EN

Competence in Solids

SWR engineering

SlideControl

Flow monitoring on air slides

Operating Instructions

SWR engineering Messtechnik GmbH

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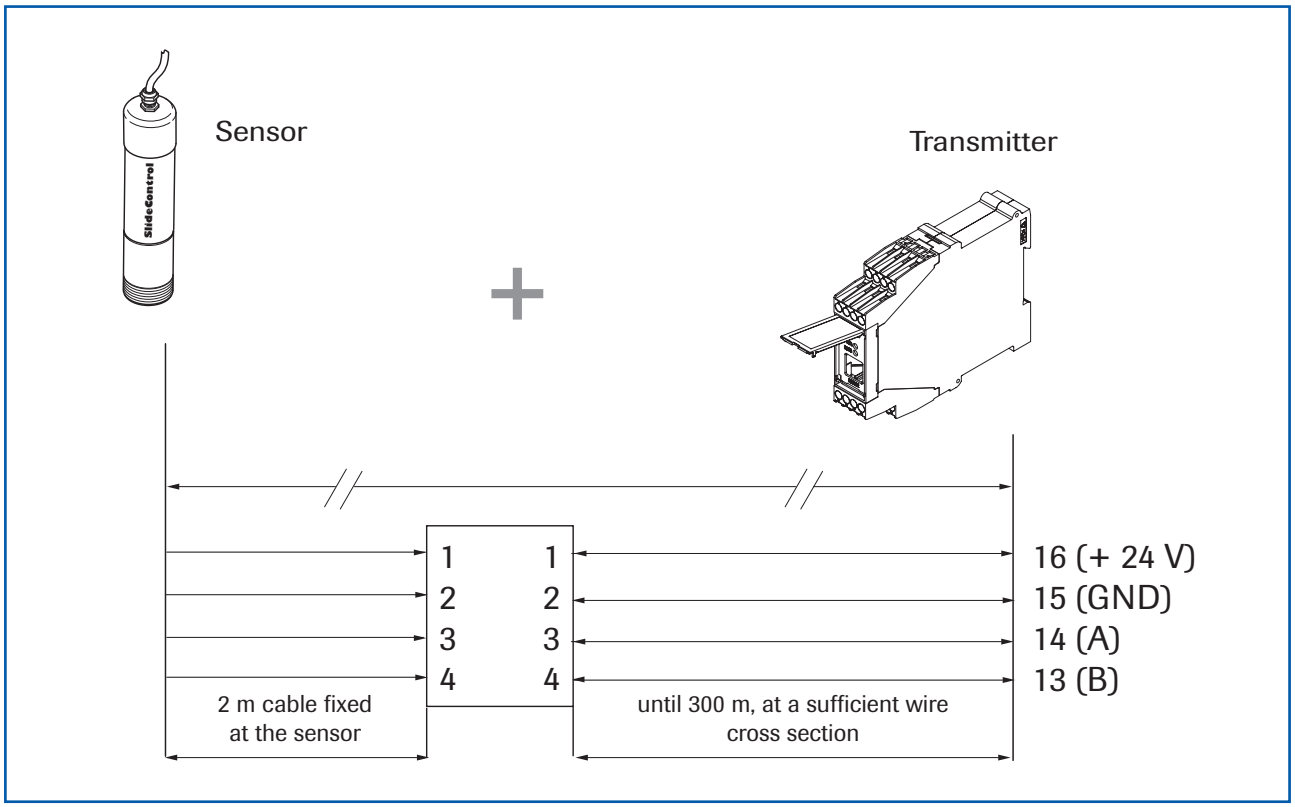
1. System Overview

A complete measuring point consists of the the following components:

- Sensor
- Transmitter in the housing
- Mounting kit
- Operating instructions



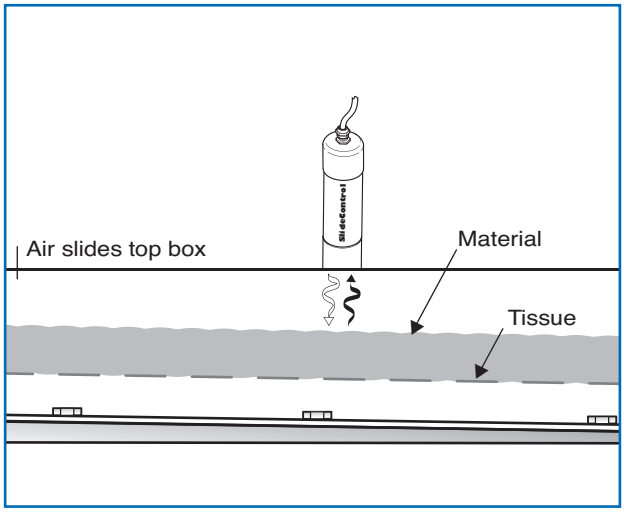
The sensor is connected by a shielded, 4-wired cable to the transmitter; the maximal distance between these devices can be at most 300 m.

2. Use

Powdery products are transported in air slides in many industries. Until now it was not possible to continuously get information about the flow.

With SlideControl there is now a sensor available, which monitors the material flow in the slide without any contact.

SlideControl is characterized by the opportunity of an easy and retrofit installation in the air slide.



2.1 Function

By using microwaves SlideControl measures the distance between the flowing material surface and the sensor and thus the filling height of the flowing material on the tissue.

This filling height is provided as 4 … 20 mA signal.
If it comes to a standstill or demolition of the conveying, the output signal immediately drops to 4 mA, even if the material is still in the slide.

With this signal it is possible to generate a trend signal for the flow rate, by using the corresponding correction factors (see chapter 6).

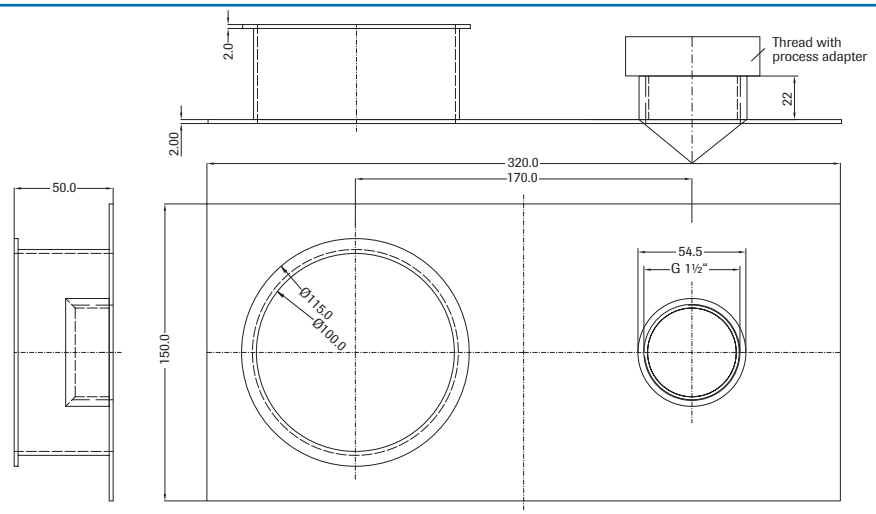
The velocity of the material flow is assumed to be constant.

2.2 System

SlideControl consists of a sensor, the associated transmitter and a mounting kit. The maximum distance between sensor and transmitter may be up to 300 m. The sensor doesn't need any additional auxiliary power supply. It is powered by the transmitter.

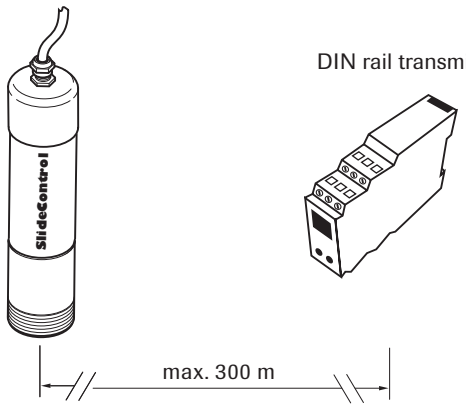
The mechanic installation occurs through the mounting plate, which has a 1 ½" process connection for the sensor and a second closable opening for inspection and calibration purposes.

Mounting kit

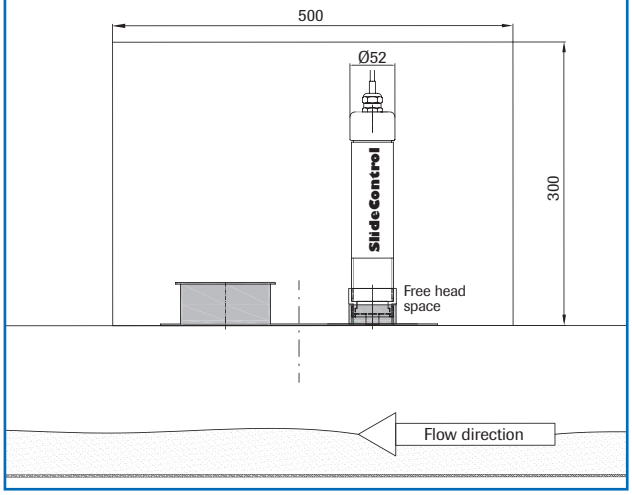


Sensor

DIN rail transmitter



Mounting



3. Safety

The measuring system SlideControl was designed, built and tested to be safe and was shipped in safe conditions. Nevertheless persons or objects may be endangered by components of the system if these are operated in an inexpert manner. Therefore the operational instructions must be read completely and the safety notes must be followed.
In case of inexpert or irregular use, the manufacturer will refuse any liability or guarantee.

3.1 Normal Use

- The measuring system must be installed for measuring the flow rate in metallic ducts only. Other usage and modifications of the measuring system are not permitted.
- Only original spare parts and accessories of SWR engineering must be used.

3.2 Identification of Hazards

- Possible dangers when using the measuring system are marked by the following symbols in the operating instructions:

Warning!

- This symbol in the operating instructions marks actions, which may represent a danger for life and limb of persons when carried out in an inexpert manner.

Attention!

- All actions which may endanger objects are marked with this symbol in the operating instructions.

3.3 Operational Safety

- The measuring system must be installed by trained and authorised personnel only.
- During all maintenance, cleaning and inspection work on the pipelines or SlideControl components, make sure that the system is in an unpressurised state.
- Switch of the power supply for all maintenance, cleaning or inspection works on the tubes or on components of the SlideControl. Follow the notes of the chapter maintenance.
- Before hot-work the sensor must be removed from the piping.
- The components and electrical connections must be checked for damages regularly. If a damage is found, it is to repaired before further operation of the instruments.

3.4 Technical Statement

- The manufacturer reserves the right to adapt technical data to the technical progress without particular advance notice. If you have any questions, SWR engineering will be pleased to inform you on possible changes and extensions of the operating instructions.

4. Mounting and Installation

4.1 Supplied Equipment:

- Sensor
- Transmitter in the housing
- Mounting kit
- Operating instructions

4.2 Required Tools

- Cut-off a hole for mounting kit

4.3 Mounting of the Sensor

The sensor is to be mounted as follows:

- Determine the place of mounting on top of the air slide. SlideControl should placed in the center of the top covers.
- Install sensor preferred on the end of air slide.

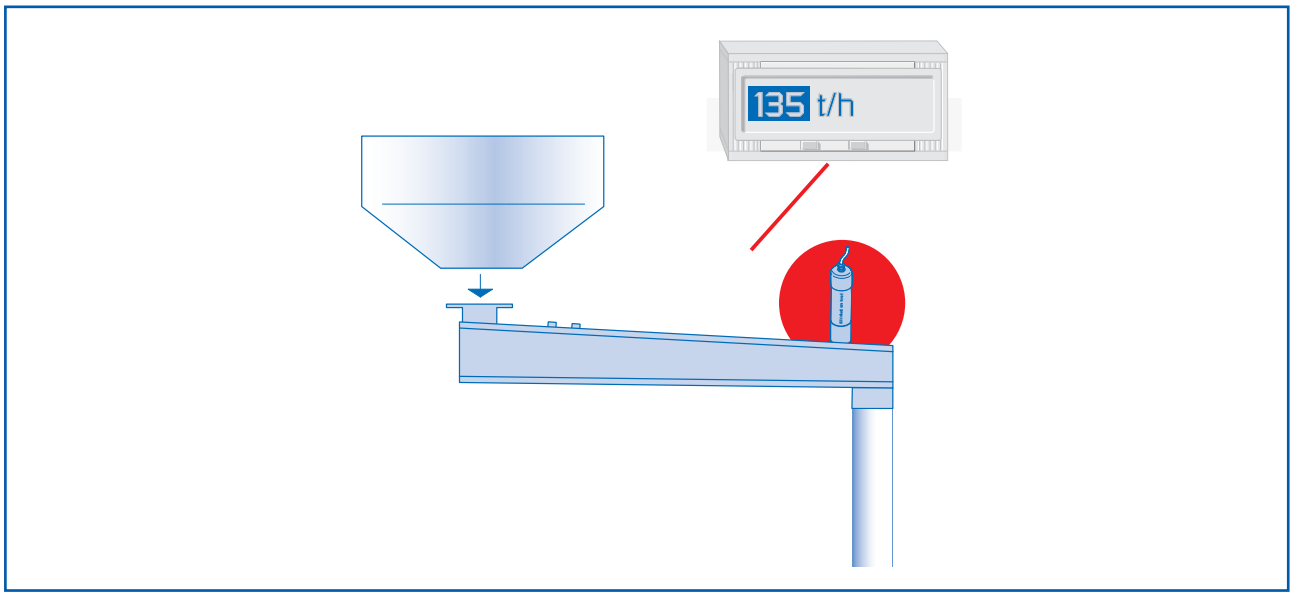


Fig. 7: Sensor position

4.4 Mounting of the Transmitter

- The whole electronic equipment can be installed at a maximum distance of 300 m from the sensor. The housing is prepared mounting in a DIN rail rack according to EN 60715 TH35.

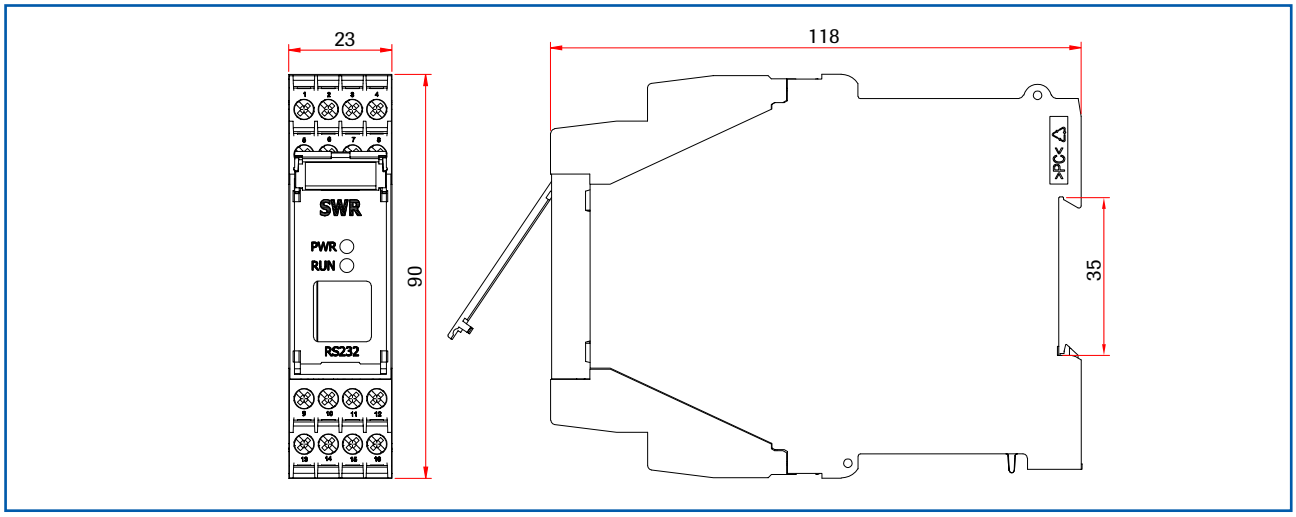


Fig. 8: Field housing transmitter

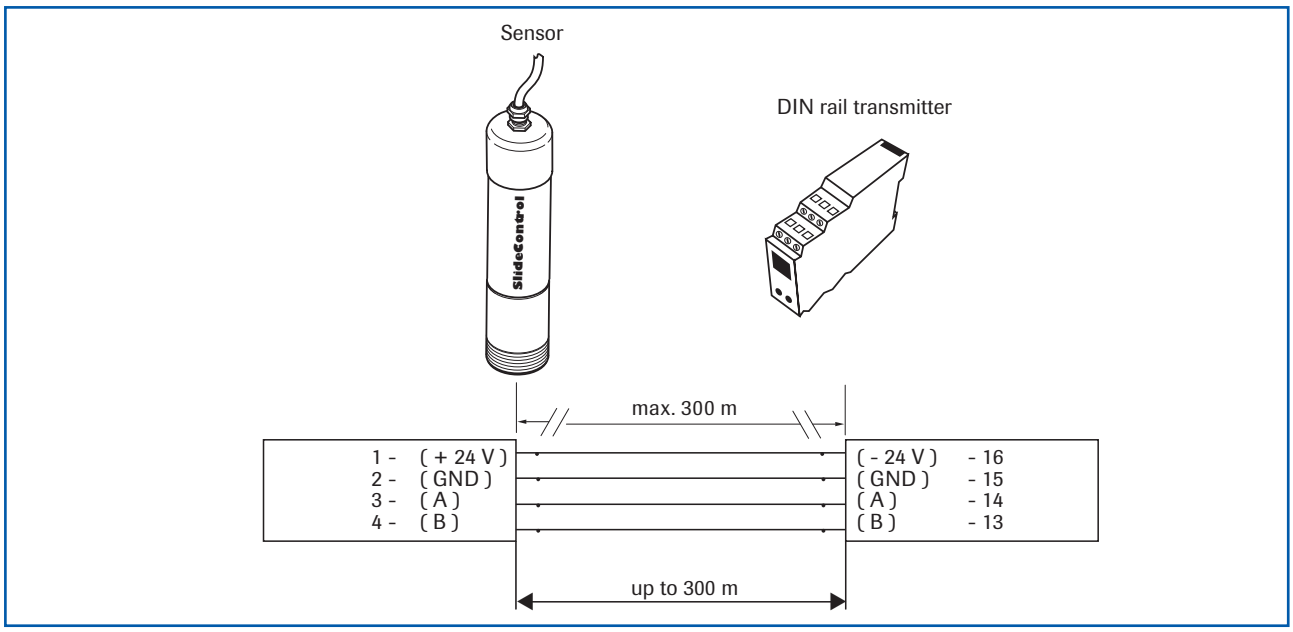


Fig. 9: Connection of sensor and transmitter

The cable between sensor and transmitter has to be 4-wired and shielded.

The required cable cross-section depends on the length:

Length	Cable cross section
up to 80 m	0.75 mm²
up to 110 m	1.00 mm²
up to 170 m	1.50 mm²
up to 300 m	2.50 mm²

5. Electrical Connections

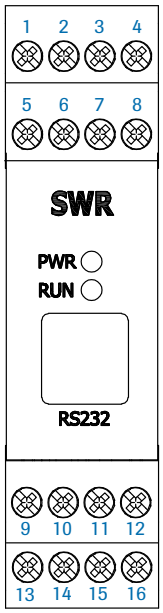


Fig. 10: Transmitter front cover

Connections

Transmitter			
Spot		**Connection**	
Connection of Power Supply			
4		Input Power Supply +24 V / DC	
3		Input Power Supply 0 V / DC	
Connections			
I/U-out	**2**	Current Output + 4 ... 0 mA	
	1	Current Output - 4 ... 20 mA	
Relay	**6**	Potential free Changer NO (Closer)	
	7	Potential free Changer C (Common Conductor)	
	8	Potential free Changer NC (Opener)	
ModBus	**11**	RS 485 Interface Data B	
	12	RS 485 Interface Data A	
Sensor	**16**	Power Supply +24 V	Cable No. **1**
	15	Power Supply 0 V	Cable No. **2**
	14	RS 485 Data A	Cable No. **3**
	13	RS 485 Data B	Cable No. **4**
RS 232C	PC-Adapter Sup-D 9pol with molex connector in front page		

6. Commissioning

- For start-up the measuring system it is necessary to adjust the sensor to the local conditions.
  After switching on the power supply there is at least a warm-up time about 15 minutes required before any adjustment starts.

  Please check again:
- The correct cabling between sensor and the transmitter.
- The correct adjustment of the wall thickness at the sensor.

  In case that despite these steps a successful measurement is impossible, please contact SWR.

Commissioning of SlideControl

For start-up the sensor **has to be calibrated and parameterized to the product,** which will be measured. It is necessary to assign the mass flow to the display and initial value. The menu functions are mostly self-explaining.

Put in the installation CD in the PC or Laptop and follow the installation menu. The program is running with the operation systems Windows 98, NT and XP. The connection is possible by using the RS 232 C-interface (slot in the front plate), or by using the integrated RS 485 interface (bus capable) at the spring clips 11 and 12. By using different addresses for each transmitter, the measuring units can be identified and operated separately and remotely over the ModBus protocol.

Following a short introduction to the overview:

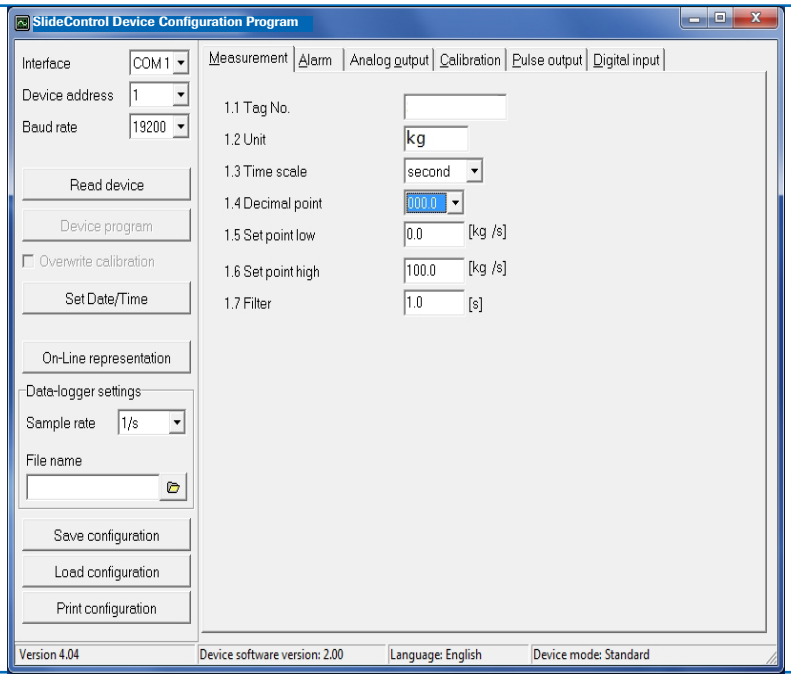
All changed values have to be confirmed by leaving the menu level and by confirming the storage function.

Starting the Menu	After the start of SlideControl configuration program the interfaces COM 1 until COM 8 (at the PC / Laptop display) have to be chosen. The baud rate has to be set at 9600 Bd. Set the transmitter address (Standard = 1).
Basic Function	It is sufficient to carry out a two-point-calibration (normally min and max). Enter the data in menu 4.
Min-Point	Set point 1 to 0, when the mass flow is shut down and calibrate this point.
Max-Point	Set point 2 to known maximum flow rate with normal conveying and calibrate as well. (This value can be adjusted later on.) Thus the basic function of the measuring system is given and it is now ready for operation.
Adjustment	See menu 1, point 1 to 3 for the adjustments to the individual local conditions regarding material, measuring units, etc.
Current- / Voltage-Output	The initial values are defined in the menu points 3.1 and 3.8. The output value (current / voltage) is assigned to the measuring range here. Standard 0 = 4 mA Max = 20 mA The measuring range filter is used for the adjustment to slower working devices or for a continuous output of the analogue output.

Alarms	entered by the user in menu 2.
Analogue Output	is modified in menu 3 and can be adjusted to the individual requirements. (e. g. 0 - 22 mA)
Auxiliary Points	The linearisation can be examined by measuring the varying mass throughput. This should be weighed out in each single case for the improvement of the accuracy. If there are deviations the non-linearity can be corrected by a basic table. According to the chosen and fixed points in menu 4.3 (Minimum 2 for the first start-up of the commissioning), it is now possible to enter a correction value in menu 4.4 for the actual mass flow. (This value can be changed afterwards.)
Storage	After carried out changes these can be stored by the menu point *device programming*. By confirmation *calibration overwrite* will the change carried out.

Following the menu parameters in detail:

7. Menu Structure of SlideControl



1. Measuring Range

1.1	**Tag No**	Adjust material (10 digits)
1.2	**Unit**	Adjust text e. g. kg
1.3	**Time Scale**	Choose: h / min / s (Reference time for the pulse output and totalizer)
1.4	**Decimal Point**	Choose position of dec. point
1.5	**Beginning of Measuring Range**	Range 0 ... 999
1.6	**End of Measuring Range**	Range 0 ... 999
1.7	**Filter Value**	Range 0.1 ... 99.9 s

2. Alarm

2.1	**Alarm 1**	
2.1	**Alarm Type**	Choose: Min / Max / None
2.2	**Value of Alarm**	-10 to 110 % in phys. units
2.3	**Alarm Dead Time**	Range 0.1 ... 99.9 s
2.4	**Alarm Hysteresis**	Range 0.1 ... 99.9 %
2.5	**Operation Mode**	Choose: Working- / Static-current principle
2.6	**Alarm Sensor Malfunction**	On / off

3.	**Analogue Output**		
	3.1	**Beginning of Measuring Range**	Range: 0 ... 22 mA (Standard: 4 mA)
	3.2	**End of Measuring Range**	Range: 0 ... 22 mA (Standard: 20 mA)
	3.3	**MIN Point**	Range: 0 ... 22 mA (Standard: 3 mA)
	3.4	**MAX Point**	Range: 0 ... 22 mA (Standard: 20 mA)
	3.5	**Value of Alarm**	Range: 0 ... 22 mA (Standard: 3 mA)
	3.6	**Filter Time**	Range: 0.1 ... 99.9 s (Standard: 1 s)
	3.7	**Calibration: 4 mA**	Adjust current output (4 mA calibrated)
	3.8	**Calibration: 20 mA**	Adjust current output (20 mA calibrated)
4.	**Calibration**		
	4.1	**Calibration Factor**	Range 0.01 ... 9.99
	4.2	**Calibration Filter**	Range 0.1 ... 999.9 s
	4.3	**Number of Calibration Points**	Range 2 ... 20 auxiliary points
	4.4	**Calibration**	
		4.4.1 Calibration Point 1 Meas. Value	Measuring value to be shown to the
		4.4.1 Calibration Point 1 Raw Value	raw value in moment
		. . . (depending on the no. of calibration points)	
		4.4.(2*N) Calibration Point N Meas. Value	Measuring value to be shown to the
		4.4.(2*N+1) Calibration Point N Raw Value	raw value in moment

SYSTEM PARAMETER	
Interface	COM 1 ... COM 12
Device address	ModBus-Address: Range 1 ... 255
Baud rate	Choose: 4800 / 9600 / 19200 / 38400 Bd
Language	Choose: D / F / E

8. Menu Parameters

1. MEASURING RANGE

1.1 Tag No.

Freely selectable symbols of the measuring-medium or -place, max. 10 digits.

1.2 Unit

Entry of the measuring range max. 6 digits.

1.3 Time scale

Choice of the time unit is important for the totalizer.
Choose between h / min / s
/ s per second
/ min per minute
/ h per hour

1.4 Decimal point

Adjust the digit in the display.

1.5 Beginning of measuring range

Enter the respective value of the measuring range you will start with.
Usually 0.0.

1.6 End of measuring range

Enter the respective value of the measuring range end.

1.7 Filter value

Adjustable damping for the **display** in seconds.
Range: 0.1 ... 99.9 s

2. ALARM

Effect on the relay.

2.1 Alarm type

Min/Max - Upper and lower limit value.

2.2 Alarm value

Threshold value
Range -10 ... 110 % of the measuring range in phys. units.

2.3 Alarm dead time

Threshold value how long the value must be over or under the limit until the alarm relay reacts. Range: 0.1 ... 99.9 s

2.4 Alarm hysteresis

Threshold value of the alarm.
Range: 0.1 ... 99.9 % of the measuring range

2.5 Operation mode

Choice of the contact work or interruption
NO (working current) - NC (static current)

2.6 Alarm sensor

Alarm with sensor mistake
ON / OFF

3. ANALOGUE OUTPUT

3.1 Starting range

Value for the output min.
(Standard 4 mA) - Range 0 ... 22 mA

3.2 End of range

Value for the output max.
(Standard 20 mA) Range 0 ... 22 mA

3.3 MIN limit

Value for the MIN limit.
Range 0 ... 22 mA (Standard 3.0 mA)

3.4 MAX limit

Value for the MAX limit.
Range 0 ... 22 mA (Standard 20 mA)

3.5 Threshold value

Alarm value (sensor error or internal alarm) at the same time relay is released.
Range 0 ... 22 mA (Standard 3 mA)

3.6 Filter time

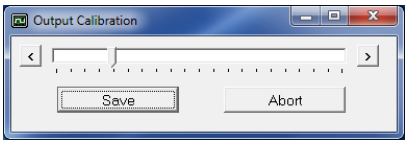
Adjustable damping for the current output.
Range 0.1 ... 99.9 s (Standard 1 s)

3.7 Calibration 4 mA

Value of current min.
Adjust to the external measuring system
(if display shows difference).

With the keys [<] and [>] the source stream on 4 mA adapt.

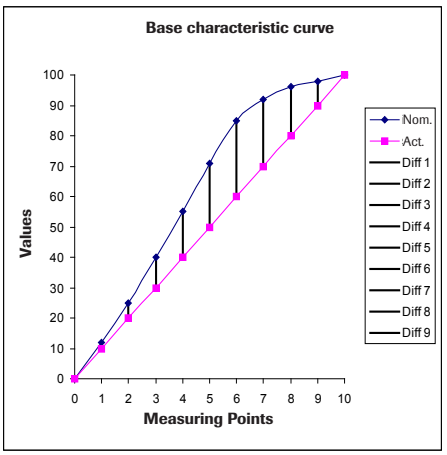
3.8 Calibration 20 mA



Value of current max.
Adjust to the external measuring system (if display shows difference).

With the keys < and > the source stream on 20 mA adapt.

4. CALIBRATION



It is only necessary if there is a disturbing nonlinearity (as you see in the diagram).

The base points of the nominal characteristic curve (red) are set and are calibrated onto the actual characteristic curve (blue).
The adjustment happens in the sensor and the value output is linear.

4.1 Calibration factor

Global calibration factor of the measuring on the display and as well the output range from 0.01 to 9.99 (Standard 1.0).

4.2 Calibration filter

Damping filter for setting unsteady signals during the calibration.
(No effect on output and display.)
0.1 to 999.9 s

4.3 Number of calibration points

Set the number of the auxiliary points.
(2 until 20 auxiliary points)

4.4 Calibration

4.4.1 Calibration point 1 – measuring value

Value measuring in phys. units.

Calibration point 1 – raw value

Indicate the initial value to the value displayed, if pressed ↵.

All other points are calibrated as the first one.

4.4.2 Calibration point 2 – measuring value

Measuring value in phys. units.

Calibration point 2 – raw value

Instantaneous raw value is grasped and assigned to the measuring value if the ↵-key is pressed.

4.4.N Calibration point N – measuring value

Measuring value in phys. units.

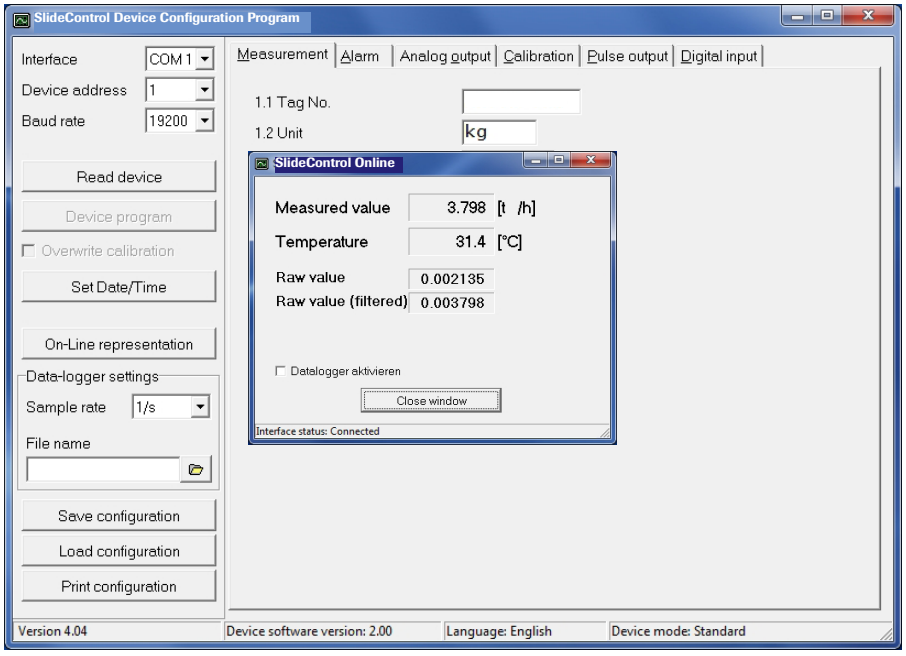
Calibration point N – raw value

Instantaneous raw value is grasped and assigned to the measuring value if the ↵-key is pressed.

5. IMPULSE OUTPUT — Function not available!

6. DIGITAL INPUT — Function not available!

SYSTEMPARAMETER Setting of the interface parameters in the PC:



Interface Choice of the serial interface in the PC (COM 1 ... COM 12)

ModBus address Address of the appealed transmitter in the ModBus (1 ... 255)

Baud rate Information of the Baud rate for serial communication (4800 / 9600 / 19200 / 38400 Bd - Standard 9600 Bd)

Device read

All parameters are read from the transmitter linked with the PC and are shown.

Device program

The changed parameters are written in the transmitter and are stored there.

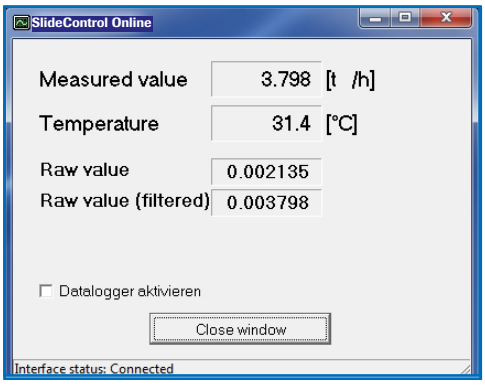
Without putting of the brand Calibration headline,
if all changes are taken over **without** calibrating data in menu point 4.

With putting of the brand Calibration headline,
if the changes of the calibrating data from menu 4 are also sent to the transmitter.

Online representation

Online representation of the measuring values on the PC:

Measuring value:	Announcement of the measuring value in phys. units.
Temperature:	Announcement of the sensor temperature (Does not correspond to the product temperature)
Raw value:	Announcement of the instantaneous raw value of the sensor
Raw value filtered:	Announcement of the subdued raw value from menu point 4.2
Totalizer*:*	Throughput counter as a calibrating aid
Reset:	Put back of the totalizer on 0
Data luggers activate:	After the input of a file name and the choice of the memory rate, the data are stored in the CSV format. Afterwards these data can be worked on with Excel or a similar programme and be analysed.



Data lugger setting

Information of the memory rate 1/s, 20/min, 10/min . . . in that the data are stored.

Filename

Information of a file name in which the CSV file should be stored.

Configuration store	To memories of the whole configuration of the transmitter on the PC.
Configuration load	Store of the configuration stored on the PC of the transmitter.
Configuration print	Print of the configuration of the transmitter in the table format.
Language	By selection of the menu point *Language* in the lowest task strip and concurrent pressure of the right mouse key appears the linguistic choice: D / F / E

9. Maintenance

Warning!

- Danger of shock with opened housing!
- Switch off the power supply for all maintenance or repair works on the measuring system. The tube must not be in operation during a sensor exchange.
- Repair and maintenance work must be carried out by trained or expert personnel only.
- The system is maintenance-free.

10. Warranty

Warranty is granted for one year starting from delivery date under the condition that the operating instructions have been followed, no interventions on the appliances have been made and the components of the system show no mechanical damage or wear resistance.

In case of a defect during the warranty period, defective components are repaired or are replaced free of charge. Replaced parts turn into the property of SWR. If desired by the costumer that the parts should be repaired or replaced in its factory, then the costumer has to take over the costs for the SWR-service staff.

SWR is not responsible for damage, which did not develop at the delivery article; especially SWR is not responsible for escaped profit or other financial damages of the customer.

11. Trouble Shooting

- **Warning!**
  The electrical installation must only be checked by expert personnel.

Problem	Cause	Measure
Measuring system does not work. POW LED off. RUN LED off.	Power supply interrupted.	Check the power supply.
	Break of cable.	Check the connecting cables for a possible break of a cable.
	Fuse defective.	Exchange the fuse.
	Device defective.	Please call SWR for further instructions.
Measuring system does not work. POW LED on. RUN LED off.	Microprocessor does not start.	Power supply switch off and switch on. Program cables remove.
Measuring system works. POW LED on. RUN LED fast flashing.	No sensor communication.	Sensor damaged. Cable break between sensor and measuring system.
	Sensor wrong connected.	Check cable.
	Sensor damaged.	Replace sensor.
	No 24 Volt supply on sensor.	Assure power supply.
	Voltage drop on the supply line too highly.	Examine cable lengths on the basis of the table in chapter 4.4 (page 8).
Measuring system outputs wrong values.	Calibration not correct.	New calibration according to section 8.
	Calibration shifted by abrasion on front end of sensor.	New calibration according to section 8.
Relay output - Relay flickering.	Hysteresis too small.	Increase hysteresis, check effects caused by external devices.
Do not open, as otherwise the warranty claim expires!		

12. Technical Data

Sensor	
Housing material	Stainless steel 1.4571
Protection type	IP 65
Process temperature	-20 ... + 80 °C -20 ... + 220 °C (with process-adapter)
Ambient temperature	-20 ... +60 °C
Working pressure	Max. 1 bar
Power supply	18 ... 24 V DC / AC
Measuring frequency	24.125 GHz, ± 100 MHz
Transmitting power	Max. 5 mW
Weight	1.0 kg
Dimensions	Enclosure: length of 216 mm / diameter of 52 mm Thread: length of 30 mm / diameter of G 1½“
Transmitter	
Power supply	24 V DC ± 10 %
Power consumption	20 W / 24 VA
Protection type	IP 40 to EN 60 529
Ambient operating temperature	-10 ... +45 °C
Dimensions	23 x 90 x 118 (W x H x D)
Weight	Approx. 172 g
Screw terminals	0.2 – 2.5 mm² [AWG 24-14]
Current output signal	4 ... 20 mA (0 ... 20 mA), load < 500 Ω
Alarm output	Relay with switchover contact - Max. 250 V AC, 1 A
Data storage	Flash

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