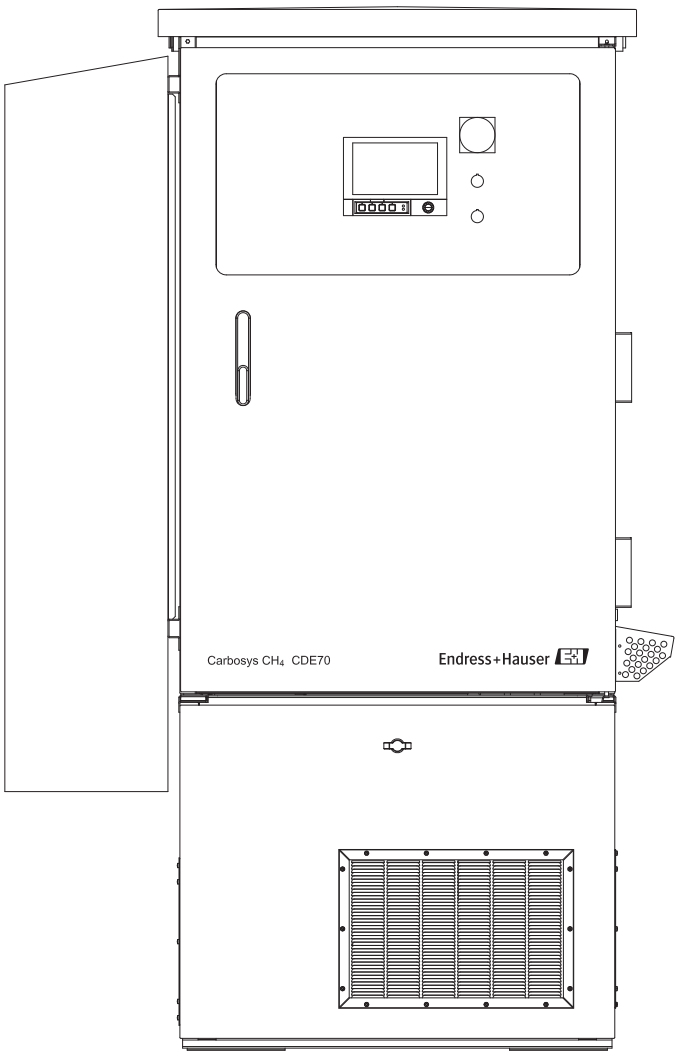
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

Carbosys CH_4 CDE70

Automatic CDM measuring station to determinate emission reduction out of methane capture applications



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Endress+Hauser
People for Process Automation

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1 Safety regulations

1.1 General instructions

Follow the instructions in the operating manual

- Knowledge of the basic safety regulations is essential for the safe handling and disruption-free operation of the measuring station.
- These operating instructions contain the most important guidelines necessary in order to safely oversee the measuring station's operation.
- All persons working on the measuring station should take note of these operating instructions, and especially those relevant to safety.
- On top of this, all rules and regulations pertinent to accident prevention which are in force at the measuring site are to be heeded.

Operator's responsibilities

It is the operator's responsibility to allow only those persons to work on the measuring station who:

- are familiar with the regulations concerning safe handling and the prevention of accidents, and who have been informed how to operate the measuring station;
- have undersigned a statement to the effect that they have read and understood the chapter on safety, and other warnings, contained in this operating manual.

The level of safety consciousness of the personnel whilst they work on the measuring station should be checked at regular intervals.

Responsibilities of staff

Before commencing work, personnel directed to service the measuring station are required to:

- adhere to regulations concerning work safety, and the prevention of accidents;
- read the chapter on safety, and other warnings contained in this operating manual, and to confirm that they have understood them by signing a statement to this effect.

Dangers involved in servicing the measuring station

The measuring station has been constructed to the latest technological standards, and to recognized safety regulations. The measuring station is only:

- to be used for the purpose designed and
- to be used when in perfectly safe working order.

Improper handling may result in physical danger to operating personnel, or to third parties, or to impairments to the measuring station or to other property. Disruptions which may affect the safe operation of the measuring station are to be rectified immediately.

Designed purpose

The Carbosys CH_4 CDE70 is a CDM monitoring solution for biogas, landfill and coal seam gas as well as all methane containing gas mixtures. Utilization for other purposes, or those exceeding these stipulations, are adjudged to be in non-accordance with its purpose.

Endress+Hauser Conducta GmbH + Co. KG is not responsible for damages resulting from such use. Utilization for the designed purpose also includes:

- observance of all instructions contained in the manual and
- adherence to the correct inspection and maintenance intervals.

Warranty and liability

On principle, the „General terms of sale and delivery“ of Endress+Hauser Conducta GmbH + Co. KG apply. These are made available to the operator upon signing the contract at the latest. All warranty or liability claims made for damage to persons or property are invalid when they prove to have as a cause one or more of the following:

- operating the measuring station for reasons other than its designed purpose;
- improper assembly, initializing, operating or maintenance of the measuring station;
- operating the measuring station when any safety or protection device is defect or non-functioning;
- non-adherence of any instructions in the operating manual concerning; transport, storage, assembly, initializing, operating or maintenance of the measuring station;
- unauthorized constructional alterations to the measuring measuring station;
- unauthorized alteration of the compressed air supply;
- exceeding or reducing the prescribed submergence depth;
- incorrect maintenance of measuring station components which are subject to wear;
- maintenance and repair work improperly carried out;
- catastrophes caused by outside interference or acts of God.

1.2 Safety regulations

An explanation of symbols and instructions

The following descriptions and symbols are included in the operating instructions to indicate possible dangers:

⚠ DANGER This symbol indicates a direct threat of physical danger to the life and health of personnel.

Not heeding this warning may have serious consequences to health and safety, and may even involve life-threatening injuries.

⚠ WARNING This symbol indicates a possible threat of physical danger to the life and health of personnel.

Not heeding this warning may have serious consequences to health and safety, and may even involve life-threatening injuries.

⚠ CAUTION This symbol indicates that a situation contains a potential for danger.

Not heeding this warning can lead to light injuries, or damage to equipment.

NOTICE This symbol gives important information concerning the correct procedure for operating the measuring station.

Non-compliance with the directions can lead to defects in the measuring station or its surroundings.

This symbol offers hints, operating tips and useful information.

These will help in ensuring that the measuring station functions correctly and optimally.

1.3 Organizational provisions

The operator must provide the necessary garments for personal protection. All of the safety devices installed must be regularly checked before any work can begin.

1.4 Safety devices

- Before any initializing of the measuring station, all of the safety devices must be properly mounted and functional.
- Safety devices may only be removed:
  - during maintenance and repair work, or when the measuring station has been disconnected from the electrical mains;
  - after the measuring station has been safeguarded against renewed operation.

When any spare parts have been delivered, the operator must ensure that the safety devices have been properly mounted.

⚠ DANGER During operation, the screw-mounted protection covers may not be removed.

Passive safety devices:
- protection covers in the measuring station

1.5 Additional safety procedures

The operating instructions must always be stored at the measuring site of the measuring station.

In addition to the operating instructions, any applicable general on-site regulations concerning accident prevention and environmental protection must be made available and heeded.

1.6 Training of personnel

Only trained and instructed personnel are allowed to work on the measuring station.
The jurisdiction of those personal responsible for tasks concerning initializing, operating, maintenance and repair work should be clearly set down.Personnel being trained to work on the measuring station must only do so in the presence of trained staff.

1.7 Regulating the measuring station

Only fully trained staff are allowed to enter in or change data in the measuring station. On no account may program changes be made to the measuring station's software.

1.8 Safety procedures in normal operation

The measuring station may only be operated when all of the safety devices are in working order.

1.9 Electrical dangers

Work on the measuring station's power supply may only be carried out by a qualified electrician. The electrical equipment in the measuring station must be routinely checked. Loose connections and scorched cables must be replaced immediately. The mains switch must be switched off during work on electrical components.

1.10 Particular danger areas

The measuring station has been built by Endress+Hauser Conducta GmbH + Co. KG with the greatest care and attention to detail and is constructed according to the present level of scientific and technological knowledge. Residual risks and danger areas incapable of being alleviated through constructional change never the less remain.

Warnings concerning these residual risks and danger areas are contained below.

1.11 Cleaning and maintenance, repairing faults

Observe the regulations concerning accident prevention.

1.12 Constructional changes to the measuring station

No changes, additions or constructional alterations are to be carried out on the measuring station without authorization from the manufacturer.

All alteration work requires prior written permission by Endress+Hauser Conducta GmbH + Co. KG.

Measuring station components no longer in perfect working order must be replaced immediately.

Only original spare, wearable and replacement parts may be used. There is no guarantee that non-original parts are designed and manufactured to cope with the demands on performance and safety.

1.13 Cleaning the measuring station and disposing of waste

All materials must be correctly disposed of. This applies especially when cleaning with solvents.

1.14 Noise level of the measuring station

The constant noise level emanating from the measuring station lies below 70 db (A).

Should the noise level of the measuring station under special conditions reach a level which could cause damage to hearing, personnel are to be suitably equipped with protective gear, and protective procedures carried out.

1.15 Copyright

2 Identification

2.1 Nameplate

Compare the order code indicated on the nameplate with the ordering structure and your order.
The nameplate bears the following information:

- Manufacturer data
- Order code (device version)
- Serial number
- Measuring range
- Power supply
- Input
- Outputs and communication
- Degree of protection
- (Permitted) ambient conditions

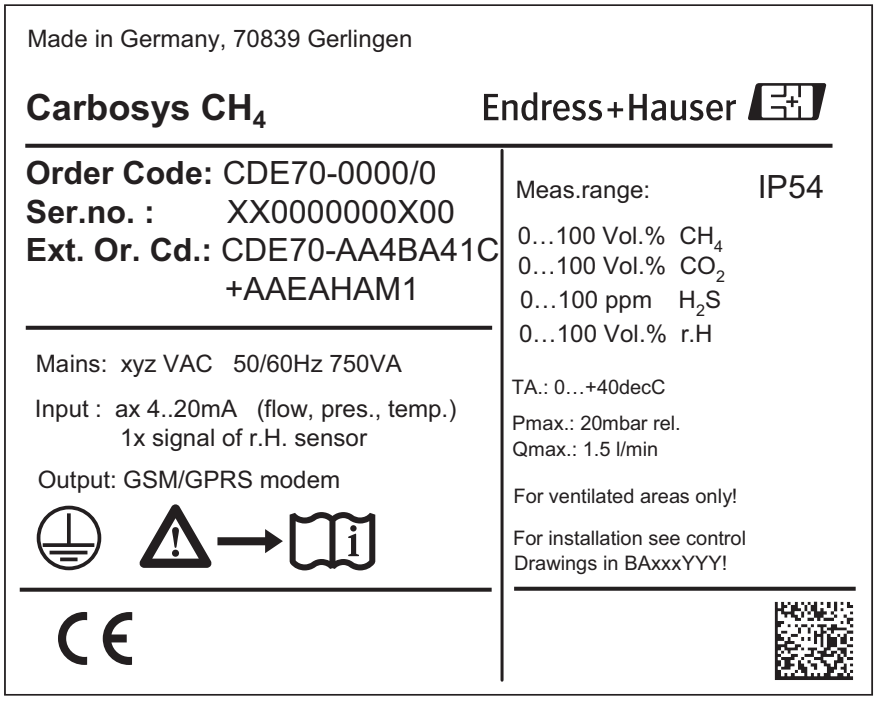


Fig. 1: Exemplary nameplate for Carbosys CH_4 CDE70

2.1.1 Product structure

	Approval
AA	Non-hazardous area
CA	cCSA/us general purpose

		Parameter
1		Methane
2		Methane + Carbon dioxide
3		Methane + Hydrogensulfide
4		Methane + Carbon dioxide + Hydrogensulfide
5		Methane + Carbon dioxide + Oxygen
9		Special version, TSP-no. to be spec.

			Operation mode
A			Batch (10 min and longer)
B			Continuous

				Method of flow; Measuring points
A1				Differential pressure; 1
A2				Differential pressure; 2
A3				Differential pressure; 3
A4				Differential pressure; 4
B1				Vortex; 1
B2				Vortex; 2
B3				Vortex; 3
B4				Vortex; 4
Y9				Special version, TSP-no. to be spec.

					Power supply
1					230 VAC/50 Hz
2					115 VAC/50 Hz
3					230 VAC/60 Hz
4					115 VAC/60 Hz

						Compensation gas humidity
A						Water saturated gas; incl. temperature sensor
B						Dry gas (less than 1 % r.h.)
C						Online humidity measurement
Y						Special version, TSP-no. to be spec.

CDE70-								<– Order code

	Operation language (only one option may be selected)
AA	English
AB	German
AD	Spanish

	Calibration (only one option may be selected)
EA	automatic

	Test, certificate (more than one option may be selected)
HA	FAT
HB	IQ/OQ template

	Communication (more than one option may be selected)
M1	GPRS modem; Telealarm

2.2 Scope of delivery

A complete Carbosys CH_4 CDE70 comprises:

- Gas composite measurement for CH_4, optional CO_2, O_2, H_2S and relative humidity
- Sample gas conditioning
- Active internal temperature stabilization
- Redundant safety system including gas warning
- Datamanager RSG40
- Intrinsic safe signal barriers as interfaces to peripheral instruments
- UPS (uninterrupted power supply) module

A complete Carbosys CH_4 CDE70 CDM installation comprises:

- Source for Methane gas mixture (e.g. biogas fermenter, landfill gas or coal seam gas collection system)
- Armature at gas sampling point *
- Gas sampling pipework including optional condensation pot and protective conduit
- Carbosys CH_4 CDE70 *
- Peripheral instruments for flow using:
  – Vortex (e.g. Endress+Hauser Prowirl 72)
  – dp-flow as orifice (e.g. Endress+Hauser Deltatop DO6x & Deltabar S PMD70)
  – dp-flow as pitot tube (e.g. Endress+Hauser Deltatop DP6x & Deltabar S PMD70)
- Absolute pressure (e.g. Endress+Hauser Cerabar S PMC71)
- Temperature as RTD (Pt100) (e.g. Endress+Hauser Omnigrad S with iTEMP TMT180) for flow Measurement
- Humidity sensor (optional) *
- Temperature as RTD (Pt100) (e.g. Endress+Hauser Omnigrad S with iTEMP TMT180) for water
- Saturated gas application for humidity determination
- Protective roof for outdoor installation of Carbosys CH_4 CDE70
- Room ventilation for indoor installation of Carbosys CH_4 CDE70
- Drain for condensate water outflow
- Consumer of methane gas mixture (e.g. flare, generator)

*scope of delivery with Carbosys CH_4 CDE70 including available options and accessories

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.

Additional standards and guidelines

- IEC 61010-1: Safety requirements for electrical measurement, control and laboratory devices (Endress+Hauser units)
- EN 61326 (IEC 61326): Electromagnetic compatibility (EMC requirements)
- 89/336/EWG: EMC regulations
- 2006/95/EG: Low voltage regulations

3 Installation and initialising

3.1 Transport and storage

The measuring station is packaged and delivered on a pallet. To avoid transit damages, the measuring station is multiply tied to the pallet. The pallet can be lifted by a pallet truck, a fork lifting truck or a crane (loading capacity min. 500kg).

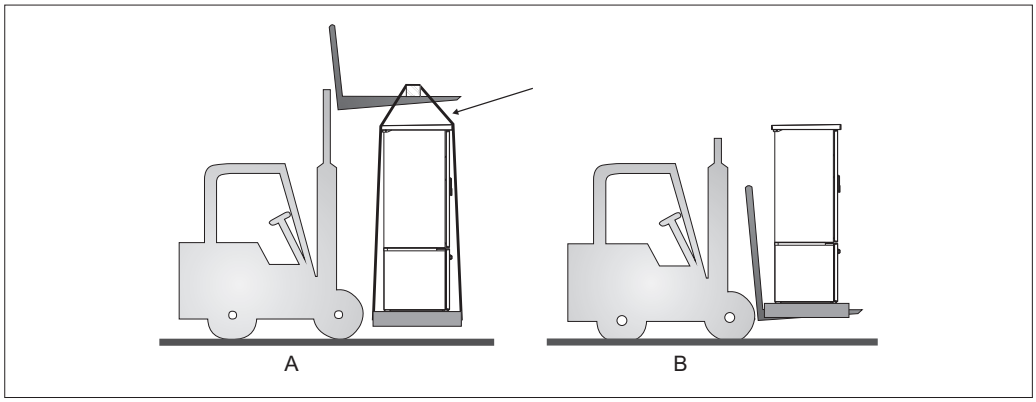


Fig. 2: Transport to installation point

Pos. A: Lifting the measuring station with a crane. Fitting correct lifting tackle (see arrow).
Pos. B: Lifting the measuring station using a fork lift truck.

The measuring station needs to stand upright and be secured against overbalancing. Agitations must be avoided.

Storing the measuring station

When storing the measuring station over a long period, the following should be noted:
- storage time should be kept as short as possible,
- shut down the measuring station according to the instructions in chapter „Shutting down operation“,
- store only in dry rooms,
- use an appropriate packing material (e.g. plastic foil).

3.2 Extent of supply and transit damages

In order to correctly set up the measuring station at the customer’s site, the supplied parts must first be checked for completeness in accordance with the delivery note. The measuring station should also be examined for evidence of any transit damages.

3.3 Installation conditions/Operating conditions

Sampling point

- According to CDM regulations the sampling point has to be located at a location with a gas composition equivalent to the gas mixture used for the methane capturing. The sampled gas must not go through any gas treatment which will have an implication on the gas composition. The correct location is typically located directly prior to the flare or generator and after the condenser and desulphurization stage (please refer to picture x or contact your Endress+Hauser representative).
- The usage of a gas armature installed directly at the sampling point is required. The gas armature is available as part of the "starter kit" and contains:
  – Ball valve (e.g. to isolate the gas sample line for maintenance)
  – Gas filter to remove particles
  – An optional pressure reducer is required in case the gas pressure in the pipeline exceeds +20 mbar gauge; standard model is suitable for a line pressure of +400 mbar gauge
  – An optional pressure regulator is required in case the gas pressure fluctuates
  – The "starter kit" is available for non-corrosive, corrosive and aggressive gas mixtures (e.g. not desulphurized biogas or unknown gas components typical in landfill gas)
- The sampling point and gas armature has to be directed upwards

Sampling pipework

- If the gas pipe work is installed in the open air, these should be protected against damage.
- A straight rising pipe is recommended to avoid blockage by condensate, otherwise the use of condensate traps (available on request) is recommended.
- To be checked daily for condensation discharge and emptied manually through the outlet at the bottom of the trap
- Recommended material: PA, PUR or stainless steel, 6/4 mm, pressure-resistant
- Pipe length up to 100 m with the given cross-section (6/4 mm)

Installation point

- It is not permitted to install Carbosys CH_4 CDE70 in a closed, not vented room – an ex-atmosphere could occur!
- Recommended locations are:
  – Outdoors – An all-weather roof is required to protect the system from direct sunlight in particular the top section of the measuring station.
  – Indoors – Accumulation of gas has to be prevented, therefore sufficient ventilation is required and the analyzed gas from the outlet should be fed outdoors to avoid an accumulation of the analyzed gas in the room.
- Refer to industry standards and local governmental regulations for gas measurement equipment and gas handling to ensure an appropriate installation.
- A solid and level foundation must be available to support the heavy system. For dimensions see the foundation plan. Install vertical and level.
- Always ensure a minimum spacing (see drawing "Dimensions") between the rear and side panels of the measuring station and any walls.
- Free and depressurized discharge of the Gas Outflow must be guaranteed.

3.4 Laying of analysis gas pipes

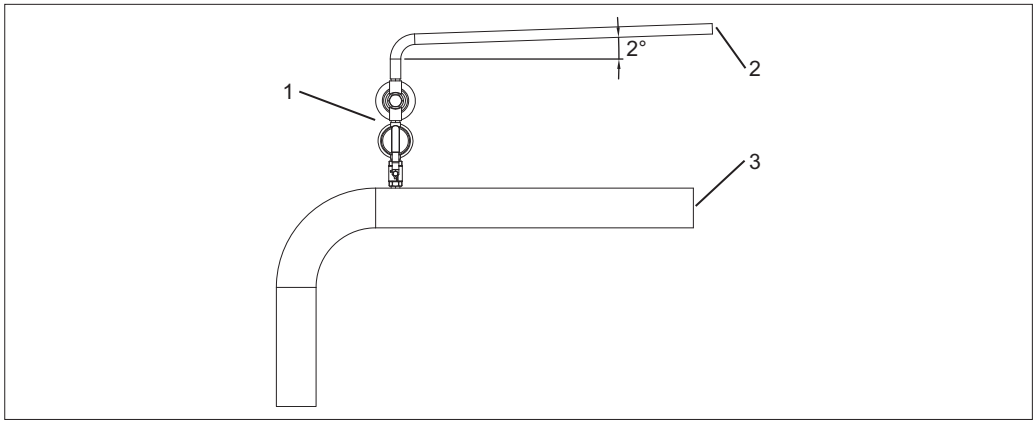


Fig. 3: Gas extraction point on top of a gas pipe with manual switch and gas filter. The analysis gas pipe is a riser.

1 Armature
2 Analysis gas pipe
3 Main biogas pipe

- Material: PA, PUR or stainless steel, 6/4 mm, pressure-resistant
- Don't insulate pipes
- From the gas extraction point install a rising analysis gas pipe for the first 1-2 meters
- Run in shield tubes, cable lines etc. to the analysis system, if possible rising (but not mandatory)
- Pipe length: With the given cross-sections up to 100 m of suction length possible (variable suction times)
- Run the pipes in a way that makes it possible to replace them after a couple of years

3.5 Gas Connections

- Gas Inflow
  - hose: 6/4 mm,
  - +5 to 20 mbar gauge, max. 1.5 l/min,
  - to be connected at safetly selenoid fitting
- Gas Outflow
  - hose: 8/6 mm,
  - unpressurized,
  - to be extended if required in ventilated area with supplied hose fitting
- Air condensate drain outflow
  - hose: 12/10 mm,
  - unpressurized,
  - to be extended if required
- Gas condensate drain outflow
  - hose: 8/6 mm
  - unpressurized,
  - to be extended if required

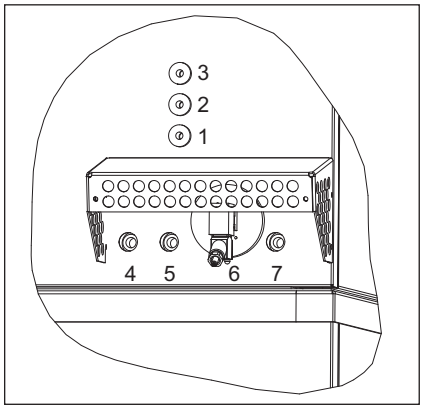


Fig. 4: Gas connections at Carbosys

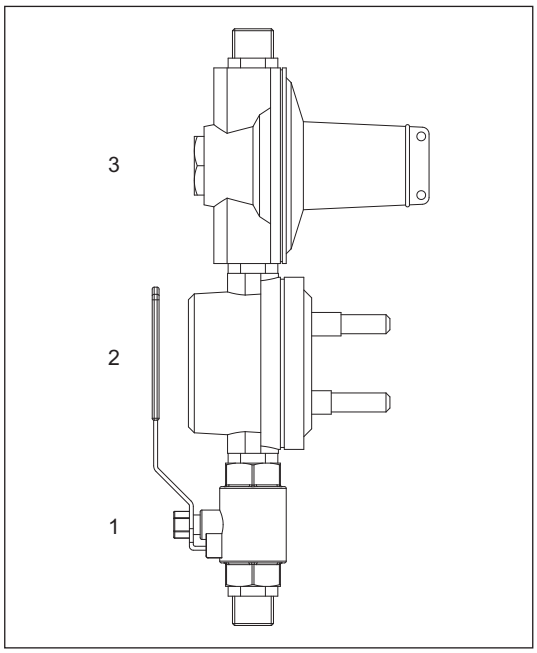
1 Exhaust gas
2 Exhaust gas (otional)
3 Exhaust gas (otional)
4 Air condensate
5 Gas condensate
6 Gas inlet at solenoid
7 Cable inlet for gas inlet at solenoid

Please make sure that the sample gas flow into the measuring station does not exceed 1.5 l/min!

If the system pressure at the extraction point exceeds 20 mbar of relative high pressure, then the pressure reducer, supplied with Carbosys has to be used which produce a stable output pressure of approx. 5 mbar of gauge pressure at a maximum of 400 mbar gauge pressure at its input.

3.6 Armature

To avoid aggregation of condensate in the armature, it has to be mounted vertical upwards.



1 Ball valve
2 Gas filter
3 Gas pressure regulator

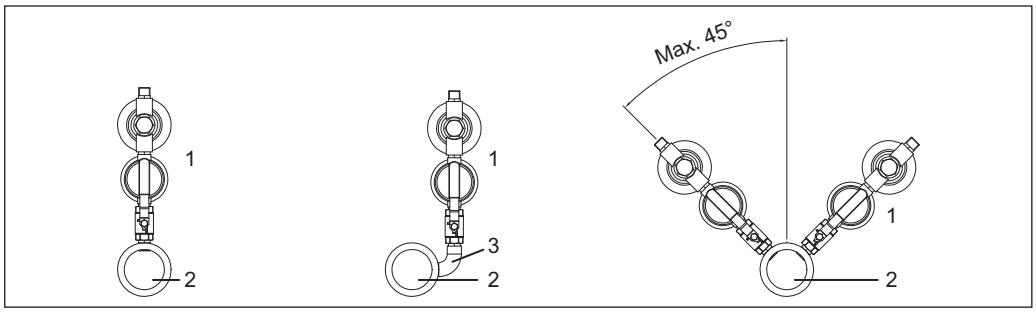


Fig. 5: Armature

1 Armature
2 Main biogas pipe
3 Elbow

Connect the armature, at max 50 m distance to the sucking point, vertical upwards or max 45° from horizontal as shown in the drawings above fig. 5. If necessary use an elbow pipe.
- process connection at ball valve or elbow to main biogas pipe: G½"
- process connection at pressure regulator to analysis gas pipe: fitting for 6/4 mm hose

3.7 Humidity Sensor EE30EX

Connect the cables as shown in the following diagram.

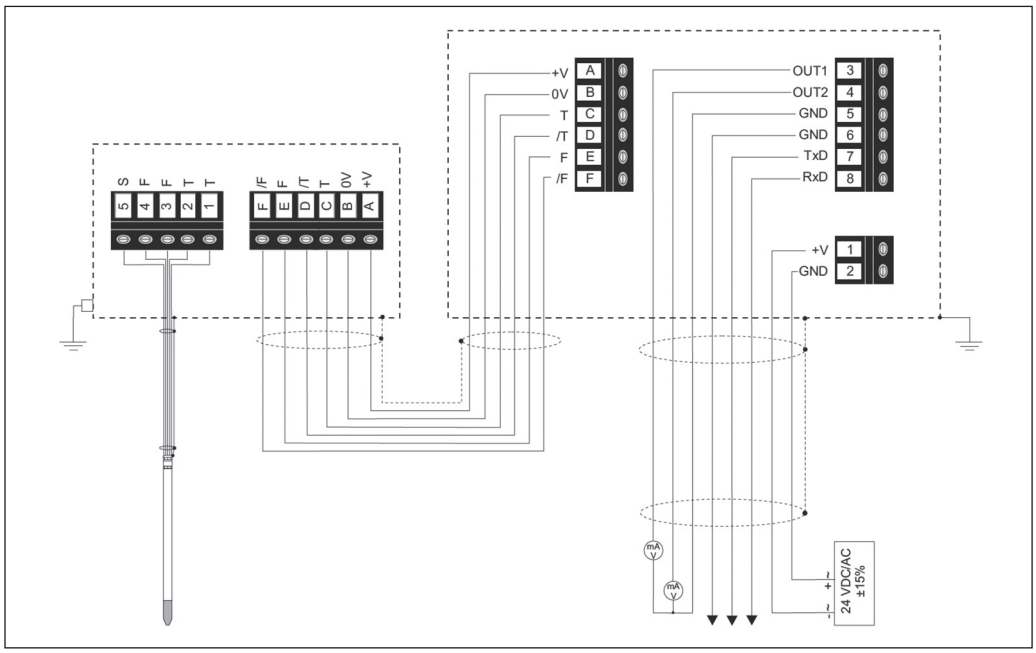


Fig. 6: Connection diagram of humidity sensor

Humidity sensor comes with below:

- Supply and Evaluation Unit (SEU)

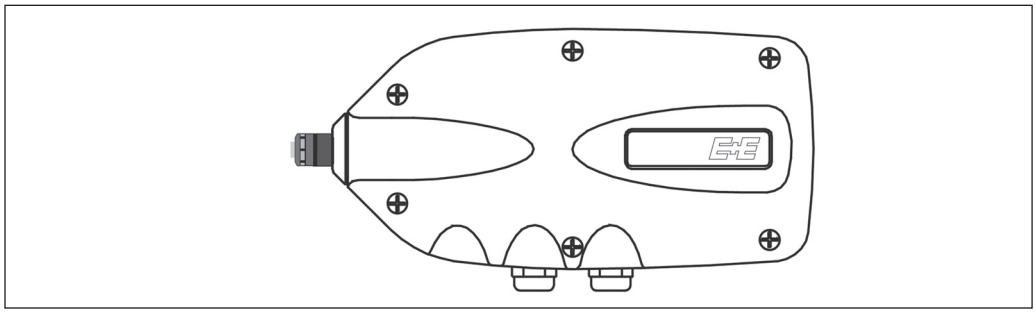


Fig. 7: SEU

- Sensor Driver Unit (SDU) {amplifier unit} and measuring head (with 1 m measuring cable)

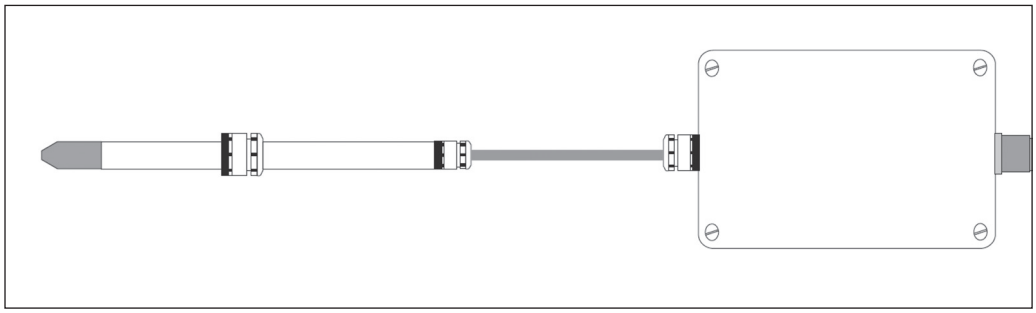


Fig. 8: SDU

Compare the serial numbers! Both SEU and SDU must have the same serial number.

4 Wiring

It is recommended that mains power is fed from the bottom through the foundation base. The signal cables through the cable channel at the back side of Carbosys.

- Connect the yellow/green (ground) cable to PE on the left-side block
- Blue (Neutral) cable to N on the right-side block
- Brown (Life) cable to L1 (left)

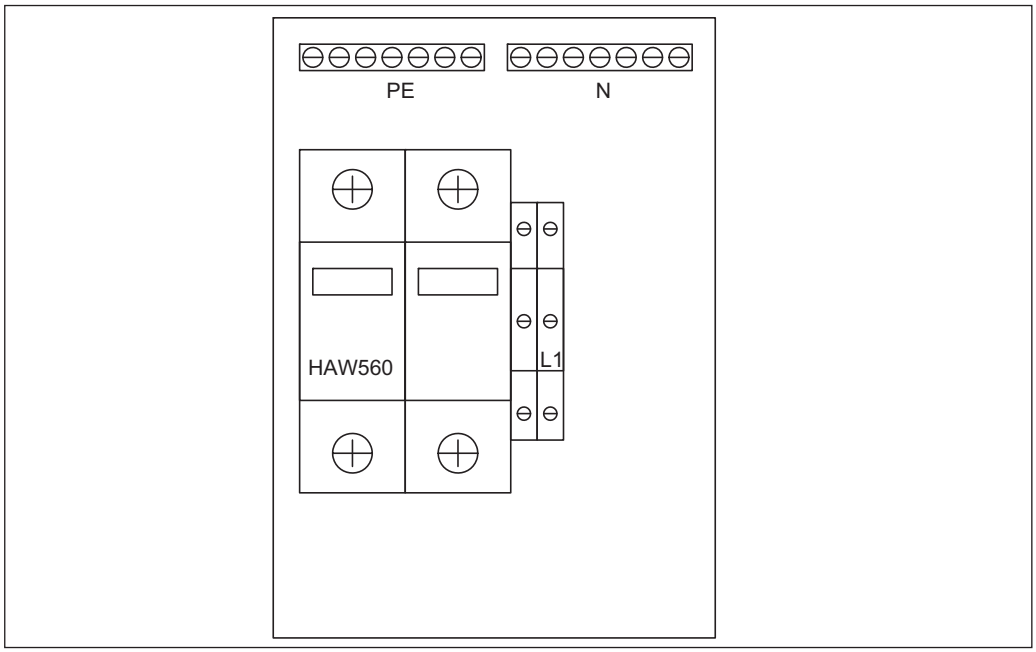


Fig. 9: Wiring into junction box in bottom section

4.1 Electrical connection

⚠ CAUTION

Inappropriate connection can cause serious injuries or death 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. Prior to beginning make sure voltage is not applied to any of the cables.

The following figures show the connection compartments as examples. Your specific model and its setup and amount of connection terminals can vary. The location of the connection terminals are always placed at the left side of the top rail.

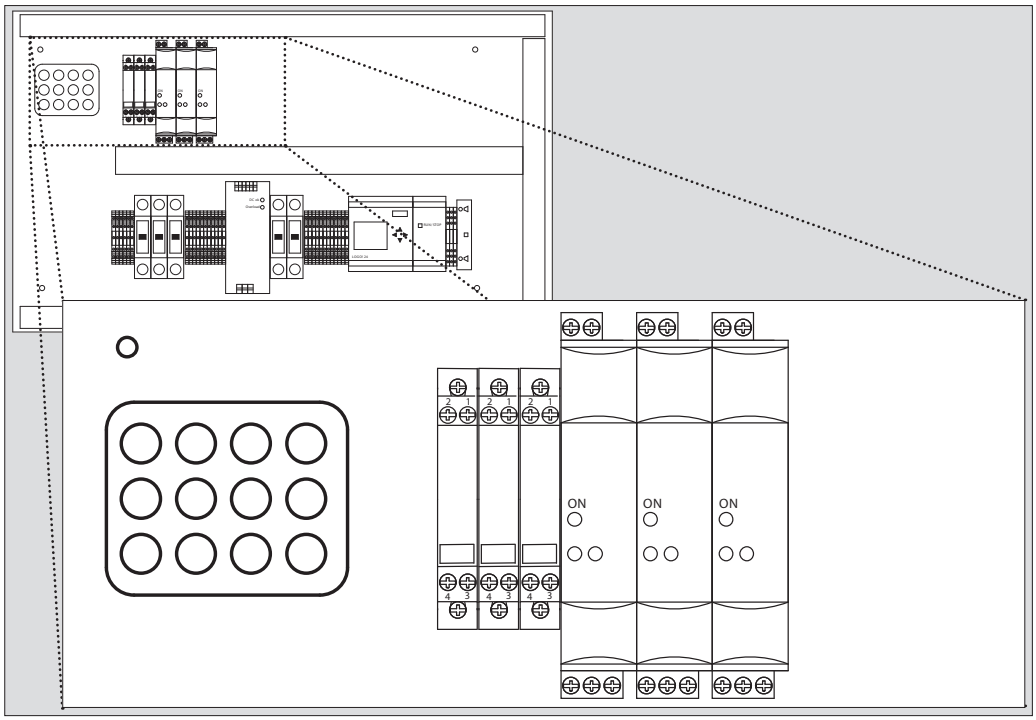


Fig. 10: Electronic compartment: Mounting plate using vortex flow instruments

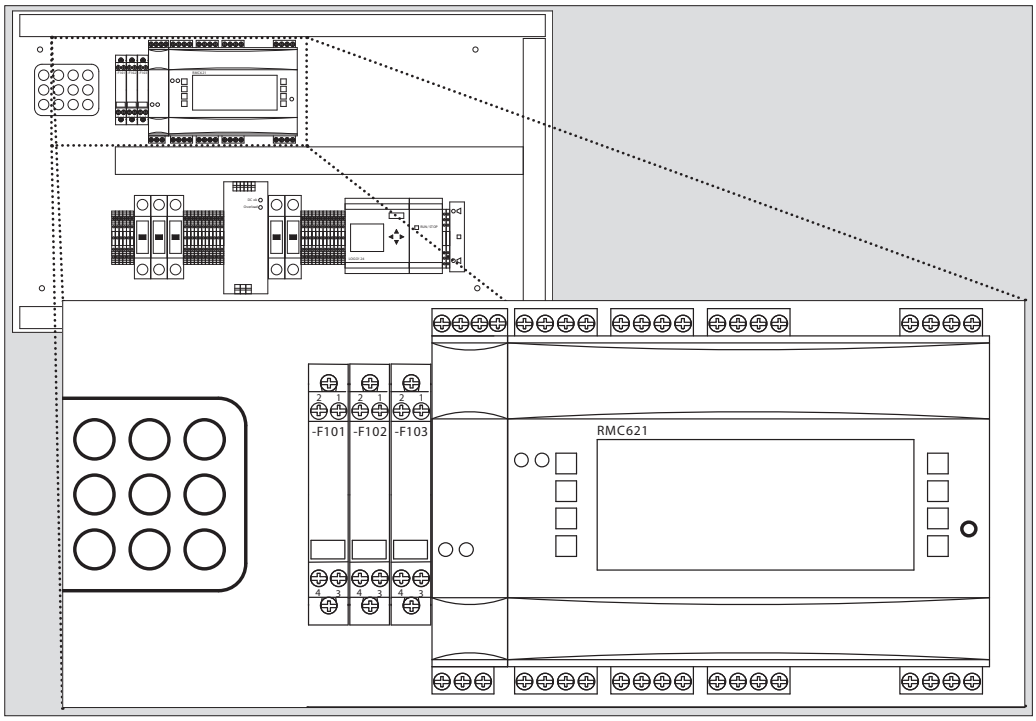


Fig. 11: Electronic compartment: Mounting plate using dp-flow instruments with additional flow-computer RMC621

Fig. 12: Connection of the signal cables of humidity probe

Device ID.	Parameter	Type of sensor	Terminal 1	Terminal 2
Measuring Point 1			0/4 to 20 mA	
-F101	Flow or dP	Prowirl or Deltabar	1(+)	2(–)
-F102	Pressure	Cerabar	1(+)	2(–)
-F103	Temperature	iTEMP	1(+)	2(–)
Measuring Point 2 (optional)			0/4 to 20 mA	
-F104	Flow or dP	Prowirl or Deltabar	1(+)	2(–)
-F105	Pressure	Cerabar	1(+)	2(–)
-F106	Temperature	iTEMP	1(+)	2(–)
Measuring Point 3 (optional)			0/4 to 20 mA	
-F107	Flow or dP	Prowirl 72F or Deltabar	1(+)	2(–)
-F108	Pressure	Cerabar	1(+)	2(–)
-F109	Temperature	iTEMP	1(+)	2(–)
Measuring Point 4 (optional)			0/4 to 20 mA	
-F110	Flow or dP	Prowirl 72F or Deltabar	+	GND
-F111	Pressure	Cerabar	+	GND
-F112	Temperature	iTEMP	+	GND
Relative humidity (optional)			internal low voltage signals	
-A5	Humidity	EEx30	A(+V) B(0V) C(T)	
			D(/T) E(F) F(/F)	
Power supply			115 / 230 VAC	
-F200	Mains power		L(L) N(N) PE(PE)	

Fig. 13: Terminal and pin and device assignment of the signal cables

Supply Voltage

115 / 230 VAC +10 %, 50/60 Hz

The power supply has to be fused with a maximum rating of 16 A.

Power consumption

Max. 650 VA (complete system)

4.2 Power supply

The integrated UPS provides an uninterrupted power supply of the system in the event of a shut down of the mains power.

The UPS is able to supply the system for maximum 20 min. This time is determined by the actual power consumption of the system and the condition of the batteries inbuilt in the UPS.

In the case Carbosys CH_4 CDE70 is installed in an unstable power grid the installation use of a power stand-by unit (generator) is recommended.

4.3 Cable entries

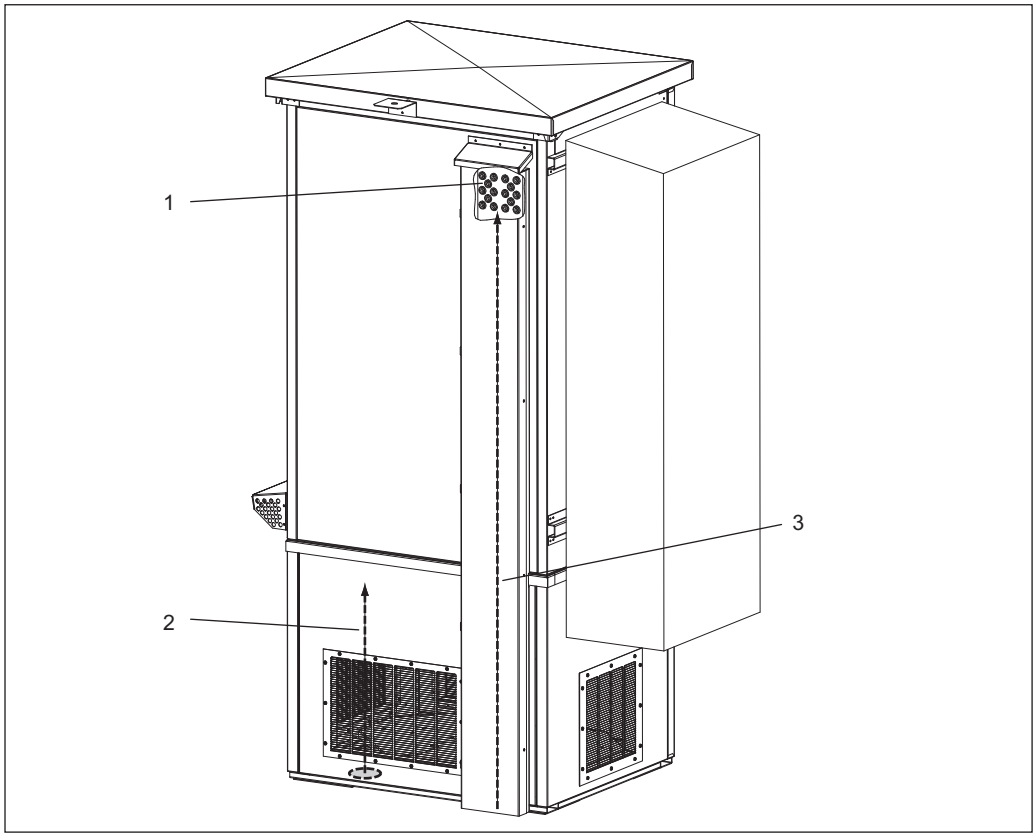


Fig. 14: Cable entries

1 Cable glands
2 Mains power
3 Signal cables

Signal cables are fed into the electronic compartment (see fig. 14) using the installed cable channel using up to 16 cable glands M20 (depending on selected order code).

The power supply cable is installed through the open bottom of the cabinet.

Cable specification

- Power supply e.g.: NYY-J 3 core, max. 4 mm²]
- Analog signal cables for peripheral two-wire instruments e.g.: LiYCY 2x2x0.5 mm² (suitable type for intrinsic safe wiring)
- Connection cable for humidity sensor EE30EX e.g. LiYCY 3x2x0.5 mm² (suitable type for intrinsic safe wiring)

5 Operation

5.1 Operating elements

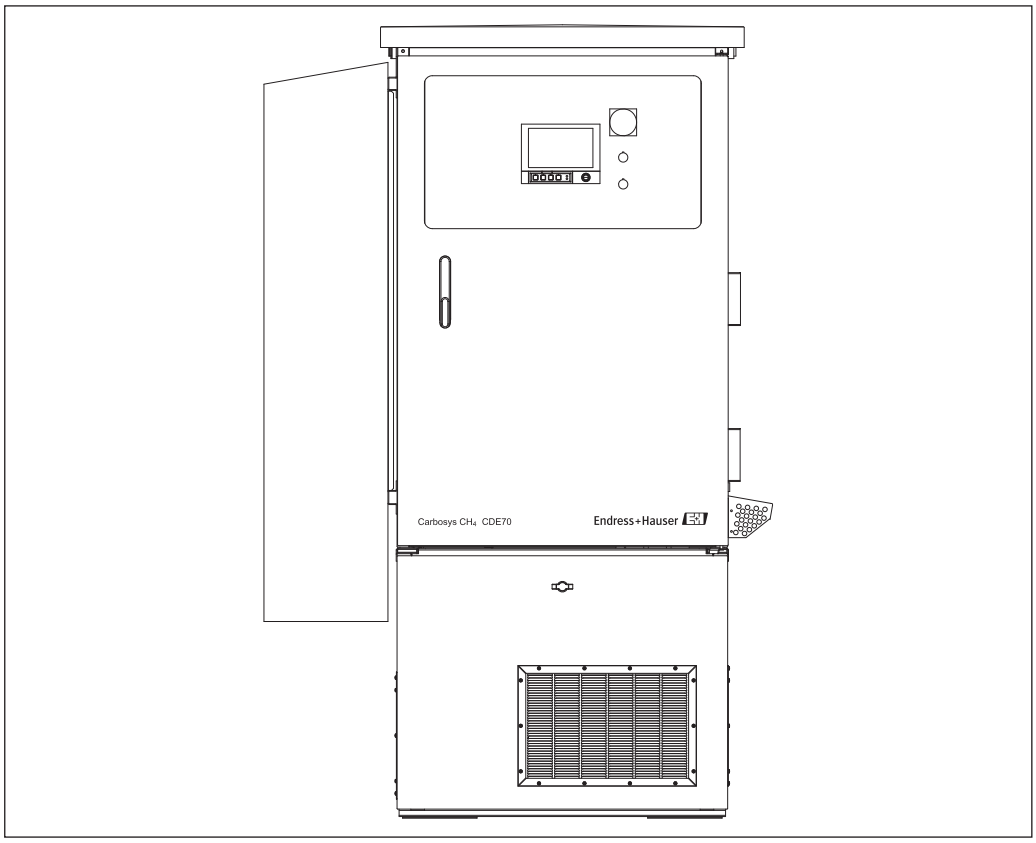


Fig. 15: Carbosys CH_4 CDE70 measuring station.

Carbosys CH_4 CDE70 comes in a stainless steel cabinet separated in three compartments. The electrical compartment is the top section and comprises of all electrical and control devices. The analyzing compartment is the middle section. The bottom section comprises the cooling module and mains connection. The cabinet has been designed to withstand tropical climate.

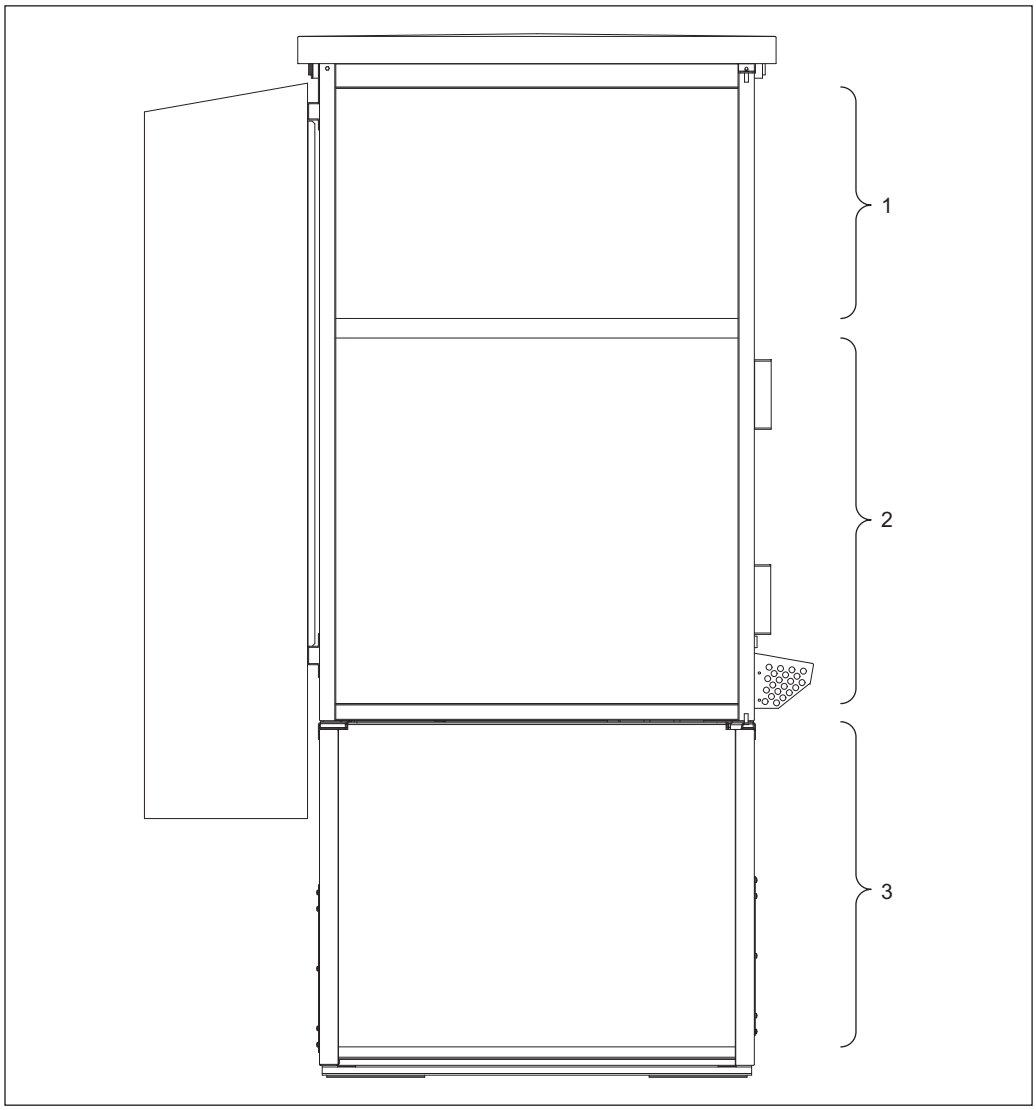
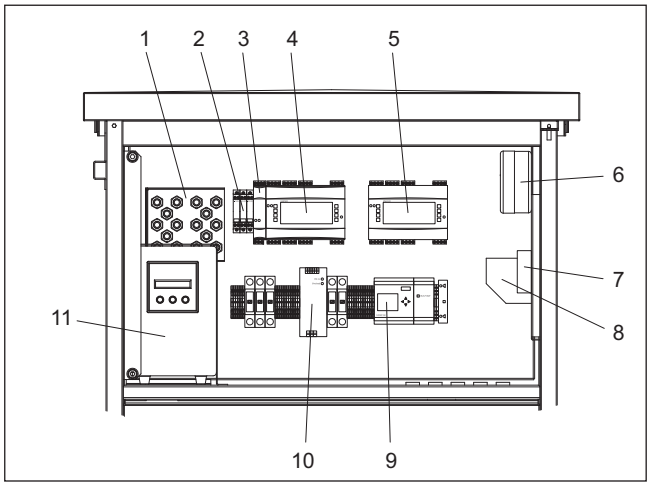


Fig. 16: Top-, middle- and bottom section of the Carbosys CH_4 CDE70 measuring station

1 Top section
2 Middle section
3 Bottom section

5.1.1 Top section – electrical compartments

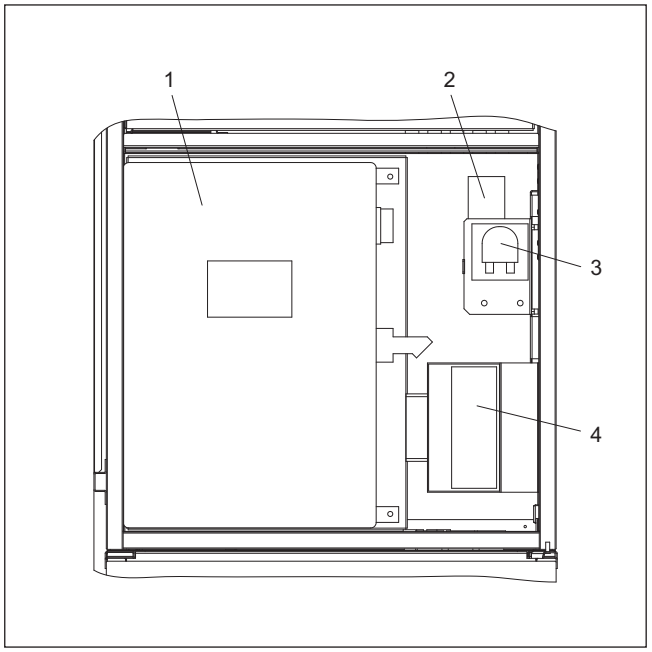
The top section comprises the RSG40 Memograph and, arranged behind it the electrical compartments. The following figure shows only the electrical compartments. The RSG40 Memograph is shown and described in chapter 5.2 “Display and keypad”



1 Inlets of Signal lines of P, DP, T and RH sensors
2 Lightning Arrester for DP, T&P
3 RN221N
4 RMC621
5 RMC621 (optional)
6 Humidity Sensor Controller
7 Modem
8 Methane sensor (Additional for inside cabinet) for continuous system
9 Siemens PLC Controller
10 24VDC Power Adaptor to Awite
11 UPS (~10 minus) after power supply cut

Fig. 17: Top section – electrical compartments

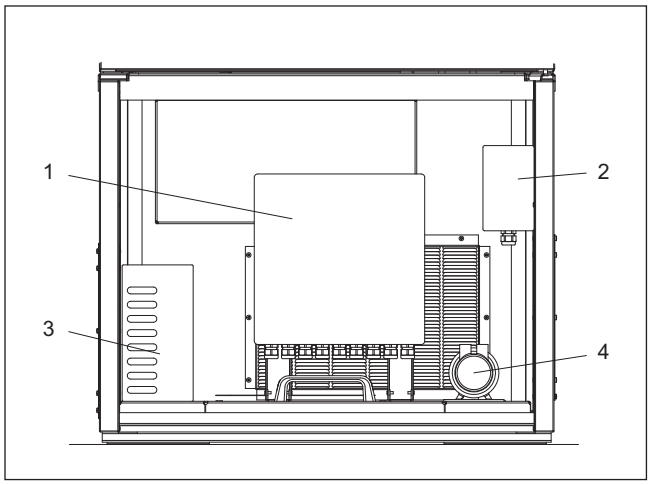
5.1.2 Middle section – analyzing compartments



1 AwiFlex
2 Gas cooler
3 Condensation pump (Perilstatic)
4 Air-Conditioning unit

Fig. 18: Middle section – analyzing compartments

5.1.3 Bottom section – cooling module



1 Controller Unit for Cooling System
2 Junction box
3 Cooling Unit Compressor
4 Water Pump

Fig. 19: Bottom section – cooling module

5.2 Display and keypad

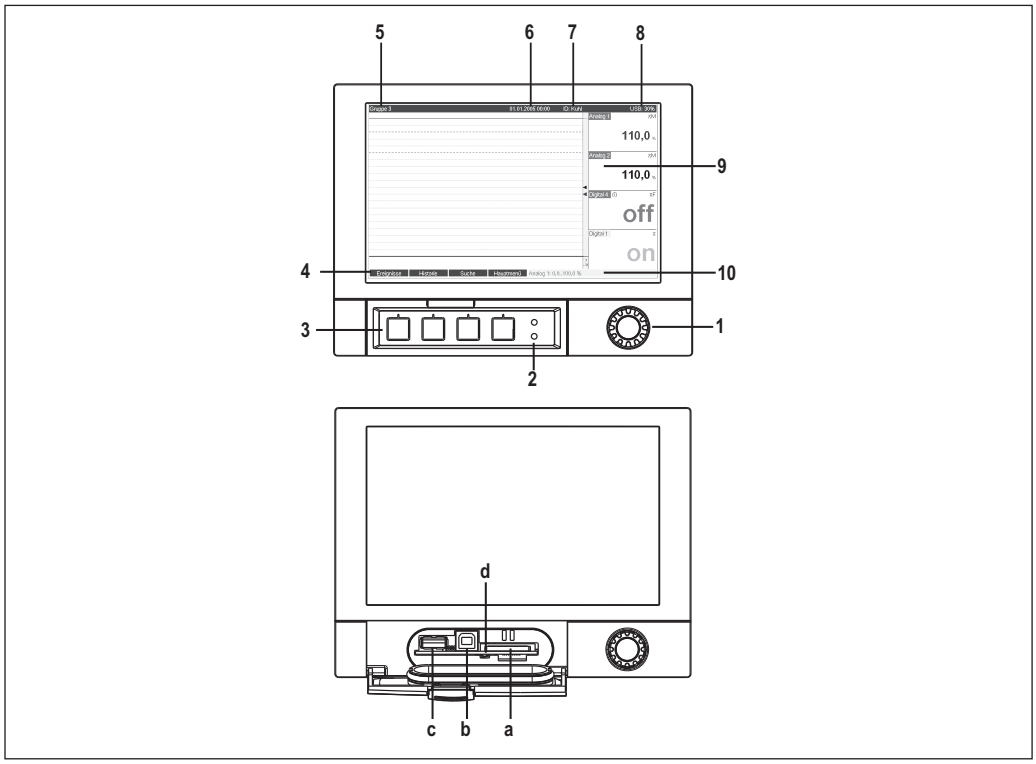


Fig. 20: Device display/operating units

Operating element (Item No.)	Operating function (Display mode = measured value display) (Setup mode = operating in the Setup menu)
1	"Navigator" jog/shuttle dial for operating with additional press function. In the Display mode: turn the dial to switch between the various signal groups. Press the dial to display the main menu. In the Setup mode or in a selection menu: turn the dial counterclockwise to move the bar or the cursor upwards or counterclockwise, changes the parameter. Turning clockwise moves the bar or cursor down or clockwise, changes parameter. Press = selects the highlighted function, starts parameter change (ENTER).
2	Functions of the LED display (as per NAMUR NE44:) ■ Green LED (top) lights up: power supply OK, unit working without faults ■ Red LED (bottom) flashes: need for maintenance if unit-external problem occurs (e.g. cable open circuit etc.) or a message / note to be acknowledged is pending, calibration in progress
3	Variable softkeys 1 to 4 (from left to right)
4	Function indicator of the softkey
5	In the Display mode: current group name, type of evaluation In the Setup mode: name of the current operating item (dialog title)
6	In the Display mode: displays current date/time In the Setup mode: --
7	In the Display mode: user ID (if the function is enabled) In the Setup mode: --
8	In the Display mode: alternating display indicating what percentage of the SD card or USB stick has already been written to. Status symbols are displayed for the following functions (alternate with the memory information): Simulation mode, data storage active, operating lock, batch active 1) In the Setup mode: the current "direct access" operating code is displayed
9	In the Display mode: screen for measured value display displays the current measured values, and the status in a fault/alarm condition, depending on the signal display selected. In the case of counters, the type of counter is displayed as a symbol 1). ! Note! If a measuring point has limit value status, the corresponding channel identifier is highlighted in red (quick detection of limit values). When you are operating the unit, measured value acquisition continues to run without interruption.
10	In the Display mode: alternating status display (e.g. set zoom range) of the analog or digital inputs in the appropriate color of the channel. In the Setup mode: different information can be displayed here depending on the display type.
a	for SD card "Caution!" Do not remove the SD card if the yellow LED (d) is lit! Risk of data loss!
b	USB B socket type "function" e.g. for laptop
c	USB A socket type "host" e.g. for USB stick
d	LED at SD slot Yellow LED lit when the unit writes to the SD card or reads it. "Caution!" Do not remove the SD card if the yellow LED is lit! Risk of data loss!

6 Commissioning

⚠ CAUTION Do not switch on the measuring station before filling water and cooling liquid in the cooling measuring station, or else the water pump will be destroyed in a few minutes!

The Carbosys CH_4 CDE70 has to be commissioned by an approved Endress+Hauser service technician.

7 Calibration and maintenance

7.1 Maintenance

The Carbosys CH_4 CDE70 device needs to be maintained at least annually. Maintenance activities are to be done solely by an approved Endress+Hauser service technician.

7.2 Calibration

The system calibrates itself automatically every 4 days. If necessary, the interval can be adjusted by a service technician. Changing the system settings and connecting the gas bottle for the automatic calibration will be done by a service technician, while commissioning or maintaining the device.

The calibration gas mixture needs to be exchanged during the annual maintenance.

The calibration gas mixture is not scope of delivery of Carbosys CH_4 CDE70. It has to be provided by the customer.

⚠ DANGER Handling high pressure gas bottles and highly flammable materials must not be done by inexpert personnel.

The following chart shows the required composition of the calibration gas mixture.

Example of Gas Bottle Composition		
	Customer Range (%)	Gas Bottle Composition (%)
CH_4	55~65	60
CO_2	30~40	35
H_2S	0.2~1.0	0.5 (500 ppm)

Example of gas composition at gas bottle (at 80 bar @ new condition):

CO_2 conc (N45): '45 %' vol. CO_2 (**44.81** +/- 0.90) Vol % +/- 2 % rel

H_2S conc (N18): 1000ppm (**1040** +/- 31) ppm +/- 3 % rel

CH_4 conc (N25): Rest

Composition to be entered into AwiFlex :

CO_2 conc : **44.81** Vol %

H_2S conc : **1040** ppm

CH_4 conc : 55.1 Vol %

8 Troubleshooting

8.1 Measuring station

The list below describes possible problems, with which the operator may have to deal after launching the device the first time or while the device is operating. Please follow the instructions closely. In case the problem still occurs, please contact a service technician.

Problem	Cause	Remedy
Beep-sound after launching the device	Phase of mains supply connection attached incorrectly	Switch phase of mains supply
Device shows no reaction	■ Incorrect installation (wrong voltage, attached incorrectly) ■ Device damaged (e.g. transport damage)	■ Check electric connections ■ Check the green LED of the power supply unit (PULS) ■ Inspect the device closely for visible damages ■ Check for correct voltage (compare the to the type plate)
After start up: Yellow or red signal is lit	■ Incorrect installation (e.g. gas connections) ■ Measuring gas missing	■ Acknowledge error message ■ Check gas connection ■ Assure gas flow ■ Check error log
Malfunction (red signal is lit)	External gas sensor defective	
	Air circulation failed	■ Check the air strainers ■ Control the fans ■ Check the flow monitor. Is the green LED at the flow monitor lit?
	Dysfunction in the cooling system ■ Excessive coolant temperature ■ Cooling system failed ■ Coolant lacks	Check the liquid level in the cooling system – refill coolant if necessary
	Gas supply failed ■ Gas flow underdosed ■ Water in the measuring station	■ Check gas flow ■ Ensure adequate gas supply ■ Check measuring circuit (function of the condensate pump, gas filters)
	Low battery capacity (< 25 %)	Restore mains supply
Continuous system: Malfunction “Gas warning” (red signal is lit), device not stopped	■ Gas concentration in the measuring station > 0.4 % Vol. of methane ■ Supposable system leakage	■ Gas concentration > 0.4 % Vol. ■ Supposable leaky system
Gas alarm (yellow signal is lit), device stopped	■ System leakage ■ Gas concentration in the measuring station > 0.8 % Vol. of methane	■ Check gas pipes for damages ■ Check gas pipe connectors for damages ■ Aerate device ■ Acknowledge error message ■ Check the display of the AwiFlex unit. For detailed information about possible system error messages see section 8.3 Troubleshooting AwiFlex Error occurs again: ■ Call service technician

8.2 Troubleshooting Memograph M

The following section is based on information out of the operating instructions of Graphic Data Manager RSG40 Memograph M (BA247R).

8.2.1 Diagnosis/simulation in the main menu

Unit information and service functions for a swift unit check. For descriptions, see Section 7.6.

8.2.2 Troubleshooting instructions

Dead pixels:

Dead pixels refer to pixels on LCD and TFT displays that are defect due to the technology or manufacturing techniques used. The TFT display used can have up to 10 dead pixels (Class III as per ISO 13406-2). These dead pixels do not entitle the user to a warranty claim.

Problem	Cause	Remedy
Display malfunction	Screen saver is active	Press a key. Check settings for screen saver in the setup.
	No LED lights up beside the keys or on the rear of the unit (Ethernet) => no power supply	Check power supply and mains connection.
	No LED lights up beside the keys or on the rear of the unit (Ethernet) => power unit defective	Replace the power unit or call the service department of the supplier!
	An LED lights up beside the keys or on the rear of the unit (Ethernet) => display defective	Replace the display or call the service department of the supplier!
SD card slot does not work	CPU defective	Replace the CPU or call the service department of the supplier!
No data on the SD card	Setup changed	Save the data onto a data carrier before making any changes to the setup.
	Software update/upgrade	Save measured values onto a data carrier before making any changes to the software.
	SD card defective	Replace the SD card, use genuine cards from the manufacturer! (Accessories, see section 8)
	CPU defective	Replace the CPU or call the service department of the supplier!
Setup is locked	Setup lock active, i.e. the setup is only released with a digital signal	Create a digital signal to remove setup lock.
	Operation is locked by a user code	Enter the correct user code to disable the lock.
Relay does not work	Incorrect connection	Check the connection and circuit of the relay.
	Incorrect configuration	Check the configuration of the relay.
	Power supply defective	Replace the power unit card or call the service department of the supplier!
	Digital card (optional) defective	Replace the digital card or call the service department of the supplier!

Problem	Cause	Remedy
No connection to the unit	Cable defective	Replace cable.
possible via the USB	Driver for USB connection not installed on the PC	Install driver.
RS232/RS485, Ethernet interface not working	Cable defective	Replace cable (Accessories, see section 8).
	Incorrect connection assignment	Use original cables.
	Incorrect unit address	Check and set correctly.
	Incorrect interface parameters	Check and set correctly.
	CPU defective	Replace the CPU or call the service department of the supplier!
Modem connection not working	Modem not initialized on unit	Initialize modem via PC software supplied.
	Incorrect or faulty connecting cable	Replace cable (Accessories, see section 8).
Digital input does not function	Incorrect connection	Check the connection and circuit of the digital input.
	Incorrect configuration	Check the digital input configuration.
	Power supply defective	Replace the power unit card or call the service department of the supplier!
	CPU defective	Replace the CPU or call the service department of the supplier!
Analog input shows “- - - - ” This means cable open circuit	The signal lines are incorrectly connected or not connected	Check connections.
Analog input shows “*******” This means the measured value is invalid	The input signal does not correspond to the configured signal	Check the input signal and the configuration.
Analog input shows “^^^^^^^” This means overranging	The sensor is defective	Check the input signal and replace the sensor.
Analog input shows “vvvvvv” This means underranging	The sensor is defective	Check the input signal and replace the sensor.
Analog output does not work	Digital card (optional) defective	Replace the digital card or call the service department of the supplier!
Communication to fieldbus (Profibus DP or Modbus) not working	Wrong settings	Check communication settings.
	Anybus communicator module defective	Replace communication module.
	Incorrect terminal assignment	Check the wiring to the fieldbus.

8.2.3 System error messages

Your unit informs you of faults or incorrect entries using plain text on the screen.

8.3 Troubleshooting AwiFlex

The following section is based on information out of the user manual of the AwiFlex unit

Error no., process analysis system	Error no., bus connection	Error text English	Short description of the error	Possible cause	Trouble-shooting
1	9999		Sensor has reached maximum signal	Sensor provides signal that is too high or indicates an error	Measured value is higher than measuring range of the sensor
7	-9995	General error (7)	General error	Corresponding object does not function properly or indicates an error	
13	-9989	Timeout: emptying took too long (13)	Timeout: emptying took too long	Pump faulty	
14	-9988	Timeout: Filling took too long (14)	Timeout: filling took too long	Pump faulty	
15	-9987	Timeout: wrong feedback (15)	Timeout: wrong feedback	Often occurs with valves with feedback that don't return expected feedback after change-over operation	If feedback is from a valve, the cause of the problem could be a blockage
17	-9985	Switched off because of overload of other sensor (17)			
18	-9984	Not measured because of filter test failure (18)			
19	-9983	No measurement yet (19)	No measurement has taken place yet	1. No measuring interval set 2. Validity expired	Check when measure-ment is planned, set measuring interval
20	-9982	Sensor has no signal! (20)	No measurement signal	1. Sensor faulty 2. Cable faulty 3. No connection to I/O module (LEDs don't flash on I/O module)	3. and 4.: Check contacts (loose connections, corrosion…) 4.: LEDs on I/O module don't flash => contact SERVICE

Error no., process analysis system	Error no., bus connection	Error text English	Short description of the error	Possible cause	Trouble-shooting
23	-9979	No feedback for RUN (23)	No feedback for RUN	A machine (mainly agitator or pump (no valves)) is not running although it was switched on by the control	Check respective component
24	-9978	Engine protection: STOPPED (24)	Engine protection triggered		■ Check the cause ■ If necessary, activate engine protection again
28	-9974	Variable not in ini file (28)	Variable not found in ini file	Configuration error	Please contact SERVICE
32	-9970	Serial Interface: Open error (32)	Serial interface could not be opened	Communication with internal or external bus component failed	Often a hardware problem, therefore check cable connections of the respective components
33	-9969	Serial Interface: Comm. error (33)	Serial interface: Communication error	Communication with internal or external bus component failed	Often a hardware problem, therefore check cable connections of the respective components
35	-9967	No life signal from peripherals (35)	No feedback from peripherals	Object ■ not running ■ does not exist ■ faulty ■ assembly faulty	Check if peripherals are faulty or not in operation
36	-9966	Status is not save: stopped (36)	Status is not safe, stopped For external process analysis systems please refer to the respective technical documentation	Respective object was stopped for safety reasons	
37	-9965	Component not connected (37)	Component does not exist		
38	-9964	Reading logfile failed (38)	Error when reading log file	Problems with datastore	

Error no., process analysis system	Error no., bus connection	Error text English	Short description of the error	Possible cause	Trouble-shooting
39	-9963	Writing logfile failed (39)	Error when writing to log file	Memory card full	If possible read out data and delete log file or request new Compact Flash Card à Please contact SERVICE
40	-9962	SMS send failed (40)	Error GSM module (SMS)		
41	-9961	Filter test failed (41)	Filter test failed	Please refer to the documentation for the AWITE process analysis system	
42	-9960	Calibration file not found (42)	Calibration file not found	Configuration error	Please contact SERVICE
43	-9959	Too few calibration points defined (43)	Too few calibration points defined	Configuration error	Please contact SERVICE
45	-9957	Emergency stop not released (45)	Emergency stop not released		Deactivate emergency stop after successful troubleshooting
46	-9956	No Flow (46)	No detectable flow	Flow monitoring: required flow does not exist (e.g. cooling water, ventilation)	
47	-9955	Bus: Timeout (47)	Communication error with bus		
48	-9954	Bus: set comm (48)	Communication error with bus		
49	-9953	Bus: CRC Error (49)	Communication error with bus		
50	-9952	Bus: failed opening (50)	Communication error with bus		
51	-9951	Bus: failed connecting (51)	Communication error with bus		
52	-9950	Bus: Socket failure (52)	Communication error with bus		
53	-9949	Calibration failed (53)	Calibration failed	Problems with optional half automatic calibration	

Error no., process analysis system	Error no., bus connection	Error text English	Short description of the error	Possible cause	Trouble-shooting
54	–9948	Calibration partly failed (54)	Calibration partly failed	Problems with optional automatic calibration	
55	–9947	Calibration: deviation too large – Sensor defective? (55)	Calibration: deviation too high	Problems with optional automatic calibration	
56	–9946	Sensor defective or dangerous atmosphere! (56)	Hazardous atmosphere or sensor faulty		Explosive atmosphere detected ■ Avoid sparks ■ No change-over operations ■ Ventilation ■ Eliminate leakage
57	–9945	Caution! Maybe Explosive Atmosphere! (57)	Risk of explosion	See –9966.0	
58	–9944	Sensor defective (58)	Sensor faulty	■ Measured value could not be accepted in the time given ■ Sensor is too slow	Sensor depleted => replace or clean sensor
59	–9943	Timeout (59)	Timeout: process takes too long	e.g. weighing change too slow during solids supply	
60	–9942	Timeout: No new measurement (60)	Timeout: time span since last measurement is too long	Error only occurs with analog outlet, measured value too old and therefore no longer valid	
61	–9941	Operation not started: remotely stopped (61)	Operation could not be started as it was stopped remotely		
62	–9940	not released (62)	Not released	Controller or process was not released by external control	Is for example true for the optional control of the air supply for desulphuri-zation

Error no., process analysis system	Error no., bus connection	Error text English	Short description of the error	Possible cause	Trouble-shooting
63	-9939	stopped (63)	Stopped	Measurement, process or process analysis system stopped due to error message from internal or external inlet	e.g. emergency stop
64	-9938	switched off (64)	Switched off	Control is switched off	Activate control
65	-9937	stopped, switched off or not released (65)	Not released, not stopped, not active or not switched on		Activate the component
66	-9936	device stopped due to failure of component (66)		e.g. water sensor was triggered	
67	-9935	vessel/tank is empty (67)		Filter depleted	
68	-9934	no data file (68)	Data file not found		Please contact SERVICE
70	-9932	Bus: failed write (70)	Communication error with bus	Communication with internal or external bus component failed	
71	-9931	Bus: failed read (71)	Communication error with bus		
72	-9930	out of memory (72)	Out of Memory	Memory full	Restart AWI CONTROL, if error persists, please contact SERVICE
73	-9929	ioperm failed (73)	No access right to hardware	Configuration error by AWITE	Please contact SERVICE
75	-9927	not ready (75)	Not all prerequisites are met	Process analysis system cannot be run as certain prerequisites are not met: ■ Other process analysis system not started up ■ Container empty ■ Wrong control setting	
76	-9926	cable broken (76)	Cable broken		

Error no., process analysis system	Error no., bus connection	Error text English	Short description of the error	Possible cause	Trouble-shooting
77	-9925	Moving logfile failed (77)	Log file could not be moved	Memory card full or faulty	If possible read out data and delete log file or request new Compact Flash Card
78	-9924	Backup failed (78)	Item (File) could not be saved		
79	-9923	miscellaneous error (79)	Item was set to error externally, e.g. by CactionTCL or visualization	The status of the object is not sufficient for the process, e.g. pressure too low	
80	-9922	script failed (80)	Error when executing (TCL) script	Programming error by AWITE	Please contact SERVICE
81	-9921	fail set by user (81)	Fail was set by user		
82	-9920	value is not a number (82)	(Measured) value is not a valid number (nan)		Please contact SERVICE
83	-9919	crazy error (83)	Strange error – something is not right		Please contact SERVICE
84	-9918	fail criteria reached (84)	End criteria with error on reaching: error, as criteria reached	Above or below limit	
85	-9917	OK criteria not reached (85)	End criteria with error on not reaching: error, as criteria not reached	Above or below limit	
87	-9915	error because of child item (87)	A subordinate object has an error		
88	-9914	error because of parent item (88)	A superordinate object has an error		
89	-9913	error because of other item (89)	Subsequent error: Another object has an error which influences the functionality of this object	Only with special process analysis systems	
90	-9912	pressure too high (90)	Pressure too high		

Error no., process analysis system	Error no., bus connection	Error text English	Short description of the error	Possible cause	Trouble-shooting
91	-9911	pressure too low (91)	Pressure too low		
92	-9910	pressure problem (92)	Pressure problem		
93	-9909	depleted (93)	Depleted/ exhausted (filter, number of SMS, etc.)		
94	-9908	oscillating (94)	FErr oscillating	Actuator has switched too often within a certain period of time	Instable sensor signal or wrong parameter (e.g. hysteresis)
98	-9904	write error (98)			
99	-9903	watchdog write error (99)			
100	-9902	could not open (100)			
103	-9899	Out of range (100)	Measuring ranges were exceeded	Set alarm limits were exceed or sensor returns signals that are too high or too low	

9 Technical Data

9.1 Input

Measured variable

- Massflow of methane; g[kgCH_4/h]
- Gas temperature; T[°C]
- Relative gas pressure; p[kPa]
- Volumetric concentration of CH_4; c[Vol.%]
- Optional:
  - Volumetric concentration of: CO_2, O_2, H_2S; c(Vol.%)
  - Relative humidity; c[%r.H.]

Measuring range

- CER, massflow, gas temperature and relative gas pressure depending on specification of peripheral instrumentation.
  - Internal sensor are specified as follows:
    - CH_4, CO_2 0 to 100 Vol%
    - O_2 0 to 25 Vol%
    - H_2S 0 to 200 ppm
    - r.H. 0 to 100 % (no condensation)
    - other ranges on request, please contact Endress+Hauser

Peripheral Instruments

- Flow transmitter using:
  - Vortex (Endress+Hauser ProWirl 72)
  - dP-flow using orifices or pitot-tubes (Endress+Hauser Deltatop) with differential pressure transmitter (Endress+Hauser Deltabar S)
  - Other methods to be evaluated
- Temperature transmitter using RTD(Pt100) probes for flow measurement (Endress+Hauser iTEMP & Omigrad S)
- Relative pressure transmitter (Endress+Hauser Cerabar S) for flow measurement
- Temperature transmitter using RTD(Pt100) probes for humidity determination in water saturated gas (Endress+Hauser iTEMP & Omigrad S)
- Relative humidity transmitter (scope of optional delivery)

Comparison of flow instrumentation:

Technique	Dp-flow		Vortex
	Pitot tube	Orifice(venturi)	
Signal type	$\dot{V}$	$\dot{V}$	$\dot{V}$
Raw signal	Differential pressure dP	Differenial pressure dP	Vortex frequency f
Required instru-ments	dP, p, T-tx	dP, p, T-tx	Vortex, p, T-tx
Inlet & outlet run	Spot measurement! ISO 5767-2 allows short in & outlet runs (7/3xDN) -> low accuracy !	Full area measurement! ISO 5767-2 requests long in & outlet runs (44/8xDN) to achieve best accuracy!	Spot measurement -> long inlet & outlet run required (20/5xDN)
Accuracy	Typ. 1-2 % o.r.	Typ. 0.5-0.7 % o.r.	< 1 % o.r.
Accuracy class	3	1	2

Technique	Dp-flow		Vortex
	Pitot tube	Orifice(venturi)	
Invest-ment f. DN100	Pitot: 1000 € dP: 1500 € p: 1000 € T: 500 € Total: 4000 €	Orifice: 500 € dp: 1500 € p: 1000 € T: 500 € Total: 3500 €	Vortex: 4000 € P: 1000 € T: 500 € Total: 5500 €
Power	2-wire loop powered	2-wire loop powered	2-wire loop powered
Ex protection	Ex ia	Ex ia	Ex ia
Recalibra-tion	All transmitters can be field-recalibrated	All transmitters can be field-recalibrated	Field-check not sufficient, recalibration only at accredited cal. rigs, second transmitter required to swap
Mainte-nance	Visual check of probe and cleaning of dusty/clogged impulse lines	Visual check for abrasion of orifice edge, cleaning of dusty/clogged impulse lines	Not required
Pressure drop	Low pressure drop	High pressure drop	- Low pressure drop if nominal bore flowmeter is used - High pressure drop if reduced flowmeter is used
Humidity influence	Can be compensated	Can be compensated	No influence
Low flow	Low accuracy at low flow application	Optimization sometimes required	Cut-off at low flow
Gas com-position influence	Compensated in Carbosys	Compensated in Carbosys	Compensated in Carbosys
Other CDM relevant benefits	- Integrated T-tx optionally available - Active part (dp-tx) not in direct medium contact	- Active part (dp-tx) not in direct medium contact - Primary element (orifice) easy to replace if damaged)	- Integrated T-tx optionally available
Other CDM relevant disadvan-tages			

CDM relevant benefits CDM relevant disadvantages

Due to several major disadvantages of thermal mass instruments in a CDM applications compiled in the table above Carbosys in its standard configuration does not support thermal mass instrumentation. It is understood that thermal mass instrumentation is used widely in Biogas applications due to its outstanding performance at very low flow conditions, in particular its high repeatability under stable process conditions.

For CDM applications flow instrumentation with best absolute accuracy (a.k. uncertainty, error) is required. Therefore an orifice plates with dp transmitter is the instrument of choice. Secondary the measuring station and it's instrumentation has to be recalibrated on a regular basis. The dp-transmitter can be field calibrated, while a thermal mass or vortex instruments has to be shipped to an accredited calibration rig, hence a second set of flow instrument is required.

9.2 Outputs

Output signal

Signals are saved digitally in Memograph M as a *.csv or *.dat (spreadsheet) file containing measured values as follows:
- Massflow of methane; g[kgCH_4/h]
- Gas temperature; T[°C]
- Relative gas pressure; p[kPa]
- Volumetric concentration of CH_4; c[Vol.%]
- Optional:
  – Volumetric concentration of: CH_4, CO_2, O_2, H_2S; c(Vol.%)
  – relative humidity; c(%r.H.)

The recorded file(s) can be transmitted using the USB interface at the Memograph. Alternatively the remote data transmission can be used as well. (Quad-Band GSM Modem compatible to SIEMENS TC35 inbuilt)

Signal on alarm

A remote alarm transmission via GSM Modem is realized with the TeleAlarm function of Memograph M. The message can be transmitted directly as a text message (SMS) to a cell phone.

9.3 Performance Characteristics

Reference operating

Ambient temperature: 25 °C

Air humidity: 55 % r.h.

Maximum measured error

For a full error analysis of the complete measuring system including the peripheral instruments please contact Endress+Hauser.

A typical system using peripheral instruments of the current generation (e.g. M or S class devices from Endress+Hauser) shows a measurement uncertainty of approx. 2.5 %.

The uncertainty of the complete system is mainly determined by the performance of the peripheral instruments.

The gas sensors integrated in the system and external humidity sensor come with following specifications:

parameter:	**uncertainty:**	**drift p.a.:**
CH_4, CO_2	+/-0.2 Vol%	1.5 Vol%
O_2	+/-0.02 Vol%	2.5 Vol%
H_2S	+/-50 ppm	300 ppm
r.H.	+/-2.3 %r.H.	TBD

Temperature drift

The drift depends on properties of the peripheral instrumentation. Instruments with smallest temperature dependency are highly recommended (e.g. Endress+Hauser S class instruments).

Within a full error analysis the temperature drift of the complete system is stated. Please contact Endress+Hauser.

Long-term drift

The drift depends on properties of the peripheral instrumentation. Instruments with smallest long term drift are highly recommended (e.g. Endress+Hauser S class instruments).

Within a full error analysis the long term drift of the complete system is stated. Please contact Endress+Hauser.

To minimize the long term drift effect an automatic calibration of the gas sensors is optional available.

Calibration gas requirements

For the "Automatic Calibration" feature or a manual recalibration calibration gas is required.

Following specification has the gas and bottle to provide:
- Calibration gas has to comprise all gas components according to sensors used in Carbosys (refer to order structure)
- Gas concentration of the mixture should represent the composition in gas sample; a typical biogas composition is is 55 % CH_4, 44 % CO_2, rest is O_2 and H_2S, The water vapor in the biogas won't be considered, the calibration gas has to be dry.
- Standard 10 l gas bottle, material: aluminium, filling pressure: 80 bar, sufficient for a calibration frequency of approx. 1/3 d for approx. 12 months

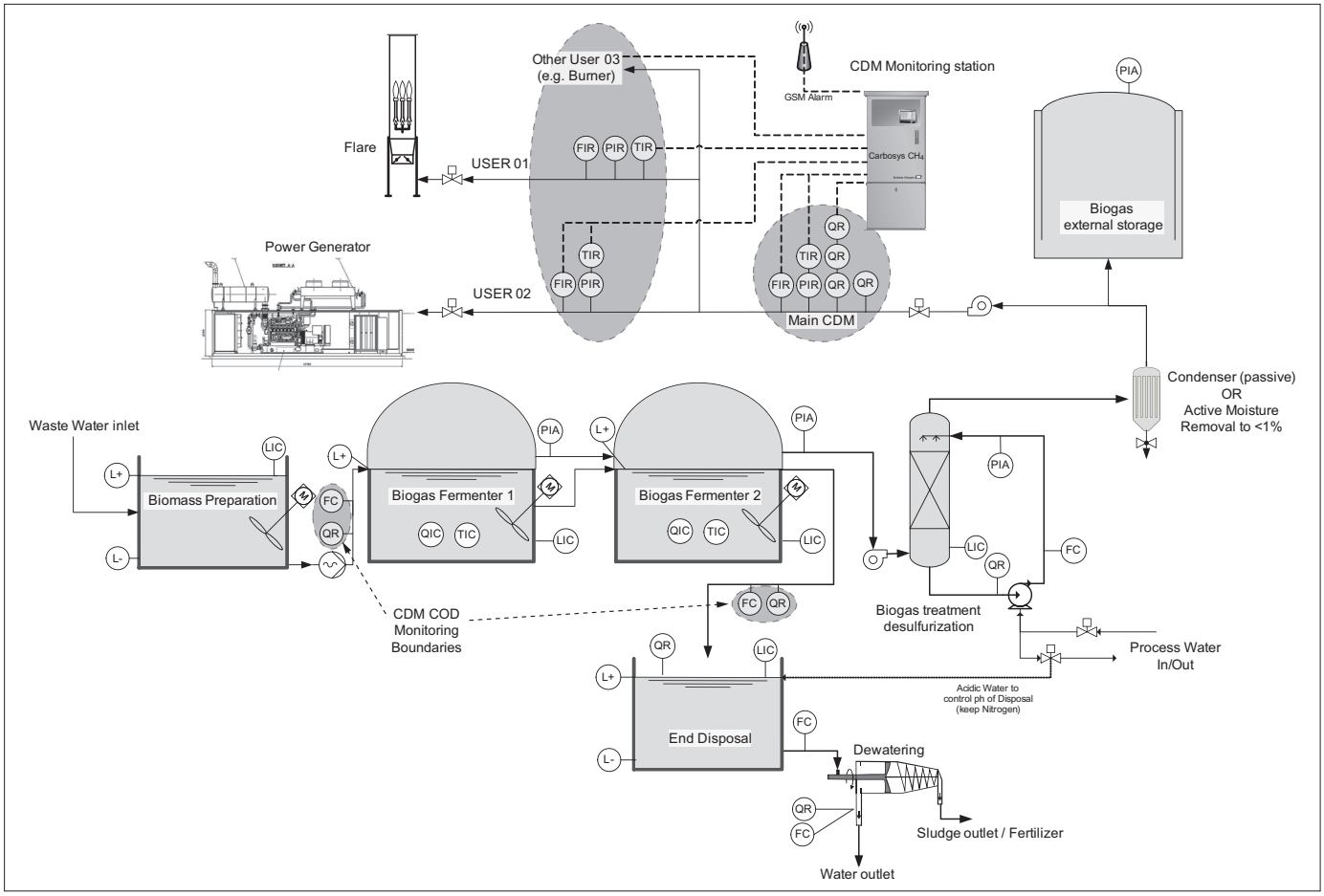


Fig. 22: Installation example

9.3 Environment

Ambient temperature
- 0 to 40 °C
- –20 to 40 °C available on request, please contact Endress+Hauser
- Avoid strong temperature fluctuations

Storage temperature
- –20 to 60 °C
- Outdoor installation only possible with protective installation (customer supplied)

Humidity
- Below dew point, installation in usual, clean rooms
- Outdoor installation only possible with protective installation (customer supplied)

Ingress Protection
- Electronic compartment and base IP44
- Measurement compartment IP54

Electromagnetic compatibility (EMC)
- All active electronic devices in the measuring station are CE marked in accordance with the EMC regulations.
- All Endress+Hauser devices in the measuring station fulfil the requirements laid down in the IEC 61326.

9.4 Mechanical construction

Design, Dimensions

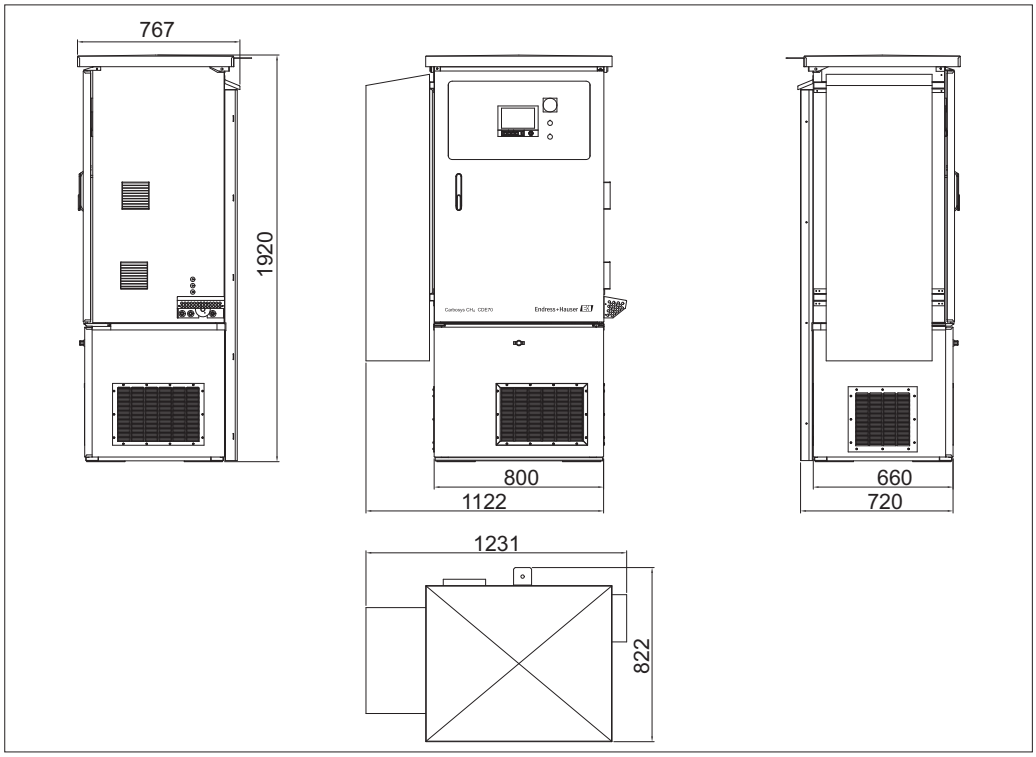


Fig. 23: Dimensions of the Carbosys CH_4 CDE70 measurement station including optional gas bottle housing amendment

Module	Component	Material
Cabinet for electronic, analysis and cooling compartment; roof	Sheet steel	SS 304 H
	Insulation	PU CO_2 foamed
	Gas bottle housing	SS 304 H
	Sight window	PC
Cooling compartment	Compressor	N/A
	Ventilator	N/A
	Evaporator	N/A
	Lubrication	N/A
	Distribution box	N/A
	Piping refrigeration system	N/A
	Piping cooling system	N/A
	Insulation	N/A
Analysis compartment	Pipework Gas Flow	SS 316 L
	Pipework Cooling System	PE
	Evaporator with ventilation	N/A
	Insulation	N/A
	Gas cooler	SS 316 L
	Condensate pump	N/A
Electronic compartment	Cabinet	SS 304 H
	Insulation	PU CO_2 foamed
	Ventilator	N/A

Weight
- Complete system: 365 kg

9.5 Process

Temperature
- 3 to 50 °C in sample pipe directly at the measuring station

Process pressure
- Main line: determined by the peripheral instrumentation
- Sample line: max. 20 mbar gauge; in case of high pressure applications the supplied pressure reducer or pressure regulator (customer supplied) needs to be installed

Medium
- Biogas, Landfill Gas, Coal seam gas and all methane containing gas mixture

Medium flow rate
- Main line: determined by the peripheral flowmeter
- Sample line: max. 1.5 l/h

9.6 Human Interface

Display Elements

Visual Data Manager Memograph
- Display: STN colour graphic display with 145 mm screen diagonal, 76800 dots (320x240 pixel)
- Display modes: Curves/sequences, plotting in zones, column/bar graph, digital display, event list (alarm set points/power failures)
- Signal grouping: 8 groups each with 8 channels

Operating Elements

Visual Data Manager Memograph
- Interactive menu led operation with integrated help function using 6 operating keys on the device.

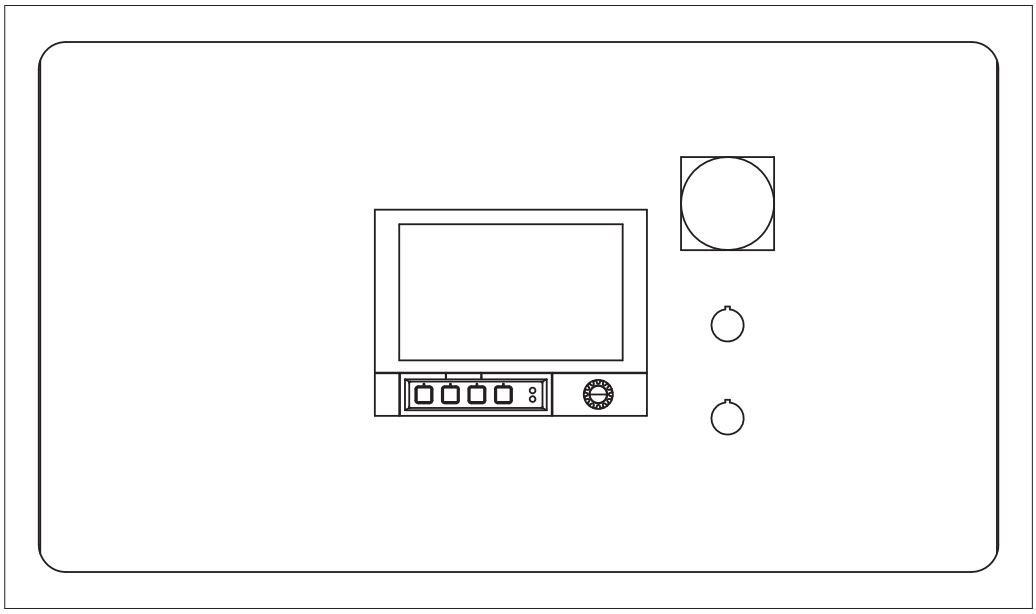


Fig . 23: Example of display and operating elements on a Memograph

Buttons with teltalate
- Gas Alarm
- Malfunction Alarm

Endress+Hauser

People for Process Automation

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* _____ [°C]
Conductivity / *Leitfähigkeit* _____ [S]
Pressure / *Druck* _____ [Pa]
Viscosity / *Viskosität* _____ [mm^2/s]

Medium and warnings
Warnhinweise zum Medium

	Medium /concentration *Medium /Konzentration*	Identification CAS No.	flammable *entzündlich*	toxic *giftig*	corrosive *ätzend*	harmful/ irritant *gesundheits-schädlich/ 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* _____

_____

Address / *Adresse*

_____

_____

Phone number of contact person / *Telefon-Nr. Ansprechpartner:*

_____

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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