Described Product
Product name: FWE200DH

Manufacturer
SICK Engineering GmbH
Bergener Ring 27 · D-01458 Ottendorf-Okrilla · Germany
Phone: +49 7641 469-0
E-mail: info.pa@sick.de

Trademarks
Windows is a Microsoft Corporation trademark. Other product names used in this document may also be trademarks and are only used for identification purposes.

Legal Information
This work is protected by copyright. Any rights derived from the copyright shall be reserved for SICK AG. Reproduction of this document or parts of this document is only permissible within the limits of the legal determination of Copyright Law. Any modification, shortening or translation of this document is prohibited without the express written permission of SICK AG. The trademarks stated in this document are the property of their respective owner.

© SICK AG. All rights reserved.

Original document
This document is an original document of SICK AG.
## Contents

1. **Important Information** ................................................................. 7  
   1.1 Main hazards.................................................................................. 7  
      1.1.1 Hazard through hot and/or aggressive gases and high pressure 7  
      1.1.2 Hazard through electrical equipment .................................. 7  
      1.1.3 Hazards through laser beam................................................. 7  
      1.1.4 Hazard through moving parts.............................................. 7  
   1.2 Symbols and document conventions ............................................ 8  
      1.2.1 Warning Symbols ................................................................ 8  
      1.2.2 Warning levels and signal words........................................ 8  
      1.2.3 Information Symbols............................................................ 8  
   1.3 Intended use .................................................................................. 8  
   1.4 Responsibility of user................................................................... 9  
      1.4.1 General information.............................................................. 9  
      1.4.2 Safety information and protective measures ....................... 9  

2. **Product Description** .................................................................. 11  
   2.1 System features and application areas ....................................... 11  
      2.1.1 System features and advantages ....................................... 11  
      2.1.2 Application areas ............................................................... 11  
   2.2 FWE200DH operating principle.................................................. 12  
      2.2.1 Functional principle............................................................ 12  
      2.2.2 Isokinetic behavior .............................................................. 14  
      2.2.3 Scattered light measuring principle.................................... 14  
      2.2.4 Response time .................................................................... 15  
      2.2.5 Automatic function check.................................................. 15  
   2.3 Device components ..................................................................... 18  
      2.3.1 Sample gas probe................................................................. 18  
      2.3.2 Flange with tube ................................................................. 18  
      2.3.3 Extraction and return hoses.............................................. 19  
      2.3.4 Measuring and control unit ............................................... 19  
         2.3.4.1 Thermo cyclone ......................................................... 22  
         2.3.4.2 Measuring sensor ...................................................... 22  
         2.3.4.3 Control unit............................................................... 24  
         2.3.4.4 Extended calibration function................................. 26  
      2.3.5 Blower unit ......................................................................... 27  
   2.3.6 Options .................................................................................. 27  
      2.3.6.1 Backpurge unit............................................................... 27  
      2.3.6.2 Heated extraction hose.............................................. 28  
      2.3.6.3 Remote unit................................................................. 28  
      2.3.6.4 Cover at the bottom .................................................... 29  
      2.3.6.5 Test equipment for linearity test............................... 29  
   2.4 SOPAS ET (PC program)............................................................. 30
### 3 Assembly and Installation ................................................................. 31

3.1 Project planning .................................................................................... 31

3.2 Assembly .............................................................................................. 32
   3.2.1 Fitting the flange with tube .......................................................... 32
   3.2.2 Installing the measuring and control unit ................................... 33
   3.2.3 Installing the blower unit ............................................................. 35
   3.2.4 Installing the remote unit option ................................................. 36

3.3 Installation ............................................................................................ 37
   3.3.1 General information ..................................................................... 37
   3.3.2 Connecting the control unit ......................................................... 38
      3.3.2.1 Connecting cables for digital, analog and status signals ............. 39
      3.3.2.2 Connecting the blower unit and supply voltage ...................... 42
   3.3.3 Fitting and connecting the Interface module option .................. 43
   3.3.4 Installing the backpurge option (only necessary when ordered separately) .......................................................... 44
   3.3.5 Connecting the remote unit option .............................................. 46

### 4 Start-up and Configuration .................................................................. 47

4.1 Putting the FWE200DH into operation .............................................. 47
   4.1.1 Preparatory work ......................................................................... 47
   4.1.2 Starting the FWE200DH ............................................................... 48
   4.1.3 Fitting the sample gas probe ....................................................... 49

4.2 Basics ................................................................................................. 50
   4.2.1 General information ..................................................................... 50

4.3 Install SOPAS ET .................................................................................. 50
   4.3.0.1 Password for SOPAS ET menus ............................................. 50
   4.3.1 Connection to the device via USB line ........................................ 50
      4.3.1.1 Finding the DUSTHUNTER COM port ..................................... 51
   4.3.2 Connection to the device via Ethernet (option) ......................... 52

4.4 Setting standard parameters ............................................................... 53
   4.4.1 Factory settings ............................................................................ 53
   4.4.2 Setting “Maintenance” mode ....................................................... 54
   4.4.3 Changing function parameters .................................................... 55
      4.4.3.1 Change temperature settings ................................................. 55
      4.4.3.2 Define limit value for the flow rate ....................................... 55
      4.4.3.3 Set the suction .................................................................... 56
   4.4.4 Setting the function check ........................................................... 57
   4.4.5 Setting the analog output parameters ........................................ 58
   4.4.6 Setting the analog input parameters ......................................... 60
   4.4.7 Setting the response time ............................................................ 60
   4.4.8 Defining regression coefficients ................................................ 62
   4.4.9 Calibration for dust concentration measurement ...................... 63
   4.4.10 Data backup .............................................................................. 65
   4.4.11 Starting measuring operation .................................................... 67
4.5 Setting the Interface module parameters ...........................................68
  4.5.1 Modbus TCP module .................................................................68
    4.5.1.1 Check MCU settings ..................................................68
    4.5.1.2 Installing the configuration program ..........................70
    4.5.1.3 Integrating the Modbus module in the network .........71
    4.5.1.4 Configuring the Modbus module ............................75
    4.5.1.5 Checking the functional capability ...........................77
  4.5.2 Setting the Ethernet module parameters ....................................78

4.6 Activating the backpurge option ..........................................................79

4.7 Operating/setting parameters via the LC-Display .......................................80
  4.7.1 General information on use ..........................................................80
  4.7.2 Password and user levels .............................................................80
  4.7.3 Menu structure .............................................................................81
  4.7.4 Setting parameters .......................................................................82
    4.7.4.1 Sample gas temperature .................................................82
    4.7.4.2 Analog outputs / inputs ............................................82
  4.7.5 Using SOPAS ET to modify display settings .................................84

5 Maintenance ..............................................................................................85
  5.1 General information ..............................................................................85
    5.1.1 Maintenance intervals ................................................................85
    5.1.2 Maintenance contract .................................................................85
    5.1.3 Auxiliary means required ............................................................85
    5.1.4 Setting “Maintenance” mode ......................................................86
  5.2 Maintenance work .................................................................................87
    5.2.1 Preparatory work .......................................................................87
    5.2.2 Visual inspection...........................................................................88
    5.2.3 Cleaning the inlet nozzles on the thermo cyclone .......................89
    5.2.4 Cleaning the ejector ...................................................................90
    5.2.5 Cleaning the suction nozzle .......................................................91
    5.2.6 Cleaning the intermediate nozzle ..............................................92
    5.2.7 Clean the sample gas probe, extraction and return hose ...........92
    5.2.8 Cleaning the swirl chamber ......................................................93
    5.2.9 Cleaning optical interfaces .......................................................94
    5.2.10 Checking / replacing the filter element of the blower unit .........95
  5.3 Putting the measuring system out of operation .......................................96

6 Troubleshooting and Error Handling ..........................................................97
  6.1 General information ..............................................................................97
    6.1.1 Display of warning and malfunction messages ..........................97
    6.1.2 Malfunctions ............................................................................98
  6.2 Warning and error messages in SOPAS ET ...........................................99
    6.2.1 Measuring sensor .....................................................................99
    6.2.2 Measuring system ...................................................................100
    6.2.3 Control unit .............................................................................102
## Specifications

### 7.1 Technical Data

### 7.2 Dimensions, Part Nos.

<table>
<thead>
<tr>
<th>Part No</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample gas probe</td>
<td>107</td>
</tr>
<tr>
<td>Flange with tube</td>
<td>107</td>
</tr>
<tr>
<td>Measuring and control unit</td>
<td>108</td>
</tr>
<tr>
<td>Blower unit</td>
<td>108</td>
</tr>
</tbody>
</table>

### 7.3 Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote unit</td>
<td>109</td>
</tr>
<tr>
<td>Frame</td>
<td>110</td>
</tr>
<tr>
<td>Weatherproof cover for blower unit</td>
<td>111</td>
</tr>
<tr>
<td>Measuring system</td>
<td>111</td>
</tr>
<tr>
<td>Interface module</td>
<td>111</td>
</tr>
<tr>
<td>Device check accessories</td>
<td>111</td>
</tr>
</tbody>
</table>

### 7.4 Consumable parts for 2-years operation

<table>
<thead>
<tr>
<th>Part No</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring sensor</td>
<td>112</td>
</tr>
<tr>
<td>Blower unit</td>
<td>112</td>
</tr>
</tbody>
</table>

## Annex

### 8.1 Standard settings FWE200DH

<table>
<thead>
<tr>
<th>Option</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard settings FWE200DH</td>
<td>113</td>
</tr>
</tbody>
</table>
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**

Hot and/or aggressive gases can escape from gas-carrying system components (sample gas probe, gas hoses, thermo cyclone, measuring unit, ejector) and cause serious health damage if the operator is unprotected.

- Switch the measuring system off before starting any work.
- Only perform work with adequate protection devices (protective clothes, protective mask).
- Let gas-carrying and hot system components cool down sufficiently before touching or use protective equipment.
- Plants with toxic gases, high temperatures or high pressure must be shut down before the sample gas probe is removed or fitted.

1.1.2 Hazard through electrical equipment

**WARNING: Danger through power voltage**

Measuring system FWE200DH is an electrical equipment.

- 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**

FWE200DH The sender/receiver unit of the FWE200DH uses a laser with laser class 2.

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

1.1.4 Hazard through moving parts

**WARNING: Hazard through moving parts**

The backpurge unit option has an electrically controlled ball valve which can cause crushing in case of improper handling.

- Do not insert any body parts (fingers) or objects into the openings during actuation.
1.2 Symbols and document conventions

1.2.1 Warning Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚠️</td>
<td>Hazard (general)</td>
</tr>
<tr>
<td>⚡</td>
<td>Hazard by voltage</td>
</tr>
</tbody>
</table>

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 personal injury or property damage.
- **NOTICE**: Hazard which could result in property damage.

1.2.3 Information Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>📝</td>
<td>Important technical information for this product</td>
</tr>
<tr>
<td>⚡️</td>
<td>Important information on electric or electronic functions</td>
</tr>
</tbody>
</table>

1.3 Intended use

**Purpose of the device**

The FWE200DH 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 on or in 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 FWE200DH measuring system is not approved for use in potentially explosive atmospheres.
1.4 Responsibility of user

1.4.1 General information

Designated users

The FWE200DH 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 malfunctions

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

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

Electric connection

It must be possible to switch off the device using a power isolating switch/circuit breaker according to EN 61010-1.
2 Product Description

2.1 System features and application areas

The measuring system FWE200DH serves for continuously measuring dust concentrations up to 200 mg/m³ (typical range of application) in wet gases (temperatures below the dew point) with a resolution of up to approx. 0.1 mg/m³. It can be used in a wide range of applications and features low installation effort and simple handling.

2.1.1 System features and advantages

- Extraction of a partial gas flow from the gas duct
- Drying and overheating the wet partial gas flow with adjustable electrical heating for constant sample gas temperature to rule out measurement errors caused by droplets existing before
- Gas extraction and return with one sample gas probe which means only one mounting flange is required
- Dust content determination using scattered light measurement for low to medium dust concentrations
- Compact measuring system design means simple assembly and installation
- Operating values and system status displayed on an LC-Display
- Flow monitoring with integrated differential pressure measurement
- Simple configuration and operation using user-friendly software
- Self-control via automatic function control (see “Automatic function check”, page 15) of the scattered light sensor and numerous control functions such as overvoltages, low voltages, high and low temperatures, pressure, flow monitoring, filter monitor for recognizing high filter contamination

2.1.2 Application areas

- Measuring dust emissions in power stations downstream from flue gas desulfurization plants
- Measuring dust in wet purifiers and waste incineration plants
- Measuring dust content in wet exhaust air from technological processes
2.2 FWE200DH operating principle

2.2.1 Functional principle

The FWE200DH functions as a bypass system. A partial gas flow is suctioned from the gas duct via a sample gas probe, overheated in a thermo cyclone so that water drops and aerosols vaporize and then fed into a measuring cell. A laser beam passes through the sample gas in the measuring cell and the light scattered by the particles in the gas flow is measured by the receiver. The measured scattered light intensity serves as basis for determining the dust concentration. The sample gas is then fed back to the sample gas probe again to be returned to the duct.

The gas flow through the measuring system is fed by an ejector. The ejector is driven by a blower.

A small part of the partial flow is led from the blower to the measuring cell as purge air flow to ensure that the optical windows in the measuring cell are kept clean and to prevent sample gas condensing in the measuring cell.
Fig. 1: FWE200DH basic layout

1 Base plate
2 Heating band 1
3 Heating band 2
4 Thermo cyclone
5 Control unit
6 Measuring sensor with measuring cell
7 Ejector
8 Extraction line
9 Return line

S SOPAS ET operating software
P Power supply 115 / 230 V AC
A Output signal 0 ... 20 mA
D Status signals
2.2.2 Isokinetic behavior

The measuring behavior of the FWE200DH is mainly independent of gas velocity changes in the duct. Therefore an isokinetic extraction (extraction velocity = gas velocity) is not required.

In standard state, the measuring system FWE200DH works with a stable volume flow between approx. 8...14 m³/h. A volume flow between approx. 12...13 m³/h is recommended as design state. Set this design state by adjusting the speed of the blower during start up.

It is recommended to select the extraction nozzle of the sample gas probe depending on the average gas velocity according to the following Table.

Possible errors due to a non-isokinetic extraction are secondary and will be compensated by calibration of the measuring system (see “Scattered light measuring principle”, page 14).

In addition, the blower speed (see “Blower unit”, page 27) is set during startup so that the flow rate is within the ideal range. This ensures reliable operation even with changing gas velocities.

The following effects can occur when the flow rate is not adapted to the equipment conditions:

- Flow rate too low
  → particles can be deposited in the gas-carrying parts.

- Flow rate too high, gas/ambient temperature very low, gas wetness very high
  → the set sample gas temperature is not reached → aerosols/water droplets do not vaporize completely (heating output of thermo cyclone is limited).

<table>
<thead>
<tr>
<th>Sample gas probe extraction aperture</th>
<th>Gas velocity in the duct in m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal diameter</td>
<td></td>
</tr>
<tr>
<td>DN23 0 ... 8</td>
<td></td>
</tr>
<tr>
<td>DN18 6 ... 15</td>
<td></td>
</tr>
<tr>
<td>DN14 12 ... 25</td>
<td></td>
</tr>
</tbody>
</table>

If $v_{design\ state}$ is not known when ordered (e.g. no information in Technical Questionnaire), the sample gas probe is delivered with the standard value DN 18.

2.2.3 Scattered light measuring principle

The FWE200DH works according to the scattered light measurement principle (forward dispersion). The high sensitivity of this principle makes it particularly suitable for measuring low particle concentrations.

A laser diode beams the dust particles in the sample gas flow with modulated light in the visual range (wavelength approx. 650 nm). The light scattered by the particles is recorded by a highly sensitive measurement receiver, amplified electrically and processed by a microprocessor in the measuring sensor (“DHSP200”) 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.
### 2.2.4 Response time

The damping time is the time until 90% of the peak is reached after a step 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.

![Response time diagram](image)

**Fig. 3: Response time**

### 2.2.5 Automatic function check

A function check can be started at fixed intervals as from a definable starting timepoint for an automatic function control of the measuring system. The setting is made using SOPAS ET (see “Setting the function check”, page 57). Any unallowed deviations from normal behavior that may occur are signaled as errors. A function check triggered manually can help localize possible error causes should a device malfunction occur.
The function check comprises:

- Approx. 30 s measurement of zero value, control value and contamination of optical interfaces
- Every 90 s (standard value), output of values determined (duration parameter can be modified see “Setting the function check”, page 57).

Fig. 4: Function check output on a plotter

- The analog output must be activated to output control values on the analog output (see “Setting the function check”, page 57).
- 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.
- Relay 3 is switched on during a function check (see “Connecting cables for digital, analog and status signals”, page 39). The single phases of the function check can be output separately via further digital outputs (see “Extended calibration function”, page 26).
- A function check is not started automatically when the measuring system is in “Maintenance” mode.
- “Function control” is displayed on the LC-Display of the control unit during the function check.
- If the start timepoint or cycle interval are changed, a function check timed between parameter setting and new start timepoint is still carried out.
- Changes to the interval time are first effective after the next start timepoint.

Zero value measurement

The sender diode is switched off for zero point control so that no signal is received. This means possible drifts or zero point deviations are detected reliably in the overall system (e.g., due to an electronic defect). 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 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.

Contamination measurement
For contamination measurement, the receiver optics is moved through the laser beam while the transmission is measured. Here the whole transfer path from the light source via the receiver optics to the optical sensor is measured and compared to the internally saved value for “clean optics”. Every deviation from the output value determined at the factory is compensated.

The measured value determined and the value defined as factory setting are used to calculate a control factor. This fully compensates any contamination that occurs.

A value between live zero and 20 mA is output on the analog output for contamination values < 40%.

For values > 30% a warning message is output, for values as from 40% “malfunction” is output (for the fault current set on the analog output for this case; see “Factory settings”, page 53, see “Setting the analog output parameters”, page 58).

Fig. 5: Contamination and control value measurement

1 Laser beam
2 Receiver optics in measuring position
3 Receiver optics in reference position
4 Light conducting cable

To receiver electronics
2.3 Device components

2.3.1 Sample gas probe

The sample gas probe serves to extract and return the partial gas flow. It is fixed on a flange with tube (see “Flange with tube”, page 18) to be fitted onsite on the gas duct.

The probes are available as standard in two nominal lengths (NL) and materials PVDF (for gas temperatures < 120 °C) and Hastelloy.

Exchangeable extraction nozzles with nominal diameters DN14, DN18 and DN23 are delivered for flow adjustment (see “Isokinetic behavior”, page 14).

Fig. 6: Sample gas probe

2.3.2 Flange with tube

Fig. 7: Flange with tube

If required, the flange with tube can also be supplied with other dimensions and materials.
2.3.3 Extraction and return hoses

Sample gas probe and control unit are connected with flexible hoses with NW32 for gas extraction and NW 50 for gas return.

Standard length is approx. 1.2 m.

In most cases, an active heating (option) is not required (available as an option). It is recommended to use an extraction hose with insulation for use outside with very low ambient temperatures and longer hoses.

Such an insulation (silicone foam hose) can be retrofitted onsite.

Recommendation:

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>Extraction hose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; -20°C</td>
<td>with active heating</td>
</tr>
<tr>
<td>-20 .. +20°C</td>
<td>with insulation</td>
</tr>
</tbody>
</table>

Longer hoses have a higher maintenance effort (removing deposits/cakings) and a higher cooling-off of suctioned partial gas flow as well as pressure loss and thus are only allowed to be used in exceptions and after checking the operating conditions.

2.3.4 Measuring and control unit

The measuring and control unit comprises the following components fitted on a base plate (7):

- Thermo cyclone (1) for overheating the sample gas with temperature sensor (2) to regulate the sample gas temperature,
- Measuring sensor (3) with sender and receiver electronics, and measuring cell to transport the partial gas flow through the optical measuring volume of the sender beam
- Ejector (4) for transporting the suctioned partial gas flow,
- Control unit (5).
Fig. 8: Measuring and control unit (without weatherproof cover, with backpurge option and cover at the bottom)

The sample gas flow is monitored with a differential pressure sensor between thermo cyclone output and measuring cell input.

The application-dependent plant and device parameters can be set via the operating program SOPAS ET (see “Setting standard parameters”, page 53). Depending on the function, three individual software modules are used (“FWE200DH” for system functions, “DH SP200” for measuring functions and “MCU” for input and output functions). The parameters are stored reliably even in the case of a power failure.

When in operation, the measuring and control unit is covered by a two-piece hood that serves as weather protection at the same time for outdoor installations. Both parts (2) are hung on hinges (1) on the base plate, can be swiveled away sideways and locked together with lock (3).
Weatherproof cover for FWE200DH

When in operation, the measuring and control unit is covered by a two-piece hood that also serves as weather protection for outdoor installations.

The cover can be omitted for use in rooms.

**Fig. 9: Weatherproof cover for FWE200DH**

```
Type code

The respective version of the measuring and control unit is marked by a type code:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Version</th>
<th>Type code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backpurge unit option</td>
<td>Without</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>With</td>
<td>X</td>
</tr>
<tr>
<td>Heated extraction hose option</td>
<td>Without</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>With</td>
<td>X</td>
</tr>
<tr>
<td>Optional Interface module</td>
<td>Modbus TCP</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Ethernet type 1</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Profibus DP</td>
<td>X</td>
</tr>
</tbody>
</table>
```
2.3.4.1   *Thermo cyclone*

The thermo cyclone comprises a housing with insulation, a swirl chamber with inlet and outlet connections and 2 heating bands to overheat the partial gas flow. The inlet connection is fitted tangentially, creating a swirl flow in the swirl chamber. A PTFE nozzle in the inlet connection accelerates the flow. The swirl chamber can be accessed easily for inspection and possible cleaning after opening a cover.

Temperature sensors attached to the heating bands measure the temperatures which are monitored by the microprocessor control in the control unit.

Additional built-in temperature fuses switch the heating bands off at temperatures above approx. 425 °C. This effectively prevents damage to the thermo cyclone through overheating even during a possible electronics failure.

A temperature sensor is fitted on the thermo cyclone outlet and serves as encoder for regulating the sample gas temperature.

2.3.4.2   *Measuring sensor*

The measuring sensor consists of two modules fitted in one stainless steel housing:

- Electronics unit (1) with the optical and electronic subassemblies to send and receive laser beam (2) as well as signal processing and evaluation.
- Measuring cell (3) with receiver optics (4), light trap (5) and nozzle to transport the sample gas flow.

The electronics unit is connected to the control unit via connection cable for signal transmission and power supply (24 V DC).

*Fig. 10: Measuring sensor open*
Sample gas (1) from the thermo cyclone flows down through measuring tube (2) vertically through laser beam (3). The active measuring volume is within the measuring tube so that all particles of the dry sample gas flowing through are captured by the laser beam. The scattered light signal measured by the receiver therefore represents the dust content in the partial gas flow.

Clean air is blown into measuring cell (3) through small opening (4) in the measuring tube and then transported further via measuring openings (6) with the sample gas. The purge air amount is very low in relation to the sample gas flow so that no mixing with the measuring volume occurs and the purge air has no effect on measuring behavior.

Condensate that may occur due to condensation effects can flow out through 2 openings (7) in the nozzle in the sample gas flow (is drawn away by the partial vacuum).
2.3.4.3 Control unit

The control unit has the following functions:

- Starting and stopping the FWE200DH
- Temperature control and monitoring for thermo cyclone heating
- Sample gas flow control
- Monitoring and controlling gas feed (switching blower unit on/off)
- Recording and evaluating status signals
- Controlling data traffic and processing data of the measuring sensor connected via the RS485 interface and system control
- Signal output via analog output (measured value) and relay outputs (device status)
- Signal input via analog and digital inputs
- Power supply for the connected measuring sensor via 24 V switch-mode power supply with wide range input
- Communication with higher level control systems via optional modules

Apart from the control electronics, the control unit also contains the connection elements for thermo cyclone, measuring sensor and blower unit, as well as for analog and status signals.

Measured values and status messages are output on an LC-Display. It also allows configuring basic functions.

The control unit is fitted in a steel sheet enclosure.

**Fig. 12: Control unit**

1. Display module
2. Fuses
3. FI circuit breaker
4. Main switch
5. Processor boards for system control (“FWE200DH”) and data recording/processing and signal input/output (“MCU”)
6. Terminal block for power supply
7. Interface Module
Standard interfaces

- Analog outputs
  3 outputs 0/2/4...22 mA (electrically isolated, active, min. 12-bit resolution) for output of scattered light intensity (corresponds to dust concentration not calibrated), dust concentration calibrated and dust concentration scaled

- Analog inputs
  6 inputs 0...20 mA (without electric isolation, min. 12-bit resolution) for connecting external sensors for measuring gas temperature, pressure and humidity and O2 content for calculating scaled dust concentration values

- Relay outputs
  9 changeover contacts 48 V, 1 A to output status signals operation/malfunction, maintenance, function check, maintenance request, limit value

- Digital inputs
  8 inputs to connect potential-free contacts for starting the function check, setting maintenance mode, purge air monitoring, triggering backpurging (when installed see “Backpurge unit”, page 27) and activating the second calibration function (option, see “Remote unit”, page 28)

- Communication
  - USB 1.1 and RS232 (on terminals) for measured value inquiries, setting parameters and software updates.
  - Interface module Modbus TCP for communication with higher-level control system

LC-Display

Functions

- Display measured values and status information

<table>
<thead>
<tr>
<th>Type</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED</td>
<td></td>
</tr>
<tr>
<td>Power (green)</td>
<td>Power supply OK</td>
</tr>
<tr>
<td>Failure (red)</td>
<td>Function fault</td>
</tr>
<tr>
<td>Maintenance request (yellow)</td>
<td>Maintenance request</td>
</tr>
<tr>
<td>LC-Display</td>
<td></td>
</tr>
<tr>
<td>Graphic display</td>
<td>2 measured values as bars (e.g., dust concentration or scattered light intensity and sample gas temperature or differential pressure), selection as shown on “Using SOPAS ET to modify display settings”, page 84</td>
</tr>
<tr>
<td>Text display</td>
<td>8 diagnosis values (see “LC-Display menu structure”, page 81)</td>
</tr>
</tbody>
</table>

Fig 13

LC-Display with graphic (left) and text display (center and right) (example)
Control buttons for basic configuration

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
</table>
| Meas   | • Toggle between text and graphic display  
        | • Display the contrast setting (after 2.5 s) |
| Arrows | Select next/previous measured value page |
| Diag   | Display alarm or error messages |
| Menu   | Display main menu and selection of submenus |

After the measuring system has been switched on, the start phase of the FWE200DH is shown on the LC-Display during the warming up time (see “Starting the FWE200DH”, page 48).

2.3.4.4 Extended calibration function

The following regression functions to calibrate dust concentration measurement are implemented in the FWE200DH as standard (see “Scattered light measuring principle”, page 14, see “Calibration for dust concentration measurement”, page 63):

- Polynomial: \( c = cc2 \cdot SI^2 + cc1 \cdot SI + cc0 \)
- Exponential: \( c = cc2 \cdot e^{(cc1 \cdot SI)} + cc0 \)
- Logarithmic: \( c = cc2 \cdot \ln(cc1 \cdot SI) + cc0 \)
- Power: \( c = cc2 \cdot SI^{cc1} + cc0 \)

Two of them can be used individually (selection and configuration, see “Calibration for dust concentration measurement”, page 63).

Digital input DI5 can be used to toggle between the two calibration functions selected. Apart from that, single values can be output during the function check (see “Automatic function check”, page 15).

<table>
<thead>
<tr>
<th>Digital input</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI5</td>
<td>Toggle between calibration function 1 and calibration function 2</td>
</tr>
<tr>
<td>DI6</td>
<td>Output the last contamination value determined on the analog output</td>
</tr>
<tr>
<td>DI7</td>
<td>Output the last control value determined on the analog output</td>
</tr>
<tr>
<td>DI8</td>
<td>Output the last zero value determined on the analog output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relay output</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Status signal for output of last contamination value</td>
</tr>
<tr>
<td>7</td>
<td>Status signal for output of last control value</td>
</tr>
<tr>
<td>8</td>
<td>Status signal for output of last zero value</td>
</tr>
<tr>
<td>9</td>
<td>Not used</td>
</tr>
</tbody>
</table>

Optional Interface module

The standard built-in Modbus TCP module can be swapped for an Interface module for Profinbus DP V0 or Ethernet (type 1) (see “Device check accessories”, page 111).

The module is installed on a top hat rail and connected to the “MCU” processor board with a corresponding cable.

```
+ Profibus DP-V0 to transfer via RS485 according to DIN 19245 Part 3 as well as IEC 61158.
```
2.3.5 Blower unit

The blower unit serves to feed the sample gas into the measuring and control unit via the ejector. Air connection to the ejector is made via a flexible NW 25 hose. At the same time, a partial flow is delivered from the ejector to the measuring cell to keep the optical components clean.

The blower control with frequency converter controls the engine speed and thus the blower capacity for an optimal sample gas flow in the specified nominal range.

*Fig. 14: Blower unit*

A weatherproof cover is available for use outdoors (see “Weatherproof cover for blower unit”, page 111).

2.3.6 Options

2.3.6.1 Backpurge unit

Subassembly (see “Measuring and control unit (without weatherproof cover, with backpurge option and cover at the bottom)”, page 20) for backpurge of sampling line (hose and sample gas probe), consisting of:

- Solenoid valve to connect instrument air
- Ball valve in the sampling line to close off the thermo cyclone during the purge process.

Backpurging is started automatically during the function check. In addition, a purge process can be triggered manually by closing digital input DI4 with an external switch.

The measuring system is in “Maintenance” mode during the purge process. The purge process is displayed on the LC-Display.

This option is released with a codeword when retrofitted later (included in scope of delivery).

> On request, the backpurge option can also be delivered for connecting water as purge medium.
2.3.6.2  **Heated extraction hose**

In special applications (e.g., very low gas temperature and high gas humidity, very low ambient temperatures, limitation of heating temperatures), it might be necessary to additionally heat the sampling line, see “Extraction and return hoses”, page 19). The standard extraction hose used can be replaced with a ready-made hose with heating. The measuring and control unit must then be specially adapted (type code see “Measuring and control unit”, page 19).

The silicone foam hose for insulation can also be fitted over the present sampling line afterwards.

An additional temperature sensor monitors the gas temperature at the thermo cyclone inlet with this option (Pos. 3, see “Measuring and control unit (without weatherproof cover, with backpurge option and cover at the bottom)”, page 20).

2.3.6.3  **Remote unit**

Module with LC-Display to display measured values and status, data inquiry and configuration. A cable to be installed onsite then serves to connect to the system technology (RS485) in the control unit.

Following wire cross-sections are required depending on the distance to the measuring and control unit:

<table>
<thead>
<tr>
<th>Max. cable length in m</th>
<th>Wire cross-section in mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>0.14</td>
</tr>
<tr>
<td>250</td>
<td>0.25</td>
</tr>
<tr>
<td>500</td>
<td>0.5</td>
</tr>
<tr>
<td>1000</td>
<td>1.0</td>
</tr>
</tbody>
</table>

The remote unit with integrated power supply unit for separate power supply can be delivered as an option (recommended for larger distances to the measuring and control unit).

*Fig. 15: Remote unit*
2.3.6.4  Cover at the bottom

This subassembly serves as additional protection of the measuring system at low ambient temperatures. It is installed on the base plate of the measuring and control unit and closes the weatherproof cover at the bottom.

*Fig. 16:  Cover at the bottom*

2.3.6.5  Test equipment for linearity test

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

SOPAS ET is a SICK software for easy operation and configuration of the FWE200DH. SOPAS ET runs on a Laptop/PC, which is connected to the FWE200DH via an USB line or Ethernet interface (option).

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

SOPAS ET is delivered on the product CD. Alternatively, you can download SOPAS ET free of charge from the SICK homepage (menu: “DOWNLOADS”).
## 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.

<table>
<thead>
<tr>
<th>Task</th>
<th>Requirements</th>
<th>Work step</th>
</tr>
</thead>
</table>
| Determine the measuring and installation 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 $d_h$) | - Follow specifications for new equipment  
- Select best possible location for existing equipment  
- For too short inlet/outlet paths: inlet path > outlet path |
| | For round and square ducts: $d_h = $ duct diameter | |
| | For rectangular ducts: $d_h = 4x$ cross-section divided by circumference | |
| | - 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 |
| Sample gas probe installation position | Installation angle to horizontal 15°; vertical fitting is also possible for horizontal or slanted ducts | 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 | Avoid/reduce vibrations through adequate measures |
| Ambient conditions | Limit values according to Technical Data (see "Technical Data", page 104) | If necessary, enclose device components |
| Intake air for blower unit | 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 | Internal duct diameter, insulation, wall thickness  
Gas temperature  
Supply voltage, internal duct pressure | Nominal length and material of sample gas probe  
Select suitable components as described in see "Technical Data", page 104 |
| Plan calibration openings | Access  
Distances to measuring level | Easy and safe  
No mutual interference of calibration probe and FWE200DH |
| | | Provide platforms or pedestals as required  
Plan sufficient distance between measuring and calibration level (approx. 500 mm) |
| Plan the voltage supply | Operating voltage, power requirements | According to Technical Data (see "Technical Data", page 104)  
Plan adequate cable cross-sections and fuses |

**NOTE:**
- Consider the weights of these components when planning brackets and strength of fitting locations for measuring and control unit and blower unit.
3.2 Assembly

Carry out all assembly work onsite. This includes:

▸ Fitting the flange with tube
▸ Installing the measuring and control unit
▸ Installing the blower 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.

---

**Auxiliary material**

● Silicone grease (for O-rings for e.g. inlet nozzle, mixing tube ejector and Teflon parts in the measuring cell and intermediate nozzle above)

---

### 3.2.1 Fitting the flange with tube

The flange must be fitted so that any condensate occurring can flow back into the duct (see “Fitting the flange with tube”, page 32). Ensure the sample gas probe is aligned as shown in see “Sample gas probe alignment”, page 33. Vertical fitting is also possible for horizontal or slanted ducts.

*Fig. 17: Fitting the flange with tube*

If none of the flanges with tube in the scope of delivery (see “Flange with tube”, page 107) should or could be used (e.g., on GRP ducts), these must be provided onsite under consideration of the probe dimensions (see “Sample gas probe”, page 107 and see “Flange with tube”, page 107).
Work to be performed

▸ Measure the fitting location and mark the installation location.
▸ Remove insulation (when fitted)
▸ Cut a suitable opening in the duct wall depending on the installation position; bore large enough holes in brick or concrete stacks (pipe diameter flange tube, see “Flange with tube”, page 18).

Fig. 18: Sample gas probe alignment

Horizontal duct

Vertical duct

Flow direction

Flow direction

NOTE:
▸ Do not let separated pieces fall into the duct.

▸ Insert the flange with tube in the opening and weld it (steel ducts).

+ For brick or concrete ducts, weld the flange with pipe onto the anchor plate when necessary and fasten it on the duct.
+ Use junction plates as well on ducts with thin walls.

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

3.2.2 Installing the measuring and control unit

Consider the following points when selecting the installation location:

▸ Measuring and control unit (1) must be fitted on a level, vertical base at an easily accessible, protected location with dimensions according to Fig. “Assembly dimensions”.
▸ Maintain the distances to sample gas probe (2).
▸ The fitting location must be vibration free.
▸ Ambient temperatures must be within the permissible range (see “Technical Data”, page 104), take possible radiant heat into consideration.
▸ Suitable hoisting gear and sufficient clearance are required for transporting and fitting the measuring and control unit (weight see “Technical Data”, page 104).
ASSEMBLY AND INSTALLATION

Fig. 19: Assembly dimensions

Work to be performed
▶ Prepare and fit fastening points according to see “Assembly dimensions”, page 34.
▶ Fit the measuring and control unit.

The measuring and control unit can also be fitted on an optionally deliverable frame (see “Frame”, page 110)

(Dimensions in mm)
3.2.3 Installing the blower unit

Consider the following points when selecting the installation location:

- A level, vertical base at an easily accessible, protected location with clean air when possible is required.
- The distance to the measuring and control unit must not exceed 10 m.
- The intake temperature must be within the permitted range (see “Technical Data”, page 104). In unfavorable conditions, lay an air intake hose or pipe to a location with better conditions.
- Provide sufficient clearance to exchange the filter element and to attach and remove the weatherproof cover when installing outdoors (see “Blower unit layout and assembly dimensions (dimensions in mm)”, page 35).
- Suitable hoisting gear and sufficient clearance are required for transporting and fitting the blower unit (weight see “Technical Data”, page 104).

Fig. 20: Blower unit layout and assembly dimensions (dimensions in mm)

Assembly work
- Prepare holder (see “Blower unit layout and assembly dimensions (dimensions in mm)”, page 35).
- Fasten the blower unit with 4 M8 screws.
- Check the filter element is in the filter housing; fit when necessary.

The blower unit can also be fitted on an optionally deliverable frame (see “Frame”, page 110)
Weatherproof cover for blower unit

The weatherproof cover (see “Weatherproof cover for blower unit”, page 111) 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.

3.2.4 Installing the remote unit option

Install the remote unit in an easily accessible, protected location (see “Remote unit assembly dimensions”, page 36). 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.
● Leave enough clearance for cables and opening the door.

Assembly dimensions

Fig. 21: Remote unit assembly dimensions

The MCU remote unit can be fitted up to 1000 m away from the measuring and control unit. We therefore recommend fitting the remote unit in a control room (measuring station or similar) to ensure free access. This considerably simplifies communication with the measuring system in order to set parameters or to locate malfunction or error causes.

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

**NOTE:**
- During installation, it must be possible to switch the power supply to the FWE200DH off using a power isolating switch/circuit breaker in accordance with EN61010-1.
- After completion of the work or for test purposes, the power supply may only be activated again by the personnel who carried out the work and complying with the valid safety regulations.

3.3.1 General information

**Prerequisites**

The assembly work described in „Assembly“ must have been carried out before starting installation.

For the power supply to the FWE200DH, a one-phase main supply voltage

- 230 V AC 50/60 Hz with fuse min. 10 A or
- 115 V AC 50/60 Hz with fuse min. 15 A

must be available.

**Installation work**

Carry out all installation work onsite unless otherwise explicitly agreed with SICK or authorized representatives. This work involves:

- Laying power supply and signal cables.
- Installing switches and mains fuses.
- Connecting the blower unit to the corresponding terminals in the control unit of the measuring and control unit.
- Connecting the cables for analog and status signals as well as digital inputs to the terminals of the I/O board in the control unit.
- Connecting the measuring and control unit to the main supply voltage.

**NOTE:**
- Only use cables specified for temperatures up to 75 °C (EN 61010-1:2011 5.1.8 Connection Boxes of Field Devices).
- The control unit can reach a temperature > 60 °C due to self-heating at maximum ambient temperature.
- Plan adequate line cross-sections (see “Technical Data”, page 104).
- Before connecting the components, check that the present power voltage/frequency matches the delivered version of measuring unit, control unit and blower unit.
3.3.2 Connecting the control unit

Check whether toggles (1) for heater voltage are set to the supply voltage present at the installation location; if not, switch accordingly.

Fig. 22: Switch for supply voltage in the measuring and control unit

Fig. 23: Control unit connections

1 Connection for Display module
2 Processor board for data recording/processing and signal input/output (MCU)
3 USB plug connector
4 Connections for measuring sensor (DHSP200)
5 Connections for system control processor board
6 System control processor board (FWE200DH)
7 Connections for signal inputs and outputs
8 Connections for blower control cable
9 Connections for backpurge option
10 Connection for external temperature sensors
11 Connection for remote unit
3.3.2.1 Connecting cables for digital, analog and status signals

Connect outputs for digital, analog and status signals using suitable cables (e.g., LiYCY 4x2x0.5 mm²) according to Fig. “Connections for processor boards” and the following Table.

Fig. 24: Connections for processor boards

1. Connection for cable shielding
2. Supply voltage 24 V DC
3. RS232
4. Connection for analog output AO1
5. Connections for analog inputs AI1 and AI2
6. Processor board for data recording/processing and signal input/output (MCU)
7. System control processor board (FWE200DH)
8. Connections for measuring sensor (DHSP200) (connected at the factory)
9. Connections for system control processor board (FWE200DH) (connected at the factory)
10. Connections for analog inputs AI3 to AI6
11. Connections for relays 6 to 9 (with the extended calibration function option installed) → p. 28, §2.3.6.3
12. Connections for digital inputs D15 to D18 (with the extended calibration function option installed) → p. 28, §2.3.6.3
13. Connections for analog outputs AO2 and AO3
14. Connections for relays 1 to 5
15. Connections for digital inputs D11 to D14
Connections on processor board for data recording/processing and signal input/output (MCU)

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Connection</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COM</td>
<td>Output relay 1 (operation/malfunction)</td>
</tr>
<tr>
<td>2</td>
<td>n.c.1)</td>
<td>Output relay 2 (maintenance)</td>
</tr>
<tr>
<td>3</td>
<td>n.o.2)</td>
<td>Output relay 3 (function check)</td>
</tr>
<tr>
<td>4</td>
<td>COM</td>
<td>Output relay 4 (maintenance request)</td>
</tr>
<tr>
<td>5</td>
<td>n.c.1)</td>
<td>Output relay 5 (limit value)</td>
</tr>
<tr>
<td>6</td>
<td>n.o.2)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>COM</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>n.c.1)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>n.o.2)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>COM</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>n.c.1)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>n.o.2)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>COM</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>n.c.1)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>n.o.2)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>d in1</td>
<td>Digital input DI1 (start function check)</td>
</tr>
<tr>
<td>17</td>
<td>d in2</td>
<td>Digital input DI2 (set maintenance mode)</td>
</tr>
<tr>
<td>18</td>
<td>gnd</td>
<td>Ground for DI1 and DI2 (usable as shield connection for signal cable)</td>
</tr>
<tr>
<td>19</td>
<td>d in3</td>
<td>Digital input DI3 (purge air monitoring)</td>
</tr>
<tr>
<td>20</td>
<td>d in4</td>
<td>Digital input DI4 (triggering backpurge option when installed)</td>
</tr>
<tr>
<td>21</td>
<td>gnd</td>
<td>Ground for DI3 and DI4 (usable as shield connection for signal cable)</td>
</tr>
<tr>
<td>22</td>
<td>+</td>
<td>Analog output AO1</td>
</tr>
<tr>
<td>23</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>gnd</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>a in1</td>
<td>Analog input AI1</td>
</tr>
<tr>
<td>26</td>
<td>gnd</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>a in2</td>
<td>Analog input AI2</td>
</tr>
<tr>
<td>28</td>
<td>gnd</td>
<td></td>
</tr>
</tbody>
</table>

1): Closed in currentless condition (normal closed)
2): Open in currentless condition (normal open)
### Connections on processor board for system control (FWE200DH)

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Connection</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>d in5</td>
<td>Digital input DI5 (calibration function switchover)</td>
</tr>
<tr>
<td>52</td>
<td>d in6</td>
<td>Digital input DI6 (output contamination value on AO)</td>
</tr>
<tr>
<td>53</td>
<td>gnd</td>
<td>Ground for DI5 and DI6</td>
</tr>
<tr>
<td>54</td>
<td>d in7</td>
<td>Digital input DI6 (output control value on AO)</td>
</tr>
<tr>
<td>55</td>
<td>d in8</td>
<td>Digital input DI8 (output zero value on AO)</td>
</tr>
<tr>
<td>56</td>
<td>gnd</td>
<td>Ground for DI7 and DI8 (usable as shield connection for signal cable)</td>
</tr>
<tr>
<td>57</td>
<td>COM</td>
<td>Output relay 6 for output of last contamination value</td>
</tr>
<tr>
<td>58</td>
<td>n.c.</td>
<td>¹)</td>
</tr>
<tr>
<td>59</td>
<td>n.o.</td>
<td>²)</td>
</tr>
<tr>
<td>60</td>
<td>COM</td>
<td>Output relay 7 for output of last control value</td>
</tr>
<tr>
<td>61</td>
<td>n.c.</td>
<td>¹)</td>
</tr>
<tr>
<td>62</td>
<td>n.o.</td>
<td>²)</td>
</tr>
<tr>
<td>63</td>
<td>COM</td>
<td>Output relay 8 for output of last zero value</td>
</tr>
<tr>
<td>64</td>
<td>n.c.</td>
<td>¹)</td>
</tr>
<tr>
<td>65</td>
<td>n.o.</td>
<td>²)</td>
</tr>
<tr>
<td>66</td>
<td>COM</td>
<td>Not used</td>
</tr>
<tr>
<td>67</td>
<td>n.c.</td>
<td>¹)</td>
</tr>
<tr>
<td>68</td>
<td>n.o.</td>
<td>²)</td>
</tr>
<tr>
<td>71</td>
<td>+</td>
<td>Analog output AO2</td>
</tr>
<tr>
<td>72</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>gnd</td>
<td>Ground (usable as shield connection for signal cable)</td>
</tr>
<tr>
<td>74</td>
<td>+</td>
<td>Analog output AO3</td>
</tr>
<tr>
<td>75</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>gnd</td>
<td>Ground (usable as shield connection for signal cable)</td>
</tr>
<tr>
<td>77</td>
<td>+</td>
<td>Analog input AI3</td>
</tr>
<tr>
<td>78</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>gnd</td>
<td>Ground for AI3 and AI4 (usable as shield connection for signal cable)</td>
</tr>
<tr>
<td>80</td>
<td>+</td>
<td>Analog input AI4</td>
</tr>
<tr>
<td>81</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>+</td>
<td>Analog input AI5</td>
</tr>
<tr>
<td>83</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>gnd</td>
<td>Ground for AI5 and AI6 (usable as shield connection for signal cable)</td>
</tr>
<tr>
<td>85</td>
<td>+</td>
<td>Analog input AI6</td>
</tr>
<tr>
<td>86</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>+</td>
<td>24 V DC for external power supply (max. approx. 500 mA)</td>
</tr>
<tr>
<td>88</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

¹): Closed in currentless condition (normal closed)
²): Open in currentless condition (normal open)
3.3.2.2 Connecting the blower unit and supply voltage

- Check whether toggle (1) for voltage supply is set to the supply voltage present at the installation location; if not, switch accordingly.

Fig 25 Switch for supply voltage in the blower unit
Fig. 26: Connecting the blower unit and supply voltage

▸ Connect the mains cable of blower unit (1) to corresponding terminals (2) in the control unit.
▸ Unscrew nut (3) from the PG screw fitting (belongs to control cable).
▸ Push plug-in connector (4) with control cable (5) through the opening in the control unit (closed in Fig. "Connecting the blower unit and supply voltage" through PG screw fitting (6)), insert the PG screw fitting through the opening and screw together with the nut and plug the plug-in connector on connection (7) on the processor board.
▸ Connect the suitable 3-wire mains cable (3) with sufficient cross-section from the onsite power supply to the corresponding terminals (9) in the control unit.
▸ Close off unused cable openings with dummy plugs.

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

3.3.3 Fitting and connecting the Interface module option

▸ Loosen the fuse for ribbon cable (10) (see "Connecting the blower unit and supply voltage", page 43) on top hat rail (11) and plug the plug-in connector of ribbon cable (12) on the Interface module (see "Measuring system", page 111).
▸ Push the onsite network cable through a free PG screw fitting, connect to the Interface module and plug the Interface module onto the top hat rail.
3.3.4 Installing the backpurge option (only necessary when ordered separately)

Fit the backpurge subassembly onto the measuring and control unit

- Disconnect extraction hose (1) from connection of adapter (2), take the adapter off and loosen connection cable (3) to the control unit from measuring sensor (4).
- Loosen top fastening nut (5) and remove lower nut (6), position backpurge subassembly (7) on the bolts on the base plate and fasten with the nuts.

The SW13 jaw wrench (9) located behind the flap of thermo cyclone (8) can be used to loosen/tighten the nuts.

- Fasten pressure monitor (10) on the base plate and connect onsite compressed air hose (11) to the pressure sensor.
- Connect hose piece (12) from the ball valve to the connection of adapter (2) and attach the adapter on thermo cyclone (13) again.
- Connect extraction hose (1) to connection (14) of the backpurge subassembly.
- Connect connection cable (3) to the control unit on measuring sensor (4) again.

Fig. 27: Fitting the backpurge subassembly onto the measuring and control unit
Connecting backpurge option

▸ Loosen the wires of connection cable (1) on plug-in connector (2), pull the cable through one of the rear PG screw fittings (3) and connect the wires, color correct, to the plug-in connector again.

▸ Plug the plug-in connector onto the system control processor board (4) and cable shoe (5) on with separator bolt (6).

▸ Switch actuation switch (7) to the upper position.

Fig. 28: Connecting option backpurge
3.3.5 Connecting the remote unit option

Version without power supply unit

▸ Connect the connection cable to the measuring and control unit (4-wire, twisted pair, with shield) to the connections in the control unit (see “Control unit connections”, page 38) and the module of the remote unit.

![Connections in the remote unit (version with integrated wide-range power pack)](image)

Version with integrated wide-range power pack:

▸ Connect the 2-wire cable (twisted pair, with shield) to the connections for RS485 A/B and shield in the control and remote unit.

▸ Connect the 3-wire mains cable with sufficient cross-section to the onsite power supply and the corresponding terminals in the remote unit.

**NOTE:**

▸ During installation, it must be possible to switch the power supply off using a power isolating switch/circuit breaker in accordance with EN 61010-1.

▸ After completion of the work or for test purposes, the power supply may only be activated again by the personnel who carried out the work and complying with the valid safety regulations.
4 Start-up and Configuration

4.1 Putting the FWE200DH into operation

Prerequisite for performing the work described in the following is completion of the assembly and installation of measuring unit, control unit and blower unit according to Section 3.

4.1.1 Preparatory work

- Check that measuring sensor (1) is in the measuring position (safety lever (2) must be in the upper position, see “Measuring and control unit”, page 47) and is locked.
- Push the NW 25 flexible hose (3) (belongs to the blower unit) onto the connection on ejector (4) and secure with a hose clip.
- Push the NW 50 hose (5) for gas return (scope of delivery) over the connections on the ejector and sample gas probe and secure with hose clips.
- Connect the NW 32 hose (6) for gas extraction to the connections of the thermo cyclone and sample gas probe.
- Open the door of the control cabinet door of the measuring and control unit and check that all fuses (7) are switched on (if not, switch on).

Fig. 30: Measuring and control unit

- Check whether the toggles for heater voltage (see “Switch for supply voltage in the measuring and control unit”, page 38) and power supply of the blower unit (see “Switch for supply voltage in the blower unit”, page 42) are set to the supply voltage present at the installation location; if not, switch accordingly.
- Switch the main switch on.
4.1.2 Starting the FWE200DH

The start phase of the FWE200DH starts when the main supply voltage is switched on.

The start process runs as follows:

<table>
<thead>
<tr>
<th>Function</th>
<th>Marginal conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch main supply voltage on</td>
<td></td>
</tr>
<tr>
<td>Heating bands 1 and 2 of the thermo cyclone</td>
<td>When average value of heat band temperatures “Heat1” and “Heat2” ≥ T\text{nominal} + warning threshold or “Heat1” or “Heat2” ≥ 200 °C</td>
</tr>
<tr>
<td>Blower unit is switched on automatically</td>
<td></td>
</tr>
<tr>
<td>End of start phase</td>
<td>When sample gas temperature “T_{Gas2}” = T\text{nominal}</td>
</tr>
<tr>
<td></td>
<td>When switching to maintenance mode</td>
</tr>
</tbody>
</table>

The current measured values are displayed on the LC-Display of the control unit (see “LC-Display with graphic (left) and text display (center and right) (example)”, page 25, see “Using SOPAS ET to modify display settings”, page 84.) The start phase is signaled with “Initialization” instead of “Operation”.

Relay 4 (maintenance) is active during the start phase. Any malfunctions possibly present are not reported to relay 1 (operation/malfunction) during this time.

The start phase finishes when the sample gas temperature reaches the set nominal value for the first time (average duration approx. 30 min). If this value is not reached (e.g. through too high gas humidity/too low gas temperature in the duct), the error “Heating up phase” is displayed in the LC display after 1 h (see “Measuring system”, page 100).

After completion of the start phase, warning and malfunction messages are displayed on the LC display (except when tolerance ranges for the sample gas temperature are exceeded [standard values for warning = T\text{nominal} - 10 K and T\text{nominal} +30 K; standard value for malfunction = T\text{nominal} - 30 K]) and output on relay 1.

The blower unit is switched off when:
- The gas temperature sinks below the malfunction threshold value
- The average value of the temperatures from heating bands 1 and 2 sinks below 80 °C
- For certain device malfunctions (see Service Manual for details).
4.1.3 Fitting the sample gas probe

**WARNING:** Danger from exhaust gas

- Only fit the sample gas probe 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.

- Check whether the suitable extraction nozzle according to the Table in “Isokinetic behavior”, page 14 is screwed in on the sampling pipe; if not, correct accordingly.
- Insert the sample gas probe in the flange with tube according to Fig. “Sample gas probe alignment” and fasten. The extraction opening of the probe must show in the flow direction (arrow on the probe flange with marking “Flow Direction”).

*Fig. 31: Sample gas probe alignment*
4.2 Basics

4.2.1 General information

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

Start-up and parameter setting comprise:

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

To achieve exact measurement, the measuring system must first be calibrated using a gravimetric comparison measurement (see “Setting standard parameters”, page 53) before being used for continuous measurement of dust content.

The operating and parameter program SOPAS ET is provided to set the parameters. The menu structure simplifies changing settings. Further functions are also available (e.g., data storage, graphic displays).

4.3 Install SOPAS ET

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

4.3.0.1 Password for SOPAS ET menus

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

<table>
<thead>
<tr>
<th>User level</th>
<th>Access to</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 “Operator”</td>
<td>Displays measured values and system states</td>
</tr>
<tr>
<td>1 “Authorized Operator”</td>
<td>Displays, inquiries and parameters required for start-up or adjustment to customer-specific demands and diagnosis</td>
</tr>
<tr>
<td>2 “Official”</td>
<td></td>
</tr>
<tr>
<td>3 “Service”</td>
<td>Displays, inquiries as well as all parameters required for service tasks (e.g., diagnosis and clearance of possible malfunctions)</td>
</tr>
</tbody>
</table>

4.3.1 Connection to the device via USB line

Recommended procedure:

1. Connect the USB line to the MCU control unit and the laptop/PC.
2. Switch the device on.
3. Start SOPAS ET.
4. “Search settings”
5. “Device family oriented search”
6. Click the desired MCU.
7. Make settings:
   - Ethernet communication (is always selected)
   - USB communication (is always selected)
   - Serial communication: Select
8. Do not enter an IP address.
9. A list of COM ports appears. Enter COM port of the DUSTHUNTER. If you don’t know the COM port: see “Finding the DUSTHUNTER COM port”, page 51
10. Assign a name for this search.
11. “Finish”
4.3.1.1 Finding the DUSTHUNTER COM port

If you do not 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:

   ![Device Manager](image)

   You are logged on as a standard user. You can view device settings in Device Manager, but you must be logged on as an administrator to make changes.

   OK

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.

   ![Device Manager](image)

   Use this COM port for communication.
4.3.2 Connection to the device via Ethernet (option)

Recommended procedure:
1. MCU must be switched off.
2. Connect the MCU to the network.
3. Connect the laptop/PC to the same network.
4. Switch the MCU on.
5. Start SOPAS ET
6. "Search settings"
7. "Device family oriented search"
8. Click the desired MCU
9. Make settings:
   - Ethernet communication (is always selected)
   - USB communication (is always selected)
   - Serial communication: Do not select
10. Enter IP address
    IP address: see “Setting the Ethernet module parameters”, page 78
11. Do not select a COM port
12. Assign a name for this search
13. “Finish”

To connect to the measuring system via Ethernet, the Ethernet interface module must be installed on the MCU (see “Device check accessories”, page 111) and the parameters set.
4.4 Setting standard parameters

4.4.1 Factory settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample gas temperature</td>
<td>Nominal value 160°C</td>
</tr>
<tr>
<td></td>
<td>Value for warning &lt; 150 °C and &gt; 180 °C</td>
</tr>
<tr>
<td></td>
<td>Value for malfunction 130°C</td>
</tr>
<tr>
<td>Differential pressure (flow monitoring)</td>
<td>0.8 hPa</td>
</tr>
<tr>
<td>Function check</td>
<td>Every 8 h; control value output (90 s each) to standard analog output</td>
</tr>
<tr>
<td>Analog output (AO)</td>
<td>Live zero (LZ) 4 mA</td>
</tr>
<tr>
<td></td>
<td>Upper measuring range value (MBE) 20 mA</td>
</tr>
<tr>
<td></td>
<td>Current during maintenance 0.5 mA</td>
</tr>
<tr>
<td></td>
<td>Current by malfunction 21 mA (optional 1 mA)</td>
</tr>
<tr>
<td>Response time</td>
<td>60 s for all measured variables</td>
</tr>
<tr>
<td>Measured variable</td>
<td>Output on AO Value at LZ Value at MBE</td>
</tr>
<tr>
<td>Dust concentration</td>
<td>1 0 mg/m³ 200 mg/m³</td>
</tr>
<tr>
<td>Scattered light intensity</td>
<td>2 0 200</td>
</tr>
<tr>
<td>Regression function 1</td>
<td>Function type polynomial</td>
</tr>
<tr>
<td>Coefficients set (only for dust concentration)</td>
<td>0.00 / 1.00 / 0.00</td>
</tr>
<tr>
<td>Regression function 2</td>
<td>Function type polynomial</td>
</tr>
<tr>
<td>Coefficients set (only for dust concentration)</td>
<td>0.00 / 1.00 / 0.00</td>
</tr>
</tbody>
</table>

The steps required to modify these settings are described in the following Sections. Prerequisite: The device data are located in the “Project Tree” window, the level 1 password has been entered and “Maintenance” mode set.
4.4.2 Setting “Maintenance” mode

▸ In SOPAS ET: Change to the “Maintenance/Maintenance” directory in the respective device file, activate the checkbox “Activate offline maintenance” in the window.

Fig. 32: SOPAS ET menu: MCU/Maintenance/Maintenance

“Maintenance” mode can also be set using the buttons on the LC-Display of the control unit (see “Menu structure”, page 81) or by connecting an external maintenance switch to the terminals for Dig In2 (17, 18) in the control unit (see “Connecting the control unit”, page 38).
4.4.3 Changing function parameters

Select device file “FWE200DH” to change temperature and pressure settings and switch to directory “Configuration / Application Parameter”.

Fig. 33: SOPAS ET menu: FWE200DH/Configuration/Application parameters (example)

4.4.3.1 Change temperature settings

In certain cases, it can be necessary to change the nominal value for sample gas temperature (e.g., for acid dew point temperature > 160 °C) and/or heater temperature(s)). To do this, enter the desired values in the respective windows in the group “Temperature settings” (see “SOPAS ET menu: FWE200DH/Configuration/Application parameters (example)”, page 55).

4.4.3.2 Define limit value for the flow rate

The differential pressure measured between the thermo cyclone and measuring cell can be used for flow monitoring. Entering a limit value triggers a message when underflown. This helps to prevent that the flow rate (e.g. resulting from deposits in the gas path) sinks below the value needed for proper device function by starting maintenance measures in time.

The FWE200DH outputs the following messages:

<table>
<thead>
<tr>
<th>Message</th>
<th>Monitoring value</th>
<th>Signals</th>
</tr>
</thead>
</table>
| Warning       | Differential pressure measured less than 1.5 times the limit value (generated device-internal) | ”Warning Eductor air/flow” displayed on LC-Display  
”Warning” relay triggers |
| Malfunction   | Differential pressure measured less than limit value | ”Malfunction Eductor air/flow” displayed on LC-Display  
Relay ”Malfunction” triggers |
For setting, enter a value in window “Limit pGas” in group “Flow settings” (see “SOPAS ET menu: FWE200DH/Configuration/Application parameters (example)”, page 55) corresponding to approx. 33% of the differential pressure shown on the LC-Display after flow adjustment according to “Basics”, page 50. The gas path must be free from deposits in this case.

Recommendation:
- average differential pressure 1.5 - 2.0 hPa: limit value 0.7 hPa
- average differential pressure 2.0 - 2.5 hPa: limit value 0.8 hPa
- average differential pressure 2.5 - 3.0 hPa: limit value 0.9 hPa

4.4.3.3 Set the suction

The following steps are necessary to adapt the suction to the equipment conditions:

- Check the gas path for deposits, clean when necessary.
- Set the frequency in group “Flow setting” (see “SOPAS ET menu: FWE200DH/Configuration/Application parameters (example)”, page 55) using the slider so that the value displayed in window “Flow” is within the recommended range.

The flow can be set to the lower value of the recommended range for very low gas temperatures and/or high gas wetness and/or low ambient temperatures.
4.4.4 Setting the function check

To change the values set at the factory (see “Factory settings”, page 53), select device file “MCU” and switch to directory “Adjustment / Function Check - Automatic”. The interval time, control value output on the analog output and the start timepoint for automatic function check can be changed here.

Fig. 34: SOPAS ET menu: MCU/Adjustment/Function check automatic (example for settings)

<table>
<thead>
<tr>
<th>Entry field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output duration of function control value</td>
<td>Value in seconds</td>
<td>Output duration of control values.</td>
</tr>
<tr>
<td>Function check interval</td>
<td>Time between two check cycles</td>
<td>see “Automatic function check”, page 15</td>
</tr>
<tr>
<td>Function Check Start Time</td>
<td>Hours, Minutes</td>
<td>Defining a start timepoint in hours and minutes.</td>
</tr>
</tbody>
</table>

The last value measured is output during control value determination (see “Function check output on a plotter”, page 16).
### 4.4.5 Setting the analog output parameters

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

- Default values see “Factory settings”, page 53
- In order to output the dust concentration under standard conditions (“Conc. s.c.” (SL)), set the parameters for the analog outputs according to “Setting the analog input parameters”.

Fig. 35: SOPAS ET menu: MCU/Configuration/IO configuration/Output parameters

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Outputs - General Configuration</td>
<td>Output Error current</td>
<td>Yes Error current is output. No Error current is not output.</td>
</tr>
<tr>
<td>Error Current</td>
<td>Value &lt; Live Zero (LZ) or &gt; 20 mA</td>
<td>mA value to be output in “Malfunction” state (error case) (size depends on connected evaluation system).</td>
</tr>
<tr>
<td>Current in maintenance</td>
<td>User value</td>
<td>A value to be defined is output during “Maintenance”</td>
</tr>
<tr>
<td></td>
<td>Last value measured</td>
<td>The value measured last is output during “Maintenance”</td>
</tr>
<tr>
<td></td>
<td>Measured value output</td>
<td>The current measured value is output during “Maintenance”.</td>
</tr>
<tr>
<td>Maintenance current</td>
<td>Whenever possible, value ≠ LZ</td>
<td>mA value to be output in “Maintenance” state</td>
</tr>
</tbody>
</table>
### Analog Output 1 Parameter

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value on analog output 1</td>
<td>Conc. a.c. (SL)</td>
<td>Dust concentration in operating state (based on scattered light intensity)</td>
</tr>
<tr>
<td></td>
<td>Conc.s.c. dry O2 corr. (SL)</td>
<td>Dust concentration under standard conditions (based on scattered light intensity)</td>
</tr>
<tr>
<td></td>
<td>SL</td>
<td>Scattered light intensity</td>
</tr>
<tr>
<td></td>
<td>T_Gas2</td>
<td>Sample gas temperature</td>
</tr>
<tr>
<td></td>
<td>p_Gas</td>
<td>Differential pressure</td>
</tr>
<tr>
<td></td>
<td>T_Heater 1</td>
<td>Temperature heater 1</td>
</tr>
<tr>
<td></td>
<td>T_Heater 2</td>
<td>Temperature heater 2</td>
</tr>
<tr>
<td></td>
<td>T_Heater 3</td>
<td>Temperature heater 3</td>
</tr>
<tr>
<td></td>
<td>T_Heater 4</td>
<td>Temperature heater 4</td>
</tr>
</tbody>
</table>

### Output check-cycle results on the AO

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live zero</td>
<td>Zero point (0, 2 or 4 mA)</td>
<td>Select 2 or 4 mA to ensure being able to differentiate between measured value and switched off device or interrupted current loop.</td>
</tr>
<tr>
<td>Output check-cycle results on the AO</td>
<td>Inactive</td>
<td>Control values (see “Automatic function check”, page 15) are not output on the analog output.</td>
</tr>
<tr>
<td></td>
<td>Active</td>
<td>Control values are output on the analog output.</td>
</tr>
</tbody>
</table>

### Analog Output 1 Scaling

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range low</td>
<td>Lower measuring range limit</td>
<td>Physical value at live zero</td>
</tr>
<tr>
<td>Range high</td>
<td>Upper measuring range limit</td>
<td>Physical value at 20 mA</td>
</tr>
</tbody>
</table>

### Limiting value

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit value</td>
<td>Conc. a.c. (SL)</td>
<td>Dust concentration in operating state (based on scattered light intensity)</td>
</tr>
<tr>
<td></td>
<td>Conc.s.c. dry O2 corr. (SL)</td>
<td>Dust concentration under standard conditions (based on scattered light intensity)</td>
</tr>
<tr>
<td></td>
<td>SL</td>
<td>Scattered light intensity</td>
</tr>
<tr>
<td></td>
<td>T_Gas2</td>
<td>Sample gas temperature</td>
</tr>
<tr>
<td></td>
<td>p_Gas</td>
<td>Differential pressure</td>
</tr>
<tr>
<td></td>
<td>T_Heater 1</td>
<td>Temperature heater 1</td>
</tr>
<tr>
<td></td>
<td>T_Heater 2</td>
<td>Temperature heater 2</td>
</tr>
<tr>
<td></td>
<td>T_Heater 3</td>
<td>Temperature heater 3</td>
</tr>
<tr>
<td></td>
<td>T_Heater 4</td>
<td>Temperature heater 4</td>
</tr>
</tbody>
</table>

### Limit Switch Parameters

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit value</td>
<td>Value</td>
<td>The limit value relay switches when the entered value is exceeded or underflown.</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Value</td>
<td>Define a tolerance for resetting the limit value relay</td>
</tr>
</tbody>
</table>

*Set the parameters for “Analog Output 2(3) Parameter” and “Analog Output 2(3) Scaling” in the same manner as for “Analog Output 1 Parameter” and “Analog Output 1 Scaling”.*
4.4.6 Setting the analog input parameters

Select the “Configuration / IO Configuration / Input Parameters” directory to set the analog inputs.

Fig. 36: SOPAS ET menu: MCU/Configuration/IO configuration/Input parameter

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

4.4.7 Setting the response time

Select the “Parameters / Value Damping” directory to set the damping time.
**Fig. 37: SOPAS ET menu: MCU/Parameters/Value Damping**

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Remark</th>
</tr>
</thead>
</table>
| Damping time| Sensor 1  | Response time for the selected measured variable (see "Response time", page 15)
|             | Value in s| Setting range 1 ... 600 s                                               |
4.4.8 Defining regression coefficients

To change the values set at the factory (see “Factory settings”, page 53), select device file “DH SP200” and switch to directory “Configuration / Application Parameters”.

Fig. 38: SOPAS ET menu: DH SP200/Configuration/Application parameter

Two different functions, independent of each other, can be selected and configured in the windows “Calibration coefficients for calculation of concentration with scattered light” for calibrating dust concentration measurement (see “Calibration for dust concentration measurement”, page 63).
4.4.9 Calibration for dust concentration measurement

NOTE:
- The steps described here serve to avoid input errors. Carrying out comparison measurements demands special knowledge that cannot be described in detail here.
- The calculation of regression coefficients \( c_2, c_1 \) and \( c_0 \) from coefficients \( K_2, K_1 \) and \( K_0 \) are only valid for the polynomial function. The coefficients of other function types (extended calibration function option) have to be calculated separately.

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

Steps to be carried out

▸ Select device file “MCU”, enter the level 1 password (see “Setting standard parameters”, page 53) and set the measuring system to “Maintenance” mode (see “Setting “Maintenance” mode”, page 54).
▸ Select the “Configuration / IO Configuration / Output Parameter” directory (see “SOPAS ET menu: MCU/Configuration/IO configuration/Output parameters”, page 58) and assign the “Scattered light intensity” measured variable to one of the three analog outputs available.
▸ Estimate the measuring range required for the dust concentration in operational state and enter this in the “Analog output 1 (2/3) Scaling” field assigned to the selected analog output assigned to the scattered light intensity.
▸ Deactivate “Maintenance” mode.
▸ Carry out the gravimetric comparison measurement 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.

\[
c = K_2 \cdot I_{\text{out}}^2 + K_1 \cdot I_{\text{out}} + K_0
\]

\[
I_{\text{out}} = \frac{LZ + SI - 20 \text{mA} - LZ}{MBE}
\]

\[
SI: \quad \text{Measured scattered light intensity}
\]
\[
LZ: \quad \text{Live zero}
\]
\[
MBE: \quad \text{Defined upper range limit (value entered for 20 mA; normally 2.5 x fixed limit value)}
\]
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/m³.

**NOTE:**
In this case, the regression coefficients set in the sender/receiver unit and the measuring range set in the MCU (option) may not be changed anymore. The dust concentration is displayed in mg/m³ on the LC display of the MCU (option) as an uncalibrated value.

- 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.

\[
c = cc2 \cdot (LZ)^2 + cc1 \cdot SI + cc0
\]

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

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

Using (3), the result is:

\[
cc0 = K2 \cdot (LZ)^2 + K1 \cdot LZ + K0
\]

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

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

Now enter the regression coefficients cc2, cc1 and cc0 determined in directory “Parameters/Application parameters” (see “SOPAS ET menu: DH SP200/Configuration/Application parameter”, page 62, see “Calibration for dust concentration measurement”, page 63) (set sender/receiver unit to maintenance mode and enter password level 1; set the sender/receiver unit to “Measurement” mode again).

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

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

The following options are available:

- Saving as a project
  Not only device parameters but also data logs can be saved.
- Saving as a device file
  Saved parameters can be processed without a device connected and transferred to the device again later.
- Saving as a protocol
  Device data and parameters are registered in the Parameter protocol.
  A Diagnosis protocol can be created for analysis of the device function and recognition of possible malfunctions.

Parameter protocol example

**Fig. 39: Parameter protocol DH SP200 (example)**

---

**Dusthunter - Parameter protocol**

**Type of device:** DH SP200  
**Mounting location:** Sensor 1

### Device information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device version</td>
<td>SP200</td>
</tr>
<tr>
<td>Serial number</td>
<td>734786710</td>
</tr>
<tr>
<td>Moddity number</td>
<td>00001</td>
</tr>
<tr>
<td>Firmware version</td>
<td>01.56.03</td>
</tr>
<tr>
<td>Firmware bootloader</td>
<td>01.56.02</td>
</tr>
</tbody>
</table>

### Installation parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus address</td>
<td>1</td>
</tr>
<tr>
<td>Measured laser temperature</td>
<td>Initially</td>
</tr>
<tr>
<td>Calibration coefficient for calculation of concentration</td>
<td>ok</td>
</tr>
<tr>
<td>Calibration function 1</td>
<td>Polynomial</td>
</tr>
<tr>
<td>a0</td>
<td>0.0000</td>
</tr>
<tr>
<td>a1</td>
<td>1.0000</td>
</tr>
<tr>
<td>a2</td>
<td>0.0000</td>
</tr>
<tr>
<td>Calibration function 2</td>
<td>Not used</td>
</tr>
<tr>
<td>a0</td>
<td>0.0000</td>
</tr>
<tr>
<td>a1</td>
<td>1.0000</td>
</tr>
<tr>
<td>a2</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### Device parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response time Sensor</td>
<td>1.0 s</td>
</tr>
<tr>
<td>Response time diagnosis values</td>
<td>19.8 s</td>
</tr>
</tbody>
</table>

### Factory calibration settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>16.2000</td>
</tr>
<tr>
<td>Gain a1</td>
<td>5.7100</td>
</tr>
<tr>
<td>Gain a2</td>
<td>31.4000</td>
</tr>
<tr>
<td>Gain a3</td>
<td>766.0000</td>
</tr>
<tr>
<td>Offset ANG</td>
<td>6.00000</td>
</tr>
<tr>
<td>Offset a1</td>
<td>6.00000</td>
</tr>
<tr>
<td>Offset a2</td>
<td>6.00000</td>
</tr>
<tr>
<td>Offset a3</td>
<td>6.00000</td>
</tr>
<tr>
<td>Scattered light</td>
<td>0.0000</td>
</tr>
<tr>
<td>a2</td>
<td>2.1970</td>
</tr>
<tr>
<td>a1</td>
<td>0.0000</td>
</tr>
<tr>
<td>a0</td>
<td>0.0000</td>
</tr>
<tr>
<td>Current laser</td>
<td>0.0000</td>
</tr>
<tr>
<td>a2</td>
<td>25.3000</td>
</tr>
<tr>
<td>a1</td>
<td>6.0000</td>
</tr>
<tr>
<td>a0</td>
<td>6.0000</td>
</tr>
<tr>
<td>Device temperature</td>
<td>0.0000</td>
</tr>
<tr>
<td>a2</td>
<td>-276.1500</td>
</tr>
<tr>
<td>a1</td>
<td>165.0000</td>
</tr>
<tr>
<td>a0</td>
<td>0.0000</td>
</tr>
<tr>
<td>Current motor</td>
<td>0.0000</td>
</tr>
<tr>
<td>a2</td>
<td>2666.0000</td>
</tr>
<tr>
<td>a1</td>
<td>-16.5000</td>
</tr>
<tr>
<td>a0</td>
<td>0.0000</td>
</tr>
<tr>
<td>Power supply</td>
<td>0.0000</td>
</tr>
<tr>
<td>a2</td>
<td>16.5000</td>
</tr>
<tr>
<td>a1</td>
<td>0.0000</td>
</tr>
<tr>
<td>a0</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
### Dusthunter - Parameter protocol

#### Type of device: FWE200DH

**Mounting location:** Sensor 3

#### Device information

- **Device version:** 01.02.06
- **Serial number:** 00068703
- **Identity number:** 00000
- **Hardware version:** 1.2
- ** Firmware bootloader:** 01.02.02

#### Configuration

- **VFD hardware activation:** activated
- **Zero point valve hardware activation:** deactivated
- **Valve valve code:** invalid
- **Heater 1:** deactivated
- **Heater 2:** deactivated
- **T Gas 1:** deactivated
- **Analog input (0...20mA):** deactivated

#### Installation parameter

- **Set temperature measuring gas:** 150 °C
- **Limit temperature heater 1:** 283 °C
- **Limit temperature heater 2:** 350 °C
- **Limit PGas:** 50 mbar
- **Frequency VFD:** 46.0 Hz
- **Flow:** 0.78 m³/h

#### Device parameter

- **Leistungsfähigkeit:** 10.0 kW
- **Anpassung Messwerte:** 10.0 s
- **Heater 1**: activated
  - **Maximal temperature:** 283 °C
  - **Min value activation:** deactivated
  - **Maximal power:** 730 W
- **Heater 2**: activated
  - **Maximal temperature:** 350 °C
  - **Min value activation:** deactivated
  - **Maximal power:** 730 W
- **Heater 3**: activated
  - **Maximal temperature:** 283 °C
  - **Min value activation:** deactivated
  - **Maximal power:** 730 W
- **Control measure gas**: activated
  - **T Gas 2**: deactivated
  - **Set temperature:** 150 °C
  - **Lower error limit:** -30K
  - **Upper error limit:** +30K
  - **Maximal control limit:** 250 °C

#### Factory calibration settings

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>-31.3333</td>
</tr>
<tr>
<td>c01</td>
<td>76.2318</td>
</tr>
<tr>
<td>c00</td>
<td>76.2318</td>
</tr>
</tbody>
</table>

**Table values:**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>-31.3333</td>
</tr>
<tr>
<td>c01</td>
<td>76.2318</td>
</tr>
<tr>
<td>c00</td>
<td>76.2318</td>
</tr>
</tbody>
</table>

**T Heater1**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>1.9522</td>
</tr>
<tr>
<td>c01</td>
<td>76.2318</td>
</tr>
<tr>
<td>c00</td>
<td>76.2318</td>
</tr>
</tbody>
</table>

**T Gas 1**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>1.9522</td>
</tr>
<tr>
<td>c01</td>
<td>76.2318</td>
</tr>
<tr>
<td>c00</td>
<td>76.2318</td>
</tr>
</tbody>
</table>

**T Heater2**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>1.9522</td>
</tr>
<tr>
<td>c01</td>
<td>76.2318</td>
</tr>
<tr>
<td>c00</td>
<td>76.2318</td>
</tr>
</tbody>
</table>

**T Gas 2**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>1.9522</td>
</tr>
<tr>
<td>c01</td>
<td>76.2318</td>
</tr>
<tr>
<td>c00</td>
<td>76.2318</td>
</tr>
</tbody>
</table>

**T Reservation**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>0.0000</td>
</tr>
<tr>
<td>c01</td>
<td>144.0000</td>
</tr>
<tr>
<td>c00</td>
<td>633.0000</td>
</tr>
</tbody>
</table>

**U I/O-Modi**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>0.0000</td>
</tr>
<tr>
<td>c01</td>
<td>0.0000</td>
</tr>
<tr>
<td>c00</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Blower voltage**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>0.0000</td>
</tr>
<tr>
<td>c01</td>
<td>110.0000</td>
</tr>
<tr>
<td>c00</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Analog input (20mA)**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>0.0000</td>
</tr>
<tr>
<td>c01</td>
<td>5.0000</td>
</tr>
<tr>
<td>c00</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Analog output (VFD)**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>c02</td>
<td>0.0000</td>
</tr>
<tr>
<td>c01</td>
<td>172.6550</td>
</tr>
<tr>
<td>c00</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
4.4.11 Starting measuring operation

Set the measuring system to “Measurement” mode after entering/modifying parameters.
To do so, stop “Maintenance” mode: Click checkmark “Maintenance sensor” off.

Fig. 41: SOPAS ET menu: MCU/Maintenance/Maintenance

Standard start-up is now completed.
4.5 Setting the Interface module parameters

The measuring system is delivered with an Interface module Modbus TCP as standard. When desired, it can be swapped for an Interface module for Profibus DP V0 or Ethernet (type 1) (see “Device check accessories”, page 111).

4.5.1 Modbus TCP module

The register assignment is supplied as separate document with the Modbus module.

4.5.1.1 Check MCU settings

▸ Connect the MCU to the SOPAS ET program, select device file “MCU”, enter the level 1 password (see “Setting standard parameters”, page 53) and set the measuring system to “Maintenance” mode (see “Setting “Maintenance” mode”, page 54).
▸ Switch to directory “Configuration / System Configuration” and check that the module type in field “Interface Module / Interface Module” is set to “RS485”.

For detailed information concerning communication via Modbus, see the “Modbus Organization” (www.modbus.org) documents, for example:
● MODBUS Messaging on TCP/IP Implementation Guide
● MODBUS APPLICATION PROTOCOL SPECIFICATION
● MODBUS over serial line specification and implementation guide

The GSD file and measured value assignment are available for the Profibus DP module on request.
Switch to directory “Configuration / I/O Configuration / Interface Module” directory and check that the interface is set according to Fig. “SOPAS ET menu: MCU/Configuration/IO configuration/Interface module” in the “RS 485 Interface Parameter” field.

Fig. 43: SOPAS ET menu: MCU/Configuration/IO configuration/Interface module
4.5.1.2 Installing the configuration program

A separate configuration program has to be installed to set the customer's requirements.

System requirements

- Operating system: MS-Windows XP or higher
- Program NET Framework 4.0
- Program Windows Installer 3.1

Installing the configuration program

▸ Connect the laptop/PC with the internet and enter “ftp://ftp.lantronix.com/pub/Device-Installer/Lantronix/4.3/”.
▸ Download the current configuration program.

Administrator rights are required to install software.

FTP Listing of /pub/DeviceInstaller/Lantronix/4.3/ at ftp.lantronix.com

Parent Directory

Oct 31 2012 00:00 Directory 4.3.0.7
Mar 28 2013 18:12 Directory 4.3.0.8
It is possible that the version number changes

Parent Directory

Mar 28 2013 17:08 Directory CB
Mar 28 2013 17:09 Directory Download
Mar 28 2013 17:10 Directory Download Man
Mar 28 2013 18:18 README.txt
Mar 25 2013 17:11 Directory SingleInstallFiles

Parent Directory

Mar 28 2013 19:16 setup_dl_windows_4.3.0.8.exe
Mar 28 2013 19:16 setup_dl_wv10a4410_4.3.0.8.exe
Select when the system requirements are not fulfilled (file size 99 MB)
Select when the system requirements are fulfilled (file size 41 MB)
4.5.1.3 Integrating the Modbus module in the network

▸ Start the “DeviceInstaller” program.

Fig. 45: Starting the “DeviceInstaller”

▸ Wait for a few seconds while the program is searching for installed components.
▸ Select the “Tools/Options” menu.

Fig. 46: “Tools/Options” menu

▸ If several networks are available, select the network interface with which the Modbus module is connected.

Fig. 47: Network connection(s) (example)
▸ Select the “Device/Search” menu and search for the Modbus module.

*Fig. 48: Searching for connected components*

▸ Select the found module.

*Fig. 49: Selecting the module*

*NOTICE:*
Select the module only in the right window, not in the tree structure on the left.
Click the “Assign IP” menu and perform the following steps.

**Fig. 50: Network assignment (address information is exemplary)**

1. Select the respective setting depending on the desired address assignment (automatic or manual assignment).

<table>
<thead>
<tr>
<th>Step</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Select the respective setting depending on the desired address assignment (automatic or manual assignment)</td>
</tr>
<tr>
<td>2</td>
<td>Manual assignment: Enter the required network connection data here.</td>
</tr>
</tbody>
</table>
Fig. 51: Defining the address settings

Complete the assignment, then wait while the module is being configured and then click “Finish”.

Fig. 52: Completing the assignment
4.5.1.4 Configuring the Modbus module

▶ After confirming the address assignment with “Finish”, the following window is displayed:

Fig. 53: “Telnet Configuration”

▶ Perform steps (1) to (3) in succession and confirm with <Enter>.

Fig. 54: “Telnet Configuration”

● Define the serial and Modbus settings with the following entries.
The Modbus module TCP is now configured.
4.5.1.5 Checking the functional capability

Enter ‘ping’ followed by the IP address under “Command Prompt” (“Start → Programs → Accessories”) and check the module reply.

*Fig. 56: Correct reply from Modbus module*
4.5.2 Setting the Ethernet module parameters

**NOTICE:**
The risk of undesired access to the measuring system is inherent when communicating via Ethernet.
▶ Operate the measuring system only behind suitable protection (e.g., Firewall).

The configuration of interface module Ethernet type 2 (see “Device check accessories”, page 111) is not possible with program SOPAS ET. A special software with description is supplied with the program

Default setting: 192.168.0.10
If required, a specified IP address is set.
To change the settings:
▶ Select directory “Configuration / I/O Configuration / Interface Module”.
▶ Set the desired network configuration and click button “Restart” in the “Interface module information” field.

**Fig. 57:** SOPAS ET menu: MCU/Configuration/I/O configuration/Interface module

```
<table>
<thead>
<tr>
<th>Expansion module Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module type: No module found</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethernet Interface Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address</td>
</tr>
<tr>
<td>Subnet mask</td>
</tr>
<tr>
<td>Gateway</td>
</tr>
<tr>
<td>TCP port</td>
</tr>
</tbody>
</table>
```
4.6 Activating the backpurge option

This option must be activated with a codeword when retrofitted. The following steps are then required:

▸ Select the “FWE200DH” device file, set the measuring system to "Maintenance" mode and enter the level 1 password.
▸ Enter the delivered code word in the “Parameters/Application parameters” directory in the “Enable code for option ball valve” field.
▸ Change to “Diagnosis / Device info” directory and check in the “Configuration / check states” field whether the “Ball valve hardware activated” display is active (if not, activate according to see “Installing the backpurge option (only necessary when ordered separately)”, page 44).

Fig. 58: SOPAS ET menu: FWE200DH/Configuration/Application parameters (example)

Fig. 59: SOPAS ET menu: FWE200DH/Diagnosis/Device Info
4.7 Operating/setting parameters via the LC-Display

4.7.1 General information on use

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

Button functions

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

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diag</td>
<td>Display diagnostic information (warnings and errors during a start using the Main menu, sensor information during a start using the Diagnostics menu see “LC-Display menu structure”, page 81)</td>
</tr>
<tr>
<td>Back</td>
<td>Switch to higher level menu</td>
</tr>
<tr>
<td>Arrow ↑</td>
<td>Scroll up</td>
</tr>
<tr>
<td>Arrow ↓</td>
<td>Scroll down</td>
</tr>
<tr>
<td>Enter</td>
<td>Execution of the action selected with an arrow button (switch to a submenu, confirm parameter selected during parameter setting)</td>
</tr>
<tr>
<td>Start</td>
<td>Start an action</td>
</tr>
<tr>
<td>Save</td>
<td>Store a changed parameter</td>
</tr>
<tr>
<td>Meas</td>
<td>Toggle between text and graphic display Display the contrast setting (after 2.5 s)</td>
</tr>
</tbody>
</table>

4.7.2 Password and user levels

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

<table>
<thead>
<tr>
<th>User level</th>
<th>Access to</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Operator</td>
<td>Displays measured values and system states. No password required.</td>
</tr>
<tr>
<td>1 Authorized operator</td>
<td>Displays, inquiries and parameters required for start-up or adjustment to customer-specific demands and diagnosis Preset password: 1234</td>
</tr>
</tbody>
</table>
4.7.3 Menu structure

* In operating state “Maintenance”
4.7.4 Setting parameters

4.7.4.1 Sample gas temperature

▷ Set the system control (FWE200DH) to “Maintenance” (see “LC-Display menu structure”, page 81) and activate submenu “Parameter”.
▷ Choose the parameter to be entered and enter the default password “1234”.
▷ Set the calculated coefficients (see “Setting standard parameters”, page 53) using the “^” and/or “→” buttons and write to the device with “Save” (confirm twice).

Fig. 62: Changing the sample gas temperature

4.7.4.2 Analog outputs / inputs

▷ Set the control unit (MCU) to “Maintenance” (see “LC-Display menu structure”, page 81) and activate submenu “I/O Parameter”.
▷ Select the desired parameter and enter the default password “1234” using the “^” (scrolls from 0 to 9) and/or “→” (moves the cursor to the right) buttons.
▷ Select the desired value using the “^” and/or “→” buttons and write it to the device with “Save” (confirm 2x).
Fig. 63: Menu structure for parameter settings analog outputs / inputs

*: Cannot be used for FWE200DH (must be set to “unlimited”)
4.7.5 Using SOPAS ET to modify display settings

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

Fig. 64: SOPAS ET menu: MCU/Configuration/Display settings

---

**Common Display Settings**

<table>
<thead>
<tr>
<th>Device Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCU</td>
</tr>
</tbody>
</table>

**Overview Screen Settings**

<table>
<thead>
<tr>
<th>Bar</th>
<th>Sensor</th>
<th>Value</th>
<th>Use AO scaling</th>
<th>Range low</th>
<th>Range high</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>MCU</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>3</td>
<td>Not Used</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>4</td>
<td>Not Used</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>5</td>
<td>Not Used</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>6</td>
<td>Not Used</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>7</td>
<td>Not Used</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>8</td>
<td>Not Used</td>
<td>1</td>
<td></td>
<td>-100</td>
<td>1000</td>
</tr>
</tbody>
</table>

**Measured Value Description**

- Dusthunter 5
  - Value 1: not used
  - Value 2: Concentration a.c. (g/L)
  - Value 3: not used
  - Value 4: not used
  - Value 5: not used
  - Value 6: not used
  - Value 7: not used
  - Value 8: not used

- Calculated values (PM10)
  - Value 1: Concentration s.c. dry 02 corr. (g/L)
  - Value 2: not used
  - Value 3: not used
  - Value 4: Temperature
  - Value 5: Pressure
  - Value 6: Mass
  - Value 7: Mass
  - Value 8: Mass

**Security settings**

<table>
<thead>
<tr>
<th>authorized operator: 1234</th>
</tr>
</thead>
<tbody>
<tr>
<td>idle time: 30 minutes</td>
</tr>
</tbody>
</table>

---

**Table:**

<table>
<thead>
<tr>
<th>Window</th>
<th>Entry field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common display settings</td>
<td>Display language</td>
<td>Language version shown on the LC-Display</td>
</tr>
<tr>
<td></td>
<td>Display Unit System</td>
<td>Unit of measurement system used in displays</td>
</tr>
<tr>
<td>Overview Screen Settings</td>
<td>Bars 1 to 8</td>
<td>Sensor address for the first measured value bar in the graphic display</td>
</tr>
<tr>
<td></td>
<td>Meas. value</td>
<td>Measured value index for the respective measured value bar</td>
</tr>
<tr>
<td></td>
<td>Use AO scaling</td>
<td>When activated, the measured value bar is scaled to the associated analog output. If not activated, define the limit values separately</td>
</tr>
<tr>
<td></td>
<td>Range low</td>
<td>Values for separate scaling of the measured value bar independent of the analog output</td>
</tr>
<tr>
<td></td>
<td>Range high</td>
<td></td>
</tr>
</tbody>
</table>

The measured value assignment is listed in the bottom field.
5 Maintenance

5.1 General information

5.1.1 Maintenance intervals

The plant operator must specify the maintenance intervals. The period depends on existing operating parameters such as gas temperature and humidity, dust content and state, how the plant is run and ambient conditions. Therefore only general recommendations can be made here (basic maintenance).

During the practical function check for receiving the QAL 1 certification, the TÜV determined a minimum maintenance interval of 3 months (extended maintenance).

The work performed by the operator has to be documented in a Maintenance Manual. The following maintenance work is recommended:

<table>
<thead>
<tr>
<th>Kind of maintenance</th>
<th>Work to be performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic maintenance</td>
<td>Visual inspection</td>
</tr>
<tr>
<td></td>
<td>Check/clean jets in inlet nozzles of the thermo cyclone</td>
</tr>
<tr>
<td></td>
<td>Check/clean the ejector</td>
</tr>
<tr>
<td></td>
<td>Check/clean the suction nozzle</td>
</tr>
<tr>
<td></td>
<td>Check/clean the intermediate nozzle</td>
</tr>
<tr>
<td>Extended maintenance</td>
<td>Check/clean the sample gas probe</td>
</tr>
<tr>
<td></td>
<td>Check/clean the extraction and return hoses</td>
</tr>
<tr>
<td></td>
<td>Check/clean the swirl chamber (in the thermo cyclone)</td>
</tr>
<tr>
<td></td>
<td>Check/clean optical interfaces in the scattered light sensor DHSP200</td>
</tr>
<tr>
<td></td>
<td>Check/clean the filter element of the blower unit</td>
</tr>
</tbody>
</table>

5.1.2 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 SICK Service or an authorized Service partner. SICK offers cost-effective maintenance and repair contracts. SICK carries out all maintenance and repair work within the framework of these agreements. Any repairs will be made by specialists onsite whenever possible.

5.1.3 Auxiliary means required

- Water
- Cleaning cloths (lint-free)
- Optics cloth, cotton swabs
- Jaw wrench, SW 7, 8, 13 and 19
- Allen key, SW 7
- Silicone grease (for O-rings for e.g. inlet nozzle, mixing tube ejector and Teflon parts in the measuring cell and intermediate nozzle above)
- Screwdriver with crosshead (middle size) and slot screwdriver (small).
5.1.4 Setting “Maintenance” mode

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

▸ Connect the measuring system to the laptop/PC using the USB cable and start SOPAS ET.
▸ Connect with the MCU (see “Connection to the device via USB line”, page 50).
▸ Enter the level 1 password (see “Password and user levels”, page 80)
▸ Set the measuring system to “Maintenance” mode: select “Sensor maintenance”

Fig. 65: SOPAS ET menu: MCU/Maintenance/Maintenance mode

● “Maintenance” mode can also be set using the buttons on the LC-Display of the control unit (see “Menu structure”, page 81) or by connecting an external maintenance switch to the terminals for Dig In2 (17, 18) in the control unit (see “Connecting the control unit”, page 38).
● An automatic functional check is carried out during “Maintenance”.
● The value set for “Maintenance” is output on the analog output (see “Setting the analog output parameters”, page 58). This is also applicable when a malfunction is present (signaled on relay output).
● When “Maintenance” mode is only set using SOPAS ET, this state is reset after a voltage failure. The measuring system switches automatically to “Measurement” after the operating voltage is switched on again.

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

NOTE:
- During performance of maintenance work, it must be possible to switch the power supply to the FWE200DH off using a power isolating switch/circuit breaker in accordance with EN61010-1.
- After completion of the work or for test purposes, the power supply may only be activated again by the personnel who carried out the work and complying with the valid safety regulations.

WARNING: Hazard through chemical compounds
Acids or bases can be created when deposits are dissolved when cleaning gas-carrying parts (hoses, nozzles etc.) with water.
- Take suitable protective measures and use suitable protection devices.
- Observe the relevant safety regulations as well as the safety notices (see “Responsibility of user”, page 9) during all work.

5.2.1 Preparatory work

▸ Remove the sample gas probe and close off the assembly opening with a blind flange.

WARNING: Hazard through gas and hot parts
Hot and/or aggressive gases can escape when removing and fitting the sample gas probe as well as gas-carrying parts.
- Take suitable protective measures and use suitable protection devices.
- Observe the relevant safety regulations as well as the safety notices (see “Responsibility of user”, page 9) during all work.
- Only remove or fit the sample gas probe on equipment with hazard potential (higher internal duct pressure, hot or aggressive gases) when the equipment is at a standstill.

▸ Switch off the fuses for heating bands 1 and 2 in the control unit.
The blower unit is switched off when the average value of both heating temperatures is below the warning limit of the nominal temperature (default: 160°C - 10K = 150°C), at the latest for temperatures < 80°C.
▸ Switch the main switch in the control unit off and wait until hot parts have cooled down sufficiently.

Fig. 66: Main switch and fuses in the control unit
MAINTENANCE

5.2.2 Visual inspection

▸ Check all hose connections for firm seat and leak tightness.
▸ Check the flow using the differential pressure (must be selected as measured value for display on the LC-Display see “SOPAS ET menu: MCU/Configuration/Display settings”, page 84).
The value must be in the range 1 to 4 mbar when the blower is running.
If this is not the case:
▸ Check all gas-carrying parts for deposits and clean when necessary (see following Section).
▸ Check the running noise of the blower (must be within the usual frequency spectrum); increases in the noise level can indicate a blower failure.
▸ Put the measuring system out of operation (see “Putting the measuring system out of operation”, page 96) and then check the blower unit.
5.2.3 Cleaning the inlet nozzles on the thermo cyclone

▸ Loosen hose clip (1) and pull extraction hose (2) off the connection of adapter (3).
▸ Carefully loosen quick-release clamps (4) of the adapter and take the adapter off.
▸ Pull jet (5) out of the adapter and remove O-ring (6)
▸ Pull inlet nozzle (8) out of the thermo cyclone and remove O-rings (7).

+i The inlet nozzle may sit very tight.

▸ Clean the nozzles and O-rings with water.
  Carefully remove solid deposits (when present) with suitable tools without damaging the nozzles.
  Fit new nozzles and/or O-rings when these are worn or damaged.
▸ Refit the O-rings and grease the two on the inlet nozzle with high-vacuum grease, insert the nozzles, fit and fasten the adapter.

+i Position the adapter centered on the inlet nozzle and tighten both quick-release clamps at the same time.

▸ Push the extraction hose onto the adapter connection and fasten with a hose clip.
▸ Fit the sample gas probe.
▸ If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig. 67: Inlet nozzles
5.2.4 Cleaning the ejector

▸ Loosen hose clips (1) of return hose (2) and the hose to blower unit (3) on ejector (4) and take the hoses off.
▸ Loosen quick-release clamps (5) on measuring cell (6) and take the ejector off.
▸ Press mixing tube (7) out of ejector housing (8).
▸ Clean the mixing tube, O-ring and ejector housing with water.
▸ Check parts for wear or damage and replace with new parts when necessary.
▸ Reassemble the ejector in reverse sequence and fit on the measuring cell.
▸ Connect the hoses and secure with hose clips.
▸ Fit the sample gas probe.
▸ If switched off, switch the fuses for the heating bands on and start the FWE200DH.

*Fig. 68: Ejector*
5.2.5 Cleaning the suction nozzle

▸ Loosen quick-release clamps (1) on measuring cell (2) and take the ejector (3) off.
▸ Push lever (4) that locks the measuring sensor down and swivel the measuring sensor out to the left.
▸ Press suction nozzle (5) downwards (e.g., with a light tap with the ball of the hand), remove and clean it with water.
▸ Grease the O-rings with silicone grease.
▸ Fit and fasten the ejector.
▸ Reassemble and lock the measuring sensor.
▸ Fit the sample gas probe.
▸ If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig. 69: Cleaning the suction nozzle
5.2.6 Cleaning the intermediate nozzle

▸ Pull the hose for differential pressure measurement of the connection (see “Cleaning the suction nozzle”, page 91).
▸ Push the lever that locks the measuring sensor down and swivel the measuring sensor out to the left.
▸ Pull sample gas cooler (1) out of hole (2)
▸ Loosen fastening nut (3), turn intermediate nozzle (4), take it out of holder (5) and clean with water.
▸ Check O-ring (6) and replace when necessary.
▸ Grease the O-rings with silicone grease.
▸ Refit the intermediate nozzle, swivel the measuring sensor back in and lock.
▸ Fit the sample gas probe.
▸ If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig. 70: Cleaning the intermediate nozzle

5.2.7 Clean the sample gas probe, extraction and return hose

▸ Loosen the hose clips on both ends of the extraction and return hoses and pull the hoses off.
▸ Clean the hoses and sample gas probe with water.
  Replace worn or defective hoses with new ones (extraction hose Part No. 5313673, return hose Part No. 5328761).
▸ Connect the hoses and secure with hose clips.
▸ Fit the sample gas probe.
▸ If switched off, switch the fuses for the heating bands on and start the FWE200DH.
5.2.8 Cleaning the swirl chamber

▸ Loosen fastening locks (1) of cover (2) and fold cover down.
▸ Loosen fastening nuts (3) of cover (4) of swirl chamber (5) and take the cover with seal (6) off.
▸ Clean the swirl chamber inside with water.
    Carefully remove any deposits with suitable tools. Replace the swirl chamber with heavy wear or damage with a new one (see Service Manual).
▸ Check the seal and baffle plate (7) and replace when necessary.
▸ Reassemble the thermo cyclone.
▸ Fit the sample gas probe.
▸ If switched off, switch the fuses for the heating bands on and start the FWE200DH.

*Fig. 71: Cleaning the swirl chamber*
5.2.9 Cleaning optical interfaces

Clean the optical surfaces when deposits can be seen or before contamination reaches the maximum allowable contamination (limit value 30% for warning, 40% for malfunction). The current contamination value can be read out on the LC-Display or in SOPAS ET.

▸ Loosen fastening screws (1) for cover (2) of the measuring cell and take the cover off.
▸ Carefully clean glass surfaces (3) and apertures (4) with cotton swabs, and also clean light trap (5) when necessary.

*Fig. 72: Cleaning optical interfaces*

Higher contamination values (above approx. 10%) which cannot be reduced even by cleaning several times indicate wear of the optical surfaces. Values up to approx. 10% do however have any influence on measuring behavior and precision.

▸ Check the seal for the cover and replace when necessary.
▸ Fit the sample gas probe.
▸ If switched off, switch the fuses for the heating bands on and start the FWE200DH.
5.2.10 Checking / replacing the filter element of the blower unit

Depending on the degree of contamination of the sucked ambient air, the filter element has to be checked for contamination in intervals determined by the operator. Replace 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.

**Work to be performed**

*Fig. 73: Replacing the filter element*

- 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.
- 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.
- Insert the new filter element with twisting-pressing movements.
- 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.

**NOTICE:**

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

**NOTICE:**

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

**Spare part:** Filter element Micro-Topelement C11 100, Part No. 5306091
5.3 Putting the measuring system out of operation

The FWE200DH should remain in operation during short equipment standstills. For longer standstills (as from approx. 1 week), we recommend putting the FWE200DH out of operation.

**NOTE:**
Put the FWE200DH out of operation immediately should the blower unit fail.

**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.
- 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.

**Work to be performed**

- Take the sample gas probe out of the gas duct.

**WARNING:** Hazard through gas and hot parts
- Only remove the sample gas probe on equipment with hazard potential (hot or aggressive gases, higher internal duct pressure) when the equipment is at a standstill.

- Close off the assembly opening with a blind flange.
- Loosen the hose connections on the sample gas probe.
- Switch the main switch off.
- After all hot parts have cooled down, remove the measuring and control unit and blower unit, and store all components in a clean, dry location.
- Use suitable auxiliary means to protect the plug-in connectors against dirt and moisture.
### Troubleshooting and Error Handling

#### 6.1 General information

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

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

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

#### 6.1.1 Display of warning and malfunction messages

Warnings or device malfunctions are signaled by:

- Status relays (see “Connecting cables for digital, analog and status signals”, page 39).
- LC-Display of the measuring and control unit
  
  “Maintenance request” or “Malfunction” displayed in the status line (see “General information on use”, page 80). In addition, the respective LED goes on (“MAINTENANCE REQUEST” for warnings, “FAILURE” for errors).

After pressing the button “Diag”, possible causes are shown as short information in the menu “Diagnosis” after selecting the device (“DH SP200”, “FWE200DH”, “MCU”).

**Fig 74** Display on the LC-Display

- In SOPAS ET
  
  The “Diagnosis / Error messages/warnings” directory provides detailed information on the current device state.
## 6.1.2 Malfunctions

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No display on the LCD</td>
<td>● Main switch and/or fuses switched off</td>
<td>◀ Check voltage supply.</td>
</tr>
<tr>
<td></td>
<td>● Main supply voltage missing</td>
<td>◀ Check connection cable.</td>
</tr>
<tr>
<td></td>
<td>● Defective fuse</td>
<td>◀ Exchange fuse.</td>
</tr>
<tr>
<td></td>
<td>● Cable to LC-Display not connected or damaged</td>
<td>◀ Contact SICK Service.</td>
</tr>
<tr>
<td></td>
<td>● Defective subassemblies</td>
<td></td>
</tr>
<tr>
<td>Analog output on Live Zero</td>
<td>● Device set to “Maintenance” mode</td>
<td>◀ Check device status.</td>
</tr>
<tr>
<td></td>
<td>● Device has function fault(s)</td>
<td>◀ Measuring range selected too large.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◀ Contact SICK Service.</td>
</tr>
</tbody>
</table>
6.2 Warning and error messages in SOPAS ET

To display, connect the measuring system to SOPAS ET and start the device file “DH SP200”; FWE200DH” or “MCU”.

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”. 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.

6.2.1 Measuring sensor

Fig. 75: SOPAS ET menu: SP200/Diagnosis/Error messages - Warnings

Malfunctions listed below can probably be cleared onsite.

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
</table>
| Contamination         | Received light intensity is lower than the allowed limit (see “Technical Data”, page 104) | Deposits on the optical interfaces | Clean optical surfaces (see “Cleaning optical interfaces”, page 94).
|                       |                                                       | Unclean purge air                                  | Check purge air filter (see “Checking / replacing the filter element of the blower unit”, page 95). |
|                       |                                                       |                                                    | Contact SICK Service.                      |
| Deviation from setpoint value > ±2% | Sudden change of measuring conditions during control value determination |                                                    | Repeat the function check. Contact SICK Service. |
### 6.2.2 Measuring system

Fig. 76: SOPAS ET menu: FWE200DH/Diagnosis/Error messages - Warnings

Malfunctions listed below can probably be cleared onsite.

#### Warning messages

<table>
<thead>
<tr>
<th>Message</th>
<th>Description/possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default value set</td>
<td>Measuring system set to delivery parameters</td>
<td>- Set the parameters of the measuring system according to the requirements.</td>
</tr>
<tr>
<td>Test operation activated</td>
<td>Automatic heating control and blower control are deactivated.</td>
<td>- Set the system to Measuring Mode.</td>
</tr>
<tr>
<td>CB2 fuse, heater 1</td>
<td>Limit value is exceeded.</td>
<td>- Clean gas paths (see &quot;Maintenance work&quot;, page 87).</td>
</tr>
<tr>
<td>CB3 fuse, heater 2</td>
<td></td>
<td>- Check/correct configuration (see “Define limit value for the flow rate”, page 55).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Contact SICK Service.</td>
</tr>
</tbody>
</table>
## Troubleshooting and Error Handling

### Malfunction messages

<table>
<thead>
<tr>
<th>Message</th>
<th>Description/possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower unit not connected</td>
<td>Blower unit is not connected or not correctly connected (see “Connecting the blower unit and supply voltage”, page 42).</td>
<td>• Check and correct connection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contact SICK Service.</td>
</tr>
<tr>
<td>Heating up phase &gt; 1 hour</td>
<td>Nominal value of sample gas temperature is not reached (sample gas temperature is too high in relation to gas humidity and gas temperature).</td>
<td>• Reduce the nominal value of the sample gas temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check application conditions</td>
</tr>
<tr>
<td>Limit value pressure monitoring</td>
<td>Limit value underflown.</td>
<td>• Clean gas paths (see “Maintenance work”, page 87).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check/correct parameter settings(see “Define limit value for the flow rate”, page 55).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contact SICK Service.</td>
</tr>
</tbody>
</table>
### 6.2.3 Control unit

**Fig. 77: SOPAS ET menu: MCU/Diagnosis/ Error messages - Warnings**

<table>
<thead>
<tr>
<th>Device Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System Status MCU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC configuration</td>
</tr>
<tr>
<td>Sensor configuration</td>
</tr>
<tr>
<td>&quot;limit and status&quot; not possible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEPROM</td>
</tr>
<tr>
<td>Primevec CRC</td>
</tr>
<tr>
<td>Power supply 12V</td>
</tr>
<tr>
<td>Transducer temperature too high - emergency air activated</td>
</tr>
<tr>
<td>Failure from device on DI3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory settings</td>
</tr>
<tr>
<td>Interface module inactive</td>
</tr>
<tr>
<td>Power supply(24V) &lt;22V</td>
</tr>
<tr>
<td>Warning from device on DI3</td>
</tr>
</tbody>
</table>
Malfunctions listed below can probably be cleared onsite.

**Warning messages**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sensor found</td>
<td>Measuring sensor and/or system control has not been recognized</td>
<td>• Communication problems on RS485 line&lt;br&gt;• Supply voltage problems</td>
<td>• Check system settings.&lt;br&gt;• Check connection cable.&lt;br&gt;• Check voltage supply.&lt;br&gt;• Contact SICK Service.</td>
</tr>
<tr>
<td>Testmode enabled</td>
<td>MCU in “Test” mode.</td>
<td></td>
<td>• Deactivate “System Test” mode (&quot;Maintenance” directory)</td>
</tr>
<tr>
<td>Interface module</td>
<td>Interface module not configured</td>
<td></td>
<td>• Configure the interface module (see “Setting the Ethernet module parameters”, page 78).</td>
</tr>
</tbody>
</table>

**Malfunction messages**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O range exceeded/underflown</td>
<td>The analog output/input current range is outside the specified range.</td>
<td>• Measured value above set range&lt;br&gt;• Configuration error&lt;br&gt;• Load does not match specification</td>
<td>• Check input/output range values with multimeter.&lt;br&gt;• Contact SICK Service.</td>
</tr>
</tbody>
</table>

**Configuration error**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO configuration</td>
<td>Number of available and configured analog outputs not identical.</td>
<td>• AO not configured&lt;br&gt;• Connection error&lt;br&gt;• Module failure</td>
<td>• Check configuration (see “Setting the analog output parameters”, page 58).&lt;br&gt;• Contact SICK Service.</td>
</tr>
<tr>
<td>AI configuration</td>
<td>Number of available and configured analog inputs not identical.</td>
<td>• AI not configured&lt;br&gt;• Connection error&lt;br&gt;• Module failure</td>
<td>• Check configuration (see “Setting the analog input parameters”, page 60).&lt;br&gt;• Contact SICK Service.</td>
</tr>
<tr>
<td>DO configuration</td>
<td>Not relevant for FWE200DH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor configuration</td>
<td>Number of available sensors does not match the number of sensors connected.</td>
<td>• Sensor failure&lt;br&gt;• Communication problems on RS485 line</td>
<td>• Check measuring sensor/system control&lt;br&gt;• Check connection cable.&lt;br&gt;• Contact SICK Service.</td>
</tr>
<tr>
<td>Interface Module</td>
<td>No communication via Interface module</td>
<td>• Module not configured&lt;br&gt;• Connection error&lt;br&gt;• Module failure</td>
<td>• Check configuration (see “Setting the Ethernet module parameters”, page 78).&lt;br&gt;• Contact SICK Service.</td>
</tr>
</tbody>
</table>
### Specifications

#### 7.1 Technical Data

<table>
<thead>
<tr>
<th>Measuring Parameters</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measured variable</strong></td>
<td>Scattered light intensity</td>
</tr>
<tr>
<td></td>
<td>Dust concentration output in mg/m³ after gravimetric comparison measurement</td>
</tr>
<tr>
<td><strong>Measuring range (freely adjustable)</strong></td>
<td>Smallest range: 0 ... 5 mg/m³</td>
</tr>
<tr>
<td></td>
<td>Largest range: 200 mg/m³ higher on request, in-between freely configurable</td>
</tr>
<tr>
<td><strong>Measuring precision</strong></td>
<td>±2% of upper measuring range value</td>
</tr>
<tr>
<td><strong>Reaction time</strong></td>
<td>0.1 ... 600 s; Freely selectable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas temperature in the duct</strong></td>
<td>Max. 120 °C for PVDF probes</td>
</tr>
<tr>
<td></td>
<td>Max. 220 °C for Hastelloy probes (higher on request)</td>
</tr>
<tr>
<td><strong>Gas temperature in the measuring cell</strong></td>
<td>Adjustable (max. 160°C)</td>
</tr>
<tr>
<td><strong>Internal duct pressure</strong></td>
<td>± 20 hPa</td>
</tr>
<tr>
<td><strong>Gas wetness</strong></td>
<td>Max. 10 g water per m³ (weight share 1%) as fluid share without water vapor (higher on request)</td>
</tr>
<tr>
<td><strong>Gas velocity</strong></td>
<td>5 ... 30 m/s (others on request)</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>-20 ... +50°C</td>
</tr>
<tr>
<td></td>
<td>-20 ... +45°C</td>
</tr>
<tr>
<td></td>
<td>Otherwise enclosure is required</td>
</tr>
<tr>
<td></td>
<td>Intake temperature for purge air</td>
</tr>
<tr>
<td></td>
<td>Extended ranges on request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function Check</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automatic self-test</strong></td>
<td>Linearity, drift, aging, contamination</td>
</tr>
<tr>
<td></td>
<td>Contamination limit values: From 30% for warning; from 40% for malfunction</td>
</tr>
<tr>
<td><strong>Manual linearity check</strong></td>
<td>Using a reference filter (test equipment for linearity test)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Displays</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LC-Display on control cabinet</strong></td>
<td>Displays measured values and system states</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Signals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog outputs</strong></td>
<td>3 outputs 0/2/4 ... 22 mA, max. load 750 Ω; electrically isolated;</td>
</tr>
<tr>
<td><strong>Relay outputs</strong></td>
<td>5 potential-free outputs (changeover contacts) for status signals; contact load 48 V, 1 A; Others on request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input signals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog inputs</strong></td>
<td>6 inputs 0 ... 20 mA (standard, without electrical isolation); precision ± 0.1 mA</td>
</tr>
<tr>
<td><strong>Digital inputs</strong></td>
<td>8 inputs for connecting potential-free contacts (see “Connecting cables for digital, analog and status signals”, page 39)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication Interfaces</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USB 1.1</strong></td>
<td>For measured value inquiries and software updates per PC/laptop using the operating program</td>
</tr>
<tr>
<td><strong>RS485</strong></td>
<td>For connecting the remote unit option</td>
</tr>
<tr>
<td><strong>Interface module</strong></td>
<td>For communication with higher-level control systems, Modbus TCP as standard</td>
</tr>
<tr>
<td></td>
<td>Alternately Profibus DP, Ethernet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Supply</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage supply</strong></td>
<td>115 / 230 V AC, 50 / 60Hz</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>Typ. 0.8 ... 1 kW, max. 1.7 kW (standard version without optional heated extraction hose)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions (W x H x D), Weight</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measuring and control unit</strong></td>
<td>approx. 820 x 730 x 300 mm; approx. 65 kg</td>
</tr>
<tr>
<td><strong>Sample gas probe</strong></td>
<td>Length 730 mm (NL 600 mm); 1330 mm (NL 1200 mm); max. 15 kg</td>
</tr>
<tr>
<td><strong>Blower unit</strong></td>
<td>550 mm x 550 mm x 258 mm; with weatherproof cover 605 mm x 550 mm x 350 mm; approx. 16 kg</td>
</tr>
</tbody>
</table>
### Miscellaneous

<table>
<thead>
<tr>
<th>Protection class</th>
<th>IP 54 (electronic housing IP 65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser</td>
<td>Laser class 1 in operating state, laser class 2 in open state; power &lt; 1 mW; White light, wavelength between 640 nm and 660 nm</td>
</tr>
<tr>
<td>Blower feed amount</td>
<td>approx. 15 ... 20 m³/h (standard state)</td>
</tr>
</tbody>
</table>
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
- EN 14181, Emissions from stationary sources

Electrical protection

- Insulation: Protection class 1 according to EN 61010-1.
- Insulation coordination: Measuring category II in accordance with EN61010-1.
- 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 source of the system must be installed and fused according to the relevant regulations.

Approvals
The measuring system is performance-tested according to EN 15267.
7.2 Dimensions, Part Nos.

All dimensions in mm.

7.2.1 Sample gas probe

Fig. 78: Sample gas probe

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample gas probe NL 600 PVDF</td>
<td>2074811</td>
</tr>
<tr>
<td>Sample gas probe NL 1200 PVDF</td>
<td>2075029</td>
</tr>
<tr>
<td>Sample gas probe NL 600 Hastelloy</td>
<td>2075038</td>
</tr>
<tr>
<td>Sample gas probe NL 1200 Hastelloy</td>
<td>2075039</td>
</tr>
</tbody>
</table>

7.2.2 Flange with tube

Fig. 79: Flange with tube

<table>
<thead>
<tr>
<th>Designation</th>
<th>Material</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange with tube D139ST200</td>
<td>St37</td>
<td>7047616</td>
</tr>
<tr>
<td>Flange with tube D139SS200</td>
<td>1.4571</td>
<td>7047641</td>
</tr>
</tbody>
</table>
7.2.3 Measuring and control unit

Fig. 80: Measuring and control unit

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring and control unit FWE200DH-NNJ</td>
<td>1066190</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-NNE</td>
<td>1068441</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-NNP</td>
<td>1069950</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-BNJ</td>
<td>1068461</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-BNE</td>
<td>1069591</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-BNP</td>
<td>1069592</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-NHJ</td>
<td>1069593</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-NHE</td>
<td>1069594</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-NHP</td>
<td>1069595</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-BHJ</td>
<td>1069596</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-BHE</td>
<td>1069597</td>
</tr>
<tr>
<td>Measuring and control unit FWE200DH-BHP</td>
<td>1069598</td>
</tr>
</tbody>
</table>

Type code: see “Type code”, page 21

7.2.4 Blower unit

Blower unit

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower unit with blower 2BH1100, filter, purge air hose length 10 m</td>
<td>1067951</td>
</tr>
</tbody>
</table>
7.3 Options

7.3.1 Remote unit

![Remote unit diagram]

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote unit</td>
<td>2075567</td>
</tr>
<tr>
<td>Remote unit with integrated wide-range power pack</td>
<td>2075568</td>
</tr>
</tbody>
</table>
7.3.2 Frame

**Fig. 82: Frame**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>7047617</td>
</tr>
</tbody>
</table>
7.3.3 Weatherproof cover for blower unit

Fig. 83: Weatherproof cover for blower unit

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weatherproof cover for purge air unit</td>
<td>5306108</td>
</tr>
</tbody>
</table>

7.3.4 Measuring system

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backpurge unit option</td>
<td>2073682</td>
</tr>
<tr>
<td>Cover at the bottom</td>
<td>2074595</td>
</tr>
<tr>
<td>Option, heated extraction hose, length 4 m (3 m heated)</td>
<td>2075575</td>
</tr>
</tbody>
</table>

7.3.5 Interface module

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface module, Profibus module DP V0</td>
<td>2040961</td>
</tr>
<tr>
<td>Interface module, Ethernet type 1</td>
<td>2040965</td>
</tr>
</tbody>
</table>

7.3.6 Device check accessories

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test equipment for linearity test FWE200DH</td>
<td>2072204</td>
</tr>
</tbody>
</table>
## 7.4 Consumable parts for 2-years operation

### 7.4.1 Measuring sensor

<table>
<thead>
<tr>
<th>Designation</th>
<th>Number</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optics cloth</td>
<td>4</td>
<td>4003353</td>
</tr>
</tbody>
</table>

### 7.4.2 Blower unit

<table>
<thead>
<tr>
<th>Designation</th>
<th>Number</th>
<th>Part No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter element, Europiclon 3000 l/min</td>
<td>4</td>
<td>5306090</td>
</tr>
</tbody>
</table>
8 Annex

8.1 Standard settings FWE200DH

The protocols for parameter settings when delivered (factory settings, see “Factory settings”, page 53) are part of the system documentation delivered with the measuring system and are therefore not described separately in these Operating Instructions.
Index

A
Additional documentation (information) ........................................... 9

C
COM port ................................................................................... 51
Connecting Ethernet ................................................................. 52
Connecting to SOPAS ET .................................................... 50
Creating an USB connection ..................................................... 50

I
Important Information ................................................................. 7
Installation location ................................................................. 8
Intended use ........................................................................ 8

M
Measured values ........................................................................ 8
Measuring function (general) ..................................................... 8

P
Parameter protocol .................................................................. 65
Password for LC display ....................................................... 80
Password for SOPAS ET .......................................................... 50
Potentially explosive atmospheres .............................................. 8
Product Description ............................................................... 11, 31, 47, 85, 104

R
Responsibility of user ................................................................. 9
Restrictions of use .................................................................. 8

S
SOPAS ET .................................................................................. 30
Symbols in this document ..................................................... 8

T
Type code ................................................................................ 21

U
User
- Responsibility of user ............................................................. 9
SICK AG | Waldkirch | Germany | www.sick.com

Australia
Phone +61 3 9457 0600
1800 334 802 – tollfree
E-Mail sales@sick.com.au

Austria
Phone +43 (0)22 36 62 28 8-0
E-Mail office@sick.at

Belgium/Luxembourg
Phone +32 (0)2 466 55 66
E-Mail info@sick.be

Brazil
Phone +55 11 3219-4900
E-Mail marketing@sick.com.br

Canada
Phone +1 905 771 14 44
E-Mail information@sick.com

Czech Republic
Phone +420 2 57 91 18 50
E-Mail sick@czech.cz

Chile
Phone +56 2 2274 7430
E-Mail info@schadler.com

China
Phone +86 4000 121 000
E-Mail info.china@sick.net.cn

Denmark
Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland
Phone +358-9-2515 800
E-Mail sick@sick.fi

France
Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany
Phone +49 211 5301-301
E-Mail info@sick.de

Great Britain
Phone +44 (0)1727 831121
E-Mail info@sick.co.uk

Hong Kong
Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary
Phone +36 1 371 2680
E-Mail office@sick.hu

India
Phone +91–22–4033 8333
E-Mail info@sick-india.com

Israel
Phone +972-4-6881000
E-Mail info@sick-sensors.com

Italy
Phone +39 02 27 43 41
E-Mail info@sick.it

Japan
Phone +81 (0)3 5309 2112
E-Mail support@sick.jp

Malaysia
Phone +603 808070425
E-Mail enquiry.my@sick.com

Netherlands
Phone +31 (0)30 229 25 44
E-Mail info@sick.nl

New Zealand
Phone +64 9 415 0459
0800 222 278 – tollfree
E-Mail sales@sick.co.nz

Norway
Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland
Phone +48 22 837 40 50
E-Mail info@sick.pl

Romania
Phone +40 356 171 120
E-Mail office@sick.ro

Russia
Phone +7-495-775-05-30
E-Mail info@sick.ru

Singapore
Phone +65 6744 3732
E-Mail sales.sgp@sick.com

Slovakia
Phone +421 482 901201
E-Mail mail@sick-sk.sk

Slovenia
Phone +386 (0)1 47 69 990
E-Mail office@sick.si

South Africa
Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea
Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain
Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden
Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland
Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan
Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Thailand
Phone +66 2645 0009
E-Mail sick@sick.com

United Arab Emirates
Phone +971 (0) 4 88 65 878
E-Mail info@sick.ae

USA/Mexico
Phone +1(952) 941-6780
1-800-325-7425 – tollfree
E-Mail info@sick.com

Vietnam
Phone +84 8 62920204
E-Mail Ngo.Duy.Linh@sicksgp.com.sg

More representatives and agencies at www.sick.com