



3.3 Sampling probe version 1 with sample tube version 1

The probe is attached with a spring-loaded clamp that can be operated with one hand.

The handle is insulated to prevent injury or burns to the operator.

An electrically conductive sample hose leads from the probe to the measuring device. This minimizes particle losses due to electrostatic precipitation.

TECHNICAL DATA

Weight	Approx. 0,5 kg
Length of sampling probe version 1	600 mm
Outer diameter of sampling probe version 1 incl. spacer	25 mm
Length sample hose version 1	2 – 4 m
Diameter sample hose version 1	11 mm x 5 mm (wall thickness 3 mm)

3.2.2 WATER SEPARATOR

To protect the measuring equipment from condensate, the water is condensed out in a separator upstream of the measuring equipment and continuously disposed of via a condensate drain.

The water separator cartridge is blown directly by the enclosure fan to achieve targeted cooling and dew point reduction.

3.2.3 ZERO AIR VALVE

A 3/2 solenoid valve can be used to switch automatically between the sample gas path and the purge gas. The purge gas is provided with ambient air drawn through a HEPA

filter. The particle-free air can also be used for an automated zero adjustment of the measuring technique. If there is an abrupt drop in pressure at the sample gas inlet (e.g. due to condensate being sucked out of the exhaust pipe), the system also automatically switches from sample gas to purge gas to prevent contamination of the measurement technology.

3.2.4 HEPA FILTER

Particle-free air is required to provide zero air and to generate the ions for diffusion charging. This is generated from ambient air with the help of disposable HEPA filters.



3.4 Filter for zero air for rinsing & generation of ions in the diffusion charger (top view)

As shown above, access to the inline filters is possible without tools at the top of the housing and can be changed simply by pulling off the hoses.

TECHNICAL DATA

Separation efficiency	> 99,9998 %
Filter fineness	0.1 µm
Input / Output	6.3 mm (1/4") hose
Length	84.5 mm
Diameter	25,5 mm

3.2.5 VOLATILE PARTICLE REMOVER

The Volatile Particle Remover (VPR) consists of a tube heated to 350°C and is used to remove volatile particles. The removal rate is greater than 90 %.

To prevent re-condensation, the aerosol is diluted after the VPR.

TECHNICAL DATA

Length of heated pipe	115 mm
Outer diameter	6 mm
Diameter inside	4 mm
Operating temperature	350° C
Electrical power	Max. 100W at 24V DC
Separation rate	> 99%

3.2.6 DIFFUSION CHARGER

The Diffusion Charger generates unipolar charged ions using the corona discharge of HEPA-filtered air. In a mixing section, the particles of the aerosol are mixed with the ions and the particles are charged via diffusion. The efficiency of the charging depends not only on the volume flow of the HEPA air and the aerosol, but also on the discharge current at the corona needle.



3.5 Diffusion Charger

TECHNICAL DATA

Power Supply	24 V DC
Power Consumption	200 mA
Dimensions	134 mm x 113 mm x 84,1 mm
Interface	CAN bus + control and supply of the precipitator (device-internal)
Aerosol flow rate	1,4 l/min
Dilution rate	0,7

3.2.7 PRECIPITATOR

The precipitator separates free ions and fractions of charged particles. The component consists of a cylindrical capacitor to which a high voltage is applied. In the capacitor, the charged particles are accelerated towards the electrodes and a certain proportion

is separated. The ratio of the separated particles depends on the electric field strength in the capacitor and the electric mobility of the particles. By cycling the electric field, the ratio of deposited particles is varied and a size-dependent correction of the number of particles can be performed.



3.6 Precipitator

TECHNICAL DATA

Power Supply	is supplied by the Diffusion Charger
Dimensions	140 mm x 109,7 mm x 60 mm
Interface	Direct interface with Diffusion Charger
Aerosol flow rate	1,4 l/min

3.2.8 FARADAY CUP



3.6 Faraday cup

The Faraday Cup consists of a conductive, insulated tube. When charged particles flow through the tube, an electric charge of opposite sign is induced in the tube. If the Faraday Cup is connected to ground, the induced charge can be derived and measured as a current.

TECHNICAL DATA

Power Supply	24 V DC
Power Consumption	200 mA
Dimensions	LxWxH 152 mm x 57 mm x 81 mm
Interface	CAN-ISO 11898 (250 kBit) + control and supply of the precipitator
Aerosol flow rate	1,4 l/min

3.2.9 PUMP

CAN-ISO 11898 (250 kBit) + control and supply of the precipitator.



3.8 Diaphragm pump

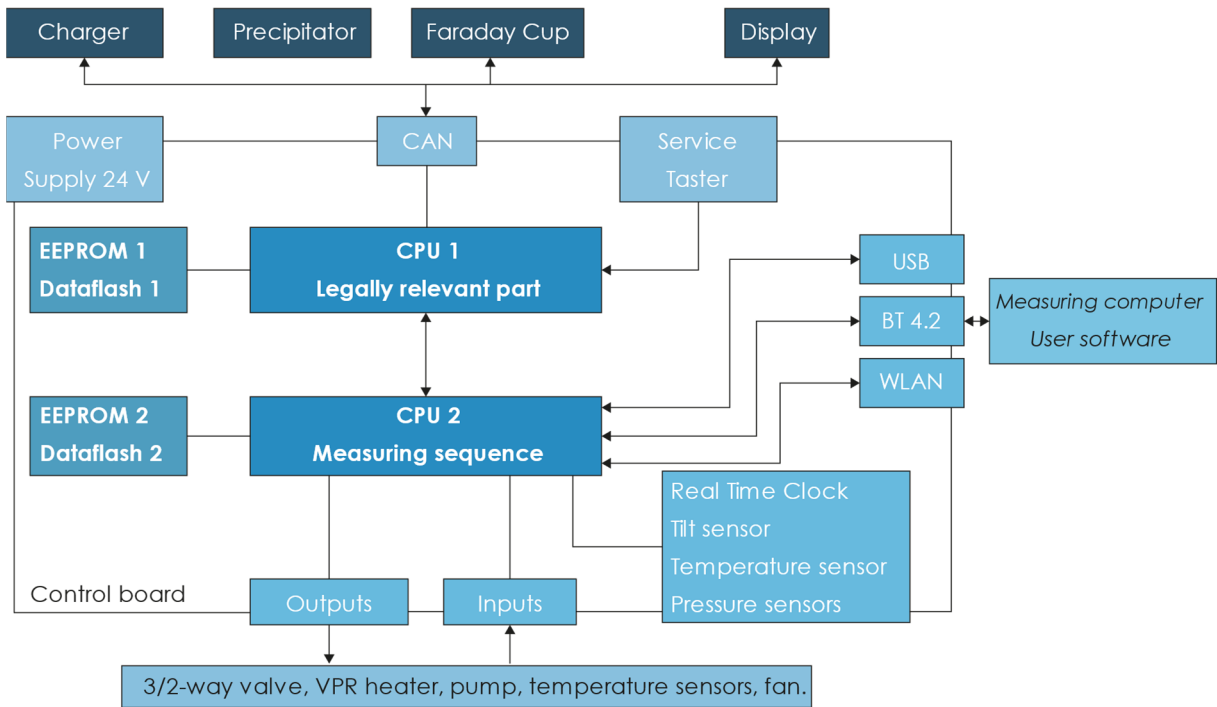
3.2.10 CONTROL BOARD

The R-PC300 has a central control board. As shown schematically below, the sensor modules of the particle measurement technology can be connected to the control board. In order to meet the requirements of the type of examination by the PTB, the design was based on a strict separation between "legally relevant" handling of the measured values and measurement sequence control as well as communication with the operator software. The CPU1 is responsible for the "legally relevant" software. The measured values are output directly to the display by the CPU1. The layout thus fulfils the requirements of the WELMEC 7.2 guideline for risk class C. The CPU2 is responsible for the "legally non-relevant" software. External communication takes place via USB Bluetooth or WLAN.

In addition to communication, the board has pressure, temperature, and inclination sensors for system monitoring. The board also controls the VPR heater, fan, and sample gas pump.

In addition, the following automated test sequences are integrated in the software of the control board:

- ✓ Self-test when switching on the meter
- ✓ Automated zero drift test
- ✓ Calibration procedure



3.9 Block Diagram of control board

The board continuously provides all relevant parameters that have a significant influence on the measuring process for monitoring.

Event logging with date, time and event also runs on the board. In this way, events such as updates, errors or calibration processes can be evaluated retrospectively.

3.2.11 METROLOGICALLY RELEVANT DISPLAY

The measured values are shown on a 2x16 digit display. The display range or value range covers 0 to 10,000,000 cm⁻³ Values outside the measuring range. (5,000 - 500,000cm⁻³) are marked accordingly with a flashing display.



3.10 Display of measured values & status on unit display (view from above)

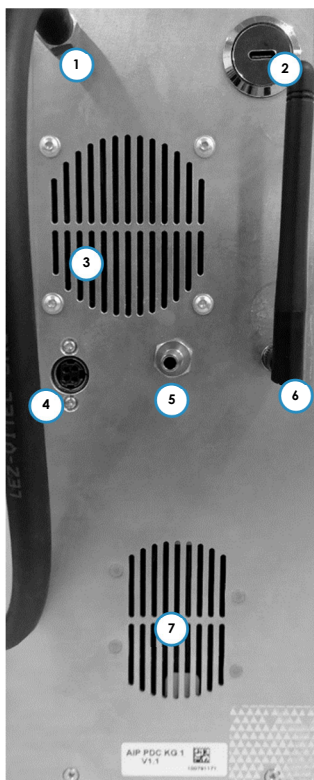
3.2.12 OBD ADAPTER

This adapter enables wireless communication of relevant OBD data to the PC on which the measurement procedure is operated. The adapter is connected directly to the vehicle. As soon as the adapter is connected to the vehicle, the green LED lights up. The red LED signals the power supply. The OBD adapter is used to read out the fault codes. The module is also used to determine the engine temperature and speed.

3.3 CONNECTIONS / INTERFACES

The connections or interfaces are located on one side of the R-PC300. The sample is fed from the sampling probe into the R-PC300 at the **SAMPLE IN** connection. **The sample is** led out of the device at the **SAMPLE OUT connection**. The antenna connection is used for wireless communication via Bluetooth. The R-PC300 is supplied with 24V at the **POWER connection**. The input is located above this and the output from the housing ventilation is located below.

In addition, there is also a USB connection. This can be used to connect the R-PC300 to the PC instead of the Bluetooth connection.



1. Sample in
2. USB – C
3. Fan inlet
4. Power
5. Sample out
6. Antenna
7. Fan outlet

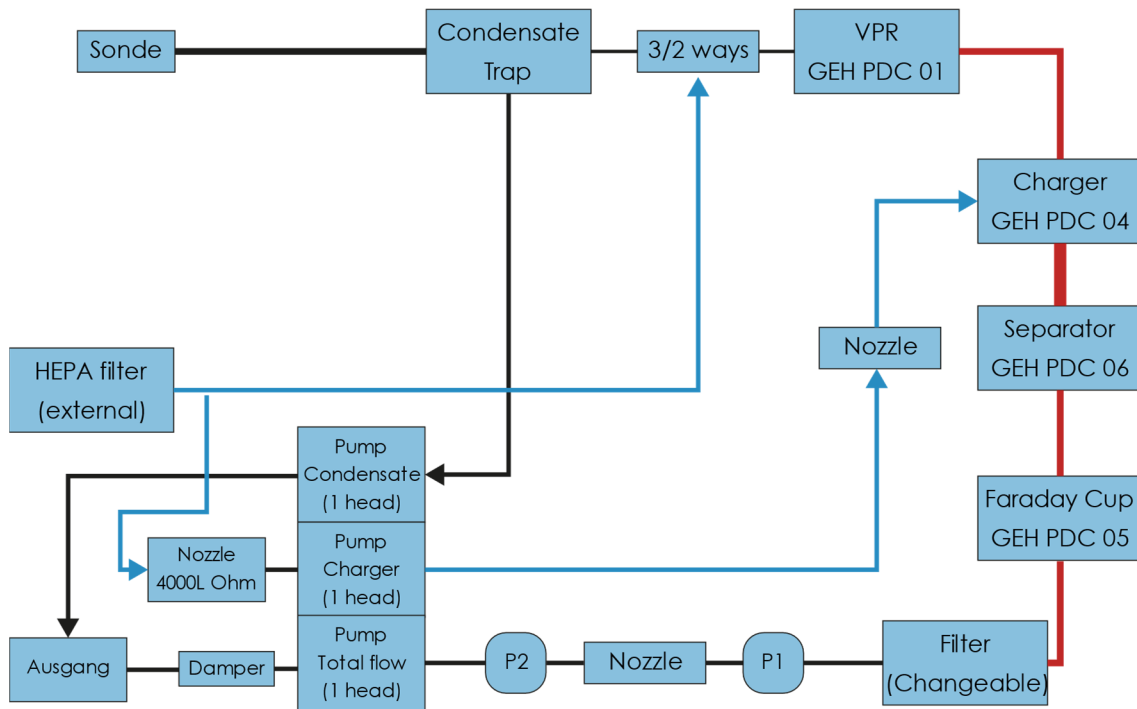
3.11 Overview of connections / interfaces

3.4 TECHNICAL DATA

Power supply	24 V +-10 % DC voltage
Power consumption	< 120 W
Weight	5 kg
Dimensions	325 mm x 103 mm x 290 mm
Situation of use	Upright (display points upwards) due to the operation of the condensate separator
Measuring range	5,000 1/cm ³ - 500,000 1/cm ³
Value range	0 1/cm ³ - 10,000,000 1/cm ³
CLIMATIC ENVIRONMENTAL CONDITION	
Temperature range	+5 °C to 40 °C
Temperature range storage	-10 °C to +50 °C
Ambient humidity	< 95 % (non-condensing), closed environment without splash water
Ambient pressure	860 hPa to 1060 hPa
Mechanical environmental condition	Class M2 (OIML D11 (2013))
Electromagnetic ambient condition	Class E2
Measuring gas flow via measuring sensors	1.32 +- 0.04 l/min
Measuring gas flow via sampling probe	2.1 +- 0.1 l/min
Error limit	± 75 % of the measured value
Set-up and warm-up time	< 5 min at 20 °C
Communication	USB, Bluetooth, WLAN (not implemented)
Max. Length signal lines	3 m
Max. Length DC supply cable	2 m
Concentration display	Metrologically relevant display (display backlit)

3.5 FLOWCHART

Operating instructions R-PC300.



4. OPERATION

4.1 COMMISSIONING

The installation site should be vibration-free, dry and frost-free. Avoid direct sunlight or the influence of intense heat sources on the unit. A hose at least 1 meter long should be connected to the sample gas outlet socket to ensure that the measured exhaust gases can be discharged safely into the open air. When discharging into suction devices, there must be no negative pressure at the point of discharge. The probe hose with sampling probe must be connected to the Sample in input. The cable connection to the PC is made **via the USB connection**. This can also be done wirelessly via Bluetooth.

After plugging in the power supply, the unit starts automatically.

4.1.1 WARM-UP PHASE

The unit starts up automatically. The display shows the current software version currently. A progress indicator also appears in the bottom line, showing the progress of the warm-up phase. In this phase, the VPR is brought up to its operating temperature of 350°C.

4.1.2 ZERO DRIFT TEST

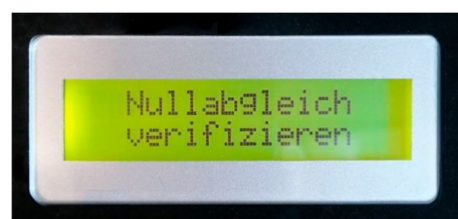
In order to be able to carry out a correct measurement, an automatic zero-point test is carried out after the warm-up phase. For this purpose, the measuring modules are pressurized with HEPA air via the integrated 3/2 directional control valve and the zero point is adjusted.

4.1.3 SELF TEST

After a successful zero drift test, the unit carries out an internal self-test in which the software and the functions of the most important assemblies are checked.

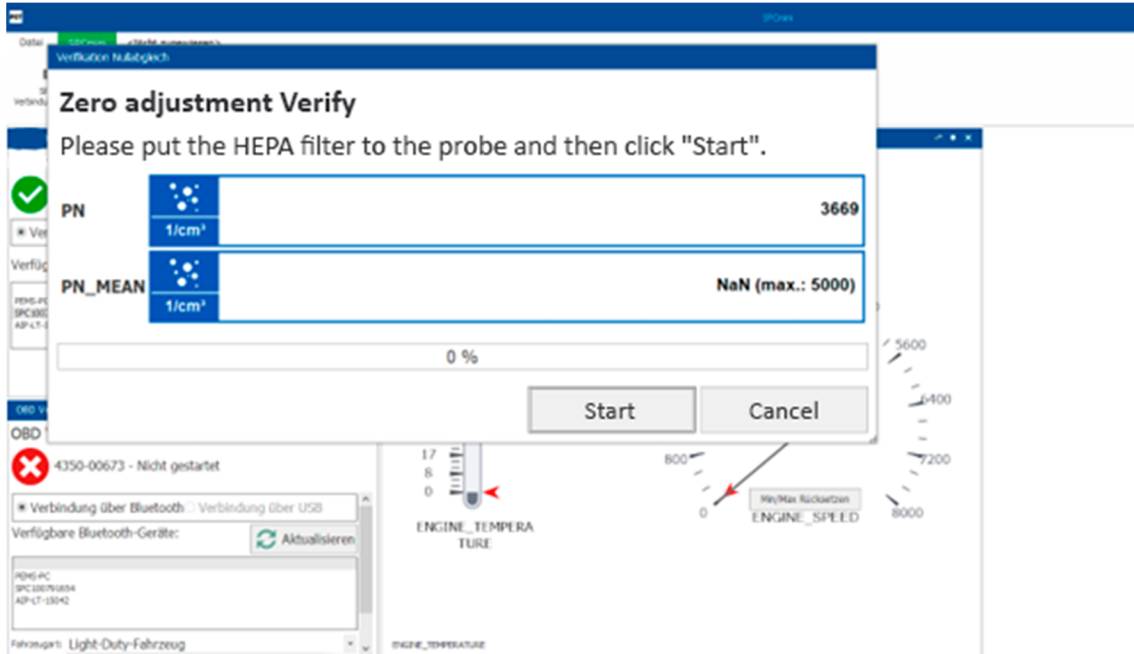
4.1.4 ZERO POINT TEST

After the self-test has been carried out successfully, the following message appears on the display of the R-PC300:



4.1 Switch on message after Warm up

As soon as the software is started, the zero-point verification message is automatically displayed as follows:



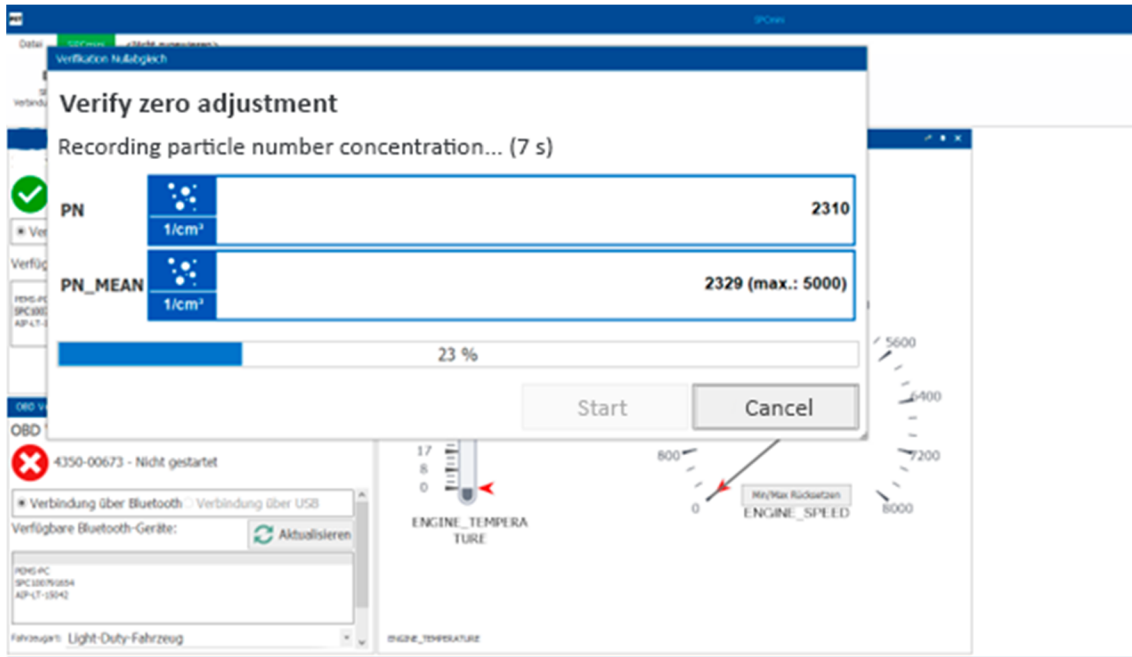
4.2 Pop Up Window for Verification of the Zero Point

Before the zero adjustment can be verified, the HEPA filter supplied must be attached to the probe (see Fig. 4-3).



4.3 Attaching HEPA filter to probe

After that, the verification can be started.



4.4 Verification procedure (example)

If the particle count remains below the required 5000 cm⁻³ for the measurement period of 30 s, the R-PC300 becomes ready for measurement and the currently measured particle count is also shown on the display. The message "Verify zero adjustment" on the display goes out.



4.1.5 MEASURING MODE

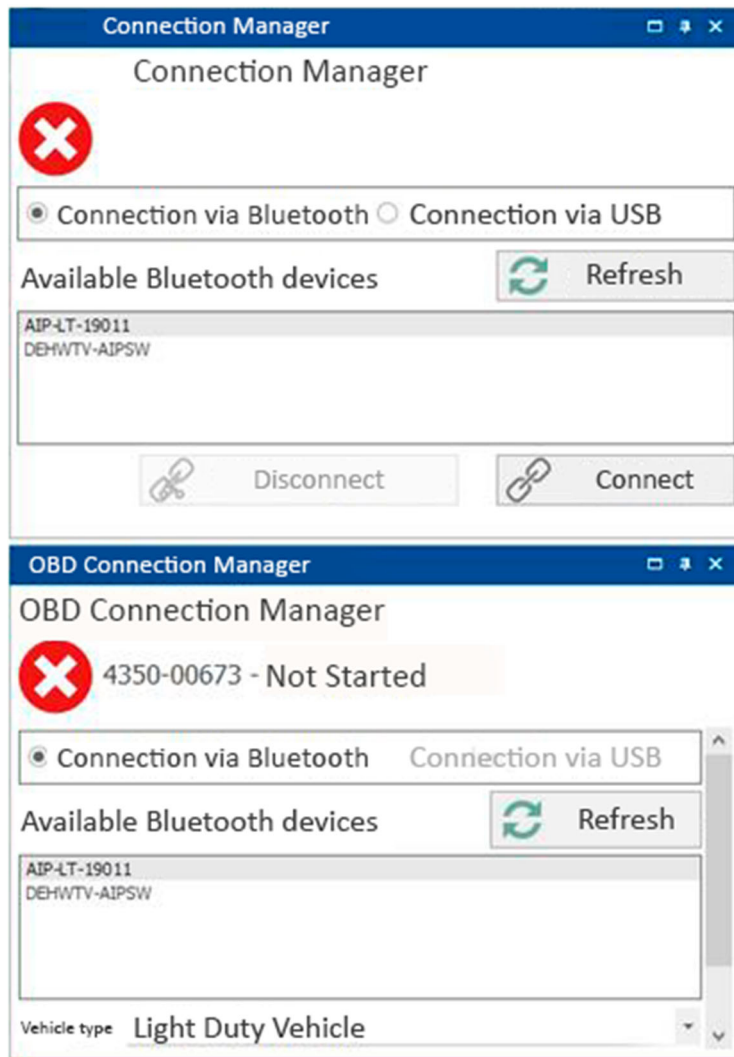
The unit is now ready to measure and can be operated via PC.

4.2 UNIT SETTINGS

Since no settings can be made on the unit itself via switches, all setting options are made via the PC connected to the unit. Here, the individual tests can also be controlled manually.

4.3 SETTINGS IN OPERATION SOFTWARE (EXAMPLE)

First, the OBD scan tool can be connected to the PC via Bluetooth in addition to the already connected R-PC300.



4.5 Connection manager operator software (example)

The units are then connected to the PC and measured values can be received.

In this channel overview, the respective software versions including their CRCs can also be queried and recorded.

The check tests to be carried out are either triggered automatically after switching on or can also be started manually via the user software. The zero point test can only be initiated via the user software, as this requires operating steps to be carried out and confirmed on the unit.

Channel Overview

Select channels

Latest ID	Source	Name	Time	Value	Unit	Channel Type	Origin	Engage
Treiber_422F5...	RYME E-OBD	DTCS_COUNT	01:01:0001 01:...	<null>		int?	Initial	
Treiber_422F5...	RYME E-OBD	IS_MIL_ON	01:01:0001 01:...	<null>		bool?	Initial	
Treiber_422F5...	RYME E-OBD	IS_CHATTING_...	01:01:0001 01:...	<null>		bool?	Initial	
Treiber_422F5...	RYME E-OBD	CAPELEC_SOF...	01:01:0001 01:...	<null>		string	Initial	
Treiber_422F5...	RYME E-OBD	ENGINE_TEMPE...	01:01:0001 01:...	<null>	K	PhysicalValue	Initial	
Treiber_422F5...	RYME E-OBD	ENGINE_SPEED	01:01:0001 01:...	<null>	1/min	PhysicalValue	Initial	
Treiber_422F5...	RYME E-OBD	ACTIVE_DTCS	01:01:0001 01:...	<null>		string	Initial	
Treiber_422F5...	RYME E-OBD	CAPELEC_SERI...	01:01:0001 01:...	<null>		string	Initial	
Treiber_422F5...	RYME E-OBD	CAPELEC_DEVI...	01:01:0001 01:...	<null>		string	Initial	
Treiber_2B77E...	RYME E-OBD	PUMP_CLOCK_...	01:01:0001 01:...	<null>	Hz	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	IS_CHARGER_OK	01:01:0001 01:...	<null>		bool?	Initial	
Treiber_2B77E...	RYME E-OBD	IS_SEPARATO...	01:01:0001 01:...	<null>		bool?	Initial	
Treiber_2B77E...	RYME E-OBD	TILT_X	01:01:0001 01:...	<null>	°	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	CHARGER_VOL...	01:01:0001 01:...	<null>	V	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	TEMPERATURE_1	01:01:0001 01:...	<null>	°C	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	TEMPERATURE_2	01:01:0001 01:...	<null>	°C	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	IS_HEATER_1_OK	01:01:0001 01:...	<null>		bool?	Initial	
Treiber_2B77E...	RYME E-OBD	TEMPERATURE_3	01:01:0001 01:...	<null>	°C	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	PARTICLE_CUR...	01:01:0001 01:...	<null>	fA	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	PARTICLE_CUR...	01:01:0001 01:...	<null>	fA	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	ION_TRAP_VO...	01:01:0001 01:...	<null>	V	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	IS_CHATTING_...	01:01:0001 01:...	<null>		bool?	Initial	
Treiber_2B77E...	RYME E-OBD	SIGMA_PARTIC...	01:01:0001 01:...	<null>	fA	PhysicalValue	Initial	
Treiber_2B77E...	RYME E-OBD	DIFFERENTIAL...	01:01:0001 01:...	<null>	Pa	PhysicalValue	Initial	

Channel overview OBD visualization Log in

4.6 Overview of the received measured values (example)

Read/write EEPROM variables Software versions read

Variable number: 0

Data type: UInt8

Variable value: 0

Request Set

Control tasks

Switch on heating 1 Switch off heating 1

Switch on heating 2 Switch off heating 2

Switch on pump Switch off pump

Switch on air filter Switch off air filter

Reset water separator

HEPA air suction

Switch on supply voltage flow sensor 2 Switch off supply voltage flow sensor 2

Start self test

Error reset charger/separator

Standby mode charger/separator Charger/separator operating mode

Reset application

4.7 Overview of the setting options (example)

In addition, the current software versions on the unit can be queried and compared.

Read/write EEPROM variables		Read software versions	
KNT PDC ST CPU 1:	<input type="text"/>	KNT PDC ST CPU 2:	<input type="text"/>
KNT PDC SE:	<input type="text"/>	KNT PDC DC:	<input type="text"/>
KNT LCD C1:	<input type="text"/>		
Inquiries			

4.8 Querying the software versions (example)

To enable a direct comparison of the legally relevant display with the display of the AU software during type approval, it is possible to freeze the measured values via the button "Activate freeze measured values". After pressing the button, the measured values of the displays are static and no longer fluctuate. After the comparison has been completed, the measured values can be displayed updated again by pressing the button "Deactivate freeze measured values".

Read/write EEPROM variables		Software versions read	
Variable number	<input type="text" value="0"/>		
Data type	<input type="text" value="UInt8"/>		
Variable value	<input type="text" value="0"/>		
<input type="button" value="Request"/>		<input type="button" value="Set"/>	
Control tasks			
<input type="button" value="Set PAUSE operating mode"/>		<input type="button" value="Set operating mode MEASURE"/>	
<input type="button" value="Activate freeze measured values"/>		<input type="button" value="Deactivate freeze measured values"/>	
<input type="button" value="Switch on heating 1"/>		<input type="button" value="Switch off heating 1"/>	
<input type="button" value="Switch on heating 2"/>		<input type="button" value="Switch off heating 2"/>	
<input type="button" value="Switch on pump"/>		<input type="button" value="Switch off pump"/>	
<input type="button" value="Switch on air filter"/>		<input type="button" value="Switch off air filter"/>	
<input type="button" value="Reset water separator"/>			
HEPA air suction			
<input type="button" value="Switch on supply voltage flow sensor 2"/>		<input type="button" value="Switch off supply voltage flow sensor 2"/>	
<input type="button" value="Start self test"/>			
Error reset charger/separator			
<input type="button" value="Standby mode charger/separator"/>		<input type="button" value="Charger/separator operating mode"/>	
<input type="button" value="Set calibration date"/>			
<input type="button" value="Reset application"/>			

4.9 Setting option for "freezing" the measured values (example)

This is indicated by a "*" on the legally relevant advertisement.



4.10 Display of the "Frozen" mode

In order to have the legally relevant software versions incl. checksum shown on the metrologically relevant display (device display) during type examination and placing on the market, variable 1524 can be set as follows. The software versions and checksums are also shown on the display for 5 seconds each time the device is started.

- Variable value 0** = normal display
- Variable value 1** = Display CPU1 on display
- Variable value 2** = CPU2 on display
- Variable value 3** = Display CPU3 on display
- Variable value 4** = Display CPU4 on display
- Variable value 5** = CPU5 on display

Read/write EEPROM variables		Software versions read	
Variable number	<input type="text" value="1524"/>		
Data type	<input type="text" value="UInt8"/>		
Variable value	<input type="text" value="0"/>		
<input type="button" value="Request"/>		<input type="button" value="Set"/>	
Control tasks			
<input type="button" value="Set PAUSE operating mode"/>		<input type="button" value="Set operating mode MEASURE"/>	
<input type="button" value="Activate freeze measured values"/>		<input type="button" value="ADeactivate freeze measured values"/>	
<input type="button" value="Switch on heating 1"/>		<input type="button" value="Switch off heating 1"/>	
<input type="button" value="Switch on heating 2"/>		<input type="button" value="Switch off heating 2"/>	
<input type="button" value="Switch on pump"/>		<input type="button" value="Switch off pump"/>	
<input type="button" value="Switch on air filter"/>		<input type="button" value="Switch off air filter"/>	
<input type="button" value="Reset water separator"/>			
<input type="button" value="HEPA air suction"/>			
<input type="button" value="Switch on supply voltage flow sensor 2"/>		<input type="button" value="Switch off supply voltage flow sensor 2"/>	
<input type="button" value="Start self test"/>			
<input type="button" value="Error reset charger/separator"/>			
<input type="button" value="Standby mode charger/separator"/>		<input type="button" value="Charger/separator operating mode"/>	
<input type="button" value="Set calibration date"/>			

4.11 Possibility to show the software versions on the display (example)

5. PC AU PROGRAMME

5.1 GENERAL

Only the R-PC300 with its metrologically relevant display (device display) is the subject of the type examination. The AU user software is not the subject of the type examination and is therefore not tested by the PTB.

Guideline: The PC AU program is approved for exhaust gas measurement according to the current guideline version 6.

Software: The PC AU software is certified by the assessors and guides the operator through the prescribed procedure of the official exhaust emission test. In addition, settings of the R-PC300 can be changed with the help of the software.

5.2 OPERATOR GUIDANCE WITH AU PC PROGRAMME

There is a separate detailed description for the user guidance in the AU PC program.



6. MAINTENANCE

- ✔ Only the maintenance activities described in this chapter may be carried out by the operator's personnel!
- ✔ Maintenance activities going beyond this may only be carried out by Ryme personnel, authorized Ryme service partners or after consultation with and approval by Ryme.
- ✔ Ryme is not liable for personal injury, property damage or service costs resulting from unauthorized activities.
- ✔ Carry out the specified maintenance activities on time or commission Ryme to do so in good time (at least 1 month before they are due).
- ✔ To ensure smooth and trouble-free operation, we recommend annual basic maintenance by Ryme personnel or by authorized Ryme service partners.
- ✔ Observe all instructions and safety regulations in this documentation as well as the relevant protection and safety regulations.
- ✔ Defects and damage detected during periodic visual inspections (e.g. loose connections, damaged cables, leaks...) must be repaired immediately!
- ✔ Should you require further information, or should particular problems arise that are not covered in sufficient detail in this documentation, please contact.
- ✔ Ryme. Important service numbers can be found on the inside cover of this document.

6.1 SAFETY INSTRUCTIONS FOR MAINTENANCE

WARNING



Risk of electric shock, risk of damage to the R-PC300

- ✔ Maintenance work only by sufficiently qualified, instructed and authorized personnel.
- ✔ Work on the electrical equipment of the R-PC300 only by authorized electricians.
- ✔ Before any maintenance work, disconnect the R-PC300 from the power supply and secure it against being switched on again!
- ✔ Observe the relevant protection and safety regulations!

WARNING



Danger to health and environment due to contaminated filters!

Spent filter elements can be toxic or corrosive.

- ✔ Wear appropriate protective equipment (respiratory protection, gloves) when handling contaminated filters.
- ✔ Dispose of the filter properly in accordance with the applicable regulations.
- ✔ Hand and skin protection when working with isopropanol - Avoid skin contact - suitable protective gloves must be worn.

ATTENTION

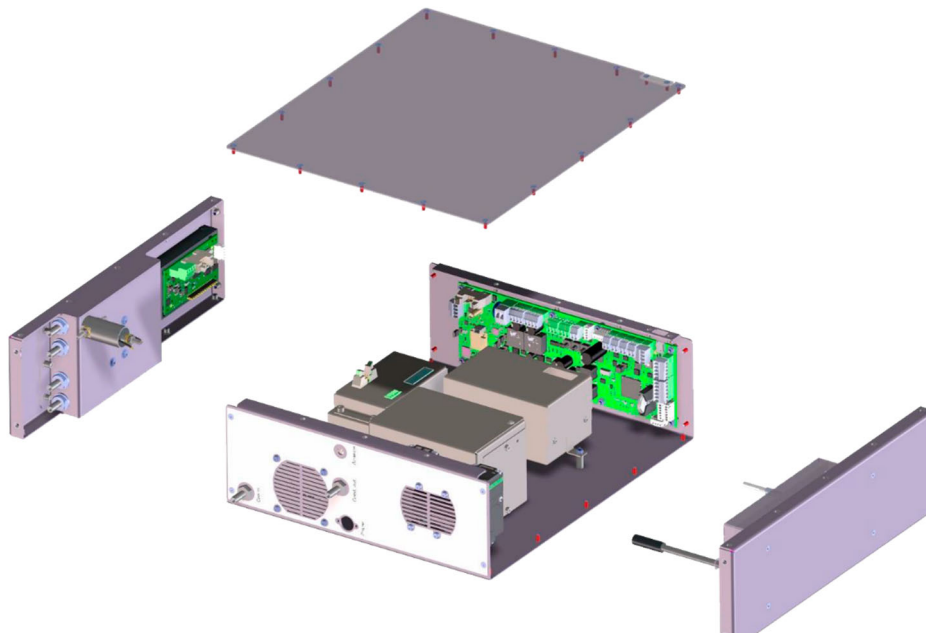


Avoid damage to the R-PC300 due to improper cleaning

- ✔ Only use suitable, non-aggressive, grease- and hydrocarbon-free cleaning agents.
- ✔ Do not use metal tools for cleaning!

6.2 MAINTENANCE PLAN

The R-PC300 has been designed to be as easy to maintain and repair as possible. As shown in the following illustration, the unit has a modular design. By removing the cover and the side panels, all components can be accessed. Volatile Particle Remover, Diffusion Charger, Precipitator, Faraday Cup and the pump are screwed to the housing as modules and can be easily replaced by trained personnel. The same applies to valves, fans, and the control board.



6.1 Modular construction R-PC300 (horizontal view, only for service work when the unit is switched off)

The maintenance intervals and especially the replacement of wear materials are highly dependent on the individual operating conditions. The following values are standard values that can be shortened if necessary.

6.2.1 DAILY TESTS TO BE CARRIED OUT

TEST	DESCRIPTION	IMPLEMENTATION
Visual Inspection	Check the probe and hose for externally visible damage.	Manual
Self-test	Memory test with clear verification of the software via a checksum and function test of the most important assemblies	Automated when the unit is switched on or when the day changes
Zero drift test	With HEPA filter on the measuring unit, the measured value must be at least 30s below 5000 cm ⁻³	Automatically when the unit is switched on or when the day changes
Zero-point test	With HEPA filter in front of the sampling device, the measured value must be at least 30 s below 5000 cm ⁻³	A filter must be manually attached to the probe. The operator software automatically carries out the test after it has been called up.

6.1 Maintenance plan - daily tests



6.2.2 MAINTENANCE WORK, MONTHLY

Component	Activity
Exhaust gas sampling probe	Blow through with compressed air
Sample hose	Blow through with compressed air

6.2 Maintenance plan - monthly

6.2.3 MAINTENANCE WORK, ANNUALLY

Component	Activity
Filter	Exchange
Pump	Flow test
Exhaust gas sampling probe	Blow through with compressed air
Sample hose	Blow through with compressed air
Measuring unit	Calibration

6.3 Maintenance plan - annual

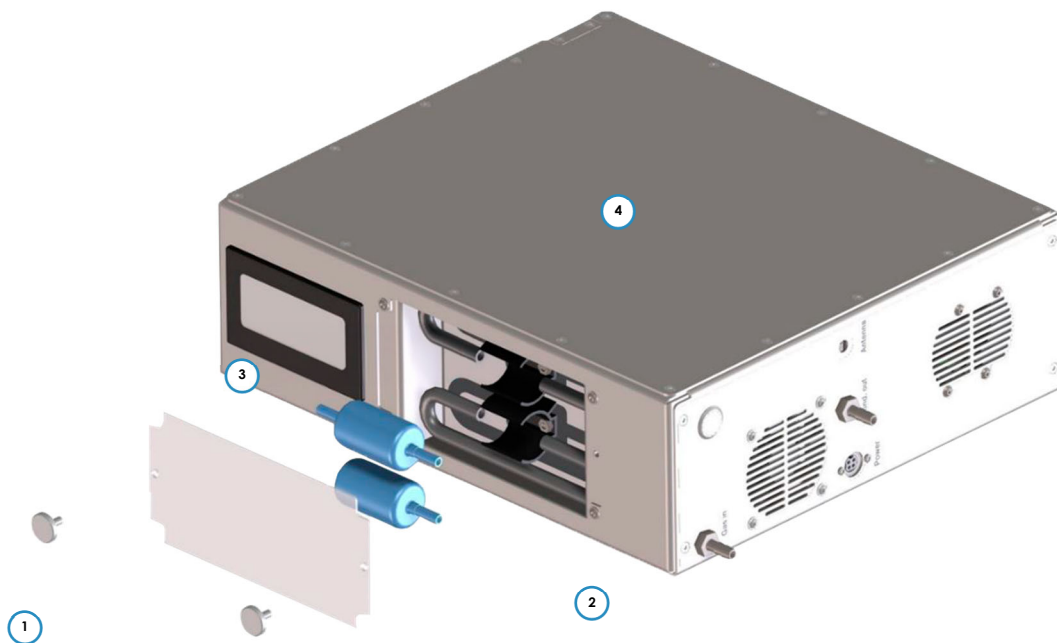
6.2.4 MAINTENANCE WORK, AS REQUIRED

Component	Activity
Exhaust gas sampling probe	Cleaning with isopropanol
Sample hose	Cleaning with isopropanol
Water separator	Cleaning with isopropanol
Pump	Exchange for defective engine
Fan	Exchange for defective engine

6.4 Maintenance plan - as required

6.2.5 DESCRIPTION OF THE MAINTENANCE WORK

Replacing the filters



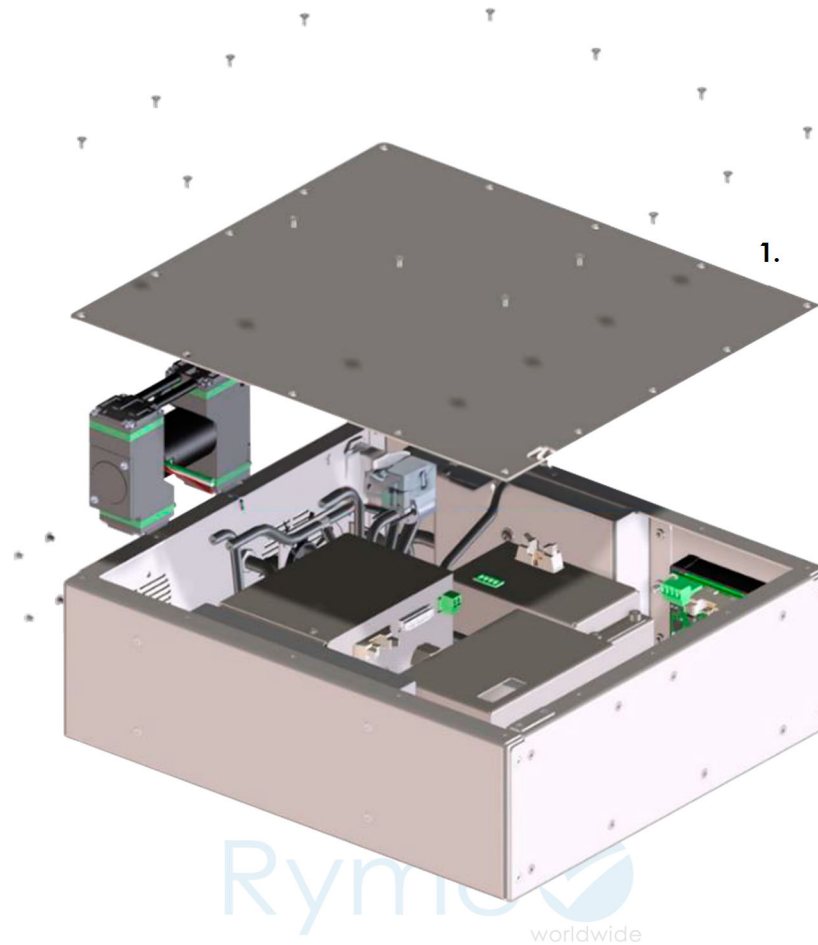
6.2 Replacing the R-PC300 filter (horizontal view, only for service work when the unit is switched off)

1. Loosening the helical screws
2. Remove plexiglass cover
3. Pull the filter out of the holder
4. Pull off the hoses from the filter

PROCEDURE

- | | |
|-------------------------------|--------------------------------------|
| 1. Loosen knurled screws | 3. Pull the filter out of the holder |
| 2. Remove the Plexiglas cover | 4. Pull the hoses off the filter |

REPLACING THE PUMP



6.3 Replacing the R-PC300 pump (horizontal view, only for service work when the unit is switched off)

PROCEDURE

1. Loosen countersunk screws hexagon socket.
2. Remove cover.
3. Loosen countersunk screws of pump holder.
4. Remove the pump and pull off hoses.

CLEANING SAMPLING WITH ISOPROPANOL

1. Pour 1L of isopropanol into a suitable container.
2. Place the inlet sampling probe in the vessel.
3. Connect the exhaust gas outlet to the vessel via a hose.
4. Activate the rinsing function in the operator software.
5. At the end of the rinsing process, remove the sampling probe from the vessel and connect a HEPA filter.
6. Starting the rinsing process with HEPA air in the operator software.

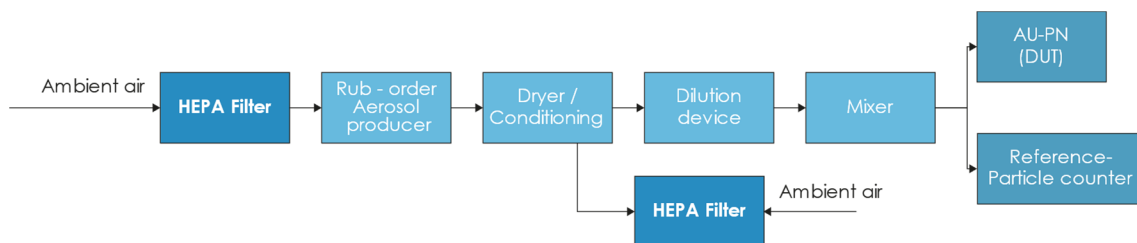
7. CALIBRATION/TESTING INSTRUCTION

The annual calibration of the devices is carried out in the following procedure from the guideline for the calibration of exhaust gas measuring devices. The linearity of the measuring system is calibrated using at least three reference samples (for example 50000 cm⁻³, 250000 cm⁻³ & 500000 cm⁻³ ; particle size 70 nm). The linearity can be adjusted via the operator software and by activating the service button.

The counting efficiency curve, which is systematically determined and proven in the type examination, remains unaffected and does not need to be calibrated or adjusted. For the adjustment, the calibration factors stored for the respective concentration levels are adapted.

These are set to 1.0 by default and can be adjusted if necessary. The new factor is calculated by dividing the measured concentration at the reference device by the measured concentration at the R-PC300. For this, only the setpoint (from the reference device) and the actual value (from the R-PC300) must be written in the operator software. The respective variables can be looked up in the software description KNT PDC SE1.

Before delivery of the devices, each measuring device receives a calibration carried out by the Ryme Particle Laboratory.



7.1 Calibration arrangement R-PC300

For an adjustment, a representative polydisperse reference particle number concentration is set with the aid of a soot or salt generator, a conditioning unit with neutralizer and a dilution device. Via a mixing T, both the reference and the test device receive the same particle number concentration. After a short stabilization phase, the displayed concentration of the reference instrument is compared with that of the test instrument.

8. DISRUPTIONS

8.1 SAFETY INSTRUCTION FOR TROUBLESHOOTING

WARNING

Improper work on the R-PC300 can lead to injuries!



- ✔ Faults, errors and deviations from normal operating conditions are to be investigated exclusively by personnel who are sufficiently qualified, instructed and authorized for this purpose.
- ✔ Observe the relevant safety regulations.

When contacting Ryme by telephone, please always quote the serial number of the unit and the version number of the control software.

Any necessary electrical and mechanical plans are included in the scope of delivery.

8.2 TROUBLESHOOTING

Faults or error messages are usually shown on the unit display as a two-line error message.

Line 1: "not ready for measurement

Line 2: Status boards each as HEX

Message	Cause	Remedy
"Not ready to measure 00000001 0000000"	Water ingress (it becomes water sucked out of the exhaust) Probe tube closed, kinked	Check probe hose and probe, restart system (or reset the 3/2-way valve→ "Reset water separator"). Check probe hose and probe, restart system (or reset the 3/2-way valve→ "Reset water separator").
"Not ready to measure 00000002 0000000"	Defective thermocouple VPR Switch-on tests are not yet completed	Service Waiting for the switch-on tests

"Service-Mode xxxxxxx"	SYS-CRC	Unit in service mode	Restart
"Not ready to measure 00000040 0000000"		Temperature VPR outside target window	Service
"Not ready to measure 00000100 0000000"		Pressure difference is not reached	Service
"Not ready to measure 00000200 0000000"		Inclination of the unit outside of tolerance	Align unit. (Water separator vertical)
"Not ready to measure 00010000 0000000"		Set for each error, that influence the measurement can	Remedy of the specific error
"CRC Param Error KNT PDC ST CPU 1"		KNT PDC ST CPU 1 EEPROM CRC32 error	Restart, in case of permanent occurrence Service
"CRC FLASH Error KNT PDC ST CPU 1"		KNT PDC ST CPU 1 FLASH CRC32 error	Restart, in case of permanent occurrence Service
"CRC FLASH Error KNT PDC ST CPU 1"		KNT PDC ST CPU 1 FLASH CRC32 error	Restart, in case of permanent occurrence Service
"Not ready to measure 00080000 0000000"		Error in communication with KNT PDC SE	Restart, in case of permanent occurrence Service
"Not ready to measure 00400000 0000000"		Zero adjustment Verification still Not executed	Zero adjustment via AU software Confirm (HEPA filter on probe)
"Not ready to measure 040000 0000000"		Filter dirty	Filter change
"Not ready to measure 080000 0000000"		Pump speed not in the target window	Service latest when flow error appearance
"10000000 0000000 "Calibration expired"		Calibration expired	Calibration
"Not ready for measurement 8000000 0000000"		Unit not ready for measurement due to missing zero adjustment verification	Confirm zero adjustment via AU software (HEPA filter on probe)

"CRC FLASH Error KNT LCD C1"	KNT LCD C1 Flash CRC32 Error	Restart, in case of permanent occurrence Service
"Not ready to measure 00000000 0000004"	Self-test not performed	Wait - Restart – Service
"Not ready to measure 00000000 0000008"	Self-test not successful	Restart – Service
"SALT" 2nd lines, flashing	Calibration option for salt is activated (only in service mode possible)	
"CRC Param Error KNT PDC SE"	KNT PDC SE EEPROM CRC32 error	Restart, in case of permanent occurrence Service
"CRC FLASH Error KNT PDC SE"	KNT PDC SE FLASH CRC32 error	Restart, in case of permanent occurrence Service
"Not ready for measurement 000000 0000100"	Error high voltage control Charger, charging current varies to strongly	Service: Blowing out GEH PDC 04 with Particle-free air via inlet Charging flow or exchange Needle module GEH PDC 03
"Not ready to measure 000000 0000200"	Short circuit in the charger	Service: Blowing out GEH PDC 04 with Particle-free air via inlet Charging flow or exchange Needle module GEH PDC 03
"Not ready to measure 000000 0000400"	Short circuit in the separator	Service
"CRC Param Error KNT PDC DC"	KNT PDC DC EEPROM CRC32 error	Restart, in case of permanent occurrence Service
"CRC FLASH Error KNT PDC DC"	KNT PDC DC Flash CRC32 error	Restart, in case of permanent occurrence Service

"Not ready to measure 00000000 0002000"	Charger failure and/or Sensor failure	Service: Blowing out GEH PDC 04 with Particle-free air via inlet Charging flow or exchange Needle module GEH PDC 03
"Not ready to measure 00000000 0004000"	Separator failure	Service
"Not ready to measure 00000000 0008000"	Crosstalk separator	Service
"Not ready to measure 0000000 0010000"	High voltage deactivated; Service flap GEH PDC 04 Not closed	Correct installation of the service flap GEH PDC 04
"Not ready to measure 0000000 0020000"	Standby KNT PDC DC	Service
"Not ready to measure 0000000 0040000"	Error voltage regulation Separator, deviation from Target voltage	Service

9. TRANSPORT, STORAGE, DISPOSAL

Disassembly, transport and disposal of the R-PC300 may only be carried out by specially authorized and trained personnel. Special hazards that must be expected are listed below.

9.1 SAFETY INSTRUCTIONS FOR TRANSPORT, STORAGE, DISPOSAL

WARNING

Risk of injury from improperly secured loads.



- ✔ Transport only by qualified personnel.
- ✔ Observe all valid national accident prevention regulations and safety regulations for occupational health and safety.

9.2 TRANSPORT

- ✔ During transport, avoid shocks and impacts to components of the R-PC300, especially when lifting and setting down.
- ✔ Dimensions and weights can be found in the mechanical plans (included in the scope of delivery).
- ✔ If you have any questions, contact Ryme. Important service numbers can be found on the inside cover of this document.

9.3 STORAGE

ATTENTION

Avoid damage to unit components due to unfavourable environmental conditions and improper handling during a storage or decommissioning period!



- ✔ Keep components of the R-PC300 away from negative influences such as moisture, dust, chemicals, vibrations, etc.!
- ✔ Follow all instructions in this chapter.
- ✔ Damage and/or service costs caused by non-compliance with these instructions are not covered by the warranty.

Original packaging is only intended for shipping and only to a limited extent for short-term storage! If you have any questions, contact Ryme. Important service numbers can be found on the inside cover of this document.

ENVIRONMENTAL CONDITIONS

- ✔ Ambient temperature: -10 °C...+50 °C; Humidity: 5%...95% (Class 1K2, IEC 60721).
- ✔ Protected from the weather, dry and low in dust
- ✔ Vibration stress: 1.5 mm at 5 Hz...9 Hz; 5 m/s² at > 9 Hz...200 Hz (1M2, IEC 60721)
- ✔ Shock load: 40 m/s² at 22 ms (1M2, IEC 60721)
- ✔ No direct sunlight or UV radiation
- ✔ Keep components away from sources of heat or ozone (no ozone-generating lighting fixtures or sparking electrical appliances).
- ✔ Oils, greases, and chemicals must not be stored in the same room.

9.4 DISPOSAL

CAUTION



**Danger to health and environment due to contaminated filters!
Spent filter elements can be toxic or corrosive.**

- ✔ Wear appropriate protective equipment (respiratory protection, gloves) when handling contaminated filters.
- ✔ Dispose of the filter properly in accordance with the applicable regulations.

- ✔ In the event of disposal of the R-PC300, it must be disposed of in an environmentally friendly manner on the basis of the locally applicable legal regulations.
- ✔ Dismantle all materials according to type and take them to a suitable recycling center.
- ✔ Dispose of any waste materials, e.g. filters, properly in accordance with the applicable regulations.

9.5 OPTIONAL ACCESSORIES

Optionally, various transport cases can be supplied for the R-PC300. An example of such a transport case is shown in Figure 9-1.



9.1 Optional transport case R-PC300 (example)



APPENDIX A: DECLARATION OF CONFORMITY



Hiermit erklärt AIP GmbH & Co. KG als Hersteller, in alleiniger Verantwortung, dass nachstehend bezeichnete Maschine in Konzeption und Bauart den grundlegenden Sicherheits- und Gesundheitsanforderungen den hier genannten EG-Richtlinien entspricht.

Herewith AIP GmbH & Co. KG declares that as a manufacturer it has the sole responsibility to ensure that the equipment named hereafter meets the safety and health regulations both in design and construction required by the EC Guidelines stated below.

Produktbeschreibung:	Product description:
Produktbezeichnung: SPCmini	Product designation: SPCmini
Seriennummer: E00029	Serial number: E00029
Maschinentyp: Gerät zur Messung der Anzahlkonzentration fester Partikel in Kraftfahrzeugabgasen	Type of equipment: Device for measuring the number concentration of solid particles in motor vehicle exhaust gases
EG-Richtlinien:	EC Guidelines:
Das bezeichnete Produkt stimmt mit allen einschlägigen Bestimmungen folgender europäischer Richtlinien überein: <ul style="list-style-type: none"> • 2006/42/EG für Maschine • Die Niederspannungsrichtlinie 2014/35/EU wurde hinsichtlich Ihrer Schutzziele eingehalten • Die Richtlinie zur Elektromagnetischen Verträglichkeit 2014/30/EU wurde hinsichtlich Ihrer Schutzziele eingehalten 	The designated product is in conformity with all the relevant provisions of the following European Directives: <ul style="list-style-type: none"> • 2006/42/EC machinery directive • The protection targets of the low-voltage directive 2014/35/EU have been complied • The protection targets of the electromagnetic compatibility directive 2014/30/EU have been complied
Harmonisierte Normen:	Harmonized Standards:
Folgende, harmonisierte Normen im Sinne der oben genannten Richtlinien wurden angewandt:	The following harmonized standards according to above mentioned directives have been applied:
EN ISO 12100:2010, EN 614-1:2006+A1:2009, EN ISO 13857:2019, EN ISO 14120:2015, EN 60204-1:2018	
Bevollmächtigte(r) für die Zusammenstellung der technischen Unterlagen:	Authorized person to compile the technical file:
Benjamin Bendl (Adresse des Herstellers / address of manufacturer)	


Haldenwang, 25.01.2022



Benedikt Grob
Bereichsleiter Entwicklung / Head of Development AIP GmbH & Co. KG

APPENDIX B: INSTRUCTION CONFIRMATION FORM

Please copy the form first and then make the entries in the copy! You will find the confirmation form on the next page.

<p>PROOF FOR AN INSTRUCTION CARRIED OUT</p>	Company	
	The instruction was carried out by:	
	Date of instruction	
	Signature of the instructor	
<p>Content of the instruction</p> <div style="text-align: center; margin-top: 20px;">  </div>		
<p>I hereby Confirm my participation in the instruction</p>		
Name	First name	Signature