



## VA40 Supplementary instructions

Variable area flowmeter  
Equipment category II 2 G with electrical components



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## 1.1 General notes

These additional instructions apply to explosion-protected versions of the VA40/././.-Ex variable area flowmeter with the designation II 2 G. They complete the installation and operating 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the installation and operation instructions for the non-explosion protected versions apply unchanged unless excluded or superseded by these instructions.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

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: Conformity with the harmonised standards was verified according to EN 60079-0 and EN 60079-11.

**PTB 05 ATEX 2026 X**

The "X" after the certificate number refers to special conditions for safe use of the device, which have been listed in these Instructions.

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

## 1.3 Security information

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



**CAUTION!**

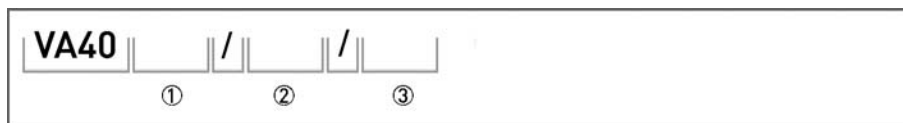
*The operator respectively his agent is responsible to follow further standards, directives or laws if required due to operating conditions or place of installation. This applies particularly for the use of easy detachable process connections such as SMS or Clamp when measuring flammable mediums.*

## 2.1 Device description

Variable area flowmeters measure and display the volume flow of flammable and non-flammable gases and liquids. Up to two separately adjustable electrical limit switches can be mounted to the on-site display.

## 2.2 Description code

The safety description code \* consists of the following elements:



- ① Type of connection
  - V - Screw connection
  - S - Tube socket
  - F - Flange connection
  - A - Aseptic connection, conforming to food standards
- ② Material of the connection
  - R - Stainless steel 1.4404 (316 L)
  - ST - Steel, electroplated and chromized
  - PV - Platics PVDF
- ③ Limit switches
  - K1 - one limit switch
  - K2 - two limit switches

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

### Safety description code TG21:



- ① Inserting limit switch
- ② Version 21

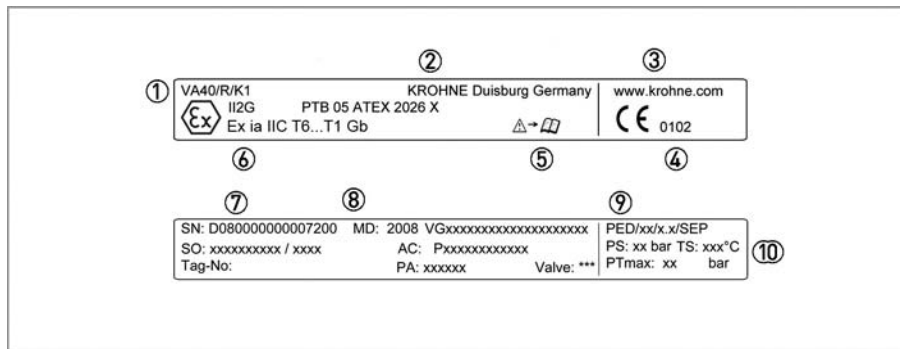
### Safety description code MS14:



- ① Magnetic switch
  - ② Reed cartridge 14
  - ③ without Limit switch with connected cable
- A - Limit switch with terminal box (standard)

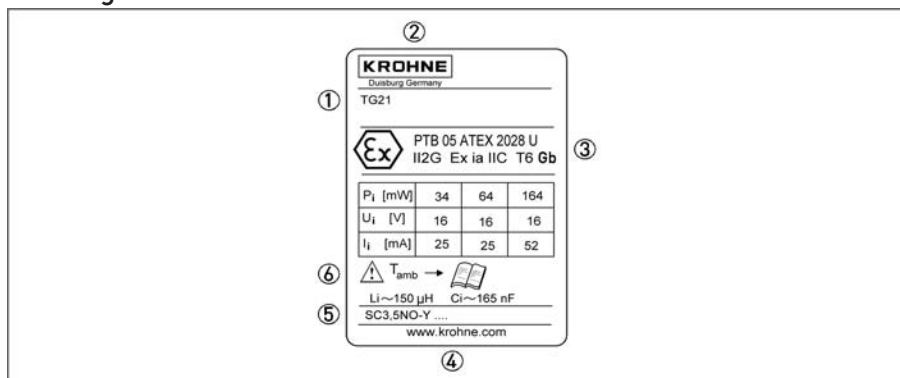
## 2.3 Marking

The marking of the complete device is shown in the following nameplate. The variable-area flowmeter is marked on the roundly housing.



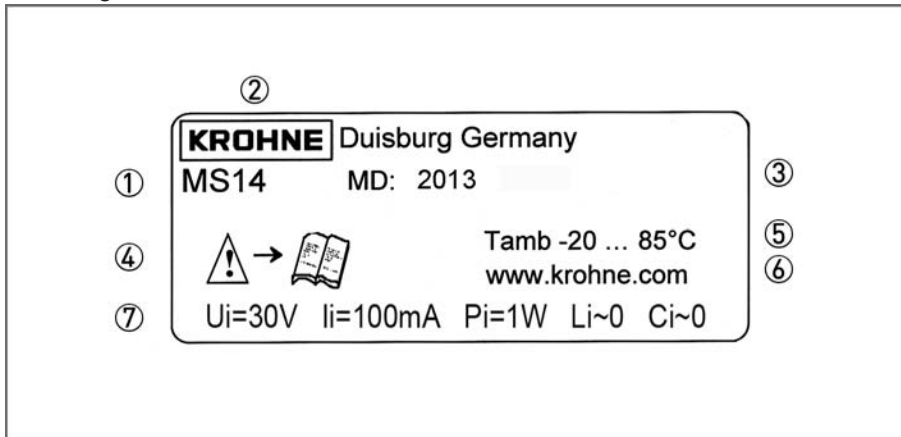
- ① Type of meter
- ② Manufacturer
- ③ Website
- ④ Appointed ATEX body
- ⑤ Pay regard to manual
- ⑥ Ex-data
- ⑦ Serial number
- ⑧ Year of manufacture
- ⑨ PED-data
- ⑩ Design data: Temperature & pressure rating

### Marking Limit switch TG21



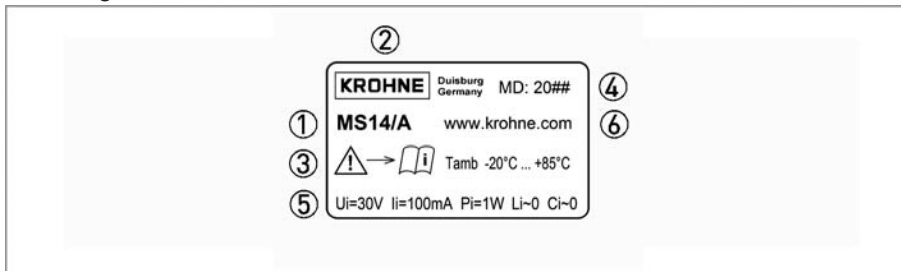
- ① Type
- ② Manufacturer
- ③ Ex data
- ④ KROHNE website
- ⑤ Built-in components
- ⑥ Observe Operation and Installation manual

Marking Limit switches MS14



- ① Type
- ② Manufacturer
- ③ Year made
- ④ Observe Operation and Installation manual
- ⑤ Ambient temperature
- ⑥ KROHNE website
- ⑦ Electrical connection data

Marking Limit switches MS14A



- ① Type
- ② Manufacturer
- ③ Observe Operation and Installation manual
- ④ Year made
- ⑤ Electrical connection data
- ⑥ KROHNE website

No Ex marking for MS14 and MS14/A, because the reed limit switch operates as a simple device and complies to intrinsic safety EN 60079-11 paragraph 5.7.

## 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

$$T_{\text{atm}} = -20^{\circ}\text{C} \dots +60^{\circ}\text{C} / -4^{\circ}\text{F} \dots 140^{\circ}\text{F} \text{ and } P_{\text{atm}} = 0.8 \dots 1.1 \text{ bar.}$$

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 units must be included in the periodic pressure tests of the system.*

## 2.5 Equipment 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 Protection types

The variable area flowmeter is designed with protection type intrinsic safety, protection level "ia" as per EN 60079-11.

The marking is: **II 2G Ex ia IIC T6...T1 Gb**

The marking contains the following information:	
<b>II</b>	Explosion protection Group II
<b>2</b>	Device category 2
<b>G</b>	Gas explosion protection
<b>ia</b>	Intrinsically safe, protection level "ia"
<b>IIC</b>	Suitable for gas groups IIC, IIB and IIA
<b>T6...T1</b>	Suitable for temperature classes T6 ... T1
<b>Gb</b>	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. 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 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.*

### Maximum permissible product and ambient temperatures TG21

Supply	Type 1			Type 2			Type 3		
Temperature class	T6	T5	T4...T1	T6	T5	T4...T1	T6	T5	T4...T1
Max. medium temperature [°C]	70	85	95	60	75	95	35	50	70
Max. medium temperature [°F]	158	185	203	140	167	203	95	122	158

### Maximum permissible product and ambient temperatures MS14/.

The maximum medium and ambient temperature is  $-20^{\circ}\text{C} \dots +85^{\circ}\text{C}$  /  $-4^{\circ}\text{F} \dots +185^{\circ}\text{F}$ .

These values may be limited by the information contained in the installation and operating instructions. The maximum values listed in the installation and operating instructions must be taken into consideration.



## 2.8 Electrical data

### Limit switch TG21

The built-in intrinsically safe NAMUR limit switch TG21 may only be connected to isolation switching amplifiers with separated intrinsically safe circuits to EN 60947 -5 -6 with the following max. values:

#### Maximum values of the power supply units

Supply	$P_i$ [mW]	$U_i$ [V]	$I_i$ [mA]
Type 1	34	16	25
Type 2	64	16	25
Type 3	169	16	52

When connecting to intrinsically safe circuits, take into consideration the following maximum values per circuit for the energy stores.

$C_i$ [nF]	$L_i$ [ $\mu$ H]
165	150

### Limit switch MS14

Built-in limit switch MS14 may only be connected to separate intrinsically safe circuits with the following maximum values:

$P_i$ [W]	$U_i$ [V]	$I_i$ [mA]
1	30	100

When connecting to intrinsically safe circuits, take into consideration the following maximum values per circuit for the energy stores.

$C_i$ [nF]	$L_i$ [ $\mu$ H]
0	0

### 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 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 separate intrinsically safe signal circuits of protection level "ia" or "ib" are electrically connected in the terminal compartment of the plug housing for the limit switch type TG21 and MS14. The limit switch MS14 is connected to the stranded wires. The terminal housing must have a protection class of min. IP20. Take note of the polarities given for the limit switch TG21.

### 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 ground potential of the hazardous area or carefully insulated against each other and against ground (test voltage  $\geq 500 V_{\text{eff}}$ ).

## 4.2 Grounding and equipotential bonding

If the device is not sufficiently electrostatically grounded via the process cables, an additional earth connection must be established using the ground terminal. The location of the ground connection on the back rail is shown below. This connection only ensures electrostatic grounding of the device and does not meet the requirements for equipotential bonding.

### Grounding connection ①



## 5.1 Start-up

Make the following checks before starting up the device:

- Suitability of the materials used for the measuring unit and for the gaskets for adequate resistance to corrosion from the process product.
- Correct connection of the built-in electrical components.
- Correct setting of the limit switches.
- Electrostatic grounding of the instrument.

## 5.2 Operation

Setting of the limit switches may be carried out during operation. For this unscrew the mounting equipment. After setting the limit switch unit to the switchpoint fix it with the fastening screw. Additionally the switching behavior of the limit switch TG21 is to adjust in its terminal box. The switching function of the MS14 is determined by the fitting position of the reed contact. A changing of the position during operation is permitted. Close the unit immediately.

## 5.3 Electrostatic charge

In variable area flowmeters, it is possible under field conditions for charge separation to occur in the measuring tube due to the transport of non-conductive fluids and/or when the flow comes into contact with non-conductive built-ins.

In glass devices, it is basically possible for the electrostatic field generated inside the measuring tube to "punch through" to the outside of the device. For that reason, variable area flowmeters need to be permanently grounded by the operator by way of the process connections in order to allow discharge of electrostatic build-up.

The operator is also responsible for extending the ground continuity of the process pipeline.

If grounding cannot be made via the process connections, e.g. top and bottom connection blocks are made of plastic, the flowmeter should be connected to the local ground potential via the connection to ground described in the section entitled "Grounding and equipotential bonding". This connection only ensures electrostatic grounding of the device and does not meet the requirements for equipotential bonding.

When dust-free gases or liquids are measured, the flow rate should not exceed 5 times the nominal flow rate. The max. allowable working pressure PS printed on the type nameplate is to be noted. The conductivity of the medium must be min. 1000pS/m.

## 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:

- 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 sight window!*

## 6.2 Dismantling

### Exchanging the limit switches

The limit switch is to replace with an identical spare part in accordance with safety guidelines.

### Exchanging the entire device

Removal and installation are the responsibility of the operator.

If at all possible, the meter should be electrically isolated before removing and replacing the indicator. 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 have to be depressurized 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.*







### KROHNE product overview

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

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