KROHNE

 7.02100.39.00

GR

Installation and Operating Instructions

Variable area flowmeter

H 250/M9
H 250/M7

Note

For devices with Approval No. PTB 01 ATEX 2181: please note the Supplementary Installation and Operating Instructions H 250/M9-EEx, Ident. No. 7.02242.21.00.
Safety limits differ from those for the version with PTB Ex-97.D.2171 certification.

Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications engineering

Engineering systems & solutions

Switches, counters, displays and recorders

Heat metering

Pressure and temperature

Product liability and warranty

H250 variable-area flowmeters are designed for measuring the volumetric or mass flow rate of liquids, gases and vapour.

Special codes and regulations are applicable to their use in hazardous areas.

Responsibility for suitability and designated use of these flowmeters rests solely with the operator.

Improper installation or operation of the flowmeters may lead to loss of warranty. In addition, the “General conditions of sale" forming the basis of the purchase contract are applicable.

If flowmeters need to be returned to KROHNE Messtechnik, for instance for repair, please take note of the information given at the end of this manual.

Items included with supply

The H 250 variable-area flowmeter, in the version as ordered, includes the supply of:

- installation and operating instructions
- declaration of conformity for ATEX
- but excludes installation material (stud bolts, flange gasket, cabling)

Special certificates (supplied to order only)

- report on factory settings
- test certificate to EN 10204:
- hydrostatic test, dye penetration test, radiographic test, leak-tightness test, ultrasonic test, helium leak detection.
- cleaning to factory specification.

CAUTION

Mounting, installation, start-up and maintenance work may only be carried out by personnel trained in explosion protection.

Maintenance work of a safety-relevant nature within the meaning of explosion protection may only be carried out by the manufacturer, his authorized representative or under the supervision of authorized inspectors

NOTE

With combustible and readily flammable products, it is not permitted to use easily removable connections such as threaded sockets to DIN 11851; SMS; Tri-Clamp (e.g. DIN 32676; ISO 2852 Clamp).

Table of contents
Variable-area flowmeter H 250 with mechanical indicator

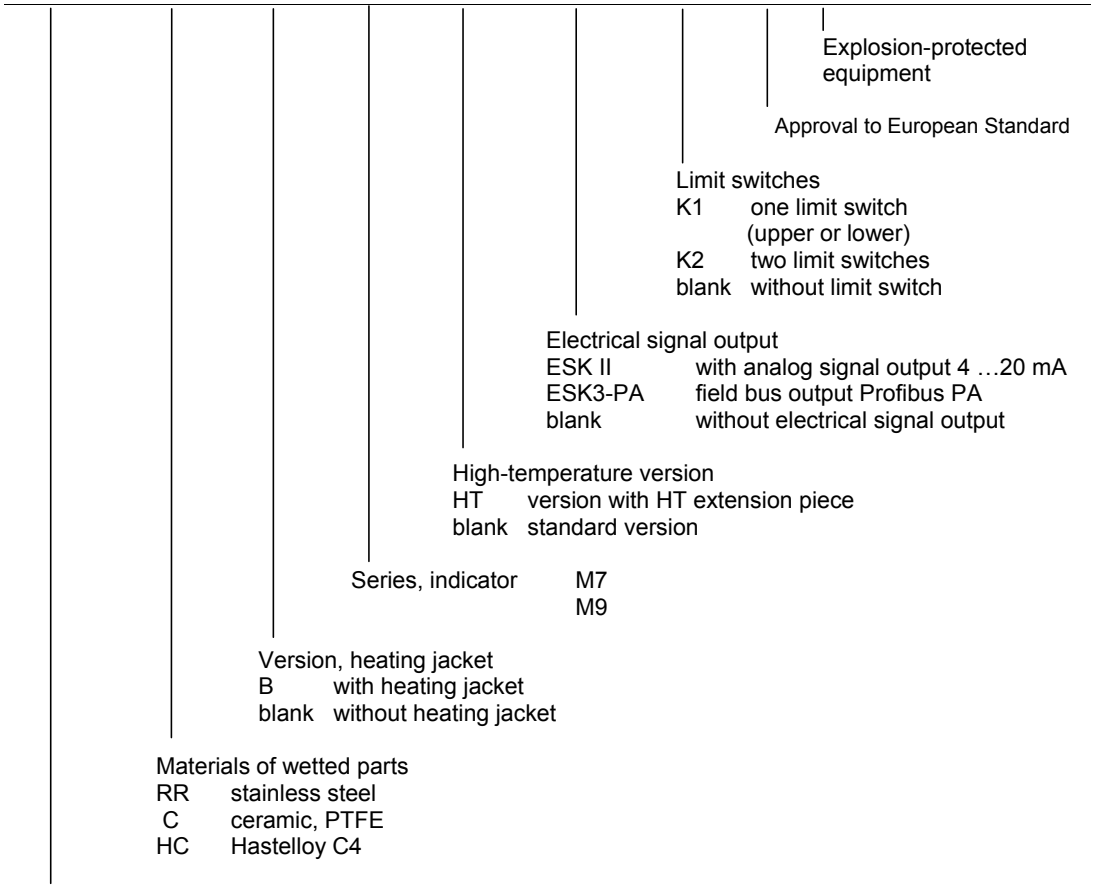
0 General

0.1 Type code

The type code is made up of the following elements: [1)]

Example

H250 / RR / - / M9 / - / ESKII / K1 - E Ex



(1) places for items not needed may be omitted from the type code

0.2 Marking

The type designation of the complete flowmeter is marked on the nameplates, reproduced below, that are attached to the indicator section (see also type code).

Marking of electrical variant

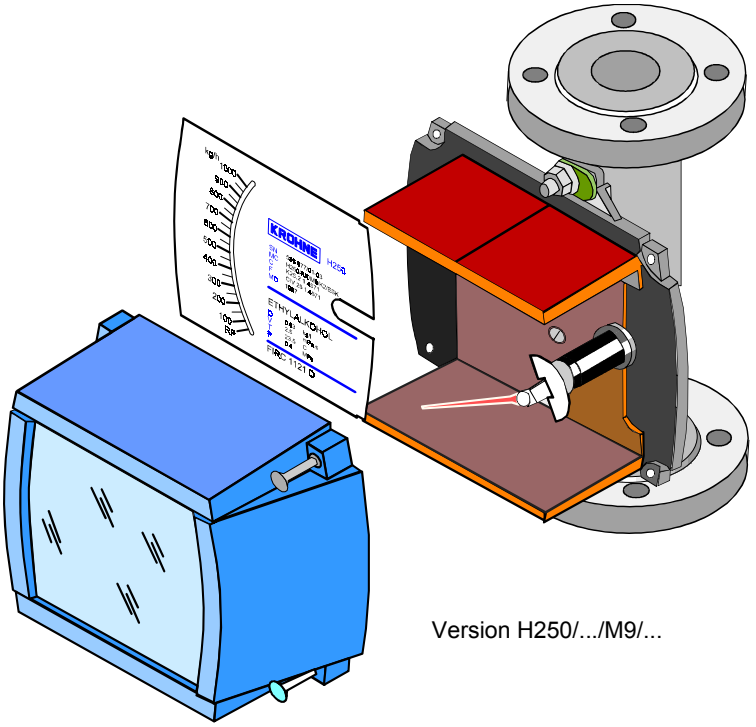
SN: 2/197270.001
SO: 704159/010
KO: 101704159
V251423311011200002510000
AC: P010104111

Marking of mechanical variant

SN: 2/195034.001
SO: 700276/010
KO: 144360725
V251423782010000000000000
AC: P010103958

SN:	Serial number
SO :	Sales order / item
KO:	KROHNE order
V251 … :	Product configurator code
AC:	Article code
MD:	Year of manufacture
PS:	max. operating pressure
TS:	max. operating temperature
Tag-No.	Measuring point identifier
0044	Ident number of controlling agencies under EC pressure equipment directive 97/23/EC/DGRL/PED

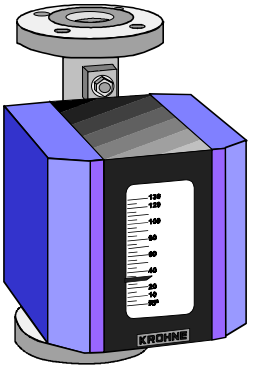
Variable-area flowmeters H 250
Modular all-metal flowmeter



Version H250/.../M9/...

0.3 Description

In its basic version, the H 250 flowmeter consists of a measuring section and a local indicator. The indicator can optionally be equipped with electrical add-on equipment.
The H 250 flowmeter is designed for the flowmetering of liquids, gases and vapour, and operates on the float principle. The measuring section features a tapered metal tube or a standard orifice plate made of high-purity Al_2O_3 ceramics, in which an appropriately shaped float is allowed to move freely up and down. Depending on the flow rate, the float will assume a certain vertical position that is transmitted by magnetic coupling to an indicator. The flowmeters are particular suitable for difficult application, operating and environmental conditions.
The M7 indicator features a two-axis indicating system to allow linear reading of the flow on the scale. All built-in components are readily accessible through two covers on the side of the housing.



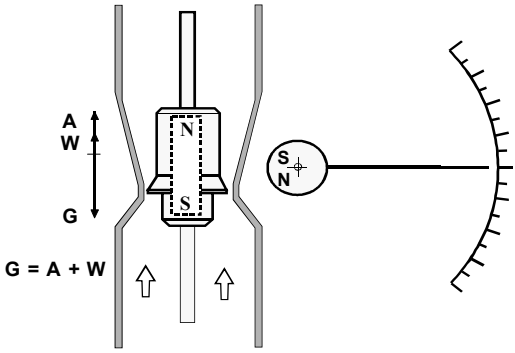
Version H250/.../M7/...

0.4 Operating principle

The flowmeter operates on the float measuring principle. The H 250 measuring section features a tapered metal tube, or a standard orifice plate, in which an appropriately shaped float is allowed to move freely up and down.

The flowmeters are designed to be installed in a vertical pipe run, with flow from bottom to top.

The guided float will assume a certain vertical position such that buoyancy A and form drag W are in equilibrium with weight G (G = A + W) to form a flow-dependent annular gap.



Flowmeters for gas and vapour are calibrated for a specific pressure. If gas is discharged into the atmosphere downstream of the flowmeter, the gas pressure will drop at the float and cause incorrect measured values. The operating pressure will then be inconsistent with the calibrated pressure specified in the order. In such operating conditions, fit a valve downstream of the flowmeter to set the required operating pressure. The gas will then expand in the valve.

1 Installation of variable-area flowmeters H250

1.1 Installation requirements

The actual system operating pressure must not exceed the operating pressure specified in the order.
The pressure rating stamped on the measuring section flange is not necessarily equal to the test pressure (see order documents and instrument scale).

- Ensure **material** of the wetted parts is **compatible** with the process fluid (for list of materials, refer to Section on Materials for device versions)
- **Ambient temperature and process temperature** may not exceed specific maximum values (see Technical data H250).
- The variable-area flowmeter **must** be installed **vertically** in the pipeline (float measuring principle, flow from bottom to top).
- **The nominal size of the flowmeter flanges** should be the same as that of the pipeline.
- To avoid **strain** caused by the pipeline, mating flanges should be located in line with the pipe axis and parallel to each other.

1.2 Preparation of the pipeline

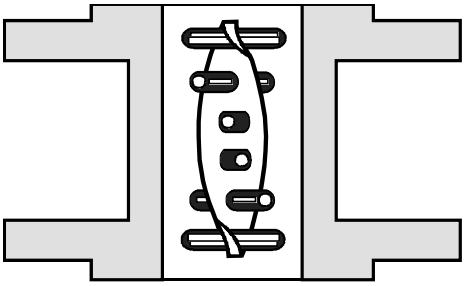
- Suitably support the pipeline to avoid **pipe vibration** and minimize axial load on the flowmeter.
- Recommended are: a straight unimpeded inlet run of 5 x DN (meter size) upstream of the flowmeter and a straight outlet run of 3 x DN downstream of the flowmeter.
- Locate **shutoff and control valves** downstream of the flowmeter.

  Recommendations for installation: see also VDE/VDI Code of Practice 3513, Sheet 3.
- Where combustible and readily flammable products are concerned, it is not permitted to use easily removable connections such as threaded sockets DIN 11851, SMS, Tri-Clamp (e.g. DIN 32676 Clamp; ISO 2852 Clamp).

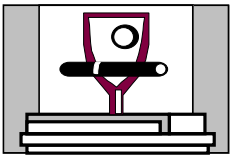
1.3 Installation in the pipeline

- When installing, make sure that **magnetic fields** caused by other locally installed equipment (e.g. heavy-current cables) will not affect measuring results.
- **Immediately prior to installation,** check that the flowmeter is free from foreign bodies.
- The flowmeter should not be subjected to any tensile or compressive forces stemming from the pipeline.
- **If magnetic filters are used:** mounting dimension plus 100 mm for Type F and mounting dimension plus 50 mm for Type FS filters, excluding gaskets.
- **Magnetic filters** are required when the process fluid contains ferromagnetic particles. The magnetic filter should be installed upstream of the flowmeter. The filter contains bar magnets in helical arrangement for optimum efficiency at low pressure losses. All magnets are coated with PTFE as protection against corrosion. Two versions are available:

Type F Adapter with flange
overall length 100 mm



Type FS Adapter without flange
overall length 50 mm



for all nominal sizes; material 1.4571 and others

- Select **bolts and gaskets** (customer supply) in keeping with the flange pressure rating and operating pressure.
  Also take note of corrosion resistance and thermal stability.
  The inside diameter of the flanges deviates from the standard dimensions (see Sect. Dimensions and weights). Enlarge the flange gaskets to the appropriate size.
- **Align the gaskets,** tighten nuts using the torques specified for the relevant pressure rating.
- **PTFE** is deformable under pressure in the cold state; therefore, for measuring sections with PTFE liner and those with **ceramic** liner and PTFE sealing face, tighten the flange bolts using the following max. torques only:

Nominal size to				Stud bolts			Max. torque			
DIN 2501		ANSI B 16.5		DIN	ANSI		DIN		ANSI	
DN mm	PN	inches	lbs		150 lbs	300 lbs	Nm	ft·lbf	150 lbs	
									Nm	ft·lbf
15	40	½“	150/300	4 x M 12	4 x ½“	4 x ½“	9.3	6.7	3.5	2.5
25	40	1“	150/300	4 x M 12	4 x ½“	4 x 5/8“	22.0	15.9	6.7	4.8
50	40	2“	150/300	4 x M 16	4 x 5/8“	8 x 5/8“	55.0	39.8	24.0	17.4
80	16	3“	150/300	8 x M 16	4 x 5/8“	8 x ¾“	47.0	34.0	43.0	31.1
100	16	4“	150/300	8 x M 16	8 x 5/8“	8 x ¾“	39.0	28.2	34.0	24.6

10 Nm ~ 1.0 kpm ~ 7.23 ft·lbf

1.4 Conformity with IP protection category requirements for built-in electrical equipment

To conform to IP protection requirements, please note the following:
M9 indicator: cable diameter 5 to 10 mm. After inserting the connecting cable, tighten down union nut on the cable gland.

M7 indicator: cable diameter 8 to 13 mm. If the fit of incoming cables is excessively tight, remove the appropriate ring from the seal on the cable entry.

- Do not remove blanking plugs from unused cable glands.
- Do not kink cables directly at the cable gland.
- Provide a water drip point (U bend in cable).
- Do not expose incoming cables to mechanical loads. See Description of electrical add-on components for M9 indicator, Sect. 9, and for M7 indicator, Sect. 15.

2 Start-up

A transport lock is not required for the M9 indicator.

- Movable parts of the M7 indicator system are fixed in place with a “transport lock” (see Technical Data M7). Remove before start-up.
- Operation of the flowmeter requires a specific minimum operating pressure (inlet pressure).

Product	Pressure loss : operating (inlet) pressure
Liquids	1 : 2
Gases (without damper)	1 : 5
Gases (with damper)	1 : 2

For pressure losses (see start-up H 250), flow tables

- On gas service, a damper (see Sect. 8.2) for TIV floats is recommended under the following conditions (only for H250/RR and H250/HC (Hastelloy C4)).

Meter size to		max. operating (inlet) pressure
DIN 2501	ANSI B 16.5	
DN mm	inches	bar
15	½	≤ 0.3
25	1	≤ 0.3
50	2	≤ 0.2
80	3	≤ 0.2

- DIV floats for gas service must always be equipped with a float damper (see Sect. 8.2).
- Avoid pulsating flow conditions.
- During operation, the float is subjected to systematic instability which will cause unsteadiness of the pointer within the range of the accuracy class (according to VDI 3513). If there is no such dynamic response, this means that either the pointer mechanism is defective (check with external magnets) or that the float is not functioning.

2.1 Measurement of liquids

- Vent the pipeline carefully during start-up to avoid water hammer.
- Open valves slowly!

2.2 Measurement of gases

- Increase pressure slowly up to operating pressure.
- Basically, vary the flow rate with the aid of adjusting valves so as to prevent the float from accelerating up to the stop (e.g. in the case of solenoid valves) and possibly damaging the measuring section.
- Flowmeters for measuring the flow of gases may be equipped with a gas damper in order to avoid possible compression-induced oscillation of the float.
- A float damper can also be retrofitted by the user (see Sect. 8.2).
- Should the float nevertheless tend to oscillate, this condition can possibly be rectified by installing a throttle valve or an appropriate orifice plate downstream of the flowmeter.

3 Flow tables

3.1 H 250/RR, H 250/HC (Hastelloy C4)

Float material	CrNi steel, Hastelloy C4	
Float shape	Water	CIV, DIV
	Air	TIV, DIV
Reference conditions	Water	at 20°C
	Air	at 20°C; 1.013 bar abs.

100% flow values, turn-down ratio 10:1

Meter size		Cone No.	Water l / h		Air m^3/h		Max. pressure drop mbar		
DIN	ANSI								
DN	inches		CIV	DIV	TIV *	DIV	CIV	TIV	DIV
15	1/2"	K 15.1	25	-	0.7	-	26	21	-
		K 15.2	40	-	1.0	-	26	21	-
		K 15.3	63	-	1.5	-	26	21	-
		K 15.4	100	-	2.2	-	26	21	-
		K 15.5	160	-	3.6	-	26	21	-
		K 15.6	250	-	5.5	-	26	21	-
		K 15.7	400	-	10	18	28	21	38
		K 15.8	630	1000	14	28	32	22	50
25	1"	K 25.1	630	-	14	-	32	24	-
		K 25.2	1000	-	22	-	33	24	-
		K 25.3	1600	-	35	-	34	25	-
		K 25.4	2500	-	50	110	38	26	78
		K 25.5	4000	6300	80	170	45	30	103**
50	2"	K 55.1	6300	-	80	230	74	13	60
		K 55.2	10000	-	110	350	77	13	69
		K 55.3	16000	25000	150	600	84	13	104
		K 55.3 ***	-	-	180	-	-	14	-
80	3"	K 85.1	25000	-	350	-	68	16	-
		K 85.2	40000	-	400	-	89	16	-
100	4"	K105.1	63000	100000		-	120	-	220

* not for flowmeters with heating ** 300 mbar with damper (gas service)
*** with float shape DIVT
The specified pressure losses apply to water and air at maximum flow rate

A float damper is recommended:

- for TIV floats with an operating (inlet) pressure of
- ≤ 0.3 bar [DN 15, DN 25, DN 80 (1/2", 1", 3")]
- ≤ 0.2 bar [DN 50 (2")]

Conversion to other process products or operating data (pressure, temperature, density, viscosity) can be carried out with the aid of the KROHNE calculation program KroVaCal on the basis of VDE /VDI Code 3513.

3.2 H 250/C (ceramic, PTFE)

Float material	PTFE, ceramic
Float shape	Type E
Reference conditions	Water: at 200°C Air: at 200°C; 1.013 bar abs.

100% flow values, turn-down ratio 10:1

Meter size		Float	100% flow rate			Max. pressure loss			Standard orifice plate
DIN	ANSI		Water		Air	Water		Air	
			PTFE	ceramic	ceramic	PTFE	ceramic	ceramic	Diameter
DN	inches	Number	l/h	l/h	m^3/h	mbar	mbar	mbar	mm
15	½“	E 17.2	25	30	–	65	62	62	12
		E 17.3	40	50	1.8	66	64	64	
		E 17.4	63	70	2.4	66	66	66	
		E 17.5	100	130	4.0	68	68	68	
		E 17.6	160	200	6.5	72	70	70	
		E 17.7	250	250	9.0	86	72	72	
		E 17.8	400	–	–	111	–	–	
25	1“	E 27.1	630	500	18	70	55	55	25.6
		E 27.2	1000	700	22	80	60	60	
		E 27.3	1600	1100	30	108	70	70	
		E 27.4	2500	1600	50	158	82	82	
		E 27.5	–	2500	75	–	100	100	
50	2“	E 57.1	4000	4500	140	81	70	70	46.4
		E 57.2	6300	6300	200	110	80	80	
		E 57.3	10000	11000	350	170	110	110	
80	3“	E 87.1	16000	16000	–	81	70	–	72
		E 87.2	25000	25000	–	95	85	–	
100	4“	E 107.1	40000	–	–	100	–	–	84

Pressure losses apply to water and air at max. flow rate.

Conversion to other process products or operating data (pressure, temperature, density, viscosity) can be carried out using the KROHNE calculation program KroVaCal on the basis of VDE /VDI Code 3513.

4 Materials of construction

Version	Material				
	Measuring tube	Flanges, sealing face	Float	Internals	Standard orifice plate
H250/RR	CrNi steel 1.4404 *	CrNi steel 1.4404 * solid	CrNi steel 1.4404 *	CrNi steel 1.4404 *	–
H250/HC	Hastelloy C4 (2.4610)	CrNi steel 1.4404 * Hastelloy C4 (2.4610)	Hastelloy C4 (2.4610)	Hastelloy C4 (2.4610)	–
H250/C	CrNi steel 1.4571 with PTFE liner (PTFE-TFM liner) **	CrNi steel 1.4571 with PTFE liner (PTFE-TFM liner) **	Al_2O_3 or PTFE or HC4 Parafluorine V 3862-75***	Al_2O_3 or PTFE	Al_2O_3

* on request, CrNi steel 1.4571 also available
** materials available on request
*** O-ring Kalrez 2035, 4079 available on request

5 Technical data

Device type		H 250 with mechanical indicator	
Measuring ranges (100% values)		Select flow value according to the flow table	
	Water (20°C)	25 to 100 000 l/h	
	Air (1.013 bar abs., 20°C)	0.7 to 600 m^3/h	
Turn-down ratio		10:1	
Accuracy class		to VDI/VDE Code 3513, Sheet 2	
	H250/RR, H250/HC (Hastelloy C4)	1.6	
	H250/C (ceramic, PTFE)	2.5	
Connection			
Flanges	Companion dimensions to	EN-1092-1	DN15 – 100, PN16 – 100
		ANSI B16.5	½“ – 4“, 150 – 600lbs
		JIS B 2238	LR15 – 100, 10K – 20K
Clamp connections	Companion dimensions to	DIN 32676	DN15 – 100, 10 – 16 bar
		ISO 2852	Size 25 –139.7 10 – 16 bar
Screw connections	Companion dimensions to	DIN11851	DN15 – 100, 25 – 40 bar
		SMS1146	1“ – 4“, 6 bar
Inside thread, welded	Companion dimensions to	ISO 228	G¾“ –, G1“ PN 50
		ANSI B1.20.1	¾“NPT
Inside thread, bolted	Companion dimensions to	ISO 228	G1/2“ – 1“, PN 40 - 50
		ANSI B1.20.1	½“ - 1“NPT,
Connection for heating system			
	Flanged connection	EN 1092-1	DN 15; PN 40
		ANSI B16.5	½“; 150 lbs / RF
	Pipe connection for Ermeto		E12, PN 40
Information on higher pressure ratings and other types of connection supplied on request			
Measuring tube	H250/RR, H250/HC (Hastelloy C4)	Metal tube with tapered measuring section	
	H250/C (ceramic, PTFE)	Measuring tube with standard orifice plate	
Float shapes	H250/RR, H250/HC (Hastelloy C4):	Liquids	CIV, DIV (damping possible)
		Gases	TIV, DIV, DIVT (damping possible)
	H250/C (ceramic, PFTE):	Liquids, Gases	conical, Type E
Scale graduation		Flow units	
Overall height			
with flanged connection (excl. gaskets)		250 mm	
with connections for the food industry		300 mm (H250/RR only)	
Max. allowable operating pressure	Directive 97/23/ EC of the Council dated 29 April 1999 concerning transportable pressure equipment (EC pressure equipment directive) applies. The max. allowable operating pressure PS is calculated for the max. allowable operating temperature TS. Both limit values (PS and TS) are given on the nameplate.		

Max. process temperature Tp without ESK, ESK-PA, K1, K2, Z:		
H250/RR/, H250/HC (Hastelloy C4)		
at an ambient temperature (Ta) ≤ 120°C		300°C, other temperatures on request
H250/C (ceramic float)		
at an ambient temperature (Ta) ≤ 120°C		250°C
H250/C (PTFE float)		
at an ambient temperature (Ta) ≤ 70°C		70°C
Min. process temperature Tp without ESK-PA, K1, K2, Z		-80°C, others on request
Max. process temperature Tp M9 indicator with ESK, ESK-PA, K1, K2, Z:		
non-“Ex“ version,	without HT	< 200°C
	with HT	< 300°C
	see Sect. 12	Table of max. process/ambient temperatures
“Ex“ version,	see Sect. 14	Certificate of Conformity H250/.../M9
H250 M9 EEx (ATEX)		see Suppl. Install. and Op. Instructions
H250 M10 EExd (ATEX)		see Suppl. Instructions M10 ATEX
The process temperature must be reduced for devices with ATEX certification and devices fitted with electrical equipment (ESK, ESK-PA, K1, K2, Z and H250/C).		
Max. process temperature Tp M7 indicator with options (ESK, K, P, ...):		
non-“Ex“ version,	see Sect. 19	Table of max. process/ambient temperatures
“Ex“ version,	see Sect. 21	Certificate of conformity H250/.../M7

Test pressure PT

The test pressure is calculated in accordance with the pressure equipment directive (97/23/EC) and AD 2000-HP30 and in compliance with the maximum allowed operating pressure and the maximum operating temperature.

Protection category of indicators M7/M9/M10 to EN 60529 / IEC 60529 IP 65, NEMA 4X

6 Certification

Use in hazardous areas
The following versions of the H 250 flowmeter are certified for use in hazardous areas by the Physikalisch-Technische Bundesanstalt:

6.1 H250 M9

H250 / M9-EEx with certificate of conformity (76/117/EEC)

Device	Type	Marking	General certificate PTB No.	Individual certificate PTB No.
General certificate	H250/M9-EEx	EEx ia IIC T6	Ex-97.D.2171	
Current output	ESK II	EEx ia IIC T6		Ex-97.D.2091
Limit contact EX	SC 3,5-NO [Ex] SC 3,5-NO –Y [Ex]	EEx ia IIC T6		Ex-95.D.2195X

Built-in electrical equipment with certificate of conformity (76/117/EEC)

Limit contact EX	SJ 3,5-SN [Ex]	EEx ia IIC T6		Ex-83/2022X
	SJ 3,5-S1N [Ex]	EEx ia IIC T6		Ex-83/2022X

H250 / M9-EEx with EC type approval certificate (94/9/EC) ATEX

Device	Type	Marking	General certificate PTB No.	Individual certificate PTB No.
General certificate	H250/M9-EEx	II 2G EEx ia IIC T6	PTB 01 ATEX 2181	
Current output	ESK II	II 2G EEx ia IIC T6		PTB 00 ATEX 2063
Profibus-PA	ESK3-PA	II 2G EEx ia IIC T6		PTB 00 ATEX 2063
Limit switch ATEX	SC 3,5-NO [ATEX] SC 3,5-NO –Y [ATEX]	II 2G EEx ia IIC T6		PTB 99 ATEX 2219X
	SJ 3,5-SN [ATEX]	II 2G EEx ia IIC T6		PTB 00 ATEX 2049X
	SJ 3,5-S1N [ATEX]	II 2G EEx ia IIC T6		PTB 00 ATEX 2049X

6.2 H 250 M7

H 250 /M7-EEx with certificate of conformity (76/117/EEC)

Device	Type	Marking	General certificate PTB No.	Individual certificate PTB No.
General certificate	H ... /M7-EEx	EEx ia IIC T6	Ex-94.C.2003 X	
Current output	ESK	EEx ia IIC T6		Ex-94.C.2067
	KINAX 3W2	EEx ia IIC T6		Ex- 91.C.2112X
Limit switch Ex	SC 2-NO [Ex]	EEx ia IIC T6		Ex-95.D.2195X
	SC 3,5-NO [Ex]	EEx ia IIC T6		Ex-95.D.2195X

Built-in electrical equipment with certificate of conformity (76/117/EEC)

Limit switch EX	SJ 2-SN [Ex]	EEx ia IIC T6		Ex-95.D.2195X
	SJ 2-S1N [Ex]	EEx ia IIC T6		Ex-95.D.2195X

Built-in electrical equipment with EC type approval certificate (94/9/EC) ATEX

Limit switch ATEX	SC 2-NO [ATEX]	II 2G EEx ia IIC T6		PTB 99 ATEX 2219X
	SC 3,5-NO [ATEX]	II 2G EEx ia IIC T6		PTB 99 ATEX 2219X
	SJ 2-SN [ATEX]	II 2G EEx ia IIC T6		PTB 00 ATEX 2049X
	SJ 2-S1N [ATEX]	II 2G EEx ia IIC T6		PTB 00 ATEX 2049X

Special versions with built-in electrical equipment and their individual certificate, on request.

6.3 Conformity with EC directives

The H250 variable-area flowmeter satisfies all requirements of the EC directives applicable to the product. These are:

- EMC Directive (89/336/EEC)
  EN 50081-1:1992
  EN 50 082-2:1995

- ATEX (94/9/EC)
  EN 50014:1997 +A1 +A2
  EN 50020:1994

- PED – pressure equipment directive (97/23/EC)

The variable-area flowmeters fall under the pressure equipment directive (PED) and are classified in various categories [Cat. I to III]. Categorization is according to Article 3, Item 1.3a) Diagram 6, Pipelines for gases in Fluid Group 1. For all categories, the conformity attestation procedure is applied. Devices for low flows (cone 15.x) are not subject to conformity attestation. For these, Article 3.3 of the DGRL is applied.

For standard products (repeat jobs) the declaration of conformity can be issued in advance. In the case of customized products, the declaration is supplied on request together with the product.
In particular devices with flanges (EN-1092-1; ANSI B 16.5; JIS B 2238) are classified in Category III (suitability for instabile gases).

7 Dimensions and weights

7.1 H 250/RR, H 250/Hastelloy C4

Flange connections for the measuring section

DIN 2501 (=BS 4504)	DN15, DN25, DN50	PN40
	DN80, DN100	PN16
ANSI B 16.5	1/2" to 4"	150lbs/RF or 300lbs/RF

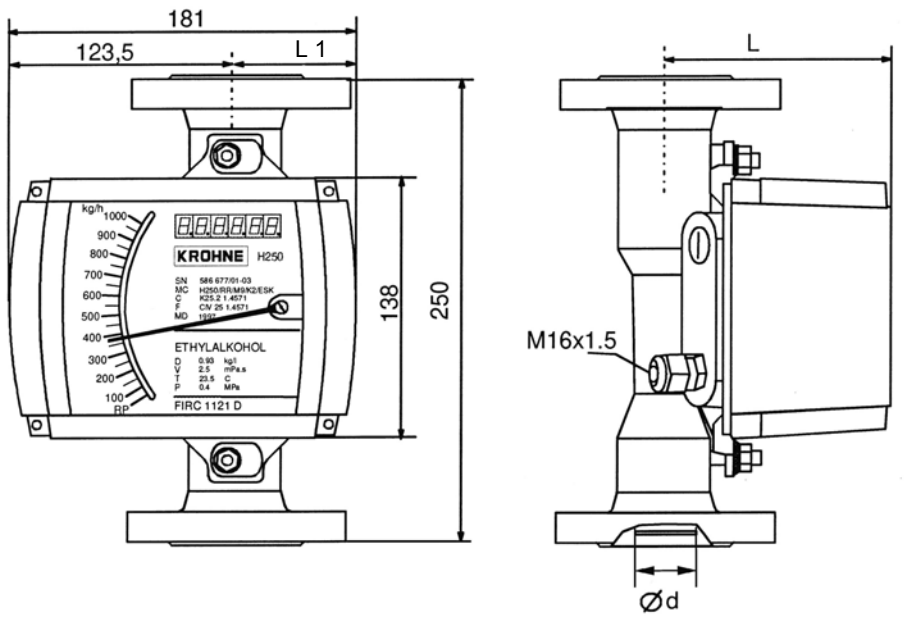
Connections for the heating jacket

Flanges to DIN 2501 (=BS4504)	DN15, DN25	PN 40
Flanges to ANSI B16.5	1/2", 1"	150lbs/RF
Pipe for	Ermeto 12	

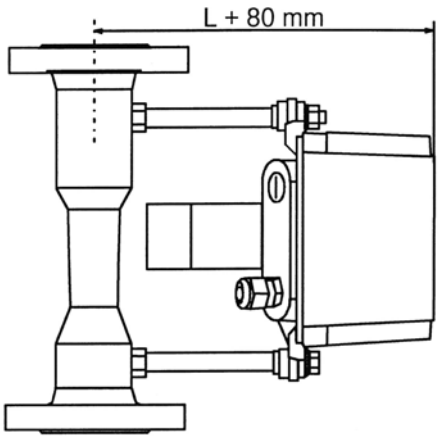
Nominal diameter to ...				**Dimensions**					**Approx. weight**	**with heating ***
DIN		**ANSI**		**L**		**L1**	**L2**	**Ø d**	**(for devices w/**	**(connection with**
				M9	**M7**	**M9**	**M7/M9**	**M7/M9**	**DIN flanges)**	**DN15 flange)**
DN	PN	inch	lbs	mm	mm	mm	mm	mm	kg	kg
15	**40**	**½“**	**150/300**	**107**	178	70.5	100	20	**3.5**	4.8
25	40	**1“**	150/300	119	189	70.5	106	32	5.2	6.7
50	40	2“	150/300	132	203	57.5	120	65	8.7	10.4
80	16	3“	150/300	148	219	57.5	160	89	12.0	14.0
100	16	4“	150/300	158	235	57.5	150	114	14.0	16.6

*** if flange connection DN25 (heating) plus 0.75 kg**
if Ermeto12 connection (heating) minus 0.9 kg

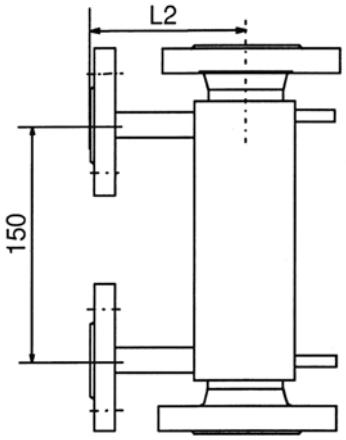
H 250/M9
with flanged connections



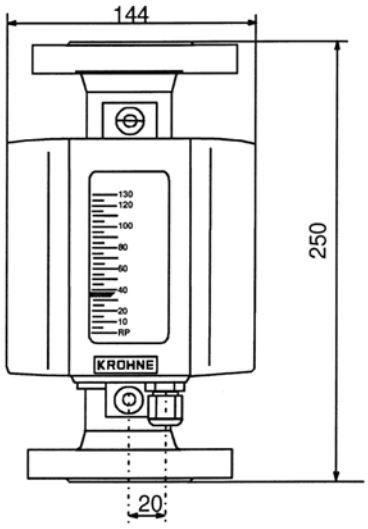
High-temperature version
H 250/M9/HT

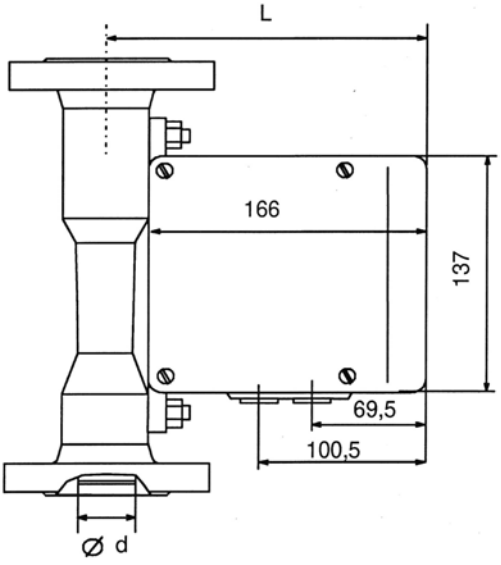


Measuring section with heating
H 250



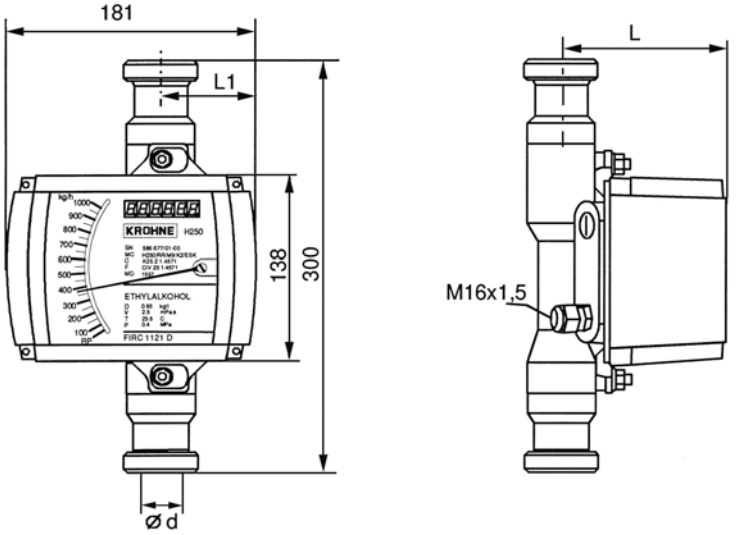
H 250/M7
with flanged connections



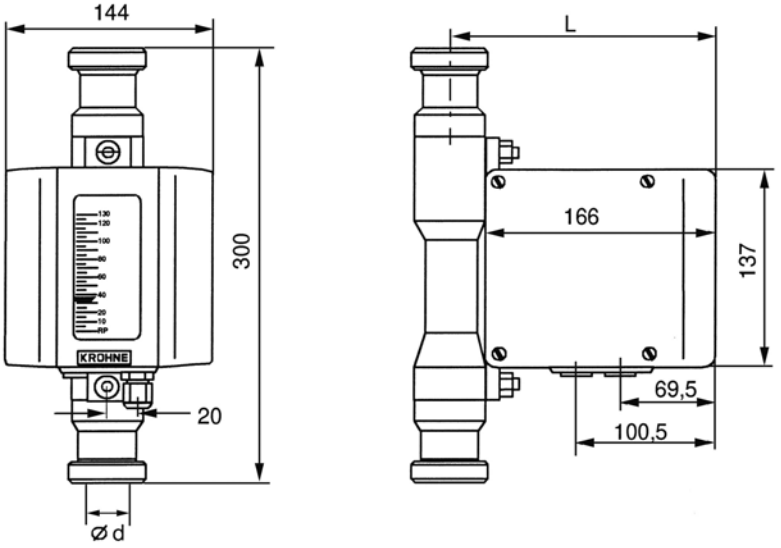


H 250 with sanitary pipe connection (threaded socket) to DIN 11851						
Flow nominal dia.	**Max. allowed operating pressure**	**Dimensions**				Approx. **weight**
		L		L1	∅ d	
		M9	M7	M9	M7 / M9	
DN	bar	mm	mm	mm	mm	kg
15	40	107	178	70.5	20	2.0
25	40	119	189	70.5	32	3.5
50	25	132	203	57.5	65	5.0
80	25	148	219	57.5	89	7.6
100	25	158	235	57.5	114	10.3

H 250/M9



H 250/M7

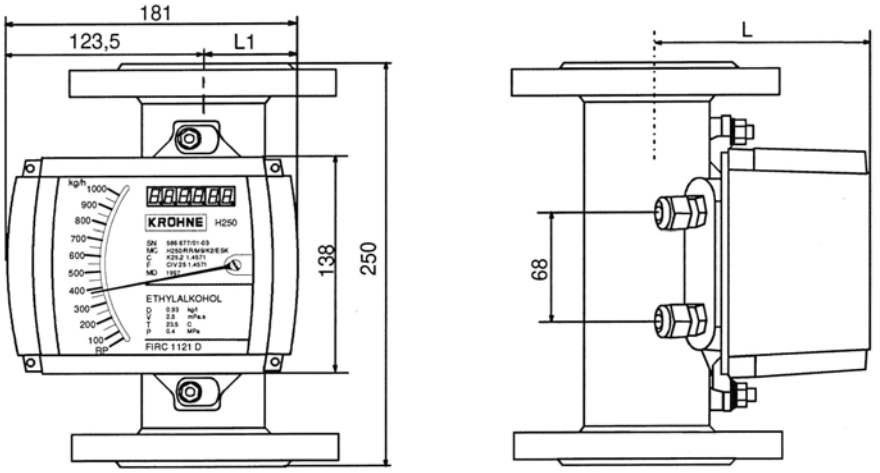


7.2 H250/C (ceramics, PTFE)

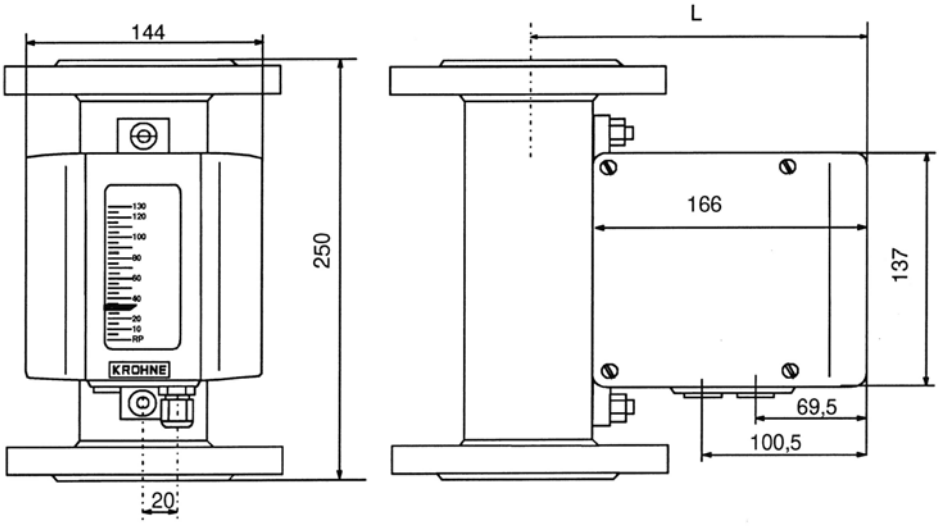
Nominal dia. to				Dimensions		Approx. weight		
DIN 2501		ANSI B 16.5		L		DIN 2501	ANSI B 16.5	
				M9	M7		150 lbs	300 lbs
DN	PN	inches	lbs	mm	mm	kg	kg	kg
15	40	½“	150/300	110	178	3.5	3.2	3.5
25	40	1“	150/300	120	187	5	5.2	6.8
50	40	2“	150/300	138	202	10	10	11
80	16	3“	150/300	148	216	13	13	15
100*	16	4“	150/300	164	222	15	16	17

* only available in PTFE

H 250/M9



H 250/M7



8 Service

8.1 Float replacement

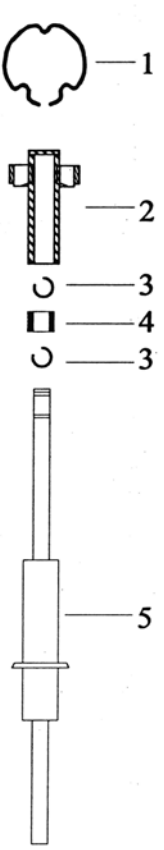
1. Remove flowmeter from the pipeline.
2. Remove upper snap ring from measuring section.
3. Remove upper float stop and float from measuring section.
4. Insert new float in the centre hole of the lower stop and then, together with the upper float stop, in the measuring section. Make sure that the upper float guide rod fits through the centre hole in the stop.
5. Insert the snap ring in the measuring section.
6. Finally, install the flowmeter in the pipeline again.

Note: Measuring error may increase if the device is not recalibrated.

8.2 Float damper

Given unstable flow conditions or insufficient operating (inlet) pressure, particularly with gaseous products, the H 250 flowmeter can be retrofitted with a float damper.
The damping system has a long service life and is self-centering, and the sleeve is made of high-tech ceramics (Al_2O_3).
A complete retrofit kit is available, consisting of:

2 snap rings (3)
1 ceramic sleeve (4) or PEEK sleeve
1 damping cylinder with float stop (2)



Installation

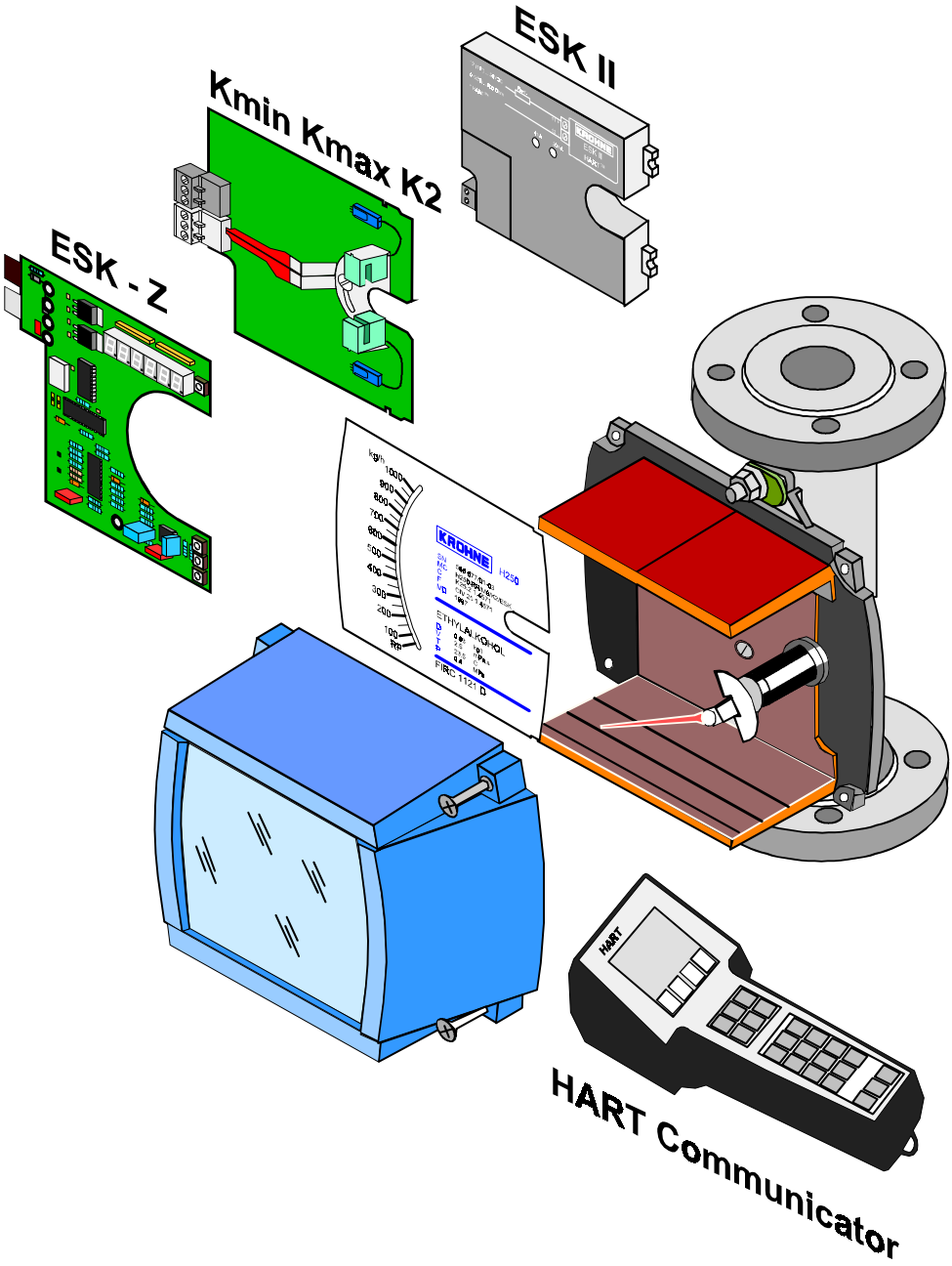
1. Remove flowmeter from the pipeline.
2. Remove upper snap ring (1) from the measuring section.
3. Remove upper float stop and float (5) from the measuring section.
4. Secure snap ring (3) in the lower groove on the float guide rod (5).
5. Slide ceramic sleeve (4) on to the float guide rod (5) and secure with snap ring (3) in the upper groove.
6. Insert float into the lower float guide in the measuring section.
7. Fit the supplied damping cylinder with integrated float stop (2) in the measuring section.
8. Insert upper snap ring (1).
9. Install flowmeter in pipeline.

8.3 List of spares

Measuring section H 250 – Order numbers

Float	DN 15	DN 25	DN 50	DN 80	DN 100
CIV	V260100010	V260100012	V260100015	V260100018	V260100021
DIV	-	V260100013	V260100016	V260100019	V260100022
TIV	V260100011	V260100014	V260100017	V260100020	-
DIV T	-	-	2101140100	-	-
Float stop	3150060300	3150120200	3150180200	3150240200	3152410100
Snap ring	3150320100	3150330100	3150340100	3150350100	3150520100
Damper retrofit kit	V260100001	V260100002	V260100003	V260100004	-

M9 indicator and add-on components

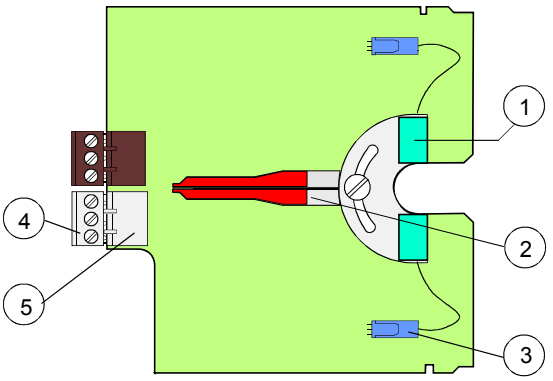


Description
The H 250/M9 indicator with built-in rack allows easy fitting and retrofitting of various optional equipment. These modules can be quickly and effortlessly fitted by slipping them sideways onto the rack and positioning them with attachment clips. Screws as fastening elements have been dispensed with.

9 Contact module Kmin, Kmax, K2

Description

The H250/M9 variable-area flowmeter can be equipped with a maximum of two electronic limit switches. The limit switch operates with an inductive slot sensor that is actuated by a semicircular metal vane on the pointer. The switching points are set by way of the contact pointer (2). The position of the contact pointer also serves to visually indicate the set limit value. The supply terminals are of the plug-in type and can be detached for connection of the cable.



Two versions are available:
2-wire technology: SC 3,5-N0-Y
3-wire technology: SJ3,5-E2-Y

1 Limit switch
2 Contact pointer
3 Connecting plug
4 Supply terminal
5 Terminal socket

Limit switches SC3,5-N0-Y have Physikalisch-Technische Bundesanstalt certification and are therefore suitable for use in hazardous areas.
They are matched for isolation switching amplifiers with certified intrinsically safe control circuit to NAMUR and DIN 19234.
The isolation switching amplifier must be installed outside the hazardous area.
For connection, take note of the specifications in VDE 0165 or equivalent national regulations.

9.1 Electrical connection

To connect the contact module, remove the housing cover of the M9 indicator. The supply terminals (4) are of the plug-in type and can be detached for connection of the cables.
Limit switches SC3,5-N0-Y to be connected in conformity with DIN 19234 (NAMUR).
An isolation switching amplifier is required to operate this limit switch in 2-wire technology.

Isolation switching amplifier	Power supply	Channel	Order No.
KFA6-SR2-Ex1.W	230 V AC	1	5015262000
KFA5-SR2-Ex1.W	115 V AC	1	5015262100
KFD2-SR2-Ex1.W	24 V DC	1	5015262200
KFA6-SR2-Ex2.W	230 V AC	2	5015262300
KFA5-SR2-Ex2.W	115 V AC	2	5015262400
KFD2-SR2-Ex2.W	24 V DC	2	5015262500

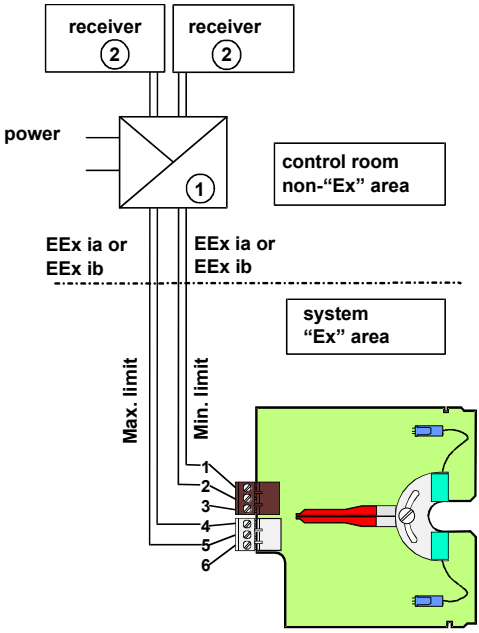
These isolation switching amplifiers have PTB No. Ex-94.C.2086

Electrical connection for hazardous areas

①
EEx ia or EEx ib certified isolation switching amplifiers with intrinsically safe input circuit (NAMUR),

1 or 2 channels with the following maximum values:
$U_0 \leq$ 16V, $I_0 \leq$ 52 mA, $P_0 \leq$ 169mW,
per circuit

②
any receiver instrument, recording device

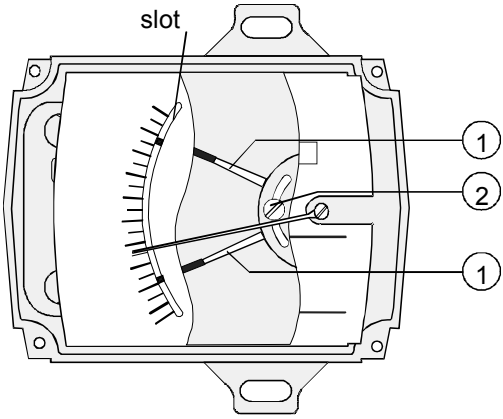


Limit switches SJ3,5-E2 in 3-wire technology have a dc voltage connection of 10 to 30 VDC. They can be operated with any commercially available power supply unit. For further details, see Sect. on Technical data M9.

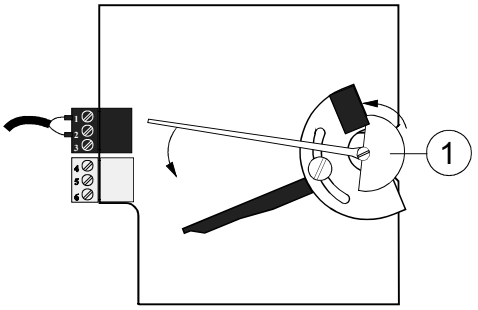
Contact	K_{MIN}			K_{MAX}		
Colour of connector	Black			Grey		
Labelling	1	2	3	4	5	6
SC3,5-N0-Y	-	+		-	+	
SJ3,5-E2-Y	+	DC	-	+	DC	-

9.2 Setting the limits

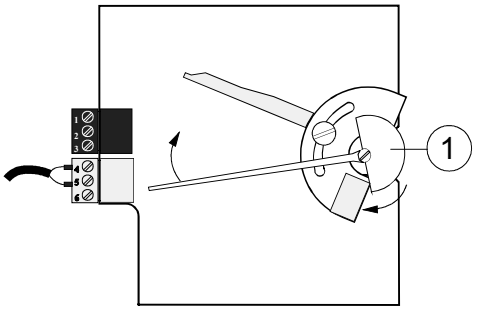
The limits are set directly by way of the contact pointers (1) without having to dismantle the flowmeter. First remove the housing cover.
The contact pointers (1) can be moved to the required switching point through the slot in the scale.
If the locking screw (2) is screwed tight, push the scale out of the rack and slacken the screw (2) to adjust the contact pointers (1). Push the scale back into its original position until it snaps into place. Subsequently the contact pointers (1) can, as described above, be set to the switching point. After setting, the contact pointers (1) should be fastened with the locking screw. Replace housing cover and screw down.



9.3 Definition of switching contacts



K MIN contact (normally open)
When the pointer vane (1) dips into the slot (and damps this sensor), this will initiate an alarm.
When the vane is outside the slot sensor, any cable break will also initiate an alarm.
Option: used as maximum contact
In the “alarm“ status the vane is located outside the slot. A cable break is not detected.



K MAX contact (normally open)
When the pointer vane (1) dips into the slot (and thus damps this sensor), this will initiate an alarm.
When the vane is outside the slot sensor, any cable break will also initiate an alarm.
Option: used as minimum contact
In the “alarm“ status the vane is located outside the slot. A cable break is not detected.

The K2 version features both contact systems: Kmin und Kmax.

9.4 Technical data

Limit switches		**SC 3,5-N0-Y**	**SJ3,5-E2-Y**
Nominal voltage U_B		8 VDC	10 to 30 VDC
Power consumption	active area clear	3 mA	
Output	active area clear		≤ 0.3 V
Power consumption	active area obscured	1 mA	
Output	active area obscured		≥ (U_B – 3 V)
Ambient temperature at limit switch		-25 to + 100°C	-25 to + 70°C
Continuous current			100 mA
No-load power consumption			15 mA
Electrical characteristics		DIN 19234 (NAMUR)	
Protection category (EN 60529 / IEC 529)		IP 67	
Electromagnetic compatibility (EMC)		to EN 50081-1, EN 50082-2	

For ATEX limit switches:
Only for connection to intrinsically safe circuits with the following peak values:

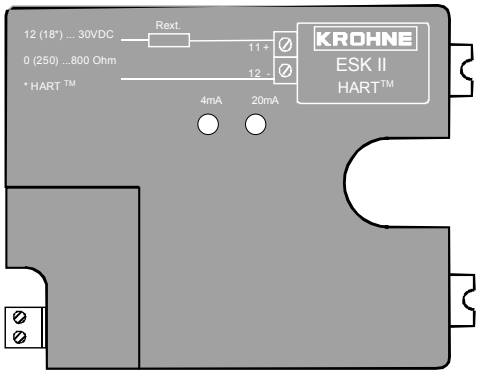
Built-in equipment	Ui [V]	Ii [mA]	Pi [mW]	Ci [nF]	Li [µH]
SC 3,5-NO [Ex] SC 3,5-NO –Y [Ex]	≤ 16	≤ 52	≤ 169	≤ 150	≤ 150
SJ 3,5-SN [Ex] SJ 3,5-S1N [Ex]	≤ 15,5	≤ 52	≤ 169	≤ 40	≤ 160
SC 3,5-NO [ATEX] SC 3,5-NO –Y [ATEX]	≤ 16	≤ 25/≤ 52*	≤ 64/≤ 169*	≤ 150	≤ 150
SJ 3,5-SN [ATEX] SJ 3,5-S1N [ATEX]	≤ 16	≤ 25/≤ 52*	≤ 64/≤ 169*	≤ 30	≤ 100

*) depending on the isolation switching amplifier used

Caution: be aware of temperature classes.
Note: limit switch SJ 3,5-E2-Y not for use in hazardous areas!

10 Electrical signal output ESK II (HART™)

Description
The ESK II generates a current of 4 to 20 mA in two-wire technology that is proportional to the current flow rate. Transmission is non-interacting and hysteresis-free. The ESK II is factory-calibrated based on the flow measuring range. The calibration data - which are used for linearization of the ESK - are filed in a memory chip (EEPROM).
The required power is a functional extra-low voltage with protective separation in conformity with VDE 0100 Part 410.



All instruments connected to the measuring circuit (indicators, recorders) should be connected in series and together should not exceed the maximum external resistance (see Sect. 9.4 Technical data). The ESK II features polarity reversal protection.

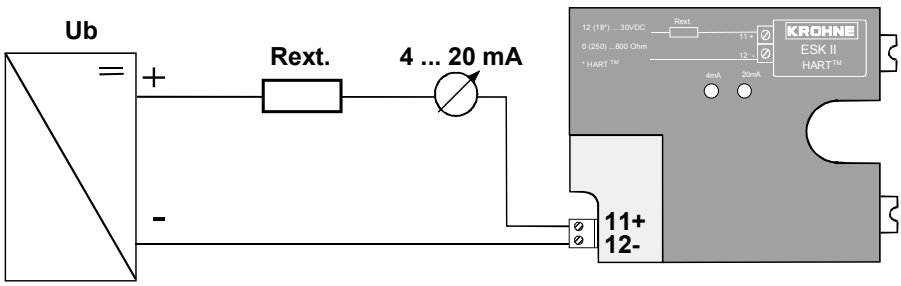
Use in hazardous areas
H 250 flowmeters of hazardous-duty design with ESK II transmitter have Physikalisch-Technische Bundesanstalt certification. PTB No.: Ex.97.D.2171
The supply power must be taken from a certified intrinsically safe feeder unit or repeater power supply unit that is mounted outside the hazardous area. For connection, consult the regulations specified in VDE 0165, or equivalent national regulations.
(For ATEX, see variable-area flowmeter H250/M9-EEx PTB 01 ATEX 2181 General Approval Suppl. Installation & Operating Instructions)

10.1 Electrical connection

To connect the ESK, first remove the housing cover of the M9 indicator. The supply terminals for the M9 indicator are of the plug-in type and can be detached for connection of the cables.
To comply with the IP protection category requirements, please take note of the following recommendations:

- Cable diameter 5 to 10 mm
- After inserting the cable, tighten union nut on the cable gland.
- Leave blanking plugs in all unused cable entries.

The supply power Ub is 12 to 30 V DC. Load impedance (line resistance + loads) should not exceed 800 Ω.

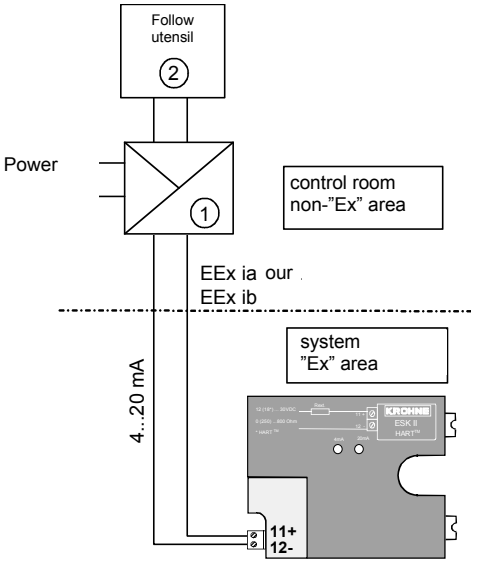


Electrical connection for hazardous areas

①
EEx ia or EEx ib certified repeater power supply unit

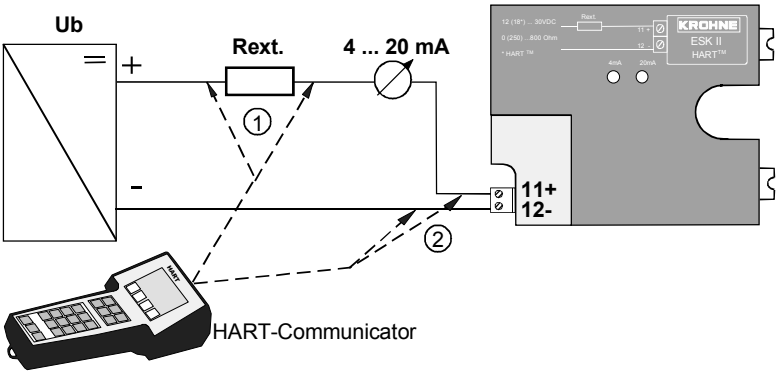
with intrinsically safe input circuit
and the following peak values:
$U_0 \leq 30$ V, $I_0 \leq 100$ mA $P_0 \leq 1.0$W

②
Receiver instrument, indicator, recording device
....



10.2 HART™ communication

HART communication is not absolutely necessary in order to operate the ESK II. If HART communication is carried out with the ESK II, this will not impair analog data transmission (4...20mA) in any way. An exception is the multidrop mode, when a maximum of 15 devices with HART function are operated in parallel, in which case their current outputs are switched to the inactive mode (I approx. 4mA).

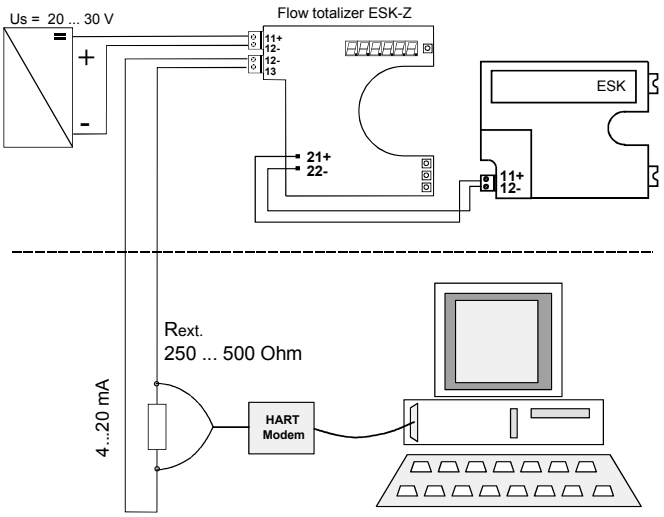


When a HART™ communicator (type Fisher Rosemount, model 275) or a PC with HART™ modem is used, the series-connected resistance (Rext.) needs to be greater than 250 ohms. The supply power must in this case be at least 18 V. The communicator or PC is connected as shown in the above drawing. It can optionally be operated via the supply terminals of the ESK II (2) or via a series-connected external resistor (1).

The HART communicator can be operated in either hazardous or non-hazardous areas. For use in hazardous areas, a transmitter feeder unit with HART/smart capability is required, e.g. KFD2-STC3-Ex1 supplied by P&F.

If the ESK II is operated in conjunction with the totalizer, HART™ communication is possible in accordance with the following diagram:

The totalizer itself cannot be read out or operated by the HART™ communication system.



10.3 Technical data

Electrical signal output ESK II in the M9 indicator

Power supply	12 (18 *) to 30V DC
Power consumption	4 to 20.4 mA for 0% to 102.5 % of meas. value > 20.8 mA for alarm status
Effect of power	< 0.1%
External resistance dependence	< 0.1%
Temperature effect	< 5 µA / K
Max. ext. resistance/load impedance	0 (250 *) to 800 Ω
2-wire connection	R_{ext} [kΩ] = (power supply [V] – 12 V) / 22mA
Ambient temperature at ESK II	- 25°C to + 85°C (T1 to T4)
Storage temperature	- 40°C to + 85°C
Protection category (EN60529 / IEC 529)	IP20

* Minimum values in connection with HART™ communication.

Only relevant for use in hazardous areas
Only for connection to intrinsically safe circuits with the following maximum values:

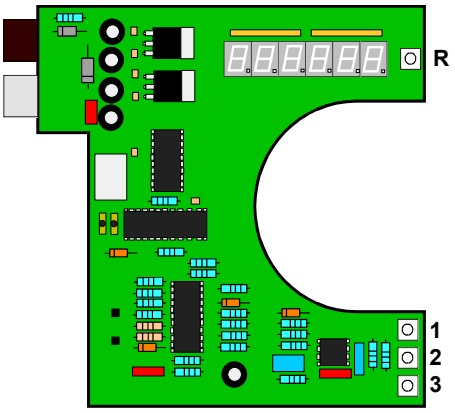
No-load voltage U_0	30 V
Short-circuit current I_K	100 mA
Output P	1 W
Effective inner capacitance	< 20 nF
Effective inner inductance	negligible
H250/M9-EEx	PTB No.: Ex.97.D.2171 (For ATEX, see signal converter ESK II / ESK3-PA PTB 00 ATEX 2063 Suppl. Installation & Operating Instructions)

11 Flow totalizer Z

Description

Flow totalizer Z is operated together with transmitter ESK II. Flow totalizer Z feeds the ESK II module in 2-wire technology, and this supplies an instantaneous flow-proportional current of 4 to 20 mA.

A 6-digit LED displays the cumulative flow value appropriate to the measuring range.

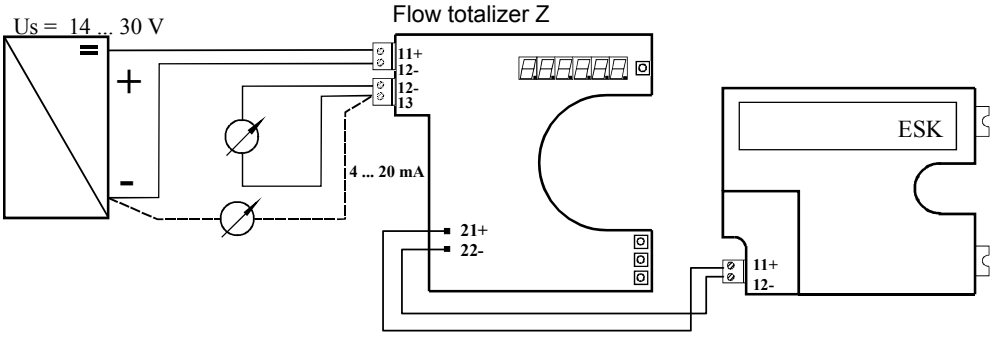


	Display	Comments
Button 1	Flow in %	Totalizing continues in the background.
Button 2	Totalizer count	e.g. litres or m^3
Button 3	Conversion factor	Standard: 10% of Q_{100}
Reset R	Delete stored totalizer value	

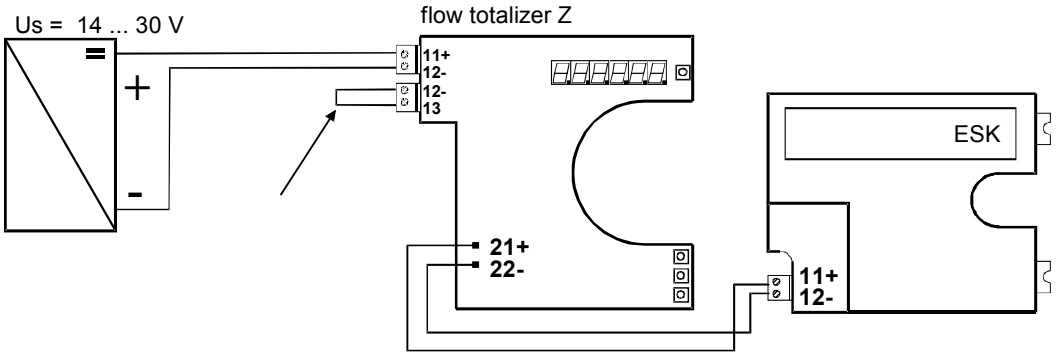
Note: Totalizer not to be used in hazardous areas!
Flow totalizer Z is factory-set in keeping with the data specified in the order and needs no adjustment. Unless specified otherwise in the order, the totalizer conversion factor is set relative to the measuring range, so that the totalizer count (in litres, m^3, etc.) can be read direct.

11.1 Electrical connection

The required power is a functional extra-low voltage with protective separation in accordance with VDE 0100 Part 410, or equivalent national regulations. All instruments connected to the measuring circuit (recorders, indicators, etc.) shall be connected in series and may not exceed a max. external resistance of 720 Ω. The supply voltage US of max. 30 VDC to be connected to terminals 11+ and 12- at the totalizer module.



If an external indicator is not required, an additional short-circuiting link (not included with flowmeter) must be connected to terminals 12 and 13.



It is then not necessary to connect terminal 13 to the power supply unit.

Not intended for use in hazardous areas!

If HART™ communication is required with the ESK II, please refer to Sect. Electrical connection ESK II, HART™ communication.

11.2 Settings, display mode

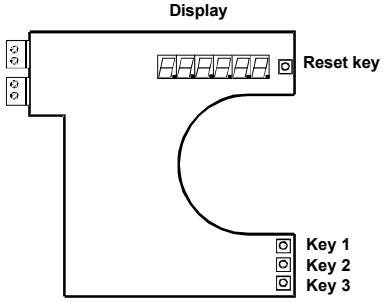
Reset: **Deletes stored totalized value**

Key 1 **Current flow rate in % (0 ... 100%)**

with decimal point and one decimal place

Key 2: **Totalizer**
no decimal point

Key 3: **Display of conversion factor**
first two decimal points light up



Conversion factor

The conversion factor is as a general rule factory-set in relation to the measuring range, so that the current totalized value can be read off at all times. Conversion factor = 10% of the full-scale range, so that the totalized value can be read direct 1:1 from the display. If the measuring range is not known, e.g. in the case of a spare part delivery, a conversion factor of 1000 is factory-set.

If the conversion factor needs to be changed or corrected, this can be done by pressing Key 2 at the same time as the supply voltage is switched on.
A factor between 1 and 1099 can be set using Keys 1 to 3. Factor 0 is undefined.

Key 1: ones
Key 2: tens
Key 3: hundreds and thousands

Input is confirmed and terminated by pressing the Reset key. The totalizer then reverts to the display mode selected last.

Totalizer count

The totalizer count is saved in the event of a power failure and can be set to zero during operation using the RESET key.
All decimal points light up when the totalizer overflows. Press the RESET key to set to zero.

Adjustment

Adjustment is not required as the totalizers are factory-adjusted.

If readjustment is nevertheless required, this can be done as follows:

- At the moment of switching on, press and hold down the RESET key until three decimal points light up.
- Set 4.00mA, then press Key 1 until digit 0 appears.
- Set 20.00mA, then press Key 3 until the figure 100 appears.
  Press Key 2 to terminate adjustment.

11.3 Technical data

Supply power	14 to 30V DC
Input signal	4 to 21.6 mA for 0% to 110% of the measured value
Consumption	max. 2 W
max. external resistance/load impedance	0 to 720 Ω depending on supply voltage
2-wire connection	R_{ext} [kΩ] = (supply power [V] – 14 V) / 22mA
Ambient temperature	- 25^0C to + 65^0C
Display error	< 1% of the displayed integrated value, max. one display unit

12 Permissible process temperature for M9 indicator with/without add-on components

Max. process temperature Tp without ESK, K1, K2, Z

H250/RR/, H250/HC (Hastelloy C4)	
at ambient temperature (Ta) ≤ 120°C	300°C, other temperatures on request
H250/C (ceramic float)	
at ambient temperature (Ta) ≤ 120°C	250°C
H250/C (PTFE float)	
at ambient temperature (Ta) ≤ 70°C	70°C
Min. process temperature Tp without ESK, K1, K2,Z	-80°C, others on request
Ambient temperature Ta with ESK, K1, K2,Z	Standard: - 25°C … 80°C dependent on process temperature

Max. process temperature Tp with optional components:

Meter size				Version	Application range		
Flanges to ...					non-hazardous area		
without heating		with heating			Ta <40°C Tp in		Ta < 60°C Tp in
DIN	ANSI	DIN	ANSI				
DN mm	inch	DN mm	inch		°C		°C
DN15/25	1/2", 1"	DN15	½"	M9/ESK II	200		180 (150)
				M9/HT/ESK II	300		300 (235)
				M9/ESKII /Z	200		80
				M9/HT/ESKII /Z	300		130
				M9/K	200		200 (150)
				M9/HT/K	300		300 (235)
				M9/KD	200		130
				M9/HT/KD	300		295 (235)
DN 50	2“	DN 25	1“	M9/ESK II	200		165 (125)
				M9/HT/ESK II	300		300 (170)
				M9/ESKII /Z	180		75
				M9/HT/ESKII /Z	300		100
				M9/K	200		200 (125)
				M9/HT/K	300		300 (170)
				M9/KD	200		120
				M9/HT/KD	300		195 (170)
DN 80/100	3“, 4“	DN 50 DN 80	2“, 3“	M9/ESK II	200		150 (105)
				M9/HT/ESK II	300		250 (145)
				M9/ESKII /Z	150		70
				M9/HT/ESKII /Z	270		85
				M9/K	200		200 (105)
				M9/HT/K	300		300 (145)
				M9/KD	190		110 (105)
				M9/HT/KD	300		160 (145)

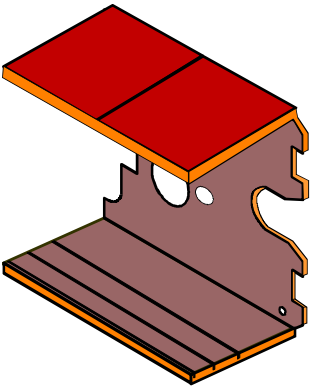
HT = high-temperature version

Figures in brackets: above these temperatures, a high-heat-resistant cable with an allowed duty temperature of min. 100°C must be used.

*** Max. allowed process temperatures for flowmeters of hazardous-duty design, see Section 14 Certificates of Conformity; for devices with PTB 01 ATEX 2181 approval, see Supplementary Installation and Operating Instructions (ATEX - general approval); and for devices with ESK3 PA, see Supplementary Installation and Operating Instructions PTB 00 ATEX 2063 A.**

13 Service - M9 indicator, Retrofitting

The H250 flowmeter mit M9 indicator can be retrofitted with all electrical options.



Modules ESK II, flow totalizer Z, Kmin, Kmax or K2 are slipped sideways into the channel section until they click into place. The modules can be replaced or retrofitted without interrupting the process and without requiring recalibration.

Also available is a retrofit kit to convert the H250/M9 into a high-temperature version. In this connection, take note of the maximum process temperatures specified in the Table.

13.1 Plug-in contact module

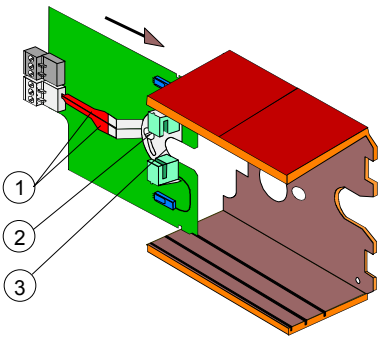
The contact module is supplied with one or two inductively actuated limit switches. (See also Sect. Electrical connection for hazardous areas.)

		Order No.:
Contact module Kmin.	(with 1 x SC 3,5-N0-Y, 2-wire technology Ex)	V 245100010
Contact module Kmax.	(with 1 x SC 3,5-N0-Y, 2-wire technology Ex)	V 245100011
Contact module K2	(with 2 x SC 3,5-N0-Y, 2-wire technology Ex)	V 245100012
Contact module Kmin.	(with 1 x SJ 3,5-E2, 3-wire technology)	V 245100030
Contact module Kmax.	(with 1 x SJ 3,5-E2, 3-wire technology)	V 245100031
Contact module K2	(with 2 x SJ 3,5-E2, 3-wire technology)	V 245100032

Items included with supply:
1 or 2 contacts, Type SC 3,5-N0-Y in 2-wire technology to DIN 19234 (NAMUR).
or
1 or 2 contacts, Type SJ 3,5-E2 –Y in 3-wire technology, direct switching, with output indicator (LED).

An isolation switching amplifier is required to operate a limit switch in 2-wire technology (see Sect. Electrical connection M9).
To install, unscrew the housing cover. Slide the flow totalizer Z (if provided) out of the subrack.

Please also consult the notes in Sect. 10.1 (Electrical connection). Before sliding the contact module into the subrack, bring the contact pointers (1) together in the middle so that the semicircular pointer guides (3) close around the pointer pedestal.
If necessary, slacken the locking screw (2) to adjust the contact pointers (1).
Insert the contact module in the third rail from the top until the semicircular pointer guide (3) on the board closes round the pointer pedestal.



Then connect up (see Sect. Electrical connection M9). The supply terminals of the contact module are of the plug-in type and can be detached for connection of the cables.

To conform to IP protection category requirements, take note of the following:

- cable diameter 5 to 10 mm
- after inserting the connecting lead, tighten down the union nut on the cable gland.
- leave blanking plugs in place on all unused cable entries.

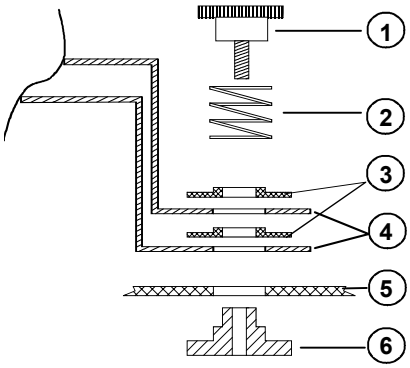
Retrofitting a second limit switch
The retrofit kit consists of contact pointer (Kmin or Kmax, as required) with integrated limit switch. The connecting lead for the limit switch features an integrally moulded plug.

Unscrew the housing cover to install. Slide flow totalizer Z (if provided) out of the subrack.

- Pull the contact module out of the subrack.
- Remove locking screw (1).

Caution: spring (2) is under pressure

- Assemble contact pointer (4), sliding discs (3), spring (2) and locking screw as shown in the drawing. The second sliding disc (3) is already provided for the version with one contact.
- Plug the connector of the limit switch (blue) into the jack on the pcb.
- Slide the contact module back into the subrack and connect up (see Sect. Electrical connection M9).



1 Locking screw
2 compression spring
3 sliding discs
4 contact pointer
5 pc board
6 counternut

13.2 Electrical signal output ESK II in the M9 indicator

	Order No.:
Electrical signal output ESK II	V245100114
Electrical signal output ESK II/ Ex	V245100113
HART™ modem (converter RS232 / HART)	4.00313.00.00
KroVaCal software (CD)	317850xx

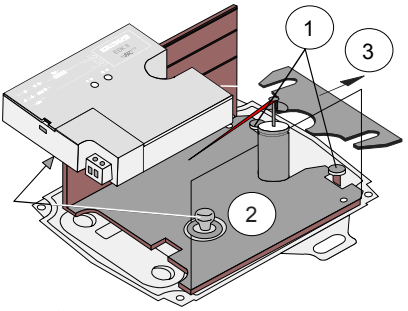
Items included with supply:
- 1 ESK with built-in EEPROM (without calibration data)
- 1 cable gland (with O-ring) M16 x 1.5

Included with retrofit kit:
The ESK II is non-linearized when supplied in the form of a retrofit kit. It includes an initialized EEPROM allowing individual linearization.

Included as spare (replacement)
The ESK II is factory standardized, so that e.g. a replacement can be made without recalibration. Plug the EEPROM of the old ESK into the new one. If necessary, zero and 100% value can be readjusted (see Sect. 13.2.3).

13.2.1 Installing an ESK II

To install or replace the ESK II, first unscrew the cover of the indicator housing.
The plug-in unit is easy and quick to install. Two half-round clips are located on the side of the ESK II housing and inserted underneath two pins (1). These pins are located on the baseplate on either side of the pointer pedestal. The hammer clip located in the baseplate snaps into a hole (2) in the base of the ESK housing, close to the supply terminal, to fasten the ESK II securely.



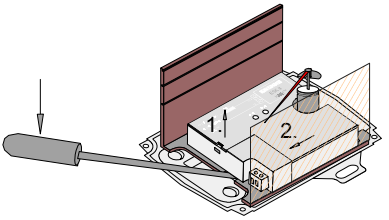
When the ESK II is retrofitted, the plate (**3**) for fastening the transformer is pushed aside automatically and can be removed as it is of no further use. Since the sensor system of the ESK directly detects the follower magnet on the pointer system, mechanical adjustment is not necessary.

13.2.2 Replacing an ESK II

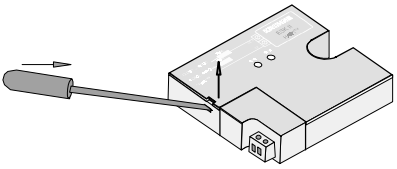
The ESK II is standardized by the factory, so recalibration of a replacement is not required.

The calibration data are stored in the EEPROM. If the flowmeter data or process data have not changed, this EEPROM can continue to be used.

First disconnect the ESK II from supply. Disconnect the power lead or simply pull off the terminals. Then use a screwdriver to lift the ESK II (1) and pull it out (2).

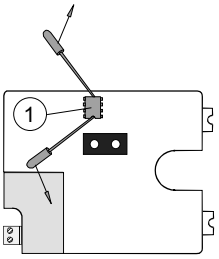


Use the screwdriver to slightly press down the lid lock, lift it up and remove the lid.



Lift the EEPROM (1) out of the base with the aid of a screwdriver. Avoid bending the terminal pins by levering up the EEPROM on the two terminal-free sides.

This EEPROM (1) is inserted in the replacement ESK II.

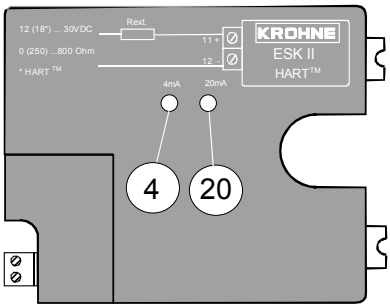


When inserting the EEPROM (1) into the base of the ESK, make sure the installation position is correct (pin 1 / notch).
Carefully plug all eight terminal pins together into the base.

Close cover

After powering the ESK II, an output current is displayed that is proportional to the scale value. If the ESK II is not built into the indicator, a current of approx. 12 mA is generated. However, should a current of > 20 mA be indicated, this means that possibly one of the terminal pins of the EEPROM is not correctly plugged into the base.

13.2.3 Setting zero and full-scale value at the ESK II



Zero and full-scale value (100%) can be set by means of integral pushbuttons. When the pushbutton behind the "4" is pressed for more than 5 seconds, the measured value will skip to 4mA. The ESK II is then in the zero adjust mode. Optionally, pushbutton 4 for downward correction or pushbutton 20 for upward correction can now be pressed until zero equals 4.00mA precisely.

Similarly, the 100% value can be set by pressing pushbutton 20 for longer than 5 seconds.

If neither of the two pushbuttons is pressed for longer than 10 seconds, the ESK II will automatically revert to its measuring mode and include the corrections. These corrections are stored and remain valid even if the ESK II is switched off for a lengthy period. These settings have no effect on the linearity of the ESK II.

Further settings can be made with the HART™ communicator or with a HART™ modem (converter RS232 / HART) and the KroVaCal PC program.

13.2.4 ESK II, retrofitting and calibration

If an ESK II is to be retrofitted, it should be installed as described above under Installation of an ESK. This ESK II does not yet have any calibration data and needs to be individually calibrated. If the M9 indicator has been prepared for an ESK II retrofit, the required calibration data will be found on the indicator housing cover.
To linearize requires the KroVaCal conversion program and a HART modem connected to the serial interface of the PC (see Sect. on HART communication). Detailed directions are included with the software. Linearization of the ESK II is carried out in 3 steps:

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

Recording of measuring points [I = f (Q); non-linear]
I = Signal output values [mA]
Q = Flow values of original product, or scale values

The measuring points should be recorded at the main scale marks to obtain the best possible linearization results.

These point can be approached in three different ways:

Dynamic setting:
setting of the flow value (original product or reference product established by conversion)

Static setting:
lifting the float **until the pointer indicates the appropriate scale value.**
Note: merely lifting the pointer is <u>not</u> sufficient!

Setting the pointer on the HT version (high-temperature):
by lifting the pointer to the appropriate scale value, the current of the ESK II can be read off precisely. The vertical position of the float has no effect on the ESK II.

Both the flow value and the relevant signal output value should be noted down for all measuring points. After all measured values have been recorded, actual linearization can begin.

Linearization is carried out using the KroVaCal program, which must be installed in a commercially available PC.

Minimum requirements:	Processor	80486	hard disk 45 MB available
	clock frequency	166 MHz	screen 800x600 small font
	16 MB RAM		CD ROM

A HART modem connected to the serial interface of the PC allows communication with the ESK II.

13.2.5 Changes and conversion, ESK II

The following parameters can be changed with the aid of the KroVaCal program:

- measuring range
- process temperature
- fluid product
- density
- viscosity
- pressure

Properties and possibilities of the KroVaCal program:

- calibration and conversion to any process fluid and any measuring range
- device identification
  device address
  serial number
  measuring point identifier (tag no.)
  storage of messages
- digital data retrieval in flow units, in % and in mA
- test / setting functions
  adjustment 4.00 und 20.00 mA
  setting the current output to any desired value
  self-testing of integral components and configurations
- printing of scale plate

However, every measuring section has its physical limits which the KroVaCal program will calculate correctly and possibly reject the required change. If a change is carried out with the program, the new data will also be transmitted to the ESK II.

13.3 Flow totalizer Z

The flow totalizer can, in conjunction with the electrical current output ESK II, also be retrofitted in the M9 indicator.

CAUTION: Installation of flow totalizers in "Ex" devices is not permissible!

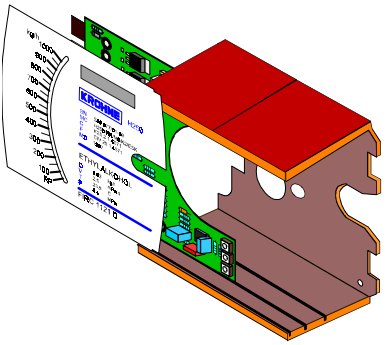
Retrofit kit – Order No.: V245100118
Items included: - flow totalizer
- **new scale with cutout for the totalizer display**

Replacement - Order No.: V245100018
Item included: - flow totalizer

When ordering the totalizer retrofit kit, please specify the device data as shown on the right, and also the measuring range. With the aid of these data, the supplied new scale with cutout for the totalizer display can be prepared in readiness for installation. The flow totalizer is then preset with the conversion factor relative to the measuring range.

SN	586 677/01-03	
MC	H250/RR/M9/K2/ESK	
C	K25.2 1.4571	
F	CIV 25 1.4571	
MD	1997	
ETHYL ALCOHOL		
D	0.93	kg/l
V	2.5	mPa.s
T	23.5	C
P	0.4	MPa
FIRC 1121 D		

Installation:
- For retrofitting, unscrew the housing cover of the indicator.
- Slide out the existing scale (to be replaced by the new one, supplied).
- Slide flow totalizer unit into the middle rail of the module rack.
- Electrical connection, see Sect. Electrical connection M9.
- Subsequently insert the new scale into the module rack.



Note: when sliding the scale over the totalizer display, lift it slightly until it frames the totalizer display.

- Further settings, see Sect. 11.2.

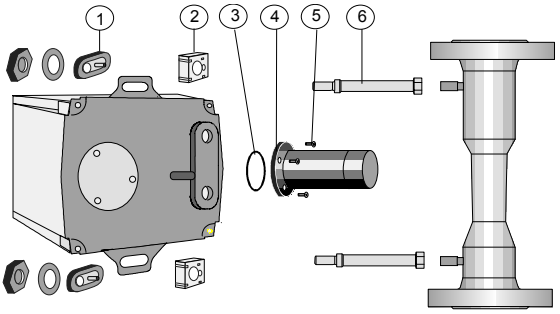
Screw down housing cover.

13.4 High-temperature version M9 indicator

Retrofit kit

Order No.: V245100021

Items included with supply:
- 1 no. HT extension piece (4)
- 1 no. gasket (3)
- 2 nos. distance bolts (6)
- 3 nos. fastening screws (5)



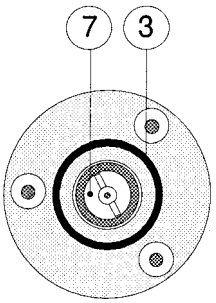
13.4.1 Installation

The flowmeter can remain in the pipeline.

- Note down the position of the pointer before dismantling the indicator!
- Detach both nuts used to fasten the indicator.
- Remove indicator and fastening clips (1,2) from the measuring section.
- Remove plastic cap from the HT extension piece (4).
- Place gasket (3) exactly in the groove of the HT extension piece (check correct seating of gasket (3)).
- When mounting the HT extension piece, make sure that the marking (7) (coloured dot) shows in the direction of the cable entry on the indicator.
- Attach the HT extension piece (4) with the three fastening screws (5) to the rear of the indicator.

Fit the distance bolts (6) to the set screws on the measuring section and tighten down (wrench size 14 mm).

Plan view of HT extension piece

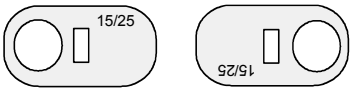


13.4.2 Mounting the indicator

Position the indicator with fastening clips (1,2) on the distance bolts (6), fit washers and tighten down with the nuts (max 8 Nm).

Note:
Note mounting position of clips.
DN15, DN25 and DN50, DN80, DN100

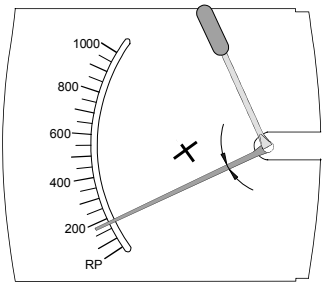
Fastening clip 1



DN15, DN25 DN50, DN80, DN100

Compare the pointer position with the previously noted indicator value.

If there is any deviation:
Hold the pointer spindle with a screwdriver (see diagram).
Set the pointer to the previously noted value by moving it against the frictional force of the pointer fastener.



13.5 List of spares

M9 indicator		**Order No.**
Housing cover and seal		4003400100
Baseplate		4003410100
Module rack		3165450100
Contact module Kmin	(SC 3,5-N0, 2-wire tech. Ex)	V245100010
Contact module Kmax	(SC 3,5-N0, 2-wire tech. Ex)	V245100011
Contact module K2	(SC 3,5-N0, 2-wire tech. Ex)	V245100012
Contact module K1mm	(SJ 3,5-E2, 3-wire tech.)	V245100030
Contact module K1max	(SJ 3,5-E2, 3-wire tech.)	V245100031
Contact module K2	(SJ 3,5-E2, 3-wire tech.)	V245100032
Electrical signal output ESK II		V245100014
Electrical signal output ESK II / Ex		V245100013
Flow totalizer replacement (without scale)		V245100018
Flow totalizer retrofit kit with new device scale		V245100118
High-temperature extension piece		V2451 00021

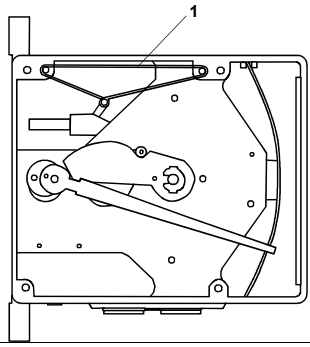
M7 indicator and add-on components

An EC Type Approval Certificate in conformity with 94/9/EC has not been applied for in respect of the H 250/M7. An appropriate EC Type Approval Certificate is at hand in respect of the limit switches.

15 Transport lock / Removal of locking device

Moving parts of the M7 indicator system are secured by a rubber band (1) to protect against damage in transit.

Remove the rubber band before starting up the flowmeter. To do so, unscrew the left housing cover of the M7 indicator.



16 Limit switches Kmin / Kmax / K2

Description
The H250/M7 variable-area flowmeter can be equipped with a maximum of two electronic limit switches.

The limit switch operates with a slot sensor that is inductively actuated by the semicircular metal vane on the measuring pointer. The switching points are set by way of contact pointers on the scale. The position of the contact pointer also serves to visually indicate the set limit value.

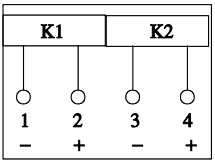
Versions are available in 2-wire and 3-wire technology:
2-wire technology: SC 2-N0 or SC 3,5-N0-Y | 3-wire technology SJ3,5-E2-Y

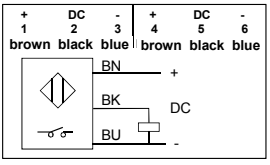
Limit switches SC 2-N0 and SC 3,5-N0-Y are certified by the Physikalisch-Technische Bundesanstalt. They are therefore suitable for use in hazardous areas.
They are matched for isolation switching amplifiers with certified intrinsically safe control circuit in conformity with NAMUR and DIN 19234.
The isolation switching amplifier must be mounted outside the hazardous area.
For connection, consult the regulations specified in VDE 0165 or equivalent national standard.

16.1 Electrical connection

Limit switches SC 2-N0 and SC3,5-N0-Y are connected up in conformity with DIN 19234 (NAMUR). An isolation switching amplifier is required for operation of this limit switch in 2-wire technology (see Electrical connection M9).
For electrical connection, remove the **left** housing cover.

K1 = 1 limit switch
K2 = 2 limit switches





Electrical connection for the hazardous area

①

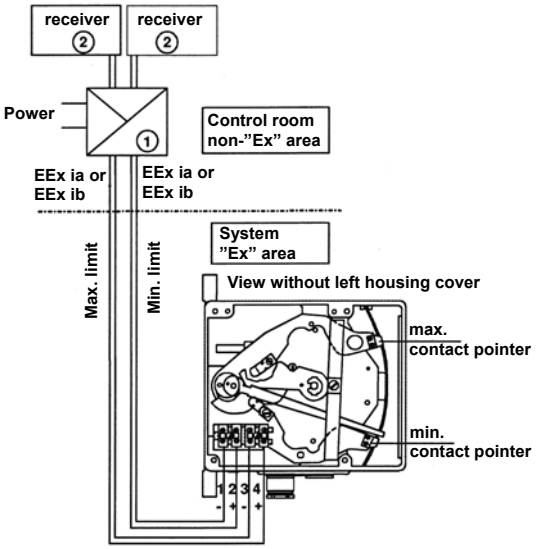
EEx ia or EEx ib certified isolation switching amplifier with intrinsically safe input circuit (NAMUR),

1 or 2 channels with the following max. values:

$U_0 \leq 16V$, $I_0 \leq 52$ mA, $P_0 \leq 169$mW, per circuit

②

any receiver instrument, recording device



16.2 Setting the limits

The switching points are set by way of the contact pointers.

- First remove the left housing cover.
- Set contact pointer to the required switching point (value on flow scale) at which the contact is to operate.
- Replace and screw down housing cover.
- The device is ready to operate.

16.3 Technical data

Limit switches		**SC 2-N0 / SC 3,5-N0-Y**	**SJ3,5-E2-Y**
Nominal voltage Ub		8 VDC	10 to 30 VDC
Power consumption	active area clear	3 mA	
Output	active area clear		≤ 0.3 V
Power consumption	active area obscured	1 mA	
Output	active area obscured		≥ (U_t – 3 V)
Ambient temperature at limit switch		-25 to + 100°C	-25 to + 70°C
Continuous current			100 mA
No-load power consumption			15 mA
Electrical characteristics		DIN 19234 (NAMUR)	
Protection category (EN 60529 / IEC 529)		IP 67	
Electromagnetic compatibility (EMC)		to EN 50081-1, EN 50082-2	

For ATEX limit switches:

Only for connection to intrinsically safe circuits with the following maximum values:

Limit switches	**Ui [V]**	**Ii [mA]**	**Pi [mW]**	**Ci [nF]**	**Li [µH]**
SC 2-NO [Ex] SC 3,5-NO [Ex]	≤ 16	≤ 52	≤ 169	≤ 150	≤ 150
SJ 2-SN [Ex] SJ 2-S1N [Ex]	≤ 16	≤ 52	≤ 169	≤ 60	≤ 100
SC 2-NO [ATEX] SC 3,5-NO [ATEX]	≤ 16	≤ 25/≤ 52*	≤ 64/≤ 169*	≤ 150	≤ 150
SJ 2-SN [ATEX] SJ 2-S1N [ATEX]	≤ 16	≤ 25/≤ 52*	≤ 64/≤ 169*	≤ 30	≤ 100

* dependent on the isolation switching amplifier used

Note: take temperature classes into consideration!

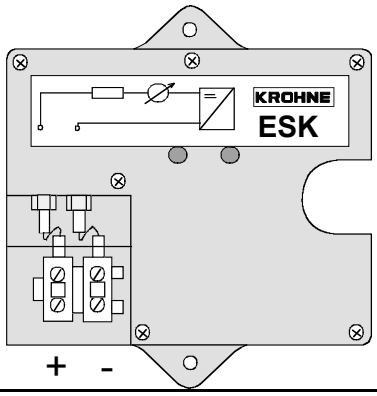
Note: limit switches SJ 3,5-E2-Y not for use in hazardous areas!

17 Electrical signal output ESK

Description
The ESK generates a current of 4 to 20 mA in two-wire technology that is proportional to the current flow rate. Transmission is non-interacting and hysteresis-free. The ESK is factory-calibrated on the basis of the flow measuring range. The calibration data - which are used for linearization of the ESK - are filed in a memory chip (EPROM).

The required power is a functional extra-low voltage with protective separation in conformity with VDE 0100 Part 410.

All instruments connected to the measuring circuit (indicators, recorders) should be connected in series and, together, should not exceed the maximum external resistance. The ESK features polarity reversal protection.



Use in hazardous areas (PTB approval only)
Flowmeters of hazardous-duty design with ESK transmitter are certified by the Physikalisch-Technische Bundesanstalt. PTB No. Ex-94.D.2067
The supply power must be taken from a certified intrinsically safe feeder unit or repeater power supply unit that is installed outside the hazardous area. For connection, consult the regulations specified in VDE 0165 or equivalent national standard!

17.1 Electrical connection

To connect the ESK, first remove the righthand housing cover.
To conform to the requirements of the IP protection category, please note the following recommendations:

- Cable diameter 8 to 13 mm
- If the fit of incoming cables is excessively tight, remove the appropriate ring from the seal on the cable gland.
- Leave blanking plugs in all unused cable entries.

The power supply Ub is 12.7 to 30 V DC. Load impedance (line resistance + loads) may not exceed 800 Ω.

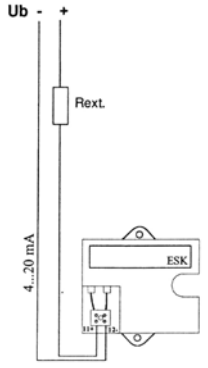
①
EEx ia or EEx ib certified repeater power supply unit with intrinsically safe input circuit and

max. values: $U_0 \leq 30$ V, $I_0 \leq 100$ mA, $P_0 \leq 1.0$W

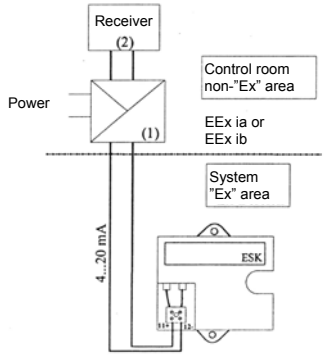
②
any receiver instrument, recording device

The supply power Ub is 12.7 to 30 V DC. Load impedance (line resistance + loads) not to exceed 800 Ω.

Conn.principle non-"Ex" area



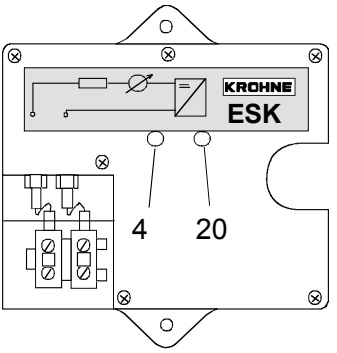
Electrical connection hazardous ("Ex") areas



17.2 Settings

The ESK is factory adjusted and calibrated on the basis of the measuring range so that zero and 100% adjustment are not required.
If fine adjustment is nevertheles required, this can be carried out as follows:

Zero	Float at rest. Set 4.00 mA with potentiometer (4).
100% value	Lift the float until the pointer indicates the 100% flow value. Set 20.00 mA with potentiometer (20).
Note	Use a non-ferromagnetic screwdriver, otherwise risk of influencing the sensor and falsifying values!



These settings have no effect on the linearity of the ESK.

17.3 Technical data

Electrical signal output ESK

Supply power	12.7 to 30V DC
Power consumption	4 to 21.60 mA for 0% to 110% of meas. value
Power influence	< 0.1% *
External resistance dependence	< 0.1% *
Temperature effect	< 10 µA / K
Max. external resistance/load impedance	0 to 800 Ω
2-wire connection	Rext [kΩ] = (supply power [V] – 12.7 V) / 22mA
Ambient temperature at ESK	- 25°C to + 80°C
Storage temperature	- 40°C to + 85°C
Protection category (EN60529 / IEC 529)	IP20

* without considering resolution steps

Only relevant for hazardous areas
Only for connection to intrinsically safe circuits with the following max. values:

No-load voltage U_0	30 V
Short-circuit current I_K	100 mA
Output P	1 W
Effective inner capacitance	< 20 nF
Effective inner inductance	negligible
Individual approval (ESK M7)	only PTB No. Ex-94.D.2067

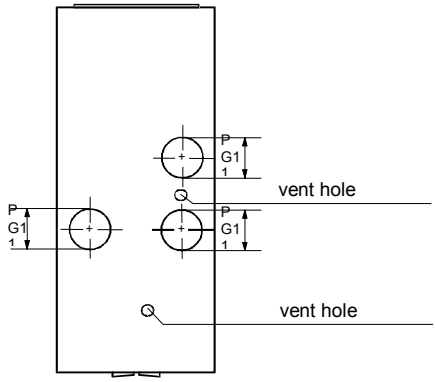
18 Pneumatic signal output P

Description
A WT 80 transmitter with VR 80 amplifier is built into the M7 indicator housing to convert the measured flow value into a pneumatic signal of 0.2 – 1 bar (2.9 – 14.5 psig).

Start-up

- Use only cleaned, oil-free and moisture-free air to operate the transmitter.
- Blow out air intake lines before connecting up.
- Intake air pressure to be a constant 1.4 ± 0.1 bar (20.3 psig + 1.45 psig).
- Connect up the input and output in accordance with the details given on the information plate on the underside of the M7 indicator.

Important:
Do not block or close off the two vents on the underside of the device.
If closed off, there is risk that the glass pane will crack.



View: Underside of M7 indicator

- Leak tightness: check NPT screw connections with leak indicator spray.
- If necessary, retighten screw connections.
- The WT 80 transmitter hs been factory-set in keeping with the order and based on the measuring range. No further adjustments are necessary.
- The device is ready to operate.

Technical data WT 80

Air inlet pressure	1.4 bar ± 0,1 bar	
Air consumption	480 l/h	
Air capacity	1800 l/h	
Output	0.2 to 1.0 bar	
Linearity error	± 0.5%	
Hysteresis	0.25%	
Sensitivity	0.1%	
Ambient temperature at WT 80	–25°C to +70°C	
Temperature effect	0.03%/°C	
Inlet pressure dependence	0.2%/0.1bar	
Load dependence (at 0.6 bar)	1.2% at 300 l/h	3% at 600 l/h
Connections	1/8“ NPT	

19 Table of maximum process and ambient temperatures

Max. process temperature Tp without ESK, K1, K2,Z

H250/RR/, H250/HC (Hastelloy C4)	
at ambient temperature (Ta) ≤ 120°C	300°C, other temperatures on request
H250/C (ceramic float)	
at ambient temperature (Ta) ≤ 120°C	250°C
H250/C (PTFE float)	
at ambient temperature (Ta) ≤ 70°C	70°C
Min. process temperature Tp without ESK, K1, K2,Z	-80°C, others on request
Ambient temperature Ta with ESK, K1, K2,Z	Standard: - 25°C … 80°C “Ex“ version: -20°C …60°C dependent on process temperature

Max. process temperature Tp with ESK, K1, K2,Z:

Meter size				Version	Application range		
Flanges to ...					Non-hazardous area		
without heating		with heating			Ta <40°C Tp in		Ta < 60°C Tp in
DIN	ANSI	DIN	ANSI				
DN mm	inches	DN mm	inches		°C		°C
DN15/25	1/2", 1"	DN15	1/2"	M7/ESK M7/K M7/KD M7/P	200 (180) 200 (180) 175 170		165 (110) 200 (110) 105 100
DN 50	2“	DN 25	1“	M7/ESK M7/K M7/KD M7/P	190 (150) 200 (150) 145 150		145 (100) 200 (100) 95 90
DN 80/100	3“, 4“	DN 50 DN 80	2“, 3“	M7/ESK M7/K M7/KD M7/P	180 (145) 200 (145) 130 125		135 (90) 175 (90) 85 85

Process temperatures higher than those in ( ) require use of a heat-resistant cable with a permissible operating temperature of min. 100°C.

*** Refer to Sect. 21, certificate of conformity M7, for max. allowed process temperatures for flowmeters of hazardous-duty design,**

20 Service

The H250 flowmeter with M7 indicator can be retrofitted with an electrical signal output.

20.1 Electrical signal output ESK

	Order No.:
Electrical signal output ESK	V 245100014
Electrical signal output ESK / Ex	V 245100013
Software, linearization ESK on 3.5“ disk, German	V 260100040
Software, linearization ESK on 3.5" disk, English	V 260100041

Items included with supply:

- 1 ESK with built-in **adjustment EPROM** (8.12286.00)
- 1 cable gland (with O-ring)
- 1 EPROM (clean)
- 1 adjustment screwdriver

The ESK electrical signal output is a two-wire transmitter with an output signal of 4...20 mA. It is non-linearized when supplied in the form of a retrofit kit but includes an EPROM allowing individual linearization. The potentiometers P0 for 4 mA und P100 for 20 mA are factory-set and **should not be readjusted before linearization** (see Section on “Adjustment").

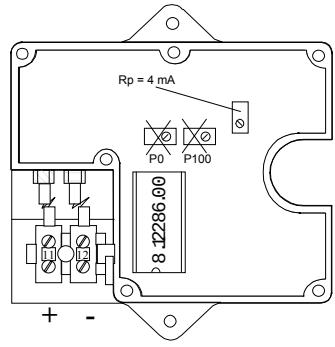
Installation
To retrofit, first unscrew the righthand housing cover.
Mount the ESK with two Phillips screws M5.
The ESK is initially non-linearized.
To connect, refer to Sect. on Electrical connection M7.

Linearization
The linearization program ESK (Order No. see above) and an appropriate EPROM programming unit are required. The ESK is linearized in 4 steps:

- Adjustment of the ESK to the float reference point (RP) = 4 mA
- Recording of the measuring points
- Linearization of the characteristic curve by means of a PC
- Storage of linearization data in the EPROM

Adjustment of the ESK to the reference point RP = 4 mA
To adjust to the RP, fit the indicator with built-in ESK to the measuring section.

- Connect the ESK to a power unit with a series-connected measuring instrument.
- Remove cover of the ESK.
- Use potentiometer RP to adjust the signal output value to 4 mA



Caution: use only the supplied “non-ferromagnetic" screwdriver.

Potentiometers for 4 mA (P_0) and 20 mA (P_{100}) are preset by the factory and should not be readjusted before linearization has been carried out.

Recording of measuring points $I = f(q_V)$
I = signal output values [mA]
q_V = flow values of the original fluid or main scale marks

The measuring points should be recorded in 10% steps or at the main scale marks to obtain the best possible linearization results. These points can be approached in two different ways:

- **dynamic setting:**
  setting of the flow value (original fluid or reference fluid established by conversion)
- **static setting:**
- lifting the float until the pointer indicates the appropriate scale value.
- Note: merely lifting the pointer is not sufficient.

Both the respective flow value and the associated signal output value should be noted down for all measuring points. After all measuring points have been recorded, actual linearization can then begin.

Linearization of the characteristic curve by means of a PC

The advice given on installation in the documentation pertaining to the ESK linearization program should be read through first, especially if the program is being used for the first time.

The ESK linearization program is started up as follows:

Transfer to the directory in which the program is located [e.g. cd ESK]
Invoke with "ESK".
After the program start, enter the following data:

- Full-scale range (100% value) for the flowrate (e.g. 1000 for 1000 l/h) with
  SHIFT F1 100% value ENTER

- Comm. No. or TAG No., without separators or blanks (data are stored ultimately under this designation) with
  SHIFT F2 Comm. No. ENTER

- Serial No. of the ESK, without separators or blanks (this number will be found on the side of the ESK module, e.g. 2930500) with
  SHIFT F3 Serial No. ENTER

- The recorded measuring points for flow rate and signal output with
  F1 1st value(q_{V1}) ENTER 1st value(I_1) ENTER
  F2 2nd value(q_{V2}) ENTER 2nd value(I_2) ENTER
  and so on
  F10 10th value(q_{V10}) ENTER 10th value(I_{10}) ENTER

- Save linearization data on hard disk and/or floppy disk with **ALT F8**

- Generate and store a Prom File (a:\promfile.prm) with **ALT F1**

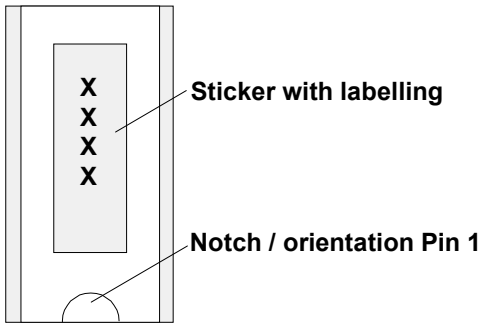
- Terminate program with **ESC**

Storing linearization data in the EPROM
The ESK retrofit kit includes a clean EPROM for storage of the linearization data.
When using a suitable programming device, e.g. Galep III, please take note of the directions given in the device manual.
After programming, take out the EPROM and label it with the Comm. No. or TAG No.

Sticker on "window" of the EPROM to protect against UV light

Subsequently replace the adjustment EPROM located in the ESK with the new EPROM containing the linearization data.

When plugging the EPROM into the ESK, ensure position is correct (Pin1 / notch)!



Caution: The EPROM is a safety-relevant component. Therefore, use only the supplied EPROM or an equivalent type in a ceramic housing.

Linearization is complete once the EPROM has been plugged in.

Error messages during data input at the PC

- **Full-scale range**
  Entered flow value is greater than q**V**$_{max}$ (flow: 100%); i.e. flow for 100%, or current flow value, is incorrect; i.e. entry needs to be corrected.
- **Please enter a number**
  Incorrect input format; only characters – no separators or blank spaces – may be entered; use a dot (.) as decimal separator.
- **mA-Max I**
  The entered value of current is greater than I_{max} (22.5 mA); i.e. input needs to be corrected.
- **Minimum of 3 values**
  Insufficient number of measuring points; a minimum of 3 points need to be linearized (recommended are 10 values).
- **Must be: 100%**
  Entered values are incorrect: flow from the last measuring point must be equal to the flow value for 100%.
- **Values implausible**
  Linearization curve does not show a steady rise; check individual measuring points.
- **Existing file**
  File cannot be stored because its name already exists; correct the entry (change file name).
- **File not found**
  File cannot be loaded; enter correct file name.

20.2 List of spares

M7 indicator	**Order No.**
Housing cover with seal	V027100110
Seal for housing cover	3122220100
Electrical signal output ESK	V260100043
Electrical signal output ESK/Ex	V260100042
Retrofit kits	
Limit switch K1	V260100094
Limit switch K2	V260100095
Pneumatic signal output	V027100151

Maintenance

The flowmeter does not normally require any maintenance when used for the designated purpose. However, cleaning is necessary if the measuring cone or float has been contaminated by the process. To clean, the flowmeter has to be removed from the pipeline.

Note
Reduce the pressure in pressurized pipes before removing the measuring section.
In connection with devices used for measurement of aggressive media, take appropriate safety precautions in respect of residual fluids in the measuring section.
Always use new gaskets when reinstalling the measuring section in the pipeline.

If you need to return flowmeters for testing or repair to KROHNE

If installed and operated in accordance with these Operating Instructions, your flowmeters will rarely present any problems.

Should you nevertheless need to return an H 250 flowmeter for checkout or repair, please pay strict attention to the following points:

Due to statutory regulations concerning protection of the environment and the health and safety of our personnel, KROHNE may only handle, test and repair returned flowmeters that have been in contact with fluids if it is possible to do so without risk to personnel and environment. This means that KROHNE can only service your unit if it is accompanied by a certificate in line with the following model confirming that the flowmeter is safe to handle.

If the flowmeter has been operated with toxic, caustic, flammable or water-endangering products, you are kindly requested

- to check and ensure, if necessary by rinsing or neutralizing, that all cavities are free from such hazardous substances,
- to enclose a certificate with the flowmeter, confirming that it is safe to handle and stating the fluid used.

KROHNE regret that they cannot service your flowmeter unless it is accompanied by such a certificate.

If you need to return a device for testing or repair to KROHNE

Your instrument has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, your instrument will rarely present any problems. Should you nevertheless need to return an instrument for checkout or repair, please pay strict attention to the following points:

Due to statutory regulations concerning protection of the environment and safeguarding the health and safety of our personnel, KROHNE may only handle, test and repair returned instruments that have been in contact with liquids if it is possible to do so without risk to personnel and environment.

This means that KROHNE can only service your instrument if it is accompanied by a certificate in line with the following model confirming that the instrument is safe to handle.

If the instrument has been operated with toxic, caustic, flammable or water-endangering liquids, you are kindly requested

- to check and ensure, if necessary by rinsing or neutralising, that all cavities in the instrument are free from such dangerous substances.
  (Directions on how you can find out whether the primary head has to be opened and flushed out or neutralised are obtainable from KROHNE on request.)

- to enclose a certificate with the instrument confirming that the instrument is safe to handle and stating the liquid used.

KROHNE regret that they cannot service your instrument unless it is accompanied by such a certificate.

Specimen certificate

Company: …….. Address: ……

Department: …….. Name: ……

Tel. No.: …… Fax No.: ……

The enclosed instrument

Type: ……

KROHNE Order No. or Series No.: ……

has been operated with the following process liquid: ……..

Because this process liquid is
water-endangering * / toxic * / caustic * / flammable *
we have
– checked that all cavities in the instrument are free from such substances *
– flushed out and neutralised all cavities in the instrument *
(* delete where not applicable)
We confirm that there is **no** risk to man or environment through any residual liquid contained in the instrument.

Date: …….. Signature: ……..

Company stamp: