



H250 M10 Supplementary instructions

Variable area flowmeter

Equipment category II 2G



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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 complement the standard documentation 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details given in the standard documentation for the non-explosion protected versions apply unchanged unless excluded or superseded by these Instructions.

1.2 EC conformity

The manufacturer declares with the EC Declaration of Conformity on his own responsibility conformity with the protection goals of Directive 94/9/EC for use in hazardous areas with gas.

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

PTB 01 ATEX 1154

The EC type test certificate may be downloaded from the manufacturer's website as needed.

1.3 Safety instructions

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



CAUTION!

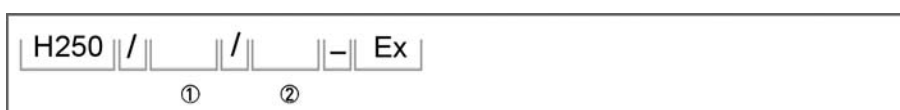
The operator respectively his agent is responsible to follow further standards, directives or laws if required due to operating conditions or place of installation. This applies particularly for the use of easy detachable process connections such as SMS or Clamp when measuring flammable mediums

2.1 Device description

Variable area flowmeters measure and display the volume flow of flammable and non-flammable gases and liquids. The display unit contains a 4...20 mA signal output with optional HART® communication, two programmable electronic switch outputs and a reset input.

2.2 Description code

The safety description code * consists of the following elements:

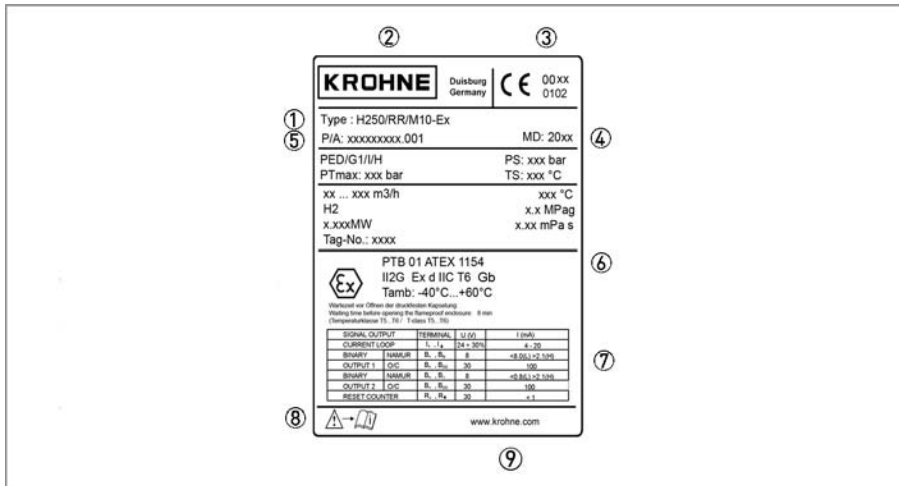


- ① Materials / versions
 - RR - Stainless Steel
 - C - PTFE or PTFE/ceramics
 - HC - Hastelloy
 - Ti - Titanium
 - F - aseptic version (food)
- ② Series of indicators
 - M10 - Converter M10

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

2.3 Marking

Type designation of the complete unit is shown on the indicator with the nameplates reproduced below (see also description code).



- ① Device type
- ② Manufacturer
- ③ ATEX & DGR code
- ④ Year of manufacture
- ⑤ Production order No.
- ⑥ Ex data
- ⑦ Electrical connection data
- ⑧ Observe operating instructions
- ⑨ Manufacturer's website

Additional markings on the housing cover:

- SN - serial number
- SO - sales order / item
- P/A - order
- Vxxx - product configurator code
- AC - article code

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

$T_{\text{atm}} = -20\dots+60^{\circ}\text{C} / -4\dots+140^{\circ}\text{F}$ and $P_{\text{atm}} = 0.8\dots1.1 \text{ bar}$.

Outside of this range, no key data are available as to ignition behaviour for most mixtures.

Installation 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.



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 for ensuring that the flowmeter is operated safely as regards 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-liner, nonconductive) the min. conductivity of the medium must be 10^{-8} S/m , in order to avoid the electrostatic charge.

2.5 Equipment category

Variable area flowmeters are designed according to EN 60079-0:2009 and EN 60079-1:2007 in Category II 2 G for use in zone 1. The parts inside the measuring unit are also approved for use in zone 1.



INFORMATION!

Definition of zone 1 acc. to EN 1127-1, Appendix B:

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

2.6 Protection types

The variable area flowmeter is designed with protection type flameproof enclosure "d", acc. to EN 60079-1.

The marking is: **II 2G Ex d IIC T6**

The marking contains the following information:	
II	Explosion protection Group II
2	Equipment category 2
G	Gas explosion protection
Ex d	Electronics compartment - protection type flameproof enclosure "d"
IIC	Suitable for gas groups IIC, IIB and IIA
T6	Suitable for temperature classes T6 ... T1
Gb	EPL, suitable for zone 1

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. Please see the following tables for the assignments.

The tables take into account the following parameters:

- Maximum values P_v
- Ambient temperature T_{amb} .
- Product temperature T_m
- Heat resistance of the connecting cable



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 standard documentation.*
- *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.*

For certain device version, lower values apply due to differing boundary conditions (e.g. lining materials). Here the user should consult the technical data sheet.

Maximum permissible product and ambient temperatures per temperature class

Temperature class	Ambient temperature		Product temperature at permanent service temperature of connecting cable					
			70°C / 158°F		80°C / 176°F		90°C / 194°F	
	[°C]	[°F]	[°C]	[°F]	[°C]	[°F]	[°C]	[°F]
T6	-40...+60	-40...+140	85	185	85	185	85	185
T5	-40...+50	-40...+122	100	212	100	212	100	212
	-40...+60	-40...+140	85	185	100	212	100	212
T4	-40...+50	-40...+122	135	275	135	275	135	275
	-40...+60	-40...+140	85	185	135	275	135	275
T3...T1	-40...+40	-40...+104	180	356	200	392	200	392
	-40...+50	-40...+122	135	275	190	374	200	392
	-40...+60	-40...+140	85	185	145	293	200	392

The cable glands and line entries must have the same degree of thermal stability as the connecting cable.

The minimum product temperature is -40°C / -40°F.

2.8 Electrical data

Electrical equipment	Rated voltage	Nominal current
Signal output M10	24 VDC ± 30%	4...20 mA with HART® communication
Binary outputs B1 and B2	8...30 VDC	max. 100 mA
Reset input	5...30 VDC	≤ 1 mA

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 manuals and the supplementary instructions must be observed at all times.

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 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

Equipotential bonding

Variable area flowmeters must be included in the equipotential bonding of the hazardous area.

Electronics compartment lock

The variable area flowmeter's flameproof electronics compartment must be locked during operation. The cover of the electronics compartment is secured by a lock. An SW3 Allen screw is used for the safety screw. With temperature classes T6 and T5, a waiting time of 8 minutes must be observed prior to opening. For temperature classes T4...T1 the waiting time is not needed.

4.1 General notes

Rated values for insulation

- The insulation of the H.../.../M10 - Ex variable area flowmeters is rated in compliance with IEC 60 664-1. The following rating parameters are taken into account:
- Overvoltage category for signal and instrument loops: II
- Pollution degree of the insulation: 2

Terminal compartment

The electrical connections for the power supply and I/O functions are located in the signal converter's electronics compartment. The protection type of the electronics compartment is "d". Unused openings shall be closed in compliance with EN 60079-1. The cables can be routed into the flameproof electronics compartment in two different ways.

- Direct entry of the connecting cables by way of approved flameproof cable glands (M20x1.5) into the flameproof terminal compartment ($V \leq 2000\text{cm}^3$). The cable glands require a separate test certificate in accordance with EN 60079-1. Observe the requirements of the test certificate for the cable glands.
- Direct entry of the connecting cables by way of conduits into the flameproof enclosed terminal compartment of the device. Once the conduit has been screwed in, it must form a flameproof joint with the housing with a minimum thread length of 8 mm. A suitable mechanical stopping box must be provided in accordance with installation provisions. The conduit must be installed in compliance with its separate test certificate.

Connecting cables

Connecting cables shall comply with relevant installation standards (e.g., EN 60079-14 / VDE 0165). The outer diameter of the connecting wires shall conform to the cable clamping area for the supplied cable entries.

The wiring for the variable area flowmeter's electrical connection shall be fixed.



CAUTION!

The IP protection category of the signal converter housing is largely determined by the cable gland used and the installation.

4.2 Power supply

The variable area flowmeter does not require a separate power supply. The required supply for the built-in electronics is provided via the 4...20mA current output.

4.4 Earthing and equipotential bonding

The signal converter shall be connected to the equipotential bonding system of the hazardous area via the external grounding connection on the signal converter housing. The measuring unit and the signal converter are electrically connected via an equipotential bonding conductor.

Any existing cable shields should be connected to earth according to applicable installation regulations (EN 60079-14). A terminal connection in the terminal compartment permits a short way earthing of the cable shields.



- ① External grounding connection
- ② Internal grounding connection

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.
- and the electronics compartment have been properly closed (pressure-resistant casing) and the applicable special lock has been fitted.

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

If the device needs to be configured due to the existence of an explosive atmosphere, this can be done using the supplied programming magnets. There is no need to open the housing as it can be done through the glass window of the electronics compartment or digitally via the signal output (HART® interface).

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.

When it comes to flammable products, the measuring sections must be included in the periodic pressure tests of the system.

Opening the housing of the electronics compartment (protection type flameproof enclosure) in hazardous areas is only permitted in a de-energised state and after complying with the waiting time. The waiting time (8 minute) only applies to temperature classes T6 and T5.



CAUTION!

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.

To maintain proper condition, regular inspections are required for systems in hazardous areas.

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.
- Checking the measuring unit and the indicator for dust deposits.
- Including the flowmeter in the regular pressure test of the process line.



CAUTION!

Avoid electrostatic charges when cleaning the surfaces (e.g. sight window).

6.2 Dismantling

General notes

If it is absolutely necessary to open the flameproof enclosure of the electronics compartment in the presence of a potentially explosive atmosphere, the device must be de-energised. For temperature classes T6 and T5, be absolutely sure to wait until the time shown on the converter nameplate has elapsed before opening the flameproof enclosure (8 minutes). The waiting period is not necessary for any of the other temperature classes.

Before connecting or disconnecting the electrical connection cables of the device, make sure that all cables leading to the converter are isolated from the ground of the hazardous area. This also applies to protective earth (PE) or functional earth (FE) and equipotential bonding conductors (PA).

After opening the converter, grease the converter's flashback resistant cover threads including the cover seals if necessary. Use the multi-purpose grease NONTRIBOS[®], type Li EP2.

Replacing the signal converter / display

The device should be de-energised before opening the flameproof enclosure.



CAUTION!

Only displays that are identical in construction and complete signal converter housings may be swapped. Individual device inserts may not be exchanged! When exchanging signal converters, compare the type plates. Only signal converters that are identical in construction may be exchanged

The display can be exchanged once the flameproof enclosure of the electronics compartment has been opened. When exchanging a complete display, refer to the section "Connecting power and I/O functions". In both cases, the measuring tube of the variable area flowmeter can remain in the pipeline, even when the product is flowing.

**CAUTION!**

Faulty prisms between the measuring tube and the display housing should be replaced.

Exchanging the entire device

Observe the information above. Also, ensure that all process connections and the pipeline are depressurized and free of product. Where environmentally critical products are concerned, carefully decontaminate the wetted parts of the flange system after dismantling.



KROHNE product overview

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

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