SGM

Installation and Operating Instructions

Variable area flow meters
SGM

Kirchner und Tochter

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Contents

1 Foreword

These Installation and Operating Instructions are applicable to devices of Series SGM. Please follow all instructions and information given for installation, operation, inspection and maintenance. The Instructions form a component part of the device, and should be kept in an appropriate place accessible to the personnel in the vicinity of the location. Where various plant components are operated together, the operating instructions pertaining to the other devices should also be observed.

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 SGM devices other than for the intended purpose

2 Safety

2.1 Symbol and meaning

Safety notice

This safety notice can be found at all hints on work safety in these assembly and operating instructions pointing out hazards for life and limb of persons. Further, this safety notice highlights safety hints in these operating instructions that point to regulations, guidelines or
operating sequences that must be observed without fail. Non-observance may result in damages to or a destruction of the variable area flow meters and / or other parts of the installation.

2.2 General safty directions

These Installation and Operating Instructions contain basic instructions for the installation, operation, inspection and maintenance of the flow meter. Failure to comply with these Instructions or improperly executed installation, wiring and repair work can lead to serious faults in the plant, giving rise to hazardous situations for "man and beast“ as well as damage to property.
The operator is required to rule out potentially hazardous situations through voltage and released media energy.

2.3 Intended use

The SGM devices are designed and intended for measuring the flow of compressible and incompressible fluids. They may only be installed between flanges in the pipeline. Select the SGM device model on the basis of the nominal diameter and nominal pressure at the site and also the kind of fluid product concerned; limit values are

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specified in the Section "Technical data" and should not be exceeded. Only devices that bear the "EEx" marking may be operated in hazardous areas.

2.4 Information 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.

2.5 Regulations and directives

In addition to the regulations mentioned below, pay attention without fail to the notices given in Section or operation in hazardous areas!

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

Regulation concerning explosion protection (ExVO National, ATEX 95)
Regulation concerning safe working conditions (Directive 1999/92/EC, ATEX 137)
If appropriate, regulation concerning hazardous materials
Accident prevention regulations
Pressure Equipment Directive PED 97/23 EC

2.6 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

The SGM device is packed by the factory in packaging appropriate for transportation and storage. Transport and storage should be carried out solely in the original packaging. Protect the device against rough handling, impact, jolts, etc.

4 General

4.1 Declarations of conformity with EC Directives

The variable area flow meter SGM meets all requirements of the EC Directives applicable to the product:

- EMC Directive (89/336/EEC)
- EN 61326 : 03/1997
  +A1 : 04/1998
  +A2 : 03/2001
- ATEX (94/9/EC)
  EN 50014:1997 +A1 +A2
  EN 50020:1994
- DGRL (97/23/EC)

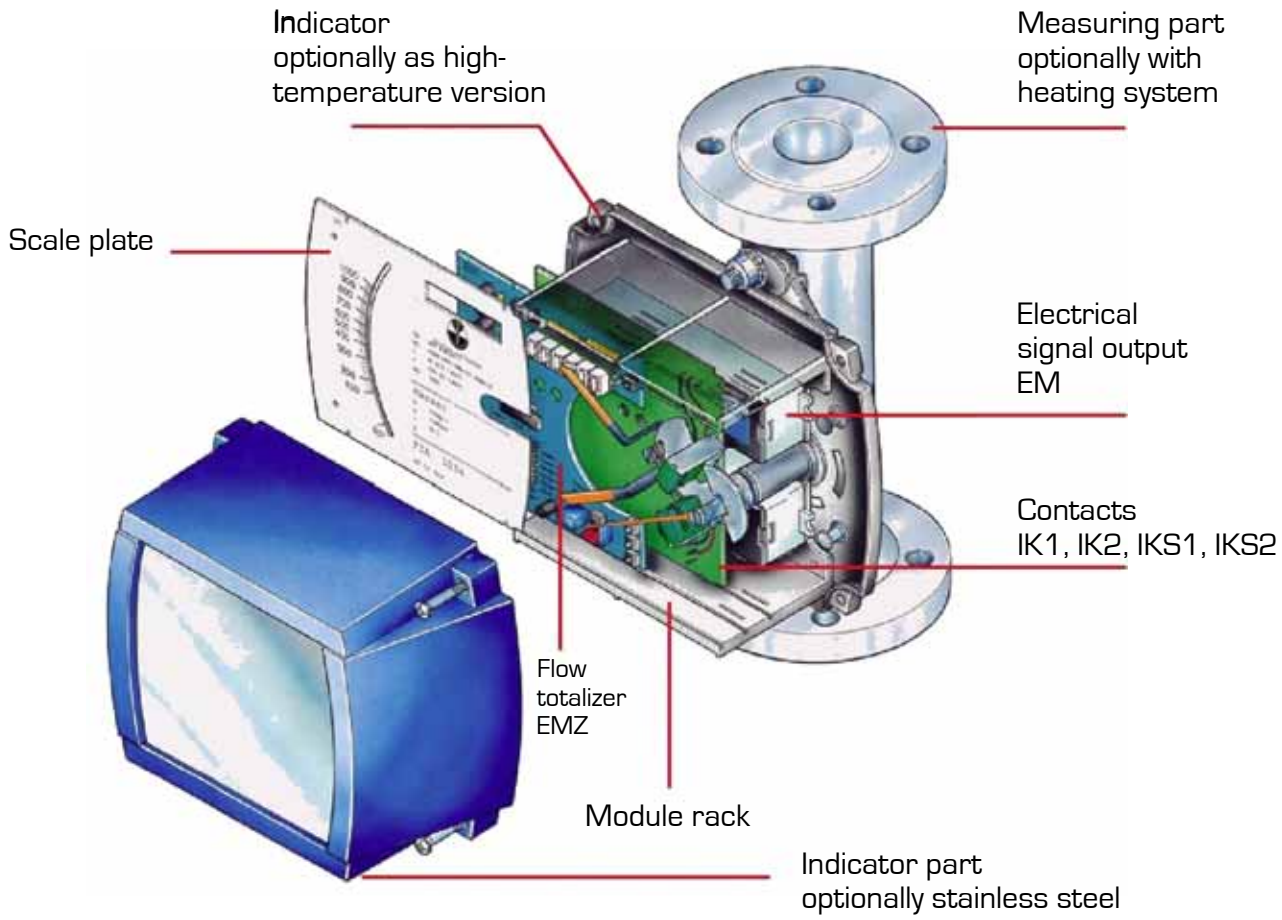
4.2 Type series

SGM	All-metal device
SGM-EM	with electrical signal output
SGM-EMZ	with electrical signal output and totalizer
SGM-IK1	with one inductive contact (SC3,5-NO-Y)
SGM-IK2	with two inductive contacts (SC3,5-NO-Y)
SGM-IKS1	with one electronic contact (SB3,5-E2)
SGM-IKS2	with two electronic contacts (SB3,5-E2)
SGM-IK1-EM	with one inductive contact and with electrical signal output
SGM-IK1-EMZ	with one inductive contact and with electrical signal output and totalizer
SGM-IK2-EM	with two inductive contacts and with electrical signal output
SGM-IK2-EMZ	with two inductive contacts and with electrical signal output and totalizer
SGM-IKS1-EM	with one electronic contact and with electrical signal output
SGM-IKS1-EMZ	with one electronic contact and with electrical signal output and totalizer
SGM-IKS2-EM	with two electronic contacts and with electrical signal output
SGM-IKS2-EMZ	with two electronic contacts and with electrical signal output and totalizer
SGM EEx	all-metal device, explosion-proof design
SGM-EM EEx	with electrical signal output, explosion-proof design
SGM-IK1 EEx	with one inductive contact, explosion-proof design
SGM-IK2 EEx	with two inductive contacts, explosion-proof design
SGM-IK1-EM EEx	with one inductive contact and with electrical signal output, explosion-proof design
SGM-IK2-EM EEx	with two inductive contacts and with electrical signal output, explosion-proof design

4.3 Description

Indicator of modular design

A module rack in the indicator accommodates all electrical options and the scale plate. The modules pertaining to the electrical options (see Figure) and the scale plate are inserted in the rack using the plug-in technique.
The modules can be replaced or retrofitted without interrupting the process and without having to remove the pointer.
If actual temperatures are higher than the max. allowable process temperatures for the standard version, the indicator can be (subsequently) adapted to suit the new operating conditions by using an adapter (HT version).
Measuring parts made of various materials and fitted with different liners are available for the process media.
The flow meter can be ordered with magnetic filter and/or float damper, and these can also be retrofitted. In the case of variable or pulsating flows, an eddy-current brake can additionally be installed to dampen the pointer.
An indicator part of stainless steel is available on request.



5 Installation

5.1 Preparation of the pipeline

- Check the direction of flow in the pipe at the installation point of the flow meter. VA flow meters are as a rule only suitable for vertical installation, with the direction of flow being from bottom to top. For all other installation situations appropriate pipe bends need to be fitted in the existing pipeline to ensure vertical flow through the device from below. Straight unimpeded pipe runs should have a length equal to 5x DN upstream and 3x DN downstream of the installation location. Any control equipment, particularly in the case of gaseous media, should always be installed downstream of the flow meter. Refer also to Guideline VDE/VDI 3513 Sheet 3.
- The SGM type series can as a special version optionally be constructed for horizontal installation.
- If necessary, support the ends of the pipeline to prevent vibration from being transmitted to the flow meter.
- Clean by blowing or flushing out the pipes leading to the device before connecting up.
- Prepare the installation point before starting to mount the flow meter. Make sure the sealing faces are correctly spaced apart and in true alignment.
- On no account should the VA flow meter be used to pull the ends of the pipeline together (stress-free installation!).

5.2 Installation in the pipeline

1. Check that the device is free from solid foreign bodies.
2. Use bolts and gaskets (to be provided by customer) in keeping with the pressure rating of the connection flanges and the operating pressure.
3. The inside diameter of the flanges differs from standard dimensions. Flange gaskets standard DIN 2690 can be applied without restriction.
4. Align gaskets, tighten nuts with the torques relevant to the appropriate pressure rating.

For measuring parts with PTFE liner and for measuring parts with ceramic liner and PTFE sealing face, tighten the flange bolts with the following max. torques:

Nominal size to ...				Stud bolts		
DIN 2501		ANSI B 16.5		DIN	ANSI	
DN	PN	in.	lbs		150 lbs	300 lbs
15	40	½"	150/300	4 x M 12	4 x ½"	4 x ½"
25	40	1"	150/300	4 x M 12	4 x ½"	4 x 5/8"
50	40	2"	150/300	4 x M 16	4 x 5/8"	8 x 5/8"
80	16	3"	150/300	8 x M 16	4 x 5/8"	8 x ¾"
100	16	4"	150/300	8 x M 16	8 x 5/8"	8 x ¾"

Nominal size to ...				Max. torque			
DIN 2501		ANSI B 16.5		DIN		ANSI 150 lbs	
DN	PN	in.	lbs	Nm	ft·lbf	Nm	ft·lbf
15	40	½"	150/300	9.8	7.1	5.2	3.8
25	40	1"	150/300	21	15	10	7.2
50	40	2"	150/300	57	41	41	30
80	16	3"	150/300	47	34	70	51
100	16	4"	150/300	67	36	50	36

6 Start-up

A minimum operating pressure (inlet pressure) is necessary for operation of the device.

Process medium	pressure drop : operating pressure
Liquids	1 : 2
Gases (without damper)	1 : 5
Gases (with damper)	1 : 2

Pressure drop: see Flow Tables

The device must be properly installed before it is started up.

1. Test the device connections.
2. To set the flow: pressurize the pipes by slowly opening the shutoff valves. On liquid service, carefully evacuate the pipeline.
3. Check that all components are leak-tight and, if necessary, retighten threaded joints or screw connections.

Applies to gases in particular:
avoid pulsation of the medium.

Basically, vary the flow with the aid of adjusting valves so that the float is not subjected to pressure surges (e.g. from solenoid valves), otherwise the measuring part could sustain damage.

Devices for flowmetering of gases can be equipped with a gas damping system to avoid possible float oscillation due to compression.

Should the float nevertheless tend to oscillate, this can be remedied by installing a throttle valve or suitable aperture plate downstream of the device, see Guideline VDE/VDI 3513 Sheet 3.

A float damping system is recommended for gas measurements.

6.1 Measuring ranges

6.1.1 Version: stainless steel

Size	Stainless steel float Water l/h	Pressure drop mbar	Air m3/h i.N.[1]	Pressure drop mbar
15 / 1/2“	2.5 – 25	26	0.065 – 0.65	21
	4.0 – 40	26	0.1 – 1	21
	6.3 – 63	26	0.15 – 1.5	21
	10 – 100	26	0.22 – 2.2	21
	16 – 160	26	0.36 – 3.6	21
	25 – 250	26	0.55 – 5.5	21
	40 – 400	28	1.0 – 10	21
	63 – 630	32	1.4 – 14	22
	100 – 1000	50	1.8 – 18	38
			2.8 – 28	50
25 / 1“	63 – 630	32	1,4 – 14	24
	100 – 1000	33	2.2 – 22	24
	160 – 1600	34	3.5 – 35	25
	250 – 2500	38	5.0 – 50	26
	400 – 4000	45	8.0 – 80	30
	630 – 6300	103 [2]	11.0 – 110	78
			17.0 – 170	103 [2]
50 / 2“	630 – 6300	74	8.0 – 80	13
	1000 – 10000	77	11.0 – 110	13
	1600 – 16000	84	15.0 – 150	13
	2500 – 25000	104	23.0 – 230	60
			35.0 – 350	69
			60.0 – 600	104
80 / 3“	2500 – 25000	68	35.0 – 350	16
	4000 – 40000	89	40.0 – 400	16
100 / 4“	6300 – 63000	120		
	10000– 100000	220		

Devices used for gas measurement: float damping system recommended!
1) i.N.: = at STP (0°C and 1.013 bar abs.) 2) 300mbar with damping system

6.1.2 Version: PTFE / ceramics

Size	PTFE float Water l/h	Pressure drop mbar	Ceramic float Water l/h	Pressure drop mbar	Air m³/h i.N.[1)]	Pressure drop mbar
15 / 1/2“	2.5 – 25	65	3 – 30	62		
	4.0 – 40	66	5 – 50	64	0.18 – 1.8	64
	6.3 – 63	66	7 – 70	66	0.24 – 2.4	66
	10 – 100	68	13 – 130	68	0.40 – 4.0	68
	16 – 160	72	20 – 200	70	0.65 – 6.5	70
	25 – 250	86	25 – 250	72	0.90 – 9.0	72
	40 – 400	111				
25 / 1“	63 – 630	70	50 – 500	55	1.8 – 18	55
	100 – 1000	80	70 – 700	60	2.2 – 22	60
	160 – 1600	108	110 – 1100	70	3.0 – 30	70
	250 – 2500	158	160 – 1600	82	5.0 – 50	82
			250 – 2500	100	7.5 – 75	100
50 / 2“	400 – 4000	81	450 – 4500	70	14 – 140	70
	630 – 6300	110	630 – 6300	80	20 – 200	80
	1000 – 10000	170	1100 – 11000	110	35 – 350	110
80 / 3“	1600 – 16000	81	1600 – 16000	70		
	2500 – 25000	95	2500 – 25000	85		
100 / 4“	4000 – 40000	100				

Devices for gas measurement: float damping system recommended!
1) i.N. = at STP (0°C and 1.013 bar abs.)

6.2 Materials

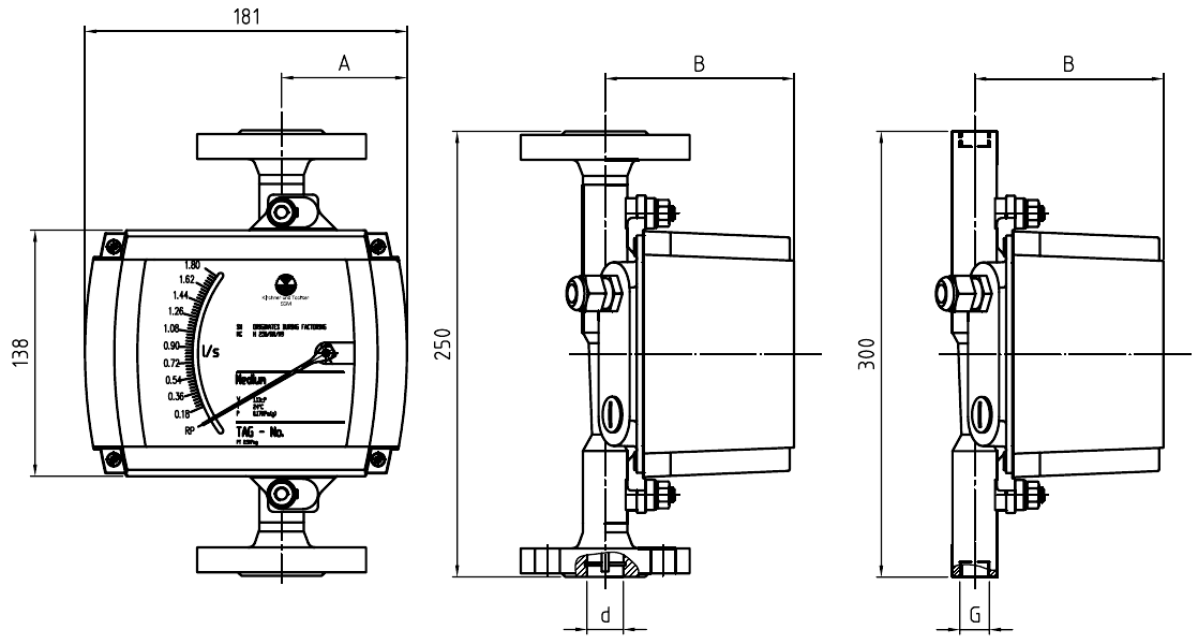
Version	Measuring tube/float	Temperatur	Ambiente
SGM / VA	SS / SS	-80°C ... + 300°C	≤120°C
SGM / C4	Hastelloy C_4/Hastelloy C_4	- 80°C ... + 300°C	≤120°C
SGM / PTFE	PTFE[1)]/PTFE	70°C	≤70°C
SGM / PTFE / K	PTFE[1)]/ceramics	150°C	≤70°C
SGM / TFM / K	TFM[1)]/ceramics	250°C	≤120°C
Indicator:			
Scale casing	Aluminium, enamelled		
Pointer	Aluminium, enamelled		
Scale	Aluminium, coated		
Window	Float glass		

1) Measuring tube of stainless steel (1.4404) with liner

6.3 Technical data SGM

Accuracy class	
Standard (VA/C4)	1.6 to VDE/VDI 3513
alt. (PTFE/ceramics)	2.5 to VDE/VDI 3513
Indicator part	
Scale	in physical units, e.g.: l/h, m3/h
Scale length	90 mm
Turndown ratio	1:10
Type of protection, indicator part Version: SS	IP 67, NEMA 4X
Allowable working pressure	
DN 15, DN 25, DN 50	PN 40
DN 80, DN 100	PN 16
Version: PTFE	
Allowable working pressure	same as SS version
Connections	Flanges to DIN 2501 (EN 1092-1), On request: ANSI B 16.5, JIS, DIN 11851, threaded pipe joint to ISO 228

6.4 Dimensions and weights



6.4.1 Version: stainless steel with flanged connection

		Dim.				Weight kg	
D N	P N	L	A	B	Ø d	DIN flanges	with heating
15	40	250	70.5	107	20	3.5	4.8
25	40	250	70.5	119	32	5.0	6.7
50	40	250	57.5	132	65	8.2	10.4
80	16	250	57.5	148	89	12.2	14.0
100	16	250	57.5	158	114	14.0	16.6

Overall length for devices with female thread to ISO 228: 300 mm; to ANSI B 16.5 (from 3“ / 300lbs): 300 mm

6.4.2 Version PTFE / ceramics with flanged connection

		Dim.				
D N	P N	L	A	B	Ø d	Weight kg DIN flanges
15	40	250	70.5	107	20	3.5
25	40	250	70.5	119	32	5.0
50	40	250	57.5	132	65	10.0
80	16	250	57.5	148	89	13.0
100[1)]	16	250	57.5	158	114	15.0

1) PTFE only

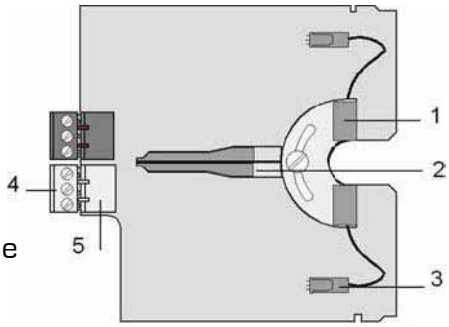
Overall length for devices with female thread to ISO 228: 300 mm; to ANSI B 16.5 (from 3“ / 300lbs): 300 mm

6.4.3 Version: stainless steel with female thread connection

		Dim.				
D N	G	L	A	B	Ø d	Weight kg
15	G ½	300	70.5	107	20	3.5
15	½“ NPT	300	70.5	107	20	3.5
15	¾“ NPT	300	70.5	107	20	3.5
15	G 1	300	70.5	107	20	3.5
25	G 1	300	70.5	119	32	5.0
25	1“ NPT	300	70.5	119	32	5.0

7 Plug-in contact unit IK1, IK2, IKS1, IKS2

The VA flow meter SGM can be equipped with a maximum of two electronic contacts. The contact operates with a slot type initiator which is actuated inductively by the half-round metal vane on the measuring pointer.
The switching points are set by means of a contact pointer, the position of the contact pointer at the same time serving to visually indicate the set limit value.



Contact types:
SC3,5-N0-Y 2-wire technology (NAMUR)
SB3.5-E2 3-wire technology

1 limit contact
2 contact pointer
3 plug connector
4 terminal
5 terminal socket

7.1 Electrical connection

Remove the housing cover of the indicator part to connect the plug-in contact unit.
The terminals (4) are of the plug-in type and can be detached for connecting the cables.
The built-in contact types are specified on the indicator nameplate.

SC3,5-N0-Y limit contacts in 2-wire technology are connected in conformity with DIN EN 50227 (NAMUR).

SB3.5-E2 limit contacts in 3-wire technology require a supply power of 10 to 30 V DC. They can be connected direct to a PLC control system.

Electrical connection of limit contact in 2-wire technology

Terminal assignment for SC3,5-NO-Y

Contact	MIN			MAX		
Plug colour	black			grey		
Labelling	1	2	3	4	5	6
2-wire technology	–	+	–	–	+	–

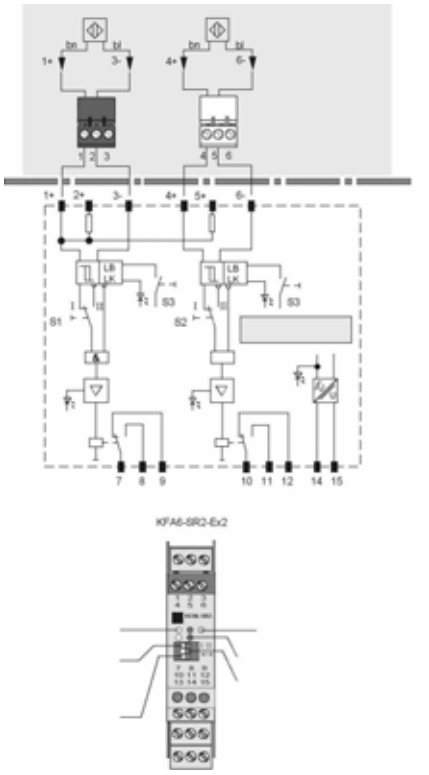
Electrical connection of limit contact in 3-wire technology

Terminal assignment for SB3,5-E2

Contact	MIN			MAX		
Plug colour	black			grey		
Labelling	1	2	3	4	5	6
3-wire technology	+	DC	–	+	DC	–

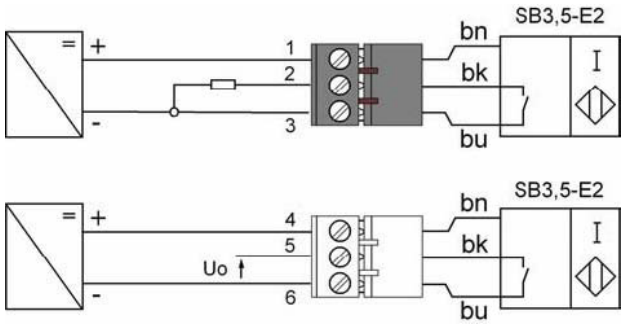
NAMUR

SC3,5-NO-Y



LB : Wire break
LK : Short-line fault

Connection diagram
3-wire SB3,5-E2

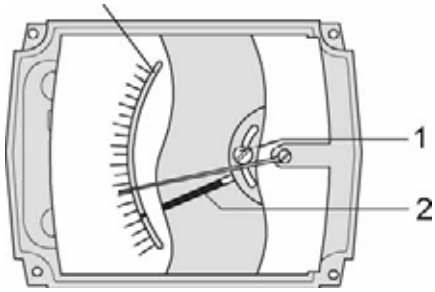


7.2 Setting the limit value

Setting is made directly via the contact pointer (2):

1. Unscrew housing cover
2. Move scale to the side
3. Slightly loosen locking screw (1)
4. Slide scale back up to point where it snaps into place
5. Set contact pointer (2) to the desired switching point.
   After setting, the pointer (2) should be tightened down again with locking screw (1).
6. Replace housing cover and screw down.

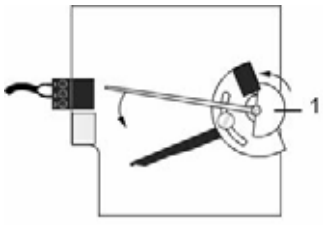
Scale opening



7.3 Switching contact definition

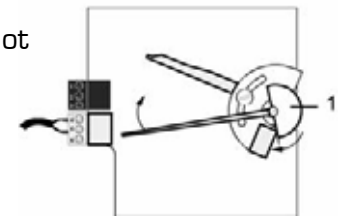
MIN contact

An alarm is generated when the pointer vane (1) dips into the slot. When the pointer vane is outside the slot type initiator, a wire break will also cause an alarm to be initiated.
No wire break identified by SB3,5-E2!
Option: version as Maximum contact
In the alarm status the vane is located outside the slot.
Wire break identification not available in this case.



MAX contact

An alarm is generated when the pointer vane (1) dips into the slot (and dampens this initiator). When the pointer vane is outside the slot type initiator, a wire break will also cause an alarm to be initiated.



No wire break identified by SB3,5-E2!
Option: version as Minimum contact
In the alarm status the vane is located outside the slot.
Wire break identification not available in this case.

In the IK2 / IKS2 version, both contact systems are equipped.

7.3.1 Technical data

	2-wire SC3,5-N0-Y NAMUR	3-wire SB3,5-E2
Switching element function	NC contact	PNP NO contact
Nom. voltage U_0	8 V	10 to 30 V
Current consumption:		
Flag not sensed	≥3 mA	≤0.3 V
Flag sensed	≤1 mA	Ub - 3 V
Continuous current	–	max. 100 mA
No-load current I_0	–	≤15 mA

7.3.2 Electrical data

Built-in equipment	Identification data				
	Ui[V]	Ii[mA]	Pi [mW]*	Ci [nF]	Li [uH]
SC3,5-N0-Y	≤16	≤25	≤64	≤150	≤150
	≤16	≤52	≤169	≤150	≤150
SJ3,5-SN	≤16	≤25	≤64	≤30	≤100

* dependent on the isolation switching amplifier used

Operation of the SC3,5-N0-Y contact requires the use of an isolation switching amplifier, e.g. Pepperl + Fuchs Series KF .. -SR2 ... .

7.4 Installation

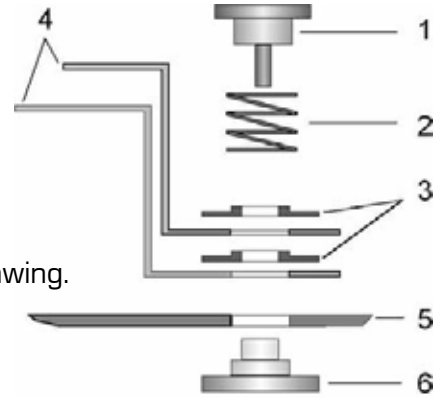
1. Unscrew housing cover,
   (if necessary, remove flow totalizer EMZ)
2. Bring contact pointers (1) together in the middle.
3. Undo locking screw (2) of contact pointers
4. Slide the plug-in contact unit into the third rail
   up to the point where the half-round (3) encloses
   the pointer spindle.

The terminals of the plug-in contact unit are of the plug-in type and can be detached for connection of the cables.
To comply with the IP degree of protection, please consult the directions given in Section 8.1.

7.5 Retrofitting a second contact

The retrofit kit consists of the required contact pointer and integrated contact. The connecting cable is fitted with the integrally moulded plug. To install, it may be necessary to unplug the flow totalizer first.

1. Unplug the contact unit from the module rack.
2. Remove locking screw (1).



⚠ Caution:
Spring (2) is under pressure

5. Assemble contact pointers (4), slide rings (3), spring (2) and locking screw as shown in the drawing.
6. The second ring (Item 3) is already provided in the version with one contact.
7. Insert plug connector of the contact (blue) into the socket on the circuit board.
8. Plug in and connect up the contact unit.

8 Electrical signal output SGM-EM

The indicator part of the SGM-EM with the ESK2A module supplies a current of 4 to 20 mA in two-wire connection that is proportional to the instantaneous flow rate. Transmission is force-free and hysteresis-free. The ESK2A has been factory-calibrated on the basis of the flow measuring range. The calibration values, used for linearization of the indicator, are stored in a memory module (EEPROM). The required power supply is a functional extra-low voltage with protective separation (galvanic) in accordance with VDE 0100 Part 410.
All instruments (indicators, recorders) connected to the measuring circuit are connected in series and together may not exceed the maximum external resistance (see 8.3). The ESK2A features polarity reversal protection.

8.1 Compliance with IP degree of protection

To comply with the IP degree of protection for built-in electrical equipment, please pay attention to the following points:

1. After inserting the connection cable, tighten the cap nut on the cable gland.
2. Close off all unused cable glands with blanking plugs.
3. Do not kink cables directly at the cable gland.
4. Provide a water drip point.
5. Ensure incoming cables are not subjected to mechanical loads.

Cable glands / screwed cable glands:

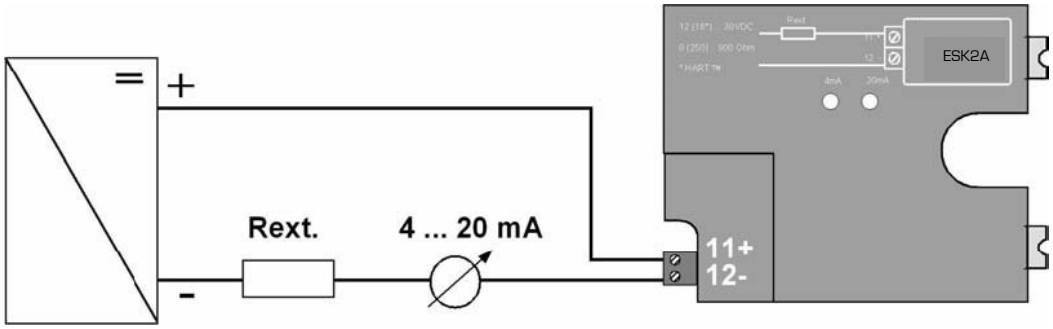
Thread	Material	Wire diameter	Protection*	Comment
M 16x1.5	PA	5 - 10 mm	IP 68 - 5 bar	Standard
M 20x1.5	PA	8 - 13 mm	IP 68 - 5 bar	
M 16x1.5	nickel-plated brass	5 - 9 mm	IP 68 - 5 bar	
M 20x1.5	nickel-plated brass	10 - 14 mm	IP 68 - 10 bar	

* Degree of protection restricted to screwed cable gland only

8.2 Electrical connection SGM-EM

The connection terminals of the ESK2A module in the SGM-EM indicator part are of plug-in design and can be removed to connect up the cables.

Terminal connection	pluggable; ≤ 2,5 mm²
Type of connection	2 wire current sink - polarity reversal protection only for connection to extra-low voltage according to SELV or PELV



Be careful by conceptual design in connection with other instruments (e.g. supply units or process control engineering).
It is possible that internal connection of ground, earth-connections or equipotential bonding will generate voltage drops, which leads to malfunction of the instrument. For this case a signal processor is required.

Connections at hazardous locations

Before installation at hazardous location read the Supplementary Installation and Operating Instruction.

8.3 Technical data ESK2A

Power supply	24 V Dc
Measuring signal	4 to 20 mA for 0 to 100% flow value > 20.8 mA for alarm status
Power effect	< 0,1%
Ext. resistance dependence	<0,1%
Temperature effect	<5µA/K
Max. ext. resistance/load	250*... to 800 ohms
Ambient temperature	-25° C...+60° C

* These values are to be conformed to as minimum values in the case of HART™-communication.

8.3.1 Self monitoring - diagnostics

Setting-up operation as well as operation there are several cyclic diagnostic functions to get operational reliability. An error detection generates an output signal (high) of ≥ 21 mA.
Additional information are given via HART™ command #48. Information and warnings will not generate an error output current.

Diagnostic functions (control):

- Plausibility of FRAM data
- Plausibility of ROM data
- Working range of internal reference voltages
- Signal detection of the measuring range of the magnet sensors
- Temperature compensation of the magnet sensors
- Calibration corresponding the application
- Plausibility of counting value
- Plausibility of physical unit and selected unit

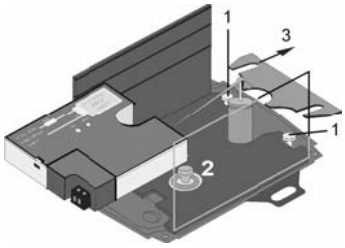
8.4 Installation / replacement ESK2A

8.4.1 ESK2A as replacement:

The ESK2A has been standardized by the factory, so that e.g. a replacement can be carried out without requiring recalibration. If necessary, the zero and the 100% value can be readjusted.
Loss of accuracy has to be expected (Class 1.6 → Class 2.5).

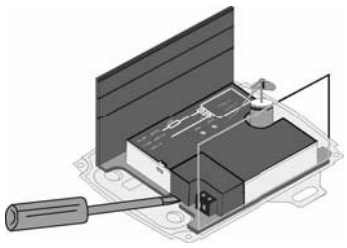
8.4.2 Installing an ESK2A

1. Assembly is based on the plug-in technique.
2. Insert the push-in lugs of the ESK2A under the two pins of the baseplate (1).
3. Using slight pressure, press the ESK2A on to the spring bolt (2) until it locks into place and fastens the ESK2A securely.
4. When the ESK2A is retrofitted, the fixing strap (3) is automatically pushed out and can be removed.



8.4.3 Replacing an ESK2A

1. Replacement of the EM requires recalibration if compliance with the accuracy class is required. Without recalibration, loss of accuracy has to be expected (Class 1.6 →Class 2.5).
2. The calibration data are stored in the memory module used.
3. Disconnect the EM from supply.
4. Use a screwdriver to lever up the EM and pull it out.



8.4.4 Setting the zero and 100% value on the EM

The zero and the 100% value can be set on the ESK2A by means of built-in pushbuttons. When the pushbutton behind the "4" is depressed for longer than 5 seconds, the measured value will skip to 4mA.
The ESK2A is then in the zero adjustment mode. Optionally, press button "4" for downward correction or button "20" for upward correction, until the zero amounts to exactly 4.00mA .
In the same way, the 100% value can be set when pushbutton "20" is held pressed for more than 5 seconds.
If no button is pressed for 10 seconds, the ESK2A will automatically go to its measuring mode and include the corrections made. These corrections are stored and remain valid even when the ESK2A is switched off. These settings have no effect on the linearity of measurement.

8.4.5 Retrofitting an ESK2A, and its calibration

Retrofitting is only possible if the indicator had been supplied "with EM preparation". The required calibration data are specified on the indicator cover.
To carry out linearization requires the conversion program KroVaCal and a HART™ modem that is connected to the serial interface of the PC.
Linearization of the ESK2A is carried out in 3 steps:

- Recording of the measuring points
- Linearization of the characteristic by means of the PC
- Storage of the linearization data in the EEPROM via the serial interface

Recording of measuring points:
Recording of the measuring points should be carried out at the main scale marks in order to obtain the best possible linearization result.
These points can be approached in three different ways:

dynamic setting:
setting the flow value (original medium or a reference medium established by conversion)

static setting:
lifting up the float (not the pointer!) until the pointer indicates the main scale value.

For all approached measuring points, both the respective flow value and also the associated current value of the ESK2A should be noted down.

8.4.6 Changes and conversion ESK2A

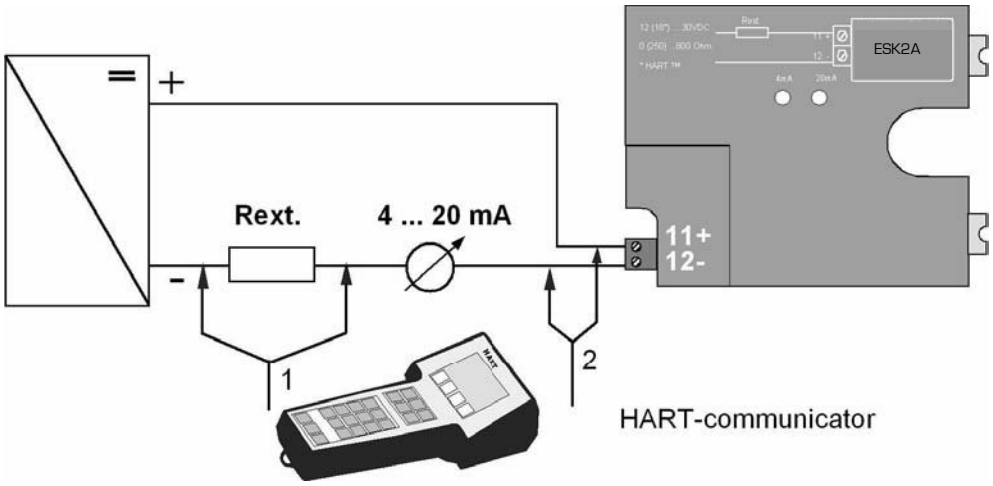
If any change is required to the measuring range, the process temperature, the process medium, the density, the viscosity, or the pressure, this can be carried out by Kirchner und Tochter.

A. Kirchner & Tochter GmbH Dieselstraße 17 · D-47228 Duisburg
Fon: +49 2065 9609-0 · Fax: +49 2065 9609-22 Internet: www.kt-web.de · e-mail: info@kt-web.de

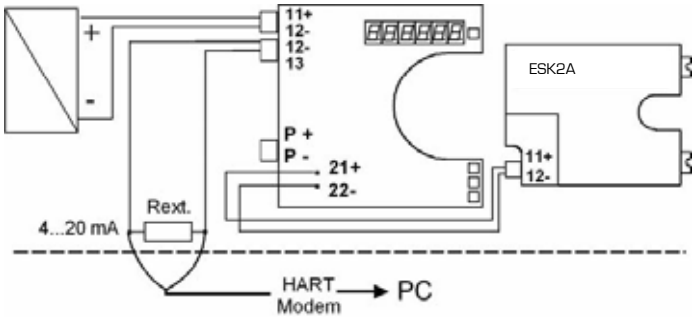
8.5 Hart™ communication with the ESK2A

HART™ communication is not obligatory in order to operate the ESK2A. If HART™ communication is carried out with the EM, it will in no way affect the analog transmission of measured values (4...20mA).... HART™ Protocol revision 5.9

Exception: in multidrop operation. In multidrop operation a maximum of 15 devices with HART™ function can be operated in parallel, their current outputs being switched to the inactive state (I approx. 4mA).



Where a HART™ communicator (Type Fisher Rosemount, Model 275) or a PC with HART™ modem is used, the series-connected resistance (Rext.) must be greater than 250 ohms. In this mode, the supply power should be a minimum of 18 V. The communicator or PC, whichever is applicable, is connected up as shown in the drawing above.
It can optionally be operated via the power terminals of the ESK2A (2) or via a series-connected external resistor (1).
When the ESK2A is operated together with the totalizer, HART™ communication is possible in accordance with the following wiring diagram:
The totalizer itself cannot be read or operated by means of the HART™ communication !



9 Electrical signal output EM-PA Profibus

9.1 Bus cable

The definitions of the FISCO Model apply only provided the bus cable used conforms to the following specifications:

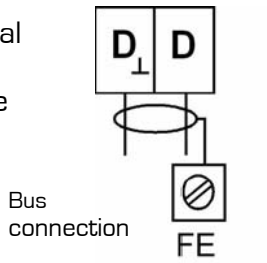
R´ = 15...150 Ohm/km
L´ = 0,4...1 mH/km
C´ = 80...200 nF/km.

9.2 Shielding and earthing

For optimum electromagnetic compatibility of systems it is extremely important for the system components, and particularly the bus cables connecting up the components, to be shielded and that, electrically speaking and if at all possible, these shields form a continuous envelope.

9.3 PROFIBUS-PA connection

For connection of the bus cable, see Figure on the right.
Connect the cable cores to D and D⊥ (polarity reversal has no effect). The cable shield should be connected with minimal length to the functional earth FE.
The equipotential bonding conductor should be connected to the device (if necessary, via the outer earth U-clamp terminal of the indicator part).



9.4 Technical data EM-PA

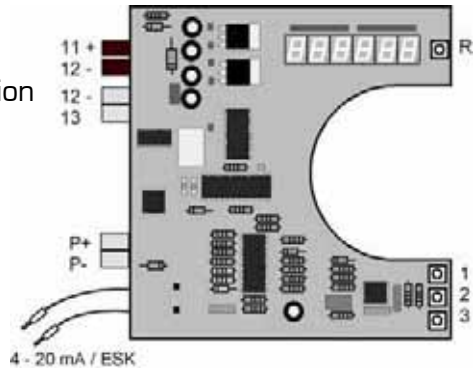
9.4.1 Hardware

Physics	to IEC 1158-2 and the FISCO Model
Supply voltage via 2-wire	9 to 32 V DC
Bus connection:	
Base current	12 mA
Starting current	< base current
FDE	< 18 mA
Accuracy to VDI / VDE 3513	1.6
Measured value resolution	< 0.1% of upper range value
Temperature effect	< 0.05% / K of upper range value

9.4.2 Software

GSD	(device master file) supplied on diskette
Device profile	complete realization of Profile B, V3.0
Function blocks	
Flow (AI0)	optionally for volume or mass flow rate Default units: Qv [m3/h]; Qm [kg/h]
Totalizer (TOT0)	Volumetric meter - default unit: [m3]
Totalizer (TOT1)	Mass flow - default unit: [kg]
Address range	0-126, default 126 (set slave address is supported)
SAP`s	Service_Access_Points 1
DD	Device-Description DD for PDM
Operator control	via Profibus-PA (no local operator control)

10 Flow totalizer EMZ



The flow totalizer EMZ in 3-wire technology can be built into the indicator part in combination with the electrical current output EM.

⚠ The flow totalizer EMZ is not suitable for hazardous environments.

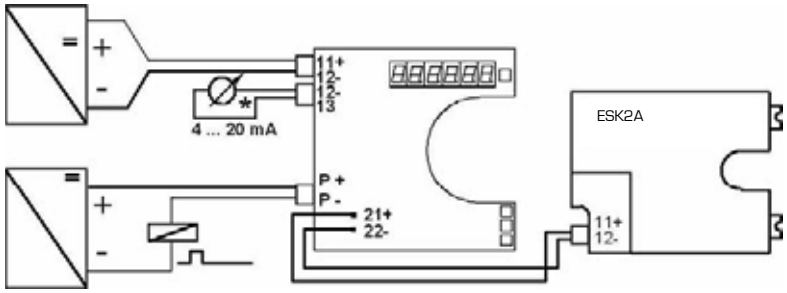
A 6-digit display indicates the total flow value, and can be switched over to the instantaneous flow value in 0 ... 100% . Supply 11/12 and current loop 12/13 are not galvanically separated! If the current loop is not needed, a shorting jumper has to be connected to terminals 12/13.

A galvanically separated pulse output P+ and P- supplies one pulse for every counter advance indicated. If the pulse output is not needed, its terminals may remain unused. Data are saved automatically in the event of a power failure.
The flow totalizer has been factory-set according to data specified in the order and requires no adjustment! The conversion factor for the totalizer, unless otherwise ordered, is set relative to the measuring range so that the summated value (in Liter, m^3 etc.) can be read directly.

	Display	Comment
Button 1	Flow in %	Totalizing continues in the background.
Button 2	Summated value	e.g. Litres or m^3
Button 3	Conversion factor	Standard: 10% of Q100
Reset R	The stored total value is deleted	

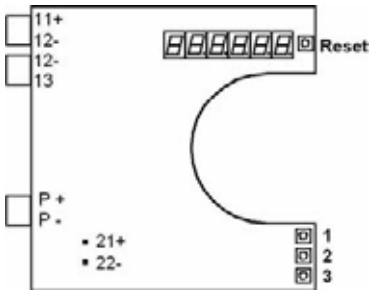
10.1 Electrical connection

The supply power required is a protective extra-low voltage (PELV) to VDE 0100 Part 410. All instruments (recorders, indicators, etc.) connected to the measuring circuit are connected in series and may not exceed the max. external resistance of 720 ohms. The supply voltage U_s of max. 30 VDC is connected to terminals 11+ and 12- at the totalizer module.



* When galvanically separated current evaluation modules (PLC) are used at terminals 12/13, the supply power (11/12) should not be earthed.
When the EM signal is needed only for the totalizer, a shorting jumper is required at terminal 12/13.

10.2 Settings, display mode



Reset Deletes the stored summated value

Button 1
Example

flow
in [%]

with decimal point and one decimal place

Button 2
Example

totalizing
counter

without decimal points

Taste 3
Example

conversion factor

The first two decimal points light up

Conversion factor

The conversion factor is factory-set and always based on the measuring range so that the current summated value can be read out at any time. Conversion factor = 10% of the full-scale range. This allows the summated value to be read from the display directly 1:1. If the measuring range is not known, e.g. spare parts delivery, a conversion factor of 1000 is factory-set.
If a change or correction to the conversion factor is necessary, this factor can be changed by pressing **Button 2 at the moment the supply voltage is switched on**.
A factor between 1 and 1099 can be set using Buttons 1 to 3. Factor 0 is not defined.
Button 1: ones
Button 2: tens
Button 3: hundreds and thousands
The Reset button is used to confirm and terminate entries. The totalizer then goes into the display mode previously selected.

Totalizer content

The totalizer content is saved in the case of a power failure and can be set to zero with the RESET button during operation.
Totalizer overflow is signalled by all decimal points lighting up. Zero reset is carried out by pressing the RESET button.

Adjustment

Adjustment is not required since the totalizer has been factory-adjusted to the current measuring range.
Should nevertheless readjustment be required, this can be done as follows:

1. at the moment of switching on, keep the RESET button depressed until three decimal points light up.
2. Set 4.00 mA and then press Button 1 until digit 0 appears
3. Set 20.00 mA and then press Button 3 until digits 100 appear
4. Exit the adjustment mode by pressing Button 2.

10.3 Technical data, totalizer EMZ

Auxiliary power	24 V DC
Rext. current loop	0 ... 600 ohms
Power consumption	max. 2 W
Max. external resistance / load Pulse output	0 to 720 ohms, dependent on supply voltage terminal P+, P-
Auxiliary power	24 V DC
Max. current	50 mA
Max. power loss	250 mW
T on	fixed pulse width 80 ms
T off	dependent on flow
U on	Ub – 3 V
U off	0 V
Pulse value	1 pulse = 1 display totalizer advance = 1 flow unit (1 Litre , 1 m^3 ....)
Ambient temperature	- 25°C to + 65°C
Indication error	< 1% of value indicated, one display unit at maximum

11 Maintenance and cleaning of the flow meter

Within the scope of routine operational maintenance of the plant and the pipelines, the flow meter should also be inspected for dirt accumulation, signs of corrosive wear, mechanical wear and damage to the measuring tube and the indicator. We recommend that inspections be carried out at least once a year. To clean the device it must be removed from the pipeline.

Attention!
Pressurized pipes to be depressurized before removing the measuring part. In connection with devices used for flow measurement of aggressive media, appropriate safety precautions should be taken in regard to residual liquids in the measuring part. New gaskets should always be used when the measuring part is reinstalled in the pipeline. Electrostatic charges should be avoided when surfaces (e.g. viewing window) are cleaned!

12 Service, retrofits and conversions

All devices with defects or deficiencies should be sent direct to our repair department. To enable our customer service facility to deal with complaints and repairs as quickly as possible, we would kindly request you to coordinate the return of devices with our sales department, Tel. +49 (0) 2065-96090.

The variable area flow meter with indicator part can be retrofitted with a number of components:

- float
- float damping system
- eddy-current brake
- contacts
- ESK2A, when indicator ordered "with EM preparation"
- totalizer EMZ

Retrofitting of the EM-PA can only be carried out by means of a recalibration.

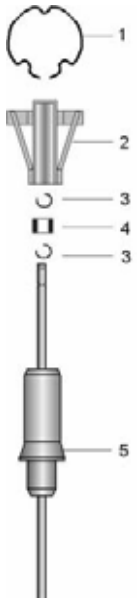
An assembly kit is also available to enable the SGM device to be converted to a high-temperature version.

12.1 Replacement of the float

1. Remove the device from the pipeline.
2. Remove the upper circlip from the measuring part.
3. Remove upper float stop and float from the measuring part.
4. Insert new float into the centre hole in the lower float stop and place it together with the upper float stop in the measuring part. Note that the upper float guide rod must be guided through the centre hole of the float stop.
5. Insert the circlip in the measuring part.
6. Re-install the device in the pipeline.

Caution!
An additional measuring error is to be expected unless recalibration is carried out.

12.2 Retrofitting a float damping system



The complete retrofit kit consists of:

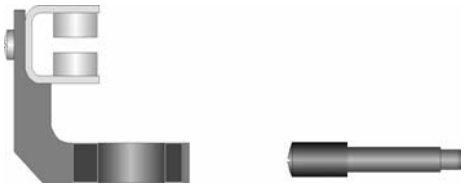
- 2 circlips (3)
- 1 collet (4)
- 1 damping cylinder with float stop (2)

Installation:

1. Remove device from the pipeline.
2. Remove upper circlip (1) from measuring part.
3. Take upper float stop and float (5) out of the measuring part.
4. Fasten circlip (3) in the lower groove on the float guide rod.
5. Slide ceramic collet (4) on to the float guide rod and fasten with the circlip (3) in the upper groove.
6. Insert float in the lower float guide in the measuring part.
7. Install the supplied damping cylinder with integrated float stop (2) in the measuring part.
8. Insert upper circlip (1).
9. Re-install device in the pipeline.

12.3 Retrofitting the eddy-current brake

In connection with the indicator part with EM / current output and contactors, be aware of the fact that short-time movements of the pointer may occur when the eddy-current brake is being installed. These may possibly generate a false alarm or cause peaking of the current output.

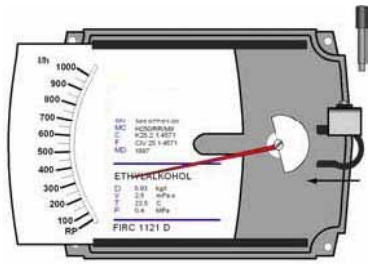


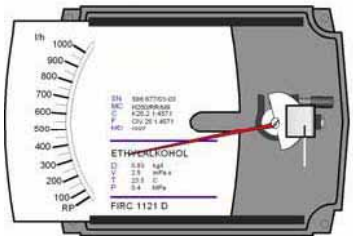
Brake Clamping

screw
The eddy-current brake consists of two parts:
The brake with retaining ring can clipped on to the pointer cylinder independent of built-in components such as EM, contacts or totalizers.

When mounting the brake, bear in mind that the slot between the brake magnets measures only approx. 3 mm und the aluminium pointer vane has a material thickness of 1 mm.
Check that the pointer vane can be moved between the magnets without coming into contact with them.

Slightly turn the eddy-current brake clockwise and screw in the clamping screw. Adjust the brake as shown on on the right and tighten down the clamping screw.





12.4 Flow totalizer EMZ

In combination with the current output EM, the flow totalizer can also be retrofitted in the indicator part

When ordering the totalizer as a retrofit kit, please specify the device data (as shown on the right) as well as the measuring range. These data will enable the new scale with totalizer display cutout to be prepared in readiness for installation! The flow totalizer is then preset with the conversion factor based on the measuring range.

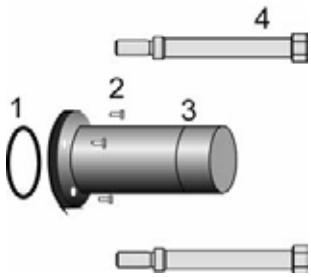
Installation:

1. Slide out the existing scale.
2. Slide the flow totalizer unit on to the middle rail of the module rack.
3. Then slide the new scale into the module rack.
4. While sliding over the totalizer display, lift the scale slightly until the scale cutout forms a frame around the totalizer display.

12.5 High-temperature version, indicator part

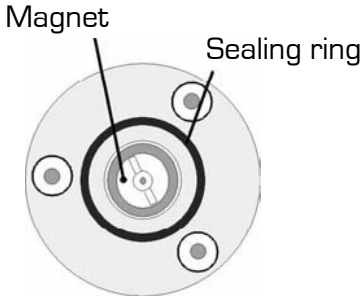
Items supplied:

- 1 no. sealing ring (1)
- 3 nos. fastening screws (2)
- 1 no. HT extension (3)
- 2 nos. distance bolts (4)



12.5.1 Installation

The device can remain in the pipeline.

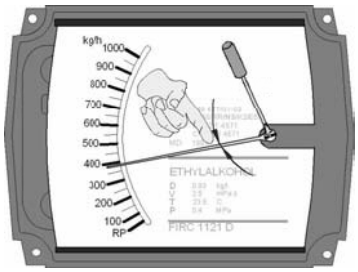


1. Note pointer position before removing indicator!
2. Detach both nuts fastening the indicator.
3. Remove indicator with its fastening clips from the measuring part.
4. Remove plastic cap from HT extension.
5. Position ring (1) exactly in the groove on the HT extension.
6. Fasten HT extension with the three screws (2) to reverse side of indicator.
7. Screw distance bolts (4) to the threaded pin on measuring part and tighten down (width A/F: 14 mm).

12.6 Mounting the indicator

Position the indicator with fastening clips on the distance bolts (4), fit washers and tighten down with nut (max. 8 Nm).
Caution: be aware of mounting position of the fastening clips:

DN15, DN25 DN50, DN80, DN100



Compare the position of the pointer with the previously recorded value indicated. If there is any deviation:

1. Use a screwdriver to hold the pointer spindle (see Figure).
2. Move the pointer to the recorded value counter to the friction forces of the measuring pointer mount.

12.7 Disposal

Please help to protect the environment by disposing of the workpieces used in accordance with current regulations or by continuing to use them.

The variable-area flow meter SGM meets all requirements of the EC Directives applicable to the product.

- EMC Directive (89/336/EEC)
  EN 61326 : 03/1997
  +A1 : 04/1998
  +A2 : 03/2001
- ATEX (94/9/EC)
  EN 50014:1997 +A1 +A2
  EN 50020:1994
- DGRL (97/23/EC)

The Kirchner equipment has been tested in compliance with the applicable CE-regulations of European Community.
The respective declaration of conformity is available on request.
The KIRCHNER QM-System will be certified in accordance with DIN-EN-ISO 9001:2000.
The quality is systematically adapted to the continuously increasing demands.
An appropriate declaration of conformity will be provided on request.