DK46 - DK800 Technical Datasheet

Variable area flowmeter

- Local measurement, setting and monitoring of very low flow rates
- Compact design, no inlet and outlet sections
- Visual control of medium

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1 Product features 3

1.1 Variable area flowmeter with glass cone ... 3
1.2 Options and variants ... 5
1.3 Functional principle ... 6

2 Technical data 7

2.1 Technical data ... 7
2.1.1 Technical data of limit switches ... 9
2.1.2 Field of application for limit switches ... 10
2.2 Dimensions ... 11
2.2.1 Device versions ... 11
2.2.2 Mounting options ... 13
2.3 Weights ... 14
2.4 Measuring ranges ... 15
2.4.1 Measuring ranges for DK46 - DK47 - DK800 ... 15
2.4.2 Measuring ranges for DK48 ... 16
2.4.3 Measuring ranges for valves ... 17
2.5 Flow regulators for variable pressure ... 18
2.5.1 Control ranges ... 19
2.5.2 Technical data for flow regulators ... 20
2.5.3 Dimensions with flow regulator ... 21

3 Installation 22

3.1 General notes on installation ... 22
3.2 Intended use ... 22
3.3 Installation conditions ... 23
3.3.1 Installation in the pipeline ... 23
3.3.2 Panel mounting ... 23

4 Electrical connections 24

4.1 Safety instructions ... 24
4.2 Limit switches ... 24
4.3 Minimum distance between two limit switches ... 26
4.4 Power-up performance ... 26
4.5 Switching performance of the limit switches ... 27

5 Order form 28

6 Notes 29

1.1 Variable area flowmeter with glass cone

The DK46/47/48/800 flowmeters are suitable for measuring liquids and gases.

The extremely compact design and the elimination of inlet and outlet sections allows for simple and cost-effective integration into measuring systems such as process analysers.

DK46 DK800 DK47 DK48

Max. permissible error:

DK46	3% of full scale range
	4% of measured value according to VDI/VDE 3513-2 (q_G = 50%)
DK800, DK47	2% of full scale range
	2.5% of measured value according to VDI/VDE 3513-2 (q_G = 50%)
DK48	1% of full scale range
	1% of measured value according to VDI/VDE 3513-2 (q_G = 50%)

Highlights

- Easy installation and commissioning
- Compact design
- Low maintenance
- Optional with limit switches and/or flow regulator
- SIL2-compliant for safety-related applications
- All variants with high-quality needle valves
- No wearing parts
- Fragment protection

Industries

- Analyser system building
- Apparatus building
- Machine building
- Chemical and petrochemical
- Oil & Gas
- Pharma
- Iron, steel and metal

Applications

The devices are particularly suitable for the measurement of small quantities of:

- Process or carrier gases
- Nitrogen, CO_2 or other industrial gases
- Sample flows for process analysers
- Purge fluids for measuring systems
- Air or water

1.2 Options and variants

DK devices with contacts

The DK measuring devices can be equipped with a maximum of two limit switches in NAMUR technology (SIL2-compliant) or in 3-wire.

DK with flow regulator

The inlet or outlet pressure regulators are used to provide constant flow rates in the case of variable inlet or outlet pressures.

Device designation

Devices with ① top and ② bottom fittings made of

Stainless steel = DK.../R

Brass = DK.../N

PVDF = DK.../PV

1.3 Functional principle

The flowmeter operates in accordance with the float measuring principle.

The measuring unit consists of a glass cone in which a float can move freely up and down. The flow goes from bottom to top.

The float adjusts itself so that the buoyancy force A acting on it, the form drag W and weight G are in equilibrium: G = A + W.

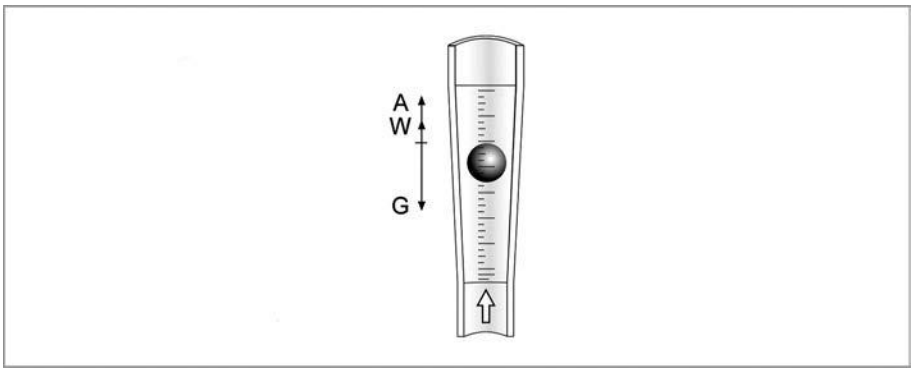


Figure 1-1: Operating principle

The height of the float is read on the scale of the measuring glass and indicates the flow rate.

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

2.1 Technical data

- *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	Flow measurement of liquids and gases
Function / Measuring principle	Float measuring principle
Measured value	
Primary measured value	Float position
Secondary measured value	Operating volume flow, nominal volume flow or mass flow

Measurement accuracy

Max. permissible error DK46	3% of full scale range
	4% of measured value according to VDI/VDE 3513-2 (q_G = 50%)
Max. permissible error DK47 / DK800	2% of full scale range
	2.5% of measured value according to VDI/VDE 3513-2 (q_G = 50%)
Max. permissible error DK48	1% of full scale range
	1% of measured value according to VDI/VDE 3513-2 (q_G = 50%)

Operating conditions

Temperature	
Max. operating temperature TS	Depending on the version (refer to nameplate)
	-5...+100°C / +23...+212°F
Max. medium temperature	Standard: -5...+100°C / +23...+212°F
	With limit switches: -5...+65°C / +23...+149°F
Max. ambient temperature	Standard: -20...+100°C / -4...+212°F
	With limit switches: -20...+65°C / -4...+149°F
Other temperatures on request	
Pressure	
Max. operating pressure PS	Depending on the version (refer to nameplate)
	DK.../R (stainless steel top and bottom fitting): 10 barg / 145 psig
	DK.../N (brass top and bottom fitting): 10 barg / 145 psig
	DK.../PV (PVDF top and bottom fitting): 4 barg / 58 psig
Test pressure PT	Depending on the version (refer to nameplate)
Higher pressures on request	

Installation conditions

Inlet and outlet sections	None

Materials

Top fitting, bottom fitting	Stainless steel 1.4404 / 316 L, nickel-plated brass, PVDF (not available for DK48)
	Option: Hastelloy® C4 / 2.4610
Measuring tube	Borosilicate glass
Float	Ball: stainless steel 1.4401 / 316
	Options: glass, Alloy C4 / 2.4610 (6 mm), Alloy C276 / 2.4819 (4 mm)
	AIII: stainless steel 1.4404 / 316 L, aluminium, Polypropylene (PP)
Dosing unit	Stainless steel 1.4571 / 316 Ti
Valve stem	Stainless steel 1.4404 / 316 L
Gaskets	Standard: PTFE / FPM
	Option: PTFE / FFKM, PTFE / EPDM, EPDM, FFKM
Protective cover	Polycarbonate

Process connections

Standard	1/4" NPT female
Option	G1/4, Ermeto 6 or 8, tube connection 6 mm or 8 mm, Dilo, Gyrolok, Swagelok
	Other connections on request

Table 2-1: Technical data

2.1.1 Technical data of limit switches

Terminal connection	Connection box M16 x 1.5				
Clamping range	3...7 mm / 0.12...0.28"				
Limit switches	I7R2010-NL	I7R2015-NL	I7R2010-N	I7R2015-N	RB15-14-E2
	RC10-14-N3	RC15-14-N3	RC10-14-N0	RC15-14-N0	
Ring diameter	10 mm / 0.4"	15 mm / 0.6"	10 mm / 0.4"	15 mm / 0.6"	15 mm / 0.6"
Switching function	bistable	bistable	monostable	monostable	bistable
NAMUR	yes	yes	yes	yes	no
SIL2-compliant according to IEC 61508	yes	yes	no	no	no
Connection technology	2-wire	2-wire	2-wire	2-wire	3-wire
Supply voltage U_0	8 VDC	8 VDC	8 VDC	8 VDC	-
Current consumption	1 mA passage ↓ ①		3 mA – float outside of the limit switch		-
Current consumption	3 mA passage ↑ ①		1 mA - float inside of the limit switch		-
Operating voltage $U_{ext.}$	-				10...30 VDC
Operating current I	-				0...100 mA
No-load current I	-				20 mA
Output U_a - passage ↓	-				≤ 1 VDC ①
Output U_a - passage ↑	-				≥ U_0 - 3 VDC ①

Table 2-2: Technical data of limit switches

① For devices with the valve at the top in the output, the function is inverted!

The limit switches with ring diameters of 15 mm / 0.6" as max. contact can only be used up to 60 l/h / 15.8 GPH water or 2400 l/h / 89.3 SCFH air (outer diameter of the measuring glass).

2.1.2 Field of application for limit switches

DK46, DK47, DK800			DK48	
Float	Ring diameter		Cone number	Ring diameter
Ø4 mm / 0.16"	10 mm / 0.4"		G13.11	-
Ø6 mm / 0.24"	15 mm / 0.6"		G14.06	-
Ø8 mm / 0.32"	-		G14.08	-
			G15.07	10 mm / 0.4"
			G15.09	10 mm / 0.4"
			G15.12	10 mm / 0.4"
			G16.08	10 mm / 0.4"
			G16.12	10 mm / 0.4"
			G17.08	15 mm / 0.6"
			G17.12	15 mm / 0.6"
			G18.06	-
			G18.08	-
			G18.12	-

Table 2-3: Field of application for limit switches

The limit switches with ring diameters of 15 mm / 0.6" as max. contact can only be used up to 60 l/h / 15.8 GPH water or 2400 l/h / 89.3 SCFH air (outer diameter of the measuring glass).

2.2 Dimensions

2.2.1 Device versions

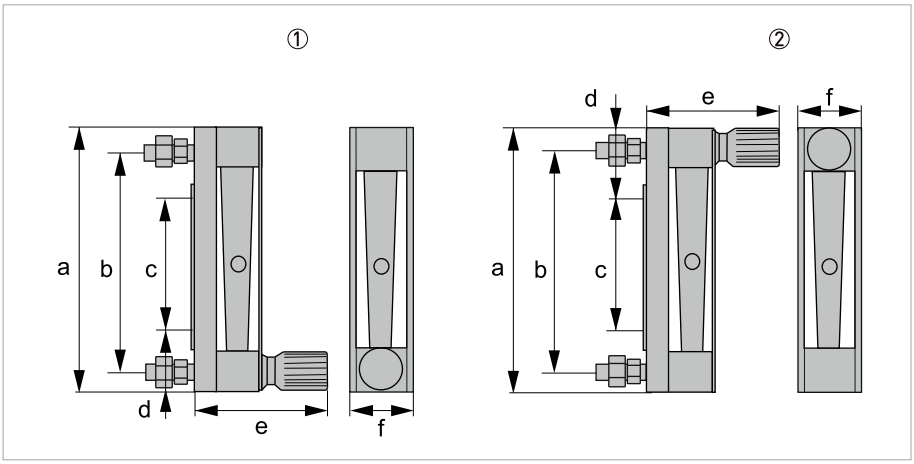


Figure 2-1: Standard versions

① Device version with bottom valve
② Device version with top valve

	a		b ± 0.25		c		d		approx. e		f	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	[mm]	[mm]	["]	[mm]	["]
DK46	111	4.37	90	3.55	45	1.77	33	1.3	82	3.2	28	1.1
DK800	146	5.75	125	4.92	80	3.15	33	1.3	82	3.2	28	1.1
DK47	196	7.72	175	6.89	130	5.12	33	1.3	82	3.2	28	1.1
DK48	346	13.6	325	12.8	280	11.0	33	1.3	82	3.2	28	1.1

Table 2-4: Dimensions in mm and inch

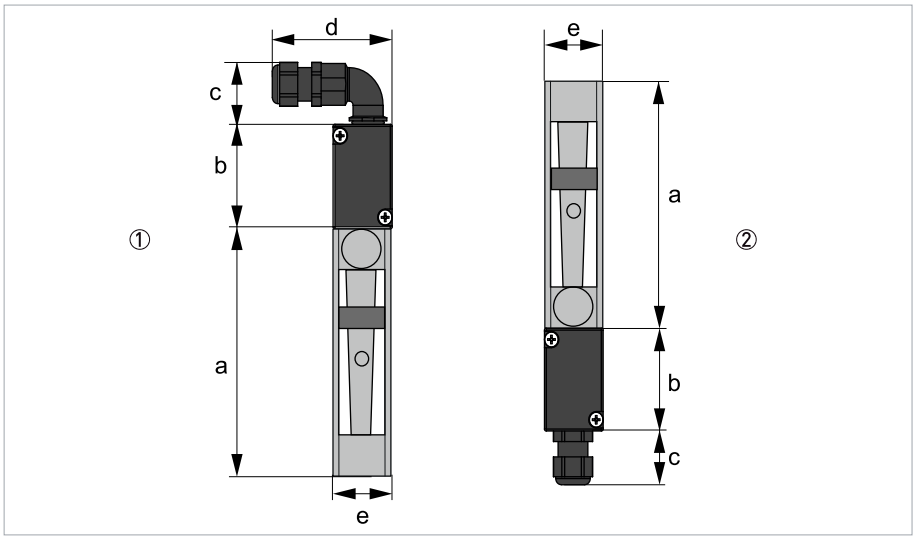


Figure 2-2: Version with limit switch and connection box

① Device version with top valve
② Device version with bottom valve

	a		b		approx. c		approx. d		e	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	[mm]	[mm]	["]
DK46	111	4.37	50	2	25	1	60	2.36	28	1.1
DK800	146	5.75	50	2	25	1	60	2.36	28	1.1
DK47	196	7.72	50	2	25	1	60	2.36	28	1.1
DK48	346	13.6	50	2	25	1	60	2.36	28	1.1

Table 2-5: Dimensions in mm and inch

2.2.2 Mounting options

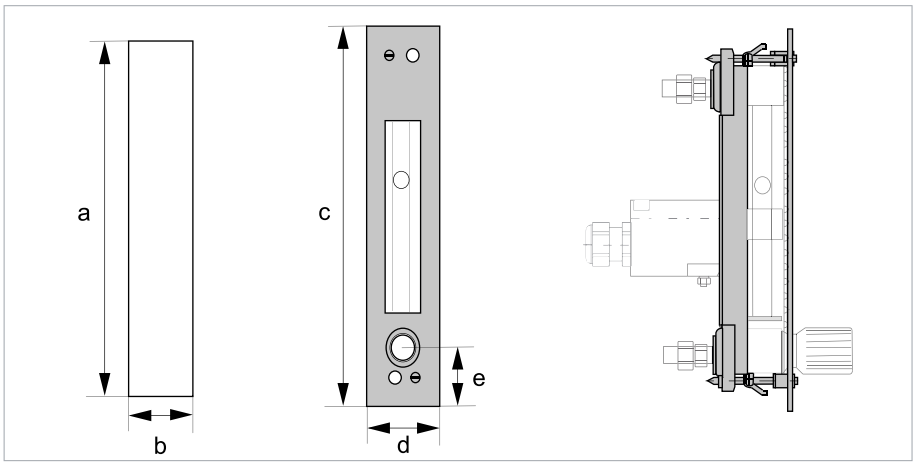


Figure 2-3: Panel cut-out and orifice plate

	a		b		c		d		e	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
DK46	128	5.04	32	1.26	145	5.71	40	1.58	27.5	1.08
DK800	163	6.42	32	1.26	180	7.09	40	1.58	27.5	1.08
DK47	213	8.39	32	1.26	230	9.06	40	1.58	27.5	1.08
DK48	363	14.3	32	1.26	380	15.0	40	1.58	27.5	1.08

Table 2-6: Dimensions in mm and inch

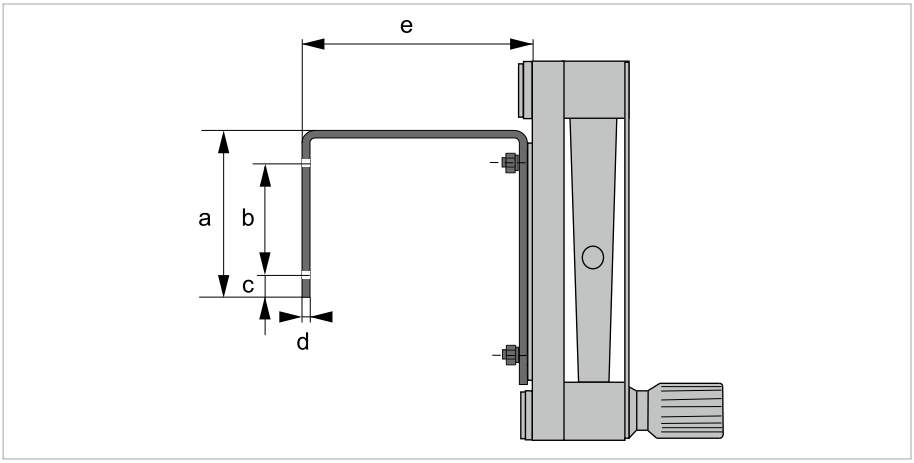


Figure 2-4: Wall mounting bracket

a		b		c		d		approx. e	
[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
67	2.64	45	1.77	10	0.39	3	0.12	84	3.31

Table 2-7: Dimensions in mm and inch

2.3 Weights

	DK46		DK800		DK47		DK48	
	[kg]	[lb]	[kg]	[lb]	[kg]	[lb]	[kg]	[lb]
Weight	0.4	0.88	0.5	1.1	0.6	1.3	0.7	1.5
Weight with regulator	2.1	4.6	2.2	4.9	2.3	5.1	2.4	5.3

Table 2-8: Weights in kg and lb

2.4 Measuring ranges

2.4.1 Measuring ranges for DK46 - DK47 - DK800

Measuring span: 10 : 1

Flow values: Values = 100%
Water: +20°C / +68°F
Air: +20°C / +68°F, 1.2 bara / 17.4 psia

Float shapes:

Float: Stainless steel

Ball AIII 4-H

Float Ø		Water						Air					
		DK46		DK47		DK800		DK46		DK47		DK800	
[mm]	["]	[l/h]	[GPH]	[l/h]	[GPH]	[l/h]	[GPH]	[Nl/h]	[SCFH]	[Nl/h]	[SCFH]	[Nl/h]	[SCFH]
4	0.158	2.5	0.65	-	-	2.5	0.65	5 ①	0.22 ①	-	-	5 ①	0.18 ①
		-	-	-	-	-	-	8 ①	0.3 ①	-	-	8 ①	0.3 ①
		-	-	-	-	-	-	16	0.6	16 ①	0.6	16	0.6
		-	-	-	-	-	-	40	1.5	40	1.5	40	1.5
		-	-	-	-	-	-	60	2.2	100	3.8	60	2.2
6	0.236	5	1.3	5	1.3	5	1.3	100	3.8	250	9.5	100	3.8
		12	3.0	12	3.0	12	3.0	250	9.5	500	19	250	9.5
		25	6.5	25	6.5	25	6.5	500	19	800	30	500	19
		40	11	40	11	40	11	800	30	-	-	800	30
		60	16	60	16	60	16	1200	45	-	-	1000	38
		100	25	100	25	100	25	-	-	-	-	1800	65
		-	-	-	-	120	30	-	-	-	-	2400	90
		-	-	-	-	160	42	-	-	-	-	3000	110
		-	-	-	-	-	-	-	-	-	-	4000	140
		-	-	-	-	-	-	-	-	-	-	5000	180
8	0.315	120	30	-	-	-	-	-	-	-	-	-	-
		160	42	-	-	-	-	-	-	-	-	-	-

Table 2-9: Measuring ranges for DK46 - DK47 - DK800

① With float AIII 4-H

The operating pressure should be at least double the pressure loss for liquids and five times for gases. The indicated pressure losses are valid for water and air at maximum flow rate. Other flow ranges on request. Conversion of other media or operating data is performed using the calculation method in accordance with VDI/VDE directive 3513.

Reference condition for gas measurements:
Flow measurements for gases are attributed to

Nl/h or Nm^3/h: Volume flow at standard (norm.) conditions 0°C / +32°F, 1.013 bara / 14.7 psia (DIN 1343)
SCFM or SCFH: Volume flow at standard (std.) conditions +15°C / +59°F, 1.013 bara / 14.7 psia (ISO 13443)

2.4.2 Measuring ranges for DK48

Measuring span: 10 : 1

Flow values: Values = 100%
Water: +20°C / +68°F
Air: +20°C / +68°F, 1.013 bara / 14.7 psia

Float: Stainless steel

Float shapes:

AIII

Float Material ▸	Water		Air					
	Stainless steel		Polypropylene (PP)		Aluminium		Stainless steel	
Cone no. ▾	[l/h]	[GPH]	[Nl/h]	[SCFH]	[Nl/h]	[SCFH]	[Nl/h]	[SCFH]
G13.11 ①	0.4	0.1	-	-	7	0.25	16	0.6
G14.06	0.6	0.16	-	-	12	0.45	25	0.95
G14.08	1	0.25	-	-	20	0.75	40	1.5
G15.07	1.6	0.4	-	-	30	1.1	60	2.2
G15.09	2.5	0.65	-	-	40	1.5	90	3.5
G15.12	4	1.0	-	-	60	2.2	140	5.0
G16.08	6	1.6	-	-	100	3.7	200	7.5
G16.12	10	2.5	-	-	160	6.0	300	11
G17.08	16	4.0	-	-	250	9.0	500	19
G17.12	25	6.5	-	-	400	15	800	30
G18.06	40	10	400	15	600	22	1200	45
G18.08	63	16	600	22	1000	37	2000	75
G18.12	100	25	1000	37	1600	60	3000	110

Table 2-10: Measuring ranges for DK48

① 2.5% max. permissible error

The operating pressure should be at least double the pressure loss for liquids and five times for gases. The indicated pressure losses are valid for water and air at maximum flow rate.
Other flow ranges on request. Conversion of other media or operating data is performed using the calculation method in accordance with VDI/VDE directive 3513.

Reference condition for gas measurements:
Flow measurements for gases are attributed to

Nl/h or Nm^3/h: Volume flow at standard (norm.) conditions 0°C / +32°F, 1.013 bara / 14.7 psia (DIN 1343)
SCFM or SCFH: Volume flow at standard (std.) conditions +15°C / +59°F, 1.013 bara / 14.7 psia (ISO 13443)

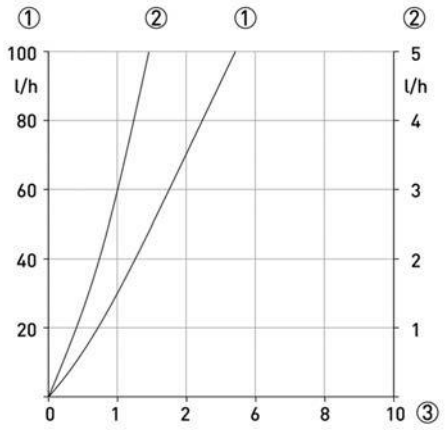
2.4.3 Measuring ranges for valves

Flow values: Values = 100%
Water: +20°C / +68°F
Air: +20°C / +68°F, 1.013 bara / 14.7 psia

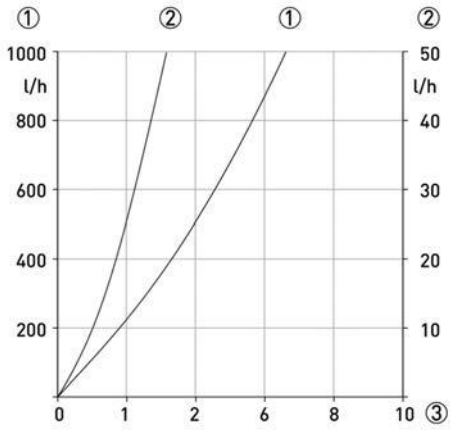
		Max. flow rate				Valve characteristic value	
Valve stem		Water		Air		Kv	Cv
Ø [mm]	Ø ["]	[l/h]	[GPH]	[Nl/h]	[SCFH]	[m^3/h]	[GPM]
1	0.039	5	1.3	100	3.7	0.018	0.02
2.5	0.98	50	13	1000	37	0.15	0.17
4.5	0.177	160	42	4300	160	0.48	0.55

Table 2-11: Measuring ranges for valves

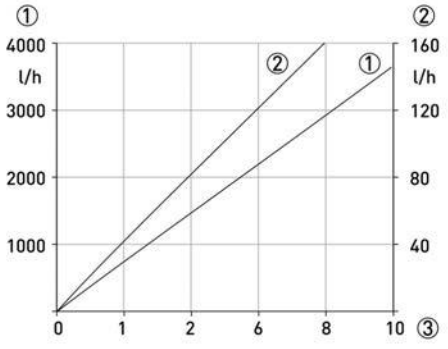
Spindle 1.0 mm / 0.039"



Spindle 2.5 mm / 0.098"



Spindle 4.5 mm / 0.177"



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

Table 2-12: Valve characteristics

2.5 Flow regulators for variable pressure

The flow regulators are used to provide constant flow rates in the case of variable inlet or outlet pressures. Minimum pressures are required to operate the regulators (refer to regulator characteristics).

Flow regulators are not equivalent to pressure regulators / pressure reducing valves!

① Flow regulator for variable inlet pressure, type RE, NRE

The regulators keep the flow rate constant in the case of a variable inlet pressure and a constant outlet pressure.

RE-1000	Current flow rate:	1000 l/h air
	Outlet pressure p2 constant:	1.013 bara / 14.7 psia

Table 2-13: Example for flow regulator for variable inlet pressure

The flow rate in the device remains constant with a fluctuating inlet pressure greater than 0.5 bar / 7.25 psi.

② Flow regulator for variable outlet pressure, 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 flow regulators to function. The inlet pressure p1 must always be greater than the outlet pressure p2.

NRA-800	Current flow rate:	800 l/h air
	Inlet pressure p1 constant:	6 bar / 87 psi

Table 2-14: Example for flow regulator for variable outlet pressure

The flow rate in the device remains constant with a fluctuating outlet pressure greater than 0...5.5 bar / 0...79.8 psi.

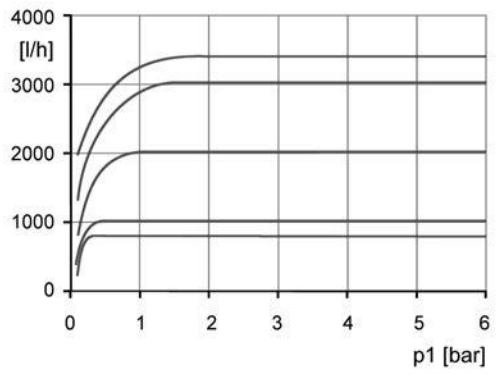
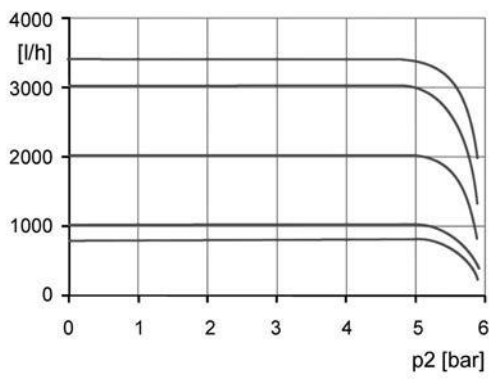
① Flow regulators for variable inlet pressure, type RE and NRE	② Flow regulators for variable outlet pressure, type RA and NRA
	

Table 2-15: Regulator characteristics

2.5.1 Control ranges

Measuring span: 10 : 1

Flow values: Values = 100%; Water: +20°C / +68°F; Air: +20°C / +68°F, 1.013 bara / 14.7 psia

	Max. flow rate				Min. inlet pressure	
	Water		Air			
	[l/h]	[GPH]	[Nl/h]	[SCFH]	p1 [bar]	p1 [psi]
RE-1000	...40	...11	...1000	...37	0.5	7.25
RE-4000	...80	...20	...2000	...75	1	14.5
	...100	...25	...3000	...110	1.5	21.8
	...160	...42	...4000	...150	2	29
NRE-100	...2.5	...0.6	...100	...3.7	0.1	1.45
NRE-800	-	-	...250	...9.0	0.1	1.45
	-	-	...800	...30	0.2	2.9
	...25	...6.6	-	-	0.4	5.8

Table 2-16: Control ranges for flow regulator for variable inlet pressure ①

	Max. flow rate				Min. inlet pressure		Min. pressure diff. *	
	Water		Air					
	[l/h]	[GPH]	[Nl/h]	[SCFH]	p1 [bar]	p1 [psi]	Δp [bar]	Δp [psi]
RA-1000	...40	...11	...1000	...37	0.5	7.25	0.4	5.8
RA-4000	...100	...25	...2000	...75	1.5	21.8	1.2	17.4
	-	-	...3000	...110	1.5	21.8	1.2	17.4
	...160	...42	...4000	...150	2	29	1.5	21.8
NRA-800	...1	...0.25	...250	...9.0	0.1	1.45	0.05	0.73
	-	-	...500	...19	0.2	2.9	0.1	1.45
	-	-	...800	...30	0.4	5.8	0.2	2.9
	...25	...6.6	-	-	0.4	5.8	0.4	5.8

Table 2-17: Control ranges for flow regulator for variable outlet pressure ②

* Differential pressure between inlet and outlet pressure

Reference condition for gas measurements:

Flow measurements for gases are attributed to:

- Nl/h or Nm^3/h: Volume flow at standard (norm.) conditions 0°C / +32°F, 1.013 bara / 14.7 psia (DIN 1343)
- SCFM or SCFH: Volume flow at standard (std.) conditions +15°C / +59°F, 1.013 bara / 14.7 psia (ISO 13443)

2.5.2 Technical data for flow regulators

Connection, standard	1/4" NPT
Connection, option	Serto, Ermeto 6 or 8, hose nozzle 6 mm or 8 mm, Dilo, Gyrolok, Swagelok, G1/4
Max. operating gauge pressure (at +20°C / +68°F)	10 barg / 145 psig 4 barg / 58 psig for DK.../PV
Medium temperature	+100°C / +212°F
Material	Stainless steel 1.4404
Gasket	PTFE
Diaphragm	Carbon/graphite-filled PTFE
O-ring	FPM or FFKM

Table 2-18: Technical data

Higher pressures and temperatures, other connections or materials on request.

2.5.3 Dimensions with flow regulator

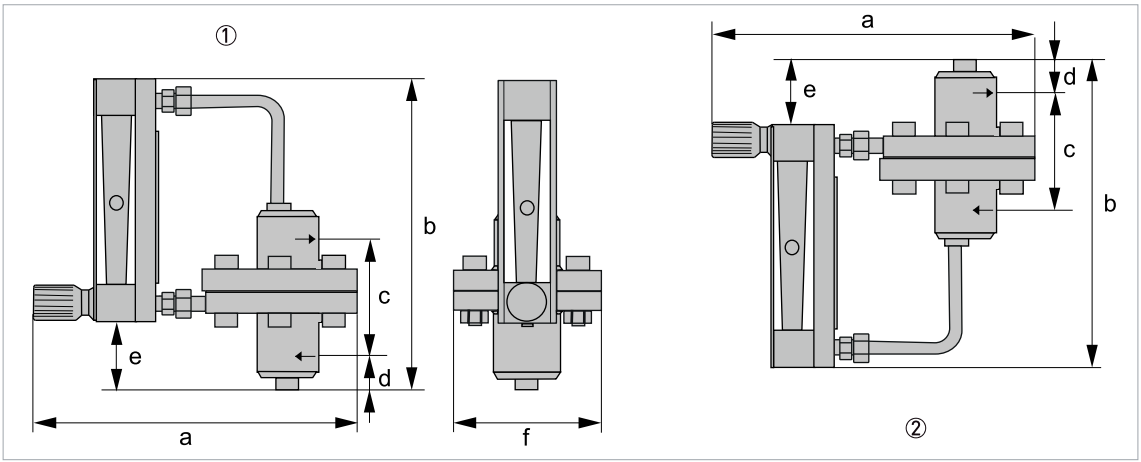


Figure 2-5: Versions with flow regulators

① DK with flow regulator for variable inlet pressure
② DK with flow regulator for variable outlet pressure

	approx. a		b		c		d		e		approx. f	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
DK46	210	8.27	163	6.42	70	2.76	19	0.75	39	1.54	90	3.55
DK47	210	8.27	233	9.18	70	2.76	19	0.75	39	1.54	90	3.55
DK48	210	8.27	383	15.1	70	2.76	19	0.75	39	1.54	90	3.55
DK800	210	8.27	183	7.21	70	2.76	19	0.75	39	1.54	90	3.55

Table 2-19: Dimensions in mm and inch

3.1 General notes on installation

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

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

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 Intended use

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.

This device is a Group 1, Class A device as specified within CISPR11. 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.

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.

- *The product may not contain any ferromagnetic particles or solids.*
- *The product must be sufficiently liquid and free of deposits.*
- *Avoid pressure surges and pulsing flows.*
- *Open valves slowly.*
- *Do not use solenoid valves.*
- *For accurate flow measurement, the application data should be consistent with the sizing data and calibration of the variable area flowmeter.*

The devices are particularly suitable for the measurement of small quantities of:

- Process or carrier gases
- Nitrogen, CO_2 or other industrial gases
- Sample flows for process analysers
- Purge fluids for measuring systems
- Air or water

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

Do not use any abrasive or highly viscous media.

3.3 Installation conditions

3.3.1 Installation in the pipeline

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

- *The variable area flowmeter must be installed vertically (within 5° of the vertical).*
- *Flow direction from bottom to top.*
- *Before connecting, blow or flush out the pipes leading to the device.*
- *Piping for gas flow need to be dried before the device is installed.*
- *Use connectors suitable for the particular device version.*
- *Align the piping centrically with the connection bores on the measuring device so they are free of stresses.*
- *If necessary, the piping has to be supported to avoid the vibrations transmitted to the measuring device.*
- *Do not lay signal cables directly next to cables for the power supply.*

3.3.2 Panel mounting

For panel mounting, the panel cut-out must be prepared according to the drawing (for details refer to *Mounting options* on page 13).

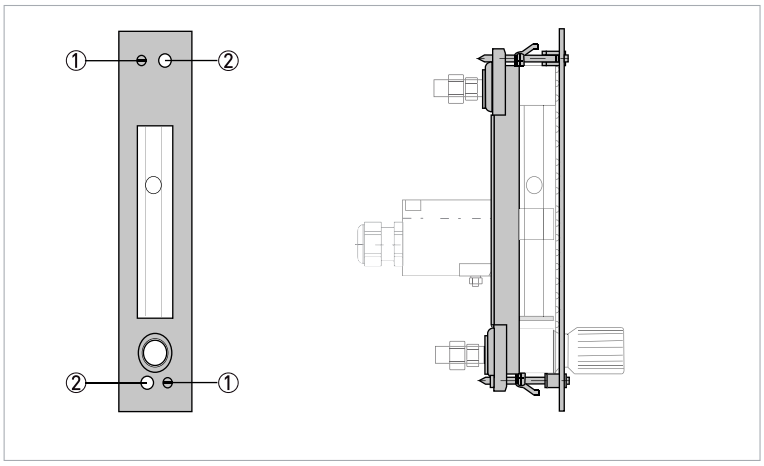


Figure 3-1: Position of screws for panel mounting

① Front side
② Back side

The option for panel mounting must be ordered with the device. Retrofit is not possible!

4.1 Safety instructions

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

Observe the national regulations for electrical installations!

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

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.

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

4.2 Limit switches

The flowmeters can be equipped with a maximum of two limit switches.
The switching function of the limit switch can be designed as monostable or bistable.

Monostable function:	Switching pulse as float passes through switching point, independent of direction of movement.
Bistable function:	Stable changeover as float passes through switching point.
Example (bistable):	Above limit: switching point "High"
	Below limit: switching point "Low"

For switching performance and electrical data refer to section "Technical data".

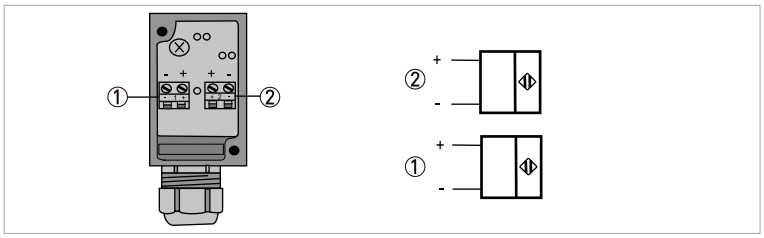


Figure 4-1: Electrical connection of 2-wire NAMUR limit switches with connection box

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

The connection box includes an EMC filter unit.

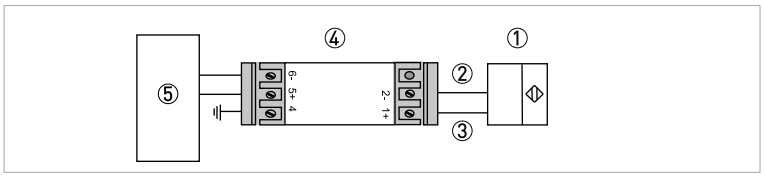


Figure 4-2: Electrical connection of 2-wire NAMUR limit switches without connection box

① Limit switch (without connection box)
② Blue cable -
③ Brown cable +
④ External EMC filter
⑤ Receiver device

When connecting to an EMC filter, the ground terminal must be connected to the back rail of the flowmeter.

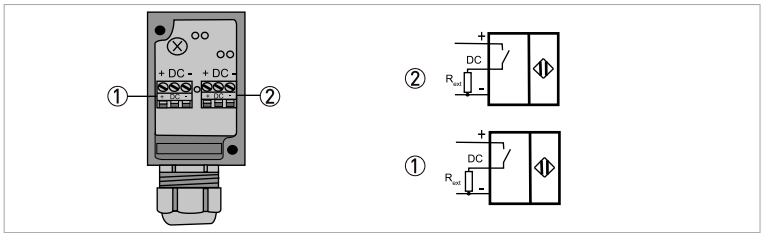


Figure 4-3: Electrical connection of 3-wire transistor limit switches with connection box

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

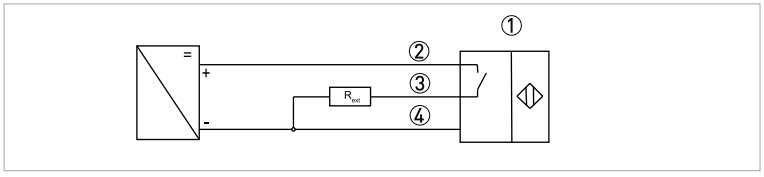


Figure 4-4: Electrical connection of 3-wire transistor limit switches without connection box

① Limit switch (without connection box)
② Brown cable: supply voltage +
③ Black cable: switch
④ Blue cable: supply voltage -

4.3 Minimum distance between two limit switches

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

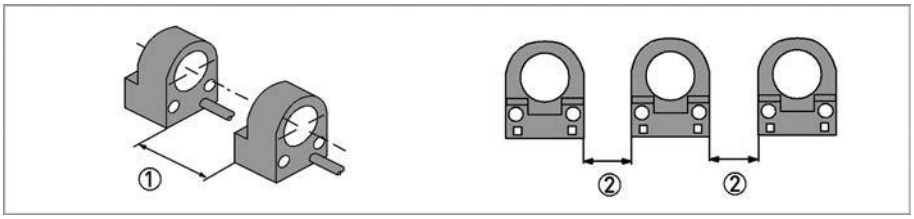


Figure 4-5: Minimum distances

Minimum distance	2-wire		3-wire	
	[mm]	[inch]	[mm]	[inch]
①	16	0.63	45	1.77
②	6	0.24	30	1.18

Table 4-1: Minimum distances

4.4 Power-up performance

2-wire limit switch NAMUR, monostable
Float outside of the limit switch: signal ≥3 mA
Float inside of the limit switch (centre): signal ≤1 mA

2-wire limit switch NAMUR, bistable
Independent of the float position and passage ①: signal ≥3 mA
Prerequisite: the float is outside of the limit switch.

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

3-wire limit switch, transistor
Independent of the float position and passage ②: signal ≤1 V
Prerequisite: the float is outside of the limit switch.

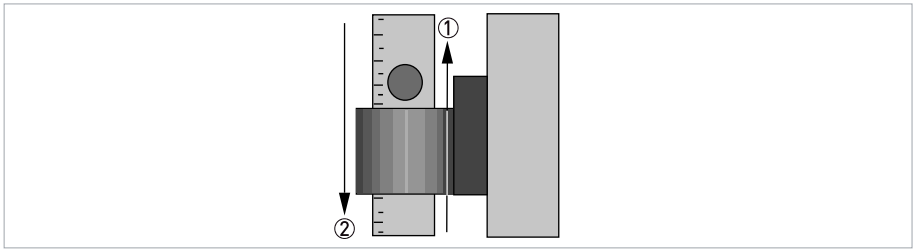


Figure 4-6: Power-up performance

4.5 Switching performance of the limit switches

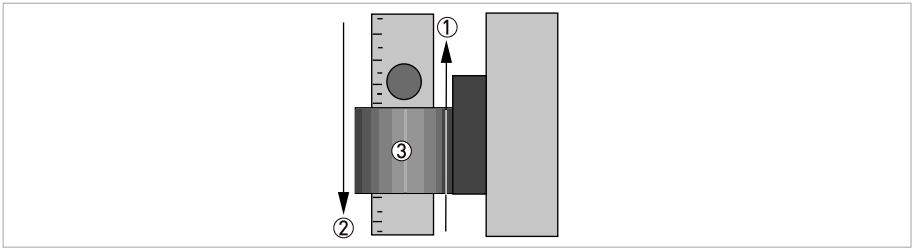


Figure 4-7: Switching performance of the limit switches

Limit switches	I7R2010-NL	I7R2015-NL	I7R2010-N	I7R2015-N	RB15-14-E2
	RC10-14-N3	RC15-14-N3	RC10-14-N0	RC15-14-N0	
Ring diameter	10 mm / 0.4"	15 mm / 0.6"	10 mm / 0.4"	15 mm / 0.6"	15 mm / 0.6"
Switching function	bistable	bistable	monostable	monostable	bistable
NAMUR	yes	yes	yes	yes	no
Supply voltage U_0	8 VDC	8 VDC	8 VDC	8 VDC	10...30 VDC
Switching signal	1 mA passage ↓ ②		3 mA – float outside of the limit switch ①, ②		≤ 1 VDC
	3 mA passage ↑ ①		1 mA - float inside of the limit switch ③		≥ U_0 - 3 VDC

Table 4-2: Switching performance

For devices with the top valve the switching function is inverted because the limit switch is upside down!

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

Please provide us with the missing information so that we can be of help to you as quickly as possible.

Then please send this page to the appropriate sales associate. We will then contact you as soon as possible.

Device data

Connection type:	_ 1/4 NPT	_ (others)		
Connection:	_ Horizontal	_ Vertical		
Pressure rating:				
Indicator:	_ DK46	_ DK47	_ DK48	_ DK800
Indicator options:	_ K1 ① _ K2 ②	_ K1 ① _ K2 ②	_ K1 ① _ K2 ②	_ K1 ① _ K2 ②
Flow regulators:	_ for variable inlet pressure		_ for variable outlet pressure	
Approval:	_ None	_ ATEX		

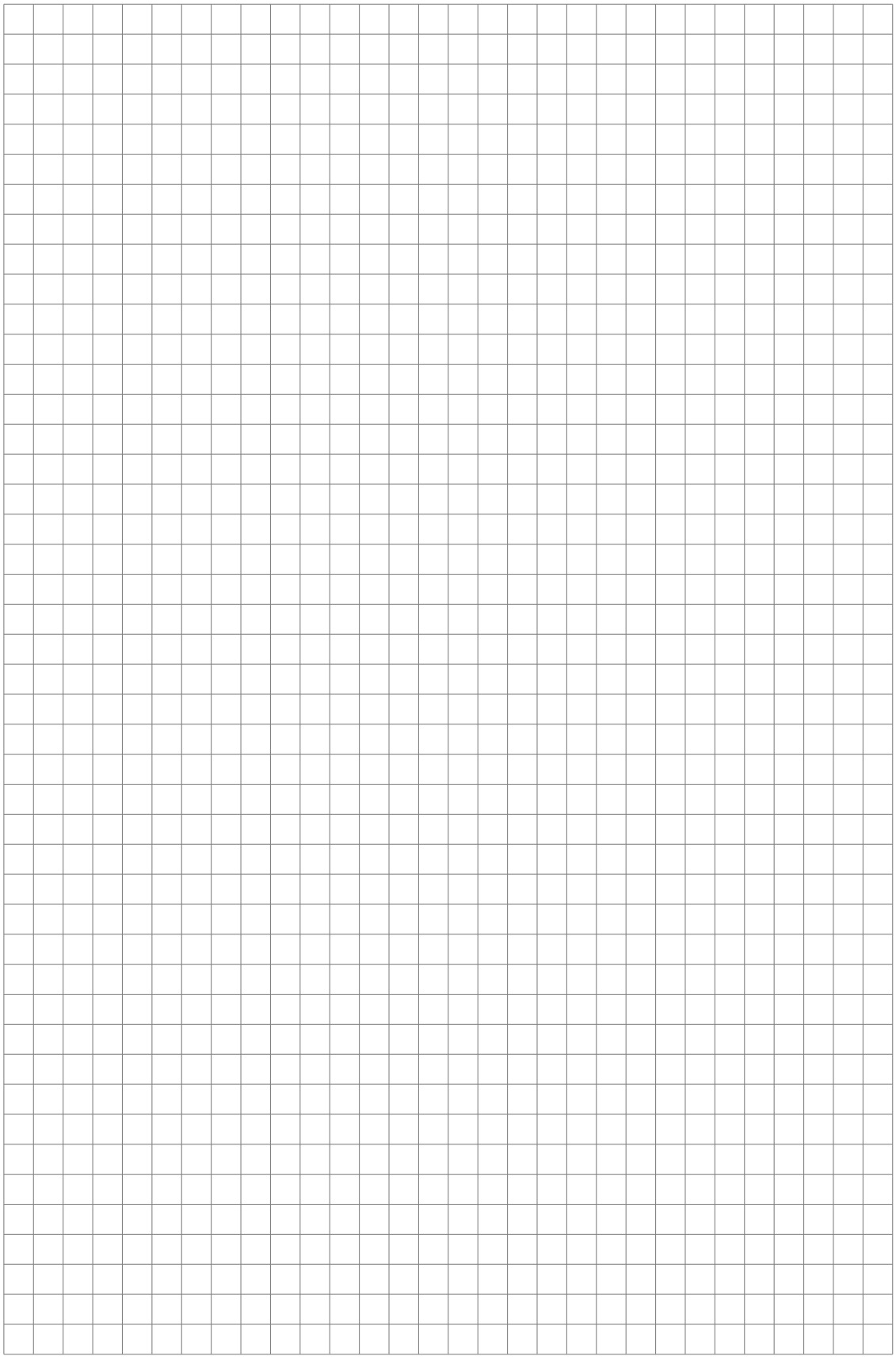
① 1 limit switch
② 2 limit switches

Rating data

Medium:			
Operating pressure:		_ Absolute pressure	_ Gauge pressure
Rated pressure:			
Operating temperature:			
Rated temperature:			
Density:		_ Standard density	_ Operating density
Viscosity:			
Flow range:			
Comments:			

Contact data

Company:	
Contact person:	
Telephone number:	
Fax number:	
E-mail:	



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