Operating Instruction Manual OI/LMS100-EN Rev. C

LMS100
Magnetic level gauge switch

K-TEK Level products

Measurement made easy



Introduction

The operation and instruction manual provides the following information:

– Mounting and installation
– Service instructions
– Electrical installation drawing
– Installation and parts drawing

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1. Introduction

The LMS100 is a magnetically actuated single pole, double throw switch. When the LMS100 is mounted on a KM26 Magnetic Level Gauge, LS Series Cage Level switch or an External Chamber that contains a magnetic float, it can sense high or low levels within a vessel. The unique magnetic coupling action eliminates the need for seals, diaphragms, spring or torque tubes. There is no physical contact with the process. Magnetic coupling also eliminates the necessity of process connections and ensures total isolation from the process.

2. Application

The LMS100 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.

3. Operation

The LMS100 consists of a form C reed switch and a magnet. The reed switch uses precious metal contacts in an inert gas atmosphere sealed by glass to metal bond. A magnetic float traveling relative to the LMS100 causes the reed switch to change state. After the float has passed, the reed switch will maintain its state until the float reverses direction and passes the switch in the opposite direction. The action of the switch is break before make. The hermetically sealed contacts serve to ensure a high degree of hazardous area safety, weather resistance and general reliability of the product.

4. Mounting & Adjustment

The LMS100 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.

NOTE:

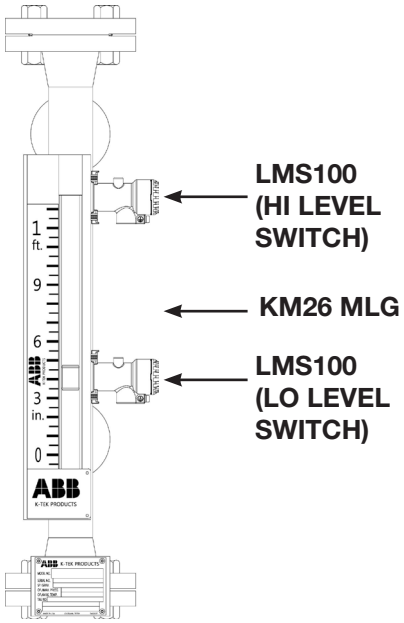
1. Do not use the switch on chambers with operating temperatures above 300°F / 149°C without using insulation between the switch and the chamber to keep the temperature of the switch from exceeding 300°F/ 149°C. Consult factory.
2. Any conduit or fittings connected to an LMS100 magnetically activated switch should be non-magnetic material. This is necessary to avoid interference with the operation of the KM26 Magnetic Liquid Level Indicator or other magnetically activated switches.

4.1 Standard Mounting

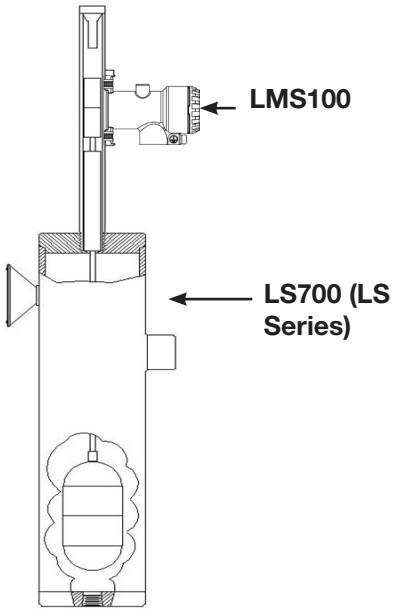
The following procedure outlines the steps necessary to install the switch:

1. Mount the switch to the chamber where you want the switch to trip. The switch should be mounted 90° from the indicator assembly to insure optimum magnetic coupling.
2. The float must be cycled past the switch in both directions to insure that the switch will operate properly when put into service.

Example Configurations:

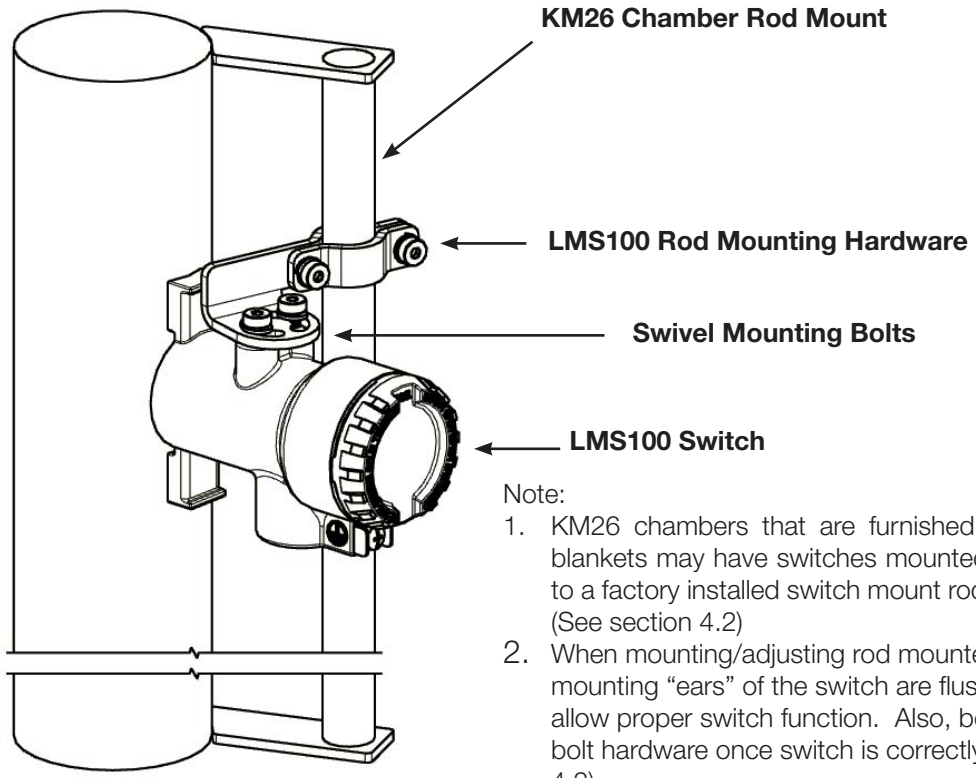


LMS100 Mounted on KM26 Magnetic Level Gauge



LMS100 Mounted on LS Series Mechanical Level Switch

4.2 Rod Mounting



Note:

1. KM26 chambers that are furnished with factory installed insulation blankets may have switches mounted via special rod mount brackets to a factory installed switch mount rod that is external to the insulation. (See section 4.2)
2. When mounting/adjusting rod mounted LMS100, ensure that the mounting “ears” of the switch are flush against the float chamber to allow proper switch function. Also, be sure to tighten all mounting bolt hardware once switch is correctly mounted into position (figure 4.2)

5. Installation

WARNING! SERVICE TEMPERATURE OF THE LMS100 IS DEPENDENT ON PROCESS TEMPERATURE, MOUNTING METHOD, AND INSULATION USAGE. REFER TO THE TABLE BELOW TO DETERMINE THE MAXIMUM SAFE PROCESS TEMPERATURE FOR EACH APPROVED COMBINATION OF INSULATION AND MOUNTING.

Mounting	Insulation	Max Process
Standard (A1)	None (Y0)	300 °F (148.8 °C)
Rod Mount (A2)	None (Y0)	350°F (176.6 °C)
Standard (A1)	Insulation Pad (P1)	575°F (301.6 °C)
Rod Mount (A2)	Chamber Insulation	800°F (426.6 °C)

CAUTION! TO ENSURE SAFE AND RELIABLE OPERATION, DO NOT OPERATE THE SWITCH BEYOND THE FOLLOWING MAXIMUM ELECTRICAL PARAMETERS:
MAX VOLTAGE: 250 V AC/DC
MAX CURRENT: 1 A
MAX POWER: 60 W/VA

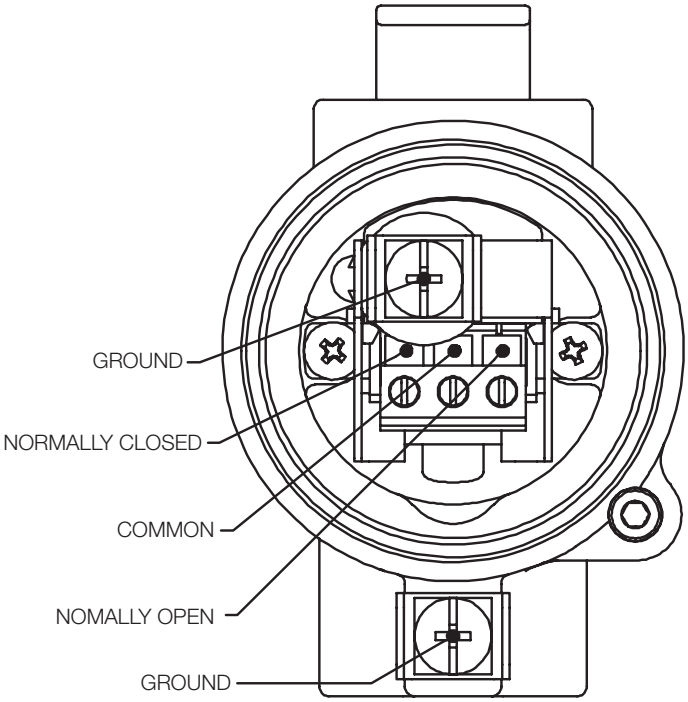
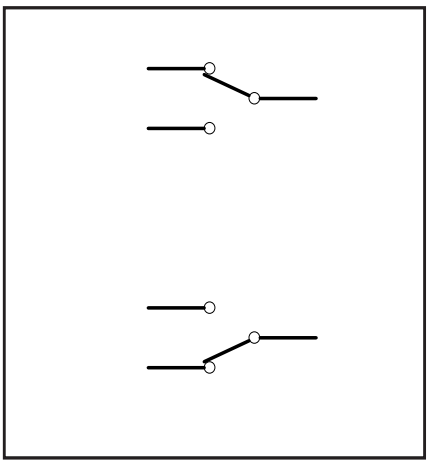


Figure 5.1b

5.1 General Installation

CAUTION: Make sure Circuit is de-energized prior to Installing the switch. If INstalling in a hazadous location, Read requirements in 5.2 before proceeding.

1. To remove the cover, first unlock the cover security bolt located at the 5 o'clock position of the cover, by turning it clockwise with an M2.5 hex key. When the bolt head no longer touches the cover, grip the cover tightly and rotate it counterclockwise to remove.
2. Remove the terminal plug from the terminal. Connect the field wires to the terminal plug according to the application. See the wiring diagram below. (figure 5.1a)
3. All field wiring that is connected to the LMS100 switch must comply with NEC, CEC, or any other applicable regional electrical codes.


Figure 5.1a: Contact closure shown for both conditions of the switch relative to the magnetic float.

5.2 Requirements for Hazardous Locations

5.2.1 General Guidelines

1. WARNING! MAKE SURE ALL CIRCUITS ARE DE-ENERGIZED PRIOR TO INSTALLATION.
2. The LMS100 has been evaluated as an Installation (Overvoltage) Category 1 / Pollution Degree 2 apparatus per IEC 1010.
3. The maximum altitude of operation is 6560 feet (2000 meters).
4. The LMS100 is designed with both internal and external protective earth (ground) terminals.
5. Housing and cover are made from 316L SS. Assess material suitability for the target environment before deploying.

6. Additional flamepath information available upon request.

7. Product label may be susceptible to electrostatic charge buildup in Group III environments. Care should be taken to prevent the buildup of electrostatic charge. Clean only with a damp cloth

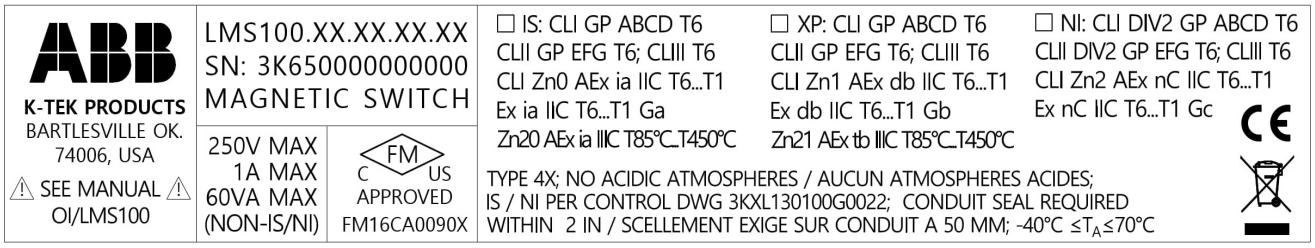
8. Do not torque any attached conduits, thread adapters, reducers, elbows, or cable glands beyond the manufacturer's recommended installation torque. Torque requirements for the LMS100's optional thread adapters are listed below.

Option	Description	Recommended Torque
U8	M20 adapter 316 SS	32.5 Nm
E8	1/2 inch by 1/2 inch NPT elbow	35 Nm
E9	1/2 inch NPT by M20 elbow	35 Nm

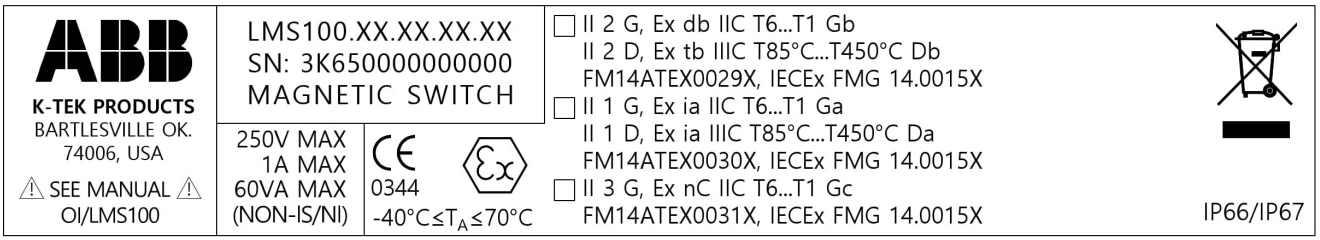
5.2.2 Nameplate Marking Procedure (Declaration of Protection Concept)

Before installing the switch, permanently indicate the protection concept associated with the hazardous area by marking the corresponding box on the product label. Only one box shall be marked. The chosen protection concept cannot be altered and shall govern the use of the product until end of life. If more than one protection concept is marked, the switch must be removed from the hazardous area immediately.

FM/FM-C Name Plate



ATEX/IECEx Name Plate



5.2.3 Flame Proof / Explosion Proof

Installation Requirements (Ex d):

The LMS100 is designed for use in Zone 1 / Division 1 hazardous areas.

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

If conduit is used in the installation, an approved conduit seal or stopping box is required immediately after (ATEX/IECCEx) or within 18 inches of (FM/FM-C/CSA) the end-use field wiring entrace.

Internal temperatures of the LMS100 can reach up to 257°F (125°C) when operated at maximum process and maximum ambient temperatures. The service temperature range of cable glands and field wiring shall be chosen accordingly.

Temperature classifications of the LMS100 are dependent on the temperature of the coupled process vessel. Use the table below to determine temperature class:

Maximum Process Temperature	Temperature Class
-40°F (-40°C) ≤ T ≤ 167°F (75°C)	T6
167°F (75°C) < T ≤ 194°F (90°C)	T5
194°F (90°C) < T ≤ 257°F (125°C)	T4
257°F (125°C) < T ≤ 374°F (190°C)	T3
374°F (190°C) < T ≤ 554°F (290°C)	T2
554°F (290°C) < T ≤ 780°F (416°C)	T1

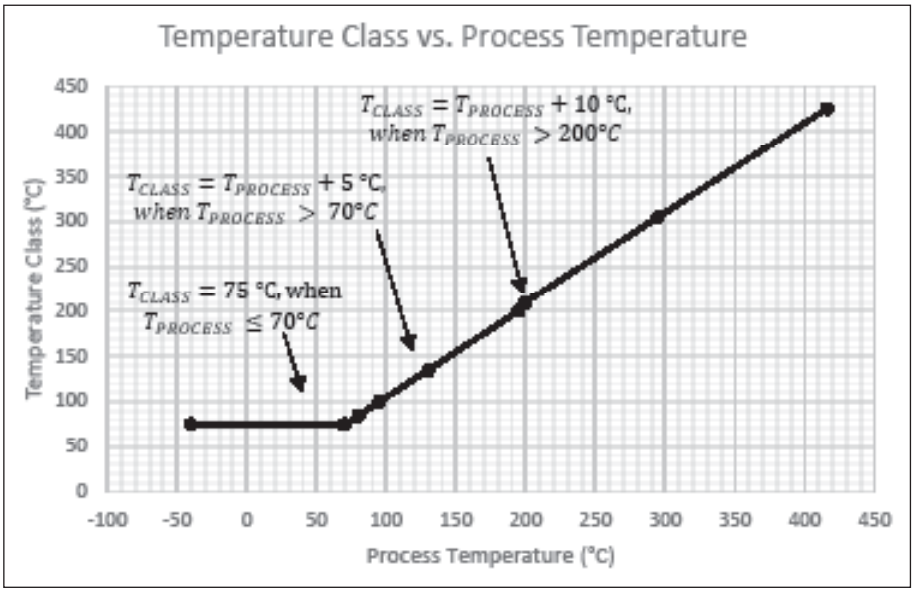
5.2.4 Protection by Enclosure

Installation Requirements (Ex tb):

Field wiring fittings such as cable glands and conduit must maintain the ingress protection rating of the enclosure (IP6X).

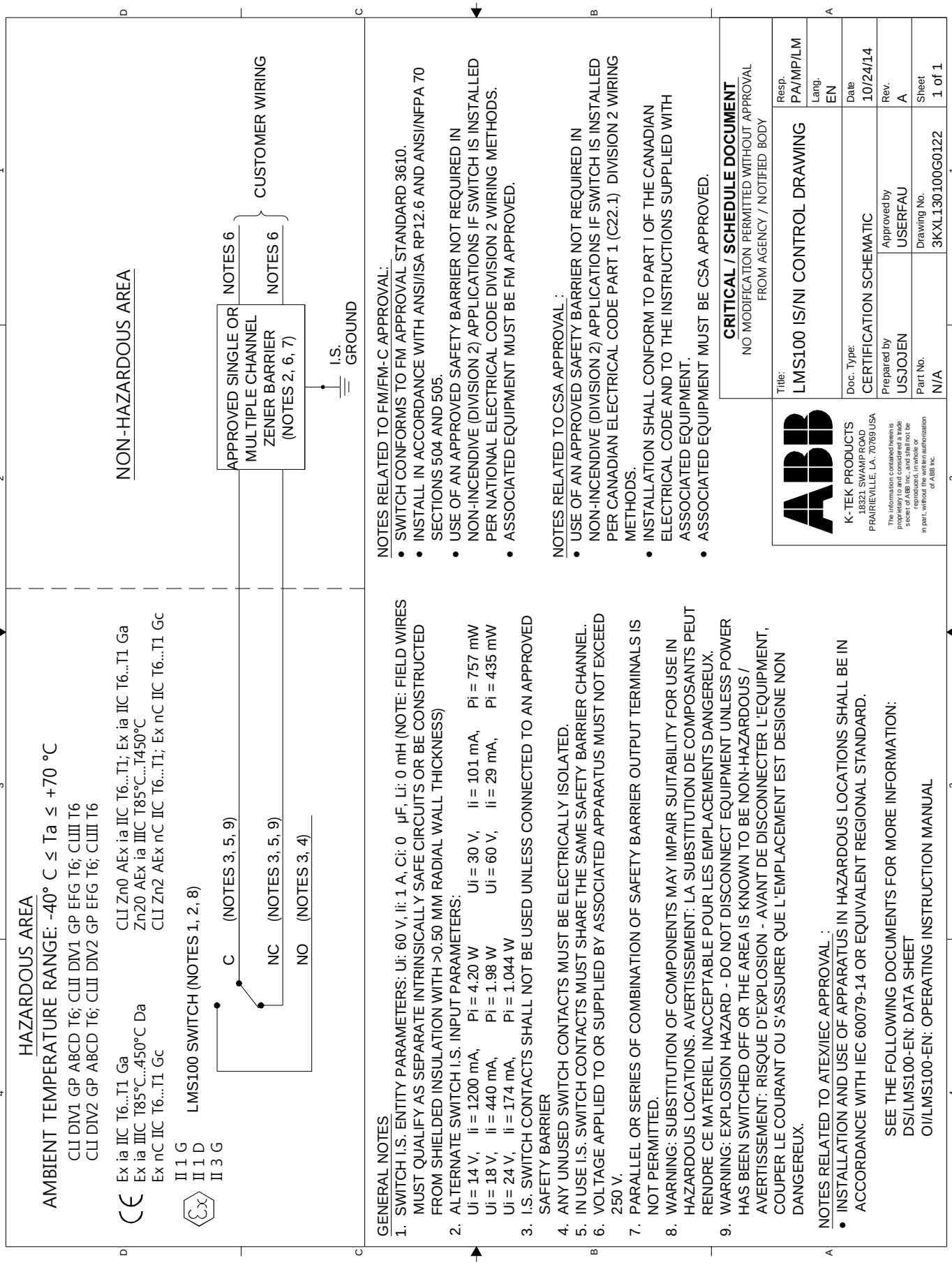
Not suitable for use in uncontrolled dust environments.

Temperature classification of the LMS100 is related to process temperature. The temperature class of the LMS100 can be determined by using the relationship below:



Max Process Temp	Temperature Class
176 °F (80 °C)	185 °F (85 °C)
203 °F (95 °C)	212 °F (100 °C)
266 °F (130 °C)	275 °F (135 °C)
383 °F (195 °C)	392 °F (200 °C)
563 °F (295 °C)	581 °F (305 °C)
780.8 °F (416 °C)	798.8 °F (426 °C)

5.2.5 Intrinsic Safety / Non-Incendive Requirements

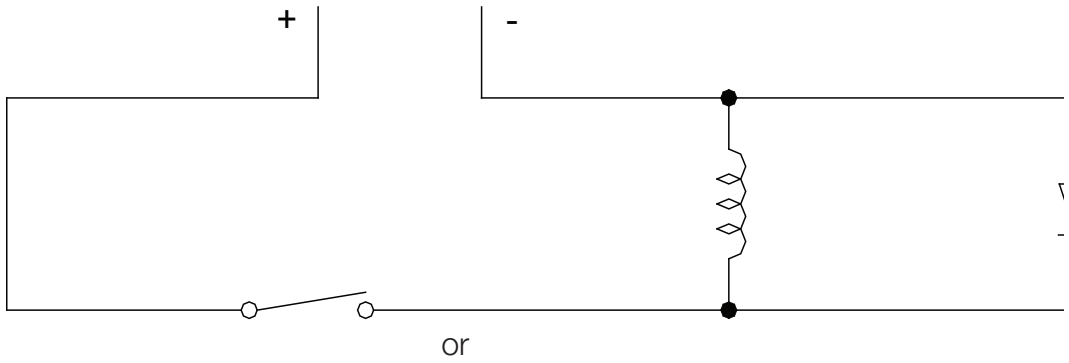


5.3 Typical Applications

Some ABB switch products (LMS100, MS50, MS10) are based on magnetically operated reed switches. Since reed switches have the inherent characteristic of very closely spaced switch contacts, it is extremely important to protect these contacts from high voltage transients caused by inductive loads. When an inductive load is de-energized., the collapsing magnetic field induces a high voltage of opposite polarity into itself and thus the switch . Two basic methods exist to clamp this voltage and thus protect the switch contacts.

6.1 Typical D.C. Applications

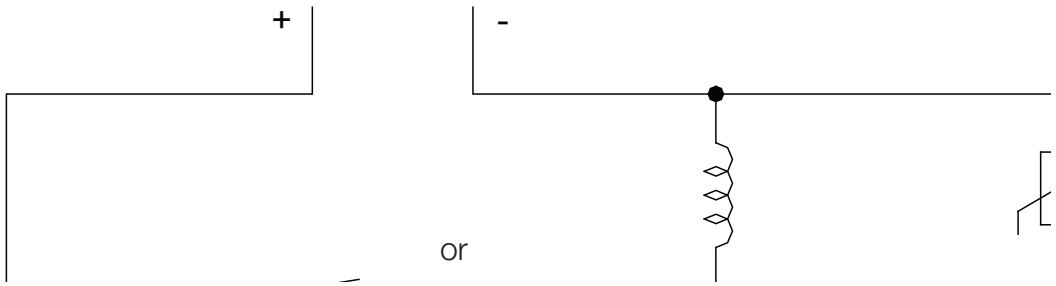
For D.C. applications, a diode is placed in parallel with the inductive load (note the polarity of the diode and power supply). A 1N4001 general purpose diode is normally sufficient to clamp the induced voltage of the inductive load to as safe level. NOTE: Not evaluated for use in hazardous locations



D.C. Contact Protection

6.2 Typical A.C. Applications

For A.C. applications, a Metal Oxide Varistor (MOV transient surge suppressor) is placed either in parallel with the switch or the inductive load. The MOV changes from a high impedance to a very low impedance when the voltage across the MOV exceeds its rated voltage (the MOV rating must correspond with the power supply voltage). For 120 VAC control systems a typical MO would be the GE (General electric Co.) part number V130LA10A. In either case shown, the result is the limiting of the switch voltage to approximately 130 volts. NOTE: Not evaluated for use in hazardous locations



A.C. Contact Protection

6. Service

The LMS100 does not require any routine maintenance in normal day to day operation.

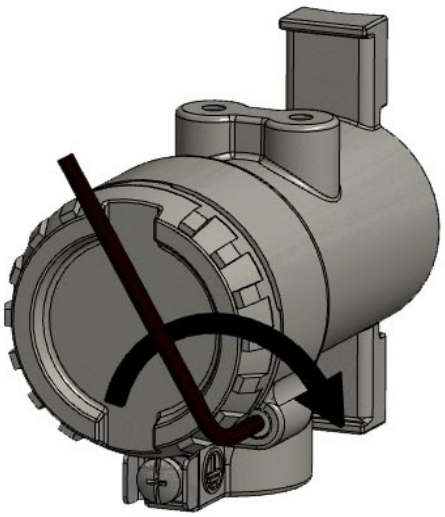
CAUTION: If there is a need to take the switch out of service or disconnect it for any reason, then make sure the circuit is de-energized or that the area is known to be non-hazardous.

The LMS100's reed switch core assembly is field replaceable. In the event of a failure, a replacement can be ordered through an ABB sales representative by referencing part number 3KXL130100L0001.

Reed Switch Core Assembly Replacement Instructions

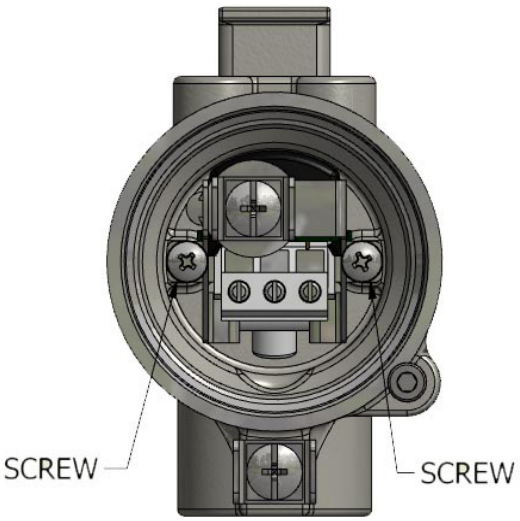
CAUTION! De-energize all field wiring before servicing.

1) To remove the cover, first unlock the cover security bolt located at the 5 o'clock position of the cover, by turning it clockwise with an M2.5 hex key. When the bolt head no longer touches the cover, grip the cover tightly and rotate it counter-clockwise to remove.

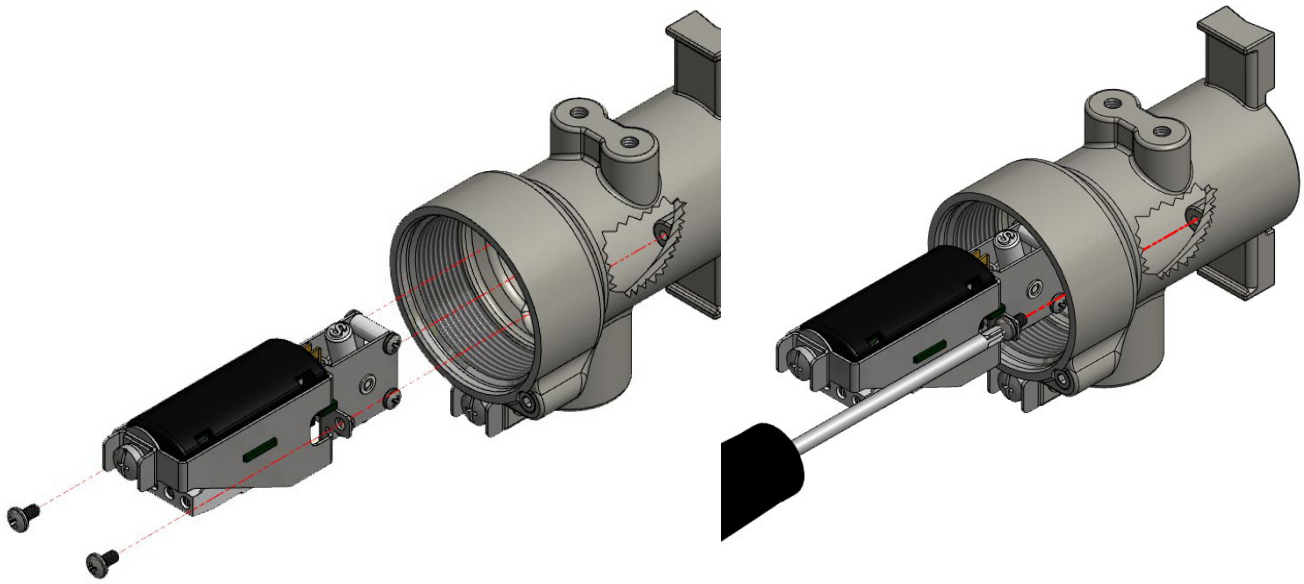


2) Remove the terminal plug and, if possible, associated field wiring from the enclosure to ensure proper clearance.

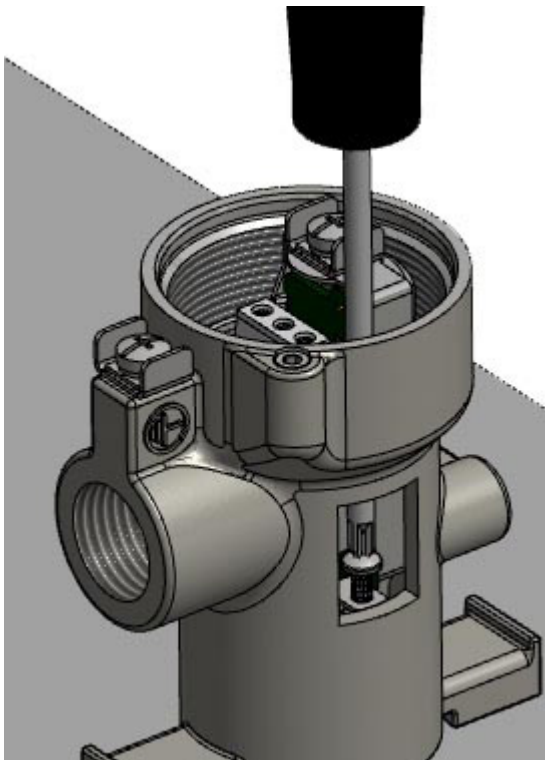
3) Using a small precision Phillips screwdriver, loosen the two screws shown in the figure below. When loose, grip the core assembly with the thumb and index fingers. Pull outward to remove. (see figure b)



4) Place the included screws into the replacement core assembly's mounting holes. Apply Loctite® 271 to each of the screws. Align the core assembly screws with the threaded holes in the enclosure as seen in the figure below. Tighten the screws with a precision Phillips screwdriver.



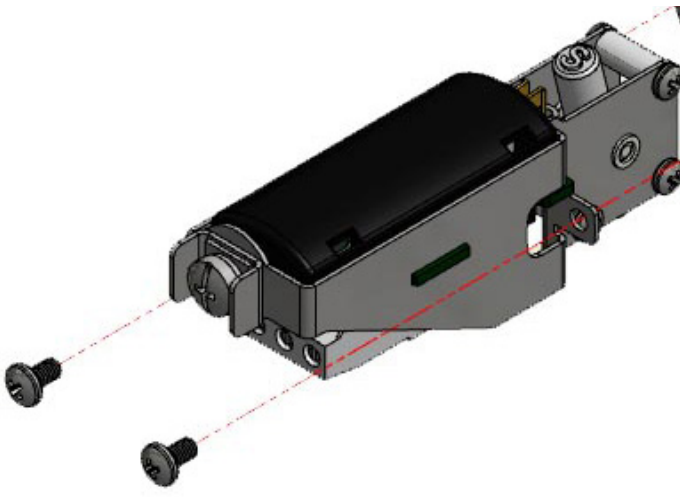
NOTE: removing the switch from the chamber and placing it on a flat surface as shown in the figure below will simplify the replacement process. Be sure to note and mark the exact mounting position of switch with respect to the chamber before removal.



CAUTION! Ensure that field wiring to the device remains de-energized before proceeding.

5) Insert the terminal plug and reconnect any field wiring removed in step 2. Replace the cover and tighten fully. Be sure to lock the cover in place by turning the cover security bolt counterclockwise with an M2.5 hex key until the bolt is pressed firmly against the cover.

7. Replacement Parts



Reed switch replacement core assembly 3KXL130101L0000

7. Warranty Statement

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

3 YEAR WARRANTY FOR:
KCAP300 & KCAP400 capacitance switches.

2 YEAR WARRANTY FOR:
AT100 and AT200 series transmitters; LMT100 and LMT200 series transmitters; RS85 liquid vibrating fork switches; TX thermal dispersion switches; IR10 and PP10 External Relays; MT2000, MT5000, MT5100 and MT5200 radar level transmitters; RI100 Repeat Indicators; A75 RF capacitance level switches; Buoyancy Level Switches (MS50 and MS10); Magnetic Level Switches (LMS100, MS40, MS41 and PS45).

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.

8. RMA Form

ABB, Inc
7051 Industrial Boulevard
Bartlesville , Oklahoma 74006 USA
Tel: + 1 918 338 4888

***** 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. (January 18, 2006)

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:

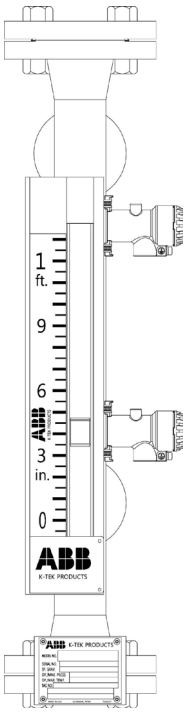
9. DATA SHEET SPECIFICATIONS:

SPECIFICATIONS:

Switch type	Magnetically actuated, hermetically sealed, bi-stable switch. Single pole, double throw (Form C)
Contact Material	Rhodium alloy
Switch Action	Break before make
Max Deadband	Approx. +/- 0.75 in. (1.9 cm) of float travel
Contact Ratings	Maximum voltage: 250 V AC/DC Maximum current: 1 A Maximum power: 60 W/VA
Minimum operating temperature	-40 °F (-40 °C) Contact factory regarding use in colder applications
Maximum operating temperature	300 °F (149 °C) For process temperatures to 800 °F (427 °C), see mounting options, below
Vibration	Tested to IEC 60068-2-6 (2-2000 Hz, 2 g)
Shock	Tested to IEC 60068-2-29 (10 g) and IEC 60068-2-27
Impact	Tested to IEC 60079-0 (1 kg)
Freefall	Test to IEC 60068-2-31 (0.5 m, 6 falls)
Hazardous Area Rating:	**FM / FM-C** • -40 °C ≤ T_A ≤ 70 °C • IS: CLI GP ABCD T6 / CLI Zn0 AEx ia IIC T6...T1 / Ex ia IIC T6...T1 Ga / CLII GP EFG T6 / CLIII T6 / Zn20 AEx ia IIIC T85°C...T450°C • XP: CLI GP ABCD T6 / CLI Zn1 AEx d IIC T6...T1 / Ex d IIC T6...T1 Gb / CLII GP EFG T6 / CLIII T6 / Zn21 AEx tb IIIC T85°C...T450°C • NI: CLI DIV2 GP ABCD T6 / CLI Zn2 AEx nC IIC T6...T1 / Ex nC IIC T6...T1 Gc / CLII DIV2 GP EFG T6 / CLIII **ATEX / IECEx** • -40 °C ≤ T_A ≤ 70 °C • II 2 G, Ex db IIC T6...T1 Gb, II 2 D, Ex tb IIIC T85°C...T450°C Db FM14ATEX0029X, IECEx FMG 14.0015X • II 1 G, Ex ia IIC T6...T1 Ga, II 1 D, Ex ia IIIC T85°C...T450°C Da FM14ATEX0030X, IECEx FMG 14.0015X • II 3 G, Ex nC IIC T6...T1 Gc FM14ATEX0031X, IECEx FMG 14.0015X
Electrical Cable Connection	1/2 in. FNPT connection
Mounting options	For process temperatures to 575 °F (301.6 °C) use switch LMS100.P1 with insulation pad. For process temperatures to 800 °F (427 °C) use switch LMS100.A2 with rod mount brackets with insulated KM26 Gauges, or, on ST95 Seal Fluid Supply Tanks with rod mount brackets.
Housing	316SS, NEMA 4X IP66/IP67, Cable entry 1/2" FNPT
Application note	Inductive and Capacitive loads require special considerations. Contact factory for technical literature and assistance.
Accessories	**IR10 10 Amp Relay Output Module and PP10 PUMP-PAK Controller. See appropriate sales literature for details.**

Ordering Information:

LMS100.a.b.c.d		
a	Mounting	
	A1	Standard, up to 300 °F (149 °C) (mounted to chamber via gear clamps)
	A2	Switch rod mount up to 350 °F (176.6 °C) max process temperatures. When used with chamber insulation option, 800 °F (427 °C) max process temperatures
b	High temperature processes insulation options	
	Y0	Standard, without insulation pad, up to 300 °F (149 °C) (standard gear clamp mounting)
	P1	Insulation pad (IH) for temperature, up to 575 °F (301.6 °C) (with standard gear clamp mounting only)
c	Approvals	
	Y0	General Purpose, (not for hazardous locations)
	N4	FM / FM-C (Canada), (see applicable approval markings on page 6)
	E4	ATEX, IECEx, (see applicable approval markings on page 6)
d	Electrical cable connection	
	A1	Standard 1/2 inch FNPT
	U8	M20 adapter 316 SS, ATEX, IEC, CSA, Ex approved
	E8	1/2 inch by 1/2 inch NPT elbow for cyrogenic insulation applications, ATEX, IEC, CSA, Ex approved
	E9	1/2 inch NPT by M20 elbow for cyrogenic insulation applications, ATEX, IEC, CSA, Ex approved
Accessories ordered separately		
	AR1	10 A relay output module (IR10)
	AR2	Pump pack controller (PP10)



Mounting

The LMS100 is mounted using two stainless steel clamps that pass behind the housing's integrated mounting tabs. 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 or at two points separated by more than the height of the switch.

Operation

The LMS100 consists of a form C reed switch actuated by a rotating permanent magnet. The reed switch uses precious metal contacts in an inert gas atmosphere sealed by glass to metal bond. A magnetic float traveling in a chamber, relative to the LMS100 causes the reed switch to change state. After the float has passed, the reed switch will maintain it's state until the float reverses direction and passes the switch in the opposite direction. The action of the switch is break before make. The hermetically sealed contacts serve to insure a high degree of hazardous area safety, weather resistance and general reliability of the product.

Application

The LMS100 will provide either a normally open or normally closed dry contact which may be used to activate external devices such as alarms or annunciator. Its main application is to sense the passing of a magnetic float in a KM26 level gauge, or similar chamber, attached to a vessel containing a fluid. These trip points can be used for alarms to activate a pump motor starter relay.

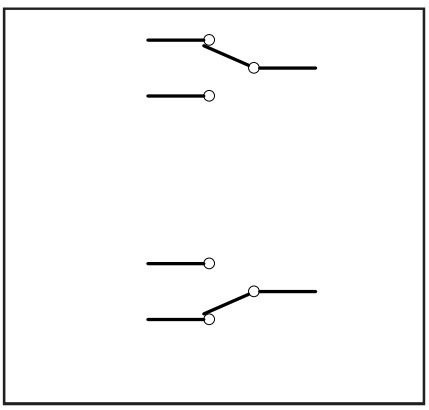


Figure 1: Contact closure shown for both conditions of the switch relative to the magnetic float.

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