OPERATING INSTRUCTIONS

DUSTHUNTER SB30
Dust Measuring System

Description
Installation
Operation

SICK
Sensor Intelligence.

Document Information

Described Product
Product name: DUSTHUNTER SB30

Document ID
Title: Operating Instructions DUSTHUNTER SB30
Part No.: 8014551
Version: 1.0
Release: 2012-12

Manufacturer
SICK AG
Erwin-Sick-Str. 1 · 79183 Waldkirch · Germany
Phone: +49 7641 469-0
Fax: +49 7641 469-1149
E-mail: info.pa@sick.de

Place of Manufacture
SICK Engineering GmbH
Bergener Ring 27 · 01458 Ottendorf-Okrilla · Germany

Original Documents
The English edition 8014551 of this document is an original document of SICK AG.
SICK AG assumes no liability for the correctness of an unauthorized translation.
Please contact the manufacturer or your local representative in case of doubt.

Warning Symbols

Hazard (general)

Hazard by voltage

Hazard by laser radiation

Warning Levels / 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 personal injury or property damage.

NOTICE
Hazard which *could* result in property damage.

Information Symbols

Important technical information for this product

Supplementary information

Link to information at another place

DUSTHUNTER SB30

1 Important Information

Main hazards
Intended use
Responsibility of user

1.1 Main hazards

1.1.1 Hazards from hot and/or aggressive gases and/or high pressure

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

WARNING: Danger from exhaust gas

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

1.1.2 Hazards through 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 Intended use

Purpose of the device

The DUSTHUNTER SB30 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 SB30 measuring system is not approved for use in potentially explosive atmospheres.

1.3 Responsibility of user

1.3.1 General information

Designated users

The DUSTHUNTER SB30 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.

Retention of documents

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

1.3.2 Safety information and protective measures

Protection devices

> ***NOTICE:***
> Suitable protection devices and safety equipment for persons must be available according to the respective hazard potential and be used by the personnel.

Behavior during purge air failure

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

> ***NOTICE:***
> 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

NOTICE:

The user must ensure that:

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

Recognizing malfunctions

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

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

Avoiding damage

NOTICE:

The operator must ensure the following to avoid malfunctions that can indirectly or directly lead to injuries to persons or material damage:

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

DUSTHUNTER SB30

2 Product Description

Measuring principle, measured variables
Device components

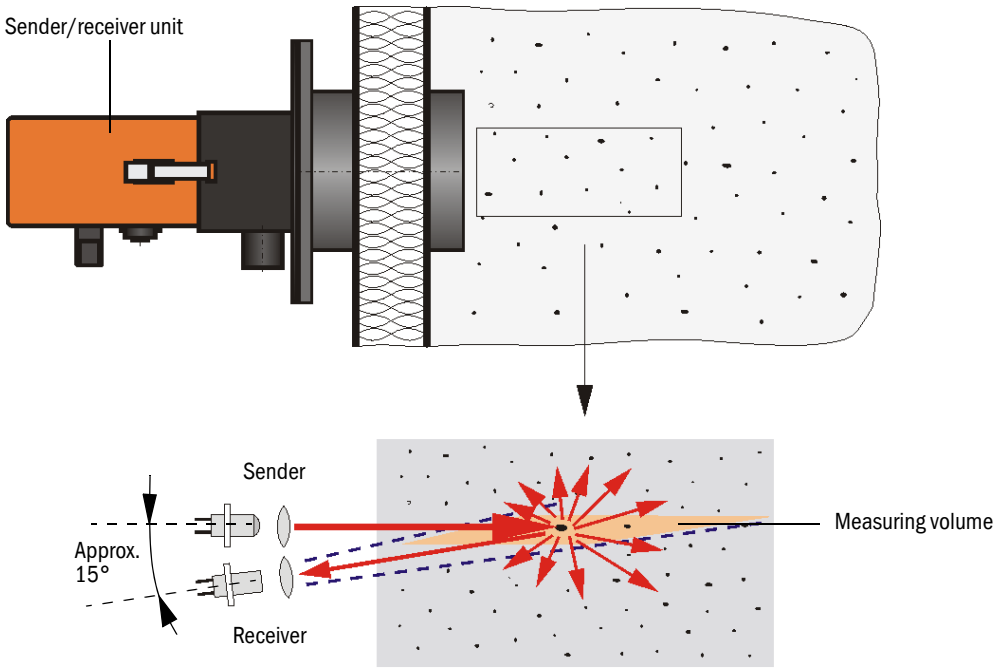
2.1 Measuring principle, measured variables

2.1.1 Functional principle

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

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

Figure 1 Measuring principle



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

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

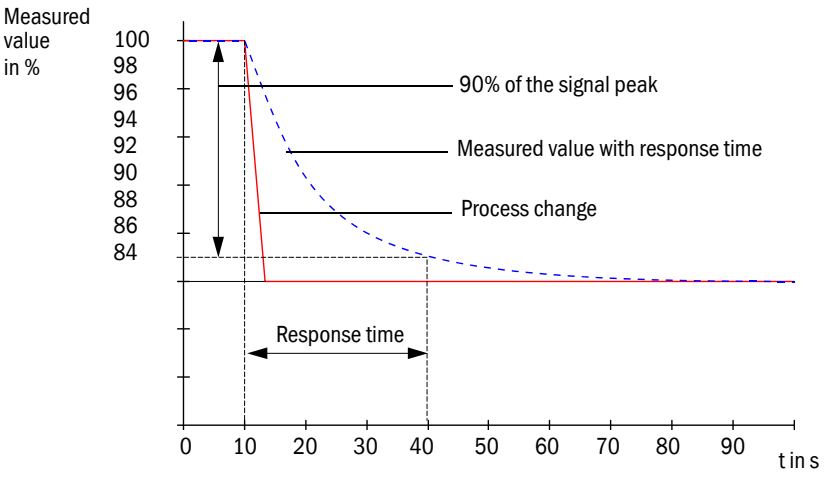
$$c = cc2 \cdot SI^2 + cc1 \cdot SI + cc0$$

(input → p. 52, §4.2.3.6; standard setting ex factory: cc2 = 0, cc1 = 1, cc0 = 0).

2.1.2 Response time

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

Figure 2 Response time



2.1.3 Functional check

The measuring system has an integrated functional check with selectable interval times which allows automatic checking for correct function (necessary settings → p. 50, §4.2.3.5). Any unallowed deviations from normal behavior that may occur are signaled as errors.

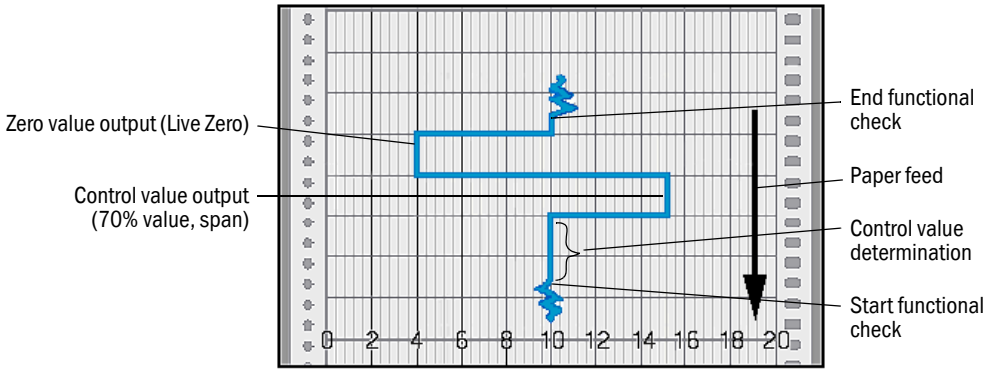
The functional check can also be initiated manually by switching the supply voltage off and on.

Further information → Service Manual

The functional check comprises:

- Approx. 30 s measurement of zero and control value
- Every 90 s (standard value), output of values determined.

Figure 3 Functional check output on a plotter



- A time interval must be set for output of the control values on the analog output (→ p. 40, §4.2.3).
- 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 functional check is not started automatically when the measuring system is in “Maintenance” mode.

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 is generated when the “zero value” is outside the specified range.

Control value measurement (Span test)

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

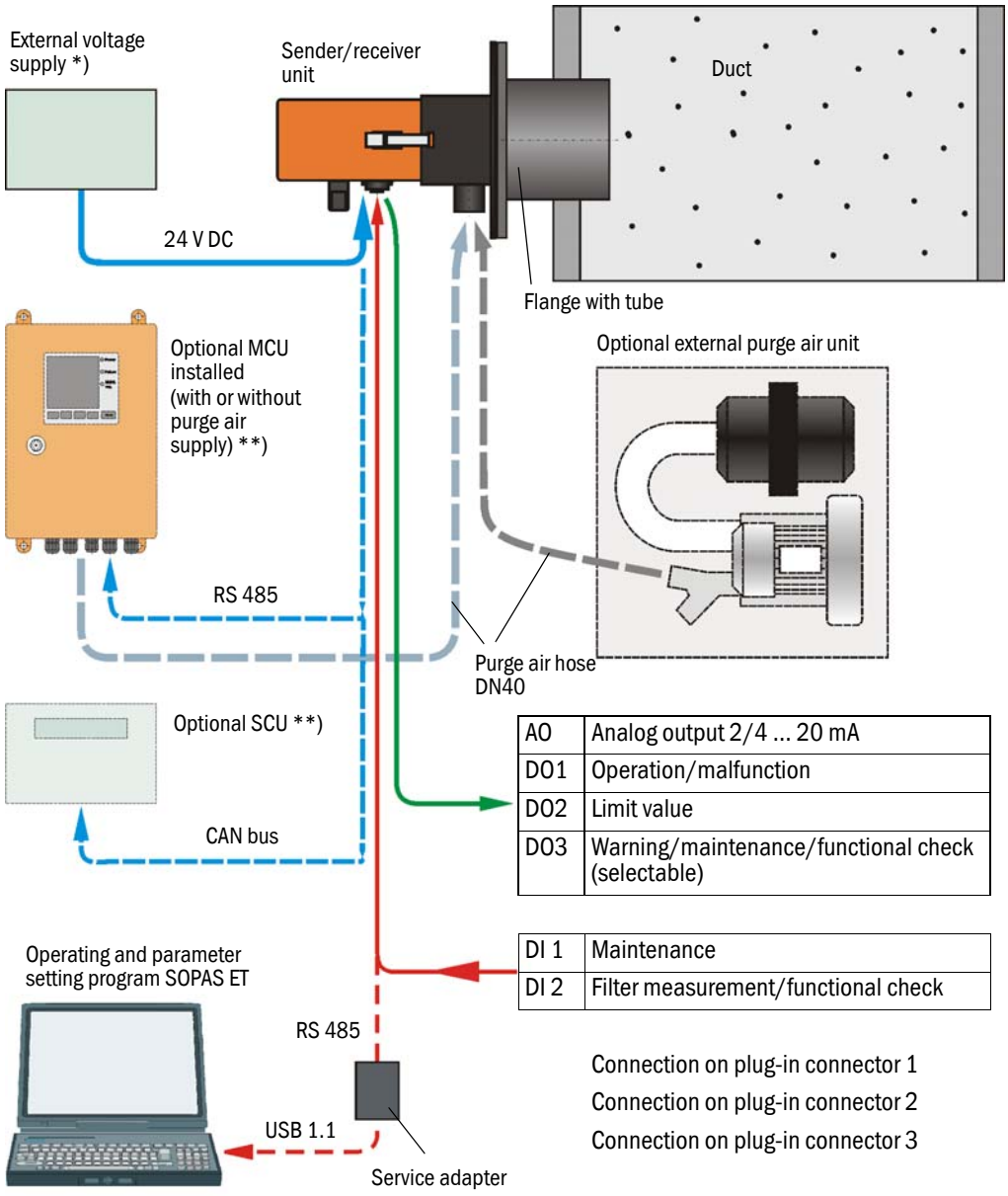
The value calculated theoretically (70%) is output for very low dust concentrations (< approx. 1 mg/m³).

2.2 Device components

Measuring system DUSTHUNTER SB comprises the components (→ Fig. 4):

- Sender/receiver unit DHSB30
- Flange with tube
- Optional MCU control unit (details on request)
  to control, evaluate and output the data of the sender/receiver unit connected via the RS485 interface
  - With integrated purge air supply, for internal duct pressure -50 ... +2 hPa
  - Without purge air supply, therefore additionally required:
- Optional external purge air unit, for internal duct pressure -50 ... +30 hPa
- Optional SCU (details on request)
  for operating several measuring systems

Figure 4 DUSTHUNTER SB30 device components



*: Not required when optional MCU installed

**): Information on request

AO	Analog output 2/4 ... 20 mA
DO1	Operation/malfunction
DO2	Limit value
DO3	Warning/maintenance/functional check (selectable)

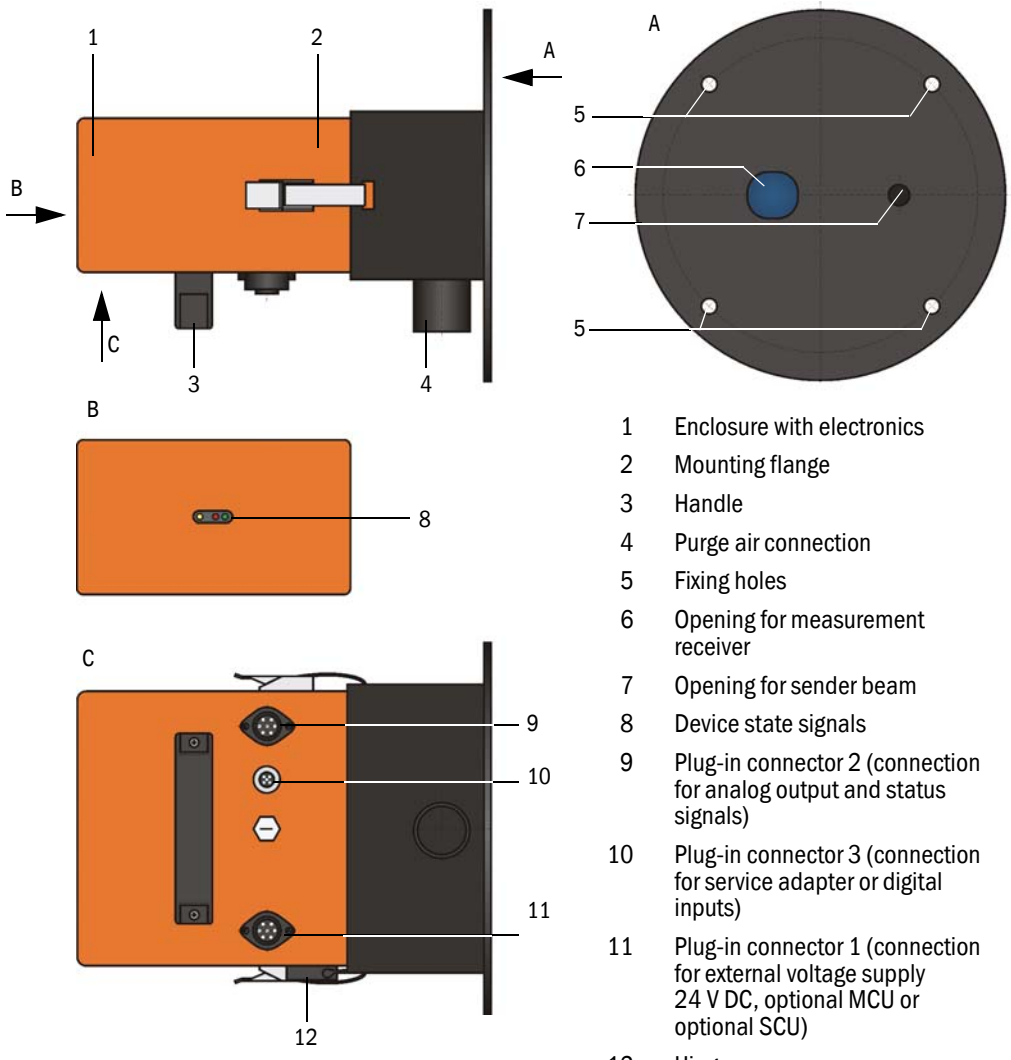
DI 1	Maintenance
DI 2	Filter measurement/functional check

2.2.1 Sender/receiver unit

The sender/receiver unit contains the optical and electronic subassemblies to send and receive the light beam as well as to process and evaluate the signals. An RS485 interface is available for service purposes. Clean air to cool the device and keep the optical surfaces clean is fed via a purge air connection.

The sender/receiver unit is fastened to the duct with a flange with tube (→ p. 17, Fig. 4).

Figure 5 Sender/receiver unit DHSB-T

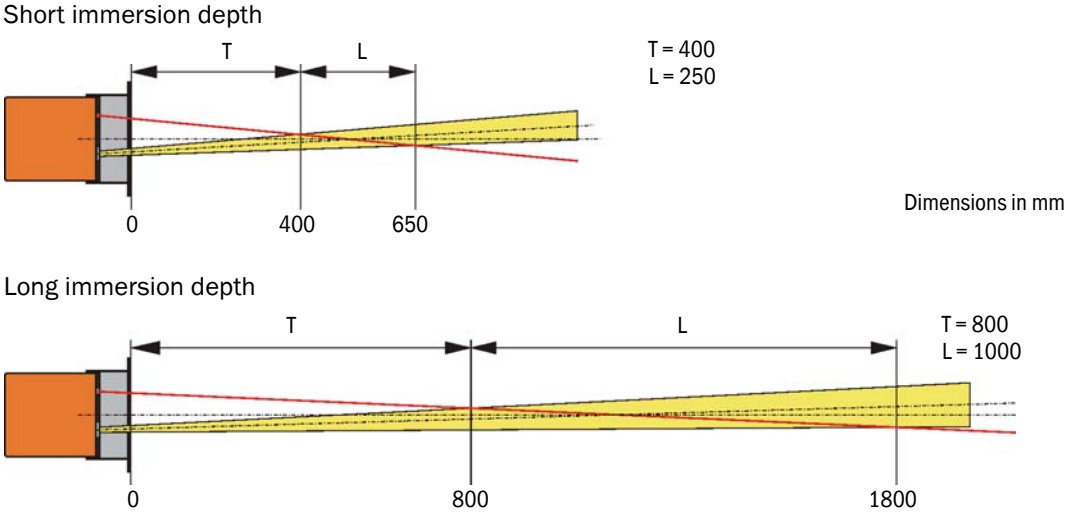


1	Enclosure with electronics
2	Mounting flange
3	Handle
4	Purge air connection
5	Fixing holes
6	Opening for measurement receiver
7	Opening for sender beam
8	Device state signals
9	Plug-in connector 2 (connection for analog output and status signals)
10	Plug-in connector 3 (connection for service adapter or digital inputs)
11	Plug-in connector 1 (connection for external voltage supply 24 V DC, optional MCU or optional SCU)
12	Hinge

The current device state (operation/malfunction, maintenance/maintenance request) is signaled on the rear side of the enclosure (green = operation, red = malfunction, yellow = maintenance).

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

Figure 6 Relation between scattering angle, immersion depth (T) and measuring volume length (L)

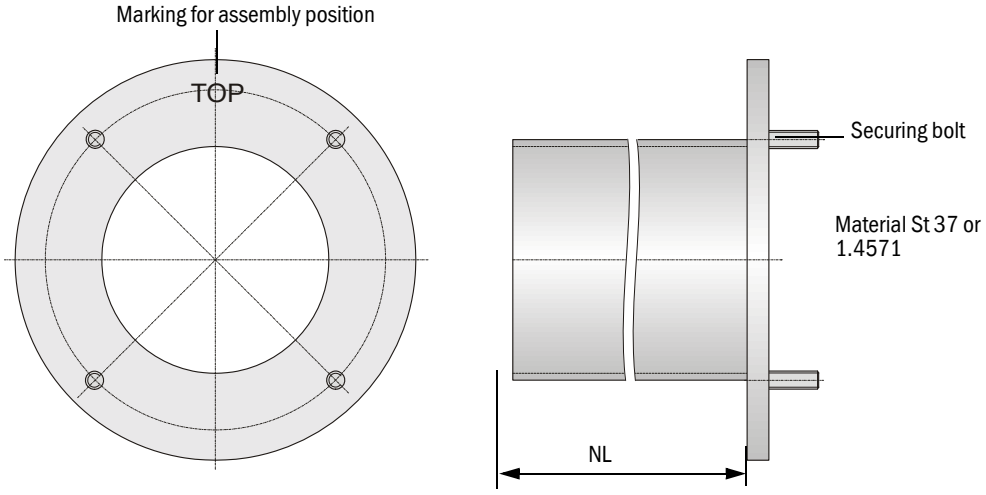


Immersion depth and measuring volume length can be changed easily onsite (→ p. 34, §4.1.1)

2.2.2 Flange with tube

The flange with tube is available in various types of steel and graded nominal lengths (NL). Selection depends on the wall and isolation thickness of the duct wall (→ nominal length) and the duct material.

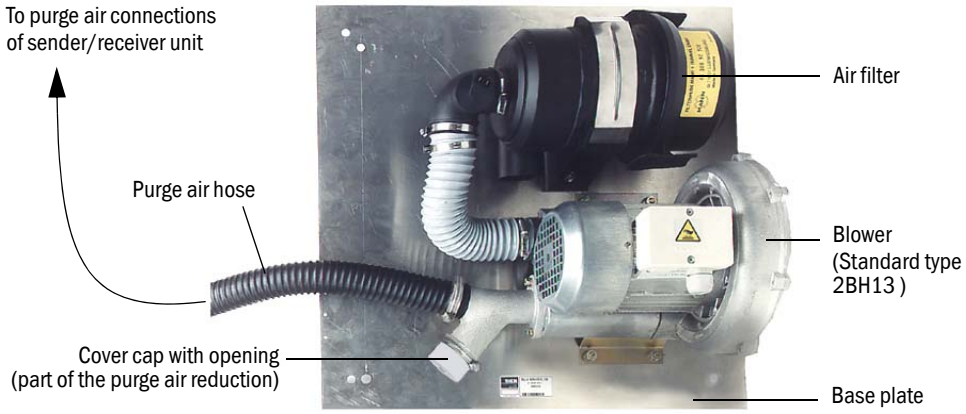
Figure 7 Flange with tube



2.2.3 Optional external purge air unit

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

Figure 8 Optional external purge air unit



A weatherproof cover is available for use outdoors (→ p. 78, Fig. 51).

2.2.4 Voltage and purge air supply

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

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

2.2.5 Installation accessories

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

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

Weatherproof cover

A weatherproof cover is available when using the sender/receiver unit outdoors (→ p. 78, Fig. 52).

Purge air heater

It is recommended to use an optional purge air heater available for delivery to prevent condensation in the device or flange tube when the measuring system is operated at gas temperatures close to the dew point or very low ambient temperatures → p. 79, §7.3.3)

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

Optional backflow valve

When the measuring system is used with overpressure in the duct, installing a backflow valve on the purge air connection of the sender/receiver unit can protect the sender/ receiver unit, external purge air unit and the environment should the purge air supply fail (→ p. 30, Fig. 14).

2.2.6 Test equipment for linearity test

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

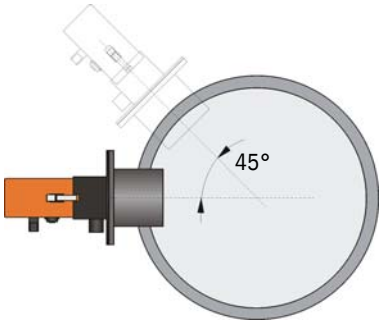
DUSTHUNTER SB30

3 Assembly and Installation

Project planning
Assembly
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	✓
Determine the measuring and fitting location 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	– Follow specifications for new equipment – Select best possible location for existing equipment; – For too short inlet/outlet paths: Inlet path > outlet path	☐
	– Uniform 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	☐
	Fitting position for the sender/receiver unit		Select best possible location	☐
	Accessibility, accident prevention	The device components must be easily and safely accessible	Provide platforms or pedestals as required	☐
	Installation free of vibrations	Acceleration < 1 g	Eliminate/reduce vibrations through suitable measures	☐
	Ambient conditions	Limit values according to Technical Data	If necessary: – Provide weatherproof covers/sun protection – Enclose or lag device components	☐
Select the purge air supply	Sufficient primary purge air pressure depending on internal duct pressure	Plan a purge air heater for gas temperatures close to the dew point or very low ambient temperatures	Select supply type	☐
	Clean intake air	Whenever possible, low amount of dust, no oil, moisture or corrosive gases	Select best possible location for air intake Determine required purge air hose length	☐
Select device components	Duct wall thickness with isolation	Flange with tube	– Set the immersion depth depending on the internal duct diameter (→ p. 34, §4.1.1) – if necessary, plan additional measures to fit the flange with tube (→ p. 25, §3.2.1)	☐
	Internal duct pressure	Type of purge air supply		
	Fitting locations	Cable and purge air hose lengths		
Plan calibration openings	Access	Easy and safe	Provide platforms or pedestals as required	☐
	Distances to measuring level	No mutual interference between calibration probe and measuring system	Plan sufficient distance between measuring and calibration level (approx. 500 mm)	☐
Plan power supply	Operating voltage, power requirements	According to Technical Data (→ p. 72, §7.1)	Plan adequate cable cross-sections and fuses	☐

3.2 Assembly

Carry out all assembly work onsite. This includes:

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

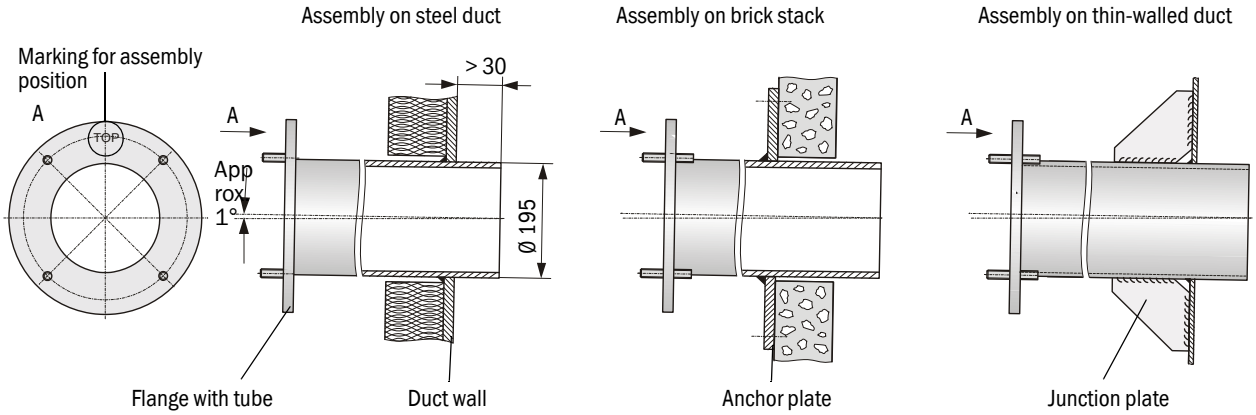
WARNING:

- Observe the relevant safety regulations as well as the safety notices in Section 1 during all assembly work.
- Only carry out assembly work on equipment with hazard potential (hot or aggressive gases, higher internal duct pressure) when the equipment is at a standstill.
- Take suitable protection measures against possible local hazards or hazards arising from the equipment.

All dimensions specified in this Section are shown in mm.

3.2.1 Fitting the flange with tube

Figure 9 Fitting the flange with tube



NOTICE:

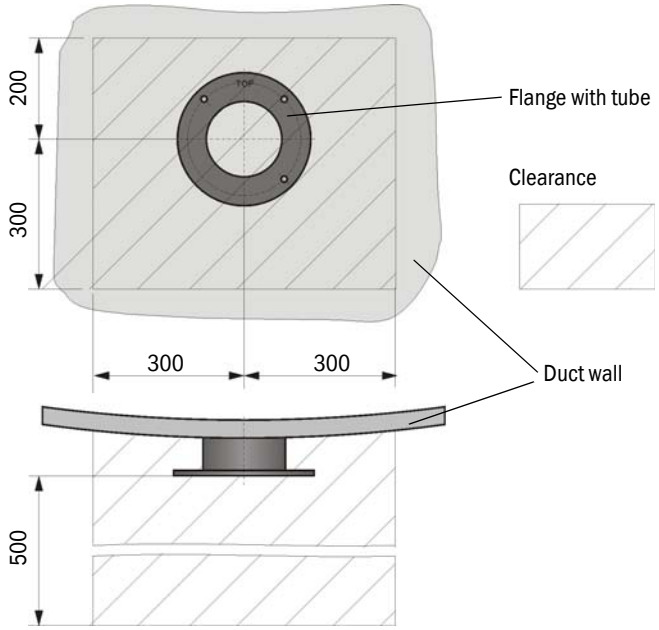
Maximum wall and isolation thickness are derived from the flange tube length (350 mm or 700 mm) less the distance between flange and stack outer wall, and stack immersion depth (> 30 mm).

Work to be performed

► Measure the fitting location and mark the assembly location.

Leave enough clearance around the flange with tube to fit the sender/receiver unit according to Fig. 10.

Figure 10 Clearance for sender/receiver unit (dimensions in mm)



► Remove insulation (when fitted)

► Cut suitable openings in the duct wall; bore large enough holes in brick or concrete stacks (flange tube diameter (→ p. 75, Fig. 48))

> ***NOTICE:***
> ⊗ Do not let separated pieces fall into the duct.

► Insert the flange with tube in the opening slanting slightly downwards (1 to 3°, → p. 25, Fig. 9) so that the “Top” marking points upwards and any condensate that may collect in the duct can drain off.

► Weld the flange with tube on using an anchor plate for brick or concrete stacks, insert junction plates for thin-walled ducts (→ p. 25, Fig. 9).

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

3.2.2 Fitting the optional external purge air unit

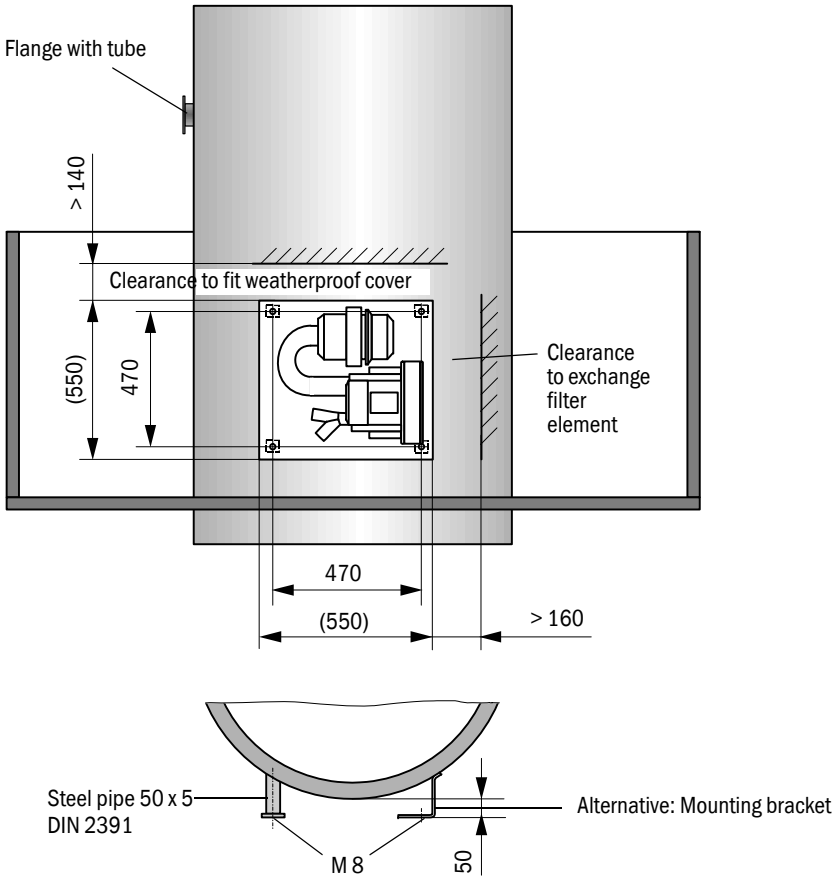
Consider the following points when selecting the assembly location:

- Install the purge air unit at a location with clean air whenever possible. The air intake temperature must correspond to specifications in the Technical data (→ p. 72, §7.1). 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 so that the purge air hose can be laid downwards (avoids water collecting).
- Leave enough clearance for replacing the filter element and for fitting or lifting the weatherproof cover when the purge air unit is fitted outdoors (→ p. 27, Fig. 11).

Assembly work

- ► Prepare holder (→ Fig. 11).
- ► Fasten purge air unit with 4 M8 screws.
- ► Check whether the filter element is fitted in the filter housing otherwise fit when necessary.

Figure 11 Purge air unit layout and assembly dimensions (dimensions in mm)



Fitting the weatherproof cover for the external purge air unit

The weatherproof cover (→ p. 78, Fig. 51) comprises a cover and locking set.

Assembly:

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

3.3 Installation

WARNING:

- ► Observe the relevant safety regulations as well as the safety notices in Section 1 during all installation work.
- ► Take suitable protection measures against possible local hazards or hazards arising from the equipment.

3.3.1 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 SICK or authorized representatives. This includes laying and connecting the power supply and signal cables, installing switches and mains fuses and connecting the purge air supply.

- Plan adequate line cross-sections.
- Cable ends with plugs to connect the sender/receiver unit must have sufficient free length.

3.3.2 Connecting/starting the optional external purge air unit

Work to be performed

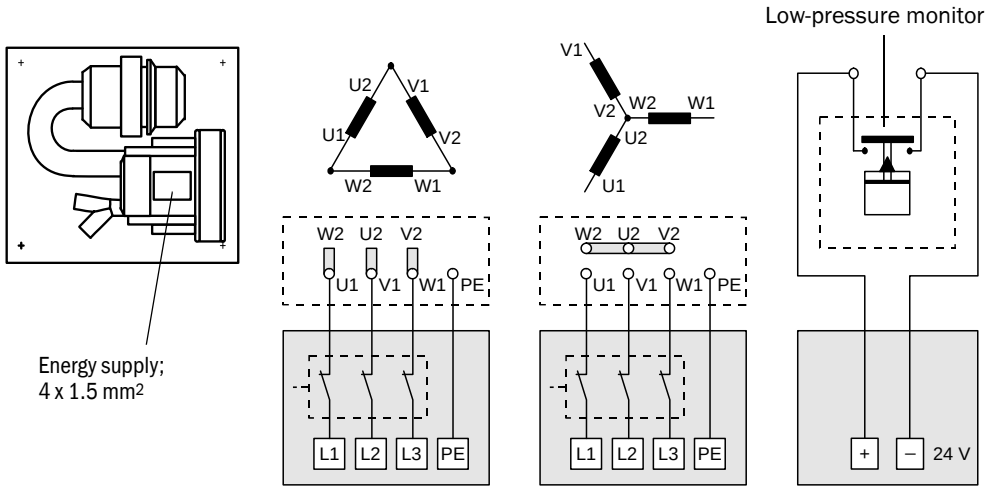
- ► Compare mains voltage and frequency with the specifications on the type plate on the purge air motor.

NOTICE:

- ► Only connect when these match!

- ► Connect the power supply cable 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; principle illustration → Fig. 12).

Figure 12 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.

> ***NOTICE:***
> In case of doubt and for special versions, the Operating Instructions delivered with the motor have priority over other specifications.

- 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 mains connections L1 and L2.
- Connect the pressure controller (option) to monitor purge air feed.

> ***NOTICE:***
> - Use a fail-safe power supply (standby unit, rails with redundant supply)
> - Fuse the purge air unit separate from the other system components. Use fuses according to the rated current (see Technical Data for purge air unit). Fuse each phase separately.
> Use circuit breakers to prevent phase failures on one side.

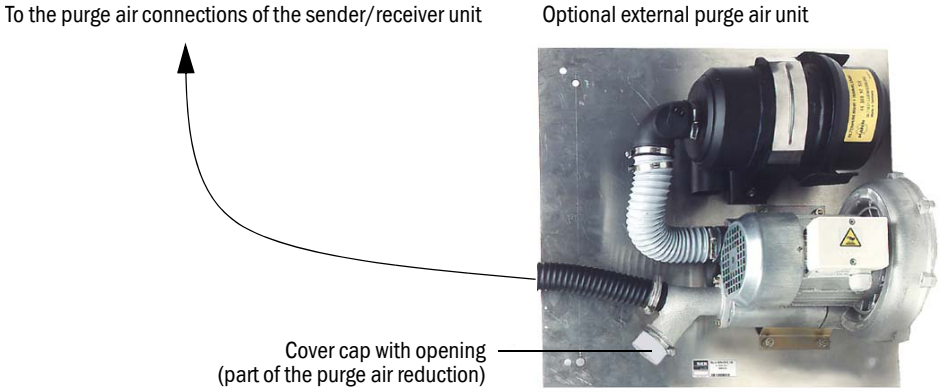
3.3.3 Installing the purge air supply

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

Optional external purge air unit

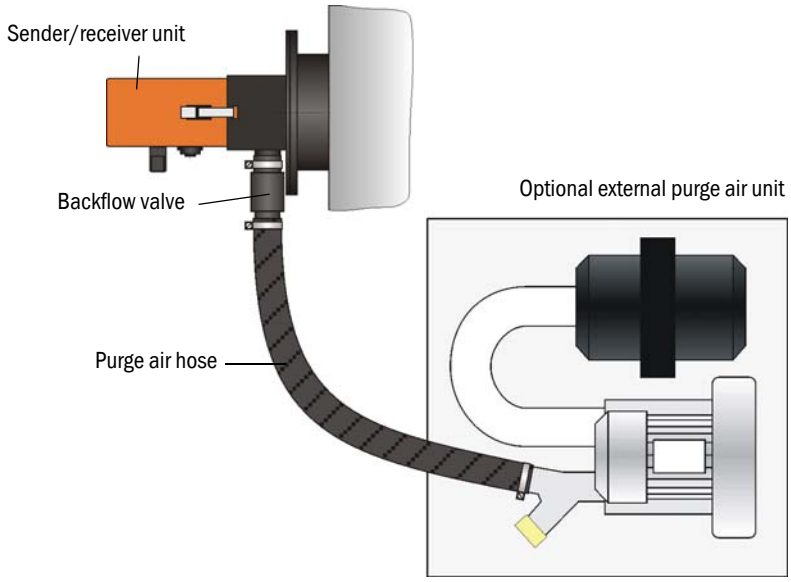
- Connect the DN 40 purge air hose to the Y-distributor of the purge air unit and secure with a D32-52 hose clamp.
- Close off the second outlet opening on the Y-distributor with the cover cap.

Figure 13 Optional external purge air unit connection



Installing the optional backflow valve

Figure 14 Backflow valve installation



3.3.4 Connecting the sender/receiver unit

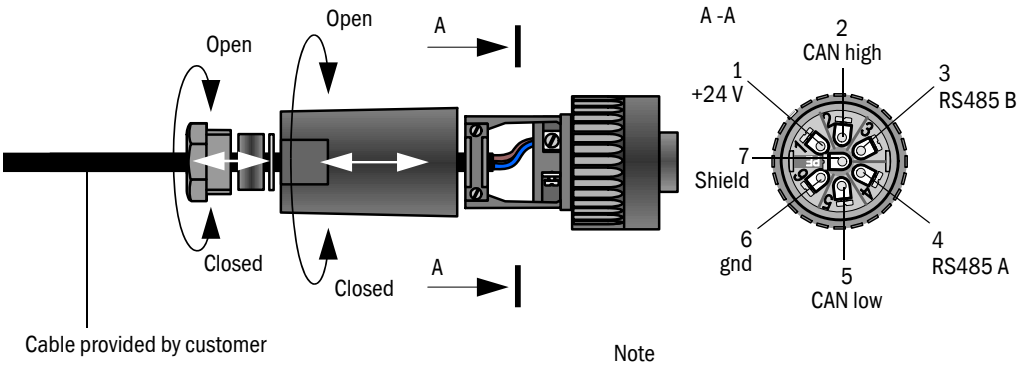
Work to be done

► Connect connection cable according to p. 31, Fig. 16.

> ***NOTICE:***
> ► Only use shielded cables with twisted wire pairs (e.g. UNITRONIC LiYCY (TP) 2 x 2 x 0.5 mm² from LAPPKabel; 1 wire pair for RS 485, 1 wire pair for power supply; not suitable for earthing).

Connecting the onsite connection cable

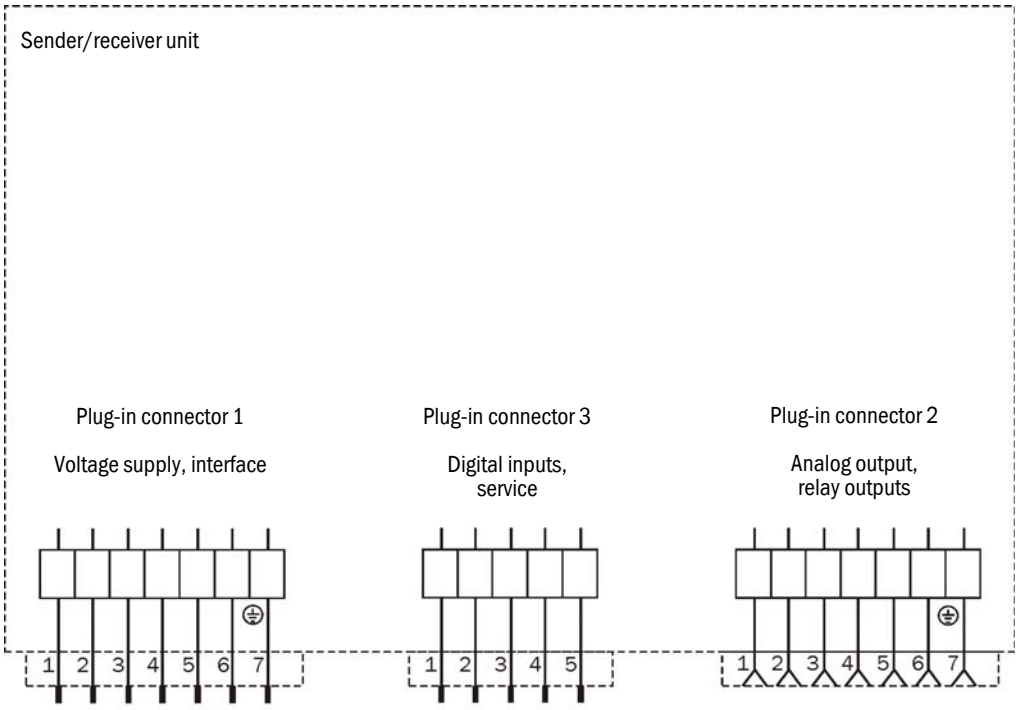
Figure 15 Plug-in connector connection on onsite cable



Note
To open, connect the plug-in connector to the plug on the sender/receiver unit.

Standard connection (without options)

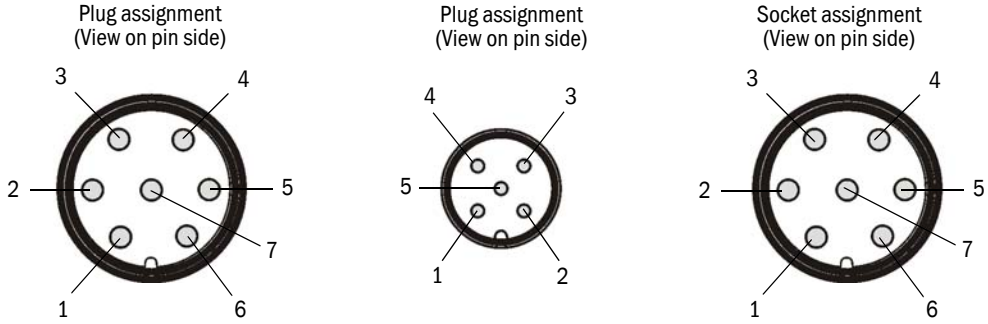
Figure 16 Standard connection



Pin	Assignment
1	+24 V DC
2	CAN high
3	RS485 B
4	RS485 A
5	CAN low
6	-24 V DC
7	Screen

Pin	Assignment
1	Maintenance
2	Functional check/ linearity measurement
3	RS485 B (Service)
4	RS485A (Service)
5	gnd

Pin	Assignment
1	+20 mA
2	-20 mA
3	Relay 1 (operation/ malfunction)
4	Relay 2 (limit value)
5	Relay 3 (maintenance/ functional check/ maintenance request)
6	Com. (Rel. 1 - 3)
7	Screen



NOTICE:

Only one RS485 interface may be connected at any one time (either on plug-in connector 1 or on plug-in connector 3). Otherwise, communication errors will occur.

DUSTHUNTER SB30

4 Start-up and Parameter Settings

Installing the sender/receiver unit
Setting the measuring system parameters

4.1 Installing the sender/receiver unit

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

4.1.1 Adapting the sender/receiver unit to the duct diameter

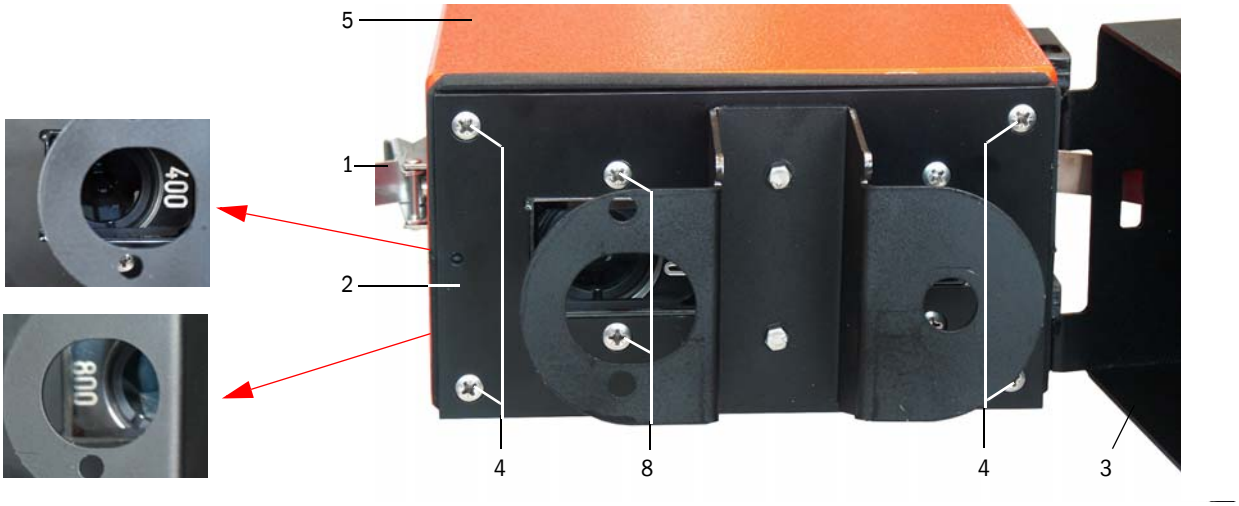
The sender/receiver unit is delivered with the short immersion depth (400 mm, → p. 19, Fig. 6) set at the factory.

> The immersion depth set is displayed in the window for the measurement receiver (→ Fig. 17).

For duct diameters larger than approx. 3 m, we recommend converting the sender/receiver unit to the long immersion depth (800 mm). The following steps are then necessary:

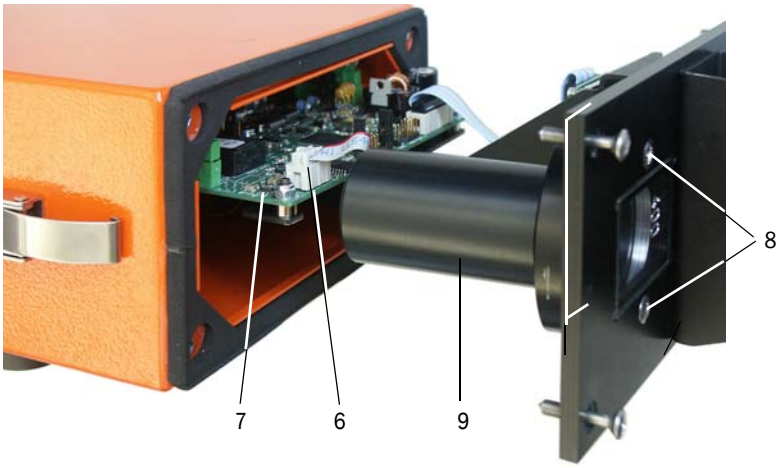
► Loosen tension locks (1) of the sender/receiver unit, swivel electronics unit (2) to the side and take off from mounting flange (3).

Figure 17 Sender/receiver unit opened



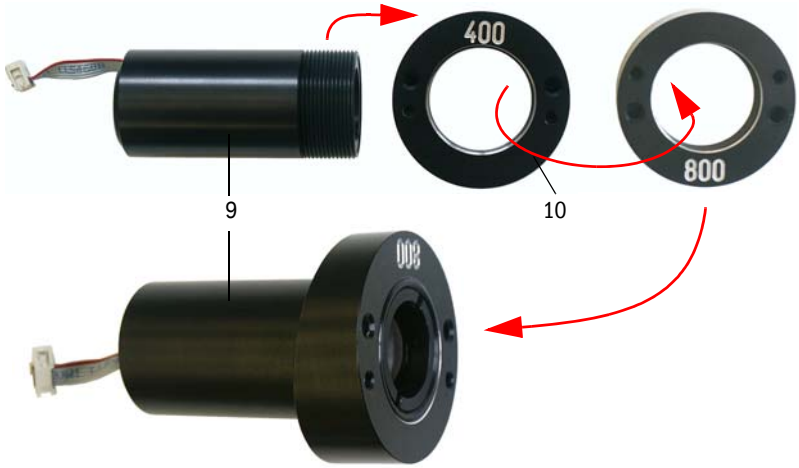
► Loosen fastening screws (4) on the electronics unit, carefully pull the electronics unit out of cover (5) and loosen plug-in connector (6) for the measurement receiver from processor board (7).

Figure 18 Electronics unit opened



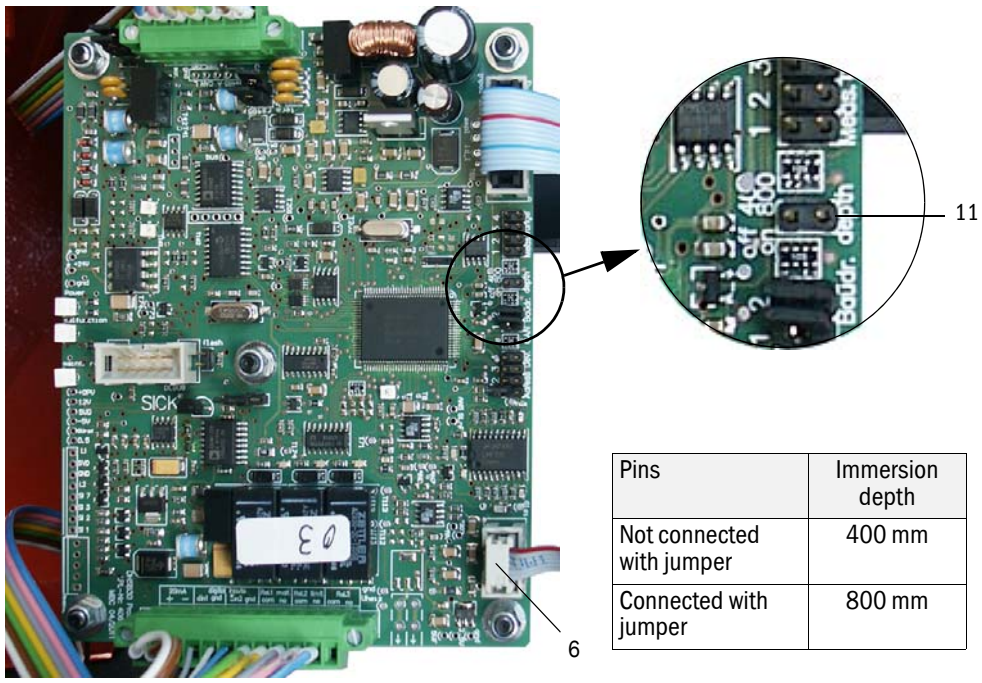
- ► Loosen fastening screws (8) for tube (9) and take the tube off (→ p. 34, Fig. 18).
- ► Unscrew mounting ring (10) from the tube, turn it round and screw it back on again.

Figure 19 Tube with mounting ring



- ► Connect the pins for the penetration depth (11) settings on the processor board by means of a jumper.

Figure 20 Processor board



Pins	Immersion depth
Not connected with jumper	400 mm
Connected with jumper	800 mm

- ► Plug the plug-in connector (6) for the measurement receiver onto the processor board.
- ► Reassemble the sender/receiver unit in reverse sequence.

4.1.2 Fitting and connecting the sender/receiver unit on the duct

Connecting the sender/receiver unit to the purge air supply

- ► Check whether the purge air supply is available (the flow direction must be correct and the purge air hose fits tight on the connection).
- ► Push the DN 40 purge air hose onto the sender/receiver unit connection and secure with a strap retainer.

Assembly without weatherproof cover

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

> Connections for connection cable and purge air hose must always be at the bottom (→ p. 17, Fig. 4).

- ► Connect the connection cable to the plug-in connector and screw tight.

4.2 Setting the measuring system parameters

4.2.1 Factory settings

The measuring system is delivered with the default settings shown in the following Table.

Parameter		Value
Measured variable		Scattered light intensity (SI); after dust concentration calibration (→ p. 52, §4.2.3.6) in mg/m³
	Value at LZ	0 SI
	Value at MBE	3000 SI
Coefficients set		0.00 / 1.00 / 0.00
Analog output (AO)	Live zero (LZ)	4 mA
	Upper measuring range value (MBE)	20 mA
	Current during maintenance	4 mA
	Current by malfunction	4 mA
	Output current by malfunction	Yes
Response time		60 s
Functional check	Interval	Every 8 h
	Output of control values on AO	Yes
	Output duration	90 s
Limit value	Relay 1	1500 SI
	Switching direction	Value exceeded
CAN bus baud rate (→ p. 17, Fig. 4)		125 kBd

Two options are available for setting the parameters:

- Change settings using the jumper on the processor board (→ p. 37, §4.2.2).
  This change can be made without a laptop/PC and user program.
- Further parameter settings using SOPAS ET (→ p. 40, §4.2.3)
  The Menu structure simplifies changing settings. Further functions are also available (e.g. data storage, graphic displays).

4.2.2 Changing settings using the jumper on the processor board

The following steps are necessary (→ p. 34, §4.1.1):

- ► Loosen tension locks of the sender/receiver unit, swivel the electronics unit to the side and take off from the mounting flange.
- ► Loosen the fastening screws on the electronics unit, carefully pull the electronics unit out of the cover.
- ► After changing the settings, reassemble the sender/receiver unit in reverse sequence.

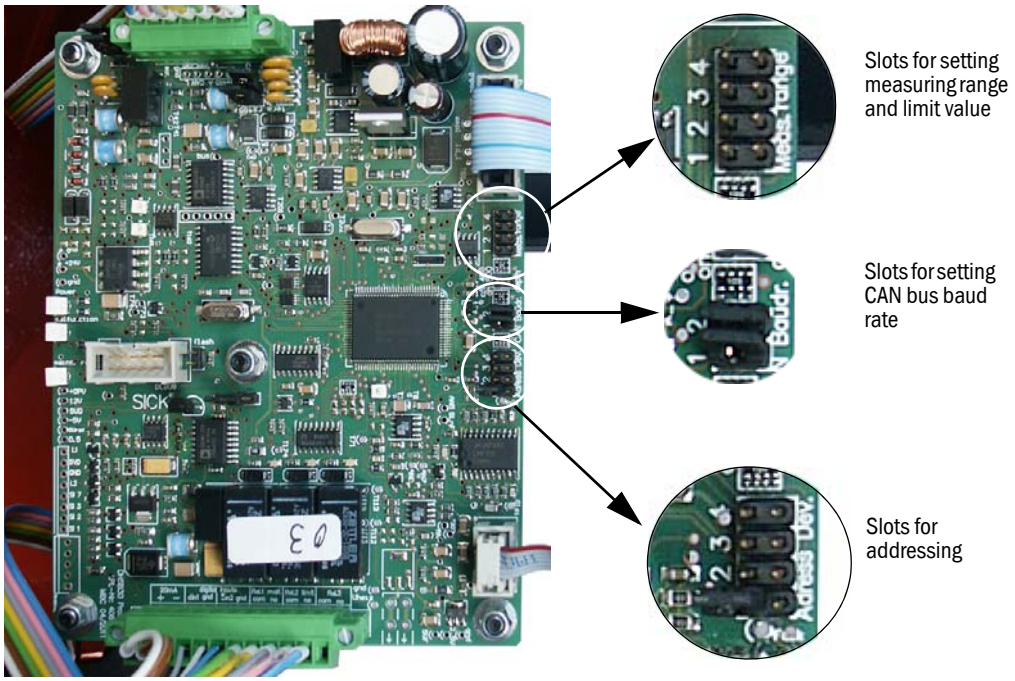
4.2.2.1 **Changing the measuring range and the limit value**

► Plug the jumper to the slot for measuring range and limit value setting which is assigned to the required setting (→ Fig. 21).

Parameter	Slot 1	Slot 2	Slot 3 (default)
Value at LZ	0 SI	0 SI	0 SI
Value at MBE	30 SI	500 SI	3000 SI
Limit value	15 SI	250 SI	1500 SI

Slot 4 is not used.

Figure 21 Slots on the processor board



4.2.2.2 Addressing

For operation of the measuring system with option MCU (→ p. 17, §2.2), an address has to be assigned to the sender/receiver unit.

► Connect the jumpers to the slots for addressing according to the following Table (→ p. 38, Fig. 21).

	Slot				Address	
	1	2	3	4	RS485 (for connection of MCU)	CAN bus (for connection of SCU)
Jumpers connected	No	No	No	No	0 (default)	0 → 0x10 (hex)
	Yes	No	No	No	1	1 → 0x11 (hex)
	No	Yes	No	No	2	2 → 0x12 (hex)
	Yes	Yes	No	No	3	3 → 0x13 (hex)
	No	No	Yes	No	4	4 → 0x14 (hex)
	Yes	No	Yes	No	5	5 → 0x15 (hex)
	No	Yes	Yes	No	6	6 → 0x16 (hex)
	Yes	Yes	Yes	No	7	7 → 0x17 (hex)
	No	No	No	Yes	8	8 → 0x18 (hex)
	Yes	No	No	Yes	1 (default)	9 → 0x19 (hex)
	No	Yes	No	Yes	1 (default)	10 → 0x1a (hex)
	Yes	Yes	No	Yes	1 (default)	11 → 0x1b (hex)
	No	No	Yes	Yes	1 (default)	12 → 0x1c (hex)
	Yes	No	Yes	Yes	1 (default)	13 → 0x1d (hex)
	No	Yes	Yes	Yes	1 (default)	14 → 0x1e (hex)
	Yes	Yes	Yes	Yes	1 (default)	15 → 0x1f (hex)

4.2.2.3 Adapting the CAN bus baud rate

When the measuring system is operated with the optional SCU (→ p. 17, §2.2), it may be necessary to reduce the baud rate set in the factory (→ p. 37, §4.2.1).

The following settings are possible (slots for setting the CAN bus baud rate, → Fig. 21):

	Slot 1	Slot 2	Baud rate
Jumpers connected	No	No	20 kBd
	Yes	No	50 kBd
	No	Yes	100 kBd
	Yes	Yes	125 kBd

4.2.3 Further parameter settings using SOPAS ET

No jumper may be connected on the slots at “Meas. Range“ on the processor board.

All the factory settings shown in the Table in → p. 37, §4.2.1 can be changed.

4.2.3.1 Installing the operating and parameter program SOPAS ET

Administrator rights are required to install the software.

Requirements

- Laptop/PC with:
  - Processor: Pentium III (or comparable type)
  - USB interface (alternative - RS232 via adapter)
  - Working memory (RAM): At least 512 MB
  - Operating system: MS-Windows 2000/XP/Vista/7 (not Windows 95/98/NT)
- USB interface cable to connect the Laptop/PC to the measuring system (MCU).
- The operating and parameter program as well as the USB driver (scope of delivery) must be installed on the Laptop/PC.
- The power supply must be switched on.

Start the file “setup.exe” when the start screen does not appear.

Install the SOPAS ET program

Insert the delivered CD in the PC drive, select the language, select “Software” and follow the instructions.

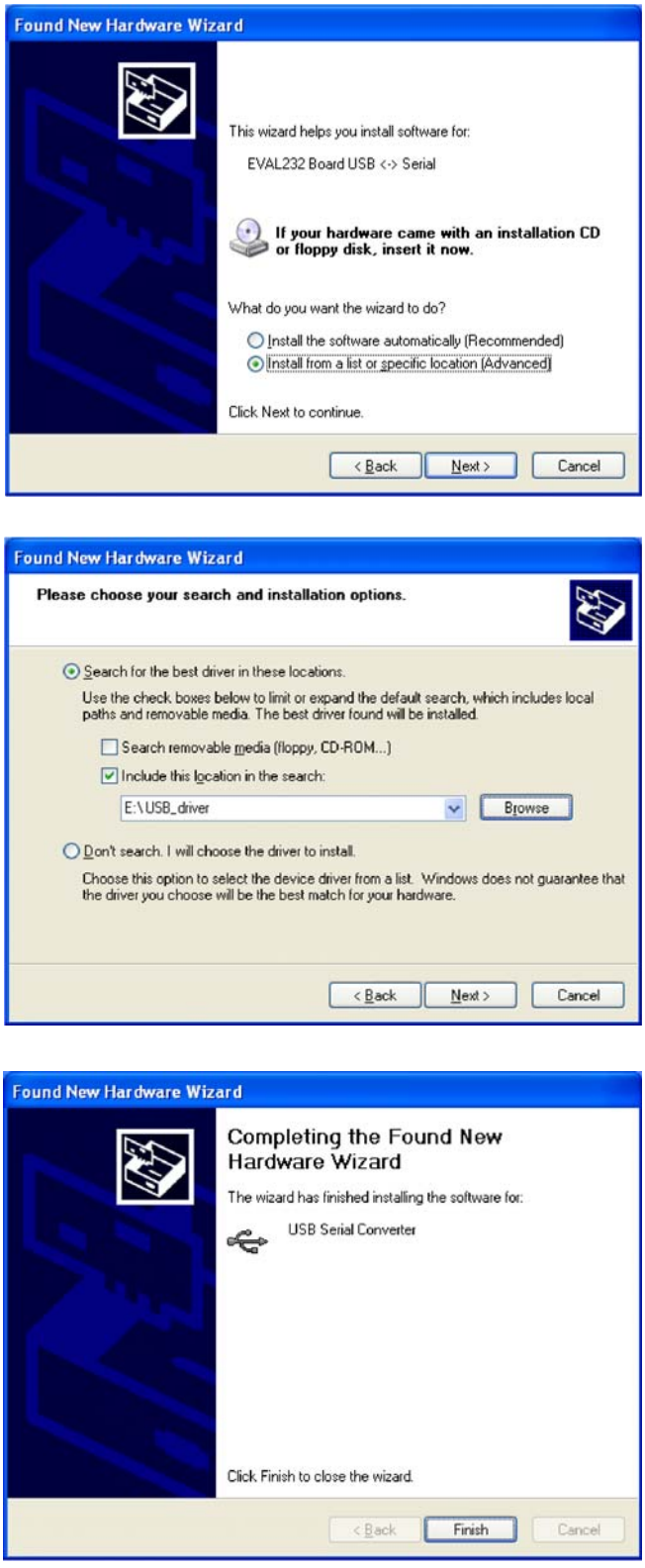
Install the USB driver

A special software driver is required for communication between the operating and parameter program SOPAS ET and the measuring system via the USB interface. For installation on a laptop/PC, connect the MCU to the supply voltage and connect to the PC via USB. A message appears on the display that new hardware has been detected. Now insert the delivered CD in the PC drive and follow the installation instructions (→ p. 41, Fig. 22).

The driver can also be installed using the hardware installation program in the Windows Control Panel.

The USB driver creates a new COM port to be used for connecting SOPAS ET to the device (→ p. 43, Fig. 26).

Figure 22 Installing the USB driver

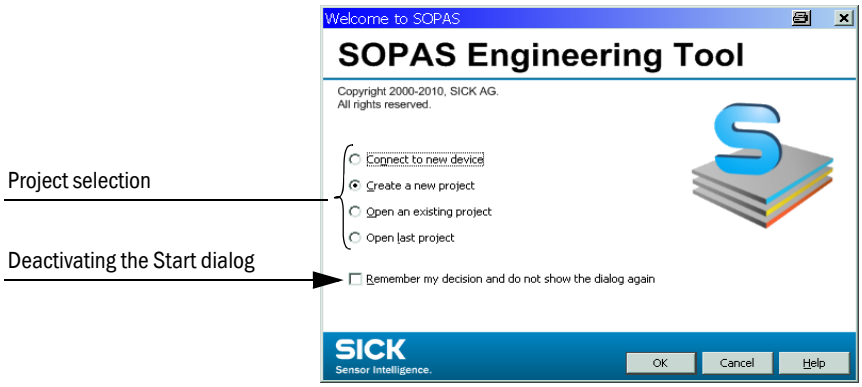


4.2.3.2 Connecting to the device

Basic settings

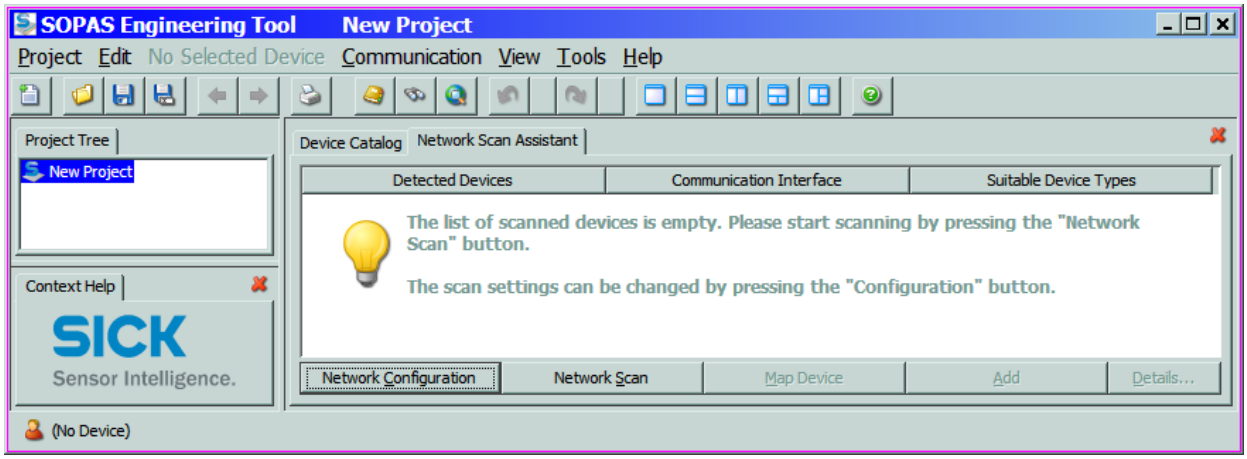
- ► Connect the USB/RCS485 adapter to plug-in connector 3 of the sender/receiver unit (→ p. 18, Fig. 5) and the laptop/PC.
- ► Start the program in the “SICK\SOPAS” start menu.
  The Start dialog appears on the screen (can be suppressed for further program usage).

Figure 23 Start dialog (as from SOPAS ET Version 02.32)



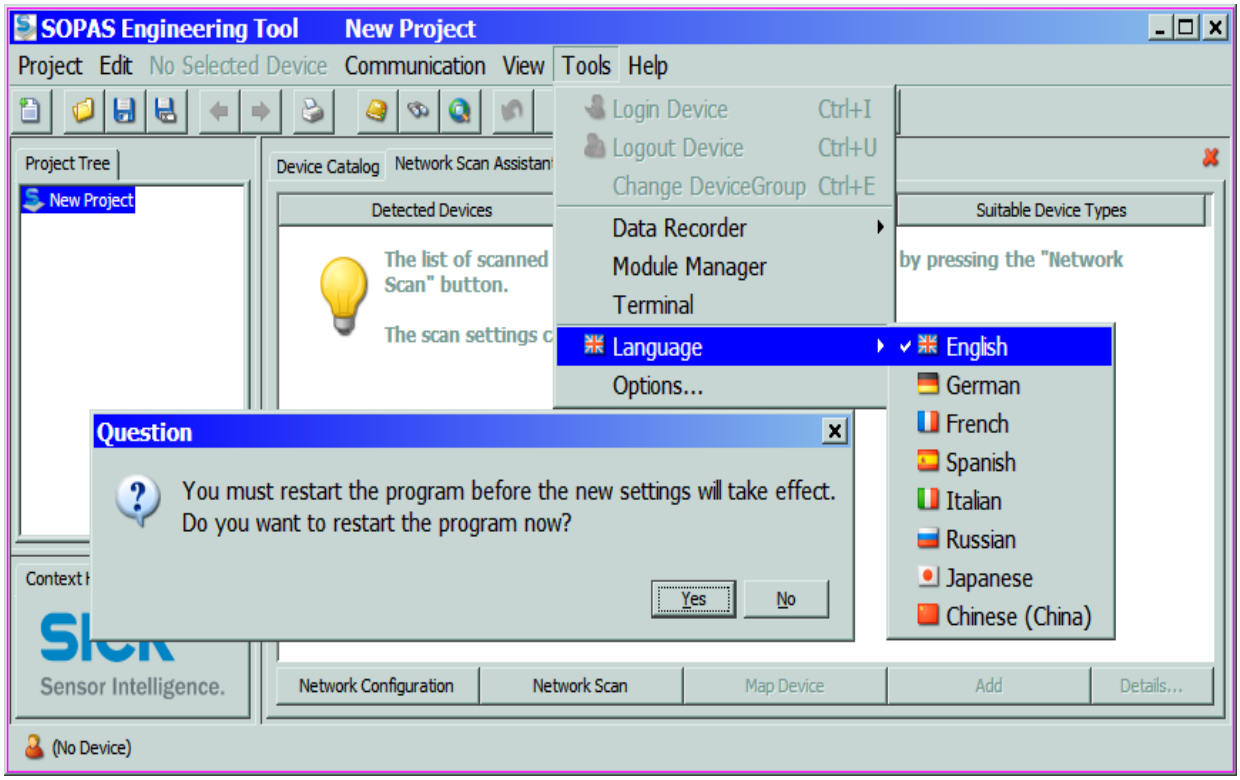
The following Start menu appears after confirmation with “OK”.

Figure 24 Start menu



- ► If necessary, set the desired language in menu “Tools / Options / Language”, confirm with “OK” and restart the program.

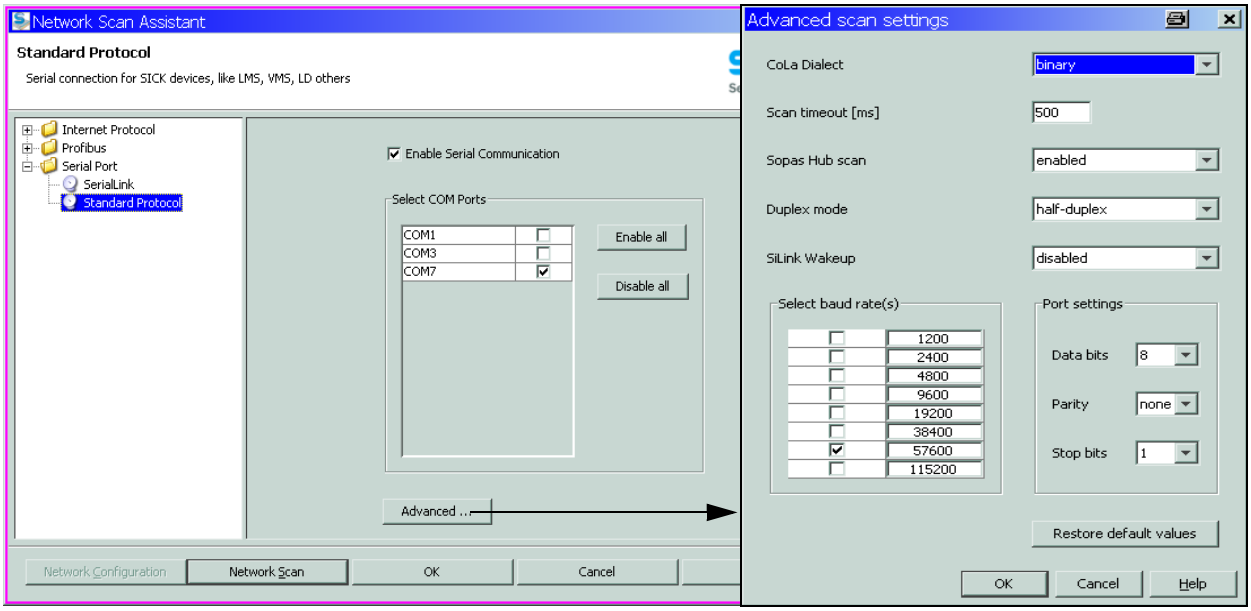
Figure 25 Changing the language setting



Configure the interface

- In the Start menu (→ p. 42, Fig. 24), activate the “Network Configuration” button and select “Standard protocol”.
- In the group “Select COM Ports”, select the interface that appears after connecting the MCU and laptop(/PC, activate the “Advanced” button and configure according to p. 43, Fig. 26 (settings only need to be made the first time a connection is made to the measuring system).

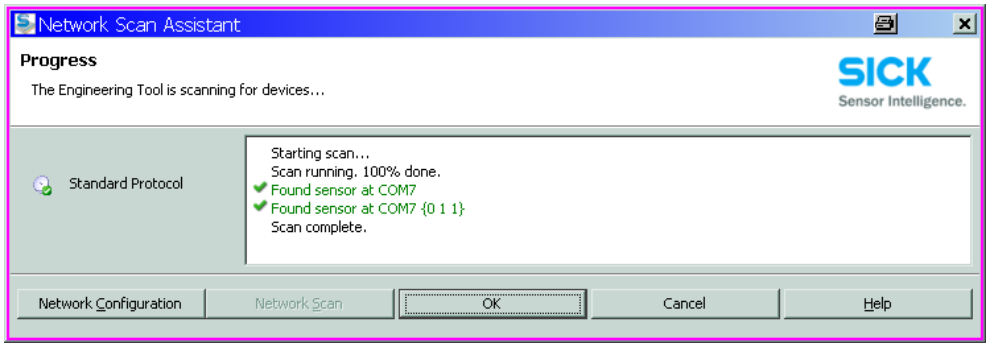
Figure 26 COM port selection and configuration



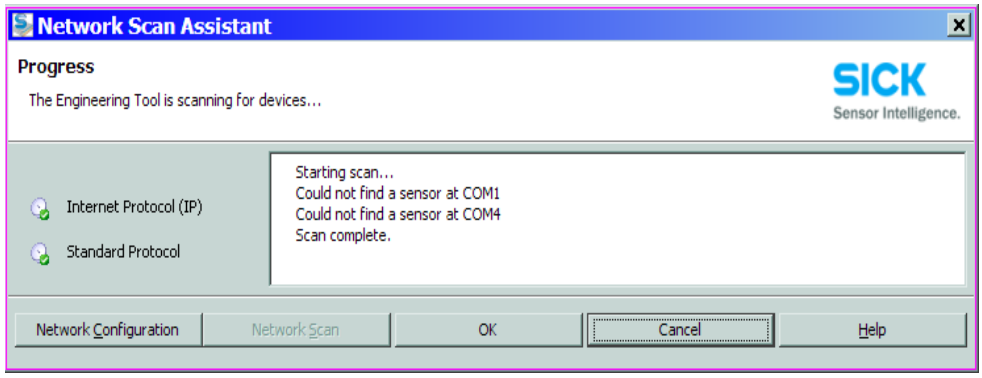
Use the tab “Network Scan Assistant” to create a connection

► Activate button “Network Scan” in tab “Network Scan Assistant”.

Figure 27 Search for connected devices



The following message appears when no device is found (Troubleshooting, see Service Manual):



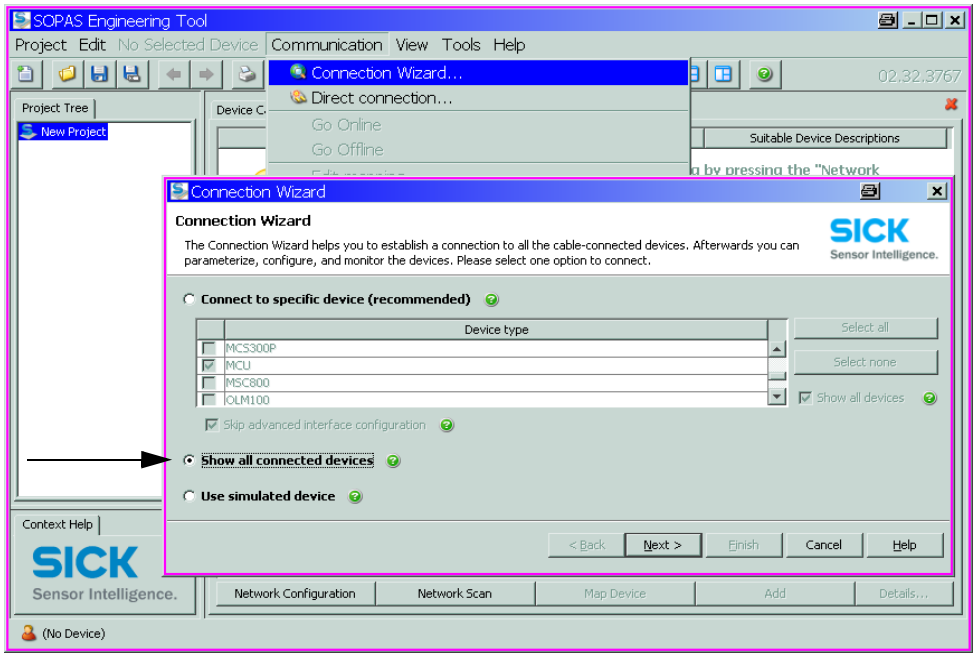
Problems on connections via Ethernet can be due to incorrect addressing → Contact your system administrator.

► Confirm search for connected devices with “OK”.

Create a connection using menu “Connection Wizard” (as from SOPAS ET Version 02.32)

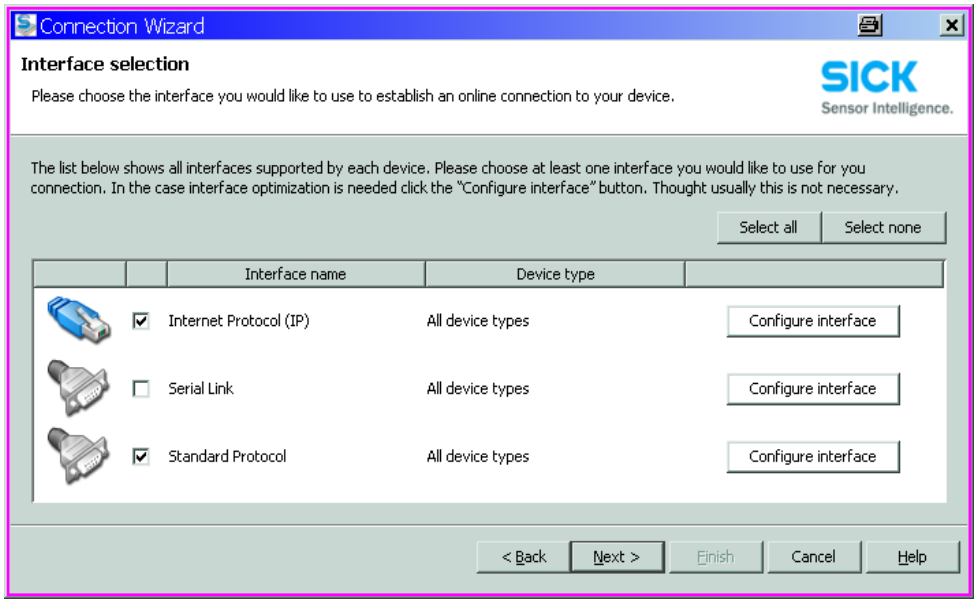
► Select menu “Connection Wizard” and activate selection “Show all connected devices”.

Figure 28 Menu “Connection Wizard”



► Activate button “Next” and select the interface (“Standard Protocol” for connection via COM port, “Internet Protocol (IP)” for connection via Ethernet).

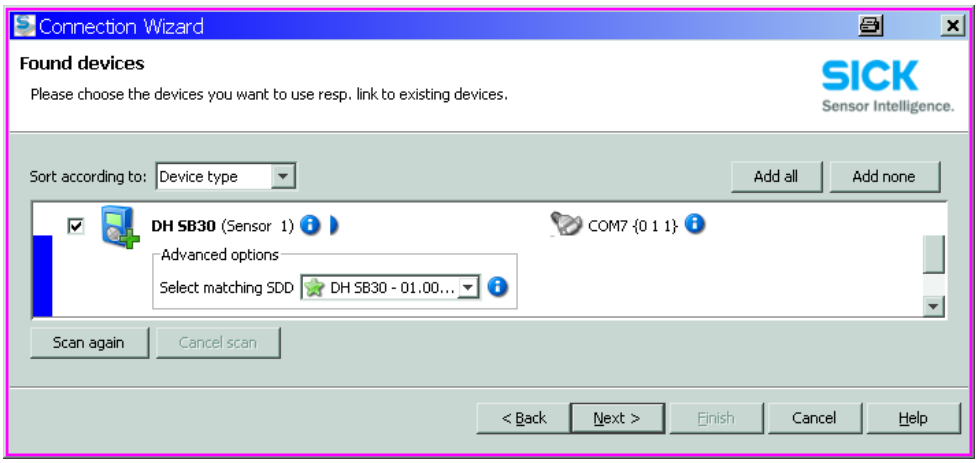
Figure 29 Interface selection



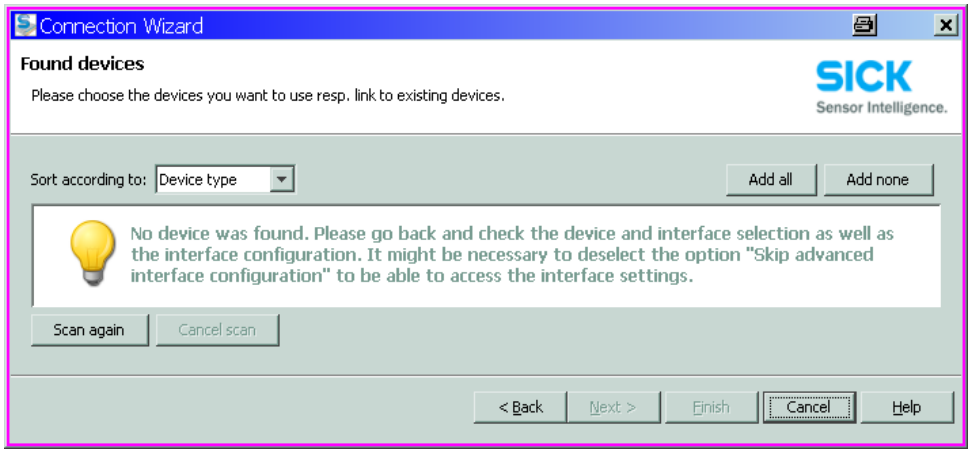
► Check the interface configuration settings in accordance with p. 44, § and change accordingly when necessary.

► Activate button “Next”.

Figure 30 Search for connected devices



The following message appears when no device is found (Troubleshooting, see Service Manual):

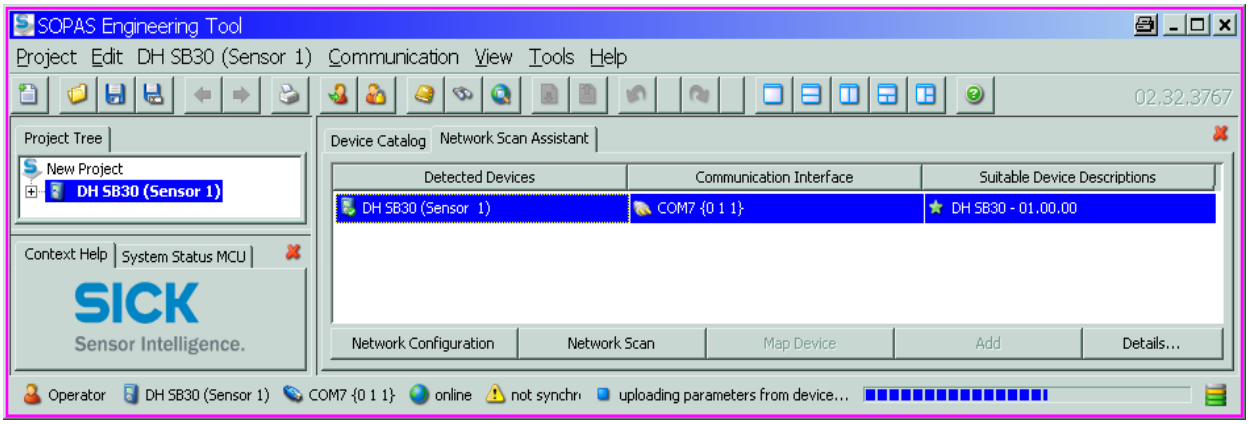


Select device

- Connection via COM port

  Select the desired device file in tab “Connection Wizard / Detected devices” and move it to window “Project Tree” (drag and drop or doubleclick per mouse or use click button “Add”).

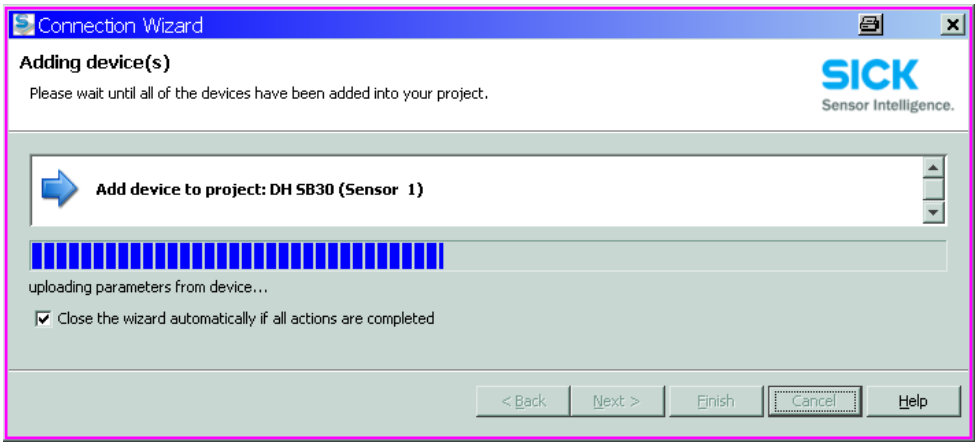
Figure 31 Select device



- Connection via “Connection Wizard””

  In window “Connection Wizard / Detected devices” (→ p. 46, Fig. 30), activate the check box for the desired device file and click “Next”. This transfers the device file to window “Project Tree”.

Figure 32 Device file transfer



4.2.3.3 Information on using the program

Password

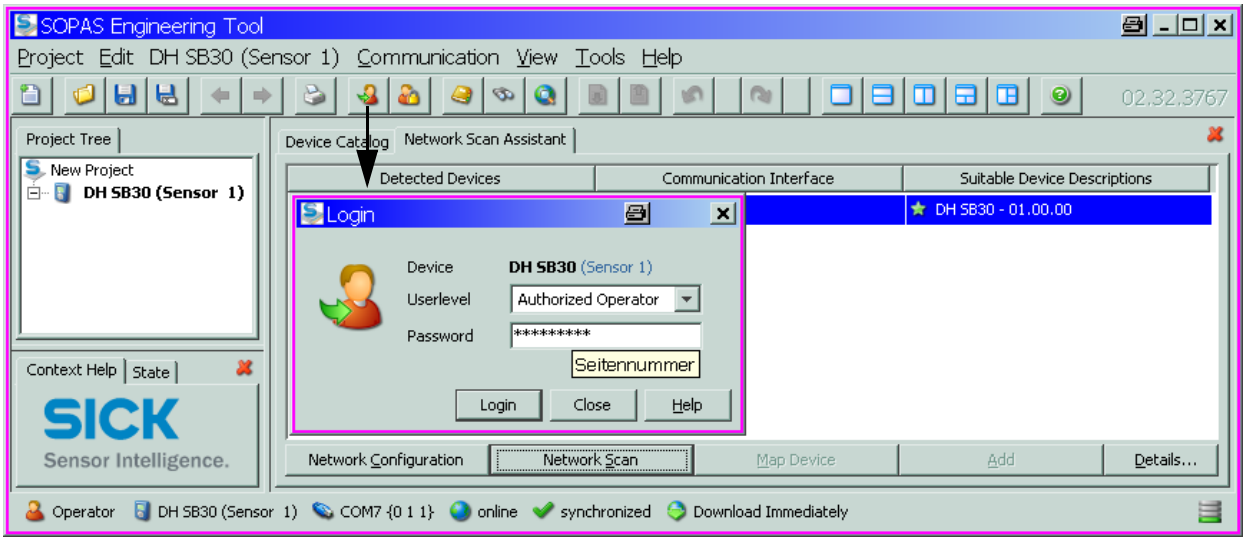
Certain device functions are first accessible after a password has been entered (→ Fig. 33). Access rights are assigned in 3 levels:

User level		Access to
0	“Operator” (machine supervisor) *	Displays measured values and system states
1	“Authorized user” (Authorized customer) *	Displays, inquiries as well as start-up or adjustment to customer-specific demands and diagnosis of necessary parameters
2	“Service”	Displays, inquiries as well as all parameters required for service tasks (e.g. diagnosis and clearance of possible malfunctions)

*): Depending on program version

The Level 1 password is contained in the Annex.

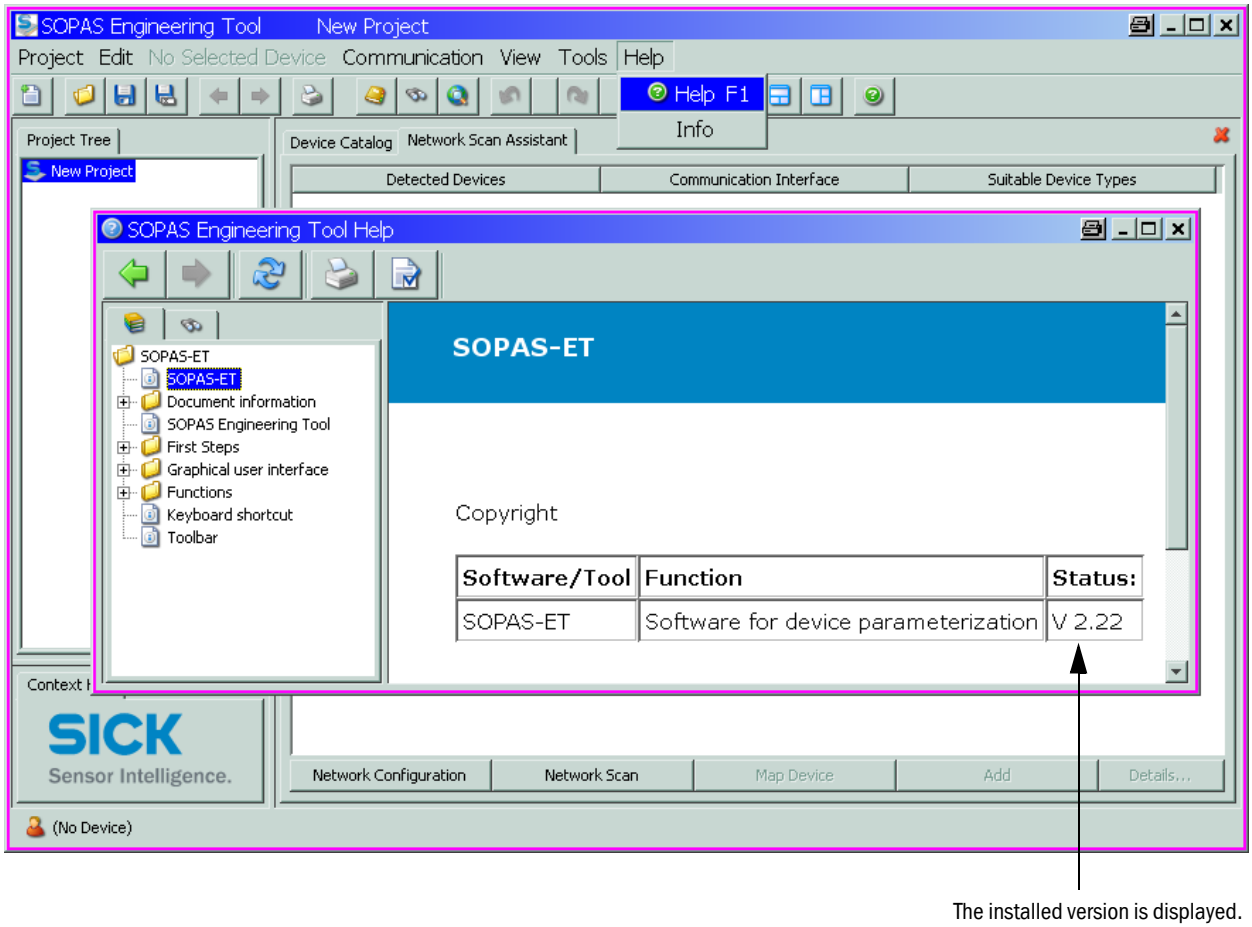
Figure 33 Password entry and language selection



4.2.3.4 Online help

The individual menus and setting options are described in detail in the online help and are therefore not described further here.

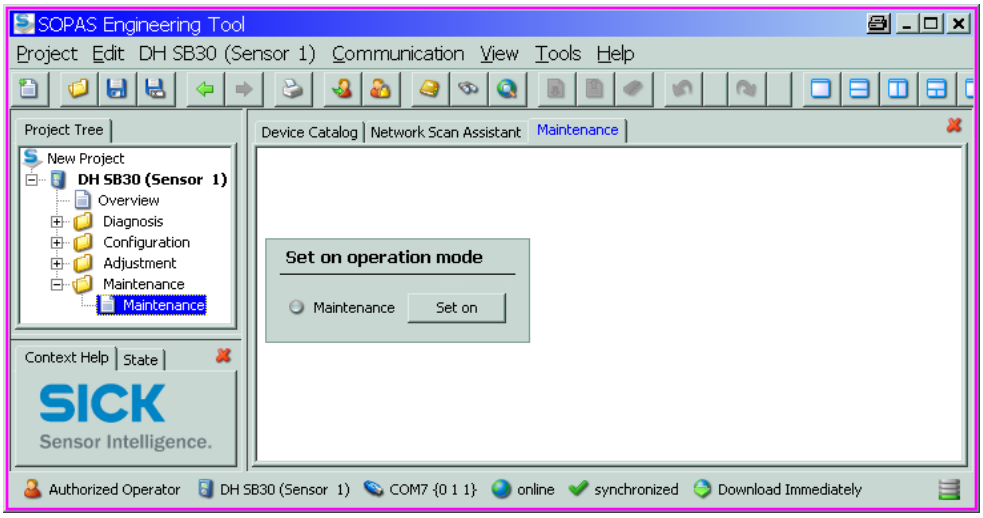
Figure 34 Online help



4.2.3.5 **Changing factory settings**

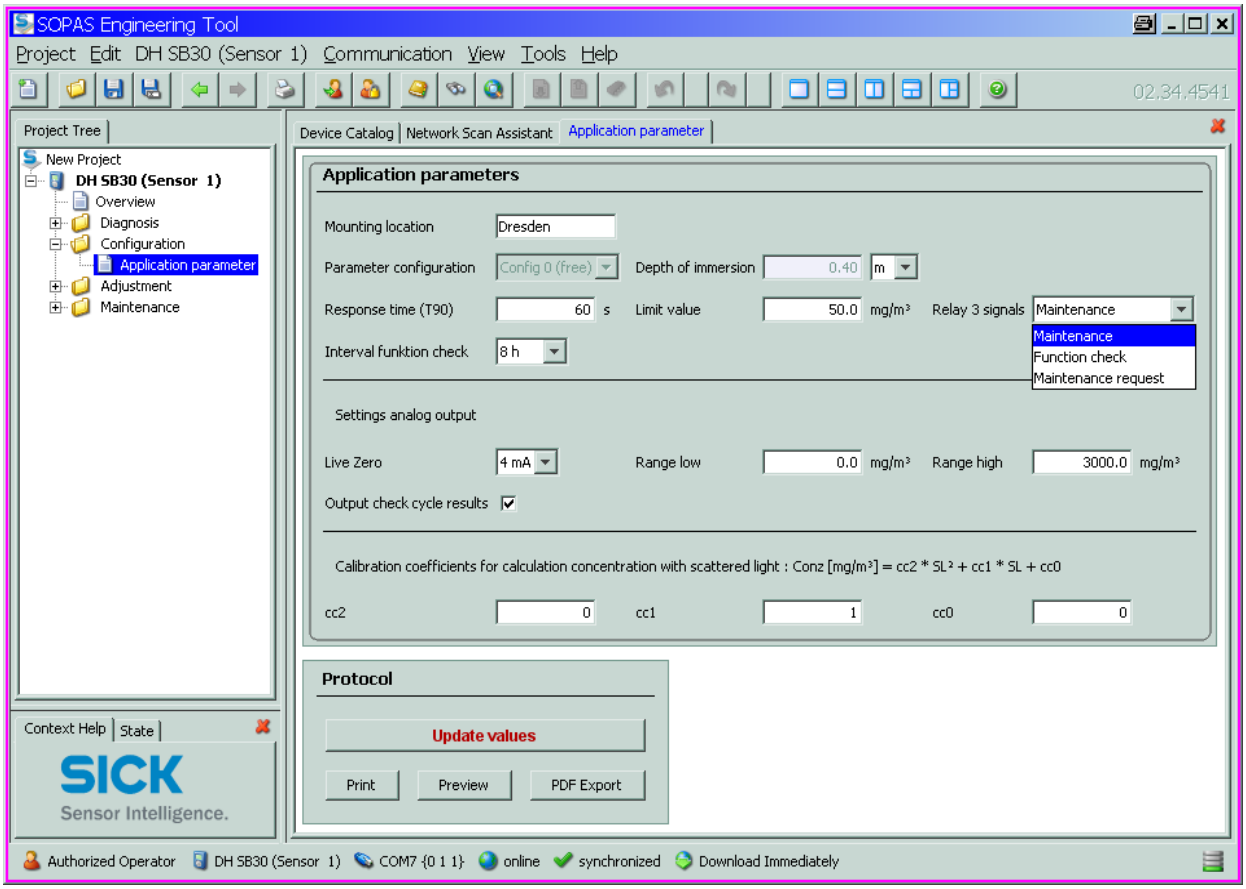
- ► Connect the measuring system to the laptop/PC using the USB RS485 adapter (→ p. 79, §7.3.5) and start SOPAS ET.
- ► Click button “Network Scan” in tab “Network Scan Assistant”, select device file “DH SB30“ and move it to window “Project Tree” (→ p. 47, §).
- ► Enter the Level 1 password (→ p. 48, §4.2.3.3).
- ► Switch to directory “Maintenance/Maintenance” and click “Set On”.

Figure 35 Setting “Maintenance” mode



► Switch to directory “Application Parameters” and set the desired parameters.

Figure 36 Directory “Configuration/Application parameters” (example for settings)



Entry field	Parameter	Remark
Mounting location	Name of the measuring location	Sender/receiver unit assignment to the respective measuring location
Response time (T90)	Value in s	Response time for the measured variable (→ p. 15, §2.1.2) Setting range 1 ... 600 s
Limit value	Value	The limit value relay switched when the value entered is overflown or underflown.
Relay 3 signals	Maintenance	The relay switched on when “Maintenance” mode is set.
	Functional check	The relay switches on during a functional check procedure.
	Maintenance request	The relay switches on for “Maintenance” mode.
Interval function check	Time between two check cycles	→ p. 15, §2.1.3
Live Zero	Zero point (2 or 4 mA)	Select 2 or 4 mA to ensure being able to differentiate between measured value and switched off device or interrupted current loop.
Range low	Lower Measuring Range Limit	Physical value at live zero
Range high	Upper Measuring Range Limit	Physical value at 20 mA

Entry field	Parameter	Remark
Output check cycle results	Inactive	Control values (→ p. 15, §2.1.3) are not output on the analog output.
	Activated	Control values (→ p. 15, §2.1.3) are output on the analog output.
cc2	Quadratic	Entry of the regression factors determined using gravimetric comparison measurement during a calibration (→ §4.2.3.6)
cc1	Linear	
cc0	Absolute	

4.2.3.6 Calibrating for dust concentration measurement

> ***NOTICE:***
> The steps described here serve to avoid input errors.
> Carrying out comparison measurements demands special knowledge that is not described in detail here.

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 scattered light values measured at the same time by the measuring system.

Steps to be carried out

- ► Select device file “MCU”, set the measuring system to “Maintenance” mode and enter the Level 1 password (→ p. 48, §4.2.3.3).
- ► Estimate the measuring range required for the dust concentration in operational state and enter the upper and lower end values.
- ► Deactivate “Maintenance” state.
- ► Carry out the gravimetric comparison measurement according to DIN EN 13284-1.
- ► Determine regression coefficients from the mA values of the analog output for “Scattered light intensity” and the actual dust concentrations measured gravimetrically.

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

c:	Dust concentration in mg/m³
K2, K1, K0:	Regression coefficients of function c = f (I_{out})
I_{out}:	Current output value in mA

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

SI:	Measured scattered light intensity
LZ:	Live Zero
MBE:	Measuring range end value determined (value entered for 20 mA; generally 2.5 x limit value)

► Enter the regression coefficients

Two options are available:

– Direct entry of K2, K1, K0 in a measured value computer.

> ***NOTICE:***
> The regression coefficients set in the sender/receiver unit and the measuring range set in the MCU may no longer be changed in this case. On the optional LC Display (when used), the dust concentration is displayed as uncalibrated value in mg/m³.

– Using the regression function of the measuring system (use without measured value computer).

The reference to scattered light intensity must be defined here. In this case, regression coefficients cc2, cc1 and cc0 to be entered in the measuring system must be determined from K2, K1 and K0.

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

Using (2) in (1) gives:

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

Including (3) gives:

$$cc0 = K2 \cdot LZ^2 + K1 \cdot LZ + K0$$

$$cc1 = (2 \cdot K2 \cdot LZ + K1) \cdot \left(\frac{20mA - LZ}{MBE}\right)$$

$$cc2 = K2 \cdot \left(\frac{20mA - LZ}{MBE}\right)^2$$

Now enter the regression coefficients cc2, cc1 and cc0 determined in directory “Configuration/Application parameters“ (→ p. 51, Fig. 36) (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.

4.2.3.7 **Data backup**

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

The following options are available:

- Saving as a project

  Not only device parameters but also data logs can be saved.
- Saving as device file

  Saved parameters can be processed without a device connected and transferred to the device again later.

  See the Service Manual for a description.
- Saving as a protocol

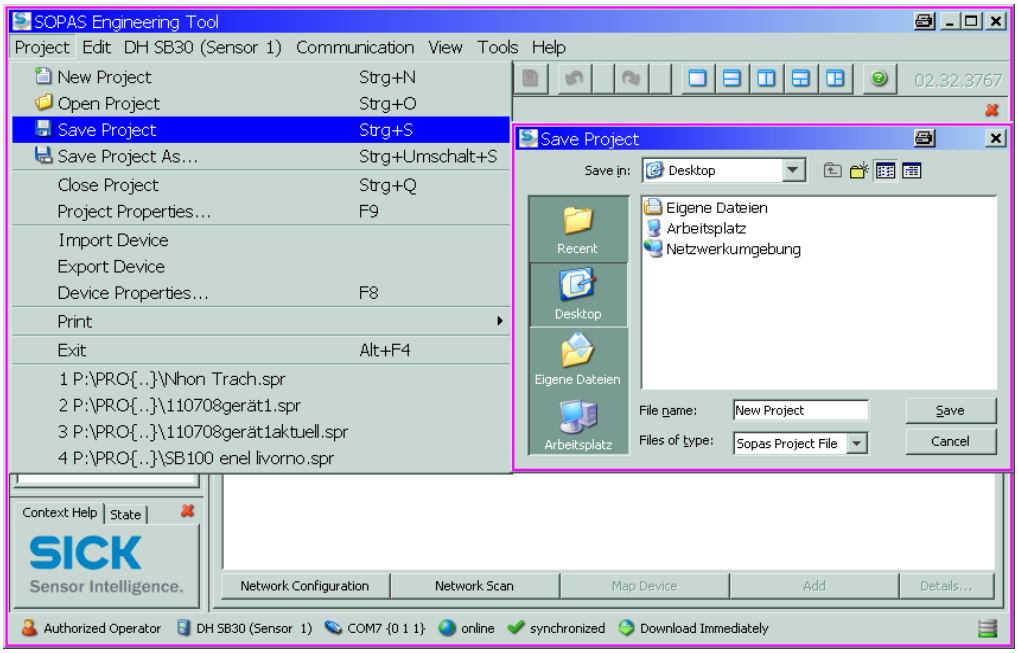
  Device data and parameters are registered in the Parameter protocol.
  A Diagnosis protocol can be created for analysis of the device function and recognition of possible malfunctions.

Saving as a project

It is recommended to store a “project” for frequent connections. It is then only necessary to open this “project” to connect to the device. All data saved beforehand are then transferred automatically to SOPAS ET.

For saving, select the respective device, call up menu “Project / Save Project“ and specify the target directory and file name. The name of the file to be stored can be chosen freely. It is useful to specify a name with a reference to the sampling point involved (name of the company, equipment name).

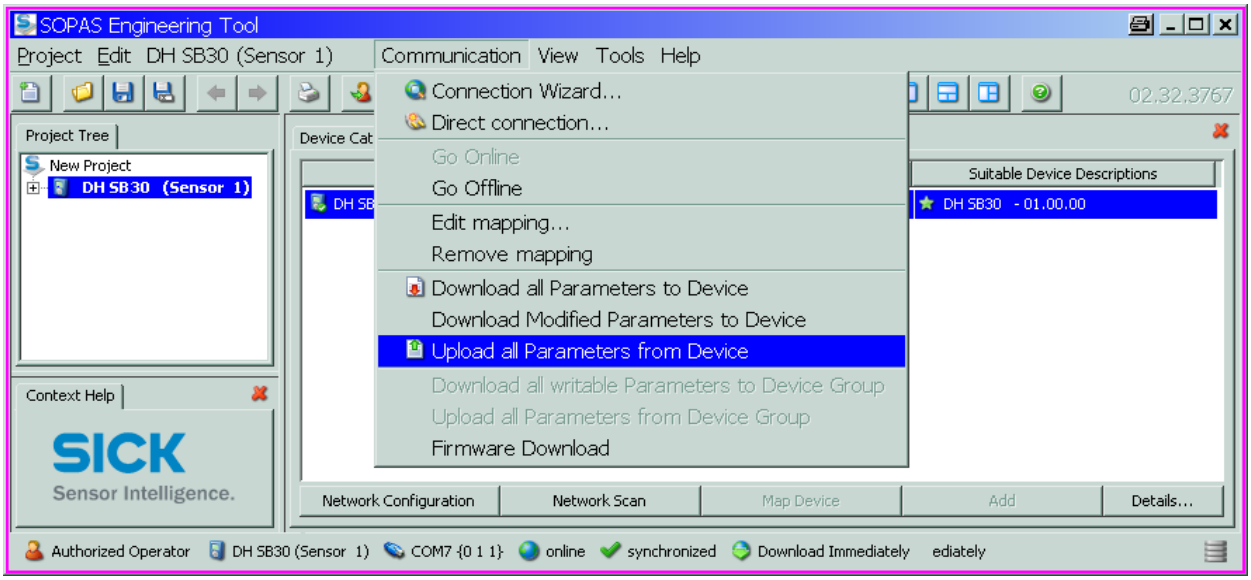
Figure 37 Menu “Project / Save Project“



Saving as a protocol

► Select “Communication / Upload all Parameters from Device” in the menu to select the device and update device data.

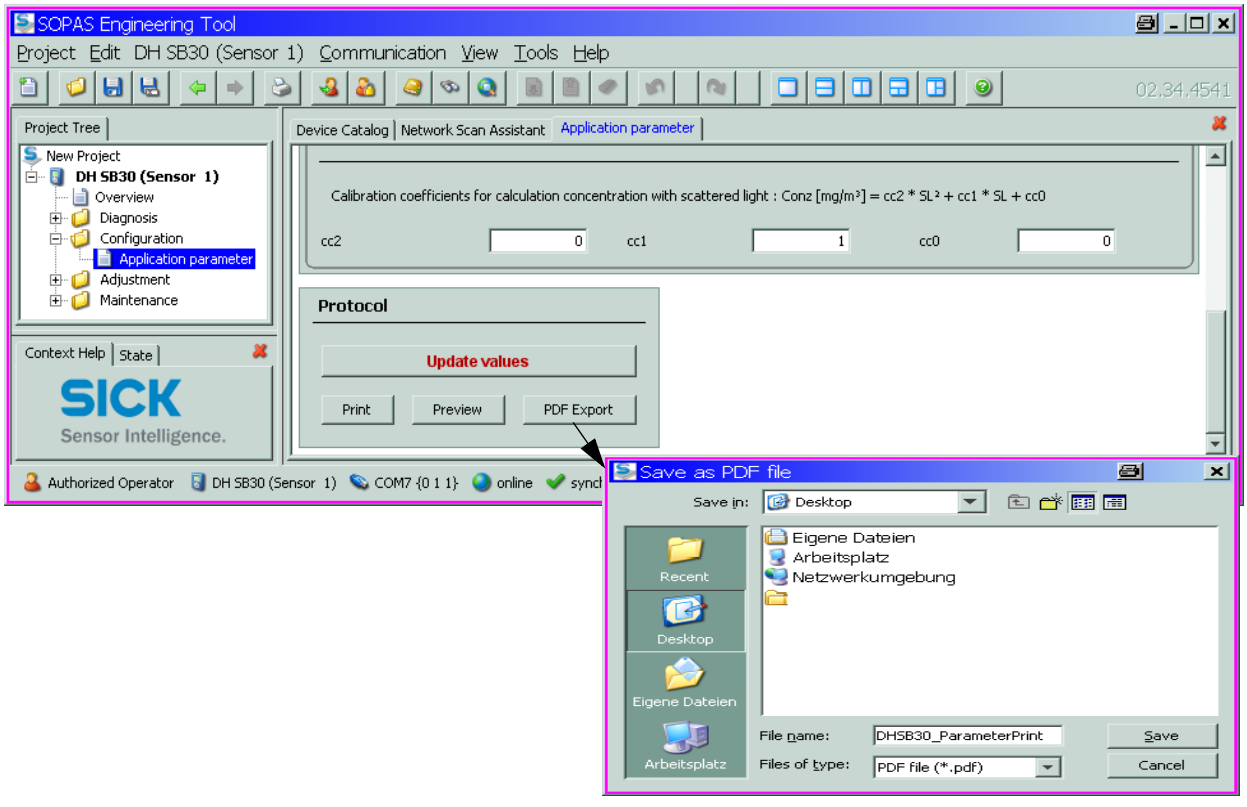
Figure 38 Update device data



► Select the “Configuration/Application parameter” directory and click the button for the desired type of registration.

The file name and storage location must be specified for export to a PDF file.

Figure 39 “Configuration / Application parameter” directory



Parameter protocol example

Figure 40 DUSTHUNTER SB30 parameter protocol (example)

Dusthunter - Parameter and Diagnosis protocol

Type of device: DH SB30
Mounting location:
Sensor 1

Device information

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

Installation parameter

Adress RS485	1
Adress CAN (hex)	10
Baudrate CAN	125 kBit

Parameter of the selected parameter configuration

Parameter configuration	Config 0 (free)
Depth of immersion	0.40m
Relay 3 signals	Maintenance
Limit value	0.0mg/m³
Response time sensor	60.0s
Function check interval	8 h
Analog output settings	
Live Zero	0 mA
Range low	0.0mg/m³
Range high	0.0mg/m³
Output control values	enabled
Calibration coefficients for calculation of concentration	
cc2	0.0000
cc1	0.0000
cc0	0.0000

Device parameter

Factory settings	
Correction factor depth of immersion	1.0
Response time diagnosis values	10.0s
Burst frequency	10000Hz
Triggerpoint	35µs

Factory settings

Scattered light (SL)	
cc2	0.0000
cc1	1.0000
cc0	0.0000
Laser current	
cc2	0.0000
cc1	30.3000
cc0	0.0000
Device temperature	
cc2	0.0000
cc1	100.0000
cc0	-275.1500
Power supply	
cc2	0.0000
cc1	11.0000
cc0	0.0000
Analog output	
cc2	0.0000
cc1	179.9600
cc0	0.0000

System state

Error	inactive
Maintenance	inactive
Maintenance request	inactive
Function check	inactive
Operation	inactive
Grenzwert	inactiv

Error

EEPROM	inactive
CRC sum parameter	inactive
Version Parameter	inactive
CRC sum factory settings	inactive
Version factory settings	inactive
Span test	inactive
Overflow mesured value	inactive
Overflow constant light	inactive
Monitor signal	inactive
Laser current to high (>100mA)	inactive
Power supply (24V) < 18V	inactive
Power supply (24V) > 30V	inactive

Warnings

Default factory parameter	inactive
Test mode	inactive
Power supply (24V) < 19V	inactive
Power supply (24V) > 29V	inactive
Laser current to high (>60mA)	inactive

Measured value

Concentration	0.0mg/m³
Scattered light	0.000

Diagnosis value

Monitor	0.000V
Laser current	0.0mA
Constant light	0.0V
Device temperature	0.0°C
Power supply (24V)	0.0V
Laserbyte	0
Monitor factor	1.000
Peak value device temp.	0°C

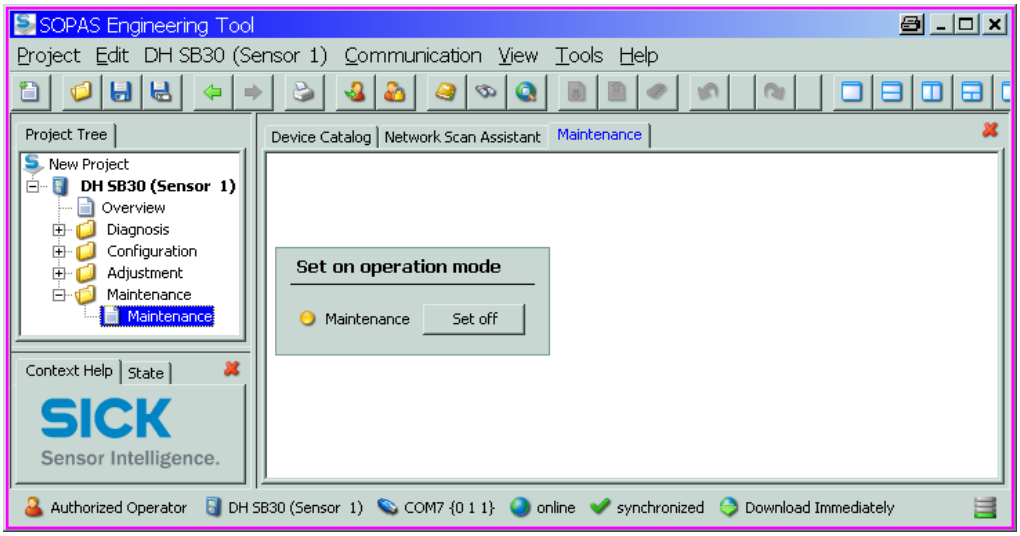
Check values

Zero point	0.00%
Span 70	70.00%
Filter check	
Nominal value Filter 1	0.00%
Measured value Filter 1	0.00%
Nominal value Filter 2	0.00%
Measured value Filter 2	0.00%
Nominal value Filter 3	0.00%
Measured value Filter 3	0.00%
Nominal value Filter 4	0.00%
Measured value Filter 4	0.00%
Nominal value Filter 5	0.00%
Measured value Filter 5	0.00%

4.2.3.8 Starting normal measuring operation

Set the measuring system to “Measurement” mode after entering/modifying parameters. To do this, switch to the “Maintenance / Maintenance” directory and click “Set off“. Start-up is now completed.

Figure 41 Setting the operational state



DUSTHUNTER SB30

5 Maintenance

General
Maintenance on the sender/receiver unit
Maintenance on the purge air supply
Shutdown

5.1 General

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

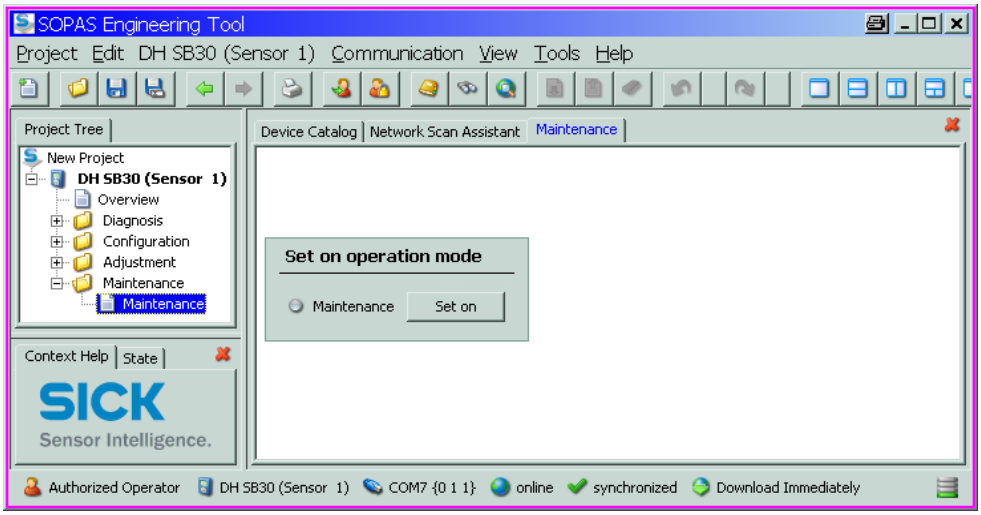
WARNING:
Observe the relevant safety regulations as well as the safety notices (→ p. 10, §1.3) during all work.

Set the measuring system to “Maintenance” state before starting maintenance work. This can be done using either an external contact on pins 1 and 6 of plug-in connector 3 (→ p. 18, §2.2.1, → p. 30, §3.3.4) or with SOPAS ET.

Setting the maintenance state with SOPAS ET

- ► Connect the measuring system to the laptop/PC using the USB RS485 adapter (→ p. 79, §7.3.5) and start SOPAS ET.
- ► Click button “Network Scan” in tab “Network Scan Assistant”, select device file “DH SB30“ and move it to window “Project Tree” (→ p. 47, §).
- ► Enter the Level 1 password (→ p. 48, §4.2.3.3).
- ► Switch to directory “Maintenance/Maintenance” and click “Set On”.

Figure 42 Setting “Maintenance” mode



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

- An automatic functional check is carried out during “Maintenance”.
- The value set for “Maintenance” is output on the analog output (→ p. 37, §4.2.1, → p. 50, §4.2.3.5). This is also applicable when a malfunction is present (signaled on relay output).
- The “Maintenance” state is reset when there is a voltage failure. In this case, the measuring system switches automatically to “Measurement” after the operating voltage is switched on again.

Maintenance intervals

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

Maintenance contract

Scheduled maintenance work can be carried out by the equipment operator. Only qualified personnel according to Section 1 should be allowed to do the work. If desired, SICK Service or authorized Service support centers can carry out all maintenance work. Any repairs will be made by specialists onsite whenever possible.

Auxiliary means required

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

5.2 Maintenance on the sender/receiver unit

NOTICE:

- ► 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.

WARNING: Danger from exhaust gas

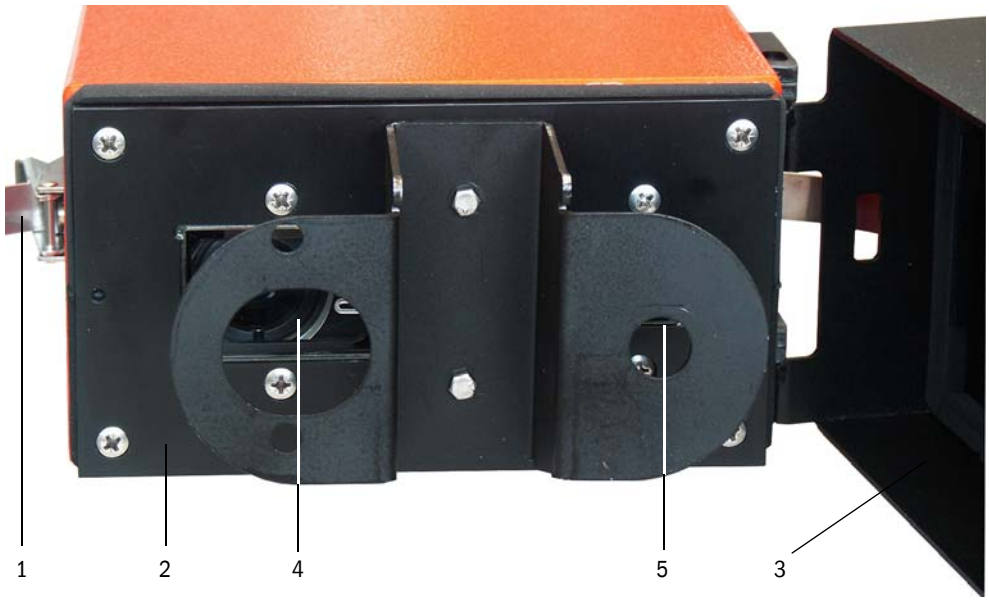
The sender/receiver unit must be opened for cleaning. On plants with overpressure gas can escape under some circumstances.

- ► Take suitable protection measures or open the sender/receiver unit only when the plant is at a standstill.

Work to be performed

- ► Loosen tension locks (1) of the sender/receiver unit and swivel electronics unit (2) to the side.
- ► Check mounting flange (3) and purge air connections (→ p. 18, Fig. 5) for contamination and clean when necessary.
- ► Carefully clean sender optics (4) and receiver optics (5) with an optics cloth or cotton swabs.
- ► Reassemble the sender/receiver unit again.
- ► Start Measuring mode again.

Figure 43 Cleaning the optical interfaces



5.3 Maintenance on the purge air supply

Maintenance work to be carried out:

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

The dust load and wear on the filter element depend on the degree of contamination of the intake ambient air. It is therefore not possible to specify precise time intervals for these tasks. We recommend the inspection of the purge air supply after start-up at short intervals (approx. 2 weeks) and to optimize the maintenance intervals over a longer operating time.

NOTICE:

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

- ► Always ensure the purge air supply when the sender/receiver unit is fitted on the duct.
- ► Disassemble the sender/receiver unit before exchanging a damaged purge air hose (→ p. 66, §5.4).

Inspection

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

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

5.3.1 Optional control unit with integrated purge air supply

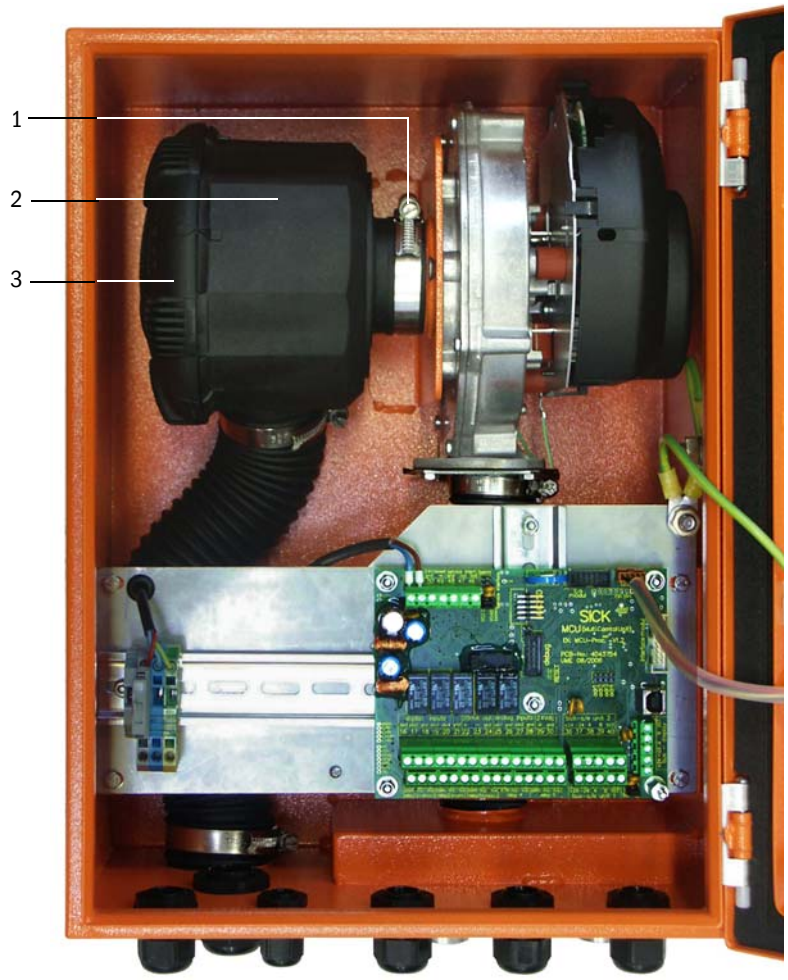
Cleaning or replacing the filter element

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

> ***NOTICE:***
> ► For wet cleaning, use only a water-soaked cloth and then dry the parts well.

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

Figure 44 Exchanging the filter element for the optional control unit with purge air supply

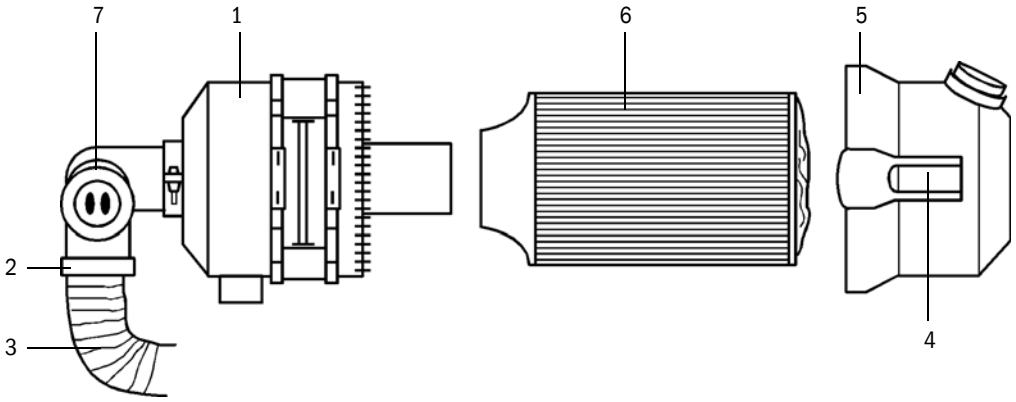


5.3.2 Optional external purge air unit

Replacing the filter element

> ***NOTICE:***
> The filter element must be replaced at the latest when low-pressure monitor (7) at the filter outlet triggers (→ Fig. 45).

Figure 45 Replacing the filter element



- ► Clean outside of filter housing (1).
- ► Loosen strap retainer (2) and clamp purge air hose (3) to a clean location.

> ***NOTICE:***
> ► Place the end of the hose in a safe place so that foreign objects cannot be sucked in (this will cause irreparable damage to the blower), but do not close the end of the hose! During this time, unfiltered purge air enters the purge air connection.

- ► Press snap locks (4) together and take off filter housing cover (5).
- ► Remove filter element (6) with twisting-pulling movements.
- ► Clean the inside of the filter housing and the filter housing cover with a cloth and brush.

> ***NOTICE:***
> ► For wet cleaning, use only a water-soaked cloth and then dry the parts well.

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

5.4 Shutdown

The measuring system must be shut down:

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

> ***NOTICE:***
> 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 cable to the MCU.
- ► Dismantle the sender/receiver unit from the duct.

> **WARNING: Hazard through gas and hot parts**
> - ► Observe the relevant safety regulations as well as the safety notices in Section 1 during all disassembly work.
> - ► Only remove the sender/receiver unit on equipment with hazard potential (higher internal duct pressure, hot or aggressive gases) when the equipment is at a standstill.
> - ► Take suitable protection measures against possible local hazards or hazards arising from the equipment.
> - ► Secure switches that should not be switched on again for safety reasons with signs and safeguards to prevent unintentional switching.

- ► Close off the flange with tube with a blind flange
- ► 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 control unit from supply voltage.

Storage

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

DUSTHUNTER SB30

6 Malfunctions

General
Sender/receiver unit

6.1 General

The “Diagnosis / Error messages/warnings“ directory provides detailed information on the current device state. To display, connect the measuring system to SOPAS ET and start the device file “DH SB30” (→ p. 47, §).

Move the mouse to the respective message to display more details on the significance of individual messages in a separate window. Click on the display to view a short description of possible causes and clearance for certain messages as “Context help” (→ p. 69, Fig. 46).

Warning messages are output when limits set internally for single device functions/ components are reached or exceeded which leads to erroneous measured values or a failure of the measuring system soon.

Warning messages do not yet imply an erroneous function of the measuring system. The current measured value continues to be output on the analog output.

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

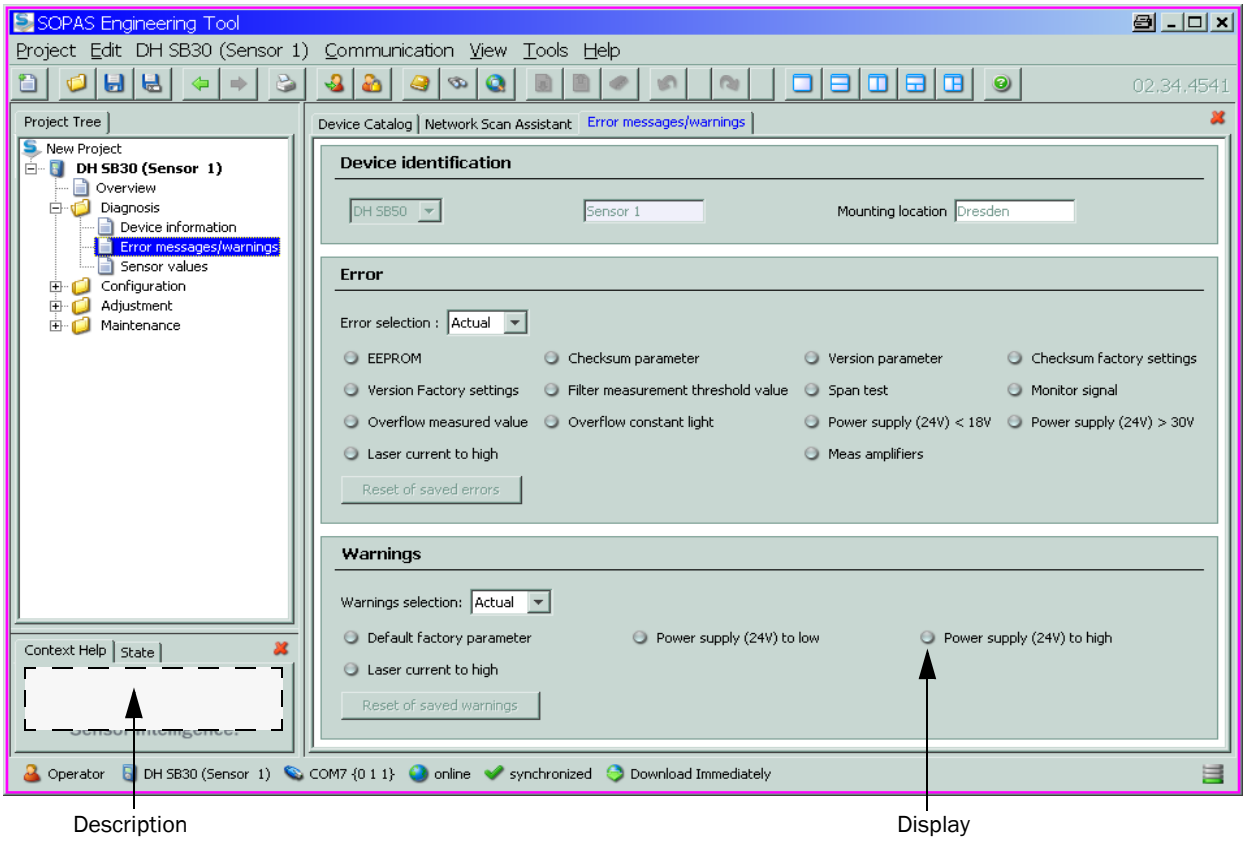
6.2 Sender/receiver unit

Malfunctions

Symptom	Possible cause	Measure
LEDs of the sender/receiver are not on	• No supply voltage • Connection cable not connected correctly or defective • Plug-in connector defective	▶ Check plug-in connector and cable. ▶ Contact SICK Service.

Warning and malfunction messages in SOPAS ET

Figure 46 Directory “Diagnosis / Error messages/Warnings”



Select “Actual” or “Saved” in the “Error selection” or “Warnings selection” window to view current or previous warning and malfunction messages recorded in error memory.

Malfunctions listed below can probably be cleared onsite.

Message	Significance	Possible cause	Measure
Span test	Deviation from nominal value above ±2%	Sudden changes in measuring conditions during determination of control values	▶ Repeat the functional check. ▶ Contact SICK Service.
Overflow constant light	Constant light signal > 3.5 V; measured values invalid	Extraneous light share too high	▶ Reduce extraneous light share (select different fitting location, sun protection, ..).
Measurement amplifier	Measurement not possible	Measurement receiver not connected	▶ Check connection to processor board and connect plug-in connector, if necessary (→ p. 34, §4.1.1).

DUSTHUNTER SB30

7 Specifications

Technical data
Dimensions, Part Nos.
Accessories
Consumable parts for 2-years operation
Password

7.1 Technical data

Measuring Parameters				
Measured variable	Scattered light intensity (SI) Dust concentration output in mg/m³ after gravimetric comparison measurement			
Measuring range	Can be preset with jumpers	Measuring range 1	Measuring range 2	Measuring range 3
		0...30 SI	0...500 SI	0...3000 SI
	Freely adjustable with program SOPAS ET		0 ... 3000 SI (higher on request)	
Measurement uncertainty [1]	±2% of rating		Repeatability at zero point 0.1%	
Response time	60 s; preset		1...600 s, freely selectable with program SOPAS ET	
Measuring Conditions				
Gas temperature [2]	-40...600 °C			
Sample gas pressure	-50 hPa... +2 hPa -50 hPa ... +30 hPa		Purge air supply with optional control unit MCU-P (or similar) Purge air supply with optional external purge air unit (or similar)	
Internal duct diameter	> 500 mm			
Ambient temperature	-40...+60 °C -40...+45 °C		Sender/receiver unit, optional control unit MCU-N Optional control unit MCU-P, intake temperature for purge air	
Function Check				
Automatic self-test	Linearity, drift, aging			
Manual linearity check	Using a reference filter			
Output Signals				
Analog output	2/4...20 mA, max. load 750 Ω; resolution 10 bits; electrically isolated			
Relay output	3 potential-free outputs (N/O contact) for status signal; load 48 V, 1 A			
Input Signals				
Digital input	2 inputs to connect potential-free contacts (e.g. for external maintenance switch, triggering functional check or linearity measurement)			
Communication Interfaces				
RS485	To connect Service adapter or optional MCU			
CAN bus	For connection of optional SCU			
Energy supply				
Sender/receiver unit	Power supply: Power consumption:		24 V from external voltage supply or optional MCU Max. 4 W	
Optional control unit MCU	Power supply: Power consumption:		90...250 V AC, 47...63 Hz; opt. 24 V DC ± 2 V MCU-N: max. 15 W MCU-P: max. 70 W	
Optional external purge air unit (with blower 2BH13)	Voltage supply (3 ph): Rated current: Motor rating:		200...240 V/345...415 V at 50 Hz 220...275 V/380...480 V at 60 Hz 2.6 A/Y 1.5 A 0.37 kW at 50 Hz; 0.45 kW at 60 Hz	
Weight				
Sender/receiver unit	7 kg			
MCU installed	13,5 kg 3,7 kg		Optional control unit MCU-P Optional control unit MCU-N	
Optional external purge air unit	14 kg			

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

[2]: Above dew point

Miscellaneous		
Protection class	IP 66 IP 54	Sender/receiver unit, optional control unit MCU Optional external purge air unit
Connection cable length	5 m, 10 m	Other lengths on request
Purge air hose length	5 m, 10 m	Other lengths on request
Laser	Degree of protection 2; capacity < 1 mW; wavelength between 640 nm and 660 nm	
Purge air feed volume	Max. 20 m³/h Max. 63 m³/h	Optional control unit MCU-P Optional external purge air unit

Compliances

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

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

Applied EN standards:

- EN 61010-1, Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326, Electrical equipment for measurement technology, control technology and laboratory use - EMC requirements
- EN 14181, Calibration of continuously operating emission measuring devices
- EN 15267-3: Certification of automated measuring systems - Part 3

Electrical protection

- Insulation: Protection class 1 according to EN 61010-1.
- Insulation coordination: Measuring category II according to EN 61010-1.
- Contamination: The control unit operates safely in an environment up to degree of contamination 2 according to EN 61010-1 (usual, non-conductive contamination and temporary conductivity by occasional moisture condensation).
- Electrical energy: The wiring system to the mains supply voltage of the system must be installed and fused according to the relevant regulations.

Approvals

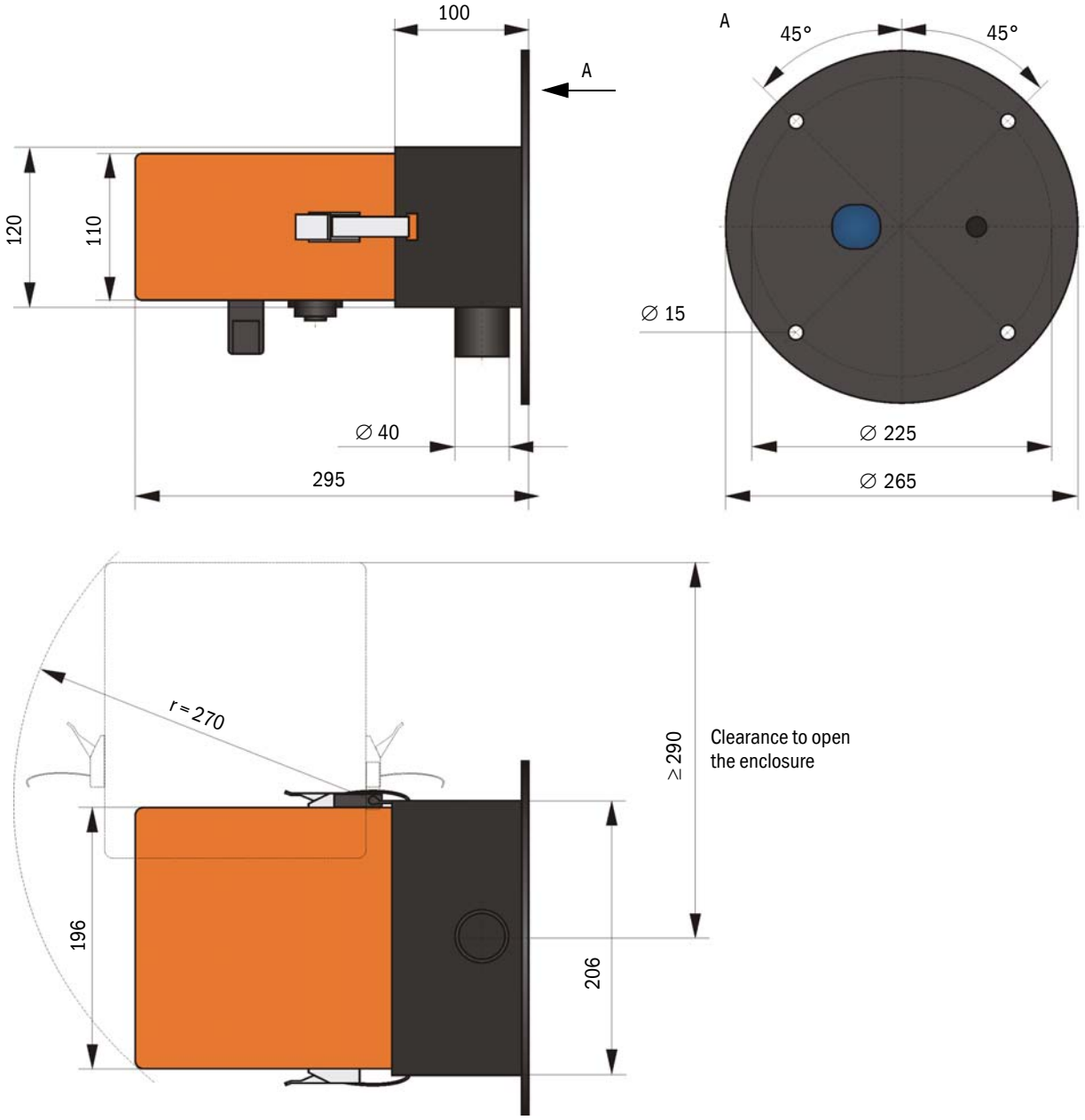
The DUSTHUNTER SB30 version is TÜV-tested.

7.2 Dimensions, Part Nos.

All dimensions are specified in mm.

7.2.1 Sender/receiver unit

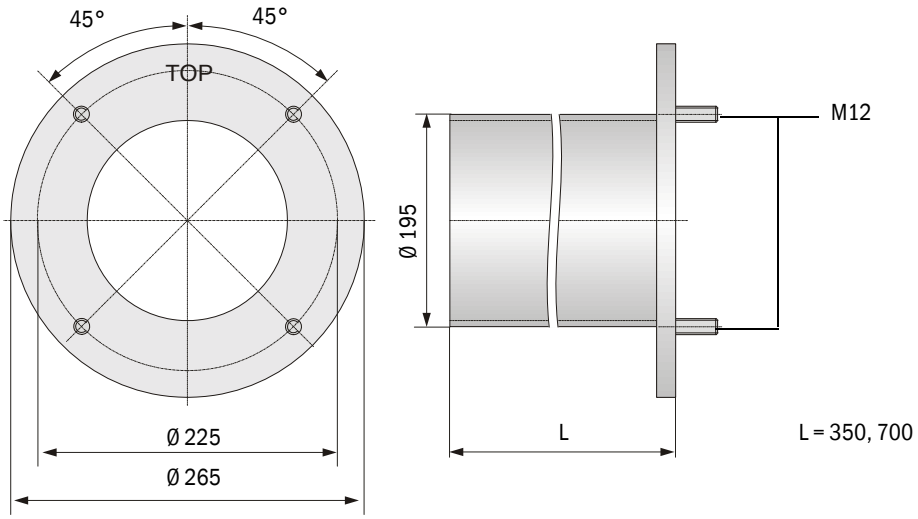
Figure 47 Sender/receiver unit



Name	Part No.
Sender/receiver unit DHSB-T30	1054351

7.2.2 Flange with tube

Figure 48 Flange with tube

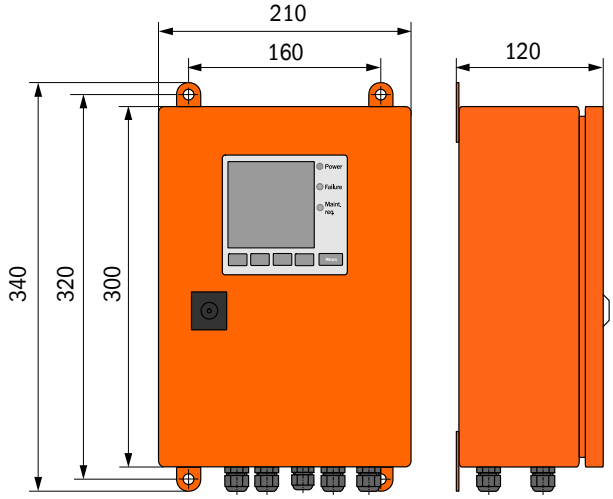


Name	Part No.
Flange with tube, DN195, length 350 mm, St37	2046526
Flange with tube, DN195, length 700 mm, St37	2046492
Flange with tube, DN195, length 350 mm, 1.4571	2047288
Flange with tube, DN195, length 700 mm, 1.4571	2047287

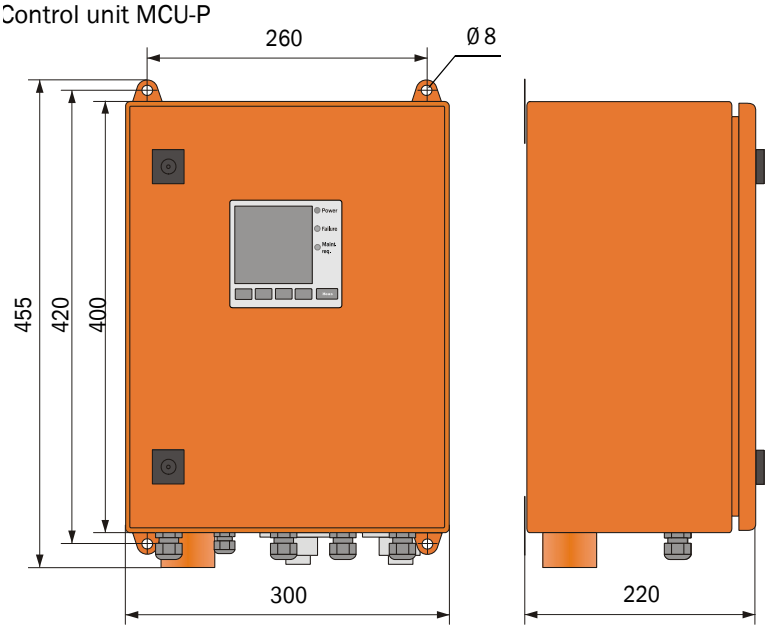
7.2.3 Optional control unit MCU

Figure 49 Optional control unit MCU

Control unit MCU-N



Control unit MCU-P

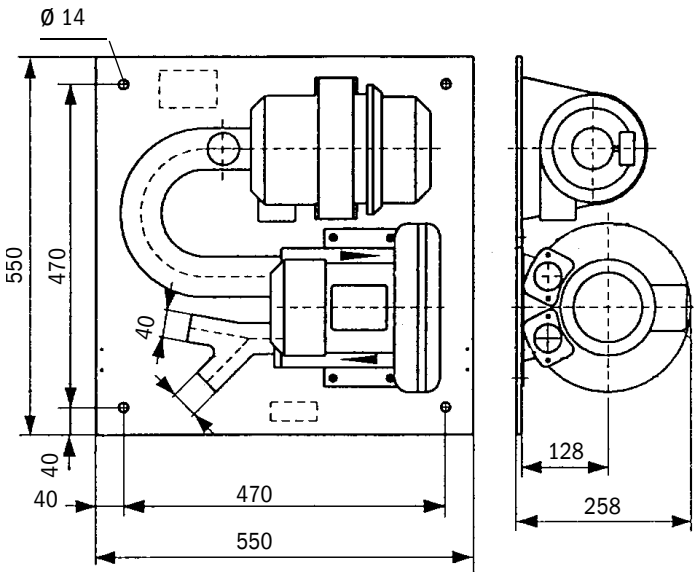


Name	Part No.
Control unit MCU-N	
Control unit MCU-NWONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, without purge air unit, without display	1040667
Control unit MCU-N2ONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, without purge air unit, without display	1040669
Control unit MCU-P	
Control unit MCU-PWONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 90 ... 250 V AC, with purge air unit, without display	1040668
Control unit MCU-P2ONN00000NNNE in wall-mounted enclosure (orange), Supply voltage 24 V DC, with purge air unit, without display	1040670

More control units on request.

7.2.4 Optional external purge air unit

Figure 50 Optional external purge air unit

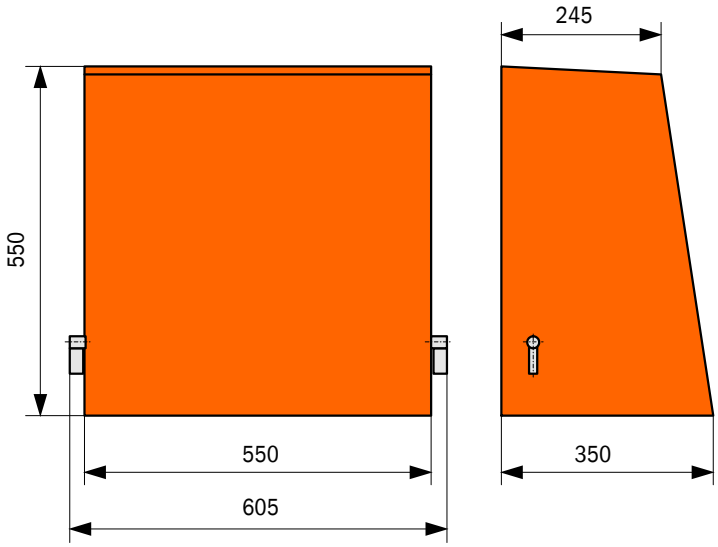


Name	Part No.
Purge air unit with blower 2BH13 and purge air hose, length 5 m	1012424
Purge air unit with blower 2BH13 and purge air hose, length 10 m	1012409

7.2.5 Weatherproof covers

Weatherproof cover for external purge air unit

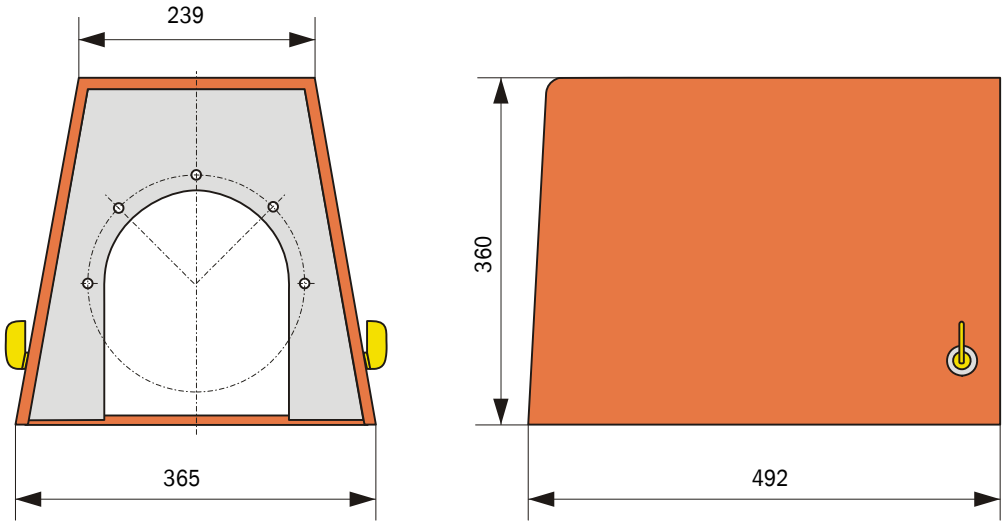
Figure 51 Weatherproof cover for external purge air unit



Name	Part No.
Weatherproof cover for purge air unit	5306108

Weatherproof cover for sender/receiver unit

Figure 52 Weatherproof cover for sender/receiver unit



Name	Part No.
Weatherproof cover flange k225	2048657

7.3 Accessories

7.3.1 Connections for sender/receiver unit

Name	Part No.
7-pole socket for connection of voltage supply (plug-in connector 1)	6049886
7-pole connector for connection of AO and status signals (plug-in connector 2)	6049036
5-pole socket for connecton of DI and service /plug-in connector 3)	6009719

7.3.2 Connection cable, sender/receiver unit - MCU

Name	Part No.
Connection cable, length 5 m	7042017
Connection cable, length 10 m	7042018
Connection cable, length 5 m for CAN bus connection	2043678
Connection cable, length 10 m for CAN bus connection	2043679

7.3.3 Purge air supply

Name	Part No.
Backflow valve DN40	2035098
Purge air hose DN 40, sold by the meter	5304683
Hose clamp D32-52	5300809
Purge air heater with housing for fitting outdoors 230 V AC, 50/60 Hz, 3000 W, 1 ph	2021514
Purge air heater with housing for fitting outdoors 120 V AC, 50/60 Hz, 2200 W, 1 ph	2021513

7.3.4 Assembly parts

Name	Part No.
Assembly kit	2048677

7.3.5 Accessories for linearity check

Name	Part No.
USB-RS485 adapter	2040718
Check filter set	2042339
Optic carrier for linearity test DUSTHUNTER SB50	2048281
Adjusting stand	2042907
7-pole connection cable for CAN bus, length 5 m	2043678

7.4 Consumable parts for 2-years operation

Name	Number	Part No.
Optics cloth	4	4003353
Filter element Micro-Topelement C11 100 (for optional external purge air unit)	4	5306091

7.5 Password

SICK

Passwort „Autorisierter Bediener“

Nach dem Start des Bedien- und Parametrierprogrammes SOPAS ET sind nur die Programmfunktionen verfügbar, die keinen Einfluss auf die Gerätefunktion haben.

Nicht eingewiesenes Personal kann keine Änderungen der Parameter vornehmen.
Zur Nutzung des erweiterten Funktionsumfanges wird das

Passwort **sickoptic** benötigt.

Falls zur Eingabe eine falsche Taste gedrückt wird, muß das Fenster geschlossen und anschließend die Passworteingabe wiederholt werden.

Password "Authorized operator"

After the start of the SOPAS ET operating and parameterization program, only menus are available which have no effect on the functioning of the device.
Untrained personnel cannot alter the device parameters. To access the extended range of functions the

password **sickoptic** must be entered

If a wrong key is pressed when entering the password, the window must be closed and then the entering repeated.

DUSTHUNTER SB30

8014551/V1.0/2012-12 | Subject to change without notice

SICK worldwide

You will find our local subsidiary or agency at:
www.sick.com

Your local sales and service partner

Sensor Intelligence.