

Miniature flowmeters DK 46, DKR 46 DK 47, DK 48, DK 800



Variable area flowmeters

- Vortex flowmeters
- Flow controllers
- Electromagnetic flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Level measuring instruments
- Communications technology
- Engineering systems & solutions
- Switches, counters, displays and recorders
- Heat metering
- Pressure and temperature



Miniature flowmeters DK 46, DKR 46, DK 47, DK 48, DK 800

with glass metering cones

Options

All flowmeters (apart from DKR 46) can be equipped with limit switches and differential pressure regulators (options).

Front plates and holding devices are available for panel mounting.

The flowmeters can be converted into bench instruments with the aid of a support base (option).

Instrument designation

Instruments with top and bottom connection block of:

Stainless steel = DK ... / R

Brass = DK ... / N

PVDF = DK ... / PV

DK 46, DK 47, DK 48, DK 800

All flowmeters are equipped with a needle valve in the base to facilitate precise setting of gas and liquid flow rates. On request, these valves can also be fitted in the top connection block.

The mounts are made of stainless steel, brass or PVDF and feature a specially designed fitting to take the glass cone.

This device permits easy cone replacement without removal of the mount.



Compact flowmeter DKR 46

The DKR 46 is a DK 46 miniature flowmeter plus an RE flow regulator combined to form one compact unit.



Technical data

Instrument type	DK 46 DKR 46	DK 47	DK 48	DK 800
Measuring range (100% values)				
Water at 20 °C, l/h; (68 °F, US GPH)	2.5 to 160* (0.66 to 42.27)*	2.5 to 100 (0.66 to 26.42)	0.4 to 100 (0.11 to 26.42)	2.5 to 160 (0.66 to 42.27)
Air at 1.2 bar abs. (17.4 psia), 20 °C, l/h; (68 °F, SCFH)	5 to 1600* (0.19 to 59.55)	16 to 800 (0.6 to 29.77)	16 to 3000 (0.6 to 111.65)	5 to 4300 (0.19 to 160.03)
DK 48: 1.013 bar abs. (14.7 psia), 20 °C (68 °F) air * DKR 46: max. 40 l/h (10.57 US GPH) water or 800 l/h (29.77 SCFH) air				
Turn-down ratio	10 : 1	10 : 1	10 : 1	10 : 1
Accuracy class to VDI/VDE Code 3513, Sh. 2	4	2.5	1	2.5
Measuring cone				
Length in mm (inches)	65 (2.65")	150 (5.91")	300 (11.81")	100 (3.94")
Scale graduation	flow units, DK 48 also in mm			
Float shapes	Ball	Ball	A III	Ball
Operating data				
max. allowable operating pressure at 20 °C (68 °F). Test pressure is 1.5 times the specified max. allowable operating pressure.*				
Standard	10 bar (145 psig)	10 bar (145 psig)	10 bar (145 psig)	10 bar (145 psig)
DK ... / PV	6 bar (87 psig)	6 bar (87 psig)	6 bar (87 psig)	6 bar (87 psig)
max. process temperature	100 °C (212 °F)	100 °C (212 °F)	100 °C (212 °F)	100 °C (212 °F)
with limit switches	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)
* At temperatures > 20 °C (68 °F) pressure drops at the rate of 1% per degree C				
Overall height and connection dimensions see Dimensions and Weights				
Connection				
Standard	1/4" NPT	1/4" NPT	1/4" NPT	1/4" NPT
Adapters	Ermeto 6 and 8, Dilo, tubing nozzle 6 or 8 mm, Gyrolok and Swagelok			
Materials				
Measuring cone	borosilicate glass			
Float				
Standard				
DK 46, 47, 800	Stainless steel 1.4401 (316)			
DK 48	Stainless steel 1.4571 (316 Ti)			
Options				
DK 46, 47, 800	titanium, POM (polyoxymethylene), glass			
DK 48	steatite, aluminium, hard rubber			
Float stop	PTFE			
Valve spindle	Stainless steel 1.4571 (316 Ti)			
Gaskets				
Standard	Viton			
Option	PTFE/FF KM (perfluorinated elastomer) PTFE (not for DK ... / PV)			
Mount	Top/bottom connection block: stainless steel 1.4581 (316 C17), brass or PVDF Rail: stainless steel 1.4571 (316 Ti)			
Ringinitiators	DK 46	available	available	available

Needle valves for gases and liquids

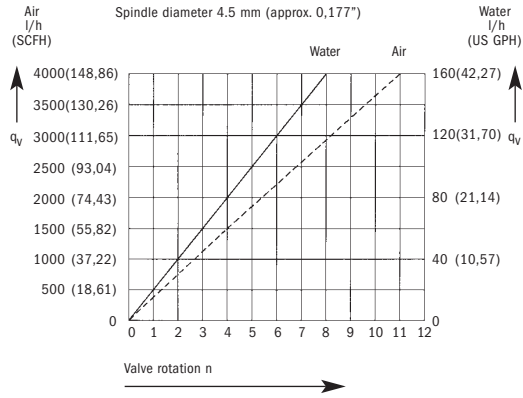
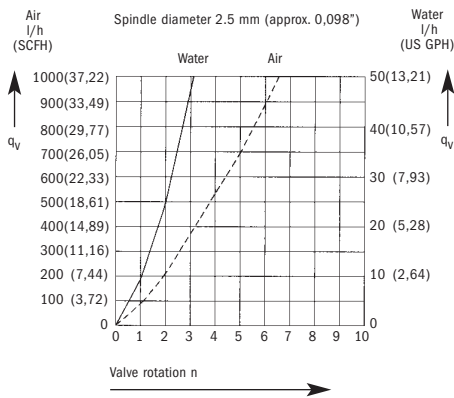
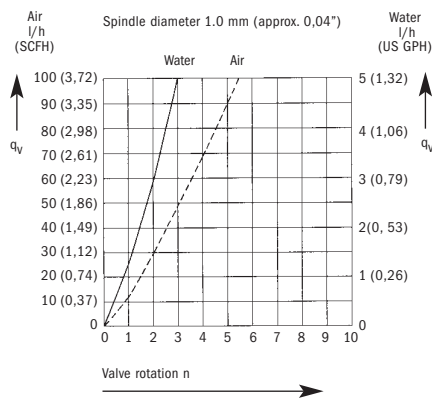
Needle valves allow precise setting of the flow rate.

Spindle dia. mm	(inches)	Max. flow rate (q_v)		Water* l/h (US GPH)		K_v factor m ³ /h	C_v factor US GPM
		Air* l/h (SCFH)	(SCFH)				
1.0	(0.04")	100	(3.72)	5	0(1.32)	0.018	0.021
2.5	(0.098")	1000	(37.22)	50	(13.21)	0.15	0.18
4.5	(0.177")	4300	(160.03)	160	(42.27)	0.48	0.56

K_v, C_v = valve characteristic

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

Valve characteristics



DK 46, DKR 46, DK 47, 48, 800

Flow table

Standard float materials

DK 46, DKR 46, DK 47, DK 800: stainless steel 1.4401 (316)
 DK 48: stainless steel 1.4571 (316 Ti)
 100% flow values
 Turn-down ratio 10 : 1

Reference conditions

Water at 20 °C (68 °F)
 Air at 20 °C (68 °F) DK 46, DKR 46, DK 47, DK 800,
 1.2 bar abs. (17.4 psia)
 DK 48, 1.013 bar abs. (14.7 psia)

Ball dia. mm	Cone No.	Water		Air													
DK 46, 47 DK 800	DK 48	DK 46 DKR 46	DK 47	DK 48	DK 800	DK 46 DKR 46	DK 47	DK 48	DK 800	DK 46 DKR 46	DK 47	DK 48	DK 800	DK 46 DKR 46	DK 47	DK 48	DK 800
		l/h	US/GPH	l/h	US/GPH	l/h	US/GPH	l/h	US/GPH	l/h	SCFH	l/h	SCFH	l/h	SCFH	l/h	SCFH
4	G 13.11	2.5	0.66			0.4	0.11	2.5	0.66	5	0.19	16	0.60	16	0.60	5	0.19
4	G 14.06					0.6	0.16			8	0.30	40	1.49	25	0.93	8	0.30
4	G 14.08					1.6	0.26			16	0.60			40	1.49	16	0.60
4	G 15.07					1.6	0.42			40	1.49			60	2.23	40	1.49
4	G 15.09					2.5	0.66			60	2.23			90	3.35	60	2.23
4	G 15.12					4.6	1.06							140	5.21		
6	G 16.08	5.5	1.32	3	0.66	6.4	1.59	5	1.32	100	3.72	160	2.23	200	7.44	100	3.72
6	G 16.12	12.5	3.17	5	1.32	10.4	2.64	12	3.17	250	9.30	100	3.72	300	11.16	250	9.30
6	G 17.08	25.5	6.61	12	3.17	16.4	4.23	25	6.61	500	18.61	250	9.30	500	18.61	500	18.61
6	G 17.12	40.5	10.57	25	6.61	25.4	6.61	40	10.57	800	29.77	500	18.61	800	29.77	800	29.77
6	G 18.06	60*	15.85*	40	10.57	40.4	10.57	60	15.85	1600*	59.55*	800	29.77	1200	44.66	1000	37.22
6	G 18.08	100*	26.42*	60	15.85	63.4	16.64	100	26.42					2000	74.43	1800	66.99
6	G 18.12			100	26.42	100.4	26.42	120	31.70					3000	111.65	2400	89.32
6								160	42.27							3000	111.65
6																3500	130.26
6																4300	160.03
8		120*	15.85*														
8		160*	42.27*														

* (not DKR 46)

Differential pressure regulators

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

- Minimum pressure levels are required to permit operation of the regulators (see regulator characteristics)
- Differential pressure regulators are not pressure reducing valves
- Max. flow rate: 4000 l/h (2.48 SCFM) air or 160 l/h (0.7 US GPM) 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)]:
10 bar (145 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.

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

Type	Identifi- cation	Material	Max. measuring range				Min. inlet pressure p_1	
			Water** l/h	US GPM	Air** l/h	SCFM	p_1 in bar	p_1 in psig
Inlet pressure regulators								
RE-1000-R	RE 10	stainless 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	stainless steel	160	0.70	4000	2.48	1	14.50
RE-4000-N	RE 40	brass	160	0.70	4000	2.48	1	14.50
NRE-100-R	NRE 1	stainless 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	stainless steel	-	-	800	0.50	0.2	2.90
NRE-800-N	NRE 8	brass	-	-	800	0.50	0.2	2.90
Outlet pressure regulators								
							Min. differential pressure* Δp in bar	
RA-1000-R	RA 10	stainless steel	-	-	1000	0.62	0.4	5.80
RA-1000-N	RA 10	brass	-	-	1000	0.62	0.4	5.80
RA-4000-R	RA 40	stainless steel	-	-	4000	2.48	0.8	11.60
RA-4000-N	RA 40	brass	-	-	4000	2.48	0.8	11.60
NRA-800-R	NRA 8	stainless 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)

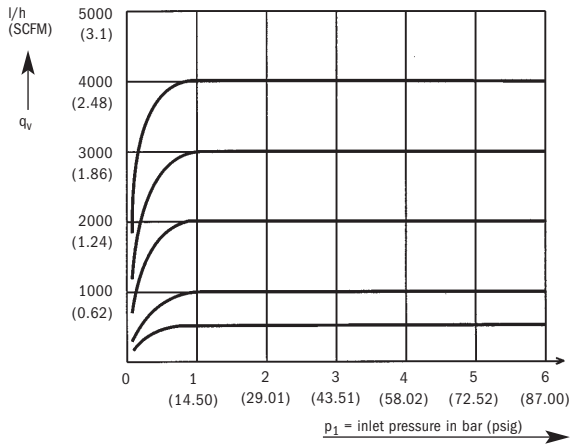
Regulator characteristics

Inlet pressure regulators Type RE, NRE

Example: variable inlet pressure ≤ 6 bar (≤ 87 psig)

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

q_v = flow rate



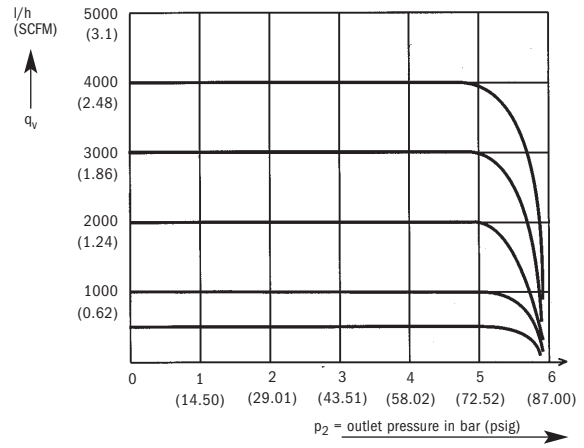
Outlet pressure regulators Type RA, NRA

Example: inlet pressure 6 bar (87 psig),

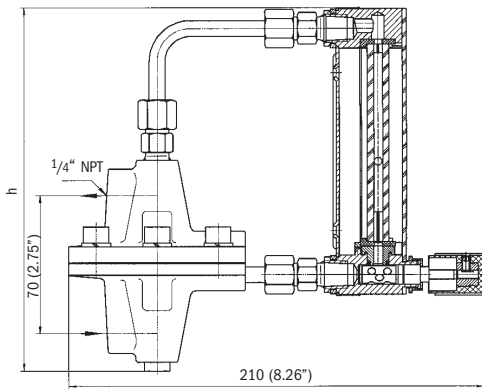
variable outlet pressure ≤ 5.5 bar (≤ 80 psig)

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

q_v = flow rate



Dimensions



h	mm	inches
DK 46	148	5.83
DK 47	233	9.17
DK 48	383	15.08
DK 800	183	7.20

Limit switches

To signal specific flow rates, the miniature flowmeters can be equipped with limit switches that initiate an electrical signal when a preset flow value has been reached. One limit switch is required for each limit value.

Limit switches are only suitable for flowmeters fitted with stainless steel floats.

The limit switches are inductive ring sensors designed to be slipped over the glass cone of DK flowmeters. An electrical signal is initiated when the metal float passes through the sensor.

Monostable limit switches (see Table "Limit Switches") act as pulse contacts. Bistable limit switches detect the direction of movement of the float. Therefore a clear differentiation can be made between "above" or "below" the ring sensor.

2-wire limit switches have electrical values according to DIN EN 50227 (Namur wiring recommendations). Disconnect diodes are required.

3-wire limit switches can be wired in without disconnect.

Function boxes with PG gland can be fitted to the flowmeters for connection to the limit switches. For bistable limit switches an EMC filter is needed in the junction box. Alternatively the filter unit can be mounted on a TS 32 rail.

Ring sensors function in the same way as pulse contacts.

RC 10-14-N3 (TG 10-1/bi) and RC 15-14-N3 (TG 15-1/bi) are bistable ring sensors. The bistable ring sensors are supplied with an EMC filter either in a PG 11 junction box or in the form of a filter unit in a DIN rail housing. This arrangement enables the direction of movement of the float to be identified, thus providing a clear indication of the float position – whether above or below the ring sensor.

Isolation switching amplifiers are required to operate the ring sensors.

Junction boxes with PG screw connection can be fitted to the flowmeters for connection of the limit switches.

Application ranges for the limit switches

	DK 48	DK 46, DK 47, DK 800
	Cone No.	Ball dia.
RC 10-14-N0 RC 10-14-N3	G 15.07	4 mm (0.16")
	G 15.09	
	G 15.12	
RC 15-14-N0 RC 15-14-N3 RB 15-14-E2-Bi	G 16.08	6 mm (0.24")
	G 16.12	
	G 17.08 G 17.12	

From a measuring range of 100 l/h (26.42 US GPH) water and 2400 l/h (89.32 SCFH) air onwards, the RC 15-14-N0 and RC 15-14-N3 limit switch can only be used as a minimum contact up to approx. 40% of the range.

Technical data

Limit switches

Version	Function	Approval	Self-inductance	Self-capacitance	Type of protection	Connection
RC 10-14-N0	monostable, dia. 10 mm (dia. 0.4")	PTB 99 ATEX 2128X	100 µH	150 nF	EEx ia IIC T1 ... T6	DIN EN 50227
RC 10-14-N3	bistable, dia. 10 mm ¹⁾ (dia. 0.4") ¹⁾	PTB 99 ATEX 2128X	120 µH	90 nF	EEx ia IIC T1 ... T6	DIN EN 50227
RC 15-14-N0	monostable, dia. 15 mm (dia. 0.6")	PTB 99 ATEX 2128X	100 µH	150 nF	EEx ia IIC T1 ... T6	DIN EN 50227
RC 15-14-N3	bistable, dia. 15 mm ¹⁾ (dia. 0.6") ¹⁾	PTB 99 ATEX 2128X	70 µH	90 nF	EEx ia IIC T1 ... T6	DIN EN 50227
RB 15-14-E2-bi	bistable, dia. 15 mm ¹⁾ (dia. 0.6") ¹⁾	non Ex-approval	-	-	-	3-wire

¹⁾ One of the EMC filters specified below is required for operation of bistable limit switches in Europe.

Limit switch Type RC ...

Connection technique	2-wire connection to DIN EN 50227
Rated voltage	8 V DC
Power consumption	
Version RC ... N0	3 mA (active area clear) 1 mA (active area obscured)
Version RC ... N3	below limit value 1mA above limit value 3mA
Ambient temperature	- 20°C to + 100°C (- 4°F to + 212°F)
Protection category to DIN 60529/IEC 529	IP 67, equivalent to NEMA 6
Electromagnetic compatibility (EMC)	to EN 60947-5-2
Connection	0.2 m (8") PVC cable (0.14 mm ²) (0.00022 sqin) or connecting housing PG11
Housing material	PBT
Electrical characteristics to DIN 50227 (NAMUR recommended circuitry)	

Version RB ...

Connection technology	3-wire technology
Operating voltage U _b	10 V to 30 V
Operating current I _b	0 to 100 mA
Output voltage U _a	below limit value 1 V above limit value U _b - 3 V after switching on 1 V
No-load current	20 mA
Ambient temperature	-25 to +70°C (-13 to +158°F)
Protection category	IP 67 (EN 60529)
Electromagnetic compatibility (EMC)	to EN 60947-5-2
Connection	2 m (6.56 ft) PUR cable (no terminal box on device)
Core cross-section	0.14 mm ² (0.00022 sqin)
Housing material	PBT

EMC filters for limit switches

Version	Function	Approval	Self-inductance ²⁾	Self-capacitance ²⁾	Type of protection
EMC-Y38620	EMC filter 1 Channel, internal ⁴⁾	DMT 99 ATEX 104X	600 µH	40 nF	EEx ia IIC T6 or
EMC-Y38622	EMC filter 2 Channel, Internal ⁴⁾	DMT 99 ATEX 104X	600 µH ³⁾	40 nF ³⁾	EEx ia IIC T5 or
KC-EMC-Y38624	EMC filter 1 Channel, external ⁵⁾	DMT 99 ATEX 104X	600 µH	40 nF	EEx ia IIC T1 ... T4

²⁾ the effective inner inductance and capacitance of the EMC filter additionally need to be taken into account.

³⁾ per channel, ⁴⁾ filter built into the DK terminal box, ⁵⁾ filter in external DIN rail housing

Max. allowable ambient temperature for limit switches

Circuit with peak values of	Ui < 16V	Ii < 25 mA	Pi < 34 mW	Ui < 16V	Ii < 25 mA	Pi < 64 mW	Ui < 16V	Ii < 52 mA	Pi < 169 mW
Temperature class	T6	T5	T4 ... T1	T6	T5	T4 ... T1	T6	T5	T4 ... T1
Max. allowable ambient temperature	75°C (167°F)	90°C (194°F)	100°C (212°F)	70°C (158°F)	85°C (185°F)	100°C (212°F)	55°C (131°F)	70°C (158°F)	90°C (194°F)

Max. allowable ambient temperature for EMC filters

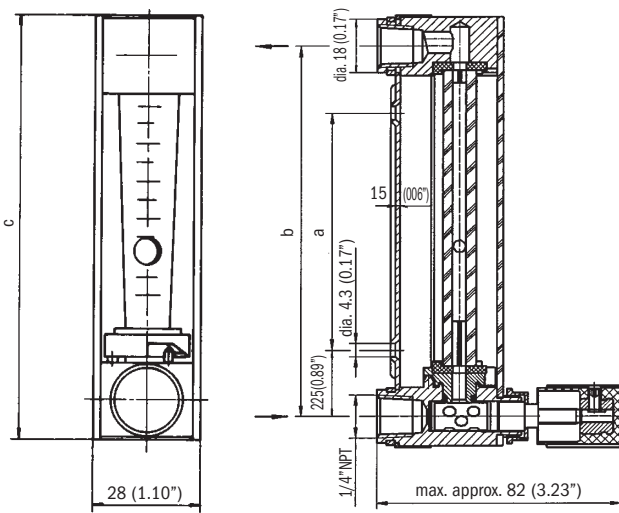
Max. allowable ambient temperature	-	-	-	-	-	-	65°C (149°F)	80°C (176°F)	100°C (212°F)
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DK 46, DKR 46, DK 47, 48, 800

Dimensions and weights

Instrument type	Dimensions in mm and inches														Weight	
							Panel recess				Cover plate					
	a		b		c		d		e		f		g		kg	lbs
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches		
DK 46	045	01.77	090	03.54	111	04.37	32	1.26	128	05.04	40	1.57	145	05.71	0.5	1.10
DK 47	130	05.12	175	06.89	196	07.72	32	1.26	213	08.39	40	1.57	230	09.06	0.6	1.32
DK 48	280	11.02	325	12.80	346	13.62	32	1.26	363	14.29	40	1.57	380	14.96	0.7	1.54
DK 800	080	03.15	125	04.92	146	05.75	32	1.26	163	06.42	40	1.57	180	07.09	0.4	0.88
DKR 46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	4.85

DK 46, DK 47, DK 48, DK 800



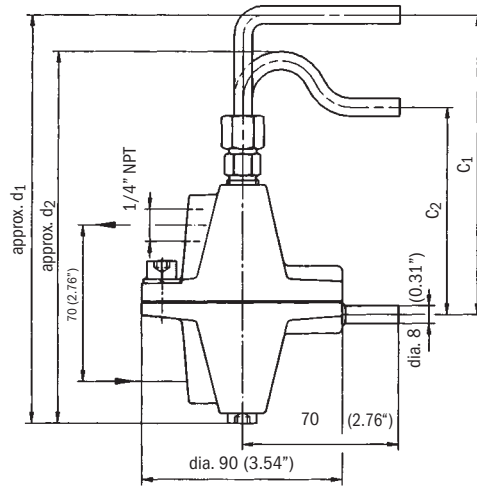
Dimensions in mm and inches

Flow regulators RA, NRA, RE, NRE

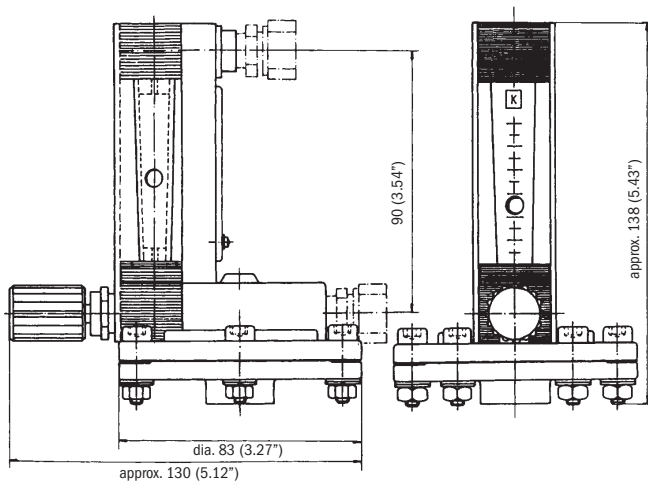
Instrument Dimensions

Instrument type	c ₁		c ₂		d ₁		d ₂	
	mm	inches	mm	inches	mm	inches	mm	inches
DK 46	-	-	90	3.54	-	-	163	6.42
DK 47	175	6.89	-	-	223	8.78	-	-
DK 48	325	12.8	-	-	373	14.7	-	-
DK 800	125	4.92	-	-	173	6.81	-	-

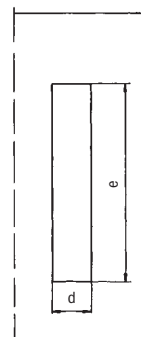
Weight: 1.5 kg (3.31 lbs)



DKR 46



Panel mounting



Cover plate

