

Vibratory Screening Machines

- for screening powdery or granular bulk material,
- dewatering water-solids mixtures,
- separating mass produced parts

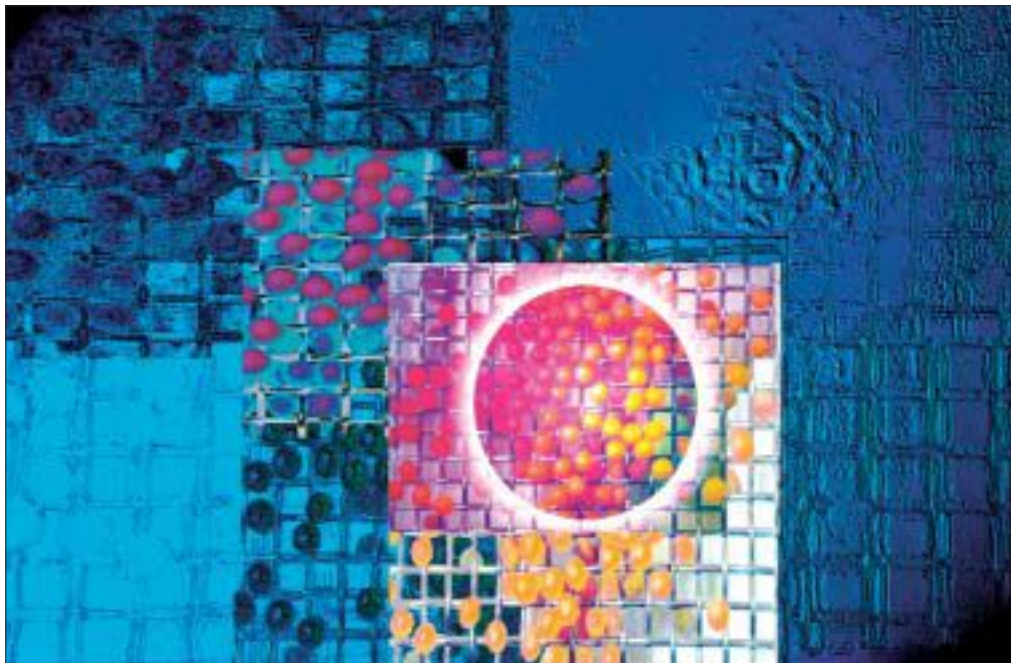




Figure 2
SR 25/10-II vibratory screening
machine with 2 screen decks,
pneumatic screen-tensioning
device and CIP mechanism for
screening milk powder



Vibratory screening machines

Application and selection of vibratory screening machines

The most important applications are:

- test or protective screening of powdery products,
- removal of impurities,
- fractionation of granular products,
- dust and oversize removal from granules or pellets.

There is also a broad range of special applications including:

- product dewatering,
- punched parts sorting,
- removal of polishing chips from polished parts, etc.

Vibratory screening machines can generally screen materials with grain sizes from approx. 0.06 mm.

Problems may however arise with fine screening due to unfavourable product properties (e.g. baking, mesh plugging). Various screening aids to improve the screening effect, such as ball or chain rappers and ultrasonic exciters, are therefore available.

We offer the vibratory screening machine series described in brief on pages 4 and 5.

Theoretical background

The separation of a bulk material with various grain sizes in vibratory screening machines is effected by the vibration of the screen deck, which conveys the product across the screen in throwing micromotions. The result of separation for a given mesh size depends primarily on the vibrational amplitude, the vibration frequency, the angle of throw, the slope of the screen and the vibrational waveform.

The efficiency of a vibratory screening machine is determined in each particular case by the screen characteristic K_v . The screen characteristic indicates the ratio of the vertical machine acceleration component (i.e. perpendicular to the screen plane) to gravitational acceleration.

At $K_v = 1$ product begins to slide on the screen deck;

At $K_v = 2-3$ gentle screening is possible;

At $K_v =$ and above screening is considered to be "tough".

Our screening machines enable the screen characteristic to be optimised by adjusting the unbalance. The optimum separation effect does not necessarily coincide with the highest characteristic, since the duration of the throwing motion increases the higher the K_v value, with the result that easy-to-screen material is less likely to pass the meshes.



Figure 4
A number of experimental units are available at our pilot plant or for testing at our customers' works to verify design parameters, which can often only be empirically determined due to the wide variety of applications.

Types available – selection criteria



Series G vibratory screening machines

General-purpose screening machines with 1 vibrating motor as standard; enclosed, easy-to-clean design with a screen slope of approx. 8°; made of standard or stainless steel with 1 to 3 vertically stacked screen decks and quick-change screen frames.

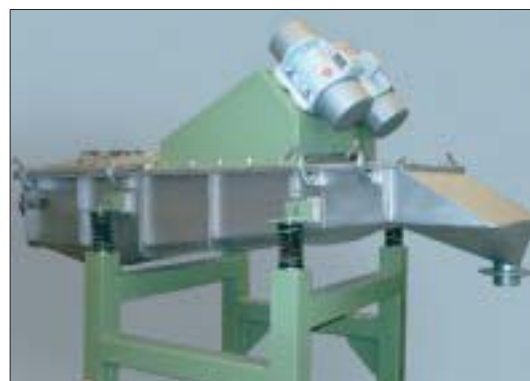
Page 6



SR vibratory screening machines

Horizontally operating screening machines with twin motor vibrator unit; enclosed, horizontal design with minimum headroom; 1 or 2 screen decks with either fixed screen-tensioning devices or replaceable screen frames.

Page 8



ESR dewatering screening machines

Screening trough conveyors with gently ascending slope, usually of open design with top or base-mounted twin motor vibrator unit; bar screens, perforated plates or screen cloth are available as screen inserts.

Page 11



SRK screening machines

Main application:
Oversize separation during screening of plastics granules.

Vibratory screening machines with a gentle screen slope and two laterally mounted vibrating motors;

vibrating motors can be tilted to adjust the angle of slope;
optimum cleanability

Page 12



VSK screen cooler/dryers

Fluid-bed cooler/dryers with integrated screening section

Page 14



VIBRAPID and RS round screening machines

Single or twin motor vibrator unit,
1 screen deck,

RS series with or without oversize discharge.

Page 16



KS 6/4 and SLU test screening machines

KS test screening machines

Screening area: 600 x 400 mm or 800 x 500 mm

SLU screening machines
Low-profile screening machines with 1 vibrating motor,
screening area up to 0.9 m².

Pages 16/17

The following approximate formula gives the specific throughput Q of a dry product (in m³/h referring to 1 m² screening area)

$$Q = A \cdot B \cdot C \cdot n \cdot d^n \left[\frac{\text{m}^3}{\text{m}^2 \cdot \text{h}} \right]$$

where:

A= factor allowing for oversize fraction

0,5 (90% oversize)

.....1,0 (0% oversize)

B= factor of screening efficiency
0,9 (screening efficiency close to 100%)

.....2,1 (screening efficiency approx. 60%)

C= factor allowing for fines fraction smaller than 1/2 d (d = mesh size)

0,6 (0% fine grain smaller than 1/2 d)

.....3,0 (90% smaller than 1/2 d)

d= aperture width (square mesh) in [mm]

n= 0.65 – 1.0 (for mesh sizes smaller than 20 mm)

The many properties and conditions that are not reducible to a formula mean that correct dimensioning of the screen often has to be verified experimentally. Our experimental station is available for this purpose.

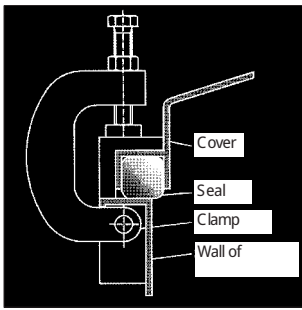


Figure 11
Cover with replaceable seal

Series G vibratory screening machines

New generation incorporating the DELTA drive unit saddle with four different vibration characteristics.

The "new generation" features a number of substantial improvements, transforming the familiar and proven production-type screening machine into an impressive universal screening machine. It offers the benefits of a unique combination of features:

The machines are available in 3 sizes with 1 to 3 screen frames one on top of the other for handling 2 to 4 grain fractions.

Type	Screening area	Power requirement (kW)
Type G 14/5	1400 x 500 mm	0.61
Type G 18/6	1800 x 600 mm	1.0
Type G 20/8	2000 x 800 mm	1.6

The number of screen frames is indicated by I ... III in addition to the type number:
I: 1 screen frame II: 2 screen frames III: 3 screen frames

The screening machines have a vibration-proof screen case with an inlet and outlets for the various grain fractions. The dustproof cover is secured to the case by swing bolts and retains the frames inside the case. A 120 mm Ø inspection window with a rubber cap allows the screening process to be observed.

The use of screen frames enables different fractions to be separated in machines with an extremely low overall height. The frames are made either of square tube or of wood.

The screen case including the vibrator is spring-mounted on the substructure. The standard height of the substructure was chosen to allow sack filling. The screening machines are available in standard or stainless steel.

The most important advantages of the Series G machines are:

1. The DELTA drive unit saddle provides four different vibration characteristics for various screening functions (see Figure 13).
2. Vibrating motors of the most up-to-date design with infinitely variable unbalance are used as high-performance drive units.
3. Rapid and thorough cleaning of the screen case is possible thanks to the elimination of internal obstructions.
4. The screen frame(s) is (are) inserted loosely into the case and retained by the dust proof sealing cover, which is secured by swing bolts. This enables the screen frames to be replaced very quickly.
5. Low-noise operation of the vibrator unit is ensured by the compact screen case in combination with the well-balanced spring suspension.



Figure 12
G 18/6-I vibratory screening machine in a drying plant

Vibrator configurations

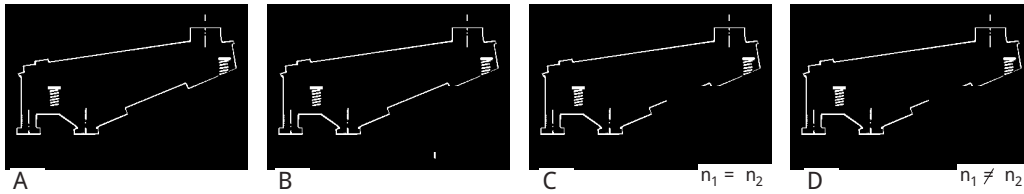


Figure 13

- A Standard design, normal residence time of the product on the screen
- B Standard design, increased residence time
- C Twin motor configuration with directional vibration for high conveying rates
- D Double-frequency configuration with excellent separation efficiency for difficult materials

Standard types, dimensions

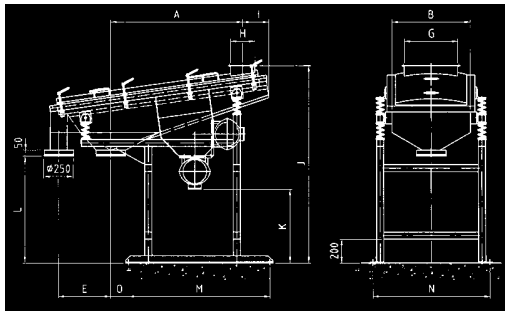


Table 1 Single-deck units

Type	Screening area	A	B	C	D	E
G 14/5-I	1 x 1400 x 500	765	610	-	-	436
G 18/6-I	1 x 1800 x 600	1120	660	-	-	442.5
G 20/8-I	1 x 2000 x 750	1350	810	-	-	710

F	G	H	I	J	K	L	M	N	O
-	450	150	200	1420	450	650	800	944	20
-	450	200	225	1655	610	890	1200	994	150
-	600	200	270	2115	825	1000	1250	1224	300

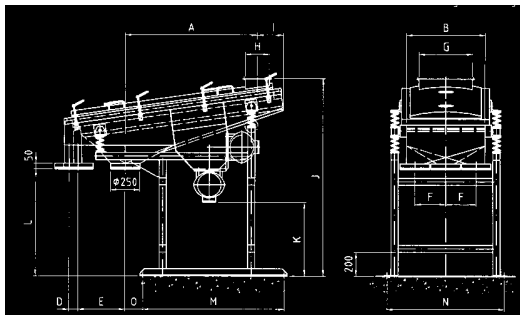


Table 2 Twin-deck units

Type	Screening area	A	B	C	D	E
G 14/5-II	2 x 1400 x 500	765	-	-	72.5	400
G 18/6-II	2 x 1800 x 600	1120	660	-	75	400
G 20/8-II	2 x 2000 x 750	1350	810	-	160	550

F	G	H	I	J	K	L	M	N	O
235	450	150	200	1420	450	650	800	944	20
260	450	200	225	1655	610	890	1200	994	150
325	600	200	300	2115	825	1000	1250	1224	300

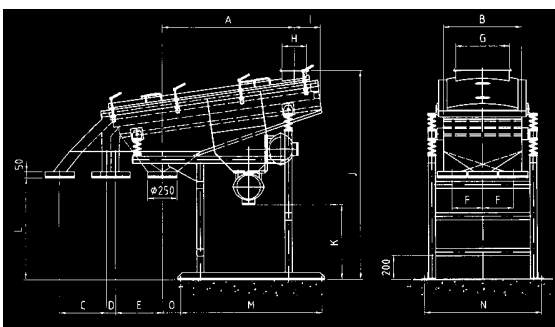


Table 3 Triple-deck units

Type	Screening area	A	B	C	D	E
G 14/5-III	3 x 1400 x 500	790	610	400	70	400
G 18/6-III	3 x 1800 x 600	1150	660	400	70	400
G 20/8-III	3 x 2000 x 750	1340	810	435	160	550

F	G	H	I	J	K	L	M	N	O
235	450	150	200	1470	400	650	800	944	15
260	450	200	225	1750	620	850	1200	994	150
325	600	200	300	2250	850	1000	1250	1224	300



Figure 14

The screen frames can be supplied either for tensioning (left) or for gluing (right).



Figure 15
Special model with pneumatically actuated tensioning device for the screen frame and CIP mechanism

Screening trough conveyors (horizontal screening machines)

The need to screen bulk materials during conveying led to the development of our screening trough conveyors, which have proven successful in many applications as horizontal screening machines. The vibration in the machines is initiated so as to facilitate both conveying and intensive screening of the products.

In addition to the possibility of easy integration in an existing conveying line, the most important advantage is the extremely low overall height compared with conventional vibratory screening machines.

The vibration of the screening trough conveyors, which are designed for continuous operation, is generated by robust twin motor vibrators with adjustable unbalance and a steep slope. Electromagnetic vibrators are used in special cases (control during operation, immediate stop after shut-off).

The screen cases are made of standard steel or rust-proof materials, and are reinforced to withstand vibration and optionally equipped with tensioning devices or screen-tensioning frames. The machine covers are secured to the screen cases by quick-release swing bolts or quick-action clamps for rapid cleaning and screen replacement. Inspection openings with silicone rubber caps allow convenient observation of the screening process.

The screening trough conveyor design permits the incorporation of a ball rapper to clear the screen apertures in machines which are used to screen especially difficult materials.



Figure 16
SR 36/10-I vibratory screening trough conveyor
Screening area 3600 x 1000 mm

Standard size screening trough conveyors

1-deck models



Figure 17
Quick-action clamps and gas springs provide optimum operating convenience

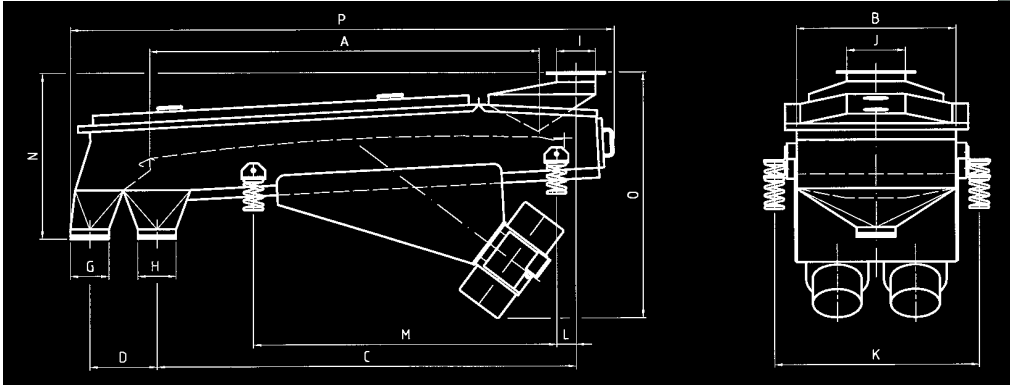


Table 4

Type	Main dimensions															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
SR 15 / 5 - I	1500	510	1650	350	0	0	200	200	200	300	750	0	1150	800	1200	2250
SR 20 / 6 - I	2000	610	2150	350	0	0	200	200	200	400	850	100	1550	850	1250	2750
SR 25 / 8 - I	2500	810	2600	350	0	0	200	200	200	450	1050	100	2000	900	1350	3200
SR 36 / 10 - I	3600	1010	3700	350	0	0	250	250	200	600	1250	400	2300	1200	1800	4400

Other dimensions on request

Designs subject to revision

2-deck models

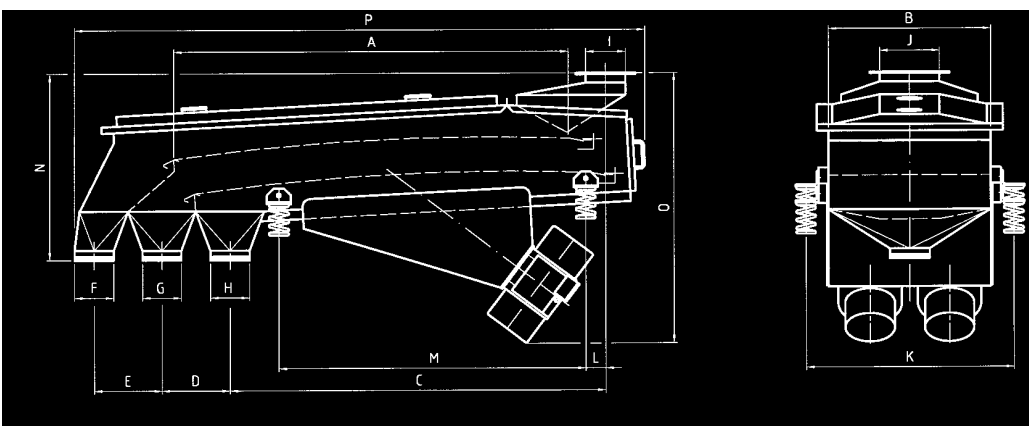


Table 5

Typ2	Main dimensions															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
SR 15 / 5 - II	1500	510	1400	350	350	200	200	200	200	300	750	0	1150	900	1300	2350
SR 20 / 6 - II	2000	610	2150	350	350	200	200	200	200	400	850	100	1550	950	1350	3100
SR 25 / 8 - II	2500	810	2600	350	350	200	200	200	200	450	1050	100	2000	1000	1500	3550
SR 36 / 10 - II	3600	1010	3700	350	350	250	250	250	200	600	1250	400	2300	1300	1950	4700

Other dimensions on request

Designs subject to revision



Figure 18
The robust twin motor vibrator unit produces directional vibration and has infinitely variable unbalance

High-performance screening trough conveyors

Screening trough conveyors suitable for continuous operation are required in many applications, particularly in the food and chemical industries, for removing oversized and undersized grain fractions from upstream processing steps by final screening.

Our high-performance screening trough conveyors have been developed and evaluated in continuous duty, and boast features well in excess of normal requirements.

In addition to their familiar characteristics (low overall height, dustproof screening, adjustable vibrators), our high-performance screening trough conveyors offer design features that considerably enhance operating convenience and screening efficiency:

1. The screen cloths are retained in the screen case like a membrane by means of quick-action torsional tensioning devices with linear compensation, so that they do not flutter at all.
2. The machine cover has eccentrically actuated quick-action clamps.
3. The lower deck has a ball rapper for cleaning the screen during operation. The upper deck is cleaned with the help of a flutter mechanism: the compression springs of the screen-tensioning device are temporarily relaxed by means of hydraulic cylinders, causing the screen cloth to effect large flutter-like vibrations.

These features help to increase the screening efficiency and reduce the downtimes for cleaning and screen replacement from between half an hour and one hour to just a few minutes.



Figure 19
Two SR 30/12-II high-performance screening trough conveyors in a freeze-drying

Dewatering screening machines

Screening machines designed for dewatering plastics granules, preserves, glass pellets or sand, for example, or for separating solids from effluents, have basically the same structure as the horizontal screening machines described on page 8, but are mounted at a slight upward angle.

The water is separated by bar screens, perforated plates or screen cloth, depending on the application, and discharged via outlets at either end of the screening machine. The motor vibrators are mounted at a large slope angle on the top or side of the machine and designed for high acceleration to achieve an optimum degree of dewatering.

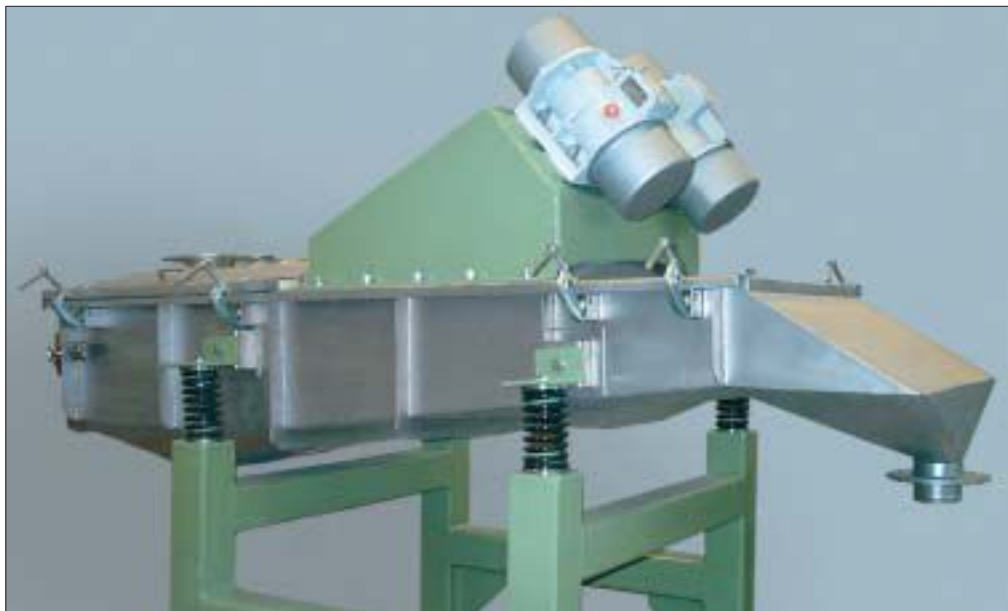


Figure 21
ESR 20/8 dewatering screening machine, 2000/800 mm, vibrator mounted on top



Figure 22
ESR 30/6 dewatering screening machine, 3000/600 mm, in a canning factory



Figure 20
The dewatering effect can be considerably improved by air nozzles.



Figure 23
The perforated-plate screen insert has no gaps or sharp-edged corners

SRK vibratory screening machines Oversize separators for plastic granules

General

Miscuts in the form of spikes or chains – commonly referred to as oversizes, occur in the production of plastics granules, particularly during the start-up and shut-down phases. These bad particles interfere with further processing of the plastics, especially extrusion, and must therefore be removed from the granules. The oversizes have the same diameter as the good particles and can only be separated by comparing their length geometries.

The oversizes must slide flat over the screen apertures for this reason. Directional vibration is consequently produced on the screen deck, whereby acceleration of the oversizes vertically from the screen is normally avoided due to the risk of dropping into the screen apertures. Instead, gravitational acceleration is used to convey the particles. A false deck is installed in the feed area to allow the product to settle and oversizes to lay flat. Perforated plates with a smooth surface and offset rows of holes in the conveying direction are used as the screen decks.

The vibrating motors for SRK screening machines are mounted laterally at a small slope angle and with a gentle screen slope. Screening thus takes place with a very low vertical acceleration, ensuring that oversize particles contained in the product (spikes) are conveyed flat across the screen without any risk of uprising. The vibrating motors can be tilted within a defined range for optimum adaptation to the feed rate. The screening efficiency depends on the ratio of the hole size to the particle size.



Figure 24
SRK 15/7.5-IV vibratory screening machine

The SRK series also includes twin-deck screening machines for additionally screening fine particles.

The machines have been developed in collaboration with major plastics manufacturers and meet the most stringent requirements for cleaning and convenience of operation. The screen case has no built-in internals for this reason.

The screen insert or inserts can be removed from the case very easily after lifting off the machine cover, which is fastened by quick-release swing bolts, because they are simply inserted into it and retained by means of the cover.

The perforated-plate screen lining is worked from a single metal sheet and has no gaps or sharp-edged corners that could obstruct cleaning. The lower screen frame which is required for the twin-deck version likewise takes the form of a basket and is generally covered with a screen cloth.

The machine is driven by means of two self-synchronising motors with adjustable unbalance, which can be tilted on the mounting plates to obtain the optimum angle of throw.



Figure 25
SRK screening machine in a granulating plant



Figure 26
SRK screening machines can also be supplied with withdrawable screens and a pneumatic screen-tensioning device.

Series SRK
Please refer to
brochure no.
P 104/2 for
technical data and
dimensions



Figure 27
The design offers extremely convenient operation and very easy cleaning.

Screen cooler/dryer

The development of vibrating fluid-bed apparatus integrating additional functions over and above the original thermal task was the outcome of calls for more compact machines suitable for use in confined conditions. Apart from the fluid-bed zone, these combined machines also feature a dewatering section and/or a screening section. The screen cooler/dryer shown in Figure 25 combines a screening machine and a fluid-bed cooler.

Before entering the screening section, the granular material is fluidised on a special distribution plate by a high-velocity air flow which intensively cools/dries and dedusts it. A continuously adjustable gate controls the bed thickness and the residence time.

Oversize particles are separated in the following screening section, in the same way as in the SRK screening machines.

A fine screen can be inserted between the distribution plate and the oversize screen to remove any fine grain fraction.

Both the distribution plate and the screen insert can be removed and cleaned very easily.

Models are available with up to 6 m² effective area for a maximum throughput of 4000 kg/h. Our screen coolers/dryers are supplied complete with the necessary air-handling equipment, such as fans, heat exchangers, filters, separators and air locks.

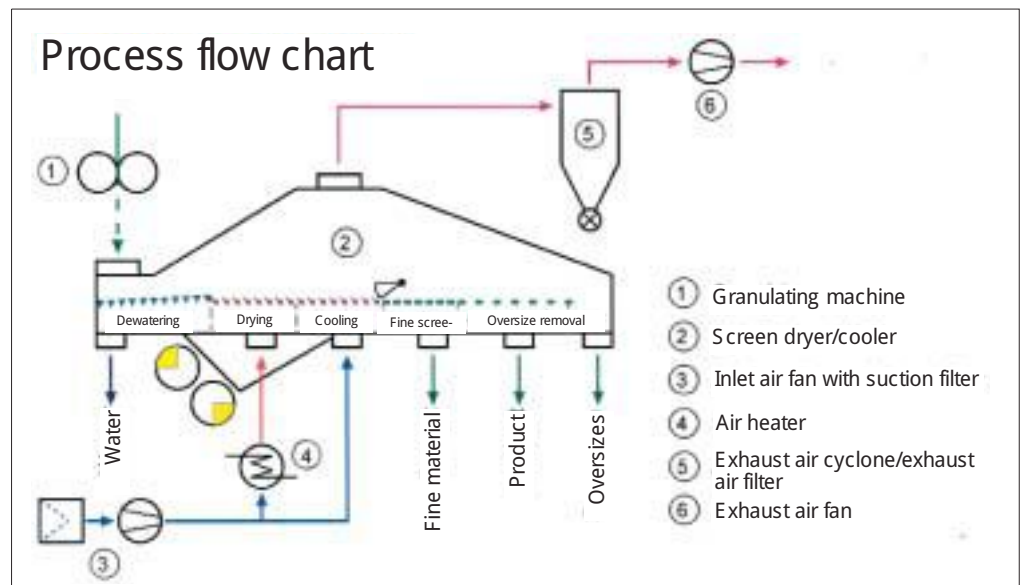


Figure 28: Process flow chart of a dewatering screen dryer/cooler



Figure 32
Hydraulically opened
guard

Figures 27, 29 and 30 show machines of this type, also simply referred to as screen dryers. The machines illustrated in Figures 29 and 30 are designed to facilitate rapid cleaning necessitated by frequent product changes: the guard is raised in the first example with the aid of a lifting unit and in the second by a hydraulic cylinder.



Figure 29
The guard of the fluid-bed dryer with integrated screen can be raised with the aid of a lifting unit to facilitate rapid cleaning.

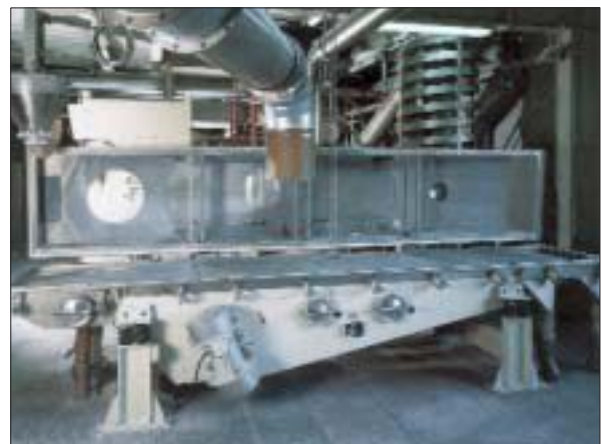


Figure 30
"S screen dryer" with hydraulically opened guard

Figure 31
VSK 25-7/7 vibratory fluid-bed dryer with integrated screen and complete air-handling equipment, including a dust filter, for drying and simultaneously screening plastics granules





Figure 33
Mobile sack feeding station with integrated round screening machine

Round screening machines

Screening machines for protective and test screening

Versions are available for batch operation and for continuous discharge of oversize material. They are suitable for wet or dry screening and are distinguished by their maintenance-free, easy-to-clean design.

VIBRAPID 2

Screen diameter: 430 mm

Material: Cast light alloy



Figure 34
VIBRAPID 2 round screening machine
Basic model

Series RS

Screen diameter: 540 to 1200 mm

Material: Stainless steel

Versions with or without discharge of oversize materials and impurities



Figure 35
RS round screening machine
Basic model

Round screening machines

Please refer to brochure no. P 108 for technical data and dimensions

KS test screening machines

These machines are suitable for test screening in extremely confined conditions; the inlet and outlet are arranged vertically in line. Oversize particles, clusters and impurities are automatically discharged to the front.

Material: Standard or stainless steel

KS 6/4: Screening area 600 x 400 mm

KS 8/5: Screening area 800 x 500 mm

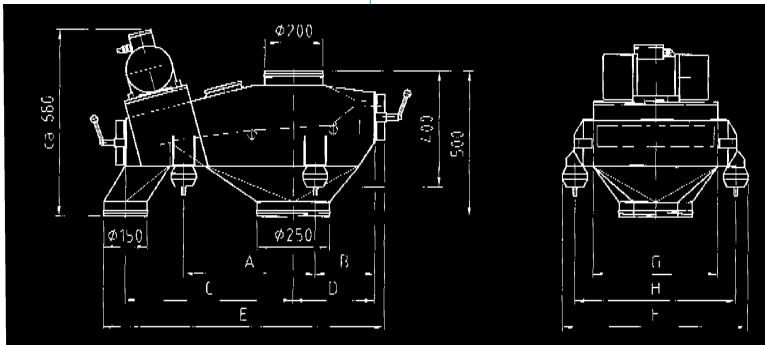


Figure 36

Type	Main dimensions								Power requirement	
	A	B	C	D	E	F	G	H	Vibrator	kW
KS 6/4	450	205	575	280	965	610	420	550	DV-A4/40	0.34
KS 8/5	650	275	675	375	1160	710	520	650	DV-B4/45	0.58
Other dimensions on request									Designs subject to revision	



Figure 38
SLUG 8/5 screening machine

SLU vibratory screening machines

These single-deck screening machines in an open or closed design (SLUG) are used for screening powdery or granular products, for sorting punched parts and for removing chips from turned parts.

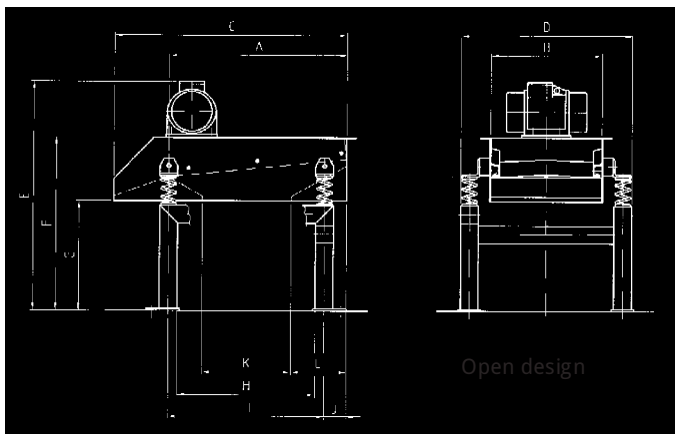
The screen cloth or perforated plate is retained in the screen case by a transverse tensioning device.

The rugged vibrating motor with adjustable unbalance can be mounted either above or below the screening area.

Material: Standard or stainless steel



Figure 37
SLUG 8/5 screening machines

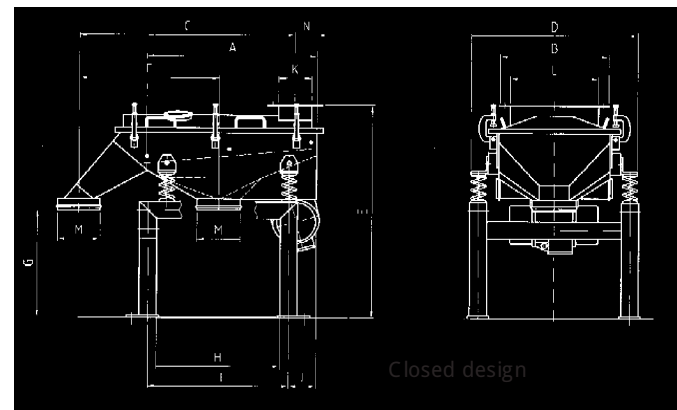


SLU - open design

Type	Main dimensions												Power requirement	
	A	B	C	D	E	F	G	H	I	J	K	L	Vibrator	kW
SLU 8 / 5	800	500	1050	770	1050	790	500	620	700	100	400	250	DV-B4/45	0.58
SLU 10 / 6	1000	600	1250	870	1110	850	500	820	900	100	900	100	DV-C4/60	0.64
SLU 15 / 6	1500	600	1750	870	1160	900	500	920	1000	250	1000	250	DV-C4/75	0.64

Other dimensions on request

Designs subject to revision



Closed design

SLUG - closed design

Type	Main dimensions												Power requirement			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Vibrator	kW
SLUG 8 / 5	800	500	1000	770	990	650	500	570	650	130	150	400	200	105	DV-C4/60	0.64
SLUG 10 / 6	1000	600	1200	870	1310	650	500	820	850	130	150	500	200	105	DV-C4/75	0.64

Other dimensions on request

Designs subject to revision



Figure 39
Vibratory screening
machine handling 600°C
hot bulk material

Examples



Figure 40
SR 15/6-I vibratory screening
machine in a chemical plant



Figure 41 SR 36/10-II twin-deck vibratory screening machine with coating station in a rubber factory



Figure 42
RS 5/4 round screening machine in a sack feeding station



Figure 43
SR 30/10-III triple-deck screening trough conveyor with pneumatic screen-tensioning device for the screen linings



Figure 44
Dewatering screening machine in a plastics plant



Figure 45
SR 18/6-IV quadruple-deck screening machine with downstream metal detector



International comparative table for test sieves

WIRE CLOTH FOR TEST SIEVES								
Germany	France	International	UK		USA		TYLER * STANDARD SCREEN SCALE	
DIN 4188	AFNOR X II - 501 (Draft)	ISO R-565	B.S. 410		A.S.T.M E-II		TYLER * STANDARD SCREEN SCALE	
HAUPTREIHE R 10 Nebenreihe R 20	DIMENSIONS PRINCIPALES R 10 Dimensions Supplémentaires R 20	DIN 4188 AFNOR X II - 501 ASTM E II B.S. 410 R 20/3 + R 10	PRINCIPAL SIZES R 20/3 Supplementary SIZES R 40/3		PRINCIPAL Sizes R 40/3 Supplementary Sizes R 10		PRINCIPAL $\sqrt{2}$ SIZES Supplementary Sizes $4\sqrt{2}$	
1969	1968	1967	1969		1970		1910	
w = Micron	w = Micron	w = Micron	w = Micron	Mesh	w = Micron	No.	w = in	Mesh
45 50	45 50	45	45	350	45	325	0.0017	325
56 63 71	56 63 71	63	53 63 75	300 240 200	53 63 75	270 230 200	0.0021 0.0024 0.0029	270 250 200
80 90 100	80 90 100	90	90	170	90	170	0.0035	170
112 125 140 160	112 125 140 160	125	106 125 150	150 120 100	106 125 150	140 120 100	0.0041 0.0049 0.0058	150 115 100
180 200	180 200	180	180	85	180	80	0.0069	80
224 250 280	224 250 280	250	212 250 300	72 60 52	212 250 300	70 60 50	0.0082 0.0097 0.0116	65 60 48
315 355 400	315 355 400	355	355	44	355	45	0.0138	42
450 500 560 630	450 500 560 630	500	425 500 600	36 30 25	425 500 600	40 35 30	0.0164 0.0195 0.0232	35 32 28
710 800	710 800	710	710	22	710	25	0.0276	24
900	900		850	18	850	20	0.0328	20
1 mm	1 mm	1 mm	1 mm	16	1 mm	18	0.039	18
1.12 1.25	1.12 1.25		1.18	14	1.18	16	0.046	14
1.4 1.6	1.4 1.6	1.4	1.4	12	1.4	14	0.055	12
1.8 2 2.24	1.8 2 2.24	2	1.7 2 2.36	10 8 7	1.71 2 2.36	12 10 8	0.065 0.078 0.093	10 9 8
2.5 2.8 3.15	2.5 2.8 3.15	2.8	2.8	6	2.8	7	0.11	7
3.55 4 4.5	3.55 4 4.5	4	3.35 4 4.75	5 4 4	3.35 4 4.75	6 5 4	0.131 0.156 0.185	6 5 4
5 5.6 6.3	5 5.6 6.3	5.6 6.3	5.6 6.3 6.7	5 6 8	5.6 6.3 6.7	6 5 4	0.221 0.263	3 1/2 3
7.1 8	7.1 8	8	8	8	8	5/16"	0.312	2 1/2

VIBRA MASCHINENFABRIK
SCHULTHEIS GmbH & Co.
Im großen Ahl 47 - 51
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