

DK46 - DK800 Technical Datasheet

Variable area flowmeter

- Local indication without auxiliary power supply
- Adaptable to meet customers' requirements
- Replaceable mounting parts that are easily assembled

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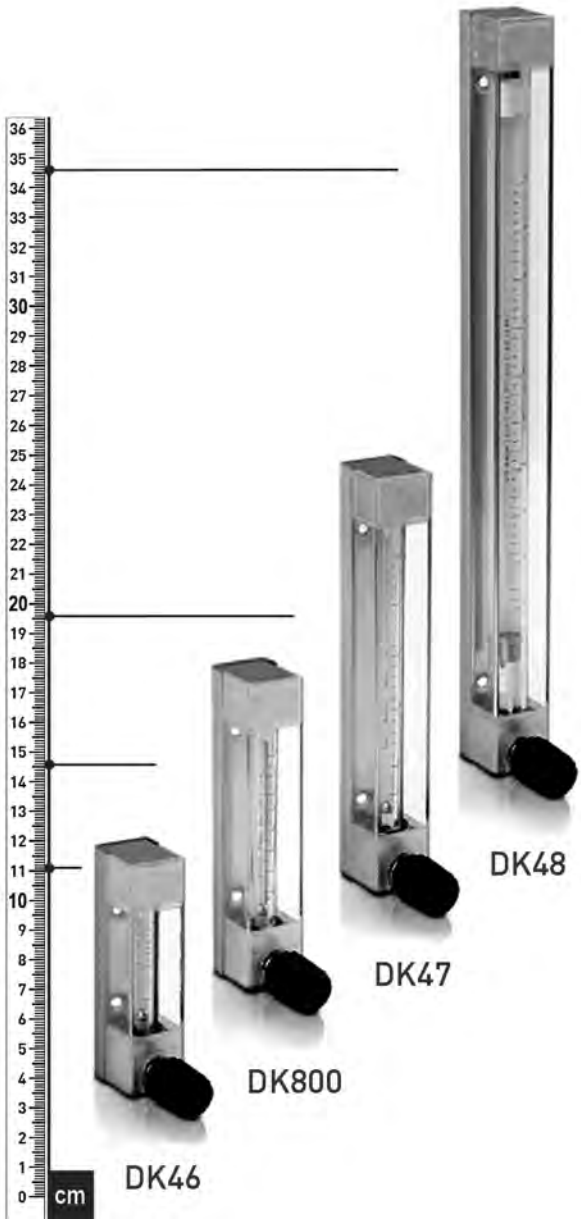
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1.1 DK46 - DK800 variable-area flowmeter

The DK46...DK800 flowmeters are suitable for measuring the volume flow rate of liquids and gases.



DK46	accuracy 4,0%
DK800	accuracy 2,5%
DK47	accuracy 2,5%
DK48	accuracy 1,0%

Highlights

- Simple installation and start-up
- Compact design
- Low maintenance
- Limit switches are optional
- All variants come with high quality needle valves
- No wearing parts
- Fragment protection

Industries

- Chemical
- Heating, cooling, and air conditioning
- Iron, steel and metal
- Oil & Gas
- Pharmaceutical
- Analytical technology
- Mechanical engineering
- Paper and pulp
- Water

Applications

- Fine metering
- Gas chromatography
- Minimum level monitoring and control
- In connection with a differential pressure regulator: Ensures constant flow rate in the case of variable inlet or outlet pressures

1.2 Options and variants

DK devices with limit switches



The DK devices can be provided with max. two limit switches, NAMUR or 3-wire open collector.

DK with differential pressure regulators



Differential pressure regulators are used to provide constant flow rates in the case of variable inlet or outlet pressures.

Instrument designation



Instruments with head ① and foot pieces ② made from:
Stainless steel = DK…/R
Brass = DK…/N
PVDF = DK…/PV

1.3 Operating principle

The flowmeter operates on the float measuring principle

The measuring unit consists of a glass cone in which a float can move freely up and down. The medium flows through the flowmeter from bottom to top.

The float adjusts itself so that the buoyancy force **A**, acting on it, the form drag **W** and its weight **G** are in equilibrium: **G = A + W**.

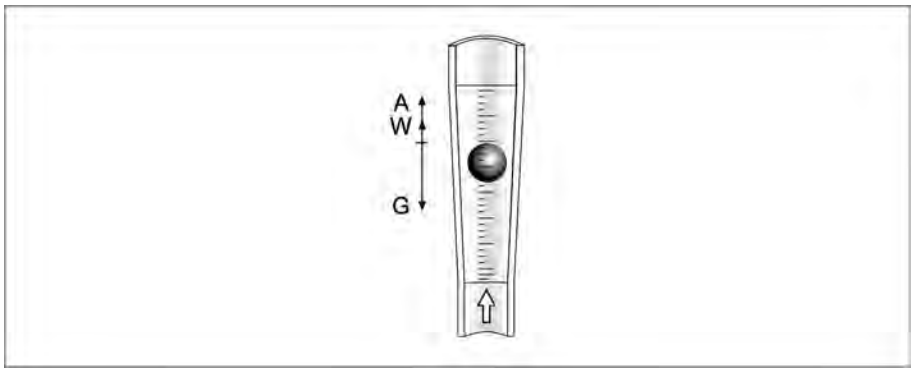


Figure 1-1: Operating principle

The height of the float is read on the scale of the measuring glass and indicates the flow rate.

The top edge of the float marks the reading line for flow values.

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

Measuring system

Application range	Flow measurement of liquids and gases
Operating method / measuring principle	Variable area measuring principle
Measurement	
Primary measured value	Float position
Secondary measured value	Operating and standard volumetric flow

Measuring accuracy

Directive	VDI / VDE 3513, sheet 2 (q_G = 50%)
DK46	4.0%
DK47	2.5%
DK48	1.0%
DK800	2.5%

Operating conditions

Temperature	
Max. operating temperature TS	-5..+100°C / +23...+212°F
Pressure	
Operating pressure PS	Pressure Equipment Directive 97/23/EC
Test pressure PT	Pressure Equipment Directive 97/23/EC
Max. permitted operating gauge pressure PS at TS = 100°C / 212°F:	
DK.../R (stainless steel top and bottom fittings)	10 bar / 145 psig ①
DK.../N (brass top and bottom fittings)	10 bar / 145 psig ①
DK.../PV (PVDF top and bottom fittings)	4 bar / 58 psig

Installation conditions

Inlet and outlet	None

① higher pressures upon request

Materials

Top fitting, bottom fitting	CrNi steel 1.4404 / 316 L, nickel-plated brass, PVDF ①
Top fitting, bottom fitting (optional)	Hastelloy®
Measuring tube	Borosilicate glass
Float (ball)	CrNi steel 1.4401 / 316
Float options	Glass, POM, titanium, Hastelloy® C4
Float DK48 (AIII)	CrNi steel 1.4571 / 316 Ti, Aluminium, PEEK
Metering unit	CrNi steel 1.4571 / 316 Ti
Valve spindle	CrNi steel 1.4404 / 316 L
Gaskets (standard)	PTFE / FPM
Gaskets (optional)	PTFE / FFKM, PTFE / EPDM
Gaskets (optional)	EPDM, FFKM
Protective cover	Polycarbonate

① top and bottom fittings made of PVDF not on DK48

Temperatures

Max. temperature of medium T_m	+100°C	+212°F
Max. T_m with limit switches	+65°C	+149°F
Min. temperature of medium T_m	-5°C	+23°F
Max. ambient temperature $T_{amb.}$	+100°C	+212°F
Max. $T_{amb.}$ with limit switches	+65°C	+149°F
Min. ambient temperature $T_{amb.}$	-20°C	-4°F
Other temperatures on request.		

Technical Data Limit Switches

Terminal connection	Connection box M16x1.5				
Cable diameter	5...10 mm				
Limit switch	I7R2010-NL	I7R2015-NL	I7R2010-N	I7R2015-N	RB15-14-E2
	RC10-14-N3	RC15-14-N3	RC10-14-N0	RC15-14-N0	
Ring diameter	10 mm	15 mm	10 mm	15 mm	15 mm
Switching function	bistable	bistable	monostable	monostable	bistable
NAMUR	yes	yes	yes	yes	no
Connection technology	2-wire	2-wire	2-wire	2-wire	3-wire
Nominal voltage U_0	8 VDC	8 VDC	8 VDC	8 VDC	
Current consumption	1 mA passage ↓ ①		3 mA - ball outside		
Current consumption	3 mA passage ↑ ①		1 mA - ball in the limit switch		
Operating voltage $U_{ext.}$					10...30 VDC
Operating current I					0...100 mA
No load current I					20 mA
Output U_a - passage ↓					≤ 1 VDC ②
Output U_a - passage ↑					≥ U_b – 3 VDC ②

① For devices with the valve at the top (at the outlet) and devices with outlet pressure regulators, the function is inverted!
② For devices with the valve at the top in the output and devices with outlet pressure regulators, the function is inverted!

Field of application for limit switches

DK46, DK47, DK800	
Ball	**Ring diameter**
Ø 4 mm / 0.158"	10 mm
Ø 6 mm / 0.236"	15 mm
Ø 8 mm / 0.315"	-

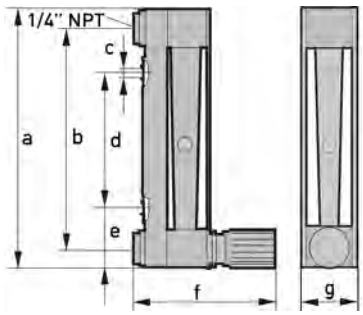
DK48	
Cone no.	**Ring diameter**
G 13.11	-
G 14.06	-
G 14.08	-
G 15.07	10 mm
G 15.09	10 mm
G 15.12	10 mm
G 16.08	10 mm
G 16.12	10 mm
G 17.08	15 mm
G 17.12	15 mm
G 18.06	-
G 18.08	-
G 18.12	-

The limit switches with ring diameters of 15mm as max. contact can only be used up to 60 l/h - 15.8 gph water or 2400 l/h - 89,3 scfh air (outer diameter of the measuring glass).

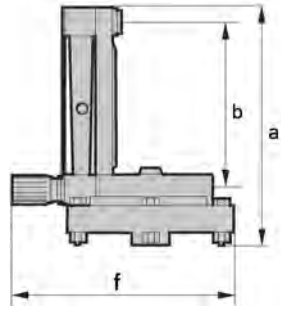
2.2 Dimensions and weights

Dimensions

Device	a		b ± 0.25		d		f approx.	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
DK46	111	4.37	90	3.55	45	1.77	82	3,2
DKR46	136	5,36	90	3,55	-	-	125	4,92
DK800	146	5.75	125	4.92	80	3.15	82	3,2
DK47	196	7.72	175	6.89	130	5.12	82	3,2
DK48	346	13.6	325	12.8	280	11.0	82	3,2



c = 4,3 mm / 0,169"
e = 33 mm / 1,3"
f ca. 82 mm / 3,2"
g = 28 mm / 1,1"

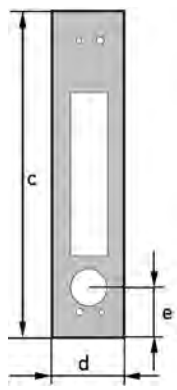


Dimensions of panel cutout and faceplate

Device	a		c	
	[mm]	["]	[mm]	["]
DK46	128	5.04	145	5.71
DK800	163	6.42	180	7.09
DK47	213	8.39	230	9.06
DK48	363	14.3	380	15.0



b = 32 mm / 1.26"



d = 40 mm / 1.58"
e = 27.5 mm / 1.08"

Weights

	DK46		DK800		DK47		DK48	
	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]	[kg]	[lbs]
Weight	0.4	0.88	0.5	1.1	0.6	1.3	0.7	1.5
Weights with regulator	2.1	4.6	2.2	4.9	2.3	5.1	2.4	5.3

Process connection

Standard	¼" NPT internal thread
Options	G¼, Ermeto 6 or 8, tube connection 6 mm or 8 mm, Dilo, Gyrolok, Swagelok ①

① other connection upon request

2.3 Measuring ranges

Measuring span 10 : 1
Flow values 100%

		Water						Air					
Ball Ø		DK46		DK47		DK800		DK(R)46		DK47		DK800	
[mm]	["]	[l/h]	[gph]	[l/h]	[gph]	[l/h]	[gph]	[l/h]	[scfh]	[l/h]	[scfh]	[l/h]	[scfh]
4	0.158	2.5	0.65	-	-	2.5	0.65	5	0,22	-	-	5	0,18
		-	-	-	-	-	-	8	0,3	-	-	8	0,3
		-	-	-	-	-	-	16	0,6	16	0,6	16	0,6
		-	-	-	-	-	-	40	1,5	40	1,5	40	1,5
		-	-	-	-	-	-	60	2,2	100	3,8	60	2,2
6	0.236	5	1.3	5	1.3	5	1.3	100	3,8	250	9,5	100	3,8
		12	3.0	12	3.0	12	3.0	250	9,5	500	19	250	9,5
		25	6.5	25	6.5	25	6.5	500	19	800	30	500	19
		40	11	40	11	40	11	800	30	-	-	800	30
		60 ①	16 ①	60	16	60	16	1200 ①	45 ①	-	-	1000	38
		100 ①	25 ①	100	25	100	25	-	-	-	-	1800	65
		-	-	-	-	120	30	-	-	-	-	2400	90
		-	-	-	-	160	42	-	-	-	-	3000	110
		-	-	-	-	-	-	-	-	-	-	4000	140
		-	-	-	-	-	-	-	-	-	-	5000	180
8	0.315	120 ①	30 ①	-	-	-	-	-	-	-	-	-	-
		160 ①	42 ①	-	-	-	-	-	-	-	-	-	-

① not for DKR46

Reference condition:
Water 20°C / 68°F
Air 20°C / 68°F - 1.2 bar abs. / 17.4 psi (in normal state)

Measuring range data for floats made of CrNi steel
Other flow ranges on request

Conversion to other media or operating data (pressure, temperature, density, viscosity) takes place using the calculation method in accordance with VDI /VDE Directive 3513.

Measuring ranges DK48

Measuring span 10 : 1
Flow values 100%

	Water		Air					
Material ▸	Stainless Steel		Hardrubber		Aluminium		Stainless Steel	
Cone no.	[l/h]	[gph]	[l/h]	[scfh]	[l/h]	[scfh]	[l/h]	[scfh]
G 13.11 ①	0.4	0.1	-	-	7	0.25	16	0.6
G 14.06	0.6	0.16	-	-	12	0.45	25	0.95
G 14.08	1	0.25	-	-	20	0.75	40	1.5
G 15.07	1.6	0.4	-	-	30	1.1	60	2.2
G 15.09	2.5	0.65	-	-	40	1.5	90	3.5
G 15.12	4	1.0	-	-	60	2.2	140	5.0
G 16.08	6	1.6	-	-	100	3.7	200	7.5
G 16.12	10	2.5	-	-	160	6.0	300	11
G 17.08	16	4.0	-	-	250	9.0	500	19
G 17.12	25	6.5	-	-	400	15	800	30
G 18.06	40	10	400	15	600	22	1200	45
G 18.08	63	16	600	22	1000	37	2000	75
G 18.12	100	25	1000	37	1600	60	3000	110

① reduced accuracy : 2.5%

Reference condition:
Water 20°C / 68°F
Air 20°C / 68°F - 1.013 bar abs. / 14.7 psi (in normal state)

Measuring range data for floats made of CrNi steel
Other flow ranges on request

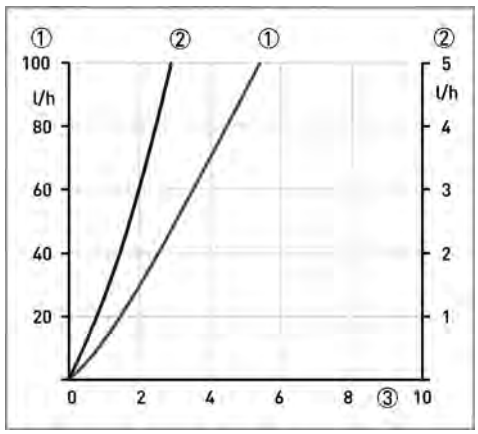
Conversion to other media or operating data (pressure, temperature, density, viscosity) takes place using the calculation method in accordance with VDI /VDE Directive 3513.

Valves

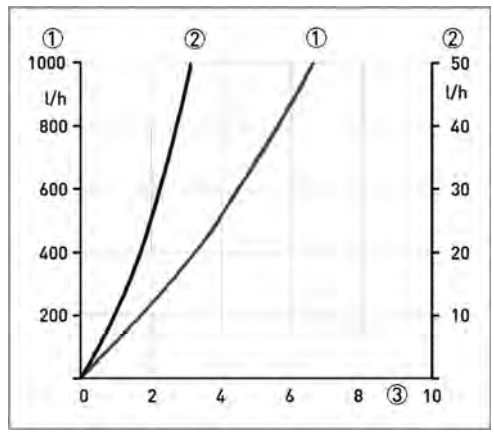
		Max. flowrate				Valve characteristic value	
Valve spindle		Water		Air		Kv	Cv
Ø [mm]	Ø [inches]	[l/h]	[gph]	[l/h]	[scfh]	[m^3/h]	[gpm]
1	0.039	5	1.3	100	3,7	0.018	0,02
2.5	0.98	50	13	1000	37	0.15	0,17
4.5	0.177	160	42	4300	160	0.48	0,55

Valve characteristics

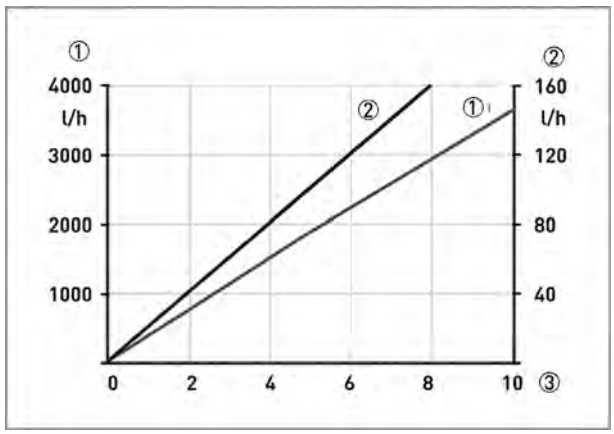
Spindle Ø 1.0mm - 0,039"



Spindle Ø 2.5mm - 0,098"



Spindle Ø 4.5mm - 0,177"



① Flow, air
② Flow, water
③ Spindle revolution n

2.4 Differential pressure regulators

Differential pressure regulators are used to guarantee constant flow during fluctuating inlet and outlet pressure. Minimum pressures are required to operate the regulators (see regulator characteristics).

Differential pressure regulators are not equivalent to pressure reducing valves!

① Inlet pressure regulators, type RE, NRE
The regulators keep the flow rate constant in the case of a variable inlet pressure and a constant outlet pressure.

Example - inlet pressure regulator RE1000:	Current flow rate:	1000 l/h air
	Outlet pressure p2 constant:	1.013 bar abs.

The flow rate in the meter remains constant with a fluctuating inlet pressure greater than 0.5 bar.

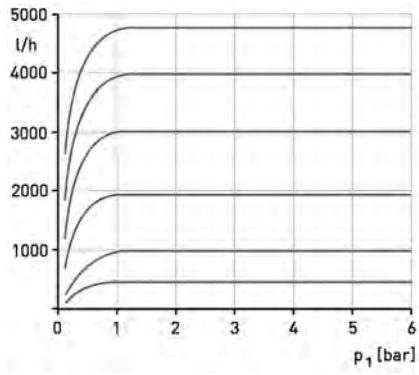
② Outlet pressure regulator, type RA, NRA
The regulators keep the flow rate constant in the case of a constant inlet pressure and a variable outlet pressure. There must be a pressure differential between the inlet and the outlet pressure for the outlet pressure regulator to function. The inlet pressure p1 must always be greater than the outlet pressure p2.

Example - outlet pressure regulator NRA 800	Current flow rate:	800 l/h air
	Inlet pressure constant:	6 bar

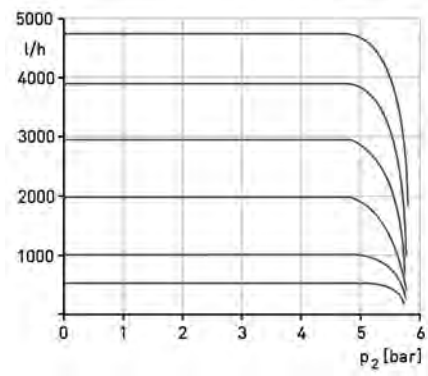
The flow rate in the meter remains constant with a fluctuating outlet pressure of 0 ... 5.5 bar.

Regulator characteristics

① Inlet pressure regulators, type RE and NRE



② Outlet pressure regulators, type RA and NRA



Control range inlet pressure regulator ①

	Max. flowrate					
	Water		Air		Min. inlet pressure	
	[l/h]	[gph]	[l/h]	[scfh]	Δ p1 [bar]	Δ p1 [psig]
RE-1000	...40	...10.6	...1000	...37,2	0.5	0.007
RE-4000	...80	...21.1	...2000	...74,4	1	0.015
	...100	...26.4	...3000	...112	1.5	0.022
	...160	...42.3	...4000	...149	2	0.029
NRE-100	...2.5	...0.66	...100	...3,72	0.1	0.001
NRE-800	-	-	...250	...9,3	0.1	0.001
	-	-	...800	...29,8	0.2	0.003
	...25	...6.60	-	-	0.4	0.006

Control ranges outlet pressure regulator ②

	Max. flowrate					
	Water		Air		Min. pressure diff.	
	[l/h]	[gph]	[l/h]	[scfh]	[bar]	[psig]
RA-1000	...40	...10.6	...1000	...37,2	0.5	0.007
RA-4000	...100	...26.4	...2000	...74,4	1	0.015
	-	-	...3000	...112	1.5	0.022
	...160	...42.3	...4000	...149	2	0.029
NRA-800	...1	...0.264	...250	...9,3	0.1	0.001
	-	-	...500	...18,6	0.2	0.003
	-	-	...800	...29,8	0.2	0.003
	...25	...6.60	-	-	0.4	0.006

Technical data, differential pressure regulator

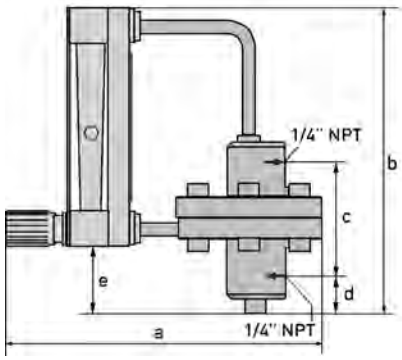
Standard connection	¼" NPT
Optional	Serto, Ermeto 6 or 8, tube nozzle 6 mm or 8 mm,Dilo, Gyrolok, Swagelok, G¼ ①
Max. operating gauge pressure PS	10 bar / 145 psig 4 bar / 58 psig for DK.../PV ②
Product temperature	TS = 100 °C / 212 °F ③
Material	CrNi steel 1.4404
Gasket	PTFE ④
Membrane	PTFE filled with carbon / graphite
O-ring	FPM ④

① other connections on request
② higher pressures on request
③ higher temperatures on request
④ other materials on request

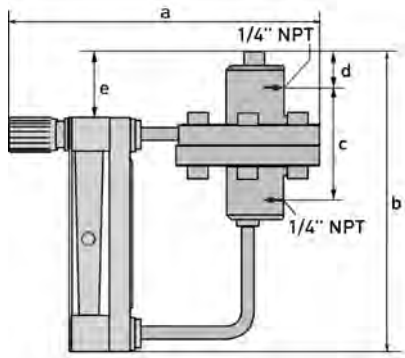
Dimensions with the differential pressure regulator

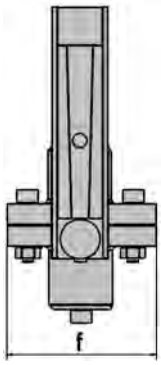
	a approx.		b		c		d		e		f approx.	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
DK46	210	8.27	163	6.42	70	2.76	19	0.75	39	1.54	90	3.55
DK47	210	8.27	233	9.18	70	2.76	19	0.75	39	1.54	90	3.55
DK48	210	8.27	383	15.1	70	2.76	19	0.75	39	1.54	90	3.55
DK800	210	8.27	183	7.21	70	2.76	19	0.75	39	1.54	90	3.55

① DK with inlet pressure regulator



② DK with outlet pressure regulator





3.1 Intended use

The variable area flowmeters are suitable for measuring gases, vapors and liquids.

These flowmeters are particularly suitable for measuring:

- Liquids
- Hydrocarbons
- Water
- Chemicals with low corrosiveness
- Industrial gases

In case of instruments which are used in explosive endangered areas please consider the supplementary installation and operating instructions mentioned in the Ex-manual.

The operator shall bear sole responsibility for the use of the flowmeters with regard to suitability, intended use and corrosion resistance of the materials used to the process product. The manufacturer shall not be liable for any damage resulting from improper use or use for other than the intended purpose.
Do not use any abrasive or highly viscous process products.

3.2 Installation conditions

3.2.1 Installation in the piping

When installing the device in the piping, the following points must be observed:

- *The variable area flowmeter must be installed vertically (measuring principle). Flow direction from bottom to top. For installation recommendations please refer also to VDI/VDE 3513 Sheet 3.*
- *Before connecting, blow or flush out the pipes leading to the device.*
- *Pipes for gas flow need to be dried before the device is installed.*
- *Use connectors suitable for the particular device version.*
- *Align the pipes axially with the connections on the measuring device so they are free of stresses.*
- *If necessary, support the piping to reduce vibrations being transmitted to the measuring device.*
- *Do not lay signal cables directly next to cables for the power supply.*

4.1 Limit switch

The flowmeters can be equipped with a maximum of two limit switches. The switching function of the limit switch can be designed as monostable or bistable.

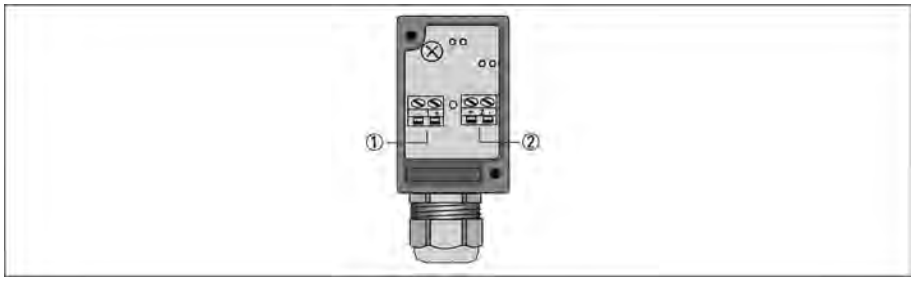
Monostable function: Switching pulse as float passes through switching point, independent of direction of movement.
Bistable function: Stable changeover as float passes through switching point.

Example (bistable): Float above limit: Output "High"

Float below limit: Output "Low"

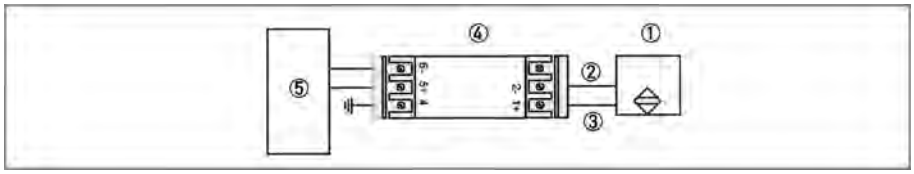
For switching patterns and electrical connection values of different limit switches, see - Technical Data - Limit Switches

Electrical connection limit switches - 2-wire NAMUR



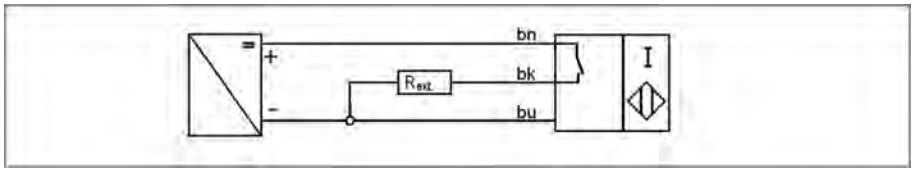
① Lower limit switch to terminal 1
② Upper limit switch to terminal 2
The terminal box includes an EMC filter unit.

Electrical connection limit switches - 2-wire NAMUR no terminal box



① Limit switch (no terminal box)
② Blue cable -
③ Brown cable +
④ External EMC filter
⑤ Receiver device
When connecting to an EMC filter, the ground terminal must be connected to the back rail of the flowmeter.

Electrical connection limit switch - 3-wire (transistor)



bn - brown: supply voltage +
bk - black - switch
bu - blue: supply voltage -

Please provide us with the missing information so that we can be of help to you as quickly as possible.

Then please fax this page to the appropriate sales associate. We will then contact you as soon as possible.

Device data

Connection type:	☐ 1/4" NPT	☐ (other)		
Connection:	☐ horizontal	☐ vertical		
Pressure rating:				
Device	☐ DK46	☐ DK47	☐ DK48	☐ DK800
Options:	☐ K1 ① ☐ K2 ②	☐ K1 ① ☐ K2 ②	☐ K1 ① ☐ K2 ②	☐ K1 ① ☐ K2 ②
Differential pressure regulator:	☐ Intlet pressure regulator		☐ Outlet pressure regulator	
Approval:	☐ Without	☐ ATEX		

① 1 limit switch
② 2 limit switches

Rating data

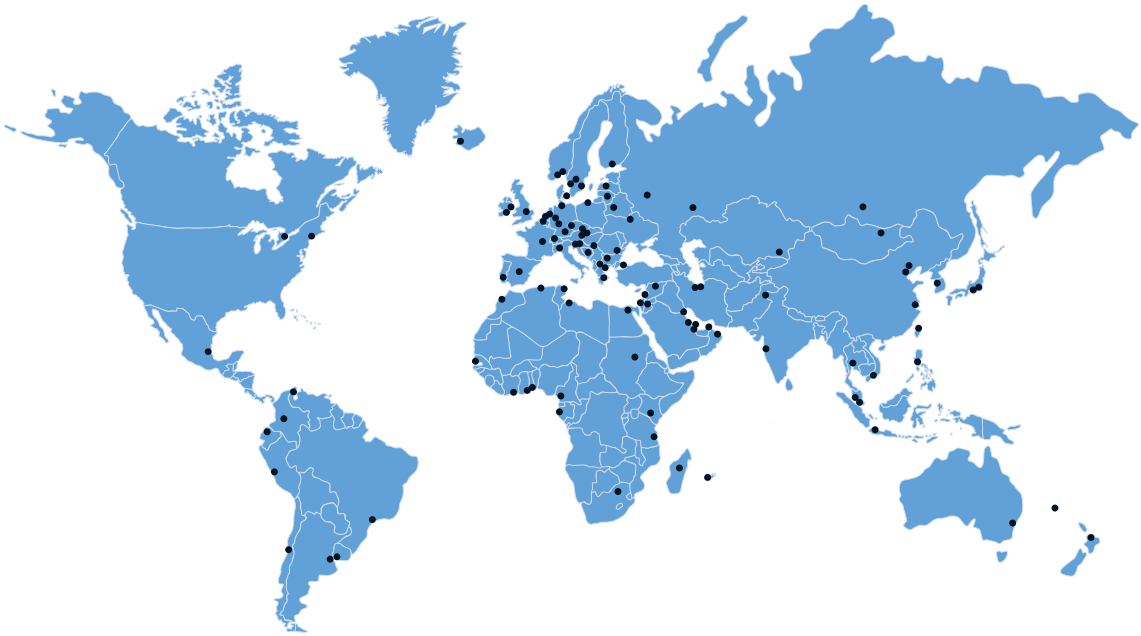
Product:			
Operating pressure:		☐ Absolute pressure	☐ Overpressure
Rated pressure:			
Operating temperature:			
Rated temperature:			
Density:		☐ Standard density	☐ Operating density
Viscosity:			
Measuring range:			
Comments:			

Contact data

Company:	
Contact person:	
Telephone number:	
Fax number:	
E-mail:	







KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

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The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com

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