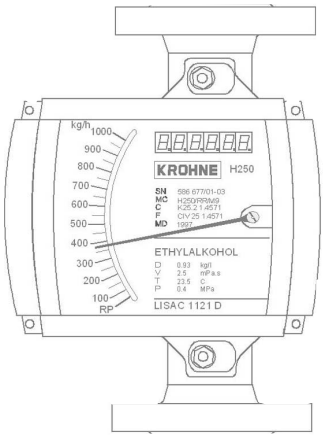
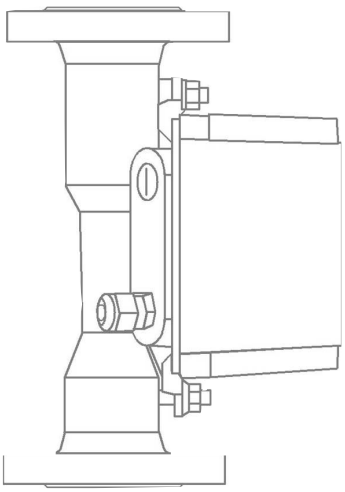
KROHNE

 7.02310.23.00

GR

Variable-area flowmeter
H 250/M9





H 250

... flow measurement can't be easier or more flexible

one all-metal flowmeter
four electrical add-on devices:

ESK	2-wire transmitter
ESK-Z	electronic totalizer
ESK3-PA	Profibus PA transmitter
K	switching contacts

four materials for the measuring section: stainless steel, Hastelloy, ceramic-PTFE, PTFE

Description

The H 250 flowmeter for measurement of the volumetric or mass flow rate of liquids, gases and steam is an all-metal flowmeter that operates on the float measuring principle. The flow-dependent vertical position of the float in the measuring tube is transmitted by a magnetic coupling system to the scale in the indicator part. The flowmeter is installed in a vertical pipe run, with flow from bottom to top. Owing to its rugged design, the H 250 variable-area flowmeter is particularly suitable for difficult applications and environmental conditions.

In the **M9 indicator**, the vertical position of the float is transmitted to the pointer/magnet system, and the flow value indicated directly on the scale.

Special technical features

Measuring sections
H 250 RR
- of highly corrosion-proof stainless steel
- rugged all-metal design
- all built-in parts replaceable
- all pressurized welds suitable for x-ray examination
- float damper of aluminium oxide (Al_2O_3), PEEK or stainless steel, also retrofittable
- the measuring section can be equipped with a heating jacket

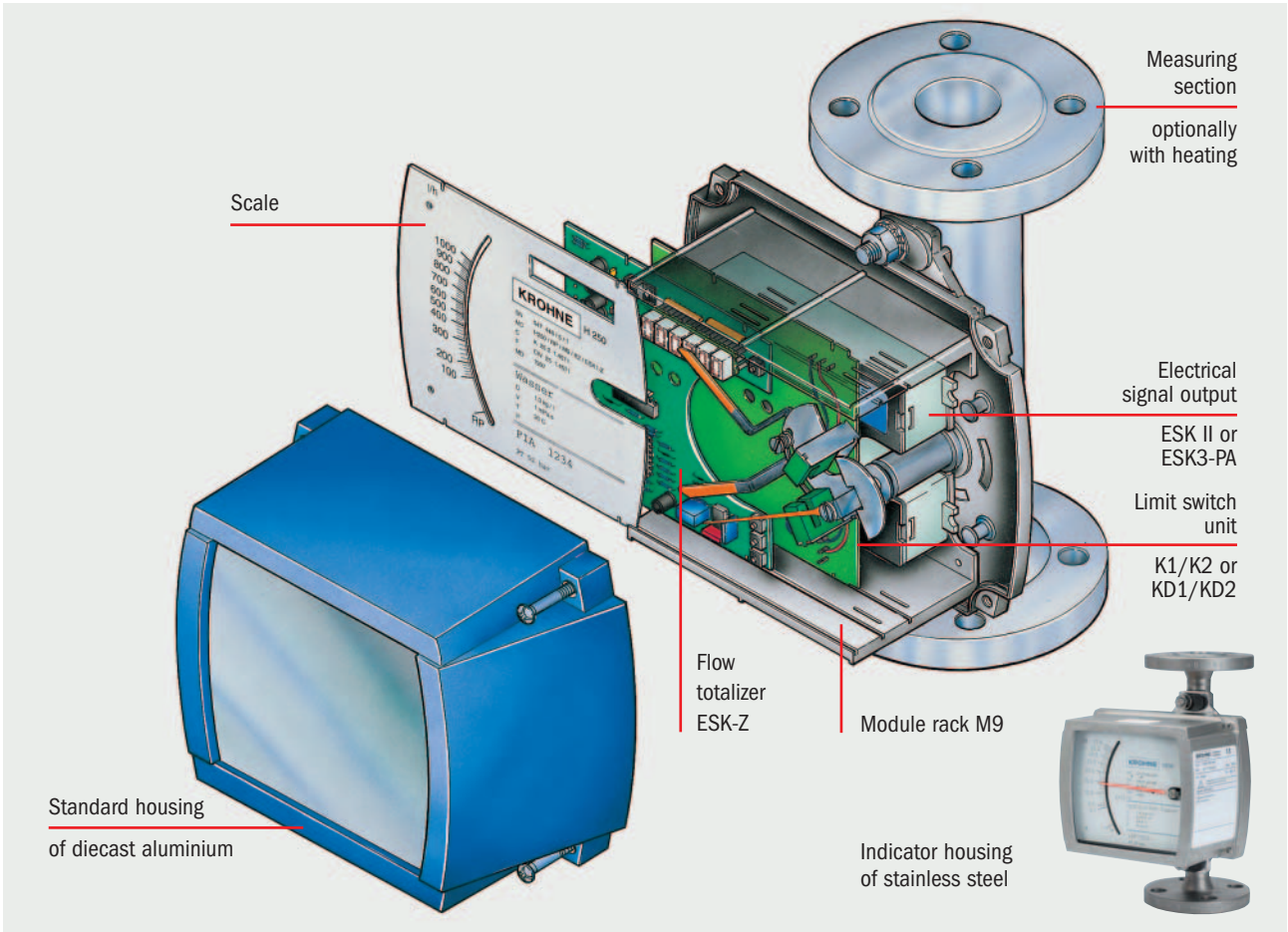
H 250/C (ceramics/PTFE)
- suitable for most acids and alkalis
- very good long-time stability
- high-temperature design up to 250°C
- all wetted parts made of ceramics (Al_2O_3) and/or PTFE

H 250/F (food)
- all-metal flowmeter, no blind spots
- surface roughness of wetted parts Ra ≤ 0.8 µm
- CIP and SIP cleanability (200°C)
- materials in conformity with FDA standards
- connections: Tri-Clamp, DIN 11851, flanges, etc.
- EHEDG tested / USA 3-A certified

Indicator
M9 indicator/modular standard and EEx e
- direct-reading flow indicator
- indicator with extension piece (HT version) for high process temperatures
- electrical signal output (ESK II) with HART® communication in 2-wire technology (can also be retrofitted)
- communication interface PROFIBUS-PA, as an alternative to ESK II
- max. 2 limit switches (K) adjustable on the scale (can also be retrofitted)
- flow totalizer ESK-Z in connection with current output ESK II (can also be retrofitted, not for hazardous duty)
- multipole ring magnet with effective eddy-current brake
- optionally, seawater-proof indicator housing
- optionally, indicator housing of stainless steel 1.4404 (M9 SS)

Indicator M9 of modular construction

- A module rack in the M9 indicator accommodates all electrical add-on functions and the scale plate.
- The modules of electrical options ESK II, ESK3-PA, ESK-Z, K1 or K2 and the scale plate are plugged into the module rack (plug-in technique).
- Module replacement or retrofitting without interrupting the process and without dismantling the pointer.
- If process temperatures should exceed the max. allowable level for the standard version, the indicator can be adapted to the new operating conditions by way of an adapter (HT version).
- Measuring sections made of various materials and with different liners are available for the process products.
- The flowmeter can be supplied with magnetic filters and/or a float damper, or these can be retrofitted.



Electromagnetic compatibility (EMC)

The variable-area flowmeter
type: **H 250/M9/ESK II**

meets the requirements of the 89/336/EEC directive
in compliance with the following European standards:

EN 61326 : 03/1997
+A1 : 04/1998
+A2 : 03/2001

and also the requirements of NAMUR recommendation NE 21/05/93.

Hazardous-duty (Ex) version

The variable-area flowmeter H 250 M9 is approved for use in hazardous areas.

Physikalisch-Technische Bundesanstalt:
EEx ia IICT6...T3 and EEx ib IICT6...T3
H 250/M9: PTB 01 ATEX 2181

Factory Mutual Research (FM) USA:
Class I, Division 1, Groups A, B, C and D
Class I, Division 2, Groups A, B, C and D
J.I.3001672

Canadian Standards Association (CSA)
Class I, Division 1, Groups A, B, C and D
Class I, Division 2, Groups A, B, C and D
LR 105802-7

Responsibility for these measuring devices as to suitability, designated use and corrosion resistance of the materials used in relation to the process product rests solely with the operator.

Technical data

Device type		H250 / M9		
Measuring ranges (100% values)		Select fluid product acc. to flow table		
	water (20°C)	25 to 100 000 l/h		
	air (1.013 bar abs., 20°C)	0.7 to 600 m³h		
Turndown ratio		10:1		
Accuracy class to VDI/VDE Code 3513, Sheet 2				
H250/RR H250/HC H250/F		1.6		
H250/C		2.5		
Connection H 250				
Flanges (H250/RR/HC/C)	companion dimensions to	EN-1092-1	DN15-100, PN16-100	
		ANSI B 16.5	1/2" - 4", 150 - 600 lbs	
		JIS B 2238	LR 15-100, 10K-20K	
Clamp connections (H 250/RR/F)	companion dimensions to	DIN 32676	DN15 - 100, 10-16 bar	
		ISO 2852	size 25-139,7 10-16 bar	
Screw connections (H 250/RR/HC/F)	companion dimensions to	DIN 11851	DN15 - 100, 25 - 40 bar	
		SMS1146	1"- 4", 6 bar	
Inside thread, welded (RR, HC)	companion dimensions to	ISO 228	G3/4" -, G1" PN 50	
		ANSI B1.20.1	3/4" NPT	
Inside thread, screwed (RR, HC) (with insert and union nut)	companion dimensions to	ISO 228	G1/2" - 1", PN 40 - 50	
		ANSI B 1.20.1	1/2" - 1" NPT	
Sterile screw connection (H 250/F)	companion dimensions to	DIN 11864 - 1	DN 15 - 50 : PN 40	DN 80 - 100 : PN 16
Sterile flange (H 250/F)	companion dimensions to	DIN 11864 - 2	DN 15 - 50 : PN 40	DN 80 - 100 : PN 16
Connection for heating system (H 250/RR/HC)				
	flange connection	EN 1092-1	DN 15; PN 40	
		ANSI B 16.5	1/2"; 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				
	H 250/RR	metal tube with tapered measuring section		
	H250/HC (Hastelloy C4)	metal tube with tapered measuring section		
	H 250/C (ceramics/PTFE)	measuring tube with standard orifice plate		
Float shapes	H250/RR,	liquids	CIV, DIV (damping possible)	
	H250/HC (Hastelloy C4)	gases	TIV, DIV, DIVT (damping possible)	
	H250/C (ceramics, PFTE):	liquids, gases	tapered, type E	
Scale marks		flow units		
Overall height				
with flange connection (excl. gaskets)		250 mm		
with special connections		300 mm (H 250/RR)		
Operating pressure PS (pressure specified)	Directive 97/23/EC of the Council dated 29 April 1999 concerning transportable pressure equipment (pressure equipment directive) applies. The max. allowable operating pressure PS is calculated for the max. allowable operating temperature TS. Both limits values (PS and TS) are specified on the nameplate. PS is normally equivalent to the nominal pressure of the connection.			
Test pressure PT (pressure tested)	The test pressure is calculated in accordance with pressure equipment directive (97/23/EC) and/or AD 2000-HP30, in compliance with the max. allowable operating pressure and the max. operating temperature			
Type of protection of indicator M9 to EN 60529 / IEC 60529		IP 67, NEMA 4X		

Max. process temperature TS H250/ .. / M9 (excl. built-in electrical equipment) (TS = temperature specified)

Version	Material	Max. process temperature TS [°C]	at ambient temperature Ta [°C]
H250 / RR	stainless steel	300	≤ 120
H250 / HC	Hastelloy C4	300	≤ 120

	Float	Liner		
H250 / C	PTFE	PTFE	70	≤ 70
H250 / C	ceramics	PTFE	150	≤ 70
H250 / C	ceramics	TFM	250	≤ 120

Min. process temperature TS -80°C, others on request
Min. ambient temperature Ta -40°C

Max. process temperatures TS in non-hazardous area for H 250 / M9 with built-in electrical equipment

without heating jacket		with heating jacket		Version	Max. allowable process temperatures in °C		
					Ta < 40°C	Ta < 60°C	
DIN	ANSI	DIN	ANSI		Tp °C	Tp °C (1)	Tp °C (2)
DN15/25	½", 1"	DN15	½"				
				M9 / ESK II	200	180	150
				M9 / HT / ESK II	300	300	235
				M9 / ESK-Z	200	80	80
				M9 / HT / ESK-Z	300	130	130
				M9 / K	200	200	150
				M9 / HT / K	300	300	235
				M9 / KD	200	130	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 / ESK-Z	180	75	75
				M9 / HT / ESK-Z	300	100	100
				M9 / K	200	200	125
				M9 / HT / K	300	300	170
				M9 / KD	200	120	120
				M9 / HT / KD	300	195	170
DN 80/100	3", 4"	DN 50	2", 3"				
		DN 80		M9 / ESK II	200	150	105
				M9 / HT / ESK II	300	250	145
				M9 / ESK-Z	150	70	70
				M9 / HT / ESK-Z	270	85	85
				M9 / K	200	200	105
				M9 / HT / K	300	300	145
				M9 / KD	190	110	105
				M9 / HT / KD	300	160	145

(1) heat-resistant cable required, with a continuous operating temperature of 100°C
(2) heat-resistant cable not required

Code designations:
ESK II - signal output 4 ... 20 mA
ESK-Z - flow totalizer
HT - high-temperature version
K - switching contact / 2-wire
KD - switching contact / 3-wire

Temperature classes for H 250 / M9 – EEx to PTB 01 ATEX 2181

Variable-area flowmeters of type H 250/M9-EEx with built-in electrical equipment are dependent on the temperature class and ambient temperature.

The tables for determining the allowable temperature class take account of the following parameters:

- built-in equipment
- allowable max. power loss Pi (for K1 and K2)
- ambient temperature T_{amb}
- process temperature $T_p \leq TS$ (max. allowable operating temperatures, non-"Ex" applications)
- meter size DN
- standard or high-temperature version (HT)
- standard or heating jacket version
- heat resistance of the power cable

Where several built-in intrinsically safe devices are used, the user should take the data of the “worst case” device as a basis.

Max. allowable process (T_p) and ambient (T_{amb}) temperatures H 250/../M9

/ ESK II-EEx (-AEx)

					Max. allowable process temperature T_p [°C]						
		Temperature class to EN 50014			T6	T5	T4	T3		T2, T1	
		T_{amb} [°C]	≤ 40	≤ 60	≤ 40	≤ 60	≤ 60	≤ 40	≤ 60	≤ 40	≤ 60
without heating jacket	with heating jacket	High-temperature version	Heat-resistant cable required for T_p [°C] and higher								
DN 15	DN 15		----	150	85	100	135	200	183	200	183
DN 25		x	----	236	85	100	135	200	200	300	300
DN 50	DN 25		----	127	85	100	135	200	165	200	165
		x	----	171	85	100	135	200	200	300	300
DN 80	DN 50		----	109	85	100	135	200	150	200	150
DN 100	DN 80	x	----	145	85	100	135	200	200	300	252

/ ESK 3-PA-EEx

					Max. allowable process temperature T_p [°C]						
		Temperature class to EN 50014			T6	T5	T4	T3		T2, T1	
		T_{amb} [°C]	≤ 40	≤ 60	≤ 40	≤ 60	≤ 60	≤ 40	≤ 60	≤ 40	≤ 60
without heating jacket	with heating jacket	High-temperature version	Heat-resistant cable required for T_p [°C] and higher								
DN 15	DN 15		----	150	83	76	135	200	183	200	183
DN 25		x	----	236	85	100	135	200	200	300	300
DN 50	DN 25		----	127	77	74	135	200	165	200	165
		x	----	171	85	91	135	200	200	300	300
DN 80	DN 50		----	109	71	72	135	200	150	200	150
DN 100	DN 80	x	----	145	85	85	135	200	200	300	252

Max. allowable process (T_p) and ambient (T_{amb}) temperatures H250/../M9

/K.-EEx (-AEx) with SC3,5-NO-Y ... /Pi ≤ 64 mW

					Max. allowable process temperature T_p [°C]						
		Temperature class to EN 50014			T6	T5	T4	T3		T2, T1	
		T_{amb} [°C]	≤ 40	≤ 60	≤ 40	≤ 60	≤ 60	≤ 40	≤ 60	≤ 40	≤ 60
without heating jacket	with heating jacket	High-temperature version	Heat-resistant cable required for T_p [°C] and higher								
DN 15	DN 15		----	150	85	100	135	200	200	200	200
DN 25		x	----	236	85	100	135	200	200	300	300
DN 50	DN 25		----	127	85	100	135	200	200	200	200
		x	----	171	85	100	135	200	200	300	300
DN 80	DN 50		----	109	85	100	135	200	200	200	200
DN 100	DN 80	x	----	145	85	100	135	200	200	300	300

/K.-EEx (-AEx) with SC3,5-NO-Y .... / Pi ≤ 169 mW

					Max. allowable process temperature T_p [°C]						
		Temperature class to EN 50014			T6	T5	T4	T3		T2, T1	
		T_{amb} [°C]	≤ 40	≤ 60	≤ 40	≤ 60	≤ 60	≤ 40	≤ 60	≤ 40	≤ 60
without heating jacket	with heating jacket	High-temperature version	Heat-resistant cable required for T_p [°C] and higher								
DN 15	DN 15		----	150	not allowed		135	200	156	200	156
DN 25		x	----	236			135	200	200	300	300
DN 50	DN 25		----	127			200	141	200	141	
		x	----	171			135	200	200	300	239
DN 80	DN 50		----	109			135	200	125	200	125
DN 100	DN 80	x	----	145			135	200	192	300	192

/ K. -EEx (-AEx) with SJ3,5-SN, SJ3,5-S1N / Pi ≤ 64 mW

					Max. allowable process temperature T_p [°C]						
		Temperature class to EN 50014			T6	T5	T4	T3		T2, T1	
		T_{amb} [°C]	≤ 40	≤ 60	≤ 40	≤ 60	≤ 60	≤ 40	≤ 60	≤ 40	≤ 60
without heating jacket	with heating jacket	High-temperature version	Heat-resistant cable required for T_p [°C] and higher								
DN 15	DN 15		----	150	85	100	135	200	200	200	200
DN 25		x	----	236	85	100	135	200	200	300	300
DN 50	DN 25		----	127	85	100	135	200	200	200	200
		x	----	171	85	100	135	200	200	300	300
DN 80	DN 50		----	109	85	100	135	200	200	200	200
DN 100	DN 80	x	----	145	85	100	135	200	200	300	300

/ **K. -EEx (-AEx)** with SJ3,5-SN, SJ3,5-S1N / Pi ≤ 169mW

					Max. allowable process temperature T_p [°C]						
Temperature class to EN 50014					T6	T5	T4	T3		T2, T1	
		T_{amb} [°C]	≤ 40	≤ 60	≤ 40	≤ 60	≤ 60	≤ 40	≤ 60	≤ 40	≤ 60
without heating jacket	with heating jacket	High-temperature version	Heat-resistant cable required for T_p [°C] and higher								
DN 15	DN 15		----	150	62	100	135	200	200	200	200
DN 25		x	----	236	85	100	135	200	200	300	300
DN 50	DN 25		----	127	59	100	135	200	200	200	200
		x	----	171	81	100	135	200	200	300	300
DN 80	DN 50		----	109	55	100	135	200	195	200	195
DN 100	DN 80	x	----	145	70	100	135	200	200	300	300

Materials for device versions

Version	Materials [1] Measuring tube	Flanges / sealing face	Float	Built-in equipment	Standard orifice plate
H 250/RR	CrNi steel 1.4404 *	CrNi steel 1.4404 * solid	CrNi steel 1.4404 *	CrNi steel 1.4404 *	-
H 250/HC	Hastelloy C4 (2.4610)	CrNi steel 1.4404 plated with Hastelloy C4 (2.4610)	Hastelloy C4 (2.4610)	Hastelloy C4 (2.4610)	-
H 250/C	CrNi steel 1.4571 with PTFE liner **	CrNi-Stahl 1.4571 with PTFE liner **	HC4, PTFE or Al_2O_3 with gasket: Kalrez KLR 6375 ***	Al_2O_3 or PTFE	Al_2O_3
H 250/F [2]	CrNi steel 1.4435	CrNi steel 1.4435	CrNi steel 1.4435	CrNi steel 1.4435	-

Available on request:
* CrNi steel 1.4571
with clamp connections: CrNi steel 1.4435
** PTFE-TFM
*** sealing ring 2035 (Kalrez)

1) Special material on request: e.g. SMO 254, titanium, 1.4435
2) wetted surfaces Ra ≤ 0.8 µm

Float damper	liquids	Hastelloy
	gases	ceramics or Hastelloy
	oxygen	PEEK
Gasket for internal thread	O-ring	FPM/FKM (e.g. Viton)

Conformity with EC directives

The H250 VA flowmeter meets all requirements of EC directives applicable to the product.

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

The variable-area flowmeters within the meaning of the pressure equipment directive (PED) fall into three categories [Cat. I to Cat. III]:

Classification is according to Article 3, Item 1.2a), Diagram 6: pipelines for gases of fluid group 1.
For all categories, the Module H conformity assessment procedure is applied. Devices for low flows (cone 15.x) are not subject to a conformity assessment. For these, Article 3.3 of the PED is applied.

For standard products (repeat jobs) the declaration of conformity can be issued in advance.

For customized products, the declaration is supplied on request together with the product.

In particular, devices fitted with flanges (EN-1092-1; ANSI B 16.5; JIS B 2238) are classified in Category III (suitability for unstable gases).

Indicator and data teletransmission

Limit switches

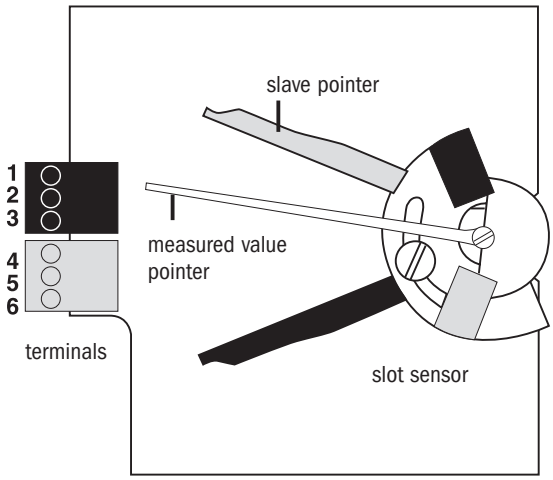
A total of two limit switches can be installed in the M9 indicator.

Switching point settings are indicated on the scale.

General mode of operation of the limit switches

The limit switches operate when the contact vane dips into the slot sensor. Action is non-contacting. The switching point is hysteresis free. The switches operate when the setting pointer drops below the min. contact and rises above the max. contact. In connection with the associated slave pointer system, the alarm can be switched on or off in the switching point.

The combination of sensor type and slave pointer version is the deciding factor for whether or not open-circuit monitoring is additionally possible.



Contact types:

SC3,5-NO-Y	2-wire technology (NAMUR)
SJ3,5-SN	2-wire technology, (fail-safe)
SB 3.5-E2	3-wire technology (not "Ex")

Terminal assignment, contact plug-in module

H250 / RR / M9 / K.

Contact	K_{MIN}			K_{MAX}		
colour of plug	black			grey		
Labelling	1	2	3	4	5	6
2-wire technology	-	+		-	+	
3-wire technology	+	DC	-	+	DC	-

Limit switches in 2-wire technology

SC3,5-NO-Y are connected to an isolation switching amplifier to DIN EN 50227 (NAMUR),
e.g. Pepperl+Fuchs series KF.. –SR2 ...

Isolation switching amplifier	Power supply	Channel	Order No.
KFA6-SR2-Ex1.W	230 V AC	1	5015262000
KFA5-SR2-Ex1.W	110 V AC	1	5015262100
KFD2-SR2-Ex1.W	24 V AC	1	5015262200
KFA6-SR2-Ex2.W	230 V AC	2	5015262300
KFA5-SR2-Ex2.W	110 V AC	2	5015262400
KFD2-SR2-Ex2.W	24 V AC	2	5015262500

Limit switches in 2-wire technology, fail-safe

SJ3,5-SN are connected in conformity with EN 60079-14 / IEC 60079-14 to a fail-safe isolation switching amplifier,
e-g- Pepperl + Fuchs K... –SH-Ex1 ...

Limit switches in 3-wire technology

SB3.5-E2 have a DC voltage connection of 10 to 30 V DC. These can be connected direct to an SPC system.

Technical data	2-wire SC3,5-NO-Y	2-wire SJ3,5-SN	3-wire SB3,5-E2
Switch element function	NAMUR NC contact	NAMUR NC contact	PNP NO contact
Nominal voltage U_0	8 V	8 V	10 to 30 V
Power consumption:			
pointer vane not sensed	≥ 3 mA	≥ 3 mA	≤ 0.3 V
pointer vane sensed	≤ 1 mA	≤ 1 mA	Ub - 3 V
Ambient temperature	-25°C to +100°C	-40°C to +100°C	-25 to +70°C
Continuous current	-	-	max. 100 mA
No-load current I_0	-	-	≤ 15 mA
EMC to	NE21	EN 60947-5-2	EN 60947-5-2
SIL to	IEC 61508		*inverse switching
Type of protection (EN 60529 / IEC 529) IP 67, NEMA 6			

Applies only to use in hazardous areas

Built-in equipment for the variable-area flowmeter H 250 / M9-EEx may only be connected to separate intrinsically safe circuits with the following max. values:

Built-in equipment	Ident data				
	Ui [V]	Ii [mA]	Pi [mW]	Ci [nF]	Li [uH]
SC3,5-NO-Y	≤ 16	≤ 25	≤ 64	≤ 150	≤ 150
	≤ 16	≤ 52	≤ 169	≤ 150	≤ 150
SJ3,5-SN	≤ 16	≤ 25	≤ 64	≤ 30	≤ 100
	≤ 16	≤ 52	≤ 169	≤ 30	≤ 100

Individual approval:

SC3,5-NO-Y...	PTB 99 ATEX 2219 X
SJ3,5-SN	PTB 00 ATEX 2049 X

SB3,5-E2 has no “Ex” approval

Limit switches

Signal transmitter/sensor	Type of contact	Flow less than (Min. value)	Flow more than (Min. value)	Flow less than (Max. value)	Flow more than (Max. value)	Open-circuit monitoring possible	Order No.	Ex / ATEX
SC3,5-NO-Y	min	switched				yes	X251033100	yes
SC3,5-NO-Y	max				switched	yes	X251033200	yes
SC3,5-NO-Y	min / max	switched			switched	yes	X251033300	yes
SJ3,5-SN	min	switched				yes *	X251033600	yes
SJ3,5-SN	max				switched	yes *	X251033700	yes
SJ3,5-SN	min / max	switched			switched	yes *	X251033800	yes
SB3,5-E2	min	switched				no	X251034200	no
SB3,5-E2	max				switched	no	X251034300	no
SB3,5-E2	min / max	switched			switched	no	X251034400	no
SB3,5-E2	min		switched			yes	X251033900	no
SB3,5-E2	max			switched		yes	X251034000	no
SB3,5-E2	min / max		switched	switched		yes	X251034100	no

* fail-safe

Floating limit switch MS 14/1

Limit switch MS 14/1 is a bistable reed contact. The measuring devices can additionally be equipped with up to two floating limit switches. These limit switches are mounted outside the indicator. They can be used as N/O or N/C contacts. The bistable function allows the direction of float movement to be identified.
The limit switches are matched for isolation switching amplifiers in intrinsically safe control circuit to DIN EN 50227, NAMUR. They are supplied with connection cable (open end / 1m). Other connection variants on request.

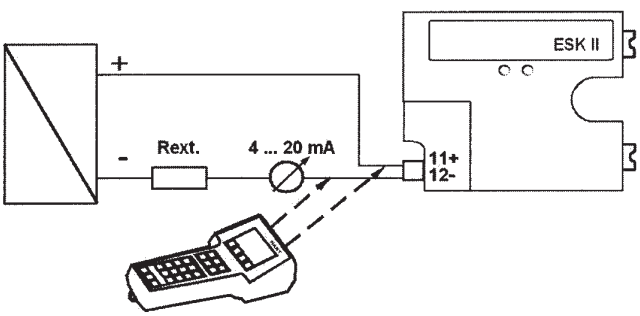
Technical data

Contact type	bistable reed contact, switchable as N/O or N/C contact
Switching capacity	23 V A
max. switching voltage	30 VDC
max. switching current	0.5 A
Ambient temperature	- 25°C to + 60°C
Type of protection to EN 60529 / IEC 529	IP 44

Electrical signal output ESK II

HART™ interface, standard
Electrical signal output ESK II can be built into the M9 indicator.
A load-independent current of 4 to 20 mA in 2-wire technology is supplied proportional to the actual flow rate.
With an intrinsically safe infeed, the transmitter can also be used in hazardous areas.
Using HART® communication, liquid product data or the measuring range can be scanned.
This requires connection of a handheld communicator.

Connection diagram



Technical data

Power supply	12 (18 **) to 30 V DC
Power consumption	4 to 20.4 mA for 0% to 102.5% of measured value
Namur failure signal	> 20.8 mA
Repeatability	< 0.1% of full scale range
Linearity error	< 0.1%
Effect of supply power	< 0.1%
External resistance dependence	< 0.1%
Temperature effect	< 5 µA / K
Max. impedance load	0 (250*) to 800 ohms
Individual approval	PTB 00 ATEX 2063

* This value is with HART® communication the minimum value.
Type of protection (EN 604529/IEC 529) IP 20

Only applicable for use in hazardous areas
Built-in equipment for variable-area flowmeter H 250/M9-EEx may only be connected to separate intrinsically safe circuits with the following max. values:

	Ident data				
Built-in equipment	Ui[V]	Ii[mA]	Pi[mW]	Ci[nF]	Li[uH]
ESK II	≤ 30	≤ 100	≤ 1000	≤ 20	= 0
ESK3-PA	≤ 24	FISCO (1)		= 0	= 0

(1) only for connection to an intrinsically safe field bus according to the FISCO model.

Flow totalizer ESK-Z (not "Ex")

The ESK-Z flow totalizer in 3-wire technology can in connection with the electrical current output ESK II be installed in the H250/M9.

A 6-digit LED display indicates the totalizing flow value, and is switch-able to the current flow value in 0 ... 100%.

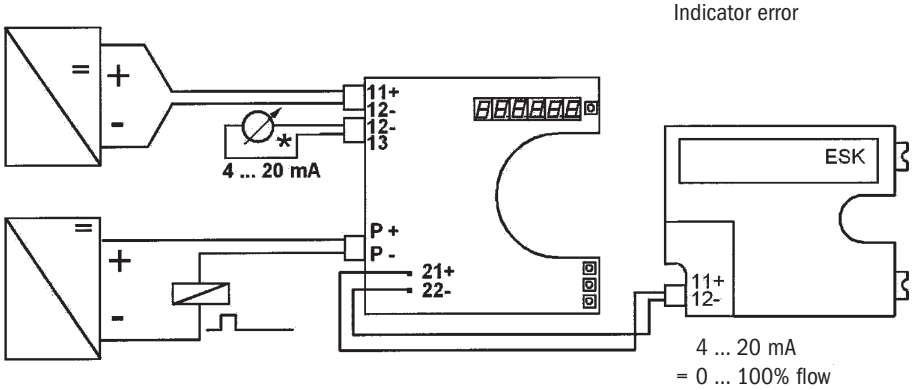
Supply terminals 11/12 and current loops 12/13 are not metallically separated! If the current loop is not needed, a short-circuiting link will need to be connected to terminals 12/13.

A metallically separated pulse output P+ and P- supplies a pulse for every indicated totalizer advance. If the pulse output is not needed, the terminals can be left unused.

Data save is automatic in the event of a voltge drop.

Technical data

Power supply	16 to 30 V DC
Rext. curent loop 12/13	0 ... 600 ohms
Power consumption	max. 2 W
Pulse output	terminal P+, P-
Power supply	10 to 30 V DC
Max. current	50 mA
Max. power loss	250 mW
T on	fixed pulse width 80 ms
T off	dependent on flow rate
U on	Ub – 3 V
U off	0 V
Pulse value	1 pulse = 1 display totalizer advance = 1 flow unit (1 litre, 1 m³ ....)
Ambient temperature	- 25°C to +65°C
Indicator error	< 1% of indicated value, max. 1 indicator unit



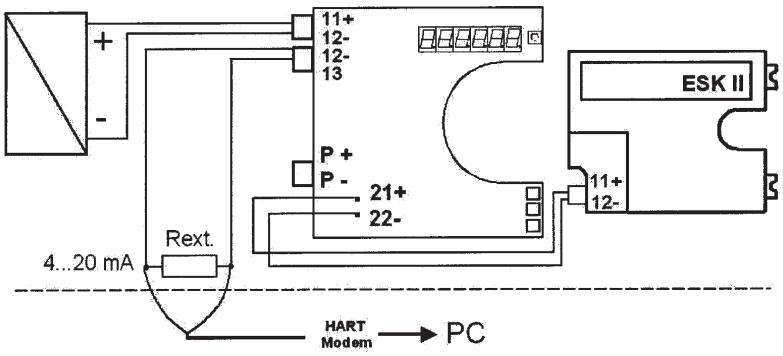
* when metallically separated current evaluator modules (SPC) are used, the power supply (11/12) should not be grounded.

Flow totalizer ESK-Z with HART™ communication

If the ESK II is operated together with the totalizer, HART™ communication is possible according to the following schematic diagram:

The totalizer itself cannot be read out or operated by means of the HART™ communication!

Rext = 250 ... 600 ohms.

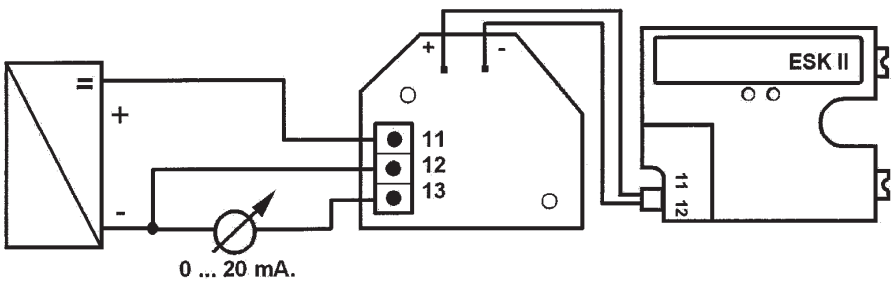


Converter 0 ... 20 mA ESK-S (non-"Ex")

The ESK-S is connected and operated on the 3-wire principle. The output signal is 0 ... 20 mA. The converter is mounted on the contact plug-in board without affecting its function. If contacts are not needed, the converter is supplied on a bare board.

Technical data

Power supply	18 ... 30 V DC
Power consumption	max. 70 mA
Input signal	4 ... 20 mA
Output sigal	0 ... 20 m-a
Rext. load impedance	0 ... 600 ohms
Ambient temperature	-25°C to +65°C
Conversion error	< 0.35%
Load effect	< 0.1%
Temperature effect	< 0.2%



PROFIBUS-PA transmitter ESK3-PA

Interconnection of devices in the hazardous area

We recommend that a PROFIBUS-PA system in the hazardous area be configured in accordance with PTB's FISCO model (see KROHNE brochure "PROFIBUS-PA networks"). For this, all electrical components to be connected (including the bus termination) must be approved according to the FISCO model.

Bus cable

The FISCO model statements apply only as and when 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.

Shielding and grounding

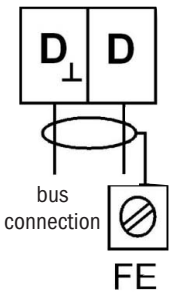
For optimum electromagnetic compatibility of systems, it is extremely important that the system components, and especially the bus cables connecting the components, are shielded and that, electrically speaking, such shields together form a covering that is as continuous as possible.

For use in **non-hazardous-duty systems**, accordingly, the cable shield should be grounded as often as possible.

In hazardous-duty systems there should be adequate **equipotential bonding in the hazardous area and non-hazardous area** along the entire field bus installation. In this case, too, multiple grounding of the shield is of advantage.

PROFIBUS-PA connection

Connect the bus cable as shown on the right:
connect cable wires to D and D ⊥;
(polarity reversal has no effect).
The cable shield should be connected with minimum length to the functional ground FE.
Equipotential bonding conductor must be connected to the device (if necessary via the external U-clamp terminal for grounding the M9 indicator part).



Technical data

Hardware

Physical	to IEC 1158-2 and the FISCO model.
Supply voltage	
via 2-wire bus connection:	
non-"Ex" application	9 ... 32 V DC
Use in hazardous areas	9 ... 24 V DC
Current consumption	
Base current	12 mA
Starting current	< base curent
FDE	< 18 mA
Accuracy	
in connection with H250/M9	
to VDI/VDE 3513	Class 1.6
Measured value resolution	< 0.1% of full-scale value
Temperature effect	< 0.05%/K of measured value
EC type approval certificate	
11 2 G EEx ia IIC T6	PTB 00 ATEX 2063

Software

GSD (device master file)	supplied on disk or via internet www.krohne.com
Device profile	full implementation of profile B, V3.0
Function blocks	
Flow (AIO)	optionally for volumetric or mass flow rate, selectable via channel parameters, default units Qv [m³/h]; Qm [kg/h]
Totalizer (TOT0)	volume totalizer default unit: [m³]
Totalizer (TOT1)	mass totalizer 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
Operation	via Profibus-PA (no local operator control at device)

Type designation of H250 flowmeter with M9 indicator, when ordering:

Built-in equipment	Order designation
SC3,5-NO / SJ3,5-SN / SJ3,5-S1N	K1 (1 contact), K2 (2 contacts)
SJ3,5-E2-Y	KD1 (1 contact), KD2 (2 contacts) (not "Ex")
Current output 2-wire 4 ... 20 mA	ESK II (always with HART™ module)
Current output 3-wire 0 ... 20 mA	ESK-S (only in connection with ESK II) (not "Ex")
Profibus, signal output, digital	ESK3-PA
Flow totalizer	ESK-Z (only in connection with ESK II) (not "Ex")

For example: H 250/RR/M9/K2

Available versions (x)

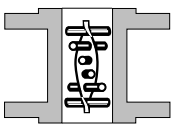
combination	1	2	3	4	5	possible combinations					
	K1/K2 KD1/KD2	ESK II	ESK3-PA	ESK-Z	ESK-S						
H 250/M9	x	x	x	x	x	1+2	1+3	1+2+4	1+2+5	2+4	2+5

Optional equipment

Magnetic filter

If the process product contains ferromagnetic particles, install a magnetic filter upstream of the flowmeter. The filter contains bar magnets in helical arrangement for optimum efficiency at low pressure loss. All magnets are individually coated with PTFE as protection against corrosion.

Two versions are available:

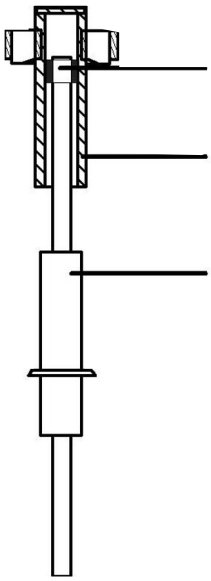


Type F - flange adapter for all nominal sizes, overall length 100 mm, material 1.4571 and others

Type FS - adapter without flange, for all nominal sizes, overall length 50 mm, material 1.4571 and others

Damping system

(also available as retrofit kit)



damping cylinder of ceramics, PEEK or stainless steel

damping tube

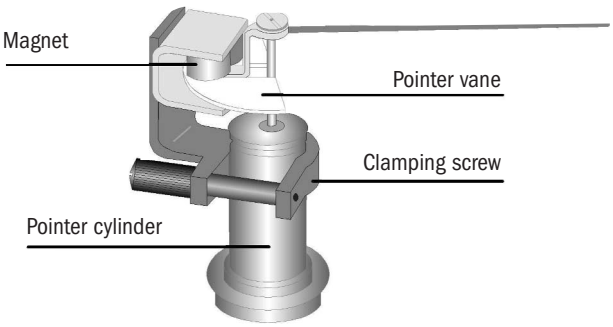
float

Given unstable flow conditions or insufficient operating (inlet) pressure on gas service, the measuring section can be equipped with a float damping system. The system has a long service life and is self-centering.

Eddy current brake

Four non-contact magnets dampen the movement of the pointer vane, thus distinctly stabilizing the pointer position without falsifying measured values. A clamping screw ensures firm seating.

Retrofitting possible.



Flow tables

Float shape
Water CIV, DIV
Air TIV, DIV
100% flow values, turndown ratio 10:1

Reference conditions
Water at 20°C
Air at 20°C; 1.013 bar abs.

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

Nominal size		Cone No.	Water		Air		Max. pressure drop mbar		
DIN	ANSI		l / h		m³/h				
DN	inches		CIV	DIV	TIV *	DIV	CIV	TIV	DIV
15	1/2"	K 15.1	25	-	0.65	-	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
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 (M9 indicator) ** 300 mbar with damper (gas service)

A float damper is recommended:
for TIV floats with an operating (inlet) pressure < 0.3 bar [DN 15, DN 25 (1/2", 1")] ≤ 0.2 bar [DN 50 (2")] and generally when CIV and DIV floats are used on gas service.

The specified 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 with the aid of the calculation method to VDE/DVI Code 3513.

Nominal size			100% flow rate			Max. pressure drop			
DIN	ANSI	Float	Water		Air	Water		Air	Standard
			PTFE	Ceramics	Ceramics	PTFE	Ceramics	Ceramics	orifice plate
DN	inches	Number	l/h	l/h	m³/h	mbar	mbar	mbar	Diameter mm
15	1/2"	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

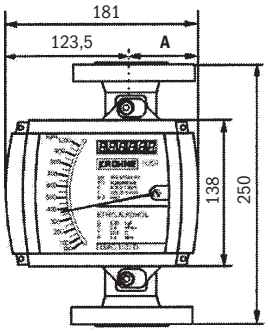
The specified pressure losses apply to water and air at max. flow rate.
Conversion to other products or operating data (pressure, temperature, density, viscosity) can be carried out with the aid of the KROHNE calculation method to VDE/DVI Code 3513.

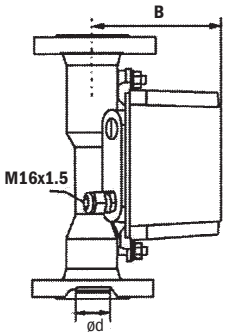
Dimensions and weights

standard version

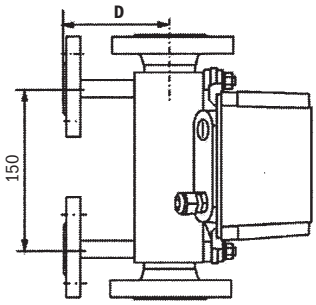
Nominal sizes		Dimensions in mm					Approx. weight with DIN flanges	Approx. weight with heating
		A	B	C	D			
DN	PN				Heating	ø d	kg	kg
15	40	70.5	107	187	100	20	3.5	4.8
25	40	70.5	119	199	106	32	5.0	6.7
50	40	57.5	132	212	120	65	8.2	10.4
80	16	57.5	148	228	160	89	12.2	14.0
100	16	57.5	158	232	150	114	14.0	16.6

H250 with flanged connections
H 250/M9

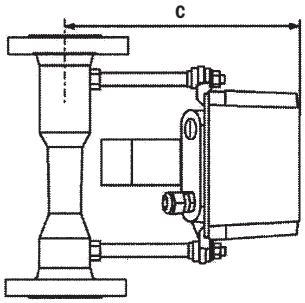




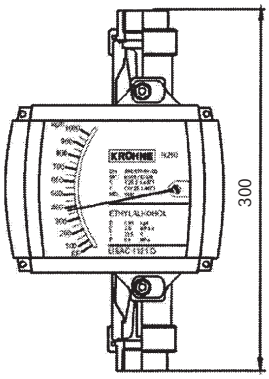
Measuring section with heating



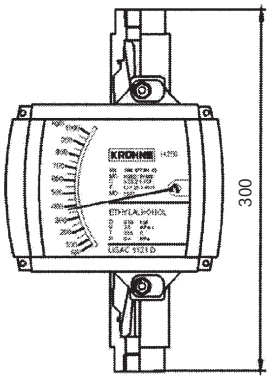
High-temperature version HT



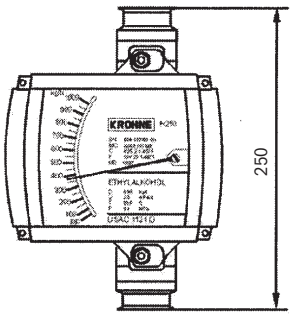
ISO 228
Internal thread, screwed



ISO 228
internal thread, welded

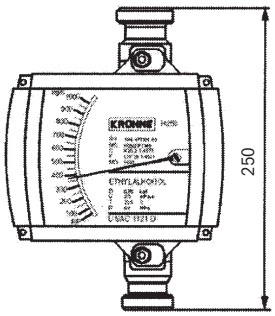


H 250/F
Food with clamp connection



Stainless steel 1.44235
EHEDG tested
Wetted surfaces Ra = 0.8 µm

H 250 / F
screw connection
DIN 11851



Weights
H 250 with screw connection to DIN 11851

Nominal size of flow		Max. allowable operating pressure		Approx. weight in	
DN mm	inches	bar	psig	kg	lbs
15	1/2"	40	580	2.0	4.4
25	1"	40	580	3.5	7.7
50	2"	25	363	5.0	11.0
80	3"	25	363	7.6	16.8
100	4"	25	363	10.3	22.7

Weights
H 250/C (ceramic/PTFE)

Meter size to				Approx. weight					
DIN 2501		ANSI B 16.5		DIN 2501		ANSI B 16.5			
						150 lbs		300 lbs	
DN	PN	inches	lbs	kg	lbs	kg	lbs	kg	lbs
15	40	1/2"	150/300	3.5	7.7	3.2	7.0	3.5	7.7
25	40	1"	150/300	5	11.0	5.2	11.5	6.8	15.0
50	40	2"	150/300	10	22.1	10	22.1	11	24.3
80	16	3"	150/300	13	28.7	13	28.7	15	33.0
100 *	16	4"	150/300	15	33.1	16	35.3	17	37.5

* PTFE only
overall height 3" / 300 lbs and more: 300 mm