



DK32 - DK34 Supplementary Instructions

Variable area flowmeter with electrical built-ins



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1.1 General notes

These supplementary instructions apply to explosion-protected versions of variable area flowmeters with electrical built-ins and the marking Ex i. It completes the standard documentation 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details given in the standard instructions for the non-explosion protected versions apply unchanged unless excluded or superseded by these supplementary instructions.

1.2 NEPSI conformity

Variable area flowmeters, type DK32 series and DK34 series have been approved by NEPSI (National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation). This product is in accordance with the following standards:

- GB 3836.1-2010 Explosive atmospheres - Part 1: Equipment - General requirements
- GB 3836.4-2010 Explosive atmospheres - Part 4: Equipment protection by intrinsic safety "i"

The certificate number is:

GYJ17.1478X

This certification together with its boundary conditions is required to be observed without fail.



INFORMATION!

The Ex marking is NOT according to the ATEX directive. Placing the product on the market of the EU for purpose of distribution and/or use in the EU is NOT permitted.

1.3 Approval according to the IECEx scheme

Conformity with IECEx standards was tested in accordance with the "IECEx Certification Scheme for Explosive Atmospheres" according 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 *:

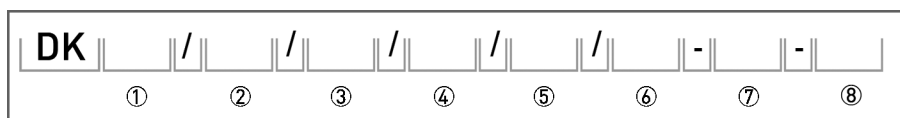


Figure 2-1: Safety description code

- 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 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).

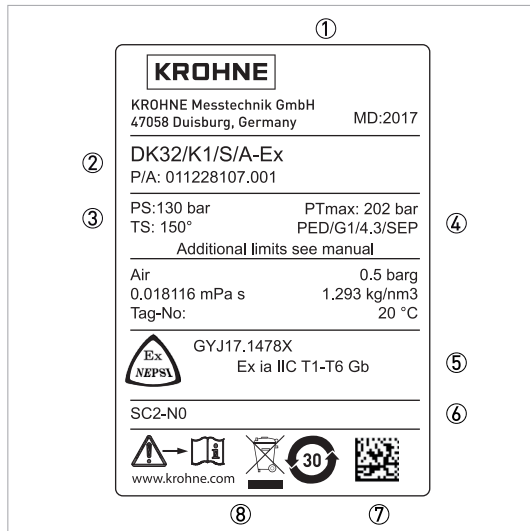


Figure 2-2: Example of nameplate

- ① Manufacturer name and address
- ② Product designation
- ③ Sizing data: temperature & pressure rating
- ④ PED data
- ⑤ Marking according to NEPSI and permissible ambient temperature range
- ⑥ Built-in equipment
- ⑦ Data matrix
- ⑧ Safety instructions, disposal symbol and China RoHs symbol

2.4 Flammable products

Atmospheric conditions:

An explosive atmosphere is a mixture of air and flammable gases, vapours, mists or dusts under atmospheric conditions. The following values define it:

$T_{\text{atm}} = -20...+60^{\circ}\text{C} / -4...+140^{\circ}\text{F}$ 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, regardless of the zone assignment, is fundamentally not applicable due to the lack of key safety data for the interior of the measuring section.



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 medium must be 10^{-8} S/m , in order to avoid danger from electrostatic charge.

2.5 Device category

Variable area flowmeters are designed in accordance with GB 3836.1-2010 and GB 3836.4-2010 for use in zone 1.

The inside of the measuring unit is also approved for zone 1.



INFORMATION!

Definition of zone 1:

An area in which an explosive atmosphere, as a result of the mixture of flammable substances in the form of gas, steam or mist with air, under normal operation may occasionally occur.

2.6 Protection types

The variable area flowmeter is designed in the type of protection "intrinsic safety", protection level "ia".

The marking for equipment protection level Gb is:

Ex ia IIC T1-T6 Gb

The marking contains the following information:	
Ex ia	Explosion protection type "intrinsic safety", level of protection "ia"
IIC	Gas group, suitable for gas groups IIC, IIB and IIA
T1-T6	Temperature class range, suitable for temperature classes T1 to T6
Gb	EPL, suitable for zone 1 and zone 2



INFORMATION!

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

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

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. 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.*

DK3./.././../A-Ex permissible product and ambient temperatures

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

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 μ H

3.1 Installation

Mounting and setup must be carried out according to the applicable installation standards (e.g. GB 3836.15) by qualified personnel trained in explosion protection. The information given in the standard documentation and the supplementary instructions must be observed at all times.

Variable area flowmeters must be installed in such a way that

- there is no danger from mechanical impact effects.
- no external forces are affecting the indication unit.
- 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.

3.2 Special conditions and requirements

Electrostatic charge

For the versions with plug connector (type code is S), friction on the surface of the plastic plug connector should be avoided in case there will cause the ignition by electrostatic accumulation.

Special requirements

- Only be connected to the certified associated apparatus, the flowmeter could be used in the explosive atmosphere. The connection should be complied with the requirements of the manual of the associated apparatus. The maximum values for connection to a certified associated apparatus are shown in the section "Electrical data".
- The correlation between the temperature classification and the permissible maximum ambient temperature for limit switch is shown in the attachment to its individual certificate, at the same time the permissible ambient temperature of the flowmeter doesn't higher than the less permissible maximum ambient temperature between the flowmeter and the limit switch at the same temperature classification.
- Users are forbidden to change the configuration to ensure the explosion protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.
- During installation, operation and maintenance refer to the relevant instructions in the standard documentation,
GB3836.13-2013 "Explosive atmospheres - Part 13: Equipment repair, overhaul and reclamation",
GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres - Part 15: Electrical installations in hazardous areas (other than mines)",
GB50257-2014 "Code for construction and acceptance of electric device for explosive atmospheres and fire hazard electrical equipment installation engineering".

4.1 General notes

For version DK3./../S../A-Ex (plug), the separate intrinsically safe signal circuits with level of protection "ia" or "ib" are electrically connected in the terminal compartment of the plug housing. 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

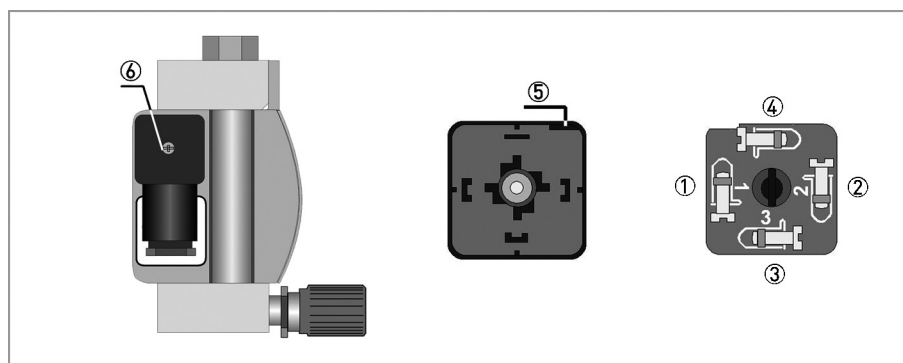
The connecting cables must be selected according to prevailing installation standards. The outer diameter of the connecting cable must be within the sealing range of the cable entry. The connecting cables must be fixed and laid in such a way that it is sufficiently protected against damage.

All cores that are not used must be securely connected to the earth potential of the hazardous area or carefully insulated against each other and against earth (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. 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 minusMax minus	green
④	Max plus	brown
⑤	Lift slot	
⑥	Fastening screw of connection box	

4.2 Connection assignment

The electrical connection of the limit switches is implemented at the version with connector (S) in the wiring space of the connector housing in accordance with the connection diagram shown in the standard instructions.

Connecting cable

The connecting cables for the intrinsically safe circuits are to be selected in accordance with the valid installation standards.

4.3 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.

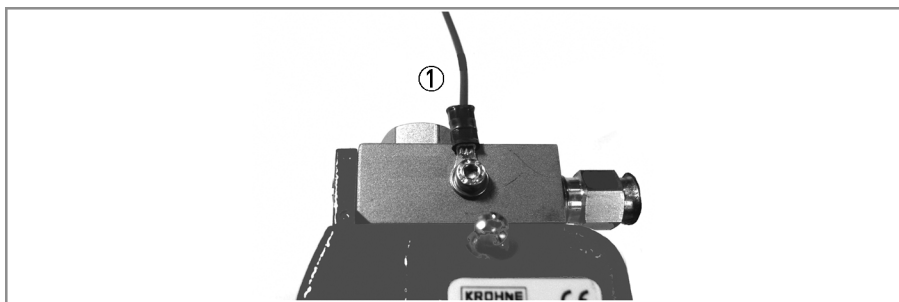


Figure 4-1: Position of the ground terminal

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

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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