

Vibratory Conveyors

Trough conveyors
Tube conveyors

with electric motor vibrators
or electromagnetic drive



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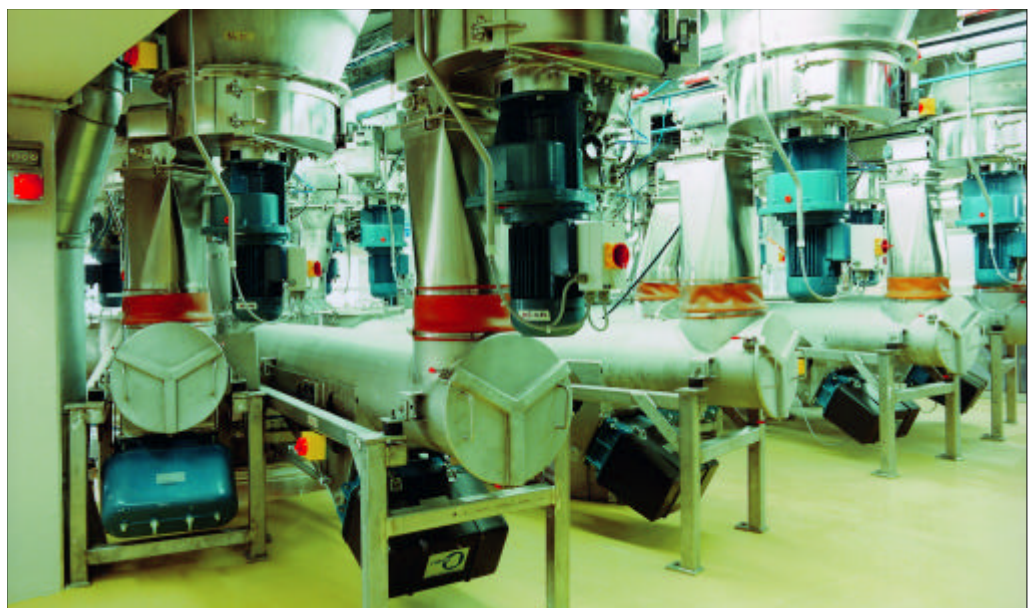


Figure 2
A total of 37 vibratory tube conveyors feed and transport components and mixtures in a fully automatic foodstuffs production plant

Vibratory Conveyors

The technology

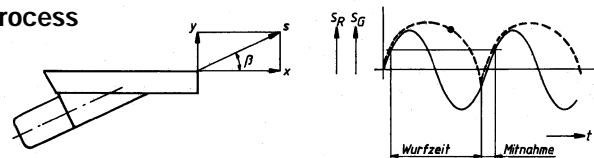
The transport of material on vibrating conveyors depends on the vibration of a conveying bottom; the direction of this vibration and that of the bottom enclose the so-called angle of throw, while the vibration's vertical acceleration exceeds the gravitational acceleration.

Basic diagram of the conveying process

s = amplitude of vibration

s_R = path of trough bottom

s_G = path of product conveyed



The behaviour of bulk materials transported on vibrating conveyors has already been the subject of numerous investigations. Since the interrelationships describing all product characteristics such as grain size, grain structure and grain distribution, bulk density, temperature, moist content etc. are still not fully clear, however, experimental studies are needed in special cases. The conveying capacities listed in the tables below are therefore to be seen only as typical for the example concerned and allow conclusions to be drawn only to a limited extent to other bulk materials. Conveying speeds generally vary between 5 and 15 m/min depending on the nature of the material to be handled. It should also be mentioned that the conveying capacity increases considerably with decreasing frequency at the same acceleration.

The linear motion required is generally generated either by electromagnetic vibrators with inherently linear motion or by synchronously contra-rotating out-of-balance motors, where the components of the circular motion standing perpendicular to the direction of transport cancel each other. Under appropriate conditions the synchronisation is achieved automatically, i.e. without the need to incorporate a special synchronising gear.

Thanks to their almost maintenance-free and low wear operation, easy control and cleaning and simple dust-proofing, vibrating conveyors are used today to efficiently convey countless products. Our vibrating conveyors have been in operation for many years without failure even under extreme conditions, e.g. handling materials heated to 600 °C, conveying and screening at -50 °C ambient temperature, under exclusion of air and even under vacuum.

Many types specially designed to solve process engineering tasks have helped our vibrating conveyors to gain an importance which extends far beyond pure conveying functions. Because of the enormous variety of possible applications, the following illustrative examples can only offer a brief summary of the application scope.



Figure 3
Vibratory trough conveyor
1000 mm wide, 6 m long, with
bar screen for separating oversized material



Figure 4
Robust series DV vibratory motors capable of continuous operation ensure problem-free long term operation

Design/Structures

The so called free vibrating conveyors with effective lengths up to about 7.5 m consist of various types of conveying channels to which vibratory drives and spring elements are fitted. The drives' mounting plates are machined so that the drive cannot be stressed during fitting. This ensures long-term operation without maintenance.

Depending on the conditions of use, various designs can be selected to take account on the one hand of the properties of the conveyed materials (e.g. dust content, moisture) and on the other hand of the operating conditions (e.g. available space, cleaning cycle, inerting).

The most important configurations are:

Open conveyor troughs

Closed conveyor troughs

(cover bolted or held by quick-release fasteners;
flat sealing or removable sealing)

Conveyor tubes

with bolted end covers and flat sealing, or
with end covers designed as doors with removable profile sealing

The most important standardised sizes are illustrated in the following dimensioned drawings and tables.

The standard versions are, of course, designed for conveying in one direction.. For transport that can be switched between two directions we offer reversible vibratory conveyors.

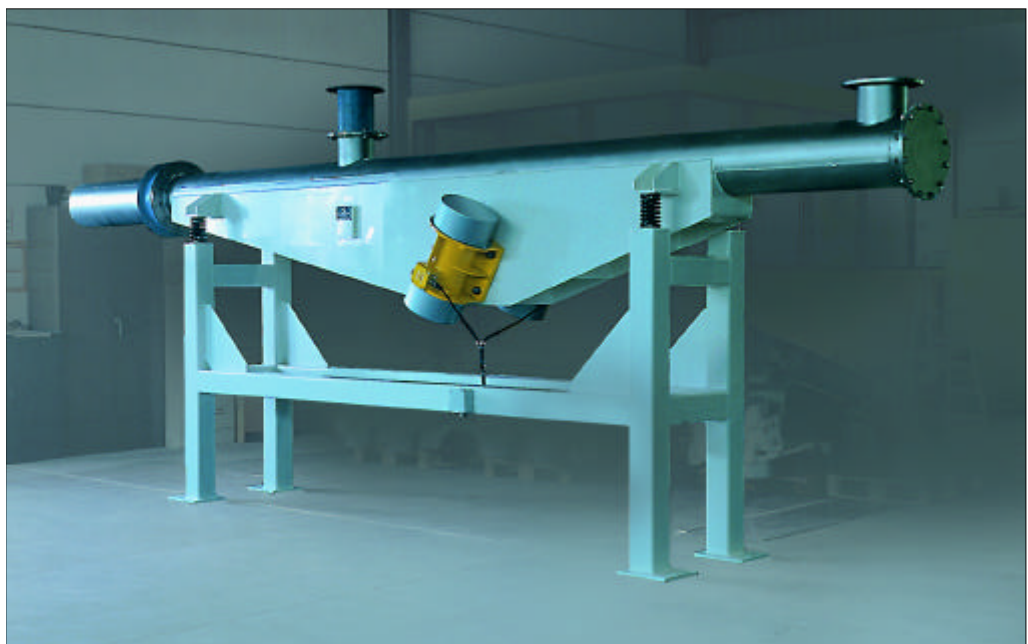


Figure 5: Pressure resistant vibratory tube conveyor with 300 mm diameter, 6 m long

Materials

The troughs or tubes are made of mild steel, sanitary stainless steel, aluminium or special materials such as TITANIUM or Hastelloy.

Conveying capacity

The following graphs illustrate typical values for conveying damp sand, particle size 1-6mm, bulk density 1,6 t/m³.

Curve 1: capacity of horizontal conveying

Curve 2: capacity of conveying under an inclination of 8°

The limiting curves a and b refer to the smallest and largest conveying distance (resp. mass) for the same size of drive.

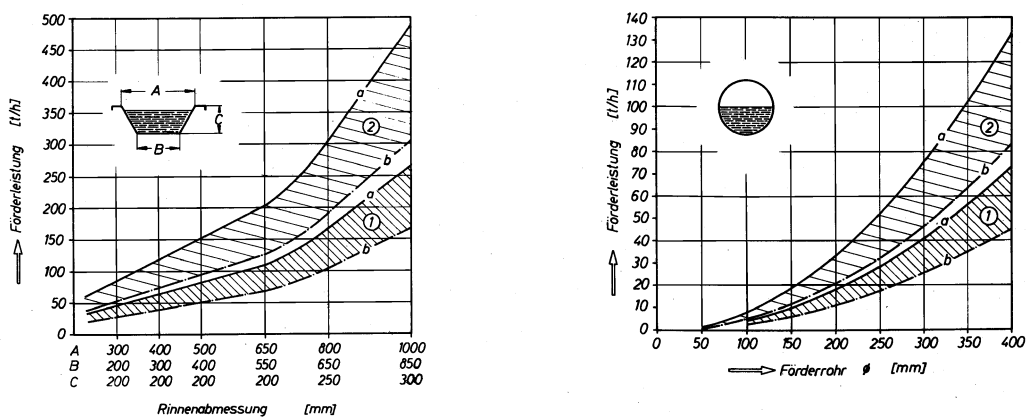


Figure 6: Conveying capacity



Figure 8
Electromagnetic vibrators of the MX series can be easily controlled during operation, and stop immediately when switched off. They are therefore suitable as drives for bin discharge conveyors and scales loading.



Figure 7: Vibratory trough conveyors 800 mm wide, 6.5 m long, used as bin discharging conveyors in a chemical factory



Figure 9
Specially constructed intermediate outlet with pneumatically operated cone stopper

Vibrational insulation, Noise level

Elastic support or suspension of vibratory conveyors is provided by certified highly elastic helical springs or by rubber springs which have lower vibrational insulation performance but contribute to noise level reduction.

Sound levels below 65 dB(A) can be achieved by combining appropriate measures (e.g. optimal vibration frequency and rubber springs).

Accessories

Numerous and accessory parts widen the range of possible applications and improve the convenience of operation:

Outlet flaps, outlet gates
for intermediate outlets on conveying troughs and conveying tubes give additional flexibility to the application of vibratory conveying technology.

In order to elastically link fixed and vibrating parts, transition sleeves are available in a wide range of materials.

Electronic thyristor controllers are an essential element in the operation of vibratory conveyors with electromagnetic drive.

Electronic braking devices suppress the excessive vibrations that otherwise occur during running down of motor vibrators. Frequency converters permit control and regulation of the conveying capacity.



Depending on the operating conditions and the properties of the product intermediate outlets can be fitted with manually or pneumatically operated outlet flaps (Figures 10.1 and 10.3) or gates (Figure 10.2).

Figure 10.1



Figure 10.2



Figure 10.3



Figure 14
Numerous tasks sprinkling onto mats, belts, dough etc. can be handled with vibratory conveyors

The standard versions mentioned above are extended by reversible vibratory conveyors, vibratory conveyors with heat exchanging pans for indirect heat exchange and natural frequency conveyors for long distance conveying with a single drive unit.

Reversible vibratory conveyors
are suitable to applications where the direction of transport must be changed, e.g. for alternating feeding of hoppers, Big-Bags, containers, mixers etc. (Figure 12).

Vibratory conveyors with heat exchanging pans
Vibratory trough and tube conveyors as well as vibratory spiral conveyors are fitted with pressure-proof heat exchanging pans for cooling water, hot water, steam or thermal transfer oil, and can so be used for cooling and drying of bulk materials being transported. Figure 13 illustrates equipment for cooling ash and sand at 400 – 800 °C from a fluidised bed furnace. Details see Leaflet No. P 113.

Natural frequency vibratory conveyors
For cases where conveying lengths of more than 7.5 m are to be covered with a single unit we manufacture natural frequency vibratory conveyors of extremely modern design (see Figure 11). Conveyors totally representing several kilometres, with individual lengths of up to 30 m, are operating smoothly in all parts of the world. Details see leaflet No. P 110E.

ER batching trough conveyors
have a thyristor controlled electromagnetic drive block, and are used for the feeding of bulk materials to processing and weighing equipment. The series includes 4 sizes for working loads up to about 40 kg. Details see leaflet No. P 92.



Figure 11: Natural frequency vibratory conveyor 300 mm wide, 12 m long

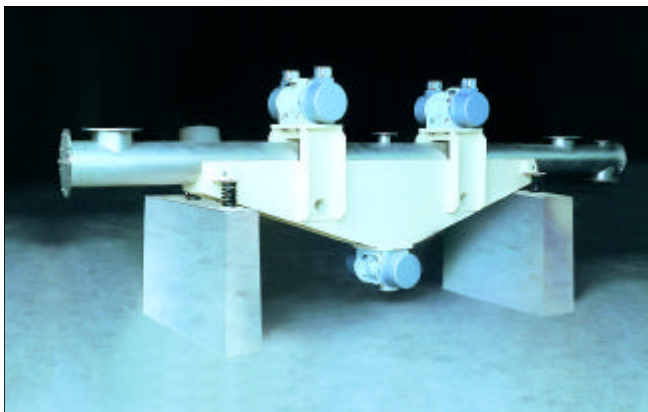


Figure 12
Reversible vibratory tube conveyor with 250 mm diameter, 4 m long



Figure 13
Vibratory conveyors for cooling ash and bed material 400-800 °C



Figure 15
The vibratory drives are also suitable for application into tough and dusty environments

Types

Open trough conveyors with vibratory motor drive, short version

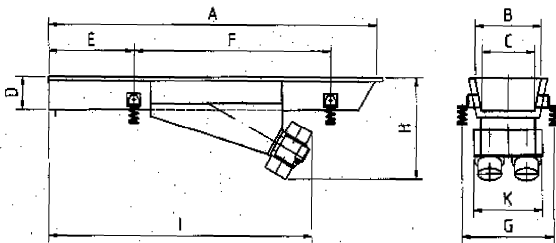


Figure 16

Table 1

Type	Principal dimensions										Weight (kg)	Drive
	A	B	C	D	E	F	G	H	I	K		
FRU 16/ 5-DV	1600	500	400	200	400	1000	700	800	1450	525	210	2 DV-B4/ 45
FRU 16/ 8-DV	1600	800	700	200	400	1000	1000	800	1450	725	290	2 DV-C4/ 60
FRU 20/ 5-DV	2000	500	400	200	550	1250	700	800	1750	525	300	2 DV-C4/ 60
FRU 20/ 8-DV	2000	800	700	200	550	1250	1000	800	1750	725	370	2 DV-D4/120
FRU 25/ 5-DV	2500	500	400	250	650	1500	700	800	2000	525	350	2 DV-C4/ 75
FRU 25/ 8-DV	2500	800	700	250	650	1500	1000	875	2000	725	460	2 DV-D4/120
FRU 30/ 5-DV	3000	500	400	250	750	1750	700	875	2350	550	450	2 DV-D4/120
FRU 30/ 8-DV	3000	800	700	250	750	1750	1000	875	2350	725	510	2 DV-D4/120
FRU 30/10-DV	3000	1000	900	250	750	1750	1200	900	2350	925	600	2 DV-D4/160

Other dimensions on request

Subject to technical change

Open trough conveyors with vibratory motor drive, long version

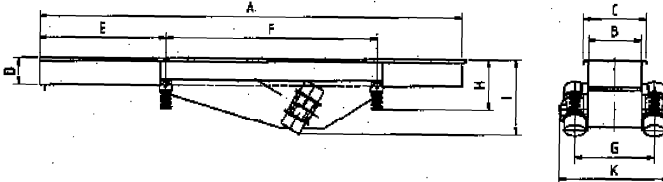


Figure 17

Table 2

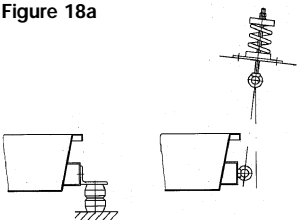
Type	Principal dimensions										Weight (kg)	Drive
	A	B	C	D	E	F	G	H	I	K		
FRU 40/ 3-DV	4000	300	400	200	1200	2000	550	415	700	900	490	2 DV-D4/120
FRU 40/ 5-DV	4000	500	600	250	1200	2000	750	465	750	1100	540	2 DV-D4/120
FRU 40/ 8-DV	4000	800	900	250	1200	2000	1050	465	750	1400	650	2 DV-D4/160
FRU 50/ 3-DV	5000	300	400	200	1000	2750	550	415	700	900	620	2 DV-D4/160
FRU 50/ 5-DV	5000	500	600	250	1000	2750	750	465	750	1100	660	2 DV-D4/120
FRU 50/ 8-DV	5000	800	900	250	1000	2750	1054	465	850	1500	840	2 DV-E4/220
FRU 60/ 3-DV	6000	300	400	200	1000	3000	554	415	850	1000	780	2 DV-E4/220
FRU 60/ 5-DV	6000	500	600	250	1000	3000	754	465	850	1200	850	2 DV-E4/220
FRU 60/ 8-DV	6000	800	900	250	1000	3000	1054	465	850	1500	970	2 DV-E4/220

Other dimensions on request

Subject to technical change

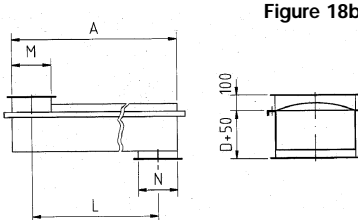
Optional types of support

Figure 18a



Totally enclosed conveying troughs

Figure 18b



Tube conveyors with vibratory motor drive, short version

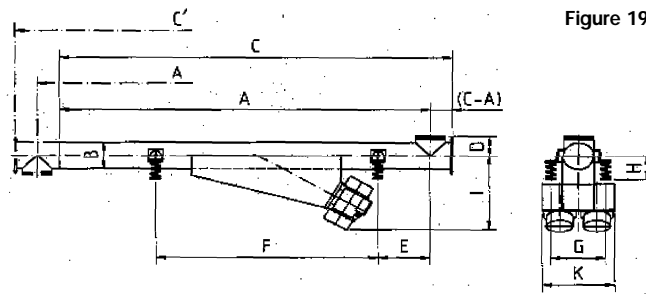


Figure 19

Table 3

Type	Principal dimensions											Weight (kg)	Drive
	A	B	C	C'	D	E	F	G	H	I	K		
FRO 16/2 -DV	1600	200	1750	1900	150	0	1000	370	180	600	500	165	2 DV-B4/ 45
FRO 16/2,5-DV	1600	250	1775	1950	175	0	1000	425	180	625	500	170	2 DV-B4/ 45
FRO 16/3 -DV	1600	300	1800	2000	200	0	1000	480	180	650	500	180	2 DV-B4/ 45
FRO 20/2 -DV	2000	200	2150	2300	150	200	1250	370	180	600	500	180	2 DV-B4/ 45
FRO 20/2,5-DV	2000	250	2175	2350	175	200	1250	425	180	625	500	190	2 DV-B4/ 45
FRO 20/3 -DV	2000	300	2200	2400	200	200	1250	480	180	650	500	200	2 DV-B4/ 45
FRO 25/2 -DV	2500	200	2650	2800	150	350	1500	370	180	600	500	200	2 DV-B4/ 45
FRO 25/2,5-DV	2500	250	2675	2850	175	350	1500	425	180	625	500	240	2 DV-C4/ 60
FRO 25/3 -DV	2500	300	2700	2900	200	350	1500	480	180	650	500	250	2 DV-C4/ 60
FRO 30/2 -DV	3000	200	3150	3300	150	500	1750	370	180	600	500	240	2 DV-C4/ 60
FRO 30/2,5-DV	3000	250	3175	3350	175	500	1750	425	180	625	500	250	2 DV-C4/ 60
FRO 30/3 -DV	3000	300	3200	3400	200	500	1750	480	180	650	500	260	2 DV-C4/ 60

Other dimensions on request

Subject to technical change

Tube conveyors with vibratory motor drive, long version

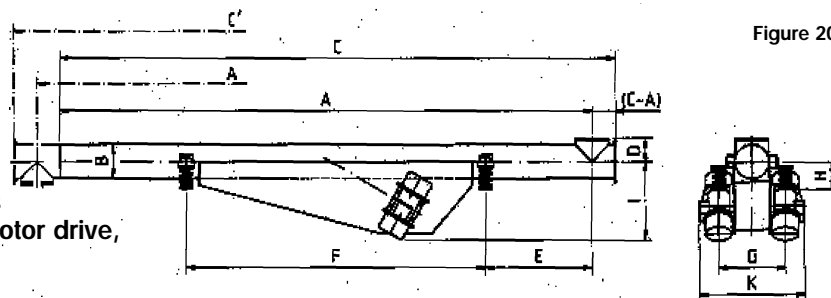


Figure 20

Table 4

Type	Principal dimensions											Weight (kg)	Drive
	A	B	C	C'	D	E	F	G	H	I	K		
FRO 40/2 -DV	4000	200	4150	4300	150	800	2250	450	180	600	750	360	2 DV-C4/ 75
FRO 40/2,5-DV	4000	250	4175	4350	175	800	2250	500	180	600	800	420	2 DV-D4/120
FRO 40/3 -DV	4000	300	4200	4400	200	800	2250	550	205	600	900	460	2 DV-D4/120
FRO 40/3,5-DV	4000	350	4225	4450	225	800	2250	600	205	600	950	480	2 DV-D4/120
FRO 50/2,5-DV	5000	250	5175	5350	175	1000	3000	500	205	650	850	500	2 DV-D4/120
FRO 50/3 -DV	5000	300	5200	5400	200	1000	3000	550	205	650	900	540	2 DV-D4/120
FR'O 50/3,5-DV	5000	350	5225	5450	225	1000	3000	600	205	650	950	570	2 DV-D4/160
FRO 60/2,5-DV	6000	250	6175	6350	175	1500	3500	500	205	650	850	600	2 DV-D4/160
FRO 60/3 -DV	6000	300	6200	6400	200	1500	3500	550	205	650	900	650	2 DV-D4/160
FRO 60/3,5-DV	6000	350	6225	6450	225	1500	3500	600	205	700	1025	800	2 DV-E4/220

andere Abmessungen auf Anfrage

Änderungen vorbehalten

Optional types of support

Figure 21

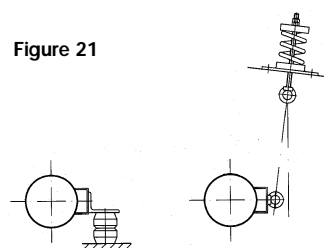


Figure 22
Vibratory tube conveyors for a
plastic works



Figure 23
Bin discharge vibratory con-
veyors with wear lining

**Open trough conveyors
with electromagnetic drive,
short version**

Figure 24

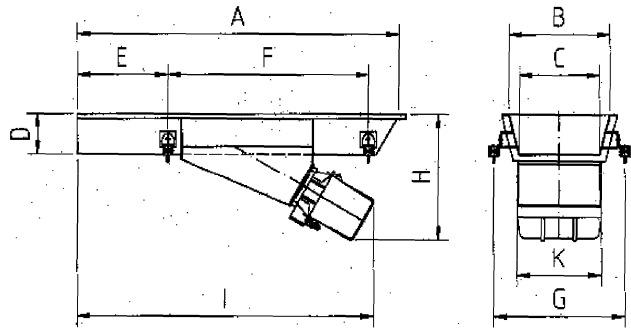


Table 5

Type		Principal dimensions									Weight (kg)	Drive		Control (Type)	
		A	B	C	D	E	F	G	H	I					
FRU 6,5/3	-MX	650	300	220	150	200	500	450	530	850	360	70	MX	400	VST 3...
FRU 6,5/4	-MX	650	400	320	150	200	500	550	530	850	360	72	MX	400	VST 3...
FRU 8/3	-MX	800	300	220	180	250	700	450	530	1000	360	76	MX	400	VST 3...
FRU 8/4	-MX	800	400	320	180	250	700	550	530	1000	360	80	MX	400	VST 3...
FRU 8/5	-MX	800	500	420	180	250	700	650	530	1000	360	83	MX	400	VST 3...
FRU 10/3	-MX	1000	300	200	200	300	800	450	550	1175	360	85	MX	400	VST 3...
FRU 10/4	-MX	1000	400	300	200	300	800	550	640	1250	420	145	MX	1200	VST 15...
FRU 10/5	-MX	1000	500	400	200	300	800	650	640	1250	420	150	MX	1200	VST 15...
FRU 10/6,5	-MX	1000	650	550	200	300	800	800	640	1250	420	160	MX	1200	VST 15...
FRU 12,5/3	-MX	1250	300	200	200	350	950	450	640	1350	420	155	MX	1200	VST 15...
FRU 12,5/4	-MX	1250	400	300	200	350	950	550	640	1350	420	160	MX	1200	VST 15...
FRU 12,5/5	-MX	1250	500	400	200	350	950	650	640	1350	420	170	MX	1200	VST 15...
FRU 12,5/6,5	-MX	1250	650	550	200	350	950	800	640	1350	420	175	MX	1200	VST 15...
FRU 16/3	-MX	1600	300	200	200	450	1000	450	640	1600	420	170	MX	1200	VST 15...
FRU 16/4	-MX	1600	400	300	200	450	1000	550	640	1600	420	175	MX	1200	VST 15...
FRU 16/5	-MX	1600	500	400	200	450	1000	650	680	1800	480	210	MX	2000	VST 15...
FRU 16/6,5	-MX	1600	650	550	200	450	1000	800	680	1800	480	230	MX	2000	VST 15...
FRU 20/3	-MX	2000	300	200	200	500	1300	450	680	2050	480	210	MX	2000	VST 15...
FRU 20/4	-MX	2000	400	300	200	500	1300	550	680	2050	480	230	MX	2000	VST 15...
FRU 20/5	-MX	2000	500	400	200	500	1300	650	680	2050	480	250	MX	2000	VST 15...
FRU 20/6,5	-MX	2000	650	550	200	500	1300	800	780	2050	620	360	MX	4000	VST 15...

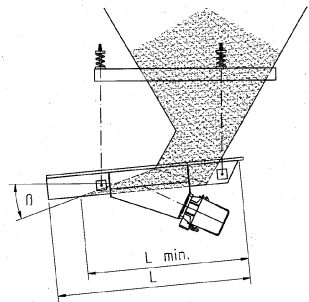
Longer models with multiple vibrators on request

Subject to technical change

When using these units in bin discharge applications, the bin outlet diameter, the bulk material slope angle and the inclination of the trough are important factors in addition to the discharge capacity. The bulk material slope angle determines the minimum trough length (see Figure 25).

It should also be observed in the planning stage that the discharge capacity is considerably affected by the bin outlet configuration. The maximum discharge capacity can only be obtained if the load on the discharge trough imposed by the material column is largely reduced . Figure 25 shows a bin outlet appropriately designed to effectively reduce the load on the trough.

Figure 26



Tube conveyors with electromagnetic drive

Bild 26

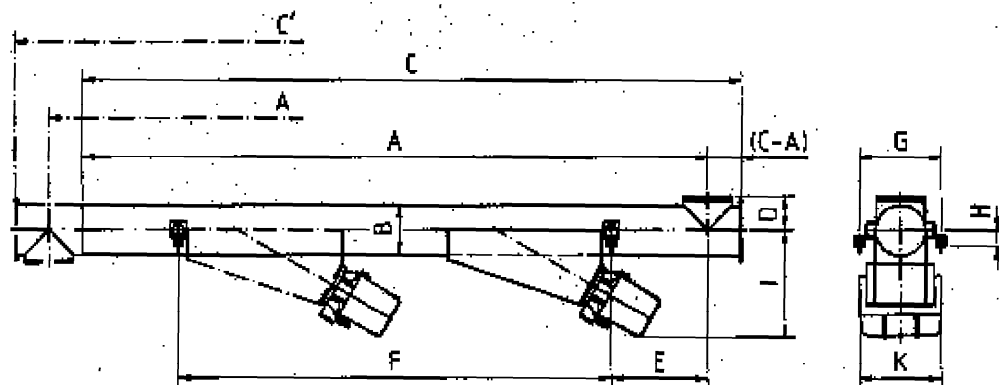


Table 6

Type	Principal dimensions											Weight (kg)	Drive	Control (Type)
	A	B	C	C'	D	E	F	G	H	I	K			
FRO 7,5/1,5-MX	750	150	875	1000	125	0	550	300	80	525	360	70	1 MX 400	VST 3...
FRO 10/1,5-MX	1000	150	1125	1250	125	0	750	300	80	525	360	73	1 MX 400	VST 3...
FRO 15/1,5-MX	1500	150	1625	1750	125	0	1000	300	80	525	360	77	1 MX 400	VST 3...
FRO 20/1,5-MX	2000	150	2125	2250	125	200	1250	300	80	575	420	145	1 MX 1200	VST 15...
FRO 25/1,5-MX	2500	150	2625	2750	125	350	1500	300	80	575	420	153	1 MX 1200	VST 15...
FRO 7,5/2 -MX	750	200	900	1050	150	0	550	350	80	525	360	78	1 MX 400	VST 3...
FRO 10/2 -MX	1000	200	1150	1300	150	0	750	350	80	525	360	80	1 MX 400	VST 3...
FRO 15/2 -MX	1500	200	1650	1800	150	0	1000	350	80	600	420	152	1 MX 1200	VST 15...
FRO 20/2 -MX	2000	200	2150	2300	150	200	1250	350	80	600	420	162	1 MX 1200	VST 15...
FRO 25/2 -MX	2500	200	2650	2800	150	350	1500	350	80	600	420	170	1 MX 1200	VST 15...
FRO 30/2 -MX	3000	200	3150	3300	150	500	1750	350	80	650	480	217	1 MX 2000	VST 15...
FRO 40/2 -MX	4000	200	4150	43900	150	500	3000	350	100	600	420	320	1 MX 1200	VST 15...
FRO 10/2,5 -MX	1000	250	1175	1350	175	0	750	400	80	550	420	155	1 MX 1200	VST 15...
FRO 15/2,5 -MX	1500	250	1675	1850	175	0	1000	400	80	550	420	163	1 MX 1200	VST 15...
FRO 20/2,5 -MX	2000	250	2175	2350	175	200	1250	400	80	550	420	174	1 MX 1200	VST 15...
FRO 25/2,5 -MX	2500	250	2675	2850	175	350	1500	400	80	600	480	208	1 MX 2000	VST 15...
FRO 30/2,5 -MX	3000	250	3175	3350	175	500	1750	420	100	600	480	240	1 MX 2000	VST 15...
FRO 40/2,5 -MX	4000	250	4175	4350	175	500	3000	420	100	550	420	310	2 MX 1200	VST 15...
FRO 50/2,5 -MX	5000	250	5175	5350	175	500	4000	420	100	600	480	412	2 MX 2000	VST 15...
FRO 15/3 -MX	1500	300	1700	1900	200	0	1000	450	80	625	480	225	1 MX 2000	VST 15...
FRO 20/3 -MX	2000	300	2200	2400	200	200	1250	450	80	625	480	236	1 MX 2000	VST 15...
FRO 30/3 -MX	3000	300	3200	3400	200	500	1750	470	100	575	420	340	2 MX 1200	VST 15...
FRO 40/3 -MX	4000	300	4200	4400	200	500	3000	470	100	625	480	470	2 MX 2000	VST 15...
FRO 50/3 -MX	5000	300	5200	5400	200	500	4000	470	100	625	480	505	2 MX 2000	VST 15...
FRO 60/3 -MX	6000	300	6200	6400	200	500	5000	470	100	575	420	710	3 MX 2000	VST 15...

Other dimensions on request

Subject to technical change



Figure 27
Vibratory tube conveyors with
electromagnetic drive in a mixing
plant



Figure 28
Vibratory tube conveyors with
acid-proof coating for a pharma-
ceutical works

Illustrated examples



Figure 29: Bin discharge vibratory conveyors in a foodstuffs factory



Figure 30
Vibratory tube conveyors with elec-
tromagnetic drive in a mixing plant



Figure 31
Vibratory trough conveyors as feed and discharge conveyors in a canning works

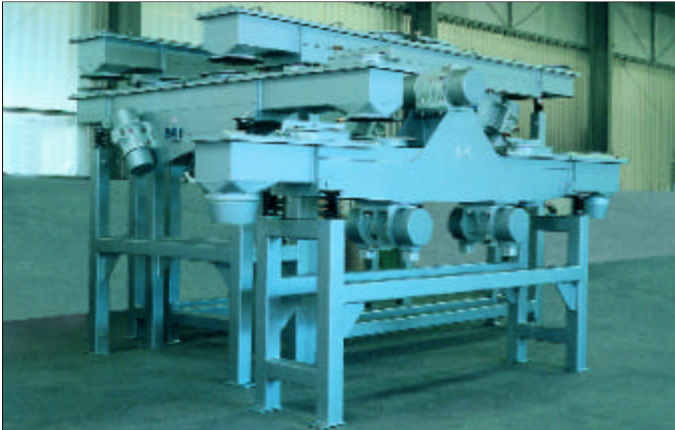


Figure 32
Assembly of vibratory conveyors for ash and slags in a power plant, the lower conveyor designed for reversible operation

Figure 33
Vibratory trough conveyors with integrated screen decks have the advantage of low height. The figure shows a single deck machine with pneumatically operated screen tensioning in a foodstuffs factory.



Figure 34: Bin discharge vibratory conveyors in a glass factory

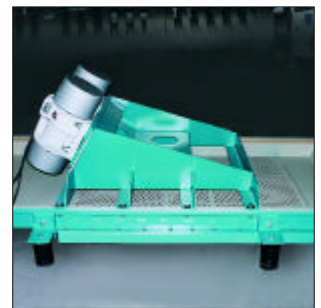


Figure 35
The conveying troughs can easily be fitted with sieve inserts



Figure 36
Trough feeders in a canning works; the troughs and hopper walls coming in contact with the product are made of textured plate to prevent the wet slices of vegetables from clinging



Figure 37
Vibratory conveyors in a chemical factory fitted underneath the ceiling



Figure 38
Vibratory conveyors for vertical and horizontal transport in an foodstuffs factory



Figure 39
Mobile furnace charging equipment for feeding brass scrap to a melting furnace



Figure 41
Vibratory tube conveyor as a
collecting conveyor under container
discharging stations

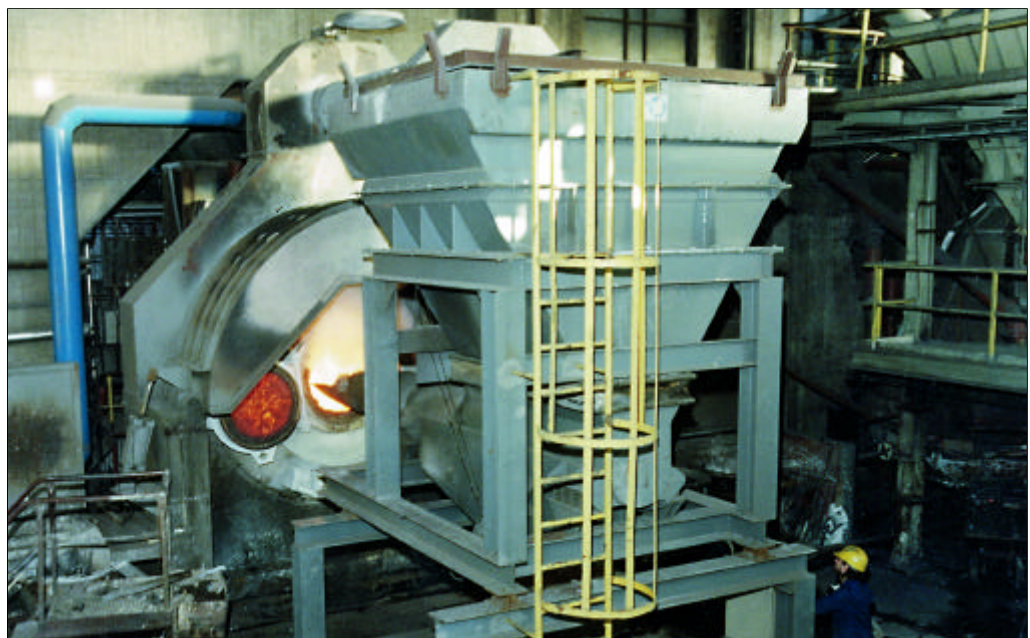


Figure 40: Mobile furnace charging equipment with a vibratory tube conveyor of 550 mm diameter in a lead works

The furnace charging equipment is constructed of heavy duty materials with replaceable wearing plates and exchangeable end pieces to suit the tough environment. The traversing gear can be designed for longitudinal or for transverse movement. For dusty products the feed containers are fitted with suction equipment operating via a surrounding slot.

Where to find VIBRA

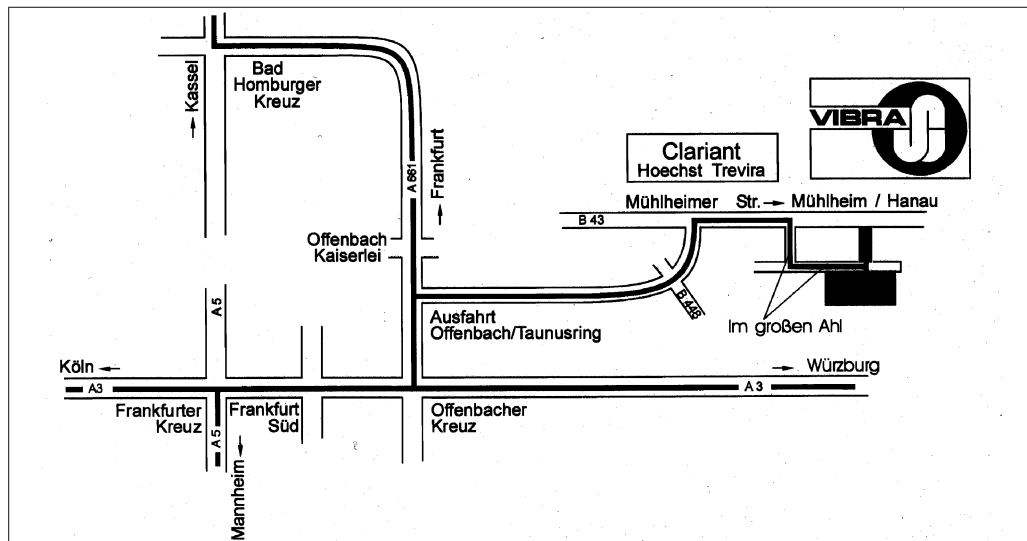
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