Conex® DIS-D, Conex® DIS-PR

Instrument amplifier and controller

Installation and operating instructions

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Original installation and operating instructions

CONTENTS

Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

Note

These complete installation and operating instructions are also available on www.grundfos.com.

1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury.

Caution

If these safety instructions are not observed, it may result in malfunction or damage to the equipment.

Note

Notes or instructions that make the job easier and ensure safe operation.

2. General information

These installation and operating instructions contain all information important for users of the **Conex® DIS-D / Conex® DIS-PR**:

- technical data
- instructions on commissioning, use and maintenance
- safety information.

Should you require further information or should you encounter problems that are not handled in sufficient depth in this manual, please contact Grundfos. We shall be pleased to support you with our comprehensive know-how in the fields of measuring and control technology as well as water treatment.

We always welcome suggestions on how to optimise our installation and operating instructions to satisfy our customers.

3. Applications

The **Conex® DIS-D** instrument amplifier and controller is suitable for measuring chlorine (Cl_2), or chlorine dioxide (ClO_2) or ozone (O_3) in drinking water, service water or swimming-pool water and for controlling the measured variable using appropriate actuators within the applications described in this manual. Only one of the measured variables (Cl_2 or ClO_2 or O_3) should be existent in the water, as the measurement is carried out non-selectively.

The **Conex® DIS-PR** instrument amplifier and controller is suitable for measuring pH and redox in drinking water, service water or swimming-pool water and for controlling these variables using appropriate actuators within the applications described in this manual.

Warning

Other applications are considered as non-approved and are not permissible. Grundfos cannot be held liable for any damage resulting from incorrect use.

4. Safety

4.1 Obligations of owner

The owner agrees that only persons complying with these requirements are allowed to work with the described device:

- are acquainted with the regulations concerning working safety and accident prevention
- have been trained in the use of the device
- have read and understood the warning information and handling symbols.

The owner is also responsible for ensuring that this manual is kept in the immediate vicinity of the device and is always available for the operating personnel.

4.2 Avoidance of danger

Warning

Do not dismantle the device components!

Cleaning, maintenance and repairs must only be carried out by authorised personnel!

The local safety regulations must be observed!

Switch off the power supply before connecting the power cable and relay contacts!

Do not open the device!

Maintenance and repair must only be carried out by authorised personnel!

Caution

The mounting location must be selected so that the housing is not subjected to mechanical loading.

Check that all settings are correct before starting up the device!

5. Identification

5.1 Nameplate

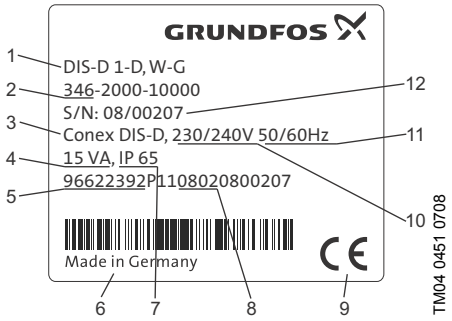

Fig. 1 Nameplate, Conex® DIS-D

Pos.	Description
1	Type designation
2	Model
3	Product name
4	Power consumption [VA]
5	Product number
6	Country of origin
7	Enclosure class
8	Year and week of production
9	Marks of approval, CE mark, etc.
10	Voltage [V]
11	Frequency [Hz]
12	Serial number

5.2 Type key

Example:		DIS-D	1-D	W	-G
Measuring amplifier and controller					
DIS-D	Dosing				
DIS-PR	Instrumentation				
	Standard				
Input parameter 1					
P	pH				
R	Redox (ORP)				
D	Chlorine (Cl_2), chlorine dioxide (ClO_2) or ozone (O_3)				
Mounting					
W	Wall-mounted				
Voltage					
G	1 x 230/240 V, 50/60 Hz				
H	1 x 115/120 V, 50/60 Hz				
I	24 VDC				

6. Technical data

6.1 Instrument versions

6.1.1 Instrument amplifier

Type	Measured variables
Conex® DIS-D	Chlorine, chlorine dioxide or ozone
Conex® DIS-PR	pH/redox and temperature

6.1.2 Versions of power supply

- 230/240 V (50/60 Hz)
- 115/120 V (50/60 Hz)
- 24 VDC.

6.2 General data

Enclosure class	IP65
Input power	Approx. 15 VA
Permissible ambient temperature	0 °C to +45 °C
Permissible storage temperature	-20 °C to +65 °C
Max. relative humidity	90 % (non-condensing)
Weight	0.8 kg
Enclosure	Plastic ABS

6.3 Electronic data and functions

6.3.1 Electronics

Electronics	16-bit microprocessor
Display	LCD
Floating relay outputs	1 alarm relay, 1 controller switching relay (250 V / 6 A, max. 550 VA)
Signal inputs	Measured value Water sensor Temperature (only Conex® DIS-PR)
Signal outputs	1 analog output 0/4 to 20 mA, max. load 500 Ω, for measured value or continuous control

6.3.2 Instrument amplifier functions

Display mode	Measured-value display: measured value in physical dimension, temperature display: in °C (only Conex® DIS-PR)
Temperature comp. (Conex® DIS-PR)	Manual or automatic with Pt100
Calibration	Manual Cal with auto-read function
Measured-value output	0/4 to 20 mA

6.3.3 Controller functions

Controller	Selectable as switching or continuous controller
Controller output for switching controller	Limit monitor, interpulse controller (P, PI), pulse frequency controller (P, PI)
Controller output for continuous controller	0/4 to 20 mA selectable

For limit monitor

Limit	0 to 100 % of measuring range, adjustable in physical dimension of measured variable
Hysteresis	0 to 50 % of full-scale value, adjustable in physical dimension of measured value

For interpulse, pulse frequency and continuous controllers

Setpoint	0 to 100 % of measuring range, adjustable in physical dimension of measured value
Proportional band, X_p	0.1 to 3000.0 %, resolution 0.1 % in the range 0.1 to 100.0 %, resolution 1 % in the range 101.0 to 3000.0 %
Reset time, T_n	0 to 3000 s, resolution 1 s
Pulse + pause time	1 to 100 s, resolution 1 s (only with interpulse controller)
Minimum ON time, T_{min}	0.1 to 10.0 s, resolution 0.1 s (only with interpulse controller)
Maximum frequency	1 to 220 pulses per minute, pulse width 50 ms (only with interpulse controller)
Control/switching direction	Upward or downward violation selectable

6.4 Measuring ranges

Chlorine Cl_2 Chlorine dioxide ClO_2 Ozone O_3	0 to 2 mg/l; 0 to 20 mg/l*
pH	0 to 14 pH; 2 to 12 pH; 5 to 9 pH
Redox	0 to 1000 mV; 0 to 1500 mV
Pt100	-5 to +120 °C

* For O_3 the actual measuring range is limited to 0 to 5 mg/l.

6.5 Factory settings

General factory settings

Current output	0 to 20 mA
Controller	Off

Conex® DIS-D

Measuring range	0 to 2.00 mg/l
Type of measuring cell	AQC-D3/-D13
Water sensor	Off

Conex® DIS-PR

Sensor system	pH
Measuring range	0 to 14 pH
Temp. measurement	Off, manual temperature compensation
Water sensor	Off

Further default values, see section *9.4 Code overview*.

6.6 Dimensions

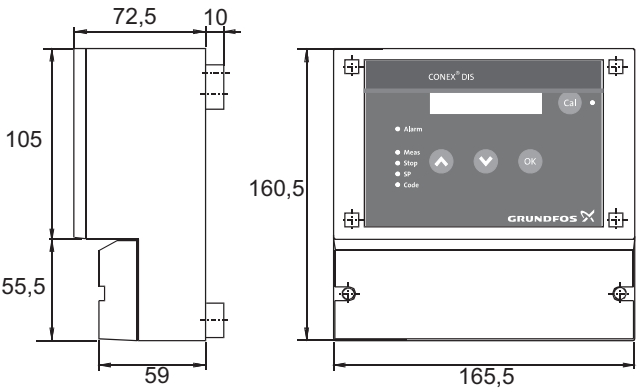

Fig. 2 Conex® DIS

TM03 7204 4506

7. Installation

7.1 Transport and storage

- Transport device carefully, do not drop!
- Store at dry and cool location.

7.2 Unpacking

1. Install as soon as possible after unpacking.
2. Check device for damage.
   Do not install or connect damaged devices!

Note Retain packing material or dispose of it according to local regulations.

7.3 Installation requirements

- Dry room
- Room temperature of 0 °C to 45 °C
- Vibration-free location.

Caution If you do not observe the installation requirements:
- The device may be damaged.
- Faulty measurements may occur.

7.4 Installation

Warning

Switch off the power supply before installing!

Enclosure class IP65 is only guaranteed if the front panel of the terminal enclosure is closed and the appropriate cable glands or dummy caps fitted.

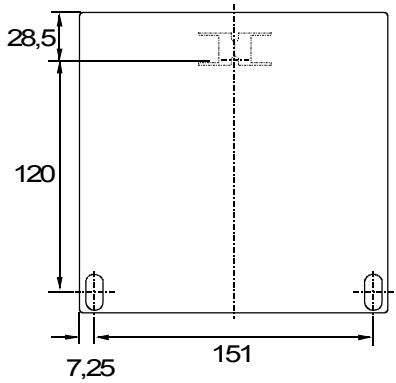

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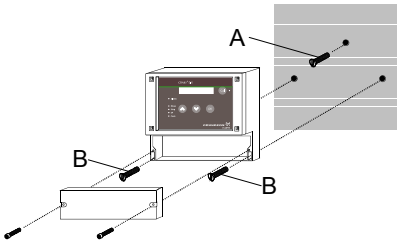
Fig. 3 Drilling diagram

1. Drill three holes (∅8) as shown in the diagram and insert the supplied dowels.
2. Screw the screw (A) into the top centre dowel until it projects by approx. 1 cm. See fig. 4.
3. Loosen the fastening screws of the front panel and remove the front panel.
4. Hang the instrument on the screw (A).
5. Tighten the instrument with the two screws (B).

Caution Enclosure class IP65 is only guaranteed if the terminal cover is correctly sealed! Do not damage the terminal cover gasket! The terminal cover gasket must fit exactly!

6. Mount the front panel of the enclosure.



TM03 7206 4506

Fig. 4 Mounting drawing

8. Commissioning / electrical connections

Warning

Switch off the power supply before installing!

Enclosure class IP65 is only guaranteed with the front panel of the terminals enclosure closed and with appropriate cable glands or dummy caps.

Warning

Switch off the power supply before connecting the power supply cable and the relay contacts! For safety reasons, the protective conductor must be connected correctly!

Observe the local safety regulations!

Protect the cable connections and plugs against corrosion and moisture.

Before connecting the power supply cable, check that the supply voltage specified on the nameplate corresponds to the local conditions!

An incorrect supply voltage may destroy the device!

Caution

To guarantee electromagnetic compatibility (EMC), the input and current output cables must be screened.

Connect the screening to the screen ground on one side.

Refer to the wiring diagram! Route the input, current output and power supply cables in separate cable channels.

Caution

Enclosure class IP65 is only guaranteed if the terminal cover is correctly sealed! Do not damage the gasket on the terminal cover!

The gasket on the terminal cover must be positioned precisely!

Do not damage the gasket!

Note

Unused terminals must remain open.

1. Remove the terminal cover on the front of the device.
2. Use the appropriate cable feedthroughs and tighten the screws carefully.
3. Connect the cables used to the terminals according to the **Conex® DIS-D/-PR** terminal assignment.
4. Close the terminal cover again with correctly positioned gasket.

8.1 Terminals

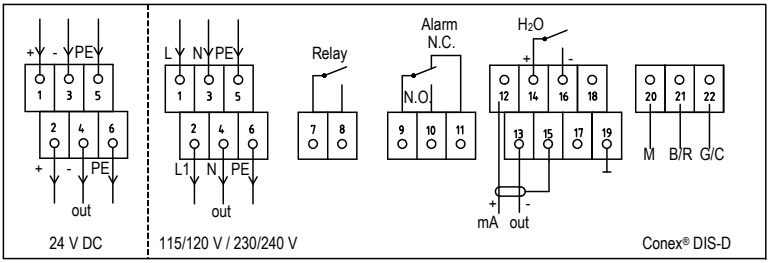


Fig. 5 Conex® DIS-D

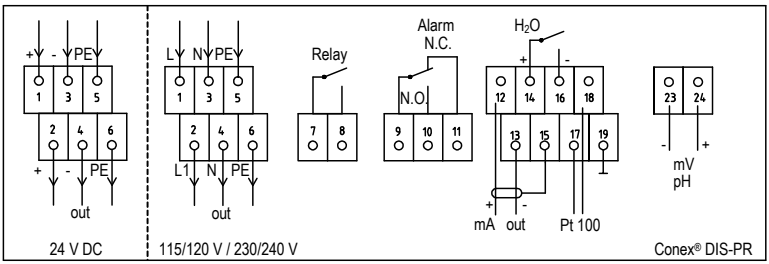


Fig. 6 Conex® DIS-PR

Legend of terminals

Pos.	Description
7, 8	**Relay:** relay
9, 10, 11	**Alarm:** alarm relay **N.O.:** normally open contact **N.C.:** normally closed contact
17, 18	**Pt100:** Pt100 temperature sensor
14, 16	**H_2O:** water sensor
12, 13	**mA out:** current output for continuous controller or measuring parameter; **Conex® DIS-D: Cl_2** (chlorine), **ClO_2** (chlorine dioxide) or **O_3** (ozone); **Conex® DIS-PR: pH, mV**
15	Screen
19	Earth
	Electrodes, Conex® DIS-D
20	**M:** measuring electrode
21	**B/R:** reference electrode
22	**G/C:** counter electrode
	Electrodes, Conex® DIS-PR
23, 24	**mV** (redox combination electrode) or **pH** (pH electrode)

8.2 Relay outputs

Note

The connection of the relay outputs depends on the application as well as the device controlled. Therefore the connections described below should only be considered as guidelines.

With inductive loads (also relays and contactors), interference suppression is necessary. If this is not possible, protect the relay contacts using a suppressor circuit as described below.

- With AC voltage:

Current up to	Capacitor, C	Resistor, R
60 mA	10 nF, 275 V	390 Ω, 2 W
70 mA	47 nF, 275 V	22 Ω, 2 W
150 mA	100 nF, 275 V	47 Ω, 2 W
1.0 A	220 nF, 275 V	47 Ω, 2 W

- With DC voltage: Connect free-wheeling diode in parallel to relay or contactor.

Caution

Provide the relay outputs with a corresponding backup fuse!

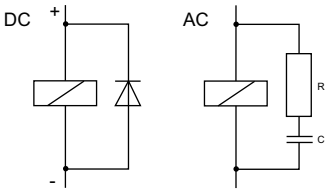


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Fig. 7 Suppressor circuit, DC/AC

8.3 Current output

Caution

Make sure that the polarity of the current output is correct! Maximum load: 500 Ω.

The current output can be set to the two standard ranges, "0 to 20 mA" or "4 to 20 mA".

Connect all screens at one end to the screen earth (terminal 15).

Current output

The current output outputs the displayed measured value as an analog current signal with respect to the measuring range.

Use of current signal

Use the current signal as input signal for an additional display unit.

8.4 Connections for water sensor and temperature sensor

Connection of water sensor

- A sensor (NAMUR switch) is used for the AQC-D1/-D11/-D2/-D12/-D3 and AQC-D13 measuring cells. For cable colours and designations, see section *8.5 Connection of measuring cells*.

Caution

When using the AquaCell AQC-D2/-D12 measuring cell, the water sensor must always be connected and activated!

Connection of Pt100 temperature sensor (Conex® DIS-PR)

1. Connect "+" conductor to terminal 17.
2. Connect "-" conductor to terminal 18.

8.5 Connection of measuring cells

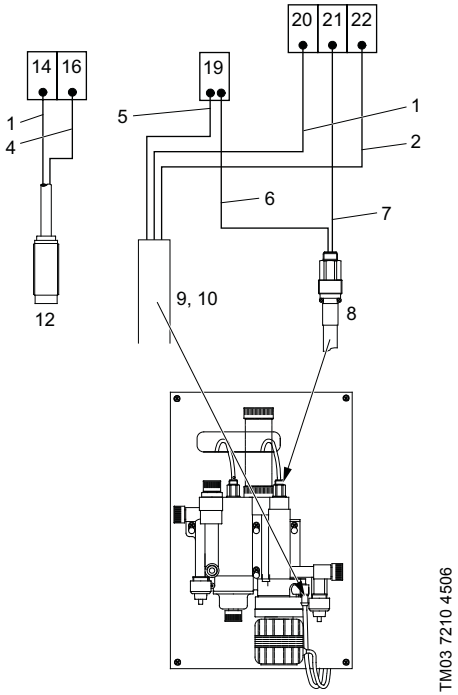

Fig. 8 Wiring diagrams for AQC-D1/-D2/-D3 measuring cells

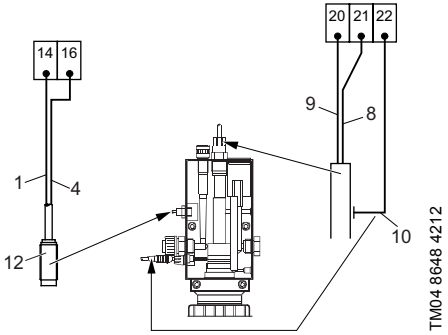

Fig. 9 Wiring diagrams for AQC-D11 measuring cells

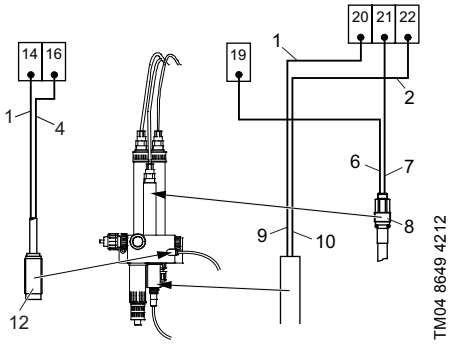

Fig. 10 Wiring diagrams for AQC-D12 measuring cells

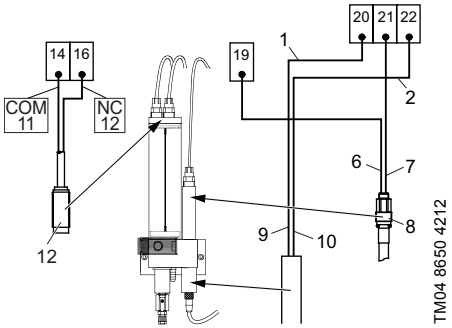

Fig. 11 Wiring diagrams for AQC-D13 measuring cells

Pos.	Component
1	Brown
2	White
4	Blue
5	Screen
6	Outer conductor (screen)
7	Inner conductor
8	Reference electrode
9	Measuring electrode
10	Counter electrode
12	Water sensor
13	Outer conductor

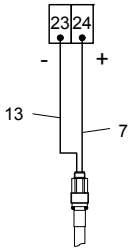

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Fig. 12 Wiring diagram for single rod measuring chains for pH/redox

Pos.	Component
7	Inner conductor
13	Outer conductor

9. Operation

9.1 Control and display elements

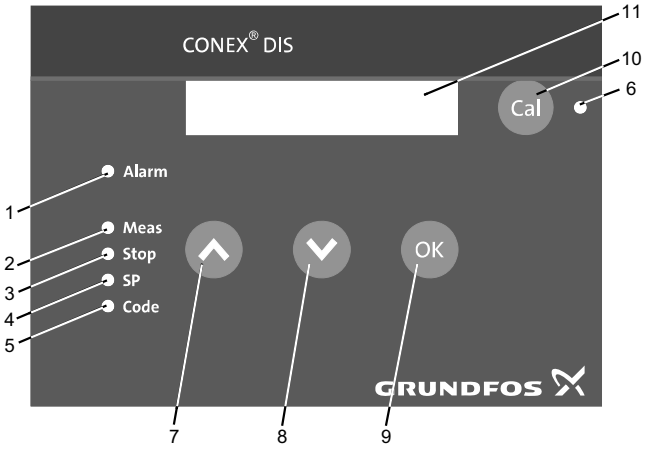

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Fig. 13 Control and display elements

LEDs

Pos.	Description
1	Alarm: The alarm LED flashes with fault or incorrect input.
2	Meas: The measuring mode LED illuminates when measurement is active.
3	Stop: The controller stop LED illuminates when a configured controller is switched off.
4	SP: The controller setpoint LED illuminates if a current limit or setpoint is displayed, and flashes if the SP menu is open in order to modify the limit or setpoint.
5	Code: The code LED illuminates when the code menu is selected and flashes when the code menu is open.
6	Cal: The calibration mode LED illuminates during calibration.

Input buttons

Pos.	Description
7	[Up]: • Increases values. • Switches between the menus.
8	[Down]: • Decreases values. • Switches between the menus.
9	[OK]: - Enters the desired selection menu. - Confirms selected value.
10	[Cal]: The button switches between calibration and measuring modes.
11	Display • Display of measured value with physical dimension • Display of codes and adjustment values for instrument operation • Display of alarm events.

9.2 Switching the instrument on/off

Switch the Conex® DIS on and off by means of the power supply.

9.3 Instrument mode/menus

Use the menus to operate the Conex® DIS. The selected menus are indicated by the flashing of the associated LEDs.

Make settings using code inputs, see section *9.4 Code overview*. Select numerical values using the [Up] or [Down] button. Press [OK] to confirm.

9.3.1 Measurement mode

In measurement mode, the current measured value is indicated in the display with the physical dimension.

If the measured value exceeds or falls below the selected measuring range, the displayed value remains at the upper or lower limit and the display flashes.

9.3.2 Stop mode

The stop mode can only be selected for controllers that have already been configured. Stop switches off the controller. The measurement continues, and the measured value is displayed (the Meas LED illuminates).

Controller stop on/off

The Meas LED illuminates, and a controller is configured.

1. Press the [Up] button.
   The Stop and Meas LEDs illuminate and the controller stops.
2. Press the [Down] button.
   The Meas LED illuminates and the controller operates again.

9.3.3 SP menu

The limit or setpoint of the controller can be set and displayed in the setpoint menu. This menu can only be selected if a controller is coded with SP access.

Navigation in the setpoint menu

Without controller stop

1. Press the [Down] button until the SP LED illuminates.

With controller stop

1. Press the [Up] button until the SP and Stop LEDs illuminate; the controller stops.
   The current limit or setpoint is displayed.

Change the limit or setpoint as follows:

2. Press [OK].
   The SP LED flashes.
3. Select the new limit or setpoint using the [Up] or [Down] button.
4. Press [OK] to confirm the selection.
5. Press the [Up] or [Down] button until only the Meas LED illuminates.

9.3.4 Code menu

Make all instrument settings in the code menu. The code always begins with a two-digit number for the code range. Enter further inputs/outputs using a four-digit code or using the [Up] or [Down] button directly.

There are two access privileges for the code menu:

- **No privilege** except for access to Code for setting the code and Exit for leaving the code menu. **Full privileges** with access to all settings: **Code 0086**.

Navigation in the code menu

1. Press the [Up] or [Down] button until the Code LED illuminates.
2. Press [OK].
   The Code LED flashes.
3. Select the two-digit range code using the [Up] or [Down] button.
4. Press [OK] to confirm the selection.
5. Depending on the selected code range, read the display or adjust a value or four-digit code using the [Up] or [Down] button.
6. Press [OK] to confirm.
7. Leave the code menu using code 99 "Exit".
   The Code LED illuminates.
8. Press the [Up] or [Down] button.
   The Code LED goes out.

See sections *9.3.7 Switching between the menus* and *9.4 Code overview*.

9.3.5 Cal menu

Select the calibration mode to calibrate the instrument. When commissioning, it is recommended to carry out the calibration prior to configuration and parameterisation of the controllers.

9.3.6 Alarm mode

The instrument has an alarm value which can be freely set within the measuring range. The alarm status is displayed when the alarm value is violated (upward or downward violation, depending on the configuration).

The alarm function has a fixed hysteresis of 2.5 % of the selected measuring range.

For the display of alarm messages, see section *10. Alarm statuses and error messages*.

9.3.7 Switching between the menus

Only menus for the current instrument configuration are available for selection; other menus are bypassed. Therefore the switching between menus as well as the selections within the menus can only be explained in principle.

The starting point is the instrument status directly following switching-on or during operation with the Meas LED illuminated.

To navigate between the menus, use the [Up] or [Down] button. The selectable menu LEDs illuminate in succession. Open the desired menu by pressing [OK]. The associated LED flashes.

To leave the menu, confirm the settings by pressing [OK]. The menu LED illuminates. Then press the [Up] or [Down] button as often as necessary until only the Meas LED illuminates.

Controllers which have already been configured can be stopped or not stopped for selecting another menu.

Switching between the menus without controller stop

- Repeatedly press the [Down] button.
  The Meas LED, Code LED and SP LED illuminate alternately if these menus are available for the current instrument configuration.

Switching between the menus with controller stop

- Repeatedly press the [Up] button.
  The Meas LED + Stop LED, SP LED + Stop LED, and Code LED + Stop LED illuminate alternately if these menus are available for the current instrument configuration.

9.4 Code overview

The factory settings (default values) are displayed in **bold type** below.

00-01	**Code area:**
00	Enter code (code 0086: code for free access)
01	Factory reset

10-16	**CTRL area (controller adjustment):**
10	Xp (proportional band) in %
11	Tn (reset time) in sec
12	Hysteresis in physical unit
13	Interpulse period in sec
14	Min. operating time in sec
15	Max. pulse frequency in Imp/min
16	Setpoint in physical unit

20-23		**CTRL area (controller set-up):**
20	**2000**	**Controller off**
	2001	Controller on, SP not adjustable
	2002	Controller on, SP adjustable
21	**2100**	Control direction upwards
	2101	Control direction downwards
22	**2200**	Limited contact controller
	2201	Interpulse period controller
	2202	Pulse frequency controller
	2203	Continuous controller
23	2300	Current output, 0 to 20 mA
	2301	Current output, 4 to 20 mA

30-32		**Disinfection sensor section area (only Conex® DIS-D):**
30	**3000**	Flow sensor off
	3001	Flow sensor on
31	3100	Cell type AQC-D1/-D11
	3101	Cell type AQC-D3/-D13
	3102	Cell type AQC-D2/-D12
32	**3200**	Measuring range 0.00 to 2.00 mg/l
	3201	Measuring range 0.0 to 20.0 mg/l (Cl_2, ClO_2) or 0.00 to 5.00 mg/l (O_3)

40-45		**mV sensor section area (only Conex® DIS-PR):**
40	**4000**	Flow sensor off
	4001	Flow sensor on
41	**4100**	pH unit set-up
	4101	Redox unit set-up
42	**4200**	Measuring range pH, 0.00 to 14.00
	4201	Measuring range pH, 2.00 to 12.00
	4202	Measuring range pH, 5.00 to 9.00
	4205	Measuring range redox, 0 to 1500 mV
	4206	Measuring range redox, 0 to 1000 mV
43	**4300**	Manual temperature compensation
	4301	Automatic temperature compensation
44	Enter reference temperature for calibration	
45	Enter temperature correction for Pt100	

50-57	**Service section area:**	
50	Incoming sensor current (Conex® DIS-D)	
	Incoming sensor tension (Conex® DIS-PR)	
51	Slope result last calibration µA/ppm: disinfection measurement mV/pH: pH measurement with redox measurement not enabled	
52	Asymmetry potential (only with pH measurement) (Conex® DIS-PR only)	
53	Display temperature in °C	
54	Display flow sensor	
55	Test routines:	
	5500	Controller relay on
	5501	Alarm relay on
	5502	Current output, 4 mA
	5503	Current output, 20 mA
	5504	Test display
56	Adjusting display contrast in %	
57	Display controller y-out	

70-72	**Alarm section area:**	
70	**7001**	Alarm value off
	7002	Alarm value on
71	**7101**	Downward violation
	7102	Upward violation
72	Enter alarm value in physical unit	

99	**Exit**
	Leave code menu

9.5 Instrument settings for commissioning

Proceed as described below to start the instrument for the first time:

1. Set access code 0086.
2. Make settings for sensor system, such as measured value, sensors, measuring cell and temperature.
3. Calibrate.
4. Select, configure and parameterise the controller in two steps:
   – Controller configuration: basic selection and configuration of controller type
   – Controller parameterisation: parameterisation of selected controller type.
5. Set alarm values.

9.6 Instrument settings

9.6.1 Setting the access code

1. Press the [Up] or [Down] button until the Code LED illuminates.
2. Press [OK].
   The Code LED flashes.
3. Select code 00 by pressing [OK].
4. Select code 0086 using the [Up] or [Down] button.
5. Press [OK] to confirm.

9.6.2 Setting the sensor system; Conex® DIS-D water sensor

1. Select code 30, and switch the water sensor on or off.
   – Code 3000: water sensor off
   – Code 3001: water sensor on.
2. Press [OK] to confirm.

Caution The water sensor must be switched on for the AQC-D2/-D12 measuring cell.

- Alarm signal with low level of sample water code *09*:

See section *10.2 Water sensor *09* / temperature sensor *12**.

Measuring cell

3. Enter the existing measuring cell under code 31:
   – Code 3100: AQC-D1/-D11 measuring cell
   – Code 3101: AQC-D3/-D13 measuring cell
   – Code 3102: AQC-D2/-D12 measuring cell.
4. Press [OK] to confirm.

Measuring range

5. Select the measuring range under code 32:
   – Code 3200: measuring range, 0.00 to 2.00 mg/l
   – Code 3201: measuring range, 0.0 to 20.0 mg/l (Cl_2, ClO_2) or 0.00 to 5.00 mg/l (O_3).
6. Press [OK] to confirm.

9.6.3 Setting the sensor system; Conex® DIS-PR water sensor

1. Select code 40, and switch the water sensor on or off.
   – Code 4000: water sensor off
   – Code 4001: water sensor on.
2. Press [OK] to confirm.

Alarm signal with low level of sample water code *09*:

See section *10.2 Water sensor *09* / temperature sensor *12**.

Measured parameter

1. Select code 41, and select the measured parameter:
   – Code 4100: pH measurement
   – Code 4101: redox measurement.
2. Press [OK] to confirm.

Measuring range

1. Select the measuring range under code 42:
   – Code 4200: measuring range, pH 0.00 to 14.00
   – Code 4201: measuring range, pH 2.00 to 12.00
   – Code 4202: measuring range, pH 5.00 to 9.00
   – Code 4205: measuring range, redox 0 to 1500 mV
   – Code 4206: measuring range redox 0 to 1000 mV
2. Press [OK] to confirm.

9.6.4 Temperature compensation; Conex® DIS-PR

- A compensation function is used to numerically cancel the temperature dependence of the sensor.
- Automatic temperature compensation is only possible if a temperature sensor (Pt100) is connected.
- In the case of manual temperature compensation, the temperature is entered manually and automatically calculated in the sensor gradient.
- Temperature compensation is not carried out for redox values.

Activation of temperature compensation

1. Select code menu 43 and press [OK] to confirm.
   – Use the [Up] or [Down] button to select code 4300 for manual temperature compensation or code 4301 for automatic temperature compensation. Press [OK] to confirm.
   – Subsequently leave the code menu using Exit and return to the display level.

Adjustment of temperature sensor

- If the actual resistance of the temperature sensor (Pt100) is changed by the cable length, compensate for the change using an offset function.
  – Select code menu 45.
  – Measure the reference temperature, e.g. using a calibrated thermometer, and enter in °C using the [Up] or [Down] button.
- The offset is calculated automatically.
- The temperature in °C can be read at any time in the code menu 53.

9.6.5 Calibration for chlorine, chlorine dioxide or ozone; Conex® DIS-D

Note The calibration value is saved even during power off (failure). To check the current calibration value use code 51.

1. Press [Cal] to select the calibration menu. The Cal LED next to the [Cal] button illuminates.
   – To prevent overdosing, the controllers are to be switched off and the actuators closed.
   – After selection of the calibration function with the [Cal] button, the measured-value display initially appears with the current measured value.
2. Use the [Up] or [Down] button to select the photometrically or analytically determined reference value (for instance measured photometrically using DIT).

3. Start the calibration by pressing [OK].
   – The sensor data are then read in by an automatic read function and the calibration is carried out.
   – The gradient (sensitivity) of the sensor is calculated.
4. The calibration result is displayed automatically directly following the calibration:
   – The sensor gradient is output in µA/ppm.

Calibration result

- The result of the current (last) calibration can be displayed in the code menu at any time:
  – Code 51: display of calibrated gradient in µA/ppm.

Error message when reading in the current signal of the sensor system

- The alarm LED flashes.
- The coded display output flashes.

13: Gradient error
The alarm is output if the plausibility check establishes the following:

Upward/downward violation of the following gradient ranges depending on the selected measuring cell:

Measuring cell	Lower limit	Upper limit
AQC-D1/-D11	7.0 µA/ppm	70.0 µA/ppm
AQC-D2/-D12	2.5 µA/ppm	70.0 µA/ppm
AQC-D3/-D13	2.5 µA/ppm	70.0 µA/ppm

- Press [OK] to acknowledge the error message and return to the display level.
- The calibration data are then imported.

Note: The instrument is operating in emergency mode! Remedy the fault, see section *11. Fault finding*, and calibrate again!

9.6.6 Calibration of the pH value; Conex® DIS-PR

Note: The calibration value is saved even during power off (failure). To check the current calibration value use code 51.

Enter buffer solution temperature

The temperature of the buffer solution must be entered in the code menu prior to the calibration.

1. Select code menu 44, and press [OK] to confirm.
2. Enter the buffer temperature in °C using the [Up] or [Down] button and press [OK] to confirm.
3. Leave the code menu using Exit, and return to the display level.

See section *9.6.4 Temperature compensation; Conex® DIS-PR*.

Select buffer values, read in buffer values and calibrate

1. Press [Cal] and select the calibration menu. The Cal LED next to the [Cal] button illuminates.
   – To prevent overdosing, the controllers are switched off and the actuators closed.
   – A two-point pH calibration is used.
   – The buffer value pH 4.01 appears automatically.
2. Modify the buffer value if required using the [Up] or [Down] button.
3. Fill buffer solution 1 from the supply bottle into a clean vessel.
4. Immerse the combination electrode into the buffer solution.
5. Start the automatic read function AUTO READ (reading in of measured signal) and the calibration by pressing [OK]. The buffer value is displayed flashing.
   During the pH calibration, the automatic read function AUTO READ ensures that the correct electrode signal is only read in for the buffer value if the measured signal remains stable for a defined period of time.
6. Discard the first buffer solution
   – Do not return it to the supply bottle!
   – Flush the combination electrode with water.
   – The buffer value pH 7.00 appears automatically once the first buffer value has been read in.
7. Modify the buffer value if required using the [Up] or [Down] button.
8. Fill buffer solution 2 from the supply bottle into a clean vessel.
9. Immerse the combination electrode into the second buffer solution.
10. Start the automatic read function and the calibration by pressing [OK]. The buffer value is displayed flashing.

- Discard the buffer solution and flush the combination electrode with water. The calibration result is automatically displayed directly after the calibration: Sensor gradient in mV/pH.

11. The following display is shown by pressing [OK]: Asymmetry potential of combination electrode in mV.
12. Return to the display level by pressing [OK].

Error messages when reading in the voltage signal of the pH combination electrode

- The alarm LED flashes.
- The coded display output flashes.

***13*:** Gradient error
The alarm is displayed if the plausibility check of the pH calibration data establishes an upward/downward violation of the gradient range from -50 to -62 mV/pH.

14: Asymmetry error
The alarm is displayed if the plausibility check of the pH calibration data establishes an upward/downward violation of the accuracy range from -60 to +60 mV.

10: Auto read time-out error
The alarm is displayed if the combination electrode does not reach a stable signal within the defined time period (120 s).

11: pH difference
The alarm is displayed if a fault exists in the combination electrode or if an incorrect buffer has been used (difference in pH of selected buffer solutions < 1.00 pH).

- The calibration procedure is aborted in all four cases.
- Press [OK] to acknowledge the error message and return to the display level.
- No new calibration data are imported; the old calibration data are not overwritten!

Calibration result

- The result of the current (last) calibration can be displayed in the code menu at any time:
  – Code 51: display of calibrated gradient in mV/pH
  – Code 52: display of asymmetry potential in mV.

9.6.7 Calibration of redox value; Conex® DIS-PR

- The redox calibration is carried out by determining the redox offset compared to a reference solution (e.g. Grundfos redox buffer 220 mV, order No.: 96609166).

1. Press [Cal] to select the calibration menu.
   The Cal LED next to the [Cal] button illuminates.
   – To prevent overdosing, the controllers are switched off and the actuators closed.
   – The buffer value 220 mV appears automatically.
2. Use the [Up] or [Down] button to change to the value of the used buffer.
3. Fill redox buffer from the supply bottle into a clean vessel.
4. Immerse the combination electrode into the buffer solution.
5. Start the automatic read function AUTO READ (reading in of measured signal) and the calibration by pressing [OK]. The buffer value is displayed flashing.
   During the redox calibration, the automatic read function ensures that the correct electrode signal is only read in for the buffer value if the measured signal remains stable for a defined period of time.
6. Discard the buffer solution (i.e. do not return it to the supply bottle!), Flush the combination electrode with water.
   The calibration result is automatically displayed directly after the calibration:
   – Redox offset in mV.
7. Return to the display level by pressing [OK].

Error messages when reading in the voltage signal of the redox combination electrode

- The alarm LED flashes.
- The coded display output flashes.
- Redox offset is flashing.

14: Asymmetry error
The alarm is displayed if the plausibility check of the redox calibration data establishes an upward/downward violation of the accuracy range from -60 to +60 mV.

The calibration procedure is aborted.

- Press [OK] to acknowledge the error message and return to the display level.
- No new calibration data are imported; the old calibration data are not overwritten!

Calibration result

- The result of the current (last) calibration can be displayed at any time in the code menu:
  – Code 52: display of redox offset in mV.

9.6.8 Controller configuration

1. Switch the controller on/off using code 20:
   – Code 2000: controller off.
   – Code 2001: controller switched on, SP (setpoint) is not adjustable.
   – Code 2002: controller switched on, SP (setpoint) is adjustable.
   See section *9.3.3 SP menu*.
2. Select the control direction using code 21:
   – Code 2100: control direction upwards (switches with downward violation of limit/ setpoint)
   – Code 2101: control direction downwards (switches with upward violation of limit/ setpoint).
3. Select the controller type using code 22:
   – Code 2200: limit monitor
   – Code 2201: interpulse controller
   – Code 2202: pulse frequency controller
   – Code 2203: continuous controller.
4. Press [OK] to confirm.

Note: After a power interruption the controller starts with a delay of 10 seconds to avoid a malfunction during the start.

9.6.9 Current output

Two standardized ranges "0 to 20 mA" and "4 to 20 mA" are available as the **current output**. These are assigned linearly to the measuring range.

1. Set the current output range using code 23:
   – Code 2300: 0 to 20 mA
   – Code 2301: 4 to 20 mA.
2. Press [OK] to confirm.

Note: The measured value is present at the current output if a limit monitor, interpulse controller or pulse frequency controller is selected.
The controller signal is present at the current output if a continuous controller is activated.

9.6.10 Controller parameterisation

The controller selected in *9.6.8 Controller configuration* is parameterised in the code area CTRL. Only the codes and parameterisation facilities matching the controller are made available.

Code 10	Xp (proportional band) in %, 0.1 to 3000.0 %, resolution 0.1 % in the band 0.1 to 100.0 %, resolution 1 % in the band 101.0 to 3000.0 %
Code 11	Tn (reset time) in sec, 0 to 3000 s, resolution 1 s
Code 12	Hysteresis in physical dimension, 0 to 50 % of full-scale value, adjustable in physical dimension of measured value
Code 13	Interpulse period in sec, 1 to 100 s, resolution 1 s
Code 14	Min. ON period in sec, 0.1 to 10.0 s, resolution 0.1 s
Code 15	Max. frequency in pulses/min, 1 to 220 pulses per minute, pulse width 50 ms
Code 16	Setpoint/limit in physical dimension, 0 to 100 % of measuring range

1. Press [OK] to confirm the selected code.
2. Use the [Up] or [Down] button to modify the displayed value within the adjustable range.
3. Press [OK] to confirm.

Note: If the reset time Tn is set to 0, the controller reacts like a pure P controller. If the proportional band XP is set to 0.0 %, the controller reacts like a limit monitor.

9.6.11 Adjustment of alarm value

1. Select code 70, and set code 7002 (alarm value on). Press [OK] to confirm.
2. Select the switching direction using code 71:
   – Code 7101: downward violation
   – Code 7102: upward violation.
3. Enter the alarm value using code 72:
   – Dimension mg/l for Conex® DIS-D
   – Dimension pH for Conex® DIS-PR, pH sensor system
   – Dimension mV for Conex® DIS-PR, redox sensor system.

- The alarm function has an automatic hysteresis of 2.5 % of the selected measuring range.

9.7 Service menu

Use the service menu to read all important settings and to check instrument functions. In the code menu, the service range covers codes 50-57.

Code 50

- Display of raw data values of cell
  - – Actual cell current in µA (Conex® DIS-D)
  - – Actual cell current in mV (Conex® DIS-PR).

Code 51

- Display of calibrated gradient of current (last) calibration.
  - – In µA/ppm (Conex® DIS-D)
  - – In mV/pH (Conex® DIS-PR with pH sensor system selected).
- Not used with Conex® DIS-PR with redox sensor system selected.

Code 52

- Display of calibrated
  - – asymmetry potential with pH sensor system
  - – redox offset with redox sensor system
- Only used with Conex® DIS-PR!

Code 53

- Display of temperature in °C with temperature sensor (Pt100) connected
- Only used with Conex® DIS-PR!

Code 54

- Display of water sensor depending on selected type of measuring cell.
  - – AQC-D1/-D11/-D3/-D13:
    Display 100 % = water present
    Display 0 % = water missing
  - – AQC-D2/-D12:
    Water sensor speed in %
    Display 0 % = 200 rpm
    Display 100 % = 800 rpm.

Code 55

Test routine, checking of various instrument functions:

5500:	Test of control relay: relay switches, flashing display of code. To return to code level, press [OK].
5501:	Test of alarm relay: like 5500
5502:	Test of current output: 4 mA are displayed at the current output, flashing display of code. To return to code level, press [OK].
5503:	Like 5502, except that 20 mA is displayed.
5504:	Display test: If the screen is completely darkened: the display is OK. If the screen remains partially bright: the display is faulty.

Code 56:

- Setting of display contrast between 0 % and 100 %.

Code 57:

- If a controller has been parameterised, the current controller performance (y-out) is displayed in %. Controller stop must not be activated in the process.
- The display is 0.00 % if a controller has not been parameterised.

9.8 Program version

The program version is displayed when the instrument is started. Example: V.0.15 28feb2003.

9.9 Reset to default settings

To reset the instrument to the factory (default) settings, do as follows:

1. Select code 01.
2. Enter factory setting code **6742**.
3. Press [OK] to confirm.

All previous settings are reset.

See sections *6.5 Factory settings* and *9.4 Code overview*.

10. Alarm statuses and error messages

Alarms are indicated by the flashing of the alarm LED and a displayed code. Various additional alarm actions are carried out depending on the alarm.

If several alarms are present, the most recent alarm is displayed. Earlier alarms are not deleted by additional alarms.

No alarms are signalled during operation of the instrument in the menu code, SP. The alarms still present are only evaluated when the respective menu is left.

10.1 Alarm value *01*/*02*

01: Downward violation of the set alarm value.
The alarm is displayed if the current value is below the set value.

02: Upward violation of the set alarm value.
The alarm is displayed if the set value is exceeded.

See section *9.6.11 Adjustment of alarm value*.

- The alarm LED flashes.
- The displayed code flashes.
- The alarm relay is switched (floating output).

To acknowledge the alarm, press [OK].

- The alarm relay is reset.
- The alarm is still indicated by the flashing of the alarm LED and the coded display output.

All alarm actions are reset when the fault is no longer present.

10.2 Water sensor *09* / temperature sensor *12*

09: Water sensor
The alarm is displayed when the water sensor is displayed for AQC-D1/-D11 and AQC-D3/-D13 measuring cells, or when the input frequency is outside the tolerance range for AQC-D2/-D12 measuring cells.

***12*:** Temperature sensor
(only with Conex® DIS-PR)
The alarm is displayed if the temperature measurement violates the measuring range.

- The alarm LED flashes.
- The coded display output flashes.
- The alarm relay is switched (floating output).
- The controller is stopped.

To acknowledge the alarm, press [OK].

- The alarm relay is reset.
- The alarm is still displayed by the flashing of the alarm LED and the coded display output. The controller remains at stop.

All alarm actions are reset when the fault is no longer present.

10.3 Calibration errors *13*/*14*/*10*/*11*

The following alarms can only occur during calibration. The calibration errors are displayed as follows:

- The alarm LED flashes.
- The coded display output flashes.

13: Gradient error
The alarm is displayed if the plausibility check of the pH calibration data establishes an upward/downward violation of the gradient range from -50 to -62 mV/pH.

14: Asymmetry error (only with Conex® DIS-PR)
The alarm is displayed if the plausibility check of the pH calibration data establishes an upward/downward violation of the accuracy range from -60 to +60 mV.

10: Auto read time-out error
(only with Conex® DIS-PR)
The alarm is displayed if the combination electrode does not reach a stable signal within the defined time period (120 s).

11: pH difference (only with Conex® DIS-PR)
The alarm is displayed if a fault exists in the combination electrode or if an incorrect buffer has been used (difference in pH of selected buffer solutions < 1.00 pH).

The respective alarm actions together with elimination of faults are described in the respective calibration sections.

See section *9.6.5 Calibration for chlorine, chlorine dioxide or ozone; Conex® DIS-D*.

See section *9.6.6 Calibration of the pH value; Conex® DIS-PR*.

See section *9.6.7 Calibration of redox value; Conex® DIS-PR*.

11. Fault finding

The instrument is maintenance-free, repairs can only be carried out in the factory.

The following table provides you with short guidelines for possible faults caused by missing or faulty cables or faults in the sensor system.

Fault	Cause	Remedy
1. No display after switching-on.	a) Power supply disconnected.	Connect the power supply.
2. SP (setpoint) LED cannot be selected.	a) Code 2001 activated.	Delete code 2001.
3. Stop (controller stop) LED cannot be selected.	a) Controller configuration has not been made.	Carry out controller configuration.
4. Code numbers cannot be selected.	a) Enable code 0086 has been deleted; instrument is protected against unauthorised operation.	Enter enable code 0086 again. See section *9.4 Code overview*.

Conex® DIS-D

Fault	Cause	Remedy
1. Measured-value display unsteady.	a) Interferences on lines from electrode/measuring cell.	Check the screen/cable.
	b) Connection cables/plugs between measuring cell and Conex® DIS interrupted or moist.	Check the cables, and replace if necessary.
	c) Sensor/electrode faulty.	Replace the sensor/electrode. Check the potentiostatic control voltage, 100 mV, between terminal M (20) and B/R (21) with operational/connected measuring cell. Use a voltmeter.
2. Display at full-scale value.	a) Connection cable between electrode/measuring cell and instrument amplifier interrupted.	Check cable, and establish connection.
	b) Measuring electrode faulty	Replace the measuring electrode.
3. Alarm during calibration.	a) Measuring cell/electrodes contaminated or blocked by deposits.	Remove the electrodes and clean the measuring and counter electrodes (see also installation and operating instructions of the measuring cells).
4. Sensor value too small compared to reference.	a) Incorrect calibration.	Repeat the calibration.
	b) pH value for measurement higher than with calibration (only with chlorine).	Keep pH value constant for measurement and calibration.
5. Sensor value too high compared to reference.	a) Incorrect calibration.	Repeat the calibration.
	b) pH value for measurement lower than with calibration (only with chlorine).	Keep the pH value constant for measurement and calibration.

Conex® DIS-PR			
Fault	**Cause**		**Remedy**
1. Measured-value display unsteady.	a)	Interferences on lines from combination electrode to Conex® DIS.	Check the screen/cable and cable routing.
	b)	Distance between combination electrode and Conex® DIS too long.	Check the cables and replace, if necessary. Position instrument max. 3 m away from combination electrode.
	c)	Connection cables/plugs between combination electrode and Conex® DIS interrupted or moist.	Check cables, and establish connection. Possibly replace combination electrode if water enters the sensor head.
	d)	Air pockets on the combination electrodes for pH or redox.	Check supply of sample water and modify, if necessary.
	e)	Combination electrode faulty.	Replace the combination electrode.
2. Display at full-scale value.	a)	Connection cable between combination electrode and Conex® DIS interrupted.	Check the cable, and establish connection.
	b)	Combination electrode faulty.	Replace the combination electrode.
3. With pH measurement, the display is constantly approx. pH 7.00, and with redox measurement 0 mV.	a)	Short-circuit in connection cable between electrode and Conex® DIS, moisture in the plug connectors.	Check cables, and eliminate short-circuit. Eliminate moisture or replace cables.
	b)	Combination electrode faulty.	Replace the combination electrode.
4. Fault during or after calibration.	a)	Combination electrode contaminated, too old or faulty.	Clean the combination electrode according to supplied description, or replace.
	b)	Used buffer solutions too old.	Renew the buffer solutions.
5. Measured-value display has sluggish response.	a)	Combination electrode contaminated.	Clean the combination electrode according to supplied description.
	b)	Combination electrode too old.	Replace the combination electrode, if necessary.

Note

If faults in the measurement: Refer to the installation and operating instructions of the respective electrode or measuring cell.

12. Maintenance

The device is maintenance-free.

Repairs can only be carried out in the factory by authorized specialists.

13. Disposal

This product or parts of it must be disposed of in an environmentally sound way. Use appropriate waste collection services. If this is not possible, contact the nearest Grundfos company or service workshop.

Declaration of conformity

GB: EU declaration of conformity

We, Grundfos, declare under our sole responsibility that the products Conex® DIA-G, DIS-G, DIS-D, DIS-PR, to which the declaration below relates, are in conformity with the Council Directives listed below on the approximation of the laws of the EU member states.

DE: EU-Konformitätserklärung

Wir, Grundfos, erklären in alleiniger Verantwortung, dass die Produkte Conex® DIA-G, DIS-G, DIS-D, DIS-PR, auf die sich diese Erklärung beziehen, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmen.

ES: Declaración de conformidad de la UE

Grundfos declara, bajo su exclusiva responsabilidad, que los productos Conex® DIA-G, DIS-G, DIS-D, DIS-PR a los que hace referencia la siguiente declaración cumplen lo establecido por las siguientes Directivas del Consejo sobre la aproximación de las legislaciones de los Estados miembros de la UE.

FR: Déclaration de conformité UE

Nous, Grundfos, déclarons sous notre seule responsabilité, que les produits Conex® DIA-G, DIS-G, DIS-D, DIS-PR, auxquels se réfère cette déclaration, sont conformes aux Directives du Conseil concernant le rapprochement des législations des États membres UE relatives aux normes énoncées ci-dessous.

IT: Dichiarazione di conformità UE

Grundfos dichiara sotto la sua esclusiva responsabilità che i prodotti Conex® DIA-G, DIS-G, DIS-D, DIS-PR, ai quale si riferisce questa dichiarazione, sono conformi alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri UE.

LT: ES atitikties deklaracija

Mes, Grundfos, su visa atsakomybe pareiškiame, kad produktai Conex® DIA-G, DIS-G, DIS-D, DIS-PR, kuriems skirta ši deklaracija, atitinka žemiau nurodytas Tarybos Direktyvas dėl ES šalių narių įstatymų suderinimo.

NL: EU-conformiteitsverklaring

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat de producten Conex® DIA-G, DIS-G, DIS-D, DIS-PR, waarop de onderstaande verklaring betrekking heeft, in overeenstemming zijn met de onderstaande Richtlijnen van de Raad inzake de onderlinge aanpassing van de wetgeving van de EU-lidstaten.

PL: Deklaracja zgodności UE

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze produkty Conex® DIA-G, DIS-G, DIS-D, DIS-PR, których deklaracja niniejsza dotyczy, są zgodne z następującymi dyrektywami Rady w sprawie zbliżenia przepisów prawnych państw członkowskich.

PT: Declaração de conformidade UE

A Grundfos declara sob sua única responsabilidade que os produtos Conex® DIA-G, DIS-G, DIS-D, DIS-PR, aos quais diz respeito a declaração abaixo, estão em conformidade com as Directivas do Conselho sobre a aproximação das legislações dos Estados Membros da UE.

RO: Declaraţia de conformitate UE

Noi Grundfos declarăm pe propria răspundere că produsele Conex® DIA-G, DIS-G, DIS-D, DIS-PR, la care se referă această declaraţie, sunt în conformitate cu Directivele de Consiliu specificate mai jos privind armonizarea legilor statelor membre UE.

RS: Deklaracija o usklađenosti EU

Mi, kompanija Grundfos, izjavljujemo pod punom vlastitom odgovornošću da je proizvod Conex® DIA-G, DIS-G, DIS-D, DIS-PR, na koji se odnosi deklaracija ispod, u skladu sa dole prikazanim direktivama Saveta za usklađivanje zakona država članica EU.

RU: Декларация о соответствии нормам ЕС

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия Conex® DIA-G, DIS-G, DIS-D, DIS-PR, к которым относится нижеприведённая декларация, соответствуют нижеприведённым Директивам Совета Евросоюза о тождественности законов стран-членов ЕС.

TR: AB uygunluk bildirgesi

Grundfos olarak, aşağıdaki bildirim konusu olan Conex® DIA-G, DIS-G, DIS-D, DIS-PR ürünlerinin, AB Üye ülkelerinin direktiflerinin yakınlaştırılmasıyla ilgili durumun aşağıdaki Konsey Direktifleriyle uyumlu olduğunu ve bununla ilgili olarak tüm sorumluluğun bize ait olduğunu beyan ederiz.

- Low Voltage Directive (2014/35/EU)*.
  Standard used:
  EN 61010-1:2011-07.
- EMC Directive (2014/30/EU).
  Standards used:
  EN 61326-1:2013,
  EN 61000-3-2:2015,
  EN 61000-3-3:2014.
- RoHS Directives (2011/65/EU and 2015/863/EU).
  Standard used: EN 50581:2012.

* Only for products with operating voltage > 50 VAC or > 75 VDC.

This EU declaration of conformity is only valid when published as part of the Grundfos installation and operating instructions (publication numbers 96709884, 95716767, 96681460, 96798355, 96681484, 95716759).

Pfinztal, 1st March 2018

Ulrich Stemick
Technical Director
Grundfos Water Treatment GmbH
Reetzstr. 85, D-76327 Pfinztal, Germany

Person authorised to compile technical file and empowered to sign the EU declaration of conformity.

Argentina
Bombas GRUNDFOS de Argentina S.A.
Ruta Panamericana km. 37.500 Centro Industrial Garin
1619 - Garin Pcia. de B.A.
Phone: +54-3327 414 444
Telefax: +54-3327 45 3190

Australia
GRUNDFOS Pumps Pty. Ltd.
P.O. Box 2040
Regency Park
South Australia 5942
Phone: +61-8-8461-4611
Telefax: +61-8-8340 0155

Austria
GRUNDFOS Pumpen Vertrieb Ges.m.b.H.
Grundfosstraße 2
A-5082 Grödig/Salzburg
Tel.: +43-6246-883-0
Telefax: +43-6246-883-30

Belgium
N.V. GRUNDFOS Bellux S.A.
Boomsesteenweg 81-83
B-2630 Aartselaar
Tél.: +32-3-870 7300
Télécopie: +32-3-870 7301

Belarus
Представительство ГРУНДФОС в Минске
220125, Минск
ул. Шафарнянская, 11, оф. 56, БЦ «Порт»
Тел.: +7 (375 17) 286 39 72/73
Факс: +7 (375 17) 286 39 71
E-mail: minsk@grundfos.com

Bosnia and Herzegovina
GRUNDFOS Sarajevo
Zmaja od Bosne 7-7A,
BH-71000 Sarajevo
Phone: +387 33 592 480
Telefax: +387 33 590 465
www.ba.grundfos.com
e-mail: grundfos@bih.net.ba

Brazil
BOMBAS GRUNDFOS DO BRASIL
Av. Humberto de Alencar Castelo Branco, 630
CEP 09850 - 300
São Bernardo do Campo - SP
Phone: +55-11 4393 5533
Telefax: +55-11 4343 5015

Bulgaria
Grundfos Bulgaria EOOD
Slatina District
Iztochna Tangenta street no. 100
BG - 1592 Sofia
Tel. +359 2 49 22 200
Fax. +359 2 49 22 201
email: bulgaria@grundfos.bg

Canada
GRUNDFOS Canada Inc.
2941 Brighton Road
Oakville, Ontario
L6H 6C9
Phone: +1-905 829 9533
Telefax: +1-905 829 9512

China
Grundfos Alldos
Dosing & Disinfection
ALLDOS (Shanghai) Water Technology Co. Ltd.
West Unit, 1 Floor, No. 2 Building (T 4-2)
278 Jinhu Road, Jin Qiao Export Processing Zone
Pudong New Area
Shanghai, 201206
Phone: +86 21 5055 1012
Telefax: +86 21 5032 0596
E-mail: grundfosalldos-CN@grundfos.com

China
GRUNDFOS Pumps (Shanghai) Co. Ltd.
10F The Hub, No. 33 Suhong Road
Minhang District
Shanghai 201106
PRC
Phone: +86-21 6122 5222
Telefax: +86-21 6122 5333

COLOMBIA
GRUNDFOS Colombia S.A.S.
Km 1.5 vía Siberia-Cota Conj. Potrero Chico,
Parque Empresarial Arcos de Cota Bod. 1A.
Cota, Cundinamarca
Phone: +57(1)-2913444
Telefax: +57(1)-8764586

Croatia
GRUNDFOS CROATIA d.o.o.
Buzinski prilaz 38, Buzin
HR-10010 Zagreb
Phone: +385 1 6595 400
Telefax: +385 1 6595 499
www.hr.grundfos.com

GRUNDFOS Sales Czechia and Slovakia s.r.o.
Čapkovského 21
779 00 Olomouc
Phone: +420-585-716 111

Denmark
GRUNDFOS DK A/S
Martin Bachs Vej 3
DK-8850 Bjerringbro
Tlf.: +45-87 50 50 50
Telefax: +45-87 50 51 51
E-mail: info_GDK@grundfos.com
www.grundfos.com/DK

Estonia
GRUNDFOS Pumps Eesti OÜ
Peterburi tee 92G
11415 Tallinn
Tel: + 372 606 1690
Fax: + 372 606 1691

Finland
OY GRUNDFOS Pumput AB
Trukkikuja 1
FI-01360 Vantaa
Phone: +358-(0)207 889 500

France
Pompes GRUNDFOS Distribution S.A.
Parc d'Activités de Chesnes
57, rue de Malacombe
F-38290 St. Quentin Fallavier (Lyon)
Tél.: +33-4 74 82 15 15
Télécopie: +33-4 74 94 10 51

Germany
GRUNDFOS Water Treatment GmbH
Reetzstraße 85
D-76327 Pfinztal (Söllingen)
Tel.: +49 7240 61-0
Telefax: +49 7240 61-177
E-mail: gwt@grundfos.com

Germany
GRUNDFOS GMBH
Schlüterstr. 33
40699 Erkrath
Tel.: +49-(0) 211 929 69-0
Telefax: +49-(0) 211 929 69-3799
E-mail: infoservice@grundfos.de
Service in Deutschland:
E-mail: kundendienst@grundfos.de

Greece
GRUNDFOS Hellas A.E.B.E.
20th km. Athinon-Markopoulou Av.
P.O. Box 71
GR-19002 Peania
Phone: +0030-210-66 83 400
Telefax: +0030-210-66 46 273

Hong Kong
GRUNDFOS Pumps (Hong Kong) Ltd.
Unit 1, Ground floor
Siu Wai Industrial Centre
29-33 Wing Hong Street &
68 King Lam Street, Cheung Sha Wan
Kowloon
Phone: +852-27861706 / 27861741
Telefax: +852-27858664

Hungary
GRUNDFOS Hungária Kft.
Tópark u. 8
H-2045 Törökbálint,
Phone: +36-23 511 110
Telefax: +36-23 511 111

India
GRUNDFOS Pumps India Private Limited
118 Old Mahabalipuram Road
Thoraipakkam
Chennai 600 097
Phone: +91-44 4596 6800

Indonesia
PT. GRUNDFOS POMPA
Graha Intirub Lt. 2 & 3
Jln. Cililitan Besar No.454. Makasar, Jakarta Timur
ID-Jakarta 13650
Phone: +62 21-469-51900
Telefax: +62 21-460 6910 / 460 6901

Ireland
GRUNDFOS (Ireland) Ltd.
Unit A, Merrywell Business Park
Ballymount Road Lower
Dublin 12
Phone: +353-1-4089 800
Telefax: +353-1-4089 830

Italy
GRUNDFOS Pompe Italia S.r.l.
Via Gran Sasso 4
I-20060 Truccazzano (Milano)
Tel.: +39-02-95838112
Telefax: +39-02-95309290 / 95838461

Japan
GRUNDFOS Pumps K.K.
1-2-3, Shin-Miyakoda, Kita-ku
Hamamatsu
431-2103 Japan
Phone: +81 53 428 4760
Telefax: +81 53 428 5005

Korea
GRUNDFOS Pumps Korea Ltd.
6th Floor, Aju Building 679-5
Yeoksam-dong, Kangnam-ku, 135-916
Seoul, Korea
Phone: +82-2-5317 600
Telefax: +82-2-5633 725

Latvia
SIA GRUNDFOS Pumps Latvia
Deglava biznesa centrs
Augusta Deglava ielā 60, LV-1035, Rīga,
Tālr.: + 371 714 9640, 7 149 641
Fakss: + 371 914 9646

Lithuania
GRUNDFOS Pumps UAB
Smolensko g. 6
LT-03201 Vilnius
Tel: + 370 52 395 430
Fax: + 370 52 395 431

Malaysia
GRUNDFOS Pumps Sdn. Bhd.
7 Jalan Peguam U1/25
Glenmarie Industrial Park
40150 Shah Alam
Selangor
Phone: +60-3-5569 2922
Telefax: +60-3-5569 2866

Mexico
Bombas GRUNDFOS de México S.A. de C.V.
Boulevard TLC No. 15
Parque Industrial Stiva Aeropuerto
Apodaca, N.L. 66600
Phone: +52-81-8144 4000
Telefax: +52-81-8144 4010

Netherlands
GRUNDFOS Netherlands
Veluwezoom 35
1326 AE Almere
Postbus 22015
1302 CA ALMERE
Tel.: +31-88-478 6336
Telefax: +31-88-478 6332
E-mail: info_gnl@grundfos.com

New Zealand
GRUNDFOS Pumps NZ Ltd.
17 Beatrice Tinsley Crescent
North Harbour Industrial Estate
Albany, Auckland
Phone: +64-9-415 3240
Telefax: +64-9-415 3250

Norway
GRUNDFOS Pumper A/S
Strømsveien 344
Postboks 235, Leirdal
N-1011 Oslo
Tlf.: +47-22 90 47 00
Telefax: +47-22 32 21 50

Poland
GRUNDFOS Pompy Sp. z o.o.
ul. Klonowa 23
Baranowo k. Poznania
PL-62-081 Przeźmierowo
Tel: (+48-61) 650 13 00
Fax: (+48-61) 650 13 50

Portugal
Bombas GRUNDFOS Portugal, S.A.
Rua Calvet de Magalhães, 241
Apartado 1079
P-2770-153 Paço de Arcos
Tel.: +351-21-440 76 00
Telefax: +351-21-440 76 90

Romania
GRUNDFOS Pompe România SRL
Bd. Biruintei, nr 103
Pantelimon county Ilfov
Phone: +40 21 200 4100
Telefax: +40 21 200 4101
E-mail: romania@grundfos.ro

Russia
ООО Грундфос Россия
ул. Школьная, 39-41
Москва, RU-109544, Russia
Тел. (+7) 495 564-88-00 (495) 737-30-00
Факс (+7) 495 564 8811
E-mail grundfos.moscow@grundfos.com

Serbia
Grundfos Srbija d.o.o.
Omladinskih brigada 90b
11070 Novi Beograd
Phone: +381 11 2258 740
Telefax: +381 11 2281 769
www.rs.grundfos.com

Singapore
GRUNDFOS (Singapore) Pte. Ltd.
25 Jalan Tukang
Singapore 619264
Phone: +65-6681 9688
Telefax: +65-6681 9689

Slovakia
GRUNDFOS s.r.o.
Prievozská 4D
821 09 BRATISLAVA
Phona: +421 2 5020 1426
sk.grundfos.com

Slovenia
GRUNDFOS LJUBLJANA, d.o.o.
Leskoškova 9e, 1122 Ljubljana
Phone: +386 (0) 1 568 06 10
Telefax: +386 (0)1 568 0619
E-mail: tehnika-si@grundfos.com

South Africa
Grundfos (PTY) Ltd.
16 Lascelles Drive, Meadowbrook Estate
1609 Germiston, Johannesburg
Tel.: (+27) 10 248 6000
Fax: (+27) 10 248 6002
E-mail: lgradidge@grundfos.com

Spain
Bombas GRUNDFOS España S.A.
Camino de la Fuentecilla, s/n
E-28110 Algete (Madrid)
Tel.: +34-91-848 8800
Telefax: +34-91-628 0465

Sweden
GRUNDFOS AB
Box 333 (Lunnagårdsgatan 6)
431 24 Mölndal
Tel.: +46 31 332 23 000
Telefax: +46 31 331 94 60

Switzerland
GRUNDFOS Pumpen AG
Bruggacherstrasse 10
CH-8117 Fällanden/ZH
Tel.: +41-44-806 8111
Telefax: +41-44-806 8115

Taiwan
GRUNDFOS Pumps (Taiwan) Ltd.
7 Floor, 219 Min-Chuan Road
Taichung, Taiwan, R.O.C.
Phone: +886-4-2305 0868
Telefax: +886-4-2305 0878

Thailand
GRUNDFOS (Thailand) Ltd.
92 Chaloem Phrakiat Rama 9 Road,
Dokmai, Pravej, Bangkok 10250
Phone: +66-2-725 8999
Telefax: +66-2-725 8998

Turkey
GRUNDFOS POMPA San. ve Tic. Ltd. Sti.
Gebze Organize Sanayi Bölgesi
Ihsan dede Caddesi,
2. yol 200. Sokak No. 204
41490 Gebze/ Kocaeli
Phone: +90 - 262-679 7979
Telefax: +90 - 262-679 7905
E-mail: satis@grundfos.com

Ukraine
Бізнес Центр Європа
Столичне шосе, 103
м. Київ, 03131, Україна
Телефон: (+38 044) 237 04 00
Факс.: (+38 044) 237 04 01
E-mail: ukraine@grundfos.com

United Arab Emirates
GRUNDFOS Gulf Distribution
P.O. Box 16768
Jebel Ali Free Zone
Dubai
Phone: +971-4- 8815 166
Telefax: +971-4-8815 136

United Kingdom
GRUNDFOS Pumps Ltd.
Grovebury Road
Leighton Buzzard/Beds. LU7 4TL
Phone: +44-1525-850000
Telefax: +44-1525-850011

U.S.A.
GRUNDFOS Pumps Corporation
9300 Loiret Blvd.
Lenexa, Kansas 66219
Phone: +1-913-227-3400
Telefax: +1-913-227-3500

Uzbekistan
Grundfos Tashkent, Uzbekistan The Representative Office of Grundfos Kazakhstan in Uzbekistan
38a, Oybek street, Tashkent
Телефон: (+998) 71 150 3290 / 71 150 3291
Факс: (+998) 71 150 3292

Addresses revised 15.01.2019

96681460 0419

ECM: 1260226