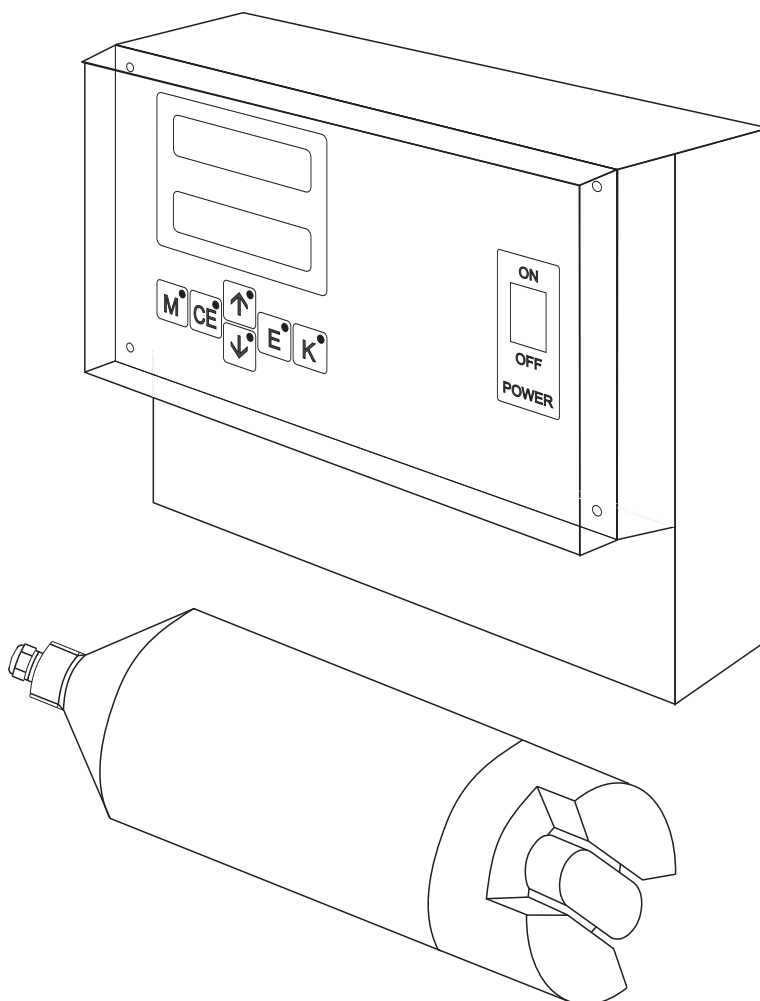


Operating Instructions

Stamosens CNM750/CNS70

Nitrate analysis system



BA215C/07/en/09.08
71092589

Valid as of:
Software version 3.0

Endress+Hauser 

People for Process Automation

Brief overview

This explains how to use these Operating Instructions to commission your system quickly and safely:




→ Page 4 → Page 5	Safety instructions General safety instructions Explanation of the warning symbols You can find special instructions at the appropriate position in the chapter in question. The positions are indicated with the icons Warning  , Caution  and Note 
→ Page 9 → Page 12	Installation Here, you can find information on installation conditions and the dimensions of transmitter and sensor. You can find information on how to install the device on this page.
→ Page 13 → Page 15 → Page 38	Wiring Here, you can see the terminal assignment and the output configurations. How to install the cleaning unit is what you read on this page. In chapter "Appendix", you can find examples for the connection of customer-specific cleaning units.
→ Page 17 → Page 23	Commissioning In chapter "Operation", you read all about operating elements and setting options. In chapter "Commissioning", you can find the working steps for the first commissioning and calibration.
→ Page 26	Maintenance You should carry out maintenance work to ensure perfect functionality. Here, you can find the maintenance schedule.
→ Page 28	Accessories You can find all accessories and the ordering information here.
→ Page 32	Troubleshooting Use the check list to find the causes for troubles with the measuring system.
→ Page 40	Index You can find important index terms here. Use the index to find out information quickly.

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1 Safety instructions

1.1 Designated use

The CNS70 sensor and CNM 750 transmitter form an analytical system for the continuous measurement of nitrate content.

The system is specifically designed to monitor:

- the denitrification stage
- the discharge of a sewage treatment plant
- drinking water treatment.

Any other use than the one described here compromises the safety of persons and the entire measuring system and is not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

1.2 Installation, commissioning and operation

Please note the following items:

- Installation, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel.
Trained personnel must be authorized for the specified activities by the system operator.
- Electrical connection must only be carried out by a certified electrician.
- Technical personnel must have read and understood these Operating Instructions and must adhere to them.
- Before commissioning the entire measuring point, check all the connections. Ensure that electrical cables and hose connections are not damaged.
- Do not operate damaged products and secure them against unintentional commissioning. Mark the damaged product as being defective.
- Measuring point faults may only be rectified by authorized and specially trained personnel.
- If faults can not be rectified, the products must be taken out of service and secured against unintentional commissioning.
- Repairs not described in these Operating Instructions may only be carried out at the manufacturer's or by the service organization.

1.3 Operational safety

The analyzer has been designed and tested to the highest standards and left the factory in perfect functioning order.

Relevant regulations and European standards have been met.

As the user, you are responsible for complying with the following safety conditions:

- Installation instructions
- Local prevailing standards and regulations.

Immunity to interference

This instrument has been tested for electromagnetic compatibility in industrial use according to applicable European standards. It is protected against electromagnetic interference by the following design measures:

- cable shielding
- interference suppression filter
- interference suppression capacitors.

Protection against interference as specified above is valid only for an instrument connected in accordance with these Operating Instructions.

1.4 Return

If the sensor or the transmitter has to be repaired, please return it *cleaned* to the sales center responsible. Please use the original packaging, if possible.

Please enclose the completed "Declaration of contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents.

No repair without completed "Declaration of contamination"!

1.5 Notes on safety icons and symbols



Warning!

This symbol alerts you to hazards that can cause serious damage to the instrument or to persons if ignored.



Caution!

This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



Note!



This symbol indicates important items of information.

2 Identification

2.1 Device designation


2.1.1 Nameplate

Please compare the order code on the nameplate with the product structure and with your order.

 Stamosens CNM750 Endress+Hauser 	
order code / Best.Nr.:	CNM 750-7A1A
serial no. / Ser.-Nr.:	410065C3N11
output 1 / Ausgang 1:	0/4-20mA, RS 232
output 2 / Ausgang 2:	-
mains / Netz:	80-250V AC, 50/60Hz, 15VA
prot. class / Schutzart:	IP 65
ambient temp. / Umgebungstemp.:	-10°C...+55°C

a0000982

Fig. 1: Nameplate of the transmitter (example)

Stamosens CNS70 Endress+Hauser 	
order code / Best.Nr.:	CNS70-C4B2A
serial no. / Ser.-Nr.:	4100A5C3N10
measuring range / Messbereich:	BS 0.2-30mg/l NO3-N

a0000983

Fig. 2: Nameplate of the sensor (example)

2.1.2 Product structure

Transmitter

Power supply	
7	80 to 250 V AC
8	24 V AC/DC
9	Special version acc. to customer specification
Communication / Output	
A	RS 232 + 0/4 to 20 mA
Y	Special version acc. to customer specification
Version	
1	One channel version
9	Special version acc. to customer specification
Additional equipment	
A	Quality certificate
Y	Special version acc. to customer specification
CNM750 -	complete order code

Sensor

Cleaning unit	
A	Without
B	230 V
C	115 V
Y	Special version acc. to customer specification
Measuring range	
4	0.2 to 30 mg/1 NO ₃ -N (activated sludge)
5	0.2 to 60 mg/1 NO ₃ -N (clear water)
9	Special version acc. to customer specification
Cable length	
A	2 m (6.56 ft)
B	7 m (23 ft)
C	5 m (16.4 ft)
D	15 m (49.2 ft)
Y	Special version acc. to customer specification
Version	
1	Without assembly
3	Sea water version (titanium sensor housing)
4	Immersion assembly 2 m (6.56 ft), 90° offset + pendulum frame w. 250 mm (9.84") wall spacing
9	Special version acc. to customer specification
Additional equipment	
A	Quality certificate
Y	Special version acc. to customer specification
CNS70 -	complete order code

2.2 Scope of delivery

The scope of delivery comprises:

- a transmitter (device type and version acc. to the nameplate)
- a sensor (sensor type and version acc. to the nameplate)
- a quality certificate
- Operating Instructions (English).

2.3 Certificates and approvals**2.3.1 CE approval****Declaration of conformity**

The product meets the requirements of the harmonized European standards. It thus complies with the legal requirements of the EC directives.

The manufacturer confirms successful testing of the product by affixing the **CE** symbol.

2.3.2 Manufacturer certificate**Quality certificate**

With the certificate the manufacturer confirms compliance with all technical regulations and the successful testing individually for your product.

3 Installation

3.1 Measuring system overview

A complete measuring system comprises:

- a CNM750 transmitter
- a CNS70 sensor
- an immersion assembly with pendulum frame

Optional:

- Cleaning unit with compressor
- Mounting post and weather protection cover

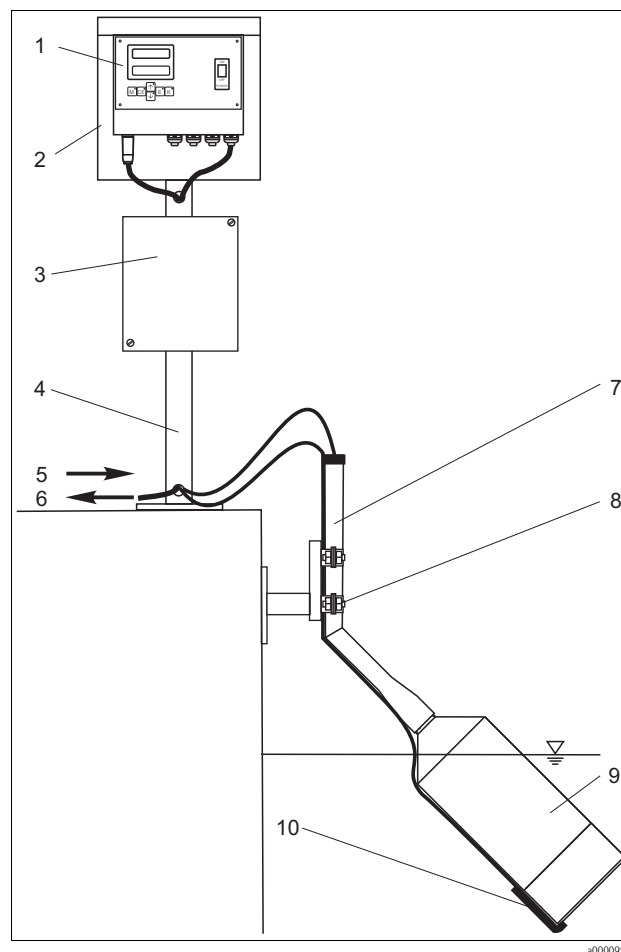


Fig. 3: Complete measuring system

- | | |
|----|--|
| 1 | Transmitter CNM750 |
| 2 | Weather protection cover |
| 3 | Compressor housing (optional, only with cleaning unit) |
| 4 | Mounting post |
| 5 | Power supply |
| 6 | Signal output |
| 7 | Immersion assembly |
| 8 | Pendulum frame |
| 9 | Sensor CNS70 |
| 10 | Cleaning unit (optional) |

3.2 Incoming acceptance, transport, storage

- Make sure the packaging is undamaged!
Inform the supplier about any damage to the packaging.
Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
Inform the supplier about damage to the contents. Keep the damaged products until the matter has been settled.
- Check that the order is complete and agrees with your shipping documents.
- The packaging material used to store or to transport the product must provide shock protection and humidity protection. The original packaging offers the best protection. Also, keep to the approved ambient conditions (see "Technical data").
- If you have any questions, please contact your supplier or your local sales center.

3.3 Installation conditions

3.3.1 Installation distances

Cable

Maximum cable length:	15 m (49.2 ft)
Maximum total length with extension via junction box:	200 m (656 ft)

Air line tubing (when using the cleaning unit)

Maximum length:	15 m (49.2 ft)
-----------------	----------------

3.3.2 Design, dimensions

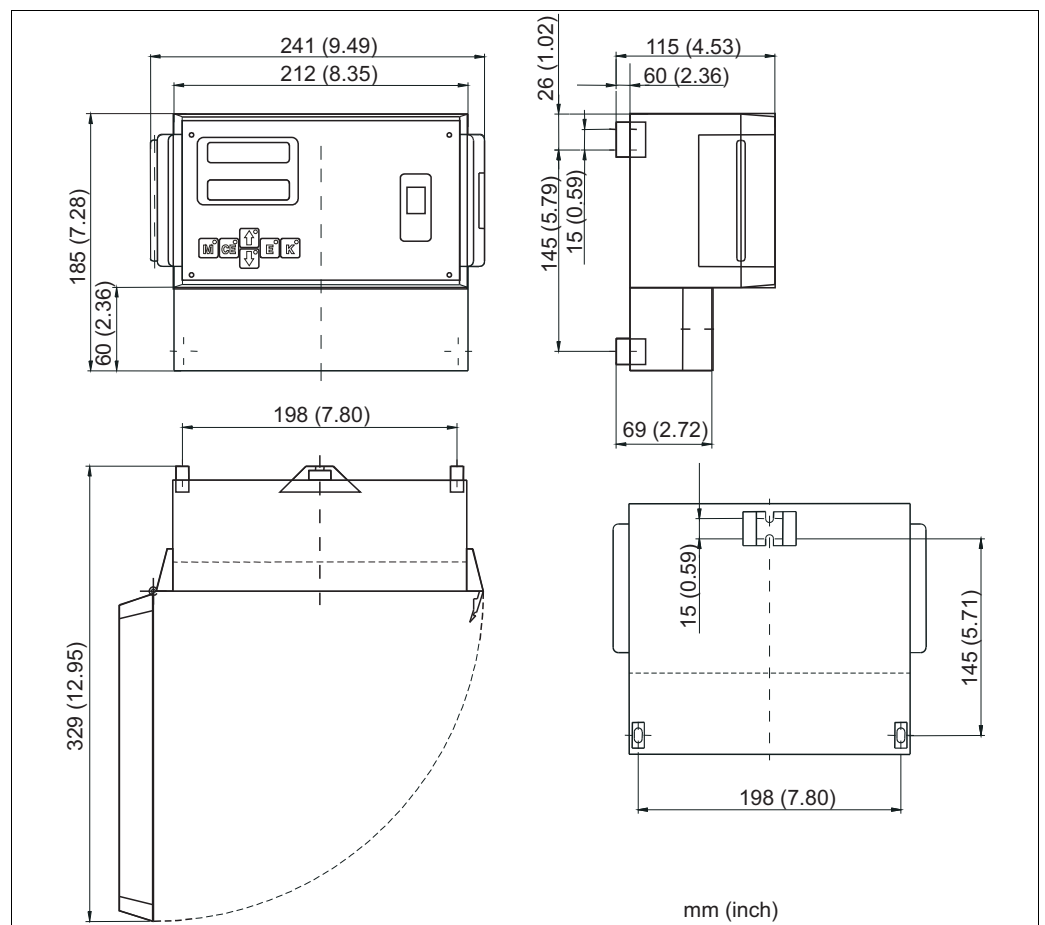


Abb. 4: Transmitter dimensions

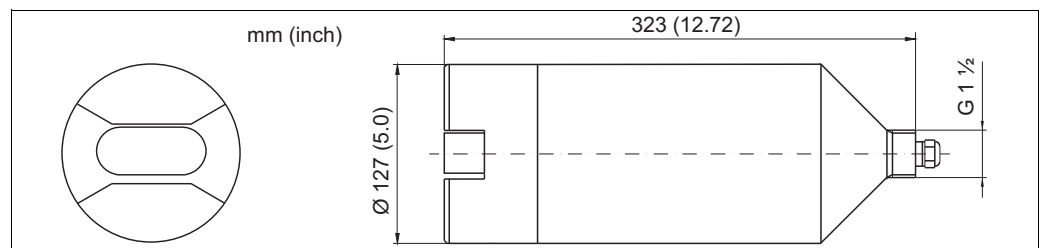


Abb. 5: Sensor dimensions

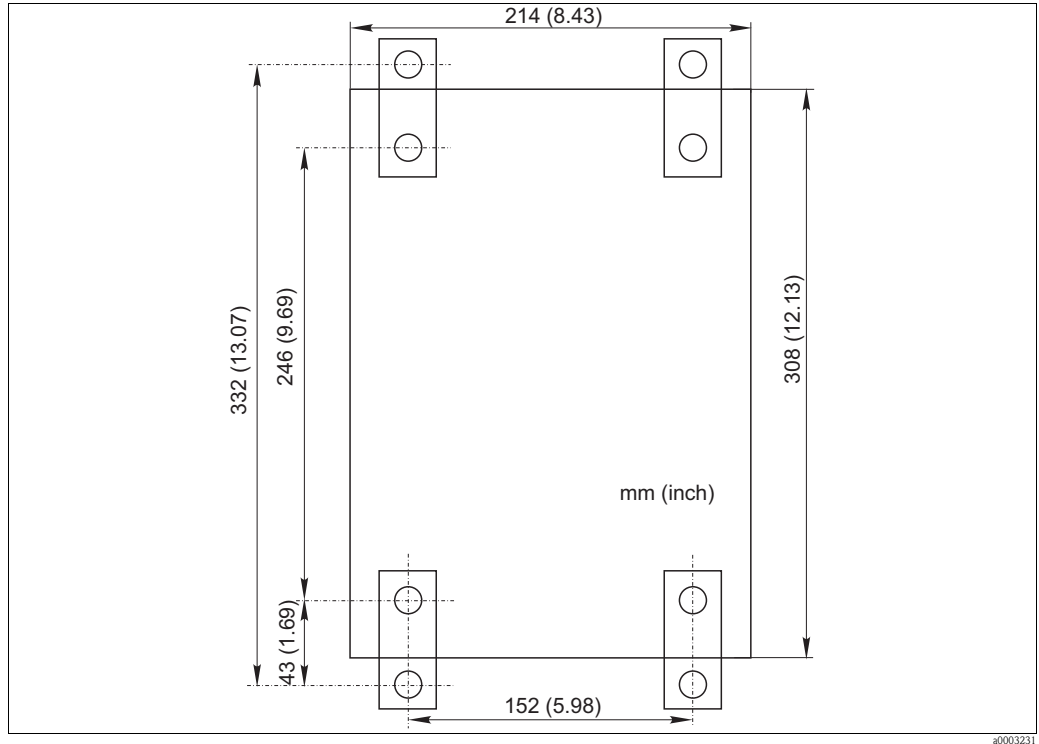


Fig. 6: Compressor of the cleaning unit

3.3.3 Sensor holders



Caution!

Do not install the sensor suspended from the cable. Use a wall bracket or an immersion assembly with pendulum frame for sensor mounting.

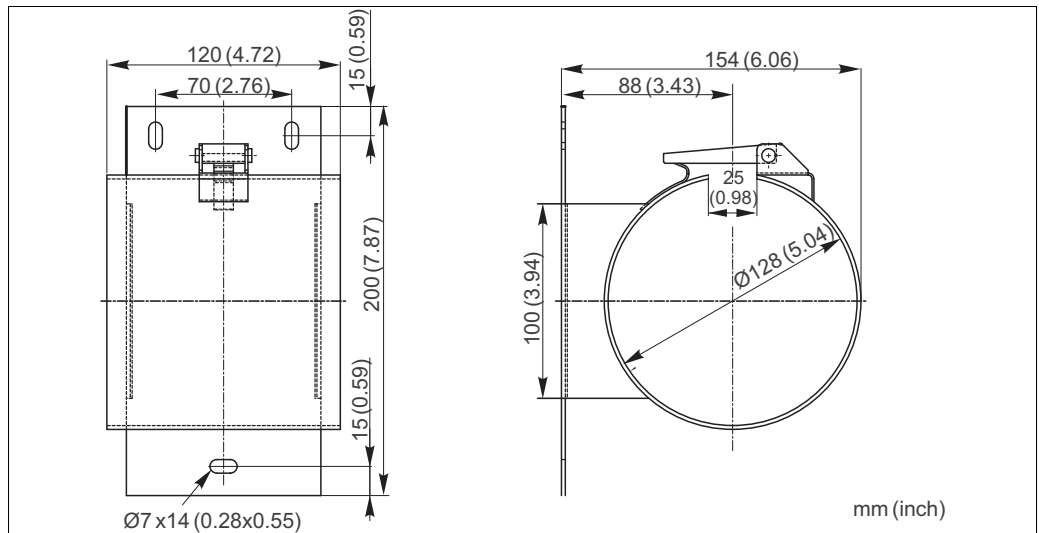


Fig. 7: Wall bracket for sensor

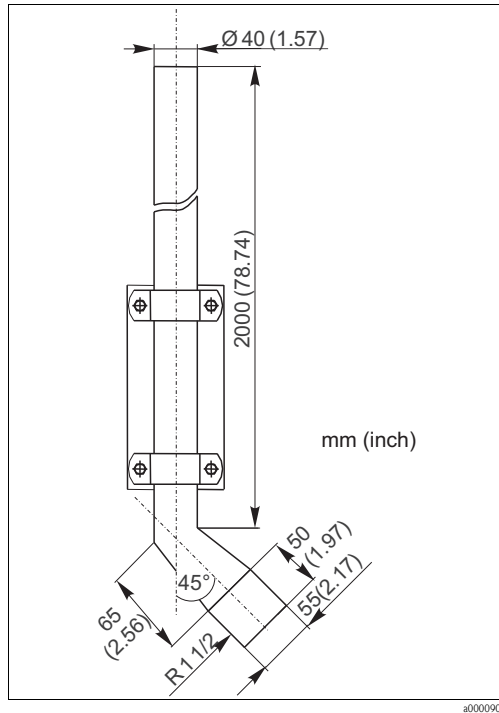


Fig. 8: Immersion assembly for sensor

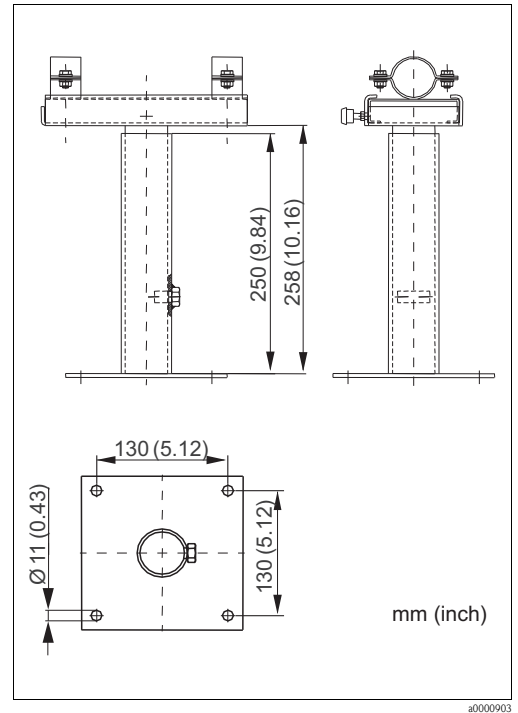


Fig. 9: Pendulum frame for immersion assembly

3.3.4 Weather protection cover and round post mount

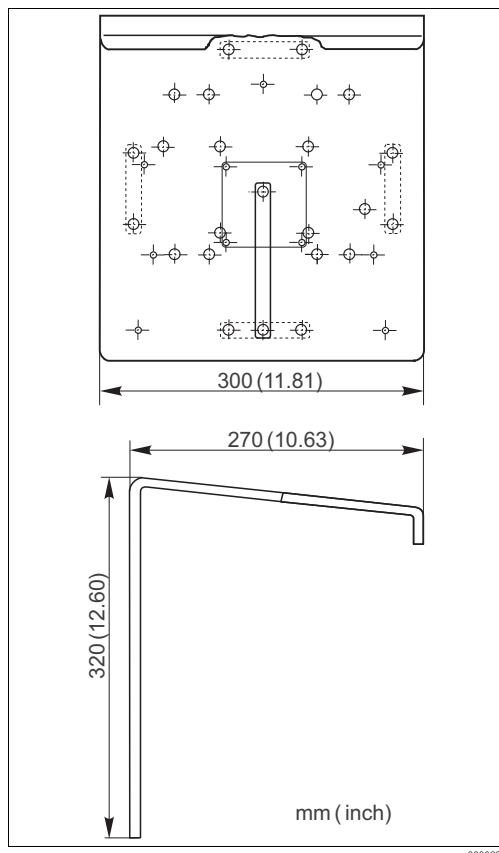


Fig. 10: Weather protection cover CYY101

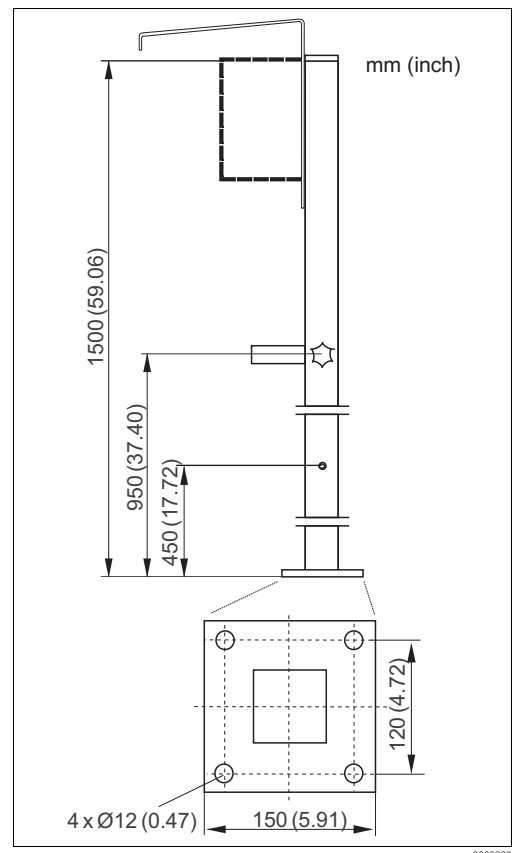


Fig. 11: Round post mount CYY102

3.4 Installation instructions

- Select a measuring point where representative measurement can be taken.
Do not mount the sensor where medium flow is turbulent and fast-flowing.
- We recommend to fit the transmitter with a weather protection cover (see "Accessories").
- Never carry the sensor by its cable.
- Attach the sensor to a special extension tube. The best fixture is a pendulum frame which holds the sensor vibration-free.
- Install the system at an easily accessible position to prevent danger for the operating personnel (during commissioning or when carrying out maintenance and cleaning work).
- Route all cable connections to prevent mechanical damage and interference from other lines.
- Install the measuring channels of the sensor in the direction of flow to obtain a self-cleaning effect.
- The activated sludge version of the sensor is equipped with a cleaning unit which prevents soiling or blocking due to particles by blowing compressed air into the measuring slit. For other applications with soiling contents, the cleaning unit is available as an accessory.
Install the air outflow of the cleaning unit at the narrower slit.

 Note!

Make sure to observe the maximum length of the air line tubing (15 m (49.2 ft)) because the power of the cleaning unit compressor is not sufficient to guarantee reliable cleaning over longer distances.

3.5 Post-installation check

- After installation, check that all connections are fitted tightly and are leakage resistant.
- Check that the sensor is secured such that it is free of vibration and tension.
- Check whether all cables have been routed without damage or electromagnetic interference.

4 Wiring

4.1 Electrical connection



Warning!

- The electrical connection must only be carried out by a certified electrician.
- Technical personnel must have read and understood the instructions in this manual and must adhere to them.
- Ensure that there is no voltage at the power cable before beginning the connection work.

4.2 Terminal assignment



Warning!

- Ensure before connection that the mains voltage corresponds with the voltage specified on the nameplate.
- A clearly marked mains disconnecting device must be installed in the vicinity of the instrument.
- Protect the transmitter by an appropriate fuse.
- Plug in and secure the sensor connector before switching the transmitter on.
- Only plug in or remove the sensor connector when the transmitter is switched off.

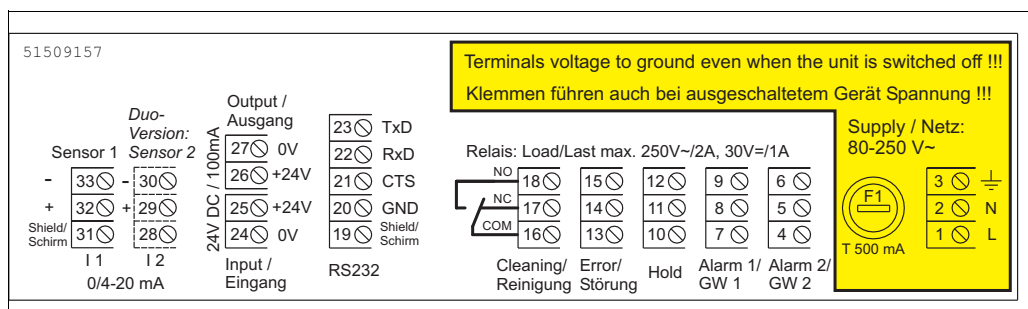


Fig. 12: Electrical connection transmitter with power supply 80 to 250 V AC

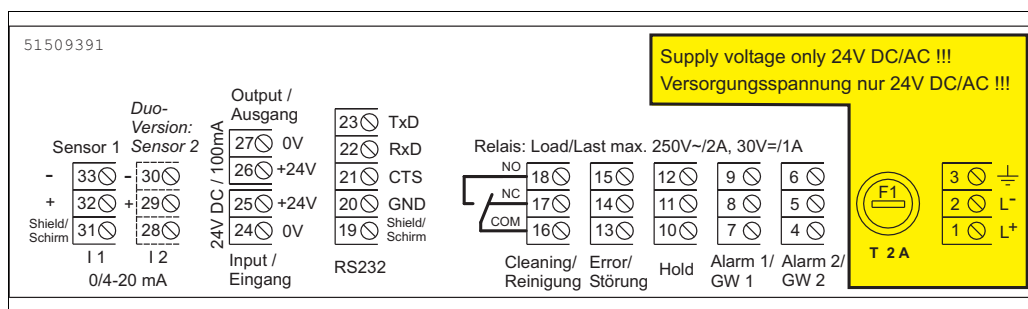


Fig. 13: Electrical connection transmitter with power supply 24 V AC/DC



Note!

The duo version with a second sensor is not available for the CNM750 and CSM750 transmitters.

4.3 Inputs and outputs

4.3.1 Control input (+24 V)

Input	Terminals	Function
24 V DC "INPUT"	24 / 25	Hold function, i.e. measurement is interrupted and the current value in the display is frozen



Note!

Use U_a (+24 V, terminal 26) to control the 24 V DC "INPUT". Then connect terminal 27 (0 V) and terminal 24 (0 V).

4.3.2 Signal output

Output	terminals	Function
Alarm 1	7 / 8 / 9	Switches when alarm value 1 is exceeded or undershot
Alarm 2	4 / 5 / 6	Switches when alarm value 2 is exceeded or undershot
Hold	10 / 11 / 12	Measurement interrupted, values held
Fault	13 / 14 / 15	Error message can be retrieved via operating menu
Cleaning	16 / 17 / 18	Switch contact to clean sensor



Note!

Switching contacts are designed for low voltage 30 V DC / 1 A or mains voltage 230 V AC / 2 A.

4.3.3 Analog output (I-1)

Output	Terminals	Function
Sensor 1 0/4 mA 20 mA	31 / 32 / 33	Measuring range start Measuring range end

4.4 Cleaning unit

The cleaning unit is connected to the mains supply. The transmitter is connected to the cleaning unit according to the following table:

Transmitter terminal	Cleaning unit terminal	Function
3 (\equiv)	PE	Grounding for housing
1 (L)	L1	Conductor
2 (N)	N	Zero conductor
16	Fuse	Fuse
18	L1	



Warning!

Disconnect the device from the mains before opening it. The connection contacts are live even when the transmitter is switched off.

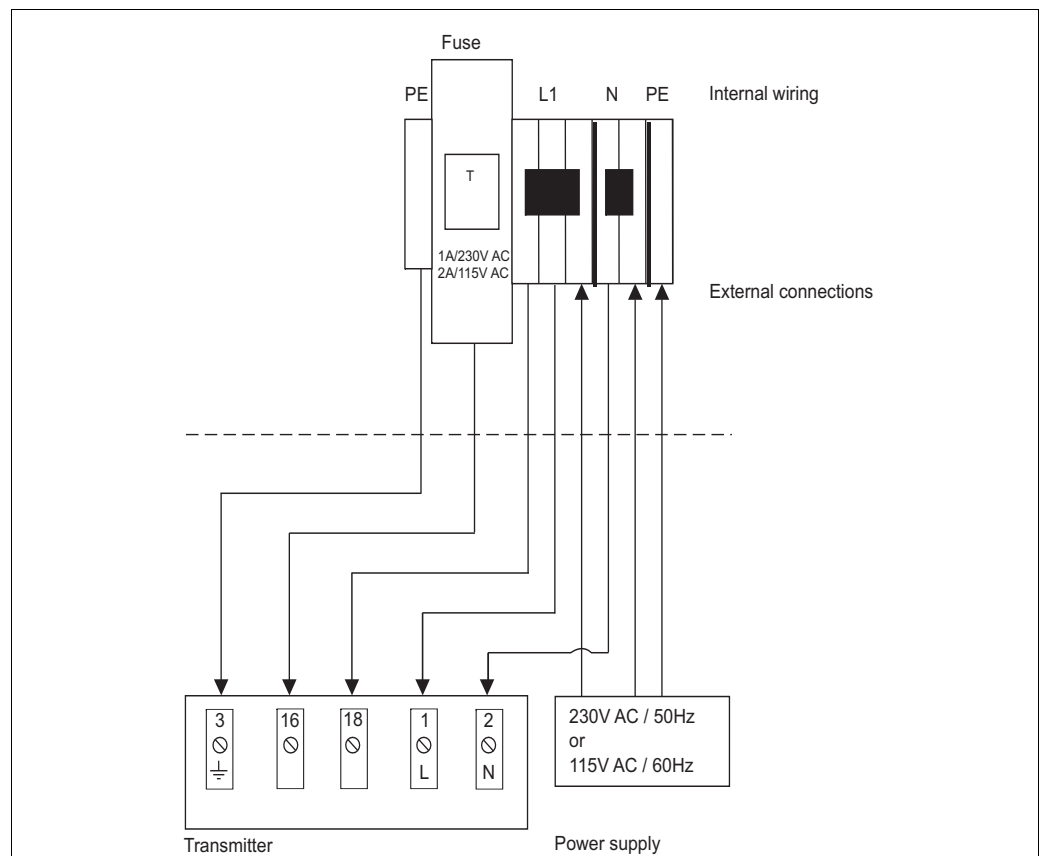


Fig. 14: Connection of the cleaning unit

4.5 Post-connection check

Device status and specifications	Note
Is the transmitter or cable externally undamaged?	Visual inspection

Electrical connection	Note
Does the supply voltage correspond to the data on the nameplate?	80 to 250 V AC 24 V AC / DC
Are current outputs screened and connected?	
Are the mounted cables relieved of tension?	
Are the cable types properly separated?	Guide power supply and signal lines separately over the entire travel distance. Separate cable channels are ideal.
Is the cable routing without scuffing or cross-overs?	
Are power supply and signal lines connected correctly according to wiring diagram?	
Are all screw terminals tightened?	
Are all cable entries mounted, tightened and leak-resistant?	
Is the transmitter protected by a fuse?	
Is a mains disconnecting device available?	

5 Operation

5.1 Display and operating elements

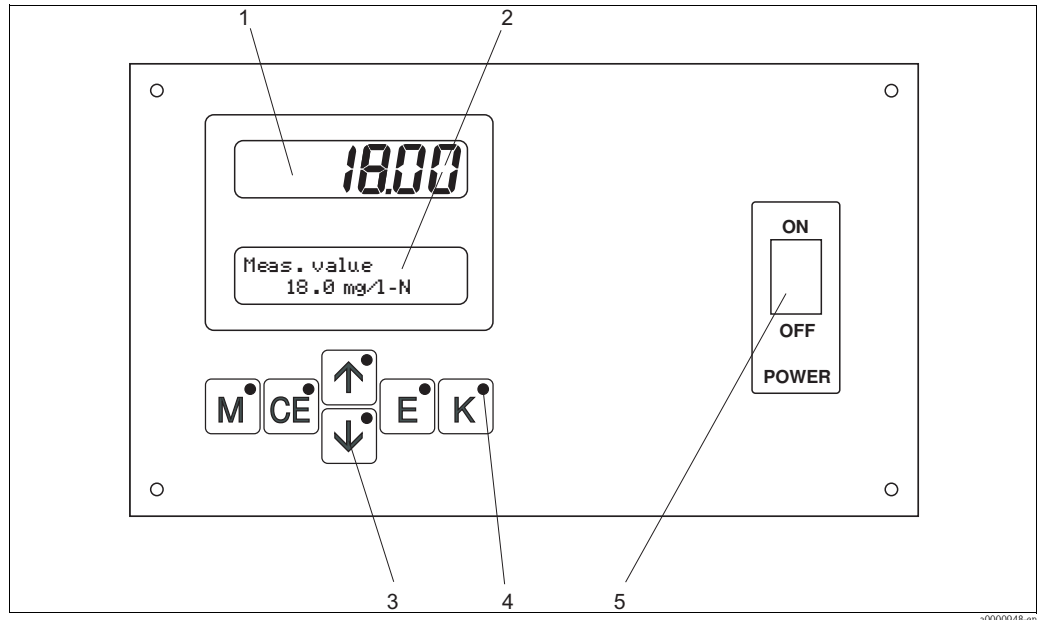


Fig. 15: Display and operating elements

- 1 LED (measured value)
- 2 LC display
- 3 Operating keys
- 4 Indicator LEDs
- 5 Mains switch

5.2 Local operation

The operating keys and the integrated indicator LEDs have the following functions:

Key	Key function	Indicator LED function
M	<ul style="list-style-type: none"> – “Auto measuring” option – back to the main menu from all sub-menus 	Alarm value 1 exceeded
CE	<ul style="list-style-type: none"> – backwards in the sub-menu (horizontal, see Appendix,) 	Alarm value 2 exceeded
↑	<ul style="list-style-type: none"> – backwards in the main menu (vertical) – increase value 	Measuring range exceeded
↓	<ul style="list-style-type: none"> – forwards in the main menu (vertical) – reduce value 	Measuring range undershot
E	<ul style="list-style-type: none"> – select option – adopt value, forwards in the sub-menu (horizontal) 	Retrieve error message
K	<ul style="list-style-type: none"> – selection in the sub-menu 	Unassigned

5.2.1 Main menu

Access the main menu by holding down the **M** key until “MEASURING” is displayed. For the main menu options and information about them, please see the following table.

Selection/display	Info
MEASUREMENT	<ul style="list-style-type: none"> ■ Acquiring and displaying: <ul style="list-style-type: none"> – the sensor signal – the analog current – the sensor frequency ■ Setting the alarm value switches ■ Displaying error messages
PARAMETER ENTRY	Setting the default values for: <ul style="list-style-type: none"> ■ Measuring ranges ■ Alarm values ■ Cleaning
CALIBRATION PTS	Defining the number of calibration points
CONCENTR. INPUT	Allocating the concentration values to the calibration points
FREQUENCY	Allocating the frequencies to the calibration points
CONFIGURATION	Setting the default values for: <ul style="list-style-type: none"> ■ Sensor type ■ Measuring unit ■ Correction factor ■ Analog output ■ Alarm values ■ Error message ■ Date, time
LANGUAGE	Selecting menu language
DIAGNOSTICS	Displaying error messages
SERVICE	<ul style="list-style-type: none"> ■ Manual measurement using a flash for service and test purposes ■ Manual triggering of the cleaning unit (optional)
DATA MEMORY	Last 340 measured values with the time of their storage. Only for service purposes.

5.2.2 MEASUREMENT



Note!

In the following table and in the tables in the next chapter, **example** images can be found for each option under "Display". However, individual numerical values in the images can differ from the actual settings.

The **actual factory settings** can be found in column 2 "Setting range / Factory settings" in bold.

Option	Setting range (factory settings bold)	Display	Info
LED display			For the first measurement, adjacent displays appear after switching-on. The same displays appear if an error situation has occurred after previous normal operation. In this case, the LED on the key is also lit. Go into the DIAGNOSTICS menu to access the error messages.
LC display			
Measured value	mg/l mg/l-N		Displays the unit depending on the sensor type selected in the CONFIGURATION menu. By pressing the key within 4 sec., you can switch between the measured value, analog output and measuring frequency during measuring.
Analog output	0/4.00 mA 20.0 mA		Displays the current value corresponding to the measured value
Measuring frequency	0 ... 5965 Hz		The LC display shows the measuring frequency depending on the sensor type selected in the CONFIGURATION menu. The LED display shows the corresponding measured value.


5.2.3 CONFIGURATION



Note!

Some settings that can be made in this menu affect the defaults in the PARAMETER ENTRY menu. In view of this, complete the CONFIGURATION menu first during initial start-up.

Option	Setting range (factory settings bold)	Display	Info
Code number	0 ... 99 0		To access the menu, enter the code "99" by pressing the key. If the incorrect code is entered, the program exits to the MEASUREMENT main menu.
Sensor type	NOx BS 0-30 NOx KW 0-60		Selection of your chosen sensor type. Selection is checked for plausibility, i.e. whether the selected sensor is identical to the connected sensor. BS = activated sludge application KW = clear water application
Measuring unit	mg/l mg/l-N		
Default setup = factory setting	yes no		To reset all parameters to their default, select "yes" by simultaneously pressing the keys and .
Correction factor	-25 ... +25% 0%		Linear correction factor of calibration curve at low fluctuation of waste water composition. Automatically set to "0" when factory setting is selected.

Option	Setting range (factory settings bold)	Display	Info
Mean value	1 ... 20 10	n mean value 10	Number of individual measured values that are used for calculating the arithmetic average before the measured value is displayed. This function is used for smoothing the daily curve.
Analog output	0 ... 20 mA 4 ... 20 mA	Analog output 4-20 mA	Selection of the current range, on which the measuring range should be mapped.
Alarm value A	Normally closed (NC) Normally open (NO)	Alarm A normally open	Setting the relay as NO or NC contact  Note! Changes to this setting will only be activated after switching the transmitter on and off.
Alarm value B		Alarm B normally open	
Diagnostic alarm		Diagnostic alarm normally open	
Date /time	01.01.00 00:00... 31.12.99 23:59	act. Date/Time 10.02.02. 11:38	You set up date and time during the first commissioning. The date format is DD.MM.YY hh:mm.

5.2.4 PARAMETER ENTRY

Option	Setting range (factory settings bold)	Display	Info
Measuring range start	0.00 ... 60 mg/l 0.20 mg/l	Range start 0.20 mg/l-N	Selectable concentration range assigned as a linear function to the analog output.
Measuring range end	0.00 ... 60 mg/l 30.0 mg/l	Range end 30.0 mg/l-N	
Alarm value A	0.20 ... 60 mg/l 12.0 mg/l	Alarm A setpoint 12.0 mg/l-N	Concentration switching values for the alarm relays. The switch hysteresis is 2% in each case. Alarm values can only be selected within the set measuring range.
Alarm value B	0.20 ... 60 mg/l 25.0 mg/l	Alarm B setpoint 25.0 mg/l-N	
Signal filter	0 ... 100 10	Signal filter 10	The signal filter indicates the number of light flashes per single measurement used to calculate the arithmetic average of the sensor signal.
1st measurement	01.01.00 00:00... 31.12.99 23:59 01.01.99 00:00	1. Measurement 01.01.99 00:00	Time of the 1st measurement (DD.MM.YY, time hh:mm). After every change the instrument does not wait for the measuring interval. If the measurement is to start immediately, set the time in the past (01.01.96 at the earliest).
Measuring interval	0 ... 120 min 0	Meas. interval 0 min	Time between two measurements. If a measuring interval = 0 min is selected, the sensor performs measurements without breaks.
Cleaning interval (optional)	0 ... 720 min 1 min	Clean. interval 1 min	Cleaning interval = 0 means cleaning is switched off.
Cleaning period (optional)	0 ... 600 s 15 s	Cleansing period 15 s	

5.2.5 CALIBRATION POINTS

Option	Setting range (factory settings bold)	Display	Info
Code number	0 ... 99 0	Code No. 0	To access the sub-menu, enter the code "99". If the incorrect code is entered, the program exits to the MEASUREMENT main menu.
Number of measuring points	1 ... 7 1	No. of points 1	Number of calibration points that should be used to form the calibration characteristic curve. The device is pre-calibrated before shipment.

5.2.6 CONCENTRATION INPUT

Option	Setting range (factory settings bold)	Display	Info
Code number	0 ... 99 0	Code No. 0	To access the sub-menu, enter the code "99". If the incorrect code is entered, the program exits to the MEASUREMENT main menu.
1st measured value	1 ... 7 1	1. Value 5.00 mg/l-N	Concentration value of the calibration measuring point to be allocated to the subsequent frequency.

5.2.7 FREQUENCY

Option	Setting range (factory settings bold)	Display	Info
Code number	0 ... 99 0	Code No. 0	To access the sub-menu, enter the code "99". If the incorrect code is entered, the program exits to the MEASUREMENT main menu.
Frequency	0 ... 5965 Hz 5312	1. Value [Hz] 5312	Frequency that is allocated to the previously entered concentration value. If you do not use the factory setting, enter the value measured in the laboratory.

5.2.8 LANGUAGE

The following languages are available:

- Deutsch
- English
- Français
- Svenska
- Suomi
- Nederlands
- Italiano
- Espanol
- Polski

5.2.9 DIAGNOSTICS



Note!

- This menu is a "read-only menu".
- You can find the individual error messages, their meaning and solutions to problems in chapter "Trouble-shooting instructions".
- If at least one error message is displayed for more than 10 s, the signal output is set to "fault".
- The current output holds the last measured value for as long as the error is displayed. Limit value alarms remain unchanged.
- The diagnostic alarm relay remains active as long as the error is present.

Option	Setting range (factory settings bold)	Display	Info
LED display	-		In the event of a malfunction or error situation, adjacent displays appear and the LED of the [E] key is lit. Go into the DIAGNOSTICS menu to access the error messages.
LC display	-		
Error messages	-		List of error messages see chapter "Troubleshooting"

5.2.10 SERVICE

Option	Setting range (factory settings bold)	Display	Info
Single measurement	-		Press [K] to trigger the single measurement. The frequency measured is displayed on the LC display. The single measurement is a function check. The displayed frequency cannot be stored in the data memory.
			After the single measurement, you can check the function of the cleaning unit. Use the [↑] or [↓] keys to switch the cleaning contact on or off.

5.2.11 DATA MEMORY

Option	Setting range (factory settings bold)	Display	Info
Measured value Date and time of measurement	-		Last 340 measured values with the time of their storage (DD.MM.YY hh:mm). If there are no values, "empty" appears. Within the data sets you move by the [↑] and [↓] keys.
Clear data	yes no		This deletes all data sets.
-	-		If you read this display, the data memory is empty.

6 Commissioning

6.1 Function check



Warning!

- Check that all connections are secure. In particular, ensure that all hose connections are secure, so that no leaks occur.
- Ensure that the power supply voltage corresponds to the voltage specified on the nameplate!

6.2 Switch-on and calibration

6.2.1 First commissioning



Note!

- Before switching the system on for the first time, familiarize yourself with the operation of the transmitter. For this, see the "Safety instructions" and "Operation" chapters.
- The sensor should be left in the medium for approx. 1 hour, so that it can adapt to the medium temperature.
- The transmitter has already been pre-configured at the factory and starts measuring automatically when switched on. Due to the different waste water composition, the media can vary greatly. Therefore, we recommend using an application-specific calibration for commissioning.

Action	Display
Switch the transmitter on.	
Press M .	MEASUREMENT
Press five times ↓ and once E .	CONFIGURATION
Press the ↓ key to set the "99" code and confirm with E .	Code No. 99
Use the ↓ or ↑ keys to select your sensor and confirm with E .	Type of sensor NOx BS 0-30
Use the ↓ or ↑ keys to select the desired unit of measure and confirm with E .	Unit of measure mg/l-N
Hold down the ↓ and ↑ keys simultaneously to activate the default setup for the selected sensor type. Note! The default setup is compulsory for initial start-up, in order to use the correct default calibration.	Default setup y: ↑+↓ n:E
Confirm the "Correction factor 0%" function with E .	Correct. factor 0%
Use the ↓ or ↑ keys to select the number of measured values for forming the mean value and confirm with E .	n mean value 10
Use the ↓ or ↑ keys to select the current output and confirm with E .	Analog output 4-20 mA

Action	Display
Use the \downarrow or \uparrow keys to select the configuration for alarm value A and confirm with E .	Alarm A normally open
Repeat the previous step for alarm value B.	Alarm B normally open
Select the configuration for the diagnostic alarm similar to the alarm value setting.	Diagnostic alarm normally open
Use the \uparrow , \downarrow and E keys to set the current date and time (DD.MM.YY hh:mm). Confirm with E .	act. Date/Time 10.02.02. 11:38
Press M .	MEASUREMENT
Press once \downarrow and six times E . Use the \uparrow , \downarrow and E keys to set the time of the 1st measurement (DD.MM.YY hh:mm). If the measurement is to start immediately, set the time in the past. Confirm with E .	1. Measurement 01.01.99 00:00
Press M . The system is ready for measurement now.	MEASUREMENT















6.2.2 One-point calibration



Note!


One-point calibration is only useful for the clear water sensor. If you are using an activated sludge sensor, perform a three-point calibration. See chapter "Three-point calibration".

Action	Display
Leave the sensor to rest in the medium for approx. 1 hour.	
Take a sample in the direct vicinity of the sensor. Write down the sensor frequency displayed at the time of sampling. To do so, press M . Then press E three times within 4 sec. to display the sensor frequency.	Frequency 4836 Hz
Determine the nitrate content of your sample in the laboratory.	
Press M .	MEASUREMENT
Press twice \downarrow and confirm with E .	CALIBRATION PTS
Press the \downarrow key to set the "99" code and confirm with E .	Code No. 99
Use the \downarrow key to set the number of measuring points to "1". Confirm with E .	No. of points 1
Press M .	MEASUREMENT
Press three times \downarrow and confirm with E .	CONCENTR. INPUT
Press the \downarrow key to set the "99" code and confirm with E .	Code No. 99

Action	Display
Use  or  to set the 1st measured value to the laboratory value. To set the last digit, use  or  and simultaneously keep the  key pressed. After the complete value is input, confirm with  .	<div style="border: 1px solid black; padding: 5px; text-align: center;"> 1. Value 5.00 mg/l-N </div>
Press  .	<div style="border: 1px solid black; padding: 5px; text-align: center;"> MEASUREMENT </div>
Press four times  and confirm with  .	<div style="border: 1px solid black; padding: 5px; text-align: center;"> FREQUENCY </div>
Press the  key to set the "99" code and confirm with  .	<div style="border: 1px solid black; padding: 5px; text-align: center;"> Code No. 99 </div>
Use  or  to set the previously noted sensor frequency value.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> Frequency 4836 Hz </div>
Press  . The one-point calibration is now completed.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> MEASUREMENT </div>

6.2.3 Three-point calibration

A one-point calibration is not useful for the activated sludge sensor. Therefore, carry out a three-point calibration:

1. Take three samples at three times of different nitrate concentration and note down the displayed frequency at the time of sampling.
 -  **Note!**
The concentrations must differ by 1 mg/l at minimum.
2. Determine the nitrate content of the samples in the laboratory.
3. Enter the value pairs of determined concentrations and noted frequencies (in order of increasing or decreasing concentrations):
 - a. Proceed as with the one-point calibration (see above).
However, enter "3" instead of "1" for the number of measuring points in the CALIBRATION POINTS menu .
 - b. Enter three concentrations in the CONCENTR. INPUT menu.
 - c. Enter the three frequency values accordingly.
 - d. After entering the last frequency, return to the measuring mode.
The calibration is then finished.



Note!

It is recommended to create a data table for the values.

7 Maintenance

The measuring system does not contain any wear parts and generally requires little maintenance.

However, you should still carry out the following maintenance work to ensure perfect functionality:


- Cleaning the sensor
- Calibration
- Checking cables and connections



Caution!

- Make sure the sensor measuring windows can not be damaged, e.g. by cleaning the measuring channels with sharp, hard objects.
- Only the manufacturer's staff may open the sensor, otherwise any warranty claims are rendered null and void.
- For all maintenance work on the device or sensor, observe possible effects on the process control or the process itself.
- Repairs **not described** in these Operating Instructions may only be carried out directly by the manufacturer or by the service organization.

7.1 Maintenance schedule

Period	Duty	Note
Weekly	– Clean sensor (measuring slit)	– Put a paper tissue into the measuring slit. – Soak with cleaning agent (see following chapter). – Allow to react for 10 to 30 min, then remove tissue.
Monthly	– Clean sensor (measuring slit) – Calibrate	– Clean optical window with ultrafiltration cleaner, where possible. – Check calibration and, if necessary, recalibrate.
Yearly	– Function check	– Check battery backup (service life approx. 5 years). – Check cables and connections.  Note! The yearly functional test is an integral part of the maintenance contract, which you can arrange with your local service organization.
Approx. every 2 years	– Function check and maintenance by the manufacturer	This service comprises: – Complete sensor check – Cleaning of the optical unit – Replacement of all wear parts and seals where necessary – New factory calibration

7.2 Cleaning agents

The appropriate cleaning agent depends on the type of soiling. The most frequent soilings and their associated cleaning agents are listed in the following table:

Type of soiling	Cleaning agent
Large residues	Cloth
Greases and oils	Agents containing detergents (alkaline) or water-soluble organic solvents (e.g. ethanol)
Lime deposits, metal hydroxide coatings, heavy biological coatings	Approx. 3% HCl or Ultrafiltration cleaner, but never together with acid!
Sulfide deposits	Mixture of hydrochloric acid (3 %) and thiocarbamide (usual commercial) or Ultrafiltration cleaner, but never together with acid!
Protein coatings	Mixture of hydrochloric acid (0.1 molar) and pepsin (usual commercial) or Ultrafiltration cleaner, but never together with acid!
Light biological coatings	Pressurized water or Ultrafiltration cleaner, but never together with acid!



Caution!

Do not use halogenated organic solvents and no acetone. These solvents may destroy plastic components of the sensor and are suspected to cause cancer (e.g. chloroform).

7.3 Checking cables and connections

Check the cables and connections according to the following checklist:

- Check sensor cable for integrity, in particular the outer insulation.
- If you are using a junction box: the box must be dry and clean inside. Moist dehydrating bags must be replaced.
- Tighten the terminals in the box.
- Tighten the terminals in the device. Also check here whether the interior and terminals are clean, dry and free of corrosion (if not: check seals and screw connections for leak-tightness and integrity).
- Cable screens must be connected exactly according to the wiring diagram. Screens that are not connected or incorrectly connected can compromise the device's immunity to interference.

8 Accessories

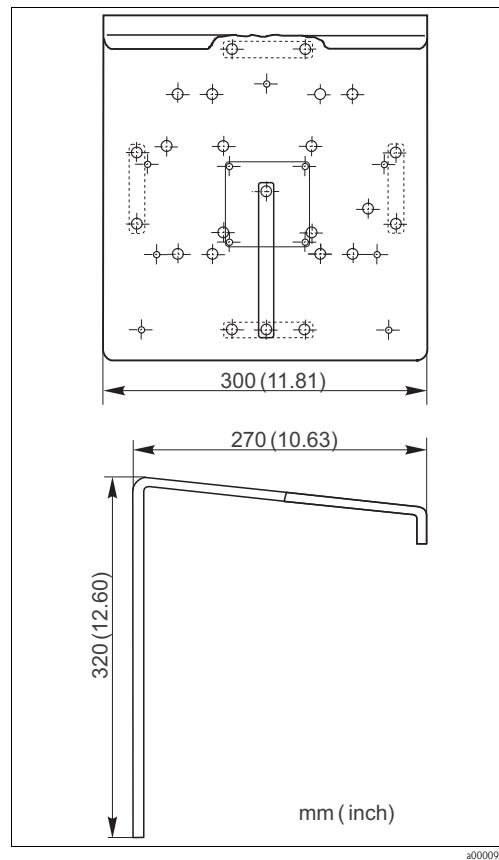


Fig. 16: Weather protection cover CYY101

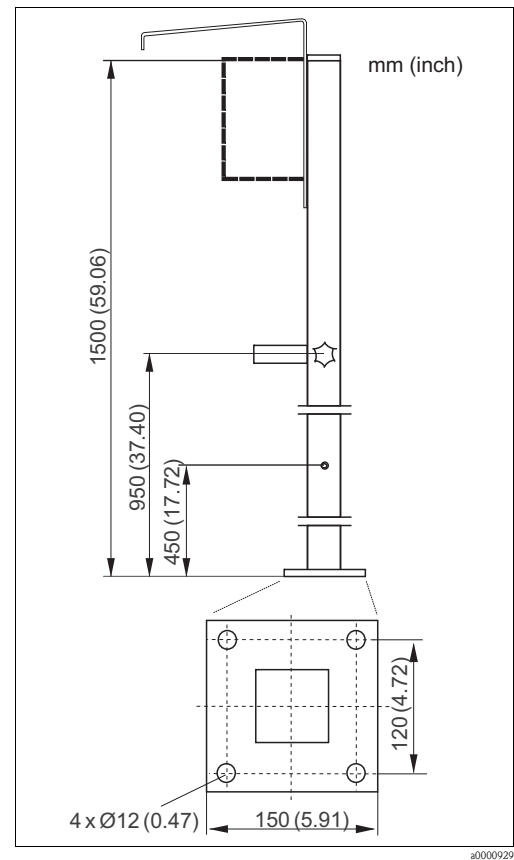


Fig. 17: Round post mount CYY102

- Weather protection cover CYY101, for field mounting of the transmitter; order no. CYY101-A
- Round post mount CYY102, for weather protection cover mounting to vertical or horizontal pipes; order no. CYY102-A
- Immersion assembly, offset 45° length 2 m; order no. 51511771
- Immersion assembly, straight length 2 m (6.56 ft); order no. 51502959 length 3 m (9.84 ft); order no. 51502960 special length; order no. 50066036
- Wall bracket for sensor; order no. 51508576
- Pendulum frame for sensor; wall spacing 250 mm (9.84"); order no. 51502962 special version; order no. 50066036
- Compressor attachment; order no. 51505419

- Cleaning unit,
230 V; order no. 51504764
115 V; order no. 51504765

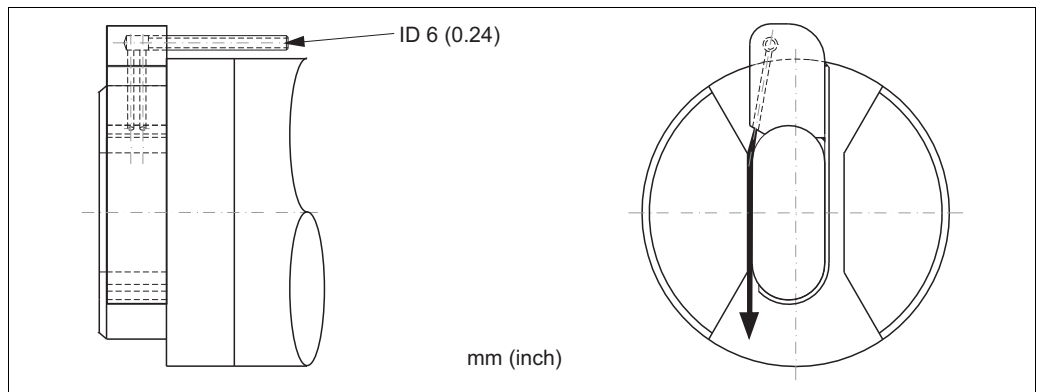


Fig. 18: Cleaning unit for sensor

- Extension cable,
cable length 10 m (32.8 ft), with plug and coupling;
order no. 51502953
- Plug,
7-pin plug, IP 67;
order no. 51502954
- Coupling;
order no. 51502955
- Control line,
50 m (164 ft), 6 x 0,34;
order no. 51503015
- Sensor terminal housing,
for cable extension from transmitter to sensor;
order no. 51502956

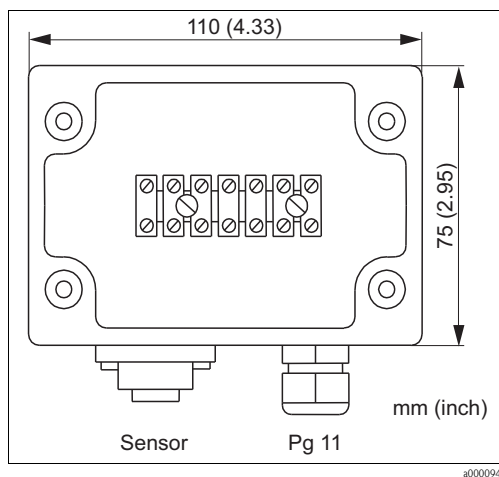


Fig. 19: Sensor terminal housing

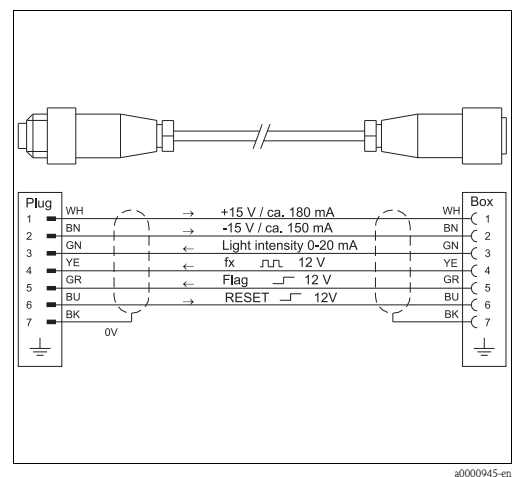


Fig. 20: Sensor connection to sensor terminal housing

- Flow assembly for drinking water application,
with reduction of the dead volume, stainless steel 1.4571 (AISI 316 Ti) / PVDF;
order no. 51509332
- without reduction of the dead volume, stainless steel 1.4571 (AISI 316 Ti) / PVDF;
order no. 51509333

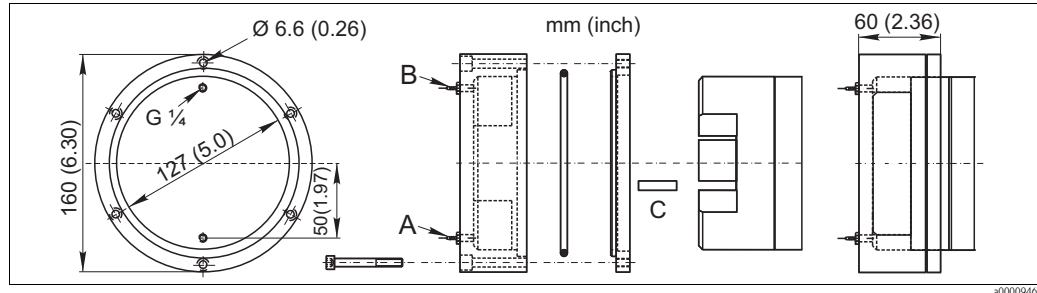


Fig. 21: Flow assembly

- A Hose connection inlet
ID 1.6 mm (with dead volume reduction)
ID 6.4 mm (without dead volume reduction)
- B Hose connection inlet
ID 1.6 mm (with dead volume reduction)
ID 6.4 mm (without dead volume reduction)
- C Split pin for dead volume reduction

- Flow vessel,
open version; with inlet and outlet
order no. 51515762

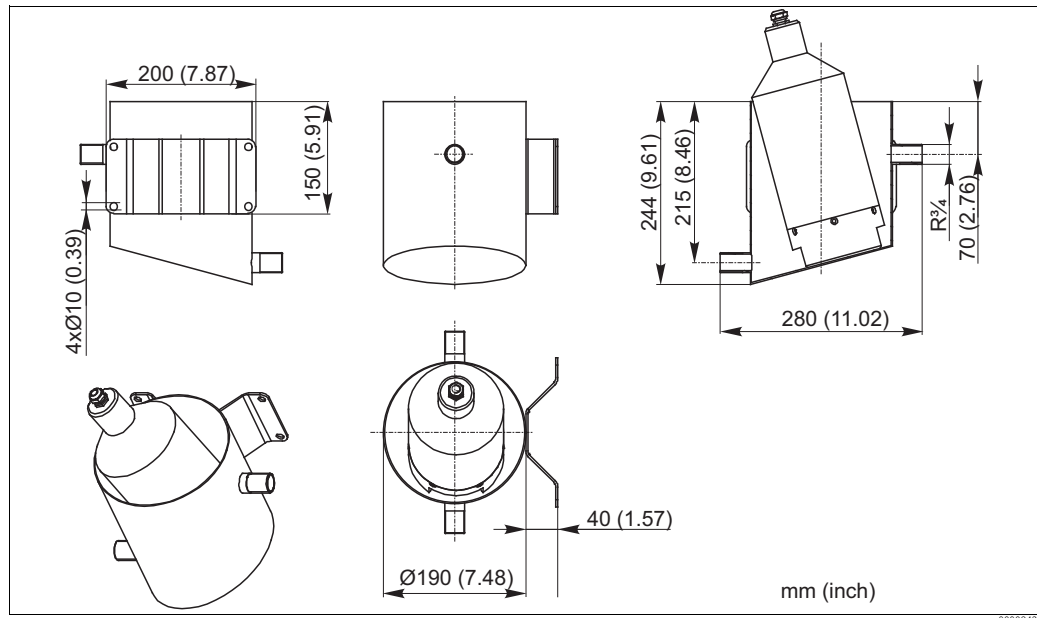


Fig. 22: Flow vessel

- Flow assembly, without external rinsing
 - with dead volume reduction and overpressure protection, order no. 51515803
 - without dead volume reduction, with overpressure protection; order no. 51515804
 - PVDF, without dead volume reduction, with stop valves and overpressure protection,
order no. 51515765
 - PVC, without dead volume reduction, with stop valves and overpressure protection;
order no. 51515769

- Flow assembly, with external rinsing
 - external switched valve needed, inlet DN10, outlet 3/4", PVDF
 - for 2 mm (0.08") slit, order no. C-A050128-10
 - for 8 mm (0.31") slit, order no. C-A041217-11
 - for 40 mm (1.57") slit, order no. C-A041122-11
 - external switched valve, order no. C-A050110-10

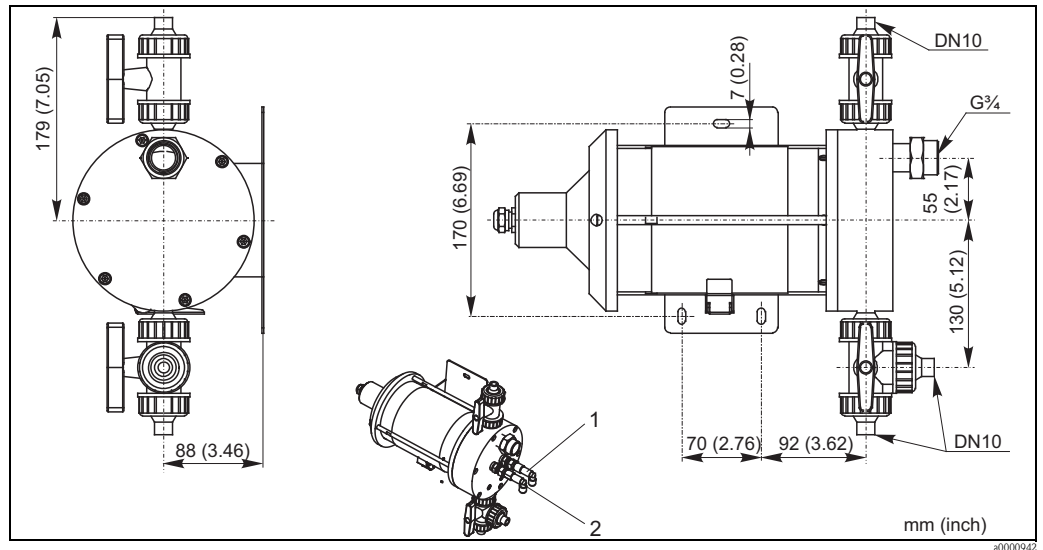


Fig. 23: Flow assembly (all versions)

- 1 with external rinsing only, 2 mm (0.08"), 8 mm (0.31") and 40 mm (1.57") slit
- 2 with external rinsing only, 40 mm (1.57") slit only

9 Troubleshooting

9.1 System error messages

Error message	Error frequency	Possible cause	Measures
Incorrect sensor type	----	Connected sensor does not correspond to the sensor selected in the CONFIGURATION menu	<ul style="list-style-type: none"> ■ Replace sensor ■ Correct sensor type in the CONFIGURATION menu
No sensor signal	0 Hz	Transmitter is not receiving a frequency signal from the sensor, e.g. due to a cable break	<ul style="list-style-type: none"> ■ Check electrical connection ■ Service
Light intensity	205 Hz	<ul style="list-style-type: none"> ■ Sensor outside of the medium ■ Incorrect sensor type, e.g. activated sludge sensor in clear water 	<ul style="list-style-type: none"> ■ Check mounting location ■ Check application ■ Check sensor type
Sensor soiled	305 Hz	Sensor's measuring window soiled	Clean sensor
Organic loads	405 Hz	Organic cross-sensitivity (suspended particles, light-absorbing organic substances in water) falsifies the measured value	<ul style="list-style-type: none"> ■ Clean sensor ■ Check application
Concentration too high	505 Hz	End of measuring range exceeded	Check measuring range and sensor type

9.2 Replacing the device fuse



Warning!
Danger to life!

- Disconnect the device from the mains before opening it.
- Check the isolation from supply and secure the switch against unintentional reactivation.
- If work under voltage is required, it must only be carried out by a trained electrician, a second person must be present for safety reasons.
- Switching contacts can be supplied by separate electric circuits. Switch the voltage to these electric circuits off as well before you work on the terminals.



Caution!

Danger for components through electrostatic discharge (ESD)

- Electronic components are susceptible to electrostatic discharge. Protection measures such as prior discharging of the operator to PE or permanent grounding of the operator with wrist strap are required. Particularly dangerous: plastic floors at low humidity and plastic clothing.
- For your own safety, only use genuine spare parts. Function, accuracy and reliability, also after repairing, are only guaranteed with original parts.

Only use the following fuses:

- 80 to 250 V AC connection: 5 x 20 mm, time-lag, 500 mA fine-wire fuse
- 24 V DC / AC connection: 5 x 20 mm, time-lag, 2 A fine-wire fuse

Other fuses are not permitted!

9.3 Return

If the sensor or the transmitter has to be repaired, please return it *cleaned* to the sales center responsible. Please use the original packaging, if possible.

Please enclose the completed "Declaration of contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents.
No repair without completed "Declaration of contamination"!

9.4 Disposal

The device contains electronic components and must therefore be disposed of in accordance with regulations on the disposal of electronic waste.
Please observe local regulations.

10 Technical data

10.1 Input

Measured variable	NO ₃ -N [mg/l], NO ₃ [mg/l]
Measuring range	Clear water 0.2 to 60 mg/l NO ₃ -N or 0 to 260 mg/l NO ₃ Activated sludge ¹⁾ 0.2 to 30 mg/l NO ₃ -N or 0 to 130 mg/l NO ₃
Wave length	Nitrate absorbance maximum

1) Please observe the notes on the interferences.

10.2 Output

Output signal	0/4 to 20 mA, galvanically separated
Signal on alarm	2 limit contacts, 1 alarm contact
Load	max. 500 Ω
Switching capacity of the contacts	230 V AC / 2 A, 30 V DC / 1 A
Serial interface	RS 232 C, slot for bus extension (for internal purposes only)

10.3 Power supply

Supply voltage	80 to 250 V AC ±10%, 50/60 Hz 24 V AC/DC
Power consumption	max. 15 VA

10.4 Performance characteristics

Response time t₉₀	≥ 60 s, selectable
Maximum measured error	2 % of upper range value or ± 0,1 mg/l with clear water resp. ± 0,3 mg/l with activated sludge, depending on which is the higher value
Repeatability	0.5 % (with homogeneous media)
Measuring interval	≥ 40 s, selectable

10.5 Environment

Ambient temperature	-10 to 50 °C (14 to 122 °F)
Ingress protection	Sensor, up to 1 bar (14.5 psi): IP 68 Transmitter: IP 65 Cleaning unit (compressor): IP 54

10.6 Process

Medium temperature	2 to 40 °C (36 to 104 °F)
Medium pressure	max. 1 bar (14.5 psi)
Solid content	Activated sludge sensor ¹⁾ 2.5 g/l to < 8 g/l Clear water sensor < 2 g/l

1) Please observe the notes on the interferences.

10.7 Mechanical construction

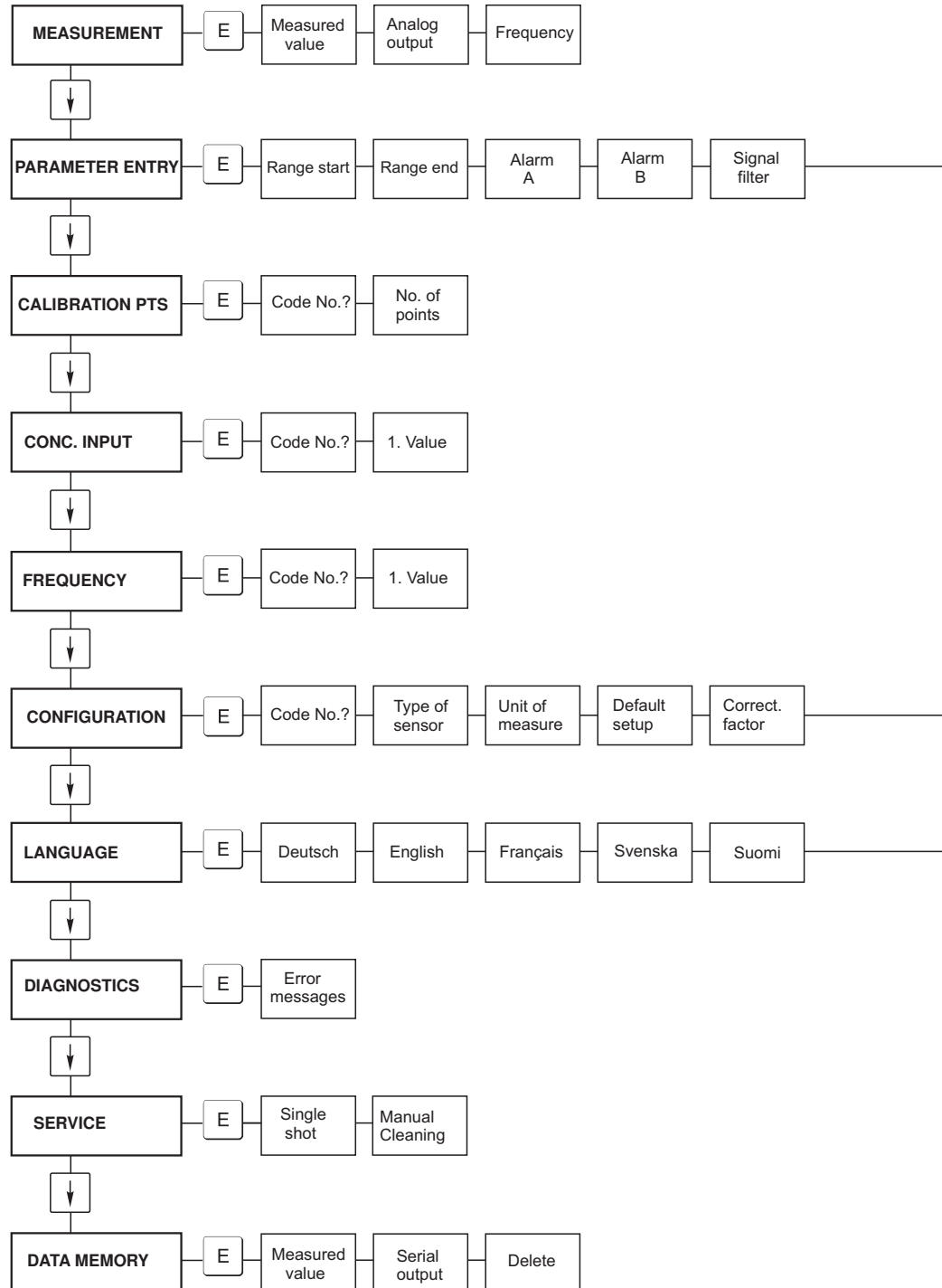
Design, dimensions	see chapter "Installation"	
Weight	Transmitter Sensor	approx. 1.6 kg (3.5 lb) approx. 5 kg (11 lb)
Materials	Sensor head Optical sensor windows Sensor housing	Stainless steel 1.4571 (AISI 316 Ti) Quartz glass POM
Process connection	Sensor head G1½	
Cable specification	Cable length: Cable extension:	2 m (6.6 ft), 5 m (16.4 ft), 7 m (23 ft) or 15 m (49.2 ft) (cable with plug) up to 200 m ¹⁾ (656 ft) (with sensor connection box, s. accessories) up to 50 m ²⁾ (164 ft) (with sensor connection box, s. accessories)
Cleaning unit	Maximum length of air line tubing:	15 m (49.2 ft)

1) with CNM750/CNS70

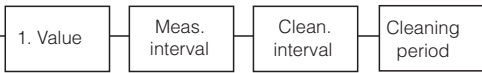
2) with CSM750/CSS70

11 Appendix

11.1 Operating matrix



a0001046-en



a0001047-en

11.2 Control for a customer-specific cleaning unit

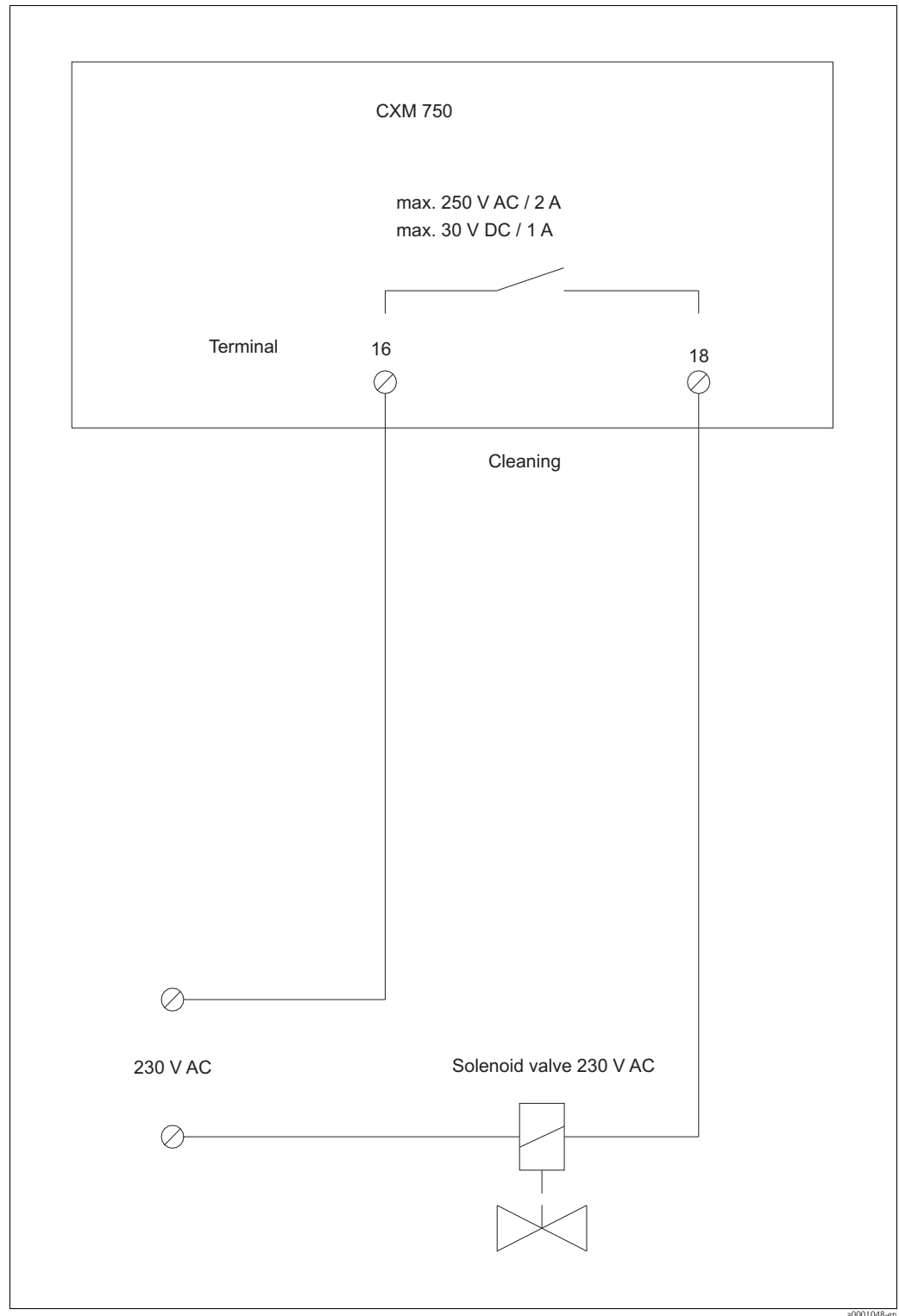


Fig. 24: Example 1

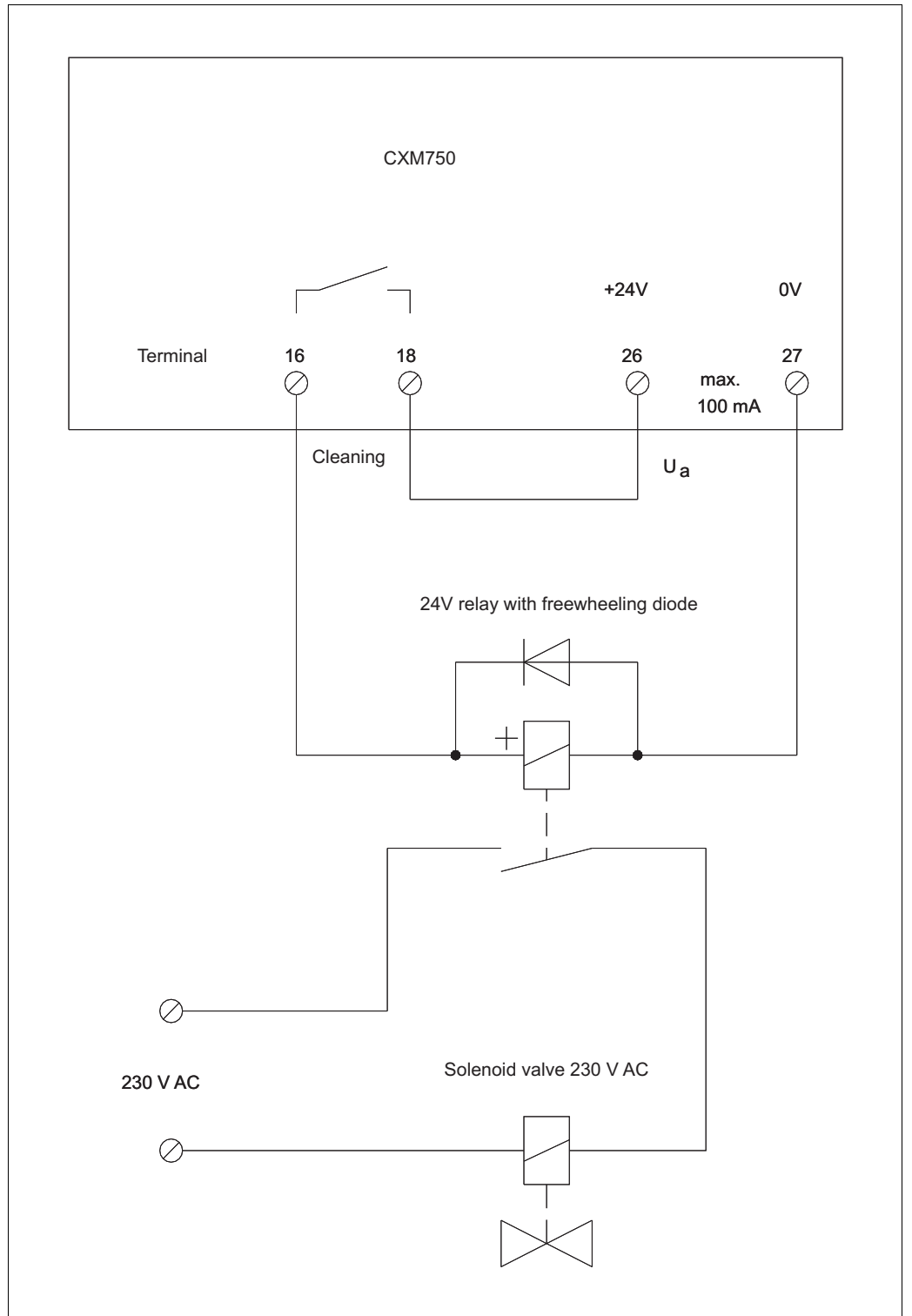


Fig. 25: Example 2

a0001049-en

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Declaration of Hazardous Material and De-Contamination Erklärung zur Kontamination und Reinigung

RA No.

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.
Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor

Geräte-/Sensortyp _____

Serial number

Seriennummer _____

Used as SIL device in a Safety Instrumented System / Einsatz als SIL Gerät in Schutzeinrichtungen

Process data / Prozessdaten

Temperature / Temperatur _____ [°F] _____ [°C] Pressure / Druck _____ [psi] _____ [Pa]
Conductivity / Leitfähigkeit _____ [µS/cm] Viscosity / Viskosität _____ [cp] _____ [mm²/s]

Medium and warnings

Warnhinweise zum Medium



	Medium /concentration Medium /Konzentration	Identification CAS No.	flammable entzündlich	toxic giftig	corrosive ätzend	harmful/ irritant gesundheitsschädlich/ reizend	other * sonstiges*	harmless unbedenklich
Process medium Medium im Prozess								
Medium for process cleaning Medium zur Prozessreinigung								
Returned part cleaned with Medium zur Endreinigung								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive

* explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.

Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / Fehlerbeschreibung _____

Company data / Angaben zum Absender

Company / Firma _____	Phone number of contact person / Telefon-Nr. Ansprechpartner: _____
Address / Adresse _____	Fax / E-Mail _____
_____	Your order No. / Ihre Auftragsnr. _____

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge. We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

(place, date / Ort, Datum)

Name, dept./Abt. (please print / bitte Druckschrift)

Signature / Unterschrift

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