



SHT 120 / 140
Vibrating Level Switch for *hot* bulk solids
Instruction Manual



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Description

The **SHT120** is a piezoelectric driven vibration type level control instrument that detects the minimum and maximum level in bins, silos and hoppers, filled with grained or powdered materials, (bulk solids), which can have temperatures up to 250°C. The instrument can be used as overflow protection, for high or low level alarm. The signal from the electronic circuit of the **SHT120** excites the blade of the instrument to vibrate on its resonance frequency of 285 Hz. When material covers the blade of the probe, the vibration stops. This is sensed by the electronic circuit which forces its relay to switch. When the blade gets uncovered the vibration will restart and the relay will switch back.

Models

- **SHT120**: standard model
- **SHT140** model with threaded tube extension

Further advantages

- single blade construction eliminates the bridging problem typical for the "tuning fork" design
- high sensitivity up to 20 g/l
- strong stainless steel construction with reinforced vibrating blade
- highest quality, manufactured in Germany according to DIN EN ISO9001:2000

Specifications

Enclosure:	diecast aluminium, (option powder coated) protection IP 66 and IP 67 1 cable duct M20x1,5 , (option: second cable duct)
Power Supply:	wide range power supply 20 ... 250V AC/DC
Power consumption:	3VA
Relay:	1 potential-free change-over contact (SPDT, option: DPDT) max. switching voltage 250V-AC, 5A max. switching power 1250 VA, $\cos \varphi = 1$ 80 Watt for DC
Time Delay:	1 second from stop of vibration 2 to 5 seconds for start of vibration
Probe:	stainless steel 1.4301 / AISI 304 thread 1 1/2" DIN 2999 or 1 1/2" NPT resonance frequency 285 Hz max. vertical load upon the end of the blade: 1000 N max. horizontal load upon the end of the blade: 150 N
Indication:	relay: red LED on PCB power: yellow LED on PCB
min. density of material:	20 g / liter
max. pressure inside bin:	10 bar
ambient temperature electronic:	-20°C ... + 70°C
process temperature probe:	-20°C ... + 250°C

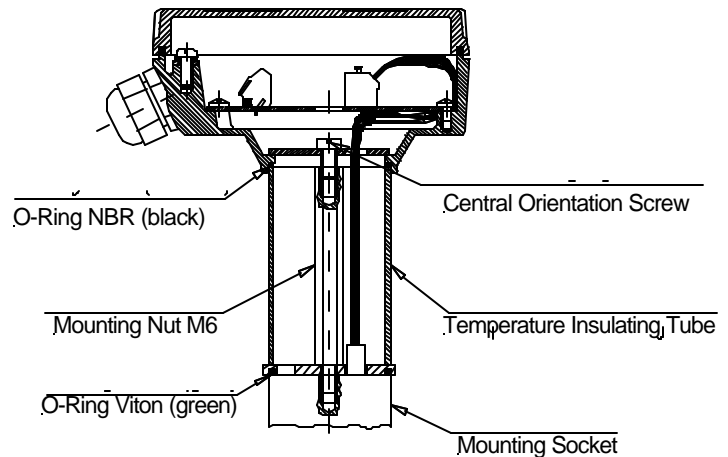
Temperature Insulating Tube

The temperature insulating tube must be mounted between probe and enclosure in order to prevent heat up of the electronics via the probe due to high process temperatures. The mounting is made according to the following sketch. The green O-ring sealing, (special material Viton), must be located between mounting socket and tube and the black standard O-Ring must be located between tube and enclosure. Use torque 3 Nm for the screwing of mounting nut and screw M6x12

The following drawing shows how probe, housing and PCB are assembled. In order to achieve protection IP66 and IP67 of the housing the following has to be considered:

- the O-ring-sealing between housing and socket must sit in its appropriate position
- the orientation screw must be tightened firmly, (torque 3 Nm)
- the sealing between housing and cover must sit in its appropriate position
- the cover must be fastened firmly onto the housing with the 4 screws
- the cable ducts must be screwed firmly into the housing wall and tightened firmly.

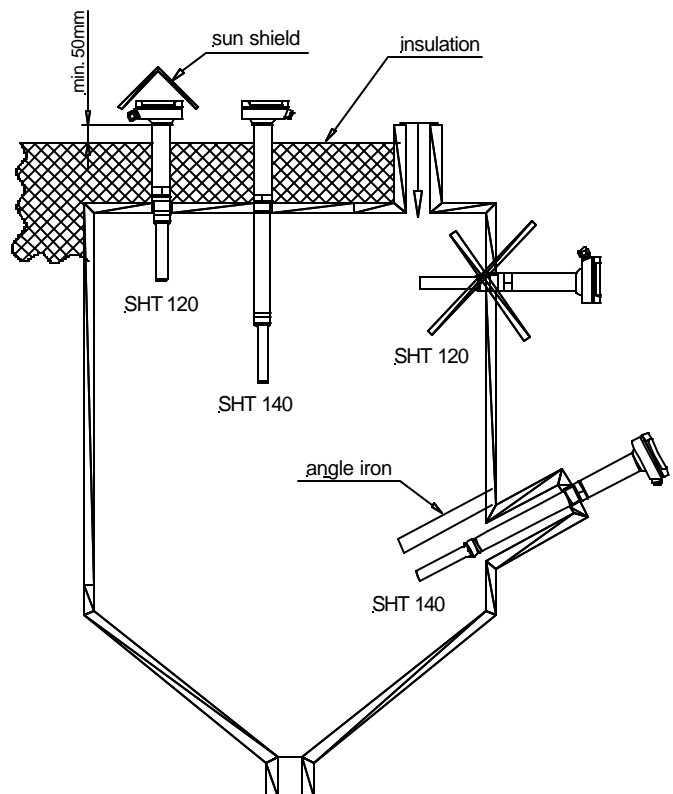
The PCB is fastened inside the housing by means of 3 screws.



Correct Mounting Position

When choosing the mounting position of the SHT at the bin the following has to be considered:

- The switching point of the SHT depends on the density of the material: for heavy materials only a few millimeters of the vibrating rod have to be covered for damping the vibration. At very light materials the material must cover the vibrating rod completely in order to damp its vibration.
- The SHT must not be mounted in or near the filling curtain of the bin. The filling stream could damage the probe and the turbulences of the pneumatic conveying system could lead to false signals.
- In order to keep the ambient temperature of the PCB within the allowed range of -20 to +70°C the housing should be protected from direct sunlight by installing a sun shield.
- The insulation of the bin should not completely cover the temperature insulating tube of the probe. The temperature insulating tube must be free in air for a length of at least 50mm in order to assure sufficient thermal emission.
- In cases where continuous vibrations of the bin are present, the PCB must be installed in a separate housing apart from the vibrations.
- For side mounting it is recommended to screw the SHT inside the bin wall with the rod pointing slightly downwards so that material can easily flow away.
- For low level detection a shield, for example an angle iron with side length approx. 50mm, must be installed approx. 150mm over the rod in order to protect the probe against falling material.
- Be sure to install the instrument in an area where no material can settle, (like in edges of the bin).
- The SHT must be mounted at a position where it cannot get damaged when the bin gets cleaned or inspected.



Mounting

The *SHT* gets installed by screwing the mounting socket of the instrument into the bin wall by means of a 50 mm open-end wrench.

Do not screw by turning the housing!

The cable ducts must always point downwards to prevent moisture seeping inside the housing.

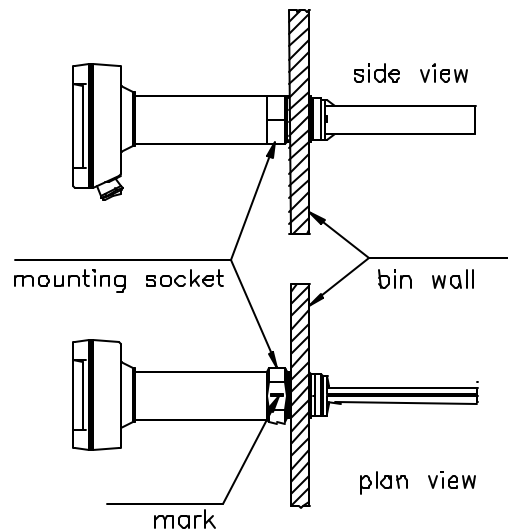
If the housing is not in the correct position after the probe has been firmly screwed into the bin wall, proceed as follows:

- remove the cover of the housing
- loosen the screw in the center of the PCB
- turn the housing into the correct position (cable ducts pointing downwards)
- tighten the screw in the center of the PCB
- replace the cover of the housing.

The *SHT* is normally screwed into the bin wall at the level to be monitored in horizontal direction or with the blade pointing slightly downwards.

The probe must be kept out of the path of falling material to avoid damage. If this is not possible a shield, for example an angle iron, must be installed over the blade. Such a shield must always be installed when the instrument is used for low level indication.

When the probe is inserted horizontally into the bin, it must be turned until the blade is vertically oriented, so that material can flow freely over the blade and does not rest on it causing false alarm. Alignment of the blade is verified by the two slots in the mounting socket. These will be facing up and down when the orientation of the blade is correct.



Connection

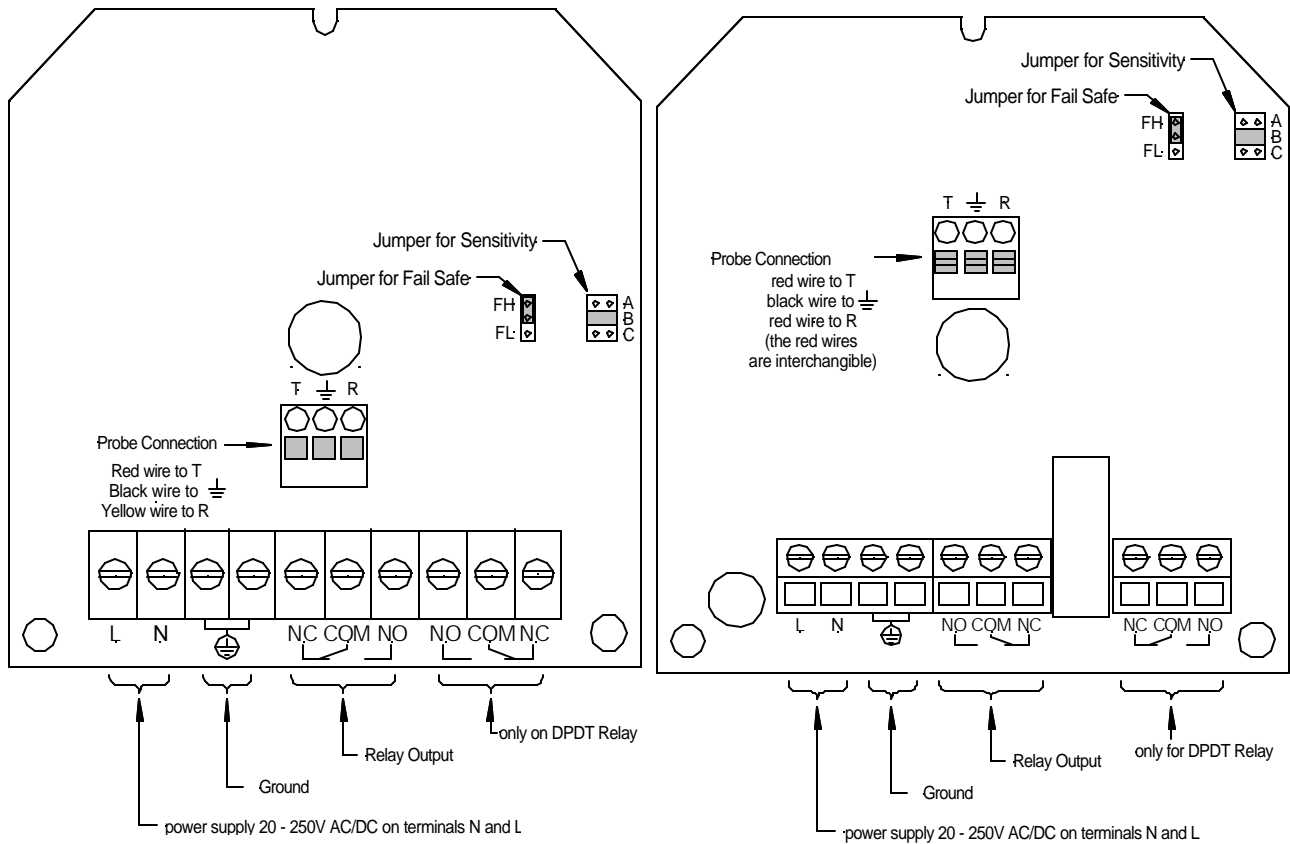
Wiring

Before you start wiring make sure that power supply on all wires has been switched off !

According to DIN EN 61010-1 a switch for power supply has to be installed nearby the instrument and must be marked as main switch of the instrument!

The cables for power supply and relays must be connected to the terminals as indicated on the PCB.
The terminal on the PCB for power supply and control circuit allows a maximum lead diameter of 2.5 mm².

The probe is connected to the PCB by the three leads as shown in the following figure. The three wires of the probe get connected to the PCB via spring cage clamps: push the button of the clamp by means of a small screw driver and insert the wire end sleeve into the clamp, then release the button.



Through hole pcb

Surface mount pcb

Sensitivity

There are three sensitivity settings which can be selected by the sensitivity switch on the circuit board:

- Pos. A: high sensitivity: for very light materials like styrofoam
- Pos. B: standard setting
- Pos. C: low sensitivity: for heavy materials which may form a deposit on the vibrating blade, for example cement and chalk.

As the sensitivity of the instrument is low at position B and C, extremely light material such as expanded styrofoam can not be detected at these settings!

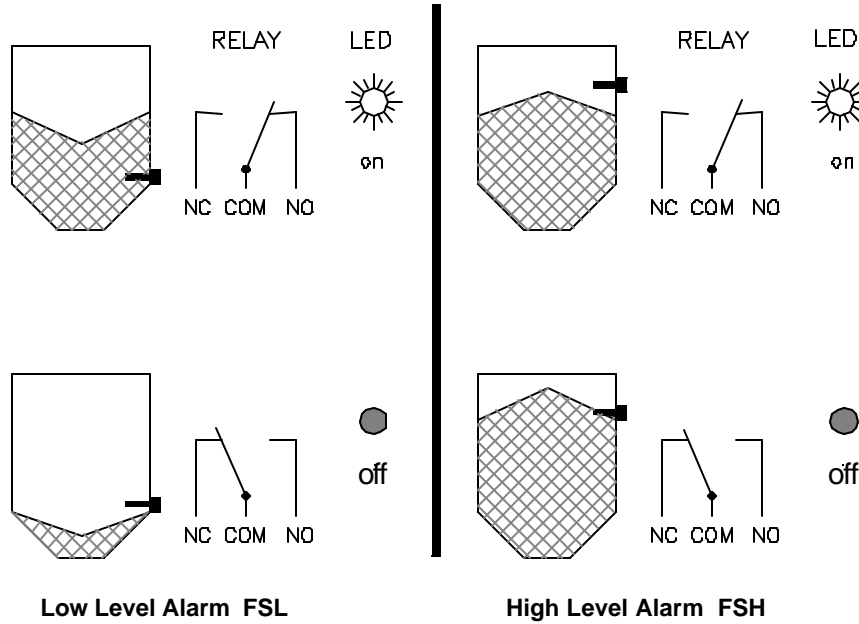
Failsafe high (FSH) / Failsafe low (FSL)

The SHT operates in either failsafe high (FH) or failsafe low (FL) mode. The failsafe mode is selected by switch on the PCB. The relay status is indicated by the red LED (D6) on the circuit board.

Through hole PCB

FSH: High Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is covered by material.

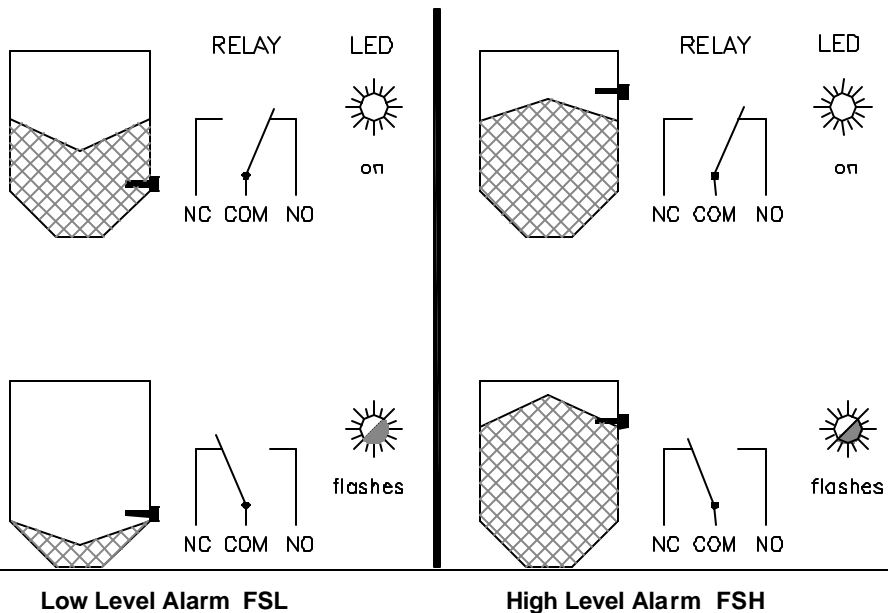
FSL: Low Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is not covered by material.



Surface Mount PCB

FSH: High Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is covered by material.

FSL: Low Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is not covered by material.



Function Control

After wiring and adjustment the function of the *SHT* can be tested by switching on the power and checking the relay status. There is a difference depending on whether the printed circuit board is a through hole design or a surface mount design.

On the through hole design , there are 2 LEDs, a Yellow LED and a Red LED. The Yellow LED must go on as soon as power is switched on. The Red LED must be on or off depending on the FH/FL jumper setting according to the figure.

On the surface mount design , there is just one Red LED. The Red LED must be on solid or flashing depending on the FH/FL jumper setting according to the figure. If the LED is off then the unit is not powered or there is a problem on the circuit board.

Please note the following exception: if the power supply will be switched on with failsafe mode at setting FL the relay, in contrary to the figure, will be energized for approx. 2 to 5 seconds although the probe is not covered with material. The relay will switch back to normal status after the probe fully vibrates. This is a normal behaviour which occurs only when power supply is switched on at FL-mode.

A final test has to be made by filling and emptying the bin.

After the positive function tests the cover must be fastened firmly onto the housing with the 4 screws and the cable gland must be tightened to ensure the protection of IP66 and IP67 of the instrument.

