ROSTA OSCILLATING MOUNTINGS

Elastic Suspension for Screens and Shaker Conveyors

high dampening
long lifetime
overload proof

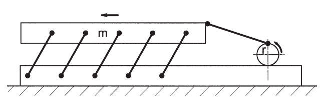
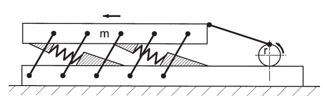
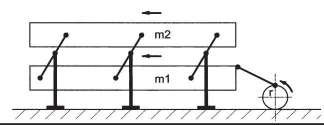
Lovejoy®

ROSTA

ROSTA

Selection Table for ROSTA Oscillating Mountings

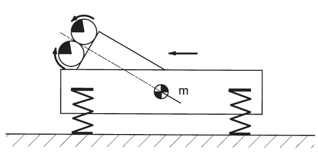
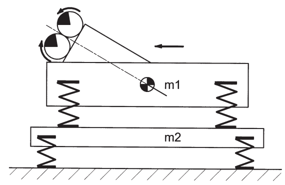
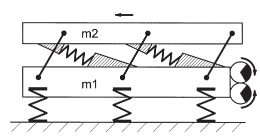
(Technical recommendation is blue marked)

Guided Shaker Systems (Crank Driven)			
Principle	**One-mass shaker** 	**One-mass shaker with spring accumulators** 	**Two-mass shaker with direct compensation of reaction forces** 
	**Single rocker with adaptable length** **Pages 54/55**	**Single rocker with adaptable length** **Pages 54/55**	
	**Single rocker (fixed centerdistance)** **Pages 58/59**	**Single rocker (fixed centerdistance)** **Pages 58/59**	
			**Double rocker for systems with direct mass compensation** **Pages 60/61**
	**Single rocker with adaptable length** **Pages 56/57**	**Single rocker with adaptable length** **Pages 56/57**	**Length adjustable double rocker for systems with direct mass compensation** **Pages 56/57**
		**Spring accumulator respectively elastic drive head** **Pages 62/63/65**	**Spring accumulator respectively elastic drive head** **Pages 62/63/65**
	**Drive head for crank transmission** **Page 64**	**Drive head for crank transmission** **Page 64**	**Drive head for crank transmission** **Page 64**

ROSTA

Selection Table for ROSTA Oscillating Mountings

(Technical recommendation is blue marked)

Free Oscillating Systems (Unbalanced Excitation)			
One-mass free oscillating screen 	**Two-mass free oscillating screen** 	**Two-mass free oscillating feeder with frame excitation** 	**Principle**
Suspension of one-mass screens/shakers $f_e \approx 2–3$ Hz **Pages 68/69**	**Suspension of two-mass screens/shakers $f_e \approx 2–3$ Hz** **Pages 68/69**	**Suspension of ground frame (m¹) $f_e \approx 2–3$ Hz** **Pages 68/69**	
Suspension of one-mass screens/shakers $f_e \approx 2–3$ Hz **Page 70**	**Suspension of two-mass screens/shakers $f_e \approx 2–3$ Hz** **Page 70**		
Suspension of one-mass screens/shakers $f_e \approx 3–4$ Hz **Page 71**	**Suspension of two-mass screens/shakers $f_e \approx 3–4$ Hz** **Page 71**		
		Rocker arm with spring accumulator for trough suspension in frame excited systems (m²) **Pages 72/73**	
Universal-joint suspensions for hanging or supported gyratory sifters **Pages 74–77**			

Technology

1. Oscillating Conveyor Technology in General

Technical development has led to a growing demand for the efficient yet gentle conveying of goods. One of the most economical answers to this need is the oscillating conveyor, which has major advantages over alternative systems:

- simple design without parts requiring a lot of maintenance
- extremely low wear in operation
- screening and separating operations may be performed at the same time.

Oscillating conveyors consist of trough-, box- or tube-shaped conveying units, the oscillation rockers and the oscillating exciter. While oscillating mass forces are set up which lead to two fundamental conveying modes. If the material "slides" forward, we speak of a chute conveyor, but if it is advanced in "short jumps" (microthrows) a shaker conveyor is involved.

Chute conveyors have low frequencies (1–2 Hz) and large amplitudes (up to about 12 in), and are specially suited for moving material in coarse lumps, as in mining.

Shaker conveyors have high frequencies (up to 10 Hz) and smaller amplitudes (up to about 0.8 in). They are suitable for moving almost all products, provided these do not cake or stick together, over short to medium distances, particularly hot and severe wearing materials.

2. Crank Shaft Driven Shaker Conveyor Systems

2.1. One-mass Oscillation System with Positive Slider Crank Drive

This simplest oscillating conveyor design (fig. 1) is the most economical and consists of the oscillating trough (I), the rocker suspension (B), the drive (CD) and base frame (III). Because there is no mass compensation here, it is employed primarily where dynamic forces exerted to the foundation are small, i.e. where the trough acceleration does not exceed 1.6 g. In any case the conveyor must be installed on a solid substructure (in a basement, on a heavy base frame or solid floor).

The direction of conveying is geared by the rocker suspension (B), so that we speak of unidirectional conveyors. As rocker suspension we recommend our types AU, AR, AS-P or AS-C (see pages 54–59).

The system is advantageously driven by a crank mechanism, in which our oscillating drive head (C) is used as a positive, elastic torsion bearing.

With this crank drive, low frequencies with long throws are achieved in simple fashion, as are essential for the design of long shakers.

The amplitude corresponds to the crank radius R, while the throw is 2 R. The frequencies of such slider crank oscillating troughs lies between 5 and 10 Hz, with throws between 0.4 and 1.6 in. The movement of material can be controlled during operation by variable-speed motors or drives. In one-mass oscillation systems the force introduction i.e. the main direction of oscillation X must be directed ahead of the centre of gravity S (fig. 1).

The crank shaft has to be driven by belts, in order to compensate the shocks at stroke ends!

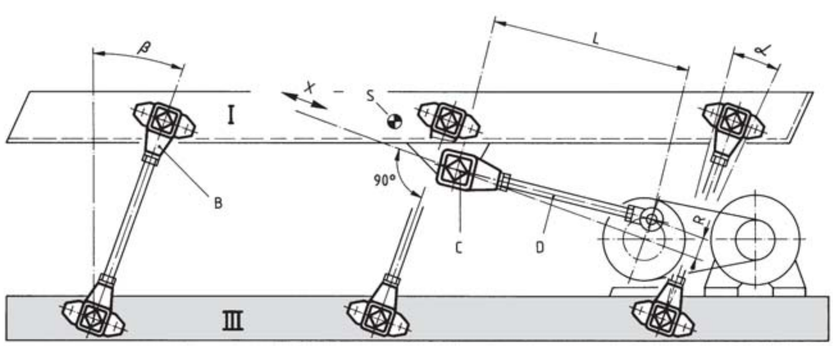


Fig. 1

B ROSTA oscillating mountings type AU, AS or AR
C ROSTA oscillating drive head type ST
D Connecting rod
L Sliding crank lenght
R Sliding crank radius (amplitude)
S Center of gravity of trough (mass)
X Main oscillating direction
α Oscillating angle max. 10° (± 5°)
β Rocker angle approx. 20° to 30°
I Trough (mass)
III Frame

Technology

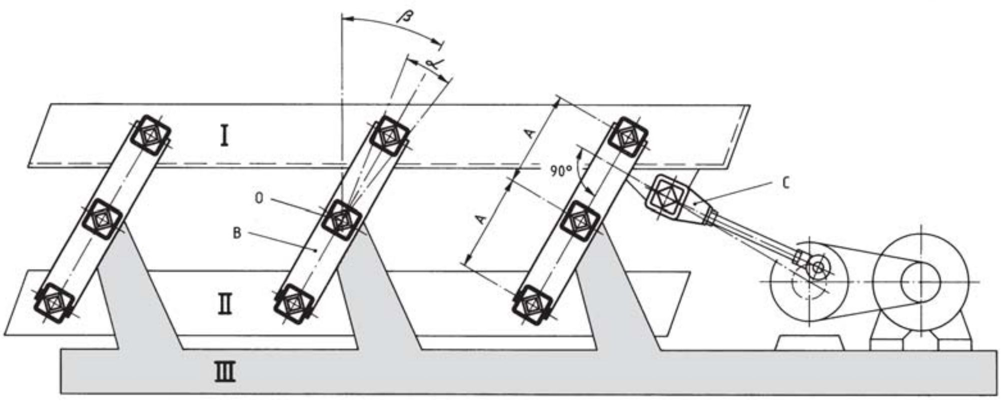
2.2. Two-mass Oscillation System with Positive Slider Crank Drive (Direct Compensation of Reaction Forces)

Higher conveying performance calls for higher frequencies and amplitudes, which inevitably cause stronger dynamic forces to be exerted on the foundation. In the two-mass oscillation system these forces are minimized due to the direct mass compensation, allowing even long and heavy conveyors to be mounted on relatively light platform structures or on upper floors.

Fig. 2 shows a shaker conveyor of this kind schematically. With trough I and the countermass (or trough) II having the same mass, the latter performing a compensatory oscillating movement in the opposite sense, the oscillation neutral point O lies in the middle of the double suspension B. If the stationary support III holds the suspension at point O, it sustains only static forces, so that the machine frame III is virtually no longer subject to dynamic loading. In this case we speak of direct mass compensation. (If the counter-mass is used as feeding trough, please note that transport direction is identic with trough I.)

Our elements type AD-P, AD-C and AR are fitted as double-suspension to support the two troughs on the machine frame (see pages 56/57 and 60/61). The system is driven by eccentric crank with the ROSTA drive head ST.

In contrast to the one-mass system, in the two-mass shaker systems the force introduction may be adapted wheresoever to the trough (mass I) or to the counter weight (mass II).



B ROSTA double suspensions type AD or AR
C ROSTA oscillating drive head type ST
α Oscillation angle max. 10° (± 5°)
β Rocker angle approx. 20° to 30°
I Trough (mass)
II Countermass
III Frame

Fig. 2

2.3. Resonance Oscillating Conveyor with Positive Slider Crank Drive

To reduce the driving forces necessary, the shaker conveyors as presented in 2.1 and 2.2 are operated also as a resonance system. Here the suspensions B (figs. 1 and 2) are key components. Also the spring accumulators, consisting of two elements type DO-A, are supporting the dynamic stiffnes of the trough and are offering a harmonic oscillation of the system, close by the resonance (see pages 62/63). Unlike conventional designs, our suspensions embodying ROSTA rubber suspension units are able to perform four important functions simultaneously:

– supporting the static load
– forming an oscillating system in which the dynamic spring stiffness is determining the resonance drive-capacity
– dictating the direction of oscillation
– insulating vibration and structure-borne noise

To obtain a system as close to resonance as possible, based on the dynamic spring value of the ROSTA elements, various data of the projected shaker conveyor trough are needed. The number and size of the suspensions depend on the weight of the oscillating mass, on the conveying capacity desired, on the stroke and drive frequency. This drive frequency must as a rule be 10% lower than the natural frequency of the installation. Typical calculations of this may be found on pages 55–65.

3. Terminology and Calculation (Crank Shaft Driven Systems)

3.1. Terminology

Symbol	*Unit*	*Term*
a	ft/sec²	Acceleration
A	inch	Center distance rockers
c_d	lb/in	Dynamic spring value (rocker)
c_t	lb/in	Total spring value (system)
f_e	Hz	Natural frequency (elements)
f_{err}	Hz	Excitation frequency
F	lb	Force
g	32.16 ft/sec²	Gravitational acceleration
K	$\frac{\text{machine acc.}}{\text{grav. acc.}}$	Oscillating machine factor

Symbol	*Unit*	*Term*
m	lb	Mass
n_{err}	rpm	Revolutions per minute
R	inch	Crank radius
S	–	Center of gravity
sw	inch	Throw (peak to peak)
v_{th}	ft/sec	Theoretical velocity (material)
z	–	Quantity (number)
W	%	Degree of isolation
α	°	Oscillation angle
β	°	Rocker angle (inclination)

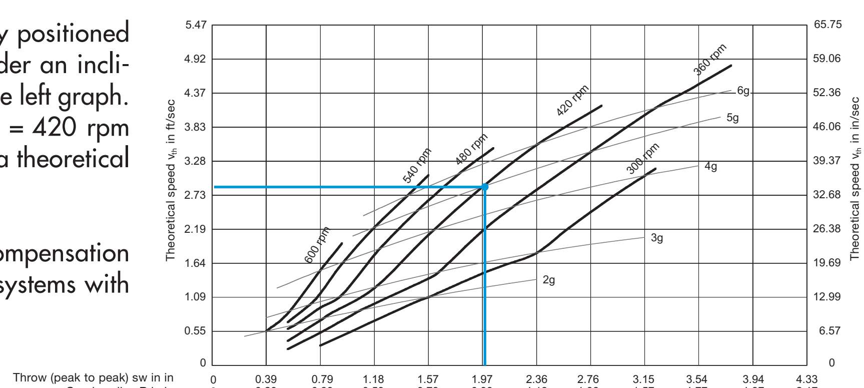
3.2. Calculation

Formulas for calculating oscillating machines based on the fundamental knowledges about oscillation theories.

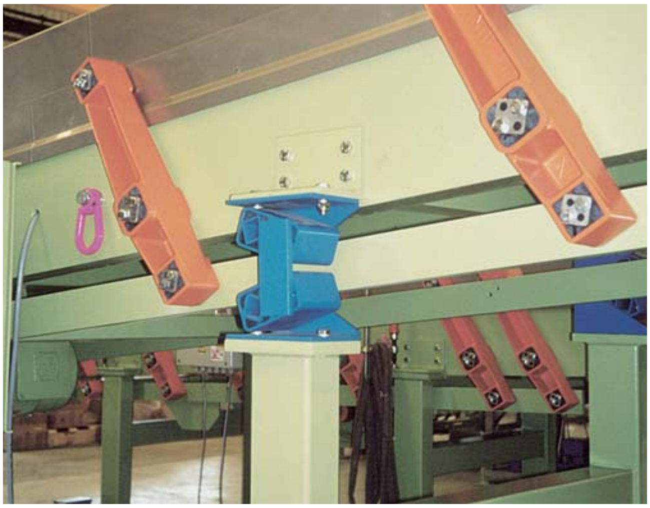
Total spring value (system)	$c_t = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot m}{g \cdot 12}$	[lb/in]
Excitation frequency	$f_{err} = \dfrac{1}{2\pi} \cdot \sqrt{\dfrac{9 \cdot 12 \cdot c_t}{m}}$	[Hz]
Number of rockers for resonance operation	$z = \dfrac{c_t}{0.9 \cdot c_d}$	[piece]
Oscillating machine factor (g-factor of acceleration)	$K = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot R}{g \cdot 12}$	[–]
Amplitude (peak to peak)	$sw = 2 \cdot R$	[in]
Acceleration force	$F = K \cdot m$	[lb]
Required driving power (approximation)	$P \approx \dfrac{R \cdot K \cdot m \cdot n_{err}}{\frac{60}{2\pi} \cdot 12 \cdot 550 \cdot \sqrt{2}}$	[hp]

The theoretical material speed of a horizontally positioned shaker conveyor with rocker arms installed under an inclination angle of 30° can be determined out of the left graph. Example: eccentric radius R = 0.98 in and n_{err} = 420 rpm is giving an acceleration of ~ 5 g and offering a theoretical material speed of ~ 2.90 ft/sec.

It requires two-mass systems with direct mass compensation by accelerations > 1.7 g (one-mass resonance systems with spring accumulators = up to 2.2 g possible).



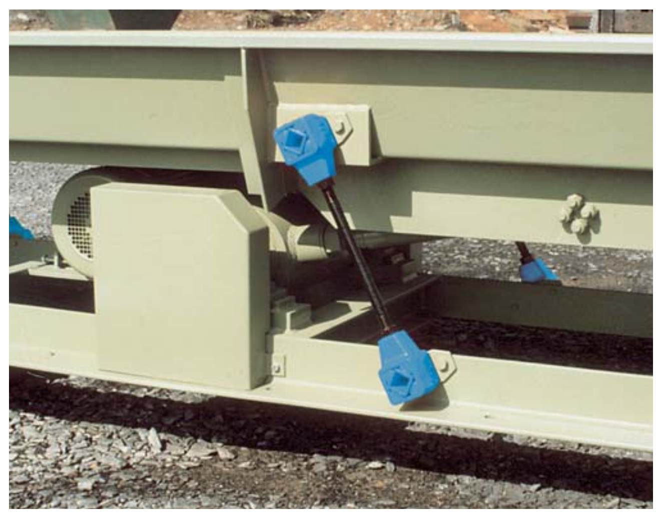
Applications



Double rockers on tabacco shaker

Drive head fixation on chip feeder

Support of heavy gyratory sifter with AK



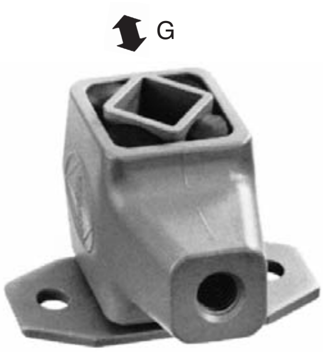
Single rocker on chip feeder

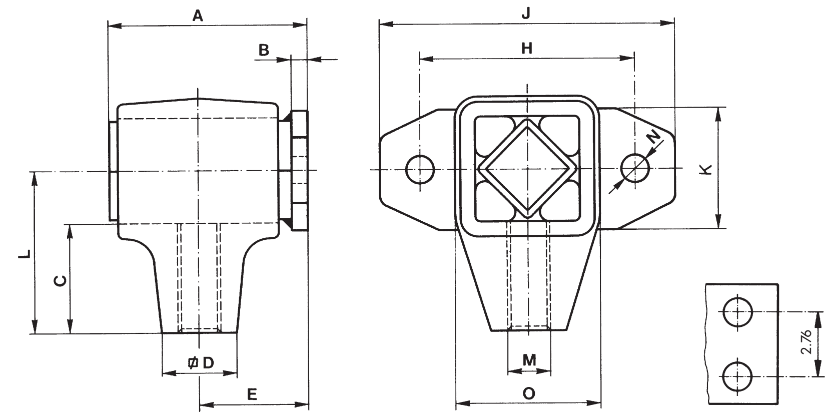
Elastic drive head on tabacco shaker

Rocker fixation on feeder frame

Oscillating Mounting

Type AU





Fixing flange
AU 60

UPC #	Type	G	n_{err}	Md_d	A	B	C	D	E	H	J	K	L	M	N	O	Weight in lbs.
					Dimensions in inches												
25158	AU 15	22.48	1200	0.32	1.97	0.16	1.14	0.79	1.10	1.97	2.76	0.98	1.57	M10	0.28	1.30	0.42
25187	AU 15 L	22.48	1200	0.32	1.97	0.16	1.14	0.79	1.10	1.97	2.76	0.98	1.57	M10 L	0.28	1.30	0.42
24854	AU 18	44.96	1200	0.97	2.44	0.20	1.24	0.87	1.34	2.36	3.35	1.38	1.77	M12	0.37	1.54	0.75
25188	AU 18 L	44.96	1200	0.97	2.44	0.20	1.24	0.87	1.34	2.36	3.35	1.38	1.77	M12 L	0.37	1.54	0.75
25160	AU 27	89.92	800	1.92	2.87	0.20	1.59	1.10	1.57	3.15	4.33	1.77	2.36	M16	0.45	2.13	1.43
25189	AU 27 L	89.92	800	1.92	2.87	0.20	1.59	1.10	1.57	3.15	4.33	1.77	2.36	M16 L	0.45	2.13	1.43
25161	AU 38	179.85	800	4.94	3.74	0.24	2.09	1.65	2.05	3.94	5.51	2.36	3.15	M20	0.55	2.91	3.42
25190	AU 38 L	179.85	800	4.94	3.74	0.24	2.09	1.65	2.05	3.94	5.51	2.36	3.15	M20 L	0.55	2.91	3.42
24162	AU 45	359.70	800	8.56	4.72	0.31	2.64	1.89	2.60	5.12	7.09	2.76	3.94	M24	0.71	3.50	5.62
25191	AU 45 L	359.70	800	8.56	4.72	0.31	2.64	1.89	2.60	5.12	7.09	2.76	3.94	M24 L	0.71	3.50	5.62
24163	AU 50	562.03	600	15.05	5.71	0.39	2.76	2.36	3.15	5.51	7.48	3.15	4.13	M36	0.71	3.62	14.77
25192	AU 50 L	562.03	600	15.05	5.71	0.39	2.76	2.36	3.15	5.51	7.48	3.15	4.13	M36 L	0.71	3.62	14.77
25164	AU 60	1124.05	400	34.39	9.17	0.59	3.35	3.15	5.04	7.09	9.06	4.72	5.12	M42	0.71	4.57	34.61
25193	AU 60 L	1124.05	400	34.39	9.17	0.59	3.35	3.15	5.04	7.09	9.06	4.72	5.12	M42 L	0.71	4.57	34.61

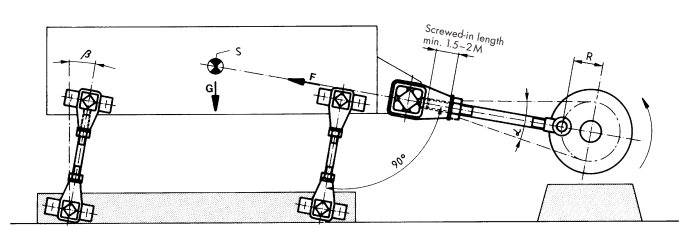
G = max. loading in lb per unit or rocker suspension
n_{err} = max. frequency in rpm at ∢ 10°, from zero ∢ ± 5°
Md_d = dynamic torque in ft.-lbs./deg. at ∢ ± 5°, in frequency range 300 – 600 rpm
Mountings for higher loads available on request.

Material Structure

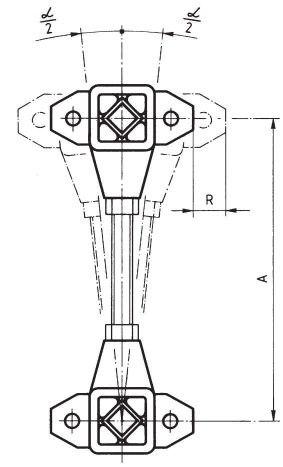
The housings up to type AU 45 are made out of light metal die cast, from type AU 50 in nodular cast; inner square and fixation flange in steel.

Guidelines for Fitting

The rocker angle β of the oscillating mounting is 10° to 30° according to experience, depending largely on the conveying performance and the material to be moved. To secure optimal performance the troughs, screens etc. must be designed stiff and rigid. If the available space does not allow the mountings to be fitted from the side, they may also be placed between the trough and the base frame. Here the threaded connecting rod allows optimal levelling in all cases.



Oscillating Mounting



To calculate the dynamic spring value of an oscillating mounting, for example 2 AU 27, operating close to resonance.

Given:

Dynamic torque Md_d = 1.92 ft.-lbs./deg.
Mounting with distance A between centres = 7.85 in

Wanted:

Dynamic spring value c_d

$$c_d = \frac{Md_d \cdot 360 \cdot 12}{A^2 \cdot \pi} = \frac{1.92 \cdot 360 \cdot 12}{7.85^2 \cdot \pi} = 42.8 \text{ lb/in}$$

Typical Calculation

Given:

Weight of trough	= 440 lbs.
Material on trough	= 110 lbs.
of this 20% coupling effect	= 22 lbs.
Total weight of oscillating mass m (trough and coupling effect)	= 462 lbs.
Eccentric radius R	= 0.55 in
Speed n_{err}	= 320 rpm

Oscillating machine factor $K = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot R}{g \cdot 12}$ = 1.6

Total spring value $c_t = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot m}{g \cdot 12}$ = 1344.3 lb/in

Wanted:

Number of oscillating mountings each comprising 2 elements type AU 27

a) in resonance operation

Here the total spring value of the mountings must be about 10% above the total spring value c_t of the installation. From this follows: Spring value c_d of an oscillating mounting consisting of two AU 27 spaced at 7.87 in = 42.8 lb/in.

$$\text{Number of mountings} = \frac{c_t}{0.9 \cdot c_d} = \frac{1344.3}{0.9 \cdot 42.8} = 34.9 \text{ pieces}$$

Selected: 36 mountings each comprising two AU 27 = 72 x AU 27

b) without resonance operation

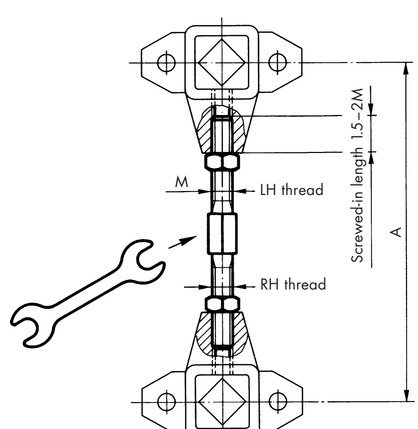
Here the total weight G must be taken up by the total number of oscillating mountings. The admissible loading of one mounting comprising two AU 27 is 89.92 lbs.

$$\text{Number of mountings} = \frac{m}{89.92} = \frac{462}{89.92} = 5.14 \text{ pieces}$$

Selected: 6 oscillating mountings each comprising two AU 27 = 12 x AU 27

Connecting Rod

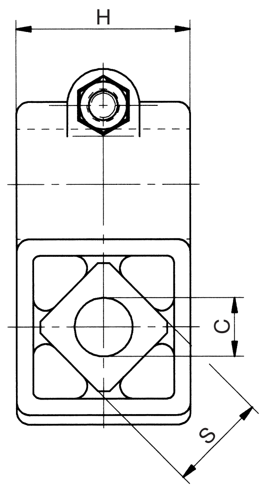
The connecting rod is provided by the customer, preferably with left-/right-hand thread. Together with the associated oscillating mountings AU the distance between elements A can then be levelled steplessly. Lower costs may be attained, though at the price of rougher levelling, by using commercial rods with right-head thread only. In any case the appropriate screwed-in length must be observed.

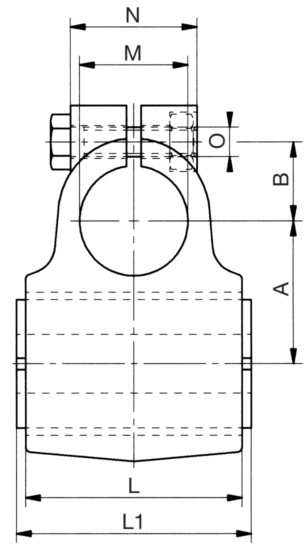


ROSTA

Oscillating Mounting

Type AR





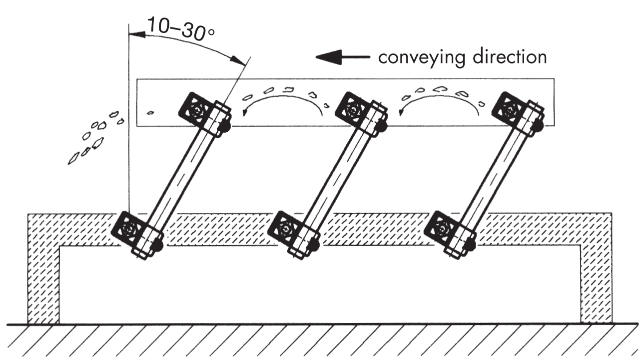
UPC #	Type	Load G in lbs. K=2	K=3	K=4	n_{err}	Md_d	Dimensions in inches A	B	C	H	L	L1	M	N	O	S	Weight in lbs.
63 657	AR 27	67.44	53.95	44.96	590	1.9	1.54	0.85	0.63	1.89	2.36	2.56	1.25	1.38	M8	1.06	0.99
63 658	AR 38	134.89	112.41	89.92	510	4.9	2.05	1.04	0.79	2.52	3.15	3.54	1.50	1.97	M8	1.50	2.09

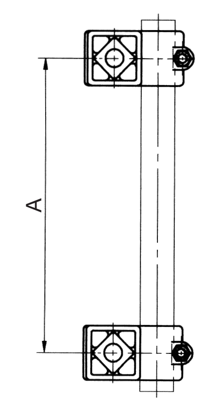
K = oscillating machine factor
n_{err} = max. frequency in rpm with ∢ ± 5°
Md_d = dynamic spring value in ft.-lbs./deg. at ∢ ± 5°, in frequency range 300 – 600 rpm

Material Structure

Housings in light metal die cast, inner square in light alloy profile.

Single Rocker Arm





ROSTA oscillating mountings type AR in **single rocker configuration:** mounted on a round tube. It is best to adjust the desired center-distance between the axes on a surface plate and to subsequently tighten the clamp in order to frictionally connect the circular tube. The unit is fixed to the trough and the machine frame by means of frictional connection to the inner square section of the element by means of a bolt.

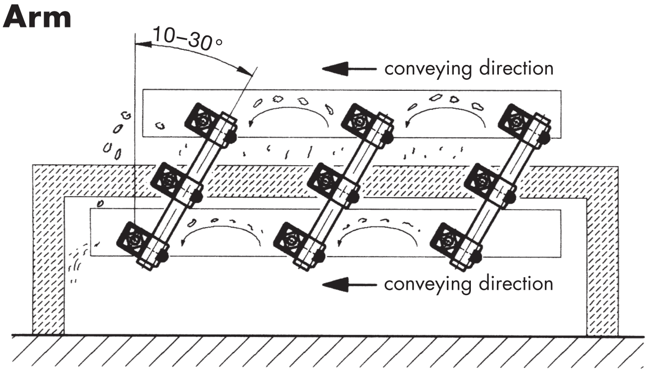
Dynamic Spring Value

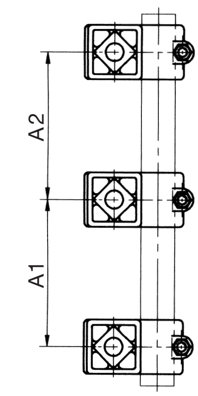
The dynamic spring value c_d of an oscillation unit consisting of 2 elements, type AR, is calculated as following:

$$c_d = \frac{Md_d \cdot 360 \cdot 12}{A^2 \cdot \pi} = [lb/in]$$

Oscillating Mounting

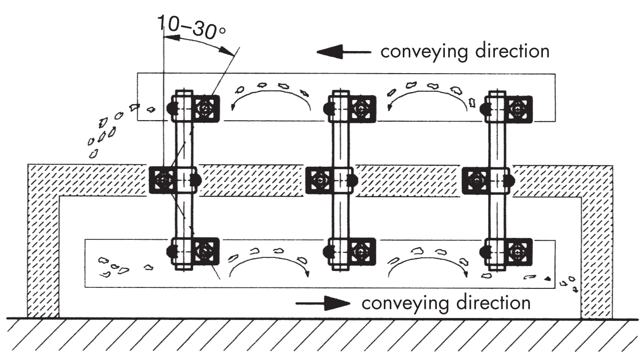
Double Rocker Arm

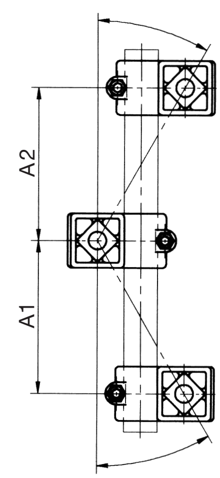




ROSTA oscillating mountings type AR in **double rocker configuration:** These elements are mounted in the same way as the single rocker arms. However, the material thickness of the round connection tube must be adapted according to the final center distances (see table on bottom left of this page). The double rocker arm allows easy installation in high-speed two-mass shaker conveyors with direct balancing. The counterweight can be used as additional conveyor trough. The material flows in the same direction, both on the trough and the counterweight.

Bidirectional Rocker Arm





ROSTA oscillating mountings type AR in **boomerang configuration** for bidirectional conveying. The double rocker is mounted vertically, the middle element is rotated by 180°. The angles of the double rocker go in opposite direction, causing the material on the counterweight to move in opposite direction, too. The bidirectional conveying allows an easier processing of the bulk material, but still guarantees a perfect balancing of masses for high-speed oscillating conveyors.

Dynamic Spring Value

The dynamic spring value c_d of an oscillation unit consisting of 3 elements, type AR, is calculated as following:

$$c_d = \frac{3 \cdot 360 \cdot Md_d \cdot 12}{4 \cdot \pi} \cdot \left(\frac{1}{A1^2} + \frac{1}{A2^2}\right) = [\text{lb/in}]$$

c_d = dynamic spring value in lb/in with torsion ±5°, frequency range 300–600 rpm.

Dimensions of the Connecting Tubes

(to be provided by the customer)

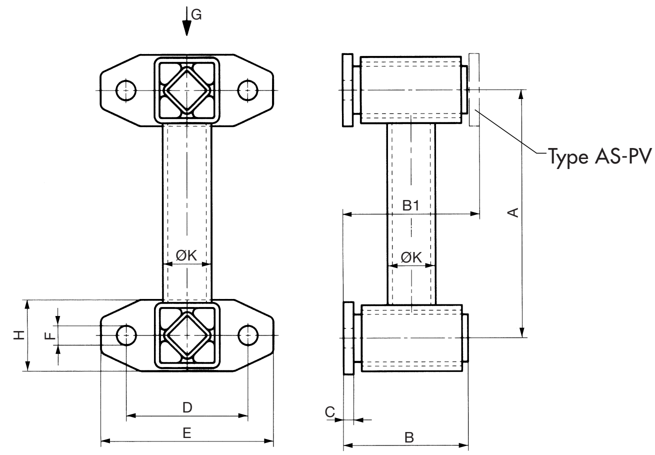
	Dimensions in inches		
Type	Tube diameter	min. thickness of tube	max. A1 or A2
AR 27	1–1/4	0.125*	7.0
	1–1/4	0.125	9.0
	1–1/4	0.250	12.0
AR 38	1–1/2	0.125*	8.0
	1–1/2	0.125	10.0
	1–1/2	0.250	12.0

* for single drive heads always use a thickness of 0.125 in.

ROSTA

Rocker Suspension

Type AS-P



Type AS-PV with one offset flange

UPC #	Type	G	n_{err}	sw	c_d	Dimensions in inches A	B	C	D	E	F	H	ØK	Weight in lbs.
37 587	△ AS-P 15	22.48	1200	0.67	29	3.94	1.97	0.16	1.97	2.76	0.28	0.98	0.71	1.19
37 588	AS-P 18	44.96	1200	0.83	57	4.72	2.44	0.20	2.36	3.35	0.37	1.38	0.94	1.79
37 589	AS-P 27	89.92	800	1.10	69	6.30	2.87	0.20	3.15	4.33	0.45	1.77	1.34	3.95
37 590	AS-P 38	179.85	800	1.38	109	7.87	3.74	0.24	3.94	5.51	0.55	2.36	1.57	7.87
57 657	△ AS-P 45	359.70	800	1.38	189	7.87	4.72	0.31	5.12	7.09	0.71	2.76	1.77	12.17
57 658	△ AS-P 50	562.03	600	1.73	217	9.84	5.71	0.39	5.51	7.48	0.71	3.15	2.36	18.23

UPC #	Type	G	n_{err}	sw	c_d	Dimensions in inches A	B1	C	D	E	F	H	ØK	Weight in lbs.
57 659	△ AS-PV 15	22.48	1200	0.67	29	3.94	2.20	0.16	1.97	2.76	0.28	0.98	0.71	1.19
57 660	AS-PV 18	44.96	1200	0.83	57	4.72	2.68	0.20	2.36	3.35	0.37	1.38	0.94	1.79
57 661	AS-PV 27	89.92	800	1.10	69	6.30	3.15	0.20	3.15	4.33	0.45	1.77	1.34	3.95
57 662	AS-PV 38	179.85	800	1.38	109	7.87	4.09	0.24	3.94	5.51	0.55	2.36	1.57	7.87
57 663	△ AS-PV 45	359.70	800	1.38	189	7.87	5.20	0.31	5.12	7.09	0.71	2.76	1.77	12.17
57 664	△ AS-PV 50	562.03	600	1.73	217	9.84	6.30	0.39	5.51	7.48	0.71	3.15	2.36	18.23

G = max. loading in lbs. per suspension
n_{err} = max. frequency in rpm at ∢ 10°, from zero ∢ ±5°
sw = max. amplitude in in
c_d = dynamic spring value in lb/in at ∢ ±5°, in frequency range 300 – 600 rpm
Suspensions for higher loads available on request.

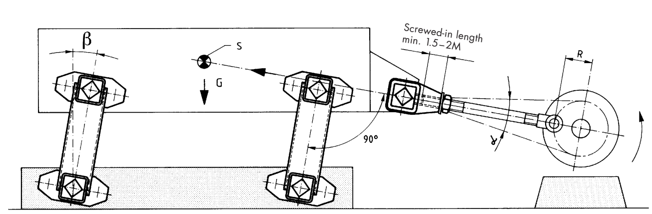
△ available on request

Material Structure

Rocker arm made out of welded steel structure; inner square and fixation flange in steel.

Guidelines for Fitting

The rocker angle β of the rocker suspensions is 10° to 30° according the experience, depending largely on the conveying performance and the material to be moved. To secure optimal performance the troughs, screens etc. must be designed stiff and rigid. If the available space does not allow the suspensions to be fitted from the side, they may also be placed between the trough and the base frame using fitting parts to be produced by the customer.

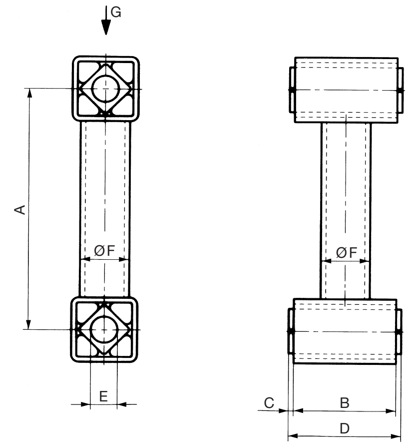


Oscillating Mountings

ROSTA

Rocker Suspension

Type AS-C



UPC #	Type	G	n_{err}	sw	c_d	A	B	Dimensions in inches C	D	E	ØF	Weight in lbs.
37 591	△ AS-C 15	22.48	1200	0.67	29	3.94	1.57	0.10	1.77	0.39	0.71	0.84
37 592	AS-C 18	44.96	1200	0.83	57	4.72	1.97	0.10	2.17	0.51	0.94	1.23
37 593	AS-C 27	89.92	800	1.10	69	6.30	2.36	0.10	2.56	0.63	1.34	2.89
37 594	AS-C 38	179.85	800	1.38	109	7.87	3.15	0.20	3.54	0.79	1.57	5.73
63 659	△ AS-C 45	359.70	800	1.38	189	7.87	3.94	0.20	4.33	0.94	1.77	8.69
63 660	△ AS-C 50	562.03	600	1.73	217	9.84	4.72	0.20	5.12	1.18	2.36	13.34

G = max. loading in lbs. per suspension
n_{err} = max. frequency in rpm at ∢ 10°, from zero ∢ ±5°
sw = max. amplitude in in
c_d = dynamic spring value in lb/in at ∢ ±5°, in frequency range 300 – 600 rpm
Suspensions for higher loads available on request.

△ available on request

Material Structure

Rocker arm made out of welded steel structure; inner square in light alloy profile.

Typical Calculation

Given:

Weight of trough = 440 lbs.
Material on trough = 110 lbs.
of this 20% coupling effect = 22 lbs.
Total weight of oscillating mass m
(trough and coupling effect) = 462 lbs.

Eccentric radius R = 0.55 in

Speed n_{err} = 320 rpm

Oscillating machine factor $K = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot R}{g \cdot 12}$ = 1.6

Total spring value $c_t = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot m}{g \cdot 12}$ = 1344 lb/in

Wanted:
Number of double rocker suspensions of size 27 for example
a) in resonance operation
Here the total spring value of the suspensions must be about 10% above the total spring value c_t of the installation. From this follows:
Spring value c_d of the rocker suspension AS 27 = 69 lb/in

Number of suspensions $= \dfrac{c_t}{0.9 \cdot c_d} = \dfrac{1344}{0.9 \cdot 69} = 21.6$ pieces

Selected: 22 of AS-P 27 or
AS-C 27

b) without resonance operation
Here the total weight G must be taken up by the total number of rocker suspensions. The admissible loading of one AS 27 suspension is 89.92 lbs.

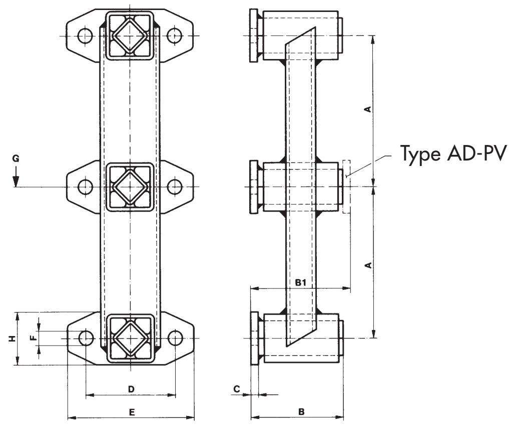
Number of suspensions $= \dfrac{m}{89.92} = \dfrac{462}{89.92} = 5.14$ pieces

Selected: 6 of AS-P 27 or
AS-C 27

ROSTA

Double Suspension

Type AD-P



Type AD-PV with offset flanges

UPC #	Type	G K = 2	K = 3	K = 4	n_{err}	sw	c_d	Dimensions in inches A	B	C	D	E	F	H	Weight in lbs.
37 579	AD-P 18	33.72	26.98	22.48	640	0.67	126	3.94	2.44	0.20	2.36	3.35	0.37	1.38	2.67
37 580	AD-P 27	67.44	53.95	44.96	590	0.83	183	4.72	2.87	0.20	3.15	4.33	0.45	1.77	5.62
37 581	AD-P 38	134.89	112.41	89.92	510	1.10	257	6.30	3.74	0.24	3.94	5.51	0.55	2.36	12.21
37 542	△ AD-P 45	269.77	224.81	179.85	450	1.38	286	7.87	4.72	0.31	5.12	7.09	0.71	2.76	18.76
57 665	△ AD-P 50	404.66	337.22	269.77	420	1.73	314	9.84	5.71	0.39	5.51	7.48	0.71	3.15	28.44

UPC #	Type	G K = 2	K = 3	K = 4	n_{err}	sw	c_d	Dimensions in inches A	B_1	C	D	E	F	H	Weight in lbs.
57 666	AD-PV 18	33.72	26.98	22.48	640	0.67	126	3.94	2.68	0.20	2.36	3.35	0.37	1.38	2.67
57 667	AD-PV 27	67.44	53.95	44.96	590	0.83	183	4.72	3.15	0.20	3.15	4.33	0.45	1.77	5.62
57 668	AD-PV 38	134.89	112.41	89.92	510	1.10	257	6.30	4.09	0.24	3.94	5.51	0.55	2.36	12.21
57 669	△ AD-PV 45	269.77	224.81	179.85	450	1.38	286	7.87	5.20	0.31	5.12	7.09	0.71	2.76	18.76
57 670	△ AD-PV 50	404.66	337.22	269.77	420	1.73	314	9.84	6.30	0.39	5.51	7.48	0.71	3.15	28.44

G = max. loading in lbs. per suspension
K = oscillating machine factor
n_{err} = max. frequency in rpm at ∢ 10°, from zero ∢ ±5°
sw = max. amplitude in in
c_d = dynamic spring value in lb/in at ∢ ±5°, in frequency range 300–600 rpm
Suspensions for higher loads or asymmetric distances between centres A available on request.

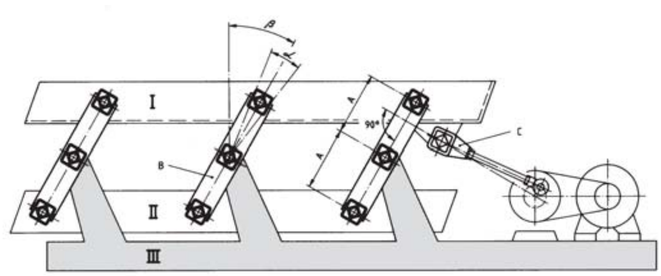
△ available on request

Material Structure

Rocker arm made out of welded steel structure; inner square and fixation flange in steel.

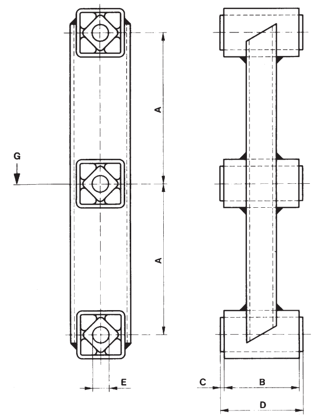
Guidelines for Fitting

The rocker angle β of the rocker suspensions is 10° to 30° according to experience, depending largely on the conveying performance and the material to be moved. To secure optimal performance the troughs, screens etc. must be designed stiff and rigid. Types AD-P are intended for flange mounting. Types AD-C for central fixing.



Double Suspension

Type AD-C



UPC #	Type	G K = 2	K = 3	K = 4	n_{err}	sw	c_d	Dimensions in inches A	B	C	D	E	Weight in lbs.
37 583	AD-C 18	33.72	26.98	22.48	640	0.67	126	3.94	1.97	0.10	2.17	0.51	1.85
37 584	AD-C 27	67.44	53.95	44.96	590	0.83	183	4.72	2.36	0.10	2.56	0.63	4.06
37 585	AD-C 38	134.89	112.41	89.92	510	1.10	257	6.30	3.15	0.20	3.54	0.79	3.02
37 586	△ AD-C 45	269.77	224.81	179.85	450	1.38	286	7.87	3.94	0.20	4.33	0.94	13.40

G = max. loading in lbs. per suspension
K = oscillating machine factor
n_{err} = max. frequency in rpm at ∢ 10°, from zero ∢ ±5°
sw = max. amplitude in in
c_d = dynamic spring value in lb/in at ∢ ±5°, in frequency range 300–600 rpm
Suspensions for higher loads or asymmetric distances between centres A available on request.

△ available on request

Material Structure

Rocker arm made out of welded steel structure; inner square in light alloy profile.

Typical Calculation

Given:

Weight of trough = 440 lbs.
Weight of counter mass = 440 lbs.
Material on trough = 110 lbs.
of this 20% coupling effect = 22 lbs.
Total weight of oscillating mass m
(trough counter mass and coupling effect) = 902 lbs.

Eccentric radius R = 0.55 in

Speed n_{err} = 360 rpm

Oscillating machine factor $K = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot R}{g \cdot 12}$ = 2.0

Total spring value $c_t = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot m}{g \cdot 12}$ = 3321.8 lb/in

Wanted:
Number of double rocker suspensions of size 38 for example
a) in resonance operation
Here the total spring value of the suspensions must be about 10% above the total spring value c_t of the installation. From this follows:
Spring value c_d of the rocker suspension AD 38 = 257 lb/in

$$\text{Number of suspensions} = \frac{c_t}{0.9 \cdot c_d} = \frac{3321.8}{0.9 \cdot 257} = 14.4 \text{ pieces}$$

Selected: 14 of AD-P 38 or
AD-C 38

b) without resonance operation
Here the total weight G must be taken up by the total number of rocker suspensions. The oscillating machine factor K = 2.0 must be taken into account, also the admissible loading of one AD 38 under acceleration 2 g = 134.89 lbs.

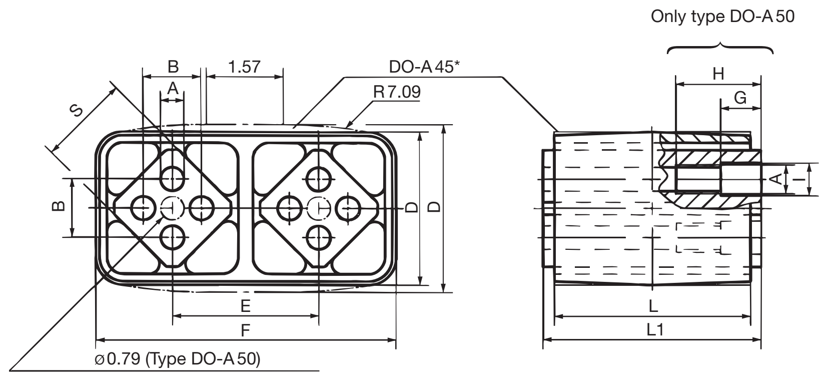
$$\text{Number of suspensions} = \frac{m}{134.89} = \frac{902}{134.89} = 6.7 \text{ pieces}$$

Selected: 8 of AD-P 38 or
AD-C 38

ROSTA

Rubber Suspension Unit (as Spring Accumulator)

Type DO-A



UPC #	Type	c_d	Dimensions in inches L	L1	A	B	D	E	F	G	H	I	S	Weight in lbs.
25 131	DO-A 45 x 80	1256	3.15	3.54	0.47	1.38	3.35	2.87	5.88	–	–	–	1.77	4.08
25 132	DO-A 45 x 100	1484	3.94	4.33	0.47	1.38	3.35	2.87	5.88	–	–	–	1.77	4.98
57 671	DO-A 50 x 120	2284	4.72	5.12	M12	1.57	3.50	3.07	6.57	1.18	2.36	0.48	1.97	12.13
57 672	DO-A 50 x 200	3426	7.87	8.27	M12	1.57	3.50	3.07	6.57	1.57	2.76	0.48	1.97	18.74

c_d = dynamic spring value in lb/in at ∢ ± 5°, in frequency range 300–600 rpm
Elements with higher load capacity are available on request.
* DO-A 45 with convex housing shape.

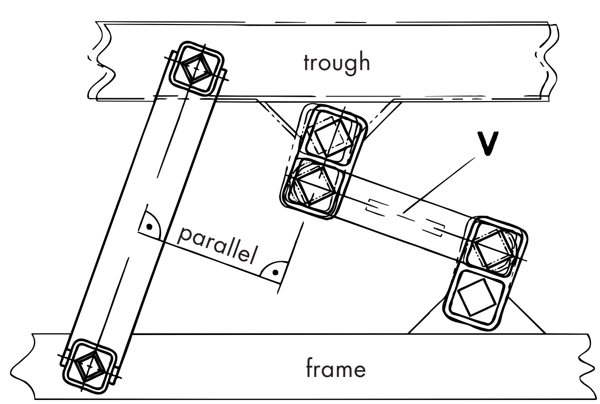
Material Structure

Housing of size 45 is made out of light alloy profile, housing of size 50 in nodular cast; inner squares in light alloy profile with 4 bores for the fixation of connection brackets shaker: frame.

A spring accumulator consists of two ROSTA rubber suspension units type DO-A and a customer supplied connection link **V.** The dynamic spring value of this configuration corresponds to only 50% of a single DO-A element, due to the effected **double serie-connection,** which is reducing the dynamic stiffness to half.

Element Type	c_d	perm. osc. angle	R	sw	n_{err}
2 x DO-A 45 x 80	628	±5° ±4° ±3°	0.49 0.39 0.30	0.98 0.79 0.59	520 780 1280
2 x DO-A 45 x 100	742	±5° ±4° ±3°	0.49 0.39 0.30	0.98 0.79 0.59	480 720 1200
2 x DO-A 50 x 120	1142	±5° ±4° ±3°	0.54 0.43 0.32	1.07 0.86 0.65	420 600 960
2 x DO-A 50 x 200	1713	±5° ±4° ±3°	0.54 0.43 0.32	1.07 0.86 0.65	380 540 860

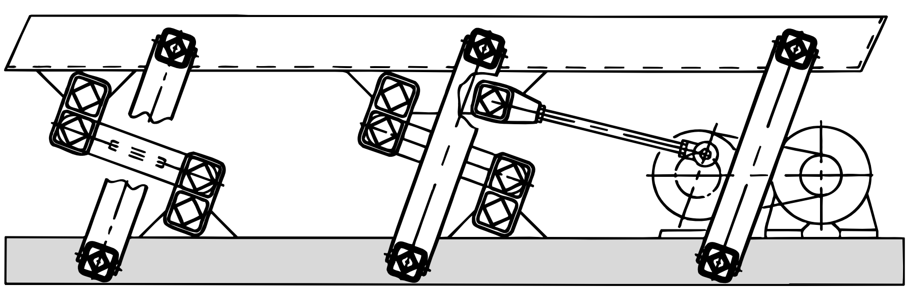
c_d = dynamic spring value in lb/in
R = permissible radius in in
sw = max. amplitude (peak to peak) in in
n_{err} = max. frequency in rpm

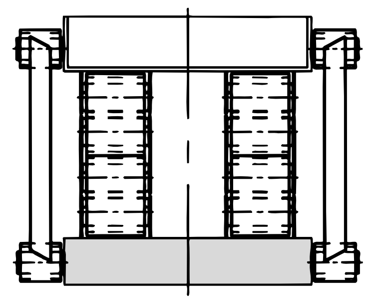


Rubber Suspension Unit

Type DO-A

As Spring Accumulator for One-mass Shaker Conveyor Troughs (Compression/Tension Spring Accumulator)





The oscillating conveyor systems are built such that they run very close to the resonance frequency in order to keep the energy consumption down and to improve the fatigue resistance of the structure (trough and frame). The total spring value c_t of the trough should be approximately equal to the stiffness of the oscillating elements. Usually the spring accumulators produce a dynamic rigidity exceeding the one of the rocker arms by far and allowing the oscillating machine to run very close to the resonance frequency in a smooth and harmonic manner.

Typical Calculation

Given:

Oscillating conveyor trough: length: 6.0 m (due to the trough stiffness there are mounted 4 rockers on each side)

Total oscillating mass	m	= 826 lbs.
Revolutions per minute	n_{err}	= 460 rpm
Crank radius	R	= 0.24 in
Oscillating machine factor	K	= 1.4
Total spring value	$c_t = \dfrac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot m}{g \cdot 12}$	= 4966 lb/in

Wanted:

Number of rocker suspensions for operation close to the resonance frequency

Load per rocker $= \dfrac{m}{8} = \dfrac{826}{8}$ = 103.25 lbs.

⟶ 8 AS-C 38 units are necessary

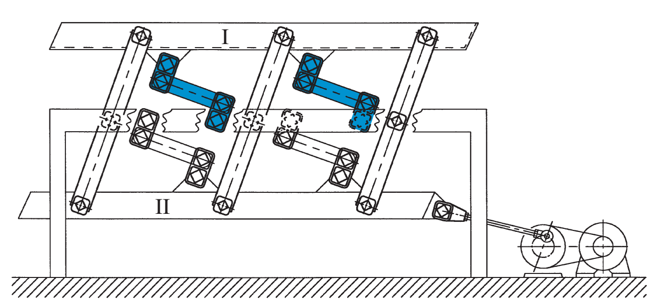
Spring value $c_d = 8 \cdot 108.5$ lb/in = 868 lb/in

4 rocker suspensions each consisting of 2 DO-A 50 x 120 elements with c_d = 1142 lb/in each = 4568 lb/in

Total c_d of all ROSTA rubber suspension units	= 5436 lb/in
Necessary total spring value c_t of trough	= 4966 lb/in
Reserve value for overload	= 470 lb/in (= 9.4%)

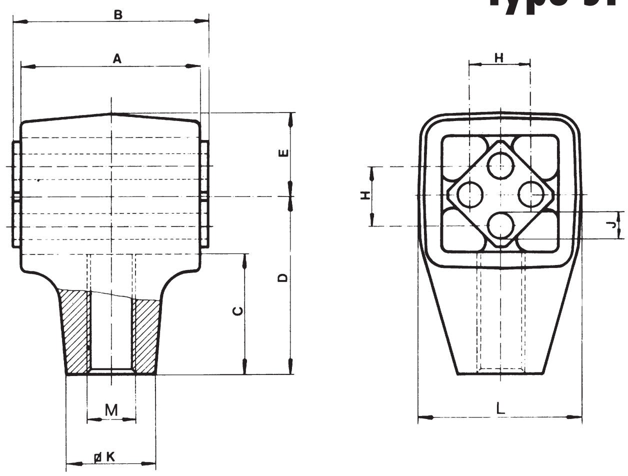
Suspension Units for Two-mass Oscillating Conveyor Trough

The installation of the two-mass oscillation conveyor system (see page 51) must be done according to the figure on the right.
The accumulators are mounted either on trough I and on the machine frame (see blue elements) or on the frame and on counterweight II.
When calculating the total spring value c_t of the two-mass oscillating machine it is necessary to **fully include** the counterweight.



Oscillating Drive Head

Type ST



UPC #	Type	F	∢ α max.	n_{err} max. in rpm	A	B	C	D	E	H	J	K	L	M	Weight in lbs.
					Dimensions in inches										
25165	ST 18	89.92	10°	1200	1.97	2.17	1.24	1.77	0.79	0.47	Ø 0.24	0.87	1.54	M 12	0.42
25194	ST 18 L	89.92	10°	1200	1.97	2.17	1.24	1.77	0.79	0.47	Ø 0.24	0.87	1.54	M 12 L	0.42
25166	ST 27	224.81	10°	1200	2.36	2.56	1.59	2.36	1.06	0.79	Ø 0.31	1.10	2.13	M 16	0.93
25195	ST 27 L	224.81	10°	1200	2.36	2.56	1.59	2.36	1.06	0.79	Ø 0.31	1.10	2.13	M 16 L	0.93
25167	ST 38	449.62	10°	800	3.15	3.54	2.09	3.15	1.46	0.98	Ø 0.39	1.65	2.91	M 20	2.31
25196	ST 38 L	449.62	10°	800	3.15	3.54	2.09	3.15	1.46	0.98	Ø 0.39	1.65	2.91	M 20 L	2.31
24851	ST 45	786.84	10°	800	3.94	4.33	2.64	3.94	1.73	1.38	Ø 0.47	1.89	3.50	M 24	4.03
25197	ST 45 L	786.84	10°	800	3.94	4.33	2.64	3.94	1.73	1.38	Ø 0.47	1.89	3.50	M 24 L	4.03
24852	ST 50	1348.86	10°	600	4.72	5.12	2.76	4.13	1.89	1.57	M12 x 40	2.36	3.66	M 36	12.13
25198	ST 50 L	1348.86	10°	600	4.72	5.12	2.76	4.13	1.89	1.57	M12 x 40	2.36	3.66	M 36 L	12.13
25170	ST 60	2697.72	6°	400	7.87	8.27	3.35	5.12	2.36	1.77	M16 x 22	3.15	4.57	M 42	35.94
25199	ST 60 L	2697.72	6°	400	7.87	8.27	3.35	5.12	2.36	1.77	M16 x 22	3.15	4.57	M 42 L	35.94
25171	ST 80	5395.44	6°	400	11.81	12.20	3.94	6.30	3.03	2.36	M20 x 28	3.94	5.91	M 52	68.34

F = max. acceleration force in lb
Mountings for higher loads available on request.

Material Structure

The housings up to size ST 45 are made out of light metal die cast, from type ST 50 in nodular cast; inner square in light alloy profile.

Typical Calculation

Given:

Weight of trough		= 440 lbs.
Material on trough		= 110 lbs.
of this 20% coupling effect		= 22 lbs.
Total weight of oscillating mass	m	
(trough and coupling effect)		= 462 lbs.
Eccentric radius	R	= 0.55 in
Speed	n_{err}	= 320 rpm
Connecting rod lenght	L	= 24 in
Ratio	R : L	= 1 : 0.023; $\alpha = \pm 1.3°$

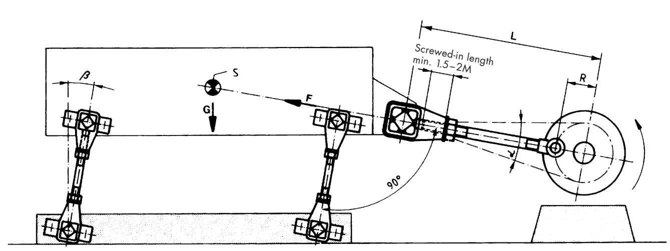
Since the ratio R : L is very low (<0.1) it is possible to achieve harmonic excitation.

Wanted:
Acceleration force F in lb

$$F = \frac{m \cdot R \cdot \left(\frac{2\pi}{60} \cdot n_{err}\right)^2}{g \cdot 12}$$

$$= \frac{462 \cdot 0.55 \cdot \left(\frac{2\pi}{60} \cdot 320\right)^2}{32.16 \cdot 12} = 739 \text{ lbs}$$

Selected: 1 piece of ST 45

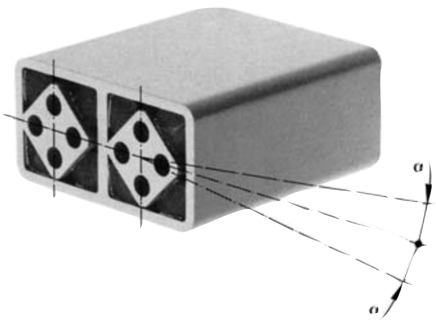


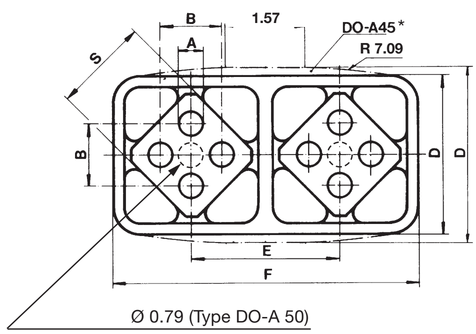
Guidelines for Fitting

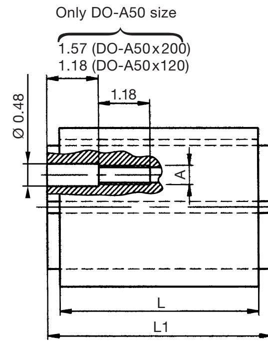
For ideal conditions the force introduction should be applied slightly ahead of the centre of gravity S and 90° to the angle β. The element axis must be 90° to the longitudinal axis of the trough and run centrally to the centre of gravity S. Fixing is done with shaft screws of 8.8 quality (analogous to fixing the universal joint support).

ROSTA

Rubber Suspension Unit (as Elastic Drive Head) — Type DO-A







UPC #	Type	c_d	L	L1	A	B	D	E	F	S	Weight in lbs.
			Dimensions in inches								
25126	DO-A 27 x 60	913	2.36	2.56	0.31	0.79	1.85	1.73	3.58	1.06	1.04
25129	DO-A 38 x 80	1199	3.15	3.54	0.39	0.98	2.48	2.36	4.84	1.50	2.54
25132	DO-A 45 x 100	1484	3.94	4.33	0.47	1.38	3.35	2.87	5.88	1.77	4.98
57671	DO-A 50 x 120	2284	4.72	5.12	M12	1.57	3.50	3.07	6.57	1.97	12.13
57672	DO-A 50 x 200	3426	7.87	8.27	M12	1.57	3.50	3.07	6.57	1.97	18.74

c_d = dynamic spring value in lb/in at $\sphericalangle \pm 5°$, in frequency range 300–600 rpm
Elements with higher load capacity are available on request.
* DO-A 45 with convex housing shape.

Material Structure

The housings up to size DO-A 45 are made out of light alloy profiles, housing of size 50 in nodular cast; inner squares in light alloy profile with 4 bores for the fixation of connection brackets shaker: eccentric rod.

Typical Calculation

ROSTA rubber suspension units DO-A employed as elastic drive heads are to be selected so that their spring value corresponds roughly to the total spring value. The oscillation angle α of the units must not exceed ±5°.

Given:

Total weight of oscillating mass m = 462 lbs
Speed n_{err} = 320 rpm
Eccentric radius R = 0.55 in

Wanted:

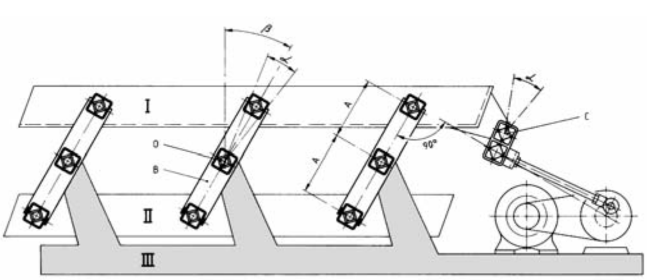
Total spring value c_t in lb/in

$$c_t = \frac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot m}{g \cdot 12} = \frac{\left(\frac{2\pi}{60} \cdot 320\right)^2 \cdot 462}{32.16 \cdot 12} = 1344 \text{ lb/in}$$

Selected: 1 piece of DO-A 45 x 100

Guidelines for Fitting

The elastic slider crank drive may be applied optionally onto the trough I or the contermass II, at the beginning of the trough or elsewhere. Force introduction must be 90° to the angle β of the rocker suspensions. The unit axis must be 90° to the longitudinal axis of the conveyor trough and run centrally with this. Fixing is by shaft screws of 8.8 quality (analogous to fixing the universal joint support). **Elastic drive heads should only be applied in natural frequency shaker systems!**



4. Free Oscillation Systems

Freely oscillating one-mass systems (figs. 4 to 6) are supported with ROSTA oscillating mountings type AB and AB-D. In this case the angle at which the excitation force is applied on the through determines the direction of oscillation. Thanks to the low frequency support, free oscillators impose only very small dynamic loads on the foundation. However for reasons of structure stiffnes (max. 23 ft), only certain conveyor lengths can be executed, otherwise oscillation nodes occur which obstruct conveying.
Free oscillating conveyors are driven by non-positive inertia drives exploiting the action of rotating unbalanced masses (unbalanced motors, exciters, eccentric double shafts). Suitable mounting of the drive systems ensures that the revolving unbalance is utilized only by the components in the actual direction of conveying. For example, two unbalanced masses counterrotating synchronously set up the necessary excitation force in that the flow components in the direction of the line joining the two centres of rotation cancel each other out, while those at right angles add up to give the harmonic excitation force. To avoid the unbalanced masses assuming excessive magnitude, the excitation frequency ≅ 12 to 50 Hz.

4.1. Drive with one Unbalanced Motor

This alternative (fig. 4) is used mainly on circular oscillators, which are used mostly for inclined screen constructions. If an unbalanced motor is flanged onto a screening unit, the system performs slightly elliptical motions whose shape depends on the distance between the two centres of gravity S (screen) and S_1 (unbalanced motor), and on the screen design.

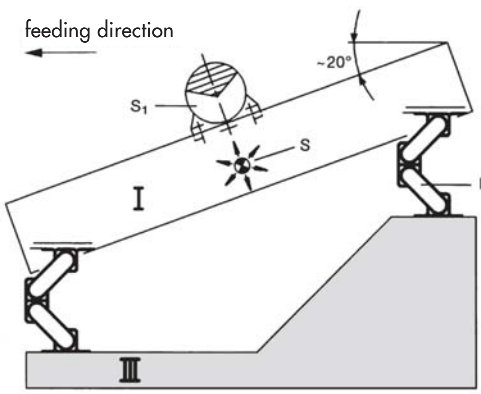
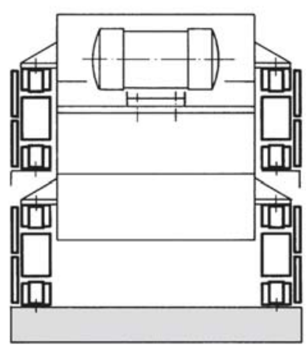


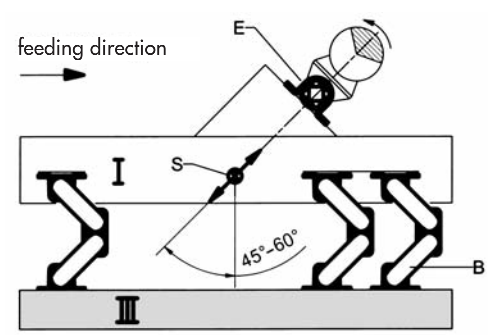
Fig. 4

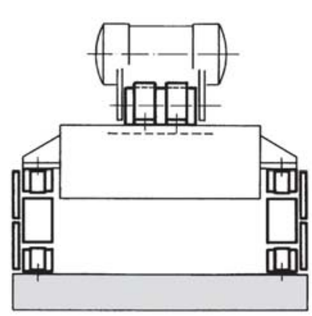


B ROSTA oscillating mountings type AB
S Centre of gravity of screen
S_1 Centre of gravity of unbalanced motor
I Screen
III Frame

4.2. Drive with one Unbalanced Motor and Pendulum Mount

Linear oscillators with unbalanced motor on a pendulum mount (fig. 5) are employed for screens and short, light conveyors.
If an unbalanced motor is flanged onto a machine through on a pendulum mount E (e.g. DK-A with bracket BK, pages 23 and 27) so that the centres of the motor and oscillating bearing and the centre of gravity of the screen lie in a straight line, then approximately linear oscillations will be generated. Through the pendulum mount the centrifugal forces are transmitted almost entirely to the screen or trough, where as the transverse forces remain ineffective. The pendulum mount drive may be used only with smaller machines.





B ROSTA oscillating mountings type AB
E ROSTA rubber suspension units type DK-A with clamp BK
S Centre of gravity of screen
I Screen
III Frame

Technology

4.3. Drive with two Unbalanced Motors

If two unbalanced motors are used with a linear shaker or screen (fig. 6), it must be borne in mind that they counter-rotate and are joined absolutely rigid, so that they synchronize at once when switched on, setting-up linear oscillations.

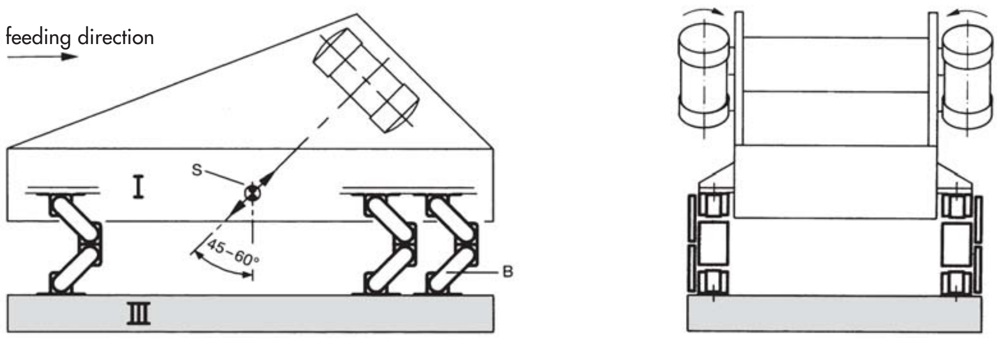


Fig. 6

B ROSTA oscillating mountings type AB
S Centre of gravity of trough/screen
I Trough/screen
III Frame

4.4. Calculation for a Linear Oscillator with two Unbalanced Motors

The proper size of the oscillation mountings type AB or AB-D is determined as follows:
Oscillating weight (conveyor with 2 motors + proportion of material being moved) divided by number of support points (the individual points must be loaded approximately equally).
At least 4 supports, if not more, are needed for the suspension of a linear oscillator. (Very often, due to the mounting position of the unbalanced motors, lies the position of the center of gravity close by the discharge-end. The load arrangement "discharge-end : feed-end" is therefore very often 60 % : 40 % and requires at least 6 or more mounts.)
The excitation frequency may be neglected, because according to experience the amplitudes do not exceed 0.6 in, so that the oscillation angles are relatively small. The natural frequency of the AB must be at least 3 times lower than its excitation frequency.

Nomogram: conveying speed for free oscillating screens

From the intersection of the coordinates amplitude = 0.16 in and motor speed n = 1460 rpm, with acceleration around 5 g the conveying speed emerges as 9.84 in/sec.

Formulas for the principal variables of a free oscillator:

Oscillating amplitude

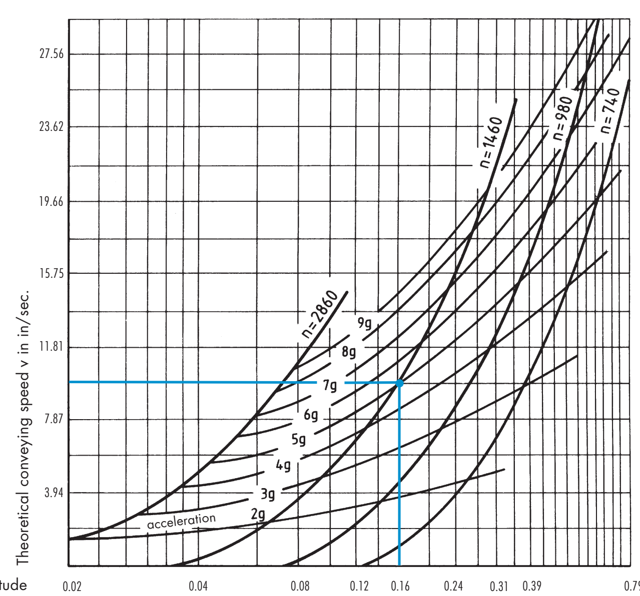
$$sw = \frac{\text{working torque in inch-pounds}}{\text{total weight in pounds}} \cdot 10 = \qquad \text{in}$$

Oscillating machine factor

$$K = \frac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot sw}{32.16 \cdot 24} = [-]$$

Insulation efficiency

$$W = 100 - \frac{100}{\left(\frac{f_{err}}{f_e}\right)^2 - 1} = \%$$



Oscillating amplitude sw in in = double the amplitude
Crank radius R in in

Oscillating Mounting

Type AB

Typical Calculation

The size and number of the oscillating mountings types AB and AB-D are calculated as follows: oscillating weight (device consisting of drive units and the material conveyed) divided by the number of supports. The oscillating angle may thus be neglected. The excitation frequency must be at least 3 times higher than the natural frequency of the AB oscillating mountings to get an acceptable degree of vibration damping towards substructure.

Given:

Weight of the empty trough with drive unit		= 1822 lbs.
Material on trough		= 134 lbs.
of which 20% for coupling effect		= 27 lbs.
Total weight of oscillating mass	m	
(trough, driving unit and coupling)		= 1849 lbs.
6 support points		

Wanted:

Loading per support = $\frac{m}{6} = \frac{1849}{6}$ = 308.17 lbs.

Selected: 6 units of type AB 38

See formulas on page 67 for calculating the amplitudes, machine factors and insulation efficiency.

Installation Guidelines

The ROSTA oscillating elements types AB and AB-D have to be chosen according to the weight of the oscillating mass (see pages 69 and 71). They must be installed between the screen structure and the basement, according to the position of the centre of gravity (see following examples). The upper arm is the rocking arm of the oscillating unit. All elements should be mounted in the same direction, the upper arms being inclined in the direction of the material flow (see following examples). This way, the upper arms of the screen mounts support the linear motion of the screening machine. The lower arm acts as a vibration damper only partly executing the movement of the machine. However, due to its considerable spring deflection the lower arm guarantees a very low natural frequency of the screen mount. **In order to assure an optimal conveying of the material it is important to fix the AB and AB-D elements axis at right angles to the conveying direction (allowance: ±1°). (Fig. 1, section A)**

Drive Options

A. Circular Oscillator with One Unbalanced Motor

The unbalanced motor causes the device to perform elliptical oscillating movements of which the form is given by the distance between the centres of gravity of the motor and the screen device and the shape of the latter. Circular vibrating screens are mounted **(inclined)** according to the their function (see fig. 1).

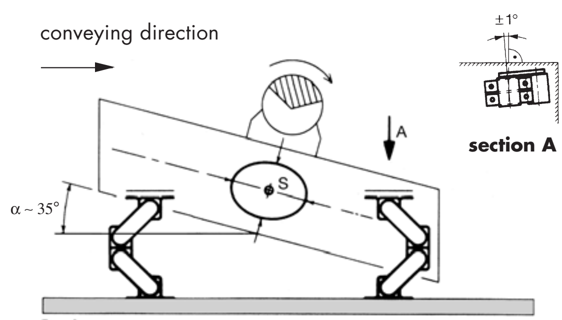


Fig. 1

B. Linear Oscillators with Two Unbalanced Motors

In case the device is supposed to perform linear oscillating movements, it is necessary to mount two unbalanced motors with rigid connection. The motors must rotate in opposite direction (to each other). The centres of gravity of the motors and the device must be on the same line, their inclination being generally 45° (see fig. 2).

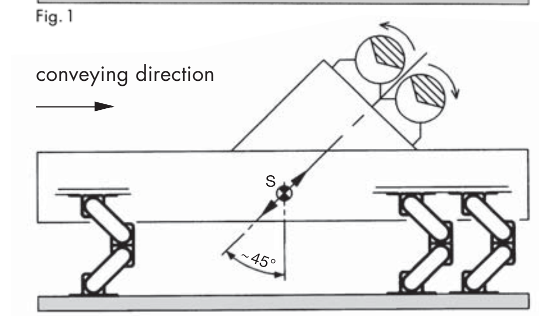


Fig. 2

C. Linear Oscillators with One Unbalanced Motor on Pendulum Mount

If the unbalanced motor is mounted on a pendulum mount, the device's oscillating movements are not exactly straight-line, but slightly elliptical. Their form depends on the distance between the centres of gravity of the motor and screen device and on the shape of the latter. Drives on pendulum mounts may be used only on smaller devices. Their inclination is usually 45° (see fig. 3).

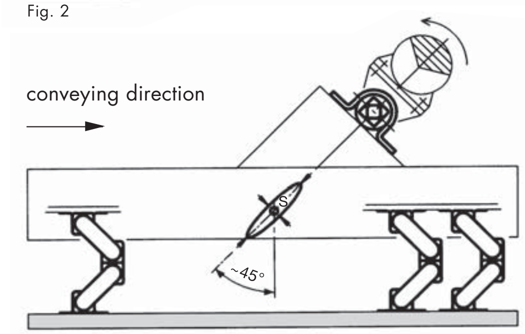
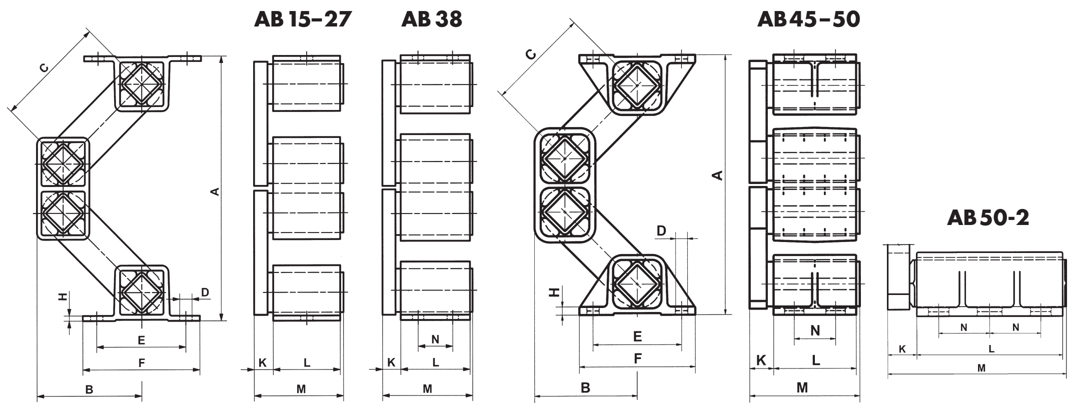


Fig. 3

ROSTA

Oscillating Mounting

Type AB



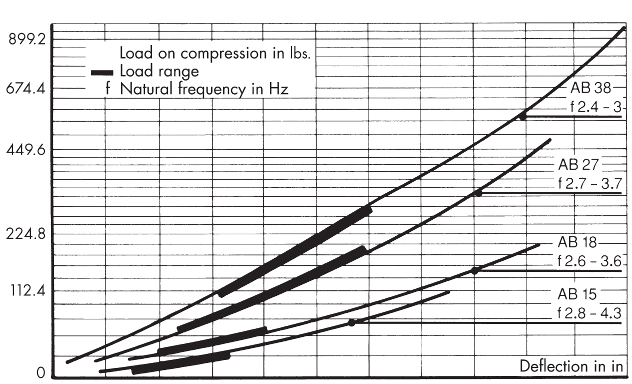
UPC #	Type	Load G in lbs.	A un-loaded	A max. load	B un-loaded	B max. load	C	D	E	F	H	K	L	M	N	Weight in lbs.
							Dimensions in inches									
25 206	AB 15	11.24 – 35.97	6.65	4.88	2.76	3.50	3.15	0.28	1.97	2.56	0.08	0.39	1.57	2.05	–	1.12
25 207	AB 18	26.98 – 67.44	8.19	6.10	3.43	4.21	3.94	0.35	2.36	3.15	0.10	0.55	1.97	2.64	–	2.54
25 208	AB 27	56.20 – 179.85	9.25	6.89	3.70	4.49	3.94	0.43	3.15	4.13	0.12	0.67	2.36	3.15	–	4.85
25 209	AB 38	134.89 – 359.70	12.01	9.25	4.72	5.67	4.92	0.51	3.94	4.92	0.16	0.83	3.15	4.09	1.57	11.24
25 210	AB 45	269.77 – 674.43	13.90	10.75	5.55	6.69	5.51	0.51 x 0.79	4.53	5.71	0.31	1.10	3.94	5.20	2.56	25.35
25 211	AB 50	562.03 – 1348.86	14.96	11.02	5.91	7.09	5.91	0.67 x 1.06	5.12	6.69	0.47	1.38	4.72	6.30	2.36	42.15
63 428	AB 50-2	944.20 – 2248.10	14.96	11.02	5.91	7.09	5.91	0.67 x 1.06	5.12	6.69	0.47	1.57	7.87	9.65	2.76	71.00

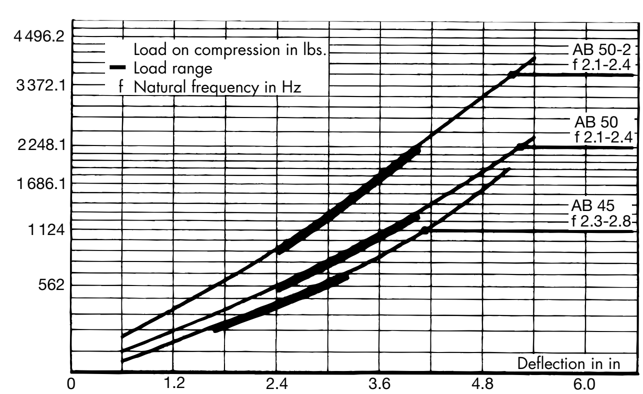
Material Structure

AB	15	18	27	38	45	50	50-2
Light alloy profile	DW DO	DW DO	DW DO	DW DO	DO		
Nodular cast					DW	DW DO	DW DO Inner parts
Steel welded construction	Inner parts						

c_d	AB 15	AB 18	AB 27	AB 38	AB 45	AB 50	AB 50-2
vertical	57	103	229	343	571	1085	1827
horizontal	34	80	143	171	286	485	799

c_d = dynamic spring value in lb/in, in nominal load range at n_{err} = 960 rpm, sw 0.315 in

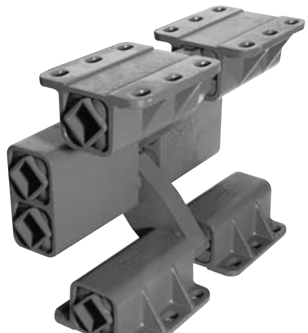


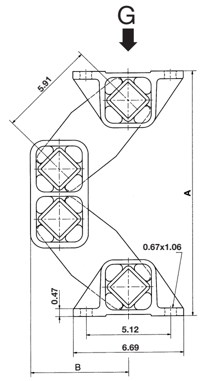


ROSTA

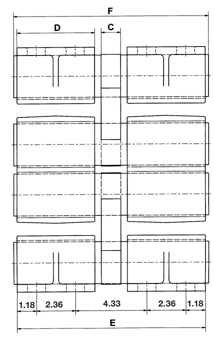
Oscillating Mounting

Type AB TWIN

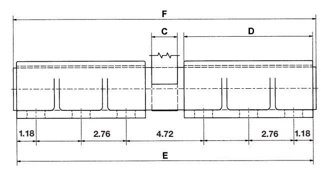




AB 50 TWIN



AB 50-2 TWIN

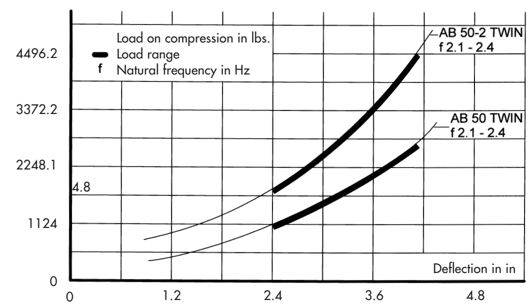


UPC #	Type	G	A un-loaded	A max. load	B un-loaded	B max. load	C	D	E	F	Weight in lbs.
63797	AB 50 TWIN	1124.06 – 2697.75	14.96	11.02	5.91	7.09	1.18	4.72	11.41	11.81	77.16
63798	AB 50-2 TWIN	1888.43 – 4496.25	14.96	11.02	5.91	7.09	1.57	7.87	18.11	18.50	119.05

G = load capacity in lbs. per mount

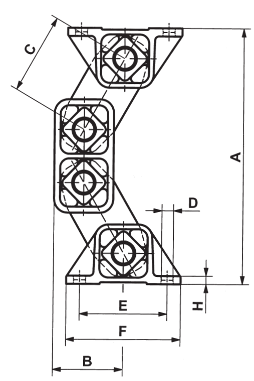
c_d	AB 50 TWIN	AB 50-2 TWIN
vertical horizontal	2170 971	3654 1599

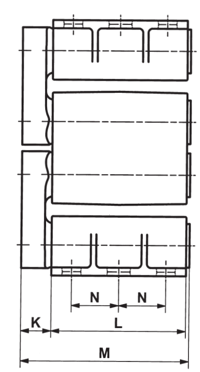
c_d = dynamic spring value in lb/in, in nominal load range at n_{err} = 960 rpm, sw = 0.315 in



Oscillating Mounting

Type AB-HD



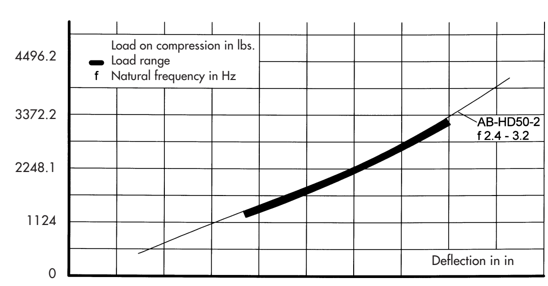


UPC #	Type	G	A un-loaded	A max. load	B un-loaded	B max. load	C	D	E	F	H	K	L	M	N	Weight in lbs.
79095	AB-HD 50-2	1348.4 –3146.3	14.8	12.24	4.09	5.55	4.72	0.67 x 1.06	5.12	6.7	0.47	1.77	7.87	9.84	2.76	78.26

G = load capacity in lbs. per mount

c_d	AB-HD 50-2
vertical horizontal	2050 1582

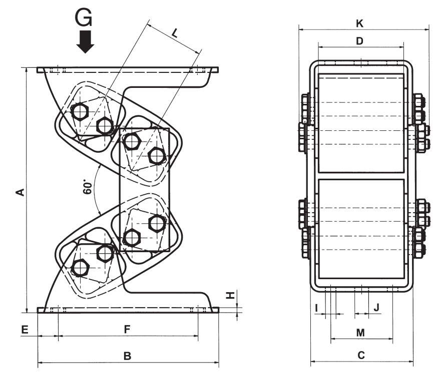
c_d = dynamic spring value in lb/in, in nominal load range at n_{err} = 960 rpm, sw = 0.315 in



Oscillating Mountings

Oscillating Mounting

Type AB-D



UPC #	Type	Load in lbs.	A un-loaded	A max. load	B	C	D	E	F	H	I	J	K	L	M	Weight in lbs.
75676	AB-D 18	112.41 – 269.77	5.39	4.61	4.53	2.40	1.97	0.49	3.54	0.12	0.35	0.35	2.91	1.22	1.18	2.87
63733	AB-D 27	224.81 – 562.03	7.24	6.18	5.91	3.66	3.15	0.59	4.72	0.16	0.35	0.43	4.57	1.73	1.97	6.39
63734	AB-D 38	449.63 – 899.25	9.61	8.23	7.28	4.65	3.94	0.69	5.91	0.20	0.43	0.53	5.79	2.36	2.76	16.54
75677	AB-D 45	674.44 – 1348.88	11.73	9.92	8.66	5.20	4.33	0.98	6.69	0.24	0.53	0.71	6.61	2.87	3.15	25.35
63854	AB-D 50	899.25 – 2023.31	12.95	10.94	9.25	5.59	4.72	0.98	7.28	0.24	0.53	0.71	6.54	3.07	3.54	48.50
63855	AB-D 50-1.6	1798.50 – 2697.75	12.95	10.94	9.25	7.32	6.30	0.98	7.28	0.31	0.53	0.71	8.43	3.07	3.54	56.22
63856	AB-D 50-2	2472.94 – 3597.00	12.95	10.94	9.25	8.90	7.87	0.98	7.28	0.31	0.53	0.71	10.24	3.07	3.54	63.94

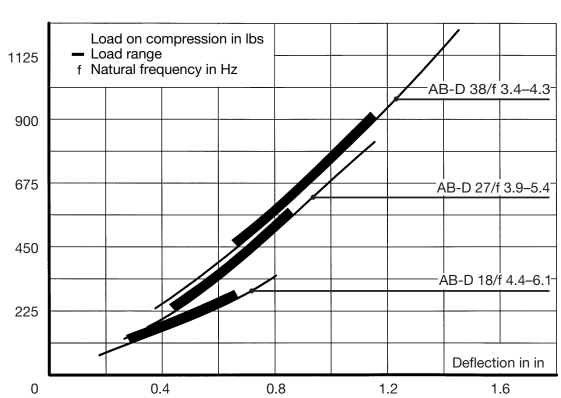
UPC #	Type	max. sw n_{err} = 740 rpm	max. sw n_{err} = 980 rpm	max. sw n_{err} = 1460 rpm	c_d at sw vertical	c_d at sw horizontal
75676	AB-D 18	0.20	0.16	0.12	570	0.16	114
63733	AB-D 27	0.24	0.20	0.16	913	0.16	200
63734	AB-D 38	0.31	0.28	0.20	1056	0.24	228
75677	AB-D 45	0.40	0.31	0.24	1312	0.31	400
63854	AB-D 50	0.47	0.40	0.31	1770	0.31	685
63855	AB-D 50-1.6	0.47	0.40	0.31	2455	0.31	913
63856	AB-D 50-2	0.47	0.40	0.31	3082	0.31	1130

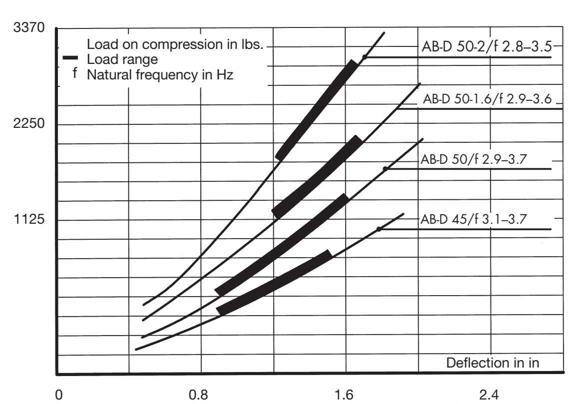
max. sw = max. amplitude in inch
c_d = dynamic spring value in lb/in, in nominal load range at n_{err} = 980 rpm (please respect max. amplitude in in).

Material Structure

The double housings of the sizes 18 to 45 are made out of light alloy profiles, the ones from size 50 in nodular cast; the inner squares in light alloy profiles; fixation brackets in steel.

Owing to the significantly shorter lever arm connections (in the double rubber suspension unit) the AB-D provides **a far higher loading capacity** compared with the type AB oscillating mountings with extremely compact construction. The linear cushioning produced under load, however, is sufficient to ensure the respectably low natural frequency of this oscillating mounting of approx. 3.5 Hz. At the oscillating machine frequency of approx. 16 Hz, the mounting provides an insulation efficiency of approx. 96 %.



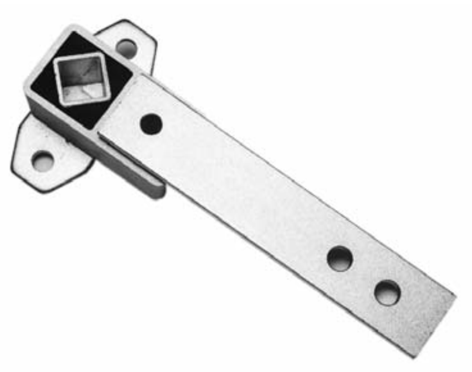


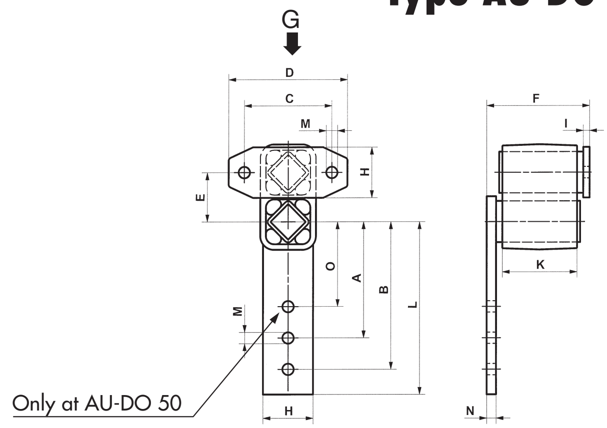
Oscillating Mountings

ROSTA

Oscillating Mounting

Type AU-DO





Technical Data (for free oscillating systems, only)

UPC #	Type	n_{err} = 740 rpm sw	c_d	G	n_{err} = 980 rpm sw	c_d	G	n_{err} = 1460 rpm sw	c_d	G
63 925	AU-DO 18	*	*	*	0.16	800	33	0.12	714	24
63 926	AU-DO 27	*	*	*	0.20	914	54	0.16	885	34
63 941	AU-DO 38	0.31	1085	117	0.28	1142	89	*	*	*
63 942	AU-DO 45	0.39	1370	209	0.31	1485	155	*	*	*
63 943	AU-DO 50	0.47	1999	319	0.39	2113	234	*	*	*

* = not recommendable
sw = max. amplitude in inch (peak to peak)
c_d = dynamic stiffness in lb/in, by ment. rpm. and amplitude
G = max. static load in lb per rocker, by ment. rpm. and amplitude
Nomogram for speed calculation, see table on page 67, below
Rocker arms for higher loads and different drive parameters are available on specific request.

Material Structure

The double housings are made out of light alloy profiles, the ones from size 50 in nodular cast. The rocker arms, inner squares and flanges in steel. All steel parts are galvanized and yellow passivated.

Dimensions

UPC #	Type	A	B	C	D	E	F	H	I	K	L	M	N	O	Weight in lbs.
63 925	AU-DO 18	4.33	5.12	2.36	3.35	1.22	2.87	1.38	0.20	1.97	5.91	0.37	0.31	–	2.43
63 926	AU-DO 27	4.72	5.91	3.15	4.33	1.73	3.27	1.77	0.20	2.36	6.89	0.45	0.31	–	4.08
63 941	AU-DO 38	5.31	6.69	3.94	5.51	2.36	4.25	2.36	0.24	3.15	7.87	0.55	0.39	–	6.17
63 942	AU-DO 45	6.30	8.07	5.12	7.09	2.87	5.35	2.76	0.31	3.94	9.45	0.71	0.47	–	13.34
63 943	AU-DO 50	7.28	9.25	5.51	7.48	3.07	6.50	3.15	0.39	4.72	10.83	0.71	0.59	5.31	21.50

For the initial selection of your shaker machine concept with AU-DO rockers please contact us, we have the appropriate electronic calculation program available for cross checking.

The AU-DO rocker arms were mainly developed for trough suspensions in **excited-chassis two-mass oscillating systems** (energetic amplification). The chassis **m¹** is excited by unbalanced motors and the spring accumulator units of the AU-DO mountings amplify the small oscillation amplitudes onto the screen or the conveyor trough **m².** The chassis of the machine has to be installed on low frequency mounts, ideally on ROSTA oscillating mountings type AB. These shaker systems are characterized by extremely low, hardly measurable residual force transmission to the machine foundations and are hence ideally suited for installation on steel scaffolding and false floors in processing building. Additional benefits of this system are the nearly noiseless running of the shaker, the low consumption of electric power and the easy installation of the spring accumulators.

These high stiffness accumulator arms are also highly suitable for the suspension of **freely oscillating single-mass systems** with unbalanced motor drive. This simple oscillating system allows the easy design of high speed conveying systems. Finally, the universal rocker arms from ROSTA are applicable in **crank-driven oscillating conveyor systems.** Here they have the function of trough guide and spring accumulator unit at the same time. This unique machine component is allowing to design different types of resonant shaking systems.

Oscillating Mounting

Type AU-DO

Free Oscillating Shaker System "Silent Flow"

Basics:

Two mass oscillating system with energetic amplification of trough mass (m_2)

Driven by two unbalanced motors

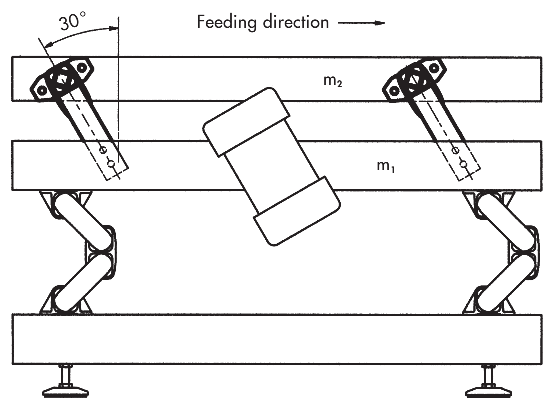
Amplitude fine-tuning by inverter

General Parameters:

Center distances between trough suspensions (depending on structure stiffness)	$m = 39.37 \ldots 59.06$ in
Ratio $m_1 : m_2$	$m_1 = 3 \cdot m_2$ (ideal) $m_1 = 2 \cdot m_2$ (minimum)

Basics of element selection:

(Please check also formulas point 3.1, page 52)



Total spring value [lb/in]

$$c_t = \frac{m_1 \cdot m_2}{m_1 + m_2} \cdot \left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot \frac{1}{g \cdot 12}$$

Quantity of required suspensions (AU-DO) for shaking function in resonance

$$z = \frac{c_t}{0.9 \cdot c_d}$$

Oscillating machine factor [–]

$$K = \frac{\left(\frac{2\pi}{60} \cdot n_{err}\right)^2 \cdot sw}{g \cdot 12 \cdot 2}$$

Total required centrifugal force of motor [lb]

$$F_z = z \cdot c_d \cdot \frac{sw}{2}$$

in using two unbalanced motors

$$\frac{F_z}{2}$$

Calculation Example

Given:

Required material speed	v_{th}	= 7.87 in/sec approx.
Weight of countermass m_1, with motors		= 203 lbs.
Weight of empty trough	m_2	= 66 lbs.
Material weight on trough on	m_2	= 18 lbs.
Effective coupling weight 20 %		= 3.6 lbs.
Total weight of trough	m_2	= 69.6 lbs.
Ratio mass	$m_1 : m_2$	= 2.9
Length of trough		= 47.24 in

Selection of the suspensions:

Excitation frequency	n_{err}	= 1460 rpm
Excitation amplitude	sw	= 0.16 in
Theoretical material speed (see diagram on page 67)	v_{th}	= 9.84 in/sec
Oscillating machine factor	K	= 5
Total dynamic spring value	c_t	= 3140 lb/in
Dynamic spring value for selection of suspensions	c_t (reserve included)	= 3489 lb/in
Quantity of suspensions type AU-DO 27 (c_d 885 lb/in)		= 4 (4·855 = 3540 lb/in)

Please check in table "technical data" on previous page, if the suspensions AU-DO 27 have the static load capacity of the mentioned mass (69.6 : 4 = 17.4 lbs. and max. capacity of the element is 33 lbs.)

Required centrifugal force per unbalanced motor*	= 140 lbs.

Selection of the supports AB under m_1

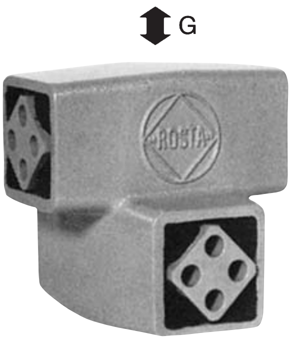
$$G = \frac{(m_1 + m_2)}{\textit{quantity AB}} = \frac{(203 \text{ lbs.} + 69.6 \text{ lbs.})}{4} = 68 \text{ lbs.} = 4 \cdot \text{AB } 27$$

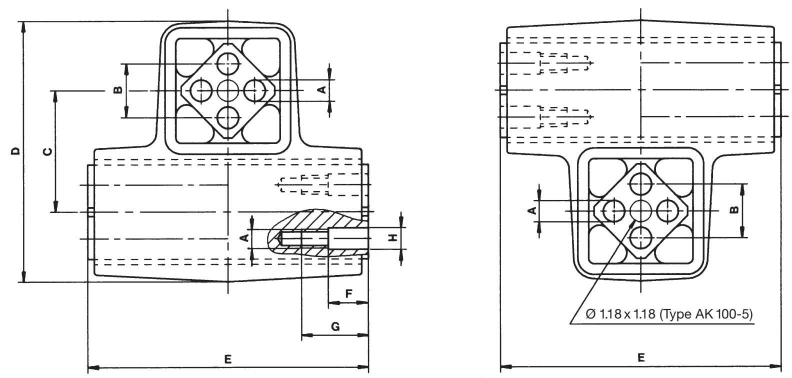
*(system with 2 motors)

ROSTA

Universal Joint

Type AK





UPC #	Type	G = max. load in lbs. per support	n max. in rpm at ± 5°	A	B	C	D	E	F	G	ØH	Weight in lbs.
				Dimensions in inches								
25 220	AK 15	35.97	1200	0.20	0.39	1.06	2.13	2.56	–	–	–	0.88
25 221	AK 18	67.44	800	0.24	0.47	1.26	2.52	3.35	–	–	–	1.32
25 222	AK 27	179.85	800	0.31	0.79	1.77	3.82	4.13	–	–	–	4.19
25 223	AK 38	359.70	800	0.39	0.98	2.36	5.12	5.12	–	–	–	8.16
25 224	AK 45	674.43	600	0.47	1.38	2.83	6.14	6.30	–	–	–	14.77
25 225	AK 50	1258.94	400	M12	1.57	3.07	6.69	8.27	1.57	2.76	0.48	25.13
25 226	AK 60	2248.10	300	M16	1.77	3.94	8.58	12.20	1.97	3.15	0.65	68.34
25 227	AK 80	4496.20	150	M20	2.36	5.35	11.14	16.14	1.97	3.54	0.81	160.94
57 674	AK 100-4	6744.30	100	M24	2.95	2.76	13.39	16.14	1.97	3.94	0.98	273.37
57 675	AK 100-5	8992.40	100	M24	2.95	6.69	13.39	20.08	1.97	3.94	0.98	326.28

For the fixation of the inner squares of the universal joints type AK 15 to AK 45 we suggest the use of threaded bolts passing the full element length. For the sizes AK 50 to AK 100 it is recommendable to use tension shaft screws quality 8.8. The inner square profiles of the AK 50 to AK 100 are also having lowered thread bores, in order to allow the use of tensile shaft screws.

Material Structure

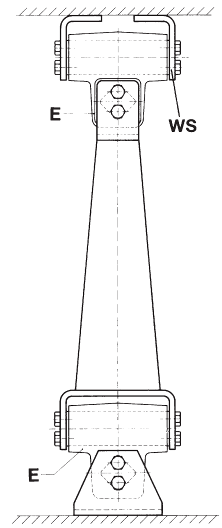
The housings of element types AK 27, 38, 45, 50, 60, 80 and 100-4 are made out of nodular cast; the other housings are made in welded steel structure. The inner squares of the sizes AK 15 to AK 50 are light alloy profiles; the squares of the types AK 60, 80 and 100 are made out of steel.

Universal Joint

Type AK

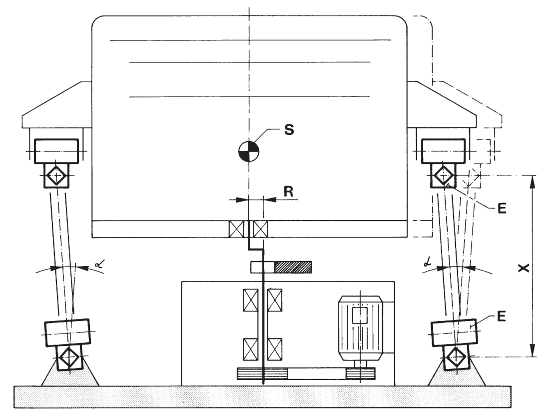
Joint Support

In order to obtain a regular torsional load on all elements and a harmonic circular motion, the inner elements "E" of the universal joints must be fitted offset 90° to the one underneath. The connection between the two universal joints AK and the support ready to be installed must be adapted to the corresponding installation height, and be provided by the customer. For the fixing of the inner square sections we recommend to use hexagonal shaft screws of 8.8 quality. For the size AK 50 or bigger there are threads borings on the inner squares of the elements.



Installation Guidelines

The oscillation angle α must not exceed 10° (±5°). Otherwise the elements "E" must be set with longer center distance (distance "X"). In order to eliminate the tilting and cardanic movements, the upper elements of the universal joint support are placed at the height close to the centre of gravity S of the screen box.



Typical Calculation ("upright" version)

Total oscillating mass m	= 3527 lbs.
Eccentric radius R	= 0.98 in
Support height X	= 31.49 in
Oscillating angle α	= 3.6°
Speed n_{err}	= 230 rpm
Number of universal joint supports z	= 4 pcs.

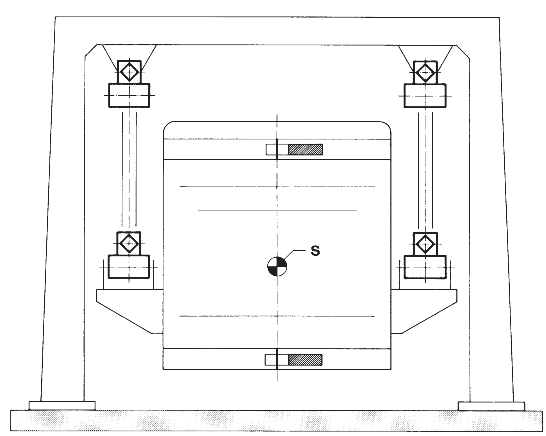
Max. dynamic load per support $G = \frac{3527 \cdot 1.25^*}{4}$ = 1102.2 lbs.

Selected: 4 supports with each 2 AK 50 elements = 8 AK 50

*= Due to the instability of the "upright" sifters, we include a security factor of 1.25 for the calculation of the AK elements.

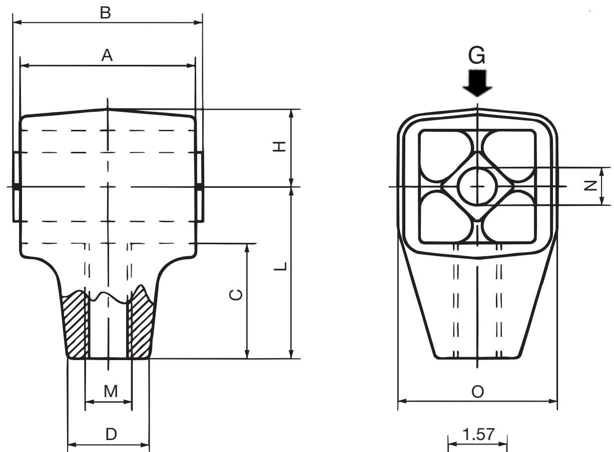
Suspended Version

We recommend our AK universal joints also for this version, which is especially used for screening tables and tumbling gyrators. Usually unbalanced motors are used to drive the screens, causing the discharge-end to oscillate freely (tumbling movements). The universal joints are under traction. However, the actual units remain the same. This version doesn't require a security factor.

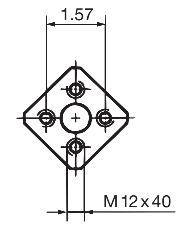


Oscillating Mounting

Type AV



Size AV 50



UPC #	Type	G	Dimensions in inches A	B	C	D	H	L	M	N	O	Weight in lbs.
63 374	AV 18	134.89 – 359.70	2.36	2.56	1.59	1.10	1.06	2.36	M 16	0.51	2.13	0.84
63 375	AV 18L	134.89 – 359.70	2.36	2.56	1.59	1.10	1.06	2.36	M 16 L	0.51	2.13	0.84
63 376	AV 27	292.25 – 674.43	3.15	3.54	2.09	1.65	1.46	3.15	M 20	0.63	2.91	2.18
63 377	AV 27L	292.25 – 674.43	3.15	3.54	2.09	1.65	1.46	3.15	M 20 L	0.63	2.91	2.18
73 378	AV 38	584.51 – 1124.05	3.94	4.33	2.64	1.89	1.73	3.94	M 24	0.79	3.50	3.84
73 379	AV 38L	584.51 – 1124.05	3.94	4.33	2.64	1.89	1.73	3.94	M 24 L	0.79	3.50	3.84
63 939	AV40	1011.29 – 1685.49	4.72	5.12	2.74	2.36	1.89	4.13	M36	0.79	3.66	9.92
63 940	AV40L	1011.29 – 1685.49	4.72	5.12	2.74	2.36	1.89	4.13	M36L	0.79	3.66	9.92
73 382	AV 50	1348.86 – 3596.96	7.87	8.27	3.35	3.15	2.36	5.12	M 42	–	4.57	27.09
73 383	AV 50L	1348.86 – 3596.96	7.87	8.27	3.35	3.15	2.36	5.12	M 42 L	–	4.57	27.09

G = max. load capacity in lbs per mount or rocker arm

Material Structure

The housings are made out of light metal die cast, housing of type AV 50 in nodular cast. Inner squares are light alloy profiles.

Typical Calculation

Given:

Total weight of oscillating mass m = 1764 lbs.

Circular oscillating, amplitude (peak to peak) = 1.57 in

Wanted:

Element size, configuration and center distance A

Load per arm: $\frac{m}{4} = \frac{1764}{4} = 441$ lbs.

Selected: 8 pcs. AV 27 (4 arms consisting of 2 AV 27, crosswise installed for purely circular motion).
Eventually with right- and left-hand threads.

Permissible center distance A by max. oscillation angle of 2°, and radius = 0.79 in:

$$A = \frac{0.79}{tg2°} = \frac{0.79}{0.034920769} = \underline{22.62}$$

Selected: center distance = 23 in

Oscillating Mounting

Type AV

Installation:

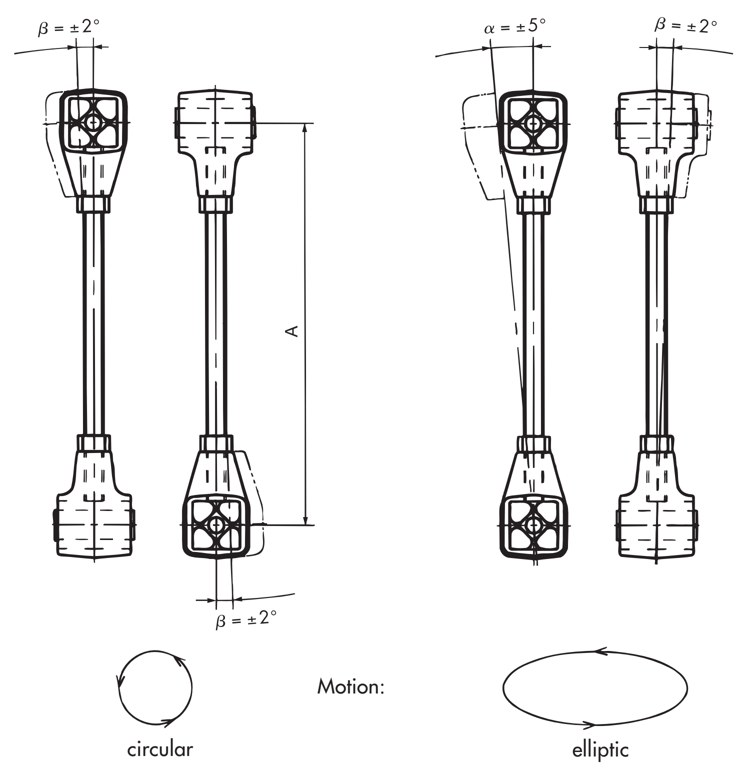


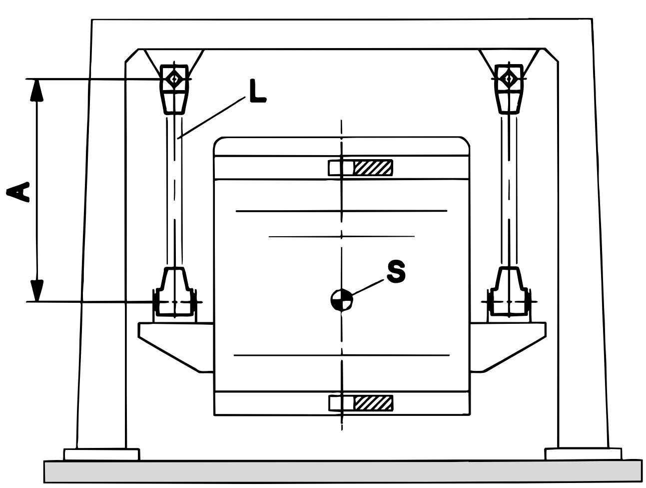
Fig. I: Element configuration "crosswise" (element axis offset 90°) for guiding *circular motions* of gyratory sifters.
Max. angle $\beta = \pm 2°$

Fig. II: Element configuration "parallel" (e.g. for support of Rotex-type screens) for guiding *elliptic motions.*
Max. angle $\alpha = \pm 5°$
Max. angle $\beta = \pm 2°$

The connection rod with nuts and spring washers has to be supplied by the customer.

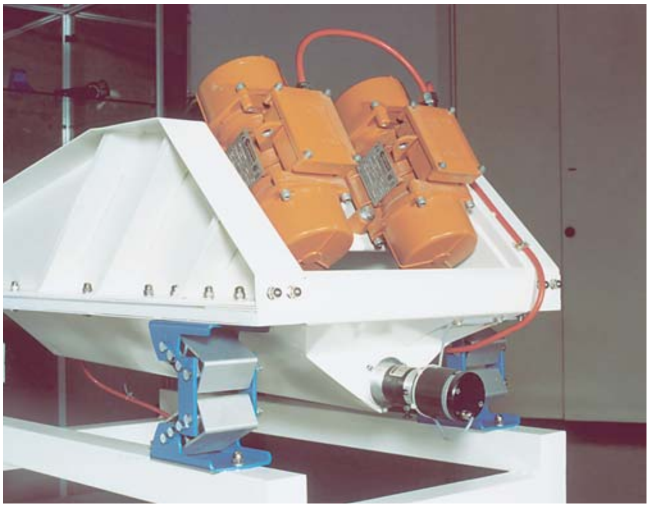
Installation

The length of the connection rod and the resulting centrifugal force determine the radius of the circular motion of the hanging gyratory screen or sifter. The rocker on the sifter should be fixed close to the centre of gravity (S) or slightly below the centre of gravity of the oscillating machine part (see sketch).
The standardised right- or left-hand threads of the AV elements allow a very easy adjustment of the four rocker arms (L) and thus of the length (A).
Use central screws (M12, M16, M20 and M24) to connect the rocker arm and the ceiling structure for elements sizes AB 18, 27, 38 and 45. For the AV 50 size use four M12 screws on both ends.

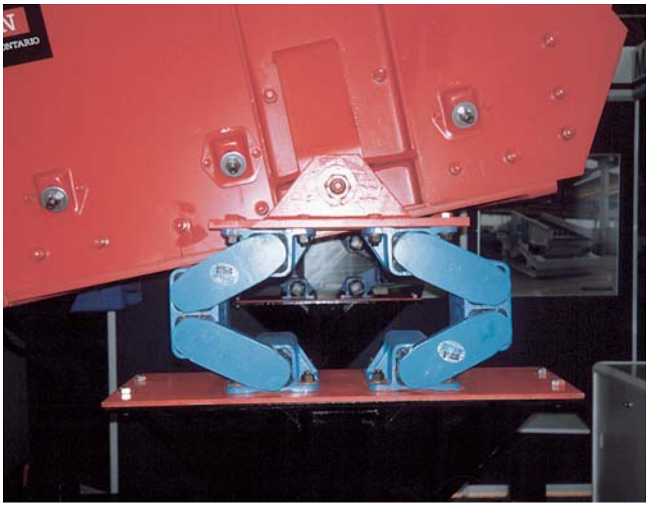


Applications

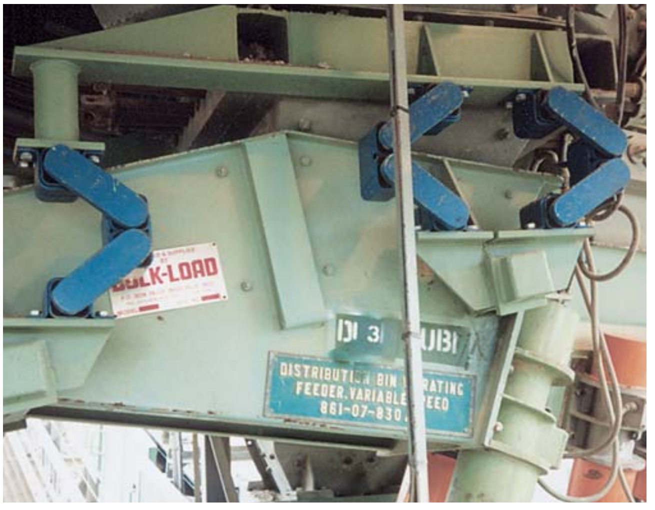
AB suspension of a vegetable feeder



AB-D suspension of a rice screen



AB suspension of a circular gravel screen



Hanging silo-discharge-feeder on AB

Stainless steel AB's supporting salad feeder

AB-D suspension of a dewatering screen