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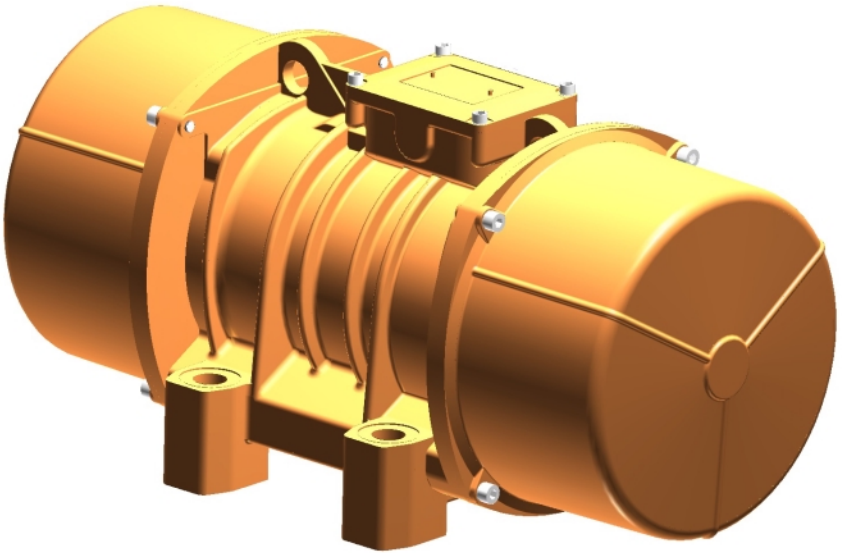
MOTOVIBRATOR SELECTION GUIDE



GUIDE TO CHOOSE THE ELECTRIC VIBRATOR

VIBRATION SYSTEMS AND METHODS

The systems that use the vibration technique can be divided into the following categories:

- **freely oscillating systems,which will be described in this guide**
- **oscillating systems bound to resonance,which require specific in-depth research.Please contact the Technical Sales Service of Italvibras if these systems are required.**

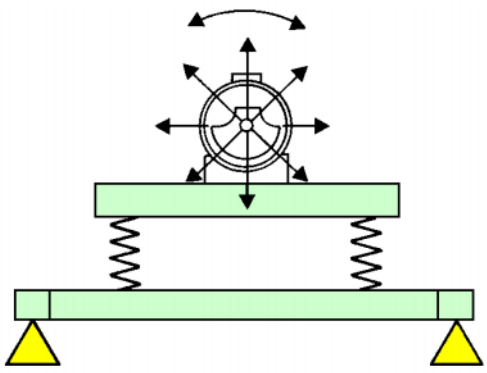
The free oscillation system includes two different methods:

- **rotational:the vibrating force is directed in all directions through 360 ° in a rotational way,either clockwise or anticlockwise.**
- **unidirectional:the vibrating force is directed in one single direction in fade-free sinoidal reciprocating mode.**

The "rotational " method is obtained by using a single electric vibrator.

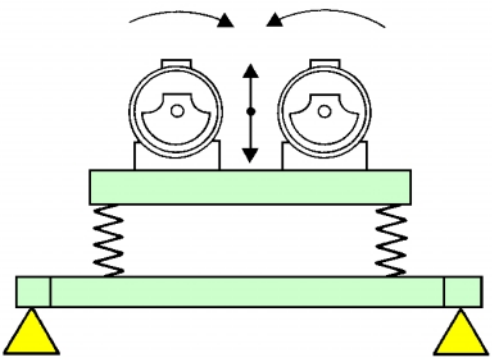
The "unidirectional " method is obtained by using two electric vibrators with the same electro--mechanical characteristics,each turning in the opposite direction to the other.

Rotational method



Vibrating force directed in all directions through 360°, in rotational mode

Unidirectional method



Vibrating force in a single direction, in sinusoidal reciprocating mode

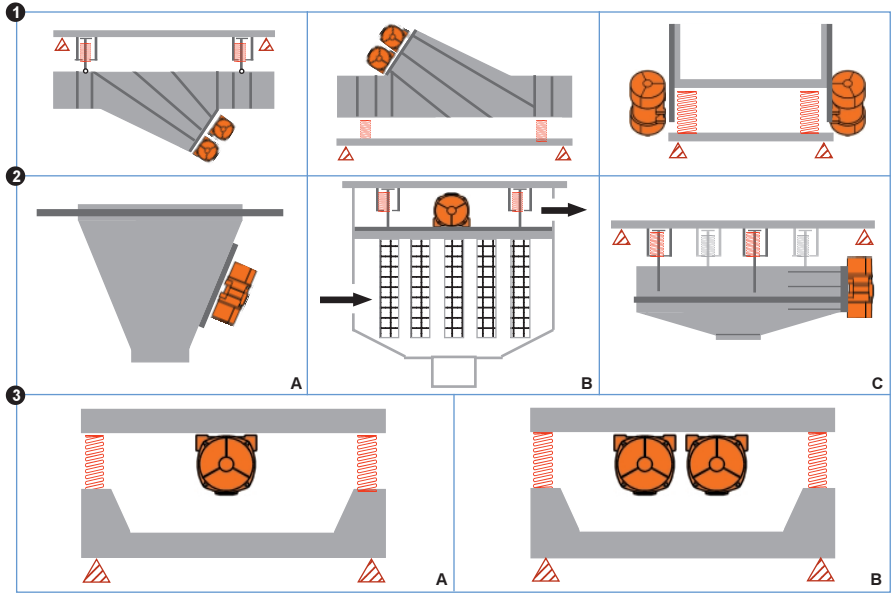
EXAMPLES OF HOW ELECTRIC VIBRATORS ARE USED IN DIFFERENT PROCESSES

The following examples illustrate a few typical uses:

1 -for conveyors,separators,sieves,sizing machines,unloaders,positioners,sorters,feeders and fluidized beds (“unidirectional method ”(1)).

2 -for silos and hoppers (2A),filters (2B)and vibrating beds (2C)(“rotational method ”).

3 -for compacting tables and tests (accelerated ageing,stress,ecc.)(“Unidirectional (3B)or rotational method (3A)”).

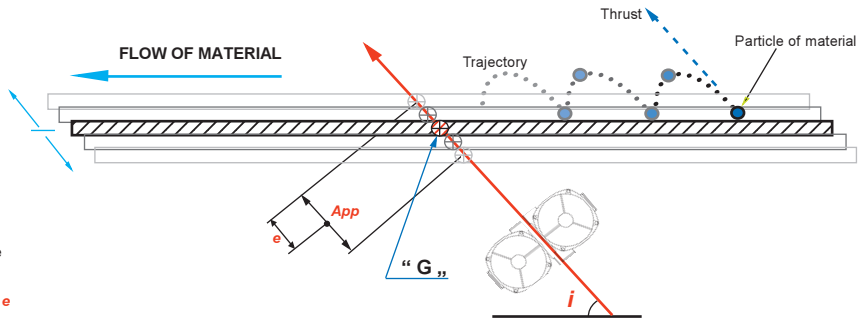


CHOICE OF THE VIBRATION METHOD AND ROTATION SPEED (AND, THUS, THE VIBRATION FREQUENCY) OF THE ELECTRIC VIBRATOR APPLIED TO THE ELASTICALLY INSULATED MACHINE, DEPENDING ON THE PROCESS

The choice of the vibration method and vibration frequency able to achieve the utmost efficiency for each type of process,depends on the specific weight and granulometry (or piece size)of the material used in the process itself (see table. Regardless of the selected vibration method,the electric vibrators can be mounted on the machine,elastically insulated with its axis in a horizontal or vertical position or,if necessary,in an intermediate position between the two directrices. The angle of incidence " *i* " (measured in degrees)of the line of force in relation to the horizontal plane should be taken into due consideration when electric vibrators are applied with the "unidirectional" method. Important the line of force for any angle of incidence must pass through center of gravity "G" of the elastically insulated machine (see figure next pages).

UNIDIRECTIONAL METHOD

Theoretic speed of the product V_{teo} in m/h or cm/s



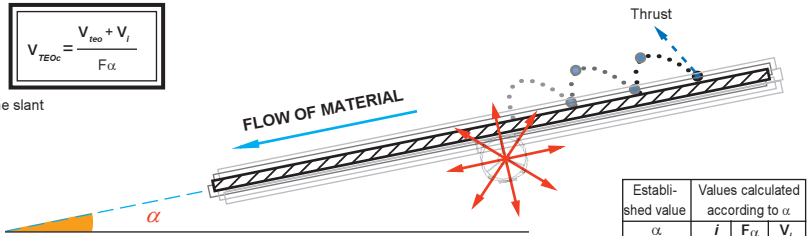
i = angle of incidence of the line of force in relation to the horizontal plane
e = eccentricity (mm)
App = peak-to-peak amplitude (mm) = 2 x *e*

ROTATIONAL METHOD

Corrected theoretic speed of the product V_{TEOc} in m/h or cm/s

$$V_{TEOc} = \frac{V_{teo} + V_i}{F\alpha}$$

V_{TEOc} = Theoretic speed corrected to take the slant of the machine into account.
V_{teo} = Theoretic speed of the product



α = angle of inclination of machine in relation to horizontal plane
i = angle of incidence = 90 - α
Vi = speed of incidence (cm/s or m/h)
F_α = corrective factor to calculate corrected theoretic speed V_{TEOc}
e = eccentricity (mm)

} Calculated according to α (see table on right)

Establi-shed value	Values calculated according to α		
α	*i*	$F\alpha$	V_i
10°	80°	0,81	80
15°	75°	0,71	75
20°	70°	0,60	70
25°	65°	0,48	65
35°	55°	0,25	55

CHOICE OF THE VIBRATION METHOD AND ROTATION SPEED (AND, THUS, THE VIBRATION FREQUENCY) OF THE ELECTRIC VIBRATOR APPLIED TO THE BRUTE FORCE MACHINE, DEPENDING ON THE PROCESS

Determination of the angle of incidence *i* of the line of force depends on the type of process and must be within the indicated range.

" *i* "	Processes / Uses
from 6° to 12°	for special separators (e.g.: the milling industry);
from 25° to 30°	for conveying, unloading, feeding, positioning and sorting;
from 31° to 45°	for sifting, grading and separating;
from 45° to 80°	for fluidized beds.

HOW TO CHOOSE THE RIGHT TYPE OF ELECTRIC VIBRATOR FOR USE IN TYPICAL PROCESSES (e.g.: conveying material)

Use the Table on next page to select the vibration method and the required number of vibrations per minute depending on the process and the granulometry of the material.
Now move to the diagram corresponding to the obtained number of vibrations per minute: 3000, 3600, ecc.
Choose the corresponding curve on the diagram, for a previously calculated angle of incidence « *i* » of the line of force.
Using that diagram and that curve: eccentricity value «e» or peak-to-peak amplitude «App», measured in *mm* and required to obtain the previously mentioned theoretic product advancement speed value «V_{teo}» or «V_{TEOc}» can be identified for a required theoretic product advancement speed «V_{teo}» (m/h or cm/s) or «V_{TEOc}» (m/h or cm/s) for tilted machines.
«V_{teo}» is determined by the flow of material, taking a reduction coefficient into account (see conveyor channel example below). Given eccentricity value «e», it is possible to determine the value of the total static moment «Mt» (Kg.mm) of the electric vibrator or vibrators. This value is calculated by means of the following formula:

$$Mt = e \times Pv$$

where: Pv = Pc + Po

with

- **Pv = total weight of the vibrating equipment (Kg);**
- **Pc = weight of the elastically isolated trough (Kg);**
- **Po = weight of the installed electric vibrator (or vibrators) (Kg); hypothetic weight to be subsequently compared to that of the determined vibrator.**

Important: calculated moment Mt is the total moment of the electric vibrators. For example, if the vibrating machine has two electric vibrators, the calculated moment must be divided by two to obtain the static moment of each vibrator.
Once the static moment of the vibrator has been calculated, consult the catalogue to determine the type of electric vibrator required.

CHECKING THE VALIDITY OF THE CHOSEN ELECTRIC VIBRATOR

Having chosen the type of electric vibrator, centrifugal force value «Fc» (in Kg) of the vibrator itself can now be found in the catalogue.

Use formula $a = \frac{Fc}{Pv}$ **(measured n times g)**

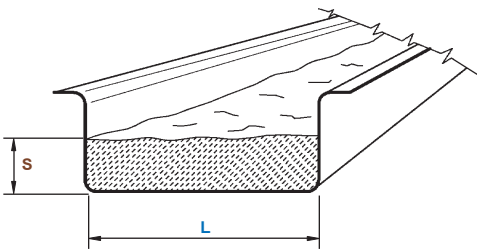
to establish acceleration value «a» along the line of force. This value must be within the range indicated in the Table (on page 8) for the required type of process.

Attention: if the chosen vibration method is "unidirectional", value «Fc» to use in the above mentioned formula will obviously be twice the value indicated in the catalogue as two electric vibrators are installed.

FLOW RATE and SPEED OF PRODUCT

$$Q = V_p \times L \times S$$

$$V_p = V_{teo} \times K_r$$



CONVEYOR CHANNEL

Q = flow rate **(m³/h)**
V_p = speed of product **(m/h)**

L = channel width **(m)**
S = layer of material **(m)**

V_{teo} = theoretic speed of the product (**m/h**) (if the channel is slanting, indicate V_{TEOc})

K_r = reduction factor depending on the type of product conveyed
A few values pertaining to this factor are indicated below

Leaf vegetables	0.70	Wooden shavings or PVC granules	0.75 to 0.85
Gravel	0.95	Sand	0.70
Small pieces of coal	0.80	Sugar	0.85
Large pieces of coal	0.85	Salt	0.95

MECHANICAL INSULATION OF THE VIBRATING EQUIPMENT FROM THE MOUNTING STRUCTURE
SIZING THE ELASTIC SYSTEMS

If free oscillation systems are used, it is advisable to fit anti-vibration mounts (such as helical steel springs, rubber supports or pneumatic actuators) to allow the vibrating machine to freely move in all directions.

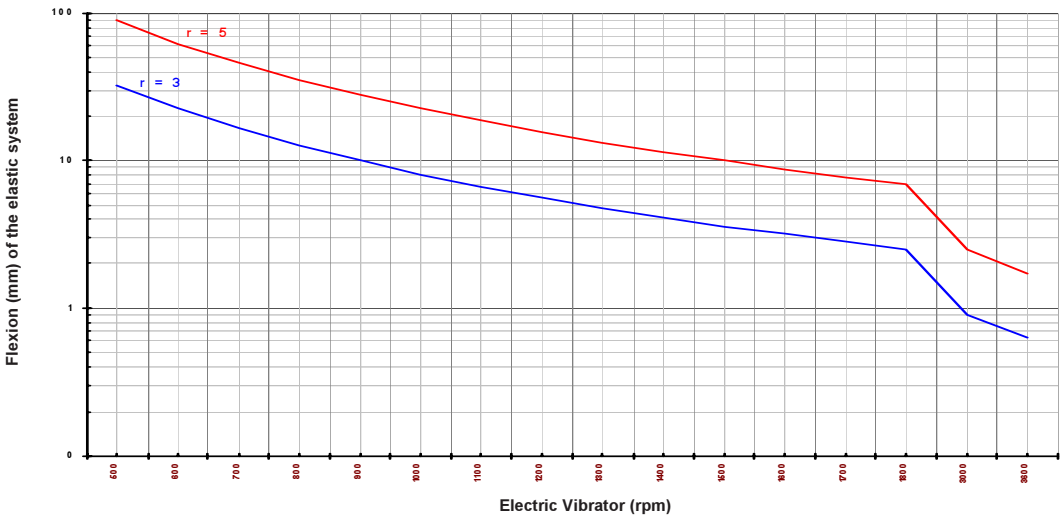
Do not use connecting rods, leaf springs or flat springs, etc., for free oscillation systems.

The non-vibrating element must be of adequate capacity, able to bear a weight equal to total weight «Pt» (i.e. the sum of the weights of the elastically insulated machine, or the electric vibrator or vibrators «Pv» and the material bearing on the machine itself «Ps») multiplied by the factor of safety , the value of which is between 2 and 2.5. Capacity «Q» of the elastic element will therefore be:

$$Q_{kg.} = \frac{Pv + Ps}{N} \times 2{,}5$$

where

Pv = total weight of the vibrating complex (Kg)
Ps = static weight of material on machine (Kg)
N = number of anti-vibration mounts



Now determine the camber «f»of the elastic system by means of diagram A, depending on the vibration frequency (rpm of the electric vibrator) and considering a resonance ratio «r» (between the vibration frequency of the vibrating complex and the frequency of the elastic system itself) between 3 and 5. The elastic constant of the anti-vibrating mount thus equals:

$$K_{Kg\cdot mm} = \frac{Pv}{f \times N}$$

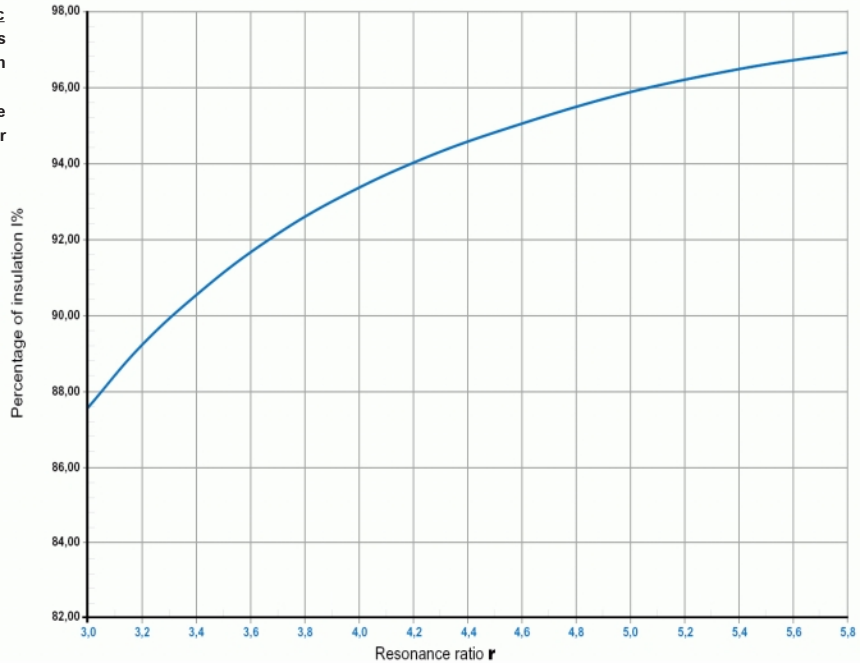
where f = camber of the elastic system (mm)

The capacity «Q_{kg}» and the elastic constant «$K_{kg\cdot mm}$» are the two entities required to choose the anti-vibration mounts on the market.
It is absolutely essential to distribute the load of the vibrating complex evenly over the elastic system.

DIAGRAM B gives the percentage of elastic insulation (I%) between the vibrating structure and bearing structure, depending on ratio « r ».
The anti-vibration mounts must be positioned so that the flexure is the same on all the elements, in order to balance the machine.

Important: *the bearing structure to which the anti-vibration mounts of the vibrating complex are fastened must be rigidly anchored to the ground or to some other type of bearing structure and always without any further anti-vibration elements.*

DIAGRAM B



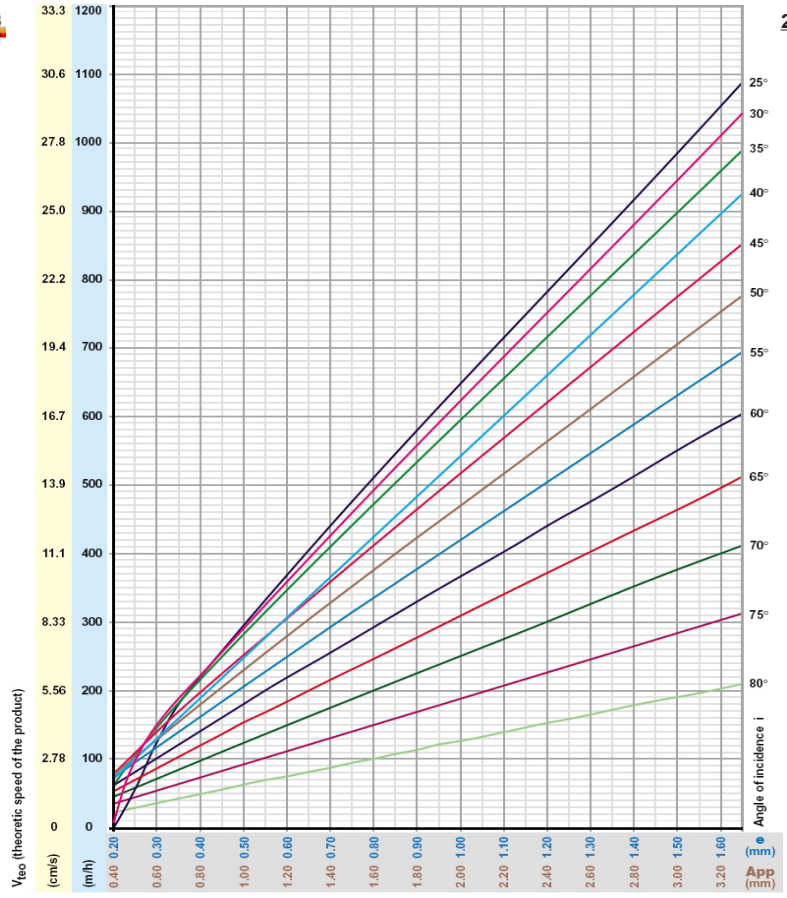
Use thise Table to select the vibration method and the required number of vibrations per minute depending on the process and the granulometry of the material.

Type of process	Specific weight	Size	Vibration di method		Vibrations per minute								Accelerat. on the line of force a
			Rotat.	Unidirec.	50 Hz	600	750	1000	1500	3000	6000	9000	
					60 Hz	720	900	1200	1800	3600	-	-	nxg
Conveying	A	F		●					●	●			4 to 9
Separating Sieving	A	M		●				●	●				4 to 6
Positioning	A	G		●			●	●					3.5 to 4.5
Grading	B	F		●					●				5 to 7
Sizing Estracting	B	M		●				●					4 to 5.5
Feeding	B	G		●			●	●					3.5 to 5.5
Filter cleaning	A/B	F	●						●	●			2 to 3
Slackening and emptying	A/B	F	●							●			Note (1)
material in silos,	A/B	M	●							●			
hoppers, etc.	A/B	G	●						●	●			
Fluidized beds				●			●	●					2 to 4
Separators (eg. for mills),				●		●	●						2 to 4
Vibrating beds		F	●							●			0.7 to 2
		M	●						●	●			
		G	●						●				
		F	●						●				
		M	●						●				
		G	●						●				
Compacting		F	●	●					●	●	●		2 to 6
		M	●	●					●	●	●		
		G	●	●					●	●	●		
Compacting concrete	—	—	●	●						●	●	●	1 to 2
Test benches (accelerated ageing)	—	—	●	●		●	●	●	●	●	●	●	0.5 to 24

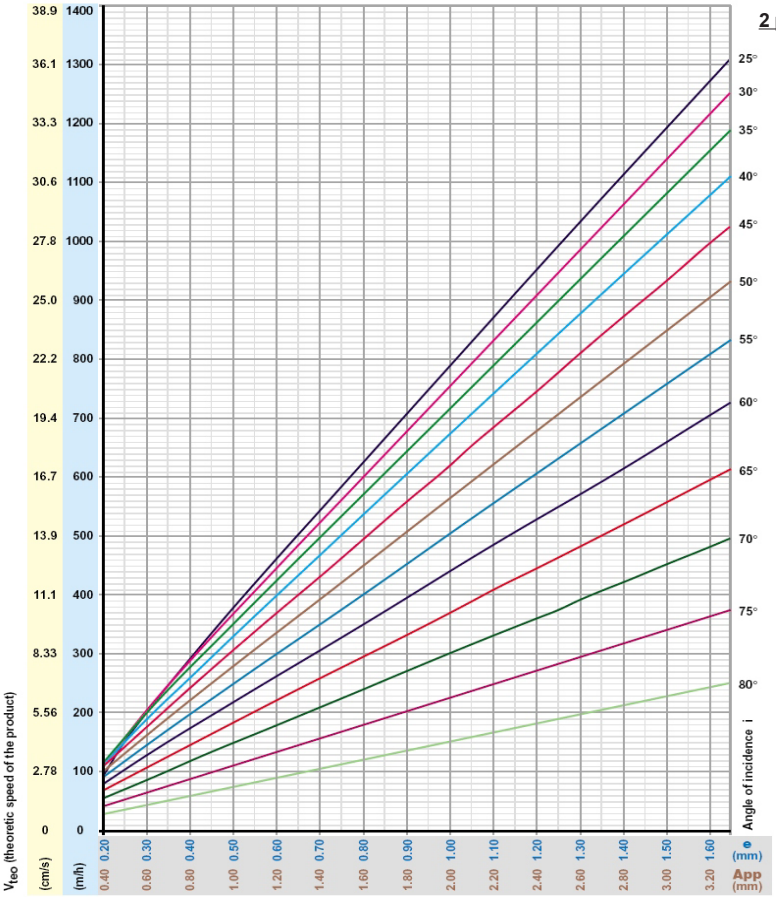
Key		
	Specific weight	A = high B = low
	Sizes	F = fine G = coarse M = medium

Note (1): Centrifugal force of the electric vibrator = 0.1 to 0.25 x the weight of the material in the tapering part of the vibrating machine.

2 poles - 3000 rpm - 50Hz



2 poles - 3600 rpm - 60Hz



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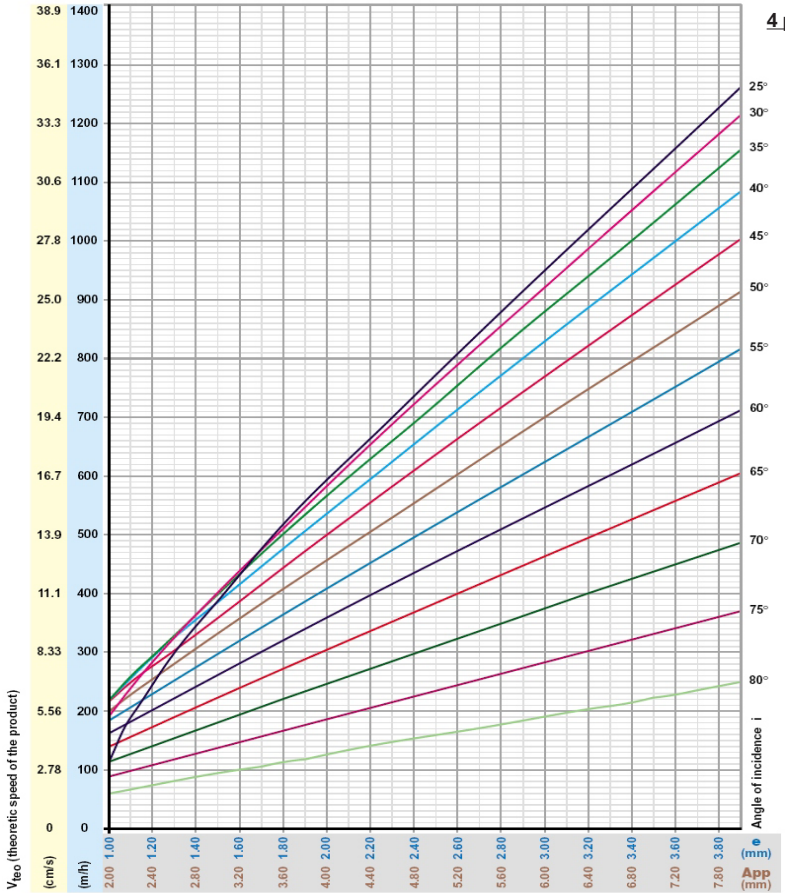
4 poles - 1500 rpm - 50Hz



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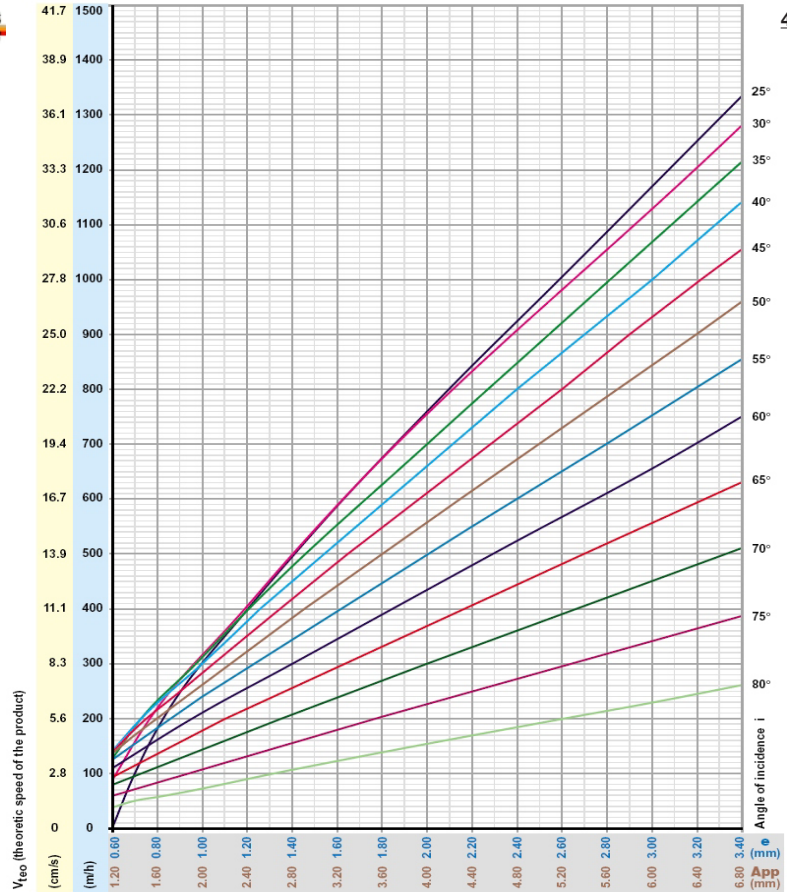
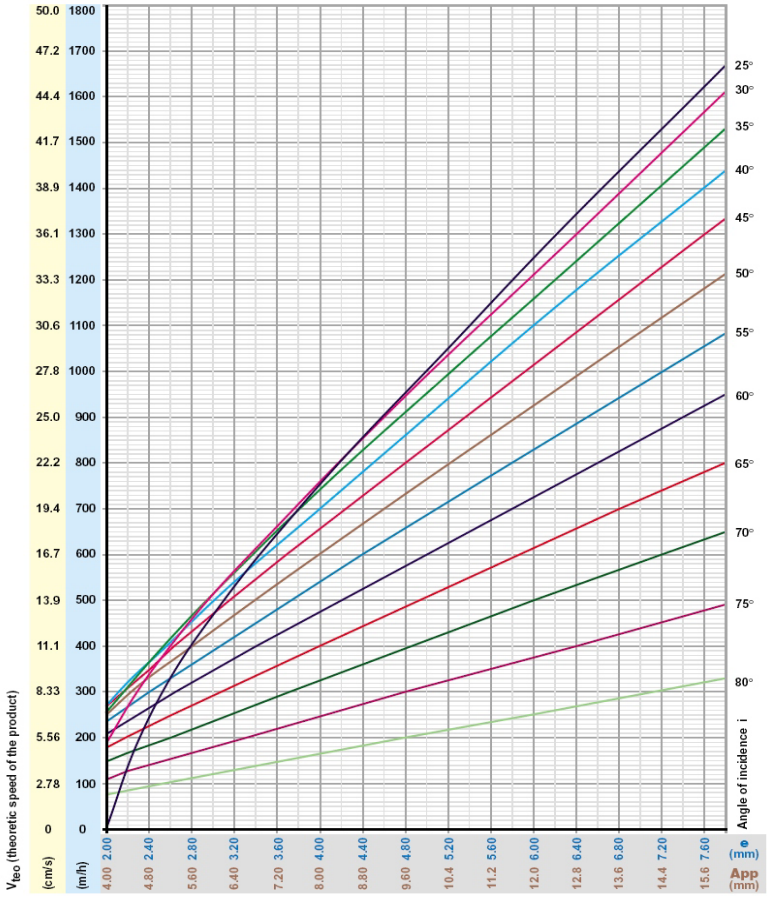
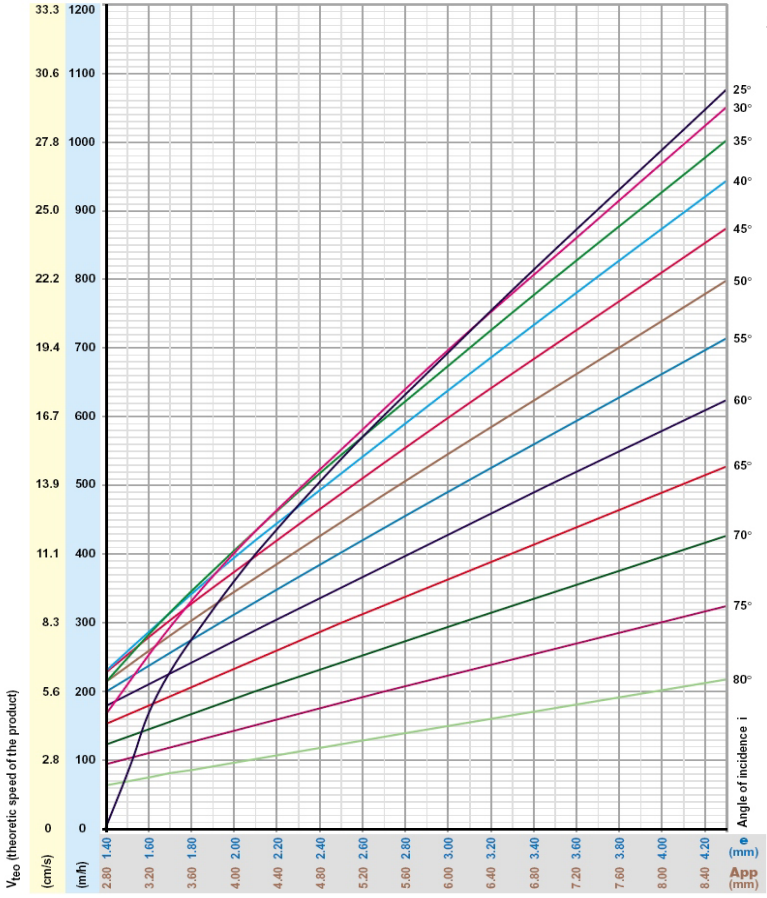
4 poles - 1800 rpm - 60Hz



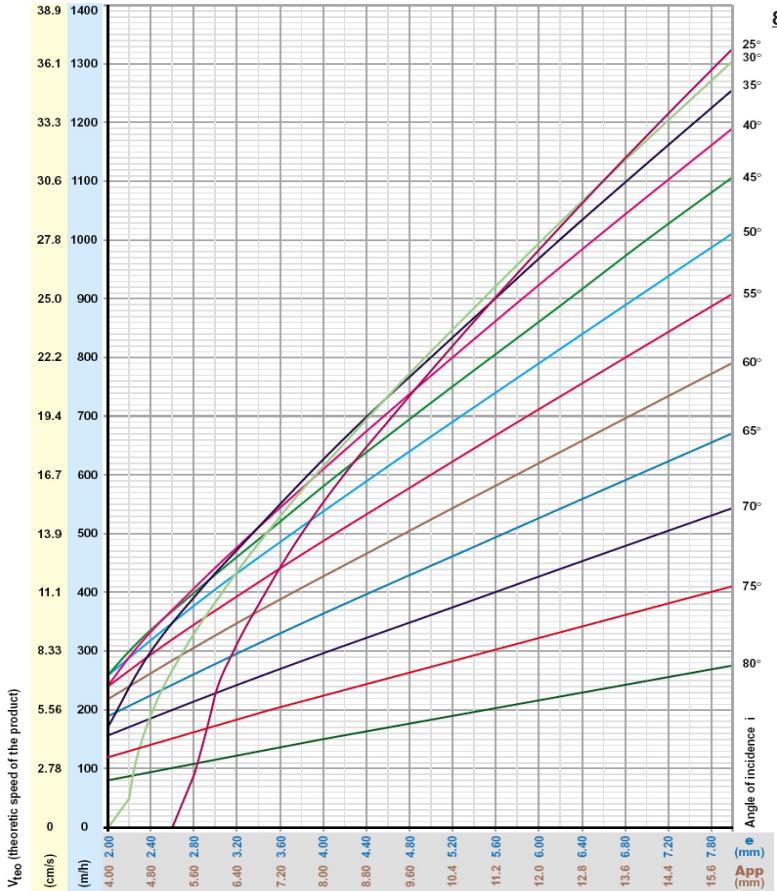
6 poles - 1000 rpm - 50Hz



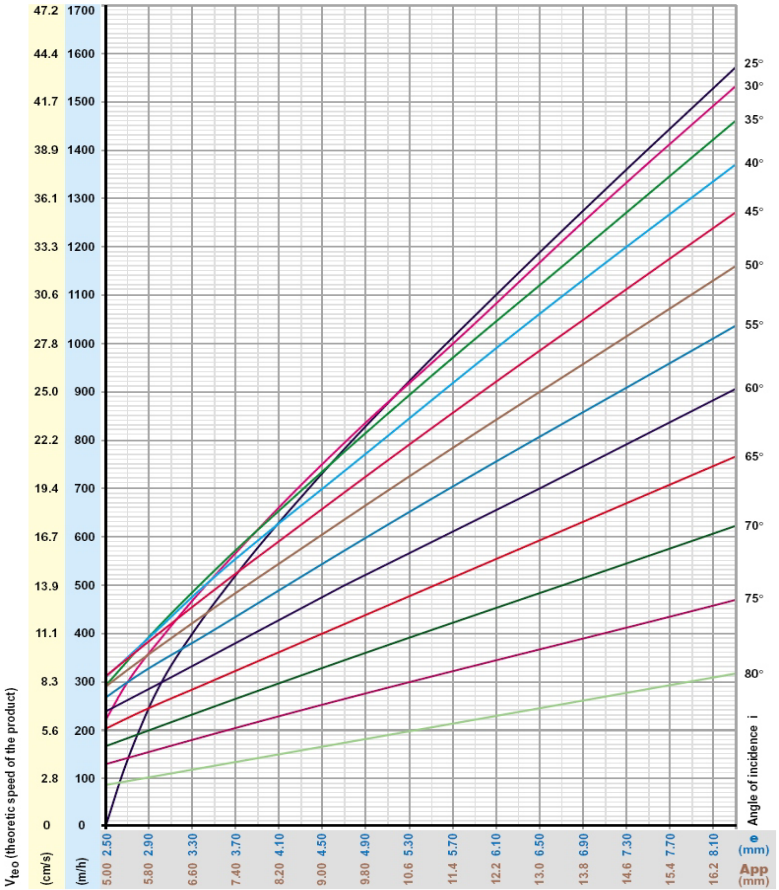
6 poles - 1200 rpm - 60Hz



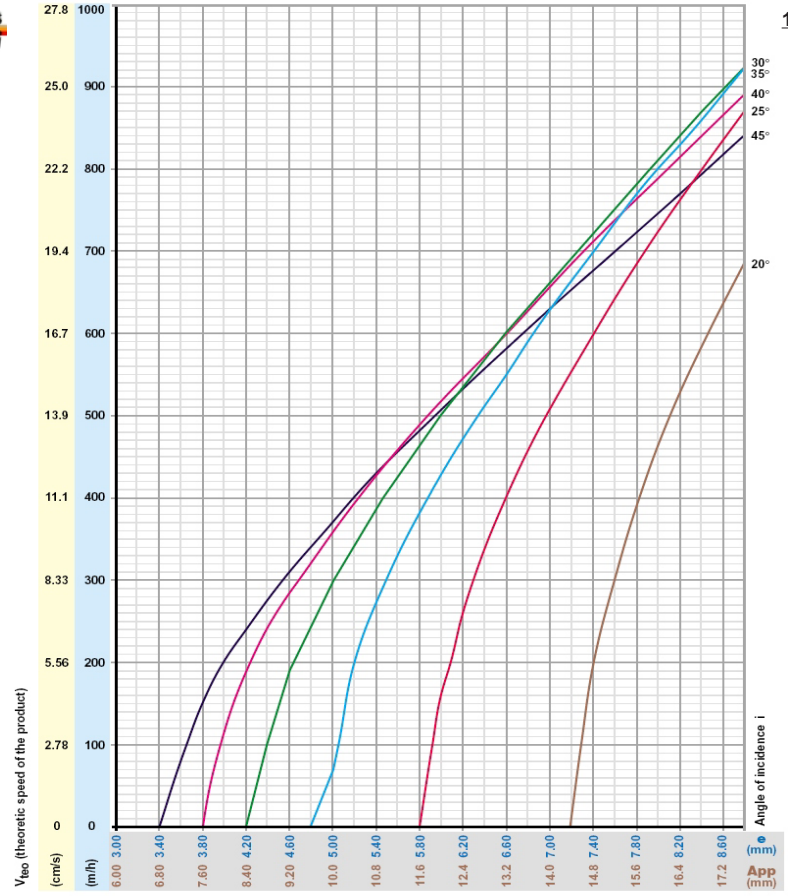
8 poles - 750 rpm - 50Hz



8 poles - 900 rpm - 60Hz

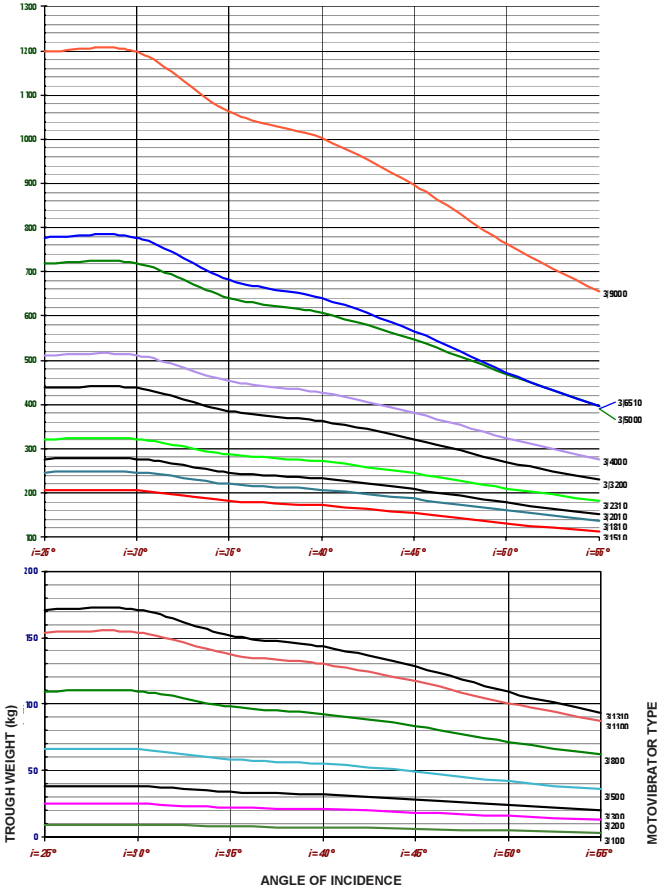


10 poles - 600 rpm - 50Hz



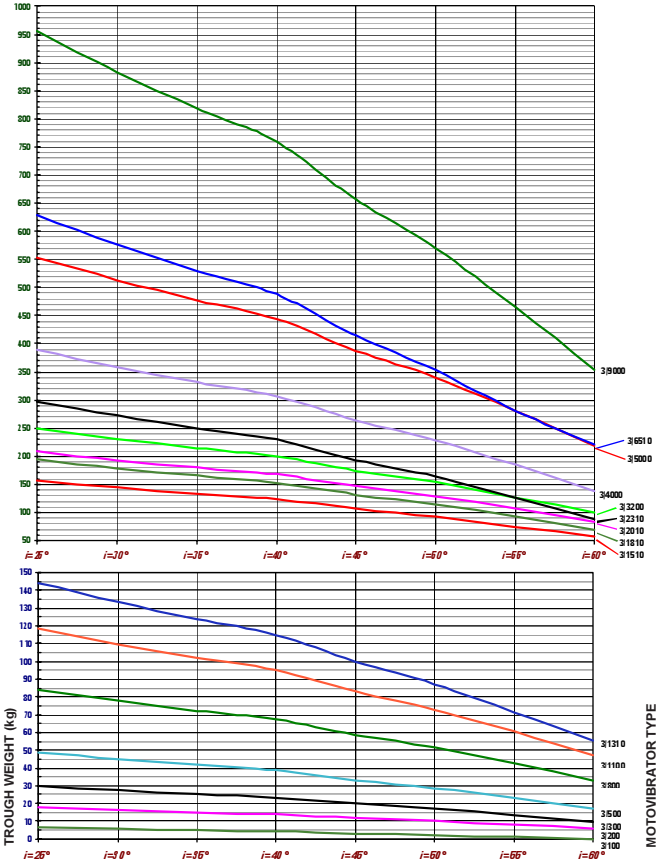
2 poles - 3000 rpm - 50Hz

Refered to V_{teo} *= 700m/h*



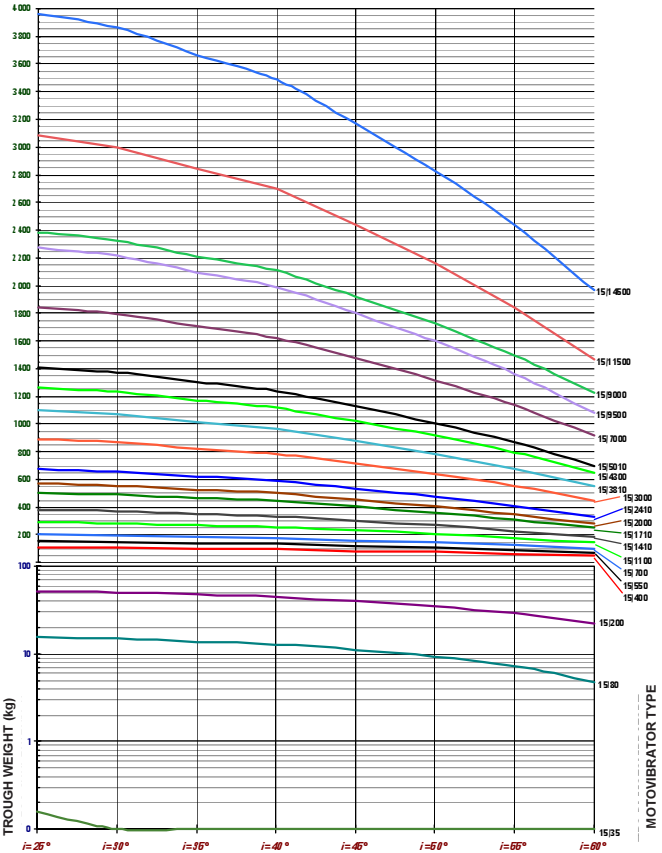
2 poles - 3600 rpm - 60Hz

Refered to V_{teo} *= 700m/h*



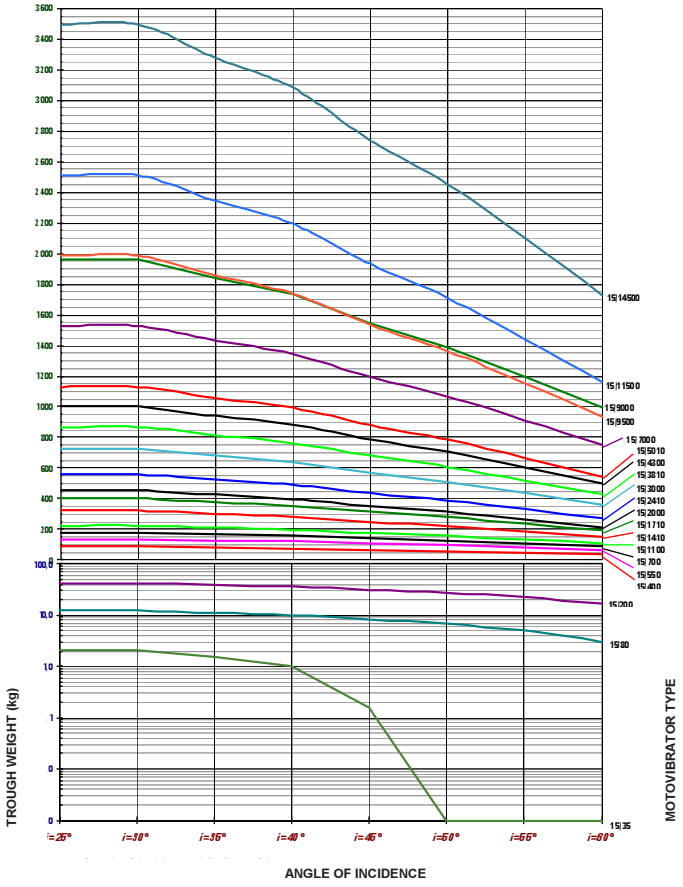
4 poles - 1500 rpm - 50Hz

Refered to V_{teo} = *700m/h*



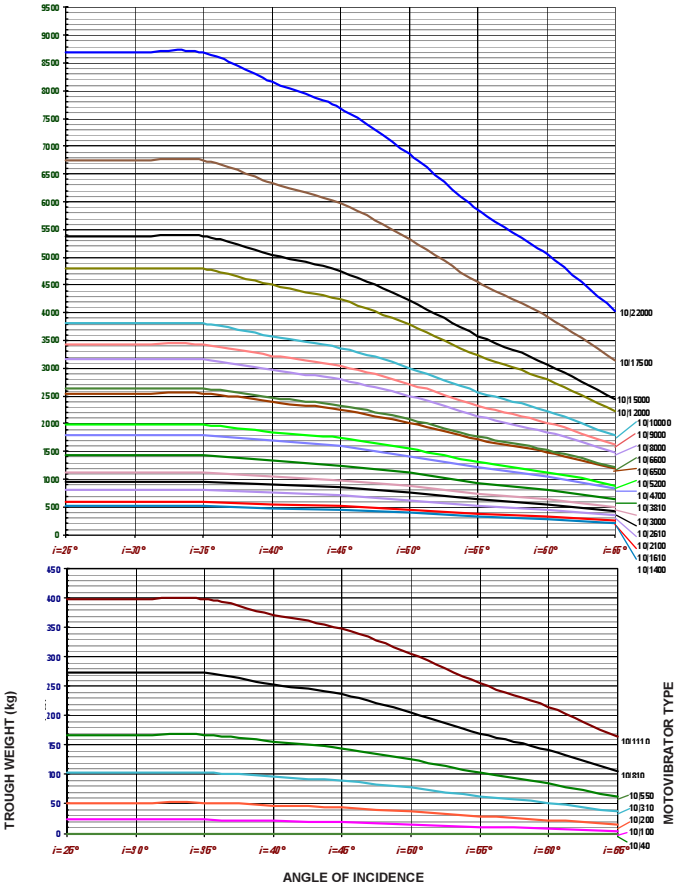
4 poles - 1800 rpm - 60Hz

Refered to V_{teo} *= 700m/h*



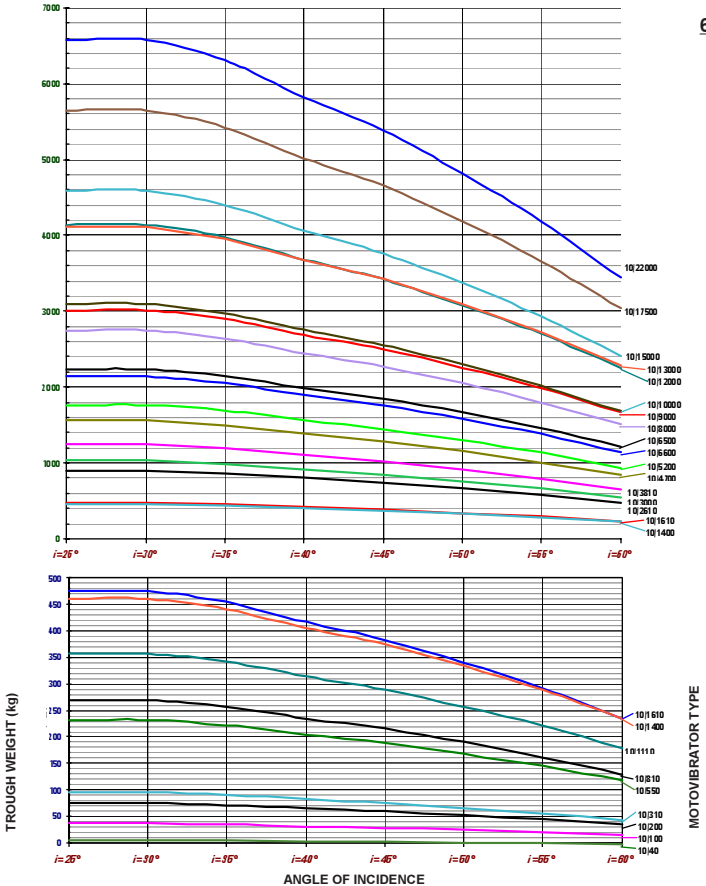
6 poles - 1000 rpm - 50Hz

Refered to V_{teo} *= 700m/h*



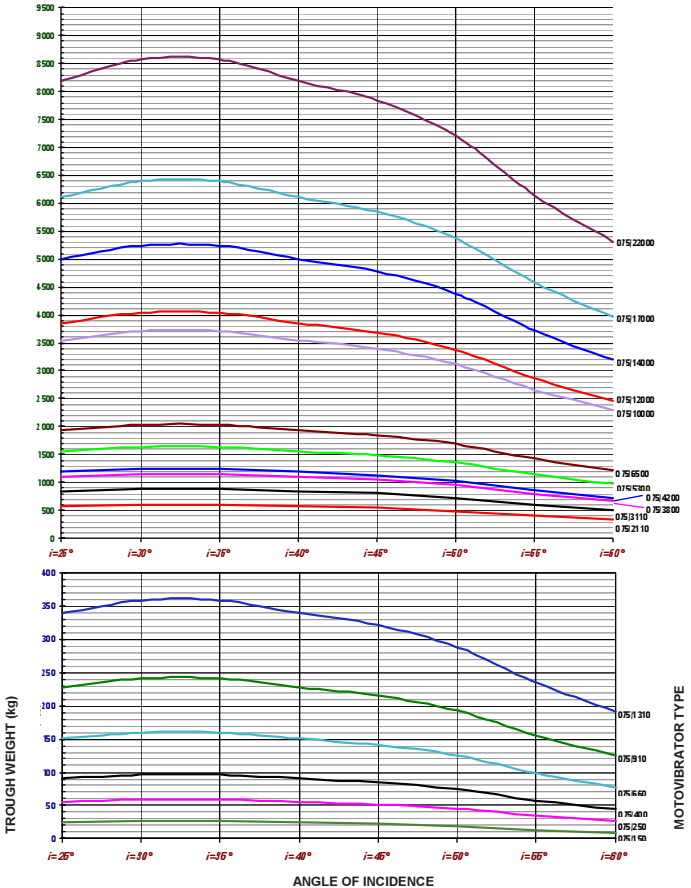
6 poles - 1200 rpm - 60Hz

Refered to V_{teo} = 700m/h



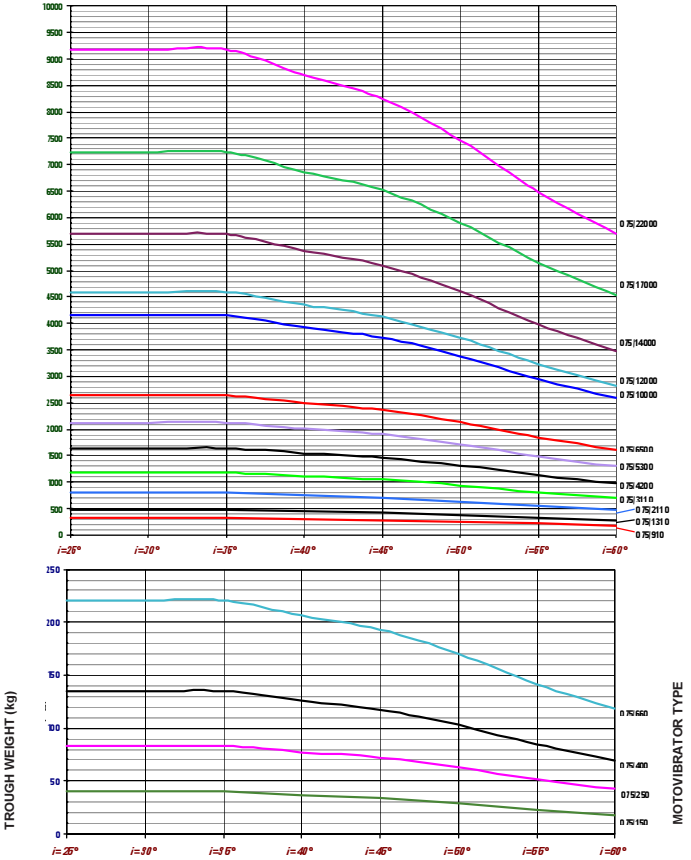
8 poles - 750 rpm - 50Hz

Refered to V_{teo} = 700m/h

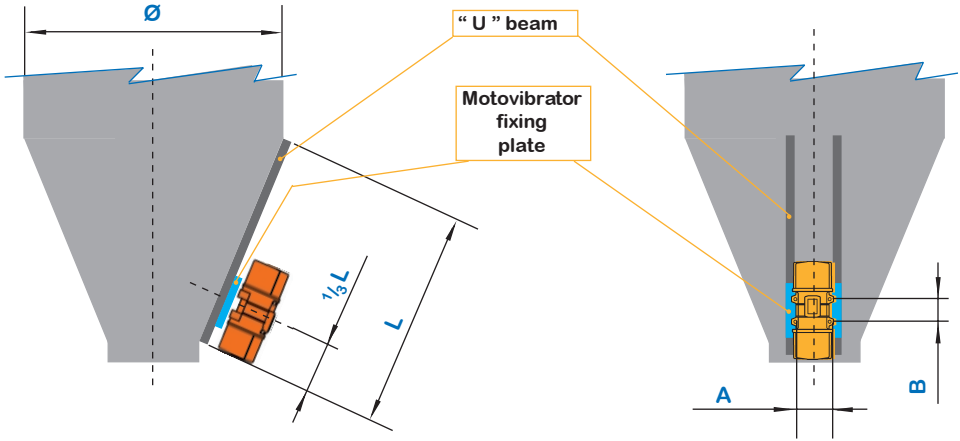


8 poles - 900 rpm - 60Hz

Refered to V_{teo} = 700m/h

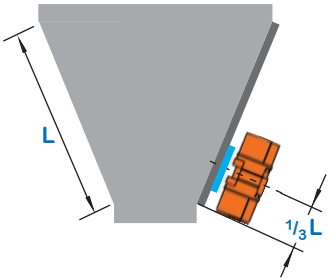


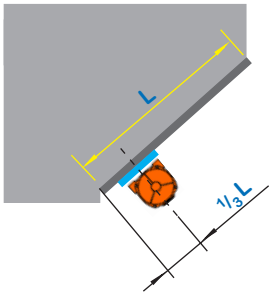
INDICATIVE OUTLINE FOR INSTALLATION OF A VIBRATOR ON SILOS

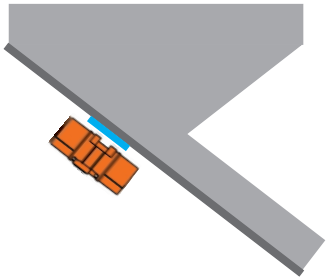


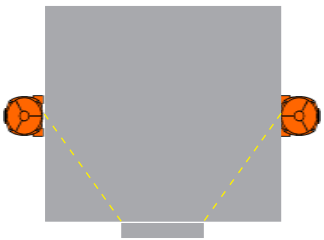
Ø (mm)	MOTOVIBRATOR
up to 800	MVSI 3/100-S90
800÷1000	MVSI 3/200-S90
1000÷1200	MVSI 3/300-S90
1200÷2000	MVSI 3/500-S90
2000÷3000	MVSI 3/800-S90
	MVSI 15/700-S90
3000 and up	MVSI 3/1300 ÷ 3/1800 -S90
	MVSI 15/1410 ÷ 15/1710 -S90

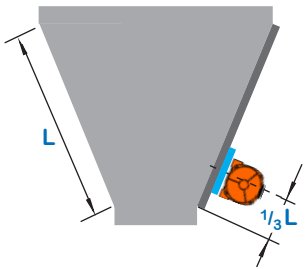
EXEMPLE OF INSTALLATIONS ON HOPPERS











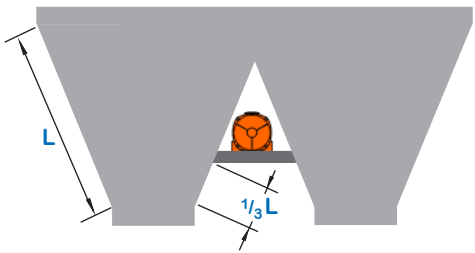
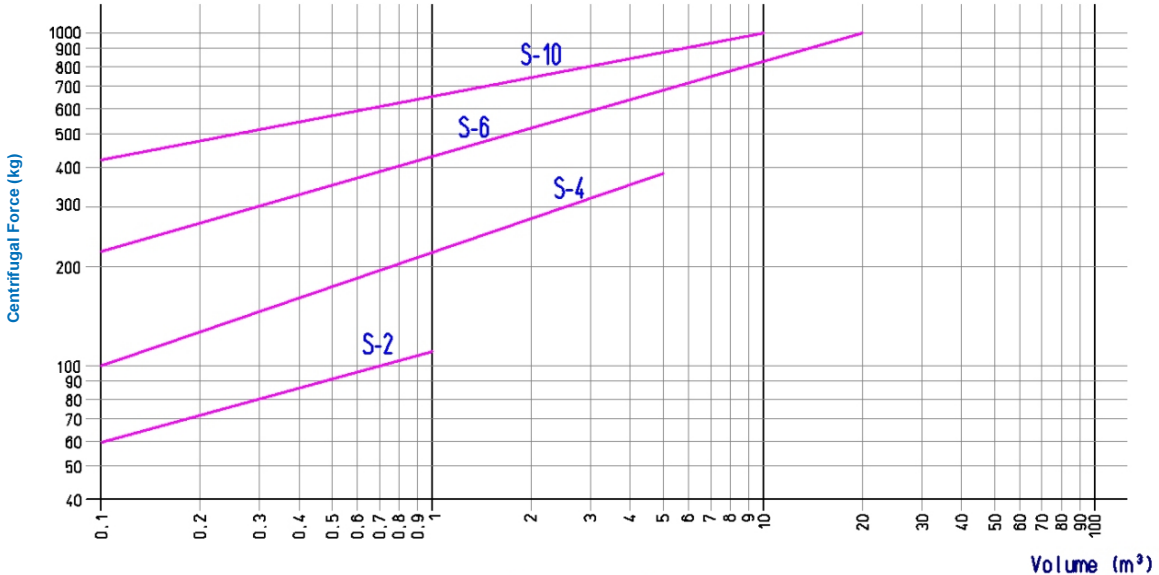
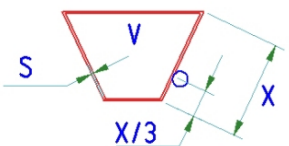


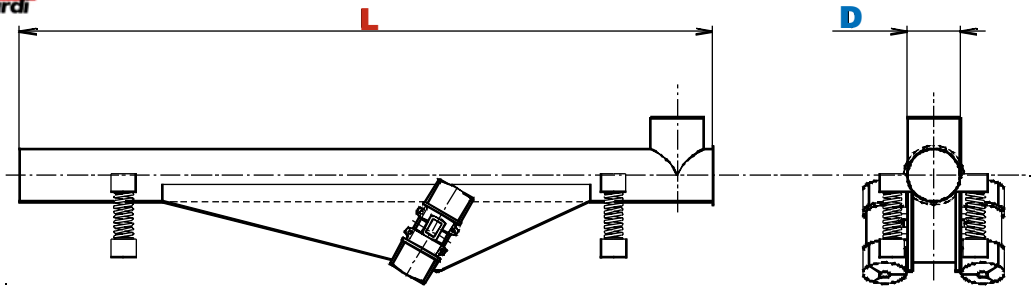
DIAGRAM FOR THE CHOICE OF THE MOTOVIBRATOR TO INSTALL ON HOPPER



S = Thickness (mm)



TUBULAR FEEDER CAPACITY m³/h



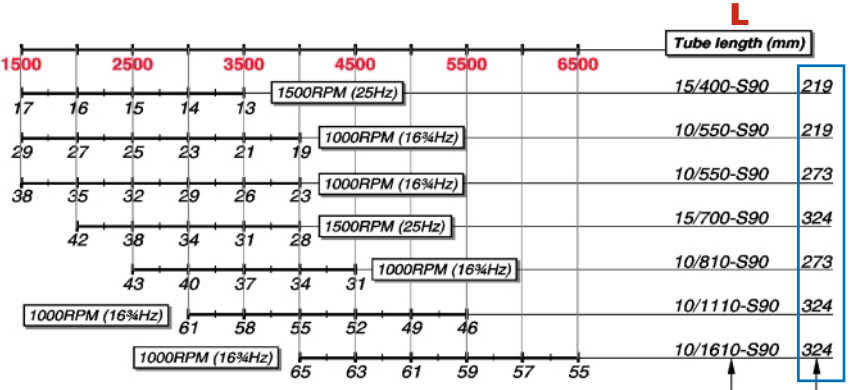
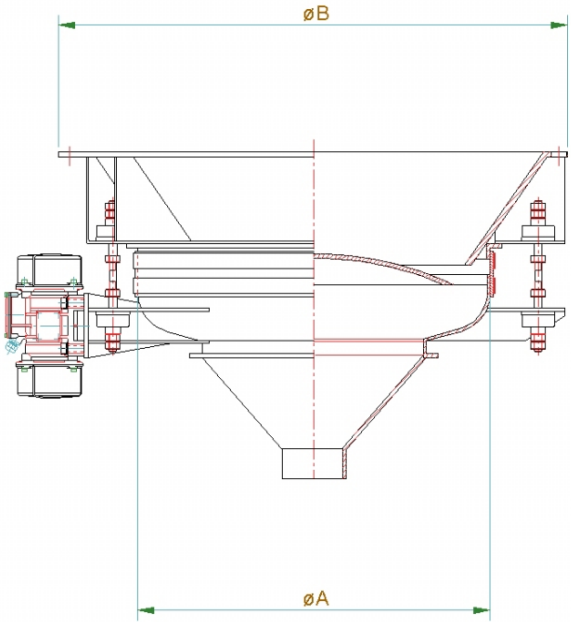


Plate Thickness

Ø219	3mm
Ø273	3.5mm
Ø324	4mm

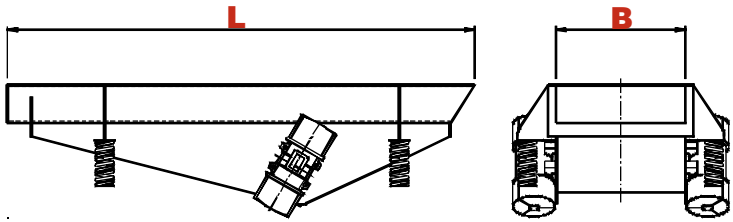
ESTRATTORE VIBRANTE CIRCOLARE
BIN DISCHARGER (BIN ACTIVATOR)



ESTRATTORE (FONDOVIBRANTE) øA	VIBRATORI ITALVIBRAS					SILOS øB	
Ø m m	VIBRATORE TIPO:	GR.	FORZA CENTRIFUGA (50HZ)	POTENZA KW	PESO KG	Ø m m MIN	Ø m m MAX
300	MVSI 3/200 MVSI 15/80	1	0÷200 0÷80	0,165 0,095	5,1 5,7	300	635
400	MVSI 3/200 MVSI 15/80	1	0÷200 0÷80	0,165 0,095	5,1 5,7	400	635
600	MVSI 3/300 MVSI 15/200	10	0÷300 0÷200	0,220 0,145	8,7 9,7	600	1270
900	MVSI 3/500 MVSI 15/400	20	0÷500 0÷400	0,350 0,200	12,5 14,5	900	1915
1200	MVSI 3/800 MVSI 15/700	30	0÷800 0÷700	0,500 0,418	33 33,8	1200	2550
1500	MVSI 3/1510 MVSI 15/1410	40	0÷1500 0÷1400	0,950 0,700	37 48	1500	3500
1800	MVSI 3/1510 MVSI 15/1410	AF50 40	0÷1500 0÷1400	1,4 0,9	37 48	1800	3820
2100	MVSI 3/2310 MVSI 15/2410	AF50 60	0÷2250 0÷2400	2,2 1,6	67 82,5	2100	4470
2500	MVSI 3/2310 MVSI 15/2410	AF50 60	0÷2250 0÷2400	2,2 1,6	67 82,5	2500	5740
3000	MVSI 3/3200 MVSI 15/3800	AF70 70	0÷3200 0÷3800	4 2,2	90 110	3000	5740

TROUGH FABRICATED MASS - WITHOUT VIBRATOR & LINING

(kg)



L Length (mm)	Plate thickness (mm)	B Width (mm) 300	400	500	600	700	800	900	1000	1200	1400	1800
1200	4	95	105	132	145	155	168	180	198			
	5	10	125	156	170	183	202	212	231			
	6				197	212	227	243	265			
1600	4	135	154	167	183	196	241	228	250			
	5	165	186	202	219	236	289	272	297			
	6			232	254	274	325	214	342	385		
2000	4	154	169	191	208	226	241	260	282			
	5	186	204	229	251	270	289	310	336	376		
	6			268	292	314	325	361	390	438	492	548
2500	4	219	240	266	289	310	344	352	380			
	5	267	292	324	350	375	402	428	459	514		
	6			382	412	443	472	503	539	602	672	741
3000	4	254	275	307	335	359	384	509	441			
	5	311	339	374	407	436	467	498	534	598		
	6			444	481	516	551	587	627	705	784	865
3500	4	301	326	360	386	414	443	490	504			
	5	371	402	443	476	506	541	574	612	782		
	6			522	562	550	640	680	722	804	891	979
4000	4			406	436	468	501	518	567			
	5			496	510	575	612	651	685	755		
	6			590	635	682	726	772	822	916	1015	1116

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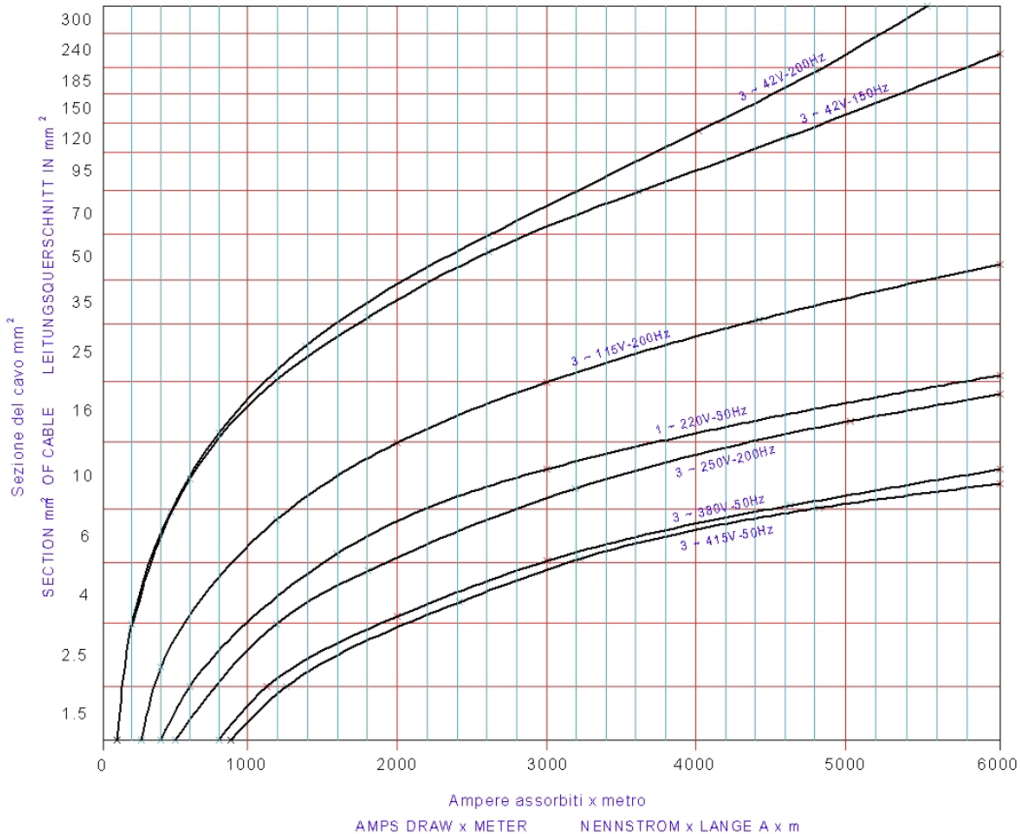
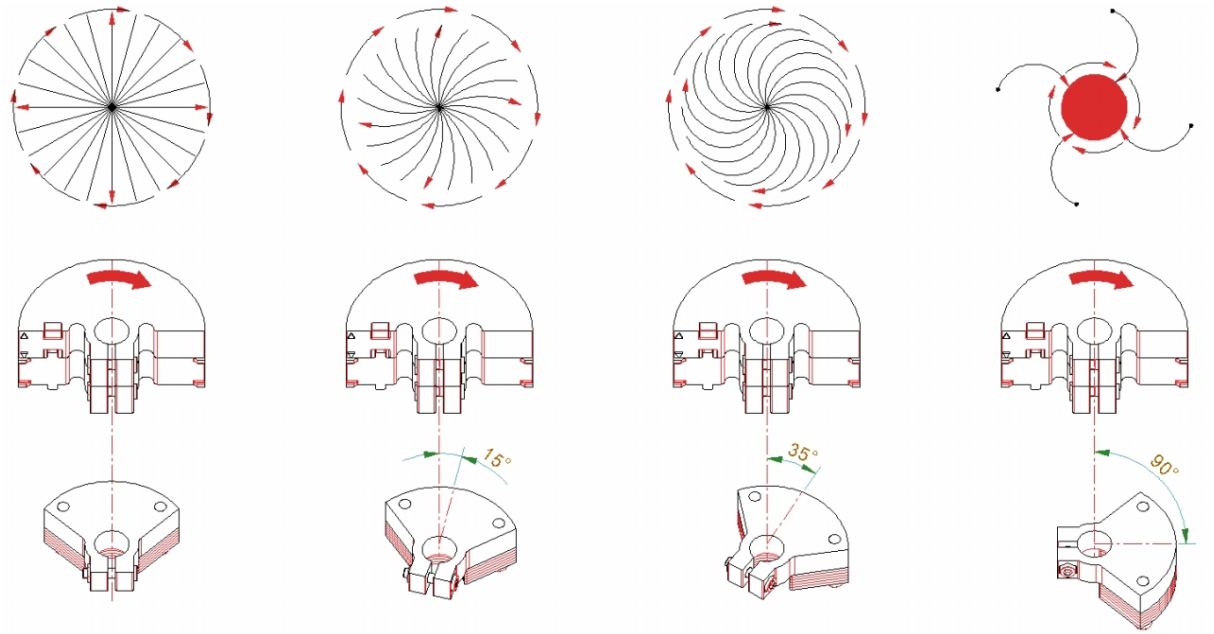
PRODUCT FLOWABILITY FACTOR

PRODUCT	ρ (T/M^3)	ε	particle si (mm)
Foundry sand	1.4	40°	< 0.5
Ashes	0.6÷0.9	30°÷40°	0÷0.5
Bauxite	1.3	30°÷40°	< 0.4
Breakstone	1.3÷1.5	30°÷40°	varies
Dolomite	1.6	30°÷40°	0÷5
Cement clinker	1.4	35÷40	0÷6
Ore	1.6÷3.2	30°÷60°	< 25
Feldspar	0.65÷1.1	40°	< 0.4
Furnace slag	0.8	30°÷45°	0÷0.8
Wood shavings	0.15÷0.25	30°÷45°	3÷60
Saw dust	0.3	35	0÷3
PVC powder	0.3÷0.7	30°÷45°	0.4
PVC granules	0.5÷0.6	30°÷45°	4
Gravel	1.6	30°÷40°	3÷7
Coal (fine)	0.8	30°÷40°	0÷6
Coal	0.7÷0.8	30°-45°	15÷40
Pit-coal	0.8	40°	0÷10
Coke (fine)	0.5	45°	0÷6
Fertilizer	1		< 1
Fertilizer granules	1	30°÷40°	0÷3
Limestone	1.2÷1.4	30°÷45°	0÷40

CABLE SECTION CHOICE
curves depending of voltage and frequency



TYPICAL SETTING - UNBALANCE WEIGHT FOR ROUND SIEVES (CIRCULAR SCREEN)



ATEX PRODUCTS

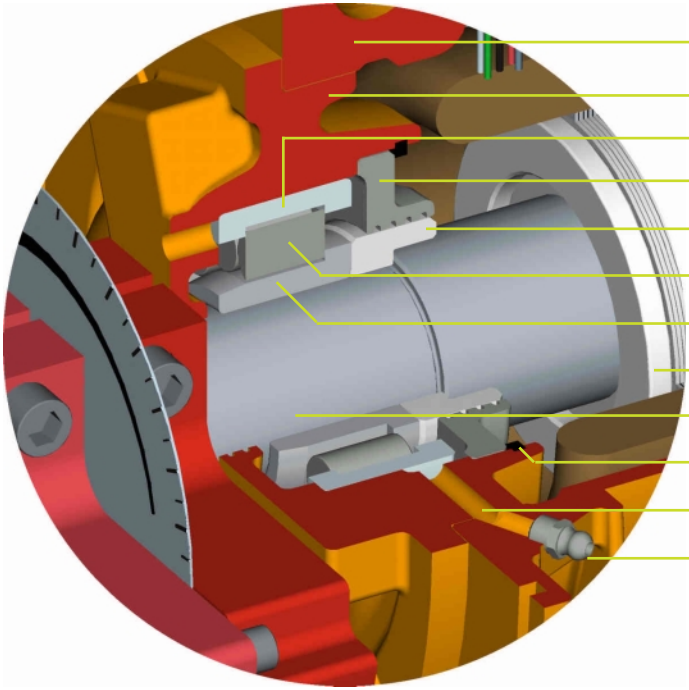
PRODUCTION QUALITY ASSURANCE NOTIFICATION

Equipment or Protective Systems or Components Intended for use in Potentially explosive atmospheres. Directive 94/9/EC

Notification number:
CESI 00 ATEX 061 Q

Product's features					Zones of use					
					G - GAS			D - DUST		
Type	Category	Protection mode	Temperature class	EC-type examination certificate	0	1	2	20	21	22
MVSI-E IM-E VM-E VMS-E MTF-E VB-E MVB-E MVB-E-FLC	II 2 G, D	EEx e II IP66	Gas: T3 (200°C) or T4 (135°C) Dust: 120°C Tambient = 40°C Gas: T3 (200°C) Dust: 120°C Tambient = 55°C	LCIE 99 ATEX 6028 X	NO	YES		NO	YES	
MVSI-P IM-P VM-P VMS-P MTF-P VB-P MVB-P MVB-P-FLC MVSS-P	II 2 D	IP 66	Dust: 120°C Tambient = 40°C Dust: 135°C Tambient = 55°C	LCIE 03 ATEX 6005 X	NO			NO	YES	
CDX IMX VMX	II 2 G, D	EEx d IIB IP66	Gas: T4 (135°C) Dust: 120°C Tambient = 40°C	DEMKO 01 ATEX 0135585	NO	YES		NO	YES	
CDX frame size110	II 2 G	EEx d IIB	Gas: T4 (135°C) Tambient = 40°C	SIRA 00 ATEX 1026	NO	YES		NO		

BEARING ZONE DETAILS



CASING

FLANGE (BEARING HOUSE)

OUTER BEARING RACE

BEARING COVER

SPACER

ROLLER

INNER BEARING RACE

ROTOR

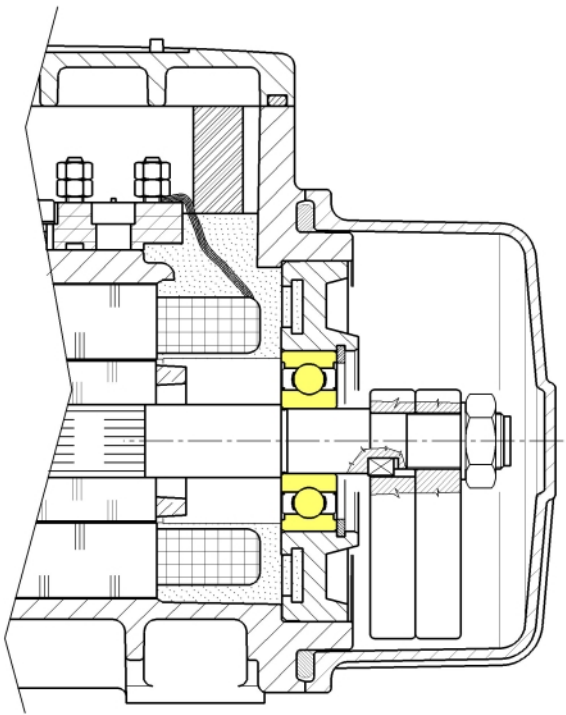
SHAFT

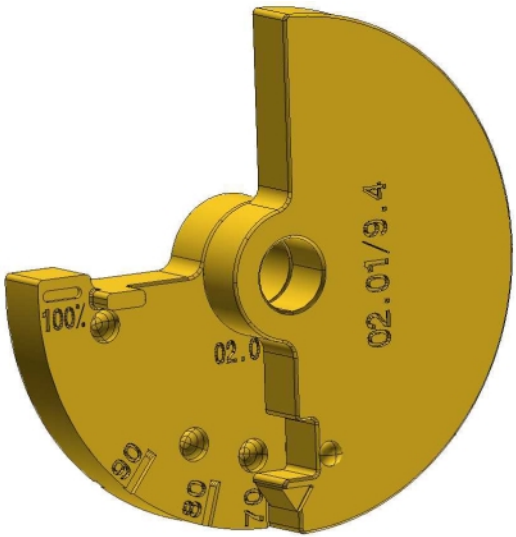
STOP-RING

LUBRICATION GROOVE

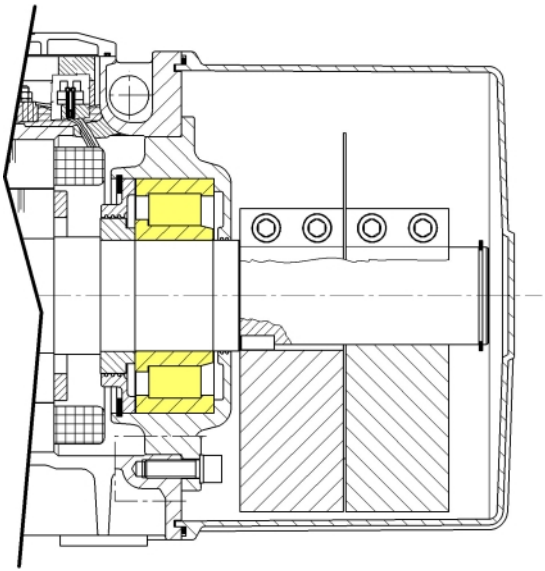
GREASE ZERK (NIPPLE)

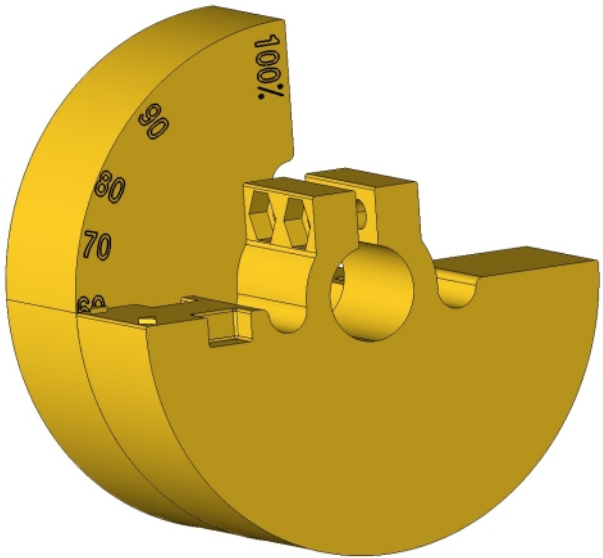
TYPICAL ASSEMBLY DRAWING FOR MOTOVIBRATOR WITH BALL BEARINGS





TYPICAL ASSEMBLY DRAWING FOR MOTOVIBRATOR WITH ROLLER BEARINGS

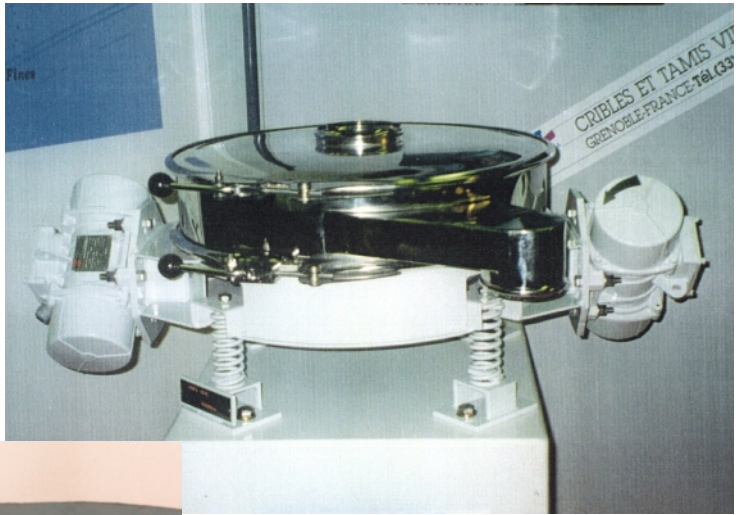


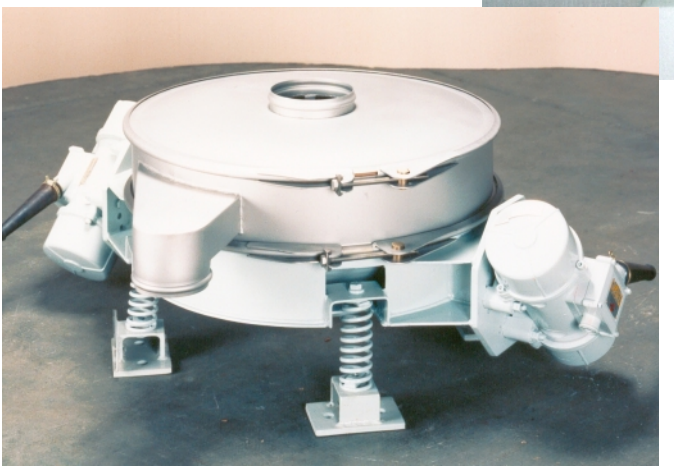


CRUSHER FEEDER (GRIZZLY)
(QUARRY AND MINES)

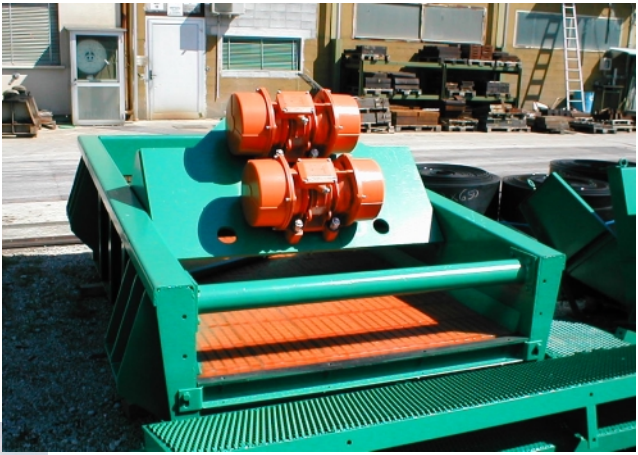
FEEDER (EXTRACTOR)

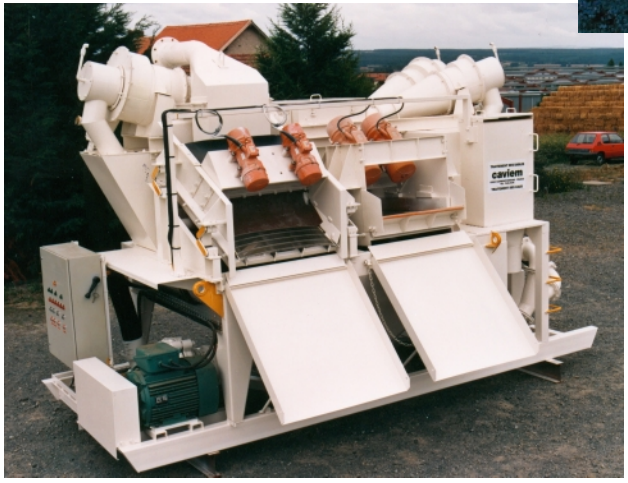
CIRCULAR SIEVES - SCREEN
(CHEMICAL - FOODS)



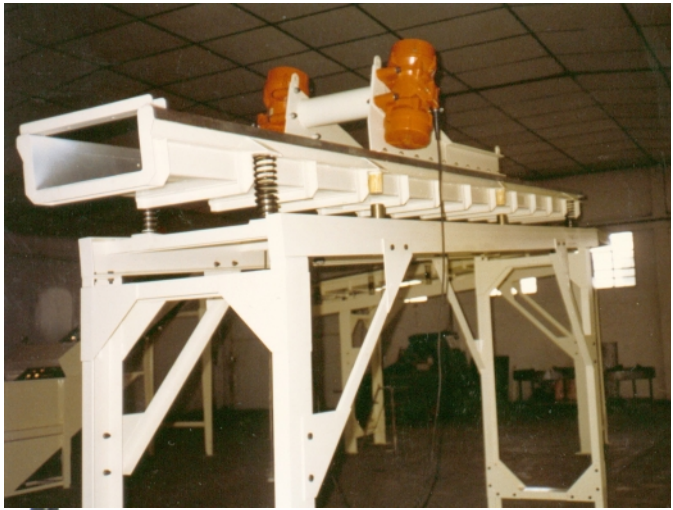


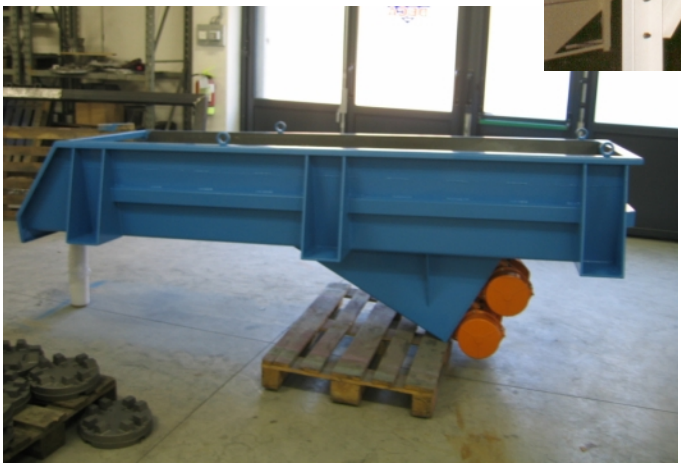
DRYERS SCREENS (DEWATERING MACHINES)
(QUARRY AND MINES)





CONVEYORS





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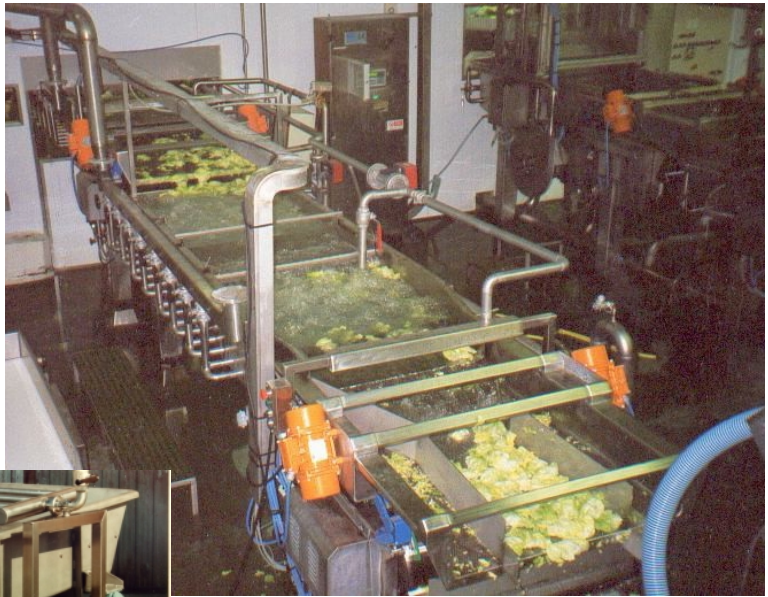
MACHINE WASHING
(FOODS)



INCINATED SCREENS
(HOLLOW AND MINES)

INCLINATED SCREENS FOR DUSTY BULKS

FORMWORKS FOR CONCRETE-BEAM

VIBRATING SIFTERS FOR PRESTRESSED CONCRETE ELEMENTS

CONVEYORS FOR ENOLOGY

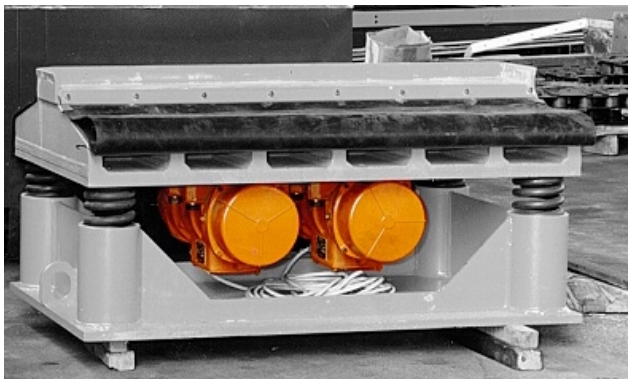
PURYFIER
(MILL INDUSTRY)

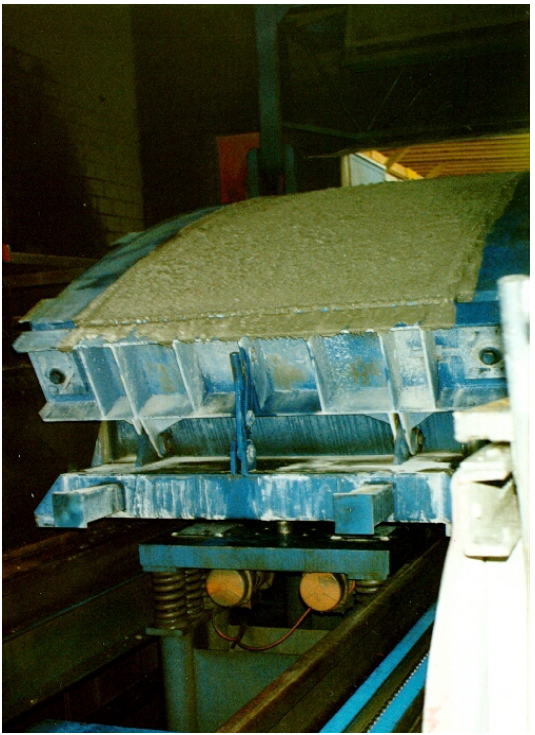
SEPARATOR
(MILL INDUSTRY)

HORIZONTAL-SCREEN FOR WASHING (GRAVEL, SAND AND COKE)

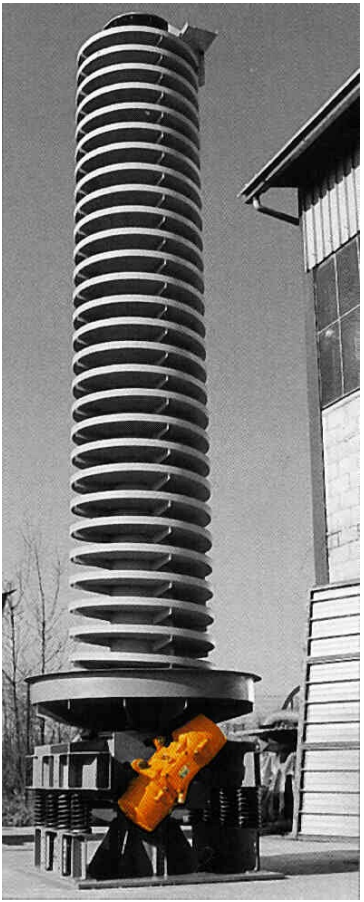
CONCRETE-PUMPS

VIBRATING TABLE FOR CONCRETE-ELEMENT PRODUCTION



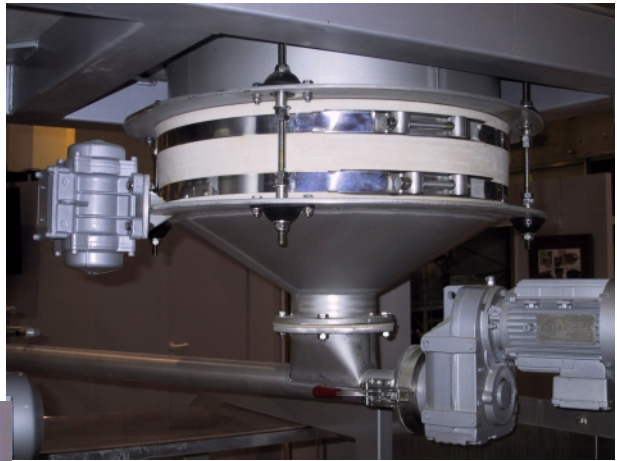


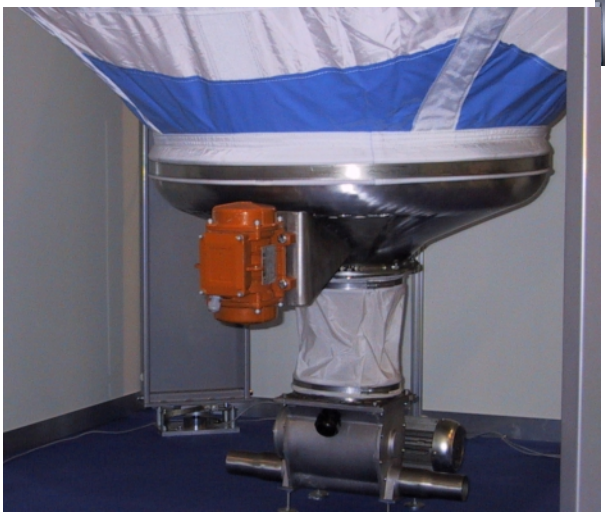
SPIRAL-ELEVATOR FOR COOLING



CONVEYORS FOR THE TREATEMENT OF BEANS AND DRY FRUIT (ALMONDS, NUTS, ECC)

VIBRATING BIN-DISCHARGER,
EXTRACTORS
(CHEMICAL, PHARMACEUTICAL AND FOOD)





CONVEYORS FOR FRESH VEGETABLE TREATMENT

FLUID-BED

TUBOLAR-CONVEYOR

TYPICAL APPLICATION ON HOPPER FOR BULK (BATCHING PLANT)

BIG HORIZONTAL SCREEN