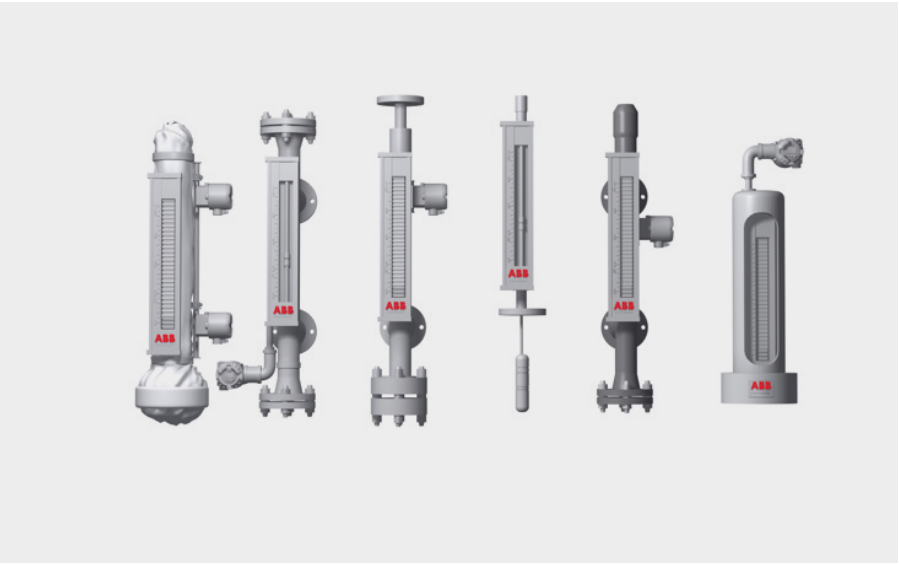
ABB MEASUREMENT AND ANALYTICS | OPERATING INSTRUCTION

KM26/MW05/LMG/EC

Magnetic level gauges



Magnetic level gauge, MagWave dual chamber level system and external chamber

Innovative magnetic level gauge solutions

Introduction

KM26

With over 350,000 installations worldwide, the KM26 magnetic level gauge has provided custom engineered solutions to liquid level applications in industries such as: oil and gas, refinery, chemical, petrochemical, power generation and many more. The KM26 MLG has proven itself to be a safe, reliable, maintenance free solution for total and / or interface level detection in toxic, corrosive, high pressure and high temperature processes.

ABB offers the standard KM26 magnetic level gauge with a chamber of virtually any non-magnetic material, extruded process connections, a custom engineered float and all accessories with stainless steel construction.

MW05

ABB also offers a dual chamber redundant level system, which has a proven record of improving feed water heater reliability in power plants around the world. The MagWave combines a highly visible magnetic level indicator with the precise level measurement of a guided wave radar transmitter. Redundant level control can be achieved by adding a magnetostrictive transmitter or switch to the float chamber.

LMG

The LMG series is a mainstay product developed based on the successful experience of our classic high-end KM26 platform. Not "Reduced Specs," but "Precise Adaptation". Unlike the high-end KM26 series designed for highly complex operating conditions involving extreme pressure, temperature, and corrosion, the LMG series has undergone design opti-mization and precise focus. We have retained the most core, market-proven quality essence of the high-end KM26, the robust magnetic coupling system, high-contrast flag display, 316 or 316L frames etc., which ensures that the LMG delivers the same level of measurement accuracy, display clarity, and operational lifespan as the high-end product under standard operating conditions.

EC

The EC (external chambers), installed externally on tanks or vessels, typically work with LWT series guided wave radars or LMT100 insertion type magne-tostrictive level transmitters, ensuring accurate and stable measurement of liquid levels in various indus-trial processes like chemical processing, oil & gas, and power generation.

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1 Introduction

This manual is designed to provide information on installing, operating and troubleshooting or maintenance of the KM26 family of magnetic level gauge (MLG). The KM26 series consist of the KM26S (side mounted), KM26T (top mounted), LMG, MW (MagWave) and EC (external chamber) models.

Every section of this manual is dedicated to the specific phases of the MLG lifecycle. The start of the lifecycle begins with the receipt of the MLG and its identification and continues through installation, the connection of all electrical components, the configuration of the device (transmitters and switches) and accessories and finally ends with the trouble-shooting and maintenance operations.

NOTICE

This instruction will provide detailed information based on KM26 series, but can also serve as a reference for EC, MW05 and LMG which are part of or variant of KM26 series.

General description of KM26 MLG

The ABB model KM26S and KM26T liquid level magnetic level gauge are designed for use in applications where a simple gauge glass cannot or should not be used. Due to its superior design, the KM26S and KM26T can safely be used with flammable, corrosive or toxic liquids; or where operating conditions exceed safety limits of glass. The rugged construction of the KM26S and KM26T make them ideally suited for use in operating environments where extreme temperature and / or pressure may be encountered.
The basic KM26S and KM26T systems consist of a 1. sealed float, 2. float chamber and 3. an indicator assembly. The float chamber is connected directly to the process vessel.

The float contains a magnet assembly and is designed and weighted to float in the process liquid submerged approximately 70 to 80%. The indicator assembly consists of a hermetically sealed glass or polycarbonate tube containing the shuttle or magnetic bar graph indicator and a graduated scale corresponding to the desired operating range. The indicator assembly is mounted in close proximity to the float chamber. Magnetic coupling exists between the float and the indicator. As the float follows the changing liquid level, the indicator changes position to reflect that level based on the magnetic coupling action.

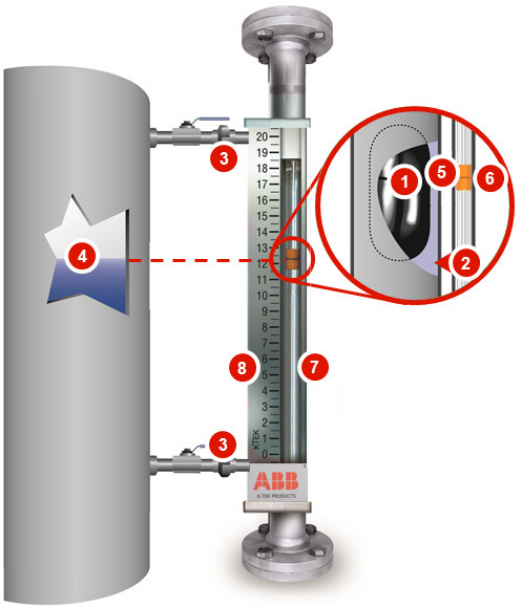
Detailed description

The float chamber of the standard KM26 is mounted as a communicating chamber to the process vessel. It is usually flange mounted, but different mounting options are available upon request. Within the float chamber is a float which is designed to float with approximately 70 to 80% of its mass submerged in the process fluid. The float magnet assembly is located such that the magnetic actuation point of the magnet assembly is at the liquid level when the fluid is at the specific gravity specified. The position of the float will vary directly with the level of the process fluid.

The indicator assembly, consisting of a glass or polycarbonate tube, an indicator (shuttle or magnetic bar graph) and a graduated scale, is installed parallel and in close proximity to the float chamber. This is necessary to allow for maximum magnetic coupling between the float and the indicator. The indicator and tube are mounted in a stainless steel channel which has a graduated scale attached. The graduations on this scale correspond to the desired operating range. The glass indicator tube is an IP68 certified hermetically sealed which prevent the ingress and accumulation of dust and moisture. The indicators are painted with high visibility paint so readings can be obtained from long distances.

Around the middle of the shuttle is a black reference line that directly corresponds to a value on the graduated scale to obtain the process liquid level. The shuttle tube must be in the proper orientation for it to operate correctly and this is determined by the rubber bumper in the glass tube. The optional magnetic bar graph indicator is available in yellow / black or red / white for use in locations where temperature is not excessive. The flippers on the bar graph rotate to change color at the fluid level. Consult the factory for applicable temperature limits and insulated options.

The indicator tube is positioned such that the normal downward travel of the float is stopped at a position that corresponds to the scale zero by a spring mounted on the bottom flange for the KM26S and a float stop tube for the KM26T. Therefore, as long as the float and the shuttle are magnetically coupled, the shuttle will be visible. Both the KM26S and the KM26T are equipped with a float stop spring at the top of the chamber. These springs absorb the force on the float that occurs if fluid levels change rapidly in the chamber and propel the float up or down.



1. Float 2. Fluid contained in this chamber 3. Process connections 4. Liquid level 5. Center of magnet assembly 6. Indicator 7. Hermetically sealed glass tube 8. Calibrated scale

Figure 1 - KM26 overview

2 Safety

General safety information

The following safety section provides an overview of the safety aspects that must be observed for operation of the device.

The device is constructed in accordance with international and local regulations and is deemed to be operationally safe. Additionally, the device is tested and shipped from the factory in working condition. The information contained within this manual, as well as all applicable documentation and certification, must be observed and adhered to in order to maintain the factory-deployed condition throughout the operations of the KM26 series system/solution.

Full compliance with the general safety requirements must be observed during operation of the device. In addition to providing general information, the individual sections within this manual contain descriptions, processes and / or procedural instructions with specific safety information for that corresponding action.

Only by observing all of the safety information the user can minimize the risk of hazards to personnel and / or the environment. The provided instructions are intended as an overview only and do not contain detailed information on all available models or every conceivable scenario that may arise during setup, operation and / or maintenance work.

For additional information, or in the event of specific issues not covered within these operating instructions, please contact the manufacturer. ABB declares the contents of this manual are not part of any prior or existing agreements, commitments or legal relationships and are not intended to amend those that are already in place.

⚠ CAUTION

Only qualified and authorized personnel are to be tasked with the installation, electrical connection, commissioning and maintenance of the KM26 series MLG. Qualified personnel are those individuals who have experience in the installation, electrical connection, commissioning and operation of the KM26 series MLG or similar devices / systems and hold the necessary qualifications. These qualifications include but are not limited to:

- training or instruction – authorization to operate and maintain devices or systems according to safety engineering standards for electrical circuits, high pressures and aggressive media
- training or instruction in accordance with safety engineering standards regarding maintenance and use of adequate safety systems.

For reasons of safety, ABB recommends that only sufficiently insulated tools, conforming to IEC EN 60900, be used. Since the MLG may form a link within a safety chain, it is recommended that the device be replaced immediately if defects are detected. In the event of use in a hazardous area, only non-sparking tools are to be used.

In addition, the user must observe all relevant safety regulations regarding the installation and operation of electromechanical systems and the relevant standards, regulations and guidelines concerning explosion protection.

⚠ WARNING

The device can be operated at high levels of pressure and with aggressive media. As a result, serious injury or significant property damage may occur if this device is operated incorrectly.

Improper use

The KM26 series MLGs are designed for reliable and accurate measurement of liquid levels in the industrial applications. Use the KM26 series MLG for this purpose only. The manufacturer accepts no liability for any form of damage resulting from improper use!
It is prohibited to use the device for the following but not limited to these purposes:

- as a climbing aid (for example, for mounting purposes) port for pipes.
- removing material (for example, by drilling any part of the MLG

Technical limit values

The device is designed for use exclusively within the values stated on the identification plates (Refer to section 4.1 identification) and within the technical limit values specified on the data sheets.
The following technical limit values must be observed:

- the maximum working pressure must not be exceeded.
- the maximum ambient operating temperature must not be exceeded.

… 2 Safety

- the maximum process temperature must not be exceeded.
- the housing protection type must be observed when switches and transmitters are mounted as part of KM26 MLG level solution.

Warranty provision

Using the device in a manner that falls outside the scope of its intended use, disregarding this manual, using underqualified personnel or making unauthorized alterations releases ABB from any liability for any resulting damage. This renders the manufacturer's warranty null and void.

Operator liability

In instances where corrosive and / or abrasive materials are being measured, the user must check the level of resistance of all parts that are coming into contact with these materials. ABB can offer guidance in the selection of material but does not accept liability in performing this service. The user must strictly observe the applicable national regulations with regards to installing, functional testing, repairing and maintaining all the associated electromechanical devices.

Use of instruction

DANGER

This symbol in conjunction with the signal word 'DANGER' indicates an imminent electrical hazard. Failure to observe this safety information will result in death or severe injury.

WARNING

This symbol in conjunction with the signal word 'WARNING' indicates a potentially dangerous situation. Failure to observe this safety information may result in death or severe injury.

CAUTION

This symbol in conjunction with the signal word 'CAUTION' indicates a potentially dangerous situation. Failure to observe this safety information may result in minor or moderate injury. This symbol may also be used for property damage warnings.

NOTICE

This symbol indicates a potentially damaging situation. Failure to observe this safety information may result in damage to or destruction of the product and / or other system components.

Note

'Note' indicates operator tips, particularly useful information or important information about the product or its further uses. The signal word 'IMPORTANT (NOTE)' does not indicate a dangerous or harmful situation.

Qualified personnel

Installing, commissioning and maintaining the MLG system may be performed only by trained personnel who are authorized by the plant operator. These trained personnel must have read and understood this manual and must comply with its instructions.

Returning devices

For the purpose of returning the device for repair or recalibration, use the original packaging or other suitably secure shipping method. The sender should contact the factory for return authorization number and fill out return form (provided at the end of the manual) and include it with the device. According to C guidelines other local laws for hazardous materials, the owner of the corresponding hazardous waste is responsible for its disposal. The owner must observe the proper regulations for shipping purposes. All devices returned to ABB must be free of any hazardous materials (for example, acids, alkalis and solvents).

Disposal

ABB actively promotes environmental awareness and has an operational management system that meets the requirements of DIN EN ISO 9001:2015, EN ISO 14001:2015 and OHSAS 18001. ABB products are intended to have minimal impact on the environment and individuals during their manufacture, storage, transport, use and disposal.
This adherence to environmental standards includes the use of natural resources. In this endeavor, ABB maintains an open dialog with the public through its publications.
The product / solution is manufactured from materials that can be reused by specialized recycling companies.

Information on WEEE directive 2012/19/EU (waste electrical and electronic equipment)

Electrical and electronic equipment marked with symbol of a crossed-out wheeled bin may not be disposed as unsorted municipal waste. Waste of electrical and electronic equipment (WEEE) shall be treated separately using the collection framework available to customers for the return, recycling and treatment of WEEE.

From August 15, 2018 onward, the KM26 is subject to the scope of the Waste Electrical and Electronic Equipment Directive (2012/19/EU). The aim of the WEEE directive is to prevent or reduce the negative environmental effects resulting from the generation and management of electrical and electronic equipment.



… 2 Safety

Safety information for electrical installation

⚠ WARNING

Electrical connections may only be established by authorized personnel in accordance with the electrical circuit diagrams. The electrical connection information in the manual must be observed; otherwise, the application protection type may be affected. Ground the measurement system according to requirements.

⚠ WARNING

There is no EMC protection or protection against accidental contact when the housing cover is open. There are electric circuits within the housing which are dangerous if touched. Therefore, the auxiliary power must be switched off before opening the housing cover.

Safety information for inspection and maintenance

Corrective maintenance work may be performed only by trained personnel.

- before removing the device, depressurize the device and any adjacent lines or containers.
- check whether hazardous materials have been used as measured materials before opening the device. Residual amounts of hazardous substances may still be present in the device and could escape when the device is open
- within the scope of operator responsibility, check the following as part of a regular inspection:
  - pressure-bearing wall / lining of the level device
  - measurement-related function
  - leak-tightness
  - wear (corrosion)

⚠ WARNING

The device can be operated at high pressure and with aggressive media. Any process media released may cause severe injuries. Depressurize the pipeline / tank before opening the transmitter connection.

Explosives atomspheres installation

For installation requirements in explosives atmospheres applications refer to IEC 60079-14 and any local safety or electric code regulations mandatory in your area.

⚠ CAUTION

- for category II 1 G installation, parts of the equipment shall be protected so that impact or friction sparks cannot occur, taking into account rare malfunction. Measures to prevent impact or friction sparks when using the equipment include but are not limited to:
  - limited mechanical agitation shall be used;
  - use of stilling wells to mitigate effect of agitation.
  - limit rate of change of level to values such that friction sparks cannot occur, less than 1 m/s, at all times.
  - extra precaution should be taken during installation and maintenance to prevent float from traveling down / up chamber too fast while initially filling and / or pressurizing the vessel / chamber and likewise while depressurizing and emptying vessel.
- the user shall take the appropriate mitigation measures in accordance with their own risk assessment to prevent any other conditions capable of producing impact or friction sparks.
- if additional non-conductive paint / coatings are applied to the process connection, flange or instrument housing (for example to provide additional corrosion resistance) there may exist a risk of electrostatic discharge due to charge build-up on the non-conductive paint / coating layer. The user shall take the appropriate mitigation measures in accordance with their own risk assessment.
- when non-metallic sensor well or probe sleeve materials are used there is a risk of ignition from electrostatic discharge due to the flow of non-conductive media (for example in stirring vessels and pipes). The user shall decide on the suitability of the equipment for the particular application.
- the equipment temperature class rating, TX, cannot exceed the auto-ignition temperature of the process fluid contained within the chamber by a safety margin and should take into account variations, fluctuations and upset conditions of process fluid temperature that may be encountered. The end user should conduct their own risk assessment to prevent auto ignition of its process fluid.
- the equipment and any ancillary equipment attached shall be grounded using at least a 4 mm 2 cross sectional area connection device onto non-painted surface for good coupling / bonding.
- to help prevent a stuck float, keep process fluid debris free and when warranted carry out cleaning of chamber considering the type of process fluid in use. These actions are the responsibility of the end user.
- Chambers and/or floats containing titanium materials shall not be used in oxygen service.
- Floats containing titanium or zirconium materials shall have a static dissipative coating with a max thickness of 0.2 mm (200 microns)

... 2 Safety

Certifications nameplates

The MLG is identified by the name plates. The nameplate provides information (refer to figures 2 and 3) concerning the model number, pressure ratings, serial number, temperature limits etc. The certification plate contains the certification-related parameters for use in a hazardous area.
Please refer to the serial number when speaking to ABB service department personnel.

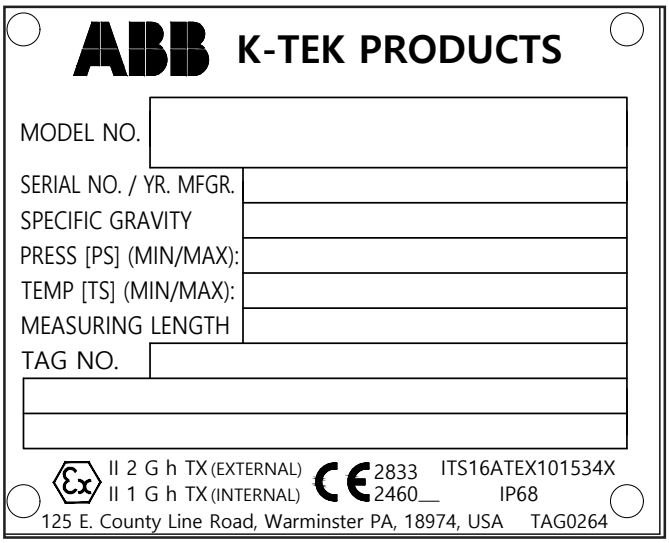


Figure 2 - ATEX and PED nameplate

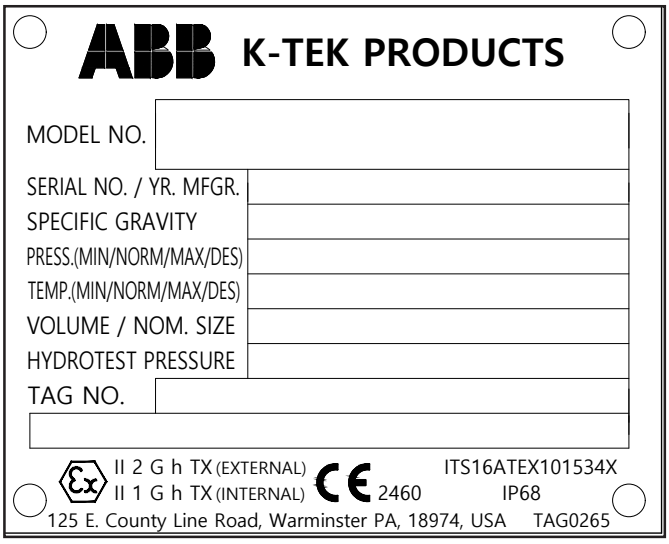


Figure 3 - ATEX only nameplate

Note
The name plates shown here are only examples. The name plates attached to the device shall contain the information per the order.

IP protection and designation

The KM26 MLG is certified as conforming to protection type IP68 (according to IEC 60529). The first number indicates the type of protection the scale assembly has against the entry of foreign bodies, including dust. '6' means that it is dust-proof (no ingress of dust). The second number indicates the type of protection the device has against the entry of water. Please refer to the respective datasheets of the transmitters, switches and accessories to have the details of the IP protection of such devices associated with the MLG system.

Grounding / earthing

The end user is responsible for grounding the KM26S or KM26T level gauge chamber and any ancillary equipment attached to these gauges. The end user is to provide a grounding / earthing connection acceptable to local and national electrical standards. Recommended locations for pipe clamp ground or pipe strap ground are the main chamber, the bottom or lower chamber branch connection locations. For the KM26S, it is also acceptable to connect a wire ring terminal to a flange stud locked in with another nut. The grounding connection must be metal to metal so any paint must be sanded off. Refer to figure 4 for possible grounding locations.

Example grounding hardware is depicted below.

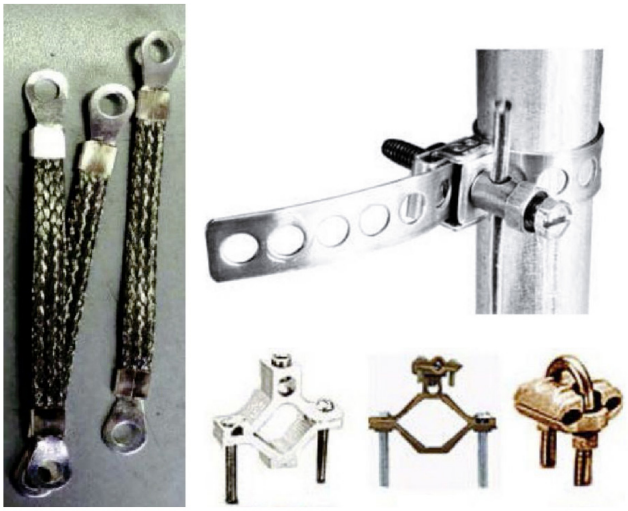
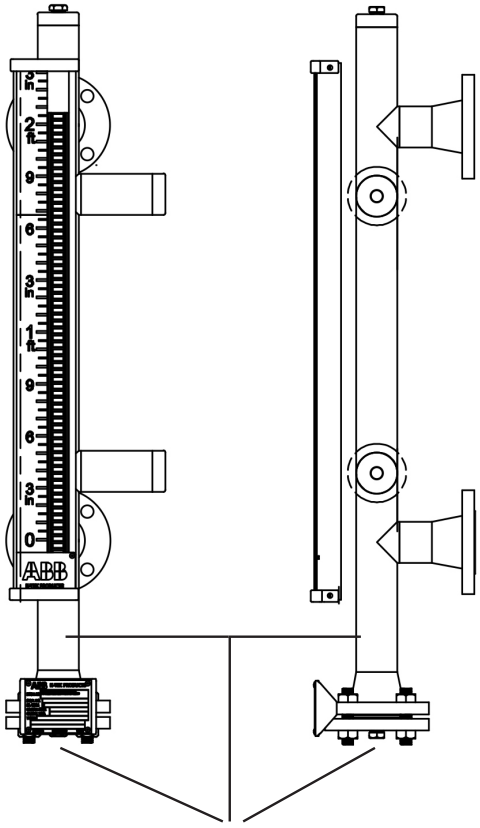


Figure 4 - Ground hardware

WARNING

A protective grounding connection is absolutely necessary to ensure personnel protection, to protect against surge (in case of installation of this option) and to prevent explosions in potentially explosive environments.

… 2 Safety



Possible grounding locations with a pipe clamp, pipe strap or ring terminal on flange stud.

Figure 5 - Grounding locations

Temperature considerations

The KM26 is capable of operation in extreme environments. Special consideration must be given to the components attached to the KM26 when used at these extremes.

At high temperatures, scales, switches, and transmitters must be protected from the adverse effects of these temperatures on their internal components. High temperature insulation is frequently used to raise the limits at which these devices may operate. This insulation should not be removed without adequate replacement. These devices rely on proximity with the chamber to operate, therefore any replacement insulation should not increase the separation of the device from the float. Any additional insulation installed should not trap unwanted heat in these devices.

At low temperatures, condensation, frosting, and freezing are a concern. Insulation for these conditions is provided as an option and in some cases, it is highly recommended. Special indicator tubes are made to reduce the effects of cryogenic chambers on the indicator. These indicator tubes require insulation that can be provided as an option. Recommendations for this insulation are included at the end of this manual. Low temperatures also cause embrittlement of some metals. Chambers and flange bolting must meet the temperature specifications. ABB does not recommend customer application of cryogenic insulation.

Temperature classification

Temperature classifications of the ATEX approved KM26 is limited to process temperatures up to 50C below the maximum surface temperature allowed for each of the temperature classes as per the below table.

Temperature class (Ex db)	Max. process temperature	Max. surface temperature
T6	< 80 °C	85 °C
T5	< 95 °C	100 °C
T4	< 130 °C	135 °C
T3	<195 °C	200 °C
T2	< 295 °C	300 °C
T1	< 445 °C	450 °C

Table 1 - ATEX constructional safety temperature classfication

ATEX constructional marking

II 2 G Ex h TX Gb (External)
II 1 G Ex h TX Ga (Internal)
Applicable Standards: EN 80079-36:2016; EN 80079-37:2016

Pressure equipment directive (PED) (2014/68/EU)

The product is designed and manufactured as per the requirements of Module H of the Pressure Equipment Directive 2014/68/EU. Devices rated below category I due to their size, do not receive the conformity mark in the scope of the PED. These devices are subject to applicable sound engineering practice (SEP) (Article 4, par 3).

Storage and handling information

To prevent damage to the shipping tubes and / or crates that the level gauges are transported in, these items should not be over-exposed to inclement weather. The KM26 magnetic level gauge should be stored in such a manner that would not allow the indicator tube to be immersed or submerged in any liquid. Sufficient precautions should be taken so that the glass or polycarbonate indicator tubes are not broken or damaged. There are no special storage requirements for the EC chamber themselves, but if there is a transmitter and / or switch, the storage requirements of the transmitter and / or switch must be met. See data sheets for specific requirement.

- after unpacking the, inspect it for damage.
- check the packaging for accessories.
- during intermediate storage or transport, only store the level gauge in the original packaging.
- if required, storage prior to installation should be indoors at ambient temperatures, not to exceed ambient conditions as specified in the individual datasheet of the accessories.

For information on permissible ambient conditions for storage and transport, refer to the specification section of the datasheet. Although there is no limit on the duration of storage, the warranty conditions stipulated on the supplier’s order of acknowledgement still applies.

... 2 Safety

Note
Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Do not discard the shipping container until all parts/components are verified and checked.

3 Mounting

General

Read the following installation instructions carefully before proceeding. Failure to observe the warnings and instructions may cause a malfunction or personal hazard. Before installing the KM26, ensure the device design meets the requirements of the measurement point from both a measure technology and safety point of view. This applies but is not limited to the following:

- explosion-protection certification
- measuring range
- pressure, temperature or operating voltage

Check the suitability of the materials in regards to their resistance to the media. This applies but is not limited to the following:

- gasket, process connection and seals
- float
- end connection, transmitter, switches and other accessories.

In addition, the relevant directives, regulations, standards and accident prevention regulations must be observed. Measurement accuracy is largely dependent on the correct installation of the KM26 MLG and, if applicable, mounting arrangement. In instances where it is possible, the measuring setup should be free from critical ambient conditions such as large variations in temperature, vibrations or shocks.

NOTICE

If unfavorable ambient conditions cannot be avoided for reasons relating to building structure, measurement technology and / or other issues, the measurement quality may be affected.

All installations

- prior to installation, verify the model of the MLG is suitable for the intended application. Information regarding the model specifications may be found on the corresponding KM26 series datasheets.
- if any transmitters or switches are mounted on the MLG, ensure that the electronics housing should be maintained as per the specified ambient conditions per the respective datasheet of the device.
- do not use the MLG as a support when mounting.

Hazardous area considerations

If the ATEX certification plate for the MLG is permanently fixed and if any transmitters or switches and the accessories have their own certifications. For specific conditions for safe use of the KM26, refer to section ‘explosives atomspheres installation’ and details for the transmitters and switches refer to their respective manuals.

Understanding the MLG parts

The standard KM26 MLG system consists of 1. chamber 2. float and 3. indicator assembly.

Chamber

The chamber (refer to figure 6) of the standard KM26 is mounted as a communicating chamber to the process vessel. It is usually flange mounted, but different mounting options are available upon request. The typical chamber size is 2 ½ in. S10 or S40 welded pipe depending upon the application pressure, temperature and corrosion allowance. The standard chamber material is 316/L however is usually the same material as that of the process vessel or the tank. The selction of the material is mainly depneding on the aplication parameters and the measured media properties.The end user shall have the responsibility to select the approriate material of the application based on the the process parameters / specifications. For the available material options, please refer to the datasheet of KM26). The chamber is also engineered with the required type and number of process connections designed to meet the relevant ANSI and ASME codes and welding meeting the similar requirements wherever applicable.

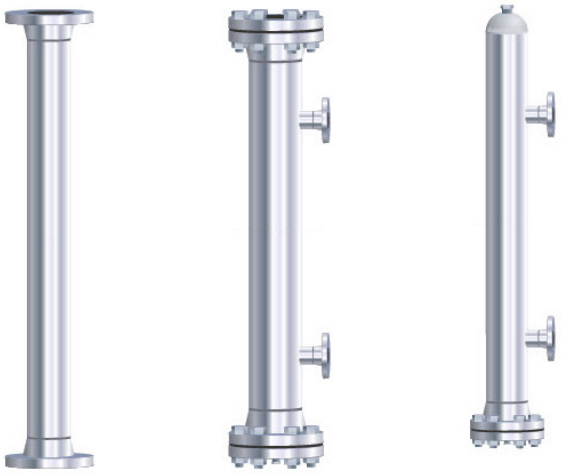


Figure 6 - KM26 MLG chamber

... 3 Mounting

MLG configurations

There are several configurations for the KM26. The major configurations are described in this section.

Side Mount

The side mount MLG is referred as the KM26S model which is the most common configuration. In its simplest configuration it contains two process connections, a fluid-filled chamber with flanges and/or caps on the top and bottom, a float, and a visual indicator. Depending on the tank/vessel height there can be up to six side process connections.When the liquid level in a vessel changes, the corresponding level in the MLG chamber changes as liquid moves through the process connections located at the top and bottom of the desired indication range.

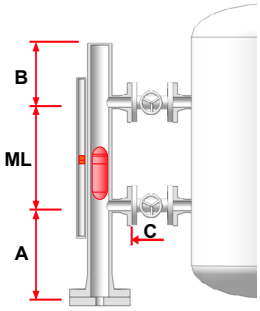


Figure 7 - side mount configuration

Top and Bottom

This configuration has process connections at the top and bottom of the chamber, which are connected to the vessel through additional piping. The top and bottom mount is commonly used in spherical-shaped vessels which are filled at the top and emptied from the bottom of the vessel. The chamber usually spans the entire height of the vessel and does not require additional space above the vessel which can be used in tight plant layouts.

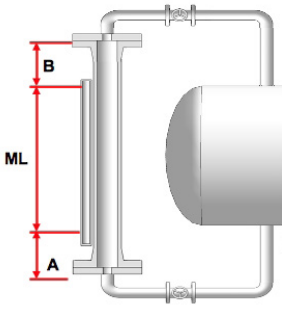


Figure 8 - top and bottom configuration

Top Mount

The top mount MLG is also known as the KM26T which is commonly used for sumps and underground tanks that do not have side connection access. In its simplest form, a top mount consists of a chamber with a single flange at the bottom and a cap at the top. A float assembly hangs below the chamber into the liquid via a guide rod. The float assembly consists of a magnet at the top of a guide rod and a float at the bottom. As the float itself does not contain any magnet in this configuration, this is also used in applications where the liquid contains magnetic particles. A stilling well, can also be used within the vessel to prevent bending of the rod during maintenance, installation, agitation, or when turbulence or flow may be present in the tank during operation.

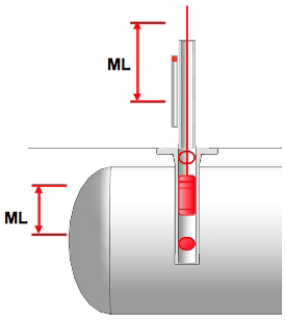


Figure 9 - top mount configuration

Dual Level

In tanks containing two or more liquids, the KM26 MLGs are able to measure the interface level between two liquids.The chamber is capable of housing two floats simultaneously. The interface float is sized and weighted so that it sinks through the upper liquid layer and floats on the lower liquid. This allows the magnets to position precisely at the point of interface. The other float is weighted to operate at the specific gravity of the upper liquid, measuring the total level. For these kind of applications, its always recommended to have at least three side process connections to ensure reliable interface measurement. In this case, shuttle indication is required for proper operation. Shuttle 1 is magnetically coupled to float 1 and shuttle 2 is magnetically coupled to float 2.

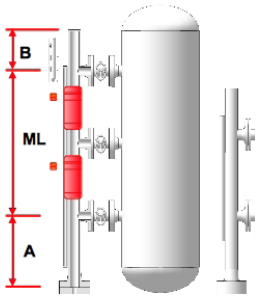


Figure 10 - dual level configuration

Other Configurations

KM26 is offered in other configurations like top and side, side and bottom.

... 3 Mounting

Floats

The float is a strong capsule that is engineered for the temperature and pressure conditions of an application and designed to be precisely buoyant in a liquid or liquids (interface). The float follows the surface of the process fluid or liquid-liquid interface as the level in the chamber fluctuates. The float interacts magnetically with a visual indicator mounted on the outside of the chamber to reveal the liquid level inside. Communicating the fluid level information using the float's magnetic field isolates the level indicator from the process allowing for longer lasting, error-free operation of the KM26 MLG.

The float (figure 11) is a key component of the KM26 MLG and is engineered to match the medium in respect of density, pressure resistance and material durability. Every float is precisely engineered to customer application, ensuring optimal accuracy and performance. Precisely spaced magnets create a 360° magnetic field coverage, safeguarding level transmitter and gauge performance, even the most challenging applications. Several materials of construction available including titanium, Monel®, Hastelloy® C, stainless steel, and plastics. Tefzel®, Halar®, TEFLON® S protective coatings are also available. The float is equipped with a ring system of permanent magnets for transmission of liquid level to the indicator. The indicator is linked magnetically to the magnet system in the float. During installation, it may be necessary to remove the float from the chamber. For proper operation, the float must be reinstalled using the proper orientation. Floats may be marked with 'top for SPM' or floats may be marked with an arrow indicating the proper orientation.

KM26S float is shipped inside the chamber unless specified for separate shipment. Most floats are labeled to indicate the top of the float, the specific gravity of the fluid and the serial number of the chamber for which they are designed. If the float is coated, labeling is not performed and the float should stay with the chamber. The top of the float can be found by locating the magnet placement and direction with respect to the indicator in the scale. The indicator should be attracted to the float, not repelled, when inserted correctly.

The KM26T float is wrapped separately in bubble wrap. The magnet assembly at the end of the float rod is inserted into the top of the guide chamber unless the float rod is too long, in which case it will be shipped outside of the guide chamber. The stop tube and disk are installed over the rod end and into the chamber. Then, the snap ring is inserted into the internal groove to hold the assembly in place. Finally, the float is threaded onto the rod and locked in place with the nut provided.

Float Stop Springs

Springs are often included in the top and bottom of a the MLG chamber. The primary purpose is to provide protection for the float during operation and shipping/handling. If pressure rapidly enters the chamber (possibly due to a quickly opened valve), the float could be propelled toward the top of the chamber at a high rate of speed. The spring will dampen the impact and assist in protecting the float from damage.



Figure 11 - KM26 MLG floats

If specific gravity decreases, the float will have more of its length below the fluid level and give a visual indication that is lower than actually exists. If the fluid specific gravity has significantly changed after the unit has been placed in service, it may be necessary to replace the float in order to allow for accurate level indication. This can change the length and magnet position of the float. The stop springs must be adjusted accordingly. On the KM26S this is accomplished by either stretching or compressing (or cutting) the bottom and top springs. The scale may also have to be adjusted to coincide with the floats' new zero position. To adjust the zero for the KM26T, the float stop tube can be elongated or reduced.

⚠ CAUTION

Do not weld on MLG or on the vessel with indicator and float installed, this will damage the magnetic circuit.

The chamber must be vertically level (plumb) to insure proper operation of the float and its follower. A unit that is not leveled properly may decouple unexpectedly due to friction with the sides or because the float travels too far away from the indicator.

NOTICE

The end user must provide adequate structural support for the chamber in the field. It is recommended that, for longer chambers (and especially for non-metallic constructions), support brackets attached to the side of the level gauge are placed at minimum intervals of 6 feet.

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⚠ CAUTION

Pressure equalized (vented) floats require special provisions when being brought into and out of service. Gradual increases / decreases of pressure in the chamber, in increments not to exceed the pressure limits of the float, must be performed. A one-minute wait period between increments is necessary to ensure that the float does not collapse or burst. Equalizing the internal and external pressure of the float will prevent float damage. Contact the applications engineering department at the factory for assistance.

Float Curve

For applications involving liquids that tend to vary in density, the ABB provides the Float Curve that will display the anticipated error, should the specific gravity change. By simply drawing a vertical line from the x-axis (liquid SG) to the curve, you can reference the length of the float that is submerged in the liquid.

For example:

1. Float designed for water (1.0 SG)
2. At 1.0 SG, the float projects 6.25 in (15.9 cm) into the liquid
3. If the media SG changes to 1.3, the visual indicator will show positive error
4. By referencing the graph, the expected float projection at 1.3 is approximately 5.88 in. (15 cm)
5. By use of subtraction, the float is reading high by 0.37 inches (1 cm)
6. A 1 centimeter position adjustment on the indicator can correct the error

Indicator assembly

The indicator assembly (figure 12), consisting of a glass or polycarbonate tube, an indicator (shuttle or magnetic bar graph) and a graduated scale, is installed parallel and in close proximity to the float chamber. This is necessary to allow for maximum magnetic coupling between the float and the indicator. The indicator and tube are mounted in a stainless steel channel which has a graduated scale attached. The graduations on this scale correspond to the desired operating range. The glass indicator tube is an IP68 certified hermetically sealed which prevent the ingress and accumulation of dust and moisture. The indicators are painted with high visibility paint so readings can be obtained from long distances. The scale is delivered correctly set up for measuring the product specified in the order. The optional magnetic bar graph indicator is available in yellow / black or red / white for use in locations where temperature is not excessive. The flippers on the bar graph rotate to change color at the fluid level. The indicator tube is positioned such that the normal downward travel of the float is stopped at a position that corresponds to the scale zero by a spring mounted on the bottom flange for the KM26S and a float stop tube for the KM26T. Therefore, as long as the float and the shuttle are magnetically coupled, the shuttle will be visible. Both the KM26S and the KM26T are equipped with a float stop spring at the top of the chamber. These springs absorb the force on the float that occurs if fluid levels change rapidly in the chamber and propel the float up or down.

Types of indicator

There are two main types of indicators—shuttle and bar-graph.

Shuttle

The shuttle (bullet or follower) indicator consists of a small, orange-colored cylinder with an embedded magnet that moves freely in a glass or plastic tube attached to the scale assembly which is externally mounted to the chamber.Shuttle indicators are often specified in lower cost configurations. It provides a visual indication that is suitable for many applications, except where flashing or extreme turbulence occurs within the process vessel which can result in erratic float movement causing it to become magnetically decoupled from the shuttle. The shuttle must then be manually reset by raising it with a strong external magnet to recouple it back to the magnetic field of the float.

Bar-graph

The bar-graph indicator is a system of small panels of material with highly contrasting colors on opposite sides. The bar-graph is also called as flags or flappers. Each flag contains a magnet that allows it to couple to the float. As the float moves up or down with the liquid level, each flag rotates to display a color that directly reflects its position in relation to the float. Flags above the float magnet will be oriented with the front of flag visible, while the flags below the float magnet will have the back of flags visible in the indicator. These indicators are more robust than shuttle indicators.

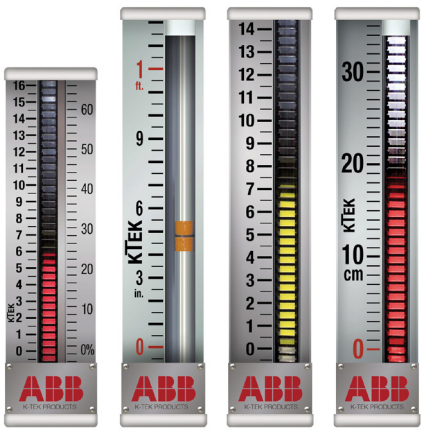


Figure 12 - KM26 indicator assembly

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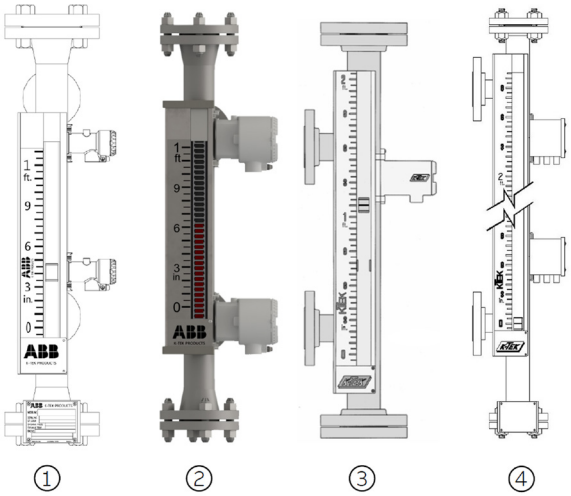
Limit switches

To signal specific liquid levels, the KM26 can be equipped with several different types of ABB limit switches. Magnetically actuated limit switches are the most commonly used devices. They can be clamped to the measuring chamber and are adjustable over the entire measuring range. They are actuated by a magnet incorporated into the float. The process operating conditions will define what limit switch type may be used (table 2).

Available magnetically actuated switches	
Reed type	LMS100
Cam action type	LMS200 and MS41
Pneumatic type	PS45

Table 2 - Available magnetically actuated switches

ABB switches can be delivered as factory assembled to the KM26 in most cases (figure 13). Please consult the applicable limit switch product data sheets for specifications, dimensions, ratings, and approvals.



MLG switches - ① LMS100, ② LMS200, ③ MS41, & ④ PS45

Figure 13 - KM26 with level switches

Limit switch use

The MLG switch will provide either a normally open or normally closed dry contact which may be used to activate external devices such as alarms or solenoids. Its main application is to sense the passing of a magnetic float in a KM26, or similar chamber, attached to a vessel containing a fluid. These trip points can be used for alarms or to activate a pump motor starter relay.

The MLG switch is mounted using two stainless steel clamps that pass around the mounting ears attached to the switch housing. The switch can be easily positioned by loosening the clamp and sliding the switch to the correct position on the chamber. Other switches can be added at any time, without the concern for additional process piping or valves. Note that two switches can be mounted so that they can trip at the same point. The switch can be easily positioned by loosening the clamp with a 5/16 in. nut driver and sliding the switch to the correct position on the chamber (figure 14).



Figure 14 - LMS100 mounted using SS clamps

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For high temperature applications using insulation jackets and alternate rod mounting approach is used (figure 15).

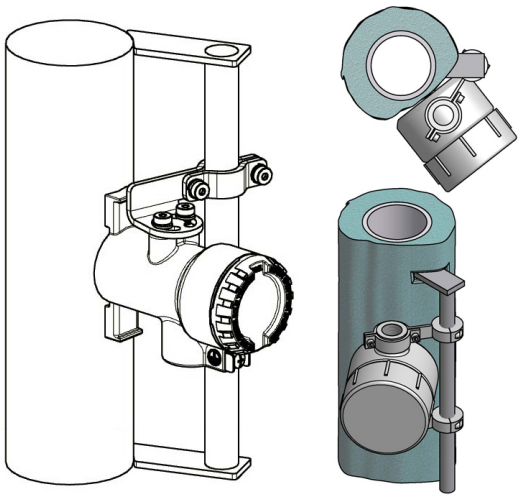


Figure 15 - MLG switch with insualtion jacket with rod mounting

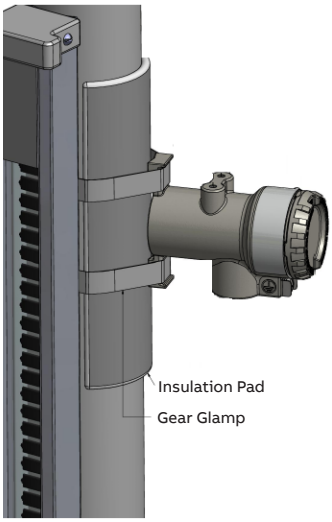


Figure 16 High temperature application with insulation pad (if no insulation on the chamber)

General installation guidelines

DANGER

Observe all applicable regulations governing electrical installation. Connections must be established only in a zero-voltage state. Since the transmitter or the switches do not switch-off elements, overvoltage protection devices, lightning protection and / or voltage separation capacity must be provided at the plant. Check that the existing operating voltage corresponds to the voltage indicated on the name plate. In case the surge protection option is present and the transmitter is installed in a hazardous area, the transmitter has to be supplied power from a voltage source isolated from mains (galvanic separation). Furthermore, the potential equalization for the entire powering cable must be guaranteed since the intrinsic safety circuit of the transmitter is grounded. Electrical shock can result in death or serious injury. Avoid contact with the leads and terminals. High voltage can be present on leads and cause electrical shock. Do NOT make electrical connections unless the electrical code designation stamped on the transmitter data plate agrees with the area classification in which the transmitter is to be installed. Failure to comply with this warning can result in fire or explosion.

WARNING

In an explosion-proof / flame-proof installation, do not remove the transmitter or switch covers when power is supplied to the unit.

1. Mount the switch to the chamber at the desired trip point. Connect or terminate wiring to the switch according to the application. Refer to the switch manual wiring diagram.

2. The KM26 float must be cycled past the switch in both directions to ensure the switch will operate properly when put in service.

3. Reference the insulation section of this manual for installing and dismantling insulation jackets.

4. KM26 chambers can be supplied with factory installed insulation jackets or insulation pads. Magnetically actuated switches can be mounted in two different configurations.
   - if an insulation jacket is used, rod mount brackets are required.
   - if insulation pads are used, stainless steel gear clamps are required.

5. These adjustable brackets and clamps allow re-positioning this switch at any point along the measuring range of the level gauge.

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Note
Insulation jacket pads are intended to wrap only the KM26 chamber, not the limit switches themselves. Refer to figure 16 and Figer 17.

6. Any conduit or fittings connected to a ABB magnetically actuated limit switch should be constructed of aluminum or other non-ferrous material. This is necessary to avoid interference with the operation of the KM26 float or the associated switches.

7. Two (or mulitple) magnetically actuated limited switches can be mounted so that they may trip at the same point or at two different points separated by less that the length of the switch.

8. Limit switches can not be within 1 in. of the upper and lower process connections because the float must travel past the switch. Process connections, gussets, support brackets, etc. may interfere with installation at desired locations. Cam actuated switches must be mounted in the correct orientation.



Figure 17 - High temperature application with rod mount bracket (if chamber already covered with insulation)

Magnetic level gague switches

Model #	Approvals	Enclosure			Switching mechanism				Application		
		Type	Rating	Electrical connection	Type / contacts	Rating	Min. / max. process temp	Deadband	High temp.	Vibration	High corrosion
LMS100 	FM, FMC ATEX, IEC	Hermetically sealed read switch	IP67 NEMA 4x	¼ in. NPT	Reed SPDT	AC/DC 1 A	-40 °F (-40 °C) 300 °F (149 °C); 800 °F (427 °C)	⅞ in.	•		
LMS200 	CFMus, ATEX/ IECEx	Aluminum	NEMA 4x	¾ in. FNPT	Cam driven, snap action DPDT	AC: 10 A DC: 2.6 A	-60 °F (-51 °C) 300 °F (149 °C); 600 °F (316 °C)	⅞ in.	•		
MS41 	FM, CSA, ATEX	Stainless steel, dual compartment, hermetically sealed, explosion proof	NEMA 4x	½ in. FNPT	Cam driven, snap action DPDT	AC: 10 A DC: 2.6 A	-320°F (-195°C) with option 300 °F (149 °C); 1000 °F (538 °C)	15/16 in.	•	•	•
PS45 	Non-electric	Stainless steel	NEMA 4x	⅛ in. MNPT port	Pneumatic	1 to 100 psig	0 °F (-18 °C) 180 °F (82 °C); 450 °F (232 °C)	15/16 in.			•

Note: For details refer respective switch datasheet

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Magnetostrictive transmitter installation

When mounting the LMT200 / AT200 level transmitter, the following rules need to be applied to ensure proper installation:

- if the LMT/AT series device was purchased with the KM26 magnetic level gauge (MLG), it will have been shipped mounted and positioned and will not typically require any further mechanical adjustment.
- the sensor tube is labeled with a factory zero mark. The line on this tag should be aligned with the zero on the scale of the level gauge.

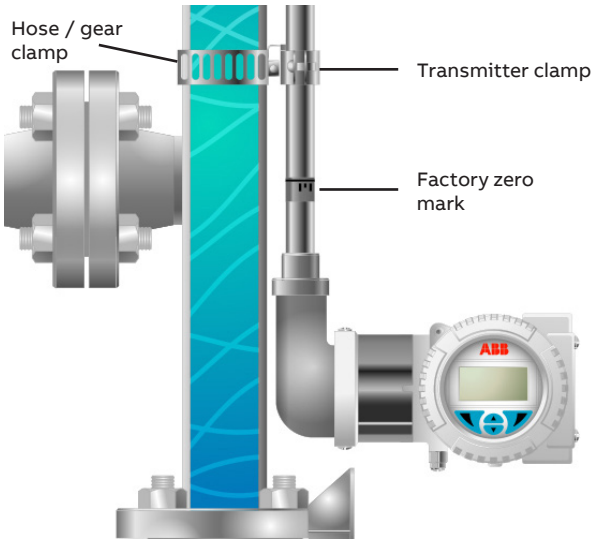


Figure 18- LMT200 mountings

- The LMT electronic housing, in reference to the sensor tube, is indicated by the model number:
  - B1 or B2 – the housing is at the bottom of the sensor tube
  - T1 or T2 – the housing is at the top of the sensor tube

Please read all directions carefully before performing any operations per the respective manuals of the transmitters.

Installation without insulation blanket or pad

The following steps are recommended for the successful installation a magnetostrictive level transmitter (MLT) on an existing magnetic level gauge (MLG) which does not include an insulation blanket or the transmitter does not include an insulation pad:

1 identify the name tag of the transmitter and based upon the model number determine the proper orientation of the electronics housing.
2 compare the measuring length of the transmitter (the last numbers in the model number) with the measuring length of the MLG and the center to center dimension if the MLG to determine if the transmitter should match the scale measurement or the center to center of the process connections.
3 identify the 'factory zero mark' sticker on the sensor tube of the transmitter.
4 block the MLG from the process.
5 drain the MLG following plant procedures for pressure relief and disposal of process fluids.
6 align the magnetostrictive transmitter with the MLG.
  – if the transmitter measuring length matches the measuring length of the gauge, align the zero mark with the zero of the scale.
  – if the transmitter measuring length matches the center to center of the gauge, align the zero mark with the center of the bottom process connection.
7 mark the MLG chamber where the mounting tabs of the transmitter match up to the chamber. Also, place a mark on the MLG chamber that corresponds to the mounting tabs of any support bracket included with the transmitter.
8 set the transmitter down.
9 slightly loosen all but the uppermost worm gear clamps which attach the scale assembly to the MLG.
10 open the worm gear clamps included with the magnetostrictive transmitter and slide one clamp beneath the scale assembly at each marked location on the MLG. Tighten the clamps slightly to hold them in place.

Note
For transmitters with a measuring length longer than 7 feet (2.1 meters), use a tape measure to determine the location of mounting tabs on the transmitter and mark the MLG accordingly.

11 realign the zero mark of the transmitter with the corresponding zero on the MLG.
12 starting with the highest transmitter mounting clamp, loosen each transmitter clamp, slide the clamp over or through the mounting tab of the transmitter, and tighten the clamp.
13 repeat step 12 until all transmitter mounting clamps are tightened.
14 tighten all scale mounting clamps being sure to align the scale vertically on the MLG.
15 to confirm the zero of the transmitter, apply power to the terminal strip of the magnetostrictive transmitter. If the transmitter reads higher than 'zero', raise the transmitter. If the transmitter reads lower than 'zero', lower the transmitter.
16 attach proper field wiring to the transmitter according to the instruction manual, included with the transmitter.
17 open the process to the MLG using the procedure included in the 'isolation valves' section.

Installation with insulation blanket

The following steps are recommended for the successful installation a magnetostrictive level transmitter (MLT) on an existing magnetic level gauge (MLG) which includes an insulation blanket.
Follow steps 1-6 in the previous section and use the following alternate steps:

7 mark the outside of the insulation blanket where the

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mounting tabs of the transmitter match up to the chamber. Also, place a mark on the insulation blanket that corresponds to the mounting tabs of any support bracket included with the transmitter.

8 set the transmitter down.

9 using a razor, cut slots in the insulation blanket ¾ in. wide and 1 in. long (19 mm x 25 mm) at each mark.

10 loosen the insulation blanket from the scale assembly opposite the location of the transmitter and slightly loosen all but the uppermost worm gear clamps which attach the scale assembly to the MLG.

11 open the worm gear clamps included with the magnetostrictive transmitter and slide one clamp beneath the scale assembly at each marked location on the MLG insulation blanket. Tighten the clamps slightly to hold them in place.

Note

For transmitters with a measuring length longer than 7 ft. (2.1 m), use a tape measure to determine the location of mounting tabs on the transmitter and mark the MLG insulation blanket accordingly.

12 Realign the zero mark of the transmitter with the corresponding zero on the MLG.

13 Starting with the highest transmitter mounting clamp, loosen each transmitter clamp, slide the clamp over or through the mounting tab of the transmitter, and tighten the clamp.

14 Repeat step 13 until all transmitter mounting clamps are tightened.

15 Tighten all scale mounting clamps being sure to align the scale vertically on the MLG and reattach the insulation blanket to the scale assembly.

To confirm the zero of the transmitter, apply power to the terminal strip of the magnetostrictive transmitter. If the transmitter reads higher than 'zero', raise the transmitter. If the transmitter reads lower than 'zero', lower the transmitter.

16 Attach proper field wiring to the transmitter according to the instruction manual, included with the transmitter.

17 Open the process to the MLG using the procedure included in the 'isolation valves' section.

Installation with insulation pad

If the transmitter includes an insulation pad: follow steps 1-17 in the 'installation without insulation blanket or pad' section. Before mounting the transmitter:

1 Align one end of the insulation pad with the end of the transmitter sensor tube.

2 Mark the insulation pad at the location of each transmitter mounting tab.

3 Using a razor, cut slots in the insulation pad ¾ in. wide and 1 in. long (19mm x 25mm) which correspond to the marks from the mounting tabs.

4 Mount the insulation pad between the transmitter sensor tube and the MLG.

5 The transmitter mounting tabs will hold the insulation pad in place.

Electric heat tracing

The optional electric heat tracing can be used for freeze protection or to keep a product in the chamber at a constant heated temperature. The electrical heat tracing is available as a factory installed option.

NOTICE

Heat tracing junction box and thermostat may vary if brand/function specified by customers. Below shows one example for reference only . More details, refer to heat tracing supplier's manual.

Example: ETXX

1. 110/120VAC, 2. 220/240VAC, 3. 277VAC, 4. 440/480VAC

Example: ET1 = 110/120VAC, ET2 = 220/240VAC

All wiring should adhere to local area electrical standards and procedures.

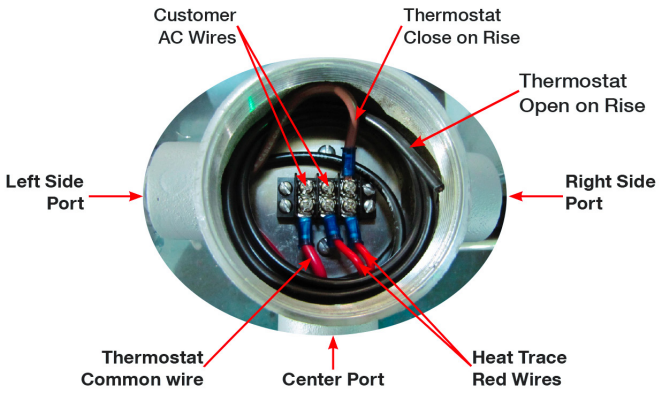


Figure 19 - ET1 wiring

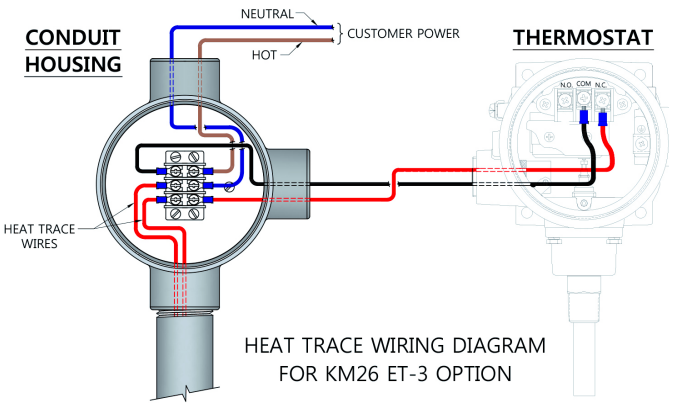


Figure 20 - ET2 and ET3 wiring

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Isolation valves

Valves should be installed between the tank and the KM26 for maintenance purposes and are available as an option.

⚠ CAUTION

Care must be used when opening the valves to prevent a surge of fluid or gases through the chamber. A surge can cause the float to be propelled against the far stop causing damage to the float shell and / or the indicator glass. Failure to comply may result in damage to the float and expense to the customer. Gradually open the upper isolation valve prior to the lower one to equalize the pressure in the level gauge chamber with the pressure in the vessel. After the pressure has equalized, gradually open the lower isolation valve. At this point, the level indicator may show a liquid level if enough liquid is present.

Vent and Drain

The vent and drain connections provide the user an alternate way to pipe into the chamber. In many cases, the drain is left either plugged or closed off with a valve. It can be opened at any time to drain the remaining liquid out of a recently emptied chamber. These accessories are offered with the KM26 as options.

Pressure testing

⚠ CAUTION

The level indicator chamber should be blocked off or the float should be removed when the vessel is hydrostatically tested. This precaution is necessary because most vessels are tested at pressures much higher than the maximum operating pressures and, even though the float chamber is capable of the high pressures, the float may not be capable of handling such pressures. All units are clearly marked as to this danger and should be given special consideration. Failure to comply may result in damage to the float and expense to the customer.

Magtraps

Magnetic particle traps (or magtraps) are provided to prevent ferromagnetic particles in a tank from entering the KM26 chamber and interfering with the movement of the float. The trap is installed at the bottom process connection. The permanent magnet in the trap ensures the clean and effective removal of ferrous contaminating materials.

Insulation

Chamber, switch, transmitter, and flange insulations are available as an option or, to meet the temperature requirements specified. These coverings protect the process, personnel, and / or equipment from temperature extremes. The customer may elect to install their own insulation. When this is done, care must be exercised to insure that associated equipment (such as scales, switches, transmitter, and other items) remains in proximity to the float magnets and that the insulation does not adversely affect the devices in terms of temperature retention.



Figure 21 - KM26 with insulation

Scale zero

Scale zero (lowest measure point on the ruler) for the KM26S is typically at the centerline of the lower side process connection or 10 in. from the face of the bottom flange. This varies with specific gravity requirements or custom designs. The KM26T zero point is typically 6 in. to 10 in. from the face of the process connection unless some special requirement calls for a change. In any case, the scale zero point coincides with the float at the lowest point in the chamber. The scale is installed so that the indicator just begins to move when the float is against the bottom stop.

Replacing indicator tube

1. Remove the machine screw in the upper tube holder. Remove the upper tube holder by sliding it out of the end of the channel (do not pull forward). For units 60 in. or longer remove all of the stainless steel wires that retain the tube in the channel. Slide the tube to be replaced out of the end of the channel.
2. Before installing replacement tube, check for proper orientation. The bottom of the shuttle tube will have an orange 'PAC-MAN™ **' shaped silicon bumper inside the tube. The bottom of the magnetic bar graph glass tube will have an indentation to align with the bottom tube holder. Insert the replacement tube into the bottom holder. Install the top holder using the machine screw to hold in place. Replace any stainless steel wires necessary to retain the tube in the channel.
3. Cryogenic indicator tubes are sealed into the scale assembly and should be replaced as a unit. These scale assemblies are strapped in place using gear clamps.

- ** - PAC-MAN is a trademark of BANDAI NAMCO ENTERTAINMENT INC

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Insulation instructions

⚠ CAUTION

Edges of the scale assembly can be sharp. Gloves and proper care are required while working.

The installation of insulation on KM26 units is dependent upon the process temperatures and type of indicator used. All temperatures referenced in insulation instructions refer to process temperatures. For design temperature under 200 °F, no insulation is required. If ordered, the insulation will be a tied-on blanket (standard insulation attached to the scale assembly). For 300 °F to 450 °F, an insulation pad is required for magnetic bargraph (MBG) indication. If chamber insulation is ordered in lieu of insulation pad, then the insulation will be a pipe wrap blanket. For 450 °F to 500 °F, pipe wrap blankets are mandatory for MBG indication. Before installing any blanket or pad, note the location of all chamber accessories to ensure a return to the proper working location. Some units are built with limited accessory locations and the accessories may not function if moved to new location.

Insulation pads

To install insulation pads, simply remove the accessory from the unit. Set the accessory on the pad. Using a razor, cut a hole through the pad wherever a bracket or clamp exists. Push the brackets or clamps through the hole and re-attach the accessory to the previous location. Verify proper operation and location.

The insulation thickness of a blanket is determined by the process temperature. In all locations where scale indications, switches, and transmitters are located, the insulation thickness is thinned to ½ in. to facilitate magnetic coupling. For all other locations the insulation thickness it governed by the following:

- 0 to 250 °F (0 to 121 °C) ½ in. thickness ceramic fiber filler with inner and outer silicone impregnated cloth covering
- 251 to 500 °F (122 to 260 °C) 1 in. thickness ceramic fiber filler with inner and outer silicone impregnated cloth covering
- 501 to 850 °F (261 to 454 °C) 1 in. thickness ceramic fiber filler with outer silicone impregnated cloth covering and 4-ply high temp liner including TempKoat™ insulation
- 851 to 1000 °F (455 to 538 °C) 2 in. thickness ceramic fiber filler with outer silicone impregnated cloth covering and 4-ply high temp liner including TempKoat™ insulation

For insulated units, it is critical to know the location of all components attached to the unit when ordering the insulation. Typically, the scale is located opposite to the process connections and the insulation will be thinned down to ½ in. on that side. If the scale has been moved from the position that it is shipped in, then the thinned insulation will not be in the correct location. When ordering, ABB refers to location by a clock system with the process connections at 12 o'clock when looking down on the unit from above. The scale is typically at 6 o'clock. Openings for the connections are made on the basis of the orientation specified by the customer. Thinning of insulation is needed for switches and transmitters as well and their positions must also be known.

Pipe wrap blanket

For pipe wrap blankets, installation requires the removal of scale assembly and transmitter (if installed). If a transmitter is installed, note its location and undo the front of the brackets (not the gear clamps) and remove the transmitter. Switches on switch mount rods will have to be rotated away from the chamber. Wrap the insulation blanket around the unit and fasten it with the Velcro straps. If a transmitter was installed, feel for the brackets under the insulation and mark their location with a marker. Sew a 1 in. square through the blanket around the marks. Using a razor, cut an X from corner to corner of the square making sure not to break the new seam. Push the brackets through the new holes. Set the scale assembly against the insulation at proper mounting location. Draw a mark on each side of each gear clamp next to the scale channel. This location on the insulation should have sewn seams down the length of the blanket to prevent fraying. It is recommend that the marks for each clamp be sewn around to reduce fraying. Using a razor, cut through the insulation to allow the gear clamp to pass through the hole. Once a hole is made for each clamp, remove the blanket from the unit. Feed the gear clamps of the scale assembly through the holes so that each end of the clamp goes through. Set the scale assembly and insulation blanket against the unit and use the gear clamps to fasten the parts to the unit. Make sure that the screw for the clamp does not interfere with the transmitter or switch locations. If applicable, feed the brackets for the transmitter through their holes in the blanket. Attach the velcro closures on the back of the blanket. Rotate any switches back into position. Re-attach the transmitter at the proper location. Verify the operation of all devices. An inoperative switch may need to be pressed tighter to the unit. Transmitters should be checked for the correct zero point and slid up or down to set to proper level.



Figure 22 - side and front view of pipe wrap

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Oversize chamber with guide rods

In applications where flashing is a concern (rapid change from liquid to gas; boiling), the sudden presence of gas bubbles expanding under the float can cause it to be forced upward and then back down very erratically. If viewed on the visual indicator, the operator would be unable to identify the true liquid level because of the very abnormal performance.

Similarly, if a large number of small bubbles form underneath and around the float, it will decrease the buoyant force that is keeping the float on the surface. This could cause the float to submerge completely in the liquid.

To combat this phenomenon, a oversize chamber with guide rod design can be incorporated into the chamber design. This provides simply a large open space surrounding the float that allows the expansion of gasses to pass around it unimpeded. In order for the float to operate the visual indicator properly, the set of guide rods must be in place to restrict lateral movement of the float so that it does not lose coupling with any externally mounted components like indicator, transmitter or switch.

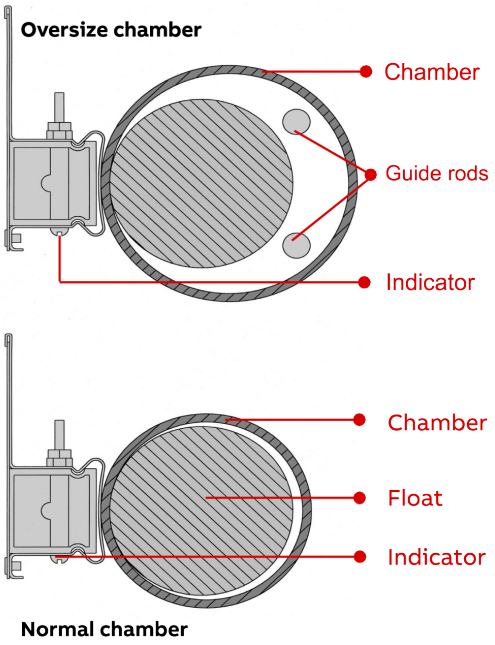


Figure 23 - normal and oversize chamber with guide rods

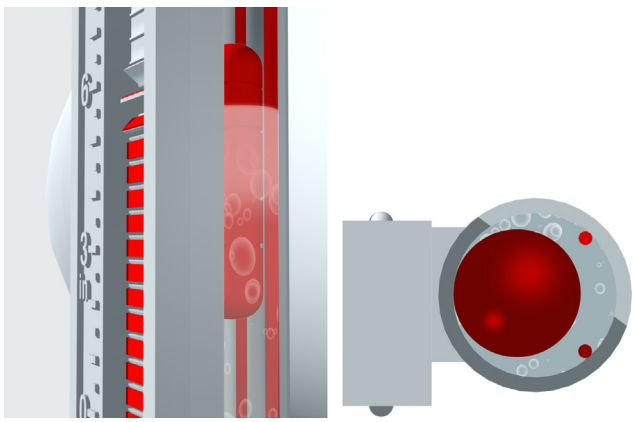


Figure 24 - oversize chamber with guide rods

Cryogenic insulation

⚠ CAUTION

ABB does not recommend customer installation of cryogenic insulation. Consult the factory.

Cryogenic insulations are used to maintain the required low temperature of the service fluid to be measured. Cryogenic units are offered with flipper styled magnetic bar graph indicators with frost extension. The face of the frost extension must always be exposed.

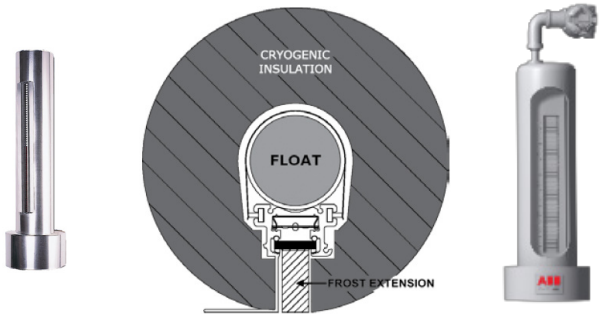


Figure 25 - cryogenic insulation

Mag wave (MW05)

The MW05 MLG is a twin-chamber design for use on applications where redundant level measurement is critical. MW05 combines MLG technology with a Guided wave Radar(GWR), magnetostrictive, or other type of direct insertion transmitter installed in the secondary chamber. It provides precise visual measurement and reliable level data transmission to a remote display or controller.

MW05 is available in a wide variety of configurations and is offered in a broad range of pressure ratings, styles, sizes and choice of process connections. Top and bottom MLG float stop springs are standard in the primary MLG chamber. The secondary chamber houses the transmitter sensor and allows the GWR transmitter to provide a backup or remote level measurement.



Figure 26 - Mag wave

4 Troubleshooting

Indicator decoupling

Causes:

- float is upside down. Remove, check field strength of magnets, and install correctly. Proximity to opposing field may weaken magnetic field.
- scale assembly is not flat against the chamber due to missing straps. Magnetic field strength drops exponentially with distance. Add gear clamps to eliminate channel separation from chamber. Add stainless steel retaining wires to eliminate indicator tube separation from channel.
- float stop springs have been bent or broken. Adjust or replace springs as needed to prevent float travel outside the range of the indicator tube.
- scale has been moved allowing float travel outside of range or causing too much separation from the float. Reposition the scale.
- float or indicator de-magnetizing by proximity to other magnetic material, high temperature, or repulsive fields. Consult factory for re-magnetization of float or replace the float and / or indicator and remove the source of demagnetization. Sources include floats and switches installed upside down, close ferrous materials, nearby magnetic fields, magnetic particles from process piping, etc.
- indicator tube is no longer sealed and contains moisture or dirt. This increases friction inside the tube. Replace the tube.
- chamber is not vertically level causing increased friction between the shuttle and glass and increased distance between the float and the scale assembly. Adjust the position of the chamber.
- indicator tube incorrectly installed. See directions for installation.
- magnetic particles from the process fluid stuck to float. This distorts the magnetic field and changes the float buoyancy. Remove and clean float and install magnetic traps in the process connections.

If for some reason, magnetic coupling is lost, it can be restored by following three simple steps.

1 Using a permanent magnet, locate the float inside the chamber.
2 Take the permanent magnet and raise the follower to the same level as the float.
3 Remove the magnet to the side as quickly as possible to set the follower in a spinning motion.

Float sinks or sticks

- process specific gravity is lower than was specified at the time of order. Identify true minimum specific gravity requirements considering temperature and pressure variations and order new float providing minimum and operating specific gravity.
- magnetic particles in the process fluid have become attached to the float changing its buoyancy. Install magnet traps in the process connection lines, then clean and reinstall float.
- solidification of process fluids on the surface of the float have changed its buoyancy. Consider replacing with a Teflon® (registered trademark of DuPont) 'S' coated float, heat tracing the chamber to decrease solidification, or reduce the amount of solidifying particles in the chamber.
- solidification of process fluid on the interior of the chamber has decreased the clearance for the float. Consider replacing with a coated chamber, heat tracing the chamber to decrease solidification, or reduce the amount of solidifying particles in the chamber.

Switch does not work

- switch installed upside down. Remove and install correctly.
- float does not travel past the switch during operation. Float may encounter float stop prior to activating switch. Switch point should be a minimum of 1 in. inside the upper and lower stop points for the float.
- contacts damaged due to excessive load, inductive load, or dead short in the circuit. Replace the switch.
- magnet has been demagnetized by proximity to magnetic source or ferrous materials. Replace the switch and remove the interference. (continued on next page)
- distance between the switch and float is too large. Strap may be loose, insulation may be too thick, attachment to a switch mount rod may have moved or the switch has been moved away from the location of a guided float.
- float has become demagnetized and indicator also decouples readily. Have the float re-magnetized at the factory and remove the source of demagnetizing.

5 Service and maintenance

Pre-startup

- If equipment is used in a manner not specified by ABB, protection provided by equipment may be impaired.
- Manually move the float from 0% to 100% and back to 0% prior to startup/check out in order to reinitialize any switch accessories (only required if magnetically actuated switches are supplied). Switches may inadvertently change state during any rough handling during transport.
- Remove float prior to pressurizing tank / vessel.
- Verify the MLGs center-to-center dimension equals that of the tank / vessel.

⚠ CAUTION

Float damage may occur if not removed prior to any pressure testing.

… 5 Service and maintenance

Equipment and tools

- open-end wrenches or an adjustable wrench to fit the process studs / nuts. A torque wrench is also recommended.
- flat-blade screwdriver or 5/16 in. nut driver
- digital multimeter or digital volt / ammeter if transmitters or switches are attached
- level
- gasket for mating flanges
- Teflon® (registered trademark of DuPont) tape and 'never seize' for threaded units
- pipe wrench for threaded units
- alan Wrench (5/32 in.)

Placing an MLG in service (startup)

⚠ CAUTION

Ensure that the operating conditions (temperature, pressure, and specific gravity, etc) are within the maximum ratings of the MLG. At the bottom area of each MLG is a nameplate that indicates all of the relevant process specifications, serial number, and tag number.

Install the MLG float (this should have been accomplished in pre-installation steps). The float is marked '>>>> UP >>>>' to insure proper orientation when placing float inside chamber. For a KM26T MLG (a top mount style), remove the float and guide rod. For a KM26S MLG (a side mount style), the MLGs are supplied with float start and stop springs. Verify these are installed at top and bottom locations.

The float chamber should be closed with no openings to the atmosphere. Check to see that all drain and vent plugs are securely in place and all vent and drain valves are closed.
The following procedural sequence is critical in pressurized applications.
When the MLG is mounted and ready to be applied to the liquid service, the TOP process connection valve should be opened FIRST and should be opened very slowly to allow pressure to equalize. This allows process fluid or vapor to enter the MLG at a slow and controlled rate that is reasonable and ultimately allows the MLG to reach operating pressure and temperature in a safe fashion.

When the MLG has reached process pressure, then the BOTTOM process connection can be opened slowly. Once this is accomplished, the startup procedure has been completed.

⚠ CAUTION

Vent or drain valves should not be used during startup for pressure relief from the process under any circumstances. This has the potential to permanently damage the instrument and is a hazard to personnel.

Removing an MLG from service

Close the BOTTOM process isolation valve to prevent further filling of the MLG. Then close the TOP process connection isolation valve to completely isolate the MLG from the process pressure.
Attach proper vapor collection equipment to the MLG vent if required. Open the top vent to relieve pressure in the MLG and allow air to flow when the bottom drain is opened.
Attach proper liquid collection equipment to the bottom drain and remove liquid. After all process fluid is completely drained, the MLG is ready to be removed from service.

Maintenance

1 Most KM26 MLGs are supplied with ½ in. vent and drain plugs (and associated valves) in the top and bottom of the float chamber to allow cleaning and removal of the process fluid as required. MLGs should be cleaned and inspected based on the severity of the service.

   To perform cleaning procedure:
   A. Block in the float and chamber with the process connection isolation valves or ensure the associated vessel/tank is empty or out of service. Follow steps outlined in 'removing an MLG from service'.

   B. Following a complete fluid drain from the MLG, remove the drain flange and allow the float to slide out of the chamber bottom. Be sure to examine the float for any excessive wear and clean as needed.

   C. Clean the chamber inside wall with a bottle brush or scrubbing tool. Some processes may require a solvent of some type for cleaning.

   D. If the MLG is located where the bottom drain is near the floor or other equipment where it is difficult to reach, it is possible to configure an instrument with the top flange in place of a standard weld cap/ vent plug. This allows the MLG to be cleaned and serviced through the chamber top end.

2 After cleaning the MLG chamber, replace the float and drain flange. A new flange gasket may be required.
3 **Note**
   Use gaskets compatible with process fluid.
4 Verify that the stainless steel pipe/gear clamps are tight and ensure that the scale assembly has the 'positive zero' in the correct location relative to the chamber and float.
5 Use a permanent magnet or KTEK magnet tool to attract the 'shuttle' until it is again coupled to float inside the chamber. (This step is not required if a magnetic bargraph type indicator is utilized.)
6 Magnetic traps are available to reduce magnetic particulate travel from the tank / vessel to the chamber. Consult the ABB factory for ordering information and configuration details.

… 5 Service and maintenance

MLG replacement / spare parts

When ordering replacement or spare parts for a KM26 MLG, the following information is a minimum requirement:

- serial number
- item description

Typical float chamber parts (reference 'MLG parts' section)

- vent and drain plug
- drain flange and spring
- float
- vent flange and spring

5.6.2 Typical indicator assembly parts (reference 'MLG parts' section)

- scale/channel assembly
- indicator tube (glass or polycarbonate)
- stainless steel gear clamps
- name plate
- indicator tube holders (top and bottom)

Replacement glass installation procedure (retrofit or replacement)

KM26 shuttle replacement glass installation procedure (refer to figures 27 and 28)

1. Remove old glass tube and tube holders from scale.
2. Assemble new bottom tube holder to scale using a #6-32 machine screw. Note the orientation of grooves in tube holder that interface with matching feature on scale channel.
3. Insert tall rubber bumper into bottom tube holder. The flat face on tall rubber bumper should rest flat in holder cavity.
4. Carefully align replacement glass with shuttle indicator into scale channel and lower into bottom tube holder. Ensure the glass tube rests flat on rubber bumper and is firmly seated. The nipple on bottom end of glass tube should protrude through the slot in the rubber bumper.
5. Place rubber bumper on top of glass tube.
6. Align top tube holder with scale channel and slide down until top surface of the holder is flush with top of scale channel. The screw hole should align with the hole in the holder.
7. Use a #6-32 machine screw to lock top tube holder in place.
8. Tighten nut and install a second nut to lock tube holders in place.

KM26 magnetic bargraph glass installation procedure (refer to figures 29 and 30)

1. Remove old glass tube and tube holders from scale.
2. Assemble new bottom tube holder to scale using a #6-32 machine screw. Note the orientation of grooves in tube holder that interface with the matching feature on the scale channel.
3. Insert one (1) rubber bumper into the bottom tube holder. The rubber bumper should rest flat in the holder cavity.
4. Carefully align new glass with bargraph indicator into scale channel and lower into the bottom tube holder. The flat faces on the glass tube should register with the corresponding flat faces in the cavity of the bottom tube holder. Ensure that the glass tube rests flat on the rubber bumper and is firmly seated. The nipple on the bottom end of the glass tube should protrude through the slot in the rubber bumper.
5. Place one (1) rubber bumper on the top of the glass tube.
6. Align the top tube holder with scale channel and slide down until the top surface of the holder is flush with the top of the scale channel. The screw hold should align with the hold in the holder.
7. Use a #6-32 machine screw to lock the top tube holder in place.
8. Tighten nut and install a second nut to lock tube holders in place.

... 5 Service and maintenance

KM26 shuttle replacement glass installation procedure

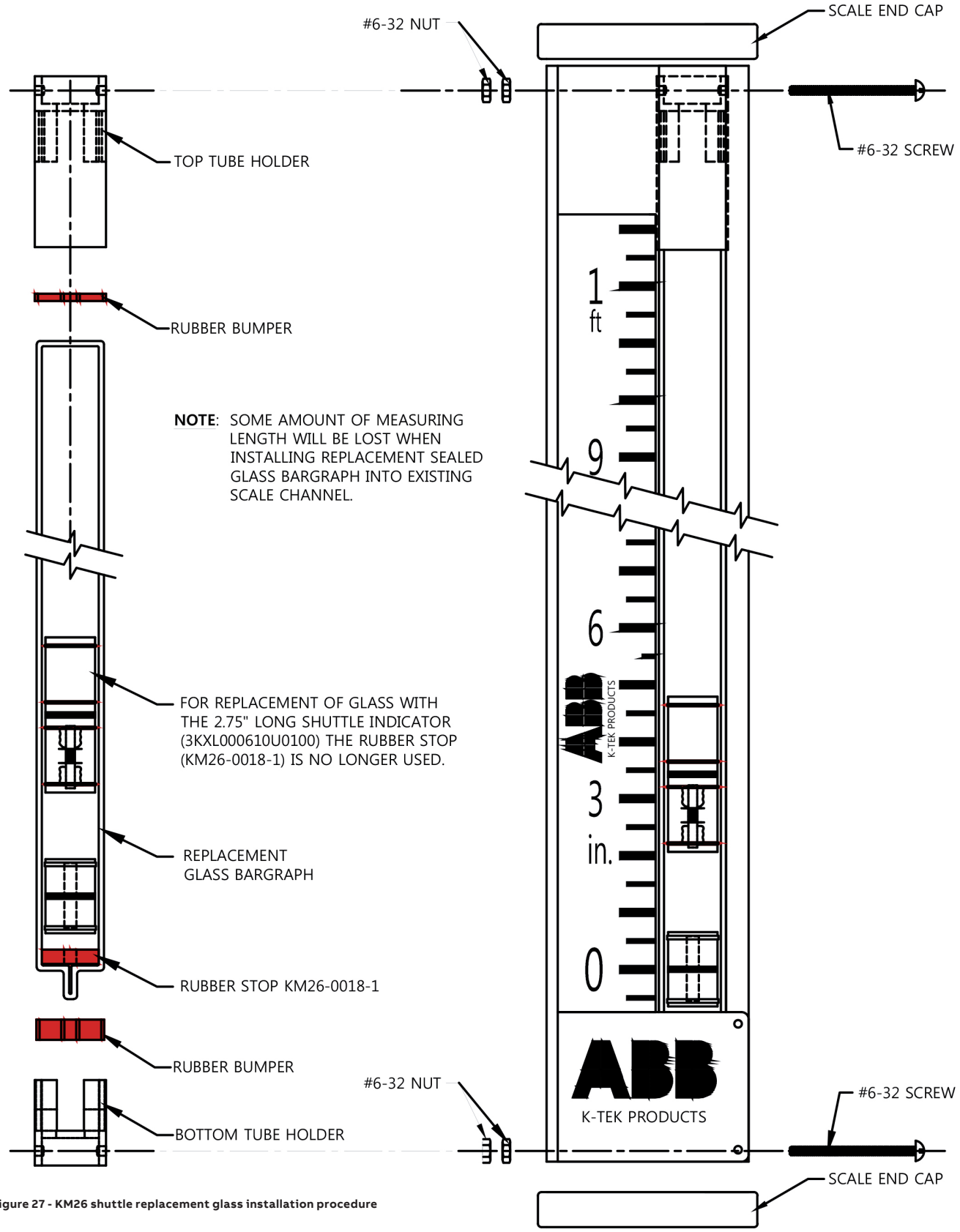


Figure 27 - KM26 shuttle replacement glass installation procedure

... 5 Service and maintenance

KM26 shuttle replacement glass installation procedure

1 Remove old shuttle and tube holders from scale
2 Assemble new bottom tube holder to scale using #6-32 machine screw. Note orientation of grooves in tube holder that interface with matching feature on scale channel
3 Insert tall rubber bumper into bottom tube holder. Flat faces on tall rubber bumper should register with corresponding flat flat faces in cavity of bottom tube holder. Rubber bumper should rest flat in holder cavity.
4 Carefully align replacement glass with shuttle indicator into scale channel and lower into bottom tube holder. Ensure glass tube rest flat on rubber bumper and is firmly seated. Nipple on bottom end of glass tube should protrude through slot in rubber bumper.
5 Place rubber bumper on top of glass tube
6 Align top tube holder with scale channel and slide down until top surface of holder is flush with top of scale channel. Screw hole should align with hole in holder
7 Use #6-32 machine screw to lock machine screw to lock top tube holder in place
8 Tighten nuts and install second nut to lock tube holders in place.

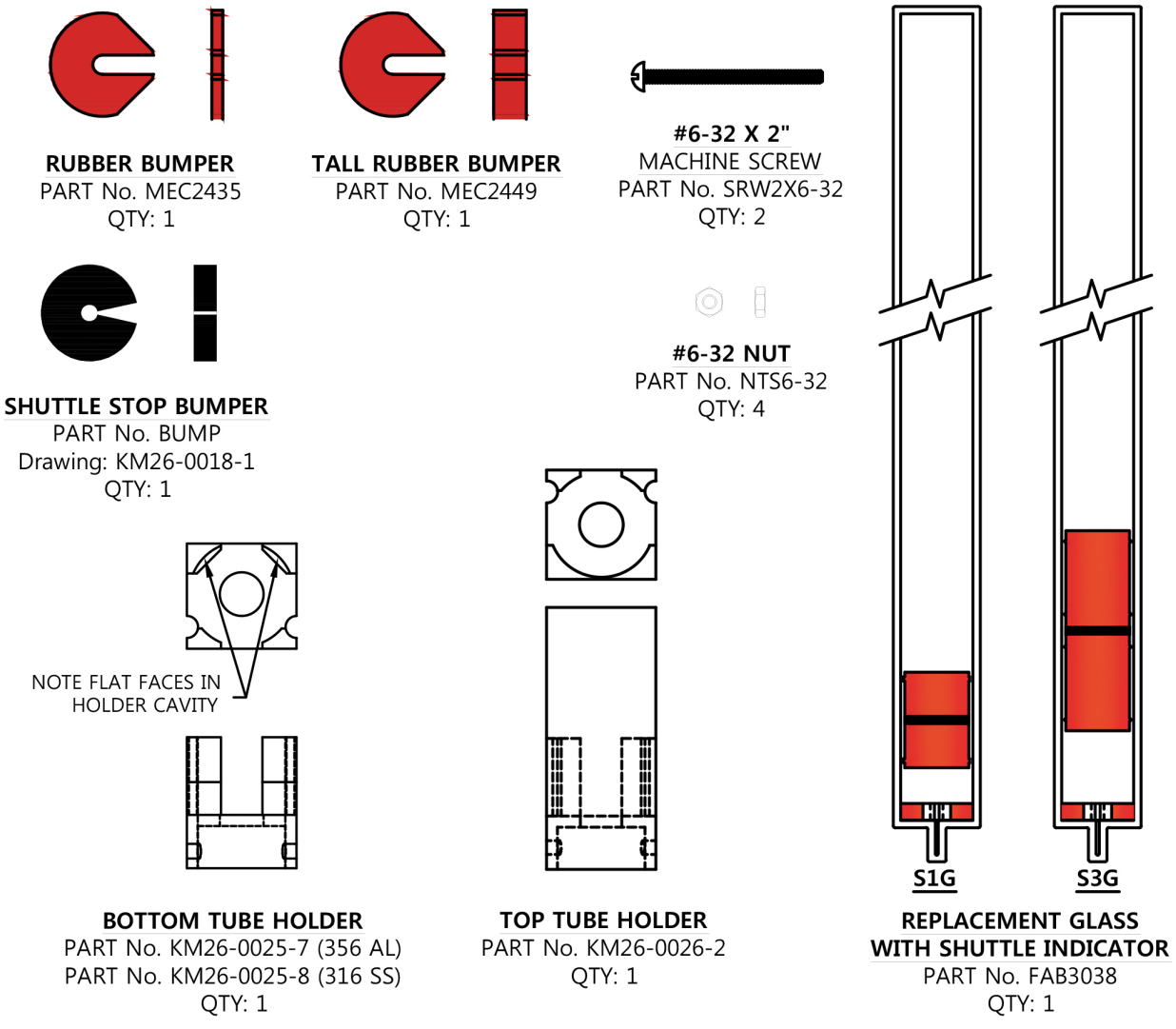


Figure 28 - KM26 shuttle replacement glass installation procedure

… 5 Service and maintenance

KM26 bargraph replacement glass installation procedure

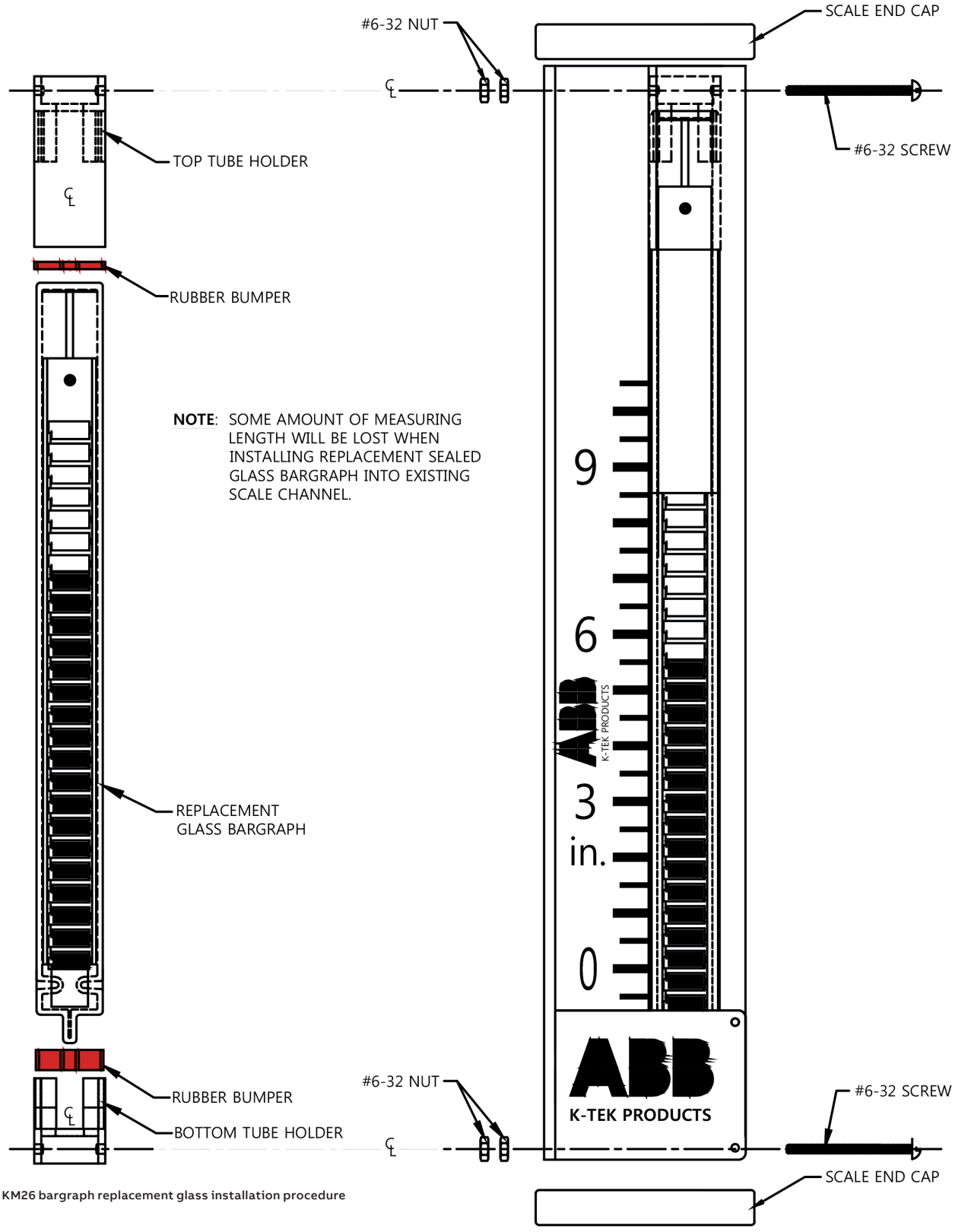


Figure 29 - KM26 bargraph replacement glass installation procedure

... 5 Service and Maintenance

KM26 bargraph replacement glass installation procedure

1 Remove old bargraph and tube holders from scale
2 Assemble new bottom tube holder to scale using #6-32 machine screw. Note orientation of grooves in tube holder that interface with matching feature on scale channel
3 Insert one (1) rubber bumper into bottom tube holder. Rubber bumper should rest flat in holder cavity.
4 Carefully align new class bargraph into scale channel and lower into bottom tube holder. Flat faces on glass tube should register with corresponding flat faces in cavity of bottom tube holder. Ensure glass tube rest flat on rubber bumper and it firmly seated. Nipple on bottom end glass of glass tube should protrude through slot in rubber bumper.
5 Place one (1) rubber bumper on top of glass tube
6 Align top tube holder with scale channel and slide down until top surface of holder is flush with top of scale channel. Screw hole should align with hole in holder
7 Use #6-32 machine screw to lock machine screw to lock top tube holder in place
8 Tighten nuts and install second nut to lock tube holders in place.

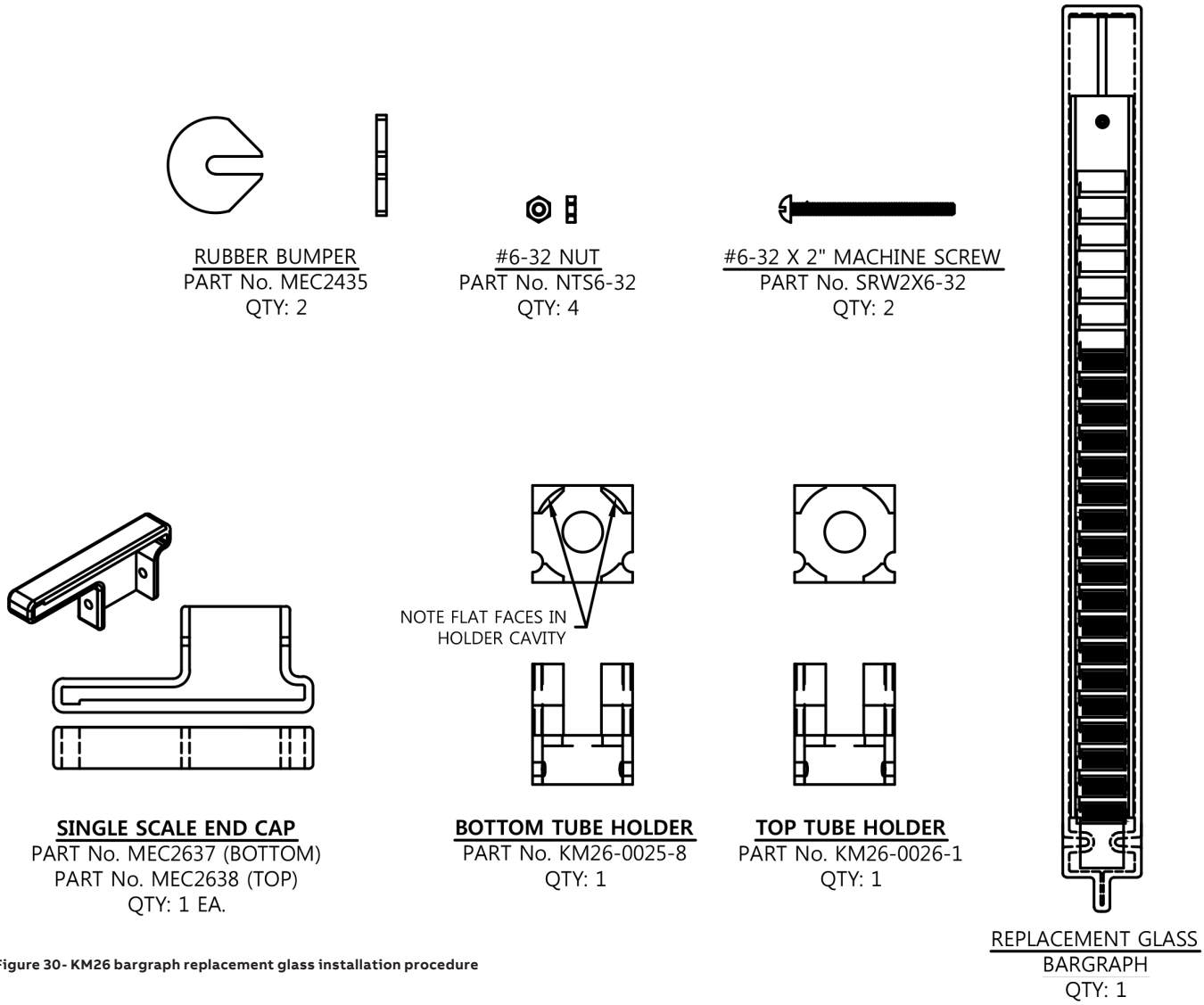
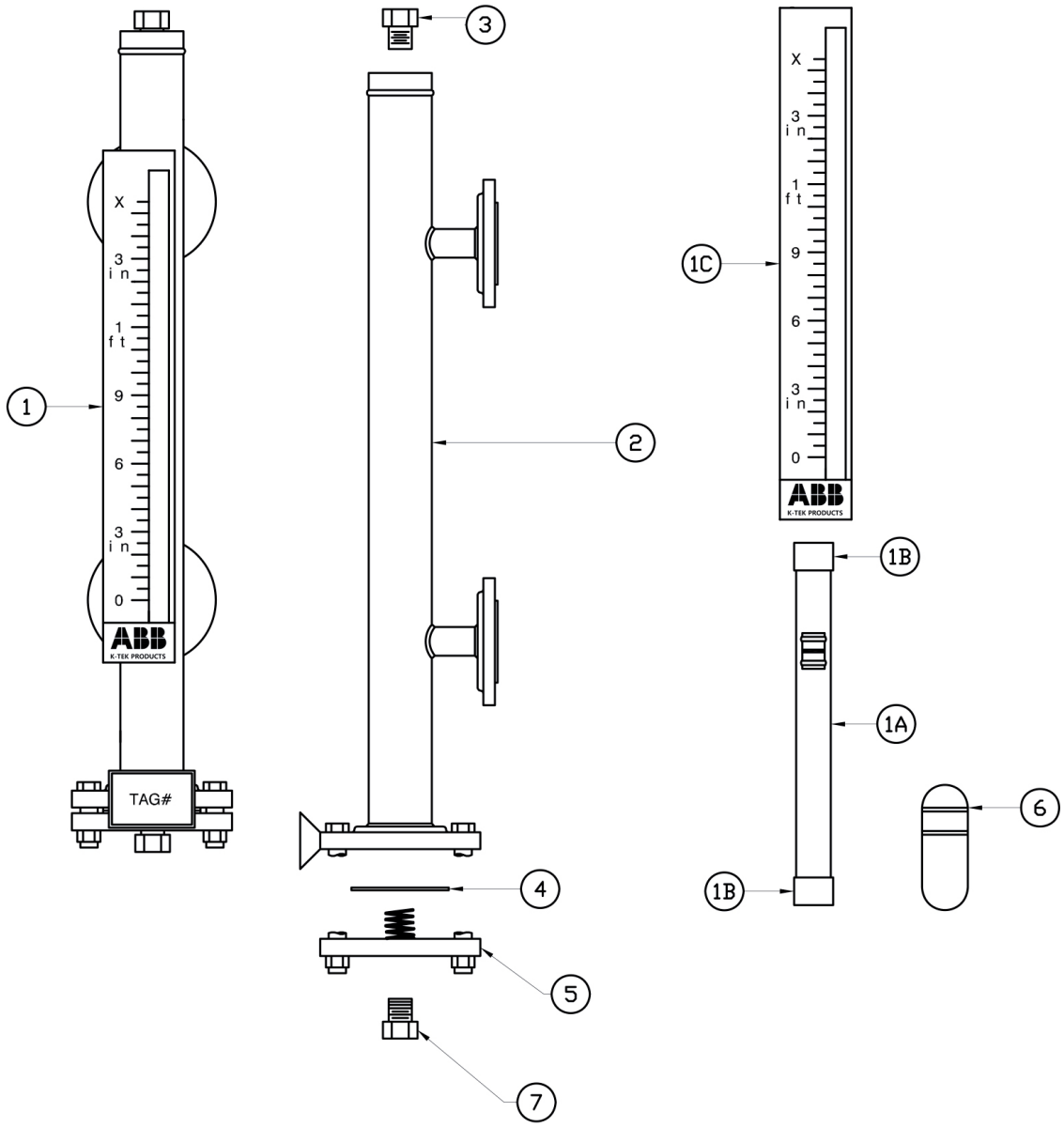


Figure 30- KM26 bargraph replacement glass installation procedure

6 MLG parts

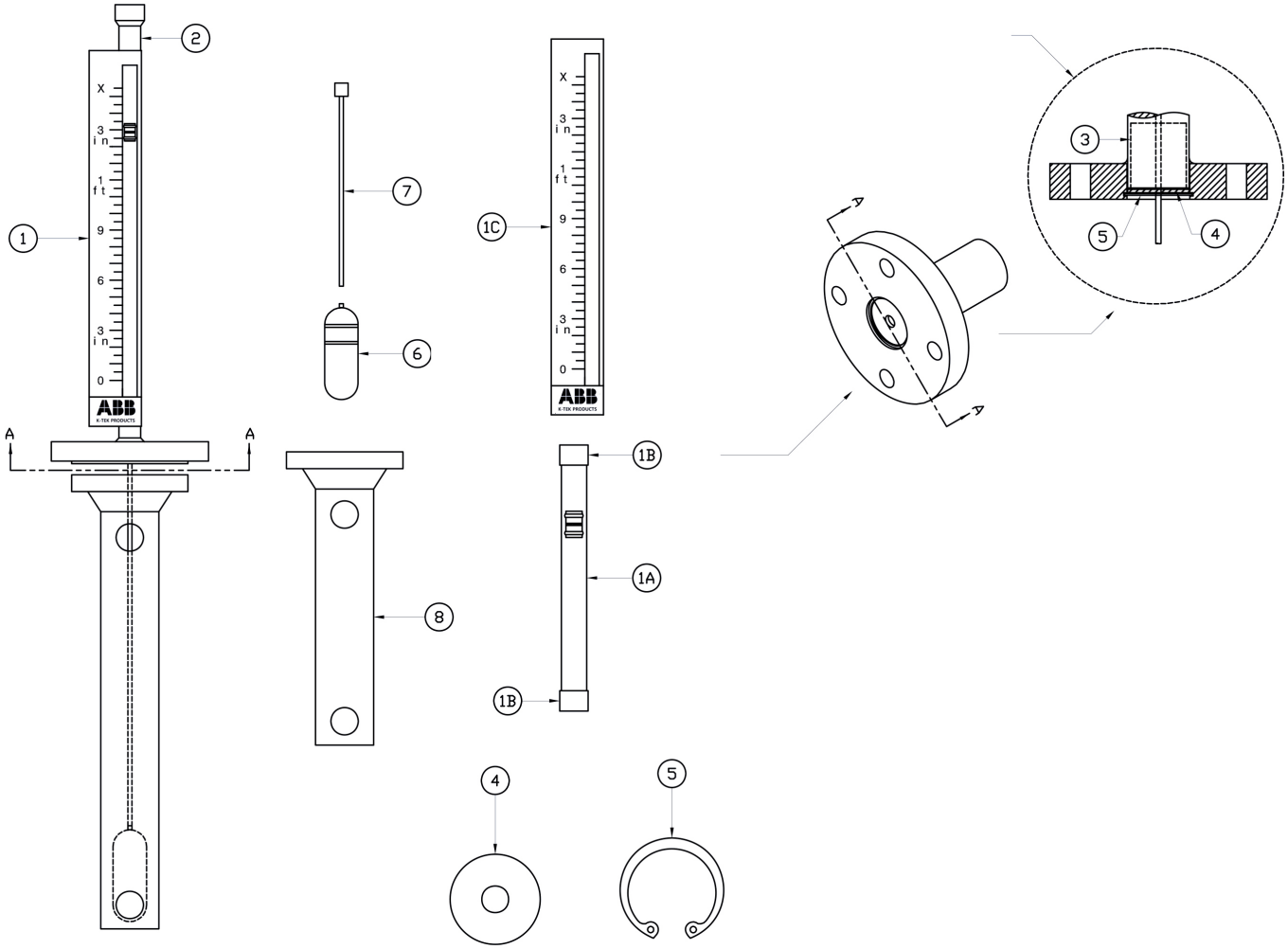
KM26S parts breakdown drawing (Same for LMG, EC, MW05 where applicable)



Item	Description	Part #
1	Scale assembly (includes 1-ABC)	Ser. # - 1
1A	Tube with follower	Ser. # - 1A
1B	Tube holder	Ser. # - 1B
1C	Scale	Ser. # - 1C
2	KM26S chamber	Ser. # - 2KS
3	Vent plug	Ser. # - 3KS
4	Gasket	Ser. # - 4KS
5	Float chamber closure	Ser. # - 5KS
	Flange with spring	
6	KM26S float	Ser. # - 6KS
	Specify total or interfaced if both exist	Ser. # - 6KS (T or I)
7	Drain plug	Ser. # - 7KS

… 6 MLG parts

KM26T parts breakdown drawing (Same for LMG, EC, MW05 where applicable)



Item	Description	Part #
1	Scale assembly (includes 1-ABC)	Ser. # - 1
1A	Tube with follower	Ser. # - 1A
1B	Tube holder	Ser. # - 1B
1C	Scale	Ser. # - 1C
2	KM26T chamber	Ser. # - 2KT
3	Float stop tube	Ser. # - 3KT
4	Float stop plate	Ser. # - 4KT
5	Snap ring	Ser. # - 5KT
6	KM26S float	Ser. # - 6KT
7	Guide rod and magnet assembly	Ser. # - 7KT
8	Stilling well	Ser. # - 8KT

7 Certificate and EU declaration of conformity

These certificates can be downloaded via the following links / QR codes or under the "Download" then "Cerificate" section on the website (https://new.abb.com/products/measurement-products/level/magnetic-level-gauges/km26-magnetic-level-gauge):

E. 1 EU declaration of conformity - ATEX constructional safety certificate

EU declaration of conformity | ATEX 2014/34/EU | PED 2014/68/EU

E. 2 EU-type examination certificate

EU-type examination certificate | ATEX 2014/34/EU

8 Warranty

Warranty statement

5 YEAR WARRANTY FOR:
KM26 magnetic liquid level gauges, MagWave dual chamber system, EC external chambers, STW stilling wells and ST95 seal pots.
2 YEAR WARRANTY FOR:
LMT100 and LMT200 series transmitters; and magnetic level switches (LMS200, MS41, PS45 and LMS100).
SPECIAL WARRANTY CONSIDERATIONS:
ABB Inc, K-TEK products, does not honor OEM warranties for items not manufactured by ABB Inc, K-TEK Products, (such as palm pilots). These claims should be handled directly with the OEM.
ABB Inc, K-TEK products, will repair or replace, at ABB Inc, K-TEK product's, election, defective items which are returned to ABB Inc, K-TEK products, by the original purchaser within the period specified above from the shipment date of the item and which is found, upon examination by ABB Inc, K-TEK products, to its satisfaction, to contain defects in materials or workmanship which arose only under normal use and service and which were not the result of either alterations, misuse, abuse, improper or inadequate adjustments, applications or servicing of the product. ABB Inc, K-TEK products's, warranty does not cover the repair or replacement of units that fail from the effects of excessive vibration unless the units are originally designed for vibration application. In addition, ABB Inc, K-TEK products's warranty does not include on-site repair or services. Field service rates can be supplied on request.

If a product is believed to be defective, the original purchaser shall notify ABB Inc, K-TEK products, and request a returned material authorization before returning the material to ABB Inc, K-TEK products, with transportation prepaid by the purchaser. (To expedite all returns/repairs from outside of the United States, consult ABB Inc, K-TEK product's customer service team (service@ktekcorp.com) to determine an optimal solution for shipping method and turnaround time.)
The product, with repaired or replaced parts, shall be returned to the purchaser at any point in the world with transportation prepaid by ABB Inc, K-TEK products, for best-way transportation only. ABB Inc, K-TEK products, is not responsible for expedited shipping charges. If the product is shipped to ABB Inc, K-TEK products, freight collect, then it will be returned to the customer freight collect.
If inspection by ABB Inc, K-TEK products, does not disclose any defects in material or workmanship, ABB Inc, K-TEK product's, normal charges for repair and shipment shall apply (minimum 250.00 USD).
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9 Requesting a return/repair Return Material Authorization (RMA)

Process for return/repair

1. Go to My Measurement Assistant (MMA)
   my-measurement-assistant.abb.com/
2. Click the support icon at the top of page
3. Select the type of service request e.g. (Return, Warranty, or Repair)
4. Fill out the required fields
   a. Invoice to
   b. Ship to
   c. Return reason
   d. Supporting documents (PO #, sales order #, etc.)
   e. Ensure unit is free of contamination
5. After submission wait for case number to appear on screen (less than 10 seconds)
6. ABB team will contact you within one business day for next steps.
   Repair email: us-pama-repairs@abb.com

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Service email: instrumentservice.abbchina@cn.abb.com

new.abb.com/products/measurement-products/level

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