

**KROHNE**

05/96

# All-metal Miniature flowmeters

**Installation and  
operating  
instructions**

**DK 32  
DK 34**



## Product liability and warranty

Responsibility as to suitability and intended use of our instruments rests solely with the operator.

Improper installation and operation of the flowmeters may lead to loss of warranty.

In addition, the "General conditions of sale" forming the basis of the purchase contract are applicable.

Should you need to return instruments for checkout or repair, please pay strict attention to the following points: Due to statutory regulations concerning protection of the environment and the health and safety of our personnel, Krohne may only handle, test and repair returned flowmeters that have been in contact with liquids or gases if it is possible to do so without risk to personnel and environment. This means that Krohne can only service your unit if it is accompanied by a certificate confirming that the flowmeter is safe to handle.

If a unit has been operated with toxic, caustic, flammable or water-endangering process products, you are kindly requested

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

Krohne regret that they cannot service your flowmeter unless accompanied by such a certificate.

## 1. Installation in the pipeline

- The variable-area flowmeter **must** be installed **vertically** (float measuring principle), with flow from bottom to top.
- Before installing the flowmeter, blow or flush out the pipeline leading to the flowmeter.
- Use connectors appropriate to the flowmeter version. Align the pipes axially with the bolt holes on the flowmeter without incurring stresses. If necessary, support the pipeline on both sides of the flowmeter to prevent vibration from being transferred to the flowmeter.

## 2. Start-up

- The actual system operating pressure and process temperature must not exceed the maximum values specified in the order.
- Ensure materials are compatible with the process product.
- Close needle valve at the flowmeter.
- Open shut-off valves upstream and downstream of the flowmeter.
- **On liquid service:** carefully vent the pipeline.  
**On gas service:** increase pressure slowly up to operating pressure. Avoid conditions (e.g. solenoid valves) in which the float can accelerate to the upper stop and possibly damage the measuring section.
- Open needle valve and set the required flow rate. The valve stem is secured against accidental disassembly.
- Where operating parameters deviate from calibration data (flow range, product, pressure, density and temperature), the flowmeter can be adjusted to suit actual conditions by converting the flow value using the method defined in VDI/VDE Code 3513.

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## Items included with supply

Version as ordered:

- miniature flowmeter
- installation and operating instructions

Special certificates, supplied to order only

- Test certificates  
to DIN 50049 (EN 10204):  
pressure test, leak-tightness test
- Calibration report

### 3. Limit switch SC 2-N0

The SC 2-N0 limit switch is a slot sensor with built-in pre-amplifier. The sensor is activated by the dipping action of an bronze vane that is mounted on the pointer shaft of the flowmeter.

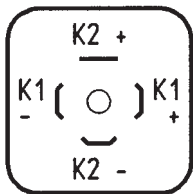
The limit switches can be set over the full measuring range. The set limits are indicated on the scale.

For hazardous-duty systems, SC 2-N0 contacts and the Krohne-recommended isolation switching amplifiers can be used.

#### Electrical connection

The limit switches are electrically connected in the connecting plug of the flowmeter.

- Loosen the screw in the connecting plug and detach the plug from the cable.
- Remove the screw from the plug, and then remove the terminal block in the plug by applying a small screwdriver to the marked opening (Lift →).
- Thread the power cable through the PG 11 screwed conduit entry.
- Wire up as shown in the stick-on schematic.



- Reassemble in reverse order.

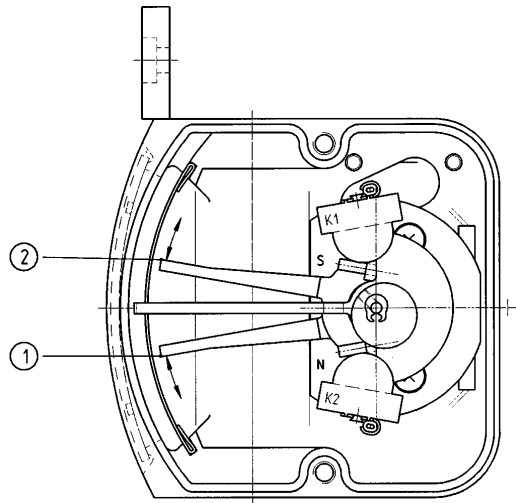
An isolation switching amplifier is required for operation of one limit switch.

Isolation switching amplifier	Power supply	Channel	Order No.
KHA6-SR2-Ex1-W	230 V AC	1	5015262000
KHA5-SR2-Ex1.W	110 V AC	1	5015262100
KHD2-SR2-Ex1.W	24 V DC	1	5015262200
KHA6-SR2-Ex2.W	230 V AC	2	5015262300
KHA5-SR2-Ex2.W	110 V AC	2	5015262400
KHD2-SR2-Ex2.W	24 V DC	2	5015262500

#### Adjustment of the limit switch

- Unscrew the housing cover.
- Simply set the pointers, minimum contact (1) and maximum contact (2), via a slip coupling along the scale to the required limit values.
- This completes the adjustment procedure.
- Screw down the housing cover.

#### View of switch with housing cover removed



#### Technical Data SC 2-N0

Rated voltage	8 V DC
Power consumption	
active area clear	3 mA
active area obscured	1 mA
Protection category (EN 60529/IEC 529)	IP 67 (NEMA 6)
Ambient temperature	-25°C to +100°C (-13°F to 212°F)
Electromagnetic compatibility (EMC)	to EN 50081.1, EN 50082-2
Electrical characteristics to DIN 19234 (NAMUR)	
<u>Only relevant for use in hazardous areas</u>	
<u>Only for connection to intrinsically safe circuits with the following peak values:</u>	
No-load voltage $U_0$	15.5 V
Short-circuit voltage $I_k$	52 mA
Output P	169 mW
Self-inductance (Li)	150 µH
Self-capacitance (Ci)	150 nF
Individual approval: PTB-No. Ex-95.D.2125X	

## 4. Differential pressure regulators

Differential pressure regulators are used to help maintain constant flow rates at fluctuating operating pressure.

### Differential pressure regulators are not pressure reducing valves

- Minimum pressure levels are required to permit operation of the regulators (see regulator characteristics)
- Max. flow rate: 3400 l/h (126.54 SCFH) air or 100 l/h (26.42 US GPH) water.
- Connections:  
Standard: 1/4" NPT  
Special version: Serto 6 or 8, tubing nozzles 6 or 8 mm, Ermeto 6 or 8, Dilo, Gyrolok, Swagelok
- Max. allowable operating pressure [at 20°C (68°F)]:  
CrNi steel 1.4571 (316 Ti): 25 bar (363 psig)  
Option: 64 bar (928 psig). Brass: 16 bar (232 psig)
- Temperatures up to max. 80°C (176°F) [option 100°C (212°F)].

### Application ranges

#### Inlet pressure regulators, type RE, NRE

The RE and NRE regulators help maintain a constant flow rate for gases and liquids at variable inlet pressure and constant outlet pressure.

#### Outlet pressure regulators, type RA, NRA

For gaseous products, the RA and NRA regulators help maintain a constant flow rate at variable outlet pressure and constant inlet pressure.

For liquids, the RE and NRE inlet pressure regulators can also be used to help maintain a constant flow rate at variable outlet pressure and constant inlet pressure.

In order to function, the outlet pressure regulator requires a specific minimum pressure difference between inlet and outlet pressures.

Inlet pressure  $p_1$  must always be greater than outlet pressure  $p_2$ .

### Technical data of differential pressure regulators

Type	Identification	Material	Max. measuring range				Min. inlet pressure p <sub>1</sub>	
			Water **		Air **			
Inlet pressure regulators			l/h	US GPM	l/h	SCFM	p <sub>1</sub> in bar	p <sub>1</sub> in psig
RE-1000-R	RE 10	CrNi steel	40	0.18	1000	0.62	0.5	7.25
RE-1000-N	RE 10	brass	40	0.18	1000	0.62	0.5	7.25
RE-4000-R	RE 40	CrNi steel	100	0.44	3400	2.11	1	14.50
RE-4000-N	RE 40	brass	100	0.44	3400	2.11	1	14.50
NRE-100-R	NRE 1	CrNi steel	–		100	0.062	0.06	0.87
NRE-100-N	NRE 1	brass	–		100	0.062	0.06	0.87
NRE-800-R	NRE 8	CrNi steel	–		800	0.50	0.2	2.90
NRE-800-N	NRE 8	brass	–		800	0.50	0.2	2.90
							Min. differential pressure* Dp in bar	
Outlet pressure regulators								
RA-1000-R	RA 10	CrNi steel	–	–	1000	0.62	0.4	5.80
RA-1000-N	RA 10	brass	–	–	1000	0.62	0.4	5.80
RA-2500-R	RA 25	CrNi steel	–	–	2500	1.55	0.8	11.60
RA-2500-N	RA 25	brass	–	–	2500	1.55	0.8	11.60
NRA-800-R	NRA 8	CrNi steel	–	–	800	0.50	0.15	2.18
NRA-800-N	NRA 8	brass	–	–	800	0.50	0.15	2.18

\* Differential pressure between inlet and outlet pressures

\*\* Reference conditions: 20°C (68°F), 1.013 bar abs. (14.7 psia)

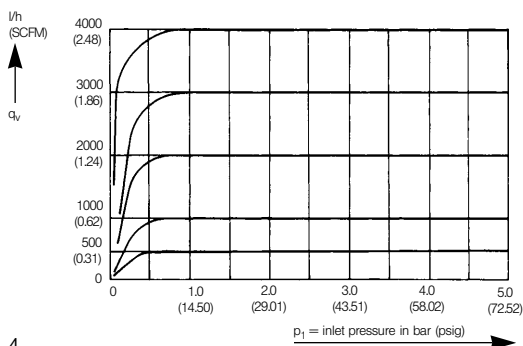
### Regulator characteristics

Inlet pressure regulators Type RE, NRE

Example: variable inlet pressure  $\leq 5$  bar ( $\leq 72.5$  psig)

Air at 20°C (68°F), 1.013 bar abs. (14.7 psia)

$q_v$  = flow rate



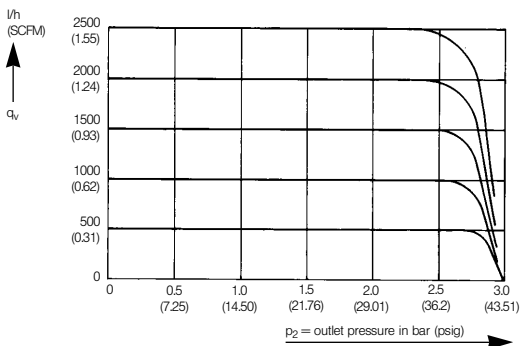
Outlet pressure regulators Type RA, NRA

Example: inlet pressure 3 bar (43.5 psig), variable

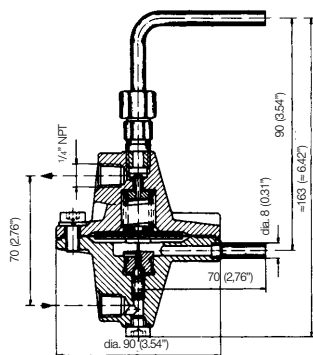
outlet pressure  $\leq 3$  bar ( $\leq 43.5$  psig)

Air at 20°C (68°F), 1.013 bar abs. (14.7 psia)

$q_v$  = flow rate

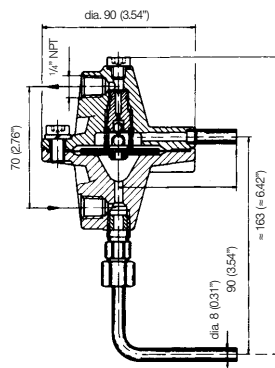


**Dimensions in mm (inches)**  
**RE, NRE**



Weight: 1.5 kg (3.31 lbs)

**RA, NRA**



**5. Flow table**

**Reference conditions**

Water at 20°C (68°F)

Air at 20°C, 1.013 bar abs (68°F, 14.7 psia)

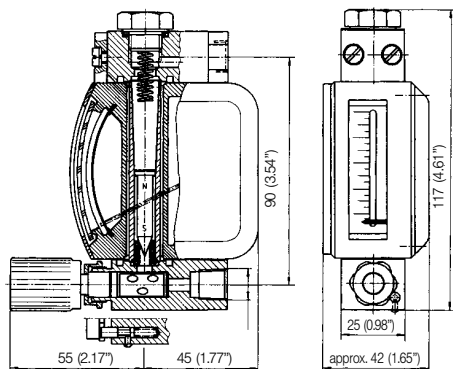
100% Flow values, Turn-down ratio 10:1

Cone		Valve spindle diameter		Water		Air		max. pressure loss	
No.	Code	mm	inches	l/h	US GPM	l/h	SCFM	mbar	psig
K 005	K 7	1.0	0.039	—	—	50	0.031	12	0.174
K 010	K 5	1.0	0.039	3	0.013	100	0.062	14	0.203
K 015	K 9	2.5	0.079	5	0.022	150	0.093	15	0.218
K 040	K 4	2.5	0.098	10	0.044	400	0.248	18	0.261
K 080	K 1	2.5	0.098	25	0.110	800	0.496	35	0.508
K 125	K 2	4.5	0.177	40	0.176	1250	0.775	65	0.943
K 200	K 3	4.5	0.177	60	0.264	2000	1.241	130	1.886
K 300	K 6	4.5	0.177	80	0.352	2500	1.551	235	3.408
K 340	K 8	4.5	0.177	100	0.440	3400	2.109	400	5.802

**6. Dimensions and weights**

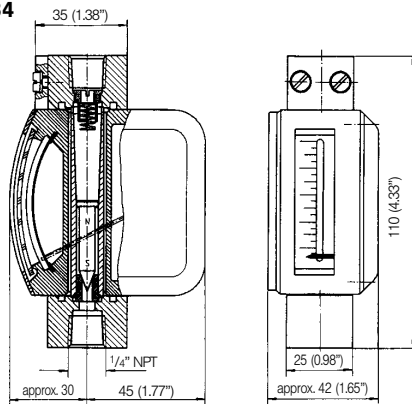
**Dimensions in mm (inches)**

**DK 32**



Weight: 0.7 kg (1.5 lbs)

**DK 34**



Weight: 0.6 kg (1.3 lbs)

## 7. Technical data

Instrument type		DK 32 with horizontal connections DK 34 with vertical connections	
<b>Full-scale range</b> (100% values)			
Water at 20°C (68°F)		3 to 100 l/h (0.013 to 0.44 US GPM)	
Air at 1.013 bar abs., 20°C (14.7 psia, 68°F)		50 bis 3400 l/h (0.031 to 2.11 SCFM)	
<b>Turn-down ratio</b>		10 : 1	
<b>Accuracy class*</b> (to VDI/VDE Code 3513, Sh. 2)		4	
<b>Scale graduation</b>		flow units	
<b>Max. allowable operating pressure</b> at 20°C (68°F)		130 bar (1885 psig)	
Test pressure is 1.3 times the specified operating pressure. Information on higher pressure levels supplied on request.			
<b>Max. process temperature</b>			
Without option K,		– 80°C to +150°C (–112°F to + 302°F)	
With option K (Ambient temperature Ta)			
Version	Max. process temperature		
	Ta < 40°C (< 104°F)	Ta < 50°C (< 122°F)	Ta < 60°C (< 140°F)
DK 32 / K, DK 34 / K	145°C (293°F)	135°C (275°F)	125°C (257°F)
<b>Connections</b>			
Standard		1/4" NPT female thread	
Adapters		Ermeto 6 or 8, Serto 6 or 8, Dilo, Gyrolok, Swagelok	
<b>Materials</b>			
Connection blocks		CrNi steel 1.4581 (318 C 17)	
Housing		die-cast zinc	
Cone, float, valve, plug		CrNi steel 1.4571 (316 Ti)	
Gaskets		PTFE	
<b>Limit switch</b>			
Type		SC 2-N0	
Number, max.		2	
Electrical connection		Right-angle plug, style to DIN 43650/ISO 4400, with PG 11 cable gland	
Protection category to EN 60529/IEC 529		IP 65, equivalent to NEMA 12 and 13	
An isolation switching amplifier is required to operate the SC 2-N0			

### \* Definition of accuracy class:

$$E_a = \frac{AC (25 + 0.75)}{F}$$

$E_a$  = Error (% actual)  
 $F$  = % Full scale flow  
 $AC$  = Accuracy Class

## 8. Maintenance

The instrument does not normally require any maintenance. However, cleaning is necessary if the measuring cone or float has been contaminated by the process.

To clean, the instrument must be removed from the pipeline and all cables disconnected from the instrument (s. sect. 3).

### **Note**

Always depressurize pipelines before removing the measuring section.

On instruments used for flowmetering corrosive products, take appropriate safety precautions regarding residual liquid in the measuring section.