Vibro level indicator
Level limit switches for bulk goods

VF1.

Operating instruction

Rhombus vibration rod
robust single rod - compact and versatile

Index

MOLLET accurate point level

▶ **Please, read and obey these safety instructions and the complete operating manual.**

1. Safety instructions

1.1 **The installation, initial operation and maintenance must be done by a qualified expert with electrical know-how.**

1.2 **Check before installation whether the measuring device is in compliance with the specification of the point of measurement as process and ambient temperature as well as the measuring range.**

1.3 **Use in potentially explosive atmospheres only devices with ⟨Ex⟩ - identification marking.**

1.4 **For the electrical connection take notice of the local and statutory rules and regulations and/or the VDE 0100.**

1.5 **Consider the data of the name plate on the device.**

1.6 **A fuse (max. 4 A) and a main switch have to be connected in series to the voltage supply.**

1.7 **Switch off the voltage supply before you open the measuring devive (dangerous voltages in case of contact).**

1.8 **Check the cable entry, cable gland and clamping nut, to see if they are sitting correctly and are sealed.**

1.9 **Put the device into operation only when the unit is closed and the cover sealing is intact.**

1.10 **Changes and repairs of the device are allowed only in so far as it is permitted in the operating instructions.**

▶ ⟨Ex⟩ **Prior to the use of the device in potentially explosive atmospheres please, read and obey the**

Special conditions and guidance for safe use

in the attached

Explosions protection information

and observe the operating instruction.

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2. Use of the device

2.1 Intended use

- The device is used as a level limit switch for bulk solids in silos, bins and so on.

2.2 Normal operation

- Please operate the measuring device only according the intended use.
- Use the measuring device only within the specified temperature ranges for process and ambience.
- Protect the electronics compartment against pollution.
- In case the measuring device becomes damaged, please stop operation immediately.

2.3 Improper use

- Ignoring safety regulations and operating instruction.
- Operation of the measuring device in inappropriate use.
- Installation of spare parts that are no original parts.
- Removal, addition or modification of components as far as it is not described in the documentation of the manufacturer.
- Violation of applicable standards and laws.

3. Data of manufacturer

Manufacturer	**MOLLET Füllstandtechnik GmbH**
Address	Industriepark RIO 103 74706 Osterburken Germany
Name of part	**MOLOSvibro** **Vibro level indicator**
Type	**VF1 ...**

4. Receiving department and storage

4.1 Receipt of goods

- Please check whether packaging or content are damaged.
- Please check whether the supplied goods are incomplete or do not comply the requirements as set out in your order.

4.2 Storage

- For storage and transportation the measuring device has to be packed shock-resistant.
- Store the device at a place protected against moisture and dust.
- Take care that the probe will not be bended.
- **Temperature range for storage** -40 °C ... +85 °C

5. Application (intended use)

The **MOLOSvibro** of the **VF1.** series is intended for the use as

level limit switch

in **silos and vessels.**

For all bulk solids with a minimum density of

0.01 t/m³.

For application in **all industry sectors**.

6. Function

- Oscillation of the Rhombus vibration rod with a resonance frequency of approx. 285 Hz is stimulated by the electronic.
- As soon as the vibration rod has been covered by bulk solids, the oscillation will be damped.
- The electronic detects the damping and switches the relay signal.
- If the filling level sinks below the vibration rod, the rod starts vibrating with its resonance frequency again and the relay switches back.

7. Information for use

Please obey the following for the use of the Vibro level indicator:

- **Switch point dependent of bulk density (t/m³; kg/l):**
  - with heavy bulk solids only the tip of the rod has to be covered for damping the vibration.
  - with light bulk solids the complete rod has to be covered for damping the vibration.
- **In order to keep the ambient temperature of the PCB below +70°C please**
  - protect the housing from direct sunlight by installing a sun shield.
  - protect the housing against temperature transfer from the silo in cases the process temperature exceeds 70°C by installation of a heat barrier between the enclosure and the bin wall or use the high temperature option **E1 / E2 /E3**.
- **The measuring device must not be mounted in or near the filling stream. The falling bulk solids could damage the probe.**

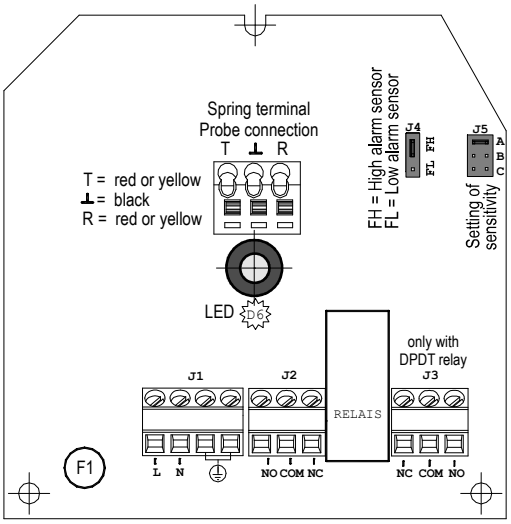
8. Technical data

Material	Rectangular-housing	Aluminium, RAL7001	
	Process connection and probe	Stainless steel 1.4301 / 304	
	Rhombus vibration rod	Stainless steel 1.4301 / 304	
	Suspension cable sheath	Polyurethane	
Process connection	**R3**	R1½ EN 10226 or **N3** 1½" NPT	
Ambient temperature		-40 °C ... +70 °C	T_a
with separate housing		-40 °C ... +80 °C	
Process temperature	**VF12, VF13**	-40 °C ... +80 °C	$T_{(Process)}$
	VF15	-40 °C ... +70 °C	
VF12, VF13 high temperature	**E1**	-40 °C ... +150 °C	
	E2	-40 °C ... +200 °C	
	E3	-40 °C ... +250 °C	
Process pressure		-0.95 bar ... 10 bar	$p_{(Process)}$
Minimum density of bulk solids		0.01 kg/l (t/m³)	
Response delay			
for damping		1 second	
for start oscillation		2 to 5 seconds	
Cable entry		Gland 2xM20x1,5	
Type of protection		**IP66/IP67** acc. DIN EN 60529	IP
with separate rectangular-housing		**IP65** acc. DIN EN 60529	
Maintenance		none	
Maximum load for the end of the vibration rod		1000 N vertical (V) 250 N horizontal (H)	
Maximum tensile force at suspension cable of type VF15		2000 N	
Installation position	**VF12, VF13**	any	
	VF15	vertical	

Subject to modification.

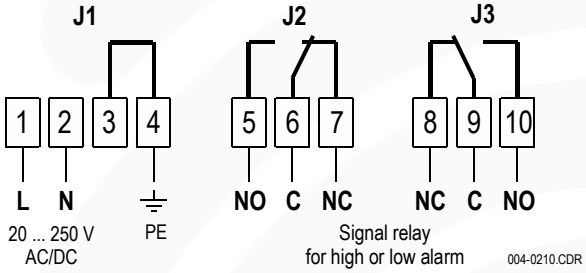
9. Electrical connection and data

9.1 Wide range electronic C8 (not available with GasEx option B11)

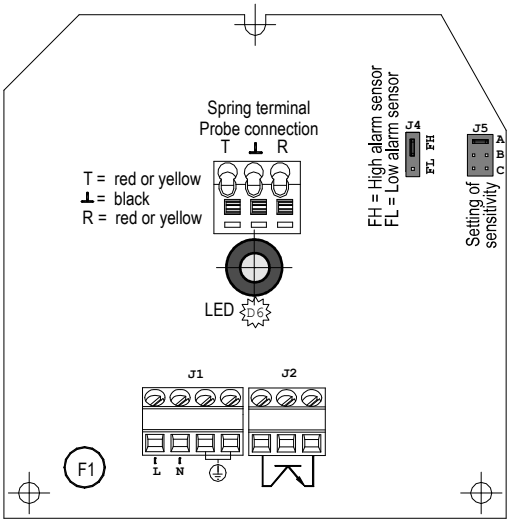


Supply voltage C8	20 ... 250 V AC / DC
Power consumption	≤ 3 VA / 3 W
Signal relay	two potential free change-over contacts (SPDT)
Capacity of contact	8 A / 250 V AC 192 / 72 W at 24 / 48 V DC
Connection clamps	maximum 2.5 mm²

Supply

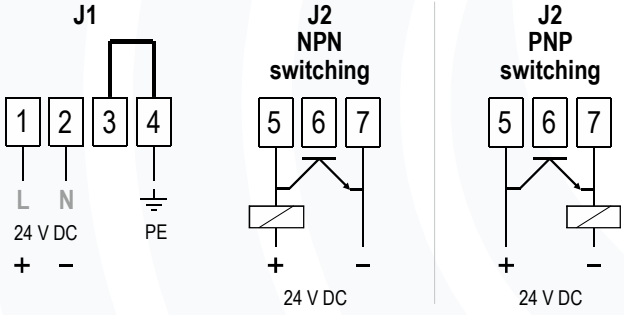


9.2 DC voltage electronic C5 (not available with GasEx option B11)



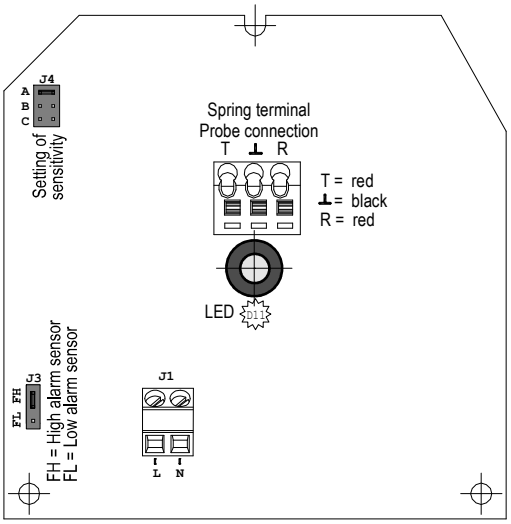
Supply voltage C5	24 V DC ±10%
Power consumption	≤ 1 W (without load)
Signal output	potential free NPN / PNP
Capacity of contact	maximum 20 W switching capacity maximum 350 mA constant current
Connection clamps	maximum 2.5 mm²

Supply

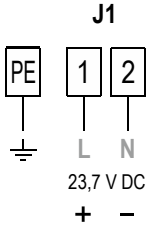


Terminals for signal output (transistor)
- Terminal 6 not used -

9.3 Two wire electronic C5i (only available with GasEx option B11)



Supply voltage U_i	23.7 V DC from **VF-VEC8-B22**
I_i	167 mA
P_i	985 mW
L_i	negligible
C_i	negligible
Connection clamps	maximum 2.5 mm²



Supply only with supply and evaluation device VF-VEC8-B22 for GasEx.

Current consumption

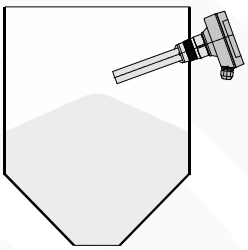
High alarm FH	Vibration rod oscillates freely	8 mA
	Vibration rod covered	16 mA
Low alarm FL	Vibration rod covered	8 mA
	Vibration rod oscillates freely	16 mA

Subject to modification.

10. High alarm sensor FH (factory setting)

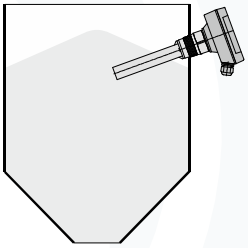
MOLOSvibro level indicator of the **VF1.** series are configurated for **high level alarm** in the factory setting. The function can be changed with a jumper on the electronic board. The switching status is indicated by a LED on the electronic board, like it is explained below.

Free status - vibration rod oscillates freely



	C8	C5	C5i
Electronic type			
LED display	LED on	LED on	LED off
Switching status	J2 J3 NO C NC NC C NO Relay energized	Transistor conductive	8 mA Current output

High alarm - vibration rod covered with bulk solids

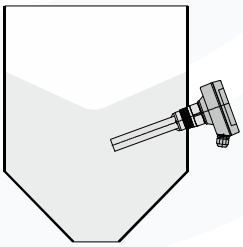


	C8	C5	C5i
Electronic type			
LED display	LED blinking	LED blinking	LED on
Switching status	J2 J3 NO C NC NC C NO Relay de-energized	Transistor blocks	16 mA Current output

11. Low alarm sensor FL (jumper repositioned)

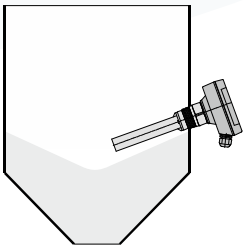
MOLOSvibro level indicator of the **VF1.** series can be used for **low level alarm** with a changed factory setting. The function can be changed with a jumper on the electronic board. The switching status is indicated by a LED on the electronic board, like it is explained below.

Covered status - Vibration rod covered with bulk solids



	C8	C5	C5i
Electronic type			
LED display	LED on	LED on	LED off
Switching status	J2 J3 NO C NC NC C NO Relay energized	Transistor conductive	8 mA Current output

Leeralarm - Vibration rod oscillates freely

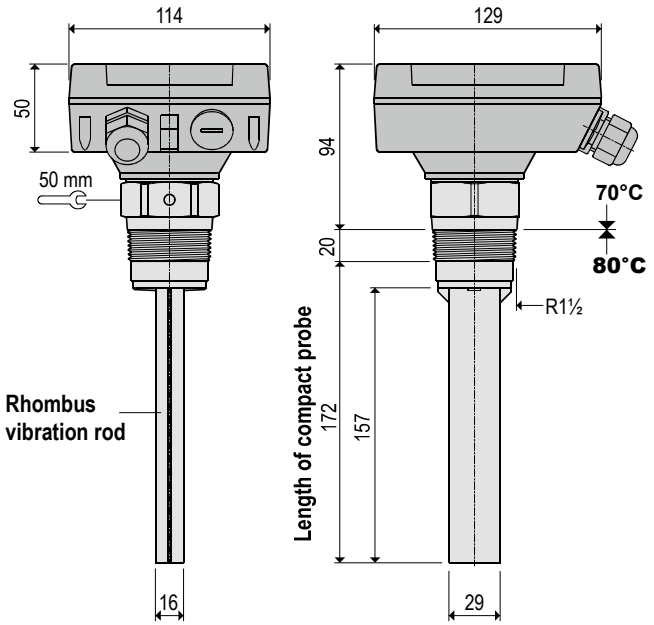


	C8	C5	C5i
Electronic type			
LED display	LED blinking	LED blinking	LED on
Switching status	J2 J3 NO C NC NC C NO Relay de-energized	Transistor blocks	16 mA Current output

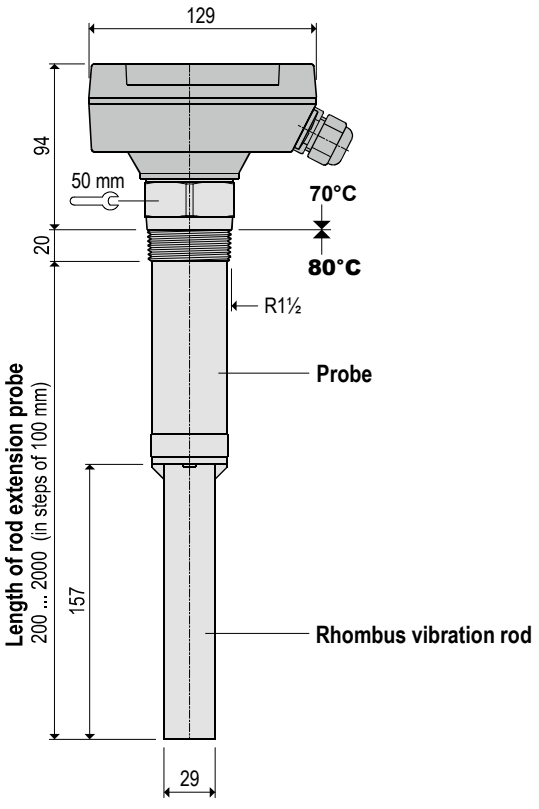
Subject to modification.

12. Versions/Dimensions

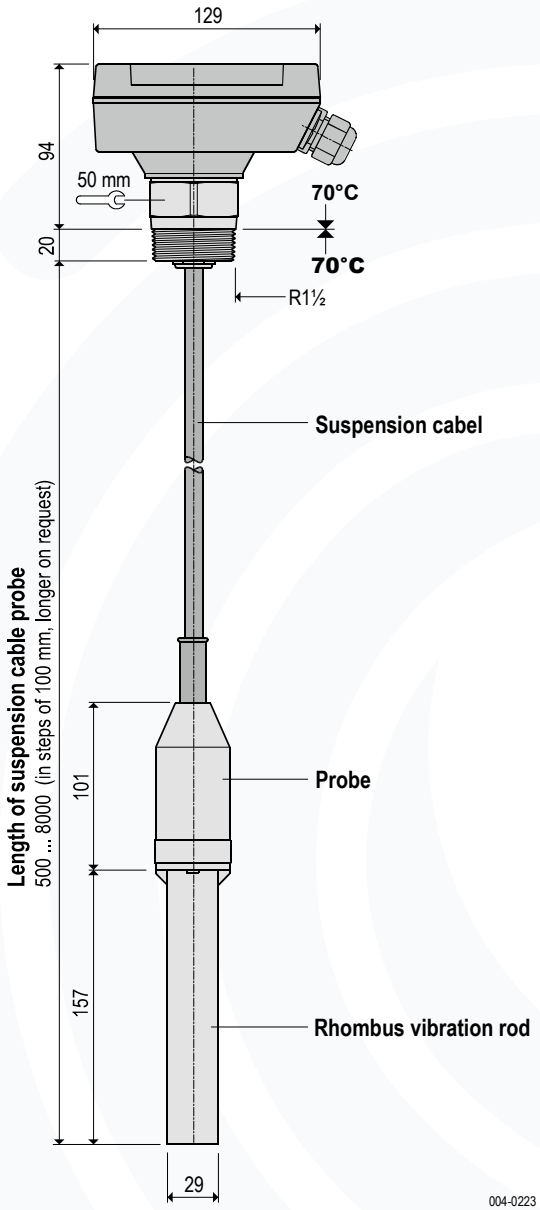
12.1 VF12 Compact sensor



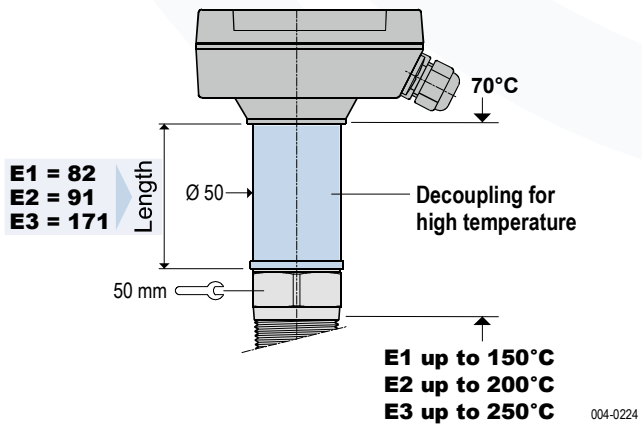
12.2 VF13 Rod extension sensor



12.3 VF15 Suspension cable sensor



12.4 E1 ... E3 High temperature



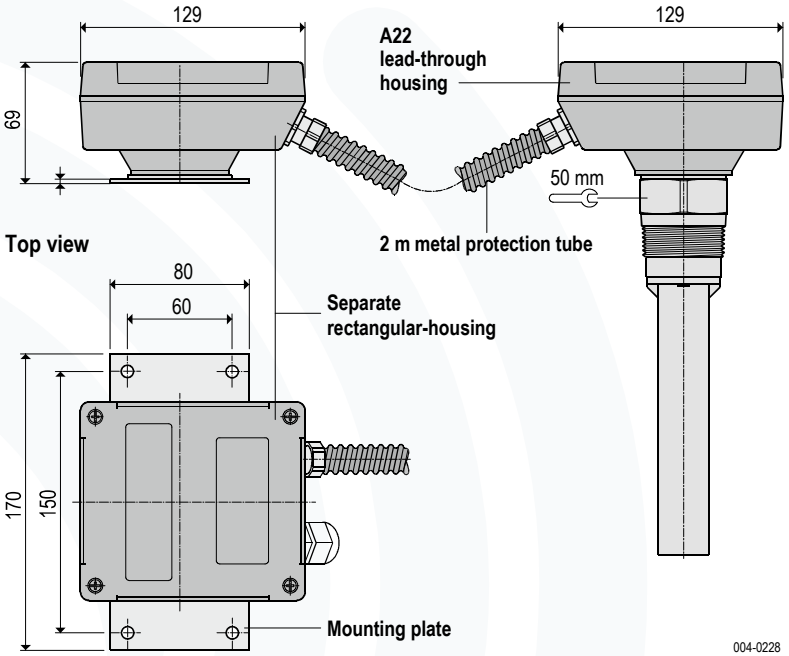
Subject to modification.

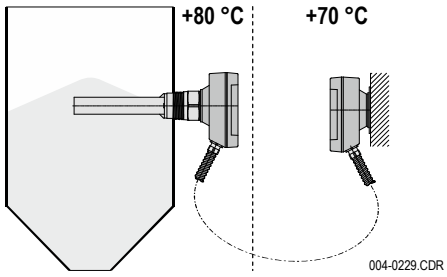
12. Versions/Dimensions

12.5 A22 Separate rectangular-housing

With the separate rectangular-housing the electronic will be mounted remote from the probe.

Front and side views





Application

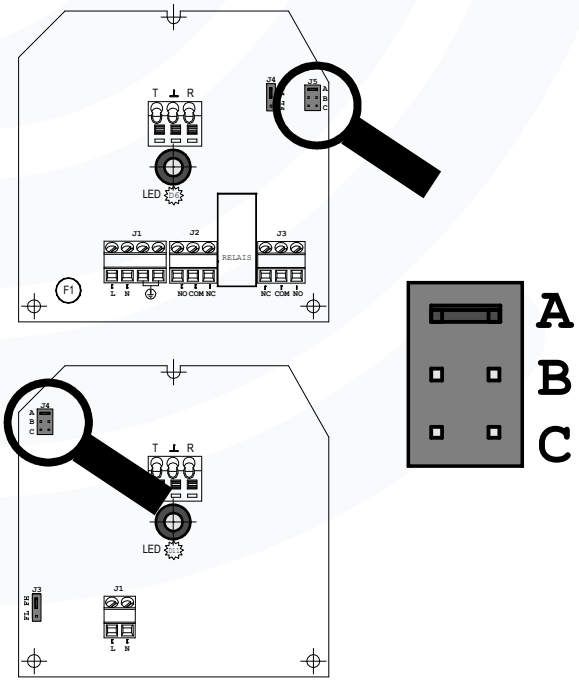
- In vessels with heavy vibrations
- Process temperatures of 150 °C to 250 °C only in combination with lead-through housing in high-temperature design
- Ambient temperatures up to +80 °C in close proximity to the container wall.

Separate rectangular-housing combinable with:

A22 lead-through housing at the probe

Metal protection tube with 2 m length.
Different length on request.

13. Setting of sensitivity



Adjustment by jumper at **A - B - C**

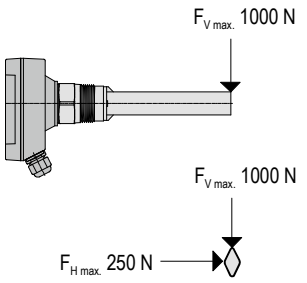
Position **A**: highest sensitivity level
for light bulk solids with a density above 0.02 kg/l

Position **B**: standard sensitivity level (factory setting)
sufficient for most bulk solids.

Position **C**: lowest sensitivity level
for heavy materials with high densities which may form a deposit on the vibrating rod.

Light materials can not be detected at this setting!

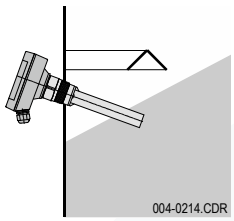
14. Load for vibration rod



Rhombus vibration rod

Due to the special shape of the Rhombus vibration rod, it is very robust and able to resist high forces up to 1000 N in vertical direction.

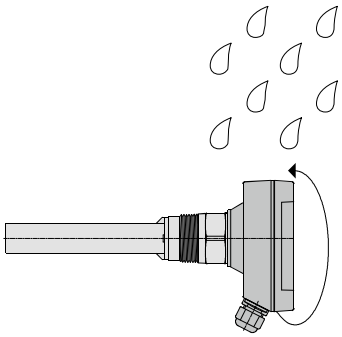
15. Protection against heavy load



If needed, a protection roof or a stable deflector has to be installed inside the container, in order to protect the probe and the rod against impinging bulk solids.

Between protection roof and the probe has to be enough space that bulk solids could penetrate but not jam.

16. Protection against moisture by alignment of 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 screw driver to loosen the screw in the center of the PCB
- turn the housing into the correct position so that the cable glands are pointing downwards
- tighten the screw in the center of the PCB, torque 3Nm
- close the cover of the housing.

Cable ducts which are not used have to be sealed!

17. Allowed temperatures

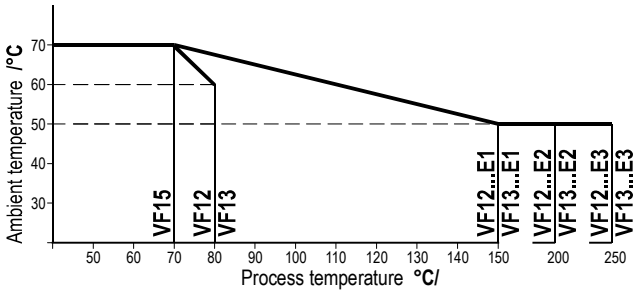
Ambient temperature at the probe (process temperature) **$T_{(process)}$ -40°C ... +80°C**

Ambient temperature at the electronic housing **T_a -40°C ... (+60°C) +70°C**

Due to the process temperature of 80 °C reduced maximum allowed ambient temperature at the electronic housing

Maximum allowed ambient temperature at the electronic housing is dependent of the process temperature.

(see diagram)



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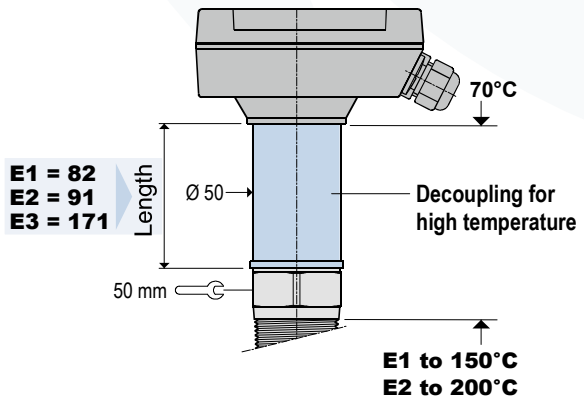
18. Bulk solids temperatures up to 250 °C

The high temperature options **E1 / E2 / E3** enables the use of the level indicators for bulk solids temperatures up to 250 °C.

- in order to protect the electronic against overheating by heat transfer from the process, a decoupling for high temperatur **E1, E2 or E3** is installed between probe and electronic housing.
- use for process temperatures above 80 °C only level indicators with the high temperature option.
- due to high process temperatures the maximum allowed ambient temperature at the electronic housing is reduced (see diagram)
- please mind for exchange of electronics that only PCBs with the marking „Special Model HT“ may be used.



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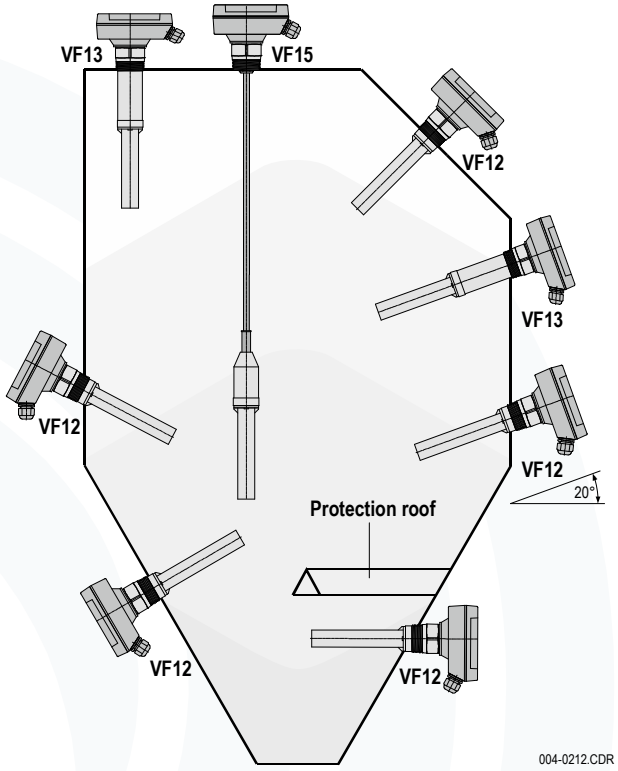
Subject to modification.

19. Possibilities for installation



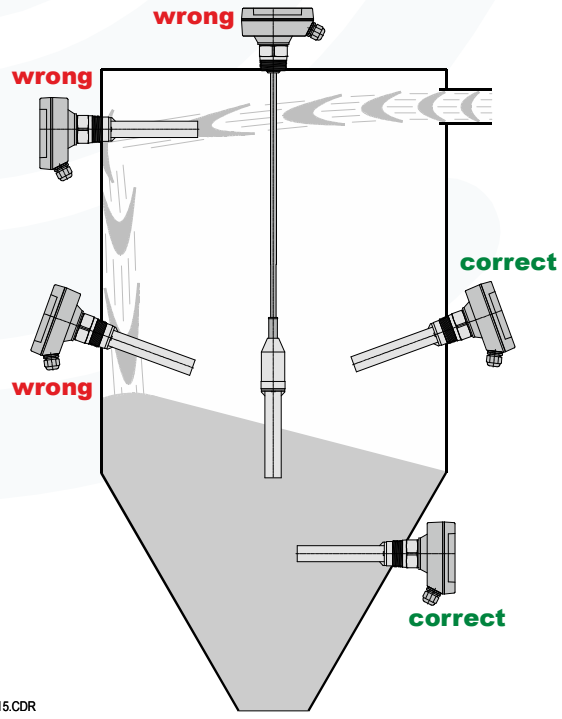
Side mounting or vertical mounting:

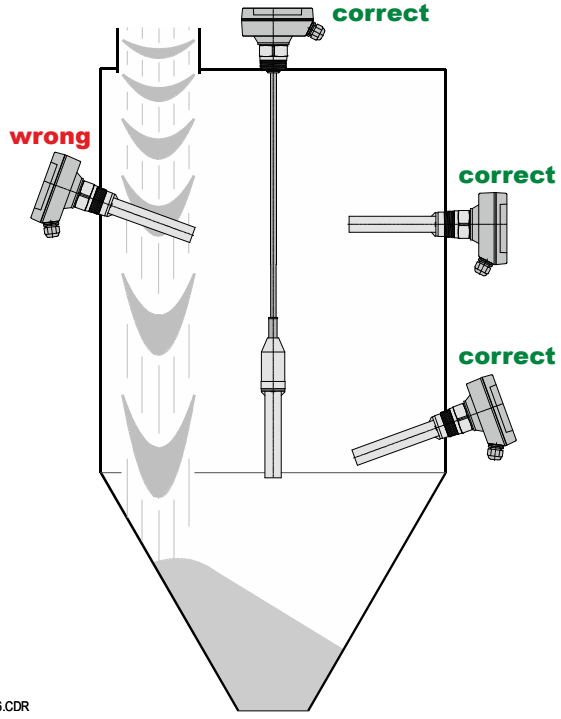
- **VF12** and **VF13** can be mounted either from the side or vertical.
- In order that bulk solids can flow off easily
  - - it is recommended to screw the measuring device slightly downwards (approx. 20°)
  - - the blade of the probe has to be oriented vertically. Correct alignment of the blade is given as soon as the two marks in the mounting socket point up and down.
- The measuring device has to be mounted in such a way that the filling stream cannot damage it.
- In case the filling stream reaches the probe nevertheless, it has to be protected by a suitable protection roof.
- If the probe is used as empty indicator in the lower area of bins/silos with heavy bulk solids, a protection roof has always to be installed.
- **VF15** is suitable for top mounting only.
- A suitable sealing, (like Teflon tape), must be applied onto the thread and the **VF** has to be screwed into the provided socket with a 50 mm open end wrench.

Attention: Do not screw by turning the housing!

20. Protection against bulk solids crashing down upon the rod

Level indicators must not be affected by flying bulk goods particles e.g. from injection pies, filling pipes or down pipes. Therefore the bulk solids stream should be directed or redirected accordingly, or the level indicator should be placed so that bulk solids cannot impact directly onto the probe and vibration rod.





Subject to modification.

21. Maintenance

The Vibro level indicators 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 tightness of the instruments.

22. Disposal

- Level indicator **VF** can be recycled.
- Disposal of the **VF** is subject to the environmental legislation of the respective country in effect for the operator's premises.

23. Returns to MOLLET

23.1 Remove all adherent material residues of filling material from the measuring device. Be aware of seal grooves and cracks where material residues could stick.

In particular if the bulk goods or liquids has been dangerous to health,
e. g. flammable, toxic, caustic or cancer-producing.

23.2 Furthermore please state:

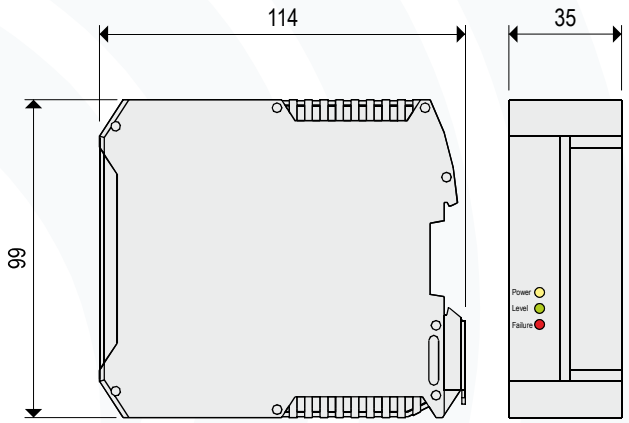
- Chemical and physical characteristics of the bulk goods or liquid
- Description of the application
- Description of the failure occurred
- Operating time of the measuring device.

Application (intended use)

The supply and evaluation device type **VF-VEC8-B22** is intended for the use as power supply for **MOLOSvibro** level indicators that are used in potentially explosive gas atmospheres.

It detects and evaluates the damping of the vibration rod, switches the signal relay and diagnoses a short circuit or broken cable at the connection to the probe and switches the failure relay.

Dimensions



Technical data

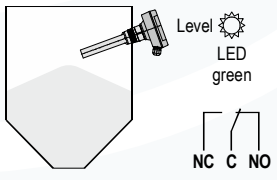
Material	Housing	Polyamid, light gray
Ambient temperature		-20 °C ... +60 °C **Ta**
Supply voltage		20 ... 250 V AC/DC
Power consumption		≤ 3 VA **Supply**
Connetion to sensor		**Ex i**
	Supply voltage	≤ 23.7 V DC
	Connection cable light grey	2-wire, maximum 35 Ω per wire
	Switching threshold	13 mA
Signal relay (potential free)		change-over contact (SPDT)
Error relay (potential free)		change-over contact
Capacity of contact	AC	6 A / 250 V
	DC	≤ 6 A at 24 V / 0,5 A at 48 V
	DC	minimum 24 V / 100 mA
Connection clamps		maximum 2.5 mm²
Type of protection		**IP20** acc. DIN EN 60529 **IP**
Ignition protection type		**II (1) G [Ex ia Ga] IIB**
		II (1) D [Ex ia Da] IIIC
LED display	Power **yellow**	Power supply available
	Level **green**	Filling level (high / low)
	Failure **red**	Error (short circuit / broken cable)
Maintenance		none
Installation		Top hat rail assembly (35 mm)
Installation position		any

High and low alarm sensor

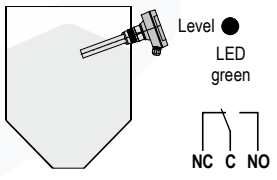
The signal relay of the supply and evaluation device **VF-VEC8-B22** has a separate switching logic, that is demonstrated below. The function can be changed with a jumper on the two wire electronic board **C5i** installed in the **MOLOSvibro** sensor housing.

High alarm sensor FH (factory setting)

Free status
Vibration rod oscillates freely

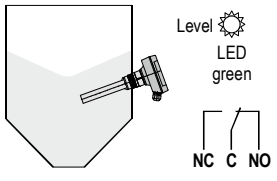


High alarm
Vibration rod covered with bulk solids

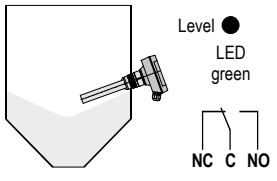


Low alarm sensor FL (jumper repositioned)

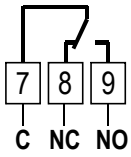
Covered status
Vibration rod covered with bulk solids



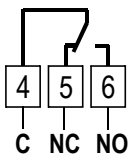
Low alarm
Vibration rod oscillates freely



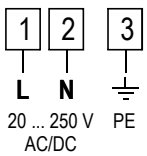
Electrical connection



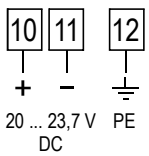
Signal relay for high and low alarm



Error relay for short circuit and broken cable
OK = Relay energized Connection **C-NO**
Failure = Relay de-energized Connection **C-NC**



Supply voltage
Wide range electronic **C8**



Connection to sensor MOLOSvibro Typ C5i
Two wire electronic **Ex i** (intrinsically safe)
Blue clamps

Subject to modification.

EU-Konformitätserklärung
EU-Declaration of Conformity

Wir/We

MOLLET Füllstandtechnik GmbH

Industriepark RIO 103
D-74706 Osterburken
Tel. 06291 64400 Fax 06291 9846

erklären in alleiniger Verantwortung, dass das Produkt:
declares under our sole responsibility, that the product:

Vibro-Füllstandanzeiger / Vibro level indicator
Schwingstab-Füllstandanzeiger / Vibration rod level indicator

Typ/Type **VF ...**

den folgenden Europäischen Richtlinien entspricht:
conforms with the following European directives:

EMV-Richtlinie	**EMC directive**	**2014/30/EU**
Niederspannungsrichtlinie	**Low voltage directive**	**2014/35/EU**

Angewandte harmonisierte Normen oder normative Dokumente:
Applied harmonized standards or normative documents

DIN EN 61326-1:2013

DIN EN 61010-1:2011

Und die Geräte mit Ex - Kennzeichnung entsprechen zusätzlich der folgenden Europäischen Richtlinie:
And the devices with Ex - marking conform additional with the following European directive:

ATEX-Richtlinie	**ATEX directive**	**2014/34/EU**

Je nach Ausführungsvariante angewandte harmonisierte Normen oder normative Dokumente:
Depending on the design applied harmonized standards or normative documents:

DIN EN IEC 60079-0:2019 **DIN EN 60079-31:2014**

EG-Baumusterprüfbescheinigungsnummer:
EU-Type Examination Certificate: **IBExU19ATEX1052**

Ausgestellt von:.
Issued by: IBExU Institut für Sicherheitstechnik GmbH, 09599 Freiberg (0637)

Qualitätssicherung:
Quality assurance: TÜV NORD CERT GmbH, 30159 Hannover (0044)

Osterburken, den 20.01.2020

MOLLET - Füllstandtechnik GmbH D-74706 Osterburken - ExBu

Wolfgang Hageleit
Geschäftsführer / managing director

Vibro level indicators
Level limit switches for bulk goods

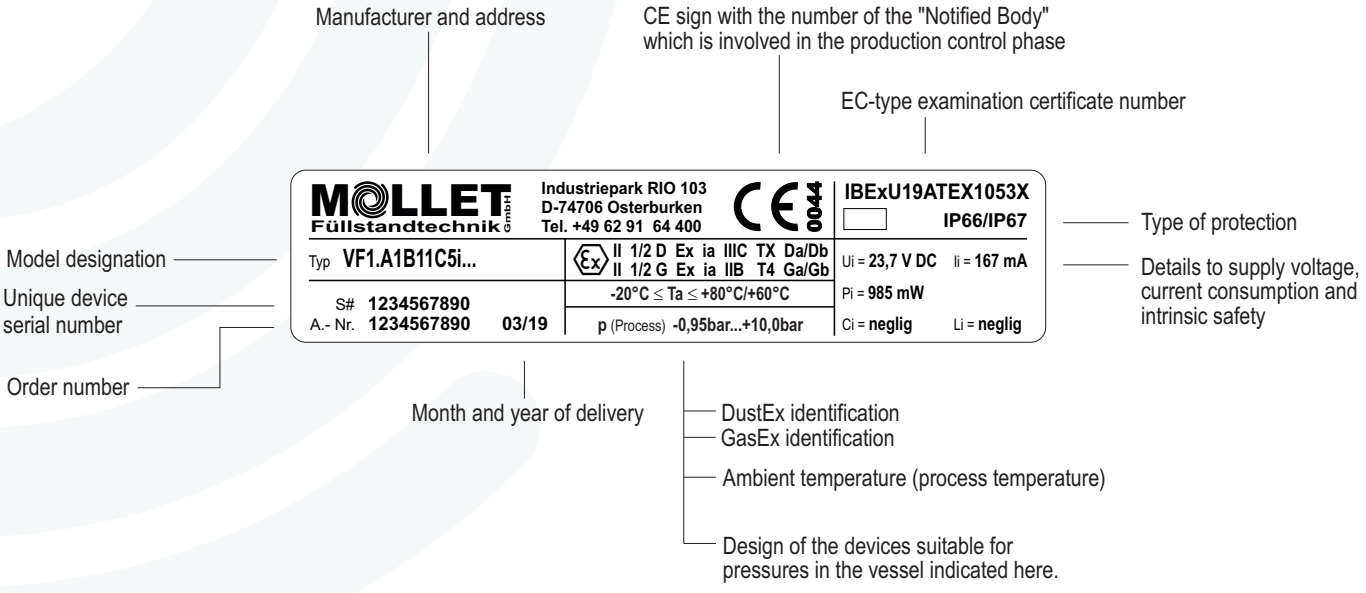
VF1.

Gas+ Dust

Explosion protection information
and supplement to the operating instructions

Type plate details with option B11

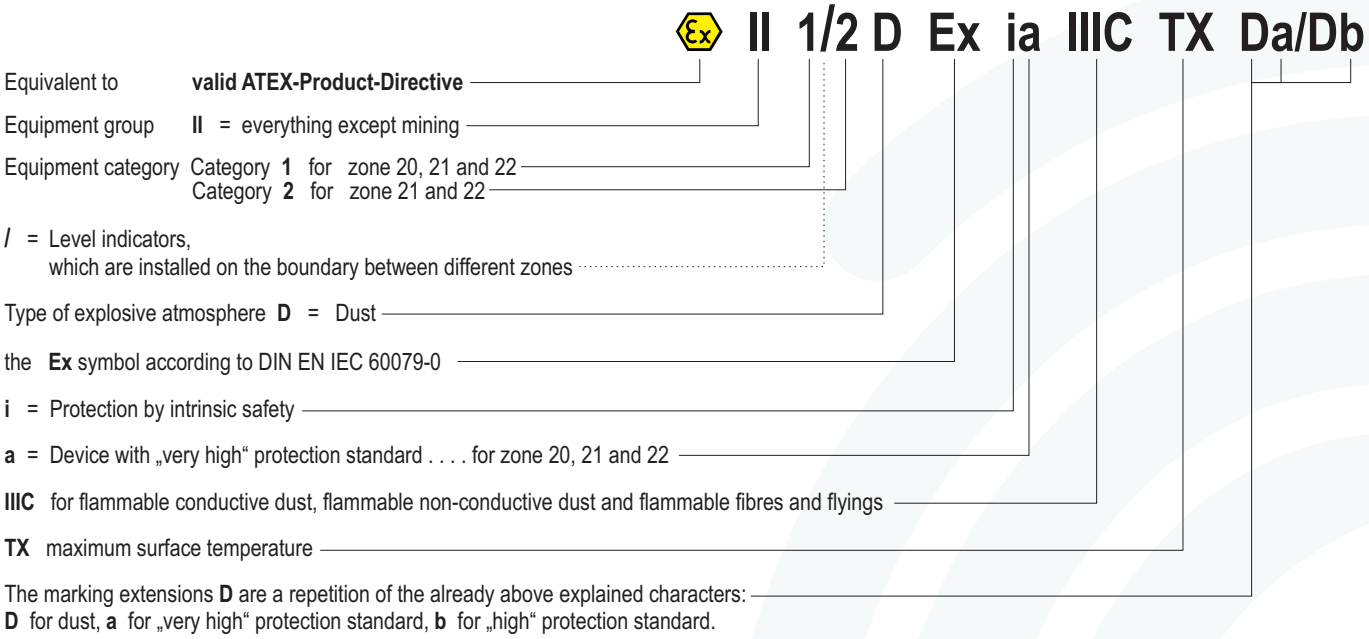
Gas+Dust



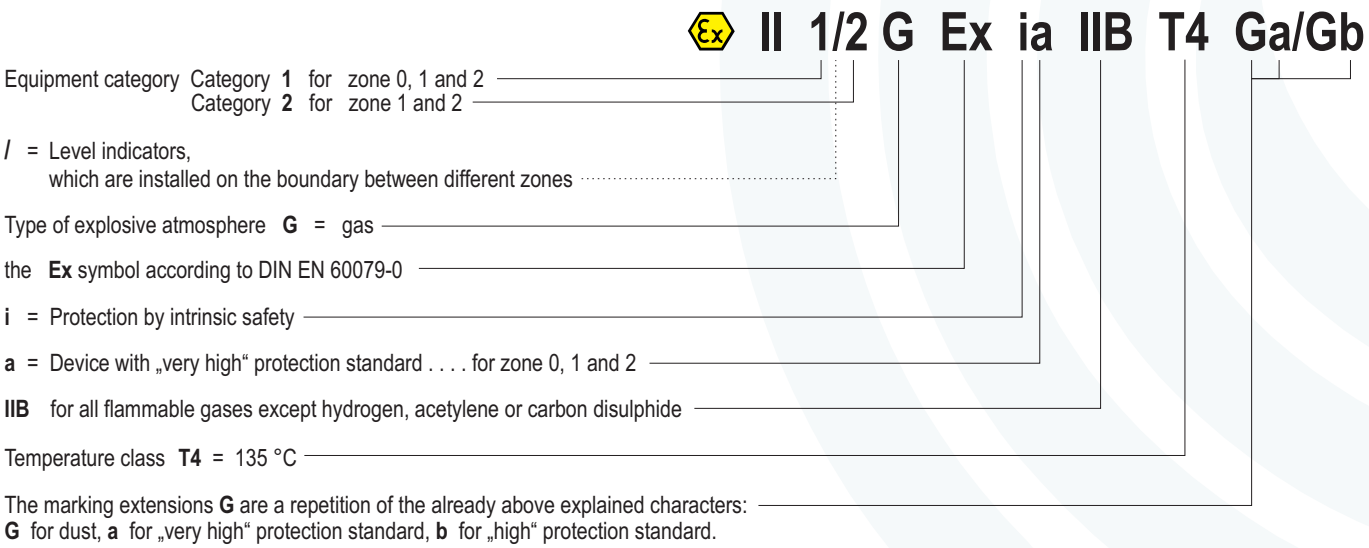
MOLLET
Competence in explosion protection

Marking in accordance with ATEX and DIN EN IEC 60079-0:2019

Vibro level indicator for use at the boundary from zone 20 to zone 21.



Vibro level indicator for use at the boundary from zone 0 to zone 1.



The „very high“ protection standard of the devices permits although the use complete in zone 20 and zone 0. Please request further information if needed.

Order code **VF12A1B11C5i...** and **VF13A1B11C5i...**

Marking: **II 1/2 D**
II 1/2 G

Gas+Dust Ex

Equipment category appropriation by zones

Vibro level indicator for use at the boundary from zone 20 to zone 21 and for use at the boundary from zone 0 to zone 1.

Ambient temperatures Ta

The ambient temperature **Ta** defines the maximum operating temperature of the indicators. Inside the vessel this is process temperature (the air or the bulk goods temperature) nearby the device.

Maximum surface temperature T, TX

The maximum surface temperature **T** means the hottest point at the equipment.
The device equates to temperature class **T 4**

Note:

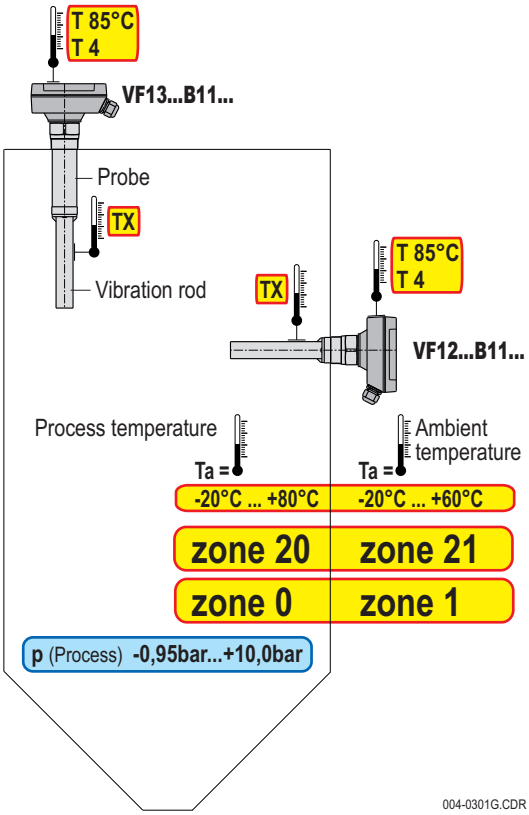
Probe and vibration rod produce no increase of temperature, but they are able to take high temperatures from inside of the vessel and forward it.

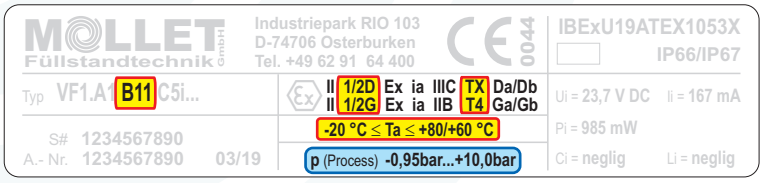
Due to this, the surface temperature **TX** has to be determined according to the process temperature (temperature of bulk solids or ambient) inside of the vessel.

Pressure, vacuum

Design of the devices is suitable for indicated pressures in the vessel.

These pressures are outside of the range for atomospheric conditions defined in the guidance to the ATEX-Product-Directive.





maximum authorised process temperature

-20 °C ≤ Ta ≤ +80 °C / ≤ +60 °C

maximum authorised ambient temperature at the electronic housing

Order code **VF15A1B11C5i...**

Marking: **II 1/2 D**
II 1/2 G

Gas+Dust Ex

Equipment category appropriation by zones

Vibro level indicator for use at the boundary from zone 20 to zone 21 and for use at the boundary from zone 0 to zone 1.

Ambient temperatures Ta

The ambient temperature **Ta** defines the maximum operating temperature of the indicators. Inside the vessel this is process temperature (the air or the bulk goods temperature) nearby the device.

Maximum surface temperature T, TX

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Note:

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Pressure, vacuum

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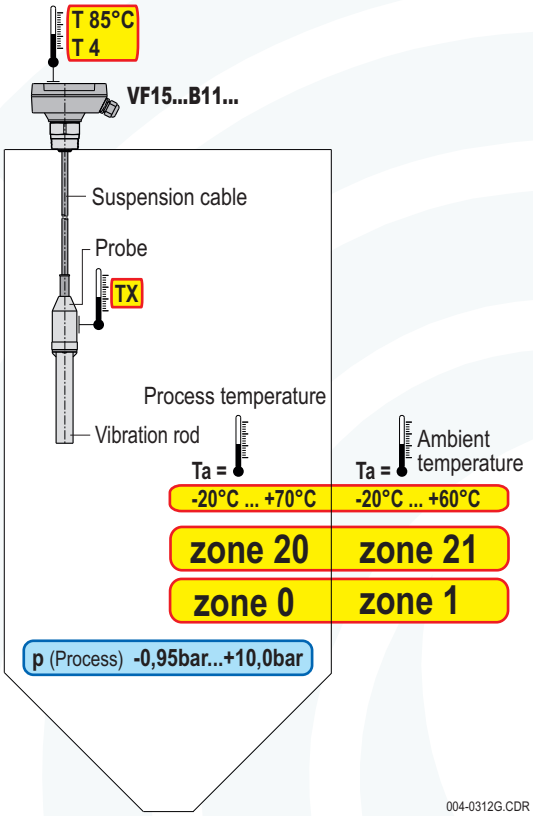

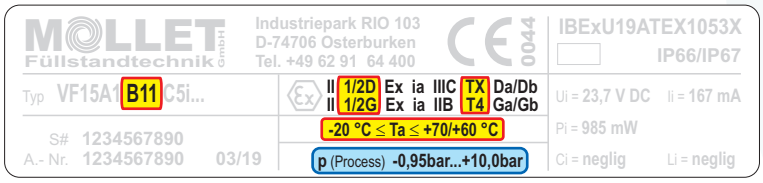

maximum authorised process temperature

$-20\ °C \leq Ta \leq \overbrace{+70\ °C}/\leq \overbrace{+60\ °C}$

maximum authorised ambient temperature at the electronic housing

Inside high process temperature, outside ambient temperature

Order code **VF12A1B11C5i...E1...** and **VF13A1B11C5i...E1...**

Marking: **II 1/2 D**
II 1/2 G

Gas+Dust Ex

Equipment category appropriation by zones

Vibro level indicator for use at the boundary from zone 20 to zone 21 and for use at the boundary from zone 0 to zone 1.

Ambient temperatures Ta

The ambient temperature **Ta** defines the maximum operating temperature of the indicators. Inside the vessel this is process temperature (the air or the bulk goods temperature) nearby the device.

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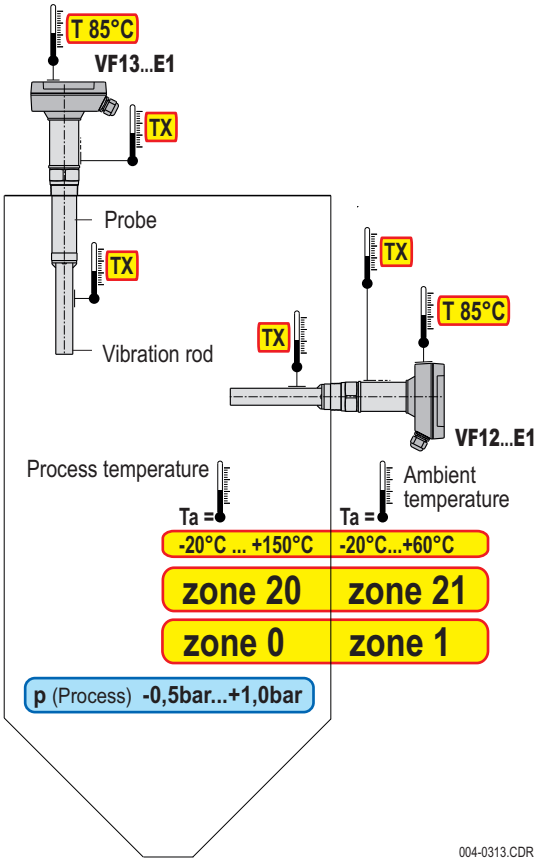
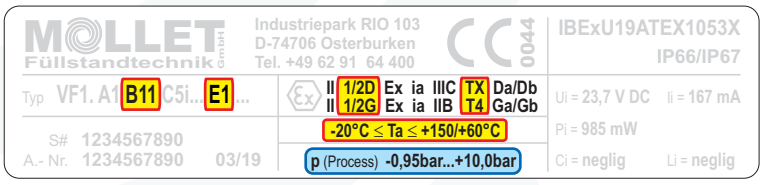




maximum authorised process temperature

-20 °C ≤ Ta ≤ +150 °C / ≤ +60 °C

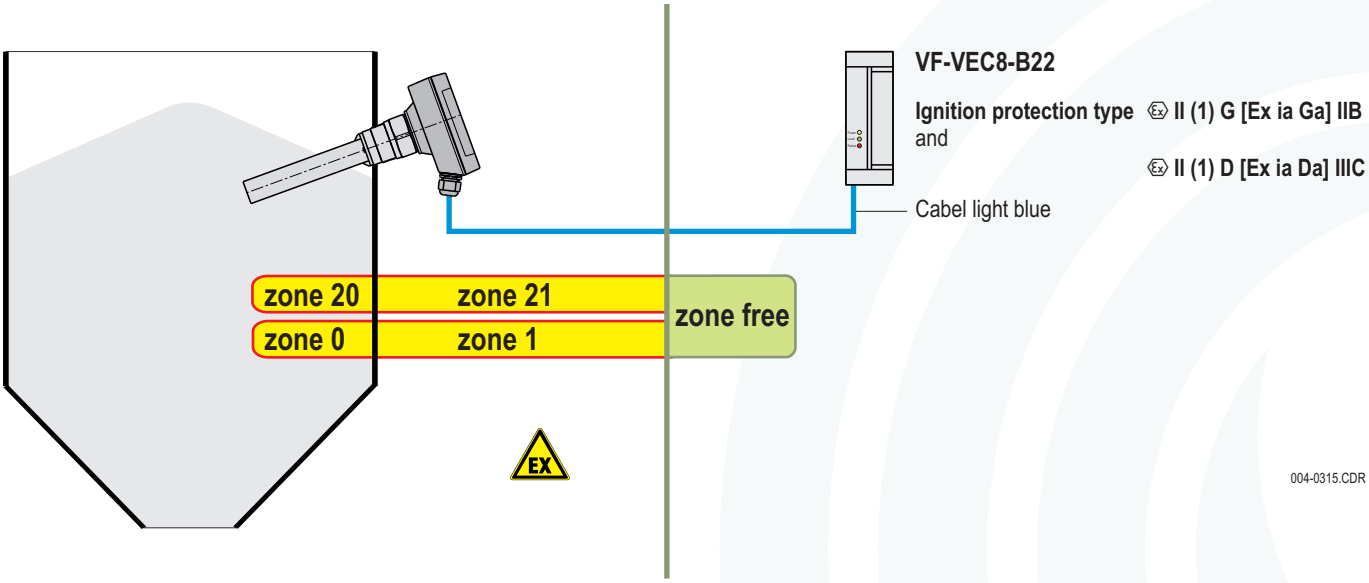
maximum authorised ambient temperature at the electronic housing

Special conditions and instructions for safe application

1. The installation, maintenance, initial operation, removal and repair have to be controlled resp. checked by an “authorized person” for explosion protection and has to be done according to the specifications in the operating instructions manual.
   - According to DIN EN 61010-1 a main switch for the supply and evaluation device has to be installed nearby and has to be made visible as such. It must be able to interrupt the power supply and relay circuit with this main switch.
   - For protection against surge voltages a overvoltage filter has to be installed accordingly.

2. - For the electrical connection you have to take notice of the local and statutory requirements and/or the VDE 0100 as well as the additional requirements for the ignition protection type „i“ - intrinsic safety according EN 60079-14 for associated equipments without galvanic isolation.
   - The vibro level indicator is a category 1 equipment that has to be installed in such a way that sparks can not be generated by shocks onto or friction at the aluminium housing.

3. The power supply must be provided by the associated equipment „Supply and evaluation device VF-VEC8-B22" only.



4. Take notice of the specifications on the data plate.

5. Standards for the connection of intrinsic safe circuits according to EN 60079-14 must be observed.

6. The associated equipment „Supply and evaluation device VF-VEC8-B22" has to be installed in a room without potentially explosive atmosphere (control cabinet).

7. As soon as the device will be brought into the explosion hazardous area it has to be mounted immediately at the intended place and a cable has to be brought into the cable gland.

8. Please check if the cable gland have loosened during mounting process or transport. When it is loosened, it has to be fixed again with a torque of 3.75 Nm.

9. To secure the type of protection, the screw nut of the cable gland has to be fixed at the installation with a minimum torque of 2.7 Nm.
   ATTENTION! If it will be fastened too strong, the IP-protection can be affected.

10. The device has to be grounded and the ground connection of the device has to be installed in such a way that mechanical damage will be excluded.

11. The device may put into operation with built-in cap-sealing and when it is closed, only.

12. Remove the dust from the housing before you open it and make sure that no dust turbulences exist.

13. Please check position and intactness of all gaskets before you close the device.

14. Tightening torque of the central fixing srew: 3 Nm and of the lid screw: 3 Nm.

15. The maximum authorised temperatures for process (bulk solids) and ambience have to be observed.

16. Take notice of the requirements of DIN EN 60079-11, DIN EN 60079-17 and DIN EN 1127-1, especially regarding the dust deposits and temperatures and follow the pertinent rules and regulations.

Type plate details

Gas+Dust