



VA40 - VA45 Handbook

Variable area flowmeter

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1	Safety instructions	5
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1.1	Intended use	5
1.2	Certifications	5
1.3	Safety instructions from the manufacturer	6
1.3.1	Copyright and data protection	6
1.3.2	Disclaimer	6
1.3.3	Product liability and warranty	6
1.3.4	Information concerning the documentation	7
1.3.5	Warnings and symbols used	8
1.4	Safety instructions for the operator	8
2	Device description	9
<hr/>		
2.1	Scope of delivery	9
2.2	Device version	10
2.2.1	Device version VA40	10
2.2.2	Device version VA45	10
2.3	Nameplate	11
2.4	Description code	12
3	Installation	13
<hr/>		
3.1	General notes on installation	13
3.2	Storage	13
3.3	Installation conditions	14
3.4	Transport locks	14
4	Electrical connections	15
<hr/>		
4.1	Safety instructions	15
4.2	VA40 limit switches	15
4.2.1	Connection ring type limit switch	16
4.2.2	Connection limit switch type MS14	16
4.2.3	Connection limit switch type TG21	17
4.3	Limit switch settings	17
4.3.1	Setting ring type limit switch	17
4.3.2	Limit switch settings MS14	18
4.3.3	Limit switch settings TG21	18
4.4	Minimum clearance between two ring initiators	19
4.5	Switching performance ring-type limit switch	19
4.6	Limit switch function reversal	20
4.6.1	Conversion of the function of ring type limit switch	20
4.6.2	Conversion of the function of limit switch MS14	20
4.6.3	Conversion of the function of limit switch TG21	21
5	Start-up	22
<hr/>		
5.1	Standard device	22

6 Service	23
<hr/>	
6.1 Maintenance	23
6.2 Spare parts availability	24
6.3 Availability of services	24
6.4 Returning the device to the manufacturer	24
6.4.1 General information	24
6.4.2 Form (for copying) to accompany a returned device	25
6.5 Disposal	25
7 Technical data	26
<hr/>	
7.1 Functional principle	26
7.2 Technical data	27
7.3 Dimensions and weights	31
7.4 Measuring ranges	33

1.1 Intended use

**CAUTION!**

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

**INFORMATION!**

This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

**INFORMATION!**

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

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

These devices are particularly suitable for measuring:

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

**DANGER!**

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

**CAUTION!**

Do not use any abrasive or highly viscous media.

1.2 Certifications

CE marking



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

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

The manufacturer certifies successful testing of the product by applying the CE mark.

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 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.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

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 or incidental 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 or 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 icons as shown below.

1.3.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.

**DANGER!**

This warning 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 delivery

**INFORMATION!**

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

**INFORMATION!**

Do a check of the packing list to make sure that you have all the elements given in the order.

**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.

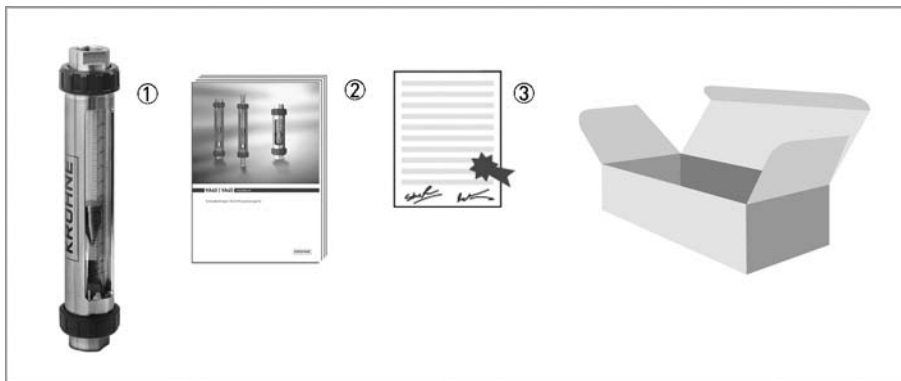


Figure 2-1: Scope of delivery

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

2.2 Device version

- VA40V or VA45V - Screw version
- VA40S or VA45S - Tube socket
- VA40F or VA45F - Flange version
- VA40A - Aseptic version

Optional versions:

- VA40 with max. two limit switches, NAMUR
- VA40 with potential-free Reed contact

2.2.1 Device version VA40



Figure 2-2: Device versions VA40

- ① VA40V - Screw version
- ② VA40S - Tube socket
- ③ VA40F - Flange version
- ④ VA40A - Aseptic version

2.2.2 Device version VA45



Figure 2-3: Device versions VA45

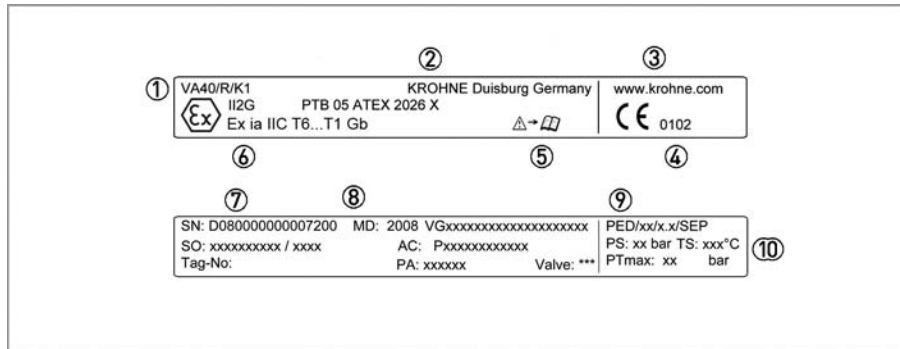
- ① VA45V - Screw version
- ② VA45S - Tube socket
- ③ VA45F - Flange version

2.3 Nameplate



INFORMATION!

Before installing the device, make sure that the information on the nameplate corresponds to the ordering data.



- ① Type of meter
- ② Manufacturer
- ③ Website
- ④ Appointed ATEX body
- ⑤ Pay regard to manual
- ⑥ Ex-data
- ⑦ Serial number
- ⑧ Year of manufacture
- ⑨ PED-data
- ⑩ Design data: Temperature & pressure rating

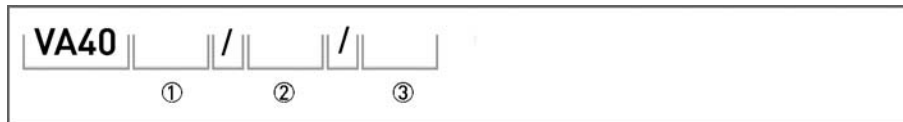
Additional markings on the indicator

- SN - serial number
- SO - sales order / item
- Tag-No. - customer spec.
- MD - year of manufacture
- PA - KROHNE order
- Vx - product configurator code
- AC - article code

2.4 Description code

Description code VA40

The description code consists of the following elements*:



- ① Type of connection
 - V - Screw connection
 - S - Tube socket
 - F - Flange connection
 - A - Aseptic connection, conforming to food standards
- ② Material of the connection
 - R - Stainless steel 1.4404 (316 L)
 - ST - Steel, electroplated and chromized
 - PV - Platics PVDF
- ③ Limit switches
 - K1 - one limit switch
 - K2 - two limit switches

* Places for items not needed may be omitted from the description code

Description code VA45

The description code consists of the following elements:



- ① Type of connection
 - V - Screw connection
 - S - Tube socket
 - F - Flange connection
- ② Material of the connection
 - R - Stainless steel 1.4404 (316 L)
 - ST - Steel, electroplated and chromized
 - PV - Platics PVDF

3.1 General notes on installation

**INFORMATION!**

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

**INFORMATION!**

Do a check of the packing list to make sure that you have all the elements given in the order.

**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 flowmeter in a dry and dust-free location.
- Avoid lasting direct exposure to the sun.
- Store the flowmeter in its original packaging.
- The permissible storage temperature is from $-40...+80^{\circ}\text{C}$ / $-40...176^{\circ}\text{F}$ for standard meters.

3.3 Installation conditions

**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 centrally with the connection bores on the measuring device so they are free of stresses.
- If necessary, support the pipeline to reduce vibrations being transmitted to the measuring device.
- Do not lay signal cables directly next to cables for the power supply.

3.4 Transport locks

Plastic rods are fitted as transport locks to protect the float during transportation. These need to be removed before start-up:

- **F** - Flange version DN15/DN25
Remove yellow plastic cap from upper flange and remove fixing rod from the glass.
- **F** - Flange version DN40/DN50
Cut through the cable tie and remove cap. Remove fixing rod from the glass.
- **V** - Screw version
Unscrew union nut and remove yellow plastic cap from the screw connection. Remove fixing rod. When assembling the meter, tighten the union nuts with strap wrench. Make sure the O-ring is positioned correctly!
- **S** - Tube socket
Unscrew union nut and remove yellow plastic cap from the screw connection. Remove fixing rod. When assembling the meter, tighten the union nuts with strap wrench. Make sure the O-ring is positioned correctly!
- **A** - Aseptic
the same as tube socket

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 VA40 limit switches

The flowmeter VA40 can be equipped with a maximum of two limit switches:

Type bistable (stable changeover from NC to NO contact and vice versa)

Type monostable (switching pulse at operating point)

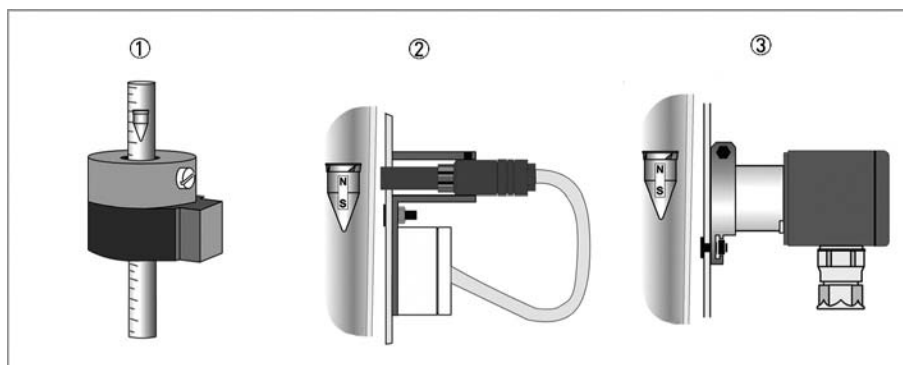


Figure 4-1: Types of limit switches

- ① Ring type limit switch
- ② MS 14/I - potential-free Reed contact
- ③ TG21 - with integrated slot sensor

Operation and Technical data of the limit switches see Technical data.

4.2.1 Connection ring type limit switch

The connecting cables of the limit switch are guided through the long slot on the back.

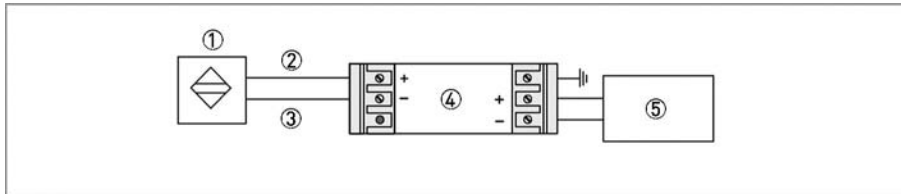


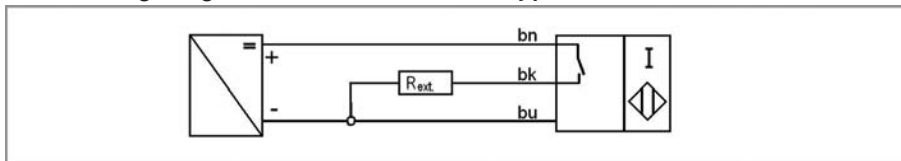
Figure 4-2: Connection of the limit switch type NAMUR

- ① Limit switch 2-wire NAMUR
- ② Colour coding +
- ③ Colour coding blue -
- ④ External EMC filter
- ⑤ Receiver device

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

The monostable types do not need an EMC filter.

Connecting diagram 3-wire transistor type



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

4.2.2 Connection limit switch type MS14

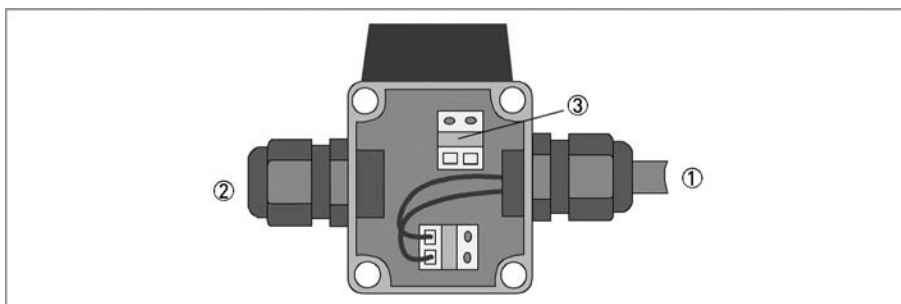


Figure 4-3: Connection limit switch type MS14

- ① Connection Reed-switch
- ② Connection Receiver device
- ③ Terminal connection (potential-free)

4.2.3 Connection limit switch type TG21

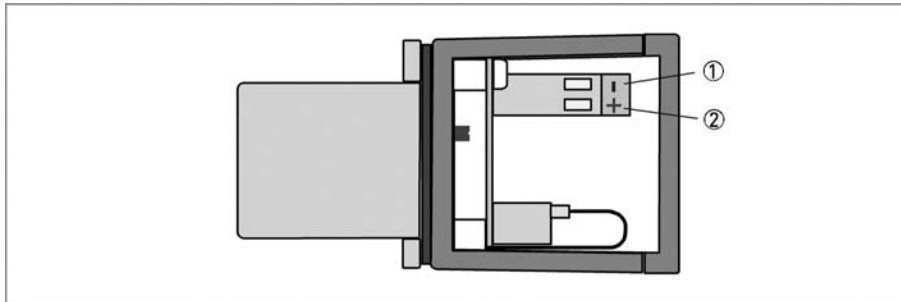


Figure 4-4: Connection limit switch type TG21

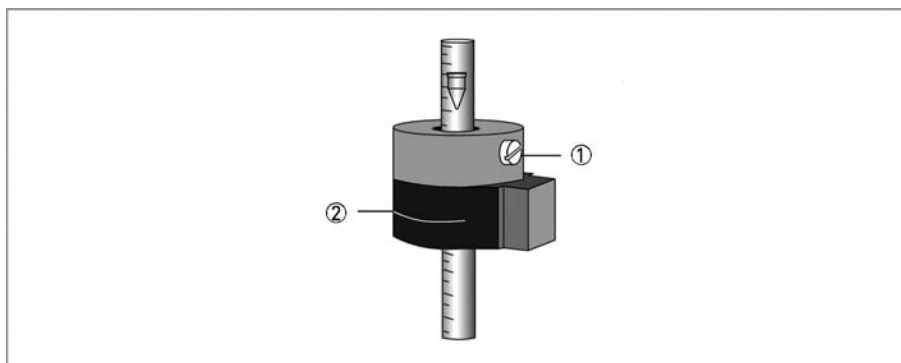
- ① Terminal -
- ② Terminal +

The type TG21 is adapted to switch amplifiers for intrinsical safe circuits in accordance to EN 60947-5-6 NAMUR.

The TG21 includes an inductive slot sensor with bistable switching performance. The slot sensor is actuated by the dipping action of an aluminium vane. The magnet on the dipping vane is moved by the magnet in the float and follows its movement. A magnet float is required.

4.3 Limit switch settings

4.3.1 Setting ring type limit switch

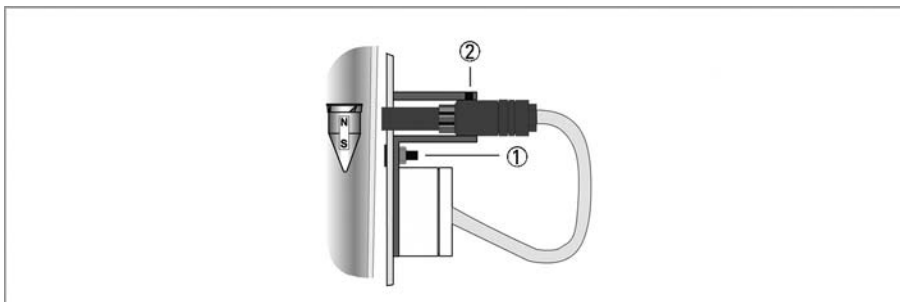


- Untighten plastic screw ① and move limit switch to desired operating point ②.
- Only slightly tighten screw ①! (Risk of breaking the glass)

The operating point is, as shown, at approx. half height of the ring ②.

The exact operating point is also dependent on the size of the used float!

4.3.2 Limit switch settings MS14

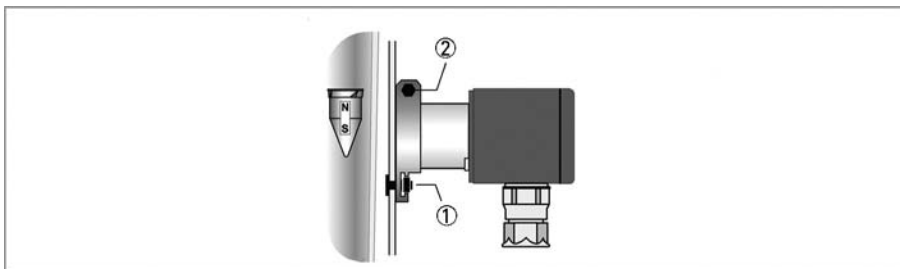


- Untighten bracket screw ① and set switching position
- Secure bracket screw ①

The distance between the limit switch and the casing is factory set with clamp screw ② so that the limit switch touches the glass taper at the maximum switching point.

The limit switch must be rotated 180° to reach the lower range of the scale.

4.3.3 Limit switch settings TG21

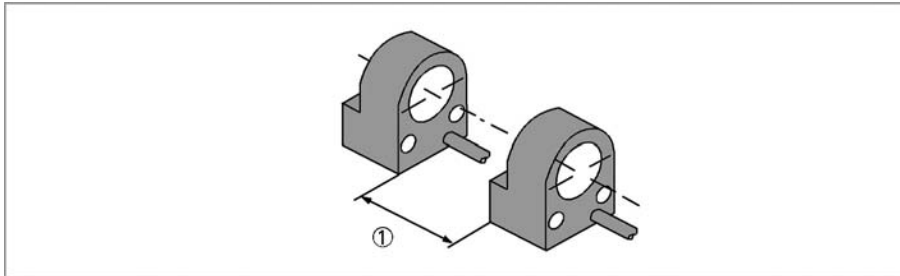


- Untighten bracket screw ① and set switching position
- Secure bracket screw ①

The distance between the limit switch and the casing is factory set at approx. 1 mm (0.039") with the clamping screw ②.

4.4 Minimum clearance between two ring initiators

Where two limit switches are in one device, and also where devices with ring limit switch are arranged close together, minimum clearances must be maintained in order to avoid mutual influence of the switches.



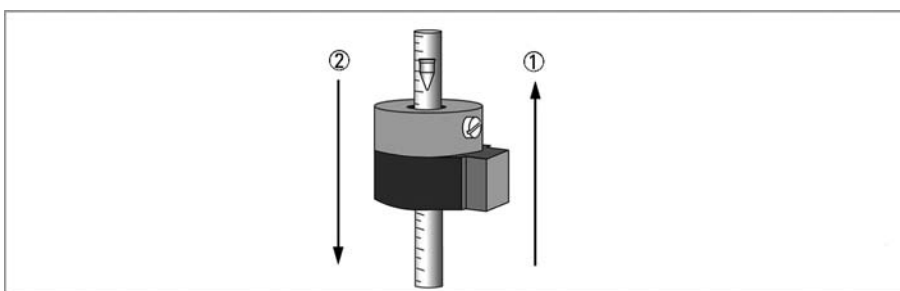
Minimum clearance	2-wire NAMUR		3-wire transistor	
①	16 mm	0,63"	45 mm	1,77"

4.5 Switching performance ring-type limit switch

Limit switch 2-wire NAMUR monostable
 Float outside limit switch: signal ≥ 3 mA
 Float inside limit switch: signal ≤ 1 mA

Limit switch 2-wire NAMUR bistable
 Independent of float position like transit ①: signal ≥ 3 mA
 Precondition: The float is located outside the limit switch.

Limit switch 3-wire transistor bistable
 independent of float position like transit ②: output $U_a \leq 1$ VDC
 Precondition: The float is located outside the limit switch.



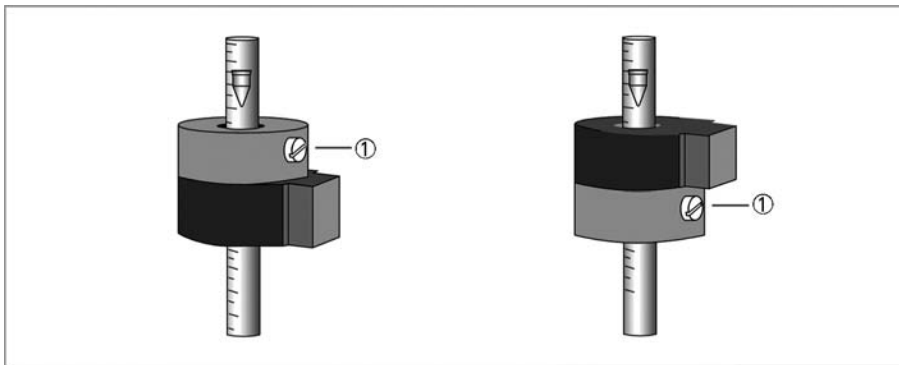
4.6 Limit switch function reversal

4.6.1 Conversion of the function of ring type limit switch

Bistable ring type limit switches can be changed over from NO to NC.

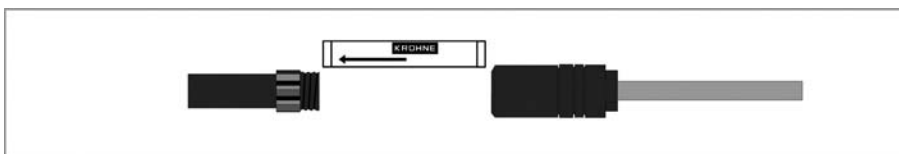


- Remove upper device connection
- Unscrew upper union nut
- Lift up and remove connection very carefully. On depending adhesion of the upper sealing ring, the connection may take the measuring glass with it!
- Untighten plastic screw ① on ring limit switch
- Carefully take the measuring glass out of the housing and the sensor. The ring limit switch remains in the housing. Avoid CANTING (glass breakage!)
- Turn limit switch through 180°
- Assemble in reverse order. Make sure sealing ring is seated correctly!



4.6.2 Conversion of the function of limit switch MS14

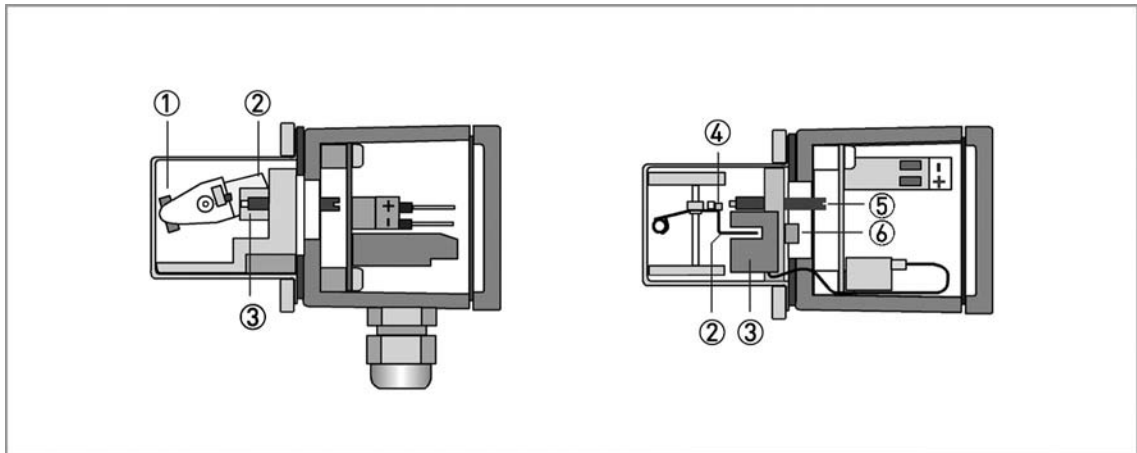
Two contact functions are available:



- Closing, at increasing flow. Arrow on reed cartridge points towards measuring glass.
- Closing, at decreasing flow. Arrow on reed cartridge points away from measuring glass.

4.6.3 Conversion of the function of limit switch TG21

The contact function can be changed over from NO to NC by shifting the position of the slot sensor ③.



- ① Magnet
- ② Contact vane
- ③ Slot sensor
- ④ Counter-magnet
- ⑤ Grub screw
- ⑥ Detaching screw slot sensor

After untightening the screw ⑥, the slot sensor ③ can be shifted to the other end position.

If vibrations could cause an unintentional switching, use the grub screw ⑤ to adjust the force of the frictional connection between adjusting magnet and counter-magnet ④ on the dipping vane ②.

The switching reproducibility is < 3% of the full-scale range and is influenced by the force of the frictional connection!

5.1 Standard device



CAUTION!

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

- *Compare the actual operating pressure and the product temperature of the system with the specifications on the nameplate (PS and TS). These specifications may not be exceeded.*
- *Make sure materials are compatible.*
- *Slowly open the shut-off valve.*
- *When measuring liquids, vent the pipes carefully.*
- *When measuring gases, increase pressure slowly.*
- *Avoid float impact (e.g. caused by solenoid valves), as this is likely to damage the measuring unit or float.*

6.1 Maintenance

Within the scope of routine maintenance of the system and pipelines, the flowmeter should also be inspected for signs of soiling, corrosive attack and mechanical wear or damage to the measuring glass. We advise that inspections be carried out at least once per year.

For VA40 (aseptic) a strap wrench is recommended to open the flowmeter.

Devices with flange connection tighten the union nut first before installation.



CAUTION!

Pressurized pipes to be depressurized before removing the device.

Empty pipes as completely as possible.

Devices used for measurement of aggressive media: take appropriate safety precautions regarding residual liquid in the measuring section.

Untighten the process connection to the piping only (except devices with female threaded connections)A

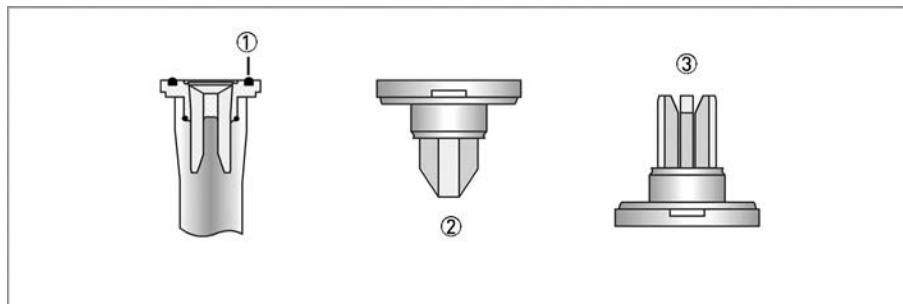
Always use new gaskets when reinstalling the flowmeter in the pipeline.

Make sure the O-ring ① is positioned correctly!

Cleaning of surfaces (e.g. viewing window): avoid electrostatic charges!

Aseptic version: when replacing gaskets, use materials conforming to FDA standards e.g. EPDM.

Before restarting an appropriate leakage test has to be performed.



① Gasket

② DN15 - upper float stop

③ DN15 - lower float stop

6.2 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

6.3 Availability of services

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



INFORMATION!

For more precise information, please contact your local sales office.

6.4 Returning the device to the manufacturer

6.4.1 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 the personnel, the 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 neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that it is safe to handle and stating the product used.*

6.4.2 Form (for copying) to accompany a returned device



CAUTION!

To avoid any risk for our service personel, this form has to be accessible from outside of the packaging with the returned device.

Company:		Address:	
Department:		Name:	
Tel. no.:		Fax no. and/or Email address:	
Manufacturer's order no. or serial no.:			
The device has been operated with the following medium:			
This medium is:	<input type="checkbox"/>	radioactive	
	<input type="checkbox"/>	water-hazardous	
	<input type="checkbox"/>	toxic	
	<input type="checkbox"/>	caustic	
	<input type="checkbox"/>	flammable	
	<input type="checkbox"/>	We checked that all cavities in the device are free from such substances.	
	<input type="checkbox"/>	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:			

6.5 Disposal



CAUTION!

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

Separate collection of WEEE (Waste Electrical and Electronic Equipment) in the European Union:



According to the directive 2012/19/EU, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste.**

The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

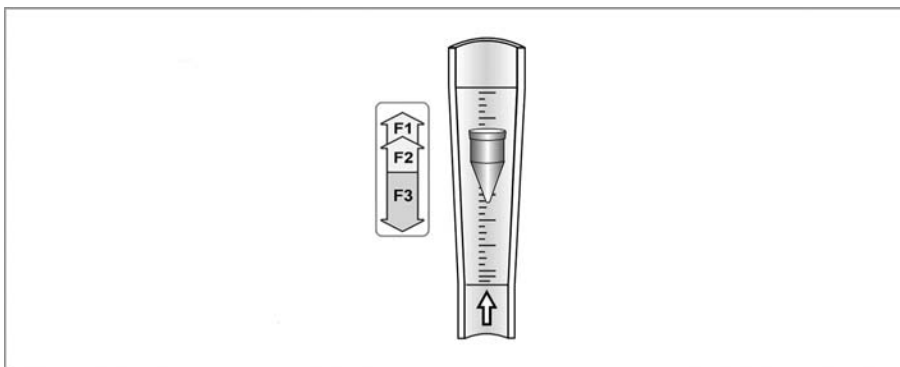
7.1 Functional principle

The flowmeter operates with the principle of variable area flowmeters.

A glass cone is installed in the measuring unit of VA40/45, in which a suitably formed float can move freely up and down.

The flowmeter is inserted into a vertical pipeline and the medium flows through it from bottom to top.

The float adjusts itself so that the buoyancy force F_1 acting on it, the flow resistance F_2 and its weight F_3 are in equilibrium: $F_3 = F_1 + F_2$



The height of the float in the measuring unit, which depends on the flow, is displayed on a scale.

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 sales office.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).

Measuring system

Application range VA40	Flow measurement of liquids, gases and vapors
Application range VA45	Flow measurement of gasses
Operating method / measuring principle	Variable area measuring principle
Measured value	
Primary measured value	Float position
Secondary measured value	Operating and standard volumetric flow
Measuring accuracy	
Directive	VDI / VDE 3513, sheet 2 (q _G = 50%)
VA40	1.0%
VA45	2.5%

Operating conditions

Temperature	
Max. operating temperature	-20...+100°C / -4...+212°F
Pressure	
Max. permitted operating press. PS at TS = 100°C	Pressure equipment directive 97/23/ EC
Test pressure PT	Pressure equipment directive 97/23/EC or AD 2000-HP30
VA40 - DN15, DN25	10 bar / 145 psig ①
VA40 - DN40	9 bar / 131 psig ①
VA40 - DN50	7 bar / 102 psig ①
VA45	1 bar / 14.5 psig ①

Installation conditions

Inlet run	≥ 5 x DN
Outlet run	≥ 3 x DN

① other pressures upon request

Materials

Threaded connection VA.../R	Stainless steel 1.4404 (316 L)
Threaded connection VA.../ST	Steel, galvanized and chromated
Tube nozzle	Stainless steel 1.4404 (316 L)
Flange connection VA.../R	Stainless steel 1.4404 (316 L)
Threaded connection / tube nozzle VA.../PV	PVDF
Housing	Stainless steel 1.4301 (304), electropolished
Screw cap	Aluminum / powder coated option: Stainless steel
Measuring cone	Borosilicate glass
Float VA45	Aluminum
Float VA40 (also for use with food)	Stainless steel, 1.4571 (316 Ti), Hastelloy® C2000, PTFE/insert
Float VA40 (not for use with food)	TFM (PTFE), Aluminum, Polypropylene (PP)
Float and insert	PVDF (conforms to FDA)
Seals	NBR, EPDM, FPM

Temperatures



DANGER!

For devices to be used in hazardous areas, special temperature ranges apply. These can be found in the separate instructions.

Max. measuring temperature T_m (standard)	-20...+100°C ①	-4...+212°F
Max. ambient temperature $T_{amb.}$	-20...+100°C	-4...+212°F

① higher temperatures on request

Limit switches

(only VA40)

Type	Switching function	Connection	Shape	Note
I7R2010-N RC10-14-N0	monostable	Two-wire NAMUR	Ring type	Non Ex
I7R2010-NL RC10-14-N3	bistable	Two-wire NAMUR	Ring type	Non Ex
I7R2015-N RC15-14-N0	monostable	Two-wire NAMUR	Ring type	Non Ex
I7R2015-NL RC15-14-N3	bistable	Two-wire NAMUR	Ring type	Non Ex
RB15-14-E2	bistable	3-wire open collector	Ring type	Non Ex
MS 14/I	bistable	Two-wire potential-free	Reed contact	float with magnet required
TG 21	bistable	Two-wire NAMUR	Slot-type	float with magnet required

Use of the limit switch

Nominal width	Cone No.	Limit switch	Nominal width	Cone No.	Limit switch	
DN15	G 13.11	-	DN25	N 21.09	MS14/A	TG21
	G 14.06	-		N 21.13	MS14/A	TG21
	G 14.08	-		N 21.18	MS14/A	TG21
	G 15.07	ring \varnothing 10mm		N 21.25	MS14/A	TG21
	G 15.09	ring \varnothing 10mm	DN40	N 41.09	MS14/A	TG21
	G 15.12	ring \varnothing 10mm		N 41.13	MS14/A	TG21
	G 16.08	ring \varnothing 10mm		N 41.19	MS14/A	TG21
	G 16.12	ring \varnothing 10mm	DN50	N 51.10	MS14/A	TG21
	G 17.08	ring \varnothing 15mm		N 51.15	MS14/A	TG21
	G 17.12	ring \varnothing 15mm		N 51.21	MS14/A	TG21
	N 18.07	MS14/A				
	N 18.09	MS14/A				
	N 18.13	MS14/A				
	N 19.09	MS14/A				
	N 19.13	MS14/A				
	N 19.19	MS14/A				
	N 19.26	MS14/A				

Technical data ring type limit switches

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 \varnothing	10mm - 0,39"	15mm - 0,59"	10mm - 0,39"	15mm - 0,59"	15mm - 0,59"
Switching function	bistable	bistable	monostable	monostable	bistable
NAMUR	yes	yes	yes	yes	no
Connection technology	two-wire	two-wire	two-wire	two-wire	three-wire
Rated voltage U_0	8VDC	8VDC	8VDC	8VDC	-
Current consumption	1mA passage ↓		3mA - sphere beyond the limit switch		-
Current consumption	3mA passage ↓		1mA - sphere is in limit switch		-
Operating voltage $U_{ext.}$	-				10...30VDC
Operating current I_b	-				0...100mA
No-load current	-				20mA
Output U_a - passage ↓	-				≤ 1 VDC
Output U_a - passage ↑	-				≥ U_b -3VDC

Technical data MS14

Contact type	N/C or N/O, can be reversed
Switching reproducibility	< 2% of the measurement range end value
Contact rating	12VA
Max. switching voltage	30VDC
Max. switching current	0.5A
Ambient temperature	- 20°C...+85°C / -4...+185°F
Protection class Acc. to EN 60529 / IEC 529	IP44

Technical data TG21

Rated voltage	8VDC
Current consumption, inactive	3mA
Current consumption, active	1mA
Ambient temperature	-25°C...+100°C / -13...+212°F
Type of protection according to EN 60529 / IEC 529	IP 67 (NEMA 6)

7.3 Dimensions and weights

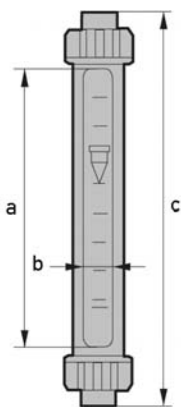
Dimensions VA40

		a	b	c - Type V	c - Type S	c - Type F	c - Type A
EN	ASME	dimensions [mm]					
DN15	1/2"	239	26	375	400	425 ①	375
DN25	1"	239	36	375	450	425 ①	375
DN40	1 1/2"	235	46	375	450	425 ①	375
DN50	2"	227	62	375	450	425 ①	375
		dimensions ["]					
DN15	1/2"	9,41	1,02	14,8	15,8	16,7 ②	14,8
DN25	1"	9,41	1,42	14,8	17,7	16,7 ②	14,8
DN40	1 1/2"	9,26	1,81	14,8	17,7	16,7 ②	14,8
DN50	2"	8,94	2,44	14,8	17,7	16,7 ②	14,8

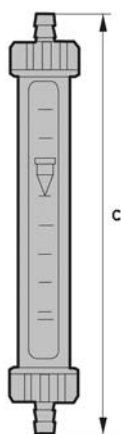
① option 500 mm

② Option 19,7"

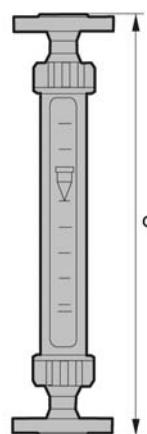
VA40/V



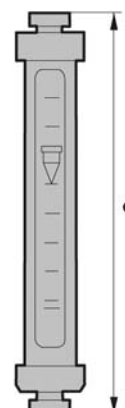
VA40/S



VA40/F



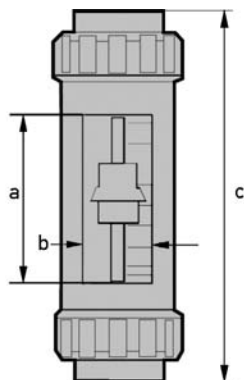
VA40/A



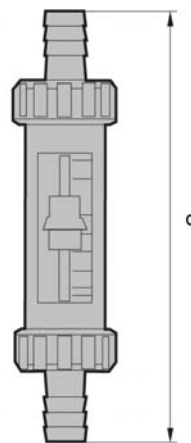
Dimensions VA45

		a		b		c - Type V		c - Type S		c - Type F	
EN	ASME	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
DN15	½"	118	4,65	26	1,02	254	10,0	279	11,0	304	12,0
DN25	1"	118	4,65	36	1,42	254	10,0	329	13,0	304	12,0
DN40	1½"	114	4,49	46	1,81	254	10,0	329	13,0	304	12,0

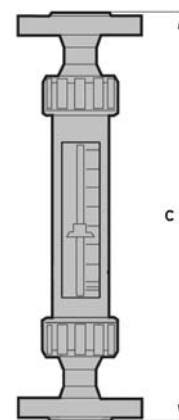
VA45/V



VA45/S



VA45/F



Weights

	VA40 Type V, S, A		VA40 Type F		VA45 Type V, S		VA45 Type F	
	[kg]	[lb]	[kg]	[lb]	[kg]	[lb]	[kg]	[lb]
DN15	0,5	1,1	1,8	4,0	0,4	0,88	1,7	3,7
DN25	1,3	2,9	3,8	8,4	1,2	2,6	3,7	8,2
DN40	2,3	5,1	6,8	15,0	2,2	4,9	6,7	14,8
DN50	3,6	7,9	9,2	20,3	-	-	-	-

Process connection

		Type V		Type S	Type F		Type A	
		Female thread acc. to			Flange acc. to		Pipe	Clamp
EN	ASME	ISO 228	ASME B1.20	Ø [mm]	EN1092-1	ASME B16.5	DIN11851	ISO 2852
DN15	1/2"	G3/8"...G½"	¼" NPT	15	DN15	½"	SC15 ①	17.2 ①
DN25	1"	G¾"...G1"	1" NPT	28	DN25	1"	SC25 ①	25 ①
DN40	1 1/2"	G1½"	1 ½" NPT	42	DN40	1 ½"	SC40 ①	40 ①
DN50 ①	2" ①	G2" ①	2" NPT ①	52 ①	DN50 ①	2" ①	SC50 ①	51 ①

① only VA40

7.4 Measuring ranges

Measuring ranges VA40

Measuring span:	10 : 1		
Declaration of flow:	Values = 100%	Water: 20°C [68°F]	Air: 20°C [68°F], 1.013 bar abs. [14.7 psia]
Float materials:	1 Stainless Steel or Hastelloy® - 2 PTFE with insert - 3 TFM - 4 Aluminium - 5 Polypropylene (PP)		

Materials →		1	2	3	1	3	4	5	1	2	3	4	5
Cone ↓		Water [l/h]			Air [Nm ³ /h]				Max. pressure loss [mbar]				
G 13.11 ①	DN15	0.4	-	-	0.016	-	0.007	-	2	-	-	1	-
G 14.06		0.63	-	-	0.025	-	0.012	-	3	-	-	2	-
G 14.08		1	-	-	0.04	-	0.02	-	4	-	-	3	-
G 15.07		1.6	-	-	0.06	-	0.03	-	4	-	-	3	-
G 15.09		2.5	-	-	0.09	-	0.04	-	5	-	-	4	-
G 15.12		4	-	-	0.14	-	0.06	-	6	-	-	5	-
G 16.08		6.3	-	-	0.2	-	0.1	-	6	-	-	5	-
G 16.12		10	-	-	0.3	-	0.16	-	7	-	-	6	-
G 17.08		16	-	-	0.5	-	0.25	-	7	-	-	6	-
G 17.12		25	-	-	0.8	-	0.4	-	8	-	-	7	-
N 18.07		40	25	13	1.5	0.6	0.8	0.5	9	6	2	3	1
N 18.09		63	40	22	2.2	0.95	1.2	0.7	9	7	3	3	2
N 18.13		100	63	35	3	1.5	1.8	1.2	9	8	3	4	2
N 19.09		160	100	55	5	2.2	2.8	1.8	13	9	4	5	2
N 19.13		250	160	85	8	3.3	4.5	2.8	16	11	4	5	2
N 19.19		400	250	140	-	-	-	-	21	14	5	7	3
N 19.26		630	400	230	-	-	-	-	27	17	6	10	4
N 21.09	DN25	630	400	230	18 ②	9	11	7	22	14	6	8	3
N 21.13		1000	630	350	28 ②	14	18	12	23	17	6	8	4
N 21.18		1600	1000	600	49 ②	-	28 ②	17 ②	26	25	7	10	6
N 21.25		2500	1600	950	70 ②	-	42 ②	26 ②	33	40	8	12	9
N 41.09	DN40	1600	1000	600	45	22	28	18	32	18	9	11	5
N 41.13		2500	1600	900	70 ②	36	45 ②	28 ②	34	20	10	12	5
N 41.19		4000	2500	1500	128 ②	-	76 ②	46 ②	38	24	11	15	8
N 51.10	DN50	4000	2500	1500	120 ②	56	70	45	43	25	12	15	7
N 51.15		6300	4000	2400	190 ②	90	110 ②	70 ②	47	30	13	16	7
N 51.21		10000	6300	3500	310 ②	-	170 ②	118 ②	55	42	14	20	10

① reduced accuracy 2.5%

② only possible with guided float



INFORMATION!

The oper. press. should be at least twice the pressure loss for liquids, and at least 5 times the pressure loss for gases! The specified pressure drops are valid for water and air at maximum flow rate. Other flow ranges on request. Conversion of other media or operating data (pressure, temperature, density, viscosity) is performed using the calculation method in accordance with VDI /VDE Directive 3513

Measuring ranges VA40

Measuring span:	10 : 1		
Declaration of flow:	Values = 100%	Water: 20°C [68°F]	Air: 20°C [68°F], 1.013 bar abs. [14.7 psia]
Float materials:	1 Stainless Steel or Hastelloy® - 2 PTFE with insert - 3 TFM - 4 Aluminium - 5 Polypropylene (PP)		

Materials →		1	2	3	1	3	4	5	1	2	3	4	5
Cone ↓		Water [GPH]			Air [SCFM]				Max. pressure loss [psi]				
G 13.11 ①	DN15	0,11	-	-	0,01	-	0,004	-	0,03	-	-	0,02	-
G 14.06		0,17	-	-	0,015	-	0,007	-	0,04	-	-	0,03	-
G 14.08		0,26	-	-	0,025	-	0,012	-	0,06	-	-	0,04	-
G 15.07		0,42	-	-	0,037	-	0,018	-	0,06	-	-	0,04	-
G 15.09		0,66	-	-	0,056	-	0,025	-	0,07	-	-	0,06	-
G 15.12		1,06	-	-	0,087	-	0,037	-	0,09	-	-	0,07	-
G 16.08		1,66	-	-	0,12	-	0,062	-	0,09	-	-	0,07	-
G 16.12		2,64	-	-	0,19	-	0,09	-	0,1	-	-	0,09	-
G 17.08		4,23	-	-	0,31	-	0,16	-	0,1	-	-	0,09	-
G 17.12		6,60	-	-	0,5	-	0,25	-	0,1	-	-	0,1	-
N 18.07		10,6	6,6	3,43	0,93	0,37	0,5	0,31	0,1	0,1	0,03	0,04	0,02
N 18.09		16,6	10,6	5,81	1,36	0,59	1,2	0,43	0,1	0,1	0,04	0,04	0,03
N 18.13		26,4	16,6	9,25	1,86	0,93	0,74	0,74	0,1	0,1	0,04	0,06	0,03
N 19.09		42,3	26,4	14,5	3,1	1,36	1,7	1,1	0,19	0,13	0,06	0,07	0,03
N 19.13		66,0	42,3	22,5	4,96	2,05	2,8	1,7	0,2	0,16	0,06	0,07	0,03
N 19.19		105	66,0	37	-	-	-	-	0,3	0,2	0,07	-	-
N 19.26		166	106	60,8	-	-	-	-	0,4	0,25	0,09	-	-
N 21.09	DN25	166	106	60,8	11,2 ②	5,58	6,8	4,3	0,3	0,2	0,09	0,1	0,06
N 21.13		264	166	92,5	17,4 ②	8,68	11	7,4	0,3	0,25	0,09	0,1	0,06
N 21.18		423	264	158	30,4 ②	-	17 ②	10,5 ②	0,3	0,3	0,1	0,15	0,9
N 21.25		660	423	251	43,4 ②	-	26 ②	16 ②	0,48	0,58	0,1	0,17	0,13
N 41.09	DN40	423	264	158	27,9 ②	13,6	17	11	0,48	0,26	0,1	0,16	0,07
N 41.13		660	423	238	43,4 ②	22,3	28 ②	17,4 ②	0,49	0,29	0,15	0,17	0,07
N 41.19		1057	660	396	79,4 ②	-	47 ②	28,5 ②	0,55	0,35	0,16	0,22	0,1
N 51.10	DN50	1057	660	396	74,4 ②	34,7	43,4	27,9	0,62	0,36	0,17	0,22	0,1
N 51.15		1664	1057	634	118 ②	55,8	68 ②	43,4 ②	0,68	0,44	0,19	0,23	0,1
N 51.21		2642	1664	925	192 ②	-	105 ②	73 ②	0,8	0,61	0,2	0,29	0,15

① reduced accuracy 2.5%

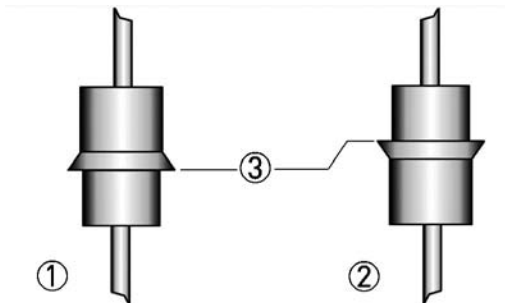
② only possible with guided float

**INFORMATION!**

The operating pressure should be at least twice the pressure loss for liquids, and at least 5 times the pressure loss for gases! The specified pressure drops are valid for water and air at maximum flow rate. Other flow ranges on request. Conversion of other media or operating data (pressure, temperature, density, viscosity) is performed using the calculation method in accordance with VDI/VDE Directive 3513

Measuring ranges VA45

Measuring span:	10 : 1	
Declaration of flow::	Values = 100%	Air 20°C [68°F], 1.013 bar abs. [14,7 psia]



- ① float form C
- ② float form D
- ③ reading line

	Cone no.	Float form	Flow air		Max. pressure loss	
			[l/h]	[SCFH]	[mbar]	[psi]
DN15	N -15.01	C	1500...2300	55,8...85,6	3	0,044
		D	2300...4800	85,6...179	3	0,044
	N -15.02	C	5500...9000	205...335	3	0,044
		D	9000...16000	335...595	3	0,044
DN25	N -25.01	C	3000...5000	112...186	3	0,044
		D	5000...7500	186...279	3	0,044
	N -25.02	C	7500...16500	279...614	3	0,044
		D	16500...25000	614...930	4	0,058
DN40	N -40.01	C	17000...26000	632...967	4	0,058
		D	26000...34000	967...1265	4	0,058
	N -40.02	C	34000...60000	1265...2232	4	0,058
		D	60000...75000	2232...2790	4	0,058

**INFORMATION!**

The operating pressure should be at least 5 times the pressure loss for gases! The specified pressure drops are valid for water and air at maximum flow rate. Other flow ranges on request. Conversion of other media or operating data (pressure, temperature, density, viscosity) is performed using the calculation method in accordance with VDI/VDE Directive 3513

Reference condition for gas measurements:

The flow measurement of gases are referred to

NI/h or Nm³/h: Volume flow in Normal state 0°C, 1.013 bar abs. (DIN 1343)

SCFM or SCFH: Volume flow in Standard state 15°C, 1.013 bar abs. (ISO 13443)



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Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
47058 Duisburg (Germany)
Tel.: +49 203 301 0
Fax: +49 203 301 10389
info@krohne.com

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

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