ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION

# MS41

## Magnetic level gauge switch

Magnetically actuated 10 A hermetically sealed electric switch

**Measurement made easy**

Installation, commissioning and maintenance instructions

## Introduction

ABB's MLG switches for point level alarm and/or control can mount to a KM26 MLG or an LS series cage level switch. These switches are completely isolated from the process fluid as they are magnetically activated by a magnet equipped float (KM26) or attraction sleeve (LS series). The unique magnetic coupling action eliminates seals, diaphragms, springs, and torque tubes common to other level switching alternatives since there is no physical contact with the process fluid. The magnetic coupling also eliminates process connections to the switch; therefore, no isolation valves are required to block off the switch for maintenance. The switch 'set point' is easily adjustable without changing any process piping and the result is a more reliable and easier way to maintain level system.

# Contents

**1 Description .....3**

**2 Safety .....3**

**3 Unpacking ..... 4–6**

**4 Operation.....5**

**5 Mounting and installation ..... 5–6**

**6 Installation and wiring .....6**

**7 Application.....7**

**8 Troubleshooting.....7**

**9 Service.....7**

**10 Requirements for hazardous locations ..... 7–9**

**11 EU declaration of conformity ..... 10**

**12 Warranty statement ..... 10**

**13 RMA form .....11**

# 1 Description

The ABB MS41 electric switch is a magnetically actuated double pole double throw switch. When the MS41 is mounted on a KM26 magnetic level gauge, LS series or an external chamber that contains a ABB magnetic float, it can sense a high or low level within a vessel. The unique magnetic coupling action eliminates the need for seals, diaphragm springs or torque tubes because there is no physical contact with the process. The switch configuration also has no process connections which insures complete isolation from the process. The maintenance free design requires no periodic cleaning or operational checks and contains hermetically sealed contacts that insure high reliability and extended product life.

# 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 MS41 switch. Please refer to the KM26 MLG manual for additional details for installation and safety requirements when a MLG switch is mounted on the KM26 MLG.

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, decommissioning/disposal and service of the MS41 MLG switch. Qualified personnel are those individuals who have experience in the installation, electrical connection, commissioning and operation of the MS41 MLG switch 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 MS41 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.

# 3 Unpacking

## Identification

The switch is identified by the product nameplate. This provides information (see figure 1) concerning items such as the model number, ratings, serial number, and temperature limits This also contains the certification–related parameters for use in a hazardous area.

Please refer to the serial number when speaking to ABB service department personnel.

**Note**
The name plates shown here are only examples. The nameplates attached to the device may be different to what you see below depending on the order.

## Unpacking and handling

If the MS41 switch is shipped independent of the MLG or LS series products, then remove the switch and all included hardware from the shipping carton.

- Do not discard the packaging material until the installation is complete.
- Normal good practice should be observed, handling with care and assistance.

## Transport and storage

After unpacking the MLG switch, inspect it for damage.

- check the packaging for accessories.
- during intermediate storage or transport, only store the switch in the original packaging.
- if required, storage prior to installation should be indoors at ambient temperatures, not to exceed the following:
  - temperature range: –40 °C to 85 °C (–40 °F to 185 °F)
  - humidity: 0 to 95% RH, non–condensing

Although there is no limit on the duration of storage, the warranty conditions stipulated on the supplier's order of acknowledgement still apply.


**Figure 1 MS41 nameplate**


**Figure 2 MS41 nameplate**

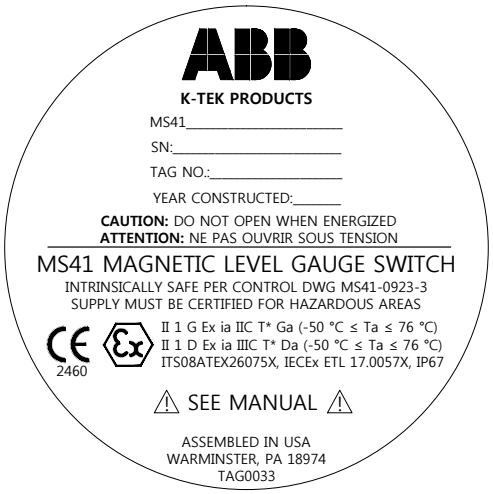



**Figure 3 MS41 nameplate**


**Figure 4 MS41 nameplate**

# 4 Operation

The MS41 consists of two snap action switches assembled in a double pole double throw configuration, and precision cam/spindle assembly that contain a rod magnet. A magnetic ABB float passing by the MS41 will cause its magnet to rotate through approximately 60° of arc, causing the integral snap action switches to actuate. The action of the contacts is break before make.

The spindle is not totally free to rotate unless a strong magnetic field is passed parallel to the MS41 switch because the spindle magnet is magnetically latched to one of two stops. The spindle magnet attraction for a stop is great enough to keep the spindle from rotating on its own, but the magnetic field of a float is strong enough to cause the spindle magnet to release from the stop to which it is attached and rotate to align itself with the float's magnetic field. As the float passes by the MS41 switch, the spindle magnet will latch to the opposite stop. It will remain in this position until the float passes by again.

**Dimensions and internal components**

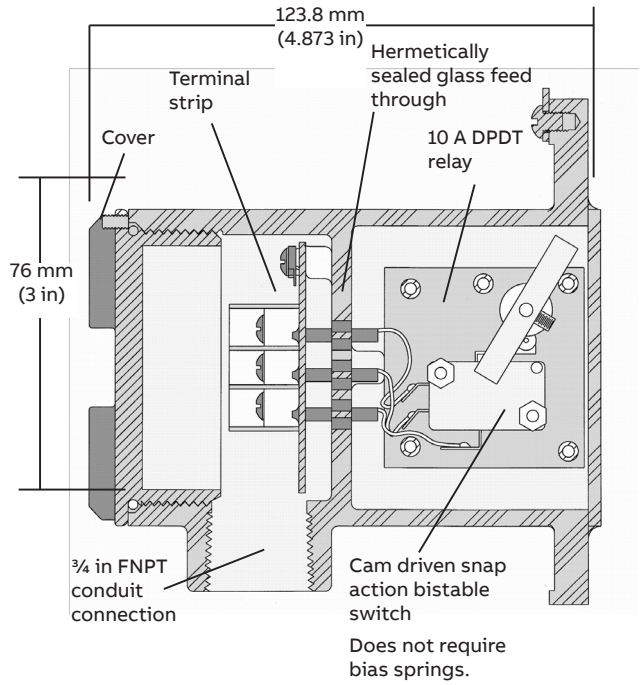



**Figure 5 Dimensions and internal components**

# 5 Mounting and installation

The standard MS41 is mounted using two stainless steel clamps that passes through the mounting slots attached to the switch housing. The clamp are then fastened to the KM26 or similar chamber. The switch can be easily re–positioned by loosening the clamps and sliding the switch to the correct position on the chamber. The switch will trip at a point about 0.5 inches above the center of the side of the housing.

A rod mount method is also available (optional). With this mounting method, a rod is permanently attached to the KM26 with the MS41 subsequently attached.

The following procedure outlines the steps necessary to install the switch.

**⚠ CAUTION**

Make sure circuit is de–energized while installing the switch.

1. Mount the switch to the chamber where the switch needs to trip. The switch should be mounted 90° from the indicator assembly to insure optimum magnetic coupling.
2. Route the field wiring through the ¾ in female NPT entry port of the MS41 enclosure base.
3. Connect the field wires to the terminal block according to the application. A (updated reference) can be found in section 5 installation and wiring on page 5.
4. Make sure the field wires do not become pinched between the MS41 cover and housing when the cover is installed. It is best that the field wires be as short and direct as possible from the coupling to the terminal block.
5. Reinstall the cover on the housing.
6. The float must be cycled past the switch in both directions to insure that the switch will operate properly when put into service.

**Notes:**

**A** Field wiring connected to the MS41 switch must comply with applicable NEC, CEC, or other applicable electrical codes.

**B** Do not use the switch on chambers with operating temperatures above 300°F / 149°C without using insulation between the switch and the chamber. Keep the temperature of the switch from exceeding 300°F / 149°C. Verify that the process temperature of the switch is less than the applicable flammable gas ignition temperature (for applications in explosive atmospheres).

**C** In classified/hazardous locations, ensure that the process temperature does not exceed the maximum allowable for the temperature classification (see installation in hazardous locations section for further details).

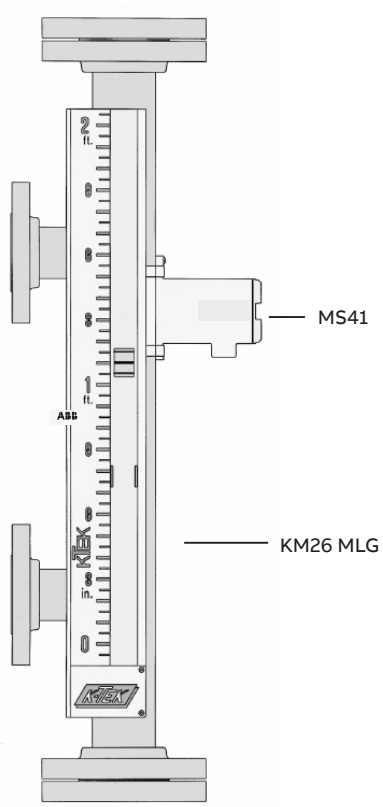
**D** Ensure that the MS41 is mounted with the electrical gland facing down. If the switch is mounted properly, but the float is placed upside–down in the chamber, the switch does not activate properly. If the float or the switch are not in alignment (north–south poles), the switch does not activate properly. Other switches can be added at any position, at any time, without the concern for additional process piping or valves.

**E** Two switches can be mounted so that they can trip at the same point or at two different points separated by less than the length of a switch.

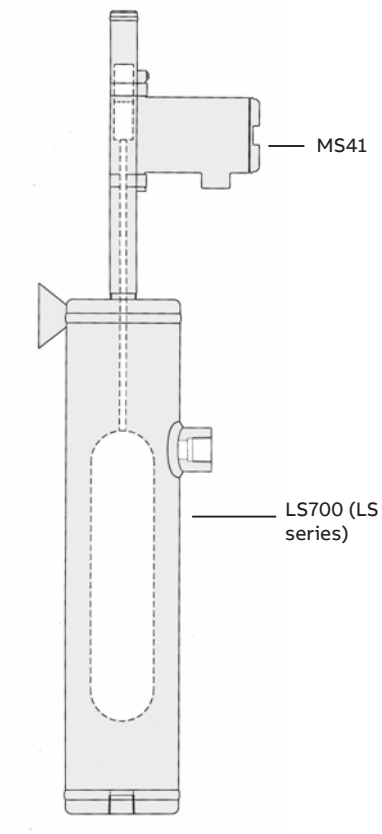
**F** Conduit seal fittings (customer supplied) are required at the conduit entrance of the MS41 switch.

## ...5 Mounting and installation

**Example configurations:**



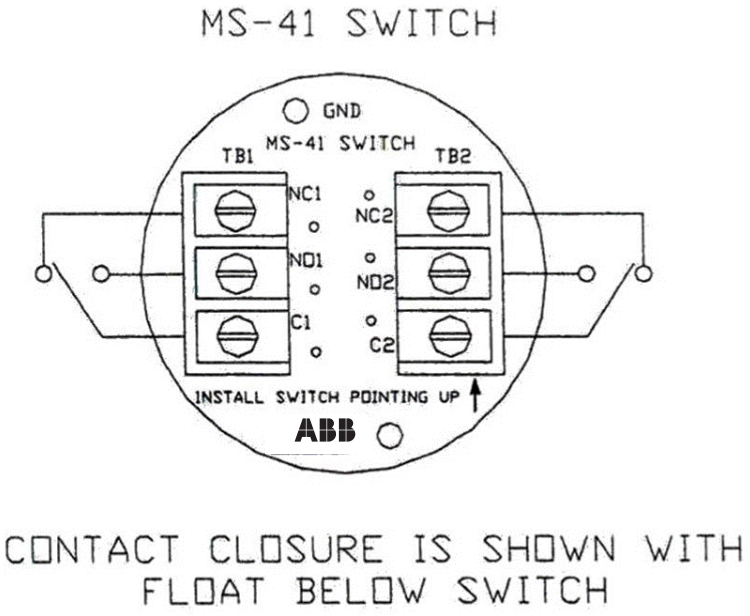

MS41 mounted on KM26 magnetic level gauge




MS41 mounted on LS series mechanical level switch

**Figure 6 MS41 configurations**

## 6 Installation and wiring



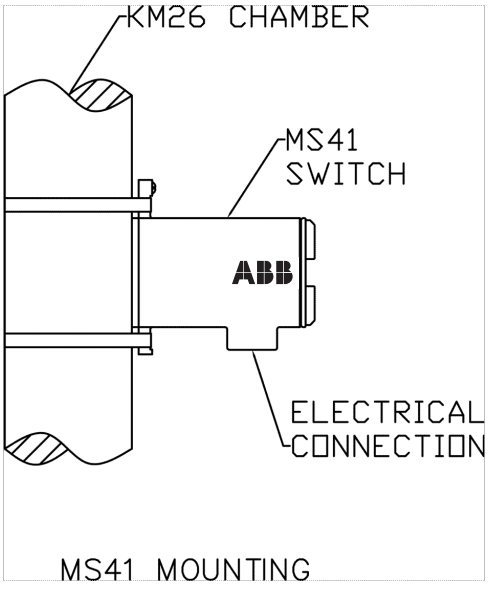




**Figure 7 MS41 installation and mounting diagrams**

# 7 Application

The MS41 will provide either normally open or normally closed dry contacts that can be used to activate external devices such as alarms or solenoids. The capacity of the switch allows for a wide range of devices to be switched, as long as the stated limits are not exceeded.

Since the MS41 is magnetically activated, it is suited for any application where it is necessary to sense the passing of a magnet or magnetic field near it. However, 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. This will provide for the detection of a start/stop trip point of either a total or interface level in any vessel. These trip points can be used for alarms or to activate a pump motor starter relay.

# 8 Troubleshooting

If the switch does not work, check if:

- 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.
- 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.

# 9 Service

The MS41 does not require any routine maintenance in normal day to day operation.

**⚠ CAUTION**

De–energize all field wiring before servicing. If there is a need to take the switch out of service or disconnect it for any reason, then make sure the circuit is de–energized or that the area is known to be non–hazardous.

**⚠ WARNING**

The MS41 can be directly coupled to chambers that operate at elevated temperatures under normal circumstances. Proper care should be taken when installing, adjusting, servicing, or removing the product from active process chambers to mitigate the risk of thermal hazards to personnel.

# 10 Requirements for hazardous locations

The MS41 switch is designed for use in division 1 and 2 applications as well as Zones 0, 1, 2, 20, and 21 applications.

Cable or conduit entries must be fitted with a suitably certified cable entry device, with or without the use of a suitably approved thread adaptor.

Installation and use of apparatus in hazardous locations shall be in accordance with an IEC 60079–14 or applicable regional standards.

**Notes**

- The MS41 has been evaluated as an Installation (overvoltage) category 1 / pollution degree 2 apparatus per IEC 61010
- The maximum altitude of operation is 6560 feet (2000 meters).
- The MS41 is designed with both internal and external protective earth (ground) terminals.
- Housing and cover are made from 316L stainless steel. Assess material suitability for the target environment before deploying to avoid an ignition hazard due to impact or friction.
- Do not torque any attached conduits, thread adapters, reducers, elbows, or cable glands beyond the manufacturer's recommended installation torque.

## Flame–proof / explosion–proof installations

**⚠ CAUTION**

The flameproof joints of the equipment are not intended to be repaired. Consult the manufacturer if repair of the flameproof joints are necessary.

The MS41 is designed for use in class i division 1 and zone 1 and 2 hazardous areas. Installation and use of apparatus in hazardous locations shall be in accordance with IEC 60079–14 or other applicable regional standards.

Internal temperatures of the MS41 can reach up to 257 °F (125 °C) when operated at maximum service temperature and maximum ambient temperatures. The service temperature range of cable glands and field wiring shall be chosen accordingly.

# … 10 Requirements for hazardous locations

Temperature classifications of the MS41 are dependent on the temperature of the coupled process vessel. Use the table below to determine temperature class:

| Maximum process temperature | Temperature class |
|---|---|
| 78 °C (170.4 °F) | T6 |
| 93 °C (199.4 °F) | T5 |
| 128 °C (262.4 °F) | T4 |
| 193 °C (379.4 °F) | T3 |
| 288 °C (550.4 °F) | T2 |
| 438 °C (820.4 °F) | T1 |

**Table 1 Flame–proof / explosion–proof installations**

## Dust–protected / dust ignition–proof installations

The MS41 is designed for use in Class II Division 1 and Zone 21 hazardous areas. Installation and use of apparatus in hazardous locations shall be in accordance with IEC 60079–14 or other applicable regional standards.

Threaded fittings for field wiring such as cable glands, conduits, and thread adapters must maintain the ingress protection rating of the MS41 enclosure (IP6X).

Temperature classification of the MS41 is related to process temperature. Use the table below to determine temperature class:

| Maximum process temperature | Temperature class |
|---|---|
| 78 °C (170.4 °F) | T80 °C |
| 93 °C (199.4 °F) | T95 °C |
| 128 °C (262.4 °F) | T130 °C |
| 193 °C (379.4 °F) | T195 °C |
| 288 °C (550.4 °F) | T290 °C |
| 438 °C (820.4 °F) | T440 °C |

**Table 2 Dust–protected / dust ignition–proof installations**

## Intrinsically safe installations

The MS41 is designed for use in class I, II, & III division 1 and zone 0 and 20 hazardous areas. Installation and use of apparatus in hazardous locations shall be in accordance with IEC 60079–14 or other applicable regional standards.

Temperature classification of the MS41 is related to process temperature. Use the table below to determine temperature class:

| Maximum process temperature | Temperature class |
|---|---|
| 76 °C (168.8 °F) | T6 |
| 91 °C (195.8 °F) | T5 |
| 126 °C (258.8 °F) | T4 |
| 191 °C (375.8 °F) | T3 |
| 286 °C (546.8 °F) | T2 |
| 436 °C (816.8 °F) | T1 |

**Table 3 Gas / vapor temperature classifications**

| Maximum process temperature | Temperature class |
|---|---|
| 76 °C (168.8 °F) | T80 °C |
| 91 °C (195.8 °F) | T95 °C |
| 126 °C (258.8 °F) | T130 °C |
| 191 °C (375.8 °F) | T195 °C |
| 286 °C (546.8 °F) | T290 °C |
| 436 °C (816.8 °F) | T440 °C |

**Table 4 Dust temperature classifications**

# … 10 Requirements for hazardous locations

The MS41 shall be installed in accordance with the control drawing below for intrinsically safe installations:

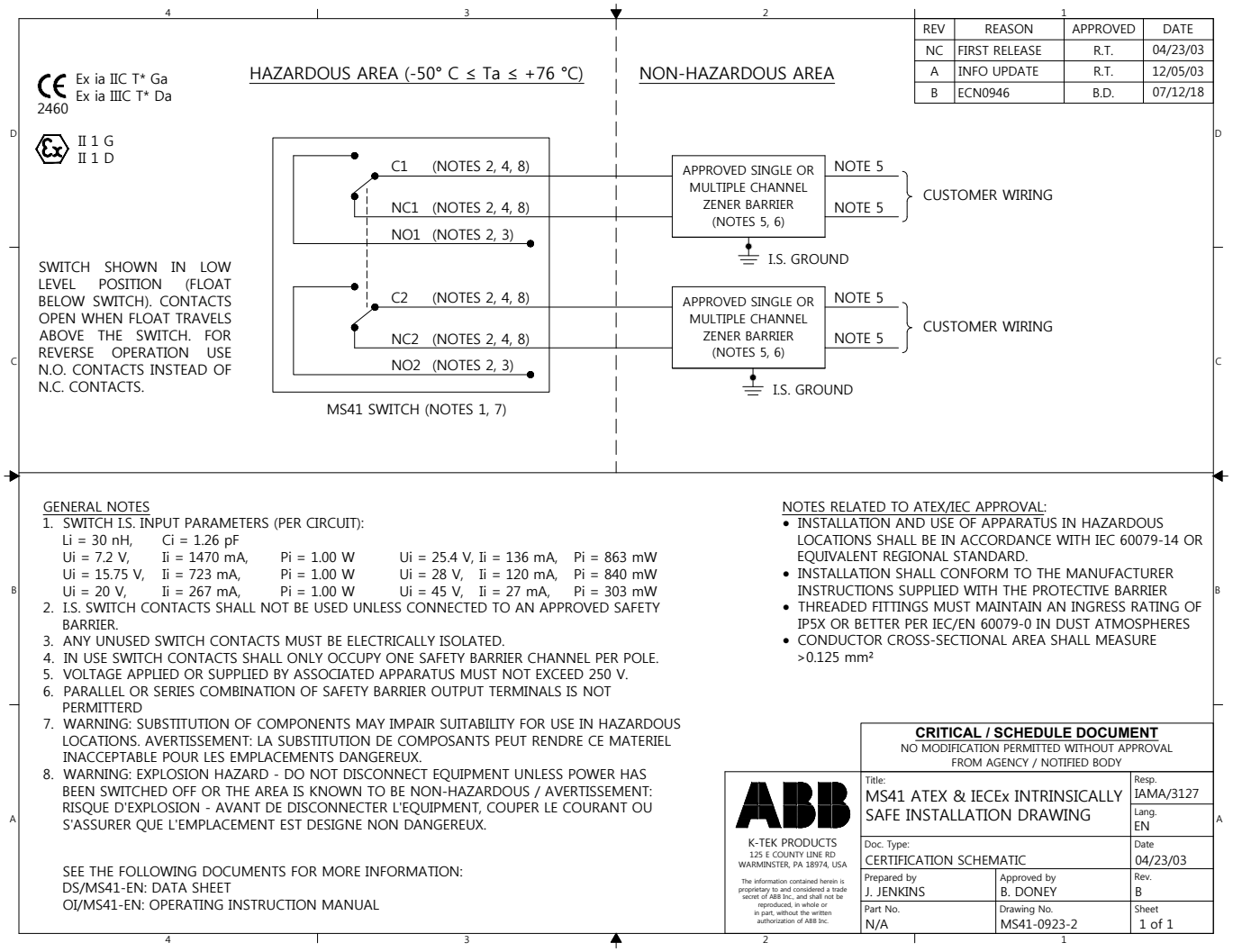



**Figure 8 MS41 intrinsically safe installations**

# 11 EU declaration of conformity

The EU declaration of conformity can be downloaded at the following link:

http://search.abb.com/library/Download.aspx?DocumentID=9AKK107045A0802&LanguageCode=en&DocumentPartId=&Action=Launch

# 12 Warranty statement

5 YEAR WARRANTY FOR:
KM26 Magnetic Liquid Level Gauges; MagWave Dual Chamber System; LS Series Mechanical Level Switches (LS500, LS550, LS600, LS700, LS800 & LS900); EC External Chambers, STW Stilling Wells and ST95 Seal Pots.

3 YEAR WARRANTY FOR:
KCAP300 & KCAP400 capacitance switches.

2 YEAR WARRANTY FOR:
AT100, AT100S and AT200 series transmitters; RS80 and RS85 liquid vibrating fork switches; RLT100 and RLT200 reed switch level transmitters; TX, TS, TQ, IX and IM thermal dispersion switches; IR10 and PP10 External Relays; MT2000, MT5000, MT5100 and MT5200 radar level transmitters; RI100 Repeat Indicators; KP paddle switches; A02, A75 & A77 RF capacitance level switches and A38 RF capacitance level transmitters; Buoyancy Level Switches (MS50, MS10, MS8D & MS8F); Magnetic Level Switches (MS30, MS40, MS41, PS35 & PS45).

1 YEAR WARRANTY FOR:
KM50 gauging device; AT500 and AT600 series transmitters; LaserMeter and SureShot series laser transmitters; LPM200 digital indicator; DPM100 digital indicators; APM100 analog indicators; KVIEW series digital indicators and controllers; SF50 and SF60 vibrating fork switches, KB Electro–Mechanical Continuous Measuring Devices, KSONIK ultrasonic level switches, transmitters & transducers, ChuteMaster Microwave Transmitter / Receiver and TiltMaster Switches.

SPECIAL WARRANTY CONSIDERATIONS:
ABB does not honor OEM warranties for items not manufactured by ABB (i.e. Palm Pilots). These claims should be handled directly with the OEM.

ABB will repair or replace, at ABB's election, defective items which are returned to ABB by the original purchaser within the period specified above from the shipment date of the item and which is found, upon examination by ABB, 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's warranty does not include onsite 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 and request a Returned Material Authorization before returning the material to ABB, with transportation prepaid by the purchaser. (To expedite all returns/repairs from outside of the United States, consult ABB'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 for best–way transportation only. ABB is not responsible for expedited shipping charges. If the product is shipped to ABB freight collect, then it will be returned to the customer freight collect.

If inspection by ABB does not disclose any defects in material or workmanship, ABB's normal charges for repair and shipment shall apply (minimum 250.00 USD).

The materials of construction for all ABB products are clearly specified and it is the responsibility of the purchaser to determine the compatibility of the materials for the application.

THE FOREGOING WARRANTY IS ABB'S SOLE WARRANTY AND ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, ARE EXCLUDED AND NEGATED TO THE MAXIMUM EXTENT PERMITTED BY LAW. NO PERSON OR REPRESENTATIVE IS AUTHORIZED TO EXTEND ANY OTHER WARRANTY OR CREATE FOR ABB ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ABB'S PRODUCTS. THE REMEDIES SET FORTH IN THIS WARRANTY ARE EXCLUSIVE OF ALL OTHER REMEDIES AGAINST ABB. ABB SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, OR SPECIAL DAMAGES OF ANY KIND. ABB'S SOLE OBLIGATION SHALL BE TO REPAIR OR REPLACE PARTS (FOUND TO BE DEFECTIVE IN MATERIALS OR WORKMANSHIP) WHICH ARE RETURNED BY THE PURCHASER TO ABB.

# 13 RMA form

ABB, Inc
8490 Bluebonnet Blvd
Suite 100
Baton Rouge, LA 70810
Tel: +1 225 408 0800
Service: +1 225 677 5836
Fax: +1 225 673 2525
Service email: ktek–service@us.abb.com

*** IMPORTANT CUSTOMER NOTICE: PLEASE READ PRIOR TO RETURNING PRODUCTS TO ABB***

Be sure to include the Return Authorization (RA) number on the shipping label or package to the attention: Customer Service. A copy of this document should also be included with the packing list. ABB wants to maintain a safe work environment for its employees. In the event, the returned product or material has been in contact with a potentially hazardous chemical, per federal regulations, the customer must provide evidence of decontamination and the related chemical composition and characteristics. In order to expedite your return, please include the applicable Material Safety Data Sheets (MSDS) and decontamination tags by affixing these documents in close proximity to the shipment label for identification purposes.

| **Return Authorization Form** | |
|---|---|
| Customer: | Date: |
| Contact Name: | Product: |
| Contact Email: | Serial No: |
| Contact Phone: | Job No: |
| Contact Fax: | Service Rep: |

**Completed by Customer**

Reason

Problem Found: None

Action: None
Requested:
Is expedited return shipping requested? ☐Yes
If yes, please provide a purchase order or your shipper's account number (ex. FedEx or UPS). ABB pays return transport via standard ground shipments only.

If purchase order is issued, a copy of purchase order must be included with return documentation.
Is ABB authorized to repair items determined to be non–warranty? ☐Yes
If yes, a copy of purchase order must be included with return documentation.

Account #:

Customer PO:

Date:

Has product been in contact with any potentially hazardous chemical? ☐Yes
If yes, documentation product and forward MSDS to ABB, "ATTN: Customer Service"

| Return Repaired Product to Address | |
|---|---|
| Shipping Address: | Billing Address: |
| | Ship Via: |

# Notes

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**ABB Inc.**
**Measurement & Analytics**
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

**ABB Engineering (Shanghai) Ltd.**
**Measurement & Analytics**
No. 4528, Kangxin Highway
Pudong District, Shanghai
201319
P.R. China
Phone: 4008209696
Fax. +86 21 61056677
Email:
instrumentservice.abbchina@cn.abb.com

**ABB Inc.**
**Measurement & Analytics**
8490 Bluebonnet Blvd
Suite 100
Baton Rouge, LA 70810
USA
Tel: +1 225 408 0800
Service: +1 225 408 0898
Email: quotes.ktek@us.abb.com
Service email: ktek–service@us.abb.com

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