Level-Radar
BM 700, BM 70 A, BM 70 P

Non-contact level gauging using electromagnetic waves

- Easy to program in the field or via PC
- Standard HART® output
- Microwave frequency ~10 GHz
- For use in process tanks

Non-contact level gauging using electromagnetic waves

Standard HART® output

Microwave frequency ~10 GHz

For use in process tanks
The BM 70 line comprises high-quality measuring instruments to perform a wide range of measuring tasks.

- The **low-cost BM 700** is ideal for storage tanks, still wells and reference vessels.
- The **BM 70 A** supplies **reliable measurements** in tanks with agitators or other internals.
- The **BM 70 P** is the **high-precision** version with a measuring accuracy of ± 1 mm.

### Contents

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<thead>
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<th></th>
<th>BM 700</th>
<th>BM 70 A</th>
<th>BM 70 P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application condition</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Liquids / liquid gases</td>
<td>✓</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Pastes / sludges</td>
<td>✓</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>Solids / particulate materials</td>
<td>❌</td>
<td>K</td>
<td>❌</td>
</tr>
<tr>
<td>Measuring range ≤ 20 m</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Measuring range 20 – 35 m</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Measuring range 35 – 100 m</td>
<td>❌</td>
<td>K</td>
<td>❌</td>
</tr>
<tr>
<td>Storage tanks</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Still wells / reference vessels</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Process tanks with slightly moving surface</td>
<td>✓</td>
<td>✓</td>
<td>K</td>
</tr>
<tr>
<td>Difficult process tanks (e.g. agitator)</td>
<td>❌</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>Large or numerous internals in the tank</td>
<td>❌</td>
<td>✓</td>
<td>K</td>
</tr>
<tr>
<td>High accuracy (± 1 mm/0.04”)</td>
<td>❌</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Excellent repeatability</td>
<td>❌</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Current output 4 – 20 mA HART®</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Intrinsically safe outputs</td>
<td>❌</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bus connection (RS485, PROFIBUS PA)</td>
<td>❌</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

✓ suitable — not suitable  
K: contact KROHNE
Flexible through modularity

**Level-Radar measuring system**

The modular design allows us to provide the optimum solution for your measuring problem. The system consists of:

- converter,
- flange,
- antenna.

Flange and antenna are available in various versions, sizes and materials.

**Converter for BM 70 A/P**

The modularity makes it possible to retrofit the converter to a communication system (e.g. PROFBUS-PA) in place of a 4 – 20 mA current output. The process need not be interrupted.

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**Horn antenna**

Most frequently used antenna, available in different metals.

Application in reactors, process and storage vessels as well as waste water tanks and still wells.

**Wave-Guide**

A tubular antenna extension is passed through the product and down to the tank bottom. The antenna extension interconnects with the tank, and for this purpose a vent hole is featured in the top part of the extension. Suitable for spherical tanks, horizontal and vertical vessels containing relatively clean products, or liquefied gases.

**Wave-Stick**

The dielectric rod antenna and the sealing face of the connecting flange are made of PTFE. Resistant to high-temperature steam, CIP/SIP capability up to 160°C (320°F).

Particularly suitable for applications in the food and beverage, waste water, chemical and pharmaceutical industries.

**Antenna purging system (w/o figure)**

The purging system is used for cleaning, heating and cooling the antenna. The purging medium is introduced through the connecting flange. Application in the petrochemical, chemical and pharmaceutical industries under conditions of very low and very high temperatures and with products tending to form deposits and incrustations.

**High-temperature (HT) distance piece**

Is mounted between flange and converter to protect the electronics of the converter against high temperature.
**Typical applications**

**BM 70 Horn antenna** mounted on a process tank and on a side vessel

**BM 70 Wave-Stick** mounted on a process tank for the food and beverage industry

**BM 70 Still-Pipe / BM 70 Wave-Guide** on a liquefied-gas tank

**BM 70 Horn antenna** for particulate materials

**BM 70 Heating system** for condensing products

**BM 70 Horn antenna / BM 70 Still-Pipe** on a storage tank

**BM 70 Ex Nautic** Variant A and C on ship tanks

**BM 70 Purging system** for cleaning, heating or cooling the antenna

**BM 70 with curved** antenna extensions for difficult applications
BM 700, 70 A, 70 P

Use in storage tanks

<table>
<thead>
<tr>
<th>Product</th>
<th>Paraffin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank atmosphere</td>
<td>Condensation</td>
</tr>
<tr>
<td>Product surface</td>
<td>Smooth</td>
</tr>
<tr>
<td>Temperature</td>
<td>70°C (158°F)</td>
</tr>
<tr>
<td>Pressure</td>
<td>Atmospheric</td>
</tr>
</tbody>
</table>

Use in process tanks

<table>
<thead>
<tr>
<th>Product</th>
<th>Alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank atmosphere</td>
<td>Condensation</td>
</tr>
<tr>
<td>Product surface</td>
<td>Turbulent</td>
</tr>
<tr>
<td>Temperature</td>
<td>90°C (194°F)</td>
</tr>
<tr>
<td>Pressure</td>
<td>2 bar (29 psig)</td>
</tr>
</tbody>
</table>

Encrustations on the antenna

<table>
<thead>
<tr>
<th>Product</th>
<th>Caustic soda with bauxite sludge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank atmosphere</td>
<td>Dust, condensation</td>
</tr>
<tr>
<td>Product surface</td>
<td>Foam</td>
</tr>
<tr>
<td>Temperature</td>
<td>50°C (122°F)</td>
</tr>
<tr>
<td>Pressure</td>
<td>Atmospheric</td>
</tr>
</tbody>
</table>
**Operating principle**

A radar signal is emitted via an antenna, reflected on the measuring surface and received after a delay time $t$.

**FMCW: Frequency Modulated Continuous Wave**

The FMCW-radar uses a high frequency signal sweep from 8.5–9.9 GHz (1). The signal is emitted, reflected from the product surface and received after a delay (2). For further signal processing the difference $\Delta f$ is calculated from the actual transmit frequency and the receive frequency (3). The difference is directly proportional to the distance i.e. a large frequency difference corresponds to a large distance and vice versa.

The frequency difference is transformed via a Fourier transformation (FFT) into a frequency spectrum and then the distance is calculated from the spectrum.

**Linearity of frequency sweeps**

The measuring accuracy of a FMCW radar is determined from the linearity of the frequency sweep and its reproducibility. Linearity is corrected via a reference measurement of the oscillator characteristics.

Non-linearity is corrected up to 98% (BM 700/BM 70 A)

Direct frequency regulation is necessary with the BM 70 P device because of the higher demand on measuring accuracy.

With the PLL technology (Phase Locked Loop) the signal frequency is directly recorded as digital data and the transmitter oscillator locks automatically on the right frequency.

**Advantages of FMCW**

Compared to the simple pulse radar technology, the use of FMCW radar offers the following advantages:

- Higher band-width of the microwave signal → better reflection separation → reliable reduction of noise
- Higher transmitting frequency → small angle → fewer interference reflections
- Higher transmitting frequency → smaller antenna diameter for same measuring range
Quality of measurement

Reflections caused by struts, weld seams and tank internals are identified as “fixed targets” and can be blanked out, provided the useful signal reflected from the product surface is greater than the interference reflection. Sporadic interference signals caused by agitator blades, falling deposits or sidestreams of the main filling flow are blanked out by the microprocessor-controlled signal evaluation.

Software is provided for tracking measured values. A “plausibility window” in which the next measured value is expected is defined by the preceding measurements in conjunction with the programmed tracking speed. Measured values not located in this “distance window” are blanked out.

Measured-value plausibility check
Level-Radar BM 700

For standard applications on storage tanks, in still wells and reference vessels, high performance and low price

- Various antenna types
- Measuring range up to 20 m
- Connections for food industry available
- Local display optional

For more information, please visit the KROHNE website or contact your local distributor.
## Technical data

### 1 Application range
- distance, level, volume measurement of liquids, pastes, slurries, in storage tanks, still wells or reference vessels

### 2 Operating mode/system structure
- FMCW radar in the X band (8.5-9.9 GHz) with digital signal processing; compact device, modular design

### 3 Input

<table>
<thead>
<tr>
<th>Measured quantities</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary quantity</td>
<td>distance</td>
</tr>
<tr>
<td>Derived quantities</td>
<td>level, volume</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Min. tank height</th>
<th>Max. measuring range</th>
<th>Block distance</th>
<th>Rate of change in level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5 m (1.6 ft)</td>
<td>20 m (65.6 ft)</td>
<td>min. 0.2 - 0.5 m (0.7 - 1.6 ft)</td>
<td>≤ 10 m/min (&lt; 33 ft/min)</td>
</tr>
</tbody>
</table>

### 4 Output

<table>
<thead>
<tr>
<th>Type</th>
<th>Ex-e current output HART®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current range</td>
<td>4 - 20 mA (error: 22 mA)</td>
</tr>
<tr>
<td>Accuracy/linearity</td>
<td>0.15 % (rel. 20 mA; 20°C/68°F)</td>
</tr>
<tr>
<td>Temperature drift</td>
<td>≤ 100 ppm/K (typically 50 ppm/K)</td>
</tr>
<tr>
<td>Load</td>
<td>≤ 350 Ω</td>
</tr>
</tbody>
</table>

| Failure signal | Current output: error signal 22 mA, plain text in local display |

### 5 Measuring accuracy

<table>
<thead>
<tr>
<th>Error of measurement</th>
<th>Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>min. ±1 cm (0.4&quot;) or ±0.3%</td>
<td>≤ 0.5 x error of measurement</td>
</tr>
<tr>
<td>Measured-value resolution</td>
<td>1 mm (0.04&quot;)</td>
</tr>
</tbody>
</table>

| Ambient temperature effect | no temperature effect on measured value (see output) |

### 6 Field service conditions

#### 6.1 Installation conditions
- avoid interference reflections and multiple reflections

#### 6.2 Ambient conditions
- Hazardous locations: Zone 0, 1, 2; IIC/IIB, T1 –T6
- Ambient temperature at signal converter: -20 ... +55°C (-4 ... +131°F); functional range: -40 ... +70°C (-40 ... +158°F)

<table>
<thead>
<tr>
<th>Flange temperature</th>
<th>Version</th>
<th>Min. flange temperature</th>
<th>Max. flange temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard version</td>
<td>Special version</td>
<td>w/o HT-distance piece</td>
</tr>
<tr>
<td>V96 with horn antenna / Wave-guide with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gasket K4079</td>
<td>-30°C (-22°F)</td>
<td>-60°C (-76°F)</td>
<td>+130°C (+266°F)</td>
</tr>
<tr>
<td>Gasket K2035</td>
<td>-30°C (-22°F)</td>
<td>-60°C (-76°F)</td>
<td>+130°C (+266°F)</td>
</tr>
<tr>
<td>Gasket K6375 / K1091</td>
<td>-30°C (-22°F)</td>
<td>-</td>
<td>+130°C (+266°F)</td>
</tr>
<tr>
<td>Gasket Viton / FEP</td>
<td>-30°C (-22°F)</td>
<td>-</td>
<td>+130°C (+266°F)</td>
</tr>
<tr>
<td>LP Flange system with horn antenna / Wave-Guide</td>
<td>-20°C (-4°F)</td>
<td>-</td>
<td>+130°C (+266°F)</td>
</tr>
<tr>
<td>Wave-Stick</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTFE with flange plate</td>
<td>-40°C (-40°F)</td>
<td>-</td>
<td>+130°C (+266°F)**</td>
</tr>
<tr>
<td>PTFE w/o flange plate</td>
<td>-20°C (-4°F)</td>
<td>-</td>
<td>+130°C (+266°F)**</td>
</tr>
<tr>
<td>PP w/o flange plate</td>
<td>-20°C (-4°F)</td>
<td>-</td>
<td>+100°C (+212°F)</td>
</tr>
</tbody>
</table>

* Safety limit 280°C (536°F) ** pressure dependant, see below

<table>
<thead>
<tr>
<th>Environment class</th>
<th>Protection category EN 60529/IEC 529</th>
<th>Shock resistance</th>
<th>Vibration endurance limit</th>
<th>EMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locations exposed direct to open-air climate, D1 Severity in conformity with EN 60654-1</td>
<td>(signal converter) IP 66 / IP 67</td>
<td>Impact test to EN 61010. Sect. 8.2 with 0.5 J energy; drop test to prEN 50178</td>
<td>IEC 68-2-6 and prEN 50178 (10-57 Hz: 0.075 mm / 57-150 Hz: 1 g)</td>
<td>EN 50081-1, EN 50082-2; NAMUR Recommendation</td>
</tr>
</tbody>
</table>
6.3 Product conditions

Physical properties

No effect on measurement results; for reliable measurements, the relative permittivity should have the following minimum values:

- $\varepsilon_r \geq 1.5; \varepsilon_r < 3$: still well recommended; Wave-Stick immersed: $\varepsilon_r \geq 4$

Product limitations

- Liquid ammonia ($\text{NH}_3$); liquid hydrogen ($\text{H}_2$); liquid helium ($\text{He}$)
- Unrestricted (but be aware of ambient and flange temperatures!)

Process temperature

Dependent on flange size and pressure rating (see table)

- Standard: up to 40 bar (580 psig) (higher on request)

Operating pressure

Horn antenna/Wave-Guide

Continuous, contact

- $+16$ (+232)
- $+1$ (+14.5)
- $–1$ (–14.5)
- $–20$ (–4)

Continuous, non-contact

- $+100$ (+212)
- $+150$ (+302)

Wave-Stick

- w/o flange plate: $\leq 2$ bar/29 psig
- with flange plate: see diagram

7 Component parts

Dimensions and weights

See “Dimensions and weights”

Materials

Signal converter housing

Aluminium with electrostatic powder coating; sight window (optional): glass

Flange system, antenna, antenna extension

Stainless steel 1.4571 (316 Ti) or 1.4435 (316 L), Hastelloy C4 or B2, titanium, tantalum

Gaskets

Kalrez 4079, 2035, 6375 or 1091; Viton (FPM);

Antenna extension (information on other materials available on request)

Wave-Stick

- only PP or PTFE in contact with the product; flanges made of stainless steel 1.4571 (316 Ti)

Process connection

Horn antenna/Wave-Guide

DIN 2501/DIN 2526, Form C

- DN 50 - DN 200, PN 6 - PN 64
- ANSI B 16.5
- 2" - 8", 150/300 lb/RF

Wave-Stick

DIN 2501/DIN 2526, Form C

- DN 50 - 150
- ANSI B 16.5
- G1/2", 2" - 6"

Dairy screw connection

DIN 11851

- DN 50, DN 65, DN 80

- SMS 1145
- 51 mm, 63 mm, 76 mm

Tri-Clamp connection

ISO 2852

- 2" - 4"

Electrical connection

Cable entries

- 3 x M 25 x 1.5

Terminals

- 0.5 - 2.5 mm² (solid conductor: max. 4 mm²)
- U-clamp terminal (max. 4 mm²)

Shielding when cable for current output is >100 m (>328 ft)

8 Local operator interface

Key pad

3 keys

Magnetic sensors

Operation with bar magnet without opening the housing

Local display

2-line illuminated LCD + 6 status markers

Operator interface language

English, German, French, Spanish, Portuguese, Swedish, Italian

Units of measurement

Lengths: m, cm, mm, inch, ft, %
Volume: m³, Liter, US Gal, GB Gal, ft³, bbl, %
Conversion unit: any text

9 Power supply

24 V DC/AC

115/230 V AC

19.2 – 28.8 V DC or 20.4 – 26.4 V AC (45 – 66 Hz)

(external power supply unit)

Power consumption

Typically 6 W / 10 VA
### BM 700

#### Dimensions and weights

**BM 700 Horn antenna**

<table>
<thead>
<tr>
<th>Nominal size to</th>
<th>Antenna Type</th>
<th>Dimensions in mm (inches)</th>
<th>Weight DN 50: approx. 12.5 kg (27.56 lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN</td>
<td>ANSI Type</td>
<td>SS 1.4571 Hastelloy C4 or SS 316 Ti</td>
<td>High-temperature version</td>
</tr>
<tr>
<td>80</td>
<td>3&quot;</td>
<td>110 (4.33)</td>
<td>17 (37.48)</td>
</tr>
<tr>
<td>100</td>
<td>4&quot;</td>
<td>148 (5.83)</td>
<td>18 (39.68)</td>
</tr>
<tr>
<td>150</td>
<td>6&quot;</td>
<td>223 (8.78)</td>
<td>23 (50.71)</td>
</tr>
<tr>
<td>200</td>
<td>8&quot;</td>
<td>335 (13.19)</td>
<td>30 (66.14)</td>
</tr>
</tbody>
</table>

Subject to change without notice

**BM 700 Wave-Stick**

- Weight DN 50: approx. 13.5 kg (29.76 lb)

**BM 700 Wave-Guide**

- Weight DN 50; 1 m: approx.: 13.5 kg (29.76 lb)

**BM 700 Wave-Stick**

- (Dairy screw connection to DIN 11851)

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**Flange connections to:**

- DIN 2501 (= BS 4504) DN 50 – DN 200 / PN 6 – PN 64
- ANSI B 16.5 / 2” – 8” / Class 150/300 lb/RF

---

**BM 700 Horn antenna**

- High-temperature version

**BM 700 Wave-Stick**

- Weight DN 50: approx. 12.5 kg (27.56 lb)

---

**BM 700 Wave-Guide**

- Weight DN 50; 1 m: approx.: 13.5 kg (29.76 lb)

---

**BM 700 Wave-Stick**

- (Dairy screw connection to DIN 11851)
Level-Radar
BM 70 A

Reliable measurement on tanks with agitators or other internals, also in extreme process conditions

Further interfaces:
RS 485, PROFIBUS-PA, Fieldbus Foundation

Max. allowable operating pressure up to 400 bar (5800 psig)

Rectangular and S-shaped antenna extensions

Measuring range up to 100 m (330 ft)

A variety of antennas available
Instrument versions

<table>
<thead>
<tr>
<th>BM 70 A</th>
<th>BM 70 P66</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM 70 A</td>
<td>BM 70 A</td>
</tr>
<tr>
<td>BM 70 A</td>
<td>BM 70 A</td>
</tr>
<tr>
<td>BM 70 A</td>
<td>BM 70 A</td>
</tr>
<tr>
<td>BM 70 A</td>
<td>BM 70 A</td>
</tr>
</tbody>
</table>

Responsibility for suitability and intended use of our instruments rests solely with the purchaser.

**Technical data**

1. **Application range**
   - Distance, level, volume and reflection measurement of liquids, pastes, slurries, solids and particulate materials in storage and process tanks, in containers of metal or concrete and in still wells.

2. **Operating mode/system**
   - FMCW radar in the X band (8.5-9.9 GHz) with digital signal processing; compact device, modular design.

3. **Input**

   **Measured quantities**
   - Distance, reflection
   - Level, volume

   **Primary quantities**
   - Distance, reflection

   **Derived quantities**
   - Level, Volume

   **Measuring range**
   - **min. tank height:** 0.5 m (1.6 ft)
   - **max. measuring range:** 40 m (131 ft) (optionally also larger); Wave-Stick: 20 m (65.6 ft)

4. **Output**

   **Variant**
   - 1 Ex-e current output HART®
   - 2 Ex-i current output HART®
   - 3 RS485 interface

   **Transmission rate**
   - 1200 Baud
   - Address
   - 0 – 15
   - Protocols
   - KROHNE-Protocol, HART®

   **Type**
   - Active (current source)
   - Passive (current sink)
   - Ex-e
   - Ex-i

   **Current range**
   - 4 – 20 mA (error: 2 / 22 mA)

   **Accuracy/Linearity**
   - 0.05 % (rel. 20 mA; 20°C/68°F)

   **Supply voltage**
   - 8 – 30 V (terminals 31+32)

   **Temperature drift**
   - ≤ 100 ppm/K (typically 30 ppm/K)

   **Load**
   - ≤ 500 Ω

   **Switching output (optionally)**
   - Max. 100 mA / 30 V DC or 30 V AC; internal resistance ≤ 20kΩ; floating

   **Digital input (optionally)**
   - to 'freeze' the measured value; voltage: 5 – 28 V DC; input resistance: ≥ 1 kΩ; floating

---

1) F = liquids, sludges, pastes; S = particulate materials; FG = liquefied gases
2) Ex version 0 – 3 m (0 – 9.8 ft)
3) higher pressures on request
4) dependent on pressure
BM 70 A

<table>
<thead>
<tr>
<th>Variant</th>
<th>4 PROFIBUS-PA (Ex-i)</th>
<th>5 Foundation Fieldbus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>to IEC 61 158-2 and</td>
<td>to IEC 61 158-2 and</td>
</tr>
<tr>
<td></td>
<td>FISCO model</td>
<td>FISCO model</td>
</tr>
<tr>
<td>Bus characteristics</td>
<td>9 – 30 V; 0.3 mA max.; 4.2 W max.</td>
<td>9 – 30 V; 0.3 mA max.; 4.2 W max.</td>
</tr>
<tr>
<td>Base current</td>
<td>10 mA</td>
<td>10 mA</td>
</tr>
<tr>
<td>Fault current</td>
<td>6 mA</td>
<td>6 mA</td>
</tr>
<tr>
<td>Failure signal</td>
<td>Current output: error signal 2/22 mA or 3.6 mA (Ex-i), plain text in local display. Switching contact: contact opens or closes. Digital interfaces: error flags.</td>
<td></td>
</tr>
</tbody>
</table>

5 Measuring accuracy

Error of measurement and reference conditions

Repeatability

Messwertauflösung

Umgebungstemperaturinfluss

6 Field service conditions

6.1 Installation conditions

Avoid interference reflections and multiple reflections.

6.2 Ambient conditions

Hazardous locations

Ambient temperature at signal converter

-20 ... +55°C (-24 ... +131°F); Functional range: -40 ... +70°C (-40 ... +158°F)

Flange temperature

Version

Min. flange temperature

Max. flange temperature

with HF-distance piece

V96 with horn antenna / Wave-guide with

Gasket K4079

-30°C (-22°F) -60°C (-76°F) +130°C (+266°F) +250°C (+482°F)*

Gasket K2035

-30°C (-22°F) -60°C (-76°F) +130°C (+266°F) +210°C (+410°F)

Gasket K6375 / K1091

-30°C (-22°F) - +130°C (+266°F) +200°C (+392°F)

Gasket Viton / FEP

-30°C (-22°F) - +130°C (+266°F) +250°C (+482°F)

Wave-Stick

PTFE with flange plate

-40°C (-40°F) - +130°C (+266°F)** +150°C (+302°F)**

PTFE w/o flange plate

-20°C (-4°F) - +130°C (+266°F) +150°C (+302°F)**

PP w/o flange plate

-20°C (-4°F) - +100°C (+212°F) -

* Safety limit 280°C (536°F) ** pressure dependant, see below

Environment class

Protection category EN 60529/IEC 529

Shock resistance

Vibration endurance limit

EMC

6.3 Product conditions

Physical properties

Relative permittivity

Product limitations

Process temperature

Operating pressure

Horn antenna/Wave-Guide

Wave-Stick

w/o flange plate: ± 2 bar/29 psig

with flange plate: see diagram

-16 (+232)

+1 (+14.5)

+1 (+14.5)

+100 (+212)

-10 (-4)

+150 (+302)

-20 (-4)

46 - 0.3 °C bar (740 - 2.4°F psig)

-20 °C (–4 °F)

-60°C (-76 °F)

+4°C (+11°F)

+4°C (+11°F)

+20°C (+68°F)

+150°C (+302°F)

-4°C (-20°F)

-180°C (-356°F)

-20°C (-4°F)

-30°C (-22°F)

-40°C (-40°F)

-20°C (-4°F)

-15°C (-2°F)

+30°C (+86°F)

+150°C (+527°F)

+150°C (+302°F)

+150°C (+302°F)

Brownells Pressure

Temperature T in °C (°F)

Pressure in bar (psig)
7 Component parts

Dimensions and weights
See “Dimensions and weights”

Materials

Signal converter housing
Aluminium with electrostatic powder coating; sight window: glass

Flange system, antenna, antenna extension
Stainless steel 1.4571 (316 Ti) or 1.4435 (316 L), Hastelloy C4 or B2, titanium, tantalum

Gaskets
Kalrez 4079, 2035, 6375 or 1091; Viton (FPM); FEP-coated
(basically in all versions, PTFE is also in contact with the product)

Wave-Stick
only PTFE in contact with the product; flanges made of stainless steel 1.4571 (316 Ti)

Process connection

Horn antenna/Wave-Guide
DN 50 – DN 200 / PN 6 – PN 64

Wave-Stick
DN 50 – DN 150

Dairy screw connection
DN 50, DN 65, DN 80

Tri-Clamp connection
ISO 2852

Electrical connection

Cable entries
3 x M 25 x 1.5

Terminals
0.5 – 2.5 mm² (solid conductor: max. 4 mm²)

PE or FE and PA
U-clamp terminal (max. 4 mm²)

Shielding for RS 485 cable and when cable for current output is > 100 m (> 328 ft)

8 Local operator interface

Key pad
3 keys

Magnetic sensors
Operation with bar magnet without opening the housing

Local display
2-line illuminated LCD + 6 status markers

Operator interface language
English, German, French, Spanish, Portuguese, Swedish, Italian

Units of measurement
Lengths: m, cm, mm, inch, ft, %,
Volume: m³, Liter, US Gal, GB Gal, ft³, bbl, %
Conversion unit: any text

9 Power supply

24 V DC/AC
18 – 31.2 V DC or 18 – 26.4 V AC (45 – 66 Hz)

115/230 V AC
optionally: 100 – 120 V AC (tolerance: 85 – 127 V),
200 – 240 V AC (tolerance: 170 – 254 V); 45 – 66 Hz

Power consumption
typically 7.5 W / 12 VA

Accuracy graph

Reference conditions
Ambient temperature: 20°C (68°F)
Rel. humidity 65%
Pressure: 1013 mbar abs. (14.69 psia)
Product: water, still surface
No interference reflections
min. distance from flange face:
1/7 x tank height

BM 70 A Horn antenna

BM 70 A Precision

BM 70 A Wave-Stick

BM 70 A

Dairy screw connection
DIN 11851 DN 50

ANSI B 16.5

Wave-Stick only PTFE in contact with the product; flanges made of stainless steel 1.4571 (316 Ti)

Electrical connection

Cable entries
3 x M 25 x 1.5

Terminals
0.5 – 2.5 mm² (solid conductor: max. 4 mm²)

PE or FE and PA
U-clamp terminal (max. 4 mm²)

Shielding for RS 485 cable and when cable for current output is > 100 m (> 328 ft)
Level-Radar
BM 70 P

Measurements with a system accuracy ± 1 mm (0.04”) and high repeatability, for use in storage tanks

Further interfaces: RS 485, PROFIBUS-PA, Fieldbus Foundation

The first radar level measurement system with dynamic PLL frequency stabilization

System accuracy + 1 mm (0.04”), repeatability better than 0.5 mm (0.02”)

Thermal endurance up to 250°C (482°F)

Measuring range up to 35 m (115 ft)
Responsibility for suitability and intended use of our instruments rests solely with the purchaser.

### Technical data

#### 1 Application range

Distance, level, volume and reflection measurement of liquids, and liquefied gases in storage tanks, generally in containers of metal or concrete, and in still wells.

#### 2 Operating mode/system structure

Quartz-controlled PLL-stabilized FMCW radar in the X band (8.5 – 9.9 GHz) with digital signal processing; compact device, modular design.

#### 3 Input

**Measured quantities**

- **Primary quantities**: distance, reflection
- **Derived quantities**: level, volume

**Measuring range**

- Min. tank height: 0.5 m (1.6 ft)
- Max. measuring range: 35 m (115 ft) with still pipe 30 m (100 ft)
- Block distance: min. 0.5 m (1.6 ft)
- Rate of change in level: ≤ 1 m/min (≤ 3.3 ft/min)

#### 4 Output

**Variant**

<table>
<thead>
<tr>
<th>1 Ex-e current output HART®</th>
<th>2 Ex-i current output HART®</th>
<th>3 RS485 interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission rate</td>
<td>1200 Baud</td>
<td>1200 - 38400 Baud</td>
</tr>
<tr>
<td>Address</td>
<td>0 - 15</td>
<td>0 - 255</td>
</tr>
<tr>
<td>Protocols</td>
<td>KROHNE-Protocol,</td>
<td>KROHNE-Protocol,</td>
</tr>
<tr>
<td></td>
<td>HART®</td>
<td>HART®, Modbus-RTU</td>
</tr>
<tr>
<td>Type</td>
<td>active (current source); Ex-e</td>
<td>passive (current sink); Ex-i</td>
</tr>
<tr>
<td>Current range</td>
<td>4 – 20 mA (error: 2 / 22 mA)</td>
<td>4 – 20 mA (error: 2 / 22 mA)</td>
</tr>
<tr>
<td>Accuracy/Linearity</td>
<td>0.05 % (rel. 20 mA; 20°C/68°F)</td>
<td>0.05 % (rel. 20 mA; 20°C/68°F)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>8 – 30 V (terminals 31+32)</td>
<td>0.3 % (rel. 20 mA; 20°C/68°F)</td>
</tr>
<tr>
<td>Temperature drift</td>
<td>≤ 100 ppm/K (typically 30 ppm/K)</td>
<td>≤ 200 ppm/K (typically 70 ppm/K)</td>
</tr>
<tr>
<td>Bürde</td>
<td>≤ 500 Ω</td>
<td>≤ (U₅ – 8 V) / 22 mA,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U₅ = external supply voltage)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 250 Ω</td>
</tr>
<tr>
<td>Switching output (optionally)</td>
<td>max. 100 mA / 30 V DC or 30 V AC; internal resistance ≤ 20 Ω</td>
<td>6 – 30 V; Iₕᵥ &lt;= 110 mA;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uₕᵥ &lt;= 2 V; Iₕₜ ≥ 900 μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U = 30 V), Iₕₜ ≥ 200 μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U = 8 V) Low: I &lt; 2 mA; High: I = 22 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(R ≤ 250 Ω) or no-load</td>
</tr>
<tr>
<td></td>
<td></td>
<td>voltage ≤ 18 V</td>
</tr>
<tr>
<td>Digital input (optionally)</td>
<td>to ‘freeze’ the measured value;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>voltage: 5 – 28 V DC; input resistance:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 1 kΩ; floating</td>
<td></td>
</tr>
</tbody>
</table>

**Variant**

<table>
<thead>
<tr>
<th>4 PROFIBUS-PA (Ex-i)</th>
<th>5 Foundation Fieldbus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>to IEC 61 158-2 und</td>
</tr>
<tr>
<td></td>
<td>FISCO model</td>
</tr>
<tr>
<td>Bus characteristics</td>
<td>9 – 30 V; 0.3 mA max.;</td>
</tr>
<tr>
<td></td>
<td>4.2 W max.</td>
</tr>
<tr>
<td>Base current</td>
<td>10 mA</td>
</tr>
<tr>
<td>Fault current</td>
<td>6 mA</td>
</tr>
<tr>
<td>Failure signal</td>
<td>Current output: error signal 2/22 mA or 3.6 mA (Ex-i), plain text in local display</td>
</tr>
<tr>
<td></td>
<td>Switching contact: contact opens or closes</td>
</tr>
<tr>
<td></td>
<td>Digital interfaces: error flags</td>
</tr>
</tbody>
</table>

#### 5 Measuring accuracy

**Error of measurement**

- Min. ± 1 mm (0.04") or ± 0.01% [T = 20°C (68°F); p = 1 bar abs. (14.7 psia)]

**Repeatability**

≤ 0.5 x error of measurement

**Measured-value resolution**

0.1 mm (0.04")

**Ambient temperature effect**

- 1 ppm/°C
6 Field service conditions

6.1 Installation conditions
- Avoid interference reflections and multiple reflections
- Horn antenna type 4: ± 6°
- Still well: ± 0°

6.2 Ambient conditions
- Hazardous locations: Zone 0, 1, 2; IIC/IIB, T1 – T6
- Ambient temperature at signal converter: -20 ... +55°C (-24 ... +131°F); functional range: -40 ... +70°C (-40 ... +158°F)

6.3 Product conditions
- Environment class: locations exposed direct to open-air climate, D1 Severity in conformity with EN 60654-1
- Protection category: EN 60529/IEC 529 IP 66 / IP 67
- Shock resistance: impact test to EN 61010, Sect. B.2 with 0.5 J energy; drop test to prEN 50178
- Vibration endurance limit: IEC 68-2-6 and prEN 50178 (10-57 Hz: 0.075 mm / 57-150 Hz: 1 g)
- EMC: EN 50081-1, EN 50082-2; NAMUR Recommendation

7 Component parts

Dimensions and weights
- see "Dimensions and weights"

Materials
- Signal converter housing: aluminium with electrostatic powder coating; sight window: glass
- Flange system, antenna, antenna extension: Stainless steel 1.4571 (316 Ti) or 1.4435 (316 L), titanium, tantalum (information on other materials available on request)
- Gaskets: Kalrez 4079, 2035, 6375 or 1091; Viton (FPM); FEP-coated (basically, in all versions, PTFE is also in contact with the product)

Process connection
- Horn antenna: DIN 2501/DIN 2526, Form C
- Wave-Guide: ANSI B 16.5
- Electrical connection: Cable entries: 3 x M 25 x 1.5
- Terminals: 0.5 - 2.5 mm² (solid conductor: max. 4 mm²)
- PE or FE and PA: U-clamp terminal (max. 4 mm²)

8 Local operator interface
- Key pad: 3 keys
- Magnetic sensors: operation with bar magnet without opening the housing
- Local display: 2-line illuminated LCD + 6 status markers
- Operator interface language: English, German, French, Spanish, Portuguese, Swedish, Italian
- Units of measurement: Lengths: m, cm, mm, inch, ft, %
- Volume: m³, Liter, US Gal, GB Gal, ft³, bbl, %
- Conversion unit: any text

9 Power supply
- 24 V DC/AC: 18 – 31.2 V DC or 18 – 26.4 V AC (45 – 66 Hz)
- Power consumption: typically 7.5 W / 12 VA
### BM 70 A, BM 70 P

**Dimensions and weights**

Dimensions in mm (inches)

**BM 70 Horn antenna**

![BM 70 Horn antenna diagram]

**BM 70 Wave-Stick**

Weight DN 50: approx. 12.5 kg (27.6 lb)

![BM 70 Wave-Stick diagram]

**BM 70 Wave-Guide**

(Dairy screw connection to DIN 11 851)

![BM 70 Wave-Guide diagram]

**BM 70 Antenna purging system**

![BM 70 Antenna purging system diagram]

**BM 70 High-temperature version**

Rectangular extension

![BM 70 Rectangular extension diagram]

**BM 70 Antenna extensions**

Straight extension

S-shaped extension

![BM 70 Straight extension diagram]

![BM 70 S-shaped extension diagram]

Flange connections to:

- DIN 2501 (= BS 4504) DN 50 – DN 200 / PN 6 – PN 64
- ANSI B 16.5 / 2”~8” / Class 150/300 lb, RF

### Table: Nominal size to Dimensions and weights

<table>
<thead>
<tr>
<th>Nominal size to ANSI Ø (inches)</th>
<th>Dimensions (mm/inches)</th>
<th>Weight (kg/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 80</td>
<td>3” 1</td>
<td>80 (3.15) 110 (4.33) 145 (5.71) 110 (4.33) 17 (37.5)</td>
</tr>
<tr>
<td>DN 100</td>
<td>4” 2</td>
<td>100 (3.94) 148 (5.83) 177 (6.97) 146 (5.75) 18 (39.7)</td>
</tr>
<tr>
<td>DN 150</td>
<td>6” 3</td>
<td>140 (5.51) 223 (8.78) 250 (9.84) 220 (8.66) 23 (50.7)</td>
</tr>
<tr>
<td>DN 200</td>
<td>8” 4</td>
<td>200 (7.78) 335 (13.19) 360 (14.17) 332 (13.07) 30 (66.1)</td>
</tr>
<tr>
<td>DN 80</td>
<td>3” 1S*</td>
<td>76 (2.98) 420 (16.54) - 18 (39.7)</td>
</tr>
<tr>
<td>DN 100</td>
<td>4” 2S*</td>
<td>100 (3.94) 620 (24.41) - 19 (41.9)</td>
</tr>
<tr>
<td>DN 150</td>
<td>6” 3S*</td>
<td>152 (5.98) 820 (32.28) - 25 (55.1)</td>
</tr>
<tr>
<td>DN 200</td>
<td>8” 4S*</td>
<td>200 (7.78) 820 (32.28) - 32 (70.5)</td>
</tr>
</tbody>
</table>

* Only for BM 70 P for use in still wells

* other lengths on request
Electrical connections

**Current output HART®, Ex e:**

- **Switching output**
  - max. 100mA/30V DC/AC
- **Digital input**
  - 82 81 42 41 32 31
  - - +
  - 5...28V
  - 4-20mA
  - max. 500 Ω
- **Current output**
  - 32 31

**Ex-i Current output HART with switching output:**

- **Switching output**
  - max. 110mA/30V
- **Current output**
  - 32 31
  - U min = 8V
  - 4-20mA
  - U max = 30V

**RS485 version:**

- **Current output**
  - B B A A 32 31
  - 4-20mA
  - max. 250 Ω

**Profibus PA or Foundation Fieldbus (FF):**

- **Current output**
  - 32 31
  - **Bus-connection**

**Profibus PA / FF with current output:**

- **current output**
  - 42 41 32 31
  - U min = 8V
  - 4-20mA
  - Ex-supply unit
  - U max = 30V

**Profibus PA / FF with switching output:**

- **switching output**
  - max. 110mA/30V
  - 42 41 32 31
  - **Bus-connection**
Communication systems

The BM 70 level radar systems can be operated with various communication interfaces.

**KROHNE SMART**
Standard interface for data transmission to a control unit.

**HART® protocol**
The HART® protocol transmits communication signals.

**PC-CAT for Windows**
User-friendly software package for setting and evaluation of BM 700 and BM 70 A/P data.

Communications interfaces

- PROFIBUS-PA protocol
- Fieldbus Foundation protocol

The following protocols are available for the RS 485 interface:
- KROHNE protocol
- Modbus protocol

**KROHNE Tank Management System**
In addition to level gauging with the BM 70 A/P, KROHNE also supplies complete tank management systems.
User program PC-CAT for Windows

Our BM 70 is easy to install. To facilitate configuration, each unit is supplied with the intuitive and time-tried software, PC-CAT for Windows. PC-CAT provides a number of useful features including:

- Quick on-site configuration
- Print-out of configuration protocol
- Simple conversion, volume or correction tables
- Check routine to monitor functionality of the BM 70
- Monitoring and recording of the radar signal during operation
- Trend and evaluation of the signal during operation

PC-CAT works on all IBM-compatible PC’s using Windows 9x or NT.

PC-CAT Version 4.00 and higher can communicate with all current KROHNE level radar gauges including BM 70 A/P, BM 700, BM 702 versions, also with HART® protocol and RS 485. The PC-CAT kit includes a PC adapter for current output. The adapter can be connected to the PC’s standard RS 232 interface.

PC-CAT allows convenient remote control of all functions of the signal converter. The vessel can be shown in schematic form together with the associated measured values and the measured spectrum. A trend graph of the output signal and threshold signal strength is also provided. All relevant instrument data can be recorded in the form of a data set small enough to be stored on a floppy disk or transferred electronically. Stored data can also be used for configuring other units of the BM 70 product line.

PC-CAT files can later be used to analyse the performance of the level gauge. All graphs and screens can be exported to word processing systems or other programs.

The customer’s PC containing PC-CAT is connected to the current output via the supplied PC adapter, max. distance from the level gauge: 1000 m or 3300 ft. The PC adapter has no effect on in-line instruments such as milliammeters, recorders, etc., connected to the current output.

With every BM 70 delivery you get the freeware program PC-CAT for Windows Lite (Vers. 4.01 / Order No.: V 5001 00 506). Herewith you can perform the normal configuration, simple analyses and record PC-CAT files - all you need is a regular HART®-adapter.
### Approvals

<table>
<thead>
<tr>
<th>Application</th>
<th>Approved by</th>
<th>Instrument version</th>
<th>Certification mark</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>With Explosion protection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In stationary storage tanks for flammable, water pollutants liquids, classes A1, AII and B</td>
<td>PTB (II 1/2 G EEx de IIC T1 - T6, Zone 0)</td>
<td>BM 70 Ex</td>
<td>PTB 99 ATEX 2061 X</td>
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<td></td>
<td>(EEx de (ia)/(ib) IIC/IIB T1 - T6, Zone 0)</td>
<td>BM 70 A, BM 70 P</td>
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<tr>
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<td>PTB (EEx de IIC/IIB T2-T6, Zone 0)</td>
<td>BM 70 Ex Nautic</td>
<td>Ex-93.C.1061X</td>
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<td>(EEx de (ia)/(ib) IIC/IIB T2-T6, Zone 0)</td>
<td>BM 70 i Nautic</td>
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<td></td>
<td>FM / USA (I Div. 1 Gr. B/C/D, II/III Div. 1 Gr. E/F/G)</td>
<td>BM 70 Ex</td>
<td>J. I. 3000 813</td>
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<td>(EEEx de IIC/IIB T1 - T6, Zone 0)</td>
<td>BM 70 Wave-Stick</td>
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<tr>
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<td>FM / USA (I Div. 2 Gr. B/C/D, II/III Div. 2 Gr. E/F/G)</td>
<td>BM 70 i</td>
<td>J. I. 3006 165</td>
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<td>FM / USA (I Div. 1 Gr. B/C/D; II Div. 1 Gr. E/F/G, III</td>
<td>BM 70 Ex</td>
<td>LR 105802-5</td>
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<td>I Div. 2 Gr. B/C/D; II Div. 2 Gr. F/G, III)</td>
<td>BM 70 Ex</td>
<td>pending</td>
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<tr>
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<td>CSA / Canada (I Gr. B/C/D; II Gr. E/F/G, III)</td>
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<td>RIIS / Japan (T6)</td>
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<tr>
<td><strong>General certificates</strong></td>
<td>Germanischer Lloyd</td>
<td>BM 70 Nautic</td>
<td>89906-94 HH</td>
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<tr>
<td><strong>Quality assurance</strong></td>
<td>TÜV/CERT</td>
<td>DIN ISO 9001/EN 29001</td>
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<td>KWU</td>
<td>KTA 1401 QSP 4A</td>
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<tr>
<td><strong>Druckbehälterverordnung</strong> (German pressure vessel code)</td>
<td>RW TÜV</td>
<td>BM 70</td>
<td>5636602</td>
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</table>
### BM 700, 70 A, 70 P

#### Ordering code

Version with horn antenna or Wave Guide

<table>
<thead>
<tr>
<th>Instrument</th>
<th>BM 70 A</th>
<th>BM 70</th>
<th>BM 70 P (only with horn antenna type 4)</th>
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<tbody>
<tr>
<td>V 500</td>
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<tr>
<td>V 502</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Internal Code

| 4 | 1.4571 (316 Ti) (always BM 700) | A Tartalum |
| 6 | Hastoll C4                     | B Titanium |
| 7 | Hastoll C22                    |            |

#### Flange material

| 1 | DN 80, PN 16 | 7 | DN 200, PN 10 | D | 4” ANSI, 300 lb |
| 2 | DN 80, PN 40 | 8 | DN 200, PN 16 | E | 6” ANSI, 150 lb |
| 3 | DN 100, PN 16 | A | 3” ANSI, 150 lb | F | 6” ANSI, 300 lb |
| 4 | DN 100, PN 40 | B | 3” ANSI, 300 lb | G | 8” ANSI, 150 lb |
| 5 | DN 150, PN 16 | C | 4” ANSI, 150 lb | H | 8” ANSI, 300 lb |
| 6 | DN 150, PN 40 | Other connections on request | | | |

#### Flange connection

| 1 | 230 V AC +10%/-25% (BM 700 with external power supply unit) |
| 2 | 115 V AC +10%/-25% (BM 700 with external power supply unit) |
| 3 | 24 V DC/AC |

#### Power supply

| 1 | 4 – 20 mA active / HART® (EEEx) (always BM 700; always for FM approval) |
| 2 | 4 – 20 mA passive / HART® (EEIx) |
| 3 | RS 485/Modbus + 4 - 20 mA (EEEx) |
| 5 | PROFIBUS-PA (EEEx) |
| 7 | 4 – 20 mA / HART® (EEEx) + relay output (EEIx) |
| 8 | PROFIBUS-PA + relay output (EEEx) |
| A | PROFIBUS-PA (EEEx) + 4 - 20 mA passive |

#### Antenna type

| 1 | Horn antenna Type 1 (ø 80 mm) | A Wave-Guide ≤ 1 m |
| 2 | Horn antenna Type 2 (ø 100 mm) | B Wave-Guide ≤ 1.5 m |
| 3 | Horn antenna Type 3 (ø 140 mm) | C Wave-Guide ≤ 2 m |
| 4 | Horn antenna Type 4 (ø 200 mm) | Y Enamel Others on request |

#### Display

| 0 | Without | 1 | With |
| 2 | Jumbo (not BM 700) |

#### Cable gland

| 0 | Without | C | G½ (2 pieces) |
| 1 | M 25 x 1.5 | (2 pieces) |
| A | ½” NPT | (2 pieces) |

#### Approval

| 0 | Without | A | FM Div. 1 (USA) |
| 1 | Ex 1 G to PTB 99 ATEX | B | FM Div. 2 (USA) |

#### Flange surface

| 1 | Form C DIN 2526 / RF (ANSI) |
| 5 | Groove DIN 2512 |
| 6 | Tongue DIN 2512 |

#### Antenna extension

| 0 | Without | 3 | 300 mm (not BM 700) |
| 1 | 100 mm | 4 | 400 mm (not BM 700) |
| 2 | 200 mm | Others on request |

#### Option

| 0 | Without |
| 1 | Purging system (only ≥ DN 100) |
| A | Heating/cooling (only 1.4571, ≥ DN 150) |
**Ordering code**

Version with Wave-Stick

<table>
<thead>
<tr>
<th>Instrument</th>
<th>BM 70 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>V 510</td>
<td>BM 70 A</td>
</tr>
<tr>
<td>V 511</td>
<td>BM 700</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal code</th>
<th>4</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Flange material</th>
<th>Wave-Stick / 1.4571 (316 Ti)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wave-Stick / 1.4571 (316 Ti) High-temperature</td>
</tr>
<tr>
<td>2</td>
<td>Wave-Stick / 1.4571 (316 Ti) (USA)</td>
</tr>
<tr>
<td>3</td>
<td>Wave-Stick / 1.4571 (316 Ti) High-temperature (USA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flange connection</th>
<th>DN 50, PN 40</th>
<th>G 1½ G 6½ ANSI, 150 lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>DN 80, PN 16</td>
<td>A 2½ ANSI, 150 lb H 6½ ANSI, 300 lb</td>
</tr>
<tr>
<td>3</td>
<td>DN 80, PN 40</td>
<td>B 2½ ANSI, 300 lb L 2½ Tri-Clamp</td>
</tr>
<tr>
<td>4</td>
<td>DN 100, PN 16</td>
<td>C 3½ ANSI, 150 lb R DN 50 sanitary connection acc. to DIN 11851</td>
</tr>
<tr>
<td>5</td>
<td>DN 100, PN 40</td>
<td>D 3½ ANSI, 300 lb V 51 mm SMS</td>
</tr>
<tr>
<td>6</td>
<td>DN 150, PN 16</td>
<td>E 4½ ANSI, 150 lb</td>
</tr>
<tr>
<td>7</td>
<td>DN 150, PN 40</td>
<td>F 4½ ANSI, 300 lb Other connection on request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approvals</th>
<th>0 Without</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EEx 2G to PTB 99 ATEX A A Ex/Div. 1 (USA)</td>
</tr>
<tr>
<td>2</td>
<td>EEx 1G to PTB 99 ATEX B A Ex/Div. 2 (USA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material / gasket</th>
<th>PTFE 384 mm / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PTFE 384 mm / -</td>
</tr>
<tr>
<td>2</td>
<td>PTFE 500 mm / -</td>
</tr>
<tr>
<td>A</td>
<td>Type SW 60 mm (for still well)</td>
</tr>
<tr>
<td>D</td>
<td>PTFE without plate – 270 mm /FFKM (BM 700 only)</td>
</tr>
<tr>
<td>E</td>
<td>PTFE without plate – 400 mm /FFKM (BM 700 only)</td>
</tr>
<tr>
<td>M</td>
<td>PP without plate – 270 mm / Viton (BM 700 only)</td>
</tr>
<tr>
<td>N</td>
<td>PP without plate – 400 mm / Viton (BM 700 only)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th>1 230 V AC +10%/-25% (BM 700 external power supply unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>115 V AC +10%/-25% (BM 700 external power supply unit)</td>
</tr>
<tr>
<td>3</td>
<td>24 V DC AC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>1 4 - 20 mA active / HART® (EExe) (always BM 700; always for FM approval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4 - 20 mA passive / HART® (EExi)</td>
</tr>
<tr>
<td>3</td>
<td>RS 485/Modbus + 4 - 20 mA (EExe)</td>
</tr>
<tr>
<td>5</td>
<td>PROFIBUS-PA (EExi)</td>
</tr>
<tr>
<td>7</td>
<td>4 - 20 mA / HART® (EExi) + relay output (EExi)</td>
</tr>
<tr>
<td>8</td>
<td>PROFIBUS-PA + relay output (EExi)</td>
</tr>
<tr>
<td>A</td>
<td>PROFIBUS-PA (EExi) + 4 - 20 mA passive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display</th>
<th>0 Without</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>With</td>
</tr>
<tr>
<td>2</td>
<td>Jumbo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cable gland</th>
<th>0 Without</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M 25 x 1.5 (2 pieces)</td>
</tr>
<tr>
<td>A</td>
<td>½½ NPT (2 pieces) C 1½ (2 pieces)</td>
</tr>
</tbody>
</table>

V 4