

# Operating Instructions

## DUSTHUNTER SP30

Dust Concentration Monitor



**Described product**

Product name: DUSTHUNTER SP30  
DUSTHUNTER SP30 LM Leakage monitor for filter check  
DUSTHUNTER SP30 DM Dust monitor for filter check

**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 fitted on the duct may only be installed/removed when the equipment is at a standstill.
- 

#### 1.1.2 Hazard through electrical equipment

**WARNING: Danger through power voltage**

The DUSTHUNTER SP30 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 SP30 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 SP30 measuring system is not approved for use in potentially explosive atmospheres.



## 1.4 Responsibility of user

### 1.4.1 General information

#### Designated users

The DUSTHUNTER SP30 measuring system 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.

#### Keeping 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 a 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:**

If no quick-release shutters are available:

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 failures**

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

- Warning indications
- 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 failures 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 failures 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 failures.
- 

**Electric connection**

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

## 2 Product description

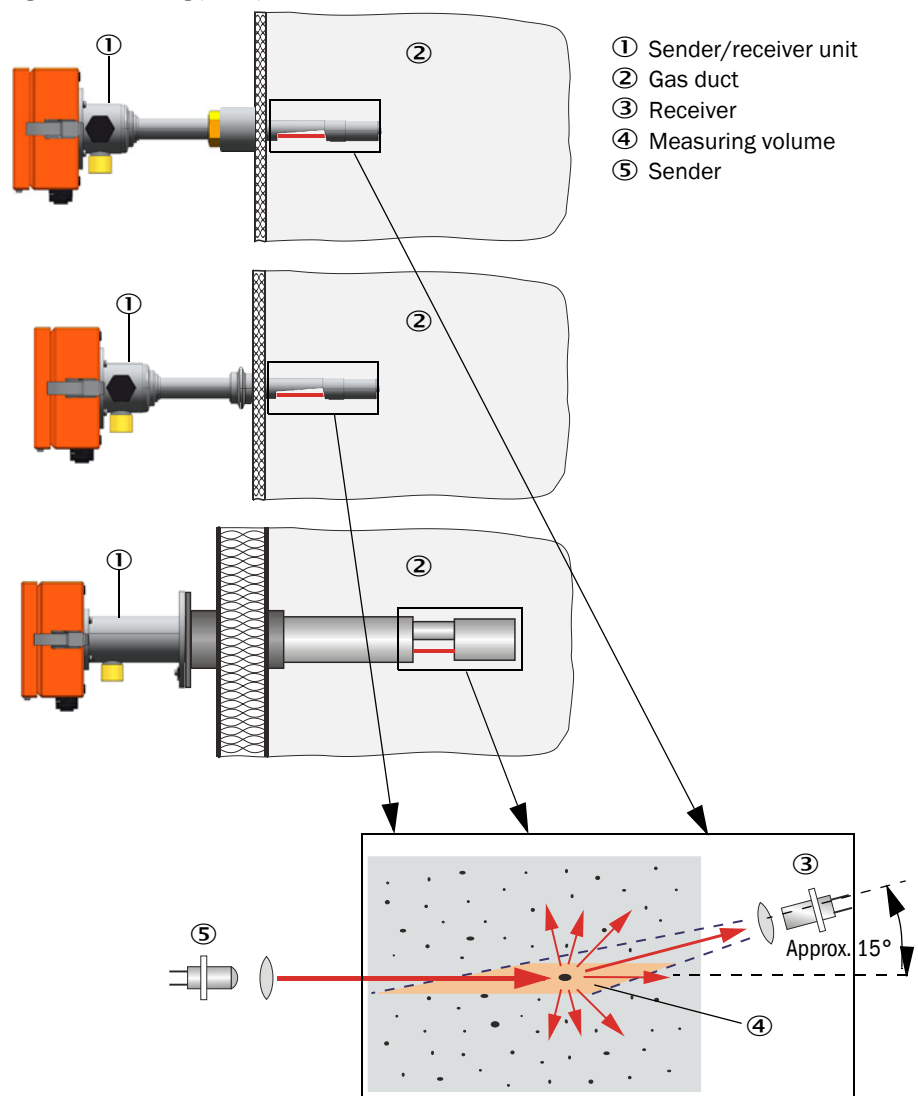
### 2.1 Measuring principle, measured variables

#### 2.1.1 Functional principle

The measuring system works according to the scattered light measurement principle (forward 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



### 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

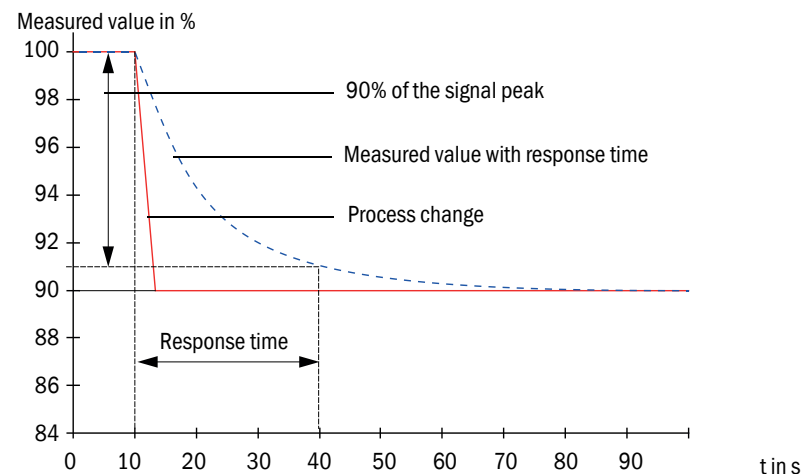
$$c = cc2 \cdot SI^2 + cc1 \cdot SI + cc0$$

(Entry, see [“Calibration for dust concentration measurement”](#), page 60; 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 0.1 and 600 s. As the response time increases, transient measured value fluctuations and interruptions are damped stronger and stronger which “smooths out” the output signal.

Fig. 2: Response time



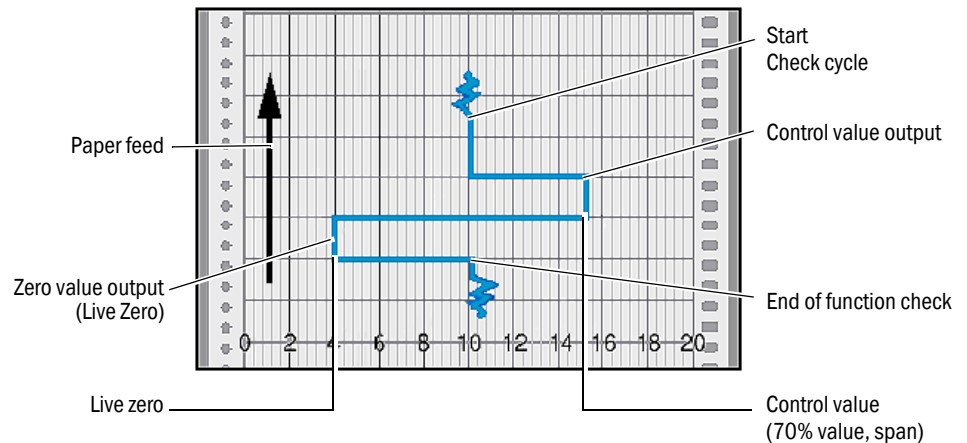
### 2.1.3 Function check

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 [“Setting application parameters”](#), page 51). 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 failure occur.

During the check cycle of the DUSTHUNTER SP30, the linearity of the measurement is checked. The check cycle takes approx. 200 s and comprises:

- Approx. 20 s measurement of zero and control value
- Output of the determined values for 180 s (can be deactivated via SOPAS ET)

Fig. 3: Function check output on a plotter



- Activate the “Enable analog output check values” to output control values via the analog output (see “Setting application parameters”, page 51).
- 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.
- A function check is not started automatically when the measuring system is in “Maintenance” mode.
- 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). An error signal “Zero value” 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 “Span test” 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.

## 2.2 Device components

### Device variants

- Measuring system DUSTHUNTER SP30 for use in ducts with a diameter larger than 150 mm. The DUSTHUNTER SP30 can be fitted to a flange with quick-release fastener (Tri-Clamp®) or to the duct with a 1" thread.
- Measuring system DUSTHUNTER SP30 for use in ducts with a diameter larger than 250 mm. Fitting on the duct is done with a flange with tube.

Measuring system DUSTHUNTER SP30 comprises the components:

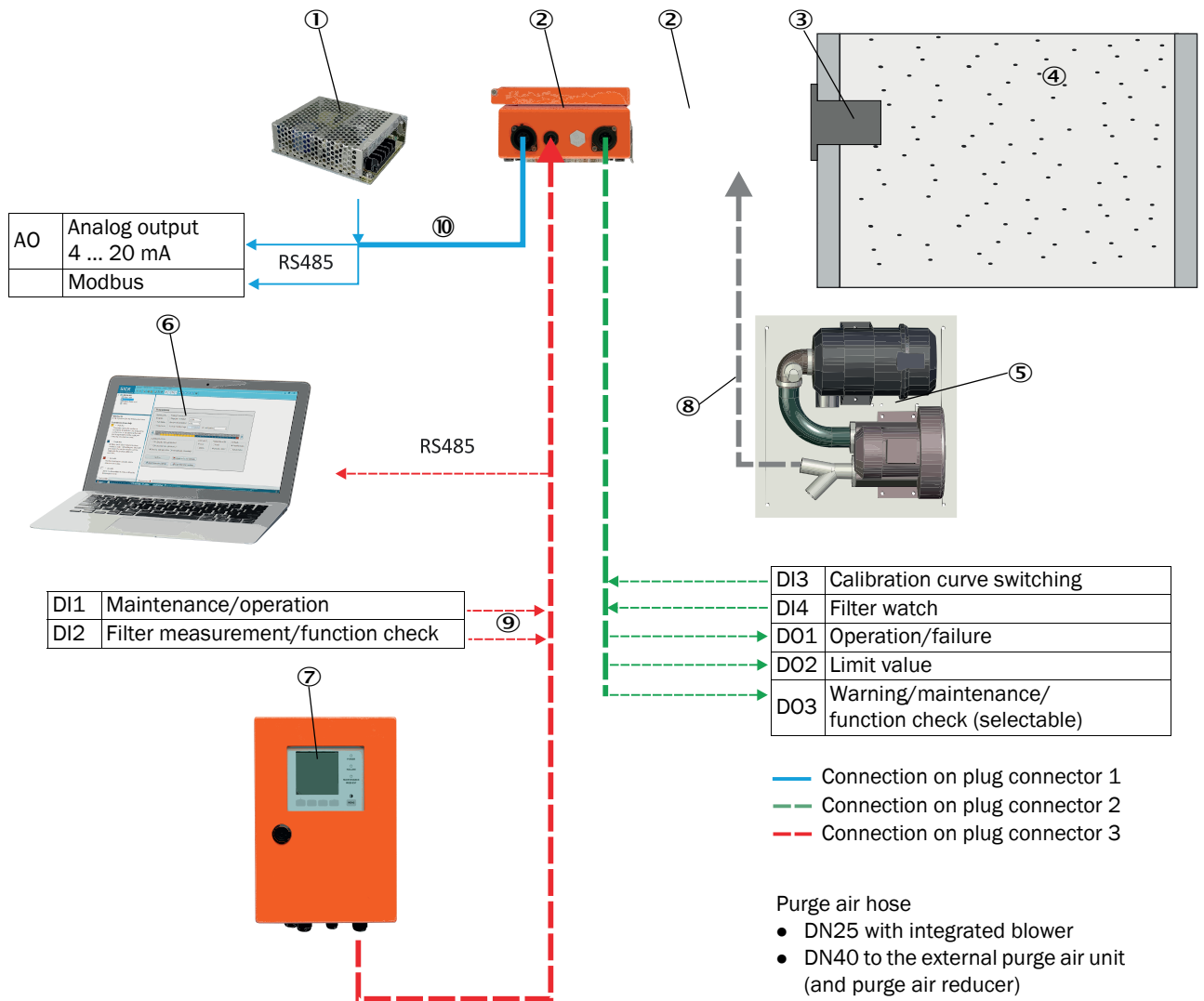
- Sender/receiver unit
- Connection line for connecting the sender/receiver unit to 24V voltage supply onsite and output of data on the analog output and Modbus via RS485 interface
- Assembly components: Flange with tube, 1" thread or flange with quick-release fastener Tri-Clamp
- Option MCU control unit (see Section 3.3.4 in Operating Instructions SP100)
- Option Purge air unit:

Internal duct pressure [hPa ]	Connection and supply components	
	Purge air	Voltage
-50 ... +10	Option with integrated purge air unit	24 V DC (from device)
-50 ... +30	Optional external purge air unit + purge air reduction	Onsite <sup>[1]</sup>
-50 ... +100	Adapter for instrument air <sup>[2]</sup>	---

[1] External purge air available in various variants matching the respective local network, see ["Installing the purge air supply", page 39](#)

[2] Instrument air onsite (free of dust, oil, moisture, non-corrosive)

Fig. 4: Device components DUSTHUNTER SP30 (flange version shown)



- ① External voltage supply\*
- ② Sender/receiver unit
- ③ Flange with tube \*\*
- ④ Duct
- ⑤ External purge air unit (option)

- ⑥ Operating and parameter program SOPAS ET
- ⑦ MCU (option)\*\*\*
- ⑧ Purge air hose
- ⑨ Digital inputs
- ⑩ Digital outputs, analog outputs

\* Not required when optional MCU is present  
 \*\* Tri-Clamp and 1" thread version not shown

\*\*\* Information on request

### 2.2.1 Sender/receiver unit

The sender/receiver unit comprises two main subassemblies:

- **Electronics unit**

It contains the optical and electronics subassemblies to send and receive the light beam as well as to process and evaluate the signals.

- **Measuring probe**

The measuring probe is available in different versions and nominal lengths and defines the device variant (see [“Device configuration”, page 24](#)).

Data transfer and voltage supply (24 V DC) of the sender/receiver unit run via a shielded line with 7 wires with plug connector. A second connection with a RS485 interface is available for service work or connection of an MCU. A third connection allows additional functionality. Detailed information on assignment, see [“Interfaces and I/O”, page 19](#).

Clean air to cool the probe and keep the optical surfaces clean is fed via a **purge air connection**.

The current device state (operation/failure, maintenance/maintenance request) is signaled on the rear side of the enclosure (green = operation, red = failure, yellow = maintenance) and is available via Modbus and viewable in SOPAS.

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

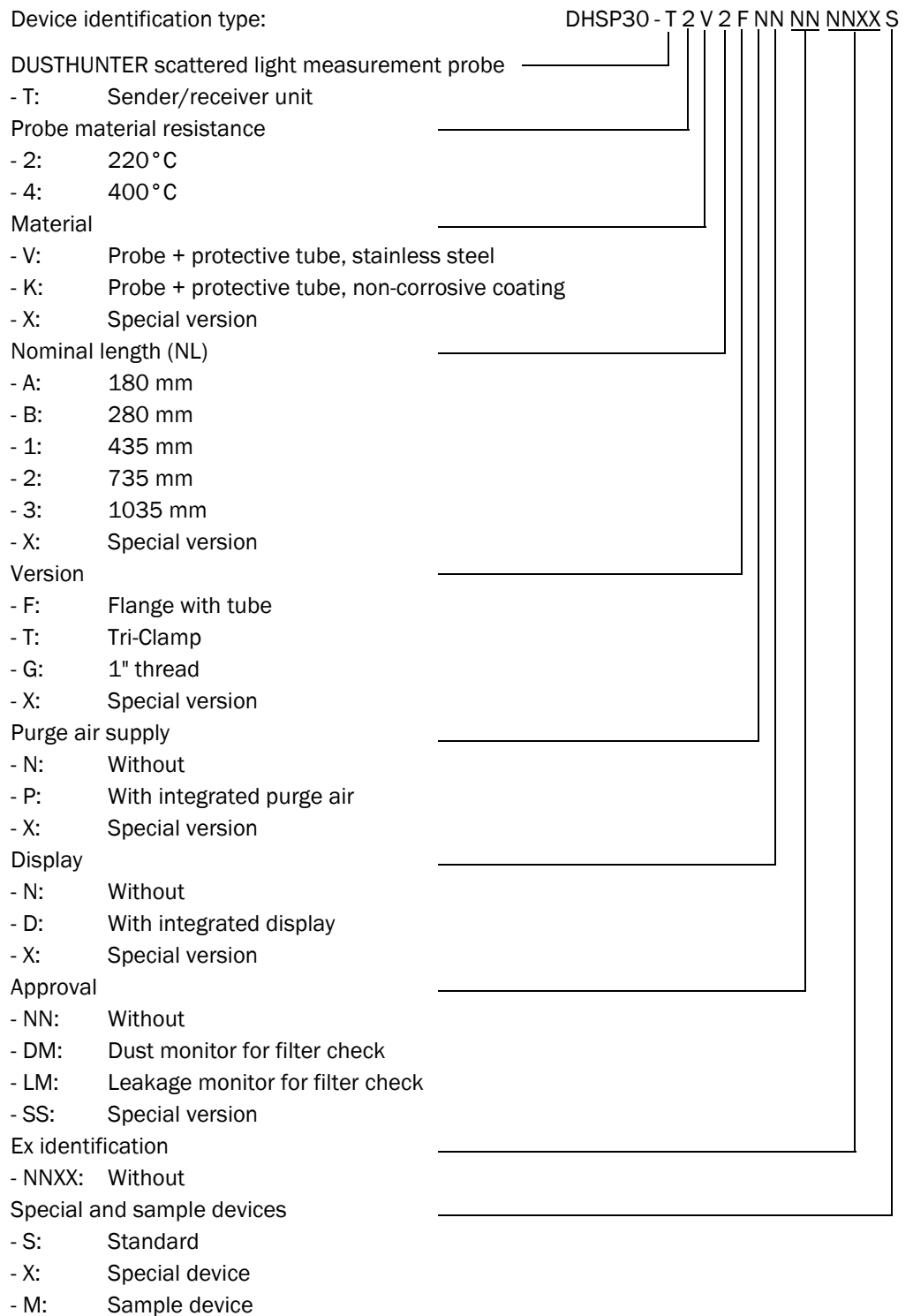
#### Basic variants

Type	Description
DUSTHUNTER SP30	TÜV type examination
DUSTHUNTER SP30 LM	Leakage monitor for filter check (according to DIN EN 15859)
DUSTHUNTER SP30 DM	Dust monitor for filter check (according to DIN EN 15859)



**Type code**

The various configuration options are defined by the basic variant and the type code which is made up as follows:



**Interfaces of the sender/receiver unit**

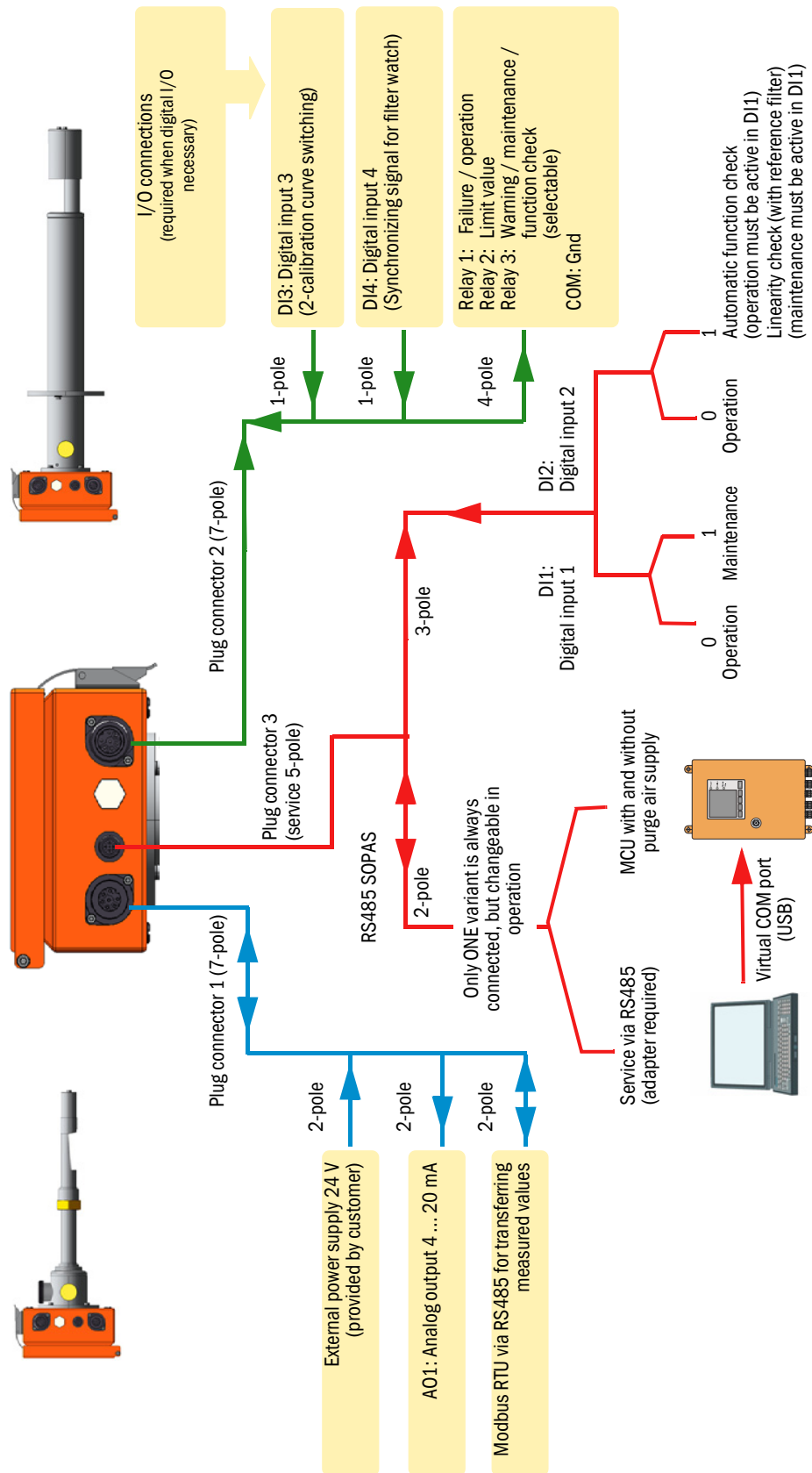
The following interfaces are available directly on the sender/receiver unit.

Analog output (1x) 0/2/4 ... 20 mA	Relay outputs Contact load 48 V, 1 A;	Digital input	Service / MCU Interface
for output of the measured variable dust concentration	for output of the status signals: <ul style="list-style-type: none"> <li>• Operation/failure</li> <li>• Limit value</li> <li>• Warning/maintenance/function check (selectable)</li> </ul>	e.g. for selecting maintenance, function check, linearity test, calibration curve switching, filter watch synchronizing signal	for configuration via the operating program SOPAS ET or connection of an MCU

**NOTE:**

Always use a weatherproof cover for use outdoors. This prevents rainwater entering (see [“Weatherproof covers”, page 92](#)).

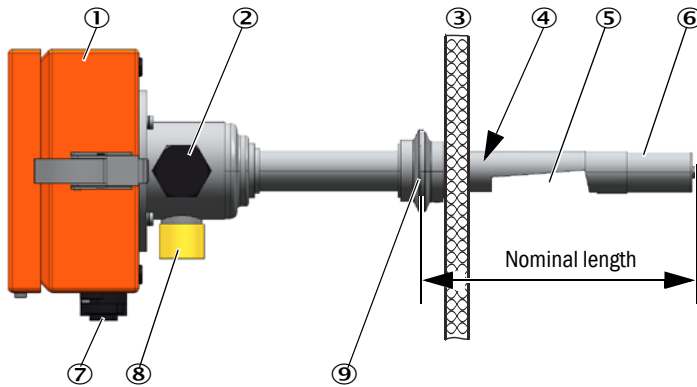
Fig. 5: Interfaces and I/O



Device variants

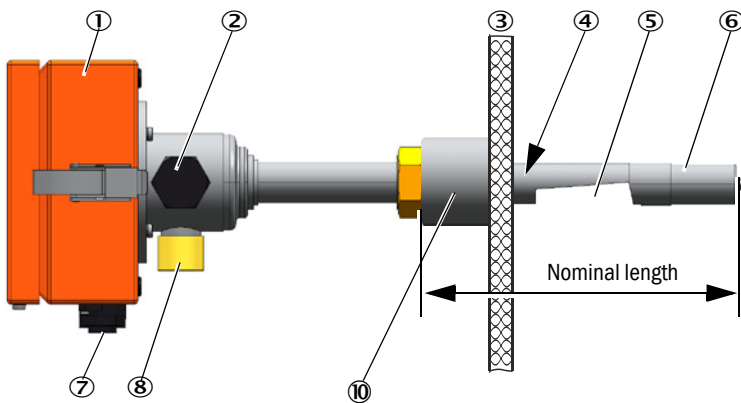
Fig. 6: Sender/receiver unit device variants

Sender/receiver unit, standard version Tri-Clamp, nominal length 180 / 280 mm

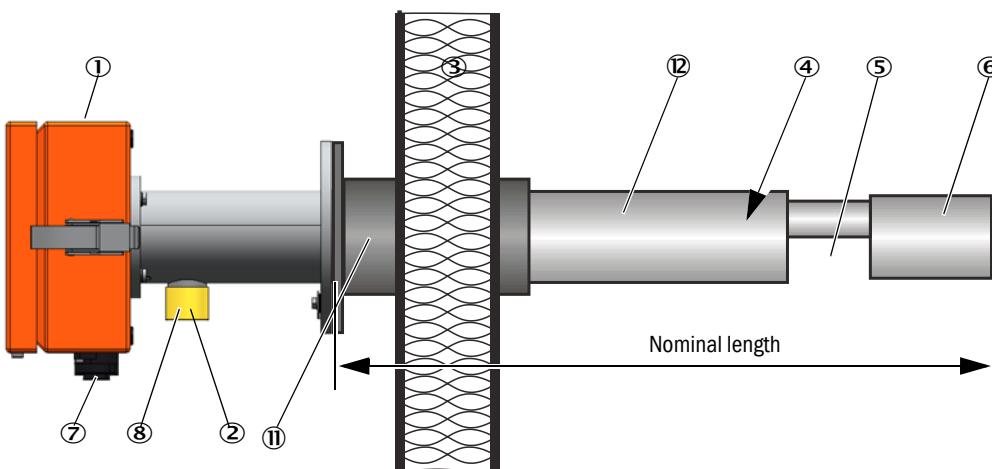


- ① Electronics unit
- ② Cleaning opening for sender optics
- ③ Duct wall
- ④ Measuring probe
- ⑤ Measuring opening
- ⑥ Probe head with receiver optics
- ⑦ Voltage supply connections, digital input and outputs, analog outputs, connection for connection cable to MCU (option)
- ⑧ Purge air connection
- ⑨ Tri-Clamp
- ⑩ 1" thread
- ⑪ Flange with tube
- ⑫ Protective tube

Sender/receiver unit, standard version, 1" thread, nominal length 180 / 280 mm



Sender/receiver unit, standard version, flange with tube, nominal length 435 / 735 mm



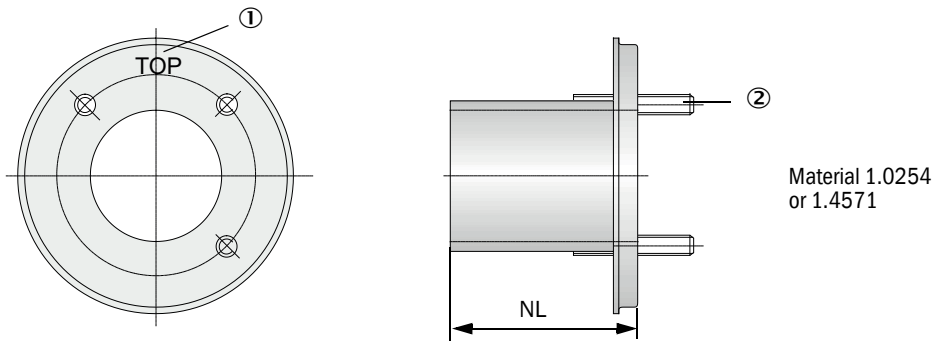
**2.2.2 Components for assembly of sender/receiver unit**

**2.2.2.1 Flange with tube**

The flange with tube is available in different steel grades and dimensions (see “Fitting elements”, page 89). Selection depends on the wall and isolation thickness of the duct wall (→ nominal length) and the duct material.

Fig. 7: Flange with tube

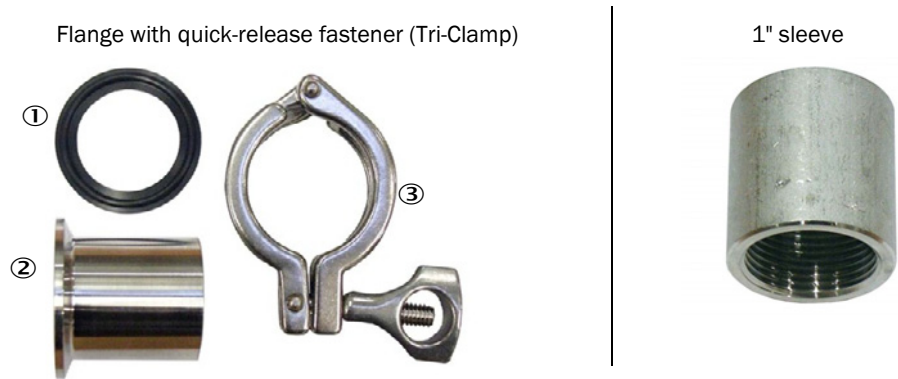
Standard version



- ① Marking for assembly position
- ② Securing bolt

**2.2.2.2 Flange with quick-release fastener / 1" thread**

Fig. 8: Components for assembly



- ① Seal
- ② Tri-Clamp flange
- ③ Quick-release fastener

### 2.2.3 Optional integrated purge air unit

The DUSTHUNTER SP30 with integrated purge air unit can be used up to 10 hPa overpressure.

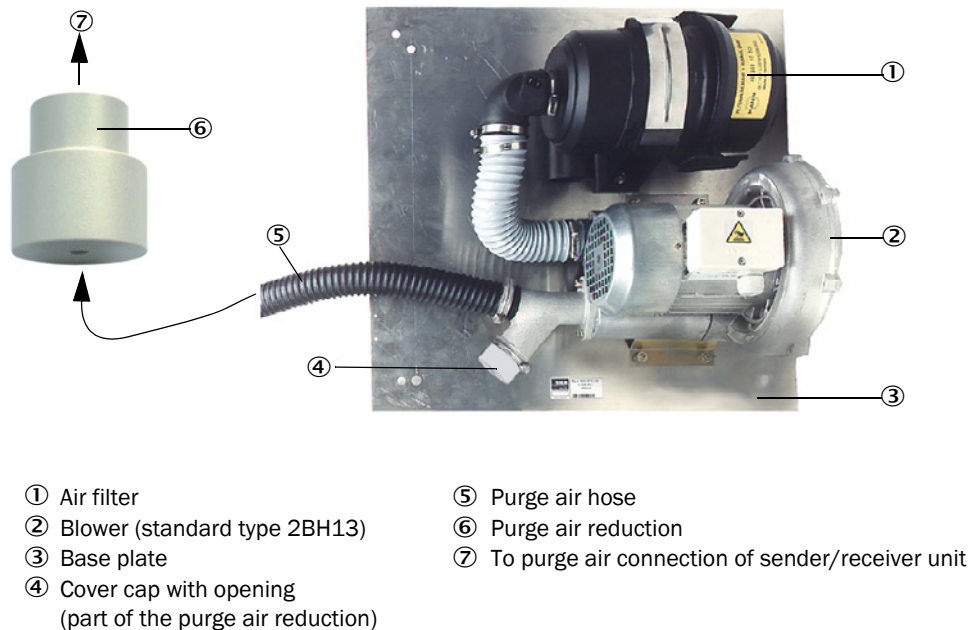
This version has the following characteristics:

- Automatic blower regulation of the purge air flow between 2 ... 5 m<sup>3</sup>/h
- LEDs on the rear side signal when the purge air flow is too low or high (see “Device displays / connections”, page 38) and via SOPAS ET (see “Warnings”, page 72).
- LEDs on the rear side signal “Warning” in case of contaminated air filter (see “Device displays / connections”, page 38) and via SOPAS ET (see “Warnings”, page 72).

### 2.2.4 Optional external purge air unit

Do not use the integrated purge air unit when the internal duct pressure exceeds +10 hPa (see “Optional integrated purge air unit”, page 22). Use the optional external purge air unit in this case (see “Optional external purge air unit”, page 91). 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. 9: Optional external purge air unit with purge air reduction

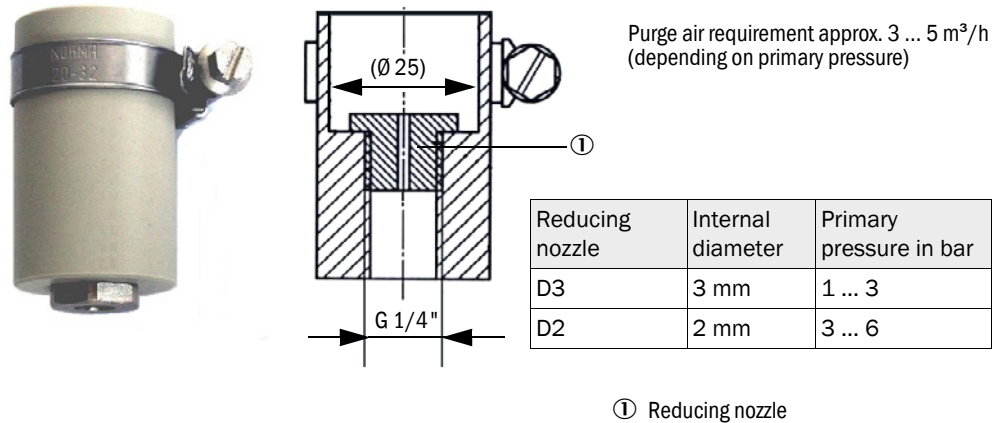


A weatherproof cover is required for use outdoors (see “Weatherproof covers”, page 92).

**2.2.5 Adapter for instrument air supply**

The sender/receiver unit can also be operated with instrument air instead of the integrated purge air or an external purge air unit. An adapter with G 1/4" thread and internal reducing nozzle is available to connect the instrument air (fixing on purge air connection of the sender/receiver unit).

Fig. 10: Adapter for instrument air supply



**2.2.6 Installation accessories**

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

- Purge air reduction (see “Optional external purge air unit with purge air reduction”, page 22) to connect the DN40 mm purge air hose when using the optional external purge air unit.
- Weatherproof cover  
A weatherproof cover is mandatory when using the sender/receiver unit outdoors (see “Weatherproof covers”, page 92).

**2.2.7 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 42).



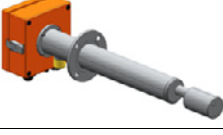
**2.2.8 Test equipment for linearity test**

A linearity test can serve to check the correct measurement function. 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 and instructions.

## 2.3 Device configuration

The device components required for a measuring system depend on the respective application conditions. The following Table should serve to assist you in your selection.

### 2.3.1 Sender/receiver unit

DUSTHUNTER device version	Nominal length	Duct diameter	Wall thickness with insulation	Process temperature	Process pressure	
DUSTHUNTER SP30 1" thread 	180 mm	> 150 mm	Max. 10 mm	≤ 220 °C	-50 ... 10 hPa: Version with integrated purge air unit  -50 ... 30 hPa: Version with external purge air unit  -50 ... 100 hPa: Version with instrument air (customer)	
	280 mm		Max. 100 mm			
DUSTHUNTER SP30 Tri-Clamp 	180 mm		Max. 10 mm			
	280 mm		Max. 100 mm			
DUSTHUNTER SP30 Flange version 	435 mm		> 250 mm			Max. 150 mm
	735 mm		> 300 mm			Max. 400 mm

Each version can be operated with an optional integrated purge air unit (see [“Optional integrated purge air unit”](#), page 22).



- The measuring opening (see [“Sender/receiver unit device variants”](#), page 20) does not have to be in the center of the duct.
- Limit values for corrosive gas composition (reference values, lower values should be used for mixtures of several components):
  - HCl: 10 mg/Nm<sup>3</sup>
  - SO<sub>2</sub>: 800 mg/Nm<sup>3</sup>
  - SO<sub>3</sub>: 300 mg/Nm<sup>3</sup>
  - NO<sub>x</sub>: 1000 mg/Nm<sup>3</sup>
  - HF: 10 mg/Nm<sup>3</sup>

## 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 (adapter, see [“Accessories for linearity test”](#), page 93) or Ethernet interface (option).

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

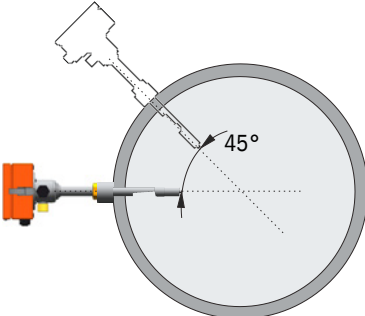
SOPAS ET is delivered on the product CD.



### 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  For rectangular ducts: $d_h$ = 4x cross-section divided by circumference	<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"/>
	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	Do not fit vertically on horizontal or slanted ducts; max. measuring axis angle to horizontal 45°  	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	Avoid/reduce vibrations through adequate measures	<input type="checkbox"/>
	Ambient conditions	Limit values according to Technical Data	Plan a weatherproof cover for use of devices with integrated purge air unit outdoors. If necessary: <ul style="list-style-type: none"> <li>Provide 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 +10 hPa with integrated purge air supply Above +10 hPa to +30 hPa, optional external purge air unit As from +30 hPa to +100 hPa, with instrument air	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> <li>If necessary, change the position of the suction filter of the integrated purge air to a more suitable location.</li> </ul>	<input type="checkbox"/>

Task	Requirements		Work step	<input checked="" type="checkbox"/>
Select device components	Internal duct diameter, duct wall thickness with isolation	Nominal length of sender/receiver unit, flange with tube / flange with quick-release fastener (Tri-Clamp) / 1" thread	Select components according to Configuration Table (see <a href="#">“Device configuration”, page 24</a> ); nominal length of the sender/receiver unit only as long as necessary (measurement in duct center not required). If necessary, plan additional measures to fit the flange with tube (see <a href="#">“Fitting the flange with tube”, page 27</a> )	<input type="checkbox"/>
	Internal duct pressure	Type of purge air supply		
	Gas temperature	Sender/receiver unit type (up to 220 °C)		
	Gas composition	Probe with special coatings (on request) for corrosive gases		
	Fitting locations	Line and purge air hose lengths		
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	Plan external supply	Power requirements according to Technical Data (see <a href="#">“Technical Data”, page 81</a> )	Plan adequate 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 optional MCU control unit
- ▶ Fitting the optional external purge air unit



**WARNING:**

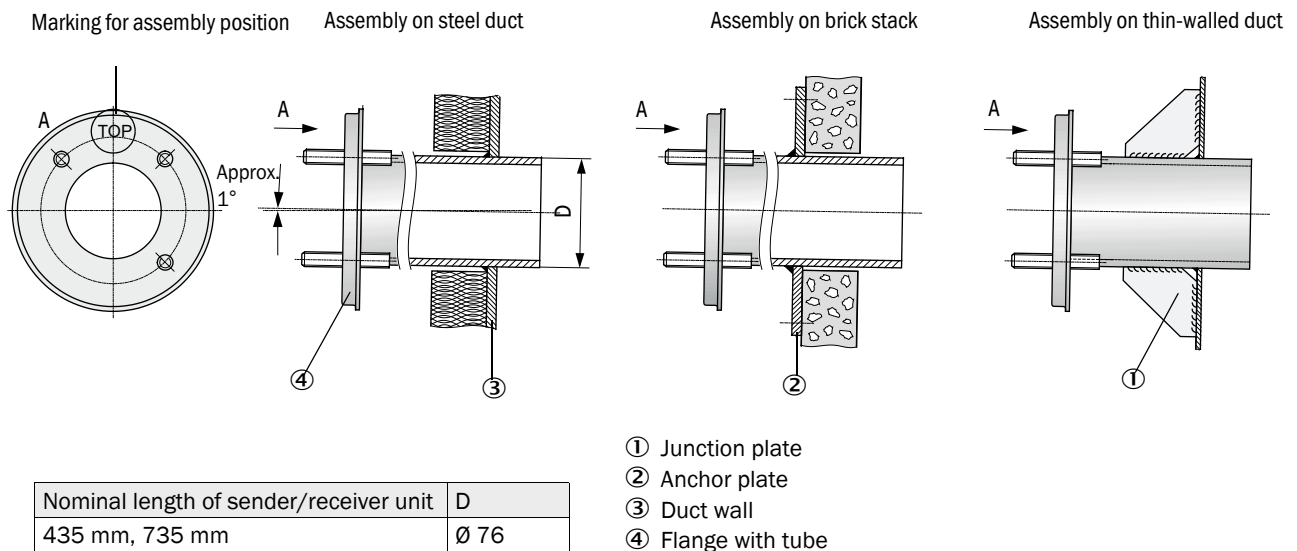
- ▶ Observe the relevant safety regulations as well as the safety notices during all assembly work: see [“Important information”, page 7](#).
- ▶ Consider the equipment weight specifications when planning the mounting brackets.
- ▶ Only carry out assembly work on equipment with hazard potential (hot 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 undeclared dimensions are specified in mm.

#### 3.2.1 Fitting the flange with tube

Fig. 11: Fitting the flange with tube (standard version shown)



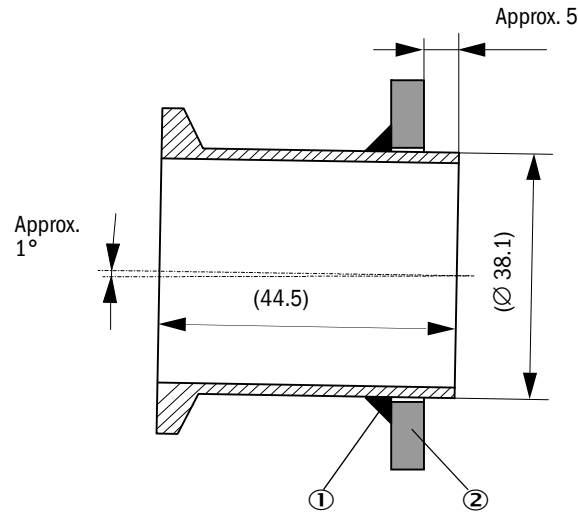
**NOTE:**

The tube length must suit the planned sender/receiver unit depending on the relation between gas temperature and nominal length (see [“Flange with tube”, page 21](#)).

- ▶ Do not shorten tubes.

### 3.2.2 Fitting Tri-Clamp welding clamps

Fig. 12: Fitting Tri-Clamp welding clamps

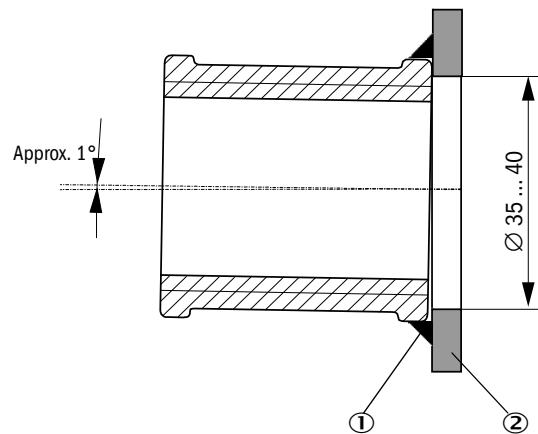


Assembly on brick stack or thin-walled duct analog to flange with tube

- ① Welding seam
- ② Duct wall

### 3.2.3 Fitting 1" sleeve

Fig. 13: Fitting 1" sleeve

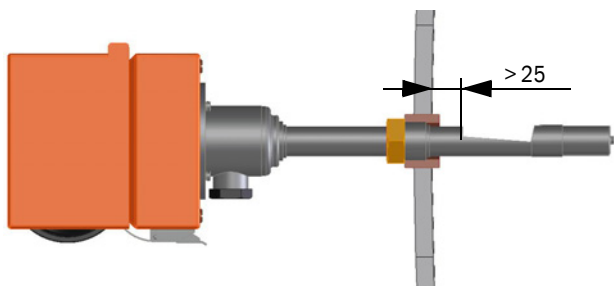


Assembly on brick stack or thin-walled duct analog to flange with tube

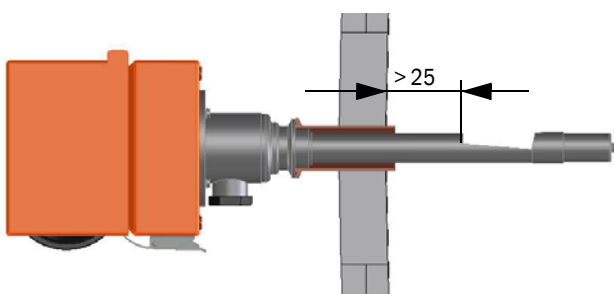
- ① Welding seam
- ② Duct wall

3.2.4 Fitting dimensions in the duct

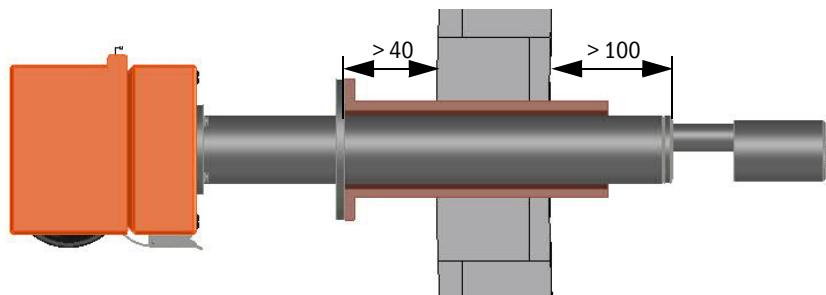
DUSTHUNTER SP30 Tri-Clamp / 1" thread, nominal length 180 mm



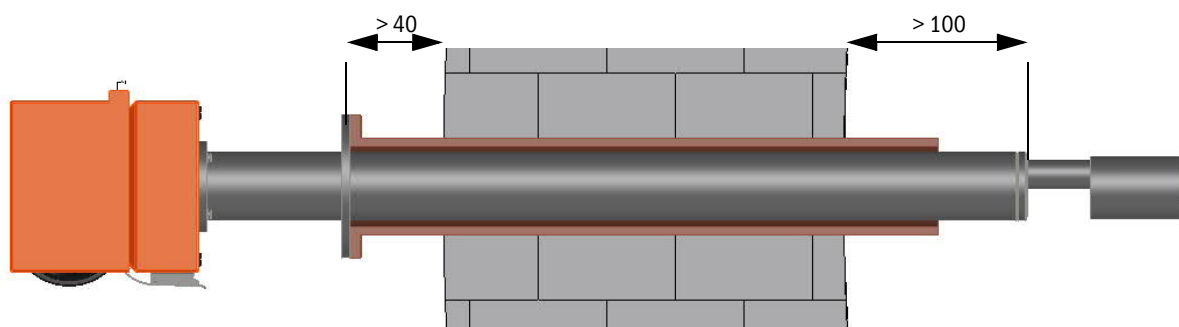
DUSTHUNTER SP30 Tri-Clamp / 1" thread, nominal length 280 mm



DUSTHUNTER SP30 Flange with tube, nominal length 435 mm



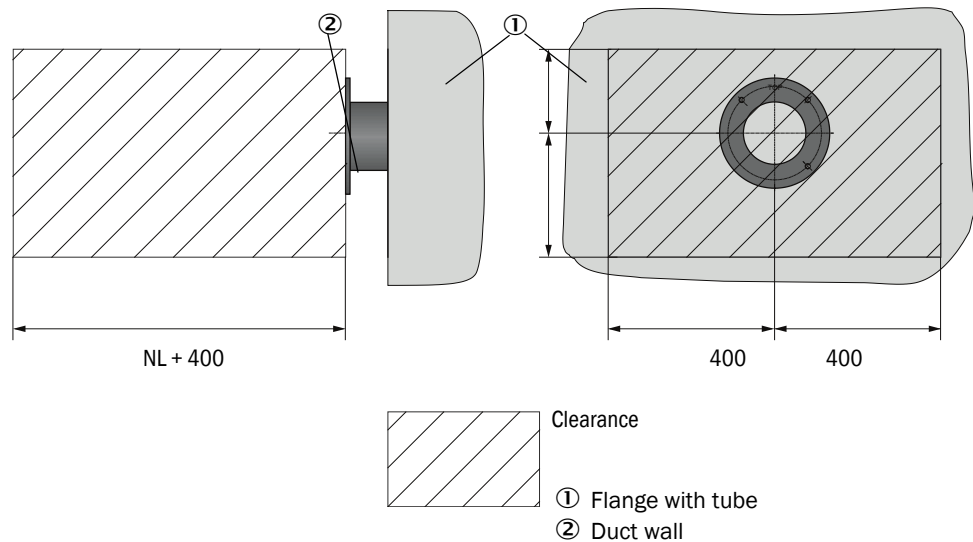
DUSTHUNTER SP30 Flange with tube, nominal length 735 mm



**3.2.5 Work to be performed**

- ▶ Measure the fitting location and mark the assembly location and provide sufficient clearance to fit and remove the sender/receiver unit.

Fig. 14: Clearance for the sender/receiver unit



- ▶ Remove insulation (when fitted)
- ▶ Cut suitable openings in the duct wall; bore large enough hole in brick or concrete stacks (pipe diameter, flange tube Fig. 11, pipe diameter, Tri-Clamp welding clamps Fig. 12, pipe diameter, 1" sleeve Fig. 13)



**NOTE:**

- ▶ Do not let separated pieces fall into the duct.

- ▶ Insert the fitting element in the opening and weld it on.



- Insert the fitting element in the opening slanting slightly downwards (1 to 3°, see Fig. 11, Fig. 12, Fig. 13) (1" sleeve centered on the opening), so that any condensate that may collect in the duct can drain off.
- Insert the flange with tube in the opening so that the "Top" marking points upwards (see Fig. 11).
- Weld the fitting element on using an anchor plate for brick or concrete stacks, insert junction plates for thin-walled ducts (see Fig. 11).

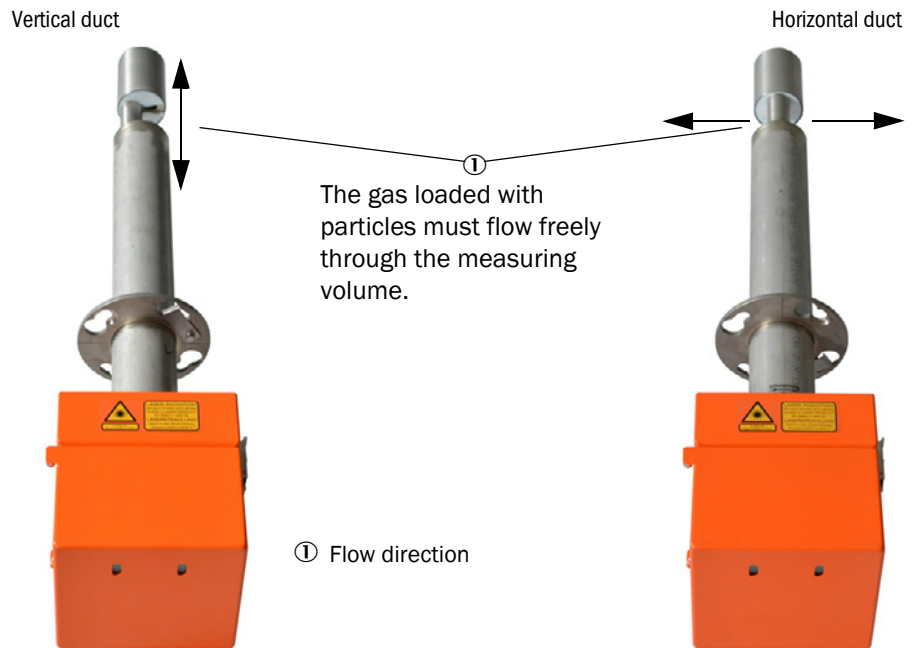
- ▶ Close off the flange opening after fitting to prevent gas escaping.

**3.2.6 Adapting to the flow direction**

Prior to commissioning, adjust the device to the flow direction in the duct to ensure correct measurement.

Ensure the sample gas can flow freely through the measuring volume. Additionally, ensure the connections and plug connectors are always on the underside of the installed device.

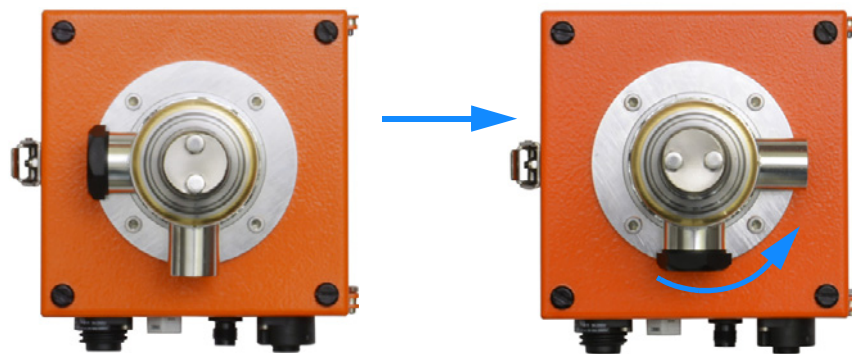
*Fig. 15: Probe alignment*



The sender/receiver unit is delivered for vertical fitting as standard when the duct direction (horizontal or vertical) is not specified in the order. Rotate the sender/receiver unit 90° when fitting on a horizontal duct.

**Modification variant DUSTHUNTER SP30 Tri-Clamp / 1" thread**

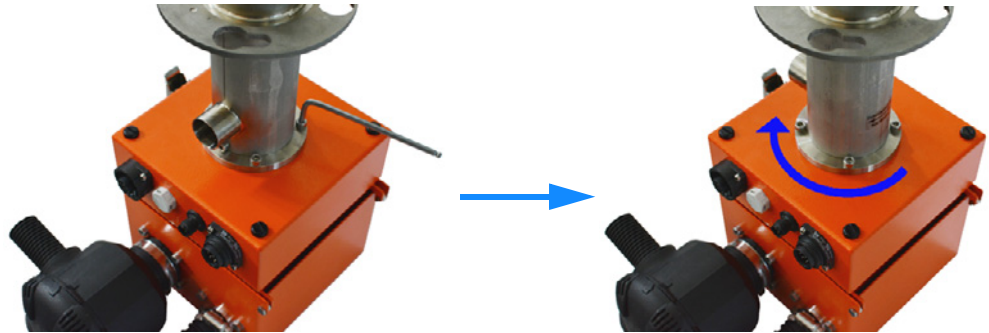
- ▶ Loosen 2 flange screws, remove the other two (see Fig.).



- ▶ Turn the probe 90° to the left.
- ▶ Mount the 4 flange screws again.

**Modification variant DUSTHUNTER SP30 flange with tube**

- ▶ Remove 4 flange screws.



- ▶ Turn the probe 90° to the right.
- ▶ Mount the 4 flange screws again.

**3.2.7 Fitting the components for the purge air supply**

Mount the air filter and hose connection prior to fitting and commissioning.

Feed the purge air directly into the DN25 purge air inlet of the device for operation without integrated purge air unit. Use a purge air reducer DN40-25 when using the external purge air unit 2BH1300 (Item no.: 7047538, see “Purge air supply”, page 93).



- ▶ Tightly fit the hose connection to the purge air unit. Secure the purge air hose with strap retainers on both sides.  
Operation of the device without purge air supply (even for a short time) can lead to a device defect.
- ▶ Secure the air filter with a strap retainer to the blower unit prior to commissioning.



### 3.2.8 Fitting to the measuring point

Use the assembly kit 2018184 for fitting DHSP30 NL 435/735 mm. For DHSP NL180/280, fit directly on the Tri-Clamp flange or the 1" sleeve.



**NOTE:**

Ensure the device is already supplied with purge air or the plant is out of operation during fitting.  
Connection to the 24V supply is necessary here for the integrated purge air blower.  
Ensure all connections on the device point downwards after fitting.



**WARNING:**

▶ Install the sender/receiver unit on the duct of equipment with hazard potential (e.g., toxic, aggressive, explosive gases/dusts, danger to health, high pressure, high temperatures) only when the equipment is at a standstill.

### 3.2.9 Fitting the weatherproof cover

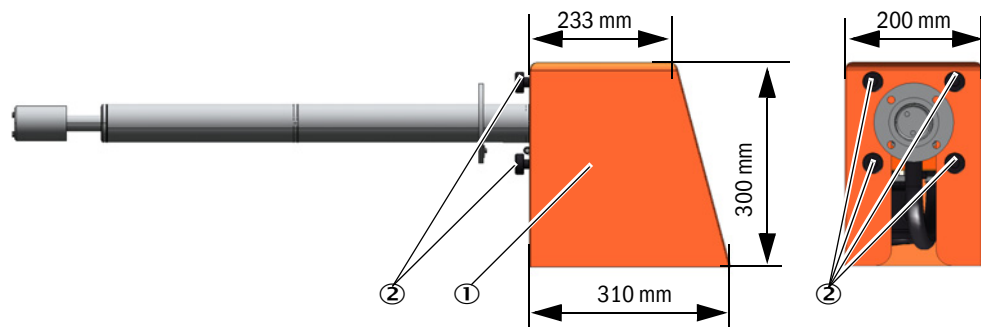
#### Weatherproof cover for sender/receiver unit

This weatherproof cover protects the sender/receiver unit. Always use a weatherproof cover for use outdoors. This prevents rainwater entering.

Installation:

- ▶ Put the cover (1) on from above.
- ▶ Fit the fastening screws on the front of the enclosure.

Fig. 16: Weatherproof cover for sender/receiver unit (dimensions in mm)



① Cover

② Fastening screws

#### Weatherproof cover for external purge air unit

The weatherproof cover (see [“Weatherproof covers”, page 92](#)) comprises a cover and locking set.

Installation:

- ▶ Fit 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.

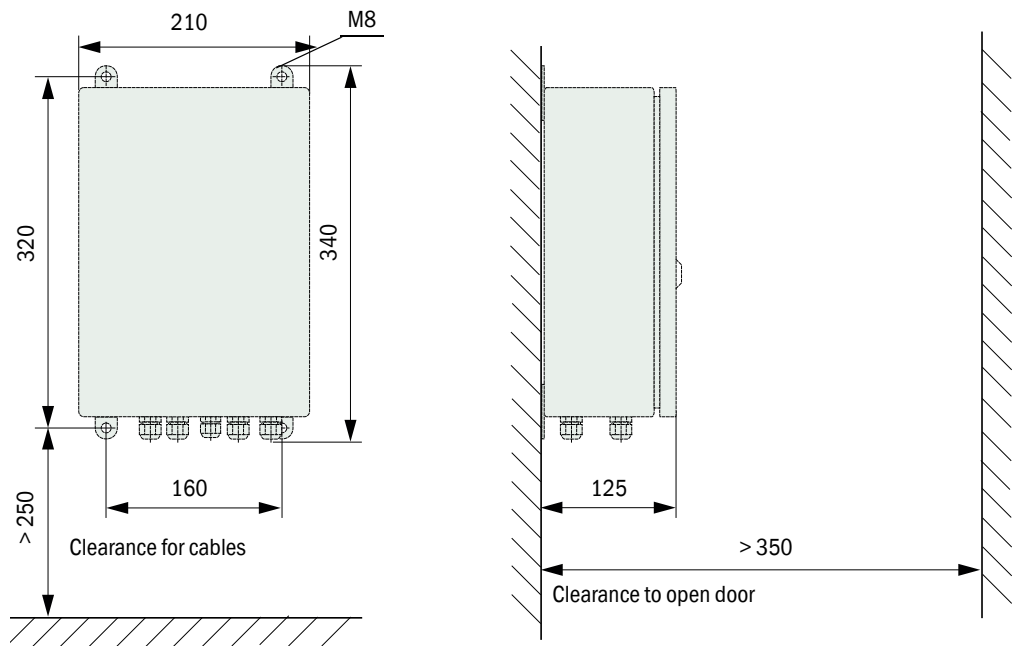
**3.2.10 Fitting the optional MCU control unit**

Fit the MCU control unit in a protected location that is easily accessible (see “MCU assembly dimensions (dimensions in mm)”, page 34). Observe the following points during installation:

- 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 installation location with minimum vibrations; dampen any vibrations when necessary.
- Provide sufficient clearance for lines and opening the door.

**Assembly dimensions**

Fig. 17: MCU assembly dimensions (dimensions in mm)



Using a suitable line (see “General information, prerequisites”, page 37), 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 failure or error causes.

### 3.2.11 Fitting the optional external purge air unit.

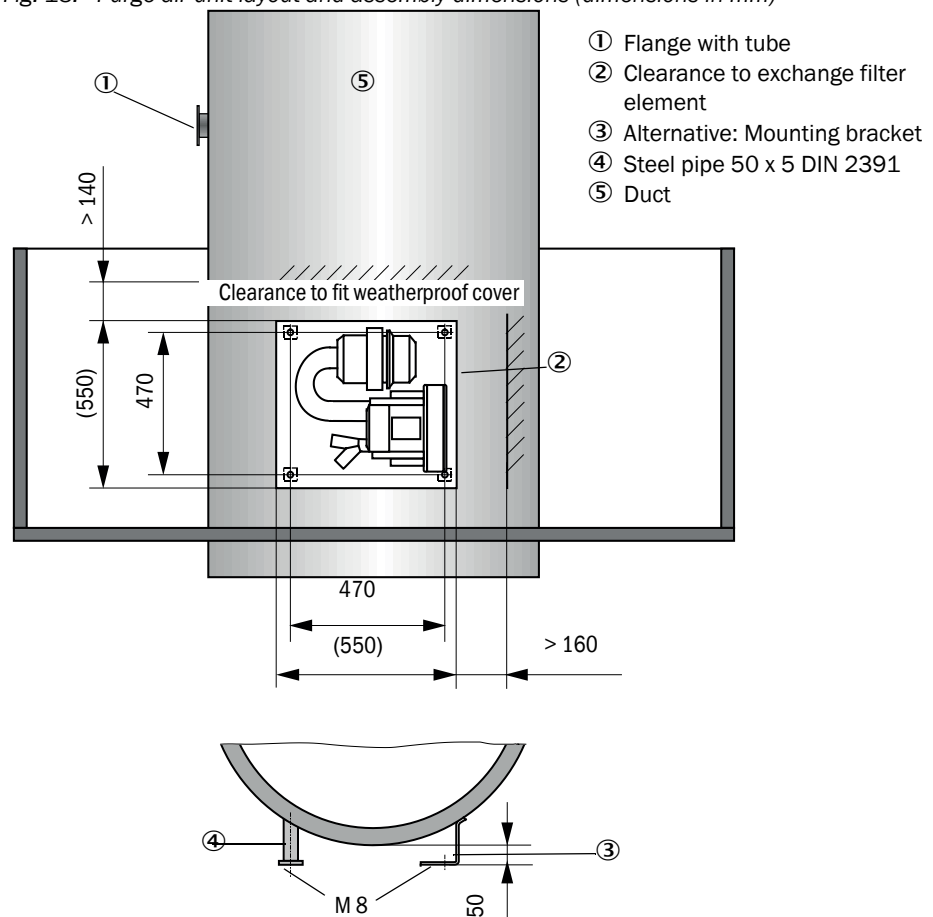
Consider the following points when selecting the installation location:

- ▶ 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 81). 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 35).

### 3.2.12 Assembly work

- ▶ Prepare holder (see “[Purge air unit layout and assembly dimensions \(dimensions in mm\)](#)”, page 35).
- ▶ Fasten purge air unit with 4 M8 screws.
- ▶ Check the filter element is in the filter housing; fit when necessary.

Fig. 18: Purge air unit layout and assembly dimensions (dimensions in mm)



### 3.3 Electrical installation

#### 3.3.1 Electrical safety



**WARNING:**

- ▶ Observe the relevant safety regulations as well as the safety, see “Important information”, page 7 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 voltage 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 voltage 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.

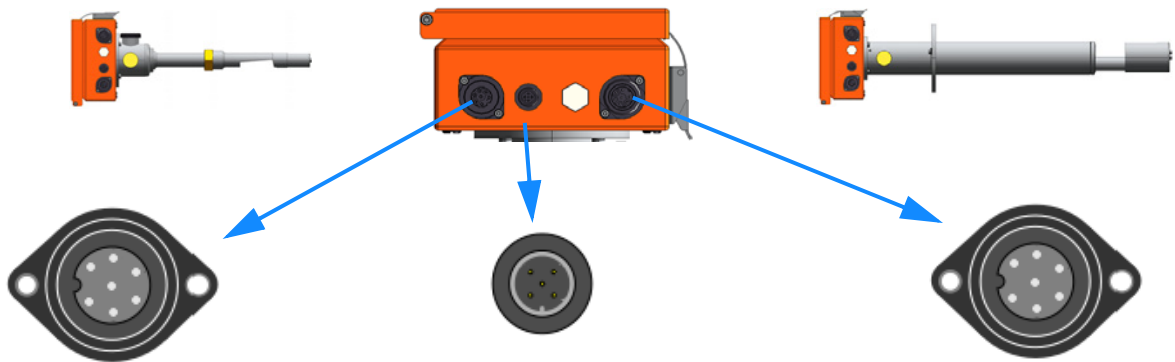
Carry out all installation work onsite unless otherwise explicitly agreed with Endress+Hauser or authorized representatives. This includes laying and connecting the power supply and signal lines, installing switches and power fuses and connecting the purge air supply.



- Plan adequate line cross-sections (see [“Technical Data”, page 81](#)).
- Line ends with plugs to connect the sender/receiver unit must have sufficient free length.

### 3.3.3 Electrical connection

- Provide a 24V DC power supply via plug connector 1 for operating the device.
- Plan LiYCY (TP) 3 x 2 x 0.5 mm<sup>2</sup> as connection cable for plug connectors 1 and 2. Plan the cross-section of the supply cable adequately for integrated purge air supply.
- The standard cable cross-section of 0.5 mm<sup>2</sup> is suitable up to approx. 15m line length to limit the voltage drop on the device to max. 10%. Without integrated purge air, the maximum line length is approx. 100 m.
- Plug connector 3 (service) is designed for device operation via RS485 with SOPAS ET and for activating further device functions (maintenance, automatic function check, linearity check). Plan a LiYCY (TP) 2 x 2 x 0.5 as connection cable for plug connector 3. A service adapter is additionally required for SOPAS application. All other signals can be used as required. Suitable plug connectors and cables are available as accessories (see [“Accessories”, page 93](#)).
- Use the respective protective caps to close plug connector connections on the device which are not used.



Pin assignment  
Plug connector 1 (plug 7-pole)  
(supply)

- 1 +24V DC
- 2 Analog output / -20mA
- 3 RS485 (B) Modbus Slave
- 4 RS485 (A) Modbus Slave
- 5 Analog output / +20mA
- 6 -24V DC
- 7 Shield

Pin assignment  
Plug connector 3 (plug 5-pole)  
(service)

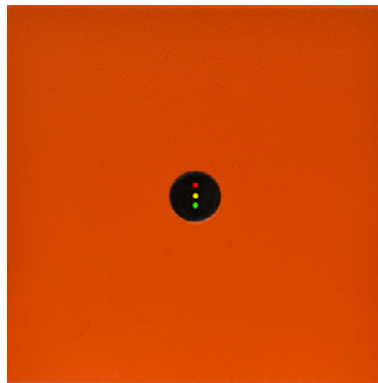
- 1 DI1 maintenance
- 2 DI2 function check/linearity measurement
- 3 RS485 B (service, MCU)
- 4 RS485 A (service, MCU)
- 5 Gnd

Pin assignment  
Plug connector 2 (socket 7-pole)  
(DI and relay)

- 1 DI3 (calibration curve switching)
- 2 DI4 (filter synchronizing)
- 3 Relay 1 N/O contact
- 4 Relay 2 N/O contact
- 5 Relay 3 N/O contact
- 6 COM relay
- 7 Gnd and shield

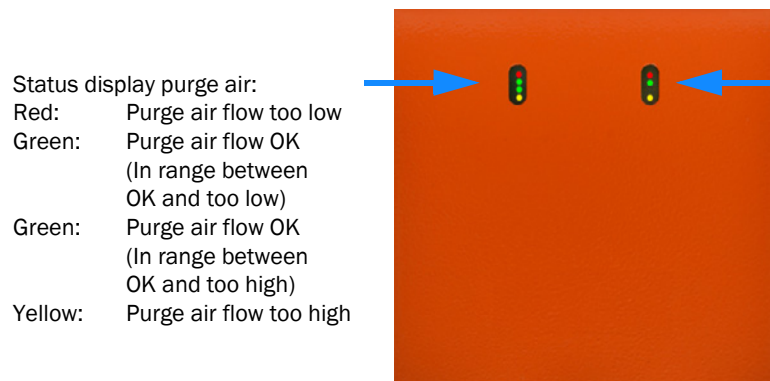
### 3.3.4 Device displays / connections

#### DUSTHUNTER SP30 without integrated purge air



Status indicator:  
Red: Failure  
Yellow: Warning  
Green: Operation

#### DUSTHUNTER SP30 with integrated purge air



Status display purge air:  
Red: Purge air flow too low  
Green: Purge air flow OK  
(In range between OK and too low)  
Green: Purge air flow OK  
(In range between OK and too high)  
Yellow: Purge air flow too high

Status indicator:  
Red: Failure  
Yellow: Warning  
Green: Operation

**3.3.5 Connecting the optional MCU control unit**

See Operating Instructions of DHSP100, Section 3.3.4 for connecting the MCU.  
Observe the connector pin assignment for connecting the DUSTHUNTER SP30.

**NOTE: Connect the power supply to plug connector 1 and the RS485 bus line to plug connector 3.**

**3.3.6 Installing the purge air supply**

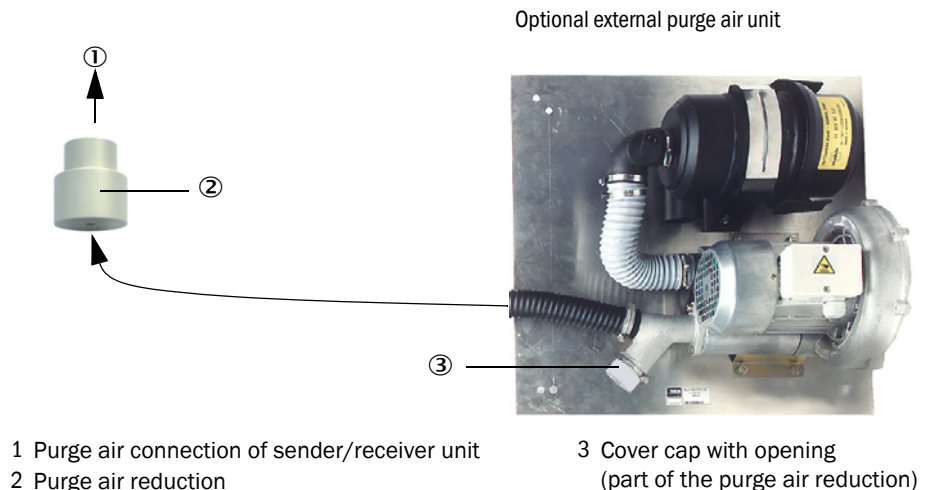
- ▶ Lay the purge air hoses with shortest paths and free of bends, shorten as required.
- ▶ Maintain sufficient distance from hot duct walls.

**3.3.6.1 Optional external purge air unit**

**Connect the purge air hose**

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

Fig. 19: Connecting the optional external purge air unit



**Electric connection**

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

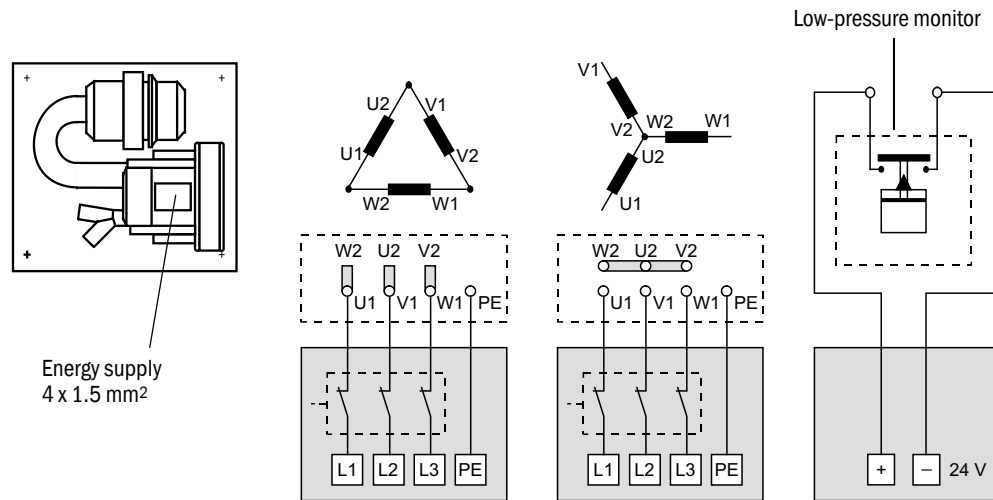


**CAUTION:**

- ▶ 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



- ▶ 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 voltage 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.

3.3.6.2 Purging with instrument air



**NOTE:**

The purge air available onsite must be free from dust, oil and condensate.

- ▶ Select the reducing nozzle (scope of delivery) matching the primary pressure and screw it into the adapter for instrument air supply.
- ▶ Connect the instrument air hose to the adapter thread.



The adapter for instrument air supply can be supplied with a reducing nipple for other adapter threads on request.



Fig. 21: Adapter connection for instrument air supply

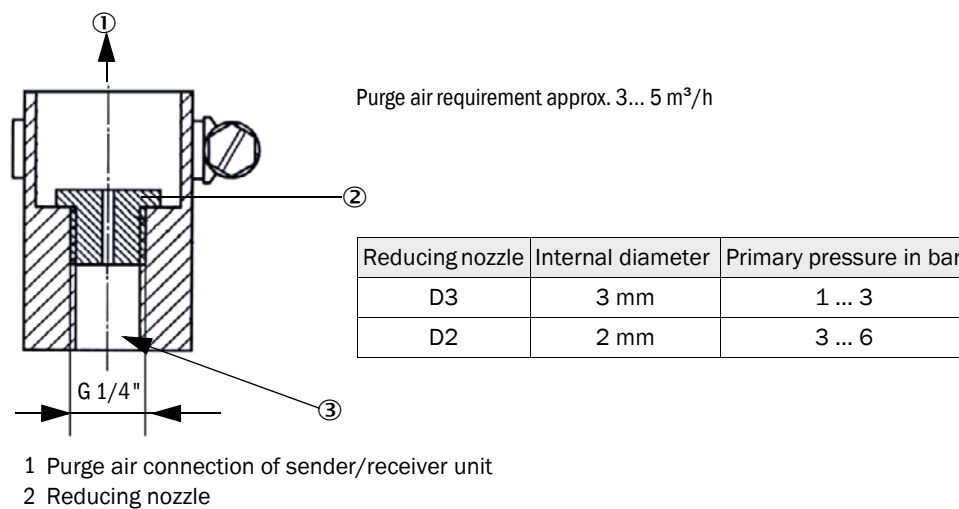
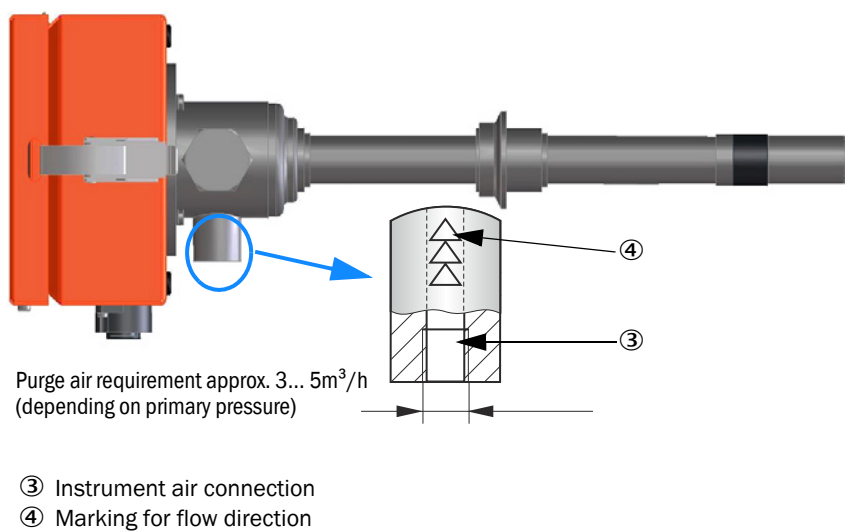
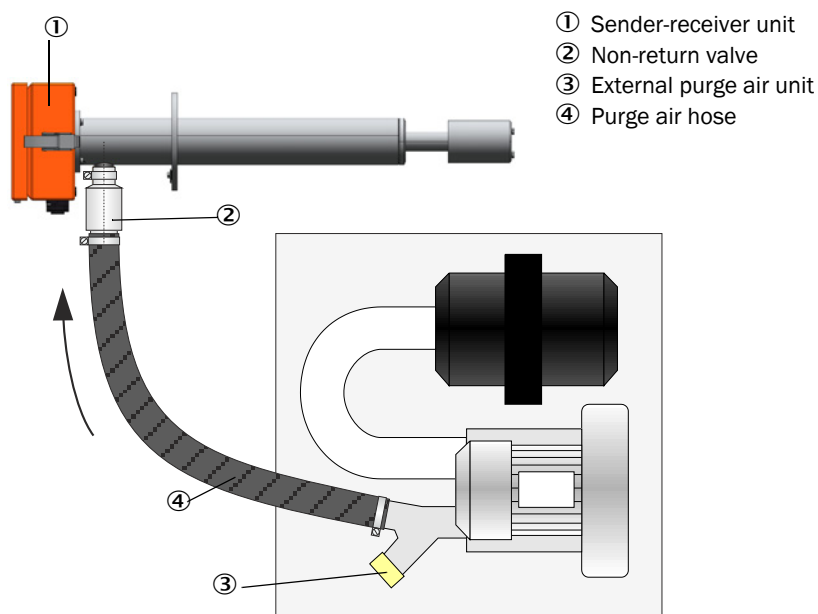


Fig. 22: Instrument air connection of sender/receiver unit for internal duct pressure up to +100 kPa



The manufacturer recommends using a float flowmeter and a pressure reducer to set and control the purge gas requirement.

3.3.6.3 *Installing the non-return valve option*Fig. 23: *Installation of non-return valve*

A non-return valve (Item no.: 2042278, see [“Purge air supply”, page 93](#)) is recommended for protecting the device for a short time during a purge air failure, especially in case of overpressure in the duct.

It prevents the process gas from flowing back inside the device to the purge air unit. In case of purge air failure, immediately remove the device from the duct or establish the purge gas supply again, even when a non-return valve is installed.

## 4 Commissioning and configuration

### 4.1 Basics

#### 4.1.1 General information

Prerequisite for work described in the following is completion of the assembly and installation as described in Section 3.

Commissioning and parameter setting comprise:

- Fitting and connecting the sender/receiver unit,
- Customizing parameter settings according to the respective requirements.

There are two possibilities for customer-specific configuration and commissioning:

- 1 Simple commissioning with pre-configured selectable settings without laptop (only limited functional range usable) (see [“Simple commissioning \(without SOPAS ET\)”](#), page 44).
- 2 Complete configuration via SOPAS ET possible, complete functional range usable (see [“Commissioning / configuring the sender/receiver unit”](#), page 50).

To achieve exact measurement, the measuring system must first be calibrated using a gravimetric comparison measurement (see [“Calibration for dust concentration measurement”](#), page 60) before being used for continuous measurement of dust content.

#### 4.1.2 Factory settings

All factory parameters are saved in the device and can be re-set in case of wrong configuration (see [“Resetting parameters”](#), page 55).

Import the SOPAS parameter file or perform configuration on the device after repairs or device changes at the factory (see [“Data backup in SOPAS ET”](#), page 62).

After delivery, customer parameters are always set to basic settings, which are saved in the following Table.

Table of basic settings for delivery:

Dust concentration mg/m<sup>3</sup> is only valid after calibration as measured value in mg/m<sup>3</sup>. (see [“Calibration for dust concentration measurement”](#), page 60).

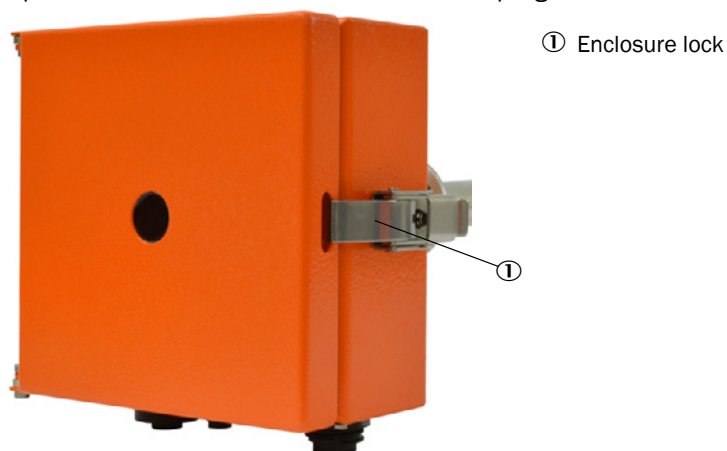
Entry field	Parameter	Default value
AO measuring range		
Measuring range 1 AO	4 ... 20 mA	0 ... 75 mg/m <sup>3</sup> (active when DI3 opened, standard)
Measuring range 2 AO	4 ... 20 mA	0 ... 750 mg/m <sup>3</sup> (can be activated via NO contact on DI3)
Set of calibration coefficients 1	cc2/cc1/cc0	0 / 1 / 0 (active when DI3 opened, standard)
Set of calibration coefficients 2	cc2/cc1/cc0	0 / 1 / 0 (can be activated via NO contact on DI3)
	Live zero	4 mA
	Current during maintenance	4 mA
	Current during failure	2 mA
	Output interference current on AO	Yes

Entry field	Parameter	Default value
Function check	Control value output on AO	Yes Note: The last value measured is output during control value determination.
	Interval	8 h
	Output duration	90 s for each control value
Response time measured value	T90	60 s
Relay use	Relay 1 (NO contact)	Failure / operation
	Relay 2 (NO contact)	Limit value (exceeded)
	Relay 3 (NO contact)	Maintenance
Modbus RTU	Address	1
	Baud rate	19200 / 8e1
	Byte sequence	ABCD => ABCD
RS485 SOPAS / MCU	Baud rate	57600 / 8n1
	Address	1

## 4.2 Simple commissioning (without SOPAS ET)

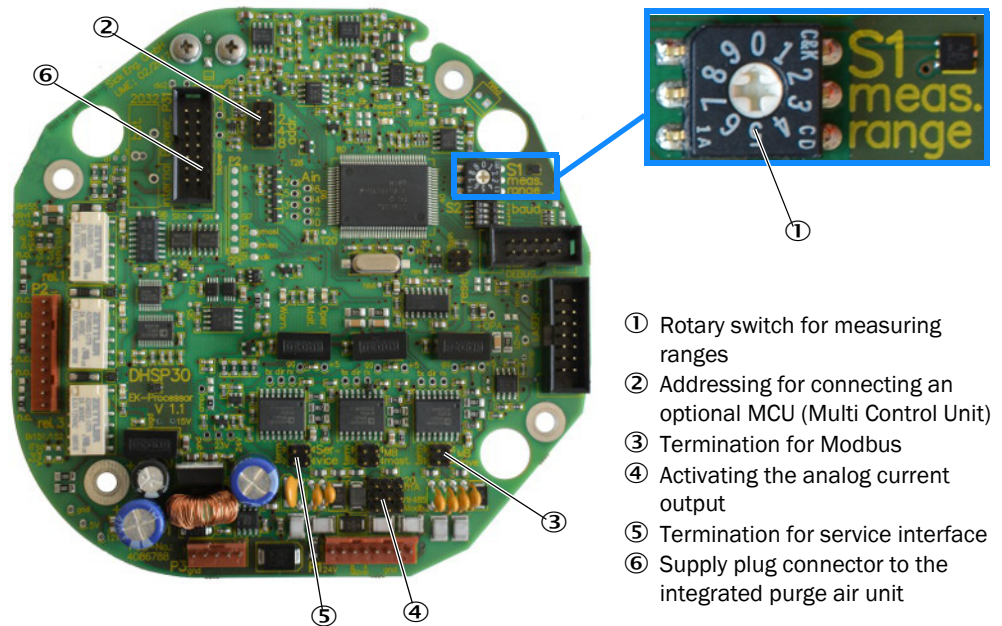
Simple commissioning is performed directly on the device. Already existing factory settings can be changed.

- Open the enclosure and swivel the cover or purge air unit to the side.



- Make the settings, described in the Figure, on the opened device.

Fig. 24: View of process card on the opened device



### Measuring ranges

DUSTHUNTER SP30 supports up to eleven different measuring ranges for analog output on plug connector 1:

- 2 freely configurable with SOPAS ET and
- 9 fixed by hardware.

- Variable measuring ranges

Ensure the rotary switch is in position 0 (see small Figure in Fig. 24). Then, select between 2 different measuring ranges via digital input 3 (plug connector 2, see “[Electrical connection](#)”, page 37). Use SOPAS ET to freely configure these two measuring ranges (see configuration – application parameters measuring ranges and calibration function).

DI3 inactive (+5V): Measuring range 1 (and calibration curve 1) is used.

DI3 active (gnd): Measuring range 2 (and calibration curve 2) is used.

When the calibration coefficients for curve 1 and curve 2 are the same, use DI3 to switch between two measuring ranges.

The default values for the two free measuring ranges are:

- Variable measuring range 1: 0 ... 75 mg/m<sup>3</sup> Limit value 1 : 50 mg/m<sup>3</sup>
- Variable measuring range 2: 0 ... 750 mg/m<sup>3</sup> Limit value 1 : 500 mg/m<sup>3</sup>

Measuring range, limit value and calibration coefficients								
Measuring range and limit					Calibration coefficients for Conc = f(scattered light)			
Using act.	Lower (4mA)	Upper (20mA)	Limit value	Using act.	cc2	cc1	cc0	
<input type="radio"/> Variable meas. range 1	<input type="text" value="0.0"/> mg/m <sup>3</sup>	<input type="text" value="75.0"/> mg/m <sup>3</sup>	<input type="text" value="50.0"/> mg/m <sup>3</sup>	<input checked="" type="radio"/> (1)	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="0"/>	
<input type="radio"/> Variable meas. range 2	<input type="text" value="0.0"/> mg/m <sup>3</sup>	<input type="text" value="750.0"/> mg/m <sup>3</sup>	<input type="text" value="500.0"/> mg/m <sup>3</sup>	<input type="radio"/> (2)	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="0"/>	
<input checked="" type="radio"/> Fix meas. range	<input type="text" value="0.0"/> mg/m <sup>3</sup>	<input type="text" value="75.0"/> mg/m <sup>3</sup>	<input type="text" value="50.0"/> mg/m <sup>3</sup>					

- Fix measuring ranges

Select the fix measuring ranges via the rotary switch with positions from 1 to 9 (see small Figure in Fig. 24). For the fix measuring ranges, the limit value is 2/3 of the upper measuring range value.

Position	Measuring range mg/m <sup>3</sup>	Limit value mg/m <sup>3</sup>
1	0 ... 7.5	5
2	0 ... 15	10
3	0 ... 45	30
4	0 ... 75	50
5	0... 150	100
6	0 ... 225	150
7	0 ... 375	250
8	0 ...1000	666.7
9	0 ... 3000	2000

### Addressing for connecting an optional MCU (Multi Control Unit)

Addressing according to the following Table is only necessary when an optional MCU (plug connector 3) is connected.

add1	add2	add4	add8	Address RS485
0	0	0	0	1 (default)
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8

### Termination for Modbus

Termination for Modbus on plug connector 1. Plug the termination jumpers for terminating RS485.

**Activating for analog current output**

Set all 3 jumpers for correct analog output (20 mA). These are set at the factory.

**Termination for service interface**

Termination for service interface on plug connector 3. Plug the termination jumpers for terminating RS485 (e.g. for connecting the Service Kit Adapter or the MCU).

**Supply plug connector to the integrated purge air unit**

Supply plug connectors for power supply and pressure difference monitoring for the integrated purge air unit (if existing).

**4.3 Checking the purge air unit**

Check the optional purge air unit for completeness prior to commissioning.

- 1 Check the suction filter is firmly fitted and check for cleanness.
- 2 Check the purge air hose is firmly connected from the purge air unit to the device.
- 3 If required, plan a weatherproof cover for use outside and/or prevent suctioning in of rainwater.

All other operating parameters are preset and allow immediate use of the unit.

**4.3.1 Install SOPAS ET**

- ▶ Install SOPAS ET on a laptop/PC.
- ▶ Start SOPAS ET.
- ▶ Follow the installation information of SOPAS ET.

**4.3.1.1 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

### 4.3.2 Connecting SOPAS to the device

An adapter is required for connecting SOPAS to the device without MCU.

2097408 Adapter kit SOPAS SP30

Creating a connection to the device:

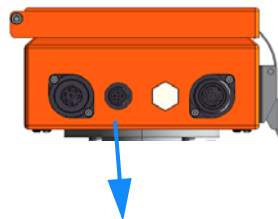
- ▶ Connect adapter cable to socket 3.
- ▶ Connect computer via USB cable.

Fig. 25: Adapter-Kit



- ① VConnection cable adapter – SP30 plug 3
- ② USB connection cable

### 4.3.3 Connection to the device via USB line



Plug connector 3 (plug 5-pole)  
(service)

Recommended procedure:

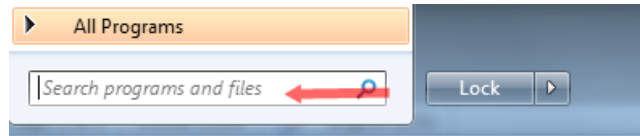
- 1 Connect service adapter and connection cable to plug connector 3 for device configuration (2097408).
- 2 Switch the device on.
- 3 Start SOPAS ET.
- 4 “Search settings”
- 5 “Device family oriented search”.
- 6 Click the desired DUSTHUNTER SP30.
- 7 Make settings:
  - Ethernet communication: not required / deactivate
  - USB communication: not required / deactivate
  - Serial communication: Click / activate
- 8 A list of COM ports appears.  
Enter COM port of the DUSTHUNTER.  
If you do not know the COM port: [see “Finding the DUSTHUNTER COM port”, page 49](#)
- 9 Assign a name for this search.
- 10 “Finish”.



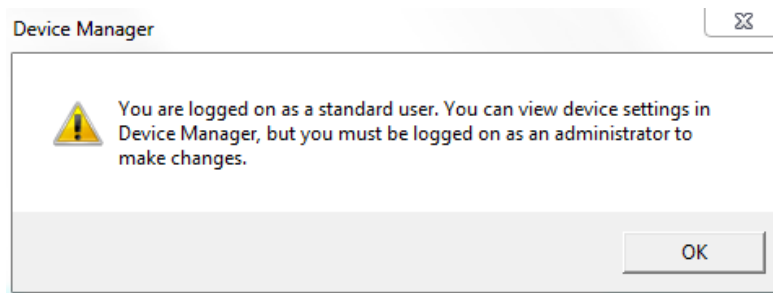
4.3.3.1 Finding the DUSTHUNTER COM port

If you don't know the COM port: Use the Windows Device Manager to find the COM port (no administrator rights are needed).

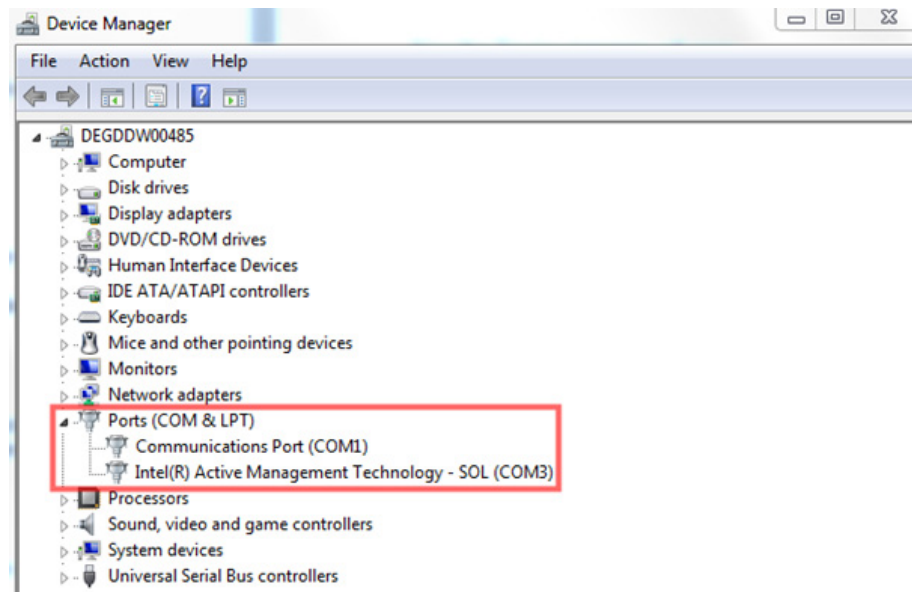
- 1 Disconnect the connection of the DUSTHUNTER and your laptop/PC.
- 2 Input: `devmgmt.msc`



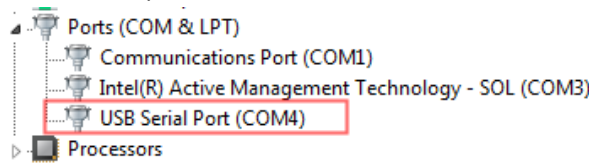
- 3 This message is shown:



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



- 6 Connect the MCU with the laptop/PC.  
A new COM port is shown.



Use this COM port for communication.

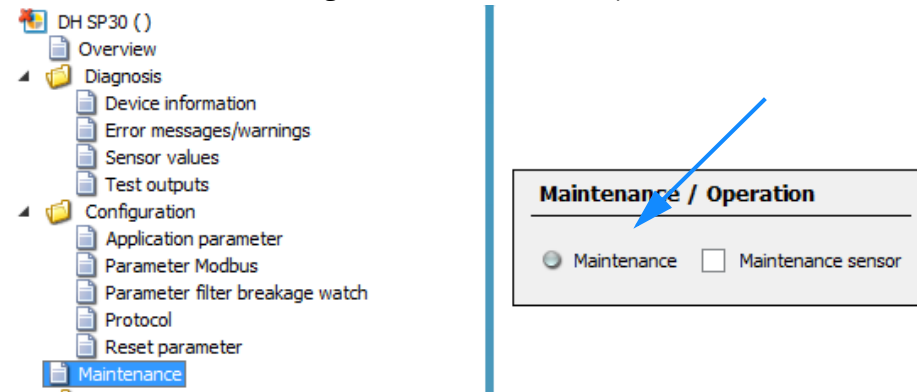
## 4.4 Commissioning / configuring the sender/receiver unit

The steps required to modify the preset factory 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 48).

- ▶ Connect the measuring system to the SOPAS ET program.
- ▶ Enter the level 1 password (see [“Password for SOPAS ET menus”](#), page 47).

### 4.4.1 Selecting maintenance

- ▶ Select maintenance in register tab “Maintenance operation”



- ▶ Deselect “Maintenance” again after configuration.  
Measuring operation is now active again.



#### NOTE:

Alternatively, use digital input 1 (DI1 on plug connector 3 service) to set the maintenance state. As long as a maintenance state is signaled on DI1, deactivation is not possible in the software menu (function with priority).

Reaction of the measured value output during change of the operating state from “Operation” to “Maintenance” is partly adjustable (see [“Setting application parameters”](#), page 51) and/or described in (see [“Factory settings”](#), page 43).

4.4.2 Setting application parameters

- Switch to project directory Configuration => “Application parameters” and set the desired parameters.

The screenshot shows the configuration interface for the DH SP30. On the left is a tree view with 'Application parameter' selected. The main area is divided into three sections:

- Application parameter:** Includes fields for 'Mounting location', 'Relay3 signals' (set to 'Maintenance'), 'Response time (T90)' (60 s), 'Automatic control cycle' (8 h), 'Enable analog output check values' (checked), 'Fix blower power' (unchecked), and 'Set value diff. pressure' (10.00 hPa).
- Measuring range, limit value and calibration coefficients:** A table with columns for 'Using act.', 'Lower (4mA)', 'Upper (20mA)', 'Limit value', 'Using act.', 'cc2', 'cc1', and 'cc0'. It shows settings for three active ranges: (1) with limits 0.0 to 75.0 mg/m³ and limit 50.0 mg/m³; (2) with limits 0.0 to 750.0 mg/m³ and limit 500.0 mg/m³; and (Fix) with limits 0.0 to 75.0 mg/m³ and limit 50.0 mg/m³. Calibration coefficients are set to cc2=0, cc1=1, cc0=0.
- Automatic self control settings:** Includes 'Enable' (unchecked), 'Threshold value' (50.0 mg/m³), and 'Time interval' (2 h).

Entry field	Parameter	Explanation
Mounting location	Name of the measuring location	Only serves as information field
Relay 3 signals	Warning, function check, maintenance	Relay is activated, when predetermined event takes place. Relay serves as NO contact.
Response time (T90)	0.1 ... 600 seconds	Setting the response time of the main measured value (SI, mg/m <sup>3</sup> )
Automatic control cycle	1 min to 7 days	Adjustable interval time between two function checks. First starting timepoint is always time of device start. Note: The last measured value measured is output during control value determination (when “Control value output on analog output” is inactive).
Fix blower power	Active / inactive (only viewable for integrated purge air blower)	Inactive in normal operation. Significance : Blower control is active and required purge air flow is set automatically. Note: Only use as service function, serves to manually set the blower with fixed value.
Set value diff. pressure	10 hPa	Differential pressure on purge air measuring orifice. Adjustable as nominal value for required purge air flow. Do not change the standard of 10hPa.
Enable analog output check values	Inactive / active	Control values measured in function check are output successively on the analog output. (First zero point measurement, then control value measurement (span test).)
Variable meas. range 1	Free entry of upper and lower limit in the measuring range of the analog output. Free entry of coefficients for calibration function 1.	Measuring range 1 and calibration function 1 are active at the same time, when DI3 is inactive. Yellow display shows which measuring range is active at the moment. Calibration, see “Calibration for dust concentration measurement”, page 60
Calibration function 1		

Entry field	Parameter	Explanation
Variable meas. range 2	Free entry of upper and lower limit in the measuring range of the analog output. Free entry of coefficients for calibration function 2.	Measuring range 2 and calibration function 2 are active at the same time, when DI3 (plug connector 2) is active. (DI3 requires potential-free NO contact to gnd). Yellow display shows which measuring range is active at the moment. Calibration, see <a href="#">“Calibration for dust concentration measurement”</a> , page 60
Calibration function 2		
Fixed meas. range	Position Measuring range mg/m <sup>3</sup> 0 Freely adjustable via SOPAS 1 0 ... 7.5 2 0 ... 15 3 0 ... 45 4 0 ... 75 5 0 ... 150 6 0 ... 225 7 0 ... 375 8 0 ... 1000 9 0 ... 3000	Use the rotary switch to activate the fixed/free measuring ranges (see <a href="#">“Simple commissioning (without SOPAS ET)”</a> , page 44) Position 0 freely adjustable measuring ranges via SOPAS Position 1-9 are fixed measuring ranges which can not be changed. They serve for easy commissioning via laptop.
Enable	active / inactive	Self-monitoring serves to signal a too high contamination, also without active contamination control.
Threshold value	Concentration value in mg/m <sup>3</sup>	This concentration value must be reached at least once in the stated time interval. When this value is not reached, the error message “Self-monitoring” is activated
Time interval	Time interval in hours	Time interval where the threshold has to be exceeded. When the threshold is exceeded in this time interval, the timer is reset and the time interval started anew.

#### 4.4.3 Modbus configuration

- Switch to project directory => “Modbus” and set the desired parameters.

**Modbus settings**

---

Protocol  Byte order

Bus address  Baudrate

Entry field	Parameter	Explanation
Protocol	RTU ASCII	Modbus Remote Terminal Unit (binary) Modbus ASCII When switching from RTU <--> ASCII, intentionally set the selection of data, parity and stop bits anew!
Byte order	ABCD -> ABCD ABCD -> CDBA ABCD -> BADC ABCD -> DABC	Setting of the byte sequence for transfer from real numbers and integers (32bit) via 2 registers. Example: Numeric value 123456789 (decimal) = 0x075bcd15 See example below Table.
Bus address	1 ... 247	Address range
Baudrate	9600 19200 38400 57600	Adjustable bus speed
Byte	7e1 7o1 7n2 8n1	Interface settings for: Data bits/parity/stop bits

The exact specifications for using Modbus in DHSP30 are described in document: “ModbusimplementationSP30\_VXX.pdf“.

**4.4.4 Filter watch**

The SP30 can be used in cyclically cleaned hose plants or other filter plants with several individual filters (filter bags) to detect defective filter bags.

Continuous evaluation of cleaning peaks of all filter bags in a cleaning cycle in connection with an internal counter determines the limit value violations of the responsible filter bag.

The following prerequisites must be met to allow use:

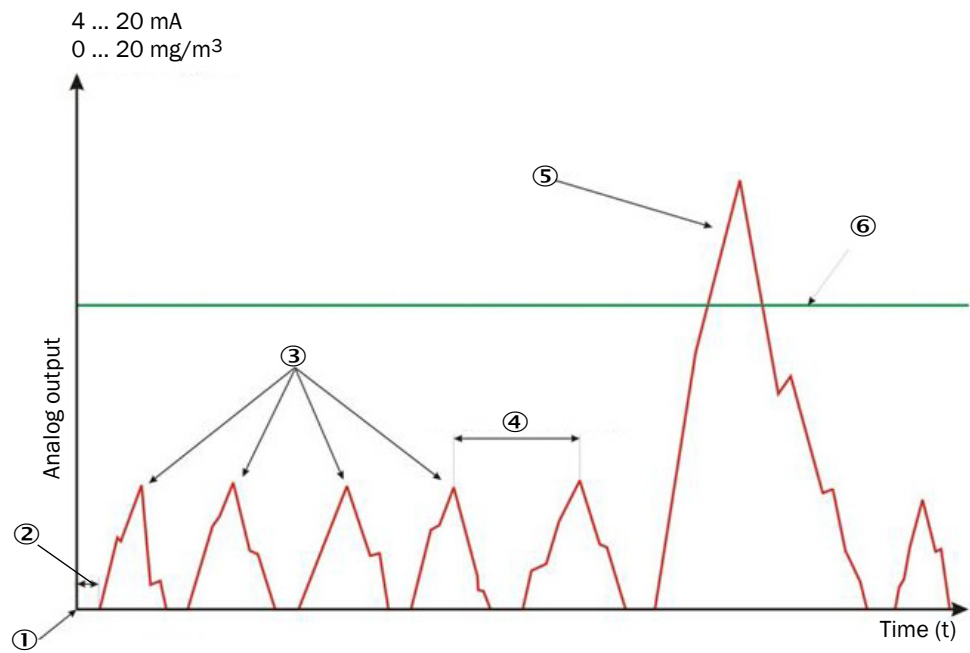
- Debounced synchronizing signal with a duration of 100 ... 900 ms for triggering a measuring cycle.  
Provide this synchronizing signal on the plant on digital input 4 (DI4, plug connector 2)
- The period between dedusting two consecutive filter bags must be higher than the double T90 time (trigger concentration) of the SP30, but at least 0.5 s.

► Switch to project directory Configuration => “Filter watch” and set the desired parameters.

Entry field	Parameter	Explanation
Enable	active / inactive	Activates filter watch
Using limit relay	active / inactive	Relay 2 can be used to signalize a filter break.
Numbers of filter bags		Number of filter groups to be cleaned within a cycle. Required for recognizing the end of a cleaning cycle.
Time interval		Period of time between dedusting two consecutive filter bags within a cycle.
Delay		Period of time between the synchronizing signal and arrival of the dust cloud at the measuring location.
Limit value		Limit value where a filter break is signaled.
Response time (T90)	T90 time for filter concentration	Separately adjustable T90 time, only used for filter watch to damp the concentration. Concentration value in “Sensor values” is not affected by this.
Waiting for start cleaning cycle	Synchronizing signal on DI4 (plug connector 2)	Waiting for a start signal for filter watch.
Filter cleaning cycle active	Filter watch running	
Number cleaning cycles	Total number of cleaning cycles measured to this point	Set to 0 for every device restart.
Concentration	Concentration for filter watch	Separate concentration measured value damped by the “Response time”.

Entry field	Parameter	Explanation
Filter number	Current filter number	Shows which filter number is currently measured
Filter break	Display for filter break	On
Read filter watch result	Button to show currently defective filters	
Wrong filter	Display for defective filter numbers	Defective filters are displayed as number, divided by a semicolon, e.g.: 3;9;15.... Start signal on DI4 resets the last measuring result.

Fig. 26: Filter watch



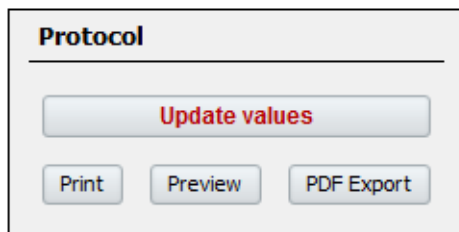
- ① Synchronizing signal (DI4)
- ② Delay
- ③ Normal dedusting impulses
- ④ Impulse interval
- ⑤ Filter break
- ⑥ Limit value

**4.4.5 Protocols**

The protocol function allows immediately viewing all relevant device parameters or archiving them as PDF file.

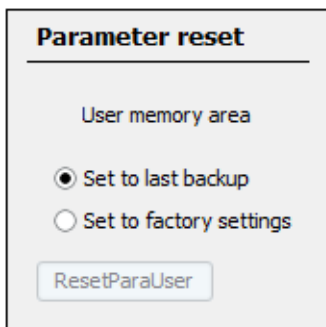
The PDF export function is especially intended for documentation and proof of linearity controls.

Press “Update values” to also read in current values prior to creating protocols.



**4.4.6 Resetting parameters**

It is possible to reset the device to factory settings after parameter changes. Due to an automatic backup created by the device after each restart, parameter changes can be restored.



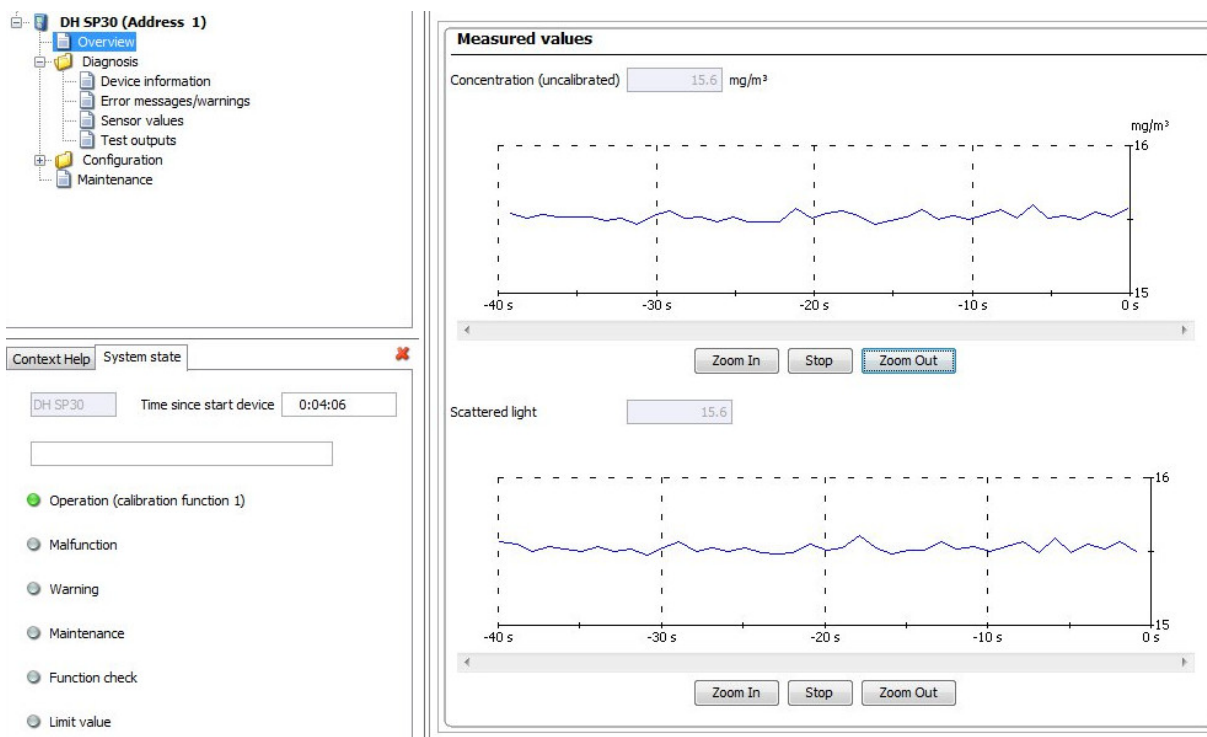
Entry field	Parameter	Explanation
Set to last backup	Parameters are reset to the state after last restart	Modbus Remote Terminal Unit (binary) Modbus ASCII When switching from RTU <--> ASCII, intentionally set the selection of data, parity and stop bits anew!
Set to factory settings	Device is reset to factory settings	Customer configuration is lost and reset to default values, <a href="#">see "Factory settings", page 43.</a>
ResetParaUser	Selected backup is used.	The device is reset and started anew; connect the device with SOPAS and read in all parameters again.

## 4.5 Measuring screen, diagnosis and control values

### 4.5.1 Overview

Menu Overview serves to graphically display the scattered light value and the concentration value in the currently valid calibration function.

Use this menu to graphically display the measured value.



### 4.5.2 Device information

Important device information for service and support purposes can be viewed here. Always have these data ready for inquiries for this product.

Device information	
Type of device	DH SP30
Device version	
Firmware version	01.02.00 (Jul 01 2017 00:00:00)
Serial number	00008700
Identity number	00000
Hardware version	1.0
Firmwareversion bootloader	V00.99.15
Operating hours	0 h



4.5.3 Measured value output and sensor information

Menu Sensor values serves to read and evaluate current measured values and internal device information. This page also serves to diagnose errors and/or allows drawing conclusions on the device state.

Some menus are only viewable when an integrated purge air unit is connected and are masked out on the standard device.

**Sensor values**

---

Concentration (uncalibrated)  mg/m<sup>3</sup>

---

	Analog input	Physical value
Scattered light (AI0)	<input type="text" value="0.000"/> V <input type="button" value="v"/>	<input type="text" value="0.000"/>
Scattered light (AI1)	<input type="text" value="0.000"/> V <input type="button" value="v"/>	
Monitor value laser	<input type="text" value="0.000"/> V	<input type="text" value="0.000"/> V
Laser current	<input type="text" value="0.000"/> V	<input type="text" value="0.00"/> mA
Difference pressure	<input type="text" value="0.000"/> V	<input type="text" value="0.00"/> hPa
Device temperature	<input type="text" value="0.000"/> V	<input type="text" value="0"/> °C <input type="button" value="°C"/>
Power supply (24V)	<input type="text" value="0.000"/> V	<input type="text" value="0.000"/> V
Din2 (AI7)	<input type="text" value="0.000"/> V	<input checked="" type="radio"/> DI2 activ

---

Current output  mA      AO signals

Laser byte

Monitor factor

Blower power  %       Purge air ok

**Digital inputs**

---

DI1 activ     
  DI2 activ     
  DI3 activ     
  DI4 activ

Blower detected

Measuring range select

**Control values**

---

		Drift	Determine ckeck values	Analog output
Span 70%	<input type="text" value="70.00"/> %	<input type="text" value="+0.00"/> %	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Zero point	<input type="text" value="0.00"/> %	<input type="text" value="+0.00"/> %	<input checked="" type="radio"/>	<input checked="" type="radio"/>

---

Next automatic start

    
  Please wait, function check is done

Entry field	Parameter	Explanation
Concentration	Measuring screen	Current measuring screen in mg/m <sup>3</sup> . When (not calibrated) is displayed, no calibration function (0/1/0) is saved and the displayed measured value = scattered light value
Analog input	Internal control measured value	Only for service purposes, conclusions can be drawn on malfunctions on the device.
Physical value	Current measured value	Displays the currently determined measured value of the respective measured variable.
Scattered light (AI0)	Scattered light value	Scattered light value which is calculated to the dust concentration via calibration function.
Monitor value laser	Voltage value	Should be between 1-4 V. Serves to control the laser brightness and is automatically monitored internally.
Laser current	Current value	Displays the current laser current. Information on laser state. For > 60 mA and/or 100 mA an automatic warning and failure is output. An increasing laser current in the same conditions can be a sign for aging.
Difference pressure	hPa	Displays the current pressure on the purge air measuring orifice. This controls the required purge air flow in the optional purge air unit. Nominal value is 10 hPa.
Device temperature		Displays the internal device temperature in the enclosure.
Power supply (24V)	V	Displays the current supply voltage on plug connector 1. Voltage is internally monitored.
Din2 (Ain7) / DI2	V and/or inactive/active	Serves to read the state of DI2. DI2 serves as input for manually activating the check cycle (switched off for maintenance) and/or filter measurement (switched on for maintenance)
Current output	mA	Current current output value on analog output (plug connector 1)
AO signals	Status	Displays the current output value on the analog output. (Measured value/control value/test value)
Laser byte	0...250	Displays the currently set laser brightness (3 levels possible)
Monitor factor		Calculation factor for scattered light due to reduced laser brightness
Blower power		Currently set blower power. The remaining available reserve power is also viewable.
Purge air flow ok	too low / ok / too high	Shows whether the purge air flow is in the allowable range. Too low = Device cooling possibly no longer sufficient (early contamination and device failure possible) Ok = Nominal state Too high = Too much purge air is blown in, measured value might be influenced.
Digital inputs 1 - 4	active / inactive	Displays the current state of all digital inputs.
Blower detected		Blower is recognized and can be activated.
Measuring range select	free / fixed	Displays the current measuring range
Span 70%	70%	Result of the 70% span value from the last function check.
Zero point	0%	Result of the 0% zero point value from the last function check.
Drift		Deviation to the last control value determination.
Determine check values		Active when control value is currently determined
Analog output		Displays the output of the relevant control value on the analog output.
Next automatic start		Time until the next automatic start of the function check. Timer is restarted during device restart.

Entry field	Parameter	Explanation
Start function check manual		Allows to manually start a function check. It can also be manually started on DI2 when the device is in measuring operation.

**4.5.4 Test outputs**

Test outputs are designed for simple device commissioning as well as checking internal device functions for correct functioning.

**Test output**

Fix output

Analog output

Malfunction (=/Operation)  
  Limit  
  Maintenance

<input type="button" value="Test EEPROM1"/>	Test Write <input type="text" value="EEPROM1_11111111"/>	Test Read <input type="text" value="EEPROM1_xxxxxxxx"/>	<input checked="" type="radio"/> Test Ok
<input type="button" value="Test EEPROM2"/>	Test Write <input type="text" value="EEPROM2_22222222"/>	Test Read <input type="text" value="EEPROM2_xxxxxxxx"/>	<input checked="" type="radio"/> Test Ok
<input type="button" value="Test Flash"/>	Test Write <input type="text" value="Flash_1234567890"/>	Test Read <input type="text" value="Flash_xxxxxxxxxx"/>	<input checked="" type="radio"/> Test Ok

Entry field	Parameter	Explanation
Fix output	active / inactive	The field Fix output serves to output defined measured values on the measured value interfaces on the device.
Analog output	0 ... 24 mA adjustable in steps	Serves for testing the analog output and can be used as test current output during commissioning.
Malfunction (=/Operation)	Relay 1 failure	Serves to switch relay 1 failure on/off. (NO contact)
Limit	Relay 2 limit value	Serves to switch relay 2 limit value on/off. (NO contact)
Maintenance	Relay 3 maintenance	Serves to switch relay 3 maintenance on/off. (NO contact)
Test EEPROM1	Content is written in the memory for test purposes (see cell Test writing) and then read out again (cell Test reading).	This serves to test the three internal device memories. A successful test is confirmed with "Test ok". When "ok" is not displayed, writing or reading was not successful. Reading result is viewable in the field Test reading. In case of a negative test, replacing the circuit board of the process card is necessary and/or contact Endress+Hauser Service.
Test EEPROM2		
Test Flash		

#### 4.5.5 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 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 “SP30”, set the measuring system to “Maintenance” mode
- ▶ Enter the level 1 password (see “Password for SOPAS ET menus”, page 47)
- ▶ Call up the “Configuration / Application parameter” directory.
- ▶ Estimate the measuring range required for the dust concentration in operational state and enter this in the “Analog Output (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 in accordance with 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 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 of 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 "[Setting application parameters](#)", page 51) (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.

#### 4.5.6 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.  
Best variant for diagnosis purposes and service requests.
- 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 failures.

#### Parameter protocol example

##### Dusthunter - Parameter protocol

Type of device: DH SP30

Mounting location:

#### Device information

Device version  
Firmware version  
Serial number 00008700  
Identity number 00000  
Hardware version 1.0  
Firmware bootloader V00.99.15

#### Parameter Modbus

Protocol RTU  
Byte order ABCD ==> ABCD  
Bus address 1  
Baudrate 19200 Bd  
Settings 8e1

#### Parameter Filter breakage watch

Filter watch enable inactive  
Using limit relay inactive  
Number of filter bags 100  
Time interval 2 s  
Delay 0 s  
Limit value 50.0 mg/m<sup>3</sup>  
Response time (T90) 1 s

#### Configuration

Application parameter  
Bus address (SopasET) 1  
Relay3 signals Maintenance  
Response time (T90) 60 s  
Response time2 (T90) 10 s  
Automatic start interval check cycle 8 h  
Enable analog output check values active  
Fix blower power inactive  
Set value diff. pressure 10.00 hPa  
**Meas ranges and limit values**  
(1) range low 0.0 mg/m<sup>3</sup>  
(1) range high 75.0 mg/m<sup>3</sup>  
(1) limit value 50.0 mg/m<sup>3</sup>  
(2) range low 0.0 mg/m<sup>3</sup>  
(2) range high 750.0 mg/m<sup>3</sup>  
(2) limit value 500.0 mg/m<sup>3</sup>  
**calibration coefficients**  
(1) cc2 0.0000  
(1) cc1 1.0000  
(1) cc0 0.0000  
(2) cc2 0.0000  
(2) cc1 1.0000  
(2) cc0 0.0000

#### Automatic self control settings

Enable inactive  
Threshold value 50.0 mg/m<sup>3</sup>  
Time interval 2 h

#### Factory calibration settings

Factor AN0-AN1 10.0000  
**Scattered light**  
cc2 0.0000 1 / V<sup>2</sup>  
cc1 (MUF) 1.0000 1 / V  
cc0 (Offset) 0.0000  
**Current laser**  
cc2 0.0000 mA / V<sup>2</sup>  
cc1 30.3000 mA / V  
cc0 0.0000 mA  
**Difference pressure**  
cc2 0.0000 hPa / V<sup>2</sup>  
cc1 4.7000 hPa / V  
cc0 -1.3800 hPa  
**Device temperature**  
cc2 0.0000 °C / V<sup>2</sup>  
cc1 100.0000 °C / V  
cc0 -55.0000 °C  
**Power supply**  
cc2 0.0000 1 / V  
cc1 7.9000  
cc0 0.0000 V  
**Analog output (20mA)**  
cc2 0.0000 Digit/mA<sup>2</sup>  
cc1 170.6667 Digit/mA  
cc0 2.0000 Digit

#### Check value

Zero point 0.00 %  
Zero point drift 0.00 %  
Span 70 70.00 %  
Span 70 drift 0.00 %

#### Control Filter check Laser

Nominal value Filter 1 0.0 %  
Measured value Filter 1 0.0 %  
Nominal value Filter 2 0.0 %  
Measured value Filter 2 0.0 %  
Nominal value Filter 3 0.0 %  
Measured value Filter 3 0.0 %  
Nominal value Filter 4 0.0 %  
Measured value Filter 4 0.0 %  
Nominal value Filter 5 0.0 %  
Measured value Filter 5 0.0 %

#### Filter breakage watch

Hex-Mask broken filterbags 128..97 00000000  
Hex-Mask broken filterbags 96..65 00000000  
Hex-Mask broken filterbags 64..33 00000000  
Hex-Mask broken filterbags 32..1 00000000

## 5 Maintenance

### 5.1 General information

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. This is possible via digital input DI1=1 (see "Interfaces of the sender/receiver unit", page 18) or operating program SOPAS ET.

#### Activating maintenance with SOPAS ET

- ▶ Connect the sensor to the laptop/PC using the USB module and start SOPAS ET.
- ▶ Connect to the sensor (see "Connection to the device via USB line", page 48).
- ▶ Enter the level 1 password (see "Password for SOPAS ET menus", page 47).
- ▶ Set the measuring system to "Maintenance" mode: Click "Maintenance sensor".



#### WARNING:

Observe the relevant safety regulations as well as the safety notices (see "Responsibility of user", page 9) during all work.

#### Resuming measuring operation

Resume measuring operation after completing the work by deactivating the "Maintenance on/off" checkbox in the "Maintenance / Operation" window and click "Set State" or set DI1=0.



- No automatic function check is carried out during "Maintenance".
- The value set for "Maintenance" is output on the analog output (see "Factory settings", page 43). This is also applicable when a failure 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 plant 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.

The work to be performed by the operator and execution must be documented in a Maintenance Manual.

Adhere to at least the following intervals:

- Cleaning optics -> 3 months
- Checking laser alignment -> 3 months
- Maintenance of purge air supply -> 6 months

**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)
- 7 mm jaw wrench for controlling laser alignment



## 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 are viewable or the measured value is no longer plausible. Only clean the optical interfaces with cotton swabs and water, aggressive detergents can damage the coating of the lens.

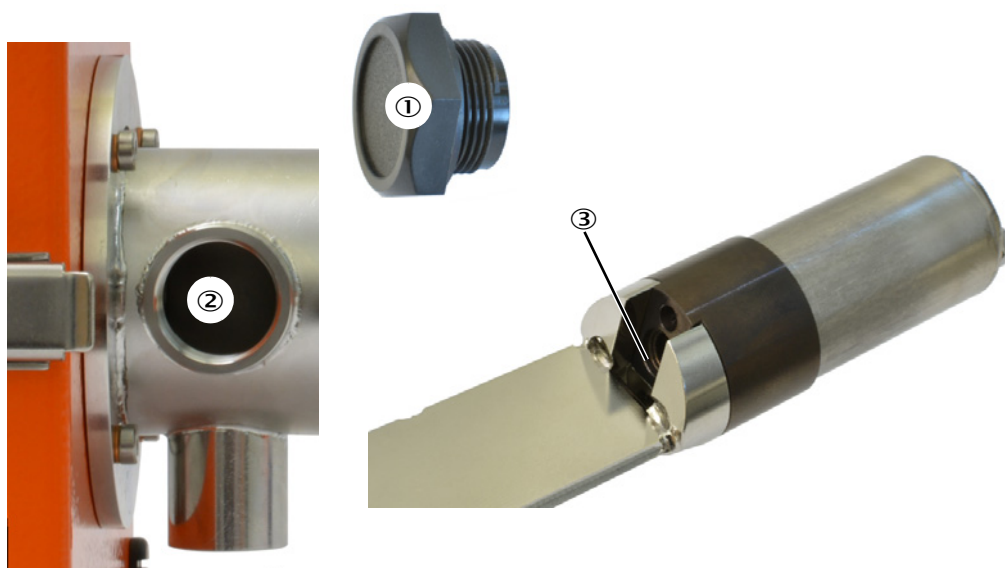
Additionally, check the laser alignment during each maintenance.

### 5.2.1 Cleaning the optics of the sender/receiver unit

**Sender/receiver unit with nominal length of 180 and 280 mm**

- ▶ Remove the sender/receiver unit from the duct.
- ▶ Close off the flange with tube with a blind flange (see [“Fitting elements”, page 89](#)).
- ▶ Remove cover (1) of cleaning opening (2).
- ▶ Clean the lens in probe opening (2).
- ▶ Fit the cover of cleaning opening (1) again.
- ▶ Clean receiver lens (3).

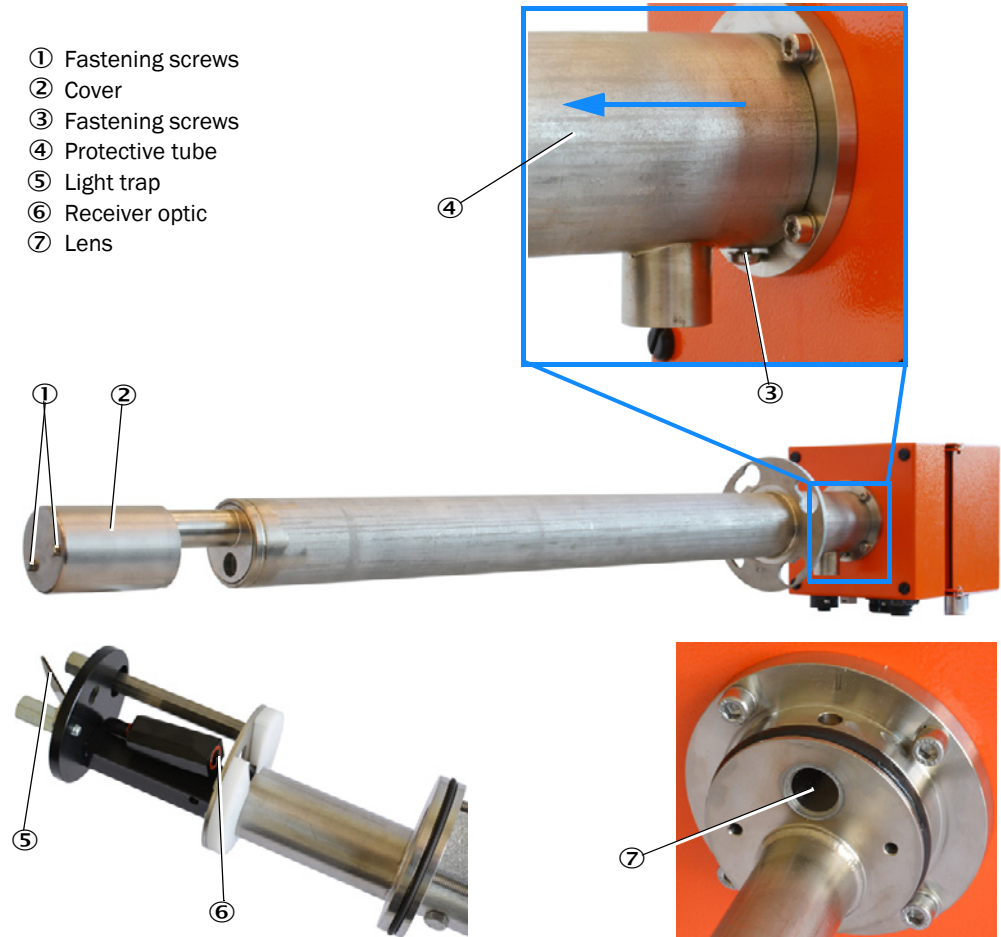
Fig. 27: Cleaning the optical interfaces, nominal lengths 180/280 mm



**Sender/receiver unit with nominal length of 435 and 735 mm**

- ▶ Remove the sender/receiver unit from the duct.
- ▶ Close off the flange with tube with a blind flange (see “Fitting elements”, page 89).
- ▶ Unscrew fastening screws (1) of cover (2) and take cover off.
- ▶ Unscrew fastening screw (3) of protective tube (4) and remove protective tube.
- ▶ Clean receiver optics (6) and check light trap (5) for contamination and clean if necessary.
- ▶ Clean lens (7) in lens opening.

Fig. 28: Cleaning the optical interfaces



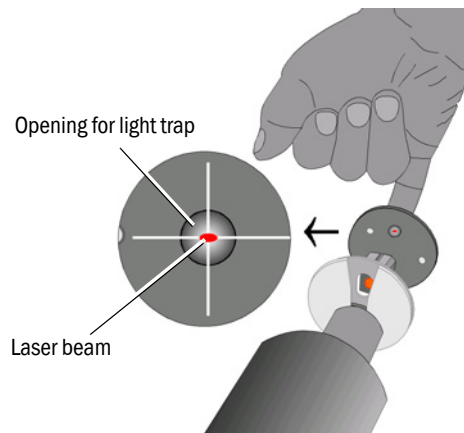
**5.2.2 Checking laser alignment**

Checking the laser alignment serves to ensure the measuring function and should be performed during each maintenance.

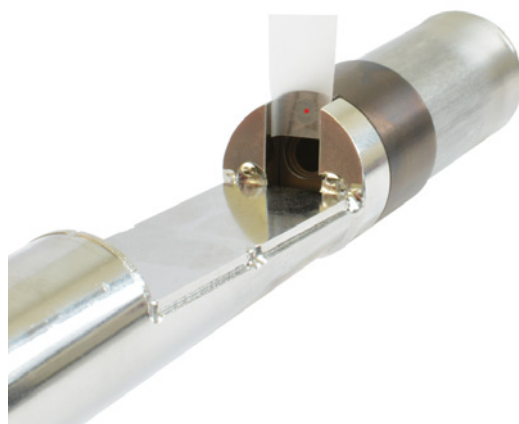
- ▶ Remove the device from the duct and close the duct off.
- ▶ Remove the cover (see “Cleaning the optics of the sender/receiver unit”, page 65).
- ▶ Check the alignment of the light trap with a suitable item or finger, as shown in the following Figure, the laser must be exactly in the middle, deviations can influence measurement.
- ▶ Adjust laser alignment, if necessary (see “Setting the laser alignment”, page 77).

Fig. 29: Checking laser alignment

**DHSP30 flanges with tube**



**DHSP30 Tri-Clamp or 1" thread**



### 5.3 Maintenance of the purge air supply

For maintenance of the purge air supply, differentiate between integrated purge air supply (see “Optional integrated purge air unit”, page 22) and external purge air unit (see “Optional external purge air unit”, page 22).

#### 5.3.1 Integrated purge air unit

Check the filter for contamination when an integrated purge air unit is installed. Replace the filter when viewable contaminations are present, however, at least every 12 months.

A blinking warning LED lights (1 second) and signals a warning state when the purge air filter is contaminated too soon. Replace the air filter in this case.

Fig. 30: Spare part filter



- ▶ Remove the device from the duct and close the duct off.



**NOTE:**

Do not perform replacement directly on the duct, as the purge air supply is interrupted here.

- ▶ Remove the clamp of the purge air hose from the filter box.
- ▶ Loosen the clamp of the filter box on the device.
- ▶ Remove the filter box from the device and open the cover.
- ▶ Remove the filter and check, replace if necessary and clean the inside of the filter box.

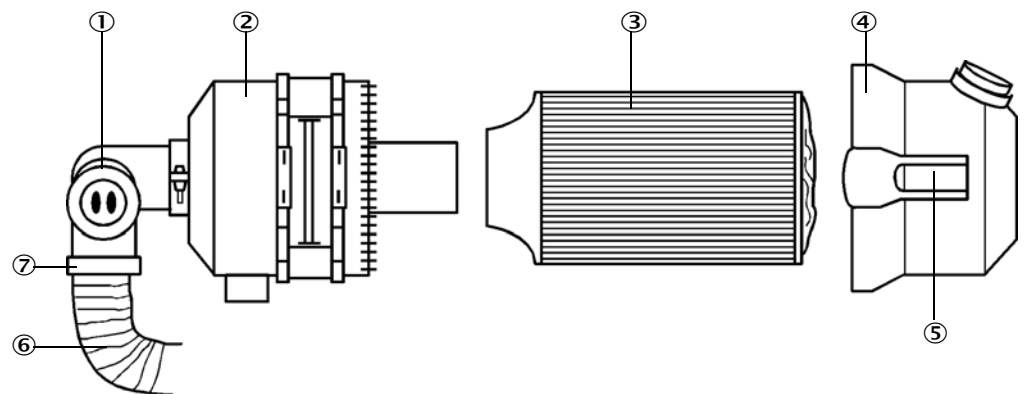
### 5.3.2 Optional external purge air unit


**NOTE:**

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 69).

#### Replacing the filter element

Fig. 31: Replacing the filter element



- ① Low-pressure monitor
- ② Filter housing
- ③ Filter element
- ④ Filter housing cover

- ⑤ Quick-release lock
- ⑥ Purge air hose
- ⑦ Strap retainer

- ▶ Switch the blower 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.


**NOTE:**

- ▶ 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.


**NOTE:**

- ▶ 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-Topolement 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 on the filter outlet using the hose clamp.
- ▶ Switch the blower 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 if necessary.
- ▶ 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, Tri-Clamp and/or 1" sleeve 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 if necessary.

### 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 information

Warning or error messages are output as follows:

- The yellow LED on the device lights.
- Relay 3 (NO contact, plug 2) is active (see [“Interfaces of the sender/receiver unit”, page 18](#)) when configured.

The device can still be used when warnings are present, the measured values are still valid. However, immediately clear the cause as failures can occur otherwise.

Device failures are output as follows:

- The red LED on the device lights (see [“Device displays / connections”, page 38](#)).
- Relay 3 (NO contact, plug 2) is active.

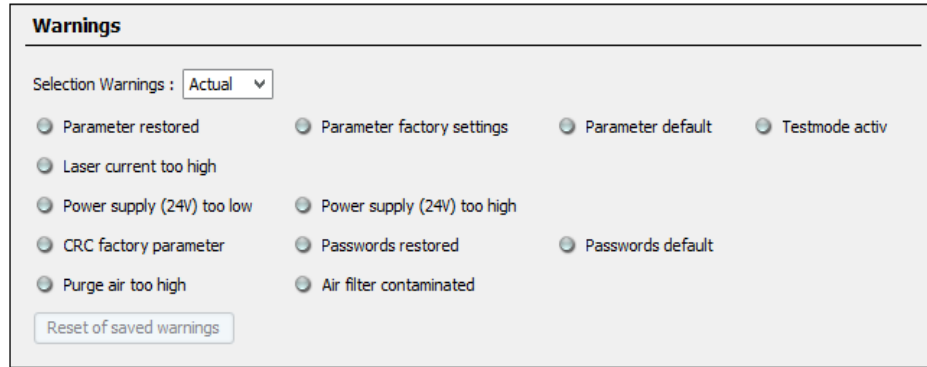
When a failure is present in the device, the measured values are no longer valid. Clear the failure to continue measuring.

## 6.2 Warnings and failures of the sender/receiver unit

The sender/receiver unit comfortably displays warnings and failures in the SOPAS ET operating program. These are described in the following Section. We recommend using SOPAS ET for troubleshooting.

### 6.2.1 Warnings

Fig. 32: Overview of warnings



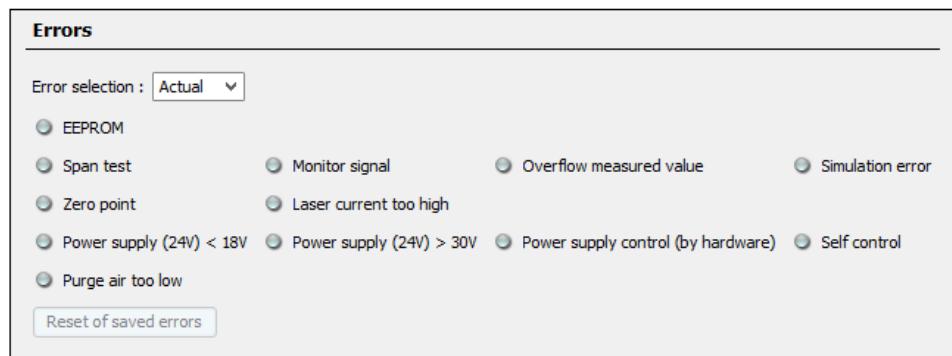
Message	Significance	Possible cause	Action
Parameter restored	Parameters could not or not completely be written, the device loaded a backup of the last valid data.	Interruption of the SOPAS connection to the device or voltage failure during writing.	▶ Check the device data, the warning is deleted after a restart.
Parameter factory settings	Parameters have been set to factory setting.	Parameters have been reset to the delivery state in SOPAS.	▶ Load device configuration via SOPAS or repeat commissioning.
Parameter default	All parameters are on default. Due to CRC error, the parameters could not be restored.	Parameters have been reset and factory settings deleted.	▶ Contact Endress+Hauser Service.
Test mode active	Relay and current output are set manually.	Test mode has been activated in SOPAS.	▶ Terminate test mode or deactivate warning.
Power supply (24V) too low	Monitoring of power supply, voltage between 18 and 19V	Line length to the device too long or line incorrectly dimensioned. Power supply unit defective.	▶ Check line length or cross-section, see <a href="#">"Electrical connection"</a> , page 37. ▶ Measure the power supply unit with a multimeter when the device is ready for operation.
Power supply (24V) too high	Monitoring of power supply, voltage between 29 and 30V	Defective or incorrect power supply unit	▶ Measure the power supply unit with a multimeter when the device is ready for operation.
Laser current too high	Laser current > 60mA	Laser defective.	▶ Laser current above warning limit, plan replacing the laser soon.
CRC factory parameter	Error when reading the EEPROM	Device could not load the factory settings from EEPROM. EEPROM defective.	▶ Load the saved project (see <a href="#">"Data backup in SOPAS ET"</a> , page 62). ▶ Replace the mainboard (see <a href="#">"Replacing the mainboard"</a> , page 75). ▶ Contact Endress+Hauser Service.
Passwords restored	Passwords have been restored with the backup copy.	Interruption of the SOPAS connection to the device or voltage failure during writing the passwords.	▶ Check the passwords, the warning is deleted after a restart.
Passwords default	Passwords correspond to the factory settings	Passwords have been reset or not yet assigned.	▶ Assign own passwords (see <a href="#">"Password for SOPAS ET menus"</a> , page 47).



Message	Significance	Possible cause	Action
Only active for integrated purge air:			
Purge air too high	Purge air flow exceeded the recommended value, measurement error increased.	Partial vacuum in duct > 10 hPa, hosing of pressure sensor incorrect.	<ul style="list-style-type: none"> <li>▶ Check hosing (see “Fitting the components for the purge air supply”, page 32).</li> <li>▶ Replace purge air circuit board.</li> <li>▶ Contact Endress+Hauser Service.</li> </ul>
Air filter contaminated	Purge air flow drops below warning limit.	Filter contaminated, counterpressure in duct too high.	<ul style="list-style-type: none"> <li>▶ Check air filter (see “Integrated purge air unit”, page 68).</li> <li>▶ Check the specifications of the device and the fitting location.</li> </ul>

6.2.2 Failures

Fig. 33: Overview of failures



Message	Significance	Possible cause	Action
EEPROM	Error when reading the permanent memory	Voltage failure during writing to the memory, EEPROM defective	<ul style="list-style-type: none"> <li>▶ Load saved project (see “Data backup in SOPAS ET”, page 62).</li> <li>▶ Replace the mainboard (see “Replacing the mainboard”, page 75).</li> <li>▶ Contact Endress+Hauser Service.</li> </ul>
Simulation error	Simulation error active	System has been set to error state by Modbus	
Overflow measured value	Scattered light is above the maximum measurable value	Reflections or contamination	<ul style="list-style-type: none"> <li>▶ Clean (see “Cleaning the optics of the sender/receiver unit”, page 65).</li> <li>▶ Check laser beam for free passage (see “Cleaning the optics of the sender/receiver unit”, page 65).</li> <li>▶ Check laser alignment (see “Checking laser alignment”, page 66).</li> </ul>
Signal too low	Filter measurement not possible, signal too low (< 50mV)	Filter glass holder with scattering screen not correctly fitted, filter damaged	<ul style="list-style-type: none"> <li>▶ Insert filter according to Manual, check filter for damage and replace if necessary.</li> </ul>
Laser current too high	Laser current > 100mA	Laser electronics defective	<ul style="list-style-type: none"> <li>▶ Replace laser (see “Replacing the laser”, page 77).</li> </ul>
Span test	Deviation from nominal value above 2% Scattered light too low or laser too weak	Scattered light too low or laser too weak	<ul style="list-style-type: none"> <li>▶ Clean (see “Cleaning the optics of the sender/receiver unit”, page 65).</li> <li>▶ Check laser beam for free passage (see “Checking laser alignment”, page 66).</li> <li>▶ Check laser alignment (see “Checking laser alignment”, page 66).</li> </ul>

Message	Significance	Possible cause	Action
Monitor signal	The current monitor value of the laser is below 0.1V Laser failure	Laser failure	<ul style="list-style-type: none"> <li>▶ Check connection cable to the laser circuit board.</li> <li>▶ Replace laser (see <a href="#">“Replacing the laser”</a>, page 77).</li> </ul>
Zero point	Zero point error > 2%	Electronics problem	<ul style="list-style-type: none"> <li>▶ Replace the mainboard.</li> </ul>
Power supply (24 V) < 18 V	Power supply monitoring, voltage too low to operate the device	Line length to the device too long or line incorrectly dimensioned, power supply unit defective, mainboard defective	<ul style="list-style-type: none"> <li>▶ Check line length or cross-section, see <a href="#">“Electrical connection”</a>, page 37.</li> <li>▶ Measure the power supply unit with a multimeter when the device is ready for operation.</li> </ul>
Power supply (24V) > 30V	Power supply monitoring, voltage too high to operate the device	Defective or incorrect power supply unit, mainboard defective	<ul style="list-style-type: none"> <li>▶ Measure the power supply unit with a multimeter when the device is ready for operation.</li> </ul>
Power supply control (by hardware)	Voltage < 16.5V (4.5V hysteresis) All EEPROM write accesses are blocked.		
Self control	Self control has been activated and limit value has not been reached in the selected time	Device is contaminated, laser is disadjusted or blocked	<ul style="list-style-type: none"> <li>▶ Clean (see <a href="#">“Cleaning the optics of the sender/receiver unit”</a>, page 65).</li> <li>▶ Check laser beam for free passage (see <a href="#">“Checking laser alignment”</a>, page 66).</li> <li>▶ Check laser alignment (see <a href="#">“Checking laser alignment”</a>, page 66).</li> </ul>
Only active for integrated purge air:			
Purge air too low	Purge air has underflown interference threshold, damage on the device possible.	Too much overpressure in the duct, air filter blocked, blower failed.	<ul style="list-style-type: none"> <li>▶ Check the specifications of the device and the fitting location.</li> <li>▶ Check air filter (see <a href="#">“Integrated purge air unit”</a>, page 68).</li> <li>▶ Check blower.</li> </ul>

### 6.3 Repairs

Bring the device to a suitable workshop for all repair work. Close off the duct with a blind flange when the device is removed from the duct (see [“Assembly parts”](#), page 93).

#### 6.3.1 Replacing the cover

Replace the cover when it is corroded or damaged. Refer to Section “Maintenance” for removal of the cover (see [“Cleaning the optics of the sender/receiver unit”](#), page 65).

Spare part for nominal length 180 mm / 280 mm: Cover

Item no.: 7047786

Spare part for nominal length 435 mm / 735 mm: Cover DHSP TXVX

Item no.: 4052222

Fig. 34: Cover



### 6.3.2 Replacing the protective tube for NL 180 and 280

Replace the protective tube when it is severely corroded or damaged. When holes in the protective tube appear due to corrosion, further severe damage on the device can occur.

**Replacement for nominal length 180 mm and 280 mm is not possible.** Contact the Endress+Hauser Customer Service in case of damage on the protective tube for these nominal lengths.

### 6.3.3 Replacing the protective tube for NL 435 and 735

Replace the protective tube when it is severely corroded or damaged. When holes in the protective tube appear due to corrosion, further severe damage on the device can occur.

#### Replacing the protective tube for 435mm / 735 mm:

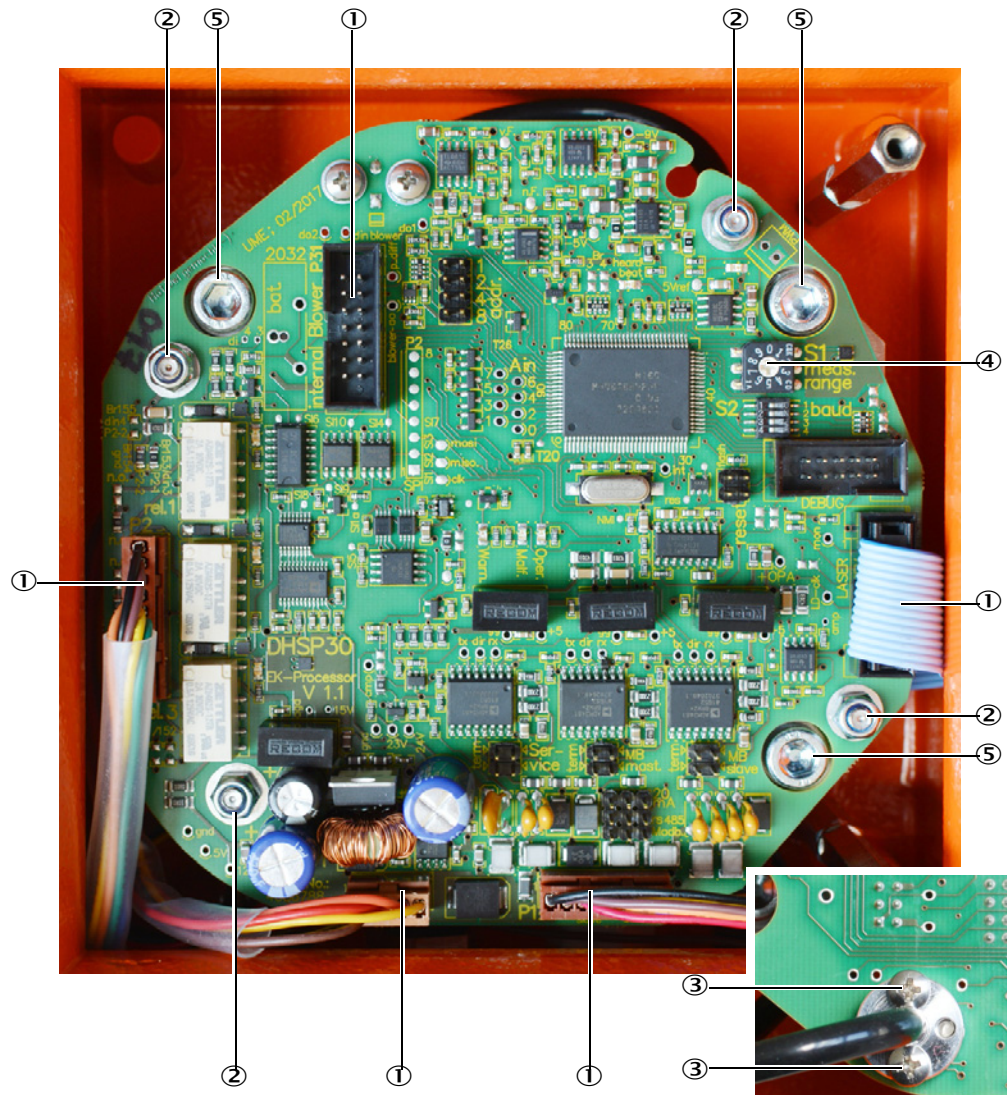
- ▶ Remove the cover (see [“Replacing the cover”, page 74](#)).
- ▶ Remove the purge air hose.
- ▶ Remove the lower screw of the protective tube (see [“Cleaning the optical interfaces”, page 66](#)).
- ▶ Remove the protective tube.
- ▶ Check optical interfaces and clean if necessary.
- ▶ Push new protective tube on probe opening.
- ▶ Tighten lower screw again.

### 6.3.4 Replacing the mainboard

Replacement of the mainboard is possible, however, the precision stated in the specifications can no longer be guaranteed after replacement.

Spare part : Mainboard SP30 (see [“Sender/receiver unit”, page 94](#))

Fig. 35: Mainboard SP30



- ▶ If still possible, connect the device to SOPAS and save the project to keep the settings, (see [“Data backup in SOPAS ET”, page 62](#)).
- ▶ Remove the device from the fitting location and transfer to a suitable location for repair work.
- ▶ Pull out all plugs (1).
- ▶ Loosen 4 fastening screws (2) of circuit board.
- ▶ Carefully remove the circuit board a few centimeters, the fiber optics are on the rear side and may not be bent.
- ▶ Loosen screws of fiber optics (3) and pull the fiber optics out.
- ▶ Remove the circuit board completely.
- ▶ Fit the new circuit board in reverse sequence.
- ▶ Set the selection switch for measuring range (4) to the same settings as on the defective circuit board.
- ▶ Put the device into operation, connect to SOPAS and load the saved project, (see [“Data backup in SOPAS ET”, page 62](#))
- ▶ Check the measured values for plausibility and whether the settings meet your requirements.

### 6.3.5 Setting the laser alignment

In case the laser is no longer correctly aligned when checking the laser alignment (see [“Checking laser alignment”, page 66](#)), adjust the laser alignment anew. The laser alignment is especially important as the device does not have a contamination measurement and thus deviations directly affect the measured value.

- ▶ Open the enclosure and tighten three screws (2) so that the springs are strained (see [“Laser carrier when fitted”, page 78](#)).
- ▶ Now loosen the screws a whole turn.
- ▶ Check alignment of the laser and use the screws to adjust it so that the laser goes through the center of the opening of the light trap.
- ▶ Check that the laser also goes through the center of the opening of the orifice, if necessary, adjust the orifice to the laser.

**NOTE:**

Adhere to the sequence! Do not align the laser to the orifice, but always to the opening of the light trap.

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### 6.3.6 Replacing the laser

Replacement of the laser is possible, however, the precision stated in the specifications can no longer be guaranteed after replacement.

Laser DHSP spare part

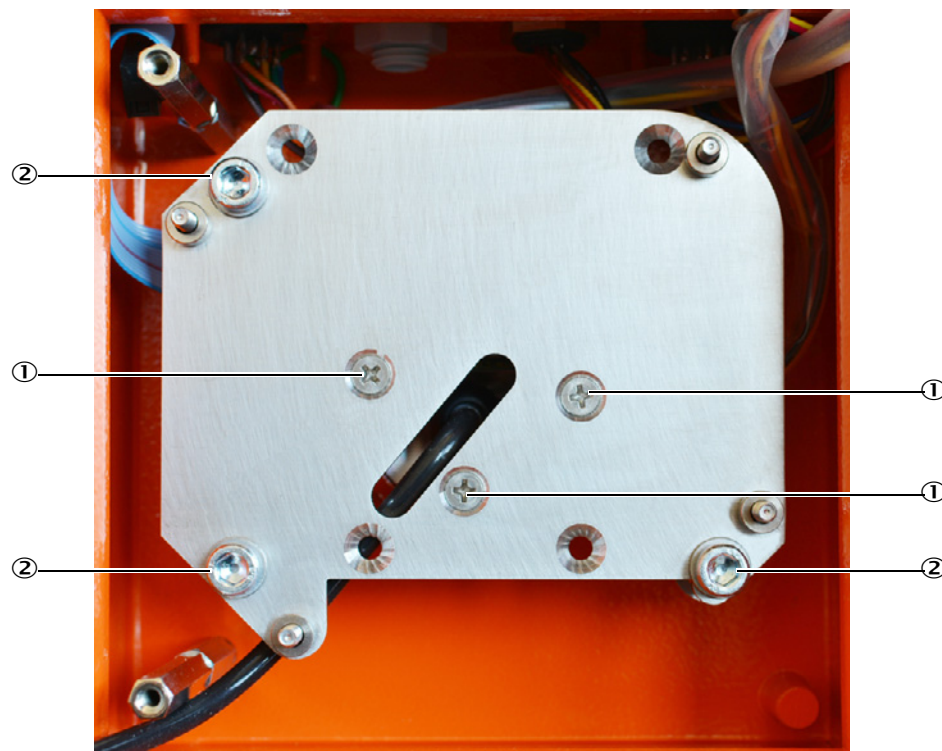
Nominal length 180 and 280 mm -> 2095385

Nominal length 435 mm -> 2095386

Nominal length 735 mm -> 2095387

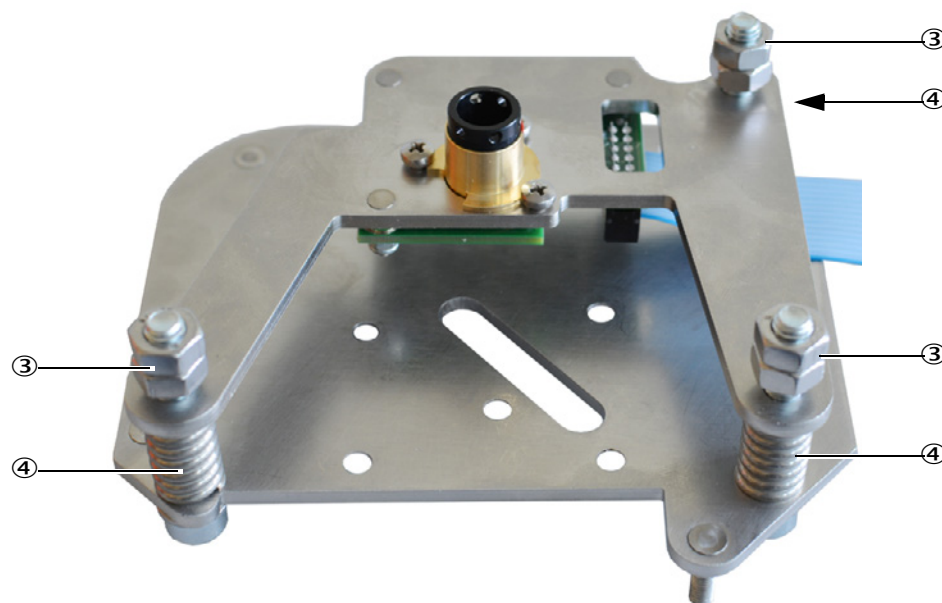
- ▶ Remove the mainboard (see [“Replacing the mainboard”, page 75](#)).

Fig. 36: Laser carrier when fitted



- ▶ Loosen three fastening screws (1) of the laser circuit board and remove laser carrier.

Fig. 37: Laser carrier when removed



- ▶ Loosen counter nuts (3) on the rear side and turn out three retaining screws (2) of the laser circuit board.
- ▶ Replace the laser circuit board and tighten fastening screws again until springs (4) are tensioned.
- ▶ Fit counter nuts (3) as shown in the Figure.

- ▶ Fit and fasten the laser carrier again, ensure the fiber optics are not crimped or bent.
- ▶ Fit the mainboard.
- ▶ Adjust the laser (see [“Setting the laser alignment”, page 77](#)).
- ▶ Put the device into operation again.

## 7 Specifications

### 7.1 Compliances

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

- EC Directive: LVD (Low Voltage Directive)
- EC 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

#### Electrical protection

- Contamination: The device operates safely in an environment up to contamination level 2 according to EN 61010-1 (usual, non-conductive contamination and temporary conductivity by occasional moisture condensation).
- Electrical power: The wiring system to the power voltage supply of the system must be installed and fused according to the relevant regulations.

### 7.2 Approvals

Variant DUSTHUNTER SP30 is TÜV type-tested.

Variant DUSTHUNTER SP30 LM is TÜV-type-tested and TÜV certified according to DIN EN 15859 for use as leakage monitor for filter check behind fabric filters in plants requiring approval and plants of the 27th BIm SchV.

Variant DUSTHUNTER SP30 DM is TÜV-type-tested and TÜV certified according to DIN EN 15859 for use as dust monitor for filter check behind fabric filters in plants requiring approval and plants of the 27th BIm SchV.



### 7.3 Technical Data

Measuring Parameters																		
Measured variable	Scattered light intensity (SI) Dust concentration output in mg/m <sup>3</sup> after gravimetric comparison measurement																	
Measuring range	Adjustable with selection switch on the device																	
	<table border="0"> <tr><td>Measuring range 1</td><td>0 ... 7.5 SI</td></tr> <tr><td>Measuring range 2</td><td>0 ... 15 SI</td></tr> <tr><td>Measuring range 3</td><td>0 ... 45 SI</td></tr> <tr><td>Measuring range 4</td><td>0 ... 75 SI</td></tr> <tr><td>Measuring range 5</td><td>0 ... 150 SI</td></tr> <tr><td>Measuring range 6</td><td>0 ... 225 SI</td></tr> <tr><td>Measuring range 7</td><td>0 ... 375 SI</td></tr> <tr><td>Measuring range 8</td><td>0 ... 1 000 SI</td></tr> <tr><td>Measuring range 9</td><td>0 ... 3 000 SI</td></tr> </table>	Measuring range 1	0 ... 7.5 SI	Measuring range 2	0 ... 15 SI	Measuring range 3	0 ... 45 SI	Measuring range 4	0 ... 75 SI	Measuring range 5	0 ... 150 SI	Measuring range 6	0 ... 225 SI	Measuring range 7	0 ... 375 SI	Measuring range 8	0 ... 1 000 SI	Measuring range 9
Measuring range 1	0 ... 7.5 SI																	
Measuring range 2	0 ... 15 SI																	
Measuring range 3	0 ... 45 SI																	
Measuring range 4	0 ... 75 SI																	
Measuring range 5	0 ... 150 SI																	
Measuring range 6	0 ... 225 SI																	
Measuring range 7	0 ... 375 SI																	
Measuring range 8	0 ... 1 000 SI																	
Measuring range 9	0 ... 3 000 SI																	
	2 measuring ranges, freely adjustable via SOPAS ET																	
Measurement uncertainty <sup>1)</sup>	± 2% of the upper measuring range value																	
Response time	0.1...600 s, freely selectable via program SOPAS ET																	
Measuring Conditions																		
Gas temperature <sup>2)</sup>	-40 °C ... +220 °C																	
Sample gas pressure	-50 hPa... +10 hPa with integrated purge air unit -50 hPa... +30 hPa with external purge air unit -50 hPa... +100 hPa with instrument air (onsite)																	
Internal duct diameter	≥ 150 mm with Tri-Clamp version, 1" thread version ≥ 250 mm with flange version																	
Ambient temperature	-40...+60 °C Sender/receiver unit -40...+45 °C Intake temperature for integrated purge air unit																	
Function Check																		
Automatic self-test	Linearity, drift, aging																	
Manual linearity check	Using a reference filter																	
Output Signals																		
Analog output	4 ... 20 mA, max. load 750 Ω; resolution 12 bits; electrically isolated																	
Relay output	3 potential-free outputs (NO contacts) for status signals; contact load 48 V, 1 A;																	
Input signals																		
Digital input	4 inputs for connecting potential-free contacts (e.g. for external maintenance switch, automatic function check, linearity measurement, calibration curve switching or filter watch)																	
Communication																		
RS-485	ColaB SOPAS operation via service adapter or connection of optional MCU																	
Modbus	RTU for transferring measured values																	
Energy supply																		
Sender/receiver unit	Voltage supply: 24 V DC ± 10% from external voltage supply or optional MCU Power consumption: max. 4 W without integrated purge air unit max. 30 W with integrated purge air unit																	
Optional MCU control unit	Voltage supply: 90 ... 250 V AC, 47...63 Hz; opt. 24 V DC ± 2 V Power consumption: MCU-N: Max. 15 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																	
Weight																		
Sender/receiver unit	Max. 8.5 kg with integrated purge air unit and 735 mm length																	
MCU installed	3.7 kg Optional MCU-N control unit																	
Optional external purge air unit	14 kg																	

Miscellaneous	
Protection class	IP 66 IP 54 Sender/receiver unit DHSP30 without integrated purge air Sender/receiver unit DHSP30 with integrated or external purge air unit
Laser	Protection class 2; power < 1 mW; wavelength between 640 nm and 660 nm
1);	In temperature range - 20 °C ... +50 °C
2);	Above dew point

### 7.4 Dimensions, item numbers

All undeclared dimensions are specified in mm.

#### 7.4.1 Sender/receiver unit

Fig. 38: Sender/receiver unit with 1" thread

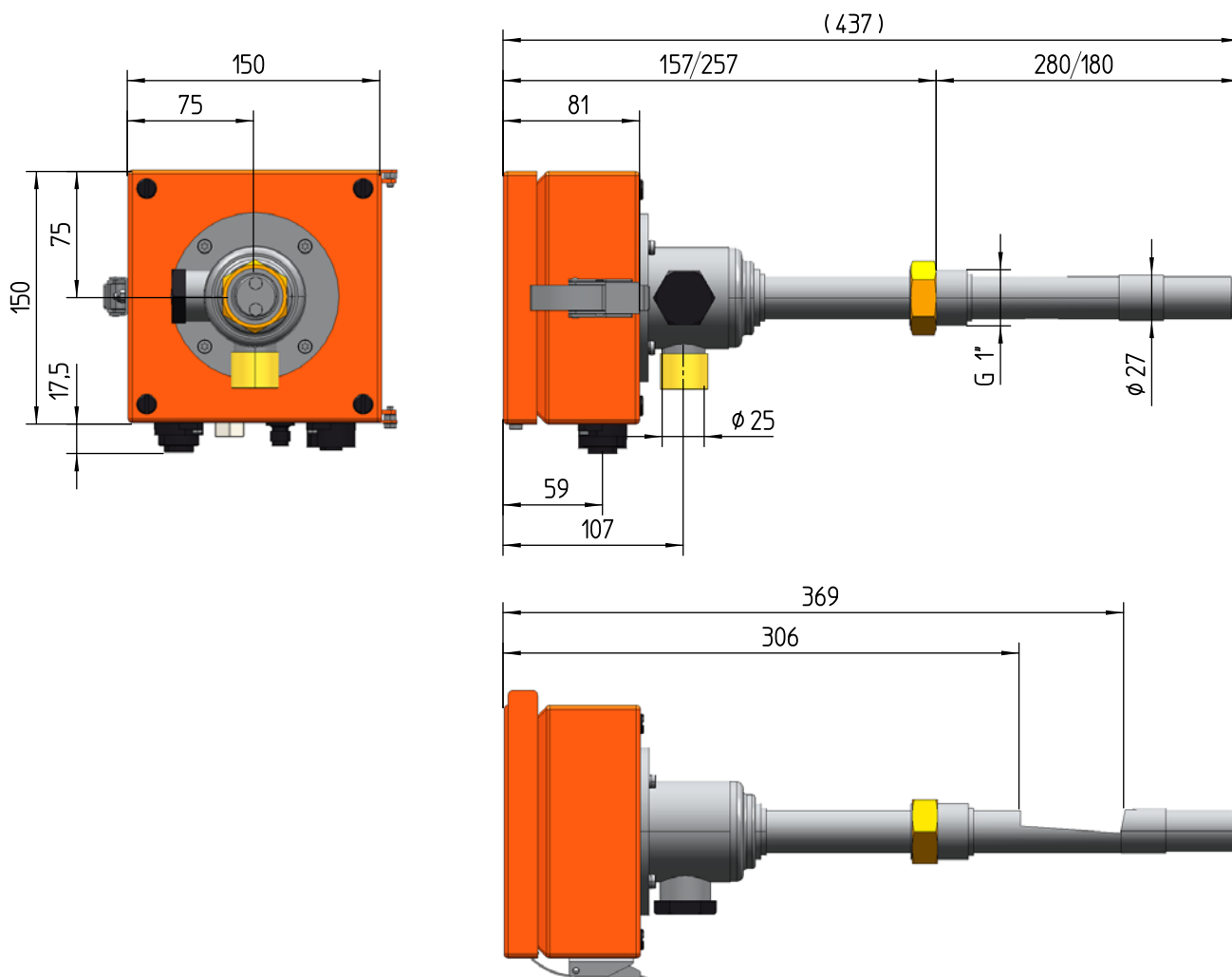
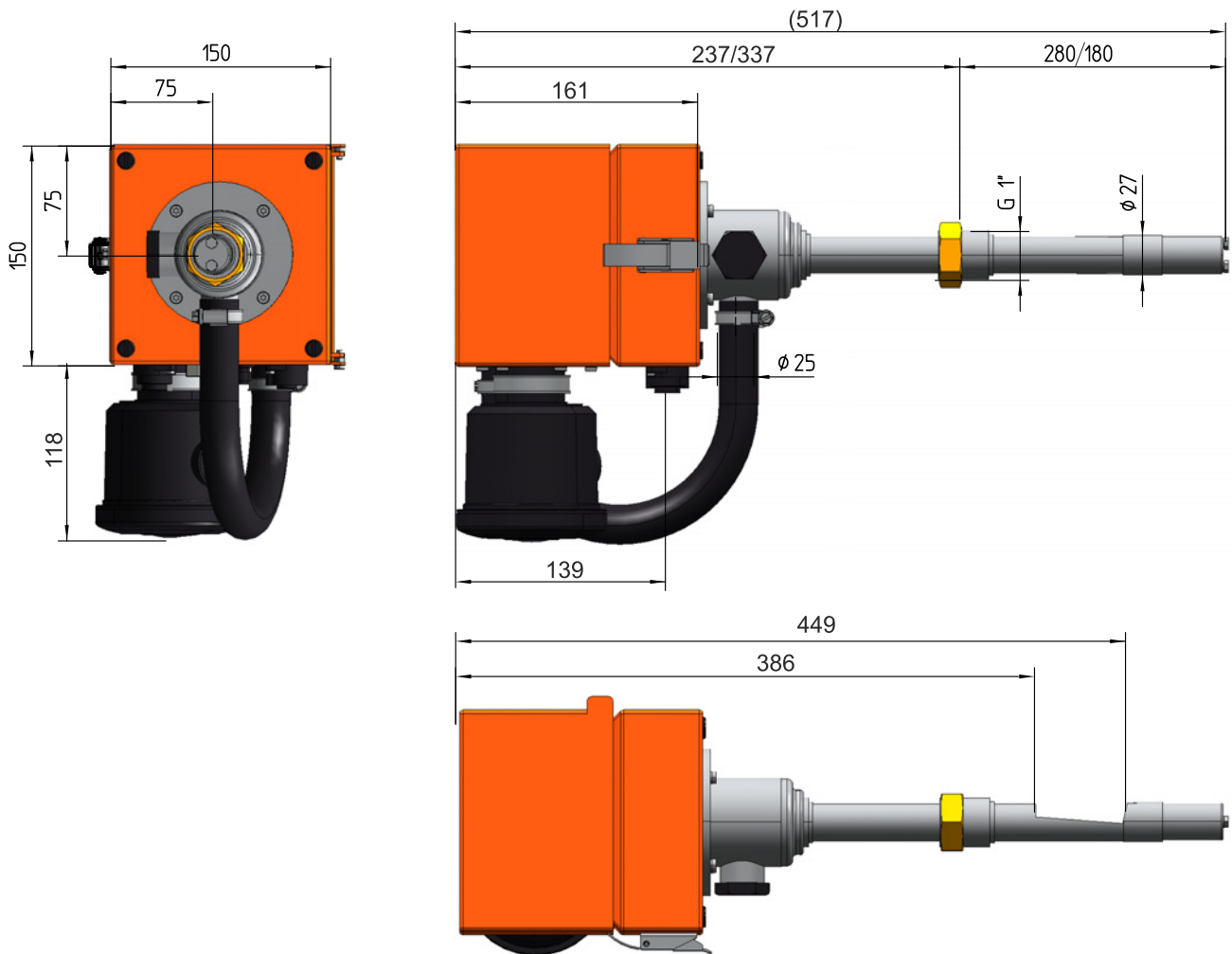


Fig. 39: Sender/receiver unit with 1" thread with integrated purge air unit



Designation	Item number
Sender/receiver unit DHSP30, for fitting with 1" thread, NL180 mm, up to 220 °C, without integrated purge air unit	1077738
Sender/receiver unit DHSP30, for fitting with 1" thread, NL280 mm, up to 220 °C, without integrated purge air unit	1077739
Sender/receiver unit DHSP30, for fitting with 1" thread, NL180 mm, up to 220 °C, with integrated purge air unit	1089200
Sender/receiver unit DHSP30, for fitting with 1" thread, NL280 mm, up to 220 °C, with integrated purge air unit	1089201

Fig. 40: Sender/receiver unit with Tri-Clamp

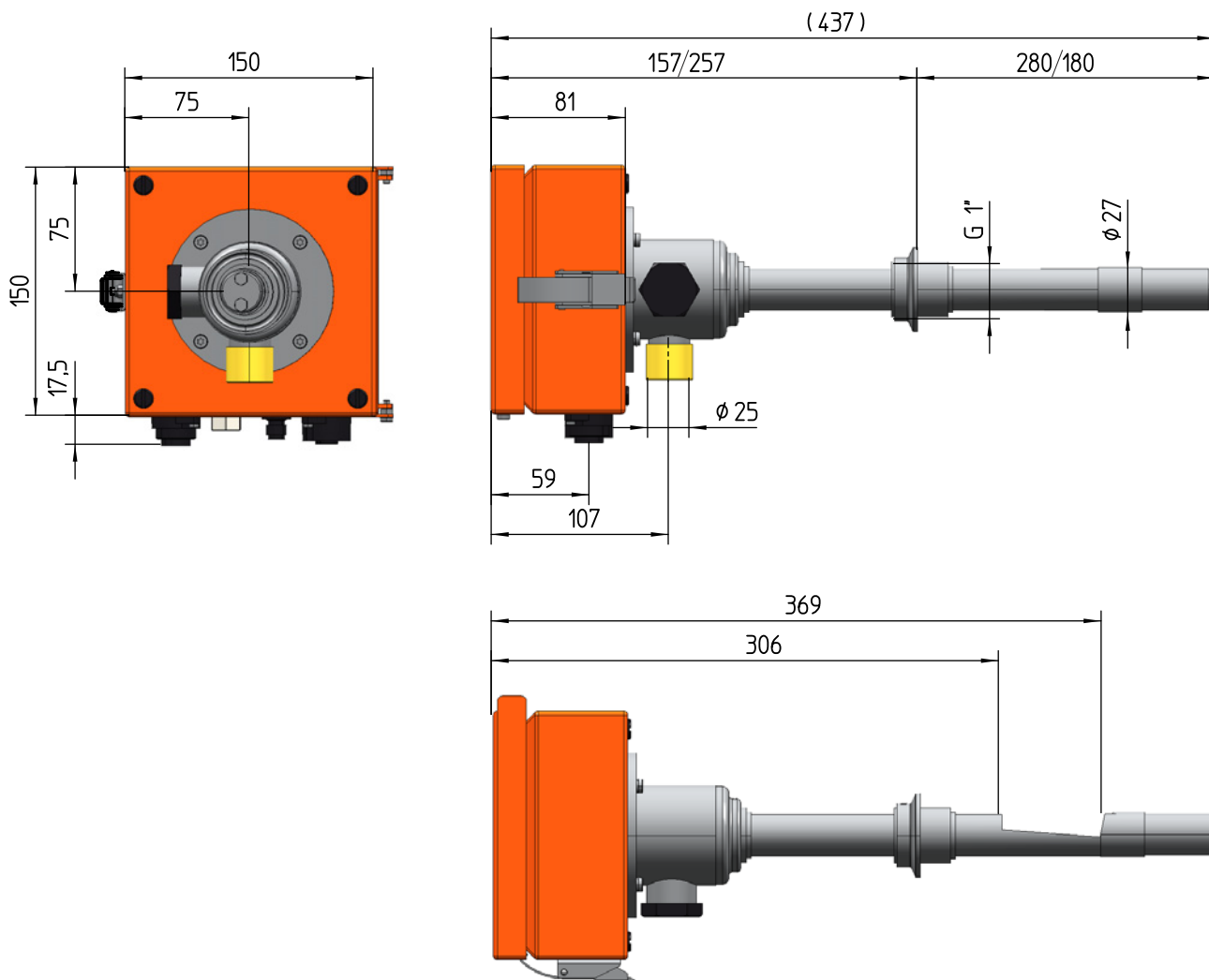
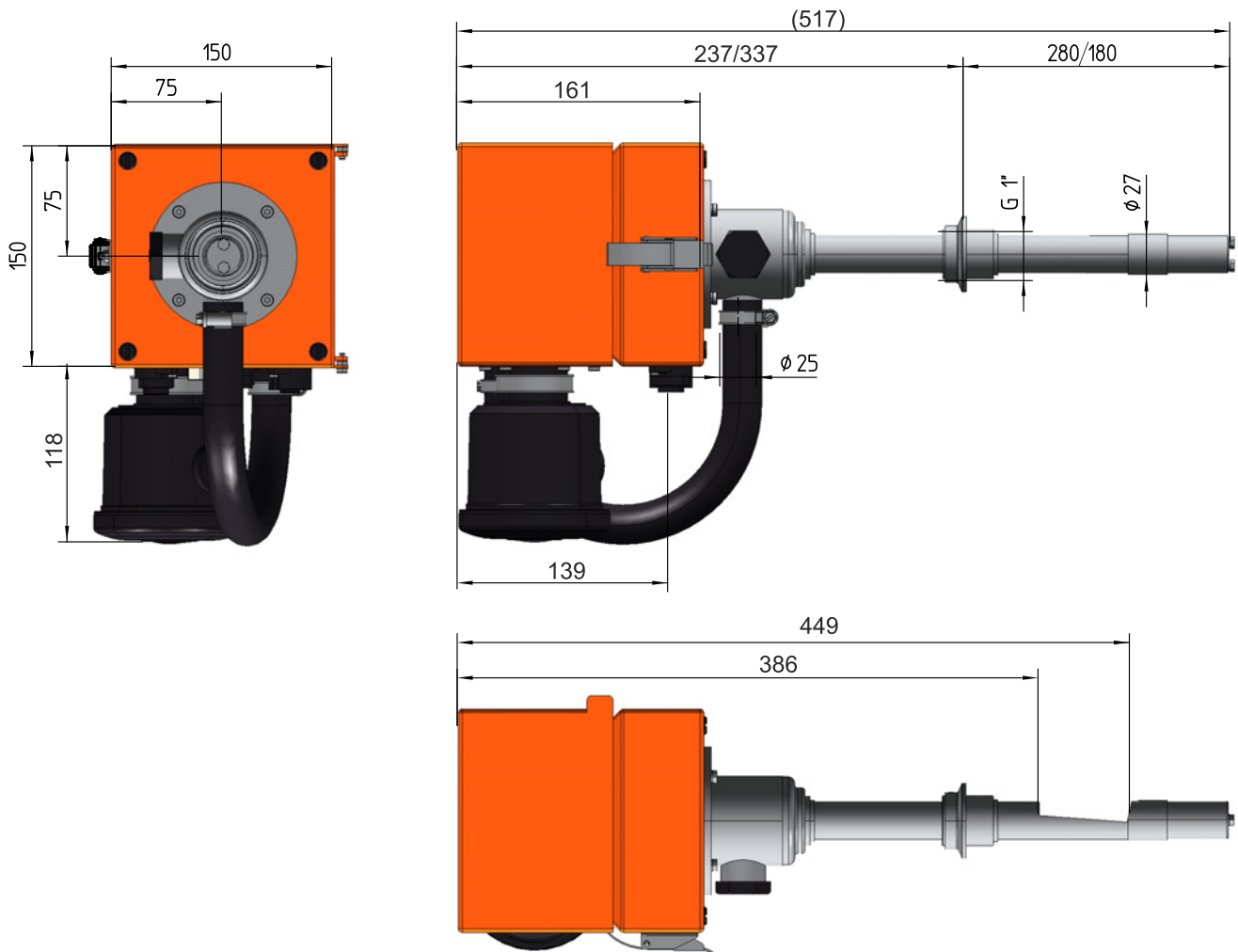


Fig. 41: Sender/receiver unit with Tri-Clamp with integrated purge air unit



Designation	Item number
Sender/receiver unit DHSP30, for fitting with Tri-Clamp, NL180 mm, up to 220 °C, without integrated purge air unit	1077736
Sender/receiver unit DHSP30, for fitting with Tri-Clamp, NL280 mm, up to 220 °C, without integrated purge air unit	1077737
Sender/receiver unit DHSP30, for fitting with Tri-Clamp, NL180 mm, up to 220 °C, with integrated purge air unit	1089198
Sender/receiver unit DHSP30, for fitting with Tri-Clamp, NL280 mm, up to 220 °C, with integrated purge air unit	1089199

Fig. 42: Sender/receiver unit with flange

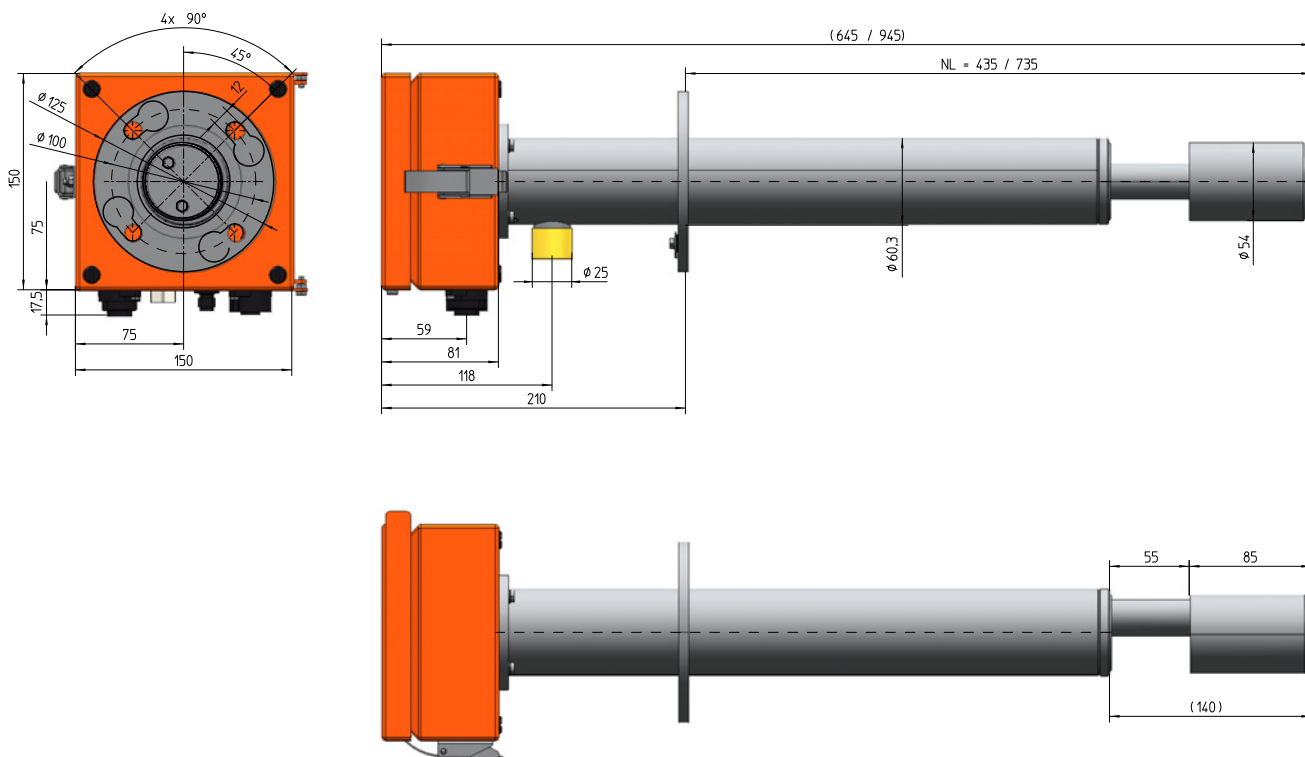
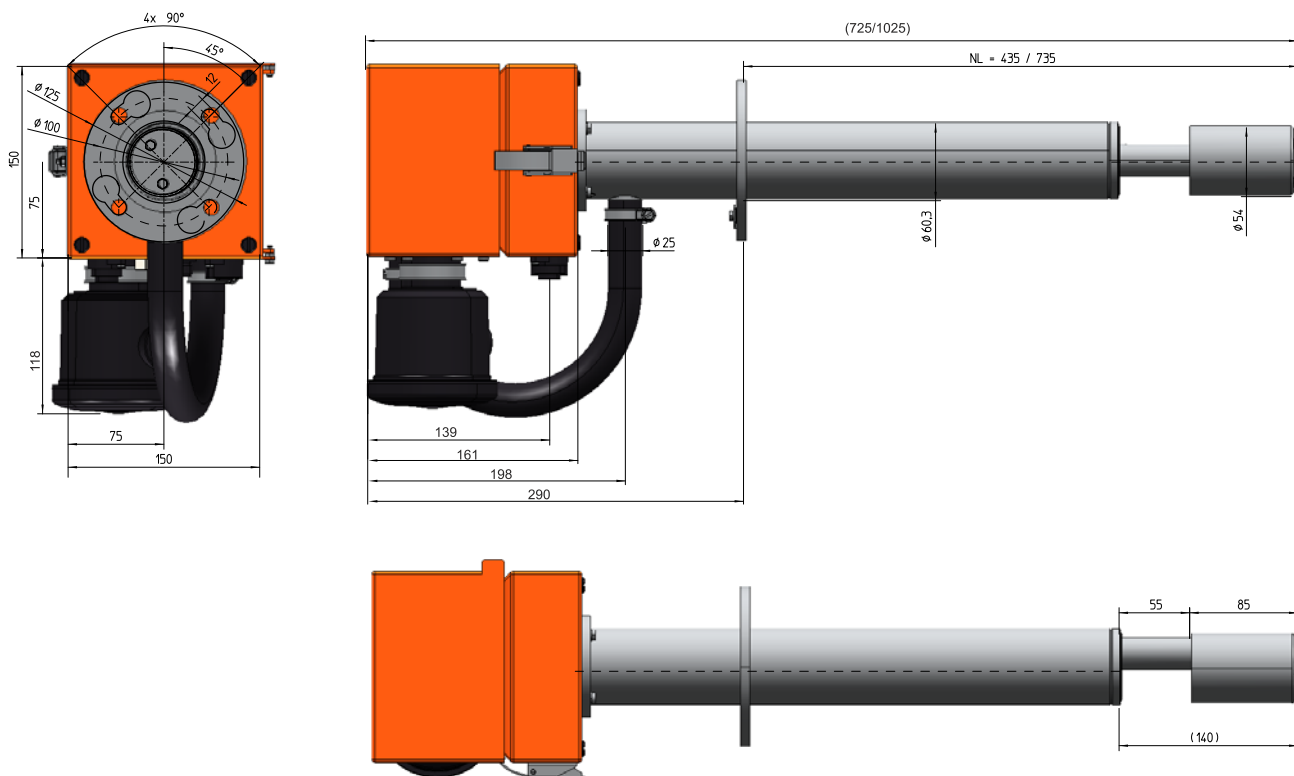


Fig. 43: Sender/receiver unit with flange with integrated purge air unit



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Designation	Item number
Sender/receiver unit DHSP30, for fitting with flange with tube, NL435 mm, up to 220 °C, without integrated purge air unit	1074327
Sender/receiver unit DHSP30, for fitting with flange with tube, NL735 mm, up to 220 °C, without integrated purge air unit	1077751
Sender/receiver unit DHSP30, for fitting with flange with tube, NL435 mm, up to 220 °C, with integrated purge air unit	1089197
Sender/receiver unit DHSP30, for fitting with flange with tube, NL735 mm, up to 220 °C, with integrated purge air unit	1089203



7.4.2 Fitting elements

Fig. 44: Flange with tube

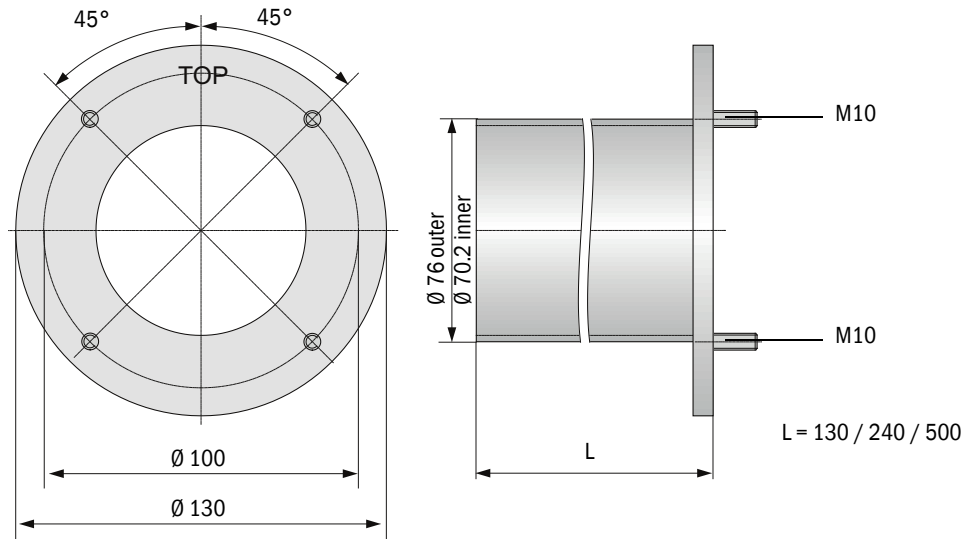
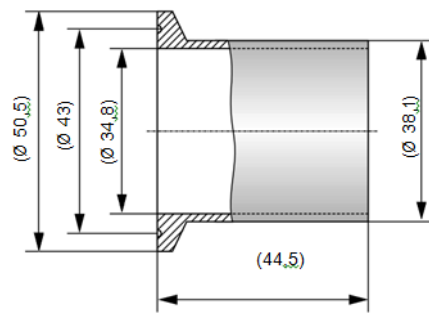


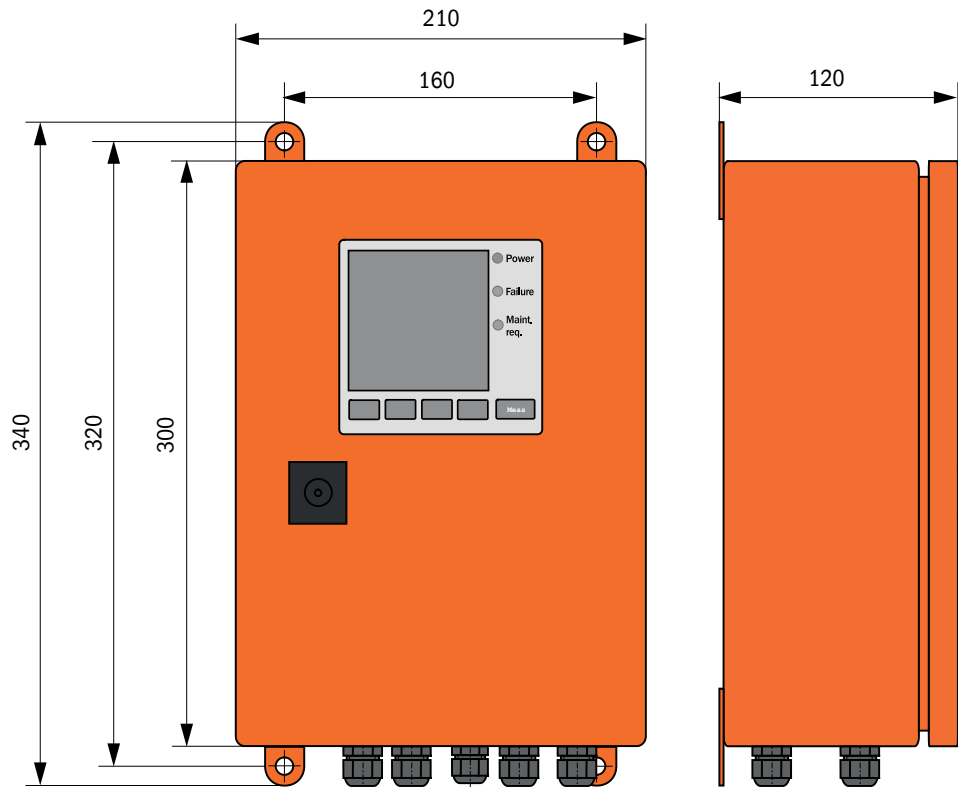
Fig. 45: Tri-Clamp welding nozzle



Designation	Item number	Usage on
Flange with tube		
Flange with tube, K100, length 130 mm, material: 1.0254	2017845	DHSP30 flange with tube NL435/735
Flange with tube, K100, length 240 mm, material: 1.0254	2017847	DHSP30 flange with tube NL435/735
Flange with tube, K100, length 500 mm, material: 1.0254	2017849	DHSP30 flange with tube NL735
Flange with tube, K100, length 130 mm, material: 1.4571	2017846	DHSP30 flange with tube NL435/735
Flange with tube, K100, length 240 mm, material: 1.4571	2017848	DHSP30 flange with tube NL435/735
Flange with tube, K100, length 500 mm, material: 1.4571	2017850	DHSP30 flange with tube NL735
Tri-Clamp flange		
Quick-release fastener with flange 1.5" Tri-Clamp with nozzle TLS14AM length 44.5 mm, fitting 1.5" 13 MHLA and seal	7047520	DHSP30 Tri-Clamp NL180/280
1" thread flange		
1" sleeve	7047526	DHSP30 1" thread NL180/280
Flange cover		
Flange cover material: 1.4571	5320851	DHSP30 1" thread NL180/280
Flange cover 1.4571	5321370	DHSP30 Tri-Clamp NL180/280
Flange cover 1.4571	7047593	DHSP30 flange with tube NL435 and NL735

7.4.3 Optional MCU control unit

Fig. 46: MCU-N control unit

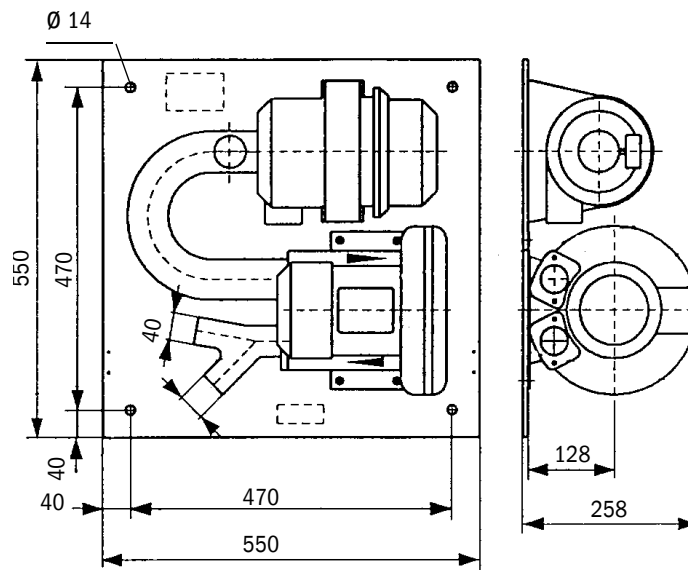


Designation	Item number
MCU-N control unit	
Control unit MCU-NWONN00000NNNE in wall enclosure (orange), supply voltage 90 ... 250 V AC, without purge air unit, without display	1040667
Control unit MCU-N2ONN00000NNNE in wall enclosure (orange), supply voltage 24 V DC, without purge air unit, without display	1040669
Control unit MCU-NWONN00000NNNE in wall enclosure (orange), supply voltage 90...250 VAC, without purge air unit, with display	1080506
Control unit MCU-N2ONN00000NNNE in wall enclosure (orange), supply voltage 24 VDC, without purge air unit, with display	1040677

Further control units on request.

7.4.4 Optional external purge air unit

Fig. 47: Optional external purge air unit

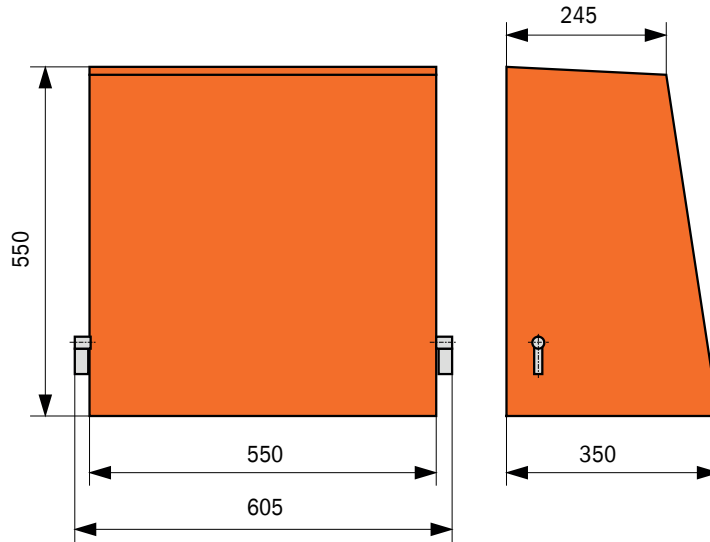


Designation	Item number
Purge air unit with blower 2BH13 and purge air hose, length 10 m	1012409

7.4.5 Weatherproof covers

**Weatherproof cover for external purge air unit**

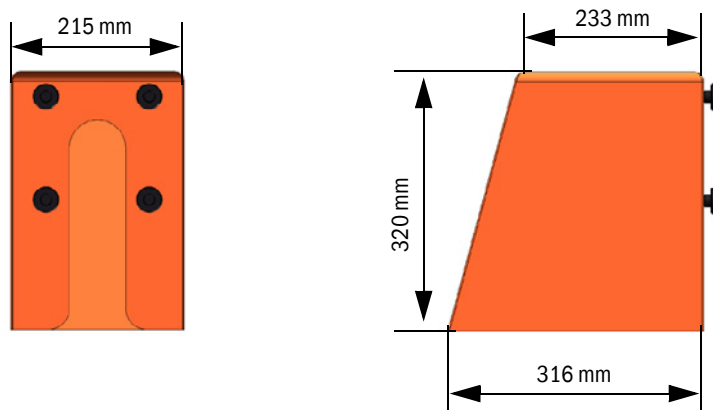
Fig. 48: Weatherproof cover for external purge air unit



Designation	Item number
Weatherproof cover for external purge air unit 2BH13	2084180

**Weatherproof cover for sender/receiver unit**

Fig. 49: Weatherproof cover for sender/receiver unit



Designation	Item number
Weatherproof cover for DHSP30 (with and without integrated purge air unit)	2095539

## 7.5 Accessories

### 7.5.1 Connections for sender/receiver unit

Designation	Item number
Connection cable 1 for connection AO, Modbus and voltage supply 24V DC	
7-pole socket	6049886
Connection cable, length 5 m	2043678
Connection cable, length 10 m	2043679
Connection cable, length 25 m	2096251
Connection cable, length 50 m	2047179
Connection cable 2 for relay and DI connection	
7-pole plug	6049036
Connection cable, length 5 m	2096285
Connection cable, length 10 m	2096286
Connection cable, length 25 m	2096287
Connection cable, length 50 m	2096288
Connection cable 3 for connecting MCU or SOPAS ET and DI	
5-pole socket	6009719
SOPAS service kit (RS485 adapter, USB 2.0 cable, connection cable 3)	2097408

### 7.5.2 Purge air supply

Designation	Item number
Purge air hose DN25, length 5m	2046091
Purge air hose DN25, length 10m	7047536
Purge air reducer	7047538
Purge air adapter for instrument air	7047539
Non-return valve DN25	2042278
Hose clamp D20-32	7045039
Hose clamp D32-52	5300809
Purge air hose DN40, per meter	5304683

### 7.5.3 Assembly parts

Designation	Item number
Assembly kit for DHSP30 NL 435/735 mm	2018184

### 7.5.4 Accessories for linearity test

Designation	Item number
Filter measuring set, complete with transport case, filter holder and 5 different scattered light filters	2049045

## 7.6 Consumable parts for 2-year operation

Designation	Number	Item number
O-ring set, contains all O-rings for protective tube and probe opening	1	2095442
Optics cloth	4	4003353
Filter element for integrated purge air unit	4	5324368
Sintered metal filter	4	7047714
Filter element Micro-Topement C11 100 (for optional external purge air unit)	4	5306091

## 7.7 Spare parts

### 7.7.1 Sender/receiver unit

Designation	Replacement for	Item number
Protective tube	DHSP30 NL435 mm	2080018
Protective tube	DHSP30 NL735 mm	2083425
Cover	DHSP30 NL 435/735 mm	4052222
Laser	DHSP30 NL180/280 mm	2095385
Laser	DHSP30 NL435 mm	2095386
Laser	DHSP30 NL735 mm	2095387
Mainboard	All DHSP30 variants	2083008
Flange seal k100	DHSP30 NL 435/735 mm	7047036
Connection cable, 7-pole, plug-plug connector	All DHSP30 variants	2093560
Connection cable, 7-pole, socket-plug connector	All DHSP30 variants	2093561
Connection cable, 5-pole, plug-plug connector	All DHSP30 variants	2061405
Quick-release fastener	All DHSP30 variants	5336941

### 7.7.2 Purge air supply

Designation	Item number
Filter housing with filter for DHSP30 with integrated purge air unit	5337164
Blower motor Micronel with plug and seal for DHSP30 with integrated purge air unit	2095699
Hose DN25 for DHSP30 with external purge air unit and integrated purge air unit	7047755
Hose clamp D20-32 for DHSP30 with external purge air unit and integrated purge air unit	7045039



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