



DK32 - DK34 Supplementary Instructions

Variable area flowmeter

Equipment protection level EPL Gb and Db



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1.1 General notes

These additional instructions apply to explosion-protected versions of variable area flowmeter model DK32 and DK34 with electrical built-ins in type of protection intrinsic safety "i" and without electrical built-ins in type of protection constructional safety "c", equipment protection level (EPL) Gb and Db.

They complete the standard manual for the non-explosion protected versions.

The information given in these instructions contains only the data relevant to explosion protection. The technical details given in the standard manual for the non-explosion protected versions apply unchanged unless excluded or superseded by these supplementary instructions.

1.2 TR CU conformity

Conformity of the variable area flowmeter for use in hazardous areas was tested in accordance with the Custom Union Technical Regulation TR CU 012/2011.

The number of the certificate is:

TC RU C-DE.AA87.B.01261

1.3 Safety instructions

If these instructions are not followed, there is a risk of explosion.

Assembly, installation, start-up and maintenance may only be performed by personnel trained in explosion protection!



CAUTION!

The operator or his agent is responsible for observing any additional standards, directives or laws if required due to operating conditions or place of installation.

This applies in particular to the use of easily detachable process connections when measuring flammable media.



CAUTION!

When an equipment fault is detected the device shall be de-energised and send back to the manufacturer for repair.

2.1 Device description

Variable area flowmeters measure and display the flow of flammable and non-flammable gases and liquids. Depending on the device version, one or two individually adjustable electrical limit switch contacts can be installed in the indication unit.

2.2 Description code

The safety description code consists of the following elements *:

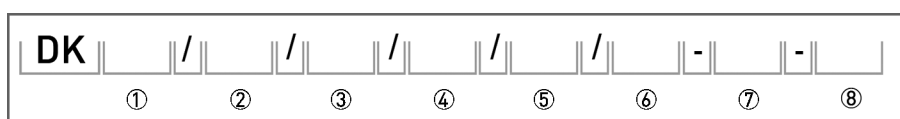


Figure 2-1: Safety description code

- ① 32 - with valve and horizontal connection / 34 - without valve and vertical connection
- ② RE - inlet pressure regulator / RA - outlet pressure regulator
- ③ K1 - one limit switch / K2 - two limit switches
- ④ S - plug connector / L - cable entry including cable
- ⑤ HT - high-temperature version
- ⑥ A - limit switch tested for EC type approval or IECEx tested
- ⑦ Ex - explosion-protected equipment

* positions which are not needed are omitted (no blank positions)

2.3 Marking

The marking of the entire device is on the indication unit, where the following identification plate can be found. An additional marking with the production number (P/A) is located inside of the indication.

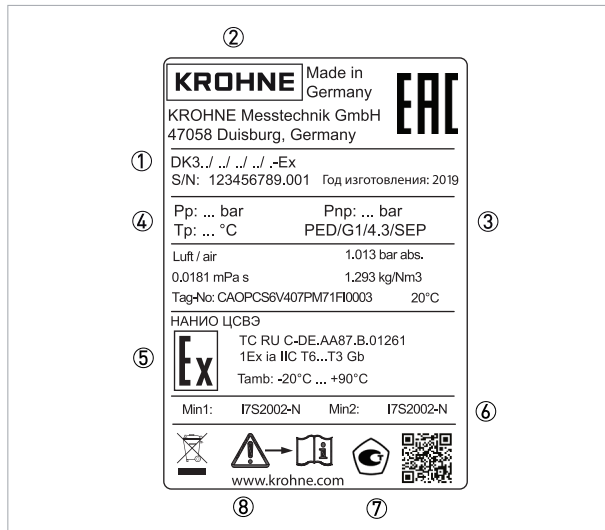


Figure 2-2: Example of a nameplate for the version with electrical built-ins

- ① Device designation
- ② Manufacturer and manufacturer address
- ③ Pressure data and PED data
- ④ Rating data: temperature & pressure rating
- ⑤ Ex data according to notified body
- ⑥ Electrical connection data (depending on built-in equipment)
- ⑦ Symbol for region (e.g. Russia)
- ⑧ Note to observe the documentation and for disposal

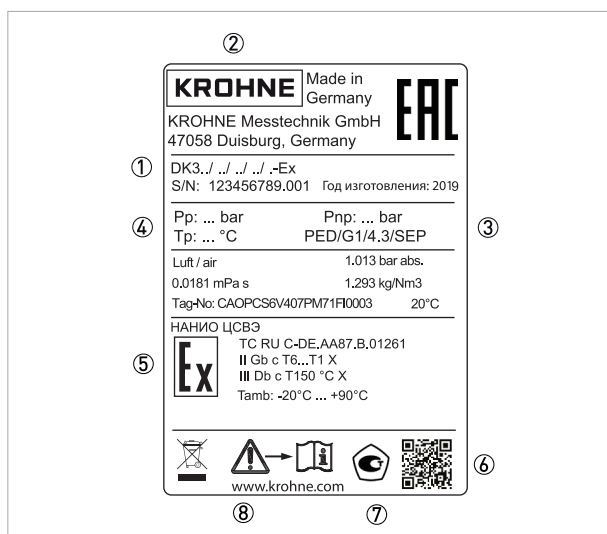


Figure 2-3: Example of a nameplate for the version without electrical built-ins

- ① Device designation
- ② Manufacturer and manufacturer address
- ③ Pressure data and PED data
- ④ Rating data: temperature & pressure rating
- ⑤ Ex data according to notified body
- ⑥ Data matrix
- ⑦ Symbol for region (e.g. Russia)
- ⑧ Note to observe the documentation and for disposal

2.4 Flammable products

Atmospheric conditions:

The standard atmospheric conditions under which it may be assumed that Ex equipment can be operated are:

- Temperature: -20...+60°C / -4...+140°F
- Pressure: 80...110 kPa (0.8...1.1 bar) / 11.6...15.9 psi
- Air with normal oxygen content, typically 21%v/v

Ex equipment operating outside the standard temperature range must be tested and certified (e.g. for ambient temperature range -40...+70°C / -40...+158°F).

Ex equipment operating outside the standard atmospheric pressure range and standard oxygen content is not permitted.

Operating conditions:

The measuring unit of variable area flowmeters operate outside the standard atmospheric pressure range, which means that explosion protection, regardless of the zone assignment, is fundamentally not applicable for the measuring unit (piping).



WARNING!

Operation with flammable products is only permitted as long as no explosive fuel/air mixture builds up inside of the piping at the same time the atmospheric conditions are exceeded.

The operator is responsible to ensure that the flowmeter is operated safely in terms of the temperature and pressure of the products used. In case of operation with flammable products the measuring units must be included in the periodic pressure tests of the piping.

2.5 Types of protection

The variable area flowmeter type DK32 and type DK34 with electrical built-ins is designed in type of protection intrinsic safety "i" according to GOST 31610.11-2014 / IEC 60079-11:2011.

Type DK32 and DK34 without electrical built-ins is designed in type of protection constructional safety "c" according to GOST 31441.5-2011 / ISO IEC 80079-37.

The identification for equipment **EPL Gb with electrical built-ins** is:

The marking is: **1Ex ia IIC T6...T3 Gb**

The marking contains the following information:	
1	Gas explosion protection for zone 1
Ex ia	Protection by intrinsic safety, level of protection "ia"
IIC	Suitable for gas group IIC, IIB and IIA
T6...T3	Temperature class range, suitable for temperature class T6...T1
Gb	EPL, suitable for zone 1 and zone 2

Table 2-1: Identification for equipment EPL Gb with electrical built-ins



INFORMATION!

For the equipment EPL Gb, connection to an intrinsically safe circuit with protection level "ib" is required.

When connecting the variable area flowmeter to an intrinsically safe circuit with protection level "ia", a higher protection level is given.

The identification for equipment **EPL Gb without electrical built-ins** is:
II Gb c IIC T6...T1 X

The marking contains the following information:	
II	Equipment group, suitable for gas areas
Gb	EPL, suitable for zone 1 and zone 2
c	Explosion protection through constructional safety "c"
IIC	Gas group, suitable for gas groups IIC, IIB and IIA
T6...T1	Temperature class range, suitable for temperature classes T6...T1
X	Indication of special conditions for safe use

Table 2-2: Identification for equipment EPL Gb without electrical built-ins

The identification for equipment **EPL Db without electrical built-ins** is:
III Db c T150°C X

The marking contains the following information:	
III	Equipment group, suitable for dust areas
Db	EPL, suitable for zone 21 and zone 22
c	Explosion protection through constructional safety "c"
T150°C	Maximum surface temperature
X	Indication of special conditions for safe use

Table 2-3: Identification for equipment EPL Db without electrical built-ins

2.6 Ambient temperature / temperature classes

Due to the influence of the product temperature, variable area flowmeters with built-in electrical equipment (electric variants) are not assigned to any fixed temperature class. In fact, the temperature class of these devices is a function of the present product temperature and ambient temperature, as well as the specific device version. The classification is outlined in the following tables.

The tables take into account the following parameters:

- Ambient temperature T_{amb}
- Product temperature T_m



INFORMATION!

The maximum permissible product temperatures listed in the tables are valid under the following conditions:

- *The measuring device is installed and operated in accordance with the manufacturer's installation instructions.*
- *It must be ensured that the flowmeter is not heated by the effects of additional heat radiation (sunshine, neighbouring system components) and thus operated above the permissible ambient temperature range.*
- *Insulation must be limited to the piping.
Unobstructed ventilation of the indicator part must be ensured.*

Temperature class	Ambient temperature		Maximum permissible product temperature with connector (S) or cable gland (L)			
			Type DK32		Type DK34	
	[°C]	[°F]	[°C]	[°F]	[°C]	[°F]
T6	-20...+40	-4...+104	75	167	80	176
	-20...+50	-4...+122	70	158	70	158
	-20...+60	-4...+140	60	140	60	140
T5	-20...+40	-4...+104	100	212	100	212
	-20...+50	-4...+122	95	203	100	212
	-20...+60	-4...+140	85	185	90	194
T4	-20...+40	-4...+104	135	275	135	275
	-20...+50	-4...+122	130	266	135	275
	-20...+60	-4...+140	120	248	130	266
	-20...+90	-4...+194	90	194	90	194
T3...T1	-20...+40	-4...+104	135	275	150	302
	-20...+50	-4...+122	130	266	140	284
	-20...+60	-4...+140	120	248	130	266
	-20...+90	-4...+194	90	194	90	194

Table 2-4: DK3./../././A-Ex permissible product and ambient temperatures

2.7 Surface temperature for equipment protection level Db

For use in areas with flammable dust it should be noted that the indicated maximum surface temperature of $T_{150}^{\circ}\text{C}$ at an ambient temperature of $+70^{\circ}\text{C}$ / $+158^{\circ}\text{F}$ and a product temperature of $+150^{\circ}\text{C}$ / $+302^{\circ}\text{F}$ is valid without a dust coating.

The maximum surface temperature is defined by the product.

2.8 Electrical data

The electronic signal output may only be connected to intrinsically safe circuits. Depending on the device design, the following maximum values apply per circuit:

U_i	16 VDC
I_i	25 mA
P_i	64 mW

Table 2-5: Maximum values for version DK3./../../A-Ex

Irrespective of the device design, the following values are to be observed for each intrinsically safe circuit in case of interconnection:

C_i	150 nF
L_i	150 μH

Table 2-6: Interconnection values for intrinsically safe circuits



WARNING!

Also, when operating the variable area flowmeter outside of the hazardous area, the connection must be made to an intrinsically safe circuit.

When connecting to non-intrinsically safe circuits, there is a risk of damage to the safety-defining components.

3.1 Mounting

Mounting and setup must be carried out according to the applicable installation standards (e.g. IEC 60079-14) by qualified personnel trained in explosion protection.

The information given in the manual and the supplementary instructions must always be observed.

Variable area flowmeters must be installed in such a way that

- there is no danger from mechanical impact effects.
- There are no external forces affecting the indicator part.
- the device is accessible for any necessary visual inspections and can be viewed from all sides.
- the nameplate is clearly visible.
- it can be operated from a location with secure footing.



CAUTION!

The manufacturer is not liable for any damage resulting from improper use or use other than the intended purpose. This applies in particular to hazards due to insufficient corrosion resistance and suitability of the materials in contact with product.



DANGER!

Components made of titanium in oxygen applications

*Variable area flowmeters with titanium components are **NOT** suitable for use in explosion-protected areas in conjunction with oxygen applications (products with an oxygen content which is significantly above the oxygen content in the earth's atmosphere)!*

3.2 Special conditions

Enclosure

For any damage affecting the integrity of the enclosure is found, the housing of the flowmeter shall be replaced.

Electrostatics

Appropriate measures shall be taken to prevent built-up of electrostatic charge on painted and non-metallic parts of variable flowmeters.

4.1 General notes

For version DK3./../S../A-Ex (plug), the separate intrinsically safe signal circuits with protection level "ia" or "ib" are electrically connected in the terminal compartment of the plug housing and for version DK3./../L../A-Ex (connecting cable) it is the connecting cable as illustrated in the connection diagram.

Permissible maximum values (electrical data) must be observed.

Connecting cable

The connecting cables must be selected according to prevailing installation standards (e.g. IEC 60079-14). The outer diameter of the connecting cable must be within the sealing range of the cable entry. The connecting cables must be fixed and laid so they are sufficiently protected against damage.

All cores that are not used must be securely connected to the ground potential of the hazardous area or carefully insulated against each other and against ground (test voltage $\geq 500 V_{eff}$).

Cable entries / blanking plugs

The DK3./../S../A-Ex variable area flowmeter is equipped with a connector. The connector guarantees ingress protection IP65 according to IEC 60529. The cable entry is closed with a plug. The plug is to be replaced with a suitable connecting cable (nominal diameter range 6...9 mm).

Connection diagram

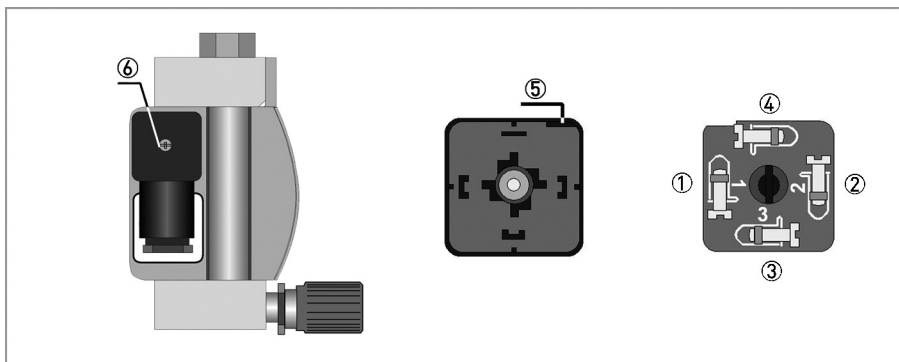


Figure 4-1: Connection for indicator with limit switches or Reed contact

	Contact connection	Cable colors of assembled cable
①	Min minus	white
②	Min plus	yellow
③	Max minus	green
④	Max plus	brown
⑤	Lift slot	
⑥	Fastening screw of connection box	

Table 4-1: Stranded wire colour for cable assembly

4.2 Grounding and equipotential bonding

If the device is not sufficiently electrostatically grounded via the process pipes, an additional ground connection must be established using the grounding screw ①. The position of the ground terminal is illustrated below. This connection only ensures electrostatic grounding of the device and does not meet the requirements for equipotential bonding.

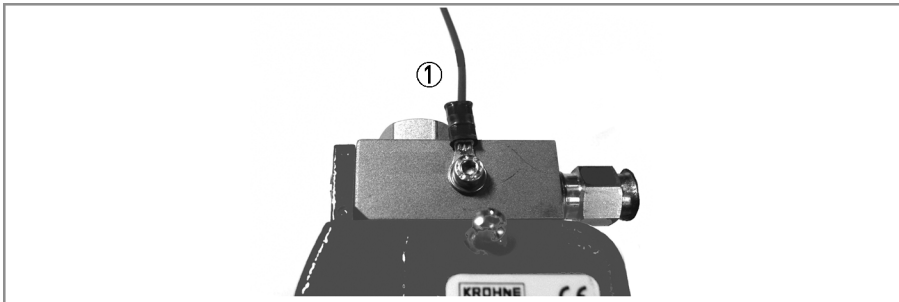


Figure 4-2: Position of the ground terminal

① Grounding screw

5.1 Start-up

Start-up is only permitted when the variable area flowmeter:

- is correctly installed in the system and connected.
- has been checked for the proper state with regard to its installation and connection requirements.

The operator of the system has to check prior to start-up, if the start-up was in compliance with the national regulations for checks.

5.2 Operation

Variable area flowmeters must be operated in such a way that they remain within the maximum and minimum permissible temperatures and pressures and the electrical limit values.

Variable area flowmeters may only be operated if the equipment parts necessary for safety are effective in the long run, and are not rendered inoperable during operation.

Adjusting the limit switch during operation is permitted. To do so, remove the housing cover. Close the housing cover immediately after the adjustment of the limit switches. For more information refer to chapter "Dismantling".



WARNING!

Ignition risks caused by pressure surges, impact or friction must particularly be avoided when titanium measuring units are used.

6.1 Maintenance

Maintenance work of a safety-relevant nature within the meaning of explosion protection may only be carried out by the manufacturer, his authorised representative or under the supervision of authorised inspectors.

For systems in hazardous areas, regular checks are required in order to maintain the proper condition.

The following checks are recommended:

- Checking the housing, the cable entries and the feed lines for corrosion and/or damage.
- Checking the measuring unit and the piping connections for leakage.

The cover is to be closed following maintenance work on the indication unit.

6.2 Dismantling

Replacing the display

Due to the modular design of the variable area flowmeter, from a safety perspective it is possible to replace a complete display with an identical spare part.



CAUTION!

There may be a loss of measuring accuracy!

Exchanging the entire device

The dismantling and installation is within the responsibility of the operator.

Exchanging and dismantling should take place in a de-energised state, if at all possible. If that is not possible, the basic conditions for intrinsic safety (e.g. no grounding or connection of different intrinsically safe circuits to one another) must be observed during dismantling.



CAUTION!

- *Pressurised pipes have to be depressurised before removing the measuring unit.*
- *In the case of environmentally critical or hazardous products, appropriate safety precautions must be taken with regard to residual liquids in the measuring unit.*
- *New gaskets have to be used when re-installing the device in the piping.*









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