



## DK32-DK34 Supplementary Instructions

Variable area flowmeter with electrical built-ins

Equipment category II 2 G



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## 1.1 General notes

These additional instructions apply to explosion-protected versions of variable area flowmeters with electrical built-ins and the marking II 2 G. They complete the standard manual for the non-explosion protection versions.

The information given in these instructions contains only the data relevant to category 2 explosion protection. The technical details given in the standard manual for the non-explosion protected versions remain unchanged unless they will be excluded or replaced by these supplementary instructions.

## 1.2 EU conformity

The manufacturer declares with the EU declaration of conformity on his own responsibility conformity with the protection goals of directive 2014/34/EU for use in hazardous areas with gas.

The EC type examination certificate of the Physikalisch Technische Bundesanstalt (PTB) forms the basis of the EU declaration of conformity:

**PTB 99 ATEX 2191**

If needed the EC type examination certificate can be downloaded from the manufacturer's website.

## 1.3 Approval according to the IECEx scheme

Conformity with IECEx standards was tested in accordance with the "IECEx Certification Scheme for Explosive Atmospheres" acc. to IEC 60079-0 and IEC 60079-11. The number of the IEC certificate is:

**IECEx PTB 09.0025**

## 1.4 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!**

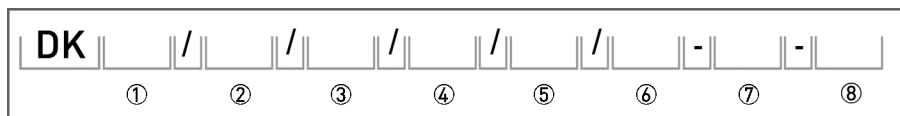
*The operator or his agent is responsible for observing any additional standards, directives or laws if required due to operating conditions or place of installation. This applies in particular to the use of easily detachable process connections when measuring flammable media.*

## 2.1 Device description

Variable area flowmeters measure and display the volume flow of flammable and non-flammable gases and liquids. The display houses one or two separately adjustable electrical limit switches.

## 2.2 Description code

The safety description code \* consists of the following elements:

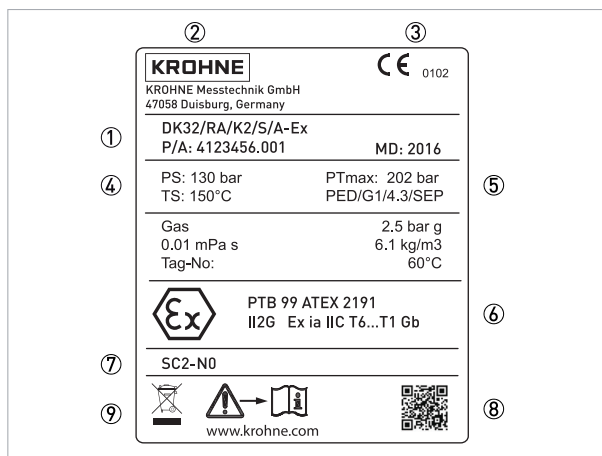


- ① 32 - with valve and horizontal connection / 34 without valve and vertical connection
- ② RE - inlet pressure regulator / RA - outlet pressure regulator
- ③ K1 - one limit switch / K2 - two limit switches
- ④ S - plug connector / L - cable gland incl. cable
- ⑤ HT - high-temperature version
- ⑥ A - 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 type marking of the device is realised visibly with the nameplate shown below. The interior of the display has an additional marking with the serial number (P/A).



- ① Device type, serial number and manufacturing date
- ② Manufacturer
- ③ Identification number of the notified body ATEX
- ④ PED data
- ⑤ Rating data: temperature & pressure rating
- ⑥ Ex data according to PTB 99 ATEX 2191 and IECEx PTB 09.0025
- ⑦ Built-in equipment
- ⑧ Data matrix
- ⑨ Safety instructions and disposal symbol

## 2.4 Flammable products

### Atmospheric conditions:

The ATEX directive does not stipulate values for atmospheric conditions. However, for determining the explosion characteristic parameters of temperature and pressure range, the following is assumed as a basis:

$T_{\text{atm}} = -20...+60^{\circ}\text{C} / -4...+140^{\circ}\text{F}$  and  $P_{\text{atm}} = 0.8...1.1 \text{ bar} / 11.6...15.9 \text{ psi}$

Outside of these ranges, for most mixtures no key figures are available for the ignition behaviour.

### Operating conditions:

Variable area flowmeters operate outside of atmospheric conditions, which means that explosion protection according to the ATEX directive, regardless of the zone assignment, is fundamentally not applicable due to the lack of key safety data for the interior of the measuring unit.



### **WARNING!**

*Operation with flammable products is only permitted as long as no explosive fuel/air mixture builds up on the inside of the flowmeter under operating conditions. 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 system. When using the device version H250/C... (PTFE version, non-conductive) the minimum conductivity of the media must be  $10^{-8} \text{ S/m}$ , in order to avoid danger from electrostatic charge.*

## 2.5 Equipment category

The flowmeters are designed in category II 2 G according to EN 60079-0 and EN 60079-11 for use in zone 1.

## 2.6 Types of protection

The variable area flowmeter is designed in type of protection "intrinsic safety", protection level "ia" according to EN 60079-11.

The marking according to ATEX is: **II 2G Ex ia IIC T6...T1 Gb**

The marking according to IECEx is: **Ex ia IIC T6**

The marking contains the following information:	
<b>II</b>	Explosion protection, group II
<b>2</b>	Equipment category 2
<b>G</b>	Gas explosion protection
<b>ia</b>	Protection type intrinsic safety, protection level "ia"
<b>IIC</b>	Suitable for gas group IIC, IIB and IIA
<b>T6...T1</b>	Suitable for temperature class T6...T1
<b>Gb</b>	EPL, suitable for zone 1

## 2.7 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. The temperature class of these devices is rather a function of the product temperature and ambient temperature that is present and the specific device version. Please see the following tables for the assignments.

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 installation instructions in the manual.*
- *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.*

### DK3./../././A–Ex permissible medium and ambient temperatures

Temperature class	Ambient temperature		Maximum permissible medium 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

## 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:

### Design DK3./../../A-Ex

$U_i$	16 VDC
$I_i$	25 mA
$P_i$	64 mW

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 $\mu$ H

### 3.1 Installation

Installation and setup must be carried out according to the applicable installation standards (e.g. EN 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 visual inspections that are necessary, 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.*



## 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

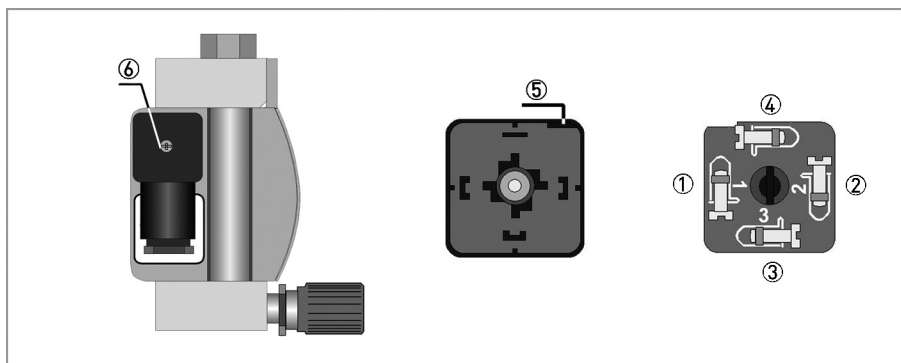
The connecting cables must be selected according to prevailing installation standards (e.g. EN 60079-14). The outer diameter of the connecting cable must be within the sealing range of the cable entry. The connecting cables must be fixed and laid so they are sufficiently protected against damage.

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 protection from foreign bodies and water (protection category) IP65 acc. to EN 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 diagrams

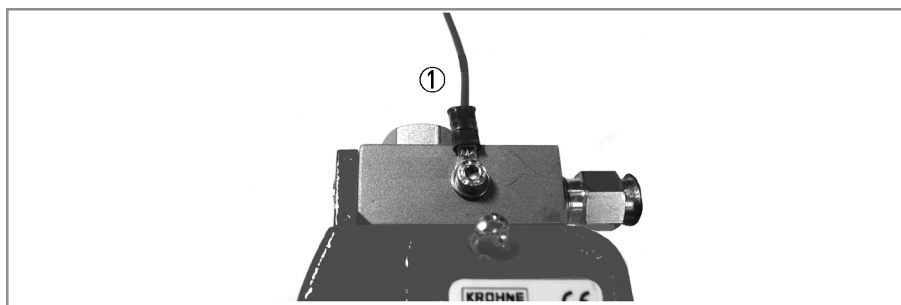


	Contact connection	Cable colors of assembled cable
①	Min minus	white
②	Min plus	yellow
③	Max minus	green
④	Max plus	brown
⑤	Lift slot	
⑥	Fastening screw of connection box	

## 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.

### DK32 - DK34



## 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

Setting of the limit switches may be carried out during operation. To do so, remove the housing cover. Close the housing cover immediately after the limit switches have been set.

## 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 flowmeters, from a safety perspective the complete display can be replaced with identical spare parts.



**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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