

Miniature flowmeters for analytical process

Installation and Operating Instructions DK 700

Installation

Ensure materials compatibility

The temperature of the product and the allowable operating pressure must not exceed the specified maximum values (see Technical Data).

The measuring section is also permitted to be filled with flammable liquids, provided a potentially explosive atmosphere is not permanently or for prolonged periods present in the measuring tube.

The calculation of the pressurized parts is effected with allowance for corrosion, erosion through abrasion or cavitation.

Installation in the pipeline

The variable area flowmeter has to be installed vertically (float measuring principle - flow direction from bottom to top). Before installing the flowmeter, blow or flush out the pipeline leading to the flowmeter.

Use connectors suitable for the flowmeter version. Align the pipes axially with the bolt holes on the flowmeter without incurring stresses.

If necessary, support the pipeline on both sides of the flowmeter to prevent vibration from being transferred to the flowmeter.

Panel mounting

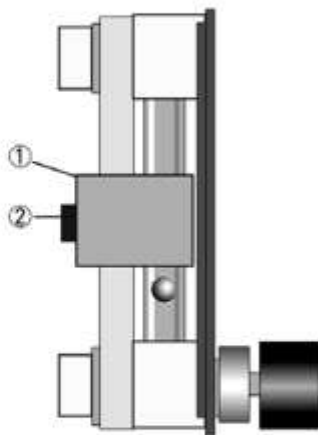
(see Dimensions and Weights)

Prepare the panel recess as shown in the drawing.

Before installing, remove the clamp clip ① and Allen screw ②, 4mm Allen key, from the flowmeter.

Insert flowmeter into recess and align vertically.

Fasten the flowmeter with the clamp clip and Allen screw (4 mm Allen key).



Initial startup

Close needle valve at the flowmeter.

Open shutoff valves upstream and downstream of flowmeter. Slowly open needle valve and set the desired flowrate. Where liquids are involved, carefully vent the pipeline to avoid water hammer that may cause breakage of the glass cone.

On gas service, increase pressure slowly up to the operating pressure. Make sure the float does not accelerate to the upper stop (e.g. in conjunction with solenoid valves) as this may damage the flowmeter.

The flowrate value is read off from the top edge of the float (ball).

Reading line



Technical Data

Measuring ranges see Flow table

Accuracy to VDI/VDE Code 3513, Sh. 2 ($q_D = 50\%$)	
DK 701	6%
DK 702	4%

Measuring cone

Type	NG 50
Length	60mm (2.36")
Scale division	flow units
Float shape	ball

Operating data

Max. allowable op. pressure	4 bar
Max. product temperature	100°C

Connection

Standard	G 1/8
Option	tube connection 6 mm
Fitting dimension	75 mm

Diameter of needle valve

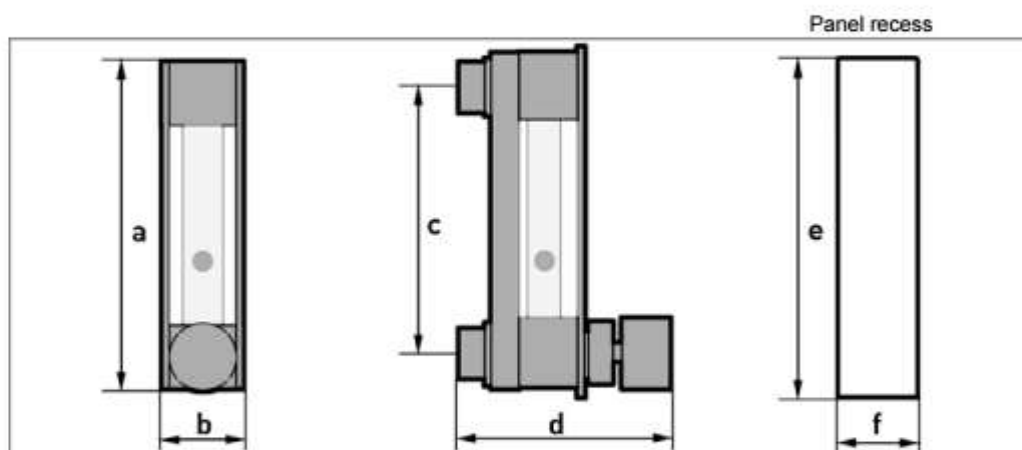
Flow ranges	
< 5 l/h water, ≤ 100 l/h air	1,0 mm
> 5 l/h water, > 100 l/h air	2,5 mm

Materials

Measuring cone	Borosilicate glass
Float	Stainless steel 1.4401, glass
Gaskets	
Standard	FKM / PTFE
Option	FFKM / PTFE
Valve spindle	Stainless steel 1.4571 (316 Ti)
Mount	
Rail	Aluminium anodized
Front plate	Polycarbonat
Top and bottom blocks	PVDF

Dimensions and weights

Dimensions												approx. Weight	
a		b		c		d		e		f		kg	lbs
mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches		
97	3.82	25	0.99	75	2.95	max. 65	max. 2.56	94	3.70	23	0.91	0.1	0.22



Flow table

Float material: stainless steel 1.4571 (316 Ti), glass
 Calibration data: Water at 20°C (68°F)
 Air at 20°C, (68°F), 1.2 bar abs. (17.4 psig) (in normal state)

100% flow values
 Rangeability 10 : 1

Ball Ø		Air				Water	
		DK 701 (Scale on frontplate)		DK 702 Scale on glass cone)		DK 702 (Scale on glass cone)	
mm	inches	l/h	SCFH	l/h	SCFH	l/h	US GPM
4	0.16	-	-	5	0.2	-	-
4	0.16	-	-	8	0.3	-	-
4	0.16	-	-	16	0.6	-	-
4	0.16	-	-	25	1	-	-
4	0.16	-	-	40	1.5	-	-
4	0.16	40	1.5	60	2.5	2.5	0.01
6	0.24	100	4	100	4	5	0.02
6	0.24	150	6	250	10	12	0.05
6	0.24	250	10	500	20	25	0.1
6	0.24	-	-	800	30	40	0.16

Product liability and warranty

Responsibility for the suitability and usage to the intended purpose of these flowmeters rests solely with the operator. Improper installation or improper operation of the flowmeters may lead to the loss of warranty. In addition, the "General conditions of sale" which forms the basis of the purchase contract are applicable.

If you need to return the unit 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 liquids 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 confirming that the flowmeter is safe to handle.

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

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

KROHNE regret that we cannot service your device unless it is accompanied by such a certificate and thank you for your understanding.



DK46 I - DK47 I

Technical Datasheet

Variable-area flowmeter

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

DK46 I - DK47 I variable-area flowmeter

The DK46 I and DK47 I flowmeters are suitable for measuring the volume flow rate of liquids and gases.



- 1 DK46 I
- 2 DK47 I

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

Options und 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

Technical data

Application range	Flow measurement of liquids and gases
Measuring accuracy acc. to Directive VDI / VDE 3513 sheet 2 ($q_G = 50\%$)	
DK46 I	4.0%
DK47 I	2.5%
Operating pressure PS	Pressure equipment directive 97/23/EC
Test pressure PT	Pressure equipment directive 97/23/EC
Max. perm. operating gauge press. PS at TS = 212°F (100°C)	
DK.../R (head piece and foot piece made from stainless steel)	145 psig (10 bar) ①
DK.../N (head piece and foot piece made from brass)	145 psig (10 bar) ①

① higher pressures upon request

Materials

Head piece, foot piece	CrNi steel 1.4404 / 316 L, nickle-plated brass
Head piece, foot piece optional	Hastelloy
Measuring tube	Borosilicate glass
Float (sphere)	CrNi steel 1.4401 / 316
Float options	Glass, POM, titanium, Hastelloy C4
DK48 float (All)	CrNi steel 1.4571 / 316 titanium, aluminum, PEEK, glass
Metering unit	CrNi steel 1.4571 / 316 Ti
Valve spindle	CrNi steel 1.4404 / 316 L
Standard seals	PTFE / FPM
Seals options	PTFE / FFKM, PTFE / EPDM
Seals options	EPDM, FFKM
Protective cover	Polycarbonate

Temperatures

Max. temperature of medium T_m	+212°F (+100°C)
Max. T_m with limit switches	+149°F (+65°C)
Min. temperature of medium T_m	+23°F (-5°C) ①
Max. ambient temperature $T_{amb.}$	+212°F (+100°C)
Max. $T_{amb.}$ with limit switches	+149°F (+65°C)
Min. ambient temperature $T_{amb.}$	-4°F (-20°C) ①

① other temperatures upon request

Technical data limit switches

Clamp-type terminal	Connection box M16 x 1.5 - Cable diameter 5...10 mm				
Limit switches	RC10-14-N3	RC15-14-N3	RC10-14-N0	RC15-14-N0	RB15-14-E2
Switching function	Bistable	Bistable	Monostable	Monostable	Bistable, 3-wire
Connection technology	NAMUR, two-wire	NAMUR, two-wire	NAMUR, two-wire	NAMUR, two-wire	Three-wire
Rated voltage U ₀	8 VDC	8 VDC	8 VDC	8 VDC	
Current consumption	1 mA passage ↓		3 mA - sphere beyond		
Current consumption	3 mA passage ↓		1 mA - sphere is in limit monitor		
Operating voltage U _b					10...30 VDC
Operating current I _b					0...100mA
No-load current					20mA
Output U _a - passage ↓					≤ 1 VDC
Output U _a - passage ↑					≥ U _b - 3 VDC

Application range of limit switches

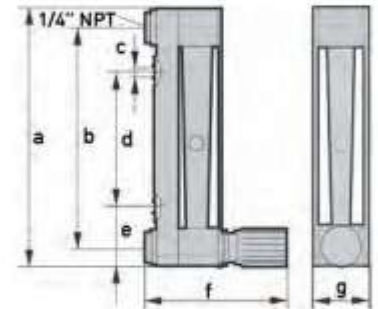
DK46 I, DK47 I	
Sphere	Limit switches
∅ 4mm	RC10
∅ 6 mm	RC15 / RB15
∅ 8 mm	-

The limit switches RC15 and RB15 (as max. contact) can only be used for up to 60 l/h (16 gal/h) water (external diameter of the measuring glass).

Dimensions and weights

Dimensions

[inch] [mm]	a	b ± 0.01 ± 0.25	c	d	e	f approx.	g
DK46 I	5.32 135	4.49 114	0.17 4.3	1.77 45	1.30 33	3.23 82	1.1 28
DK47 I	9.65 245	8.82 224	0.17 4.3	5.12 130	1.30 33	3.23 82	1.1 28



Weights

Device	DK46 I	DK47 I
Weight [kg]	0.5	0.7
Weight with regulator	2.1	2.3

Process connection

Standard	1/4" NPT internal thread
Options	G 1/4, Ermeto 6 or 8, tube connection 6 mm or 8 mm, Dilo, Gyrolok, Swagelok ⓘ

ⓘ other connections upon request

Measuring ranges

Measuring span 10 : 1

Flow values 100%

Sphere Ø mm	Water				Air			
	DK46 I		DK47 I		DK46 I		DK47 I	
	[GPH]	[l/h]	[GPH]	[l/h]	[SCFH]	[l/h]	[SCFH]	[l/h]
4	0.65	2.5	-	-	0.22	5	-	-
4	-	-	-	-	0.3	8	-	-
4	-	-	-	-	0.6	16	0.6	16
4	-	-	-	-	1.5	40	1.5	40
4	-	-	-	-	2.5	60	3.8	100
6	1.3	5	1.3	5	3.8	100	-	-
6	3	12	3	12	9	250	9	250
6	6.5	25	6.5	25	18	500	18	500
6	11	40	11	40	30	800	30	800
6	16	60	16	60	45	1200	-	-
6	25	100	25	100	-	-	-	-
8	30	120	-	-	-	-	-	-
8	42	160	-	-	-	-	-	-

Reference condition:

water 68°F (20°C)

air 68°F (20°C), 17.4 psi (1.2 bar abs.) in a standard state

Other flow rate measuring ranges can be provided upon request.

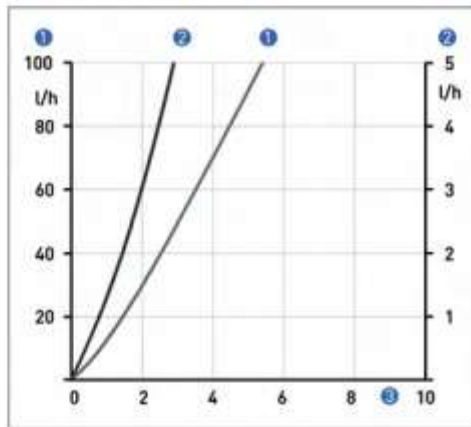
The conversion of other materials or operating data (pressure, temperature, density, viscosity) is done with the help of the calculation procedure as detailed in Directive VDI /VDE 3513

Valves

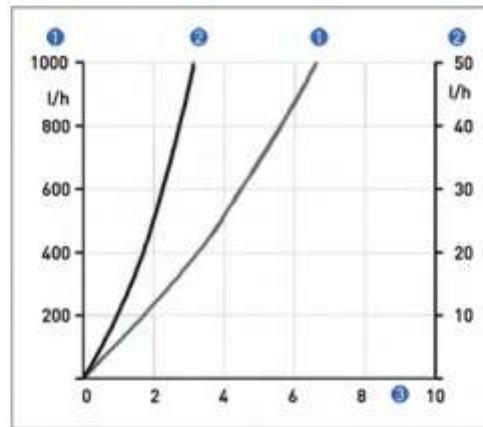
Spindle Ø [mm]	Max flowrate				CV/Kv valve characteristic value	
	Water [l/h]		Air [l/h]			
	[GPH]	[l/h]	[SCFH]	[l/h]	[gal/min]	[m ³ /h]
1	1.32	5	3.5	100	0.021	0.018
2.5	13.2	50	35	1000	0.17	0.15
4.5	42.3	160	177	5000	0.56	0.48

Valve characteristics

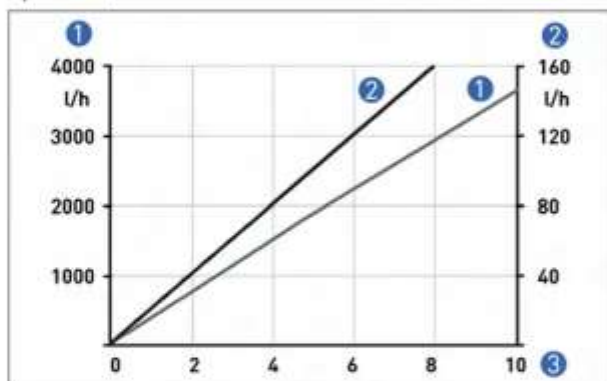
spindle Ø 1.0mm



spindle Ø 2.5mm



spindle Ø 4.5mm



- 1 Flow, air
- 2 Flow, water
- 3 Spindle rotation n

Differential pressure regulators

Differential pressure regulators are used to provide constant flow rates in the case of variable inlet or outlet pressures. Minimum pressure levels are necessary to operate the regulators (see regulator characteristics).

Differential pressure regulators are not 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:	35 ft ³ /h (1000 l/h) air
	Outlet pressure p ₂ constant:	14.7 psi (1.013 bar abs.)

The flow rate is constant in the device in the case of a fluctuating inlet pressure greater than 7.3 psig (0.5 bar).

2 Outlet pressure regulator, type RA, NRA

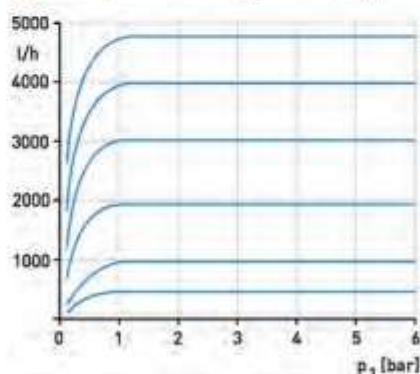
The regulators keep the flow rate constant in the case of a constant inlet pressure and a variable outlet pressure. There must be a pressure differential between the inlet and the outlet pressure for the outlet pressure regulator to function. The inlet pressure p₁ must always be greater than the outlet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

Example - outlet pressure regulator NRA 800	Current flow rate:	28.3 ft ³ /h (800 l/h) air
	Inlet pressure constant:	87 psig (6 bar)

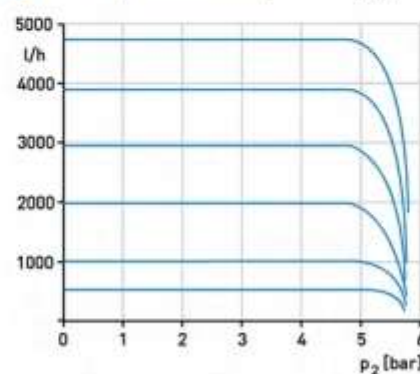
The flow rate is constant in the device in the case of a fluctuating outlet pressure of 0 ... 80 psig (5.5 bar).

Regulator characteristics

1 Inlet pressure regulators, type RE and NRE



2 Outlet pressure regulators, type RA and NRA



Control ranges

Inlet pressure regulator						
	Max flow rate				Min. inlet pressure Δp_1	
	Water		Air			
	[gal/h]	[l/h]	[ft ³ /h]	[l/h]	[psig]	[bar]
RE-1000	...10	...40	...35	...1000	7.3	0.5
RE-4000	...21	...80	...70	...2000	14.5	1
	...26	...100	...106	...3000	21.8	1.5
	...42	...160	...141	...4000	29	2
NRE-100	...0.66	...2.5	...3.5	...100	1.5	0.1
NRE-800			...8.8	...250	1.5	0.1
			...28	...800	2.9	0.2
	...6.6	...25			5.8	0.4

Outlet pressure regulator						
	Max flow rate				Min. pressure diff.	
	Water		Air			
	[gal/h]	[l/h]	[ft ³ /h]	[l/h]	[psig]	[bar]
RA-1000	...10	...40	...35	...1000	7.3	0.5
RA-4000	...26	...100	...70	...2000	14.5	1
			...106	...3000	21.8	1.5
	...42	...160	...141	...4000	29	2
NRA-800	...0.26	...1	...8.8	...250	1.5	0.1
			...18	...500	2.9	0.2
	...6.6	...25	...28	...800	5.8	0.4

Technical data, differential pressure regulator

Standard connection	1/4" NPT
Option	Serto, Ermeto 6 or 8, tube nozzle 6 mm or 8 mm, Dilo, Gyrolok, Swagelok, G 1/4 ①
Max. operating gauge pressure PS	145 psig (10 bar) ②
Material	CrNi-Steel 1.4404
Temperature	TS = 212°F (100 °C) ③

① other connections upon request

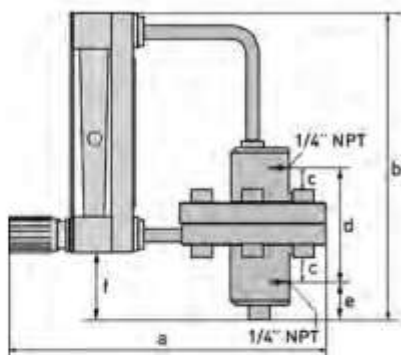
② higher pressures upon request

③ higher temperatures upon request

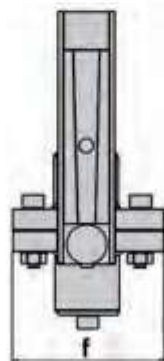
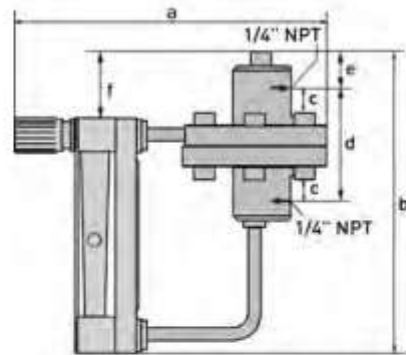
Dimensions with the differential pressure regulator

Dimensions [inch] [mm]	a approx.	b	c approx.	d	e	f approx.	g
DK46 I	8.27 210	7.37 187	0.51 13	2.76 70	0.75 19	1.54 39	3.55 90
DK47 I	8.27 210	11.11 282	0.51 13	2.76 70	0.75 19	1.54 39	3.55 90

DK with inlet pressure regulator



DK with outlet pressure regulator



KROHNE measuring technology - Product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Mass flowmeters
- Ultrasonic flowmeters
- Vortex flowmeters
- Flow controllers
- Level measuring instruments
- Temperature measuring instruments
- Pressure measuring instruments
- Analysis
- Oil and gas industry

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Malaysia
Mauritius
Mexico
Morocco
New Zealand
Peru
Portugal
Romania
Saudi Arabia
Senegal
Slovakia
Slovenia
Sweden
Taiwan
Thailand
Tunisia
Turkey
Venezuela
Yugoslavia

Other countries

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