Supplementary Installation and Operating Instructions

BM 100 A
BM 100 Ai
Reflex-Radar

KEMA 01 ATEX 1078X

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<td>Vortex flowmeters</td>
</tr>
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<td>Flow controllers</td>
</tr>
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<td>Electromagnetic flowmeters</td>
</tr>
<tr>
<td>Ultrasonic flowmeters</td>
</tr>
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<td>Mass flowmeters</td>
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</tbody>
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**Level measuring instruments**
- Communications engineering
- Engineering systems & solutions
- Switches, counters, displays and recorders
- Heat metering
- Pressure and Temperature
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Attachment 1 Statement of Conformity to ISO/IEC Guide 22 15
Attachment 2 EC Type Test Certificate KEMA 01 ATEX 1078 X 16
Nameplate

Signal converter without intrinsically safe I/O function

Nameplate for the version with non-intrinsically safe I/O functions, such as current output, RS485, etc.

Type of protection; approved Gas Group and Temperature Classes, e.g.: EEx d [ia]
IIC T6-T3

Approved Category: Ex II 1/2 DT
75…150°C or Ex II 1/2 G

Type code

Year of manufacture

Serial number

Purchase order number

Measuring point number

Voltage supply

Terminal markings

Maximum working pressure (max. 100 bar)

Mechanical primary constant

Probe length

Housing protection class

Signal converter with intrinsically safe current outputs

For the BM 100 A i with 1 or 2 intrinsically safe current outputs or with one intrinsically safe active current output, the part containing the terminal markings of the outputs and their maximum safety values will change.

Signal converter with intrinsically safe I/O functions

For the BM 100 A i with intrinsically safe communication module (PA-PROFIBUS or Foundation Fieldbus) and one optional intrinsically safe current output, the part containing the terminal markings of the outputs and their maximum safety values will change.
Range of application

The BM 100 A and BM 100 Ai Reflex-Radar level gauges are designed solely for measuring the distance, level, volume and interface of liquids, solids and particulate materials. They can be operated on storage and process tanks and also on still pipes and reference vessels.

Product liability and warranty

Responsibility for suitability and intended use of these level gauges rests solely with the user. Improper installation and operation of our devices may lead to loss of warranty.

In addition, the “General conditions of sale”, forming the basis of the purchasing contract, are applicable.

General safety information

These Supplementary Instructions may only be used in conjunction with the standard Installation and Operating Instructions for the BM 100 A level gauge. If you do not have these standard Instructions, please contact your nearest KROHNE office.

Special regulations are applicable to use in hazardous locations, and these are described in these Supplementary Instructions (supplied only with “Ex” devices).

The information given in these Instructions contains only the data relevant to explosion protection. The technical details given in the standard Installation and Operating Instructions apply unchanged unless excluded or superseded by these Supplementary Instructions.

Standards / Approvals

In compliance with European Directive 94/9 EC (ATEX 100a), the level gauges described in these Supplementary Instructions are certified in conformity with European Standards EN 50014, EN 50018, EN 50019, EN 50020, EN 50284 and EN 50281-1-1 for use in hazardous locations by the KEMA certification body under KEMA 01 ATEX 1078 X.

It is absolutely necessary that the details contained in this approval certificate, together with its boundary conditions, are observed.

The level gauges of the BM 100 A series are suitable for use in explosive atmospheres of all flammable substances of Gas Group IIA, IIB and IIC (with the exception of the cases named in these Supplementary Instructions) and for applications requiring Category 1/2G, 1/2D, 2G or 2D equipment.

Assembly, installation, start-up and maintenance may only be carried out by "personnel trained in explosion protection"!
Section 1 – Main safety-relevant characteristics

1. Main safety-relevant characteristics

1.1 Approved categories

1.1.1 1/2 G and 1/2 D
The signal converter is installed in hazardous locations requiring Category 2 G or 2 D equipment. The probe is installed in hazardous locations requiring Category 1 G or 1 D equipment. The devices are suitable for use in explosive atmospheres of all flammable substances of Gas Group IIA, IIB and IIC.

⚠️ Please take note of the following exceptions:

• Plastic-coated probes may not be used in connection with Gas Group IIC substances.
• Devices with plastic-coated probes may not be used for applications requiring Category 1/2 D equipment, unless effective measures have been taken to avoid electrostatic discharge.

1.1.2 2 G and 2 D
BM 100 A level gauges are installed in areas requiring Category 2 G or 2 D equipment. The devices are suitable for use in explosive atmospheres of all combustible substances of Gas Group IIA, IIB and IIC.

⚠️ Please take note of the following exceptions:

• Plastic-coated probes may not be used in connection with substances of Gas Group IIC.
• Devices with plastic-coated probes may not be used for applications requiring Category 2 D equipment, unless effective measures have been taken to avoid electrostatic discharge.

1.2 Electrical limits

1.2.1 Intrinsically safe I/O functions
Intrinsically safe circuits for I/O functions of the BM 100 A are safety-separated from ground and also from each other (test voltage > 500 V AC). In addition, all intrinsically safe circuits are safety-separated from the non-intrinsically safe power circuits up to a peak voltage of 375 V.

Only certified intrinsically safe equipment with EEx ia IIC type of protection may be connected to the I/O output circuits. This requirement applies independent of the required category and also in cases where the device is not operated in the hazardous location.
The connected equipment may not exceed the following maximum safety values:

<table>
<thead>
<tr>
<th>I/O function</th>
<th>Marking</th>
<th>Maximum safety values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passive current output</strong></td>
<td>EEx ia IIC or EEx ib IIC</td>
<td>U&lt;sub&gt;i&lt;/sub&gt; ≤ 30V, I&lt;sub&gt;i&lt;/sub&gt; ≤ 250mA, P&lt;sub&gt;i&lt;/sub&gt; ≤ 1.0W</td>
</tr>
<tr>
<td><strong>Active current output</strong></td>
<td>EEx ia IIC or EEx ib IIC</td>
<td>U&lt;sub&gt;o&lt;/sub&gt; ≤ 23.5V, I&lt;sub&gt;o&lt;/sub&gt; ≤ 98mA, P&lt;sub&gt;o&lt;/sub&gt; ≤ 0.4W</td>
</tr>
<tr>
<td><strong>Interface PROFIBUS-PA&lt;sup&gt;(1)&lt;/sup&gt;</strong></td>
<td>EEx ia IIC or EEx ib IIC/IIB</td>
<td>U&lt;sub&gt;i&lt;/sub&gt; ≤ 30V, I&lt;sub&gt;i&lt;/sub&gt; ≤ 300mA, P&lt;sub&gt;i&lt;/sub&gt; ≤ 4.2W</td>
</tr>
<tr>
<td><strong>Interface FF</strong></td>
<td>EEx ia IIC or EEx ib IIC/IIB</td>
<td>U&lt;sub&gt;i&lt;/sub&gt; ≤ 30V, I&lt;sub&gt;i&lt;/sub&gt; ≤ 300mA, P&lt;sub&gt;i&lt;/sub&gt; ≤ 4.2W</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> suitable for connection to intrinsically safe fieldbus systems based on the FISCO model

### 1.2.2 Non-intrinsically safe I/O functions

For devices with non-intrinsically safe I/O functions the following restrictions should be noted.

<table>
<thead>
<tr>
<th>I/O function&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>Rated values of the non-certified receiver instrument</th>
<th>Restriction for non-certified receiver instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to standard</td>
<td>Refer to standard installation and operating instructions</td>
<td>Supply power for receiver instruments: max. 250V</td>
</tr>
<tr>
<td>Installation and operating</td>
<td>Instructions</td>
<td></td>
</tr>
</tbody>
</table>

<sup>(1)</sup> only for connection to circuits with “functional extra-low voltage with safety separation (PELV)”

### 1.3 Allowable pressure

The maximum allowable operating pressure for level gauges installed in locations requiring Category 2 G or 2 D equipment is dependent on the device flange, the flange material and the maximum operating temperature. The maximum allowable pressure is 10000 kPa (PN100 flange). The upper limit applies e.g. to a stainless steel flange at ambient and process temperatures of 20°C (e.g. DN 50, PN 100). Higher pressure ratings are not allowed.

For applications requiring Category 1/2 G or 1/2 D equipment, atmospheric application conditions (operating pressure 80 - 110kPa) must prevail inside the tank.
1.4 Allowable temperatures

1.4.1 Process temperature
For applications requiring Category 1/2 G or 1/2 D equipment, the following process temperatures are allowed as a function of the Temperature Class:

<table>
<thead>
<tr>
<th>Temperature Class</th>
<th>Process temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-20…+85°C</td>
</tr>
<tr>
<td>T5</td>
<td>-20…+100°C</td>
</tr>
<tr>
<td>T4</td>
<td>-20…+135°C</td>
</tr>
<tr>
<td>T3</td>
<td>-20…+150°C</td>
</tr>
<tr>
<td></td>
<td>-20…+200°C at flange temperatures ≤ 150°C and probes with distance piece</td>
</tr>
</tbody>
</table>

For applications requiring Category 2 G or 2 D equipment, the following process temperatures are allowed as a function of the Temperature Class:

<table>
<thead>
<tr>
<th>Temperature Class</th>
<th>Process temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-50…+85°C</td>
</tr>
<tr>
<td>T5</td>
<td>-50…+100°C</td>
</tr>
<tr>
<td>T4</td>
<td>-50…+135°C</td>
</tr>
<tr>
<td>T3</td>
<td>-50…+150°C</td>
</tr>
<tr>
<td></td>
<td>-50…+200°C at flange temperatures ≤ 150°C and probes with distance piece</td>
</tr>
</tbody>
</table>

1.4.2 Ambient temperature
The minimum and maximum ambient temperatures (-20…+50°C) for the electronic equipment are independent of Temperature Class and Category.

1.4.3 Surface temperature
For applications requiring Category 1/2 D or 2 D equipment,
- with a dust layer of ≤ 5 mm,
- an ambient temperature of ≤ 50°C, and
- a flange temperature of ≤ 150°C,
the maximum surface temperature at any point of the measuring device shall be equal to the process temperature, but at least 75°C.
2 Installation

In accordance with current installation standards for hazardous locations (e.g. EN 60079-14 / VDE 0165), assembly and installation may only be carried out by specialist personnel who have received training in explosion protection.

The notes given in the standard Installation and Operating Instructions and in these Supplementary Instructions and the EC Type Test Certificate (see Attachment A.2) shall be observed without fail.

2.1 Probes

The various probe types shall be installed such that they cannot come into contact with the tank wall, and that, in consideration of internals and flow conditions in the tank, buckling or breakage of the probes can be ruled out with sufficient certainty.

3 Electrical installation

3.1 Terminal compartment

Connection to power and I/O functions is effected in the terminal compartment of the signal converter. The terminal compartment can be constructed in ignition protection categories EEx e, EEx d, EEx ei and EEx di:

Type of protection EEx e or EEx ei

Only parts certified to EN 50 019 are permitted as cable entries and blanking plugs. The cable clamping area for the supplied cable entries measures 8.5 - 16 mm for the outside cable diameter. If a shielded cable is used, the outside diameter of the inside insulator must be between 6 and 12 mm. Use only cables with the appropriate diameter or approved cable entries with matching clamping area in accordance with their test certificate.

Type of protection EEx d or EEx di

- Direct entry of the connecting cables by way of flameproof cable glands into the flameproof terminal compartment requires a separate test certificate in conformity with EN 50 018 for the flameproof glands.

- Direct entry of the connecting cables by way of conduits into the flameproof terminal compartment requires, after the flameproof cable conduit has been screwed in, a flameproof joint in accordance with ISO 965 / DIN 13 with a minimum of 5 full turns depth of engagement. A suitable mechanical stopping box shall be provided within 450 mm of the entry into the terminal compartment. Installation of the conduit must be carried out as specified in its separate test certificate. As a rule, an EN 50018 certified adapter is required between the ‘PG’ thread (heavy-gauge conduit thread) of the terminal compartment and the conduit thread.
3.2 Connecting cables

The connecting cables for the non-intrinsically safe power circuits and the non-intrinsically safe or intrinsically safe I/O circuits must be in keeping with the valid installation standard (e.g. EN 60079-14 / VDE 0165).

Where elevated process temperatures (above 100°C) are concerned, use heat-resistant cables with a continuous service temperature of ≥ 75°C in conformity with the type test certificate.

3.3 Connection of supply power and I/O functions

- Before connecting or disconnecting the electrical interconnecting cables of the device, make sure that all cables leading to the signal converter are isolated from the reference potential (ground) of the hazardous location. This also applies to protective conductors (PE) and equipotential bonding conductors (PA).

- Carefully insulate all cores and shields of the connecting cables not safety-connected to the equipotential bonding system for the hazardous location from each other and from ground (insulation test voltage 500V_{rms} for conductors in intrinsically safe cables, insulation test voltage 1500V_{rms} for conductors in non-intrinsically safe cables).

- Connect all shields by the shortest possible route to the press-fitted U-clamp terminal (FE) in the terminal compartment. If shields are to be grounded at both ends (e.g. for EMC reasons), adequate equipotential bonding is required between the two shield ends to avoid unacceptable equalizing currents.
Independent of the type of supply power, the device must be incorporated in the equipotential bonding system in the hazardous location. This can be done by way of an appropriately conductive connection between the device flange system and the tank. If connection to the equipotential bonding system is to be made via a separate conductor, this must be connected to the outer press-fitted U-clamp terminal on the signal converter flange.

For device versions with intrinsically safe I/O functions (BM 100 A i), only certified intrinsically safe equipment with the maximum values (see Type Test Certificate, Attachment A.2) may be connected to the power terminals. This requirement also applies when the device is not operated in the hazardous location!

### 3.4 Connection of supply power

For all BM 100 A variants, the power connection is not intrinsically safe.

Functional extra-low voltage with safety separation (PELV). Connection of a functional ground FE is not mandatory.
### 3.5 Options, current output

Options 1 to 7 apply to devices with intrinsically safe outputs (BM 100 A i) and to devices with non-intrinsically safe outputs (BM 100 A). Options 8 and 9 apply to devices with non-intrinsically safe outputs.

Outputs with Intrinsic Safety type of protection may only be connected to certified feed devices.

#### I/O functions of the BM 100A (i)

<table>
<thead>
<tr>
<th>Option</th>
<th>I/O function</th>
<th>Power terminals</th>
<th>EEx 'e' BM 100 A</th>
<th>EEx 'ia' BM 100 Ai</th>
<th>Electrical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Current output HART® passive</td>
<td>-5; +6</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Current output HART +current output passive</td>
<td>-5; +6</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4; +4.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Current output HART active</td>
<td>-5; +4.1*</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>PROFIBUS-PA passive</td>
<td>4; 4.1</td>
<td>x</td>
<td>x</td>
<td>see Section 3.3</td>
</tr>
<tr>
<td>5</td>
<td>PROFIBUS-PA +current output   passive</td>
<td>4; 4.1</td>
<td>-5; +6</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>6</td>
<td>FF passive</td>
<td>4; 4.1</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>FF + current output passive</td>
<td>4; 4.1</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5; +6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Interface RS485 active B4; A4.1</td>
<td>x</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Interface RS485 +current output active</td>
<td>B4; A4.1</td>
<td>x</td>
<td>/</td>
<td></td>
</tr>
</tbody>
</table>

* power terminals 6 and 4 must be shorted
4 Initial start-up

Disconnect from power before starting work!

Check the following points before device start-up:

• Do probe, flange and gaskets have adequate corrosion resistance to the tank product?
• Do the data on the signal converter nameplate agree with your operating data?
• Check that the measuring device has been properly installed on the tank.
• Is the equipotential bonding system correctly connected?
• Are supply power and I/O functions correctly connected?
• Are the covers of the terminal and electronics compartments firmly in place?
• Have the special cover locks been tightened down?

Further start-up procedures are described in the standard Installation and Operating Instructions for the BM 100 A.

5 Operation

In a potentially explosive atmosphere you can parametrize the device with the aid of the supplied bar magnet (control via magnetic sensors without opening the housing) or digitally via the signal output.

Do not open the covers of terminal compartment and electronics compartment while operating in a potentially explosive atmosphere.
6 Service / maintenance

The device has no maintenance requirement when used for the intended purpose and in standard applications.

6.1 Signal converter

Disconnect from power before starting work!

Should it prove necessary to open the flameproof enclosure or the electronics compartment in the presence of an explosive atmosphere, allow the waiting time specified on the nameplate of the signal converter to elapse first:

- 27 min for Temperature Class T6
- 12 min for Temperature Class T5

Before connecting or disconnecting the electrical interconnecting cables, make sure that all cables leading into the signal converter are isolated from the ground (reference potential) of the hazardous location. This also applies to protective conductors (PE) and equipotential bonding conductors (PA).

After carrying out any maintenance work, always regrease the flameproof cover thread of the signal converter housing, including the cover gaskets, with a resin-free and acid-free all-purpose grease.

Dismantling of the electronic unit is described in the standard Installation and Operating Instructions. Use only same-construction units with identical supply voltage and configuration of the output modules.

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

- Check housing, cables entries and incoming cables for signs of corrosion and damage.
- Check the tank connections for leakages.

6.2 Probes

The probes do not require any maintenance when used for the intended purpose and under normal operating conditions. However, heavy deposits on the probe can cause measurement deviations or faulty operation.

If the probe is dirty, clean according to the directions given in the standard Installation and Operating Instructions. When dismantling the probe, be aware of working conditions (e.g. check for presence of flammable liquid and/or potentially explosive atmosphere in or around the tank, pressurized tank, etc.).

6.3 Replacement of complete device

Make quite sure that all process connections and the tank are non-pressurized.

In connection with environmentally critical products, carefully decontaminate the wetted parts of the flange system after dismantling.
6.4 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.
Attachment 1  Statement of Conformity to ISO/IEC Guide 22

Konformitätserklärung

Wir: KROHNE SA
Usine des Orrs
26103 ROMANS
France

erklären in alleiniger Verantwortung, daß das Produkt:

Füllstandmessgerät
BM 100 A

auf das sich diese Erklärung bezieht, mit den folgenden Normen oder normativen
Dokumenten übereinstimmt:

- EN 61010-1
- EN 50082-2
- EN 50014
- EN 50019
- EN 50220
- EN 50224
- EN 50281-1-1

gemäß den Bestimmungen der Richtlinien 89/336/EWG (Elektromagnetische Verträglich-
heit), 73/23/EWG (Niederspannungsrichtlinie) und 94/9/EG (ATEX).

Romans, den 29. Oktober 2001

Christian Siever
Geschäftsführer

Declaration of Conformity

We: KROHNE SA
Usine des Orrs
26103 ROMANS
France

declare under our sole responsibility that the product:

Level Measuring Instrument
BM 100 A

to which this declaration relates, is in conformity with the following standards or other normative
documents:

- EN 61010-1
- EN 50081-1
- EN 50062-2
- EN 50014
- EN 50016
- EN 50019
- EN 50220
- EN 50224
- EN 50281-1-1

according to the provisions of Directives 89/336/EEC (Electromagnetic Compatibility),
73/23/EEC (Low Voltage Directive) and 94/9/EC (ATEX).

Romans, October 29th, 2001

Christian Siever
General Manager

Déclaration de conformité

Nous: KROHNE SA
Usine des Orrs
26103 ROMANS
France

déclarent sous notre seule responsabilité que le produit:

Transmetteur de niveau
BM 100 A

auquel se réfère cette déclaration, est conforme aux normes ou aux autres documents normatifs:

- EN 61010-1
- EN 50081-1
- EN 50082-2
- EN 50014
- EN 50016
- EN 50019
- EN 50220
- EN 50224
- EN 50281-1-1

conformément aux dispositions des directives 89/336/CEC (Compatibilité Electromagnétique),
73/23/CEE (Basse Tension) et 94/9/CE (ATEX).

Romans, le 29 octobre 2001

Christian Siever
Directeur Général
## Schedule

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Description 1</td>
<td>01.01.2022</td>
</tr>
<tr>
<td>2</td>
<td>Description 2</td>
<td>02.02.2022</td>
</tr>
<tr>
<td>3</td>
<td>Description 3</td>
<td>03.03.2022</td>
</tr>
</tbody>
</table>

### Test Documentation (continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Description 10</td>
<td>10.10.2022</td>
</tr>
<tr>
<td>11</td>
<td>Description 11</td>
<td>11.11.2022</td>
</tr>
<tr>
<td>12</td>
<td>Description 12</td>
<td>12.12.2022</td>
</tr>
</tbody>
</table>

### Notes

- Please refer to the test documentation for further details.
- All tests are completed as per the schedule.

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**Attachments**

- BM 100 A ATEX 10/2001