



DK32 - DK34 - DK37 Technical Datasheet

Variable area flowmeters

- Local measurement, setting and monitoring of very low flow rates
- Compact design, no inlet and outlet sections
- High resistance to pressure and temperature



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1.1 Variable area flowmeters in an all-metal design

The solid metal DK flowmeters are suitable for measuring liquids and gases.

Because of their robust design the flowmeters are particularly suited for difficult operating and environmental conditions.

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.



Highlights

- DK32 with horizontal connections - with valve
- DK34 with vertical connections - without valve
- DK37 with a higher measuring accuracy and larger indication
- Narrow design enabling a high packing density
- Easy installation and commissioning

Industries

- Chemical
- Petrochemical
- Oil & Gas
- Mechanical and plant engineering
- Analyser system building
- Compressor and pump technology

Applications

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

- Process or carrier gases
- Nitrogen, CO₂ or other industrial gases
- Sample flows for process analysers
- Sealing gas or sealing liquid measurement on sealing systems
- Purge fluids for measuring systems
- Air or water
- Chemicals and additives
- Lubricating, cooling and anti-corrosive agents

1.2 Options for type DK metal

DK32



- Horizontal process connections, rear
- For flow rates of 0.15...150 l/h liquid or 1.6...4800 l/h gas
- Design with valve at bottom, valve on top or without valve

DK34



- Vertical process connections
- For flow rates of 0.15...150 l/h liquid or 1.6...4800 l/h gas
- Design without valve

DK32, DK34 with electrical signal outputs

**Electrical options:**

- 1 or 2 limit switches, NAMUR
- 1 limit switch, Reed
- 4...20 mA current output and HART® communication

DK32, DK34 with flange connection adapter

Flange connection adapters with a standard length of 250 mm / 9.8" and DN15/DN25 flanges can be used for connection to the process instead of the NPT/G threads.

DK37/M8E

- Electronic bargraph indicator
- 4...20 mA current output and HART® communication
- For flow rates of 0.15...250 l/h liquid or 1.6...8000 l/h gas
- Design with valve at bottom, valve on top or without valve

Standard housing M8E: PPS, conductive plastic
Optional housing M8E/R: stainless steel 1.4404/CF8M

DK37/M8M

- Max. two limit switches (NAMUR)
- For flow rates of 0.15...250 l/h liquid or 1.6...8000 l/h gas
- Design with valve at bottom, valve on top or without valve

Standard housing M8E: PPS, conductive plastic
Optional housing M8E/R: stainless steel 1.4404/CF8M

DK32, DK37 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.

1.3 Functional principle

The flowmeter operates in accordance with the float measuring principle.

The measuring unit consists of a metal 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 resistance W and its weight G are in equilibrium: $G = A + W$

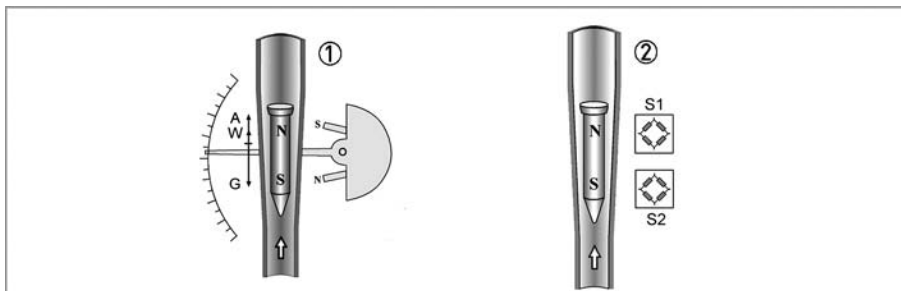


Figure 1-1: Functional principle

For DK32, DK34 and DK37/M8M ① the flow-dependent height of the float in the measuring unit is transmitted by means of a magnetic coupling on a scale.

For DK37/M8E, DK32/ESK and DK34/ESK ② the flow-dependent height of the float in the measuring unit is transmitted to the electronic display by means of a magnetic coupling on sensors S1 and S2.

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 or 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

Measuring accuracy

Directive	VDI/VDE 3513, sheet 2 (q _G = 50%)
DK32, DK34	4.0%
DK37	2.5%

Operating conditions

Max. operating temperature TS	Depending on the version (refer to nameplate)
	Standard version: up to +150°C / +221°F
	HT version: up to +200°C / +392°F
Max. operating pressure PS	Depending on the version (refer to nameplate)
	Standard version: 130 barg / 1885 psig ①
Max. test pressure PT	Depending on the version (refer to nameplate)
	Standard version: 202 barg / 2930 psig ①

Ingress protection

DK32, DK34 mechanical	IP66/IP68
DK32, DK34 with limit switches K1/K2	IP65
DK32, DK34 with transmitter ESK3x	IP66/IP68
DK37 with PPS indicator	IP66
DK37 with stainless steel indicator	IP66/IP67

Installation conditions

Inlet and outlet sections	None
Protect devices from vibration and high-frequency oscillation	Use in accordance with IEC 61298-3 in control room or field with medium vibration level

① Higher pressures on request

Materials

Top fitting, bottom fitting, cone	CrNi steel 1.4404 / 316 L
Lock screw	CrNi steel 1.4404 / 316 L
Float, standard	CrNi steel 1.4404 / 316 L or titanium
Dosing unit	CrNi steel 1.4571 / 316 Ti
Valve stem	CrNi steel 1.4404 / 316 L
Gasket of lock screw	PTFE
Gasket of dosing unit	FPM/PTFE, PTFE, FFKM ①
Indicator housing of DK32, DK34	Die-cast aluminium with powder coating
Indicator housing of DK37/M8_/	PPS
Indicator housing of DK37/M8_/R/	Stainless steel 1.4408/CF8M

① Other gasket materials on request

Other options on request:

- Surface passivation of all metallic, wetted parts
- Special materials: e.g. Hastelloy[®], Monel[®], Inconel[®], titanium a.o.

Process connection

Standard	1/4 NPT (female)
Option	G1/4, Ermeto, Serto, Gyrolok, Swagelok, flanges ①

① Other connections on request

Temperatures

Max. product temperature at $T_{amb.} < +40^{\circ}\text{C} / +104^{\circ}\text{F}$ ①	[°C]	[°F]
DK34, DK32, DK37 without valve	-80...+150	-112...+302
DK32, DK37 with valve FPM/PTFE	-25...+150	-13...+302
DK32, DK37 with valve FFKM	-20...+150	-4...+302
DK32, DK37 with valve PTFE	-40...+150	-40...+302
DK32 HT, DK34 HT high-temperature with FFKM	-20...+200	-4...+392
DK32, DK34 with transmitter ESK3x	-40...+140	-40...+284

Permissible ambient temperature ①	[°C]	[°F]
DK32, DK34, DK37/M8M without electrical built-ins	-40...+70	-40...+158
DK32, DK34, DK37/M8M with limit switch I7S2002-N or SJ2-SN	-40...+70	-40...+158
DK32, DK34, DK37/M8M with limit switch SC2-N0	-25...+70	-13...+158
DK32, DK34 with transmitter ESK3x	-40...+70	-40...+158
DK37/M8E	-40...+70	-40...+158
DK32 HT, DK34 HT high-temperature	-25...+200	-13...+392

① For restrictions in hazardous areas refer to the temperature tables in the supplementary Ex instructions

Indicator DK32, DK34, DK37/M8M with limit switch

DK32 - 34 /K./S DK37/M8M	Cable gland: M16 x 1.5	
	Terminal connection: 1.5 mm ²	
DK32 - 34 /K./S	Clamping range: 4.5...10 mm / 0.18...0.4"	
DK37/M8M	Clamping range: 3...7 mm / 0.12...0.28"	
DK32 - 34/K./L	Ø Connecting cable: 6.3 mm / 0.25"; 0.75 mm ²	
	Cable length: approx. 1.7 m / 5.6 ft (other lengths on request)	
Limit switches	SC2-NO I7S2002-N	SJ2-SN (safety-oriented)
Connection type NAMUR	2-wire	2-wire
Switching element function	Normally closed	Normally closed
Nominal voltage U ₀	8 VDC	8 VDC
Pointer vane not detected	≥ 3 mA	≥ 3 mA
Pointer vane detected	≤ 1 mA	≤ 1 mA
DK32 - DK34 with Reed contact	Type: SPDT (3-wire, normally closed and normally open)	
	Switching reproducibility: < 5% of full scale range	
	Switching capacity: 12 VA ①	
	Max. switching capacity: 30 VDC ①	
	Max. switching current: 0.5 A ①	

① Reduced values for Ex

Transmitter ESK3x for DK32, DK34

Cable entry	M16 x 1.5 or 1/2" NPT
Clamping range of cable gland	3...7 mm / 0.12...0.28" (PA gland) or 5...10 mm / 0.2...0.39" (stainless steel gland)
Terminal connection	1.5 mm ²
Measuring signal	4...20 mA = 0...100% flow value in 2-wire technology
Power supply	12...32 VDC (non-Ex)
Power supply influence	< 0.1%
Dependence on load impedance	< 0.1%
Temperature influence	<0.3%/10 K
Max. external resistance / load	500 Ω (24 VDC), 800 Ω (32 VDC)
Min. load for HART®	250 Ω
NAMUR type test acc. to NE 95	Fulfills NE 21, NE 43, NE 107

ESK3x - electrical characteristics

Process variable flow rate	Values [%]	Signal output [mA]
Upper range limit	+103.125	20.5
Device error identification	< -2.5 or > 106.25	<3.6 or > 21
Maximum	118.75	23.0
Multi-Drop operation	-	4.0
Min. U _{ext.}	12 VDC	
Capacitance number (CN)	2	

ESK3x HART Device

Manufacturer name (code)	KROHNE Messtechnik (0x0045)
Model name	ESK3x (0x45BA)
HART® protocol	Revision 7.6
Device revision	1
Equipment category	Transmitter

Indicator DK37/M8E

Cable gland	M16 x 1.5
Clamping range	3...7 mm / 0.12...0.28"
Terminal connection	2.5 mm ²
Measuring signal	4...20 mA = 0...100% flow value in 2-wire technology
Power supply	14.8...30 VDC
Min. power supply for HART®	20.5 VDC
Power supply influence	<0.1%
Dependence on load impedance	<0.1%
Temperature influence	<10 µA/K
Max. external resistance / load	640 Ω (30 VDC)
Min. load for HART®	250 Ω
Software firmware version	01.15
Identification number	3204090400
NAMUR type test acc. to NE 95	Fulfills NE 21, NE 43

M8E HART® configuration

Manufacturer name (code)	KROHNE Messtechnik (69)
Model name	M8E (230)
HART® protocol	Revision 5.1
Device revision	1
Physical Layer	FSK
Equipment category	Transmitter

M8E process variable

Process variable flow rate	Values [%]	Signal output [mA]
Upper range limit	+102.5 (±1%)	20.24...20.56
Device error identification	>106.25	≥21.00
Maximum	112.5	22
Multi-Drop operation	-	4.5
Min. U _{ext.}	14.8 VDC	

Approvals for DK32, DK34

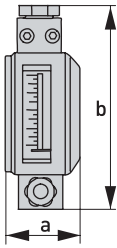
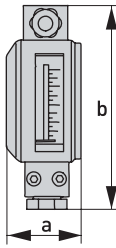
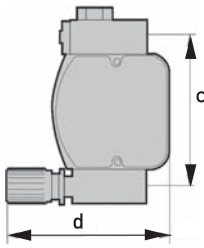
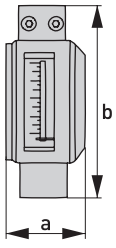
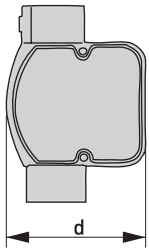
Standard	Device version	Marking
ATEX	Mechanical, without electrical built-ins	II2G Ex h IIC T6...T3 Gb II2D Ex h IIIC T150°C Db
	NAMUR limit switch K1/K2	II2G Ex ia IIC T6 Gb II2D Ex ia IIIC T75°C Db II3G Ex nA/ec IIC T6 Gc
	Reed limit switch R1	II2G Ex ia IIC T6 Gb
	4...20 mA / HART signal output ESK3x	II2G Ex d IIC T6 Gb II2G Ex ia IIC T6 Gb II2D Ex ia IIIC T75°C Db II3G Ex nA/ec IIC T6 Gc II2D Ex tb IIIC 75° Db
IECEX	NAMUR limit switch K1/K2	Ex ia IIC T6 Gb Ex ia IIIC T75°C Db Ex nA/ec IIC T6 Gc
	Reed limit switch R1	Ex ia IIC T6 Gb
	4...20 mA / HART signal output ESK3x	Ex d IIC T6 Gb Ex ia IIC T6 Gb Ex ia IIIC T75°C Db Ex nA/ec IIC T6 Gc Ex tb IIIC 75° Db
FM (US)	NAMUR limit switch K1/K2	IS/I/1/ABCD; T6 NI/I/2/ABCD; T6
	Reed limit switch R1	IS/I/1/ABCD; T6
QPS (US/C) (pending)	4...20 mA / HART signal output ESK3x	XP/I/1/ABCD; T6 IS/I/1/ABCD; T6 NI/I/2/ABCD; T6 DIP/II,III/1EFG;T6
Other approvals as NEPSI, INMETRO, KCS, CCOE, EAC on request.		

Approvals for DK37

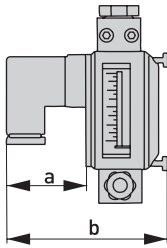
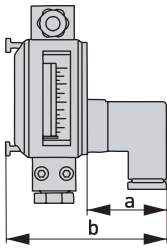
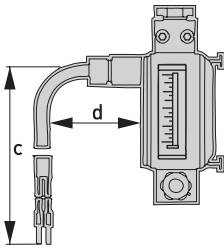
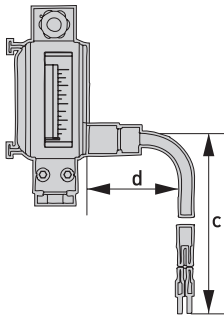
Standard	Device version	Marking
ATEX	Mechanical, without electrical built-ins	II2G Ex h IIC T6...T3 Gb II2D Ex h IIIC T150°C Db
	Electrical	II2G Ex ia IIC T6 Gb II2D Ex ia IIIC T75°C Db
IECEX	Electrical	Ex ia IIC T6 Gb Ex ia IIIC T75°C Db
QPS (US/C)	Electrical	IS/I/1/ABCD; T6
Other approvals as NEPSI, INMETRO, KCS, CCOE, EAC on request.		

2.2 Dimensions and weight

2.2.1 DK32, DK34

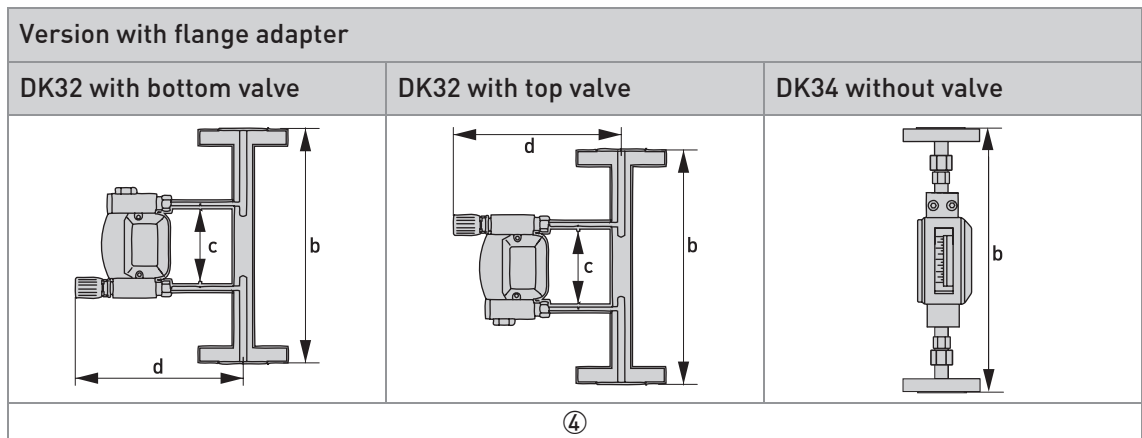
DK32 with top/bottom valve and rear process connection			DK34 without valve and vertical process connection		
					
①			②		

		Dimensions								Weight approx.	
		a		b		c		d			
		[mm]	[""]	[mm]	[""]	[mm]	[""]	[mm]	[""]	g	lb
①	DK32	42	1.66	118	4.65	90	3.55	100	3.94	700	1.54
②	DK34	42	1.66	110	4.33	-	-	75	3.07	600	1.32

Version with limit switch with connector		Version with limit switch with cable end	
DK32 with bottom valve / DK34 without valve	DK32 with top valve	DK32 with bottom valve / DK34 without valve	DK32 with top valve
			
③			

		Dimensions								Weight approx.	
		a		b		c		d			
		[mm]	[""]	[mm]	[""]	[mm]	[""]	[mm]	[""]	g	lb
③	DK32	46	1.81	approx. 90	approx. 3.55	1500	59	approx. 50	approx. 1.97	700	1.54
	DK34										600

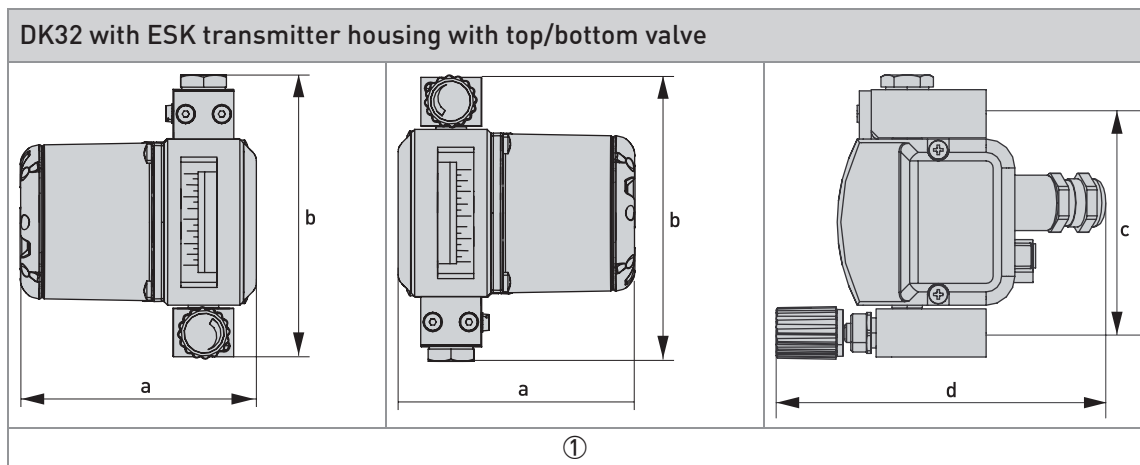
Weight for DK32 with differential pressure regulator: 2500 g / 5.51 lb



		Dimensions							
		a		b		c		d	
		[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
④	DK32	-	-	250	10.2	90	3.55	approx. 195	approx. 7.68
	DK34	-	-	250	10.2	-	-	-	-

Extra weight for flange adapter dependent on pressure rating of flange: approx. 1.5...9 kg / 3.3...19.8 lb

2.2.2 DK32, DK34 with transmitter housing ESK3x



Dimensions

		a		b		c		d	
		[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
①	DK32	100	3.94	118	4.65	90	3.55	140	5.51

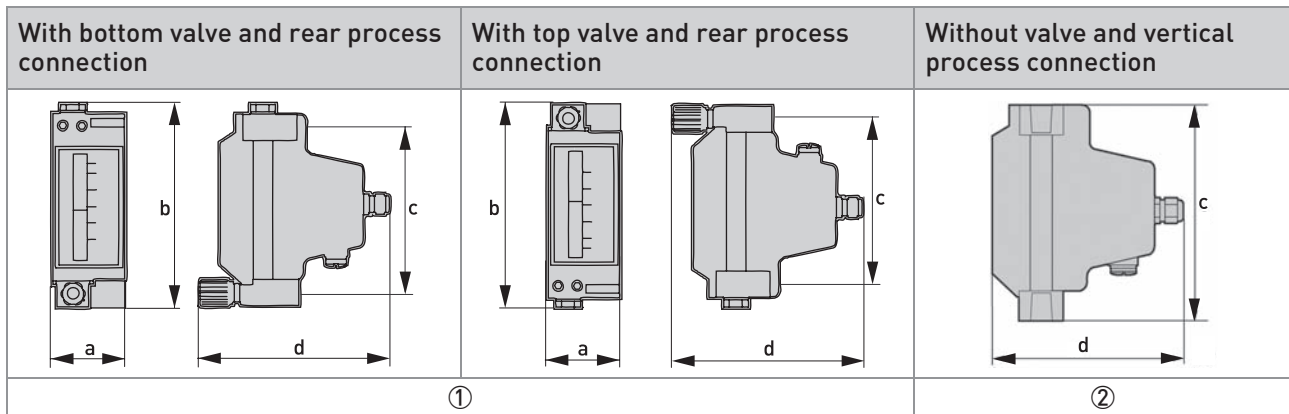
Total length of flange connection adapter:

DK32/ESK with top or bottom valve: 250 mm / 9.8"

Weights

	approx. g	approx. lb
DK32 with transmitter ESK3x	1100	2.43
DK34 with transmitter ESK3x	1000	2.21

2.2.3 DK37/M8M



Dimensions

		a		b		c		d	
		[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
①	With valve	56	2.21	153	6.03	125	4.92	approx. 144	approx. 5.67
②	Without valve	56	2.21	145	5.71	145	5.71	approx. 144	approx. 5.52

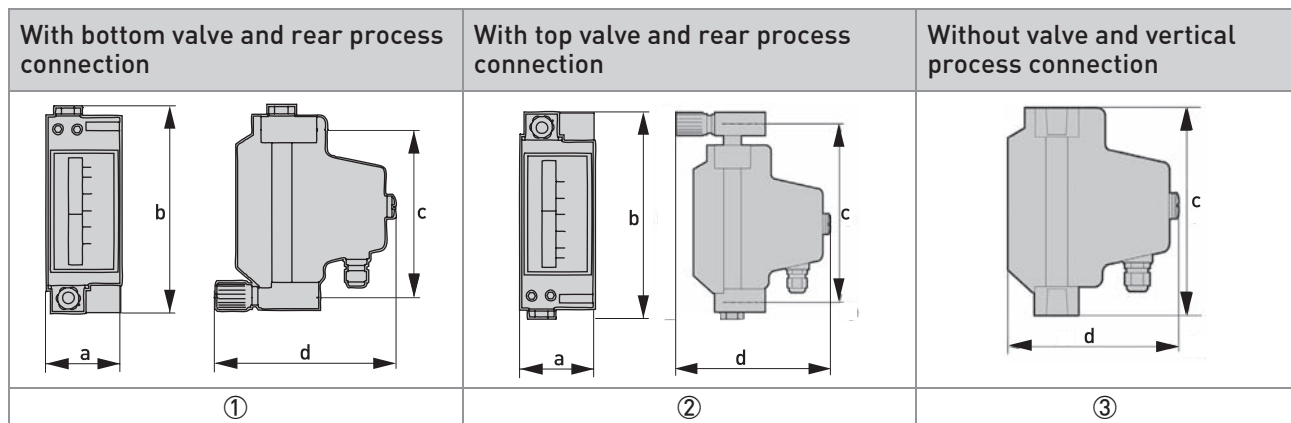
Total length of flange connection adapter:

DK37/M8M with top/bottom valve: 250 mm / 9.8"

Weights

	approx. g	approx. lb
DK37/M8M	800	1.76
DK37/M8M with differential pressure regulator	2600	5.73
DK37/M8M/R	2100	4.63
DK37/M8M/R with differential pressure regulator	3900	8.60

2.2.4 DK37/M8E



Dimensions

		a		b		c		d	
		[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
①	With bottom valve	56	2.21	153	6.03	125	4.92	approx. 144	approx. 5.67
②	With top valve	56	2.21	183	7.21	155	6.11	approx. 144	approx. 5.67
③	Without valve	56	2.21	145	5.71	145	5.71	approx. 121	approx. 4.77

Total length of flange connection adapter:

DK37/M8E with bottom valve: 250 mm / 9.8"

DK37/M8E with top valve: 300 mm / 11.8"

Weights

	approx. g	approx. lb
DK37/M8E	1000	2.21
DK37/M8E with differential pressure regulator	2800	6.18
DK37/M8E/R	2300	5.07
DK37/M8E/R with differential pressure regulator	4100	9.04

2.2.5 Minimum distances when installing several measuring devices

When installing several measuring devices side by side, a minimum distance between them has to be observed.

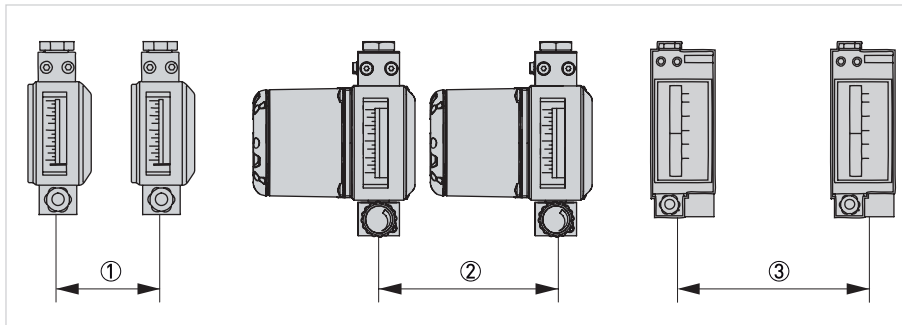


Figure 2-1: Minimum distances when installing several measuring devices

	Device	[mm]	["]
①	DK32, DK34	60	2.36
②	DK32/ESK, DK34/ESK	140	5.51
③	DK37/M8M	100	3.94
③	DK37/M8E	120	4.73

2.3 Measuring 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

Cones	Float	Flow, water		Flow, air		Pressure loss	
		[l/h]	[GPH]	[Nm ³ /h]	[SCFH]	[mbar]	[psi]
K 005	N3 titanium ①	-	-	16	0.6	17	0.25
K 005	N1 titanium ①	-	-	25	1		
K 005	N1 Stainless steel	-	-	50	2	31	0.45
K 010	N1 titanium ①	1.5	0.4	70	2.6	31	0.45
K 010	N1 Stainless steel	3	0.8	100	4	38	0.55
K 015	N1 titanium ①	3	0.8	100	4	17	0.25
K 015	N1 Stainless steel	5	1.3	150	6	19	0.28
K 040	N2 titanium ①	7	1.8	250	10	17	0.25
K 040	N2 Stainless steel	10	2.6	400	15	27	0.39
K 080	N2 titanium ①	16	4.2	550	20	32	0.47
K 080	N2 Stainless steel	25	6.6	800	30	55	0.8
K 125	N2 titanium ①	25	6.6	-	-	45	0.65
K 125	N2 Stainless steel	40	11	1250	50	42	0.61
K 200	N2 Stainless steel	60	16	2000	75	85	1.23
K 300	N2 Stainless steel	80	21	2500	100	117	1.7
K 340	N2 Stainless steel	100	26	3400	125	166	2.4
K 340	N2 Triamet	150	40	4800	180	210	3.01
K 340 ②	Special Stainless steel	200	53	6000	225	462	6.7
K 340 ②	Special Triamet	250	66	8000	300	722	10.5

① Titanium components are not suitable for use in oxygen applications (media with an oxygen content that is significantly higher than the oxygen content in the earth's atmosphere)!

② DK37 only

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:

- Nm³/h or Nm³/h: Volume flow at standard (norm.) conditions 0°C / +32°F, 1.013 bara / 14.7 psia (DIN 1343)

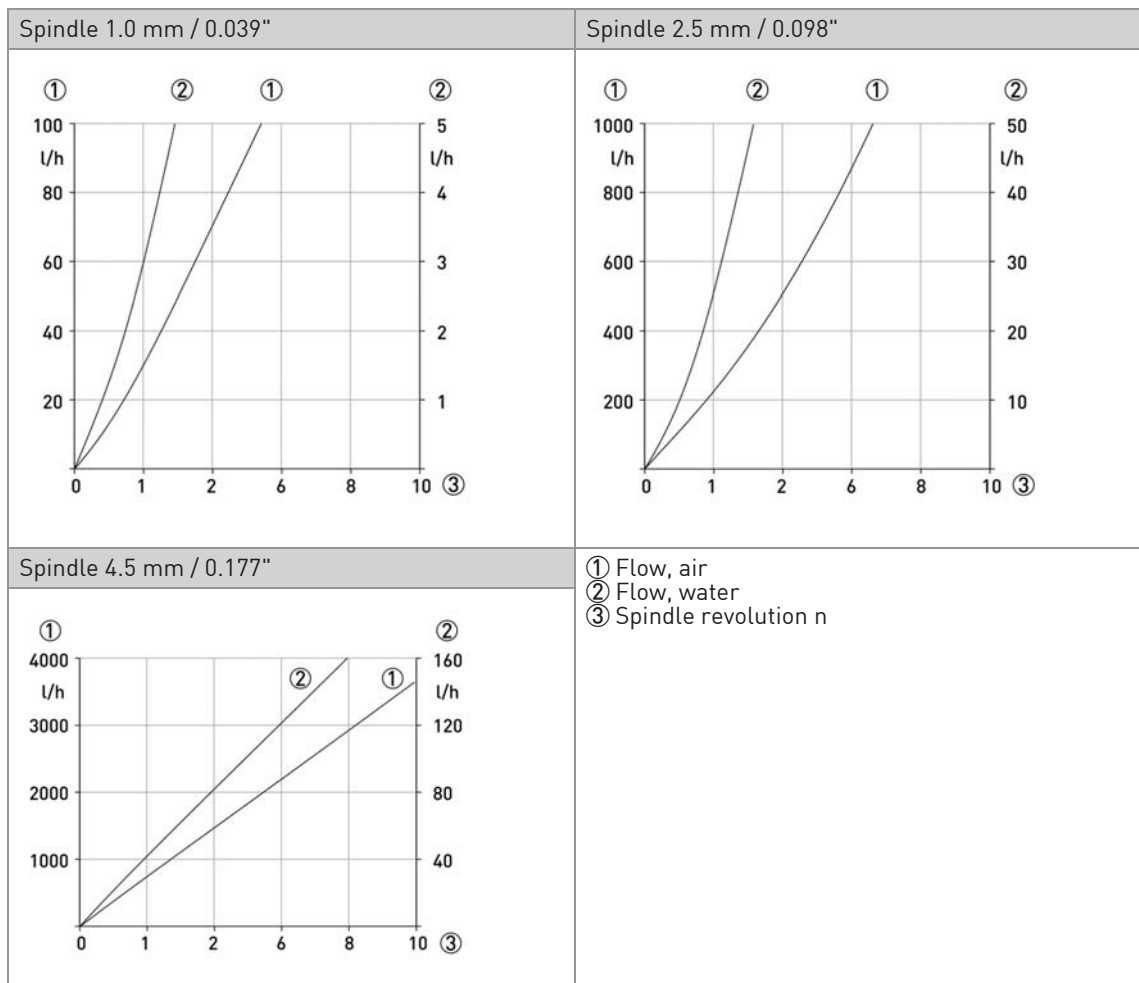
- SCFM or SCFH: Volume flow at standard (std.) conditions +15°C / +59°F, 1.013 bara / 14.7 psia (ISO 13443)

Valves

Measuring span: 10 : 1
 Flow values: Values = 100%
 Water: +20°C / +68°F
 Air: +20°C / +68°F, 1.013 bara / 14.7 psia

Only DK32 and DK37	Max. flow Qv						Valve characteristic value	
	Valve stem		Water		Air		Kv	Cv
	Cones	∅ [mm]	∅ ["]	[l/h]	[GPH]	[NI/h]	[SCFH]	[m ³ /h]
K 005 - K 010	1	0.039	5	1.32	100	3.72	0.018	0.021
K 015 - K 040 - K 080	2.5	0.98	50	13.2	1000	37.2	0.15	0.175
K 125 - K 340	4.5	0.177	160	42.3	4300	160	0.48	0.552

Valve characteristics



2.4 Differential pressure regulators

Differential pressure regulators are used (only DK32 and DK37) to guarantee constant flow during fluctuating inlet and outlet pressure. Minimum pressures are required to operate the regulators (refer to regulator characteristics).

Differential pressure regulators are not equivalent to 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 of inlet pressure regulator RE-1000	Current flow rate:	1000 l/h air
	Outlet pressure p2 constant:	1.013 bara / 14.7 psia

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

② Outlet pressure regulator, type RA, NRA

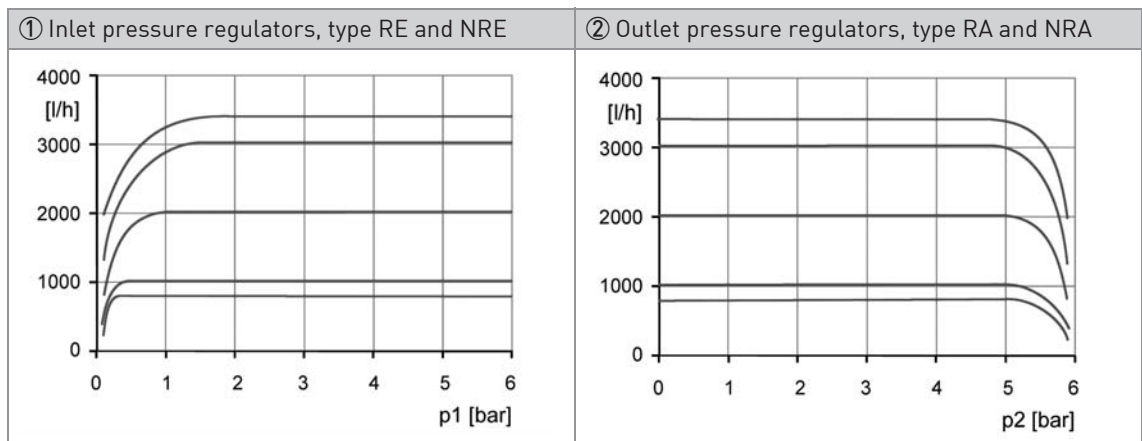
The regulators keep the flow rate constant in the case of a constant inlet pressure and a variable outlet pressure.

There must be a pressure differential between the inlet and the outlet pressure for the outlet pressure regulators to function. The inlet pressure p1 must always be greater than the outlet pressure p2.

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

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

Regulator characteristics



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

Inlet pressure regulator ①

	Max. flow rate				Min. inlet pressure	
	Water		Air			
	[l/h]	[GPH]	[NI/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

Outlet pressure regulator ②

	Max. flow rate				Min. inlet pressure		Min. pressure diff. *	
	Water		Air					
	[l/h]	[GPH]	[NI/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

* Differential pressure between inlet and outlet pressure

Reference condition for gas measurements:

Flow measurements for gases are attributed to:

- NI/h or Nm³/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)

Technical data for differential pressure regulator

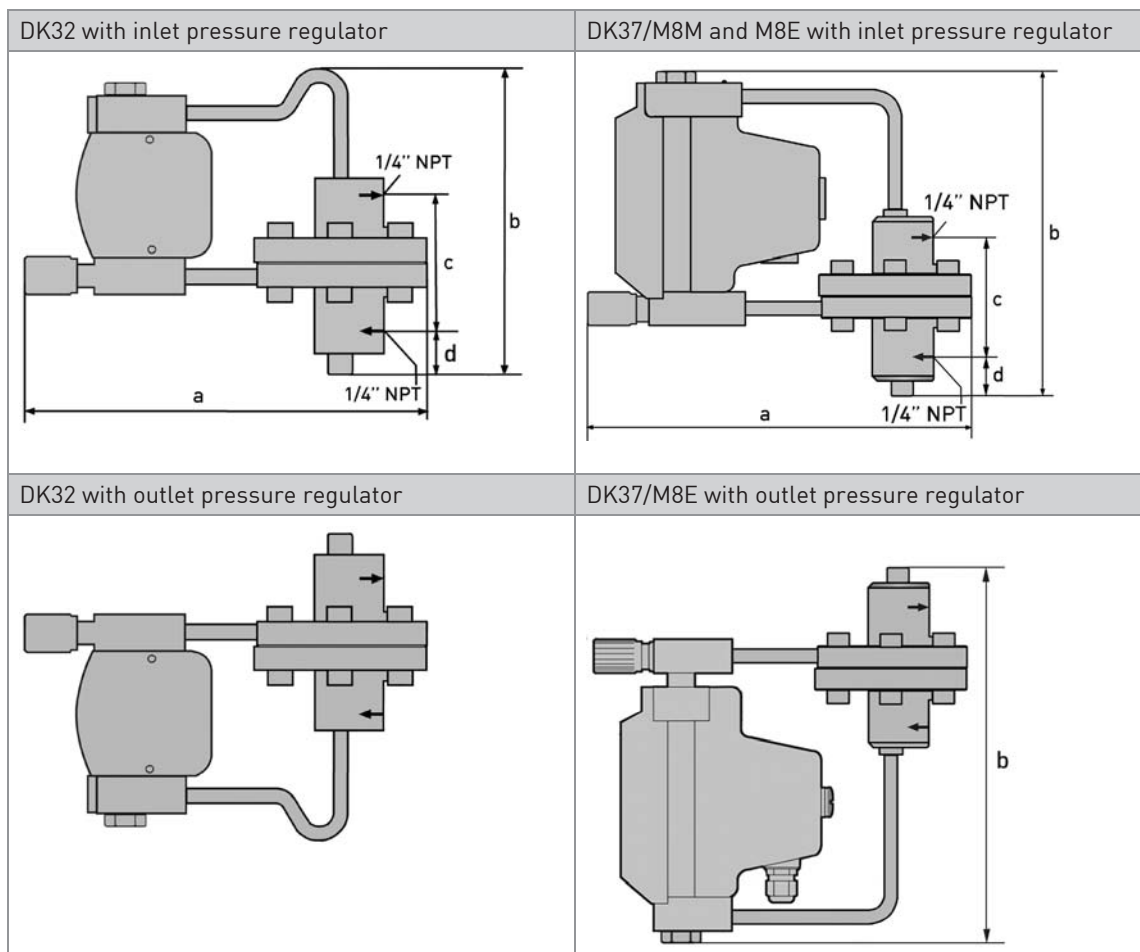
Connection, standard	1/4" NPT
Connection, option	Serto, Ermeto 6 or 8, hose nozzle 6 mm or 8 mm, Dilo, Gyrolok, Swagelok, G1/4
Max. operating gauge pressure (at +20°C / +68°F)	64 barg / 928 psig
Product temperature	+150°C / +302°F
Material	CrNi steel 1.4404
Gasket	PTFE
Diaphragm	Carbon/graphite-filled PTFE
O-ring	FPM or FFKM

Higher pressures and temperatures, other connections or materials on request

Dimensions with differential pressure regulator

	approx. a		approx. b		c		d	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
DK32	230	9.1	163	6.4	70	2.8	23	0.91
DK37	230	9.1	200	7.9	70	2.8	23	0.91
DK37/M8E ①	230	9.1	230	9.1	70	2.8	23	0.91

① with outlet pressure regulator



3.1 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 CISPR11:2009. 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.

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

- Process or carrier gases
- Nitrogen, CO₂ or other industrial gases
- Sample flows for process analysers
- Sealing gas or sealing liquid measurement on sealing systems
- Purge fluids for measuring systems
- Air or water
- Chemicals and additives
- Lubricating, cooling and anti-corrosive agents

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

Do not use any abrasive media containing solid particles.

3.2 Installation conditions

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 directive VDI/VDE 3513, sheet 3.*
- *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 centrally 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.*
- *When several devices are installed next to one another, a minimum distance between the devices is necessary (for details refer to chapter "Technical data").*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to an electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*

4.1 Electrical connection of the limit switches

The electrical connection of the limit switches is made for

- DK.././S - in connection plug
- DK.././L - via a cable assembly

The following procedures are to be performed (DK.././S):

- Loosen the screw ⑥ of the connector plug
- Pull out the plug.
- Remove the screw ⑥ completely from the plug.
- Insert a screwdriver in the marked opening ⑤ (lift) and remove the terminal block.
- Lead the connection cable through the cable gland.
- Insert the cable (max. 1.5 mm²) and tighten it.

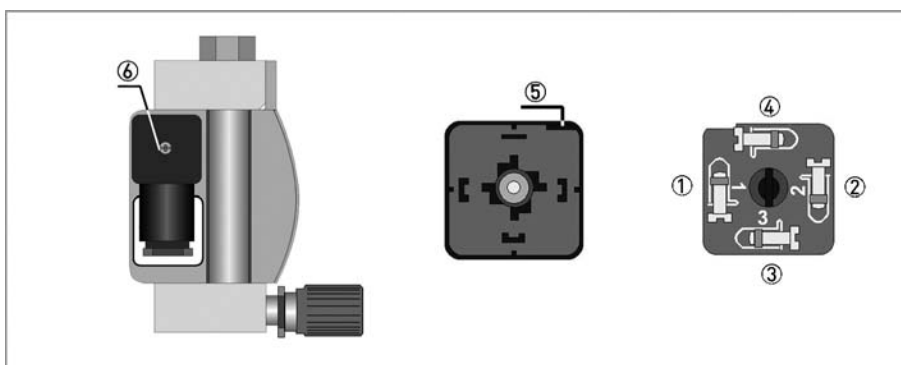


Figure 4-1: Electrical connection of the limit switches

⑤ Lift slot

⑥ Fastening screw of connection box

	Contact connection	Stranded wire colour for cable assembly
①	Min minus	white
②	Min plus	yellow
③	Max minus	green
④	Max plus	brown

Table 4-1: Contact connections

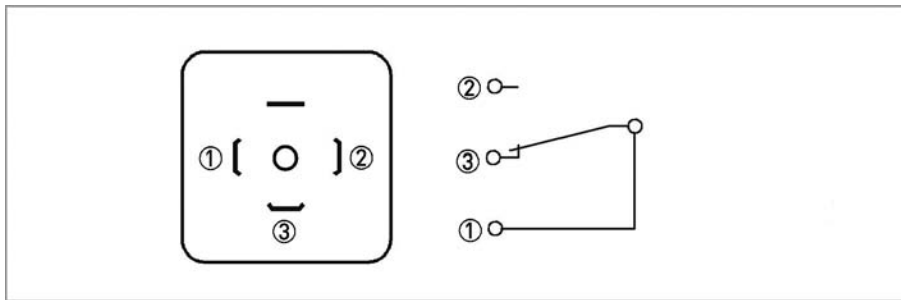


Figure 4-2: Connection of 3-wire reed contact

①	Silicone-insulated wire - yellow/green / FEP-insulated wire - red
②	Silicone-insulated wire - brown / FEP-insulated wire - brown
③	Silicone-insulated wire - blue / FEP-insulated wire - blue

Table 4-2: Stranded wire colour for devices with cable assembly

4.2 Electrical signal output ESK3x for DK32, DK34

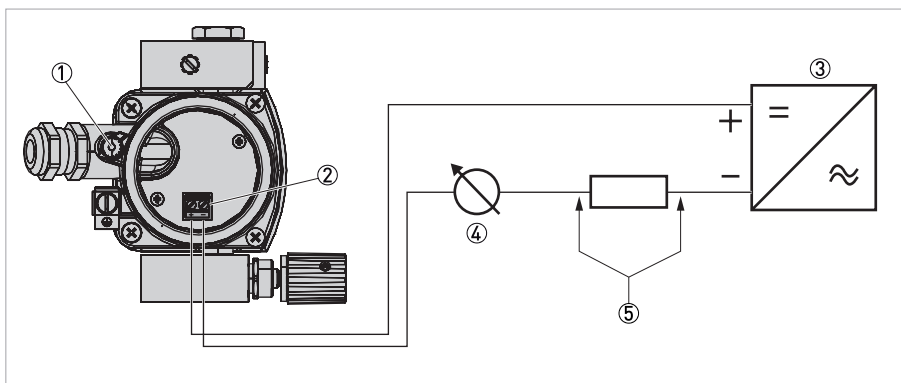


Figure 4-3: Electrical connection of ESK3x

- ① Lock screw
- ② Terminal block
- ③ Power supply 12...32 VDC
- ④ Measuring signal 4...20 mA
- ⑤ External load, HART® communication

The following procedures are to be performed:

- Loosen the lock screw ① on the locking mechanism using an Allen key (WS3).
- Unscrew the cover.
- Connect the connecting cables to the device terminals in the terminal block ② by ensuring the correct polarity.
- Screw on the cover.
- Tighten the lock screw on the locking mechanism using an Allen key (WS3).

For devices intended for use in hazardous areas with dust-resistant housing and/or secondary pressure containment, the special conditions for sealing the electronic compartment and for the cable entry are available in the supplementary instructions.

4.2.1 Power supply

The supply voltage has to be between 12 VDC and 32 VDC. This is based on the total resistance of the measuring loop. To calculate this, the resistance of each component in the measuring loop (not including the device) must be added up.

The required supply voltage can be calculated using the following formula:

$$U_{\text{ext}} = R_L * 22 \text{ mA} + 12 \text{ V}$$

with

U_{ext} = minimum supply voltage

R_L = total measuring loop resistance

The power supply has to be able to supply a minimum of 22 mA.

4.2.2 Load for HART communication

For HART[®] communication a load of at least 230 Ω is required.

The maximum load resistance is calculated as follows:

$$R_L = (U_{\text{ext}} - 12 \text{ V}) / 22 \text{ mA}$$

Use a twisted two-core cable to prevent electrical interference from impeding the DC output signal.

In some cases a shielded cable may be necessary. The cable shield may only be grounded (common ground connection) at one point (on the power supply unit).

4.2.3 Configuration

The ESK3x electrical signal output can be configured via HART[®] communication. DDs (Device Description) and DTMs (Device Type Manager) are available for the configuration. They can be downloaded free of charge from our website.

The current flow rate can be transmitted using the integrated HART[®] communication. A flow counter can be configured. Two limit values can be monitored. The limit values are assigned either to flow values or to the counter overflow.

4.3 Settings of limit switches for DK37/M8M

The limit switches can be set over the entire measuring range using the maximum pointer. The set limit values are displayed on the scale. The pointers are set to the desired limit values using a slip coupling along the scale.

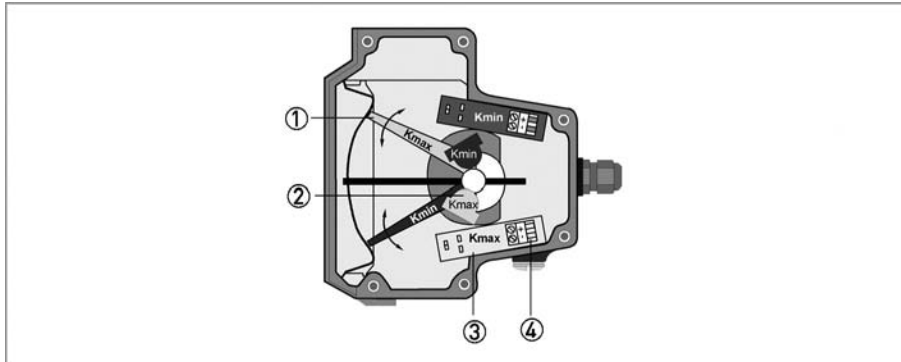


Figure 4-4: Position of the limit switch

- ① Maximum pointer, switching point indicator
- ② Limit switches
- ③ Connection board
- ④ Connection terminal

If the pointer vane goes into the slot, an alarm is triggered. An alarm is also triggered in the event of a cable break or short circuit if a suitable amplifier is used.

4.4 Electrical signal output for DK37/M8E

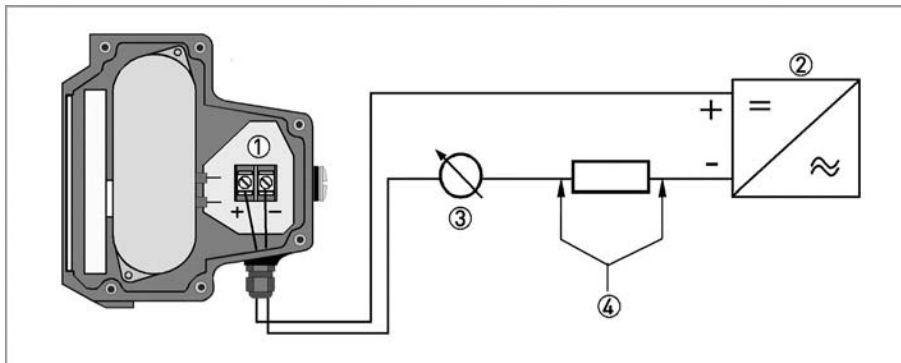


Figure 4-5: Electrical connection M8E

- ① Terminal connection
- ② Power supply 14.8...30 VDC
- ③ Measuring signal 4...20 mA
- ④ External load, HART® communication

Wiring must be planned with great care when it comes to connecting other devices such as evaluation units or process control. Internal connections in these devices (e.g. GND with PE, mass loops) may lead to non-permitted voltage potentials which could negatively affect the function of the device itself or that of a device connected to it. In such cases a protected extra-low voltage (PELV) is recommended.

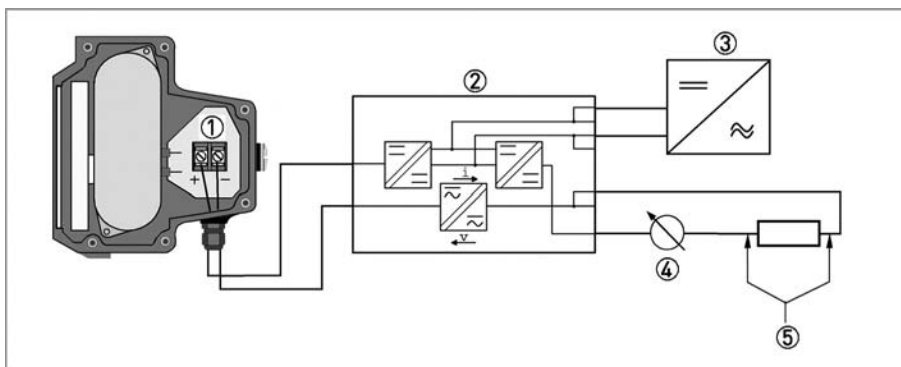


Figure 4-6: Electrical connection with galvanic isolation

- ① Terminal connection
- ② Signal converter isolator with galvanic isolation
- ③ Power supply (refer to isolator information)
- ④ Measuring signal 4...20 mA
- ⑤ External load, HART® communication

4.4.1 Power supply

The supply voltage has to be between 14.8 VDC and 30 VDC. This is based on the total resistance of the measuring loop. To calculate this, the resistance of each component in the measuring loop (not including the device) must be added up.

The required supply voltage can be calculated using the following formula:

$$U_{\text{ext}} = R_L * 22 \text{ mA} + 14.8 \text{ V}$$

with

U_{ext} = minimum supply voltage

R_L = total measuring loop resistance

The power supply has to be able to supply a minimum of 22 mA.

4.4.2 Load for HART communication

For HART[®] communication a load of at least 230 Ω is required.

The maximum load resistance is calculated as follows:

$$R_L = (U_{\text{ext}} - 14.8 \text{ V}) / 22 \text{ mA}$$

Use a twisted two-core cable to prevent electrical interference from impeding the DC output signal.

In some cases a shielded cable may be necessary. The cable shield may only be grounded (common ground connection) at one point (on the power supply unit).

4.4.3 Configuration

The M8E electronic indicator can be configured via HART[®] communication. DDs (Device Description) and DTMs (Device Type Manager) are available for the configuration. They can be downloaded free of charge from our website.

The current flow rate can be transmitted using the integrated HART[®] communication. A flow counter can be configured. Two limit values can be monitored. The limit values are assigned either to flow values or to the counter overflow. The limit values are not depicted on the display.

4.5 Grounding connections

The measuring unit is grounded on the top fitting ① (M4 threaded holes).
Alternatively, the DK32 and DK34 with ESK3x transmitter can be grounded at the transmitter housing.

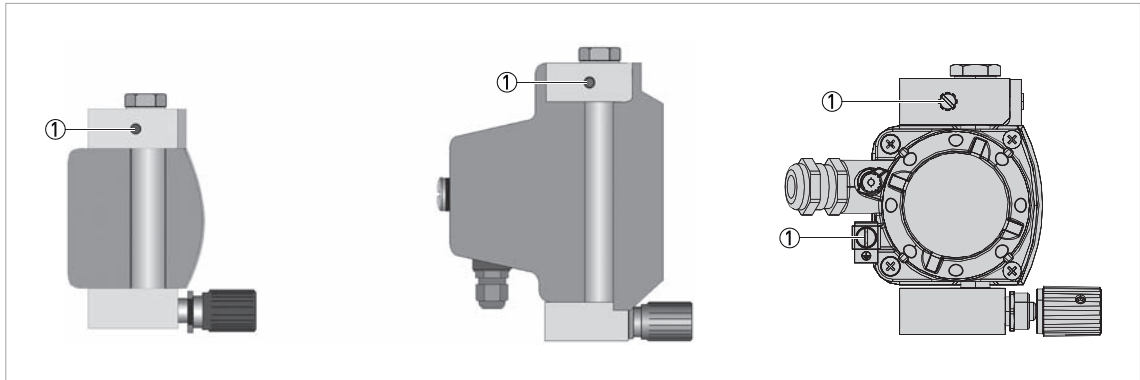


Figure 4-7: Grounding connections

① Grounding connection at measuring unit

*The grounding wire may not transfer any interference voltage.
Do not use this grounding cable to ground any other electrical devices.*

4.6 Ingress protection

The variable area flowmeters DK32 / DK34 / DK37 have been tested for IP protection in accordance with EN 60529. The following protection categories have been achieved:

Device variant	Ingress protection according to EN 60529
DK32, DK34 mechanical	IP66/IP68
DK32, DK34 with limit switches K1/K2	IP65
DK32, DK34 with transmitter ESK3x	IP66/IP68
DK37 with PPS indicator	IP66
DK37 with stainless steel indicator	IP66/IP67

After all servicing and maintenance work on the measuring device, the specified ingress protection category must be ensured again.

Therefore it is essential to observe the following points:

- Use only original gaskets. They must be clean and free of any damage. Defective gaskets must be replaced.
- The electrical cables used must be undamaged and must comply with regulations.
- The cables must be laid with a loop ③ upstream of the measuring device to prevent water from getting into the housing.
- The cable feedthroughs ② must be tightened.
- Close the unused cable feedthroughs using blind plugs ①.
- Do not remove the required cable bushing from the cable feedthrough.



Figure 4-8: Cable feedthrough

- ① Use blanking plugs if no cable is routed through
- ② Tighten the protection cap
- ③ Lay the cable in a loop

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

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

Device data

Connection type:	<input type="checkbox"/> 1/4 NPT	<input type="checkbox"/> [others]		
Connection:	<input type="checkbox"/> Horizontal	<input type="checkbox"/> Vertical		
Pressure rating:				
Indicator:	<input type="checkbox"/> DK32	<input type="checkbox"/> DK34	<input type="checkbox"/> DK37/M8M	<input type="checkbox"/> DK38/M8E
Indicator options:	<input type="checkbox"/> K1 ① <input type="checkbox"/> K2 ① <input type="checkbox"/> R1 ② <input type="checkbox"/> ESK ③	<input type="checkbox"/> K1 ① <input type="checkbox"/> K2 ① <input type="checkbox"/> R1 ② <input type="checkbox"/> ESK ③	<input type="checkbox"/> K1 ① <input type="checkbox"/> K2 ①	<input type="checkbox"/> ESK ③
Differential pressure regulators:	<input type="checkbox"/> Inlet pressure regulator	<input type="checkbox"/> Outlet pressure regulator		
Approval:	<input type="checkbox"/> None	<input type="checkbox"/> ATEX	<input type="checkbox"/> QPS (US/C)	<input type="checkbox"/> NEPSI
		<input type="checkbox"/> IECEx	<input type="checkbox"/> Others: _____	

① NAMUR limit switch

② Reed limit switch

③ 4...20 mA / HART®

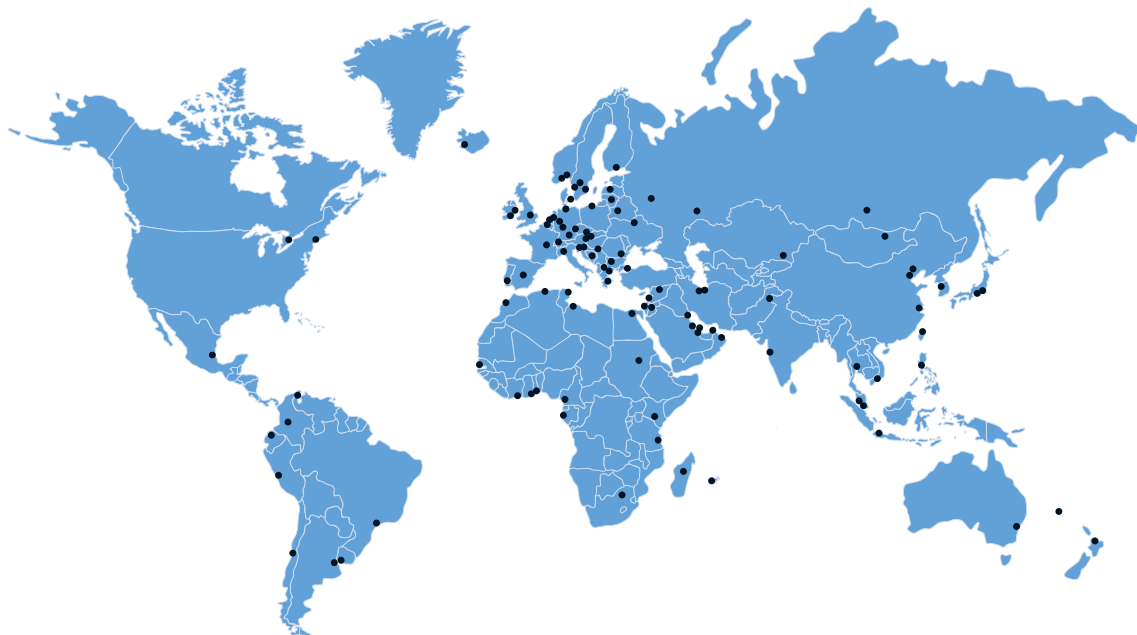
Rating data

Medium:			
Operating pressure:		<input type="checkbox"/> Absolute pressure	<input type="checkbox"/> Gauge pressure
Rated pressure:			
Operating temperature:			
Rated temperature:			
Density:		<input type="checkbox"/> Standard density	<input type="checkbox"/> Operating density
Viscosity:			
Flow range:			
Comments:			

Contact data

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





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