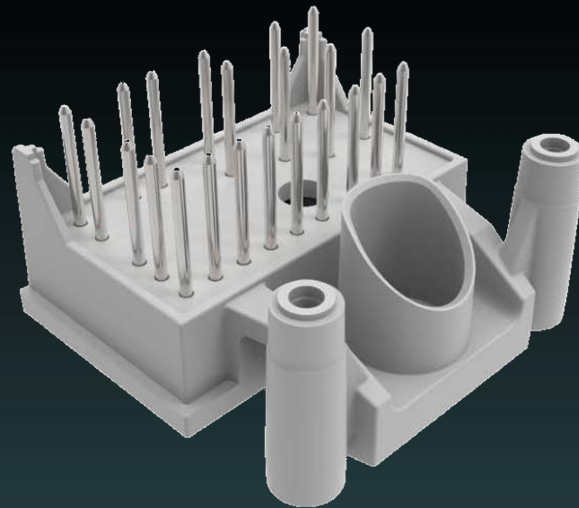




Vincotech

# Handling Instructions

for *flow* OB packages



*This document is valid for all type of flow OB modules  
with solder pins*

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Rev. 03

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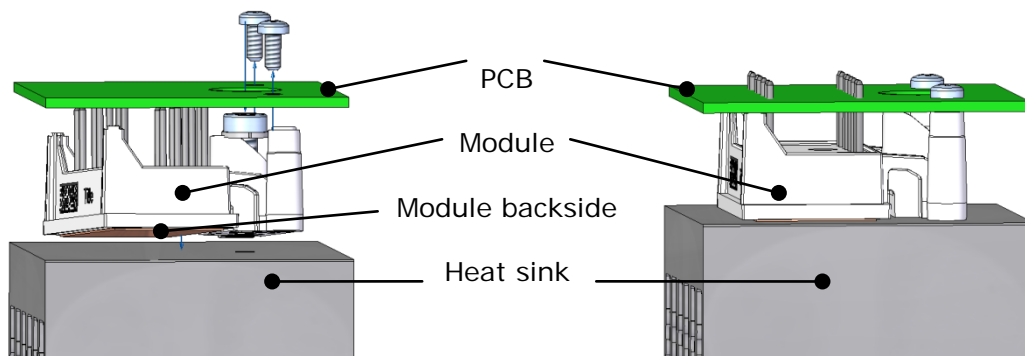
## Revision History

<b>Date</b>	<b>Revision Level</b>	<b>Description</b>	<b>Page Number(s)</b>
12.11.2013	01	New document	
04.07.2014	02	Change on housing design	3,4,5
05.06.2015	03	Change format; change preliminary to final ver.	all



## 1 General assembly instructions

The *flowOB* type modules have to be mounted **first** to PCB, and afterwards fixed to heat sink. The electrical connections between module and PCB are made by soldering. It is also required to fix the PCB to the heat sink with threaded spacers. The number and the position of the fixing points depend on the design of the circuit and location of different masses like capacitors or inductors and the environment of the system. General recommendation cannot be given. The recommended height of the spacers is:  $17^{-0.1}$  mm.



1. Figure: Module with PCB and heat sink

During assembly the pins are not to be drawn or pushed more than  $\pm 0.2$  mm or loaded with a force bigger than 35 N. The tension of the pin must not exceed  $\pm 5$  N at a maximum substrate temperature of 100 C.

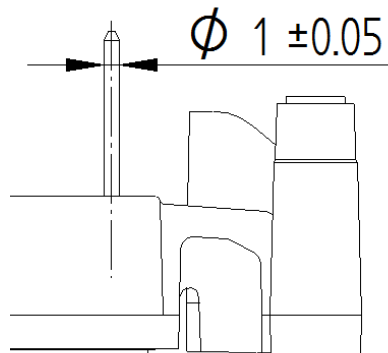


## 2 Specification for PCBs

- Printed board material meets the requirements of IEC 61249-2-7;
- The number of conductive layers is not limited.

### 2.1 Specification for modules with solder pins

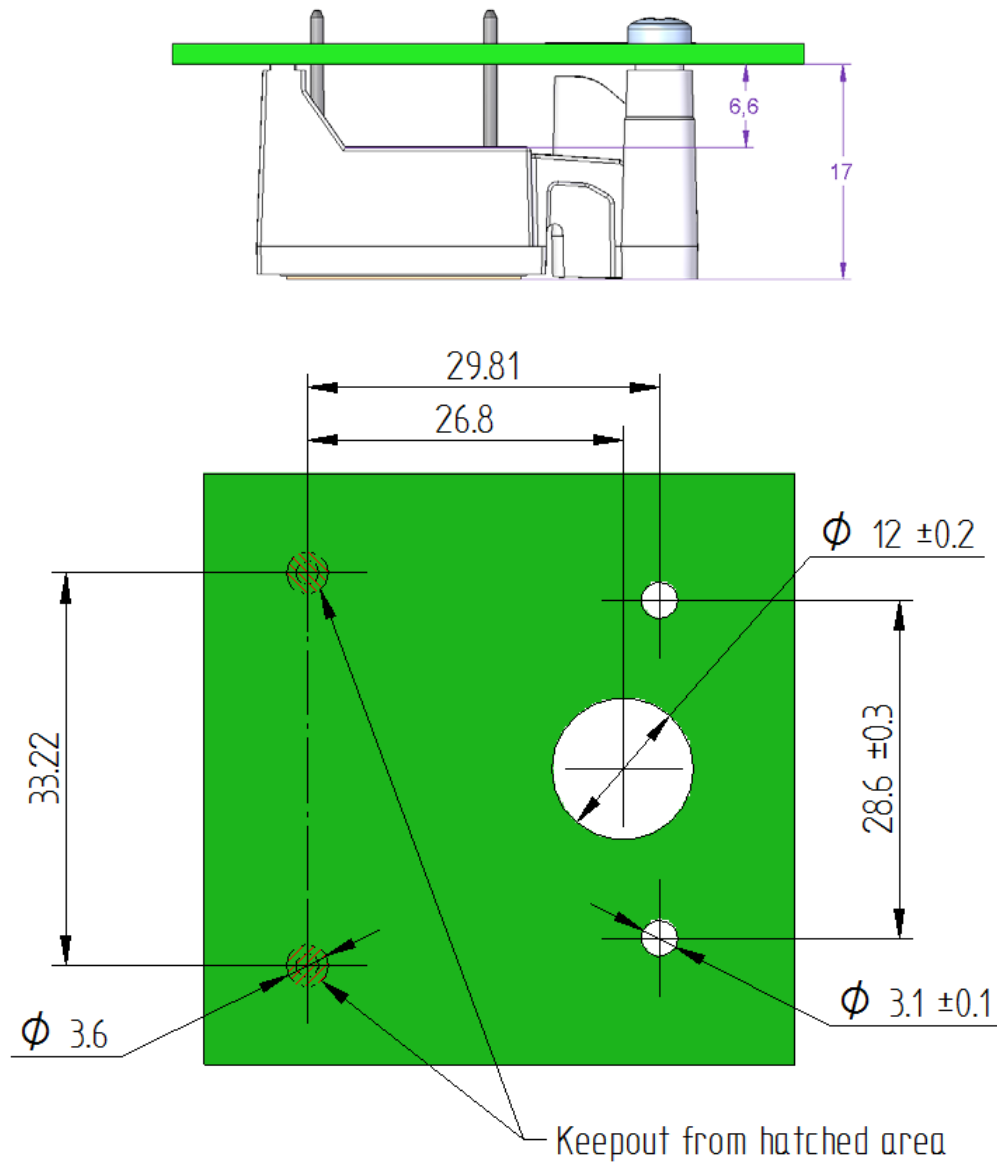
- The module must be fixed to the PCB with 2 screws (type BN82428, D=2.5 mm and L=6 mm) before soldering the pins into the PCB. Mounting torque: 0.4 Nm.
- After screwing, all pins must be soldered into the PCB. The hole diameters on the PCB has to be designed according to the soldering pin diameter which is  $\varnothing 1 \pm 0.05$  mm. For further dimensions or 3D model please contact your local sales manager.



2. Figure: Solder pin diameter



## 2.2 Required PCB cutouts for screwing holes



3. Figure: PCB cutouts for two-clip modules with solder pins

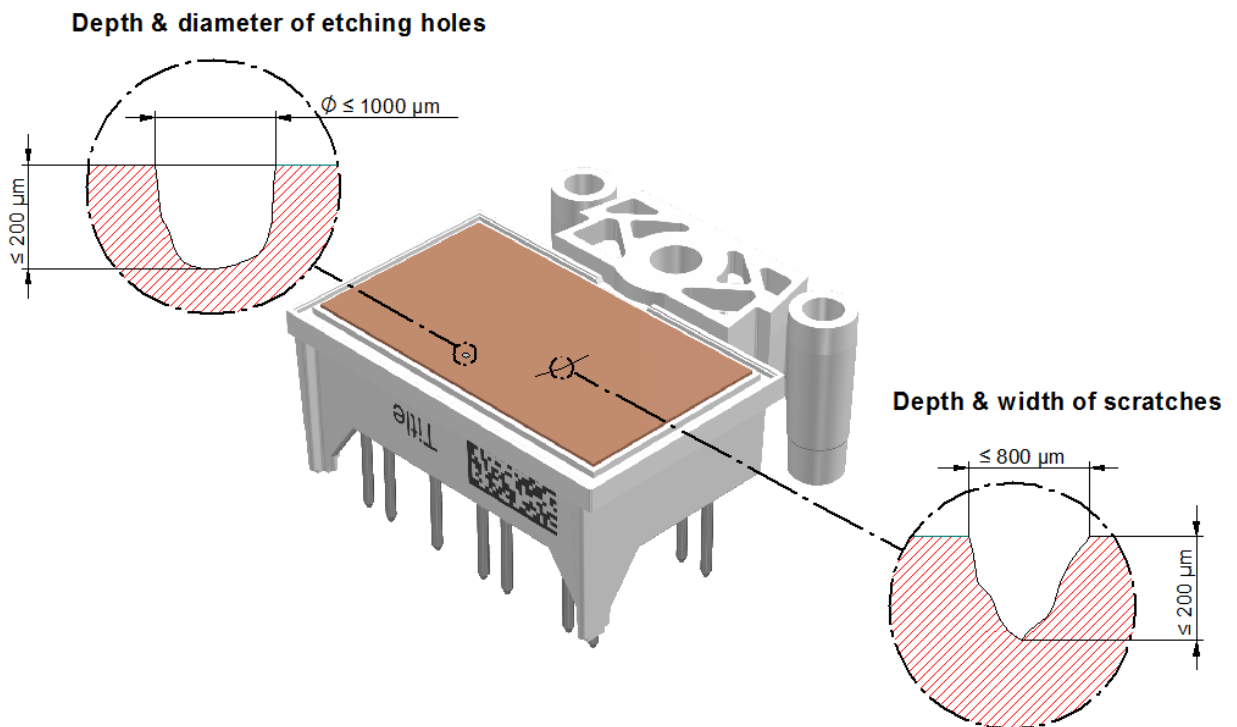
In the keepout area it is not allowed to be any PCB component between module and PCB.



### 3 Specification for module backside surface

The thermal properties are not affected if the dimensions of the surface imperfections are within the following values.

- Polishing is allowed on the whole nickel plated surface if copper doesn't become visible.
- If copper becomes visible, the unit is scratched and the following acceptance criteria should be used. The depth and width of the scratch can't exceed 200  $\mu\text{m}$  and 800  $\mu\text{m}$ , respectively. The length of the scratch does not matter but the total area of scratches must not exceed 5 % of the total substrate surface.
- The diameter and depth of etching holes have to be below 1000  $\mu\text{m}$  and 200  $\mu\text{m}$ , respectively.



4. Figure: Scratch and etching hole dimensions



5. Figure: Polished surface





6. Figure: Discoloration of substrate



7. Figure: Fingerprint on the surface

## 4 Specification for heat sink

The whole heat sink surface under the module must be plane, clean and free of particles.

- The flatness tolerance should be:  $< 25 \mu\text{m}$  in general.
- In case the thermal paste thicker than  $50 \mu\text{m}$  the flatness tolerance can be  $< 50 \mu\text{m}$ .  
(A flatness tolerance specifies a tolerance zone defined by two parallel planes within which the surface must lie.)
- The surface roughness should be less than:  $R_z < 10 \mu\text{m}$ .
- Heat sink surface imperfections should be within the values described for the module backside surface (please refer to section 3).



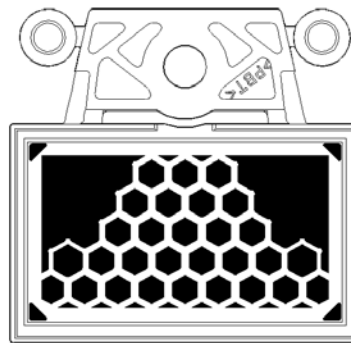
## 5 Specification for thermal interface materials

### 5.1 OPTION 1: Thermal paste:

- Apply a homogeneous layer of thermal conductive paste over the whole backside of the module, with a roller or spatula.
- Apply thermal paste in a honeycomb pattern, seen on 9. Figure. The preferred technology for paste application is screen printing. For a drawing of the pattern please contact your local sales representative.

The recommended thermal paste thickness is  $55 \mu\text{m} \pm 15 \mu\text{m}$  in this case.

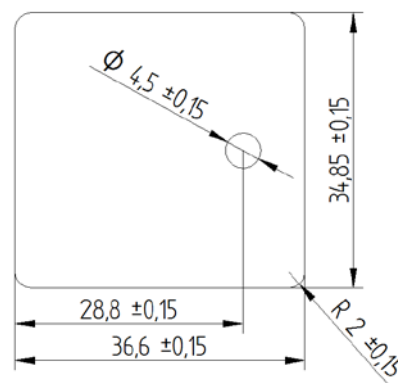
Thermal paste thicker than recommended will increase thermal resistance ( $R_{th}$ ).



8. Figure: Thermal paste honeycomb pattern

### 5.2 OPTION 2: Thermal foil:

- A thermal foil comprising of an aluminium core layer and two outer layers of phase change material should be used.
- The total thickness of the foil has to be less than  $80 \mu\text{m}$ . Thicker foils could cause the ceramic substrate to break and increase the thermal resistance.
- Recommended foil type: Kunze Folien KU-ALC5 or ALF5
- Recommended foil dimensions: see below.



9. Figure: Recommended thermal foil dimensions

- The thickness of the foil is less than  $80 \mu\text{m}$ .
- Material of the foil is aluminum, covered with a phase change material.



### 5.3 OPTION 3: Pre-applied thermal interface material

- The modules may have already been pre-printed with thermal interface material.

## 6 Specification for fastening screws to the heat sink

- Screws M4 (recommended screw type DIN 7984)
- Min. depth of the screw in the heat sink: 6 mm
- Flat washer ISO 7092 (DIN 433)
- Spring washer DIN127 or DIN 128
- Mounting torque:  $2 \text{ Nm} < M_s < 2.2 \text{ Nm}$

A torque wrench shall be used to tighten the mounting screws at the specified torque as excessive torque may result in damage or degradation of the device. The inaccuracy of torque wrench tightening method can range up to  $\pm 12\%$ . This has to be taken into account to prevent over-tightening the fastener.

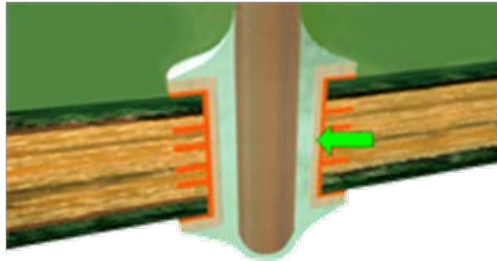
Due to excessive temperature fluctuations washers should be used to prevent the loosening of the screws. After accurate tightening of the screws the spring washer exerts a constant force on the joint. The flat washer distributes this force on the plastic surface.

### 6.1 Screw with pre-assembled washers

Screws with pre-assembled washers (SEMS or kombi screws) combine the screw and the washers into a single component. These screws eliminate the need to slip the washers into place by hand, boosting the speed and efficiency of the assembly process. The specifications of these screws are provided below:

- Screw size M4 according to DIN 6900 (ISO 10644; JIS B1188)
- Flat washer according to DIN 6902 Type C (ISO 10673 Type S; JIS B1256)
- Split lock spring washer according to DIN 6905 (JIS B1251)
- Mounting torque range:  $2 \text{ Nm} < M_s < 2.2 \text{ Nm}$

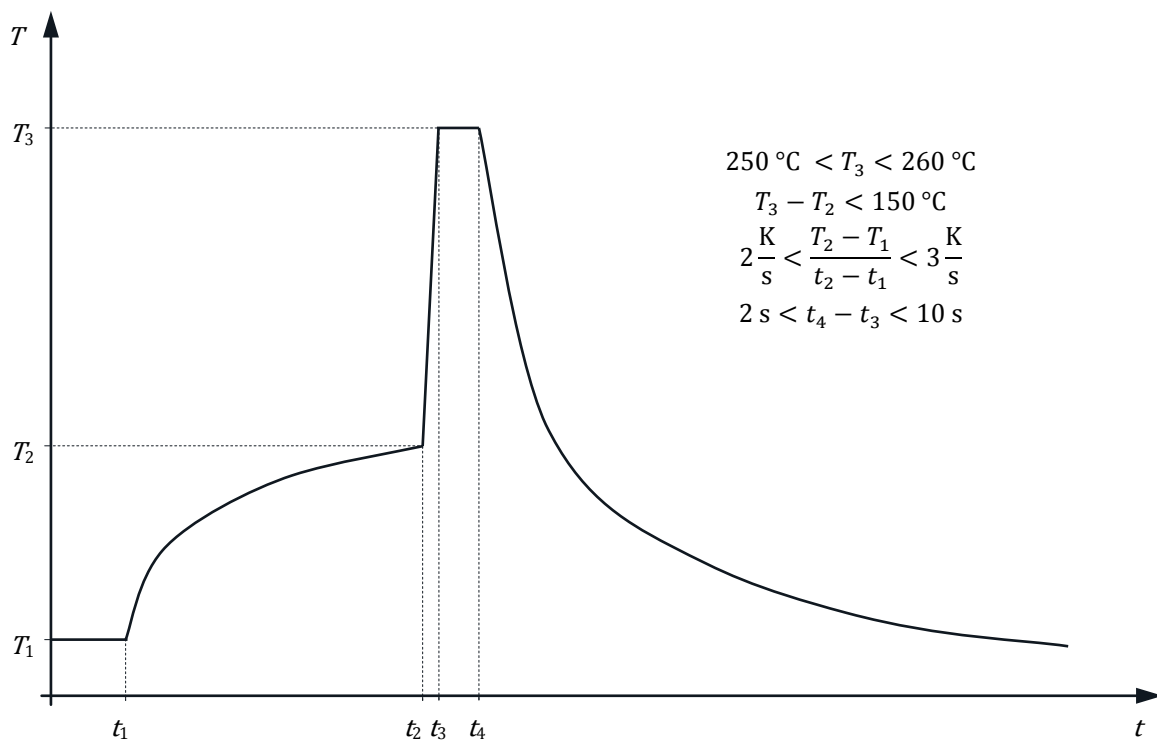
## 7 Recommendation for soldering



10. Figure: Plated through hole, good soldering

Plated through holes should exhibit a vertical solder fill of 100 %, with a fully formed fillet on the solder side and evidence of 100 % wetting on the component side lead, barrel and pad.

### 7.1 Wave soldering of modules with solder pins



11. Figure: Typical profile for wave soldering

### 7.2 Hand soldering parameters

- Max. solder iron temperature: 350 °C
- Max. contact time with component lead: 10 s
- Number of heat cycles: 3



## 8 ESD protection

Modules are sensitive to electrostatic discharge which can damage or destroy sensitive semiconductors. All modules are ESD protected in the shipment box by semi conductive plastic trays. During the handling and assembly of the modules it is recommended to wear a conductive grounded wrist band and ensure a conductive grounded working place.

The modules have the following ESD sensitivity levels according the ESD Association classification:

ESD STM5.1-1998 Human Body Model: Class 0

ESD STM5.2-1999 Machine Model: Class M1

ESD STM5.3.1-1999 Charged Device Model: Class C1

Please take into consideration the following standards for handling electrostatic-sensitive devices: EN61340-5-1, ANSI S20.20

## 9 Environmental conditions

The modules can be subjected to environmental conditions characterized by the following classes:

Storage: 1K2 / 1B1 / 1C1 / 1S2 / 1M2

Transportation: 2K2 / 2B1 / 2C1 / 2S1 / 2M2

These classes are defined in the IEC 60721-3-1 and IEC 60721-3-2 standards. The modules with wire pins have 1 year shelf life with the given storage conditions.

Flammability classification of the plastic material for *flow* OB are V-0 and 5-VA (self-extinguishing, no dripping of flaming particles) according to UL 94, IEC 60695-11-10 and IEC 60695-11-20 test methods.

### 9.1 Parameters of environment classes

The parameters detailed below are for informative purposes only. This section does not substitute the above mentioned standards. Please read the IEC 60721-3-1 and IEC 60721-3-2 standards for the description of the environment classes.

#### 9.1.1 Climatic conditions

1K2

Air temperature: 5 °C to 40 °C

Humidity: 5 % to 85 % RH but max. 1 g/m<sup>3</sup> to 25 g/m<sup>3</sup> absolute

Rate of change of temperature: 0.5 °C/min

Air pressure: 70 kPa to 106 kPa

Solar radiation: 700 W/m<sup>2</sup>

Movement of surrounding air: 1 m/s

Condensation: No

Precipitation: No

Water from other sources than rain: No

Formation of ice and frost: No



## 2K2

Temperature:	-25 °C to 60 °C
Change of temperature air/air:	±25 °C
Relative humidity not combined with rapid temperature changes:	max. 75 % (at 30 °C temperature)
Relative humidity combined with rapid temperature changes:	No
Low air pressure:	70 kPa
Change of air pressure:	No
Solar radiation:	700 W/m <sup>2</sup>
Movement of surrounding air:	No
Precipitation:	No
Heat radiation:	No
Water from other sources than rain:	No
Wetness:	No

### 9.1.2 Biological conditions

#### 1B1

Flora and fauna: Negligible

#### 2B1

Flora and fauna: No

### 9.1.3 Chemically active substances

#### 1C1

Sea and road salts:	No (Salt mist may be present in sheltered locations of coastal areas.)
Sulphur dioxide:	0.1 mg/m <sup>3</sup>
Hydrogen sulphide:	0.01 mg/m <sup>3</sup>
Chlorine:	0.01 mg/m <sup>3</sup>
Hydrogen chloride:	0.01 mg/m <sup>3</sup>
Hydrogen fluoride:	0.003 mg/m <sup>3</sup>
Ammonia:	0.3 mg/m <sup>3</sup>
Ozone:	0.01 mg/m <sup>3</sup>
Nitrogen oxides:	0.1 mg/m <sup>3</sup> (Expressed in equivalent values of Nitrogen dioxide.)

#### 2C2

Sea salts:	none
Sulphur dioxide:	0.1 mg/m <sup>3</sup>
Hydrogen sulphide:	0.01 mg/m <sup>3</sup>
Nitrogen oxides:	0.1 mg/m <sup>3</sup> (Expressed in the equivalent values of Nitrogen dioxide.)
Ozone:	0.01 mg/m <sup>3</sup>



Hydrogen chloride: 0.1 mg/m<sup>3</sup>  
Hydrogen fluoride: 0.003 mg/m<sup>3</sup>  
Ammonia: 0.3 mg/m<sup>3</sup>

#### 9.1.4 Mechanically active substances

1S2

Sand: 30 mg/m<sup>3</sup>  
Dust (suspension): 0.2 mg/m<sup>3</sup>  
Dust (sedimentation): 1.5 mg/(m<sup>2</sup>h)

2S1

Sand in air: No  
Dust (sedimentation): No

#### 9.1.5 Mechanical Conditions

1M2

Stationary vibration, sinusoidal

Frequency range: 2 Hz to 9 Hz  
displacement amplitude: 1.5 mm  
Frequency range: 9 Hz to 200 Hz  
peak acceleration: 5 m/s<sup>2</sup>

Non stationary vibration, including shock

Shock response spectrum type L  
peak acceleration: 40 m/s<sup>2</sup>

Static load: 5 kPa

2M2

Stationary vibration, sinusoidal

Frequency range: 2 Hz to 9 Hz  
displacement amplitude: 3.5 mm  
Frequency range: 9 Hz to 200 Hz  
peak acceleration: 10 m/s<sup>2</sup>  
Frequency range: 200 Hz to 500 Hz  
peak acceleration: 15 m/s<sup>2</sup>

Stationary vibration, random

Acceleration  
spectral density: 1 m<sup>2</sup>/s<sup>3</sup>  
Frequency range: 10 Hz to 200 Hz  
and  
Acceleration  
spectral density: 0.3 m<sup>2</sup>/s<sup>3</sup>  
Frequency range: 200 Hz to 2000 Hz

The later range can be neglected transporting with vehicles with high damping.



Non stationary vibration, including shock

Shock response spectrum type I.

peak acceleration: 100 m/s<sup>2</sup>

and

Shock response spectrum type II.

peak acceleration: 300 m/s<sup>2</sup>

Free fall

1.2 m (mass of the object is less than or equal to 20 kg)

or

1 m (mass of the object is between 20 kg and 100 kg)

or

0.25 m (mass of the object is higher than or equal to 100 kg)

Toppling Around any of the edges.

Rolling, pitching

Angle: ±35°

Period: 8 s

35° may occur for short time periods but 22.5° may persist permanently.

Acceleration 20 m/s<sup>2</sup>

Static load 10 kPa

## 10 Disclaimer

The information and recommendations in this document are based on standards and common engineering practices. Customer specific applications and specifications may require additional processes and tests that may supersede those recommended in this document.