



DIAMOND POINT DP600

Vibrating Level Switch

Operation and Instruction Manual



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1. Application

The DP600 is a vibration type level control instrument that detects the minimum or maximum level in bins, silos and hoppers. Due to its small size the DP600 is ideal for use in small hoppers filled with granular solids or pellets like granular plastics, foods, grains etc. The DP600 is best for detecting materials with bulk densities of 50 grammes per liter and higher.

Important: ***The instrument can not be used for detecting sticky materials and materials which tend to hang up!***
The DP600 is not recommended for use with powdered materials.

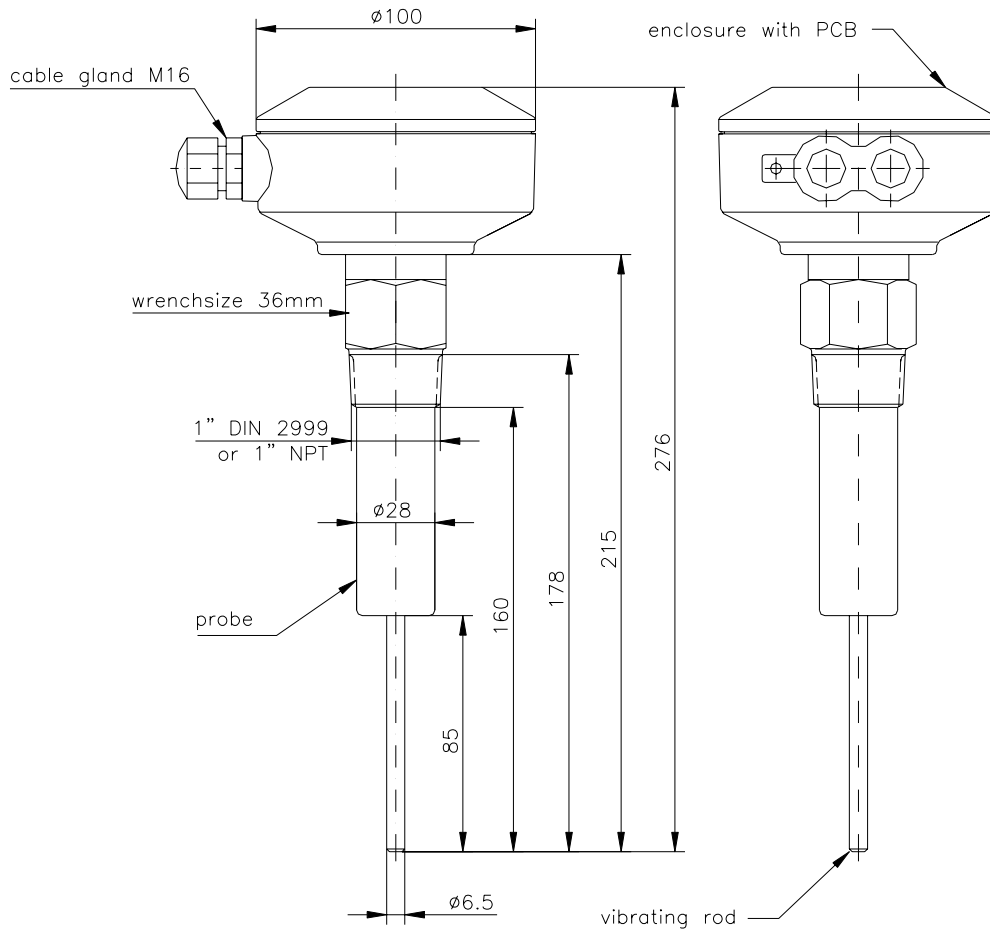
2. Function

The signal from the electronic circuit of the DP600 excites the 85 mm stainless steel rod of the probe to vibrate on its resonance frequency of 460 Hz. When material covers the rod of the probe, the vibration stops. This is sensed by the electronic circuitry which forces its relay to switch. When the rod gets uncovered, the vibration will restart and the relay will switch back. As only the end of the vibrating rod is sensitive and not the base, buildup on the container wall has no influence on the function of the instrument.

3. Technical Data

Enclosure	diecast aluminium protection IP 66 and IP 67 1 cable gland M16, (optionally 2 cable glands)
Probe	stainless steel 1.4301 / AISI 304 resonance frequency 460 Hz
Connection	thread 1" DIN 2999 or 1" NPT, (optionally 1 ¼"NPT)
Power Supply	wide range 20 ... 250 V AC/DC
Power consumption	3 VA
Relay	1 potential-free change-over contact (SPDT) max. switching voltage: 250V-AC max. switching current: 5A max. switching power : 1250 VA, $\cos \varphi = 1$; 150 Watt for DC
Time Delay	1 second from stop of vibration 2 to 5 seconds for start of vibration
Indication	relay: red LED on PCB power: yellow LED on PCB
min. density of material to be monitored: 50 g / liter	
max. lateral load upon the end of the rod: 80 N	
max. pressure inside bin: 10 bar	
ambient temperatures:	electronic: -20°C ... + 60°C standard probe: -20°C ... + 80°C
optionally:	probe HT: -20°C ... + 150°C (special model high temp.)

4. Dimensions



Insertion length:	160 mm
Installation:	top- and side mounting
Weight:	0,95 kg

5. Installation

5.1 Correct mounting position

When choosing the mounting position of the DP600 at the bin the following has to be considered, (see also Fig. 5.1):

- Keep in mind the material cone and the material depression which will result from filling and emptying of the bin.
- The switching point of the DP600 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 DP600 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 +60°C the housing should be protected from direct sunlight by installing a sun shield.
- A heat barrier has to be installed between the housing and the bin wall in cases the temperature of the material inside the bin exceeds 60°C. Instead it also is possible to install the PCB in a separate housing up to 2 meters away from the bin, (option).
- In cases where continuous vibrations of the bin are present, the PCB must be installed in a separate housing apart from the vibrations, (option).
- For side mounting it is recommended to screw the DP600 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 as shown in Fig. 5.1 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 DP600 must be mounted at a position where it can not get damaged when the bin gets cleaned or inspected.

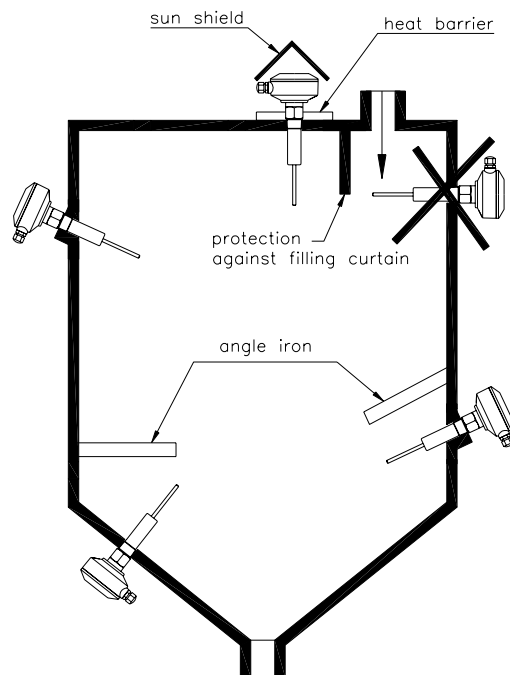


Fig. 5.1: Mounting position

6. Connection

6.1 Wiring

Before you start wiring up 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 cable gland must be screwed firmly into the housing.
- Open the cover of the housing by loosening the center screw.
- The terminals on the PCB for power supply and relay allow a maximum lead diameter of 1.5 mm².
- The cables for power supply and relay must be connected to the terminals as indicated on the PCB:

terminal power supply: 1 = L } 20...250V AC/DC
 2 = N }
 3 = ground
 4 = ground

terminal relay: 5 = NO
 6 = COM
 7 = NC

- The probe is connected to the PCB by three leads:

terminal probe: 8 = T (red lead)
 9 = R (yellow lead)
 10 = ⊥ (black lead)

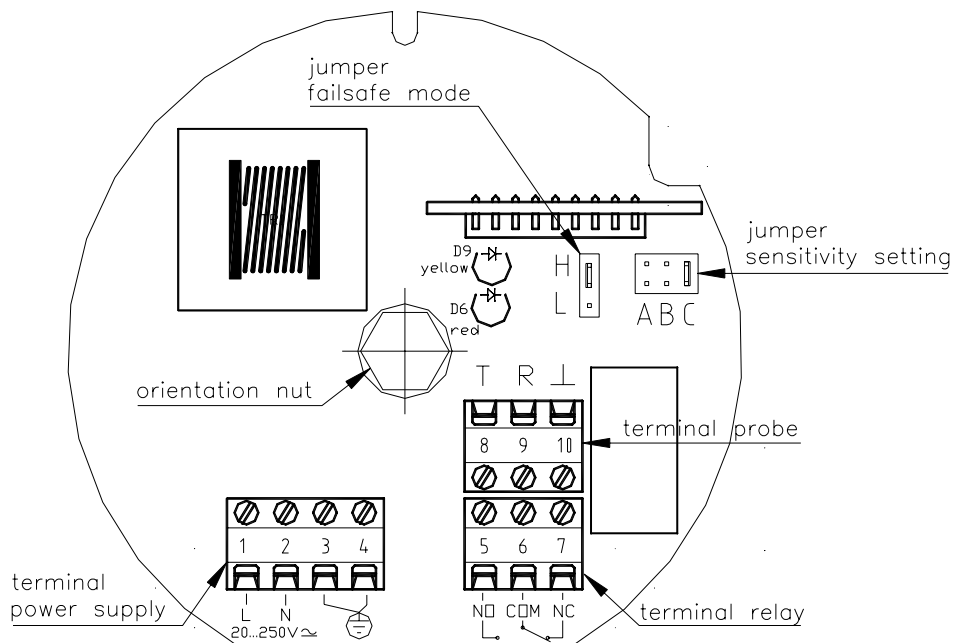


Fig. 6.1: DP600 Printed Circuit Board

6.2 Adjustment

- Failsafe high (H) / Failsafe low (L)

The DP600 operates in either failsafe high (H) or failsafe low (L) mode. The failsafe mode is selected by jumper on the PCB. The relay status is indicated by the red LED (D6) on the circuit board.

- H: for high level alarm: the relay is deenergized (LED off), when the rod is covered by material or power has failed.
- L: for low level alarm: the relay is deenergized (LED off), when the rod is free or power has failed.

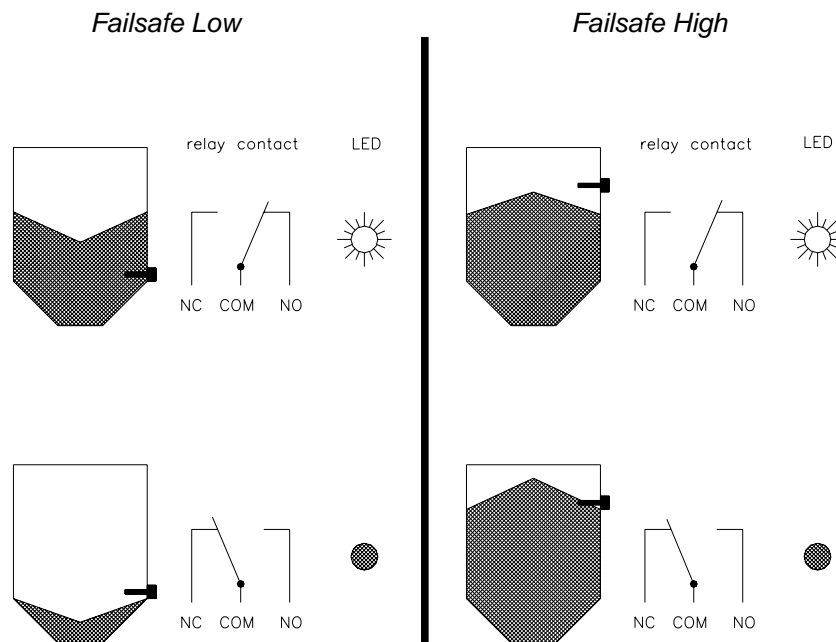


Fig. 6.2 Relay status at failsafe high and failsafe low

- Sensitivity Setting

There are three sensitivity settings which can be selected by a jumper on the circuit board, (see Fig. 6.1, page 5):

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

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

6.3 Function Control

After wiring and adjustment the function of the DP600 can be tested by switching on the power and checking the relay status. The red LED must be on or off depending on the setting H/L according to Fig. 6.2. Please note the following exception: if the power supply will be switched on with failsafe mode at setting L the relay, in contrary to Fig. 6.2, 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 DP600 fully vibrates. This is a normal behaviour which occurs only when power supply is switched on at L-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, (torque 2,0 Nm), and the cable gland must be tightened to ensure the protection of IP66 and IP67 of the instrument.

7. Trouble Shooting

If the DP600 should not work correctly the following checking list will assist in finding the error.

General:

- Check the power supply on the terminals and the yellow LED.
If the power supply is OK but the yellow LED is off, the PCB is damaged. Contact HYCONTROL for spare part PCB or repair.
- Check if correct failsafe mode has been chosen.
- Check jumper H/L: the red LED must go on and off while switching.
If not: PCB is damaged. Contact HYCONTROL for spare part PCB or repair.
- Check the instruments which are connected to the relay: they must react correspondingly to the switching from H to L.

Failsafe mode high (H):

Error	Possible reason	Solution
although level in bin is low the DP600 indicates full bin, (relay deenergized, red LED off), no vibration	a) material is sticking onto the rod b) the probe is damaged	a) clean the rod b) contact HYCONTROL for spare part probe or repair
Although bin is full the DP600 indicates that level has not yet reached maximum, (relay energized, red LED on), probe is vibrating	a) the density of the material is too low for the DP600 b) the probe can vibrate inside a cavity which has been built inside the material	a) contact HYCONTROL for a different instrument with higher sensitivity b) install the probe at a different place at the bin where cavity building is not possible

Failsafe mode low (L):

Error	Possible reason	Solution
although level in bin is high the DP600 indicates empty bin, (relay deenergized, red LED off), probe is vibrating	a) the density of the material is too low for the DP600 b) the probe can vibrate inside a cavity which has been built inside the material	a) contact HYCONTROL for a different instrument with higher sensitivity b) install the probe at a different place at the bin where cavity building is not possible
Although bin is empty the DP600 indicates that level is higher than min., (relay energized, red LED on), no vibration	a) material is sticking onto the rod b) the probe is damaged	a) clean the rod b) contact HYCONTROL for spare part probe or repair

Testing the probe:

- Uninstall the probe from the bin.
- Check the outline of the probe: is the vibrating rod bended, are there any other hints of mechanical damage?
- *IMPORTANT*: if yes, check the reason of the mechanical damage and make sure that it can not happen again before installing a new probe.
- Check the vibration of the probe: clap the rod by hand, the vibration should remain for several seconds.
- Measure the capacity of the piezo crystals with a capacity measuring instrument: measure between red and black resp. yellow and black wires:
 $C = 1,5nF \pm 0,3nF$ on each piezo crystal.

If any of above is not in the allowed range the probe is defective. In this case send the probe to HYCONTROL for evaluation. We will check whether the probe can be repaired or if it has to be replaced by a new one.