Kirchner und Tochter
Durchflussmesstechnik seit 1951

Supplemetary
assembly and operating Instructions

Flow totalizer Module EMZ
for flow meter
SGM
KFS

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Contents

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1 Foreword

This supplementary installation and operating instructions apply to flowmeters of SGM and KFS series with the totalizer module EMZ. All information for the installation, operation, servicing and maintenance are to be observed and complied with.

The manual is part of the device, it should be kept accessible to personnel at a suitable location near the operating site. In case of interaction of different plant components the operating instructions of the other devices must be observed too.

Always pay special attention to the installation and operating instructions for the basic device SGM or KFS.

2 Safety

2.1 Symbol and meaning

Safety notice

This symbol is placed against all directions/information relating to occupational health and safety in these Installation and Operating Instructions, and draws attention to danger to life and limb. Such notices should be strictly observed.

2.2 General safety directions

This document contains basic instructions for the installation, operation, inspection and maintenance of the variable area flow meter. Non-observance of these directions can lead to hazardous situations for man and beast and also to damage to property, for which Kirchner und Tochter disclaims all liability.

The operator is required to rule out potentially hazardous situations through voltage and released media energy.

2.3 Exemption from liability

Kirchner und Tochter accepts no liability for any damage or interruptions of operation resulting from human error, failure to comply with these installation and operating instructions, improper performance of installation and repair work, use of spare parts other than those from the original manufacturers or use of the KFS devices other than for the intended purpose.

2.4 Intended use

The Series SGM and KFS devices are flow meters designed for liquids and gases. Installation in the pipeline should be carried out solely in accordance with the Instructions of the basic device. The required version of the flow meter should be selected on the basis of the pipe diameter at the place of use. The limit values pertaining to the device are given in the installation and operating instructions and should not be exceeded. Modifications or other alterations to the flow meter may only be carried out by Kirchner und Tochter.

2.5 Safety instructions for operator and operating personnel

Authorized installation, operating, inspection and maintenance personnel should be suitably qualified for the jobs assigned to them, and should receive appropriate training and instruction. All persons charged with assembly, mounting, operation, inspection and maintenance duties must have read and understood the operating instructions. Gaskets in contact with the fluid product must be replaced after all maintenance and repair work

2.6 Regulations and directives

In addition to the regulations mentioned below, pay attention without fail to the notices given in the “Supplementary installation and operating instructions - Flap-type flow meter KFS ... Ex”!

All relevant regulations should be observed in respect of flow meter operation. These include in particular:

- Regulation concerning explosion protection (11. ProdSV, 2014/34/EU)
- Regulation concerning safe working conditions (BetrSichV , 2009/104/EG)
- If appropriate, regulation concerning hazardous materials
- Accident prevention regulations
- Pressure Equipment Directive PED (2014/68/EU)
- Explosion Protection Directive ATEX (2014/34/EU)

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2.7 Notice as required by the hazardous materials directive

In accordance with the law concerning handling of waste (critical waste) and the hazardous materials directive (general duty to protect), we would point out that all flow meters returned to Kirchner und Tochter for repair are required to be free from any and all hazardous substances (alkaline solutions, acids, solvents, etc.).

Make sure that devices are thoroughly rinsed out to neutralize hazardous substances.

3 Transport and storage

Always use the original packing for transport, handling and storage. Protect the device against rough handling, impact, jolts, etc

4 General Information

4.1 Declarations of Conformity to the EU directives

The indicator part M40 with totalizer module EMZ meets all the requirements applicable to the product according to EU Directives.

• EMC Directive (2014/30/EU)	EN 61326-2-3: 2013 EN 61626-2-5:2013
• ATEX (2014/34/EU)	EN 60079-0:2012 EN 60079-1:2007 EN 60079-11:2012 EN 60079-15:2010 EN 60079-31:2009

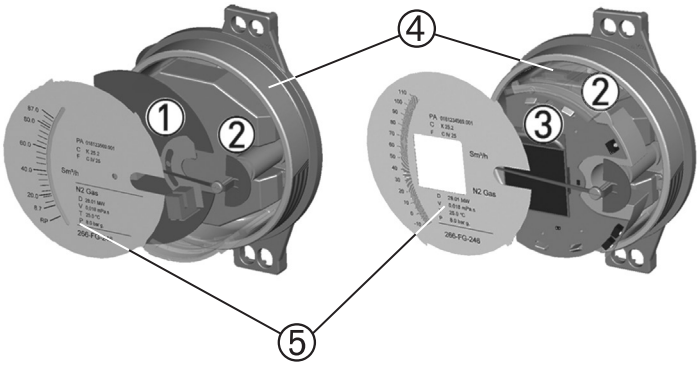
4.2 Type series

SGM-EMZ	all-metal variable area flowmeter with electrical signal output and totalizer
KFS-EMZ	flap flowmeter with electrical signal output and totalizer

4.3 Description

All electrical auxiliary functions and the scale plate fit into the module carrier of the M40 indicator part and are installed via plug-in technology.
Replacing or upgrading the modules can be done without interrupting the process and without dissembling the pointer.

If the max. allowable temperatures for the standard version are exceeded, the indicator can also be retrofitted with an adapter to meet the new operating conditions (HT version).
Indicator part made of stainless steel is available on request.



① Limit switches IK1, IK2, IKS1, IKS2
② Electrical signal output EM 4...20mA
③ Flow totalizer EMZ
④ Module rack
⑤ Scale

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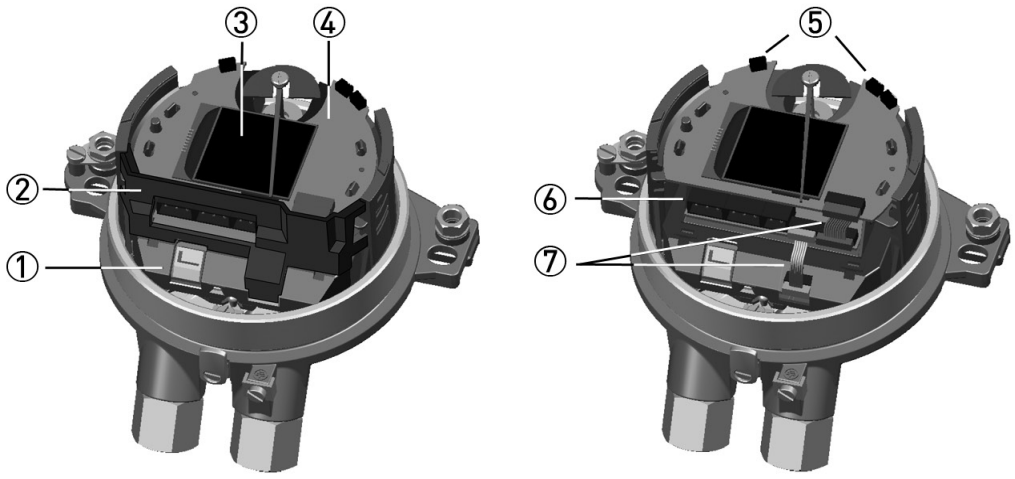
5 Flow totalizer EMZ



① ESK4 connection
② Module cover
③ Display
④ Display module ESK4-IO
⑤ Operating keys ↵ ↑
⑥ Connection binary outputs and reset input
⑦ Module connection cable

The flow totalizer ESK4-T (EMZ) is the combination of the electrical current output ESK4 (EM) and the display module ESK4-IO. Both modules are installed together in the M40 indicator part, whereas the ESK4-IO can only be used together with the ESK4.

For use of the devices in **hazardous areas**, refer to the “Supplementary installation and operating instructions - Flap-type flow meter KFS ... Ex“ resp SGM. Due to possible static charges, the M40 indicators glass screen may only be cleaned with a damp cloth.

A passive graphic LCD displays measurement with units and/or counter reading with units. The max. 11-digit counter reading is equipped a with power failure proof storage. Limit value status displayed via Binary flags and measurement via 0...100% bar graph.
Furthermore NE107 diagnostics status symbols are shown and the configuration menu is carried out in plain text. There are two configurable binary outputs for switch or pulse output and a binary input for start / stop or reset the counter included. The power and data connection between ESK4 and ESK4-IO via a supplied ribbon cable.

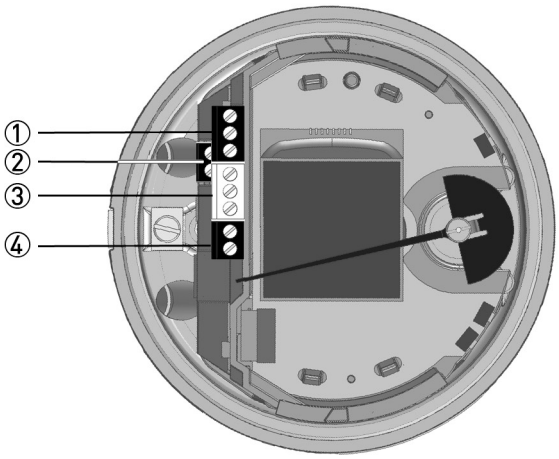
The flow totalizer is factory set according to the order data and does not need to be adjusted!

The conversion factor of the counter is adjusted (unless otherwise ordered) based on the measurement range, so that the total value (in liters, m³, etc.) can be read directly.

5.1 Binary inputs / outputs ESK4-T

After unscrewing the M40 housing cover, the scale can be pulled out. The terminals are pluggable and can be removed for connecting the cables.

① Binary output 1
② Power supply / current output ESK4
③ Binary output 2
④ Binary input



The binary inputs / outputs are galvanically isolated from each other and from the current output ESK4 and can only be operated, when the power supply is connected to the terminal ESK4 11+ and 12-. The binary inputs / outputs are disabled by default and must be activated before the first use (see chapter 7.5 Menu ESK4-T)

5.1.1 Connection binary outputs

According to the desired signal transmission for the binary outputs B1 and B2, one of the following pattern is to be select:

- NAMUR (DC interface according to EN 60947-5-6)
- Transistor output (passive, open collector)

Binary output	**B1**			**B2**		
Terminal no.	1	2	3	4	5	6
connection NAMUR	+	-		+	-	
Connection transistor output	+		B_{OC}	+		B_{OC}

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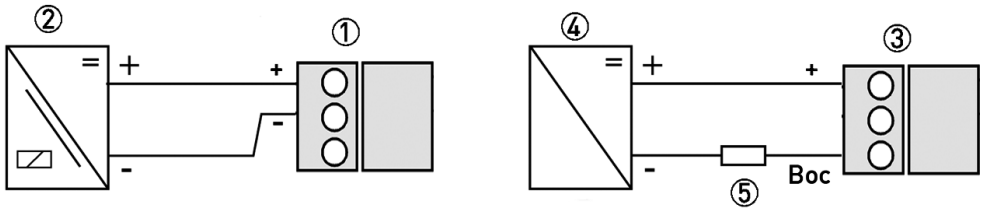


① NAMUR terminal connection
② Isolated switching amplifier
③ OC switch output terminal connection
④ Power supply $U_{ext.}$
⑤ Load R_L

Value range NAMUR

	Normally closed	Normally open
Switching value reached	≤1 mA	> 3 mA
Switching value not reached	> 3 mA	≤1 mA

Value range applies only when connected to a switching amplifier with the following reference values:

- Open-circuit voltage U_0 = 8.2 VDC
- Internal resistance R_i = 1 kΩ

Value range for transistor output

Signal voltages	U_L [V]		U_H [V]	
	lower limit	upper limit	lower limit	upper limit
via load R_L	0	2	16	30

Signal currents	I_L [mA]		I_H [mA]	
	lower limit	upper limit	lower limit	upper limit
Category 2	0	2	20	110

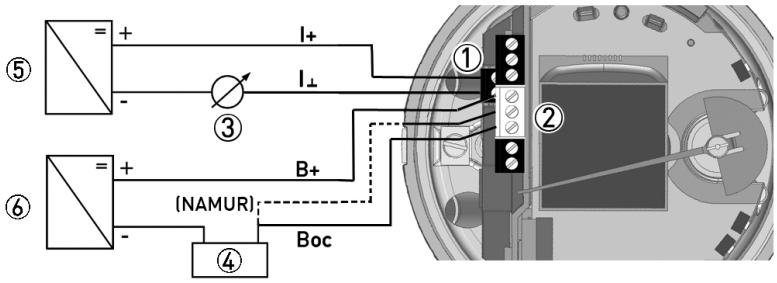
To ensure the value ranges, a load RL between 250 Ω and 1 kΩ is recommended for the passive transistor output with a nominal voltage of 24 VDC. If other loads are used, caution is advised as the range of values of the signal voltages then no longer corresponds to the range of values for the inputs of process control systems and controls (DIN IEC 946).

CAUTION! The upper limit of the signal current must not be exceeded as this may damage the transistor output.

5.1.2 Pulse output mode

The pulse output B2 is a passive „open collector“ output which is electrically isolated from the current output and output B1. It can be operated as a low-resistance output or as a NAMUR output.
The total resistance ④ must be adapted so that the total current Itot does not exceed 100 mA.

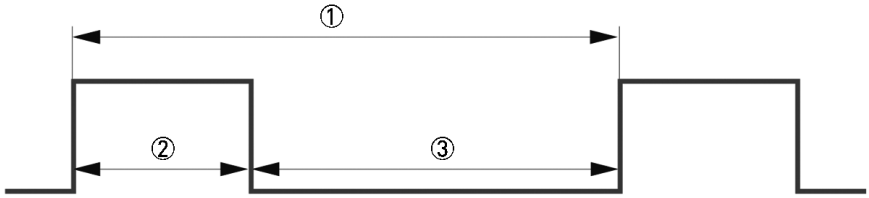
Electrical connection of pulse output



① Terminal for power supply - current output
② Terminal B2
③ Flow measurement 4...20 mA
④ Pulse output load e.g. counter
⑤ Power supply for ESK4
⑥ Power supply for pulse output

The pulse output B2 is a passive “open collector” output which is electrically isolated from the current output and output B1. It can be operated as a low-resistance output or as a NAMUR output.

Data for pulse output



① f_{max} = 10 Hz
② t_{on}
③ t_{off}

The pulse width t_{on} can be configured from 50...500 ms in the indicator menu.

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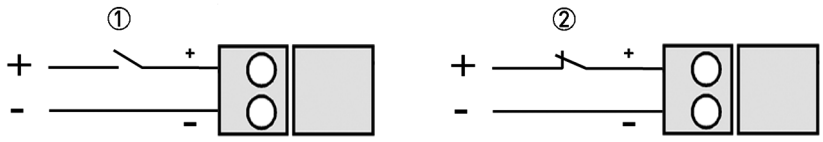
5.1.3 Binary Input

The binary input can be used to control the internal flow counter (start/stop/reset).

Value range for NAMUR

Binary input	B3	
Terminal no.	7	8
Connection	+	-

Binary input



① Function active HI
② Function active LO

This binary input can be activated in the menu of the indicator and can be configured to ACTIVE HI or ACTIVE LO.

If the input is set as ACTIVE LO, an interruption causes the counter to be reset.

For further information on configuration of each function refer to ESK4-T menu sec. 7.5.

Value range

Input voltage	U_L [V]		U_H [V]	
	lower limit	upper limit	lower limit	upper limit
Terminal (7) (8)	0	2	16	30

The binary input has an internal resistance R_i of 20 kΩ.

5.2 Technical Data

Binary output

Two binary outputs	Galvanically isolated; passive	
Mode	Switching output	NAMUR or transistor (OC)
Configurable as	switch contact or pulse output	NC / NO or max. 10 pulses/s
NAMUR switch output		
Power supply	8.2 VDC	
Signal current	> 3 mA switching value not reached;	< 1 mA switching value reached
Switching output transistor (Open Collector)		
Power supply	Nominal 24 VDC, maximal 30 VDC	
P_{max}	500 mW	
Continuous current	Max. 100 mA	
No load current	$I_0 \leq 2$ mA	

Pulse output

T_{on}	Configurable from 50...500 ms
T_{off}	Depending on flow rate
Pulse weight	Configurable in flow units e.g. 5 pulses/m³

Binary Input

Input	Galvanically isolated
Mode	Reset counters or Start / Stop
Configurable as	active HI / active LO
H signa	16...30 VDC
Internal resistance R_i	Typ. 20 kΩ
T_{on} (active)	≥ 500 ms

LC display

Technology	Passive graphic LCD
Display	Measurement with units and/or counter reading with units. Counter reading max. 11-digit with power failure proof storage. Binary flags for limit value status. 0...100% bargraph for measurement. NE 107 diagnostic status symbols. Plain text menu for configuration.
Configuration	Local plain text menu navigation via microswitch or bar magnet or using DD/DTM software

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6 Start-up

INFORMATION!

The device is always preset for the user and his application.

Start
After the device is switched on, the display shows

- „INITIALISING“
- Firmwareversion IO-Module

The device first performs a self-test. Here, all of the parameters preset for the customer are analysed and checked for plausibility. The device then switches to measuring mode and indicates the current measured value.

7 Operation

INFORMATION!

The device is low-maintenance.

Comply with the application limits with regard to temperature of the medium and ambient temperature.

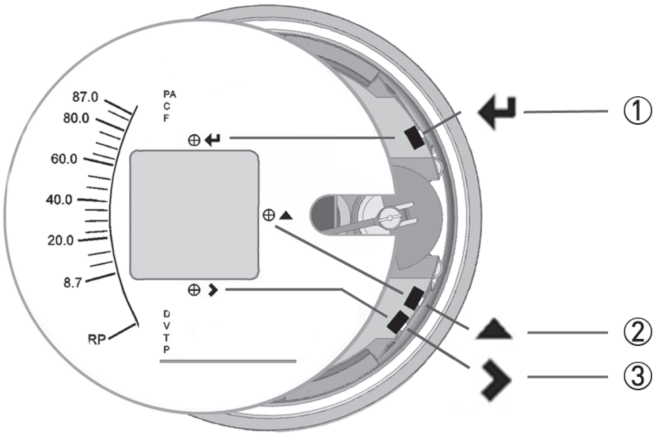
7.1 Operating elements

The device is operated with the cover on the front open, using the mechanical keys, or with the cover closed using a bar magnet.

CAUTION!

The switching point of the magnetic sensors is directly at the height of the corresponding circle (see figure). Only touch the circle vertically and from the front using the bar magnet. Touching it from the side may cause an error in the measurement as the float position is recorded by the magnetic field sensors.

Display and operating elements



① Enter button (circuit for bar magnet)
② Up button (circuit for bar magnet)
③ Right button (circuit for bar magnet)

The mechanical keys and keys for the bar magnet have the same functionality. In this documentation the keys are represented as symbols to describe the operating functions:

	Key	Symbol
①	Enter	↵
②	up	↑
③	right	→

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7.2 Basic principles of operation

7.2.1 Description of the operating keys

→	Switch from measuring mode to menu mode
	Switch to one menu level lower
	Open menu item and activate change mode
	Confirm query whether data should be accepted
	In change mode: Move the input cursor one position to the right. After the last digit the input cursor jumps back to the beginning.
↑	Change between the menu items within a menu level
	In measuring mode: Switch between measured values and error messages
	In change mode: Changing parameters or settings. Run through the available characters (including decimal point)
↵	**In measuring mode:** Switch between measured value display and error messages / warnings
	Switch to one menu level higher
	Return to measuring mode with a query whether the data should be accepted
	Cancel the query, whether data should be accepted

7.2.2 Navigation within the menu structure

Navigate through the menu using the →, ↑ and ↵ keys. Pressing the → key takes you one menu lower. Using the ↑ key takes you one menu item higher (e.g. from 1 to 2). Pressing the ↵ key takes you one menu higher.

If you are already at the lowest level (function level), the key takes you to the change mode, where you can set data and values.

If you are at the first level (main menu), you can use the ↵ key to exit the menu mode and return to the measuring mode.

If settings were changed, the query whether they should be saved will appear. Confirm this query with the → key or cancel it with the ↵ key.

Navigation in menu structure

Measuring mode	→ ↵	Main menu ↑	→ ↵	Submenu ↑	→ ↵	Function ↑	→ ↵	Edit → ↑ ↵

7.2.3 Change the settings in the menu

Starting operation

Operation is started using the → key.

If an operation lock is set, the code (→ → → ↵ ↵ ↵ ↑ ↑ ↑) must be entered. The code can be set in menu 3.13. The code shown here is set at the factory but not activated. If no key is activated within 5 seconds or an incorrect code is entered, a warning message is displayed and the indication returns to measuring mode.

Exit operation

Operation is exited by pressing the ↵ key several times.

If data have been changed:

Save Yes	→	Changes are accepted. An update is carried out and the display returns to measuring mode.
Save No	↵	Changes are discarded and the display returns to measuring mode.

CAUTION!

Each time parameters or settings are changed, the measuring device carries out an internal plausibility check.

If inplausible entries were made, a warning message is shown. If this warning is confirmed with the ↵ key, the display returns to the respective menu item without saving the relevant change. A new entry can now be made.

Example: Changing the flow unit from m3/h to l/h

	Display			Display
Example:	7.2 m³/h		1 x →	Fct. 3.11.1 MEAS'D VALUE
1 x →	Fct. 1 OPERATION		1 x →	10.0000 m3/h
2 x ↑	Fct. 3 INSTALLATION		4 x ↑	10000 l/h
1 x →	Fct 3.1 LANGUAGE			confirm with → deny ↵
10 x ↑	Fct 3.11 FS&UNIT		3 x ↵	7200 l/h

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7.3 Overview of the units

Volume units can either represent real operating volumes (no prefix before the unit) or standard volumes virtually converted to reference statuses.

Prefix	Volume definition
None	Operating volume flow e.g. m³/h or ft³/h
N	Volume flow at standard (norm.) conditions (0°C - 1.013 bara) acc. to DIN 1343 e.g. Nm³/h
S	Volume flow at standard (std.) conditions (15°C - 1.013 bara) acc. to ISO 13443 e.g. Sft³/h

Measured variables	Units			
Operating volume flow	m3/s	m3/min	m3/h	m3/d
	L/s	L/min	L/h	-
	ft3/s	ft3/min	ft3/h	ft3/d
	gal/s	gal/min	gal/h	gal/d
	bbl/s	bbl/min	bbl/h	bbl/d
	ImpGal/s	ImpGal/min	ImpGal/h	ImpGal/d
Standard (norm.) volume flow	Nm3/s	Nm3/min	Nm3/h	Nm3/d
	NL/s	NL/min	NL/h	-
Standard (std.) volume flow	Sm3/s	Sm3/min	Sm3/h	Sm3/d
	SL/s	SL/min	SL/h	-
	Sft3/s	Sft3/min	Sft3/h	Sft3/d
Mass flow	g/s	g/min	g/h	-
	kg/s	kg/min	kg/h	kg/d
	-	t/min	t/h	t/d
	lb/s	lb/min	lb/h	lb/d
	-	STon/min	STon/h	STon/d
	-	-	LTon/h	LTon/d
Operating volume totalizer	m3	l	hl	ft3
	ImpGal	gallon	bbl	bbl (liq)
Standard (norm.) volume totalizer	Nm³	NL		
Standard (std.) volume totalizer	Sft³	SL	Sm³	
Mass totalizer	kg	g	t	lb
	STan	LTon		
Temperature	°C	°F K		

In addition to the predefined units shown here, a user-defined unit can be activated in Menu 3.12 by entering a conversion factor and a unit designation as free text.

7.4 Error messages

Error messages and warnings are indicated by one of the following symbols in the bottom left corner of the display. The ↵ key switches from the measured value display to the display of current errors / warnings. The table below contains a description of possible error messages.

Symbol	NE107 Category	Description	Consequence
	F	Failure	No measured value available, Output signal invalid, Error current signal is output.
	S	Out of specification	Measurement available but increasing measurement uncertainty. Device must be checked.
	M	Maintenance required	Measurement still sufficiently accurate but maintenance required.
	C	Function check	Device is in test or linearization mode. The output signal temporarily does not correspond to the measurement.
	I	Information	No influence on the measurement, information only.

Error message	Description	Category	Remedy
NOT LINEARIZED	Linearization faulty or not activated = measuring error	S	Activate linearization or carry it out again (HART® communication and linearization software are required; the original calibration values must be known), or send the device back to the manufacturer for linearization.
NEW LINEARI. TABLE BAD	Faulty or missing data in the linearization table = measuring error	S ①	
LINEARIZATION UNDER CONFIG	The device is in linearization mode = measuring error	S	Complete the linearization and activate it (HART® communication and linearization software are required), or send the device back to the manufacturer for linearization.
UNIT SYSTEM CONFLICT	The unit for the linearization flow is incompatible with the selected flow type (mass/volume)	S	Correct error, carry out linearization again if necessary (HART® communication and linearization software are required), or send the device back to the manufacturer for linearization.

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Error message	Description	Category	Remedy
TOO FEW ENTRIES	The linearization table has too few data points	S	Carry out linearization at at least 5 points (HART® communication and linearization software are required), or send the device back to themanufacturer for linearization.
NOT MONOTONOUS	The sequence of the linearization values is not strictly monotonic increasing	S	Check linearization and/or carry it out again (HART® communication and linearization software are required), or send the device back to the manufacturer for linearization.
FIRST NOT 0 %	The first flow value if the linearization table is not 0%		
LAST NOT 100 %	The last flow value if the linearization table is not 100%		
NO ZERO CAL OF AO	The current output zero point 4.00 mA is not calibrated = poss. measuring error in the process control system	S	Perform calibration using ammeter and menu 3.10 or using standard HART® tools/process control system and poss. external ammeter. Caution: during calibration, switch the measuring point to manual control.
NO F.SC. CAL OF AO	The current output 100% =20.00 mA is not calibrated= poss. measuring error in the process control system	S	Perform calibration using ammeter and menu item 3.11 or using standard HART® tools and external ammeter if necessary. Caution: during calibration, switch the measuring point to manual control.
NO TEMP. COMPENSATION	The sensor temperature compensation of the device is faulty or was not carried out = possible measuring error	S	The device, together with an indication of the error, must be sent back to the manufacturer for checking.
WRONG ELEC.REV.	The ER revision of the ESK4 / ESK4A is not compatible with the addon module, or the ribbon cable connection is not connected properly.	S	Check that the ribbon cable fits properly. Check module compatibility.

Error message	Description	Category	Remedy
OUTPUT NOT LINEARIZED	Linearization is not activated = measuring error	S	Activate linearization or carry it out again (HART® communication and linearization software are required; the original calibration values must be known), or send the device back to the manufacturer for linearization.
COUNTER LOST	Totalizer value was reset by error/overflow	S ①	Because the reset time is not known: Controlled reset of the counter using menu item 1.6.1 or using HART® tools/process control system.
FRAM WRITE FAULT	Internal communication error	F	Check whether the display is plugged in correctly and restart the device. If the error occurs again: send the device back to the manufacturer with an indication of the error.
ROM/FLASH ERROR	Memory error detected during self-test.	F	Restart device. If the error occurs again: send the device back to the manufacturer with an indication of the error.
RESTART OF DEVICE	A device restart has taken place	I	The device has been restarted using menu item 1.6.2 since the last time the error messages were reset.
MULTIDROP MODE	The HART® multidrop mode is activated. The current output is set to a fixed value of 4.5 mA.	I	The HART® multidrop mode is activated with selection of a polling address not equal to 0 using menu item 3.7. Polling address 0 reactivates the current output.
CRYSTAL OSC FAULT	Internal error in device	F	The device must be sent back to the manufacturer with an indication of the error.
REF VOLTAGE FAULT	Internal error in device		
SENSOR A FAULT	Internal error in device	F ①	
SENSOR B FAULT	Internal error in device		
MEMORY CORRUPTION	Internal memory error, caused by a hardware or software problem	F	Restart the device; if the error occurs again the device must be sent back to the manufacturer with an indication of the error.
AO FIXED	The current output is set to a fixed value.	I	The current output is fixed and does not reflect the measured value. This is the case in multidrop mode, with current output test/calibration using the menu or HART®.

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Error message	Description	Category	Remedy
AO SATURATED	Current output saturated	I	The current output is saturated at >20.4 mA and is no longer linked to the measurement.
ERROR TIMEOUT	Data not transferred, or transferred incorrectly from the ESK to the counter module	F	Confirm menu item „1.6.3 WRITE INFO I/O“.
WARNING TIMEOUT		I	

① Category can be changed by user

7.5 Menu ESK4-T

7.5.1 Factory settings

Function	Setting
1.1.1 OUTPUT B1	INACTIVE
1.2.1 OUTPUT B2	INACTIVE
1.3.1 PULSEWDTH	50ms
1.3.2 PULSE/UNIT	1 Pulse/Unit
1.4 DISPLAY	MEAS'D VALUE
1.4.2 ROTATION	0°
1.5 TIME CONST.	1.0s
1.6.1 COUNTER	NO
1.6.2 ERROR	NO
1.6.3 RE-INIT I/O	NO
3.1 LANGUAGE	ENGLISH
3.2 FUNCTION B1	INACTIVE
3.3 CONTACT B1	NORM.OPEN
3.4 FUNCTION B2	INACTIVE
3.5 CONTACT B2	NORM.OPEN
3.6 FUNCTION B3	INACTIVE
3.7 MULTIDROP	POLLING ADD: 00
3.8 4mA CALIBR.	4.000mA
3.9 20mA CALIBR.	20.000mA
3.10 ALARM CURR.	ALARM HIGH
3.11 FS&UNIT	Application specific
3.11.2 COUNTER	Application specific
3.12 EDIT UNIT	User defined unit / factor
3.13 L.FL.CUTOFF	4% ON; 6% OFF
3.14 DESCRIPTOR	Free text
3.15 ENTRY CODE	OFF
3.16 DEFAULT VAL.	NO

INFORMATION!

The measuring device has been preset at the factory in accordance with the customer order. Therefore subsequent configuration via the menu is only necessary if the intended use of the device is changed.

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7.5.2 Menu structure

Main menu	Submenu 1	Submenu 2
1 OPERATION	1.1 OUTPUT B1	1.1.1 INACTIVE, MEAS.VAL. B1, CNT. VAL. B1, PULSE WIDTH
		1.1.2 HYST. B1, PULSE/UNIT
	1.2 OUTPUT B2	1.2.1 INACTIVE, MEAS.VAL. B2, CNT. VAL. B2, PULSE WIDTH
		1.2.2 HYST. B2, PULSE/UNIT
	1.3 PULSE OUTP.	1.3.1 PULSE WIDTH
		1.3.2 PULSE/UNIT
	1.4 DISPLAY	1.4.1 MEAS'D VALUE, COUNTER, MV/COUNTER, MV&COUNTER, PERCENT
		1.4.2 ROTATION
	1.5 TIME CONST	-
	1.6 RESET	1.6.1 COUNTER
		1.6.2 ERROR
		1.6.3 WRITE INFO IO
2 TEST & INFO	2.1 4-20mA OUTP	2.1.1 NORMAL OP
		2.1.2 4.0mA
		2.1.3 5.6mA
		2.1.4 7.2mA
		2.1.5 8.8mA
		2.1.6 10.4mA
		2.1.7 12.0mA
		2.1.8 13.6mA
		2.1.9 15.2mA
		2.1.10 16.8mA
		2.1.11 18.4mA
		2.1.12 20.0mA
		2.1.13 21.6mA
	2.2 ALARM CURR.	ALARM HIGH, ALARM LOW
	2.3 OUTPUT B1	2.3.1 NORMAL OP
		2.3.2 OPEN
		2.3.3 CLOSED
	2.4 OUTPUT B2	2.4.1 NORMAL OP
		2.4.2 OPEN
		2.4.3 CLOSED
	2.5 INPUT B3	ACTIVE HI, ACTIVE LO, ON, OFF

Main menu	Submenu 1	Submenu 2
2 TEST & INFO	2.6 DEV. IDENT.	2.6.1 ELEC. REV.
		2.6.2 SERIAL ESK4
		2.6.3 PROD. ORDER
		2.6.4 DEV. SN.
3 INSTALLATION	3.1 LANGUAGE	3.1.1 ENGLISH
		3.1.2 DEUTSCH
		3.1.3 FRANCAIS
		3.1.4 ITALIANO
		3.1.5 ESPANOL
		3.1.6 CESKY
		3.1.7 POLSKI
		3.1.8 NEDERLANDS
		3.1.9 DANSK
	3.2 FUNCTION B1	INACTIVE, SWITCH POINT, COUNT. LIMIT, PULSE OUTP.
	3.3 CONTACT B1	NORM.OPEN, NORM.CLOSED
	3.4 FUNCTION B2	INACTIVE, SWITCH POINT, COUNT. LIMIT, PULSE OUTP.
	3.5 CONTACT B2	NORM.OPEN, NORM.CLOSED
	3.6 FUNCTION B3	INACTIVE, ACTIVE HI, ACTIVE LO, STARTH STOPL, STARTL STOPH
	3.7 MULTIDROP	POLLING ADD.
	3.8 4mA CALIBR.	4.000mA
	3.9 20mA CALIBR.	20.000mA
	3.10 ALARM CURR.	OFF, ALARM HIGH, ALARM LOW
	3.11 FS&UNIT	3.11.1 MEAS'D VALUE
		3.11.2 COUNTER
	3.12 EDIT UNIT	3.12.1 MEAS'D VALUE
		3.12.2 COUNTER
	3.13 L.FL.CUTOFF	3.13.1 CONTROL ON, CONTROL OFF
		3.13.2 ON VALUE
		3.13.3 OFF VALUE
	3.14 DESCRIPTOR	Free text
	3.15 ENTRY CODE	OFF, ON
	3.16 DEFAULT VAL.	SET ALL

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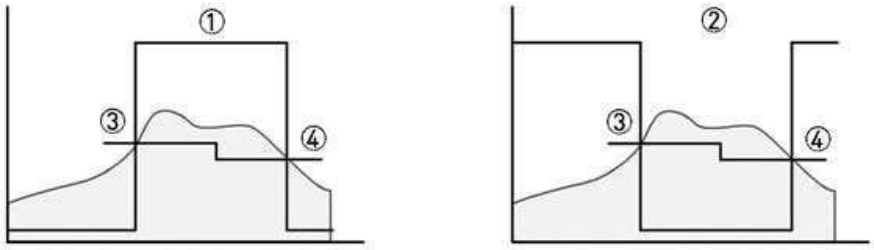
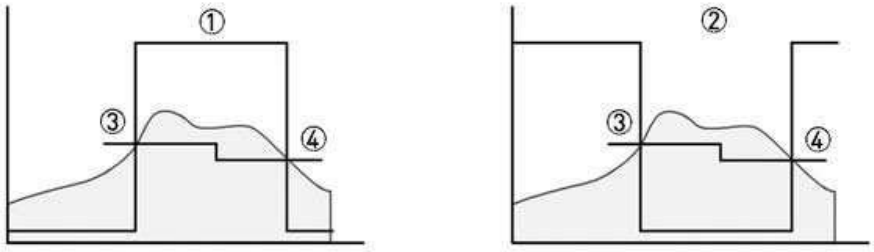
7.5.3 Menu description

1 OPERATION

Selection / Input	Explanation
1.1 OUTPUT B1	Output B1 is a binary switching output. In Fct. 3.2, one of the following functions can be selected for this output: INACTIVE, SWITCH POINT, COUNT. LIMIT, PULSE OUTP.
	One of the following functions can be selected as contact type in Fct. 3.3: NORM.OPEN ① / NORM.CLOSED ② 
1.1.1 INACTIVE	-
MEAS.VAL. B1	Switching point of flow value Value range: 0.0…full scale range The switching point is entered in flow units. If the current flow value exceeds this pre-determined switching point, output B1 changes its binary state ③. In Fct. 1.1.2 a hysteresis can be specified additionally.
CNT. VAL. B1	Switching point of totaliser value Value range: 0.0…counter limit The switching point is entered in volume or mass units. If the the current counter value exceeds this pre-determined switching point, output B1 changes its binary state ③. There is no hysteresis setting for the switching point of the counter value.
PULSE WIDTH	Pulse weight (pulse/unit) The weight is only displayed here. A configuration takes place in Fct. 1.3.1 PULSE WIDTH, 1.3.2 PULSE/UNIT and 3.11.2 COUNTER.

Selection / Input	Explanation
1.1.2 HYST. B1	Hysteresis for the switching point of the flow value Value range: 0.0…switching point If the current flow value exceeds the pre-determined switching point from Fct. 1.1.1, output B1 changes its binary state ③. In order for output B1 to change its binary state back to the initial setting, the switching point made smaller by the hysteresis must be undershot ④. Example: In 1.1.1, a switching point of 200 L/h is set. The possible value range for the hysteresis is then 0.0…200 L/h. With a hysteresis value of 0, the switching point has no hysteresis (③=④). If a hysteresis value of 20 L/h is entered, output B1 changes its binary state to the initial setting, if it drops below 180 L/h ④.
1.2 OUTPUT B2	Output B2 is a binary switching output. In Fct. 3.4, one of the following functions can be selected for this output: INACTIVE, SWITCH POINT, COUNT. LIMIT, PULSE OUTP.
	One of the following functions can be selected as contact type in Fct. 3.5: NORM.OPEN ① / NORM.CLOSED ② 
1.2.1 INACTIVE	-
MEAS.VAL. B2	Refer to MEAS.VAL. B1 In Fct. 1.2.2 a hysteresis can be specified additionally.
CNT. VAL. B2	Refer to CNT. VAL. B1
PULSE WIDTH B2	Refer to PULSE WIDTH B1 A configuration takes place in Fct. 1.3.1 PULSE WIDTH, 1.3.2 PULSE/UNIT and 3.11.2 COUNTER.
1.2.2 HYST. B2	Refer to HYST. B1
1.3 PULSE OUTP.	-
1.3.1 PULSE WIDTH	
50ms	Ti = 50 ms; fmax = 10 Hz; max. pulses/h = 36000
100ms	Ti = 100 ms; fmax = 5 Hz; max. pulses/h = 18000
200ms	Ti = 200 ms; fmax = 2.5 Hz; max. pulses/h = 9000
500ms	Ti = 500 ms; fmax = 1 Hz; max. pulses/h = 3600

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Selection / Input	Explanation
1.3.2 PULSE/UNIT	0.001...1000 Pulse per volume or mass unit of counter (setting in Fct. 3.11.2), which can be output via one of the binary outputs. The maximum frequency for the pulse output (refer to Fct 1.3.1) cannot be exceeded, even at maximum flow rate (full scale). Example: Final value Qmax = 1200 L/h; volume unit of counter = Litre; pulse width = 100ms; If the factor 1 is entered, 1 pulse/litre = 1200 pulses are generated in one hour at maximum flow rate. Number of max. permissible pulses: $\frac{\frac{P_{max}}{h}}{Q_{max}} = \frac{18000\frac{P}{h}}{1200\frac{l}{h}} = 15\frac{P}{l}$
1.4 DISPLAY	Different measured values can be selected for permanent or alternating display. The reading on the display can be rotated.
1.4.1	
MEAS'D VALUE	Permanent display of flow in flow units
COUNTER	Permanent display of totalizer
MEAS.VAL/CTN	Alternating display of flow value in flow units and totalizer
MEAS.VAL&CTN	Simultaneous display of flow value and totalizer
PERCENT	Permanent display of flow value in percent
1.4.2 ROTATION	
0°	The reading is not rotated.
90°	The reading on the display is rotated by 90°.
180°	The reading on the display is rotated by 180°.
270°	The reading on the display is rotated by 270°.
1.5 TIME CONST	0.0...20.0s
	Given in seconds The output variables (value of the current loop and indicated flow value) follow the current process by the value set here (in seconds) with a time delay. Note: If the current flow is polled via HART® communication, the transferred measured value is also played back with a delay.
1.6 RESET	Local resetting of totalizer and acknowledgement of warnings. There is always a safety prompt ("YES / NO"), to avoid accidental resetting. Note: External resetting of the totalizer can be installed with the binary input B3.

Selection / Input	Explanation
1.6.1 COUNTER	Confirming with "YES" resets the value of the totalizer to 0.0.
1.6.2 ERROR	Confirming with "YES" acknowledges all existing warnings. Note: Confirming with "YES" acknowledges existing errors and warnings.
1.6.3 RE-INIT IO	As a general rule, data is transferred from the counter module to the ESK4 and vice versa when the device starts. For safety, another data transmission can be performed by selecting this menu item and confirming with "YES".

2 TEST & INFO

Selection / Input	Explanation
2.1 4-20mA OUTP	Testing the current loop by setting various current values. Note: The test is not available in HART® multi-drop mode (refer to Fct. 3.7) Attention: During the test, the value of the current loop does not follow the current process.
2.1.1 NORMAL OP	The value of the current loop follows the current process.
2.1.2 4.0mA	The value of the current loop no longer follows the current process. It is set to the selected current value.
2.1.3 5.6mA	
2.1.4 7.2mA	
2.1.5 8.8mA	
2.1.6 10.4mA	
2.1.7 12.0mA	
2.1.8 13.6mA	
2.1.9 15.2mA	
2.1.10 16.8mA	
2.1.11 18.4mA	
2.1.12 20.0mA	
2.1.13 21.6mA	
2.2 OUTPUT B1	<3.6 / >21 mA Testing the alarm current HIGH/LOW according to the settings in Fct. 3.10.
2.3 ALARM CURR.	Testing the binary switching output B1 by changing its binary status. Attention: During the test, the binary status does not correspond to the current process.
2.3.1 NORMAL OP	The binary status of the switching output corresponds to the current process.

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Selection / Input	Explanation
2.3.2 OPEN 2.3.3 CLOSED	The binary status of the switching output no longer corresponds to the current process. The selected status is tested.
2.4 OUTPUT B2 2.4.1 NORMAL OP 2.4.2 OPEN 2.4.3 CLOSED	Refer to 2.2 OUTPUT B1
2.5 INPUT B3	The current binary status of the binary input B3 is displayed. External switching of the voltage applied to input B3 activates a change of the displayed binary status. Note: A reaction to the switching of the voltage applied to input B3 only occurs if the function B3 is activated (refer to Fct. 3.6).
2.6 DEV. IDENT.	Information for device identification
2.6.1 ELEC. REV.	Electronic revision
2.6.2 SN ESK4	Serial number ESK4
2.6.3 PROD. ORDER	Production order for the complete flowmeter
2.6.4 DEV. SN.	Serial number for the complete flowmeter
2.7 SOFT.VERSION	Information about software revision status
2.7.1 FW. ESK4	Software revision status for device insert ESK4-Basic
2.7.2 FW. ESK4 I/O	Software revision status for optional add-on module ESK4-T
2.8 TAG NB.	8 digits Measuring point identifier Alphanumerical characters. Up to eight digits are possible.
2.9 LONG TAG	32 digits Measuring point identifier Alphanumerical characters. Up to 32 digits are possible.

3 ISTALLATION

Selection / Input	Explanation
3.1 LANGUAGE	Language selection for the displayed menu texts.
3.1.1 ENGLISH	The menu texts are displayed in the selected language.
3.1.2 DEUTSCH	
3.1.3 FRANCAIS	
3.1.4 ITALIANO	
3.1.5 ESPANOL	
3.1.6 CESKY	
3.1.7 POLSKI	
3.1.8 NEDERLANDS	
3.1.9 DANSK	
3.2 FUNCTION B1 -	
INACTIVE	The binary switching output B1 has no function.
SWITCHING POINT	The binary switching point B1 acts as a limit switch depending on the current flow value. Configuration of the switching point is in Fct. 1.1.1 MEAS.VAL. B1.
COUNT. LIMIT	The binary switching point B1 acts as a limit switch depending on the current counter value. Configuration of the switching point is in Fct. 1.1.1 MEAS.VAL. B1.
PULSE OUTP.	The binary switching point B1 acts as a pulse output depending on the current flow value. Pulses of a maximum of up to 10 Hz can be generated. The configuration is in Fct. 1.3.1 PULSE WIDTH and 1.3.2 PULSE/UNIT. Note: The configuration in Fct. 1.3.1 and Fct. 1.3.2 applies to both pulse outputs. If both B1 and B2 are configured as pulse outputs, both binary outputs behave in exactly the same way.
3.3 CONTACT B1	-
NORM.OPEN	The contact type of the binary switching output B1 is "normally open".
NORM.CLOSED	The contact type of the binary switching output B1 is "normally closed".
3.4 FUNCTION B2	-
INACTIVE	Refer to FUNCTION B1
SWITCHING POINT	Refer to FUNCTION B1 Configuration of the switching point is in Fct. 1.2.1 MEAS.VAL. B2.
COUNT. LIMIT	Refer to FUNCTION B1 Configuration of the switching point is in Fct. 1.2.1 MEAS.VAL. B2.
PULSE OUTP.	Refer to FUNCTION B1 The configuration is in Fct. 1.3.1 PULSE WIDTH and 1.3.2 PULSE/UNIT.
3.5 CONTACT B2	-
NORM.CLOSED	Refer to CONTACT B1
NORM.OPEN	Refer to CONTACT B1

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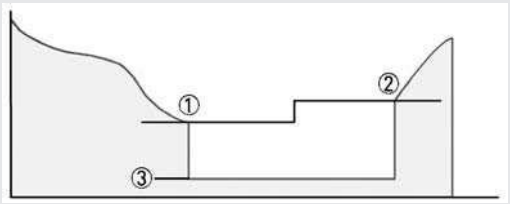
Selection / Input	Explanation
3.6 FUNCTION B3	-
INACTIVE	The binary switching input B3 has no function.
ACTIVE HI	The internal flow counter is reset to 0.0 if there is an H level at input B3 for at least 100 ms.
ACTIVE LO	The internal flow counter is reset to 0.0 if there is an L level at input B3 for at least 100 ms.
STARTH STOPL	The counter is started by creating an H level at input B3 and stopped by creating an L level at input B3.
STARTL STOPH	The counter is started by creating an L level at input B3 and stopped by creating an H level at input B3.
3.7 MULTIDROP	0…15 Polling address for HART® multi-drop mode When the address is 0, the HART® multi-drop mode is disabled. Attention: When the HART® multi-drop mode (Address 1…15) is activated, the current loop is inactive (fixed current value of "4.5mA") and no longer follows the current process.
3.8 4mA CALIBR.	D/A calibration for lower range value (4mA) Note: This function is not available in HART® multi-drop mode. Attention: During calibration, the value of the current loop does not follow the current process. If an ampere meter detects in the 4...20 mA loop a deviation from the desired value of "4.000mA", the measured value must be entered. The correction value is accepted following the query to save and confirm with yes.
3.9 20mA CALIBR.	D/A calibration for the full scale value (20 mA) Note: This function is not available in HART® multi-drop mode. Attention: During calibration, the value of the current loop does not follow the current process. If an ampere meter detects in the 4...20 mA loop a deviation from the desired value of "20.000mA", the measured value must be entered. The correction value is accepted following the query to save and confirm with yes.
3.10 ALARM CURR.	-
OFF	Error indication via the current loop is deactivated. The current loop follows the current process. Note: This function is not available in HART® multi-drop mode.

Selection / Input	Explanation
ALARM HIGH	Error indication via the current loop is activated (failure signal "high" acc. to NE43). Note: This function is not available in HART® multi-drop mode.
ALARM LOW	Error indication via the current loop is activated (failure signal "low" acc. to NE43). Note: 1) This function is not available in HART® multi-drop mode. 2) This function is supported from ER 2.2.x.
3.11 END&UNIT	By changing the unit, the respective final value is scaled accordingly. Depending on calibration, either units for volume or mass flow measurement are available for selection.
3.11.1 MEAS'D VALUE	For units for volume flow or mass flow, refer to Overview of the units ESK4-T sect. 7.3.
3.11.2 COUNTER	For units for volume counter or mass counter and pulse output, refer to Overview of the units ESK4-T sect. 7.3.
3.12 EDIT UNIT	User-defined unit with conversion to calibrated unit.
3.13 L.FL.CUTOFF	L.FL.CUTOFF stands for low flow cutoff. To ensure a stable zero point of the current output, the current output can be set to a stable value of "4.00mA" ③ in a selectable range. 
3.13.1	
CONTROL OFF	LFC function is not active.
CONTROL ON	L.FL.CUTOFF function is active.
3.13.2 LFC ON VAL	Switch-on value ①: Value range 1…19% (of full scale range) The flow is greater than the switch-on value. The current output corresponds to this. If the flow rate falls, the current output follows until the switch-on value ①. If the flow value continues to fall, the current output is switched to "4.00mA" ③. Note: The switch-on value to be set must be smaller than the previously selected switch-off value.

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Selection / Input	Explanation
3.13.3 OFF VALUE	Switch-off value ②: Value range 2…20% (of full scale range) The flow rate is 0. The current output is "4.00mA" ③. If the flow rate increases, the current output remains at "4.00mA" until it has reached the switch-off value ②. Note: The switch-off value to be set must be greater than the previously selected switch-on value.
3.14 DESCRIPTOR	12 digits Free text input for header in LCD
3.15 ENTRY CODE	Entry code for the local operating menu. The entry code is not active by default.
3.15.1 OFF	The use of an entry code is not activated.
3.15.2 ON	If "YES" is selected, the last code that was entered has to be typed in. Factory code: → → → ↵ ↵ ↵ ↑ ↑ ↑ If, after confirmation with "YES", the → key is pressed additionally, then a new, individual, nine digits code can be typed in. The display shows the required key combination.
3.16 DEFAULT VAL.	Resetting parameters to factory default. There is always a safety prompt ("YES / NO"), to avoid accidental resetting.

Always pay special attention to the installation and operating instructions for the basic device SGM or KFS.

Notes

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Notes

The devices from **Kirchner und Tochter** have been tested in compliance with applicable EC/EU CE-regulations of the European Community.

The respective declaration of conformity is available on request. Subject to change without notice. The current valid version of our documents can be found at www.kt-flow.de.

The **Kirchner und Tochter** QM-System is certified in accordance with DIN EN ISO 9001:2008. The quality is systematically adapted to the continuously increasing demands.

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