

# MS40/EX

## Magnetic Level Gauge Switch

Magnetically actuated 10 amp  
DPDT electric switch

K-TEK Level products



### Introduction

This operation and instruction manual provides the following information:

- Operation - see page 3
- Mounting and installation - see page 3-4
- Maintenance - see page 4

# Table of Contents

1.0 Description.....	3
2.0 Application.....	3
3.0 Operation.....	3
4.0 Mounting & Installation.....	3-4
5.0 Maintenance.....	4
6.0 Warranty Statement.....	9
7.0 RMA Form.....	10

## 1.0 Description

The MS40 is a magnetically activated double pole double throw switch. When the MS40 is mounted on a KM26 or an external chamber that has a magnetic ABB float it can sense high or low levels within a vessel.

The unique magnetic coupling action eliminates the need for such things as seals, diaphragms, springs. Or torque tubes because there is no physical contact with the process. No valves are required to block off the switch from the process to perform any maintenance or operational checks, and since the MS40 is isolated from the process it does not need to be cleaned.

## 2.0 Application

The MS40 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 MS40 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.

## 3.0 Operation

The MS40 consists of two snap action switches assembled in a double pole double throw configuration, and a precision cam/spindle assembly which contains a rod magnet. A magnetic ABB float passing by the MS40 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 MS40 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 MS40 switch, the spindle magnet will latch to the opposite stop. It will remain in this position until the float passes by again.

## 4.0 Mounting & Installation

The standard MS40 is mounted using a stainless steel clamp that passes through the mounting slot in the housing. The clamp is then fastened to the KM26 or similar chamber. The switch can be easily positioned by loosening the clamp and sliding the switch to the correct position on the chamber. The switch will trip at a point 0.5" 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 MS40 subsequently attached.

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

**Warning:** Make sure circuit is de-energized while installing 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. Remove the cover of the MS40 (or MS40/EX) enclosure. The switch mechanism is mounted to the base of the enclosure with its integral terminal block easily accessible. Note: The MS40/EX/B switch employs a wiring harness and the connections should be made external to the switch enclosure.
3. Route the field wiring through the "female NPT coupling of the MS40 (or MS40/EX) enclosure base.
4. Connect the field wires to the terminal block according to the application. A schematic diagram can be found at the end of this document.
5. Make sure the field wires do not interfere with the rotation of the spindle or that they will not become pinched between the MS40 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.
6. Reinstall the cover on the housing being careful not to pinch the wires.
7. The float must be cycled past the switch in both directions to insure that the switch will operate properly when put into service.

## 4.0 Mounting & Installation (cont'd)

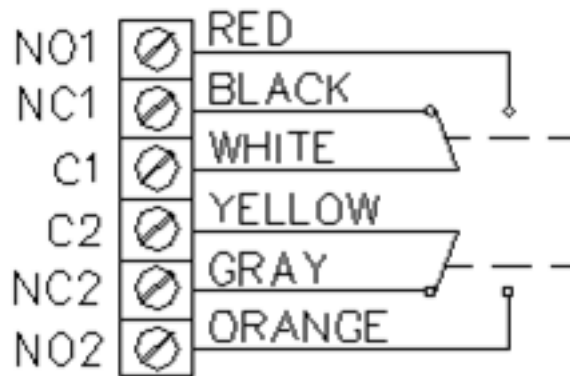
### Notes:

- All field wiring that is connected to the MS40 switch must comply with applicable National Electric Code guidelines.
- Do not use the switch on chambers with operating temperatures above 300°F without using insulation between the switch and the chamber to keep the temperature of the switch from exceeding 300°F. Also, verify tht the operating temperature of the switch is less than the applicable flammable gas ignition temperature (for applications in explosive atmospheres).
- On KM26 chambers that are funished with factory installed insulation blankets the switch may be mounted via special rod mount brackets to a factory installed switch mount rod that is external to the insulation.
- Any conduit of fittings connected to a magnetically activated switch should be aluminum or some other non-magnetic material. This is necessary to avoid interference with the ioperation of the KM26 Magnetic Liquid Level Indicator or other magnetically activated switches.
- Other switches can be added at any position, at any time, without the concern for additional process piping or valves.
- 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.
- Option B is not available.

## 5.0 Maintenance

The MS40 does not require any routine maintenance in normal day to day operation

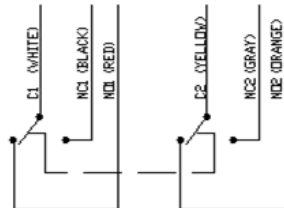
**CAUTION** **Warning:** If there is a need to take the switch out of service or disconnect it for any reason, then make sure the circuit is de-energized or that the area is known to be non-hazardous.



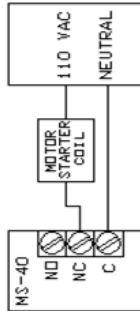
MS40 Connection Diagram  
(Shown with float below switch)

ITEM	DESCRIPTION	PART NO.
1	HOUSING, MS-40	MS40-1
2	SWITCH CORE, MS-40	MS40-2
3	MOUNTING HARDWARE	MS40-3
4	SWITCH CORE, MS-40/EX/B	MS40-4
5	HOUSING, MS-40/EX/B	MS40-5
6	HOUSING, MS-40/EX	MS40-6
7	SWITCH, SNAP ACTION	MS40-7

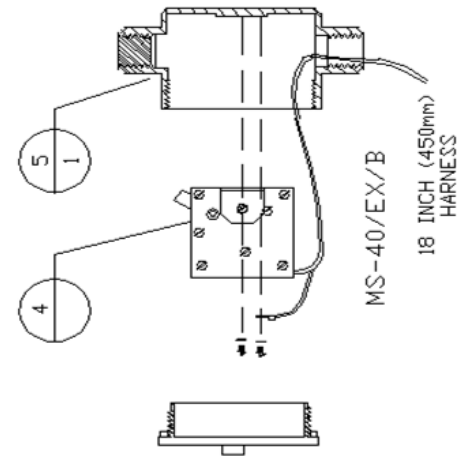
MS-40 SWITCH WITH  
FLOAT ABOVE SWITCH



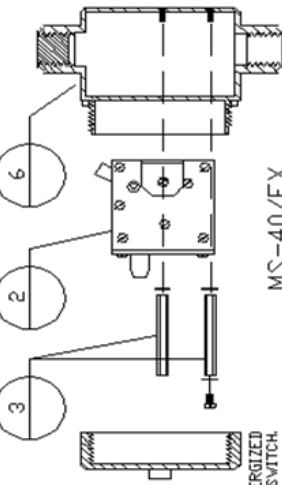
#### SWITCH MECHANISM



MOTOR STARTER WILL BE ENERGIZED  
WHEN FLOAT IS BELOW THE SWITCH.  
EXAMPLE APPLICATION OF A LOW  
LEVEL LIMIT ACTIVATING PUMP

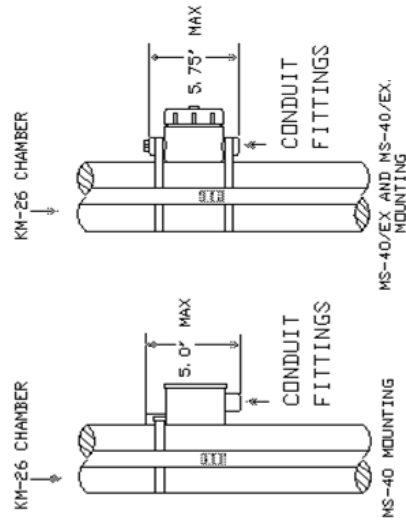


MS-40/EX/B



MS-40

MS-40/EX



- INSTALLATION NOTES AND WARNINGS:
1. GENERAL:
    - WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.
    - AVERTISSEMENT: RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLOIS DE CLASSE 1, DIVISION 2.
  2. WARNING: EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
    - AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE EST DESIGNÉ NON DANGEREUX.
  - FM RATED: NI, CL 1, DIV 2, GP A,B,C,D WHEN INSTALLED PER DRAWING MS40-0924.
  - 2) CLASS 1, DIVISION 1 WARNING (MS-40/EX AND MS-40/EX/B)
  - CAUTION: OPEN CIRCUIT BEFORE OPENING COVER.
  - ATTENTION: OUVRIRE LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.
  - 3) DEVICE IS APPROVED (CERTIFIED) AS INTRINSICALLY SAFE (SECURITE INTRINSEQUE) WHEN INSTALLED PER CONTROL DRAWING MS40-0923

Exio.

- 4) SEAL FITTINGS ARE REQUIRED WITHIN 18 INCHES (450mm) OF ENCLOSURE ON GROUP B INSTALLATIONS (MS-40/EX/B ONLY).
- 5) SEE USERS MANUAL MS40-0200-1 FOR ADDITIONAL INFORMATION.



## NOTES RELATED TO FM APPROVAL

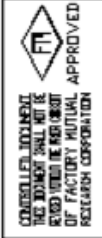
(JL 0T9A7AE)

1. THESE SWITCHES CONFORM TO FMRC APPROVAL STANDARD NO.3640 APPROVAL STANDARD, INTRINSICALLY SAFE APPARATUS FOR USE IN CLASS I,II,III, DIVISION 1 HAZARDOUS (CLASSIFIED) LOCATIONS.  
ENTITY PARAMETERS:  $V(\text{max})=100\text{V}$ ,  $I(\text{max})=750\text{mA}$ ,  $C(0)=0\mu\text{F}$ ,  $L(0)=0\text{mH}$ .
2. SINGLE OR MULTIPLE CHANNEL PROTECTIVE BARRIER PARAMETERS MUST MEET THE FOLLOWING REQUIREMENTS:  $V(\text{oc})$  OR  $V(\text{t})$  ( $\leq 100\text{V}$ ,  $I(\text{sc})$  OR  $I(\text{t})$  ( $\leq 750\text{mA}$ ,  $C(\omega) \geq C(0) + C(\text{cable})$ ,  $L(\omega) \geq L(0) + L(\text{cable})$ ).
3. INSTALLATION SHALL CONFORM TO MANUFACTURERS INSTRUCTIONS SUPPLIED WITH THE PROTECTIVE BARRIER AS WELL AS THE NATIONAL ELECTRIC CODE AND ANSI/ISA-RP12.6-1987 (INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN HAZARDOUS (CLASSIFIED) LOCATIONS).
4. MAXIMUM NON-HAZARDOUS VOLTAGE AREA SHOULD NOT EXCEED  $250\text{V}_{\text{rms}}$ .
5. THESE SWITCHES ARE CONSIDERED A SIMPLE APPARATUS IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEPA) AND ANSI/ISA-RP12.6-1987. NO SPECIFIC APPROVAL FOR SUCH DEVICE IS REQUIRED TO PERMIT USAGE WITH SAFETY BARRIERS.
6. SWITCH CONNECTION SHOWN FOR FAIL-SAFE OPERATION (CONTACTS OPEN ON ALARM). IF HIGH LEVEL ALARM IS REQUIRED INSTEAD OF LOW ALARM, CONNECT AS PER NOTE BELOW SWITCH CONTACTS.
7. PROTECTIVE ZENER BARRIER IS NOT REQUIRED FOR NON-INCENDIVE APPLICATIONS PER K-TEK DOCUMENT NS40-0924.
8. ALL SWITCH CONTACTS MUST CONNECTED TO A PROTECTIVE BARRIER OR NOT USED.

## NOTES RELATED TO CSA CERTIFICATION

(FILE LR 79626-1)

- A) THESE SWITCHES CONFORM TO CSA STANDARD NO.157 ENTITY PARAMETERS:  $V(\text{max})=100\text{V}$ ,  $I(\text{max})=750\text{mA}$ ,  $C(0)=0\mu\text{F}$ ,  $L(0)=0\text{mH}$ .
- B) INSTALLATION SHALL CONFORM TO THE MANUFACTURERS INSTRUCTIONS SUPPLIED WITH THE PROTECTIVE BARRIER AS WELL AS THE CANADIAN ELECTRICAL CODE.
- C) MAXIMUM NON-HAZARDOUS AREA VOLTAGE SHOULD NOT EXCEED  $250\text{V}_{\text{rms}}$ .
- D) SWITCH CONNECTION SHOWN FOR FAIL-SAFE OPERATION (CONTACTS OPEN ON ALARM). IF HIGH LEVEL ALARM IS REQUIRED INSTEAD OF LOW LEVEL, CONNECT AS PER NOTE BELOW SWITCH CONTACTS.
- E) SAFETY BARRIERS MUST BE CSA APPROVED.
- F) MAXIMUM AMBIENT TEMPERATURE FOR I.S. INSTALLATIONS =  $50\text{C}$  ( $122^{\circ}\text{F}$ ).
- G) ADDITIONAL NOMENCLATURE:  
Exia - INTRINSICALLY SAFE - SECURE INTRINSEQUE

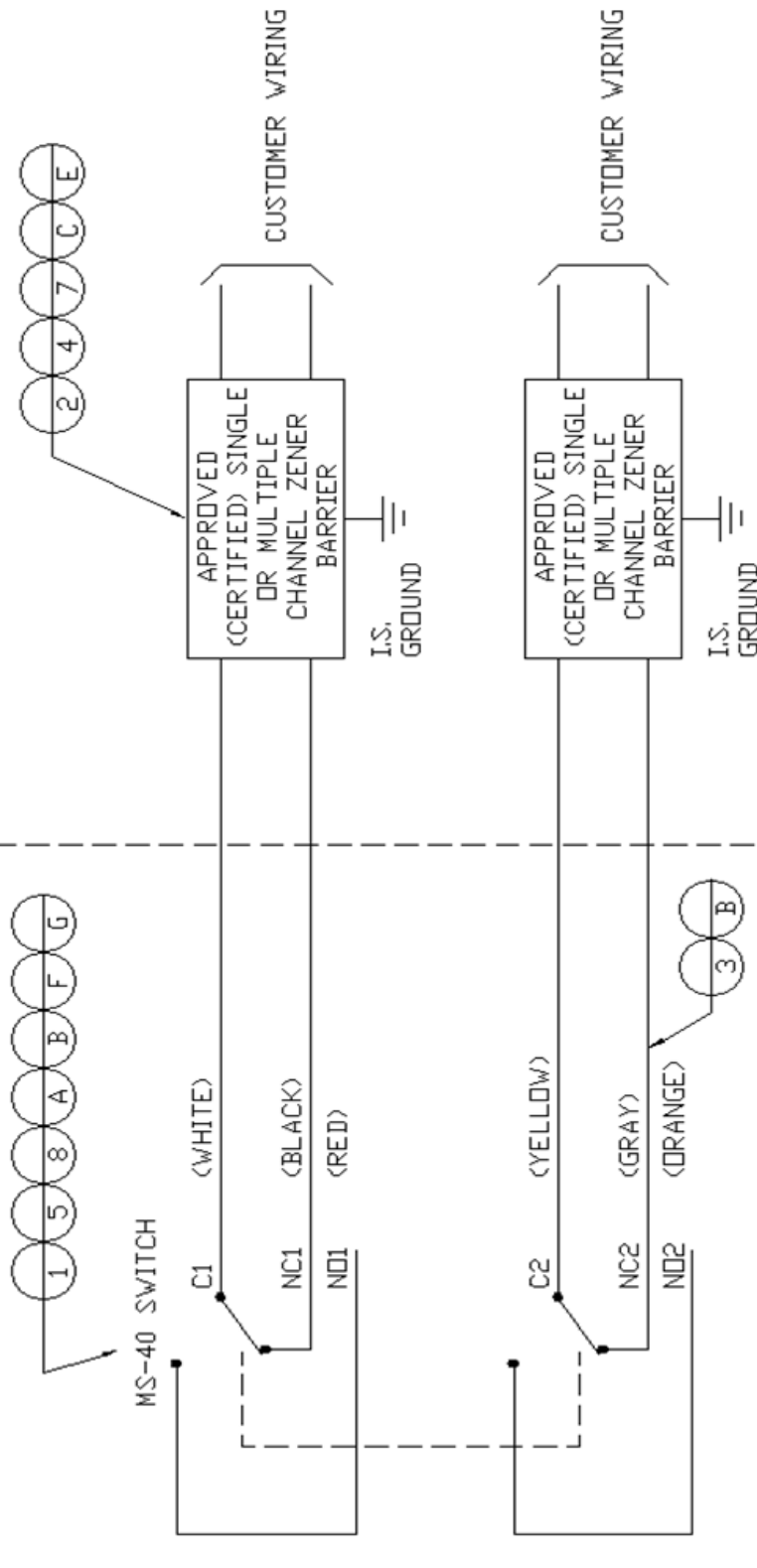


DOCUMENT CONTENTS:  
PAGE 1 - NOTES  
PAGE 2 - GENERIC BARRIER

PAGES 1 & 2 OF THIS DOCUMENT ARE  
SUPPLIED WITH EACH SWITCH (USERS MANUAL).

HAZARDOUS AREA  
 CLASS I, DIVISION I, GROUPS A,B,C,D  
 CLASS II, DIVISION I, GROUPS E,F,G  
 CLASS III

NON-HAZARDOUS AREA



SWITCH SHOWN IN LOW LEVEL POSITION  
 (FLOAT BELOW SWITCH) CONTACTS OPEN  
 WHEN FLOAT TRAVELS ABOVE SWITCH  
 FOR OPPOSITE OPERATION USE CONTACT NO  
 INSTEAD OF NC



ITEM  
 NOTE

SEE NOTES ON SHEET 1

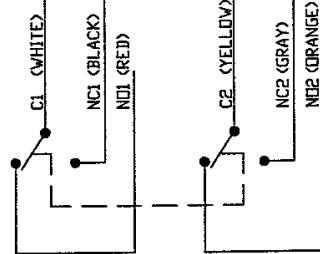


# HAZARDOUS AREA

CLASS I, II, III, DIVISION 2, GROUPS A,B,C,D,F,G



MS-40, MS-40/EX, OR MS-40/EX/B SWITCH



SWITCH SHOWN IN HIGH LEVEL POSITION (FLOAT ABOVE SWITCH) FOR LOW LEVEL OPERATION USE N.O. CONTACT IN PLACE OF N.C. COLOR CODES SHOWN ARE FOR UNITS SUPPLIED WITH WIRING HARNESS

# NON-HAZARDOUS AREA

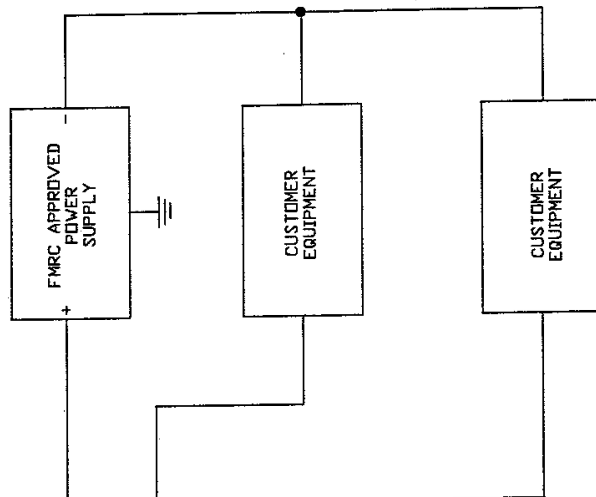


TABLE 1	
V <sub>max</sub> (V)	I <sub>max</sub> (mA)
10	5000
20	445
30	135
40	72
50	49
60	35.5
70	31.5
80	27
90	23.4
100	21.6
110	18.9
120	18
130	17
140	15.3
150	14.4
160	13.9
170	13.5
180	13
190	12.6
200	12.2

V<sub>max</sub> >= V<sub>t</sub> OR V<sub>oc</sub>  
I<sub>max</sub> >= I<sub>t</sub> OR I<sub>sc</sub>  
C<sub>a</sub> >= C<sub>i</sub> + C<sub>cabl</sub>  
L<sub>i</sub> >= L<sub>i</sub> + L<sub>cabl</sub>  
C<sub>i</sub> = 0uF  
L<sub>i</sub> = 0mH

- NOTES:
- 1) THE MS-40 SWITCH CONFORMS TO FMRC APPROVAL STANDARD No. 3611 (APPROVAL STANDARD ELECTRICAL EQUIPMENT FOR USE IN CLASS I, DIV 2, CLASS II, DIV 2 AND CLASS III, DIV 1 & 2 HAZARDOUS CLASSIFIED LOCATIONS. REFER TO TABLE 1 FOR ALLOWABLE NON-INCENDIVE VOLTAGE AND CURRENT PARAMETERS. SWITCH CONTACTS C1, NO1, C2, NO2, AND NC2 ARE DESIGNATED NON-INCENDIVE FIELD CONTACTS FOR FIELD WIRING.
  - 2) FMRC APPROVED POWER SUPPLY AND CUSTOMER EQUIPMENT REQUIRED TO INSURE NON-INCENDIVE ENERGY LEVELS IN THE HAZARDOUS AREA. SEE POWER SUPPLY MANUFACTURERS INSTALLATION INSTRUCTIONS FOR ALLOWABLE CAPACITANCE AND INDUCTANCE PARAMETERS.
  - 3) NOTE THAT C<sub>60</sub> >= C<sub>0</sub> + C<sub>cabl</sub> AND L<sub>60</sub> >= L<sub>0</sub> + L<sub>cabl</sub>, WHERE C<sub>0</sub> >= C<sub>SWITCH</sub> CAPACITANCE >= 0uF AND L<sub>60</sub> >= C<sub>SWITCH</sub> INDUCTANCE >= 0mH. ALSO SEE NOTE 7.
  - 4) INSTALLATION MUST CONFORM TO POWER SUPPLY MANUFACTURERS INSTRUCTIONS SUPPLIED WITH APPROVED POWER SUPPLY AND NATIONAL ELECTRICAL CODE.
  - 5) MAXIMUM NONHAZARDOUS AREA VOLTAGE SHOULD NOT EXCEED 250 V(rms).
  - 6) NO CONNECTION SHALL BE MADE TO UNUSED SWITCH CONTACTS.
  - 7) APPLICABLE TO MS-40, MS-40/EX, MS-40/EX/B (GROUP B OPTION).
  - 8) CABLE CAPACITANCE AND INDUCTANCE VALUES MUST BE ADDED TO THE SWITCH PARAMETERS FOR SYSTEM CALCULATIONS (i.e. ALL FIELD INSTALLED INDUCTANCE AND CAPACITANCE MUST BE CONSIDERED). IF CABLE PARAMETERS ARE NOT KNOWN, 60 pF/ft AND 0.2 uH/ft SHOULD BE USED.





## 6.0 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](mailto: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.

## 7.0 RMA Form



ABB  
18321 Swamp Road  
Prairieville, LA 70769  
Phone: +1 (225) 673-6100  
Fax: +1 (225) 673-2525  
Email: service@ktekcorp.com  
Toll Free: (800) 735-5835

**\*\*\* 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? <input type="checkbox"/> 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.	
<b>If purchase order is issued, a copy of purchase order must be included with return documentation.</b>	
Is ABB authorized to repair items determined to be non-warranty? <input type="checkbox"/> Yes	
If yes, a copy of purchase order must be included with return documentation.	
Customer PO:	Account #:
Date:	
Has product been in contact with any potentially hazardous chemical? <input type="checkbox"/> Yes	
If yes, documentation product and forward MSDS to ABB, "ATTN: Customer Service"	

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



# Contact us

## **ABB Inc.**

Industrial Automation  
125 E. County Line Road  
Warminster, PA 18974 USA  
Tel: +1 215 674 6000  
Fax: +1 215 674 7183

## **ABB Inc.**

17100 Manchac Park Lane - Suite B  
Baton Rouge, LA 70817 USA  
Phone: +1 225 408 0800  
Service: +1 225 408 0898  
Fax: +1 225 408 0897  
Service e-mail: ktek-service@us.abb.com  
com

## **ABB Engineering (Shanghai) Ltd.**

No. 4528, KangXin Hwy.  
Pudong New District  
Shanghai, 201319, P.R. China  
Phone: +86 10 64231407  
Service: +86 21 61056421  
Fax: +86 10 64371913  
E-mail: norman-suijun.xia@cn.abb.com  
Service e-mail: rola.li@cn.abb.com

**[www.abb.com/level](http://www.abb.com/level)**

## **Note**

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents - in whole or in parts - is forbidden without prior written consent of ABB.

Copyright© 2017 ABB  
All rights reserved