

## Vibracon LVL-B1, LVL-B2

**Level limit switch**  
**Robust vibration limit switch for bulk solids,**  
**also for dust incensive hazard areas**



### Application

Vibracon LVL-B\* is a robust level limit switch for silos with fine-grained or coarse-grained, non-fluidised bulk solids.

The various designs means the device has a wide range of applications. Certificates are also available for use in dust incensive hazard areas.

**LVL-B1** compact design (250 mm (10 in)) as vibrating rod for installation in any direction

**LVL-B2** vibrating rod with extension pipe (500 mm/1000 mm/1500 mm/20 in/40 in/60 in) for installation in any direction

Typical applications: cereals, coffee beans, sugar, animal feed, rice, detergents, dye powder, chalk, gypsum, cement, sand, plastic granules.

### Features

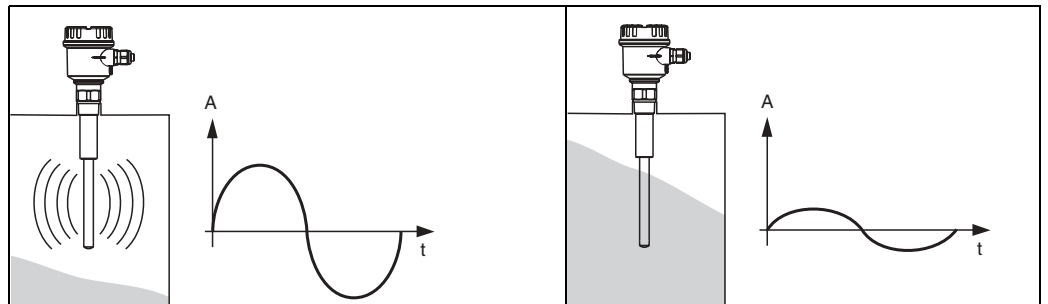
- No calibration: easy commissioning (plug and play)
- Insensitive to build-up: maintenance-free operation
- No mechanically moving parts: no wear, long operating life
- Sensor material 316L: hardly any abrasion even with building materials
- F16 plastic housing with cover with sight glass: switch status visible from outside
- F18 aluminium housing also available
- Insensitive to external vibration and flow noises
- Also available with explosion protection ATEX II 1/3 D, FM or CSA approval

<b>Function and system design</b> . . . . .	<b>3</b>	<b>Process</b> . . . . .	<b>8</b>
Measuring principle . . . . .	3	Environment . . . . .	8
Measuring system . . . . .	3	Thermal shock resistance . . . . .	8
<b>Cable specifications</b> . . . . .	<b>4</b>	Limiting medium pressure range . . . . .	8
Cable entries . . . . .	4	State of aggregation . . . . .	8
<b>Input</b> . . . . .	<b>4</b>	Grain size . . . . .	8
Measured variable . . . . .	4	Bulk density . . . . .	8
Measuring range (application) . . . . .	4	Lateral load . . . . .	8
Input signal . . . . .	4	<b>Mechanical construction</b> . . . . .	<b>9</b>
Measuring frequency . . . . .	4	Design, dimensions . . . . .	9
<b>Output</b> . . . . .	<b>4</b>	Weight . . . . .	10
Galvanic isolation . . . . .	4	Material . . . . .	10
Switch behaviour . . . . .	4	<b>Human interface</b> . . . . .	<b>11</b>
Power-on behaviour . . . . .	4	Display elements . . . . .	11
Fail-safe mode . . . . .	4	Operating elements of electronic inserts . . . . .	11
Switching delay . . . . .	4	Sediment detection . . . . .	11
Ex specifications . . . . .	4	<b>Certificates and approvals</b> . . . . .	<b>12</b>
<b>Electronic insert FEM 22 (E5)</b> . . . . .	<b>5</b>	CE mark, declaration of conformity . . . . .	12
Electrical connection . . . . .	5	Ex approval . . . . .	12
Output signal . . . . .	5	Type of protection . . . . .	12
Signal on alarm . . . . .	5	Other standards and guidelines . . . . .	12
Connectable load . . . . .	5	<b>Ordering information</b> . . . . .	<b>13</b>
Power supply . . . . .	5	Product structure LVL-B1 . . . . .	13
<b>Electronic insert FEM 24 (WA)</b> . . . . .	<b>6</b>	Product structure LVL-B2 . . . . .	13
Electrical connection . . . . .	6	<b>Accessories</b> . . . . .	<b>14</b>
Output signal . . . . .	6	High pressure sliding sleeve . . . . .	14
Signal on alarm . . . . .	6	Sliding sleeve . . . . .	14
Connectable load . . . . .	6	Spare parts . . . . .	14
Power supply . . . . .	6	<b>Supplementary documentation</b> . . . . .	<b>15</b>
<b>Operating conditions</b> . . . . .	<b>7</b>	Operating instructions . . . . .	15
Installation instructions . . . . .	7	Safety informations . . . . .	15
<b>Environment</b> . . . . .	<b>7</b>	Directive conformity . . . . .	15
Ambient temperature range . . . . .	7	Supplementary informations . . . . .	15
Storage temperature . . . . .	7		
Climate class . . . . .	7		
Degree of protection . . . . .	7		
Vibration resistance . . . . .	7		
Electrical safety . . . . .	7		
Electromagnetic compatibility . . . . .	7		

## Function and system design

### Measuring principle

A piezoelectric drive excites the vibrating rod of Vibracon LVL-B1, LVL-B2 to its resonance frequency. If medium covers the vibrating rod, the rod's vibrating amplitude changes (the vibration is damped). Vibracon's electronics compare the actual amplitude with a target value and indicates whether the vibrating rod is vibrating freely or whether it is covered by medium.



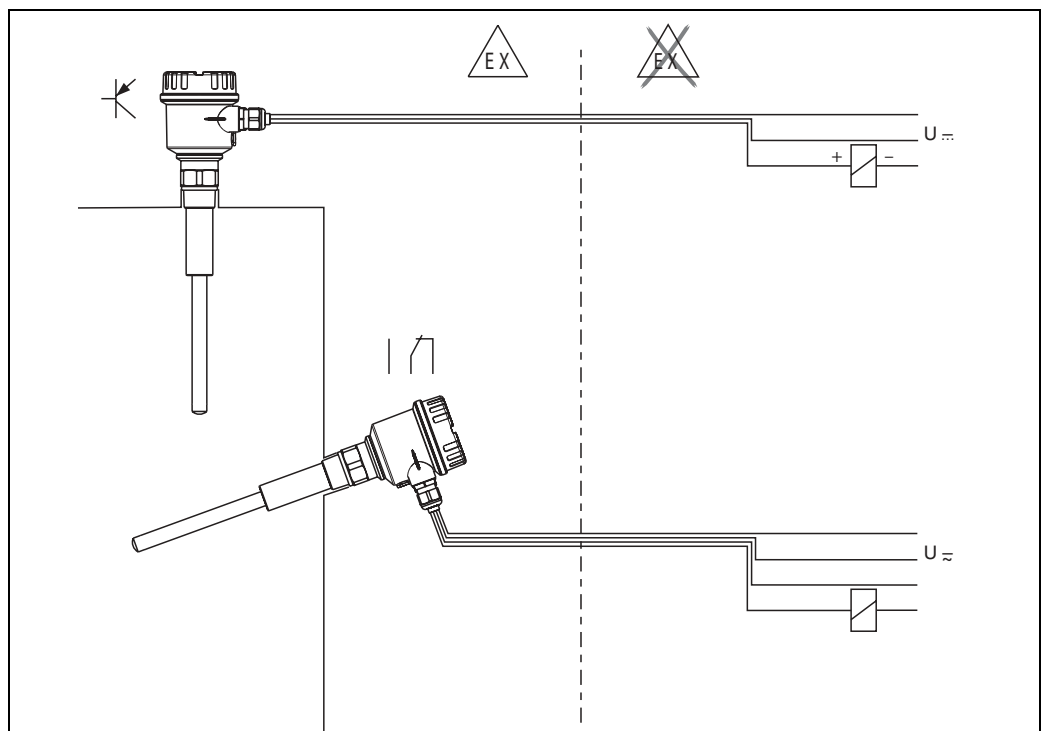
A = amplitude

### Measuring system

**Vibracon LVL-B\* is a compact electronic switch.**

Thus, the entire measuring system only consists of:

- Vibracon LVL-B1 or LVL-B2 with FEM 22 (E5) or FEM 24 (WA) electronic insert
- a supply point and
- the connected control systems, switching units, signalling systems (e. g. lamps, horns, PCS, PLC, etc.)



## Cable specifications

Use a shielded cable in the event of strong electromagnetic radiation.

### Immunity to temperature change of connecting cable

The connecting cables must withstand the ambient temperature +15 K.

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**Cable entries** M20 x 1,5 (cable gland); ½ NPT; G½

## Input

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**Measured variable** Level (according to the mounting location and the overall length)

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**Measuring range (application)** The measuring range depends on the mounting location of Vibracon LVL-B\* and the length of the pipe extension selected. The pipe extension is available in the following lengths: 500 mm, 1000 mm, 1500 mm, 20 in, 40 in, 60 in.

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**Input signal** Probes covered → small amplitude  
Probe not covered → large amplitude

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**Measuring frequency** 700 Hz ... 800 Hz

## Output

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**Galvanic isolation** FEM 22 (E5): between sensor and power supply  
FEM 24 (WA): between sensor, power supply and load

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**Switch behaviour** binary

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**Power-on behaviour** When switching on the power supply the output is set to "signal on alarm".  
After a maximum of 3 s it switches to the correct output signal.

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**Fail-safe mode** Minimum/maximum quiescent current safety can be switched at electronic insert.  
Max. = maximum safety:  
When the vibrating rod is covered, the output switches in the direction of the signal on alarm.  
Used for overfill protection for example.  
Min. = minimum safety:  
When the vibrating rod becomes exposed, the output switches in the direction of the signal on alarm.  
Used for empty running protection for example.

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**Switching delay** 0.5 s when the sensor is covered, 1 s when the sensor is exposed

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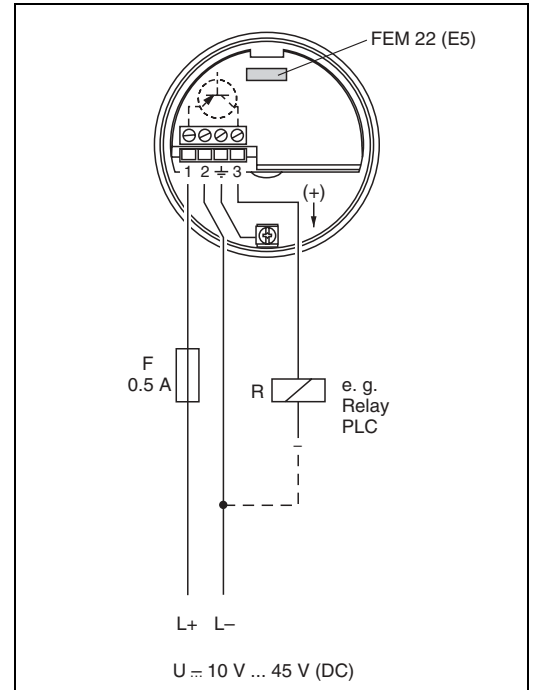
**Ex specifications** FEM 22 (E5), FEM 24 (WA):  
Explosion protection for explosive dust-air mixtures: Dust-Ex, DIP

## Electronic insert FEM 22 (E5)

### Electrical connection

#### Three-wire direct current connection

Preferred in conjunction with programmable logic controllers (PLC), DI modules as per EN 61131-2.  
Positive signal at electronics switch output (PNP); Output blocked at level limit.



### Output signal

$I_L$  = load current (switched through)

$< 100 \mu A$  = residual current (blocked)



= lit



= not lit

Safety connection	Level	Output signal	LEDs	
			green	yellow
Max.		$L+ \xrightarrow{I_L} 3$		
		$1 \xrightarrow{< 100 \mu A} 3$		
Min.		$L+ \xrightarrow{I_L} 3$		
		$1 \xrightarrow{< 100 \mu A} 3$		

### Signal on alarm

Output signal on power failure or in the event of device failure:  $< 100 \mu A$

### Connectable load

- Load switched via transistor and separate PNP connection
- Load current: max. 45 V (cyclical overload and short-circuit protection), continuous max. 350 mA
- Residual current:  $< 100 \mu A$  (for blocked transistor)
- Capacitive load: max. 0.5  $\mu F$  for 45 V, max. 1.0  $\mu F$  for 24 V
- Residual voltage:  $< 3 V$  (for transistor switched through)

### Power supply

DC voltage 10 V ... 45 V  
Ripple max. 5 V, 0 Hz ... 400 Hz  
Current consumption max. 15 mA  
Power consumption max. 0.68 W  
Reverse polarity protection  
Separation voltage: 2.2 kV  
Overvoltage protection: overvoltage category III

## Electronic insert FEM 24 (WA)

### Electrical connection

### Universal current connection with relay output

Power supply:

Please note the different voltage ranges for AC and DC.

Output:

When connecting a device with high inductance, provide a spark arrester to protect the relay contact.

A fine-wire fuse (depending on the load connected) protects the relay contact in the event of a short-circuit.

Both relay contacts switch simultaneously. DPDT (double pole double throw)

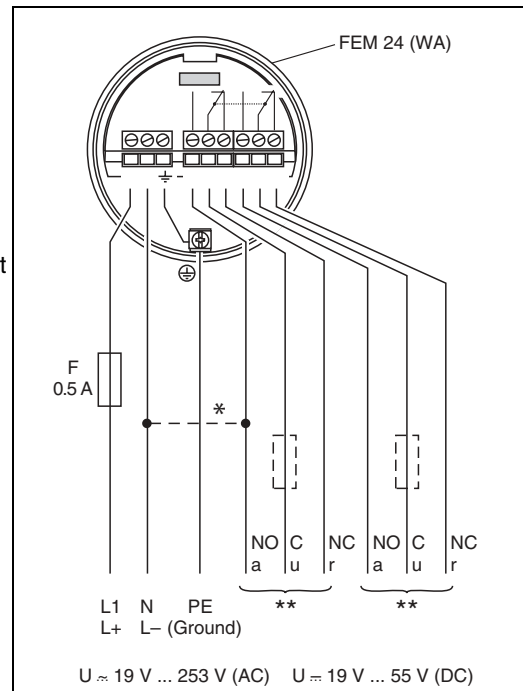
\* When jumpered, the relay output works with NPN logic.

\*\* see below "Connectable load"



#### Note!

Please note the different voltage ranges for direct and alternating current.



### Output signal

- = relay energised
- = relay de-energised
- = lit
- = not lit

Safety connection	Level	Output signal	LEDs	
			green	yellow
Max.				
Min.				

### Signal on alarm

Output signal in event of power failure: relay de-energised

### Connectable load

- Loads switched via 2 floating change-over contacts.
- I~ max. 6 A, U~ max. 253 V; P~ max. 1500 VA, cos φ = 1, P~ max. 750 VA, cos φ > 0.7;
- I- max. 6 A to 30 V, I- max. 0.2 A to 125 V.
- The following applies when connecting a functional extra-low voltage circuit with double insulation as per IEC 1010: sum of voltages of relay output and power supply max. 300 V

### Power supply

Alternating voltage 19 V... 253 V, 50/60 Hz or DC voltage 19 V ... 55 V

Power consumption max. 1.3 W

Reverse polarity protection

Separation voltage: 2.2 kV

Overvoltage protection: overvoltage category III

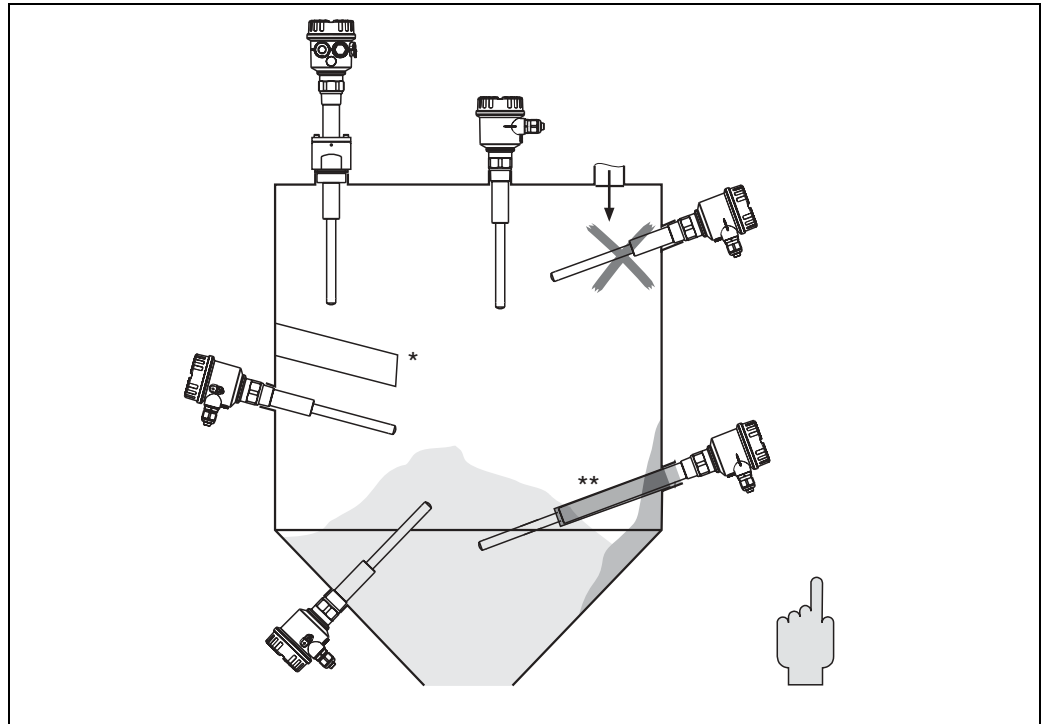
## Operating conditions

### Installation instructions

#### Mounting location

e. g. storage or buffer container

#### Orientation



Horizontal installation/vertical installation

\* with protective cover (to be provided by customer)

\*\* with protecting tube (to be provided by customer)

## Environment

### Ambient temperature range

-40 °C ... 70 °C (233 K ... 343 K)

### Storage temperature

-40 °C ... 85 °C (233 K ... 358 K)

### Climate class

Climatic protection as per DIN IEC 68 part 2-38, fig. 2a

### Degree of protection

IP66/IP67, Nema 4x

### Vibration resistance

DIN 60068-2-27/IEC 68-2-27: shock 30 g, vibration 0.01 g<sup>2</sup>/Hz

### Electrical safety

IEC 61010, CSA 1010.1-92, FM3600

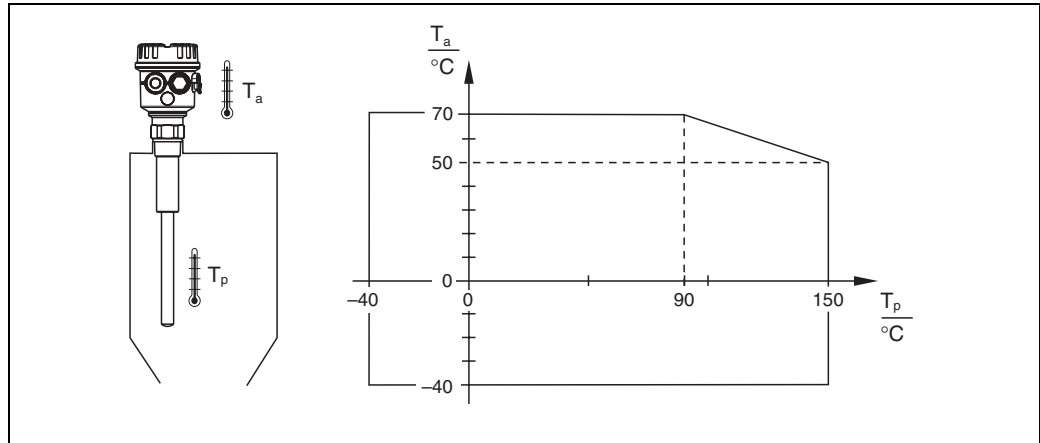
### Electromagnetic compatibility

Interference emission to EN 61326, Electrical Equipment Class B  
Interference immunity to EN 61326, annex A (Industrial)

## Process

**Environment**

Permitted ambient temperature  $T_a$  at housing depending on the medium temperature  $T_p$  in the container:



**Thermal shock resistance** max. 120 K

**Limiting medium pressure range** -1 bar ... 25 bar

**Maximum working pressure (MWP)**  
25 bar

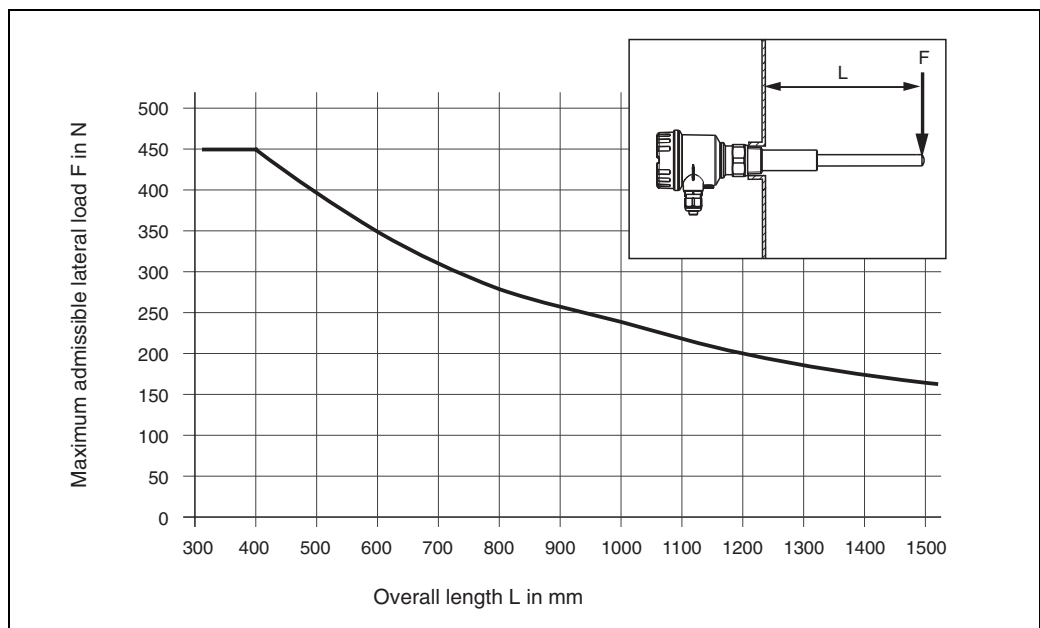
**Burst pressure**  
100 bar

**State of aggregation** Solids

**Grain size**  $\leq 25$  mm

**Bulk density**  $\geq 200$  g/l, not fluidised

**Lateral load**



100 mm = 3.94 in



## Mechanical construction

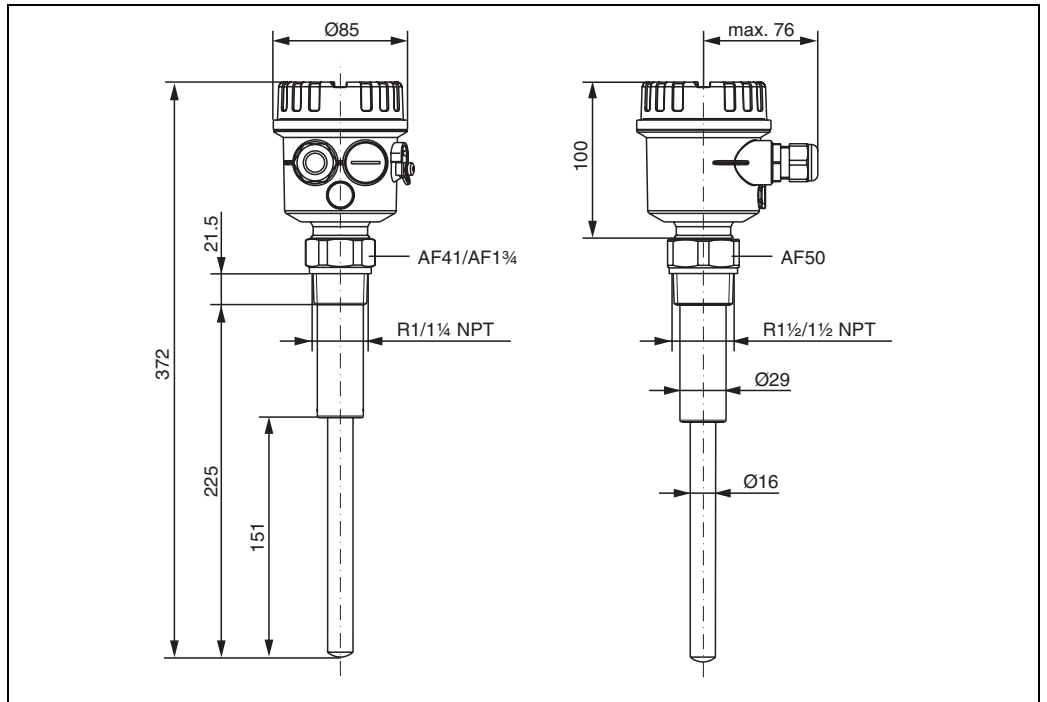


**Note!**

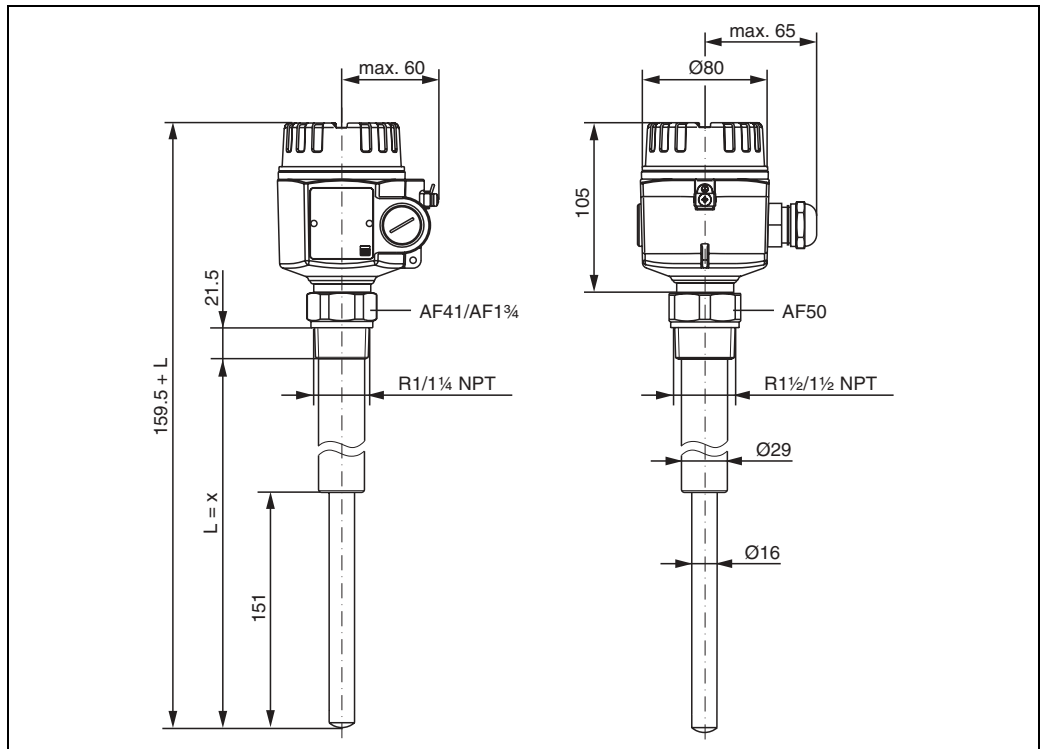
All dimensions in mm! (100 mm = 3.94 in)

### Design, dimensions

#### Compact version LVL-B1



#### Version with pipe extension LVL-B2



x = 500 mm; 1000 mm; 1500 mm; 20 in; 40 in; 60 in

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<b>Weight</b>	LVL-B1/LVL-B2 with F16 housing, FEM 24 (WA) and R1 thread: kompakt = approx. 1.0 kg 500 mm = approx. 1.3 kg 1000 mm = approx. 2.0 kg 1500 mm = approx. 2.6 kg
<b>Material</b>	F16 housing: PTB-FR, cover with transparent glass made of PA12, EPDM cover seal F18 housing: Aluminium EN-AC-AISi10Mg, plastic coated Cover seal: EPDM Process connections: <ul style="list-style-type: none"><li>• R1, R1½ (1.4435/316L, DIN 2999)</li><li>• 1¼ - 1½ NPT, 1½ - 1½ NPT (1.4435/316L, ANSI B 1.20.1)</li></ul> Sensor: 1.4435/316L

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## Human interface

### Display elements



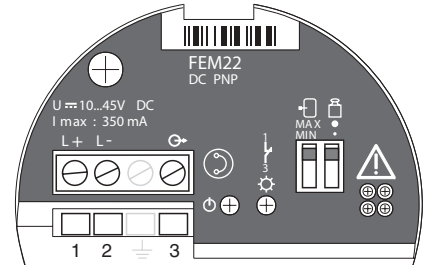
**Note!**

The switch settings in the following graphics are in the as-delivered state.

**FEM 22 (E5)**

One green LED: operation

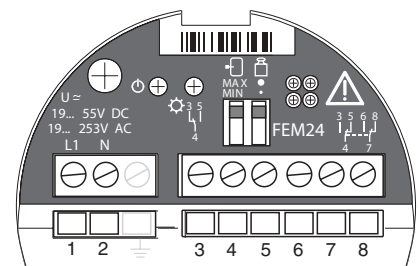
One yellow LED: electronic switch closed



**FEM 24 (WA)**

One green LED: operation

One yellow LED: contact closed  
(relay energised or fed with current)



### Operating elements of electronic inserts



(Factory setting)



one switch for safety mode  
MAX – overflow protection  
MIN – dry running protection

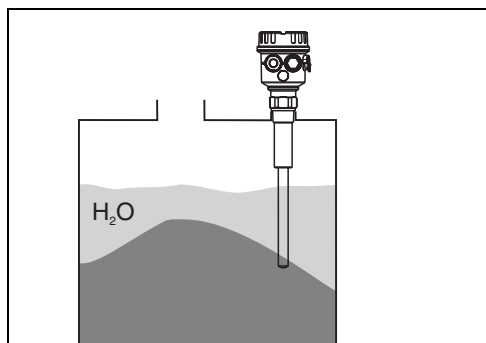


one switch for bulk density/density setting

- 400 g/l (high bulk density)
- 200 g/l (low bulk density)

### Sediment detection

### Detection of solids under water



The system does not detect coverage by liquids similar to water.

## Certificates and approvals

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<b>CE mark, declaration of conformity</b>	<p>The instrument is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate.</p> <p>The instrument complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EG directives. Pepperl+Fuchs confirms the successful testing of the instrument by affixing to it the CE mark.</p>
<b>Ex approval</b>	<p>ATEX approval in preparation</p> <p>Your Pepperl+Fuchs sales centre can provide you with information on the Ex versions which can currently be delivered.</p> <p>All explosion protection data are given in a separate documentation (see "Supplementary documentation") which is available upon request.</p>
<b>Type of protection</b>	<p>See "Ordering information" as of page 13 and "Supplementary documentation" on page 15.</p>
<b>Other standards and guidelines</b>	<p>Other standards and guidelines that were taken into consideration in designing and developing Vibracon LVL-B1, LVL-B2:</p> <ul style="list-style-type: none"><li>• Low Voltage Directive (73/23/EEC)</li><li>• DIN EN 61010 part 1, 2001 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures Part 1: general requirements</li><li>• EN 61326 Electrical Equipment for Measurement, Control and Laboratory Use EMC requirements</li></ul>



## Accessories

### High pressure sliding sleeve

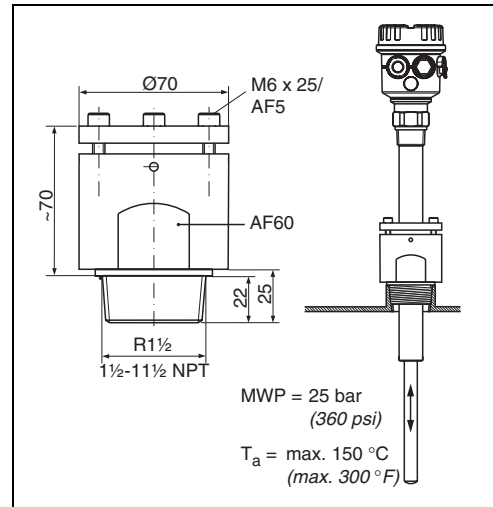
for pressurised container

- R1½, DIN 2999  
ordering code: LVL-Z200
- 1½-11½ NPT, ANSI B 1.20.1  
ordering code: LVL-Z201



**Note!**

Suitable for multiple switch-point configurations!



### Sliding sleeve

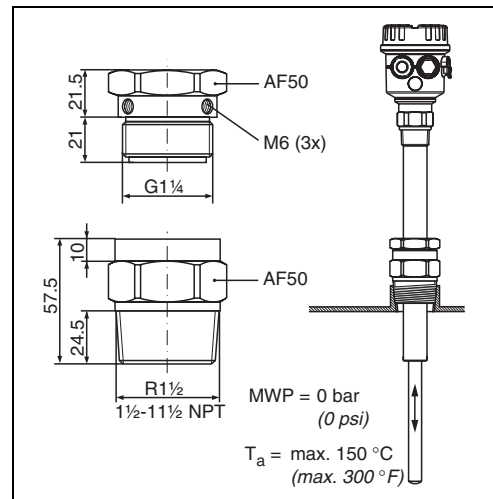
for unpressurised container, IP65

- R1½, DIN 2999  
ordering code: LVL-Z202
- 1½-11½ NPT, ANSI B 1.20.1  
ordering code: LVL-Z203



**Note!**

Only suitable for one-time switch-point configuration!



### Spare parts

- FEM 22 (E5) electronic insert
- FEM 24 (WA) electronic insert
- Cover for polyester housing (F16), transparent plastic with seal
- Cover for aluminium housing (F18), aluminium with seal
- Cover for aluminium housing (F18), aluminium with glass insert and seal (not for EEx d)

## Supplementary documentation

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<b>Operating instructions</b>	KA 2270
<b>Safety informations</b>	SI 3000-A (ATEX approval in preparation)
<b>Directive conformity</b>	Directive conformity 89/336/EC (EMC) <ul style="list-style-type: none"><li>• Emitted interference to EN 61326, class B equipment</li><li>• Interference immunity to EN 61326, annex A (industrial sector) and NAMUR EMC recommendation (NE 21)</li></ul> Directive 94/9/EC (ATEX) Directive 73/23/EC (Low Voltage Directive) EN 61010-1
<b>Supplementary informations</b>	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a> .

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