



DK46 - DK800 Handbook

Variable area flowmeter

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1.1 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



DANGER!

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



WARNING!

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.

1.2 Certifications

CE marking



The flowmeter meets the statutory requirements of the following EC directives:

- Pressure Equipment Directive 97/23/EC - article 3.3
- EMC Directive 2004/108/EC for instruments with electrical options
- ATEX Directive 94/9/EC for instruments in Ex-areas

KROHNE Messtechnik GmbH & Co. KG certifies successful testing of the product by providing the CE Declaration of Conformity.

1.3 Safety instructions from the manufacturer

1.3.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to German copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

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We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.3.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect, incidental, punitive and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.3.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation and operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.3.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of underneath icons.

1.3.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



DANGER!

This information refers to the immediate danger when working with electricity.



DANGER!

This warning refers to the immediate danger of burns caused by heat or hot surfaces.



DANGER!

This warning refers to the immediate danger when using this device in a hazardous atmosphere.



DANGER!

These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.



WARNING!

Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.



CAUTION!

Disregarding these instructions can result in damage to the device or to parts of the operator's plant.



INFORMATION!

These instructions contain important information for the handling of the device.



LEGAL NOTICE!

This note contains information on statutory directives and standards.



• **HANDLING**

This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➞ **RESULT**

This symbol refers to all important consequences of the previous actions.

1.4 Safety instructions for the operator



WARNING!

In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

2.1 Scope of supply

**INFORMATION!**

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Check the packing list to check if you received completely all that you ordered.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

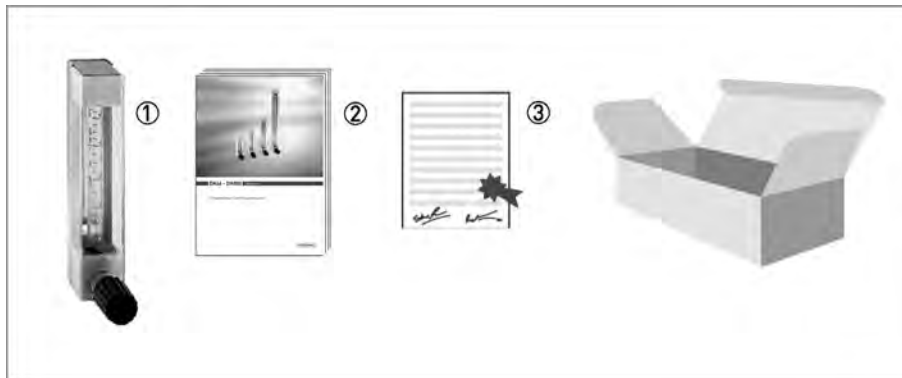


Figure 2-1: Scope of delivery

- ① Flowmeter in the ordered version
- ② Manual
- ③ Certificates, calibration certificate (supplied to order only)

2.2 Device versions



Figure 2-2: Device versions

- ① DK46 with valve and an overall length of 111 mm
- ② DK47 with valve and an overall length of 196 mm
- ③ DK48 with valve and an overall length of 346 mm
- ④ DK800 with valve and an overall length of 146 mm



Figure 2-3: DK47 with differential pressure regulators

- ① DK47 with inlet pressure regulator
- ② DK47 with outlet pressure regulator

2.3 Nameplate



INFORMATION!

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

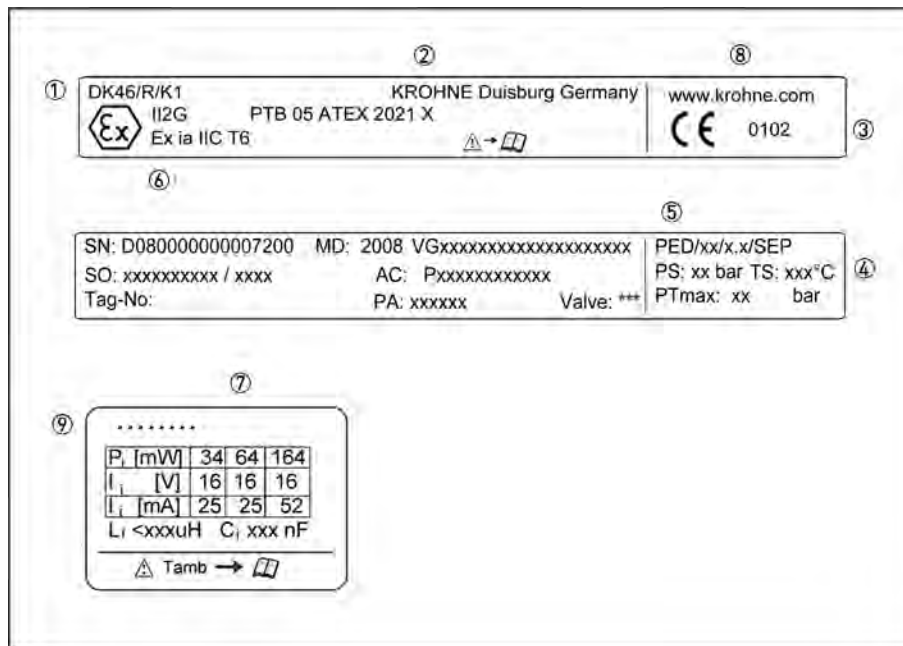


Figure 2-4: Nameplates (Examples)

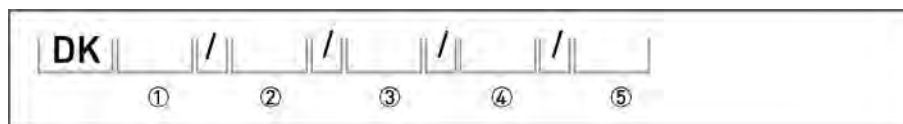
- ① Type of meter
- ② Manufacturer
- ③ Appointed ATEX body
- ④ Design data: temperature & pressure rating
- ⑤ DGR data
- ⑥ Ex data
- ⑦ Electrical connection data
- ⑧ KROHNE website

Additional markings on the measuring device

- SN - serial number
- SO - sales order / item
- Tag-No - Measuring point identifier
- MD - manufacturing date
- PA - KROHNE order
- Vx - product configurator code
- AC - article code

2.4 Description code

The description code* consists of the following elements:



① R - with integrated inlet pressure regulator (DKR46 only)

② Device type:

46 - Overall length of measuring cone 65 mm

47 - Overall length of measuring cone 150 mm

48 - Overall length of measuring cone 300 mm

800 - Overall length of measuring cone 100 mm

③ Material for top and bottom fittings

N - brass

R - stainless steel

PV - PVDF

④ Differential pressure regulators

RE - inlet pressure regulator

RA - outlet pressure regulator

⑤ K1 - one limit switch / K2 - two limit switches

* positions which are not needed are omitted (no blank positions)

3.1 Notes on installation

**INFORMATION!**

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Check the packing list to check if you received completely all that you ordered.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Storage

- Store the device in a dry and dust-free location.
- Avoid lasting direct exposure to the sun.
- Store the device in its original packing.
- The permissible storage temperature for standard devices is -40...+80°C / -40...+176°F.

3.3 Installation conditions

3.3.1 Installation in the piping

**CAUTION!**

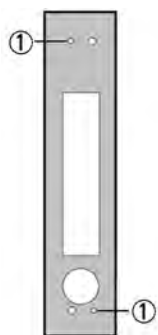
When installing the device in the piping, the following points must be observed:

- *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.*

3.3.2 Panel mounting

Prepare the panel cutout as shown in the drawing (see chapter - Technical Data - Dimensions).

To mount in the panel, slightly loosen the two screws ① on the front panel of the measuring device. Insert the device into the panel cutout from the front, align and fasten with the two screws ①.



4.1 Safety instructions

**DANGER!**

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

**DANGER!**

Observe the national regulations for electrical installations!

**DANGER!**

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

**WARNING!**

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 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.

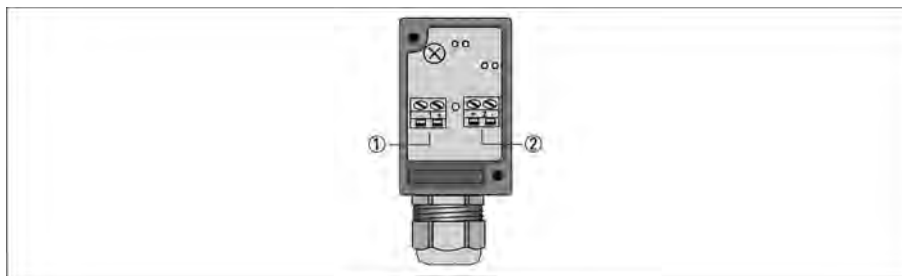
Bistable function: Stable changeover as float passes through switching point.

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

Float below limit: Output "Low"

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

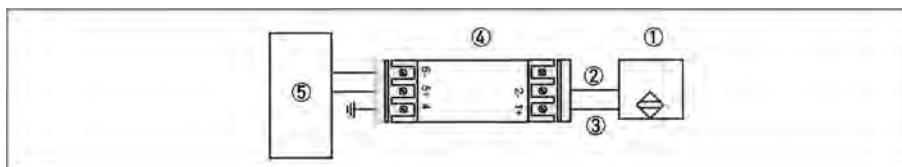
Electrical connection limit switches - 2-wire NAMUR



- ① Lower limit switch to terminal 1
- ② Upper limit switch to terminal 2

The terminal box includes an EMC filter unit.

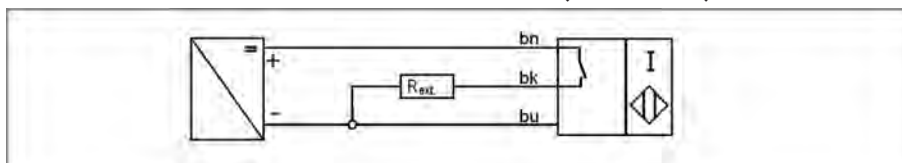
Electrical connection limit switches - 2-wire NAMUR no terminal box



- 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)



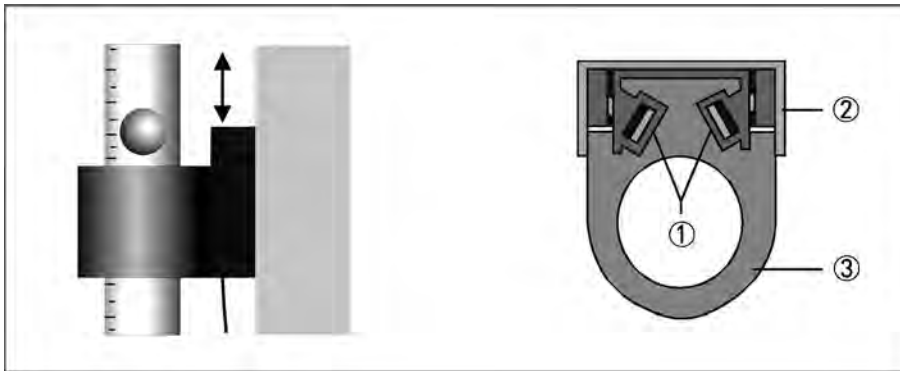
- bn - brown: supply voltage +
- bk - black - switch
- bu - blue: supply voltage -

4.3 Limit switch settings



The following procedures are to be performed (DK../../K):

- Remove both clamping screws ①
- Slide the limit switch over the measuring glass
- Use the two clamping screws ① to fasten the limit switch ③ to the back rail ② of the measuring device.
- Reinstall the protective cover following installation.



For installation after the fact, the measuring glass must be removed. (refer to chapter entitled "Service")



CAUTION!

When setting the limit switch, be careful to lay the cable so that it does not get damaged. Avoid canting of the limit switch during installation: glass breakage

The connecting lead of the limit switch is guided through a hole in the base of the device and sealed.

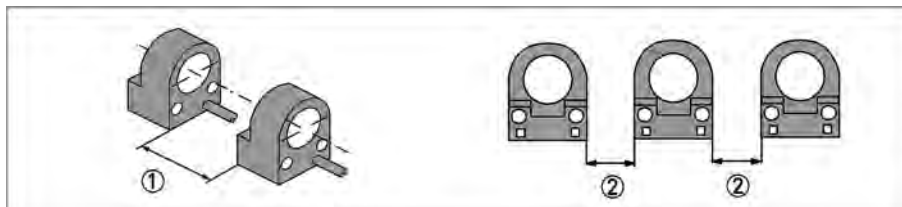
Observe the following for bistable limit switches with external EMC filters in separate DIN rail housing:

The EMC filter unit and the back rail of the meter must be galvanically connected and grounded.

An isolation switching amplifier with intrinsically safe circuit controls is necessary to operate the NAMUR limit switches.

4.4 Minimum clearance between two limit switches

Where two limit switches are used in one device and also where meters with limit switches are in close proximity of each other, minimum clearances must be maintained in order to avoid mutual influence of the switches.



Minimum clearance	NAMUR 2-wire		transistor 3-wire	
①	16 mm	0,63"	45 mm	1,77"
②	6 mm	0,236"	30 mm	1,18"

4.5 Switching performance

Limit switch NAMUR monostable

Ball outside limit switch: signal ≥ 3 mA

Ball inside limit switch (centre): signal ≤ 1 mA

Limit switch NAMUR bistable

Regardless of ball position after passage ①: signal ≥ 3 mA

Prerequisite: the ball is outside the limit switch.



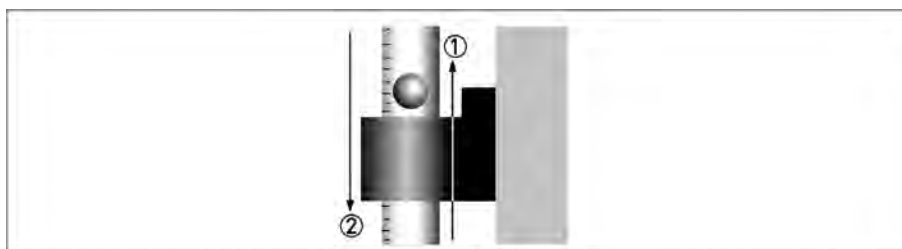
INFORMATION!

For proper initialisation following power up, the NAMUR bistable limit switches should pass through each of ① and ② once.

3-wire limit switch (transistor)

Independent of ball position after passage ②: signal ≤ 1 V

Prerequisite: the ball is outside the limit switch.



4.6 Limit switch function reversal

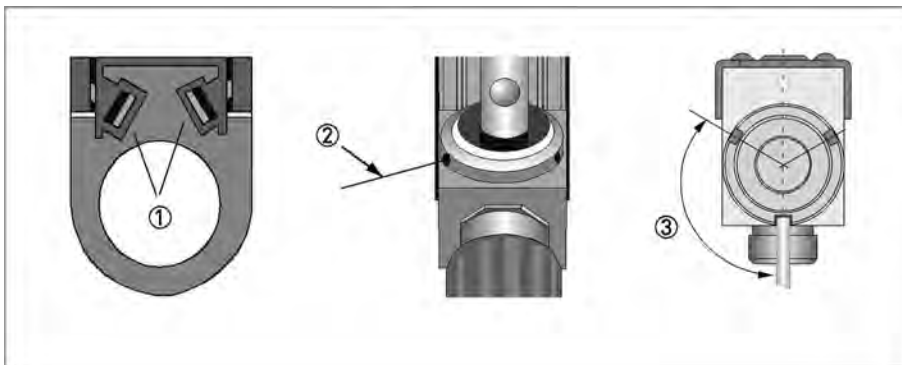
The bistable limit switches can be changed from closers to openers.

The prefabricated connection cable must be long enough to do this.

When installing and setting, make sure the cable is not damaged when laid.



- Loosen terminal screw ①
- Turn tensioning screw ② counter-clockwise to loosen
- Pull out the measuring glass along with the limit switch
- Turn limit switch 180°
- Install the measuring glass
- Tighten tensioning screw ② by hand
- Use a 3mm pin to tighten tensioning screw by turning 4 or max. 5 times in 120° increments ③ in a clockwise direction.



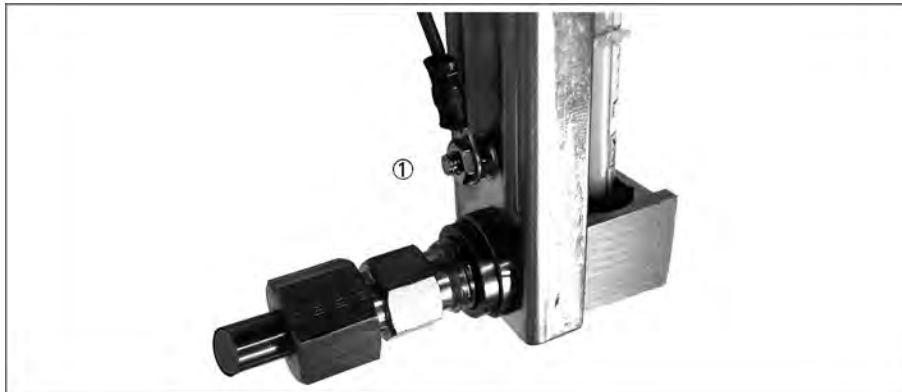
CAUTION!

To avoid breakage, the measuring glass must be positioned centrally between the gaskets.

Test the leak tightness by suitable means prior to start up.

4.7 Grounding connection

The measuring section is grounded on the back rail ① (M4 thread). The connection guarantees only an electrostatic connection of the device and does not comply with the requirements of potential equalisation connection.



DANGER!

The grounding wire may not transfer any interference voltage.

Do not use this grounding wire to ground any other items of electrical equipment.

4.8 Protection category

The limit switch with connection housing meets all requirements as per protection category IP 65.



Therefore it is essential to observe the following points:

- Use only original gaskets. They must be clean and free of any damage. Defective gaskets have to be replaced.
- The electrical cables used must be undamaged and must comply with regulations.
- The cables must be laid with a loop ③ upstream of the measuring device to prevent water from getting into the housing.
- The cable glands ② must be tightened.
- Close the unused cable glands using blanking plugs ①.



DANGER!

After all servicing and maintenance work on the device, the specified protection category has to be ensured again.

5.1 Start-up



CAUTION!

When starting up the flowmeter, the following points must be observed:

- *Compare the actual operating pressure and the process temperature of the system with the specifications on the nameplate (PS and TS); these limits must not be exceeded.*
- *Make sure materials are compatible.*
- *Close the needle valve at the flowmeters.*
- *Slowly open the shut-off valve upstream and downstream of the flowmeter.*
- *When measuring liquids, vent the pipes carefully.*
- *When measuring gases, increase pressure slowly.*
- *void float impact (e.g. caused by solenoid valves), as this is likely to damage the measuring section or float.*
- *Open needle valve at the flowmeters and set the required flow rate.*
- *The top edge of the float marks the reading line for flow values:*

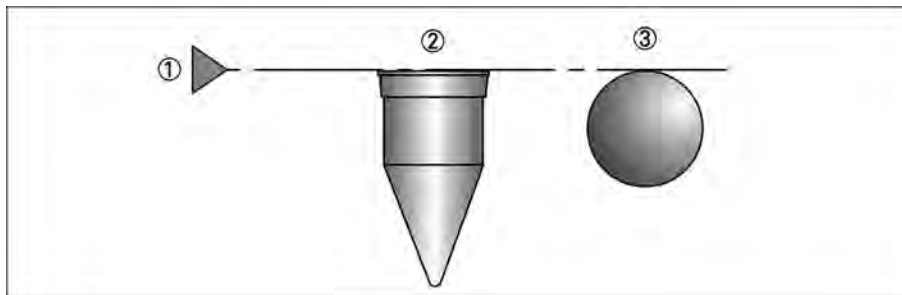


Figure 5-1: Reading edge

- ① Reading edge
- ② DK48 - floatform AIII
- ③ Dk46, DK47, DK800 - floatform ball

6.1 Maintenance

Within the scope of routine maintenance of the system and pipings, the flowmeter should also be inspected for signs of dirt, corrosion, mechanical wear and leaks, as well as damage to the measuring device.

We advise that inspections be carried out at least once per year.

The device must be removed from the piping before cleaning.



CAUTION!

Pressurized pipes must be depressurized before removing the device.

In the case of devices used for measuring aggressive or hazardous media, appropriate safety precautions must be taken with regard to residual liquids in the measuring unit.

Always use new gaskets when reinstalling the device in the pipings.



CAUTION!

The packing seal for the valve may have to be adjusted during the service life. The lock nut must be tightened for this.

Apply a tightening torque of not more than 5 Nm.



CAUTION!

Valves that have not been used for a longer period of time may exhibit a higher actuating torque.

6.2 Changing the measuring cone



- Close the valves located upstream and downstream of the device.
- Close needle valve
- Push protective cover upwards and remove towards the front
- Turn tensioning screw ① counter-clockwise to loosen
Devices with a top and bottom fitting made of PVDF (DK.../PV) have a tensioning screw in the device head (6mm Allen key). This can be loosened with approx. 1 full turn.
The measuring glass can be removed to the front.

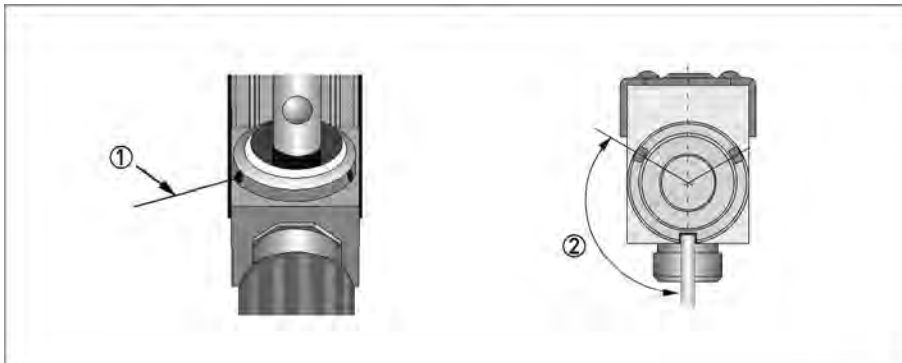


Figure 6-1: Maintenance



CAUTION!

Residual liquid or gas may leak out!



- Install in the reverse order
- Tighten tensioning screw ① by hand
- Use a 3mm pin to tighten tensioning screw 4 or max. 5 times in 120° increments ② in a clockwise direction.



CAUTION!

To avoid breakage, the measuring glass must be positioned centrally between the gaskets.

Test the leak tightness by suitable means prior to start up.

6.3 Spare parts availability

The manufacturer adheres to the basic principle that operational spare parts for each device or each important accessory part will be kept available for a period of 10 (ten) years after delivery of the last production run for that device.

Operational spare parts are defined as parts that are subject to faults in normal operation.

6.4 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, technical support and training.



INFORMATION!

For more precise information, please contact your local representative.

6.5 Returning the device to the manufacturer

6.5.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.



CAUTION!

Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*



CAUTION!

If the device 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 dangerous substances,*
- *to enclose a certificate with the device confirming that is safe to handle and stating the product used.*

6.5.2 Form (for copying) to accompany a returned device

Company:		Address:	
Department:		Name:	
Tel. no.:		Fax no.:	
Manufacturer's order no. or serial no.:			
The device has been operated with the following medium:			
This medium is:	water-hazardous		
	toxic		
	caustic		
	flammable		
	We checked that all cavities in the device are free from such substances.		
	We have flushed out and neutralized all cavities in the device.		
We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.			
Date:		Signature:	
Stamp:			

6.6 Disposal



CAUTION!

Disposal must be carried out in accordance with legislation applicable in your country.

7.1 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: $G = A + W$.

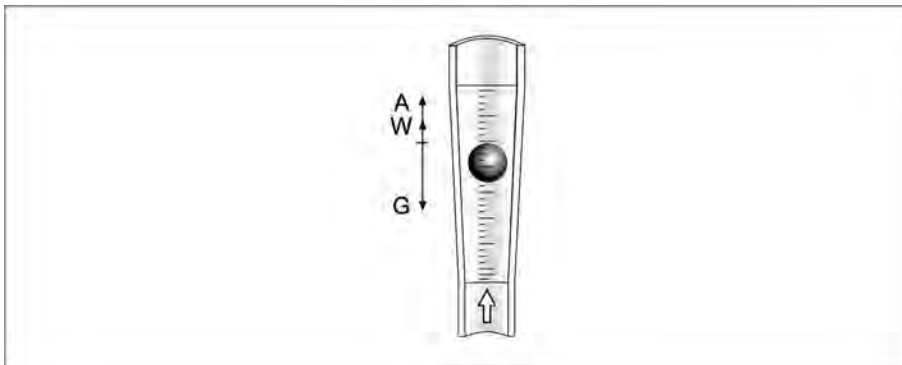


Figure 7-1: Operating principle

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.

7.2 Technical data



INFORMATION!

- 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

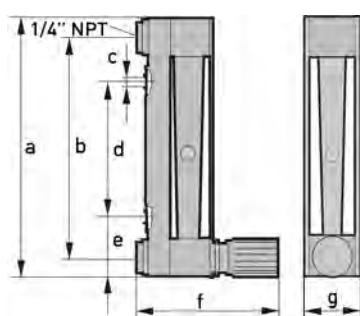
DK46, DK47, DK800		DK48	
Ball	Ring diameter	Cone no.	Ring diameter
Ø 4 mm / 0.158"	10 mm	G 13.11	-
Ø 6 mm / 0.236"	15 mm	G 14.06	-
Ø 8 mm / 0.315"	-	G 14.08	-
		G 15.07	10 mm
		G 15.09	10 mm
		G 15.12	10 mm
		G 16.08	10 mm
		G 16.12	10 mm
		G 17.08	15 mm
		G 17.12	15 mm
		G 18.06	-
		G 18.08	-
		G 18.12	-

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).

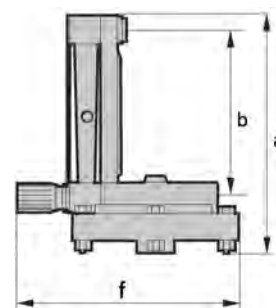
7.3 Dimensions and weights

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

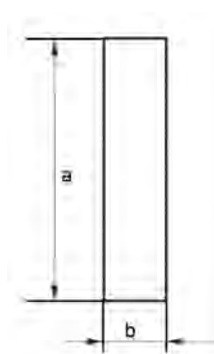


$c = 4,3 \text{ mm} / 0,169''$
 $e = 33 \text{ mm} / 1,3''$
 $f \text{ ca. } 82 \text{ mm} / 3,2''$
 $g = 28 \text{ mm} / 1,1''$

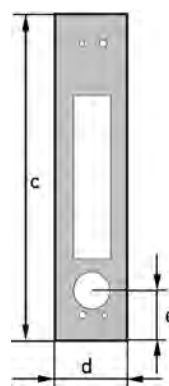


Dimensions of panel cutout and faceplate

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



$b = 32 \text{ mm} / 1.26''$



$d = 40 \text{ mm} / 1.58''$
 $e = 27.5 \text{ mm} / 1.08''$

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	G¾, Ermeto 6 or 8, tube connection 6 mm or 8 mm, Dilo, Gyrolok, Swagelok ①

① other connection upon request

7.4 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

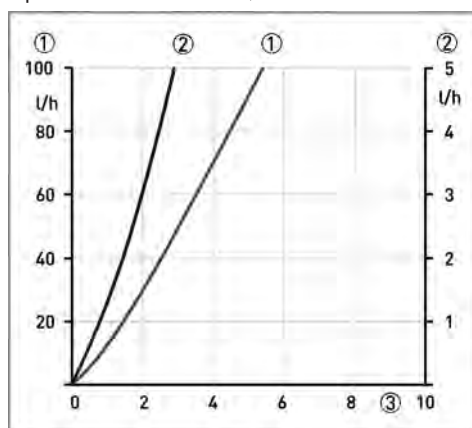
Conversion to other media or operating data (pressure, temperature, density, viscosity) takes place using the calculation method in accordance with VDI / VDE Directive 3513.

Valves

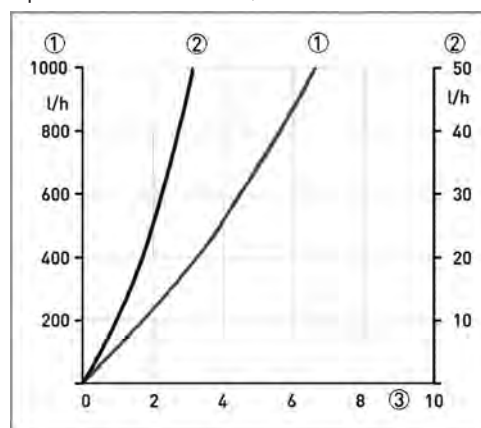
Valve spindle		Max. flowrate				Valve characteristic value	
		Water		Air		Kv	Cv
Ø [mm]	Ø [inches]	[l/h]	[gph]	[l/h]	[scfh]	[m ³ /h]	[gpm]
1	0.039	5	1.3	100	3,7	0.018	0,02
2.5	0.98	50	13	1000	37	0.15	0,17
4.5	0.177	160	42	4300	160	0.48	0,55

Valve characteristics

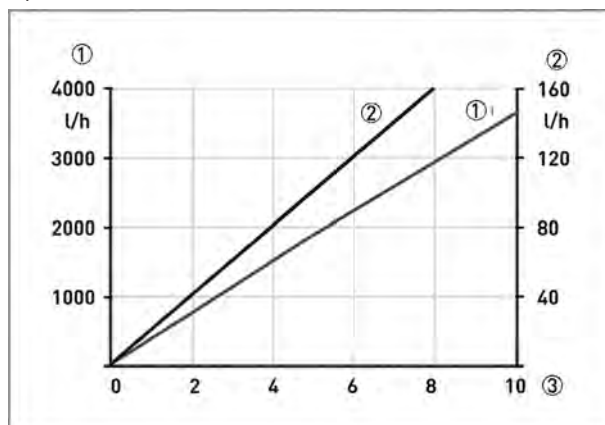
Spindle Ø 1.0mm - 0,039"



Spindle Ø 2.5mm - 0,098"



Spindle Ø 4.5mm - 0,177"



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

7.5 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

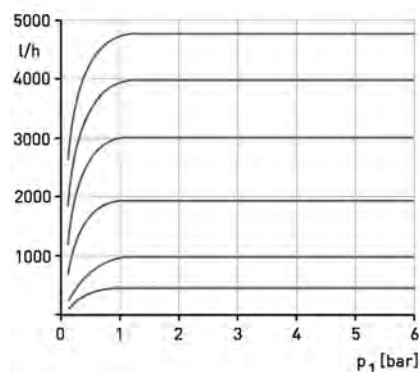
The regulators keep the flow rate constant in the case of a constant inlet pressure and a variable outlet pressure. There must be a pressure differential between the inlet and the outlet pressure for the outlet pressure regulator to function. The inlet pressure p1 must always be greater than the outlet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

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

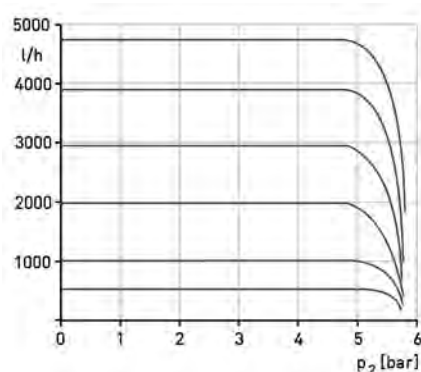
The flow rate in the meter remains constant with a fluctuating outlet pressure of 0 ... 5.5 bar.

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			
	[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				Min. pressure diff.	
	Water		Air			
	[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

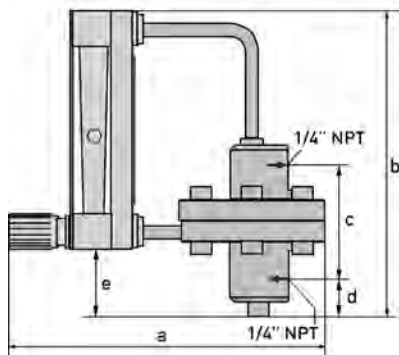
③ higher temperatures on request

④ other materials on request

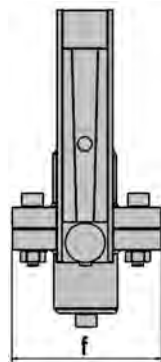
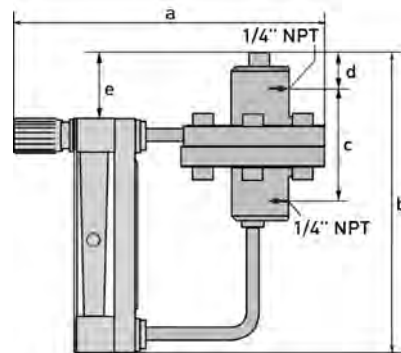
Dimensions with the differential pressure regulator

	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









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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