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# Supplementary Installation and Operating Instructions Variable Area Flowmeter

# H 250/../M9S..


## Category II3GD

- Variable area flowmeters
- Vortex flowmeters
- Flow controllers
- Electromagnetic flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Level measuring instruments
- Communications technology
- Engineering systems & solutions
- Switches, counters, displays and recorders
- Heat metering
- Pressure and temperature

## Contents

## 1 General safety information

These additional Instructions apply to the hazardous-duty versions of H250/../M9S... variable-area flowmeters with the marking II3G and II3D. They are supplementary to the Installation and Operating Instructions for the non-hazardous-duty versions.

The information given in these Instructions contains only the data relevant to Category 3 explosion protection. The technical details given in the Installation and Operating Instructions for the non-hazardous-duty versions apply unchanged unless excluded or superseded by these Instructions.

In compliance with European Directive 94/9 EC, a statement of conformity for use in hazardous areas, gas and dust is given by the manufacturer.
The assessment is registered company-internal under KMT-TDZ-A041 X. This register number is also given on the nameplate.
This statement of conformity, together with its boundary conditions, is required to be observed without fail (see Attachment “Statement of Conformity“).

**Mounting, installation, start-up and maintenance work may only be carried out by personnel trained in explosion protection !**

## 2 Main safety characteristics

### 2.1 Category / Zone

Variable-area flowmeters of Type H250/M9S... are designed for the volumetric flowmetering of flammable and non-flammable process products.

The indicator sections are basically designed in Category II3GD for use in Zone 2 and Zone 22 (EN 60 079-14).
Flammable products may be used provided they are not potentially explosive and the variable-area flowmeter is included in the periodic pressure test of the plant. The allowable pressures are given in the standard installation and operating instructions. Devices under category II3D are allowed to install in areas with conductive dust in compliance with European Directive EN 50281-1-2:1998, part 5.

### 2.2 Types of protection

The limit switches and the signal output are designed in type of protection “nA“ (non-sparking apparatus). The signal output features internal circuits which are designed in “nL“ type of protection.
The marking of the internal signal output ESK3-PA (Profibus-PA) and/or one or two limit switches K. is II3G EEx nA II T6.
The marking of the internal signal output ESK II and/or one or two limit switches K. is II3G EEx nA II T6.
The dust protection is assured by housing, which prevents appropriately ingress of dust.
All versions are market II3D IP65 T65°C.

### 2.3 Temperature of surface area (II3D)

Applications in areas with flammable dust the maximum surface temperature must not exceed T65°C with a max. ambient temperature of 60°C and medium temperature of 60°C. Higher medium temperatures determine the surface temperature.

## 2.4 Temperature classes(II3G)

The H250/../M9S... variable-area flowmeters are approved, subject to type, temperature class and ambient temperature, for the process temperatures listed in Tables 1 and 2.

Temperature classification is dependent upon the type of measuring section (meter size) and on the built-in electrical components in the indicator part.

The distinction is made between indicators equipped with limit switches (K.) and those equipped with signal output (ESK II). Where indicators are equipped with signal output and limit switches, the allowable process temperature is defined by the signal output. No distinction is made between indicators with one and two contacts.

Make sure that the surface temperature of the housing must not exceed by externally heating. Pay attention to European Directive EN 1127-1 (1997) part 6.4.2 for devices of category 3.

| Meter size | Version | | Max. permissible process temperature [°C] for use in | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T6 | T5 | T4 | T3 | | T2. T1 | | Heat-resistant cable above a process temp. of | |
| DN | H250/ | HT | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C |
| | M9S/ESK... | | 85 | 100 | 135 | 200 | 183 | 200 | 183 | --- | 150 |
| 15 | M9S/ESK... | X | 85 | 100 | 135 | 200 | 200 | 300 | 300 | --- | 236 |
| 25 | M9S/K. | | 85 | 100 | 135 | 200 | 155 | 200 | 155 | --- | 150 |
| | M9S/K. | X | 85 | 100 | 135 | 200 | 200 | 300 | 300 | --- | 236 |
| | M9S/ESK... | | 85 | 100 | 135 | 200 | 165 | 200 | 165 | --- | 127 |
| | M9S/ESK... | X | 85 | 100 | 135 | 200 | 200 | 300 | 300 | --- | 171 |
| 50 | M9S/K. | | 85 | 100 | 135 | 200 | 140 | 200 | 140 | --- | 127 |
| | M9S/K. | X | 85 | 100 | 135 | 200 | 200 | 300 | 235 | --- | 171 |
| | M9S/ESK... | | 85 | 100 | 135 | 200 | 150 | 200 | 150 | --- | 109 |
| 80 | M9S/ESK... | X | 85 | 100 | 135 | 200 | 200 | 300 | 252 | --- | 145 |
| 100 | M9S/K. | | 85 | 100 | 135 | 200 | 125 | 200 | 125 | --- | 109 |
| | M9S/K. | X | 85 | 100 | 135 | 200 | 190 | 300 | 190 | --- | 145 |

Table 1 Device versions without heating jacket

| Meter size | Version | | Max. permissible process temperature [°C] for use in | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T6 | T5 | T4 | T3 | | T2. T1 | | Heat-resistant cable above a process temp. of | |
| DN | H250/ | HT | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C | $T_{amb} \leq$ 40°C | $T_{amb} \leq$ 60°C |
| | M9S/ESK... | | 85 | 100 | 135 | 200 | 183 | 200 | 183 | --- | 150 |
| 15 | M9S/ESK... | X | 85 | 100 | 135 | 200 | 200 | 300 | 300 | --- | 236 |
| | M9S/K. | | 85 | 100 | 135 | 200 | 155 | 200 | 155 | --- | 150 |
| | M9S/K. | X | 85 | 100 | 135 | 200 | 200 | 300 | 300 | --- | 236 |
| | M9S/ESK... | | 85 | 100 | 135 | 200 | 165 | 200 | 165 | --- | 127 |
| 25 | M9S/ESK... | X | 85 | 100 | 135 | 200 | 200 | 300 | 300 | --- | 171 |
| 50 | M9S/K. | | 85 | 100 | 135 | 200 | 140 | 200 | 140 | --- | 127 |
| | M9S/K. | X | 85 | 100 | 135 | 200 | 200 | 300 | 235 | --- | 171 |
| | M9S/ESK... | | 85 | 100 | 135 | 200 | 150 | 200 | 150 | --- | 109 |
| 50 | M9S/ESK... | X | 85 | 100 | 135 | 200 | 200 | 300 | 252 | --- | 145 |
| 80 | M9S/K. | | 85 | 100 | 135 | 200 | 125 | 200 | 125 | --- | 109 |
| | M9S/K. | X | 85 | 100 | 135 | 200 | 190 | 300 | 190 | --- | 145 |

Table 2 Device versions with heating jacket

**Ambient temperature: -**20°C ... +60°C (T6: +40°C)

The maximum permissible process temperatures apply on the following conditions:

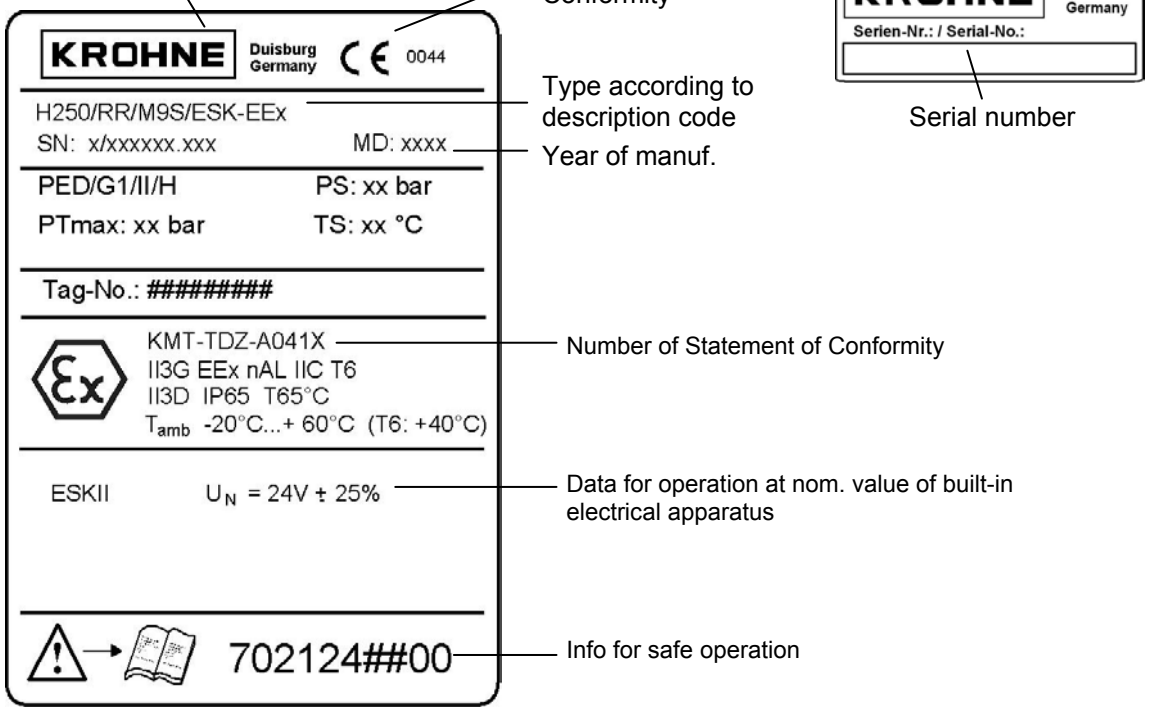
- that the built-in electrical components are operated within their nominal value range,
- that the variable-area flowmeter is operated in its as-intended mounting position,
- that the variable-area flowmeter is not exposed to any heat radiation (e.g. solar radiation, adjacent hot plant parts),
- that pipeline insulation does not obstruct free ventilation of the indicator part.
- Device versions equipped with heating jacket: that the temperature of the heating medium does not exceed the max. permissible process temperature.

Note:
The listed values take only the built-in electrical components into account. Further restrictions may result from operating characteristics (see Technical Data Sheet).

## 3 Marking

Type designation of the complete flowmeter is identified on the indicator by the nameplate shown below. Matching of housing cover and flowmeter is ensured by an additional nameplate which contains the serial number and is attached inside the device.

**Nameplate**




**Supplementary data plate**




The description code is described in the standard Installation and Operating Instructions.

## 4 Mounting and installation

**Important Notes, regard essentially !**

- The connection cables of limit switches and signal output are choosed from installation standards (e.g. EN 60079-14) and local conditions. The connection cables are passed fix and protect against damage.
- The line diameter must be conform to the cable entry.
- Unused cable entries seal with blind plugs. Pay attention to correct position of gaskets.
- For non intrinsically circuits in Zone 2 / Zone 22 use only non sparkling instrument, which are suitable for Zone 2 / Zone 22.
- Connections and disconnections of non intrinsically circuits under supply are allowed only for installation and maintenance. Be sure for non explosion hazard.
- Be sure that the temperature of heat medium devices with heat jacket not exceed the medium temperature (see table 2).
- Connect limit switches K only to isolating switching amplifier (refer to EN 50227). If limit switches K in Zone 2 are connected to non intrinsically safe circuits be sure that the supply voltage do not increase of more than 40%.
- Use a fuse of 50mA, if the signal output ESK II is connected to power supply with a short-circuit current > 100mA. Please note, that the variable area flowmeter is approved for mechanical hazard to EN 50014 (max. perm. funct. impact energy 4/2 Joule).
- Mounting and installation work to be carried out in conformity with the valid installation standards for hazardous areas (e.g. EN 60079-14 / VDE 0165) by specialist personnel trained in explosion protection.

The information given in the standard Installation and Operating Instructions, the Supplementary Installation and Operating Instructions for Category 3G equipment, and the Statement of Conformity (see Attachment A.1) shall be observed without fail.

Verify suitability of the variable-area flowmeter for the application in question by checking the information given on the nameplate. Check compatibility of process product with the wetted parts against the data specified in the order.

Special attention should be paid to the following points when installing.

### 4.1 Electrical connection

Connect the built-in electrical components only when disconnected from the supply!
When connecting the built-in electrical components of the VA flowmeters, be sure to meet the following conditions:

- Limit switches

  The limit switches for the VA flowmeter may only be connected to separated circuits via NAMUR disconnectors to e.g. EN 52 227 with the following nominal values:

  $U_i \leq 8$ VDC to Ri ≥ 1k Ohms
  $I_i = 1$ to 3 mA

  If appropriate measures for limiting transients to EN 50 021 are not provided in the disconnector, the operator shall provide such measures.

- Signal output ESK II

  Connect the signal output in compliance with the nominal voltage of
  $U_N = 24$ VDC ± 25 %

  When connecting to voltage sources with a short-circuit current > 100 mA, provide fuse protection in the form of a fine-wire fuse (nominal value 50 mAT).

- Signal output ESK3-PA, Profibus- PA

  Connect the signal output in compliance with the nominal voltage of
  $U_N$ = max. 24 VDC

  Additional instructions for ESK3-PA see Instrallation and Operating Instructions Profibus- PA.

#### 4.1.1 Equipotential bonding conductor

The indicator parts are equipped with a U-clamp terminal, connecting capacity ≤ 4 mm², for connection of an equipotential bonding conductor.

#### 4.1.2 Terminal assignment

Electrical connection of the built-in electrical components of the indicator part is carried out with the aid of push-lock terminals. These are designed:

- at the limit switches as 3-pin terminals, in two different colours.
- at the signal output as a 2-pin terminal.

The terminal assignment is shown in Table 3 below.

| | Built-in electrical components | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Designation | Kmin. | | | Kmax. | | | ESK. | |
| Connector colour | black | | | grey | | | any | |
| Marking | 1 | 2 | 3 | 4 | 5 | 6 | 11 | 12 |
| Polarity | - | + | --- (1) | - | + | --- (1) | + | - |

Table 3

(1) unassigned terminal

### 4.1.3 Connecting cable

Select the connecting cables for the circuits according to the valid installation standard (e.g. EN 60079-14 / VDE 0165).

## 5 Start-up

Check the following points before initial start-up:

- Suitability of the materials used for the measuring cone and for the gaskets for adequate resistance to corrosion from the liquid product.
- Correct connection of the built-in electrical components.
- Correct setting of the limit switches.
- Correct closure of the housing and all bore holes (class of protection min. IP 54)

## 6 Operation

During operation it is not permitted to open the indicator in the presence of a potentially explosive atmosphere.

## 7 Preventive maintenance

### 7.1 Indicator

The indicator section does not require any maintenance under normal operating conditions and when used for the intended purpose.

Within the scope of checks required to be carried out in hazardous areas to maintain systems in proper working order, the following visual inspections should be carried out at regular intervals:

- inspection of the housing, cable entries and incoming cables for signs of corrosion and damage,
- check of the measuring section for leakages.

### 7.2 Measuring section

The measuring section is maintenance-free under normal operating conditions and when used for the intended purpose. Depending on application, however, the measuring function may in unfavourable cases become impaired through soiling of the measuring cone or the float.
The measuring section should be cleaned as described in the Installation and Operating Instructions for the non-hazardous-duty versions. The measuring section must be dismantled before it can be cleaned. In this connection, refer to the notes on replacement of the overall device (see Section 8.2).

## 8 Dismantling

### 8.1 Replacement of indicator section

Indicator replacement is possible thanks to the modular structure of the variable-area flowmeters. The measuring tube need not be removed and can remain in the pipeline. This also applies to pressurized pipes.

Replacement and removal may only be carried out when the device is disconnected from the supply or the presence of a potentially explosive atmosphere can be positively ruled out.

### 8.2 Replacement of complete flowmeter

The same conditions apply as described in Sect. 8.1.

**Caution!**
Pressurized pipes to be depressurized before removing the measuring section.
Avoid uncontrolled discharge of residual liquid from the measuring section.
In the case of environmentally critical substances, carefully decontaminate the wetted parts of the measuring tube after dismantling.
Removal and installation are the responsibility of the operator.

## 9 Maintenance

Maintenance work of a safety-relevant nature within the meaning of explosion protection may only be carried out by the manufacturer, his authorized representative or under the supervision of authorized inspectors.

# DECLARATION OF CONFORMITY

**Konformitätserklärung | Déclaration de Conformité**

KROHNE
The Level and Flow Company

**KROHNE Messtechnik GmbH & Co. KG, Ludwig-Krohne-Str. 5, D-47058 Duisburg Germany**

We declare herewith under responsibility that the product(s):
Wir erklären hiermit unter alleiniger Verantwortung, daß das Produkt / die Produkte:
Nous déclaration sous notre seule respondabilité que le(s) produit(s):

## H250/..M9./..

Variable Area Flowmeters are in conformity with the protection requirements of Council Directives (as far as applicable):
Schwebekörper-Durchflussmessgeräte konform sind mit den Schutzzielen der Richtlinien des Europäischen Parlaments (sofern zutreffend):
Débimètre à Section Variable soyez dans la conformité avec les conditions de protection des directives du Conseil (autant qu´applicable):

The stipulated safety and public health safety requirements are fulfilled in accordance with the harmonized standards or mentioned technical specifications (as far as applicable):
Der geforderte Sicherheits- und Gesundheitsschutz wird erfüllt in Übereinstimmung mit den harmonisierten Standards oder den angeführten technischen Normen (sofern zutreffend):
La protection de santé/ sécurité exigée est réalisée en accord avec les standards harmonisés ou les normes techniques mentionnées (si appliquant):

| **Directive / Richtlinie** | | **harmonized standards / harmonisierte Standards** | |
|---|---|---|---|
| **89/336/EEC** | **EMC Directive**<br>**EMV Richtlinie** | EN 60947 -5-2 | EN 60947 -5-6 |
| **94/9/EC** | **Ex Directive**<br>**Ex Richtlinie** | EN 1127 -1<br>EN 50014: 1997 +A1 +A2<br>EN 50021: 1999 | EN 13463 -1<br>EN 50020: 1994<br>EN 50281 -1 -1: 1998 |
| **97/23/EC** | **Pressure Equipment Directive**<br>**Druckgeräterichtlinie** | EN 13445 -2 EN 729 -2<br>AD-2000-Merkblatt Reihe B<br>AD-2000-Merkblatt Reihe W | |

The equipment type plates contain due to these directives the following:
Die Kennzeichnung des Gerätes enthält entsprechend den zutreffenden Richtlinien folgende Angaben:
L´inscription de type de l´équipment contient selon les directives des informations suivantes:

| | | **Marking / Kennzeichnung** | | | | |
|---|---|---|---|---|---|---|
| Directive / Richtlinie | Assessment Konformitäts-bewertung | EC Type Approval or Reg.No. | Category Kategorie | Notified Body | Ident. No. | |
| 89/336/EEC | Module A | n.a. | | n.a. | n.a. | CE |
| 94/9/EC | Module A+ | PTB 03 ATEX D127X | II 2 G/D, II 3 G/D | n.a. | n.a. | CE |
| | Module A | KMT-TDZ-A041X | II 3 G/D | n.a. | n.a. | CE |
| | Module B+D | PTB 01 ATEX 2181 | II 2 G | PTB | 0102 | CE |
| | Module H | n.a. | I, II, III | RW-TÜV | 0044 | CE |
| 97/23/EC | Art. 3.3 SEP | n.a. | Art. 3.3 | n.a. | n.a. | n.a. |

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