

Installation and operating instructions

Level-Radar BM 700



Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications technology

Engineering systems & solutions

Software History

Intro- duction	Signal converter		User program			Instructions	
	Mth./Yr	Hardware	Firmware	Hardware	Operating- system	Software	Device
04/98	BM 700	5.00PREnn 5.01PRE01	PC	DOS 5.0 and higher	PC-CAT 3.00 PREnn	Suppl. instruction to BM 70A	7.02221.11 + Suppl. instruction
Test versions for BM 700.							
10/98	BM 700	5.01	PC	DOS 5.0 and higher	PC-CAT 3.00	10/98	7.02221.11 + Suppl. instruction
First serial version for BM 700.							

Items included with supply

The scope of supply includes, in the version as ordered:

- Signal converter bolted to waveguide window and antenna; optionally: antenna extension, sunshade (with fastening material in each case)
- Shielding material with tightening strap (not for the US market)
- Installation and operating instructions plus instruction card
- Report on factory settings for the signal converter
- Certification and approval documents, unless reproduced in the device documentation
- Bar magnet for operator control (only for version with local display)
- Wrench for covers

Installation material (stud bolts, flange gasket and cabling) not supplied, to be provided by customer!

Contents:

	page
1 Handling and storage	3
2 Installation	4
2.1 Field assembly	4
2.2 Mechanical installation	5
3 Electrical connection	7
4 Setting the parameters	8
5 Maintenance, error handling	16
6 Safety information	17
7 Technical data (extract)	18
8 BM 700 Level-Radar Type code	19
9 Parameter check list BM 700	21
Appendix	22

Product liability and warranty:

The BM 700 level gauge is designed solely for measuring the level, distance, volume and reflection of liquids, pastes, slurries, particulate materials and solids.

The BM 700 level gauge does not form part of an overflow protection system as defined in the WHG (= German water pollution regulation).

Local codes and regulations apply to its use in hazardous areas.

Responsibility as to suitability and intended use of these level gauges rests solely with the user.

Improper installation and operation of our level gauges may lead to loss of warranty.

In addition, the "General conditions of sale", form the basis of the purchasing contract.

If you need to return the level gauge to the manufacturer or supplier, please refer to the information given in Section 5

1 Handling and storage

Safety advice

Depending on the version, the device will weigh between approx. 10 kg and 30 kg. To carry, use both hands to lift the device carefully by the converter housing. If necessary, use lifting gear.

When handling the BM 700, avoid hard blows, jolts, impact, etc.

When storing the "Wave-Stick" version, make sure that the device is not placed on its side on the PTFE antenna, as this may cause the rod to bend.

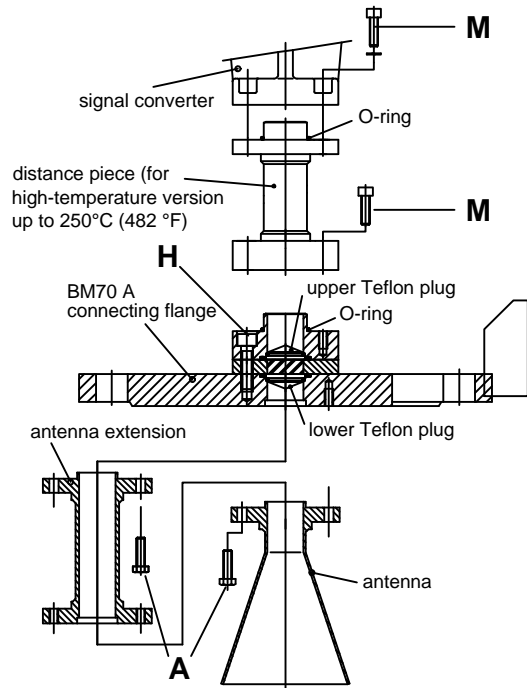
2 Installation

Most of the BM 700 versions are supplied in fully assembled condition. In this case, you may skip this chapter. However, if a device should be delivered in parts, or parts are subsequently replaced, the following should be noted.

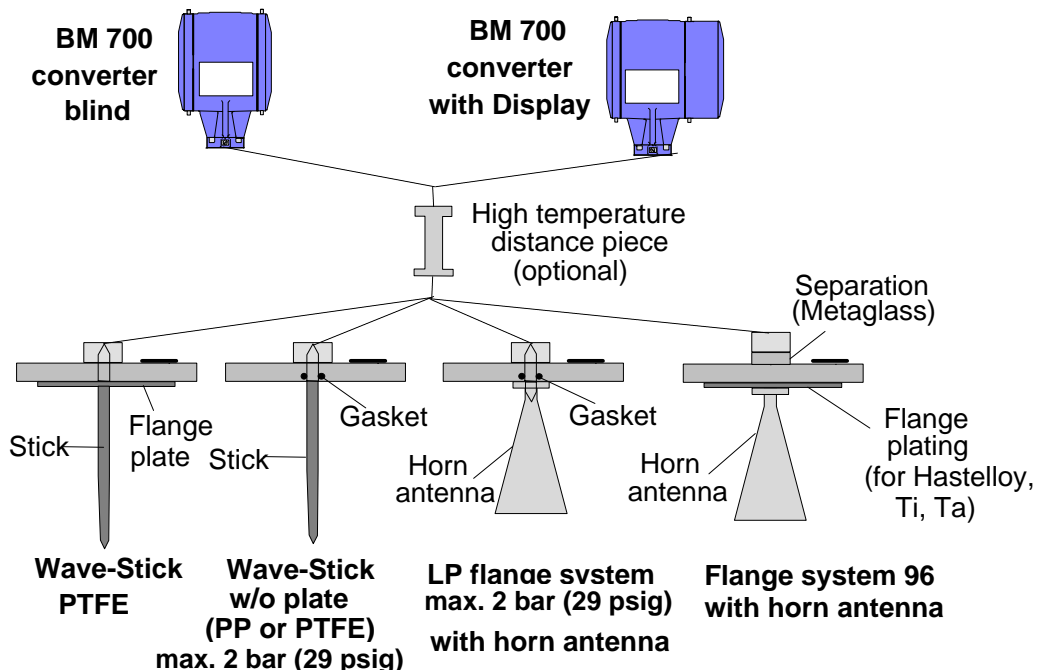
2.1 Field assembly

- For any necessary field assembly of the BM 700, all parts are included with the supply (stud bolts, washers, etc.).
- Bolt the waveguide window (flange mount) or distance piece, if supplied loose, to the BM 700. Torque for the sets of 4 Allen screws **M** (key size 5 mm): max. 8 Nm ~ 0.8 kpm (5.8 ft lbf).
- **Note:** Ensure the upper Teflon plug is kept absolutely dry and clean! Moisture and dirt will impair functionality of the BM 700!
- Bolt antenna extension to the antenna; torque for the 3 stud bolts **A**: max. 8 Nm ~ 0.8 kpm (5.8 ft lbf).

Do not detach bolts **H** !



Versions:



2.2 Mechanical installation

Hazardous-duty systems:

- The BM 700 Ex is certified in conformity with **European Standard** for use in Zone 0, 1 and 2 hazardous locations (dependent on version).
- Attention is drawn to the data and information given on the **nameplate of the converter**, the **nameplate of the flange** and the specifications in the **approval certificates**.

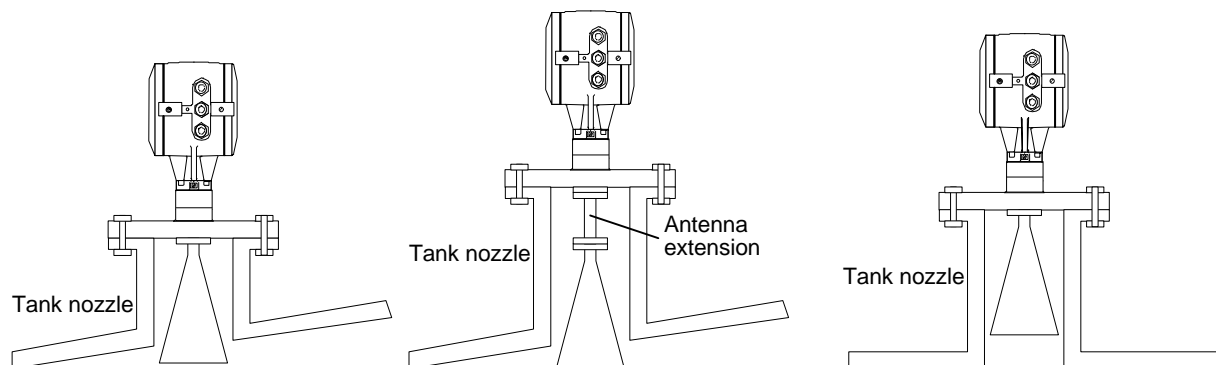
Safety:

- **Surface temperature:** The housing of the signal converter can, in extreme ambient conditions, have a temperature of more than 70°C (158°F)!
- Check **material compatibility** of antenna, extension, flange, gaskets, and PP or PTFE (used in all versions) with the product! See also section 8 "Type code"!

Mounting on the tank nozzle

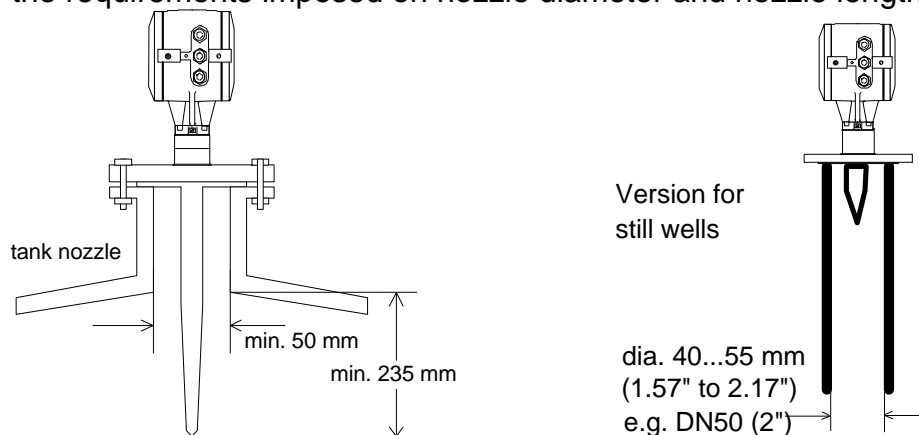
a) Devices with horn antenna:

The antenna should project out of the nozzle. If necessary, use an antenna extension. Exception: in case of a symmetrical tank fitting.



b) Wave-Stick

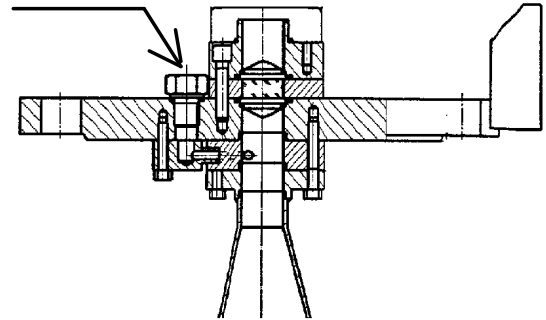
Note the requirements imposed on nozzle diameter and nozzle length:



c) Purging device

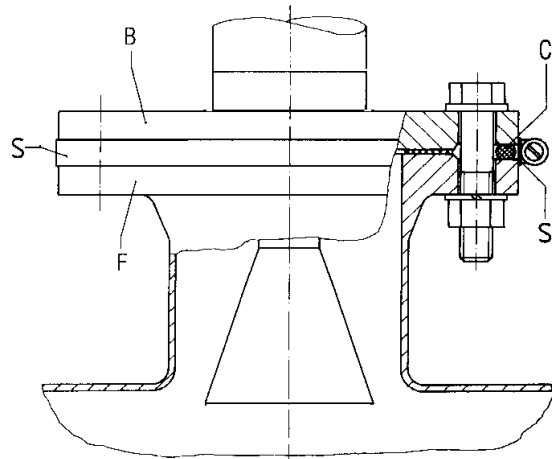
Remove screw plug ¼" R and screw in screwed tube joint, e.g. Ermeto ¼" R.

Consult "Ex" specifications relating to the purging circuit (provided by customer)!



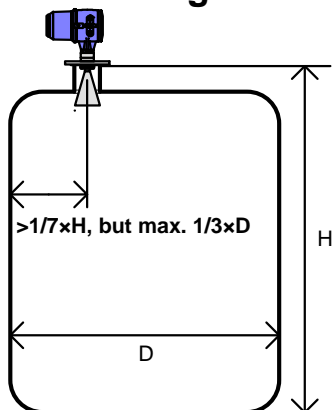
Installation on the tank

- Do not forget the gasket when positioning the BM 700 on the tank nozzle flange. Align BM 700 and gasket, slightly tighten nuts on stud bolts (by hand).
- Press **shielding strip C*** in the gap between tank and BM 700 flanges and secure with **strap retainer S*** (both items included with supply).
- **Strap retainer S*** must fit closely and overlap both flanges.
* only required for European radio approvals
- Tighten down stud bolt nuts firmly. The tightening torque is dependent upon the strength properties of the stud bolts and the pressure rating of the tank.

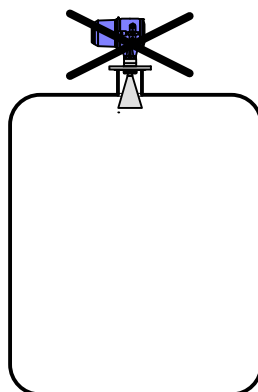


C* = shielding strip B = BM 700 flange
S* = strap retainer F = tank flange

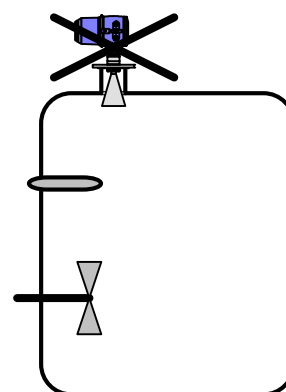
Positioning on the tank



Recommended **distance** from the **tank wall**



Do not position in tank **centreline!** (multiple reflections!)



Do not position above **internals!** (interference reflections!)

A **Stilling well** or **Wave-Guide** may be mounted in any position on the tank!

When using the PTFE Wave-Stick in hazardous areas of Zone 0, any electrostatic charging of the stick, e.g. by flow of product, must be avoided!

3 Electrical connection

To open the terminal compartment of the signal converter, first open the safety lock with an Allen key (size: 4 mm) and then use the enclosed special wrench to turn the cover anticlockwise.

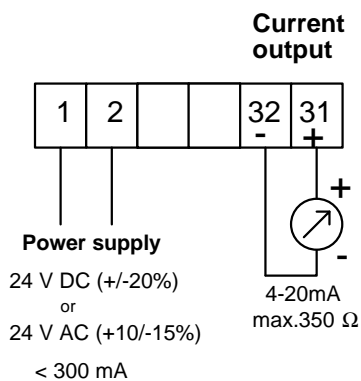
Supply power

Variant	Voltage range	Recommended fuse protection
24 V DCAC	19.2 - 28.8 V DC <i>or</i> 20.4 - 26.4 V AC	min. T 0.5 A

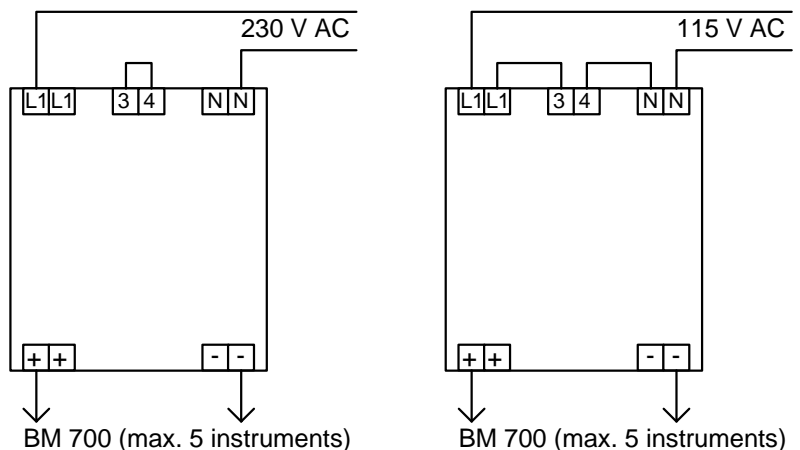
Terminal assignment

Supply power:

Terminal compartment BM 700:



External power supply "FEAS, type PSLC242":



Power supply galvanically insulated according to VDE 0551
Dimensions (W×H×D): 55×75×110 mm, usable for rail mounting

Class of protection

The BM 700 level gauge is designed for **safety class 1** in conformity with VDE 0106 Part 1.

24 V DCAC supply

When connected to a “**functional extra-low voltage with safety separation**“ power source (SELV or PELV) in accordance with VDE 0100, Part 410 or equivalent (inter)national regulations, connection of a safety conductor (PE) is not required.

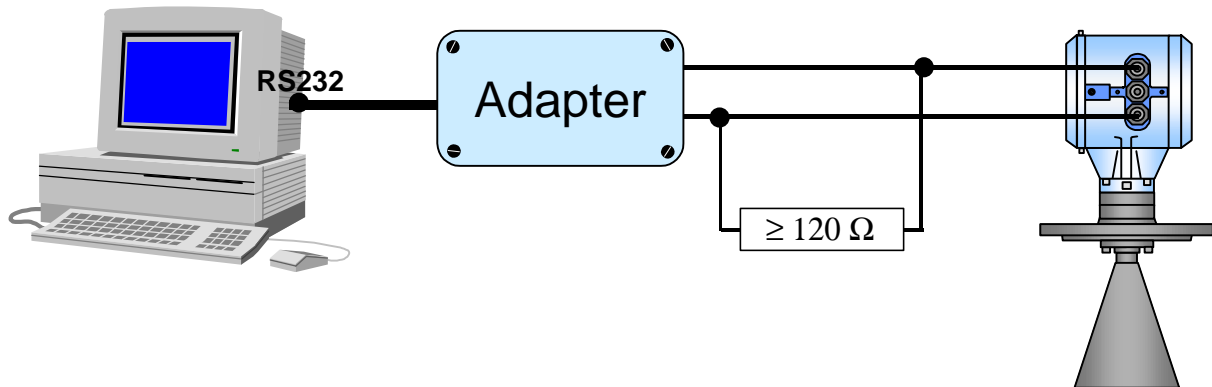
Equipotential bonding

When used in hazardous areas, the BM 700 Ex **must** be incorporated in the **PA equipotential bonding system**, irrespective of the type of power supply! If the PA is connected via a separate conductor, this must be connected to the separate U-clamp terminal at the “neck“ of the BM 700 Ex. Cancellation of equipotential bonding is only permitted when the BM 700 is **disconnected from supply**.

Rated temperature of connecting cables: see Section 6.

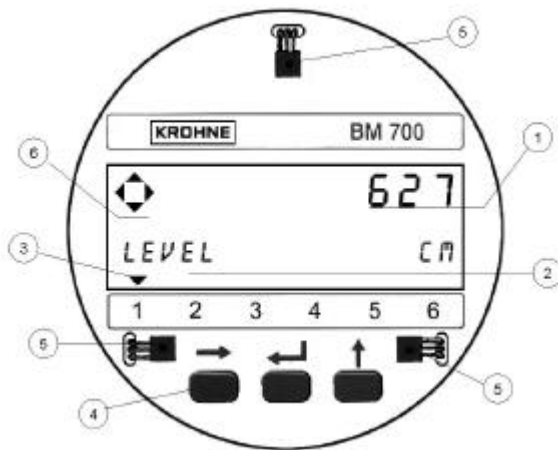
4 Setting the parameters

Setting parameters via program PC-CAT



With the program PC-CAT, version 3.00 or higher, you can configure BM 700 instruments in a very comfortable way from a PC. Connect the current output of BM 700 over a load between 120Ω and 350Ω to the Smart adapter (delivered together with PC-CAT) and connect it with a serial port of the PC.

Local display (optional)



Numeric display, measured values
Alphanumeric display, function/unit
Max. 6 markers to display measurement status
3 keys for configuration and error interrogation
Magnetic sensors for operator control through the closed housing (function same as the 3 keys)
Compass field, indicates actuation of a key

Function of keys (only for version with local display)

Operator control via the keys: For reasons of electrical safety, the keys (below the display, when housing is open) may only be actuated for servicing and repair work by specialist personnel, **on no account, however, when there is risk of explosion!**

Operator control can be carried out with the aid of the supplied bar magnet without opening the housing. However, a particularly convenient form of parameter setting is offered by the PC program PC-CAT (special accessories, see above).

- (cursor key):
 - selects the configuration menu,
 - branches the menu to the next lower level,
 - shifts the cursor* to the next column on the right.
- ↑ (select key):
 - branches the menu to the next digit on the same level,
 - changes the content (digit, text character) at the cursor* position.
- ↵ (ENTER key):
 - branches the menu to the next higher level,
 - stores newly entered parameters,
 - executes displayed functions,
 - selects special functions (e.g. error memory, see Sect. 5).

* The cursor position is signalled by flashing of the character or the option at the appropriate place.

Meaning of status markers (only for version with local display)

The 6 markers below the local display only show information about the status of measurement and are no error displays!

- 1: **No current measured value:** The device is searching for a new value. If the search for a plausible level fails for a certain time, "SIGNAL DOWN" appears as error display.
- 2: **Signal too strong:** Mean of reflected microwaves is very high. Gain is automatically stepped down.
- 3: **Poor spectrum:** Brief showing of this marker has no significance. If permanently on, this may result in uncertain (incorrect) measured values or the error message "NO M.VALUE".
- 4: **No measured value as yet:** Evaluable measured values not available after the device has been started up. Measured value automatically set to the level of the tank bottom. This marker disappears when the first valid measured value is obtained.
- 5: **Tank bottom:** In tanks with dished bottom, for example, the measuring signal can "disappear" if measurements are carried out near the bottom. The measured value is then automatically set to the level of the tank bottom.
- 6: **Measurement frozen:** Device is in the block distance detection (see below).

Description of functions

The table on the following 2 pages provides an overview of all parameters that can be set in the configuration menu.

This is followed by more precise explanations of some functions and a typical configuration.

Function (Fct.)	Input range	Description
3.3 SIGNAL OUT		
3.3.1 FUNCTION I	Select OFF/ LEVEL /DISTANCE /CONVERSION//SW.OUTPUT.	Select function of the current output.
3.3.2 RANGE I	Select 4-20mA 4-20mA/E2 4-20mA/E22	Select range/error status for the current output (hold last value or 2mA / 22mA in error status).
3.3.3 SCALE 4mA	Enter -200.00 ... +200.00 [m] 0.00 ... 99999.99 [m ³]	Enter lower measuring range value for the current output (4 mA). (see explanatory notes)
3.3.4 SCALE 20mA	Enter -200.00 ... +200.00 [m] 0.00 ... 99999.99 [m ³]	Enter full-scale range value for the current output (20 mA). (see explanatory notes)
3.3.5 BAUDRATE	Select 1200 Bd	Baud rate for HART communication (non-changeable).
3.3.6 ADDRESS	Enter 0 ... 255	Enter device address. (for HART multidrop)
3.3.7 PROTOCOL	Select HART/KROHNE-PC	Select communications protocol
3.4 USER DATA		
3.4.1 LANGUAGE	Select GB-USA/D/F/I/E/P/S	Select language for the optional display.
3.4.2 ENTRY CODE 1	Select NO /YES	Switch the access lockout on/off. If YES, for every access a 9-digit entry code on the 3 keys is necessary.
3.4.3 CODE 1	Enter code (RRREEUUU)	Enter the entry code for access lockout.
3.4.4 LOCATION	Enter text (8 characters)	Enter a device identifier.
3.5 APPLICAT.		
3.5.1 AUTO TANKH.	Special function	Automatic determination of tank height (see explanatory notes).
3.5.2 EMPTY.SPEC.	Select OFF/ ON /RECORD	Recording the profile of the empty tank (empty-tank spectrum) (see explanatory notes).
3.5.3 TIMECONST.	Value 1... 10 ...100 [s]	Enter time constant for measured-value filtering
3.5.4 TRACING.VEL.	Value 0.01... 0.50 ...10.00 [m/Min]	Enter the maximum rate of change in level that can occur in operation.
3.5.5 MULT.REFL.	Select NO /YES	Switch the multi-reflection identifier on/off.
3.5.6 BD-DETECT.	Select NO / YES	Switch the block distance (overflow) identifier on/off (see explanatory notes).
3.5.7 FUNCT. FTB	Select OFF /PARTIAL	Select function of tank bottom tracing system (see explanatory notes).
3.5.8 EPSILON R	Enter 1.1000 ... 8.0000	Enter relative permittivity of product (only for Fct. 3.5.7)
3.5.9 TANKTYPE	Select STORAGE T. /PROC TANK	Select tank type. STORAGE T. = smooth product surface PROC TANK = slightly disturbed product surface

Default values are shown in **bold** type in the table.

Explanatory notes

Tank height

The tank height (**Fct. 3.1.1**) for the BM 700 is defined as the distance between the top edge of the tank connecting flange and the bottom reference point. The bottom reference point is that “point” in the tank on which the microwaves of the BM 700 hit and from which they are reflected. This may be the tank bottom (symmetrical tank with flat bottom) or the non-horizontal part of the bottom (e.g. tank with dished bottom) or an additionally fitted plate. The BM 700 cannot measure below this point (“sump” in the tank).

Note: When the tank is completely empty and the tank bottom provides good reflections (flat, not dished bottom!), the tank height can also be automatically determined with the aid of Function **Fct. 3.5.1** AUTO TANKH. Before confirming, check carefully that the proposed tank height is plausible!

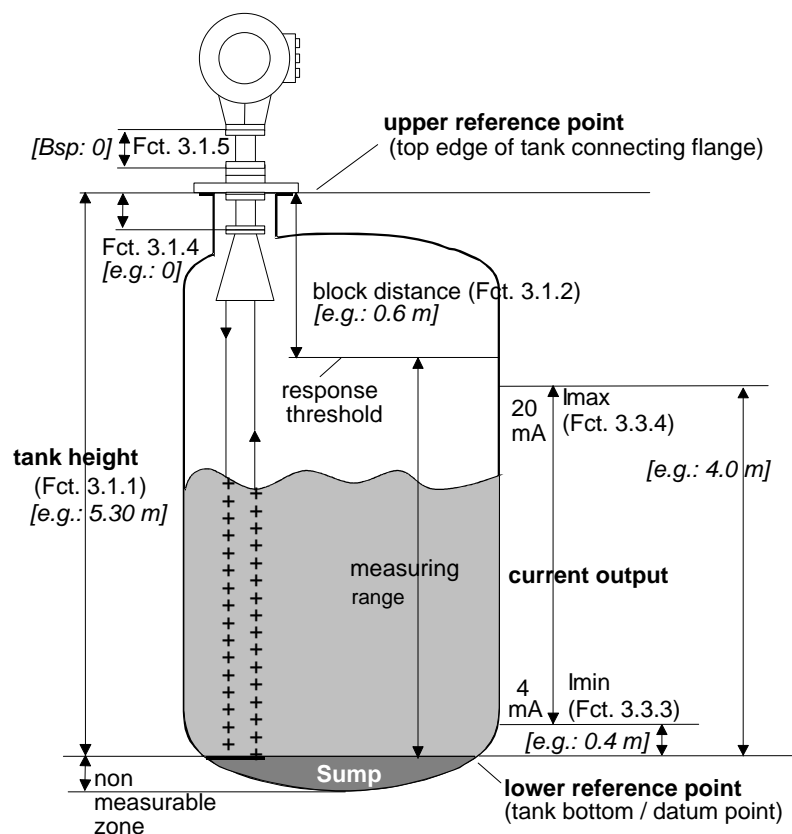
Block distance

The “block distance” function (**Fct. 3.1.2**) defines a zone below the top reference point in which measurements are not meant to take place. The value should be at least 10 - 20 cm greater than the length of antenna+antenna extension, or at least 20 cm in the case of the Wave-Stick.

Signals within the block distance are suppressed; a rise in the tank filling above this limit (response threshold) will lead to a measuring result corresponding to a distance = block distance, when **Fct. 3.5.6** BD-DETECT. is switched on.

Scaling of the current output

The scaling of the current output (**Fct. 3.3.3**: level 1 = 4 mA ; **Fct. 3.3.4**: level 2 = 20 mA) should if possible lie within the measuring range (between bottom reference point and response threshold).



Empty-tank spectrum

To enable the BM 700 to identify and blank out interference signals, e.g. caused by fixed and moving tank internals, the tank profile (empty-tank spectrum) needs to be recorded once only prior to (initial) start-up. For recording, the tank should be completely empty and all moving parts (e.g. agitators) switched on. If major interference through internals is not expected, recording of the empty-tank spectrum can also be dispensed with, since the factory has already carried out and stored a partial empty spectrum of the flange system.

Empty-tank spectrum recording via display

After selecting menu item **Fct. 3.5.2**, press key →. The display then shows whether the empty spectrum is currently ON or OFF. Then press the ↓ key if no change is to be made, or use the ↑ key to choose between the following options:

- ON: the empty-tank spectrum is (again) switched on and taken into account for measurements.
- OFF: the empty-tank spectrum is not taken into account for measurements, but remains stored in the BM 700 and can be switched on again at a later date.
- RECORD: the existing empty-tank spectrum is to be deleted and a new one recorded.

After selecting "RECORD": if other parameters had previously been changed, the query "ACCEPT YES" is first made as to whether they are to be stored. In this case, confirm by pressing ↓. To record, use the ↑ key to select one of the following options:

- MAX. VALUES: (only maximum values are taken into account when the empty-tank spectrum is recorded; useful e.g. with "difficult" agitators).
- AVERAGE: (values are averaged; this setting can be used for most applications).

After selecting with the ↑ key, press the ↓ key to select TOTAL or the ↑ key to select PARTIAL.

- When TOTAL is selected, the empty-tank spectrum is recorded over the entire range (tank height).
- If the tank has not been fully drained, the empty-tank spectrum can also be recorded up to a certain distance, in which case the menu item PARTIAL should be selected. When this has been selected, a query takes place by way of the ↓ key concerning the distance value up to which the empty-tank spectrum is to be recorded. The tank area below the current filling level is then excluded from the empty-tank recording. It is recommended to maintain a safety distance of 20 to 30 cm from the actual product distance.

Subsequently press key ↓ to start recording the empty-tank spectrum. The display starts with "1000" and counts down to "0". The sign WAIT flashes in the display. READY appears after approx. 2 minutes. Then press key ↓ five times to store the recorded empty-tank spectrum, which is taken into account for measurements.??

Empty-tank spectrum recording via PC-CAT

Connect the BM 700 and press in the display mode of PC-CAT the key combination Ctrl-L. The type of empty-tank spectrum can be selected by one of the following keys:

- | | | |
|---------------|-----------------|----------|
| 1: Max.Values | 4: Max. Partial | A: Break |
| 2: Average | 5: Avg. Partial | |

Tank bottom tracing mode (FTB)

The BM 700 includes an additional function for measuring reliably low levels in tanks with flat bottom and poorly reflecting products (low dielectric constant). This tank bottom tracing system (abbreviated FTB) is activated in the vicinity of the tank bottom (max. 20% level). Given higher levels, the normal measuring method is used (reflection from the product surface).

If the measurement jumps to the correct level only after filling above a certain level (approx. 0.3-1.0 m), you can activate the FTB function **Fct. 3.5.7** „PARTIAL“. The relative permittivity ϵ_r of the tank product must be set in **Fct. 3.5.8**. If it is not known, enter the figure of 2.0. Since the exact position of the tank bottom must be known for this process, it is advisable when using the FTB to determine the tank height automatically with an empty tank, using **Fct. 3.5.1**.

Conversion table/Volume table

A table consisting of a maximum of 50 points can be stored in the BM 700 for non-linear or linear conversion of the level, e.g. into a volumetric value. This table, however, can only be programmed with the PC-CAT program (Fct. 3.7.2).

Sequence for setting parameters (example)

(for version with local display)

The following description refers to a storage tank with the parameter examples taken from the illustration in this Section. If the device no longer contains the default parameters, the keystroke combination for entering the numerical values may differ.

<i>Activity</i>	<i>Keys to be actuated</i>	<i>Content of BM 700 display after activity carried out</i>
Entry into configuration menu	→	Fct. 1.0 OPERATION
Setting the parameter: tank height	↑↑ → →	Fct. 3.1.1 Tankheight
Display of default value	→	10.000 m
Input of tank height "5.30 m"	→ 9x ↑ → 5x ↑ → 3x ↑	05.300 m
Confirm tank height and move to block distance	↓ ↑	Fct. 3.1.2 Blockdist
Display default value	→	0.5000 m
Enter block distance "0.60 m"	→ ↑	0.6000 m
Confirm block distance and move to current output configuration	↓ ↓ ↑ ↑	Fct. 3.3 SIGNAL OUT
Move to lower range value	→ ↑ ↑	Fct. 3.3.3 Scale 4 mA
Display default value	→	+ 00.000 m
Enter lower range value (0.4 m = 4 mA)	3x → 4x ↑	+ 00.400 m
Confirm lower range value and move to full-scale range value	↓ ↑	Fct. 3.3.4 Scale. 20mA
Display of default value	→	010.00 m
Enter full-scale value (4.0 m = 20 mA)	2x → 9x ↑ → 4x ↑	004.00 m
Confirm full-scale value and move to empty tank spectrum	↓ ↓ ↑ ↑ → ↑	Fct. 3.5.2 EMPTY.SPEC.
Select: re-record empty spectrum	→ ↑ ↑	RECORD
Store changed parameters	↓	Accept. Yes
Confirm and select: averaging	↓ ↑	AveragE
Confirm and start recording; then wait for approx. 2 minutes!	↓ ↓	READY
Confirm and move to tank type	↓ 7x ↑	Fct. 3.5.9 Tank type
Display of default value	→	PROC tank
Select tank type "storage tank"	↑ ↑	Storage t.
Return to measurement function with confirmation of changed parameters	5x ↓	Param.Check, then START, then meas.val. display

5 Maintenance, error handling

Hazardous-duty systems

- Within the scope of routine checks required to be carried out on systems operated in hazardous areas (maintaining the system in good working order), the “flameproof enclosure“ (cover on signal converter) should also be **visually inspected** for outward damage and signs of corrosion.
- Before **opening** the “**flameproof enclosure**“ (e.g. to inspect the inside or for repair work) or the **terminal compartment** (e.g. to connect or disconnect cables) or **replacing the signal converter** in hazardous locations, make sure:
 - that the BM 700 Level-Radar has been disconnected from supply,
 - before opening the flameproof enclosure allow the prescribed waiting time of 10 minutes to elapse first,
 - or that there is no explosion hazard (gas-free certificate!).

Replacement of the signal converter

Before commencing, note the parameters of the BM 700 and switch off the power supply!

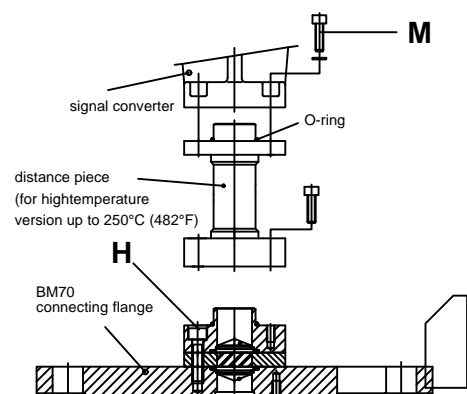
1. Detach safety lock at terminal compartment using Allen key (size 4 mm) and unscrew cover from terminal compartment using the special wrench. If a sunshade (option) is fitted, remove this first.
2. Disconnect all cables from the terminals in the terminal compartment.
3. Remove the 4 Allen screws M (Allen key size 5 mm) and lift off the signal converter. The flange unit (incl. waveguide window) will remain tight even with pressurized tanks.

Caution

On pressurized tanks, do not on any account remove the 4 screws **H** connecting the wave guide window to the BM 700 flange! DANGER!

4. Fit the new BM 700 converter.
5. Reconnect all cables in the terminal compartment, as described in Section 3.
6. Check against the enclosed report on settings whether the factory-set parameters are correct for your application. If not, reset.
7. Record the empty spectrum, see Section 4.

Important: Make sure that the screw thread of the covers on the terminal and electronic compartments is well greased at all times.



Returning a BM 700

The party returning a device is obligated to check and ensure that all cavities in the device are free from dangerous substances (toxic, caustic, flammable, water-endangering), and that a certificate is enclosed with the device confirming that it is safe to handle.

Error display during measurement (only for versions with local display)

When function 3.2.5 "ERROR. MSG." is set to YES, any error occurring during measurement is indicated in the display and alternates with the measured value for as long as the error is present.

In addition, all errors are stored. Press the keystroke combination ↵ ↑ → → to get into the error list. You can page through the list with key → , and acknowledge the errors at the end - if required - by "QUIT YES". Press key ↵ twice to return to the measuring mode.

Fatal errors (FATAL ERROR), that are detected when the device is started up, render operation of the BM 700 impossible.

6 Safety information

Insulation rating

The insulation of type BM 700 level gauges is rated in conformity with VDE 0110/01.89, equivalent to IEC 664, and takes into account the following ratings:

- overvoltage category for the power line circuit: III
- overvoltage category for the output circuit: II
- insulation contamination level: 2 (inside the device)

Disconnecting device

The type BM 700 level gauge does not feature any device for switching or disconnection.

Hazardous-duty systems

- **Types of protection in the BM 700 terminal compartment:**

Increased Safety "e" for signal output and power supply

- Consult the relevant wiring and installation regulations, e.g. VDE 0165, before **mounting, dismantling or making electrical connections** in a hazardous area.
- Before making the electrical connection, make sure all cables leading into the BM 700 Ex are **disconnected from supply!**

Temperature rating of connecting cables:

The temperature rating of connecting cables is dependent on the maximum temperature of the flange:

Version	Max. flange temperature	Cable temperature rating
Without high temperature distance piece	≤ 100°C (212°F)	70°C (158°F)
	> 100°C (212°F)	80°C (176°F)
With high temperature distance piece	≤ 200°C (392°F)	70°C (158°F)
	> 200°C (392°F)	80°C (176°F)

7 Technical data (extract)

Tank height (measuring range)	0.5 m to 20 m (1.64 ft to 65.6 ft)
Measuring accuracy (distance)	from 1 m (3.3 ft): ± 1 cm (0.4") from 3.3 m (10.8 ft): $\pm 0.3\%$
Measured-value resolution	1 mm (0.04")
Rate of change in level	max. 10 m/min (33 ft/min) (tracking speed)

Connecting flanges

Horn antenna/Wave-Guide	DIN 2501 DN 50 to DN 200 / PN 6 to PN 64 and higher; Shape C to DIN 2526 or others
Wave-Stick	ANSI B16.5 2" to 8", Class 150 lbs or 300 lbs, RF Only DN 50...150 or ANSI 2"...6", dairy DIN11851 DN50/65/80, Triclamp 2/3/4", SMS 51/63/76 mm, G 1½ "

Max. allowable operating pressure -1 bar (14.5 psig) (vacuum) to max. 64 bar (928 psig) , depending on version and flange pressure rating. (see name plate)

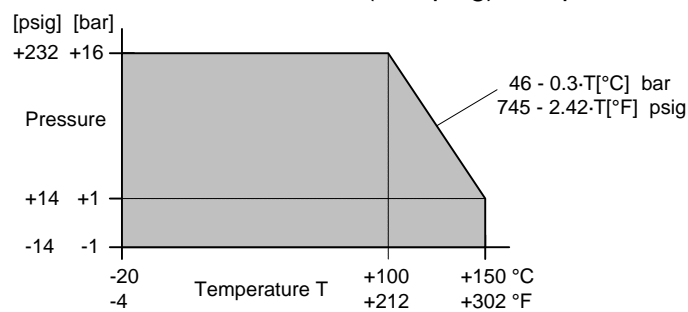
LP flange system with horn antenna, Wave-Guide or Wave-Stick without flange plate
2 bar

V96 flange system with Hornantenne or Wave-Guide:

Connection: nominal dia.		Flange rated pressure							
		PN 16		PN 25		PN 40		PN 64	
DN mm	inches	bar	psig	bar	psig	bar	psig	bar	psig
80	3	16	232	---	---	40	580	64	928
100	4	16	232	---	---	38	551	55	797
150	6	16	232	---	---	34	493	47	681
200	8	16	232	25 bar	362	32	464	45	652

Wave-Stick:

max. 16 bar (232 psig), temperature-dependent:

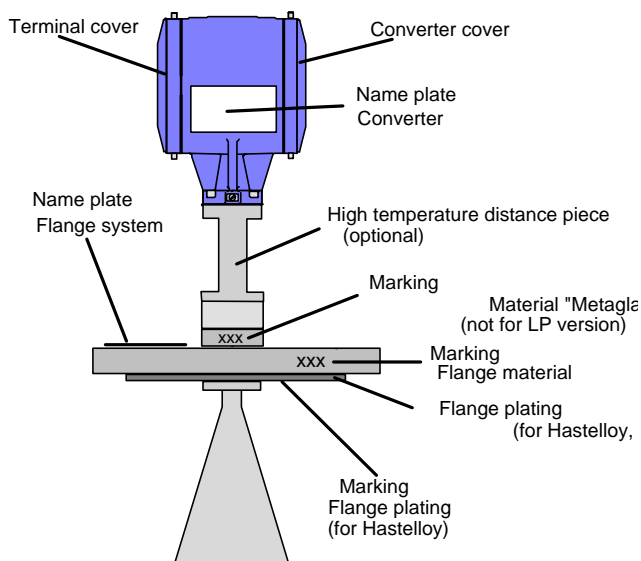


Operating temperature at flange (see also chapter 8)	<u>LP flange system</u> :	-20°C (-4°F) to +150°C (302°F)
	<u>V96 flange system</u> :	
	Basic version:	-30°C (-22°F) to +130°C (266°F)
	Special version:	min. - 60°C (-76°F)
	High temp. version, FFKM:	max. +250°C (482°F)
	Kalrez 2035:	max. +210°C (410°F)
FPM (Viton) or FEP-coated:	max. +200°C (392°F)	
<u>PTFE-Wave-Stick</u> :	-20°C (-4°F) to + 150°C (302°F), pressure depend	
<u>PP-Wave-Stick</u> :	-20°C (-4°F) to + 100°C (212°F)	

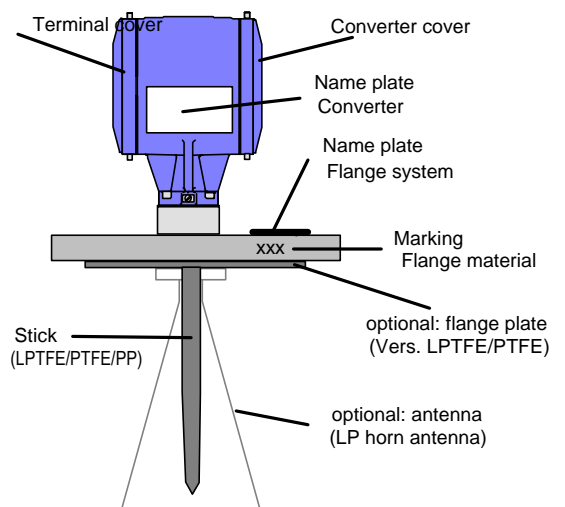
Product temperature	Unrestricted, provided ambient temperature and flange temperature are within the specified limits
Ambient temperature	Signal converter (T_{amb}): - 20°C (-4°F) to + 55°C (131°F)
Power supply	
24 V DCAC	19.2 - 28.8 V DC or 20.4 - 26.4 V AC (45 - 66 Hz) Power consumption (typical) approx. 6 W; AC: approx. 12 VA
Microwaves	
Measuring principle	FMCW Radar
Frequency range	X-Band 8.5 - 9.9 GHz
Antenna radiation angle	Type 3: $\pm 8^\circ$ Type 4: $\pm 6^\circ$ Wave-Stick: $\pm 9^\circ$
Ex-e current output HART® (active)	
Current	4 - 20 mA; without or with error message 2 mA or 22 mA
Accuracy and linearity	0.15 %; TC=100 ppm/K
Load impedance	≤ 350 Ohm
Digital communication	HART®
Ambient conditions	
Environment class	Locations exposed direct to open-air climate, D1 Severity in conformity with EN 60654-1
Protection category (converter)	IP66 / IP67 (equivalent to NEMA 4 and 4X)
Electrical connection	
Cable entries:	3 x M25 x 1.5 (US: with adapter ½ " NPT) (delivered with 2 cable glands 9-16 mm (0.35"-0.63") and 1 blind cap)
Terminals:	Cable cross-section 0.5-2.5 mm ² (AWG 20-14) (solid conductor: max. 4 mm ² (AWG 12))
U-clamp terminals	(for PA and FE) cable cross-section max. 4 mm ² (AWG 12)

8 BM 700 Level-Radar Type code

Series V96 or LP:



Series WS:



Marking of the **signal converter** (see name plate):

BM 700 non-Ex version for non-hazardous areas
BM 700 / E-EEEx Ex version for hazardous areas,
terminal compartment in Increased Safety „e“

Marking of the **Flange systems** (see name plate on flange):

..(1)..(2)..... non-Ex version for non-hazardous areas
..(1)..(2)..... – E Ex ..(3).. Ex version for hazardous areas

(1) *Series*

V96 Flange system V96
(with „Metaglass“ as versions with horn antenna or Wave-Guide)

WS Wave-Stick
(plastics rod antenna or short stick for still wells)

LP LP version
(with horn antenna or Wave-Guide)

(2) *Materials of the parts in contact with the product*
- Series V96:

» Antennas and flanges:

SS Flange and antenna of stainless steel
used material: see marking on flange

HB Flange plating and antenna of Hastelloy B (e.g. B2)
used material: see marking on plating

HC Flange plating and antenna of Hastelloy C (e.g. C4 or C22)
used material: see marking on plating

Ti Flange plating and antenna of Titanium

Ta Flange plating and antenna of Tantalum

Mo Flange plating and antenna of Monel

» gasket material:

FFKM Gaskets of FFKM, e.g. Kalrez™ 4079 or Parofluor™ V3819-75

K2035 Gaskets of Kalrez™ 2035

FPM Gaskets of FPM, e.g. Viton™

FEP Gaskets FEP-coated (FPM core)

- Series WS

LPTFE Stick and flange plate of conductive PTFE

PTFE Stick and flange plate of PTFE

SS PTFE stainless steel PTFE, gasket of FFKM
also for version „LP horn antenna“

SS PP stainless steel PP, gasket of FPM (Viton™)

(3) *Application conditions, equipment group II*
(explosive atmosphere by gases, vapours, mists)

1G equipment category 1, application in Zone 0
(versions V96, or Wave-Stick LPTFE or PTFE with Metaglass)

2G equipment category 2, application in Zone 1
(Wave-Stick PP or PTFE without Metaglass, or LP flange system)

(free) Without Ex approval (e.g. LP version)

Limits of temperature at flange:

Version	Minimum flange temperature		Maximum flange temperature	
	Standard version	Special version with marking „2.4610“ at the Metaglas ring	Without high temperature distance piece	With high temperature distance piece
V96 ... FFKM	- 30°C (- 22°F)	- 60°C (-76°F)	+130°C (+266°F)	+250°C (+482°F)
V96 ... K2035	- 30°C (- 22°F)	- 60°C (-76°F)	+130°C (+266°F)	+210°C (+410°F)
V96 ... FPM	- 30°C (- 22°F)	- 60°C (-76°F)	+130°C (+266°F)	+200°C (+392°F)
V96 ... FEP	- 30°C (- 22°F)	- 60°C (-76°F)	+130°C (+266°F)	+200°C (+392°F)
WS LPTFE	- 40°C (- 40°F)	—	+130°C (+266°F)	+150°C (+302°F)
WS PTFE	- 40°C (- 40°F)	—	+130°C (+266°F)	+150°C (+302°F)
WS SS PTFE	- 20°C (- 4°F)	—	+130°C (+266°F)	+150°C (+302°F)
WS SS PP	- 20°C (- 4°F)	—	+100°C (+212°F)	+100°C (+212°F)

9 Parameter check list BM 700

<i>Menu item changed on Version:</i>			
Fct. Configuration parameters (extract)			
3.1.1 Tank height			
3.1.2 Block distance			
3.1.3 Antenna			
3.1.4 Antenna extension			
3.1.5 Distance piece			
3.1.6 Stillwell / diameter			
3.1.7 Reference offset			
3.1.8 Tank bottom			
3.3.1 Current output, function offset			
3.3.2 Current output range/error			
3.3.3 Min. current scale			
3.3.4 Max. current scale			
3.5.2 Empty spectrum			
3.5.3 Time constant			
3.5.4 Tracking speed			
3.5.5 Multiple reflections (yes/no)			
3.5.6 Block distance ident (yes/no)			
3.5.7 Function FTB			
3.5.8 Epsilon R			
3.5.9 Tank type			

Appendix

(for Germany)

Gazette 129, 20.11.1989

Decree 1117/1989

General licence No. 353 for radio transmitting and receiving installations

The installation and operation of the radio transmitting and receiving system "BM 70 Level Radar" and "BM 70 Ex Level Radar" manufactured by Firma KROHNE Messtechnik GmbH & Co. KG, frequency in the 8.1 - 9.4 GHz frequency range, is hereby authorized pursuant to §§ 1 and 2 of the law concerning telecommunication systems as adopted in the version dated 03.07.1989. The radio systems may only be operated inside totally enclosed metal tanks.

1. The radio system, including radio systems, must not suffer any interference.
2. The radio systems of the above-mentioned type designations must be identical in all respects with the models examined and tested by the Central Appraisal Authority. The identification mark must be "Postsignum Z G490353X" and the name of KROHNE Messtechnik GmbH & Co. KG, 4100 Duisburg, and the type designation "BM 70 Level Radar" or "BM 70 Ex Level Radar".
3. The identification mark must be embossed or engraved on the housing or on a plate made of metal or similarly strong material. The plate must be attached to the housing in such a way that it is impossible to remove or can only be removed by the use of force. *The identification mark must be visible at all times from the outside.*
4. The operator of such radio systems has no benefit of protection whatsoever against interference from other telecommunication systems or telecommunication equipment (e.g. including radio systems that are duly operated in the same frequency range).
5. The above-mentioned radio systems may not be linked to other telecommunication systems or telecommunication equipment without special approval from the Deutsche Bundespost.
6. This "general licence" can at any time be revoked in toto - or in isolated cases can also be revoked for individual radio systems by the relevant local licensing authority.

Additional notes for manufacturer and users

1. The manufacturer of these generally licensed radio systems has the responsibility towards the Deutsche Bundespost to ensure that a reprint of this "general licence" accompanies each and every instrument brought onto the market under the above-mentioned certification mark.
2. The licence to link these radio systems with other telecommunication systems or telecommunication equipment is governed by the respective requirements (provisions concerning private-sector cabled telecommunication equipment, and the telecommunication regulations). Information in this respect is available from the appropriate telecommunication offices (acceptance and testing service).

281-3 A 3552-2/A

Decree 241/1995

Extension of the general licence No. 353 for radio transmitting and receiving installations

To Gazette Decree 1117/1989, page 2066

The above-mentioned general licence for radio installations issued to the company of KROHNE Messtechnik GmbH & Co. KG, 47058 Duisburg, shall with immediate effect also include radio installations that operate at a frequency in the frequency range of 8.1 - 9.9 GHz, for the same purpose are placed by the company on the market and which are marked in accordance with the general licence. At the same time, the purpose **is extended to level measurements in concrete tanks having a minimum wall thickness of 19 cm**. The radio installations may only be **operated in fully enclosed tanks**.

314-1A 3552-2/A

CE Manufacturer's declaration:

DECLARATION OF CONFORMITY

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

declare on our own responsibility that the products

- BM 700 Level-Radar

to which this declaration refers, are in conformity with the following standards:

- EN 50081 - 1 : 1993 - 3
- EN 50082 - 2 : 1995 - 3
- pr EN 50178 : 1994 - 8
- EN 61010 - 1 : 1993 - 4

in accordance with the provisions of Directives 89 / 336 / EEC and 73 / 23 / EEC.

Duisburg, 01.09.1998
(Place and date of issue)

(signed: Company Management)

Funktechnische Zulassung

Amtsbl 129, 20.11.1989

Fernmeldewesen

Vfg 1117/1989

Allgemeingenehmigung Nr. 353 für Sende- und Empfangsfunkanlagen

Das Errichten und Betreiben der Sende- und Empfangsfunkanlage "BM 70 Level Radar" sowie "BM 70-Ex Level Radar" der Firma KROHNE Meßtechnik GmbH & Co. KG, 4100 Duisburg, für Fernwirkzwecke (Füllstandsmessungen in Metalltanks) auf einer Frequenz im Frequenzbereich 8,1 - 9,4 GHz, wird aufgrund der §§ 1 und 2 des Gesetzes über Fernmeldeanlagen in der Fassung der Bekanntmachung vom 03.07.1989 hiermit genehmigt. Die Funkanlagen dürfen nur innerhalb allseits geschlossener Metalltanks betrieben werden.

1. Andere Fernmeldeanlagen und Telekommunikationseinrichtungen, die öffentlichen Zwecken dienen, sowie Funkanlagen dürfen nicht gestört werden.
2. Funkanlagen, die unter den vorgenannten Typenbezeichnungen in den Verkehr gebracht werden, bedürfen keiner besonderen Genehmigung im einzelnen, wenn sie mit den beim Zentralamt für Zulassungen im Fernmeldewesen (ZZF) technisch geprüften Baumustern elektrisch und mechanisch übereinstimmen und mit dem Zulassungszeichen der Deutschen Bundespost wie folgt: "Postsignum Z G490353X" sowie mit dem Namen der Firma KROHNE Meßtechnik GmbH & Co. KG, 4100 Duisburg, und der Typenbezeichnung "BM 70 Level Radar" bzw. "BM 70-Ex Level Radar" gekennzeichnet sind.
3. Die Kennzeichnung muß in das Gehäuse bzw. auf einem Plättchen aus Metall oder ähnlich festem Material eingepreßt oder eingraviert sein. Das Plättchen muß so mit dem Gehäuse verbunden sein, daß es nicht oder nur mit Gewalt von diesem entfernt werden kann. *Die Kennzeichnung muß von außen jederzeit sichtbar sein.*
4. Der Betreiber solcher Funkanlagen genießt keinerlei Schutz vor Störungen durch andere Fernmeldeanlagen und Telekommunikationseinrichtungen (z.B. auch durch Funkanlagen, die ordnungsgemäß im gleichen Frequenzbereich betrieben werden)
5. Die obengenannten Funkanlagen dürfen ohne eine besondere Genehmigung der Deutschen Bundespost nicht mit anderen Fernmeldeanlagen oder Telekommunikationseinrichtungen verbunden werden.
6. Diese "Allgemeingenehmigung" kann insgesamt - oder im Einzelfall auch für einzelne Funkanlagen durch die örtlich zuständige Genehmigungsbehörde - jederzeit widerrufen werden.

Zusatzhinweise für die Herstellerfirma und die Benutzer

1. Die Herstellerfirma dieser allgemein genehmigten Funkanlagen hat sich gegenüber der Deutschen Bundespost verpflichtet, jedem unter dem o.g. Zulassungszeichen in Verkehr zu bringenden Gerät einen Nachdruck dieser "Allgemeingenehmigung" beizufügen.
2. Die Genehmigung zum Verbinden dieser Funkanlagen mit anderen Fernmeldeanlagen oder Telekommunikationseinrichtungen richtet sich nach den jeweiligen Vorschriften (Bestimmungen über private Drahtfernmeldeanlagen bzw. der Telekommunikationsordnung). Auskünfte hierzu erteilen die zuständigen Fernmeldeämter (Abnahme- und Prüfdienst).

281-3 A 3552-2/A

Vfg 241/1995

Erweiterung der Allgemeingenehmigung Nr. 353 für Sende- und Empfangsfunkanlagen

Zur AmtsblVfg 1117/1989, S.2066

Die obengenannte Allgemeingenehmigung für Funkanlagen der Firma KROHNE Meßtechnik GmbH & Co. KG, 47058 Duisburg, erstreckt sich ab sofort auch auf die Funkanlagen, die auf einer Frequenz im Frequenzbereich 8,1 - 9,9 GHz arbeiten, von der Firma für den gleichen Verwendungszweck in den Verkehr gebracht werden und die entsprechend der Allgemeingenehmigung gekennzeichnet sind. Gleichzeitig wird der Verwendungszweck auf **Füllstandsmessungen in Betontanks mit einer Mindestwandstärke von 19 cm erweitert**. Die Funkanlagen dürfen nur in **allseits geschlossenen Tanks betrieben werden**.

314-1A 3552-2/A

CE-Herstellererklärung:

KONFORMITÄTSERKLÄRUNG

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

erklären in alleiniger Verantwortung, dass die Produkte

- BM 700 Level-Radar

auf die sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmen:

- EN 50081 - 1 : 1993 - 3
- EN 50082 - 2 : 1995 - 3
- pr EN 50178 : 1994 - 8
- EN 61010 - 1 : 1993 - 4

gemäß den Bestimmungen der Richtlinien 89 / 336 / EWG und 73 / 23 / EWG.

Duisburg, 01.09.1998

(Ort und Datum der Ausstellung)

(gez. Geschäftsführung)