Dr. Thiedig

Anlagen - und Analysentechnik

Instruction manual

Degassed Acid Conductivity Analyser

Digox 601 *dac*

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Contents

1 General Information

This technical information contains instructions for installation, initial start-up, maintenance, repair, packaging and transport of the measuring instrument described below.

For reasons of clarity, however, this publication cannot take all detailed information about all types or all possible cases of installation and operation into account.

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The device support for the Digox 601 device series and its components is taken over by our subsidiary company Dr. Leye GmbH.

If you require further information, or problems which are not dealt with in detail in this publication occur, please request information directly from:

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We would like to point out that the warranty in the sense of our General Terms and Delivery Conditions can only be accepted if:

- installation, connection, adjustment, initial start-up and maintenance of the device is carried out exclusively by authorised specialists with appropriate qualifications,
- only original spare parts are used during repairs and
- the device is only deployed in accordance with the information contained in this technical information.

It is imperative that the safety information highlighted in this publication is observed.

If the manual is translated into other languages, the German original must always be considered superordinate.

2 Safety information

The warnings, cautions and notes highlighted in this technical information have the following meaning:

Warning!
This heading is used if incorrect following or nonobservance of operating manuals, job instructions, prescribed operational sequences or similar could lead to injuries or accidents.

Caution!
This heading is used if incorrect following or nonobservance of operating manuals, job instructions, prescribed operational sequences or similar could lead to damage to the device or measurement errors.

Note:
This heading is used if attention is to be drawn to a special feature.

The device has been constructed and tested in accordance with safety precautions for electronic devices and has left the works in perfect safety-related condition.

In order to retain this condition and to safeguard hazard-free operation, the user must observe the information and warning notes contained in this technical information. If it can be assumed that hazard-free operation is no longer possible, the device must be shut down and secured against unintentional operation. This is the case:

- if the device has visible damage,
- if the device appears to be no longer operational,
- after longer periods of storage in unfavourable conditions.

Warning!
The installation and connection of this device in addition to the appropriate additional components (e.g. recorder etc) must take place in accordance with the relevant safety regulations. Such work may only be carried out by trained and authorised personnel. Only tools suitable for the work at hand may be used!

Caution!
The installation site must be selected so that the device is not subject to any mechanical or chemical loading.

Note:
All parameters must be checked for their correct settings before initial start-up of the device.

3 Introduction

3.1 Preliminary remarks

Minimisation of corrosion within the piping and device itself, in addition to protection of the steam turbine from particles and contamination, are the most important aspects in quality assurance of the water-steam circulation in connection with power generation by steam turbines.

A rapid and effective process in this context is measurement of the conductivity as a summary parameter, especially the measurement of acid conductivity (cation conductivity). In this connection, increasing the conductivity through chemical condition for the achievement of a low-corrosion environment with the help of ammonia and/or caustic soda solution (volatile metering) is suppressed through the use of the cation filter.

The occurrence of dissolved carbon dioxide increases the cation conductivity but does not have any negative influence on corrosion. For this reason, attempts are being made to avoid measuring the proportion of carbon dioxide at the same time, especially during turbine start-up during which an excess of carbon dioxide is expected due to the entry of air into the turbine condenser, non-degassed make-up water or organic impurities.

The resulting increase in acid conductivity caused by the carbon dioxide delays the time at which the turbine can be loaded. If the dissolved carbon dioxide is selectively removed, however, a precise evaluation of the corroding anionic impurities can be carried out.

Warning!

The installation, connection and initial start-up of the device in addition to its associated components (e.g. recorder etc) must be carried out by appropriately trained and authorised personnel. All work must be carried out under observance of the relevant safety regulations. If there is any suspicion of damage which could result in unsafe operation, the device must be shut down immediately.

3.2 Warranty

The ox 601 *dac* has been designed for continuous operation. The motors used in the device have a guaranteed service life of > 10.000 operating hours. The cartouche for carbon dioxide removal from the air has a service life of at least 1 year under normal conditions.

The Digox 601 *dac* can only be guaranteed to make correct measurements when the installation and operation of the device takes place in accordance with the instructions and operating manual. The installation and initial start-up requirements described below must be strictly observed and readjusted if necessary, as must the quantity of consumables, the sample flows and the stated period in order to guarantee fault-free, correct operation.

Caution!

The Digox 601 *dac* may never be put into operation without a connected sample supply. This can lead to irrepairable damage to the spinning disc reactor bearings.

Warning!

All work on the device may only be carried out by appropriately trained and authorised personnel!

3.3 Use in accordance with regulations

The analysers in the Digox 601 *dac* series have been designed for special requirements on quality assurance in the industry for the monitoring of water-steam circuits, especially those containing live steam since the CO2 there has a major influence on the limit values for running up the steam turbine.

Typical measuring points in a power station:

- Monitoring of live steam water quality
- Monitoring of feed steam water quality

Warning!
The Digox 601 *dac* requires the use of soda lime as an absorber. The sealtightness of the air system and the gas treatment hoses must be regularly checked in order to avoid unintentional additional CO_2 infeed.

3.4 Storage

The measuring device must always be protected against humidity and stored in dry rooms. For further information please also refer to 3.6.

Caution!
It must be ensured that there is no water in the device if the temperatures are at or below freezing. Ion exchangers, alkalising media and sensors must be stored at temperatures above +1°C. Temperatures of above 25°C should be avoided during storage.

3.5 Properties and special features of the Digox 601 *dac*

- menu-guided operation using six keys with plain text display
- password-protected operational level
- eight-line display with background lighting for display of conductivity 1 + 2, temperature 1 + 2, pH-value, flow rate, cation exchanger depletion level in addition to alarm messages on the Con 204 *delta*,
- eight-line display with background lighting for the display of conductivity, temperature, flow rate and alarm messages on the Con 204 *µS*
- display of all measured values with dimensional units
- three relay outputs (floating, unbreakable cable make contact) for water shortage, temperature limit value and collective fault/limit value exceedance on Con 204 *delta* and Con 204 *µS*
- analogue outputs (3 on Con 204 *delta* and 2 on Con 204 *µS*) parameterisable over the required measuring range between 0/4 ... 20 mA
- temperature compensation selectable between: manual with specified temperature or automatic using the PT 100 or PT1000 (optional) integrated in the conductivity cell or separate
- linear temperature compensation characteristic adjustable over the entire measuring range (0.0 ... 8.0 %/K)
- non-linear temperature compensation through selectable temperature characteristics for:
    - ammonia
    - strong bases
    - morpholines
    - strong acids
    - neutral salts
- RS485 serial interface (second RS 485 optionally available)
- pH value calculation in accordance with Appendix 2 VGB guidelines 450 L, vers. 1988. F on Con 204 *delta*

The following conditions must be fulfilled for pH value calculation:

- only one single acid-base pair is contained in the sample (alkalising medium)
- the sample has not been contaminated by trisodium phosphate (>1-2 mg/l)
- the concentration of impurities is low compared with the alkalising medium at pH values below 8
- the pH value is greater than 7.5
- the pH value is less than 10.5

3.6 Digox 601 *dac* technical data

Mains voltage	230 V, 50 Hz, battery-free parameter saving (110 V and 24 V on request)
Power consumption	40 VA
Protection class	IP65 (transducer), IP54 (external housing)
EMC:	corresponding to DIN EN 61000-6-3 and DIN EN 61000-6-4
Display	128x64 pixel graphic display, 62x44mm, backlit
Power outputs	0/4-20 mA galvanically separated, max. load 400 Ohm
Registration range:	freely selectable within measuring range
Interface (optional):	RS485
Relay output	Alarm relay with potential-free make contact Relay sloping in fault situation (unbreakable cable)
Contact load	6A/250 V, max. 550 VA ohmic load (with RC contact safety circuit)
Connections	spring-type terminals for cables up to max. 1.5 mm^2
Dimensions	W x H x D 500 x 700 x 250 mm (without attachments)
Weight	approx. 30 kg
Permissible surrounding temperature during operation	0 to +40°C[1]
Permissible storage temperature	1°C (-20°C[2]) to +65°C
Permissible air humidity%	max. 90% at 40°C (non-condensing)
Sample input pressure	0.5-1 bar
Sample quantity	10...20 l/h , minimum quantity 10 l/h
Sample condition	max. temp. 50°C
Feed connection	coupling for hose with external diameter 6 mm
Overflow bypass connection	coupling for hose with external diameter 6 mm
Overflow exhaust air	coupling for hose with external diameter 6 mm
Overflow outfeed	coupling for hose with external diameter 6 mm
Measuring principle	conductive conductivity measurement
Measuring range	0-20.00 MΩ/cm, 0-2.000 µS/cm, 0-20.00 µS/cm, 0-200.0 µS/cm 0-2.000 µS/cm, 0-20.00 mS/cm, 0-200.0 mS/cm
Recommended cell constants	0-20.00 MΩ/cm C = 0.05/0-2.000 µS/cmC = 0.05 0-20.00 µS/cm C = 0.05/0-200.0 µS/cmC = 0.05 0-2.000 µS/cm C = 0.2/0-20.00 mS/cm C = 1 0-200.0 mS/cm C = 10
Precision	1% of the set measuring range
Temperature sensor	Pt100
Calibration	flow rate calibration with measuring cylinder
Measured value correction	with suitable comparison measuring instrument via cell constant adaptation
Electrical safety	IEC 1010, IEC 664
Certification	CE mark, serial number

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1 It must be ensured that freezing point is never reached at any point in the device through the use of an appropriately high sample temperature. (Keep door closed)

2 It must be ensured that there is no water in the device if the temperatures are at or below freezing. Ion exchangers must be stored at temperatures above +1°C.

3.7 Device description and measuring principle theory

3.7.1 Device description

The DAC (Degassed Acid Conductivity) spinning disc reactor is a measuring instrument which selectively and quantitatively removes dissolved carbon dioxide from the sample and measures the conductivity before and after removal of the carbon dioxide. In doing so, the specific conductivity upstream of the cation filter, the acid conductivity downstream of the cation filters and the degassed acid conductivity downstream of the degassing reactor are measured successively.

The sample flow through the cation filter and the partial flow through the degassing reactor are also flow rate-monitored. The pH value is calculated and displayed in accordance with VGB Guideline R 450L (revised 1988) from the measured value difference between the specific conductivity and the acid conductivity when required.

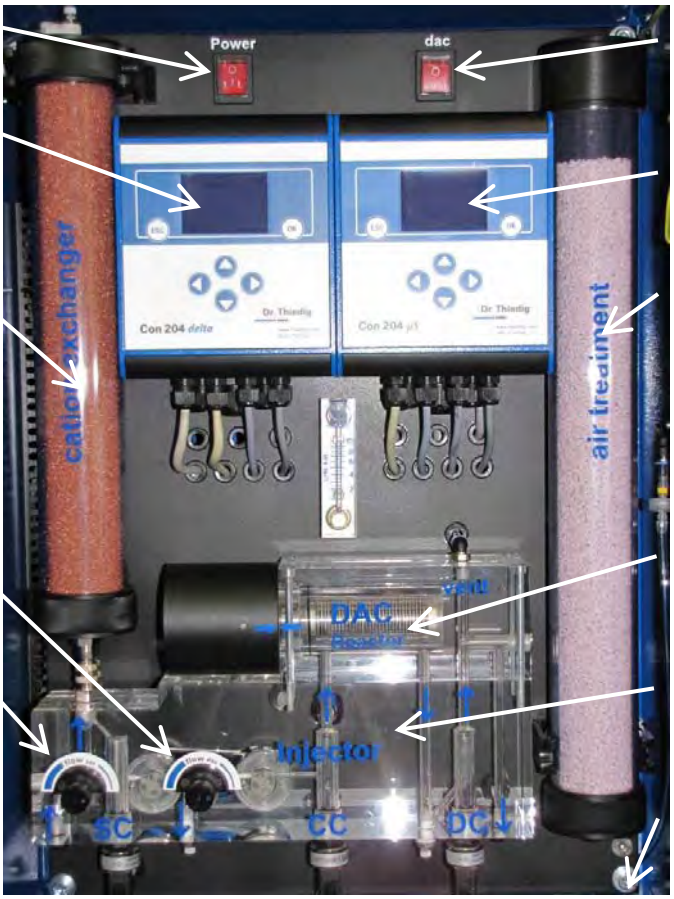


Fig. 1 Digox 601 *dac* setup

The degassing reactor itself consists of a package of spinning disks in a horizontally aligned cylinder through which the sample flows. A water film forms on the discs due to the rotation in the approximately half-full cylinder, and this increases the effective surface for gas exchange with the atmosphere above. This enables gas exchange with the medium to take place more quickly because CO_2 is forced out the by the increased partial pressure into the CO_2-free air which is to be metered.

Before the medium flows into the DAC reactor, a defined quantity of CO_2-free air is mixed with the sample. The water and the air are separated from each other by the spinning disks and the exhaust air which now contains dissolved, separated carbon dioxide, can escape freely into the surroundings at the end of the DAC reactor housing.

As soon as the DAC flow rate has decreased too strongly (limit value can be set in Con 204 *µS),* the spinning disc reactor including the air treatment process can be switched off in order to avoid damage to the bearings and the reactor itself.

As long as the sample does not contain any carbon dioxide, no significant difference between the acid conductivity and the degassed conductivity can occur. If the sample is contaminated with CO_2, a difference between the acid conductivity and degassed conductivity (DAC) will set in if the media and gas flow rates have been correctly set. 100% degassing cannot take place within the DAC reactor due to the carbon dioxide equilibrium in liquids (see Fig. 3, Page 15). For this reason, an extrapolation is integrated in the Con 204 *µS* measuring amplifier which projects degassing to 100% depending on the pH value, the temperature and the CO_2 content in the sample. This means that the degassed displayed conductivity value is equivalent to the acid conductivity without CO_2. Any temperature deviation of the measured probe from 25°C is temperature-compensated for all three conductivity values. You can find more information about this in the attached Con 204 *delta* operating manual (Con 204 *µS* is analogue but only has one conductivity input).

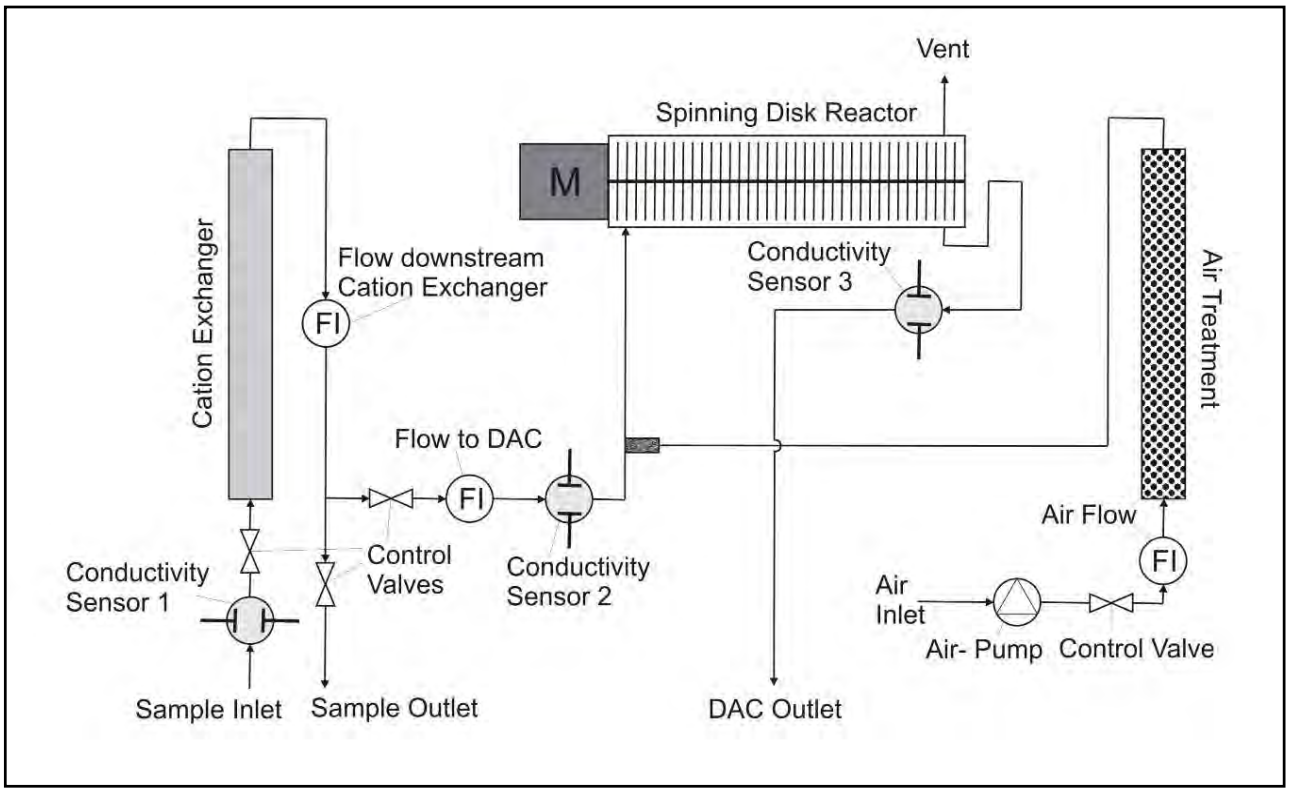


Fig. 2 Schematic setup of complete DAC measuring instrument

3.7.2 Measuring principle theory

Since the introduction of the so-called Larson-Lane column[3], or the cation exchanger for proving traces of anionic impurities in water-steam circuits, chemists in power stations have noticed that this method cannot differentiate between inorganic anions and dissolved carbon dioxide if the salts have been converted into their corresponding acids once they have passed the strongly acidic cation exchanger resin. This problem has been causing puzzlement for more than three decades, and a series of researchers have proposed a wide range of solutions over this period.

All the methods described have a common aim of separating the dissolved carbon dioxide from the sample, and the subsequent measurement. The sample must be converted into an acidic condition in order to change the equilibrium to the benefit of the free carbon dioxide. The dissolved gas can then be removed from the sample. The sample flow through the cation exchanger results in an increase in the acid content due to the presence of anionic impurities. Although the entire carbon dioxide content, which is mostly present as bicarbonate ion in the pH conditions present in water-steam circuits, cannot be converted into free gas (pH < 4.2), there is still a 50% conversion at a pH value of 6.5 (see Fig. 3).

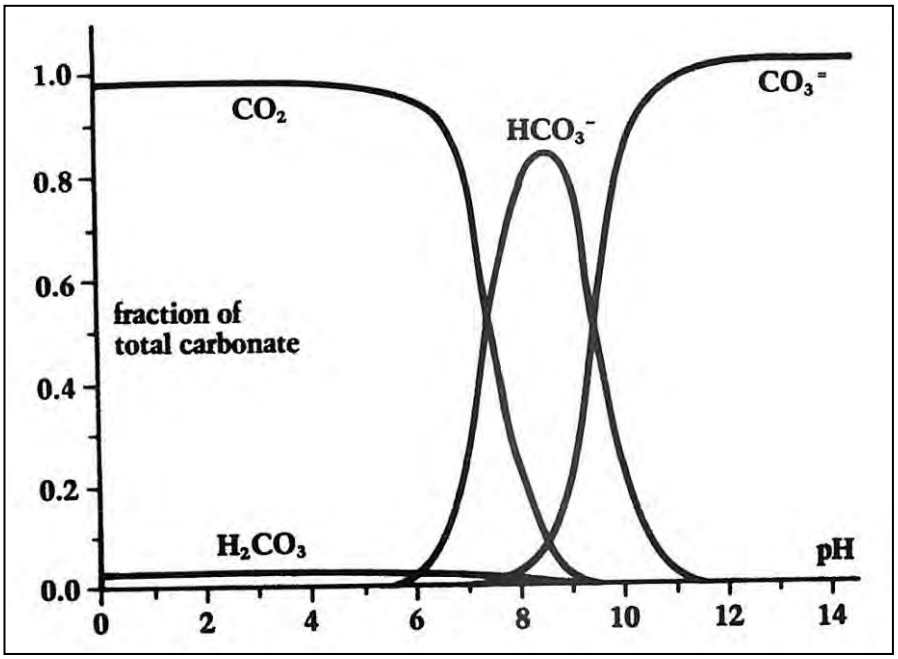


Fig. 3 Regression curve for dissolved carbon dioxide

It can be seen from Fig. 3 that it is difficult to completely remove the dissolved carbon dioxide since it is chemically bonded with the water. Theoretically, free carbon dioxide is only released at a pH value below 4.

[3] Lane R.W., Neff C.H. and Larson T.D. Proceedings American Power Conference, XXIII, Chicago, (1961), p. 530

3.8 Required PSE / special tools

Warning!

When handling the consumables and chemicals used in the device, it is necessary to wear PSE (personal safety equipment). The basis for the use of PSE is provided by the applicable statutory standards for safety at work in addition to internal works regulations at the place of use.

This applies especially to handling the absorber compounds and the ion exchanger resin.

Warning!

Only suitable tools approved for the work tasks at hand may be used. Special tools are not necessary. The only tools required are standard screwdrivers and monkey wrenches or pliers.

4 Installation of the Digox 601 *dac*

4.1 Unpacking

The packaging must be checked for external damage on goods receipt. Any damage which has occurred must be documented and reported to Dr. Leye GmbH immediately. Disposal of the transport packaging and packaging materials must take place in accordance with the client's works disposal concept.

4.2 Inspection of extent of delivery

The extent of delivery must be checked for completeness with the help of the delivery note immediately after being unpacked. Differences between the delivery note and the goods supplied must be reported immediately to Dr. Leye GmbH. Complaints at a later date cannot be taken into account. The extent of delivery, especially accessories, can vary depending on the order.

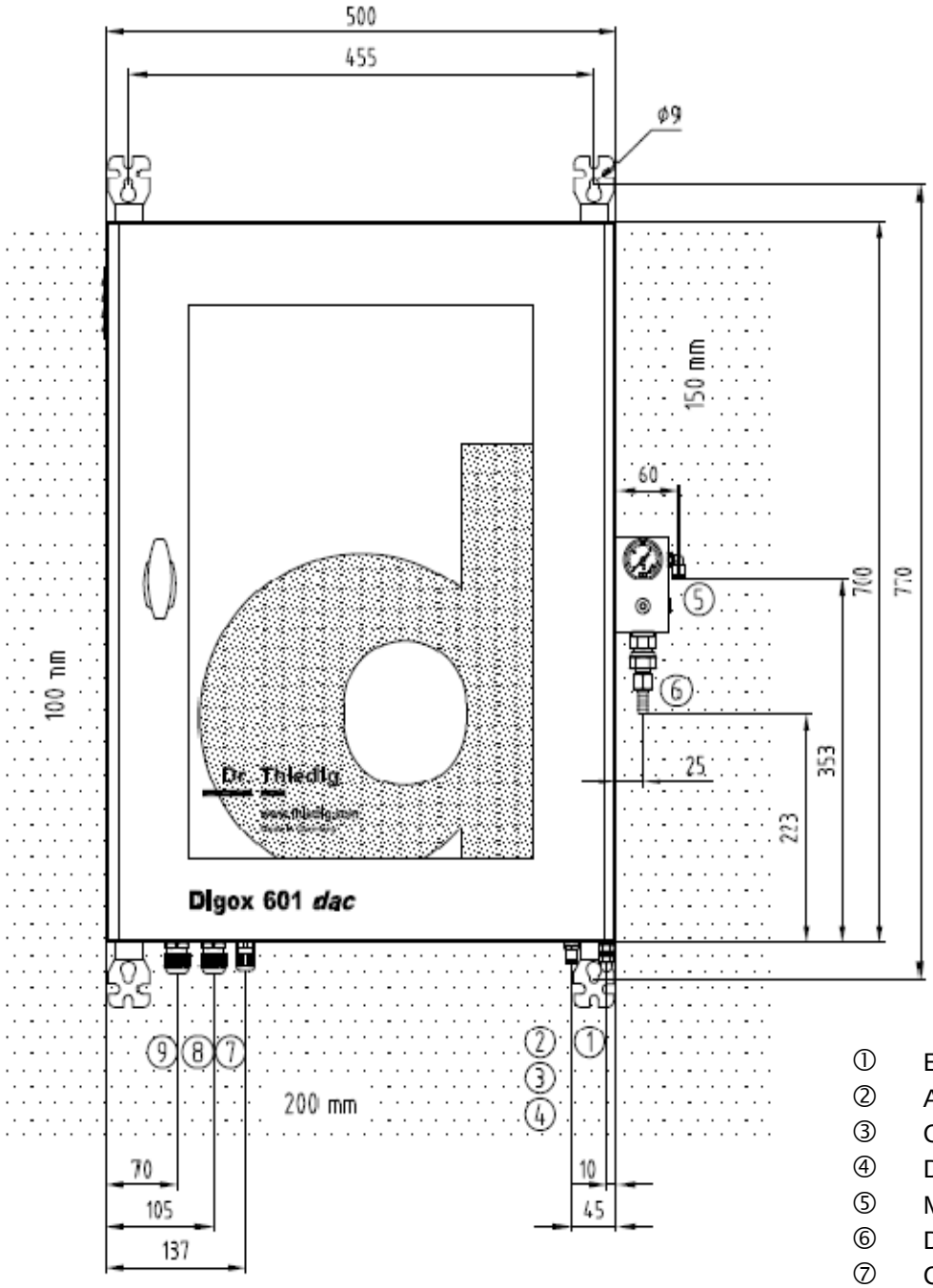
4.3 Installation requirements

Installation of the analyser must take place in a dry, vibration-free environment, and the analyser must be protected against direct sunlight. The analyser must be fitted horizontally on a vertical support (mounting frame or wall). We recommend that the analyser is placed so that there is a free space of a least 100 mm to each side for installation and operation, and an operating space of a least 600 mm is required in front of the analyser. Since cable connections and water connections take place from below, a free space of a least 200 mm must be provided below the analyser. See Fig. 4, Chapter 4.4.1.

4.4 Installation

4.4.1 Fixing points and device dimensions

The fixing points and dimensions of the DAC reactor are shown below in Fig. 4:



① Earthing bolt, M8
② Air discharge
③ Overall drain DAC reactor
④ Drain to ion exchanger/bypass
⑤ Media input
⑥ Drain pressure regulator
⑦ Cable connection, M16x1.5
⑧ Cable connection, M20x1.5
⑨ Cable connection, M20x1.5

Fig. 4 Installation dimensions

4.4.2 Swivelling out the swivel frame for electrical and hydraulic installation

The analyser has been fitted with a swivelling frame which must be swivelled out in order to fit the electrical and hydraulic connections. To do this, the four screws in the corner of the baseplate must be unscrewed using a 6 mm Allen key and the screws and washers must then be removed. After this, the swivel frame can be swivelled out of the analyser housing (see Fig. 5 and Fig. 6).

In general you must take the appropriate location of cables and lines which are fixed to the rear panel of the swivelling frame when swivelling out into account, especially in the case of the electrical and hydraulic connections to the outside still to be installed, see Chapters 4.5 and 4.6.

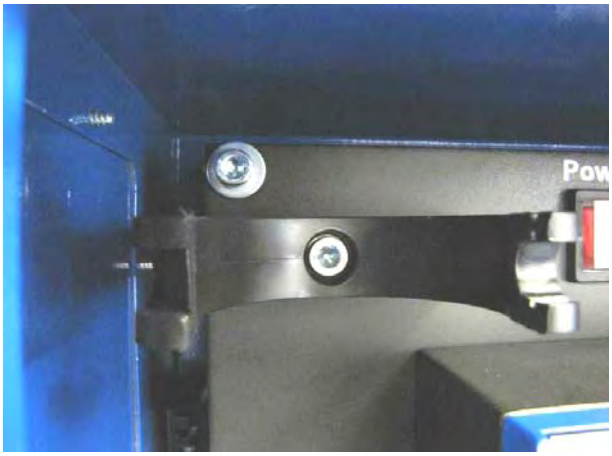


Fig. 5 Example of location of top left retaining screw

Fig. 6 Swivel frame pulled out

4.5 Hydraulic connection

4.5.1 Media input

The sample feed line is connected to the media input on the sample conditioning unit using a PE hose of external diameter 6 mm. Hoses made of soft material are only conditionally suitable, and the hose material must also be ultrapure water-resistant.

A regulating valve must be located upstream of the sample input on site in order to limit the feed flow to the device, otherwise larger sample quantities are lost through the pressure regulator. The pressure regulator limits the sample flow coming into the device to around 1 bar. The resulting pressure can be read off at the pressure gauge. Excess sample flow is diverted into a drain from the pressure regulator. Please also see Fig. 7.

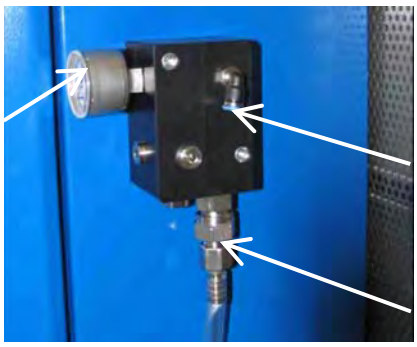


Fig. 7 Sample conditioning unit

4.5.2 Media discharge or drains and exhaust air

There are a total of three media discharges on the device which need to be routed unpressurised and free-draining so that unimpeded discharge is possible. In addition to the exhaust air discharge, there is a sample discharge upstream of the degasser (drain to cation filter/bypass) and a sample discharge downstream of the degasser.
The connection for all media discharges on the bottom of the device take place using a hose of 6 mm external diameter, see also Fig. 8.

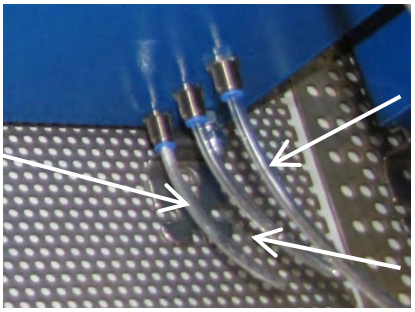


Fig. 8 Drains on device bottom right-hand side

Caution!
The hose length for exhaust air and overall drain may not be longer than 10 cm to prevent possible backlogs in the device.

4.6 Electrical connection

4.6.1 Preliminary remarks

The electrical connection to the analyser should preferably be made using flexible cables. Recommended cross sections are 1.5 mm² for power supply, 0.5 mm^2 for binary signals <60 V and analogue signals.

Warning!

Connection of the device or implementation of all electrical work on the device may only be carried out by appropriately trained and authorised personnel. Switch off the supply voltage before connecting the device!

Caution!

The supply voltage can be read off from the nameplate. Connection of the incorrect supply voltage can lead to destruction of the device!

4.6.2 Power supply

The cable entries are located on the bottom of the device, left-hand side (see Fig. 9).

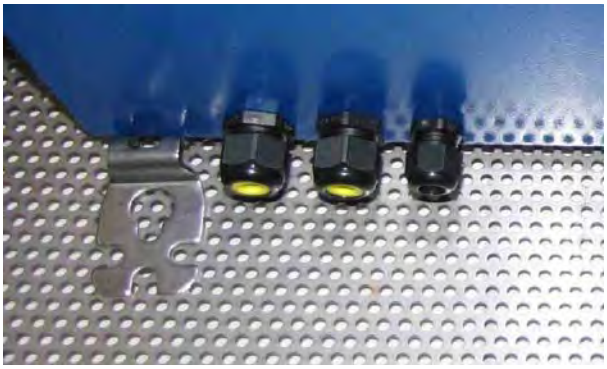


Fig. 9 Cable entries device bottom left-hand side

Once the Digox 601 *dac* has been securely fixed (described in Chapter 4.4) the entire DAC analyser can be carefully swivelled out of the blue enclosure on its swivel frames after the 4 fixing screws on the mounting plate have been removed (see Fig. 5). This makes access to the measuring instrument easier for simplified connections. Fig. 10 shows the analyser swivelled out. Pull the mains cable over the swivel frames into the cable duct provided as far as the terminal box.

The power supply is connected to terminals **(L), (N)** and **(PE)** in the terminal box on the left-hand side, see Terminals in the terminal connection diagram Fig. 12 on Page 24 or Fig. 15 on Page 27, and Fig. 13 on Page 25 or Fig. 16 on Page 28.

Caution!

When routing the cable, please ensure that the cable is routed together with the swivelling frame and is pushed through the cable duct provided (see Fig. 10). The cable should preferably be suitable for flexible routing, cable lengths must be adapted appropriately.

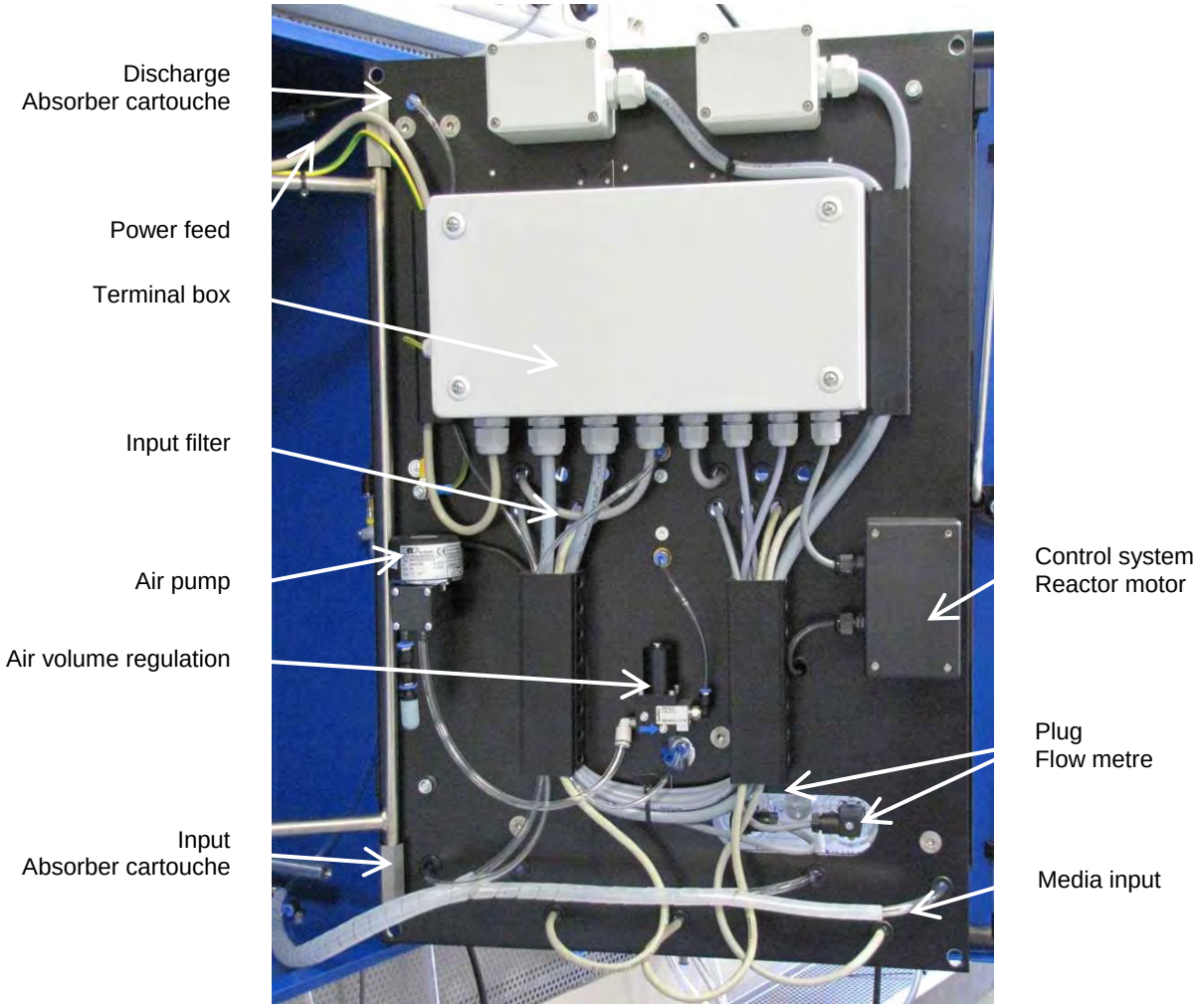


Fig. 10 Digox 601 *dac* folded out

4.6.3 Signal line connections

Up to S/N 681xxxxxx00038, the cables for transmitting the analogue power outputs and the alarm messages must be connected directly to the appropriate measuring amplifiers Con 204 *delta* or Con 204 *µS* (see Con 204 *delta* operating manual; the connection is made analogue on the Con 204 *µS*). To do this, the signal cable is rooted parallel to the power cable and through the mounting plate into the appropriate measuring instrument (see Fig. 10 and Chapter 4.6.5, Fig. 18 and Fig. 19. Starting from S/N 681xxxxxx00039, the signal connection is done directly in the terminal box as well as the power connection, see Fig. 15.

4.6.4 Wiring the relay outputs

The Con 204 *delta* and Con 204 *µS* conductivity measuring amplifiers each have three relay contacts and one floating changeover contact, terminals see Fig. 18/Fig. 19, Page 30. Starting from S/N 681xxxxxx00039, the binary signals (dry contacts) for common alarm and flow alarm are connected to the terminal box as well as the analogue signals, see Fig. 15, Page 27. Additionally, a binary signal for the degassing reactor (no rotation) is available.

The relays are permanently allocated to the following functions:

Relay 1 - water shortage
Relay 2 - temperature monitoring (relay switches at a temperature >50°C)
Relay 3 - collective fault, limit value exceedance

The relays are activated during fault-free operation and deactivate in the case of a fault, whereby a power failure can also be evaluated as a fault. We recommend that cabling takes place with unbreakable cables as a make contact.

Caution!

Relay 1 for a water shortage on the Con 204 *µS* has already been internally cabled for switching on and off the DAC reactor and may not be used for other purposes. Relay 1 on the Con 204 *delta* is used for external monitoring of the flow rate, see also Fig. 13 Wiring diagram Digox 601 *dac*, Part 1, Page 25. Starting from S/N 681xxxxxx00039, the flow control signal (low flow) is available in the terminal box, see Fig. 15.

If inductive loads are connected (including relay and contactor coils), these must be interference-suppressed. If this is not possible, the relay contact must be protected using protection circuitry in accordance with the following table.

Under alternating voltage

current to	Condenser C	Resistor R
60 mA	10 nF, 260 V~	390 Ω, 2 Watt
70 mA	47 nF, 260 V~	22 Ω, 2 Watt
150 mA	100 nF, 260 V~	47 Ω, 2 Watt
1.0 A	220 nF, 260 V~	47 Ω, 2 Watt

Under direct voltage, the relay or contactor coil must be interference-suppressed using a freewheeling diode:

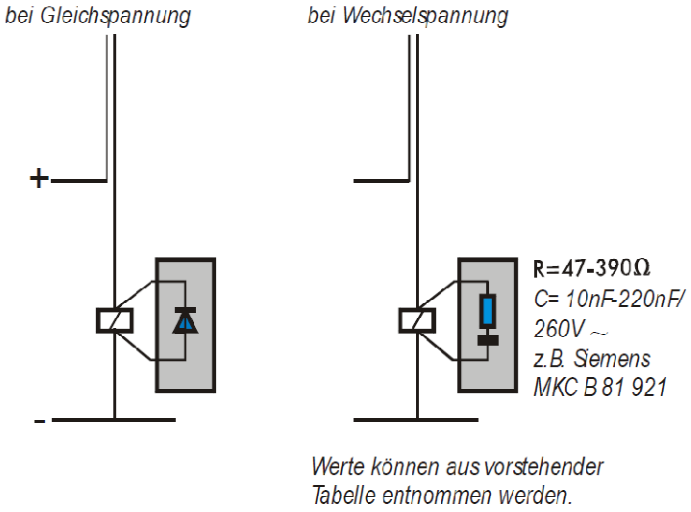


Fig. 11 Relay switching under direct or alternating voltage

Caution!

If the relay outputs are switched using artificial potentials, they must be provided with a suitable backup fuse on site. Please refer to the technical data in this operating manual for maximum contact loading values.

4.6.5 Terminal connection diagram up to S/N 681xxxxxx00038

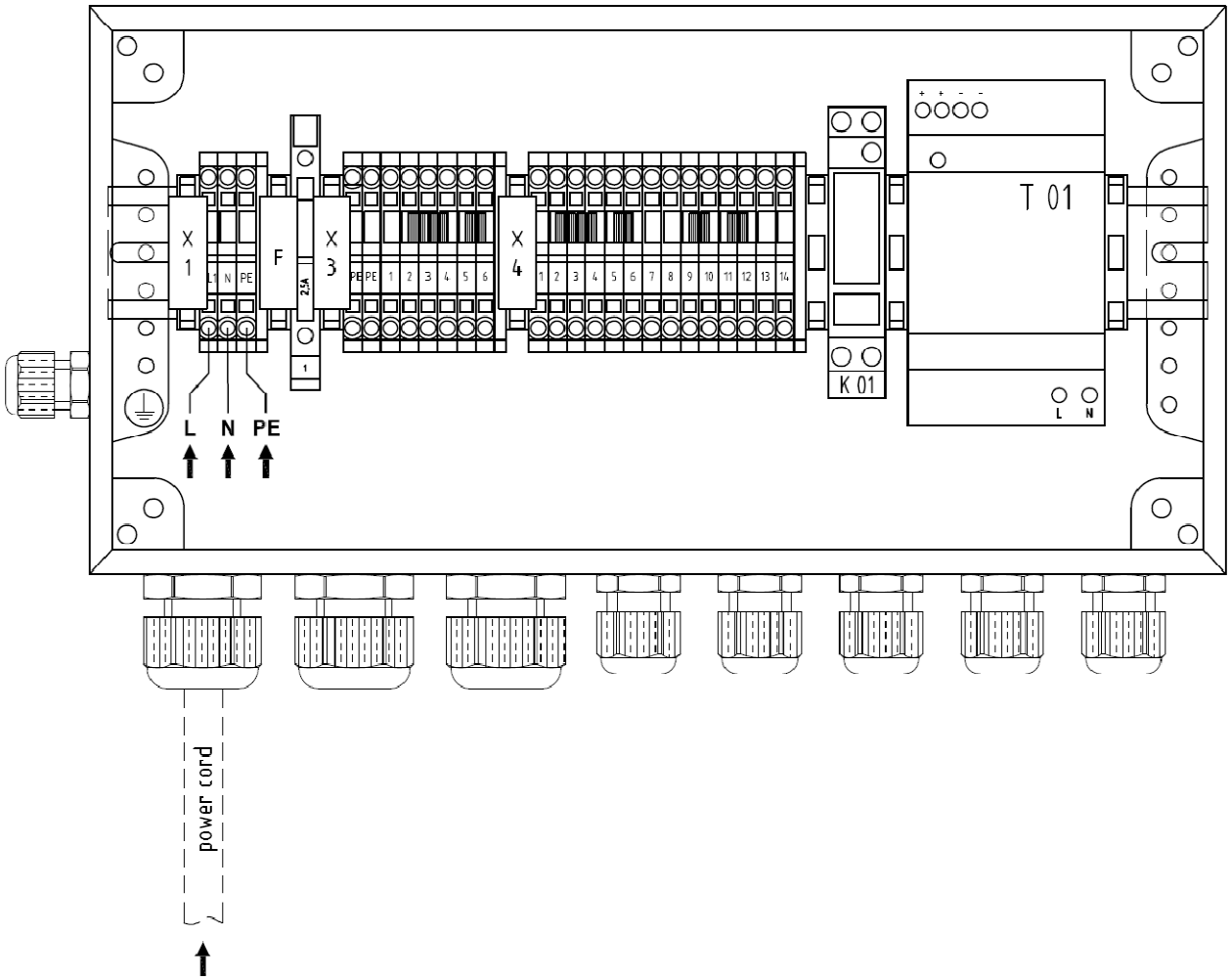


Fig. 12 Terminal connection diagram Digox 601 *dac:* power supply connection left-hand side up to S/N 681xxxxxx00038

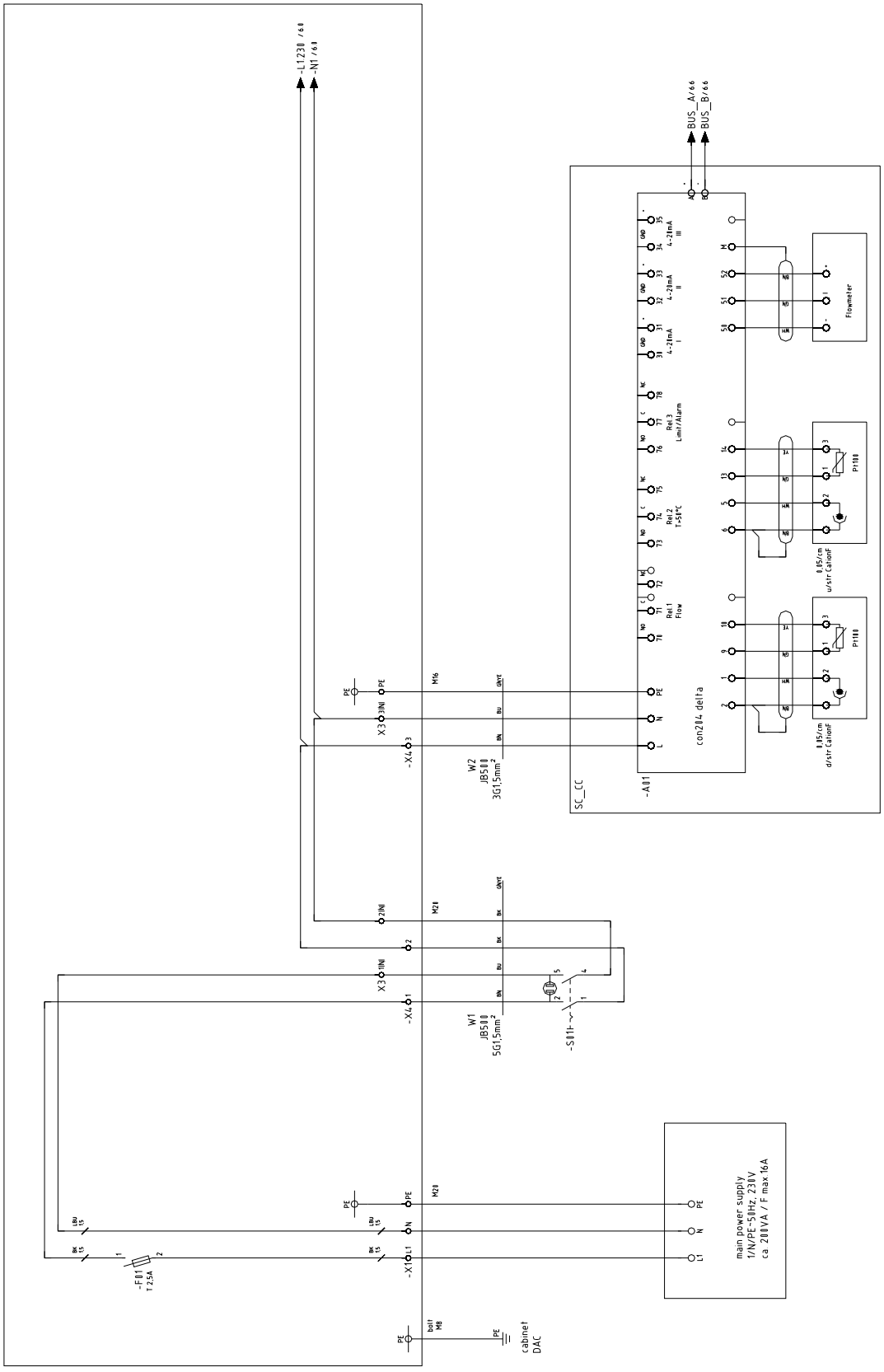


Fig. 13 Wiring diagram Digox 601 *dac*, Part 1, up to S/N 681xxxxxx00038

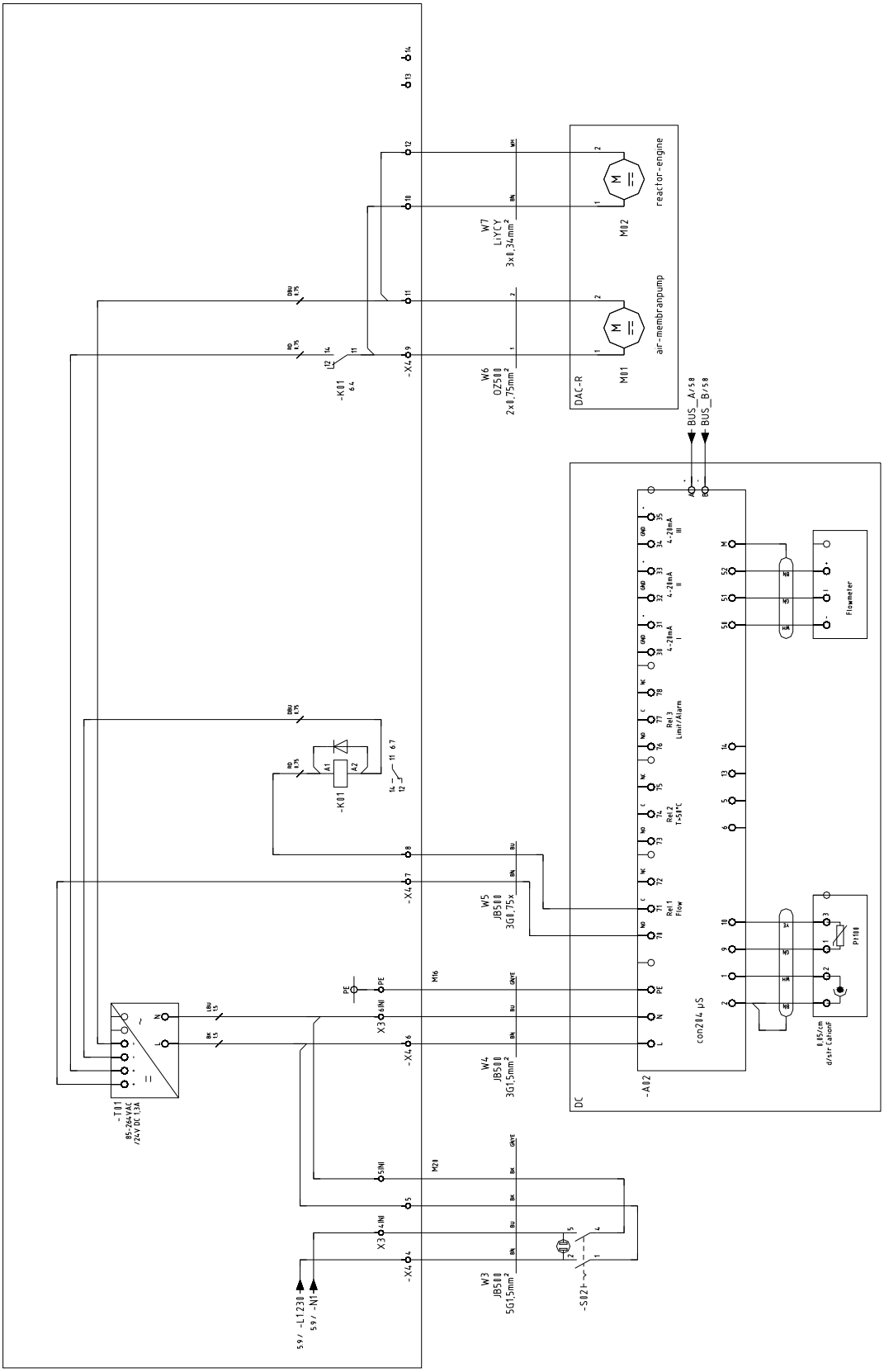


Fig. 14 Wiring diagram Digox 601 *dac*, Part 2, up to S/N 681xxxxxx00038

4.6.6 Terminal connection diagram from S/N 681xxxxxx00039

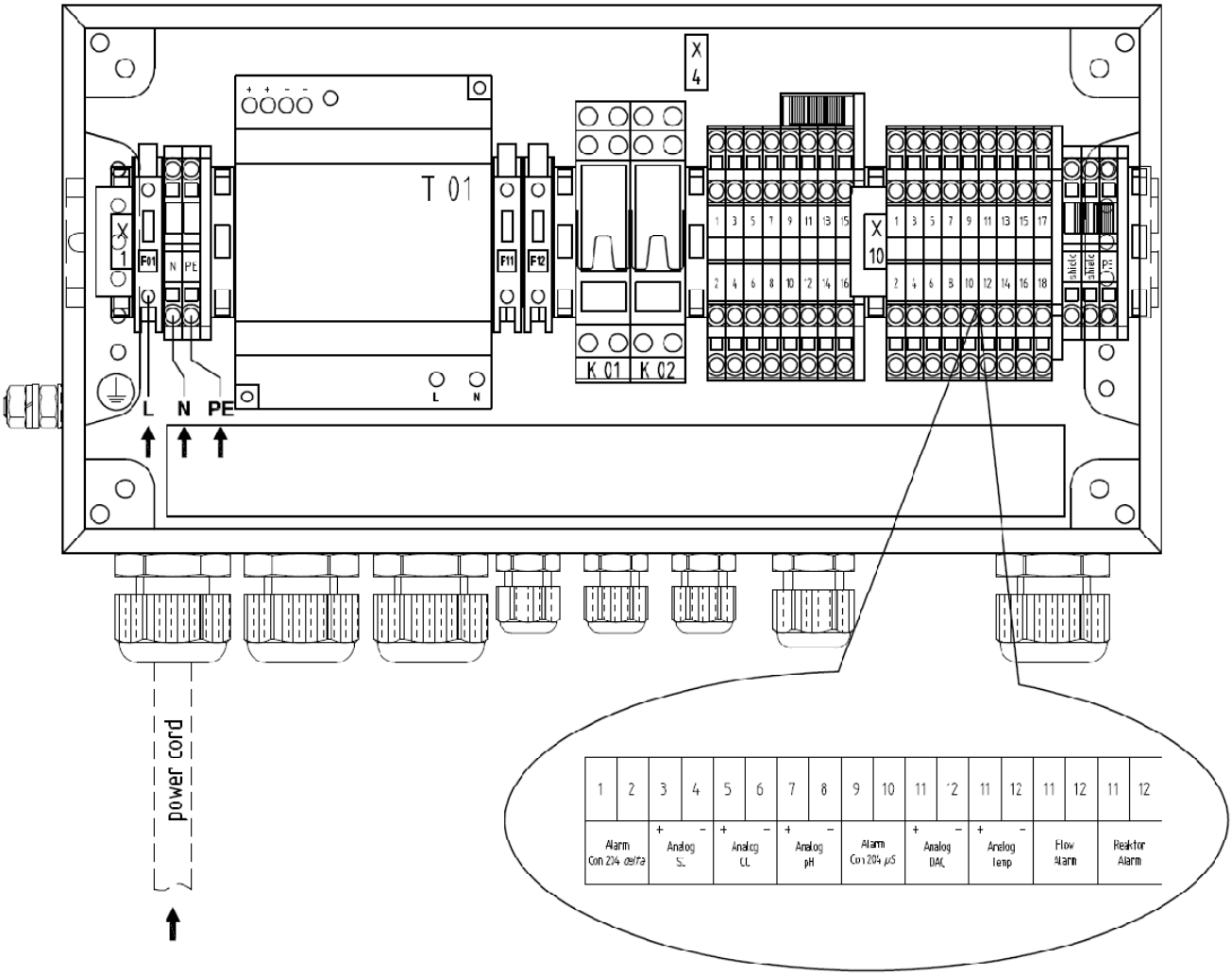


Fig. 15 Terminal connection diagram Digox 601 *dac:* power supply connection left-hand side from S/N 681xxxxxx00039

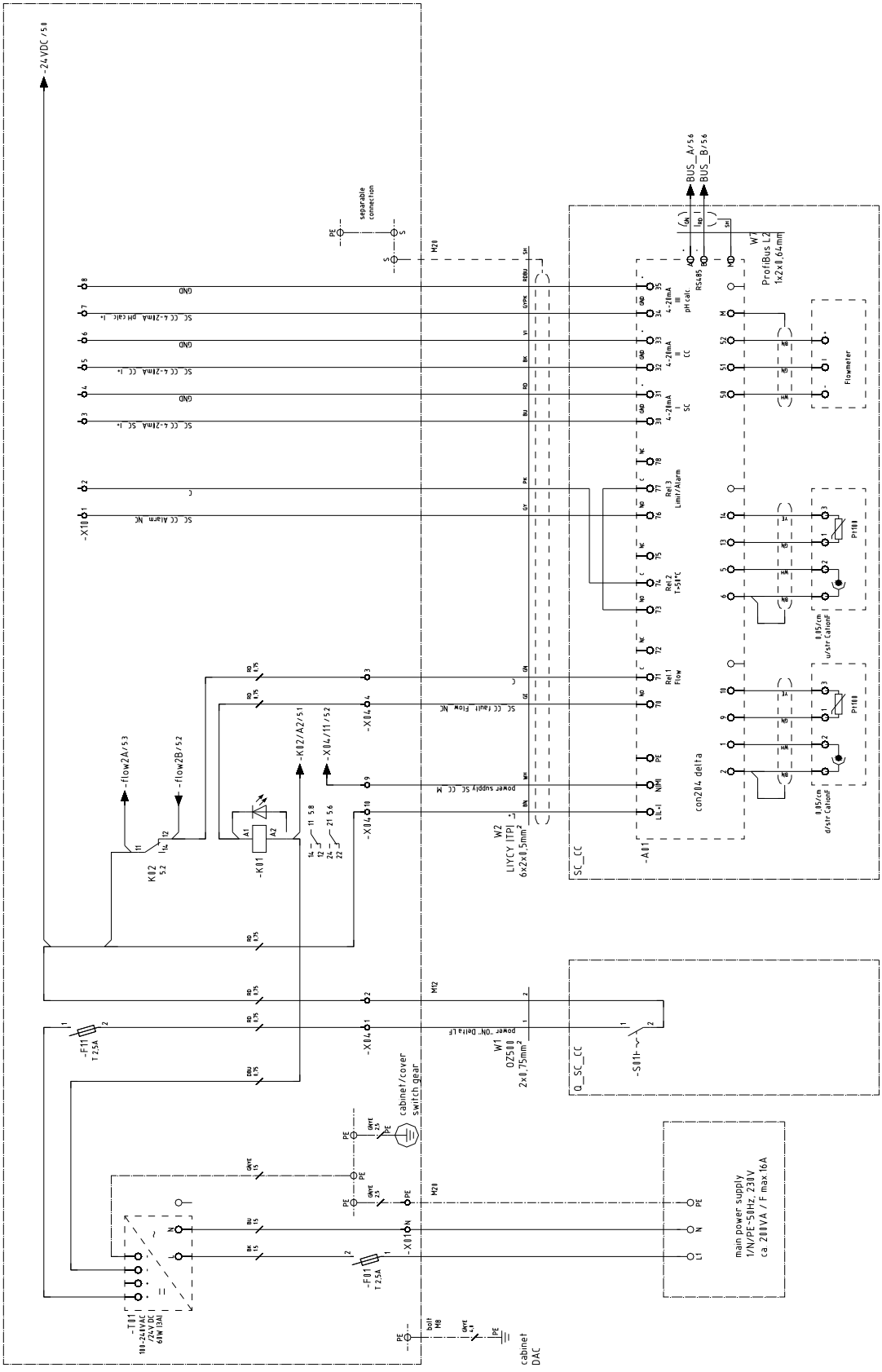


Fig. 16 Wiring diagram Digox 601 *dac*, Part 1, from S/N 681xxxxxx00039

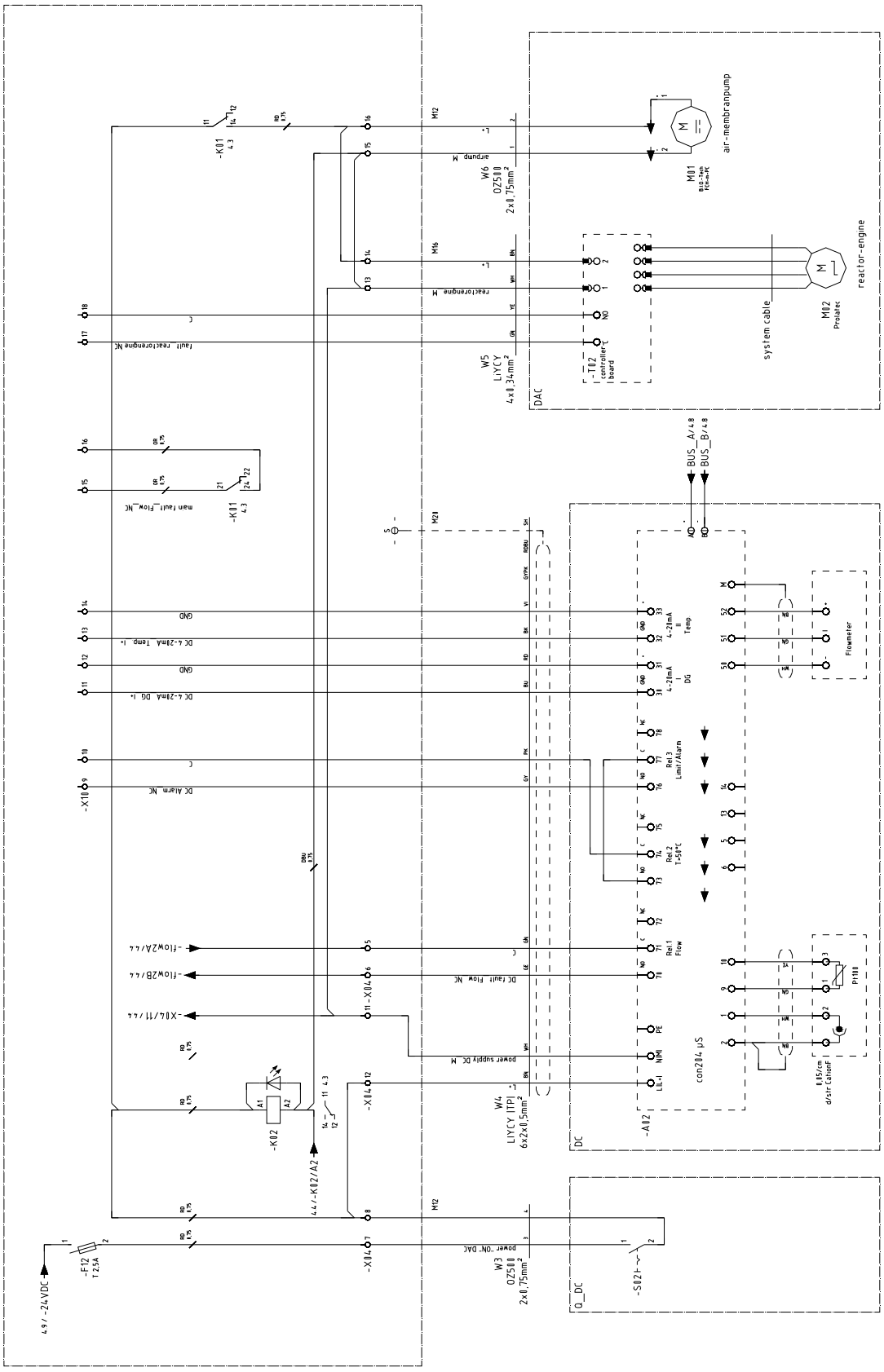


Fig. 17 Wiring diagram Digox 601 *dac*, Part 2, from S/N 681xxxxxx00039

4.6.7 Terminal connection plan of measuring amplifier

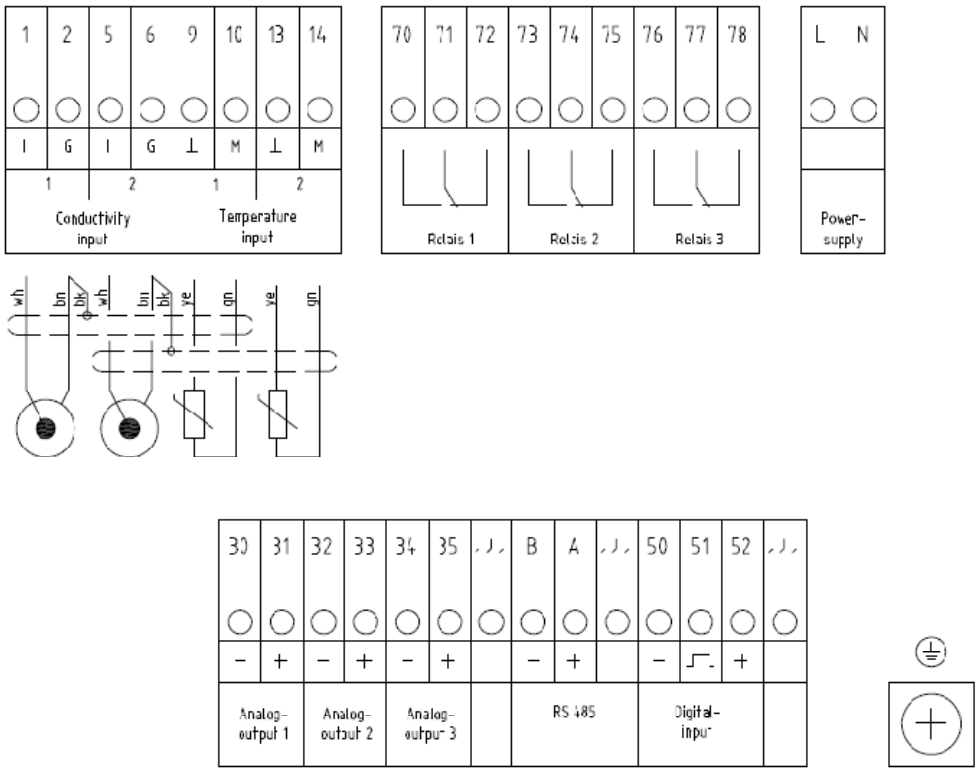


Fig. 18 Terminal connection plan Con 204 *delta*

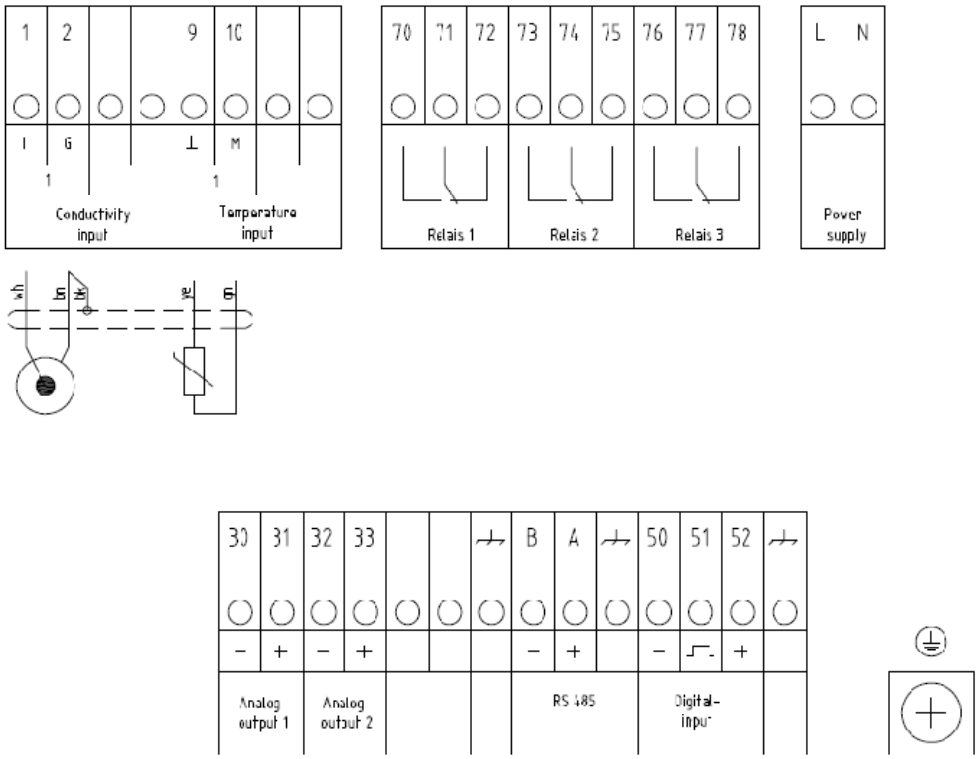
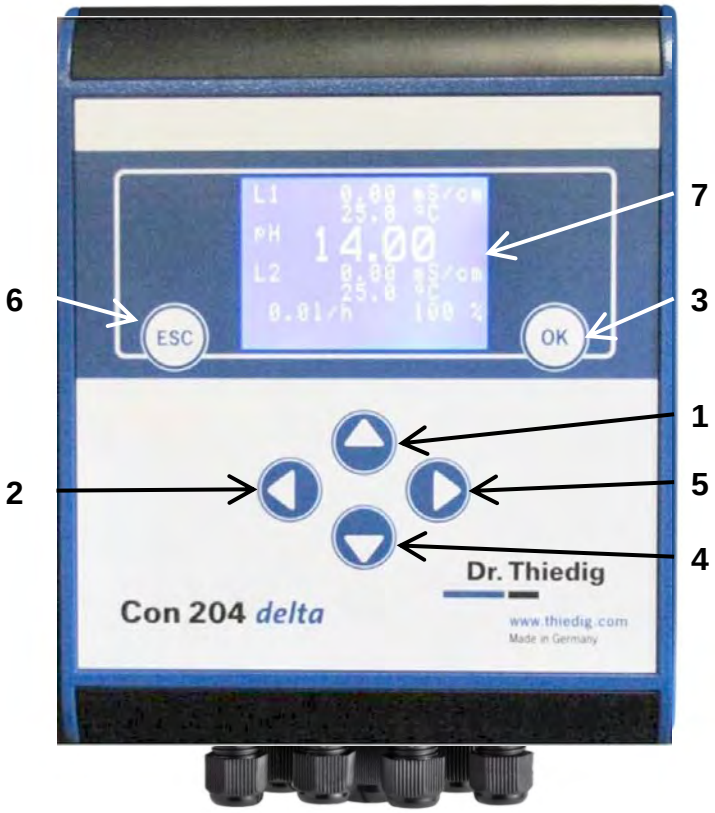


Fig. 19 Terminal connection plan Con 204 *µS*

5 Operator interface

5.1 Con 204 *delta* operating philosophy



The Con 204 *delta* conductivity measuring amplifier is operated using a 6-key membrane keypad.

1. key (menu control key, increase value within a menu command)
2. key (quit menu command and save)
3. OK key: enables confirmation of the set measurement range, menu selection and confirmation of flow rate calibration, depletion of cation exchanger in combination with the "right" key, ...
4. key (menu control key, decrease value within a menu command)
5. key (function selection within menu command)
6. ESC key: return to measurement menu at any time
7. LCD display: 8-line backlit display

5.2 Con 204 *µS* operating philosophy

The Con 204 *µS* conductivity measuring amplifier is operated using a 6-key membrane keypad.

1. key (menu control key, increase value within a menu command)
2. key (quit menu command and save)
3. OK key: enables confirmation of the set measurement range, confirmation of menu selection and flow rate calibration in combination with the "right" key, ...
4. key (menu control key, decrease value within a menu command)
5. key (function selection within menu command)
6. ESC key: return to measurement menu at any time
7. LCD display: 8-line backlit display

5.3 Description of code levels

The Con 204 *delta* and the Con 204 *µS* are provided with 3 password-protected menu levels.

- o Code 11 authorisation for diagnosis menu (for monitoring personnel)
- o Code 86 authorisation for maintenance and parameter menu (for trained operating personnel)
- o Code 99 authorisation for service menu (for trained service personnel)

The code entry is activated using the key. Use the and keys to change the value of the code and accept with OK.

Caution!

Changes under code 99 may only be carried out by suitably trained service personnel and must be authorised by the manufacturer!

5.4 Con 204 *delta* display elements

All displayed values and menu commands are shown using an 8-line backlit LCD display.

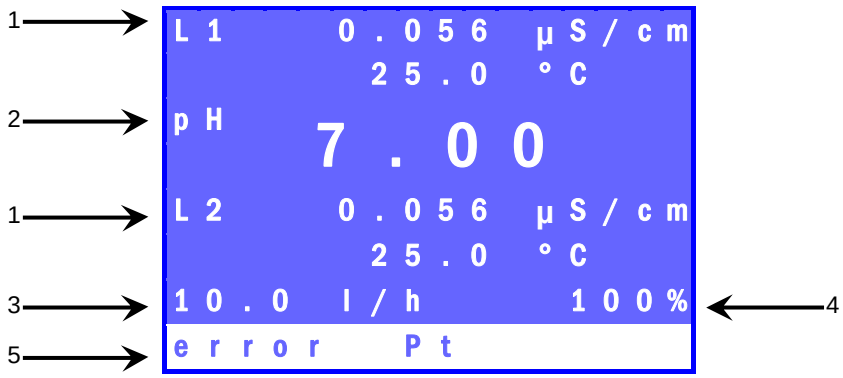


Fig. 20 Con 204 *delta* display with possible visualisations

1. Display of conductivity and temperatures upstream - (C1) and downstream - (C2) of strongly acidic
   cation exchangers
2. Display of calculated pH values in accordance with the VGB Guideline 450 L of 1988
3. Display of volume flow
4. Display of depletion level in cation exchanger
5. Alarm messages (several messages are shown alternately)

5.5 Con 204 *µS* display elements

All displayed values and menu commands are shown using an 8-line backlit LCD display.

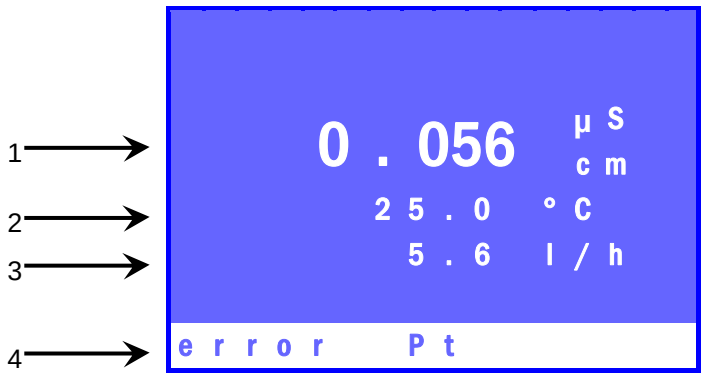
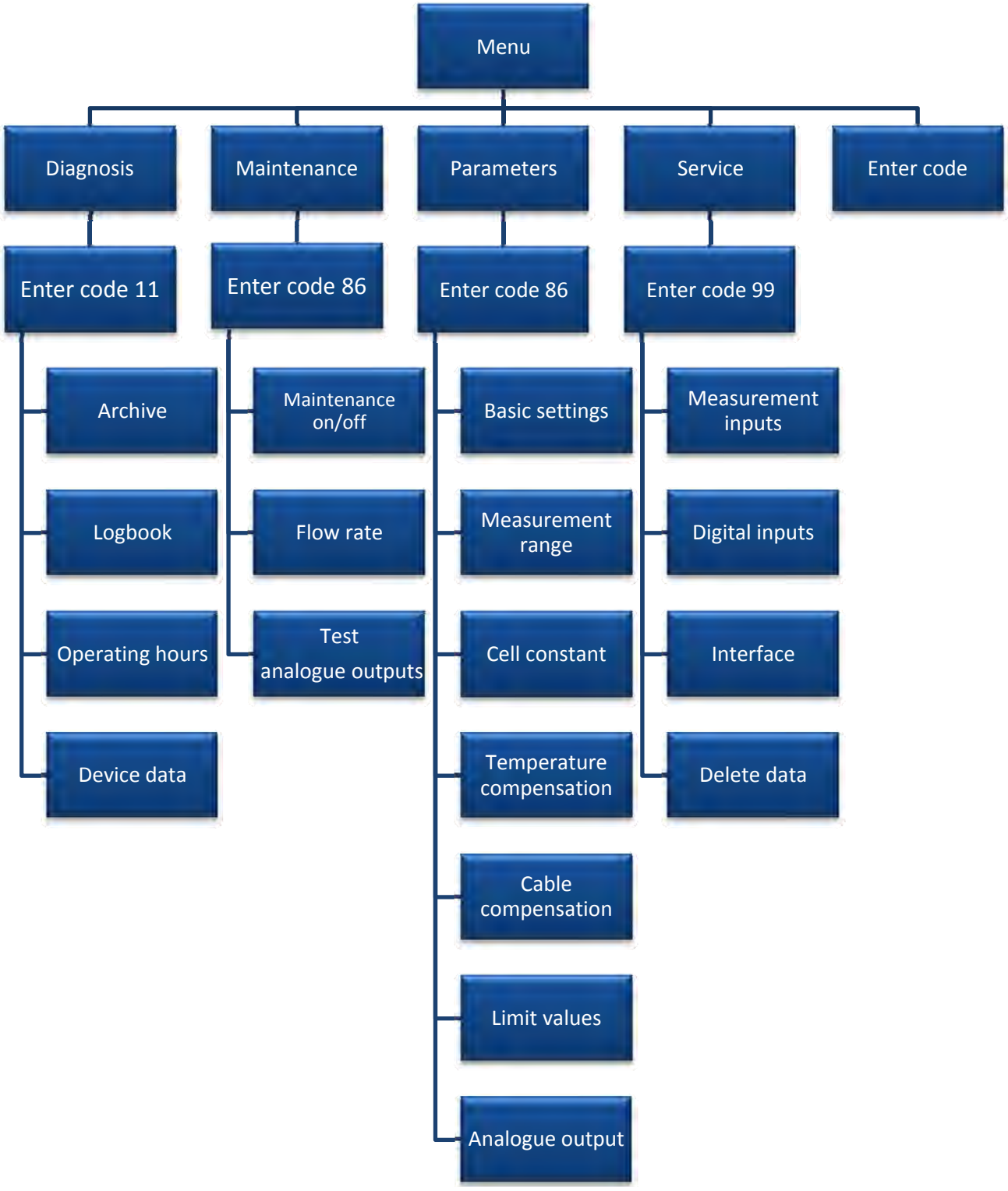


Fig. 21 Con 204 *µS* display with possible visualisations

1. Display of conductivity
2. Display of temperature
3. Display of volume flow
4. Alarm messages (several messages are shown alternately)

5.6 Con 204 *delta* menu structure

5.7 Con 204 *µS* menu structure



6 Initial start-up of the Digox 601 *dac*

☝ Caution!

All the necessary connections must be checked for correct implementation before initial start-up! Installation in accordance with Chapter 4 must have been completed.

6.1 Preparation for initial start-up: fitting of ion exchanger cartouche

The cartouche supplied is completely filled with cation exchanger resin and pre-rinsed. Unpack the cartouche, place it on the quick couplers (Fig. 22) and allow to engage with slight downwards pressure. Fig. 23 on Page 39 shows the analyser with fitted cation exchanger.

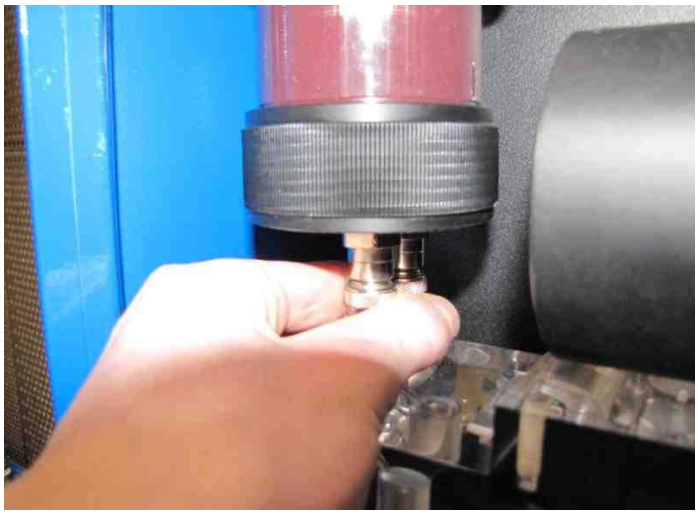


Fig. 22 Fastening the quick lock

6.2 Brief description of initial start-up

Initial start-up can take place after completion of installation under the precondition that the sample medium and electrical auxiliary energy is available (see Fig. 23, Page 39).

1. Installation of the Digox 601 *dac* has been completed in accordance with Chapter 4.
2. The sample conditioning unit (see Fig. 7, Page 20) is set to a sample flow of approx. 12-15 l/h at the pressure regulator with the help of the valve provided on site. When the input valve at the analyser is closed, the sample flows out via the regulator on the conditioning unit and can be measured there.
3. Now switch the Con 204 *delta* differential conductivity measuring instrument on (power on).
4. Open the left-hand valve for the overall sample flow carefully in an anticlockwise direction and ensure that you can see flow rate downstream of the cation exchanger.
5. Rinse and vent the ion exchanger by opening the rinsing valve on the top cover of the ion exchanger cartouche.
6. Increase the flow rate at the needle valve until the flow indicator on the Con 204 *delta* shows a flow rate of 10 l/h (alarm limit our 8.0 l/h and 12.0 l/h).
7. Open the right-hand valve to the DAC reactor carefully in an anticlockwise direction. Check to see that the outflow from the DAC reactor is free and unimpeded (cf. Fig. 8 Page 20).
8. Switch the DAC power switch on.
9. Check the flow rate at the Con 204 *µS* individual conductivity measuring instrument and adjust it to 4 l/h flow rate. (Alarm limits are 3.0 l/h and 5.0 l/h)
10. If the sample flow rate is correct through the DAC reactor, this will start to revolve and bubbles must be seen rising through the vertical drillhole in the DAC reactor.

> ☞ **Note:**
>
> The Digox 601 *dac* may never be put into operation without a connected sample supply. The spinning disc reactor only switches in at a suitably large flow rate (>3 l/h). Measurements made when the reactor is switched off are irrelevant!

11. Check the overall sample flow rate and adjust it if necessary.
12. The float element flow metre for the air must show a constant flow rate (approx. 0.5 l/min).
13. As soon as all adjustments have been correctly carried out, there must be a visible difference between the conductivity measurements upstream and downstream of the DAC reactor if carbon dioxide is present.

> ☞ **Note:**
>
> The sample flows and flow rate measurements must be checked daily during operation in order to guarantee secure functioning of the analyser. If necessary, the flow rate measurements must be readjusted at the valves provided for this purpose.
>
> Target values: Flow 1: approx. 10 l/h (limit value 8.0 - 12.0 l/h)
> Flow 2: approx. 4 l/h (limit value 3 – 5 l/h)
> Air Flow: approx. 0.5 l/min

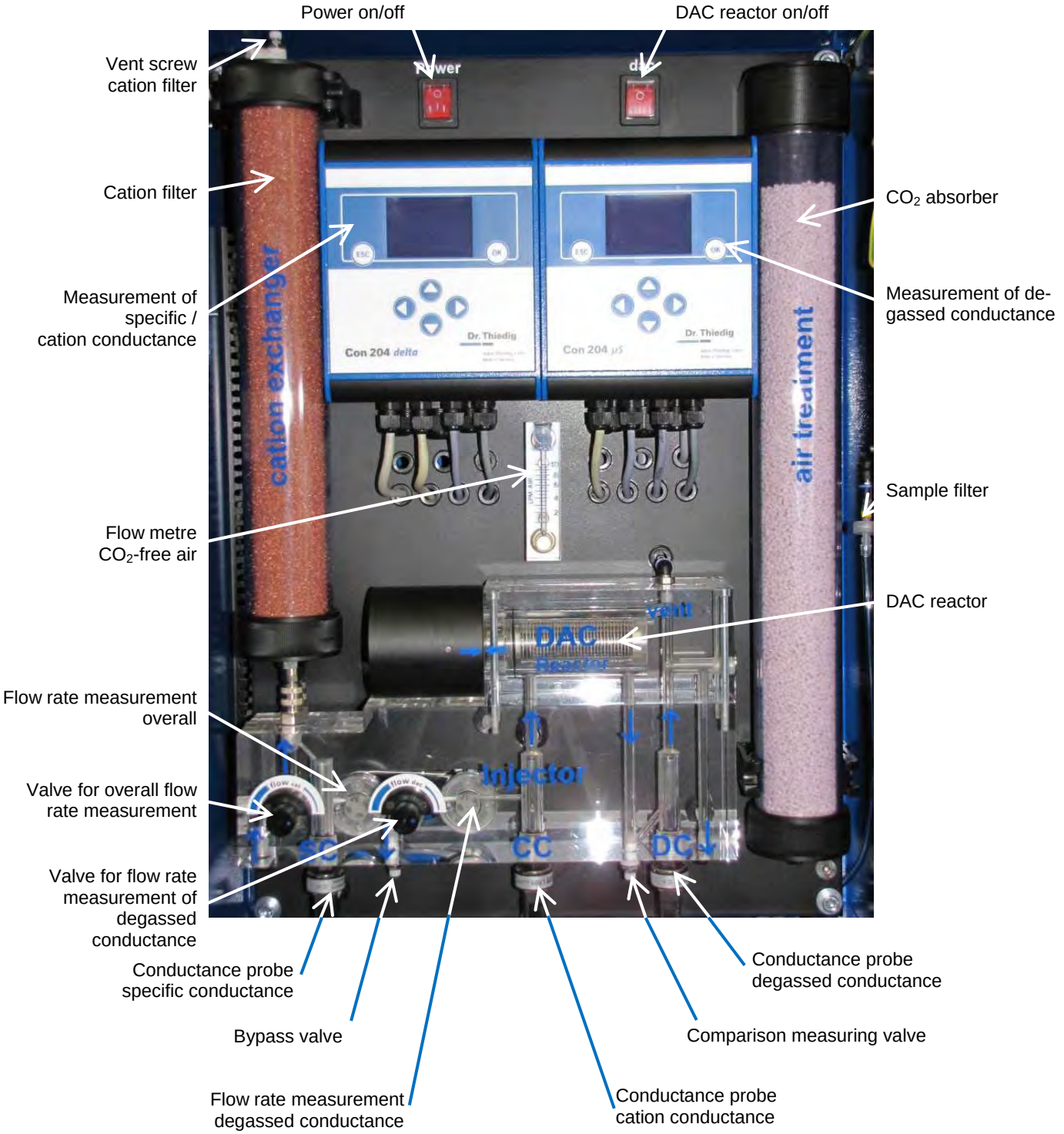


Fig. 23 DAC analyser with cation exchanger, DAC reactor, CO2 absorber and operating elements

6.3 Control of parameterisation

Note:

The measuring instrument has been thoroughly tested before delivery and parameterised in accordance with the customer's information on ordering. Despite this, all parameters must be tested for correctness and adjusted if necessary.

6.3.1 Basic settings

6.3.1.1 Overview

The language, the date/time and the bus address can be changed in the basic settings menu.

Call up the menu using the key.

Select the "Parameters" menu with the key and then confirm it with the key

Select the "Basic settings" menu using the key and confirm it with the key

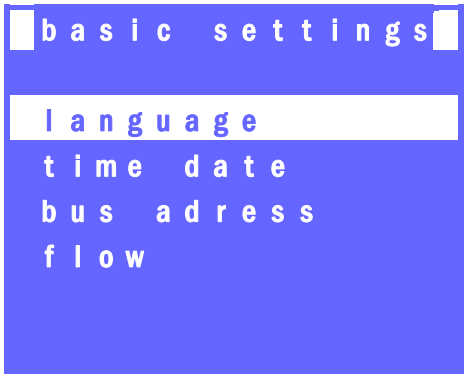


Fig. 24 Basic settings screen

6.3.1.2 Language

You can switch between languages (German, English or French) in the Languages menu. Use the key to make a selection and confirm it with the OK key.
You can use the key to go back one menu level, and the OK key returns straight to the measured value display.

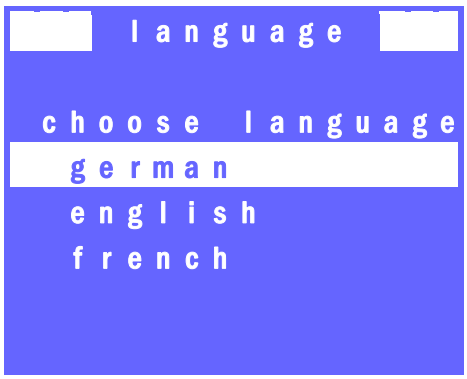


Fig. 25 Language selection screen

6.3.1.3 Time/date

In the time/date menu, the settings must be checked and updated if necessary when initially starting up the measuring amplifier. Select the line to be updated using the ▼ and ▲ keys. The setting is activated using the ▶ key. Now use the ▼ and ▲ keys to carry out the parameterisation and save it using the OK key. Repeat this procedure for each line which needs updating. The measuring amplifier will now show the right time and the right date.

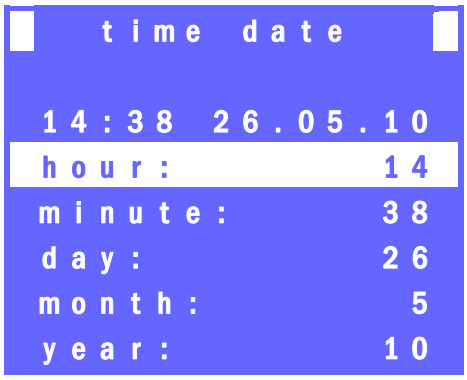


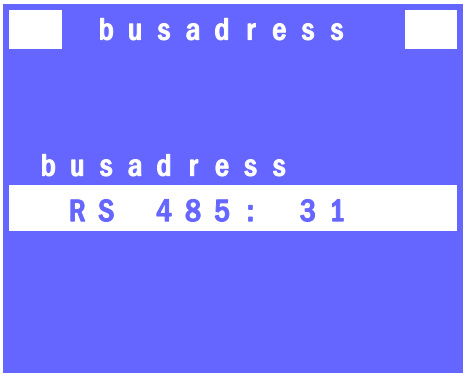
Fig. 26 Time setting screen

6.3.1.4 Bus address

This menu is used to change the RS 485 interface bus address. This is necessary to safeguard communication between the two devices. To do this, activate the menu point with the ▶ key and set the required address using the ▼ and ▲ keys. The entry is saved using the OK key. The setting range is between 00 and max. 32.

The value **must** be **31** on the **Con 204 *delta*** and **must** be **32** on the **Con 204 *µS*** .

Con 204 *delta*



Con 204 *µS*

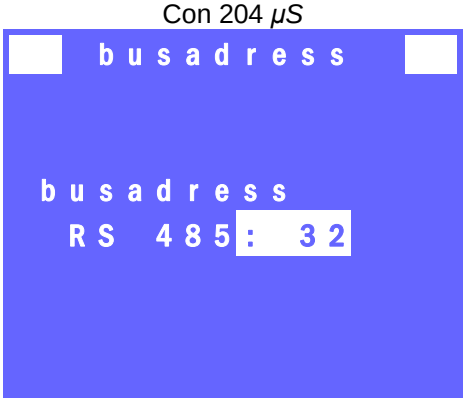


Fig. 27 Bus address screen

☞ Note:

The bus addresses have already been correctly set as delivered, and may not be changed afterwards.

6.3.1.5 Cation filter

This menu is used to switch monitoring of the ion exchanger depletion level on or off. The monitoring function is switched on as delivered. To switch off, activate the menu command using the key and switch the monitoring function off with the OK key. After switching off, the ion exchanger depletion level will no longer be displayed in the main menu.

6.3.1.6 pH measurement

This menu is used to switch calculation of the pH value on or off. pH value calculation is switched on as delivered. To switch off, activate the menu command using the key and switch PH calculation off with the OK key. After switching off, the pH value will no longer be displayed in the main menu.

6.3.1.7 Flow rate

This menu is used to switch monitoring of flow rate over between contact and sensor. In the Digox601dac, flow rate monitoring must always be set to "Sensor" in order to display the impulses provided by the measuring turbines and to output an alarm, or switch the reactor an air pump off if necessary, if any faults occur. To switch over, activate the menu command using the key and switch over between sensor and contact with the OK key. If the "Contact" function is used, no value for the current flow rate will be displayed in the main menu. The function will only switch an alarm on (if a read contact is being used).

Caution!

The Digox 601 *dac* must always be operated using the "Sensor" setting in order to display the impulses provided by the flow metres as a flow rate value, and to output an alarm and to switch the reactor and air pump off if faults occur.

Use the key to return one menu level to the "Basic settings" menu, and if you press the key again you will return to the "Parameters" submenu.
Use the ESC key to return to the measured value display immediately.

6.3.2 Measuring range

☞ Note:

As delivered, the measuring range 0-20 µS has been set at C1 on the Con 204 *delta*, in expectation of the conductivities occurring during operation. 0-2 µS have been set at C2 on the Con 204 *delta* and on the Con204 *µS*

Call up the menu using the ▼ key.

Select the "Parameters" menu with the ▼ key and then confirm it with the ▶ key

Select the "Measuring range" menu using the ▼ key and confirm it with the ▶ key

Confirm "Conductivity C1" using the ▶ key

- The first line displays the measuring range, for example 0 – 20 µS
- The second line, new measuring range, displays 0 – 20 µS, which can be changed.

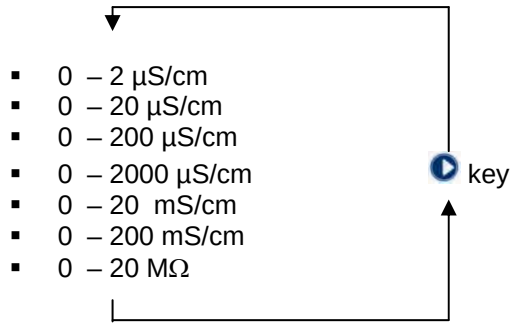
Use the ▶ key to alter the measuring range until 0-2 µS is shown on the display, confirm and save using the OK key.

0-2 µS should now be displayed in the top "Current measuring range" display line. Use the ◀ key to return to the start menu and then repeat the procedure for measuring range C2.

The same procedure must be carried out for the last conductivity on the Con 204 *µS* measuring amplifier.

Measured value selection

The settings in "New measuring range" can be changed as follows (assuming smallest measuring range 0-2 µS/cm):



The required measuring range must be confirmed using the OK key and will then be applied to "Measuring range" (lines 3 and 4).

6.3.3 Cell constant

Note:

The cell constants have been set as delivered, and the values have been verified. Changes to the cell constants may only take place in combination with a comparison measurement, see Chapter 9.2.9.

Call up the menu using the key.

Select the "Parameter" menu with the key and then confirm it with the key

Select the "Cell constants" menu using the key and confirm it with the key

Use the key to confirm "C-value C1"

The following menu will be displayed:

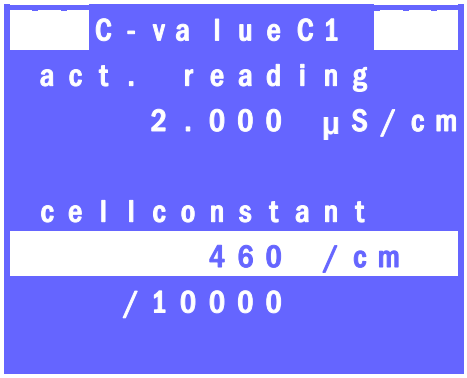


Fig. 28 screen for setting the cell constant.

This procedure is then repeated for C value C2 on the Con 204 *delta* and for the C value on the Con 204 *µS*.

6.3.4 Temperature compensation

☞ Note:

The Pt100 values on the devices have been set as delivered, and the values have been verified. Changes to the correction factors may only take place in combination with a comparison measurement!

Call up the menu using the ▼ key.

Select the "Parameters" menu with the ▼ key and then confirm it with the ▶ key

Select the "Temp. Comp." menu using the ▼ key and confirm using the ▶ key

Confirm "Temp. Comp. C1" using the ▶ key.

You can then use the OK key in the first menu command to change from Manual Comp. to Automatic Comp. (with real temperature display).

Correction Pt 100 is then shown in the display and can be corrected in the subsequently appearing window. The temperature coefficient necessary for measurement operation must be set in the third line.

Use the ▶ and ▼ keys to control the menus.

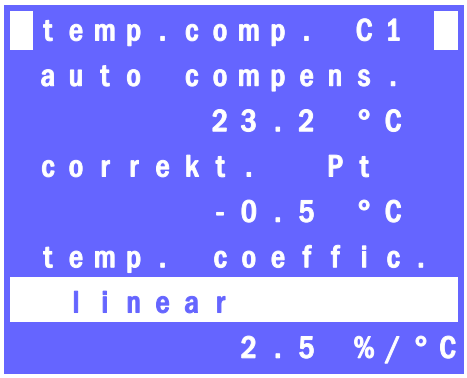


Fig. 29 This is shown on the adjusted display

This procedure is then repeated for Pt100 C2 on the Con 204 *delta* and for Pt100 on the Con 204 *µS*.

6.3.5 Cable compensation or zero point at air

Note:
The cable compensations for all conductivity sensors have been carried out and verified as delivered. Renewed cable compensation is only necessary if the sensor or cables are changed.

Call up the menu using the key.

Select the "Parameters" menu with the key and then confirm it with the key

Select the "Cable compensa." menu using the key and confirm it with the key

Use the key to confirm "Cable Comp. C1".

Use the key to change the presetting from "no" to "yes" and confirm with OK.

Use the ESC key to return to the main display

This means that the first cable resistance has been compensated, and the procedure is then repeated for cable C2 in the Con 204 *Delta* measuring amplifier and analogue for cable L3 in the Con 204 *µS* measuring amplifier.

Caution!
Cable compensation may only be carried out when the sensors are dry in order to compensate for the influence of the connected cable.

6.3.6 Limit values

Note:

In the limit values menu, top and bottom limits and their respective alarm delays can be parameterised for all conductivities and their associated temperatures.

6.3.6.1 Conductivity limit values

The limits for the measuring range are saved as standard in the settings menu for the conductivity limit values. If you press the key the menu command will be activated and the required value can be set using the and keys. The value can be selected from between the top and bottom limits of the measuring range. Use the OK key to save the parameterisation. If the minimum value is fallen below or the maximum value is exceeded and the delay period which has been set expires, relay 3 will be triggered. The alarm delay can be set within a range of 0 s to 2000 s .

Parameterisation for the conductivity measurement 2 limit value takes place using the same procedure as described above.

Press the key to quit the menu and return one menu level.
Use the ESC key to return to the measured value display immediately.

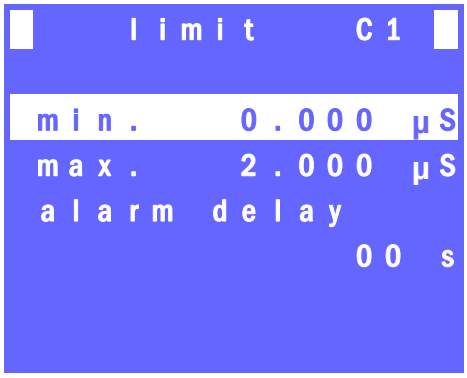


Fig. 30 Conductivity screen

6.3.6.2 Temperature limit value

The limit value for the temperature is based on the sample temperature. If you press the key the menu command will be activated and the required value can be set using the and keys. The setting is saved using the OK key.

A maximum sample temperature within the range of –30.0°C to 140.0°C can be entered. Relay 2 is triggered if the set temperature is exceeded. The alarm delay can be set within a range of 0 s to 2000 s .

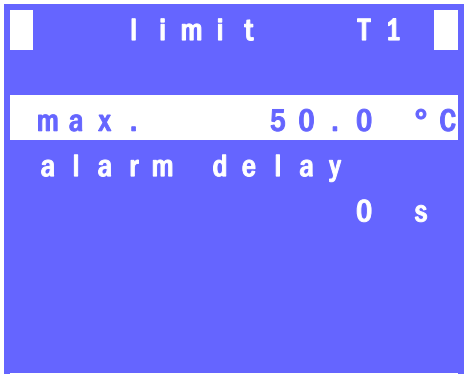


Fig. 31 Temperature screen

Parameterisation for the temperature measurement 2 limit value takes place using the same procedure as described above.

Press the key to quit the menu and return one menu level.
Use the ESC key to return to the measured value display immediately.

6.3.7 Analogue output

☞ Note:

The analogue outputs are parameterised and verified before delivery using customer specifications.

Call up the menu using the key.

Select the "Parameters" menu with the key and then confirm it with the key

Select the "Analogue outputs" menu using the key and confirm it with the key

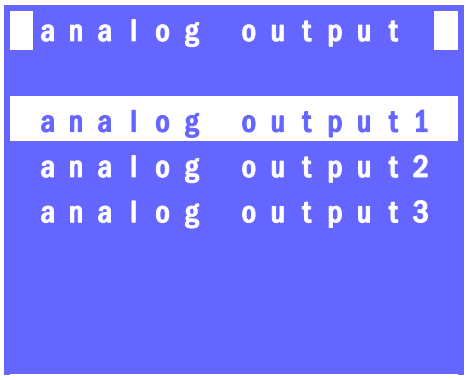


Fig. 32 Screen after confirmation

Parameterisation of current outputs 1, 2 and 3 is described below using analogue output 1 as an example.

6.3.8 Current output

The output of the measurement value, the output type and analogue output setting values are displayed in the current output menu. The current outputs can represent the following measurement values:

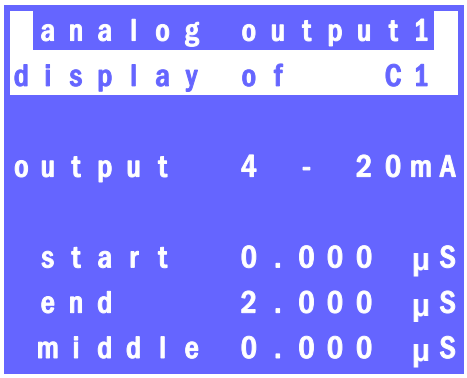


Fig. 33 Screen after confirmation

- Output of conductivity 1 (C1)
- Output of conductivity 2 (C2)
- Output of temperature 1 (T1)
- Output of temperature 2 (T2)
- Output of calculated pH value (pH)

Use the OK key to select from the "Output of…" Menu command. The type of current output can be changed in the "Outlet…" Menu command from 0 - 20 mA to 4 - 20 mA using the OK key. This means that the 50% value of the current output changes accordingly from 10 mA to 12 mA.

Parameterisation of the current output values is carried out in the bottom 3 lines. Use the and keys to make your selection. If you press the key the menu command will be activated and the required value can be set using the and keys. The value can be selected from between the top and bottom limits of the measuring range. Use the OK key to save the parameterisation. The values correspond to the following current output values:

- Initial value = 4 mA
- Final value = 20 mA
- Mean = 12 mA

The bilinear current output is activated as soon as a value for the inflection point = 50% value is entered.

7 Continuous measurement operation

7.1 Preliminary remarks

During continuous measurement operation, the measured values are shown in the display, and analogue signals, alarms and error messages are transmitted to the central control system in accordance with parameterisation.

☞ Note:

The diagnosis menu enables inspection personnel to determine current information about the measuring instrument condition and therefore to specify and carry out any necessary measures. No parameter changes can be carried out in this menu (only read authorization).

Use the ▼ and ▲ keys to select the appropriate submenu commands. Use the OK key or the ▶ key to confirm the selection.

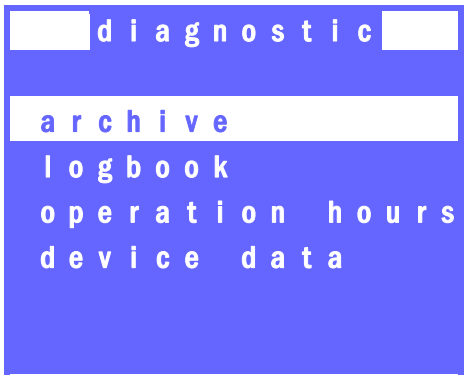


Fig. 34 Diagnosis menu screen

7.2 Archive (datalogger)

You can use the archive menu to call up the measured values over the last 3 hours for conductivity 1 and 2, in addition to the calculated pH value, as a trend line. Use the and keys to select the appropriate trendline. Use the OK key or the key to confirm the selection. If you press the OK key you will access a further menu in which the minimum and maximum trend line values can be parameterised.

Use the and keys to select the minimum or maximum value. Use the to activate the parameterisation.
Use the and keys to parameterise the required minimum or maximum value.
The minimum value is set to 0.000 µS and the maximum value to 2.000 µS for trend lines C1 and C2. The setting is saved using the OK key.

Use the key to return one menu level to the trend line.

7.3 Logbook

All error messages and warning notices are saved together with their time and date in the logbook. Use the and keys to scroll through the entries. Use the key to quit the menu and return one menu level to the diagnosis menu.

7.4 Operating hours

The Con 204 *delta* operating hours are displayed in the operating hours menu. Use the key to quit the menu and return one menu level to the diagnosis menu.

7.5 Device data

The Con 204 *delta* device number, software status and date of manufacture can be read off in the device data menu.

Caution!
If you have any problems or service queries about the Con 204 *delta* or Con 204 *µS*, please always state the internal device, the software status and the date of manufacture. It is also necessary to state the serial number (located on the top of the housing) for the relevant measuring amplifier.

8 Decommissioning/device standstill

8.1 Interrupting sample feed

To interrupt the sample feed, please close the right-hand regulating valve (SC, see Fig. 23) completely. If the analyser has an upstream revision block fitted, this must also be completely closed.

8.2 Dismantling of sensors and drainage on the Digox 601 *dac*

Loosen the mounting plate in the analyser and foldout the folding frames with mounting plate as stated in Chapter 4.4.2, please refer to Fig. 5, Fig. 6). The probes in the sensor block can now easily be reached on the mounting plate, see Fig. 35. The screws (right-hand thread) on the conductivity cell connecting plugs should be loosened using a screwdriver. (see Fig. 36)

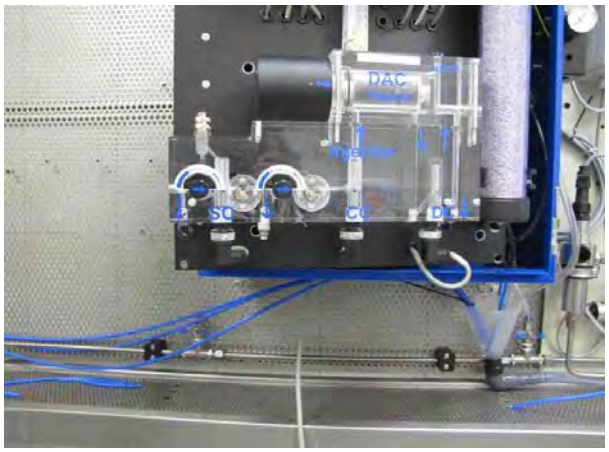


Fig. 35 Sensor block on folded out mounting plate

Fig. 36 Loosening fixing screws on the sensor plug

Fig. 37 Removing sensor plugs

Fig. 38 Dismantling the sensors

The connecting plug now needs to be pulled off the conductivity cells from below. Please make sure you do not lose the gasket on the sensors (see Fig. 37). The conductivity cells (right-hand thread) must now be screwed out of the acrylic block (see Fig. 38).

In doing so, make sure that neither the connecting plug nor the contacts on the conductivity cells become wet. If any water should get onto the contacts, wipe it off immediately with a cloth or similar. Once all the water has been removed from the block, the cells can be refitted with gasket and plugs. When refitting, please proceed in reverse order to the dismantling procedure.

The valve for comparison measurements (Fig. 39) on the bottom of the acrylic block, on the left next to the DC conductivity sensor (see Fig. 23, Page 39) should be opened by turning it anticlockwise so that any water still in the acrylic block can be removed. (see Fig. 39). Once all the water has been removed from the block the valve must be closed again (clockwise).

Fig. 39 Opening the valve for comparison measurements

8.3 Switching off permanently

If the analyser is to be switched off permanently, the measuring amplifiers must also be switched off with the relevant main switch is. The ion exchanger must be dismantled, the watered and stored under suitable conditions.

8.4 Disposal of used consumables

Used consumables must be disposed of in accordance with the operator's works disposal concept!

Warning!

The water and indicator resin discharging from the ion exchanger and analyser are extremely acidic. Avoid contact with skin or eyes. Suitable safety equipment must be worn. Rinse out immediately with clean water on contact. When handling the absorber compound, the PSE required in accordance with the datasheet must be used.

9 Maintenance and service

Warning!

Maintenance work may only be carried out by appropriately trained and authorised personnel!

The functions in the maintenance menu can be accessed using Code 86.

9.1 Maintenance menu

9.1.1 Preliminary remarks

The following menu commands can be accessed via the maintenance menu (see Chapters 5.6 Con 204 *delta* menu structure and 5.7 Con 204 *µS* menu structure):

- Maintenance on/off
- Flow rate
- Cation exchanger
- Test analogue outputs

Use the and keys to select the appropriate submenu commands. Use the OK key or the key to confirm the selection.

9.1.2 Maintenance

The maintenance switch can be switched on or off using the maintenance menu. This enables work to be carried out on the device without negatively influencing signals to the central control system. If the light switch is switched on, the current analogue signals are "frozen" and any possible changes are no longer transmitted.

Use the key to select the menu command for switching on, then activate using the key and switch maintenance on using the OK key. If the maintenance switch is switched on, the main menu displays the "Maintenance being carried out" message.

Caution!

Once maintenance work is complete, the maintenance switch must be switched off again so the correct transmission of all signals to the central control system is ensured!

Use the key to quit the submenu and return one menu level to the Maintenance menu.

9.1.3 Flow rate

9.1.3.1 Preliminary remarks

The flow rate menu is used to check the current flow rate value, to set minimal and maximal flow rate values and to calibrate the flow metre. Use the key to select the menu command and activate it using the key.

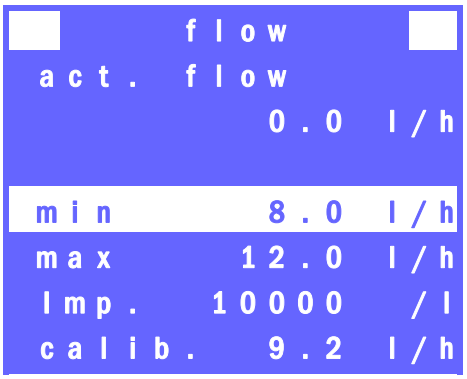


Fig. 40 Display with flow rate settings on the Con 204 *delta*

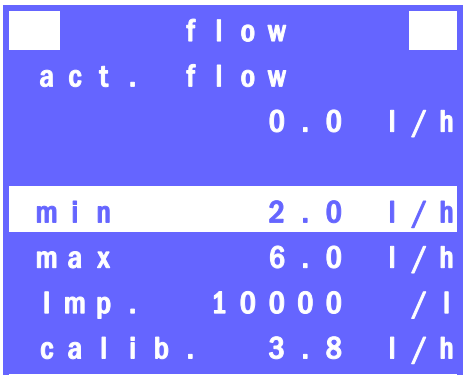


Fig. 41 Display with flow rate settings on the Con 204 *µS*

9.1.3.2 Flow rate calibration on the Con 204 *delta*

The values set in the measuring transducer should be checked before carrying out flow rate calibration, see Fig. 40.

min	8.0 l/h
max	12.0 l/h
Imp.	10000 1/l

The cation filter flow rate is designed for 10 l/h, the basic setting for the measuring amplifier flow rate is 10 l/h. For calibration, the hoses upstream of the bypass and upstream of the degassed conductivity outflow (see Fig. 42, arrangement 1) are fed into a measuring cylinder and the water is collected over a period of precisely 1 min in the cylinder.

The established value must be multiplied by 60 and then divided by 1000.

Example: 154 ml volume collected in measuring cylinder → (154 x 60)/1000 = 9.24 l/h

Now enter the value you calculated in the "Calib." line and then transmit this to the program by pressing simultaneously with the OK key. This value must appear on the display as the current flow rate. Use the key to quit the submenu and return one menu level to the Maintenance menu.

9.1.3.3 Con 204 *µS* flow rate calibration

The values set in the measuring transducer should be checked before carrying out flow rate calibration, see Fig. 41.

min	3.0 l/h
max	5.0 l/h
Imp.	10000 1/l

The ideal flow rate through the reactor should be around 4 l/h; The basic flow rate setting in the measuring amplifier is 4.0 l/h. For calibration, the hose from the degassed conductivity outflow (see Fig. 42, arrangement 2) is fed into a measuring cylinder and the water is collected over a period of precisely 1 min in the cylinder.

The calculation and settings take place analogue to Chapter 9.1.3.2

9.1.3.4 Verification of calibrated flow rates

The calibrated flow rates should be checked approximately every 4 weeks. Procedure as follows.

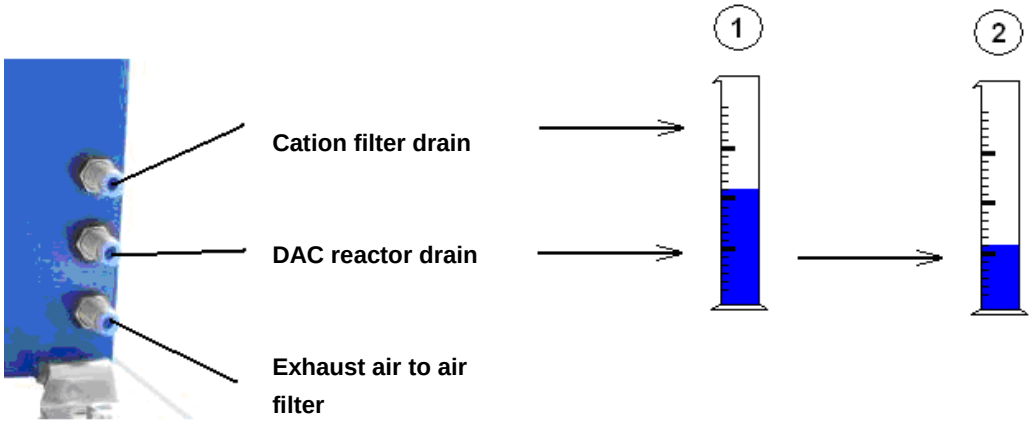


Fig. 42 Measurement arrangement for determining real flow rate

Measuring arrangement 1: The outflow hoses from the cation filter drain and the DAC reactor drain are fed into a measuring cylinder with around 250 ml volume. The water quantity entering is measured over precisely 1 min.

Measurement arrangement 2 The outfeed hose from the BAC reactor drain is fed into a measuring cylinder with around 250 ml volume. The water quantity entering is measured over precisely 1 min.

9.1.3.5 Cation filter (only on Con 204 *delta*)

The basic data for the ion exchanger used can be adapted in the cation filter menu. Once the indicator resin has been exchange, display of the residual utilisation capacity must be reset in this menu. Use the key to select the menu command and activate it using the key.

Use the key to select the "New calculation" point and activate it using the key. The display will then change from "No" to "Yes". Use the OK key to confirm the new calculation. Once confirmation has been made, the residual capacity will be displayed in the main menu as "100%".

Use the key to quit the submenu and return one menu level to the Maintenance menu.

9.1.4 Test analogue outputs

9.1.4.1 Preliminary remarks

The "Test analogue outputs" menu can be used to verify the correctness and assignment of the analogue output signals. This is especially helpful if loop checks to downstream central control systems are being carried out. In addition, this menu has a facility for adapting or adjusting the accuracy of individual current outputs to the on-site conditions. Current output adjustment range +/-30 digits.

9.1.4.2 Testing analogue outputs

Use the key to select the menu command and activate it using the key. Use the OK key to switch the test function for all current outputs on. Use the key to select the required output and then activate the setting function using the key. Adjust the required current value using the and keys (freely selectable between 0 and 20 mA) and then use the OK key to activate the selected value. The measuring instrument will now output this analogue value at the analogue output. The value can be measured using a suitable instrument or compared with the appropriate display in the control system if fitted. This function can be used for all available current outputs.

9.1.4.3 Adjusting the analogue outputs

All current output have been tested, adjusted and verified on delivery. It is, however, possible that readjustment of the current outputs is necessary on site. To do this, the analogue value output is measured with a calibrated mA measuring instrument (multimetre or similar) in series with the current loop. A nominal value of 4 mA (as described in Chapter 9.1.4.2) is then set and compared with the displayed value on the multimetre. If there are any variations, these can be compensated by changing the digit upwards or downwards.

To do this, use the key to select the +/-Digi point and then activate the entry using the key. Use the and keys to correct the value up or down (+/-30 Digits). Then confirm the adjusted value with the OK key and now check against the value displayed on the multimeter again. Repeat this procedure is often as is required to achieve the required accuracy.

For control purposes, you should also set 12 mA and 20 mA and verify these by measurement.

Caution!

Once the tests or adjustments have been completed, the test function must be switched off again so the correct transmission of all signals to the central control system is ensured!

9.2 Carrying out maintenance work

9.2.1 Maintenance intervals

Caution!

The maintenance intervals described below are reference values based on experience. These intervals may need to be adjusted to guarantee fault-free measuring operation depending on the installation conditions.

Description of maintenance task	Interval	Check/adjust	Replace/clean
Flow rates and overall sample flow	daily	Check/adjust	no
Impurities in throughflow block	daily	Check	Clean, if necessary
Function of reactor and gassing	daily	Check/adjust	no
Ion exchanger depletion level	weekly	Check	Replace, if depleted
Impurities in flow metre	weekly	Check	Clean, if necessary
Impurities on conductivity sensors	monthly	Check	Clean, if necessary
Correctness of displayed flow rates	monthly	Check/adjust	no
Correctness of displayed measured values	monthly	Check/adjust	no
Absorber compound depletion level	every six months	Check	Replace, if depleted
Sealtightness of hydraulic connections	every six months	Check	Replace, if depleted
Signal and alarm transmission to control system	annually	Check/adjust	no

9.2.2 Cleaning of flow rate measurements

The sample feed must be interrupted as described under Chapter 8.1 in order to clean the flow rate measurements. The device folding frames must be swivelled out as described in Chapter 4.4.2 so that the flow metres can be dismantled. The flow metres can be removed from the rear of the mounting plate, see Fig. 10, Page 22. The flow metre plugs must be removed using a suitable Phillips screwdriver. Please make sure you do not lose the seals located under the plugs!

Fig. 43 Dismantled flow metre with seal

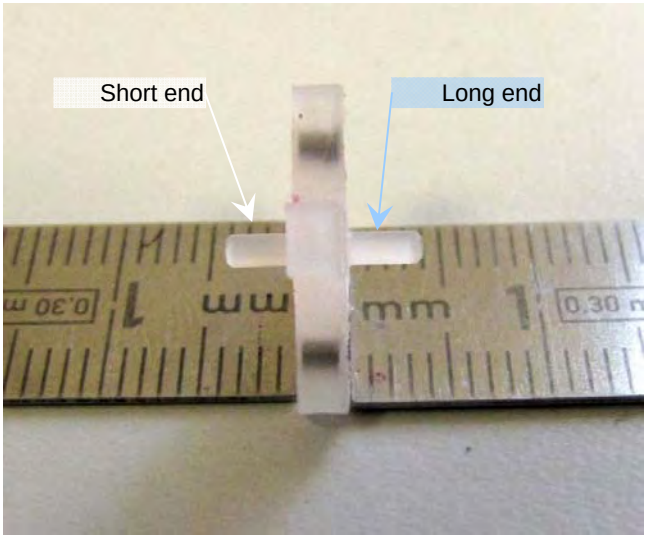


Fig. 44 Dismantled impeller

The flow metres must be dismantled using a 2 mm Allen key. The flow metre seal must be checked for intactness and replaced if necessary. Fig. 43 shows a removed flow metre.

A lint-free cloth must be used for cleaning. Aggressive cleansing agents may not be used. Observe insertion direction of the impeller when reassembling. The shorter part of the axle must face the transducer. Fig. 44 shows a removed impeller with differing axle lengths.

☝ Caution!

The flow metre axle is made of plastic. It must be positioned precisely in the axle bearings without pressure when reassembling to guarantee fault-free function of the impeller sensor.

9.2.3 Cleaning the sensors

If impurities are deposited on the measuring cell, an insulating layer forms on the electrodes. This results in an increasing cell constant and leads to measurement errors. If there is an obvious increase in the cell constants caused by impurities, the measurement accuracy can be restored by cleaning the measuring cells.

In the case of normal accumulations, hot water with a little washing-up liquid has proved effective. If there are lime or hydroxide accumulations, a 5 to 10% HCI solution is used. Organic accumulations such as oils and greases are removed with acetone. A chlorine solution (bleach solution) can be used for algae, bacteria or sludge.

In all cases, possible residues of cleansing agents must be thoroughly rinsed off using demineralised water. Never use any sharp objects or materials to clean the electrodes. Damage to the electrode surface can result in a change in the cell constant, as can polishing or grinding which always lead to measurement errors.

Warning!

Never use hydrochloric acid and bleach solution simultaneously! This produces highly poisonous chlorine gas! The PSE required by the works safety at work regulations must be used when handling cleansing agents.

9.2.4 Ion exchanger cartouche

9.2.4.1 Preliminary remarks

The ion exchanger cartouche is filled with indicator resin. Depletion of the indicator resin can be seen from a colour change from brown to red. In addition, the residual period of use is shown in the Con 204 *delta* display.

Warning!

The water discharging from the ion exchanger and the indicator resin are extremely acidic. Avoid contact with skin or eyes. Suitable safety equipment must be worn. Rinse out immediately with clean water on contact.

9.2.4.2 Removing the ion exchanger cartouche

The cation exchanger cartouche is removed in the following stages in accordance with Fig. 45, Fig. 46 and Fig. 47:

- Loosen the cartouche by simultaneously pushing the two quick locks downwards
- Remove the cartouche from the top holder and remove it forwards out of the device

Fig. 45 Loosening the quick locks

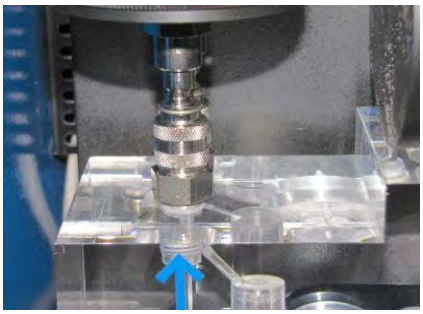


Fig. 46 Released quick locks

Fig. 47 Removing the cartouche

9.2.4.3 De-watering the ion exchanger cartouche

The cartouche must be de-watered before opening. This takes place in the following steps (see Fig. 48, Fig. 49 and Fig. 50):

- Open the air bleed valve on the top cover of the ion exchanger cartouche by turning it anticlockwise.
- Turn the ion exchanger cartouche over and open the external quick lock downwards with slight pressure using a suitable tool (e.g. ballpoint pen). Any water in the cartouche will now run out of the air bleed hose.
- Allow all the water in the cartouche to flow out, then close the air bleed valve in the top cover of the ion exchanger cartouche by turning it clockwise.

Fig. 48 Opening the air bleed valve

Fig. 49 Opening the quick locks

Fig. 50 Water draining out of the cartouche

9.2.4.4 Resin replacement

The top cover of the ion exchanger cartouche must be dismantled by turning anticlockwise (threaded) in order to replace the indicator resin. The seal on the inside may not be lost, and must be checked for intactness and replaced if necessary! Fig. 51 shows the ion exchanger cartouche with cover removed.

The depleted indicator resin is then shaken out of the cartouche. A suitable vessel must be ready to collect the resin! The operator is responsible for professional disposal or regeneration of the indicator resin!

When refilling the cartouche with new resin, no resin may flow into the thread in the tube or in the cover. This leads to leaks during later operation! A maximum 1 L of new indicator resin may be filled in. Space for free water above the resin bed is planned and required! After refilling, the ion exchanger cartouche is reinserted into the device as described in Chapter 6.1, Page 37. The sample feed connected again and the required flow rates must be set.

Fig. 51 Dismantled cartouche cover with seal

9.2.4.5 Venting/rinsing on reoperation

The ion-exchange cartouche is to be vented and the resin bed must be rinsed through by opening the air bleed valve. We recommend at least 5 times volume replacement when using new resin.

☞ Note:

Red colouring of the rinsing water is normal. Please note that new indicator resin requires a run-in time to achieve realistic measurement values.

9.2.5 Air filter cartouche

9.2.5.1 Preliminary remarks

The air filter cartouche is filled with absorber compound. Depletion of the absorber compound can be recognised from a colour change from white to blue/purple. Under normal operating conditions, one filling lasts for around one year.

Warning!

When working with the absorber compound, the safety precautions stated in the datasheet must be taken and the required PSE must be worn.

9.2.5.2 Loosening and removing the air filter cartouche

Disassembly of the air filter is carried out in a few steps (see Fig. 52, Fig. 53 and Fig. 54):

- Release the hose connection on the floor to disassemble the cartouche. A plug-in system is used here. Fig. 52 shows the released hose.
- The cartouche is screwed out of the upper section by turning anticlockwise and removed from the device downwards/forwards. The seal located in the cover may not be lost, must be checked for intactness and replaced if necessary.
- The filter material located in the upper section must be replaced when replacing the absorber compound.

9.2.5.3 Replacing CO_2 absorber compounds

- Shake the depleted absorber compound out of the open cartouche. A suitable vessel must be ready to collect the absorber compound! The operator is responsible for professional disposal of the absorber compound!
- Refill the cartouche with a new absorber compound; no particles may enter the pipe thread or the cover, otherwise there will be leaks during later operation! A maximum 0.8 kg of new absorber compound may be filled.
- Space for free air above the absorber compound is planned and required!
- The filter located in the upper section must be replaced. When doing so, please ensure that the filter is placed in the upper section with the solid side facing upwards, and that the filter does not contact the gasket.
- After refilling, screw the air filter cartouche clockwise into the upper section. Please ensure that the gasket is seated correctly. When re-operating, the air section sealtightness must be checked.

Caution!

The absorber compound may only be subjected to the surrounding air for a brief period. It will become contaminated with CO_2 on longer contact with surrounding air. This reduces the service life.

Fig. 52 Released hose on bottom cartouche cover.

Fig. 53 Dismantled cartouche

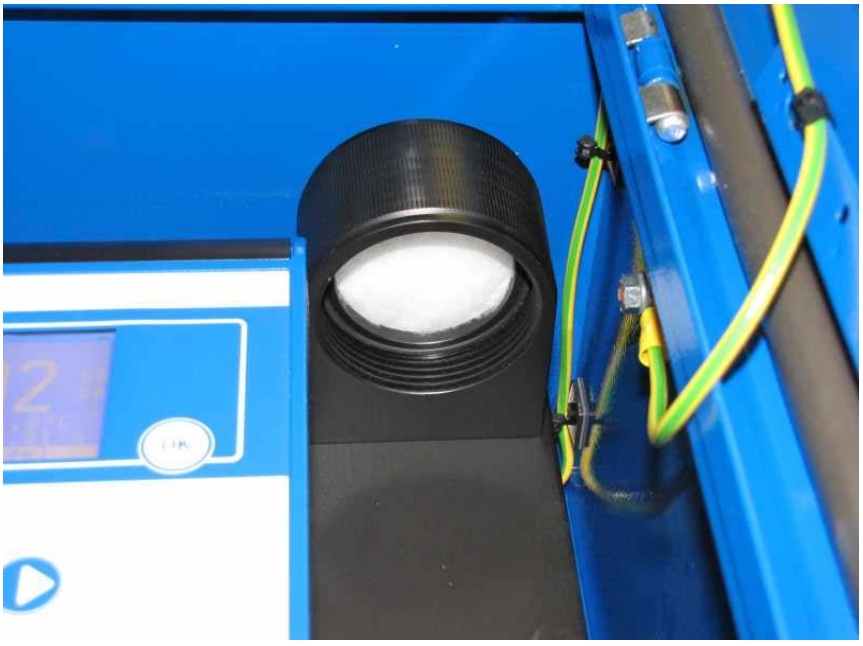


Fig. 54 Upper section, filter and seal

9.2.6 Calibration of flow rate measurements

Calibration of the flow rate measurements should be carried out when required as described in Chapter 6.3.1.7.

9.2.7 Calibration Pt100

When necessary, the Pt100 must be calibrated using a suitable comparison measuring device or a measured reference temperature. The menu function is described under 5.2.4. Once the reference temperature has been determined, use the ▼ to select the Pt100 Correction point and then activate the entry using the ▶ key. The correction value is entered using the ▼ and ▲ keys and then confirmed using the OK key. The Pt100 can be corrected within a range of +/- 5°C.

9.2.8 Calibration/setting cell constants

If, during a reference measurement, there are discrepancies with one of the comparison values measured on the calibrated reference device, these can be compensated by correcting the cell constants.

The menu function is described in 6.3.3 on Page 44.

To change the cell constants in the C value C1 menu, select the cell constant with the ▶ key and then press the ▶ key again to activate the entry. The correction value is entered using the ▼ and ▲ keys and then confirmed using the OK key.

☞ Note:
Changes to the cell constants should not be carried out in large steps (step size max. 0.0005 1/cm). You must observe and adaptation time of around 2 min between individual changes!

The cell constants can also be determined using a reference measurement, please refer to Chapter 9.2.9.

9.2.9 Reference measurements

9.2.9.1 Preliminary remarks

To check the device, or for retrospective calibration of the cell constants, a reference measurement is necessary. The reference device must be suitable for a low measuring range and must also be calibrated. It is used to calibrate the temperature and conductivity. Please observe the following during the reference measurement:

- The reference sensor is mounted in a flow cell sealed off to the atmosphere.
- The flow direction through the sensor in the reference flow cell is from bottom to top.
- You must ensure that no air bubbles whatsoever are located in the throughflow vessel, or can collect there.
- The feed hose to the reference measuring cell should be gas tight as far as possible, silicon hoses are, for example, less suitable.
- A period of 10 min waiting time must be observed until the measured values have stabilised.

Caution!

Only a suitable, calibrated reference measuring device may be used for calibration measurements. The cell constants for the reference device used must be selected to match the measuring ranges selected in the Digox601dac.

9.2.9.2 Reference measurement of specific conductivity (SC)

The reference measurement is either switched in series in front of the DAC analyser or in a parallel sample circuit (see Fig. 55) or to a parallel sample circuit in front of the device (see Fig. 56). The flow rate is at least 10 l/h.

9.2.9.3 Reference measurement of acidic conductivity downstream of cation exchanger (CC)

The reference measured is connected to the bypass circuit on the DAC analyser, see Fig. 57. The water draining off is discarded. The flow rate should be set to around 8-10 l/h.

9.2.9.4 Reference measurement of degassed conductivity (DC)

The reference measured is connected to the comparison measuring valve on the DAC analyser, see Fig. 58. The water draining off is discarded. The flow rate is only around 4 l/h. Since the CO_2 is displaced with CO_2-free air, the water is enriched with gas. For this reason, you must take special care that no further air bubbles form on the electrode.

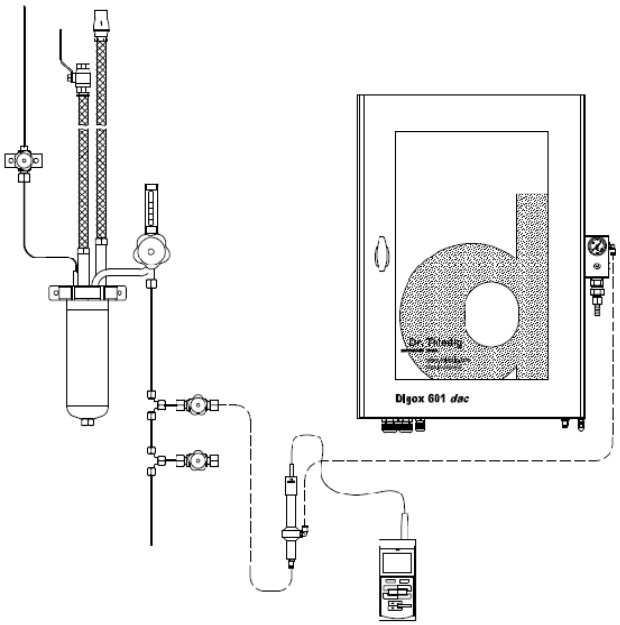


Fig. 55 Measurement arrangement for specific conductivity SC in series

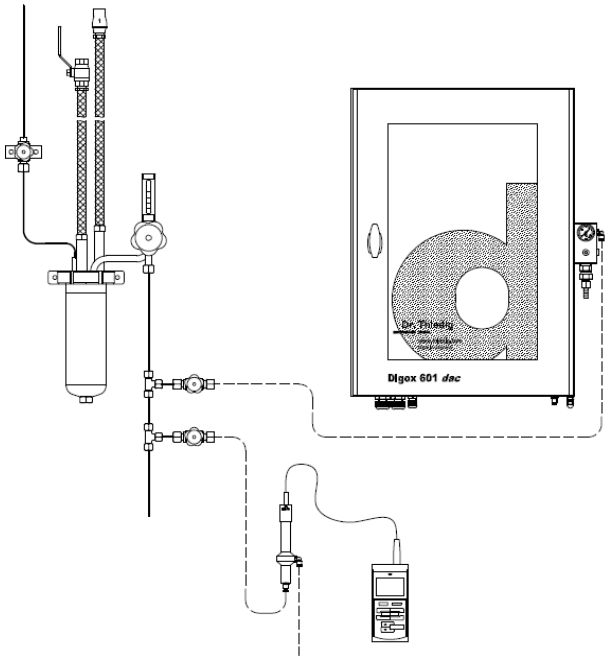


Fig. 56 Measurement arrangement for specific conductivity SC parallel to the device

Fig. 57 Measuring arrangement cation conductivity CC

Fig. 58 Measuring arrangement degassed conductivity DG

9.2.10 Calibration of analogue outputs

Calibration of the analogue outputs is carried out if required as described in 9.1.4 on Page 58.

9.3 Service menu

9.3.1 Preliminary remarks

Use the key to call up the service menu (under Code 99) and then activate it using the key. After this, the submenu commands are shown in Fig. 56 are available for selection. Use the ESC key to return to the measured value display immediately.

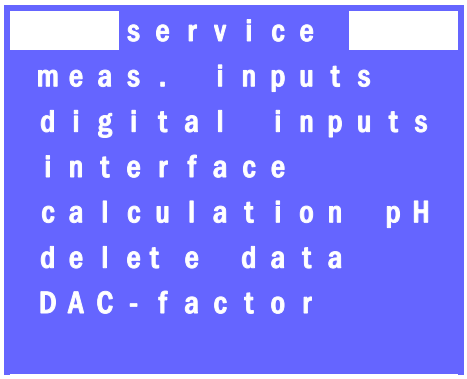


Fig. 59 Menu display in service menu

Note:
The pH calculation menu point is only implemented in the Con 204 *delta*. The DAC factor menu point is only implemented in the Con 204 *µS*.

9.3.2 Measurement inputs

Use the to activate the menu command. The current values for the measurement inputs are displayed here. Settings cannot be made. Evaluation of the measurement inputs allows diagnoses of the connected sensors and electronics to be made. Press the key to quit the menu and return one menu level.

9.3.3 Digital inputs

Use the to activate the menu command. The current values for the flow rate measurements are displayed here. Settings cannot be made. Evaluation of the impulse displays allows diagnoses of the connected impeller sensors to be made. Press the key to quit the menu and return one menu level.

9.3.4 Interfaces

Use the to activate the menu command. Correct functioning of the digital interface (RS485) can be tested here. A special diagnosis tool must be used to test the digital interface. This is only available to Dr. Leye GmbH service personnel. Press the key to quit the menu and return one menu level.

9.3.5 pH calculation

Note:
The pH calculation menu point is only implemented in the Con 204 *delta*.

Use the to activate the menu command. The calculation factor for the pH calculation is adjusted here. Changes to the Z value may only be carried out by trained and authorised service personnel! Press the key to quit the menu and return one menu level.

9.3.6 Deleting data

Caution!

If you delete data, all device settings and parameterisations will be deleted. Before deleting data, all setting values must be logged so that they can be re-entered at a later date.

Use the to activate the menu command. Use the OK key and the key to start deleting data.
The display will show "Delete process running". Once installation is complete, the device will jump back to the measurement menu.

Note:

The measuring instrument starts with Code 11 after successful data deletion. The appropriate code must be entered in order to carry out settings.

Caution!

Once data has been deleted, all the settings which were previously logged must be restored. Calibration of the flow metre, adjustment of the current outputs and calibration of the temperatures must be carried out. A comparison measurement of all conductivity sensors is also recommended! All parameters must be compared with records and adapted if necessary.

9.3.7 DAC factor

Note:

The DAC factor menu command is only implemented on the Con 204 *µS* and only available if Con 204 *delta* and Con 204 *µS* communicate via the RS485.

Use the to activate the menu command. You can set the DAC calculation factor here. Changes to the DAC factor have a significant influence on calculation of conductivity for the degassed conductivity (DC). Changes to the DAC factor may only be carried out by trained and authorised service personnel. Press the key to quit the menu and return one menu level.

9.4 Spare and wear parts

Caution!

Only original spare parts or consumables may be used! The guarantee becomes invalid if an authorised spare parts or consumables are used.

Note:

The following table lists the spare parts and consumables required for regular maintenance. You can obtain information about further spare parts on request.

Designation	Item No.	Note
Ion exchanger resin with indicator, 1 l	11205020	Consumable
CO_2 absorber compound, 1 kg	13550064	Consumable
CO_2 cartouche filter insert	11451004	Consumable
O-ring for valve gate and valve spindle	11190029	Wear part
Fine filter for sample inflow	11205102	Wear part
O-ring cation filter and CO_2 cartouche	11190189	Wear part
Air filter for air pump	11170001	Wear part
Fine-wire fuse T 2.5A	12231178	Wear part
PUN hose water section	11010329	Wear part
PUN hose air section	11010330	Wear part
PVC hose drain	11010004	Wear part
Conductivity measuring cell LS05 k=0.05 with angle plug and Pt100	12450041	Spare part
Flow metre without housing	11460094	Spare part
Ion exchanger cartouche filled, including connections	51451000	Spare part
Air preparation cartouche filled, including connections	51451001	Spare part
Nonreturn throttle valve	11171307	Spare part
Air flow regulator	11440011	Spare part
Valve spindle	51171024	Spare part
Quick connector plug for cation filter	11150029	Spare part
Quick connector socket for cation filter	11150030	Spare part
Internal parts for pressure regulator	11171255	Spare part
Pressure gauge 0 - 1.6 bar	11455041	Spare part

10 Error messages/troubleshooting

☞ Note:

The following section shows possibly occurring error messages, their causes and their rectification. If the recommended measures do not have any success in fault elimination, please contact the Dr. Leye GmbH support department immediately.

Error message	Cause	Measure
Water shortage	No flow rate at measuring turbines, no impulse at measuring turbines	Check flow rate and readjust if necessary. Check flow metre for correct functioning. Check feed lines for seal tightness.
Flow rate high	Set upper limit value for flow rate exceeded	Check flow rate and readjust if necessary.
Flow rate low	Set lower limit value for flow rate fallen below	Check flow rate and readjust if necessary.
Limit value min	Lower limit value fallen below	Check limit value settings. Check current measuring conditions.
Limit value max	Upper limit value exceeded	Check limit value settings. Check current measuring conditions.
Cationic filter depleted	Ion exchanger resin depleted	Check colour change on ion exchanger resin, replace ion exchanger resin
Pt100 error	Temperature sensor failure	Check sensor for damage. Check cable connection and plug, replace conductivity sensor if necessary.
Temperature high	Limit value for temperature exceeded	Check limit value settings. Check current measuring conditions.

11 Packaging and transport

11.1 Packaging of ion exchanger cartouche

Completely de-water the cartouche as described in Chapter 9.2.4.3 on Page 63. Pack the cation ion exchanger cartouche in suitable packaging material (e.g. bubble film) as shown in Fig. 60 and Fig. 61.

Fig. 60 Cartouche prepared for packing

Fig. 61 Cartouche packed in suitable packaging material

11.2 Packing the Digox 601 *dac* for transport

The ion exchanger cartouche packed separately as described in chapter 11.1 is placed in the housing on the left-hand side. (see Fig. 62, Page 75). The analyser is padded using suitable packaging material. (see Fig. 63, Page 75).

The analyser is now packed in a suitable packaging material (e.g. bubble film) and fixed in a suitable transport container in a lying position. The wall mountings provided on the device can be used for fixing. Fig. 64 on Page 75 shows an example of correct packing of an analyser.

☞ Note:
If required, several analysers can be transported together in appropriately suitable transport containers. When doing so, please ensure that there is suitable spacing between objects and that the fixings are stable to prevent transport damage.

☝ Caution!
Damage caused by improper packaging or transport is not covered by the guarantee.

Fig. 62 Separately packed ion exchanger cartouche placed in container

Fig. 63 Analyser padded with suitable packaging material

Fig. 64 Example of approved transport packaging (wooden case)

12 Attachment

12.1 Safety datasheets for consumables

12.1.1 Safety datasheet for ion exchanger resin

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II - Europe

SAFETY DATA SHEET

LEWATIT S 100 G1

LANXESS Energizing Chemistry

00431206

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name : LEWATIT S 100 G1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses : Ion exchange, resins and catalysts

1.3 Details of the supplier of the safety data sheet

Supplier : LANXESS Deutschland GmbH, Industrial & Environmental Affairs
51369 Leverkusen, Germany, Telephone: +49 214 30 65109
E-mail: infosds@lanxess.com

1.4 Emergency telephone number : +49 214 30 99300 (Sicherheitszentrale CHEMPARK Leverkusen)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Directive 1999/45/EC [DPD]

Classification : Xi; R41

Human health hazards : Risk of serious damage to eyes.

2.2 Label elements

Hazard symbol or symbols :

Irritant

Risk phrases : R41- Risk of serious damage to eyes.

Safety phrases : S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S39- Wear eye/face protection.

2.3 Other hazards

Other hazards which do not result in classification : Not available.

SECTION 3: Composition/information on ingredients

Product definition (REACH) : Mixture

LEWATIT S 100 G1	00431206 / 2

Product/ingredient name	Identifiers	%	Classification 67/548/EEC	Regulation (EC) No. 1272/2008 [CLP]
styrene-divinylbenzene-copolymer with sulphonic acid groups in H-form	CAS: 69011-20-7	45 - 50	Xi; R41	Eye Dam. 1, H318
			See section 16 for the full text of the R-phrases declared above	**See Section 16 for the full text of the H statements declared above.**

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Inhalation : Move exposed person to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Ingestion : Wash out mouth with water. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

4.3 Indication of any immediate medical attention and special treatment needed

See Section 11 for more detailed information on health effects and symptoms.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : In case of fire, use water spray (fog), foam, dry chemical or CO_2.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : No specific fire or explosion hazard.

Hazardous combustion products : Decomposition products may include the following materials: carbon oxides

5.3 Advice for firefighters

Special precautions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures : No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Put on appropriate personal protective equipment (see Section 8).

6.2 Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

6.4 Reference to other sections : See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous.

7.2 Conditions for safe storage, including any incompatibilities : Store between the following temperatures: -20 to 40°C (-4 to 104°F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

Remarks : Take precautionary measures against electrostatic discharges. Do not allow to dry out.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Exposure limit values : Not available.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to European Standard EN 689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances.

8.2 Exposure controls

Risk management measures

Occupational exposure controls

Technical measures : If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Personal protection measures

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. After contamination with product change the gloves immediately and dispose of them according to relevant national and local regulations Recommended: (< 1 hour) Polyvinyl chloride - PVC , Nitrile rubber - NBR , Polychloroprene - CR

Eye protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. Recommended: safety glasses with side-shields

Skin protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Environmental exposure controls

Technical measures : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

General information

Appearance

Physical state : Solid. [beads]

Colour : Brown. [Light]

Odour : Odourless.

Important health, safety and environmental information

pH : 7 [Conc. (% w/w): 10%]

Density : 1.22 kg/L (20 °C)

Bulk density : 800 to 900 kg/m³

Solubility : Insoluble in the following materials: cold water

Ignition temperature : >250°C

9.2 Other information

No additional information.

SECTION 10: Stability and reactivity

10.1 Reactivity : No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability : The product is stable.

10.3 Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid : Take precautionary measures against static discharges. Contact with strong oxidising agents may cause hazardous reactions.

10.5 Incompatible materials : No specific data.

10.6 Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Potential acute health effects

Eye contact : Severely irritating to eyes. Risk of serious damage to eyes.

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure	Test
LEWATIT S 100 G1	LD50 Oral *	Rat	>5000 mg/kg	-	-

*Test results on an analogous product

Irritation/Corrosion

Skin : Non-irritating . Test results on an analogous product .

Eyes : Corrosive. Risk of serious damage to eyes. Test results on an analogous product .

SECTION 12: Ecological information

12.1 Toxicity

Conclusion/Summary : Not available.

12.2 Persistence and degradability

Conclusion/Summary : Not available.

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

PBT : Not applicable.

vPvB : Not applicable.

12.6 Other adverse effects

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Not available.

Other adverse effects : Not available.

AOX : The product does not contain organically bound halogens which could lead to an AOX value in waste water.

Remarks : The product is insoluble in water. Therefore, ecological tests have not been conducted.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Methods of disposal : Examine possibilities for re-utilisation. Product residues and uncleaned empty containers should be packaged, sealed, labelled, and disposed of or recycled according to relevant national and local regulations. Where large quantities are concerned, consult the supplier. When uncleaned empty containers are passed on, the recipient must be warned of any possible hazard that may be caused by residues. For disposal within the EC, the appropriate code according to the European Waste List (EWL) should be used. It is among the tasks of the polluter to assign the waste to waste codes specific to industrial sectors and processes according to the European Waste List (EWL).

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN/ADNR	IMDG	IATA
14.1 UN number	-	-	-	-
14.2 UN proper shipping name	-	-		
14.3 Transport hazard class(es)/Marks	-	-	-	-
14.4 Packing group	-	-	-	-

14.5 Environmental hazards	No.	No.	No.	No.
14.6 Special precautions for user/Additional information	Not regulated.	Not regulated.	Not regulated.	Not regulated.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Hazard notes:

Not dangerous cargo.
Avoid temperatures below -20 °C.
Avoid heat above +40 °C.
Keep separated from foodstuffs.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

15.2 Chemical Safety Assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number

Full text of abbreviated H statements : H318 Causes serious eye damage.

Full text of R-phrases referred to in sections 2 and 3 : R41- Risk of serious damage to eyes.

History

Date of issue : **2011-04-06**

Date of previous issue : **2009-03-31**

Version : **2**

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Indicates information that has changed from previously issued version.

Notice to reader

The data given here is based on current knowledge and experience. The purpose of this Safety Data Sheet is to describe the products in terms of their safety requirements. The above details do not imply any guarantee concerning composition, properties or performance.

12.1.2 Safety data sheet for CO_2 absorber compound

MERCK

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

Revision Date 15.06.2011 Version 5.0

SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Catalogue No.	106733
Product name	Sodalime with indicator, granules ~ 1 - 2,5 mm
REACH Registration Number	This product is a mixture, REACH Registration Number see chapter 3.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Reagent for analysis For additional information on uses please refer to the Merck Chemicals portal (www.merck-chemicals.com).

1.3 Details of the supplier of the safety data sheet

Company	Merck KGaA * 64271 Darmstadt * Germany * Phone:+49 6151 72-0
Responsible Department	EQ-RS * e-mail: prodsafe@merck.de

1.4 Emergency telephone number

Please contact the regional company representation in your country.

SECTION 2. Hazards Identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Serious eye damage, Category 1, H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

Classification (67/548/EEC or 1999/45/EC)

Xi	Irritant	R41

For the full text of the R-phrases mentioned in this Section, see Section 16.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms

Signal word

Danger

Hazard statements

H318 Causes serious eye damage.

Precautionary statements

P280 Wear eye protection.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact

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Product name	Sodalime with indicator, granules ~ 1 - 2,5 mm

lenses, if present and easy to do. Continue rinsing.

Labelling (67/548/EEC or 1999/45/EC)

Symbol(s)	Xi	Irritant
R-phrase(s)	41	Risk of serious damage to eyes.
S-phrase(s)	26-39	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear eye/face protection.

2.3 Other hazards

None known.

SECTION 3. Composition/information on ingredients

Chemical nature: Mixture of inorganic and organic compounds.

Hazardous components (REGULATION (EC) No 1272/2008)

CAS-No	EC-No. / Registration number	Index-No.	Classification
Calcium hydroxide (>= 50 % - <= 100 %)			
1305-62-0	215-137-3 / *)	-	Serious eye damage, Category 1, H318 Skin irritation, Category 2, H315 Specific target organ toxicity - single exposure, Category 3, H335
sodium hydroxide (>= 2 % - < 5 %)			
1310-73-2	215-185-5 / *)	011-002-00-6	Skin corrosion, Category 1A, H314 Corrosive to metals, H290

*) A registration number is not available for this substance as the substance or its use are exempted from registration according to Article 2 REACH Regulation (EC) No 1907/2006, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

For the full text of the H-Statements mentioned in this Section, see Section 16.

Hazardous components (1999/45/EC)

CAS-No	EC-No.	Index-No.	Classification
Calcium hydroxide (>= 50 % - <= 100 %)			
1305-62-0	215-137-3	-	Xi, Irritant; R37/38-41
sodium hydroxide (>= 2 % - < 5 %)			
1310-73-2	215-185-5	011-002-00-6	C, Corrosive; R35

For the full text of the R-phrases mentioned in this Section, see Section 16.

SECTION 4. First aid measures

4.1 Description of first aid measures

After inhalation: fresh air. Consult doctor if feeling unwell.

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Product name	Sodalime with indicator, granules ~ 1 - 2.5 mm

After skin contact: wash off with plenty of water. Remove contaminated clothing.

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist.

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
Irritation and corrosion, Cough, Shortness of breath
Risk of corneal clouding.

4.3 Indication of any immediate medical attention and special treatment needed
No information available.

SECTION 5. Fire-fighting measures

5.1 Extinguishing media
Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
Special protective equipment for fire-fighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

Further information
Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid substance contact, Avoid inhalation of dusts, Ensure adequate ventilation, Evacuate the danger area, observe emergency procedures, consult an expert

Advice for emergency responders: Protective equipment see section 8.

6.2 Environmental precautions
Do not empty into drains.

6.3 Methods and materials for containment and cleaning up
Cover drains, Collect, bind, and pump off spills.
Observe possible material restrictions (see sections 7,2 and 10,5).
Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
Indications about waste treatment see section 13.

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Catalogue No.	106733
Product name	Sodalime with indicator, granules ~ 1 - 2,5 mm

SECTION 7. Handling and storage

7.1 Precautions for safe handling

Observe label precautions.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers

Do not use light-weight-metal containers.

Tightly closed, Dry.

Storage temperature: no restrictions.

7.3 Specific end uses

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8. Exposure controls/personal protection

8.1 Control parameters

8.2 Exposure controls

Engineering measures

Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.

See section 7.1.

Individual protection measures

Protective clothing needs to be selected specifically for the workplace, depencing on concentrations and quantities of the hazardous substances handled. The chemical resistance of the protective equipment should be enquired at the respective supplier.

Hygiene measures

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

Eye/face protection

Tightly fitting safety goggles

Hand protection

full contact:

Glove material	Nitrile rubber
Glove thickness:	0,11 mm
Break through time:	> 480 min

splash contact:

Glove material	Nitrile rubber
Glove thickness:	0,11 mm
Break through time:	> 480 min

The protective gloves to be used must comply with the specifications of EC Directive 89/686/EEC and the related standard EN374, for example KCL 741 Dermatril® L (full contact), KCL 741 Dermatril® L (splash contact).
The breakthrough times stated above were determined by KCL in laboratory tests acc. to EN374 with samples of the recommended glove types.

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Product name	Sodalime with indicator, granules ~ 1 - 2.5 mm

This recommendation applies only to the product stated in the safety data sheet<(>,<)> supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Other protective equipment
protective clothing

Respiratory protection
required when dusts are generated.
Recommended Filter type: Filter P 2 (acc. to DIN 3181) for solid and liquid particles of harmful substances
The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Environmental exposure controls
Do not empty into drains.

SECTION 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Form	solid
Colour	light grey
Odour	odourless
Odour Threshold	No information available.
pH	at 50 g/l 20 °C alkaline, (filtered slurry)
Melting point	No information available.
Boiling point	No information available.
Flash point	No information available.
Evaporation rate	No information available.
Flammability (solid, gas)	No information available.
Lower explosion limit	No information available.
Upper explosion limit	No information available.
Vapour pressure	No information available.
Relative vapour density	No information available.
Relative density	No information available.

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Catalogue No.	106733
Product name	Sodalime with indicator, granules ~ 1 - 2,5 mm

Water solubility	at 20 °C insoluble
Partition coefficient: n-octanol/water	No information available.
Autoignition temperature	No information available.
Decomposition temperature	No information available.
Viscosity, dynamic	No information available.
Explosive properties	No information available.
Oxidizing properties	No information available.

9.2 Other data

Bulk density	ca.750 kg/m³
Particle size	Particle size 2 - 5 mm

SECTION 10. Stability and reactivity

10.1 Reactivity
See section 10.3.

10.2 Chemical stability
sensitive to moisture

10.3 Possibility of hazardous reactions
Violent reactions possible with:

acids

Risk of ignition or formation of inflammable gases or vapours with:

Light metals

10.4 Conditions to avoid
Moisture.

10.5 Incompatible materials
Light metals

10.6 Hazardous decomposition products
no information available

SECTION 11. Toxicological information

11.1 Information on toxicological effects
Acute oral toxicity
Symptoms: Irritations of:, Gastrointestinal tract

Acute inhalation toxicity

Symptoms: Possible damages:, mucosal irritations, Cough, Shortness of breath

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Catalogue No.	106733
Product name	Sodalime with indicator, granules ~ 1 - 2.5 mm

Skin irritation
rabbit
Result: No skin irritation
OECD Test Guideline 404
(Test in preparation)

in case of perspiration/moisture corrosive.

Eye irritation
rabbit
Result: Causes serious eye damage.
OECD Test Guideline 405
(Test in preparation)

Risk of corneal clouding.
Causes serious eye damage.

Specific target organ toxicity - single exposure
The substance or mixture is not classified as specific target organ toxicant, single exposure.

Specific target organ toxicity - repeated exposure
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard
Based on available data the classification criteria are not met.

11.2 Further information
Quantitative data on the toxicity of this product are not available.

Further data:

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12. Ecological information

12.1 Toxicity
No information available.

12.2 Persistence and degradability
No information available.

12.3 Bioaccumulative potential
No information available.

12.4 Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted.

12.6 Other adverse effects
Additional ecological information
Biological effects:

Harmful effect due to pH shift. Forms corrosive mixtures with water even if diluted.

Further information on ecology

Discharge into the environment must be avoided.

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Catalogue No.	106733
Product name	Sodalime with indicator, granules ~ 1 - 2,5 mm

SECTION 13. Disposal considerations

Waste treatment methods

See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14. Transport Information

Not classified as dangerous in the meaning of transport regulations.

SECTION 15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU regulations

Major Accident Hazard Legislation	96/82/EC Directive 96/82/EC does not apply
Occupational restrictions	Take note of Dir 94/33/EC on the protection of young people at work.
Storage class	10 - 13

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out.

SECTION 16. Other Information

Full text of H-Statements referred to under sections 2 and 3.

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

Full text of R-phrases referred to under sections 2 and 3

R35	Causes severe burns.
R37/38	Irritating to respiratory system and skin.
R41	Risk of serious damage to eyes.

Training advice

Provide adequate information, instruction and training for operators

Key or legend to abbreviations and acronyms used in the safety data sheet

Used abbreviations and acronyms can be looked up at www.wikipedia.org.

Regional representation

This information is given on the authorised Safety Data Sheet for your country.

The information contained herein is based on the present state of our knowledge. It characterises the product with regard to the appropriate safety precautions. It does not represent a guarantee of any properties of the product.

12.2 Declaration of conformity Digox 601 *dac*

DR.LEYE
Analysen- und Anlagentechnik

EC Declaration of Conformity

pursuant to EC Directive 2004/108/EEC
Electromagnetic Compatibility Act (EMC Act)

CE marking has been performed under Council Directive 2004/108/EEC concerning the harmonisation of the legal regulations of the Member States.

The

DAC-Analyzer

Digox 601 *dac*

described herein bear the CE mark, thus ensuring that, when operated in conformity with the intended purpose, the electromagnetic compatibility requirements set forth in the following generic standards will be met.

Radio interference suppression acc. to DIN EN 61000-6-3
Electromagnetic compatibility - Generic emission standard,

Immunity acc. to DIN EN 61000-6-2
Electromagnetic compatibility - Generic immunity standard

and

Protective measures acc. to IEC 364-4-41:1992,

provided that the fitting and installation instructions given in the technical product documentation are observed.

Geringswalde 18.01.2011

Uwe Wunderlich
Quality Representative / QR TÜV
Dr.Leye GmbH

CE

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