



QuickTOC_{purity}

TOC-ANALYSIS

User Manual

Document QuickTOC[®]_{purity} ATEX Zone 2
04E3920 - 09/2020
Software Version: 4.4



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All information and drawings regarding look, specifications, output, dimensions, weight, consumption, servicing times and other are not binding and only give an approximate description. The manufacturer reserves the right of variations in form and construction as well as changes in colour and of the scope of delivery.

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Certificates

Certificate

Standard **ISO 9001:2015**

Certificate Registr. No. **01 100 5122**

Certificate Holder:



LAR Process Analysers AG
Neuköllnische Allee 134
D - 12057 Berlin

Scope:

Development, production, distribution and technical support of measurement-instruments for environmental and process analysis

Proof has been furnished by means of an audit that the requirements of ISO 9001:2015 are met.

Validity:

The certificate is valid from 2017-05-24 until 2020-05-18.
First certification 1998

2017-05-24


TÜV Rheinland Cert GmbH
Am Grauen Stein · 51105 Köln

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EU-KONFORMITÄTSERKLÄRUNG DECLARATION OF CONFORMITY



Erzeugnis Product	Online Meßsystem
Typenbezeichnung Model/Type	QTex, QUex, QPex, QTNPex, QTNPCex, QTNex, QCODex, QTOGex, QTONex, QTOCnpox, QuickTOCuvex Zone 1 /T4 (ATEX/ IECex) Zone 2 /T3 Zone 2 /T4
Hersteller (Firma und Ort) Manufacturer (Name and place)	LAR Process Analysers AG Neuköllnische Allee 134 12057 Berlin
CE Koordinator CE Coordinator	O. Dacke

Das bezeichnete Erzeugnis stimmt mit den Anforderungen der folgenden europäischen Richtlinien überein:

The described product is in accordance with the requirements of the following european Directives:

2006/42/EG	Maschinenrichtlinie	Machinery directive EN
2014/30/EU	EMV-Richtlinie	EMC directive
2014/34/EU	ATEX-Richtlinie	ATEX directive
2011/65/EU	ROHS Richtlinie	Restriction of Hazardous Substances

Folgende Normen wurden angewendet: The following standards were used:	Kennzeichnung: Marking:
VDE 0701/0702 EN 61010-1: 2011 EN 61010-2-010: 2015 (Zutreffende EMV Normen; applicable EMC norms) EN 60079-0: 20012 + A11:2013 Elektrische Betriebsmittel für gasexplosionsgefährdete Bereiche (allg. Anforderungen) electrical devices for explosion proof areas affected by explosive gases (general standards) EN 60079-2: 2014 Überdruckkapselung „p“; Explosion proof enclosure type „p“	QTex, QUex, QPex, QTNPex, QTNPCex, QTNex, QCODex, QTOGex, QTONex, QTOCnpox, QuickTOCuvex Ex II 2 G Ex px IIC T4 Gb QuickTOCuv Ex II 3 G Ex pz IIC T4 QuickTOC Ex II 3 G Ex pz IIC T3

Berlin, 09.10.2017
Ort, Datum/place, date


Unterschrift Hersteller/sign manufacturer

(1) **Baumusterprüfbescheinigung**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(3) Baumusterprüfbescheinigungsnummer



TÜV 10 ATEX 7902 X

(4) Gerät: **QuickTOC Analyser**

(5) Hersteller: **LAR Process Analysers AG**

(6) Anschrift: **Neuköllnische Allee 134 D – 12057 Berlin**

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Die TÜV Zertifizierungsstelle für Ex-Schutz-Produkte der TÜV Rheinland Industrie Service GmbH, TÜV Rheinland Group, bescheinigt die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 194/Ex902.00/10 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 60079-0: 2006; EN 60079-2: 2007

mit Ausnahme der Anforderungen, die in Punkt 18 der Anlage gelistet sind.

(10) Falls das Zeichen „X“ hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Bau des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes. Diese Anforderungen werden durch diese Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes muß die folgenden Angaben enthalten:

 **II 3 G Ex pz II T3**

TÜV Zertifizierungsstelle für Explosionsschutz Köln, den 03.08.2010


Dipl.-Ing. K. Wettingfeld

Diese Baumusterprüfbescheinigung hat ohne Unterschrift und Stempel keine Gültigkeit

Diese Baumusterprüfbescheinigung darf nur unverändert verbreitet werden. Auszüge und Änderungen bedürfen der Genehmigung der TÜV Zertifizierungsstelle für Ex-Schutz-Produkte

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1.Ergänzung

gemäß Richtlinie 94/9/EC

zur

Baumusterprüfbescheinigung

TÜV 10 ATEX 7902 X



Gerät: **QuickTOC Analyser Q.....**

Hersteller: **LAR Process Analysers AG**

Anschrift: **Neuköllnische Allee 134, D – 12057 Berlin**

Beschreibung der Ergänzungen und Änderungen:

Die Geräte durchliefen technische Änderungen, welche hauptsächlich die Steuerung und die Software betreffen. Außerdem ist die Nutzung als Mehrstrommessgerät nunmehr möglich. Die Seriennummern können nunmehr lauten: QT..... oder QU..... oder QP.....

Die Erfordernisse für die Herausspülung leichter Gase wurden durch zusätzliche Gehäusebohrungen erfüllt.

Herangezogenen Normen: EN 60079-0: 2012 EN 60079-2: 2007

Technische Daten

Betriebsspannung:	230 V AC / 50/60Hz Hz
Leistung:	ca. 1,6 kW
Schutzart:	> IP 4X
Vordruck für den Druckminderer:	min. 2,0 bar
Spüldruck:	12,9mbar
Spülzeit:	14 Minuten 48 Sekunden
Spülvolumen:	2200 l
Innendruck bei Betrieb:	7,4 mbar
Gehäusevolumen	327 Liter
Min. Überdruck	80 Pa
Umgebungstemperatur	-20°C bis +40°C

Diese Ergänzung zur Baumusterprüfbescheinigung hat ohne Unterschrift und Stempel keine Gültigkeit

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Prüfbericht-Nr.

557 / Ex 902.01 / 13

Auflagen/Bedingungen für die sichere Verwendung bzw. Verwendungshinweise

Die Bedingungen der ursprünglichen Baumusterprüfbescheinigung TÜV 10 ATEX 7902 X sind zu beachten.

Davon ausgenommen ist der Punkt 1. Er entfällt.

Kennzeichnung

II 3 G Ex pz IIC T3 Gc

Grundsätzliche Sicherheits- und Gesundheitshinweise

Abgedeckt durch die verwendeten Normen

TÜV Rheinland Zertifizierungsstelle für Explosionsschutz

Köln den 23.04.2013


Dipl.-Ing. Heinz Farke



Diese Ergänzung zur Baumusterprüfbescheinigung hat ohne Unterschrift und Stempel keine Gültigkeit

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Seite 2 / 2

2. Ergänzung

zur Baumusterprüfbescheinigung TÜV 10 ATEX 7902 X



Gerät: QuickTOC Analyser Q
Hersteller: LAR Process Analysers AG
Adresse: Neuköllnische Allee 134
D – 12057 Berlin

Beschreibung der Ergänzungen und Änderungen:

(15) Folgende Änderungen sind gültig für die 2. Ergänzung

Verwendete Normen:

EN 60079-0: 2012
EN 60079-2: 2007

Schutzartkennzeichnung

II 3 G Ex pz IIC T4 Gc

15.1 Gegenstand

QuickTOC Analyser Q

Diese 2. Ergänzung zur Baumusterprüfbescheinigung hat ohne Unterschrift und Stempel keine Gültigkeit.
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Seite 1 / 3 zur 2. Ergänzung von TÜV 10 ATEX 7902 X



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15.2 Beschreibung der Geräte

Gegenstand der Prüfung ist der überdruckgekapselte Teil des Gerätes.
Die Verwendung weiterer Anbauteile liegt in der Verantwortung des Herstellers.

Änderungen :

1. Das Volumen des Gehäuses hat sich vergrößert auf 350l. Der Schlauchanschlussdurchmesser für das Sicherheitsspülventil hat sich von ID 6 auf ID10 vergrößert. Die Prüfung auf ermitteln der Spülzeit wurde erneut durchgeführt. Siehe hierzu den Laborprüfbericht.
2. Die Geräte können auch eine Temperaturklasse von T4 erreichen, wenn alle Anbauteile auch mindestens T4 entsprechen. Eine Temperaturmessung des Gehäuses wurde erneut durchgeführt. Siehe dazu Laborbericht 124468918_001.
3. Die Gehäuse dürfen auch bei leichten Gasen verwendet werden.

15.3 Technische Daten

Betriebsspannung:	230 V AC / 50/60Hz Hz
Leistung:	ca. 1,6 kW
Vorsicherung:	100 mA im Spülgerät
Schutzart:	> IP 4X
Vordruck für den Druckminderer:	min. 2,0 bar
Spüldruck:	12,9mbar
Spülzeit:	14 Minuten 48 Sekunden
Spülvolumen:	2200l
Innendruck bei Betrieb:	7,4mbar
Alarmdruck:	0,8mbar
Düse:	3mm
Typenbezeichnung	QuickTOC Analyzer Q
Gehäusevolumen	350 Liter
Min. Überdruck	80 Pa
Max. Überdruck	1.500 Pa
Leckverlustrate	< 6 m³/h
Umgebungstemperatur	5°C bis +35°C

(16) Prüfberichts-Nr. 557 / Ex 902.02 / 10

Teile der Gerätekombination, die die Anforderungen der Kategorien bereits erfüllen, wurden nicht durch die TÜV Rheinland Industrie Service geprüft und bewertet.

Vom TÜV selbst wurde die Eignung und der Zusammenbau der mechanischen und elektrischen Geräte und die Komponenten des QuickTOC Analyzer hinsichtlich des Explosionsschutzes überprüft und bewertet.

Diese 2. Ergänzung zur Baumusterprüfbescheinigung hat ohne Unterschrift und Stempel keine Gültigkeit.
Diese Ergänzung zur Baumusterprüfbescheinigung darf nur unverändert verbreitet werden.
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Seite 2 / 3 zur 2. Ergänzung von TÜV 10 ATEX 7902 X



(17) **Besondere Bedingungen / Special conditions for safe use**

Es sind der Grundschein und die 1. Ergänzung zu beachten.

1. Der elektrische Anschluss muss entweder außerhalb des Ex-Bereiches oder über einen für den Ex-Bereich zugelassenen Anschluss erfolgen.
2. Die Öffnung des Schaltschranks darf nur in Ex-freier Umgebung erfolgen, andernfalls ist nach Energieabschaltung eine Wartezeit von 45 Minuten einzuhalten.
3. Die max. Temperatur des Zündschutzgases (der Luft) darf 30°C nicht überschreiten.
4. Das Schaltschrankgehäuse ist in den Potenzialausgleich des Aufstellungsortes einzubinden.
5. Die besonderen Bedingungen der Anbauteile sind zu beachten, ebenso müssen alle Anbauteile die Temperaturklasse T4 erfüllen.
6. Das Sicherheitsspülventil ist bei normaler Spülung auf. Der Betreiber muss sicherstellen dass nach erfolgter Spülung für die Notabschaltung genug Luft in der angeschlossenen Gasflasche (Druckluft) vorhanden ist.

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

erfüllt

TÜV Rheinland Zertifizierungsstelle für Explosionsschutz

Köln, 2015-03-20



Dipl.-Ing. Klauspeter Graff

Diese 2. Ergänzung zur Baumusterprüfbescheinigung hat ohne Unterschrift und Stempel keine Gültigkeit.
Diese Ergänzung zur Baumusterprüfbescheinigung darf nur unverändert verbreitet werden.
Auszüge und Änderungen bedürfen der Genehmigung der TÜV Rheinland Zertifizierungsstelle für Ex-Schutz-Produkte
TÜV Rheinland Industrie Service GmbH Am Grauen Stein 51105 Köln
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Seite 3 / 3 zur 2. Ergänzung von TÜV 10 ATEX 7902 X

1 General Information

Read the manual at hand carefully prior to using the analyser.
Keep the manual in a place near the analyser for further reference.
The improper usage of the analyser may void the warranty.

The following symbols are used in this operating manual to highlight instructions:



Notice



Warning



Danger

1.1 Safety Notes



Danger

The general codes for working with chemicals and electrical equipment must be observed while using the analyser.

The voltage specified on the nameplate of the analyser must match that of your power supply.

Bear in mind the hazards potentially emanating from the different waters.

Use protective gloves and goggles as required.

The analyser must be switched off before working on live parts.

For safety reasons, the rear part of the analyser may only be opened by authorised personnel.

When work is carried out in the front part of the enclosure, you must ensure that the analyser is in Offline mode.

If faults occur when the analyser is running which you cannot rectify yourself, please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 257).

1.2 Safety Symbols

For your safety, the following symbols are attached to the analyser. Observe the symbols when working on the analyser.

Mandatory:



Refer to manual



Use goggles



Use gloves

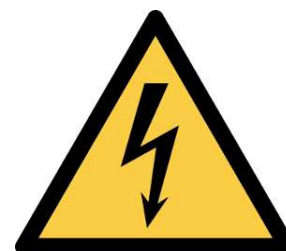
Warning:



Hot surfaces



Corrosive agents



Electric hazard

Prohibition:

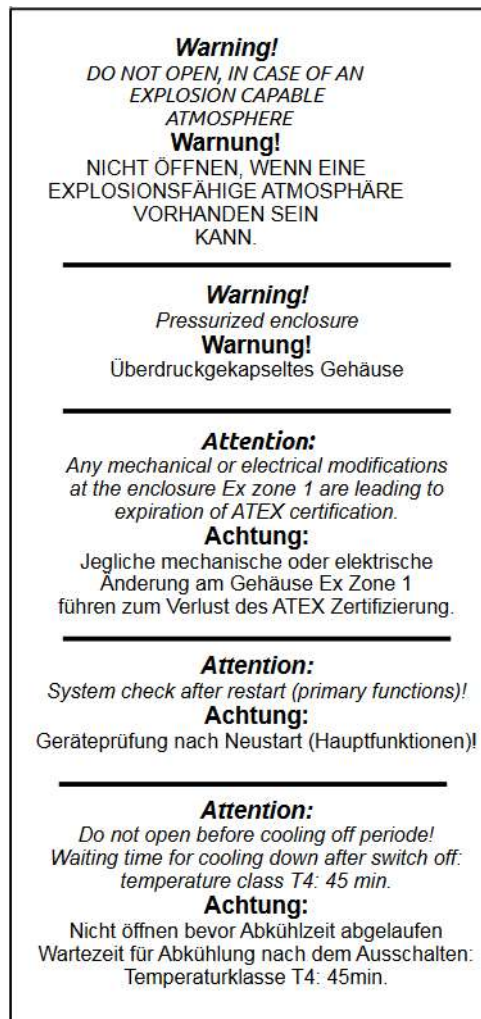


Keep out

1.3 Warning Sign on Casings with Explosion Protection:

Any modification of the casing or the electric wiring lead to loss of the Certificate for Explosion Protection. Contact our Technical Services prior to carrying out modifications on the casing or its wiring.

The following warning label is attached to the front door of the casing (example):



2 Operating Principle of the Analyser

The online measurement system determines the corresponding parameters using the high temperature method at 1,200°C according to the following measurement methods:

:

- TOC-Difference Method: TC, TIC, TOC (in accordance with DIN EN 1484:1997 and US-EPA 415.2)
- TOC-Direct Method: NPOC (in accordance with DIN EN 1484:1997 and US-EPA 415.2)
- TOnly Method: TC (in accordance with DIN EN 1484:1997 and US-EPA 415.2)

2.1 Measurement of TOC

2.1.1 The Sum Parameter TOC

The TOC (Total Organic Carbon), in addition to COD (chemical oxygen demand) and BOD (biochemical oxygen demand), is an important sum parameter for assessing the organic load of water. Because all organic carbon compounds are read and specified as mass carbon (unit: mg/l C), the TOC is a precisely definable, absolute parameter, and can be directly measured. Other parameters are always stated in relation to the TOC. Their interrelations and respective meanings are shown below:

The basis of all TOC measurement methods is oxidation - normally using thermal or wet chemical oxidation of organically-ligated carbon to carbon dioxide (CO₂). The CO₂ produced is detected and determined quantitatively.

2.1.2 High Temperature Method at 1,200°C

In the ceramic furnace without catalyst the carbon compounds are reliably oxydized at a combustion temperature of 1,200°C. This high temperature method does not require a filtration. The NDIR detector (Non-Dispersive Infrared) detects the CO₂ contents of the sample. If required, the samples can be homogenised and be measured with all particles contained within, allowing for measurement of the TRUE TOC.

2.1.3 High Temperature Method vs. Wet Chemical Method

High temperature methods (as well as wet chemical methods, such as the UV persulphate method) are used to determine the TOC. The advantages of the high temperature method compared to the wet chemical UV persulphate method is described in the European Norm EN 1484:1997:

“Devices which determine the TOC with the UV persulphate method are not appropriate for media containing suspended and turbid solids”.

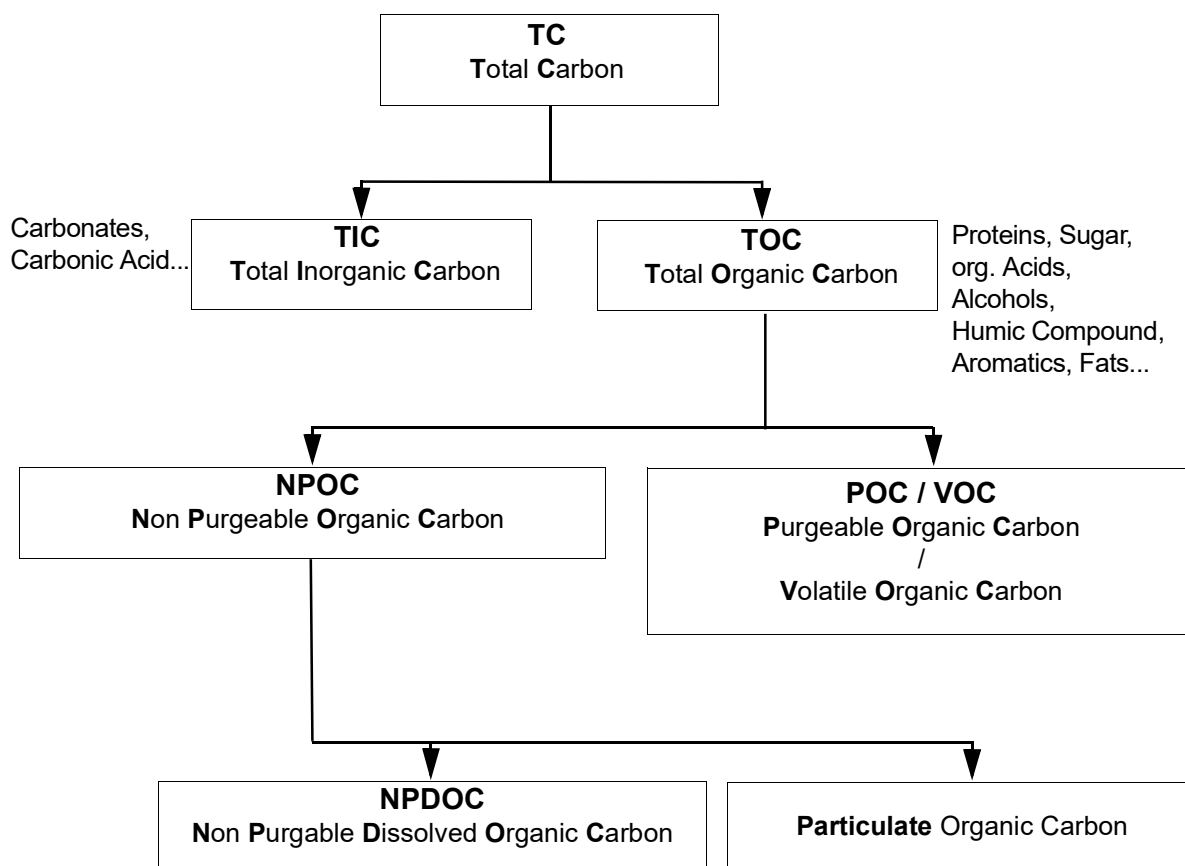


Fig. 1: Sum parameters of organic compounds

Furthermore, Wei reports in the "Proceedings of the Water Quality Technology Conference (1998, Paper 2-E2)" that the UV persulphate method can show TOC values between 30 and 50% lower than with the high temperature method, while the values measured can have a 23% higher variance. It is for these reasons that the high temperature method is the more common method in waste water analysis. For this reason, it is also used in the QuickTOC[®]_{purity}.

2.1.4 The Measurement Principle of the TOC-Difference Method

2.1.4.1 Proceeding

First, the sample is transferred into the sample vessel via the inlet. From here, the sample is injected by the injection system into the ceramic furnace.

The sample oxidises completely to CO₂ at 1,200°C in the ceramic furnace. After the oxidation a carrier gas, which flows continuously through the ceramic furnace, transports the measurement gas to a cooler.

The water vapour produced by oxidation is condensed out by the cooler, and remaining corrosive. Combustion gases are cleaned by the filters. The CO₂ concentration is determined in the NDIR detector displayed as TC.

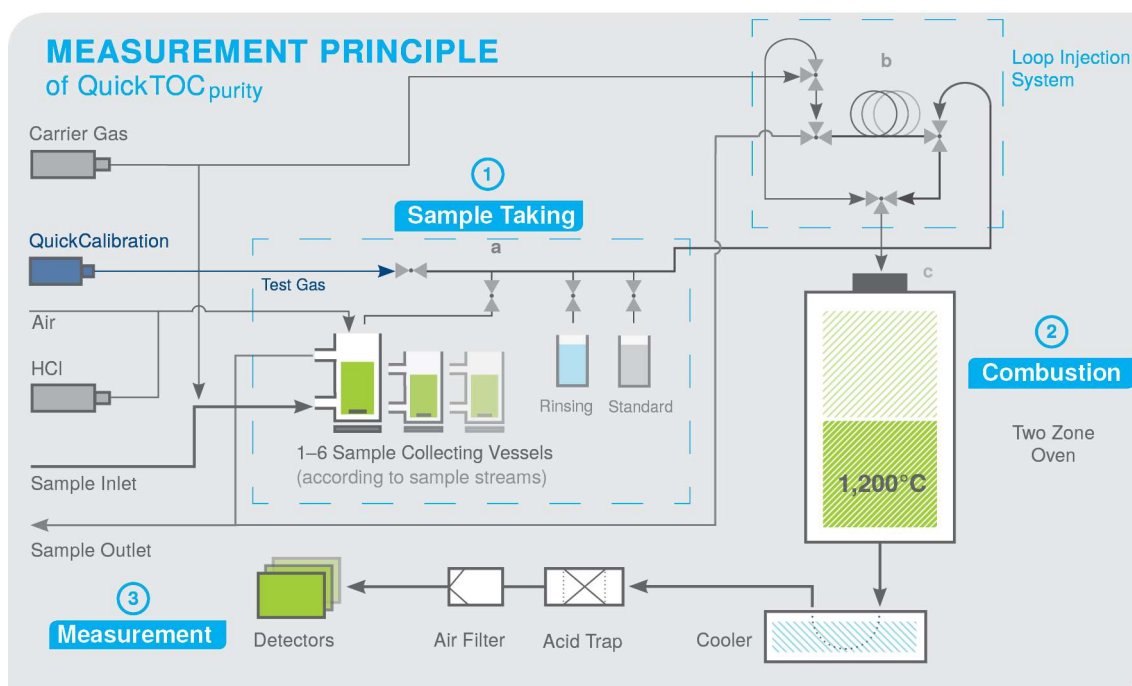


Fig. 2: Measurement Principle of the TOC-Difference Method

2.1.4.2 Advantages

In this method, no volatile organic components (POC / VOC) are expelled from the sample. Because all particles can be measured, all of the TOC remains in the sample - meaning the TRUE TOC is measured in this method. With the TOC Difference Method the analyser allows for fast and exact analysis of the parameters:

- TC
- TIC
- TOC

taking the POC/VOC under account.

Summing up the advantages of the TOC-Difference Method:

- Quick measurement results are available between 2 and 3 minutes.
- The entire TOC is determined (no loss of purgeable/volatile organics).
- High precision of results.

2.1.5 The Measurement Principle of the TOC-Direct Method (NPOC-Method)

2.1.5.1 Proceeding

In the TOC direct method, the sample is first acidified externally with a strongly diluted hydrochloric acid before it is moved into the sample vessel. There, CO₂-free air (carrier gas) continually flows through the sample. Because of the low pH value (< 2), the anorganics are removed from the sample and drained off. At the end of this process, the sample only contains the NPOC (Non Purgeable Organic Carbon).

In the next step, the injection system transfers the sample from the sample vessel to the ceramic furnace, which then completely oxidises to CO₂ at 1,200°C.

The water vapour produced by oxidation is condensated out by a cooler, and remaining corrosive combustion gasses are then cleaned by the filters. Then the CO₂ concentration is determined in a NDIR detector and output as the TOC.

2.1.5.2 Advantages

The direct method is recommended for determining the TOC when the concentration of the anorganic carbon is considerably greater than the concentration of the organic carbon. Furthermore, the direct method is recommended when it is known that the sample contains hardly any volatile carbon, and thus cannot be lost during the purging process:

$$\text{TOC} = \text{NPOC} + \text{POC/VOC}$$

$$(\text{POC/VOC} = 0)$$

$$\text{TOC} = \text{NPOC} + 0$$

$$\text{TOC} = \text{NPOC} [\text{mg/l C}]$$

Summing up the advantages of the TOC-Direct Method:

- Quick measurement results are available in only three to five minutes.
- Prevention of impurities from organic substances in the sample vessel, and possibly in the sample tubes, because adding acid has a cleaning effect.
- Lower consumption of reagents (5% HCl). Only 135 ml are consumed in one day at a measurement frequency of 12 minutes.



Notice

Depending on the application, hydrochloric acid concentrations between 3 % and 5 % can be used.

Please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 245) before using other concentrations.

2.1.6 The Measurement Principle of the TConly Method

2.1.6.1 Proceeding

First, the sample is transferred into the sample vessel via the inlet by the help of a peristaltic pump, before the sample is injected into the ceramic furnace via the injection system.

The sample oxidises completely to CO₂ at 1,200°C in the ceramic furnace. After the oxidation a carrier gas, which flows continuously through the ceramic furnace, transports the measurement gas to a cooler.

The water vapour produced by oxidation is condensated out by the cooler, and remaining corrosive combustion gasses are then cleaned by the filters. Then the CO₂ concentration is determined in a NDIR detector and output as the TC.

2.1.6.2 Advantages

The TC only method is the correct choice when the concentration of the organic carbon is considerably greater than the concentration of the inorganic carbon, especially when the inorganic fraction can be neglected as a result ($TIC < 5\%$ of the TC):

$$TOC = TC - TIC$$

$$(TIC \ll TOC)$$

$$TOC = TC - (\sim 0)$$

$$TOC = TC \text{ [mg/l C]}$$

Summing up the advantages of the TOnly Method:

- Measurement results are available in 60 to 90 seconds.
- No reagents and acids are required.
- Overhead for care and maintenance is very low.

2.1.6.3 Measurement Ranges

The analyser can be deployed in several measurement ranges (application-specific). Each measurement range is assigned a recommended working range.

Table 1: Overview of the Measuring Ranges for TOC and TC Measurement

Measuring Range
0,1 - 20 mg/l (ppm)
0,5 - 50 mg/l (ppm)
2 - 200 mg/l (ppm)
5 - 1.000 mg/l (ppm)
10 - 2.000 µg/l (ppb)

Table 2: Overview of the Measuring Ranges for TN_o Measurement

Measuring Range
0,1 - 50 mg/l (ppm)
10 - 200 mg/l (ppm)

2.2 Explosion Protection

The Instruction Manual at hand describes the use of the analyser in areas with high risks of explosions. According to DIN EN 60079-14 the pressurisation type „pz“ defines devices for ATEX zone 2. The pressurization according to ATEX zone 2 prevents potentially explosive atmospheres from entering the analyser. Thanks to the pressurization, the atmosphere rating in the analyser is downgraded from „dangerous“ to „inert“.

The analyser has been built in accordance with the European Safety Guidelines for Explosion Protection for ATEX Zone 2. Please see the relevant certifications *in Chapter Certificates from page 1*.

ATEX Zone 2 defines the explosive atmosphere as follows:

„During normal operation it is unlikely that a potentially explosive atmosphere may arise (mix of air and inflammable gas, vapour or mist), or, if it arises, then only seldom and for very short periods of time.“

During operation of the analyser the casing is overpressurised, thus preventing potentially explosive atmosphere from getting inside the casing.

The overpressure is regulated by a control unit and a magnetic valve. At startup, the control unit initiates a flushing procedure to remove all potentially explosive atmosphere from inside the analyser. During the flushing procedure at 7 to 10 mbar, the casing is simultaneously checked for pressurisation.

After the flushing procedure, the overpressure in the casing is reduced and maintained at 2 to 3 mbar.

The flushing procedure is ensured by a separate compressed air supply. All dead spots in the casing (ceramic furnace, pump engines and the transformer) are being reached by the flushing air. The pump engines and the transformer are equipped with aeration holes. The furnace is flushed through a separate conduct.

From the flushing air conduct, a separate conduct is diverted for the carrier gas. The carrier gas flows through filter cartridges with activated carbon and natron lime. The processed carrier gas then enters the casing of the analyser.

In case of automatic shutdown due to loss of pressure or power outage, an emergency flushing procedure is initiated. The emergency flushing cools hot surfaces (especially in the area around and on the furnace) within a predetermined time. The backup air for the furnace emergency cooling must come from a separate source.

Temperature classes

Devices and utilities may be operated in explosive atmospheres only if their surface temperature is below the ignition point of the potentially explosive air mix. The air mix is subdivided in temperature classes from T1 to T6. For the determination of the temperature classes the maximum operating temperature has to be taken into account.

Depending on the temperature class, the ventilator must ensure cooling down within 45 mins. to the maximum temperature for the selected temperature class:

- for temperature class T3 max. 200° C
- for temperature class T4 max. 135° C

Depending on the temperature class, your analyser is equipped with an accordingly suitable ventilator for cooling.

3 Product

This chapter gives an overview of the analyser and its components.

3.1 Scope of Delivery

The analyser „QuickTOC[®]_{purity}“ for ATEX zone 2 , associated individual parts and any required operating material are delivered in a sturdy wooden crate.

The crate contains:

- Analyser „QuickTOC[®]_{purity}“ for ATEX zone 2
- User Manual „QuickTOC[®]_{purity}“ for ATEX zone 2
- Case with:
 - Reactor foot
 - Injection port
 - Furnace head
 - Reactor
 - Tube cassettes
 - Vessels
 - Operating material
 - Data stick
- Accessories (optional) (see Chapter 9 from page 155)

3.2 Identification plate

On the side of the housing is a nameplate with name of the analyser, serial number, year built, mains voltage, power consumption, further technical data and the contact address of LAR.





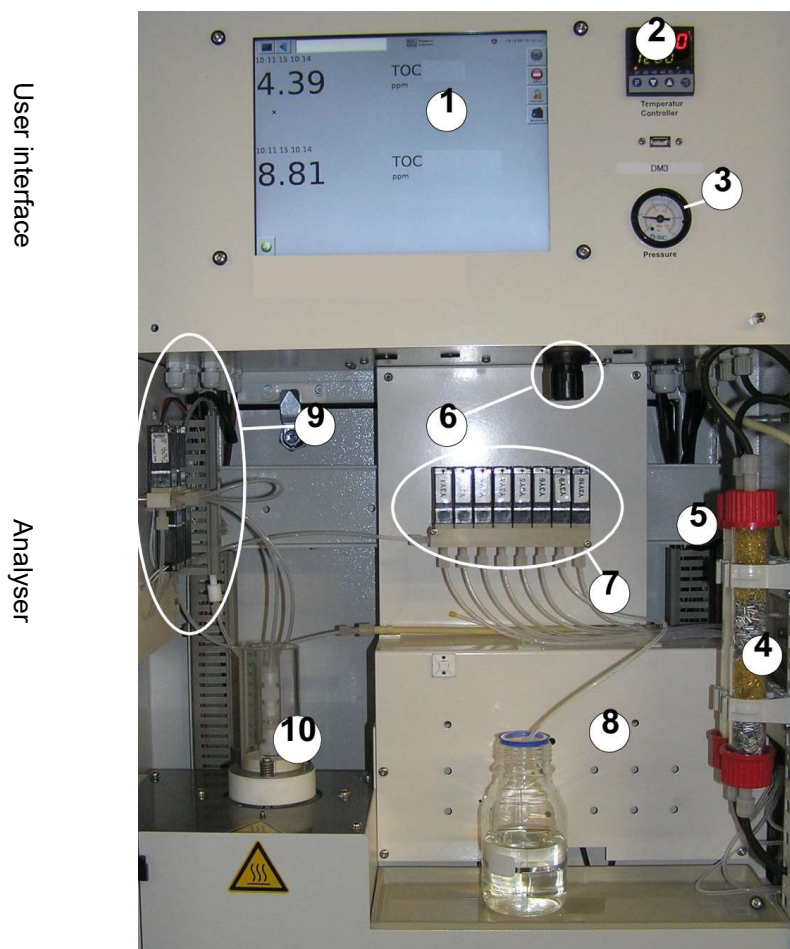
 Neuköllnische Allee 134 12057 Berlin Germany Phone: +49 30 278958-0 Fax: +49 30 278958-700		 Neuköllnische Allee 134 12057 Berlin Germany Phone: +49 30 278958-0 Fax: +49 30 278958-700	
QuickTOC Analyzer / Pressurized enclosure system		QuickTOC Analyzer / Pressurized enclosure system	
TÜV 10 ATEX 7902 X		TÜV 10 ATEX 7902 X	
CE 0035  II 3 G Ex pz IIC T3 Gc		CE 0035  II 3 G Ex pz IIC T4 Gc	
Serial-NR.:	QU170213	Date:	19.06.2017
(Analyzer) Tag-No.:	73-AT-026A	(Analyzer) Tag-No.:	73-AT-026A
Supply pressure Min./Max.:	3500/4000	hPa	
Internal pressure Min./Max.:	80/1500	Pa	
Enclosure volume:	300	L	
Purging time:	14.48	min	
Purging medium:	pressurized air		
Nozzle:	3.0	mm	
Ambient temperature:	5...35	°C	
Pre-fuse in purging unit:	230 VAC	100 mA	
Made in	230	VAC	1.6 kW
GERMANY	50/60	Hz	6 A

Fig. 3: Identification plate (left: temperature class T3, right: temperature class T4)

3.3 Construction of the Analyser

3.3.1 Front View



- | | |
|---|-------------------------------|
| 1 Touchscreen | 6 Valve block for samples |
| 2 Temperature regulator (Actual/Target) | 7 Calibration vessel |
| 3 Pressure display of carrier gas prepressure | 8 Sample vessel |
| 4 Quartz wool filter | 9 Injection block and furnace |
| 5 Pressure regulator | 10 Injection unit with needle |

Fig. 4: Front view of the analyser (open) (Example: 6 sample streams, TOC direct method)



Danger

Danger of Burns!

The area around the injection block and the furnace system (9) is hot during operation. Use heat-resistant gloves when working on the injection block or the furnace system.



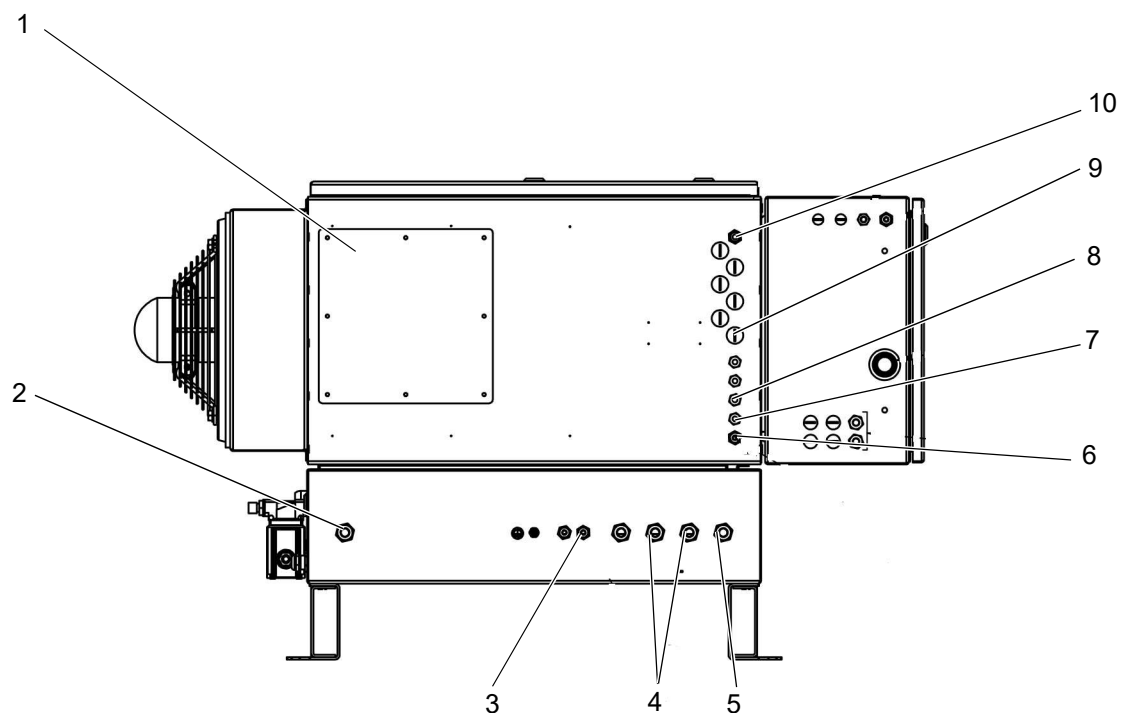
Notice

A system key is included for personell with authorisation. Unauthorised personell are not permitted to open the front door of the housing.

**Notice**

Depending on the method of measurement and the number of samples, there is an additional cabinet on the right side of the analyser with pumps for transporting the samples to the analyser.

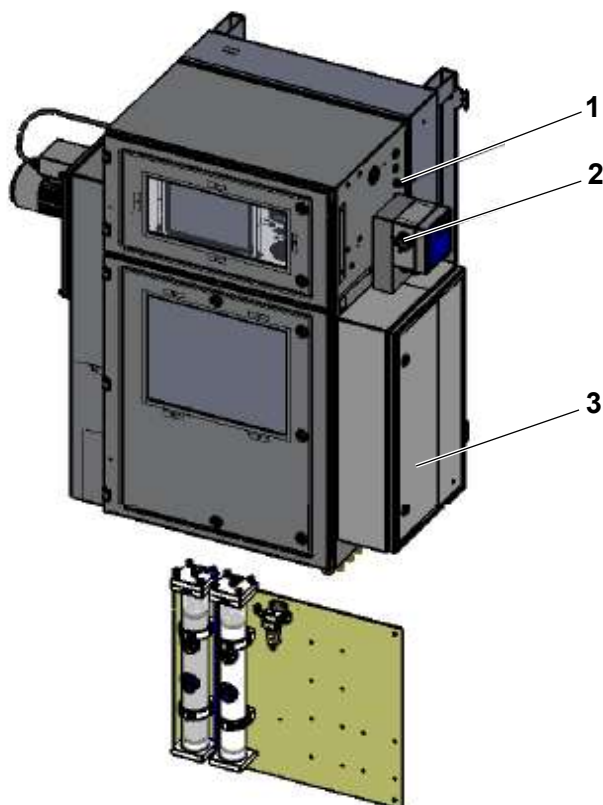
3.3.2 Bottom of the Analyser



- | | |
|--|--|
| 1 Maintenance lid for reactor foot | 6 Inlet for emergency cooling |
| 2 Feedthrough for electric connection | 7 Inlet for rinsing solution |
| 3 Carrier gas inlet | 8 Acid inlet |
| 4 Incoming signals (from relays) | 9 Sample drain |
| 5 Feedthrough for electric connection of control unit F840 | 10 Condensation and rinsing solution drain |

Fig. 5: Bottom of the analyser

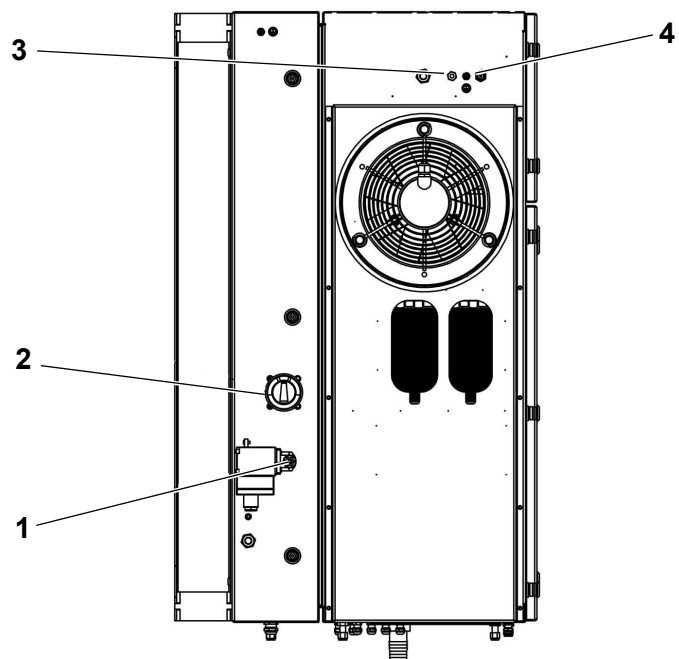
3.3.3 Right side



- 1 Carrier gas outlet
- 2 Carrier gas outlet
- 3 Sample cabinet (Multi-Stream-Option)

Fig. 6: Right side of the analyser

3.3.4 Left side



- 1 Rinsing air inlet
- 2 Main switch

- 3 Ground connection
- 4 Connection for trackball

Fig. 7: Left side of the analyser

3.4 Components of the Analyser

To provide you with an overview of the components fitted, this section explains the most important components, and their positions and functions in the analyser.

3.4.1 Pump System

Depending on the number of sample streams and the selected measurement method, the number of pumps, pump type, and position of the pump may vary within the analyser (installed inside or outside).



Notice

The analyser is equipped with a tube cassette pump fitted with five tube cassettes at the factory. This tube cassette pump is used to drain the condensate and, when using the TOC difference method, to transport the required acid to and from the TIC reactor.

3.4.1.1 Tube Cassette Pump

The tube cassette pump (Fig. 8) is used for different applications within the analyser and depends on the selected measurement method.

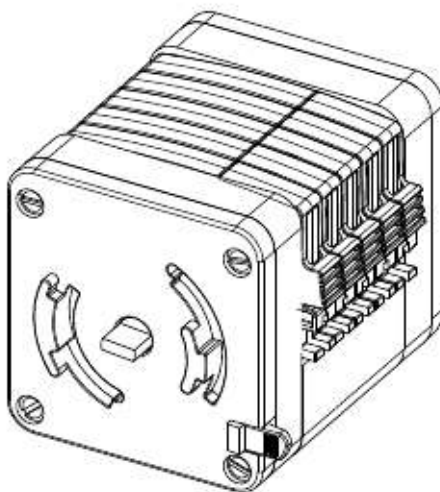


Fig. 8: Tube cassette pump with five tube cassettes



Danger

Danger of crushing

During operation, the rollers of the tube cassette pump are in motion.

Do not reach into the working area of the tube cassette pump during operation.

3.4.1.2 Tubes (for the Tube Cassette Pump)

The tubes (3) for the tube cassette pump (2) have three colour-coded-stoppers (1). The three stoppers enable uniform spanning of the tube at all times - which has a positive effect on reproducibility of the flow rate. The colour coding also gives reliable identification of the tube dimension. The flow rates of the individual tubes depend on their internal diameters.

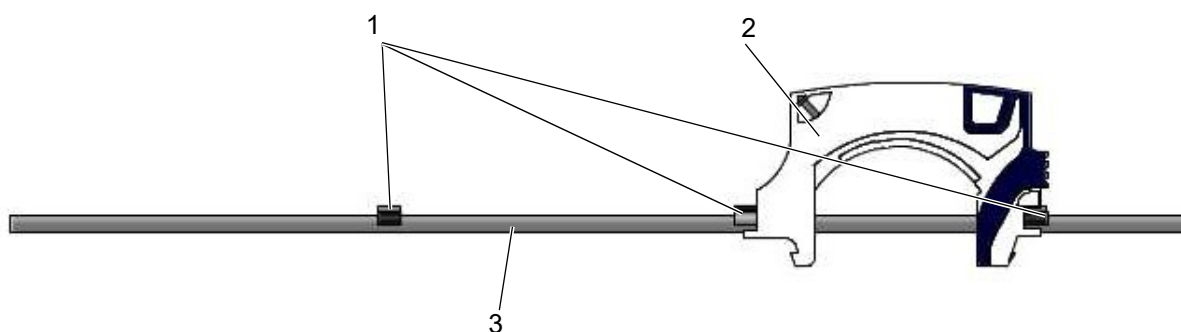


Fig. 9: Tube for the tube cassette pump (example)

3.4.1.3 Sample Pump

The sample pump (Fig. 10) is used to transport the sample(s) for the TOC-difference and TOnly methods. The number of sample pumps depends on the number of sample streams.



Fig. 10: Head of the sample pump (closed)



Danger

Danger of crushing

During operation, the rollers of the tube cassette pump are in motion.

Do not reach into the working area of the tube cassette pump during operation.

3.4.2 Glass Components

The following glass components are installed in the analyser. The number of glass components can vary depending on the number of sample streams and the measurement method:

3.4.2.1 Calibration vessel

The calibration vessel (1) is located in the main cabinet.

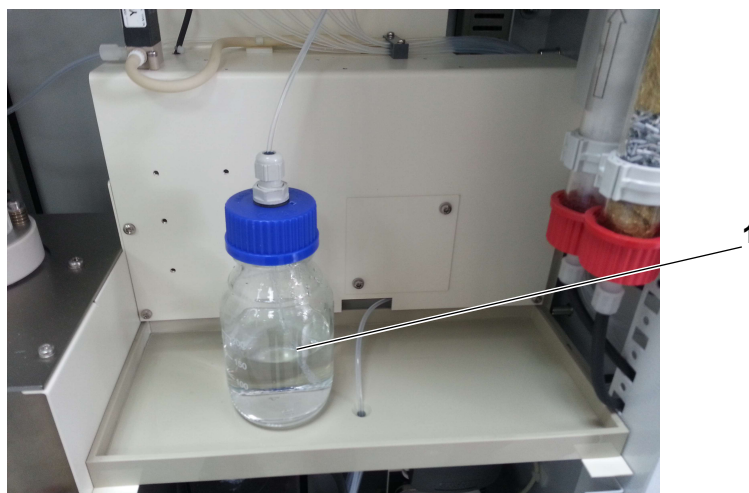


Fig. 11: Calibration vessel

3.4.2.2 Sample Vessels

The sample vessels (2) with the corresponding sample pumps (3) are located in the add-on unit.

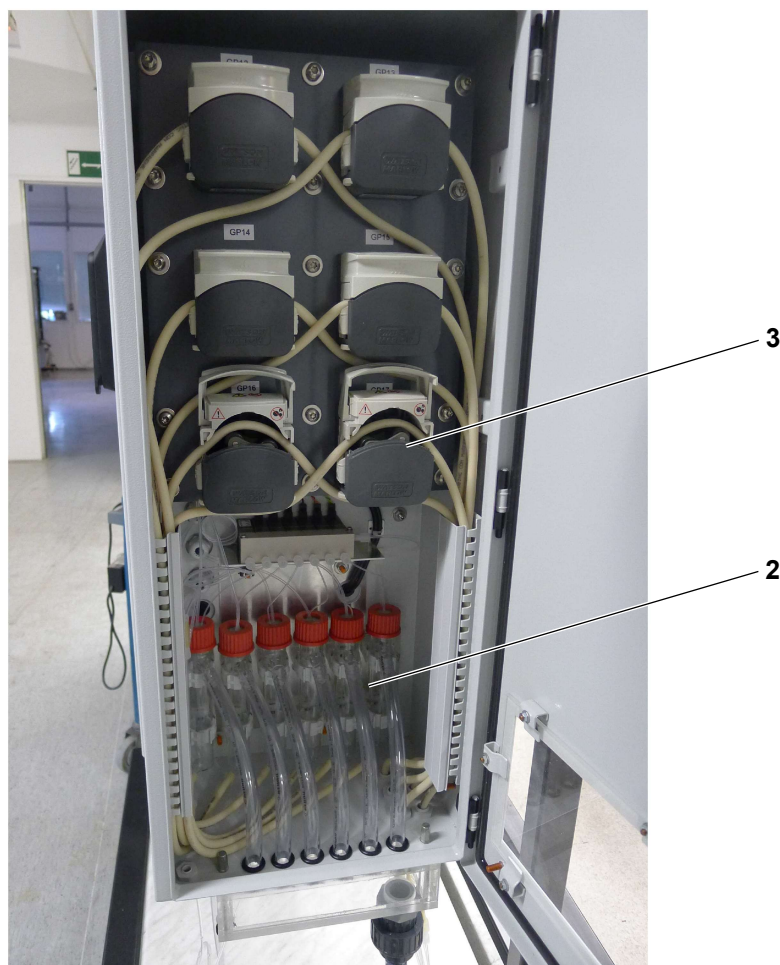


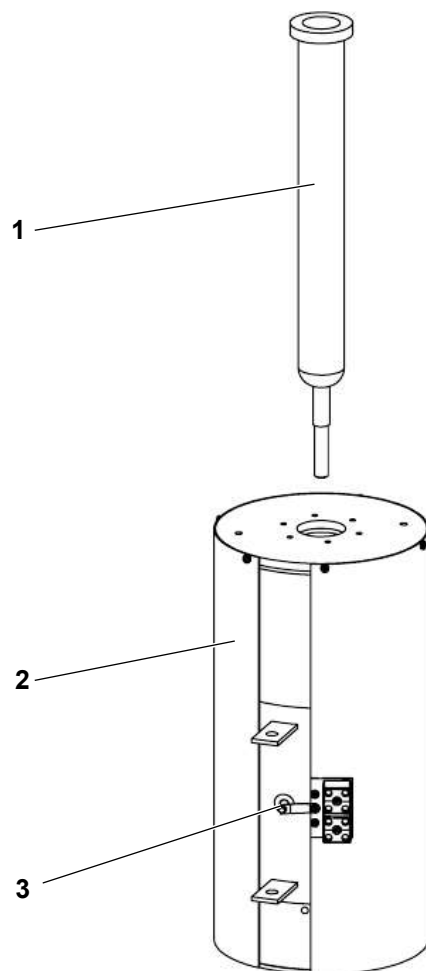
Fig. 12: Sample vessels in the add-on unit

3.4.3 Ceramic Furnace

The catalyst-free ceramic furnace is the heart of the analyser. In it, all carbon compounds are reliably oxidised at 1,200°C, enabling a complete analysis of the sample. Absolute safety is guaranteed in every environment despite the high temperatures.



Fig. 13: Furnace head



- 1 Ceramic reactor pipe
- 2 Furnace
- 3 Thermocouple

Fig. 14: Ceramic Furnace

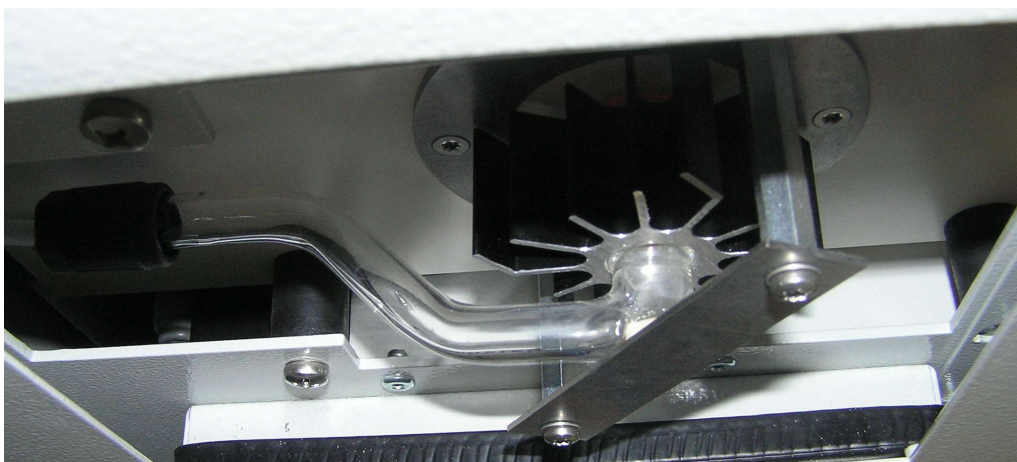


Fig. 15: Reactor foot

3.5 Trackball

The analyser can optionally be equipped with an external trackball. With the external trackball, you can control the analyser and operate the keyboard on the screen without having to open the case. This prevents the overpressure in the analyser from being reduced or having to rebuild first.

The external trackball can be used to access all software functions. In operation mode, readings, signals, and statistics are available.

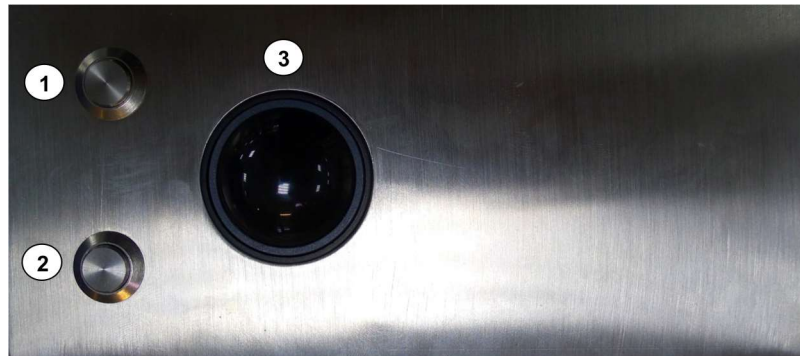


Fig. 16: Example of a Trackball

The function of the trackball (3) is the same as a mouse; however, only the left mouse button (2) is used to operate the software. The right mouse button (1) is inoperative.

The trackball is connected to the left housing wall. If the trackball is not connected, there is no leak in the housing wall.

The trackball can be connected at any time while the analyser is running.

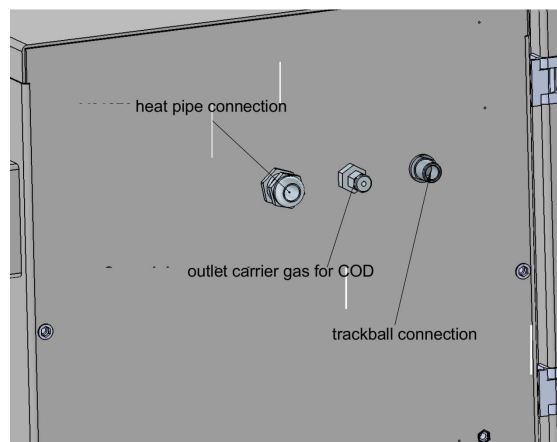


Fig. 17: Connection of the trackball

3.6 Components of the Explosion Protection

3.6.1 Overpressure System

The pressurized enclosure is provided by the F840 control unit (1). The control unit ensures continuous flushing with an inert gas. The housing is continuously filled via a proportional valve (2), so that all leaks in the housing are compensated and a slight internal pressure in the housing is ensured.

When the device is put into operation, the control unit starts with a rinsing phase to flush out potentially explosive gases. The analyser remains switched off. All cavities larger than 20 cm³ are flushed with inert

gas.

Only after successful rinsing is the analyser (3) switched on and the interfaces connected to the customer level.

An error is output at a relay output of the control unit as "Alarm".

For service work on the device by trained personnel there is a bypass mode in the control unit, which is protected by a password

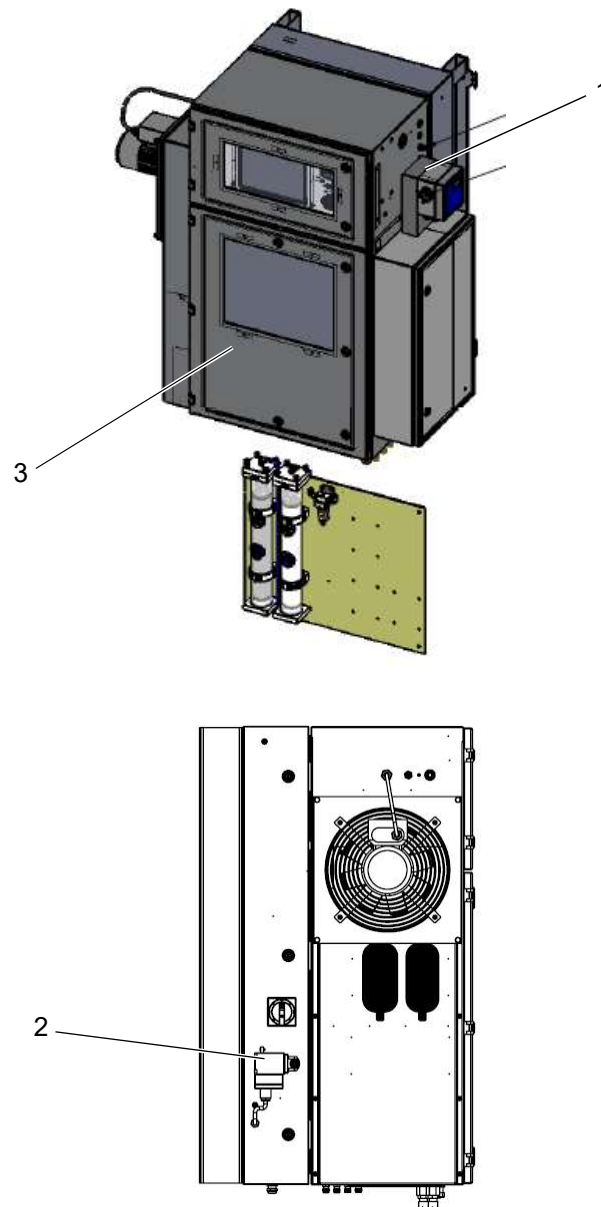


Fig. 18: Components of the Overpressure System

3.6.2 Cooling and Emergency Cooling

The analyser is equipped with a heatpipe (3) in order to keep the inner temperature of the casing within acceptable limits for the control logic - despite the high temperature of the furnace. Deflectors (4) within the heatpipe transport the hot air out of the casing. The heatpipe is filled with a liquid and uses the physical effect of evaporation and condensation. These two processes generate a high output of energy. The liquid evaporates on the hot side of the heatpipe, and condensates on the cool side. Thanks to capillary force, the condensation then returns to the hotter area in the heatpipe.

The correct functioning of the heatpipe is guaranteed by two ventilators (1, 5). The ventilator (1) is located in the explosive area. This ventilator is set up for temperature class T3 or T4, and allows for continuous operation and has protection class IP55.

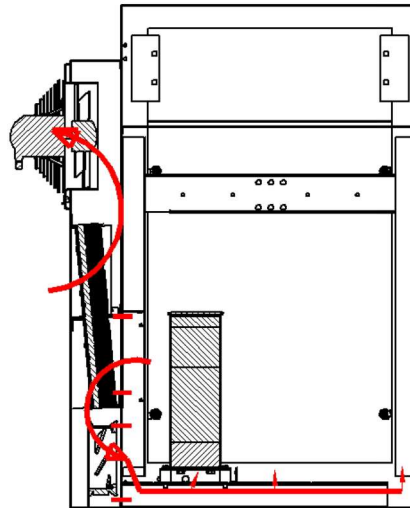


Fig. 19: Cooling Principle

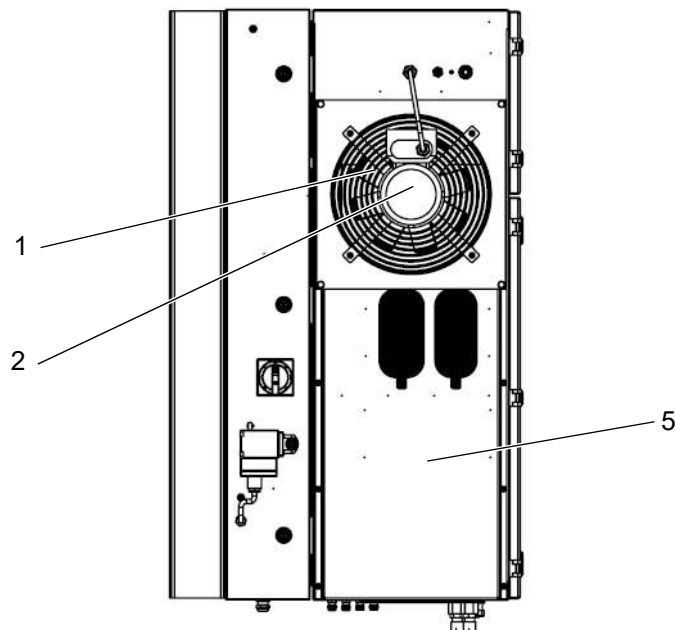


Fig. 20: Heatpipe, outside view with mounted upper ventilator (Example)

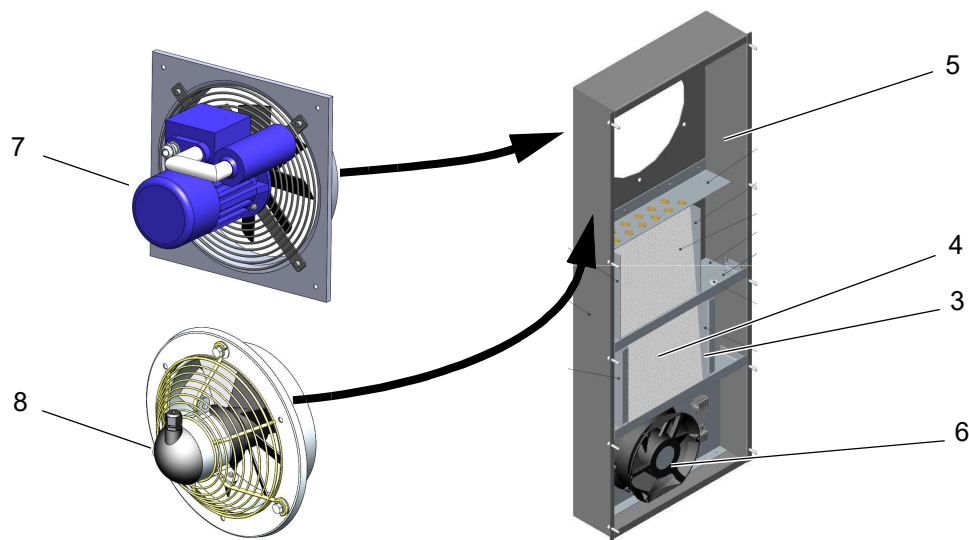


Fig. 21: Heatpipe, inside view

Depending on the temperature class, the cooling is equipped with a corresponding fan.

- The fan (7) (similar to illustration) complies with the specifications for temperature class T4.
- The fan (8) complies with the specifications for temperature class T3.

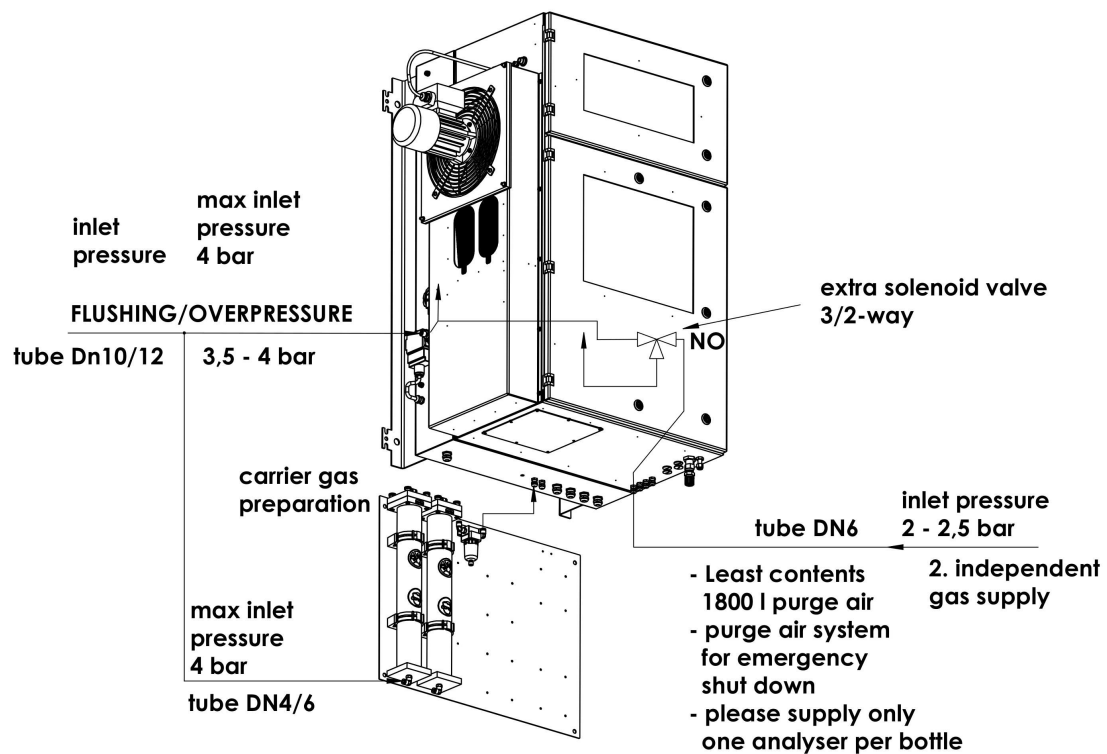


Fig. 22: Tubing for carrier gas, overpressure system and emergency cooling

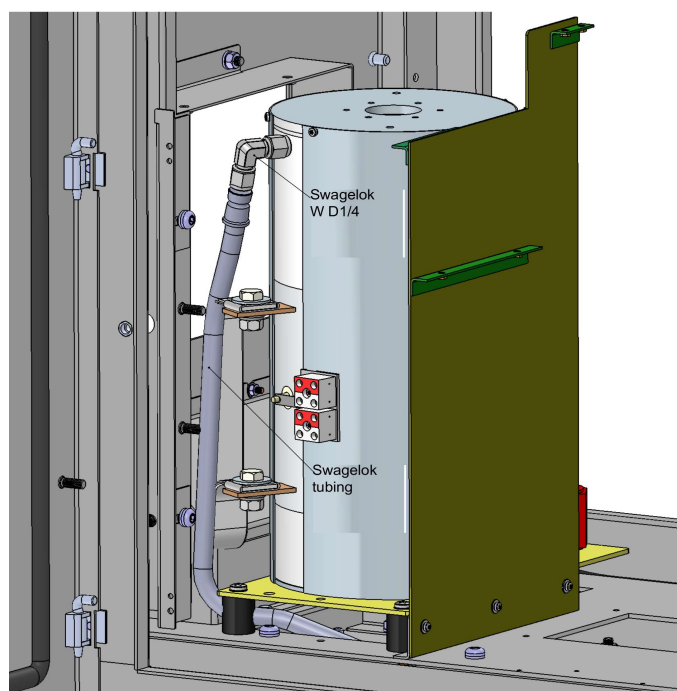


Fig. 23: Furnace tubing for cooling and emergency cooling

3.6.3 Connections



Danger

Danger of burns

During operation, the furnace is extremely hot.

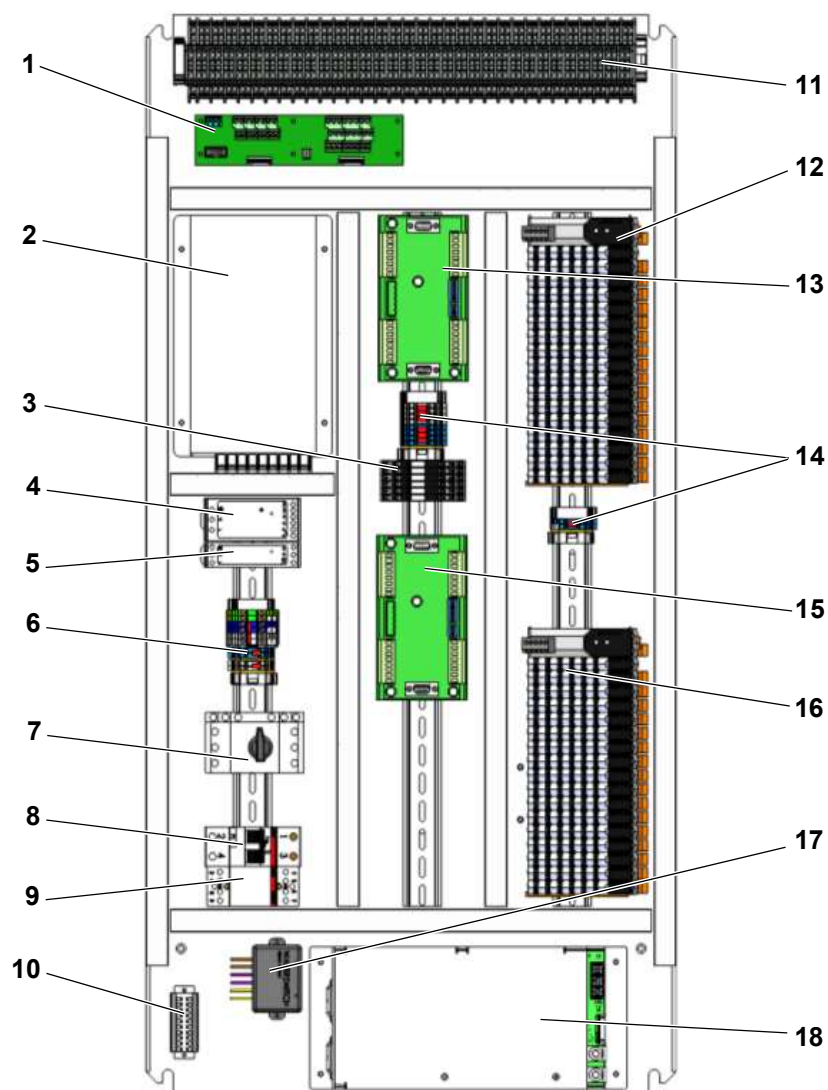
Use heat-proof gloves when working on the furnace system.

The analyser has various connectors, which are detailed in the following chapter.

3.6.3.1 Mounting Plate

**Notice**

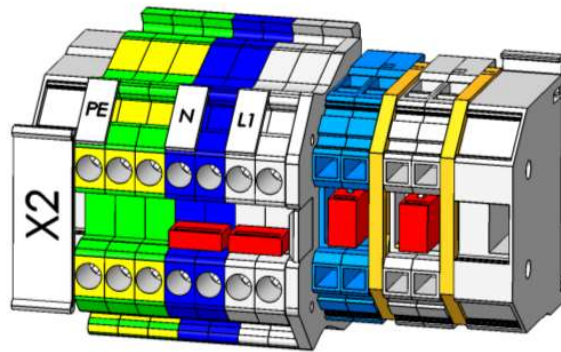
The device comes without power cord. The power cord must be supplied by the end-user.



- | | |
|--|---|
| 1 TRC-Board (RS232 Serial Interface, Relays, Digital Inputs) | 10 Connection Terminal for Ambient Air Preparation Unit (24 V/DC) |
| 2 Switching power supply(24 V / 13 A) | 11 Connection Terminals for Analog Outputs (X101) |
| 3 Relays for sample pump | 12 Analog output node |
| 4 Switching power supply 12 V | 13 Digital Node for Sample Stream 1 and 2 |
| 5 Switching power supply (5 V) | 14 Through terminals |
| 6 Mains connector | 15 Digital Node for Multi-Stream-Analyser |
| 7 Motor circuit breaker (for analysers with EX-Zone housing) | 16 Analog output node |
| 8 Main fuse (8 A) | 17 Water Detector(for analysers with EX-Zone housing) |
| 9 Furnace contactor | 18 Switching Power Supply of the furnace |

Fig. 24: Mounting plate with maximum placement

3.6.3.2 Power Supply



PE (green): Protective conductor

N (blue): Neutral

L (gray): Conductor

Fig. 25: Connection to power supply



Warning

Warning of improper electrical connection

The analyser may be damaged if it is connected to a local power supply not specified on the type plate.

Before switching on the analyser, check that the local voltage supply matches that on the rating plate.

If this power supply is not available, contact LAR Technical Support.

Do not switch on the analyser without a LAR-authorized technician before using it for the first time, as this will void the warranty of your analyser!



Warning

Warning about improper commissioning

The analyser may be damaged if improperly put into operation.

Do not switch on the analyser without a LAR-authorized technician before using it for the first time, as this will void the warranty of your analyser!

3.6.4 Electronic Connections (Digital and Analog Connections)



Notice

De-energize the analyser before beginning to cabling the system.

3.6.4.1 Connections on the TRC-Board

The analyser is equipped with a TRC board for connection to external devices or to a process control system. It is located on the upper left side of the mounting plate in the rear housing (Fig. 25, page 40). Open the rear housing door to gain access to the TRC board.

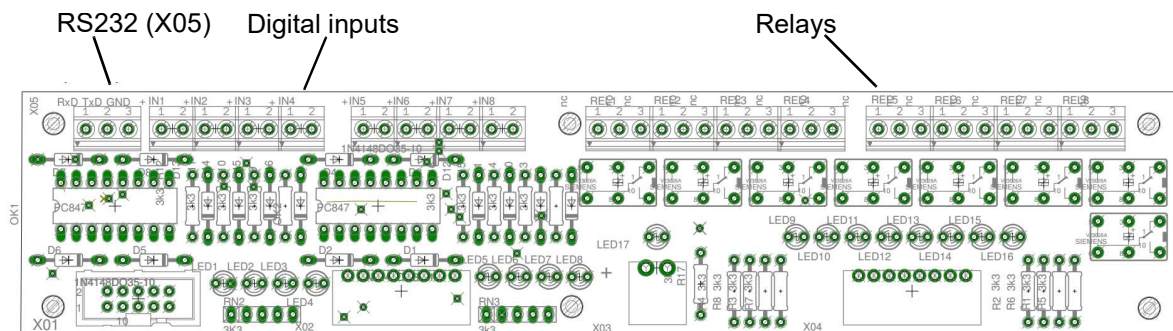


Fig. 26: TRC-Board (complete)

The TRC board has the following connections

- 1x RS 232 interface
- 8x Digital inputs
- 8x Relays



Notice

For connecting the signal cables to the TRC board, use a cable cross-section of 1.5 mm^2 = cable diameter of 1.4 mm.

Connection	Function	Usage
RS232 (X05)		
1	RXD	used by operator and LAR technical support
2	TXD	used by operator and LAR technical support
3	GND	used by operator and LAR technical support
Digital inputs (24V)		
1+	IN1	remote control for stream 1
2-	IN1	
1+	IN2	remote control for stream 2
2-	IN2	
1+	IN3	Hold
2-	IN3	
1+	IN4	remote control for stream 3
2-	IN4	
1+	IN5	remote control for stream 4
2-	IN5	
1+	IN6	remote control for stream 5
2-	IN6	
1+	IN7	remote control for stream 6
2-	IN7	
1+	IN8	Start gas validation
2-	IN8	
1+	IN8	unused
2-	IN8	
Relays		
1	nc break	programmable
	com	
	no make	
2	nc break	programmable
	com	
	no make	
3	nc break	programmable
	com	
	no make	
4	nc break	programmable
	com	
	no make	
5	nc break	programmable
	com	
	no make	
6	nc break	programmable
	com	
	no make	
7	nc break	programmable
	com	
	no make	
8	nc break	programmable
	com	
	no make	

Fig. 27: TRC-Board (RS 232 serial interface, digital inputs relays)

3.6.4.2 RS232 Serial Interface

The serial RS232 interface can be used to transfer the current data to a remote computer unit that is connected to the analyser via an RS232 cable. The pin assignment of the interface is shown in Fig. 27, page 42. Set the serial interface parameters on your computer as follows:

Tabelle 3: Serial interface parameters

Baud rate	9600Bd
Parity	none
Data bits	8
Stop bits	1
Protocol	Xon / Xoff

Example:

If you send the letter D, the analyser will reply with the transmission of the current data in the following format:

Date; time; measured value display1; measured value display2; ... last measured value display; respective status

Formats:

- Date; time: dd.mm.yyyy-hh:mm:ss
- Display measured values: @@@@.@@ (six digits before and two digits after the comma, not used digits are displayed as „Zero“)
- Status (Example): "Errors = (E1835_E1836)" ; "Limits = (L1_max LV1_max)" ; "Status = (M1)" (Underscore = blank space)

Various activities are listed in the status string. The maximum length of the transmitted string is 4095 characters.

3.6.4.3 Digital Inputs

The analyser can be controlled via the digital inputs. This option allows e.g. to start only one measurement if a sample is present. The necessary input signals (0 - 24 VDC) must be provided by the user:

Tabelle 4: Digital input of the applied DC voltage

Digital Input 1, 2, 4, 5, 6, 7 (Sample Measurement)	
0 - 3 V	no changes
12 - 24 V	Measurement
Digital input 3 (General Stop of the Analyser)	
0 - 3 V	no changes
12 - 24 V	measurement is stopped



Notice

The digital inputs are assigned to the corresponding sample streams. For an overview see Fig. 27.

3.6.4.4 Relays

The analyser has 8 isolated relays (switch contacts). These are capable of switching external circuits up to 24 V DC / AC with 1 A and can be assigned by the user in the operating software. The relays can be programmed as normally open and normally closed (settings in the software, default is normally open). See Chapter 7.2.6 from page 100).

3.6.4.5 Analog Outputs

The maximum load for the isolated 0 / 4-20 mA current loops is 500 ohms. The type of analogue output (0-20 mA or 4-20 mA current loop) can be set in the software. If the output is set to 4 - 20 mA, a so-called "live zero feature" can be set in the operating software. This means that instrument errors are output at 0 mA. The conditions of the error display can be programmed individually in the operating software. The analyser mounting plate (Fig. 22, page 37) contains the X101 terminal strip for the analog outputs (Fig. 28, page 44). The individual terminals of X101 are labeled. The first digit stands for the sample flow (PS) and the second for the outgoing parameter.



Warning

Damage to the analyser due to current or voltage at analog outputs!

At the analog outputs of the analyser neither current nor voltage must be applied actively. The LAR analysers only output different currents in mA.

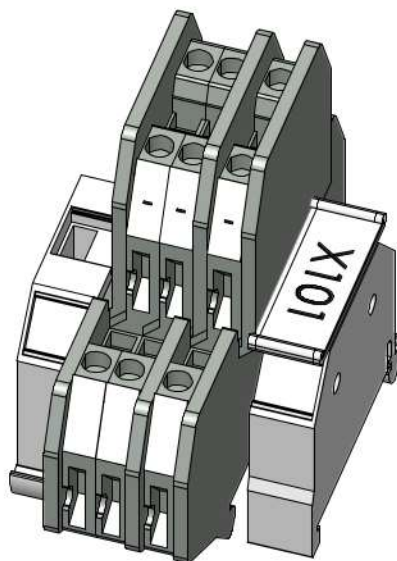


Fig. 28: Analog outputs



Notice

Note that the terminal diagram (Fig. 29, page 45 to Fig. 31, page 47) is designed as an example for the maximum configuration (6 sample streams) and that the analyser ordered by you corresponds to your configuration.

The relays and analog outputs can be programmed individually by LAR Technical Support (Chapter 15.1 on page 183) during commissioning.

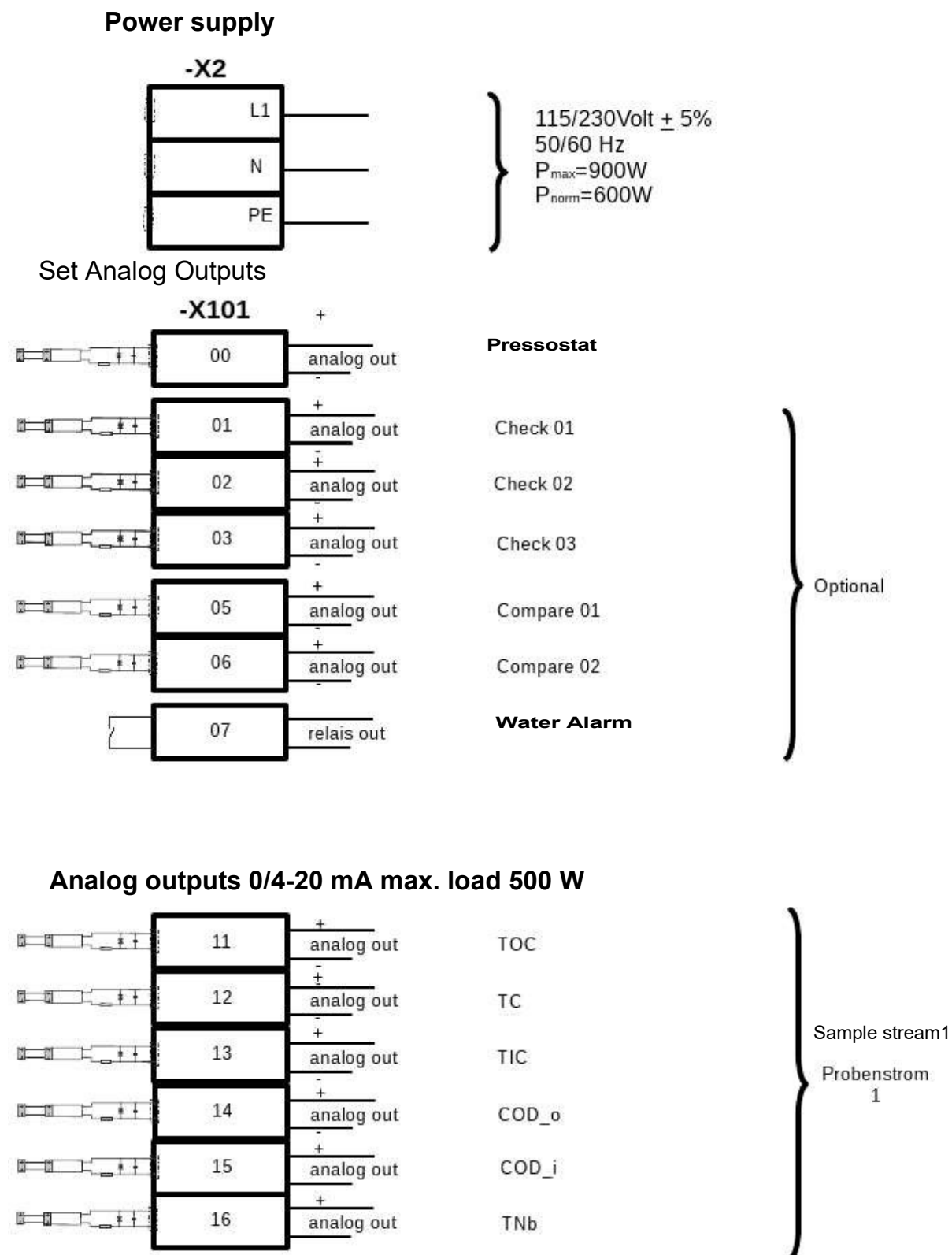


Fig. 29: Terminal plan (part I) - Power supply, fixed analogue outputs, programmable analogue outputs

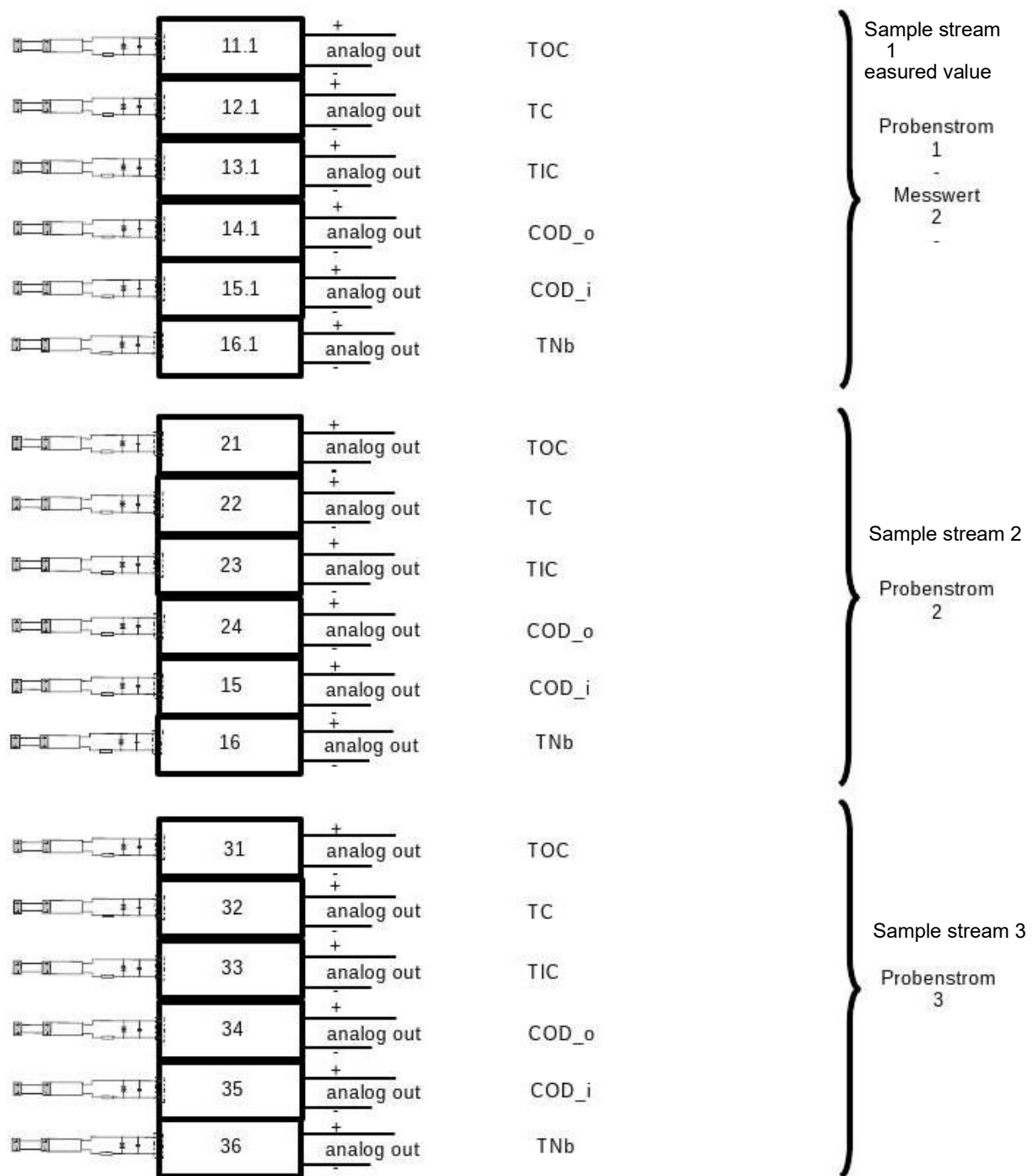


Fig. 30: Terminal plan (part II) - Programmable analogue outputs

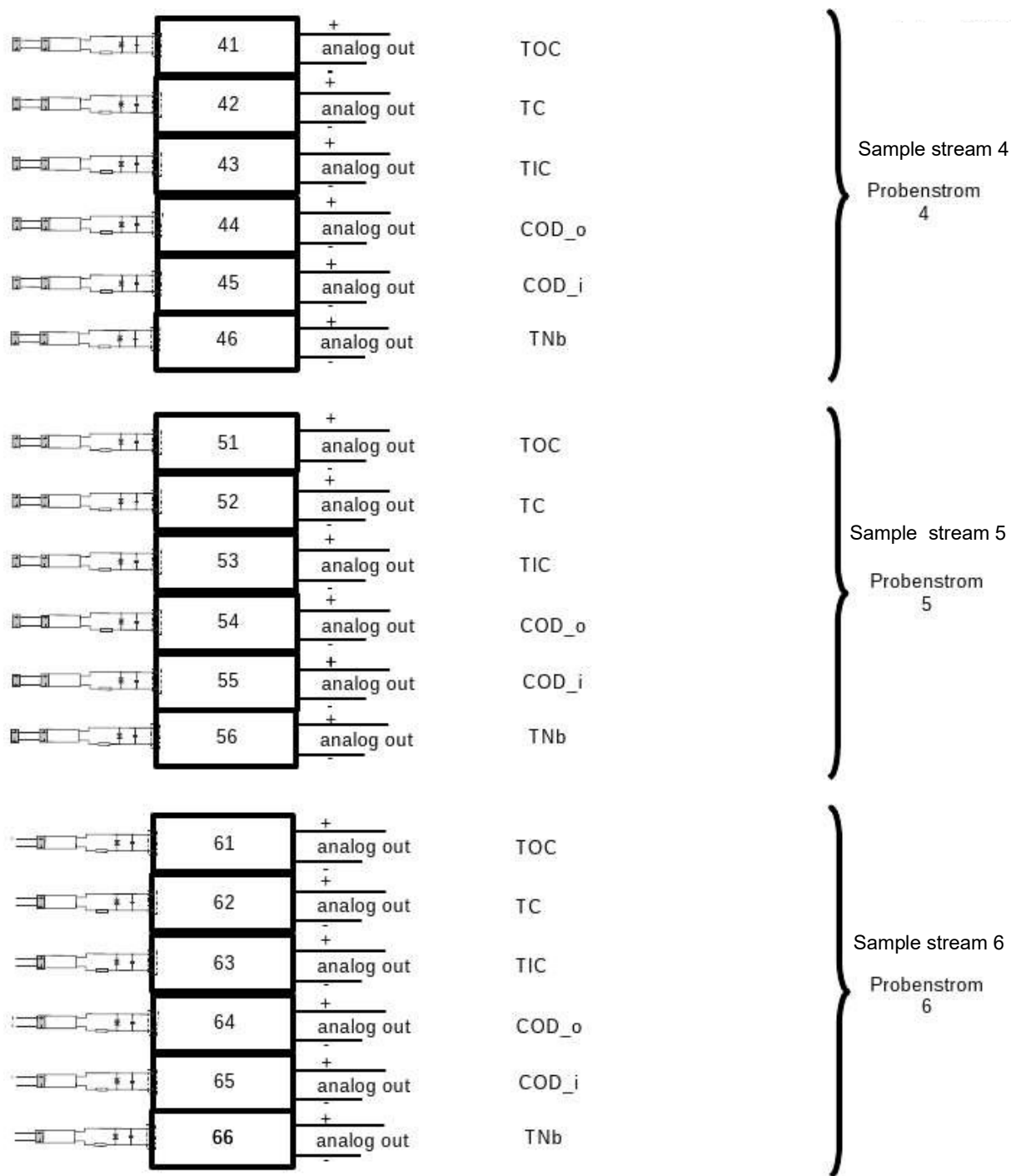


Fig. 31: Terminal plan (part III) - Programmable analogue outputs

3.6.5 Carrier Gas

The carrier gas supplied to the measuring system must be CO₂-free, as it carries the CO₂ produced during the oxidation of the sample to the detector. The carrier gas must be supplied with a pre-pressure of 3.5 to 4 bar.

The carrier gas must be free of:

- CO₂
- Carbon
- Dust
- Water
- Oil

4 Installation

The following chapter will give you instructions for installing the analyser. The following installation procedure serves as overview. Perform the installation correctly and log the installation process that you should perform and log correctly.



Warning

Warning about structural changes to the analyser

Any changes to the housing or the internal wiring lead to the immediate expiry of the ATEX certificate. This information is also noted on the front door.

Before switching on the analyser, check whether the local voltage corresponds to that on the nameplate.

Contact LAR Technical Support if changes to the analyser are required.



Warning

Explosion Protection

All external or external components (purge valve, control unit, Ex interface relays) must be installed with electrical grounding wires.

Unused cable glands must be closed with blanking plugs. Covers on all external units (pressure control, circuit breaker) must be installed. Otherwise, the system may not be used in Ex environments!

4.1 Installation Procedure

The installation procedure is divided into the installation of the analyser and the installation of optional accessories to the analyser.

4.1.1 Installation of the Analyser

1. Ensure environmental conditions (Chapter 4.2 on page 50)
2. Set up the Analyser (Chapter 4.3 on page 52)
3. Provide Carrier Gas (Chapter 4.4 from page 55)
4. Provide sample inlet and drain (Chapter 4.5 on page 56)
5. Set up the Power Supply (Chapter 4.6 on page 56)
6. Connect the Signal Cables (Chapter 4.7 on page 57)
7. Provide Rinsing Solution (Chapter 4.8 on page 57)
8. Provide Acid Solutions (Chapter 4.9 on page 58)
9. Provide Calibration Standards (Chapter 4.10 on page 59)

Tabelle 5: Installation protocol for the analyser

Task	Criteria	OK	Comment
Ensure Environment Conditions	<ul style="list-style-type: none"> • Dry and frost-proof • Temperature: 5 -35° C • Rel. humidity: < 80% • No direct exposure to sunlight • No aggressive environment • No aggressive sample contents 	<input type="checkbox"/>	
Mounting and Installation of the Analyser on Site	<ul style="list-style-type: none"> • Wall mounting: <i>Free space (W x H x D)</i> <i>approx. 1.430 x 1.760 x 1.190 mm</i> 	<input type="checkbox"/>	
	<ul style="list-style-type: none"> • Mounting rack: <i>Free space (W x H x D)</i> <i>approx. 1.500 x 2.000 x 1.420 mm</i> 	<input type="checkbox"/>	
Provide Carrier Gas	<ul style="list-style-type: none"> • Free of CO₂, Carbon, Dust, Water und Oil • Pre pressure 3,5 - 4 bar • Available in the direct vicinity 	<input type="checkbox"/>	
Provide Sample Inlet	<ul style="list-style-type: none"> • Depressurised • Available in the direct vicinity 	<input type="checkbox"/>	
Provide Drain	<ul style="list-style-type: none"> • Depressurised • Available in the direct vicinity 	<input type="checkbox"/>	
Provide Power Supply	<ul style="list-style-type: none"> • Mains voltage correct • Power cable on power supply connected 	<input type="checkbox"/>	
Install Signal Connections	<ul style="list-style-type: none"> • Serial interface connected • Digital Inputs connected • Analog Outputs connected • Relays connected 	<input type="checkbox"/>	
Provide Rinsing Water	<ul style="list-style-type: none"> • Rinsing water provided 	<input type="checkbox"/>	
Provide Acid Solution	<ul style="list-style-type: none"> • Acid solution provided 	<input type="checkbox"/>	
Provide Calibration Standards	<ul style="list-style-type: none"> • Calibration Standard provided 	<input type="checkbox"/>	
<div> Date: <div>Signature:</div> </div>			

4.2 Site Selection - Ambient Conditions

The following ambient conditions apply for choosing the analyser location:

- Dry and frost-proof
- Allowed temperature ranget 5°C - 35°C
- Max. relative humidity 80%
- No direct exposure to sunlight
- No aggressive environment for housing type IP54
- Mains voltage 115/230 V at 50/60 Hz, 16 A fusing (K-characteristics)

**Warning****Warning of incorrect electric connections**

The analyser may be damaged if it is not connected to the mains matching the data stated on the nameplate.

Before the analyser is switched on, a check must be run on whether the local voltage supply matches that on the nameplate.

If this power supply is not available, please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 245).

Do not switch the analyser on before using it for the first time without the presence of a technician authorised by LAR - otherwise this voids the warranty of your analyser.

4.3 Mounting the Analyser On-Site

The analyser is normally mounted on to a wall (Chapter 4.3.2 from page 54) or to the LAR mounting rack (Chapter 9.2 on page 156).



Notice

LAR technical support does not carry out any construction work. The installation of the analyzer and the options must be done by the user before putting the analyzer into operation.

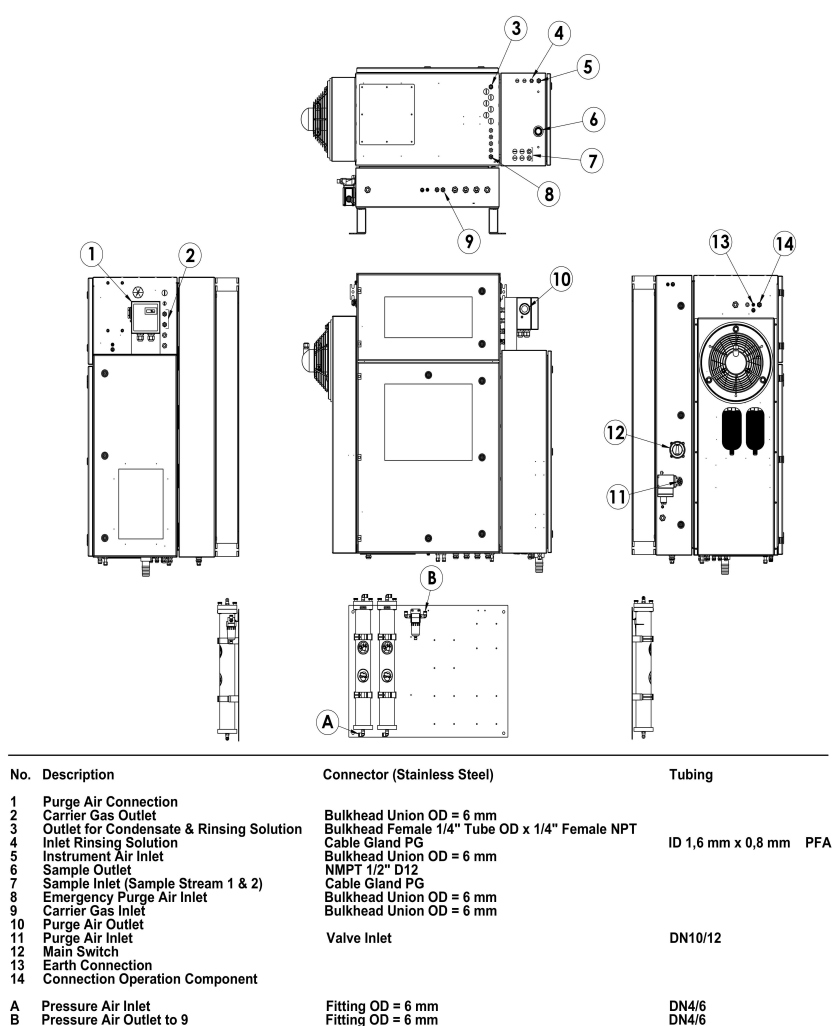
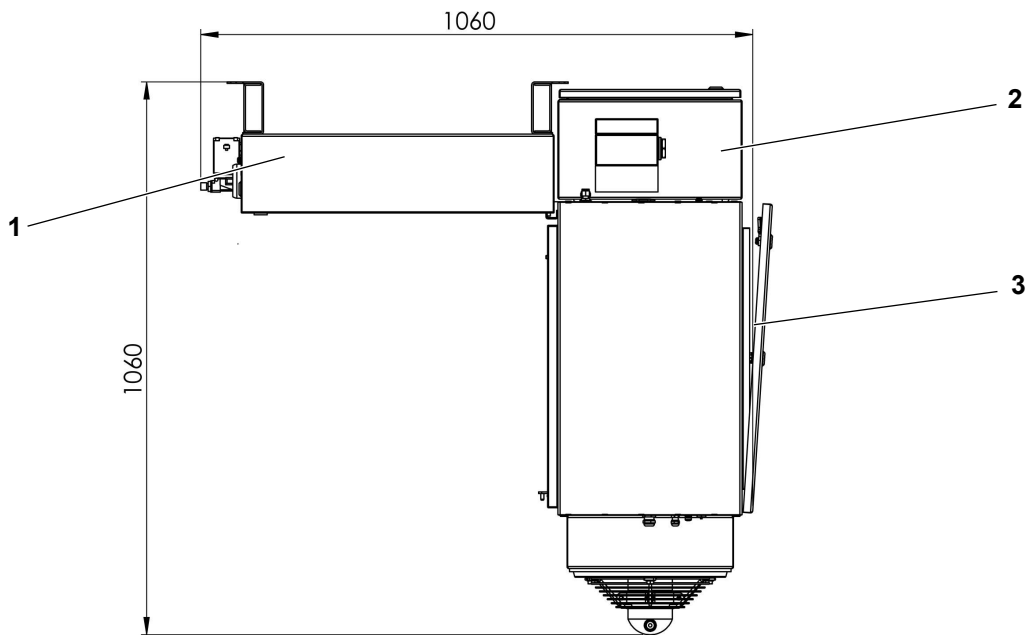


Fig. 32: QuickTOC_{purity} (one sample stream, in ATEX Zone 2, T4, with carrier gas conditioning (Example))

4.3.1 Maximum Swing-Open of the Analyser

**Notice**

For all mounting options, distance to side and opposite walls must be maintained so that the analyser can be swung open.



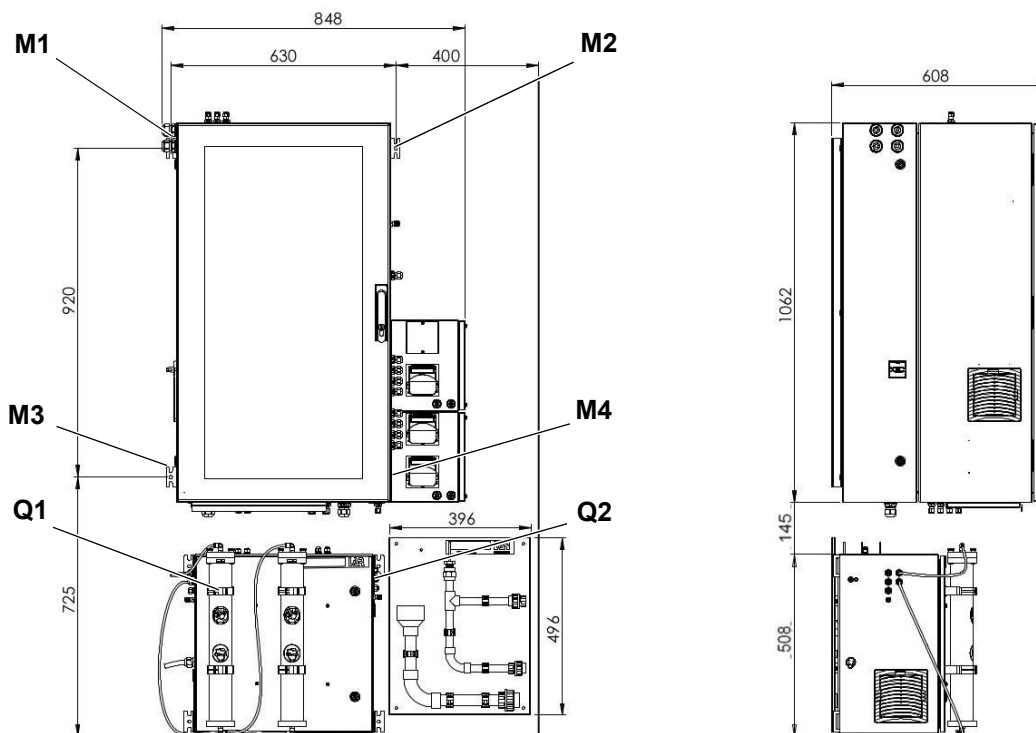
- 1 Rear housing
- 2 Front housing
- 3 Housing door

Fig. 33: Maximum swing-open of the analyser

4.3.2 Wall Mounting

Observe the following mounting dimensions:

Minimum 1.430 x 1.760 x 1.210 mm (W x H x D)



M1 - M4: Mounting points for analyser

Q1 - Q2: Mounting points for carrier gas conditioning

Fig. 34: Wall mounting of the QuickTOC[®]_{purity} with carrier gas conditioning and FlowSampler[®] (Example)

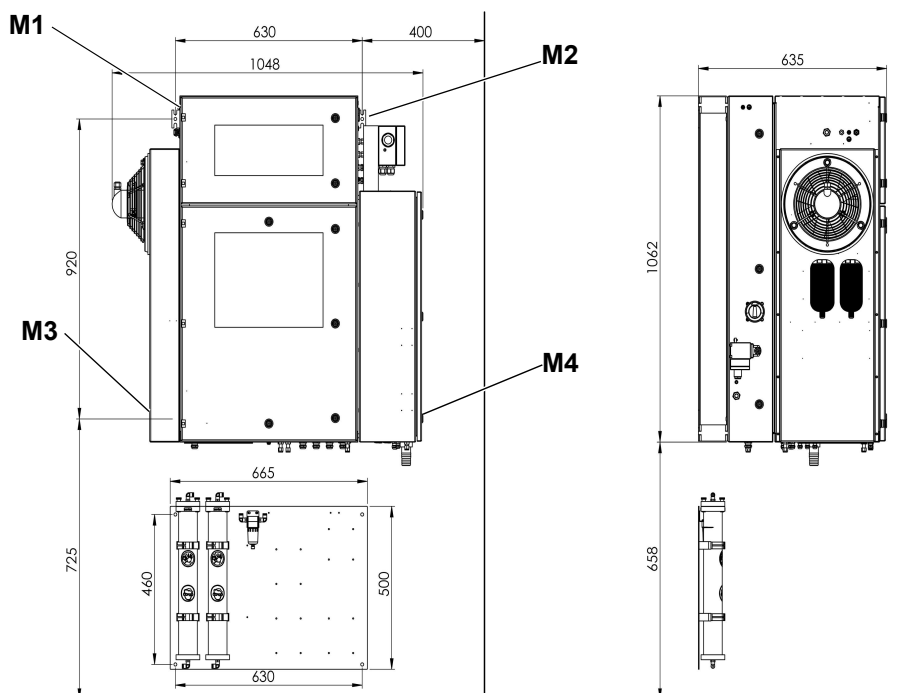


Fig. 35: Wall mounting of the analyser

**Warning****Improper Mounting!**

The distance to side and opposing walls must be kept so that the analyser can be opened.

Take into account the condition of the wall to which the analyser is to be affixed. The wall should have the solidity of a concrete wall. Gas concrete walls are unsuitable! Use all of the brackets (M1 - M4) of the analyser for installation.

Ensure that the analyser is aligned horizontally. Use a spirit level for levelling.

**Notice**

If the condition of the wall does not meet the requirements, LAR recommends to mount the analyser on the LAR mounting rack.

For information on mounting the analyser on the mounting rack, please refer to Chapter 9.6 from page 199.

4.4 Carrier Gas

For the operation of the analyser, a carrier gas is required with the following specifications. For more information see Chapter 3.5 on page 27.

Ensure that the carrier gas is:

- free of CO₂, carbon, dust, water and oil
- pre-pressurized to 2 - 5 bar

- dew point: max. -5°C
- provided in the direct vicinity of the analyser

4.5 Sample Inlet and Drain

Please ensure that sample inlet and drain are depressurised and available in the direct vicinity of the analyser.

4.6 Power Supply

A 115/230 V, 50/60 Hz mains voltage is required to use the analyser. The mains voltage for your analyser is specified on the nameplate (Fig. 3, page 9) (on the right-hand side). You must provide a mains lead and connect it to the mains connector (Fig. 15, page 19) on the installation plate (Fig. 14, page 18) of the analyser.

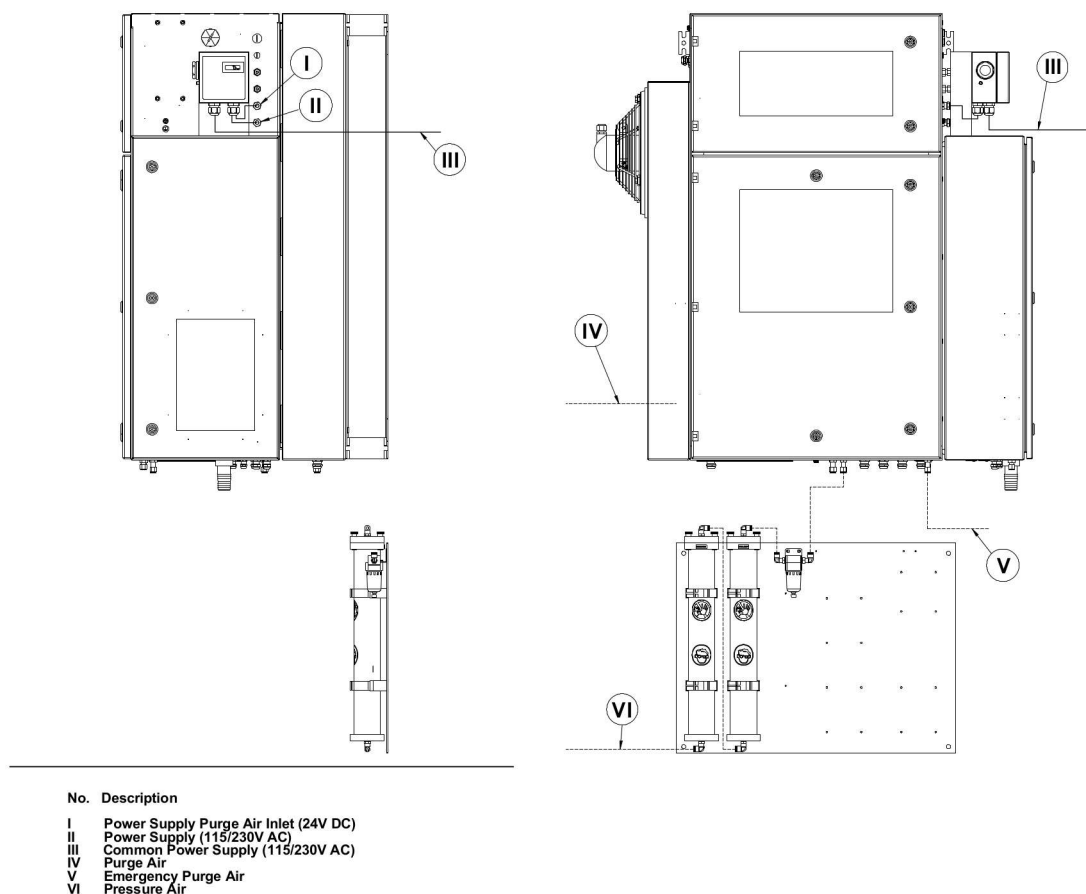


Fig. 36: Electric Installation

**Notice**

It is possible to use other mains voltages.

If you have any question, please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 245).

4.7 Signal connections

The analyser has different digital connections. The signal lines can be connected by you on the installation plate in the rear part of the housing, and be programmed by **your local partner** or the **Technical Support of LAR** as part of initial start-up.

Signal lines to be connected:

- RS232 serial interface to a computer unit via an RS232 cable (Chapter 3.4.5.2 on page 22)
- Digital Inputs (Chapter 3.4.5.3 on page 22)
- Relays (Chapter 3.4.5.4 on page 23)
- Analog Outputs (Chapter 3.4.5.5 on page 23)

**Warning**

Warning of incorrect electric connections

The analyser may be damaged if it is not connected to the mains matching the data stated on the nameplate.

Before the analyser is switched on, a check must be run on whether the local voltage supply matches that on the nameplate.

If this power supply is not available, please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 245).

Do not switch the analyser on before using it for the first time without the presence of a technician authorised by LAR - otherwise this voids the warranty of your analyser.

**Warning**

Warning of incorrect setting-up

The analyser may be damaged if it is not connected to the mains matching the data stated on the nameplate.

Do not switch the analyser on before using it for the first time without the presence of a technician authorised by LAR - otherwise this voids the warranty of your analyser.

**Notice**

Disconnect the analyser from electric power prior to cabling the system.

4.8 Rinsing Water

Rinsing Water (provided by the operator) used for rinsing the injection needle is required for Start-Up.

See Chapter 6.1.2 on page 55.

4.9 Provide Acid Solution (TOC-Direct and TOC-Difference Method)

For the usage of the analyser with the TOC-Direct or TOC-Difference Method, an acid solution for stripping out inorganic carbon compounds (TIC) must be provided. See Chapter 6.1.3 on page 56 for the TOC-Difference Method or the Chapter 6.1.4 on page 56 for the TOC-Direct Method.



Notice

For the start-up, please use an acid solution which is not older than five days.
It is best to keep canisters in the Reagent Cabinet (see Chapter 9 from page 169).

4.10 Provide Calibration Standards

A calibration standard must be provided by the operator to calibrate the analyser. See Chapter 6.2 from page 57.



Warning

Warning of improper storage

The calibration standard must be stored in a cool place (such as a refrigerator).
For the start-up, please use a calibration standard not older than five days.



Notice

Certified calibration standards can be sourced directly from LAR to minimise overhead.

For more information please contact the **Sales Department of LAR** (Chapter 15 on page 245).

5 Start-up

This section provides all information about the start-up of the analyser. The following start-up procedure serves as an overview. The start-up must be carried out properly and documented by Technical Support of LAR or by another person authorised by LAR.



Warning

Warning of improper start-up

Do not switch on the analyser before start-up without having completed the installation (described in the previous chapter) and without the presence of a technician authorised by LAR - because this voids the warranty of your analyser.

5.1 Procedure

The start-up procedure is divided into start-up of the analyser and start-up of accessories.

5.1.1 Start-Up of the Analyser

1. Checking the Pre-fusing (Chapter 5.2 on page 62)
2. Checking the mounting plate (Chapter 5.3 on page 62)
3. Removing the transportation locks (Chapter 5.4 on page 63)
4. Aligning the voltage (Chapter 5.5 on page 65)
5. Switching on the fuses (Chapter 5.6 on page 65)
6. Filling and installing the reactor pipe (Chapter 5.7 on page 65)
7. Completing the furnace system (Chapter 5.8 on page 68)
8. Installing the pump tubes (Chapter 5.9 on page 70)
9. Tubing the analyser (Chapter 5.10 on page 72)
10. Connecting the control unit and the relays (Chapter 5.11 on page 73)
11. Connecting the furnace emergency cooling (Chapter 5.12 on page 74)
12. Switching on the analyser (Chapter 5.13 from page 74)
13. Setting the bypass for the control unit (Chapter 5.14 on page 75) and switching into bypass mode
14. Rinsing the injection system and the sample tubes (Chapter 5.15 on page 76)
15. Customizing application-specific settings (Chapter 5.16 on page 76)
16. Checking status parameters (Chapter 5.17 on page 76)
17. Performing a calibration (Chapter 5.18 on page 76), if need be, performing a second calibration.

Tabelle 6: Start-up protocol for the analyser

Task	Criteria	OK	Comment
Checking the Pre-fusing	• Pre-Fuse is installed correctly	<input type="checkbox"/>	
Checking the Mounting plate	• Components are fixed	<input type="checkbox"/>	
Removing the transportation locks	• Furnace Transport Screw is removed	<input type="checkbox"/>	
Aligning the voltage	• Voltage is correct	<input type="checkbox"/>	
Date:		Signature:	

Task	Criteria	OK	Comment
Switching on the fuses	<ul style="list-style-type: none"> Fuse Lock is removed All Fuses are switched on 	<input type="checkbox"/>	
Filling and installing the reactor pipe	<ul style="list-style-type: none"> Reactor Pipe is filled Reactor Pipe is installed 	<input type="checkbox"/>	
Completing the Furnace System	<ul style="list-style-type: none"> Furnace Head is installed Injection Port is installed Reactor Foot is installed 	<input type="checkbox"/>	
Installing the pump tubes	<ul style="list-style-type: none"> Pump tubes are installed 	<input type="checkbox"/>	
Tubing of the Analyser	<ul style="list-style-type: none"> Tubing is performed like in Flow Diagram Tubes are hand-screwed onto the screwed joints 	<input type="checkbox"/>	
Connecting the Control Unit and the Relays	<ul style="list-style-type: none"> Control Unit and Relays are connected 	<input type="checkbox"/>	
Connecting the Furnace Emergency Cooling	<ul style="list-style-type: none"> Emergency Cooling of the Furnace is connected 	<input type="checkbox"/>	
Switching on the Analyser	<ul style="list-style-type: none"> Analyser is switched on Analyser is booted 	<input type="checkbox"/>	
Setting bypass of the Control Unit and switching into the bypass mode	<ul style="list-style-type: none"> Bypass for the Control Unit is set and Bypass mode is ON 	<input type="checkbox"/>	
Rinsing the Injection System and Sample Tubes	<ul style="list-style-type: none"> Injection System and Sample Tubes are rinsed 	<input type="checkbox"/>	
Customizing application-specific settings	<ul style="list-style-type: none"> Hardware and Parameter Settings are set 	<input type="checkbox"/>	
Checking Status Parameters	<ul style="list-style-type: none"> Carrier Gas IN / OUT: approx. 30 l/h (High Salt: approx. 20 l/h) Humidity: Actual < Target Gas Pressure: Actual < Target Zero Signal: 0 - 0.1 FSR 	<input type="checkbox"/>	
Performing a Calibration	<ul style="list-style-type: none"> Analyser is calibrated 	<input type="checkbox"/>	
<div> Date: Signature: </div>			

5.2 Checking the Pre-Fusing

Before start-up can begin, it is important to ensure that correct pre-fusing has been installed at the operator.

5.3 Checking the Installation Plate

Before start-up can be performed, it is important to ensure that no components have become loose or suffered damage during transit. The housing and the components on the installation plate in the rear part of the housing (Fig. 14, page 18) must also be checked.

5.4 Removing Transport Locks

Transport locks are affixed to safeguard the analyser and its components during transport. They must be removed before the analyser is used.

5.4.1 Furnace Transport Screw



Notice

Transport locks can also be affixed to accessories and options.

Information to remove transportation locks of accessories and options can be found in Chapter 9 from page 169.

For transportation, the furnace is secured with a bolt and a spacer sleeve, which must be removed for operation.

Proceed as follows:

1. Open the furnace door in the analyser.
2. Use the screwdriver to remove the transport bolt (1) for the furnace.
3. Remove the spacer sleeve (2).
4. Close the furnace door of the analyser.



Fig. 37: Removing the transport locks of the furnace

5.5 Aligning the Voltage

1. Check the power supply.
2. Compare the mains voltage with that specified on the analyser (siehe Fig. 3, page 20) ab.

5.6 Switching on the Pre-Fusing

In order to switch the analyser on, the lock on the automatic circuit breaker must be removed and the fuses must be switched on.

Proceed as follows:

1. Open the rear part of the housing to access the mounting plate (Fig. 14, page 18).
2. Open the yellow lock (1) by pulling it forwards.
3. Use your finger and thumb to press in the metal clip, and remove the lock (1).
4. Switch all fuses on.
5. Close the rear part of the housing.

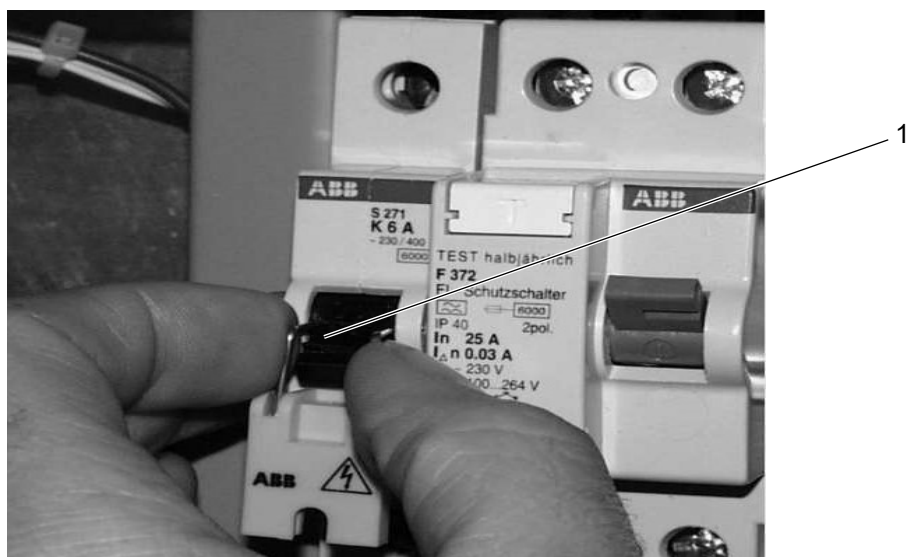


Fig. 38: Remove the safety clip of the Pre-fusing

5.7 Filling and Installing the Reactor Pipe



Warning

Warning of damage to the analyser

The analyser may suffer irreparable damage if operated with an unfilled reactor pipe or without a reactor pipe.

Fill the reactor pipe and install the reactor pipe in the furnace before operating the analyser.

Some components of the furnace system are packed individually for safety during transit. These components must be fitted in the furnace.

Remove the following components from the packaging:

- Reactor Pipe
- Protective Pipe
- Ceramic Sieve
- Ceramic Balls
- Green Protective Seal

Assembly of the Reactor Pipe:

I

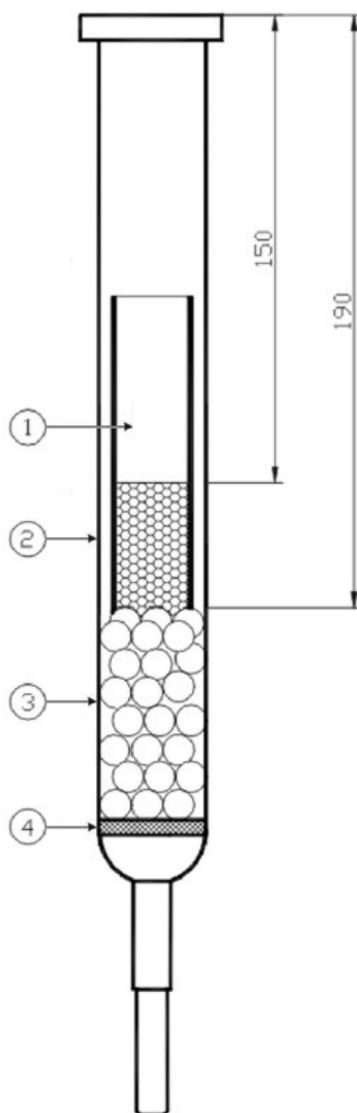


Fig. 39: Reactor pipe filling

Proceed as follows:

1. Place the ceramic sieve (4) on the taper of the reactor tube. Make sure that the ceramic sieve rests horizontally.
2. Fill 7 mm of the ceramic balls (3) to the height of 190 mm from the top of the reactor tube.
3. Fill 3.5 - 4.5 mm of the ceramic balls (2) up to a height of 150 mm from the top of the reactor tube.
4. Insert the short protective tube (1).

**Warning****Damage due to improper filling**

Incorrect filling of the reactor pipe can damage the reactor pipe.

Use a funnel to fill the ceramic balls so that the ceramic balls do not fall between the reactor pipe and the protective pipe.

Any deviations from the standard filling should be discussed in advance with LAR Technical Support (Chapter 15.1 on page 183) or with a service partner authorized by LAR.

**Notice**

As our research and development progresses, we encourage you to stay in touch with your **LAR** contact to stay up-to-date with any additions.

5.8 Completing the Furnace

Install the furnace system as shown in Fig. 40, page 68 and Fig. 41, page 69.

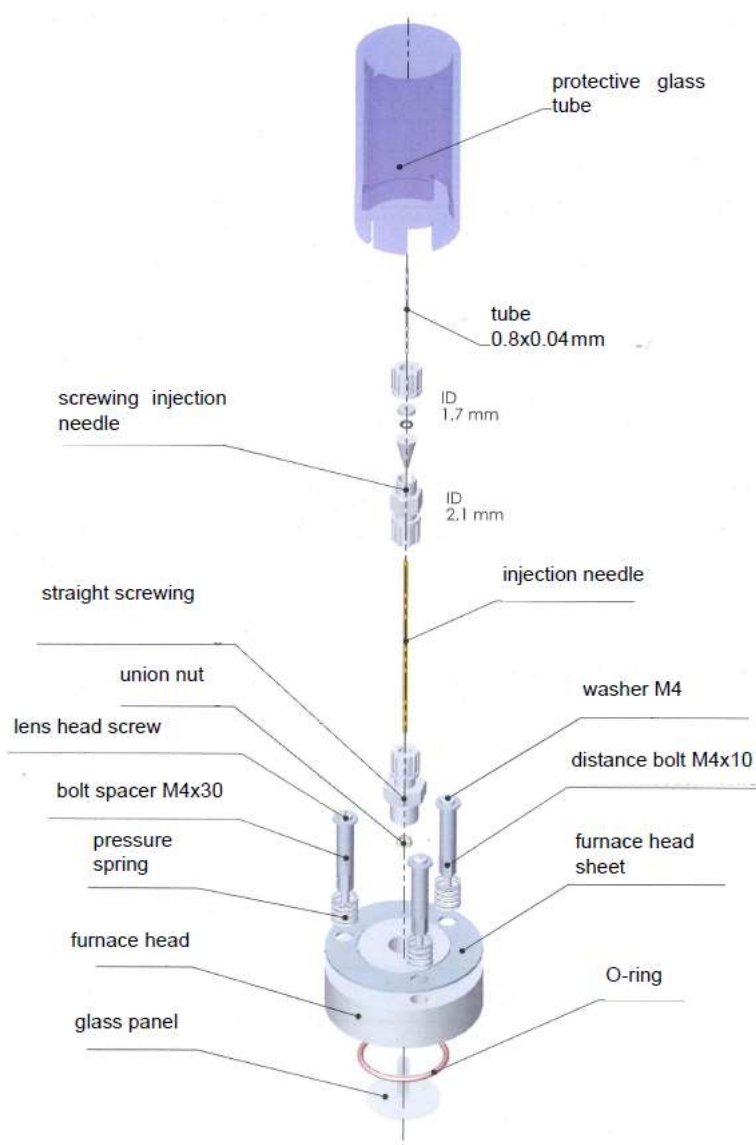


Fig. 40: Assembly of the reactor head

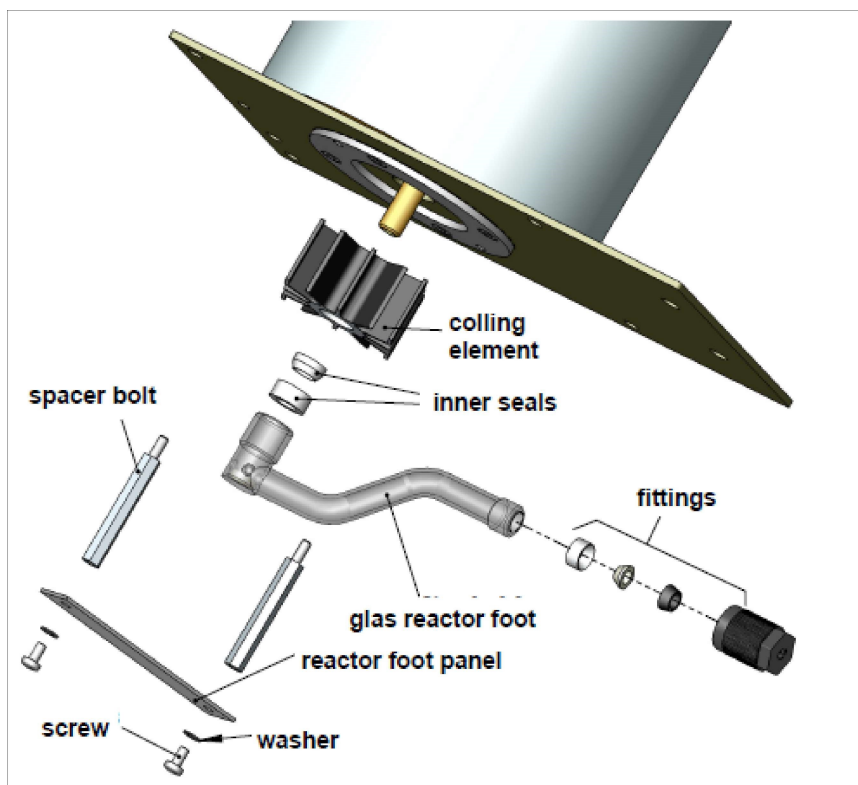


Fig. 41: Assembly of the reactor foot



Notice

Mount the reactor foot when the furnace has reached a temperature of approx. 800° C. The high temperature simplifies the assembly of the reactor bottom.

5.9 Installation of the Pump Tubes

5.9.1 Installation of the Tubes into the Tube Cassette Pump

In order to pump the solutions, the tubes must be placed into the tube cassette pump correctly.

Proceed as follows:

1. Use the overview to localise all tube cassette pumps (Tab. 2, page 13).
2. Place the tube into the cassette between two of the coloured stoppers with the marking facing upwards.
3. Apply silicone oil to the tube.
4. Place the cassette onto the pulley head of the pump until a click is heard.
5. Proceed in the same way with other cassettes on the tube cassette pump and other tube cassette pumps..

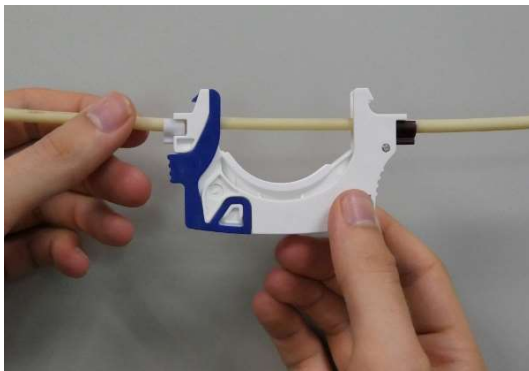


Fig. 42: Insert tube (Example)



Fig. 43: Cassette with Fixing Flap (Example)



Fig. 44: Mounting the Tube Cassette (Example)



Fig. 45: Schlauchkassette auf Pumpe (Example)



Notice

Hoses with three color code stoppers can be used longer by pushing them forward. The service life of a hose is thereby doubled.

To ensure long life and good performance of the pump tubing, use only original **LAR** pump tubing.

5.9.2 Installation of the Tubes into the Sample Pump

In order to pump the samples, the tubes must be placed correctly into the sample pump.

Proceed as follows:

1. Locate all sample pumps by using Tab. 2, page 24.
2. Open the upper lid (1) of the sample pump.
3. Place the tube (2) close to the roller (3).
4. Pay attention not to twist the tube (2).
5. Pull the tube (2) down on both sides to make sure that the tube (2) is in both sides of the guide (4).
6. Select the value according to the diameter of the used tubing (2) by means of the adjustment wheels (5). The value can be either 3,2 mm or 4,8 mm.
7. Close the upper lid (1) of the sample pump.
8. Proceed analogously with the other pump tubings and sample pumps.

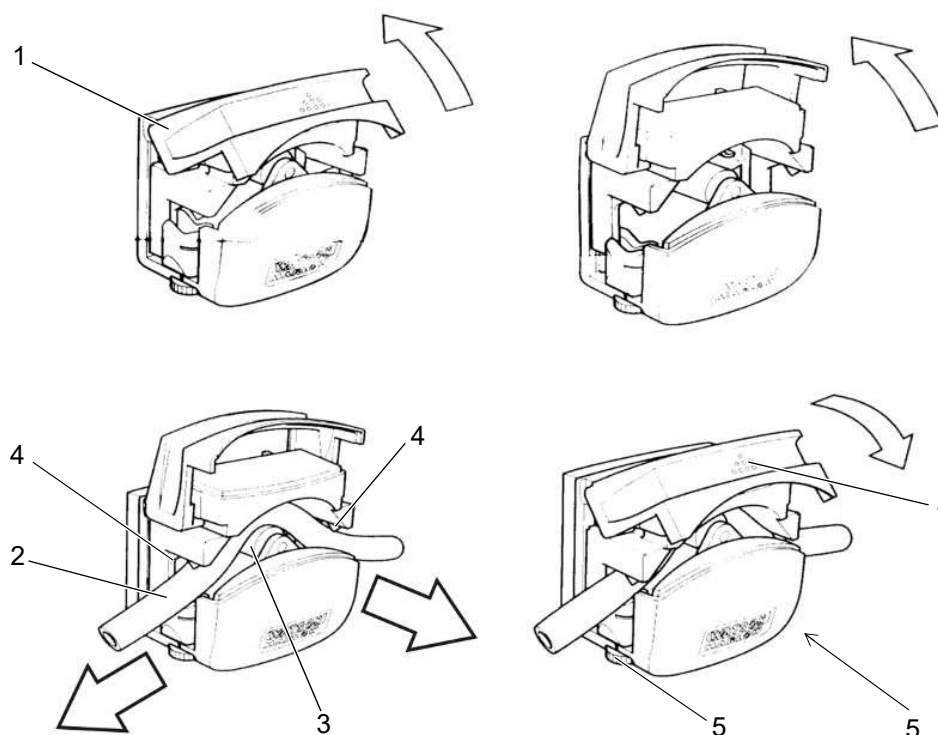


Fig. 46: Installation of the Tubes into the Sample Pump

5.10 Analyser Tubing

Inside the analyser, samples, reagents and the carrier gas are transported from one component to the next. Different tubes are used for this, which must be connected properly to the components.



Notice

For tubing of your analyser, follow the flow diagram for your configuration (Chapter 12 from page 217).

Ensure for tubing that

- tubes are in perfect condition (e.g. no kinks)
- routing diagram is observed depending on configuration
- tubes are hand-screwed onto the screwed joints
- drain is depressurised

5.11 Connecting the Control Unit

Connect the F840 control unit according to the following connection diagram.

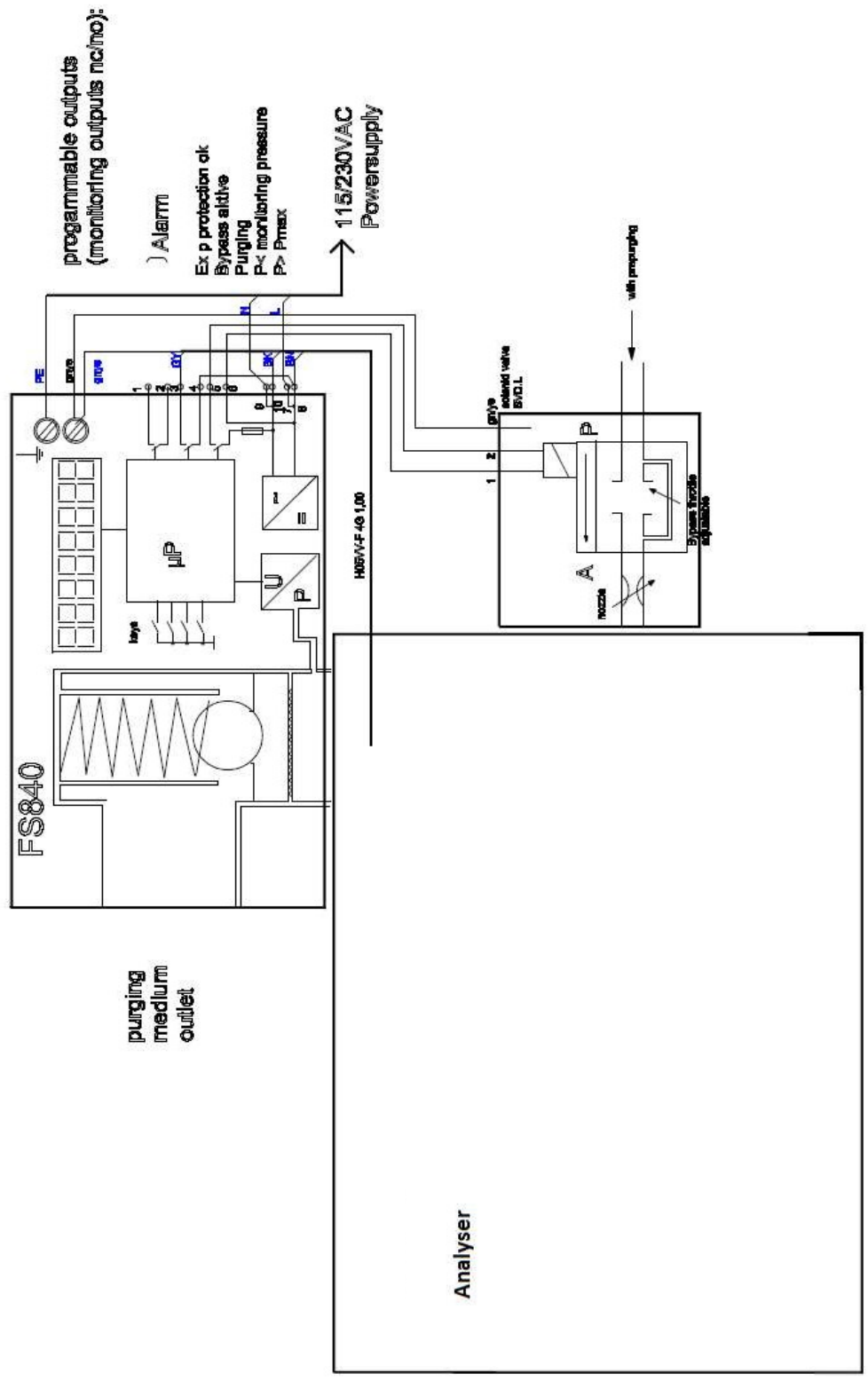


Fig. 47: Electric connection for the control unit

5.12 Connecting the Furnace Emergency Cooling

Connect the furnace emergency cooling.

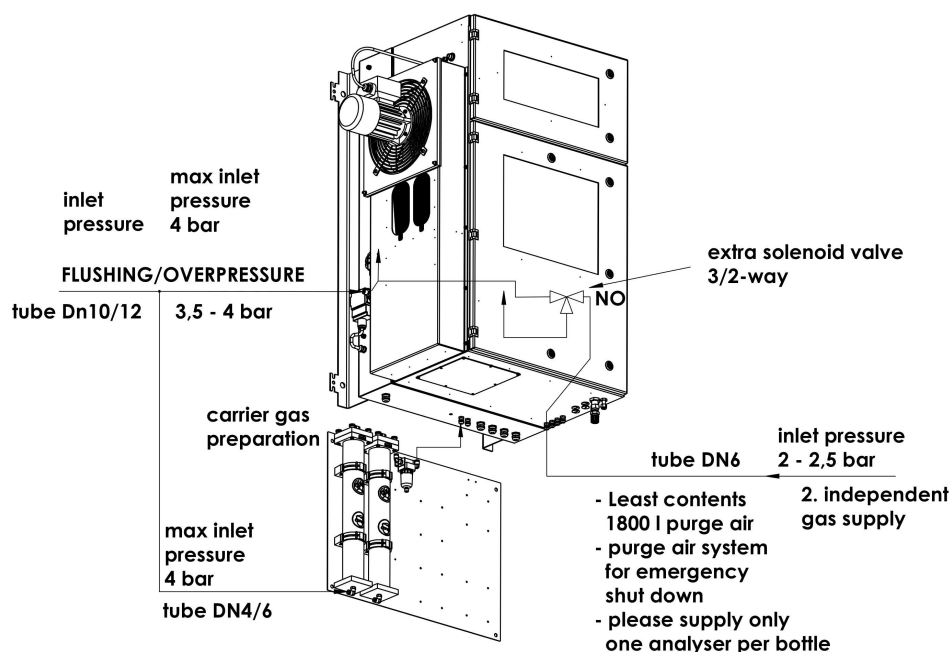


Fig. 48: Connection of the furnace emergency cooling

5.13 Switch on the Analyser

The analyser is switched on for the first time by Technical Support of LAR or by a person authorised by LAR.

Preconditions:

- Completion of installations (Chapter 4 from page 29)
- Removal of transport locks (Chapter 5.4 from page 63)
- Switch-on of internal fuses (Chapter 5.6 on page 65)
- Filling and installation of the reactor pipe (Chapter 5.7 from page 65)



Warning

Warning of warranty void

The warranty of the analyser may be void if the analyser has been improperly installed prior to initial use!

Turn on the analyser after proper installation by a person authorized by **LAR**.



Notice

Fault message "E1820 - Furnace temperature not reached" is shown when the system is switched on. This message disappears once the furnace has reached the required temperature. It does not need to be confirmed in the log book.

1. Before the measuring mode is started, the control unit produces the pressurized enclosure.
2. Close the analyser (if it previously was open).

3. The control unit produces an overpressure of 7 to 10 mbar in the analyser for 10 to 15 minutes to check the tightness of the pressurized enclosure.
4. After successful verification of the tightness, the overpressure in the analyser is reduced to 2 to 3 mbar.

5.14 Setting the Bypass for the Control Unit



Warning

Adjustment of the bypass

The bypass may only be activated if there is no explosive atmosphere in and around the Ex-p system.

The operator must have an ex-protection authorization.



Warning

Never close the air outlet of the pressurized enclosure system.

To perform maintenance or repair work, set a bypass for the controller. The analyser can only be opened when the bypass is set. The bypass can only be adjusted if you are sure that no explosive atmosphere prevails in the housing. For this a fire protection certificate must be available.

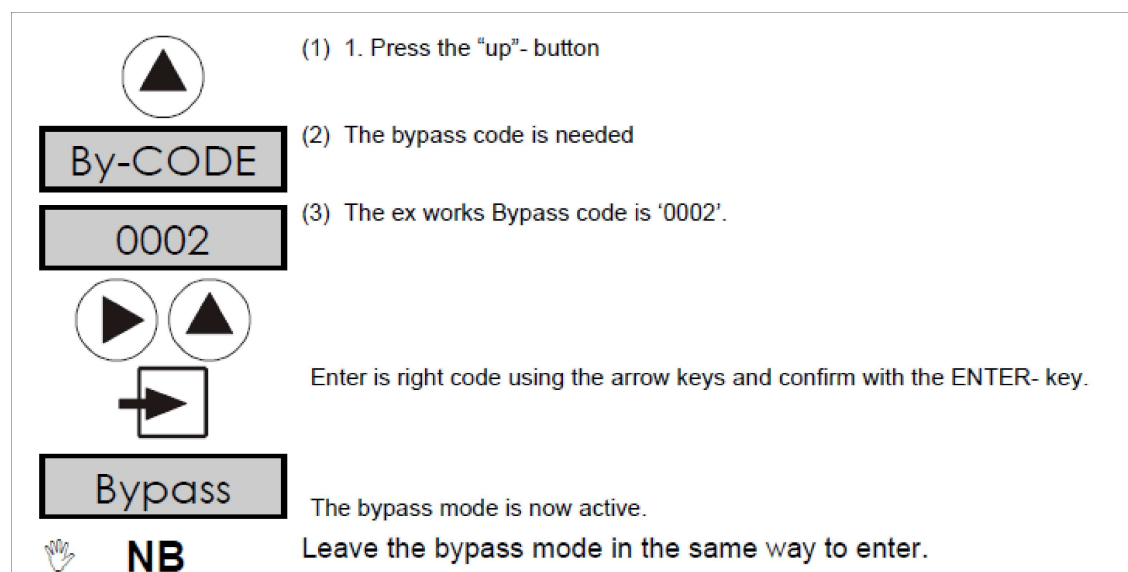


Fig. 49: Activate and deactivate bypass

1. Remove the four cover screws and take the cover off.
2. Follow the instructions in Fig. 49, page 75
3. Put the cover back into place and tighten the cover screws.

5.15 Rinse the Injection System und Sample Tubes



Notice

Before the first measurement, the injection system and sample tubes must be rinsed.

Proceed as follows:

1. Switch to the “Service Action” display (Chapter 7.2.11 from page 86).
2. Rinse the injection system using the “Rinse injection system” function.
3. Rinse the sample tubes using the “Rinse sample tubes” function.

5.16 Costumisation of Application-Specific Settings

Application-specific hardware and parameter changes can be set.

Change the following settings:

- Measurement Parameters (Chapter 7.2.2 from page 68)
- Measurement Channels (Chapter 7.2.7 on page 82)
- Relays (Chapter 7.2.5 from page 79)
- Analog Outputs (Chapter 7.2.19 on page 104)

5.17 Checking Status Parameters

The status parameters on the Status screen must be checked to ensure perfect operation of the analyser. Use for the check the start-up log (Tab. 6, page 61), in which all relevant status parameters are recorded with associated status information permitted. The status parameters are on the “Status screen” display (Chapter 7.2.10 from page 85).



Notice

If a status parameter differs from the status, contact the **LAR** Technical Support (Chapter 15.1 on page 267).

5.18 Perform a Calibration

Before the measurements can be started, the analyser must undergo application-specific calibration. A 2-point or multi-point calibration can be used here (Chapter 7.2.3 from page 71).



Notice

The calibration standards provided by the user are a prerequisite for calibration (Chapter 6.2 from page 84).

5.19 Operation with Trackball

See Chapter 9.3 on page 158.

5.20 Start Measuring Mode

1. Before the measuring mode is started, the control unit produces the pressurized enclosure.
2. Close the analyser.
3. The control unit produces an overpressure of 7 to 10 mbar in the analyser for 10 to 15 minutes to check the tightness of the pressurized enclosure.
4. After successful verification of the tightness, the overpressure in the analyser is reduced to 2 to 3 mbar.



Notice

If any questions should arise during start-up, contact **LAR Technical Support** (Chapter 15.1 on page 183).

6 Reagents and Calibration Standards

Deionised water, rinsing water, calibration standards (and possibly acid solutions) are required for the analyser measurement mode. This section shows how you can prepare the calibration standards and solutions yourself.



Warning

Harmful Chemicals

Observe the safety rules for the preparation of chemical solutions.

Follow the instructions for setting up the solutions.

6.1 Reagents



Notice

You can prepare the necessary stock solutions yourself or order them from LAR. When ordering solutions, please bear in mind the supplier specifications for shelf life and storage conditions.

6.1.1 Deionised Water for Calibration Standards

Deionised Water is required to make the calibration standards. It should contain a low fraction of carbon and nitrogen compounds. The purity of the deionised water is dependent on the working range set.

Table 7: Purity Grades of the Deionised Water for TOC Measurement

Working Range [mg/l C]	Maximum Permitted C-Concentration [mg/l C]
< 2	0.1
< 10	0.3
10 – 100	0.5
> 100	1.0

Tabelle 8: Purity Grades of the Deionised Water for COD Measurement

Working Range [mg/l COD]	Maximum Permitted C-Concentration [mg/l COD]
< 25	1,0
25 - 250	2,0
> 250	3,0

6.1.2 Rinsing Water

Deionised water is required to rinse the injection needle. The amount is dependent on the measurement frequency set and the number of sample streams. The conductivity of the deionised water must be between 1µS/cm and 10µS/cm, and the maximum permitted concentration for TC may not exceed 1 mg/l.

Proceed as follows:

1. Fill a 5 l graduated flask with 5 litres of deionised water.
2. Add 1 ml of 85% phosphoric acid (H_3PO_4).
3. Degas the rinsing water using underpressure or put it into an ultrasonic bath for five minutes.
4. Keep the rinsing water underneath the analyser (e.g. in the Reagent Cabinet or Ambient Air Preparation Unit).

6.1.3 Phosphoric Acid (H_3PO_4) for TOC-Difference Method

1% phosphoric acid (H_3PO_4) is used for the outgassing or elimination of inorganic carbon compounds (TIC), such as carbonate. The low pH value converts the ligated CO_2 (e.g. carbonate) into gas phase, which is then gassed out of the liquid and can be determined.

Proceed as follows:

1. Fill a 5 l graduated flask with 4 litres of deionised water.
2. Add 58 ml of an 85% phosphoric acid (H_3PO_4).
3. Fill the graduated flask up to 5 l with deionised water.
4. Add 1 g of copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) to the solution to prevent bacteria forming.
5. Keep the phosphoric acid solution underneath the analyser (e.g. in the Reagent Cabinet or Ambient Air Preparation Unit).



Notice

Biological deposits can form in the stripping vessel for strongly biological samples. A sulphuric acid (H_2SO_4) should be used here instead of the phosphoric acid (H_3PO_4) for determination of the TIC.

Please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 245) before using another acid.

6.1.4 Hydrochloric Acid (HCl) for TOC-Direct Method (NPOC-Method)

1% hydrochloric acid (HCl) is used for the outgassing or elimination of inorganic carbon compounds (TIC), such as carbonate. The low pH value converts the ligated CO_2 (e.g. carbonate) into gas phase, which is then gassed out of the liquid and can be determined.

Proceed as follows:

1. Fill a 5 l graduated flask with 4 litres of deionised water.
2. Add 200 ml of a 25% hydrochloric acid (HCl).
3. Fill the graduated flask up to 5 l with deionised water.
4. Keep the hydrochloric acid solution underneath the analyser (e.g. in the Reagent Cabinet or Ambient Air Preparation Unit).



Notice

Hydrochloric acid concentrations between 3 and 5% can also be used depending on the application.

Please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 245) before using another concentration.

6.1.5 Other Chemicals

If ambient air is cleaned with LAR equipment as a carrier gas, the following chemicals are required:

- Activated carbon (1) (instrument air / zero air generator supply only)
- Highly volatile organic compounds (such as solvents) in the ambient air may adversely affect the accuracy of the measurement, depending on the installation site. All volatile carbons (VOCs) must be removed from the ambient air. Activated carbon is used for this task.
- Soda lime pellets (2)
- The CO₂ in the ambient air is removed by pellets.



Danger

Danger of chemical burns

The soda cookies are corrosive.

Use gloves, goggles and dust mask.

When handling the soda lime cookies, follow the safety guidelines for handling corrosive chemicals.

Saturation of the chemicals

When the chemicals are saturated with volatile carbon (VOC), the analyser's base signal rises. The signal value depends on the detector connected to the analyser.

If the activated carbon has changed color, the activated carbon must be replaced. See chapter 9.3.5.1 from page 169 onwards

If the soda lime cookies have changed color, the soda lime cookies must be replaced. See chapter 9.3.5.1 from page 169 onwards.

Production of calibration standards (CODO method)

The concentration of the standard depends on the set measuring range. It should be at least 50% and max. 100% of the full scale value. The standard is set according to DIN EN 1484: 1997.

Example:

If a measuring range of up to 1,000 mg / l COD is set, the calibration standard must be between 500 mg / l and 1,000 mg / l COD.

Ideal concentration: 750 mg / l or 800 mg / l COD.

6.1.6 Calibration Standards - TOC-Difference Method

This section explains how you can prepare the calibration standards for the TOC-Difference Method.

First, a stock solution needs to be prepared which can then be diluted to obtain the required calibration standard concentration.



Notice

To minimise mistakes, LAR always recommends using the stock solution as the initial solution for dilutions.

The stock solution and its dilutions can be used as a calibration standard.

6.1.6.1 Stock Solution - TOC-Difference Method

This section shows how to prepare a stock solution for TOC-Difference Method analogous to DIN EN 1484:1987.

Chemicals required:

- 6.382 g Potassium hydrogen phthalate ($\text{C}_8\text{H}_5\text{KO}_4$) p.a. dried for 2 hours at 105°C
- 4.415 g Sodium carbonate (Na_2CO_3) dried for 1 hour at 185°C
- 3.500 g Sodium hydrogen carbonate (NaHCO_3) dried for at least 24 hours in the exsiccator with silica gel

Proceed as follows:

1. Dissolve the weighted sample of each of the three substances in a 1,000 ml graduated flask in 700 ml of deionised water.
2. Fill the 1,000 ml graduated flask up to the mark with deionised water.

The concentration of this stock solution is:

- TC (Total Carbon) = 4,000 mg/l C
- TIC (Total Inorganic Carbon) = 1,000 mg/l C
- TOC (Total Organic Carbon) = 3,000 mg/l C



Warning

The stock solution can be kept in a sealed glass bottle for about four weeks at a temperature of 4°C . Please note that the pipetting accuracy can be negatively impacted when the stock solution is diluted.

6.1.6.2 Dilution of the Stock Solution - TOC-Difference Method

Because the analysers work in different working ranges, the following three stock solution dilutions are listed. These dilutions enable calibration standards to be made which have a lower concentration than listed in the table below.

Proceed as follows:

1. Take a 500 ml/2,000 ml graduated flask.
2. Fill the dilution amount specified in the table into the graduated flask.
3. Fill the graduated flask with deionised water up to the 500 ml/2,000 ml mark.

Table 9: Dilution of the Stock Solution (TOC-Difference Method)

	Amount Stock Solution : Deionised Water	Stock Solution to Deionised Water	TC [mg/l C]	TIC [mg/l C]
Dilution I	1 : 10	50 ml to 500 ml	400	100
Dilution II	1 : 40	12.5 ml to 500 ml	100	25
Dilution III	1 : 800	2.5 ml to 2,000 ml	5	1.25

The calibration standard can be diluted further after the stock solution is diluted:

1. Take a 100 ml graduated flask.
2. Fill the dilution amount specified in the table into the graduated flask.
3. Fill the graduated flask with deionised water up to the 100 ml mark.

Table 10: Dilution of the Calibration Standards (TOC-Difference Method)

TC [mg/l C]	TIC [mg/l C]	Dilution	Amount Dilution
360	90	I	90 ml
300	75	I	75 ml
280	70	I	70 ml
200	50	I	50 ml
120	30	I	30 ml
50	12.5	II	50 ml
40	10	II	40 ml
20	5	II	20 ml
10	2.5	II	10 ml
2	0.5	III	40 ml
1	0.25	III	20 ml
0.5	0.125	III	10 ml
0.2	0.05	III	4 ml
0.1	0.025	III	2 ml



Notice

The calibration standards can be kept in a sealed glass bottle for about one week at a temperature of 4°C.

6.1.7 Calibration Standards - TOC-Direct Method / TOnly Method

This section explains how you can prepare the calibration standards for the TOC-Direct Method and TOnly Method yourself.

First, a stock solution needs to be prepared which can then be diluted to arrive at the calibration standard concentration required.



Notice

To minimise mistakes, LAR always recommends using the stock solution as the initial solution for dilutions.

The stock solution can be used as a calibration standard.

The stock solution dilutions can be used as a calibration standard.

6.1.7.1 Stock Solution - TOC-Direct Method / TOnly Method

This section shows how to prepare a stock solution for TOC-Direct Method and TOnly Method analogous to DIN EN 1484:1987.

Chemicals required:

- 2.125 g Potassium hydrogen phthalate ($\text{C}_8\text{H}_5\text{KO}_4$) p.a. dried for 2 hours at 105°C

Proceed as follows:

1. Dissolve the weighted sample of each of the three substances in a 1,000 ml graduated flask in 700 ml of deionised water.
2. Fill the 1,000 ml graduated flask up to the mark with deionised water.

The concentration of this stock solution is:

- TOC (Total Organic Carbon) = 1,000 mg/l C



Warning

The stock solution can be kept in a sealed glass bottle for about four weeks at a temperature of 4°C.

Please note that the pipetting accuracy can be negatively impacted when the stock solution is diluted.

6.1.7.2 Dilution of the Stock Solution - TOC-Direct Method / TOnly Method

Because the analysers work in different working ranges, the following four stock solution dilutions are listed. These dilutions enable calibration standards to be made which have a lower concentration than listed in the table below.

Proceed as follows:

1. Take a 500 ml/1,000 ml graduated flask.
2. Fill the dilution amount specified in the table into the graduated flask.
3. Fill the graduated flask with deionised water up to the 500 ml/1,000 ml mark.

Table 11: Dilution of the Stock Solution (TOC-Direct Method and TOnly Method)

	Amount Stock Solution : Dionised Water	Stock Solution to Deionised Water	TOC [mg/l C] Amount
Dilution I	1 : 2	250ml to 500ml	500
Dilution II	1 : 10	50ml to 500ml	100
Dilution III	1 : 20	25ml to 500ml	50
Dilution IV	1 : 1,000	1ml to 1,000ml	1

The calibration standard can be diluted further after the stock solution is diluted:

1. Take a 100 ml graduated flask.
1. Fill the dilution amount specified in the table into the graduated flask.
1. Fill the graduated flask with deionised water up to the 100 ml mark.

Table 12: Dilution of the Calibration Standards (TOC-Direct Method and TOnly Method)

TOC [mg/l C]	Dilution	Amount Dilution
375	I	75 ml
250	I	50 ml
125	I	25 ml
50	II	50 ml
40	II	40 ml
20	II	20 ml
10	II	10 ml
5	II	5 ml
25	III	50 ml
5	III	10 ml
2.5	III	5 ml
0.5	III	1 ml



Notice

The calibration standards can be kept in a sealed glass bottle for about one week at a temperature of 4°C.

7 How to Work With the Analyser

Once all installation and commissioning points have been met, the main switch (1) on the left side of the analyser can be operated by an authorized LAR technician to "ON".

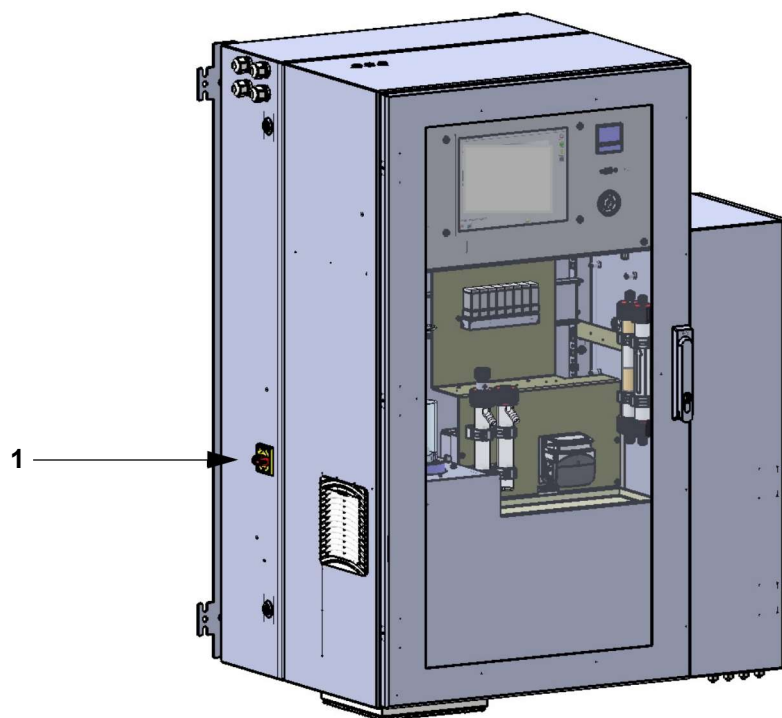


Fig. 50: Main switch

After a self-test of the device, the login screen is displayed.

Enter your login details here to log in. To get to user level I for the first time, press the button at the bottom right (1) without entering the password.

By default, the default password is 'lar'. Leave the input field "Operator Log" empty, to reach the Level II

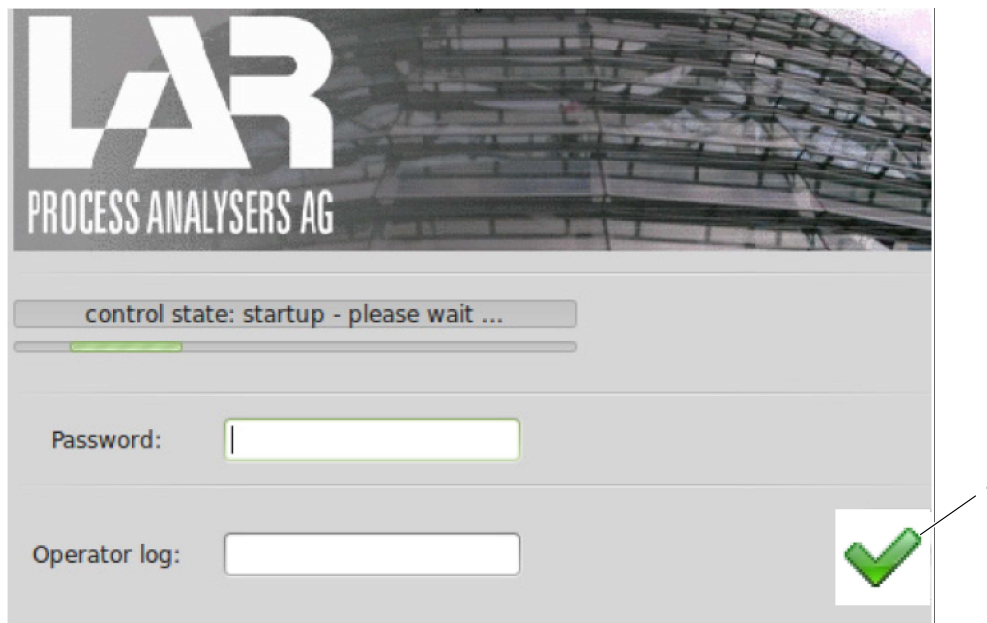


Fig. 51: Login

The opening screen with device number and software version is displayed.

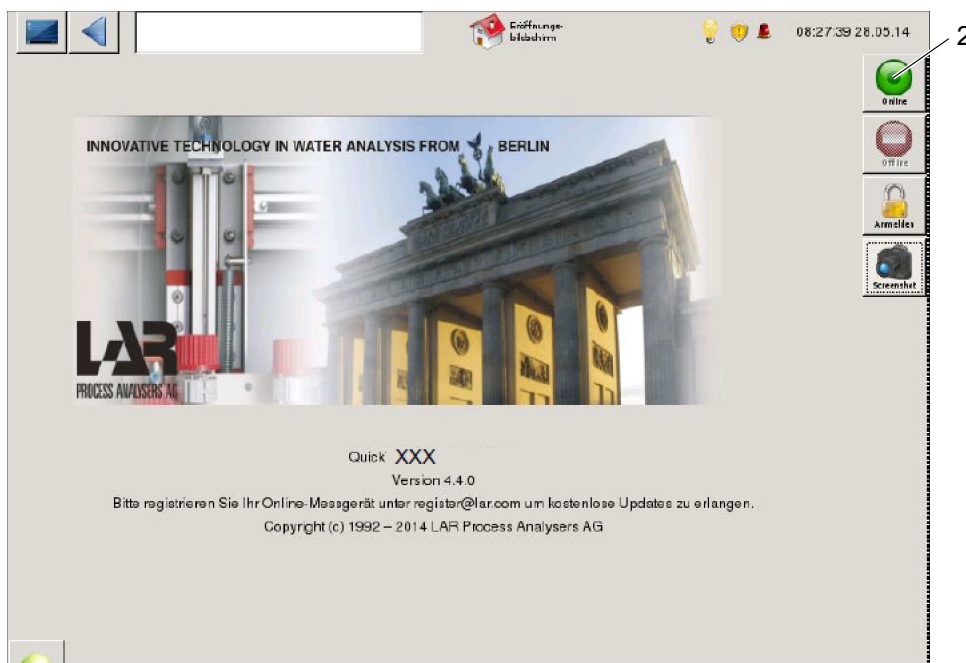


Fig. 52: Opening screen

When the analyser is first switched on, the device starts in offline mode. After switching off or after a power failure, the device starts and automatically and enters the last active mode (online or stand-by).



Notice

The analyser can only start a measurement when the furnace has reached the working temperature.

7.1 General

The QuickTOC[®] purity is equipped with a touchscreen. Use your fingers or a stylus to operate the touchscreen



Warning

Damage to the touchscreen

The touch screen can be damaged if it is operated with sharp objects. Operating errors and illegibility can be the result.

Use only your fingers or stylus to operate the touchscreen.

7.1.1 User Levels

The operating program has three user levels. The user levels control the access rights to the software. The current user level is displayed at the top left of the status bar.

Classification of user levels and access permissions:

- **User level 1**

The user can view data (such as readings) but can not change anything in the system.

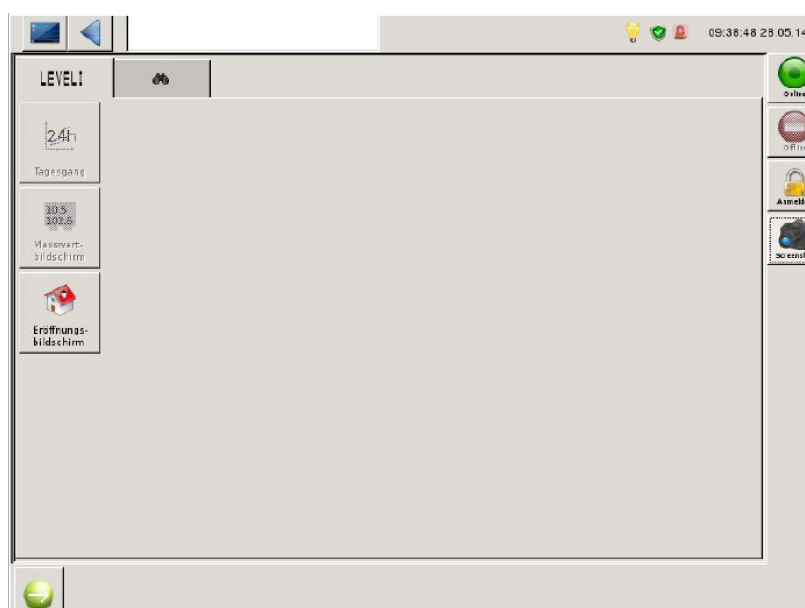


Fig. 53: Opening screen user level 1

• User level 2

The user can view data (such as readings) and use functions described in this chapter. For user level 2 an access authorization with password can be set up (Chapter 7.3.1 on page 120).

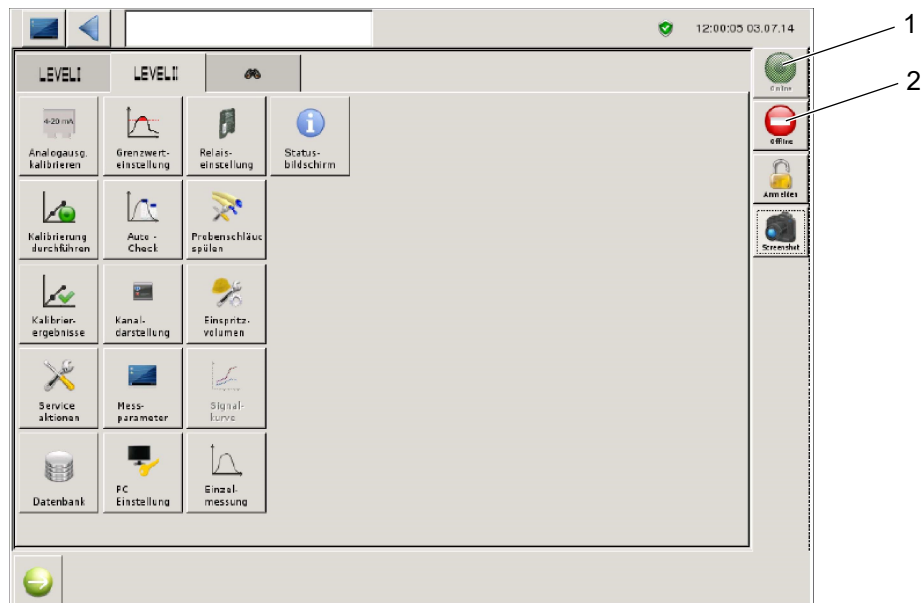


Fig. 54: Opening screen user level 2



Notice

In order to use the functions of user level 3 (expert level), you must first undergo training with LAR. If you are interested in this training, contact LAR Technical Support (Chapter 15.1 on page 183).

User level 3 (expert level) can only be activated via an authorized USB stick from LAR.

After pressing the green "Online" button (1), the analyser goes into RUN mode. To cancel a running measurement or another action, press the red "Offline" button (2).

• User level 3

In user level 3 advanced settings can be made. The advanced settings are described in Chapter 7.3.10 on page 122

7.2 Configuration

7.2.1 Setting the Working Parameters

In user level II, the measurement parameters, calibration, relay settings, operator password, date / time, name and units as well as the channels are set up. To set up the specific requirements, the following steps are necessary. Check the set parameters before starting the measurement.

- Setting up the measuring parameters (Fig. 7.2.2, page 91)
- Definition of the measured value screen (Fig. 7.2.1, page 90)
- Setting the limit values (Fig. 7.2.15, page 112)



Notice

Some values are set up by LAR Technical Support or a LAR-authorized technician. All values depend on the application and must be adapted to it. To change the values of the operating parameters, please contact LAR Technical Support

7.2.2 Setting the Measurement Parameters

The measuring parameters are set up in user level 2. As soon as all measuring parameters have been set up, the measurement can be started by clicking the "Online" button.

The measured values are displayed on:

- Measurement screen at level 1 (user level 1)
- Status screen (user level 2)
- Database (user level 2, display "Measurement Parameters")



Notice

The unit in the signal screen or during calibration is indicated in FSR. FSR stands for "Full Scale Range". The values are between 0 and 1 FSR (corresponds to 0 to 20 or 4 to 20 mA).

The "Status screen" lists all detectors. LAR has predefined the correct detectors of the device according to the application. If the parameters need to be changed, contact the **LAR technical support** (Chapter 15.1 on page 183).

Parameter	Value	Unit
Messintervall	30 Minuten	
Füllzeit Probe	15	sec
Füllzeit Säure	8	sec
Entleerungszeit Probe	20	sec
Ausgasungszeit (NPOC)	180	sec
TIC Verzögerung	0	sec
TIC Verzögerung	50	sec
Vorbereitungszeit Injektionsschleife	5	sec
Füllzeit Injektionsschleife	2	sec
Wartezeit vor Injektion	6	sec
Injektionszeit	10	sec
Wiederholungen bei einer Messung	1	
Ausreißer bei einer Messung	0	
Maximaler CV bei einer Messung	2	%
Mittelung Werte	Aus	

Fig. 55: Setting the measurement parameters (Example)

Here, parameters for gas measurement (gas calibration / gas validation) and sample measurement for the respective sample stream can be set.

7.2.2.1 Measuring intervals of the sample streams 1 to 6

Here, the measurement intervals of the measurements per sample stream are selected. If a measurement takes more time than the selected interval, the instrument will automatically select the next higher interval. The following measurement intervals are available:

Possible measuring intervals

Possible settings	Description
1, 2, 3, 4, 5, 6, 10, 12, 15, 30 minutes	Measurement interval in minutes
1, 2, 4, 6, 8, 12, 24 hours	Measurement interval in hours
Fastest testing mode	Shortest measuring frequency
Remote	Deviation at the carrier gas outlet



Notice

Different parameters influence the maximum achievable measuring frequency. If an interval is selected that can not be performed, the unit automatically selects the fastest possible interval.

For further information please contact LAR Technical Support (Chapter 15.1 on page 183).

7.2.2.2 Filling time of the sample

This parameter determines the duration of the filling of the sample storage vessel before the measurement (pumping time). A minimum of 30 seconds must be allowed for filling hoses and sample vessels.

7.2.2.3 Filling time of the acid

This parameter determines the duration of the filling of the acid before the measurement (pumping time).

7.2.2.4 Emptying time sample

Here, the duration of emptying the sample storage vessel can be set. The emptying of the sample storage vessel requires at least 45 seconds.

7.2.2.5 Outgassing time (NPOC)

This parameter is only needed for the TOC direct method. The parameter determines the duration in seconds of stripping the sample in the sample receiver (TIC vessel) to blow out the TIC.

7.2.2.6 TC delay

This parameter determines the waiting time before a TC measurement (sampling).

7.2.2.7 TIC delay

This parameter determines the waiting time before a TIC measurement (sampling).

7.2.2.8 Preparation time of the injection loop

Here you can specify the duration in which the device aspirates part of the sample to guarantee the permanent filling of the tubes. The preparation time of the injection loop is at least 5 seconds.

7.2.2.9 Filling time of the injection loop

Here you can specify the duration in which the device fills the injection loop with sample.

7.2.2.10 Waiting time of the injection loop

Here you can specify how long the filled injection loop will wait for the sample to be injected into the oven. The waiting time is at least 5 seconds.

7.2.2.11 injection time

This option can be used to specify how many individual measurements are to be made per output measured value. The permissible values are between 1 and 10. The default value of this option is 1. Several individual measurements are averaged over a measured value.



Notice

If a user with Level 3 permission on the Measure Parameters screen in User Level 2 modifies the Percentage on Multiple Determination parameter (> 0), users with Level 2 permission can only see this parameter in gray. Further parameters "Repetition during a measurement", "Outliers during a measurement" and "Maximum CV during a measurement" are then only visible in gray and can not be changed (Chapter 13.2.1 from page 172).

7.2.2.12 Outliers in a measurement

Using the outlier correction, incorrect measurements can be taken out of the averaging of the individual values. Permissible values are 0 to 2 measured values. For the determination of the outlier, the measured value with the largest standard deviation is chosen as the mean value. If the standard deviation is within the tolerance range of the maximum CV, the measured value of the individual measurements is used for averaging. If this is above the maximum CV, the measured value is treated as an outlier and is ignored when calculating the mean value and the coefficient of variation (CV).

7.2.2.13 Maximum CV for a measurement

The maximum CV or coefficient of variation describes the repeatability or reproducibility of several consecutive individual readings taken on the same sample. The maximum CV or coefficient of variation is only effective in combination with the outlier correction. If the outlier correction is activated by entering the numbers 1 or 2, then the maximum CV is taken into account when determining the outlier. The default value is 0, i. there is no consideration. The maximum adjustable value is 10%.

$$CV = \frac{\text{Standard deviation}}{\text{Medium value}} \times 100$$

7.2.2.14 Averaging values

Here, the calculation of the average values can be activated. Upon activation, the number (1-5) of values from which the average is formed may be indicated

7.2.3 Setting Parameters for Gas Measurement

The following parameters can be set in user level 2 for a gas measurement (gas calibration / gas validation):

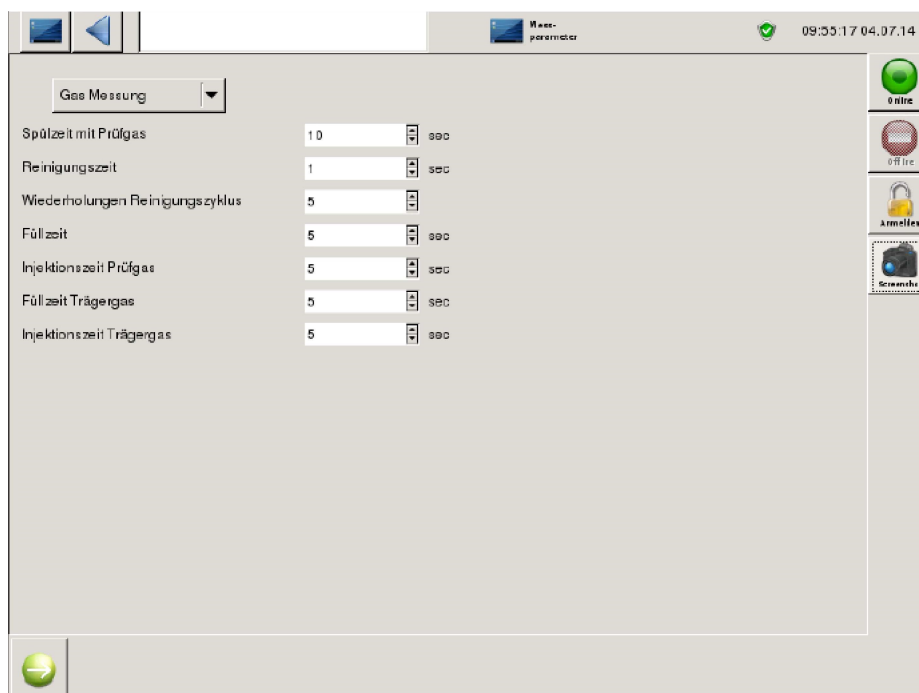


Fig. 56: "Measurement Parameters" screen, "Gas Measurement" selection (Example)

7.2.3.1 Purge time test gas

Fill the injection loop with test gas before the gas measurement begins. Minimum 5 seconds are needed.

7.2.3.2 Cleaning time

Duration of cleaning of the injection loop.

7.2.3.3 Repeat the cleaning cycle

The cleaning can be repeated up to 20 times depending on the setting. If the value is set to zero, no cleaning cycle is performed.

7.2.3.4 Filling

Duration of filling the injection loop with test gas during a gas measurement.

7.2.3.5 Injection time test gas

Here you can specify the time in which the device should inject the test gas from the injection loop into the oven.

7.2.3.6 Filling time carrier gas

Duration of filling the injection loop in a gas measurement with carrier gas and performing a zero-point measurement.

7.2.3.7 Injection time carrier gas

Here, the duration can be specified in which the device is to inject the carrier gas from the injection loop into the oven. A zero-point measurement is performed.

7.2.4 Calibration

In user level 2 you can start a manual calibration.

Two screens provide calibration information:

- Perform calibration
 - Carry out calibration
 - Display details of the calibration
 - Calibration graph
- Calibration results

A manual calibration should be performed if:

- the analyser is put into operation for the first time
- maintenance was done while the reactor filling was changed
- the reactor or the reactor filling were replaced
- the carrier gas flow was changed
- the injection volume was changed.

Before a calibration can be performed, the necessary calibration solution must be provided and the necessary settings made in the Run Calibration screen. The concentrations and the production of the calibration standards (Chapter 6 from page 79). Depending on the selected measuring method, a mixed standard or a single substance standard is used.

The Calibration Results screen displays the measurement results of the individual calibration points. (Chapter 7.2.4.2 from page 98).

The calibration can be stopped at any time by clicking the "Offline" button



Notice

In a manual calibration, the current carrier gas flow is stored as a setpoint. If the volume flow after calibration has deviated by more than 5% over time, the error message "E1835 Carrier gas flow is low" is displayed.

If this error message occurs, the tightness of the carrier gas flow must be re-established (possibly a leak - leak repair).

7.2.4.1 Perform Calibration



Notice

The analyser will display on the calibration screens as many sample streams as are enabled. Please repeat the steps given for each sample stream.

The calibration can be performed with both a water sample and test gas.

For gas calibration, the test gas must be connected. Test gas can be carbon dioxide and methane in appropriate concentrations. Unlike calibration with liquid samples, the injection loop for the measurements during gas calibration is filled with test gas and which is then injected into the furnace. When using methane, this is burned in the oven to carbon dioxide. The carbon dioxide is guided by means of carrier gas to the detector and determines the signal surface. The injection parameters for the gas calibration are set in the "Measurement parameters" screen under "Gas measurement".

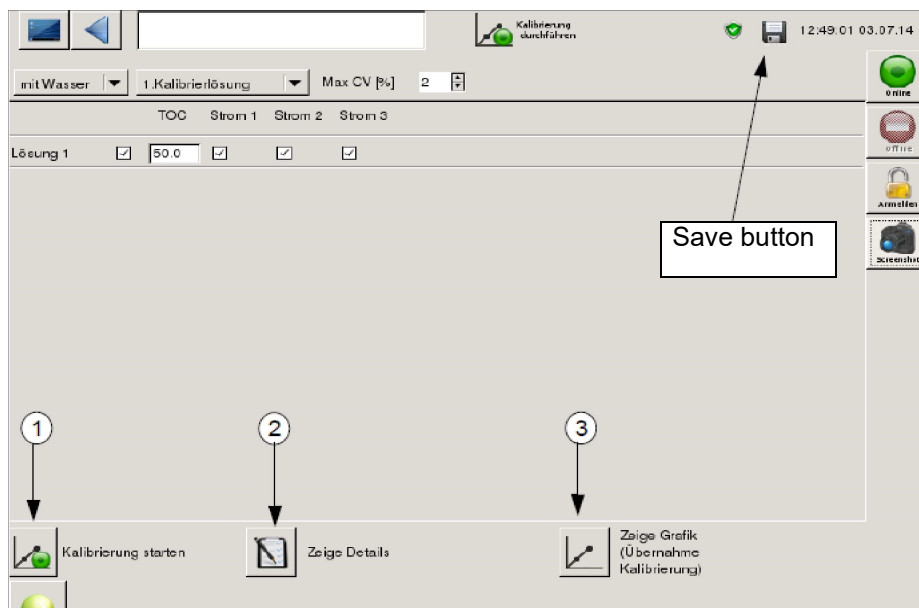


Fig. 57: Perform Calibration Screen (Example)

In this screen, a one-point calibration or a multi-point calibration for a stream can be performed. For a multi-point calibration, it must be noted that the calibration solutions can only be measured one after the other.

- **Show details (2)**

First, a calibration must be performed to enable this button. Click the button to see a more detailed view of the raw values of the solutions, currents, and signals. Outliers are automatically highlighted in yellow and are not included in the calculation.

- **Show graphic (3)**

First, a calibration must be performed to enable this button. To view the calibration graph (Fig. 57, page 103), the "Show graph" key must be pressed. The current (blue curve) and the new calibration graph (red curve) are shown in this graph. To go back to the start of calibration, press the "Back to Start Calibration" button.

- **Back to the start of calibration (1)**

This key returns you to the "Start Calibration" view. This button can only be clicked when it is in the "Show Details" or "Show Graph" view.

7.2.4.1.1 Perform a 1-point calibration for a sample stream

1. Preparation of the calibration solution and positioning of the calibration vessel.
2. In the selection box "Calibration solutions" the number of calibration solutions can be selected. After selecting the number of solution, this quantity will be displayed on the screen.
3. The maximum CV can be entered in% for the calibration.
4. Between solution and stream there are input fields for the concentration of the solution. Enter all ingredients of the solution in the table. To make an entry: Click in the input field. A number pad and keyboard will appear. Please enter the concentration (in ppm).
5. To accept the new calibration concentration, save it with the floppy disk symbol (Fig. 57, page 96).
6. Activate the check box for the sample stream and the solution.
7. Now the calibration can be started with the button "Start calibration".
8. Raw values can be viewed in the next screen using the Show Details button.
9. All check boxes in the "Show Details" screen are enabled for the performed solution and the sample stream. Outliers are detected by the software and highlighted in yellow. These outliers are not included in the calculation.
10. Thereafter, the new calibration graph can be viewed in the "Display Graph" screen with the

previous graph.

11. In the Calibration Results screen, the calibration results (slope and intercept) can be viewed and activated.

7.2.4.1.2 Perform a multipoint calibration (three solutions) for a sample stream

1. Preparation of the calibration solutions and positioning of the first calibration vessel.
2. In the selection box "Calibration solutions" the number of calibration solutions can be selected.
3. After selecting the number of solutions, this amount will be displayed on the screen. The maximum CV can be entered in% for the calibration.
4. Between solution and power there are input fields for the concentration of the solution. Enter all ingredients of the solutions in the table: Double-click in the input field. A number pad and keyboard will appear. Please enter the concentration (ppm).
5. To accept the new calibration concentration, save it with the floppy disk symbol (Fig. 57, page 96).
6. Select the check box for the sample stream and all solutions. Now the calibration can be started with the button "Start calibration".
7. After passing through the first solution (5 measurements), a message appears (Fig. 54, page 101). Here, the green arrow must be pressed when the next calibration solution has been placed to measure the next solution. This stop message will be displayed twice until all three solutions have been measured.
8. After passing through the three calibration solutions, the raw values can be viewed in the next screen with the "Show Details" button. All check boxes in the "Show Details" screen are enabled for the solutions and the power being performed. Outliers are detected by the software and marked in yellow. These outliers are not included in the calculation.
9. Afterwards, the new calibration graph can be viewed in the "Show graph" screen with the previous graph.
10. In the screen "Calibration results", the calibration results (slope and intercept) can be viewed (see chapter 7.2.4.1 from page 99) and activated.

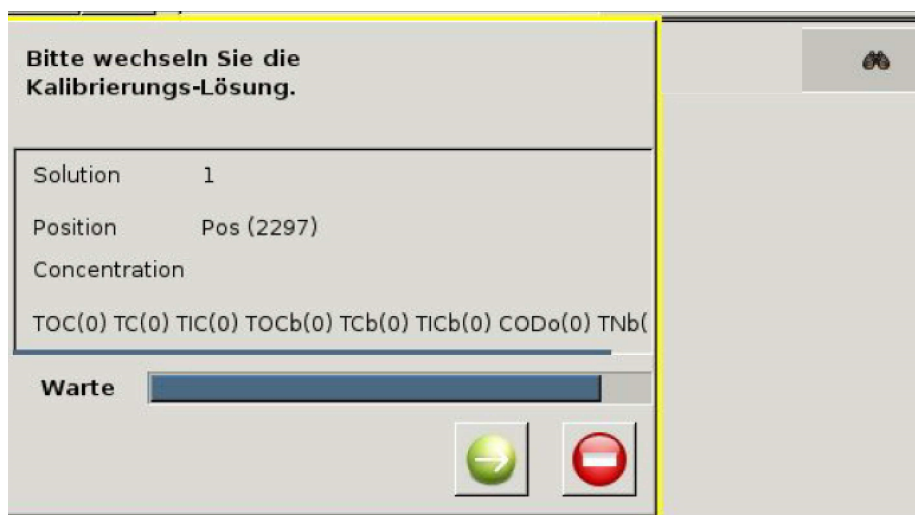


Fig. 58: Stop message for further calibration solutions (Example)

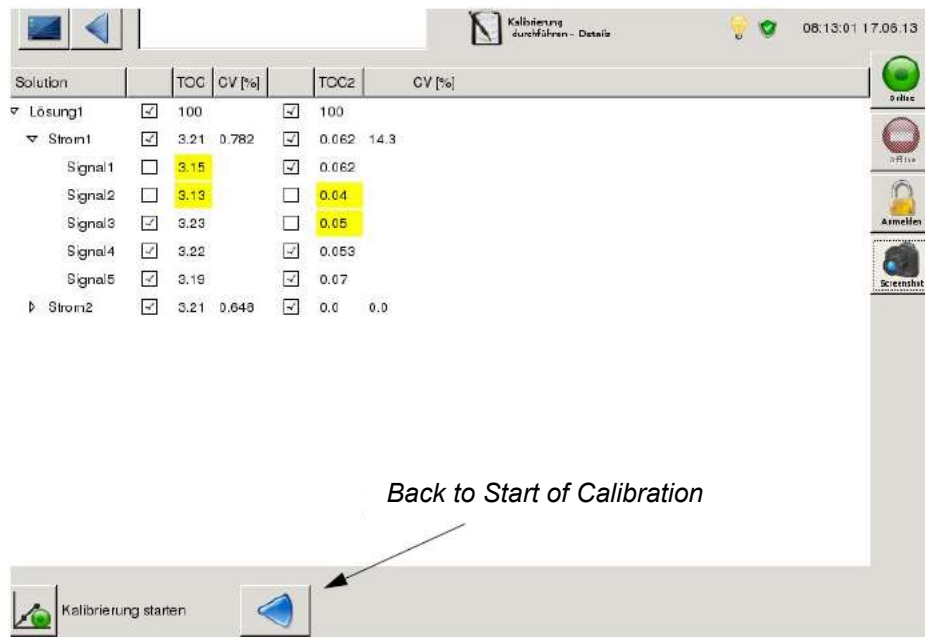


Fig. 59: Calibrate Screen - Show Details (Example)

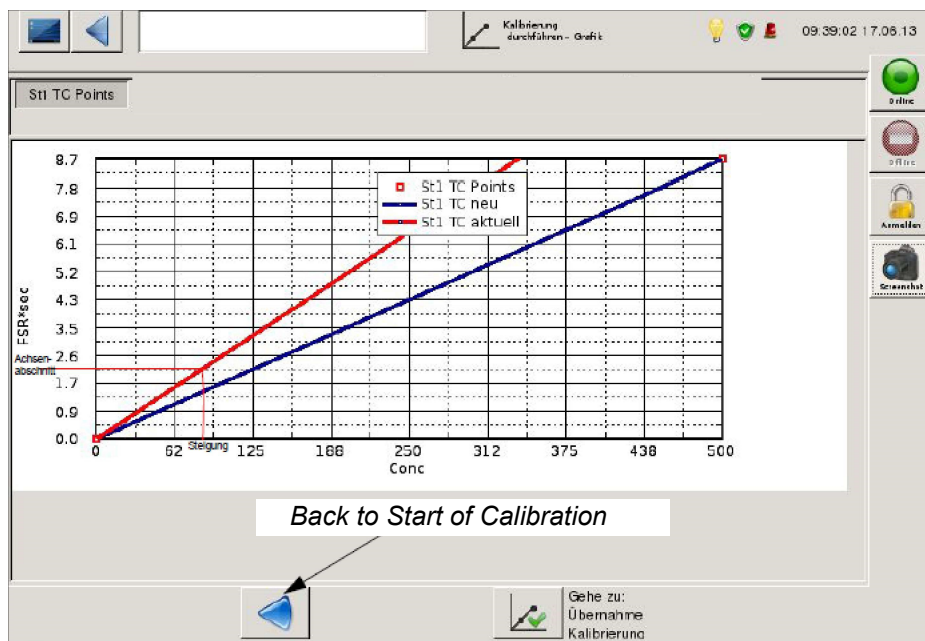


Fig. 60: Calibrate Screen - Calibration Graph (Example)

7.2.4.2 Calibration Results

After a successful calibration (Chapter 7.2.4.1 from page 95), the results are displayed on the "Calibration Results" screen (Fig. 61, page 99). To the right, the values of the previous calibration are displayed. Please activate the calibration via the button "Activate the calibration results". The result is saved. Furthermore, this screen displays the "carrier current setpoint".



Fig. 61: Screen with Calibration results

7.2.5 Injection Volume

In user level 2, the injection volumes injected into the furnace during the measurement can be determined:

- TC for each existing stream

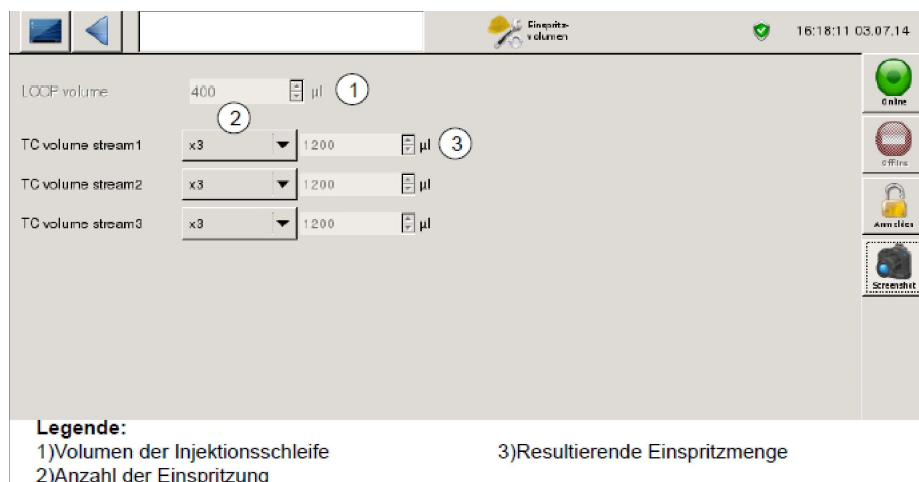


Fig. 62: Injection volume screen (three sample streams, example)

When changing the amount of injections for each stream (2) (especially for multiple injection), the injection amount (3) is increased or decreased.

7.2.5.1 Volume of the Injection Loop

Here you can view the volume of the injection loop.



Notice

For the measuring methods TOnly or TOC Difference, the injection volume should be at least 800 µl (1200 µl), otherwise condensate will be formed in the reactor bottom and CO₂ will be absorbed. This can lead to minor findings.

7.2.5.2 TC for each sample stream

Here you can determine how much liquid is injected into the furnace during a TC measurement. In the field next to it, the resulting injection volume is displayed.

7.2.6 Relay Settings

The analyser is equipped with eight relays. The function of the relays can be set individually by selecting the "Relay setting" screen.

Fig. 63: Relay settings screen (Example)



Notice

As a default value, relay 1 is assigned as a group error for important fault messages.

To enter the desired values in the input fields, use the keyboard and number field.

1. Click in the input field. The keyboard is displayed at the bottom of the screen. If this is not the case, press the keyboard button on the bottom right of the screen.
2. Please enter the appropriate "limits or errors".
3. Save your changes (Chapter 7.3.9 on page 121).

7.2.6.1 Programming Tools

- !-Operator

The ! Operator is used to invert a condition (! L1 means that the condition is met if the set limit no. 1 has NOT been exceeded).

- &-Operator

The & operator is used as a multi-condition AND connection (E1835 & E1810 & E2024 means that the analog output drops to 0 mA only if all three error messages occur simultaneously).

- | operator

The | operator is used as an OR connection multiple condition (E1810 | E1844 | E2024 means that the analog output falls to 0 mA when one of the error messages occurs).

Examples:

- Collective alarm: The corresponding relay is programmed as follows: E1810 | E1844 | E1835 If the relay is to act as a normally closed contact, then the following must be entered: ! (E1810 | E1844 | E1835 | E2024) ? Please observe the round brackets!
- Measurement finished: The corresponding relay is programmed as follows: ! M1. This means that the relay is closed when the activity "Measure channel" is finished. The contact remains closed until the next measurement begins.

7.2.6.2 Testing the Relays

Check the relays with a multimeter (to be carried out only by authorized personnel as the rear housing must be opened) or check the programming of the relays at the control center.

Check the relays with a multimeter (which can emit a sound):

1. Open the rear housing
2. Connect the multimeter to the relay (Fig. 26, page 41). First set the continuity test on the multimeter.
3. Activate the selection window for the multi-meter connection in the "Relay setting" view (Example the multimeter is connected in relay No. 2, so the relay 2 selection box in the "Relay setting" screen must be set to "ON")
4. A sound will sound (only if the multimeter can output a sound!)
5. If there is no sound, check the multi-meter. If the multi-meter is in order, please contact the technical support of LAR AG (*Chapter 15.1 on page 183*).
6. After checking the relays, close the housing again.

Check your programming of the relays in the control center:

1. If the relay is programmed and connected to the control center, this can be checked with the control center.
2. Confirm the corresponding relay with the selection box.
3. In the control center the error message is now displayed.
4. If no error message is displayed, it is usually due to a wiring error. Please contact the technical support of LAR AG (*Chapter 15.1 on page 183*).

7.2.7 PC Settings

There are the following settings options:

- Change password
- Change date / time
- View software version
- Calibrate the touch screen



Fig. 64: PC settings screen

Change password

For user level II, a password can be set up. If the password is deactivated, you need the USB key with the access permissions.

Factory default password: lar

To change the default password, proceed as follows:

1. Click in the input field to open the keyboard.
2. Enter a new password. Pay attention to uppercase and lowercase letters
3. Save by pressing the "Disk" button.

Set date/time

Date and time are displayed in all views in the upper right corner of the screen. To change to winter / summer time or to synchronize with other measuring devices, the current date and time can be reset in the "PC settings" view. Under the input field the input format is displayed.

Proceed as follows to set date/time:

1. Click in the input field to open the keyboard.
2. Enter the date and time in the format Year-Month-Day Hours: Minutes: Seconds.
Example: **2012-08-28 13:51:32**
3. Save by pressing the "Disk" button.
4. Start a new measurement.

Versions number

Version number, patch and compile date are displayed automatically

Calibrate Touchscreen

1. Calibrate the touchscreen if the display of the screen is too small or too large, e.g. if the touchscreen is not working properly.
2. Press the "Calibrate Touchscreen" button.
3. The calibration screen is displayed on the screen.
4. Press each calibration point by holding it for one second. Start with the calibration point at the bottom left.

5. After pressing all nine calibration points, the view returns to the PC Settings screen.

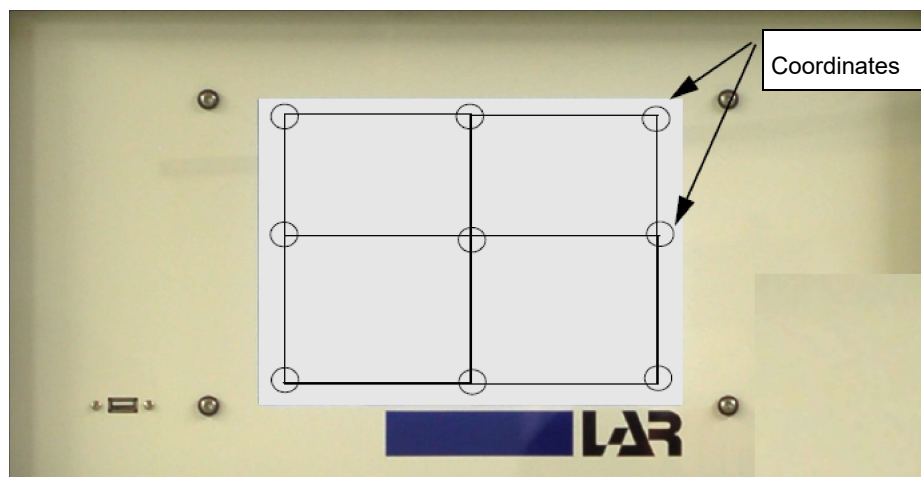


Fig. 65: Calibrate touchscreen

7.2.8 Channel Display

In the "Channel display" view, the measured value displays can be defined. A channel is defined by sample flow, sensor, function, parameters and channel parameters. These settings are factory-set and can be viewed in user level 3 under the "Names and Units" screen (Chapter 7.3.14 from page 131). The first 8 measured values (channel display) can be viewed in the measured value screen. The settings of the channel display are set with the requirements of the device. If the channel display has to be changed, the processing can be done by means of the corresponding selection boxes..

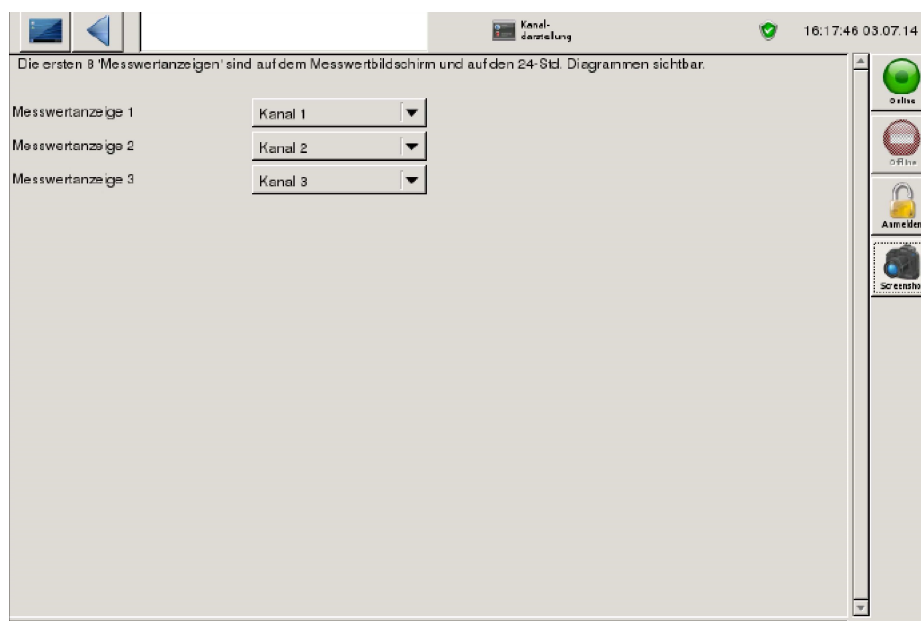


Fig. 66: Channel display (Example)

7.2.9 Measured Values Screen

The measured value screen displays the current measured values and the time they were measured. To change the settings, please contact LAR technical support (*Chapter 15.1 on page 183*).

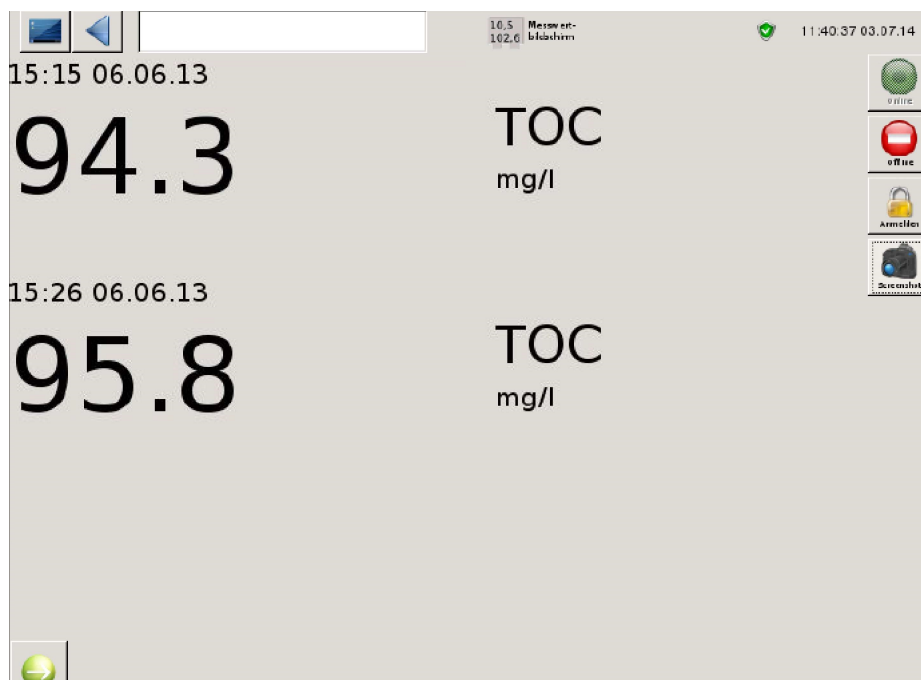


Fig. 67: Measured values screen (Example)

7.2.10 Signal Curve

To view the measurement curve, go to the "Signal Curve" view in Level II. If the analyser has more than one sensor, the detector can be selected on the upper left side of the screen.

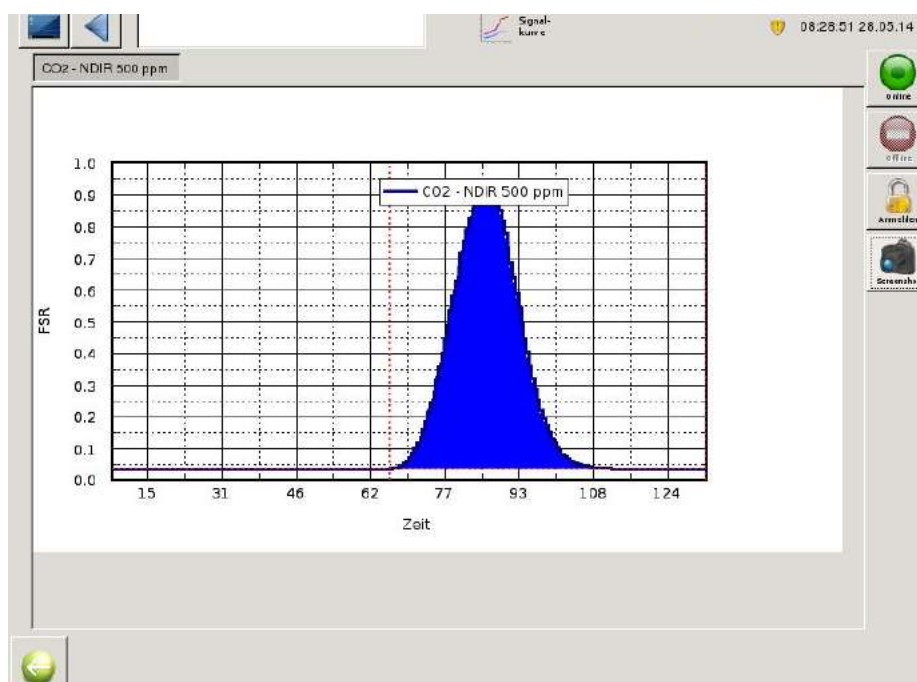


Fig. 68: Signal Curve (Example)

7.2.11 Status Screen

In this two-part screen, the right-hand window provides an overview of the current status of the device. In the left-hand window, the previous values can be viewed.

If further sample streams are installed in the analyser, the measured values of all existing sample streams can be displayed here.

To view the measured values of another sample stream, press the "Current" button. Next to these selection windows, the time of the next measurement is displayed for each sample stream. Column 1 shows the time [hh: min: sec] of the measurement. Column 2 shows the measured values. Other columns show more parameters (e.g., TNb, COD, etc.).

The following parameters are displayed in the top right-hand window:

- Oven status (on / off)
- Gas cooler status (on / off)
- Carrier gas flow input / output (actual / target)
- Humidity (actual / target)
- Gas pressure (actual / target)
- Status signals (error messages (errors), limit values (limit) and measuring status of the analyser (Controlstate))

The lower right screen shows the following values of the sensor:

- Selection of the sensor
If several sensors are installed in the analyser, the corresponding sensor must be selected in the selection window.
- Zero signal

The zero signal of the detector is measured during an adjustable period of time before the start of the measurement. Upon detection of the zero or zero signal, the measurement begins when the difference between the current signal and the zero signal is greater than the value of the start integration. In general, the integration of a peak is the most relevant part of any measurement, as it directly affects the measurement results. In standby mode, the integration value of the last measurement is displayed until a new measurement starts. The integration is measured as $FRS * s$ (full scale range of the detector * seconds).

- Integration
Peak area after the measurement.
- Integration TIC
Peak area of the TIC after the measurement. This value is only relevant for the TIC measurement.
- Current signal
This value corresponds to the current signal during a measurement. This value can be used to control the basic contamination of the carrier gas when no measurement is taken.

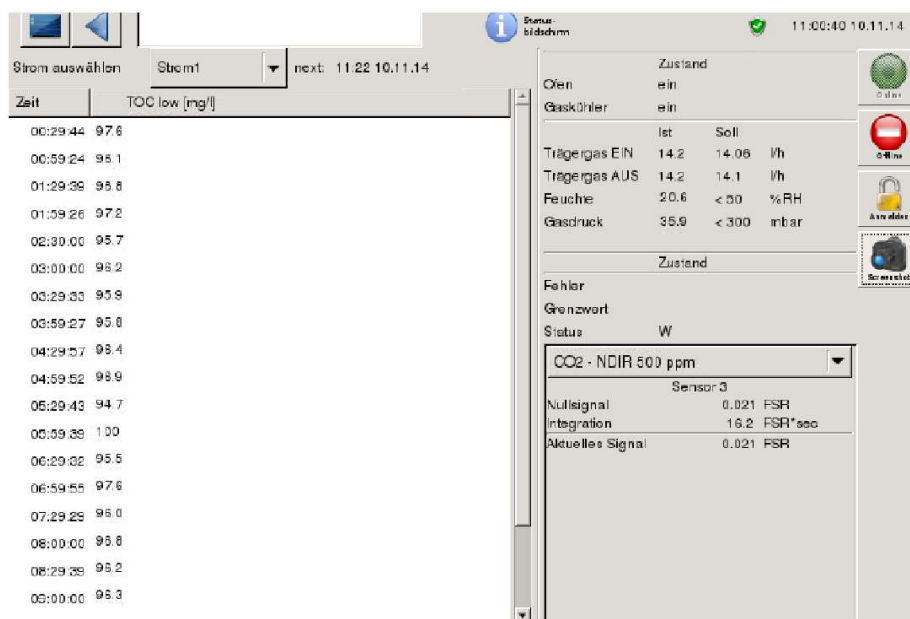


Fig. 69: Status screen (Example)

7.2.12 Service Actions

The following actions can be selected in the "Service Actions" view:

- Rinse sample tubes (with indication of rinse time)
- Oven on / off
- Condensate pump on / off

If a measurement or calibration is performed, none of these actions can be activated; First, the action currently being performed (for example, measurement) must be completed via the "Offline" button.

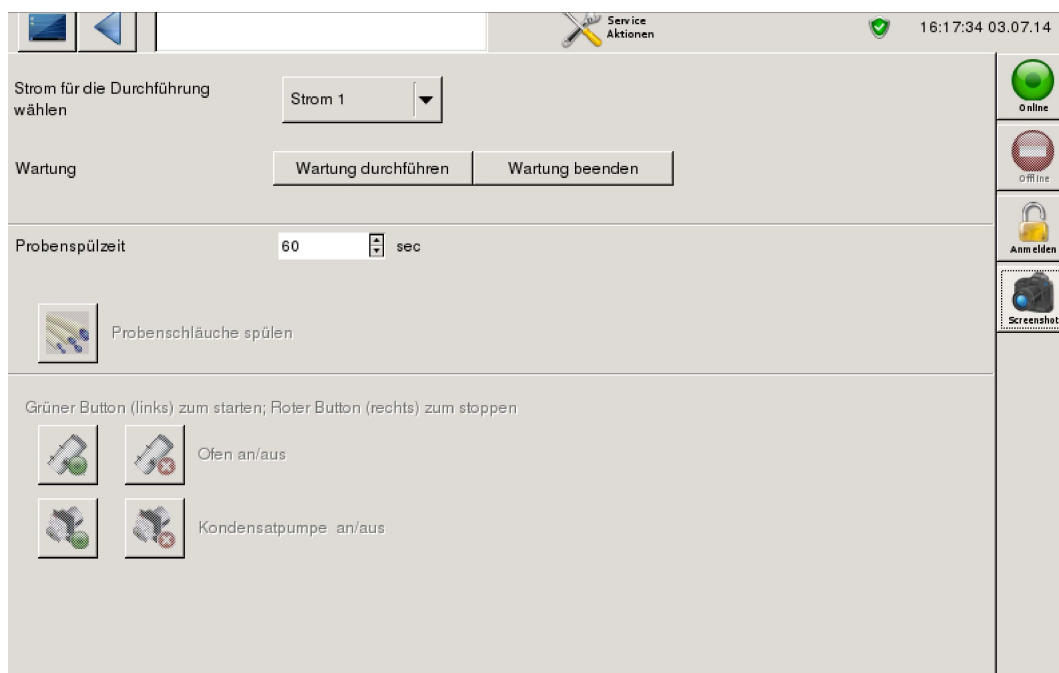


Fig. 70: Service actions

**Notice**

The sample pumps must not be in continuous operation, as otherwise warranty claims for the pumps may go out.

If a new measurement, calibration or individual measurement is to be carried out again after a care or maintenance operation by pressing the "Perform maintenance" button, the "End maintenance" button must first be pressed.

To activate the "Service Actions" screen:

1. End the measuring process or the current action with the "Offline" button.
2. Press the "Carry out maintenance" button

To disable the "Service Actions" screen:

1. Click on the button "End maintenance"
2. Start a new measurement or calibration.

7.2.12.1 Select sample flow for flushing the sample tubes

Select in this screen the sample flow for which the rinsing of the sample tubes is to be carried out.

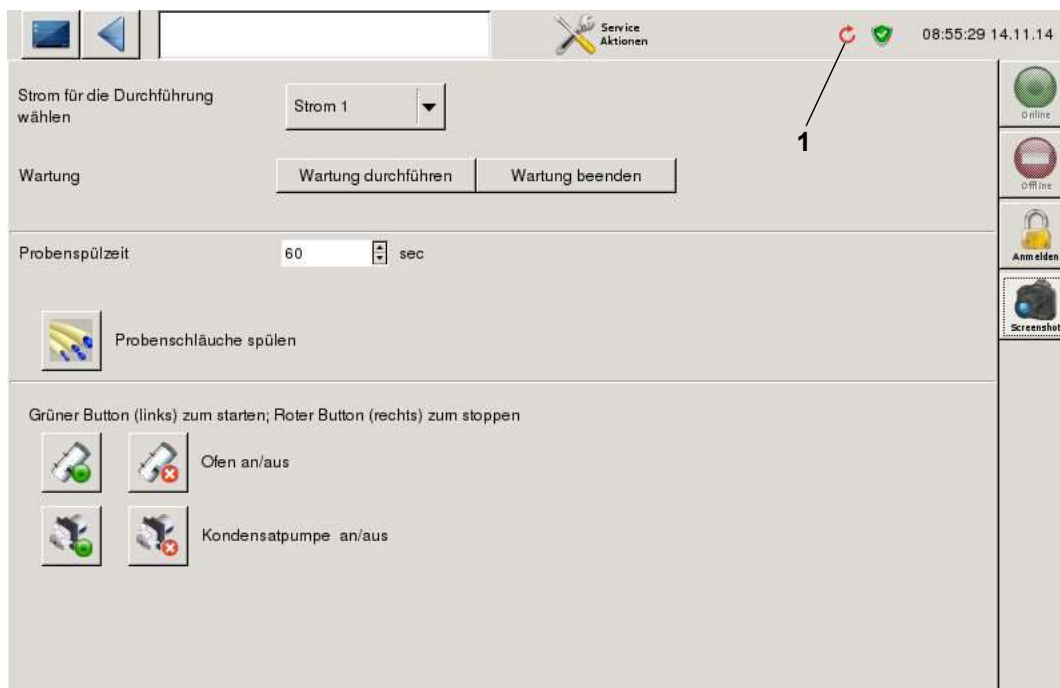


Fig. 71: Service actions - „Perform maintenance“

The icon (1) in the status bar on the right symbolizes that the "Perform maintenance" button has been pressed.

7.2.12.2 Maintenance

Pressing the „End Maintenance“ button greys and disables all of the service action buttons on the Online Action Services screen. The Perform Maintenance button activates the maintenance or maintenance buttons.

7.2.12.3 Rinse Sample Tubes

To prepare the measuring process, the sample tubes can be filled with the sample. The sample purging time is entered in seconds.

1. Select sample current (Fig. 71, page 108) via the "Select current for the execution" button.
2. Enter the sample rinsing time and save it via the "floppy disk symbol"
3. Press the "Carry out maintenance" button.
4. Press the button "Rinse sample tubes".
5. After completing the rinsing for the sample tubes, the button "End maintenance" must be pressed. Only then a measurement can be started.

7.2.12.4 Switching the Furnace On and Off

1. Press the "Perform maintenance" button Press
2. Press the "Furnace off" button. To switch the stove back on, activate the "Furnace on" button. After switching on the furnace, press the "End maintenance" button. Only then can a measurement be started.



Notice

The heating time of the oven is about 120 minutes (2 hours). This corresponds to a heating rate of 10° C / min. This time is fixed and not changeable.

7.2.12.5 Switching the Condensate Pump On and Off

1. Press the "End maintenance" button.
2. Press the "Condensate pump off" button To switch on the condensate pump, press the "Condensate pump on" button. When all maintenance has been completed, the "End maintenance" button must be pressed. Only then can a measurement be started.

7.2.13 Single Measurement

With the single measurement single calibrations or samples can be measured. The single measurement can be used to check calibrations.



Notice

The measured values of the single measurement are not saved in the database and in the "Status screen" and are not transmitted to the analog outputs.

The measured values are only displayed in the "Single measurement" screen.

During the online measurement, the buttons "Select current" and "Start single measurement" are deactivated. A single measurement can only be performed in an offline mode.

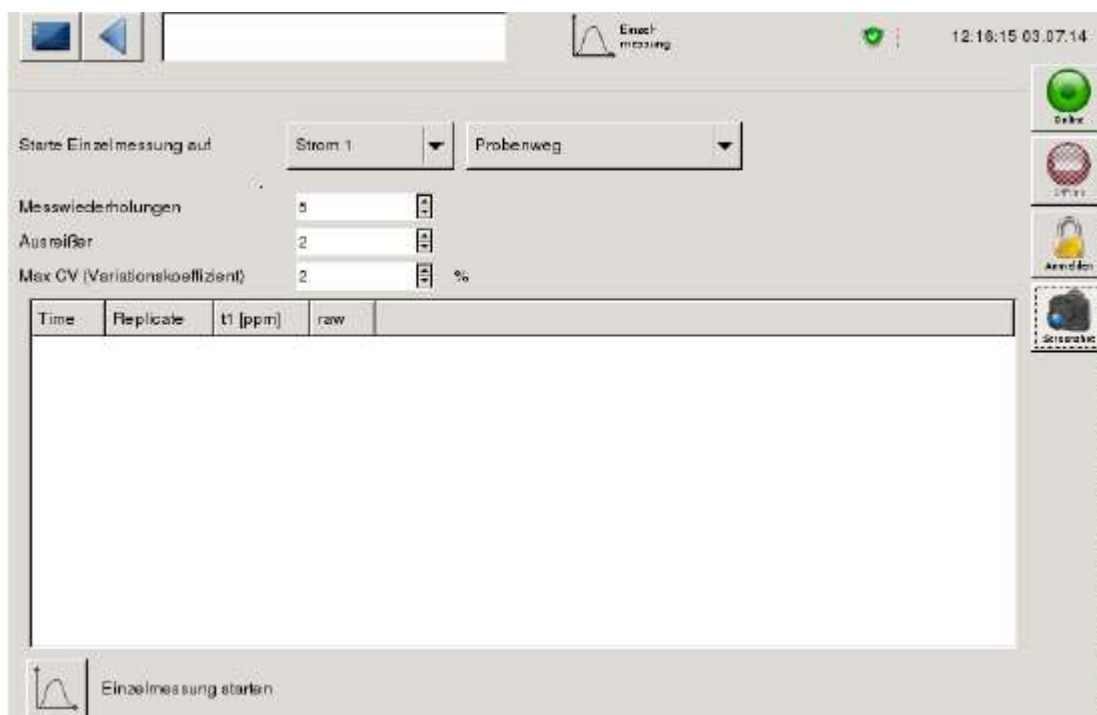


Fig. 72: Single measurement screen

The current, the calibration path / sample path and the three parameters (repeat measurement, outlier

and CV) can be adjusted before a single measurement. Once the three parameters (repeated measurements, outliers, max.CV) have been set and saved with the disk symbol, the single measurement can be started via the "Start single measurement" button. The table displays the repetitions, results and the CV of the measurement. The outliers are automatically highlighted in yellow and not included in the calculation.

Proceed as follows to set parameters:

- Repetition during a measurement
This option can be used to specify how many individual measurements are to be made per output measured value. The permissible values are between 1 and 10. The default value of this option is 1. Several individual measurements are averaged over a measured value.
- Outliers in a measurement
Using the outlier correction, incorrect measurements can be taken out of the averaging of the individual values. Permissible values are 0 to 2 measured values. For the determination of the outlier, the measured value with the largest standard deviation is chosen as the mean value. If the standard deviation lies in the tolerance range of the maximum CV, the measured value of the individual measurements is used for averaging. If this is above the maximum CV, the measured value is treated as an outlier and is ignored when calculating the mean value and the coefficient of variation (CV).
- Maximum CV in one measurement
The maximum CV or coefficient of variation describes the repeatability or reproducibility of several consecutive individual measurements taken on the same sample. The maximum CV or coefficient of variation is only effective in combination with the outlier correction. If the outlier correction is activated by entering the numbers 1 or 2, then the maximum CV is taken into account when determining the outlier. The default value is 0, i. there is no consideration. The maximum adjustable value is 10%.

$$CV = \frac{\text{Standard deviation}}{\text{Average}} \times 100$$

7.2.14 Auto Check

This screen offers you the following functions:

- Auto Calibration: Automatic calibration by standards
- Auto-Check: Automatic check by standards

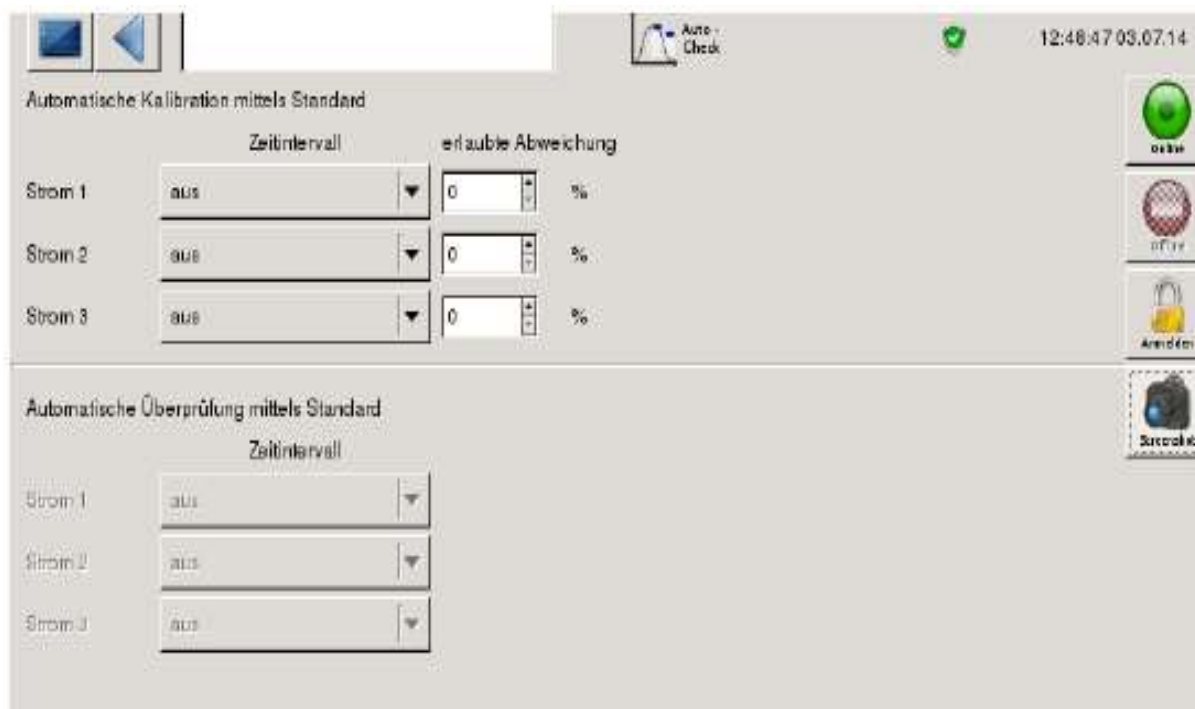


Fig. 73: „Auto Check“ screen (Example for 3 sample streams)

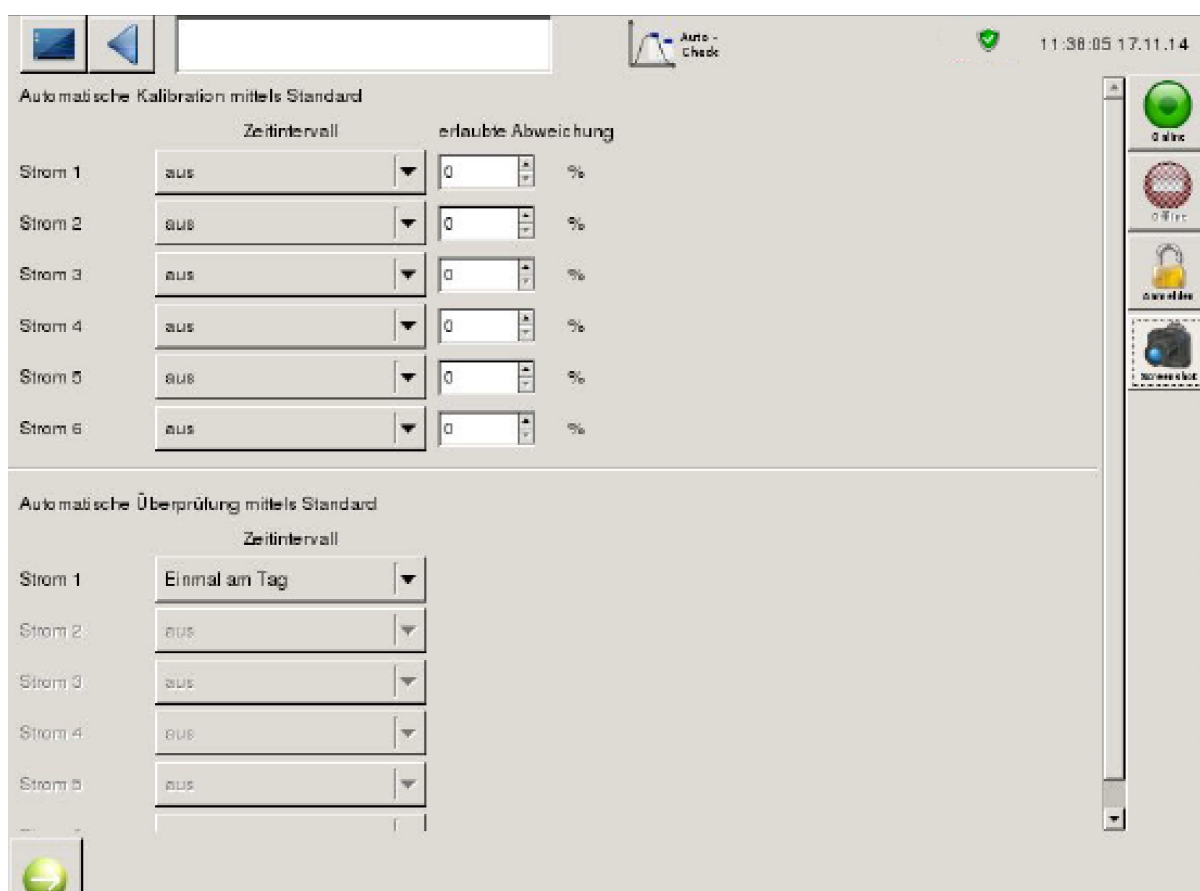


Fig. 74: „Auto Check“ screen - Activation of one sample stream (Example)

7.2.14.1 Auto Calibration: Automatic Calibration through Calibration Standards

This feature allows automatic calibration of the instrument, where each sample stream can be selected and eight different time intervals are available.

In the input field "Deviation", the percentage deviation of the new calibration must be entered.

The integration range of the automatic calibration is compared with the last manual calibration. If the deviation of the automatic and the manual calibration is within a defined percentage, the values of the automatic calibration are taken over as a new calibration. If the deviation is too large, the calibration is discarded.



Notice

Before a calibration or measurement can be started, the status must be checked and a visual check made on the meter. Otherwise, the Danger insists that an incorrect calibration or measurement occurs.

If an automatic calibration is set, please make sure that there is enough fresh calibration standard available.

Click the "Online" button to start an automatic calibration.

Tabelle 13: Possible calibration intervals

Adjustment	Calibration on
NONE	No calibration
1 day	after 24 hours
2 days	after 48 hours
3 days	after 72 hours
4 days	after 96 hours
5 days	after 120 hours
6 days	after 144 hours
7 days	after one week

1. Activate time interval per sample stream (selection window).
2. Set deviation in percent per sample stream.
3. Start online measurement with the green button.
4. Auto-calibration starts after the selected time.

7.2.14.2 Autocheck - Automatic checking with Calibration Standards

This screen can be used to determine if the device should perform autochecks. For this, there must be a channel that is in an online measurement and another that performs the control measurement. In order to perform the "Check" function, please contact the technical support of the LAR (*Kapitel 15.1 ab Seite 183*), as this function must be enabled.

In this screen can be determined how often measured. Thus, the device itself checks in the interval you specify whether it still works correctly.

7.2.15 Setting Limits

A maximum of 41 limit values can be set. The parameters to be set are:

the channel

the minimum value of the measured value (lower limit)

the maximum value of the measured value (upper limit)

the name of the limit (name)

The first three points are necessary. The name is not binding and is for documentation purposes. Select

the channel by pressing the corresponding selection button. To enter the minimum or maximum limit and name, click in the white input field under "Minimum / Maximum". A number field and a keyboard are displayed. Please enter the desired value and save the change with the "disk" symbol.

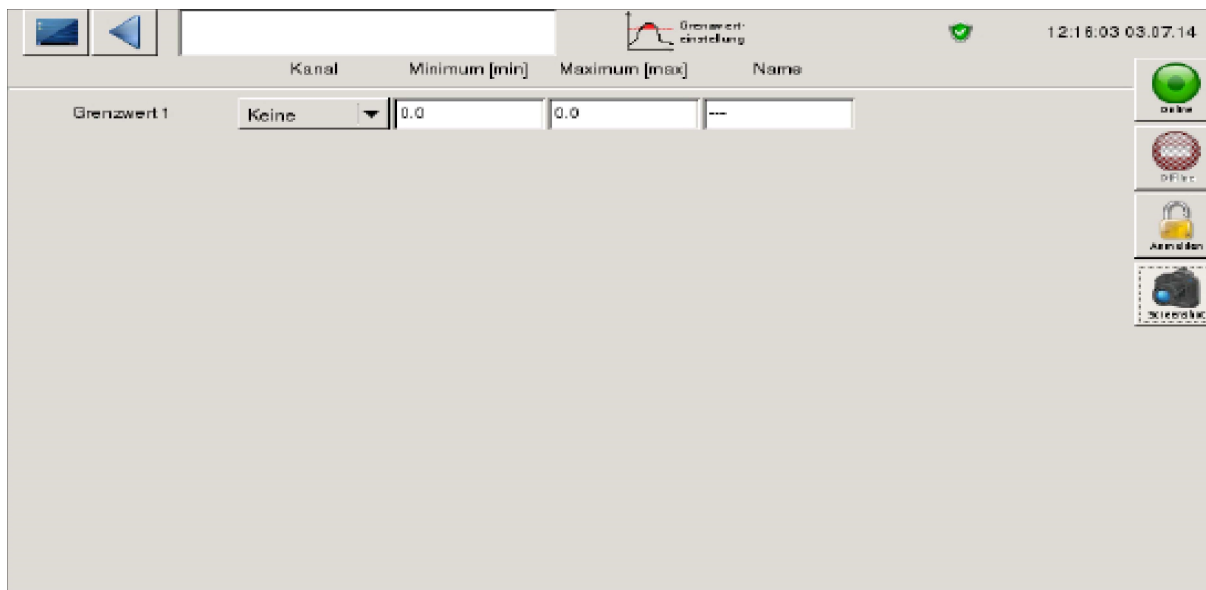


Fig. 75: Limit setting screen (Example with one limit)



Notice

To define more limits, the last limit must be selected and a next limit will be displayed automatically.

7.2.16 Rinse Sample Tubes

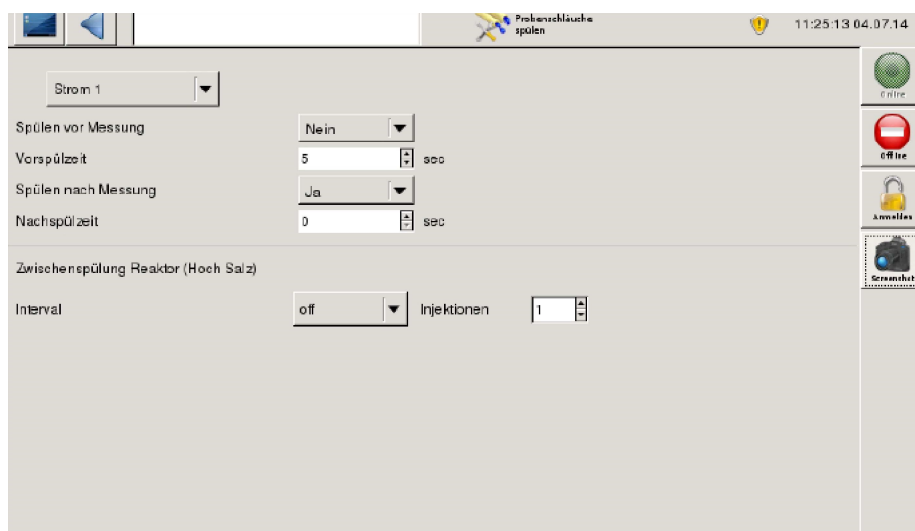


Fig. 76: Rinse sample tubes screen

All parameters in this screen are intended for deionized water.

7.2.16.1 Rinse before Measurement

Here you can set whether the tubing system should be rinsed before a measurement with rinse water via Y3Y10.

7.2.16.2 Purge Time

If the parameter "Rinse before measurement" is activated, the duration of the rinse must be specified here.

7.2.16.3 Rinse after Measurement

Here you can set whether the tubing system should be rinsed after a measurement with rinse water via Y3Y10.

7.2.16.4 Rinse

If the parameter "Purge after measurement" is activated, the duration of the purge must be specified here.

7.2.16.5 Automatic high-salt rinse from the reactor

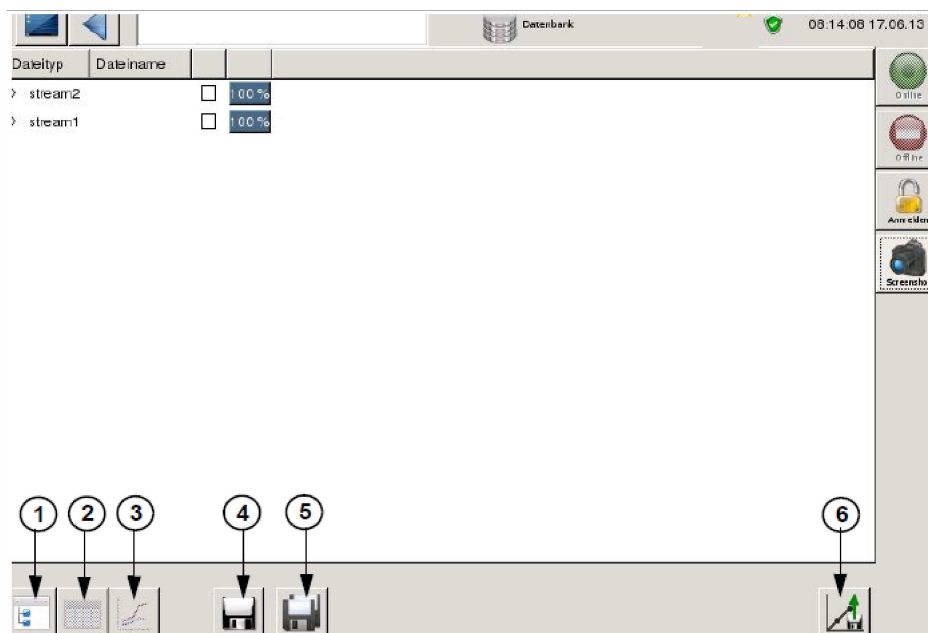
Choose if and how often rinse water should be injected into the reactor. Maximally, this can be done every 30 minutes. Also select how many injections should be made for each rinse.

7.2.17 Database

If you go to the "Database" screen, three screens can be activated for the user Level II:

- Overview of the database
- Table form of the measured data
- Daily course of the measured data

In the first screen "Overview Database" (Fig. 77, page 115) the measured data can be loaded per current and per day. To see the individual measurement data, click on "stream" and "day" (measurement). The selection boxes can be activated or deactivated. When the charging process is 100%, the measured data can be displayed as a table (Fig. 78, page 116) or daily course (Fig. 79, page 117). The "Table form of the measured data" button can be pressed to display a new table with the selected current and day.



- 1 Overview of the database
- 2 Data in table form
- 3 Daily results
- 4 Save data to storage device
- 5 Save all data to storage device
- 6 Dub parameters

Fig. 77: Database screen



Notice

Only when a file is selected (100% loaded) the "Table shape and waveform of the measured data" button can be selected.

To see the subfolders, press the small triangle to the left of the stream or date.

Save data

1. Measurement data can be stored on a USB stick.
2. Connect the USB stick to the analyser.
3. Select the desired measurement data. All measurement data can also be selected individually. Activate the respective check boxes.
4. Press the "Save" button; the files are copied to the USB stick.

Dub parameters

After successful commissioning, the default parameters are transferred to a USB stick. If parameters have been changed or the analyser is no longer running properly, the default commissioning parameters can be replayed on the analyser.

1. Stop measurement.
2. Connect USB stick to the device.
3. In the "Database" screen, click the "Transfer parameters" button.
4. A query is displayed. Confirm this with the green tick.
5. A query with Yes / No takes place: If yes, the device is automatically restarted. If no, the process is aborted.
6. After successful dubbing the stick can be removed.



Notice

The existing data and settings will be overwritten, please contact the technical support of the LAR (**chapter 15.1 from page 203**)!

7.2.17.1 Data in Table Form

The measured values are displayed to the right of the timestamp when you press the "Data in table form" button (1). If the selected measurement data is to be displayed as a curve, the "Measurement history" button (2) must be activated.

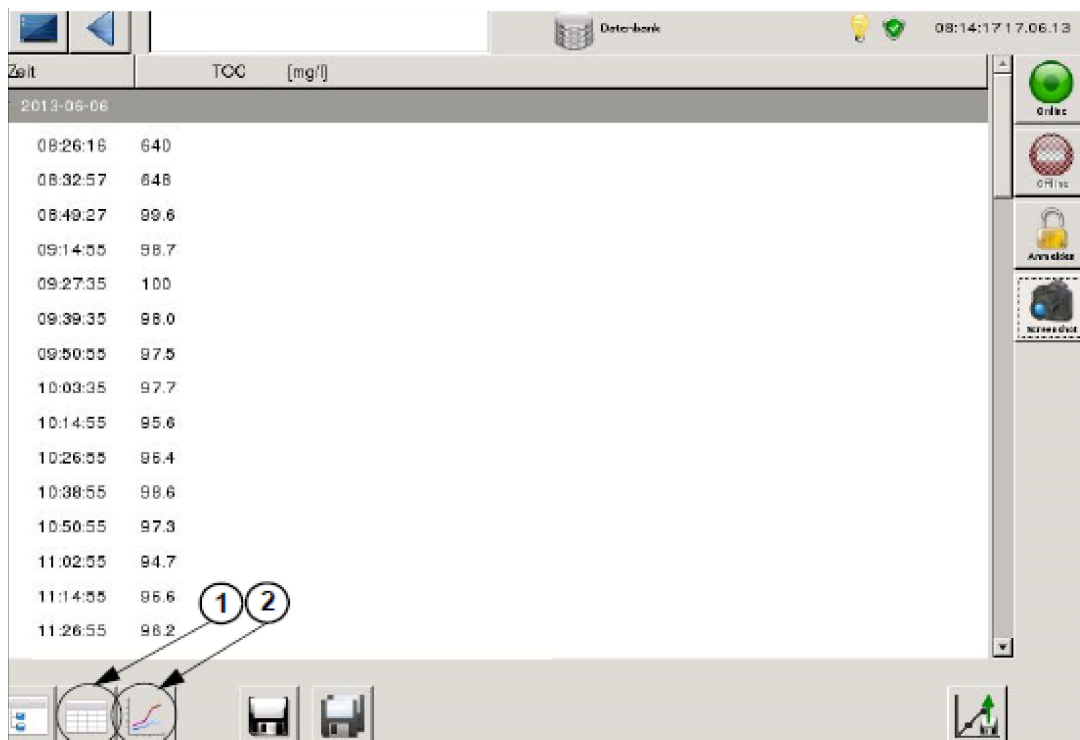


Fig. 78: "Database" screen - table form of the measured data (Example)

7.2.17.2 Daily results as a curve

If the selected measurement data is to be displayed as a graphic in the "Overview database" screen, the "Measurement data as curve" button must be activated. Each parameter has its own diagram. In order to change the parameters (e.g. TOC to TC) use the buttons on the top left. From the "Measured data as table" view (Fig. 77, page 115), you can access the trend view. Click on the button "Daily data history" (3, Fig. 77, page 115) and the corresponding trace will be displayed.

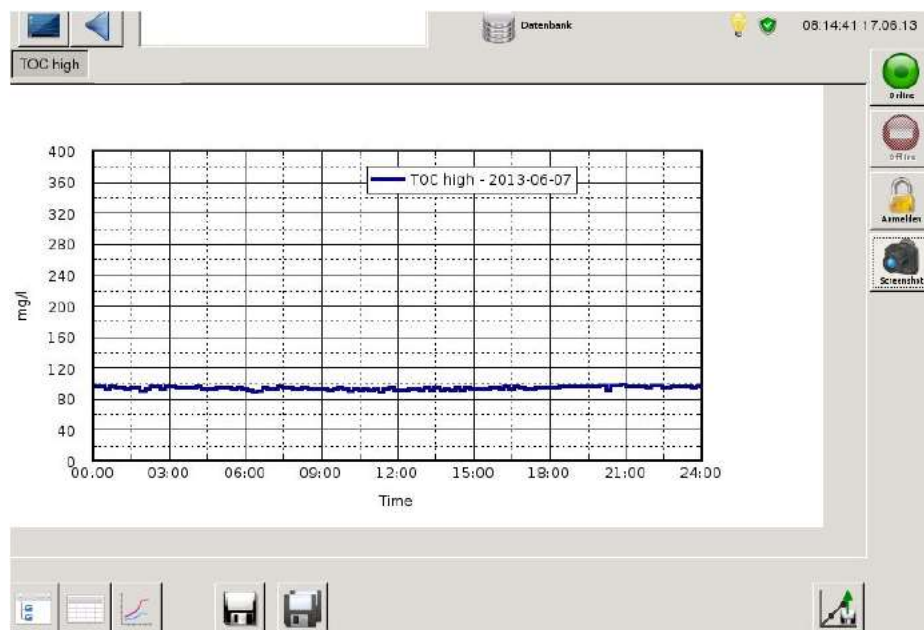


Fig. 79: Database - curve form (Example)

7.2.18 Log



Notice

The logbook screen is only displayed from user level 2 onwards.

The logbook can be accessed via the status bar.

1. To do this, press the icon "To get to the logbook" (2).
2. A selection window is displayed (Fig. 81, page 118). Select "control state" on this selection window.
3. A new screen is displayed.

There are two views in the logbook:

4. Archiving the logbook
5. Currently applied errors

The logbook insight icon (2) top right consists of three colors:

Green: No fault messages are pending. All necessary conditions for a valid measurement are fulfilled. The measured value is trustworthy and process-relevant.

Yellow: Fault messages are pending. The measurement could be disturbed and untrustworthy.

Red: Fault messages are pending and the measurement is aborted. The boundary conditions do not allow a valid measurement (eg: missing reagents, failed calibration) The device requires immediate maintenance.

There are three subfolders in the archiving logbook view:

Error

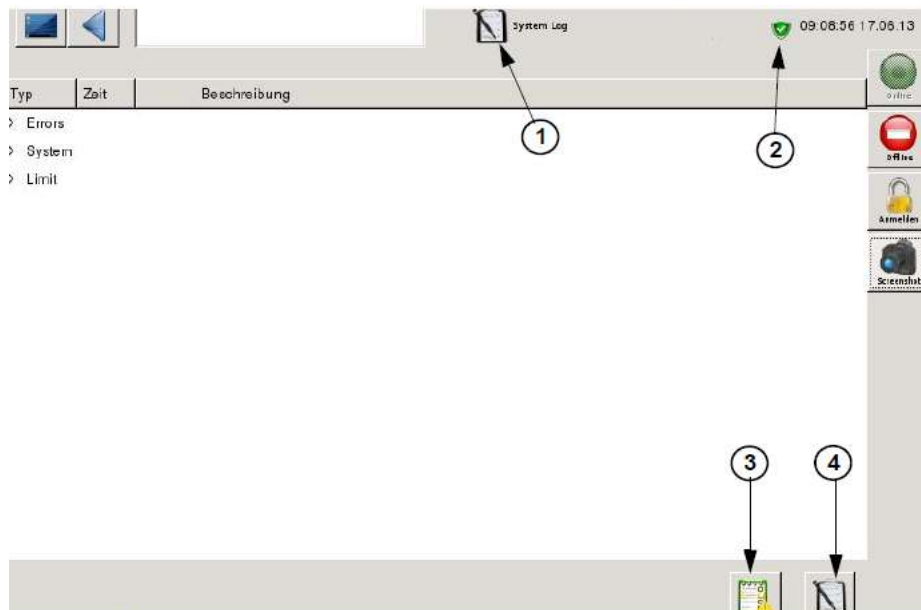
List of all occurring errors with time of appearance and disappear / reset.

system

The list contains system data of the entire activities of the system (measurement, parameters, self-test, etc.)

Limits

The list contains limit values or overshoots with times. To see the subfolders, press the small triangle on the left of Errors, System, Limit or Service Log. A corresponding listing is displayed.



- 1 View of the log
- 2 Go to Log
- 3 Unsolved errors
- 4 Log view

Fig. 80: Log

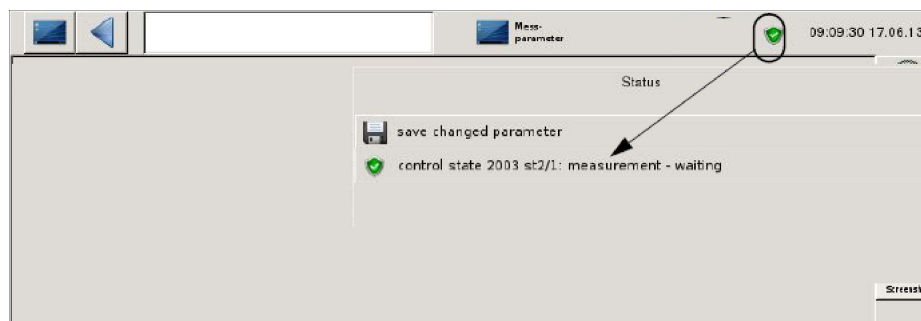


Fig. 81: Selections for Log

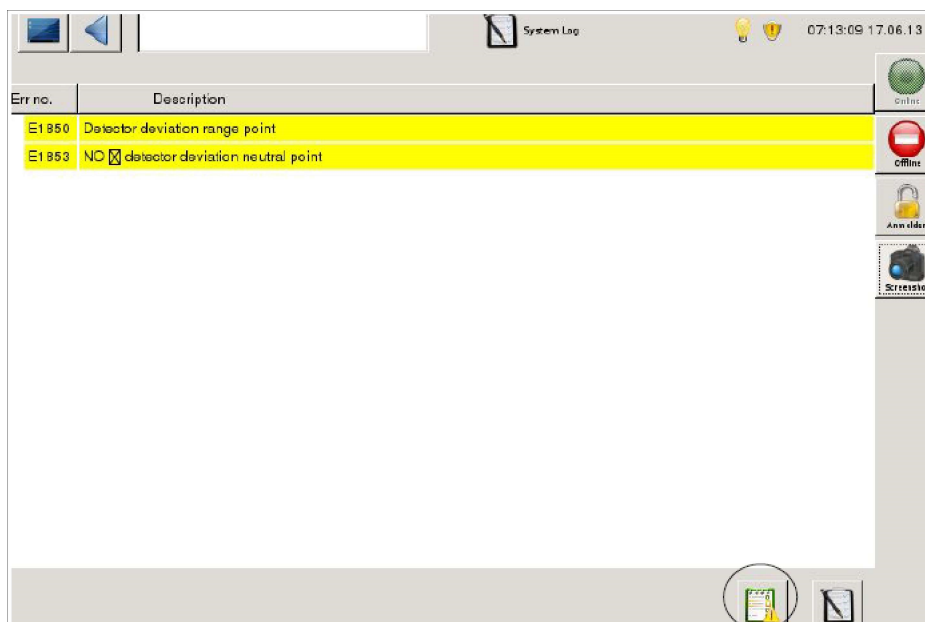


Fig. 82: Database screen - Log - View of actual errors

7.2.19 Saving Data

Data storage takes place during commissioning and maintenance of the device. Current operating parameters are stored and archived in the LAR database.

Please contact LAR technical support (*Chapter 15.1 on page 183*) if you need a backup.

7.2.20 Calibrate Analog Output

In principle, it is possible to operate the analogue outputs in the range 0-20 mA or 4-20 mA. The analyser integrates a "live zero" mechanism via the analogue outputs. This means that 0 mA can be applied to the current output in case of a device error. Under which conditions this "live zero" mechanism is activated can be set individually by the user in the selection window. To activate the "live zero" mechanism, the analogue output must be set to "4/20 mA".

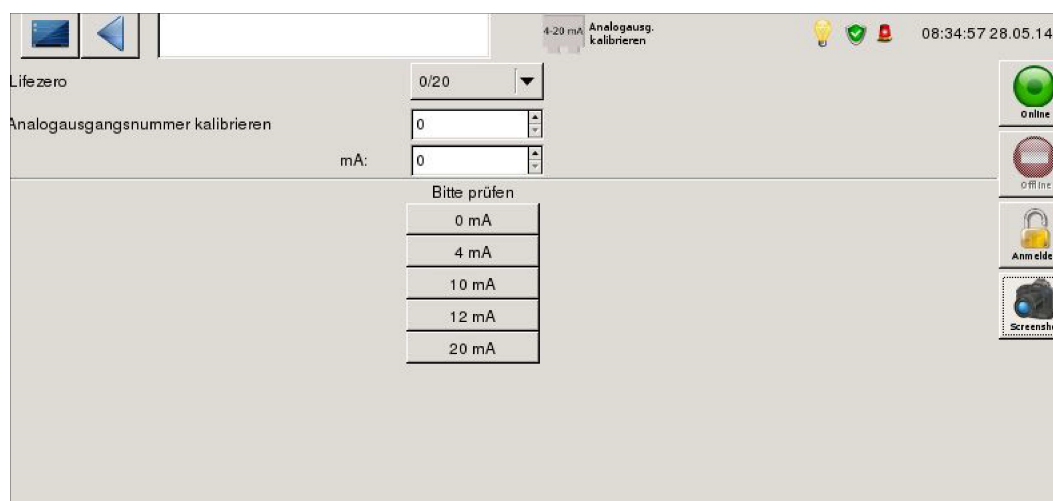


Fig. 83: Calibrate analog output screen

Only an authorized technician should perform an analog output calibration, as this requires opening the rear housing.

1. Open the rear part of the unit.
2. Connect the multimeter (amperemeter) to the analogue output.
3. In the Calibrate Analog Output view, specify the number (analog output) to which the multimeter is connected.
4. Click on the desired mA value (0, 4, 10, 12 or 20 mA).
5. The mA value must be recognizable on the ammeter. If a different value is displayed, please contact **LAR technical support** (*Chapter 15.1 on page 183*).
6. After checking the analog output, close the rear part of the unit.



Notice

Before checking all possibly already connected signal cables for
Remove process control system (connections to analog outputs).

7.3 Good to know

7.3.1 Password

The password can be changed to user level 2 (PC Settings screen). When changing the password, this should be documented in a safe place. If the default password has been changed or deactivated, a USB stick with access level 2 access rights becomes necessary. The USB stick is delivered in a separate spare parts container.



Notice

The default password is given by LAR AG at the factory and reads: **lar**

For security reasons, a USB stick with access level 2 access is required if the password is disabled or changed.

7.3.2 Software Version

The opening screen (Fig. 52, page 88) and the PC Settings screen (Fig. 86, page 122) show the current software version number.

7.3.3 Abort Measurement

The measurement continues until it is canceled by pressing the "Offline" button (top right). The device is then put into the wait state and all measurement data not yet stored are stored. Now you can carry out maintenance work (Chapter 7.2.12.2 on page 108), evaluate old measuring data or change operating parameters (measuring frequency, etc.). If the measurement was e.g. interrupted by a power failure, an autostart will be performed when the power is restored and automatically returns to the measurement mode. The unit continues its programmed measurement cycle after the power failure without operator intervention.

7.3.4 Furnace On - Off

Manually switching the furnace on - off

Please switch off the oven for maintenance purposes only. This can be done in the "Service Actions" view (Fig. 70, page 107). Frequent switching off and on reduces the life of the furnace. The meter is equipped with a high-temperature furnace, which makes it possible, at high temperatures without catalysts, to achieve complete conversion of the sample. The setpoint temperature is set at the factory and is password protected. An intervention in the programming of the temperature controller is inadmissible and can lead to damage of the oven. In case of temperature problems, contact the technical support of the LAR (*Chapter 15.1 on page 183*).

7.3.5 Automatic Temperature Control

The controller labeled "Temperature Control" displays two values at the front of the analyser. The actual value and the setpoint. With the help of the control knob "Temperature Monitor", the stove is switched off when the temperature rises above 1250° C. It is located on the back wall in the device. To heat the stove about 120 min = 2 h are needed. This corresponds to a heating rate of 10° C / min. These settings are factory set and can not be changed.

7.3.6 Condensate pump on - off

The condensate pump runs continuously and is only switched off for care and maintenance purposes (such as changing hoses). Switch on the condensate pump again after the care and maintenance work.

7.3.7 Date and Time

The date and time are visible in all views and can be found in the upper right corner of the screen. Changes can be made in the PC Settings view (*Chapter 7.3.10.1 from page 122*).

7.3.8 Language

The language settings of the software are factory set and can be changed by the LAR Technical Support (*Chapter 15.1 on page 183*) or an authorized service partner on the device.



Notice

German and English are available as standard languages in the device. For other languages, please contact LAR technical support (*Chapter 15.1 on page 183*).

7.3.9 Save

Storage is necessary for all changes made to the operating parameters and settings. Perform storage:

1. Settings have been changed (eg. parameters). Press "Enter" (only for number fields).
2. The floppy disk button appears in the status bar (upper right side). Press the "Disk" button and a selection window will be displayed.
3. Select "Save changed parameter". A new window opens.
4. If the change is to be accepted, press the green "check mark" to confirm. If the change is not accepted, press the red "X".



Fig. 84: Save - first step

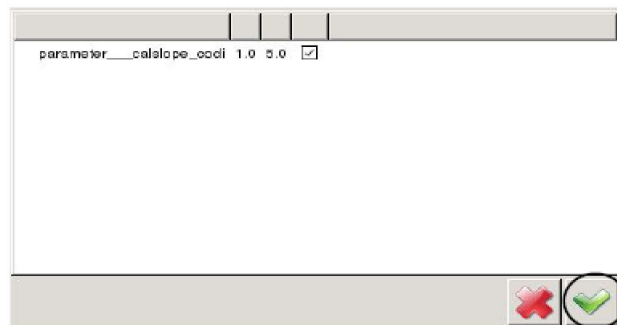


Fig. 85: Save - second step

**Notice**

In the second step of saving two values can be seen in the screen mask. The first value is the previous parameter value and the second value is the desired new parameter value that has been entered.

If several parameters are changed at the same time, a saving process is sufficient. During the saving process every parameter change can / should be checked. After pressing the "floppy disk" symbol, a list of the "old" and "new" parameter values appears, which are confirmed with "check marks". If one of the several changes is not accepted, the "tick" on the record must be removed. All parameters activated with "check mark" are saved and accepted.

7.3.10 User Level 3

In user level 3, various parameters can be set.

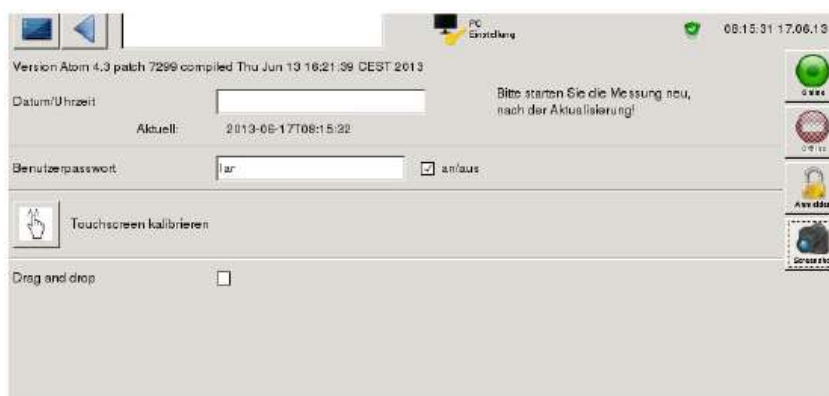
7.3.10.1 PC Settings

Fig. 86: PC settings screen

Activate / deactivate password protection for user level 2

1. As a user with authorization for user level 3, you can activate or deactivate password protection in user level 2. Save your changes via the "floppy disk" icon.
2. If the password is disabled, the USB key with access level 2 or level 3 access is required. The default password is: lar.

Drag and drop for buttons

Activate the checkbox to activate the function. If this function is activated, you can move buttons in different screens.

7.3.10.2 Calibration Results

In this screen form in user level 2, as user of user level 3, you can manually change and save the measurement results (intercept and slope).

Strom	TOC	neu	aktuell
Strom 1	Achsenabs <input type="checkbox"/> 0.0	0.0	--
	Steigung <input checked="" type="checkbox"/> 0.224837	2.25E-01	--
Strom 2	Achsenabs <input type="checkbox"/> 0.0	0.0	--
	Steigung <input checked="" type="checkbox"/> 0.224837	2.25E-01	--
Strom 3	Achsenabs <input type="checkbox"/> 0.0	0.0	--
	Steigung <input checked="" type="checkbox"/> 0.224837	2.25E-01	--

☒ Aktivierung der Kalibrierergebnisse
 Sollwert des Trägergasstromes: 13.6 l/h

Bitte kontrollieren Sie die Kalibrierergebnisse vor der Aktivierung.
 Nach der Aktivierung werden die Kalibrierergebnisse im Bildschirm „Aktive Kalibrierung“
 angezeigt und für weitere Messungen verwendet.

Fig. 87: Service calibration results screen

7.3.10.3 CAN Selftest

```

# node-process selftest
#
#
# Date: 2013-06-14T11:32:29.188737396
#
2013-06-14T11:32:29.188940411 S init canbus start
2013-06-14T11:32:29.556264184 S Initialize new node Analog1 ID=04 application version 65536
2013-06-14T11:32:31.821102431 S Initialize new node Doppelmotor1 ID=12 application version 196608
2013-06-14T11:32:31.999568625 S Initialize new node Doppelmotor2 ID=14 application version 196608
2013-06-14T11:32:32.503970393 S Initialize new node Digital1 ID=18 application version 20975874
2013-06-14T11:32:33.007904817 S Initialize new node AnalogExp1 ID=16 application version 43192
2013-06-14T11:32:48.806557527 E node ID=04 Analog1 not found
2013-06-14T11:32:48.806598179 E node ID=12 Doppelmotor1 not found
2013-06-14T11:32:48.806632069 E node ID=14 Doppelmotor2 not found
2013-06-14T11:32:48.806665077 E node ID=18 Digital1 not found
  
```

Aktualisieren

Fig. 88: CAN Selftest screen

The device has a so-called CAN circuit diagram. In the CAN circuit diagram, all parts of the device are entered with their own ID. The device independently tests this plan and displays the results in this screen. If, for example, a node is missing, this screen displays its name, ID and the suffix "not found". This information is important to LAR technical support for troubleshooting.

7.3.10.4 Hardware Info

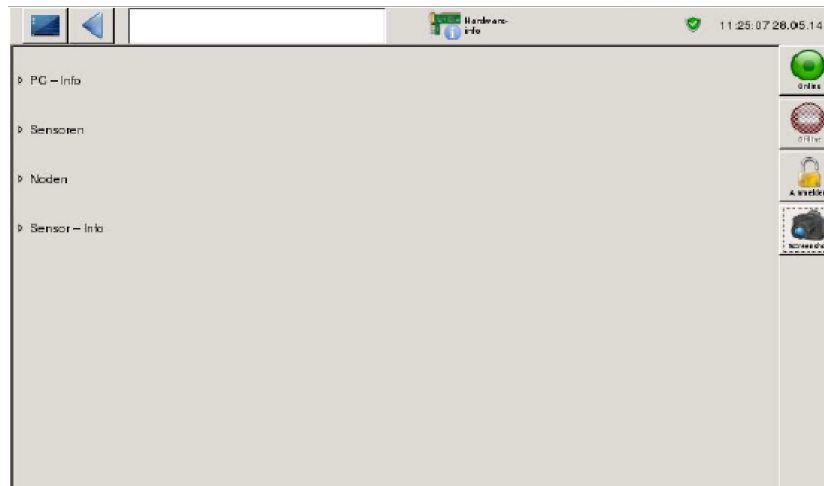


Fig. 89: Hardware Info screen

This screen provides information about the hardware of the device:

- PC Info
- sensors
- Modem Info
- Sensor Info

Furthermore, the voltages of the analog inputs of the respective device parts are displayed.

7.3.10.5 DIGITAL IN 1, 2 and 3

These three screens show the status of digital inputs 1, 2 and 3. The values can be changed manually.

	Zustand
User - specific	aus
User - specific	aus
Kundenspezifisch	aus
Kundenspezifisch	aus
EC - Kühler	ein
B7 - Fluidsensor 1	aus
B7 - Fluidsensor 2	aus
N2 - Temperaturregler	ein
N3 - Temperaturüberwachung	ein
Fernsteuerung Strom 1	aus
Fernsteuerung Strom 2	aus
Halballe PS	aus
Fernsteuerung Strom 3	aus
Türschaller	aus
Kundenspezifisch	aus
Kundenspezifisch	aus

Fig. 90: DIGITAL IN 1 screen



Fig. 91: DIGITAL IN 2 screen



Fig. 92: DIGITAL IN 3 screen

7.3.10.6 DIGITAL OUT 1, 2 and 3

These three screens show the status of digital outputs 1, 2 and 3. The values can be changed manually.

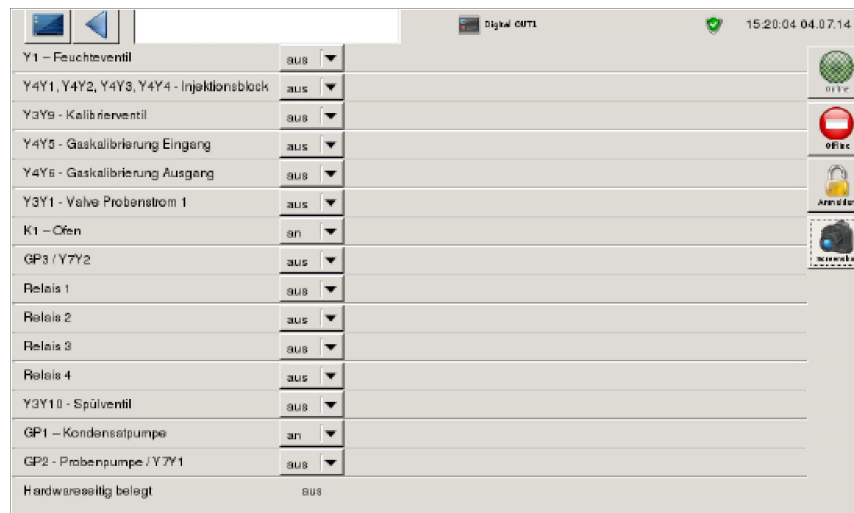


Fig. 93: DIGITAL OUT 1 screen

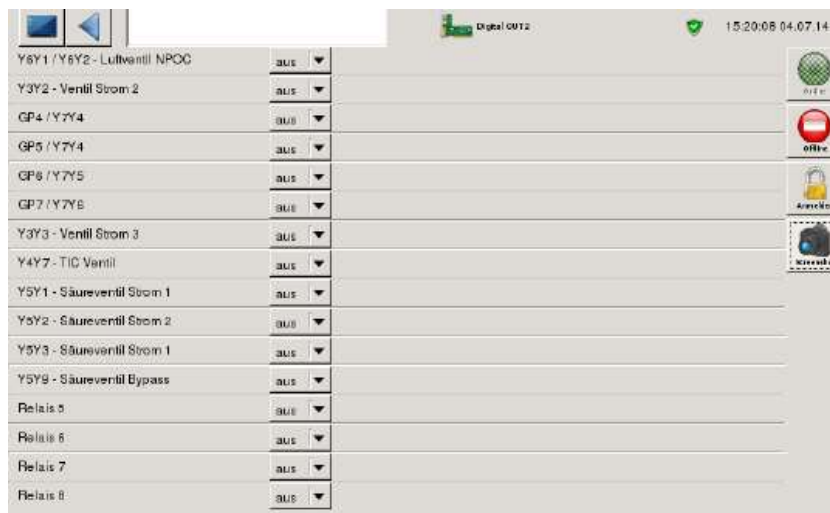


Fig. 94: DIGITAL OUT 2 screen

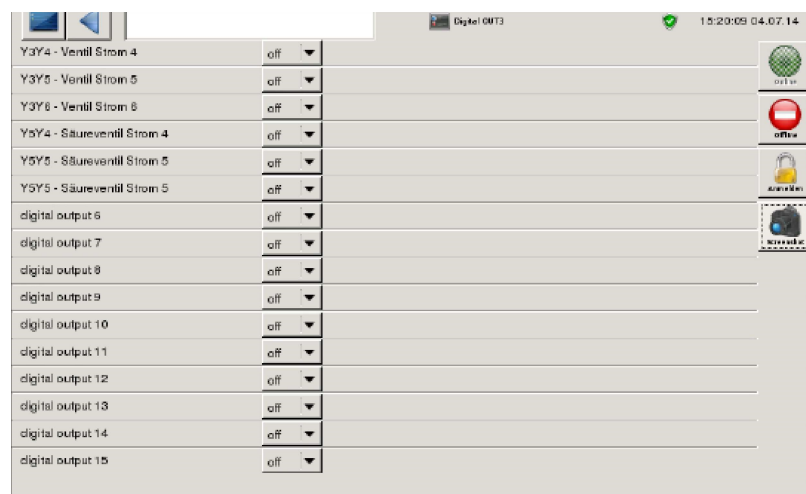


Fig. 95: DIGITAL OUT 3 screen

7.3.11 Calibrations

Calibrate in two different screens:

- in user level 2 in the screen "Perform calibration"
- in user level 3 in the screen "Service Calibration"



Notice

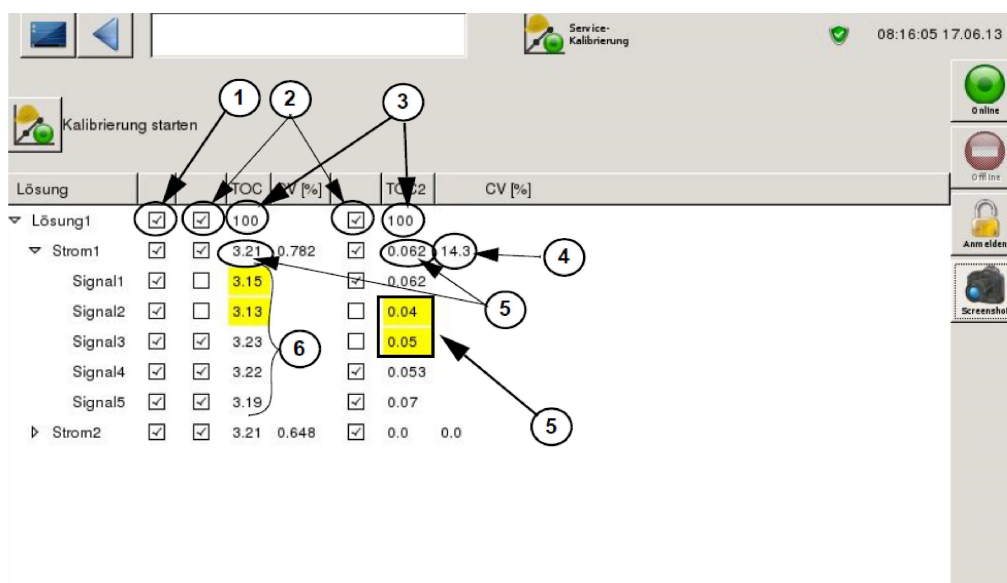
Before calibration can be performed, the necessary calibration solution must be provided and the necessary level II adjustments made in the Calibrate screen. Only then can a calibration be carried out in user level 3 under "Service Calibration".

Calibration can be stopped at any time by pressing the red "Offline" button.

7.3.11.1 Service Calibration

In user level 3 in the "Service Calibration" screen, "Start calibration" can also be selected. Please note the default settings in user level 3 (Chapter 7.3.10 from page 122). In the screen "Service Calibration" the 5 raw values (signal values) (6), as well as the calculated mean value (5) and the calculated CV (4) for the respective solutions and currents are displayed.

Outliers are automatically highlighted in yellow and are not included in the calculation. However, outliers can be included in the calculation by activating the respective checkbox. The checkboxes of the first column enable / disable all other checkboxes in the respective row. Furthermore, new raw values for outliers can be entered manually via the number field. The number field is displayed as soon as you click in the field to be filled in the screen mask.



- 1 Check box, activates all other check boxes of a row
- 2 Selection of individual value
- 3 Calibration value [ppm]
- 4 Calculated CV value of raw values
- 5 Calculated mean of the raw values
- 6 Raw value (signal value [FSR * s])
- 7 Outliers

Fig. 96: Service calibration screen

Perform a one-point calibration for a sample stream:

1. Make a calibration solution and position the calibration vessel in the analyser.
2. In the "Calibration solutions" selection box at user level 2, "Perform calibration" screen, select the

- calibration solution.
3. Enter the maximum CV in% for calibration in the Perform Calibration screen.
 4. After selecting the solution number, it will be displayed in user level 3 in the "Service Calibration" screen.
 5. Click on the solution to display the streams.
 6. When you click on the measured current, the five repetitions (signals) are displayed.
 7. Click in the input field to enter the ingredients of the solution.
 8. Double-click in the input field. The number pad and keyboard are displayed. Please enter the appropriate concentration (3).
 9. To accept the calibration concentration, save it with the "floppy disk" symbol.
 10. Activate all check boxes for the current and the solution to be measured.
 11. Start the calibration via the "Start calibration" button
 12. Raw values of the calibration can be viewed immediately in the table. When all calibration passes have been completed, raw values are available for each signal (repetitions). To the right of the stream is the mean value of the raw values (5). All check boxes are enabled for the measured solution and current. Outliers are detected by the software and highlighted in yellow. These outliers are not included in the calculation.
 13. If you are sure that the 5 measurements (signals) have an outlier that was not detected by the software, this can be removed from the calculation by deactivating the corresponding check box.
 14. In the screen "Calibration results" (user level 2), the results of the calibration (slope and intercept) can be viewed and activated.

Perform a multi-point calibration (three solutions) for a sample stream:



Notice

In a multi-point calibration, it must be noted that the calibration solutions can only be measured one after the other.

In the Service Calibration screen, the first left check box is responsible for the entire row. If this checkmark is removed (disabled), all others in the series will be disabled.

1. Make a calibration solution and position the calibration vessel in the analyser.
2. In the "Calibration solutions" selection box at user level 2, "Perform calibration" screen, select the calibration solution.
3. Enter the maximum CV in% for calibration in the Perform Calibration screen.
4. After selecting the solution number, it will be displayed in user level 3 in the "Service Calibration" screen.
5. Click on the first solution to display the streams.
6. When you click on the measured current, the five repetitions (signals) are displayed.
7. Click in the input field to enter the ingredients of the solution.
8. Double-click in the input field. The number pad and keyboard are displayed. Please enter the three concentrations (3).
9. To accept the calibration concentrations, save them with the "floppy disk" symbol.
10. Activate all check boxes for the current to be measured and the three solutions.
11. Start the calibration via the "Start calibration" button
12. Raw values of the calibration can be viewed immediately in the table. When all calibration passes have been completed, raw values are available for each signal (repetitions). To the right of the stream is the mean value of the raw values (5). All check boxes are enabled for the measured solution and current. Outliers are detected by the software and highlighted in yellow. These outliers are not included in the calculation.
13. If you are sure that the 5 measurements (signals) have an outlier that was not detected by the software, this can be removed from the calculation by deactivating the corresponding check box.

7.3.12 Service Parameter

Kalibrierungswert für Trägergasstrom	13.6101	l/h	1
Erlaubte Abweichung	5.0	%	2
Auch bei Gasflussfehlern messen	NEIN		3
Schwellwert der Trägergasfeuchte	60.0	% RH	4

Gasfluss kalibrieren	5
Trägergas EIN	16.8 l/h
Trägergas AUS	13.6 l/h

Fig. 97: Service Parameter screen

Define and view parameters for the carrier gas flow in this screen.

Definable parameter:

- Also measure for gas flow errors (3)
- Here you can choose between YES or NO. If YES is selected, the measurement will also be made if the deviation from the carrier current calibration value is greater than the value specified by them.

Fixed parameters:

- Calibration value for carrier gas flow (1)
- After a calibration, the value for the carrier gas flow is displayed here. If the actual value does not match the calibration value during a measurement, the measurement is aborted and the error must be corrected before a new measurement can be started.
- Permitted deviation (2)
- Here, the allowable deviation of the carrier gas flow will be indicated. If the deviation is below the percentage, it will still be measured.
- Threshold of carrier gas moisture (4)
- Here, the threshold value for the carrier gas moisture is defined. If the actual value is greater than the threshold, no measurement can be performed until the error is corrected. In the "Status screen", a "target value" is displayed for the two carrier gas sensors. This "target value" is generated by the "Carrier gas flow calibration value". The value that was generated during a calibration is automatically displayed.
- Calibrate gas flow (5)
- At this point, the carrier gas inputs and outputs can be viewed. This setting is factory set to YES.

7.3.13 Update Manager

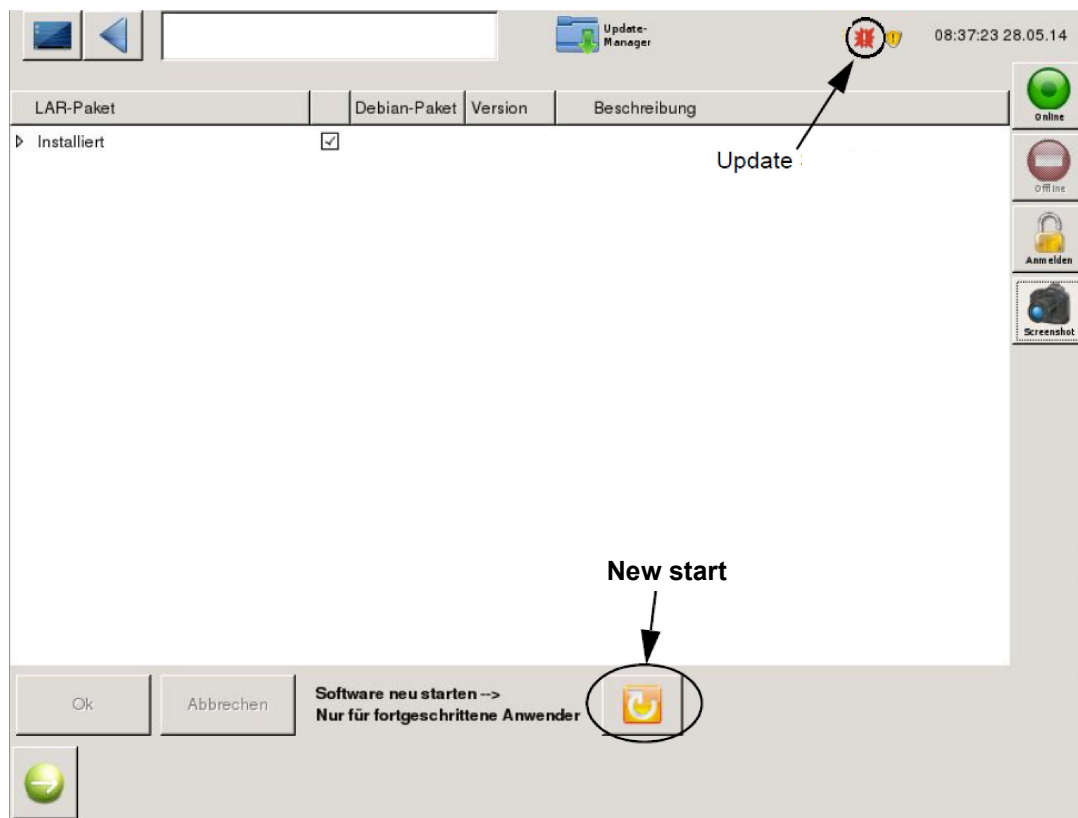


Fig. 98: Update Manager screen

This screen allows new software updates to be installed. To do this, a USB stick with access authorization for user level 3 and the update must be connected to the device. Furthermore, all installed files are displayed.

The yellow arrow key (bottom center) restarts the LAR software.

To run a software update:

1. Connect the USB stick with the analyser update.
2. A red "Update" symbol appears in the status bar. Click the icon to get to the Update Manager.
3. The screen for Update Manager will be displayed.
4. Select the installation file by checking the appropriate box.
5. Click "OK" to install the software. Click on "Cancel", if e.g. an incorrect file would be selected.
6. After pressing the "Ok" button, the screen will turn off for 30-40 seconds and the new software will be installed.



Notice

Already installed files can not be activated or deactivated.

7.3.14 Names and Units

The screenshot shows the 'Names und Einheiten' (Names and Units) configuration screen. At the top, there are navigation icons and a title bar. The main area is divided into sections for each channel (Channel 1 to Channel 6). Each channel section includes a 'Strom' (Stream) dropdown, a 'Sensor' dropdown, a 'Funktion' (Function) dropdown, and a 'Parameter' dropdown. Below these are 'Channel parameters' including 'Name', 'Einheit' (Unit), 'Min', 'Max', and 'KorrFal' (Correlation Factor). The right sidebar shows status indicators: Online (green circle), Offline (red circle), Anmelden (lock icon), and Screenshot (camera icon). The top right shows a timestamp: 13:54:15 25.11.14.

Channel	Strom	Sensor	Funktion	Parameter	Name	Einheit	Min	Max	KorrFal
Channel 1	Stream 1	CO2 - NDIR 150 ppm	CHECK	TOC	TOC1a	ppb	0.0	10000	1.0
Channel 2	Stream 1	TNb - 100 ppm	RAW	TNb	TOC1b	ppb	0.0	10000	1.0
Channel 3	Stream 2	CO2 - NDIR 150 ppm	RAW	TOC					
Channel 4	Stream 2	TNb - 100 ppm	RAW	TNb					
Channel 5	Stream 3	CO2 - NDIR 150 ppm	RAW	TOC					
Channel 6	Stream 3	TNb - 100 ppm	RAW	TNb					

Fig. 99: Names and Units screen

In this screen, the parameter and channel settings can be viewed and a correlation factor adjusted for each channel. The logbook records a correlation change.

7.3.15 Control State

The current device status is displayed on the Status Screen. This view only shows the latest status report (2) and current error messages as well as limit overruns for the respective stream (1).

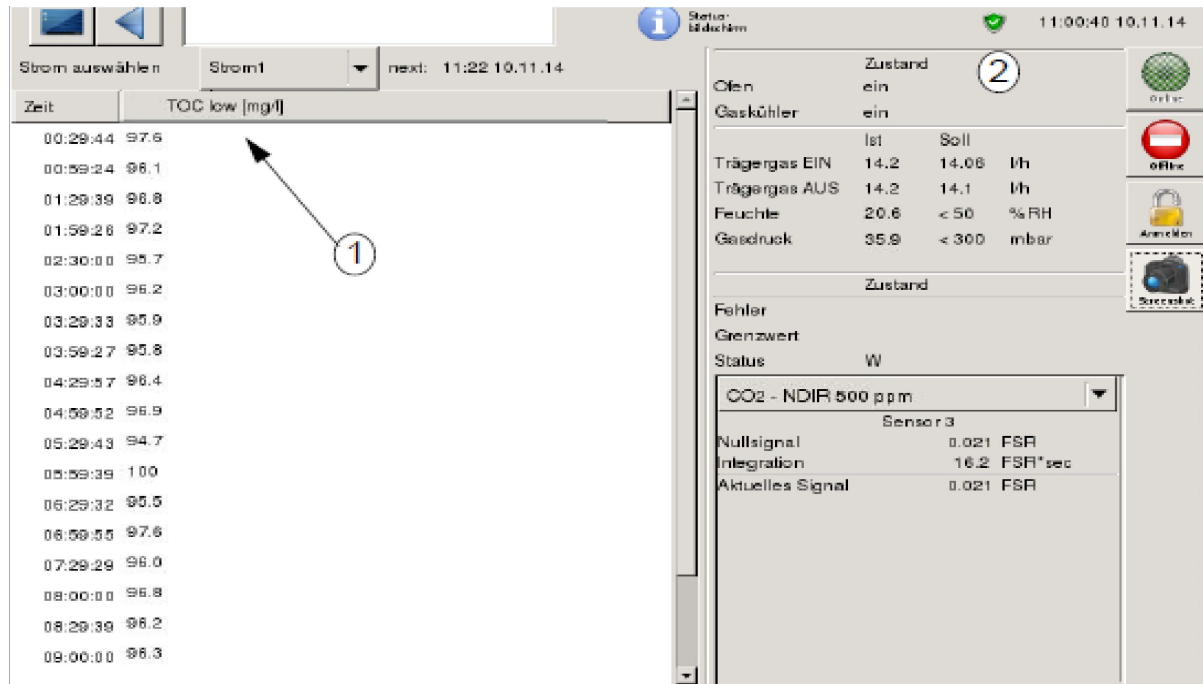


Fig. 100: Control state screen

To view the device status of the entire day (24-hour profile), go to the "Log" view and click on "Error" (Chapter 7.2.18 on page 117). For questions or help, please contact LAR AG Technical Support (Chapter 15.1 on page 183).

Tabelle 14: Control State

Status	Description	Possible cause	Action
Activity			
M	Measurement (dependent on streams, e.g. one stream analyser → M1)		
C	Calibration (dependent on streams, e.g. one stream analyser → C1)		
W	Waiting time (Time between two measurement modes)		
M&W	Short waiting time before each measurement (dependent on streams, e.g. one stream analyser → M1&W)		
S	Single measurement (dependent on streams, e.g. one stream analyser → S1)		
D	Auto-check - function (automatic calibration/validation using standards) (dependent on streams, e.g. one stream analyser → D1)		
P	Offline mode		
Limits			
L_min	Minimum limits (dependent on streams, e.g. one stream analyser → L1_min)		
L_max	Maximum limits (dependent on streams, e.g. one stream analyser → L1_max)		
Selection of instrument incidents			
E1810	Furnace emergency off	Furnace overheating	Check cable and controller → contact LAR technical support (9.2 on page 220)
E1815	Humidity emergency off	Relative humidity → > 60% or broken cable	Check the humidity and if necessary drainage the analyser → contact LAR technical support (9.2 on page 220)
E1820	Furnace deviation band alarm	Furnace too cold	Please wait until the furnace has reached the right temperature
E1830	Cooler deviation band alarm	Cooler temperature too hot	Please wait until the carrier gas flow (gas cooler) has reached the right temperature
E1833	Pressure is high	Pressure > 600mBar, furnace or filter blocked	Demount the reactor feed and check the end of the reactor (chapter 5.8, page 159 ff.)
E1835	Carrier gas flow deviation > -5%	Carrier gas flow is low	Find leakage!
E1836	TC carrier gas flow deviation > -5%	TC carrier gas flow is low	Find leakage!

Status	Description	Possible cause	Action
E1837	TIC Carrier gas flow deviation > - 5%	TIC carrier gas flow is low	Find leakage!
E1841	Injection error stream1	Injection of air, no sample	Check sample supply
E1842	Injection error stream2	Injection of air, no sample	Check sample supply
E1843	Injection error stream3	Injection of air, no sample	Check sample supply
E1844	Injection error stream4	Injection of air, no sample	Check sample supply
E1845	Injection error stream5	Injection of air, no sample	Check sample supply
E1846	Injection error stream6	Injection of air, no sample	Check sample supply
E1850	Limit of detector exceeded	Limit exceeded detector	Contact LAR technical support (chapter 10.2, page 156) or an authorized distributor.
E1851	Zero signal NDIR1 out of range	CO ₂ - detector 1 defective or soda lime pellets exhausted	Check detector cable and change soda lime pellets
E1852	Zero signal NDIR2 out of range	CO ₂ - detector 2 defective or soda lime pellets exhausted	Check detector cable and change soda lime pellets
E1853	Zero signal EC cell out of range	NO - detector defective	Check EC-detector cable
E1854	Zero signal oxygen detector out of range	CO ₂ - detector defective, leaking massflowpermaton	Check Zirox detector cable, if necessary adjust the signal
E1950	Sample missing (IN 05 digital input)	Sample is not available	Check sample supply
E1960	Reagents missing (IN 06 digital input)	Reagents are not available	Check/ Prepare reagents
E2128	Error when opening the furnace valve	Furnace valve defective	Contact LAR technical support (chapter 10.2, page 156) or an authorized distributor.
E2128	Error at the time of closing the furnace valve	Furnace valve defective	Contact LAR technical support (chapter 10.2, page 156) or an authorized distributor.
E2136	Error at the time of closing the furnace valve	Furnace valve defective	Contact LAR technical support (chapter 10.2, page 156) or an authorized distributor.

8 Care and Maintenance

Only minor effort is required to service and maintain the analyser. This section shows you the best way to look after your analyser to guarantee trouble-free operation. The documentation of maintenance and service work is a precondition for any warranty and guarantee claims, and also represents a valuable aid in locating resolutions when malfunctions occur (Chapter 10 on page 163).



Notice

The scope of analyser maintenance and care work depends on the application. All maintenance, care action and intervals, pertain to the most demanding of applications and are to be understood as recommendations from **LAR**.

Care and Maintenance:



Danger

Ex-Protection

Before servicing or repairing, turn on the bypass of the pressurized enclosure system on the right side.

Stay away from the analyser when an explosive atmosphere prevails. Maintain and repair the analyser only when it is ascertained that there is no explosive atmosphere around the analyser.

- Care measures are application-dependent and are recommended by LAR. The effort for maintenance work is about 30 minutes / week.
- Maintenance includes replacement of consumables and consumables. The cost of maintenance is about 5 - 10 min / week.
- After maintenance and servicing, some functional tests must always be performed to check analyser status



Notice

If you have any questions about maintenance and / or service, contact LAR Technical Support (Chapter 15.1 on page 267).

As part of customer support, **LAR** Technical Support offers **customizable maintenance contracts** and **device-specific training** to extend your know-how. Further information at: **www.lar.com**.

8.1 Overview of Regular Care and Maintenance Actions

The following maintenance schedule provides an overview of recommended and regular actions for caring and maintaining your analyser. Visual inspections are used to check the applicative need for care and maintenance actions.

8.1.1 Tightness Test

After replacement of components, e.g. a reactor tube, a tightness test should be performed.

1. To run this test, the "status screen" in user level 2 must be called.
2. Set the pressure to 0.5 bar via the pressure regulator.
3. The screen shows the carrier gas inlet on the right side of the screen. This value must be considered in this test all the time.
4. Bend off the black Viton hose (outlet of the radiator) with a hose clamp. The exam takes a few minutes. The flow (carrier gas inlet) must drop to <5 l / h. If this is not the case, contact LAR AG Technical Support.
5. At the end of the test loosen the kink in the hose and set the pre-pressure to 0.5 bar.

8.2 Protocol for Visual Inspection (Analyser)

Visual Inspection	Criteria	OK	Measures
Interval: 1 week			
Zero signal	<ul style="list-style-type: none"> 0 - 0,1 FSR 	<input type="checkbox"/>	<input type="checkbox"/> Check soda lime <input type="checkbox"/> Contact support
Carrier gas	<ul style="list-style-type: none"> Carrier gas on / off: ca. 13,5 - 15,5 l/h 	<input type="checkbox"/>	<input type="checkbox"/> Check fittings <input type="checkbox"/> Contact support
Injection system	<ul style="list-style-type: none"> no air bubbles in the glass 	<input type="checkbox"/>	<input type="checkbox"/> Rinsing
Glass components	<ul style="list-style-type: none"> no impurities 	<input type="checkbox"/>	<input type="checkbox"/> Cleaning
Canister and supply tubes	<ul style="list-style-type: none"> levels > 1 liter no impurities normale elasticity 	<input type="checkbox"/>	<input type="checkbox"/> Top up canisters <input type="checkbox"/> Clean canisters <input type="checkbox"/> Replace tube
Input and drain tubes	<ul style="list-style-type: none"> no impurities normal elasticity 	<input type="checkbox"/>	<input type="checkbox"/> Replace tube
Check inlet and outlet of the control unit for impurities	<ul style="list-style-type: none"> no impurities no corrosion 	<input type="checkbox"/>	<input type="checkbox"/> Contact support
Check ventilator for impurities	<ul style="list-style-type: none"> no impurities no corrosion 	<input type="checkbox"/>	<input type="checkbox"/> Clean ventilator
Interval: 3 months			
Injection tube	<ul style="list-style-type: none"> no impurities normal elasticity 	<input type="checkbox"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Replace tube
Tube cassette pump and sample pump	<ul style="list-style-type: none"> no humidity rollers run smoothly no impurities normal elasticity 	<input type="checkbox"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Set tubes forth <input type="checkbox"/> Replace tube <input type="checkbox"/> Contact support
Sample and pump tubes	<ul style="list-style-type: none"> no impurities rollers run smoothly 	<input type="checkbox"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Contact support
Viton tubes	<ul style="list-style-type: none"> no impurities normal elasticity 	<input type="checkbox"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Replace tube
Acid trap	<ul style="list-style-type: none"> at least 1/3 of the zinc is shiny at least 1/3 of the brass wool is yellow 	<input type="checkbox"/>	<input type="checkbox"/> Replace filling <input type="checkbox"/> Replace acid trap
Quartz wool filter	<ul style="list-style-type: none"> no humidity no discolorations 	<input type="checkbox"/>	<input type="checkbox"/> Replace filling <input type="checkbox"/> Replace filter
Date:		Signature:	

Proceed as follows:

1. In user level 2, call up the "Status screen" display.
2. Check if the zero signal is between 0 - 0,1 FSR.

3. If the signal is not within the permitted range, contact LAR Technical Support (chapter 11.1 on page 141).
4. Check the carrier gas flow. The volume flow at the input vein should have values between 13.5 - 15.5 l / h. Only during injection, the volumetric flows at the outputs can vary by ± 5 l / h. Normally, make sure that the volume flow at the outlet shows the same value as at the input. $V_{in} = V_{out}$ (13.5 - 15.5 l / h). Maximum deviation: 1 l / h.
5. Check all visual inspection items noted in the "Visual Inspection (Analyser) Protocol".
6. If the test criterion is fulfilled, proceed to the next step.

8.3 Care and Maintenance Tasks

8.3.1 Overview

Interval	Task	Task Type	Chapter
1 week	Visual inspection and analyser status check	Care	Chapter 8.2 on page 137
	Clean vessel for calibration fluid and replace calibration standard	Care	Chapter 8.3.3 on page 141
	Check pump tubes and clean if necessary	Care	Chapter 8.3.4 on page 141
	Check inlet and outlet of the control unit for impurities	Care	Chapter 8.3.5 on page 141
3 months	Check gas cooling pipes	Care	Chapter 8.3.8 on page 142
	Check pump cassettes and clean if necessary	Care	Chapter 8.3.9 on page 143
	Check the pump head rollers for ease of movement	Care	Chapter 8.3.4 on page 141
	Clean and grease bearing pin	Maintenance	Chapter 8.3.11.1 on page 144
	Perform calibration	Care	Chapter 8.3.13 on page 145
	Check and document a measurement	Care	Chapter 8.3.15 on page 146
6 months	Replace pump tubes and condensate tubes	Maintenance	Chapter 8.3.16 on page 146

Interval	Task	Task Type	Chapter
1 year	Replace reactor tube or change reactor filling (if necessary)	Maintenance	Chapter 8.3.17 on page 147
	Replace reactor seal (if necessary)	Maintenance	Chapter 8.3.18 from page 149
	Injection needle (if necessary) and tube for Replace injection needle	Maintenance	Chapter 8.3.19 from page 151
	Replace loop tubing	Maintenance	Chapter 8.3.19 from page 151
	Change sample drain tubes (if necessary)	Maintenance	Chapter 8.3.20 from page 152
	Replace quartz wool filling	Maintenance	Chapter 8.3.21 from page 152
	Replace pre-detector gas filter 0,1 µm	Maintenance	Chapter 8.3.22 from page 153
If necessary	Check the Viton hoses, clean or replace if necessary	Care	Chapter 8.3.23 from page 153

8.3.2 Actions

Use a copy of the "Care Protocol (Analyser)" for the care actions, which you will find in *Kapitel 13.3 auf Seite 178*.

Interval	Measure	Task completed	Notes
1 week	Check pump tubes and clean if necessary	<input type="checkbox"/>	
	Check inlet and outlet of the control unit for impurities	<input type="checkbox"/>	
	Check ventilator for impurities	<input type="checkbox"/>	

Interval	Measure	Task completed	Notes
3 months	Check reactor pipe end and clean if necessary	<input type="checkbox"/>	
	Inspection of the gas cooling pipes	<input type="checkbox"/>	
	Check pump cassettes and clean if necessary	<input type="checkbox"/>	
	Check the rollers of the pump head for ease of movement	<input type="checkbox"/>	
	Checking the measured values with standard solution	<input type="checkbox"/>	
	Check and document analyser status	<input type="checkbox"/>	
	Perform a measurement and check the values	<input type="checkbox"/>	
if necessary	Check viton tubes and replace if necessary	<input type="checkbox"/>	
Date:		Signature:	

Use a copy of the "Maintenance Protocol (Analyser)" for maintenance purposes, which you will find in Chapter 13.4 on page 179.

Interval	Measure	Task completed	Notes
3 months	Clean and grease bearing pin	<input type="checkbox"/>	
6 months	Replace pump tubes and condensate tubes	<input type="checkbox"/>	
1 year	Replace reactor tube or change reactor filling (if necessary)	<input type="checkbox"/>	
	Replace loop tubing	<input type="checkbox"/>	
	Change sample drain tubes (if necessary)	<input type="checkbox"/>	
	Change quartz wool filling	<input type="checkbox"/>	
	Replace the pre-detector gas filter 0.1 µ	<input type="checkbox"/>	
Date:		Signature	

8.3.3 Clean Vessel for Calibration Fluid and Replace Calibration Standard



Notice

First stop measuring mode with the "Offline" button before carrying out this monitoring and maintenance activity.

1. Renew the calibration standard weekly (with automatic calibration!) to prevent a change in the standard.
2. Discard the remainders of the old standard and rinse the container of the calibration standard carefully with deionised water. Establish the calibration standard according to the relevant regulations. Always use the same glass vessel for your calibration standard.

8.3.4 Check Pump Hoses and Clean if Necessary

1. Open the tube cassettes of the sample pump and check the tubing for contamination.
2. Clean the tubing from the sample inlet to the sample vessel.
3. Rinse the tubing with a wash bottle of deionised water.
4. Close the tube cassettes.

8.3.5 Check the Inlet and Outlet of the Control Unit for Contamination

Check the inlets and outlets of the control unit for contamination (oil, dust) and for corrosion. Contact LAR if you find contamination.

8.3.6 Check Ventilator for Contamination

1. Check the fan for contamination (oil, dust) and for corrosion. If contamination is found, cleaning must be performed
2. Clean the fan and blades with a dry, scum-free cloth.
3. Check the fan for ease of movement. If the fan does not run smoothly, contact LAR for replacement.

8.3.7 Check Reactor Foot and Clean if Necessary

1. Use heat-resistant gloves!
2. Disassemble the air vent on the bottom of the analyser by gently pulling the air vent forward with your hands (Figure 112, page 175). Loosen the maintenance door screws on the bottom of the analyser and remove the service door.
3. Undo the screws of the second bottom grid behind it and detach it. Now the reactor foot is visible.
4. Unscrew the four black spacer bolts (there are two for the high salt option).
5. Unscrew the three screws from the seating of the reactor foot.
6. Undo the screwed insert with teflon tube from the reactor foot seat.
7. Carefully pull the reactor foot from the reactor pipe end.
8. Use a 3.5 mm drill bit (1) to carefully drill into the reactor pipe (2) by hand [note: do not use a cordless or power drill].
9. Then use if required a bigger drill bit of maximum size 5.5 mm.
10. Manually drill into the reactor pipe all the way by hand to remove the deposits.
11. A drill bit is not necessary when the high salt option is used. Remove the deposits using a large

screwdriver.



Warning

Destruction of the reactor pipe filling

Never insert the drill or screwdriver deeper than 7 cm into the reactor tube.



Fig. 101: Manual cleaning of the reactor pipe with a drill bit

8.3.8 Check the Gas Cooler

The gas cooler is located in the lower part of the device behind the lower front panel.



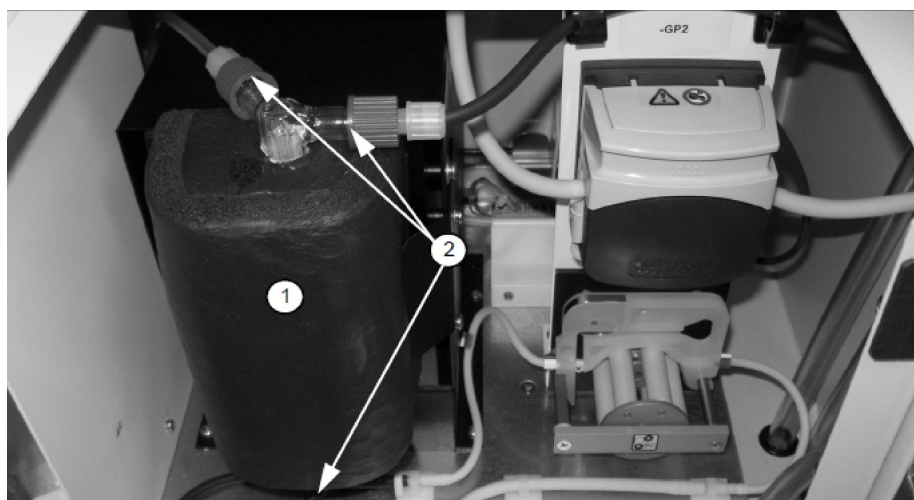
Warning

Warning about improper connection!

The analyser may give incorrect readings if the tubing of the gas cooling tube is reversed.

Mark the hoses before disassembling the gas cooler.

1. Unscrew the connectors with hose connections (2) to remove the gas cooler glass tubes (1).
2. After all connections have been removed, the glass heat exchanger can be carefully pulled up out of the guide.
3. After the heat exchanger or gas cooling tube has been pulled out of the cooler, the surface can be cleaned with a soft paper towel.
4. Rinse the gas cooling tube from the inside with deionised Water. Use a laboratory vial filled with deionized water or a disposable syringe. Rinse with deionised water in succession in the openings of the heat exchanger. If there are still contaminants in the heat exchanger after this flushing operation, a small bottle brush or pipe cleaner can be used for cleaning. If cleaning with demineralized water is not sufficient, glass cleaning agents can also be used. If cleaning agent is used, the gas cooling tube must be rinsed after cleaning with 200 ml of deionised water.
5. Dry the surfaces of the heat exchanger with a soft paper towel. The lateral hose connections of the heat exchanger are dried using a pipe cleaner. For cleaning of the gas cooling tube, a damp cotton cleaning cloth or a damp bottle brush can be used. The connectors of the gas cooler must not be cleaned with sharp objects, as otherwise the transition surface from the cooler to the gas cooler will be damaged.
6. Coat the outer surfaces of the gas cooling tube with silicon-free thermal compound.
7. Slide the gas cooling tube into the radiator receptacles.
8. Reconnect the hose connectors correctly.



- 1 Gas cooler
- 2 Tube connectors

Fig. 102: Gas cooler, view from above

8.3.9 CleanTube Cassette Pump and Pump Cassettes

Precondition: - Tube cassette pump and/or pump cassettes are contaminated.

1. Take the pump cassettes from the pump.
2. Take the tubes from the pump cassettes.
3. Clean the pump and the pump cassettes.
4. Fit the tubes into the pump cassettes.
5. Insert the pump cassettes into the pump.

8.3.10 Clean Sample Pump

Precondition: - Sample pump is contaminated.

1. Open the pump head.
2. Take the tube from the sample pump.
3. Use a paper cloth and a little water to clean the pump rollers.
4. Whilst cleaning the rollers, rotate them by hand so that everywhere can be cleaned.
5. Insert the pump tube back in.
6. Close the pump head.

8.3.11 Adjust Sample Pump

Precondition: - Sample pump not adjusted correctly.

1. Open the pump head all the way (the cover must be vertical).
2. Turn the adjustment wheel on both sides (left and right) so that the setting value is 3.2 or 4.8 depending on the tube used.

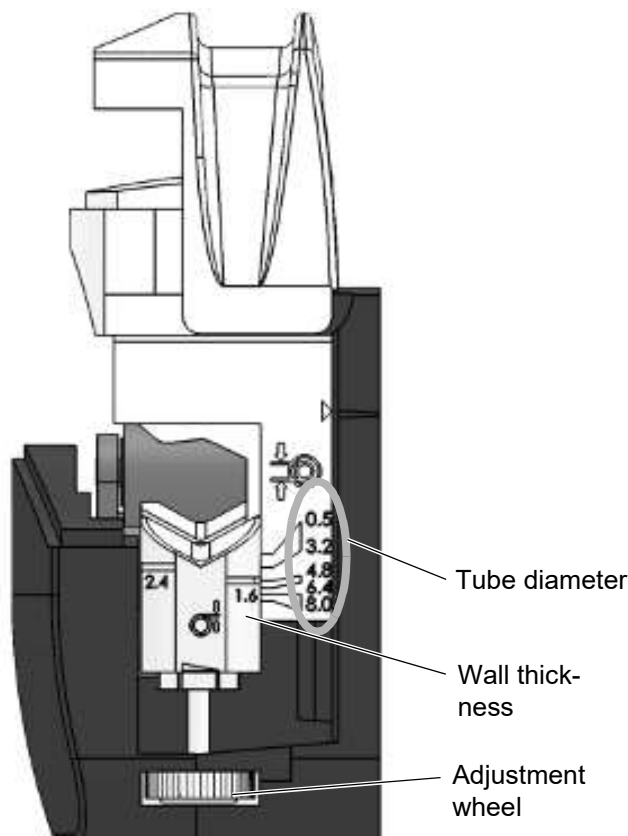


Fig. 103: Sample pump Adjustment



Warning

Reduced delivery rate of the pump

Deviating settings can cause poor pump performance and incorrect results.

Adjust the pump head according to the application and to the correct hose diameter.

8.3.11.1 Clean and Grease Bearing Pin

3. Turn off the pump.
4. Remove the screws on both sides of the pump cassette.
5. Remove the metal sheet with the bearing pin and clean the bearing pin with a non-abrasive cloth.
6. Coat the bearing pins with grease.
7. Screw the sheet to the pump.
8. Check with your fingers if the rollers are running smoothly.
9. Switch on the pump.

8.3.12 Checking Measurement Values of the Standard Solution

1. Use a standard solution or use a ready-made standard solution from a certified laboratory.
2. Place the standard solution in a clean calibration vessel and place the vessel in the appropriate position for incorporation into the sample stream.
3. Measure the standard solution (screen mask "Single measurement", see Chapter 7.2.13 on page 109). In the measured value screen (see Chapter 7.2.9 on page 104) in user level 1 and in the single measurement screen in user level 2, the measured values of the standard solution can

be checked.

4. Start the measurement to complete the check

8.3.13 Perform a calibration

See Chapter 7.3.11 from page 127.

8.3.13.1 Perform a Gas Calibration

1. Please check the stability of the carrier gas flow in the status screen.
2. Make sure that the injection system of the injection loop has also been previously cleaned with calibration gas.
3. Choose the Calibration Gas Concentration in Dependence of the Measuring Range of NDIR Detectors:

Tabelle 15: Gas Calibration

NDIR [CO ₂]	Calibration Gas
50 ppm	450 ppm
150 ppm	
500 ppm	1500 ppm

4. Open the main valve on the calibration gas cylinder and set the secondary pressure between 0.5 and 1 bar. The internal pressure regulator (KH8) of the QuickTOC_{purity} is set to 0.2 bar. In the status screen (user level II) the system pressure is displayed with approx. 200 mbar.
5. In user level II, enter the following values in the "Measurement parameters" screen:

Measurement Parameters

Gasmeasurement ▼

Purgetime with Gas: 10 sec

Cleaning time: 1 sec

Replicates of cleaning cycle: 5

Filling time: 5 sec

Injectiontime testgas: 5 sec

Filling time carriergas: 5 sec

Injectiontime carriergas: 5 sec

6. In User Level II, go to the "Perform Calibration" screen on the drop-down menu and select "Gas Calibration".

7. Enter the gas calibration values in ppm in the far right box.

Calibration Carry Out

with gas 3Calibrationsolution Max CV [%] 2 test gas concentration 450

TC Stream 1

Solution	Check	Conc.	Result	Check
Solution 1	<input checked="" type="checkbox"/>	1	241.35	<input checked="" type="checkbox"/>
Solution 2	<input checked="" type="checkbox"/>	5	1206.7	<input checked="" type="checkbox"/>
Solution 3	<input type="checkbox"/>	10	2413.5	<input type="checkbox"/>

8. Select the calibration points (at least three calibration points) and the number of injections for each calibration point. The different concentration results depend on the number of loop injections. The software automatically calculates the concentration for each calibration point in ppb.
9. Start calibration in user level II - "Perform calibration". The analyzer automatically executes all selected calibration points.

8.3.14 Check and Document the Status of the Analyser.

See Chapter 8.2 from page 137.

8.3.15 Check and Document a Measurement

1. Check the temperatures or displays in the device status. The instrument will only take measurements when the furnace has reached the working temperature of 1200° C and the radiator has reached its operating temperature between 4 and 5° C.
2. Check the carrier gas pressure on the indicating instrument. The setpoint is 0.3-0.5 bar.
3. Check the volumetric flow in the status screen in idle state, e.g. V_{on} : 10-50 l / h, V_{off} : 10-50 l / h. $V_{on} = V_{off}$. At 15 l / h input value, the setpoint for the output is also 15 l / h.
4. Only during the injection may the output value have a deviation of up to 5% from the input value.

8.3.16 Replace Pump Tubes and Condensate Tubes

1. Switch off the pump (user level 2, screen window Service Actions, see Chapter 7.2.12 on page 106).
2. Take the pump hose out of the pump on both sides and insert a new, same hose into the pump.
3. Continue until all pump hoses have been replaced.
4. Switch on the pump and press the "End maintenance" button (user level 2, screen window Service Actions, see Chapter 7.2.12 on page 106).
5. After this maintenance work, the measurement can be restarted.

8.3.17 Replace Reactor Pipe or Reactor Pipe Filling

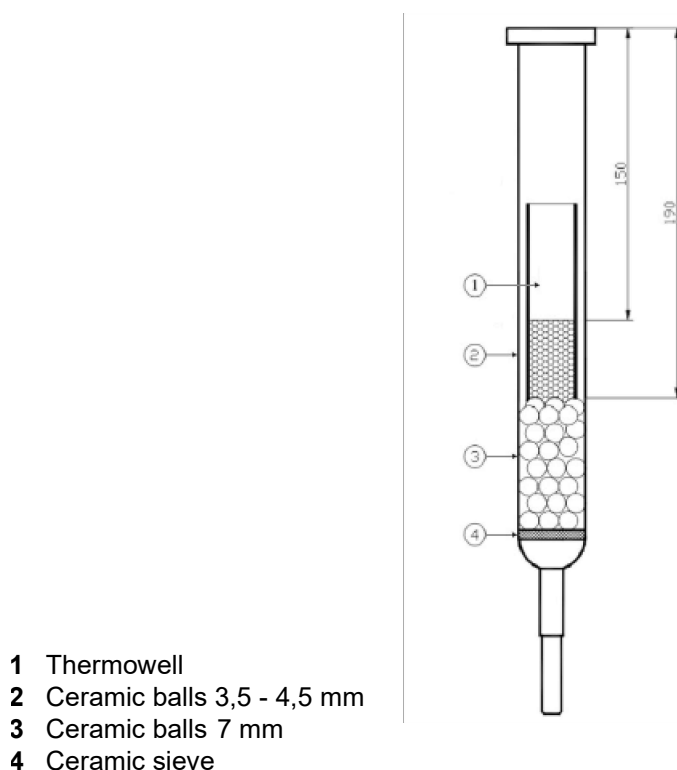


Fig. 104: Reactor filling



Danger

Danger of burns

Allow the furnace to cool completely (2 hours in total). One hour after switching off the furnace, the temperature of the reactor tube is still about 400° C to 500° C!

Always use heat-resistant gloves when working on the furnace.



Warning

Correct installation of removed components

During assembly, remember that all parts that have been removed and / or disassembled must be reassembled as they were in their original condition.

Disassembly:

1. Switch off the oven via the "Service Actions" display (Chapter 7.2.12 on page 106) and allow it to cool down for 2 hours.
2. Open the maintenance flap on the bottom of the analyser.
3. Unscrew the three screws from the socket of the reactor base.
4. Loosen the screwed connection with Teflon hose from the reactor foot receptacle.
5. Carefully pull the reactor foot off the reactor tube end and lay it to one side.
6. Disconnect the injection port connector.
7. Carefully loosen the three screws of the oven head one after the other crosswise.
8. Disconnect the hose from the hose connection.

9. Remove the furnace head and injection port from the reactor tube and set aside.
10. Make sure the furnace head, injection port, and reactor foot are removed.
11. After cooling the oven (about 2 hours), pull the reactor tube out of the oven. Use heat-resistant gloves.
12. Place the reactor tube on a fireproof pad or place it with the taper down in a sand-filled bucket and allow to cool completely.

Replacement:

1. If the reactor tube is damaged, replace it with a new reactor tube.
2. Observe the order of filling the reactor tube.
3. Place the ceramic sieve (4, Abb. 104, Seite 147) horizontally on the taper of the reactor tube or let it fall into the reactor tube.
4. Shake the reactor tube to bring the ceramic sieve into a horizontal position (you can use a flashlight to check placement).
5. Carefully insert the protective tube (1) from above into the reactor tube.



Warning

Damage due to improper filling

Incorrect filling of the reactor tube can damage the reactor tube.

Use a funnel to fill the ceramic balls so that the ceramic balls do not fall between the reactor tube and the protective tube.

6. Fill the ceramic balls with a diameter of 7 mm (3) to the specified height (190 mm, measured from the top edge with a measuring tape).
7. Fill the ceramic balls with a diameter of 3.5 mm - 4.5 mm (2) to the specified height (150 mm, measured from the upper edge with a tape measure).

Assembly:

1. Place the green protective gasket for the reactor tube on the furnace.
2. Push the filled reactor tube into the center of the oven from the top.
3. Place the oven head on the oven and reactor tube.
4. Connect the black hose to the intended hose connection.
5. Screw the three fixing screws of the furnace head with the oven head plate crosswise.
6. Carefully tighten the injection port until a slight resistance is felt (the injection port should point diagonally to the left front).
7. Insert the plug of the injection port again.
8. Attach the reactor foot receptacle to the reactor foot plate with three M4x30 screws.
9. Connect the Teflon tube (PFA) to the screwed connection.
10. Screw the screwed connection to the reactor foot receptacle.
11. Insert the reactor bottom from below onto the reactor tube.
12. Screw in the distance bolts (4x).
13. Pull the reactor bottom down so that the gas path is not blocked by the reactor tube.
14. Attach the floor grate again.
15. Reinstall the maintenance flap.
16. Dispose of the old reactor tube filling and, if necessary, the old reactor tube.
17. Switch on the oven via the "Service actions" display (*Kapitel 7.2.12 ab Seite 106*).

**Notice**

The reactor tube filling shown in Abb. 104, Seite 147 is an excellent solution for the majority of applications.

However, some applications can be optimized by varying the listed default fill. Any deviations from the standard filling should be discussed in advance with LAR Technical Support or with a LAR authorized service partner.

As our research and development progresses, we ask that you stay in touch with your LAR contact to stay up-to-date with any additions

8.3.18 Replace Reactor Seal

**Danger****Danger of burns**

Allow the furnace to cool completely (2 hours in total). One hour after switching off the furnace, the temperature of the reactor tube is still about 400° C to 500° C!

Always use heat-resistant gloves when working on the furnace.

**Warning****Correct installation of removed components**

During assembly, remember that all parts that have been removed and / or disassembled must be reassembled as they were in their original condition.

Disassembly:

1. Switch off the oven via the "Service Actions" display (Chapter 7.2.12 on page 106) and allow it to cool down for 2 hours.
2. Disassemble the ventilation grille on the bottom of the analyser by carefully pulling it forward with your hands.
3. Loosen the maintenance flap screws on the bottom of the analyser and remove the service cover.
4. Loosen the screws of the second floor grate behind and take it off. Now the reactor foot is visible.
5. Unscrew the four black spacers.
6. Unscrew the three screws from the socket of the reactor base.
7. Loosen the screwed connection with Teflon hose from the reactor foot receptacle.
8. Remove the reactor foot carefully from the reactor pipe.

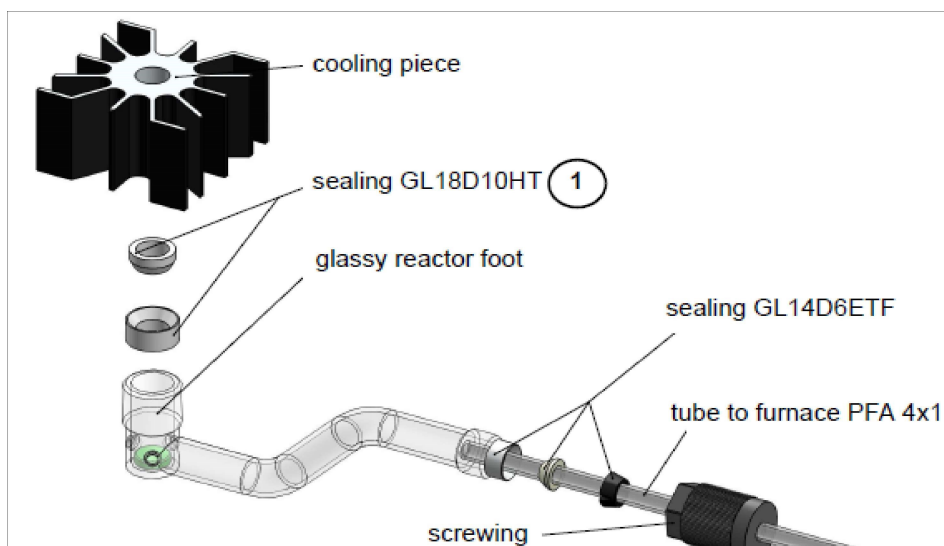


Fig. 105: Reactor foot with cooler

9. Remove the two gaskets (1, Fig. 105, page 150) between the furnace base and heat sink.
10. Clean the base of ash and dirt with a damp cloth and insert two new gaskets.
11. Attach the heat sink to the oven base.
12. Disconnect the injection port connector.
13. Carefully loosen the three screws of the oven head one after the other.

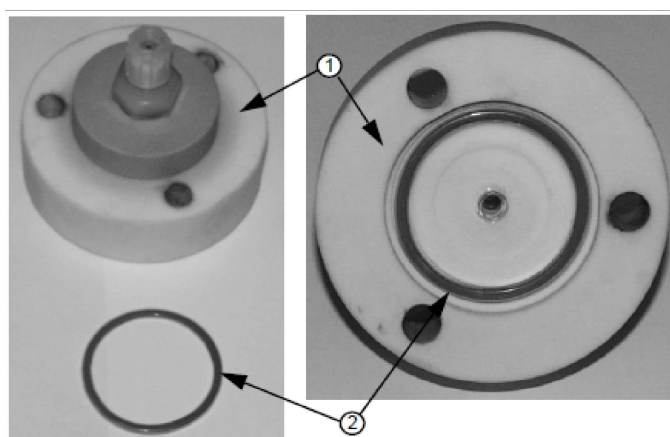


Fig. 106: Furnace head with furnace head seal

14. Remove the gasket (2) from the furnace head (1) with tweezers.
15. Insert a new furnace head gasket into the groove of the furnace head.
16. Disconnect the hose from the hose connection.
17. Remove the furnace head and injection port from the reactor tube and set aside.
18. Make sure the furnace head, injection port, and reactor foot are removed.
19. After cooling the oven (about 2 hours), pull the reactor tube out of the oven with heat-resistant gloves.

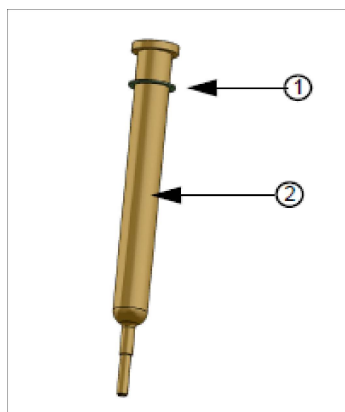


Fig. 107: Ractor pipe

20. Place the reactor tube (2) on a fireproof pad or place it with the taper down in a sand-filled bucket and allow to cool completely.
21. Remove the protective gasket (1) and replace the gasket with a new gasket.

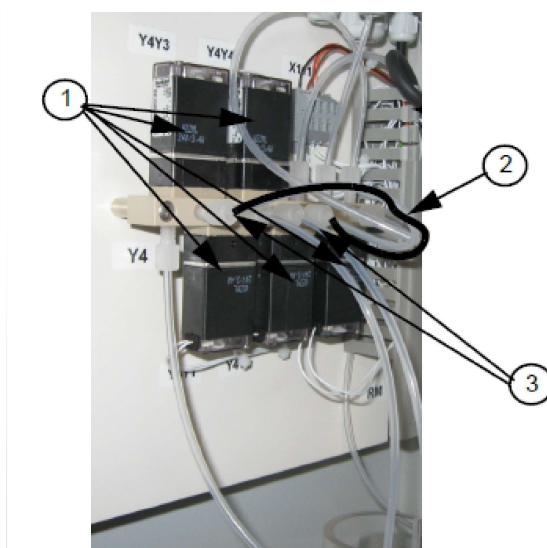
Assembly:

1. Insert the filled reactor tube (2) from the top into the center of the furnace.
2. Place the oven head on the oven and reactor tube.
3. Connect the black hose to the intended hose connection.
4. Screw the three fixing screws of the furnace head with the oven head plate crosswise.
5. Carefully tighten the injection port until a slight resistance is felt (the injection port should point diagonally to the left front).
6. Insert the plug of the injection port again.
7. Attach the reactor foot receptacle to the reactor foot plate with three M4x30 screws.
8. Connect the Teflon tube (PFA) to the screwed connection.
9. Screw the screwed connection to the reactor foot receptacle.
10. Insert the reactor bottom from below onto the reactor tube.
11. Screw in the distance bolts (4x).
12. Pull the reactor bottom down so that the gas path is not blocked by the reactor tube.
13. Attach the floor grate again.
14. Reinstall the maintenance flap.
15. Fasten the ventilation grille again.
16. Switch on the oven via the "Service actions" display (Chapter 7.2.12 from page 106).

8.3.19 Loop System Tube

The loop system is located on the left above the ceramic oven.

1. Loosen the hose connectors (3) of the loop hose (2) on the two solenoid valves (1).
2. Cut a new tube as required (50, 100, 200 or 400 µl).
3. Attach the new loop hose to the hose connectors (3).



- 1 Solenoid valves
- 2 Loop tube
- 3 Connectors

Fig. 108: Loop system

8.3.20 Check Sample Drain Tubes and Replace

1. Check the sample drain tubes for brittleness and elasticity. If the tubes are brittle or inelastic, the hoses must be changed.
2. Loosen the cable gland and compression fitting on the device..



Warning

Correct disassembly and assembly of components

When removing hoses from the sample glass sample container, make sure that it is not damaged.

Do not grease hoses during assembly!

3. Using a sharp knife, cut the other end of the tube into the sample storage vessel and remove the tube from the sample storage vessel.
4. Slide a new tubing onto the drain of the sample storage vessel.
5. Attach the other end of the hose to the unit using the cable gland and compression fitting.

8.3.21 Check Quartz Wool Filter and Replace if Necessary

1. Call the Status Screen and make a note of the actual pressure value.
2. Take the quartz wool tube out of the holder.
3. Loosen the upper and lower screws.
4. Take the used quartz wool out of the tube.
5. Fill the pipe with new quartz wool. When filling, make sure that the pipe at the bottom is loosely filled with quartz wool at the top and that there is no quartz wool at the top of the pipe.
6. Clean the red fittings of any deposits.
7. During assembly, make sure that the black O-ring is securely in the groove provided in the screw connection.
8. Put the quartz wool tube back in the holder.

9. After installing the freshly filled quartz wool filter, the status screen must be recalled. The pressure value [mbar] should not deviate too much from the previously read pressure value.
10. Insert a new tube of the same length into the sample pump.

8.3.22 Replace Gas Filter

The gas filter is located behind the control panel in front of the detector.

1. Open the clamp at the top right where the gas filter (2) is attached.
2. Disconnect the connection hoses (1) of the gas filter from the connections.
3. Pay attention to the direction of the volumetric flow (see black arrow).
4. Insert the new gas filter (2).
5. Pull the connecting hoses (1) of the gas filter onto the connections.
6. Close the clamp.

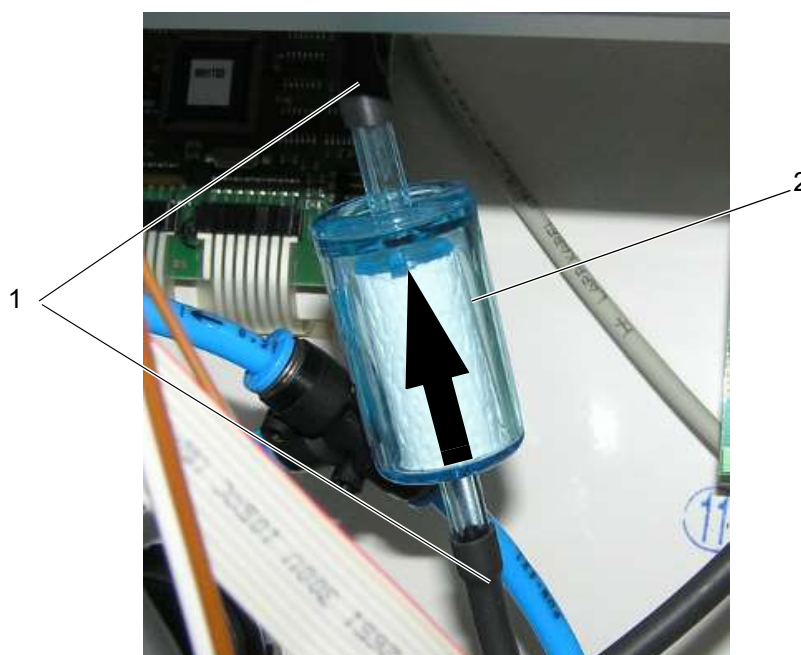


Fig. 109: Gas filter

8.3.23 Check Viton Tubes and Replace if Necessary

The Viton tubes are black and are located on the gas cooler.

1. If the visual inspection results in a lining or blockage inside the tube, it must be cleaned or replaced.
2. Clean the hose with deionised water and a pipe cleaner in a laboratory flask. If the hose is too dirty, it should be replaced.
3. Remove the hose from both sides of the device and insert a new, identical Viton tube. This allows the hoses to be replaced one after the other.

9 Accessories and Options

In this section you will find illustrations for and explanations of components you can select as accessories or options for the analyser.

9.1 Overview

Accessories:

- Mounting rack

Options:

- Multistream option
- Multiparameter option)

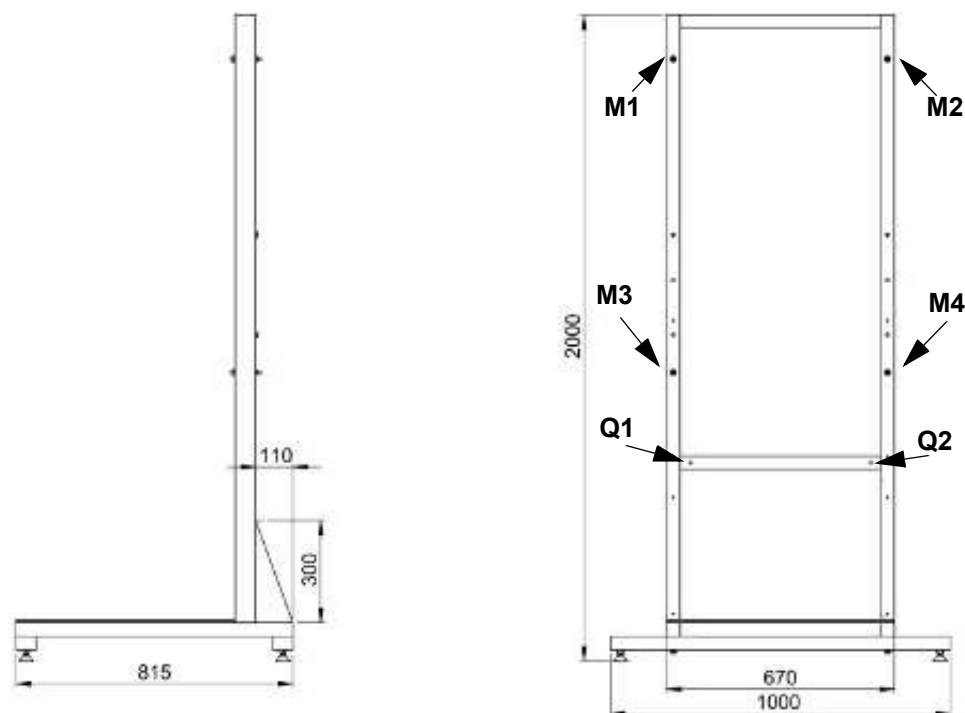


Notice

If you have any questions, contact the **distributor of LAR** (Chapter 15.1 on page 183).

9.2 Mounting Rack

The analyser can be supplied with an optional LAR mounting rack.



M1 - M4: Holes for the fixing of the Analyser

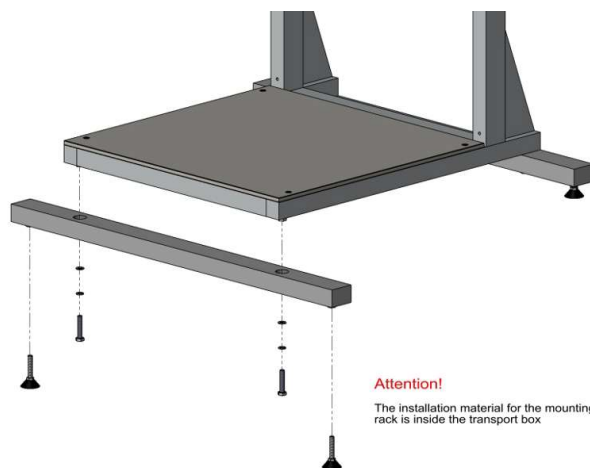
Q1 - Q2: Holes for the fixing of the Ambient Air Preparation Unit / Reagent Cabinet

Fig. 110: LAR Mounting Rack



Warning

The LAR mounting rack is not fully assembled on delivery. The cross braces and adjustable feet of the installation rack must be fitted before the installation.



Attention!

The installation material for the mounting rack is inside the transport box

Fig. 111: Mounting of the LAR Mounting Rack

The following installation dimensions must be observed:

min. 1,070 x 2,000 x 1,420 mm (W x H x D)



Warning

The distance to side and opposing walls must be kept so that the analyser can be swivelled open.

If you do not have access to a forklift or lifting equipment, the analyser should be fitted by at least four people.

Recommendations for installation on the LAR mounting rack:

- The simplest method is to lay the analyser in the horizontal (flat) position after pre-assembly onto the similarly horizontal LAR installation rack and secure it with four M8 bolts (M1 - M4). It is then raised into the vertical position using lifting equipment (or a crane).
- In the second method, the analyser is mounted directly onto the vertical LAR rack using the M8 bolts. The weight of the analyser means lifting equipment or a forklift is required for this variant. First, screw two bolts into the upper holes of the rack so they protrude by about 15 mm. Then hook the analyser into these bolts with the mounting eyes, and lower it until the rear part of the housing is resting against the rack. Then screw the bottom bolts through the mounting eyes into the LAR rack, and tighten all the bolts.

9.3 Multi Parameter Option

The analyser may measure multiple parameters with single sample streams. This can be factory-set or be upgraded later.

The analyser can be fitted with up to four detectors for this option. The parameters can also be set for every sample stream and channel.

The parameters can be measured are:

- TOG = Total Organic Carbon
- TIC = Total Inorganic Carbon
- TC = Total Carbon (TOG + TIC)
- COD = Chemical Oxygen Demand
- TN_b = Total Nitrogen bound



Notice

Please contact the **Sales Department of LAR** if you are interested in upgrading to this option (Chapter 15 on page 183).

9.4 Multi Stream Option

The analyser may measure up to six sample streams in succession. Each sample stream is equipped with a sample vessel and pump. The parallel switchover means that during the measurement cycle of one sample the preparation of the next sample starts thus there are no measurement delays.



Notice

For optimal operation, LAR recommends a maximum of four sample streams. This ensures that calibration of the analyser and rinsing of the injection needle can be automatic without any additional effort.



Caution

For an analyser with five sample streams, there is only one position left for calibration vessel or rinsing vessel. This position may have to be swapped with the calibration or rinse vessel depending on requirement. Only one place is available for one of the vessels.

For an analyser with six sample streams, six sample vessels take up all the space for vessels (V1-V6). For a calibration, the first vessel must be removed from the position and be replaced by a calibration vessel. Before a calibration can be performed, the positioning must be checked on the „Test Run“ display. To rinse the injection needle, a sample preparation vessel must be defined, at best in one in which no repeat measurements take place and preferably low concentrations are present.

10 Minor Disruptions - Quickly Solved

10.1 Preconditions for Fault-Free Measurement Mode

If disruptions of your analyser occur during measurement mode and the causes are not entirely obvious, please check the following:

1. Ambient conditions

The ambient temperature must be within the range permitted. The relative humidity should be below 80% (not condensing).

2. Chemicals used

It is advisable to renew all chemicals and calibration standards when you notice that readings or reproducibility are/is being severely impacted. Contamination of phosphoric acid, hydrochloric acid, rinsing water and calibration standards can severely impact measurement results and reproducibility. To prevent gas from forming in the injection system, it is important to acidify the rinsing water of the needle to pH3.

3. Configuration of the Software

If there are questions about the configuration, note the system parameters and please contact your local partner or the Technical Support of LAR (Chapter 15 on page 245). A USB stick may be used to store screenshots generated with the Screenshot button (which show system parameters for example).

4. Autostart in Case of a Power Cut

After a power outage, the analyser automatically performs an Autostart. If the analyser was performing a measurement at the time of the power outage, the analyser continues the measurement. The Autostart can be prevented by pressing the red "Offline" button. If the temperature of the furnace drops so much during a power outage that it is no longer within the temperature tolerance, the furnace is, after the Autostart, first heated until it has reached its target temperature. Only then the measurement will be continued.

5. Storage of the Analyser in Dry Conditions which are protected from Frost

The analyser must be stored under dry conditions, protected from frost. The period of storage should not exceed 6 months.

10.2 Breakdowns

This section provides information on and solutions for possible malfunctions with the measurement system. Possible causes and actions are listed in the following table - the problem type is used as an indicator. If you have questions, please contact your local partner or the Technical Support of LAR (Chapter 15 on page 245).

Table 16: Troubleshooting

Problem	Possible cause	Actions
Analyser does not start after connecting the power supply plug and switching the main switch to „ON“	<ul style="list-style-type: none"> No voltage No power 	<ul style="list-style-type: none"> Check the fuses (Chapter 10.3 on page 165). Switch on if necessary.
Software does not start/ Screen is black	<ul style="list-style-type: none"> Main switch off Blown fuse(s) 	<ul style="list-style-type: none"> Switch on the analyser using the main switch on the left side of the analyser. Check the fuses (Chapter 10.3 on page 237).
Cooler temperature is too low or high	<ul style="list-style-type: none"> Ambient temperature is too low or high Cooler fuses are blown Cooler is out of order 	<ul style="list-style-type: none"> Ensure the ambient temperature is between 5 °C - 35 °C. Replace the fuses Contact your local partner or the Technical Support of LAR (Chapter 15 on page 245)
Furnace temperature is too low or high	<ul style="list-style-type: none"> Furnace fuse is blown Connecting cable is defective Furnace is defective 	<ul style="list-style-type: none"> Switch on the fuses Check the connections Contact your local partner or the Technical Support of LAR (Chapter 15 on page 245)
The difference of temperature and temperature regulator is more than 10°C	<ul style="list-style-type: none"> Thermocouple is not at the right position or defective 	<ul style="list-style-type: none"> Contact your local partner or the Technical Support of LAR (Chapter 15 on page 245)
Calibration values are not plausible	<ul style="list-style-type: none"> Calibration standard empty or prepared false 	<ul style="list-style-type: none"> Produce a new calibration standard Perform a new calibration
Measurement values sway strongly	<ul style="list-style-type: none"> Sample vessels are contaminated High particle density Bubbles in the injection system System leaky 	<ul style="list-style-type: none"> Clean sample vessels Check injection system (glass syringe) Check tightness and rectify leaks
Measurement cannot start	<ul style="list-style-type: none"> Temperature of cooler or furnace is not in the allowed range Analyser is in maintenance mode Purge air is not connected No ex-protection triggered on the control unit 	<ul style="list-style-type: none"> Check the temperature of the cooler and the furnace Check tubing and connections of the purge air circuit Check the control unit

Table 16: Troubleshooting

Problem	Possible cause	Actions
Error E1810 is shown	<ul style="list-style-type: none"> Emergency shutdown of the furnace Error in the position of the injection system 	<ul style="list-style-type: none"> Contact your local partner or the Technical Support of LAR (Chapter 15 on page 245) immediately!
Needle is dripping	<ul style="list-style-type: none"> Injection system leaky 	<ul style="list-style-type: none"> Check the tubing of the injection system. Contact your local partner or the Technical Support of LAR (Chapter 15 on page 245)
Injection needle does not hit the needle guide of the furnace or other x-positions	<ul style="list-style-type: none"> Positions have been altered due to maintenance or care actions 	<ul style="list-style-type: none"> Perform a test run and adjust the injection positions (Chapter 7.2.13 from page 92).

10.3 Check the Fuses - Automatic Circuit Breaker

A measurement must be ended and the analyser switched off (main switch) before a fuse can be checked or replaced. Unlock the housing using the key. The automatic circuit breaker is on the rear installation plate (Fig. 14, page 18). If a fuse has blown, tilt the lever back up to its original position.

Table 17: Check the Fuses

Fuses	115 V AC Power Supply	230 V AC Power Supply
Analyser (F1)	8 A Type K	8 A Type K

The cooler has 2 x internal 5 AT fuses, which can be checked and/or replaced by unscrewing them from the back of the plate on the cooler when the rear housing part is opened.



Caution

If a fuse blows again when the analyser is switched on, please contact **your local partner** or the **Technical Support of LAR** (Chapter 15 on page 245).

10.4 Breakdowns of the Temperature Regulator

Your analyser is fitted with a high temperature furnace which facilitates conversion in full of the carbon contained in the sample to CO₂ without catalysts. The target temperatures of the furnace regulators are factory-set and password-protected.

The programming of the temperature regulator may not be changed. If you have questions, please contact your local partner or the Technical Support of LAR (Chapter 15 on page 245).

Target temperature ranges of the individual units of the analyser:

- Temperature Furnace: 1,180°C – 1,250°C
- Temperature Cooler: 4°C – 5°C

Table 18: Error message of the temperature regulator

Display	Description	Troubleshooting
9999 (blinking)	No connection between temperature element and regulator.	<ul style="list-style-type: none"> • Check the electrical connections, renew the thermocouple if required. • If the temperature regulator is still inactive after the thermocouple is replaced, go to display "Service actions" (Chapter 7.2.11 on page 86) and activate „furnace“.



Fig. 112: Temperature Regulator on the Front Plate

11 Technical Data



Notice

All graphic, electronic or mechanical changes intended for technical progress are reserved.

11.1 Specifications

Tabelle 19: Analyser specifications

Type	Dimensions/Description
Housing	Explosion protected housing, stainless steel (IP65), Certification ATEX EX II 3G Ex pz II T3 or EX II 3G Ex pz II T4
Type of explosion protection	Overpressure encapsulation with rinse
Dimensions of the analyser (W x H x D)	T3 Configuration: 920 x 1.060 x 635 mm (W x H x D) T4 Configuration-Konfiguration: 1.010 x 1.060 x 635 mm (W x H x D)
Housing volume	1 Channel 300 l 6 Channels 360 l
Weight	from approx.. 160 kg (depending on the configuration)
Mains voltage (see specifications on the type plate)	115/230 V/AC at 50/60Hz Fusing minimum 16A (K-characteristics)
Power input	approx. 1,2 KW
Signal outputs	Number: depending on configuration 2 - 33 analog outputs Warning: Each analog output is galvanically isolated from the other analog outputs and the analog outputs are galvanically isolated from the housing. 0 – 20mA or 4 – 20mA max. load 500 Ohm
Interface	serial interface RS 232
Noise level	max. 70 dB
Potential-free contacts	8 programmable relays (NO or NC) Voltage: max. 24 V=, 24V~ Amperage: max. 1 A=, 1A~
USB interface	USB 2,0
Display	10,4" resistive Touchscreen, TFT Display
Carrier gas consumption	Standard: approx. 30 l/h (Nitrogen 5.0)
External air supply(optional)	Dew point max. -5°C
Digital inputs	8 digital inputs

11.2 Ambient Conditions

Tabelle 20: Ambient conditions

Type	Dimensions/Description
Temperature	min. 10°C - max. 42°C
Humidity	max. 80%
Dimensions (wall mounting))	min. 1.030 x 1.760 x 1.210 mm (W x H x D)
Dimensions (LAR mounting rack)	min. 1.070 x 2.000 x 1.440 mm (W x H x D)

11.3 Specifications for Accessories and Options

Tabelle 21: Specifications for accessories and options

Type	Dimensions/Description
Carrier gas treatment	approx. 630 x 500 x 100 mm (W x H x D);
Dimensions of the LAR mounting rack	ca. 1.000 x 2.000 x 815 mm (W x H x D); Weight approx. 65 kg

12 Flow Diagrams

The analyser can be operated with different configurations and methods. Furthermore, several methods can be used in an analyser.



Notice

If you have any questions, contact LAR Technical Support (Chapter 15.1 on page 183).

12.1 Component Labelling

Tabelle 22: Component labelling

Component	Labeling
Detector	B
Sensor	BF
Humidity sensor	BM
Pressure sensor	BP
Acid container	CM
Furnace and reactor	EB
Cooler	EC
Pump	GP1
Filter	HG
Acid trap	HS
Regulator	KH
Filter	HQ
Non-return valve	RM
Valve	Yx

12.2 TC-Only Method (1 Sample Stream)

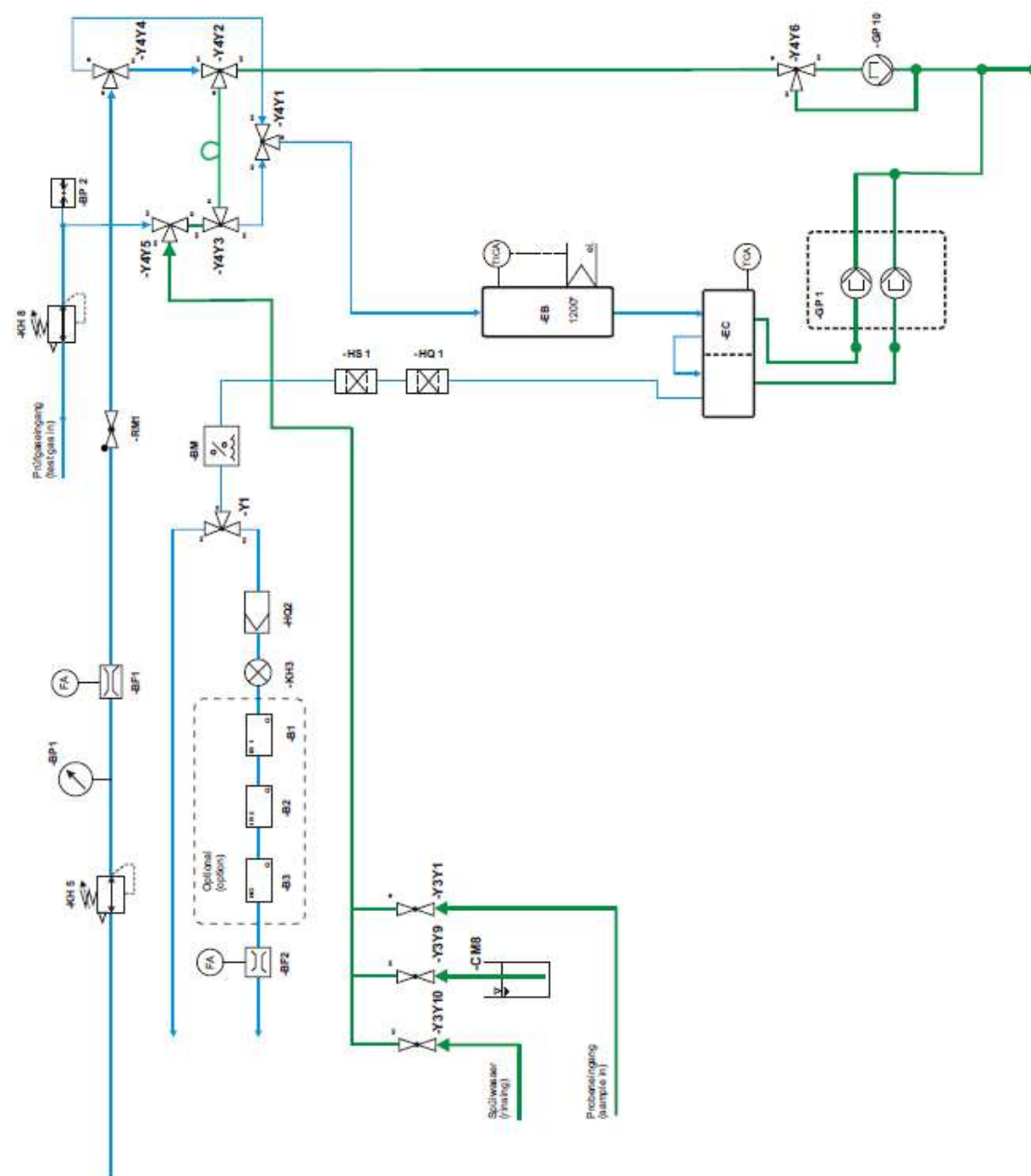


Fig. 113: Flow diagram for TC-Only Method (1 Sample stream)

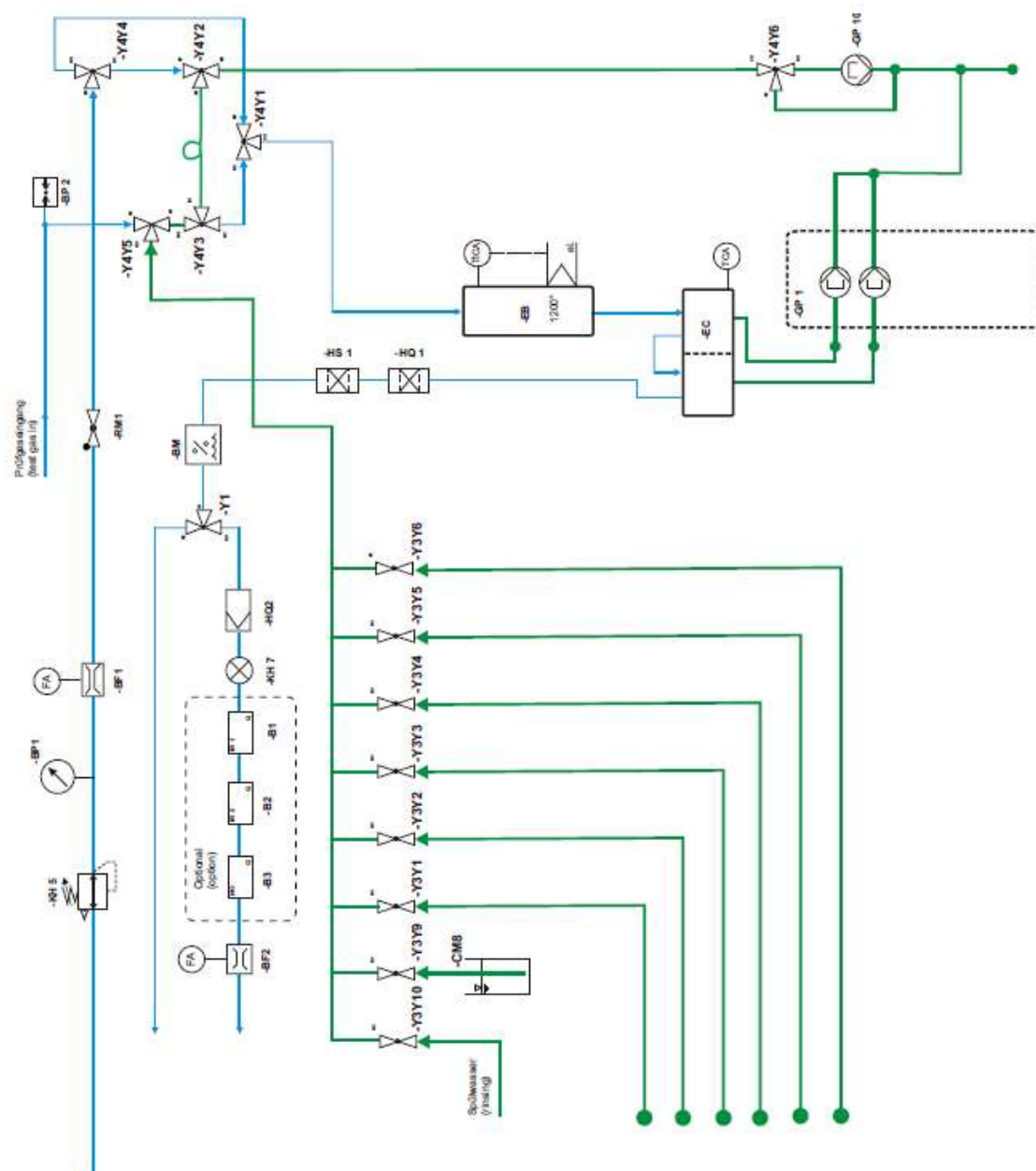


Fig. 114: Flow diagram for TOG-Difference Method (3 Sample streams)

12.4 NPOC Method (1 Sample stream)

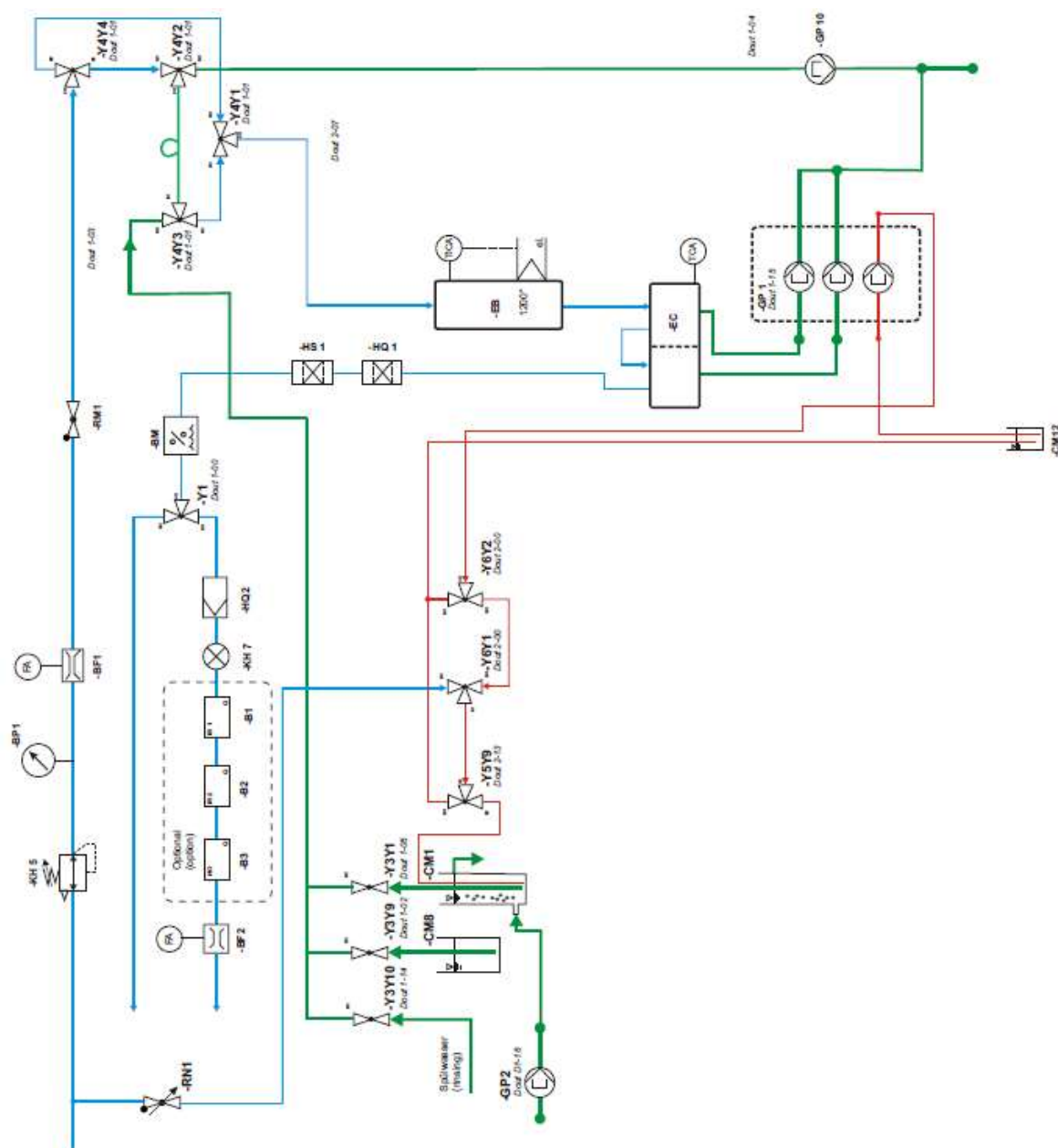


Fig. 115: Flow diagram for NPOC Method (1 Sample stream)

12.5 NPOC Method (6 Sample streams)

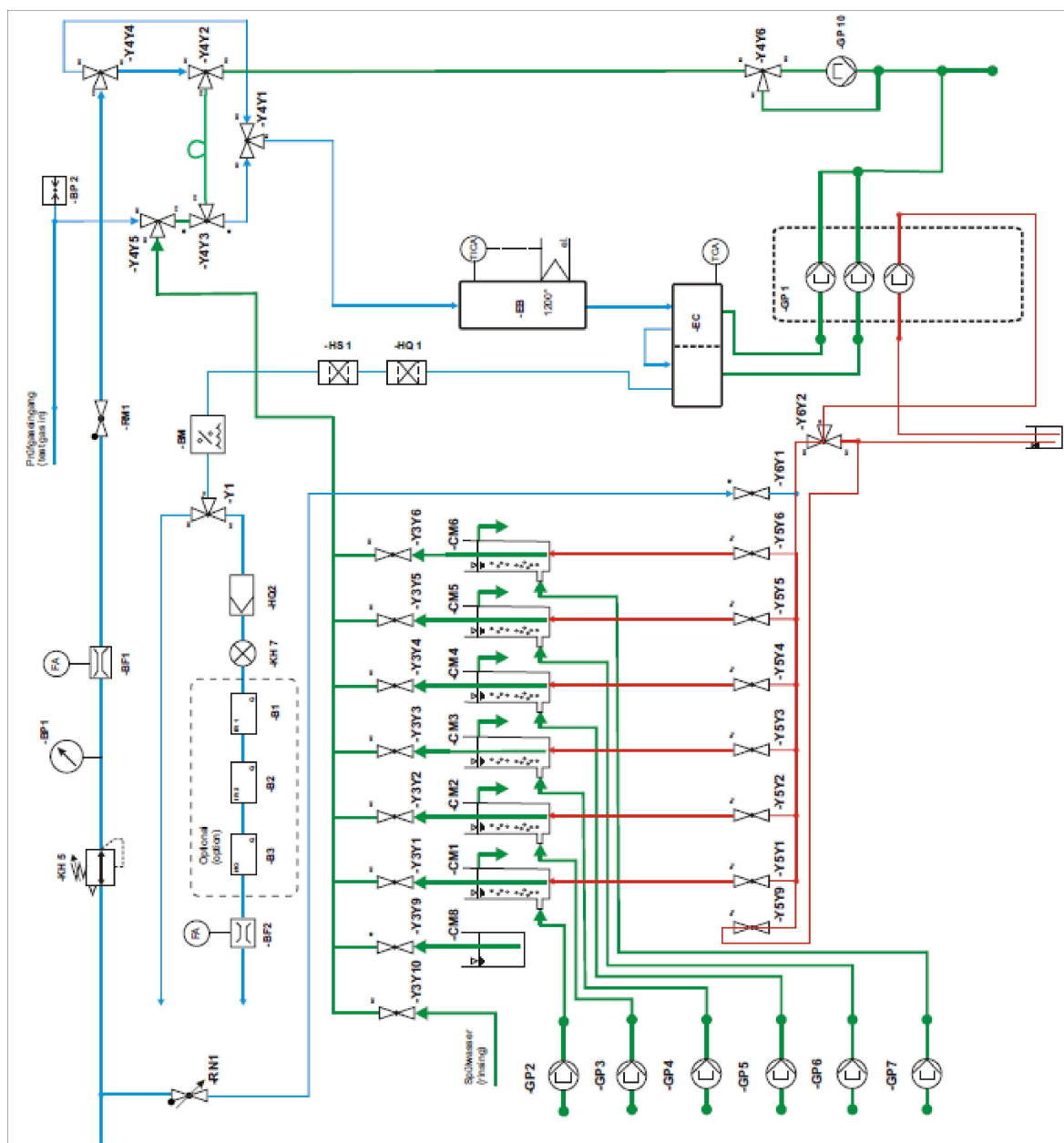


Fig. 116: Flow diagram for NPOC Method (6 Sample streams)

13 Logs and Protocols

On the following pages you will find the operating log and the protocols mentioned in the operating instructions as a copy template. It is recommended that you make a few copies and file them in a folder at the end of the manual or separately.



Warning

Do not write on the templates

Do not write on the templates. You will not be able to use them as a template later.

13.1 Operating Log

[illegible]

13.2 Protocol for Visual Inspection (Analyser)

Visual Inspection	Criteria	OK	Measures
Interval: 1 week			
Zero signal	<ul style="list-style-type: none"> 0 - 0,1 FSR 	<input type="checkbox"/>	<input type="checkbox"/> Check soda lime <input type="checkbox"/> Contact support
Carrier gas	<ul style="list-style-type: none"> Carrier gas on / off: ca. 13,5 - 15,5 l/h 	<input type="checkbox"/>	<input type="checkbox"/> Check fittings <input type="checkbox"/> Contact support
Injection system	<ul style="list-style-type: none"> no air bubbles in the glass 	<input type="checkbox"/>	<input type="checkbox"/> Rinsing
Glass components	<ul style="list-style-type: none"> no impurities 	<input type="checkbox"/>	<input type="checkbox"/> Cleaning
Canister and supply tubes	<ul style="list-style-type: none"> levels > 1 liter no impurities normale elasticity 	<input type="checkbox"/>	<input type="checkbox"/> Top up canisters <input type="checkbox"/> Clean canisters <input type="checkbox"/> Replace tube
Input and drain tubes	<ul style="list-style-type: none"> no impurities normal elasticity 	<input type="checkbox"/>	<input type="checkbox"/> Replace tube
Check inlet and outlet of the control unit for impurities	<ul style="list-style-type: none"> no impurities no corrosion 	<input type="radio"/>	<input type="checkbox"/> Contact support
Check ventilator for impurities	<ul style="list-style-type: none"> no impurities no corrosion 	<input type="radio"/>	<input type="checkbox"/> Clean ventilator
Interval: 3 months			
Injection tube	<ul style="list-style-type: none"> no impurities normal elasticity 	<input type="radio"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Replace tube
Tube cassette pump and sample pump	<ul style="list-style-type: none"> no humidity rollers run smoothly no impurities normal elasticity 	<input type="radio"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Set tubes forth <input type="checkbox"/> Replace tube <input type="checkbox"/> Contact support
Sample and pump tubes	<ul style="list-style-type: none"> no impurities rollers run smoothly 	<input type="radio"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Contact support
Viton tubes	<ul style="list-style-type: none"> no impurities normal elasticity 	<input type="radio"/>	<input type="checkbox"/> Cleaning <input type="checkbox"/> Replace tube
Acid trap	<ul style="list-style-type: none"> at least 1/3 of the zinc is shiny at least 1/3 of the brass wool is yellow 	<input type="radio"/>	<input type="checkbox"/> Replace filling <input type="checkbox"/> Replace acid trap
Quartz wool filter	<ul style="list-style-type: none"> no humidity no discolorations 	<input type="radio"/>	<input type="checkbox"/> Replace filling <input type="checkbox"/> Replace filter
Date:		Signature:	

13.3 Care Protocol (Analyser)

Interval	Measure	Task completed	Notes
1 week	Clean vessel for calibration fluid and replace calibration standard	<input type="checkbox"/>	
	Check pump tubes and clean if necessary	<input type="checkbox"/>	
	Check inlet and outlet of the control unit for impurities	<input type="checkbox"/>	
	Check ventilator for impurities	<input type="checkbox"/>	
3 months	Check reactor pipe end and clean if necessary	<input type="checkbox"/>	
	Inspection of the gas cooling pipes	<input type="checkbox"/>	
	Check pump cassettes and clean if necessary	<input type="checkbox"/>	
	Check the rollers of the pump head for ease of movement	<input type="checkbox"/>	
	Checking the measured values with standard solution	<input type="checkbox"/>	
	Perform a calibration	<input type="checkbox"/>	
	Check and document analyser status	<input type="checkbox"/>	
	Perform a measurement and check the values	<input type="checkbox"/>	
if necessary	Check viton tubes and replace if necessary	<input type="checkbox"/>	
Date:		Signature:	

13.4 Maintenance protocol (Analyser)

Interval	Measure	Task completed	Notes
3 months	Clean and grease bearing pin	<input type="checkbox"/>	
6 months	Replace pump tubes and condensate tubes	<input type="checkbox"/>	
1 year	Replace reactor tube or change reactor filling (if necessary)	<input type="checkbox"/>	
	Replace reactor seal (if necessary)	<input type="checkbox"/>	
	Replace loop tubing	<input type="checkbox"/>	
	Change sample drain tubes (if necessary)	<input type="checkbox"/>	
	Change quartz wool filling	<input type="checkbox"/>	
	Replace the pre-detector gas filter 0.1 µ	<input type="checkbox"/>	
Date:		Signature	

13.5 Functional Test Protocol (Analyser)

Visual inspection	Criteria	OK	Measure
Analyser status	<ul style="list-style-type: none"> Zero signal between 0 - 0,1 FSR Carrier gas on / off: approx. 30 l/h 	<input type="checkbox"/>	<input type="checkbox"/> Contact support _____ _____ _____
Tightness test	<ul style="list-style-type: none"> Carrier gas rate falls to < 5 l/h 	<input type="checkbox"/>	<input type="checkbox"/> Contact support _____ _____
Checking the measured values	<ul style="list-style-type: none"> Measured values correspond to the calibration standard 	<input type="checkbox"/>	<input type="checkbox"/> Contact support _____ _____
Checking the measurement	<ul style="list-style-type: none"> Measurement takes place without problems 	<input type="checkbox"/>	<input type="checkbox"/> Contact support _____ _____
Date:		Signature	

14 Safety Data Sheets

Different chemicals, depending on the application, are used to operate the analyser. Chemical-suppliers provide safety data sheets for their produced chemicals. Please ensure that you receive the safety data sheets from your chemical suppliers.

Please feel free to contact us - we can provide you with safety data sheets for the following chemicals:

- Potassium hydrogen phthalate
- Sodium carbonate
- Sodium bicarbonate
- Potassium permanganate
- Sulfuric acid
- Hydrochloric acid
- Phosphoric acid
- Brass wool (acid trap)
- Zinc chips (acid trap)
- Quartz wool (acid trap)
- Soda lime (Ambient Air Preparation Unit)
- Activated carbon (Ambient Air Preparation Unit)

15 Contact

15.1 Contact to LAR

Table 23: LAR Contact Details

Kontakt	Telefon	E-Mail
Contact	Telephone	E-Mail
Technical Support	+49 30 278958 - 55	service@lar.com
Sales Department	+49 30 278958 - 31 +49 30 278958 - 43	export@lar.com

15.2 Distributors / Authorized Service Partners

You will find contact details of all our distributors and authorized service partners on our website:

www.lar.com/about-lar/international-sales

15.3 Optimization

If you have any requirements for or comments about the LAR analyser, please contact the Technical Support of LAR or the Sales Department of LAR..

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