DK37/M8 - H250/M8 Supplementary Instructions

Variable area flowmeter with electrical built-ins

Equipment category II 2 G

KROHNE

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 installation and operation instructions for the non-explosion protected versions.

The information given in these instructions contains only the data relevant to category 2 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the installation and operation instructions for the non-explosion protected versions apply unchanged unless excluded or superseded by these instructions.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 EC conformity

Under his sole responsibility, the manufacturer hereby declares conformity with the protection goals of Directive 94/9/EC for use in hazardous areas.

The EC Type Examination Certificate of the Physikalisch Technische Bundesanstalt (PTB) forms the basis of the EC Declaration of Conformity:

PTB 01 ATEX 2202

If required the EC Type Test Certificate can be downloaded under www.krohne.com.

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!

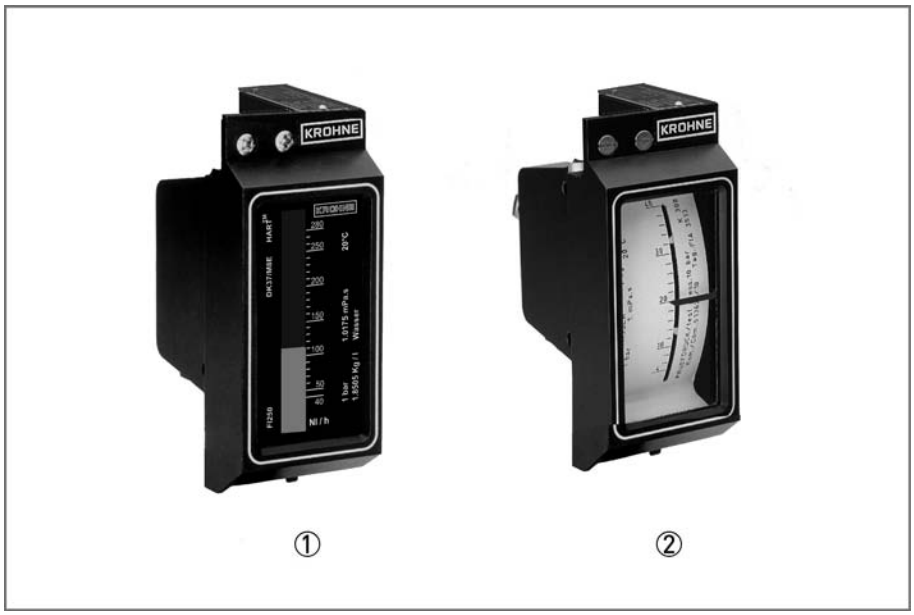
CAUTION!
The operator or his agent is responsible for observing any additional standards, directives or laws if required due to operating conditions or place of installation. This applies in particular to the use of easily detachable process connections when measuring flammable media.

2.1 Device description

Variable area flowmeters are used to measure and display volume flows of flammable and non-flammable gases and liquids.

The M8E ① indicator houses a signal output 4...20 mA with a bar graph indicator.

The M8M ② indicator houses two separately adjustable electrical limit switches.



2.2 Description code

Type series H250

The safety description code * consists of the following elements:

① Type series measuring unit H250

② Materials / versions
RR - Stainless Steel
C - PTFE or PTFE with ceramic liner
HC - Hastelloy
Ti - Titanium
F - aseptic version (food)

③ Series of indicators
M8 - Indicator M8

④ Design of indicator M8
MG - Mechanical indicator
EG - Electronic indicator with signal output 4...20 mA

⑤ Limit switch - M8MG design
K1 - Design with a limit switch (upper or lower)
K2 - Design with two limit switches

Type series measuring unit DK37

The safety description code * consists of the following elements:

① Type series measuring unit DK37

② M8 indicator type series

③ Design of indicator
M - Mechanical indicator
E - Electronic indicator with signal output 4...20 mA

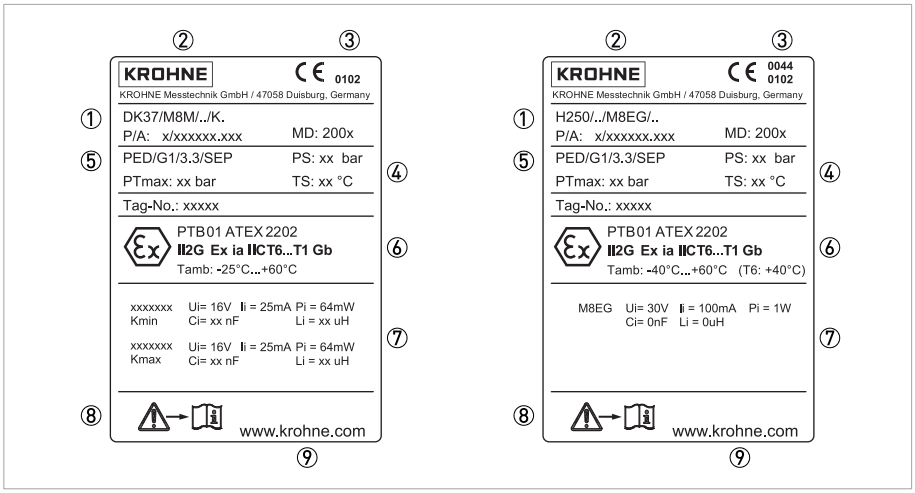
④ Differential pressure regulators
RE - inlet pressure regulator
RA - outlet pressure regulator

⑤ Limit switch (only M8M indicator)
K1 - One limit switch
K2 - Two limit switches

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

2.3 Marking

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



① Device type
② Manufacturer
③ Notified ATEX (PED body)
④ Sizing data: temperature & pressure rating
⑤ PED data
⑥ Ex data
⑦ Electrical connection data
⑧ Note manual
⑨ KROHNE website

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_{atm} = -20°C...+60°C / -4°F...+140°F and P_{atm} = 0.8...1.1 bar / 11.6...15.9 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} S/m, in order to avoid danger from electrostatic charge.

2.5 Device category

The flowmeters are designed in Category II 2G 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 with type of protection intrinsic safety, level of protection "ia" as per EN 60079-11.

The marking II 2G Ex ia IIC T6...T1 Gb contains the following information:

II	Explosion protection Group II
2	Device category 2
G	Gas explosion protection
ia	Intrinsically safe, level of protection "ia"
IIC	Suitable for gas groups IIC, IIB and IIA
T6...T1	Suitable for temperature classes T6 ...T1
Gb	EPL, suitable for zone 1 or zone 2

2.7 Ambient temperature / temperature classes

Because of the influence of the temperature of the product, no fixed temperature class is assigned to variable area flowmeters. In fact, the temperature class of a device is a function of the temperature of both the product and the environment. A distinction is made between devices with signal output 4...20 mA and limit switches. There is no distinction between devices with one or two contacts. 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 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.

DK37/M8./../.. permissible medium and ambient temperatures

Temperature class	Ambient temperature up to		Maximum permissible medium temperature			
			Type DK37/M8E/..		Type DK37/M8M/..K.	
	[°C]	[°F]	[°C]	[°F]	[°C]	[°F]
T6	+40	+104	+60	+140	+85	+185
	+50	+122	-	-	+85	+185
	+60	+140	-	-	+70	+158
T5	+40	+104	+100	+212	+100	+212
	+50	+122	+85	+185	+100	+212
	+60	+140	+65	+149	+100	+212
T4	+40	+104	+135	+275	+135	+275
	+50	+122	+130	+266	+135	+275
	+60	+140	+115 ①	+239 ①	+135	+275
			+90 ②	+194 ②		
T3...T1	+40	+104	+145	+293	+200	+392
	+50	+122	+130	+266	+200	+392
	+60	+140	+115 ①	+239 ①	+200 ①	+392 ①
			+90 ②	+194 ②	+140 ②	+284 ②

① Temperature resistance of the cable ≥ +80°C / +176°F
② Temperature resistance of the cable ≥ +70°C / +158°F

H250/../M8.G/.. permissible product and ambient temperatures

Temperature class	Ambient temperature up to		Maximum permissible medium temperature			
			Type H250/../M8EG/..		Type H250/../M8MG/../..	
	[°C]	[°F]	[°C]	[°F]	[°C]	[°F]
T6	+40	+104	+75	+167	+85	+185
	+50	+122	-	-	+85	+185
	+60	+140	-	-	+85	+185
T5	+40	+104	+100	+212	+100	+212
	+50	+122	+100	+212	+100	+212
	+60	+140	+70	+158	+100	+212
T4	+40	+104	+135	+275	+135	+275
	+50	+122	+135	+275	+135	+275
	+60	+140	+135 ①	+275 ①	+135	+275
			+90 ②	+194 ②		
T3...T1	+40	+104	+200 ①	+392 ①	+200	+392
			+190 ②	+374 ②		
	+50	+122	+185 ①	+365 ①	+200	+392
			+145 ②	+293 ②		
	+60	+140	+145 ①	+293 ①	+200	+392
			+90 ②	+194 ②		

① Temperature resistance of the cable ≥ +80°C / +176°F
② Temperature resistance of the cable ≥ +70°C / +158°F

The minimal permissible ambient temperature depends on the display and the built in limit switches:

Type	Electrical built in	Minimum ambient temperature
H250/../M8EG DK37/M8E/../..	Signal output 4...20 mA	-40°C / -40°F
H250/../M8MG DK37/M8M/../..	SJ2-S1N SC2-N0	-25°C / -13°F
H250/../M8MG DK37/M8M/../..	I7S2002-N SJ2-SN	-40°C / -40°F

2.8 Electrical data

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

Version DK37/M8E/.. and H250/../M8EG

U_i	30 VDC
I_i	100 mA
P_i	1000 mW

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

C_i	≈ 0
L_i	≈ 0

Version DK37/M8M/../K. and H250/../M8MG/K.

U_i	16 VDC
I_i	25 mA
P_i	64 mW

Depending on the built in limit switches the following values are to be observed for each intrinsically safe circuit in case of interconnection:

Type of limit switch	I7S2002-N SC2-N0	SJ2-SN	SJ2-S1N
C_i	165 nF	45 nF	75 nF
L_i	150 µH	100 µH	100 µH

The values specified for C_i and L_i also take into account the capacities and inductances of the internal EMC filter.

3.1 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 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

The limit switch or electronic signal output with protection level "ia" or "ib" is electrically connected in the terminal compartment of the display housing. Permissible maximum values (electrical data) must be observed. Observe the specified polarities.

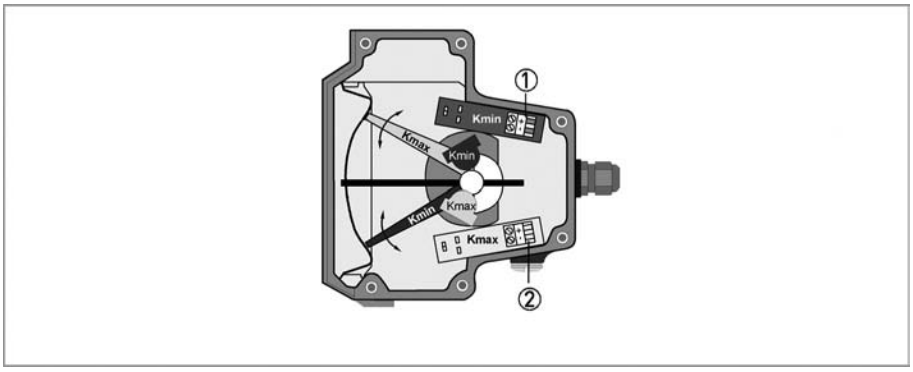
Connecting cable

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 earth potential of the hazardous area or carefully insulated against each other and against earth (test voltage ≥ 500 V_{eff}).

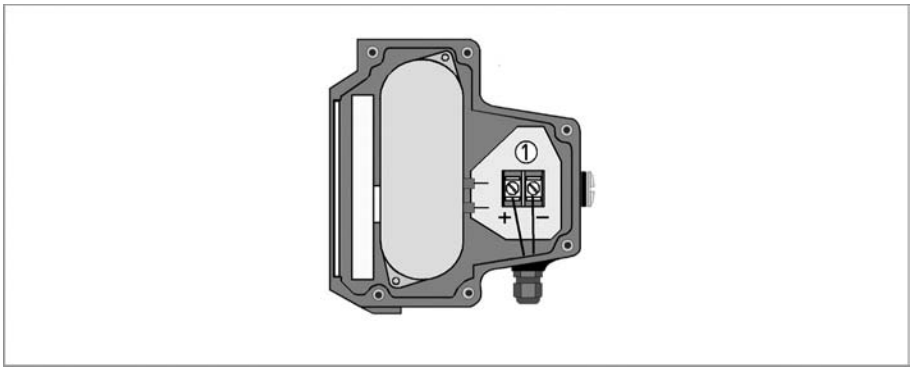
Connection diagrams

Indicator M8M - M8MG



① Terminal Kmin
② Terminal Kmax

Indicator M8E - M8EG



① Terminal signal output 4...20 mA

Cable entries / Blanking plugs

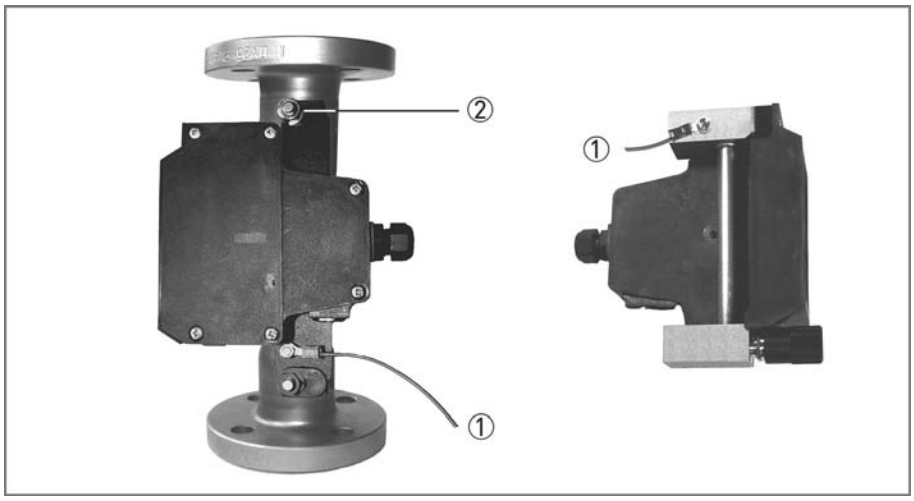
The variable area flowmeter is equipped as standard with a blanking plug and a cable entry. These elements guarantee protection from foreign bodies and water (protection type) IP65 as per EN 60529.

The cable entries provided also ensure protection from foreign bodies and water. The nominal diameter range of the cable entries is 3...7 mm.

Suitable blanking plugs and seals are to be used for unused cable entries. Ensure that the seals are tight.

4.2 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.



For the H250/../M8.G/.. designs also ensure proper fit of the mounting screws ②.

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

5.2 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.

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 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 piping connections and the measuring unit as well as the needle valve, if necessary, for leaks.
- Include the flowmeter in the regular pressure testing of the process line.

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

6.2 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 are the responsibility of the operator.

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 to be depressurized before removing the flowmeter.*
- *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.*

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Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
47058 Duisburg (Germany)
Tel.: +49 203 301 0
Fax: +49 203 301 10389
info@krohne.com

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com

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