HYCONTROL
LEVEL MEASUREMENT SOLUTIONS

Vibrating Level Switch

DP600

DP630

DP650

Instruction Manual

Second revision, April 2016

Hycontrol Limited . Larchwood House . Orchard Street . Redditch . Worcestershire . England . B98 7DP

Tel: +44 (0) 1527 406800 . Fax: +44 (0) 1527 406810 . Email: sales@hycontrol.com . Web: www.hycontrol.com

Certified according to:
DIN EN ISO9001:2008

0813 *English*

Instruction Manual

IMPORTANT:

For safety reasons, and to ensure proper function of these instruments, it is strongly recommended users carefully read this instruction manual before installation.

Application

The DP600/630/650 SERIES are vibration-type level control instruments that detect the minimum and maximum level in bins, silos and hoppers, filled with grained materials (bulk solids). Typical product applications are plastic granules, all kinds of pellets, corn etc.

IMPORTANT:

The instruments cannot be used for detecting materials which are sticky and tend to build a deposit on the vibrating blade!

General Notes:

- Installation and maintenance must be performed by qualified technical personnel only.
- DP600/630/650 must be used only in the manner outlined in this instruction manual.
- Never expose these instruments to mechanical loads and temperatures higher than indicated in the technical data. Do not make any changes on these instruments.

Models

- DP600: standard model, insertion length 157mm
- DP630: model with tube extension, insertion length max. 1,0m
- DP650: model with cable extension, insertion length max. 4,0m

Function

The signal from the electronic circuit excites the rod of the instrument to vibrate on its resonance frequency of approx. 460 Hz. When material covers the rod of the probe, the vibration stops. This is sensed by the electronic circuitry which forces its output to switch. When the blade gets uncovered, the vibration will restart and the output switches back.

Technical Data

General:

Enclosure:	die-cast aluminium (option: powder coated) protection IP66 and IP67 1 cable gland M16x1,5 (option: 2 cable glands) suitable for cable diameters 4,5 to 10 mm
Probe:	stainless steel 1.4301 / AISI 304 resonance frequency approx. 460 Hz extension cable DP650: PU sheeted
Connection:	thread 1“ conical DIN 2999 or 1“ NPT
Time Delay	1 second from stop of vibration 2 to 5 seconds for start of vibration
Indication	relay: red LED on PCB 2-wire: green LED on PCB Power supply: yellow LED on PCB (relay version only)
Density of material to be monitored:	min. 20 g / litre
Max. load upon the end of the blade:	80 N

Max. load onto cable DP650: 200 kg

Max. pressure inside bin: 10 bar
(0,8 … 1,1 bar for models with ATEX approval)

Safety: protection class I / installation category III / pollution degree 2 / altitude max. 2000m

Electronics:

Wide range version with relay output

Power Supply:	20...250V AC/DC
Relay Output: (SPDT)	one potential free change over contact max. switching voltage 250V-AC max. switching current 5A max. switching power 1250VA @ cos φ = 1 150 Watt for DC
Power Consumption:	3VA

2-Wire DC-Version with 8/16mA current output

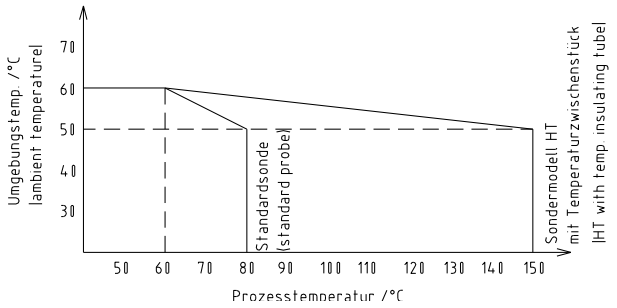
Power Supply:	20…30V-DC (max. 23,7V at Exi-Versions)	
Current:	Max-Alarm FH:	8mA (probe vibrating) 16mA (probe damped)
	Min-Alarm FL:	8mA (probe damped) 16mA (probe vibrating)

Conversion into relay signal by ext. supply and analyzing unit *DP2000AE*
Power consumption: ≤ 0,5W

Max. lead diameter for power supply and output signal: 1,5 mm²

Max. allowed ambient and process temperature range:

Ambient temperature for electronics: -20°C ... + 60°C
Ambient temperatures depend on process temperatures as follows:



Process temperature for standard probe: -20°C ... + 80°C
Process temperature for probe HT: -20°C ... + 150°C
(special model for high temperatures)
Process temperature for probe DP650: -20°C ... + 70°C

CE-Conformity

The level switches DP600/630/650 meet the requirements of the following regulations:

- EG-EMC-directive 2014/30/EU
- EG-Low Voltage Directive 2014/35/EU

The following standards are applied:
- EN 61326-1:2013
- EN 61010-1:2011

Approvals

Dust-Ex: The vibration type level switches DP600StEx can be used in the presence of combustible dust according to ATEX directive 2014/34/EU:
Equipment group II, category 1/2 D or II 1/3D for models with remote electronics installation. Approved instruments do have the indices „*StEx*“ and a name plate showing the following data:

HYCONTROL LTD www.hycontrol.com
Orchard Street - Redditch - Worcestershire B98 7DP - ENGLAND - sales@hycontrol.com

CE 0038 DP600DIN-StEx
Ser.No.: xxxxxStEx
Power Supply: 20...250V AC/DC
Relay Output: max. 8A @ 250V
Power Consumption: 3 VA

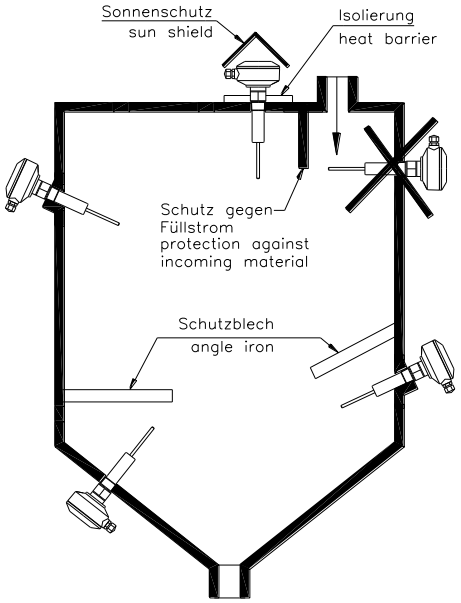
Ex II 1/2D Ex ta/tb IIIC T95° Da/Db IBExU09ATEX 1133
Ambient temp. encl. (Zone 21): -20..+60°C Process temp. probe (Zone 20): -20..+80°C

Applied standards: EN 60079-0:2012 and EN60079-31:2014.

Mounting

The following has to be considered when mounting DP600/630/650, (please refer to the sketch below):

- The switching point depends on the density of the material: for heavy materials only a few millimetres of the vibrating rod have to be covered for damping of the vibration. With light materials the material must cover the vibrating rod completely in order to damp its vibration.
- The instrument must not be mounted in or near the path of incoming material. The falling material could damage the probe.
- 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 enclosure and the bin wall in cases the temperature of the material inside the bin exceeds 60°C. Instead it also is possible to use a temperature insulating tube which must be mounted between mounting socket and enclosure, (see chapter *Special Models*).



Side mounting or vertical mounting:

- DP600 and DP630 can be mounted at the container either from the side or vertically from top or bottom. DP650 is for top mounting only.
- For side mounting it is recommended to screw the unit into the bin wall with the vibrating rod pointing slightly downwards (approx. 20°) so that material can more easily flow.
- The unit must not be mounted in or near the path of incoming material. If this cannot be avoided a protection shield, for example an angle steel with side length approx. 50mm, must be installed approx. 150mm over the probe. A protection shield is also necessary for low level detection in order to protect the probe against falling material.
- The unit gets installed by screwing the mounting socket of the instrument into the bin wall by means of a 36 mm open end wrench.
- A suitable sealing (like Teflon tape) must be applied onto the thread.

IMPORTANT:

Do not screw by turning the housing!

Orientation of the cable glands:

The cable glands 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, use a 4mm hexagon socket screw key, (Allen key)
- Use a 10mm wrench to loosen the mounting nut in the centre of the enclosure
- Turn the housing into the correct position so that the cable glands are pointing downwards
- Tighten the mounting nut, torque 3 to 4 Nm
- Close the cover of the housing (torque 3Nm).

Cable ducts which are not used must be sealed!

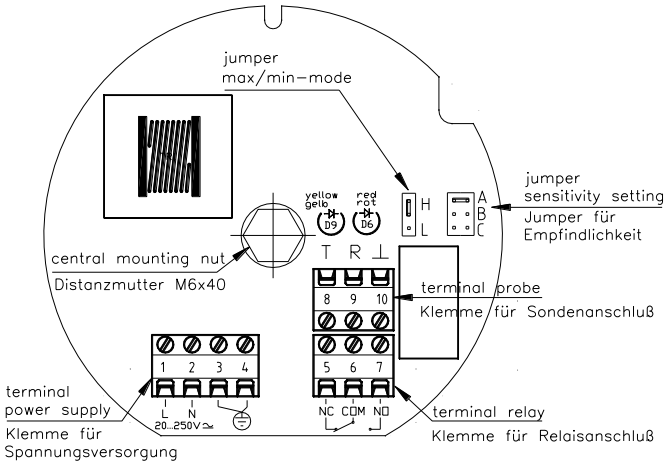
Wiring

Safety Guidelines:

- The instruments must be used only at fixed installation of the cables for supply voltage and output signal.
- Wiring of these instruments must only be performed by qualified technical personnel.
- Before opening the cover and start of wiring make sure that power supply on all wires has been switched off.
- According to DIN EN 61010-1 a main switch for this instrument has to be installed nearby the instrument with which power supply for this instrument **and** its output can be switched off. This switch must be marked as main switch of the instrument.
- For power supplies ≥ 50V protective earth has to be connected to the terminal on the enclosure.
- If power supply and relay signal do not have the same source the connecting wires of the power supply have to be separated from the connecting wires of the relay by means of wire fasteners in order to prevent the connecting wires of the power supply getting in touch with the output terminals and vice versa, (which might be possible in case of an error, e.g. brake of a wire).

The cables for power supply and output signal must be connected to the terminals according to the following sketch:

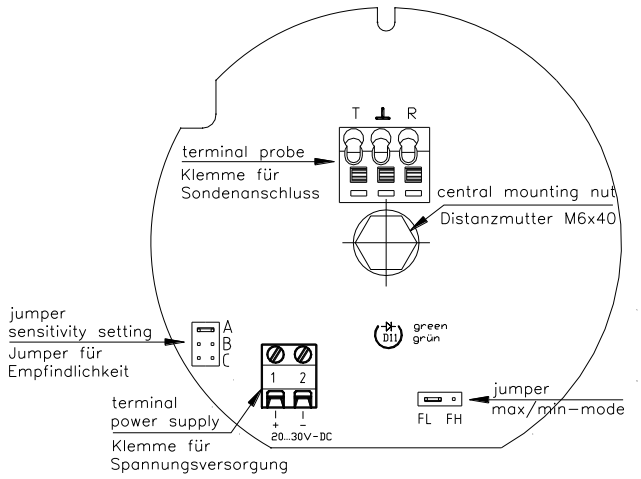
Wide range version with relay output



Terminals for power supply:	1 = L	Terminals for relay:	5 = NC
	2 = N		6 = COM
	3 = protective earth		7 = NO
	4 = protective earth		

The probe is connected to the PCB by the three leads of the probe:
terminal probe: 8 = T (red lead), 9 = R (yellow lead), 10 = ⊥ (black lead)

2-wire-version with current output 8/16mA



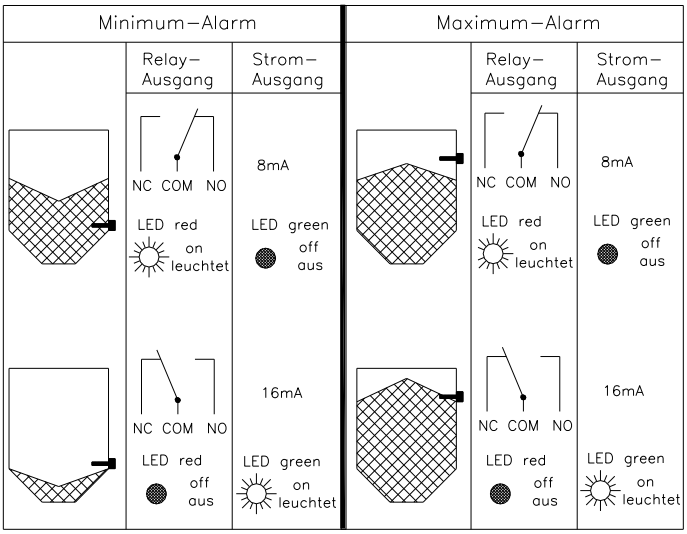
This model must be connected to a supply and analysing unit as follows: **T1: 20-30vDC T2: ground**

Adjustment

Failsafe high (FH) / Failsafe low (FL):
Switching Logic: see following sketch.

Failsafe high for high level alarm: jumper in position FH:
The relay is de-energized (position NC, red LED off), when the rod is covered by material or power has failed. The 2-wire version takes 16mA and the green LED is on.

Failsafe low for low level alarm: jumper in position L:
The relay is de-energized (position NC, red LED off), when the blade is free, (not covered by material), or power has failed. The 2-wire version takes 16mA and the green LED is on.



Sensitivity setting:
Selectable by jumper:

Pos. A: use this setting only for light material with densities down to 20g/l. The sensitivity is high at this setting.

Pos. B: standard setting, sufficient for most materials.

Pos. C: for heavy materials with high densities which may form a deposit on the vibrating rod. As the sensitivity of the instrument is low at position C, light materials can not be detected at this setting!

Options

The following options are available:

- Enclosure powder coated
- Second cable gland

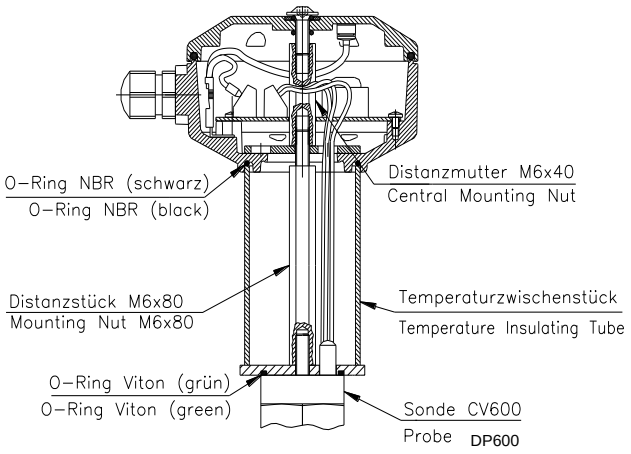
Special Models

Special model for high temperatures:

This model can be used for process temperatures up to 150°C.
Important: the instruments have got the same outlook as the standard instruments, therefore they are marked with labels *„Special Model HT“* and the serial numbers of probes and electronics do have the indices *„-HT“*. **Special model probes must only be used together with the according special model electronics and vice versa!** In order to ensure that the ambient temperature of the electronics, (60C°), will not be exceeded due to thermal conduction via the probe a temperature insulating tube has to be mounted between probe and enclosure, (see following chapters).

Temperature Insulating Tube:

The tube gets fixed onto the mounting socket of the probe by means of a 80mm long mounting nut M6. The enclosure gets fixed onto the tube by means of a washer ∅50x3 and the mounting nut M6x40. The red O-ring sealing, (special material silicon), must be located between mounting socket and tube and the black standard O-Ring must be located between tube and enclosure. Use torque 3 to 4 Nm for the screwing of the mounting nuts.



Remote Electronics Installation

If the temperature outside the bin near the bin wall exceeds the max. allowed ambient temperature of the PCB, (60°C), as an alternative to the temperature insulating tube the PCB can be installed in a remote enclosure apart from the bin where the temperature is in the allowed range. Remote electronics installation is also necessary in the case of heavy vibrations of the bin. In this case the remote enclosure 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 enclosure, fixed on top of the mounting socket of the probe. A metal hose which is screwed between the remote enclosure and the enclosure that contains the terminal PCB is protecting the cable. The remote enclosure can be installed by means of the mounting plate. Cable and metal hose can withstand temperatures up to 80°C. In order to achieve IP65 protection both connections of the metal hose have to be tightened firmly (torque 3 to 4 Nm).

Spare Parts

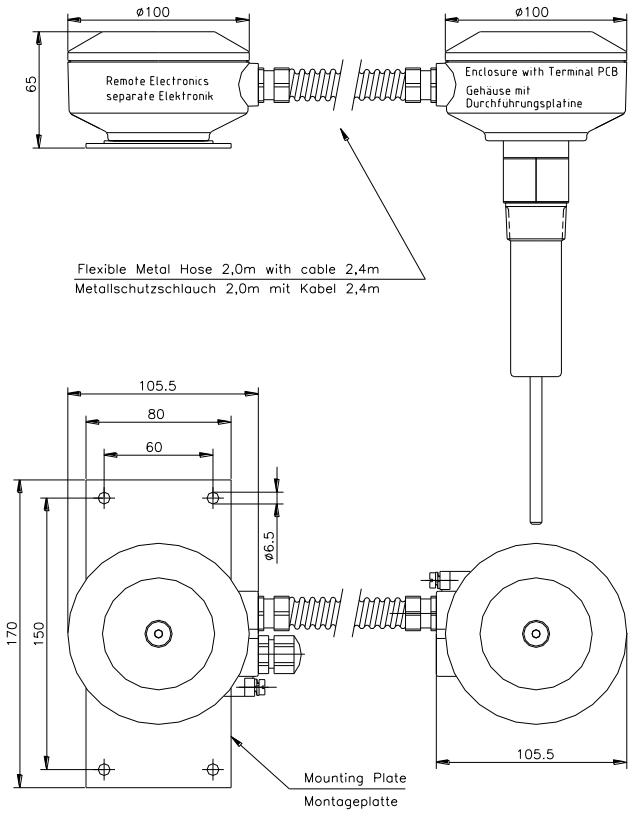
The following spare parts are available:

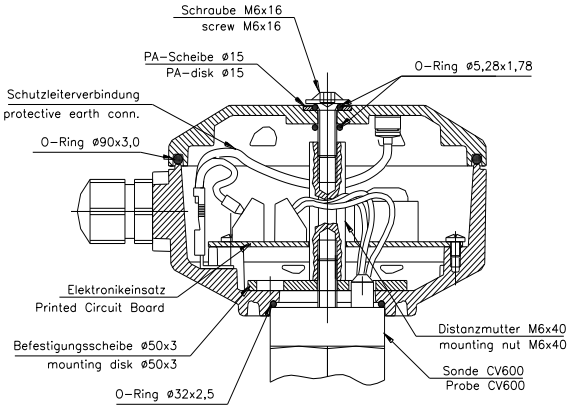
- vibrating probe
- electronics
- enclosure

Contact the distributor who has supplied you with this instrument for spare parts or contact Hycontrol directly.

Assembling of probe, enclosure and electronics must be done according the sketch aside.

Drawing of the remote electronics installation





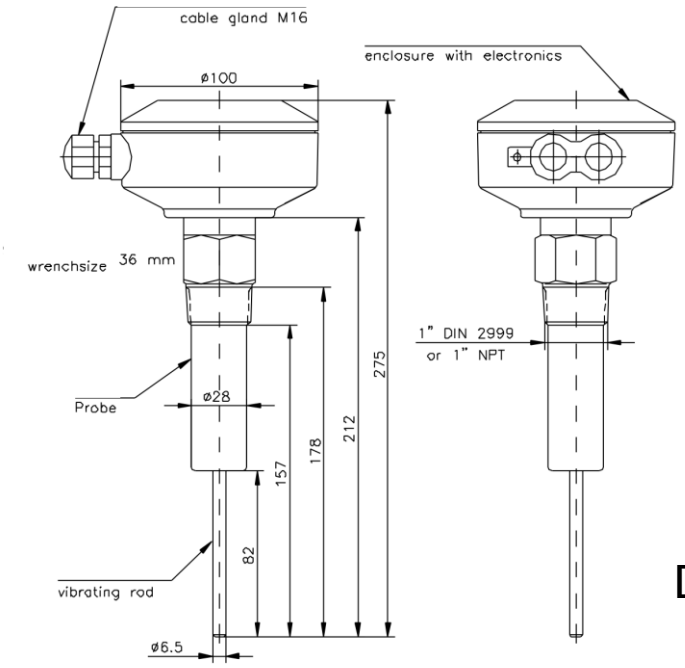
The following has to be considered:

- assembling must be done by qualified personnel only
- all O-ring sealing must sit in its appropriate position according to the sketch aside
- apply torque 3 to 4Nm for the mounting nut M6x40
- apply torque 3Nm for the screw M6x16
- apply torque 3Nm for the cable gland.
- care must be taken that special model probes will only be used together with the appropriate special model electronics.

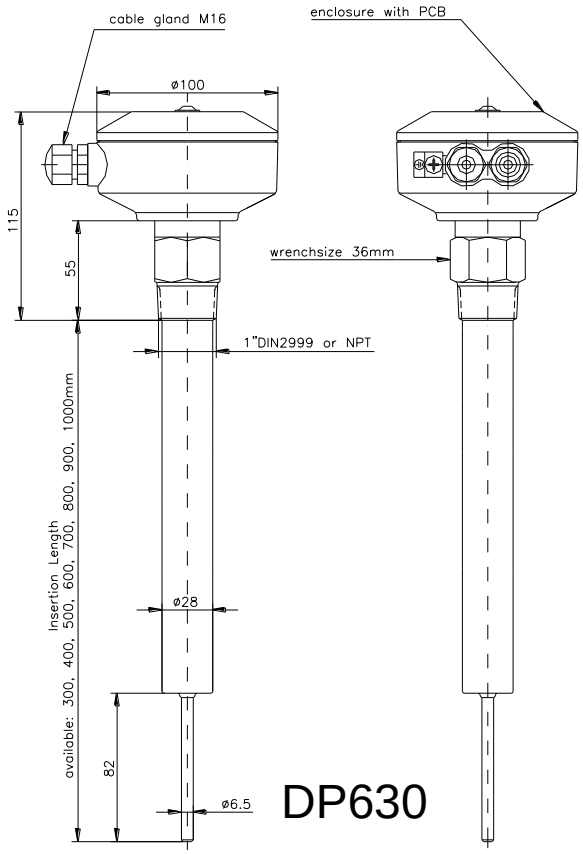
Maintenance

DP600/630/650 require no maintenance.
For applications with materials that are a little bit sticky we recommend to clean the vibrating blade of the instrument in certain periods of time. If the instruments are exposed to corrosive atmosphere they must be inspected in certain periods of time regarding corrosion of probe and enclosure in order to ensure the protection of the instruments.

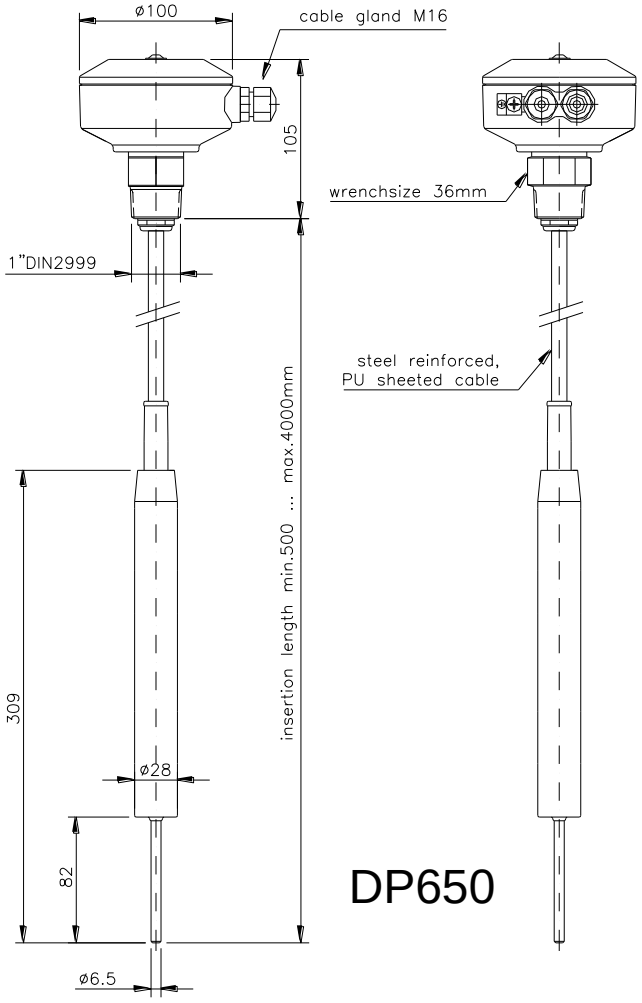
Dimensions



DP600



DP630



DP650

Safety Guidelines

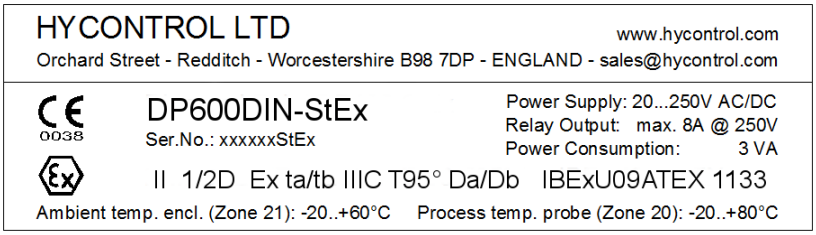
Safety guidelines for use of the vibrating level switches DP600StEx / DP630StEx / DP650StEx in the presence of combustible dust.

General:

The vibrating level switches DP600StEx / DP630StEx / DP650StEx can be used in the presence of combustible dust according to ATEX directive 2014/34/EU: equipment group II, category 1 / 2 D.

Marking of approved instruments according to directive 2014/34/EU:

On the enclosure of the vibrating level switches DP600StEx / DP630StEx / DP650StEx is a nameplate showing the following data:



e.g:

DP600 StEx with wide range power supply, standard unit (no high temp)

Categories and allowed Zones of the components:

Component	Category	can be used in Zone
Probe	1 D	20, 21 or 22
Enclosure with PCB	2 D	21 or 22

Protection according to EN 60079-0 and EN60079-31:

- protection by dust-tight enclosure IP6X
- limited surface temperatures of the apparatus

.

Maximum surface temperatures:

Zone	max. permissible amb. temperature	max. surface temperature at failure	heat up due to failure
Zone 20	80°C for standard units 70°C for DP150 150°C for high temperature (= process temp.)	80°C for standard 70°C for DP150 150°C for high temp	0 K 0 K 0 K
Zone 21	60°C	95°C	+35 K

The 35K maximum heat up of the enclosure surface results on 25K heat up of the electronics at failure and additional 10K due to heat conduction via the probe in cases the process temperature is higher than 60°C.

Special guidelines for installation, set up and maintenance of apparatus in the presence of combustible dust:

- Installation, set up and maintenance must be performed in conjunction with the instruction manual and by qualified technical personnel only.
- Local governing regulations and standards must be followed.
- The enclosure must only be opened when power supply on all wires has been switched off.
- Before opening the enclosure dust deposits must be removed and dust clouds must be avoided.
- In order to maintain the protection by dust-tight enclosure it is essential that assembling of the instruments must be performed according to the descriptions in the instruction manual. Special care must be taken that all sealings and sealing planes are not to be damaged and that all sealings sit in its appropriate position. All screws must be fastened by applying the torques according to the instruction manual.