

# Vibro level indicator

## Level limit switches for bulk goods

# VF1.


# Operating instruction

**Rhombus vibration rod**  
*robust single rod - compact and versatile*

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- 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  - 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 device (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.

-  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.

## 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	<b>MOLLET Füllstandtechnik GmbH</b>
Address	Industriepark RIO 103 74706 Osterburken Germany
Name of part	<b>MOLOSvibro Vibro level indicator</b>
Type	<b>VF1 ...</b>

### 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/m<sup>3</sup>.**

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:

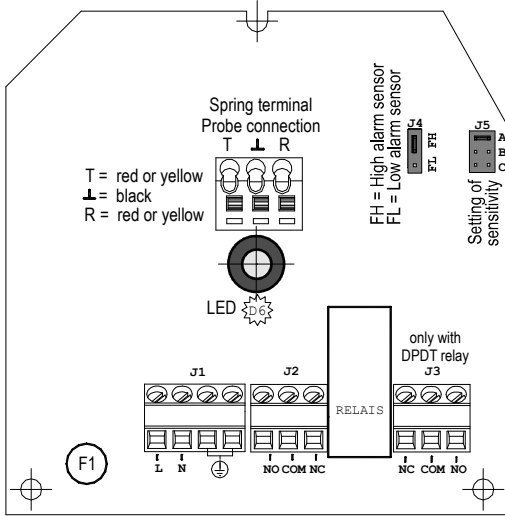
- **Switch point dependent of bulk density (t/m<sup>3</sup>; kg/l):**
  - with heavy bulk solids only the tip of the rod has to be covered for damping the vibration.
  - with light bulk solids the complete rod has to be covered for damping the vibration.
- **In order to keep the ambient temperature of 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

<b>Material</b>	Rectangular-housing Process connection and probe Rhombus vibration rod Suspension cable sheath	Aluminium, RAL7001 Stainless steel 1.4301 / 304 Stainless steel 1.4301 / 304 Polyurethane	
<b>Process connection</b>	<b>R3</b>	R1½ EN 10226 or <b>N3 1½" NPT</b>	
<b>Ambient temperature</b>		-40 °C ... +70 °C with separate housing -40 °C ... +80 °C	<b>T<sub>a</sub></b>
Process temperature	<b>VF12, VF13 VF15</b>	-40 °C ... +80 °C -40 °C ... +70 °C	<b>T<sub>(Process)</sub></b>
<b>VF12, VF13 high temperature</b>	<b>E1 E2 E3</b>	-40 °C ... +150 °C -40 °C ... +200 °C -40 °C ... +250 °C	<b>T<sub>(Process)</sub></b>
<b>Process pressure</b>		-0.95 bar ... 10 bar	<b>p<sub>(Process)</sub></b>
<b>Minimum density of bulk solids</b>		0.01 kg/l (t/m <sup>3</sup> )	
<b>Response delay</b>		for damping 1 second for start oscillation 2 to 5 seconds	
<b>Cable entry</b>		Gland 2xM20x1,5	
<b>Type of protection</b>		<b>IP66/IP67</b> acc. DIN EN 60529 <b>IP65</b> acc. DIN EN 60529	<b>IP</b>
<b>Maintenance</b>		none	
<b>Maximum load for the end of the vibration rod</b>		1000 N vertical (V) 250 N horizontal (H)	
<b>Maximum tensile force at suspension cable of type VF15</b>		2000 N	
<b>Installation position</b>	<b>VF12, VF13 VF15</b>	any vertical	

## 9. Electrical connection and data

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



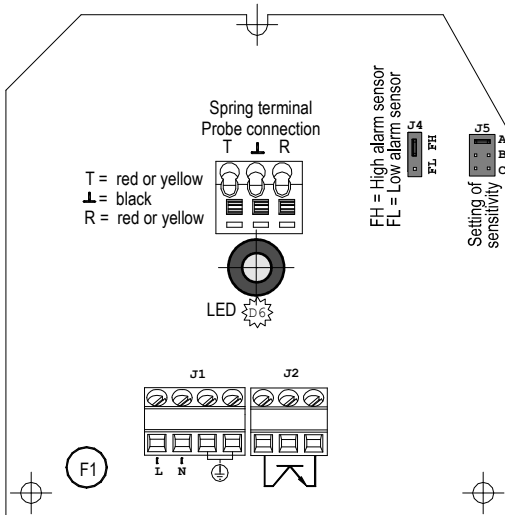
<b>Supply voltage C8</b>	20 ... 250 VAC/DC	<b>Supply</b>
<b>Power consumption</b>	≤ 3 VA / 3 W	
<b>Signal relay</b>	two potential free change-over contacts (SPDT)	
<b>Capacity of contact</b>	8 A / 250 V AC 192 / 72 W at 24 / 48 V DC	
<b>Connection clamps</b>	maximum 2.5 mm <sup>2</sup>	

20 ... 250 V AC/DC PE

Signal relay for high or low alarm 004-0210.CDR

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



<b>Supply voltage C5</b>	24 V DC ±10%	<b>Supply</b>
<b>Power consumption</b>	≤ 1 W (without load)	
<b>Signal output</b>	potential free NPN / PNP	
<b>Capacity of contact</b>	maximum 20 W switching capacity maximum 350 mA constant current	
<b>Connection clamps</b>	maximum 2.5 mm <sup>2</sup>	

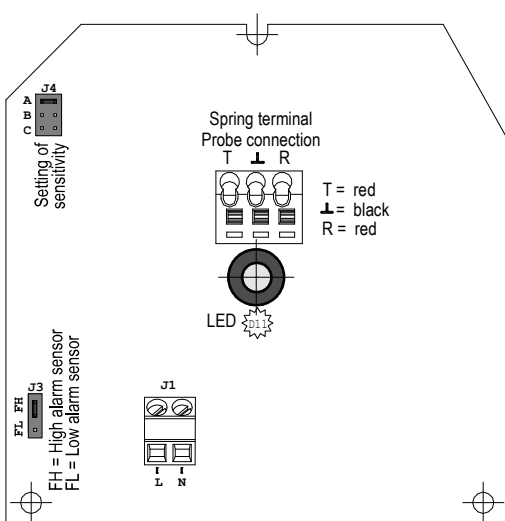
24 V DC PE

24 V DC

24 V DC

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

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



<b>Supply voltage U<sub>i</sub></b>	23.7 V DC from VF-VEC8-B22
<b>I<sub>i</sub></b>	167 mA
<b>P<sub>i</sub></b>	985 mW
<b>L<sub>i</sub></b>	negligible
<b>C<sub>i</sub></b>	negligible
<b>Connection clamps</b>	maximum 2.5 mm <sup>2</sup>

23,7 V DC

PE L N

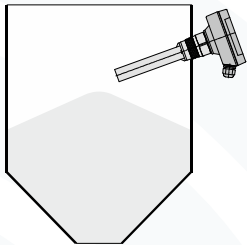
Supply only with supply and evaluation device VF-VEC8-B22 for GasEx.

<b>Current consumption</b>		
<b>High alarm FH</b>	Vibration rod oscillates freely	8 mA
	Vibration rod covered	16 mA
<b>Low alarm FL</b>	Vibration rod covered	8 mA
	Vibration rod oscillates freely	16 mA

### 10. High alarm sensor FH (factory setting)

MOLOSvibro level indicator of the VF1. series are configured 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



**Electronic type**

**LED display**

C8



LED on

C5



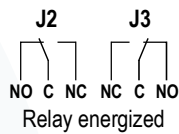
LED on

C5i



LED off

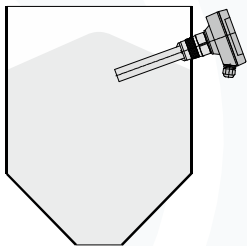
**Switching status**



Transistor conductive

8 mA  
Current output

**High alarm** - vibration rod covered with bulk solids



**Electronic type**

**LED display**

C8



LED blinking

C5



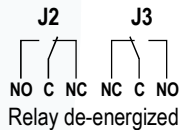
LED blinking

C5i



LED on

**Switching status**



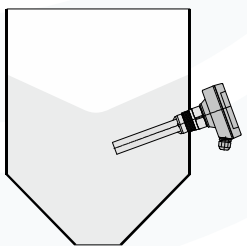
Transistor blocks

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



**Electronic type**

**LED display**

C8



LED on

C5



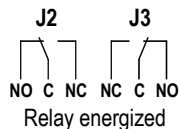
LED on

C5i



LED off

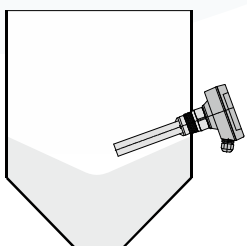
**Switching status**



Transistor conductive

8 mA  
Current output

**Leeralarm** - Vibration rod oscillates freely



**Electronic type**

**LED display**

C8



LED blinking

C5



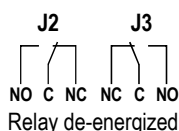
LED blinking

C5i



LED on

**Switching status**

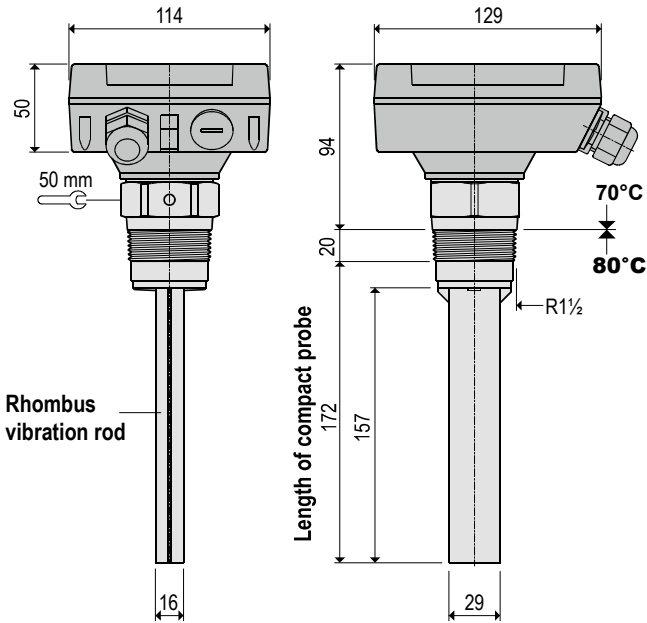


Transistor blocks

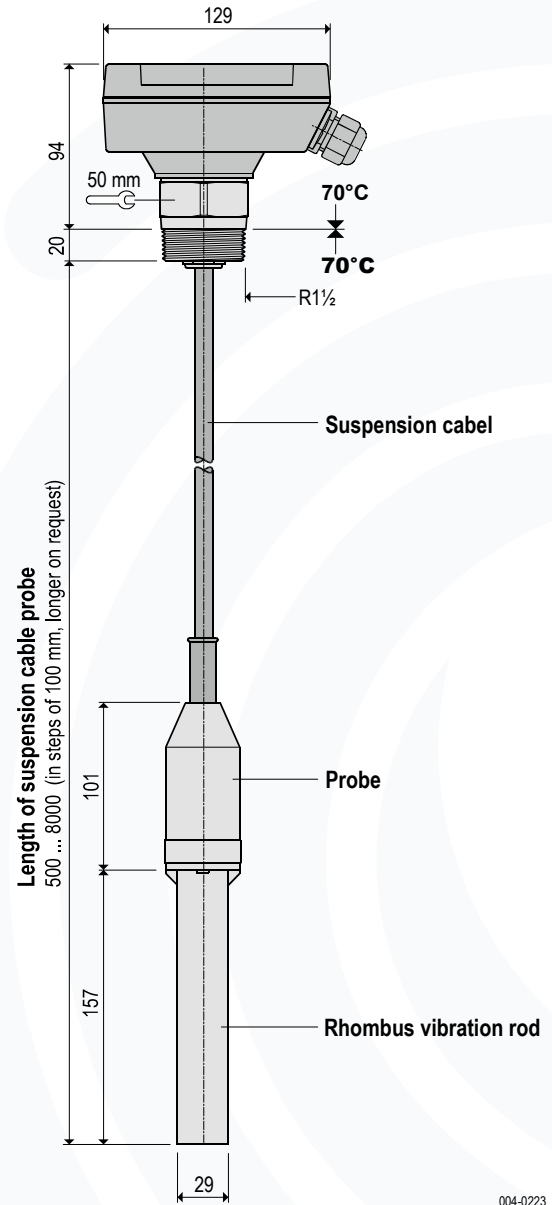
16 mA  
Current output

12. Versions/Dimensions

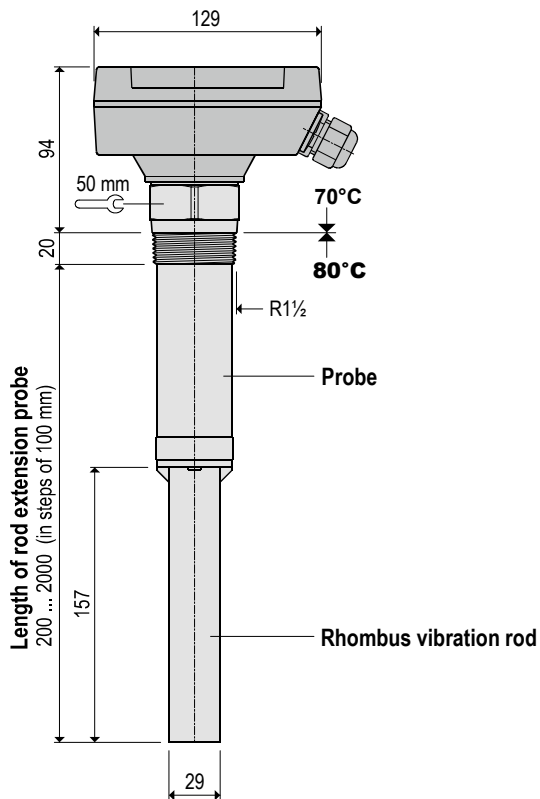
12.1 VF12 Compact sensor



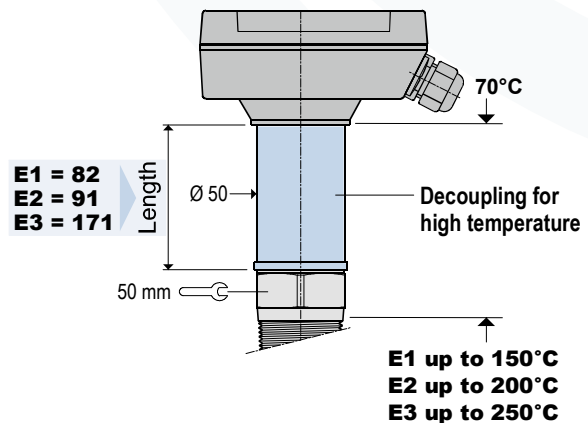
12.3 VF15 Suspension cable sensor



12.2 VF13 Rod extension sensor



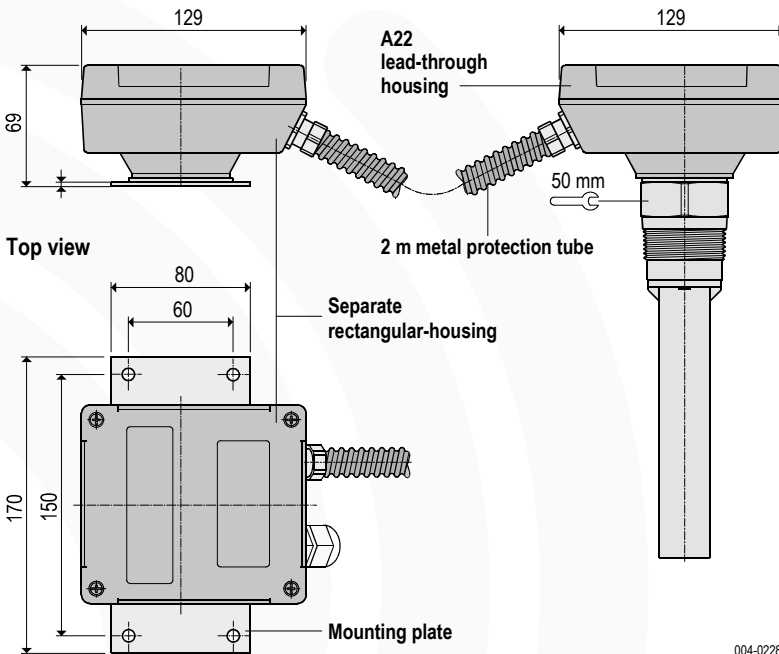
12.4 E1 ... E3 High temperature



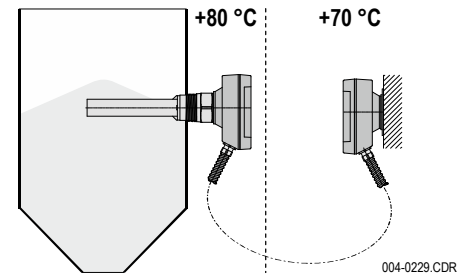
12. Versions/Dimensions

12.5 A22 Separate rectangular-housing

Front and side views



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



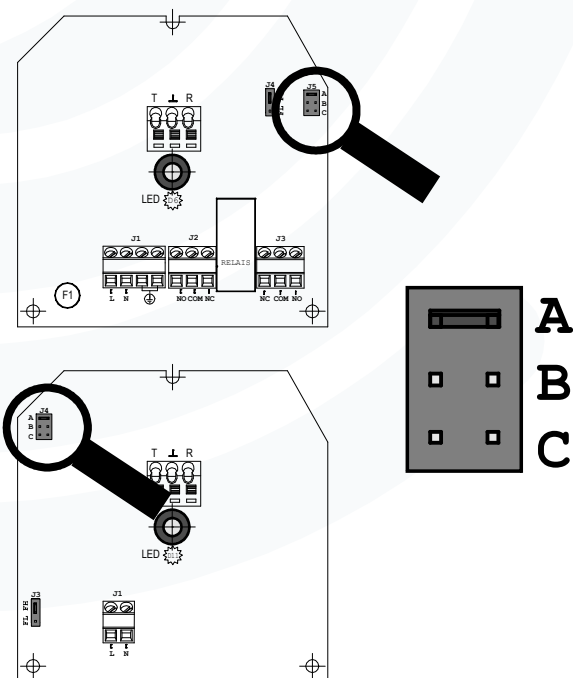
**Application**

- 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.

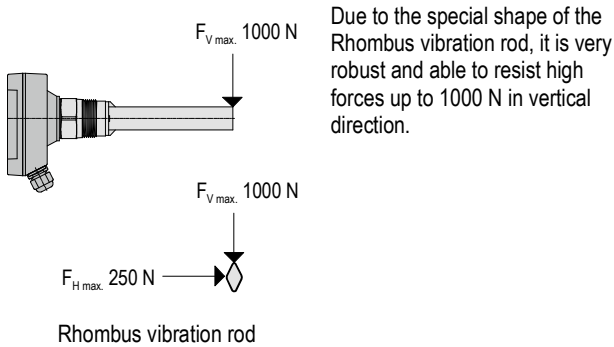
13. Setting of sensitivity



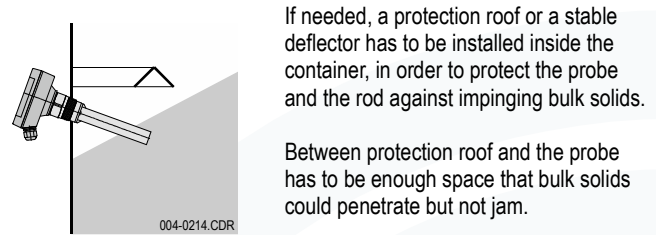
Adjustment by jumper at **A - B - C**

- 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!

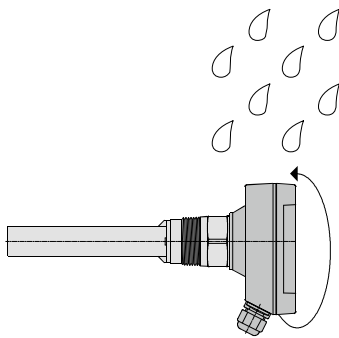
## 14. Load for vibration rod



## 15. Protection against heavy load



## 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

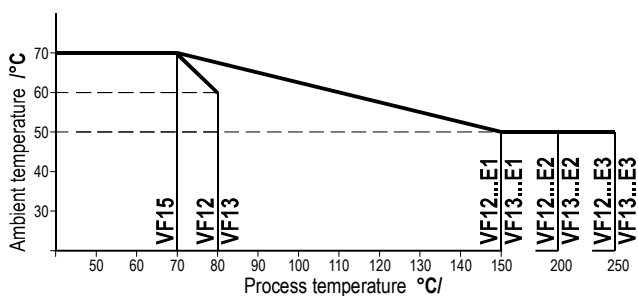
Ambient temperature at the probe (process temperature)  $T_{(process)}$  **-40°C ... +80°C**

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)

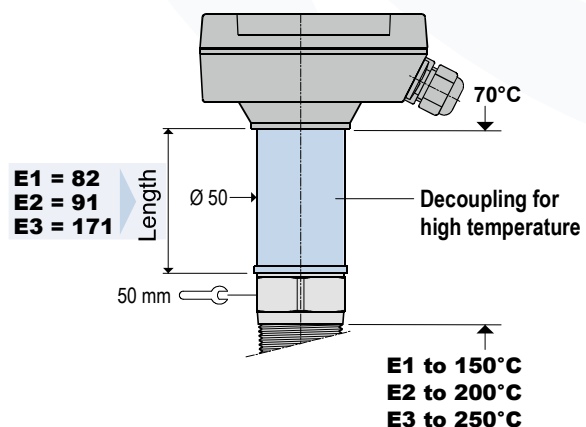


004-0739.CDR

## 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.

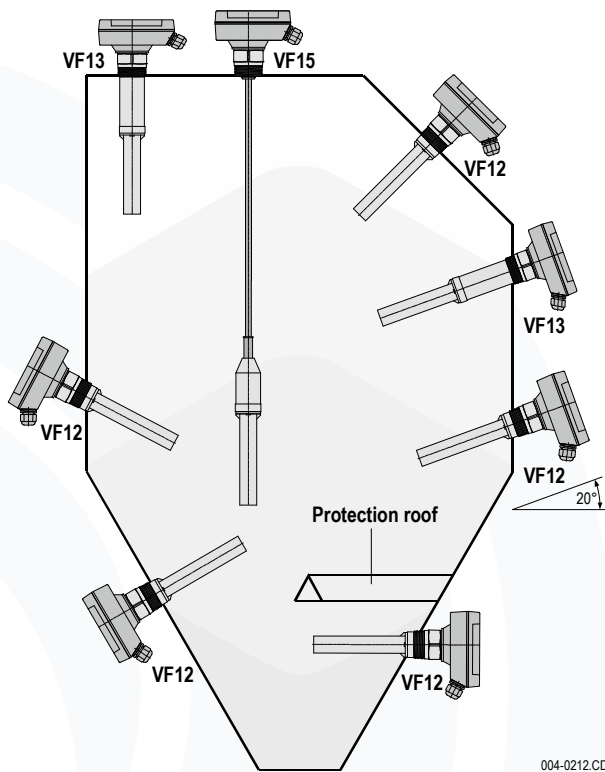
- in order to protect the electronic against overheating by heat transfer from the process, a decoupling for high temperature **E1, E2 or E3** is installed between probe and electronic housing.
- use for process temperatures above 80 °C only level indicators with the high temperature option.
- due to 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.



004-0224



## 19. Possibilities for installation



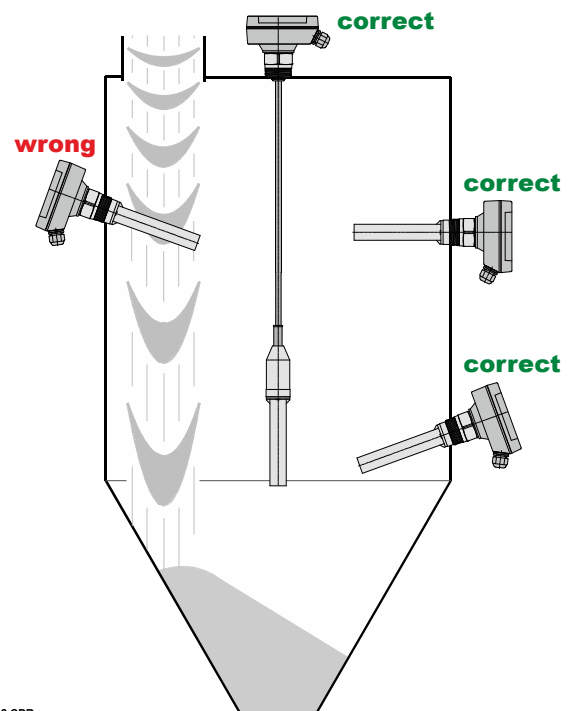
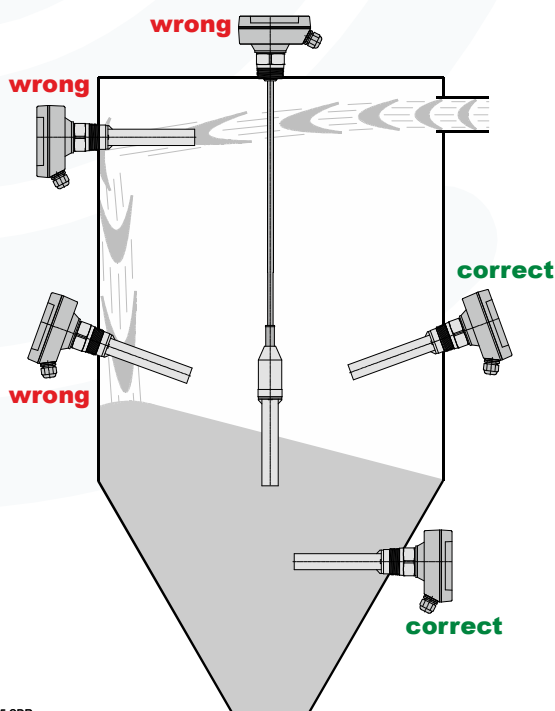
### Side mounting or vertical mounting:

- 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.



## 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:

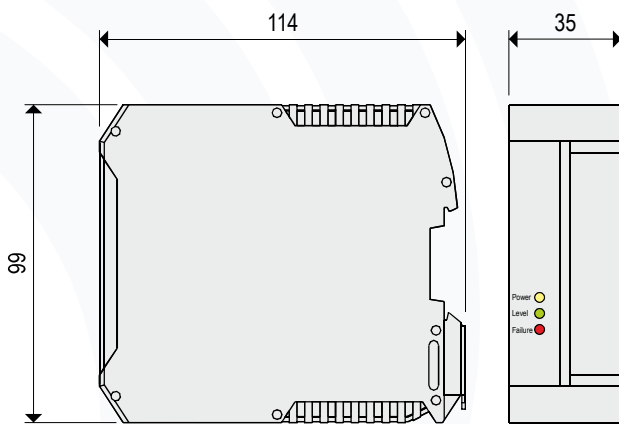
- Chemical and physical characteristics of the bulk goods or liquid
- Description of the application
- Description of the failure occurred
- Operating time of the measuring device.

## 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



004-0240.CDR

## Technical data

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

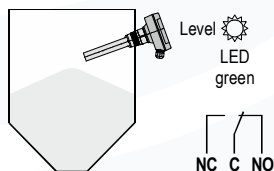
## High and low alarm sensor

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)

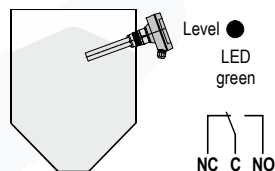
#### Free status

Vibration rod oscillates freely



#### High alarm

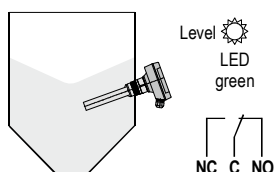
Vibration rod covered with bulk solids



### Low alarm sensor FL (jumper repositioned)

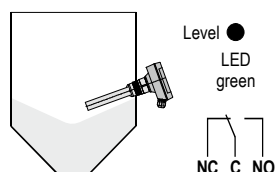
#### Covered status

Vibration rod covered with bulk solids

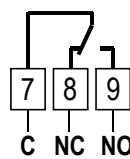


#### Low alarm

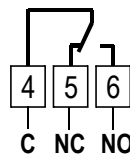
Vibration rod oscillates freely



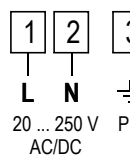
## Electrical connection



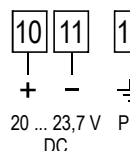
Signal relay for high and low alarm



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:

<b>EMV-Richtlinie</b>	<b>EMC directive</b>	<b>2014/30/EU</b>
<b>Niederspannungsrichtlinie</b>	<b>Low voltage directive</b>	<b>2014/35/EU</b>

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  - Kennzeichnung entsprechen zusätzlich der folgenden Europäischen Richtlinie:  
And the devices with  - marking conform additional with the following European directive:

<b>ATEX-Richtlinie</b>	<b>ATEX directive</b>	<b>2014/34/EU</b>
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Je nach Ausführungsvariante angewandte harmonisierte Normen oder normative Dokumente:  
Depending on the design applied harmonized standards or normative documents:

<b>DIN EN IEC 60079-0:2019</b>	<b>DIN EN 60079-31:2014</b>
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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



**Wolfgang Hageleit**  
Geschäftsführer / managing director

Diese Erklärung darf nur unverändert weiterverbreitet werden.  
This declaration is only allowed to hand out in unchanged form.