ON-LINE MANUAL
Pneumatic Requirements

2. Pneumatic Requirements

2.1. 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.

In the following table the air consumption in liters per minute for 2 and 6 bar air operating pressure are given. The values may vary about 10 % due manufacturing tolerances.

Fig. 2.1. Air consumption [liters per minute] of the FINDEVA vibrators

Type	2 bar	6 bar	*	Type	2 bar	6 bar	*	Type	2 bar	6 bar
K-8	83	195	*	R-50	100	195	*	DAR-2	70	200
K-10	92	200	*	R-65	200	400	*	DAR-3	100	300
K-13	94	225	*	R-80	290	570	*	DAR-4	120	360
K-16	122	280	*	R-100	370	730	*	DAR-5	130	390
K-20	130	340	*	R-120	500	970	*	DAR-6	170	470
K-25	160	425	*				*	DAR-7	180	500
K-30	215	570	*				*			
K-36	260	675	*				*			

Type	2 bar	6 bar	*	Type	2 bar	6 bar	*	Type	2 bar	6 bar
GT-4/6	33	83	*	T-50-LP	70	165	*	FP-12-S	1	25
GT-8/10	46	112	*	T-50-HP	80	190	*	FP-12-M	1	20
GT-13/16	120	390	*	T-65-LP	90	240	*	FP-12-L	1	20
GT-20/25	185	455	*	T-65-HP	110	290	*	FP-18-S	5	57
GT-30/36	330	745	*	T-80-LP	150	290	*	FP-18-M	4	25

GT-40/48	425	970	*	T-80-HP	150	390	*	FP-18-L	5	46
			*	T-100-HP	200	390	*	FP-25-S	13	93
								FP-25-M	23	87
								FP-25-L	18	93
								FP-35-S	23	162
								FP-35-M	24	141
								FP-35-L	38	135

2.1.1. Calculation of the average air consumption

FORMULAS	1. Air Consumption according to table 2.1. : CONS. = ... liters / minute
	2. Operating Factor (On/Off) x 100% : OPF = ... %
	3. Average Air Consumption = CONS x OPF : ACON = ... liters / minute
	4. Total Average Consumption = ACON x NUMBER OF UNITS DRIVEN

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 comsumption 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 CONS for .... minutes

= ..... liters / minute during ..... minutes

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.

2.2. 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 much 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 oil with the viscosity:
ISO VG 5 with 5cSt/40°C (5 centistokes or approx. 42.4 Susec or 5 cm2 sec2)

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 10 drops per minute at minimum.

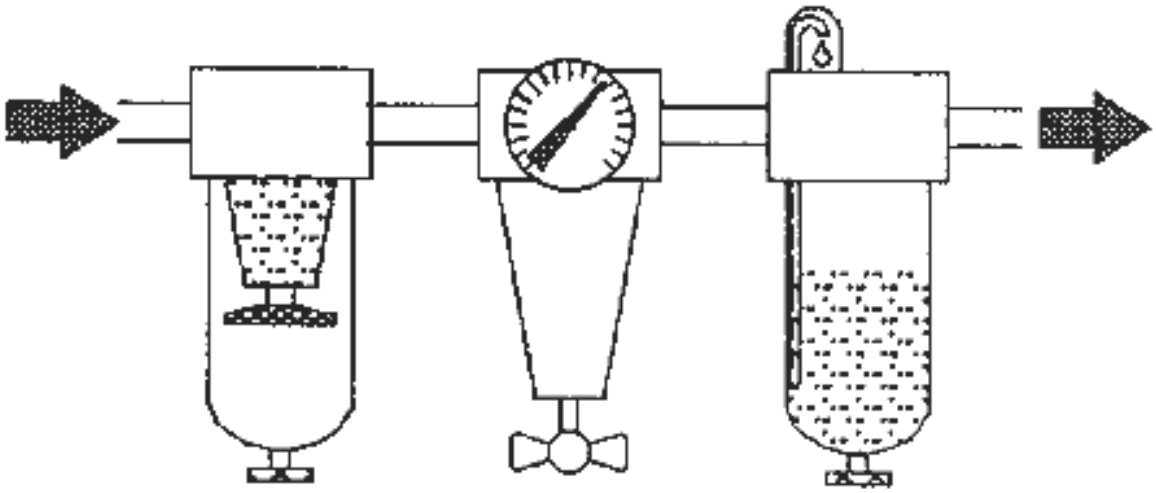
As line oilers, "drip feed" lubricators provide better results than "wick oilers". Check the silencer for oil trace and adjust the lubricator for minimal, but not completely without, trace. Too much lubrication will lead pistons and rollers to clog and should therefore be avoided.

2.3. 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.



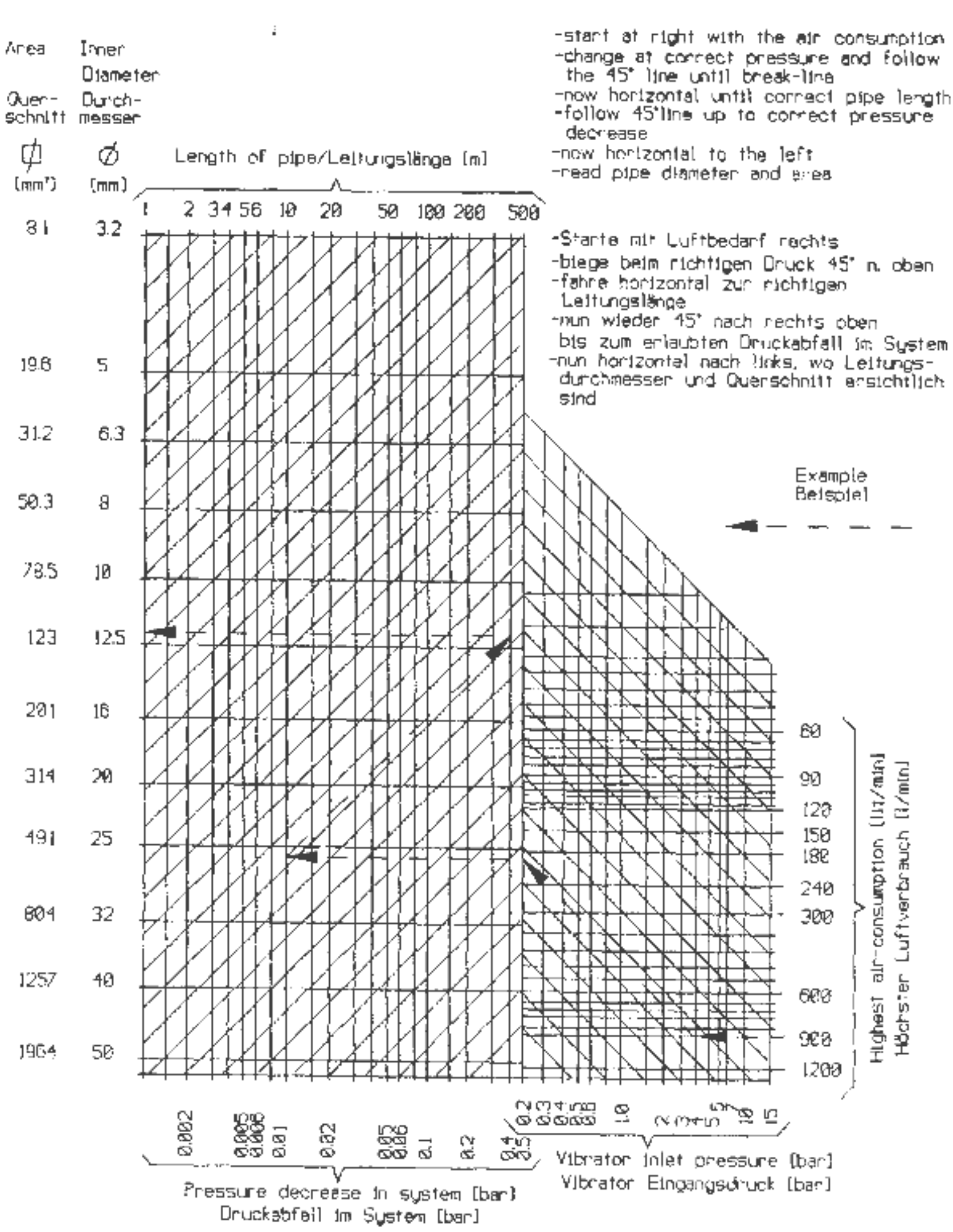
Correct installation : filter, then regulator and lubricator.

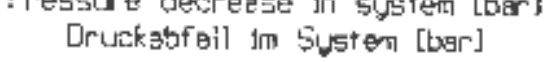
2.4. Air Pressure Pipes

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 ratio of these tubes 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(in) x P(in) = V(out) x P(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.


Area
Inner Diameter
Quer-schnitt
Durch-messer
Length of pipe/Leitungslänge [m]
1 2 3 4 5 6 10 20 50 100 200 500
(mm²)
(mm)
8
3.2
19.6
5
31.2
6.3
50.3
8
78.5
10
123
12.5
201
16
314
20
491
25
804
32
1257
40
1964
50
-start at right with the air consumption
-change at correct pressure and follow the 45° line until break-line
-now horizontal until correct pipe length
-follow 45°line up to correct pressure decrease
-now horizontal to the left
-read pipe diameter and area
-Starte mit Luftbedarf rechts
-biege beim richtigen Druck 45° n. oben
-fahre horizontal zur richtigen Leitungslänge
-nun wieder 45° nach rechts oben bis zum erlaubten Druckabfall im System
-nun horizontal nach links, wo Leitungs-durchmesser und Querschnitt ersichtlich sind
Example
Beispiel
60
90
120
150
180
240
300
600
900
1200
Highest air-consumption [lit/min]
Höchster Luftverbrauch [l/min]
0.002
0.005
0.008
0.01
0.02
0.05
0.06
0.1
0.2
0.4
0.5
0.2
0.3
0.5
0.6
0.8
1.0
2
3
4
5
6
10
15
Pressure decrease in system [bar]
Druckabfall im System [bar]
Vibrator inlet pressure [bar]
Vibrator Eingangsdruck [bar]



Graph to determine diameter and area of air pipes

An exhaust pipe that is too long or too short will hinder the air movemnt 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. Since the question of correct pipe diameter is of importance, the above graph can be used to determine the required value.

EXAMPLE The air consumption is 900 liters per minute at 4 bar pressure.
The pipe length is 10 meters.
So start at the right side with 900 to the left until 4 bar line. Now follow 45° up until the break line. Then go straight to the left until 10 meter line, then 45° up to the right until the desired line of maximum pressure loss allowed in the system. The inner diameter and the area can be seen at the left now.

NOTE: The pressure loss in the pipe should not be more than 0.5 bar; however, it does not make sense to minimize this value too much since this will increase the size and the cost of the pipes required. A value between 0.1 and 0.5 bar will be OK.

The required size of the exhaust pipes can be determined the same way. Use the vibrator inlet pressure nomogram lines but instead of inlet pressure use exhaust pressure that is about 0.2 to 0.5 bar.

2.5. Air Valves and Pressure Regulators

2.5.1. 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.

2.5.2. 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 upstart 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. (See Nomogram to determine diameter and

area of air pipes.) Otherwise, the vibrator will not run at full vibrating energy, and piston vibrators eventually experience difficulty 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.

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