

# C O N T E N T

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# 1. PNEUMATIC REQUIREMENTS

## Air Consumption and Air Compressors

The air consumption, especially the average air consumption, of a vibrator system is the basis for calculating the size of the air compressor needed.

The **Powtek Pneumatic Vibrators Catalog** lists air consumption in cfm for 30, 60 and 90 PSI. The values may vary about 10 % due manufacturing tolerances.

To get the average consumption of several vibrators and/or other air consumers connected to the same supply pipe, multiply the Average Air Consumption by the number of units if the air consumption is the same. If the air consumption is not the same, do the calculation for every consumer separately and add the results.

To determine the size of the air compressor required it is recommended to add about 20 % as a safety figure to the above calculated demand since the values given may vary. Also, leaks or additional installations may require a larger compressor. Extra power for future installations may also be necessary.

To define the air compressor size required another figure is necessary. It is the highest consumption at any given time. This figure can be estimated taking the air consumption of all units that may be in operation at the same time and the length of this period :

Highest Air Consumption = Number of units x cfm or consumption at a specified pressure level.

Both the volume of the highest air consumption as well as the average consumption of the system should be used to determine the proper compressor.

## Lubrication

Dry or not dry? This is an important question. Generally speaking, lubrication always increases the lifetime of moving parts since it significantly reduces friction. But, lubricating ball vibrators is a waste of lubricants because it will not visibly increase the vibrator's lifetime whereas dry running T-turbine ball bearings will fail quickly.

Thanks to special material and treatments (teflon-coating, etc.) the operating friction can be minimized so that piston vibrators (FP-series) and DAR-vibrators alike have very good emergency running properties. Still, after time, lubrication becomes necessary to avoid increased abrasion.. The question of how many drops of oil per minute are sufficient or how many are too many cannot be answered in general. It is possible that a reciprocating or piston air compressor supplies sufficient oil in the air so that the use of a lubricator is not necessary. Unfortunately, the same compressor type may supply too much machinery oil if the leakage is too great which causes the DAR-series to decrease in frequency and force due to oil gumming. On the other hand, air compressors with built-in air dryers require a line lubricator to keep T-turbine, DAR- and FP vibrators from wearing out quickly.

**IMPORTANT:** For lubrication of FINDEVA vibrators use airtool oil with the viscosity: ISO VG 5 with 5cSt/40°C (5 centistokes or approx. 42.4 Susec or 5 cm<sup>2</sup> sec<sup>2</sup> )

The oil needs to be non gumming. Some examples are listed below :

- Shell Tellus Oil C5
- Esso Nuto H5
- Mobil Velocite No.4
- BP Energol HP 5
- For food applications : Mobil Whiterex 304 (vegetable base)

NOTE: Oil with viscosity other than recommended will reduce frequency and power! For FP-piston vibrators only, distilled water may be used instead of oil with the same lubrication effect.

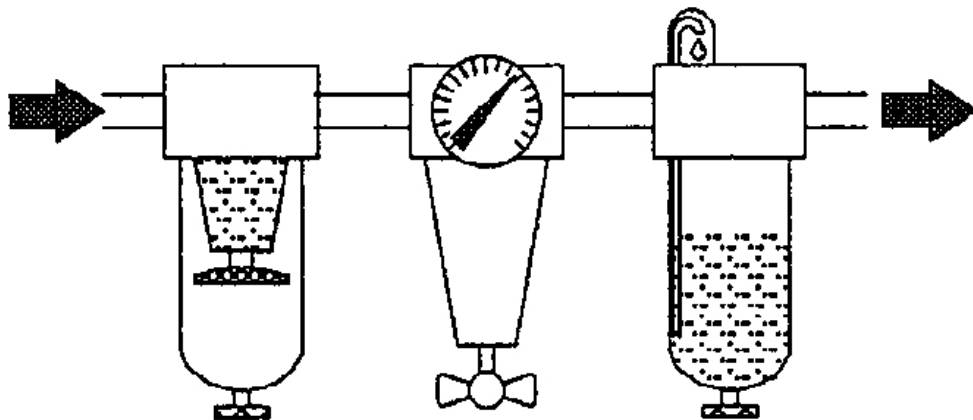
Adjust the lubricator to 1drop per minute at minimum.

As line oilers, "drip feed" lubricators provide better results than "wick oilers". Check the silencer for oil trace and adjust the lubricator for minimal, but not completely without, trace. Too much lubrication will lead pistons and rollers to clog and should therefore be avoided.

### Air Filters and Pressure Regulators

All air compressors are equipped with air filters to protect the compressor valves. This compressed air is clean enough to be used in all of our rotative vibrators. Small dirt particles will be blown through, but we strongly recommend the use of an air line filter of 5 micrometers or less. This will help to prolong the lifetime of the vibrator.

**NOTE: For FP-piston vibrators the use of 5 micrometer filters is strongly recommended due to the small tolerance between piston and bore.**



The air filter must be installed close to the vibrator to avoid rust particles from iron pipes reaching vibrator. It is advisable to connect the filter, air pressure regulator and lubricator in line as shown.

## Air Pressure Pipes

It is of course possible to adjust the vibrator by decreasing or increasing the air pressure or the air volume.

However the supply and the exhaust-pipes have to be dimensioned correctly. If the size of these tubing is too small, the vibrator will not be able to run at full power.

The exhaust pipe should be as short as possible because the volume of the exhausted air (expanded) is many times greater than the pressure difference.

The respective formula is  $V(\text{in}) \times P(\text{in}) = V(\text{out}) \times P(\text{out})$  where P is the absolute pressure and not only the overpressure. Therefore, it can be shown easily that when running a vibrator at 6 bar (overpressure) the exhaust air volume is 6 times the air pressure inlet volume.

An exhaust pipe that is too long or too short will hinder the air movement in such a way that all of the air pressure cannot be transformed in the vibrator into vibrating energy.

Using the silencer mounted directly onto the vibrator is the best way to gain as much power as possible.

## Air Valves and Pressure Regulators

### Pressure regulators

With the help of a pressure regulator (a needle valve, for example), the vibrator can be adjusted to its best working conditions.

The adjustable flow volume influences vibration frequency and energy.

We recommend installing the pressure regulator between air filter and lubricator to get best results.

### Air valves

For some applications like emptying bins and hoppers it is advisable to use the vibrator intermittently. To do so you may place a solenoid valve after the lubricator. Do not put the solenoid valve in line before the regulator and lubricator because then the regulator has to restart every time and the air pressure is not available immediately.

This could cause the vibrator to malfunction. It also is recommended that you place the valve as close as possible to the vibrator.

NOTE: Do not place supporting devices such as air filters, pressure regulators, lubricators, etc. on a vibrating mount. This will cause devices to malfunction.

**CAUTION: Make sure the inner width of the valve is large enough. Otherwise, the vibrator will not run at full vibrating energy, and piston vibrators eventually will experience difficulty in starting properly.**

It is also possible that piston vibrators will not start when the valve is manually driven because for a proper start the piston needs to be supplied with full pressure right from the beginning. When manually driven try to open the valve as quickly as possible or make use of solenoid valves. **This is very important for FP & PFLF Piston Vibrators**

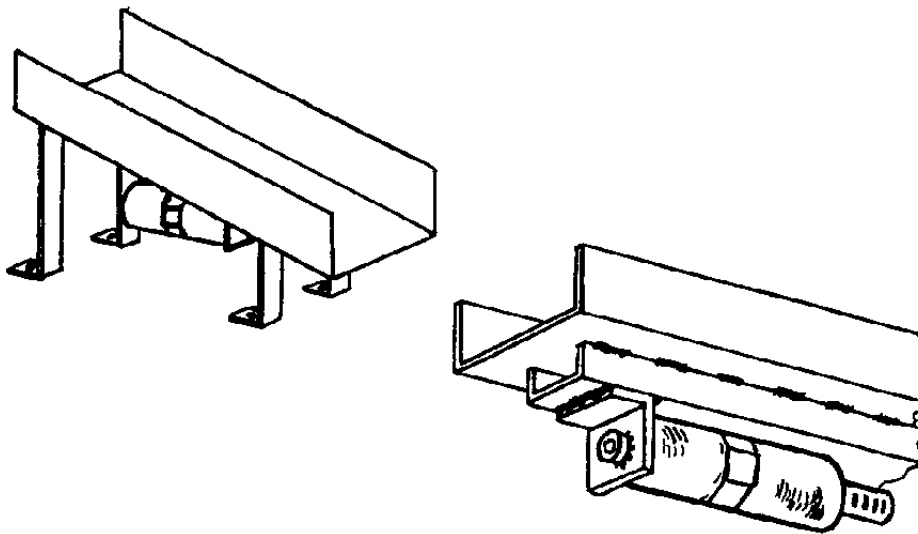
## 2. Where and how to attach the vibrator

### Linear Piston Vibrators

These vibrators are used mainly for feeding applications. The most common feeder forms are channels, chutes and spiral chute feed hoppers. Piston vibrators are not recommended for emptying bins and hoppers since they produce impacting energy that moves bin walls back and forth which can cause oil canning problems as greater force is needed to make material flow. The impact and the force may cause structural damage to the bin also.

The FP-FPLFseries are non-impacting.

### Chutes

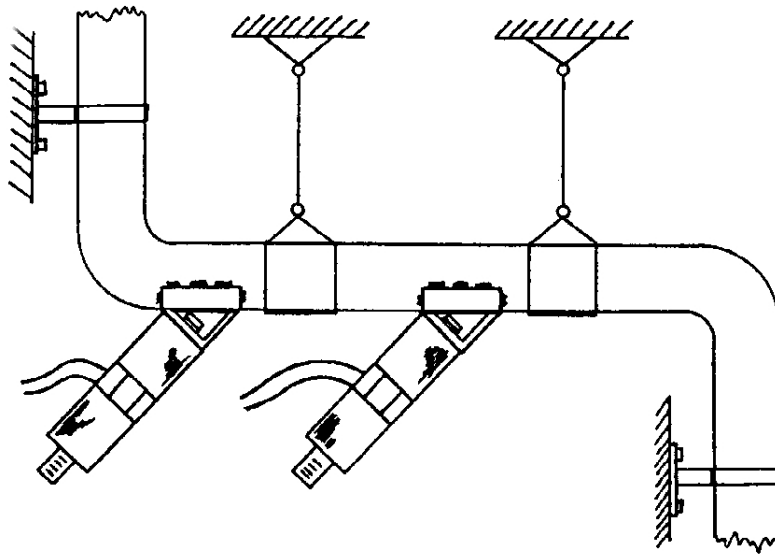


Feeding materials in chutes consists mainly of aiding gravity's natural force, since chutes, in most cases, are mounted with a downward slope. To allow the vibrator to function properly, the chute should be suspended on laminated iron springs, fiber springs or rubber elements.

The vibration direction should be horizontal only.

Make sure the vibrator is mounted rigidly to the chute. If the chute base is not stiff enough the vibrator should be mounted on a stiffening channel or U-shaped iron running the full length of the chute.

## Channels and tubes



### Channel

Channels or tubes like the one shown above are used to feed fine materials such as chemical powder, flour, or sugar between silos and production machines.

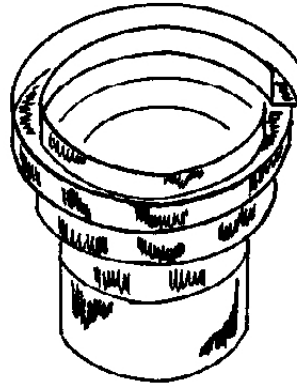
The advantage is that the material does not come in contact with anything other than the channel which can be made out of chemical resistant material. This satisfied regulations regarding cleanliness and non-contamination in food and pharmaceutical industries.

The vibrators are mounted with a 45° angle which causes the powder material to be pushed forward. If necessary additional transversal rib elements can be fixed in the channel, so even upward slope does not hinder the feeding.

It is important to insure that the channel is stiff but not mounted too rigidly. It is possible to use several piston vibrators in line if the channel is long, but they have to be of the same type and model so that they will operate at the same frequency and phase assuming the channel is stiff. The channel itself can be stiffened by welding a small channel with heavy wall thickness to the outside of the channel or tube.

Please note that the ends of such channels iron must not be welded for the first 3 mm.

## Spiral chute feed hopper



Spiral chute feed hoppers are used whenever small bulky parts have to be feed automatically into machines. They often include a system to position parts in a certain way when they are fed into the machine.

Normally, spiral chute feed hoppers are driven by electrical, rotary or electromagnetic vibrators. Pneumatic piston vibrators are advantageous for saving space while keeping high vibration power.

The spiral chute should be mounted on laminated springs or rubber elements. Two vibrators should be mounted opposite each other to get an imaginary vertical fulcrum. The exact mounting angle of the vibrators must be obtained by practical tests, but an angle of  $45^\circ$  to the chute base line is normally a good value.

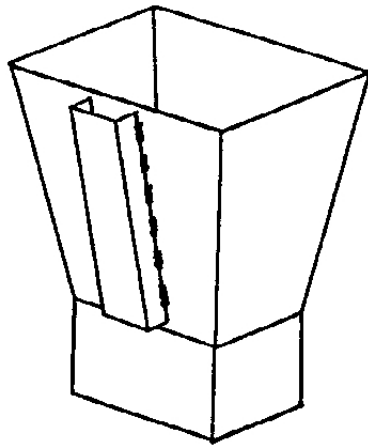
## Rotary Vibrators

Rotary vibrators produce a sinusoidal vibration. This type of vibrator is much more efficient in bringing materials into resonance than the linear vibrators. The frequency of a rotary vibrator can be adjusted in a wide range by using a pressure or flow regulator.

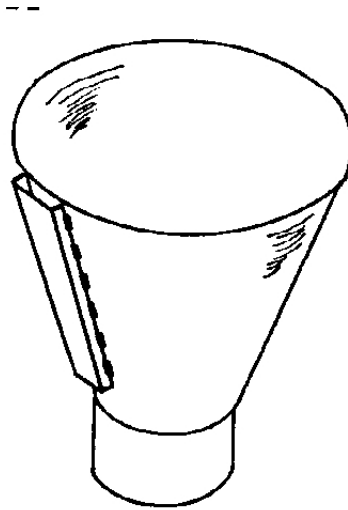
Rotary vibrators are used mainly to separate or compact materials. One common application is emptying bins, silos, and hoppers. The function of the vibrator in separation applications is to separate clogged material to free it. Once it is freed it moves downward by the force of gravity. Rotary vibrators can be used for feeding materials similarly to linear ones. Since piston vibrators do not produce strong forces, larger rotary vibrators are commonly used for feeding heavier materials like gravel in chutes and for screening materials which respond better to sinusoidal vibrations than impact vibrations.

Linear vibrators are not effective in compacting concrete. The unidirection motion will compact when moving forward and separate while moving backwards. To compact concrete two types of rotary vibrators are used, namely, internal and external vibrators. Internal vibrators are sometimes called poker vibrators. That are dipped into concrete, and a needle containing a rotary mass is driven electrically, pneumatically or with a flexible shaft by an engine into the concrete. These poker vibrators are used for building or bridge construction wherever larger areas are to be compacted. They may also be used in wall, pylon, or tunnel construction, but external vibrators placed on the outside moulding form are recommended for these situations.

## Mounting on bins and hoppers

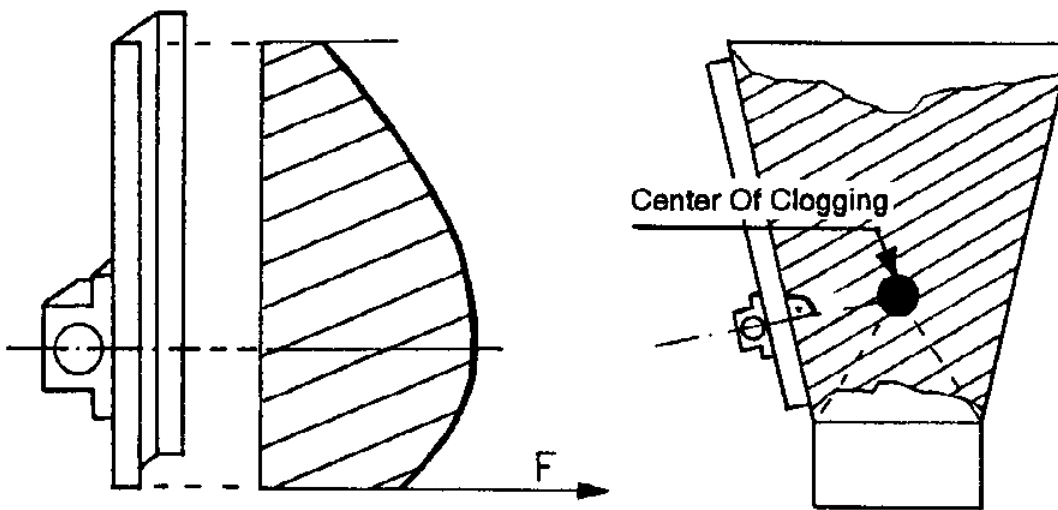


Using a C-Channel Iron



Using a channel iron that is stich welded vertically is the best way to transfer as much as possible vibration energy into the material inside the bin. The channel should be placed on the symmetrical axis of the larger side of a four-cornered bin. Take care that no frame structure moves closer than half of the length of the channel iron to the channel iron because it would absorb most of the vibration energy and could also lead to damage of the frame structure.

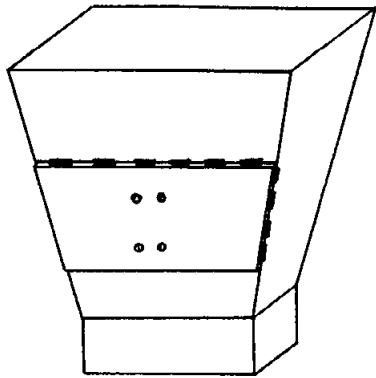
The channel works as stiffener so that the vibrating power is spread over the full length of the channel. Of course the vibrating power at the ends of the channel is less than the power near the vibrator. The vibration waves are pushed away in a  $90^\circ$  angle to the channel's length, so the optimal place for the vibrator is on the imaginary line connecting the channel iron to the center of clogging.



Vibrating power on a channel / center of clogging

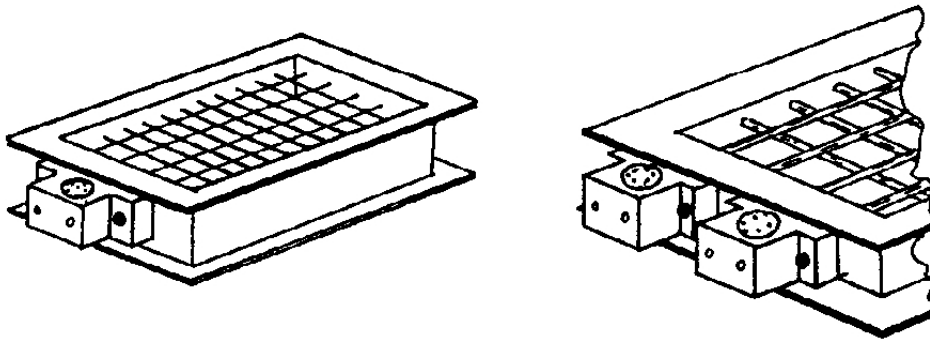


If the center of clogging is unknown, practical experiences indicated that a good mounting site is at about 1/3 of the height of the bin or hopper. Instead of a channel iron a plate can be welded to the bin to assure enough stiffness to spread the vibrating energy throughout the bin or hopper. Because of their thickness, area and weight a certain amount of vibrating energy is therefore wasted to vibrate the plate itself.



Using a mounting plate

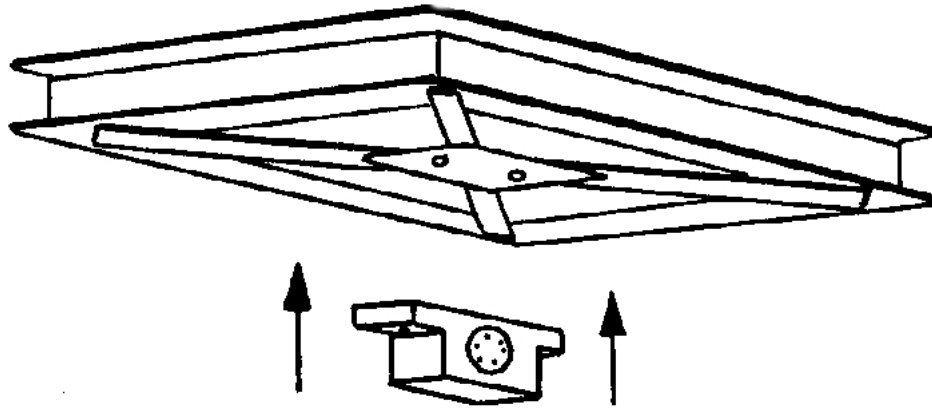
### Mounting on screens



### Mounting on a screen

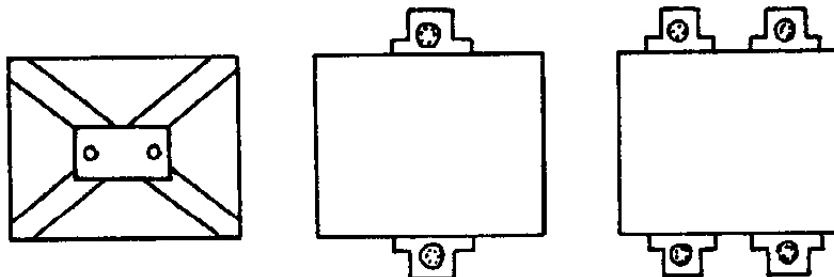
As mentioned earlier, screens are very similar to chutes. Screens may be activated by a vibrator mounted on the smaller edge or in the center. Often, when screening heavier material like gravel one single vibrator is not powerful enough. Under such circumstances two units can be mounted very close to each other. They will immediately synchronize and double the vibrating power. Make sure that the frame is stiff enough. If it is not, the rigidity can be increased by using channel (C or H type) irons and a vibrator mounted in the center as in the following figure.

The screen must be mounted on springs or rubber elements so that the vibration energy is not absorbed by the screening machinery's structure. Make sure the air pressure tube and connection to the vibrator cannot be mechanically damaged.



Increasing the rigidity of a screen (bottom view)

### Mounting on a concrete mold



As with bins, the use of a channel iron or mounting plate is recommended to spread the vibration energy when mounting on a concrete mold.

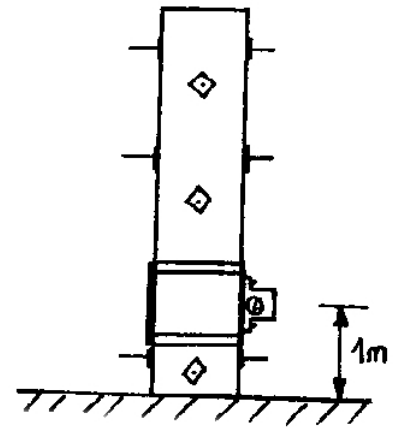
If the mold is extremely small (less than 500 by 500 mm / 20 by 20 inches) the vibrator may be placed in the center under the mold. If it is larger, one of three configuration is recommended: one vibrator only, two vibrators mounted opposite each other on the longer sides of the mold, or four vibrators with two mounted opposite each other on the longersides of the mold.

Like the screens, pneumatic vibrators mounted on molds will synchronize immediately after they begin to vibrate. The mold should be mounted on rubber elements or laminated springs, but also fixed in a fairly rigid position so the mold will not continue to swing or vibrate after the vibrator's air pressure is turned off.

## Mounting on a concrete form

Under normal circumstances the wooden or iron form plates of concrete pilons are sufficiently stiff to mount a vibrator since the square area is relatively small. It is best to place the vibrator relatively close to the bottom of the pilon, around a height of 1 m. This guarantees that the lower portion of the pilon will be vibrated correctly.

The upper part can move relatively freely, and the reinforcing steel in the pilon will transfer the vibration energy upwards. Even for pilons of up to 4 m in height, one single vibrator is absolutely sufficient. It can be attached with clamps.



Mounting on a pilon form

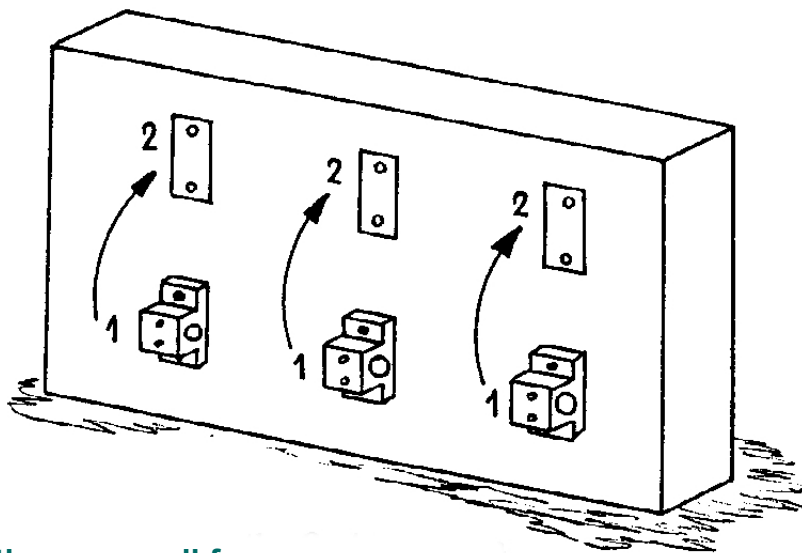
For longer pilons, instead of using two or more vibrators, the first few meters should be vibrated as it is poured.

Subsequently, every few meters, the poured concrete should be vibrated separately until the pilon is completed.

The time of vibration varies according to the viscosity of the concrete and the additives used. Unlike pilon forms, concrete forms for walls are generally not very stiff. Hence, the vibrating energy may not be spread very well using only one vibrator.

Instead of using only one vibrator to cover a given area, several have to be used. They may be smaller accordingly.

The wall should be vibrated piece by piece (portions of 1 to 2 m in height at maximum).



Mounting on a wall form

# 3. Installation and operation

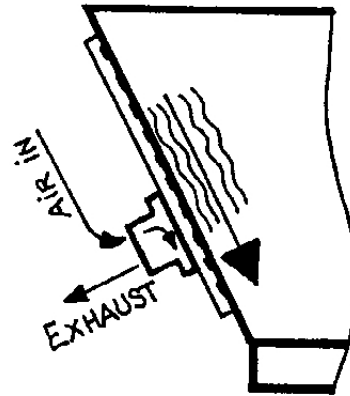
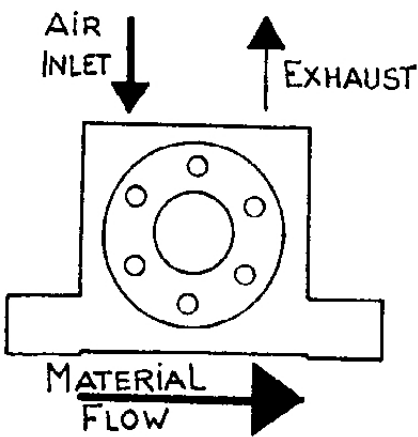
## Mounting

Before mounting the vibrator make sure the location has been carefully selected to insure the best working results (refer to Chapter 3).

The mounting area must be clean and even. Please note that an uneven mounting area may cause the vibrator to malfunction due to torsion in the vibrator's body.

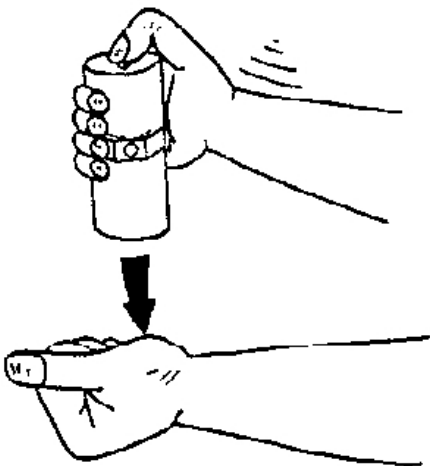
The vibrator should be placed, whenever possible, so that the rotation of the ball, roller or turbine supports the direction of material flow.

It is easy to verify the correct placement with the help of the air inlet.



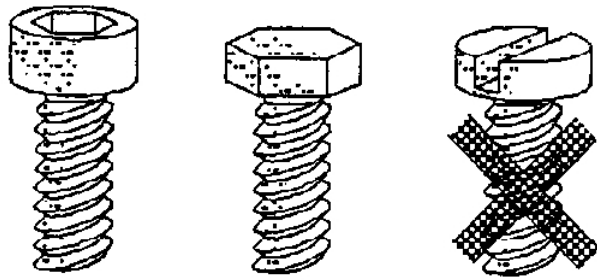
## Support of Flow and Correct Placement on a bin

### Check free movement of the piston



Before mounting the Piston Vibrator FP-series, check to make sure that the piston is moving freely. Hit the vibrator against the ball of the thumb. You will hear a metallic "clack" of the piston when knocking the end cap. If the piston is not moving freely, add some drops of petroleum (kerosene) into the air inlet. It will loosen the clog of the piston which is probably caused by the hard oil we use in manufacturing.

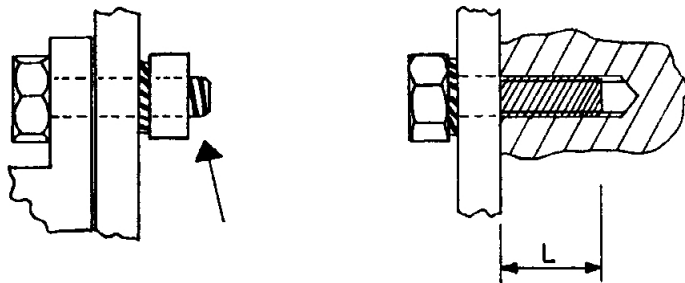
## Screws and Nuts



Allen screws / Hexagon Screws / Slotted screws

MODEL	8/10	13/16	20/25	30/36	40/48
K series	M6	M8	M8	M10	----
GT series	M6	M8	M8	M10	M16
MODEL	50	65	80	100	120
R series	M6	M8	M8	M10	M16
T series	M6	M8	M8	M12	
MODEL	2	3	4	5	6/7
DAR series	M6	M8	M8	M10	M16
MODEL	12	18	25	35	50/60
FP -FPLF series	M8	M10	M12	M12	M16

Allen Screws or Hexagon Screws with a minimum grade 5 are recommended. Similarly, the nuts should also conform to grade 5 level. Slotted Screws or other types of screws with less tensile strength should be avoided. The screws should be long enough so that at least one full thread is out of the nut. If a threaded hole in the object is used for mounting, the screw should be torn in at least 1.5 times the screw diameter.



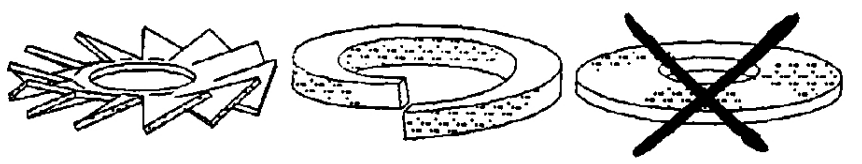
### Lengths of the screw in the thread

For FP-series the length of the screw in the vibrator thread should be as follows:

FP Type	FP 12	FP 18	FP 25	FP 35
Minimum (mm)	10	10	12	12
Maximum (mm)	13	13	15	15

CAUTION: Always use a Tooth Lock Washer or a Spring Lock Washer. The use of an adhesive sealant (LOCTITE 270 for instance) is suggested. Please follow the manufacturer's instructions.

Never use an ordinary Flat Washer or a Curved Washer because these washers do not stop movement, therefore loosening of the screw during vibration may occur.



### Tooth Lock Washer / Spring Lock Washer / Curved Washer

The washer should be placed between mounting plate and nut, and between mounting plate and screw for FP vibrators.

The tightening torque must not exceed the following values :

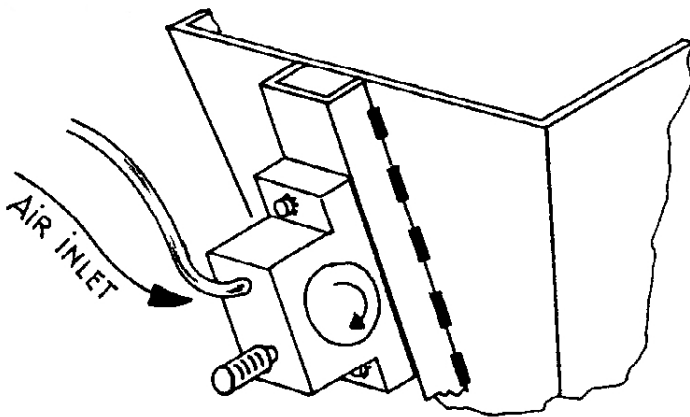
Thread	Minimum	Maximum
M6	6 newtons	10 newtons
M8	15 newtons	21 newtons
M10	30 newtons	42 newtons
M12	50 newtons	72 newtons
M16	150 newtons	174 newtons

Minimum / maximum torque

*NOTE: FP-series : The socket with the mounting thread is the end cap with the smaller diameter. The thread in the other end cap (air exhaust port) is in BSP and therefore not metric!*

The vibrator is to be placed, whenever possible, so that the rotation of the ball, roller or turbine supports the direction of material flow.

It is easy to verify the correct placement with the help of the air inlet as shown below



Support of flow and correct placement on a bin

**CAUTION:** Make sure the vibrator is securely fixed! We strongly recommend that you retighten the screws after a few minutes of operation.

A loose vibrator may fall down and harm people or any machinery

## Air connection

The air pressure tube should be wide enough to allow a good air flow. The **main air line** should be dimensioned according to the guidelines described on the next page

The **connection** from the main line to the vibrator is made with a short flexible tube.

Make sure the inner span of this flexible connecting tube conforms to the chart below:

Vibrator type	GT 4-6	GT 8-10	GT 13-16	GT 20-25	GT 30-36	GT 40-48
Min tubing ID (inches)	1/4"	3/8"	1/2"	5/8"	5/8"	3/4"
Min tubing ID (mm)	8	10	12	16	16	20

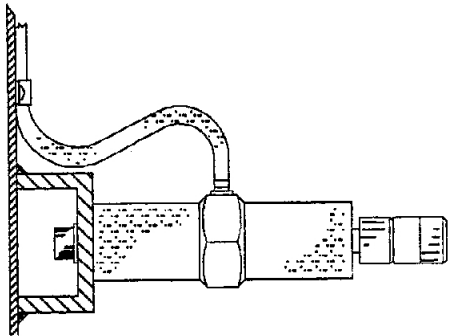
### Minimum ID size for air connecting tubing

Make sure the air pressure tube at the air inlet port is flexible and freely movable so that vibration does not damage the tube at the transition piece.

The tube is to be securely fixed at the object side, so that the tube may not come in resonance. You can let the tube hang from a structure point directly to the inlet port, but make sure that it does not create a safety hazard.

Make sure that the tube can never be bent & warped.

**NOTE:** The pipe thread is BSP type (British Standard Pipe) but will accept US NPT (National Pipe Thread) that is conical and has one extra turn per inch.  
Tighten very closely using Teflon-tape



### How to attach air tubing

The filter, regulator and lubricator unit should be placed as close as possible to the vibrator (less than 2 m - 6').

If a solenoid valve is connected into the air line for intermittent operation of the vibrator, the distance between vibrator and valve should be less than 50 cm (20")

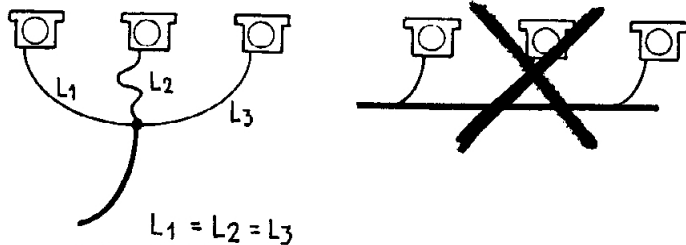
This will guarantee a proper and immediate start and stop.

Only one lubricator unit needs to be used for a maximum of three vibrators.

The lines from the junction to every vibrator should be of the same length to ensure that all vibrators are supplied with same pressure and flow through.



Again, when using solenoid valves, place each one within 50 cm of every vibrator so it is guaranteed that all vibrators will start and stop at the same time.



### Connection of three vibrators to one lubricator unit If a lubricator is used,

If a lubricator is used (for all the models except GT and FPLF) the oil should be ISO VG5. Please note that suppliers of servicing units (filter-regulator-lubricator) sell their own oil for lubrication. Please verify it conforms to ISO VG5!

We recommend that you add a few drops of kerosene into the vibrator's air inlet before mounting the air tube.

Kerosene will disperse the corrosion protective additive inside new vibrators during the first few seconds of operation.

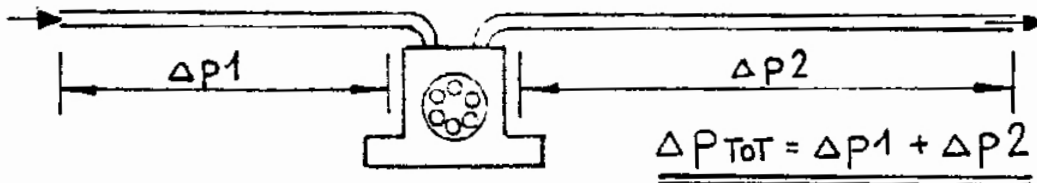
### Muffler

All vibrators except the R-series may be equipped with mufflers or an exhaust hose.

Mufflers may clog due to dirt in air; hence, the use of air line filters is strongly recommended, but clogged silencers (filter types and sintered types) may be washed out with petroleum (kerosene).

Instead of using silencers the exhaust air may be blown through a hose.

Make sure that the hose inner diameter is large enough, otherwise the full pressure (difference from air inlet port to the end of the exhaust hose) is not transformed into mechanical energy. Pressure loss in pipes (whether supplying or exhausting) must not exceed 10 PSI in total.



### Pressure loss

The exhaust pipe should not exceed 6'  
Longer spans will require large size hoses.

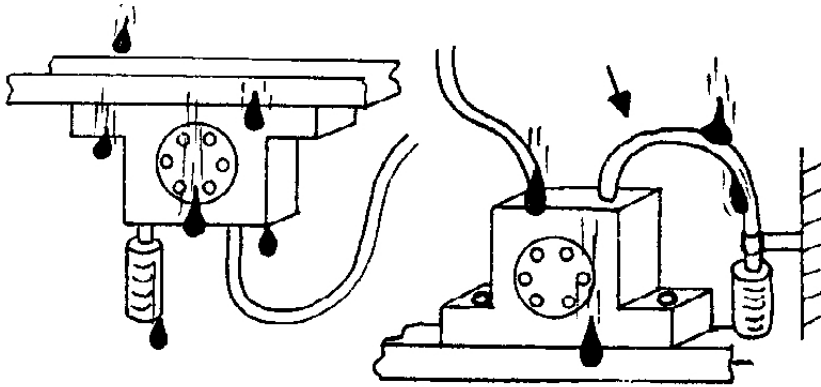
## Outdoor application

All pneumatic vibrators may be used outdoors when operated in the conditions below:

The vibrator is to be installed so that no fluid may reach it.

If the vibrator is exposed to fluids (rain drops or other moisture), then the vibrator should be mounted so that the exhaust port with silencer is turned against the ground or the exhaust port should be connected to a hose that is mounted so its end is against the ground, not allowing liquid or dirt to enter the vibrator.

### Mounting outdoors or exposed to liquids, dirt, etc.



If the vibrator is exposed to fluids but above the measures can not be followed, use a silencer and have a continuous flow of about 0.7 to 1.5 bar (10 to 20 PSI) so that no fluids may enter.

**CAUTION:** Never operate vibrators without a silencer or exhaust hose otherwise dirt, liquids or other particles (concrete powder, caustic solution, etc.) could enter the exhaust port.

## Operation

After having successfully installed the vibrator, it can be set into operation.

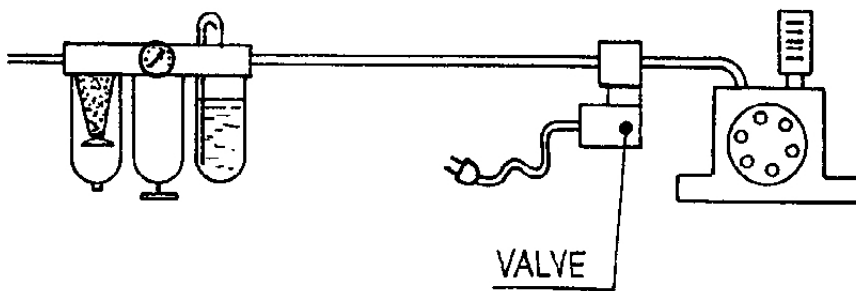
### WARNINGS:

- Wear ear protection around pneumatic vibrators!
- Operation without a silencer should be avoided to keep the noise level (and possibility of ear damage) reduced as much as possible!
- Make sure the lubricator (if any) is filled.
- Make sure that the maximum air pressure to the vibrator is no more than 7 bar!
- Check again that mounting screws are tightly fastened.
- Make sure air pressure tube is connected to the inlet port.
- **Vibrators mounted on bins and hoppers should not be operated when bin and hoppers are empty as this may cause structural damage.**

When starting the first time, the vibrator might reach its nominal frequency and force after only a few minutes. This is because the moving parts are covered with grease and the temperature is low so that the grease is stiff. All vibrators are run during the final inspection in the plant for some minutes but because of stocking the grease may have a chance to clog again.

We recommend that you operate vibrators intermittently if possible for several reasons:

- the lifetime of the vibrator is extended
- costly air pressure energy is conserved
- less air consumption
- operate only when material flow is required and shutters and gates are open to prevent material from packing in the bin, hopper or chute.
- an Operating Factor of 10 to 30 seconds ON and 1 to 5 minutes OFF has been found to



be most efficient for most applications.

### Intermittent operation

For intermittent operation, we recommend the use of solenoid valves controlled by timers or the machinery control system.

The valve has to be set in line between the lubricator and the vibrator.

The closer the valve is set to the vibrator the stronger start- and stop-intervals are.

When the valve is set farther from the vibrator, the air pressure volume remaining in the air pressure tube has to be emptied and refilled.

Very often there is no need to run the vibrator at full power. Air power energy can be saved using a pressure regulator. Adjusting to the resonant frequency of the system extends the life time as well. The frequency of all vibrators can be controlled with the help of pressure regulators in the supply pressure line. The FF-silencer connected to the piston vibrator's exhaust also allows adjustment of the vibration amplitude.

**WARNING: For the following inspection wear ear protection !**

When operating a vibrator for the first time, disconnect the exhaust hose and run the vibrator and measure its frequency and force. Do the same again with the exhaust hose mounted. Any difference in the values obtained show pressure and energy loss in the exhaust hose. If this occurs, increase diameter of the hose or cut the length of the hose. The same procedure can be done with a silencer to verify the air flow is sufficient or to detect clogging. If the vibrator cannot be set into operation or the desired operation power cannot be obtained please refer to troubleshooting.

## 4. Maintenance & Repair

### Maintenance

Under normal circumstances, the pneumatic vibrator units themselves do not require any kind of maintenance if they are operated in a proper way.

We suggest checking the vibrating system at regular intervals to insure that it is functioning properly. The frequency of the system can be measured with the help of a Vibrometer.

A change in frequency is always the first indication for a loss in vibrating power.

NOTE:

The frequency of a vibrator may vary depending on the size of the air compressor and the air tank. Make sure frequency and power measurements are obtained only when the air tank is filled. Required regular maintenance for the air pressure supply includes checking the following at regular intervals :

- The air filter for accumulation of dirt (clogging). This may lead to a loss in vibration energy. If clogged, wash out or replace.

- The silencer for accumulation of dirt (clogging). This may lead to a loss in vibration energy. If clogged, wash or replace.

- The lubricator for sufficient oil in the container.

NOTE: Very often vibrators are damaged because the lubricator runs out of oil. Therefore, make one person responsible either to keep the lubricators filled or to check the lubricators at regular intervals.

**NOTE: For Piston Vibrators only !**

The air lubricator may be filled with distilled water for the operation of piston vibrators.

The materials (teflonized aluminum and leaded bronze) may be operated oilfree with only distilled water with excellent results. Operation with distilled water requires a 5 to 10 times higher flow rate than operation with oil because water is blown away very quickly, while oil adheres longer to the moving parts and the walls.

# Troubleshooting

## Vibrator does not start

- Piston Vibrator only: Remove it from the mount and hold it vertically in your hand. Turn it on. If it runs, check starter spring inside.
- Gumming of oil may keep the parts stuck together (mainly for FP- and DAR-Vibrators). Add ten drops of Kerosene (Petroleum) into the air pressure inlet to dissolve the gumming oil.
- If you suspect air pressure supply blockage:  
Unscrew silencer or exhaust hose and run the vibrator. If it operates properly, then check the silencer or hose for clogging. If clogged, wash out (kerosene) or replace.  
Check air pressure to localize the blockage
  - at the compressor's site
  - at the maintenance unit (filter-regulator-lubricator)
  - at the end of the flexible tube

## Vibrator does not always start

Occurs in Piston Vibrators because they require a few seconds OFF- time before supplying again.

Starter problems usually occur if the OFF-time cycle is extremely short.

The piston may need a few seconds to be pushed by the spring into the start position. This time depends on the manner of installation, with a longer supply pipe between valve and vibrator extending the OFF-time needed. Also, a clogged silencer will hinder the exhaust. To test this possibility, remove the silencer and run the vibrator.

If it runs, then wash silencer out or replace it.

If the OFF-time required is short (less than 4 seconds), it is advantageous to use a 3-way valve so that the supply pipe to the vibrator is bled when switching OFF.

Using a hand-driven valve may sometimes cause starting problems if the air pressure is not moved through quickly enough. Electrically or pneumatically driven valves are recommended. Insufficiently large tube or valve diameters may cause similar problems.

## Vibrator runs too slow / Vibration power too low

### *New Installations*

Vibrators need up to 15 minutes to reach full power since excessive grease and anticorrosives have to be moved through.

Adjust air pressure regulator to increase vibrator's speed

Check that the air supply is connected to the inlet port and not to the exhaust port (arrow marks)

Check that the flexible tube is not bent.

Check to make sure that the inner span of the air pressure supply pipe is wide enough and not too long. Also check the inner span of the valves used.

Check that there are not too many other machine consuming air being operated at the same time with one air line. The other machines should be selectively controlled.

### Existing Installations

Remove silencer or exhaust hose. If the vibrator operates properly without them, then the silencer or exhaust hose is probably clogged with dirt.

Wash out with petroleum (kerosene) or replace.

Check the air line filter for accumulation of dirt.

Air supply metal pipe may get rusty and these particles may clog the filter.

Check the air supply for leaks. Make sure that the compressor is working continuously.

Check to see if the flexible tube is bent.

Eventually the lubrication oil will gum up.

Add a few drops of petroleum (kerosene) into the air inlet port to clean.

Check vibrator for accumulation of dirt and clean with petroleum (kerosene).

### Excessive noise during operation

High acoustic frequency:

The vibrator is probably running too quickly or mounted too rigidly. Reduce the air pressure and adjust the vibrator to its optimal working frequency.

The ball of ball vibrators may be worn out and cause an increase in frequency and a decrease in vibrating force.

### Crackling sound

Verify that the vibrator mounting screws are securely fixed

If the bin or hopper is empty, cut down air supply.

In turbine vibrators, ball bearings may be damaged

### Repair

All FINDEVA vibrators except the K-series can be easily dismantled, maintained and repaired if necessary.

The following tools are necessary :

- Pin Wrench Pin 4, 5, 6, 7 or 8 mm (refer to chart below)
- Vise with aluminum jaws
- Hammer
- For T-Turbines: Allen key  
(2.5 mm : T-50/-65 ; 3 mm : T-80/-100)

Special Pin Wrenches custom made for GT Vibrators (as per enclosed picture) are also available from Powtek upon request.



Wrench pin size (mm)	R	DAR	GT	FP
4	50	2	8/10	12/18
5	65	3	13/16	
6	80	4	20/25	25/35
7	100	5	30/36	
8	120	6/7	40/48	

## Pin wrench diameter cross reference

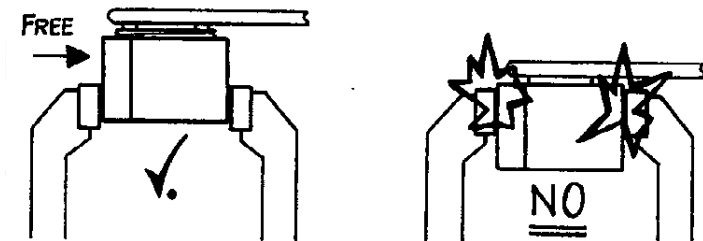
Place the vibrator (as shown in picture below) in the vise.

Make sure that the part with the end cap to be loosened is not be pressed by the vise.

Open the end cap in the same direction the rotor, ball or roller moves.

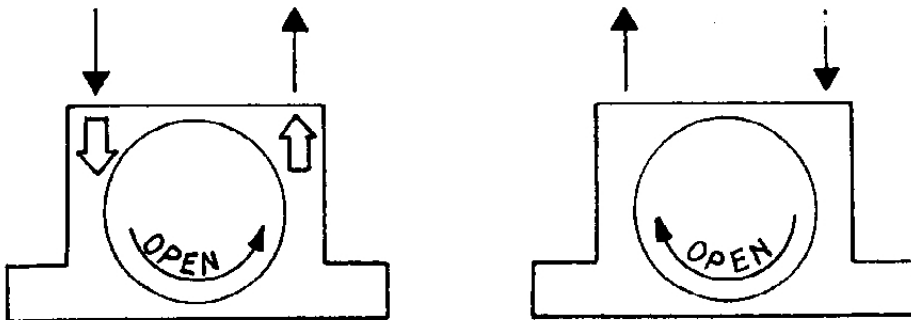
Piston Vibrator end caps or sockets should be opened counter clockwise.

NOTE: If both end caps or the end cap and socket of a piston vibrator are to be opened, first loosen both sides before opening. This prevents the housing from breaking.



## Do not press the end caps

NOTE: When changing parts, use only original parts. Other parts may not be of the same quality and may lead to premature malfunction.



## Turning direction to open the End Caps

### Ball vibrators K-series

Ball vibrators should not be repaired since only the end caps and the ball can be replaced. If the ball is worn out, the races will be also, but the races can not be changed. It is still possible to gain a few hundred hours of operation with a new ball. The only way to open the end cap is to destroy it by drilling a hole into it. Check the races for cracks before closing again. A new end cap can be pressed in by hand.

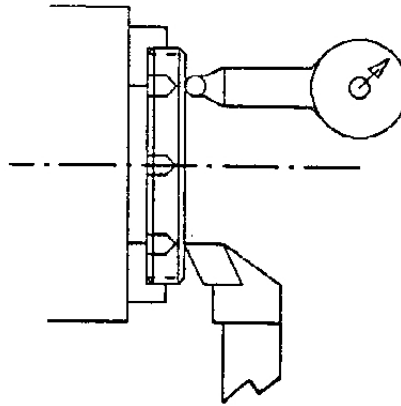
### Roller vibrator R-series

When opening the vibrator check both of the black end caps for grooves due to abrasion of the roller. If grooves are visible it is an indication to use more lubrication and that the end caps should be changed. Please note that the end caps have right- and left-hand thread, and are sold in matched pairs only. Also, check the roller race for rust, cracks, etc. Rust or other dirt particles may cause the roller to jump, causing the race to be worn out quickly. It is possible to run the vibrator without the silencer plates on the end caps but the noise level will be greatly increased, and the silencer plates protect the vibrator from dirt entering through the exhaust holes.

### Roller vibrator DAR-series

Like the R-series, the brass end caps may be worn out due to lack of lubrication or dirt contamination. If so place the end plate in a lathe as shown above. Check that the surface of the endplate is running true using D.T.I., and overturn the plate until it is even again. This should be done before the groove is more than 0.03 mm.

Also, check the roller race for rust, cracks, etc. Rust or other dirt particles may cause the roller to jump, causing the race to be worn out quickly.





## Turbine vibrator T-series

NOTE: Before opening the threaded end cap, make sure the Allen Key Screw on top of the housing is loosened to avoid destroying the thread.

The Allen key screw is a 2.5 mm (T-50 and T-65) or 3 mm type (T-80 and T-100). Open the threaded end cap counterclockwise. The other end cap is the same used with ball vibrator K-series and should not be moved away under normal circumstances.

The rotor and the ball bearings on its axles can be taken out of the housing. The ball bearings can be removed from the rotor's axles using a ball bearing extractor.

When reassembling the vibrator, the direction of the rotor blades is important, but the rotor cannot be mounted the wrong way because one end of the rotor axle contains a hole that fits into the fixed end cap.

When using a new threaded end cap make sure that the end cap is tightened before screwing in the Allen key screw. Now use a 4.2 mm drill (T-50 and T-65) or a 5.0 mm drill for T-80 and T-100 to spot-drill the end cap's thread through the Allen screw hole, so that the headless Allen screw is securely blocking the end cap.

Then, tighten the Allen key screw securely and place the sticker on the side of the end cap.

If new ball bearings are in use please note that the vibrator will need a few minutes to work up to its nominal frequency as the grease used in manufacturing is displaced.

When putting the vibrator back into operation, check the lubricator to make sure that it is operating properly and that the air tank is filled.

## Turbine vibrator GT-series

Under normal circumstances, the GT-Vibrator can only be opened on one side. The rotor and the ball bearings can be taken out, and the ball bearings can be removed from the axles very easily.

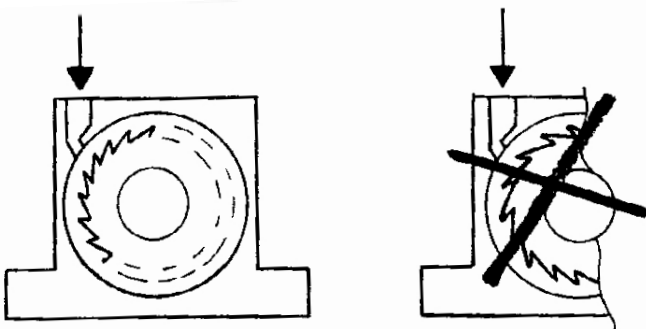
Please note that the ball bearings are not standard, since they must be shielded and they contain only one tenth of the standard amount of grease. This is sufficient to guarantee optimal greasing, while a standard amount of grease slows the frequency down considerably.

As a temporary solution to keep the production machines running, a pair of standard ball bearings may be used, but they must not be used longer than a few days while waiting for new original spare bearings to arrive.

NOTE: We do not recommend the use of other than the original spare ball bearings and will not take any responsibility for any damage resulting from the use of standard ball bearings.

When reassembling the vibrator, make sure that the rotor is mounted correctly.

The pockets of the rotor must be mounted so that the air pressure may fill them. Otherwise the rotor will turn, but with only about 50% of frequency and vibrating force.



Under normal circumstances a GT-vibrator will last longer than any other type of vibrator because changing the ball bearings makes the vibrator as good as a brand new one.

### Correct mounting of the rotor

## Piston vibrator FP-series

We recommend opening the socket end (the end with the metric mounting thread and the smaller diameter).

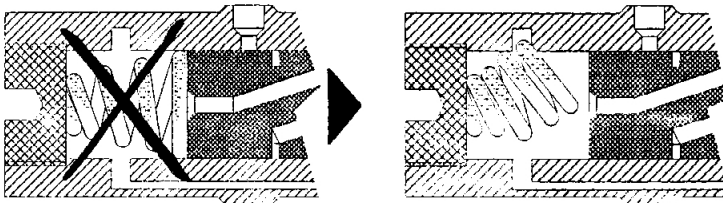
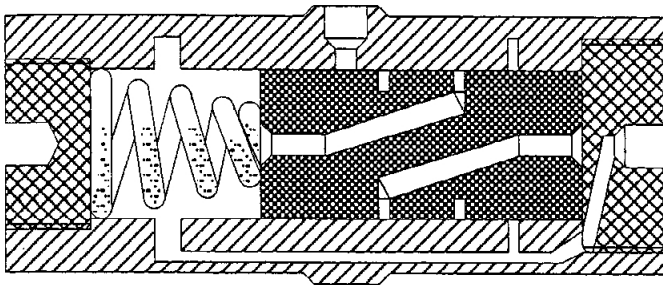
Check the spring for correct length and the piston for abrasion tolerance

Piston abrasion tolerance and spring length tolerance.

The vibrator will work if it is out of tolerance, but the leakage area between piston and boring increases with the square of the diameter. The higher the leakage the less vibrating power the vibrator is able to generate. This is especially important with both the larger models FP-25 and FP-35 because of their already large diameter.

Hence, we strongly recommend lubricating the piston vibrator to avoid abrasion as much as possible.

When reassembling the vibrator, it is important to place the spring, with the smaller end of the spring against the piston, otherwise the spring will block and damage the vibrator.

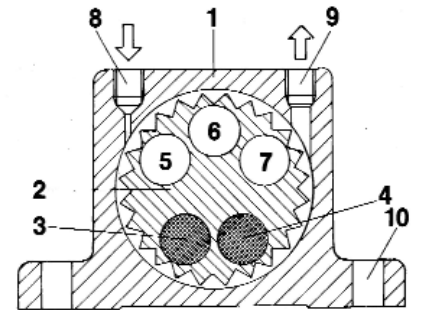


**Correct / Incorrect installation of the spring**

# 5. SPARE PART LIST

## GT TURBINE VIBRATORS

MODEL	Threaded Cap Right	Threaded Cap Left	Ball Bearing	Rotor	Muffler
GT-4	98004.31	98004.32	98004.10	98004.10	MF-18
GT-6	98004.31	98004.32	98004.10	98006.20	MF-18
GT-8	98008.31	98008.32	98008.10	98008.20	MF-18
GT-10	98008.31	98008.32	98008.10	98010.20	MF-18
GT-10 S	98008.31	98008.32	98008.10	98010.21	MF-18
GT-13	98013.31	98013.32	98013.10	98013.20	MF-14
GT-16	98013.31	98013.32	98013.10	98016.20	MF-14
GT-16 S	98013.31	98013.32	98013.10	98016.21	MF-14
GT-20	98020.31	98020.32	98020.10	98020.20	MF-14
GT-25	98020.31	98020.32	98020.10	98025.20	MF-14
GT-25 S	98020.31	98020.32	98020.10	98025.21	MF-14
GT 30	98030.31	98030.32	98030.10	98030.20	MF-38
GT 36	98030.31	98030.32	98030.10	98036.20	MF-38
GT-40	98040.31	98040.32	98040.10	98040.20	MF-38
GT-48	98040.31	98040.32	98040.10	98048.20	MF-38
GT-48 S	98040.31	98040.32	98040.10	98048.21	MF-38



## FP PISTON VIBRATORS

MODEL	Piston	Spring	Socket	End Cap	Muffler
FP 12 S	99012.10	99012.20	99012.30	99012.40	MF-18
FP 12 M	99012.11	99012.21	99012.30	99012.40	MF-18
FP 12 L	99012.12	99012.22	99012.30	99012.40	MF-18
FP 18 S	99018.10	99018.20	99018.30	99018.40	MF-18
FP 18 M	99018.11	99018.21	99018.30	99018.40	MF-18
FP 18 L	99018.12	99018.22	99018.30	99018.40	MF-18
FP 25 S	99025.10	99025.20	99025.30	99025.40	MF-14
FP 25 M	99025.11	99025.21	99025.30	99025.40	MF-14
FP 25 L	99025.12	99025.22	99025.30	99025.40	MF-14
FP 35 S	99035.10	99035.20	99035.30	99035.40	MF-14
FP 35 M	99035.11	99035.21	99035.30	99035.40	MF-14
FP 35 L	99035.12	99035.22	99035.30	99035.40	MF-14
FP 50	99050.11	99050.21	99050.30	99050.40	MF-14
FP 60	99060.11	99060.21	99060.30	99060.40	MF-14
FP 95	99095.11	99095.21	99095.30	99095.40	MF-38

