

# Operating Instructions

## **DUSTHUNTER SB**

Dust Concentration Monitor



**Described product**

Product name: DUSTHUNTER SB  
Variants: DUSTHUNTER SB50  
DUSTHUNTER SB100

**Manufacturer**

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## 1 Important information

### 1.1 Main hazards

#### 1.1.1 Hazard through hot and/or aggressive gases and high pressure

The optical subassemblies are fitted directly on the gas-carrying duct. On equipment with low hazard potential (no danger to health, ambient pressure, low temperatures), the installation or removal can be performed while the equipment is in operation providing the valid regulations and equipment safety notices are observed and suitable protective measures are taken.

**WARNING: Danger from exhaust gas**

- ▶ On equipment with gases detrimental to health, high pressure or high temperatures, the sender/receiver unit component fitted on the duct may only be installed/removed when the equipment is at a standstill.
- 

#### 1.1.2 Hazards through electrical equipment

**WARNING: Danger through power voltage**

- The DUSTHUNTER SB measuring system is classified as electrical.
- ▶ Disconnect power supply lines before working on power connections or parts carrying power voltage.
  - ▶ Refit any contact protection removed before switching the power voltage back on again.
- 



#### 1.1.3 Hazards through laser beam

**WARNING: Hazards through laser beam**

- ▶ Never look directly into the beam path
  - ▶ Do not point the laser beam at persons
  - ▶ Pay attention to laser beam reflections.
-

## 1.2 Symbols and document conventions

### 1.2.1 Warning Symbols

Symbol	Significance
	Hazard (general)
	Hazard by voltage

### 1.2.2 Warning levels and signal words

**DANGER**

Risk or hazardous situation which *will* result in severe personal injury or death.

**WARNING**

Risk or hazardous situation which *could* result in severe personal injury or death.



**CAUTION**

Hazard or unsafe practice which *could* result in less severe or minor injuries.

**NOTICE**

Hazard which *could* result in property damage.

### 1.2.3 Information symbols

Symbol	Significance
	Important technical information for this product
	Important information on electric or electronic functions

## 1.3 Intended use

### Purpose of the device

The DUSTHUNTER SB measuring system only serves continuous measurement of dust concentrations in exhaust gas and exhaust air plants.

### Correct use

- ▶ Use the device only as described in these Operating Instructions. The manufacturer bears no responsibility for any other use.
- ▶ Observe all measures necessary for conservation of value, e.g., for maintenance and inspection and/or transport and storage.
- Do not remove, add or modify any components to or on the device unless described and specified in the official manufacturer information. Otherwise
  - the device could become dangerous
  - the manufacturer's warranty becomes void

### Restrictions of use

- The DUSTHUNTER SB measuring system is not approved for use in potentially explosive atmospheres.

## 1.4 Responsibility of user

### 1.4.1 General information

#### Designated users

The measuring system DUSTHUNTER SB may only be installed and operated by skilled technicians who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.

#### Special local conditions

- ▶ Observe the valid legal regulations as well as the technical rules deriving from implementation of these regulations applicable for the respective equipment during work preparation and performance.
- ▶ Carry out work according to the local conditions specific for the equipment as well as operational hazards and regulations.

#### Retention of documents

Keep the Operating Instructions belonging to the measuring system as well as equipment documentation onsite for reference at all times. Pass the respective documentation on to any new owner of the measuring system.

### 1.4.2 Safety information and protective measures

#### Protection devices

**NOTE:**

Depending on the particular hazard potential, an adequate number of suitable protection devices and personal safety equipment must be available and used by the personnel.

---

#### Behavior during purge air failure

The purge air supply serves to protect optical subassemblies fitted on the duct against hot or aggressive gases. Leave the supply switched on when the equipment is at a standstill. Optical subassemblies can be severely damaged in a short time if the purge air supply fails.

**NOTE:**

When no fail-safe shutters are fitted:  
The user must ensure that:

- ▶ The purge air supply runs reliably and continuously
  - ▶ Failure of the purge air supply is immediately detected (e.g., by using pressure monitors)
  - ▶ Optical subassemblies are removed from the duct if the purge air supply fails and the duct opening is closed off (e.g. with a flange cover).
- 

#### Preventive measures for operating safety

**NOTE:**

The user must ensure that:

- ▶ Neither failures nor erroneous measurements can lead to operational states that can cause damage or become dangerous
  - ▶ The specified maintenance and inspection tasks are carried out regularly by qualified, experienced personnel.
-



**Recognizing malfunctions**

Every deviation from normal operation is to be regarded as a serious indication of a functional impairment. These are, amongst others:

- Warning displays
- Significant drifts in measured results
- Increased power consumption
- Higher temperatures of system components
- Monitoring devices triggering
- Smells or smoke emission
- Heavy contamination.

**Avoiding damage****NOTE:**

In order to avoid malfunctions that can cause direct or indirect personal injury or property damage, the operator must ensure:

- ▶ The responsible maintenance personnel are present at any time and as fast as possible
  - ▶ The maintenance personnel are adequately qualified to react correctly to malfunctions of the measuring system and any resulting operational interruptions (e.g., when used for measurement and control purposes)
  - ▶ The malfunctioning equipment is switched off immediately in case of doubt and that switching off does not cause collateral malfunctions.
- 

**Electrical connection**

Ensure the device can be switched off with a power isolating switch/circuit breaker in accordance with EN 61010-1.

## 2 Product description

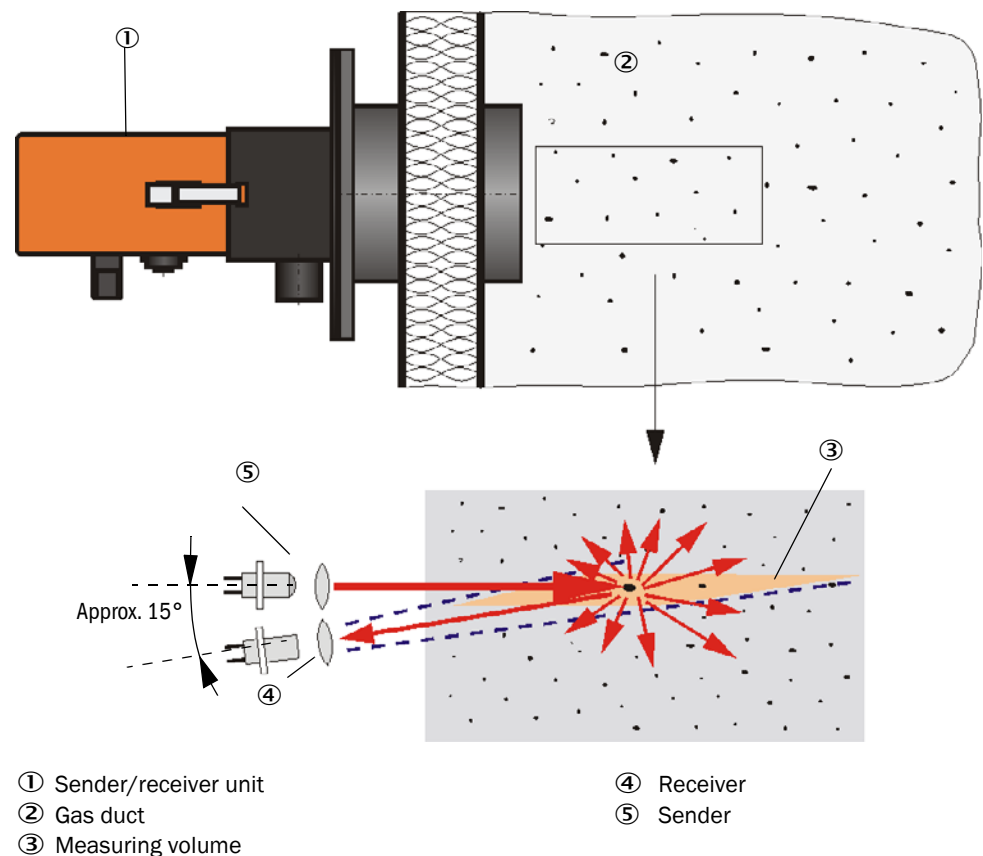
### 2.1 Measuring principle, measured variables

#### 2.1.1 Functional principle

The measuring system works according to the scattered light measurement principle (backward dispersion). A laser diode beams the dust particles in the gas flow with modulated light in the visual range (wavelength approx. 650 nm). A highly sensitive detector registers the light scattered by the particles, amplifies the light electrically and feeds it to the measuring channel of a microprocessor as central part of the measuring, control and evaluation electronics. The measuring volume in the gas duct is defined through the intersection of the sender beam sent and the receive aperture.

Continuous monitoring of the sender output registers the smallest changes in brightness of the light beam sent which then serves to determine the measurement signal.

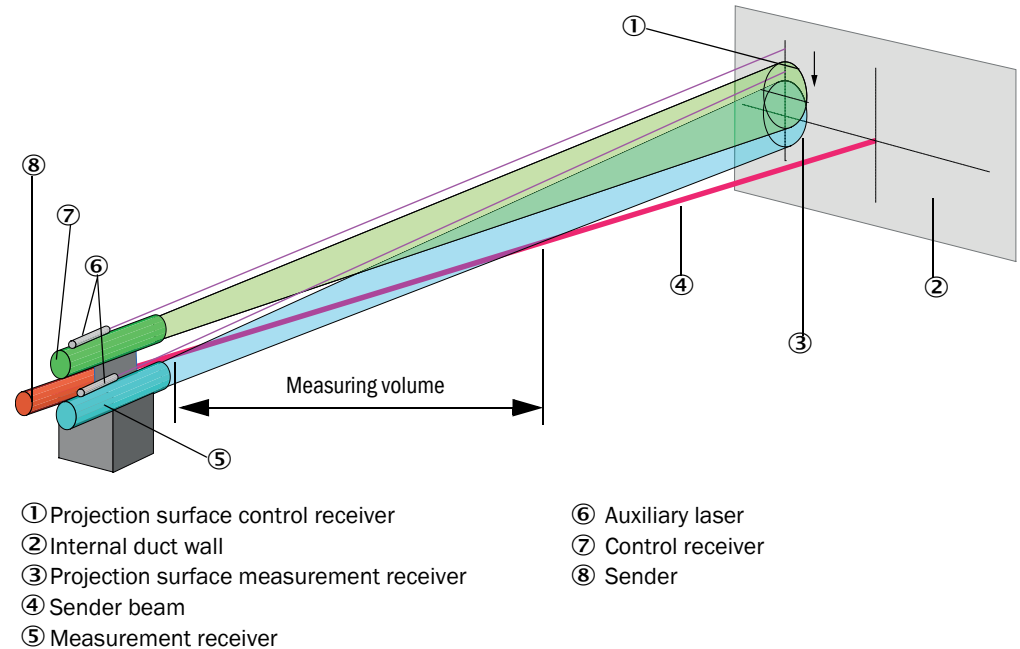
Fig. 1: Measuring principle



An additional control receiver prevents background light and ambient light influencing the measured value. This is adjusted so that the projection surfaces of the measurement receiver and control receiver on the opposite duct wall are over each other (see [“Compensating background lighting and ambient light”](#), page 11). The signal measured by the control receiver (resulting from background light and ambient light) is deducted from the signal measured by the measurement receiver.

The incline of the control receiver can be modified for differing internal duct diameters. A small light trap may be required in certain cases for very narrow internal duct diameters (most unfavorable conditions for background light).

Fig. 2: Compensating background lighting and ambient light



### Determining the dust concentration

Measured scattered light intensity (SI) is proportional to dust concentration (c). Scattered light intensity not only depends on the number and size of particles but also on the optical characteristics of the particles and therefore the measuring system must be calibrated using a gravimetric comparison measurement for exact dust concentration measurement. The calibration coefficients determined can be entered directly in the measuring system as

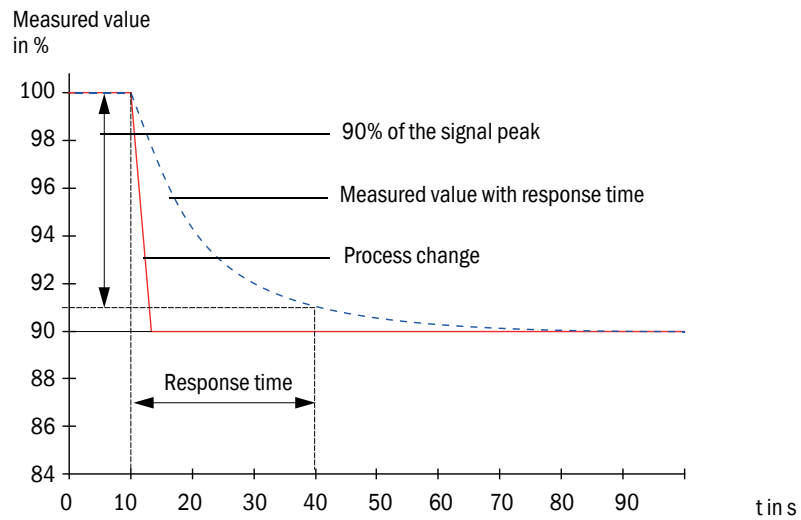
$$c = cc2 \cdot SI^2 + cc1 \cdot SI + cc0$$

(Entry see [“Calibration for dust concentration measurement”](#), page 64; standard factory setting: cc2 = 0, cc1 = 1, cc0 = 0).

### 2.1.2 Response time

The response time is the time required to attain 90% of the signal peak after a sudden change in the measurement signal. It can be set anywhere between 1 and 600 s. As the response time increases, transient measured value fluctuations and interruptions are damped stronger and stronger which “smoothes out” the output signal.

Fig. 3: Response time



### 2.1.3 Function check

A function check can be triggered at fixed intervals as from a definable starting timepoint for an automatic function check of the measuring system. The setting can be made using the SOPAS ET operating program (see “Determining the function check”, page 59). Any unallowed deviations from normal behavior that may occur are signaled as errors. A function check triggered manually can help localize possible error causes should a device malfunction occur.

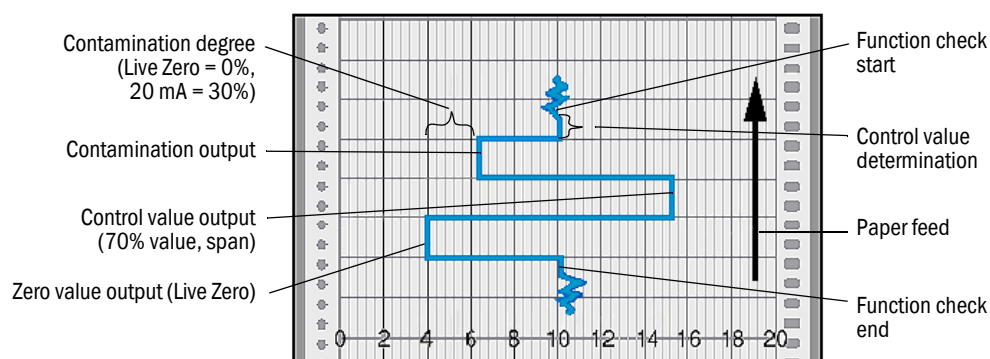


Further information → Service Manual

The function check comprises:

- Approx. 30 s measurement of contamination on optical interfaces (not on DUSTHUNTER SB50), zero and control value  
The measuring time depends on the increase in contamination value (change > 0.5% → measurement is repeated up to 2 times).
- Every 90 s (standard value), output of values determined (duration parameter can be modified, see “Determining the function check”, page 59).

Fig. 4: Function check output on a plotter



- The analog output must be activated to output control values on the analog output (see “Setting the analog outputs parameters”, page 60).
- The value measured last is output on the analog output during control value determination.
- If the control values are not output on the analog output, the current measured value is output when control value determination has completed.
- During a function check, relay 3 is activated (see “MCU processor board connections”, page 43) and the green LED in the control window of the sender/receiver unit flashes (see “Sender/receiver unit”, page 16).
- A function check is not started automatically when the measuring system is in “Maintenance” mode.
- “Function control” is displayed on the LC-Display of the MCU control unit during the function check.
- If the start timepoint or cycle interval are changed, a check cycle timed between parameter setting and new start timepoint is still carried out.
- Changes to the interval time are first effective after the next start timepoint.

#### Zero value measurement

The sender diode is switched off for zero point control so that no signal is received. This means possible drifts or zero point deviations are detected reliably in the overall system (e.g., due to an electronic defect). A warning signal is generated when the “zero value” is outside the specified range.

### Control value measurement (Span test)

Sender beam intensity changes between 70 and 100% during control value determination. The light intensity received is compared against the standard value (70%). The measuring system generates an error signal for deviations greater than  $\pm 2\%$ . The error message is cleared again when the next function check runs successfully. The control value is determined with high precision through statistical evaluation of a high number of intensity changes.

For DUSTHUNTER SB100, the control value is determined when the optical subassembly is in reference position (see [“Contamination measurement”, page 14](#)).

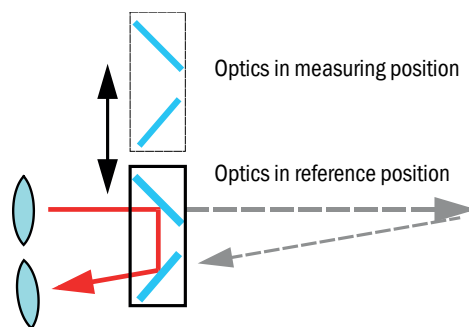
For DUSTHUNTER SB50, the value calculated theoretically (70%) is output for very low dust concentrations ( $< \text{approx. } 1 \text{ mg/m}^3$ ).

### Contamination measurement (only for DUSTHUNTER SB100)

The sender beam is diverted by sliding in an optical component and sent directly to the receiver. An integrated damping filter reduces the light intensity to a normal level to prevent overmodulation of the receiver. The measured value determined and the value defined as factory setting are used to calculate a correction factor. This serves to completely compensate any contamination that occurs.

A value between live zero and 20 mA is output on the analog output for contamination values  $< 30\%$ ; when this value is exceeded, the “Failure” status is output (on the analog output the set error current; see [“Factory settings”, page 58](#), see [“Setting the analog outputs parameters”, page 60](#)).

Fig. 5: Contamination measurement

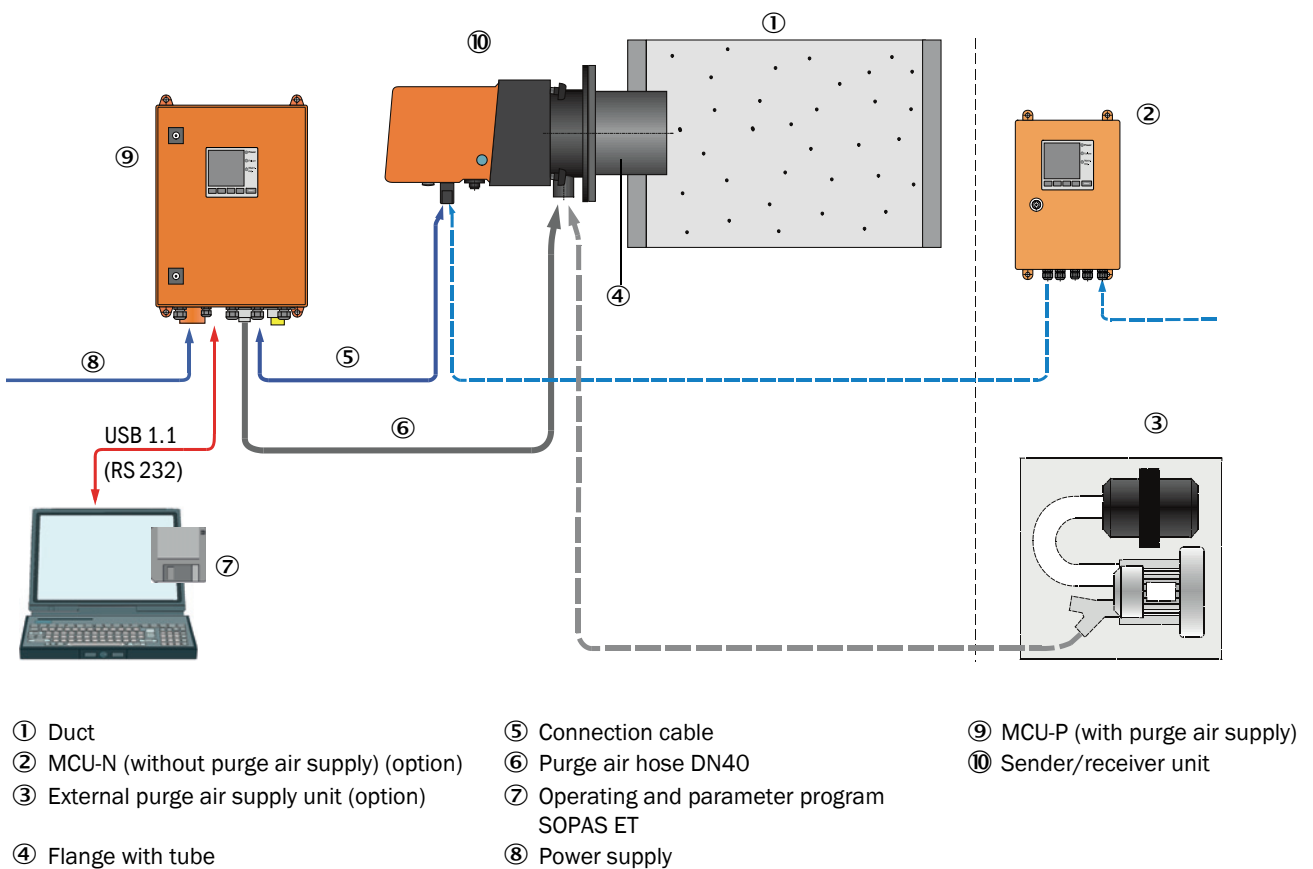


## 2.2 Device components

Measuring system DUSTHUNTER SB comprises the components:

- Sender/receiver unit DHSB-T
- Connection line to connect the sender/receiver unit to the MCU control unit (lengths 5 m, 10 m)
- Flange with tube
- MCU control unit
  - to control, evaluate and output the data of the sender/receiver unit(s) connected via the RS485 interface
    - With integrated purge air supply, for internal duct pressure -50 ... +2 hPa
    - Without purge air supply, therefore additionally required:
- Optional external purge air unit, for internal duct pressure -50 ... +30 hPa

Fig. 6: DUSTHUNTER SB device components



### Communication between sender/receiver unit and MCU

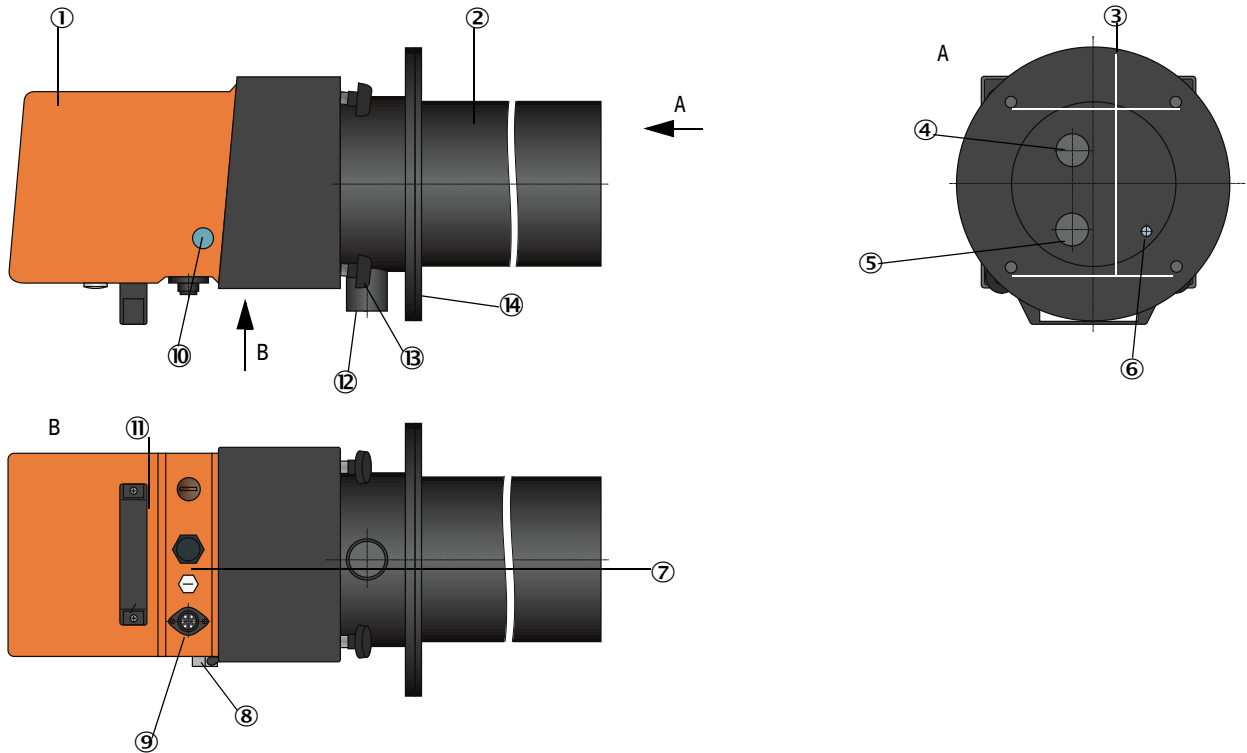
As standard, each sender/receiver unit is connected to an MCU control unit via the connection line.

2.2.1 Sender/receiver unit

The sender/receiver unit contains the optical and electronic subassemblies to send and receive the light beam as well as to process and evaluate the signals. Data transfer to and power supply (24 V DC) from the MCU control unit run via a shielded line with 4 wires and plug connector. An RS485 interface is available for service purposes. Clean air to cool the device and keep the optical surfaces clean is fed via a purge air connection.

The sender/receiver unit is fastened to the duct with a flange with tube (see “DUSTHUNTER SB device components”, page 15).

Fig. 7: Sender/receiver unit DHSB-T



- |                                               |                                             |                        |
|-----------------------------------------------|---------------------------------------------|------------------------|
| ① Enclosure with electronics (swivel-mounted) | ⑥ Opening for sender beam                   | ⑪ Handle               |
| ② Tube to blend out background                | ⑦ Cover screw for auxiliary laser alignment | ⑫ Purge air connection |
| ③ Mounting holes                              | ⑧ Hinge                                     | ⑬ Knurled screw        |
| ④ Opening for control receiver                | ⑨ Connection for connection cable to MCU    | ⑭ Flange               |
| ⑤ Opening for measurement receiver            | ⑩ Control window                            |                        |

The alignment of the measurement and control receiver is shown in the control window when the auxiliary laser is switched on (see “Compensating background lighting and ambient light”, page 11). The current device state (operation/failure) is signaled on the rear side of the enclosure.

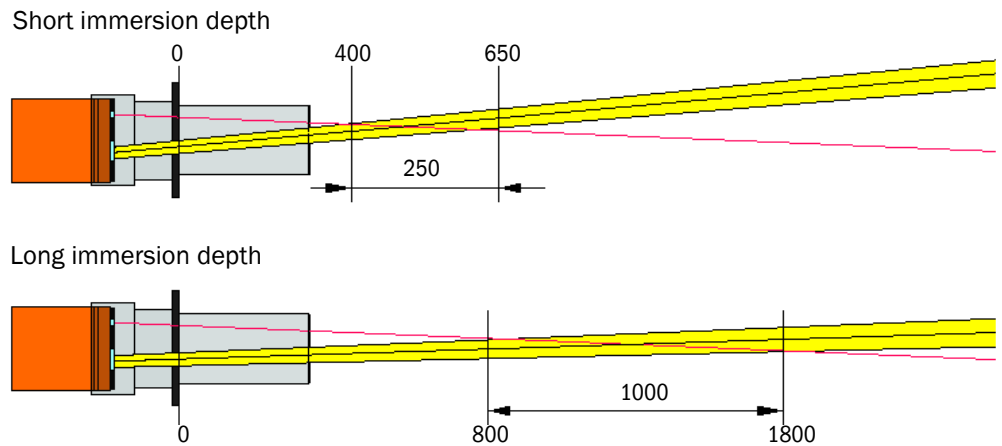
The enclosure with fitted sender/receiver unit can be swiveled to the side after the knurled screws have been loosened. Optics, electronics and mechanical components can then be easily accessed for maintenance work.



**Versions**

The sender/receiver unit is available without (DUSTHUNTER SB50) and with contamination measurement (DUSTHUNTER SB100) and with different angles between the sender beam and receive aperture (see “Relations between scattering angle, immersion depth and measuring volume length”, page 17). The resulting different immersion depths (distance flange – measuring volume) and lengths of the measuring volume enable easy adaptation to different wall thicknesses and duct diameters.

Fig. 8: Relations between scattering angle, immersion depth and measuring volume length



**Type code**

A type code identifies the special version:

Sender/receiver unit: \_\_\_\_\_ DHSB-TXX

Contamination measurement: \_\_\_\_\_

- 0: Without

- 1: With

Immersion depth \_\_\_\_\_

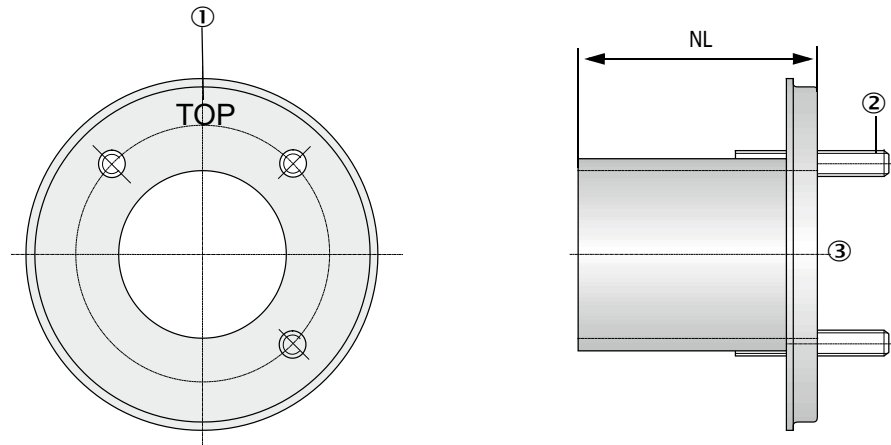
- 0: Short

- 1: Long

### 2.2.2 Flange with tube

The flange with tube is available in different steel grades and dimensions (see “Flange with tube”, page 95). Selection depends on the wall and isolation thickness of the duct wall (→ nominal length) and the duct material.

Fig. 9: Flange with tube



- ① Marking for assembly position
- ② Securing bolt
- ③ Material St 37 or 1.4571

**2.2.3 MCU control unit**

Control unit MCU has the following functions:

- Control of the data traffic and processing of the sender/receiver unit data connected via the RS485 interface
- Signal output via analog output (measured value) and relay outputs (device status)
- Signal input via analog and digital inputs
- Power supply for the connected measuring unit via 24 V switch-mode power supply with wide range input
- Communication with higher level control systems via optional modules

Equipment and device parameters can be set easily and conveniently via a USB interface using a PC and a user-friendly operating program. The parameters are stored reliably even in the case of a power failure.

Control unit MCU has a sheet steel enclosure as standard.

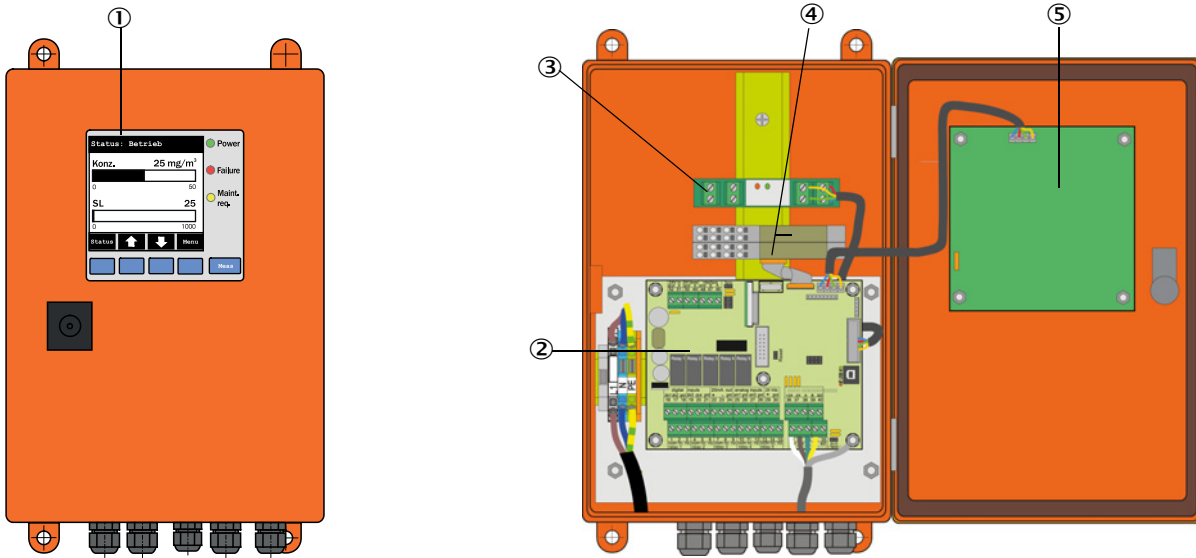
**2.2.3.1 Standard interfaces**

Analog output	Analog inputs	Relay outputs	Digital inputs	Communication
0/2/4...22 mA (electrically isolated, active); resolution 10 bits <ul style="list-style-type: none"> <li>• 1x on DUSTHUNTER SB50 to output the dust concentration</li> <li>• 3x on DUSTHUNTER SB100 to output the scattered light concentration (corresponds to the uncalibrated dust concentration), calibrated dust concentration, scaled dust concentration.</li> </ul>	2 inputs 0 ... 20 mA (standard, without electrical isolation); Resolution 10 bits	5 changeover contacts (48 V, 1 A) to output status signals: <ul style="list-style-type: none"> <li>• Operation/failure</li> <li>• Maintenance</li> <li>• Function check</li> <li>• Maintenance request</li> <li>• Limit value</li> </ul>	4 inputs to connect potential-free contacts (e.g. to connect a maintenance switch, trigger a function check or more error messages)	<ul style="list-style-type: none"> <li>• USB 1.1 and RS232 (on terminals) for measured value inquiries, setting parameters and software updates.</li> <li>• RS485 for sensor connection</li> </ul>

2.2.3.2 Versions

- Control unit MCU-N without purge air supply

Fig. 10: Control unit MCU-N with options

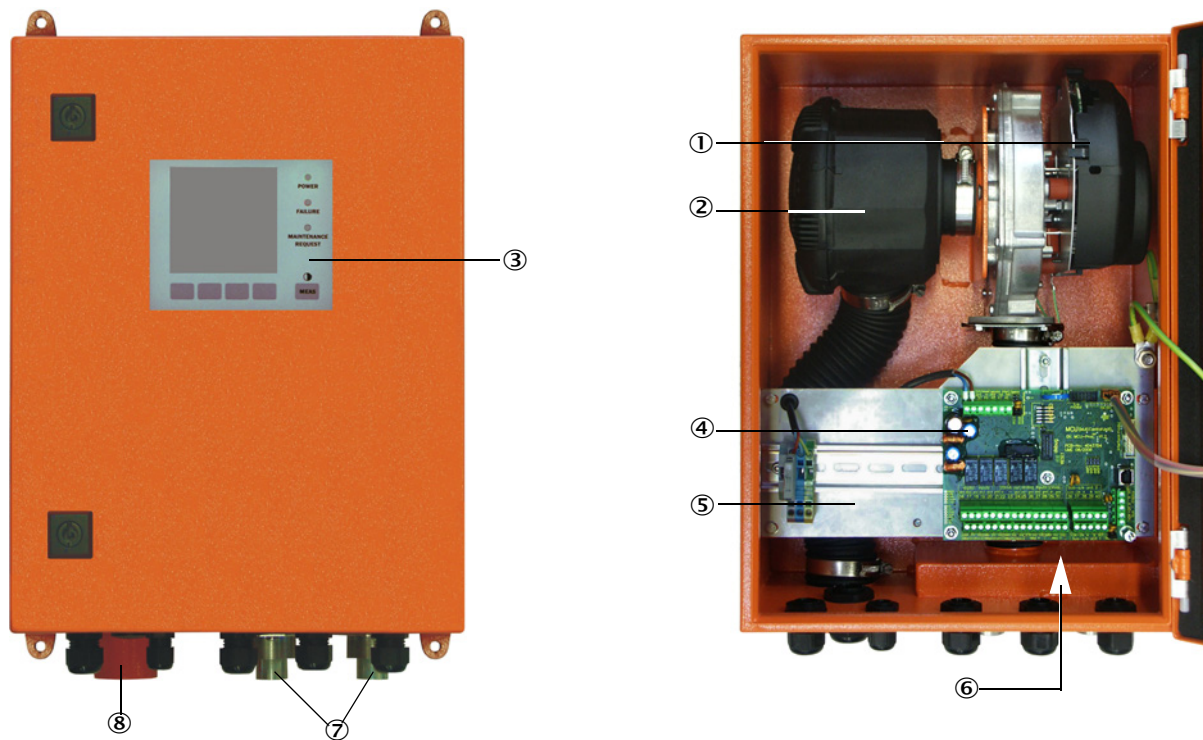


- ① Display module (option)
- ② Processor board
- ③ Interface module (option)

- ④ I/O module (option)
- ⑤ Display module (option)

- MCU-P control unit with integrated purge air supply  
This version is also fitted with a purge air blower, air filter and purge air connection to connect the purge air hose to the sender/receiver unit.

Fig. 11: Control unit MCU-P with integrated purge air supply



- |                           |                                                     |
|---------------------------|-----------------------------------------------------|
| ① Purge air blower        | ⑤ Installation plate                                |
| ② Air filter              | ⑥ Power supply unit (on back of installation plate) |
| ③ Optional Display module | ⑦ Purge air connection                              |
| ④ Processor board         | ⑧ Purge air inlet                                   |

The purge air hose (standard lengths 5 and 10 m (see [“Purge air supply”](#), page 100)) is a separate part of the measuring system and must be ordered separately.



2.2.3.4 Options

The options described in the following can considerably expand the functionality of the MCU:

2.2.3.5 Modules

1 Display module

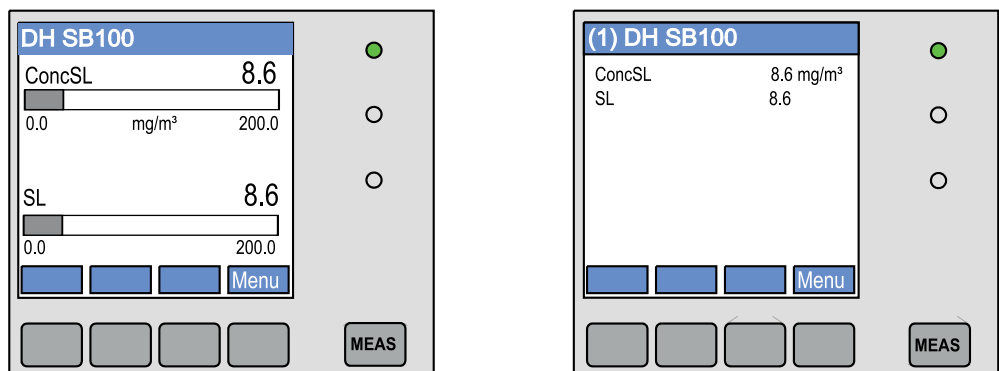
Module to display measured values and status information and for configuration during start-up, selection via operating buttons.

a) Displays

Type	Display	
LED	Power (green)	Voltage supply OK
	Failure (red)	Function fault
	Maintenance request (yellow)	Maintenance request
LC-Display	Graphic display (main screen)	- Dust concentration - Scattered light
	Text display	Six possible measured values (see graphic display)

The graphic display shows two main measured values of a connected sender/receiver unit selected at the factory or calculated values from the MCU (e.g., scaled dust concentration) as bar charts. Alternatively, up to 8 single measured values of a sender/receiver unit can be displayed (toggle with “Meas” button).

Fig. 12: LC-LC-Display with graphic (left) and text (right) display



b) Control buttons

Button	Function
Meas	<ul style="list-style-type: none"> <li>• Toggle between text and graphic display</li> <li>• Display the contrast setting (after 2.5 s)</li> </ul>
Arrows	Select next/previous measured value page
Diag	Display alarm or fault message
Menu	Display of main menu and selection of submenus

## 2 I/O module

To be fitted on the module carrier (see “Options for MCU control unit”, page 101), optional as:

- 2x analog output 0/4 ... 22 mA to output further measured variables (max. load 500  $\Omega$ )
- 2x analog input 0/4 ... 22 mA to read-in values from external sensors (gas temperature, internal duct pressure, moisture, O<sub>2</sub>) to calculate the dust concentration in standard state.



- One module carrier is required per module (to plug in on the hat rail). One module carrier is connected to the processor board using a special line and another one is docked.
- On the DUSTHUNTER SB50 version, a maximum of 1 Analog Input and 1 Analog Output module can be plugged on.
- On the DUSTHUNTER SB100 version, a maximum of 1 Analog Input module can be plugged on.

## 3 Interface modules

Module to pass on measured values, system status and service information to higher level control systems, optionally for Profibus DP V0 or Ethernet, to plug onto hat rails. A corresponding line serves to connect the module to the connection board.



Profibus DP-V0 for transfer via RS485 according to DIN 19245 Part 3 as well as IEC 61158.

## 4 MCU remote control unit

The MCU remote control unit has identical functions to the MCU display near the device, however, it can be installed further away.

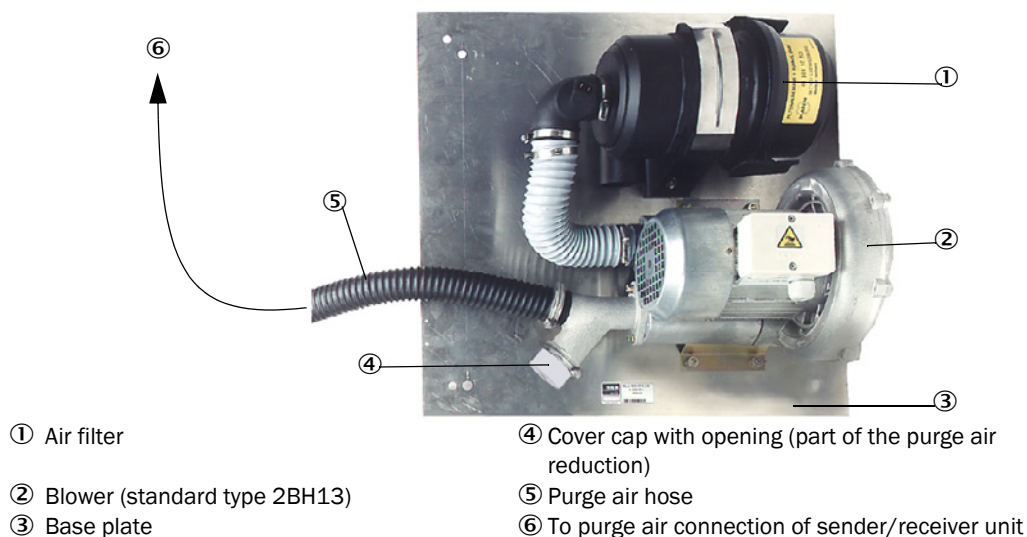
- Operating function the same as the MCU display
- Distance to the device:
  - MCU remote control unit without separate power supply unit: Max. 100 m
  - MCU remote control unit with own power supply unit: Max. 1000 m
- The MCU and the MCU remote control unit are interlocked (it is not possible to operate both MCUs at the same time).



### 2.2.4 Optional external purge air unit

The MCU control unit with integrated purge air supply cannot be used when the internal duct pressure is greater than +2 hPa. Use the optional external purge air unit in this case. It has a powerful blower and can be used for excess pressure in the duct up to 30 hPa. The scope of delivery includes a purge air hose with 40 mm nominal diameter (length 5 m or 10 m).

Fig. 13: Optional external purge air unit



A weatherproof cover is available for use outdoors (see [“Weatherproof covers”](#), page 99).

### 2.2.5 Installation accessories

Separate parts of the measuring system (order separately) are:

- Purge air hose with 40 mm nominal diameter for purge air supply to the sender/receiver unit from the MCU-P control unit,
- Connection line from the MCU to the sender/receiver unit.

#### Weatherproof cover

A weatherproof cover is available when using the sender/receiver unit outdoors (see [“Weatherproof covers”](#), page 99).

#### Purge air heater

It is recommended to use an optional purge air heater available for delivery (see [“Purge air supply”](#), page 100) to prevent condensation in the device or flange tube when the measuring system is operated at gas temperatures close to the dew point or very low ambient temperatures



The purge air heater can only be used for purge air supply with an external purge air unit.

**Optional non-return valve**

When the measuring system is used in applications with overpressure in the duct, it is possible to protect the sender/receiver unit, external purge air unit and the environment against the consequences of purge air supply failure by installing a non-return valve on the purge air connection of the sender/receiver unit (see [“Installation of non-return valve”, page 41](#)).

**2.2.6 Test equipment for linearity test**

A linearity test can serve to check the correct measurement function (see Service Manual). In this case, filter glasses with defined transmission values are positioned in the beam path and the values compared against those measured by the measuring system. Compliance within the allowed tolerance means the measuring system is working correctly. The filter glasses with holder required for the check are deliverable including a carrying case.

## 2.3 Device configuration

Two versions of the DUSTHUNTER SB measuring system are available with the following features (standard components):

### Variants

Device version	
DUSTHUNTER SB50	DUSTHUNTER SB100
Smallest range: 0 ... 20 mg/m <sup>3</sup>	Smallest range: 0 ... 10 mg/m <sup>3</sup>
Sender/receiver unit DHSB-T T0x without contamination measurement	Sender/receiver unit DHSB-T T1x with contamination measurement
Control unit MCU-xxOx00000NNNE with 1 analog output, LC-Display as option	Control unit MCU-xxODO10000NNNE with 3 analog outputs (2x with module), with LC-Display

### Voltage and purge air supply

Internal duct pressure [hPa ]	Connection and supply components	
	Purge air	Voltage
-50 ... +2	MCU-P + purge air hose DN40	
-50... +30	Optional external purge air unit	MCU-N



We recommend using the optional external purge air unit when the sender/receiver unit is more than 10 m away from the MCU control unit.

## 2.4 SOPAS ET (PC program)

SOPAS ET is a SICK Software for easy operation and configuration of the DUSTHUNTER.

SOPAS ET runs on a laptop/PC connected to the DUSTHUNTER via a USB line or Ethernet interface (option).

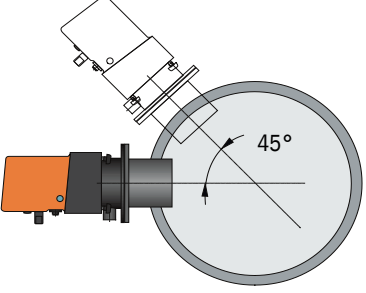
The menu structure simplifies changing settings. Further functions are also available (e.g., data storage, graphic displays).

SOPAS ET is delivered on the product CD.

### 3 Assembly and installation

#### 3.1 Project planning

The following Table provides an overview of the project planning work necessary as prerequisite for trouble-free assembly and subsequent device functionality. You can use this Table as a Checklist and check off the completed steps.

Task	Requirements		Work step	<input checked="" type="checkbox"/>
Determine measuring location and fitting locations for the device components	Inlet and outlet paths according to DIN EN 13284-1 (inlet at least 5x hydraulic diameter $d_h$ , outlet at least 3x $d_h$ ; distance to stack opening at least 5x $d_h$ )	For round and square ducts: $d_h$ = duct diameter	<ul style="list-style-type: none"> <li>Follow specifications for new equipment</li> <li>Select best possible location for existing equipment;</li> <li>For too short inlet/outlet paths: Inlet path &gt; outlet path</li> </ul>	<input type="checkbox"/>
		For rectangular ducts: $d_h$ = 4x cross-section divided by circumference		<input type="checkbox"/>
	Homogeneous flow distribution Representative dust distribution	Whenever possible, no deflections, cross-section variations, feed and drain lines, flaps or fittings in the area of the inlet and outlet paths	If conditions cannot be ensured, define flow profile according to DIN EN 13284-1 and select best possible location	<input type="checkbox"/>
	Fitting position for the sender/receiver unit		Select best possible location	<input type="checkbox"/>
	Accessibility, accident prevention	The device components must be easily and safely accessible	Provide platforms or pedestals as required	<input type="checkbox"/>
	Installation free of vibrations	Acceleration < 1 g	Eliminate/reduce vibrations through suitable measures	<input type="checkbox"/>
	Ambient conditions	Limit values according to Technical Data	If necessary: <ul style="list-style-type: none"> <li>Provide weatherproof covers/sun protection</li> <li>Enclose or lag device components</li> </ul>	<input type="checkbox"/>
Select the purge air supply	Sufficient primary purge air pressure depending on internal duct pressure	Up to +2 hPa, MCU control unit with integrated purge air supply Above +2 hPa to +30 hPa, optional external purge air unit Plan a purge air heater for gas temperatures close to the dew point or very low ambient temperatures	Select supply type	<input type="checkbox"/>
	Clean intake air	Whenever possible, low amount of dust, no oil, moisture or corrosive gases	<ul style="list-style-type: none"> <li>Select best possible location for air intake</li> <li>Determine required purge air hose length</li> </ul>	<input type="checkbox"/>
Select device components	Duct wall thickness with isolation	Flange with tube	Select components according to Configuration Table (see <a href="#">“Device configuration”</a> , page 27); If necessary, plan additional measures to fit the flange with tube (see <a href="#">“Fitting the flange with tube”</a> , page 31)	<input type="checkbox"/>
	Internal duct pressure	Type of purge air supply		<input type="checkbox"/>
	Fitting locations	Line and purge air hose lengths		<input type="checkbox"/>

Task	Requirements		Work step	<input checked="" type="checkbox"/>
Plan calibration openings	Access	Easy and safe	Provide platforms or pedestals as required	<input type="checkbox"/>
	Distances to measuring level	No mutual interference between calibration probe and measuring system	Plan sufficient distance between measuring and calibration level (approx. 500 mm)	<input type="checkbox"/>
Plan the voltage supply	Operating voltage, power requirements	According to Technical Data (see <a href="#">"Technical data", page 92</a> )	Plan adequate line cross-sections and fuses	<input type="checkbox"/>

### 3.2 Assembly

Carry out all assembly work onsite. This includes:

- ▶ Fitting the flange with tube
- ▶ Fitting the MCU control unit,
- ▶ Fitting the optional external purge air unit.



**WARNING:**

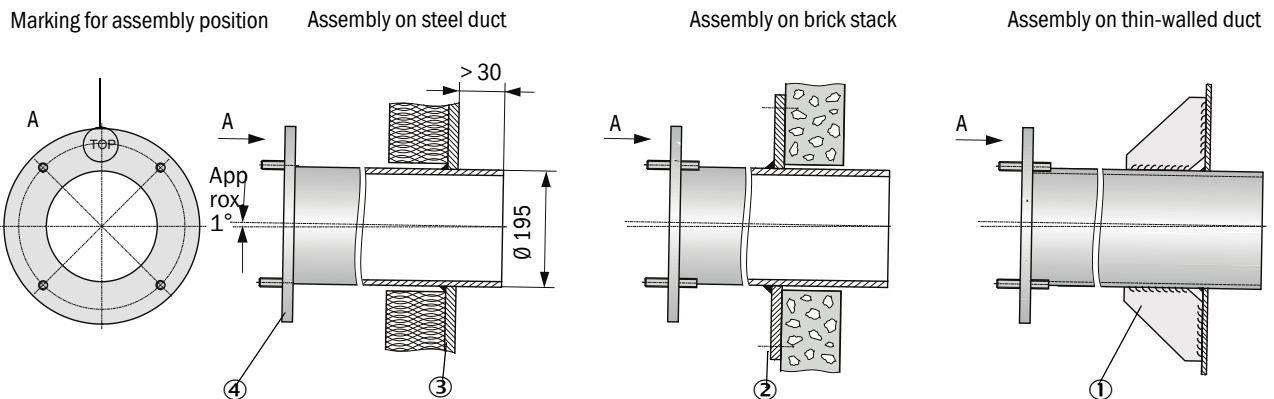
- ▶ Observe the relevant safety regulations as well as the safety notices during all work: see “Important information”, page 6
- ▶ Consider the equipment weight specifications when planning the mounting brackets.
- ▶ Only carry out assembly work on equipment with hazard potential (hot or aggressive gases, higher internal duct pressure) when the equipment is at a standstill.
- ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.



All dimensions specified in this Section are shown in mm.

#### 3.2.1 Fitting the flange with tube

Fig. 14: Fitting the flange with tube



- ① Junction plate
- ② Anchor plate
- ③ Duct wall
- ④ Flange with tube



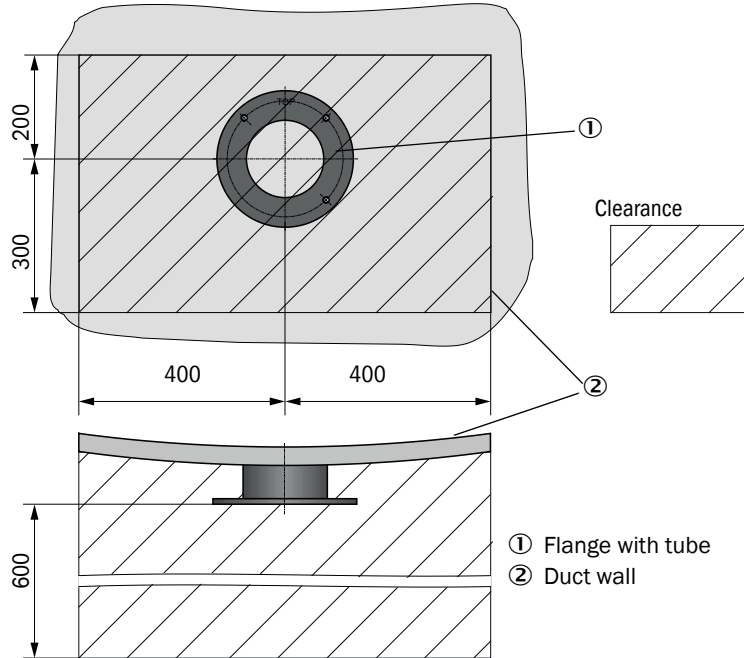
**NOTE:**

Maximum wall and isolation thickness are derived from the flange tube length (350 mm or 700 mm) less the distance between flange and stack outer wall, and stack immersion depth (> 30 mm).

**3.2.2 Work to be performed**

- ▶ Measure the fitting location and mark the assembly location.  
Leave enough clearance around the flange with tube to fit the sender/receiver unit.

Fig. 15: Clearance for sender/receiver unit (dimensions in mm)



- ▶ Remove insulation (when fitted)
- ▶ Cut suitable openings in the duct wall; bore large enough holes in brick or concrete stacks (flange tube diameter (see “Flange with tube”, page 95))



**NOTE:**

- ▶ Do not let separated pieces fall into the duct.
- 
- ▶ Insert the flange with tube in the opening slanting slightly downwards (1 to 3°, see “Fitting the flange with tube”, page 31) so that the “Top” marking points upwards and any condensate that may collect in the duct can drain off.
  - ▶ Weld the flange with tube on using an anchor plate for brick or concrete stacks, insert junction plates for thin-walled ducts (see “Fitting the flange with tube”, page 31).
  - ▶ Close off the flange opening after fitting to prevent gas escaping.



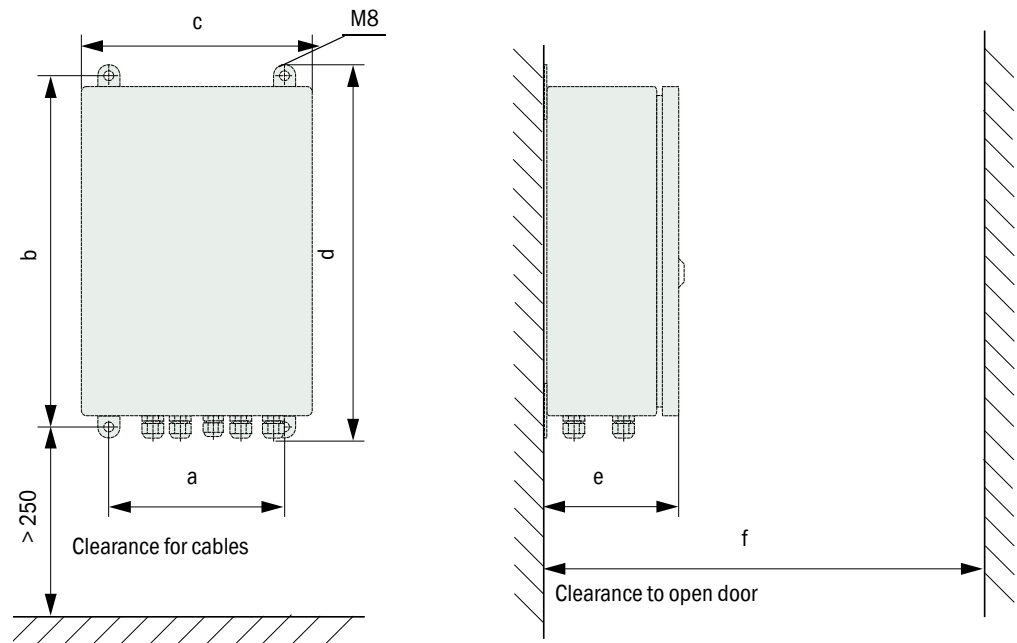
**3.2.3 Fitting the MCU control unit**

Fit the MCU control unit in a protected location that is easily accessible (see “MCU assembly dimensions”, page 33). Observe the following points during fitting:

- Maintain the ambient temperature according to the Technical Data; take possible radiant heat into consideration (shield when necessary).
- Protect against direct sunlight.
- Whenever possible, choose an assembly location with minimum vibrations; dampen any vibrations when necessary.
- Provide sufficient clearance for lines and opening the door.

**Assembly dimensions**

Fig. 16: MCU assembly dimensions



Dimension	Control unit type	
	MCU-N	MCU-P
a	160	260
b	320	420
c	210	300
d	340	440
e	125	220
f	> 350	> 540

MCU-N:  
Control unit without purge air supply  
MCU-P:  
Control unit with purge air supply  
(see “MCU control unit”, page 19)

Using a suitable line (see [“General information, prerequisites”, page 39](#)), the MCU-N control unit (without integrated purge air supply) can be located up to 1000 m away from the sender/receiver unit.

We therefore recommend fitting the MCU in a control room (measuring station or similar) to ensure free access to the MCU. This considerably simplifies communication with the measuring system in order to set parameters or to locate malfunction or error causes.

It is advantageous to provide weather protection (tin roof or similar), to be made onsite, for use outdoors.

#### **Requirements when using the MCU-P control unit**

The following is applicable in addition to the general specifications:

- Install the MCU-P control unit at a location with clean air whenever possible. The air intake temperature must correspond to specifications in the Technical data (see [“Technical data”, page 92](#)). In unfavorable conditions, lay an air intake hose to a location with better conditions.
- The purge air hose to the sender/receiver unit should be as short as possible.
- When possible, lay the purge air hose so that no water can collect.
- We recommend using the optional external purge air unit when the sender/receiver unit is more than 10 m away from the MCU control unit.

### 3.2.4 Fitting the optional external purge air unit

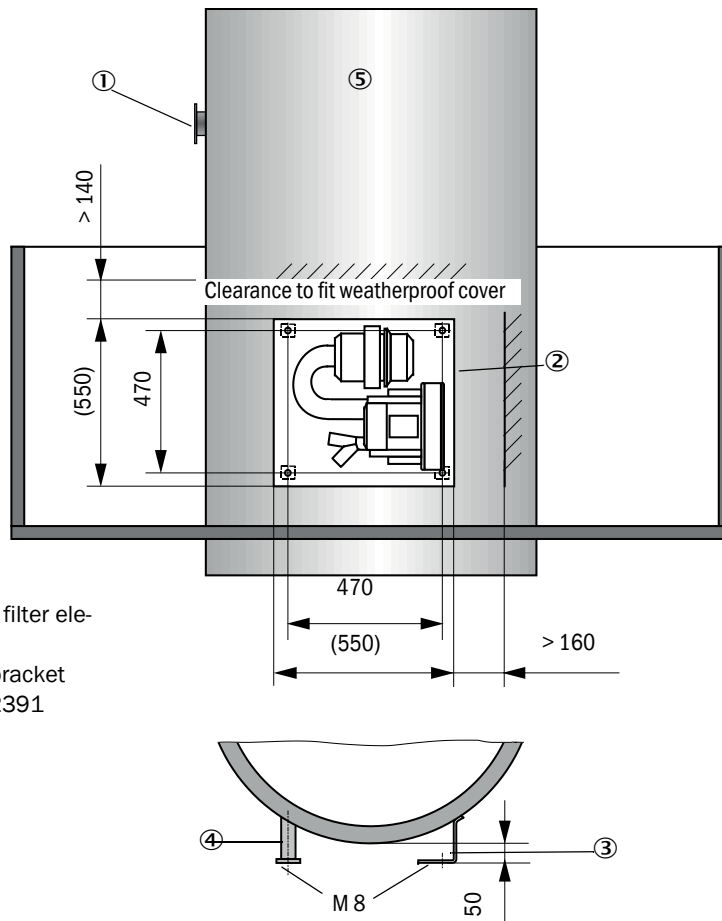
Consider the following points when selecting the assembly location:

- ▶ Install the purge air unit at a location with clean air whenever possible. The air intake temperature must correspond to specifications in the Technical data (see [“Technical data”, page 92](#)). In unfavorable conditions, lay an air intake hose or pipe to a location with better conditions.
- ▶ The fitting location must be easily accessible and meet all safety regulations.
- ▶ Install the purge air unit only as far as necessary below the flange with tube for the sender/receiver unit so that the purge air hoses can be laid downwards (avoids water collecting).
- ▶ Provide sufficient clearance to exchange the filter element.
- ▶ Provide sufficient space to attach and remove the weatherproof cover when installing the purge air unit outdoors see [“Purge air unit layout and assembly dimensions \(dimensions in mm\)”, page 36](#)).

3.2.5 Assembly work

- ▶ Prepare holder (see “Purge air unit layout and assembly dimensions (dimensions in mm)”, page 36).
- ▶ Fasten purge air unit with 4 M8 screws.
- ▶ Check whether the filter element is fitted in the filter housing otherwise fit when necessary.

Fig. 17: Purge air unit layout and assembly dimensions (dimensions in mm)



### 3.2.6 Fitting the weatherproof cover

#### **Weatherproof cover for external purge air unit**

The weatherproof cover (see [“Weatherproof covers”, page 99](#)) comprises a cover and locking set.

Assembly:

- ▶ Mount the locking pins from the locking set on the base plate.
- ▶ Put the weatherproof cover on from above.
- ▶ Insert the holding catches into the counterpieces from the side, twist and lock in.

### 3.3 Electrical installation

#### 3.3.1 Electrical safety



**WARNING:**

- ▶ Observe the relevant safety regulations as well as the safety notices in [see “Important information”, page 6](#) during all installation work.
- ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.

##### 3.3.1.1 Properly installed power isolating switches



**WARNING:**

- Endangerment of electrical safety during installation and maintenance work when the power supply is not switched off.  
An electrical accident can occur during installation and maintenance work when the power supply to the device or lines is not switched off using a power isolating switch/circuit breaker.
- ▶ Before starting work on the device, ensure the power supply can be switched off using a power isolating switch/circuit breaker in accordance with DIN EN 61010.
  - ▶ Make sure the power isolating switch is easily accessible.
  - ▶ An additional disconnecting device is mandatory when the power isolating switch cannot be accessed or only with difficulty after installation.
  - ▶ The power supply may only be activated again after the work or for test purposes by personnel carrying out the work under consideration of valid safety regulations.

##### 3.3.1.2 Lines with correct rating



**WARNING:**

- Endangerment of electrical safety through power line with incorrect rating. Electrical accidents can occur when the specifications for replacement of a removable power line have not been adequately observed.
- ▶ Always observe the exact specifications in the Operating Instructions (Technical Data Section) when replacing a removable power line.

##### 3.3.1.3 Grounding the devices



**CAUTION:**

- Device damage through incorrect or missing grounding.
- ▶ During installation and maintenance work, it must be ensured that the protective grounding to the devices and/or lines involved is effective in accordance with EN 61010-1.

##### 3.3.1.4 Responsibility for system safety



**WARNING:**

- Responsibility for the safety of a system.
- ▶ The person setting the system up is responsible for the safety of the system in which the device is integrated.

### 3.3.2 General information, prerequisites

All assembly work previously described must be completed (as far as applicable) before starting installation work.

Carry out all installation work onsite unless otherwise explicitly agreed with Endress+Hauser or authorized representatives. This includes laying and connecting the power supply and signal lines, installing switches and power fuses and connecting the purge air supply.



- Plan adequate line cross-sections (see “Technical data”, page 92).
- Line ends with plugs to connect the sender/receiver unit must have sufficient free length.

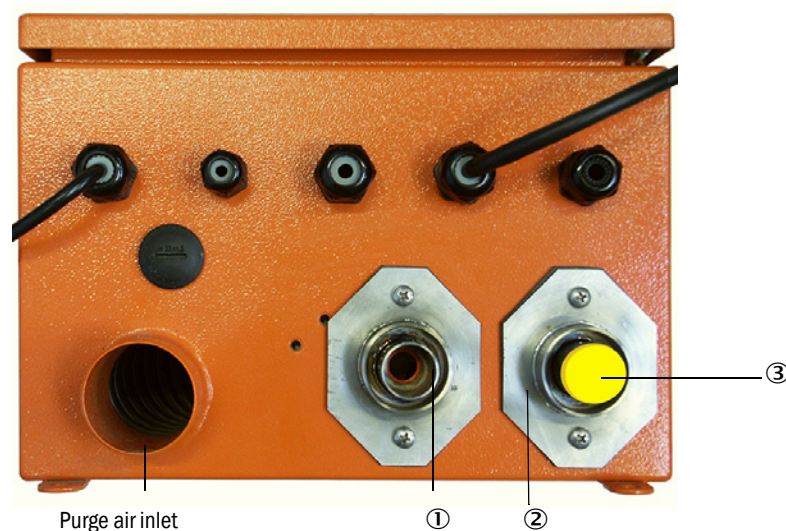
### 3.3.3 Installing the purge air supply

- ▶ Lay the purge air hoses with shortest paths and free of bends, shorten as required.
- ▶ Maintain sufficient distance from hot duct walls.

#### 3.3.3.1 Control unit with integrated purge air supply (MCU-P)

Connect the purge air hose DN40 to the purge air outlet DN40 (1) on the underside of the MCU-P and secure with a strap retainer. Set the purge air outlet as shown (correct when necessary). Close the second purge air outlet (2) with a cap (3) (scope of supply).

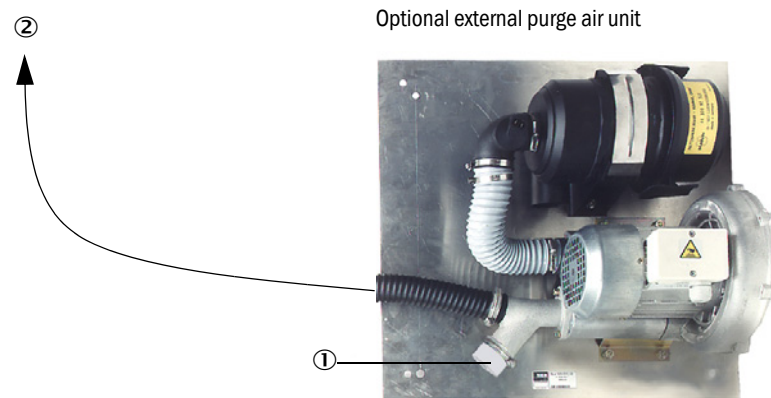
Fig. 18: Underside of MCU-P



3.3.3.2 *Optional external purge air unit*

- 1 Connect the purge air hose
  - ▶ Connect the DN 40 purge air hose to the Y-distributor of the purge air unit and secure with a D32-52 hose clamp.
  - ▶ Close off the second outlet opening on the Y-distributor with the cover cap.

Fig. 19: *Optional external purge air unit connection*



- ① Cover cap with opening (part of the purge air reduction)
- ② To the purge air connections of the sender/receiver unit

2 Electrical connection

- ▶ Compare power voltage and frequency with the specifications on the type plate on the purge air motor.

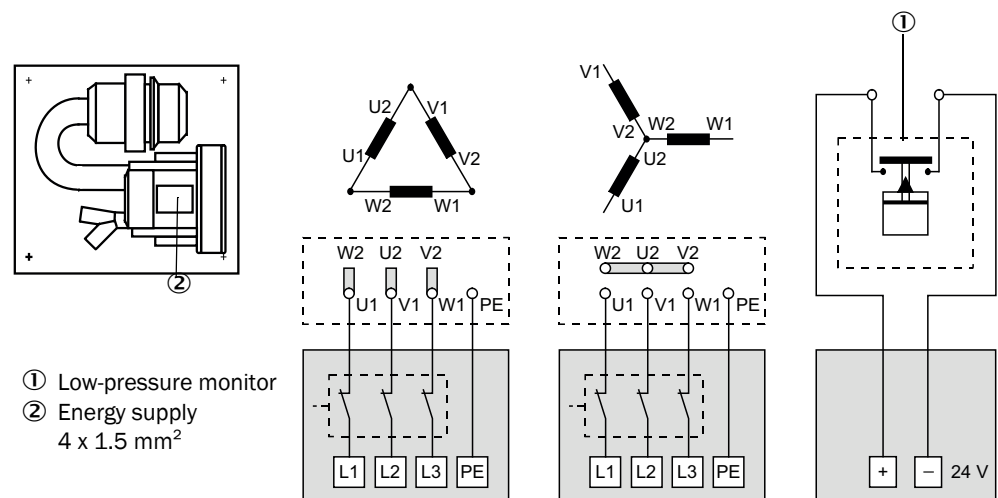


**CAUTION:**

- ▶ Only connect when these match!

- ▶ Connect the power supply line to the purge air motor terminals (refer to the supplementary sheet on the purge air motor and lid of the motor terminal box for terminal allocation).

Fig. 20: *Electrical connection of the external purge air unit*



- ① Low-pressure monitor
- ② Energy supply  
4 x 1.5 mm<sup>2</sup>

- ▶ Connect protective conductor to terminal.



- ▶ Set motor circuit breakers according to the blower connection data (see Technical Data for purge air unit) to a value 10% above the rated current.

**NOTE:**

In case of doubt or when using a special motor version, the operating instructions supplied with the motor have priority over any other information.

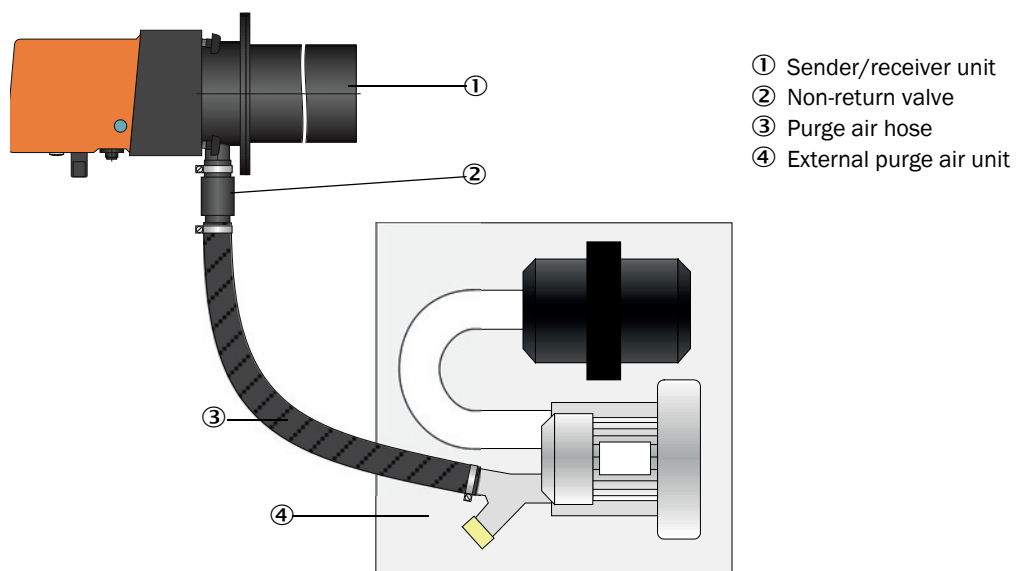
- ▶ Check the function and running direction of the blower (purge air flow direction must match the arrows on the inlet and outlet openings on the blower). For wrong direction on 3-phase motors: Swap power connections L1 and L2.
- ▶ Connect the pressure controller (option) to monitor purge air feed.

**NOTE:**

- ▶ Use a fail-safe power supply (standby unit, rails with redundant supply)
- ▶ Fuse the purge air unit separate from the other system components. The fuse type must match the rated current (see technical details of purge air unit). Fuse each phase separately.  
Use circuit breakers to prevent phase failures on one side.

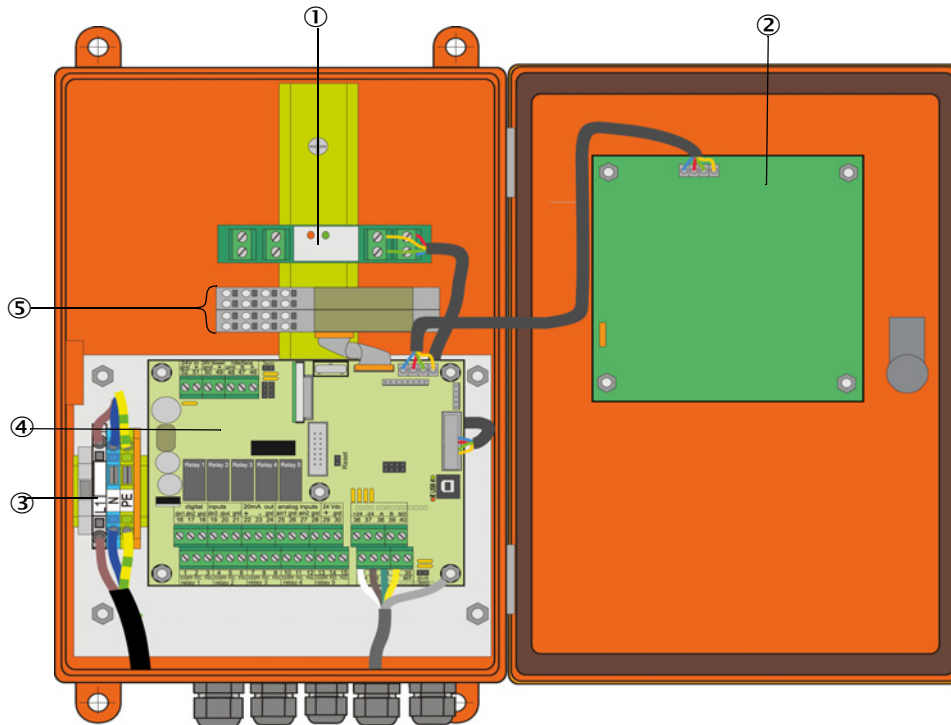
### 3.3.3.3 Installing the non-return valve option

Fig. 21: Installation of non-return valve



3.3.4 Connecting the MCU control unit

Fig. 22: Component layout in the MCU (without purge air supply, with options)



- ① Optional Interface module
- ② Optional Display module
- ③ Terminals for power connection
- ④ Processor board
- ⑤ Optional I/O modules

3.3.4.1 Work to be done

- ▶ Connect the connection line: see “Standard connection”, page 45.

**+i** If an onsite line is to be used, it must be connected to a suitable 7-pole socket (see “Plug connector connection to onsite line”, page 44; Part No.: 7045569).

- ▶ Connect lines for status signals (operation/failure, maintenance, function check, maintenance request, limit value), analog output, analog and digital inputs according to requirements (see “Standard connection”, page 45, p. 48, Fig. 27 and Fig. “Terminal assignment of analog input module”; only use shielded lines with twisted pairs).



**NOTICE:**

- ▶ Only use shielded lines with twisted pairs (e.g., UNITRONIC LiYCY (TP) 2 x 2 x 0.5 mm<sup>2</sup> from LAPPKabel; 1 pair of wires for RS 485, 1 pair of wires for power supply; not suitable for underground laying).

- ▶ Connect power line to terminals L1, N, PE of the MCU (see “Component layout in the MCU (without purge air supply, with options)”, page 42).

- ▶ Close off unused line openings with dummy plugs.

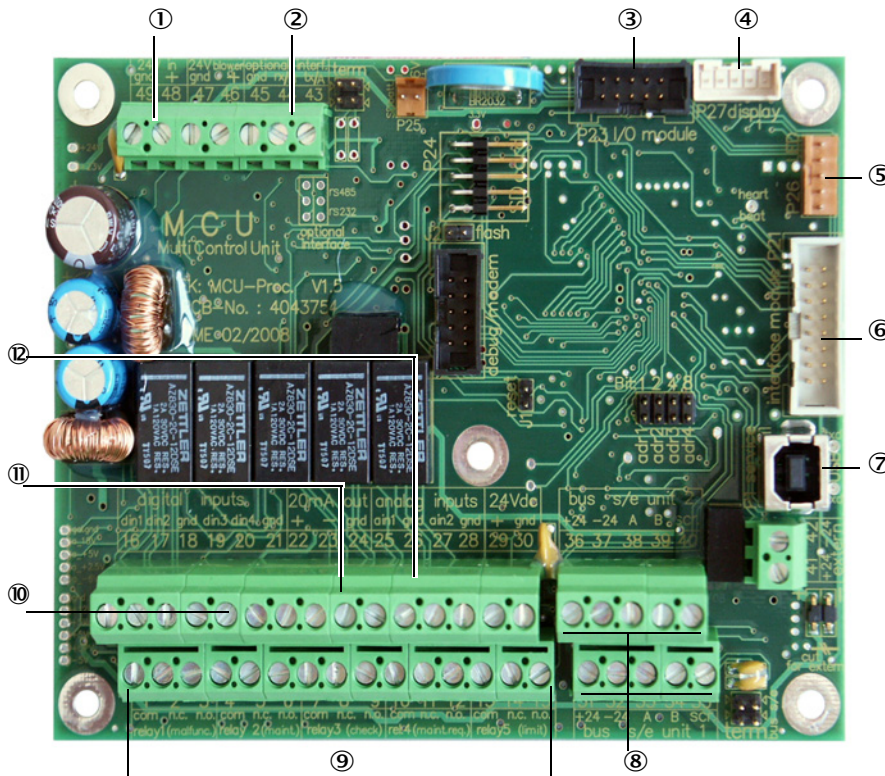


**WARNING:**

- ▶ Be sure to check the wiring before switching the supply voltage on.
- ▶ Only modify wiring when disconnected from the power supply and potential-free.

3.3.4.2 MCU processor board connections

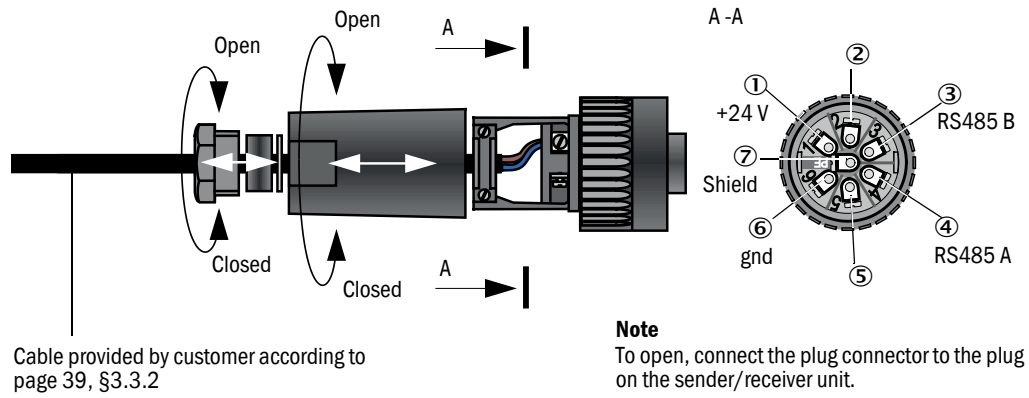
Fig. 23: MCU processor board connections



- ① Supply voltage 24 V DC
- ② RS232
- ③ Connection for optional I/O module
- ④ Connection for Display module
- ⑤ Connection for LEDs
- ⑥ Connection for optional Interface module
- ⑦ USB plug connector
- ⑧ Connections for sender/receiver units
- ⑨ Connections for relays 1 to 5
- ⑩ Connections for digital inputs 1 to 4
- ⑪ Connection for analog output
- ⑫ Connections for analog inputs 1 and 2

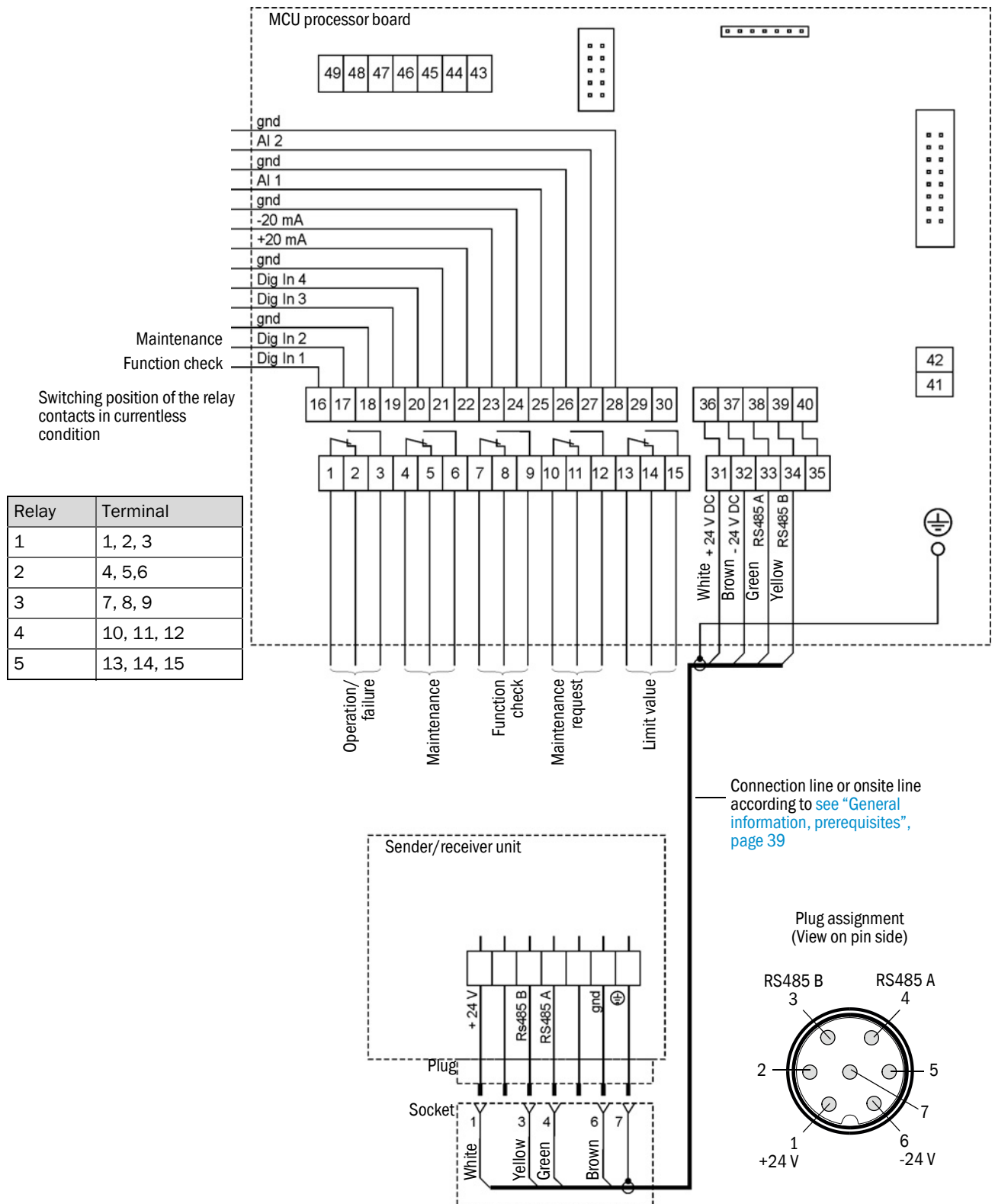
3.3.4.3 Connection of connection line to MCU

Fig. 24: Plug connector connection to onsite line



3.3.4.4 Standard connection

Fig. 25: Standard connection



**3.3.5 Connecting the MCU remote control unit**

**3.3.5.1 Connection to the MCU control unit**

Electrical connection see “Standard connection”, page 45

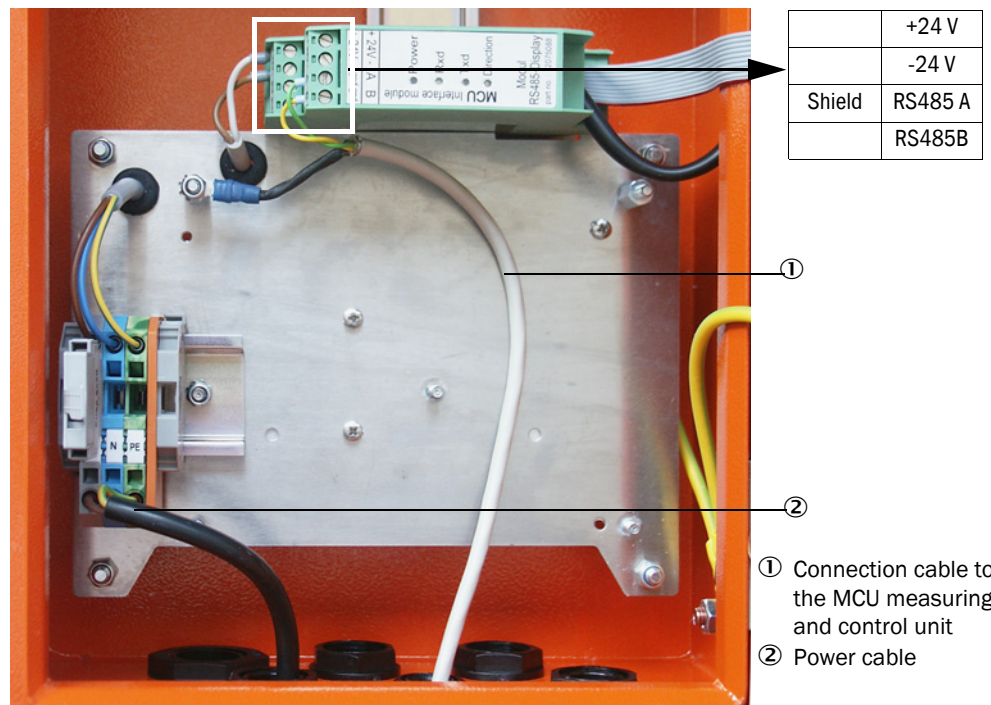
- Electrical connection of the MCU remote control unit without an own power supply unit:
  - 24V supply: Terminals 36 and 37 (or equivalent)
  - Signals: Terminals 38 and 39 (or equivalent)
- Electrical connection of the MCU remote control unit with an own power supply unit:
  - Signals: Terminals 38 and 39 (or equivalent)

**3.3.5.2 Connection to the MCU remote control unit**

**Version without power supply unit**

- Connect the connection cable to the measuring and control unit (4-wire, twisted pair, with shield) to the connections in the control unit and the module of the remote unit.

Fig. 26: Connections in the remote control unit (version with integrated wide-range power pack)



**Version with integrated wide-range power pack:**

- Connect the 2-wire cable (twisted pair, with shield) to the connections for RS485 A/B and shield in the control and remote control unit.
- Connect the 3-wire power cable with sufficient cross-section to the onsite power supply and the corresponding terminals in the remote unit.

**NOTICE:**

- ▶ During installation, it must be possible to switch the power supply off using a power isolating switch/circuit breaker in accordance with EN 61010-1.
- ▶ After completion of the work or for test purposes, the power supply may only be activated again by the personnel who carried out the work and complying with the valid safety regulations.

### 3.3.6 Fitting the interface and I/O module (option)

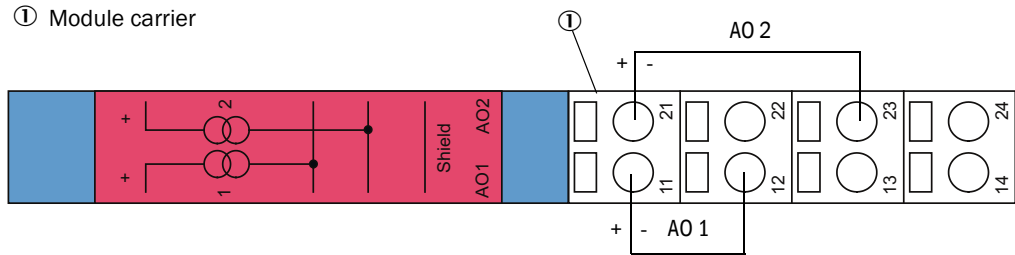
Plug Interface modules and module carriers for I/O modules onto the hat rail in the MCU (see “Component layout in the MCU (without purge air supply, with options)”, page 42) and connect to the associated connection on the processor board with the line with plug connector (see “MCU processor board connections”, page 43). Then plug the I/O modules on the module carriers.

Connect the Interface modules using the customer provided network line to the local network. Use the terminals on the module carrier to connect I/O modules.

#### Terminal assignment of AO module

Fig. 27: Terminal assignment of analog output module

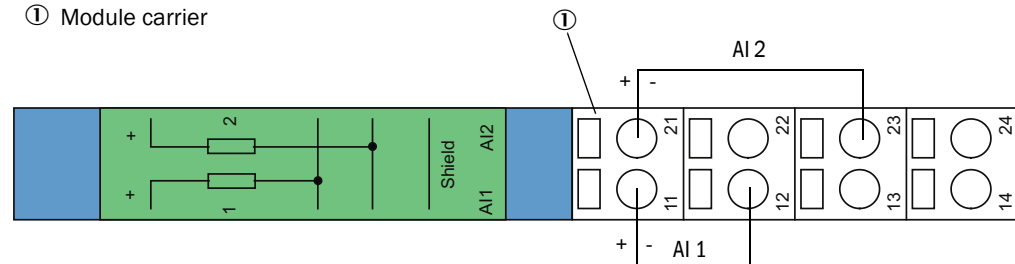
① Module carrier



#### Terminal assignment of AI module

Fig. 28: Terminal assignment of analog input module

① Module carrier





## 4 Start-up and parameter settings

### 4.1 Basics

#### 4.1.1 General information

Assembly and installation must have been completed according to Section 3 before starting the work described in the following.

Start-up and parameter setting comprise:

- Setting the measuring system to the duct dimensions
- Fitting and connecting the sender/receiver unit,
- Customizing parameter settings according to the respective requirements.

To achieve exact measurement, the measuring system must first be calibrated using a gravimetric comparison measurement (see [“Calibration for dust concentration measurement”](#), page 64) before being used for continuous measurement of dust content.

**4.1.2 Installing SOPAS ET**

- Install SOPAS ET on a laptop/PC.
- Start SOPAS ET.
- Following the installation instructions of SOPAS ET.

**4.1.2.1 Password for SOPAS ET menus**

Certain device functions are first accessible after a password has been entered.

User level		Access to
0	Operator	Displays measured values and system states No password required
1	Authorized operator	Displays, inquiries as well as start-up or adjustment to customer-specific demands and diagnosis of necessary parameters. Preset password: sickoptic

**4.1.3 Connection to the device via USB line**

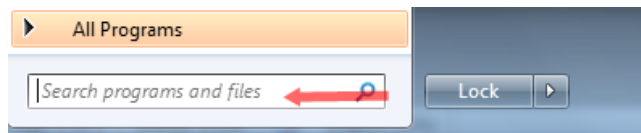
Recommended procedure:

- 1 Connect the USB line to the MCU control unit (see “MCU processor board connections”, page 43) and the laptop/PC.
- 2 Switch the device on.
- 3 Start SOPAS ET.
- 4 “Search settings”
- 5 “Device family oriented search”
- 6 Click the desired MCU.
- 7 Make the settings:
  - Ethernet communication (always clicked)
  - USB communication (always clicked)
  - Serial communication: Click
- 8 Do not specify IP addresses.
- 9 A list of COM ports is shown.  
Specify the COM port of the DUSTHUNTER.  
If you do not know the COM port: see “Finding the DUSTHUNTER COM port”, page 50
- 10 Assign a name for this search.
- 11 “Finish”

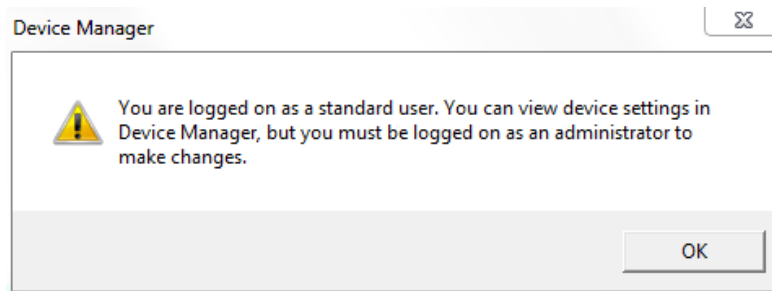
**4.1.3.1 Finding the DUSTHUNTER COM port**

If you do not know your COM port: You can find the COM port with the Windows Device Manager (Administrator rights are not required).

- 1 Disconnect the DUSTHUNTER from your laptop/PC.
- 2 Input: `devmgmt.msc`

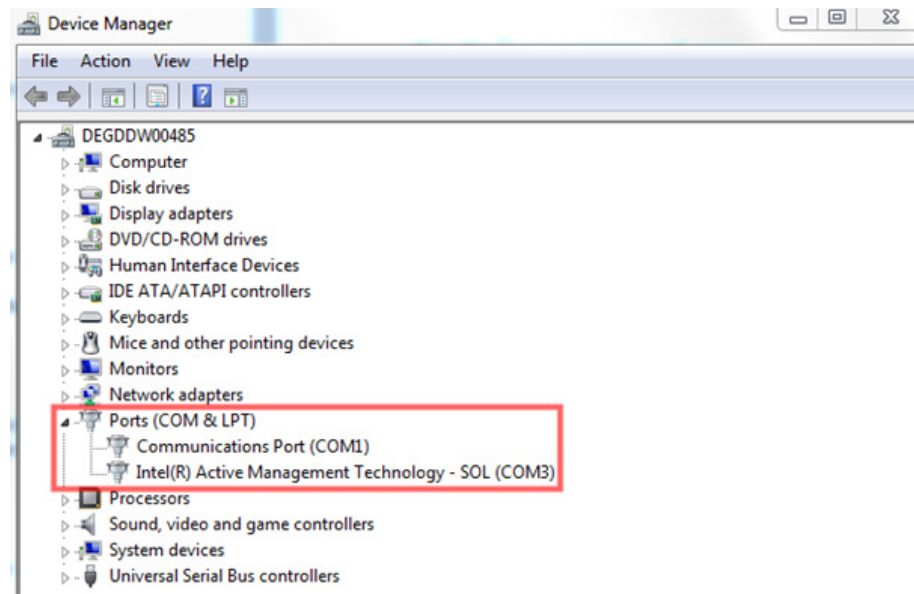


3 this message is shown:

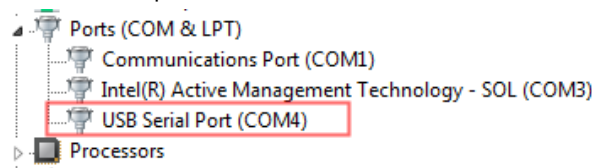


4 "OK"

5 The Device Manager opens.  
See: "Ports (COM & LPT)"



6 Now connect the MCU with the laptop/PC.  
A new COM port is shown.



Use this COM port for communication.

#### 4.1.4 Connection to the device via Ethernet (option)

**i** The Ethernet interface module (see "Options for MCU control unit", page 101) must be installed in the MCU (see "Fitting the interface and I/O module (option)", page 48) and configured (see "Setting the Ethernet module parameters", page 69) to connect to the measuring system via Ethernet.

Recommended procedure:

- 1 The MCU must be switched off.
- 2 Connect the MCU with the network.

- 3 Connect the PC to the same network.
- 4 Switch the MCU on.
- 5 Start SOPAS ET.
- 6 “Search settings”
- 7 “Device family oriented search”
- 8 Click the desired MCU
- 9 Make the settings:
  - Ethernet communication (always clicked)
  - USB communication (always clicked)
  - Serial communication: Do *not* click
- 10 Specify the IP addresses
  - IP address: see [“Setting the Ethernet module parameters”](#), page 69
- 11 Do not click a COM port
- 12 Assign a name for this search
- 13 “Finish”

## 4.2 Fitting the sender/receiver unit

### 4.2.1 Connecting the sender/receiver unit to the purge air supply

- ▶ Check whether the purge air supply is available (the flow direction must be correct and the purge air hose fits tight on the connection).
- ▶ With purge air supply from the MCU-P control unit or an optional external purge air unit, push the DN 40 purge air hose onto the sender/receiver unit connection and secure with a strap retainer.

### 4.2.2 Fitting and connecting the sender/receiver unit on the duct

#### Assembly without weatherproof cover

- ▶ Lay the seal on the flange with tube, position the sender/receiver unit in the flange with tube and fasten with the assembly kit.



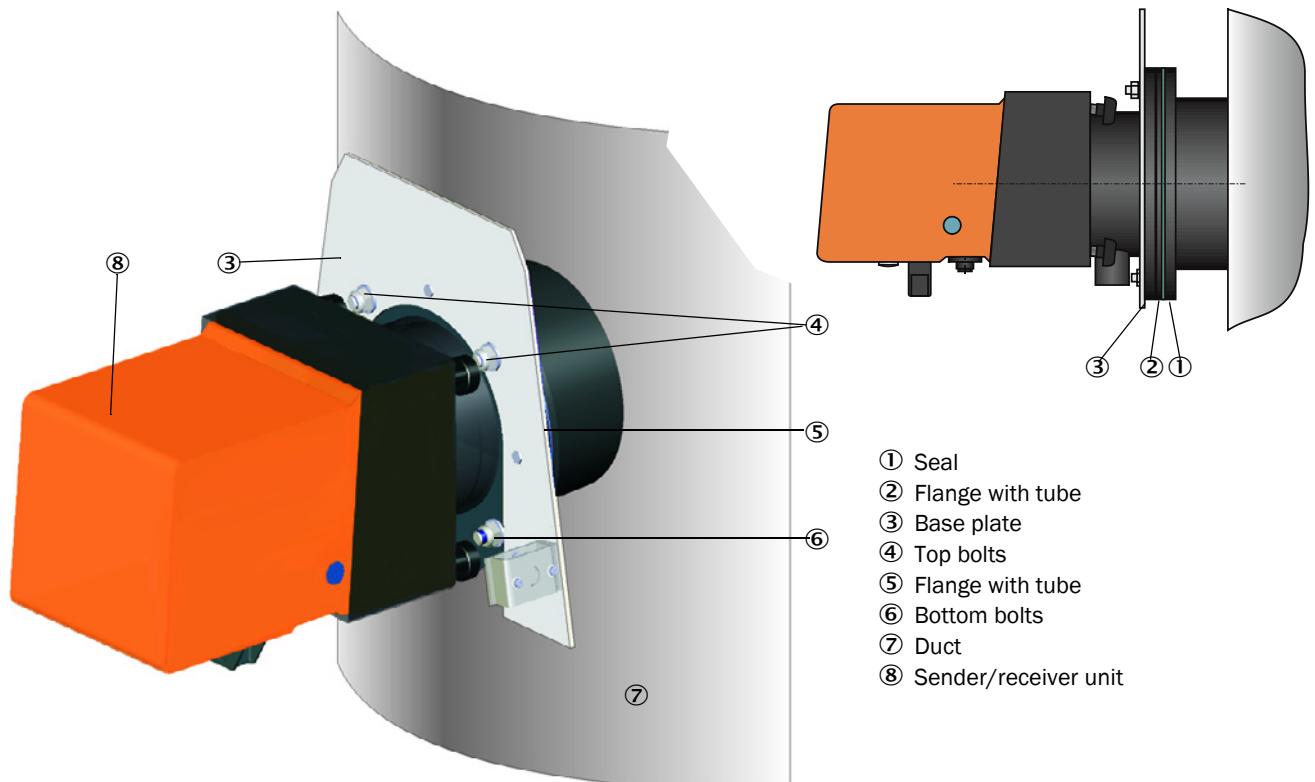
Connections for connection lines and purge air hose must always be at the bottom (see "DUSTHUNTER SB device components", page 15).

- ▶ Connect the connection line to the MCU on the plug connector and screw tight.

#### Assembly with weatherproof cover

- ▶ Lay seal (1) on flange with tube (2), position sender/receiver unit (8) in the flange with tube and fasten on the bottom bolts (6).
- ▶ Place base plate (3) on flange with tube (2) and fasten on the top bolts (4).

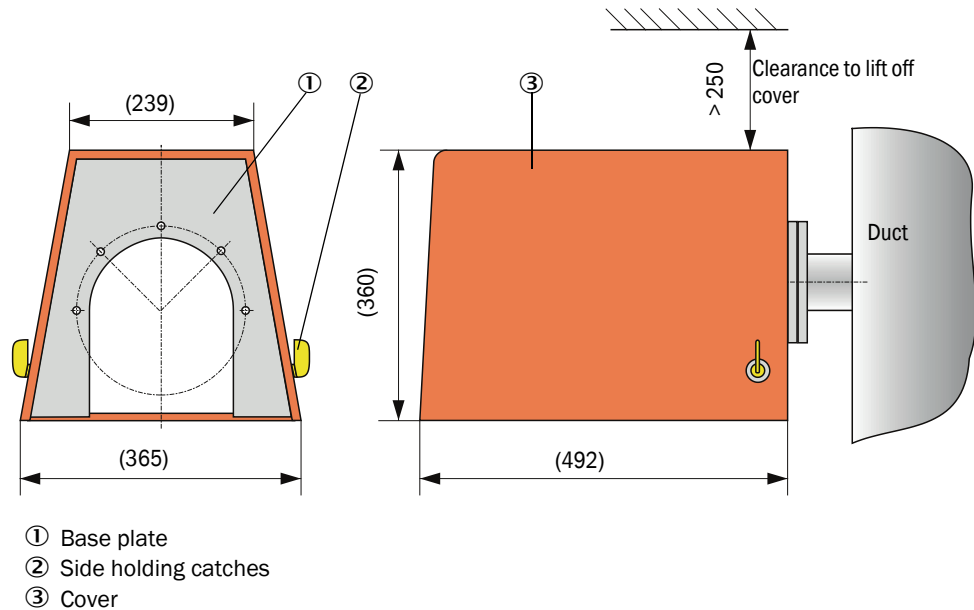
Fig. 29: Installation of base plate for weatherproof cover



- ① Seal
- ② Flange with tube
- ③ Base plate
- ④ Top bolts
- ⑤ Flange with tube
- ⑥ Bottom bolts
- ⑦ Duct
- ⑧ Sender/receiver unit

- ▶ Place cover (3) from above on base plate (1).
- ▶ Insert the side holding catches (2) into the counterpieces, twist and lock in.

Fig. 30: Installation of weatherproof cover (dimensions in mm)



#### 4.2.3 Aligning the laser control

- ▶ Start the SOPAS ET program and connect to the measuring system (see [“Connection to the device via USB line”, page 50](#)).
- ▶ Select device file “DH SB50” or “DH SB100” and move it to the “Project Tree” window.



The respective device type connected is displayed automatically

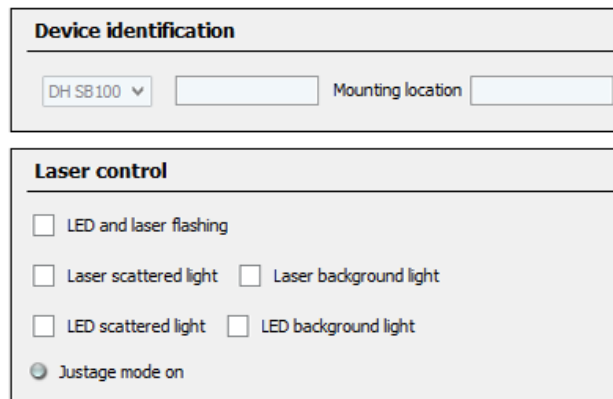
- ▶ Enter password level 1.
- ▶ Set the sender/receiver unit to “Maintenance”: Click “Maintenance sensor”.

Fig. 31: Set “Maintenance” mode

Device identification	
DHT100	Mounting location
Set on operational mode	
<input type="radio"/> Maintenance	<input checked="" type="checkbox"/> Maintenance sensor

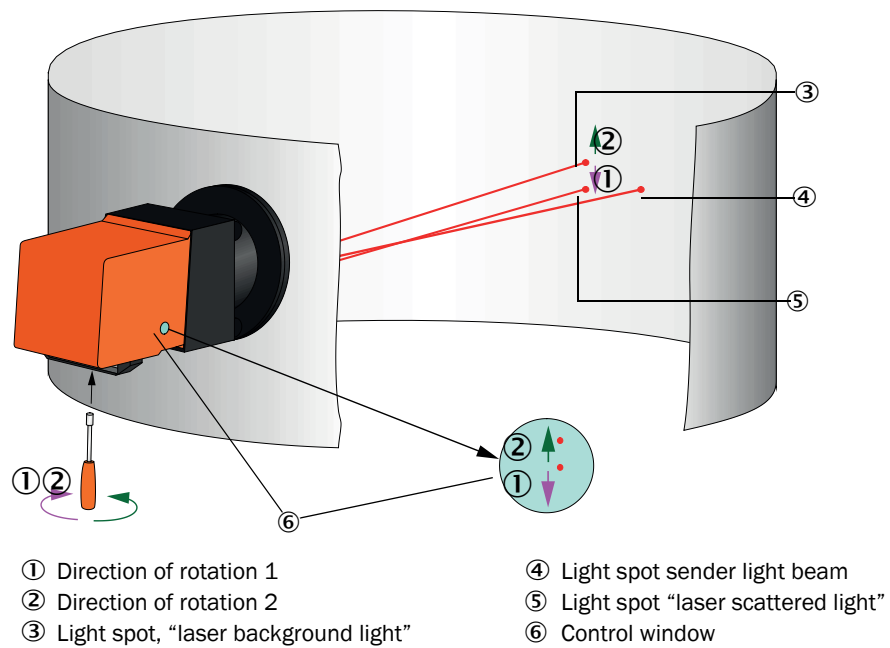
- ▶ Select the “Adjustment / Manual Adjustment / Laser control” directory and switch the auxiliary laser by clicking “Laser scattered light” and “Laser background light” in the “Laser control” group.

Fig. 32: SOPAS ET menu: SBxx/Adjustment/Manual Adjustment/Laser control



- ▶ Unscrew the cover screw for auxiliary laser alignment on the underside of the sender/receiver unit to align the laser (see “Sender/receiver unit DHSB-T”, page 16).
- ▶ Push the SW 8 socket wrench into the opening and onto the adjustment screw.
- ▶ Align the laser control so that the light spot of the auxiliary laser for the laser control (“Laser background light”) is as near as possible to the light spot of the auxiliary laser for the receiver (“Laser scattered light”).

Fig. 33: Aligning the laser control



- ▶ Screw the cover screw back in.
- ▶ Deactivate the auxiliary lasers again (see [“SOPAS ET menu: SBxx/Adjustment/Manual Adjustment/Laser control”](#), page 55).



The entry fields “LED scattered light” and “LED background light” in the “Adjustment / Manual Adjustment / Laser control” directory in the “Laser control” group are only needed for service tasks (see Service Manual).

#### 4.2.4 Assigning the sender/receiver unit to the measuring location (in SOPAS ET)

The sender/receiver unit can be assigned explicitly to the respective measuring location. For assignment select the “Configuration / Application parameter” directory and enter the desired data in the “Mounting location” entry field in group “Device identification”.

Fig. 34: “Configuration / Application parameter” directory

Device identification		
DH SB100 ▾	<input type="text"/>	Mounting location <input type="text"/>

Calibration coefficient			
	cc2	cc1	cc0
Concentration	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="0"/>



### 4.3 Setting standard parameters

#### 4.3.1 Assigning the MCU to the sender/receiver unit

The MCU must be set to the sender/receiver unit to be connected. A malfunction is reported in case of a mismatch. Assignment must be made after installation when the setting is not possible at the factory (e.g., when several devices are delivered at the same time or when the MCU is swapped later). The following steps are then necessary:

- ▶ Connect the measuring system to the SOPAS ET program.
- ▶ Enter the Level 1 password (see “Password and operating levels”, page 70).
- ▶ Set the sender/receiver unit to “Maintenance”: Click “Maintenance sensor”.

Fig. 35: SOPAS ET menu: MCU/Maintenance/Maintenance

- ▶ Change to the “Configuration / Application selection” directory (see “SOPAS ET menu: MCU/Configuration/Application selection”, page 57).
- ▶ The basic type of the sender/receiver unit connected is displayed in the “Connected variant” window (field “Application selection”). Click “Save selection” to assign to the MCU.

**+i** The sender/receiver unit must be connected to the MCU.

Fig. 36: SOPAS ET menu: MCU/Configuration/Application selection

### 4.3.2 Factory settings

Parameter		Value	
Function check		Every 8 h; output of control values (every 90 s) on standard analog output	
Analog output (AO) [mA]	Live zero (LZ)	4	
	Upper measuring range value (MBE)	20	
	Current during maintenance	0.5	
	Current by malfunction	21 (optional 1)	
Response time		60 s for all measured variables	
Measured variable	Output on AO	Value at LZ	Value at MBE
Dust concentration [mg/m <sup>3</sup> ]	1	0	200
Scattered light intensity	2 *		
Coefficients set (only for dust concentration)		0.00 / 1.00 / 0.00	

\*: Only when an optional analog module is present (standard on DUSTHUNTER SB100)

The steps required to modify these settings are described in the following Sections. For this purpose, the devices must be connected in SOPAS ET (see [“Connection to the device via USB line”](#), page 50), the Level 1 password set and the “Maintenance” mode set.

4.3.3 Determining the function check

Interval time, control value output on the analog output and the starting timepoint for automatic function check can be modified in the “Adjustment / Function Check - Automatic” directory.

**+i** Default values see “Factory settings”, page 58

Fig. 37: SOPAS ET menu: MCU/Adjustment/Function Check - Automatic (example)

<b>Device Identification</b>		
MCU	Selected variant: DUSTHUNTER	Mounting Location: SICK
<b>Function Check</b>		
Output duration of function control value	90	s
Function check interval	8 hours	
<b>Function Check Start Time</b>		
Hour	8	Minute: 0

Entry field	Parameter	Remark
Output duration of function control value	Value in seconds	Output duration of control values.
Function check interval	Time between two check cycles	<a href="#">see “Function check”, page 13</a>
Function Check Start Time	Hour	Defining a start timepoint in hours and minutes.
	Minute	

**+i** The value measured last is output during control value determination (see “Function check output on a plotter”, page 13).

### 4.3.4 Setting the analog outputs parameters

Select the “Configuration / IO Configuration / Output Parameters” directory to set the analog outputs.

**+i**

- Default values see “Factory settings”, page 58
- In order to output the dust concentration under standard conditions (“Conc. s.c.” (Ext)), set the parameters for the analog outputs according to see “Setting the analog inputs parameters”, page 62.

Fig. 38: SOPAS ET menu: MCU/Configuration/IO configuration/Output Parameters

<b>Device Identification</b> MCU <input type="text"/> Selected variant: DUSTHUNTER <input type="text"/> Mounting Location: S10C <input type="text"/>	
<b>Analog Outputs - General Configuration</b> Output Error current: yes <input type="text"/> Error Current: 21 mA <input type="text"/> Current in maintenance: Measured value <input type="text"/> Maintenance current: 0.5 mA <input type="text"/>	
<b>Optional Analog Output Modules</b> Use first analog output module <input type="checkbox"/>	
<b>Analog Output 1 Parameter</b> Value on analog output 1: Conc. a.c. (SL) <input type="text"/> Live zero: 4mA <input type="text"/> Output checkcycle results on the AO <input type="checkbox"/> Write absolute value <input type="checkbox"/>	<b>Analog Output 1 Scaling</b> Range low: 0.00 mg/m <sup>3</sup> <input type="text"/> Range high: 0.00 mg/m <sup>3</sup> <input type="text"/>
<b>Limiting Value</b> Limit value: Conc. a.c. (SL) <input type="text"/> Hysteresis type: <input type="radio"/> Percent <input checked="" type="radio"/> Absolute Switch at: Over Limit <input type="text"/>	<b>Limit Switch Parameters</b> Limit value: 0.00 mg/m <sup>3</sup> <input type="text"/> Hysteresis: 1.00 mg/m <sup>3</sup> <input type="text"/>

**+i** The “Analog Output 2(3) Parameter” and “Analog Output 2(3) Scaling” fields only appear after activation of the “Use first analog output module” checkbox and when an AO module is plugged in (standard on DUSTHUNTER SB100).

Field		Parameter	Remark	
Analog Outputs - General Configuration	Output Error current	Yes	Error current is output.	
		No	Error current is not output.	
	Error Current	Value < Live Zero (LZ) or > 20 mA	mA value to be output in "Malfunction" state (error case) (size depends on connected evaluation system).	
	Current in maintenance	User defined value	A value to be defined is output during "Maintenance"	
		Value measured last	The value measured last is output during "Maintenance"	
Maintenance current	Measured value output	The current measured value is output during "Maintenance".		
Optional Analog Output Modules	Use first analog output module	Inactive	Not permitted for DUSTHUNTER SB100 (results in error, because AO 2 and AO 3 are available by default).	
		Active	Opens the fields <a href="#">see "Function check", page 13</a> to set parameters for AO 2 and AO 3 (standard for DUSTHUNTER SB100)	
Analog Output 1 Parameter	Value on analog output 1	Conc. a.c. (SI)	Dust concentration under operating (actual) conditions (based on scattered light intensity)	The selected measured variables are output on the analog output.
		Conc.s.c.dry O2 corr. (SI)	Dust concentration under standard conditions (based on scattered light intensity)	
		SI	Scattered light intensity	
	Live zero	Zero point (0, 2 or 4 mA)	Select 2 or 4 mA to ensure being able to differentiate between measured value and switched off device or interrupted current loop.	
	Output checkcycle results on the AO	Inactive	Control values ( <a href="#">see "Function check", page 13</a> ) are not output on the analog output.	
		Active	Control values are output on the analog output .	
	Write absolute value	Inactive	Positive and negative measured values are differentiated.	
Active		The amount of the measured value is output.		
Analog Output 1 Scaling	Range low	Lower measuring range limit	Physical value at live zero	
	Range high	Upper measuring range limit	Physical value at 20 mA	
Limiting Value	Limit value	Conc. a.c. (SI)	Dust concentration under operating (actual) conditions (based on scattered light intensity)	Select the measured variable for which a limit value is to be monitored.
		Conc.s.c.dry O2 corr. (SI)	Dust concentration under standard conditions (based on scattered light intensity)	
		SI	Scattered light intensity	
	Hysteresis type	Percent	Assignment of the value entered in the "Hysteresis value" field as relative or absolute value of defined limit value	
		Absolute		
Switch at	Value exceeded	Define the switching direction		
	Underflow			
Limit Switch Parameters	Limit value	Value	The limit value relay switches when the entered value is overflown or underflown.	
	Hysteresis	Value	Define a tolerance for resetting the limit value relay	

**+i** Set the parameters for "Analog Output 2(3) Parameter" and "Analog Output 2(3) Scaling" in the same manner as for "Analog Output 1 Parameter" and "Analog Output 1 Scaling".

### 4.3.5 Setting the analog inputs parameters

Select the “Configuration / I/O Configuration / Input Parameters DUSTHUNTER” directory to set the analog inputs.

Fig. 39: SOPAS ET menu: MCU/Configuration/IO configuration/Input Parameters

The screenshot displays the 'Input Parameters' configuration screen. At the top, 'Device Identification' shows 'MCU' and 'Selected variant: DUSTHUNTER'. Below are four main sections: 'Temperature Source', 'Pressure Source', 'Moisture Source', and 'Oxygen Source'. Each section has a radio button for 'Constant Value' (selected) and 'Analog Input' (unselected). Below each source section is a 'Constant' section with a 'Fixed value' input field. The values shown are: Temperature (0.00 °C), Pressure (1013.25 mbar), Moisture (0.00 %), and Oxygen (6.00 %).

Field	Parameter	Remark
Temperature Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Constant Temperature” field to enter the scaling value in °C (° F for imperial units) or K.
	Analog Input 1	The value from an external sensor connected to analog input 1 (standard scope of delivery) is used to calculate the scaled value. This parameter opens the “Analog input 1 - Temperature” field to set the lower and upper range limit values and the Live Zero value.
Pressure Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Constant Pressure” field to enter the scaling value in mbar (= hPa).
	Analog Input 2	The value from an external sensor connected to analog input 2 (standard scope of delivery) is used to calculate the scaled value. This parameter opens the “Analog input 2 - Pressure” field to set the lower and upper range limit values and the Live Zero value.
Moisture Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Constant Moisture” field to enter the scaling value in %.
	Analog Input 3	The value from an external sensor connected to analog input 3 (optional module required) is used to calculate the scaled value. This parameter opens the “Analog input 3 - Moisture” field to set the lower and upper range limit values and the Live Zero value.
Oxygen Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Constant Oxygen” field to enter the scaling value in %.
	Analog Input 4	The value from an external sensor connected to analog input 4 (optional module required) is used to calculate the scaled value. This parameter opens the “Analog input 4 - Oxygen” field to set the lower and upper range limit values and the Live Zero value.

**4.3.6 Setting the response time**

Select the “Configuration / Value Damping” directory to set the damping time.

Fig. 40: SOPAS ET menu: MCU/Configuration/Value Damping

<b>Device Identification</b>		
MCU	Selected variant: DUSTHUNTER	Mounting Location: SICK
<b>Value Damping Time</b>		
Damping time for Sensor 1: 60 sec		

Field	Parameter	Remark
Damping time for Sensor 1	Value in s	Response time for the selected measured variable (see “Response time”, page 12) Setting range 1 ... 600 s

### 4.3.7 Calibration for dust concentration measurement

For exact dust concentration measurement, the relation between the primary measured variable scattered light intensity and the actual dust concentration in the duct must be established. To do this, the dust concentration must be determined based through a gravimetric comparison measurement according to DIN EN 13284-1 and set in relation to the values measured at the same time by the measuring system.



**NOTE:**

Carrying out a gravimetric comparison measurement demands special knowledge that cannot be described in detail here.

**Steps to be carried out**

- ▶ Select device file “MCU”, set the measuring system to “Maintenance” mode
- ▶ Enter the Level 1 password (see “Password and operating levels”, page 70).
- ▶ Select the “Configuration / IO Configuration / Output Parameters” directory (see “SOPAS ET menu: MCU/Configuration/IO configuration/Output Parameters”, page 60) and assign the “Scattered light intensity” measured variable to an analog output.
- ▶ Estimate the measuring range required for the dust concentration in operational state and enter this in the “Analog Output 1 (2/3) Scaling” field assigned to the selected analog output assigned to the scattered light intensity.
- ▶ Deactivate “Maintenance” mode.
- ▶ Carry out the gravimetric comparison measurement according to DIN EN 13284-1.
- ▶ Determine regression coefficients from the mA values of the analog output for “Scattered light intensity” and the actual dust concentrations measured gravimetrically.

$$c = K2 \cdot I_{out}^2 + K1 \cdot I_{out} + K0 \quad (1)$$

c: Dust concentration in mg/m<sup>3</sup>  
 K2, K1, K0: Regression coefficients of the function  $c = f(I_{out})$   
 I<sub>out</sub>: Current output value in mA

$$I_{out} = LZ + SL \cdot \frac{20mA - LZ}{MBE} \quad (2)$$

SI: Measured scattered light intensity  
 LZ: Live Zero  
 MBE: Defined upper range limit value  
 (value entered for 20 mA;  
 normally 2.5 x fixed limit value)



► Enter the regression coefficients

There are two options:

- Direct input of K2, K1, K0 in a measured value computer.



**NOTE:**

In this case, the regression coefficients set in the sender/receiver unit and the measuring range set in the MCU may not be changed anymore. On the optional LC Display (when used), the dust concentration is displayed as uncalibrated value in mg/m<sup>3</sup>.

- Use the regression function of the measuring system (use without measured value computer).

In this case, the correlation to the scattered light intensity has to be determined. To do this, calculate the regression coefficients cc2, cc1, cc0 to be entered in the measuring system from K2, K1, K0.

$$c = cc2 \cdot SL^2 + cc1 \cdot SL + cc0 \quad (3)$$

Using (2) in (1), the result is as follows:

$$c = K2 \cdot \left( LZ + SL \cdot \frac{20mA - LZ}{MBE} \right)^2 + K1 \cdot \left( LZ + SL \cdot \frac{20mA - LZ}{MBE} \right) + K0$$

Using (3), the result is as follows:

$$\begin{aligned} cc0 &= K2 \cdot LZ^2 + K1 \cdot LZ + K0 \\ cc1 &= (2 \cdot K2 \cdot LZ + K1) \cdot \left( \frac{20mA - LZ}{MBE} \right) \\ cc2 &= K2 \cdot \left( \frac{20mA - LZ}{MBE} \right)^2 \end{aligned}$$

Now enter the regression coefficients cc2, cc1 and cc0 determined in directory "Configuration/Application parameters" (see ["Assigning the sender/receiver unit to the measuring location \(in SOPAS ET\)", page 56](#)) (set sender/receiver unit to "Maintenance" state and enter the Level 1 password.

Reset the sender/receiver unit back to "Measurement" state afterwards).



This method allows changing the parameters for the selected measuring range as desired.

### 4.3.8 Data backup in SOPAS ET

All parameters relevant for recording, processing and input/output of measured values as well as current measured values can be saved in SOPAS ET and printed. This allows easy reentering of set device parameters as needed or registering device data and states for diagnostic purposes.

The following options are available:

- Saving as a project  
Not only device parameters but also data logs can be saved.
- Saving as a device file  
Saved parameters can be processed without a device connected and transferred to the device again later.



Description, see SOPAS ET Help menu and DUSTHUNTER Service Manual.

- Saving as a protocol  
Device data and parameters are registered in the Parameter protocol.  
A Diagnosis protocol can be created for analysis of the device function and recognition of possible malfunctions.

#### Parameter protocol example

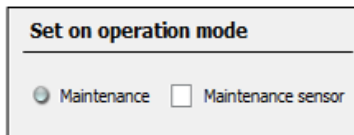
Fig. 41: DUSTHUNTER SB100 Parameter protocol (example)

Dusthunter - Parameter protocol			
Type of device: DH SB100			
Mounting location:			
<b>Device information</b>		<b>Factory settings</b>	
Device version		<b>Scattered light (SL)</b>	
Firmware version		cc2	0.0000
Serial number	00008700	cc1	1.0000
Identity number	00000	cc0	0.0000
Hardware version	1.1	<b>Background light (BL)</b>	
Firmware bootloader	V00.99.15	cc2	0.0000
		cc1	1.0000
		cc0	0.0000
<b>Installation parameter</b>		<b>Laser current</b>	
Bus address	1	cc2	0.0000
<b>Calibration coefficients for calculation of concentration</b>		cc1	30.3000
cc2	0.0000	cc0	0.0000
cc1	1.0000	<b>Device temperature</b>	
cc0	0.0000	cc2	0.0000
<b>Device parameter</b>		cc1	100.0000
<b>Factory settings</b>		cc0	-275.1500
Correction of scattered light	off	<b>Motor current</b>	
Depth of immersion	0.4 m	cc2	0.0000
Correction factor depth of immersion	1.0	cc1	2000.0000
Response time sensor	1.0 s	cc0	0.0000
Response time diagnosis values	10.0 s	<b>Power supply</b>	
Reference value scattered light	0.0 V	cc2	0.0000
Reference value background light	0.0 V	cc1	11.0000
		cc0	0.0000

#### 4.3.9 Starting measurement mode

Set the measuring system to “Measurement” mode after entering/modifying parameters. To do so, cancel “Maintenance”: Deselect “Maintenance sensor”.

Fig. 42: SOPAS ET menu: MCU/Maintenance/Maintenance



Standard start-up is now completed.

## 4.4 Setting the Interface module parameters

### 4.4.1 General information

The following steps are necessary to select and set the optionally available Interface modules Profibus DP, Modbus TCP and Ethernet type 1:1

- ▶ Select device file “MCU”, set the measuring system to “Maintenance” mode
- ▶ Enter the Level 1 password (see “[Password and operating levels](#)”, page 70).
- ▶ Switch to the “Configuration / System Configuration” directory.  
The installed interface module is displayed in the field “Interface Module”.
- ▶ Configure the Interface module according to requirements.

Fig. 43: SOPAS ET menu: MCU/Configuration/System Configuration

**Device Identification**

MCU Selected variant DUSTHUNTER S (SB50, SB100,SF100,SP100) Mounting Location SICK

---

**Interface Module**

Interface Module No Module ▾

No Module  
 Profibus  
Ethernet  
 RS 485

---

**Current Time**

Date/Time

---

**Adjust Date/Time**

Day  Month  Year

Hour  Minute  Second

Date / Time set
  Invalid value

---

**System Time Synchronization**

Date / Time: Thursday, October 1, 2015 9:58:24 AM CEST

---

**Settings for service interface**

Protocol selection CoLa-B ▾ Modbus Address  Serial service port baudrate

Use RTS/CTS lines



GSD file and measured value assignment are available for the Profibus DP module on request.

4.4.2 Setting the Ethernet module parameters



**NOTICE:**

The risk of undesired access to the measuring system is inherent when communicating via Ethernet.

- ▶ Operate the measuring system only behind suitable protection (e.g., Firewall).



The configuration of interface module Ethernet type 2 (see “Options for MCU control unit”, page 101) is not possible with program SOPAS ET. A special software with description is supplied with the program.

Standard setting: 192.168.0.10

A predefined IP address is set on request.

To change the settings:

- ▶ Select directory “Configuration / I/O Configuration / Interface Module”.
- ▶ Set the desired network configuration in the “Expansion module information” field and click “Reset module”.

Fig. 44: SOPAS ET menu: MCU/Configuration/IO configuration/Interface Module

**Expansion module information**

---

Module type: No module found ▼

Reset module    When this button is clicked, the connection will be reseted

**Ethernet Interface Configuration**

---

IP Address    192    168    0    10

Subnet mask    255    255    255    0

Gateway    0    0    0    0

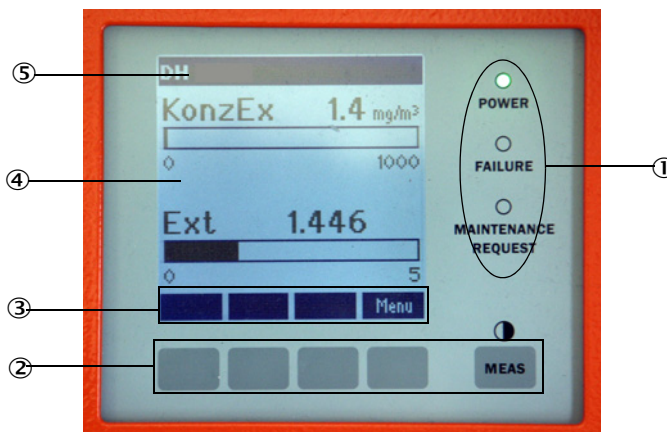
TCP port    2111

## 4.5 Operating/setting parameters via the optional LC-Display

### 4.5.1 General information on use

The display and operating interface of the LC-Display contains the functional elements shown in Fig. "LC-Display functional elements".

Fig. 45: LC-Display functional elements



- ① Status LED
- ② Control buttons
- ③ Current button function
- ④ Display field
- ⑤ Status bar

#### Button functions

The function shown depends on the Menu currently selected. Only the function shown in the button is available.

Button	Function
Diag	Display diagnostic information (warnings and errors during a start using the Main menu, sensor information during a start using the Diagnostics menu)
Back	Switch to higher level menu
Arrow ↑	Scroll up
Arrow ↓	Scroll down
Enter	Execution of the action selected with an arrow button (switch to a submenu, confirm parameter selected during parameter setting)
Start	Start an action
Save	Store a changed parameter
Meas	Switch from main measured values to measured sensor values Display the contrast setting (after 2.5 s)

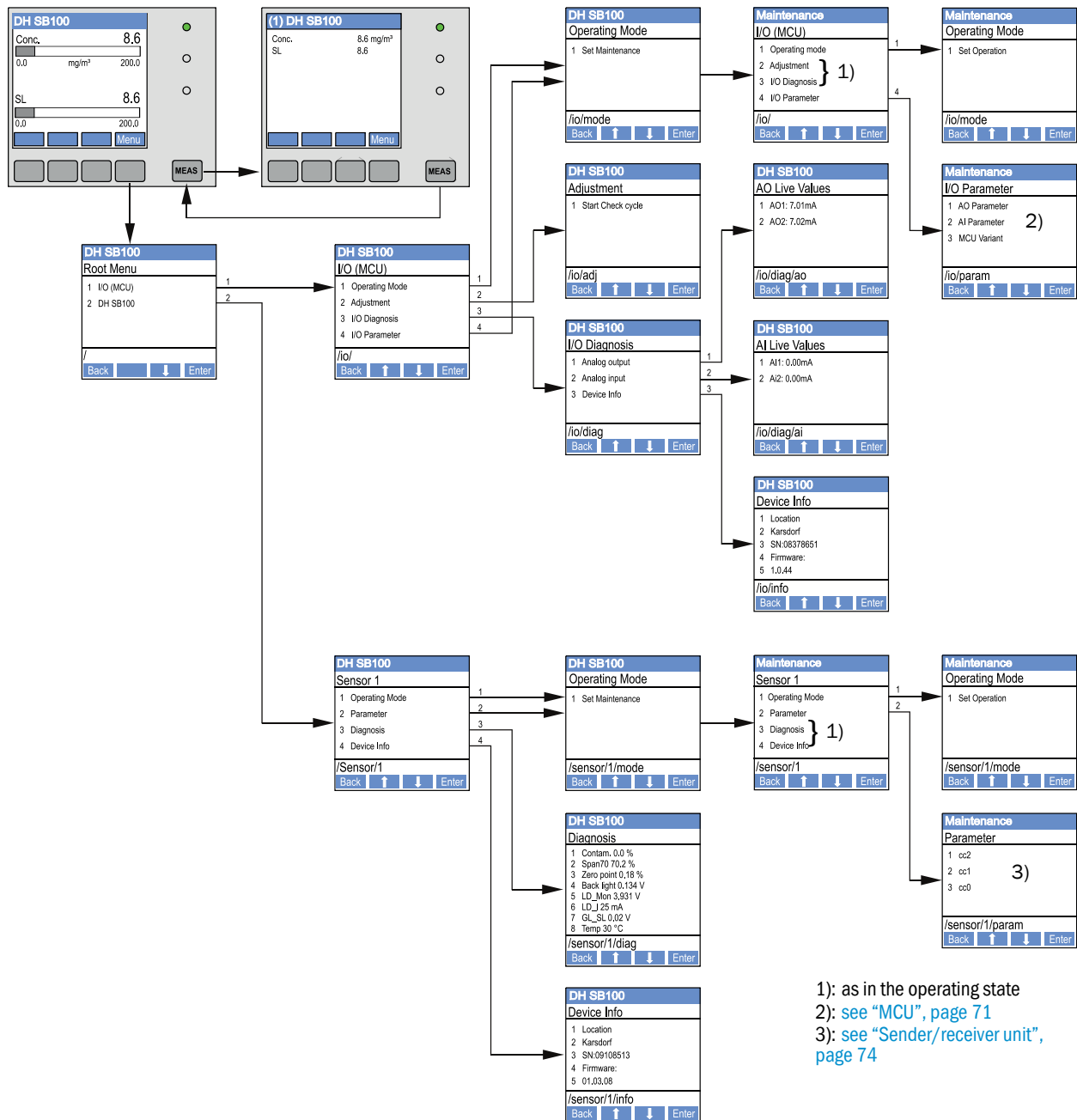
### 4.5.2 Password and operating levels

Certain device functions are first accessible after a password has been entered.

User level	Access to
0 Operator	Displays measured values and system states No password required
1 Authorized operator	Displays, inquiries as well as start-up or adjustment to customer-specific demands and diagnosis of necessary parameters Preset password: 1234

4.5.3 Menu structure

Fig. 46: LC-Display menu structure



1): as in the operating state  
 2): see "MCU", page 71  
 3): see "Sender/receiver unit", page 74

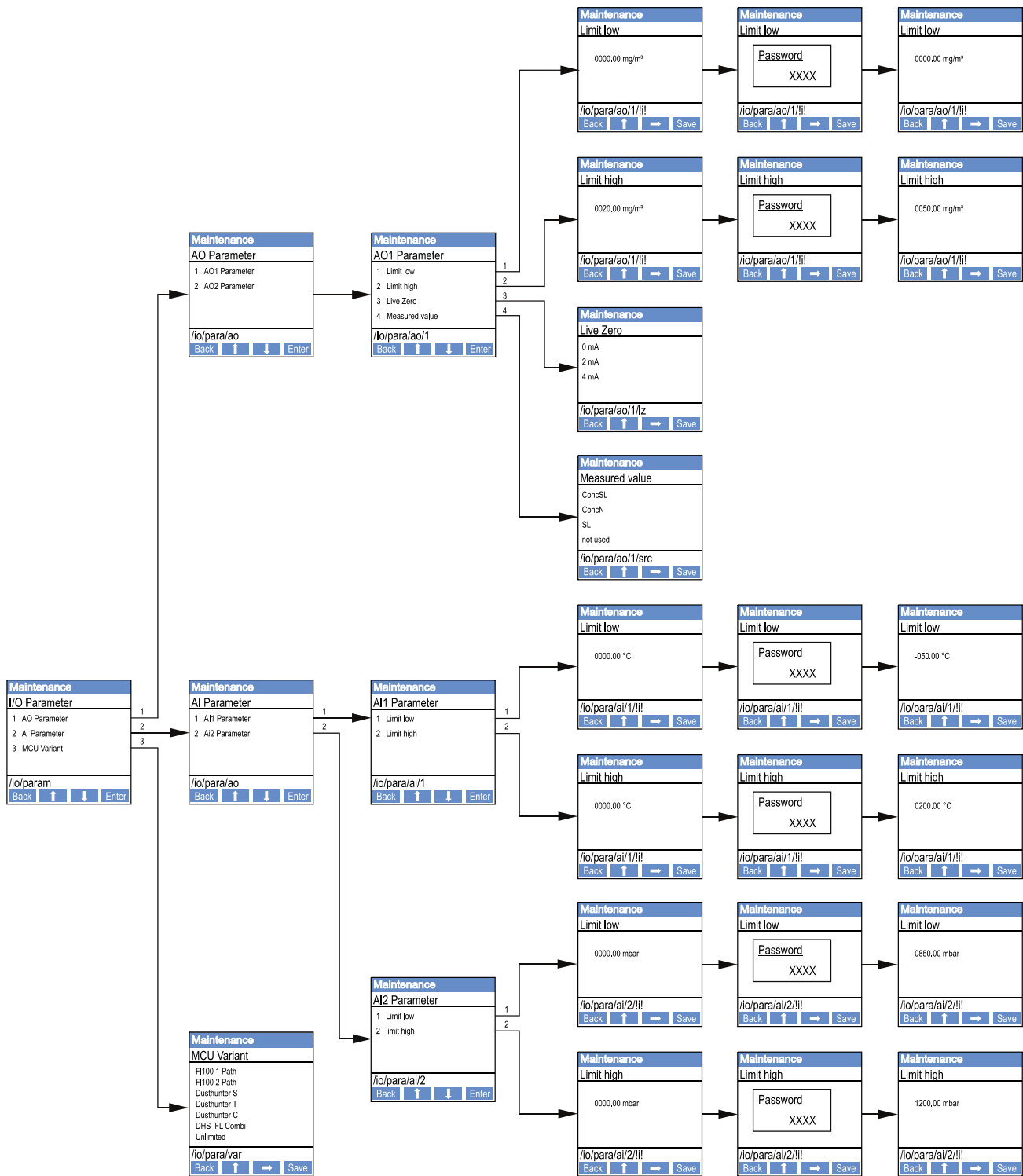
4.5.4 Configuration

4.5.4.1 MCU

Analog outputs / inputs

- ▶ Set the MCU to "Maintenance" mode and select the "I/O Parameter" submenu.
- ▶ Select the desired parameter and enter the default password "1234" using the "^^" (scrolls from 0 to 9) and/or "→" (moves the cursor to the right) buttons.
- ▶ Select the desired value using the "^^" and/or "→" buttons and write it to the device with "Save" (confirm 2x).

Fig. 47: Menu structure for configuring analog outputs/inputs and setting the MCU variant





**Setting the MCU variant**

The following steps are required to set the MCU for the DUSTHUNTER SB50 or SB100 sender/receiver unit to be connected (see [“Assigning the MCU to the sender/receiver unit”, page 57](#)):

- ▶ Set the MCU to “Maintenance” mode, select the “MCU Variant” submenu and select the type “DUSTHUNTER S”.
- ▶ Enter the default password and store the type with “Save” (confirm twice).

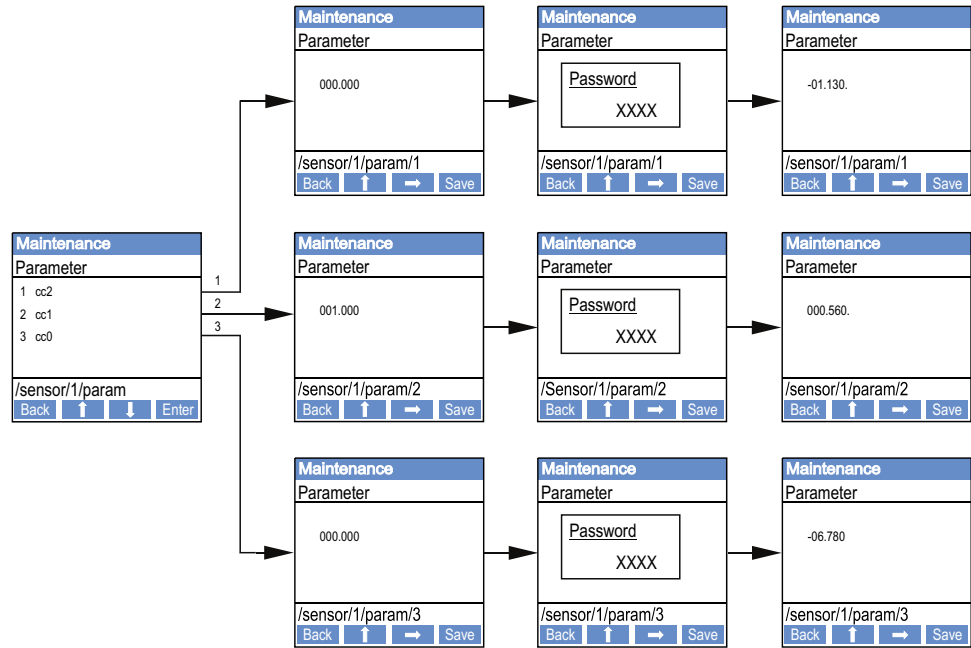
The other selection options have no significance here.

4.5.4.2 Sender/receiver unit

The following steps are required to enter the regression coefficients:

- ▶ Set the sender/receiver unit to “Maintenance” and select the “Parameter” submenu.
- ▶ Select the desired parameter and enter the password (see “Password and operating levels”, page 70).
- ▶ Set the calculated coefficients (see “Calibration for dust concentration measurement”, page 64) using the “^” and/or “→” buttons and write to the device with “Save” (confirm twice).

Fig. 48: Entering the regression coefficients



4.5.5 Using SOPAS ET to modify display settings

To modify the factory settings, connect SOPAS ET with the “MCU” (see “Connection to the device via USB line”, page 50), enter the Level 1 password and select the “Configuration / Display Settings” directory.

Fig. 49: SOPAS ET menu: MCU/Configuration/Display Settings

**Device Identification**

MCU Selected variant DUSTHUNTER Mounting Location SICK

**Common Display Settings**

Display language English Display Unit System metric

**Overview Screen Settings**

Bar 1	Sensor 1	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000
Bar 2	MCU	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000
Bar 3	Not Used	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000
Bar 4	Not Used	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000
Bar 5	Not Used	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000
Bar 6	Not Used	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000
Bar 7	Not Used	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000
Bar 8	Not Used	Value	Value 1	Use AO scaling	<input type="checkbox"/>	Range low	-100	Range high	1000

**Measured Value Description**

<p><b>Dusthunter S</b></p> <p>Value 1 = not used                  Value 2 = Concentration a.c. (SL)                  Value 3 = not used                  Value 4 = not used                  Value 5 = not used                  Value 6 = not used                  Value 7 = Scattered Light                  Value 8 = not used</p>	<p><b>Calculated values (MCU)</b></p> <p>Value 1 = Concentration s.c. dry O2 corr. (SL)                  Value 2 = not used                  Value 3 = not used                  Value 4 = not used                  Value 5 = Temperature                  Value 6 = Pressure                  Value 7 = Moisture                  Value 8 = Oxygen</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Security settings**

Authorized operator 1234 Idle time 30 Minutes

Window	Entry field	Significance
Common Display Settings	Display language	Language version shown on the LC-Display
	Display Unit System	Unit of measurement system used in displays
Overview Screen Settings	Bars 1 to 8	Number of measured value for the first measured value bar in the graphic display
	Value	Measured value index for the respective measured value bar
	Use AO scaling	When activated, the measured value bar is scaled to the associated analog output. If not activated, define the limit values separately
	Range low	Values for separate scaling of the measured value bar independent of the analog output
	Range high	
Security settings	Authorized operator	Password input for the Display menu operating level "Authorized Operator" Default: 1234
	Idle time	Time until user level "Authorized Operator" is automatically switched off again.

#### Measured value assignment

MCU measured value	Sender/receiver unit measured value
Value 1	Not used
Value 2	Concentration (SL)
Value 3	Not used
Value 4	Not used
Value 5	Not used
Value 6	Not used
Value 7	Scattered light
Value 8	Not used
MCU Value 1	Concentration s.c.

## 5 Maintenance

### 5.1 General

The maintenance work to be carried out is limited to cleaning work and securing the purge air supply function.

Take the following steps to set the measuring system to “Maintenance” mode before starting maintenance work.

- ▶ Connect the MCU to the laptop/PC using the USB line and start program SOPAS ET.
- ▶ Connect with the MCU (see “[Connection to the device via USB line](#)”, page 50).
- ▶ Enter the Level 1 password (see “[Password and operating levels](#)”, page 70).
- ▶ Set the sender/receiver unit to “Maintenance”: Click “Maintenance sensor”)

Fig. 50: SOPAS ET menu: MCU/Maintenance/Maintenance

Device Identification	
MCU	Selected variant: DUSTHUNTER
Mounting Location	SICK
Offline Maintenance	
Activate offline maintenance	<input checked="" type="checkbox"/>



#### WARNING:

Observe the relevant safety regulations as well as the safety notices (see “[Responsibility of user](#)”, page 8) during all work.

#### Resuming measuring operation

Resume measuring operation after completing the work (deactivate the “Maintenance on/off” checkbox in the “Maintenance / Operation” window and click “Set State”).



- “Maintenance” mode can also be set using the buttons on the display on the MCU (see “[Menu structure](#)”, page 71) when the LC-Display option is present or by connecting an external maintenance switch to the terminals for Dig In2 (17, 18) in the MCU (see “[Connecting the MCU control unit](#)”, page 42).
- An automatic function check is not carried out during “Maintenance”.
- The value set for “Maintenance” is output on the analog output (see “[Setting the analog outputs parameters](#)”, page 60). This is also applicable when a malfunction is present (signaled on relay output).
- The “Maintenance” mode is reset when there is a voltage failure. In this case, the measuring system switches automatically to “Measurement” after the operating voltage is switched on again.

#### Maintenance intervals

The equipment operator must specify the maintenance intervals. The period depends on existing operating parameters such as dust content and state, gas temperature, how the equipment is run and ambient conditions. Therefore only general recommendations can be made here. Normally, the maintenance intervals are about 4 weeks during the initial period and can be steadily incremented to up to a year depending on the respective conditions.

The equipment operator must specify the specific work to be carried out and its performance in a Maintenance Manual.

**Maintenance contract**

Scheduled maintenance work can be carried out by the equipment operator. Only qualified personnel according to Section 1 should be allowed to do the work. If requested, all maintenance activities can also be performed by Endress+Hauser Service or an authorized Service partner. Any repairs will be made by specialists onsite whenever possible.

**Auxiliary means required**

- Brush, cleaning cloth, cotton swabs
- Water
- Replacement air filter, preliminary filter (for suction)

## 5.2 Maintenance on the sender/receiver unit



### NOTE:

- ▶ Do not damage any device parts during maintenance work.
- ▶ Do not interrupt the purge air supply.

Clean the outside of the sender/receiver unit in regular intervals. Remove deposits with water or mechanically using suitable auxiliary means.

Clean the optical interfaces when deposits can be seen or, on DUSTHUNTER SB100, when the contamination limit values are reached (20% for warning, 30% for failure).

In addition to cleaning, check that the control receiver is still aligned correctly (see [“Aligning the laser control”](#), page 54) (if necessary, correct alignment).

### DUSTHUNTER SB50

- ▶ Set the measuring system to “Maintenance” mode (see [“General”](#), page 77).
- ▶ Loosen the knurled screws and swivel electronic unit (1) to the side (see [“Cleaning optical interfaces \(Optic carrier \(2\) only for DUSTHUNTERS SB100\)”](#), page 80).
- ▶ Close the mounting flange with cover (see [“Miscellaneous”](#), page 101).
- ▶ Carefully clean sender optics (3), receiver optics (4) and optics for control receiver (5) with an optics cloth/cotton swabs (see [“Cleaning optical interfaces \(Optic carrier \(2\) only for DUSTHUNTERS SB100\)”](#), page 80).
- ▶ Swivel the electronic unit back again and lock with the knurled screws.
- ▶ Resume Measuring mode.

### DUSTHUNTER SB100

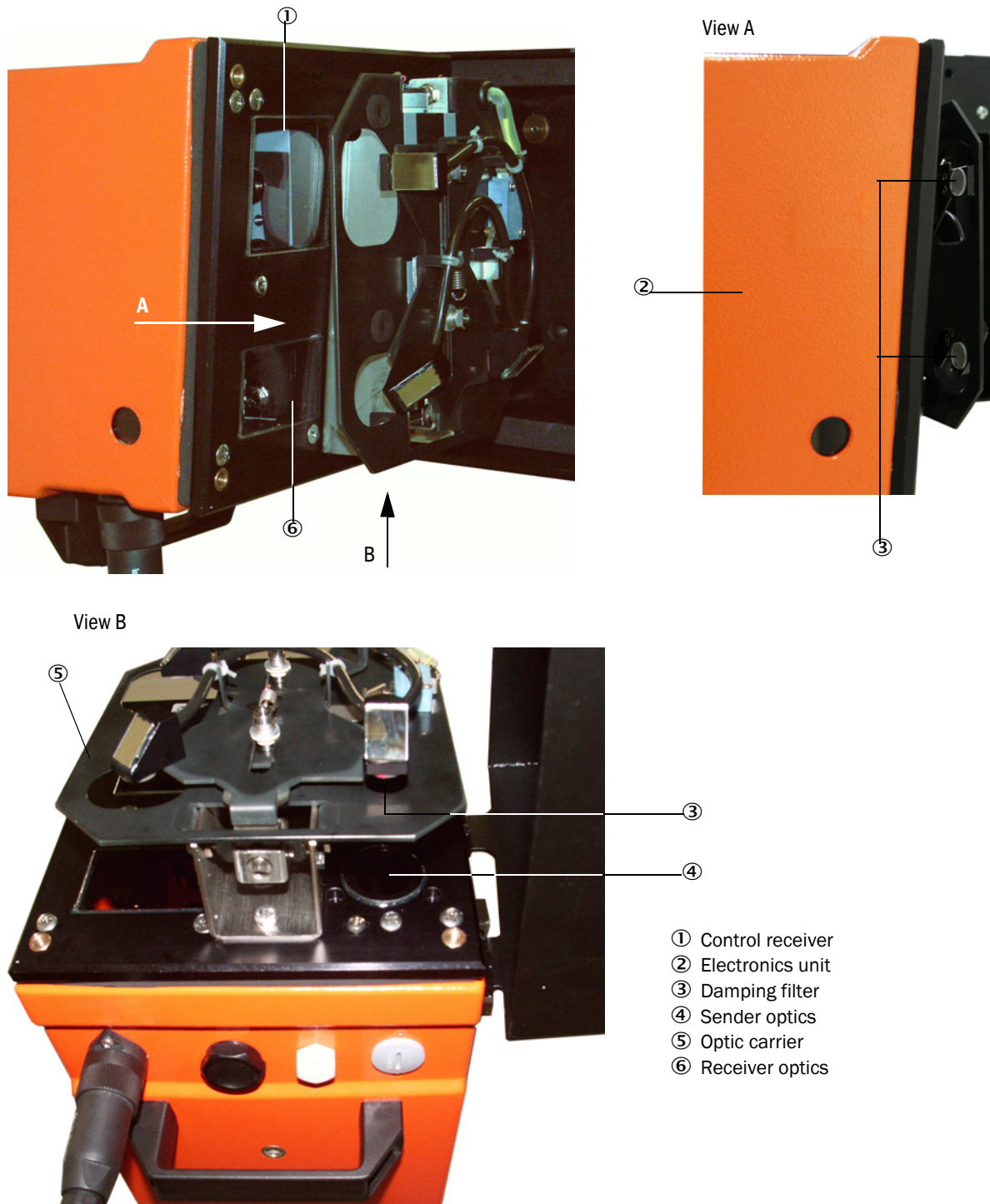
- ▶ Set the measuring system to “Maintenance” mode.
- ▶ Loosen the knurled screws and swivel the electronics unit to the side.
- ▶ Close the mounting flange with cover (see [“Miscellaneous”](#), page 101).
- ▶ Select the “Adjustment / Manual Adjustment / Motor control” subdirectory and click “Move to control position”. Optic carrier (2) is then moved to the reference position so that all the optical surfaces are accessible.

Fig. 51: SOPAS ET menu: DH SBxx/Adjustment/Manual Adjustment/Motor control

The screenshot shows a software interface with two main sections. The top section, titled 'Device identification', contains a dropdown menu set to 'DH SB100', an empty text input field, and a label 'Mounting location' followed by another empty text input field. The bottom section, titled 'Motor control', features two radio buttons: 'Measurement position' (which is selected) and 'Control position'. Below these are two buttons: 'Move to measuring position' and 'Move to control position'.

- ▶ Carefully clean sender optics (3), receiver optics (4) and optics for control receiver and damping filter (6) with an optics cloth/cotton swabs.
- ▶ Click “Move to measuring position” to move optic carrier (2) back to the measuring position.
- ▶ Remove the cover from the mounting flange, swivel the electronics unit back and lock with the knurled screws.

Fig. 52: Cleaning optical interfaces (Optic carrier (2) only for DUSTHUNTERS SB100)



► Start the function check by selecting device file “MCU” under tab “Network Scan Assistant / Detected devices”, moving it into the “Project tree” window, changing to the “Adjustment / Function Check Manual” directory and clicking the “Start Manual Function Check” button.



Fig. 53: SOPAS ET menu: MCU/Adjustment/Function Check - Manual

<b>Device Identification</b>		
MCU	Selected variant DUSTHUNTER	Mounting Location SICK
<b>Start Manual Function Check</b>		
Start Manual Function Check		

**+i** The function check can also be started via the LC-Display buttons on the MCU (see “Menu structure”, page 71).

- ▶ Select the “DH SB100” device file in the “Project Tree” window, select the “Diagnosis / Check values” directory and check the contamination value.

Fig. 54: SOPAS ET menu: DH SBxx/Diagnosis/Check values

<b>Device identification</b>	
DH SB100	Mounting location
<b>Measurement of contamination</b>	
Contamination scattered light	0 %
Contamination background light	0 %
Contamination	0 %
<b>Check values</b>	
Zero point	0 %
Span 70%	70 %
Refresh	

- ▶ If the measured values for contamination, zero point and span are within the allowed ranges, save them to the device by clicking the “Refresh” button (“Check values” field); if not, repeat cleaning and check the contamination value again by triggering a renewed function check.

**+i**

- The contamination value can also be displayed on the LC display of the MCU (initiate a function check and select the “SB100/Diagnosis” menu, see “Menu structure”, page 71).
- If the contamination value does not sink below the value for warning (20%) in spite of several cleaning processes, the device is probably defective → contact Endress+Hauser Service.

- ▶ Remove the cover from the mounting flange, swivel the electronics unit back, lock with the knurled screws and resume Measuring mode (see “Resuming measuring operation”, page 77).

### 5.3 Maintenance on the purge air supply

Maintenance work to be carried out:

- Inspecting the entire purge air supply
- Cleaning the filter housing
- Replacing the filter element, if necessary.

The dust load and wear on the filter element depend on the degree of contamination of the intake ambient air. It is therefore not possible to specify precise time intervals for these tasks. We recommend inspecting the purge air supply at short intervals (approx. 2 weeks) and then optimizing maintenance intervals over a longer period of operation.



**NOTE:**

Irregular or insufficient maintenance of the purge air supply can cause it to fail and thus cause severe damage to the sender/receiver unit.

- ▶ Always ensure the purge air supply when the optical component sender/receiver unit is fitted on the duct.
  - ▶ Disassemble the connected components before exchanging damaged purge air hoses (see “Shutdown”, page 85).
- 

#### Inspection

- ▶ Check the running noise of the blower at regular intervals; increases in the noise level can indicate a blower failure.
- ▶ Check that all hoses are secure and free of damage.
- ▶ Check the filter element for contamination.
- ▶ Exchange the filter element when:
  - Severe contamination (deposits on the filter surface) is visible
  - The purge air volume is reduced considerably as compared to operation with a new filter.



The purge air supply does not have to be switched off to clean the filter housing or to replace the filter element, i.e. the components can remain on the duct.

### 5.3.1 Control unit MCU with integrated purge air supply

#### Cleaning or replacing the filter element

- ▶ Open the door of the MCU with the appropriate key.
- ▶ Loosen strap retainer (1) on the filter outlet and pull filter housing (2) off the connection piece.
- ▶ Remove the filter housing.
- ▶ Rotate filter housing cover (3) in the "OPEN" arrow direction and remove the cover.
- ▶ Take out the filter element and replace with a new element.
- ▶ Clean the inside of the filter housing and the filter housing cover with a cloth and brush.

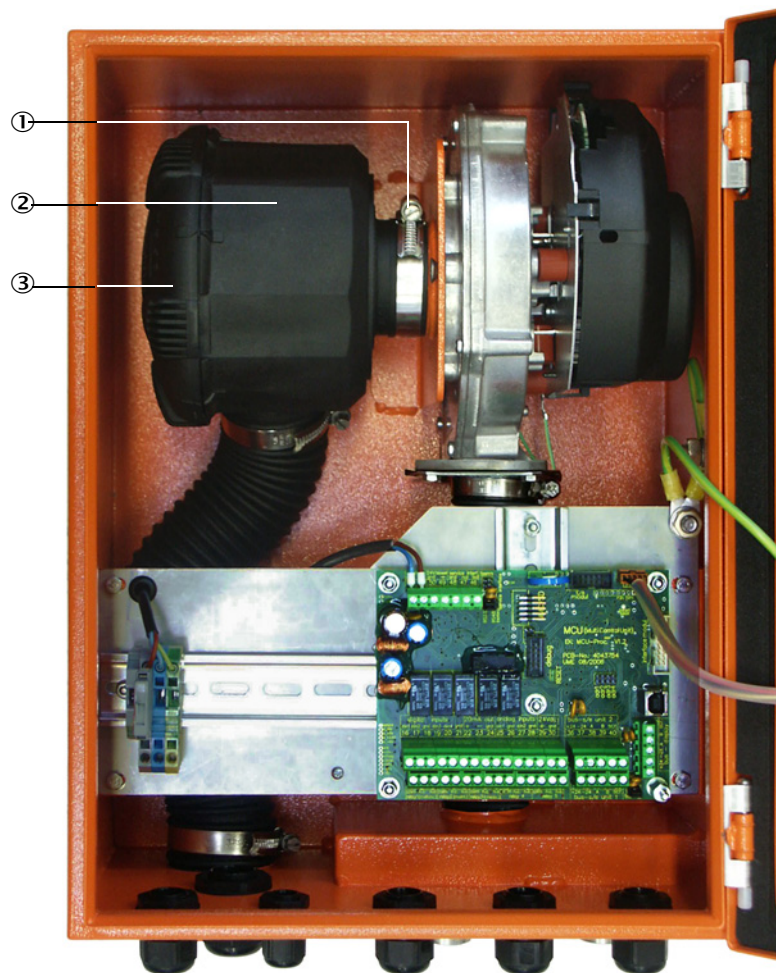


#### NOTICE:

- ▶ For wet cleaning, use only a water-soaked cloth and then dry the parts well.

- ▶ Insert new filter element.  
*Spare part: Filter element C1140, Part No. 7047560*
- ▶ Mount the cover on the filter housing cover and rotate opposite to the direction of the arrow until it clicks into place.
- ▶ Reinstall the filter housing in the control unit.

Fig. 55: Exchanging the filter element for the control unit with purge air supply



- ① Strap retainer
- ② Filter housing
- ③ Filter housing cover

5.3.2 Optional external purge air unit

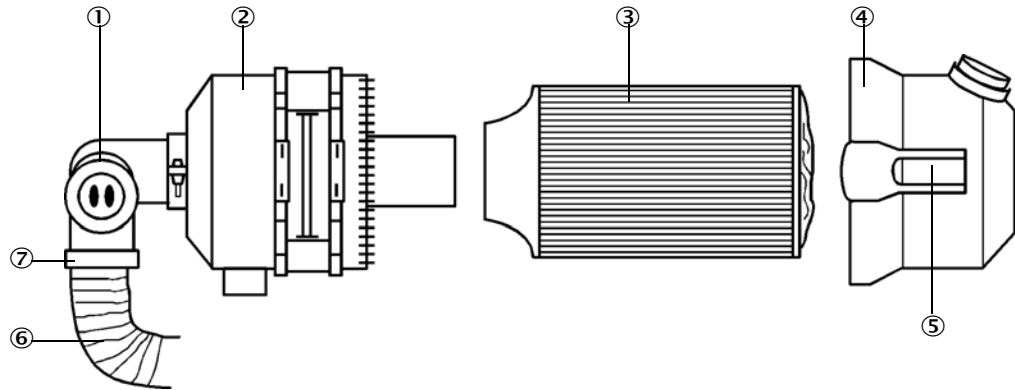


**NOTICE:**

The purge air unit must be serviced at the latest when the low-pressure monitor (7) at the filter outlet triggers (see "Replacing the filter element", page 84).

**Replacing the filter element**

Fig. 56: Replacing the filter element



- ① Low-pressure monitor
- ② Filter housing
- ③ Filter element
- ④ Filter housing cover
- ⑤ Snap lock
- ⑥ Purge air hose
- ⑦ Strap retainer

- ▶ Switch the fan off for a short time.
- ▶ Clean outside of filter housing (2).
- ▶ Loosen strap retainer (7) and clamp purge air hose (6) to a clean location.



**NOTICE:**

▶ Place the end of the hose in a safe place so that foreign objects cannot be sucked in (this will cause irreparable damage to the blower), but do not close the end of the hose! During this time, the purge air entering the purge air connection pieces is unfiltered.

- ▶ Press snap locks (5) together and take off filter housing cover (4).
- ▶ Remove filter element (3) with twisting-pulling movements.
- ▶ Clean the inside of the filter housing and the filter housing cover with a cloth and brush.



**NOTICE:**

▶ For wet cleaning, use only a water-soaked cloth and then dry the parts well.

- ▶ Insert the new filter element with twisting-pressing movements.  
*Spare part:* Filter element Micro-Top element C11 100, Part No. 5306091
- ▶ Mount the filter housing cover, ensuring that it is aligned correctly with the housing, and snap the snap locks into place.
- ▶ Reconnect the purge air hose to the filter outlet using the hose clamp.
- ▶ Switch the fan on again.

## 5.4 Shutdown

The measuring system must be shut down:

- Immediately when the purge air supply fails
- If the equipment is to be put out of operation for a longer period of time (as from approx. 1 week)

**NOTE:**

Never switch off or interrupt the purge air supply when the sender/receiver unit is fitted on the duct.

---

**Work to be performed**

- ▶ Loosen the connection line to the MCU.
- ▶ Dismantle the sender/receiver unit from the duct.

**WARNING: Hazard through gas and hot parts**

- ▶ Observe the relevant safety regulations as well as the safety notices in Section 1 during all disassembly work.
  - ▶ Only remove the sender/receiver unit on equipment with hazard potential (higher internal duct pressure, hot or aggressive gases) when the equipment is at a standstill.
  - ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.
  - ▶ Secure switches that should not be switched on again for safety reasons with signs and safeguards to prevent unintentional switching.
- 
- ▶ Close off the flange with tube with a blind plug.
  - ▶ Switch off the purge air supply
  - ▶ Loosen the hose clamps and pull the purge air hose off the connections and secure the hose ends against dirt and moisture
  - ▶ Disconnect the MCU control unit from the supply voltage.

**Storage**

- ▶ Store dismantled device parts in a clean, dry location.
- ▶ Use suitable auxiliary means to protect the connection line plug connectors against dirt and moisture.
- ▶ Secure purge air hoses against penetration by dirt and moisture.

## 6 Troubleshooting

### 6.1 General

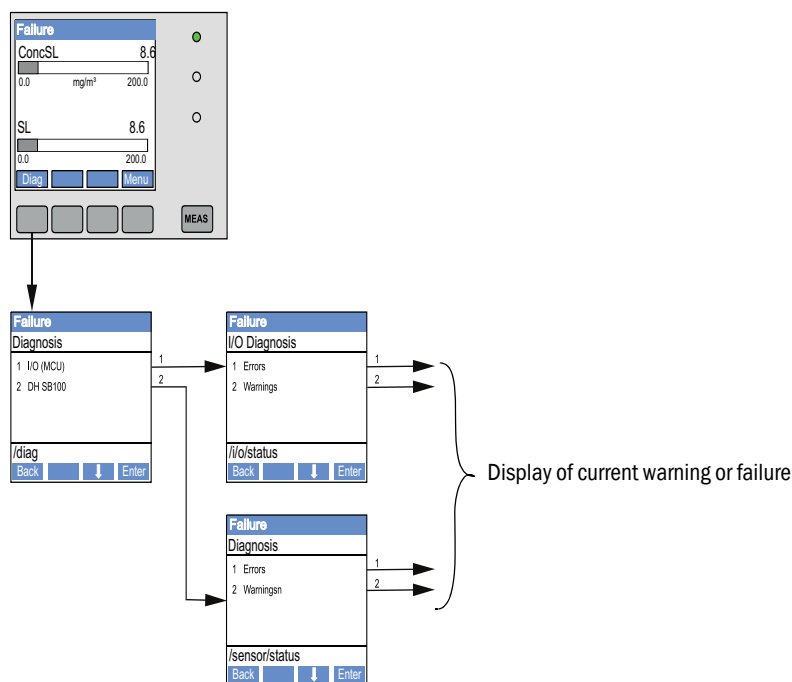
Warning or error messages are output as follows:

- On the MCU, the respective relay is switched on (see “Standard connection”, page 45).
- Maintenance requ.” or “Failure” is displayed in the status bar of the LC-Display. In addition, the respective LED goes on (“MAINTENANCE REQUEST” for warnings, “FAILURE” for errors).

After pressing the button “Diag”, possible causes are shown as short information in the menu “Diagnosis” after selecting the device (“MCU” or “DH SB50/DH SB100”).

Figure 57

Display on the LC-Display



“Diagnosis / Error messages/warnings” provides detailed information on the current device state. To display, connect the measuring system to SOPAS ET and start the device file “DH SB50”, “DH SB100” or “MCU”.

Move the mouse to the respective message to display more details on the significance of individual messages in a separate window. Clicking on the display shows a short description of possible causes and corrections under “Help” (see “Warning and error messages in SOPAS ET”, page 87, ).

Warning messages are output when internal limits for individual device functions/components are reached or exceeded which can then lead to erroneous measured values or an imminent failure of the measuring system.



Warning messages do not imply a malfunction of the measuring system. The current measured value continues to be output on the analog output.



See the Service Manual for a detailed description of messages and options for clearance.

## 6.2 Sender/receiver unit

### Malfunctions

Symptom	Possible cause	Action
<ul style="list-style-type: none"> <li>LEDs of the sender/receiver are not on</li> </ul>	<ul style="list-style-type: none"> <li>No supply voltage</li> <li>Connection line not connected correctly or defective</li> <li>Defective plug connector</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check plug connectors and lines.</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>

### Warning and error messages in SOPAS ET

Fig. 58: SOPAS ET menu: DH SB100/Diagnosis/Error messages/Warnings

The screenshot displays the SOPAS ET interface for DH SB100. It is divided into three main sections:

- Device identification:** Includes a dropdown menu for 'DH SB100', an empty input field, and a 'Mounting location' input field.
- Error:** Features an 'Error selection' dropdown set to 'Actual'. Below it are several radio button options: EEPROM, Checksum parameter, Version parameter, Checksum factory settings, Version Factory settings, Filter measurement threshold value, Span test, Monitor signal, Overflow measured value, Overflow constant light, Power supply (24V) < 18V, Power supply (24V) > 30V, Laser current to high, Contamination, and Detection of final position. A 'Reset of saved errors' button is at the bottom.
- Warnings:** Features a 'Warnings selection' dropdown set to 'Actual'. Below it are radio button options: Default factory parameter, Power supply (24V) to low, Power supply (24V) to high, Laser current to high, Reference value, and Contamination. A 'Reset of saved warnings' button is at the bottom.

Current warning or error messages, or earlier messages stored in the error memory, can be shown by selecting “actual” or “memory” in the “Error selection” or “Warnings selection” window.

- Display of error or warning: With LED symbol
- Description of error or warning: In the description field of SOPAS ET

Malfunctions listed below can probably be cleared onsite.

Message	Significance	Possible cause	Action
Contamination (only for DUSTHUNTER SB100)	Current reception intensity is lower than the allowable limit value (see “Technical data”, page 92)	<ul style="list-style-type: none"> <li>Deposits on the optical interfaces</li> <li>Unclean purge air</li> </ul>	<ul style="list-style-type: none"> <li>▶ Clean the optical surfaces (see “Maintenance on the sender/receiver unit”, page 79).</li> <li>▶ Check purge air filter (see “Maintenance on the purge air supply”, page 82)</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>
Span test	Deviation from nominal value above ±2%	Sudden changes in measuring conditions during determination of control values	<ul style="list-style-type: none"> <li>▶ Repeat the function check.</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>
Overflow constant light	Constant light signal > 3.5 V; measured values invalid	Extraneous light share too high	▶ Reduce incidence of extraneous light (select different fitting location, sun protection, ...).

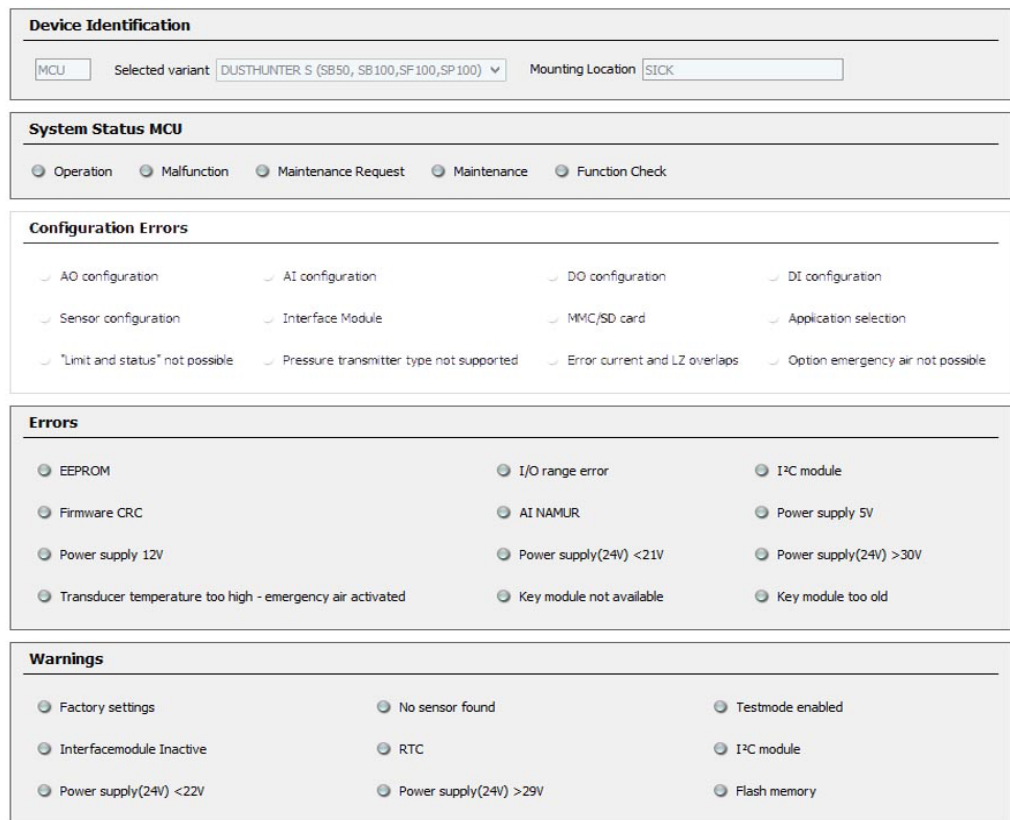
### 6.3 MCU control unit

#### 6.3.1 Malfunctions

Symptom	Possible cause	Action
No display on the LCD	<ul style="list-style-type: none"> <li>No supply voltage</li> <li>Connection line to LC-Display not connected or damaged</li> <li>Defective fuse</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check voltage supply.</li> <li>▶ Check the connection line</li> <li>▶ Exchange fuse.</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>

#### 6.3.2 Warning and error messages in the SOPAS ET program

Fig. 59: SOPAS ET menu: MCU/Diagnosis/Error messages/Warnings



- Display of error or warning: With LED symbol
- Description of error or warning: In the description field of SOPAS ET



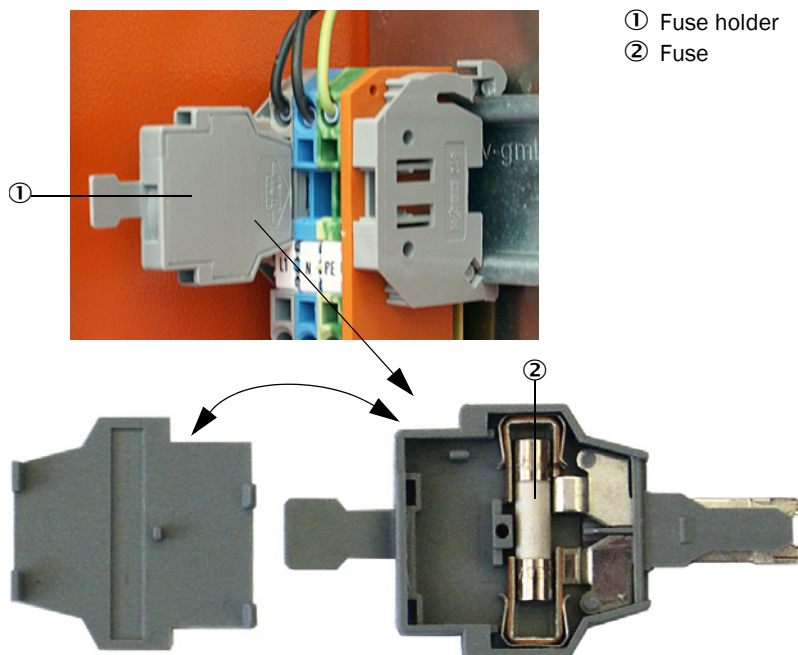
Malfunctions listed below can probably be cleared onsite.

Message	Significance	Possible cause	Action
AO configuration	the number of available and configured analog outputs is not identical.	<ul style="list-style-type: none"> <li>No parameters set for AO</li> <li>Connection error</li> <li>Module failure</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check configuration (see <a href="#">“Setting the analog outputs parameters”, page 60</a>).</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>
AI configuration	Number of available and configured analog inputs not identical.	<ul style="list-style-type: none"> <li>No parameters set for AI</li> <li>Connection error</li> <li>Module failure</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check configuration (see <a href="#">“Setting the analog inputs parameters”, page 62</a>).</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>
Interface Module	No communication via Interface module	<ul style="list-style-type: none"> <li>No parameters set for module</li> <li>Connection error</li> <li>Module failure</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check configuration (see <a href="#">“Setting the Ethernet module parameters”, page 69</a>).</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>
No sensor found	Sender/receiver unit was not recognized	<ul style="list-style-type: none"> <li>Communication problems on RS485 line</li> <li>Supply voltage problems</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check system settings.</li> <li>▶ Check the connection line</li> <li>▶ Check voltage supply.</li> <li>▶ Contact Endress+Hauser Customer Service.</li> </ul>
Variant configuration error	MCU setting does not match the connected sensor	Sensor type has been changed	<ul style="list-style-type: none"> <li>▶ Correct application settings (see <a href="#">“Assigning the MCU to the sender/receiver unit”, page 57</a>).</li> </ul>
Testmode enabled	MCU in “Test” mode.		<ul style="list-style-type: none"> <li>▶ Deactivate “System Test” mode (“Maintenance” directory)</li> </ul>

### 6.3.3 Replacing the fuse

- ▶ Control unit MCU must be disconnected from the power supply and potential-free.
- ▶ Open the door of the MCU, remove and open fuse holder (1).
- ▶ Replace the defective fuse (2) (see “Miscellaneous”, page 101).
- ▶ Close and attach the fuse holder.
- ▶ Close the door and connect power voltage.

Fig. 60: Replacing the fuse



## 7 Specifications

### 7.1 Compliances

The technical design of this device complies with the following EU directives and EN standards:

- EU Directive: LVD (Low Voltage Directive)
- EU Directive: EMC (Electromagnetic Compatibility)

Applied EN standards:

- EN 61010-1, Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326, Electrical equipment for measurement technology, control technology and laboratory use - EMC requirements
- EN 14181, Stationary source emissions - Quality assurance of automated measuring systems

#### Electrical protection

- Insulation: Protection class 1 according to EN 61010-1.
- Insulation coordination: Measuring category II according to EN 61010-1.
- Contamination: The device operates safely in an environment up to degree of contamination 2 according to EN 61010-1 (usual, not conductive contamination and temporary conductivity by occasional moisture condensation).
- Electrical energy: The wiring system to the power supply voltage of the system must be installed and fused according to the relevant regulations.

#### Approvals

DUSTHUNTER SB is performance-tested according to EN 15267 and may be used for continuous emission monitoring in plants requiring approval and plants according to EU Directives.

## 7.2 Technical data

Measuring Parameters	
Measured variable	Scattered light intensity Dust concentration output in mg/m <sup>3</sup> after gravimetric comparison measurement
Measuring range (freely adjustable)	Smallest range: 0 ... 20 mg/m <sup>3</sup> DUSTHUNTER SB50 0 ... 10 mg/m <sup>3</sup> DUSTHUNTER SB100 Largest range: 0 ... 200 mg/m <sup>3</sup> Higher on request
Limit values for corrosive gas composition .	HCl: 10 mg/Nm <sup>3</sup> DUSTHUNTER SB50 SO <sub>2</sub> : 800 mg/Nm <sup>3</sup> DUSTHUNTER SB100 SO <sub>3</sub> : 300 mg/Nm <sup>3</sup> NOx: 1000 mg/Nm <sup>3</sup> HF: 10 mg/Nm <sup>3</sup>
Measurement uncertainty <sup>1)</sup>	±2% of upper measuring range value
Response time	1 ... 600 s; freely selectable
Measuring Conditions	
Gas temperature (above dew point)	-40 ... 600 °C
Sample gas pressure	-50 hPa ... +2 hPa MCU-P control unit -50 hPa... +30 hPa Optional external purge air unit
Internal duct diameter	> 500 mm
Ambient temperature	-40 ... +60 °C Sender/receiver unit, MCU-N control unit -40 ... +45 °C MCU-P control unit, intake temperature for purge air
Function Check	
Automatic self-test	Linearity, drift, aging, contamination (only DUSTHUNTER SB100) Contamination limit values (only DUSTHUNTER SB100): As from 20% warning, as from 30% failure
Manual linearity check	Using a reference filter
Output Signals	
Analog output	0/2/4 ... 20 mA, max. load 750 Ω; resolution 10 bits; electrically isolated 1 input on DUSTHUNTER SB50, 3 inputs on DUSTHUNTER SB100; Optional, 2 further analog outputs on DUSTHUNTER SB50 (see "MCU control unit", page 19)
Relay output	5 potential-free outputs (changeover contacts) for status signal; load 48 V, 1 A
Input signals	
Analog input	2 inputs 0...20 mA (standard; without electric isolation); resolution 10 bits 2 further analog inputs when using an Analog Input module (option, see "MCU control unit", page 19)
Digital input	4 inputs to connect potential-free contacts (e.g., for external maintenance switch, triggering function check);
Communication Interfaces	
USB 1.1, RS 232 (at terminals)	For measured value inquiries and software updates per PC/laptop using the operating program
RS485	For connection of sender/receiver unit
Optional Interface module	To communicate with the Host PC, optional for Profibus, Ethernet
Power supply	
MCU control unit	Voltage supply: 90...250 V AC, 47...63 Hz; opt. 24 V DC ± 2 V Power consumption: Max. 15 W without purge air supply Max. 70 W with purge air supply
Sender/receiver unit	Voltage supply: 24 V from MCU control unit Power consumption: Max. 4 W
Optional external purge air unit (with blower 2BH13)	Voltage supply (3 ph): 200 ... 240 V/345...415 V at 50 Hz; 220...275 V/380...480 V at 60 Hz Rated current: 2.6 A/Y 1.5 A Motor rating: 0.37 kW at 50 Hz; 0.45 kW at 60 Hz
MCU connection line	Shielded lines with twisted pairs (e.g., UNITRONIC LIYCY (TP) 2 x 2 x 0.5 mm <sup>2</sup> from LAPPKabel; 1 pair of wires for RS 485, 1 pair of wires for power supply; not suitable for underground laying).

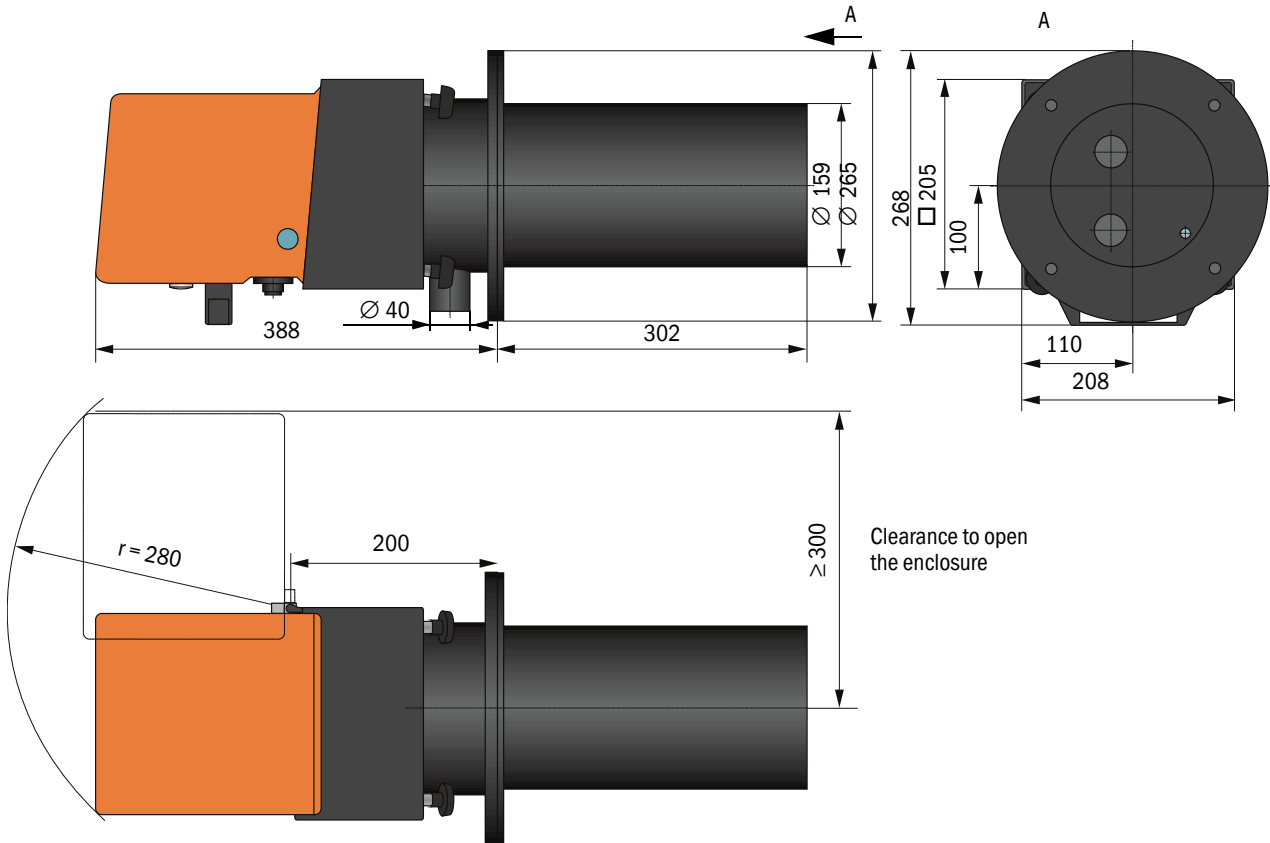
Weight		
Sender/receiver unit	9 kg 10 kg	DHSB-T0 DHSB-T1
MCU control unit	13.5 kg 3.7 kg	MCU-P MCU-N
Optional external purge air unit	14 kg	
Miscellaneous		
Protection class	IP 66 IP 54	Sender/receiver unit, MCU control unit Optional external purge air unit
Connection line length	5 m, 10 m	Other lengths on request
Purge air hose length	5 m, 10 m	Other lengths on request
Laser	Degree of protection 2; capacity < 1 mW; wavelength between 640 nm and 660 nm	
Purge air feed volume	Max. 20 m <sup>3</sup> /h Max. 63 m <sup>3</sup> /h	MCU-P control unit Optional external purge air unit

1): In temperature range - 20 °C ... +50 °C

### 7.3 Dimensions, part Nos.

All measures are specified in mm.

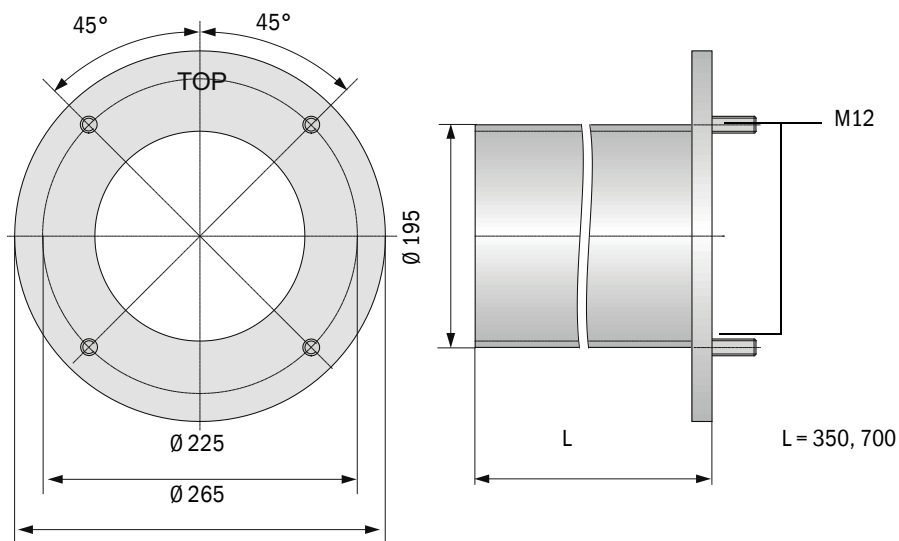
Fig. 61: Sender/receiver unit



Designation	Part No.
Sender/receiver unit DHSB-T00 without contamination measurement, immersion depth 400 mm	1043909
Sender/receiver unit DHSB-T01 without contamination measurement, immersion depth 800 mm	1046851
Sender/receiver unit DHSB-T10 with contamination measurement, immersion depth 400 mm	1043910
Sender/receiver unit DHSB-T11 with contamination measurement, immersion depth 800 mm	1046850

7.3.1 Flange with tube

Fig. 62: Flange with tube

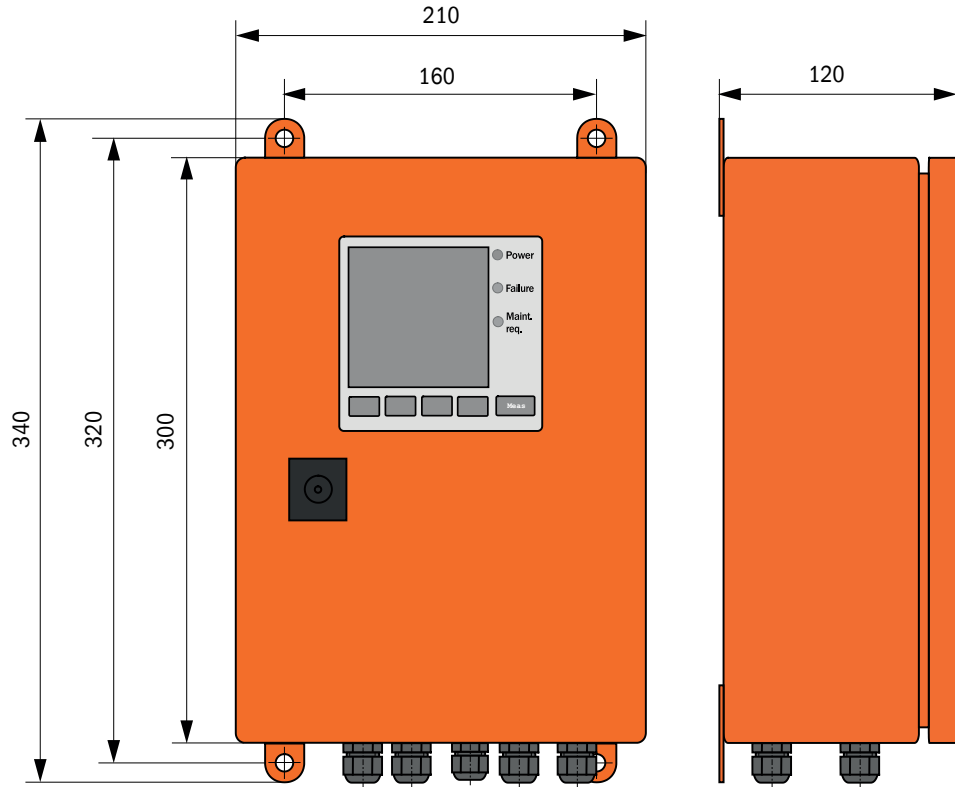


Designation	Part No.
Flange with tube, DN195, length 350 mm, St37	2046526
Flange with tube, DN195, length 700 mm, St37	2046492
Flange with tube, DN195, length 350 mm, 1.4571	2047288
Flange with tube, DN195, length 700 mm, 1.4571	2047287

7.3.2 MCU control unit

MCU-N control unit and MCU remote control unit without integrated purge air supply

Fig. 63: MCU-N control unit



Designation	Part No.
Control unit MCU-NWONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, without purge air unit, without display [1]	1040667
Control unit MCU-NWODN00000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, without purge air unit, with display 1)	1040675
Control unit MCU-N2ONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, without purge air unit, without display 1)	1040669
Control unit MCU-N2ODN00000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, without purge air unit, with display 1)	1040677
Control unit MCU-NWONN01000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, without purge air unit, without display 1)	1044496
Control unit MCU-NWODN01000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, without purge air unit, with display [2]	1045001
Control unit MCU-N2ONN01000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, without purge air unit, without display 1)	1044999
Control unit MCU-N2ODN01000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, without purge air unit, with display 2)	1045003
MCU remote control unit without power supply unit	2075567
MCU remote control unit with power supply unit	2075568

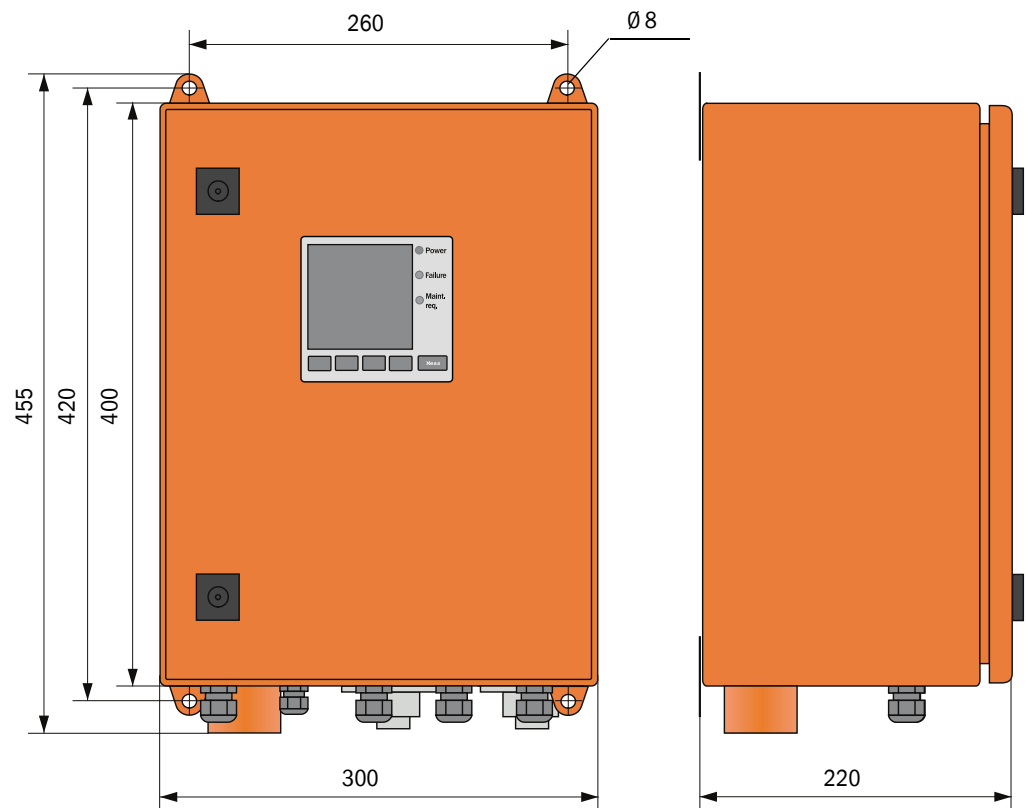
[1] Only for DUSTHUNTER SB50

[2] For DUSTHUNTER SB50 and SB100



**MCU-P control unit with integrated purge air supply**

Fig. 64: MCU-P control unit



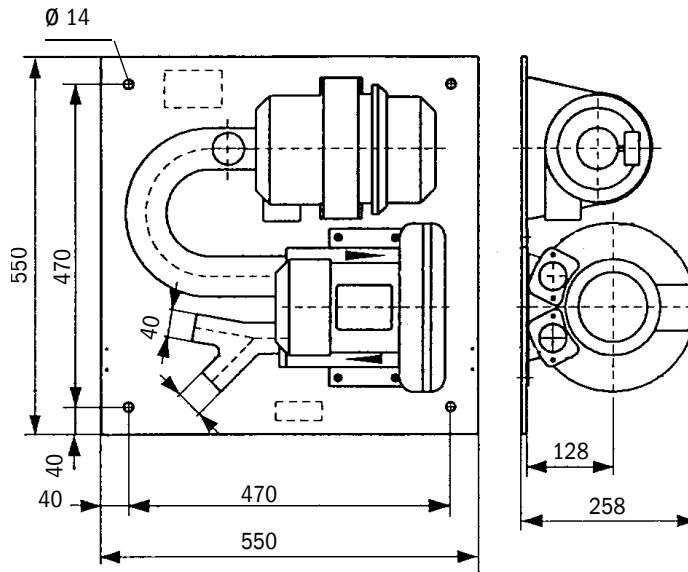
Designation	Part No.
Control unit MCU-PWONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, with purge air unit, without display [1]	1040668
Control unit MCU-PWODN00000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, with purge air unit, with display 1)	1040676
Control unit MCU-P2ONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, with purge air unit, without display 1)	1040670
Control unit MCU-P2ODN00000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, with purge air unit, with display 1)	1040678
Control unit MCU-PWONN01000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, with purge air unit, without display <sup>1)</sup>	1044497
Control unit MCU-PWODN01000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, with purge air unit, with display [2]	1045002
Control unit MCU-P2ONN01000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, with purge air unit, without display 1)	1045000
Control unit MCU-P2ODN01000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, with purge air unit, with display 2)	1045004

[1]Only for DUSTHUNTER SB50

[2]For DUSTHUNTER SB50 and SB100

7.3.3 Optional external purge air unit

Fig. 65: Optional external purge air unit

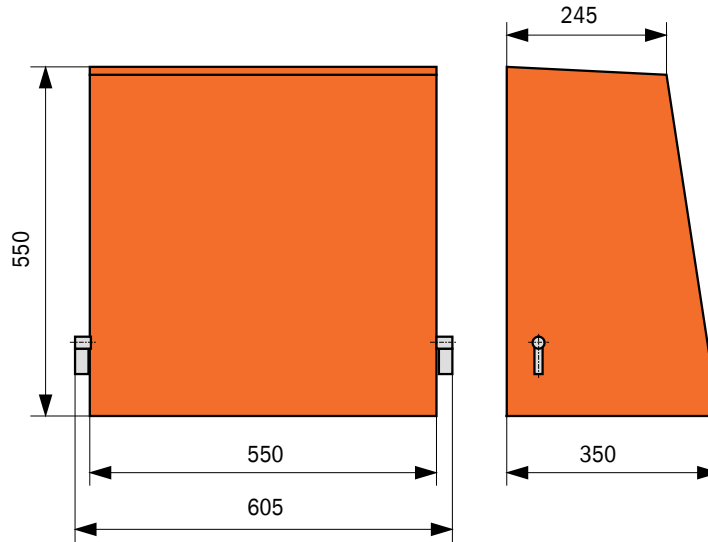


Designation	Part No.
Purge air unit with blower 2BH13 and purge air hose, length 5 m	1012424
Purge air unit with blower 2BH13 and purge air hose, length 10 m	1012409

7.3.4 Weatherproof covers

**Weatherproof cover for external purge air unit**

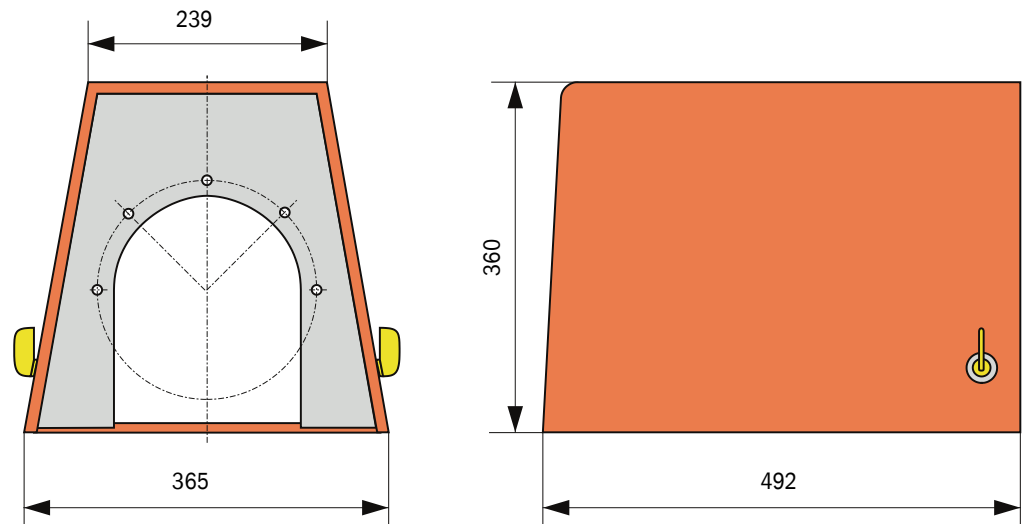
Fig. 66: Weatherproof cover for external purge air unit



Designation	Part No.
Weatherproof cover for purge air unit	5306108

**Weatherproof cover for sender/receiver unit**

Fig. 67: Weatherproof cover for sender/receiver unit



Designation	Part No.
Weatherproof cover flange k225	2048657

## 7.4 Accessories

### 7.4.1 Line sender/receiver unit - MCU

Designation	Part No.
Connection line, length 5 m	7042017
Connection line, length 10 m	7042018

### 7.4.2 Purge air supply

Designation	Part No.
Non-return valve DN40	2035098
Hose clamp D32-52	5300809
Purge air heater with enclosure for fitting outdoors 230 V AC, 50/60 Hz, 3000 W, 1 ph	2021514
Purge air heater with enclosure for fitting outdoors 120 V AC, 50/60 Hz, 2200 W, 1 ph	2021513

### 7.4.3 Assembly parts

Designation	Part No.
Assembly kit	2048677

### 7.4.4 Device check accessories

Designation	Part No.
Check filter set	2042339
Optic carrier for linearity test DUSTHUNTER SB50	2048281

**7.4.5 Options for MCU control unit**

Designation	Part No.
Analog input module, 2 channels, 100 W, 0/4...22 mA, electrically isolated	2034656
Analog output module, 2 channels, 500 W 0/4 ... 22 mA, Electrically isolated per module, resolution 12 bit	2034657
Module carrier (for one each AI or AO module)	6028668
Connection line for optional I/O modules	2040977
Interface, Profibus module DP V0	2048920
Interface module Ethernet type 1	2055719

**7.4.6 Miscellaneous**

Designation	Part No.
Cover	2052377
Seal	4055065
Fuse set T 2 A (for MCU with power voltage supply)	2054541
Fuse set T 4 A (for MCU with 24 V supply)	2056334

**7.5 Consumable parts for 2-years operation****7.5.1 MCU with integrated purge air supply**

Designation	Number	Part No.
Filter element C1140	4	7047560
Optics cloth	4	4003353

**7.5.2 Optional external purge air unit**

Designation	Number	Part No.
Filter element Micro-Topelement C11 100	4	5306091
Optics cloth	4	4003353

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