ENOTEC
GAS SENSING SOLUTIONS SINCE 1980

Installation and Operation Manual

O_2 / COe Analyzer System

COMTEC® 6000

Version 18
for software version: 4.13

ENOTEC REMOTE

Doc.-ID: COM6000_11022020_EN

ENOTEC
GAS SENSING SOLUTIONS SINCE 1980

Preface

Dear Customer,

Thank you for selecting the COMTEC® 6000 as your InSitu Flue Gas Oxygen/Combustibles (CO_e) measuring system. Since 1980 our analyzer systems have been operating in numerous applications with tens of thousands of units being produced and shipped worldwide. ENOTEC is committed to absolute quality and performance and over time we have continuously enhanced our products to integrate various features and functions.

In this package, the electronic unit uses the very latest Microprocessor Technology, making the SME5 electronic unit one of the most advanced and up-to-date monitoring units, permitting you to reduce your maintenance & fuel costs and to achieve increased measuring accuracy with operational reliability.

The COMTEC® 6000 is a unique O_2 und CO_e analyzer system for reliable InSitu measurement and analysis in flue and process gases which enables a redundant measurement of Oxygen and combustibles with high accuracy. The installed MXP sensor measures not only CO but also all other combustibles (hydrocarbons and hydrogen) present. This one of a kind analyzer system is the ideal flue gas analyzer for all fuels such as coal, oil, gas and also waste products of all kinds.

All ENOTEC instruments are thoroughly tested in the factory and are subject to a strict ISO9001 Quality Assurance Procedure. Therefore, with the correct installation, the operation of the COMTEC® 6000 is straightforward and user friendly and will provide you with many years of trouble free operation with perfect measuring results.

Symbols used in this Manual

The symbols below are found attached to the COMTEC® 6000 system and in this manual. They emphasize important information as well as safety instructions for installation, operation and maintenance, to protect the personnel and the equipment.

	**Warning** Follow all instructions of this manual
	**Warning hot Surface** Warns of danger of burns which could occur from hot system parts
	**Caution** Warns of risks of destroying the system or its components or its functionality

	**Consider Information** Points out important information which must be considered before execution
	**Note** Contains further detailed information
	Ground earth electrical protection

Safety Instructions

This system is operated with line voltage. If covers are removed during which line voltage is still connected, an electric shock hazard will occur.
Only well trained and authorized personnel are allowed to conduct work on this system. Personnel have to understand all precautions, safety instructions, installation and maintenance instructions in this manual. The trouble free and safe operation of this system requires safe transportation, professional storage, installation, operation and maintenance.
Furthermore, all local safety requirements have to be considered.
This system may not be used in the vicinity of combustible gases as parts of the system may cause a risk of explosion.

The device may only be put into operation if the enclosed instructions have been fully understood.
This manual is also available in other languages on request.

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1 System Description

1.1 System Overview of the COMTEC 6000

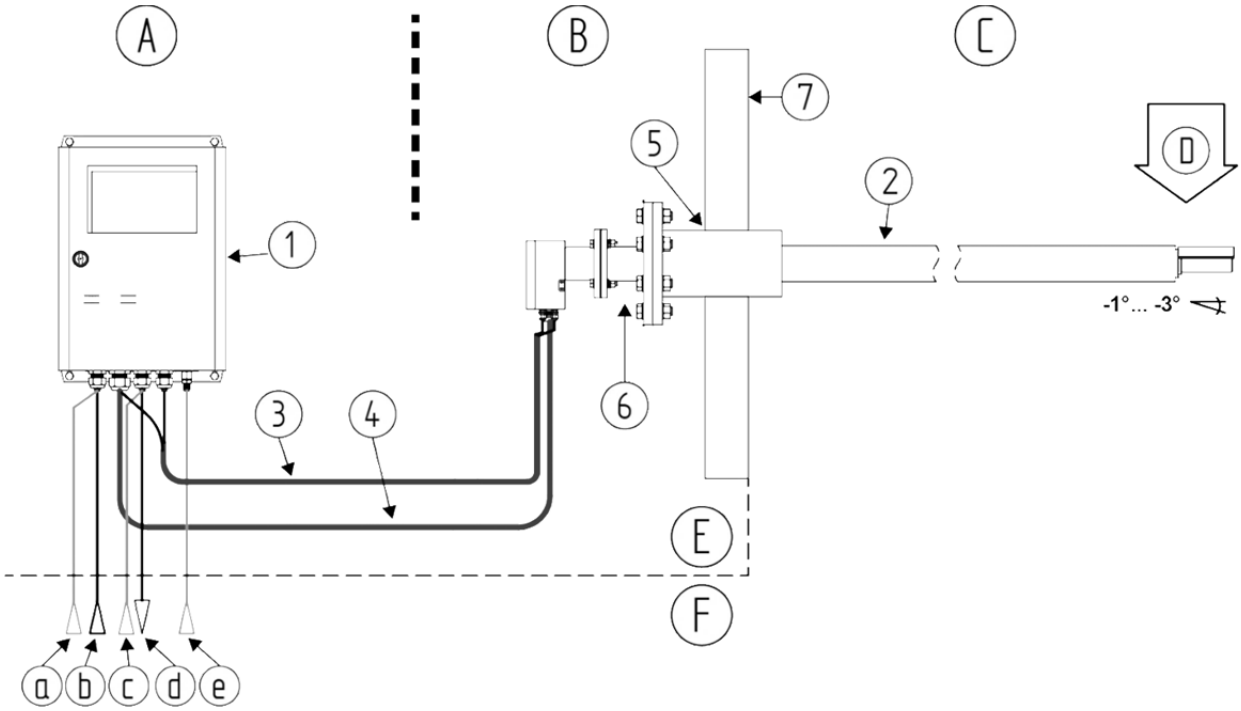


Figure 1 - System overview of the COMTEC 6000 for flue gas temperatures of up to 600° C

1	Electronic unit SME5 / IP66
2	InSitu measuring probe / IP65
3	Pneumatic cable
4	O_2 probe signal cable
5	Counter flange
6	Isolation: Customer
7	Duct wall

A	Safe Area - Max. ambient temp.: -20 °C to +55 °C (-4 °F to + 131 °F)
B	Safe Area - Max. ambient temp.: -40°C to +80°C (-4 °F to + 167 °F)
C	Duct / combustion chamber
D	Flue gas direction – max. flue gas temperature 500 °C
E	Manufacturer supply
F	Customer supply
a	Test gas in
b	Power supply
c	Instrument air in
d	Output signals *(analog and digital)*
e	Test air in *(only with pump version of electronics)*

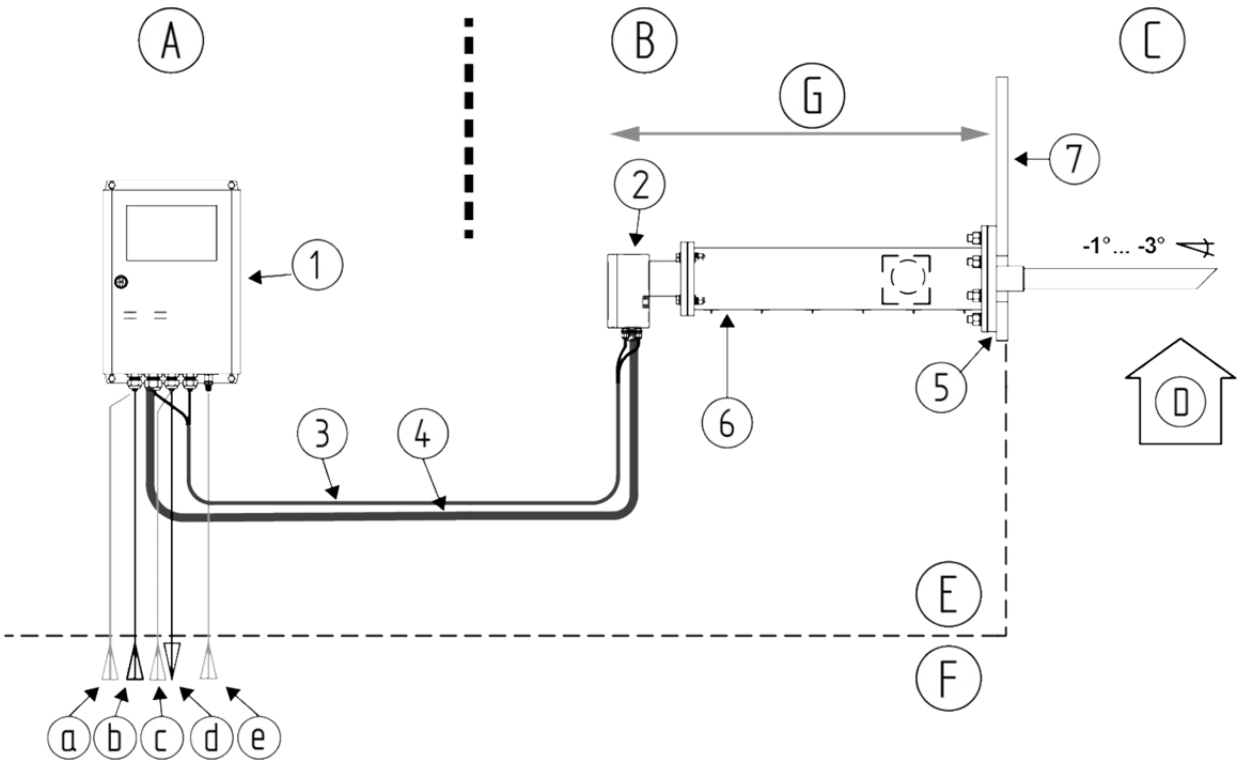


Figure 2 - System overview of the COMTEC 6000 with cooling protection tube for flue gas temperatures of up to 1400° C

1	Elektronik SME5 / IP66
2	InSitu measuring probe / IP65
3	Pneumatic cable
4	O_2 probe signal cable
5	Counter flange
6	Isolation: Customer
7	Duct wall

A	Safe Area - Max. ambient temp.:-20 °C to +55 °C (-4 °F to + 131 °F)
B	Safe Area - Max. ambient temp.:-40 °C to +80 °C (-4 °F to + 167 °F)
C	Duct / combustion chamber
D	Flue gas direction – max. flue gas temperature 1600 °C
E	Manufacturer supply
F	Customer supply
G	Space required: 2.0 m for standard installation. 0.8 m for 90° elbow construction
a	Test gas in
b	Power supply
c	Instrument air in
d	Output signals *(analog and digital)*
e	Test air in *(only with pump version of electronics)*

1.2 Measuring Principles

The COMTEC® 6000 O_2 / CO_e analyzer system consists of an in-situ probe which is installed in a duct to measure non-combustible process gases and of an electronic unit for voltage and gas supply, as well as for signal processing.

The O_2 sensor of the COMTEC 6000 is at the tip of the probe and is regulated to 800 °C and works on the zirconium oxide principle of measurement. Here, a mV signal between the reference gas side of the sensor (inside, instrument air 20.95% O_2) and the measured gas side is measured, which depends logarithmically on the ratio of oxygen partial pressures on both sides of the sensor. The mV signal is converted according to the Nernst equation into oxygen partial pressure within the process gas, whereby the O_2 concentration is determined in the process gas. Gas-tight separation of reference air and process gas is of particular importance.

The CO_e sensor at the tip of the COMTEC® 6000 probe detects combustible, gaseous molecules whereby the measured value corresponds to the CO equivalent (CO_e = CO equivalent). This value can be used as an indication of the combustion efficiency. A high CO_e value correlates with poor efficiency because a portion of the fuel is not completely oxidized.

The InSitu sensor is in contact with the sample gas with both electrodes. These catalytically active electrodes cause oxidation of the non-oxidized gas molecules, so that a voltage is generated between the electrodes, which depend on the CO_e concentration. Thus CO, H2 and C_xH_y (Hydrocarbons) can be measured.

1.3 Intended Use of COMTEC 6000

Info
ENOTEC InSitu analyers measure in flue gases of combustion plants or in comparable inert gas mixtures. If oxidizable gas components are contained in these processes, contact ENOTEC..

Info
The COMTEC 6000 InSitu Analyzer System is a system for measuring the oxygen concentration and the concentration of CO_e in flue gases. For reasons of safety and the possible occurrence of accidents, unauthorized conversions and modifications of the system are prohibited.

Warning
The COMTEC 6000 analyzer system may not be used to determine the oxygen content in combustible gases or be used in the vicinity of combustible gases. Doing this will cause a risk of explosion.

Info
The minimum concentration of O_2 in flue gas should, under normal process conditions, not be less than 0.5%.
If a reducing atmosphere of less than 0,5% O_2 regularly occurs, ENOTEC recommends **CSP** (Cell Surface Protection) for lasting protection of the measuring cell. (CSP is optional)

Info
The CO_e sensor requires a minimum O_2 concentration for correct measurement.
If the O_2 concentration falls below this limit, the CO_e measured value as well as the mA output rises up to the highest possible value for the given measuring range.

Caution
Under no circumstance should the measuring probe be directly connected to the 230V main power supply, as this will immediately destroy the probe heater element!

1.4 Safety Hazards

Warning hot Surface

During operation, the temperature of the probe filter head and of all parts exposed to flue gas is 150 °C – 600 °C (302 °F-932 °F). Direct contact with the hot parts for dismantling or maintenance will cause severe burns!

The probe may only be removed with heat-insulated gloves. Before removing the probe, always switch off the supply voltage to the electronic system. After removal, store the probe in a safe, protected place and wait until it has cooled downs below 35 °C (95 °F).

1.5 Disruption of the Process

The analyzer system has to be kept in operation also in the event of the process being disrupted or if the plant is powered off temporarily (e.g. at night or during the weekend). Frequently cooling down and heating up of the probe results in thermal stress of the hot probe parts (heater, thermocouple and sensor) and reduces their product life. ENOTEC will not accept any responsibility for resultant damage.

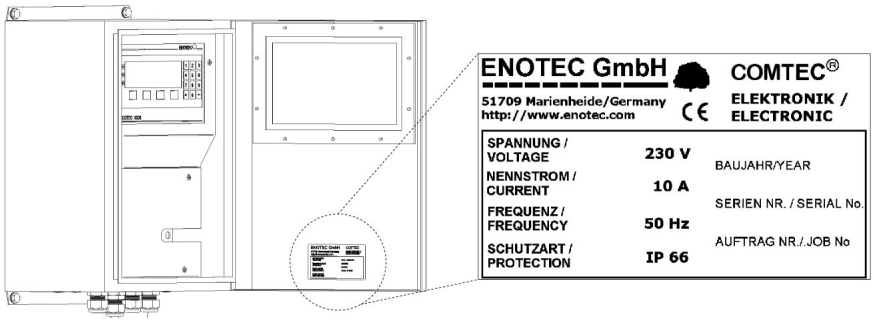
1.6 Storage instructions

ENOTEC equipment and spares are to be stored in a dry and ventilated environment at temperatures between -40 °C to +80 °C (-40 °F to 176 °F). Paint fumes, silicone sprays, etc. must be avoided in the storage environment.

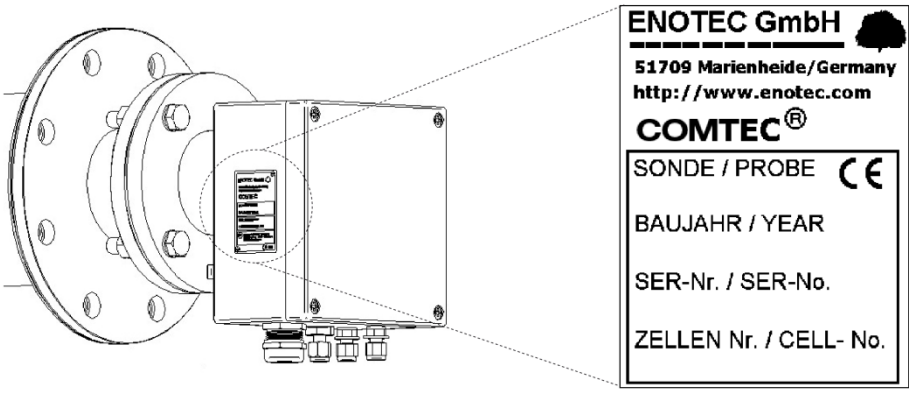
1.7 Name Plates

The name plate contains information about the line voltage, the nominated current, frequency, protection class, year of manufacture, serial number, order number and system order code.

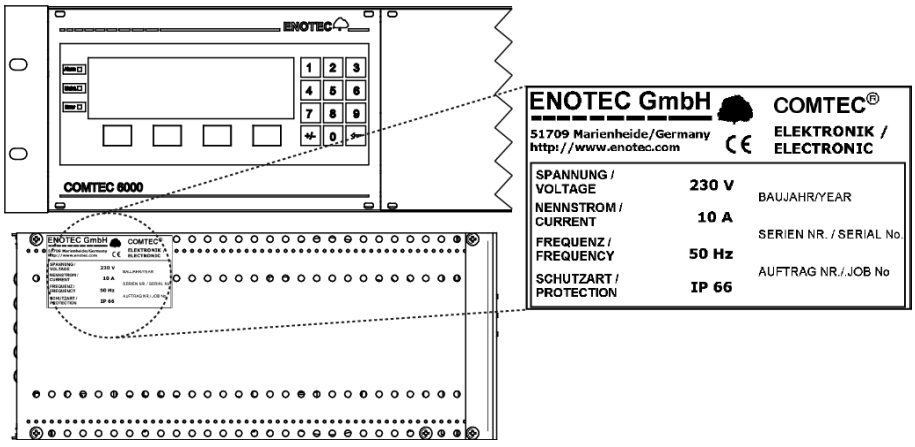
The system order code refers to information which is detailed in the system test report and supplied with the system.



SME-53



Probe Connection Box



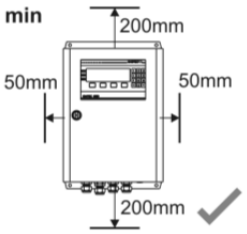
SME-57 (19" rack)

Figure 3 - Name Plates

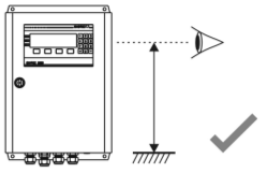
2 Installation

	Warning The electronic unit does not have a line voltage main switch. The line voltage power supply requires a switch or breaker. The line voltage switch/fuse/breaker must be in accordance with the local technical standards and should be in close proximity to the electronic unit and must be identifiable as such. The probe cable is suitable for an ambient temperature range from -40°C to +90°C. All other installed cables must be suitable for the ambient temperature range at side and must have the required size. All electronic unit terminals are specified from 0,08mm² (AWG 26) to 2,5mm² (AWG 14). If wire end ferrules are used the next smaller size is required. Before removal of the electronic terminal cover the line voltage must be switched off. The line voltage to the electronic unit must be switched on again after the cover is back in position. After installation, power conducting parts may not be accessible.

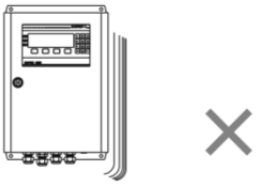
2.1 Installation requirements for electronic unit



Keep the minimum distance to adjacent objects

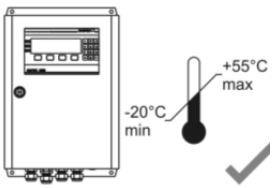


Install at eye level



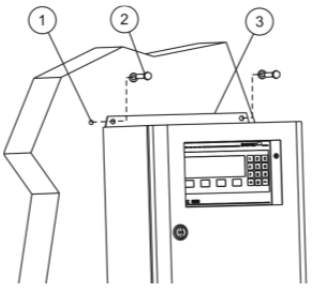
Avoid vibrations greater than 2g

Mind the IP code



Heavy equipment, ensure proper lifting and carrying

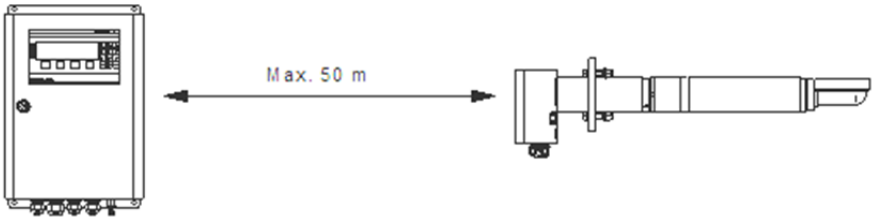
Ambient temperatures
Min.: -20 °C (-4 °F) / Max.: +55 °C (+131 °F) - (Pump version 20°C - +50°C)



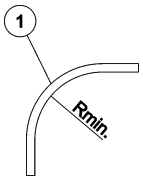
①	Drilled holes for the electronic unit
②	Use suitable screws
③	Electronic unit

Figure 4 - Installation of the Electronic unit

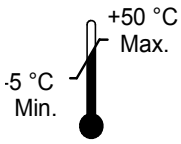
2.2 Installation of probe signal cable FEP-0007/8



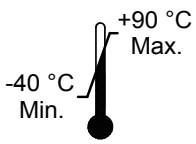
Abide by the maximum cable length (max. 50m)



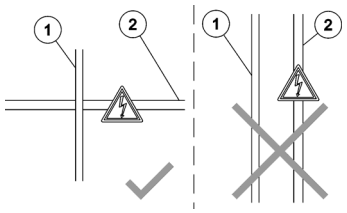
Note the minimum bending radius.
FEP-0007➔Rmin=252 mm
FEP-0008➔ Rmin=329 mm



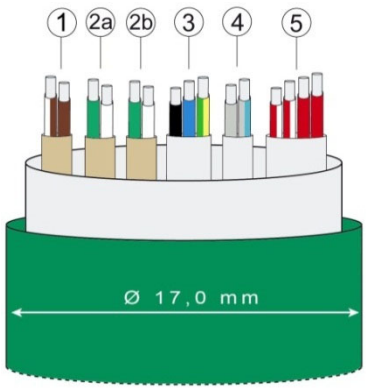
Temperature during installation



Temperature during operation



Cross the probe signal cable ① (FEP-0007/8) at right angle to any power supply cables ②.



COMTEC Probe Cable FEP-0007 (FEP-0008 armored)				
No.	**Function**	**Diameter**	**Colors**	**Info.**
①	Measuring cell	2 x 0,75 mm^2	white-brown / brown	With shield
2a	Thermocouple 1	2 x 0,75 mm^2	green / white	With shield
2b	Thermocouple 2	2 x 0,75 mm^2	green / white	With shield
③	Probe heater	3 x 1,5 mm^2	black / blue / green-yellow	
④	Probe Solenoid valve	2 x 0,75mm^2	grey / grey-blue	
⑤	CO_e Sensor heater and	4 x 1,0mm^2	red-white / red-white / red / red	

Figure 5 - Probe cable FEP-0007

Caution
Only use ENOTEC probe cables, as the thermocouple cables **2a** and **2b** are compensating cables and are necessary for correct measurement.
The shield of the probe cable must only be connected at the electronic housing at the PE terminal. Under no circumstance should the shield also be connected at the probe.

2.3 Access to the Terminals

⚠	**Warning** Before removing the terminal covers, switch off the mains voltage to the system. Switch the mains voltage on only after attaching the terminal cover. After the installation has been completed, live parts may no longer be accessible.

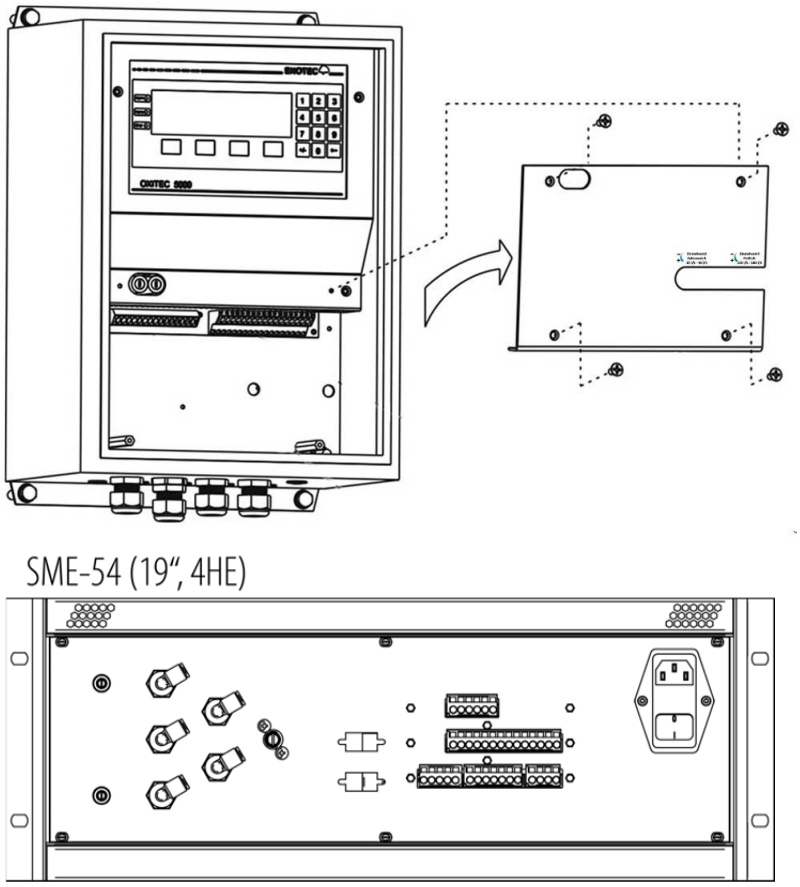


Figure 6 - Access to the Terminals

2.4 Ferrite Sleeves (EMC)

!	**Caution** In order to avoid cable related disturbances to the electronic unit, the supplied ferrite sleeves must be used. **CE-conformity is invalid if these ferrite sleeves are not fitted!**

2.5 Wiring diagram of the Electronic Unit

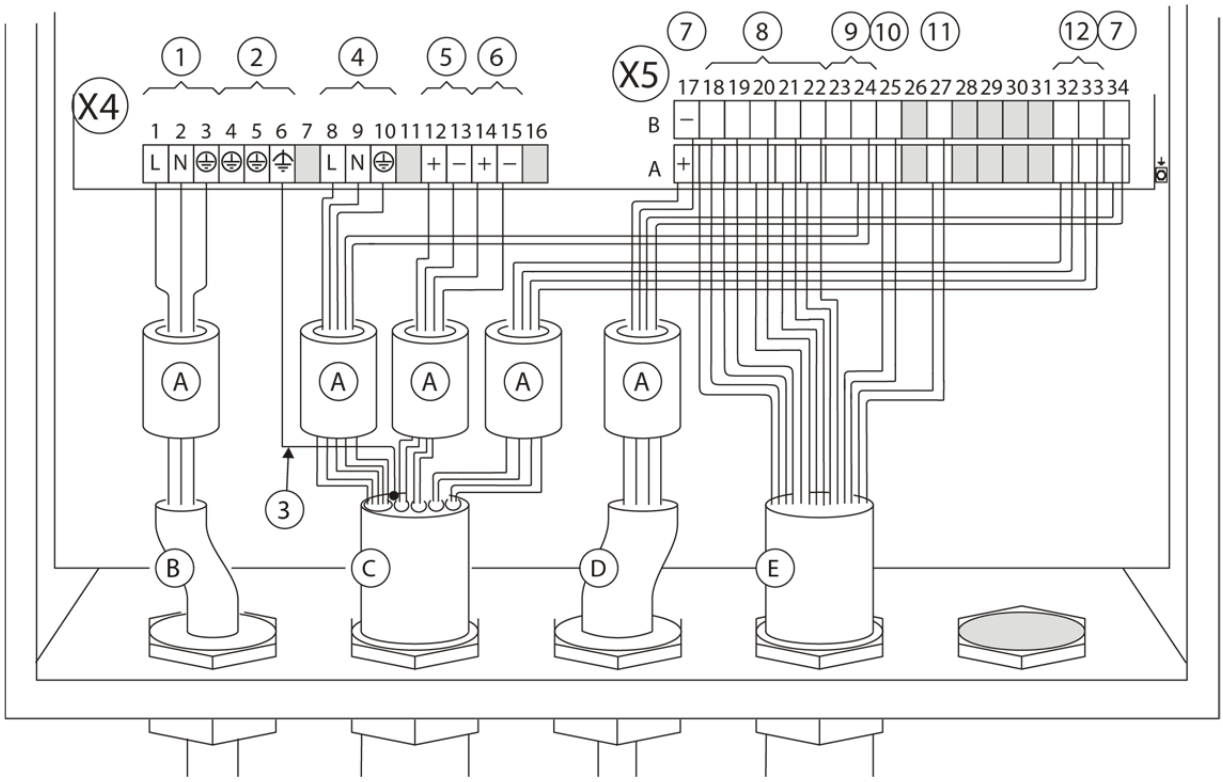


Figure 6 - Wiring diagram of the electronic unit

(A) Ferrite sleeves (Enclosed)

(B) Power supply cable (customer)

(C) Probe signal cable

(1) **Internal Power supply**

1	L	phase
2	N	neutral wire
3	PE	protection earth

(2) **Grounding**

4	PE	protection earth
5	PE	protection earth
6	PE	functional earth

(3) **Shielding**

(4) **Power supply probe heater (115V)**

8	L	black
9	N	blue
10	PE	green/yellow

(5) **O_2-sensor signal**

12	+	brown
13	-	brown/white

(6) **Thermocouple (O_2 sensor)**

14	+	green
15	-	white

(7) **Analogue outputs (active 4-20mA)**

17A	+	O_2
17B	-	O_2
34A	+	CO_e
34B	-	CO_e

(D) Analogue output cable (customer)

(E) Status signal cable (customer)

(8) **Relay contacts for status signals - Potential free**

18 A/B	Maintenance
19 A/B	System Error
20 A/B	Output A O_2 measuring range
21 A/B	Limit Alarm 1 (O_2)
22 A/B	Limit Alarm 2 (CO_e)

(9) **Probe solenoid valve**

23 A 23 B	Internal Power supply for probe solenoid valve (115VAC)	
24A	L	grey
24B	N	grey/blue

(10) **Measuring Range O_2 (12..24V DC- External supply)**

25A	+
25B	-

(11) **Calibration release (12..24V DC - External supply)**

27A	+
27B	-

(12) **CO_e sensor**

32A	CO_e sensor	white/red 2
32B		white/red 1
33A	CO_e sensor	red 4
33B		red 3

2.6 Wiring Diagram of the COMTEC 6000 System

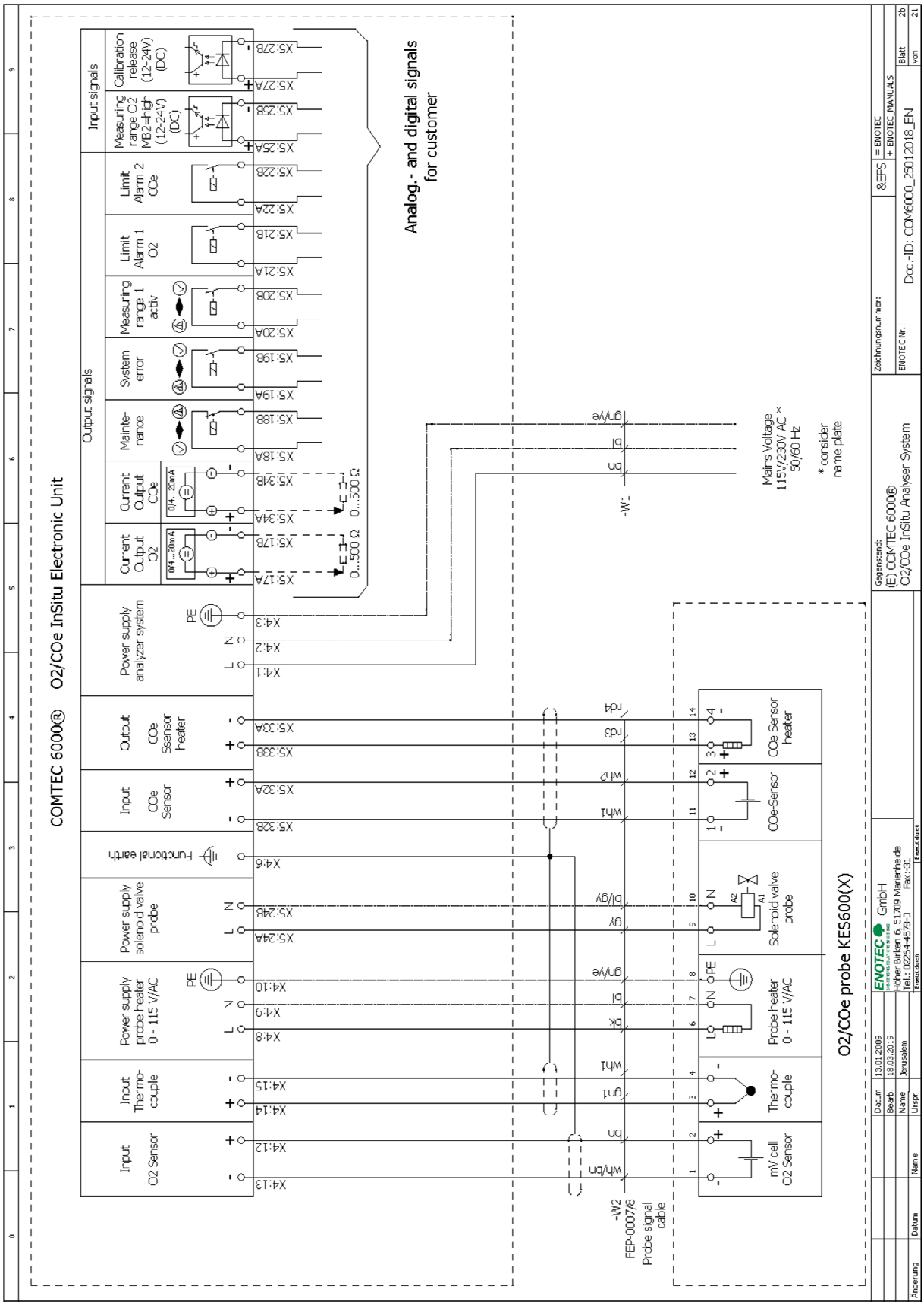


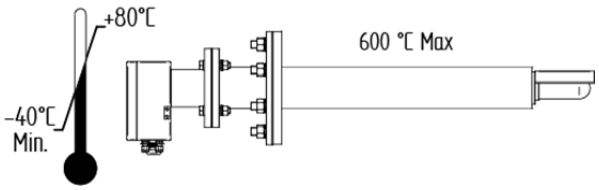
Figure 7 - Wiring diagram of the COMTEC 6000

2.7 Installation of the probe

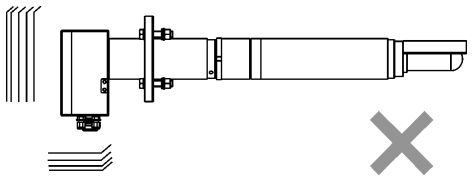
The flue gas temperature, pressure and all other process conditions must be in accordance with the specification. Leave enough space for insertion/removal of the probe and protection tube (if supplied) and ensure access to the measuring probe and/or connecting box.

Before cutting a hole in the flue gas duct, make sure that the inside of the duct has enough space for probe installation and that no soot is blown out nearby or any obstacles are in the way.

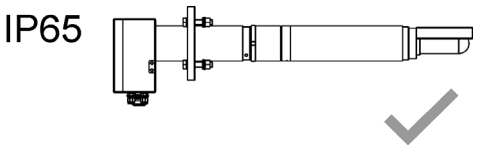
For probe lengths exceeding 2000 mm, a support must be mounted inside the duct (every 2 m) to prevent the probe and mounting tube from flexing or bending. **ENOTEC recommends installing the probe horizontally (- 1 ° to - 3 °) for the fastest possible response time. A vertical (90 °) installation decreases the response time significant.**



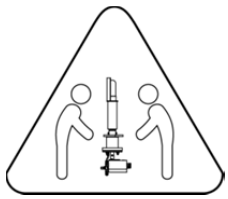
The ambient temperature at the connection box and the process temperature must not be exceeded.



Avoid vibrations greater 2g



Maintain the protection class of the connection box.



Heavy equipment, ensure proper lifting and carrying

2.8 Mounting of the Counter Flange at the Duct

The flange has to be mounted with an angle of 1° to 3° ②, so that condensed flue gas elements can flow back into the duct.

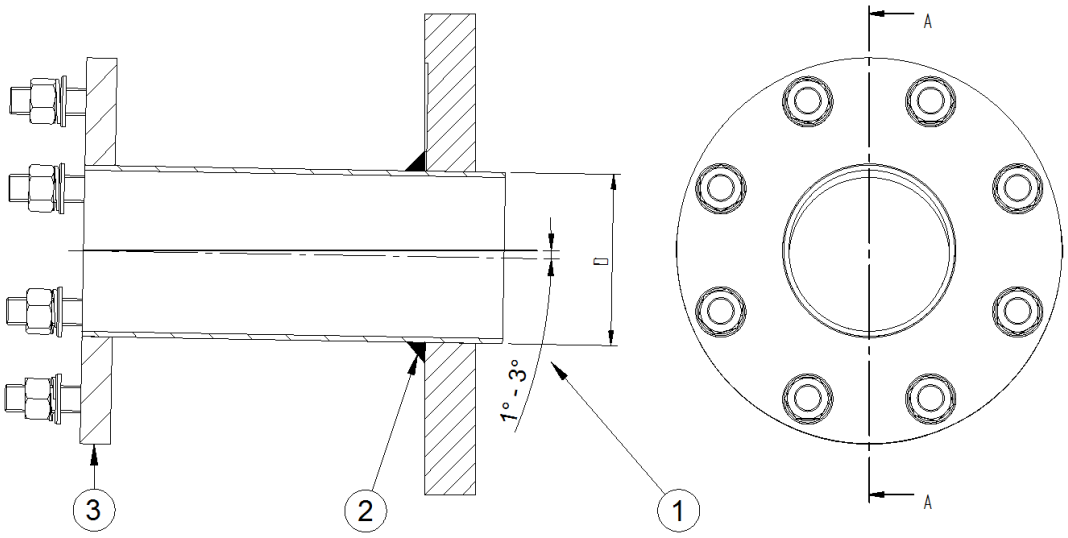


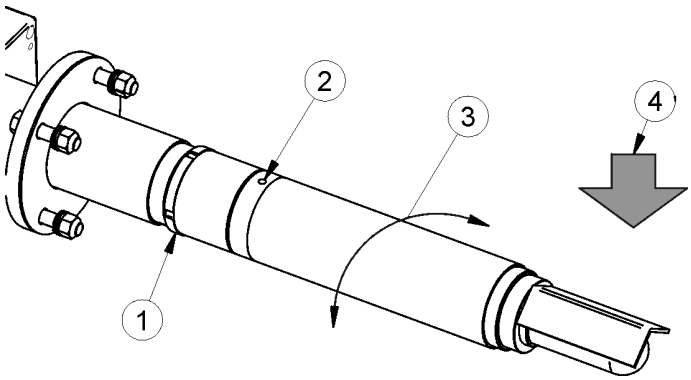
Figure 8 - Mounting of the counter flange at the duct

①	Pitch of the counter flange
②	The flange has to be welded gastight.
③	Counter flange (supplied by customer)

2.9 Adjustment of the Probe Filter Head

Info

Determine the flow direction of the process gas at the place of installation.



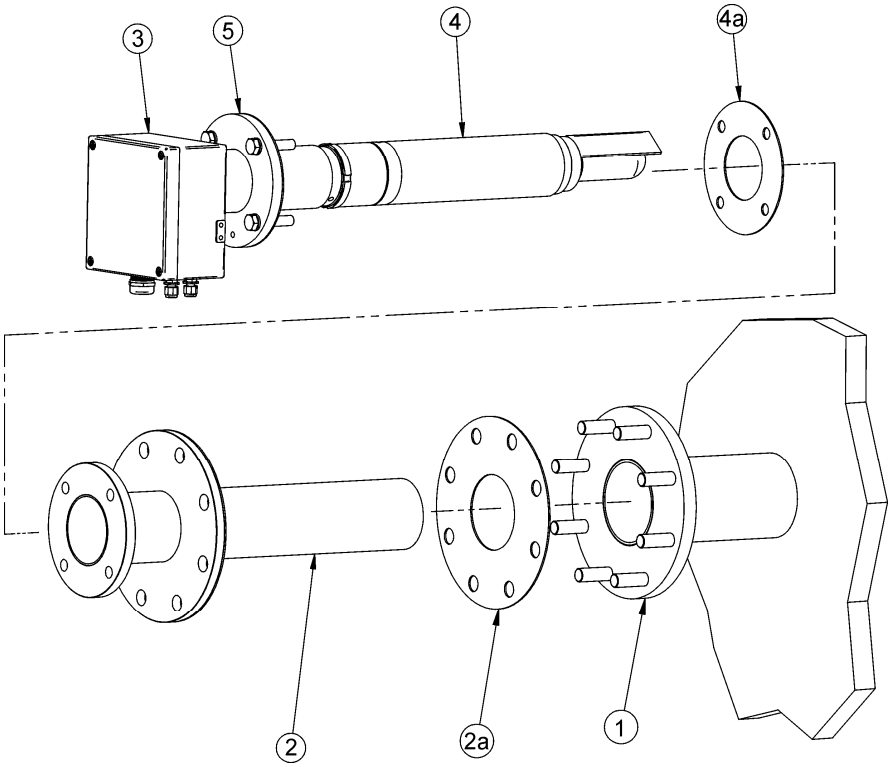
- Unscrew the retaining ring ① ➔ (clockwise) with a hook wrench
- Turn the filter head V-shield ③ into the correct position ② with a pin wrench. The V-shield must face the direction of the flue gas ④ .
- Tighten the retainer ring ① after adjusting the filter head.

Figure 9 - Adjustment of the V-Shield

2.10 Probe Protection Tube at the Mounting Flange

Info

Use only new and undamaged gaskets for the installation of the probe. Tighten the nuts firmly, to guarantee the gastight seal of the flange connection. Never leave the probe unheated for longer periods of time in the running process.



①	Counter flange
②	Protection tube
②a	Protection tube flange gasket
③	Connection box
④	O_2/CO_e probe
④a	Probe flange gasket
⑤	Probe flange

Figure 10 - Mounting of the protection tube at the mounting flange

2.11 Insulating the Protection Tube outside the Duct

Info
If a cooling protection tube is used, the part of the protection tube outside the duct wall must be insulated or heated if necessary. If only a protection tube is in use and not a cooling protection tube, this insulation may also be
necessary.

Make sure that the gas outlet is not blocked.

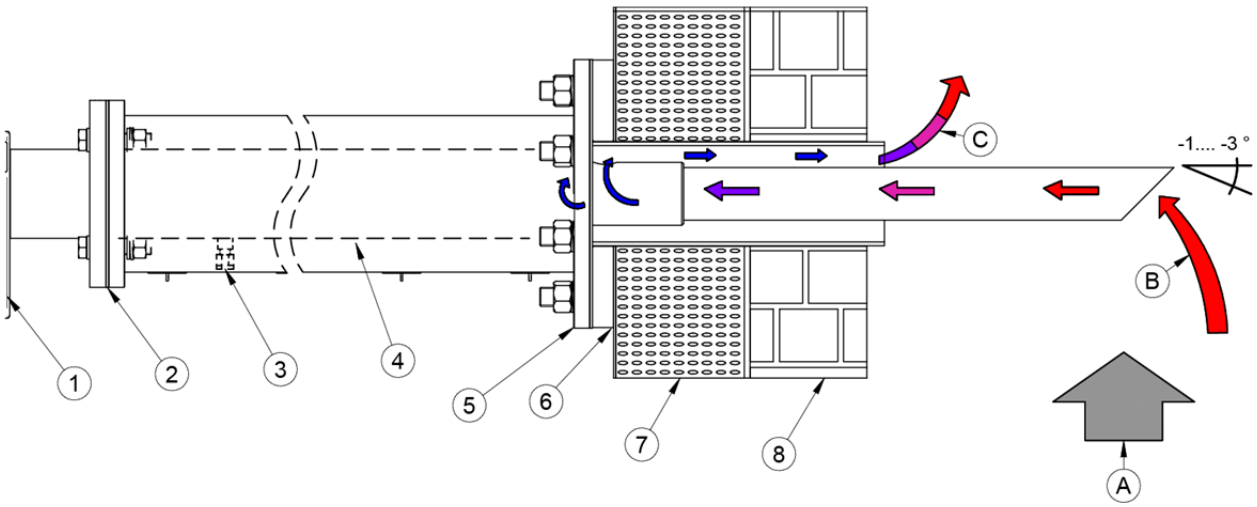


Figure 11 - Insulation of the cooling protection tube

1	Probe connection box
2	Flange gasket
3	Suction connection
4	Cooling tube - Insulate to avoid condensation
5	Protection tube flange
6	Counter flange welded gas tight at correct angle

7	Steel cover
8	Duct wall
A	Flue gas
B	Gas entry
C	Gas outlet – do not block

2.12 Electrical Connections of the Probe

	Info The Probe Signal Cable FEP-0007/8 has to be connected to the terminal board in the probe terminal box. **Do not connect the shield here.**

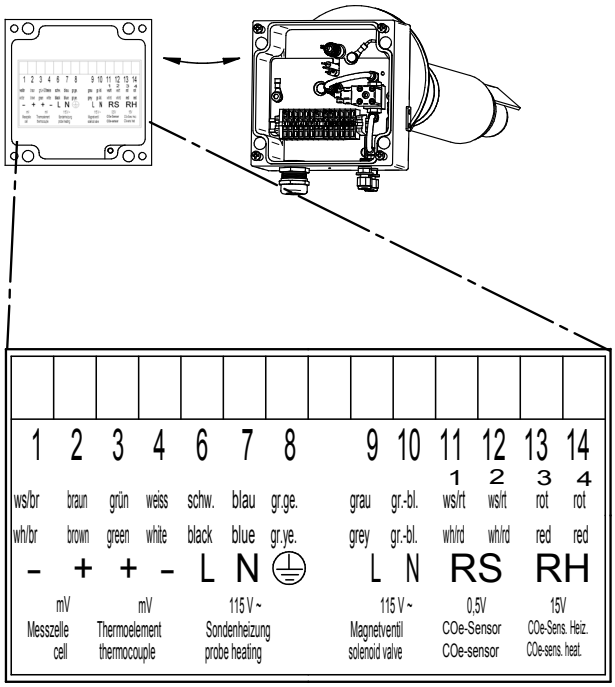
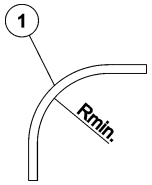
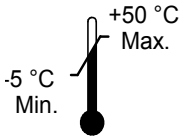
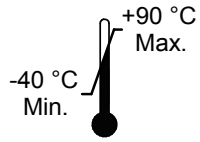
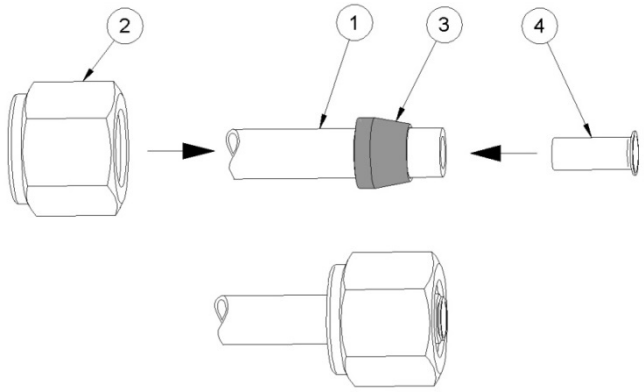


Figure 12 - Electrical connections of the probe connection box

2.13 Requirements for Pneumatic Cable FEP-0002

	Note the minimum bending radius. FEP-0002➔R_{min} = 138 mm
 Temp. during installation	 Temp. during operation

2.14 Preparation of the pneumatic Cable

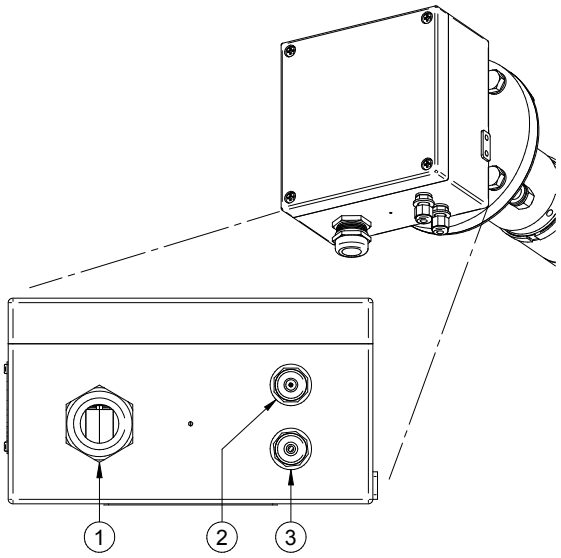


①	Pneumatic tubing of the pneumatic cable FEP-0002
②	Nut
③	Clamp ring
④	Support sleeve

Both, the pneumatic tubing for the reference air (blue) and the test gas (green) have to be prepared with support sleeves④, clamp rings③ and nuts②.

Figure 13 - Preparation of pneumatic tubes

2.15 Pneumatic Connections of the Probe

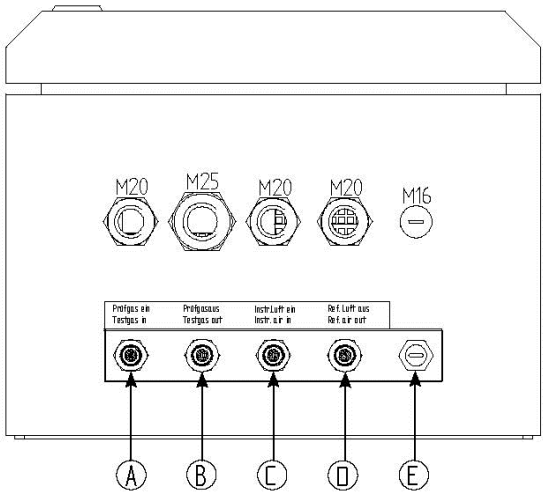


①	Cable gland for Probe Signal Cable (FEP-0007/8)
②	Blue tubing (Ref. air)
③	Green tubing (Test gas)

The two pneumatic tubes – blue and green have to be connected at the probe terminal box.
Please follow the color code:
connect the green tubing with the green ring and connect the blue tubing to the blue ring

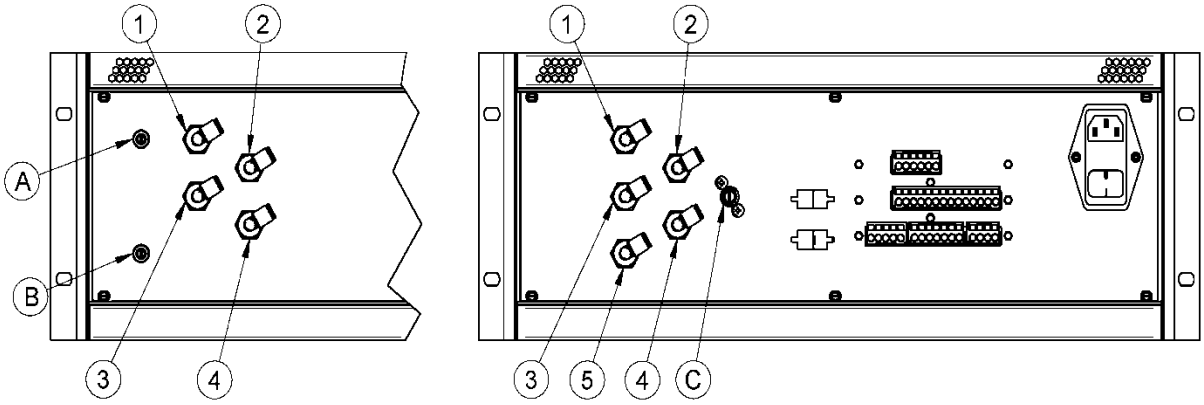
Figure 14 - Connection of the pneumatic tubes at the measuring probe

2.16 Pneumatic Connections of Electronic Units



Nr.	Tube	Pump version	Instrument air version
A	1/4“	Testgas in	Testgas in
B	1/4“	Testgas out	Testgas out
C	1/4“	Reference air in	Instrument air in
D	1/4“	Reference air out	Reference air out
E	1/4“	Test air in	

Figure 15 - Bottom view of SME-53 with pneumatic unit



Instrument air version **Pump version**

Figure 16 - Back view of SME-54 (19” 4HE) showing pneumatic connections.

Nr.	Tube	Pump version	Instrument air version
1	1/4“	Testgas in	Testgas in
2	1/4“	Testgas out	Testgas out
3	1/4“	Reference air input	Instrument air in
4	1/4“	Reference air output	Reference air out
5	1/4“	Test air input	

A	Regulator reference Air
B	Regulator test Air
C	Regulator test Air

3 Initial Operation

3.1 Checklist before commissioning the system

- Is the system number of the probe identical to the system number of the electronic unit? If not, change the assignment.
- Does the voltage specified on the name plate correspond to the line voltage? (See section **1.7 - Name Plates**)
- Is the electrical wiring connected correctly? (See section **2.5 - Wiring Diagram of the Electronic Unit**)
- Are the pneumatic connections correct and gas tight? (See sections **0** and **0 – Pneumatic Connections**)
- Make sure that there are no leakages at the probe - e.g. is the counter flange welded gas tight to the duct and are the flange bolts tightened sufficiently? Are gaskets in use? (See section **2.7 – Installation of the probe**)
- Do the conditions at site match the specification in the data sheets? (See section **A - Technical Data**)

3.2 System Power Up

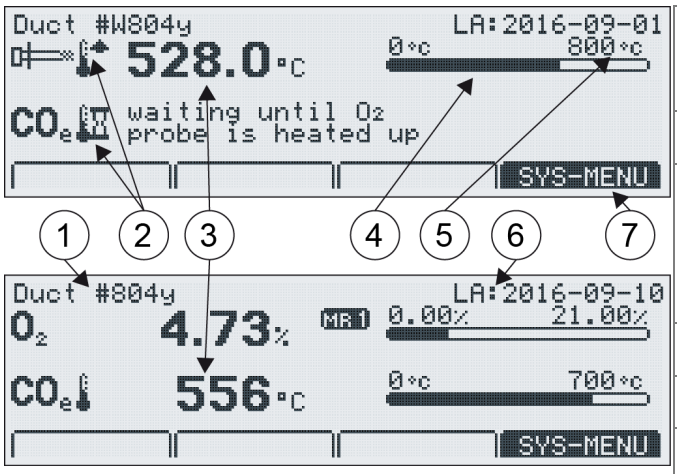
Switch on the line voltage to the system. After a short power up information, the user is prompted to **Select language**, set the **System date**, **System time,** enter a **TAG number** and **ENOTEC REMOTE code** (only if option ENOTEC REMOTE is factory activated) and the cable length.

The probe heating phase now begins which is followed by the measuring mode.

!	**Caution** **Enter the probe cable length correctly!** Entering the wrong cable length may result in an incorrect measurement and could possibly destroy the MXP Sensor.

Figure 17 - System Power up. Note the software version at the bottom right of the display

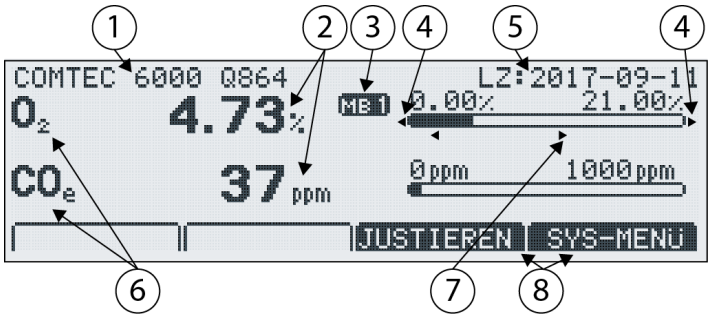
3.3 Display - Probe Heating Phase



The probe heating phase begins with the heating up of the O_2 sensor. After this is concluded, the CO_e sensor begins its heating up phase.		
①	TAG number	
②		Rising probe temperature
		(or) waiting period
		(or) heater error
③	Current temperature	
④	Analogue temperature bar	
⑤	Setpoint probe temperature	
⑥	Last access	
⑦	Softkey title: e.g. System menu	

Figure 18 - O_2 and CO_e sensor heating phase

3.4 Display - Measuring Mode

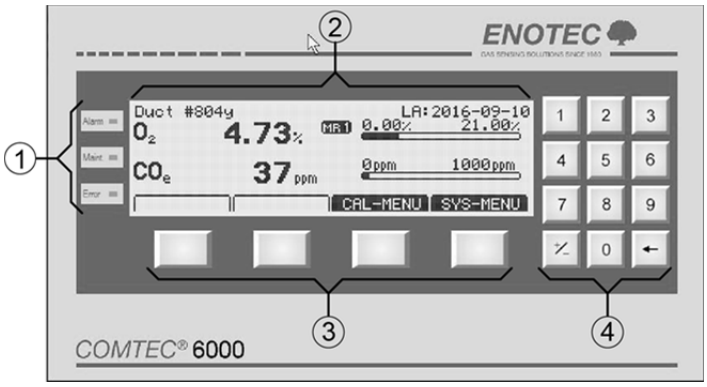


* Only if the limit alarms are switched on and the limits are within the set measuring range.

①	TAG number
②	Measured values
③	Active measuring range
④	Blinking indicators showing under or over measuring range
⑤	Last access
⑥	Measured components
⑦	Limit alarm indicators min-Alarm / max-Alarm *
⑧	Softkey titles

Figure 19 – Display Measuring mode

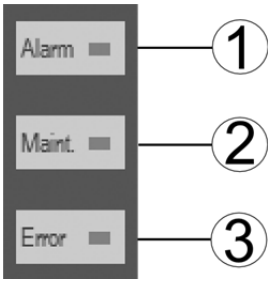
3.5 Keypad and Display



The controls and display of the COMTEC® 6000 are housed in the electronic unit and are comprised of:	
①	Three LED indicators depicting active status reports for limit alarms, maintenance and system faults
②	Graphic enabled, back-lit display
③	Four softkeys with varying layout (softkeys)
④	Numeric keypad

Figure 20 - Keypad and display

3.6 Status LEDs



Alarm, - orange - is lit when an alarm has been activated (e.g. O_2 limit alarm)

Maint. - Orange - a function has been accessed which may affect the measurement

Error - red - is lit when a system error has occurred

3.7 Softkey Symbols

- Moves the selection one position upwards
- Moves the selection one position downwards
- Leave an area
- Abort a function or entry
- Select or confirm a function/value

3.8 System Code

Info

The system code on delivery is 0000. In this state, entry into the system is granted without having to enter the system code. The system code protects the system from unauthorized use.
Functions which may alter the measurements are therefore also protected.

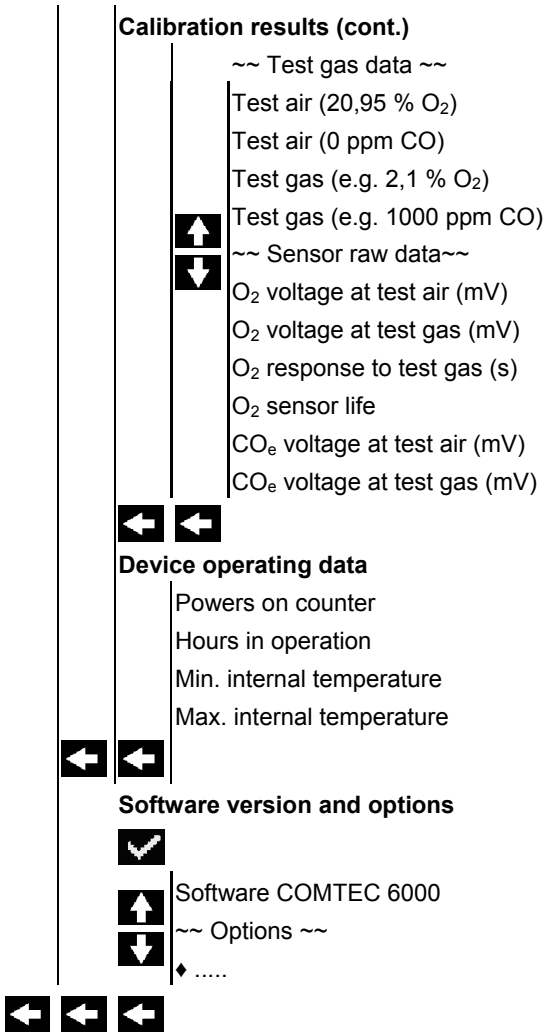
Caution: If the system code has been altered, the new code must be kept in a safe place!

4 Software Overview and Explanations

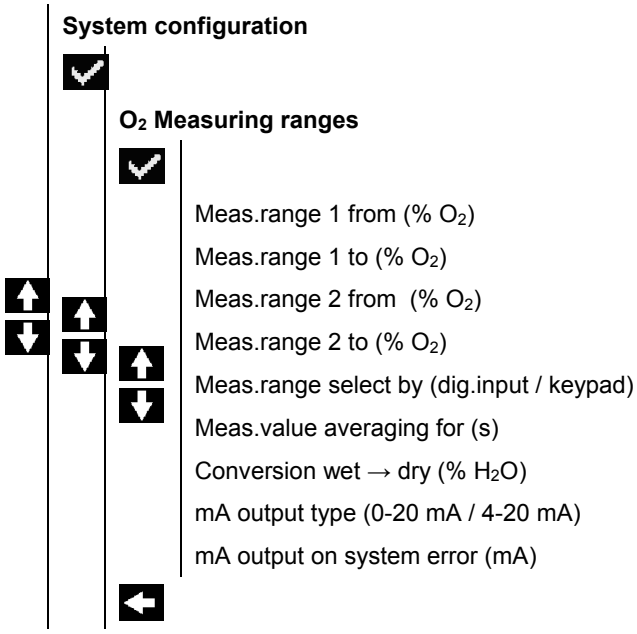
4.1 Software Overview - SYS-MENU

SYS-MENU

- **System Information**
- ✓ **Actual measured values**
  - O_2 measured value (% O_2) {may be ppm}
  - O_2-mA output 17A/B (mA)
  - O_2 sensor input (mV)
  - CO_e measured value (ppm or mg/m^3)
  - CO_e mA output (mA)
  - CO_e sensor input (mV)
  - Flow rate reference air (l/h)
  - O_2 probe temperature (°C / °F)
  - ↑ O_2 probe heater power (%)
  - ↓ Thermocouple input (mV)
  - CO_e sensor temperature
  - CO_e heater power (mW)
  - CO_e heater resistance (Ω)
  - CO_e heater voltage (mV)
  - CO_e heater current (mA)
  - Terminal temperature (°C / °F)
  - Internal temperature (°C / °F)
  - O_2 sensor life (%)
- ↑ ↓ ←
- **Calibration results**
  - ✓ e.g. 2012-04-20 (Choose date/time)
    - ✓
      - Executed at
      - Calibration method
      - O_2 sensor calibration
      - CO_e sensor calibration
      - ~~ Calibration results ~~
      - O_2 value at test air (20,95 % O_2)
      - ♦ calibrated to (% O_2)
      - ↑ O_2 value at test gas (% O_2)
      - ↓ ↑ ♦ calibrated to (% O_2)
      - ↓ CO_e value at test air (0 ppm COe)
      - ♦ calibrated to
      - CO_e value at test gas (ppm COe)
      - ♦ calibrated to
      - ~~ Calibration data ~~
      - O_2 sensor offset (mV)
      - O_2 sensor slope (mV / dec)
      - CO_e sensor offset (mV)
      - CO_e factor beta


Calibration results (cont.)
~~ Test gas data ~~
Test air (20,95 % O2)
Test air (0 ppm CO)
Test gas (e.g. 2,1 % O2)
Test gas (e.g. 1000 ppm CO)
~~ Sensor raw data~~
O2 voltage at test air (mV)
O2 voltage at test gas (mV)
O2 response to test gas (s)
O2 sensor life
COe voltage at test air (mV)
COe voltage at test gas (mV)
Device operating data
Powers on counter
Hours in operation
Min. internal temperature
Max. internal temperature
Software version and options
Software COMTEC 6000
~~ Options ~~
♦ .....

SYS-MENU


System configuration
O2 Measuring ranges
Meas.range 1 from (% O2)
Meas.range 1 to (% O2)
Meas.range 2 from (% O2)
Meas.range 2 to (% O2)
Meas.range select by (dig.input / keypad)
Meas.value averaging for (s)
Conversion wet → dry (% H2O)
mA output type (0-20 mA / 4-20 mA)
mA output on system error (mA)

O_2 limit alarms

- Limit alarm 1 (O_2)(OFF/ON)
  - ♦ at
  - ♦ hysteresis

  } *visible when set to "ON"*
- Limit alarm 2 (CO_e)(OFF/ON)
  - ♦ at
  - ♦ hysteresis

  } *visible when set to "ON"*

O_2 sensor calibration values

- O_2 cal.value - offset (mV)
- O_2 cal.value - slope (mV/dec)

COe measuring range

- Measuring range from (ppm / mg/m^3)
- Measuring range to (ppm / mg/m^3)
- Measuring value averaging for (s)
- mA output on system errors (mA)

COe sensor calibration values

- CO_e cal. value: offset
- CO_e cal. value: alpha
- CO_ecal. value: beta
- CO_e cal. value: gamma
- CO_e cal. value: delta
- CO_e cal. value: SO_2 correction value

Calibration settings

- Time per test gas apply (Min.)
- Delay time to process (Min.)
- Pre-purge time (Min.)
- Measurement value hold on calibration (ON/OFF)
- Auto.calibration (ON/OFF)
  - ♦ Calibration method (1-Point / 2-Point /O_2+COe) } *visible when set to "ON"*
  - ♦ Test gas1 (bottle value % O_2) { when preset to 2-point} } *visible when set to "ON"*
  - ♦ Test gas 2 (bottle value ppm CO) { when preset to 2-point} } *visible when set to "ON"*
  - ♦ Start by (Time, dig. Input, both)
    - ♦ Interval (days)
    - ♦ next ACAL at (set date)

    } *not applicable with dig.input*

System clock/TAG number

System date (jjjj-mm-tt)
System time (hh:mm:ss)
TAG

ENOTEC REMOTE settings (optional) } *Visible when ENOTEC REMOTE interface is activated*

ENOTEC REMOTE (ON/OFF)
Passkey (8 digit code)
Range (Short / Medium / Maximum) } *Visible when ENOTEC REMOTE is ON*

Measuring units

Temperature (°C / °F)
Pressure (mbar / psi)
COe value (ppm / mg/m^3)

Probe type and cable length

Probe type
cable length (m)

Language

Choose language (Deutsch / English / Spanish / Polish / French)

Change system code

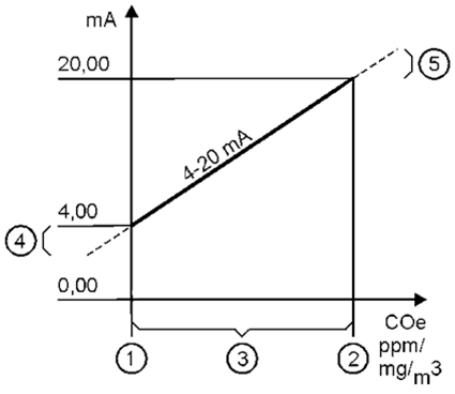
Load factory settings

Set CO_e measurement ON/OFF

Service

4.2 Software Explanations - SYS-MENU

4.2.1 O_2 Measuring Ranges (Scaling)



The O_2 Measuring range ③ is linearly scaled and converted to a linear current output (0/ 4-20 mA).

The parameter „O_2 Measuring range from“ ① is the start value of the O_2 range, leading to an output of 4,00 mA.

„O_2 measuring range to“≤ ② is the end value of the O_2 range, leading to an output of 20,00 mA.

If a measured value is lower than the start value of the O_2 measuring range, the current output signal drops to 3,60 mA.

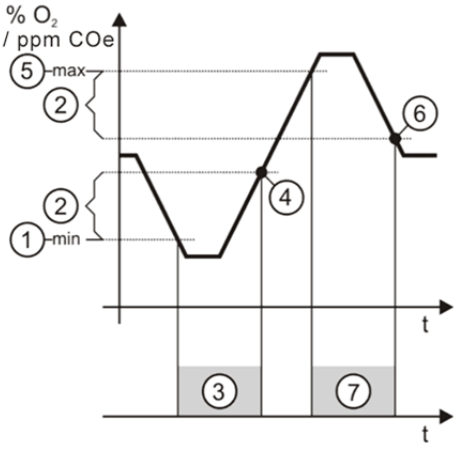
(If the current output is set to 0- 20mA the output in this case is 0 mA)

If the measured O_2 value is higher than the end value of the O_2 measuring range end, the analogue output rises to 20,40 mA.

If during normal operation the measured O_2 value is under, ④ or over ⑤ the programmed measuring range, an error message appears on the display (in measuring mode).

Figure 21 - O_2 Measuring Ranges

4.2.2 Limit alarm settings



The entry "by" sets the value at which the limit alarm is activated.

The limit alarm function "min" ① defines a value by which the limit alarm ③ is activated if the measured value falls below the limit.

If the hysteresis is set to greater than 0,00, ②
the limit alarm is reset when the measured value rises above the limit plus the hysteresis value ④.

The limit alarm function "max" ⑤ defines a value by which the limit alarm ⑦ is activated if the measured value rises above the limit.

If the hysteresis is set to greater than 0,00, ②
the limit alarm is reset when the measured value falls below the limit minus the hysteresis value ④.

If the hysteresis is set to 0, the triggered limit alarm must be manually switched off.

Figure 22 - Limit alarm settings

4.2.3 O_2 Sensor calibration values

	Info The sensor calibration values can be altered through a 1 or 2 point calibration. Manual entry of values is only necessary after replacing the O_2 sensor. (The sensor calibration values, "cell constant" and "cell slope" can be found on the probe test protocol for new probes.)

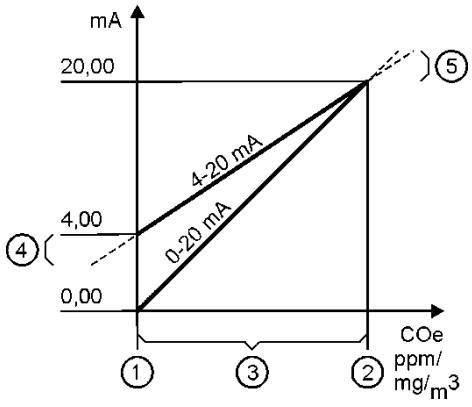
4.2.4 Measuring value averaging for (O_2 / CO_e)

This entry sets the duration for the continuous average measurement (flowing average). During a calibration or sensor verification, the measurement average is switched off

4.2.5 mA output on system errors (O_2 and CO_e)

Here the mA output value is set corresponding to a measurement error. The measurement output range for the shown value (3,60 mA .... 20,40 mA) cannot be defined in this case.

4.2.6 CO_e Measuring Ranges (Scaling)



The CO_e Measuring range ③ is linearly scaled and converted to a linear current output (0/ 4-20 mA).

The parameter „COe Measuring range from“ ① is the start value of the CO_e range, leading to an output of 4,00 mA.

„CO_e measuring range to" ② is the end value of the COe range, leading to an analogue output of 20,00 mA.
If a measured value is lower than the start value of the COe measuring range, the current output signal drops to 3,60 mA.

(If the current output is set to 0- 20mA the output is 0 mA)

If the measured COe value is higher than the end value of the COe measuring range end, the analogue output rises to 20,40 mA.

If during normal operation the measured COe value is under, ④ or over ⑤ the programmed measuring range, an error message appears on the display (in measuring mode).

Figure 23 - COe Measurement Ranges

4.2.7 CO_e Sensor Calibration values

The COe sensor calibration values are sensor specific. Every CO_e sensor has a Test Certificate in which the calibration values **offset, alpha, beta, gamma, delta**, **CO_e heater resistance (RH_0)** and **SO2 Correction Value** are noted. The Test Certificate is attached to the probe or measuring cell on delivery. After a calibration, these values are updated.

4.2.8 Time per test gas apply

Here the maximum duration of time for the application of test gas or test air is set. If sensor stability is not reached within the maximum time, the following error message is displayed: "**O_2 Sensor calibration failed - O_2 sensor signal instable"** resp.**" CO_e Sensor calibration failed - CO_e sensor signal instable**". This problem can be offset by setting a longer duration. The factory setting for maximal duration is 10 Minutes. If necessary, the time can be adjusted between 5 minutes and 30 minutes.

4.2.9 Delay time to process

Here the delay time showing the last measured value from the data storage is frozen after test air or test gas has been applied (only when "Meas. value hold on cal. is set to on) This value also sets the time for showing the trend representation on the display after test air or test gas application after a sensor calibration is set.

4.2.10 Pre-purge time

The pre-purge time defines the duration of time the sensors flushed with test air / test gas 1 before a 2-point calibration of the CO_e or O2+CO_e sensors. By default, the pre-purge time is switched off.

4.2.11 Automatic Calibration (ACAL)

Automatic calibration enables a cyclic, time-based or remote controlled calibration (using the digital input) of the sensors. The ACAL can be globally switched on or off and can only be started from the main screen of the display.

When a 2 Point ACAL is set, a test gas bottle must be permanently connected and turned on.

	**Info** Make sure that the test air and test gas volume and flow settings needed for calibration are correct. For systems with flow monitoring: The flow rates can be checked under System Checks → O_2 sensor check For systems without flow monitoring: Check the flow rates through an external flow meter and adjust to 150 - 180 l/h via an external throttle valve.

Only when the ACAL is switched on, are the ACAL settings visible. The calibration method determines whether the ACAL is carried out as a 1 point calibration only with test air (instrument air or ambient air) or as a 2 point calibration with test air and test gas. Ambient air is preset to a fixed O_2 concentration of 20.95% and this value is not shown nor can it be changed.

The ACAL can be started by:

Time: Time based start with set intervals in days and the corresponding time

Time + Digital Input: Same as "Time", additionally a control voltage of 12-24V DC must be applied to the "calibration release" so that an automatic calibration can be started.

Digital Input: A control voltage of 12-24V DC must be applied to the "calibration release" so that an automatic calibration can be started. If the control voltage is still present after the calibration has ended, the calibration will immediately restart

	**Info** For a CO_e 1 or 2 calibration without a calibration the O_2 sensor, separate span gas values can be used.

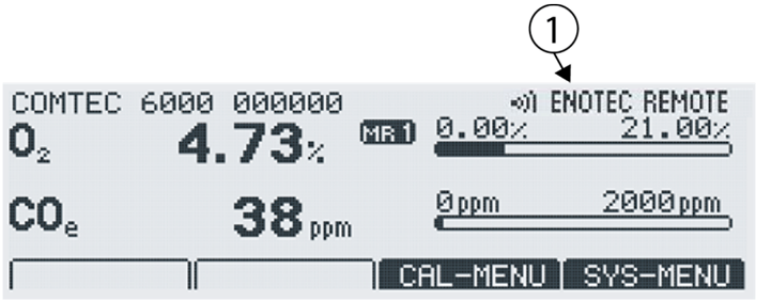
4.2.12 ENOTEC REMOTE

	**Info** ENOTEC REMOTE is disabled by default. Password and range are not displayed. After activation (only possible from system access level), the 8-digit password that is requested during the remote connection setup must be assigned.

The ENOTEC REMOTE password is used for:

- authentification and pairing with a smartphone / tablet / laptop / pc.
- authentification / login after every connection. Without Authentication / login, device data cannot be read or modified. The device configuration can also not be altered.

Range limits the transmission power of the ENOTEC REMOTE module. **Maximum** = 100m, **medium** = 10m, **short** = 1m. The actual possible range may vary due to structural factors and the reception strength of the Smartphone/Tablet.



When an ENOTEC REMOTE connection to the analyzer is active, the connection is shown in the upper right corner of the display ①.

Figure 24 - ENOTEC REMOTE connection active

	**Info** A maximum of 16 users (smartphones /tablets) can connect to the ENOTEC REMOTE module of an ENOTEC analyzer. Should additional users attempt a connection, the connection will fail. In this case, manually switch off the ENOTEC REMOTE and switch it back on again **SYS MENU => System configuration => ENOTEC REMOTE Settings** which will reset the module. All previously paired users will need to delete their saved connection to the analyzer and re-pair their devices.

4.2.13 Measuring units

Measuring units can be set for temperature in °C and °F and for pressure in mbar and psi.

4.2.14 Language

Set the language for all text shown on the display. One can choose between English, German, Spanish and Polish.

4.2.15 Change system code

The system code protects the system configuration against unauthorized usage. Settings which may influence the measurements are also protected.

	**Info** **The system code on delivery is 0000. In this state, entry into the system is granted without entering the system code. For security reasons, change the code and store it in safety. In case of loss of the system code, a system reset has to be carried out. The reset process may only be carried out by trained service technicians. As an option, a 6 digit code is available.**

4.2.16 Load factory settings

Loading factory settings will restore all original settings and values to the default values programmed in the factory. If activated, all set parameters and also values such as sensor calibration values and calibration results are lost. Take note of the sensor calibration values beforehand and re-enter them after the loading the factory settings. If this is not done, a calibration has to be carried out.

4.2.17 Set CO_e measurement to off/on

Before replacing a COe sensor or a complete probe, the CO_e measurement must be set to OFF to prevent the probe from being destroyed. After the replacement, the CO_e measurement has to be switched back on manually.

Once the CO_e measurement is switched ON, the user is queried whether or not the CO_e sensor has been exchanged. If this is confirmed, the user is then prompted to enter the following sensor calibration values which can be found on the CO_e sensor test certificate

- **CO_e RH_0 - Offset - Alpha - Beta - Gamma - Delta - SO_2 correction value**

Following this, a security query for the COe RH0 value must be confirmed regarding the RH0 value **"A wrong value will destroy the CO_e sensor immediately!"** If the value is not confirmed, the value must be reentered; otherwise the COe measurement will be switched on using the original/previous data. If confirmed, the CO_e sensor will switch on, heat up and the system will proceed with its measuring mode.

If the CO_e sensor was not replaced, the user needs to confirm this once again. In this case, the CO_e measurement is switched on using existing COe sensor parameters.

If a CO_e sensor fault (short circuit, wire breakage etc.) is detected by the system, the CO_e measurement is automatically switched off and needs to be manually switched back on by the user once the problem has been rectified.

The CO_e sensor test certificate can be found at the probe or sensor on delivery.

4.2.18 Service

The service functions are password protected and are only accessible by trained service personnel. These functions are protected with a code, different to the system code.

4.3 System Checks

O_2 + CO_e Sensor checks

Source: **Test air**
O_2 sensor .. mV = .. %
CO_e sensor .. mV = .. ppm
Flow rate .. l/h

Source: **Test gas**
O_2 sensor ... mV =... %
CO_e sensor ... mV =... ppm
Flow rate (3 bar max) ... l/h

Source: **Process**
O_2 sensor .. mV = .. %
CO_e sensor .. mV = .. ppm

Check mA outputs

Set mA output 17A/B (mA)
Set mA output 34A/B (mA)

Check relay outputs

Relay contact at 18A/B (opened / closed)
Relay contact at 19A/B (opened / closed)
Relay contact at 20A/B (opened / closed)
Relay contact at 21A/B (opened / closed)
Relay contact at 22A/B (opened / closed)

Check digital inputs

Input status at 25A/B
Input status at 27A/B

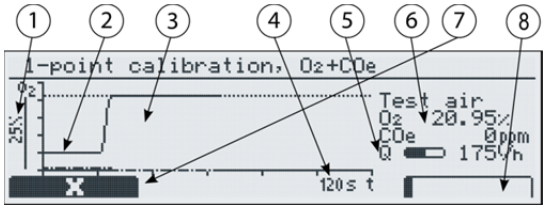
4.4 CAL MENU

CAL MENU

1 point calibration, O_2
2 point calibration, O_2
1 point calibration, CO_e
2 point calibration, CO_e
1 point calibration, O_2 + CO_e
2 point calibration, O_2 + CO_e

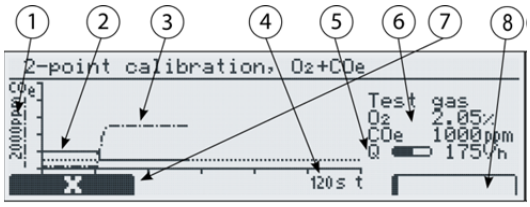
4.4.1 Calibration Menu - Display Overview

1-point calibration display:

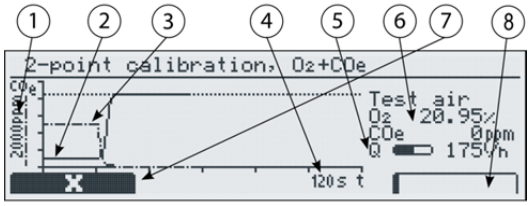


①	Maximum measuring range is depicted (display jumps between O_2 and CO_e)
②	Representation of measured O_2 value
③	Representation of measured CO_e value
④	Time scale showing the elapsed time of the current calibration process. The amount in seconds (here 240 s) refers to the end of the time scale
⑤	The flow rate currently measured
⑥	Current measured value of O_2 and CO_e
⑦	Abort the calibration
⑧	Progress bar

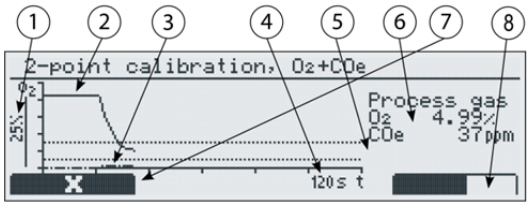
2-point calibration displays:



Test Gas apply



Test Air apply



Process gas apply

Figure 25 – Different calibration displays.

4.4.2 1-point calibration (O_2 and/or CO_e) (manual)

During the 1-point calibration of the sensor, the calibration offset is determined. Test air is hereby applied to the sensor. In systems without an integrated pneumatic unit, test gas needs to be applied manually and the flow control also may need to be checked and adjusted if necessary.

Course of events

(1) Enter System Code
(2) Maintenance LED is lit
(3) Prompt to apply test air *(only for systems without flow monitoring)*
(4) The calibration process is carried out with test air
(5) Prompt to end the test air application. *(only for systems without flow monitoring)*
(6) Display of the return to process if the difference between the measured concentration in the process and the O_2 concentration with test air is more than 3.00%.
(7) Prompt to enter test gas concentration *(does not apply to test air)*
(8) Display of the calibration results (max. 1 minute)
(9) Maintenance LED switches off *(is delayed by the set value in "Delay time to process" if "Meas. Value hold on cal" is set ON)*
(10) Revert to main display

4.4.3 2-point calibration (O_2 and/or CO_e) (manual)

During the 2-point calibration of the sensor, the calibration offset and slope is determined. Hereby two gases are applied to the sensor (test air and test gas. In systems without integrated pneumatic units, test gas needs to be applied manually and the flow control also may need to be checked and adjusted if necessary.

Course of events

(1) Enter System Code
(2) Maintenance LED is lit
(3) Prompt to apply test gas *(only for systems without flow monitoring)*
(4) The calibration process is carried out
(5) Prompt to apply test air *(only for systems without flow monitoring)*
(6) The calibration process is carried out with test air
(7) Prompt to end the test air application. *(only for systems without flow monitoring)*
(8) Display of the return to process if the difference between the measured O_2 concentration in the process and the concentration with test air (test gas 1) is more than 3.00%.
(9) Prompt to enter test gas concentration(s)
(10) Display of the calibration results (max. 1 minute)
(11) Maintenance LED switches off *(is delayed by the set value in "Delay time to process" if "Meas. Value hold on cal" is set ON)*
(12) Revert to main display

5 Service and Maintenance

5.1 Exchange fuses

⚠	**Warning** De-energize the system first!

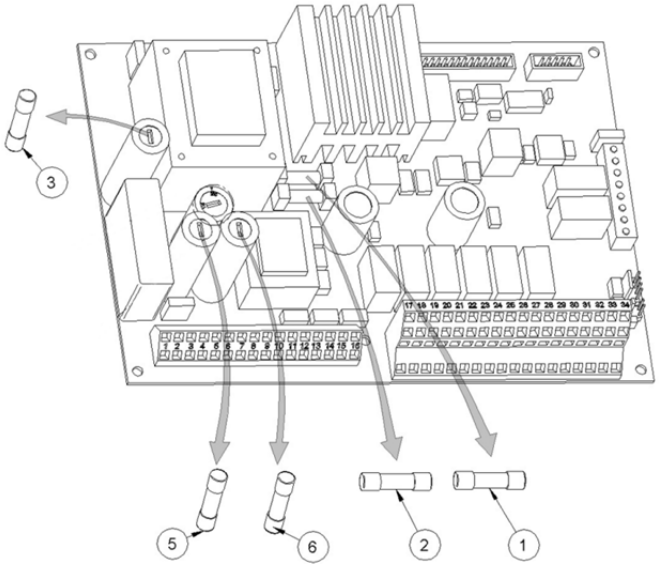


Abb. 26 Position of the fuses

	fuse	system voltage	ampere	nominal voltage	characteristic	Size
①	F3	115 / 230 V AC	0.5 A	250 V AC	T / L	5x20 mm
②	F4	115 / 230 V AC	0.5 A	250 V AC	T / L	5x20 mm
③	F5	115 / 230 V AC	1.0 A	250 V AC	M / L	5x20 mm
⑤	F1	230 V AC	2.0 A	250 V AC	T / H	5x20 mm
⑤	F1	115 V AC	4.0 A	250 V AC	T / H	5x20 mm
⑥	F2	115 / 230 V AC	4.0 A	250 V AC	M / H	5x20 mm

5.2 Pressure and Flow rates for Test Air and/or Reference Air

The systems are factory-set to the correct amounts of test air and/or reference air.
The instrument air versions are designed for an inlet pressure of 2-10 bars. With a higher inlet pressure of 6 bar, it is necessary to readjust the flow of reference air and/or test air.
The flow rates should be in the following range:

Test air: 150l/h - 180l/h

Reference air: 30l/h - 40l/h

The flow of reference air can be checked in the actual value menu [SYS MENU ➔ System Information ➔ Actual measured value]. In systems with integrated pneumatic unit, test air and/or test gas flow is displayed during calibration or system test.

5.3 Adjusting Flow Rate (SME 53 with Pneumatics)

In the instrument air version in the Safe Area housing with an integrated pneumatic unit, it is possible to adjust the reference and test air at the electronic unit.

In this respect, the pump and instrument air versions are different:

- In the pump version, only the flow rate of test air can be adjusted.
- In the instrument air version, both flow rates (test air and reference air) can be adjusted.

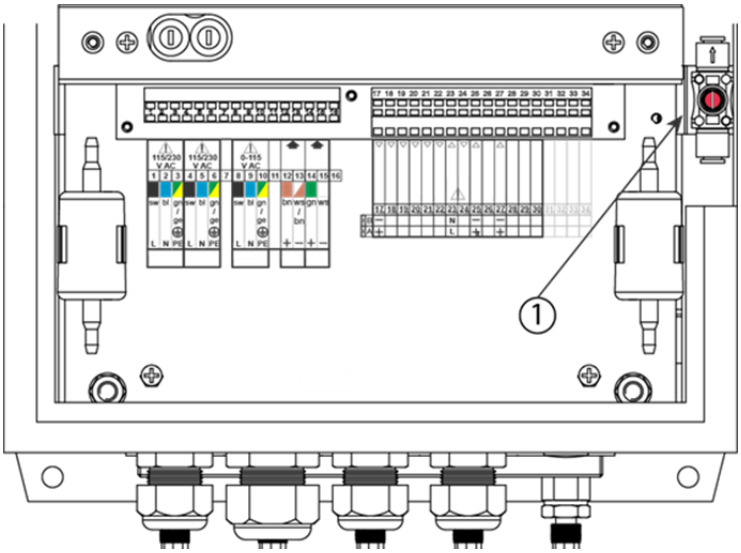


Figure 27 - Adjust flow of test air ① - (pump version)

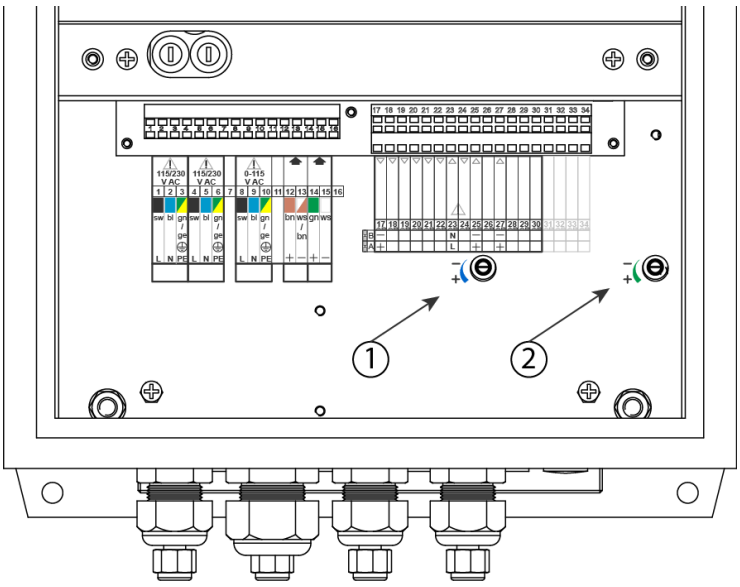


Figure 28 - Adjust flow of reference air ① and test air ②(instrument air version)

5.4 Position of the adjustment valves

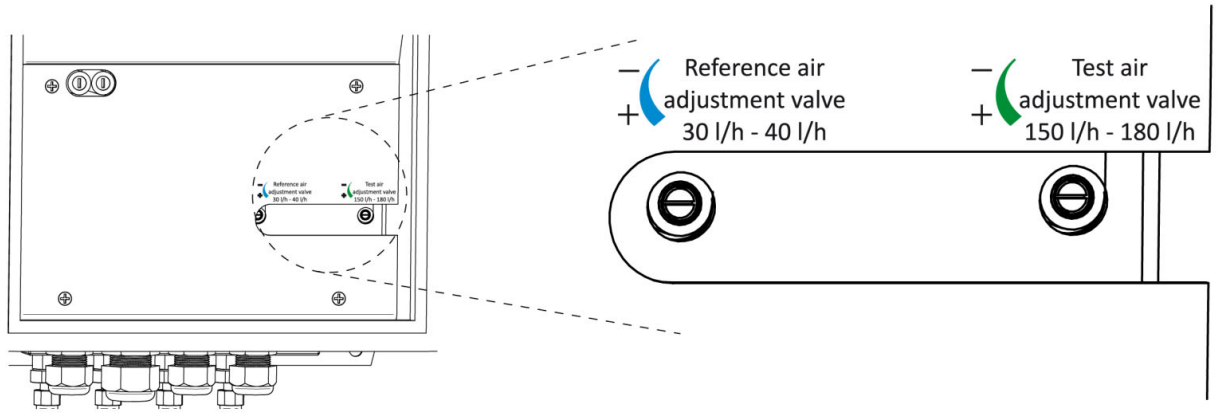


Figure 29 - Terminal cover of the SME-53 electronic unit showing the position of the reference air and test air valves below

5.5 Adjusting Flow Rate (SME-54)

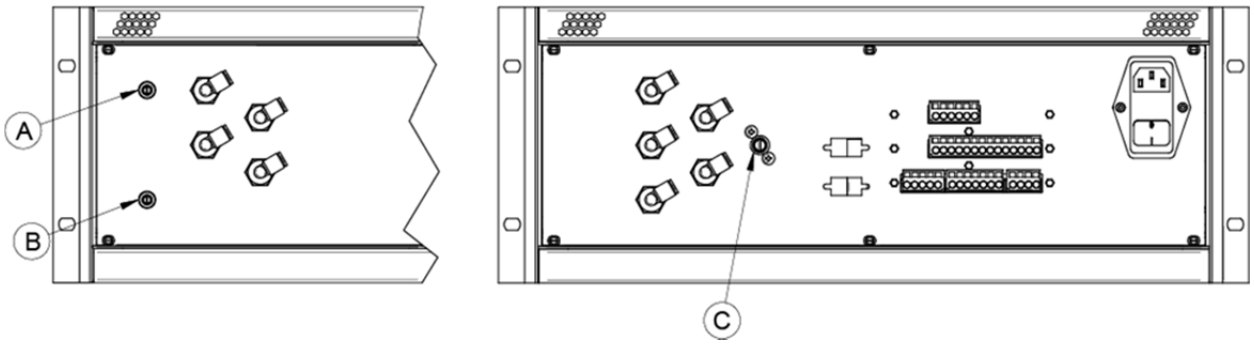
With systems in 19“ racks the reference air and test air quantity can be adjusted at the back of the electronic unit.

There are differences between the pump and the instrument air version:

- In the pump version, only the flow rate of test air can be adjusted.
- In the instrumental air version, both flow rates (test air and reference air) can be adjusted.

In systems with integrated pneumatics unit, the flow rate of reference air can be seen in the menu "Actual measured values".

Instrument air version **Version with pumps**

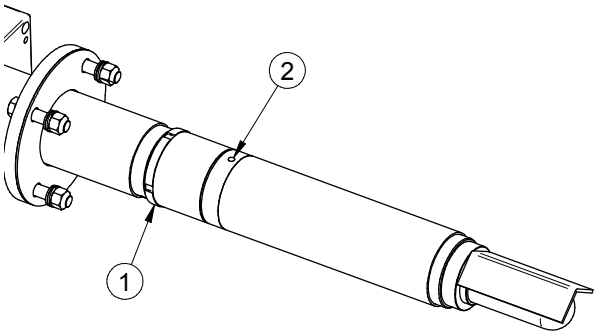


A	Regulator Test Air
B	Regulator Reference Air
C	Regulator Test Air

Figure 30 - SME-54 - Adjusting the flow rate

5.6 Replacing the Filter

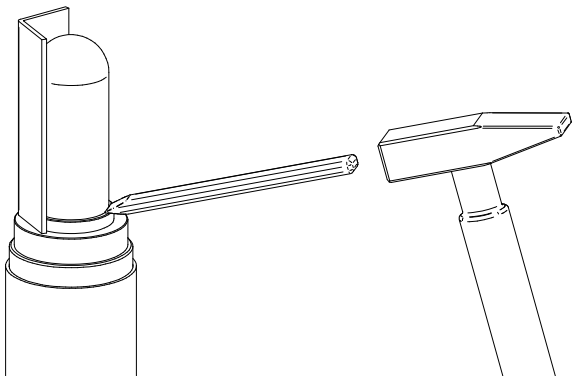
	**Warning hot surface** The probe may only be removed with heat-insulated gloves. Before removing the probe, always switch off the supply voltage to the electronic system. After removal, store the probe in a safe, protected place and wait until it has cooled down below 35°C/95°F.



Loosen the retaining ring at the filter head (1) with a hook wrench and screw off the filter head from the probe (2) with a pin wrench

If needed, a set of spanners for loosening the filter head can be ordered at ENOTEC. Part-No.: PST-0002 (for filter heads with retaining ring). Both sets of spanners additionally have an Allen key for the loosening of the O_2 sensor screws.

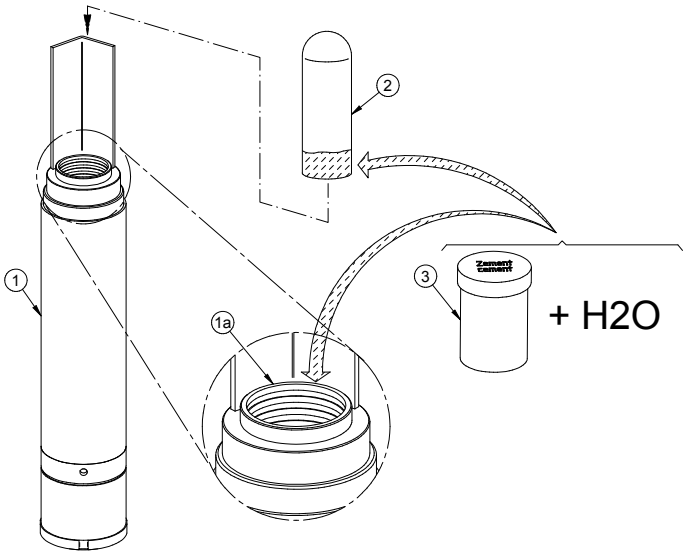
Figure 31 - Removing the filter head



Clamp the filter head in a vice

Remove filter completely by prying it loose with a chisel or a similar tool.

Figure 32 - Removing the old filter



Remove all residue and pieces of the old filter.

Also clean the grooves (1a) of the filter seat.

Install the new filter (2) as follows:

Mix the supplied glue (3) with water according to the instructions. Spread the glue into the grooves of the seat and onto the filter part which comes into contact with the seat. Push - turn the filter (2) into the seat. Evenly smooth the glue between the filter and seat and remove all excess glue.

Figure 33 - Glue the filter in place

	**Info** The cement dries at room temperature within 24 hours. Using the cement supplied by ENOTEC, all types of ceramic, basalt and sintered metal filters supplied by can be inserted and fixated.

5.7 Replacing the probe

Warning Hot Surface
The probe may only be removed with heat-insulated gloves.

Caution
Before replacing the probe, heed all warnings in chapter 5.10- Replacing the CO_e Sensor

1. Switch off the CO_e measurement
   SYS-MENU -> System configuration ->Set CO_e measurement OFF
2. switch off the mains supply to the electronic system
3. Disconnect the probe cable at the probe connection box.
4. Loosen the bolts connecting the probe to the counter flange and remove the probe
5. Insert the replacement probe using a new gasket. Consider the flue gas direction and adjust the V-Shield (filter head)
   accordingly. See chapter **2.9 – Adjustment of the Probe Filter Head**
6. Tighten the flange bolts and reconnect the wiring at the connection box.
7. Switch on the power to the analyzer and switch on the CO_e measurement
   SYS-MENU -> System configuration ->Set CO_e measurement ON
8. *Follow the on-screen directions and* enter the values specified in the CO_e sensor test certificate
9. Carry out 2-point calibration (under process conditions)

5.8 Exchange of Probe Inner Part

Switch off the electronic unit, take the probe out of the protection tube and wait until it has cooled down.

Warning hot surface
The probe may only be removed with heat-insulated gloves. Before removing the probe, always switch off the supply voltage to the electronic system. After removal, store the probe in a safe, protected place and wait until it has cooled down below 35 °C/95 °F.

Disconnect the wires of the probe inner part ①, the two tubes ② - ③and the thin reference air tube. Loosen the two screws ④ and dismount the plate ⑤. Now the complete probe inner part (4 hole ceramic rod with measuring signal wire, thermocouple and heater) can be unplugged carefully ⑥.

Move the new probe inner part carefully into the probe and screw the plate ④. The probe inner part is now pushed against the cell by the spring. Connect all electrical and pneumatic connections. Connect the wires as follows:

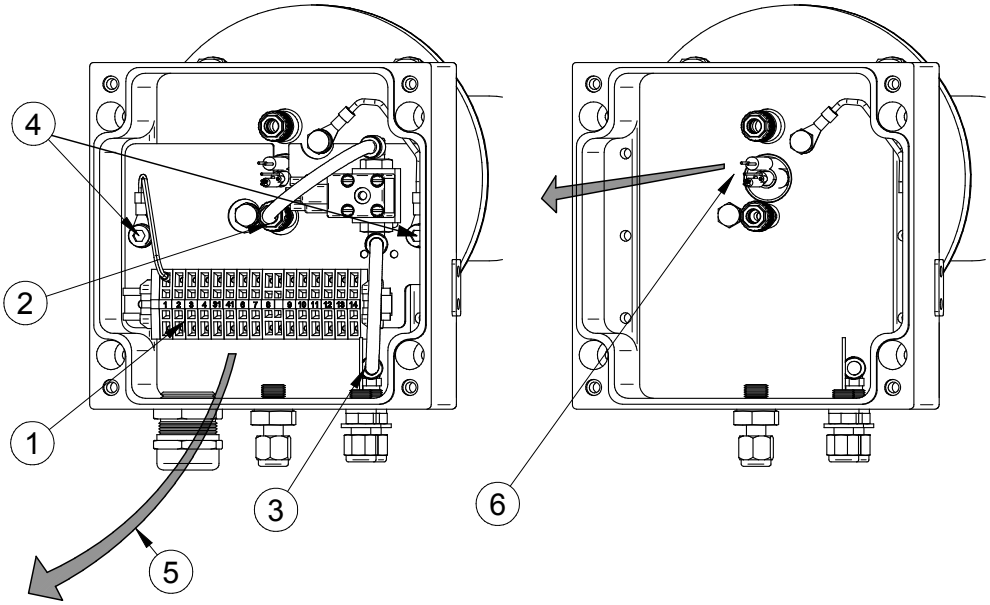
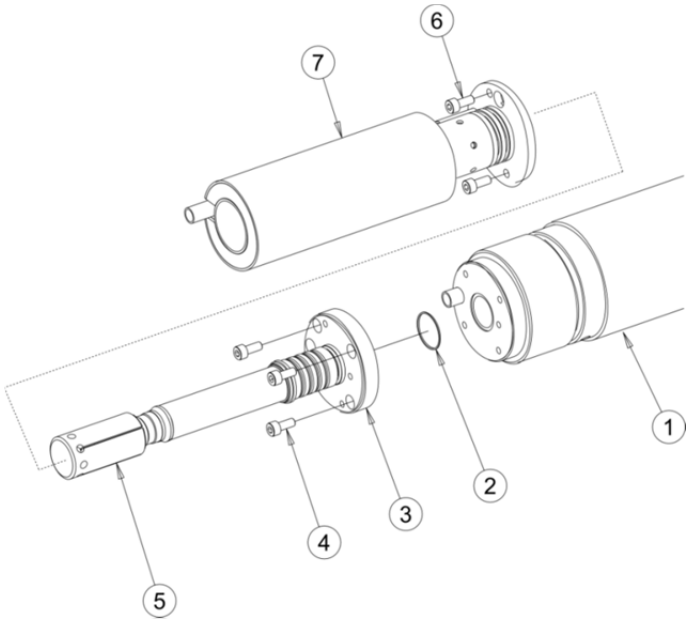


Figure 34 - Probe connection box

Terminal	Color	Description	Polarity	Unit
1	white/brown	signal wire, measuring cell	-	mV
2	orange	signal wire, measuring cell	+	mV
3	green	thermocouple element 1	+	mV
4	white	thermocouple element 1	-	mV
6	black	heating element		
7	blue	heating element		
8	green/yellow	ground/earth heater		
9	grey	solenoid valve		
10	grey / blue	solenoid valve		
11	white / red	CO_e sensor measuring value		
12	white / red	CO_e sensor measuring value		
13	red (no.3)	CO_e sensor heating element		
14	red (no.4)	CO_e sensor heating element		

5.9 Replacing the O_2 Sensor

	**Warning hot surface** The probe may only be removed with heat-insulated gloves. Before removing the probe, always switch off the supply voltage to the electronic system. After removal, store the probe in a safe, protected place and wait until it has cooled down below 35°C/95°F.



Take the probe out of the protection tube and wait until it has cooled down.

Dismantle the probe inner part. (**See 5.8**)
Unscrew the filter head and dismantle the test gas distributor with guide tube (7), by loosening the two allen screws. (6)
Now remove the 4 Allen screws at the Measuring cell flange and remove the measuring cell (3) of the probe tube (4)
Also carefully remove the old measuring flange gasket (2)

Figure 35 - Mounting the O_2 Sensor (KES600x)

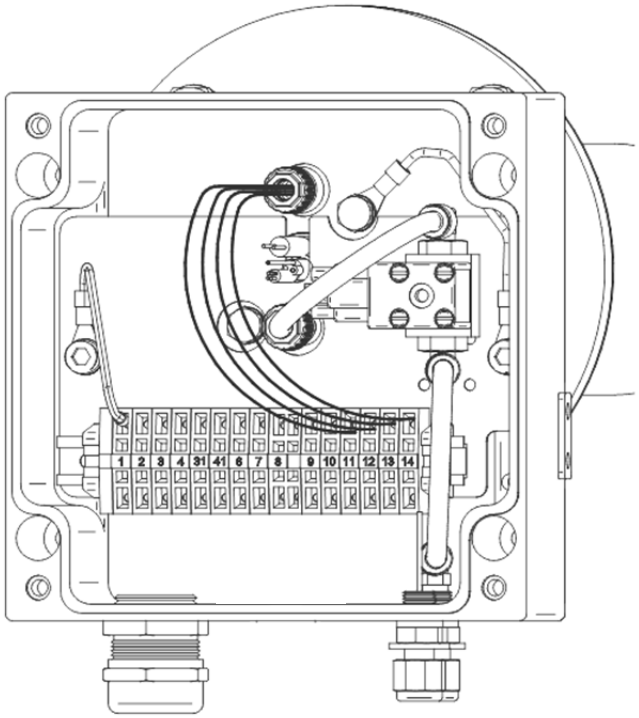
Clean the flange at the probe tube with fine sandpaper. Install the new cell with a new metal gasket and four new screws at the measuring cell flange of the probe tube.

Insert the probe inner parts and ensure that the inner parts do not bind in the tube.

Press the locking bolt against the spring, so that the inner parts assembly is pressed against the measuring cell with enough spring tension. Tighten locking bolt and connect the wires:

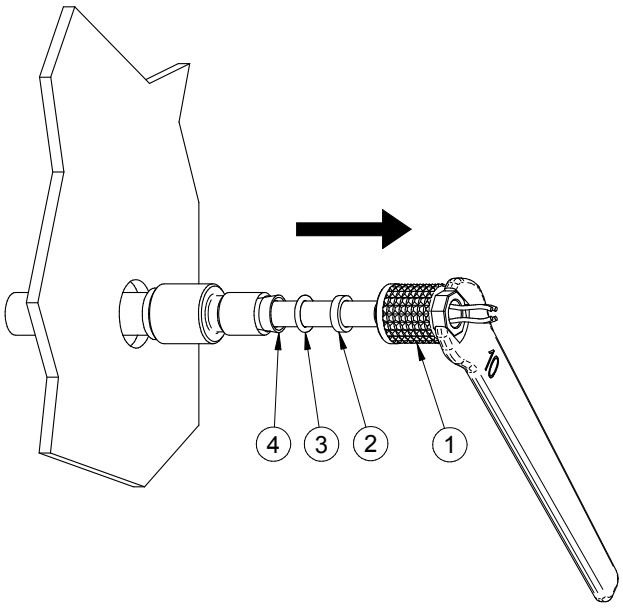
5.10 Replacing the CO_e Sensor

!	**Caution** Failure to observe this information may destroy the new replacement CO_e sensor. Disable the CO_e Sensor (via the software) SYS-MENU ➔ System Configuration ➔ Set CO_e measurement OFF Switch off the power supply of the analyzer system.



Disconnect the CO_e sensor wires at the probe terminal block no. 11-14.

Figure 36 - Connection of the CO_e sensor

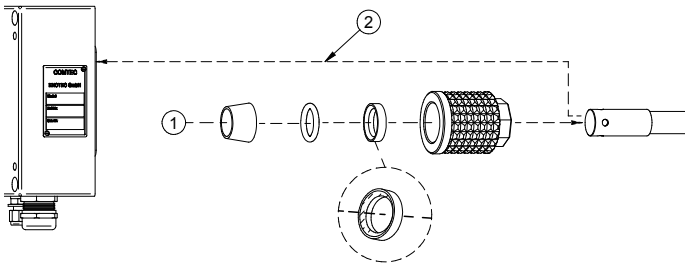


Unscrew and remove the cap nut (1).
Loosen the clamping ring (4), the O-ring (3) and the retainer ring (2).

Pull the CO_e sensor out of the probe.

Take care: The COe sensor may be hot

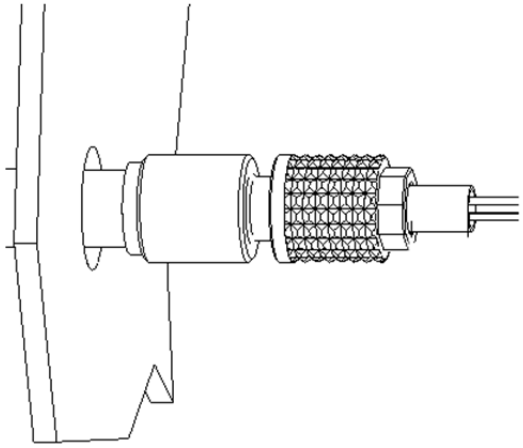
Figure 37 - Remove the CO_e sensor



- Prepare the new CO_e sensor as follows:
- Take the clamping ring, the O-ring, retainer ring and the cap nut and cover them over the CO_e sensor.

Note: Mind the position of the bevel.
Bevel must face O-ring**!**

Figure 38 - Prepare the new COe sensor



- Insert the new CO_e-sensor into the probe
- Tighten the cap nut. Please tighten the cap nut **once more** after the system and the plant are in normal operation for two hours.
- Connect the CO_e sensor wires at the probe terminal block no. 11-14.
- Switch on the power supply

Figure 39 - Insert the new CO_e sensor

!	**Caution** The following parameters have to be entered to ensure correct measurement. Failure to observe this information will destroy the COe sensor immediately! The CO_e sensor must now be activated (via the software) SYS-MENU ➔ System Configuration ➔ Set CO_e measurement ON. After a CO_e sensor replacement, the following values need to be entered as specified in the test certificate (**see paragraph 4.2.17**): **CO_e RH_0** **CO_e Offset** **CO_e Alpha** **CO_e Beta** **CO_e Gamma** **CO_e Delta** **CO_e SO_2 correction value** If incorrect values have inadvertently been entered, switch the CO_e measurement off and back on again.

5.10.1 Seal the CO_e sensor guide tube

In the event of the CO_e sensor being removed for a prolonged period of time, the CO_e sensor guide tube must be sealed to avoid the intake of false air. This must be done with the **locking rod** and **sealing kit for CO_e sensors** which are delivered with the probe as accessories.

5.11 Relay Outputs / Functions and Correlation

The relay contacts are designed for 24V and 1A AC/DC = (Exception: probe valve)

Relay	Contact	Function	
System error*	Normally closed	Signals operation-critical errors	X5 (19A/B)
Maintenance	Normally open	System code was entered, system is in maintenance mode	X5 (18A/B)
Measuring range	Normally open	Closed: Measuring range 1 active	X5 (20A/B)
Probe valve**	Normally open	Triggering of the probe valve	X5 (24A/B)
Limit value 1	Normally closed	Signals a violation of limit value 1	X5 (21A/B)
Limit value 2	Normally closed	Signals a violation of limit value 2	X5 (22A/B)

* The relay „system error“ is active also during the heating phase.

** The relay contact for the probe valve is designed for max. 230V and 1A ≅.

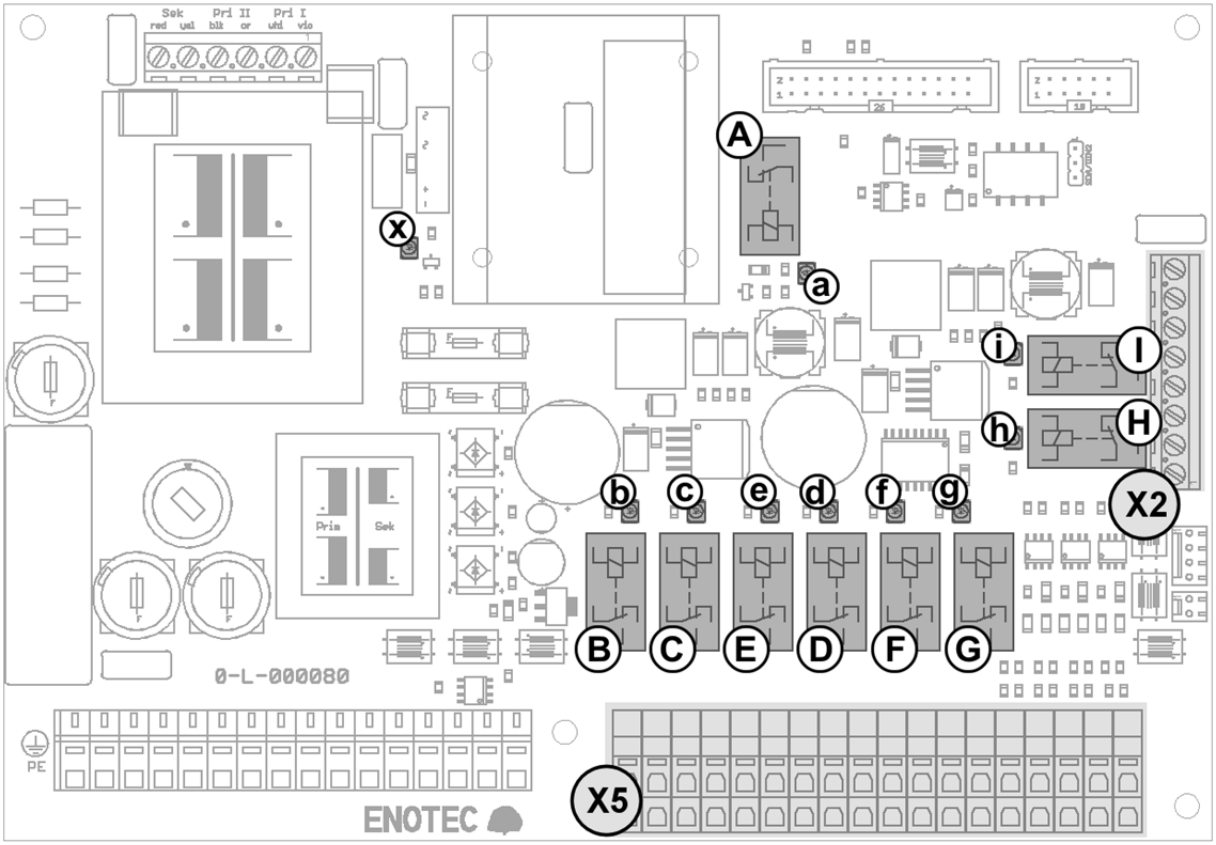


Figure 40 - Relay plate with marked relays and LEDS

Relay Marking	LED Marking	Function
A	a	Main probe heater relay
B	b	Maintenance
C	c	System error
D	d	Limit O2 1
E	e	Measuring range
F	f	Limit O2 2
G	g	Probe valve
H	h	Solenoid valve test gas 1
I	i	Solenoid valve test gas 2
J	x	Probe heater control

6 Status Messages

6.1 Error Messages

Error Message	Relay contact	O_2 signal output	Description
Hardware error 1-7	System error, open	2.00 mA, when not set differently	The error can occur at any time and signalizes a failure of one of the electronic components. The O_2 sensor heater is switched off. Contact a service point, if the error returns after restarting the system.
Open circuit thermocouple	System error, open	2.00 mA, when not set differently	The error can occur at any time and signals a break in the circuit of the thermocouple. The O_2 sensor heater is switched off. Once the fault has been corrected, the error can be reset. **Possible causes:** contact problems of the thermocouple wire to the terminal points of the electronics or the sensor, sensor cable is damaged or the thermocouple is defective.
O_2 probe set point temp. not reached	System error, open	2.00 mA, when not set differently	The error can occur during the heating of the O_2 sensor (Max. 90 minutes). The O_2 sensor heater is switched off. An error reset can be carried out by the user in order to restart the heating process. **Possible causes:** F2 fuse defective, contact problem of the O_2 sensor heater wire to the terminal points of the electronics or the sensor, sensor cable is damaged, short-circuited thermocouple, reference air flow greater than 60 l / h, power supply too low, flow rate too high and / or temperature in the process too low , electronic failure.
O_2 probe temperature too low	System error, open	2.00 mA, when not set differently	The error can occur during measurement, indicating that the O_2 sensor temperature drops 20 ° C (68 ° F) below the set point temperature. The O_2 sensor heater is switched off. An error reset can be carried out by the user in order to restart the heating process. **Possible causes:** F2 fuse defective, contact problem of the O_2 sensor heater wire to the terminal points of the electronics or the sensor, sensor cable is damaged, short-circuit thermocouple, reference air flow greater than 60 l / h, power supply too low, flow rate too high and / or temperature in the process too low, electronic failure.
O_2 probe temperature too high	System error, open	2.00 mA, when not set differently	The error can occur during measurement, indicating that the O_2 sensor temperature has risen 20 ° C (68 ° F) above the set point temperature. The O_2 sensor heater is switched off. An error reset can be carried out by the user in order to restart the heating process. **Possible causes:** Process temperature too high, O_2 sensor cable to the transmitter connected incorrectly, electronic failure.
Open circuit O_2 sensor	System error, open	2.00 mA, when not set differently	The error can occur at any time and signals a break in the circuit of the O_2 sensor. Once the fault has been corrected, the error can be reset. **Possible causes:** contact problem of the O_2 sensor wire to the terminal points of the electronics and the probe, probe cable is defective, contact problem of the probe the inner part of the O_2 sensor.
O_2 sensor calibration failed	System error, open		O_2 sensor calibration has failed for one of the following reasons. An error reset can be carried out by the user. All corresponding entries are then reset as well.
Test gas flow rate too low	System error, open		The error can occur during an O_2 sensor calibration and signals an insufficient test gas flow. An error reset can be carried out by the user. A successful re-calibration also resets the error. **Possible causes:** test gas bottle empty, test gas flow incorrectly set, instrument air supply to the system does not exist.
Test gas flow rate too high	System error, open		The error can occur during an O_2 sensor calibration and signals a test gas flow which is too high. An error reset can be carried out by the user. A successful re-calibration also resets the error. **Possible causes:** test gas bottle empty, test gas flow incorrectly set, instrument air supply to the system does not exist.
O_2 sensor offset too low	System error, open		The error can only occur only during an O_2 sensor calibration. An error reset can be carried out by the user. A successful re-calibration also resets the error. **Possible causes:** inadequate reference air supply, process pressure is too high, incorrect test gas, O_2 sensor defective.

Error Messages (cont.)

Error Message	Relay contact	O_2 signal output	Description
O2 sensor offset too high	System error, open		The error can only occur during an O2 sensor calibration. An error reset can be carried out by the user. A successful re-calibration also resets the error. **Possible causes:** defective false test gas (not applicable with test air), test gas flow too low, O2 sensor defective.
O_2 sensor slope too low	System error, open		The error can only occur only during an O_2 sensor calibration. An error reset can be carried out by the user. A successful re-calibration also resets the error. **Possible causes:** Incorrect calibration gas, test gas flow too low, probe filter damaged, filter head missing, faulty O_2 sensor.
O_2 sensor slope too high	System error, open		The error can only occur only during an O_2 sensor calibration. An error reset can be carried out by the user. A successful re-calibration also resets the error. **Possible causes:** Incorrect calibration gas, O_2 sensor defective.
O_2 sensor signal instable	System error, open		The error can only occur only during an O_2 sensor calibration. An error reset can be carried out by the user. A successful re-calibration also resets the error. **Possible causes:** test gas flow too low, probe filter is damaged, process pressure fluctuations too high.
CO_e board communicatio n error		20.80mA unless set otherwise	The error can occur at any time and signals a failure in communication between the display circuit board and the CO_e circuit board. A reset can be carried out by the user. If the error occurs again, switch the system on and off. If the error persists after restarting the system, contact an ENOTEC service point.
CO_e sensor heater short circuit		20.80mA unless set otherwise	The error can occur at any time and signals a short circuit either by CO_e sensor heating or within the connection between the electronic unit and CO_e sensor. A reset can be carried out by the user. **Possible causes:** Short-circuit of the CO_e sensor heater cable at the terminal points of the electronics or the sensor, short circuit within the probe cable, short circuit inside the COe sensor
CO_e sensor heater short circuit		20.80mA unless set otherwise	The error can occur at any time and signals a break in the circuit of CO_e sensor heater. A reset can be carried out by the user, once the fault has been remedied. **Possible causes:** contact problems between CO_e sensor cable and terminal points of the electronics respectively the probe, probe cable is damaged, defective COe sensor
Open circuit CO_e sensor heating		20.80mA unless set otherwise	The error can occur at any time and signals a break in the circuit of CO_e sensor. A reset can be carried out by the user, once the fault has been remedied. **Possible causes:** contact problems CO_e sensor wire to the terminal points of the electronics and the probe, probe cable is damaged, defective CO_e sensor
Open circuit CO_e sensor		20.80mA unless set otherwise	The error can occur at any time and signals a failure of the electronic components of the CO_e board. A reset cannot be carried out by the user. If the error persists after restarting the system, contact an ENOTEC service point.
COe board hardware error A-C		20.80mA unless set otherwise	CO_e sensor calibration failed for one of the following reasons. A reset cannot be carried out by the user. All entries triggered by this error will then also be deleted.
CO_e sensor calibration failed		20.80mA unless set otherwise	CO_e sensor calibration failed for one of the following reasons. A reset cannot be carried out by the user. All entries triggered by this error will then also be deleted.
CO_e sensor offset too low/high		20.80mA unless set otherwise	The error can only occur only during COe sensor calibration. A reset cannot be carried out by the user. A successful re-calibration remedies the error. Possible causes: insufficient supply of reference air.
CO_e factor alpha/beta/ gamma invalid		20.80mA unless set otherwise	The error can only occur only during CO_e sensor calibration. It can be reset by the user. A reset cannot be carried out by the user. A successful re-calibration also remedies the error. **Possible causes:** inadequate reference air supply, process pressure is too high, incorrect test gas (not test air), CO_e sensor defective.
Error ENOTEC REMOTE module	System error, open		Indicates a hardware error of the ENOTEC REMOTE module. **Possible cause:** the ENOTEC REMOTE module is defective.

Unlisted errors: Other errors cannot be remedied by the customer.
Please contact an ENOTEC service point

6.2 Alarm Messages

Error Message	Relay contact	Description
Reference air flow too low		**Possible Cause:** reference air flow set incorrectly, instrument air supply is inadequate, reference air pump is faulty.
Reference air flow too high		**Possible Cause:** reference air flow is set incorrectly
Limit alarm 1	O_2 limit alarm 1, open	**Possible Cause:** Over or under range of the O_2 limit alarm.
Limit alarm 2	CO_e limit alarm 2, open	**Possible Cause:** Over or under range of the CO_e limit alarm.
Electronic temp. too low		**Possible Cause:** The ambient temperature of the transmitter is lower than the specified lower limit. The specified measurement tolerances are no longer guarateed.
Electronic temp. too high		**Possible Cause:** The ambient temperature of the transmitter is higher than the specified upper limit. The specified measurement tolerances are no longer guarateed.
Clock battery low		The alarm can only be reset by the user after replacing the clock battery (Lithium type 2032). As long as the system is connected to AC power, the alarm has no impact. Only after restarting system will the time / date be incorrect. A possible timed automatic calibration can no longer work correctly.

Unlisted alarm messages: Other messages cannot be remedied by the customer.
Please contact an ENOTEC service point

6.3 Service Messages

Maintenance message	Relay contact	Description
Measured value(s) held	Service, closed	When the measured values held is set to on, the determined O_2 mA output remains saved for a duration before a calibration.

7 Troubleshooting

Unsteady, widely varying measuring value (O_2)

Possible reasons	Procedure
Intermittent contact caused by wire breakage	Eliminate bad/loose contact
Intermittent contact inside the probe - internal mV connection	
Broken filter element	Visual inspection by dismounting the probe
Wrongly installed V-shield	
Probe has been installed without filter head	

O_2 display remains at the end of the measuring range or is higher than expected

Possible reasons	Procedure
Leakages at the measuring probe or at the O_2 sensor flange seal.	Check all flanges and screw connections for tightness. Exchange O_2 sensor or replace O_2 sensor flange seal. In case of a leakage in the area of the O_2 sensor, the O_2 sensor must be exchanged.
Probe flange not welded gas tight.	Tighten flange bolts with required torque, possible renew the gasket.

Local Displays correct, Output not correct

Possible reasons	Procedure
Electronic unit is defective	Check measuring range. Check whether the current value is outside the measuring range
	Measure the mA output on the strip terminal.

O_2 Display Indicates 0 %, although the Process Operation Mode expects a higher O_2 Value

Possible reasons	Procedure
Measuring probe heater defective (resistance must be approx. 37.5-47.5 Ohm, disconnect probe and check).	Check the measuring cell temperature (set value 800°C/1472°F. A lower temperature could have the effect of showing a value of 0 %.
Thermocouple defective (check resistance, approx. 2-80 Ohm).	Check the mV value of the O2 measuring cell
Fuse for heater voltage defective.	Replace the fuse
Cable short circuit. Electronic units input defective. Wire break	Check wiring. Measure probe cable.
Transformer (230/115V) is defective	Check the fuse
There is no mV contact in the probe (measuring signal wire) or it is interrupted.	Check probe inner part for good contact.
Combustibles in the flue gas.	Check whether the probe reacts to test gas. If it does, there may be a high proportion of combustibles in the flue gas. In this case, there are reducing conditions at the probe sensor, which reduce the oxygen content at the sensor surface. **Caution: Explosion hazard!**
Measuring cell defective.	Replace the sensor.

Local Displays correct, Output not correct

Possible reasons	Procedure
Electronic unit is defective	Check measuring range. Check whether the current value is outside the measuring range
Electronic unit is defective	Measure the mA output on the strip terminal.

O_2 reads higher than expected, and CO_e reads lower than expected

Possible reasons	Procedure
This may be due to a poor seal of the CO_e sensor coupling located in the terminal box housing. If the stainless steel nut is not tight enough the O-ring seal allows ambient air to enter into the CO_e senor mounting tube which influences the sensors readings	Tighten or replace the CO_e sensor coupling assembly.

No COe-Measuring Value; Arrow instead of a value

Possible reasons	Procedure
The physical measuring range has been exceeded	Perform a O_2 + CO_e sensor check
An error has occurred with the CO_e sensor	Check all electrical connections.

No Measuring Value for O_2; empty Bar Graph

Possible reasons	Procedure
O_2 value out of the coverage of the electronic unit, for example caused by a low O_2 concentration in connection with a high COe concentration	Perform an O_2 + CO_e sensor check

A Technical Data

A.1 Technical Specifications - Electronic Unit

Housing:	sheet steel powder coated; RAL6029 (GRP version optional) (SME-54, 19” rack optional)	
IP Code:	Safe Area Housing: IP66 GRP cabinet: IP66 19“ housing: IP20	
Display:	LC Dot Matrix 240 x 64 - LED backlit	
Keypad:	membrane keypad	
Signal LEDs:	orange: alarm, orange: maintenance, red: error	
O_2 measuring range:	2 ranges, freely configurable from 0-2 % O_2 to 0-25 % O_2 (other O_2 measuring ranges on request)	
Accuracy O_2:	< 0.5 % of measured value or 0.02 Vol % O2 (higher value valid)	
CO_e measuring range:	1 range, min.: 0-1000 ppm / max.: 0-5000 ppm (factory adjustable, other ranges on request)	
Accuracy CO_e:	5 % of range end	
Mains Voltage:	115 VAC ±10 % 50 to 60 Hz 230 VAC ±10 % 50 to 60 Hz	
Power consumption:	225 VA (typical measuring mode) 425 VA (heating phase)	
Recommended fuse:	10 A	
Output signal:	**O_2** - active, 0/4 to 20 mA max. load 500 Ω	**CO_e** - active, 4 to 20 mA max. load 500 Ω
Relay contact:	24 V AC/DC, 1 A	
Relay contact solenoid valve:	230 V AC/DC, 1 A	
Dimensions:	300 x 440 x 240 mm (W x H x D) (standard field housing) 483 x 177 x 400 mm (W x H x D) (19" rack)	
Weight:	approx. 20 kg approx. 12 kg (19” rack)	
Temperature range - storage: *	-40 °C to +80 °C (-40 °F to 176 °F)	
Temperature range - operation: *	-20 °C to +55 °C (-4 °F to 129 °F); others on request	

* Other temperature ranges on request

A.2 Technical Specifications - Probes

Process gas temperature:	up to 500 °C (932 °F) up to 1600 °C (2912 °F) with cooling tube
Insertion depth:	KES-6001: 470 mm KES-6002: 930 mm KES-6003: 1850 mm
Insertion depth with cooling tube:	500/1000 mm others on request
Measuring principle:	Zirconium oxide for O_2 MXP for CO_e
Flue gas pressure:	±50 mbar (±0.725 PSIG) to atmospheric pressure
Flue gas flow velocity:	0 to 10 m/s, others on request
Ambient temperature:	-40 °C to +80 °C (-40 °F to +176 °F)
Reaction time (O_2):	< 1 s (with test gas)
T90 (O_2):	< 5 s (with test gas)
Probe material:	stainless steel (SS316)
Protection class:	IP65
Detection limit:	< 10 ppm O_2
Power supply:	Through electronic unit
Probe dimensions:	on request

Requirements of the Gas Supply

The analyzer system uses the connected instrument air continuously for the supply of reference air, and during calibration and system test respectively, for the supply of test air (test gas 1).

Instrument air supply for reference air / test air	
Specification:	According to ISO 8573-1 class 2 (Particle size max. 1µm, Particle density max. 1mg/m³, Oil content max. 0,1mg/m³, Pressure dew point max. -40 °C or 10 °C below lowest possible ambient temperature Constant 20,95 Vol. %O_2
Input pressure:	2-10 bar
Flow rate	continuously maximum 40 l/h (for reference air supply) 180 l/h during calibration

Test gas (test gas bottle) for calibration / system test	
Input pressure:	max. 3 bar
Specification test gas 1 (optional):	21% O_2 in N_2 (synthetic air – in case instrument air is not available)
Specification test gas 2:	The test gas used for calibration purposes must have the exact same composition as the test gas specified in the test certificate. The test certificate can be found attached to the probe / sensor on delivery. The test gas recommendations for O_2 and CO_e sensor may possibly differ. In this case, the sensors must be individually calibrated.
Flow rate	180 l/h at 1,1 bar (+/- 0,1).

	**Note** The flow rate of the test gas bottle is set via the bottle pressure regulator.

B Dimensional drawings

B.1 Electronic Units

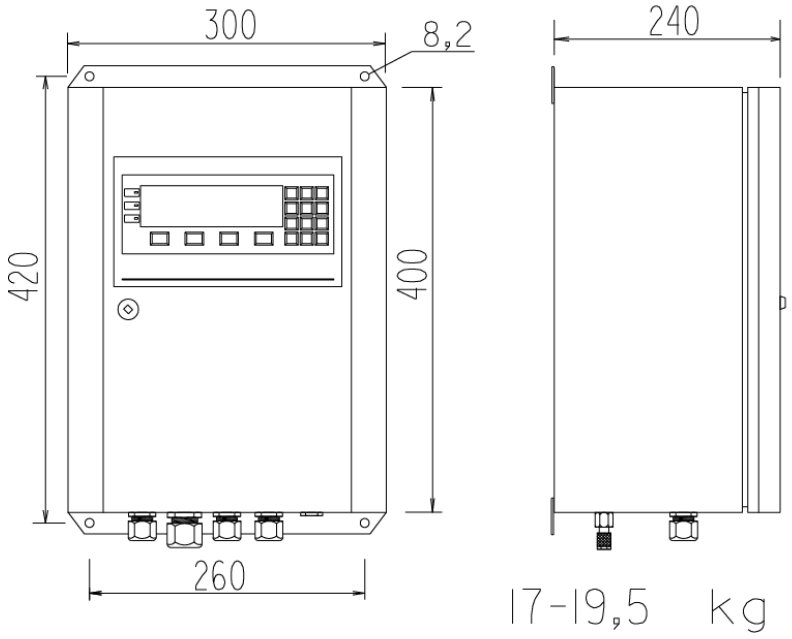


Figure 41 - Dimensions (mm) of the electronic unit SME-53

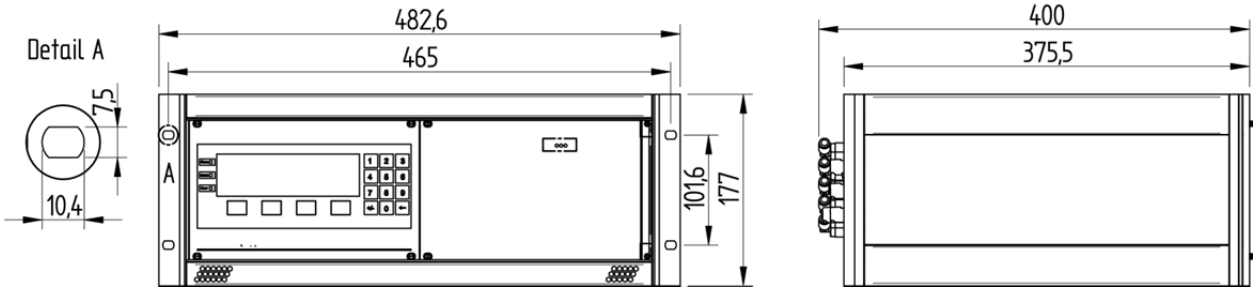


Figure 42 - Dimensions (mm) of the electronic unit in 19'' rack - SME 54

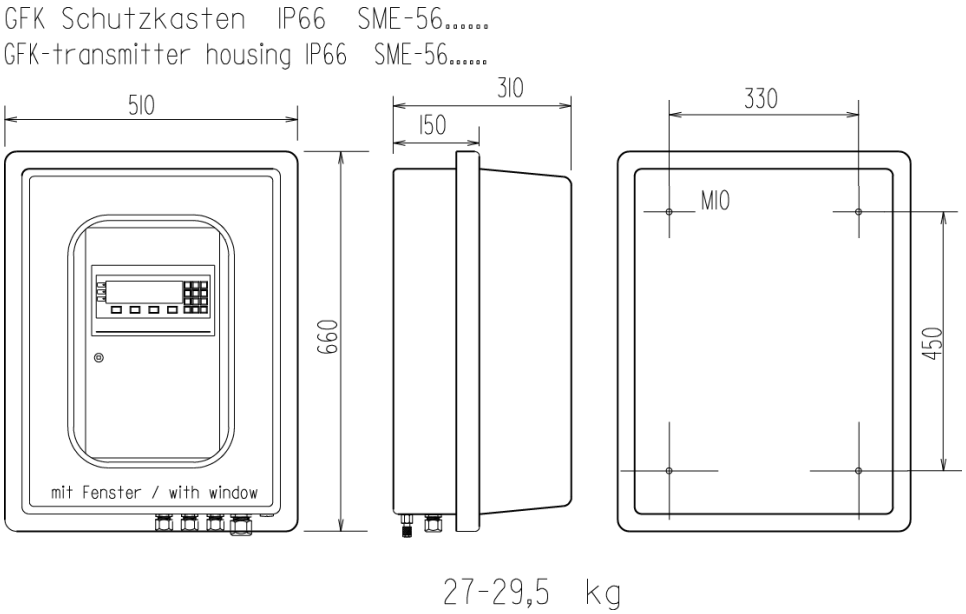
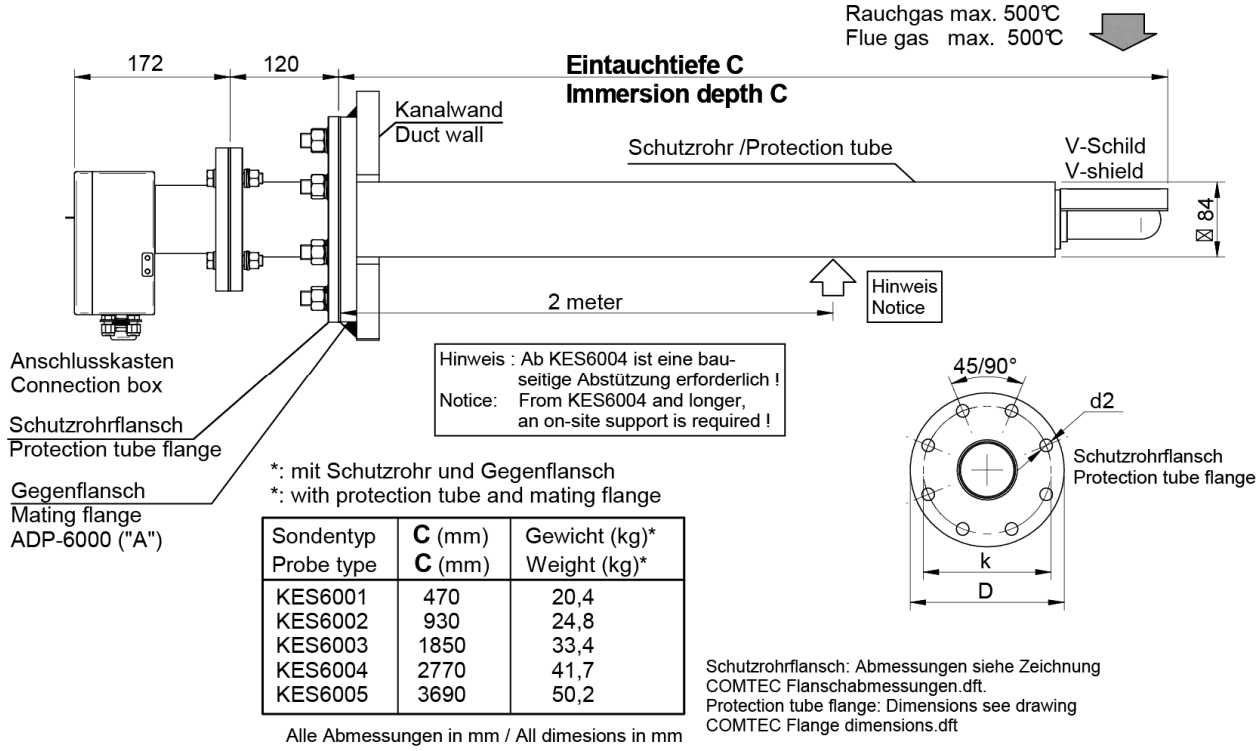


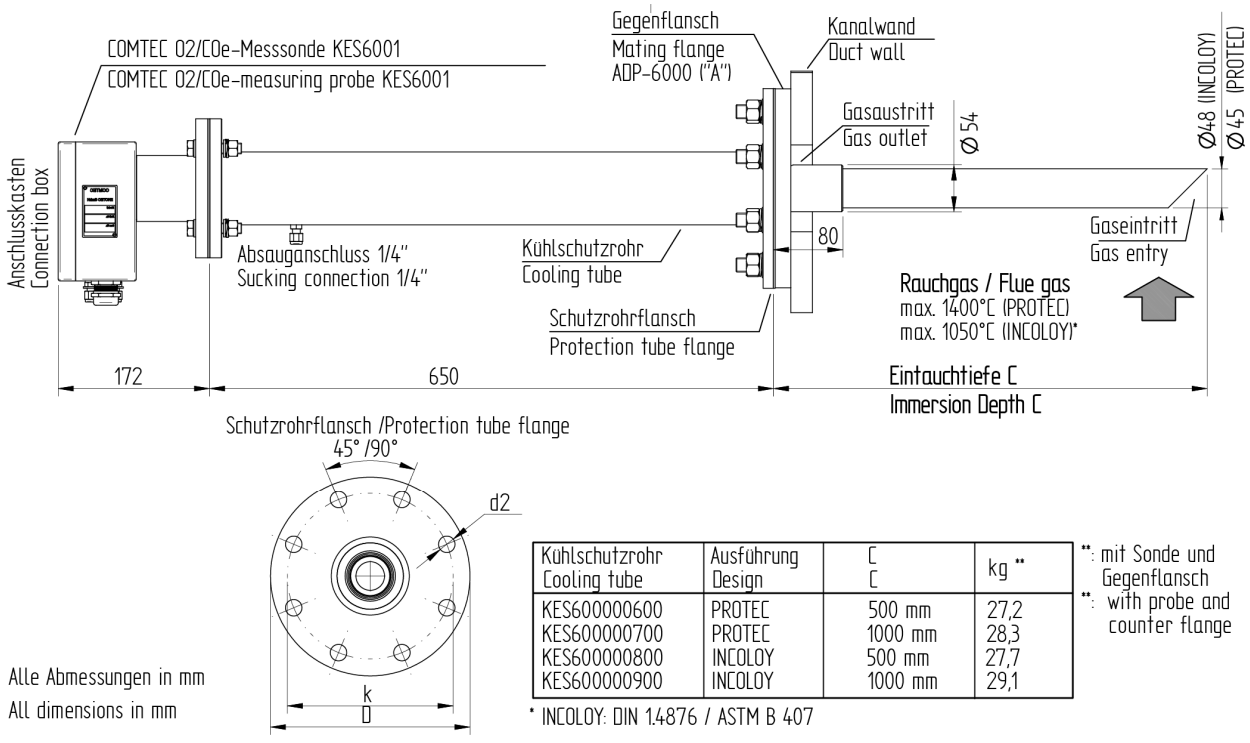
Figure 43 - Dimensions (mm) of the Optional SME-56 GRP Cabinet

B.2 Dimensional drawing of probes KES600x



Sondentyp Probe type	C (mm) C (mm)	Gewicht (kg)* Weight (kg)*
KES6001	470	20,4
KES6002	930	24,8
KES6003	1850	33,4
KES6004	2770	41,7
KES6005	3690	50,2

Figure 44 - Dimensional drawing of probe KES600x



Kühlschutzrohr Cooling tube	Ausführung Design	C C	kg **
KES600000600	PROTEC	500 mm	27,2
KES600000700	PROTEC	1000 mm	28,3
KES600000800	INCOLOY	500 mm	27,7
KES600000900	INCOLOY	1000 mm	29,1

**: mit Sonde und Gegenflansch
**: with probe and counter flange
* INCOLOY: DIN 1.4876 / ASTM B 407

Figure 45 - Dimensional drawing of probe KES600x with cooling protection tube

B.3 Counter flanges

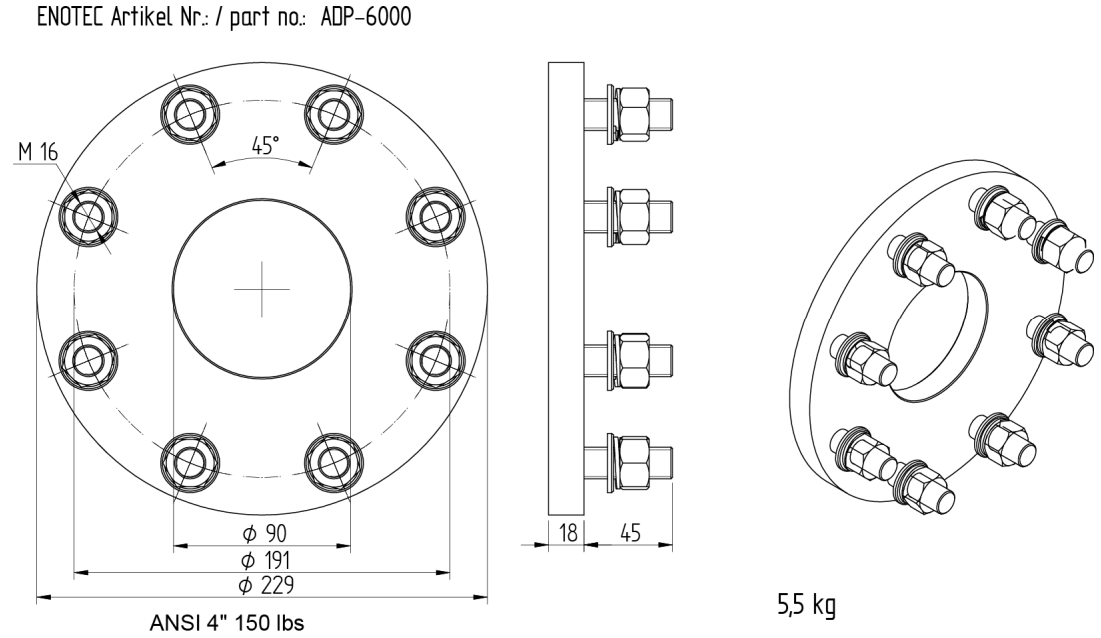


Figure 46 - Dimensions (mm) of counter flange ADP-6000

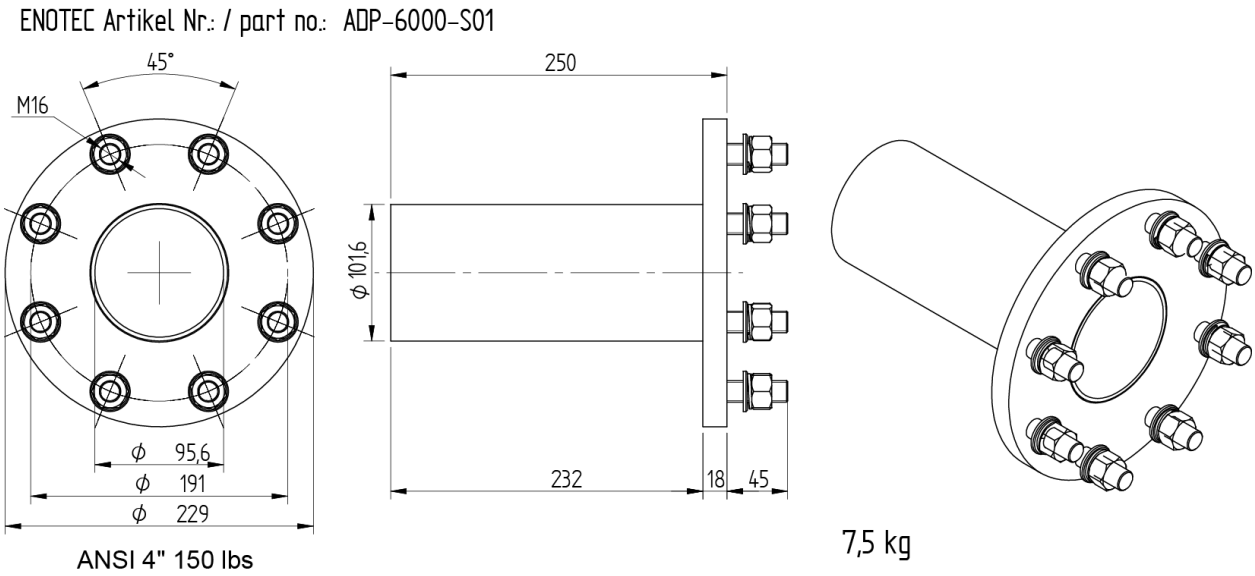


Figure 47 - Dimensions of counter flange ADP-6000-S01

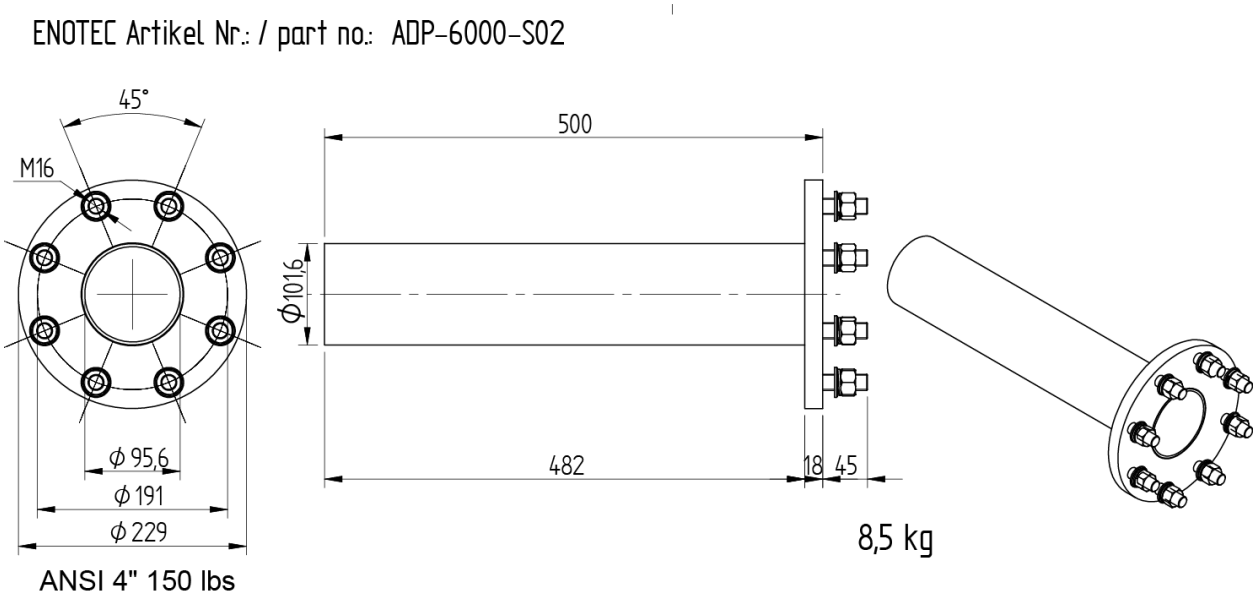


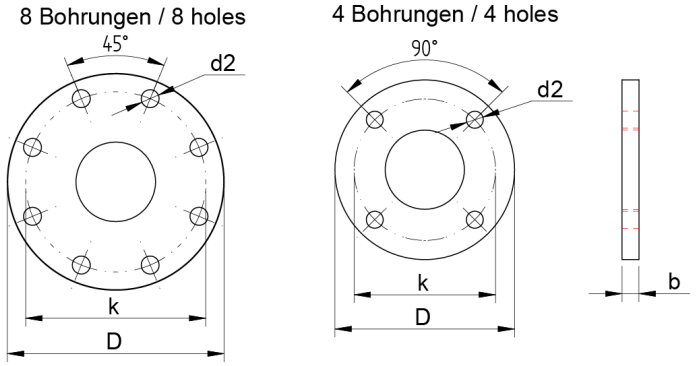
Figure 48 - Dimensions of counter flange ADP-6000-S02

B.4 Dimension of Protection Tube Flanges

Abmessungen Schutzrohrflansche / Dimensions of protection tube flanges

Abmessungen / Dimensions / Flanschtyp / type of flange	D	b	k	d2	holes
ANSI 4" 150lbs FF eq. Order code: **A**	228,6 (9,00)	12,5 (0,50)	190,5 (7,50)	19,0 (0,75)	8
ANSI 3" 300lbs Order code: **F**	209,5 (8,25)	28,6 (1,13)	168,3 (6,63)	22,2 (0,87)	8
ANSI 3" 150lbs Order code: **J**	190,5 (7,50)	23,9 (0,94)	152,4 (6,00)	19,1 (0,75)	4
DIN2527 DN80/PN6 Order code: **K**	190,0 (7,48)	18,0 (0,71)	150,0 (5,91)	18,0 (0,71)	4
DIN2527 DN80/PN16 Order code: **L**	200,0 (7,87)	20,0 (0,79)	160,0 (6,29)	18,0 (0,71)	8
DIN2527 DN100/PN16 Order code: **M**	220,0 (8,66)	20,0 (0,79)	180,0 (7,09)	18,0 (0,71)	8
Servomex 700 eq Order code: **N**	155,0 (6,10)		120,6 (4,75)	11,0 (0,43)	8
Servomex 790M eq Order code: **P**	220,0 (8,66)		186,0 (7,32)	11,0 (0,43)	4
DIN2527 DN150/PN16 Order code: **R**	285,0 (11,22)	22,0 (0,87)	240,0 (9,45)	22,0 (0,87)	8
ANSI 4" 150lbs RF Order code: **T**	228,6 (9,00)	12,5 (0,50)	190,5 (7,50)	19,1 (0,75)	8

Alle Abmessungen in mm (inch) / All dimensions in mm (inch)



Schutzrohrflansch;Mat.:DIN 1.4571 / AISI 316 Ti
Abmessungen: siehe Tabelle
Aussendurchmesser Schutzrohr: 84mm!!
Aussendurchmesser Kühlschutzrohr: 54mm
Protection tube flange; Mat.: DIN 1.4571 / AISI 316 Ti
Dimensions: see table
Outside diameter protection tube: 84mm!!
Outside diameter cooling protection tube: 54mm

Gültig für alle KES600X / KEX600X
Für StaubEX auf Anfrage
Available for all KES600X / KEX600X
For DustEx on request

Technische Änderungen vorbehalten.
Andere Flansche auf Anfrage.
Data subject to change without notice.
Other flange types on request.

Figure 49 - Dimensional drawing of the protection tube flanges for KES600X

B.5 Probe components

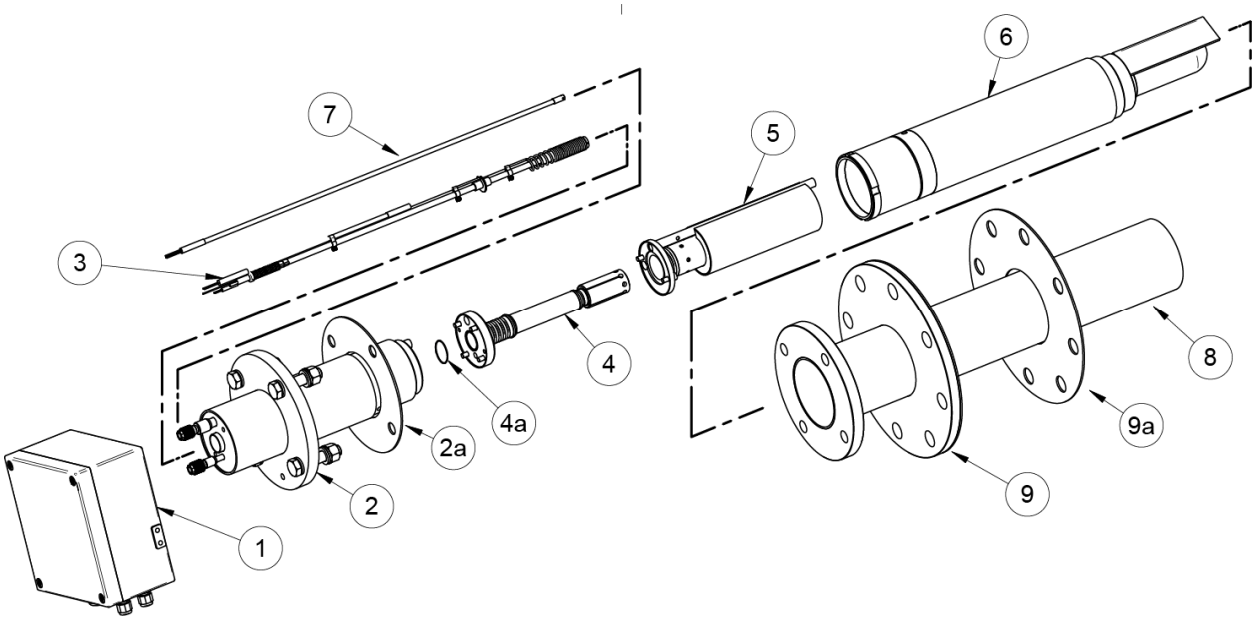
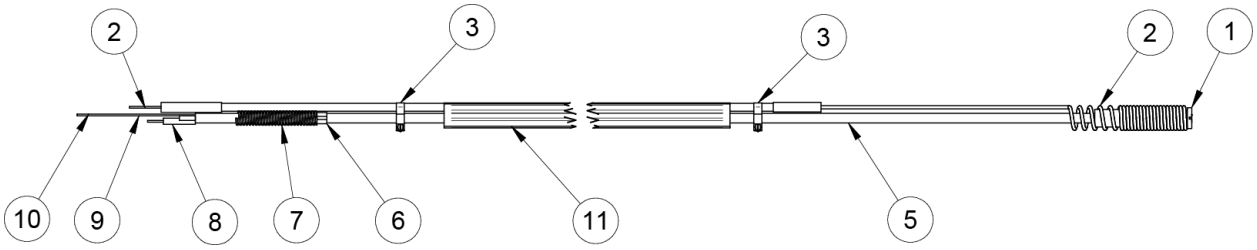


Figure 50 - Probe components

No.	ENOTEC Part-No.	Description
①	ASK-0003	Connection box
②	MSR-6001	Probe tube
②a	FLD-1000	Probe flange gasket
③	SIK-600x (x=1,2…5)	Probe inner part complete
④	ZO2-6011	O_2 Measuring cell complete (MLT)
④a	MZD-0005	Metal-O-ring seal
⑤	0-R-002311	Test gas distributor with insulation tube
⑥	KES60000x0000(x=1,2…5)	Filter head
	KEF-200x	Ceramic filter with cement
	BAF-200x	Basalt filter with cement
	SMF-200x	Sintered metal filter with cement
⑦	KES60000D000	CO_e sensor
⑧	KES600000x00(x=1,2…5)	Protection tube
⑨	KES600000x00(x=A, B…)	Protection tube flange
⑨a	Depending on flange type	Protection tube flange gasket

B.6 Probe inner parts assembly



Nr.	Description	Article Number (depends on probe type)
		KES-600X
1	Heater support tube	**HZH-00002**
2	Heater	**HEI-200X**
3	heater clamp	**0-R-000474**
5	Ceramic rod	**KER-200X**
6	Tube clamp	**0-R-000500**
7	Spring	**0-R-000044**
8	Thermocouple	**MT2-200X**
9	Reference air hose	**RLS-0001**
10	Signal wire	**MSD-2001**
11	Reinforcement profile	

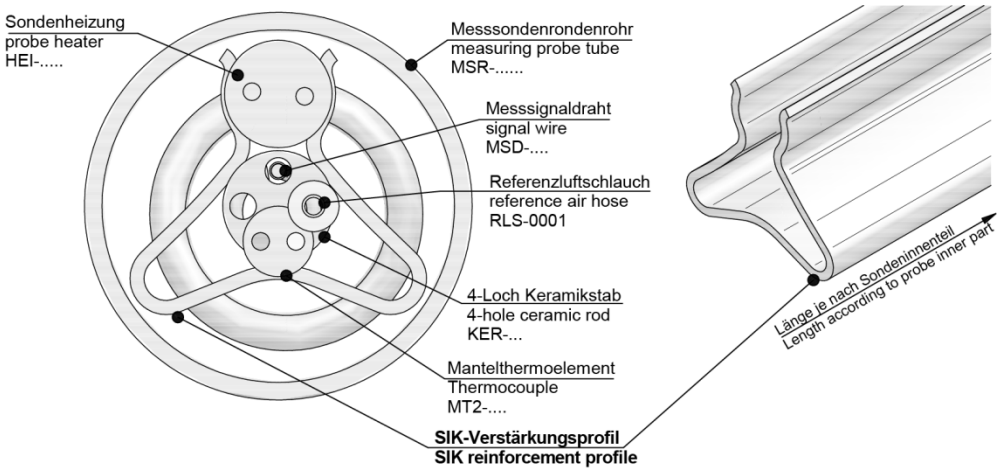
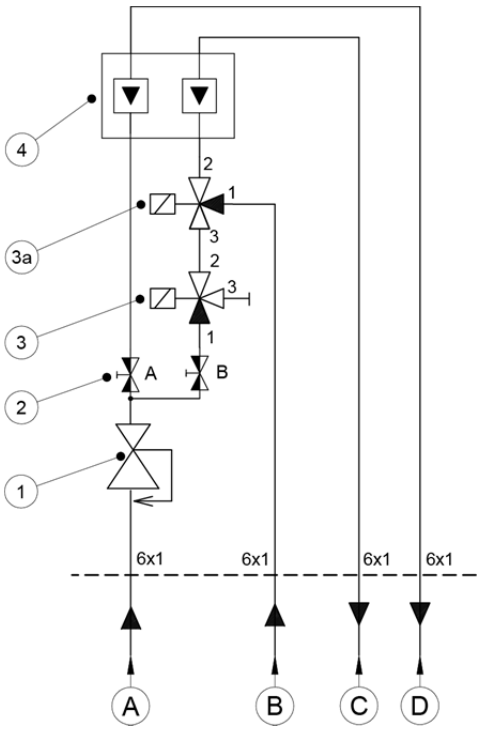


Figure 51 – Reinforced probe inner part assembly

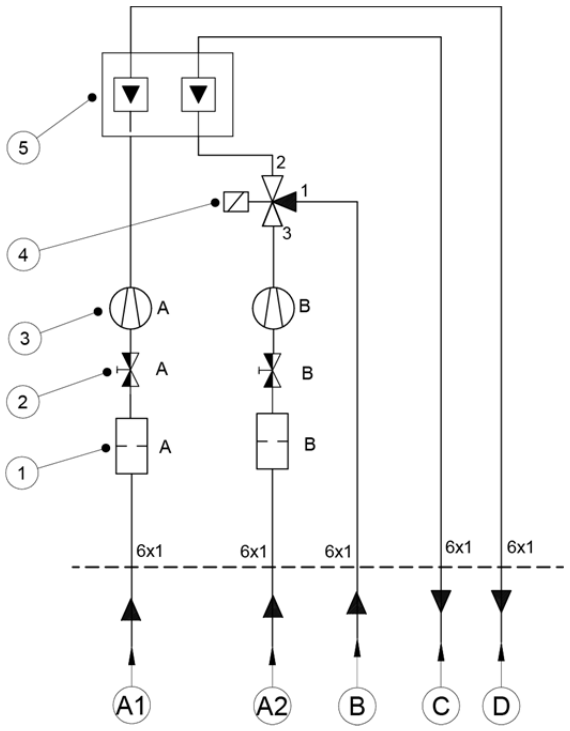
B.7 Gas plans

Pneumatic version for Instrument air
SME-50000010



1	Pressure control valve
2	Choke non return valve
3	Solenoid valve 3/2 ways
3a	Solenoid valve 3/2 ways
4	Flow meter
A	Instrument air in, 4 – 10 Bar
B	Test gas in, Max. 3 Bar
C	Test gas out
D	Reference air out

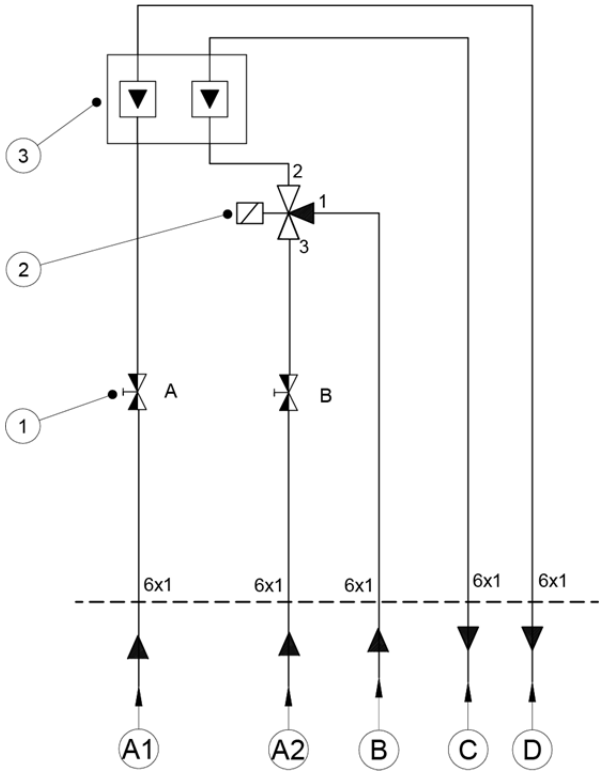
Pneumatic version with pumps
SME-50000020



1	Filter
2	Choke non return valve
3	Reference air pump / Test air pump
4	Solenoid valve 3/2 ways
5	Flow meter
A1	Reference air in
A2	Test air in
B	Test gas in
C	Test gas out
D	Reference air out

Figure 52 - Gas plans

Electronics with external pneumatics - SME-50000080



①	Choke non return valve A - Reference air B - Test air
②	Solenoid valve 3/2 ways
③	Flow meter
A1	Instrument air in
A2	Test air in
B	Test gas in
C	Test gas out
D	Reference air out

Figure 53 - SME-50000080 gas plan for external pneumatics

Gas plan SME-5 Instrument air (Version A)

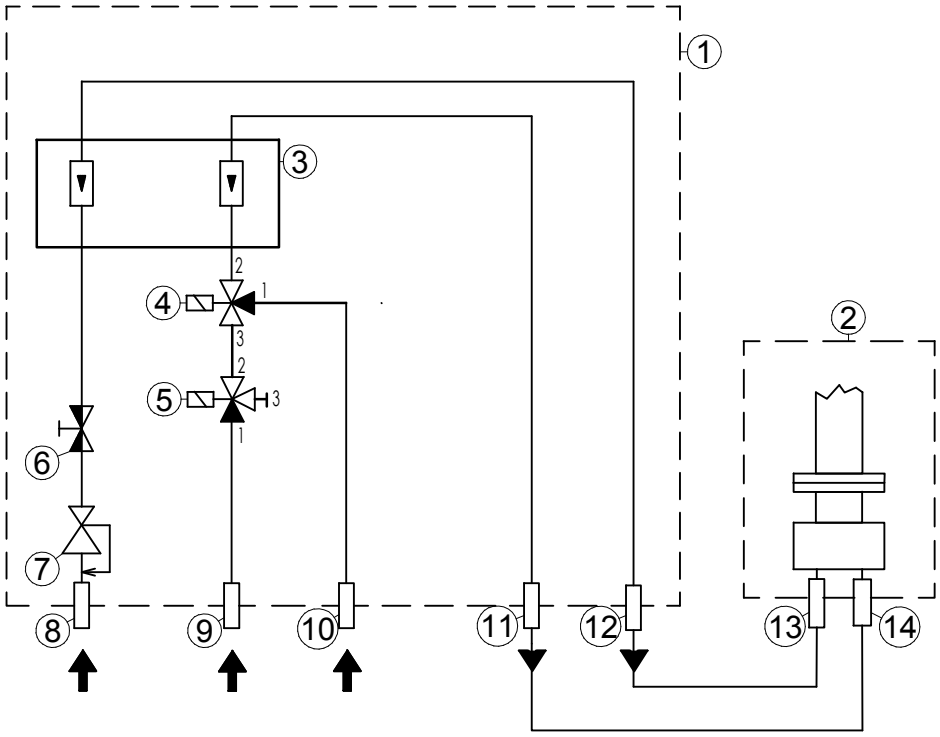
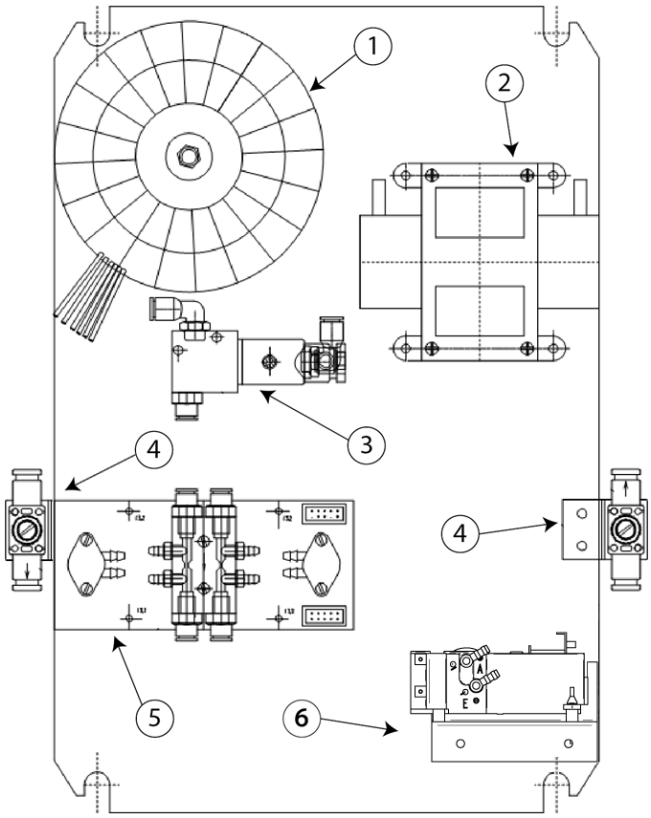


Figure 54 - Gas plan (instrument air version A)

①	Electronic unit	⑧	Instrument air in (2-10 bar, oil free, dry)
②	O_2/CO_e Probe	⑨	Test gas 1 in (max. 3 bar)
③	Flow meter	⑩	Test gas 2 in (max. 3 bar)
④	3/2-way solenoid valve (for test gas 2)	⑪	Test gas out ➔ green tubing (150-180l/h)
⑤	3/2-way solenoid valve (for test gas 1)	⑫	Reference air out ➔ blue tubing (5-60l/h; optimal:30-40l/h))
⑥	Choke reference air	⑬	Probe reference air in ➔ blue tubing
⑦	Pressure reducer	⑭	Probe test gas in ➔ green tubing

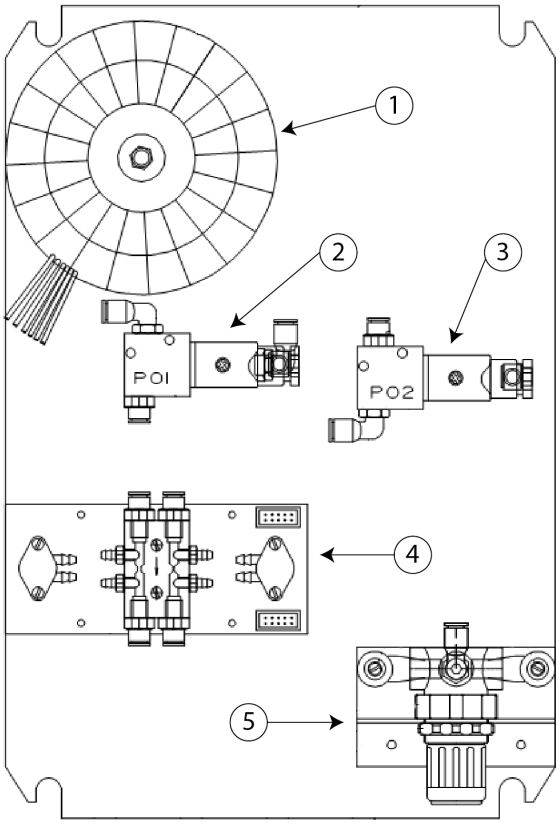
C Spare Parts

C.1 Mounting Plates of SME-53 Electronic Unit



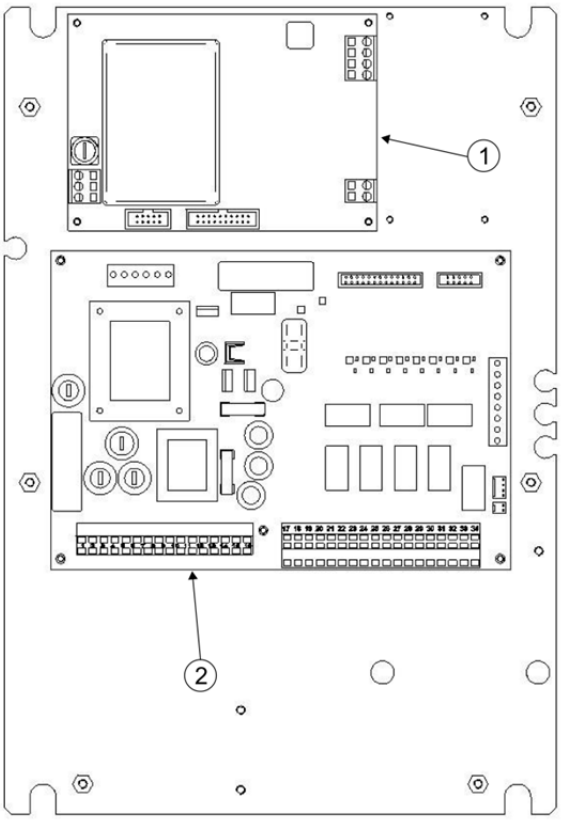
Mounting Plate 1 **Test gas and reference air unit with internal pumps**		
1	TRA-0017	Transformer prim. 2*115V, sec. 115V
2	PLU-0028	Test air pump for SME5 720 l/h
3	PGM-0001	Test gas solenoid valve P01 for SME53 - with pneumatic unit and fittings
4	0-P-001508	Restrictor one way - 6 mm
5	DFM-0001	Internal flow meter for reference air and test gas SME5
6	PLU-0025	Reference air pump for SME5 30l/h

Figure 55 - Mounting plate 1 (version with pumps)



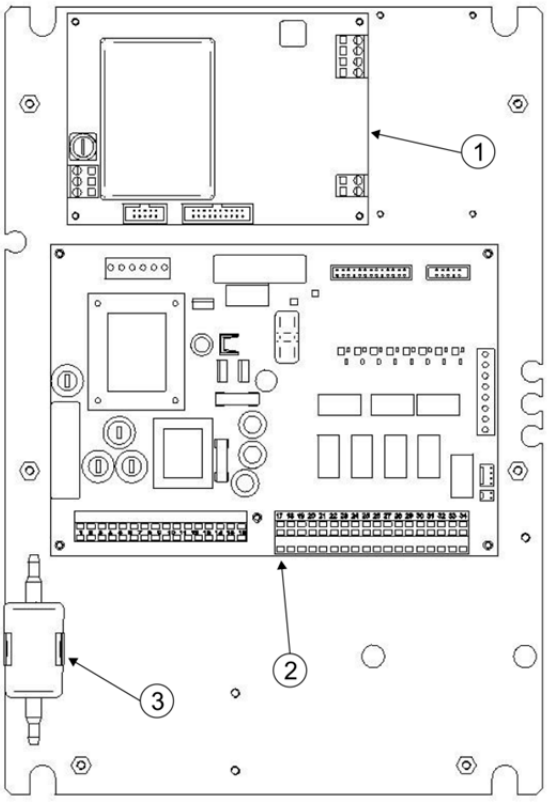
Mounting Plate 1 **Test gas and reference air unit for instrument**		
1	TRA-0017	Transformer primary 2*115V, sec. 115V
2	PGM-0001	Test gas solenoid valve P01 for SME53 - with pneumatic unit and fittings
3	PGM-0002	Test gas solenoid valve P02 for SME5 - with instrument air unit and fittings
4	DFM-0001	Internal flow meter
5	0-P-000752	Pressure regulator

Figure 56 - Mounting plate 1 (version with instrument air)



Mounting Plate 2 instrument air version		
	ENOTEC-Part No.	**Description**
1	0-L-000107	CO_e sensor board
2	0-L-000080	Power board

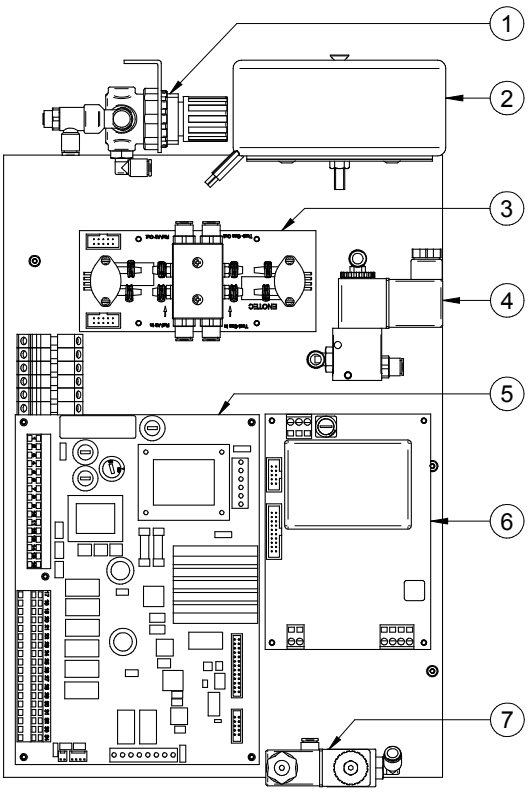
Figure 57 - Mounting plate 2 (instrument air)



Parts List - Mounting Plate 2 Version with pumps		
1	0-L-000100	CO_e Sensorboard
2	0-L-000080	Power board
3	0-P-000658	Miniature filter 0,3µm

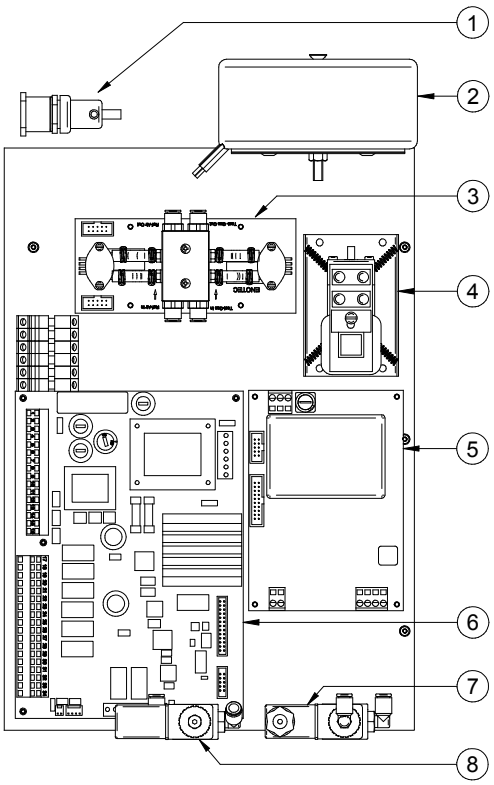
Figure 58 - Mounting plate 2 (with pumps)

C.2 Mounting Plates of 19" Rack SME-57



Mounting Plate **instrument air, version A and version 1**		
①	0-P-000780	Pressure regulator with two chokes ➔ Version 1
	0-P-001369	Pressure regulator with one choke ➔ Version A
②	TRA-00017	Toroid transformer 2x115V;sec.115V/330VA
③	DFM-0001	Internal flow meter for reference air and test gas SME5
④	PGM-0001	Solenoid valve for test gas P01
⑤	0-L-000080	Power board
⑥	0-L-000100	CO_e sensor board
⑦	PGM-0002	Solenoid valve for test gas P02

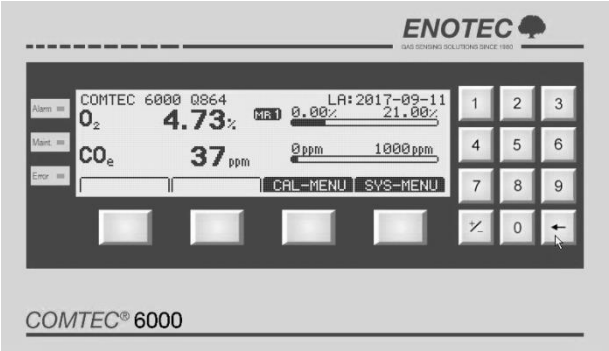
Figure 59 - Mounting plate (with instrument air, Version A and Version 1)



Mounting Plate **with pump**		
①	PLF-0001 PLF-0002	Test air / ref. air filter Spare filter element
②	TRA-00017	Toroid transformer 2x115V;sec.115V/330VA
③	DFM-0001	Internal flow meter for reference air and test gas SME5
④	PLU-0025	Reference air pump
⑤	0-L-000100	CO_e sensor board
⑥	0-L-000080	Power board
⑦	PGM-0001	Solenoid valve for test gas P01
⑧	PGM-0002	Solenoid valve for test gas P02

Figure 60 - Mounting plate (with pump)

C.3 Display Board



ENOTEC Part No.		Description
①	0-L-000102+	COMTEC display board with software

Figure 61 - Display and microprocessor unit

D Warranty

E N O T E C W A R R A N T Y

ENOTEC warrants that systems manufactured and sold by it will, upon shipment, be free of defects in workmanship or material. Should any failure to conform to this warranty become apparent during the relevant warranty periods, ENOTEC shall, upon prompt written notice from the purchaser, correct such nonconformity by repair or replacement of the defective part or parts. The purchaser is not entitled to claim any other legal remedies on the basis of this warranty. Please refer to the ENOTEC international warranty conditions for details.

The warranty durations are as follows:

24 months after delivery for systems.
12 months after delivery for spare parts.

ENOTEC accepts no responsibility or liability for defects and damage to ENOTEC products which are to be attributed to the following causes: Wear, corrosion, improper use, unauthorized modifications, inadequate maintenance and non-compliance with the operating instructions.

All ENOTEC products and systems which incorporate a heated sensor must be operated under continuous conditions. If the heater power is switched off and on regularly, the resultant thermal stress for the probe heater, probe thermocouple and sensor will cause a shorter life span. If it is not possible to operate the heated equipment continuously for a longer period of time, please contact ENOTEC for technical advice.

Note: When installing the equipment, the customer must ensure that all necessary supply lines are connected and the operating temperature of the probe is reached. Experience has shown that products installed but not put into operation may be damaged by the process or by external influence. ENOTEC will not accept any responsibility for such damages.

Suitable tools must be used when installing and commissioning ENOTEC products and systems. If any damage is caused due to the use of unsuitable tools, ENOTEC will not accept any responsibility for damages.

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Email: info@enotec.de

E Declaration of Conformity

We hereby declare that the products listed below, based on their conception and design as well as in the equivalent execution which we have brought into circulation, comply with the essential safety and health requirements of the EC-directives as follows. Any unauthorized changes to the products, renders this declaration invalid. The manufacturer carries the sole responsibility for issuing this declaration.

Manufacturer:

ENOTEC GmbH
Höher Birken 6
51709 Marienheide - Germany
Tel.: +49 2264 45 78-0

Product model:

System:	*COMTEC*® 6000
Electronic units:	SME-53, SME-54
Probe types:	KES-6000

Description:

InSitu O_2 / CO_e analyzer system

Relevant EC directives:

- 2014/30/EU, electromagnetic compatibility (EMC)
- 2014/35/EU, low voltage directive
- 2014/53/EU, radio and telecommunications terminal equipment directive
- 1985/374/EWG, product liability directive

Applied harmonized standards:

- EN 55011 Kl.B:2009 + A1
- EN 61326-1:2013
- EN 61010-1:2010
- EN 300 328:V2.1.1
- EN 301 489-1:V2.1.1
- EN 301 489-17:V3.1.1

Marienheide, 09.06.2017

Manufacturer signature: _____

Fred Gumprecht
Managing Director

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