Yekan MS60/ Mechanical Vibration Switch

User Guide / Installation Manual

Rev. V1.1

The MS60 Yekan's mechanical vibration switches provide vibration protection for low- to medium-speed machinery. An inertia sensitive mechanism activates a snap-action switch with SPDT output contacts if the vibration exceeds an adjustable setpoint. The MS60 mechanical vibration switch contacts can be used to activate an alarm or initiate equipment shutdown. The housing is weatherproof with hazardous area rating. Electrical (remote) reset with start-up time delay and a second set of SPDT output contacts to accommodate DPDT needs (e.g. separate trip) are available.

Typical Application

The mechanical vibration switch is a completely self-contained, power-free device designed for monitoring and protecting rotating industrial equipment against excessive vibration levels.

This switch operates based on a spring-mass mechanism with an adjustable sensitivity spring and a permanent magnet calibration system. It measures vibration acceleration within a range of 0 to 5 g with a precision of 0.2 g, and provides reliable and repeatable triggering performance.

When the vibration level exceeds the preset threshold defined by the user, the internal relay contacts are activated. This immediately sends a shutdown signal to halt the operation of the rotating machine, preventing potential damage caused by excessive or abnormal vibration.

The device supports a frequency response up to 300 Hz, and ensures stable operation at ambient temperatures up to 90 °C.

A key feature of this switch is its dual reset mechanism — it can be reset locally or remotely. The remote reset function allows the equipment to be re-armed from the control room by applying a specified control voltage to the relay coil, which is especially useful when switches are installed in inaccessible locations.

The switch is ruggedly built for operation in harsh industrial environments, compliant with IP66 protection rating, guaranteeing dust-tight and water-resistant performance.

A typical application of this device is in cooling towers of power plants, where vibration monitoring plays a critical role in equipment protection and operational reliability.

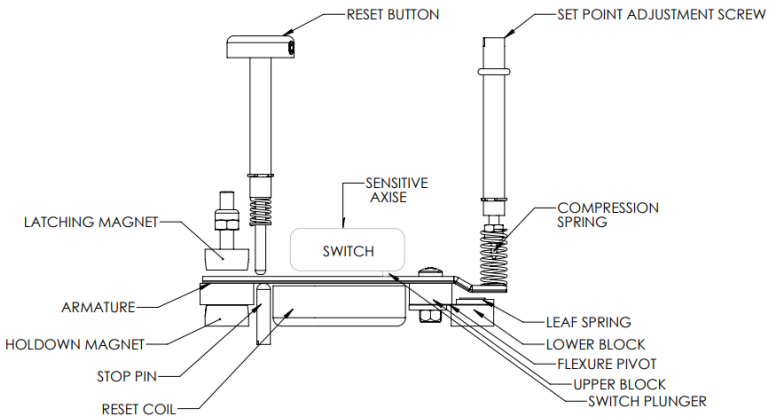
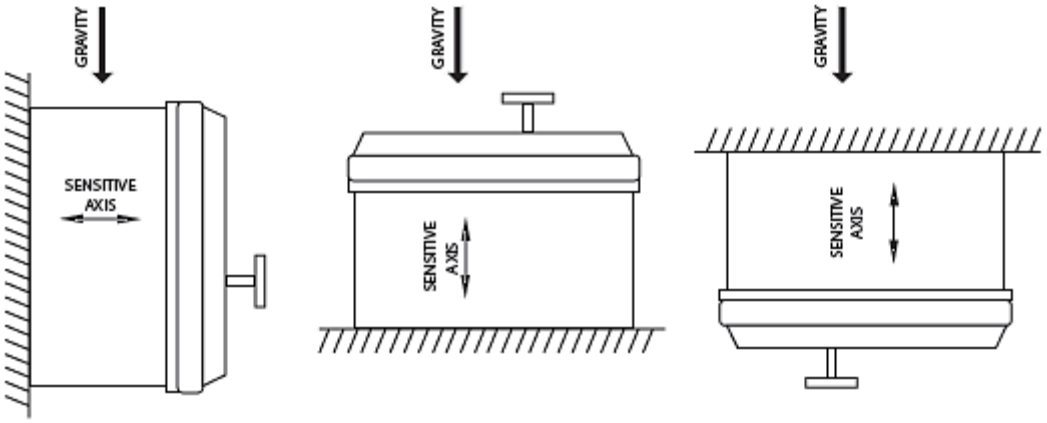


Figure 1. MS60 Mechanism

Figure 2. MS60 setpoint adjustment and manual reset Mechanism

Switch Orientation

Depending on how the switch is oriented, gravity will act on the trip mechanism's movable mass to either add to or subtract from the spring force. For MS60 switch, the switch orientation is the direction in which the cover faces. With the switch oriented horizontally (Figure 3A), the effects of gravity will be negligible and only the spring force will govern the trip plate's behavior. With the switch oriented vertically up (Figure 3B), gravity acts to keep the trip plate's movable mass in the untripped position, and inertial excitation must counteract both gravity and the spring force. With the switch oriented vertically down (Figure 3C), gravity acts in the opposite direction and opposes the spring's force. Thus, with the same setpoint adjustment, a switch facing up will require the most excitation to trip, a switch facing horizontally will require 1g less excitation to trip, and a switch facing down will require 2g less excitation to trip.



3A: Horizontal orientation cover facing right

3B: Vertical orientation cover facing up

3C: Vertical orientation cover facing down

Figure 3. Side views showing horizontal and vertical orientations of MS60 switch

Vibration Forces Acting on the Switch

By shaking or impacting the switch along its sensitive axis with sufficient inertial force for a sufficient duration and within its frequency response range, the trip plate mechanism will overcome the combined forces of gravity (depending on orientation) and spring tension, snapping from its untripped position to its tripped position.

Maintenance Convenience Versus Measurement Quality

While it is desirable to mount the switch in a location in which it can be easily serviced and maintained, this should not be the dominant consideration. The switch serves as a mechanical sensor and for it to provide suitable machinery protection, it must be mounted in a location and orientation where the machine's inertial forces during malfunction conditions will be suitably large to trip the switch. Thus, locating the switch for optimal mechanical sensing – rather than optimal serviceability – must always remain the primary consideration. However, in most circumstances, judicious choice of mounting location and switch orientation can accommodate both requirements satisfactorily.

Sensitive Axis

The switch is designed to respond to inertial forces only in the direction of its sensitive axis (Figure 3). When care is not taken to mount the switch properly, relatively large inertial forces can occur elsewhere on the machine that will not be transmitted properly to the switch, and/or will occur in a direction perpendicular to the switch's sensitive axis. Both of these conditions can render the switch's ability to trip less effective or even ineffective.

Horizontal Orientation

A horizontal orientation of the switch means that it is mounted with its sensitive axis perpendicular to the direction of gravity (refer to Figure 3A). In this orientation, the effects of gravity on the switch's trip mechanism are negligible and the trip point is governed almost entirely by the spring. It is recommended that the switch be oriented horizontally because most machines are less constrained (less stiff) in the horizontal direction than in the vertical direction and will therefore vibrate more in the horizontal direction.

Vertical Orientation

A vertical orientation of the switch means that it is mounted with its sensitive axis parallel to the direction of gravity. It is not recommended that the switch be oriented vertically because most machines are more constrained (more stiff) in the vertical direction than in the horizontal direction, and will therefore vibrate less in the vertical direction.

Mounting Rotation

The switch can be rotated about its sensitive axis without affecting its operation and serviceability. However, when possible, it is recommended that conduit fittings be oriented facing down, helping to prevent moisture or condensation accumulation inside the device.

Affixing The Switch To The Machine

Mount the switch securely to the machine using the 4-hole pattern on the baseplate. It is extremely important that the device be rigidly attached to the machine so that it reflects machinery vibration – not vibration incurred by a loose mounting, an insufficiently stiff mounting bracket, or a bracket resonance. Also, the switch should be mounted in a location where its own mass does not appreciably affect the natural frequency(ies) of the member to which it is attached. When attaching to a support beam, skid, or other member, thought should be given to the usefulness of the measurement and what level of machinery damage must be present before sufficient acceleration will occur at the measurement location. For additional application assistance, consult the Yekan Co.

Wiring

The switch provides a single SPDT relay or optional double SPDT relays, allowing use as a DPDT device. When a reset / startup delay coil is specified, suitable wiring terminals are also available. Refer to Figure 4 for wiring terminal assignments.

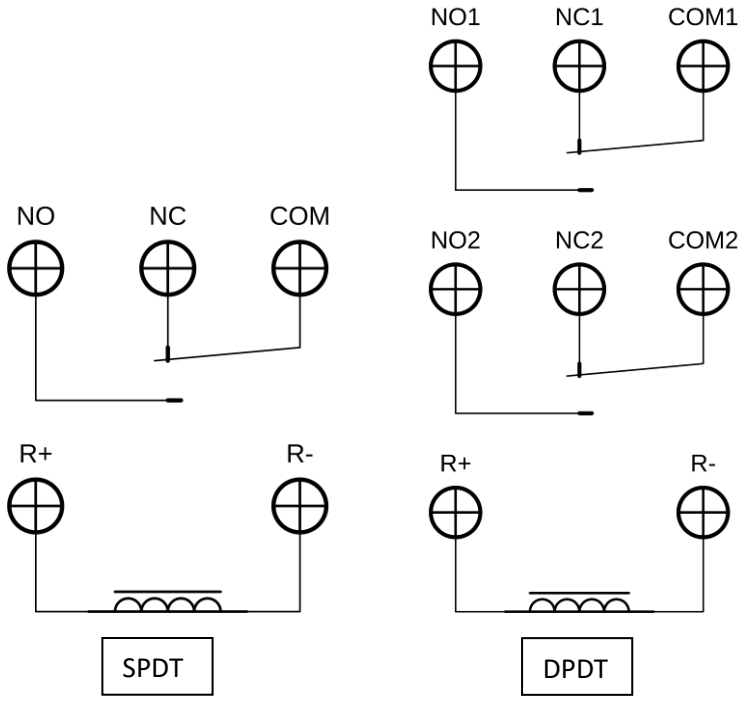


Figure 4. Wiring connections

WARNING: Voltages present at switch terminals can result in serious injury or death. Always de-energize these circuits prior to installation or maintenance and use appropriate lock-out / tag-out procedures where applicable.

When wiring the device, observe the following:

1. Do not exceed switch contact ratings listed on the nameplate.
2. Comply with all applicable electrical codes.
3. Keep field wiring away from the moving parts of the trip plate mechanism.

> **CAUTION:** If field wiring is allowed to obstruct the moving parts of the switch, it may prevent the trip plate from operating correctly. Machinery protection can be compromised and serious machinery damage and/or personnel injury may result.

4. All power must be switched off before opening the enclosure in an explosive atmosphere.
5. The switch must be electrically connected by means of a flameproof/dust cable gland or stopping box certified to IEC60079-0:2017 (EN60079-0:2017), IEC60079-1:2014 (EN60079-1:2014)
6. For ambient temperatures below -10°C, use field wiring suitable for the minimum ambient temperature.
7. Reinstall the cover by first ensuring the o-ring is in place and properly seated in the housing's groove. Place the cover on the unit and screw tight (Figure5).

> **NOTE:** Do not over-torque the cover bolts on the model MS60 switch. This could damage the housing and compromise the seal.

Figure 5. MS60 cover bolts location

Conduit: When attaching conduit, observe the following:

1. Avoid long runs of unsupported conduit that can transfer unwanted impacts or vibration of the conduit, rather than of the machine.
2. Always slope conduit away from the switch and generally orient such that accumulated moisture or condensation does not drain into the switch. For non-explosion proof installations, consider the use of an adequate number of J-traps or other drain mechanisms at low points to preclude moisture from collecting in the switch or in the conduit. When possible, mount the switch so that the conduit outlet faces down.
3. Units with NPT conduit holes have ¾" NPT threads. Units with metric conduit holes have M20 x 1.5 threads.
4. Use proper conduit seals and hole plugs meeting the environmental requirements of the installation to prevent ingress of moisture and dust.

IMPORTANT SAFETY INFORMATION

General Safety Summary	
CONNECT AND DISCONNECT PROPERLY	Do not connect or disconnect this product while it is connected to a live power source.
GROUND THE PRODUCT	The housing of this product should be connected to earth ground. Before energizing the product, ensure its housing is properly grounded.
OBSERVE ALL TERMINAL RATINGS	To avoid fire or shock hazard, observe all ratings and markings on the product.
DO NOT OPERATE WITHOUT COVER	The cover serves multiple purposes that may include protection against moisture and dust ingression, protection of personnel from electrical shock, and protection against ignition of flammable atmospheres when used in locations with hazardous area ratings. Do not use the device without its cover except when making adjustments or connections as noted in this manual.
AVOID EXPOSURE TO CIRCUITRY	Do not touch exposed electrical connections and components when power is present.
DO NOT OPERATE WITH SUSPECT FAILURES	If you suspect there is damage to this product, have it inspected by qualified personnel.

SETPOINT ADJUSTMENT

The MS60 mechanical vibration switch allows the user to adjust the trip point according to the desired vibration level. In all these methods, ensure the four bolts on the cover are firmly tightened.

There are three available methods for performing this adjustment:

Method 1 — Laboratory Calibration (Recommended)

This method provides the most accurate and repeatable calibration.

> **NOTE:** This method must be performed by a qualified calibration technician in an accredited vibration laboratory.

Method 2 — Field Adjustment Using Gravity (Approximate 1 g Reference)

This method is utilized when a calibration shaker is unavailable, using Earth's gravity (1 g) as the reference force.

Procedure:

1. Hold the switch facing you, positioning its sensitive axis perpendicular to the ground (Figure 3B).
2. Rotate the switch by 180 degrees (Figure 3C). Then, press the Reset Button.
3. Adjust the adjustment screw via trial and error until the switch trips exactly at the equivalent acceleration of 1 g (Earth's gravity).
4. Cover facing up and press the Reset Button again, and then slowly return the switch by rotating it 180 degrees (Figure 3c). The switch must operate correctly with the Earth's gravity in this final state.

Method 3 — On-Machine Adjustment (Not Recommended)

This method is suitable only when other calibration options are not available.

Procedure:

1. Ensure the rotating machine is healthy by the relevant technical expert. (Current vibrations must be below the permitted limit.)
2. Install the switch on a healthy rotating machine (motor, fan, or gearbox).
3. Run the machine under normal operating conditions.
4. Using the adjustment screw and the local reset button, we find the trip threshold of the switch.
5. Slowly turn the adjustment screw back by approximately one turn from that point.

> **Warning:** This method is not accurate and should be used only as a temporary or field adjustment. For reliable protection, a laboratory calibration is strongly recommended.

ELECTRICAL RESET AND STARTUP DELAY

When a reset coil is specified an electrical magnet mechanism is installed that allows remote reset of the switch when in its tripped position, and initiation of a startup delay when in its untripped position. To activate these features, the rated voltage must be applied to the reset coil wiring terminals. The reset function requires only momentary application of voltage. The startup delay function requires continuous application of voltage for the duration of the factory pre-set time delay.

Startup Delay

The startup delay feature is intended for use in machines that exhibit high vibration during startup. This feature maintains the switch in an untripped position for a factory pre-set delay period of approximately 3 minutes, after which the switch resumes normal operation. To activate startup delay, Or you have to constantly keep your hand on the local reset button or continuously apply the specified voltage across the reset terminals and the switch will be suppressed from tripping for the preset delay period, allowing the machine to run up to operating speed and normal vibration levels. Voltage must be continuously applied for the duration of the startup delay (approximately 3 minutes). If this voltage is removed prematurely, the coil will de-energize and the switch will not be suppressed from tripping.

NOTE: The time required for the switch to cool down before being used again is at least 10 minutes.

DRAWINGS, SPECIFICATIONS, AND ORDERING INFORMATION

all figures and illustrations in this manual depict the model MS60 mechanical switch. The MS60 has a housing that is rated for use in the more stringent IIC gas group. For additional information on model MS60 specifications, and ordering information, refer to Yekan product datasheet.

ENVIRONMENTAL INFORMATION

This electronic equipment was manufactured according to high quality standards to ensure safe and reliable operation when used as intended. Due to its nature, this equipment may contain small quantities of substances known to be hazardous to the environment or to human health if released into the environment. For this reason, Waste Electrical and Electronic Equipment (commonly known as WEEE) should never be disposed of in the public waste stream. The “Crossed-Out Waste Bin” label affixed to this product is a reminder to dispose of this product in accordance with local WEEE regulations. If you have questions about the disposal process, please contact Yekan Customer Service.

Yekan company is acting in the field of supply, consulting and engineering services associated with vibration measurement and monitoring equipment and works as the middle east representative of Bently Nevada, Metrix and CTC brands.

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