KROHNE

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CMD

Supplementary Installation and Operating Instructions

BW25/.././.../../.../..

Liquid level indicator

Ex

Category II1/2G

Contents

1. General safety instructions

This supplementary manual applies to BW25 liquid level indicators that are designed for use in hazardous areas. It supplements the installation and operating instructions for non-hazardous area versions.

The instructions in this manual only include data that relates to explosion protection. The technical details in the Installation and Operating Instructions for non-hazardous area versions apply in their entirety provided they have not been excluded or superseded by information contained in this manual.

BW25 series liquid level indicators are approved according to the European directive 94/9 EC (ATEX 100a) as per European standards EN 50XXX for use in hazardous areas under

PTB 05 ATEX 1053 X

by the Physikalisch-Technische Bundesanstalt (PTB) (German national metrology institute).

The EC type test certification is available for downloading at www.krohne.com.

Always adhere to these important instructions!

- It is particularly important to follow the rules in EN 60079-14 "Electrical apparatus for explosive gas atmospheres", in addition to installation rules for power systems (VDE 0100.)
- Assembly, installation, start-up and maintenance shall be carried out exclusively by personnel specifically trained to work in hazardous areas.

1.1 Symbols used

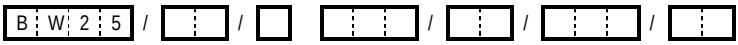
Special symbols are used to identify warnings or refer to information regarding certain applications. The symbols are explained in the following:

Caution
Failure to follow this information can result in product malfunction.

2. Safety-related description code

2.1 Series BW25/../../.../../…/.. liquid level indicator

The description code consists of the following elements: 1)



1 BW25 design series meter

2 Materials/versions
- RR: stainless steel
- TI: stainless steel (meter flange), titanium (displacement rod)

3 Reference vessel version
- B: including reference vessel

4 Indicator design series
- M9: standard version
- M9S: standard version with impact-resistant window
- M9R: stainless steel version
- M9T: stainless steel version with impact-resistant window
- M10: M10 converter

5 High-temperature version
- HT: version with HT extension

6 Electric signal output
- ESK: electronic transmitter

7 Limit switch
- K1: one limit switch
- K2: two limit switches

1) Places for items not needed may be omitted from the description code

3. Main safety-related features

3.1 Category / Zone

The liquid level indicators are designed for Category 1/2 as per RL 94/9 EC and according to EN 60079/14 for use in Zone 0. The converters are designed for Category 1/2 as per RL 94/9 EC for use in Zone 1.

3.2 Atmospheric conditions, flammable liquids

EN 1127, section 3.17 defines "potentially explosive atmosphere" as a mixture of air and flammable gases, vapors, mist and dust under atmospheric conditions. EN 13463-1, section 1 defines these as T_{atm} = - 20°C…+60°C and P_{atm} = 0.8…1.1 bar. There are no safety-related specifications outside this range for most ignition sources. If the application conditions do not fall within the above range, the risk of ignition in each individual situation must be analyzed on the basis of the known parameters (e.g. pressure, temperature, process product, meter material).

3.3 Protection types

M9 converters without electric components are supplied as protection type "c". Electrical circuits for M9. converters with limit switches or electronic signal outputs are supplied as intrinsically safe, category "ia" or "ib".
M10 converter M10 is supplied as protection type "explosion proof". The device descriptions are as follows:

- Version BW25/../../M9./..: c
- Version BW25/../../M9./../…/..: EEx ia IIC T6
- Version BW25/../../M10: EEx d IIC T6

3.4 Temperature class

Liquid level indicators are exposed to three sources of heat that can affect surface temperature:

- ambient temperature T_{amb}
- radiated from electrical components P_v
- process product / flange temperature T_m

The suitability of the liquid level indicators for the following approved process product / flange temperatures depends on the type of converter, temperature class and ambient temperature,

Maximum allowable process product / flange temperature for BW25/../../M9./../.../..

Device type			Maximum allowable process product / flange temperature [°C] for temperature class and T_{amb}					
Indicator	built-in module(s)	HT	T6	T5	T4	T3	T2	T1
			T_{amb} ≤40°C	T_{amb} ≤60°C				
M9	ESK		85	97	135*	200*	290*	290*
M9S	ESK	X	85	100	135	200*	300*	400*
	K.		85	100	135*	200*	290*	290*
	K.	X	85	100	135	200*	300*	400*
	ESK/K.		85	97	135*	200*	290*	290*
	ESK/K.	X	85	100	135	200*	300*	400*
M9R	ESK		85	85	135*	200*	250*	250*
M9T	ESK	X	85	100	135*	200*	295*	295*
	K.		85	100	135*	200*	275*	275*
	K.	X	85	100	135*	200*	295*	295*
	ESK/K.		85	85	135*	200*	250*	250*
	ESK/K.	X	85	100	135*	200*	295*	295*

* heat-resistant connecting cable $T_{min.}$ ≥ 90°C

Minimum ambient temperature for BW25/../../M9/../.../..

Indicator type	Electrical module		Minimum allowable ambient temperature in °C
	limit switch	electrical signal output	
M9	---	ESK....	-40
M9 / M9R	SJ3,5-SN SJ3,5-S1N SC3,5-N0-Y	optional	-20
M9S / M9T	SJ3,5-SN	optional	-40

Maximum allowable process product / flange temperature for BW25/../../M9/..

Device type			Maximum allowable process product / flange temperature [°C] for temperature class and T_{amb} -40…60°C
Indicator	built-in module(s)	HT	
M9.	none		300
		X	400

Maximum allowable process product / flange temperature for BW25/../../M10

Indicator type	Maximum allowable process product / flange temperature [°C] for temperature class and T_{amb} -40…60°C					
	T6	T5	T4	T3	T2	T1
M10	85	100	135*	200*	300*	300*

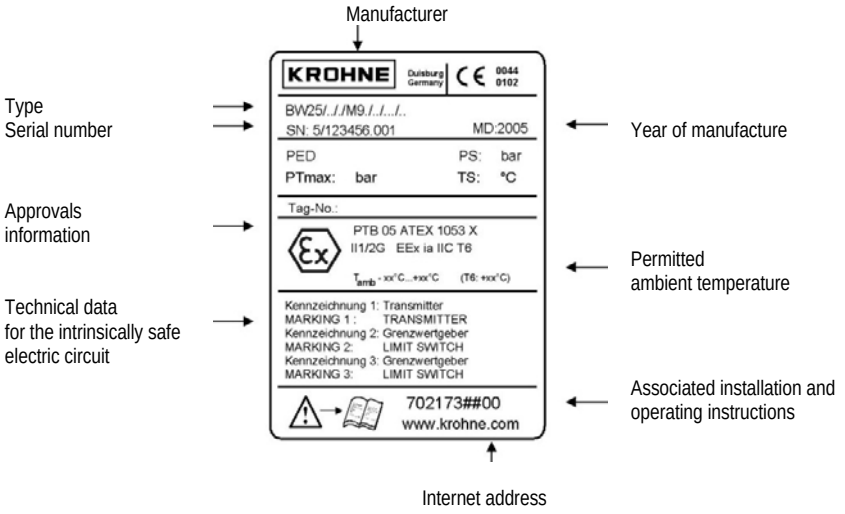
* heat-resistant connecting cable $T_{min.}$ ≥ 90°C

4. Marking

4.1 Indicator part marking

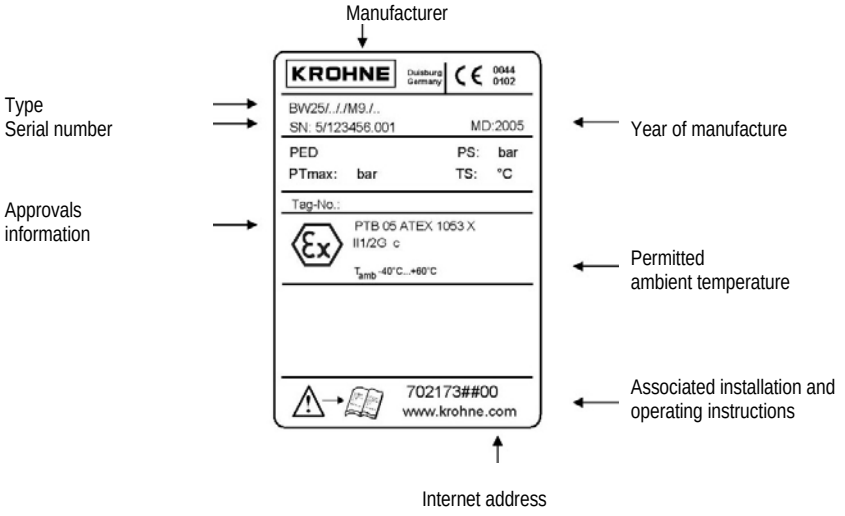
The device type identification is as shown in the following nameplate, which is located on the indicator housing. The description of the type code can be found in chapter 2.

4.1.1 Version BW25/../../M9/../.../.. (with electric components)

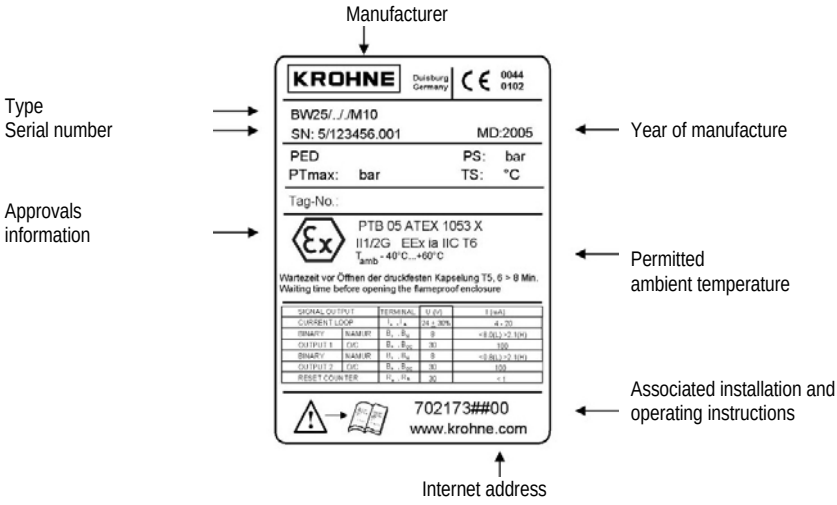


A supplementary product code and serial number is included on the inside of the indicator for liquid level indicators with M9 indicator components.

4.1.2 Version BW25/../../M9/.. (without electric components)



4.1.3 Version BW25/../../M10



5. Assembly and installation

Assembly and installation shall be performed in accordance with applicable installation standards for hazardous areas (e.g., EN 60079-14 / VDE 0165), by personnel specifically trained to work in hazardous areas.
Instructions contained in the Installation and Operating Instructions and the Supplementary Installation and Operating Instructions (Ex) shall be followed without fail.

The suitability of the liquid level indicator for the intended application shall be verified by checking the nameplate. Check the contract data to verify that the material of the wetted parts is suitable for the process product.

In particular, pay close attention to the following during assembly and installation.

5.1 Meter BW25/../../…/../…/..

5.1.1 Installation requirements

The device shall be installed such that mechanical forces from incoming flow or impact sparks in the measuring system (e.g., from agitators) are prevented, particularly for displacement rods made of titanium.

5.1.2 Tank socket

The tank socket for the meter must form a flameproof joint with the screw thread on the tank such that the joint conforms to EN 50 018.

5.1.3 Auxiliary connections on the reference vessel

The locking screw's thread builds a flameproof joint with the reference vessel when given at least five full turns. This screw must be removed to use the auxiliary connection. The screw shall only be removed if containers are empty.

Appropriate measures must be undertaken to ensure that this auxiliary connection is flameproof. The fitting screwed into the auxiliary connection must form a flameproof joint that conforms to EN 50 018 (note thread quality grade and thread length).

When using the auxiliary connection, the operator shall ensure that no prohibited changes are made to the process conditions (e.g., temperature, pressure, etc.).

5.2 General information

Rated values for insulation:
The insulation for the BW25/../../.../../.../.. liquid level indicator is rated in accordance with VDE 0110-1, in compliance with IEC 60 664-1. The following ratings apply:

- Overvoltage category for signal and instrument loops: II
- Pollution degree of the insulation: 2

5.3 Electrical connection BW25/../../M9../.../..

The electronic ESK signal output and the limit switch shall only be connected to separate intrinsically safe electric circuits. Maximum values shall be maintained for the isolated circuits and the following reactances shall be taken into consideration.

Circuit	Ui	Ii	Pi	Ci	Li
ESK II	30 V	100 mA	1 W	~ 20 nF	~ 0 µH
ESK3-PA	24 V	FISCO field device			
SC3,5-NO-Y..	16 V	25 mA	64 mW	150 nF	150 µH
SJ3,5-SN	16 V	25 mA	64 mW	30 nF	100 µH
SJ3,5-S1N					

5.3.1 Terminal assignment

The electrical connection for the limit switch or the electronic signal output is made in the terminal compartment of the indicator housing. Ensure that the connection conforms to the terminal polarity labeling. When the meter is equipped with two different limit switches, the switch configuration is shown on the nameplate and on the terminals to ensure they are assigned correctly.

5.3.2 Connection cable

Connection cables for the intrinsically safe circuits must be selected to comply with the applicable installation standard (e.g., EN 60079-14 / VDE 0165). The formation of summation currents between the various intrinsically safe circuits shall be prevented.
Wiring shall be routed such that there is sufficient clearance between the surfaces of the meter and the connecting cables.

5.3.3 Electrostatic grounding

If the process connection does not establish an adequate electrostatic ground for the device, a supplementary ground connection shall be made using the optional ground connection on the indicator. The location of the grounding screw on the indicator is shown in the photo below. Also ensure that the mounting screws for the indicator are firmly tightened.

This bond only provides an electrostatic connection for the device and does not fulfill the requirements for an equipotential connection.

Optional grounding screw

5.4 Electrical connection BW25/../../M10

5.4.1 Terminal compartment

The cover for the electronics compartment is secured by means of a special clasp. Use an SW3 Allen key to turn the screw.
The electrical connections for the power supply and I/O functions are made in the integrated terminal compartment of the converter. The protection type of the terminal compartment is EEx d. Unused openings shall be closed in compliance with EN 50 018.

Cable entries and blanking plugs used shall comply with protection class IP67 when they are ready for operation and receive individual separate certification in accordance with EN 50 018.
The cables can be routed into the flameproof terminal in various ways.

- Direct entry of the power cables by way of flameproof cable glands in the flameproof terminal compartment requires a separate test certificate as per EN 50 018 for the flameproof glands.
- Direct entry of the cables by way of conduits into the flameproof terminal compartment of the device requires a flameproof joint after screwing in the conduit and a suitable stopping box in accordance with EN 50 018.
- Direct entry of the cables by way of conduits using built-in conical thread adapters. Only conduit with threaded ends that comply with the description on the adapter shall be inserted into the thread adapter. The thread on the conduit must conform to the requirements of standard EN50018 (min. 6 threads). A suitable stopping box shall be provided within 450 mm of the entry into the terminal compartment.

CAUTION

Ensure that the thread adapter is firmly seated in the housing. This applies in particular after loosening the conduits. Devices shall be electrically isolated before loosening the conduits. Before loosening any conduit adapters, be sure to allow for any necessary waiting times before opening the flameproof enclosure.

The continuous service temperature range of any components used shall be at least -40…70°C. For temperature ranges where a heat-resistant cable is specified, the continuous service temperature range must be at least -40…90°C.

5.4.2 Connecting cables

Connecting cables shall comply with relevant installation standards (e.g., EN 60079-14 / VDE 0165). The outer diameter of the connecting wires shall conform to the cable clamping area for the supplied cable entries. The data included in the last table of chapter 3.4 Temperature class must be taken into consideration.

5.4.3 Connecting power and I/O functions

- The converter shall be connected to the equipotential bonding conductors via the outer PA connector.
- The wiring for the liquid level indicator's electrical connection shall be fixed.

Liquid level indicators BW25/../../M10 do not need a separate power supply. The necessary power is supplied via the current output.

When connecting the I/O interfaces for BW25/../../M10 liquid level indicators, the following data shall be taken into account.

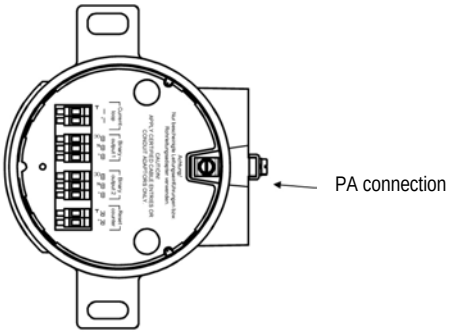
I/O function(1)	Rated values of the non-certified receiver instrument
According to standard installation and operating instructions	According to standard installation and operating instructions
(1) only for connection to circuits with "protective extra-low voltage (PELV)"; maximum values $U_{AC} \leq 25V$; $U_{DC} \leq 60V$	

- Before connecting or disconnecting the electrical connection cables of the device, make sure that all cables leading to the converter are isolated from the ground of the hazardous area. This also applies to equipotential bonding conductors (PA).
- All connecting cable conductors and shields that are not securely connected to the equipotential grounding system of the hazardous area shall be carefully isolated from one another and from ground ($1500V_{rms}$ test voltage for non-intrinsically safe cables).
- Connect all shields by the shortest route possible to the press fitted U-clamp (PE) terminal located 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 shields to avoid unacceptable equalizing currents.

The converter shall be incorporated into the equipotential bonding system of the hazardous area. Connect the conductor to the press-fitted U-clamp mounted on the outside of the converter housing.

- The meter can be incorporated into the equipotential bonding system of the hazardous area using the U-clamp mounted on the flange if present, or suitable conductive connections (seals, etc.).
- The terminal assignment is listed in the following table:

Function Signal output		Terminal identification (see sketch)	
HART current loop		I_+	$I_\perp$
Status output (1) (binary output 1)	NAMUR	B_+	B_N
	O/C- PNP	B_+	B_{OC}
Status output (2) (binary output 2)	NAMUR	B_+	B_N
	O/C- PNP	B_+	B_{OC}
Status input (reset counter)		R_+	$R_\perp$



6. Start-up

Check the following before initial start-up.

- Check suitability of the meter materials and the sealing materials, making sure that they have adequate corrosion resistance to the process product.
- Check that the electrical devices are correctly connected.
- Check that the liquid level indicator is properly mounted on the container, including any auxiliary equipment such as the reference vessel and/or the auxiliary connections.
- Check that the equipotential bonding system is connected properly (BW25/../../M10 only)
- Check that the electrostatic ground is connected properly (BW25/../../M9/../…/.. only).
- Check that power and I/O functions are connected correctly.
- Check that the covers of the electronic compartment are firmly in place and special locks have been tightened down (BW25/../../M10 only).

7. Operation

7.1 Version BW25/../../M9/../…/..

Adjusting the limit switch during operation is allowed. To do so, the housing cover must be removed. Replace the housing cover immediately after adjusting the limit switch.

7.2 Version BW25/../../M10

Do not open the cover of the electronics compartment in the presence of an explosive atmosphere. Should it become necessary to parameterize the device in the presence of an explosive atmosphere, this can either be done by using the supplied programming bar magnet and applying it to the glass window of the electronics compartment without opening of the housing, or digitally via the signal output.

8. Maintenance

8.1 M9 indicator

The indicator requires no maintenance under normal operating conditions and when used as prescribed. The following visual checks should be carried out at regular intervals in conjunction with the plant inspections required in hazardous areas to keep equipment in good operating condition:

- Inspect the housing, cable entries and incoming cables for signs of corrosion or damage.

8.2 M10 indicator

The converter requires no maintenance under normal operating conditions and when used as prescribed. The device must be electrically isolated if it becomes necessary to open the flameproof electronics compartment in the presence of an explosive atmosphere. For temperature classes T6 and T5, be absolutely sure to wait until the time shown on the converter nameplate has elapsed before opening the flameproof enclosure (8 minutes).

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

Re-grease the flameproof cover thread of the converter and the cover seals with a suitable resin-free grease after doing any maintenance work.

The following visual checks should be carried out at regular intervals in conjunction with the plant inspections required in hazardous areas to keep equipment in good operating condition:

- Inspect the housing, cable entries and incoming cables for signs of corrosion or damage.

8.3 Meter

The meter requires no maintenance under normal operating conditions and when used as prescribed.
The following visual checks should be carried out at regular intervals in conjunction with the plant inspections required in hazardous areas to keep equipment in good operating condition:

- Check the meter and, if applicable, the reference vessel for leakage
- Include the liquid level indicator in regular pressure tests of the process vessels (only for flammable process products).

Depending on the application, worst-case operating conditions may lead to reduced measuring performance as a result of fouling of the measuring system.
Clean the meter in accordance with the installation and operating instructions for non-explosion proof versions of the product. To do so, the meter must be removed.

Removing the meter will need to be coordinated with operating conditions (e.g., check for existence of a flammable liquid or explosive atmosphere in or at the tank or pressurized tank) and is the responsibility of the operator.
Follow the instructions for removing the entire device (see chapter 9.2).

9. Removing the device

9.1 Removing the indicator

Because of the modular design of the liquid level indicator it is possible to replace the indicator and, if applicable, the electronic components with identical spare parts. The meter process connections do not need to be removed. This also applies to pressurized processes.

9.1.1 Replacing indicator M9.

If at all possible, the meter should be electrically isolated before removing and replacing the indicator. If this is not possible, be sure to adhere to the general conditions for intrinsically safe circuits when removing (e.g., grounding or interconnecting any intrinsically safe circuits).

9.1.2 Replacing indicator M10

Before disconnecting the electrical connection cables of the device, make sure that all cables leading to the converter are isolated from the ground of the hazardous area. This also applies to equipotential bonding conductors (PA).
The device shall be electrically isolated if it becomes necessary to open the flameproof electronics compartment enclosure in the presence of an explosive atmosphere. For temperature classes T6 and T5, be absolutely sure to wait until the time shown on the converter nameplate has elapsed before opening the flameproof enclosure (8 minutes).

9.2 Removing the entire device

The same requirements as described in chapter 9.1 apply for the indicator.

Make sure any process connections are depressurized before removing the meter.
Avoid allowing any liquids remaining in the meter to flow out in an uncontrolled manner.
When dealing with environmentally sensitive products, the wetted parts of the measuring tube must be decontaminated after removing the meter.

CAUTION The operator is responsible for installing and removing the meter.

10. Maintenance

Maintenance work related to safety in hazardous areas shall only be done by the manufacturer, an authorized representative or under the supervision of authorized inspectors.

Notes

Notes

11. Returning a device for testing or repair to KROHNE

This device has been carefully manufactured and tested.
If installed and operated in accordance with these instructions, it will rarely present any problems. Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, KROHNE may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.

This means that KROHNE can only service this device if it is accompanied by the following certificate confirming that the device is safe to handle.

If the device has been operated with toxic, caustic, flammable or water-endangering products, you are kindly requested:

- to check and ensure, if necessary by rinsing out or neutralizing, that all cavities are free from such dangerous substances.
- to enclose a certificate with the device confirming that is safe to handle and stating the product used.

KROHNE regret that they cannot service your device unless accompanied by such a certificate. Thank you for your understanding.

F O R M S H E E T (for copying)

Company:…… Address:……

Department:…… Name:……

Tel. No.:…….. Fax No.:……..

The accompanying device,

Type:……

KROHNE order or serial No.:……..

has been operated with the following liquid: ……

Because this liquid is:
☐ water-endangering ☐ toxic ☐ caustic ☐ flammable

we have:
☐ checked that all cavities in the device are free from such substances
☐ flushed out and neutralized all cavities in the device

We confirm that there is no risk to man or environment through any residual liquid contained in this device.