

Diamond Point Level Switch

Level Control Instrument

DP120 / DP130 / DP140 / DP150

Instruction Manual

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1. Applications

The *Diamond Point* is a vibration type level control instrument that detects the minimum and maximum level in bins, silos and hoppers, filled with grained or powdered materials. The following list shows some of these materials:

powdered milk	peanuts
frozen potato chips	tobacco
beans	wood shavings
sugar	chalk
sweets	stearine chips
coffee beans	powdered cellulose
coffee ground	glass finely ground
coffee freeze-dried	granular plastics
tea (leaf)	gravel
salt	powdered clay
flour (in a flour mill)	polysterene powder
foundry sand	styrofoam
spices	soda
animal food	soot dry
pellets	

Important: *The instrument can not be used for detecting sticky materials and materials which tend to hang up!*

2. Operation

2.1. General

The signal from the electronic circuit of the *Diamond Point* excites the blade of the instrument to vibrate on its resonance frequency of 285Hz. When material covers the blade of the probe, the vibration stops. This is sensed by the electronic circuitry which forces its relay to switch. When the blade gets uncovered, the vibration will restart and the relay will switch back. As only the end of the vibrating blade is sensitive and not the base, buildup on the container wall has no influence on the function of the instrument. The shape of the blade and its vibration have a self-cleaning effect.

2.2. Sensitivity

There are three sensitivity settings which can be selected by the sensitivity switch on the circuit board, (also see Fig. 7.2, page 14):

- 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!

2.3. Failsafe high (FSH) / Failsafe low (FSL)

The *Diamond Point* operates in either failsafe high (FSH) or failsafe low (FSL) 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.

FSH: for high level alarm: the relay is deenergized (LED off), when the blade is covered by material or power has failed.

FSL: for low level alarm: the relay is deenergized (LED off), when the blade is free or power has failed.

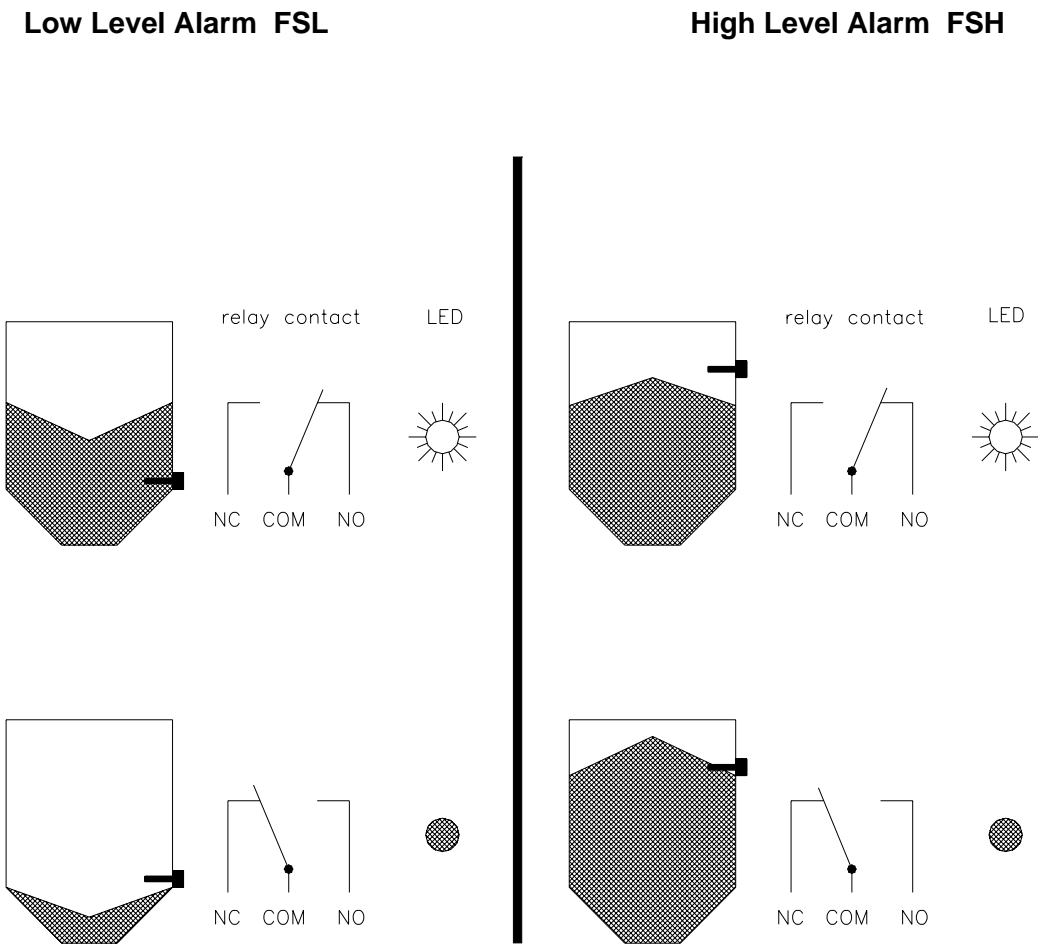


Fig. 2.1: Failsafe Low / Failsafe High

3. Specifications

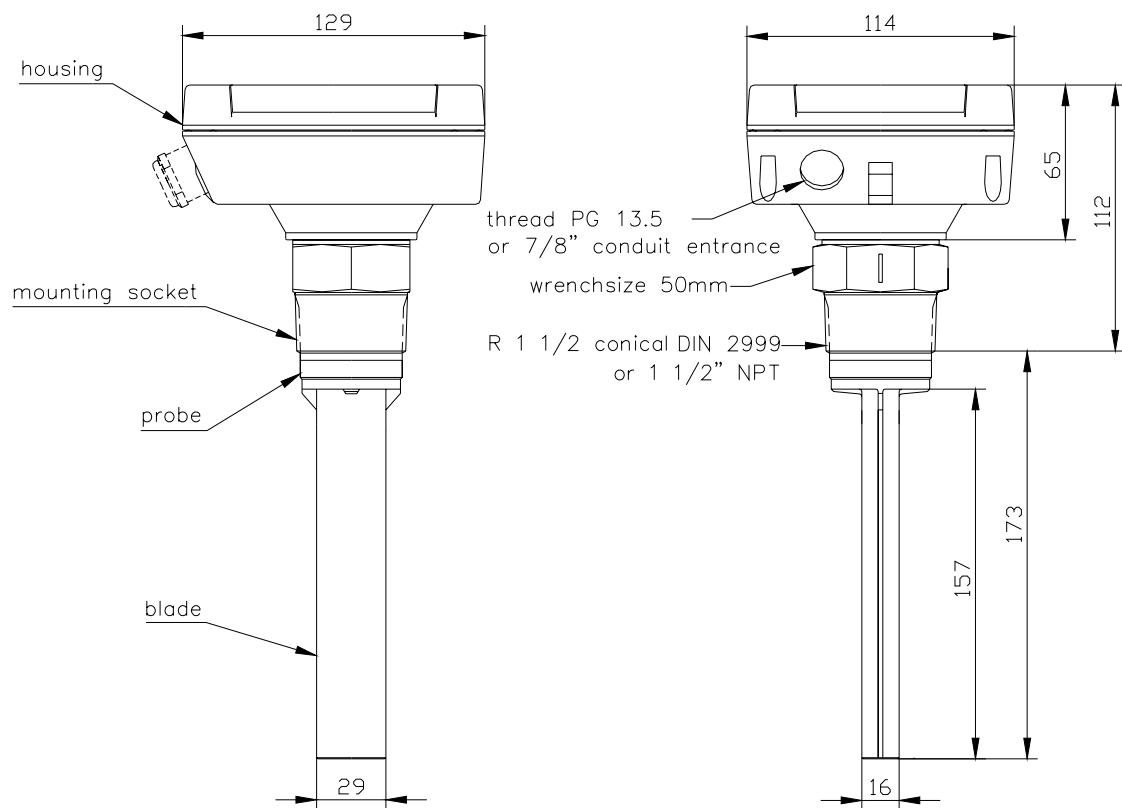
Enclosure:	Diecast aluminium (option powder coated) protection IP 66 / 67 1 cable duct PG 13.5 (option second cable duct)
Power Supply:	20-250V AC/DC
Power consumption:	3 VA
Relay:	1 potential-free change-over contact (SPDT) max. switching voltage 250V-AC max. switching current 8A max. switching power 1000 VA cos φ = 1; 80 Watt for DC option: 2 potential-free change-over contacts (DPDT)
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" conical DIN 2999 or 1 1/2" NPT resonance frequency 285 Hz max. vertical load upon the end of the blade: 1000N (100kp) max. horizontal load upon the end of the blade: 150N (15kp) max. tensile load of cable DP150: 200 kg
Indication:	relay: red LED on PCB power: yellow LED on PCB
min. density of material to be monitored: 20 g / liter	
max. pressure inside bin: 10 bar	
ambient temperature:	- electronic: -20°C ... + 60°C - probe: -20°C ... + 80°C - probe HT: -20°C ... + 150°C

4. Versions

The *LevelSwitch* is available in 4 different versions:

- DP120 standard insertion length 173 mm
- DP130 insertion length extended up to 4m by tube welded between vibrating probe and mounting socket
- DP140 insertion length extended up to 4 meters by a tube which is screwed between the vibrating probe and the mounting socket.
- DP150 insertion length extended up to 6 meters by a cable extension.

4.1. Diamond Point DP120



Insertion length: 173 mm

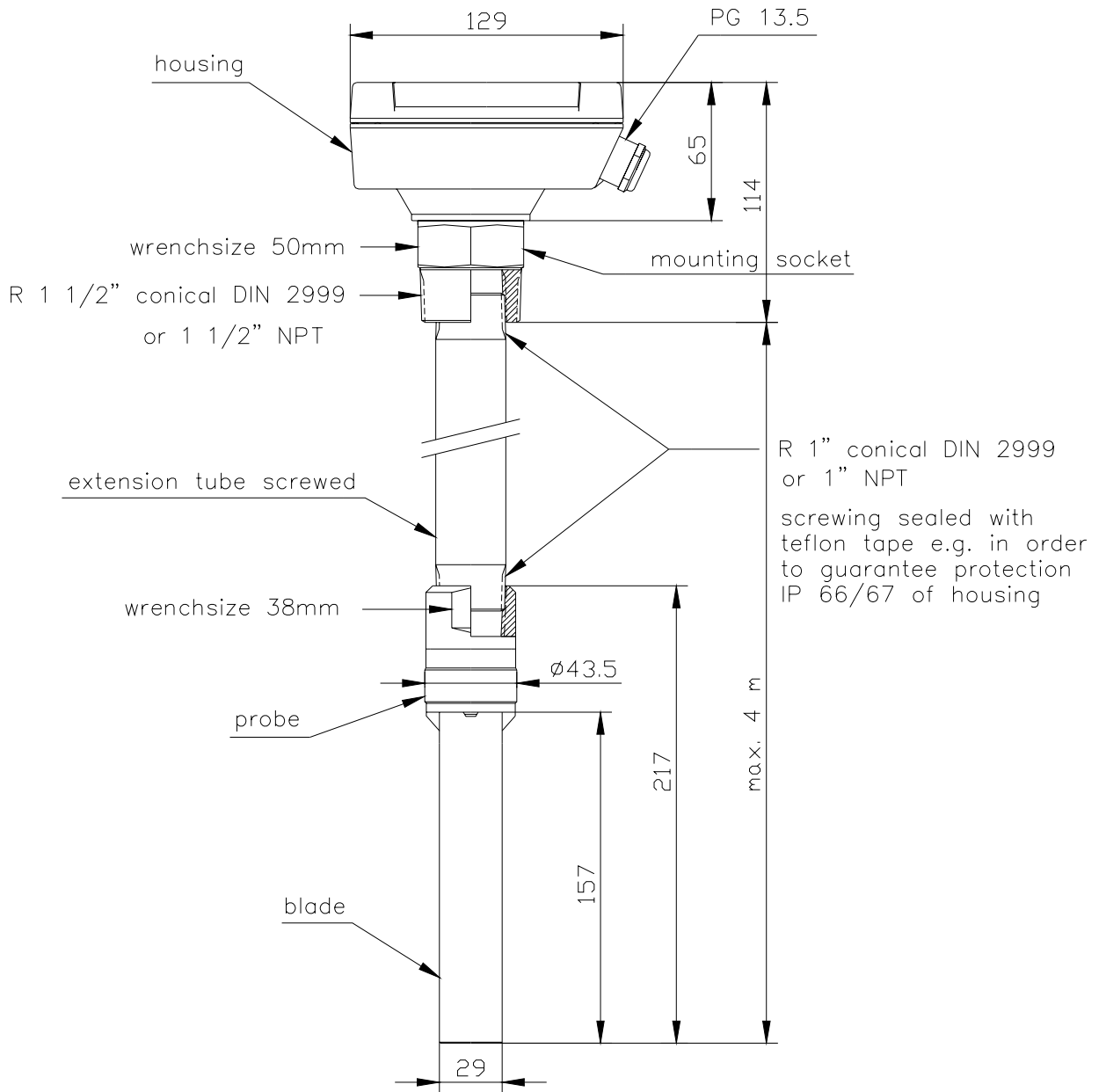
Installation: top- and side mounting

Weight: 2,0 kg

4.1.1 Diamoi

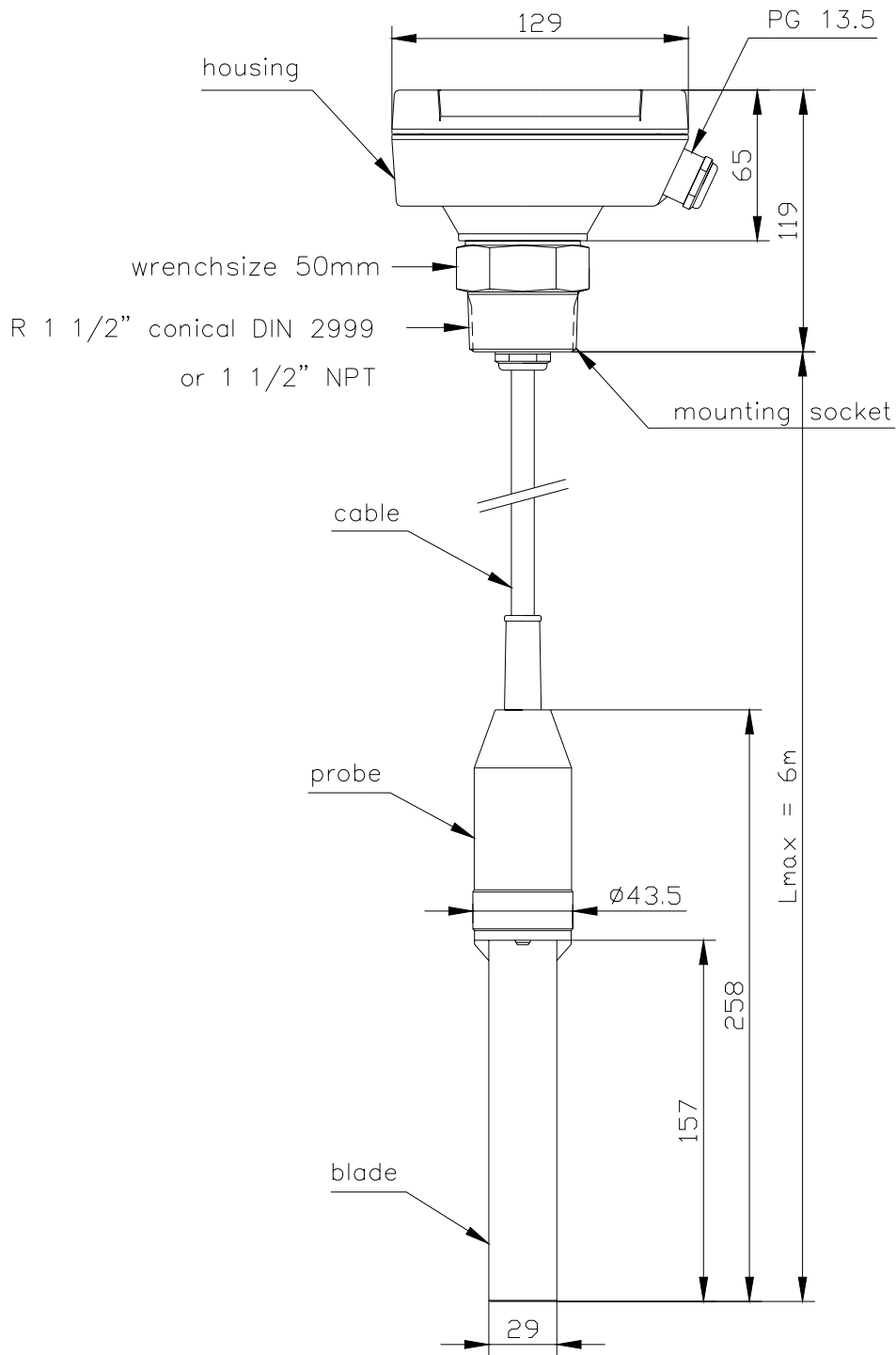
Insertion length:	max 4m
Installation:	top mounting (side mounting for short extensions possible)
Weight:	max. 11.0kg with max. Insertion length of 4m

4.2. Diamond Point DP140



- Insertion length: max. 4 m
- Installation: top mounting
(side mounting for short extensions possible)
- Weight: max. 11,0 kg with max. insertion length of 4 m

4.3. Diamond Point DP150



- Insertion length: max. 6 m
- Installation: top mounting
- Weight: max. 3.0 kg with max. insertion length of 6 m

5. Options

Besides the above standard versions the following options are available:

- HT-version for high temperatures in the bin up to 150°C (not for DP150)
- Separate housing installation for PCB which is necessary for HT-version and in case of heavy continuous vibration of the bin (see chapter 9.1)
- Housing powder coated (grey or blue)
- Second cable gland
- Relay with two potential-free change over contacts (DPDT)

6. Installation

6.1. General

Fig. 6.1 shows typical installation possibilities of the *LevelSwitch*.

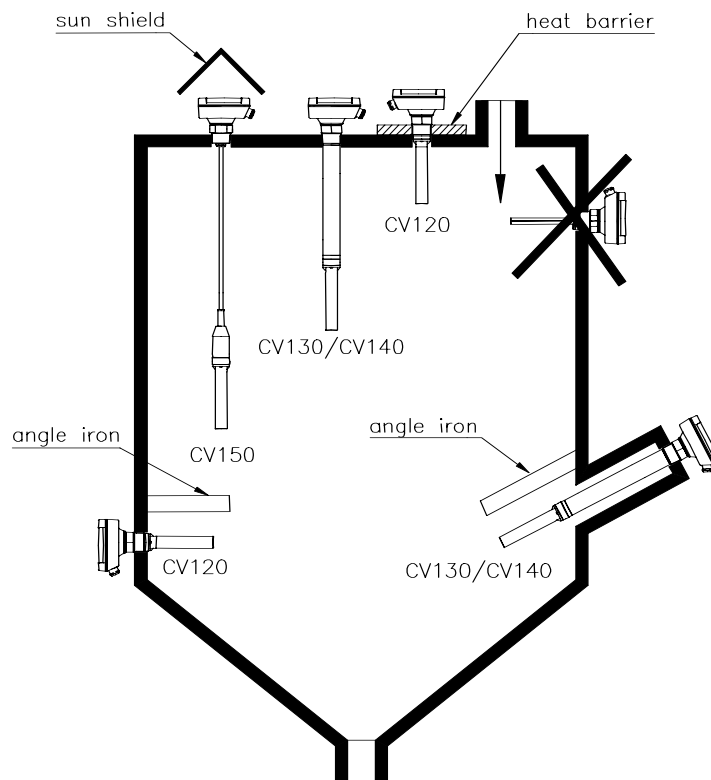


Fig. 6.1: Installation possibilities of the *Diamond Point*

The *Diamond Point* is 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.

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 (see chapter 9.1).

In cases where continuous vibrations of the bin are present, the PCB must be installed in a separate housing apart from the vibrations (see chapter 9.1).

6.2. Side Mounting

6.2.1. DP120

The DP120 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 as shown in Fig. 6.1. 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. (See Fig. 6.2).

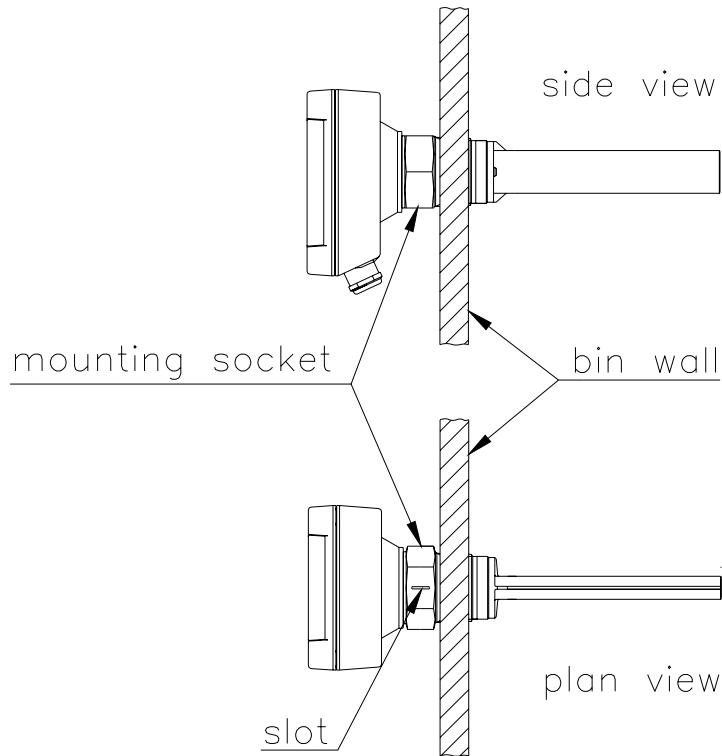


Fig. 6.2: Orientation of the blade at horizontal installation

6.2.2. DP130/DP140

The extended versions DP130/DP140 are designed for top mounting. Side mounting of these versions is possible for short extensions if the probe as well as the protection shield over the blade are supported adequately.

6.3. Top Mounting

Top mounting is possible for all versions of the *Diamond Point*. The DP150 is designed for top mounting only. The DP150 must not be installed within the path of falling material which might damage the cable.

7. Connection

Fig 7.1 shows the way how probe, housing and PCB are assembled.

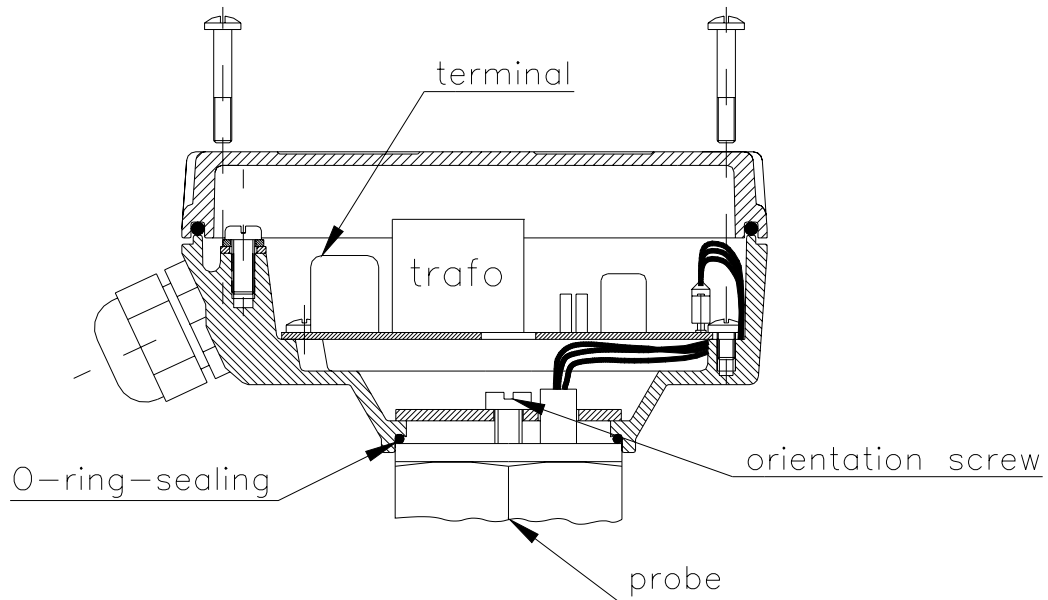


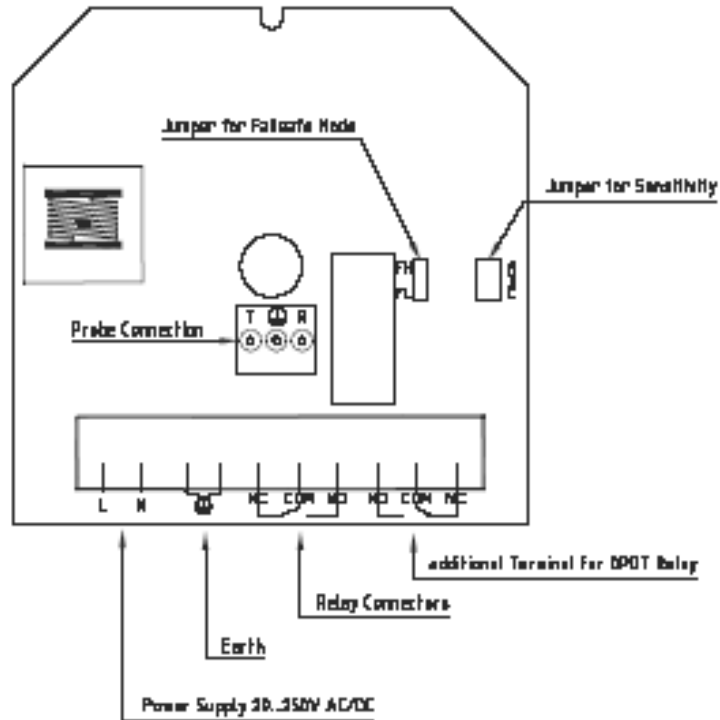
Fig. 7.1 Assembly of probe, housing and PCB

The orientation screw must be tightened firmly, (torque 3 Nm).

The standard PCB is suitable to all versions of the *Diamond Point* probes. But the PCB-HT (for high temperature probe) must be used for HT (high temperature)-probes only and vice versa.


Non-standard PCBs are marked with a label „ *Special Model HT*“ e.g.

The probe gets connected to the PCB by the three leads as shown in Fig. 7.2



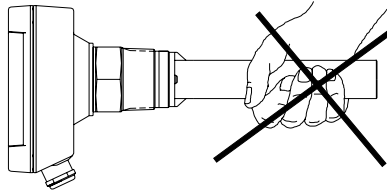
The terminal on the PCB for power supply and control circuit allows a maximum lead diameter of 2.5 mm².

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.

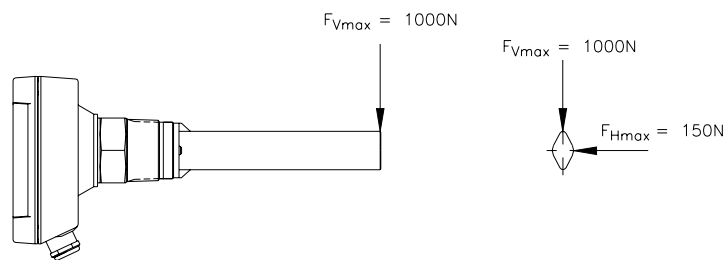
- | | |
|----------------------|---|
| Probe Connection: | red wire of probe to T
Black wire of probe to 
Red wire of probe to R |
| Failsafe Mode: | FH for High Level Alarm
FL for Low Level Alarm |
| Sensitivity Setting: | A high sensitivity for extremely light material
B for normal material
C low sensitivity for heavy materials and materials which might build a deposit on the vibrating blade. |

8. Handling / Caution

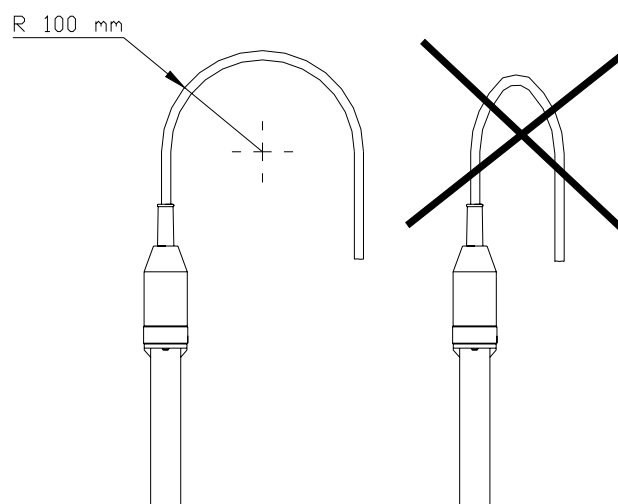
- The *Diamond Point* must never be handled by the blade!



- The blade must not be bent and its dimensions must not be altered.
- The maximum vertical load upon the end of the blade must not exceed 1000 N (100kp).
- The maximum horizontal load upon the end of the blade must not exceed 150 N (15kp).



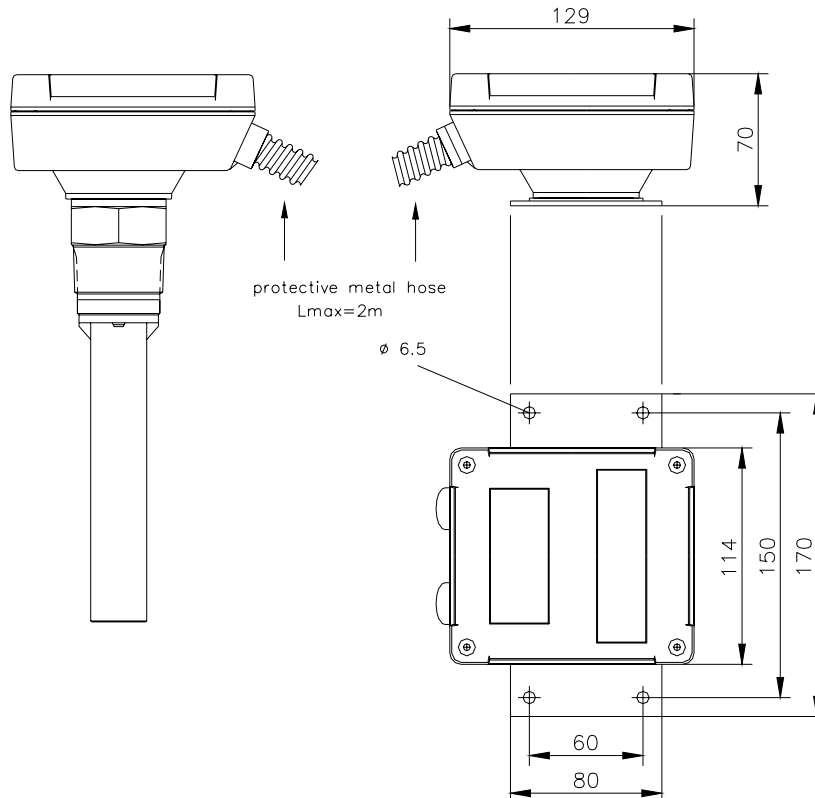
- The cable of the DP150 must not be bent with a bending radius smaller than 100 mm.



9. Appendix

9.1 Separate Housing Installation

The drawing shows a separate housing installation of the DP120. Separate housing installation is also possible for DP130, DP140 and DP150.



If the temperature outside the bin near the bin wall exceeds the maximum ambient temperature of the PCB, (60°C), it is necessary to install the PCB in a separate housing apart from the bin where the temperature is in the allowed range.

Separate housing installation is also necessary in case of heavy vibrations of the bin.

In this case the separate housing has to be installed at a place apart from the vibrations.

PCB and probe get connected by a shielded cable via the terminal PCB which is located inside the housing on top of the mounting socket of the probe. A metal hose which is screwed between the separate housing and the housing that contains the terminal PCB is protecting the cable. The separate housing can be installed by means of the mounting plate.