

SP60

Vibrating Fork Level Switch

Vibrating level switch for solids in
liquid interface
K-TEK Products



Introduction

This operating instruction manual provides the following information:

- Mounting guidelines - see page 8
- Electrical connections/approvals - see page 11
- Switching logic - see page 12
- Adjustment/maintenance - see page 13

TABLE OF CONTENTS

| | |
|--|----|
| 1.0 INTRODUCTION | 3 |
| Function | |
| Range of Application | |
| Typical Installations | |
| 2.0 TECHNICAL DATA | 5 |
| General Dimensions | |
| Mechanical Data | |
| Electrical Data | |
| Operating Conditions | |
| 3.0 MOUNTING | 8 |
| General Installations Guidelines | |
| Tips for Installation | |
| 4.0 ELECTRICAL CONNECTIONS/APPROVALS | 11 |
| Safety Instructions | |
| Approvals | |
| SF50 Electrical Connections | |
| 5.0 SWITCHING LOGIC | 12 |
| 6.0 ADJUSTMENT/MAINTENANCE | 13 |
| Adjustment | |
| Maintenance | |
| 7.0 WARRANTY | 15 |

1.0 INTRODUCTION

The SP60 is used for solids in liquid level monitoring in all types of containers and silos. It can be used in solids in liquids interface applications where materials do not have any build-up or deposits on the forks.

Due to the short insertion length (6.25") and therefore the small area that is touched by the bulk material, the units are suitable for high mechanical loading caused by material during dischargement. The geometry of the fork also prevents a material bridge between the vibrating rods.

Field of applications:

- Industry of Building Materials
 - For lime, Styrofoam, moulding sand, etc.
- Foodstuff Industry
 - For milk powder, flour, salt, etc.
- Plastics Industry
 - For plastics granules, etc.
- Timber Industry
- Chemical Industry
- Mechanical Engineering
- Detection of Solids in Water
 - Activated carbon (reprocessing), plastic granular in water, etc.

FUNCTION

The piezo electrically stimulated probe vibrates at its natural resonance frequency of approximately 350 Hz. If the probe is covered by the bulk material, the damping thus generated is registered electronically and a corresponding signal output is actuated. The oscillation of the SP60 ensures that it features certain self-cleaning properties.

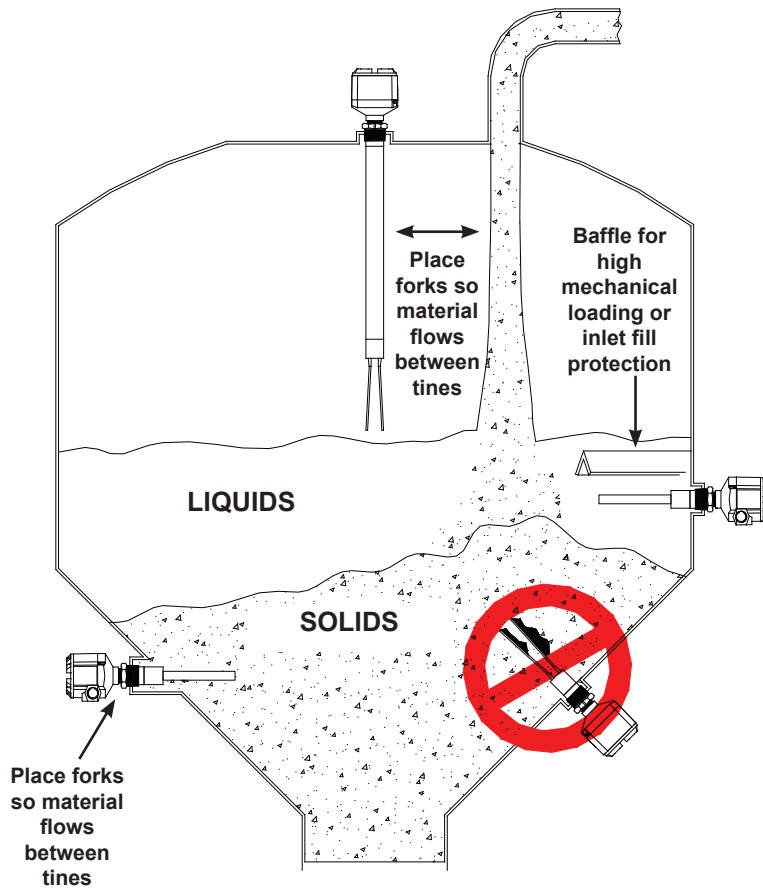
RANGE OF APPLICATION

The SP60 probe is normally screwed into the lateral container wall so that it is level with the filling height to be registered and monitored.

The SP60 can also be mounted onto the top side of the container and in this case an extension piece is used to mount the probe level with the height to be measured.

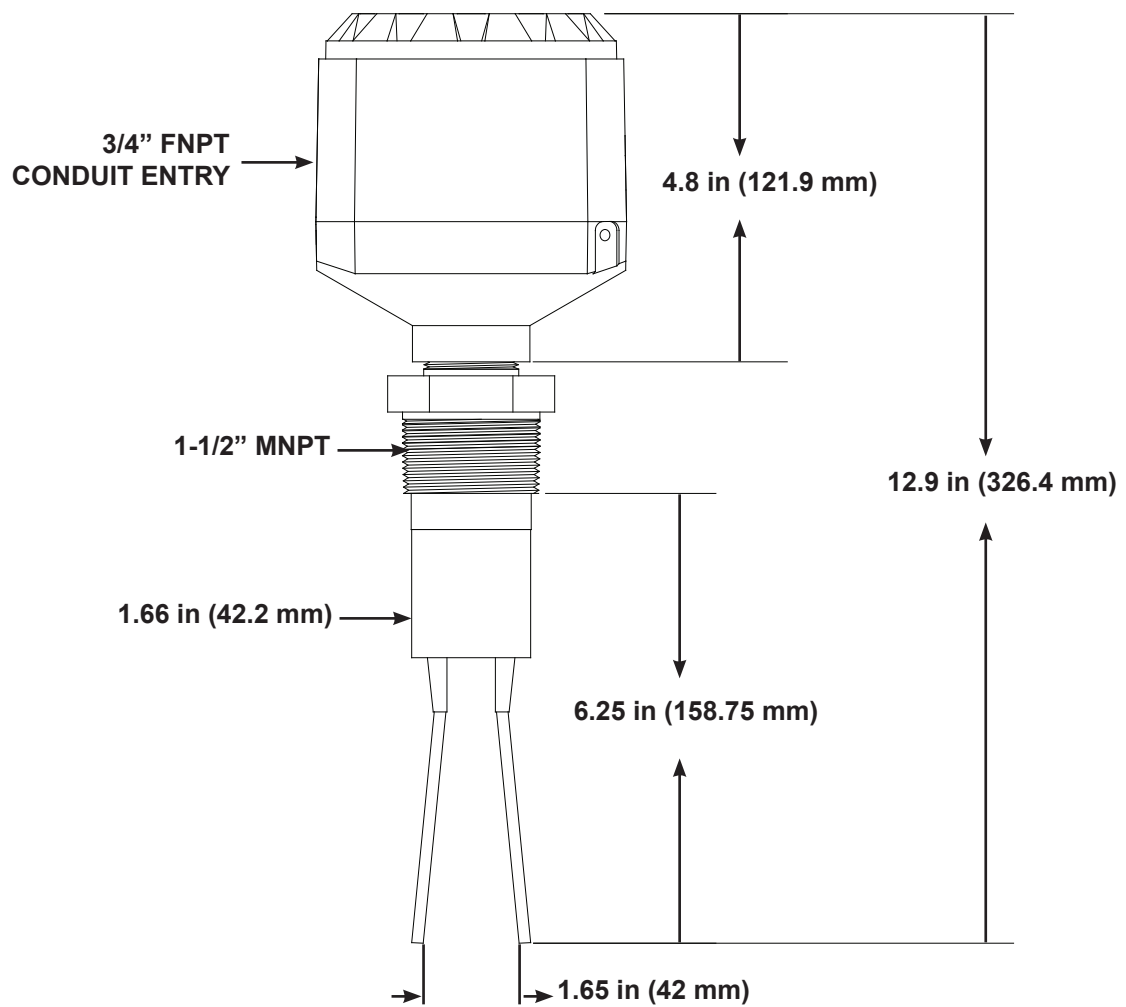
When replacing paddle type switches, a mounting plate accessory is used to allow for a direct drop-in replacement (see page 9 for details). The length of the probe can be up to 156 in. with an extension tube. The use of a sliding sleeve is recommended so that the switch point can be changed continuously during operation of the SP60.

TYPICAL INSTALLATIONS



2.0 TECHNICAL DATA

GENERAL DIMENSIONS



MECHANICAL DATA

| | |
|--|--|
| Enclosure: | Single compartment Cast aluminum Powder coated |
| Vibrating Fork | |
| Material: | 316 stainless steel |
| Width Across: | 1.65 in. (42mm) |
| Process Connection: | 1 ½" MNPT |
| Oscillator | |
| Material: | Stainless steel |
| Surfaced Treatment of Vibrating Rods: | Polished |
| Overall Weight | |
| SP60 Std: | Approx. 3.53 lbs. (1.6 kg) |
| SP60 Ext: | Approx. 3.53 lbs. (1.6 kg) + extension tube |
| Options | |
| Flange Connections: | Loose or welded flanges available |
| Mounting Plate: (see page 09) | For Rotary Paddle switch "drop in" replacement |

ELECTRICAL DATA

| | |
|-----------------|--|
| Supply Voltage: | Universal Input Voltage: 19 - 253 VAC, 50/60 Hz 19 - 60 VDC |
| Installed Load: | Max. 1 VA (relay) |
| Cable Entry: | ¾" FNPT |
| Signal Output: | Universal voltage with relay-output Floating relay output: Max. AC 253V, 4A, 500W Max. DC 253V, 4A, 60W |

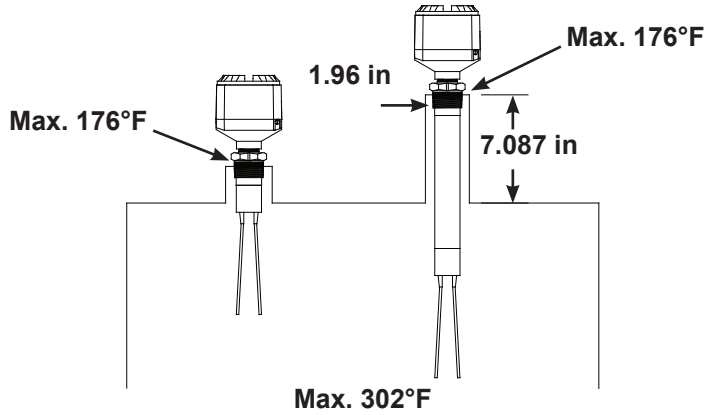
| | |
|------------------------|---|
| Switch Status Display: | By built-in LED |
| Signal Delay: | Probe free -> covered Approx. 1 sec. Probe covered -> free Approx. 1..2 sec. |
| Safety Operation: | To be switched over for (FSL, FSH) low / high level fail-to-safe |
| Sensitivity: | Adjustable to two levels |
| Measuring Frequency: | Approx. 350Hz |
| Isolating: | Power supply to signal output: 3700Vrms signal output to signal output (DPDT): 2500Vrms |
| Protection Class: | I |

OPERATING CONDITIONS

| | |
|--|---|
| Ambient Temperature at the Housing: | -13°F to 140°F / -25°C to 60°C |
| Internal Temperature of the Container: | -13°F to 302° F / -25°C to 150°C |
| Min. Powder Density: | Approx. 50 g/l |
| Features of Bulk Materials: | No strong propensity to cake or deposit Max. grain size .40 in (10 mm) |
| Max. Oscillator Load: | Max. 135 ft-lb (600N) laterally (on oscillating rods) |
| Max. Torque: | 221 ft-lb (300 NM) |
| Max. Tensile Force: | 449.6 ft-lb (2 Kn) |
| Max. Container Pressure: | 145 psi (10 bar) |
| Protective Measures in Case of High Loading: | Mounting of a protective baffle above the probe |

Mounting in container up to 302°F/ 150°C:

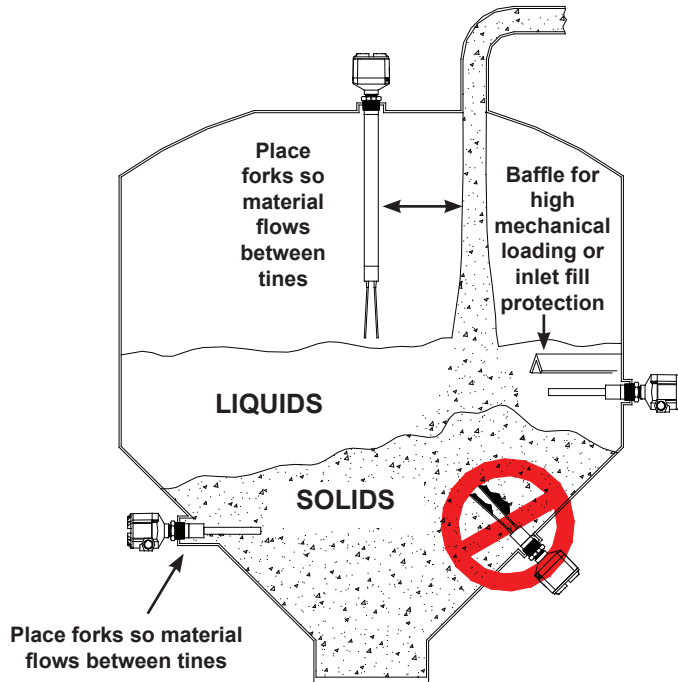
Maximum ambient temperature at the housing -13°F to 140°F



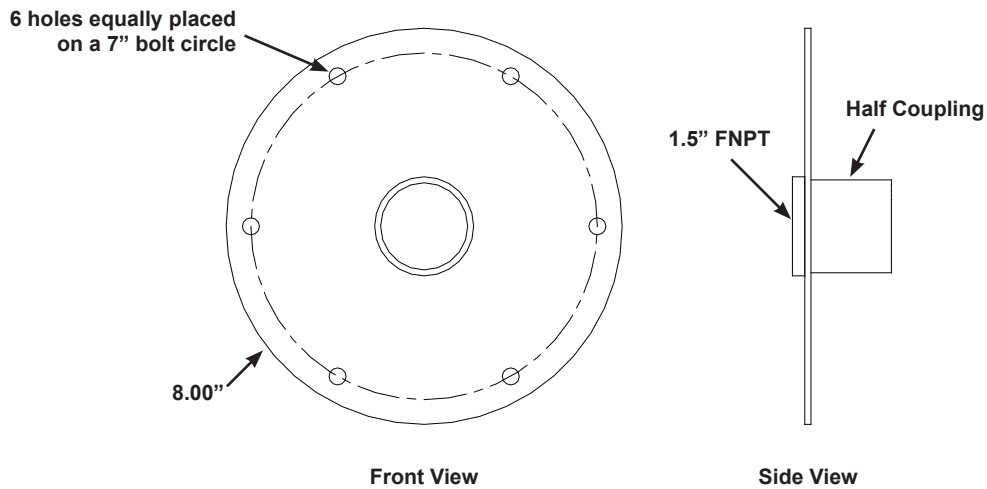
Installation of the SP60 in the socket:
The socket has to be high enough, so that the maximum surface temperature at the thread part on the housing is 176°F.

3.0 MOUNTING

Flange Mounting: A plastic sealant must be used to tighten the flange



MP6 Mounting Plate Detail Required for Paddle Switch Replacement



Note: For paddle switch replacements, use the SF/MP6 mounting plate for installation.

TIPS FOR INSTALLATION

Switch Point:

Heavy bulk material

→ cover of ~ 1/4"

Light bulk material

→ cover of ~ 3/4"

Oscillating Fork:

Do not bend, shorten or extend the oscillating rods since this will destroy the SP60.

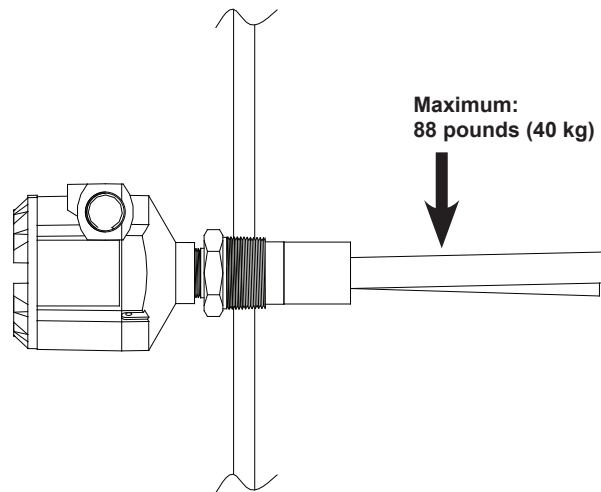
Screwing the SP60 in:

Use a 50mm open-end wrench (do not turn the housing).

Flange Mounting:

A plastic sealing must be used to tighten the flange.

The Maximum Downward Force on the Fork Assembly Can Be Derived by:



Formula: Maximum height of material in feet (m) =

$$\frac{2200 \text{ (lbs/ft}^3\text{)}}{\text{Bulk density (kg/m}^3\text{)}}$$

Example: If the material weighs 50lbs/ft³ (800.9 kg/m³), the maximum allowable height of material above the fork is =

$$\frac{2200}{50} = 44\text{ft. (13.41m)}$$

4.0 ELECTRICAL CONNECTIONS

The electrical connections are made in accordance with the connection Diagram (see page 11). Make sure that the cable in the screwed cable gland is seated tightly without fail.

In case of using a conduit system (with NPT thread) and instead of a cable gland, the regulations of the country where the unit is installed, must be observed. The conduit must have a tapered thread $\frac{1}{2}$ " according to ANSI B 1.20.1. Not used inlets must be tight closed with a metal closing element. If this instruction is not observed, the tightness of the housing (and the explosion protection for version according to ATEX 1/2D) is not ensured.

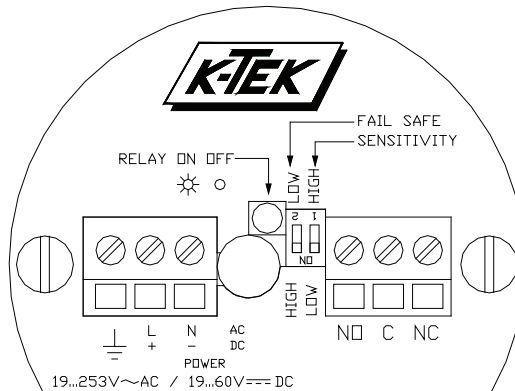
SAFETY INSTRUCTIONS

- Only qualified technical personnel may accomplish installation, maintenance and commissioning.
- The valid installation instructions must be observed.
- For terminal connections of the SP60, the local regulations or NEC (National Electrical Code) must be observed.
- Use a fuse for the supply voltage (max. 4A).
- Provide protection for relay contacts and output transistors to protect the SP60 against spikes with inductive loads.
- Compare the supply voltage applied with the specifications given on the electronic module before switching the SP60 on.
- Make sure that maximum .314 in. of the pigtails are bared (danger of contact with live parts).
- Make sure that the boots for protecting cable terminations are not longer than .314 in. (danger of contact with live parts).
- Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion).
- A voltage-disconnecting switch must be provided near the SP60.
- In the case of a defect, the distribution voltage must automatically be cut off by a FI protective switch so as to protect the user of the SP60 from indirect contact with dangerous electric tensions.
- In the case of non-ensure handling or handling malpractice, the electric safety of the SP60 cannot be guaranteed.
- Switch off the supply voltage before opening the SP60.
- Before opening the lid, take care that no dust deposits or whirlings are present.

APPROVALS

| | | |
|----|--------|------------|
| CE | EMV | EN61326/A1 |
| | Safety | EN61010-1 |

SP60 ELECTRICAL CONNECTIONS



5.0 SWITCHING LOGIC

Low / High Level Fail-to-Safe

If the probe is used to indicate full load:

→ set to maximum-security level FSH

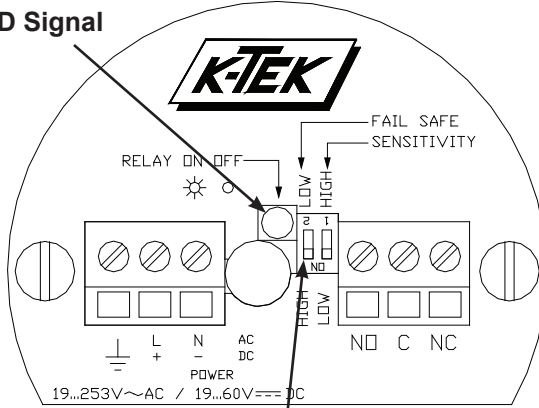
Power failure or line break is regarded as “full” signal (protection against overcharging).

If the probe is used to indicate empty load:

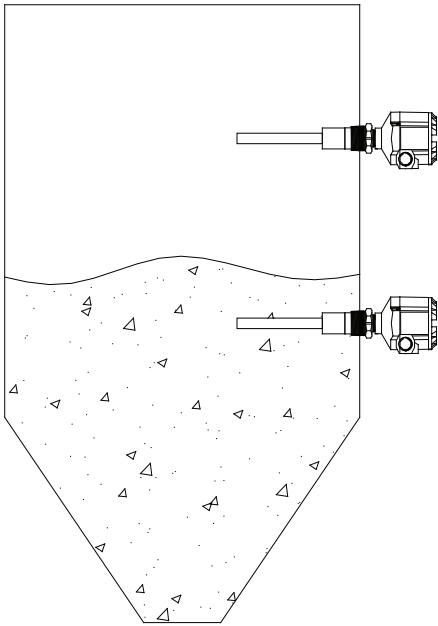
→ set to minimum-security level FSL

Power failure or line break is regarded as “empty” signal (protection against running dry).

LED Signal



Switch FSL / FSH



| FSL | FSH | |
|-----|-----|-------------------|
| | | relay output |
| | | transistor output |
| | | LED “signal” |

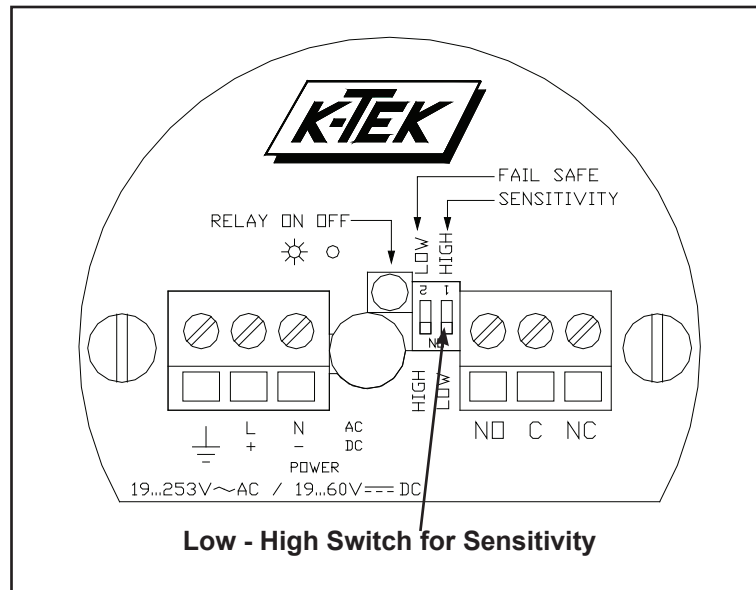
| | | |
|--|--|-------------------|
| | | relay output |
| | | transistor output |
| | | LED “signal” |

6.0 ADJUSTMENT / MAINTENANCE

ADJUSTMENT

Adjustment - Sensitivity

All probes have a factory default (factory default = position “high”). Therefore, they usually do not have to be re-adjusted for increased sensitivity. However, if the bulk material has a strong propensity to cake or deposit, the adjustment switch can be set to position “low” so as to decrease the sensitivity of the probe (Factory default = position “high”).



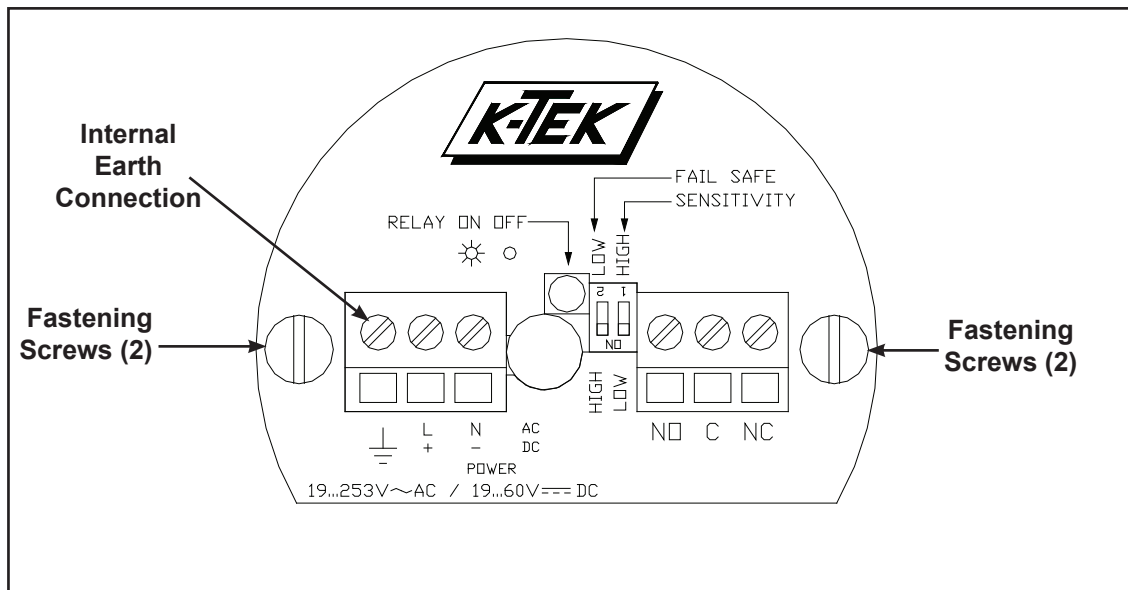
MAINTENANCE

Normally, the SP60 requires no maintenance. However, depending on the individual field of application, the following should be observed and inspected:

- mechanically damaged oscillating rods
- coarse cleaning of the oscillating rods

Changing the Electronic Module

1. Open the housing lid, remove the pigtails from the SP60.
2. Disconnect internal wire for earth connection from terminal PE (not at electronic module 2-wire).
3. Unscrew two fastening screws of the electronic module.
4. Pull out electronic module.
5. Insert new electronic module (until it locks into place).
6. Fix internal wire for earth connection to terminal and screw down the fastening screws.
7. Connect the pigtails to the SP60.



7.0 WARRANTY

5 YEAR WARRANTY FOR:

KM26 Magnetic Liquid Level Gauges, Buoyancy Level Switches (LS20, MS50, MS10 & MS8), Magnetic Level Switches (MS30, MS21, MS40, MS41, PS35 & PS45), EC External Chambers and ST95 Seal Pots.

3 YEAR WARRANTY FOR:

KCAP300 & KCAP 400 capacitance switches.

2 YEAR WARRANTY FOR:

AT100 and AT200 series transmitters; VF20 and VF30 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 radar level transmitters; KP paddle switches; A02, A75 & A77 RF capacitance level switches and A38 RF capacitance level transmitters.

1 YEAR WARRANTY FOR:

KM50 gauging device; AT500 and AT600 series transmitters; LaserM and SureShot series laser transmitters; LPM 100 and 200 series digital indicators; DPM100 digital indicators; APM100 analog indicators; KVIEW series digital indicators and controllers; SF50 and SP60 vibrating fork switches, KB Electro-Mechanical Continuous Measuring Devices, KSONIK ultrasonic level switches, transmitters & transducers.

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. (Request door to door delivery via New Orleans International Airport located in Louisiana, USA.) 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 100.00 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.

Contact us

ABB Inc.

18321 Swamp Road
Prairieville, LA 70769 USA
Phone: +1 225 673 6100
Service: +1 225 677 5836
Fax: +1 225 673 2525
Service e-mail: service@us.abb.com

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© 2012 ABB
All rights reserved