LEVELSWITCH-RD

CV120 / CV130 / CV140 / CV150

New design for an established and proven equipment:

the tough and reliable **LEVELSWITCH**-series has been reworked and now comes with a new designed state-of-the-art enclosure.

These vibrating level switches for bulk solids convince by their high versatility. They are applicable for the detection of almost all bulk materials: heavy or lightweight, granular or powdered.

1020

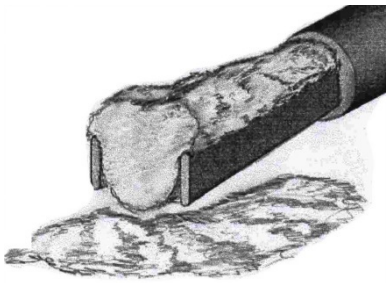
zertifiziert nach
DIN EN ISO9001:2015

Advantages of the operating principle over alternative level sensing technologies:

- no moving parts: high durability, no wear out
- no maintenance required
- unaffected by environmental changes e.g. temperature, pressure, humidity
- unaffected by material changes
- unaffected by dust clouds and agitation
- no calibration required
- maximum versatility
- the vibration has a self-cleaning effect

Single blade design

- The special design where only one rod comes in touch with the material to be detected prevents material bridging, a failure that is typically associated with the dual blade „tuning fork“ design.



- Extremely sensitive: the **LEVELSWITCH** can be used for extremely lightweight material with densities as low as 20 grams / liter.
- Strong stainless steel construction with patented reinforced membrane makes the **LEVELSWITCH** tough for the use with heavy material such as cement.
- Material build-up on the container wall has no influence on the function of the **LEVELSWITCH** as only the tip of the vibrating blade is sensitive and not the base.

Highest quality

- latest state-of-the-art piezoelectric technology
- solid stainless-steel construction
- designed and manufactured at PTL in Germany according to DIN EN ISO9001:2015
- more than 35 years of experience in the field of level control.

1020

Function and Application

The vibrating system of the **LEVELSWITCH** gets forced to vibrate on its resonance frequency by a piezo crystal drive. If filling material, (bulk solids), covers the vibrating blade of the probe, its vibration gets damped. This is sensed by the electronic circuitry which forces its output to switch. When the blade gets uncovered due to declining level, the probe restarts to vibrate and the output switches back.

Because of its maximum versatility the **LEVELSWITCH** is ideal for applications where contents changes are common since the instrument must not be calibrated according to the characteristics of the material.

The following list shows some of the material the **LEVELSWITCH** has been successfully used for:

powdered milk	tea (leaf)	wood shavings
frozen chips	salt	chalk
beans	flour	styrofoam
sugar	spices	cellulose
sweets	soda	glass ground
coffee beans	pellets	granular plastics
coffee ground	animal food	powdered clay
peanuts	carbon black	polystyrene
tobacco	chemicals	gravel
cement	foundry sand	sawdust

Models

Compact model: *LEVELSWITCH CV120*

Insertion length: 170mm.
Connection: thread 1-1/2” EN10226 (equals BSPT) or NPT
Mounting: Top- or side mounting.

Pipe extension welded: *LEVELSWITCH CV130*

For application that require longer insertion lengths. This model offers the possibility to adapt the insertion length exactly to the application.

Insertion length: min. 200mm
max. 2000mm
Connection: 1-1/2” EN10226 (equals BSPT) or NPT

Alternatively: **“Tri-Clamp”** according to DIN32626.

Mounting: Top mounting.
Side mounting is possible for insertion lengths shorter than 1 meter and if the extension pipe gets adequately supported.

Extension by threaded pipe: *LEVELSWITCH CV140*

Insertion length: min. 250mm
max. 4000mm
Connection: 1-1/2” EN10226 (equals BSPT) or NPT
Mounting: Top mounting.
Side mounting is possible for insertion lengths shorter than one meter if the extension pipe gets adequately supported.

The extension is performed by a 1“ pipe with threads on both ends which simply gets screwed between the vibrating probe and the 1½“ mounting socket. As no special equipment is necessary to do the extension it is possible that the customer obtains and mounts the extension tube at the site which helps to save costs for equipment and transport.
The type of the 1” inside thread for the extension tube (EN10226 or NPT) equals the type of the 11/2” outside thread for process connection.

Flexible cable extension: *LEVELSWITCH CV150*

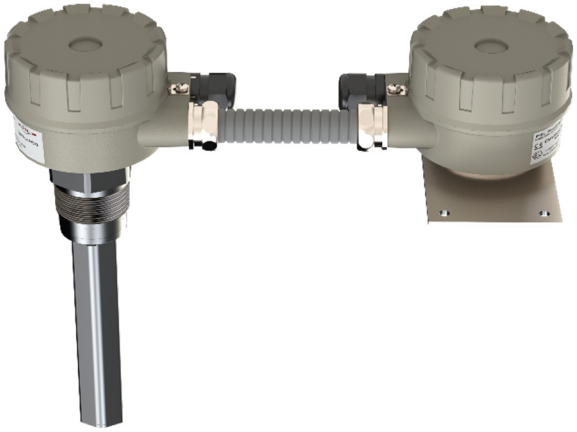
Insertion length: min. 300mm, max. 20.000mm
Connection: thread 1-1/2” EN10226 (equals BSPT) or NPT
Mounting: Top mounting only.

The extension is performed by means of a PU-sheathed, steel rope reinforced cable which withstands tensile loads up to 200kg.

The CV150 offers the advantage that very long insertion lengths can be realized and the units still can be shipped in very compact boxes.

Remote electronics installation

This version offers a split architecture of probe and electronics.



Application: - if the ambient temperature near the container wall exceeds 60°C
- if heavy vibrations are present at the container.

Hose length: standard 2 meter,
other lengths on request

High temperature model

Available for CV120, CV130 and CV140.

Application: for process temperatures above 80°C to max. 150°C.

To protect the electronics from too high temperatures, a temperature insulating tube gets mounted in between the process connection and the enclosure. Instead it is as well possible to install the electronics at a place with lower ambient temperature by using the remote electronics installation.

Special model „Extreme Sensitivity“:

This special model is designed for applications where extremely light material with densities down to 10g/l has to be detected.

Options

The following options are available:

- enclosure powder coated grey, blue, orange or beige
- externally visible LED for indicating relay status (not in combination with ex approval)
- process connection “Tri-Clamp” according to DIN32626, (available for CV130 only)
- Ex approvals according ATEX directive 2014/34/EU for CV120, CV130, CV150: dust-ex and gas-ex.

Approvals

- CE-approval for all instruments according to the following directives:
  - EC-EMC-directive 2014/30/EU
  - EC-low voltage directive 2014/35/EU
- Ex-approval according to ATEX 2014/34/EU available for CV120, CV130 and CV150:
  - Dust-Ex: ATEX II 1/2D Ex ta/tb IIIC T95°C Da/Db for zones 20/21/22
  - Gas-Ex: ATEX II 1G Ex ia IIB T4 Ga
    or ATEX II 1/2G Ex ia IIB T4 Ga
    for zones 0, 1 or 2

For detailed information see page 6 and 7.

Specifications

Enclosure: die cast aluminum, (option powder coated)
protection IP 66 and IP 67 (IP65 for remote electronics installation)
2 cable glands M20 x 1,5

Electronics: **Wide range power supply 22 ... 250V AC/DC with relay output:**
two potential-free change-over contacts (DPDT)
max. switching datas AC: 250V-AC, 8A, 2000VA, cosφ = 1
max. switching datas DC: 8,0A at 24V-DC / 1,5A at 48V-AC
min. switching datas DC: 24V / 100mA
Power consumption: < 3 VA

or: **power supply 24V-DC with transistor output (3-wire):**
potential free, NPN or PNP type
350mA @ 24V-DC, shorttime max. 1A, max. power 20W
power loss max. 3V, max. leakage current 100µA; short circuit proof
power consumption at blocked transistor: < 1 W

or: **power supply 20…30V-DC with 8/16mA-output (2-wire):**
available with square housing only
power consumption: < 0,5 W
The probe can be supplied by the supply and analyzing unit *CV2000AE* e.g.
Gas-Ex approval with protection concept *intrinsic safety* is available for this version.

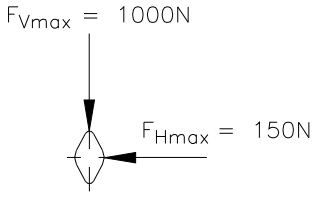
Time Delay: 1 second from stop of vibration
2 to 5 seconds for start of vibration

Indication: LED on PCB (option: externally visible)

Probe: Material: stainless steel 1.4301 / AISI 304
Extension cable CV150: polyurethane sheeted

connection: - thread 11/2“ DIN 2999 (equals BSPT) or 11/2“ NPT
- process connection “Tri-Clamp” according to DIN32626
(available for CV130 only)

resonance frequency: approx. 286 Hz
max. horizontal load upon the end of the blade: 150 N
max. vertical load upon the end of the blade: 1000 N
max. tensile load of cable CV150: 200 kg



Material to be detected: non sticky bulk solids
min. density 20 grams per litre, with special model as low as 10 g / liter
grain size from powder to max. 40mm

max. pressure inside bin: 10 bar

ambient temperature electronics: standard probe: -40°C ... + 60°C
probe HT: -15°C ... + 60°C

process temperature: standard probe: -40°C ... + 80°C (CV150: max. 70°C)
probe HT: -15°C ... + 150°C

1020

Products with ATEX Approval: Protection Level, Marking, Zones

➢ Dust-Ex, Protection by Enclosure: CV120StEx, CV130StEx, CV150StEx

The vibrating level switches CV120StEx/CV130StEx/CV150StEx can be used in the presence of combustible dust according to ATEX directive 2014/34/EU: equipment group II, category 1/2D or 1/3D for remote electronics installation.

Marking according to directive 2014/34/EU:

The vibrating vibrating level switches CV120StEx / CV130StEx / CV150StEx have a nameplate on the enclosure showing the following data:
e.g: CV120 StEx with wide range power supply, standard unit, (no high temp)

PTL Hermann GmbH
Kellermatten 3 - 79618 Rheinfelden - Germany - info@ptl-hermann.com
www.ptl-hermann.com

CE 0044
Level Switch CV120DIN-StEx
Ser.No.: xxxxxxStEx
Power Supply: 20...250V AC/DC
Relay Output: max. 8A @ 250V
Power Consumption: 3 VA

Ex II 1/2D Ex ta/tb IIIC T95°C Da/Db IBExU03ATEX1033 IP6X

T_{amb} (Gehäuse, Zone 21): -20..+60°C $T_{process}$ (Sonde, Zone 20): -20..+80°C

Allocation of Categories, EPL and Zones:

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 60079-31:

- 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 CV150 150°C for high temperature (= process temp.)	80°C for standard 70°C for CV150 150°C for high temp	0 K 0 K 0 K
Zone 21/22	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.

➢ Gas-Ex, Protection Concept Intrinsic Safety: CV120Exi, CV130Exi, CV150Exi

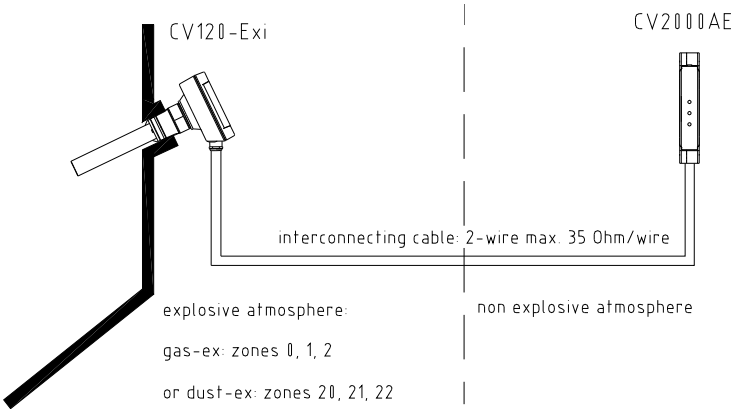
The vibration type level switches CV120Exi / CV130Exi / CV150Exi have approval according to ATEX directive 2014/34/EU for the use in explosive atmospheres as follows:

- Gas-Ex: II 1 G Ex ia IIB T4 Ga or II 1/2G Ex ia IIB T4 Ga
- Dust-Ex: II 1 D Ex ia IIIC TX Da or II 1/2D Ex ia IIIC TX Da

Architecture

The units come with a split architecture allowing the probe with low energy 8/16mA-output to be installed within the explosive atmosphere whereas the supply and analyzing unit *CV2000AE[Exi]* with wide range power supply and relay output must be installed at the non explosive safe area.

For installation it is important to know that the associated apparatus *CV2000AE[Exi]* is not galvanically isolated. Special requirements according to EN60079-14 have to be considered.



Applied standards: EN60079-0, EN60079-11, EN60079-26, EN60079-31.

Marking according ATEX directive 2014/34/EU:

The units have a nameplate showing the following details:
e.g. Cat. 1 apparatus CV120Exi

Allocation of Categories and Zones:

Apparatus type	Marking	Component	Category	for Gas-Ex Zones	for Dust-Ex-Zones
Cat.1-apparatus	1G Ex ia IIB T4 Ga 1D Ex ia IIIC TX Da	Probe	1G or 1D	0, 1 or 2	20, 21 or 22
		Encl. with electronics	1G or 1D	0, 1 or 2	20, 21 or 22
Cat.1/2-apparatus	1/2G Ex ia IIB T4 Ga 1/2D Ex ia IIIC TX Da	Probe	1G or 1D	0, 1 or 2	20, 21 or 22
		Encl. with electronics	2G or 2D	1 or 2	21 or 22

Allowed ambient temperatures T_{amb}:

Apparatus type	Unit type	Temp. -class	max. surface temperature	T_{amb} at electronics	T_{amb} at probe without temp. insul. tube	T_{amb} at probe with temp. insul. tube
Cat.1-apparatus	*Standard units* CV120Exi/CV130Exi/ CV150Exi	T4	Probe: 60°C Encl.: 75°C	-20 … +60°C	-20 … +60°C	combination not available
Cat.1/2-apparatus	*Standard units* CV120Exi/CV130Exi/ CV150Exi	T4	Probe: 60°C Encl.: 85°C	-20 … +60°C	-20 … +80°C	combination not available
	High temp. units CV120Exi-HT CV130Exi-HT	T4	Probe: 108°C Encl.: 85°C	-15 … +60°C	combination not available	-15 … +108°C *
	High temp. units CV120Exi-HT CV130Exi-HT	T3, T2, T1	Probe: 150°C Encl.: 85°C	-15 … +60°C	combination not available	-15 … +150°C *

* listed temperatures already include reduction to 80% according to EN1127-1 chpt. 6.4.2

Technical data referring to intrinsic safety:

- Ui=23,7V, Ii=167mA, Pi=985mW, Li: negligible, Ci: negligible
- Power supply and signal conversion is made by the associated apparatus *CV2000AE[Exi]*.

Special requirements according to EC-Type Examination No. IBExU09ATEX1005X:

- For functional reasons the probes are connected to earth. The enclosure of the apparatus must be connected to the equipotential bonding system.
- Special requirements for associated apparatus without galvanic isolation according EN 60079-14 have to be observed.
- In case the units are used as category 1 apparatus in zones 0 or 20 the units must be installed in a way that the generation of sparks due to friction or strokes on the aluminium housing is eliminated.
- The allowed temperature range and the mounting instructions according to the instruction manual have to be observed.
- In case the units are used as category 1 / 2 apparatus at gas explosive atmospheres the 1-1/2“ thread which serves for process connection and separation of zones 0 and 1 must be sealed in a way that protection IP67 according to EN60529 is achieved.

CV2000AE[Exi]

The *CV2000AE* is a supply and analysing unit for the vibration type level switches STOCKTROL CV210/310/410/510 with 8/16mA output. For the intrinsically safe probes CV210Exi / CV310Exi / CV510Exi the *CV2000AE [Exi]* has approval according to ATEX 2014/34/EU as the associated apparatus.

Function:

The *CV2000AE* supplies the connected vibration type level switch with a DC voltage. Depending on the level inside the bin, (probe covered with filling material or not), the electronics of the probe takes more or less current. This current change is sensed by the *CV2000AE* and gets converted into a relay output. The interconnecting cable between probe and *CV2000AE* gets monitored permanently for short circuit and line break. In case of short circuit or line break an additional relay output switches.

Technical Data:

Enclosure:	Polyamid enclosure for carrier rail mounting 35mm according to EN50022 dimensions 114x35x99mm; protection IP20	
Electronics:	Power Supply:	20...250V AC/DC; max. 3VA
	Output power supply for probe:	20V-DC (without load)
	Relay Output:	one potential free change over contact (SPDT), max. 5A/250V
	Failure indication:	detection of line break and short circuit by add. relay max. 5A/250V
	Connection cable to probe:	2-wire, max. 35 Ohms per wire
	Indication:	yellow LED: power supply
		green LED: relay status
		red LED: failure indication (line break and short circuit)
Temperature:	-20°C ... + 60°C	

Approvals:

The *CV2000AE* meets the following European directives:
- EC EMC directive 2014/30/EC
- EC low voltage directive 2014/35/EC

The following standards have been applied:
- EN 61326 05.04
- EN 61010-1

The *CV2000AE [Exi]* has approval according to ATEX 2014/34/EU as the associated apparatus for intrinsically safe vibration type level switches as follows:

Gas: II (1)G [Ex ia Ga] IIB

Dust: II (1)D [Ex ia Da] IIIC

PTL Hermann GmbH www.ptl-hermann.com
Kellermatten 3 - 79618 Rheinfelden - Germany - info@ptl-hermann.com

CE 0044 CV2000AE [Exi]
Ser.No.: xxxxxxExi
Power Supply: 20..250V AC/DC
Power Consumption: 3VA
Uo=23,7V; Io=166mA; Um=375V
Co=390nF; Lo=4,3mH, Kennlinie linear

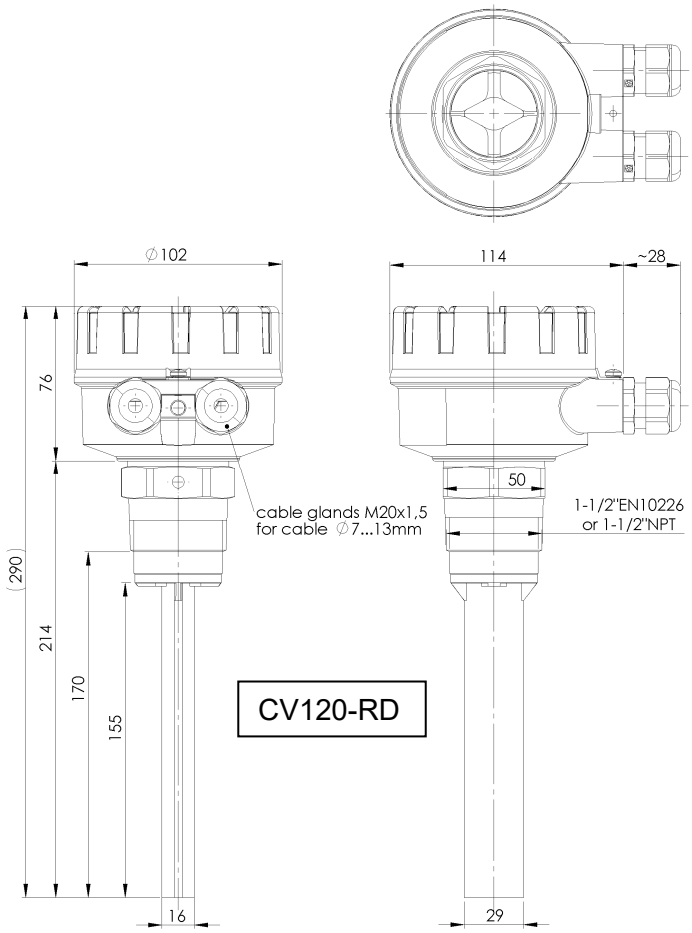
II (1) G [Ex ia Ga] IIB
II (1) D [Ex ia Da] IIIC
IBExU09ATEX1006 X
Ta=-20 ... +60°C

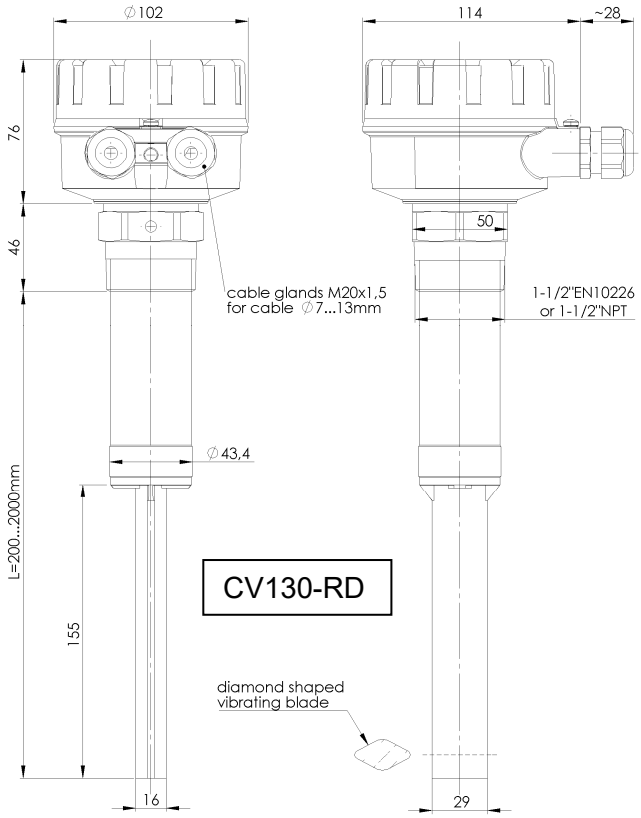
Special requirements according to EC-Type Examination No. IBExU09ATEX1006X:

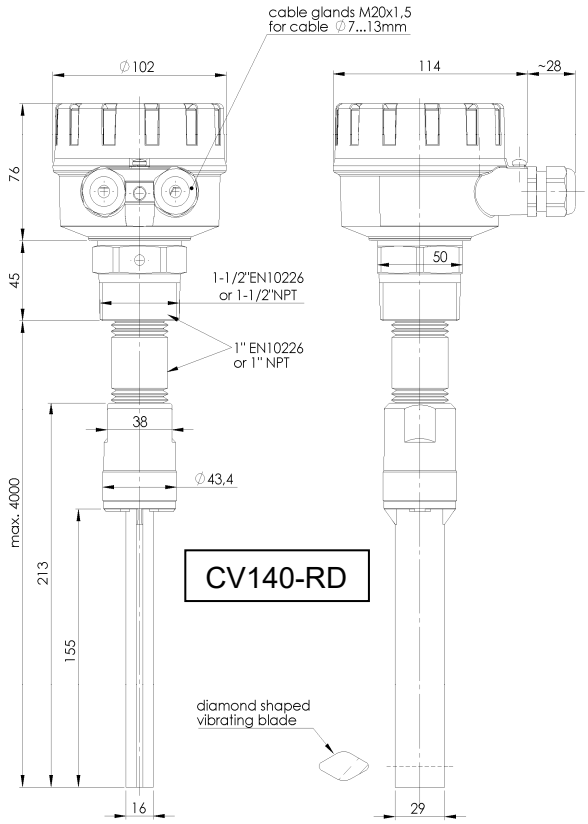
According to the EC-Type Examination Certificate of the ***CV2000AE [Exi***] the following special requirements have to be fulfilled:

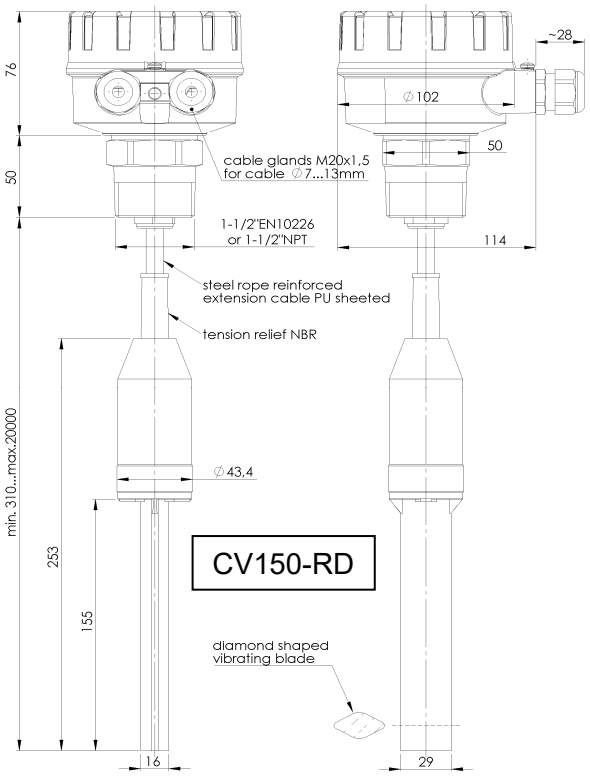
At the installation the additional requirements for associated apparatus without galvanic isolation according to EN 60079-14 have to be considered.

Dimension

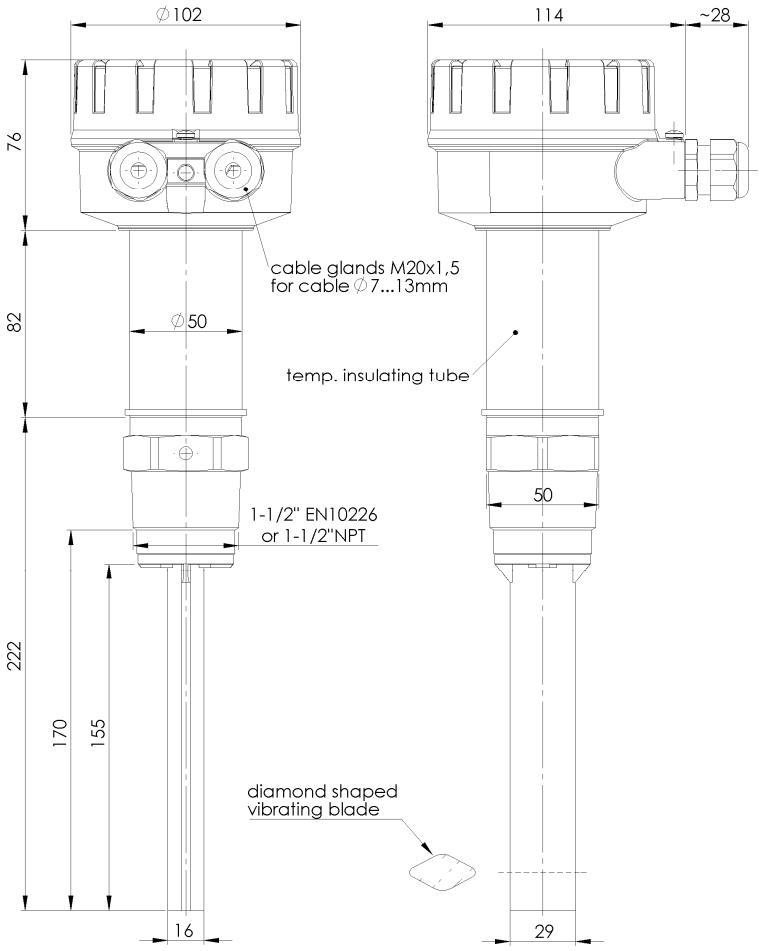

∅102
114
~28
76
214
290
170
155
50
16
29
cable glands M20x1,5
for cable ∅7...13mm
1-1/2"EN10226
or 1-1/2"NPT
CV120-RD


∅102
114
~28
76
46
50
L=200...2000mm
155
16
29
∅43,4
cable glands M20x1,5
for cable ∅7...13mm
1-1/2"EN10226
or 1-1/2"NPT
diamond shaped
vibrating blade
CV130-RD

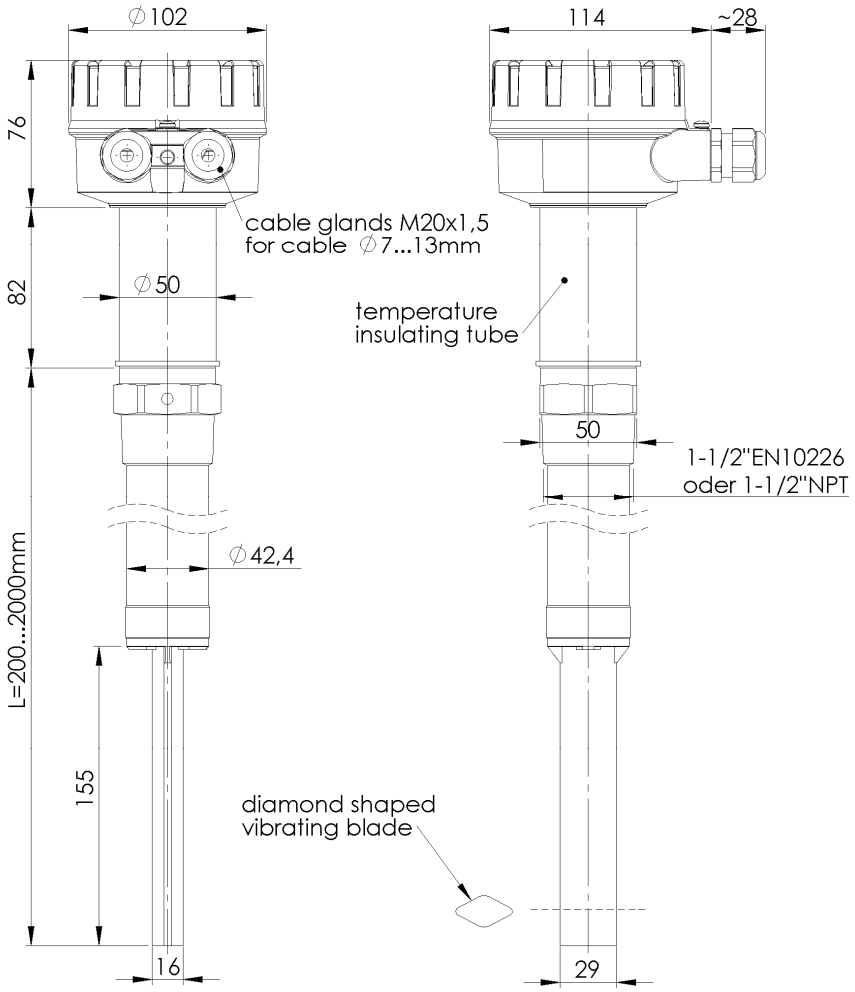

cable glands M20x1,5
for cable ∅7...13mm
∅102
114
~28
76
45
50
max. 4000
213
155
16
29
38
∅43,4
1-1/2"EN10226
or 1-1/2"NPT
1" EN10226
or 1" NPT
diamond shaped
vibrating blade
CV140-RD


~28
76
50
∅102
50
cable glands M20x1,5
for cable ∅7...13mm
1-1/2"EN10226
or 1-1/2"NPT
114
steel rope reinforced
extension cable PU sheeted
tension relief NBR
min. 310...max.20000
253
155
16
29
∅43,4
diamond shaped
vibrating blade
CV150-RD

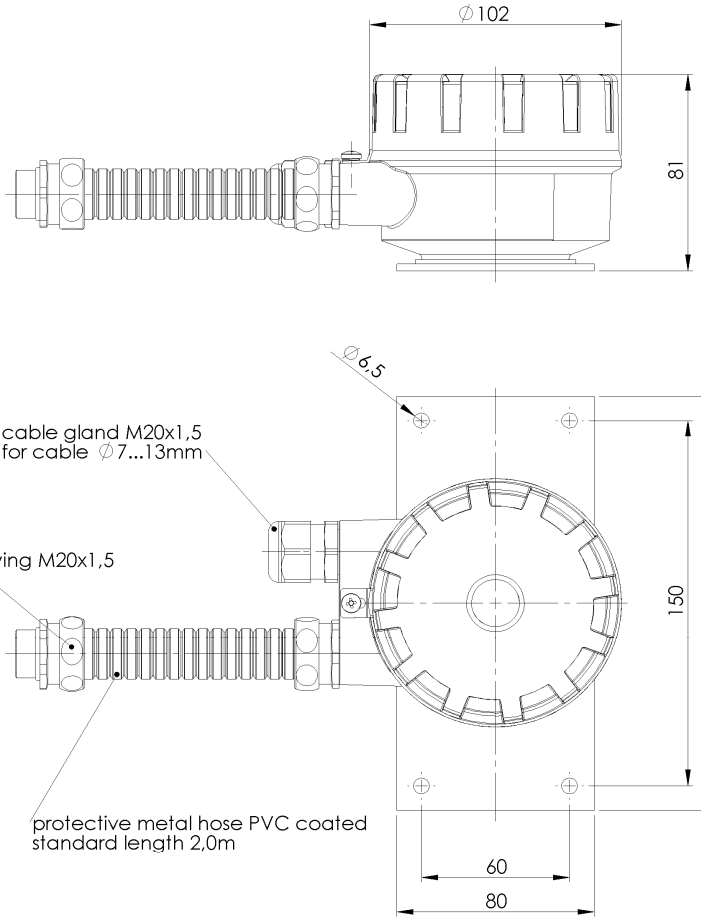
CV120-HT-RD
mit Temperaturisolierzwischenstück



CV130-HT-RD
mit Temperaturisolierzwischenstück



Set Remote Enclosure
for remote electronics installation



Set includes:
- enclosure on mounting plate
- 2,0m protective hose with connection cable
- terminal PCB to be mounted into probe housing for connecting probe to connection cable

---

CV2000AE[Exi]