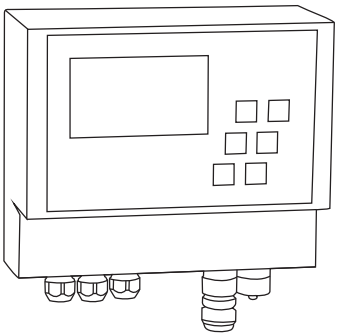
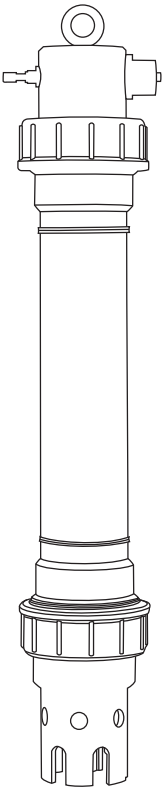
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

ISEmax CAM40/CAS40

Ion-selective electrode system





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People for Process Automation

Table of contents

1 Safety instructions

1.1 Designated use

The ion-selective electrode system is designed for measuring tasks in the activated sludge basin and the inlet of the activated sludge basin of municipal sewage treatment plants.

The following parameters can be monitored depending on the device version:
- Nitrate
- Ammonium
- Potassium (to compensate ammonium)
- Chloride (to compensate nitrate)
- pH value

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 sensor has been designed and tested according to the state of the art 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.

1.4 Return

The CAM40 or CAS40 is repaired on site.
Contact your Endress+Hauser Service.

1.5 Notes on safety icons and symbols

Warning!
This symbol alerts you to hazards. They 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.

1.6 Cross references and other symbols

 This symbol indicates a cross reference to a defined page (e.g. p. 1).

 This symbol indicates a cross reference to a defined figure (e.g. fig. 2).

 Additional information, tips

 Permitted or recommended

 Forbidden or not recommended

 An explanatory video-clip for the topic in question is provided on the original CD.

2 Identification

2.1 Device designation

2.1.1 Nameplate

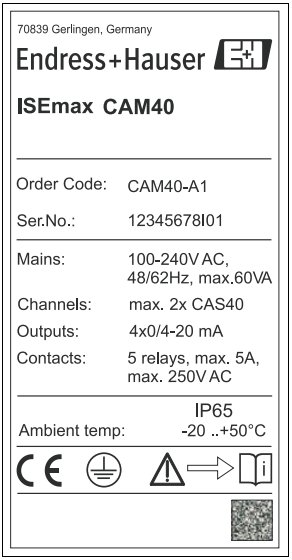


Fig. 1: Example for CAM40

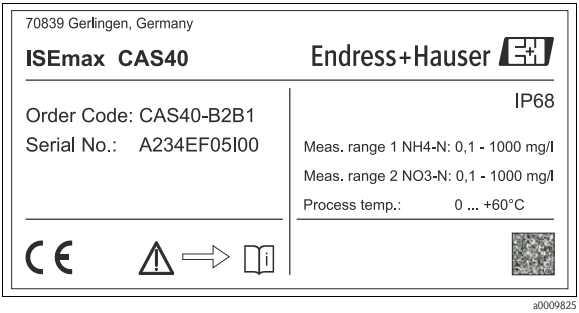


Fig. 2: Example for CAS40

2.1.2 Product structure

CAM40 transmitter

	Power supply		
	A		100 - 240 VAC; 50/60 Hz
		Signal output	
		1	4 x 0/4 - 20 mA
CAM40-			Complete order code

CAS40 sensor

	Application				
	A	Aeration basin, nitrification, denitrification, with reference electrode			
	B	Inlet aeration basin, with pH compensation (only ammonium)			
		Ion-selective parameter			
		1	Ammonium + nitrate		
		2	Ammonium		
		3	Nitrate		
			Compensation electrode		
			A	None	
			B	Potassium (Ion-selective parameter="1" or "2" only)	
			C	Chloride (Ion-selective parameter="1" or "3" only)	
				Cable length	
				1	10 m (33 ft)
				9	Special version, to be specified
CAS40-					Complete order code

2.2 Scope of delivery

The scope of delivery comprises:
- 1 transmitter
- 1 sensor (version as per nameplate)
- 3 screws for fastening to the weather protection cover
- 1 set of Brief Operating Instructions
- 1 set of Operating Instructions on CD-ROM

If you have any questions, please contact your supplier or your local sales center.

2.3 Certificates and approvals

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.

3 Installation

3.1 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.

3.2 Installation conditions

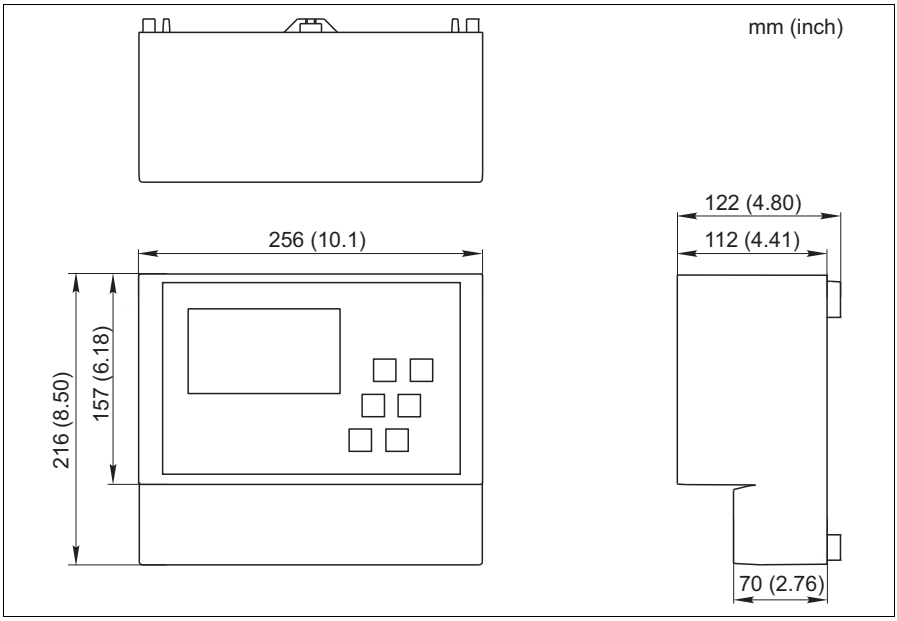


Fig. 3: CAM40 dimensions

Note!
Please refer to the original drawing of the housing for other dimensions, such as that of the rear housing panel with the suspension grooves (—> pdf file on the CD for the BA).

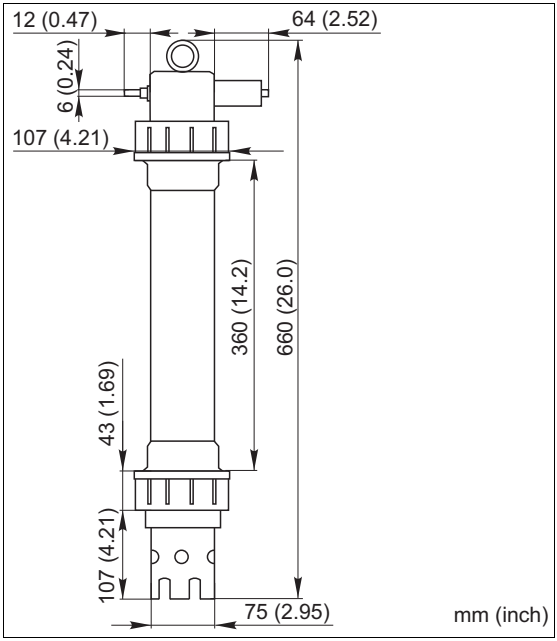


Fig. 4: CAS40 dimensions

3.3 Installation instructions

Caution!

- The reference electrode or the optional pH electrode are supplied with a protection cap. If you remove the sensor from the medium for an extended period (> 20 min.), you have to put the protection cap, which is filled with 1-3 M KCl solution, back onto the reference electrode or pH electrode. In this way, you avoid irreparable damage resulting from the unit drying out.
- The ion-selective electrodes do not have a protection cap and should never be fitted with such a cap since removing the cap would damage the membrane.
- The compressed air supply should not exceed 3.5 bar (50 psi) as this could damage the relay.
- The compressed air must be supplied through an air filter (5 µm). This filter is already installed in the optional cleaning unit (—> Accessories).

Note!

- Select a measuring place that is easily accessible so that no hazards for operating staff can occur.
- Select a measuring place with representative concentration levels and sufficient flow.
- If mounting the transmitter outdoors, you must use a weather protection cover which you can order as an accessory.

Installing at the measuring point

1. Secure the transmitter to an upright post, a railing or a wall.


2. **Air bubbles**
Air bubbles can form in the electrodes after transporting the sensor or if the sensor is stored in a horizontal position. These air bubbles cause measuring errors.
   a. Before installing the sensor, eliminate any air bubbles by gently shaking the unit for example.
   b. Then make sure to only hold the sensor in an upright, vertical position (electrodes pointing downwards) until the sensor is installed at the measuring point.

3. Where necessary, install additional electrodes into the sensor and connect them to the suitable cable connector. —> "Wiring"
In addition, adapt the sensor configuration (number of parameters, address of the measuring channel, electrode type, measuring unit). —> "Commissioning/Addressing the sensor" and "Operation/Sensor data/Sensor menu"

4. Mount the sensor using the optional bracket. The sensor has to be immersed in the medium up to the thread adapter nut and be at a distance of approx. 0.5 m (1.64 ft) from the basin rim.


5. Route the cables in such a way that no mechanical damage or interference influences can arise from other cables.

6. Connect the optional cleaning unit to the transmitter and the pressurized hose (OD 8) to the sensor.


3.4 Installation example

A complete measuring system comprises:
- CAM40 transmitter
- CAS40 sensor
  - Ion-selective electrode(s) for ammonium and/or nitrate
  - Reference electrode
  - Ion-selective electrode for compensating cross-interference
  - pH glass electrode

Optional
- Upright post with boom
- Wall retainer
- Weather protection cover – absolutely essential if mounting the transmitter outdoors!
- Compressed air generator (if no compressed air is available on site)

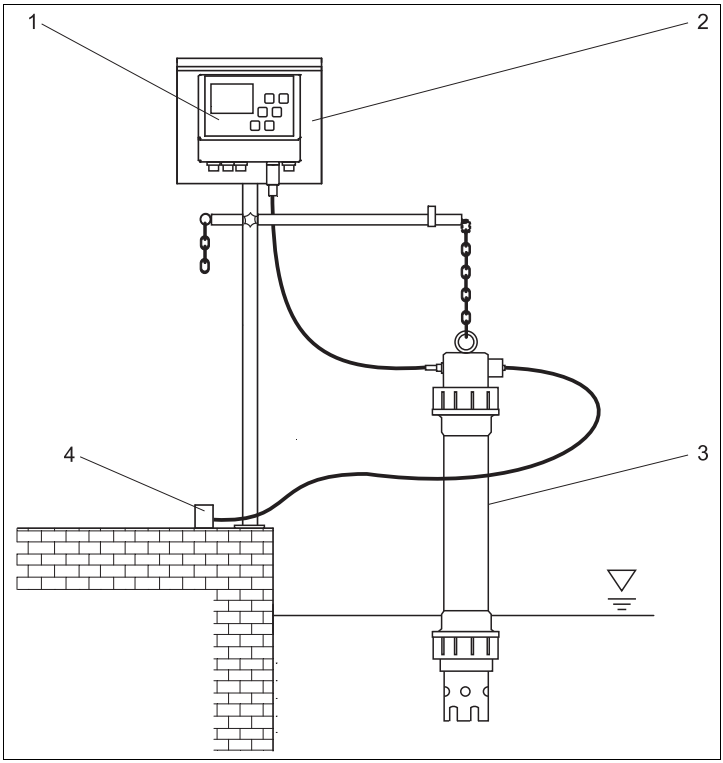


Fig. 5: Example: measuring system on basin rim

1	*CAM40 transmitter*	*3*	*CAS40 sensor*
2	*Upright post with weather protection cover*	*4*	*Compressed air supply (cleaning)*

3.5 Post-installation check

- After mounting, check all the connections to ensure they are secure and leak-tight.
- Check all cables and hoses for damage.
- Check whether the cables are routed such that they are free from electromagnetic interference influences.

4 Wiring

⚠ 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.

4.1 Electrical connection to the transmitter

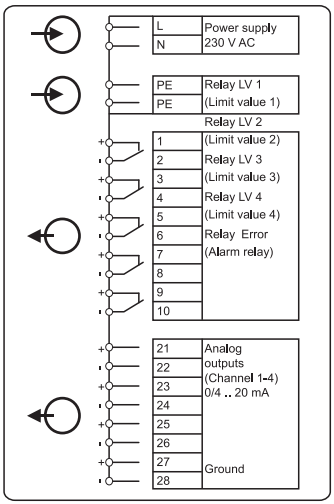


Fig. 6: CAM40 wiring diagram

Terminal	Assignment
L1, N	230 V AC power supply
1, 2	Relay 1, max. 230 V AC, 2 A
3, 4	Relay 2, max. 230 V AC, 2 A
5, 6	Relay 3, max. 230 V AC, 2 A
7, 8	Relay 4, max. 230 V AC, 2 A
9, 10	Relay 5, max. 230 V AC, 2 A
21, 22	Analog output 1
23, 24	Analog output 2
25, 26	Analog output 3
27, 28	Analog output 4
PE, PE	Protective earth
	✎ Note! A compressor can optionally be controlled to terminals 9 and 10. In such instances, relay 5 is no longer available.

4.2 Sensor connection

Connect the sensor(s) directly to the transmitter via the cable connector.

- You can connect a maximum of 2 sensors to CAM40.
- You can install a maximum of 3 electrodes in every sensor. However, a maximum of only 4 measuring parameters can be displayed and output at the transmitter.
- Compressed air is supplied to two sensors by means of a common cleaning unit.

Sensor/parameter combinations when using two sensors (examples!):

Sensor	Version 1	Version 2	Version 3
Sensor 1	■ Ammonium ■ Potassium (compensation)	■ Ammonium ■ Potassium (compensation)	■ Ammonium (no compensation) ■ pH
Sensor 2	■ Nitrate ■ Chloride (compensation)	■ Ammonium (no compensation) ■ Nitrate (no compensation)	■ Nitrate ■ Chloride (compensation)

Electrode connection in the sensor:

Electrode	Color of the screw head	Color of the membrane cap	Cable label
Ammonium	RD	RD	1
Nitrate	BU	GY	2
Potassium	YE	BK	3
Chloride	BK	BK	3
Reference	-	-	GN/YE
pH	-	-	2 or 3 (depending on version)

Caution!
Free cable ends always have to be provided with a protection cap (—> "Spare parts"). Otherwise, moisture may cause short-circuits.

4.3 Optional cleaning unit connection

1. Connect the cleaning unit to the CAM40 transmitter by applying the voltage L1 to terminals 9 and 10 (relay 5).

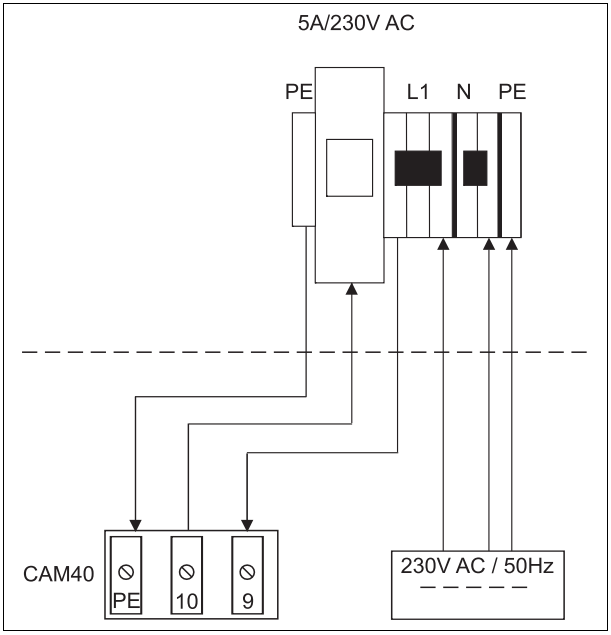


Fig. 7:

2. Go to the "General data" menu (–> "Operation/Operating structure").
3. Scroll to the third page with MENU.
   If the cursor is disabled, enable it by pressing ↵ + MENU simultaneously.
4. Scroll to the "Menue" item with ▼.
5. Select the "ValveMnu" function (↵ –> ▼ –> ↵).
6. Under the "Water" function in the ValveMnu menu, configure the value **04096**.
7. Exit the ValveMnu by selecting "MainMnu" under "Menue" (↵ –> ▼ –> ↵).
8. From the main menu, you can go back to the "General data" display with MENU.

4.4 Post-connection check

Checks	Notes
Is the supply voltage correct?	100 to 240 V DC
Are the installed cables strain-relieved and not twisted?	
Are all the cable entries installed, firmly tightened and leak-tight?	

5 Operation

5.1 Display and operating elements

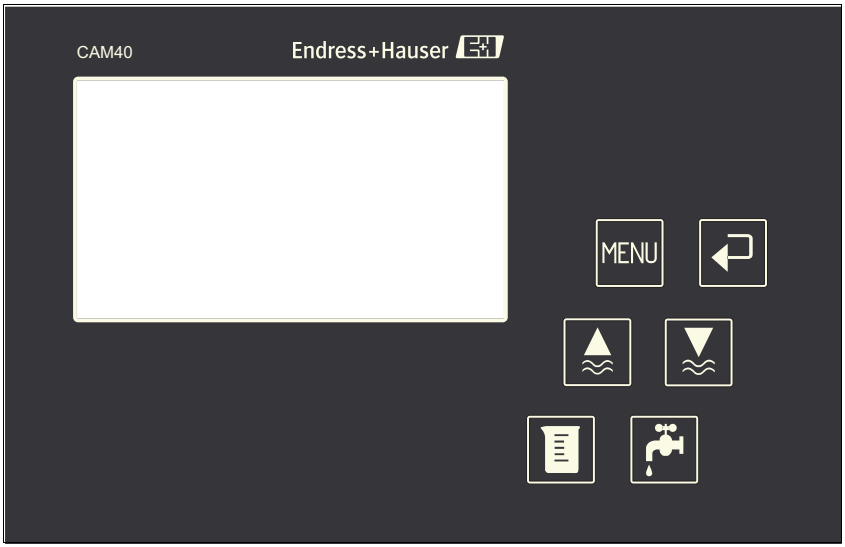


Fig. 8: ISEmax CAM40 display

MENU *Call up the menu functions*

Confirm, switch, scroll

"Freeze" (hold) the output signals

Measure + release the output signals

Call up calibration routines

Trigger manual cleaning

5.2 Operating concept

Call up a menu	MENU
Call up the editing mode	+ MENU
Navigate in the menu	,
Scroll	MENU
Select function/position	
Change position/value	,
Save the settings	Cursor on "Menu", twice

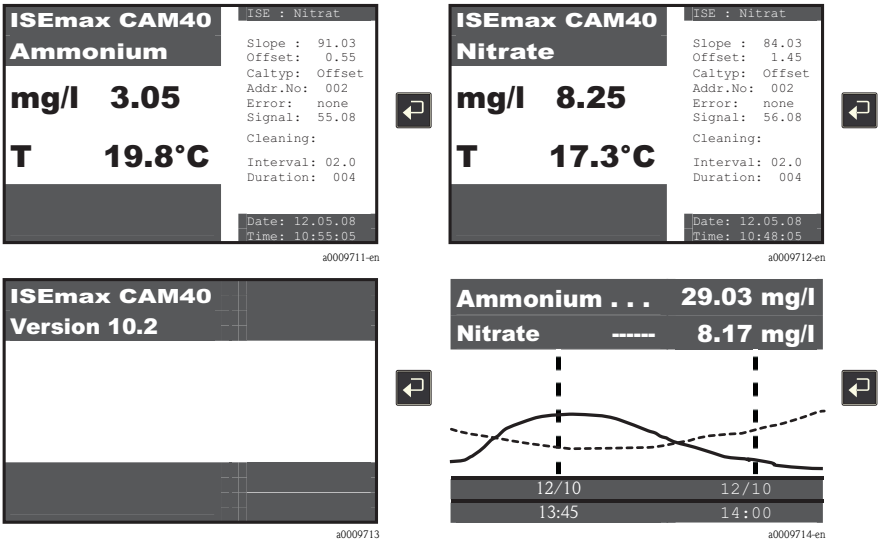
You have to wait 10 minutes before the settings are saved automatically to the EEPROM. If you want to save your changes immediately, you have to select "Save data" under "Display/change" in the "Sensor data" main menu. Otherwise, the changes are lost if you switch off the device before 10 minutes have elapsed.	
Exit the menu	MENU

Characters available for user-defined fields:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
	W	X	Y	Z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
	s	t	u	v	w	x	y	z		!	"	#	$	%	&	'	(	)	*	+	,	-
	.	/	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?	@			

5.3 Local operation

5.3.1 Measuring channels and other displays



You can change the measuring channel displayed and other displays by pressing the ↵ key.

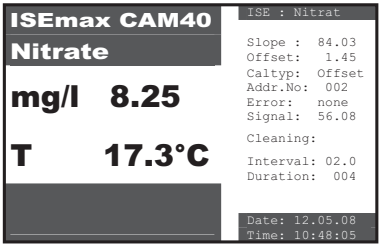
Note!
The factory settings are highlighted in bold in the following tables.

5.3.2 Sensor data

Note!
This menu is available for every measuring channel. You have to make the settings separately for each individual measuring channel (=electrode).
Since the functions are the same, the menu is only explained once here.

Main menue

Switch to the measuring channel you want to configure, e.g. nitrate:



The MENU key takes you to the "Sensor data" main menu.

Function	Configuration options	Description
Name Addr:xx[1)]	User-defined text	Enter a tag name.
Sensordata		
Slope	0.00 to 100%	Relative slope in relation to the nominal value 59.1 mV, at 25 °C (77 °F)
Offset	-9.99 to +9.99 pX	Electrode zero point The electrode offset changes with the duration of use. Regular calibration is required to adapt the zero point of the transmitter to the actual zero point of the electrode.
Electrode	■ Ammonium ■ Nitrate ■ Potassium ■ Chloride ■ pH-Type	Select the electrode type. This enables factory settings that apply for this electrode type.
Zeroline	00.00 mg/l	Corresponds to the lower determination limit. Do not change this value.

Function	Configuration options	Description
Calibration		
Actual value	00.00 to 99.99 mg/l	Calibration value Enter the laboratory value of a sample with added standard.
Method	▪ **Offset** ▪ 2-Point ▪ StdAdd. ▪ C-Curve (✖)	▪ Use **Offset** calibration as the standard method for all **ion-selective electrodes**. ▪ **Two-point calibration** is the standard method for **pH** electrodes. ▪ You can use **standardaddition** as an alternative method for calibrating compensation electrodes (**potassium or chloride**). For example, this method is useful if you cannot perform the offset calibration that is necessary for laboratory measurements. ▪ C-Curve is not supported.
General		
Start position	▪ **Measure** ▪ Service	Mode of the transmitter after power-up. In the "Service" position, the analog outputs are set to "Hold". You have to press the ▼ key to switch to the "Measure" operating mode.
Checktype	▪ **Off** ▪ Normal ▪ Medium ▪ Strong	Here you can specify what criterion should apply to electrode function monitoring. In the "Off" position, the electrode is only checked during the calibration. In all other positions, it is checked constantly with different tolerances.
Auto Zero	▪ **Manual** ▪ Automatic	▪ Manual: zero adjustment with the calibration. Normal situation for large measuring ranges. ▪ Automatic: internal zero adjustment. Increases the accuracy in the lower measuring range.
Current outputs (2nd page, scroll with MENU)		
mA-range	▪ **4 to 20 mA** ▪ 0 to 20 mA	You define the signal range that corresponds to your measuring range.
Start point	00.00 to 99.99 mg/l **0.00 mg/l**	Enter the concentration that should correspond to the 0 mA or 4 mA signal (= start of measuring range).
End point	00.00 to 99.99 mg/l **20.00 mg/l**	Enter the concentration that should correspond to the 20 mA signal (= end of measuring range).
Limit values		
Prealarm	00.00 to 99.99 mg/l **25.00 mg/l**	The prealarm or alarm is triggered if the value is overshot.
Alarm	00.00 to 99.99 mg/l **30.00 mg/l**	
Hysteresis	00.00 to 99.99 mg/l **00.01 mg/l**	Switching threshold
Delay	000.0 to 999.9 min **000.0 min**	The alarm is delayed by the time configured.

Function	Configuration options	Description
Display		
Units	Depending on the measuring channel: ■ **NH4-N** ■ **NO3-N** ■ NH4 ■ NO3 ■ g/l ■ log ■ mV ■ **pH**	The options and the factory settings depend on the electrode configured. Theoretical raw values (mV): Ammonium: -230 mV corresponds to 0 mg/l, -60 mV corresponds to 10 mg/l Nitrate: 150 mV corresponds to 0.1 mg/l, 30 mV corresponds to 10 mg/l
Modification	■ **allowed** ■ locked ■ save data ■ load data (✖)	This setting only refers to the measuring channel in question. ■ Allowed: Changes are saved automatically after 10 minutes ■ Locked: Changes are not saved ■ Save data: Changes are saved if CAM40 is switched off and switched back on again once this option is selected ■ Load data: Do not use
System	■ Reset ■ Default ■ Test (✖)	■ Reset: restart with the current settings ■ Default: restart with factory settings All user settings are lost! ■ Test: test operation, do not use!
Zero point	00.00 to 99.99 mg/l **00.02 mg/l**	Lowest concentration that can be displayed and output at the signal outputs.
Rinsing (3rd page, scroll with MENU)		
Intervall	00.00 to 99.99 h **01.00 h**	Interval between two rinses When using the optional cleaning unit: min. 6 x "Duration" recommended: inlet 30 min., sludge activation 1 h
Duration	000 to 999 s **004 s**	Rinsing duration Maximum with optional cleaning unit: 180 s
Hold time	000 to 999 s **010 s**	Time during which the measured value is held after a rinse.
Automatic	■ Yes ■ **No**	Automatic function active or not

Function	Configuration options	Description
Winterservice		
Intervall	00.00 to 99.99 h **00.10 h**	Interval between two rinses
Duration	000 to 999 s **001 s**	Rinsing duration
Hold time	000 to 999 s **005 s**	Time during which the measured value is held after a rinse.
Temperature	000 to 999 °C **008 °C**	The winter service is enabled if this temperature is undershot.
Automatic	■ Yes ■ **No**	Function active or not
Menue	■ **MainMnu** ■ CalMnu ■ SensorMnu ■ AddOnMnu	From here, switch to the calibration or sensor menu. If you accept the MainMnu factory setting, you remain in this menu.

1) xx stands for the measuring channel number actually displayed

Sensor menu

Function	Configuration options	Description
Name Addr:xx[1)]	User-defined text	Only change this field in the main menu. Otherwise, you overwrite your entries in the main menu.
Cross-Sensitivity		Ions that have an identical charge and a comparable ion radius exhibit cross-sensitivity. For this reason, potassium interferes with ammonium measurement, and chloride with nitrate measurement. A potassium concentration of 20 mg/l feigns an ammonium concentration of 1 mg/l, and 240 mg/l of chloride feigns 1 mg/l nitrate.
Channel number	00 to 99 **01**	Here, enter the channel to which you have connected an optional compensation electrode. **Example:** You are in the sensor menu for ammonium. Enter the channel to which you have connected a potassium electrode.
Coefficient	-9.99 to +9.99 **-9.99**	Logarithmic factor which is used to compensate the cross-sensitivity of the interference ion. $-9.99 = 10^{-9.99}$, virtually corresponds to no compensation
Addition	■ Yes ■ **No**	■ Yes: The measured value is increased depending on the concentration of the interference ion and the factor. ■ No: The measured value is decreased depending on the concentration of the interference ion and the factor (normal situation).
Electrode-Specification		
Buffer solution	-999 to 999 mV **+270 mV**	Sensor-specific data Assigned automatically. Do not change anything here.
Norm-Offset	-9.99 to +9.99 pX **+0.00 pX**	
mA-Outputs		
Averaging over	000 to 999 points **000 points**	In the event of severely fluctuating measuring signals, you can obtain a more stable signal at the analog output by averaging over the set number of measuring points.
mA-simulation	00.00 to 99.99 mA **00.00 mA**	Use this function to test communication via the current output. Specify a current value that should be output at the analog output.

Function	Configuration options	Description
Armature-Specification (2nd page, scroll with MENU)		
No of parameter	00 to 08 **03**	Corresponds to the number of electrodes connected to a sensor
Base address	01 to 08 **01**	Address of the first electrode of a sensor Base addresses when connecting two sensors: 01 for the first electrode of the first sensor, 04 for the first electrode of the second sensor.
No of channels	00 to 08 **01**	Do not change the factory setting.
Second title	User-defined text	
Sensordata		
Softwareversion	Current version	Only Info fields!
Hardwareversion	Current version	
Serial number	Device serial number	
Menue	■ MainMnu ■ Default	You return to the main menu with **"MainMnu"**. **"Default"** causes a restart with the factory settings (user settings **lost**).

1) xx stands for the measuring channel number actually displayed

Add on menu

Function	Configuration options	Description
Name Addr:xx[1)]	User-defined text	Only change this field in the main menu. Otherwise, you overwrite your entries in the main menu.
Fix values for parameter		
Fix value	00.00 to 9999 mg/l	Fixed value for the measured value display and analog output e.g. for simulation
Error value	00.00 to 9999 mg/l	Fixed value for the measured value display and analog output is displayed in the event of an error
Fix values for temperature		
Fix value	00.00 to 9999 mg/l	Fixed value for the measured value display and analog output e.g. if the temperature sensor fails
Error value	00.00 to 9999 mg/l	Fixed value for the measured value display and analog output is displayed in the event of an error
Menue	■ **MainMnu** ■ Default ■ AddOnMnu	You return to the main menu with **"MainMnu"**. **"Default"** causes a restart with the factory settings (user settings **lost**).

1) xx stands for the measuring channel number actually displayed

Calibration menu

Function	Configuration options	Description
Name Addr:xx[1)]	User-defined text	Only change this field in the main menu. Otherwise, you overwrite your entries in the main menu.
Calibration curve		
Actual point	00.00 to 9999 mg/l	Calibration value Enter the laboratory value of a sample with added standard.
Standardaddition		
Probe volume	0000 to 9999 ml **5000 ml**	Container volume where you perform standard addition.
Flowrate	00.00 to 99.99 ml **01.00 ml**	Volume of the added standard
Standard	0.000 to 9.999 M/l	Concentration of the addition standard in mol/l
Duration	00.00 to 99.99 min **01.00 min**	Inflow duration for the standard during automatic standard addition.
No of steps	00 to 99 steps **03 steps**	Number of calibration points that are to be added with standard addition
Automatic	▪ Yes ▪ **No**	No: function switched off
Conditioning		(✖)
Flowrate	00.00 to 99.99 ml/min **03.50 ml/min**	
Duration	00.00 to 99.99 min **01.00 min**	
Manual correction (2nd page, scroll with MENU)		
Value	-99.9 to +99.9 mg/l **+00.0 mg/l**	Fixed correction value that is added to the measured value. You can correct known interference influences that do not change radically with this function. **Example:** 20 mg/l potassium feigns an ammonium concentration of 1 mg/l. If you do not apply compensation with an optional potassium electrode, enter a correction value of -01.0 mg/l in this example.
Temperature Calibration		
Temperatur	000.0 to 999.9 °C **020.0 °C**	You can correct the measured value of the temperature sensor by entering a more plausible value obtained through reference measurement.

Function	Configuration options	Description
Twopoint calibration		
1. Buffer	00.00 to 99.99 mg/l **20.00 mg/l**	Concentration of the first calibration standard
2. Buffer	00.00 to 99.99 mg/l **01.00 mg/l**	Concentration of the second calibration standard
Measuring mode	■ C-Curve ■ 2-Point	Way of converting the measured voltage values of an electrode to concentration values **Ammonium:** "C-curve" factory setting **All other electrodes:** "2-point" factory setting Do not change this setting.
Menue	■ **MainMnu** ■ Default ■ CalPoints	You return to the main menu with **"MainMnu"**. **"Default"** causes a restart with the factory settings (user settings **lost**).

1) xx stands for the measuring channel number actually displayed

Calibration points

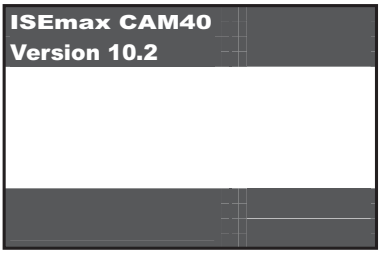
Function	Configuration options	Description
Calibration points		
1. Actual value	000.0 to 999.9 mg/l	Calibration points for the "C-curve" measuring mode. Factory settings are only stored for ammonium. Do not change anything here.
Sensor signal	xxx.x mV	
2. Actual value	000.0 to 999.9 mg/l	
Sensor signal	xxx.x mV	
3. Actual value	000.0 to 999.9 mg/l	
Sensor signal	xxx.x mV	
4. Actual value	000.0 to 999.9 mg/l	
Sensor signal	xxx.x mV	
5. Actual value	000.0 to 999.9 mg/l	
Sensor signal	xxx.x mV	
6. Actual value	000.0 to 999.9 mg/l	
Sensor signal	xxx.x mV	

Function	Configuration options	Description
Execute Cal.	■ **Offset** ■ 2-Point ■ StdAdd ■ C-Curve (✖)	
Menue	■ MainMnu ■ Default	You return to the main menu with **"MainMnu"**. **"Default"** causes a restart with the factory settings (user settings **lost**).

5.3.3 General data

Main Menue

Switch to the software version info screen:



The MENU key takes you to the "General data" main menu.

Function	Configuration options	Description
General data		
Scroll time	00.0 to 99.9 min **00.1 min**	The display changes the measuring channel automatically during this time. You disable this function if you enter 0.00 min. You then switch manually from one measuring channel display to the next.
Modification	■ **allowed** ■ locked ■ save data ■ load data (✖)	■ Allowed: Changes are saved automatically after 10 minutes ■ Locked: Changes are not saved ■ Save data: Changes are saved if CAM40 is switched off and switched back on again once this option is selected ■ Load data: Do not use
Parameter	■ **Normal** ■ Hold ■ Reset ■ Default	With "Normal", the relay contacts remain active as long as the limit values are exceeded. With "Hold", the relay contacts are active even if the limit values are no longer exceeded. You have to press the ↓ key to disable the hold.

Function	Configuration options		Description
Relais mode			
Inverted	00000 to 11111 **00000**		Relay assignment (numerical position=relay number) 0 = NO contact (quiescent current, normally open) 1 = NC contact (working current, normally closed)
Relais contacts			
Relais No. 1	00 to 16 **00**	Prealarm	00 = not active 01 = active at measuring channel 1 02 = active at measuring channel 2 03 = active at measuring channel 3 etc. You can program the relays as you require. However, you can only assign one alarm condition per relay (prealarm, alarm or error). Incorrect assignment or multiple assignment will cause the transmitter to behave incorrectly.
Relais No. 1		Alarm	
Relais No. 1		Error	
Relais No. 2		Prealarm	
Relais No. 2		Alarm	
Relais No. 2		Error	
Relais contacts (2nd page, scroll with MENU)			
Relais No. 3	00 to 16 **00**	Prealarm	00 = not active 01 = active at measuring channel 1 02 = active at measuring channel 2 03 = active at measuring channel 3 etc. You can program the relays as you require. However, you can only assign one alarm condition per relay (prealarm, alarm or error). Incorrect assignment or multiple assignment will cause the transmitter to behave incorrectly.
Relais No. 3		Alarm	
Relais No. 3		Error	
Relais No. 4		Prealarm	
Relais No. 4		Alarm	
Relais No. 4		Error	
Relais No. 5		Prealarm	
Relais No. 5		Alarm	
Relais No. 5		Error	
Date and time			
Date	01.01.04 to 31.12.99		Format DD.MM.YY
Time	00:00 to 23:59		No automatic changeover to daylight saving time!

Function	Configuration options	Description
Hypertrend/Datalogger (3rd page, scroll with MENU)		
Statuscurve	■ Yes ■ **No**	Yes = in the measuring channel display, a hypertrend for the corresponding parameter is also displayed below the temperature display. No = no additional hypertrend
No of windows	00 to 03 **01**	Refers to hypertrend display. You can activate a maximum of 3 windows with hypertrends.
Output values	■ **Normal** ■ Test	
Resolution	00.02 to 99.00 min **00.10 min**	Interval from one measuring point displayed to the next
Time range	000.1 to 999.9 h **024.0 h**	Time range for displaying the hypertrend
Menue	■ **MainMnu** ■ Parameter ■ DiscoMnu ( ) ■ ValveMnu	DiscoMnu corresponds to MainMnu. Do not use. For accepting the settings.

Parameter menu

Caution!
Never change the baud rate for "Armature RS422" as
the sensor cannot be used afterwards. In such situations, you have to send the sensor in for repair.

Function	Configuration options	Description
Calibration of current out		
Channel number	01 to 08	Select the channel for which the analog output should be calibrated.
Simulation	00 to 20 mA	Fixed simulation value for the specified channel for checking the signal lines. 00 mA = no simulation
Actual value	00 to 20 mA	

Function	Configuration options	Description
Fix relations		
Parameter	00:00:00:00	Manual distribution of the measuring channels to analog outputs (maximum 4 possible). Make sure that you do not output a measuring channel more than once. "00:00:00:00" = automatic channel assignment
mA-outputs	00:00:00:00	Assignment of analog outputs 01, 02, 03 and 04 to the measuring channels specified above. Example: ■ Parameter 01:02:00:00 ■ mA-Outputs 02:03:01:04 –> Measuring channel 01 is set to analog output 02, measuring channel 02 is set to analog output 03. No measuring channel is set for analog outputs 01 and 04.
Armature type	■ **Standard** ■ Flowcell ( ) ■ DISCO ( ) ■ UPTS ( )	
baude rates/language		
PC/PLS Armature RS422	■ 2400 baud ■ 4800 baud ■ 9600 baud ■ **19200 baud** ■ 38400 baud	Data transmission rate between the transmitter and PC/control system or sensor (=Armature RS422). Caution! Never change the baud rate for "Armature RS422" as the sensor cannot be used afterwards. In such situations, you have to send the sensor in for repair.
Language	■ **Deutsch** ■ English	Select the language for the menu.
Temperature mA output (2nd page, scroll with MENU)		
Channel address	01 to 08 **01**	
mA-range	■ 0 to 20 mA ■ **4 to 20 mA**	Select the signal span for the temperature measuring range.
Low point	000.0 to 999.9 °C **000.0 ° C**	Temperature that is assigned to the 0 mA or 4 mA signal (start of measuring range).
High point	000.0 to 999.9 °C **050.0 ° C**	Temperature that is assigned to the 20 mA signal (end of measuring range).
Menue	■ **MainMnu** ■ Parameter ■ DiscoMnu ( ) ■ ValveMnu	DiscoMnu corresponds to MainMnu. Do not use. For accepting the settings.

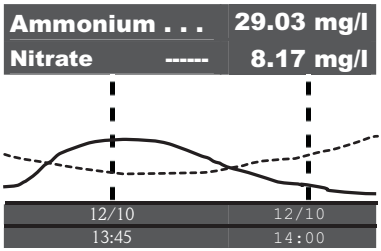
Compressor settings (ValveMnu)

Function	Codes	Description
Zuweisungen		
Outlet	00001	**When using a cleaning unit:** In this menu, check whether the code 04096 is configured for "Water" or set this code if necessary. Do not change any other code.
Titration	00002	
Konditioning	00004	
Water	04096	
Cleaner	00032	
Stirrer	00128	
1. Probe Valve	00016	
2. Probe Valve	00000	
3. Probe Valve	00000	
4. Probe Valve	00000	
1. Probe Pump	00064	
1. Buffer Pump	00000	
2. Buffer Pump	00000	
Titration (2)	00000	
Menue	▪ **MainMnu** ▪ Parameter ▪ DiscoMnu ( ) ▪ ValveMnu	DiscoMnu corresponds to MainMnu. Do not use. For accepting the settings.

5.3.4 Trend display (hypertrends)

Note!
This menu is available for every screen with hypertrends. Consequently, you have to make the settings separately for each screen.
You can specify the number of screens displayed in the "General data" menu.

Switch to the load curve display:



The MENU key takes you to the "Trend display" main menu.

Function	Configuration options	Description
Hypertrend		
Range	000.0 to 999.9 h **024.0 h**	Time range for displaying the hypertrend
Scaling	000.0 to 999.9 h **006.0 h**	Range breakdown and labeling with date and time
If you want to display a week with a 24-hour interval, you have to enter 168 hours for "Range" and 24 hours for "Scaling".		
1. Curve		
Address	00 to 08 **01**	Address of the measuring channel that is displayed in the first curve.
Title	User-defined text **Ammonium**	It is best to give the curve the name of the measuring parameter that is assigned to the first measuring channel.
Start point	000.0 to 999.9 mg/l **000.0 mg/l**	Start of measuring range displayed
End point	000.0 to 999.9 mg/l **020.0 mg/l**	End of measuring range displayed

Function	Configuration options	Description
2. Curve		
Adress	00 to 08 **02**	Address of the measuring channel that is displayed in the second curve.
Title	User-defined text **Nitrate**	It is best to give the curve the name of the measuring parameter that is assigned to the second measuring channel.
Start point	000.0 to 999.9 mg/l **000.0 mg/l**	Start of measuring range displayed
End point	000.0 to 999.9 mg/l **020.0 mg/l**	End of measuring range displayed
3. Curve		
Adress	00 to 08 **00**	Address of the measuring channel that is displayed in the third curve. The address 00 means that the channel is not displayed.
Title	User-defined text **Ammonium**	It is best to give the curve the name of the measuring parameter that is assigned to the third measuring channel.
Start point	000.0 to 999.9 mg/l **000.0 mg/l**	Start of measuring range displayed
End point	000.0 to 999.9 mg/l **020.0 mg/l**	End of measuring range displayed

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 Switching on the measuring system

6.2.1 Switching on the unit

1. Remove the protection cap from the reference electrode or pH electrode.
   Keep the protection cap in a safe place for later use.
2. Switch on the main switch of the transmitter (underneath the operating field, left).

✎ Note!
CAM40 performs a self-test for approximately 20 seconds. In doing so, it recognizes all the electrodes connected. In addition, CAM40 starts the automatic cleaning function.
The display is inactive during the self-test. The first channel is automatically displayed after the self-test.
During initial commissioning with factory settings, the display changes to the next measuring channel every 6 seconds.

6.2.2 Selecting a language

1. Use ↵ to navigate to the "General data" display and call up the main menu (MENU).
2. Scroll to the third page with MENU and call up the editing mode (flashing cursor, launch with ↵ + MENU).
3. Under "Menue", select the "Parameter" submenu (↵, ▲, ↵).
4. In the same way, select your preferred software language under the "Language" function.
5. Go back to the "General data" main menu using "Menue".
6. Save the language setting by selecting the "Save data" option under the "Modifications" function (▲, ↵, ▲, ↵).
7. Switch the CAM40 off and then on again. Only now is the language changed.

Software languages available:
- German
- English

6.2.3 Addressing the sensor

Note!
You do not have to change the settings here if you are only connecting one sensor with two electrodes. CAM40 detects the sensor values automatically. In this case, just check the settings.

1. Navigate with ↵ to the display for the first measuring channel (e.g. ammonium) and call up the main menu (MENU):

```
Name Addr: 01    : >  CAS40 - NH4
********Sensor data ********
Slope            : >  094.8 %
Offset           : >  -1.29 px
Electrode        : >  Ammonium
Zeroline         : >  00.00 mg/l
******** Calibration ********
Actual value     : >  07.00 mg/l
Method           : >  Offset
********** General **********
Start position   : >  Measure
Check type       : >  Off
Auto zero        : >  Manual
```

2. Call up the editing mode (flashing cursor, launch with ↵ + MENU).
3. Under "Name Addr" enter a name for this measuring channel (↵, ▲, ↵). You can enter a maximum of 12 characters, e.g. "CAS40 - NH4".
4. Scroll to the third page with MENU and select the "SensorMnu" under "Menue" (↵, ▲, ↵).
5. Scroll to the second page with MENU and enter the number of electrodes in the sensor, e.g. "2", under "No of parameter":

```
***  Armature-Specification  ****
No of parameter  : > 02
Base Adress      : >  01
No of channels   : >  01
Second title     : >  Ammonium


******** Sensordata  *******
Softwareversion  : >  0125
Hardwareversion  : >  0104
Serial number    : >  08639462

Menue            : >  SensorMnu
```

6. Under "Base address", enter the address for the measuring channel, e.g. "01" for the electrode of the first sensor that is connected to cable 1.
   You can also specify a second title. This is displayed in the measuring channel under the name of the measuring channel ("Name Addr", see Point 3).
7. Go back to the measuring display.

Note!
- Your settings are accepted automatically after 10 minutes. Alternatively, you can choose "Save data" in the main menu under "Modification" and switch CAM40 off and then on again.
- Under "Name Addr" enter an individual name such that users can easily distinguish between the measuring channel displays. This is particularly important if you are connecting two sensors with the same electrode types.

6.2.4 Working with two sensors (optional)

Note!
The settings are accepted automatically after 10 minutes.
Alternatively, you can choose "Save data" in the main menu under "Modification" and switch CAM40 off and then on again. The settings are then accepted immediately.

Addressing the second sensor

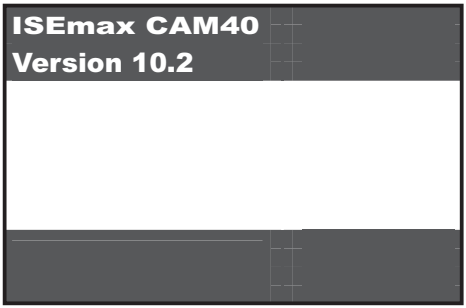
1. Switch the CAM40 off.
2. Disconnect the cable connector of the first sensor from the transmitter.
3. Connect the second sensor to the second plug-in jack that has not yet been used.
4. Switch on the CAM40 and wait for the self-test to be completed (approx. 20 seconds).
5. In the main menu of the first measuring channel (e.g. nitrate), assign a new name ("Name Addr") for this measuring channel.
6. Go to the sensor menu and configure the number of parameters and the base address of the first electrode (e.g. "03" if the first sensor is already using "01" and "02"). Also assign a second title.
7. For every additional measuring channel of the second sensor, also assign the base address and a second title. For this purpose, go to the main menu of the measuring channel and repeat steps 5 and 6 (base address e.g. "04").

Measuring with two sensors

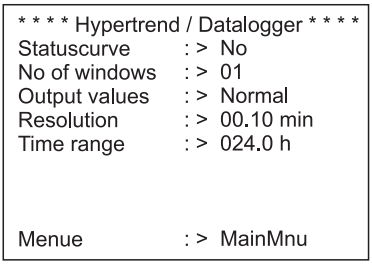
1. Switch the CAM40 off.
2. In addition to the second sensor, also reconnect the first sensor to the transmitter.
3. Switch the CAM40 on and wait for the self-test to be completed.
4. Navigate through all the measuring channels (max. 4). You should see the individual name and the address of every channel on the display.
5. Make the necessary settings for every measuring channel in the main menu in question (—> "Operation").

Displaying the hypertrends of all the measuring channels

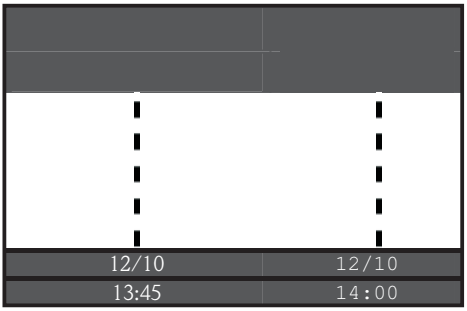
1. Switch to the display for "General settings":



2. Go to this menu and scroll to the 3rd page ("Hypertrend/Datalogger"):



3. Configure the value "02" for the "No of windows".
4. Go back to the measured value display.
5. Go to the display for "Hypertrends" (second screen):



6. In the "Hypertrends" menu, assign the address of the measuring channel for the first and, if applicable, for the second curve and specify the title which should be displayed for the curve:

```
******** Hypertrend ********
Range          : >  024.0 h
Scaling        : >  008.0 h
********* 1. Curve *********
Adress         : >  03
Title          : >  Ammonium
Start point    : >  00.00 mg/l
End point      : >  20.00 mg/l
********* 2. Curve *********
Adress         : >  04
Title          : >  Potassium
Start point    : >  00.00 mg/l
End point      : >  50.00 mg/l
```

7. Switch back to the measured value display.

Your measuring point is now working with two sensors.

6.3 Calibration

A calibration is necessary:
- During initial commissioning
- Each time an electrode or membrane cap is replaced
- In the event of implausible measured values

Note!
Condition the sensor for at least 1 hour in the medium before the first calibration and each time the membrane cap and electrode are replaced.

6.3.1 Calibration modes

The following calibration modes are available:
- Offset calibration
  - Standard method for all ion-selective electrodes
- Two-point calibration
  - Standard method for the pH electrode
  - Alternative for ion-selective electrodes (ammonium, nitrate) if the offset calibration does not return the desired result
- Standardaddition
  - Alternative for compensation electrodes (potassium, chloride) if offset calibration is not possible since a laboratory value cannot be determined, for example

6.3.2 Offset calibration (ion-selective electrodes)

Note!
The section below describes the calibration if the activated sludge basin is the point where the sensor is being used. If you use the sensor in the inlet to the sludge activation, you have to use a higher standard concentration for the calibration, e.g. 50 mg/l.

Preparing to calibrate

1. Take 3 l (0.79 US gal.) of sample from the sewage treatment plant outlet.
2. Have some of the sample analyzed in the laboratory for the parameter to the calibrated.
3. Press to switch off rinsing.
4. Add 2 ml (0.068 fl.oz.) standard (1 mol/l ≙ 14 g/l) to 2 l (0.52 US gal.) of the sample. Concentration of the sample with standard added [mg/l] = laboratory measured value [mg/l] + 14 mg/l.
5. Transfer the sample with the standard to a suitable container and immerse the sensor into it.
   —> The measured value display increases.

Configuring the offset

1. Select the measuring channel of the parameter you want to calibrate.
2. Press the MENU key.
3. Hold down and also press MENU until the cursor appears.
4. Using , navigate to the "Calibration/actual value" menu item.
5. Enter the concentration of the sample with the standard.
6. Make sure that the "Offset" calibration mode is set under "Calibration/method".
7. Navigate to the "Menue" menu item, select "MainMnu" and press .

Calibration

1. During calibration, move the sensor in the container.
   This ensures the necessary flow to the ion-selective electrode.
2. Press the key.
   —> An electrode symbol is displayed in addition to other symbols. The transmitter measures and averages the current sensor signal.
3. Wait until the electrode symbol disappears. This can take several minutes in some circumstances.
4. Press the key again.

—> The "Actual value" set in the menu is displayed. After an internal delay period, all the symbols disappear and the display changes to the measuring channel.

5. Ammonium only:
   Make sure that the value for "Slope" in the measuring channel display is > 90%.
   If this is not the case, the electrode is used up and has to be replaced.

The new calibration data are saved automatically after 10 minutes.

Checking the calibration

1. Immerse the sensor into a suitable container with drinking water.
2. Compare the measured value to the specifications for drinking water.
   —> The measured value has to drop to the local concentration for drinking water (e.g. ammonium in Germany: < 0.5 mg/l.)
3. If the measured value does not meet expectations:
   a. Repeat offset calibration.
   b. If the repeated calibration is not successful, you have to record another calibration point using a sample with less standard added:
      – Add 0.2 ml (0.0068 fl.oz.) standard (1 mol/l ≙ 14 g/l) to 2 l (0.52 US gal.) of a sample from the sewage treatment plant outlet.
        Concentration of the sample with standard added [mg/l] = laboratory measured value [mg/l] + 1.4 mg/l.
      – In the menu, set the new, low concentration of the sample with the standard as the current value.
      – Rinse the sensor thoroughly with outlet water before transferring it from the sample with more standard added to the sample with less standard added. This prevents sample being carried over from one container to the next.
      – Perform the calibration as described.
      – In the calibration menu, navigate to the "Menue" item and select "CalMnu".
      – Navigate to "Menue" again and select "CalPoints".
      – In the list that follows, the high value and the low value have to be displayed at the top.
      – Under "Execute cal", select the "2-Point" value and go back to the measuring channel.

Calibration with a second, low value is only required on rare occasions.

6.3.3 Two point calibration (pH electrode, ion-selective electrodes)

This example describes two-point calibration for pH measurement.
The same process applies for ion-selective electrodes.

Preparing to calibrate

1. Prepare two Endress+Hauser pH quality buffers in a suitable vessel (min. 1 l) (or two standard solutions for ammonium or nitrate).
2. Go to the main menu of the measuring channel to be calibrated.
3. On Page 1, configure "Two-point" as the method:

```
Name Addr: 03    : >  CAS40 - pH
******* Sensor data ********
Slope            : >  094.8 %
Offset           : >  -1.29 px
Electrode        : >  pH
Zeroline         : >  00.00
******** Calibration ********
Actual value     : >  07.00
Method           : >  2-Point
********** General **********
Start position   : >  Measure
Check type       : >  Off
Auto zero        : >  Manual
```

4. Scroll to Page 3 of the main menu and select "CalMnu" for menu.
5. Scroll to Page 2 of this menu and configure the pH values of your buffer solutions under two-point calibration, e.g. 7 and 4 (or the concentrations of the standard solutions for ammonium or nitrate):

```
***** Manual correction ******
Value            : >  +00.0 ppm

***  Temperature calibration  ***
Temperatur       : >  025.0 C

******** Calibration ********
1. Buffer        : >  07.00
2. Buffer        : >  04.00


Measuring mode : >  C-Curve
Menue            : >  CalMnu
```

6. Go back to the measured value display.

Calibration

1. Press to switch off rinsing.
2. Immerse the sensor into the first buffer solution, e.g. pH 7 and wait until the measured value has stabilized.
3. Press the key.
   —> Wait until the electrode symbol disappears.
4. Immerse the sensor into the second buffer solution, e.g. pH 4 and wait until the measured value has stabilized.
5. Press the key.
   —> Wait until the electrode symbol disappears.
6. This concludes the calibration.

The new calibration data are saved automatically after 10 minutes.

6.3.4 Standardaddition (alternative for compensation electrodes)

Standardaddition is only necessary if offset calibration is not possible for compensation electrodes (potassium or chloride).

Preparing to calibrate

1. Place the sensor in a suitable vessel with 1 l (0.26 US gal.) of drinking water.
2. Press to switch off rinsing.
3. Go to the main menu of the measuring channel (e.g. potassium) and configure "StdAdd" for the method on Page 1:

```
Name Addr: 03    : >  CAS40 - K
******* Sensor data ********
Slope            : >  094.8 %
Offset           : >  -1.29 px
Electrode        : >  Potassium
Zeroline         : >  00.00 mg/l
******** Calibration ********
Actual value     : >  00.00 mg/l
Method           : >  StdAdd
********* General *********
Start position   : >  Measure
Check type       : >  Off
Auto zero        : >  Manual
```

4. Scroll to Page 3 of the main menu and select "CalMnu" for menu.

5. Under Standardaddition on Page 1, enter the probe volume, the standard concentration, the standard volume and the number of steps (= number of calibration points):

```
Name Addr: 03    : >  CAS40 - K
****** Calibration curve ******
Actual point     : >  00.00 mg/l
***** Standardaddition *******
Probe volume     : >  1000 ml
Flow rate        : >  01.00 ml
Standard         : >  1.000 M/l
Duration         : >  01.00 min
No of steps      : >  02 step
Automatic        : >  no
******* Conditioning ********
Flow rate        : >  00.02 ml/min
Duration         : >  00.00 min
```

"Flowrate" here means the volume of standard added per step.

6. Go back to the measured value display.

Calibration

1. Press the key.
   —> Wait until the electrode symbol disappears. The text "+1.0 ml" with a black background appears on the right of the display (if you entered 1.0 ml for the flowrate).
2. Add 1 ml standard solution to the sample. Move the sensor during the measurement to generate the necessary flow.
3. Press the key.
   —> Wait until the electrode symbol disappears. The text "+2.0 ml" appears on the display (if you entered "2" or more for the number of steps).
4. Add 1 ml standard solution to the sample again. Move the sensor during the measurement to generate the necessary flow.
   —> Wait until the electrode symbol disappears.
5. If you selected more than 2 steps, repeat the process for adding standard and taking measurements until all the calibration points are recorded.
6. Press the key to end the calibration.
   —> The current value of the potassium or chloride concentration appears on the display.

The new calibration data are saved automatically after 10 minutes.

6.3.5 Calibrating the temperature

Here, enter a reference value that you determined with an external measurement.

1. Go to the main menu of the first measuring channel (e.g. ammonium).
2. Scroll to Page 3 and select "CalMnu" for menu.
3. Go to Page 2 of the CalMnu and specify the measured reference temperature for "Temperature calibration":

```
***** Manual correction ******
Value              : >  +00.0 ppm

***  Temperature calibration  ***
Temperatur         : >  025.0 C

******** Calibration ********
1. Buffer          : >  07.00
2. Buffer          : >  04.00


Measuring mode : >  C-Curve
Menue              : >  CalMnu
```

4. Go back to the measured value display (MENU).
   —> The electrode symbol and the hourglass appear on the display.
5. Once the electrode symbol has disappeared (the hourglass does not disappear), go back to Page 2 of the CalMnu.
6. Go to the "Temperature Calibration" menu item again and press ↵ to confirm the value.
7. Go back to the measured value display (MENU).
   —> The hourglass disappears and the temperature value entered is accepted.

6.4 Potassium or chloride compensation

As an alternative to using a compensation electrode, you can also use a manual correction factor (—> "Operation/Local operation/Sensor data/Calibration menu"). However, this only makes sense if the concentration of the interference ion in the medium is permanently constant.
Interference ion = ion that affects the measurement of another ion on account of its chemical properties and its concentration in the medium

Note!
- Compensation is necessary if there are high concentrations of interference ions in your medium.
- Potassium affects ammonium, and chloride affects nitrate.

Using a compensation electrode

1. Install the compensation electrode into the sensor and connect it to the right cable connector (—> "Wiring").
2. Address the electrode and configure the associated measuring channel (—> "Addressing the sensor").
3. Calibrate the compensation electrode (—> "Calibration").
4. In the main menu of the measuring channel (ammonium or nitrate), configure the address of the compensation electrode and the cross-sensitivity coefficients:

```
Name Addr: 01    : >  CAS40 - NH4
***** Cross - Sensitivity *****
Channel number : >  03
Coefficient    : >  -0.85 px
Addition       : >  No
*** Electrode - Specification ***
Buffer solution  : >  +000 mV
Norm-Offset      : >  +2.00 px
******* mA-Outputs *******
Averaging over   : >  000 points
mA-simulation    : >  00.00 mA

Menue            : >  SensorMnu
```

Cross-sensitivity coefficients are values determined empirically. They only apply if the ionic strength of the interference ion remains constant. This is generally the case in sewage treatment plants (exception: if nitric acid is added).

Use the following coefficients:
-0.85 for potassium compensation and
-2.00 for chloride compensation

Additional information —> CD-ROM

5. Recalibrate the measuring channel (ammonium or nitrate) (offset calibration).

7 Maintenance

Take all the necessary precautions in time to ensure the operational safety and reliability of the entire measuring system.

Caution!
- When performing any work on the system, bear in mind any potential impact on the process control system or on the process itself.
- For your own safety, only use genuine accessories. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.

7.1 Maintenance schedule

	Membrane cap and electrolyte replacement			Sand membrane	Replace		Clean
Maint. interval	**Ammonium**	**Nitrate**	**Potassium**	**Chloride**	**Ref. electr.**	**O-ring**	**Membrane**
Fortnightly							X
Biannually	X	X	X				
Annually				X	X	X	

Note!
The intervals indicated are average empirical values and can be shorter or longer depending on the operating conditions. You, or the plant operator, are responsible for adapting the intervals to suit your conditions.

7.2 Cleaning the membrane

If the membrane is very contaminated, you have to clean it regardless of the maintenance intervals.

Caution!
- Do not touch the membrane with your hands.
- Use a clean tissue and water for cleaning purposes.

Note!
The optional chloride electrode has a crystal instead of a membrane.
To clean the electrode, place sandpaper (grain size 600) on a table. Now rub the sensor with the crystal area facing downwards on the paper until all residues of fouling are removed (visual inspection, rubbing the sensor for a few seconds usually suffices).

7.3 Replacing the membrane cap and electrolyte

Note!
If the sensor is removed from the medium for longer than 15 minutes, it has to be reconditioned (approx. 1 hour).

Membrane cap and electrolyte replacement

Removing the electrode

1. Remove the sensor from the medium.
2. Clean the sensor with water.
3. Loosen and remove the protection guard including the distancing ring.
4. Unscrew the coupling nut.
5. Remove the electrode holder from the sensor.
6. Release the electrode connector from the cable.
7. Remove the electrode using a socket wrench, AF17.

Replacing the membrane cap and electrolyte

1. Unscrew the membrane cap from the electrode.
   The membrane cap is waste that you must dispose of properly.
2. Drain the electrolyte from the electrode body.
3. Remove fresh electrolyte with the pipette supplied and fill the electrode body with electrolyte up to approx. 1 mm (0.04") below the brim.
4. Dry the thread of the electrode carefully.
5. Screw on the membrane cap hand-tight.
6. Remove any air bubbles by shaking the electrode while holding it vertically.

Note!
Afterwards, only hold the electrode and sensor vertically until they are installed in the process in order to avoid new air bubbles forming at the membrane surface.

Installing the electrode

1. Screw in the electrode and tighten it hand-tight with the socket wrench, AF17.
2. Connect the electrode connector to the cable.
   Make sure the pin assignment is correct (—> "Wiring").
3. Carefully push the electrode holder and the air hose back into the sensor.
4. Screw on the coupling nut.
5. Fit the distancing ring and secure it with the protection guard.
6. Perform offset calibration (—> "Commissioning/calibration").

8 Accessories

Note!
In the following sections, you find the accessories available at the time of issue of this documentation.
For information on accessories that are not listed here, please contact your local service.

8.1 Installation accessories

Immersion assembly holder CYH101
- For pH, ORP, oxygen, conductivity assemblies, for oxygen and turbidity sensors and for ISEmax;
- With weather protection cover
- Ordering acc. to product structure (Technical Information TI092C/07/en)

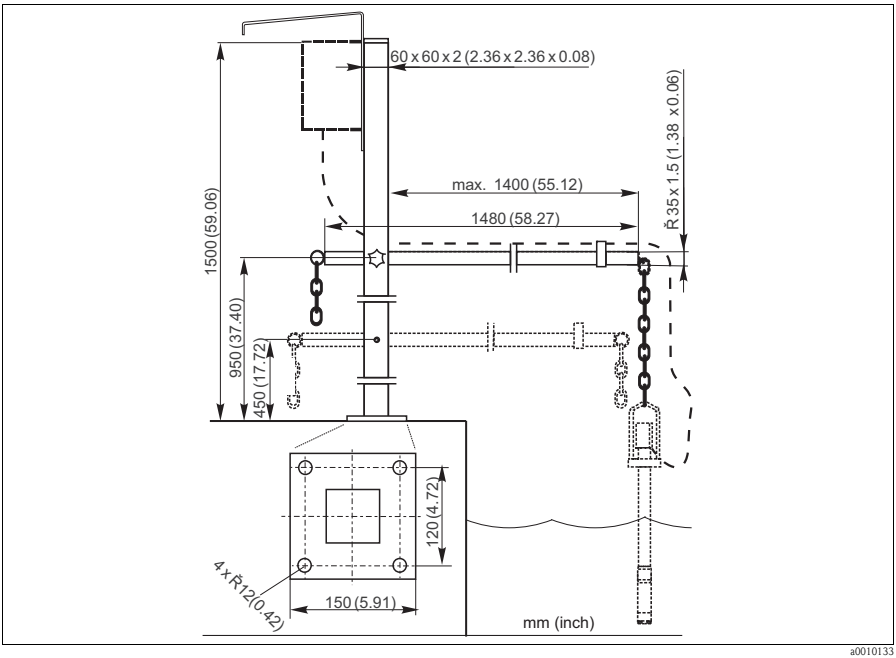


Fig. 9: Immersion assembly holder CYH101

CYY102 universal post
- Square pipe for mounting transmitters
- Material: stainless steel 1.4301 (AISI 304)
- Order No. CYY102-A

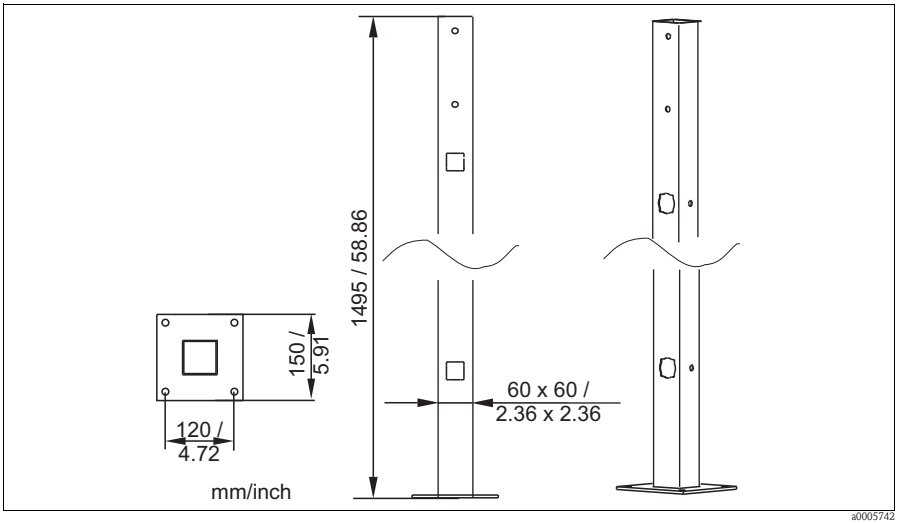


Fig. 10: Square post

CYY101 weather protection cover for field devices, absolutely essential if operating the unit outdoors

- Material: stainless steel 1.4031 (AISI 304)
- Order No. CYY101-A

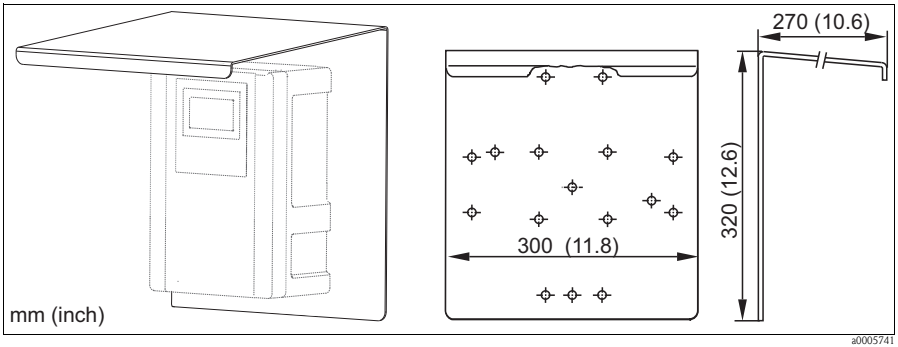


Fig. 11: Weather protection cover for field devices

8.2 Maintenance kits

Membrane kit
- 2 membrane caps
- Electrolyte
- Order numbers:
  - Ammonium: 71072574
  - Nitrate: 71072575
  - Potassium: 71072576

Maintenance kit for the chloride electrode
- Sandpaper
- Electrolyte
- Order number: 71085727

8.3 Electrodes

Ion-selective electrode
- Electrode, complete
- Order numbers:
  - Ammonium: 71072578
  - Nitrate: 71072580
  - Potassium: 71072581
  - Chloride: 71072582
  - pH: CPS64-1AA2GSA

Reference electrode
- Order number: CPS13-0TA2GSA

8.4 Standard solutions

8.4.1 Ammonium, nitrate, potassium and chloride

	Standard solution				
	1	Ammonium nitrate, 1 molar			
	2	Potassium chloride, 1 molar			
		Container size			
		A	250 ml (8.45 fl.oz.)		
			Transport documents		
			1	Standard documents	
			2	Incl. dangerous goods sheets	
			3	Safety data sheet	
				Certificate	
				A	None
				B	Manufacturer's certificate
CAY40-					Complete order code

8.4.2 pH

High-quality buffer solutions of Endress+Hauser - CPY20
The secondary buffer solutions have been referenced to primary reference material of the PTB (German Federal Physico-technical Institute) and to standard reference material of NIST (National Institute of Standards and Technology) according to DIN 19266 by a DKD (German Calibration Service) accredited laboratory.

	pH value				
	A	pH 2.00 (accuracy ± 0.02 pH)			
	C	pH 4.00 (accuracy ± 0.02 pH)			
	E	pH 7.00 (accuracy ± 0.02 pH)			
	G	pH 9.00 (accuracy ± 0.02 pH)			
	I	pH 9.20 (accuracy ± 0.02 pH)			
	K	pH 10.00 (accuracy ± 0.05 pH)			
	M	pH 12.00 (accuracy ± 0.05 pH)			
		Quantity			
		01	20 x 18 ml (0.68 fl.oz) only buffer solutions pH 4.00 and 7.00		
		02	250 ml (8.45 fl.oz)		
		10	1000 ml (0.26 US gal)		
		50	5000 ml (1.32 US gal) canister for Topcal S		
			Certificates		
			A	Buffer analysis certificate	
				Version	
				1	Standard
CPY20-					complete order code

8.5 Cleaning unit

Caution!
- Not suitable for continuous operation!
  Operating interval: max. 3 minutes cleaning, break for at least six times the cleaning time.
- Avoid condensation in the pressurized hoses.

Cleaning unit in the housing
- 230 V, IP 65
- Conveying rate at atmospheric pressure: 50 l/min (13.2 gal/min)
- Power consumption: 240 W
- Current consumption: 1.3 A
- Overheating protection: Automatic switchoff at T > 130 °C (266 °F)
- Order no.: 71072583

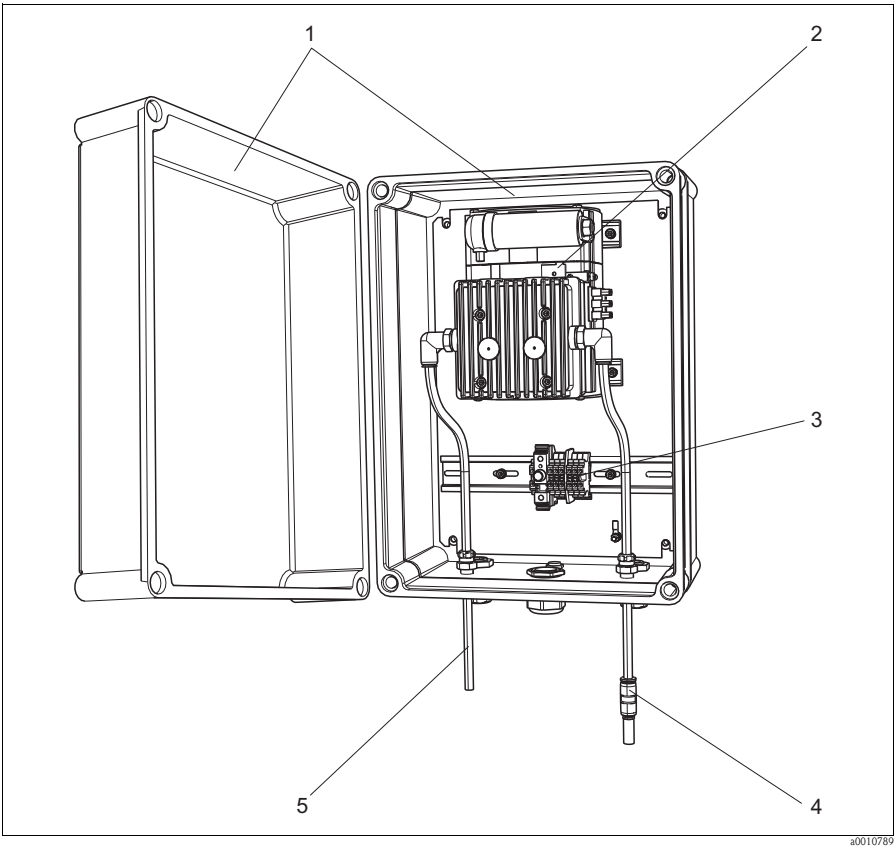


Fig. 12: Cleaning unit

1 Housing
2 Pump
3 Terminal strip with fuse
4 Suction side
5 Compressed air supply (to the sensor)

9 Trouble-shooting

9.1 Trouble-shooting instructions

Display	Cause	Tests and/or remedial measures
Telephone symbol	RS422 interrupted	■ Check the connecting cable and replace if necessary ■ Check the baudrate (19200) ■ Open the sensor – Check the cable harness for wet – Allow it to dry
Electrode symbol flashing	Electrode not properly calibrated or defective, or air in the electrode	■ Calibrate the electrode ■ Replace the membrane cap ■ Replace the electrode ■ Remove the air bubbles carefully
Slope or offset	Incorrect calibration, slope too low (must be > 90%)	■ Repeat the calibration ■ Perform the calibration with a low value (drinking water)
Buffer	Membrane or electrolyte worn out or wrong electrolyte used	■ Replace the membrane cap ■ Replace the electrolyte
Implausible measured values for ammonium and nitrate	Reference electrode defective	■ Replace the reference electrode
Implausible measured values for ammonium or nitrate	■ Ammonium or nitrate electrode defective ■ Moisture in the sensor due to incorrect assembly ■ Membrane fouled or damaged	■ Replace the ammonium or nitrate electrode ■ Dry the sensor, cables, cable connectors and electrode connections thoroughly ■ Clean or replace membrane
Implausible measured values for temperature	Temperature sensor defective	■ Replace complete electrode holder ■ Quick workaround: Configure a fixed value for the temperature in the AddOnMnu (measuring channel/main menu 3rd Page: "Menue=AddOnMnu")

9.2 Spare parts

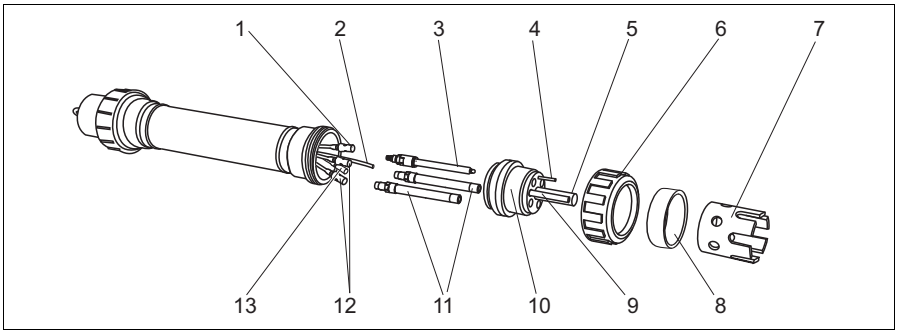


Fig. 13: CAS40 exploded view

1	*pH electrode cable connector*	*6*	*Coupling nut*	*11*	*Ion-selective electrode*
2	*Compressed air hose*	*7*	*Electrode protection guard*	*12*	*Cable connectors for ion-select. electrodes*
3	*pH electrode/reference*	*8*	*Distancing ring for protection guard*	*13*	*Cable connector for reference electrode*
4	*Potential matching pin*	*9*	*Temperature sensor Electrode holder*		
5	*Rinsing nozzle*	*10*			

Note!
If the temperature sensor (item 9) is defective, the complete electrode holder (item 10) must be replaced. The same applies if a rinsing nozzle to be replaced or electrodes can no longer be screwed out of the electrode holder.

No.	Name	Order number
1, 12-13	CAS40 kit: multiple cable for electrodes	71071398
5	CAS40 kit: rinsing nozzle for electrodes	71071404
6	CAS40 kit: coupling nut for protection guard	71071395
7	CAS40 kit: electrode protection guard	71071387
8	CAS40 kit: distancing ring for protection guard	71071393
10	CAS40 kit: electrode holder with Pt100	71071397
-	CAS40 kit: 3 caps for electrode connector	71071399
-	CAS40 kit: 3 drain plugs with seal	71071401
-	CAS40 kit: sensor connecting cable, 10 m (33 ft)	71071409
-	CAS40 kit: O-ring set for sensor	71071411
-	Connection QS-8-6 (for air hose)	71082499

9.3 Return

The CAM40 or CAS40 is repaired on site.
Contact your Endress+Hauser Service.

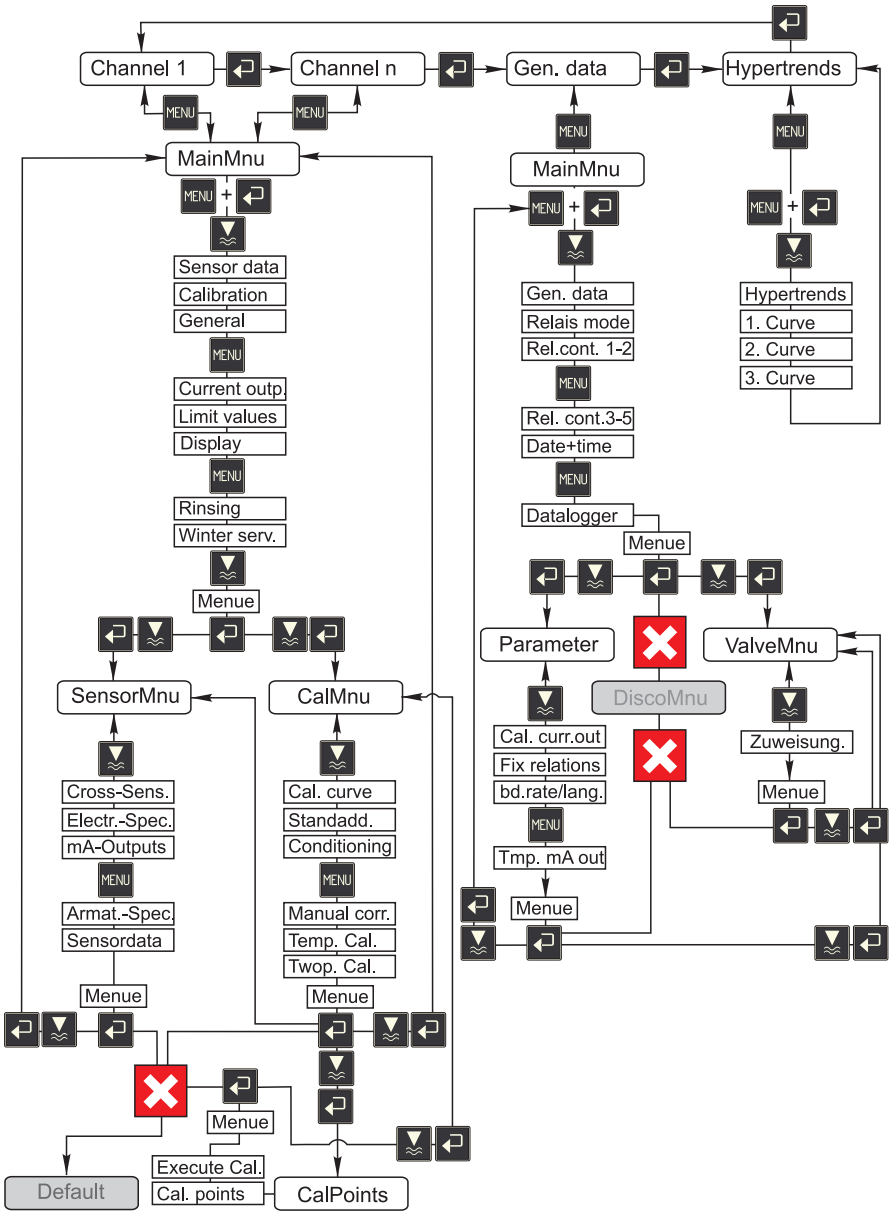
9.4 Disposal

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

You can find all the technical data in the corresponding chapters of the Technical Information on the original CD.

11 Operating structure



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Endress+Hauser

People for Process Automation

Declaration of Hazardous Material and De-Contamination

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.

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.

Type of instrument / sensor _____ **Serial number** _____

☐ **Used as SIL device in a Safety Instrumented System**

Process data

Temperature _____ [°F] _____ [°C] Pressure _____ [psi] _____ [Pa]

Conductivity _____ [µS/cm] Viscosity _____ [cp] _____ [mm^2/s]

Medium and warnings

	Medium /concentration	Identification CAS No.	 flammable	 toxic	 corrosive	 harmful/ irritant	 other *	 harmless
Process medium								
Medium for process cleaning								
Returned part cleaned with								

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

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

Description of failure _____

_____

_____

Company data

Company _____

_____

Address

_____

_____

Phone number of contact person

_____

Fax / E-Mail _____

Your order No. _____

"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."

_____ (place, date)

_____ Name, dept. (please print)

_____ Signature

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