



Vibrating Level Switch

DP600

DP630

DP650

Instruction Manual

Seventh revision, February 2022

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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 or 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 rod!

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 at 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 rod gets uncovered, the vibration will restart and the output switches back.

Technical Data

General:

Enclosure:	Die-cast aluminium (powder coated RAL 2008) Protection IP66 (IP65 for remote electronics installation) 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 sheathed
Connection:	Thread 1" BSPT (EN 10226) 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 rod:	80 N
Max. load on cable DP650:	200 kg
Max. pressure inside bin:	10 bar (0.8 ... 1.1 bar for models with ATEX or UKEX 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:	One volt free change over contact (SPDT) Max. switching voltage: 250V AC Max. switching current: 5A (NO-contact), 3A (NC-contact) Max. switching power: 1250VA @ $\cos \varphi = 1$, 150 Watt for DC
Power Consumption:	3VA

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

Power Supply:	20...30V DC
Current:	Max-Alarm FH: 8mA (probe vibrating) 16mA (probe damped) Min-Alarm FL: 8mA (probe damped) 16mA (probe vibrating)

Note: 2-Wire version is **NOT** ATEX or UKEX approved.

For 2-Wire models without approval, power supply and signal conversion can be performed by any suitable DC supply with current sensing capability. In this case the maximum technical data have to be considered.

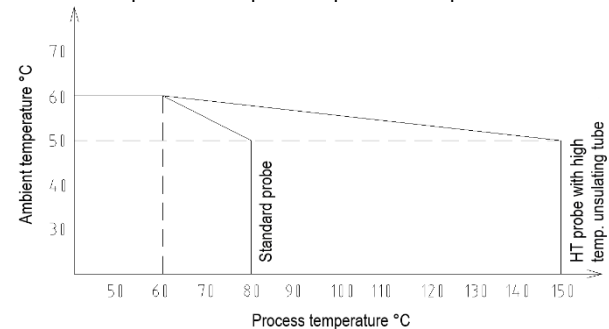
Power consumption: $\leq 0.5W$

Max. wire 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:
(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 EU regulations:

- EU EMC-directive 2014/30/EU
- EU Low Voltage Directive 2014/35/EU
- ROHS2 2011/65/EU

UKCA Conformity

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

- UK Electro magnetic compatibility Regulations SI 2016 No. 1091
- UK Electrical Equipment (Safety) regulations SI 2016 No. 1101
- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations SI 2012 No. 3032 (as amended)

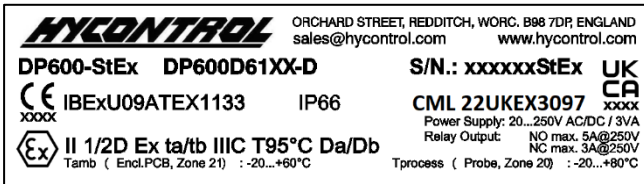
The following standards are applied:

- EN 61326-1
- EN 61010 -1
- EN 50581

Approvals

Dust Ex

The vibration type level switches DP600StEx/ DP630StEx and DP650StEx can be used in the presence of combustible dust according to *ATEX directive 2014/34/EU* or *UKEX SI 2016 No. 1107 (as amended)*: equipment group II, category 1/2 D or 1/3 D for models with remote electronics installation. Approved instruments have the indices "StEx" and a name plate showing the following data:



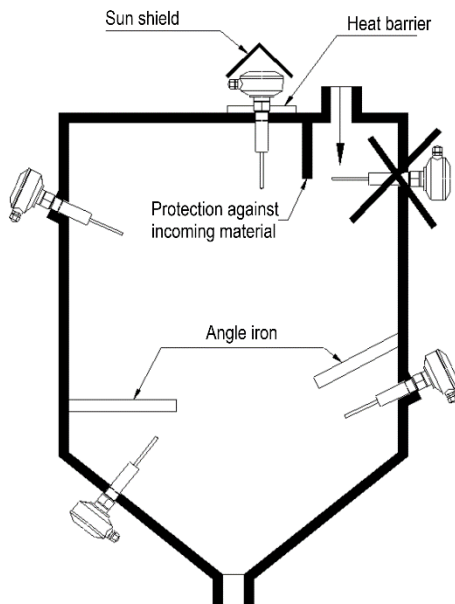
Applied standards: EN 60079-0 and EN60079-31.

For ATEX or UKEX approved instruments please also read the special safety instructions at page 7 of this manual!

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 should be installed between the enclosure and the bin wall if the temperature of the material inside the bin exceeds 60°C. Alternatively it is possible to use a temperature insulating tube fitted between the mounting socket and enclosure (see page 5 - *Special Models*).



Side mounting or vertical mounting:

- DP600 and DP630 can be mounted on 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 iron 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 is installed by screwing the mounting socket into the bin wall by means of a 36 mm open end wrench.
- A suitable sealing (like Teflon tape) must be applied to 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!

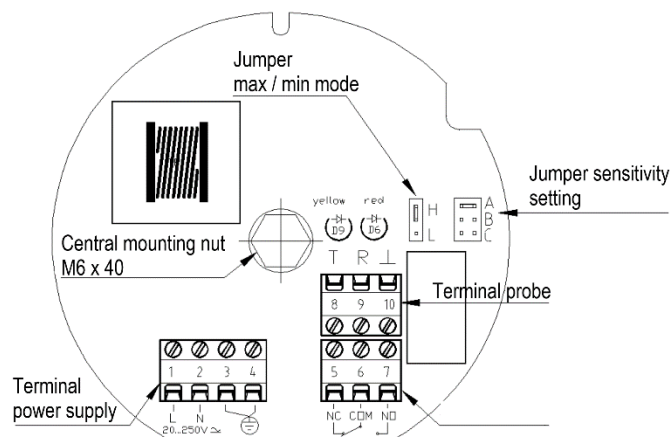
Wiring

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 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 $\geq 50V$ 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 from touching the output terminals and vice versa, (which might be possible in case of an error, e.g. a broken wire).

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

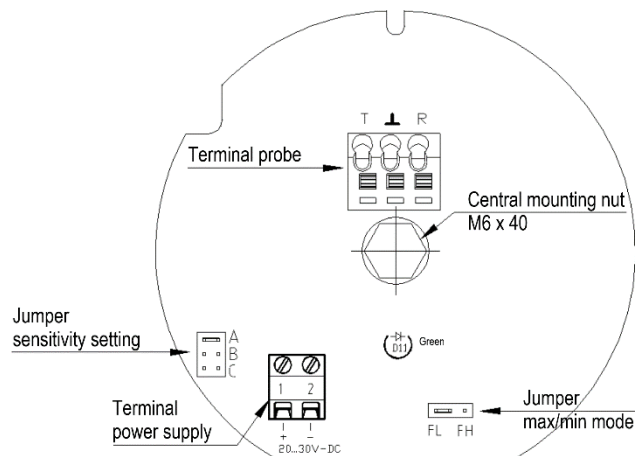
Wide range version with relay output



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**

Note: 2-Wire version is NOT ATEX or UKEX approved.

Adjustment

Failsafe high (FH) / Failsafe low (FL):

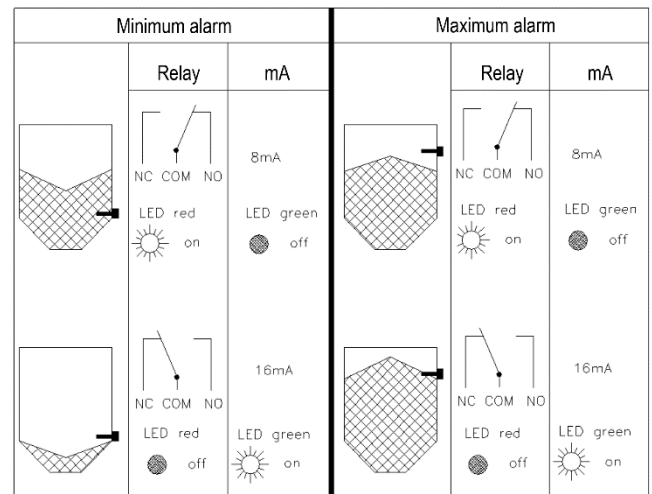
Switching Logic: see following sketch.

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 cannot be detected at this setting!

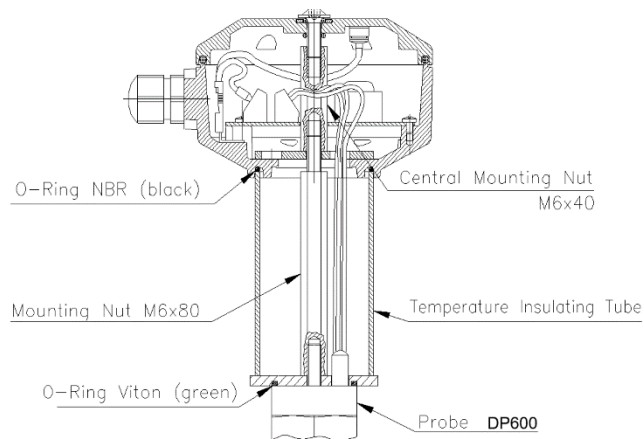
Special Models

Special model for high temperatures:

This model can be used for process temperatures up to 150°C.

Important: the instruments appear similar to the standard instruments, therefore they are marked with labels “*Special Model HT*” and the serial numbers of probes and electronics have the indices “*HT*”. **Special model probes must only be used together with the appropriate special model electronics and vice versa!** In order to ensure that the ambient temperature of the electronics, (60°C), 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 (Already assembled):



The tube is fixed onto the mounting socket of the probe by means of a 80mm long mounting nut M6. The enclosure is fixed onto the tube by means of a washer Ø50x3 and the mounting nut M6x40. The red O-ring sealing, (special material Silicon), must be located between the 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 away 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 are 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 protects 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

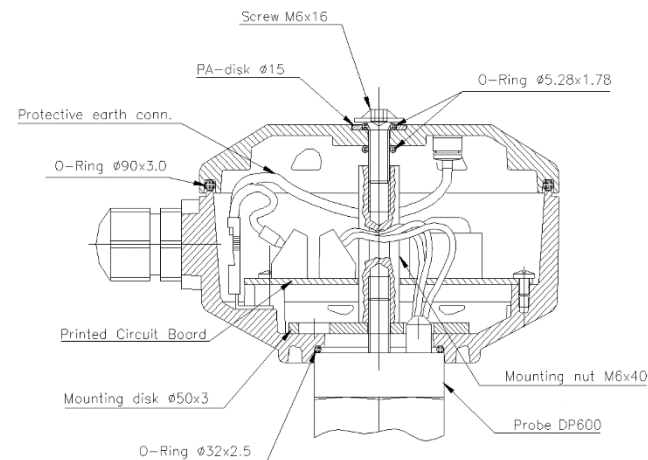
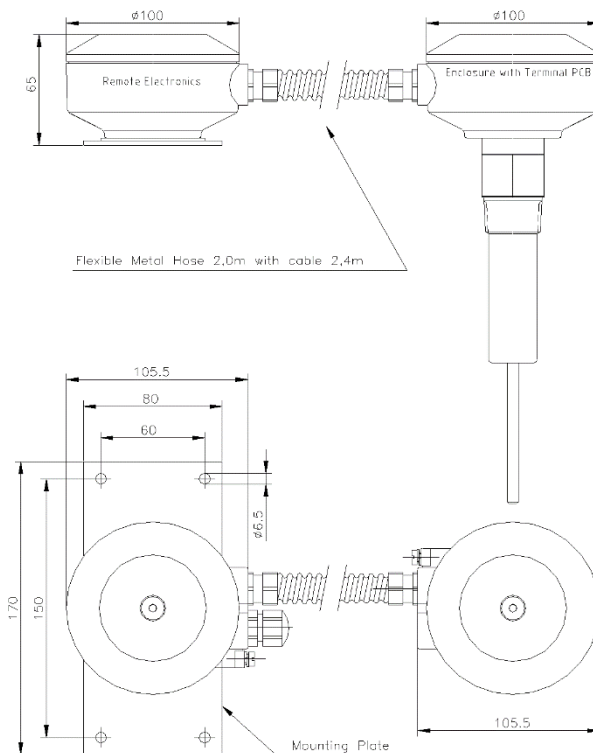
The following spare parts are available:

- 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 to the sketch on the right.

Drawing of the remote electronics installation



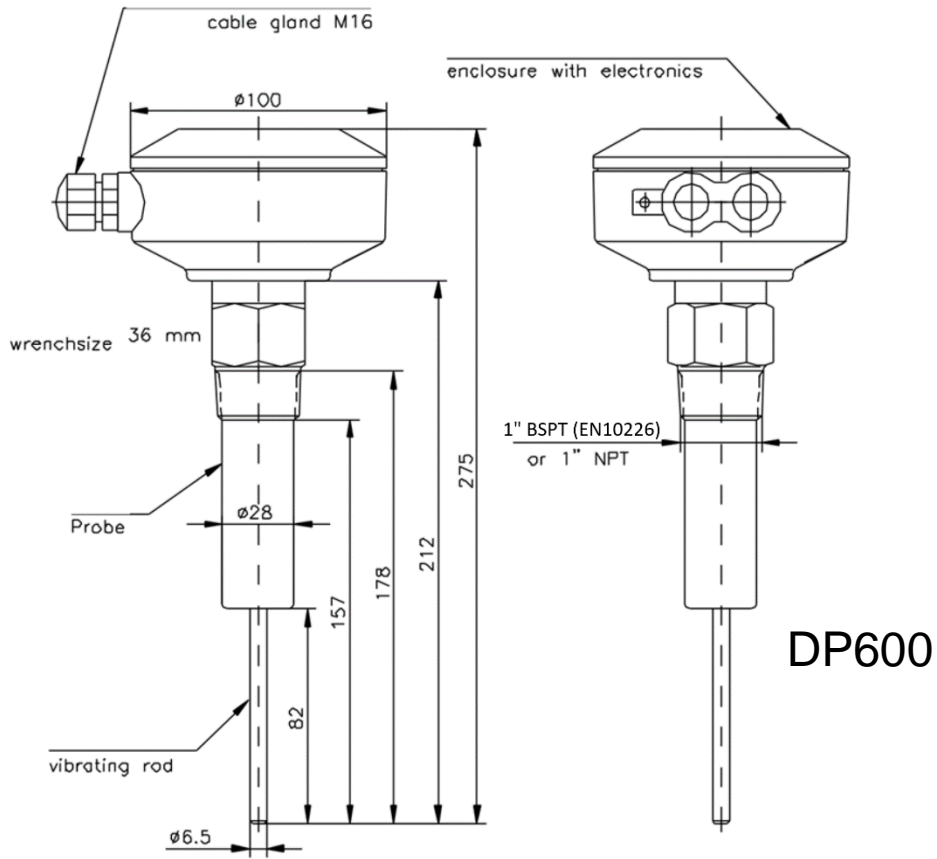
The following has to be considered:

- assembling must be done by qualified personnel only
- all O-ring sealing must sit in its appropriate position according to the sketch above
- 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.

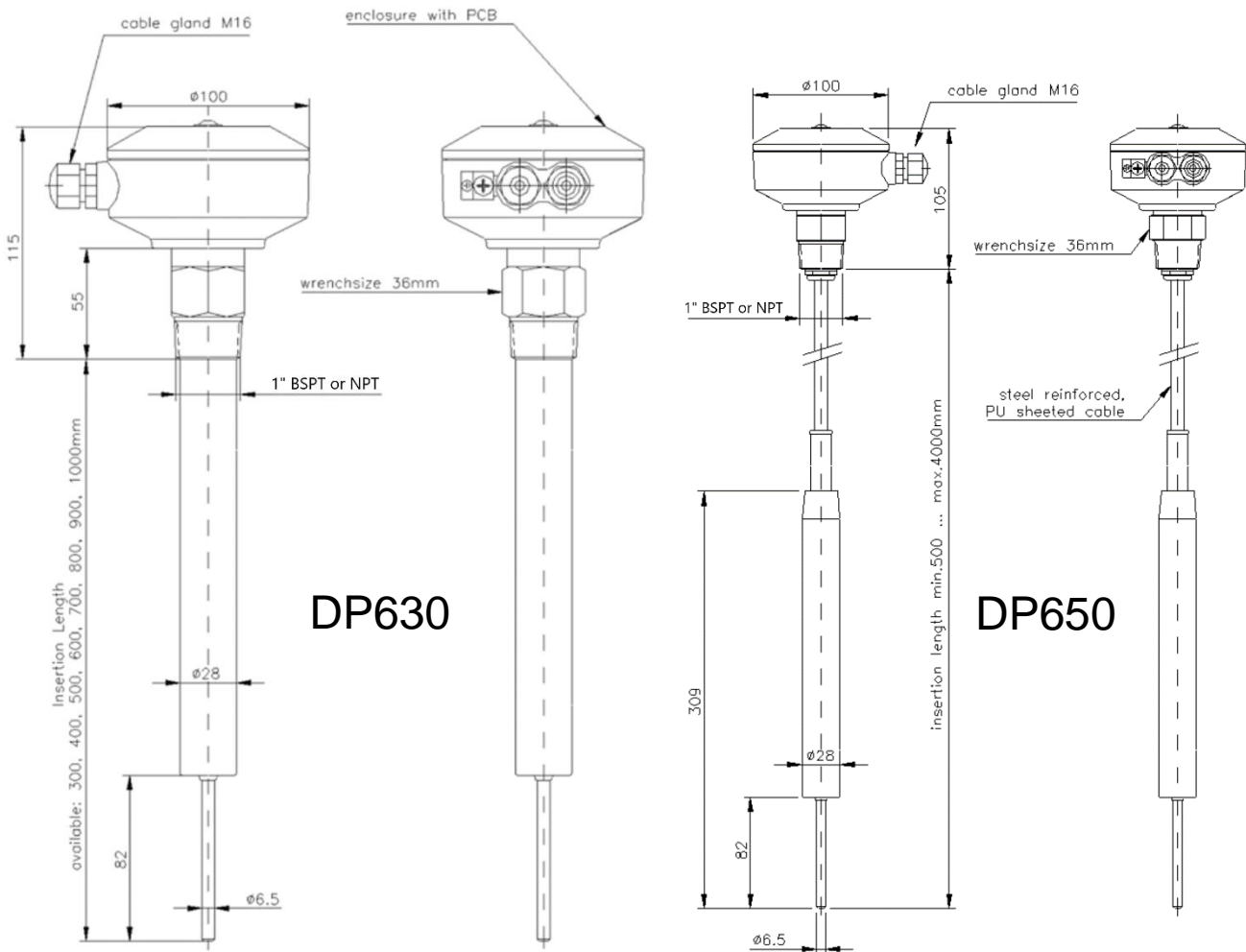
Maintenance

DP600/630/650 require no maintenance. For applications with materials that tend to be sticky we recommend cleaning the vibrating rod of the instrument periodically. If the instruments are exposed to a corrosive atmosphere they must be inspected periodically regarding possible 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 or UKEX SI 2016 No. 1107 (as amended): equipment group II, category 1/2 D or 1/3 D for remote electronics installation.

Marking of approved instruments according to ATEX directive 2014/34/EU or UKEX SI 2016 No. 1107 (as amended):

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

HYCONTROL		ORCHARD STREET, REDDITCH, WORC. B98 7DP, ENGLAND	
		sales@hycontrol.com www.hycontrol.com	
DP600-StEx	DP600D61XX-D	S/N.: xxxxxxStEx	UK
	IBExU09ATEX1133	IP66	CA
xxxx		CML 22UKEX3097	xxxx
	II 1/2D Ex ta/tb IIIC T95°C Da/Db	Power Supply: 20...250V AC/DC / 3VA	Relay Output: NO max. 5A@250V NC max. 3A@250V
	Tamb (Encl.PCB, Zone 21) : -20...+60°C	Tprocess (Probe, Zone 20) : -20...+80°C	

e.g:
DP600 StEx with wide range power supply, standard unit (no high temp)

OR

HYCONTROL		ORCHARD STREET, REDDITCH, WORC. B98 7DP, ENGLAND	
		sales@hycontrol.com www.hycontrol.com	
DP600-REM-StEx	DP600D6123-D	S/N.: xxxxxxStEx	UK
	IBExU09ATEX1133	IP65	CA
xxxx		CML 22UKEX3097	xxxx
	II 1/3D Ex ta/tc IIIC T95°C Da/Dc	Power Supply: 20...250V AC/DC / 3VA	Relay Output: NO max 5A@250V NC max 3A@250V
	Tamb (Encl.PCB, Zone 21) : -20...+60°C	Tprocess (Probe, Zone 20) : -20...+80°C	

e.g:
DP600-REM StEx Remote electronics with wide range power supply, standard unit (no high temp)

OR

HYCONTROL		ORCHARD STREET, REDDITCH, WORC. B98 7DP, ENGLAND	
		sales@hycontrol.com www.hycontrol.com	
DP600-HT-StEx	DP600D6125-D	S/N.: xxxxxxStEx	UK
	IBExU09ATEX1133	IP66	CA
xxxx		CML 22UKEX3097	xxxx
	II 1/2D Ex ta/tb IIIC T95°C Da/Db	Power Supply: 20...250V AC/DC / 3VA	Relay Output: NO max. 5A@250V NC max. 3A@250V
	Tamb (Encl.PCB, Zone 21) : -15...+60°C	Tprocess (Probe, Zone 20) : -15...+150°C	

e.g:
DP600-HT StEx with wide range power supply, high temp

OR

HYCONTROL		ORCHARD STREET, REDDITCH, WORC. B98 7DP, ENGLAND	
		sales@hycontrol.com www.hycontrol.com	
DP600-REM-HT-StEx	DP600D6102-D	S/N.: xxxxxxStEx	UK
	IBExU09ATEX1133	IP65	CA
xxxx		CML 22UKEX3097	xxxx
	II 1/3D Ex ta/tc IIIC T95°C Da/Dc	Power Supply: 20...250V AC/DC / 3VA	Relay Output: NO max 5A@250V NC max 3A@250V
	Tamb (Encl.PCB, Zone 21) : -15...+60°C	Tprocess (Probe, Zone 20) : -15...+150°C	

e.g:
DP600-REM-HT StEx Remote electronics with wide range power supply, high temp

xxxx = Notified or Approved body number for Quality Assurance Notification.

Categories and allowed Zones of the components:

Component	Category	EPL Equipment protection level	can be used in Zone
Probe	1 D	Da	20, 21 or 22
Enclosure with PCB	2 D	Db	21 or 22
Remote Electronics Installation	3 D	Dc	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	Type	Max. permissible temperature	Max. surface temperature at failure	Heat up due to failure
Zone 20 (probe)	DP600/DP630	80°C	80°C	0 K
	DP650	70°C	70°C	0 K
	High temperature version	150°C	150°C	0 K
Zone 21/22	Enclosure with PCB	60°C	95°C	+35 K*

*The 35K maximum heat up of the enclosure surface results in a 25K heat up of the electronics at failure and an additional 10K due to heat conduction via the probe in cases where 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.