ROSTA-Oscillating Mountings

ROSTA

Technology

By virtue of their unique design, ROSTA rubber suspension units are eminently suited for guiding and linking a variety of vibrating and screening equipment. The jointed rubber spring assists the amplitudes to be transmitted to the actual oscillating equipment with a directional rotary rocking motion. Owing to the specific spring characteristic the element also acts as a virtually non-wearing spring accumulator, and is therefore predestined for linking applications in resonance vibration systems. Due to its unique design neither shear nor bending stresses occur at the support points – guaranteeing above-average life of the link rods.
ROSTA supplies standardized link rods, rocker arms, spring supports and universal joints for all kinds of shaking, conveying and screening machines with positive or freely oscillating drive systems. ROSTA oscillating mountings have proved their worth for decades in vibrating, oscillating and rotating machinery in general process engineering.

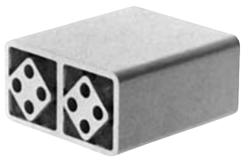
Superior Technology

lateral mounting for suspension and support

performs circular motions

acts as spring accumulator

maintenance-free oscillating bearing



prestressed: therefore hard wearing

compensates inaccuracies: optimal centering

high insulating efficiency due to low natural frequency

elastic rocking motion

high admissible oscillation frequency for maximum conveying performance

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 300 mm), and are specially suited for moving material in coarse lumps, as in mining.

Shaker conveyors have high frequencies (up to 10 Hz) and small amplitudes (up to about 20 mm). 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. Different Oscillation 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, AS-P or AS-C (see pages 52 to 57).
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 ratio R : L must be as low as possible in order to obtain harmonic excitation. The amplitude corresponds to the crank radius R, while the throw is 2 R. The frequencies of such slider crank oscillating troughs lie between 5 and 10 Hz, with throws between 10 and 40 mm. 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!

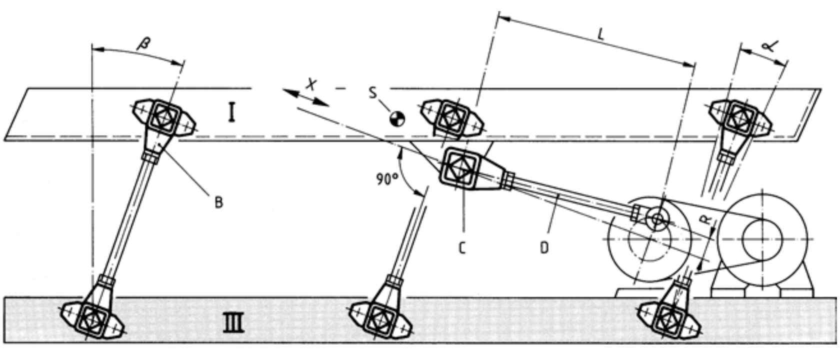


Fig. 1

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

Technology

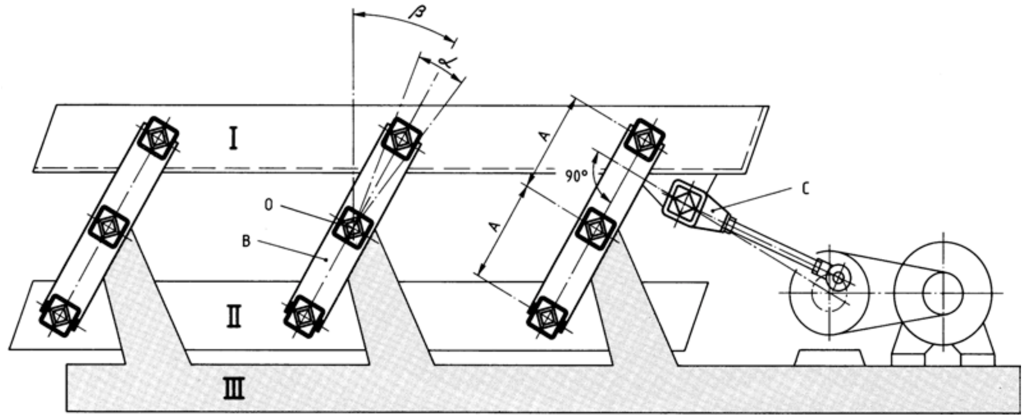
2.2. Two-mass Oscillation System with Positive Slider Crank Drive

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.

Our elements type AD-P and AD-C are fitted as double-suspension to support the two troughs on the machine frame (see pages 58 and 59). The system is driven by eccentric crank with the ROSTA drive head ST.

In contrast to the one-mass system, in the two-mass oscillation system the force introduction may be adapted wheresoever to the trough design. Also the drive may be applied optionally to trough I or II.



B ROSTA double suspensions type AD
C ROSTA oscillating drive head type ST
α Oscillation angle max. 10° (±5°)
β Rocker angle approx. 10° 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. 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 53 to 59.

Technology

3. Terminology and Calculation

3.1. Terminology

Symbol	Unit	term
a	$m \cdot s^{-2}$	Acceleration
A	mm	Distances between centres
c_d	N/mm	Dynamic spring value
c_t	N/mm	Total spring value
f	Hz	Frequency
f_e	Hz	Natural frequency
f_{err}	Hz	Excitation frequency
F	N	Force
g	$9.81 m/s^2$	Gravitational acceleration
K	$\frac{\text{machine acc.}}{\text{grav. acc.}}$	Oscillating machine factor
m	kg	Mass
M	Nm	Torque
n_e	min^{-1}	Revolutions per minute

Symbol	Unit	Term
R	mm	Crank radius
S	–	Center of gravity
sw	mm	Throw
t	s	Time
v	m/s	Velocity
v_{th}	m/s	Theoretical velocity
Z	–	Quantity (number)
W	%	Isolation efficiency
α	°	Oscillation angle
β	°	Rocker angle
Γ	–	Throw factor
ω	rad/s	Rotational frequency

3.2. Calculation

Formulas for calculating oscillating machines
by the known equation from oscillation theory

Total spring value	$c_t = m \cdot \left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot 10^{-3}$	[N/mm]
Natural frequency	$f_e = \frac{1}{2\pi} \cdot \sqrt{\frac{c_t \cdot 1000}{m}}$	[Hz]
Number of rocker suspensions for resonance operation	$z = \frac{c_t}{c_d}$	[piece]
Oscillating machine factor Ratio of machine acceleration to gravitational acceleration	$K = \frac{\left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot R}{9810}$	[–]
Throw factor	$\Gamma = K \cdot \sin\beta$	[–]
Accelerative force	$F = K \cdot m \cdot g$	[N]
Driving power (approximation)	$P \approx \frac{R \cdot K \cdot m \cdot g \cdot n_e}{9550 \cdot 1000 \cdot \sqrt{2}}$	[kW]

4. Free Oscillation Systems

Freely oscillating one-mass systems (figs. 4 to 6) are supported with ROSTA oscillating mountings type AB. In this case the angle at which the excitation force is applied determines the direction of oscillation. Thanks to the low frequency support, free oscillators impose only very small dynamic loads on the foundation. Because the dynamic flexural rigidity decreases as the square of the length, however, 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.

Suitable mounting of the drive 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 is 15 to 50 Hz.

4.1. Drive with one Unbalanced Motor

This alternative (fig. 4) is used mainly on rotary 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.

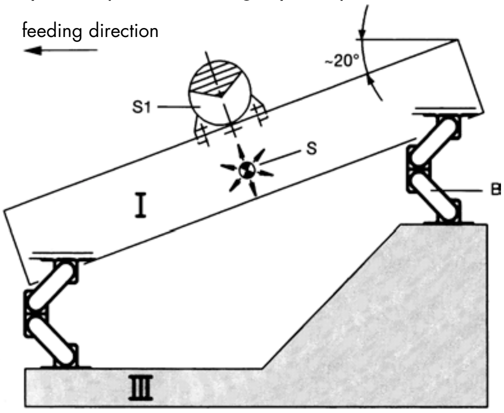
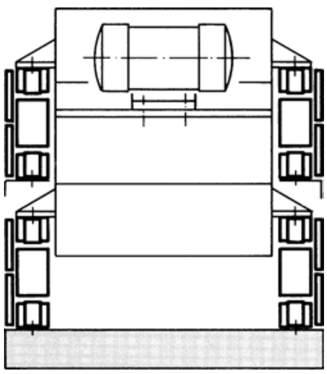


Fig. 4



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

4.2. Drive with one Unbalanced Motor and Oscillation Bearing

Linear oscillators with unbalanced motor on an oscillating bearing (fig. 5) are employed for screens and short, light conveyors.
If an unbalanced motor is flanged onto a machine through on an oscillating bearing E (e.g. DK-A with bracket BK, pages 21 and 26) 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 oscillating bearing the centrifugal forces are transmitted almost entirely to the screen or trough, where as the transverse forces remain ineffective. The oscillating bearing drive may be used only with smaller machines.

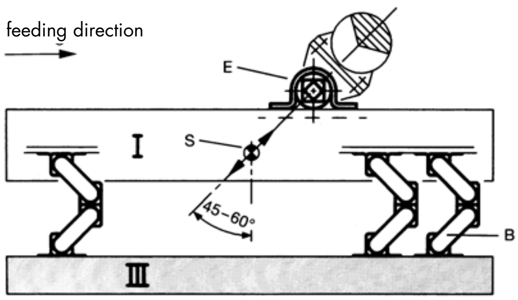
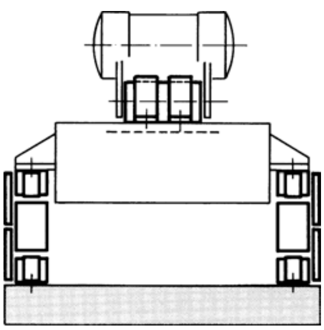


Fig. 5



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 conveyor or screen (fig. 6), it must be borne in mind that they counterrotate and are joined absolutely rigid, so that they synchronize at once when switched on, setting-up linear oscillations.

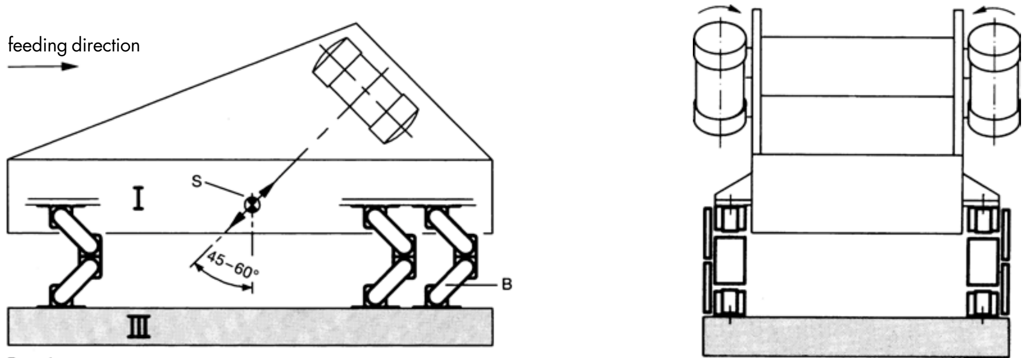


Fig. 6

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 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 6 supports, if not more, are needed for a linear oscillator. The excitation frequency may be neglected, because according to experience the amplitudes do not exceed 15 mm, 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.

Formulas for the principal variables of a free oscillator:

Oscillating amplitude

$$sw = \frac{\text{working torque in kgcm}}{\text{total weight in kg}} \cdot 10 = \quad \text{mm}$$

Oscillating machine factor

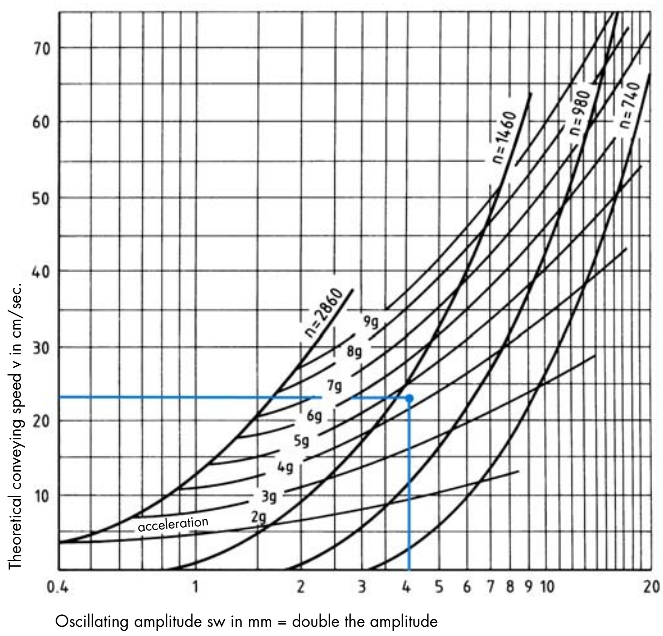
$$K = \frac{\left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot R}{9810} = [-]$$

Insulation efficiency

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

Nomogram: conveying speed for free oscillating screens

From the intersection of the coordinates amplitude = 4 mm and motor speed n = 1460 rpm, with acceleration around 5 g the conveying speed emerges as 25 cm/sec.



Product Range

ROSTA Oscillating Mounting Type AU

Pages 52 and 53

ROSTA oscillating mountings type AU are maintenance-free elastic joints for suspending or supporting conveying troughs, screens, sorters and all devices excited by eccentric drives or unbalanced motors with directed oscillations. They are primarily used for installations with an effective distance between the single units (rocker length A) in special designed small serie shakers and troughs, i.e. in cases the spacing of the AS type does not fit the construction.
These AU elements are mounted on the trough by means of fixing flanges. The housings are available with either right- or left-hand threads. They are joined together by means of a threaded rod which must be provided by the customer.
The rocker housings are made of die-cast aluminium, AU 50 and 60 types are made of spheroidal graphite cast iron. All cores have fixing plates made of steel.

ROSTA Rocker Suspension Type AS-P/AS-C

Pages 56 and 57

The ROSTA rocker suspension units type AS-P and AS-C are maintenance-free elastic guide arms used for the same purposes as the oscillating mountings type AU. This low-cost model is a suitable for fixed distances between the two bearings (rocker length A).
The AS-P types are mounted on the trough or the machine frame by means of fixing flanges. The AS-C types are designed to be frictionally engaged to the machine frame. The central mounting allows an easy adjustment of the rocking angle.
The housings and the inner square sections are made of welded steel. The core of the AS-P type is equipped with fixing plates which are similar to the ones of the AU type. The inner square section of the AS-C type is made of aluminium profile.

ROSTA Double Suspension Type AD-P/AD-C

Pages 58 and 59

The ROSTA double suspension units type AD-P/AD-C are used for suspending and supporting two-mass shaker systems. The centre point, for frame fixation, is in the middle of the double rocker arm.
The AD-P suspension units are mounted by means of fixing flanges. The AD-C model is designed to be frictionally engaged in the same way as the AS-C type.
The housings and the inner square sections are made of welded steel. The core of the AD-P type is equipped with fixing plates constructed analogously to the AU type. The inner square section of the AS-C type are made of aluminium profile.

ROSTA Oscillating Mounting Type AB

Pages 60 and 61

The ROSTA oscillating mountings type AB are maintenance-free elastic joints for suspending or supporting vibrating screens or shakers driven by different exciter systems. They guide the centrifugal forces in the conveying direction and optimally keep the oscillating part in linear direction. The extremely low resonant frequency guarantees best vibration isolation to substructure and basement. The AB mountings considerably reduce the uncontrolled tumbling of the spring supports by passing the natural frequency.
The AB oscillating units are mounted to the basement or the screen body by means of fixing clamps (except type AB 50), which allows to adjust these units also laterally when installing them.
The double housings of size 15 to 45 are made of light alloy; the housings of sizes 50 are made of spheriodal graphite cast iron.

Product Range

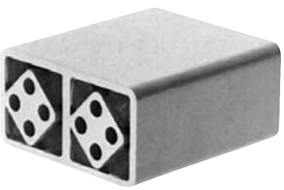
ROSTA Oscillating Drive Head Type ST

Page 62

ROSTA oscillating drive heads type ST are flexible joints transmitting the acceleration forces from eccentric drive to the oscillating machine part – free of play, silently, reliably and without requiring maintenance. The common maintenance problems which are characteristic of these drive components are thus eliminated.
The inner square section (core) and the trough are joined together by a so-called "fork". The outer housing is screwed to the slider crank rod and locked. Right- or left-hand threads are available, which allows the crank length to be adjusted easily.
The drive heads up to type ST 45 have got an aluminium housing and core; type ST 50 has a housing made of SC iron and an aluminium core; ST 60 and ST 80 have an SC iron housing and a steel core.

ROSTA Rubber Suspension Unit Type DO-A
used as elastic drive head or spring accumulator

Pages 63, 64 and 65



The ROSTA rubber suspension unit type DO-A for resonance shaker conveyors is used as an elastic oscillating drive head and/or as spring accumulator in natural frequency shakers. Its high dynamic stiffness, best reliability and maintenance-free functioning are the most important features of this component. The same element DO-A is used especially in general mechanical engineering (see page 23).
Types with sizes up to 45 have got aluminium housings. Types 50 have got SC iron housings; the inner square sections are made of light alloy with 4 holes allowing to fix them to the eccentric rod or shaker conveyor by means of a fork bracket.

ROSTA Universal Joint Type AK

Pages 66 and 67

The ROSTA universal joints type AK are maintenance-free elastic joints which can be moved in any direction. They are used as universal joint supports for mounting or suspending gyratory screens, screening tables, tumbling oscillators, sorters and screening machines positively driven by eccentrics or freely oscillating with unbalanced drive.
The types AK 27, AK 38, AK 45, AK 50 and AK 100 have got housings made of SC iron, all the other sizes are made of welded steel structures. The types AK 15 to AK 50 have got aluminium square sections, the other sizes have steel cores.

ROSTA Oscillating Mounting Type AV

Pages 68 and 69

The ROSTA oscillating mountings type AV are maintenance-free elastic joints designed for guiding circular motions of hanging screens such as gyratory sifters and screens in flour mills, chemical processing plants and paper mills.
The rubber inserts of these oscillating mountings are larger than the ones of the other ROSTA elements. Therefore they intensively absorb the vibrations of the hanging sifters and better protect the building structures and ceilings.
All these mounting types have got housings made of cast aluminium; only type AV 50 has got an SC-cast-iron housing. The cores are all made of aluminium profiles.

ROSTA Oscillating Mounting Type AR

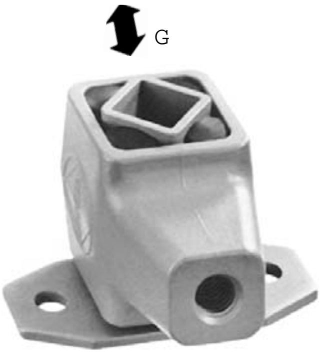
Pages 54 and 55

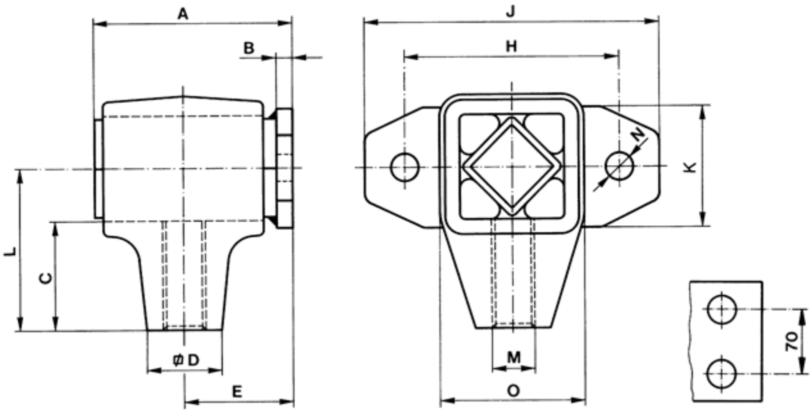
The ROSTA oscillating mountings type AR are maintenance-free elastic joints used for the same purposes as our other oscillating mounting types AU, AS or AD. The distance between the centres can be freely chosen. The commercial circular tube (connection between the two elements) must be supplied by the customer. The inner square profile is frictionally engaged to the machine frame, analogously to type AS-C and AD-C.
The housing of mounting type AR is made of cast aluminium, the core is made of aluminium profile.

ROSTA

Oscillating Mounting

Type AU





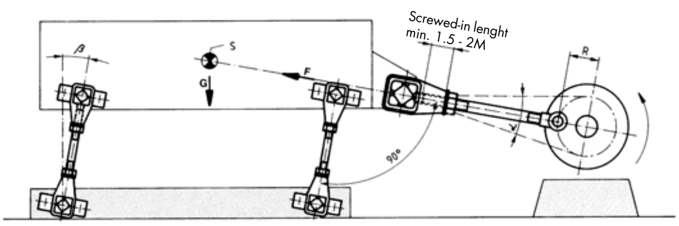
Fixing flange
AU 60

Art. Nº	Type	G	n_e	Md_d	A	B	C	D	E	H	J	K	L	M	N	O	Weight in kg
07011001	AU15	100	1200	0.44	50	4	29	20	28	50	70	25	40	M10	7	33	0.19
07021001	AU15L	100	1200	0.44	50	4	29	20	28	50	70	25	40	M10L	7	33	0.19
07011002	AU18	200	1200	1.32	62	5	31.5	22	34	60	85	35	45	M12	9.5	39	0.34
07021002	AU18L	200	1200	1.32	62	5	31.5	22	34	60	85	35	45	M12L	9.5	39	0.34
07011003	AU27	400	800	2.60	73	5	40.5	28	40	80	110	45	60	M16	11.5	54	0.65
07021003	AU27L	400	800	2.60	73	5	40.5	28	40	80	110	45	60	M16L	11.5	54	0.65
07011004	AU38	800	800	6.70	95	6	53	42	52	100	140	60	80	M20	14	74	1.55
07021004	AU38L	800	800	6.70	95	6	53	42	52	100	140	60	80	M20L	14	74	1.55
07011005	AU45	1600	800	11.60	120	8	67	48	66	130	180	70	100	M24	18	89	2.55
07021005	AU45L	1600	800	11.60	120	8	67	48	66	130	180	70	100	M24L	18	89	2.55
07011006	AU50	2500	600	20.40	145	10	70	60	80	140	190	80	105	M36	18	92	6.70
07021006	AU50L	2500	600	20.40	145	10	70	60	80	140	190	80	105	M36L	18	92	6.70
07011007	AU60	5000	400	46.60	233	15	85	80	128	180	230	120	130	M42	18	116	15.70
07021007	AU60L	5000	400	46.60	233	15	85	80	128	180	230	120	130	M42L	18	116	15.70

G = max. loading in N per unit or rocker suspension
n_e = max. frequency in min^{-1} at ∢ 10°, from zero ∢ ±5°
Md_d = dynamic torque in Nm/° at ∢ ±5°, in frequency range 300 – 600 min^{-1}
Mountings for higher loads available on request.

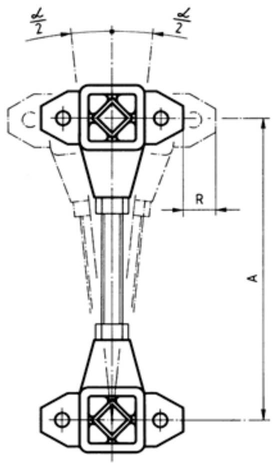
Guidelines for Fitting

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 de-signed 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

Type AU



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

Given:

Dynamic torque. Md_d = 2.6 Nm/°

Mounting with distance A between centres = 200 mm

Wanted:

Dynamic spring value c_d

$$c_d = \frac{Md_d \cdot 360 \cdot 1000}{A^2 \cdot \pi} = \frac{2.6 \cdot 360 \cdot 1000}{200^2 \cdot \pi} = 7.4 \text{ N/mm}$$

Typical Calculation

Given:

Weight of trough	= 200 kg
Material on trough	= 50 kg
of this 20% coupling effect	= 10 kg
Total weight of oscillating mass m (trough and coupling effect)	= 210 kg
Eccentric radius R	= 14 mm
Speed n_e	= 320 min^{-1}

Oscillating machine factor $K = \dfrac{\left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot R}{9810}$ = 1.6

Total spring value $c_t = m \cdot \left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot 10^{-3}$ = 235.8 N/mm

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 200 mm = 7.4 N/mm.

$$\text{Number of mountings} = \frac{c_t}{0.9 \cdot c_d} = \frac{235.8}{0.9 \cdot 7.4} = 35.4 \text{ pieces}$$

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

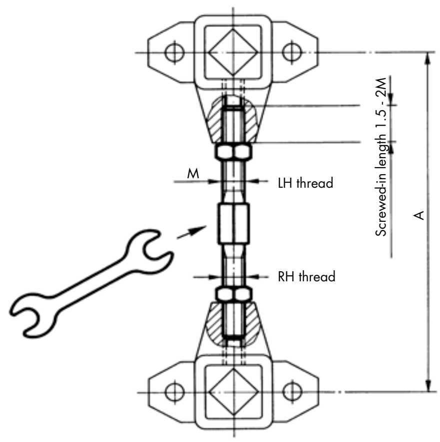
b) without resonance operation
Here the total weight G must be taken up by the total number of oscillating mountings. The admissible loading of one mounting comprising two AU 27 is 400 N.

$$\text{Number of mountings} = \frac{m \cdot g}{400} = \frac{210 \cdot 9.81}{400} = 5.15 \text{ pieces}$$

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

Connecting Rod

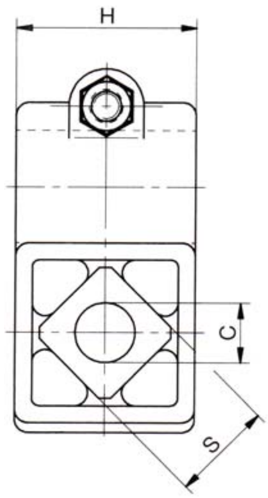
The connecting rod is provided by the customer, preferably with left/right-hand thread. Together with the associated oscillating mountings AU the distance between elements A can then be levelled steplessly. Lower costs may be attained, though at the price of rougher levelling, by using commercial rods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

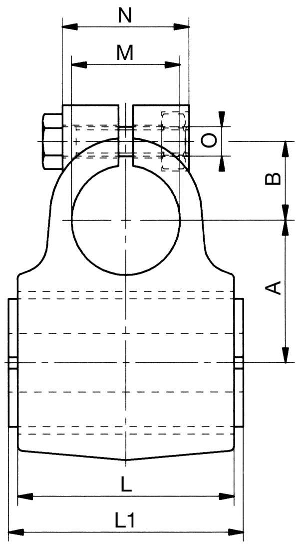


ROSTA

Oscillating Mounting

Type AR



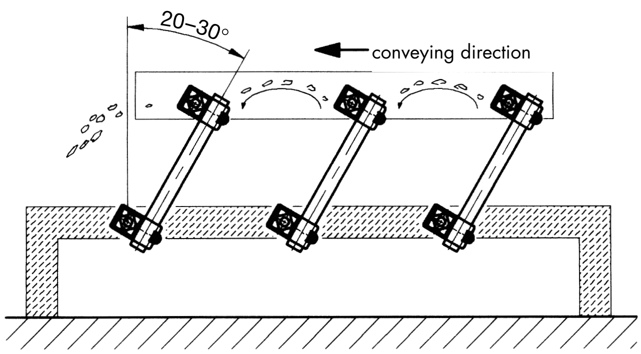


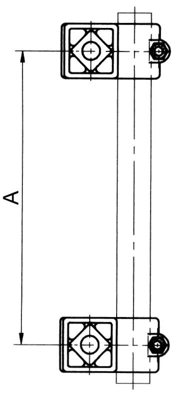
Art. Nº	Type	Load G in N K=2	K=3	K=4	n_e	Md_d	Dimensions in mm A	B	C	H	L	L1	M	N	O	S	Weight in kg
07291003	AR 27	300	240	200	590	2.6	$39^{\pm 0.2}$	21.5	$16^{+0.5}_{+0.3}$	48	60	$65^{0}_{-0.3}$	30	35	M8	27	0.45
07291004	AR 38	600	500	400	510	6.7	$52^{\pm 0.2}$	26.5	$20^{+0.5}_{+0.2}$	64	80	$90^{0}_{-0.3}$	40	50	M8	38	0.95

K = oscillating machine factor
n_e = max. frequency in min^{-1} with ∢ ±5°
Md_d = dynamic spring value in Nm/° at ∢ ±5°, in frequency range 300 – 600 min^{-1}

Oscillating Mountings

Single Drive Head





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

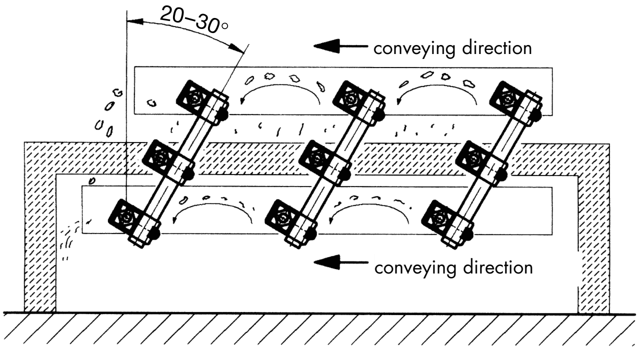
The dynamic spring value c_d of an oscillation unit consisting of 2 elements, type AR, is calculated as following:

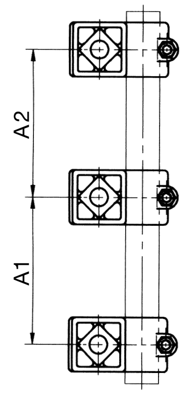
$$c_d = \frac{Md_d \cdot 360 \cdot 1000}{\pi \cdot A^2} = [N/mm]$$

Oscillating Mounting

Type AR

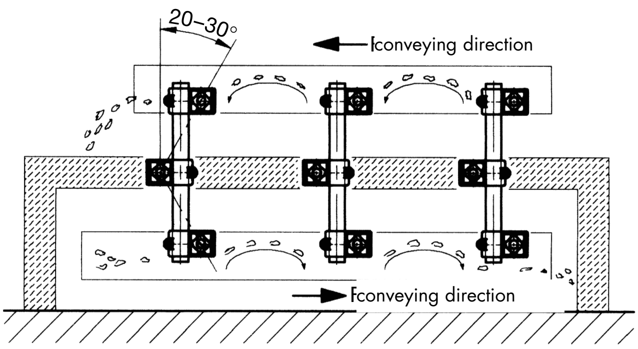
Double Drive Head

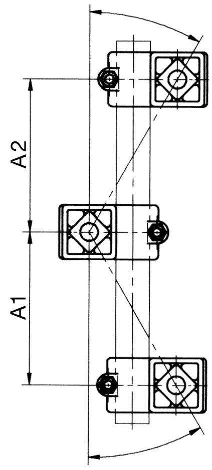




ROSTA oscillating mountings type AR in **double rocker configuration:** These elements are mounted in the same way as the single rocker arms. However, the material thickness of the round connection tube must be adapted according to the final center distances (see table on bottom left of this page). The 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 Drive Head





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:

$$c_d = \frac{3 \cdot 360 \cdot Md_d \cdot 1000}{4 \cdot \pi} \cdot \left(\frac{1}{A1^2} + \frac{1}{A2^2}\right) = [N/mm]$$

c_d = dynamic spring value in N/mm with torsion ∢ ±5°, frequency range 300 – 600 min^{-1}.

Dimensions of the Connecting Tubes

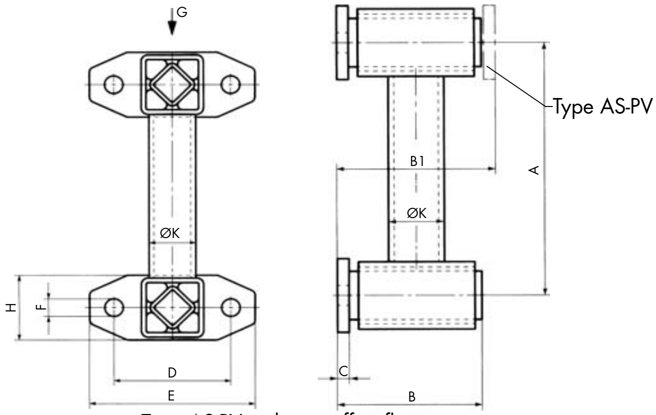
(to be provided by the customer)

	Dimensions in mm		
Type	Tube Ø	Min. thickness of tube	max. A1 or A2
AR 27	30	3*	160
	30	4	220
	30	5	300
AR 38	40	3*	200
	40	4	250
	40	5	300

* for single drive heads always use a thickness of 3 mm.

Rocker Suspension

Type AS-P



Type AS-PV with one offset flange

Art. No	Type	G	n_e	sw	c_d	A	B	C	D	E	F	H	ØK	Weight in kg
07 081 001 △	AS-P 15	100	1200	17	5	100	50	4	50	70	7	25	18	0.54
07 081 002	AS-P 18	200	1200	21	10	120	62	5	60	85	9.5	35	24	0.81
07 081 003	AS-P 27	400	800	28	12	160	73	5	80	110	11.5	45	34	1.79
07 081 004	AS-P 38	800	800	35	19	200	95	6	100	140	14	60	40	3.57
07 081 005 △	AS-P 45	1600	800	35	33	200	120	8	130	180	18	70	45	5.52
07 081 006 △	AS-P 50	2500	600	44	38	250	145	10	140	190	18	80	60	8.27

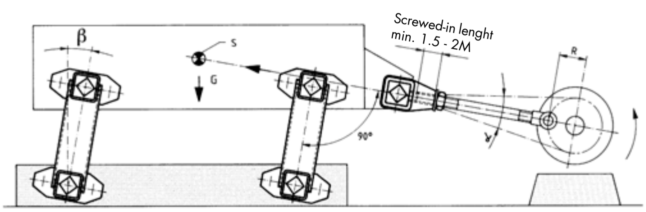
Art. No	Type	G	n_e	sw	c_d	A	B1	C	D	E	F	H	ØK	Weight in kg
07 091 001 △	AS-PV 15	100	1200	17	5	100	56	4	50	70	7	25	18	0.54
07 091 002	AS-PV 18	200	1200	21	10	120	68	5	60	85	9.5	35	24	0.81
07 091 003	AS-PV 27	400	800	28	12	160	80	5	80	110	11.5	45	34	1.79
07 091 004	AS-PV 38	800	800	35	19	200	104	6	100	140	14	60	40	3.57
07 091 005 △	AS-PV 45	1600	800	35	33	200	132	8	130	180	18	70	45	5.52
07 091 006 △	AS-PV 50	2500	600	44	38	250	160	10	140	190	18	80	60	8.27

G = max. loading in N per suspension
n_e = max. frequency in min^{-1} at ∢ 10°, from zero ∢ ±5°
sw = max. amplitude in mm
c_d = dynamic spring value in N/mm ∢ ±5°, in frequency range 300 – 600 min^{-1}
Suspensions for higher loads available on request.

△ available on request

Guidelines for Fitting

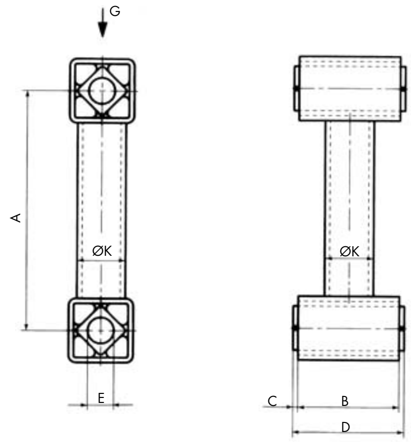
The rocker angle β of the rocker suspensions is 10° to 30° according the experience, depending largely on the conveying performance and the material to be moved. To secure optimal performance the troughs, screens etc. must be designed stiff and rigid. If the available space does not allow the suspensions 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.



ROSTA

Rocker Suspension

Type AS-C



Art. No	Type	G	n_e	sw	c_d	A	B	C	D	E	ØF	Weight in kg
07 071 001	△ AS-C 15	100	1200	17	5	100	40	2.5	45	$10^{+0.4}_{+0.2}$	18	0.38
07 071 002	AS-C 18	200	1200	21	10	120	50	2.5	55	$13^{0}_{+0.2}$	24	0.56
07 071 003	AS-C 27	400	800	28	12	160	60	2.5	65	$16^{+0.5}_{+0.3}$	34	1.31
07 071 004	AS-C 38	800	800	35	19	200	80	5	90	$20^{+0.5}_{+0.2}$	40	2.60
07 071 005	△ AS-C 45	1600	800	35	33	200	100	5	110	$24^{+0.5}_{+0.2}$	45	3.94
07 071 006	△ AS-C 50	2500	600	44	38	250	120	5	130	$30^{+0.5}_{+0.2}$	60	6.05

G = max. loading in N per suspension
n_e = max. frequency in min^{-1} at ∢10°, from zero∢ ±5°
sw = max. amplitude in mm
c_d = dynamic spring value in N/mm at∢±5°, in frequency range 300 – 600 min^{-1}
Suspensions for higher loads available on request.

△ available on request

Typical Calculation

Given:

Weight of trough = 200 kg
Material on trough = 50 kg
of this 20% coupling effect = 10 kg
Total weight of oscillating mass m
(trough and coupling effect) = 210 kg

Eccentric radius R = 14 mm

Speed n_e = 320 min^{-1}

Oscillating machine factor $K = \dfrac{\left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot R}{9810}$ = 1.6

Total spring value $c_t = m \cdot \left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot 10^{-3}$ = 235.8 N/mm

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 = 12 N/mm

Number of suspensions $= \dfrac{c_t}{0.9 \cdot c_d} = \dfrac{235.8}{0.9 \cdot 12} = 21.8$ pieces

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

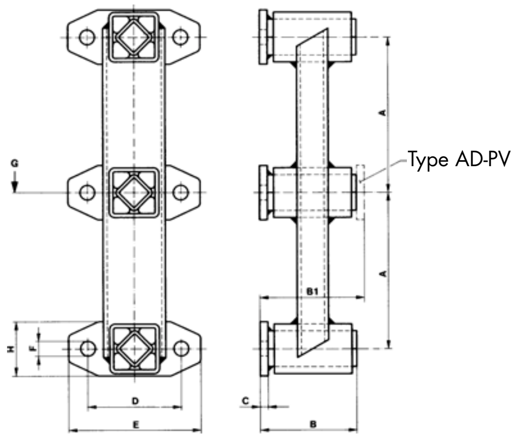
b) without resonance operation
Here the total weight G must be taken up by the total number of rocker suspensions. The admissible loading of one AS 27 suspension is 400 N.

Number of suspensions $= \dfrac{m \cdot g}{400} = \dfrac{210 \cdot 9.81}{400} = 5.15$ pieces

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

Double Suspension

Type AD-P



Type AD-PV with offset flanges

Art. Nº	Type	G K=2	G K=3	G K=4	n_e	sw	c_d	A	B	C	D	E	F	H	Weight in kg
07111001	AD-P18	150	120	100	640	17	22	100	62	5	60	85	9.5	35	1.21
07111002	AD-P27	300	240	200	590	21	32	120	73	5	80	110	11.5	45	2.55
07111003	AD-P38	600	500	400	510	28	45	160	95	6	100	140	14	60	5.54
07111004 △	AD-P45	1200	1000	800	450	35	50	200	120	8	130	180	18	70	8.51
07111005 △	AD-P50	1800	1500	1200	420	44	55	250	145	10	140	190	18	80	12.90

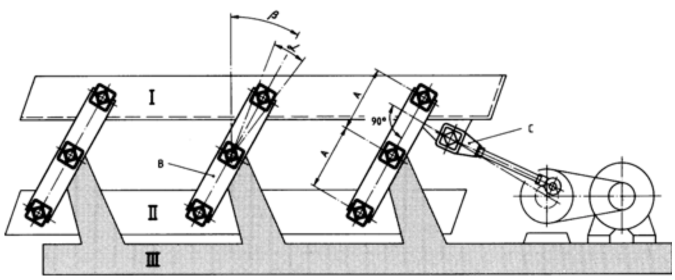
Art. Nº	Type	G K=2	G K=3	G K=4	n_e	sw	c_d	A	B_1	C	D	E	F	H	Weight in kg
07121001	AD-PV18	150	120	100	640	17	22	100	68	5	60	85	9.5	35	1.21
07121002	AD-PV27	300	240	200	590	21	32	120	80	5	80	110	11.5	45	2.55
07121003	AD-PV38	600	500	400	510	28	45	160	104	6	100	140	14	60	5.54
07121004 △	AD-PV45	1200	1000	800	450	35	50	200	132	8	130	180	18	70	8.51
07121005 △	AD-PV50	1800	1500	1200	420	44	55	250	160	10	140	190	18	80	12.90

G = max. loading in N per suspension
K = oscillating machine factor
n_e = max. frequency in min–1 at ∢10°, from zero ∢±5°
sw = max. amplitude in mm
c_d = dynamic spring value in N/mm at ∢±5°, in frequency range 300–600 min–1
Suspensions for higher loads or asymmetric distances between centres A available on request.

△ available on request

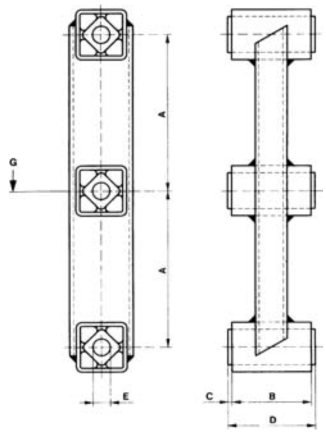
Guidelines for Fitting

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



Art. No	Type	K=2	K=3	K=4	n_e	sw	c_d	A	B	C	D	E	Weight in kg
07101001	AD-C18	150	120	100	640	17	22	100	50	2.5	55	$13_{-0.2}^{0}$	0.84
07101002	AD-C27	300	240	200	590	21	32	120	60	2.5	65	$16_{+0.3}^{+0.5}$	1.84
07101003	AD-C38	600	500	400	510	28	45	160	80	5	90	$20_{+0.2}^{+0.5}$	4.09
07101004	△ AD-C45	1200	1000	800	450	35	50	200	100	5	110	$24_{+0.2}^{+0.5}$	6.08

G = max. loading in N per suspension
K = oscillating machine factor
n_e = max. frequency in min–1 at ∢ 10°, from zero ∢ ±5°
sw = max. amplitude in mm
c_d = dynamic spring value in N/mm at ∢ ±5°, in frequency range 300–600 min–1
Suspensions for higher loads or asymmetric distances between centres A available on request.

△ available on request

Typical Calculation

Given:

Weight of trough	= 200 kg
Weight of counter mass	= 200 kg
Material on trough	= 50 kg
of this 20% coupling effect	= 10 kg
Total weight of oscillating mass m (trough counter mass and coupling effect)	= 410 kg
Eccentric radius R	= 14 mm
Speed n_e	= 360 min^{-1}
Oscillating machine factor $K = \frac{\left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot R}{9810}$	= 2.0
Total spring value $c_t = m \cdot \left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot 10^{-3}$	= 582.7 N/mm

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 = 45 N/mm

$$\text{Number of suspensions} = \frac{c_t}{0.9 \cdot c_d} = \frac{582.7}{0.9 \cdot 45} = 14.4 \text{ pieces}$$

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

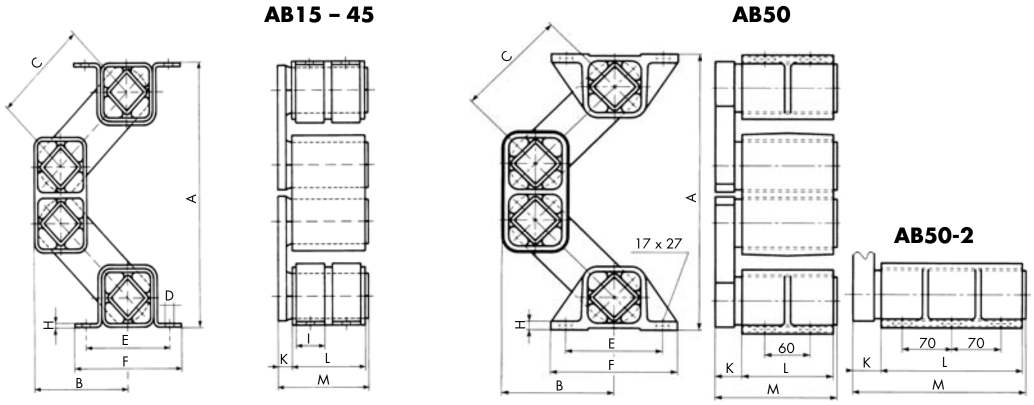
b) without resonance operation
Here the total weight G must be taken up by the total number of rocker suspensions. The oscillating machine factor K = 2.0 must be taken into account, also the admissible loading of one AD 38 under acceleration 2 g = 600 N

$$\text{Number of suspensions} = \frac{m \cdot g}{600} = \frac{410 \cdot 9.81}{600} = 6.7 \text{ pieces}$$

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

Oscillating Mounting

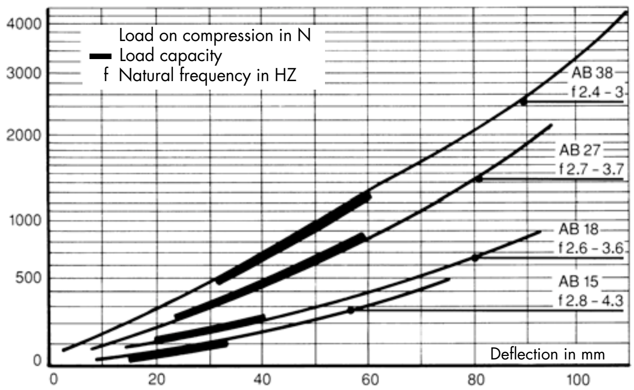
Type AB

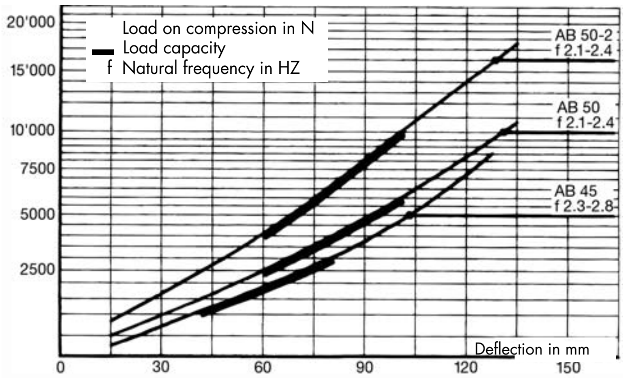


Art. No	Type	Load in N	A un loaded	A max. loaded	B un-loaded	B max. loaded	C	ØD	E	F	H	I	K	L	M	Weight in kg
07 051 001	AB 15	– 160	165	120	70	89	80	7	50	65	2	25	10	40	52	0.67
07 051 002	AB 18	120 – 300	203	150	87	107	100	9	60	80	2.5	30	14	50	67	1.35
07 051 003	AB 27	250 – 800	230	170	94	114	100	11	80	105	3	35	17	60	80	2.65
07 051 004	AB 38	600 – 1600	295	225	120	144	125	13	100	125	4	40	21	80	104	6.20
07 051 005	AB 45	1200 – 3000	340	260	137	164	140	13	115	145	5	45	28	100	132	10.60
07 051 006	AB 50	2500 – 6000	380	280	150	180	150	–	130	170	12	–	35	120	160	19.12
07 051 050	AB 50-2	4200 – 10000	380	280	150	180	150	–	130	170	12	–	40	200	245	30.00

c_d	AB 15	AB 18	AB 27	AB 38	AB 45	AB 50	AB 50-2
vertical	10	18	40	60	100	190	320
horizontal	6	14	25	30	50	85	140

c_d = dynamic spring value in N/mm, in nominal load range at n_e = 960 rpm, sw 8 mm





Brackets BR

For the fixation of the oscillating elements type AB 15 to AB 45 it requires clamps, which are not included in the "AB" article no. They have to be ordered according the bystanding list.

Art. No	Type	AB Type	Quantity per unit
01 500 002	BR 15	AB 15	2
01 500 003	BR 18	AB 18	2
01 500 004	BR 27	AB 27	2
01 500 005	BR 38	AB 38	4
01 500 006	BR 45	AB 45	4

Oscillating Mounting

Type AB

Typical Calculation

The size and number of the oscillating mountings type AB are calculated as follows: oscillating weight (device consisting of drive units and the material conveyed) divided by the number of supports. The excitation frequency can be ignored as the amplitudes do not exceed 15 mm. 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.

Given:

Weight of the empty trough with drive unit	= 680 kg
Material on trough	= 50 kg
of which 20% for coupling effect	= 10 kg
Total weight of oscillating mass m	
(trough, driving unit and coupling)	= 690 kg
6 support points	

Wanted:

Loading per support = $\frac{m \cdot g}{6} = \frac{690 \cdot 9.81}{6}$ = 1128.15 N

Selected: 6 units of type AB 38

See formulas on page 49 for calculating the amplitudes, machine factors and insulation efficiency.

Installation Guidelines

The ROSTA oscillating elements type AB have to be chosen according to the weight of the oscillating mass (see page 60). They must be installed between the screen structure and the basement, according to the position of the centre of gravity (see following example). 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 example). This way, the upper arms of the drive heads 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 support. **In order to assure an optimal conveying of the material it is important to fix the AB element 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).

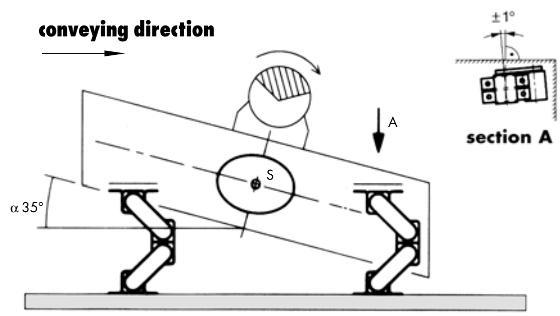


Fig. 1

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).

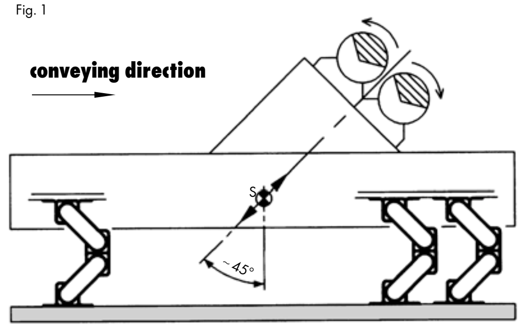


Fig. 2

C. Linear Oscillators with one unbalanced Motor on Pivoted Base
If the unbalanced motor is mounted on a pivoted base, 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 pivoted bases may be used only on smaller devices. Their inclination is usually 45° (see fig. 3).

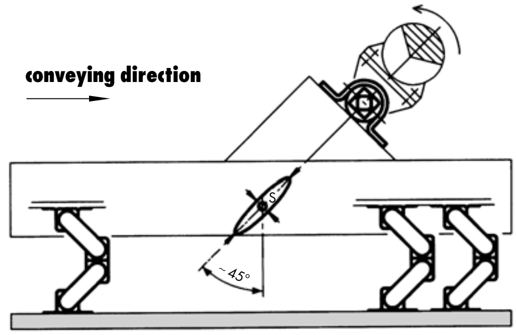
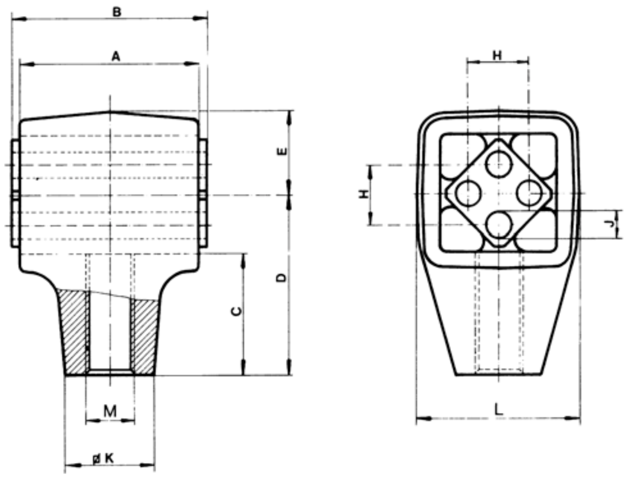


Fig. 3

Oscillating Drive Head

Type ST



Art. No	Type	F	∢ α max.	n_e max. in min^{-1}	A	$B^{0}_{-0.3}$	C	D	E	H	$J^{+0.5}_{0}$	K	L	M	Weight in kg
07031001	ST18	400	10°	1200	50	55	31.5	45	20	$12^{\pm0.3}$	Ø 6	22	39	M12	0.19
07041001	ST18L	400	10°	1200	50	55	31.5	45	20	$12^{\pm0.3}$	Ø 6	22	39	M12L	0.19
07031002	ST27	1000	10°	1200	60	65	40.5	60	27	$20^{\pm0.4}$	Ø 8	28	54	M16	0.42
07041002	ST27L	1000	10°	1200	60	65	40.5	60	27	$20^{\pm0.4}$	Ø 8	28	54	M16L	0.42
07031003	ST38	2000	10°	800	80	90	53	80	37	$25^{\pm0.4}$	Ø 10	42	74	M20	1.05
07041003	ST38L	2000	10°	800	80	90	53	80	37	$25^{\pm0.4}$	Ø 10	42	74	M20L	1.05
07031004	ST45	3500	10°	800	100	110	67	100	44	$35^{\pm0.5}$	Ø 12	48	89	M24	1.83
07041004	ST45L	3500	10°	800	100	110	67	100	44	$35^{\pm0.5}$	Ø 12	48	89	M24L	1.83
07031005	ST50	6000	10°	600	120	130	70	105	48	$40^{\pm0.5}$	M12 x 40	60	93	M36	5.50
07041005	ST50L	6000	10°	600	120	130	70	105	48	$40^{\pm0.5}$	M12 x 40	60	93	M36L	5.50
07031006	ST60	12000	6°	400	200	210	85	130	60	45	M16 x 22	80	116	M42	16.30
07041006	ST60L	12000	6°	400	200	210	85	130	60	45	M16 x 22	80	116	M42L	16.30
07031007	ST80	24000	6°	400	300	310	100	160	77	60	M20 x 28	100	150	M52	31.00

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

Typical Calculation

Given:

Weight of trough = 200 kg
Material on trough = 50 kg
of this 20% coupling effect = 10 kg
Total weight of oscillating mass m
(trough and coupling effect) = 210 kg
Eccentric radius R = 14 mm
Speed n_e = 320 min^{-1}
Connecting rod lenght L = 600 mm
Ratio R : L = 1 : 0.023; α = ±1.3°

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

Wanted:

Acceleration force F in N

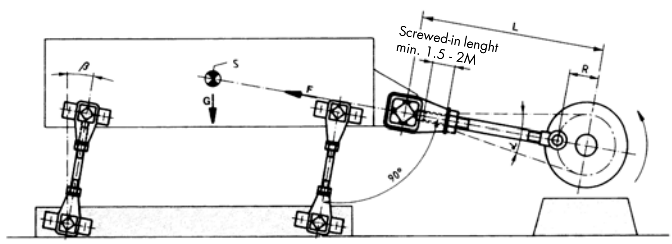
$$F = m \cdot R \cdot 10^{-3} \cdot \left(\frac{2\pi}{60} \cdot n_e\right)^2$$

$$= 210 \cdot 14 \cdot 10^{-3} \cdot \left(\frac{2\pi}{60} \cdot 320\right)^2 = 3301 \text{ N}$$

Selected: 1 piece of ST 45

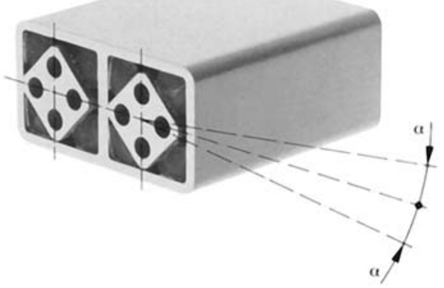
Guidelines for Fitting

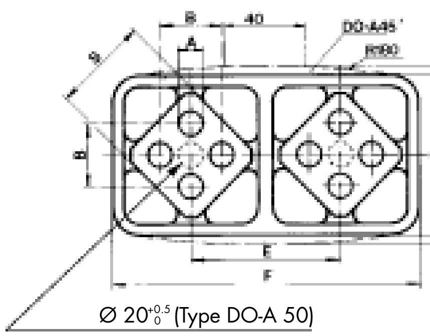
For ideal conditions the force introduction should be applied slightly ahead of the centre of gravity S and 90° to the angle β. The element axis must be 90° to the longitudinal axis of the trough and run centrally to the centre of gravity S. Fixing is done with shaft screws of 8.8 quality (analogous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

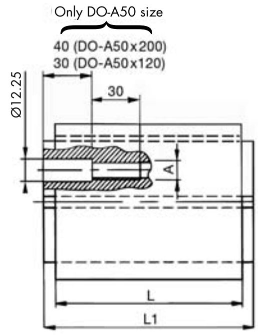


Rubber Suspension Unit (as elastic drive head)

Type DO-A







Art. N°	Type	c_d	L	$L1^{0}_{-0.3}$	A	B	D	E	F	S	Weight in kg
01 041 008	DO-A 27 x 60	160	60	65	$8^{+0.5}_{0}$	$20^{\pm0.4}$	$47^{+0.15}$	44	$91^{+0.2}_{0}$	27	0.47
01 041 011	DO-A 38 x 80	210	80	90	$10^{+0.5}_{0}$	$25^{\pm0.4}$	$63^{+0.2}$	60	$123^{+0.3}_{0}$	38	1.15
01 041 014	DO-A 45 x 100	260	100	110	$12^{+0.5}_{0}$	$35^{\pm0.5}$	85	73	$149.4^{+1.6}_{-0.4}$	45	2.26
01 041 016	DO-A 50 x 120	400	120	130	M12	$40^{\pm0.5}$	89	78	167	50	5.50
01 041 017	DO-A 50 x 200	600	200	210	M12	$40^{\pm0.5}$	89	78	167	50	8.50

c_d = dynamic spring value in N/mm at ∢ ±5°, in frequency range 300–600 min^{-1}
Elements with higher load capacity are available on request.
* DO-A 45 with convex housing shape.

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 = 210 kg
Speed n_e = 320 min^{-1}
Eccentric radius R = 14 mm

Wanted:

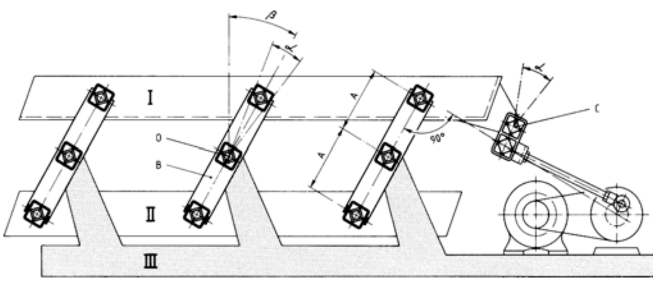
Total spring value c_t in N/mm

$$c_t = m \cdot \left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot 10^{-3} = 210 \cdot \left(\frac{2\pi}{60} \cdot 320\right)^2 \cdot 10^{-3} = 235.8 \text{ N/mm}$$

Selected: 1 piece of DO-A 45 x 100

Guidelines for Fitting

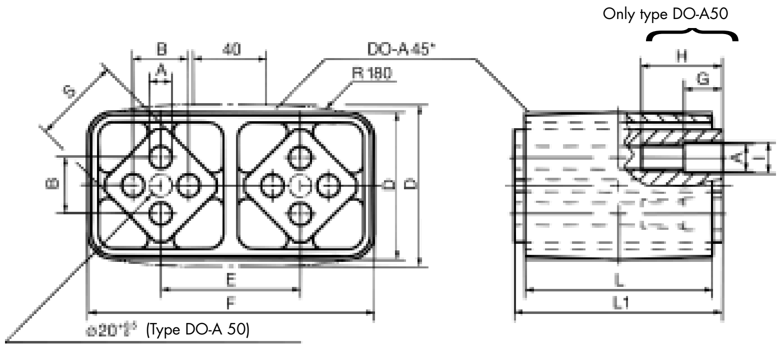
The elastic slider crank drive may be applied optionally onto the trough I or the contermass II, at the beginning of the trough or elsewhere. Force introduction must be 90° to the angle β of the rocker suspensions. The unit axis must be 90° to the longitudinal axis of the conveyor trough and run centrally 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!**



ROSTA

Rubber Suspension Unit (as spring accumulator)

Type DO-A

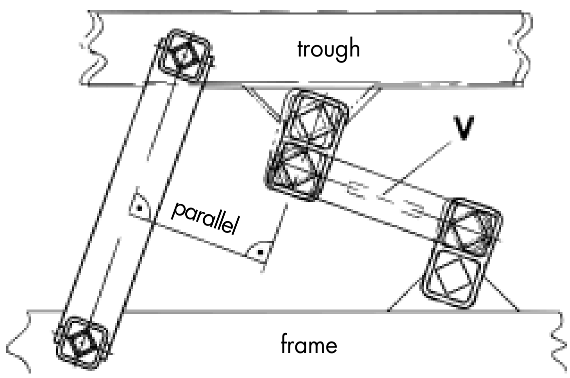


Art. No	Type	c_d	L	$L1_{-0.3}^{0}$	A	B	D	E	F	G	H	I	S	Weight in kg
01041014	DO-A 45 x 100	260	100	110	$12^{+0.5}_{0}$	$35^{\pm0.5}$	85	73	$149.4^{+1.6}_{-0.4}$				45	2.26
01041016	DO-A 50 x 120	400	120	130	M12	$40^{\pm0.5}$	89	78	167	30	60	12.25	50	5.50
01041017	DO-A 50 x 200	600	200	210	M12	$40^{\pm0.5}$	89	78	167	40	70	12.25	50	8.50

* DO-A 45 with convex housing shape.

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_e
2 x DO-A45 x 100	130	±5°	12.5	25.0	480
		±4°	10.0	20.0	720
		±3°	7.5	15,0	1200
2 x DO-A50 x 120	200	±5°	13.6	27.2	420
		±4°	10.9	21.8	600
		±3°	8.2	16.4	960
2 x DO-A50 x 200	300	±5°	13.6	27.2	380
		±4°	10.9	21.8	540
		±3°	8.2	16.4	860

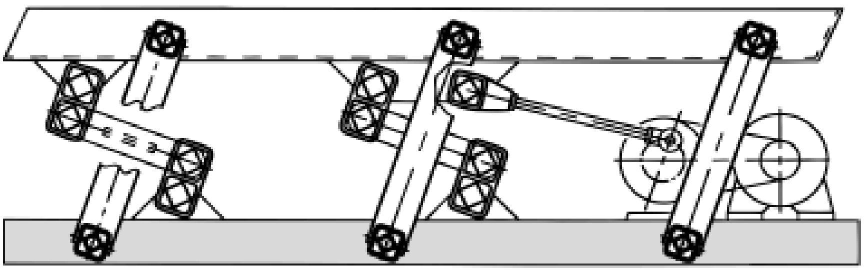


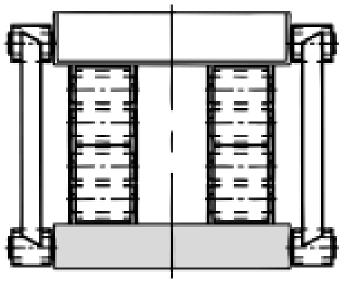
c_d = dynamic spring value in N/mm
R = permissible radius in mm
sw = max. amplitude (peak to peak) in mm
n_e = max. frequency in min^{-1}

ROSTA

Rubber Suspension Unit — Type DO-A

As Spring Accumulators 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. The total spring value c_t of the trough should be approximately equal to the stiffness of the oscillating elements. The installation of rocker suspensions allows the number of guide heads to be reduced to a minimum according to the structure stiffness. 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	= 375 kg
Revolutions per minute n_e	= 460 min^{-1}
Crank radius R	= 6 mm
Oscillating machine factor K	= 1.4
Total spring value $c_t = m \cdot \left(\frac{2\pi}{60} \cdot n_e\right)^2 \cdot 10^{-3}$	= 870 N/mm

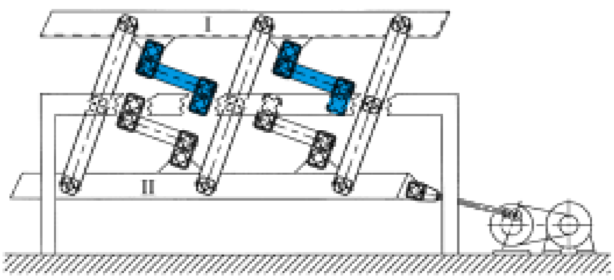
Wanted:

Number of rocker suspensions for operation close to the resonance frequency

Load per rocker $= \frac{m \cdot g}{8} = \frac{375 \cdot 9.81}{8}$	= 459.8 N
——► 8 AS-C 38 units are necessary	
Spring value c_d = 8 · 19 N/mm	= 152 N/mm
4 rocker suspensions each consisting of 2 DO-A 50 x 120 elements with c_d = 200 N/mm each	= 800 N/mm
Total c_d of all ROSTA rubber suspension units	= 952 N/mm
Necessary total spring value c_t of trough	= 870 N/mm
Reserve value for overload	= 82 N/mm (= 9.4%)

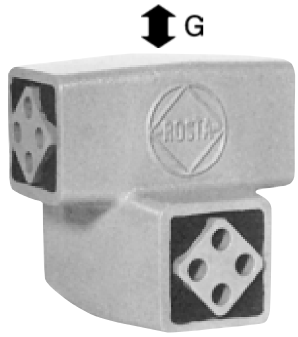
Suspension Units for Two-mass Oscillating Conveyor Trough

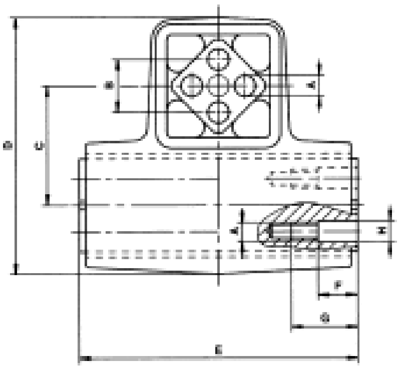
The installation of the two-mass oscillation conveyor system (see page 46) must be done according to the figure on the right.
The accumulators are mounted either on trough I and on the machine frame (see blue elements) or on the frame and on counterweight II.
When calculating the total spring value c_t of the two-mass oscillating machine it is necessary to **fully include** the counterweight.

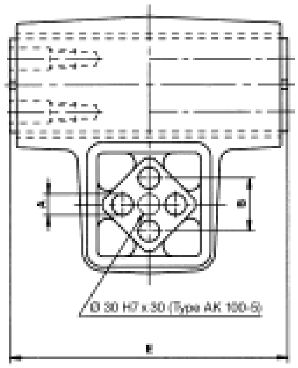


Universal Joint

Type AK



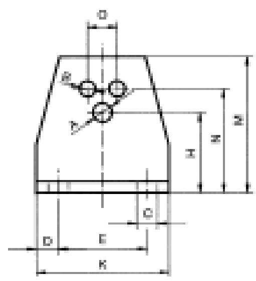


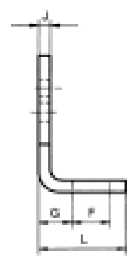


Art. Nº	Type	G = max. Load in N per support	n_e max. in min^{-1} at ±5°	A	B	C	D	$E^{0}_{-0.3}$	F	G	ØH	Weight in kg
07061001	AK 15	160	1200	$5^{+0.5}_{0}$	$10^{\pm0.2}$	27	54	65	–	–	–	0.40
07061002	AK 18	300	800	$6^{+0.5}_{0}$	$12^{\pm0.3}$	32	64	85	–	–	–	0.60
07061003	AK 27	800	800	$8^{+0.5}_{0}$	$20^{\pm0.4}$	45	97	105	–	–	–	1.90
07061004	AK 38	1600	800	$10^{+0.5}_{0}$	$25^{\pm0.4}$	60	130	130	–	–	–	3.70
07061005	AK 45	3000	600	$12^{+0.5}_{0}$	$35^{\pm0.5}$	72	156	160	–	–	–	4.50
07061011	AK 50	5600	400	M12	$40^{\pm0.5}$	78	156	210	40	70	12.25	8.00
07061007	AK 60	10000	300	M16	45	100	200	310	50	80	16.50	31.00
07061008	AK 80	20000	150	M20	60	136	272	410	50	90	20.50	73.00
07061009	AK 100-4	30000	100	M24	75	170	340	410	50	100	25	124.00
07061010	AK 100-5	40000	100	M24	75	170	340	510	50	100	25	148.00

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.

Support Type WS





Art. Nº	Type	fit to AK	A	B	C	D	E	F	G	H	J	K	L	M	N	O	Weight in kg
06590001	WS 11–15	15	6.5	5.5	7	7.5	30	13	11.5	27	4	45	30	46	35	10	0.08
06590002	WS 15–18	18	8.5	6.5	7	7.5	40	13	13.5	34	5	55	32	58	44	12	0.15
06590003	WS 18–27	27	10.5	8.5	9.5	10	50	15.5	16.5	43	6	70	38	74	55	20	0.28
06590004	WS 27–38	38	12.5	10.5	11.5	12.5	65	21.5	21	57	8	90	52	98	75	25	0.70
06590005	WS 38–45	45	16.5	12.5	14	15	80	24	21	66	8	110	55	116	85	35	0.90
06590006	WS 45–50	50	20.5	12.5	18	20	100	30	26	80	10	140	66	140	110	40	1.80

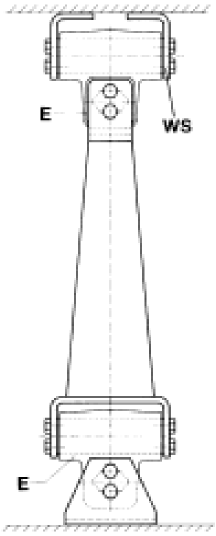
The bores "B" are designed for the fixation of the AK inner profiles.

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. Up to size 50 it is possible to mount the standard WS angle brackets as supports. 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 available to be used instead of the through bores.



Installation Guidelines

The oscillation angle α must not exceed 10° (±5°). Otherwise the elements "E" must be set further apart (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.

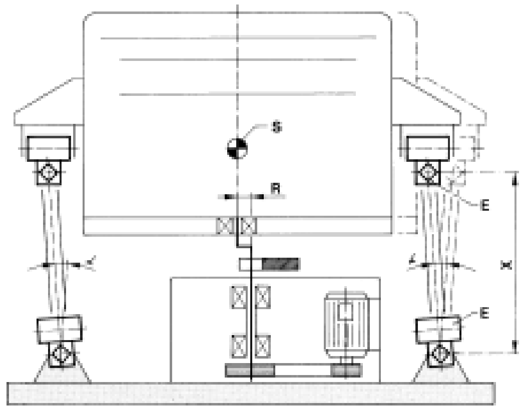
Typical Calculation ("upright" version)

Total oscillating mass m	= 1600 kg
Eccentric radius R	= 25 mm
Support height X	= 800 mm
Oscillating angle α	= 3.6°
Speed n_e	= 230 min^{-1}
Number of universal joint supports z	= 4 pcs.

Max. dynamic load per support $G = \frac{1600 \cdot 9.81 \cdot 1.25^*}{4}$ = 4905 N

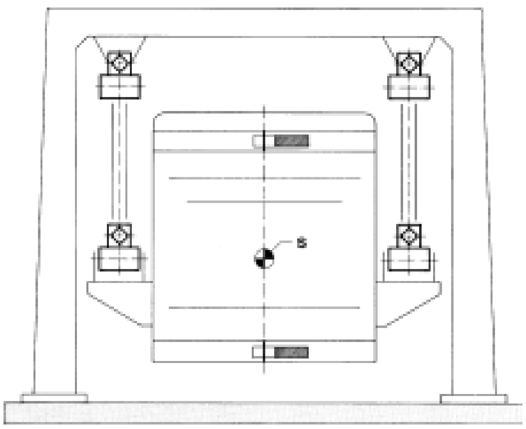
Selected: 4 supports with each 2 AK 50 elements = 8 AK 50

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



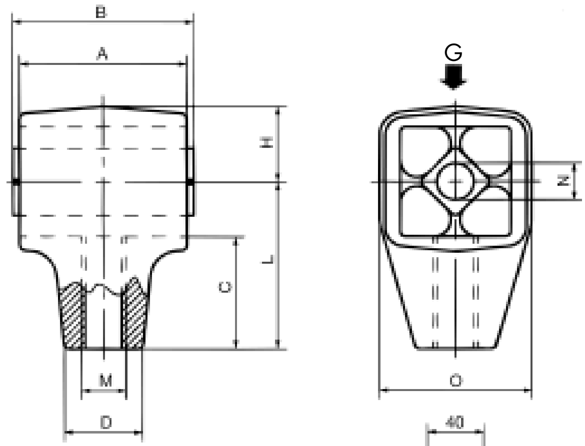
Suspended Version

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 units to oscillate freely (tumbling movements). The universal joints are under tension. However, the actual units remain the same. This version doesn't require a security factor.

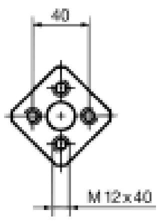


ROSTA

Oscillating Mounting — Type AV



Size AV 50



Art. No	Type	Load G in N	Dimensions in mm									Weight in kg
			A	$B^{0}_{-0.3}$	C	D	H	L	M	N	O	
07261001	AV 18	600 – 1600	60	65	40.5	28	27	60	M16	$13^{0}_{-0.2}$	54	0.38
07271001	AV 18L	600 – 1600	60	65	40.5	28	27	60	M16L	$13^{0}_{-0.2}$	54	0.38
07261002	AV 27	1300 – 3000	80	90	53	42	37	80	M20	$16^{+0.5}_{+0.3}$	74	0.99
07271002	AV 27L	1300 – 3000	80	90	53	42	37	80	M20L	$16^{+0.5}_{+0.3}$	74	0.99
07261003	AV 38	2600 – 5000	100	110	67	48	44	100	M24	$20^{+0.5}_{+0.2}$	89	1.74
07271003	AV 38L	2600 – 5000	100	110	67	48	44	100	M24L	$20^{+0.5}_{+0.2}$	89	1.74
07261004	AV 45	4500 – 10000	150	160	75	60	54	115	M36	$24^{+0.5}_{+0.2}$	108	4.50
07271004	AV 45L	4500 – 10000	150	160	75	60	54	115	M36L	$24^{+0.5}_{+0.2}$	108	4.50
07261005	AV 50	6000 – 16000	200	210	85	80	60	130	M42	–	116	12.29
07271005	AV 50L	6000 – 16000	200	210	85	80	60	130	M42L	–	116	12.29

Typical Calculation

Given:

Total weight of oscillating mass m = 800 kg

Circular oscillating, amplitude (peak to peak) = 40 mm

Wanted:

Element size, configuration and center distance A

Load per arm: $\frac{m \cdot g}{4} = \frac{800 \cdot 9.81}{4} = 1962$ N

Selected: 8 pcs. AV27 (4 arms consisting of 2 AV27, 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 = 20 mm:

$$A = \frac{20}{tg2°} = \frac{20}{0.034920769} = \underline{572.72 \text{ mm}}$$

Selected: center distance = 600 mm

Oscillating Mounting Type AV

Installation

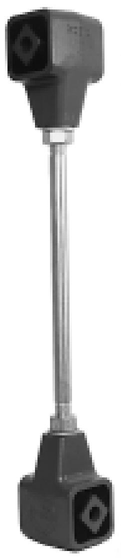


Fig. I

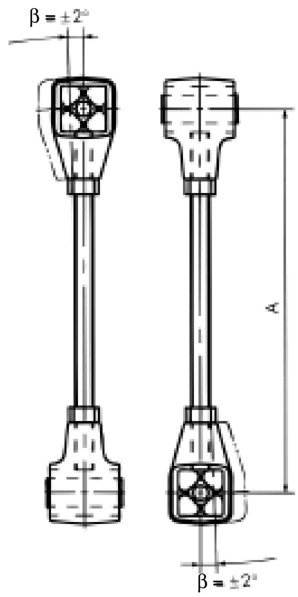
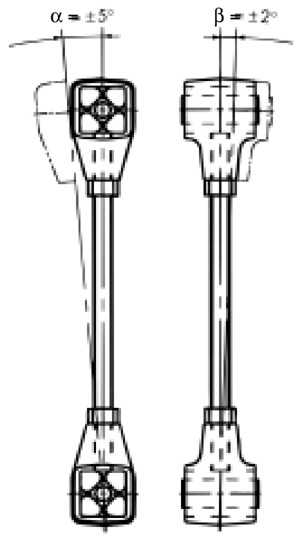
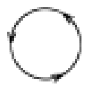


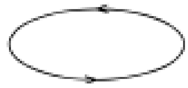
Fig. II





circular

Motion:



elliptic

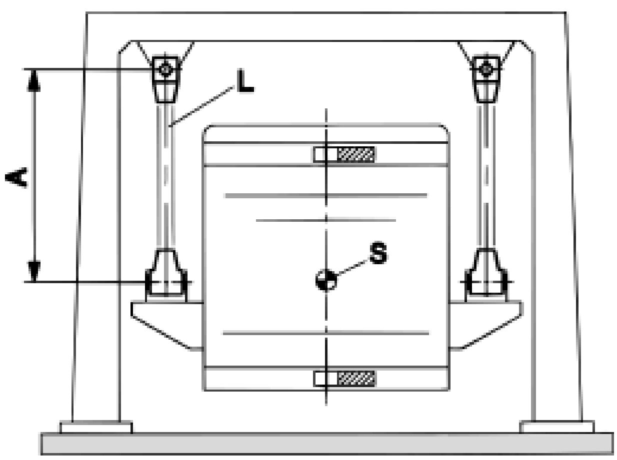
Fig. I: Element configuration “crosswise” (element axis offset 90°) for guiding *circular motions* of gyratory sifters.
Max. angle β = ±2°

Fig. II: Element configuration “parallel” (e.g. for support of Rotex-type screens) for guiding *elliptic motions.*
Max. angle α = ±5°
Max. angle β = ±2°

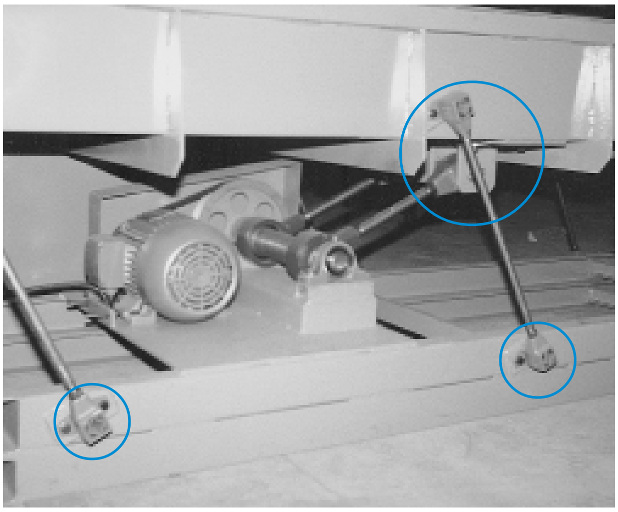
The connection rod with nuts and spring washers has to be supplied by the customer.

Installation

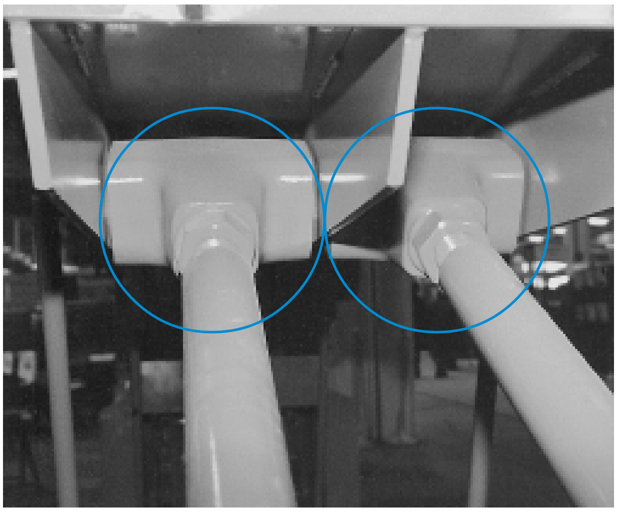
The length of the connection rod largely determines the radius of the circular motion of the hanging gyratory screen or sifter. The rocker on the sifter should be fixed close to the centre of gravity (S) or slightly below the centre of gravity of the oscillating machine part (see sketch).
The standardised right- or left-hand threads of the AV elements (available in either version) allow a very easy adjustment of the four 4 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.



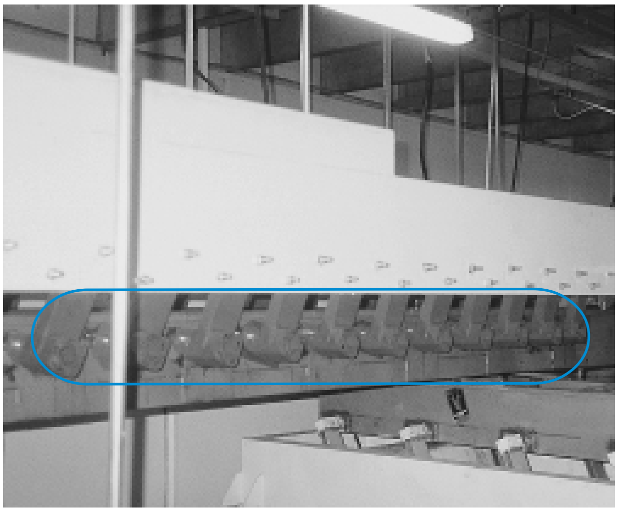
Installations



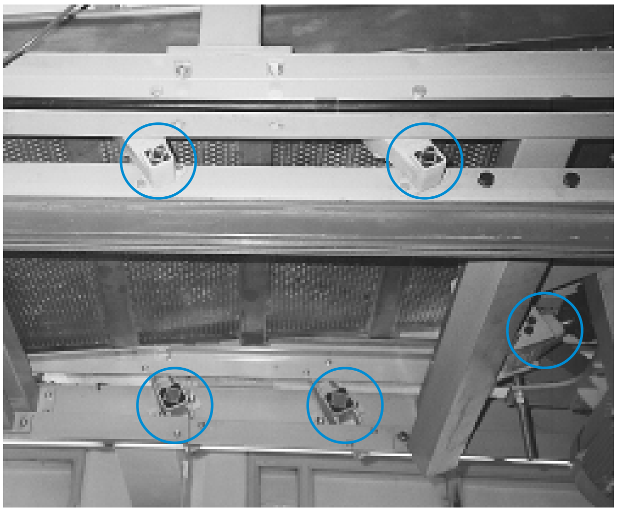
Conveyor trough with types AU and ST



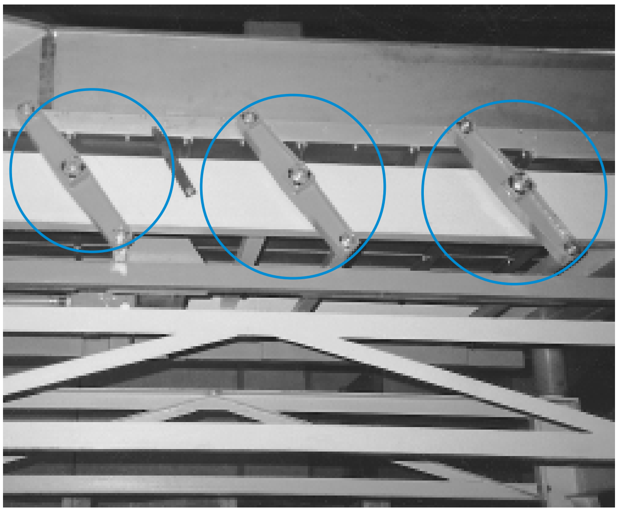
Crank drive with type ST



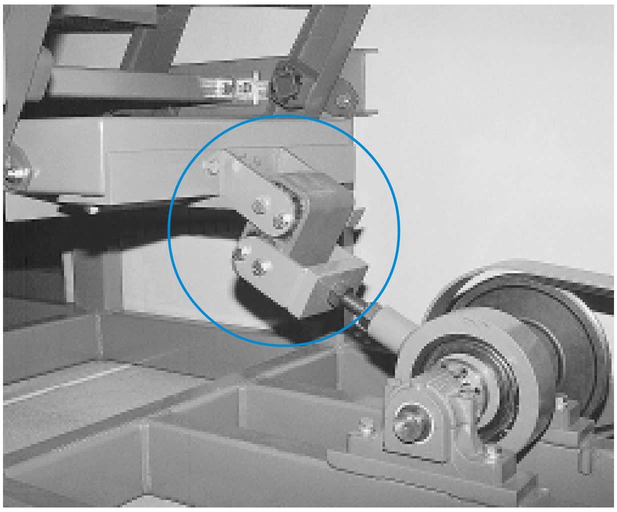
Vibrating conveyor with type AS-P



Vibrating screen with types AD-P and ST



Conveyor trough with types AD-C



Elastic crank drive with type DO-A