DK32 DK34 Supplementary instructions

Variable area flowmeter with electrical built-ins

Equipment category Ex nl

KROHNE

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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 Ex nL IIC T1...T6. They complement the Installation and Operation Instructions 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the Installation and Operation Instructions for the non-explosion protected versions apply unchanged unless excluded or superseded by these Instructions.

1.2 Conformity

The DK32, DK34 variable-area flowmeters series has been approved by NEPSI (National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation in China) under Certification No.

GYJ05318

This certificate can be downloaded under www.krohne.com.

1.3 Safety information

Mounting, installation, (initial) start-up and maintenance work in connection with hazardous-duty equipment may only be carried out by personnel who have received training in explosion protection!

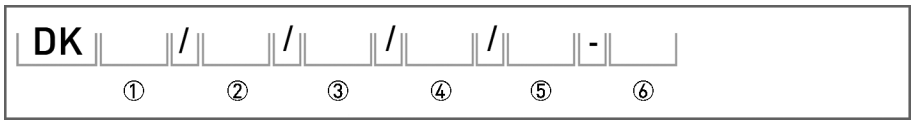
CAUTION!
The operator respectively his agent is responsible to follow further standards, directives or laws if required due to operating conditions or place of installation.

2.1 Device description

Variable area flowmeters are used to measure and display volume flows of flammable and non-flammable gases and liquids. Depending on the device version, electrical limit switches can be built into the indicator part.

2.2 Description code

The safety description code * consists of the following elements:

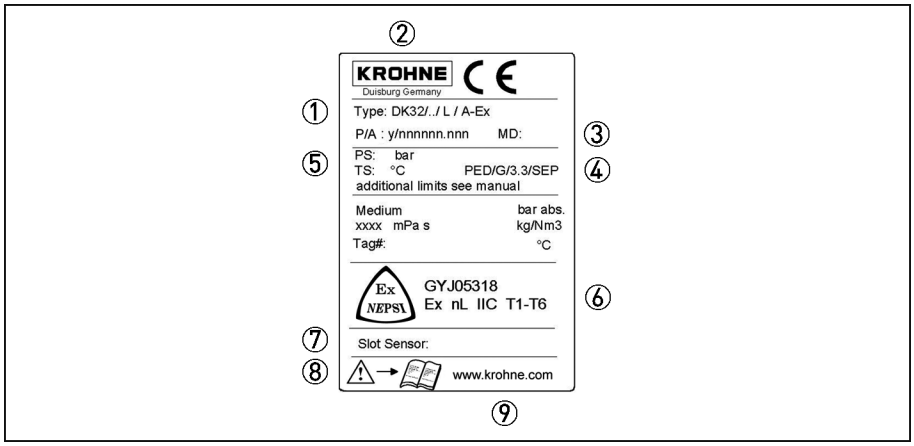


① 32 - with valve and horizontal connection / 34 without valve and vertical connection
② RE - inlet pressure regulator / RA - outlet pressure regulator
③ K1 - one limit switch / K2 - two limit switches
④ L - cable gland incl. cable
⑤ HT - high-temperature version
⑥ Ex - Explosion-protected equipment

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

2.3 Marking

The type marking of the instrument is realized visibly with the rating plate shown below. The interior of the display has an additional marking with the serial number (P/A).



① Device type
② Manufacturer
③ Year of manufaction
④ PED data
⑤ Sizing data: temperature & pressure rating
⑥ Ex-data
⑦ Built-in equipment
⑧ Note manual
⑨ KROHNE website

2.4 Flammable products

Atmospheric conditions

An explosive atmosphere is defined as a mixture of air and flammable gases, vapours, mists or dusts under atmospheric conditions with the values
T_{atm} = -20°C...+60°C / -4°F...140°F and P_{atm} = 0,8...1,1bar.
Outside of this range, no key data are available as to ignition behaviour for most mixtures.

Operating conditions

Variable area flowmeters operate outside of atmospheric conditions, which means that explosion protection according to Directive 94/9/EC (ATEX) – regardless of the zone assignment – is fundamentally not applicable due to the lack of key safety data for the interior of the measuring section.

CAUTION!
Operation with flammable products is only permissible if no explosive fuel/air mixture is formed on the interior of the flowmeter under operating conditions. The user is responsible for the safe operation of the flowmeter with regard to the temperatures and pressures of the products used. In case of operation with flammable products the measuring sections must be included in the periodic pressure tests of the system.

2.5 Device category

The series is certified in type of protection Ex nL for use in Zone 2.

2.6 Types of protection

The variable area flowmeter is designed with type of protection intrinsic safety, level of protection nL.

The marking is: **Ex nL IIC T6**

The marking contains the following information:	
nL	Intrinsically safe, level of protection level "nL"
IIC	Suitable for gas groups IIC, IIB and IIA
T6	Suitable for temperature classes T6 ...T1

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 installation and operating 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./../../../../.–Ex permissible medium and ambient temperatures

			Maximum permissible medium temperature			
	Ambient temperature		Type DK32		Type DK34	
Temperature class	[°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
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

2.8 Electrical data

Design DK3./../.././../A–Ex

U_i	20 VDC
I_i	25 mA
P_i	64 mW

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

Type of limit switch	C_i	L_i
SC2-N0	150 nF	150 µH
SJ2-SN / SJ2-S1N	30nF	100 µH

The terminal assignment is according to the standard Installation and Operating Instructions.

2.9 Installation

Installation and setup must be carried out according to the applicable installation, installation standards (e.g. EN 60079-14), by qualified personnel trained in explosion protection. The information given in the Installation and Operation Instructions and the Supplementary Installation and Operation Instructions must always be observed.

Variable area flowmeters must be installed in such a way that

- 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 for 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.

3.1 General notes

For version DK3./../../S/../.-Ex (plug), the separate intrinsically safe signal circuits with level of protection "ia", "ib" or "nL" are electrically connected in the terminal compartment of the plug housing and for version DK3./../../L/../.-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 in such a way as to be 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 ≥ 500 V_{eff}).

Cable entries / Blanking plugs

The DK3./../../S/../.-Ex variable area flowmeter is equipped with a connector. The connector guarantees protection from foreign bodies and water (protection category) IP65 as per 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...9mm).

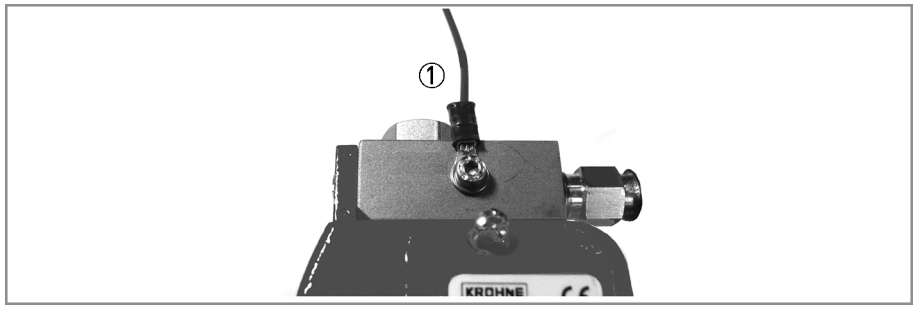
Limit switch connections

Contact	Cable colors of assembled cable
Min minus	white
Min plus	yellow
Max minus	green
Max plus	brown

3.2 Earthing and equipotential bonding

If the device is not sufficiently electrostatically grounded via the process cables, an additional earth connection must be established using the earth screw ①. The position of the ground terminal is illustrated below. The connection guarantees only an electrostatic connection of the device and does not comply with the requirements of an equipotential bonding connection.

DK32 - DK34



4.1 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 user of the system must have it checked before start-up in compliance with the national regulations for checks before startup.

4.2 Operation

Setting of the limit switches may be carried out during operation. Remove the housing cover to this purpose. The housing cover has to be closed immediately after the limit switches have been set.

5.1 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 tests are required in order to maintain the proper condition.

The following checks are recommended:

- Inspection of the housing, the cable entries and the feed lines for corrosion and damage.
- Checking the measuring section and the piping connections for leaks.

The cover is to be closed following maintenance work on the signal converter.

5.2 Dismantling

Replacing the display part

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

CAUTION!
There may be a loss of measuring accuracy!

Exchanging the entire device

Removal and installation is the user's responsibility.

Any replacement and removal should take place in a de-energized state if 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!

- *Pressurized pipes must be depressurized before removing the measuring section.*
- *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 seals must be used when re-installing the device in the piping.*

KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

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