



KRAL flowmeters.

Series OME, OMG, OMH, OMP, OMX



Observe the information and regulations for use in potentially explosive areas.

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Original instructions

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1 About this document

1.1 General information

These instructions supplement the operating instructions of the flowmeter. It is imperative that they be observed in the case of use in potentially explosive areas.

Like the operating instructions of the flowmeter, these supplementary instructions form part of the product and must be kept for future reference.

1.2 Associated documents

- Operating instructions of the flowmeter
- Technical data and operating instructions of the used intrinsically safe components (sensors)
- Technical data and operating instructions of the used safety equipment (for example isolating amplifier)
- Manufacturer's declaration in accordance with EU Directive 2014/34/EU for the flowmeter
- Declaration of conformity according to EU Directive 2014/34/EU for the components and safety equipment used

1.3 Target groups

The instructions are intended for the following persons:

- Persons who work with the product
- Operator-owners who are responsible for the use of the product




Information on the required qualification of the personnel is provided separately at the beginning of the individual chapters in these instructions. The following table provides an overview.

Target group	Activity	Qualification
Transport personnel	Transportation, unloading	Transport personnel are qualified personnel who carry out the transportation of products properly due to their training, knowledge and experience and on the basis of the relevant provisions. Transport personnel recognize and avoid possible dangers and damage to property that are connected with this activity.
Mobile crane operators, crane operators, forklift operators	Unloading, positioning	Mobile crane operators, crane operators and forklift operators are qualified personnel who carry out work with cranes and forklifts properly due to their training, knowledge and experience and on the basis of the relevant provisions. Mobile crane operators, crane operators and forklift operators recognize and avoid possible dangers and damage to property that are connected with this activity.
Fitter	Mounting, connection	Fitters are qualified personnel who carry out the mounting work properly due to their training, knowledge and experience and on the basis of the relevant provisions. Fitters recognize and avoid possible dangers and damage to property that are connected with this activity.
Electrician	Electrical connection	Electricians are qualified personnel who carry out work on electrical equipment and installations properly due to their training, knowledge and experience and on the basis of the relevant provisions. Electricians recognize and avoid possible dangers and damage to property that are connected with this activity.
Trained personnel	Delegated task	Trained personnel were instructed by the operator-owner in the task delegated to them and the possible dangers arising through improper behaviour.


Tab. 1: Target groups

1.4 Symbols









1.4.1 Danger levels

	Signal word	Danger level	Consequences of non-observance
	DANGER	Immediate threat of danger	Serious personal injury, death
	WARNING	Possible threat of danger	Serious personal injury, invalidity
	CAUTION	Potentially dangerous situation	Slight personal injury
	ATTENTION	Potentially dangerous situation	Material damage

1.4.2 Danger signs

	Meaning	Source and possible consequences of non-observance
	Electrical voltage	Electrical voltage causes serious physical injury or death.

1.4.3 Symbols in this document

	Meaning
	Warning personal injury
	Safety instruction
	Request for action
1. 	Multi-step instructions for actions
2. 	
3. 	
	Action result
	Cross-reference

2 Safety

2.1 Proper use in potentially explosive areas

The ATEX Directive 2014/34/EU is applicable to products for proper use in potentially explosive areas. Products in the sense of the directive are:

1. Within the potentially explosive area
Equipment and protective systems for proper use in potentially explosive areas as well as their components
2. Outside the potentially explosive area
Safety, control and regulating equipment that serves the safe operation of devices and protective systems within the potentially explosive area

Equipment is by definition machines, devices, ... which, separately or jointly, are intended for the generation, transfer, storage, measurement, control and conversion of energy and/or for the processing of material and which are capable of causing an explosion through their **own** potential ignition sources.

KRAL flowmeters are solely suitable for flow measurement of lubricating liquids that are chemically neutral and that do not contain gas or solid components.

2.2 Potentially explosive atmosphere

A potentially explosive atmosphere is a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

Products are therefore only considered as being subject to the scope of the ATEX Directive if they are intended in whole or in part for use in potentially explosive areas.

2.3 Potential ignition sources

Potential ignition sources can be: electric sparks, arcs and thunderbolts, electrostatic discharges, electromagnetic waves, ionising radiation, hot surfaces, flames and hot gases, mechanically produced sparks, radiation in the optic region, chemical reactions, densification.

A further defining element of products in the sense of the ATEX Directive is the fact that they must have their own potential ignition sources.

Own ignition sources at non-electrical products such as flowmeters can be, for example, hot surfaces or sparks arising from friction.

2.4 Limits for surface temperatures

The standard ISO 80079-36 defines the permissible limits for surface temperatures. In the process gases/vapours and dusts are differentiated.

At gases and steams the products are divided into temperature classes.

Temperature class	Max. surface temperature [°C]	Temperature range for mixtures [°C]	Typical gas (selection)
T1	450	>450	I: Methane II A: Acetone, methane, methanol, propane II B: Town gas II C: Hydrogen
T2	300	>300 – ≤450	II A: Ethyl alcohol, n-butane II B: Ethylene II C: Acetylene
T3	200	>200 – ≤300	II A: Diesel, fuel oils II B: Hydrogen sulphide
T4	135	>135 – ≤200	II A: Acetaldehyde, ethyl ether
T5	100	>100 – ≤135	–
T6	85	>85 – ≤100	II C: Sulphur hydrocarbon

Tab. 2: Limit temperatures for gases and vapours

2 Safety

2.5 Evaluation of flowmeters

In the case of dusts the maximum permissible surface temperature of the product is specified instead of the temperature class, since a safety margin between the surface temperature and the ignition temperature has to be observed additionally in this case.

The permissible surface limit temperature results from the two determined values of the Process A and B of IEC 50281-2-1:

Limit temperature = MIN (value A - 75 °C) and (value B x 2/3)

Dust (selection)	IEC 50281-2-1 Process A [°C]	IEC 50281-2-1 Process B [°C]	Permissible max. surface limit temperature [°C]
Wood flour	300	400	225
Cellulose	370	500	295
Lignite	225	380	150
Soot	385	620	310
Sulphur	280	280	186
Aluminium	280	530	205

Tab. 3: Limit temperatures for dusts at Equipment group II

Dust	IEC 50281-2-1 Process A [°C]	IEC 50281-2-1 Process B [°C]	Permissible max. surface temperature [°C]
On every surface that contains dust	–	–	150
When coal dust deposits are not to be expected, for example in the housing inside	–	–	450

Tab. 4: Limit temperatures for dusts at Equipment group I

2.5 Evaluation of flowmeters

In accordance with the risk assessment according to EN 1127, the flowmeters of the specified series do not have their own ignition sources. The mechanical parts of the flowmeters are therefore **not** products in the sense of the ATEX Directive and therefore do not have an Ex-identification.

The combination of mechanical parts of the flowmeter with ATEX-compliant components must be considered an "assembly" in accordance with Article 44 of the ATEX Directive. The manufacturer of the assembly may suggest the conformity of the components if a corresponding declaration of conformity exists. This applies in particular for the used sensors (pick ups, temperature sensors) that are components in the sense of the directive. For further information see the corresponding documentation of the components.

The manufacturer of an assembly solely verifies whether further dangers arise through the final combination of the components. This is not the case with the flowmeters manufactured by KRAL. In accordance with the Directive there is therefore no need for a further evaluation of conformity or for an overall identification of this assembly.

Sensors as electrical components represent a possible ignition source. Therefore KRAL flowmeters are equipped with intrinsically safe sensors for use in potentially explosive areas. The sensors may solely be operated with suitable intrinsically safe devices according to EN 60079-11.

2.6 Additional obligations of the operator-owner when used in potentially explosive areas

When the product is used in potentially explosive areas the operator-owner has to observe the following additional obligations from the ATEX directive (minimum regulations for improving the health protection and the safety of the employees that can be endangered through potentially explosive atmospheres).

This results in the following additional obligations for the operator-owner:

- Identify potentially explosive areas.
- Mark and identify all prohibitions clearly.
- Draw up explosion protection documents for each zone.
- Issue prohibitions of access for unauthorized persons.

2.7 Safety instructions

2.7.1 Additional safety instructions for use in potentially explosive areas



The following safety instructions must be observed strictly:

Potentially explosive areas are divided into zones in accordance with the frequency and duration of the occurrence of a potentially explosive atmosphere. The scope of measures to be taken in accordance with Directive 1999/92/EC results from this classification.

The following sections list possible ignition sources in accordance with EN 1127-1.

2.7.2 Ignition sources in normal operation

Ignition sources in normal operation	Causes and protective measures
Electrical compensating currents	Through stray currents sparks can be ignited during the disconnection, connection or bypassing of the flowmeter as an electrically conductive part of a system. ▶ Earth the flowmeter thoroughly and ensure equipotential bonding.
Electromagnetic waves (10 ⁴ –3x10 ¹¹ Hz)	In the case of high-frequency electromagnetic waves the flowmeter can act like a receiving antenna. ▶ Ensure that no danger of ignition through electromagnetic waves can occur in the area surrounding the flowmeter. ▶ Earth the flowmeter thoroughly and ensure equipotential bonding.
Electromagnetic waves (3x10 ¹¹ –3x10 ¹⁵ Hz)	In this spectral range, for example sunlight, ignition can occur through absorption on solid surfaces such as the flowmeter – in particular if focussing occurs. ▶ Ensure that no danger of ignition through electromagnetic waves can occur in the area surrounding the flowmeter. ▶ Earth the flowmeter thoroughly and ensure equipotential bonding.
Hot surfaces	In normal operation the surface temperature of the flowmeter lies only marginally above the temperature of the liquid. Slightly higher temperatures arise in the interior of the pump through friction of the rotating parts. The permanent flow and the resulting cooling of the rotating parts prevents a significant heating up of the device.

Tab. 5: Ignition sources in normal operation

- ▶ In addition observe the operating instructions of the sensors.

2.7.3 Ignition sources at foreseeable malfunctions

Ignition sources at foreseeable malfunctions	Causes and protective measures
Frictional heat	Possible causes: <input type="checkbox"/> Damage to bearing or surface damage Sluggishness due to damage to bearing or superficial damage leads to friction at the rotating parts with only minimal heating up. ▶ Only use flowmeters for flow measurement of lubricating liquids that are chemically neutral and that do not contain gas or solid components ▶ In the case of damage to bearings (increased running noises) replace the bearings. See the operating instructions of the flowmeter.

Tab. 6: Ignition sources at foreseeable malfunctions

- ▶ In addition observe the operating instructions of the sensors.

3 Identification

3.1 ATEX marking

Flowmeters do not have an ATEX marking since they does not have their own ignition sources.

Sensors for use in potentially explosive areas have a corresponding ATEX marking. In this context observe the associated operating instructions and data sheet.

4 Function description

4.1 Safe use in Ex-area

4 Function description

4.1 Safe use in Ex-area

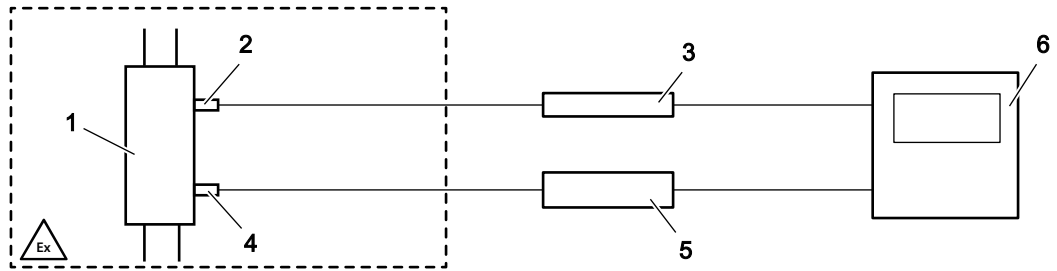


Fig. 1: Protection of the Ex-area

1	Flowmeter	4	Pick up
2	Temperature sensor	5	Isolating amplifier (separating barrier)
3	Repeater (separating barrier)	6	KRAL electronic unit

For flow measurement in potentially explosive areas the flowmeter 1 has to be equipped with intrinsically safe, ATEX approved sensors (pick up 4, temperature sensor 2). Intrinsically safe ATEX sensors operate with low voltages and currents, so that they are not an ignition source. The pick ups installed at the factory, for example, are operated with a nominal voltage of only 8.2 V DC.

The evaluation of the measuring data occurs via a separate electronic unit 6. KRAL electronic units are not ATEX products and have to be installed outside the potentially explosive area. Intrinsically safe safety devices are required as separating barriers between the sensors and a KRAL electronic unit (for example repeater 3, isolating amplifier 5). These safety devices, like the KRAL electronic unit, have to be installed outside the potentially explosive area. They ensure the secure supply and signal transmission between the Ex-area and non-Ex-area.

Notice When electronic units of other manufacturers are used, deviating conditions may apply. Observe the operating instructions of the manufacturer.

5 Connection

5.1 Connecting the KRAL electronic unit

Personnel qualification:	<input type="checkbox"/> Electrician
Aids:	<input type="checkbox"/> Operating instructions for sensors, safety devices and electronic unit



! DANGER

Risk of death through loss of the explosion protection.

The sensors installed at the flowmeter may not represent ignition sources.

- ▶ Ensure that the flowmeter is solely equipped with intrinsically safe ATEX sensors.
- ▶ Ensure that a secure signal transmission for the electronic unit is ensured by safety devices, for example through intrinsically safe separating barriers such as isolating amplifiers, which are installed outside the potentially explosive areas between sensors and electronic unit.

Requirement:

- ✓ Flowmeter with ATEX sensors
- ✓ Electronic unit and separating barriers outside the potentially explosive area
- ➔ Connect the sensors of the flowmeter via separating barriers with the KRAL electronic unit.

5.2 Connecting other electronic units

Personnel qualification:	<input type="checkbox"/> Electrician
Aids:	<input type="checkbox"/> Operating instructions for sensors, safety devices and electronic unit



DANGER

Risk of death through loss of the explosion protection.

The sensors installed at the flowmeter may not represent ignition sources.

- ▶ Ensure that the flowmeter is solely equipped with intrinsically safe ATEX sensors.
- ▶ Observe operating instructions of the manufacturer of the electronic unit.

Requirement:

- ✓ Flowmeter with ATEX sensors
- Connect sensors of the flowmeter with the electronic unit in accordance with the operating instructions of the manufacturer.

6 Operation

6.1 Commissioning

6.1.1 Checking the function of the ATEX components

- Before commissioning check ATEX components, meaning sensors (pick up, temperature sensor) and required safety devices.

7 Maintenance

7.1 Additional required maintenance in case of use in potentially explosive areas

Electronic systems in potentially explosive areas have special features that guarantee proper operation in these areas. For safety reasons the effectiveness of these special features must be maintained during the whole service life. In addition to the performed initial test this also requires periodic inspections during operation.

Also see EN 60079-17 "Potentially explosive atmosphere – Part 17: Inspection and maintenance of electrical installation".

Component	Required maintenance	Cycle
Sensor	<input type="checkbox"/> Function test	4 weeks
Safety device (for example isolating amplifier)	<input type="checkbox"/> Function test	4 weeks

Tab. 7: Additional required maintenance

Notice Test intervals have to be specified for the entire operating life in accordance with the applicable national laws on occupational safety laws. Tests and checks have to be carried out at least once a year.

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