Operating manual for DUROMAT® IQ

Analyser for automated monitoring
of total hardness, residual hardness, or carbonate hardness in process water

Content

General notes

This operating manual describes the installation and operation of the online analyser DUROMAT® IQ. The installation and commissioning are to be carried out by an authorised specialist.

The device may only be operated under the conditions described in this operating manual. The device may be used only for the specified purpose of use. For the installation and operation of the analyser, all the provisions applicable on site (such as EN, DIN, VDE, UVV) are to be followed.

The analyser is used for automatic determination of total water hardness or carbonate water hardness in process water. Proper operation can only be guaranteed if the reagents and spare parts recommended by us are used.

Modifications to the electrical wiring and the programming may only be made by a trained specialist.

The water connection pipes to the device should be kept as short as possible and should not be laid together with network lines or in their immediate vicinity. Near strong electromagnetic emitters, the analysis can become disturbed. In this case, separate interference suppression measures are to be taken; in particular the EMC directives are to be followed.

It is recommended to always have access to the analyser when familiarising oneself with these operating instructions to understand the described relationships and functions immediately. Since certain areas are built upon one another, it is advisable to work through the chapter in the specified order.

If there are any questions when using the analyser, you will receive support from our partners or us. You can reach us by phone during normal business hours or by email. You will find complete contact details of our technicians and our partners on our website.

Intended use

- The DUROMAT® ® professional analyser is a measurement system: colorimetric with an indicator (not included in delivery)
- Water temperature: **max. 40 ° C**
- Checking the hardness (Ca + Mg) of drinking water = see European Standard or residual hardness after the ion exchange softening system (regeneration with brine)
- Uses not allowed: electric / electromagnetic field softener, softener that changes the hardness from limestone to calcite (or similar), softening with grouping of hardness (for example: anti-scaling), swimming pool water measurement, direct control of the mixing valve
- Not suitable for use in explosive and / or radioactive environments
- Not suitable for use in environments with outside temperatures over 45 ° C
- Not suitable for use with demineralized water (risk of corrosion)
- We decline any responsibility for improper or inappropriate use of the instrument

Installation

- Protect from temperatures below 5 ° C
- Do not expose to direct sun and / or high temperatures over 45 ° C
- Do not expose to rain and / or direct splashing of water
- Do not install the instrument below any leaks from the surrounding pipes
- Do not install in environments with high electromagnetic fields (interfere with operation)
- Do not install in the immediate vicinity of components equipped with inverters and / or inverters themselves
- Do not connect / position the power / signal cables together with the high voltage cables
- Do not install near chemical fumes and / or vapours
- If installed inside an iron container, provide for the use of an air conditioning and / or heating system
- Install a water leakage sensor under the analyser

Surveillance/Maintenance

- The instrument requires regular maintenance and cleaning (every 6 months)
- If you measure non-softened water, the cleaning interval of the measuring chamber may also be much more frequent
- Check every day: operation, tightness, presence of indicator and its expiration

Current/Voltage

- Before connecting to the current, make sure that the voltage used is the same as that described on the instrument plate
- Disconnect the power before working on the internal boards of the instrument
- Even if the instrument is turned off using the switch, attention must be paid to the presence of external current (flow to the output relays).

Analysis / chemical

- Accuracy of analysis: +/- 5% of the maximum value of the indicator on the intended use indicated
- Use only the original reagent
- Do not drink /smoke during the use of the reagent
- Keep reagent out of reaching of children, well-sealed, and in the original packaging
- Keep the safety data sheet in proximity of the chemical product
- To replace the reagent: wear safety eyeglasses, gloves and apron
- The reagents stains irreversibly clothes, can colour also marble and porcelain
- Do not dispose the waste reagent in the sink drains especially in marble/porcelain
- The drainage must be backpressure and slope
- The chemical product has an expiry date, do not use it beyond that date.

Export/Import

- The exporter must make sure that the product can be exported (Dual Use, Embargo etc. etc.).
- Internal wiring and connection comply the European legislation, make sure if there are no different regulations in the country where you want to install the instrument.
- In this case the exporter and the importer must check and adjust to ensure the instrument complies with national reference standard regulations
- The exporter must also verify that the name of the appliance or its components is not a registered trademark in the country of use of the same, this to not cause legal problems associated with any other companies with the same trademark.

Further:

- In this operating instruction you will find registered trademark that may not report the symbol © or ®. The missing of this symbol do not means that is not a registered trademark
- Headquarters for any controversy of any kind: Italy

N.B. for the final consumer

The information above are for our warranty. The retailer or the builder of the plant can choose other uses on his own responsibility.

Safety indication and symbols used

In these instructions for use there are safety indications that indicate a potential risk during the assembly, start-up, maintenance and management of a water analyser. There are risks for:

- People
- Systems and equipment interfaced with the appliance
- Surrounding environment

Safety instructions and used symbols

This operating manual contain various safety instructions that indicate possible risks when using the analyser. This specifically concerns hazards for

- people,
- this product or related devices and installations,
- the working environment.

General notes

Various symbols in this manual indicate special hazards to avoid personal injury and equipment damage. Please read the entire text in full before starting work.

This symbol indicates useful tips for a better understanding of the device.

This symbol is a general warning that indicates circumstances that need to be considered.

Pressure

This symbol is a warning that you must expect lines under pressure.

Voltage

This symbol indicates the risk of electric current and the endangerment of people and electronic components and assemblies.

Transport

Check immediately after receipt that the device is complete and free from transport damage. The analyser is shipped in a manner safe for transport. Nevertheless, damage may occur during transport. Instruct the deliverer immediately about damage during transport.

Protect the analyser from possible damage during transport. If necessary, remove any liquids still in it in advance. Remove the reagent bottle and close it to prevent the reagent from leaking.

Storage

Store the analyser in a dry place at temperatures between 0 - 45° C and without direct sunlight.

Instruction on disposal

The device must not be disposed of as residual waste. Bring the device to a collection point. The battery should be disposed of separately.

Alternatively, you can return the analyser to your dealer or us for disposal.

DUROMAT® IQ in detail

The DUROMAT® IQ online analyser has the following features:

- reliable, accurate and fully automatic analyser
- monitoring of a programmable limit value
- total hardness or carbonate hardness can be measured with the same analyser
- simple commissioning via configuration wizard
- BOB operation (72 hours)
- self-calibrating and self-monitoring
- easy maintenance and cleaning
- compact design
- multicoloured, multilingual graphic display
- relay output for limit value
- relay output for error message
- analogue output 0/4 - 20 mA for measured value or status message
- digital input for start analysis, flow switch or interval reset
- Measurement data memory and measurement data protocol on SD card
- no condensation in the optics
- Software updates via SD card

The DUROMAT® IQ is not a system that prevents hardness irruption.

Scope of supply

The DUROMAT® IQ is available in two versions:

1. *Wall-mounted analyser*

   The analyser consists of a controller and the measuring chamber. Both are mounted on a wall bracket. This version is fully functional and includes connections for the water inlet and -outlet and a holder for holding a reagent bottle (Figure 1).

Article name	Article no.
Analyser DUROMAT® IQ on a plate 230 V version	200140

2. *Analyser in housing*

   Optionally for wall-mounted analyser, a plastic housing is available to use the analyser in locations where more severe contamination is expected (Figure 2). The analyser on the wall mount can be quickly mounted in the housing with 4 screws. If the analyser and the housing are ordered together, the device is already mounted in the housing.

Article name	Article no.
Analyser DUROMAT® IQ in a box mounting 230 V version	200141

The analyser can be operated intuitively via menu using the graphic display and 8 keys on the controller housing.

Figure 1:
Wall mounted DUROMAT® IQ

Figure 2:
Wall mounted DUROMAT® IQ in housing

The wall mounted DUROMAT® IQ analyser is mounted in the housing with 4 supplied screws.

DUROMAT® IQ in detail

Device description

The analyser consists of the following components: The controller with graphic display and control panel is on the left side of the device. 4 cable bushings are provided on the lower controller housing. The dosing pump is on the right side and the measuring chamber is below the dosing pump.

The dosing pump is plugged onto the motor shaft of the motor and snaps into the receptacle. It can be removed without tools. The measuring chamber is attached to 2 guide pins on the controller housing. This can also be removed without tools and is undone with 2 captive locking pins. Dosing plugs, actuator plugs, inlet- and outlet plugs are attached to the measuring chamber in the same way and can be quickly undone.

The measuring chamber, which is always depressurised and always filled to prevent germs, is in the middle. The actuator plug with a white high-power LED is in the middle of the measuring chamber. The sensor system is in the housing. The agitator (magnetic agitator), which is firmly connected to the housing, is below the measuring chamber.

The water connections for hoses with an outer diameter of 6 mm are below the reagent bottle. Inlet with sample water (left) and outlet (right). Both are firmly bolted to the wall bracket.

There is a solenoid valve in the supply line behind the reagent bottle.

Figure: View of the solenoid valve (no reagent bottle installed)

For a more detailed description of the components, see page 32.

DUROMAT® IQ in detail

Principle of function

The DUROMAT® IQ based on the DUROMAT® series is an online analyser for the automatic determination of water parameters according to the colorimetric titration method. By adding a reagent to the water sample, a colour reaction is produced. Depending on the reagent used, the device evaluates the colour intensity. By changing the colour of the sample during the addition of the reagent, the DUROMAT® IQ calculates the concentration of the substances in water. The device can only determine one parameter at a time. Parameters and measuring range are determined by the reagent used.

General specification

Parameter	Value/range	
Voltage supply (230 V version)	85 - 305 VAC (47...440 Hz)	
Power consumption	25 VA (in operation)	3.5 VA (standby)
Load capacity	Load capacity of the relays with internal current supply of 1 A from terminals 5 to 8	
	Load capacity of the relays with external current supply of 2.5 A	
Protection class	open wall mounting IP43 Installation in the housing IP56	
Storage temperature	0 °C – 45 °C	
Ambient temperature	10 °C – 45 °C	
Measuring water temperature	5 °C – 40 °C	
Air humidity	20 – 90 % RH (without ice or condensate)	
Pressure of inlet water	min: 0.5 bar - max: 5 bar - recommendation 1 - 2 bar	
General inlet water	clear, colourless, free of solids, without gas bubbles	
Requirements for the water quality when measuring the water hardness	pH:	4 - 10
	Iron:	< 3 ppm
	Copper:	< 0.2 ppm
	Aluminium:	< 0.1 ppm
	Manganese:	< 0.2 ppm
	Acid capacity:	KS 4.3 < 5 mmol/l

Note on oxidizing agents:
Oxidizing agents, e.g. calcium hypochlorite, chlorine, chlorine dioxide, sodium hypochlorite or ozone beyond the limits permitted attack the dye contained in the reagent and interfere with the measurement. An exact determination of the water hardness is no longer guaranteed. An activated carbon filter upstream of the analyzer can remove these oxidants from the sample water and thus allow the correct determination of the water hardness.
The capacity of an activated carbon filter consumes during operation. Therefore, the activated carbon filter must be replaced at regular intervals. The effectiveness of the charcoal filter can be checked using Apura® test kits.

DUROMAT® IQ in detail

Technical data

Parameter	Value/range	
Installation	Wall mounting in closed rooms	
Dimensions	without housing:	280 x 360 x 113 mm (W x H x D)
	with housing:	315 x 390 x 130 mm (W x H x D)
Weight	without housing:	approx. 1.9 kg
	with housing:	approx. 3.8 kg

Analysis properties

Parameter	Value/range		
Measurement method	Titration with colour change		
Measurement range		Total hardness	Carbonate hardness
	ppm $CaCO_3$	0,21 ... 535,7	5,4 ... 401,8
	°dH	0,012 ... 30	0,3 ... 22,5
	°f	0,021 ... 53,6	0,5 ... 40,2
	°e	0,015 ... 38,6	0,39 ... 28,9
	mmol/l	0,0021 ... 5,36	0,11 ... 8,04
	The measuring range is defined by the reagent used. The entire measuring range of the total hardness is achieved by using different reagents.		
Accuracy	Measuring accuracy: ± 5% of the maximum reading of the respectively used reagent Repeat accuracy: ± 2.5% of the maximum reading of the reagent used Please note: Depending on the substances in the water, there may be shifts in the reading that affect the measurement accuracy. In such cases, we recommend performing a hardness measurement by hand titration and calibrating the analyser to this reading.		
Current interface	± 0.3 mA		
Reagent consumption	approx. 0.05 - 0.5 ml/analysis, depending on the measured water hardness		
Measuring duration	approx. 3 min, depending on the water hardness and the set flushing time		
Number of analyses	max. approx. 10,000 analyses / 500 ml of reagent at low water hardness. The consumption depends on the measured water hardness and the reagent used.		
Shelf life of the reagents	at least 2 years with proper storage (<25° C, dark)		
Water consumption	approx. 1 l/analysis with 2 bar The water consumption varies depending on the inlet pressure and the set flushing time.		

DUROMAT® IQ in detail

Inputs/outputs

Parameter	Value/range
2 relay outputs	max. 250 VAC 1 A (For more information, see page 11) as potential-free outputs NC/NO The relays provide the following functions: • Limit alarm • Device error • Standby
Signal input	electrically separated contact input • Start analysis • Flow switch • Interval reset
Analogue output	0 – 20 mA / 4 – 20 mA Resolution: < 100 µA max. load: 750 Ω

Maintenance interval

Interval	Maintenance works
every 6 months	Cleaning of measurement chamber  At high ambient- and water temperatures or water with high organic load, the cleaning intervals may need to be shortened.
every 30,000 analyses or after 2 years of operation	Cleaning of measurement chamber (as above), Installation of maintenance kit: Changing the peristaltic pump cartridge and the gaskets

DUROMAT® IQ in detail

Reagents for monitoring total hardness

Name Reagent	Measurement ranges °dH	ppm $CaCO_3$	°f	Art.-no. 500 ml bottle
500S/500	0,012 ... 0,12	0,21 ... 2,14	0,021 ... 0,214	200852
500/500	0,02 ... 0,2	0,36 ... 3,57	0,036 ... 0,357	200855
501/500	0,03 ... 0,3	0,54 ... 5,36	0,054 ... 0,536	200860
502/500	0,06 ... 0,6	1,1 ... 10,7	0,11 ... 1,07	200862
503/500	0,09 ... 0,9	1,6 ... 16,1	0,16 ... 1,61	200863
505/500	0,15 ... 1,5	2,7 ... 26,8	0,27 ... 2,68	200865
510/500	0,3 ... 3,0	5,4 ... 53,6	0,54 ... 5,36	200870
520/500	0,6 ... 6,0	10,7 ... 107,1	1,1 ... 10,7	200875
530/500	0,9 ... 9,0	16,1 ... 160,7	1,6 ... 16,1	200876
550/500	1,5 ... 15	26,8 ... 267,9	2,7 ... 26,8	200878
600/500	3 ... 30	53,6 ... 535,7	5,4 ... 53,6	200880

Reagents for monitoring carbonate hardness

Name Reagent	Measurement range °dH	ppm $CaCO_3$	°f	Art.-no. 500 ml bottle
C 710/500	0,3 ... 7,5	5,4 ... 133,9	0,5 ... 13,4	200887
C 715/500	0,5 ... 11,5	8 ... 205,4	0,8 ... 20,5	200889
C 720/500	0,6 ... 15,0	10,7 ... 267,9	1,1 ... 26,8	200890
C 730/500	0,9 ... 22,5	16,1 ... 401,8	1,6 ... 40,2	200891

The measured value to be monitored should be as close to the middle of the measuring range of the reagent as possible.

One bottle of reagent suffices for at least 10,000 analyses if the measurement point is in the lower range of the reagent type used.

The exact number of possible analyses with a reagent bottle depends on the respective degree of hardness and the reagent used.

Installation

The installation should be done in the following steps to avoid errors:

- Install the analyser in a dry, easily accessible, and easily visible location.
- Fix the analyser or housing stably with screws according to the manual.
- Connect the device electrically and pay attention to the correct input voltage. Ensure this using the nameplate.
- Connect inlets and outlets according to the installation manual. Pay attention to a correct inlet pressure and free, short outlet.
- Insert the reagent and connect it to the dosing pump. Make sure that the connecting hoses are not twisted.
- Do not switch on the device until all preliminary works have been completed and the housing is closed.
- Now set the device settings on the device.

The sample water must be clear and free of solids. Otherwise, a filter should be provided in front of the analyser. Solids in the water can damage the solenoid valve or prevent it from closing. If the solenoid valve blocks or does not open or close any longer, the measuring chamber will not be flown-through properly. This leads to incorrect measurements.

Temperature of the sample water must be between 5 and 40 °C.

If the sample water has a higher temperature, a sample cooler should be used. This is available as an accessory.

Installation

Wall mounting without housing

The DUROMAT® IQ must be installed upright. The wall bracket has four 6 mm holes for attaching the analyser.

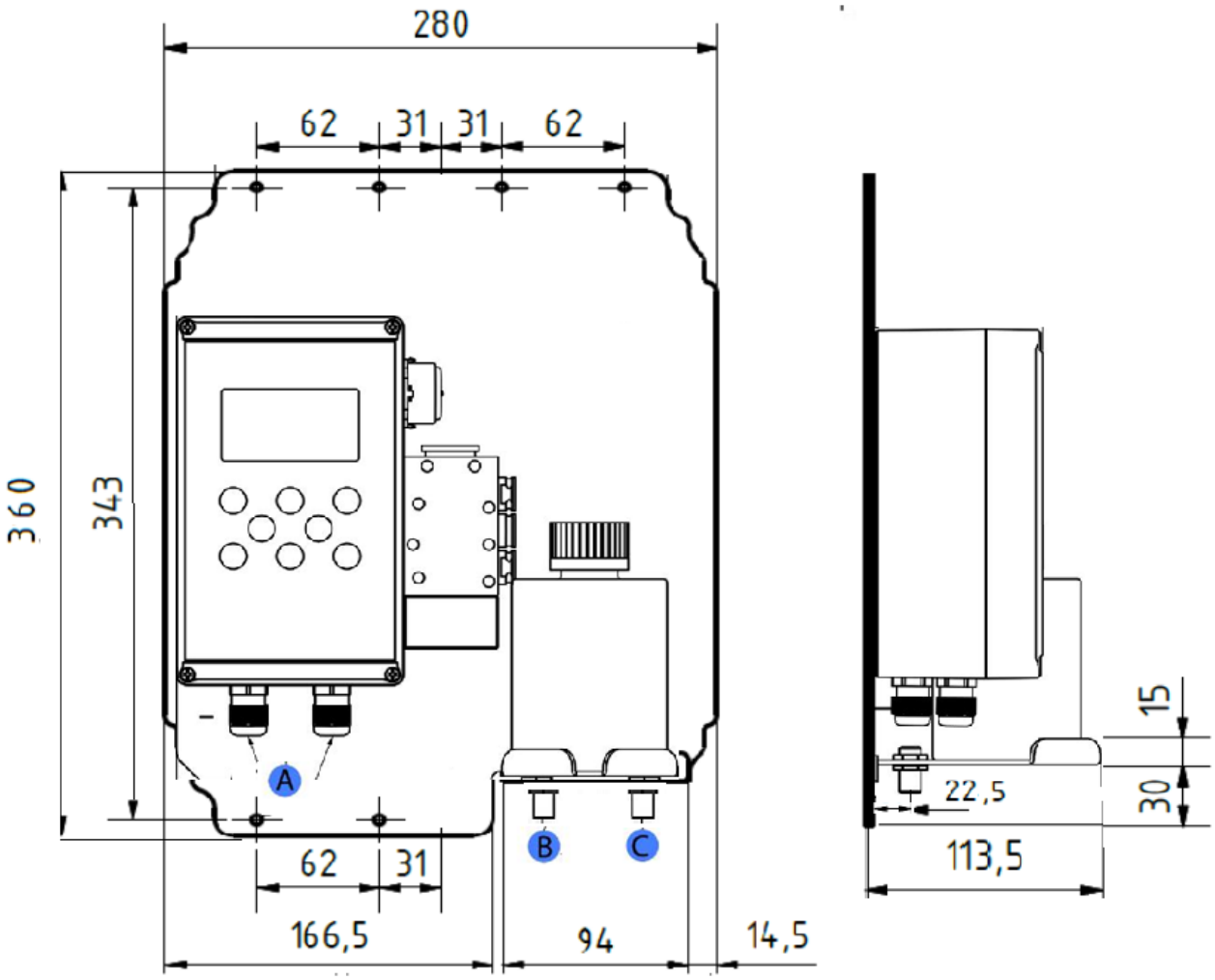


Figure: Drill guide for attaching the analyser without housing

Position	Description
A	Cable glands for electrical connection
B	Water inlet - push-in fitting for tube with external diameter 6 mm
C	Water drain - push-in fitting for tube with an external diameter of 6 mm

Wall mounting with housing

The analyser is also available mounted in a box.

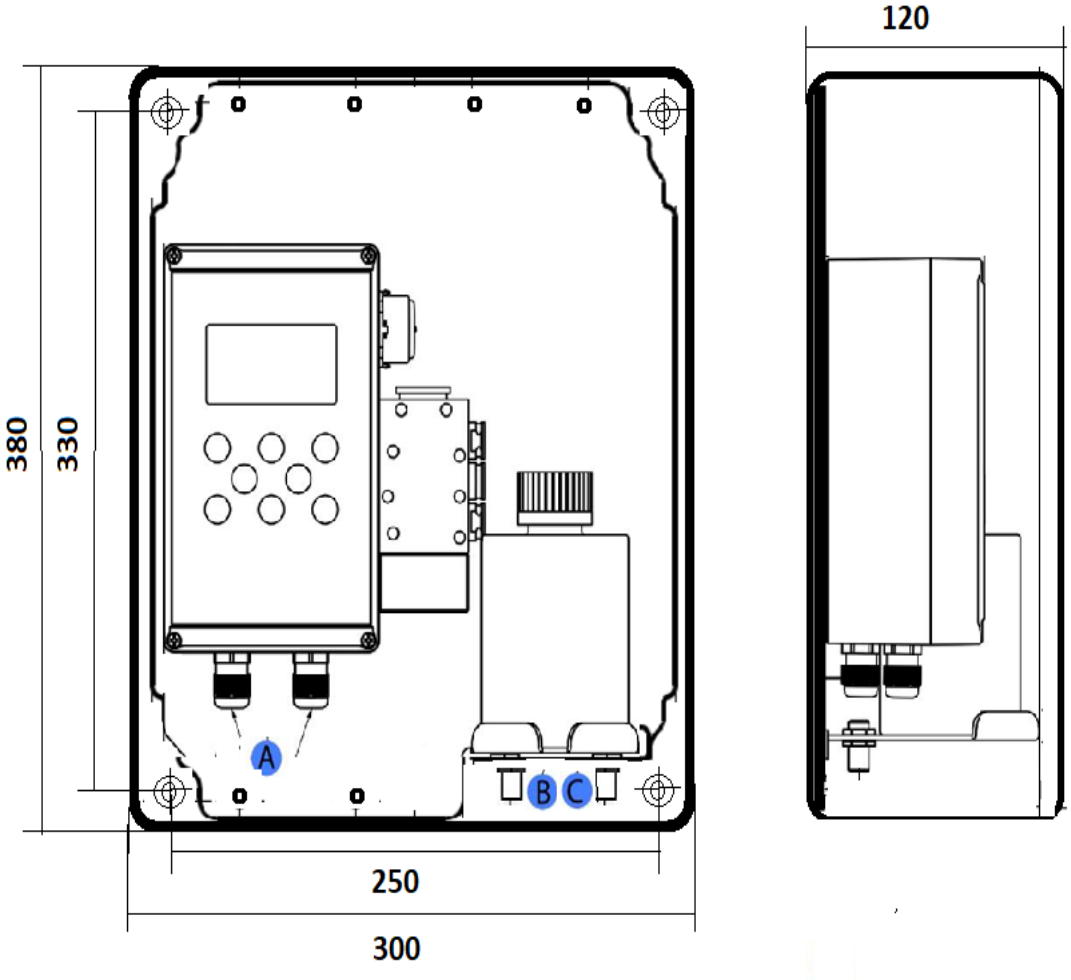


Figure: Drill guide for attaching the analyser in the housing

	Attention: leave a space on the left (door opening) of 60mm and under the box of 50 mm (water supply and drainpipes).

Description

A Cable gland for the electrical connection
B Water inlet - push-in fitting for tube with external diameter 6 mm
C Water drain - push-in fitting for tube with an external diameter of 6 mm

Installation

Work on pressurised water lines

Pressure

Maintenance and repair works should only be carried out by qualified personnel.

- Before starting work, make sure that all lines are depressurised.
- Hoses, connections and gaskets must be regularly checked and, if necessary, preventively replaced, even if they show no visible damage. Maintenance intervals must be complied with.
- Before commissioning after maintenance, make sure all connections, threaded fittings, and gaskets are properly installed. Check that all housing parts are closed, and filters or other parts connected to the device are installed correctly.
- Remove all tools, spare parts or other materials required for maintenance prior to commissioning.
- Clean the device, take any leaked fluids and leave the device in a clean condition.
- Check that all safety devices are present and ready for operation.

The analyser has 2 connections with bulkhead fittings for plastic hoses with an external diameter of 6 mm for the water inlet (left) and water outlet (right). These are only inserted into the screwed connections.

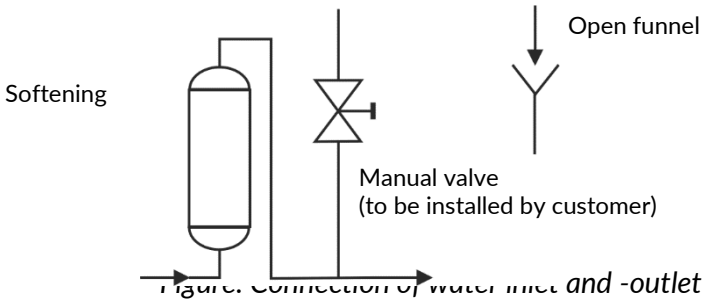


Figure: Connection of water inlet and -outlet

Pressure

The inlet pressure of the water sample must be between 0.5 and 5.0 bar.

The recommended inlet pressure of the water sample should be between 1 and 2 bar.

The hose length of the water outlet must not be longer than 2 m and must lead away vertically downwards. The system must be able to relax freely against the atmospheric pressure. There must be no back pressure greater than the inlet pressure. The water is drained without pressure in an open funnel or drain.

Operation with unpressurised sample water

If the sample water is depressurised, a pressure-controlled membrane or submersible pump is required to transport the sample water into the measuring chamber of the analyser.

Electrical installation

Voltage

Work on electrical connections may only be carried out by authorised specialist personnel in compliance with the current regulations. All lines must be de-energised. The permissible supply voltage is 85 - 305 VAC (47 – 440 Hz).

Open the lid of the controller by loosening the four screws in the corners of the lid.

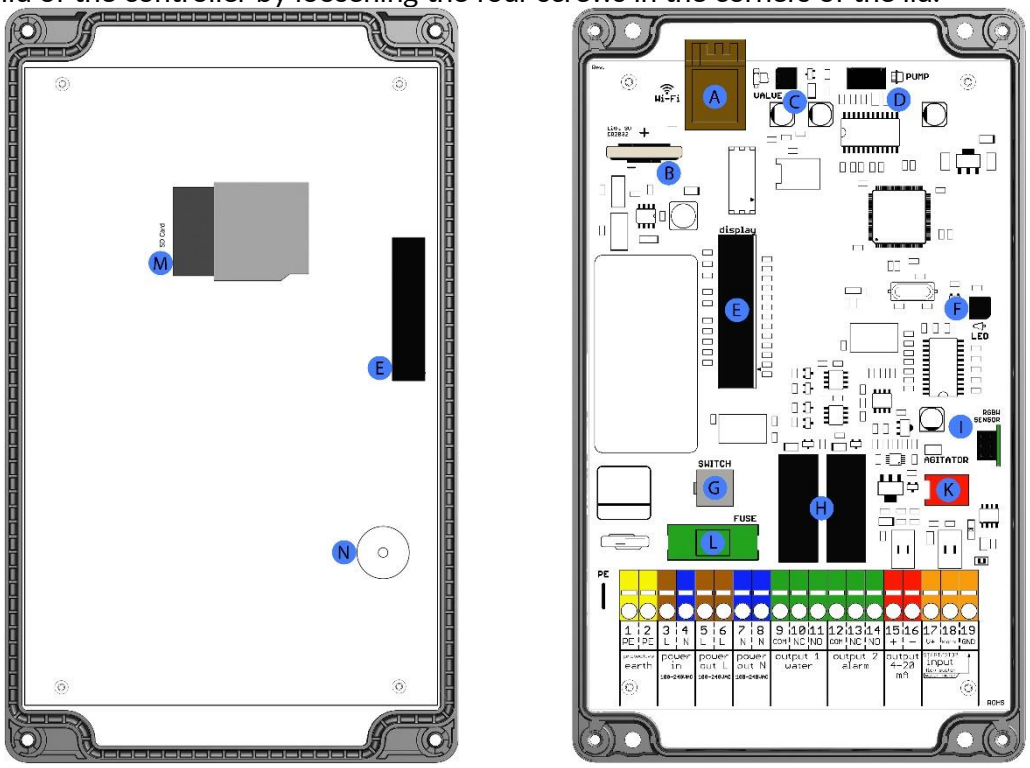


Figure: Back cover of the lid (left side), circuit board (right side)

Position	Description
A	Wi-Fi (optional)
B	Battery holder
C	Solenoid valve port
D	Reagent pump port
E	Display port
F	Actuator plug LED port
G	Main switch port
H	2 x relay
I	RGB sensor
K	Agitator port
L	Fuse (5 x 20 mm) 1 A time-lag
M	SD card base
N	Sound emitting device

Electrical installation

Connection of supply voltage

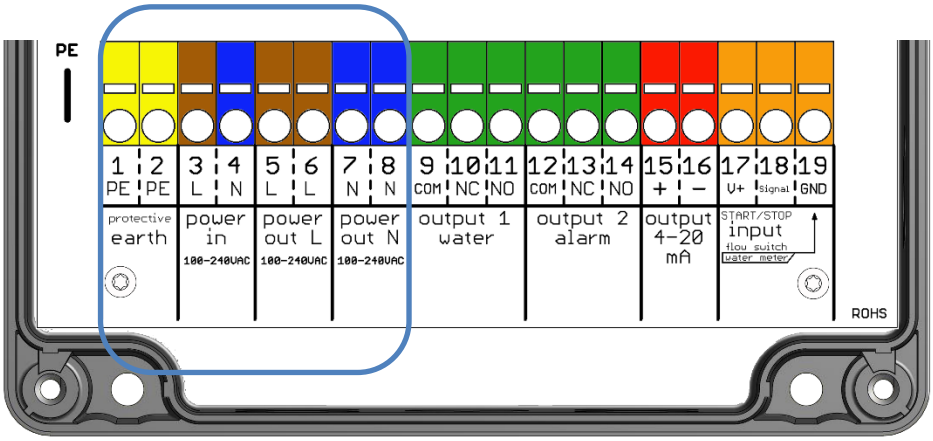


Figure: Terminals for the connection of the supply voltage (blue border)

Connection of supply voltage

Terminal designation	Description
1 PE	Earthing
2 PE	Earthing
3 L (power in)	Supply voltage between L and N 85 - 305 VAC (47 – 440 Hz).
4 N (power in)	

Output terminals which are connected via the device switch

Terminal designation	Description
5 L power out	Switched supply voltage between L and N 85 - 305 VAC (47 – 440 Hz).
6 L power out	
7 N power out	
8 N power out	

Voltage

The maximum connected capacity of all loads must not exceed 250 VAC / 1 A.

Electrical installation

Connection of the relay outputs

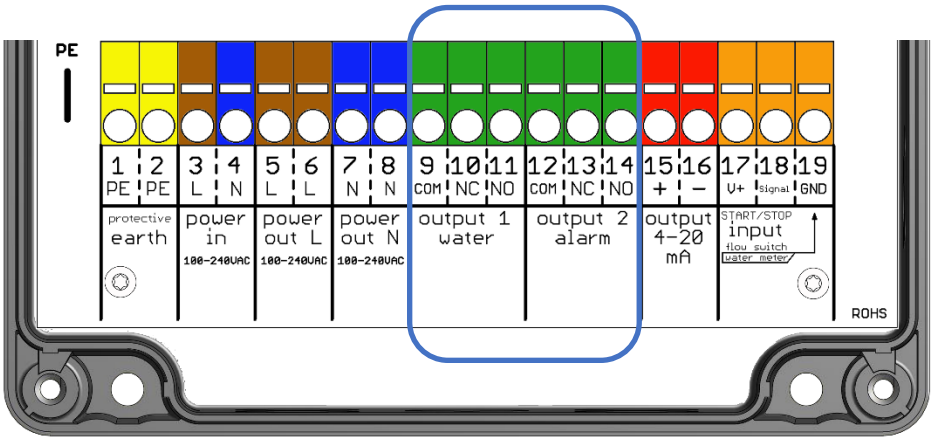


Figure: Terminals for connecting the relay outputs (blue border)

The relays are designed as change-over contacts, with a common connection and the switching outputs NC and NO.

Output 1 water (relay 1): Water hardness notification

Terminal designation	Description		Connection
9 COM	Relay 1 COM	common connection	see page 11 “Load capacity”
10 NC	Relay 1 NC	normally closed	
11 NO	Relay 1 NO	normally open	

Output 1 / relay 1 function (notification of water hardness):
If the measured value of the sample falls below the limit set in the DUROMAT®, relay 1 is deenergised and a connection from COM to NC is established. In addition, the symbol R1 is not marked in the display.
If the measured value of the sample exceeds the limit set in the DUROMAT®, relay 1 is energised and a connection from COM to NO is established. In addition, the symbol R1 is highlighted in black on the display.

Output 2 alarm (relay 2): Device error notification

Terminal designation	Description		Connection
12 COM	Relay 2 COM	common connection	see page 11 “Load capacity”
13 NC	Relay 2 NC	normally closed	
14 NO	Relay 2 NO	normally open	

Output 2 / relay 2 function (device error notification):
If a device error occurs or the device is switched off, the relay 2 is deenergised (connection from COM to NC). In addition, the symbol R2 is not marked in the display.
The relay 2 is energised in the error-free state of the device (connection from COM to NO), this serves the wire break safety. In addition, the symbol R2 is highlighted in black on the display.

Current interface contact

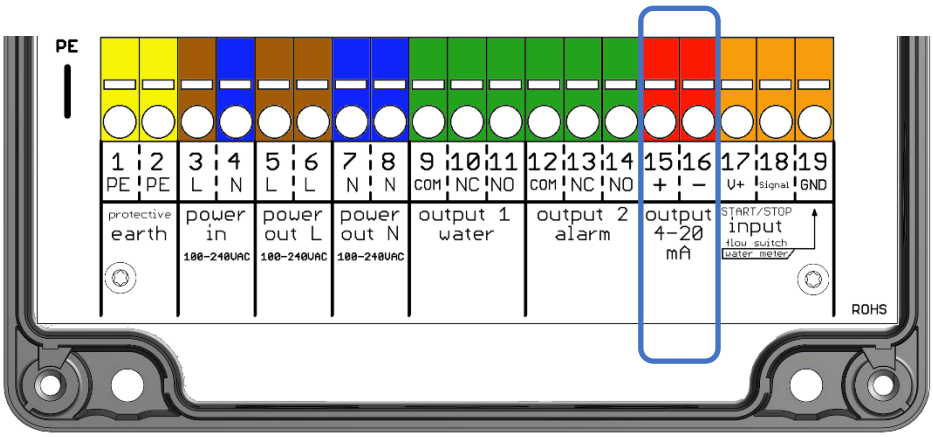


Figure: Terminals for connecting the current interface contact (blue border)

Output 0/4 – 20 mA: Current interface

Terminal designation	Description	
15 +	+ Output	0 - 20 mA or 4 - 20 mA
16 -	- Output	0 - 20 mA or 4 - 20 mA

Current interface function:
The current interface is used to provide the present water hardness or device status as current output. The current range can be selected between the settings 0 - 20 mA or 4 - 20 mA. The maximum load is 750 Ω.

Selection options for current interface type:

- From
- 0 – 20 mA value
- 4 – 20 mA value
- 0 – 20 mA status
- 4 – 20 mA status

For more information, see page 31.

Electrical installation

Input contact

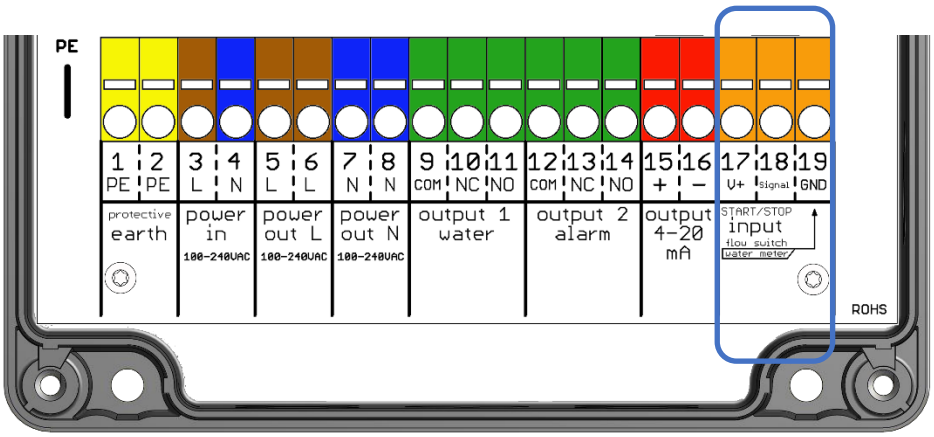


Figure: Terminals for connecting the input contact (blue border)

Start/Stop Input: Start input contact for analysis / flow switch / Interval reset

Terminal designation	Description
17 V+	+ 24 V auxiliary voltage to connect potential-free outputs
18 Signal	Signal input
19 GND	Ground connection for the + 24 V connection

Input contact function:
A flow switch or other potential-free switches can be connected to the input contact. If the input contact is closed, the symbol IN is highlighted in black on the display.

For more information, see pages 26 through 28.

Connection of external components

To connect additional components, the device is equipped with an input, 2 relays and an analogue output (current interface 4 - 20 mA). A flow switch, a potential-free switch or an electronic switch (open collector) can be connected to the input. An auxiliary voltage of 24 VDC at terminal 17 and GND at terminal 19. For signal detection, 24 VDC must be bridged to terminal 18. No external voltage sources may be connected to the input. If necessary, a potential separation must be made with a relay or optocoupler.

The connections of the relays are all brought out potential-free. For switching external devices, the internal network voltage or alternatively an external supply voltage can be used. The connection to external controllers is usually established via the potential-free contacts of the relays.

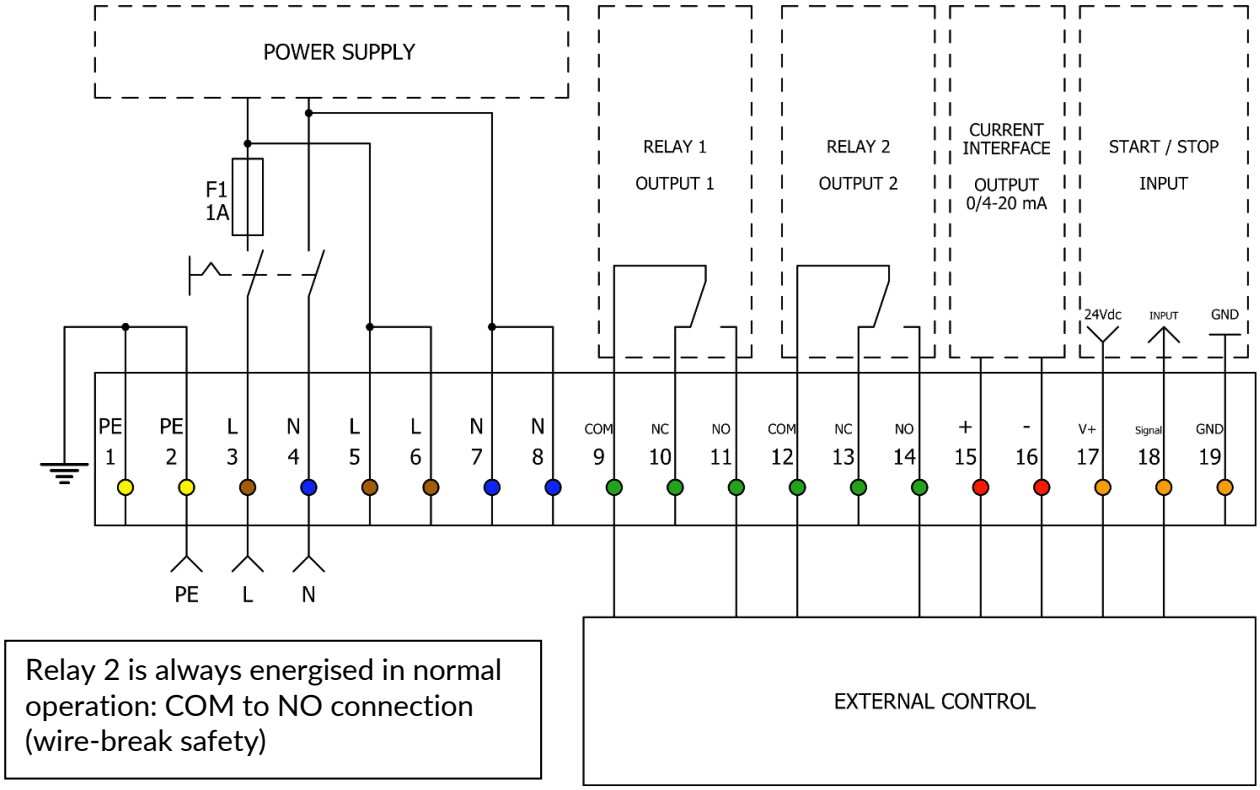


Figure: Schematic plan view of connection terminals

Voltage

The supply voltage connected through the device switch is applied to output terminals 5 to 8 and can be used on the output relay in order to actuate drive pumps, solenoid valves or other loads. The maximum total connected load to output terminals 5 to 8 must not exceed 250 VA. The output terminals are switched with the network switch of the analyser and protected by the fine-wire fuse of the device.

Connection of external components

Switch for starting the analysis externally

In addition to the option of running an analysis on a time-dependent basis, there is also an option to trigger additional analyses using an external button. This can be a potential-free push-button or the relay output of a PLC controller or water softening controller.
The use of a switch at the input is intended as an addition to the normal time interval. The analyser operates at a set time interval. A signal can be delivered to the input via the switch and thus an additional analysis can be started.

(When using this function, the DUROMAT® must be in automatic mode.)

An additional analysis can also be triggered by pressing down the [OK] key for 3 seconds.

With a permanently connected input contact in the analysis start mode, analyses are carried out permanently.

Programming: Menu > Settings > Input > Start analysis

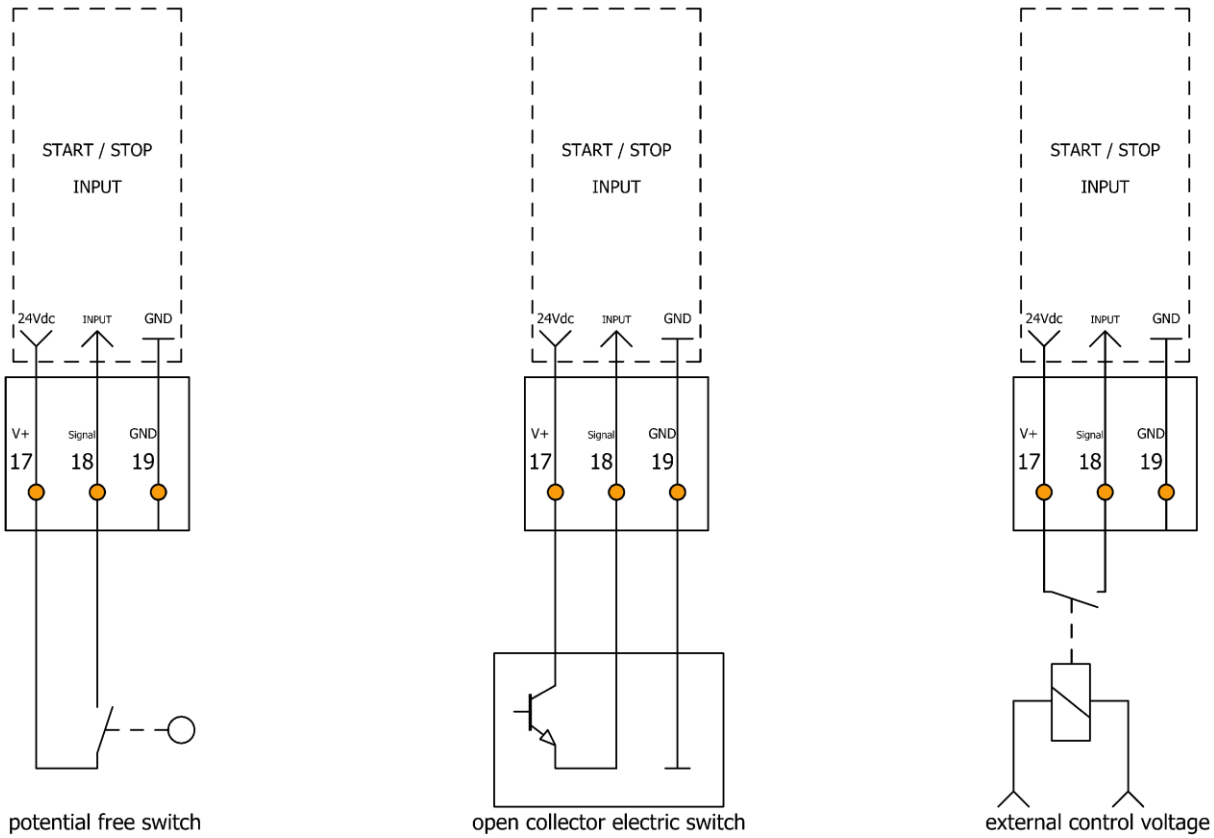


Figure: Three possible connection variants to start the analyser with an external controller

Connection of external components

Flow switch

Typically, an ion exchanger is monitored every 10 minutes to ensure that hard water does not reach the load in the event of a sudden hardness irruption. When installed on a system where monitoring is required only during operating hours, the input contact can be used in combination with a flow switch or a timer. Thus, the time interval can be paused during a system downtime, which can reduce reagent and power consumption.
As a flow switch, a paddle can be used. Potential-free contact of a timer is also possible. The examples below show various connection options at the input contact.
When using a flow switch, the analyses are only carried out if a defined signal is present at the input (input) (flow switch reports flowing water).
Depending on the installed contact, the input can be configured as NC or NO type.

(When using this function, the DUROMAT® must be in automatic mode.)

Programming: Menu > Settings > Input > Flow switch

This function must not be confused with the function "Start analysis" by external controller.

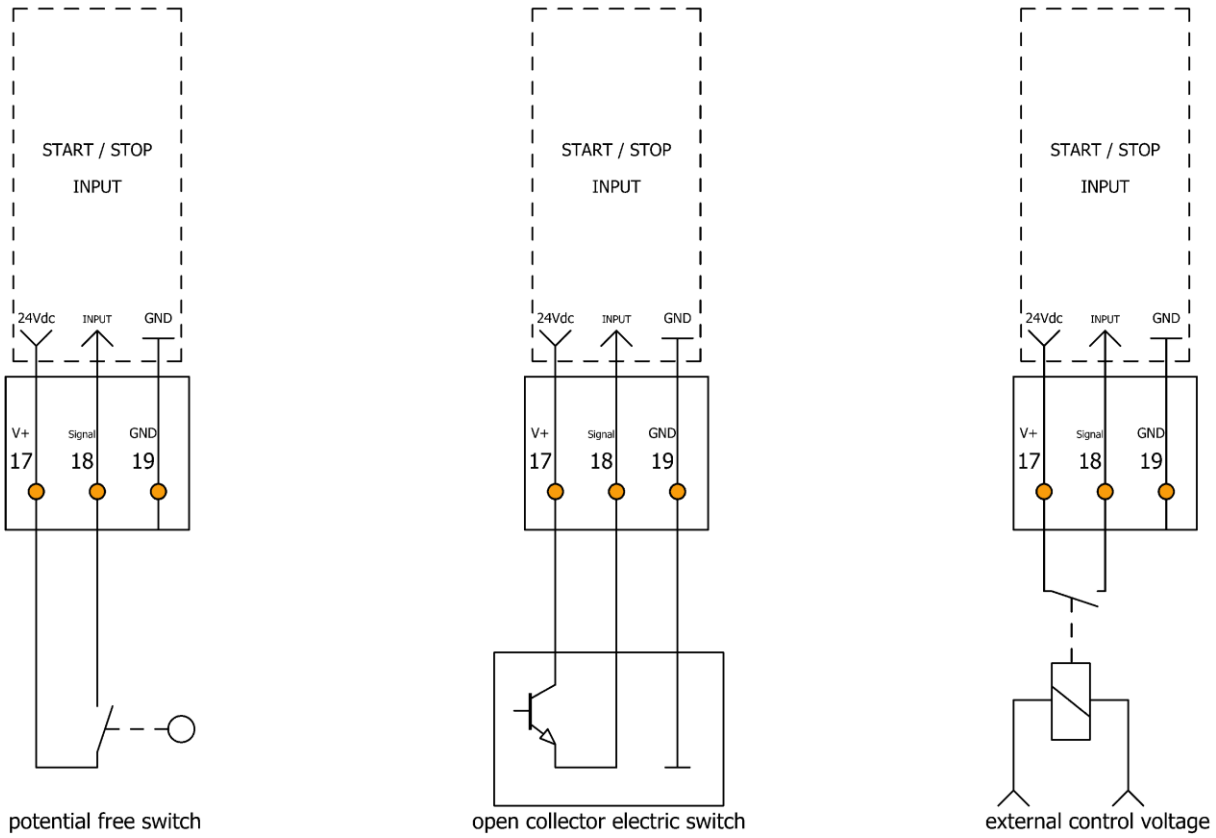


Figure: Three possible variants for connecting a flow switch

Connection of external components

Interval reset

Input IN as reset of interval during automatic mode.
The mode interval reset is used during monitoring single or pendulum softening systems. During operation of the water softening system, the analyses are running in the programmed analysis interval. When regeneration starts, the input contact closes to stop the analysis interval. The last display value is deleted from the display and the analysis interval pauses if the input contact is closed. After completion of the regeneration or after switching to the second water softening system, the input contact is opened again. The first analysis starts after one minute. The following analyses are performed again in the programmed analysis interval.

Input contact is closed: Analyses are stopped immediately and paused as long as the input contact remains closed.

As soon as the input contact is opened, the analysis interval begins, but since no display value is yet in the display, the first analysis is carried out after 1 minute before the set analysis interval begins (e.g. 5 min).

(When using this function, the DUROMAT® must be in automatic mode.)

Programming: Menu > Settings > Input > Interval reset

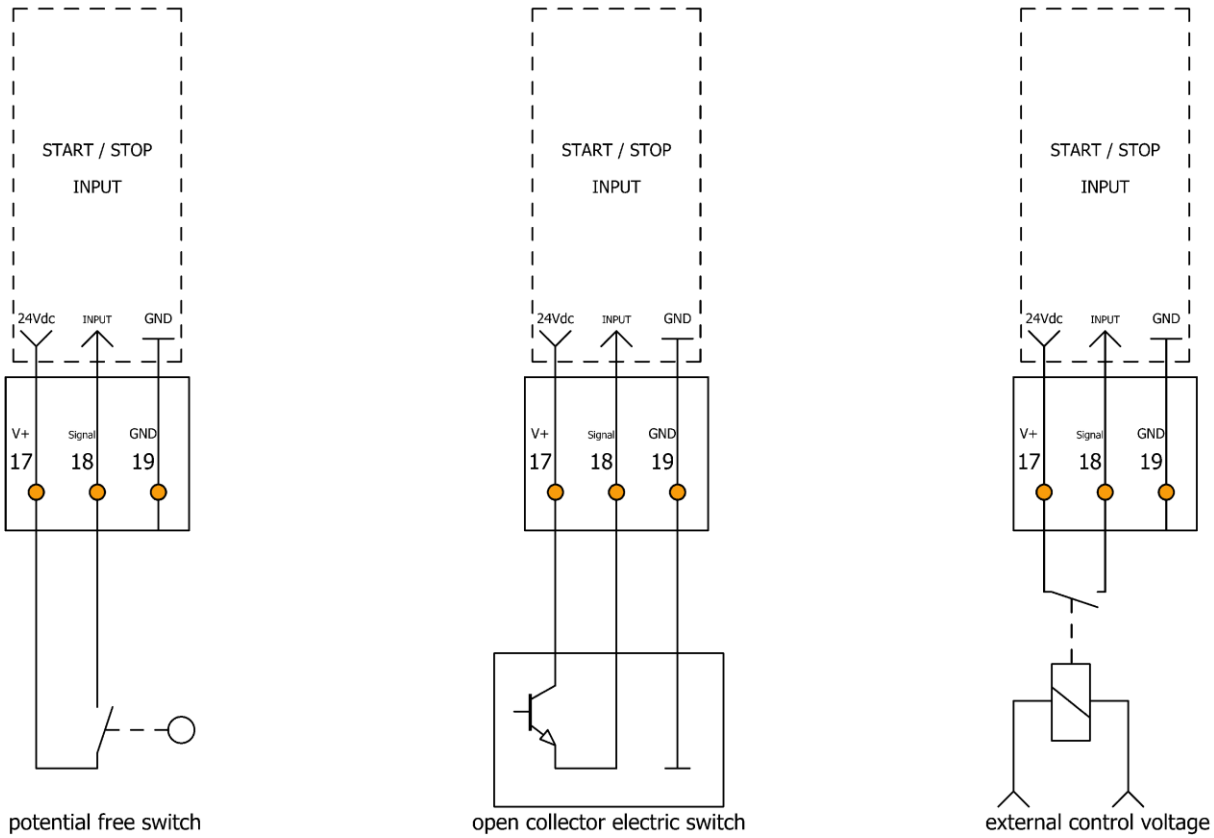


Figure: Three possible variants for connecting a reset switch

Connection of external components

Reagent light / horn

A reagent light or horn to signalise a limit violation can be connected to relay 1 / output 1.

Relay 1 / output 1 is energised when the limit value is exceeded and the connection from COM to NO is made. This position can be programmed in the program as a permanent contact or as a pulse contact.

Continuous contact on relay 1 / output 1:
Relay 1 / output 1 remains switched in the position (connection from COM to NO) when the limit value is exceeded until the measured water hardness is below the limit again. Next, the limit value exceedance is lifted and relay 1 / output 1 is switched back (connection from COM to NC).

Pulse contact on relay 1 / output 1:
Relay 1 / output 1 remains switched in the position (connection from COM to NO) only for a programmed pulse duration when the limit value is exceeded. Once the programmed pulse duration expires, relay 1 / output 1 switches back (connection from COM to NC). The next time the limit is exceeded, relay 1 / output 1 is switched again as a pulse.

Programming: Menu > Settings > Outputs > Relay 1

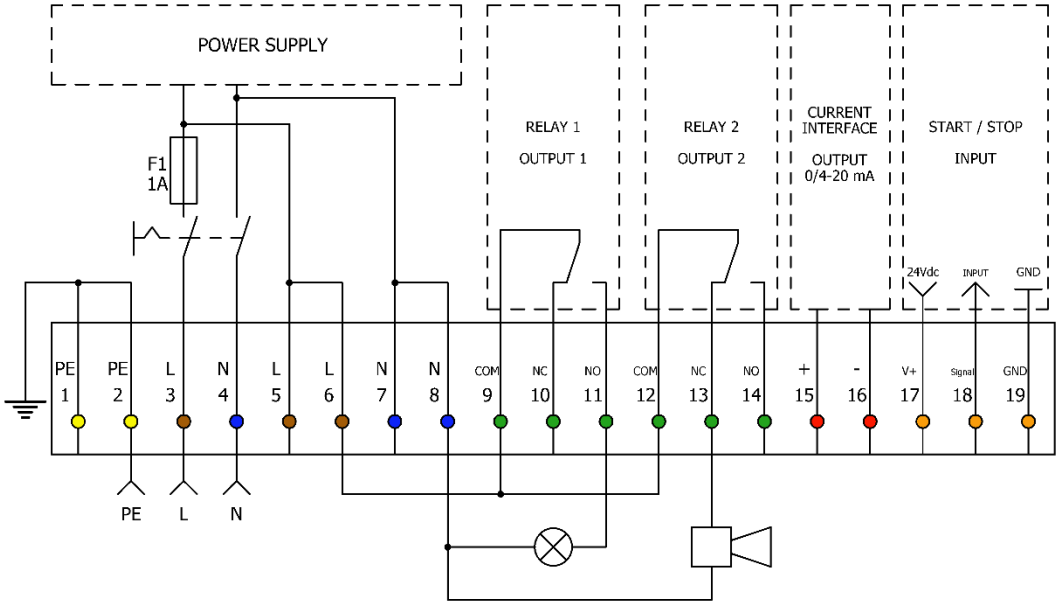


Figure: Terminal assignment when connecting reagent light / horn

The relay 2 / output 2 is used to report detected errors (e.g. optical error, faulty zero sample, missing supply voltage at the analyser). If the analyser is in normal operation and there is no fault, relay 2 / output 2 is energised and the connection from COM to NO is made. If an error is detected, the relay 2 / output 2 is deenergised and the connection from COM to NC is established.

Connection of external components

Regeneration system for demand-controlled regeneration triggering

Preparation plants are usually regenerated according to their capacity according to a constant flow rate. To ensure that no hard water reaches the load, the regeneration takes place before the actual exhaustion of the plant. If regeneration is triggered by an analyser, regenerants and water are saved. In the case of strongly fluctuating raw water hardness, a qualitative regeneration triggering via an analyser is unavoidable.
The pulse output for the regeneration triggering takes place via relay 1 / output 1. Due to longer service life or due to excessive load, premature regeneration can be triggered by the counter ion effect. It is therefore recommended to repeat the measurement if the limit value is exceeded with a control measurement.
Programming: Menu > Settings> Analysis> Control measurement

Analogue measuring device

The present measured value is available as an analogue value at terminals 15 and 16. Recorders or external devices can be connected to process the measured value. You can choose between a current output 0 - 20 mA value or 4 - 20 mA value. In addition, you must specify which current value of 20 mA corresponds to which total hardness / carbonate hardness.

Programming: Menu> Settings > Outputs> Current loop type
Programming: Menu > Settings > Outputs > Current loop calibration

(Enter the total hardness / carbonate hardness value that should correspond with 20 mA.)

The supplied current of the current loop for the displayed measured value is calculated as:

$$I = I_0 + \frac{(20\ mA - I_0) \cdot MeasuredHardness}{Max\_Hardnessvalue}\ [mA]$$

Here, I_0 is to be set to 0 or 4 mA depending on the operating mode.
The number "*Max Hardness value*" corresponds to the entered water hardness value for 20 mA. Usually, the end of the measuring range of the reagent deployed is used.

We recommend setting the upper degree of hardness to the end of the reagent measurement range.

Example of calculation:
For the analysis, a reagent 503/500 is used. Measuring range 0.09° dH to 0.9° dH.

Upper hardness is set to 0.9° dH, which corresponds to 20 mA.

For the current interface type "0 - 20 mA", 0 mA corresponds to 0° dH.
For the current interface type "4 - 20 mA", 4 mA corresponds to 0° dH.

Calculation for current interface type "0 - 20 mA"

$$I = 0\ mA + \frac{(20\ mA - 0\ mA) \cdot 0{,}42\ °dH}{0{,}9\ °dH}\ [mA]$$
$$I = 9{,}3\ mA$$

9.3 mA corresponds to 0.42° dH.

Calculation for current interface type "4 - 20 mA"

$$I = 4\ mA + \frac{(20\ mA - 4\ mA) \cdot 0{,}42\ °dH}{0{,}9\ °dH}\ [mA]$$
$$I = 11{,}46\ mA$$

11.46 mA corresponds to 0.42° dH.

Operating status via analogue current interface

The operating status of the device can be transmitted via the current interface terminals 15 and 16.

Programming: Menu> Parameters> Outputs> Current interface type
Selection options:

- 0 – 20 mA status
- 4 – 20 mA status

Operating status	Current interface	
	0 – 20 mA status	4 – 20 mA status
Standby (until first analysis is complete)	3.5 mA	6.8 mA
Fallen short of limit	7.5 mA	10.0 mA
Limit exceeded	12.5 mA	13.6 mA
Reagent fill level < 10%	16.5 mA	16.8 mA
Fault	0 mA	4 mA

The information given here may vary by a deviation of ± 0.3 mA.

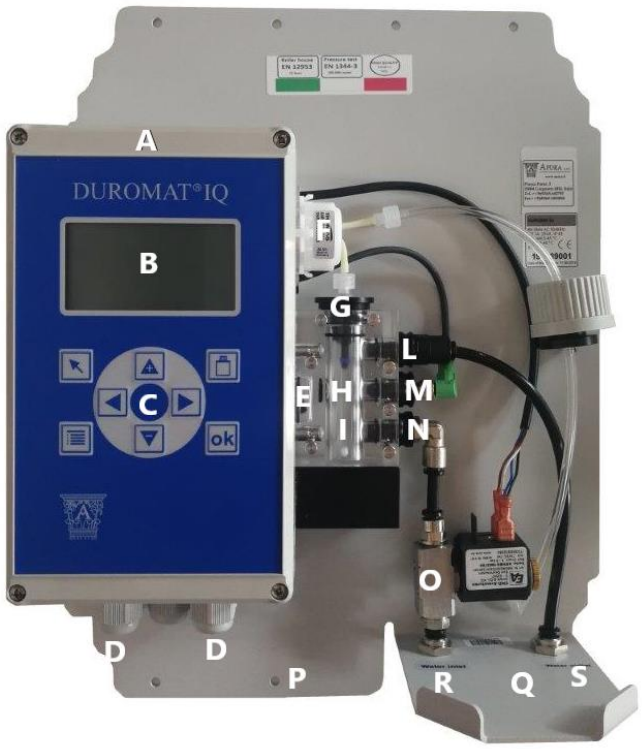


Figure: DUROMAT® IQ analyser without reagent bottle

Position	Description
A	Controller
B	Graphic display
C	Control panel
D	Cable grommet
E	On/Off switch
F	Dosing pump
G	Dosing plugs (reagent plugs)
H	Optical measurement path
I	Measurement chamber (The locking pins can only be pulled up and cannot be pulled out)
K	Agitator (magnetic agitator)
L	Drain plug
M	Actuator plug LED
N	Inlet plug
O	Solenoid valve (concealed behind the reagent bottle)
P	Wall bracket
Q	Place for reagent bottle 500 ml
R	Water inlet / sample water (Plug connection for plastic hoses with 6 mm outer diameter)
S	Water outlet (plug connection for plastic hoses with 6 mm outer diameter)

Operation

Display and keypad

The analyser has a graphic display in which both the measured values and the menu can be displayed for operation. Depending on the state of the device, the background colour of the display changes:

Background colour	State
White	Device operates correctly
Red	Limit value exceedance or device error

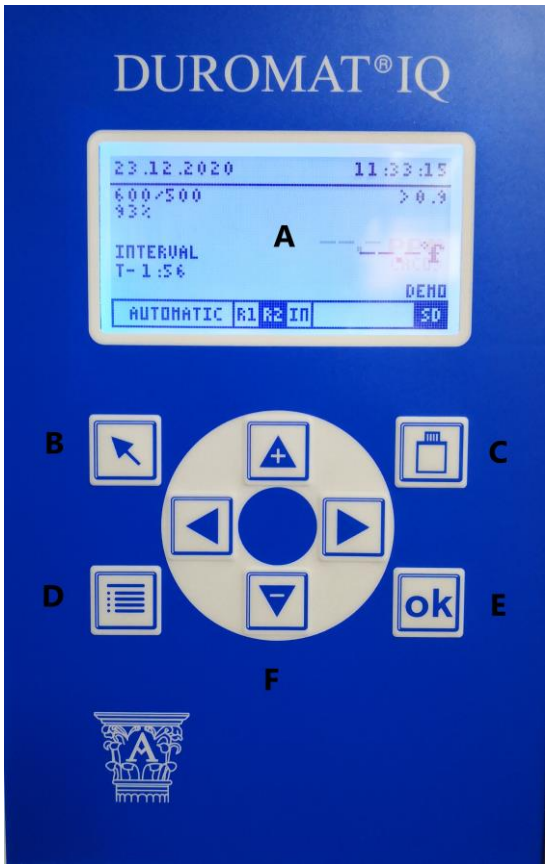


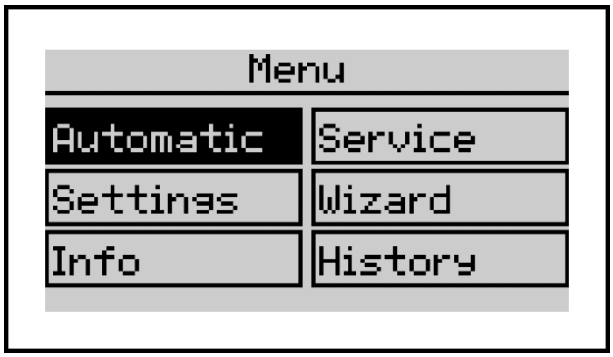
Figure: Structure of the front cover of the controller

Settings can be set via 8 keys.

Position	Description
A	Display
B	Return / do not save / stop analysis
C	Confirmation of supply indicator
D	Basic menu / Return to the basic display
E	OK / confirmation
F	Arrow for navigation / change the parameters

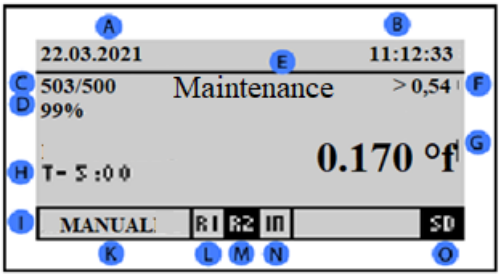
Display menu

The following selection options are available in the menu window:



Menu item	Description
Automatic	To activate and deactivate the automatic analysis operation.
Settings	Under this menu item, all device settings can be made.
Info	Informs about: Hardware- and software versions, analysis counter, maintenance counter, maintenance date, good- and bad measurements.
Service	Start analysis (manual), Pump reagent (new bottle inserted), Manual flushing, Confirm maintenance, Reset good- and bad counter, Diagnostic program (testing of the actuators and sensors installed in the DUROMAT® including the hardware)
Assistant	The wizard guides you through all settings in the device and facilitates the commissioning.
History	Displays the history of the last 100 measurements as a graph.

Display during a measurement



Position	Description
A	Date
B	Time
C	Selected reagent
D	Bottle fill level in %
E	Device status (maintenance: maintenance counter expired, cleaning: optics dirty)
F	Set limit for relay 1
G	Analysis result
H	Analysis step (T - 5:00 remaining time in minutes until next analysis)
I	Status bar
K	Manual mode or automatic mode
L	Relay 1 de-energised
M	Relay 2 energised (fields highlighted in black are active)
N	Digital input (IN) inactive
O	SD card present

Simple starting of analysis.
press down the [OK] key for 3 seconds to start an analysis.

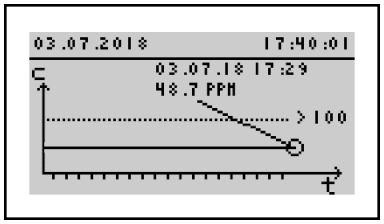
The analysis can be started in manual and automatic mode.

Display of measured value history (history)

With the aid of the arrow keys [◀] and [▶] the last 100 measurements with date and time stamp can be read in the display mode. The set limit is drawn as a dotted line in the history.

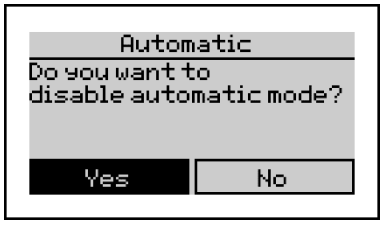
To analyse the measured values on a PC, the trend.csv file is available on the SD card.

You can open the history using the Menu> History keys. Press the [Back] key to return to the measured value display.



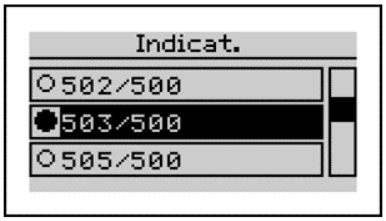
Display of selection menu

When selecting, you can change the selection with the [◀] and [▶] keys. The setting is confirmed with the [OK] key. If you do not want to change the setting, you can leave the selection with the [Back] key. In the picture below, the active selection is the [Yes] key highlighted in black.



Display of selection list

You can change the selection in a selection list using the [▲] and [▼] keys. The setting is confirmed with the [OK] key. If you do not want to change the setting, you can leave the selection with the [Back] key. If the selection list offers more than three options, a scroll bar is displayed on the right edge of the display. The currently selected reagent type is highlighted in black (503/500).
The circle to the left of the reagent type filled in black indicates which reagent is currently programmed for analysis.



Display with value entry

The numbers are entered via a display keypad. You can move the cursor with the arrow keys [◀], [▶], [▲] and [▼] of the device. The input mask additionally displays the currently set numerical value and the valid input range.

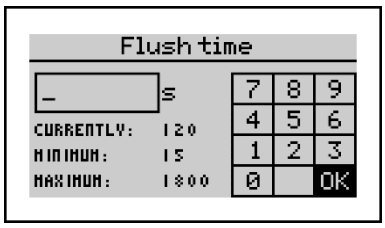
You will see an input keypad. Now use the arrow keys to move the black cursor to the desired digit and press the [OK] key.

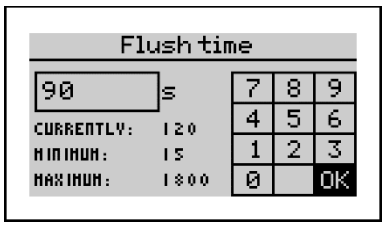
The selected digit appears on the left side in a frame. Repeat the entry until the desired number is in the frame. Now move the cursor to the OK field in the keyboard and press the [OK] key.

You will see the following information:
Current: currently set value
Minimum: smallest settable value
Maximum: largest settable value

Should the value at "Current" corresponds to your request, then you do not need to re-enter the number and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

In the lower example of flushing time, a flushing time between 15 and 1800 seconds can be set. The currently programmed flushing time is 120 seconds.





After entering a flushing time of 90 seconds, confirming with the [OK] key overwrites the current flushing time with 90 seconds.

Factory settings

The following factory settings are stored in the device:

Menu items		Factory settings
General	Language	Italian or German
Analysis	Unit	°dH
	Reagent	503/500
	Limit value	0.5 °dH
	Flushing time	120 seconds
	Auto. Time interval	5 minutes
	Stop analysis	No
	Control measurement	No repetition
	Calibration factor	100 %
Input	Input	Start analysis
	Flow switch	From
Outputs	Current interface type	4 ... 20 mA values
	Calibrate current interface	0.9 °dH
	Relay 1	Limit as permanent contact
	Relay 2	Reporting of errors

Reset the factory settings with
Programming: Menu > Settings > General > Factory settings

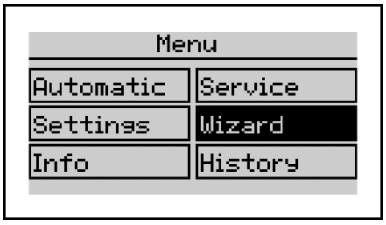
Configuration assistant

The configuration wizard is designed for simplified commissioning. The menu-driven device accompanies you step by step through all necessary settings. It also checks whether the device is working properly.

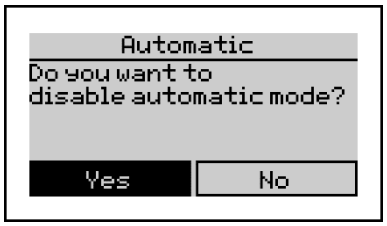
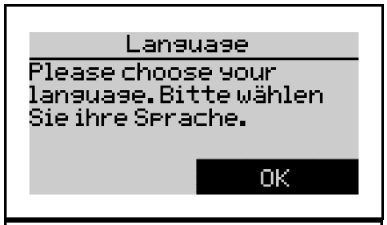
Later, all settings can be changed separately in Menu > Parameters again.

To start the wizard, select:

Programming: Menu > Wizard

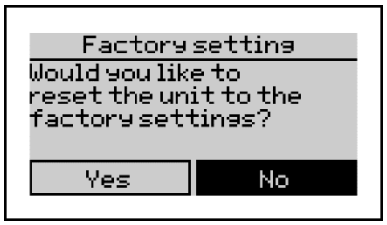


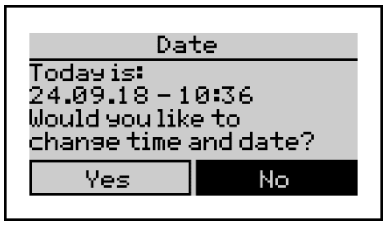
The following steps are executed:

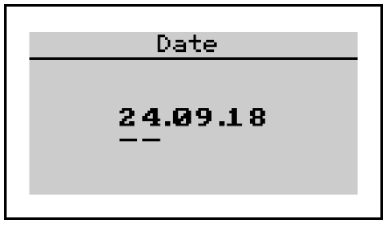
Automatic mode	If the automatic mode is still active, it must now be quit.
	Select [Yes] or [No] with the arrow keys [◀] and [▶] and confirm with [OK] key. [Yes] Terminate the automatic mode. [No] Return to measured value view
Language selection	Please choose your language
 	Press [OK] key. Selectable languages: German, English, French, Italian, Spanish, Russian, Select language with [▲] and [▼] and confirm with [OK] key.

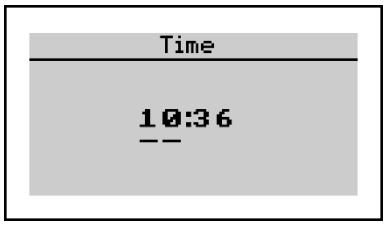
Configuration

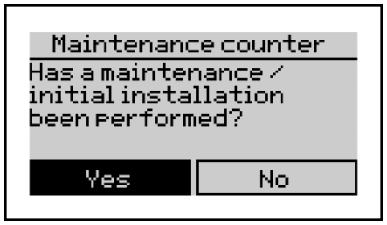
Assistant	Would you like to start the configuration wizard?
	Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key. [Yes] Start the configuration wizard. [No] Go back to the main menu.

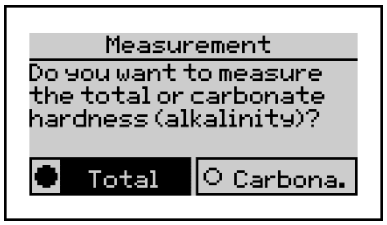
Factory settings	Do you want to reset the device to factory settings first?
	Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key. [Yes] Reset the device to the recommended factory settings . [No] The device retains the settings programmed by the user. The factory settings can be found on page 38.

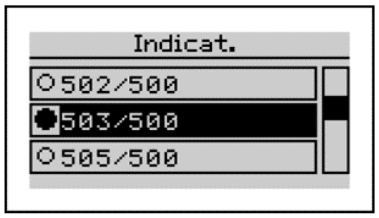
Date	Today is: XX/XX/XX – XX:XX Do you want to set date and time?
	Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key. [Yes] Set date and time. [No] The device keeps the date and time unchanged.

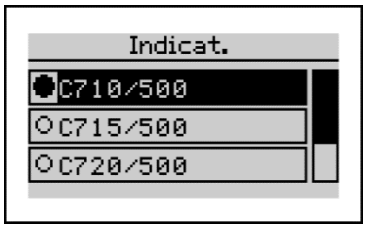
Adjust date	
	Use the arrow keys [▲] and [▼] to move the date. Confirm with the [OK] key and change step by step from day to month and further to the year until the date is set. Press [OK] key.

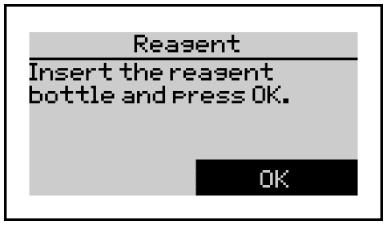
Setting the time	
	You can move the hour with the arrow keys [▲] and [▼] Confirm the hour with the [OK] key and program the minutes in the second step. The seconds are set to 0 seconds upon completion. Press [OK] key.

Maintenance counter	Is a maintenance / initial installation carried out?
	Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key. [Yes] Maintenance counter is set to 30,000 analyses and the maintenance date is set to 24 months. (Can be read in the Menu > Info) [No] The device retains the previous data.

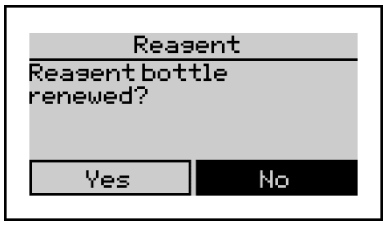
Parameter	Would you like to measure the total hardness or carbonate hardness (alkalinity)?
	Select [Total] or [Carbonate] with [◀] and [▶] and confirm with [OK] key. [Total] The total or residual hardness will be measured. [Carbonate] The carbonate hardness will be measured.

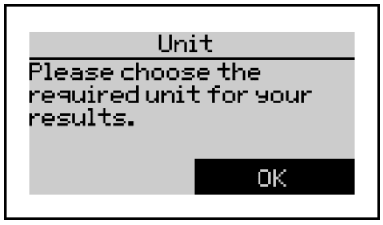
When selecting total hardness	Please select a total hardness reagent.
	Select the reagent 503/500 used for total hardness monitoring with [▲] and [▼] from the displayed list. Measuring ranges of the reagents can be found in the table on page 14. After selecting, press the [OK] key.

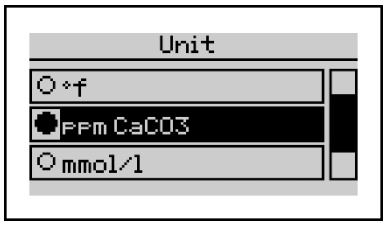
When selecting carbonate hardness	Please select a carbonate hardness reagent.
	Select the reagent C.../500 for carbonate hardness monitoring with [▲] and [▼] from the displayed list. Measuring ranges of the reagents can be found in the table on page 14. After selecting, press the [OK] key.

Reagent	Insert a new reagent bottle and press OK.
	Insert new reagent bottle and press the [OK] key.

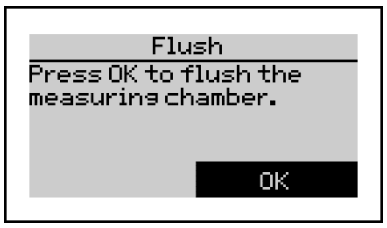
Reagent	
	Reagent is pumped into the measuring chamber. The pumping process can be stopped by pressing the [OK] key before the time has elapsed.  Make sure that the reagent has been pumped bubble-free into the measuring chamber.

Reagent	Has a full reagent bottle been used?
	Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key. [Yes] The bottle fill level is set to 100%. [No] The previous bottle fill level in % is maintained.

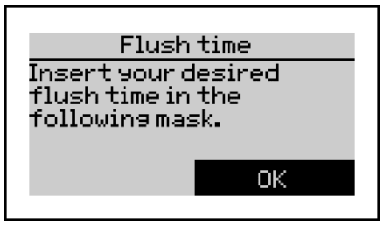
Unit	Select the displayed hardness unit.
	Press [OK] key.

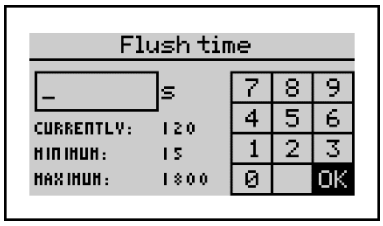
Unit	
	Use [▲] and [▼] to select the desired unit for display and SD card measurement protocol from the displayed list. After selecting, press the [OK] key.

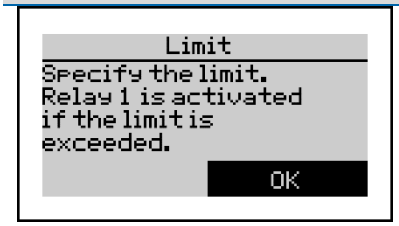
When using a sample cooler, check the proper operation of the sample cooler before the next step in order to rule out any danger from hot steam or hot water.

Flushing	Press OK to flush the supply line and the measuring chamber.
	Press [OK] key.

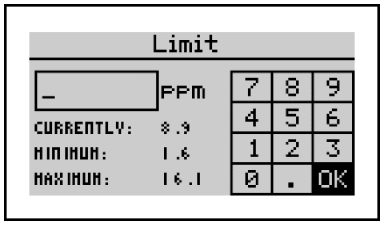
Flushing	
	The solenoid valve opens and flushes the measuring chamber. Here, the previous flushing time is shown in the display. This can be used as reference time to set the flushing time before analysis. The flushing process is ended with the [OK] key. The solenoid valve closes.  Make sure the sample water is clear and free of bubbles.

Flushing time	Set the flushing time in the following mask.
	Press [OK] key.

Flushing time	
	You will see an input keyboard on the right side. Use the arrow keys ([◀], [▶], [▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key. The selected digit appears on the left side in a frame. Repeat the entry until the desired flushing time is within the range. Now move the cursor to the OK field in the keyboard and press the [OK] key. You will see the following information on the left: Current: currently programmed value Minimum: smallest settable value Maximum: largest settable value Should the value at "Current" corresponds to your request, then you do not need to re-enter the digits and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Limit value	Enter the limit, above which relay 1 should be switched.
	Press [OK] key.

Limit value



You will see an input keyboard on the right side.
Use the arrow keys ([◀], [▶], [▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key.
The selected digit appears on the left side in a frame.
Repeat the entry until the desired limit is within the range.
Now move the cursor to the OK field in the keyboard and press the [OK] key.

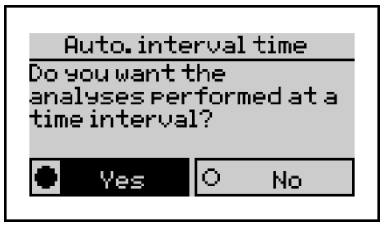
You will see the following information on the left:

Current:	currently programmed value
Minimum:	smallest settable value
Maximum:	largest settable value

Should the value at "Current" corresponds to your request, then you do not need to re-enter the number and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Auto. Time interval

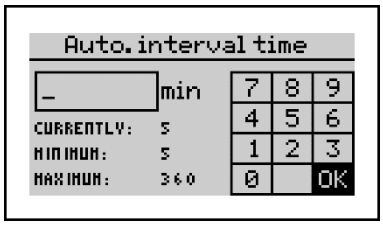
Do you want the analyses to run in a time interval?



Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.

[Yes]	Analyses are performed in an automatic time interval.
[No]	Do not perform any analyses in the automatic time interval.

Auto. Time interval	Set the automatic interval time, in which the analyses are to be carried out.

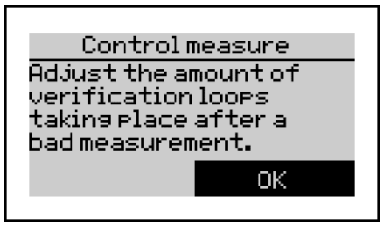


You will see an input keyboard on the right side.
Use the arrow keys ([◀], [▶], [▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key.
The selected digit appears on the left side in a frame.
Repeat the entry until the desired analysis interval time is within the range.
Now move the cursor to the OK field in the keyboard and press the [OK] key.

You will see the following information on the left:
Current: currently programmed value
Minimum: smallest settable value
Maximum: largest settable value

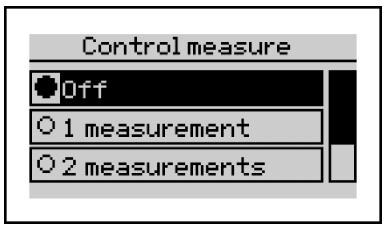
Should the value at "Current" corresponds to your request, then you do not need to re-enter the number and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Control measurement	How often should a limit exceedance be verified before notification?



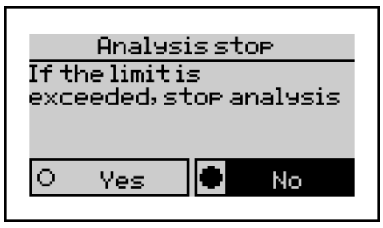
Press [OK] key.

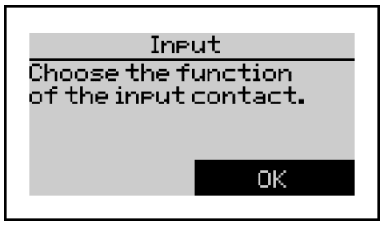
Control measurement	

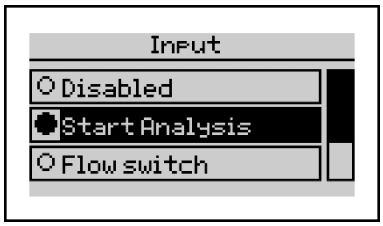


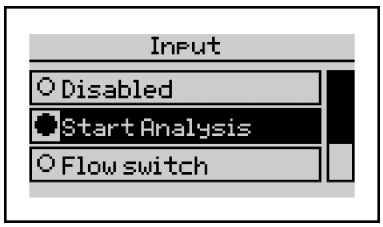
Use [▲] and [▼] to set the number of control measurements that should be performed before any exceedance of limit value should be reported. These are carried out after a limit value exceedance in a 3-minute interval to avoid false alarms due to the counter-ion effect of the water softening system.

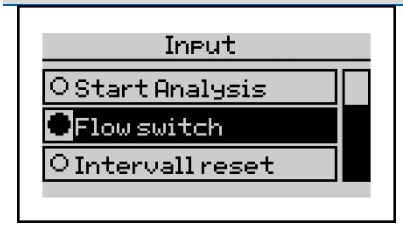
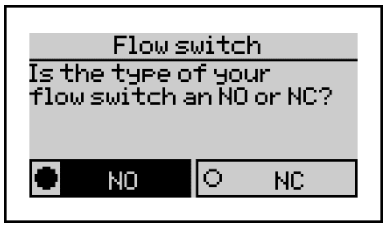
Make a selection and confirm with the [OK] key.

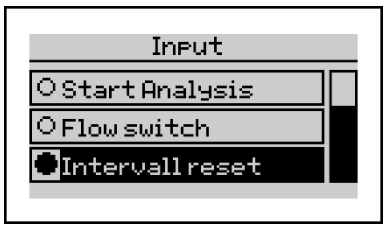
Stopping the analysis	Auto. Stop interval after limit exceedance?
	Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key. [Yes] Auto. Interval is paused after a limit exceedance. (In order to carry out further analyses, the automatic mode must be reactivated on the device). [No] Further analyses are also carried out after a limit has been exceeded.

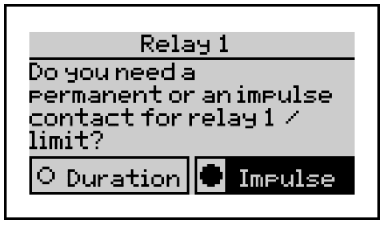
Input	Select the function of the input.
	Press [OK] key.

Input	
	You have the following options at the input: • Deactivated • Start analysis • Flow switch • Interval reset Select and confirm with the [OK] key.

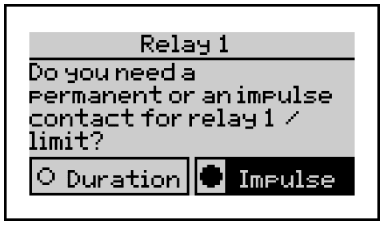
If Start analysis is selected	
	An analysis is started as soon as the "Start/Stop Input: Inlet Contact" terminal 17 is bridged to terminal 18. (When using this function, the DUROMAT® must be in automatic mode.)

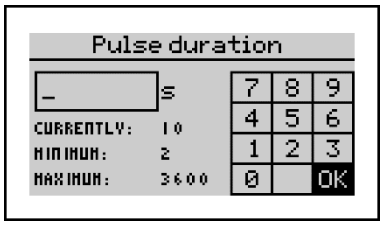
When selecting flow switch	Does the flow switch an NC or NO type?
	[NO] Analysis interval paused: start of next analysis waits for an open input contact. [NC] Analysis interval paused: start of next analysis waits for a closed input contact.
	Select and confirm with the [OK] key. (When using this function, the DUROMAT® must be in automatic mode.)

When selecting interval reset	
	If the input contact is closed, the analyses are stopped Immediately and paused if the input contact remains closed. As soon as the input contact is opened, the analysis interval begins. However, as the display does not yet show a value, the first analysis is carried out after 1 min before the set analysis interval (e.g. 5 min) begins. (When using this function, the DUROMAT® must be in automatic mode.)

Relay 1	Do you need a permanent or pulse contact at relay 1 / limit?
	[Duration] or select [Pulse] and press the [OK] key. [Duration] The relay switches to a permanent contact if the limit value is exceeded until an analysis that falls below the limit value takes place. [Impulse]The relay switches for a set pulse time.

If impulse contact is selected	Set the pulse duration for relay 1.





You will see an input keyboard on the right side.
Use the arrow keys ([◀], [▶], [▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key.
The selected digit appears on the left side in a frame.
Repeat the entry until the desired pulse duration is within the range.
Now move the cursor to the OK field in the keyboard and press the [OK] key.

You will see the following information on the left:
Current: currently programmed value
Minimum: smallest settable value
Maximum: largest settable value

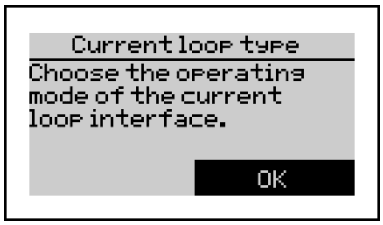
Should the value at "Current" corresponds to your request, then you do not need to re-enter the number and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

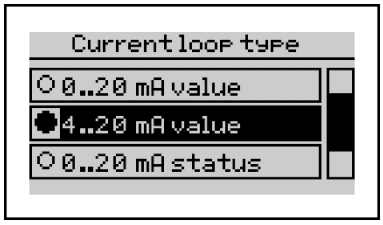
Relay 2	Relay 2 is used to indicate a device error. Press [OK] key

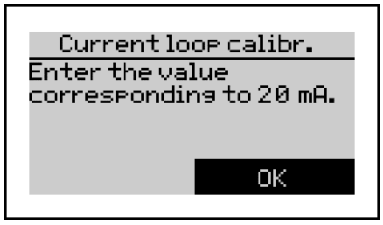
Relay 2 is used to indicate a device error and cannot perform any other functions.

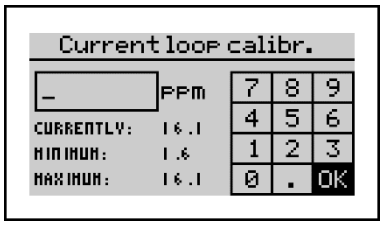
Relay 2 is always energised in normal operation, connection from COM to NO (wire break safety).

In the event of a device error, relay 2 is de-energised and establishes the connection from COM to NC.

Current interface type.	Select the operating mode of the current interface.
	Press [OK] key.

Current interface type.	
	Use [▲] and [▼] to select the setting of the current interface type from the following options: • From • 0 to 20 mA value • 4 to 20 mA value • 0 to 20 mA status • 4 to 20 mA status (When selecting status, see further information on page 31.) Select and confirm with the [OK] key.

When selecting value	Enter the value corresponding to 20 mA.
	Press [OK] key.

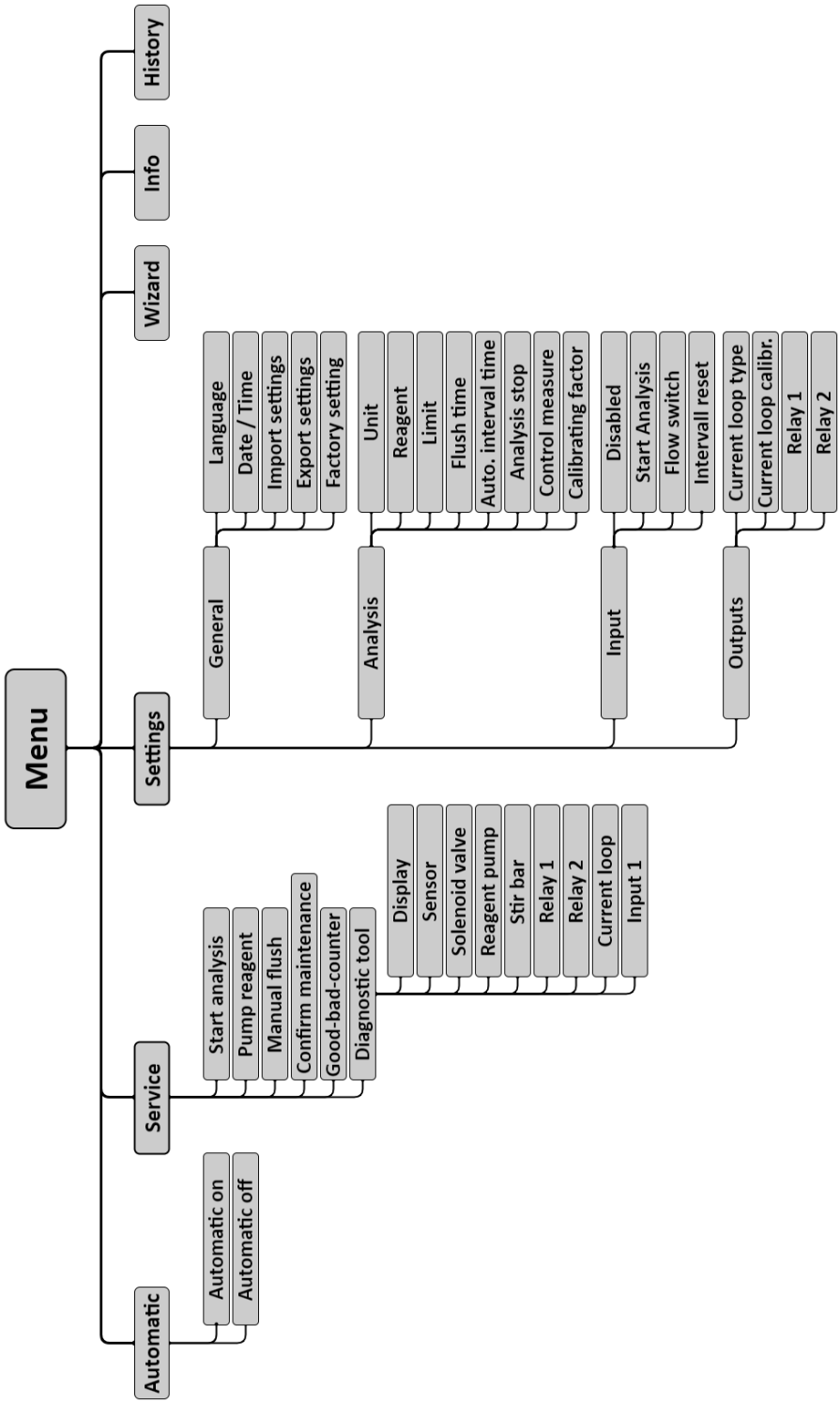
Calibrate current interface	Enter the value corresponding to 20 mA.
	Here you can enter the measured value, up to which the current interface should be scaled. We recommend setting the value for 20 mA at the end of the measurement range of the reagent, but you can also set values below it. For more information, see page 30. You will see an input keyboard on the right side. Use the arrow keys ([◀], [▶], [▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key. The selected digit appears on the left side in a frame. Repeat the entry until the desired number is in the frame. Now move the cursor to the OK field in the keyboard and press the [OK] key. You will see the following information on the left: Current: currently programmed value Minimum: smallest settable value Maximum: largest settable value Should the value at "Current" corresponds to your request, then you do not need to re-enter the number and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.
Assistant	The configuration is complete. The wizard is terminated.
	Press [OK] key.

This completes the configuration of the device.

If necessary, individual settings can also be set without the wizard.
Programming: Menu > Settings

Menu structure

The following is an overview of the menu structure to give you an overview of all the functions of the analyser.



Mode

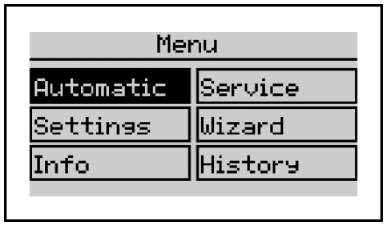
Manual and automatic mode

The analyser can be started in automatic mode (Menu> Automatic), depending on the time or via an external button or flow switch. In manual mode (automatic off), functions such as starting analysis, conveying reagent or flushing can be manually controlled. In addition, a diagnostic function is included in manual mode to test individual device components.

In automatic mode, analyses are carried out at the programmed interval or by external starting. After switching on, the automatic mode is active. The first analysis is started after switching on at the programmed internal interval after 3 minutes. All subsequent analyses are performed in the programmed interval.

Main menu

The main menu can be opened by pressing the [Menu] key from the measured value view.

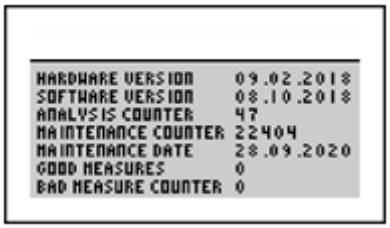


Menu item	Description
Automatic	Changing between automatic and manual mode
Parameter	Setting the device and analysis parameters
Info	Overview of hardware- and software version and display of counter readings
Service	Functions for maintenance, diagnostics, and changing reagent
Assistant	Setup wizard for a guided parameterisation of the device
History	Display of the last 100 measurement results with date and time

Mode

Info display

The Info menu item in the main menu displays additional information about the device and the measuring point:



Information	Description
Hardware version	Version of the hardware used
Software version	Installed software version
Analysis counter	Number of analyses performed since commissioning
Maintenance counter	Number of remaining analyses - service life of the peristaltic pump cartridge: will be set to 30,000 analyses when the maintenance is acknowledged in the service menu.
Maintenance date	Expiry date of the peristaltic pump cartridge used: is set to 2 years when the maintenance is acknowledged in the service menu.
Good counter	Number of analyses without limit exceedance: can be reset in the service menu under the item good/bad counters.
Fail counter	Number of analyses with limit exceedance: can be reset in the service menu under the item good/bad counters.

Behaviour in the event of power failure

All settings of the device are stored on the SD card or in the internal memory. In the event of a power failure, all settings are available again after switching on the device. If the device has been in automatic mode, the analyser automatically restarts after a short dwell time with an analysis according to the set interval times.

Relay 2 (ready for operation/error) picks up after switching on the device (connection COM to NO). Thus, an external controller can determine whether the device is ready for operation or whether there is a fault such as a device fault, power failure or a defective line.

If a device failure occurs and the device needs to be replaced, you can export the settings from the old device to the SD card inserted in the device (Menu > Settings > General > Export settings). After inserting the SD card into the new device, the settings can be imported (Menu > Settings > General > Import settings). The measurement protocol on the SD card is continued by the new device.

Mode

SD-card

The analyser contains an SD card. The following information is stored on this memory card: measured values, error messages, device configuration, device firmware.
The data is stored on the SD card as .csv files. These files can be opened with an editor or spreadsheet program (e.g. MS Excel, OO Calc) and the data can be processed further. Furthermore, system files are present on the SD card (.bin).
The analyser is fully functional even without an SD card, but only the last 100 readings are saved internally.

The bottle level is stored on the SD card. If the device is switched off and on again without an SD card, the device cannot read in a bottle level from the SD card and therefore issues a BOB message (bottle level below 10%).

If you want to use a different SD card than the one supplied, make sure that it is formatted as follows:

Storage capacity:	max. 2.0 GB
File system:	FAT16
Size of the allocation files:	32 kB

Mode

The following files are stored on the card:

File name	Type	Content
trend.csv	Data	Measured values in tabular form with date, time and measured value The data becomes filed in the following format: YYYY.MM.DD [Tab] hh.mm [Tab] x.xxx [Tab] Unit [LF] The measured values (x.xxx) are stored on the device in the unit displayed.
error.csv	Data	Error messages in tabular form with time, date and error The data becomes filed in the following format: YYYY.MM.DD [Tab] hh.mm [Tab] Error code [LF].
history.dat	System	Time-stamped analysis results The device loads these into the internal memory at start-up.
setting.dat	System	Complete device setting of the analyser (optional file) Before replacing the analyser, you can transfer the saved device configuration directly to the new device. The export is located in the menu under Parameters> General> Export settings. The device configuration can be imported in the menu under: Parameters> General> Import settings.
logfile.dat	System	Date, time stamp and device start This file is needed for internal purposes.
TA27xxx.bin	Operating system	This file is not on the SD card by default. If there are any software updates for your analytical instrument, they will be made available to you by our sales partners or can be downloaded from our homepage. You can copy this file to the SD card and perform a software update. More information about installing a software update can be found on page 66. We recommend that you delete the file from the SD card after installing an update.

Maintenance and service

In order to enable a long and trouble-free operation of the analyser, maintenance on the device must be carried out at regular intervals. Make sure the device is turned off before performing any maintenance. During this time, no analyses are carried out. As a rule, wear protective goggles and gloves during maintenance to avoid contact with reagent, cleaning fluid or other liquids.

The following maintenance intervals must be complied with:

Interval	Maintenance and service
every 6 months	Cleaning of measurement chamber At high ambient- and water temperatures or water with high organic load, the cleaning intervals may need to be shortened.
every 30,000 analyses or after 24 months	maintenance as after 6 months and installing maintenance kit

For cleaning, we recommend the "Maintenance set 02" See page 73.

Maintenance and service

Cleaning the measuring chamber

The cleaning of the measuring chamber takes about 20 minutes. Proceed as follows to clean the measuring chamber:

- Switch off the device.
- Pull the hose pump cassette from the bracket by unlocking the clips at the top and bottom.
- Release the connection to the reagent plug and reagent bottle.
- Pull the locking pins slightly forward. (The locking pins can only be pulled up and not out).
- Pull the drain plug, actuator plug and inlet plug out of the measuring chamber.
- Pull the measuring chamber to the right from the retaining bolts on the control housing.
- Remove the stirring blade.
- Use a flat-tip screwdriver to lever the reagent plug upwards. (Make sure that the locking pins are raised before levering.)
- Clean the measuring chamber and the plugs using the DUROMAT® cleaning set as described on the package insert.

For a trouble-free operation it is important that not only the measuring chamber, but also the actuator plug is cleaned with the white (LED). Take a cloth and moisten it with the Cleaning Set and wipe the actuator plug thoroughly.

Please observe the following sequence when assembling:

- Lubricate O-rings (3 x J and 1 x C) with technical Vaseline. See picture Spare parts on page 71

The blue dosing O-ring (D) on the reagent plug must not be lubricated with technical Vaseline.

In contrast, the black O-rings (3 x J and 1 x C) must be lubricated with technical Vaseline before insertion into the measuring chamber.

- Pull up the locking pins Insert the reagent plug and lock it.
- Place the cleaned measuring chamber on the retaining bolts and lock.
- Insert the stirring blade into the measuring chamber.
- Pull up the locking pins Insert the inlet plug, actuator plug and drain plug into the measuring chamber and lock.
  (Make sure that all plugs are inserted into the measuring chamber up to the stop and only then locked, otherwise the plugs can be damaged).

- Connect the hose pump cassette to the reagent plug and to the reagent bottle.
- Place the peristaltic pump cassette on the bracket so that it snaps into place.
- Switch the unit on again.
- Flush the measuring chamber (Programming: Menu > Service > Manual flush).
- Feed the reagent into the measuring chamber (Programming: Menu > Service > Pump reagent).

Was a full reagent bottle used?

Select [Yes] or [No] and press the [OK] key.
[Yes] The cylinder filling level is set to 100 %.
[No] The previous cylinder filling level in % is retained.

- Flush the measuring chamber again (Programming: Menu > Service > Manual flush).

The instrument is ready for operation again.

Inserting the "Maintenance set 02"

The hose pump cassette, hoses and seals must be replaced at regular intervals.
The required replacement parts are included in the "Maintenance set 02".

Maintenance takes about 25 minutes.

Proceed as follows:

- Switch off the device.
- Pull the hose pump cassette from the bracket by unlocking the clips at the top and bottom.
- Release the connection to the reagent plug and reagent bottle.
- Replace the bottle connector, the suction lance and the hose pump cassette.
- Pull the locking pins slightly forward. (The locking pins can only be pulled up and not out).
- Pull the drain plug, actuator plug and inlet plug out of the measuring chamber.
- Pull the measuring chamber to the right from the retaining bolts on the control housing.
- Remove the stirring blade.
- Use a flat-tip screwdriver to lever the reagent plug upwards. (When levering it out, make sure that the locking pins are raised).
- Pull up the locking pin for light rod plugs.
- Take a non-metallic object such as a plastic or wooden rod, insert it into the actuator plug hole and push out the light rod plug (The light rod stopper belongs to the optical measuring section and must not be scratched).
- Remove the O-rings (4 x J, 1 x C and 1 x D) from the plugs. See Spare parts illustration on page 71.
- Clean the measuring chamber and the plugs using the DUROMAT® cleaning set as described on the package insert.

For a trouble-free operation it is important that not only the measuring chamber, but also the actuator plug is cleaned with the white (LED). Take a cloth and moisten it with the Cleaning Set) and wipe the actuator plug thoroughly.

Please observe the following sequence when assembling:

- Slide the O-rings onto the plugs (4 x J, 1 x C and 1 x D) See spare parts illustration on page 71.

The blue dosing O-ring (D) on the reagent plug must not be lubricated with technical Vaseline.

In contrast, the black O-rings (4 x J and 1 x C) must be lubricated with technical Vaseline before insertion into the measuring chamber.

- Pull up the locking pin Insert the light rod plug and lock it.
- Pull up the locking pins Insert the reagent plug and lock it.
- Place the cleaned measuring chamber on the retaining bolts and lock.
- Insert the stirring blade into the measuring chamber.
- Pull up locking pins Insert inlet plug, actuator plug and outlet plug into the measuring chamber and lock.
  (Make sure that all plugs are inserted into the measuring chamber up to the stop and only then locked, otherwise the plugs can be damaged).

- Connect the hose pump cassette to the reagent plug and to the reagent bottle.
- Place the peristaltic pump cassette on the bracket so that it snaps into place.
- Switch the unit on again.
- Flush the measuring chamber (Programming: Menu > Service > Manual flush).
- Feed the reagent into the measuring chamber (Programming: Menu > Service > Pump reagent).

Has a full reagent bottle been inserted?

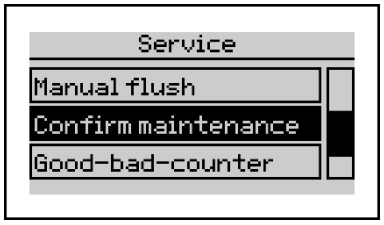
Select [Yes] or [No] and press the [OK] key.
[Yes] The cylinder filling level is set to 100 %.
[No] The previous cylinder filling level in % is retained.

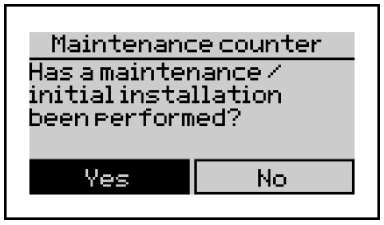
- Flush the measuring chamber again (Programming: Menu > Service > Manual flush).
- Reset the maintenance counter to 24 months / 30,000 analyses.
  (Programming: Menu > Service > Confirm maintenance).

The device is ready for operation again.

Reset the maintenance counter

After maintenance has been carried out with the "Maintenance set 02" inserted, the maintenance counter in IQ must be reset.
The message "Maintenance" disappears from the display and only appears after the 24 months have elapsed or after 30,000 analyses, then maintenance must be carried out again.
(Programming: Menu > Service > Confirm maintenance).





Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.
[Yes] Maintenance counter is set to 30,000 analyses and the maintenance date is set to 24 months.
(Can be read in the Menu > Info)
[No] The device retains the previous data.

Changing the reagent bottle

First check the expiry date of the new reagent bottle. Use only the reagent whose shelf life has not been exceeded.

Always use reagent bottles with 500 ml content.

Proceed as follows:

- Switch off the device.
- To replace the reagent bottle, undo the screw cap on the bottle and insert the new reagent bottle. Absorb drip quantities if necessary.
- Switch the device on again.
- Flush the measuring chamber (Programming: Menu > Service > Manual flush).
- Feed the reagent into the measuring chamber (Programming: Menu > Service > Pump reagent) until the reagent reaches the measuring chamber free of bubbles. Then press the [OK] key to stop purging the reagent line.

Has a full reagent bottle been used?

Select [Yes] or [No] and press the [OK] key

[Yes] The bottle fill level is set to 100%.

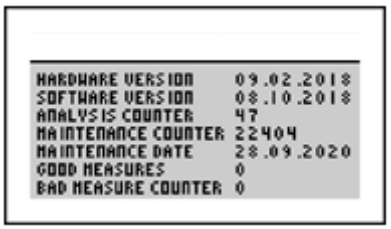
[No] The previous bottle fill level in % is maintained.

- Flush the measuring chamber again (Programming: Menu > Service > Manual flush) to clean the measuring chamber.
- Test the analysis process by starting an analysis. To do this, hold down the [OK] key for 3 seconds in the measured value view.

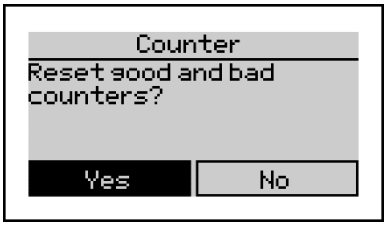
The device is again ready for operation.

Good- and bad counter

The good and bad counters are used to count the analysis results. They are displayed in the info screen.
Programming: Menu > Info



If the limit is exceeded, the bad counter is increased, and if the limit is undershot, the good counter is increased. This counter can be used to assess the function of a water softening system. Here, the number of bad measurements should be much smaller than that of the good measurements. The counters can be reset in the menu.
Programming: Menu> Service> Good-bad-counter



Maintenance and service

Calibrating the device

The device is calibrated at the factory at a room temperature of 20° C. When operating in very hot or cold places, we recommend calibrating the device during commissioning.

To calibrate the device, proceed as follows:

- Perform an analysis on the device. Water hardness of the sample must be within the measuring range of the reagent used. A reading such as < 0.012° dH cannot be used.
- Analyse the water in the laboratory in parallel.
- Calculate the correction factor for the analyser using the following formula:

$$Correctionfactor = \frac{Measured_{Laboratory}}{Measured_{Analyser}} \cdot 100\ \%$$

- Set the correction factor in the device under the specified path.
  (Programming: Menu> Parameters> Analysis> Calibration factor)

Example of calculation:
Measured $_{Laboratory}$ = 0.55° dH
Display value from the DUROMAT® display = 0.61° dH

$$Correctionfactor = \frac{0{,}55\ °dH}{0{,}61\ °dH} \cdot 100\ \%$$
$$Correctionfactor = 90{,}1\ \%$$

90.1% rounded => *Correction factor = 90%*

Only integers can be entered as input, so round off / round up and enter the correction factor in the input mask on the device.

Maintenance and service

Changing the battery

If the device does not display any time after switching off and switching on again, the internal back-up battery must be replaced.

Proceed as follows:

- Switch off the device and disconnect the power supply.
- Open the controller housing with 4 screws. On the inside you will see the battery holder.
- Replace the battery with a new one of CR2032 type.
- Close the controller again. Make sure that the connection cable between the reagent circuit board and the controller has not come loose.
- Dispose of the battery in a collection point for batteries.

Software update

The analyser offers the option of a software update. As part of the product improvement, you will receive software updates via your dealer or our website. Should this be required, your dealer will send you a file called TA27xxx.bin.

To perform a software update, proceed as follows:

- Switch off the device and disconnect the power supply.
- Open the controller housing with 4 screws and remove the SD card.
- Copy the TA27xxx.bin file to the SD card using a computer and reinsert it.
- Close the controller again. Make sure that the connection cable between the reagent circuit board and the controller has not come loose.
- Hold down the [OK] key and turn on the power. When software update appears on the display, release the [OK] key. The device updates the software and finally starts measurement mode again.
- Turn off the device, remove the SD card, and delete the TA27xxx.bin file from the SD card.
- Insert the SD card back into the device.
- Check the device configuration of the device.

Diagnosis functions

Here, pay attention to possibly connected controllers and peripherals.
Follow the valid safety regulations.

Call up the following program function:
Programming: Menu> Service> Diagnostic program

Display

The display changes colour between red, green and blue.
To exit, press the [OK] key.

Sensor

The LED in the measuring chamber is switched on and off. If this is not the case, check the electrical connection of the LED on the actuator plug and in the device. If the connectors are properly seated, the actuator must be replaced. To exit, press the [OK] key.
The positioning of the connectors can be found on page 20.

Solenoid valve

The solenoid valve in the water inlet can be opened and closed via the [OK] key. If this is not the case, check the electrical connection of the solenoid valve in the device. If the connectors are properly seated, measure the voltage with "valve open" between the connections on the valve. This should be at 24 VDC. If this is the case, a fault in the electronics is to be excluded and the solenoid valve is defective.
To exit, move the cursor to Exit and press the [OK] key.
The positioning of the connectors can be found on page 20.

Reagent pump

When starting the reagent pump, the peristaltic pump cartridge is driven for 2 seconds. Here, rotation of the rollers in the peristaltic pump cartridge is visible and the turning of the motor can be heard. If this is not the case, check the four-pole connection of the motor on the circuit board. If only the noise is noticeable, the peristaltic pump cartridge is defective. Otherwise, a fault of the motor or the control circuit board is possible. To exit, move the cursor to Exit and press the [OK] key.
The positioning of the connectors can be found on page 20.

Diagnosis functions

Agitator blade

The agitator blade in the measuring chamber is actuated and slowly increases its speed to the maximum. If the agitator blade does not turn, check the correct seating of the drive motor connector on the control circuit board (red plug connector).
Remove the measuring chamber and check whether the drive disc (which has two silver-coloured magnets) in the agitator does not drag or rest on the motor housing.
If none of these causes can be determined, the drive motor must be replaced. To exit, press the [OK] key.
The positioning of the connectors can be found on page 20.

Relay 1 and 2

When the diagnostic function relay is started, the selected relay is switched between the two contacts NC and NO via the [OK] key.
Use a continuity tester to check the contact between the COM and NC connection and COM and NO connection. If the switching operations are not measurable, replace the control circuit board.
To exit, move the cursor to Exit and press the [OK] key.
The positioning of the connectors can be found on page 22.

Current interface

An ammeter is required to test the current interface. Measurements are made between terminals 15 (+) and terminal 16 (-).
The output current is shown in the display as I = xx mA. The same value should also be measured at the two terminals. Tolerance ± 0.3 mA. Please note the accuracy of your current ammeter.
Pressing the [OK] key increases the output current by 2 mA respectively, until the maximum value of 20 mA is reached. To exit, move the cursor to Exit and press the [OK] key.

Input

To test the input, you will need a ladder or multimeter that is set for continuity testing.
If there is no jumper between terminals 17 and 18, the display shows "opened".
If a jumper is set between terminals 17 and 18, the display shows "closed".
(Should you wish to make the jumper with a multimeter, the COM port of the multimeter must be connected to terminal 17 and the Volt port of the multimeter must be connected to terminal 18. Otherwise, no bridge will be made by the multimeter
Press the [OK] key to exit.
The positioning of the connectors can be found on page 23

The diagnostic mode has ended.

Error analysis

Analysis does not start

- Check if a flow switch is configured and connected.
- Check if an interval time has been entered.
- Check if a water meter is fully configured and connected.
- If necessary, check the connection from an external controller to the device.

Zero sample is faulty

- Check that there is water in the measuring chamber and the water supply line and drain are connected the right way around.
- Check the measuring chamber for contamination, gas bubbles or foreign bodies.
- Check the water inlet for function and pressure (recommended 1 - 2 bar).
- Check that the water outlet is clear and that no foreign matter has stuck in the solenoid valve.
- When using a pump for conveying samples, check whether the pump is correctly connected.
- Use the diagnostic menu to check the sensor and the solenoid valve.

Titration is not carried out correctly

- Check whether there is sufficient reagent in the reagent bottle.
- Check the connection hose between the reagent bottle and the hose pump for air bubbles. If necessary, convey the reagent until the hose is filled with the reagent.
- Check that the blue O-ring is on the reagent plug.
- Check if there is water in the measuring chamber.
- Check if the agitator blade is in the measuring chamber.
- Check the reagent feed, the sensor, and the agitator blade in the diagnostics menu.

Measurement deviates

- Check whether the programmed reagent type corresponds to the one used.
- Check the reagent hose for air bubbles.
- Check the sample water for discoloration due to foreign matter and turbidity due to air bubbles during the zero sample.
- Check that the water connection and the outlet are not mixed up.
- Check if the agitator blade is present.
- Check that the blue O-ring is present on the dosing plug and is seated correctly.
- Calibrate the device and enter the newly determined correction factor.
- Check that the solenoid valve is closing neatly.
- Replace the peristaltic pump cartridge.

Error analysis

Error message E11 reagent

- Check that there is still enough regent in the bottle.
- Check the suction pipe, it must be free of air bubbles. Deaerate
- Check if there is water in the measuring chamber.
- Check the dosage and that the magnet turns in the chamber.
- Check if the drain is free.
- With use of a launch pump: check the operation of the pump.
- Check whether the inlet and outlet are connected the right way round. Inlet = under solenoid valve
- Check the inlet prefilter.
- If the 0-20 mA output has been programmed as a "value", the output gives 0 mA.

Error message E12 water flow

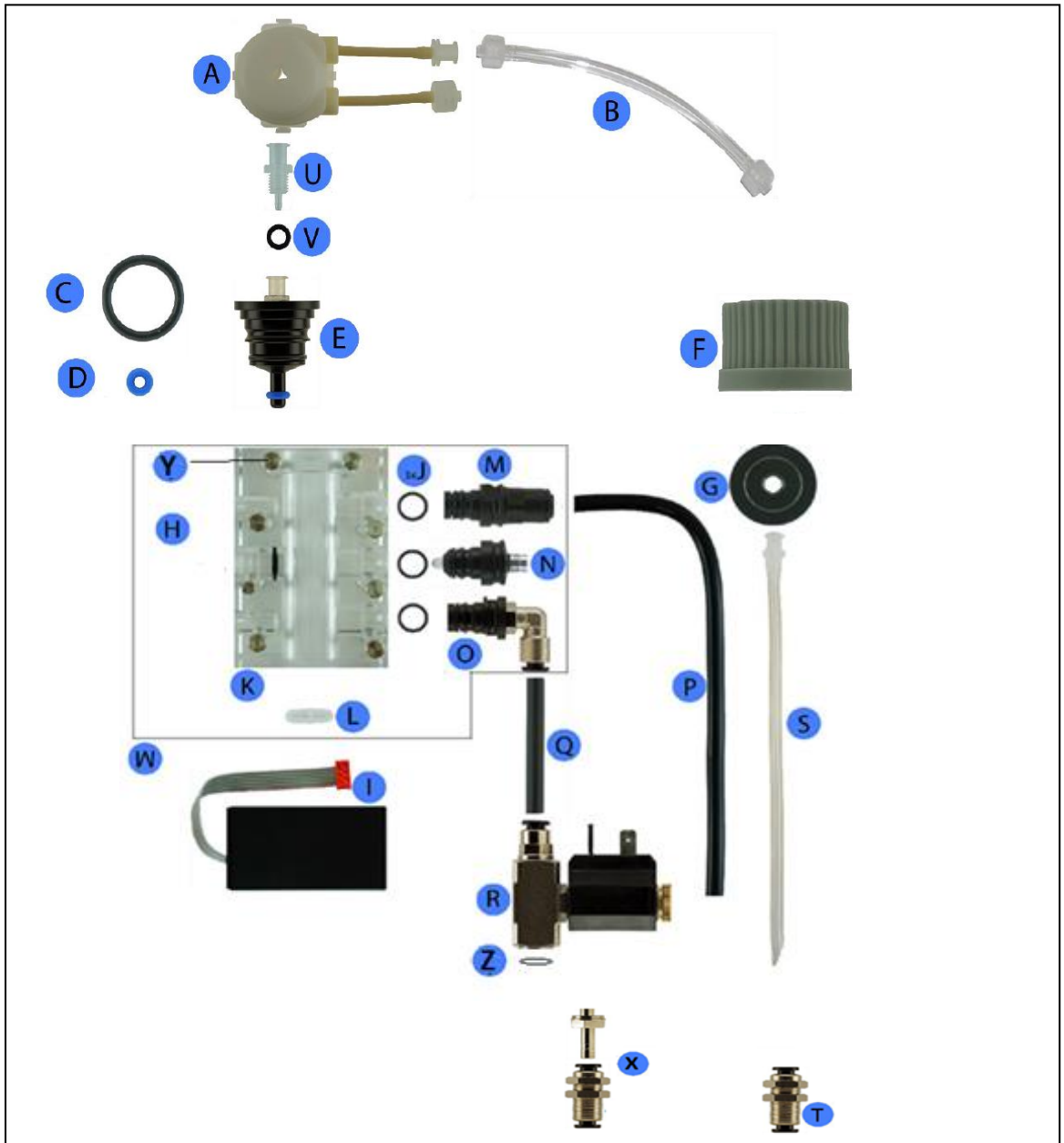
- Check for pressure.
- Check the function of the solenoid valve.
- Check whether the drain is blocked.
- Check the launch pump, shut-off valves or external solenoid valves (if present).
- If the 0-20 mA output has been programmed as a "value", the output gives 0 mA.

Error message E13 optics

- Dirty measuring chamber, dirty sensor.
- Sensor connection cable - damaged electronics (possibly rusty).
- Check the correct position of the actuator plug.
- Check sensor operation in the diagnostic step.
- If the 0-20 mA output has been programmed as a "value", the output gives 0 mA.

Spare parts

Spare parts



Set di Manutenzione / Maintenance set

A, B, C, D, 3xJ, S	Set di manutenzione Maintenance set	111906

Ricambi per 2-3 anni di funzionamento / Spare parts for 2 – 3 years

I	Motorino del magnete Actuator of magnetic stirrer	1 px 111727
R	Valvola elettromagnetica 24V Solenoid valve 24V complete	2 px 111014
W	Camera di misura completa Measuring chamber complete	1 px 111700
E	Iniettore indicatore completo di tappo (compreso pos. U, V, C, D) Dosing plug (complete with Pos. U, V, C, D)	1 px 111716
Z	Filtrino 8,5mm Filter 8,5 mm	3 px 111901
A, B, C, D, 3xJ, S	Set di manutenzione Maintenance set	4 px 111906
C, D, 3xJ	Serie guarnizioni completa (111217, 3x111210, 111218) Set O-Ring complete (111217,3x111210,111218)	2 px 111911

Spare parts

Position	Description	Nr. Art.
A	Testa della pompa con il tubo di dosaggio DUROMAT® Prof. / IQ Head pump with dosing pipe DUROMAT® Prof. / IQ	111000
B	Tubo di collegamento alla bottiglia indicatore Pipe connecting the indicator bottle	111008
C	O-Ring per tappo in alto camera di misura O-Ring for plug	111217
D	O-Ring di dosaggio indicatore (blu) O-Ring for dosing indicator (Dosing-Ring blu)	111218
E	Iniettore indicatore completo di tappo (compreso pos. U, V, C, D) Dosing plug (complete with Pos. U, V, C, D)	111716
F	Vite della bottiglia DUROMAT® Bottle screw DUROMAT®	111060
G	Tappo interno per vite di bottiglia di indicatore Internal cap for reagent bottle screw	111039
I	Motorino del magnete Actuator of magnetic stirrer	111727
J	Anello (ci sono 3 pezzi presenti, ordinare 3 volte l'articolo) O-Ring 9 x 1,5 (there are 3 px, order for 3 time the article)	111210
K	Corpo camera complete di perni Body of the measuring chamber	111701
L	Magnete Magnetic stirrer	111002
M	Collegamento 1/4" in uscita camera di misura Outlet plug 1/4"	111712
N	LED trasmettitore (durezza dell'acqua e ferro nell'acqua) Transmitter LED (water hardness and iron in the water)	111713
O	Raccordo 1/4" acqua in entrata alla camera di misura Inlet plug 1/4"	111711
P	Tubo 6mm Outlet connection 6mm	111015
Q	Tubo 1/4" Inlet connection 1/4"	111013
R	Valvola elettromagnetica 24V Solenoid valve 24V complete	111014
S	Tubo d'aspirazione dalla bottiglia (interna) Suction pipe (internal bottle)	111011
T	Raccordo completo uscita acqua (dall'analizzatore) 6mm, ferro Bilkhead fitting complete 6mm (outlet from analyzer), iron	111071
U	Raccordino sopra iniettore indicatore completo Connector on injector of indicator	111719
V	O-Ring per raccordino 111719 O-ring for fitting 111719	111220
W	Camera di misura completa Measuring chamber complete	111700
X	Raccordo completo entrata acqua (all'analizzatore) 6mm x 1/8", ferro Bilkhead fitting (inlet analyzer) complete 6mm x 1/8", iron	111070
Y	Perno per fissaggio raccordi camera di misura Replacement pin for fixing the measuring chamber fittings	111702
Z	Filtrino 8,5mm Filter 8,5 mm	111901

Optional

Maintenance sets

The DUROMAT® IQ is largely maintenance-free. A maintenance set is available for the analyzer. It is recommended to change the hose pump cassette, hoses and O-rings after 30,000 analyses or 24 months. At the end of the maintenance interval, the instrument displays a maintenance note on the display. The maintenance counter must be reset or confirm after maintenance has been carried out.

In addition, it is recommended to clean the measuring chamber regularly, but at least every 6 months. The DUROMAT® cleaning set is offered for this purpose. It contains all the aids required for cleaning as well as the cleaning fluid.

Information on performing maintenance can be found in the chapter "Maintenance and Service" starting on page 57.

Article name		Article no.
Maintenance set 02		111906
DUROMAT® cleaning set Cleaning set for measuring chambers, available in 2 version: - Cleaning set for all types of DUROMAT®® - Cleaning set for all types DUROMAT®® (for air transport)		200013 or 200013S

Optional

Accessories

Article name	Article no.
Pressure regulator with wall holder Includes the following articles: • Pressure regulator with wall bracket • 2 x hose connection outer diameter 6 mm Technical data: • Max. Inlet pressure 8 bar • Control range 0.8 to 3.9 bar • Optionally a manometer can be mounted	200022

Sample cooler
The maximum inlet temperature of the sample water is 40° C. If the sample water has a higher temperature, use a pre-cooler. Pre-coolers are offered for flow cooling depending on the temperature of the water and the cooling water.

Further information and data sheets can be found on our website.

Declaration of conformity

CE DECLARATION OF CONFORMITY
(Low voltage and electromagnetic compatibility directive)

I, the undersigned, represent the following manufacturer

manufacturer: Apura s.r.l.
address: Piazza Porto, 3 – 25084 Gargnano (BS)

hereby declares that the product

Identification of the product: “DUROMAT®”

results in compliance with the provisions of the following EU directives
(including all applicable changes)

Refer to n°	Title
2014/30/UE 2014/35/UE	EMC (ELECTROMAGNETIC COMPATIBILITY) LVD (LOW VOLTAGE)

and that all the standards and / or technical specifications indicated on the back have been applied.

Last two digits of the year in which the CE marking was affixed.....19.....

Gargnano, 11/01/2019

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Photo back: Apura s.r.l., 2019

10.02.2020