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SCHMIDT® Technology

SCHMIDT® LED Measured Value Display
MD 10.015
Instructions for Use

Table of Contents

Version 531011.02

Subject to modifications

1 Important Information

These instructions for use contain all the required information for a fast commissioning and a safe operation of **SCHMIDT®** LED measured value displays:

- These instructions for use must be read completely and observed carefully, before putting the unit into operation.
- Any claims under the manufacturer's liability for damage resulting from non-observance or non-compliance with these instructions will become void.
- Tampering with the device in any way whatsoever - with the exception of the designated use and the operations described in these instructions for use - will forfeit any warranty and exclude any liability.
- The unit is designed exclusively for the use described below (refer to *chapter* 2). In particular, it is not designed for direct or indirect personal protection.
- **SCHMIDT Technology** cannot give any warranty as to its suitability for a certain purpose and cannot be held liable for accidental or sequential damage in connection with the delivery, performance or use of this unit.

Symbols used in this manual

The symbols used in this manual are explained in the following section.

Danger warnings and safety instructions - please read them!

Non-observance of these instructions may lead to injury of the personnel or malfunction of the device.

General note

All dimensions are indicated in mm.

2 Application range

The **SCHMIDT®** LED measured value display MD 10.015 (material numbers: 527330 and 528250) is used to display measured values which are transmitted by up to two sensors in form of an analog signal (current or voltage). The supply voltage of the sensors can be provided by the LED measured value display. The sum function is used to determine the flow volume. In the bidirectional mode, a bidirectional flow signal can be generated from the two unidirectional flow sensors.

Switching points for two alarm outputs can be derived from the input signals and the quantity. The galvanically isolated analog output allows the scalable output of the display values.

The **SCHMIDT®** LED measured value display MD 10.015 can also be used for **SCHMIDT®** flow sensors as well as for other sensors (e.g. pressure, temperature, humidity) which are equipped with standard analog outputs.

The **SCHMIDT®** LED measured value display MD 10.015 is designed for the use inside closed rooms and is not suitable for outdoor use (risk of condensation on electronic parts). Moreover, the use in safety relevant applications are not allowed.

3 Mounting instructions

Dimensions

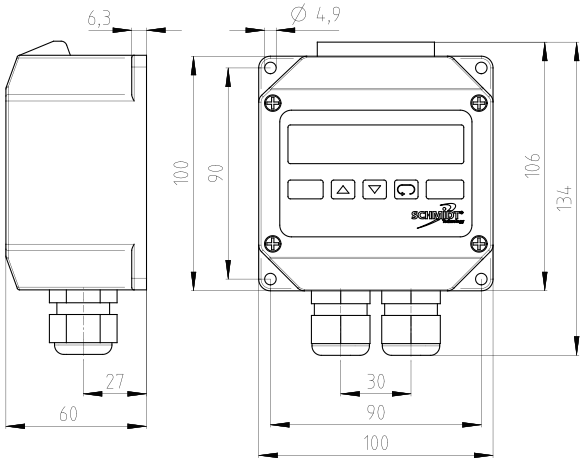


Figure 1: Dimensions of the housing

Wall mounting

The measured value display is installed on the wall by means of four screws. The distances of the holes are indicated in Figure 1. Please make sure that there is enough space to open the upper part of the housing in order to establish the electrical connection.

Lateral through-bolt joints

After installation of the measured value display, the through bolt joints included in the delivery can be mounted instead of the dummy plugs.

Opening the housing

To establish the electrical connection, the housing must be opened. For this, loosen the four screws on the housing. To facilitate the opening of the housing, loosen the screws, pull them to the top as far as possible and fix them in the cover by turning them to the left.

During electrical installation ensure that no voltage is applied and inadvertent activation is not possible.

As a result of the design, the components susceptible to ESD inside the open housing are not protected against unintentional contact. The terminals are resistant to ESD in contrast to the other parts of the electronic system (e.g. cover board with configuration jumper). In order to avoid damages to the electronic parts, make sure that no ESD spark can be transmitted to the electronic parts (e.g. electronic discharge of the operating person on a grounded object before opening the housing).

Take respective protective measures to avoid damages due to electrostatic discharge (ESD).

4 Electrical connection

During electrical installation ensure that no voltage is applied and inadvertent activation is not possible.

The electrical connection must be carried out by trained and qualified personnel.

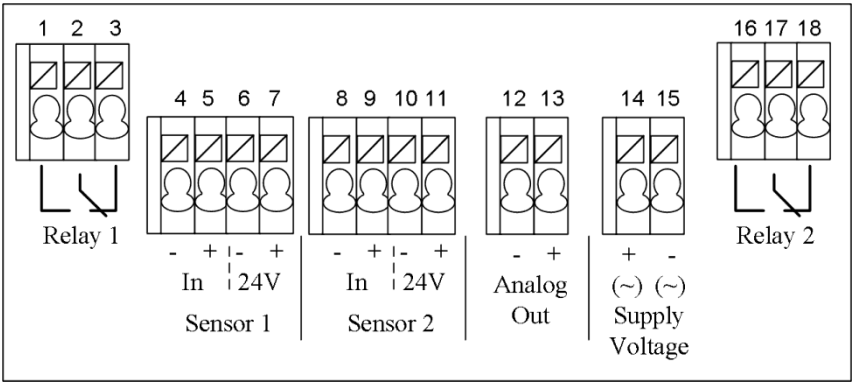


Figure 2: Terminals

Terminal	Designation	Function
1 - 3	Relay 1	Alarm output 1 (max. 250 VAC / 5 A)
4	Sensor 1 In-	GND
5	Sensor 1 In+	Analog input 1 (jumper Ch.1 for configuration of current or voltage input)
6	Sensor 1 24V -	GND
7	Sensor 1 24V+	Supply voltage for sensor 1 (24 V ± 15 %)
8	Sensor 2 In-	GND
9	Sensor 2 In+	Analog input 2 (jumper Ch.2 for configuration of current or voltage input)
10	Sensor 2 24V -	GND
11	Sensor 2 24V+	Supply voltage for sensor 2 (24 V ± 15 %)
12	Analog Out -	AGND (galvanically isolated from GND)
13	Analog Out+	Analog output
14-15	Supply Voltage	Operating voltage according to the version: DC: (10) 24V, (11) GND AC: (10) , (11)
16 – 18	Relay 2	Alarm output 2 (max. 250 VAC / 5 A)

Table 1: Connection

Operating voltage

For the proper operation, the measured value display requires DC voltage with a nominal value of 24 V with permitted tolerance of ± 20% (material No. 527330) or an AC voltage between 90 and 230 (material No. 528250).

Only operate the measured value display in the defined operating voltage range and with the respective voltage type.

Undervoltage may result in malfunction, overvoltage may lead to irreversible damages.

Analog inputs

The jumper in the housing cover can be used to switch the analog inputs between current and voltage signal.

If the bridge is placed on the left contact pins (*Voltage*) a voltage signal is expected. If the plug connects the right pair of pins (*Current*), a current signal must be active.

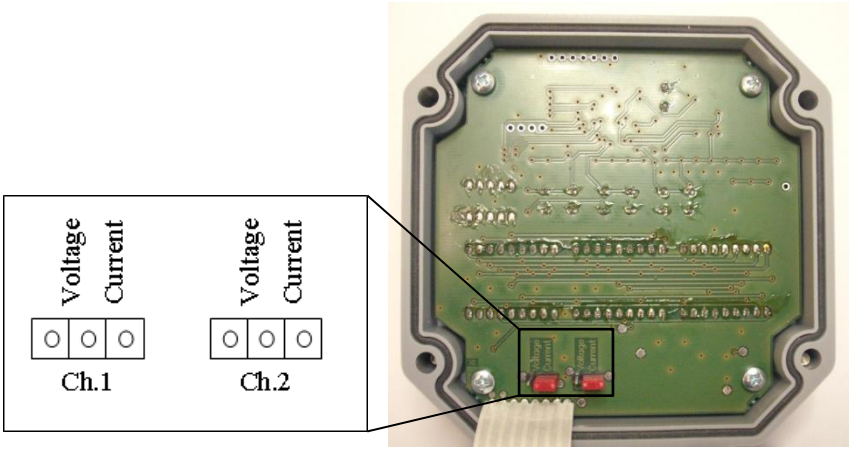


Figure 3: Jumper Current/voltage input in the housing cover

Analog output

The analog output of the MD 10.015 is galvanically isolated from the energy supply and the sensors. Depending on the value of the measuring resistance R_L (switching threshold: R_L = 500 Ω), the signal electronics switches automatically between the operation as voltage interface (U) or current interface (I). In the configuration menu, a beginning of the measuring range without offset (0 mA or 0 V) or with offset (signal transmitting zero point: 2 V or 4 mA) can be selected.

5 Operating modes

The LED measured value display can be operated in three different operating modes (parameter in the configuration menu: Selection of operating mode).

Standard mode

In the standard mode (setting:Std) up to two sensor signals can be configured independently of each other. The volume can be determined from the measured value of sensor 1, the sum of both sensor signals or the difference of the sensor signals.

Bidirectional mode

The **SCHMIDT**® LED measured value display MD 10.015 and two unidirectional **SCHMIDT**® chamber head flow sensors can be used in addition to detect the flow direction and to determine the flow volume from both directions.

The two sensors must be built in the same tube at a distance of 10 times the tube diameter and at an angle of 180 degrees towards each other. Flows in measuring direction of sensor 1 are evaluated by the measured value display as positive flows.

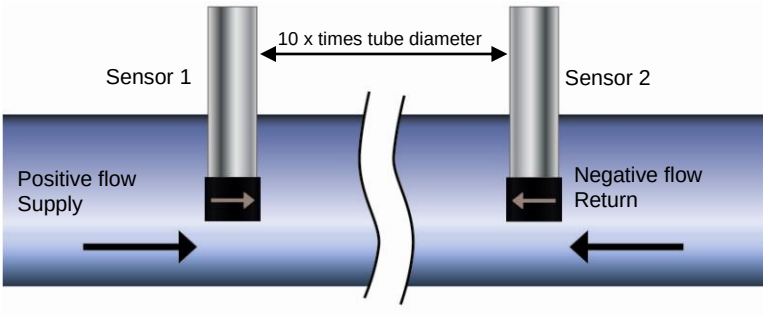


Figure 4: Bidirectional measurement

The measured value display can be configured for two measurement versions in the bidirectional mode.

Version 1 (setting b 1): Positive and negative flows are displayed. To determine the quantity, the positive flows are summed up and negative flows are subtracted.

Version 2 (setting b 1P): Positive flows are displayed, negative flows are suppressed. For the determination of the volume, only the positive flows are considered.

6 Signalizations

Display

Display	State
Init	Initialization of measured value display. Duration approx. 5s after having switched on the supply voltage
Loc	Key lock activated
Err 11	Error message sensor 1
Err 12	Error message sensor 2
Display flashes	Area that can be displayed is exceeded or not reached

Table 2

Analog output

If one of the connected sensors indicates an error, the error is also transmitted to the analog output:

- Output area without offset: 0 ... 20 mA and ... 10 V

  In the current mode the interface outputs 0 mA.

  In the voltage mode the output switches to 0 V.

- Output area with offset: 4 ... 20 mA and 2 ... 10 V

  In the current mode the interface outputs 2 mA.

  In the voltage mode the output switches to 1 V.

7 Startup

Before switching on the **SCHMIDT®** measured value display MD 10.015, check whether the device is installed correctly, both mechanically and electrically.

If the measured value display is in the correct operational state, the display is ready for operation approx. 5 s after switching on the supply voltage.

Operating and display elements

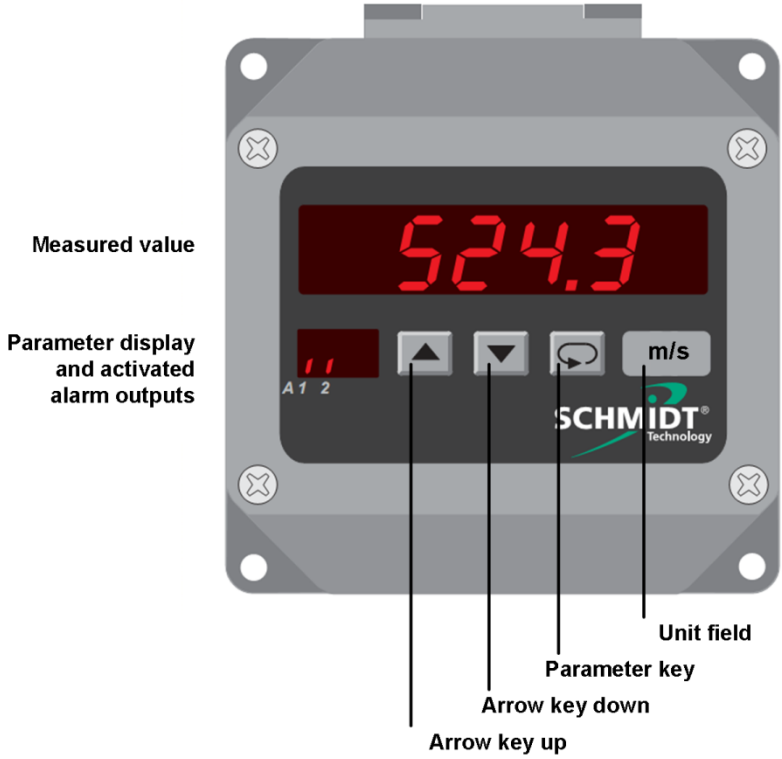


Figure 5: Operating and display elements

General

After switching on the supply voltage, the device is ready for operation as a standard display device and indicates the currently measured value or the measured volume and the states of the alarm outputs.

The device can be operated by means of two different menus. In both menus, the menu items are selected using the parameter key. The settings in the selected menu item can be modified using the arrow keys.

Shortly press the parameter key to open the display menu. In this menu, the display of the current measured values of sensor 1 and 2, the measured volume, the minimum and maximum values or the peak values and the switching points of the alarm outputs can be selected. If no key is pressed for more than two minutes, the device returns automatically to the main display.

If the parameter key is pressed for more than 2 s, the configuration menu opens. It can be used to configure the measuring inputs (sensor signals), the bidirectional mode, the volume calculation, both alarm outputs and the analog output.

The configuration menu of the display is left automatically after the last menu item or if no key is pressed for more than 2 minutes. It can also be quitted at any time by a long press on the parameter key.

The labels included in the delivery can be placed on the unit field to indicate the desired measuring unit (e.g. m/s, m³/h, m³ ...) of the main display.

States of the alarm outputs

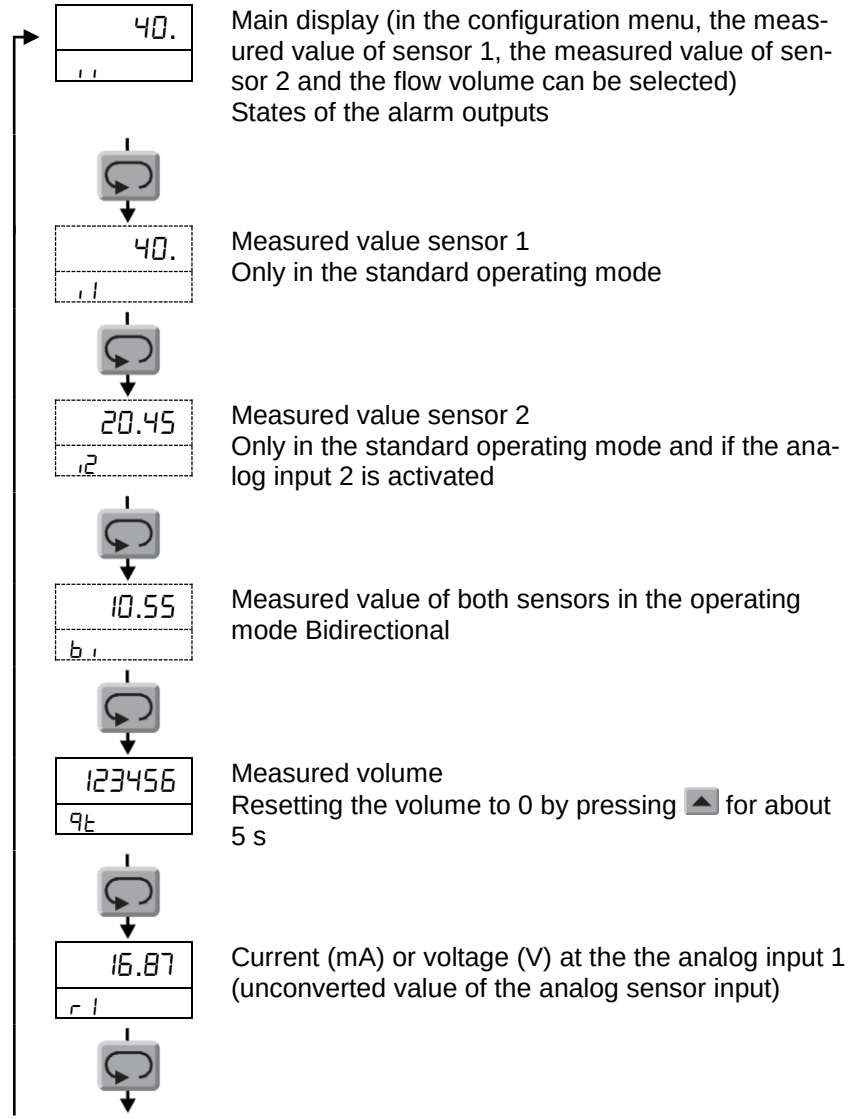
Display	State
	Alarm output 1 not activated Alarm output 2 not activated
	Alarm output 1 activated Alarm output 2 not activated
	Alarm output 1 not activated Alarm output 2 activated
	Alarm output 1 activated Alarm output 2 activated

Table 3

Information regarding the display

Menu item is only displayed if the respective configuration is selected

Display menu



Main display (in the configuration menu, the measured value of sensor 1, the measured value of sensor 2 and the flow volume can be selected)
States of the alarm outputs

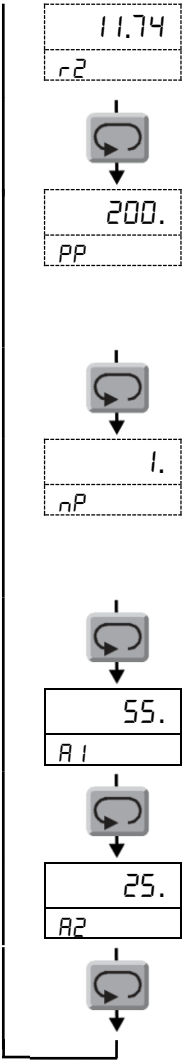
Measured value sensor 1
Only in the standard operating mode

Measured value sensor 2
Only in the standard operating mode and if the analog input 2 is activated

Measured value of both sensors in the operating mode Bidirectional

Measured volume
Resetting the volume to 0 by pressing ▲ for about 5 s

Current (mA) or voltage (V) at the the analog input 1 (unconverted value of the analog sensor input)



Current (mA) or voltage (V) at the the analog input 2 (unconverted value of the analog sensor input)
Only if the analog input 2 is activated

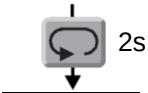
Peak value memory
Maximum measured value of the sensor selected for the main display
Deleting the maximum values of both sensors by pressing ▲ for about 5 s

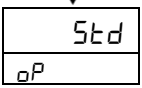
Peak value memory
Minimum measured value of the sensor selected for the main display
Deleting the minimum values of both sensors by pressing ▲ for about 5 s

Switching point alarm output A1

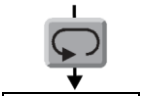
Switching point alarm output A2

Configuration menu

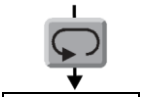




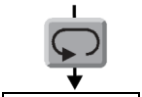
Selection of the operating mode:
Std (Standard), bi (Bidirectional mode), biP (Bidirectional mode, only positive direction)



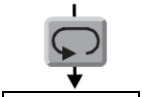
Selection of the main display:
in1 (Measured value sensor 1), in2 (Measured value sensor 2), bi (Measured value in the operating mode Bidirectional), qty (Flow volume)
Modification by pressing the arrow keys



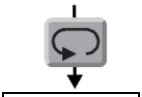
Averaging of the input signals
oFF, 0.5, 1.0, ... 10.0 s
Modification by pressing the arrow keys



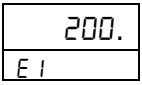
Selection of the input signal 1:
4-20 (mA), 0- 10 (V), 0-20 (mA)
Modification by pressing the arrow keys



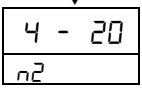
Number of decimal places of the measured value sensor 1:
000000., 00000.0, 0000.00, 000.000, 00.0000
Modification by pressing the arrow keys



Start value for the measuring range of sensor 1 (e.g. 0 ... 200 m³/h).
Modification by pressing the arrow keys



End value for the measuring range of sensor 1
(e.g. 0 ... 200 m³/h).
Modification by pressing the arrow keys

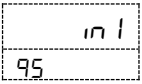


Selection of the input signal 2:
oFF, 4-20 (mA), 0- 10 (V), 0-20 (mA)
Modification by pressing the arrow keys

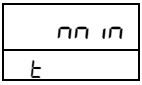
Number of decimal places of the measured value sensor 2:
000000., 00000.0, 0000.00, 000.000, 00.0000
Only if the input 2 is activated.
Modification by pressing the arrow keys

Start value for the measuring range of sensor 2
(e.g. -40 ... +85 °C).
Only if the input 2 is activated.
Modification by pressing the arrow keys

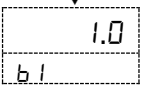
End value for the measuring range of sensor 2
(e.g. -40 ... +85 °C).
Only if the input 2 is activated.
Modification by pressing the arrow keys



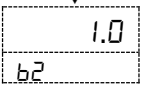
Signal from which the volume is to be calculated:
in 1 (Measured value sensor 1), d iFF (Difference: Sensor1 - Sensor2), Add (Sum; Sensor1 + Sensor2)
Not in the operating mode Bidirectional
Modification by pressing the arrow keys



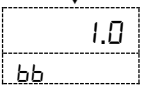
Time base of the signal for flow volume measurement (e.g. l/min):
SEc (seconds), mn in (minutes), hoUr (hours)
Modification by pressing the arrow keys



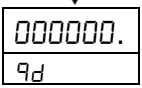
Neutral zone sensor 1 in % of the measuring range between 0 and 9.9 %. Values within the neutral zone are not used for measuring of the volume.
Only in the standard operating mode.
Modification by pressing the arrow keys



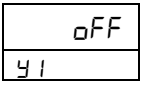
Neutral zone sensor 2 % of the measuring range between 0 and 9.9 %. Values inside the neutral zone are not used for measuring of the volume.
Only if the measured value of sensor 2 are used to calculate the volume.
Modification by pressing the arrow keys



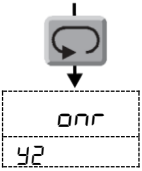
Neutral zone in % of the measuring range between 0 and 9.9 %. Values within the neutral zone are not used for measuring of the volume.
Only in the operating mode Bidirectional.
Modification by pressing the arrow keys



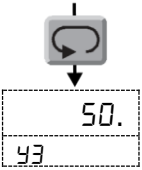
Number of decimal places of the measured volume:
000000., 00000.0, 0000.00, 000.000, 00.0000
In case of setting 000000. The maximum quantity is 9999E9 and the minimum quantity is -999E9. For the other settings, the quantity is limited by the indication range.
Modification by pressing the arrow keys



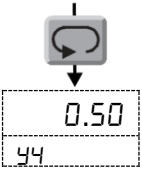
Signal source for alarm output:
oFF (off), in1 (measured value sensor 1), in2 (measured value sensor 2), bi (measured value in operating mode Bidirectional), ntY (measured volume).
Modification by pressing the arrow keys



Switching behavior alarm output 1:
onr (Switches as soon as the switching point is exceeded)
onL (Switches if the switching point is not reached)
Modification by pressing the arrow keys



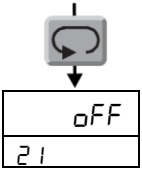
Switching point alarm output 1:
Modification by pressing the arrow keys



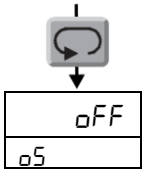
Hysteresis alarm output 1 (four digits)
Modification by pressing the arrow keys

Response delay alarm output 1:
0.00.00 ... 9.00.00 (h.mm.ss)
Modification by pressing the arrow keys

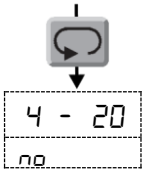
Release delay alarm output 1:
0.00.00 ... 9.00.00 (h.mm.ss)
Modification by pressing the arrow keys



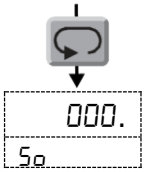
Parameterization alarm output 2 identical to parameterization of alarm output 1 (menu items 21 to 26)



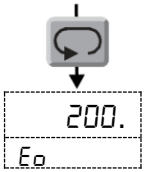
Signal source for (reference signal):
oFF, in1 (measured value sensor 1),
in2 (measured value sensor 2), bi (measured value in the operating mode Bidirectional), qty (measured volume).
Modification by pressing the arrow keys



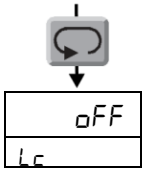
Selecting the signal mode of output signal:
4-20 (mA), 0- 10 (V), 0-20 (mA)
Modification by pressing the arrow keys



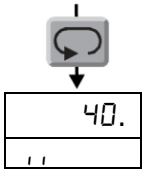
Start value for display range of analog output
Number of decimal places is defined by the configuration of the reference signal.
Modification by pressing the arrow keys



End value for display range of analog output
Number of decimal places is defined by the configuration of the reference signal.
Modification by pressing the arrow keys



Key lock: oFF, on
Modifications in the configuration menu and reset of the peak value memory and the measured volume are locked
Modification using the arrow keys even if the key lock is active



Return to the main display

Application example

In a circular pipeline DN 80, the consumption is to be measured by means of 2 flow sensors according to Figure 4 (see page 8). Alarm should be sent to the alarm output 1 as soon as the flow volume exceeds 100,000 m³. The complete flow range that can be measured, from the maximum negative to the maximum positive flow, should be output in form of a current interface with offset at the analog output.

Sensor data of both sensors:

- **SCHMIDT®** flow sensors using the chamber head technology
- Measuring range 0...60 m/s or 0 ... 920 m³/h in the tube DN 80.
- Analog output 4 ... 20 mA

Determining the volume flow measuring range using the data sheet of the sensor or with the help of the **SCHMIDT®** flow calculator on our homepage (www.schmidttechnology.de).

Note: Plug the jumpers in the housing cover for current measurement.

Menu item	Setting	Meaning
oP	bi	Operating mode: Bidirectional
bA	qty	Main display: Flow volume
n1 / n2	4 - 20	Signal mode analog inputs: 4 ... 20 mA
d1 / d2	0000.00	Display accuracy: 2 decimal places
S1 / S2	0.00	Start value: 0 m³/h (corresponds to 4 mA)
E1 / E2	920.00	End value: 920 m³/h (corresponds to 20 mA)
t	hour	Time base: hours (unit m³/h)
bb	0.5	If a flow volume is indicated even if there is no flow, use the neutral zone to avoid a wrong volume measurement. A neutral zone of 0,5 % corresponds to a value of 4.6 m³/h with a measuring range of 0 ... 920 m³/h. A flow that is lower than this value is not considered for the volume measurement.
qd	000000.	The maximum value should be visible on the 6-digit display. The highest measuring range can be reached if there are no places after the decimal point.
y1	qty	Configuration alarm output 1: ➢ Reference value: Flow volume ➢ Switching mode: active when exceeded ➢ Switching point: 100,000 m³ ➢ Switching hysteresis: 15 m³ (alarm output is released
y2	onr	
y3	100000	

Menu item	Setting	Meaning
Y4	15	if the value falls below 99990 m³) ➢ No response delay ➢ No release delay
Y5	0.00.00	
Y6	0.00.00	
21	oFF	Alarm output 2: deactivated
o5	b1	Configuration analog output: ➢ Reference value: Flow volume ➢ Signal mode: 4 ... 20 mA ➢ Start value: -920 m³/h (≙ 4 mA) ➢ End value: 920 m³/h (≙ 20 mA)
no	4 - 20	
So	-920.00	
Eo	920.00	

Table 4: Configuration example

8 Service information

Eliminating malfunctions

The following table lists possible errors (error images). A description of the way to detect errors is given. Furthermore, the possible causes and measures to be taken to eliminate errors are listed.

Error image	Possible causes	Troubleshooting
Displays off, analog output to zero	Supply voltage U_B: ➢ No U_B present ➢ U_B (DC) has wrong polarity ➢ U_B too low Measured value display defective	Supply voltage: ➢ Check if connected correctly to control unit ➢ Check the voltage type (DC, AC) ➢ Check if there is supply voltage at the terminal (cable break)
Measuring range too large / small	Defective configuration of the sensor's measuring range	➢ Check whether the analog measuring value is correct (r 1) ➢ Configuration of start (S 1) and end value (E 1) of the sensor's measuring range
Analog measured value (r 1) too large / small	Jumper signal mode analog input	➢ Set the jumper in accordance with the signal mode
	Input configuration	➢ Check the input configuration (n 1, n2) according to the input signal
Analog signal too large / small	Output configuration	➢ Check configuration
Unexpected values at the alarm output	Configuration alarm output	➢ Check configuration

Table 5

9 Technical data

Technical data	
Display	Seven segments LEDs red, height 14,2 mm, 6 digits Additional display: 2 digits, 7 mm
Input signal	2 x 4 ... 20 mA (R_i = 100 Ω) or 0 ... 10 V (R_i ≥10 kΩ)
Analog output	1 x 4 ... 20 mA / 2 ... 10 V or 0 ... 20 mA / 0 ... 10 V (depending on the resistance, galvanically isolated, short-circuit protected) Voltage output: > 500 Ω Current output: < 500 Ω
Relay outputs	2 relay changeover contacts (potential-free), max. 250 VAC / 5 A
Accuracy analog output	± 0.2 % of measured value
Supply voltage Material no.: 527330 Material no.: 528250	 85 - 250 VAC, 50 ... 60 Hz 18 - 30 VDC
Current consumption	Max. 8 VA
Current supply of the sensors	2 x 24 VDC ± 15 %, together max. 160 mA (short-circuit proof)
Operating temperature	-20 … +60°C
Storage/transport temperature	-40 … +70°C
Environmental conditions	Non-condensing (up to 95% relative humidity)
Connection	18 spring clamp, one conductor 1.5mm², 4 through-bolt joints
Operating position	any
Ingress protection / Protection class	IP65, contact protected
Housing material	Polyamide, glass-fiber reinforced (PA6-GF 15/15), color similar to RAL 7001
Weight	approx. 370 g

Table 6

10 EC Declaration of conformity

EG-Konformitätserklärung

Certificate of Conformity

Déclaration de conformité CE

SCHMIDT Technology GmbH erklärt, dass das Produkt
SCHMIDT Technology GmbH herewith declares that the product
SCHMIDT Technology GmbH déclare que le produit

SCHMIDT® MD 10.010 Part-No.: **527 320 / 528 240**
MD 10.015 **527 330 / 528 250**

den wesentlichen Schutzanforderungen entspricht, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über elektromagnetische Verträglichkeit (**2004/108/EG**) festgelegt sind.

is in compliance with the relevant protection requirements in respect of the electromagnetical compatibility (EMC) which are laid down in the guidelines of the council for the harmonization of the regulations of the members within the European community (**2004/108/EG**).

correspond aux prescriptions de protection établies dans la norme du conseil pour l'harmonisation de règles de droit des Etats membre sur la compatibilité électromagnétique (**2004/108/EG**).

Zur Beurteilung hinsichtlich elektromagnetischer Verträglichkeit wurden folgende Normen herangezogen:

The assessment of EMC for industrial applications refers to the following European standards:

Pour le jugement de la compatibilité électromagnétique normes suivantes sont appliquées:

a) Störaussendung (Emission) / Electromagnetic Emission / Interférence
EN 61000-6-3:2007

b) Störfestigkeit / Electromagnetic Immunity / Immunité aux parasites
EN 61000-6-2:2005

Helmar Scholz

Leiter Entwicklung Sensoren / R&D Manager Division Sensors / Directeur développement capteur

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CE

SCHMIDT Technology GmbH
Feldbergstrasse 1
78112 St. Georgen / Schwarzwald
Phone +49 (0)7724 / 899-0
Fax +49 (0)7724 / 899-101
info@schmidttechnology.de
www.schmidttechnology.de