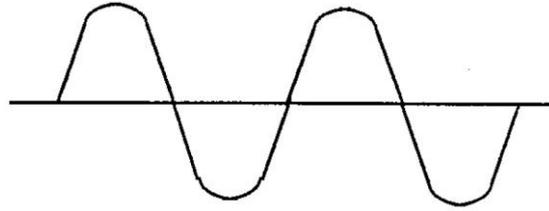


# Contents

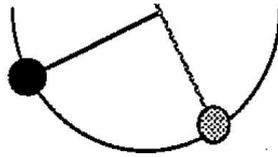
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# WHAT IS VIBRATION?

Generally speaking, vibration is an oscillation:



An oscillation is generated by removing a mass from its centre of gravity. As an example, a pendulum generates an oscillatory movement.



Any mass being set in motion generates ENERGY. This occurs, for example, with earthquakes agitating huge masses which are able to destroy all human constructions, and with tree-shaking in order to harvest fruit without great effort.

These energies and their applications are calculated by means of vibration technology.

As a source of drive, applied VIBRATION TECHNOLOGY requires so-called vibration exciters, e.g. external vibrators. External vibrators feed circular or linear oscillatory energy in periodically changing directions in order to enter their force into the mass to be agitated.

With the help of these vibration exciters, vibratory technology allows for the excitation of the mass to be set to motion predominantly by means of periodical force and thus creates an oscillation with a determined frequency and amplitude.

When an unbalance is being generated, the excited mass follows a circular or elliptical path whereas a linear-type vibrator makes the mass move in a forward-and-backward direction.

There are three common types of energy for the drive of vibrators: pneumatic, electric, or hydraulic energy.

Important fields of application are:

**Conveying**

The particles of the goods to be conveyed are pushed at a certain angle and in a way to create a succession of micro-size throwing movements to generate a conveying movement in one direction.

**Dissolving**

Individual bulk goods particles are dissolved from a material aggregation by means of vibration. A frictional reduction makes sure the material is slackened and allows for the flowing of the material, respectively.

**Compressing**

The reduction of friction among material particles results in a particle rearrangement. With the help of gravity, increased material density together with simultaneous de-aeration is obtained.

**Places of application**

Among others, our external vibrators are employed in the following fields of industry: conveying, dosing, weighing, and sieving technologies, chemistry, mining, mechanical engineering, non-metallic mineral processing, metallurgical, packing, building construction and food industries, foundries, climate and de-dusting technologies.

The vibrators are in use with dosing, discharging, de-dusting, de-watering, de-airing, conveying, dissolving, slackening, compressing, mixing, sieving, sorting, cleaning, checking, feeding, etc.

The external vibrators can be mounted to: construction machines, silos, hoppers, conveying troughs, bowl feeders, vibrating conveyors, moulds, boarding units, vibrating tables, stone-shaping machines, surface dressing machines, vibratory boards, racks, and grates, filtering systems, downspouts, packing machines, and many others.

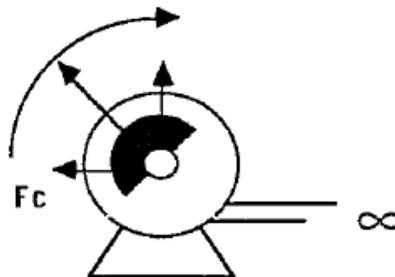
# TYPES OF ACTUATION

Two types of vibration can be generated:

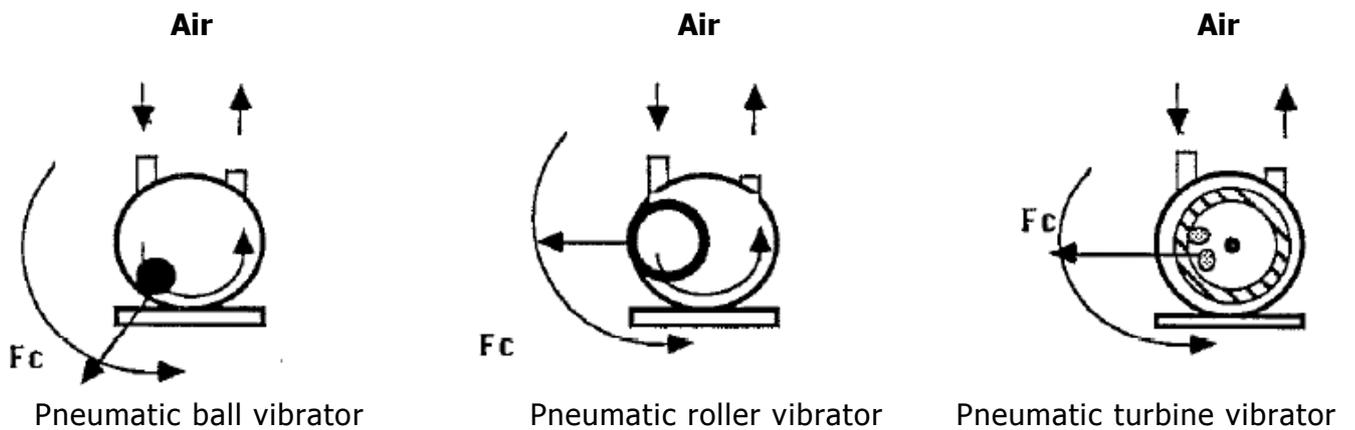
1. CIRCULAR VIBRATION by means of only one vibrator: in any case, the centrifugal force continuously changes its direction. The structure linked to the vibrator is moved elliptically.

There are three possible types of energy: electric, pneumatic or hydraulic energy

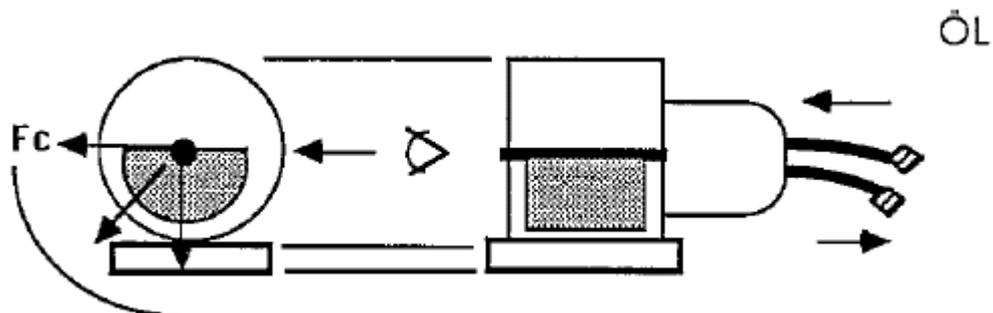
Electric vibrator:



Pneumatic vibrator:



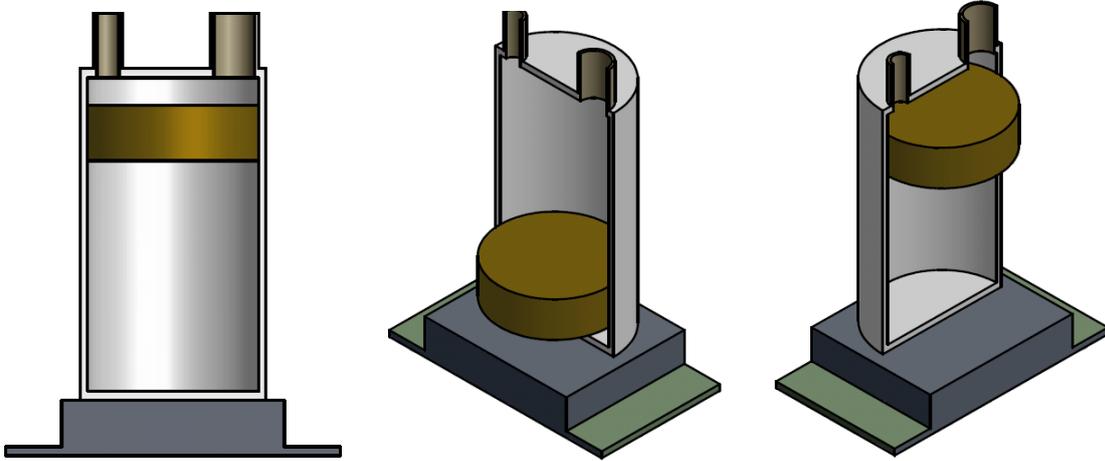
Hydraulic vibrator:



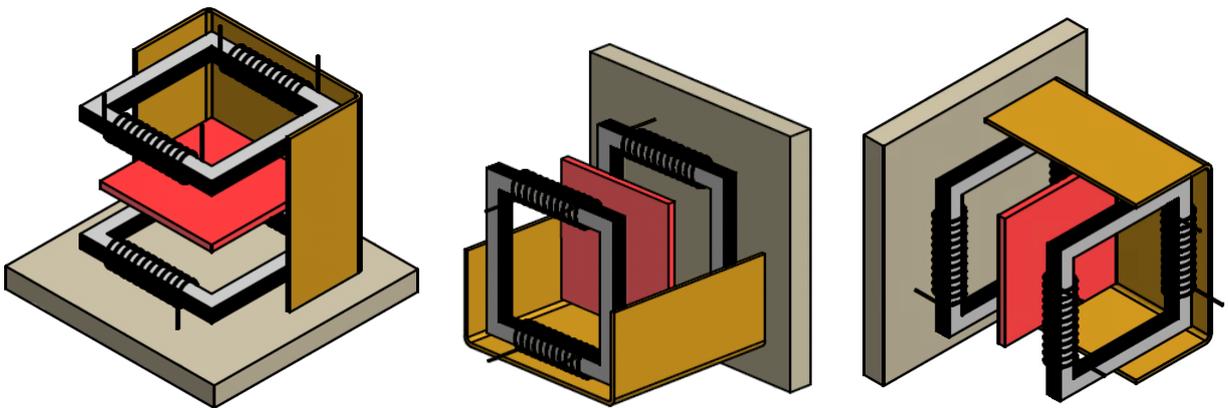
## 2. LINEAR VIBRATION

a) By means of only one vibrator; There are mainly two types:

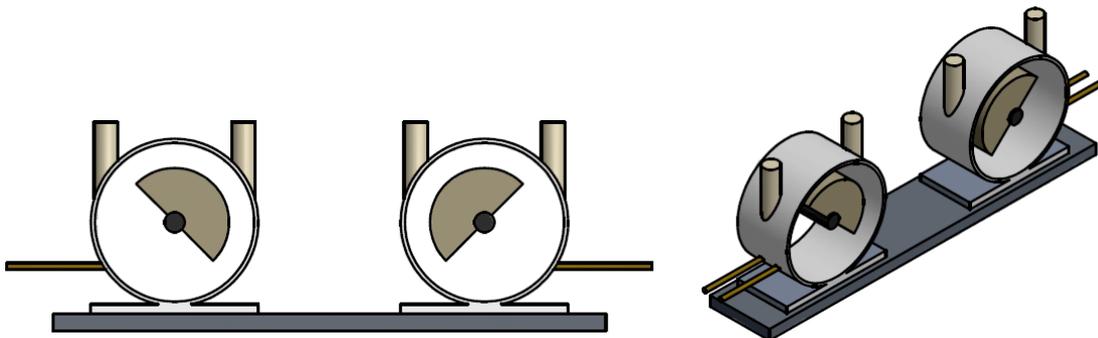
Pneumatic piston vibrator:



Electric: ELECTROMAGNETIC VIBRATOR:



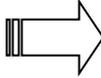
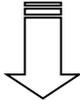
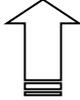
b) By means of two circular vibrators turning in different senses of rotation and thus generating a one-sided directional vibration. These vibrators have to be solidly linked on the same level. The horizontal components are located on the same level and have the same, but converse impact. This means, only those components placed vertically to this level are being considered, i.e. added. The vibration takes place along this direction.



# WHAT'S THE USE OF VIBRATION?

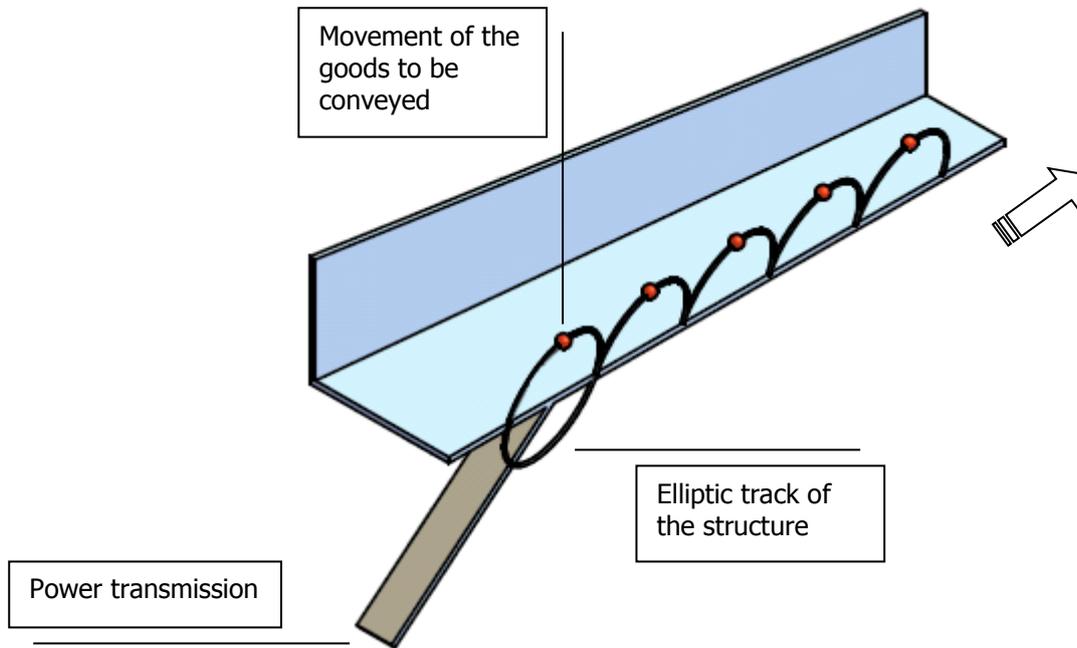
In almost all fields of modern industry, there are examples of the continuously increasing importance of vibration technology and thus of the application of pneumatic or electric vibrators. The following listing of applications is to be considered for orientation purposes only as it is not exhaustive at all!

There are three predominant fields of application:

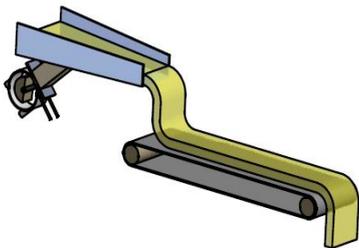
	<i>Fields of application</i>	<i>Main direction of power transmission</i>
1.	CONVEYING	
2.	DISSOLVING	
3.	COMPRESSING	

# CONVEYING

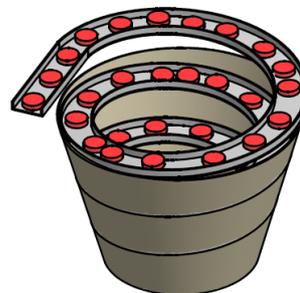
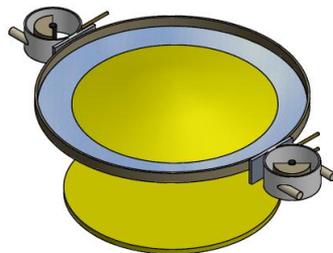
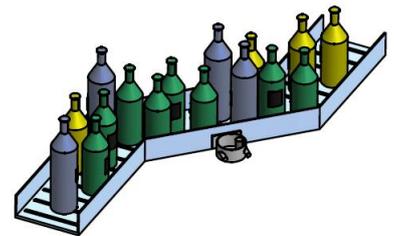
Generally speaking, conveying deals with forcing goods to be conveyed to move in one direction. The individual goods particles or pieces, respectively, are pushed at a certain angle in a way that chain-like micro-size throwing movements are generated:



These are the main applications of this technology:



CONVEYING    FEEDING  
 DISCHARGING    DOSING  
 SORTING    LOADING  
 DISSOLVING (jam-dissolving)  
 SPEEDING-UP    MIXING  
 SEPARATING (see also dissolving)  
 SIEVING, SCREENING, etc. ...

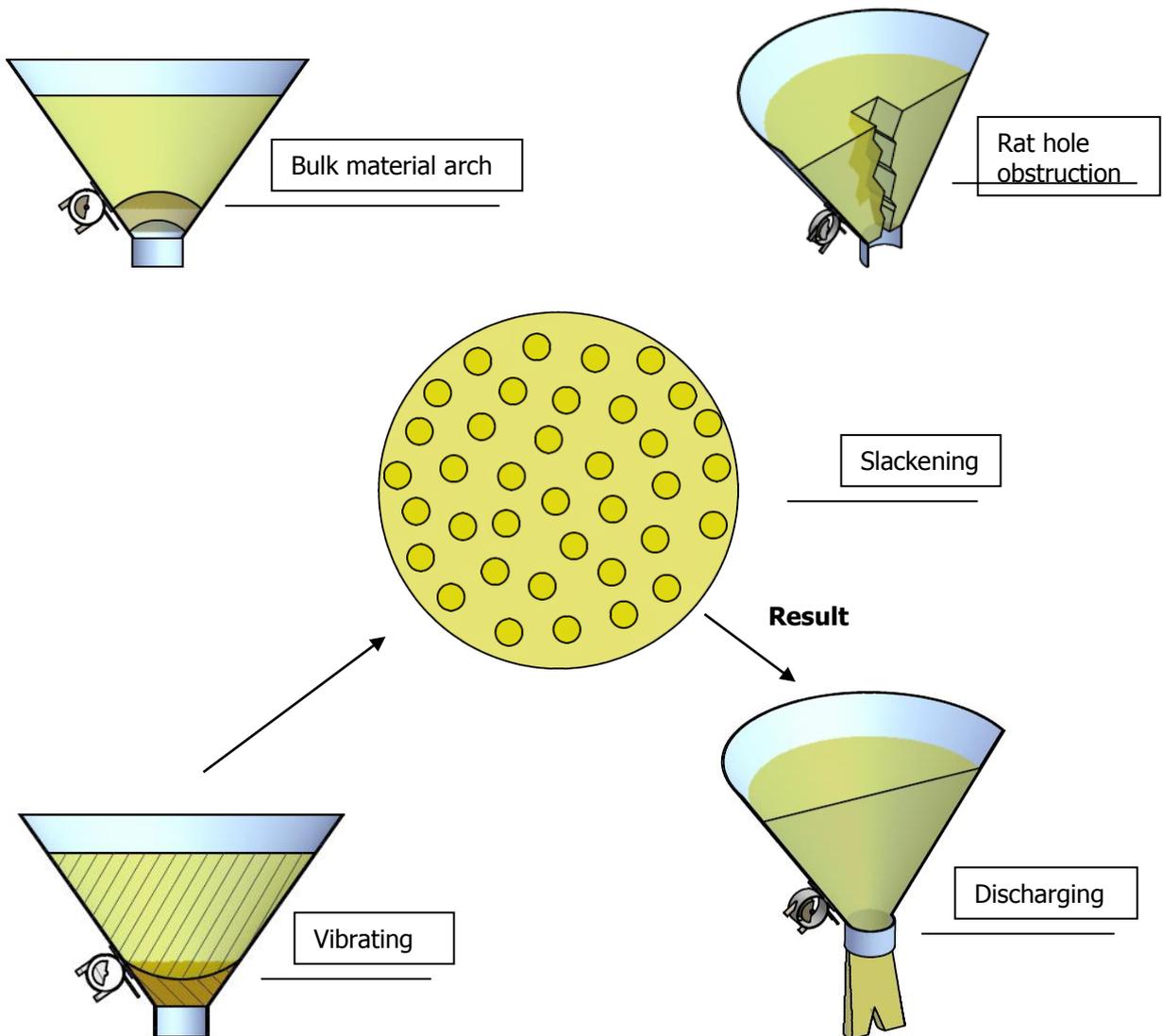


... with all types of bulk goods: powder, nails, screws, wheat, vegetables, nuts, electric components, grains, clips, waste, hot cast parts, raw material parts, bottles, tins, cans, ampoules, pills, etc.

# DISSOLVING / SLACKENING

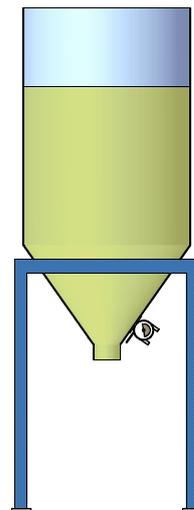
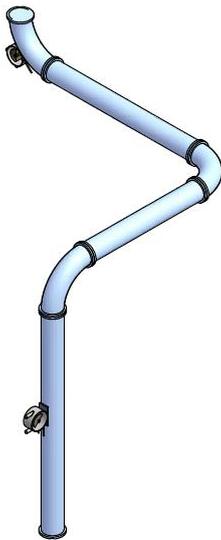
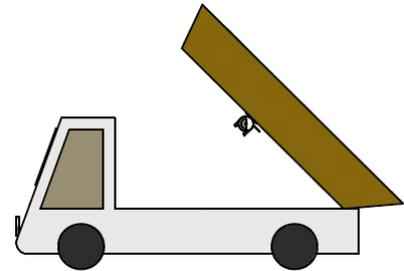
On principle, dissolving and slackening is employed to dissolve individual parts from a material aggregation. This is achieved by reducing the friction between individual material particles or by eliminating strong adhesive forces.

Application with congestion in silos:



The main applications with this technology are as follows:

- DISCHARGING of silos, lorries, freight wagons, ...
- DE-DUSTING / DE-COKING of filters, piping, ...
- SLACKENING of sands, powders, flasks (foundries), bakings, ...



### **Mounting of the external vibrator**

Mounting of the external vibrator to the silo is an important item not only for the efficiency of the external vibrator but also for the integrity of the silo. In any case, the external vibrator must not be mounted directly to the wall of the silo or to the discharge funnel as material stress on these spots would be strong enough to crack the steel sheet there.

In addition, the working impact of the external vibrator would be limited to a very small area only. In order to avoid these negative effects, a stiffening device facilitating the mounting of the vibrator has to be installed on the funnel.

Welding (i.e. step-by-step welding) of a steel channel section has proven to be a simple and efficient way of stiffening.

Depending on the size of the funnel, the steel channel section should be a U 80 to U 120 type with a minimum length of one third of the funnel edge length. It is recommendable to attach the steel channel section up to the transversal cross-bracing and to weld it to the cross-bracing. The external vibrator is mounted vertically to the axis of the steel channel section. The sense of rotation of the vibrator should be chosen in a way that, on looking onto the vibrator from the side, the unbalances move from top to bottom on the funnel wall.

As the vibrator is acting against the rigid axis of the steel channel section, the funnel wall and the stiffening device are prevented from damage and the vibration generated by the external vibrator is distributed more efficiently.

The screwed connections to fasten the external vibrator have to be re-tightened a short period after commissioning and their tight seating has to be checked in weekly inspection and maintenance intervals.

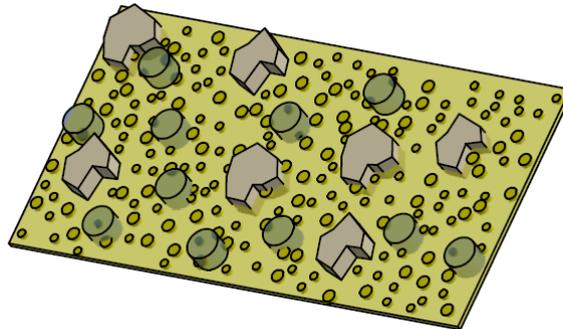
It is recommendable to secure the vibrator against unintended falling-down by means of a steel wire rope sufficiently dimensioned for the vibrator's weight.

The external vibrators should only be switched on if the bulk material can flow off since, otherwise, an undesirable compression process may be started to exert unnecessary stress to the material inside the silo and to the weld seams on the mounting plate or the mounting section, respectively.

# COMPRESSING

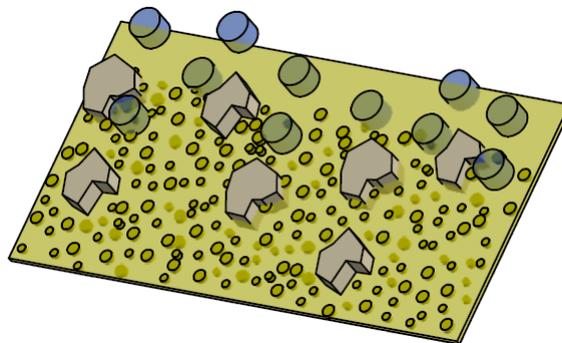
Compressing serves for the rearrangement of particles within the material. Thus, friction among the material components is reduced (flowing process) and a maximum storage density and simultaneous de-aeration is obtained with the help of gravity or a superimposed load. The result: the air pore volume is minimised and the material is actually "compressed".

Among others, densification of concrete is absolutely necessary:

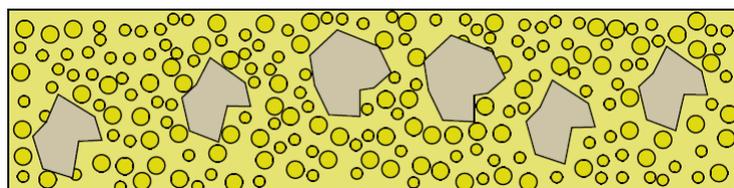


Miss-arrangement of the individual material components (water, cement paste, air, sand, and gravel) prior to the vibration

Vibrating:



Water and air escape upwards.  
Sand and gravel seep down to the ground.



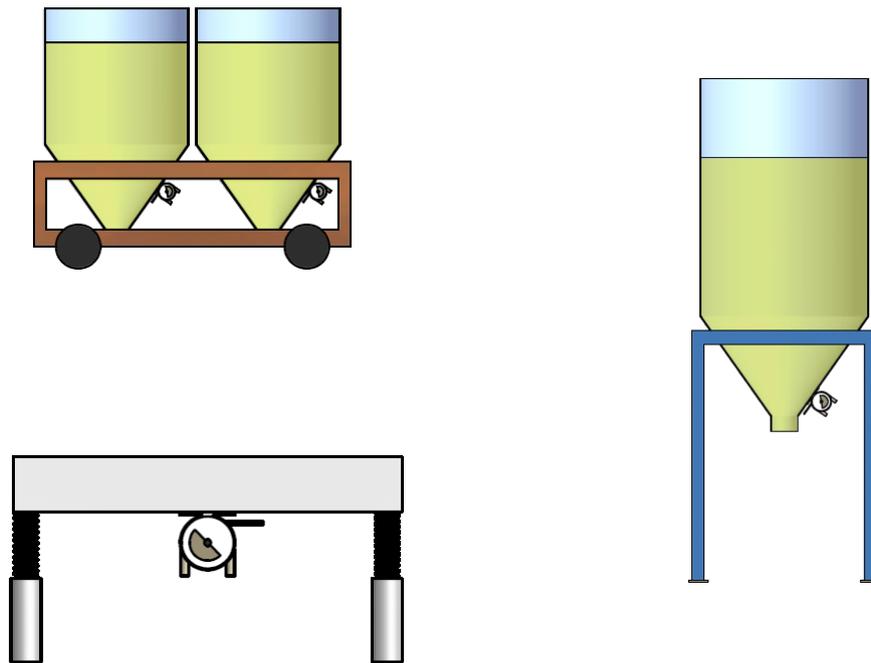
Perfect arrangement of material components

The main application fields of this technology are as follows:

DE-WATERING of: concrete and many other materials

DE-AERATION of: concrete, cellulose, powder, molasses, ...

FILLING of: freight wagons, packages, moulds, ...



# EXAMPLES OF APPLICATION

## PREAMBLE

1. As a rule, vibrators

are firstly chosen with regard to their APPLICATION

and secondly chosen with respect to their FREQUENCY.

This is particularly true with electric and hydraulic vibrators.

On employing the pneumatic vibration technology, another method is required in most cases:

Predominantly, the formula:  $g \times \Sigma M$  is used.

IN THE CASE OF A PNEUMATIC VIBRATOR, THE FACTOR "g" IS TO BE DETERMINED. THE VIBRATOR ITSELF ADAPTS THE FREQUENCY – AND THE AMPLITUDE – TO THE STRUCTURE.

2. On working, pneumatic vibrators feature a loss of frequency. Therefore, the nominal centrifugal forces and frequencies indicated for idle running have to be corrected by recalculating them with the help of the following CORRECTION VALUES:

Vibrator Type	Correction value for frequencies	Correction value for forces
VT (turbine-type)	0.90	0.85
VK (ball-type)	0.75	0.60
VR (roller-type)	0.60	0.35

# EXAMPLES OF APPLICATION CALCULATION

## I. CONVEYING

Functions	Conveying, feeding, dissolving, speeding-up, spiral up, etc.														
Fields of application	Conveying troughs, discharge troughs, conveying tubes, vibratory chutes, bowl feeders, etc.														
Frequency range	<p>Normal frequency, i.e. from 1,000 up to 3,000 min<sup>-1</sup> (this does not apply to air vibrators!)</p> <p>The frequency depends on the weight of the material particles to be moved.</p> <p>The higher the particle weight, the higher the frequency.</p>														
Amplitude	<p>The amplitude depends on the stiffness of the structure. The following values can be deemed to be correct and suitable:</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-right: 20px;">Frequencies in min<sup>-1</sup></td> <td style="padding-right: 40px; text-align: center;">1,000</td> <td style="padding-right: 40px; text-align: center;">1,500</td> <td style="text-align: center;">3,000</td> </tr> <tr> <td style="padding-right: 20px;">Amplitude in mm</td> <td style="padding-right: 40px; text-align: center;">3.5 – 11</td> <td style="padding-right: 40px; text-align: center;">1.5 – 5</td> <td style="text-align: center;">0.4 – 2</td> </tr> </table> <p>Extreme amplitudes that must not be exceeded in any case (please see item "Important information"):</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-right: 20px;"></td> <td style="padding-right: 40px; text-align: center;">25</td> <td style="padding-right: 40px; text-align: center;">12</td> <td style="text-align: center;">3</td> </tr> </table>			Frequencies in min <sup>-1</sup>	1,000	1,500	3,000	Amplitude in mm	3.5 – 11	1.5 – 5	0.4 – 2		25	12	3
Frequencies in min <sup>-1</sup>	1,000	1,500	3,000												
Amplitude in mm	3.5 – 11	1.5 – 5	0.4 – 2												
	25	12	3												
Power requirement	<p>Factor "g" = 1.8 to 2.2 of the total mass to be vibrated (mass of the material – mass of the installation and of vibrators).</p> <p><u>EXCEPTION</u>: with horizontal vibration (e.g. sieving), these figures are halved in value.</p> <p style="text-align: center;"><math>\Sigma F \text{ in daN} = \Sigma M \times 1.8 \text{ to } 2.2</math></p> <p>Required force F: (M = mass)      <math>\Sigma M \text{ in kg} = M \text{ of material} + M \text{ of installation} + M \text{ of the vibrators}</math></p> <p>Factor "g" depends on the particle weight of the material:</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-right: 20px;">With light particle weight: Y &lt; 1 kg/dm<sup>3</sup> Smaller graining, e.g. powder</td> <td style="padding-right: 40px;"></td> <td style="text-align: center;">g = &lt; 1.8</td> </tr> <tr> <td style="padding-right: 20px;">With higher particle weight: Y &gt; 1 kg/dm<sup>3</sup> Smaller graining, e.g. powder</td> <td style="padding-right: 40px;"></td> <td style="text-align: center;">1.8 &lt;= g &lt;= 2.2</td> </tr> </table>			With light particle weight: Y < 1 kg/dm <sup>3</sup> Smaller graining, e.g. powder		g = < 1.8	With higher particle weight: Y > 1 kg/dm <sup>3</sup> Smaller graining, e.g. powder		1.8 <= g <= 2.2						
With light particle weight: Y < 1 kg/dm <sup>3</sup> Smaller graining, e.g. powder		g = < 1.8													
With higher particle weight: Y > 1 kg/dm <sup>3</sup> Smaller graining, e.g. powder		1.8 <= g <= 2.2													

**Special applications**

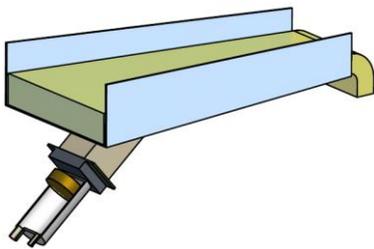
1. **Conveying troughs** for transporting, dosing, feeding, weighing.

Direction of force      Inclination of 5° to 30°

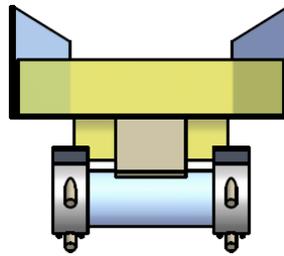
The inclination depends on the weight of the material particles to be moved. The higher the particle weight, the bigger the inclination.

Type of vibrations      Linear or directed vibrations  
Frequency: adapt to Y

Mounting spot            mounting below the installation to be vibrated



Piston/electromagnetic vibrators



2 units of electric vibrators

Length-related limitation      (maximum field of efficiency): 2 to 3.5 m per vibrator, depending on the stiffness of the structure.

In the case of applications involving two vibrators with different senses of rotation, the resultant is computed as follows:

$$\begin{aligned} \text{Vibrator output} &= F_o \\ \text{Useful output} &= F_R \end{aligned} \qquad F_R = \frac{2 F_o}{\sqrt{2}}$$

2. **Vibration bowls**  
**Bowl feeders**

For sorting, grading, aligning  
 level-bridging

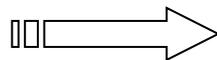


Vibration bowls



Bowl feeders

Direction of force

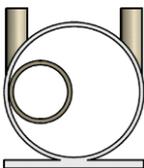


Type of vibration

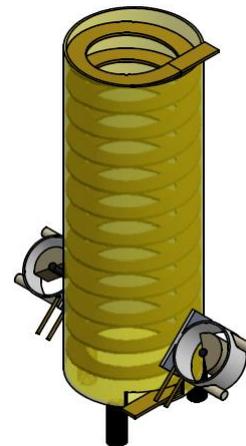
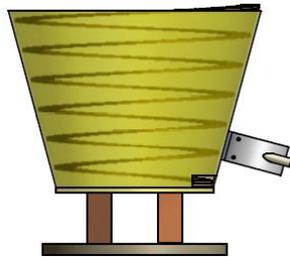
Directed vibration

Mounting spot

mounting to the lower lateral part of the installation to be vibrated



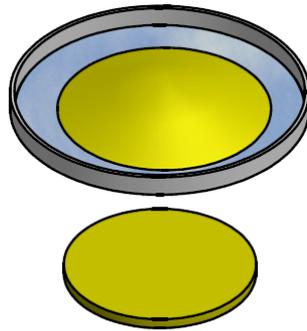
Piston / Electromagnetic vibrators



Circular vibrators for directed vibrations  
 on bowl feeder

### 3. Sieving

For separating, sorting, grading, de-watering, dehydration troughs, ceramics sieving, ...

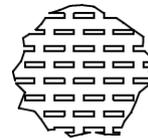


Direction of force

Mostly



Exception: Special sieving holes for grading



Factor "g"

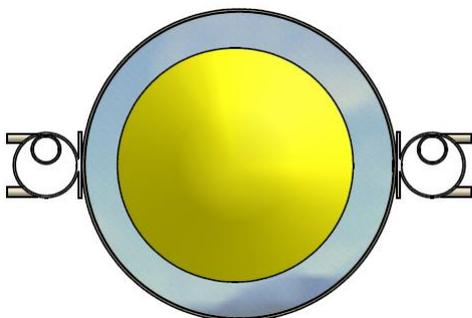
Normal values are halved  
(Exception: sieving of sticky materials)  
Predominantly, this applies to horizontal vibration.

Type of vibration

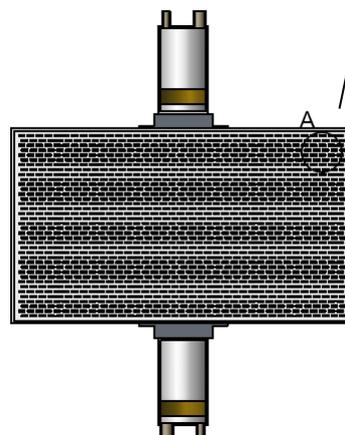
Mostly circular vibration  
In exceptional cases: directed vibration  
Frequency: to be adapted as per particle weight  
Factor "g": to be adapted as per particle weight

Mounting spot

Mounting laterally onto the structure



One or two pneumatic or electric vibrators rotating in the same direction



One or two piston or electromagnetic vibrators or electric vibrators generating directed vibrations

# EXAMPLES OF APPLICATION CALCULATION

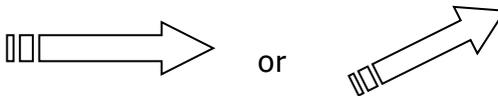
## II. DISSOLVING

Functions	Discharging, de-dusting, slackening, cleaning of sand, lime, cement, coal, etc.										
Fields of application	Silos, freight wagons, tipper trucks, filters, tubes, ...										
Frequency range	<p>Middle range from 1,500 to 3,000 min<sup>-1</sup> (this does not apply to air vibrators!)</p> <p>The frequency depends on the type of the material particles to be moved.</p> <p>The stickier the material, the lower the frequency.          1,500 min<sup>-1</sup> with wet or sticky materials          3,000 min<sup>-1</sup> with dry and relatively liquid materials</p>										
Amplitude	<p>Depends on the frequency. The following values can be deemed to be correct and suitable:</p> <table border="0" style="width: 100%; margin-left: 40px;"> <tr> <td style="text-align: left;">Frequencies in min<sup>-1</sup></td> <td style="text-align: center;">1,500</td> <td style="text-align: center;">3,000</td> </tr> <tr> <td style="text-align: left;">Amplitude in mm</td> <td style="text-align: center;">1.5 – 5</td> <td style="text-align: center;">0.4 – 2</td> </tr> <tr> <td style="text-align: left;">Extreme amplitudes that must not be exceeded in any way (please see item "Important information"):</td> <td style="text-align: center;">12</td> <td style="text-align: center;">3.5</td> </tr> </table>		Frequencies in min <sup>-1</sup>	1,500	3,000	Amplitude in mm	1.5 – 5	0.4 – 2	Extreme amplitudes that must not be exceeded in any way (please see item "Important information"):	12	3.5
Frequencies in min <sup>-1</sup>	1,500	3,000									
Amplitude in mm	1.5 – 5	0.4 – 2									
Extreme amplitudes that must not be exceeded in any way (please see item "Important information"):	12	3.5									
Power requirement	<p>Factor "g" = 1.8 to 3.5 of the mass to be vibrated. This refers to the mass of material inside the silo to be vibrated only. The mass of the structure to be vibrated has to be determined with other applications.</p> <p>There are <u>POSSIBLE EXCEPTIONS</u> with special applications</p> <table border="0" style="width: 100%; margin-left: 40px;"> <tr> <td style="width: 30%;"></td> <td style="text-align: center;"><math>\Sigma F</math> in daN = <math>\Sigma M \times 1.8</math> to 3.5</td> </tr> <tr> <td style="vertical-align: top;">Required force F: (M = mass)</td> <td style="text-align: center;"><math>\Sigma M</math> in kg = M of material in the cone of a silo or M of the structure</td> </tr> <tr> <td style="vertical-align: top;">With dry, relatively liquid materials</td> <td style="text-align: center;">1.8 = &lt; g = &lt; 2</td> </tr> <tr> <td style="vertical-align: top;">With wet, sticky materials</td> <td style="text-align: center;">2 = &lt; g = &lt; 3.5</td> </tr> </table>			$\Sigma F$ in daN = $\Sigma M \times 1.8$ to 3.5	Required force F: (M = mass)	$\Sigma M$ in kg = M of material in the cone of a silo or M of the structure	With dry, relatively liquid materials	1.8 = < g = < 2	With wet, sticky materials	2 = < g = < 3.5	
	$\Sigma F$ in daN = $\Sigma M \times 1.8$ to 3.5										
Required force F: (M = mass)	$\Sigma M$ in kg = M of material in the cone of a silo or M of the structure										
With dry, relatively liquid materials	1.8 = < g = < 2										
With wet, sticky materials	2 = < g = < 3.5										

## Special applications

### 1. **Discharging**

of silos, hoppers, containers, flasks, ...

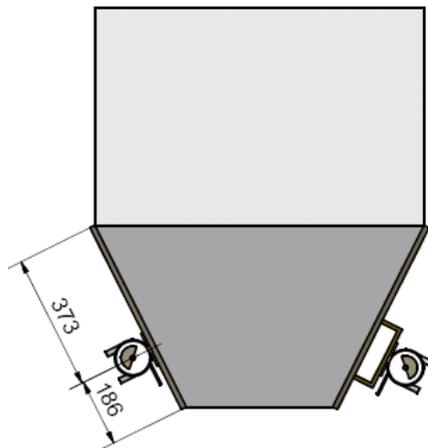
Direction of force 

In each case, the direction of force runs vertically to the structure to be vibrated.

Type of vibration Mostly circular, but also directed vibration

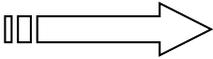
Type of application Power: in most case, Factor "g" = 2 is sufficient with a cone inclination up to some 30°. With regard to this value, please see the applicable correction values listed below.

- Mounting is done on one third of the cone length.
- The vibrator must be fastened to a steel-type reinforcement piece in order to have optimum effect of the vibration onto the material.



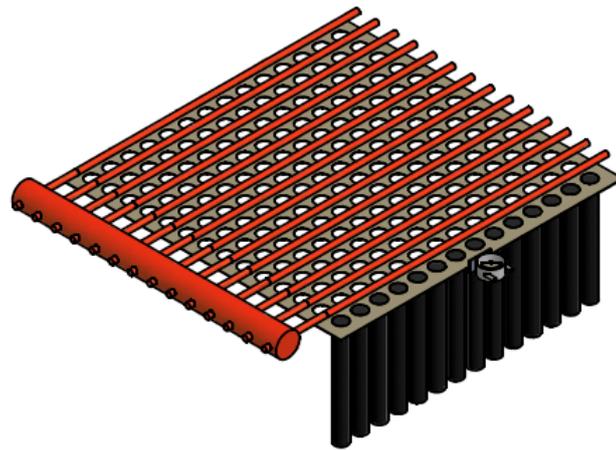
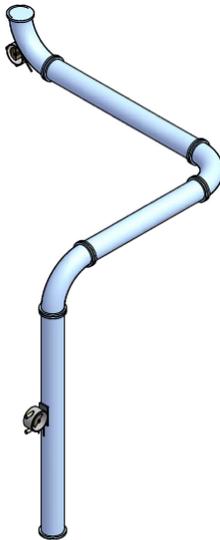
Mostly pneumatic vibrators of the turbine, ball, or piston types.  
Electric vibrators with bigger installations.  
(With dusty atmosphere, please see ATEX vibrator)

2. **Slackening / cleaning de-dusting** of filters, tubes, screens, flasks (foundries), ...

Direction of force  vertically to the structure

Type of vibration Mostly circular, occasionally directed vibration.  
Lower frequency: max. 1,500 min<sup>-1</sup> with electric vibrators.  
Exception: tube cleaning which requires high frequency.  
With air vibrators = adapt the exact frequency  
Power:  
Factor "g": 2 to 2.5 of total mass of the structure to be vibrated  
Factor "g": 2.5 to 3 with flasks  
With horizontal vibration, these values are halved.

Mounting spot mounting is done laterally onto the structure



Filter cleaning

# EXAMPLES OF APPLICATION CALCULATION

## III. COMPRESSING

Functions	Filling, compressing of concrete						
Fields of application	<p>Generally speaking, there are two fields of application.</p> <p><u>With industry:</u>          For filling purposes on packing bulk goods, powder, graphite, quartz flour (in the glass industry), granulate, ...          For the flask preparation (foundries)</p> <p><u>With building construction:</u>          For the compressing of concrete</p>						
Frequency range	<p>High frequency from 6,000 to 9,000 min<sup>-1</sup>          This does not apply to air vibrators.          The frequency depends on the type of the material particles to be moved.</p> <p>The smaller the grain size, the higher the frequency.          In most cases:          6,000 min<sup>-1</sup> with most materials and with concrete          Up to 9,000 min<sup>-1</sup> with very small grain-type materials or concrete</p> <p>Exception:          3,000 min<sup>-1</sup> with very dry concrete</p> <table border="0" style="margin-left: 40px;"> <tr> <td style="padding-right: 100px;">Frequencies in min<sup>-1</sup></td> <td style="padding-right: 50px;">6,000</td> <td>9,000</td> </tr> <tr> <td>Amplitude in mm</td> <td>0.3 – 0.4</td> <td>0.2 – 0.25</td> </tr> </table>	Frequencies in min <sup>-1</sup>	6,000	9,000	Amplitude in mm	0.3 – 0.4	0.2 – 0.25
Frequencies in min <sup>-1</sup>	6,000	9,000					
Amplitude in mm	0.3 – 0.4	0.2 – 0.25					
Power requirement	<p>a) With industry:          Factor "g" = 0.8 to 1.5 of the total mass to be vibrated. Mass of the material <u>plus</u> mass of the installation and the vibrators</p> <p>0.8 = &lt; g = &lt; 1.5</p> <p>b) With building construction:          Very different depending on the forms and on the boarding.</p> <p>Please contact our company!</p>						

**Special applications**

1. **Filling**

Allows for up to 20% of additional cubic content

Direction of force



Type of vibration

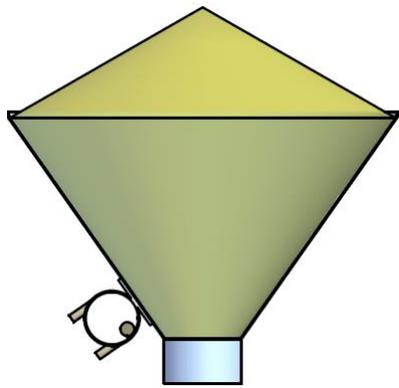
Circular vibration

High frequency: 6 to 900 rpm depending on the graining of the material particles.

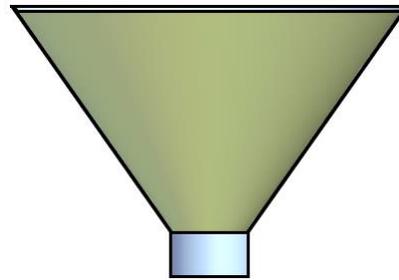
The smaller the grain size, the higher the frequency

Mounting spot

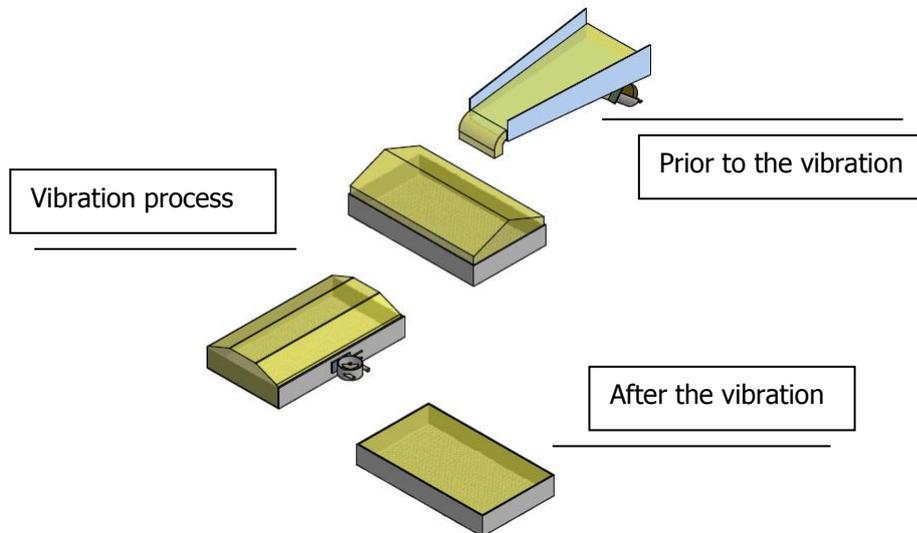
Mounting on the lower lateral part of the structure



Prior to the vibration



After the vibration



2. **Compression of concrete** on vibrating tables: compression of stone blocks, flasks

Direction:

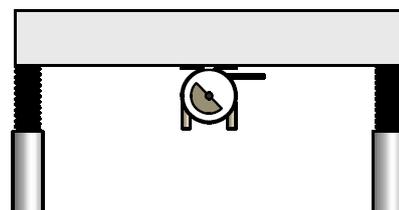


Type of vibration:

3,000 rpm

Factor "g": up to 1.5

Exceptionally: 2.5



# CALCULATION EXAMPLES

(The mass to be moved amounts to 100 kg!)

## Conveying

	<b>Electric vibrators</b>	<b>Pneumatic vibrators</b>
Mean working frequency:	1,500 min <sup>-1</sup>	not required
Mean value of factor "g":	2	2
Nominal power required:	$F = 2 \times 100 = 200 \text{ daN}$	$F = 2 \times 100 = 200 \text{ daN}$
Correction:	none	$200 / 0.85^* = 235 \text{ daN}$
By type:	WEV 10/02/4	VT 24

\* Correction value with VT types

## Dissolving

	<b>Electric vibrators</b>	<b>Pneumatic vibrators</b>
Mean working frequency:	3,000 min <sup>-1</sup>	not required
Mean value of factor "g":	2.7	2.7
Nominal power required:	$F = 2.7 \times 100 = 270 \text{ daN}$	$F = 2.7 \times 100 = 270 \text{ daN}$
Correction:	none	$270 / 0.85^* = 317 \text{ daN}$
By type:	WEV 10/14/2	VT 31

\* Correction value with VT types

## Compressing

	<b>Electric vibrators</b>	<b>Pneumatic vibrators</b>
Mean working frequency:	3,000 min <sup>-1</sup>	not required
Mean value of factor "g":	1.2	1.2
Nominal power required:	$F = 1.2 \times 100 = 120 \text{ daN}$	$F = 1.2 \times 100 = 120 \text{ daN}$
Correction:	none	$120 / 0.85^* = 141 \text{ daN}$
By type:	WEV 05/14/2	VT 16

\* Correction value with VT types

(1) In this case the VT 24 could be replaced by another type of pneumatic vibrator (but only on the customer's demand, as the turbine type only has advantages with regard to ball or roller vibrators):

a) By a VK vibrator:

After correction, the output indicated for a VK has to amount to:

$$200 / 0.6 = 333.5 \text{ daN, i.e. } 3,335 \text{ N.}$$

Checking the tables in the prospectuses shows that this output is granted by a VK26.

b) By a VR vibrator:

After correction, the output indicated for a VR has to amount to:

$$200 / 0.35 = 571.5 \text{ daN, i.e. } 5,715 \text{ N.}$$

Checking the tables in the prospectuses shows that this output is granted by a VK78.

(2) In this case, and by a similar calculation, the V31 allows to be replaced:

a) By a VK vibrator:

$$266 / 0.6 = 443.5 \text{ daN, i.e. } 4,435 \text{ N} \rightarrow \text{VK 26}$$

b) By a VR vibrator:

$$266 / 0.35 = 760 \text{ daN, i.e. } 7,600 \text{ N} \rightarrow \text{VR 78}$$

(3) In this case, and by a similar calculation, the VT 16 allows to be replaced:

a) By a VK vibrator:

$$121 / 0.6 = 201 \text{ daN, i.e. } 2,010 \text{ N} \rightarrow \text{VK 22}$$

b) By a VR vibrator:

$$121 / 0.35 = 346 \text{ daN, i.e. } 3,460 \text{ N} \rightarrow \text{VR 47}$$

# IMPORTANT INFORMATION

## Information for the selection of the right type of vibration

Each vibrator type features advantages, disadvantages and application limits each customer should know well.

### **Pneumatic vibrators**

#### **Advantages**

- HIGH FLEXIBILITY: they adapt frequency and amplitude by themselves in each case.
- HIGH FREQUENCY: they are particularly suitable for small-particle materials, e.g. powder etc.
- EXPLOSION-PROOF: an absolute necessity with dusty atmospheres. With electric vibrators, there is always the danger of a short circuit with explosion-proof devices, too.
- TEMPERATURE-RESISTANT: they resist temperatures up to and more than 200 °C (particularly important for foundries). ASK FOR TYPE "UCV"!
- COMPRESSED AIR SUPPLY: available in most factories.
- They feature a small installation mass when compared to their performance.

Please pay special attention to the performance data shown in the prospectus.

#### **Disadvantages**

- HIGHER ENERGY COSTS
- Roller vibrators require pneumatic air-line lubrication
- LOUD: with the exception of type VT with a maximum of 70 dBA.

## Electric vibrators

### Advantages

- ENERGY-SAVING
- CLEAN
- LOW-NOISE
- ADJUSTABLE CENTRIFUGAL FORCE: by means of readjusting the unbalance units
- LARGE SCALE OF PERFORMANCE:
  - Please pay special attention to the performance data in the prospectus.

### Disadvantages

- UNFLEXIBILITY: frequency variation available at high costs only.
- NOT EXPLOSION-PROOF in dusty atmosphere; with explosion-proof models, too, there is the chance of a short circuit due to the external cable.
- TEMPERATURE-SENSITIVE: there is danger with temperatures exceeding 50 to 70 °C
- Big installation mass in comparison with the performance.