Variable area flowmeter
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1 SAFETY INSTRUCTIONS

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

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

The flowmeter meets the statutory requirements of the following EC directives:
- Pressure Equipment Directive 97/23/EC
- EMC Directive 89/336/EC for instruments with electrical options

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 Display conventions

The following symbols are used to help you navigate this documentation more easily:

WARNING!
These warning signs must be observed without fail. Even only partial disregarding such warnings can result in serious health damage, damage to the device itself or to parts of the operator's plant.

DANGER!
This symbol designates safety advice on handling electricity.

CAUTION!
These warnings must be observed without fail. Even only partial disregarding such warnings can lead to improper functioning of the device.

LEGAL NOTICE!
This symbol designates information on statutory directives and standards.

NOTE!
This symbol designates important information for the handling of the device.

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

• CONSEQUENCE
This symbol designates 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

**NOTE!**
Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to your local office.

**NOTE!**
Check the packing list to make sure that you have received your complete order.

**NOTE!**
Please check on the device nameplates, that the device is supplied according to your order. Check for the correct mains voltage printed on the nameplate. If not, contact your local representative for advice.

![Figure 2-1: Scope of supply](image.png)

1. Flowmeter in the version ordered
3. Certificates, calibration certificate (supplied to order only)
2.2 Device versions

2.2.1 Versions

Figure 2-2: Device versions

1. DK46I with valve and an overall length of 135 mm (5.32 inch)
2. DK47I with valve and an overall length of 245 mm (9.65 inch)

2.2.2 Versions with regulator

Figure 2-3: DK47I with differential pressure regulators

1. DK47I with inlet pressure regulator
2. DK47I with outlet pressure regulator
2.3 Nameplate

INFORMATION!
Before installing the flowmeter, make sure that the information given on the nameplate corresponds to the ordering data.

Additional markings on the flowmeter
- SN - serial number
- SO - sales order / item
- Tag-No - measuring point (customer spec.)
- MD - year of manufacture
- KO - KROHNE order
- Vx - product configurator code
- AC - article code
2.4 Description code

The description code consists of the following elements*:

- **1** R - With integral inlet pressure regulator (only DKR46)
- **2** Instrument type:
  - 46I - Measuring cone overall length 65 mm
  - 47I - Measuring cone overall length 150 mm
- **3** Material for top and bottom fittings:
  - R - Stainless steel
- **4** Differential pressure regulator:
  - 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 INSTALLATION

3.1 Notes on installation

**NOTE!**
Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to your local office.

**NOTE!**
Check the packing list to make sure that you have received your complete order.

**NOTE!**
Please check on the device nameplates, that the device is supplied according to your order. Check for the correct mains voltage printed on the nameplate. If not, contact your local representative for advice.

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 to +80°C for standard meters.
3.3 Installation requirements

3.3.1 Installing in the pipeline

**CAUTION!**
When installing the flowmeter in the pipeline please observe the following points:
- The variable area flowmeter has to be installed vertically (float measuring principle), flow direction from bottom to top. For installation recommendations please also refer to the Directive VDI/VDE 3513, Sheet 3.
- Before installing the flowmeter, blow or flush out the pipeline leading to the flowmeter.
- Pipelines for gas flow are to be dried before the flowmeter is installed.
- Use connectors appropriate to the flowmeter version for the connection.
- 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 in order to prevent vibration from being transferred to the flowmeter.
- Do not lay signal cables directly next to cables for the power supply.

3.4 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.

![Diagram of Reading edge](image-url)
**4 Electrical connections**

**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 national installation regulations!

**WARNING!**
Observe the regional occupational health and safety regulations without fail. Only work on the device electrics if you are appropriately trained.

**NOTE!**
Please check on the device nameplates, that the device is supplied according to your order. Check for the correct mains voltage printed on the nameplate. If not, contact your local representative for advice.

**4.2 Limit switches**

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

- Type RC...-N3 and RB...-E2 with bistable function
- Type RC...-N0 with monostable function

Function monostable: Switching pulse by transit of the float in the operating point, independently of the moving direction.

Function bistable: Stable changeover by transit of the float through the operating point.

Example:
- Float above limit: output "High"
- Float below limit: output "Low"
Electrical connection limit switches - 2-wire terminal box

1. lower limit switch - to terminal 1
2. upper limit switch - to terminal 2

The junction box includes an EMC filter unit.

Electrical connection limit switches - 2-wire without terminal box

1. Limit switch (without terminal box)
2. Colour coding blue -
3. Colour coding brown +
4. external EMC filter
5. Receiver device

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

Electrical connection limit switch - 3-wire [RB...-E2]

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

4.3 Setting the limit switch

Following procedure is to perform (DK../../K):

- Detach clamping screws 1
- Slide the limit switches over the measuring glass.
- Use the two clamping screws 2 to fasten the limit switch 3 to the back rail 1 of the measuring device.
- Reinstall the protection cover after installation.

To install, first remove the measuring glass as described under chapter Maintenance.

CAUTION!

When setting the ring sensor, make sure the cable is laid such that it cannot be damaged!
Avoid CANT - glass breakage!

The connecting lead for the limit switch is routed the hole in the device bottom fitting and sealed.

For bistable limit switches with external EMC filter in separate DIN-rail housing, observe the following:
EMC filter unit and back rail of the flowmeter must be galvanically connected and grounded.

An isolation switching amplifier with intrinsically safe control circuits NAMUR is necessary for operation of the NAMUR limit switches.
4.4 Minimum clearance between two limit switches

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

<table>
<thead>
<tr>
<th>Min. clearance</th>
<th>RC...-2-wire</th>
<th>RB...-3-wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16 mm (0.63&quot;)</td>
<td>45 mm (1.773&quot;)</td>
</tr>
<tr>
<td>2</td>
<td>6 mm (0.236&quot;)</td>
<td>30 mm (1.182&quot;)</td>
</tr>
</tbody>
</table>

4.5 Switching performance

Limit switch RC...-N0
Ball outside sensor: Signal ≥ 3 mA
Ball inside sensor: Signal ≤ 1 mA

Limit switch RC...-N3
Independent of ball position see image 1: Signal ≥ 3 mA
Pre condition: The ball is located outside the sensor.

NOTE!
To get a correct mode of operation after power on the limit switches RC...-N3 have to pass through for one time 1 and 2.

Limit switch RB...-E2
Independent of ball position like transit 2: Signal ≤ 1 V
Pre condition: The ball is located outside the sensor.
4 ELECTRICAL CONNECTIONS

4.6 Conversion of the function

The bistable limit switch RC 10...N3 can be changed from NO to NC function.

The precut cable with connectors must be sufficiently long for this!

When setting the limit switch, make sure the cable is laid such that it cannot be damaged!

- Detach clamping screws 1
- Detach tensioning screw 2. Turn anti-clockwise.
- Carefully pull out the measuring glass together with the limit switch.
- Turn the limit switch 180°.
- Assemble in reverse order.
- Turn tensioning screw 2 hand-screwed
- Use a 3mm pin to tighten the lock nut with 4x ... max. 5x. 120° turns clockwise.

CAUTION!
To avoid glass breakage, the measuring glass must be inserted concentrically between the gaskets.

Before restarting the flowmeter, check leak-tightness by suitable means.
5.1 Maintenance

Within the scope of routine maintenance of the system and pipelines, the flowmeter should also be inspected for signs of fouling, corrosion, mechanical wear and leaks, as well as damage to the measuring tube and indicator.

We advise that inspections be carried out at least once a 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 flowmeters used for measuring aggressive or hazardous products, appropriate safety precautions must be taken with regard to residual liquids in the measuring section. Always use new gaskets when reinstalling the flowmeter in the pipeline.

**CAUTION!**
Under certain circumstances the valve packing gland may have to be adjusted during its service life. This means that the union nut has to be retightened. If necessary, press the retaining pin against its internal spring.
Apply a tightening torque of not more than 5 Nm.

**CAUTION!**
Valves that have not been actuated for a longer period of time may exhibit a higher initial actuation torque.
Changing the measuring cone

- Close valve upstream and downstream of the device.
- Close needle valve.
- Push protective cover upwards and remove to front.
- Turn the lock nut in the device base anti-clockwise. Devices with a top and bottom fitting made of PVDF (DK.../PV) have a tensioning screw in the device head (Allen key 6mm). This can be unlocked with approx. 1 full turn.

The measuring glass can be removed to the front.

Install in the reverse order:

- Fix the measuring glass in position by tightening the lock nut finger-tight in the device base first of all.
- Use a 3mm pin to tighten the lock nut with max. 120° turns clockwise.

CAUTION!
Residual liquid or gas may leak out!

CAUTION!
To avoid glass breakage, the measuring glass must be inserted concentrically between the gaskets.

Before restarting the flowmeter, check leak-tightness by suitable means.
5.2 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.

5.3 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.

**NOTE!**
For more precise information, please contact your local representative.
5.4 Returning the device to the manufacturer

5.4.1 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 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.
5.4.2 Form (for copying) to accompany a returned instrument

<table>
<thead>
<tr>
<th>Company:</th>
<th>Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department:</td>
<td>Name:</td>
</tr>
<tr>
<td>Tel. no.:</td>
<td>Fax no.:</td>
</tr>
<tr>
<td>Manufacturer’s order no. or serial no.:</td>
<td></td>
</tr>
</tbody>
</table>

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:

5.5 Disposal

CAUTION!
Disposal must be carried out in accordance with legislation applicable in your country.
6.1 Functional principle

The flowmeter operates on the float measuring principle.

The measuring section 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.

\[ G = A + W \]

The flow-dependent height of the float can take reading on a scale of the measuring glass.

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

#### Materials

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head piece, foot piece</td>
<td>CrNi steel 1.4404 / 316 L, nickle-plated brass</td>
</tr>
<tr>
<td>Head piece, foot piece</td>
<td>Hastelloy</td>
</tr>
<tr>
<td>Measuring tube</td>
<td>Boroisicate glass</td>
</tr>
<tr>
<td>Float (sphere)</td>
<td>CrNi steel 1.4401 / 316</td>
</tr>
<tr>
<td>Float options</td>
<td>Glass, POM, titanium, Hastelloy C4</td>
</tr>
<tr>
<td>DK48 float (All)</td>
<td>CrNi steel 1.4571 / 316 titanium, aluminum, PEEK, glass</td>
</tr>
<tr>
<td>Metering unit</td>
<td>CrNi steel 1.4571 / 316 Ti</td>
</tr>
<tr>
<td>Valve spindle</td>
<td>CrNi steel 1.4404 / 316 L</td>
</tr>
<tr>
<td>Standard seals</td>
<td>PTFE / FPM</td>
</tr>
<tr>
<td>Seals options</td>
<td>PTFE / FFKM, PTFE / EPDM</td>
</tr>
<tr>
<td>Seals options</td>
<td>EPDM, FFKM</td>
</tr>
<tr>
<td>Protective cover</td>
<td>Polycarbonate</td>
</tr>
</tbody>
</table>

#### Temperatures

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. temperature of medium Tm</td>
<td>+212°F (+100°C)</td>
</tr>
<tr>
<td>Max. Tm with limit switches</td>
<td>+149°F (+65°C)</td>
</tr>
<tr>
<td>Min. temperature of medium Tm</td>
<td>+23°F (-5°C)</td>
</tr>
<tr>
<td>Max. ambient temperature Tamb.</td>
<td>+212°F (+100°C)</td>
</tr>
<tr>
<td>Max. Tamb. with limit switches</td>
<td>+149°F (+65°C)</td>
</tr>
<tr>
<td>Min. ambient temperature Tamb.</td>
<td>-4°F (-20°C)</td>
</tr>
</tbody>
</table>

1. higher pressures upon request
2. other temperatures upon request
Technical data limit switches

<table>
<thead>
<tr>
<th>Clamp-type terminal</th>
<th>Connection box M16 x 1.5 - Cable diameter 5...10 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit switches</td>
<td>Connection technology</td>
</tr>
<tr>
<td>RC10-14-N3</td>
<td>NAMUR, two-wire</td>
</tr>
<tr>
<td>RC15-14-N3</td>
<td>NAMUR, two-wire</td>
</tr>
<tr>
<td>RC10-14-N0</td>
<td>NAMUR, two-wire</td>
</tr>
<tr>
<td>RC15-14-N0</td>
<td>NAMUR, two-wire</td>
</tr>
<tr>
<td>RB15-14-E2</td>
<td>Three-wire</td>
</tr>
</tbody>
</table>

Application range of limit switches

<table>
<thead>
<tr>
<th>Sphere</th>
<th>Limit switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 4mm</td>
<td>RC10</td>
</tr>
<tr>
<td>Ø 6 mm</td>
<td>RC15 / RB15</td>
</tr>
<tr>
<td>Ø 8 mm</td>
<td>-</td>
</tr>
</tbody>
</table>

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).
6.3 Dimensions and weights

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>[inches]</th>
<th>a</th>
<th>b ± 0.01</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f approx.</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK46 I</td>
<td></td>
<td>5.32</td>
<td>4.49</td>
<td>0.17</td>
<td>1.77</td>
<td>1.30</td>
<td>3.23</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>135</td>
<td>114</td>
<td>4.3</td>
<td>45</td>
<td>33</td>
<td>82</td>
<td>28</td>
</tr>
<tr>
<td>DK47 I</td>
<td></td>
<td>9.65</td>
<td>8.82</td>
<td>0.17</td>
<td>5.12</td>
<td>1.30</td>
<td>3.23</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>245</td>
<td>224</td>
<td>4.3</td>
<td>130</td>
<td>33</td>
<td>82</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weights</th>
<th>Device</th>
<th>DK46 I</th>
<th>DK47 I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight [kg]</td>
<td></td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>Weight with regulator</td>
<td></td>
<td>2.1</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Process connection

<table>
<thead>
<tr>
<th>Standard</th>
<th>1/4” NPT internal thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>G 1/4, Ermeto 6 or 8, tube connection 6 mm or 8 mm, Dilo, Gyrolok, Swagelok</td>
</tr>
</tbody>
</table>

1 other connections upon request
### 6.4 Measuring ranges

Measuring span 10 : 1
Flow values 100%

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.65</td>
<td>2.5</td>
<td>0.22</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>1.5</td>
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<td>1200</td>
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<td>-</td>
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<td>120</td>
<td>-</td>
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</tr>
<tr>
<td>6</td>
<td>42</td>
<td>160</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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]**

<table>
<thead>
<tr>
<th>Spindle Ø</th>
<th>Max flowrate</th>
<th>CV/Kv valve characteristic value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water [l/h]</td>
<td>Air [l/h]</td>
</tr>
<tr>
<td></td>
<td>[GPH]</td>
<td>[SCFH]</td>
</tr>
<tr>
<td>1</td>
<td>1.32</td>
<td>5</td>
</tr>
<tr>
<td>2.5</td>
<td>13.2</td>
<td>58</td>
</tr>
<tr>
<td>4.5</td>
<td>42.3</td>
<td>160</td>
</tr>
</tbody>
</table>

**Valve characteristics**

- **Spindle Ø 1.0mm**
- **Spindle Ø 2.5mm**
- **Spindle Ø 4.5mm**

1. Flow, air
2. Flow, water
3. Spindle rotation n
6.5 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 ft³/h (1000 l/h) air
  - Outlet pressure p₂ 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 850:**
  - Current flow rate: 28.3 ft³/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 (0.5 bar).

**Regulator characteristics**

![Graphs of regulator characteristics](image)
### Control ranges

#### Inlet pressure regulator

<table>
<thead>
<tr>
<th></th>
<th>Water</th>
<th>Air</th>
<th>Min. inlet pressure ( \Delta p_1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[gal/h]</td>
<td>[l/h]</td>
<td>[ft³/h]</td>
</tr>
<tr>
<td>RE-1000</td>
<td>10</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>RE-4000</td>
<td>26</td>
<td>100</td>
<td>106</td>
</tr>
<tr>
<td>NRE-100</td>
<td>42</td>
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<td>141</td>
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<tr>
<td>NRE-800</td>
<td>0.66</td>
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<td>3.5</td>
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</tbody>
</table>

#### Outlet pressure regulator

<table>
<thead>
<tr>
<th></th>
<th>Water</th>
<th>Air</th>
<th>Min. pressure diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[gal/h]</td>
<td>[l/h]</td>
<td>[ft³/h]</td>
</tr>
<tr>
<td>RA-1000</td>
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<td>35</td>
</tr>
<tr>
<td>RA-4000</td>
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</tr>
<tr>
<td>NRA-800</td>
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<td>160</td>
<td>141</td>
</tr>
</tbody>
</table>

**DK46I – DK47I**
Technical data, differential pressure regulator

<table>
<thead>
<tr>
<th>Standard connection</th>
<th>1/4” NPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option</td>
<td>Serto, Ermelo 6 or 8, tube nozzle 6 mm or 8 mm, Dilo, Gyrolak, Swagelok, G 1/4,</td>
</tr>
<tr>
<td>Max. operating gauge pressure PS</td>
<td>145 psig (10 bar)</td>
</tr>
<tr>
<td>Material</td>
<td>CrNi-Steel 1.4404</td>
</tr>
<tr>
<td>Temperature</td>
<td>TS = 212°F (100 °C)</td>
</tr>
</tbody>
</table>

Dimensions with the differential pressure regulator

<table>
<thead>
<tr>
<th>Dimensions [inch] [mm]</th>
<th>a approx.</th>
<th>b</th>
<th>c approx.</th>
<th>d</th>
<th>e</th>
<th>f approx.</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK46 I</td>
<td>8.27</td>
<td>737</td>
<td>0.51</td>
<td>2.76</td>
<td>0.75</td>
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<td></td>
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<td>202</td>
<td>13</td>
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<td>19</td>
<td>37</td>
<td>98</td>
</tr>
</tbody>
</table>

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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