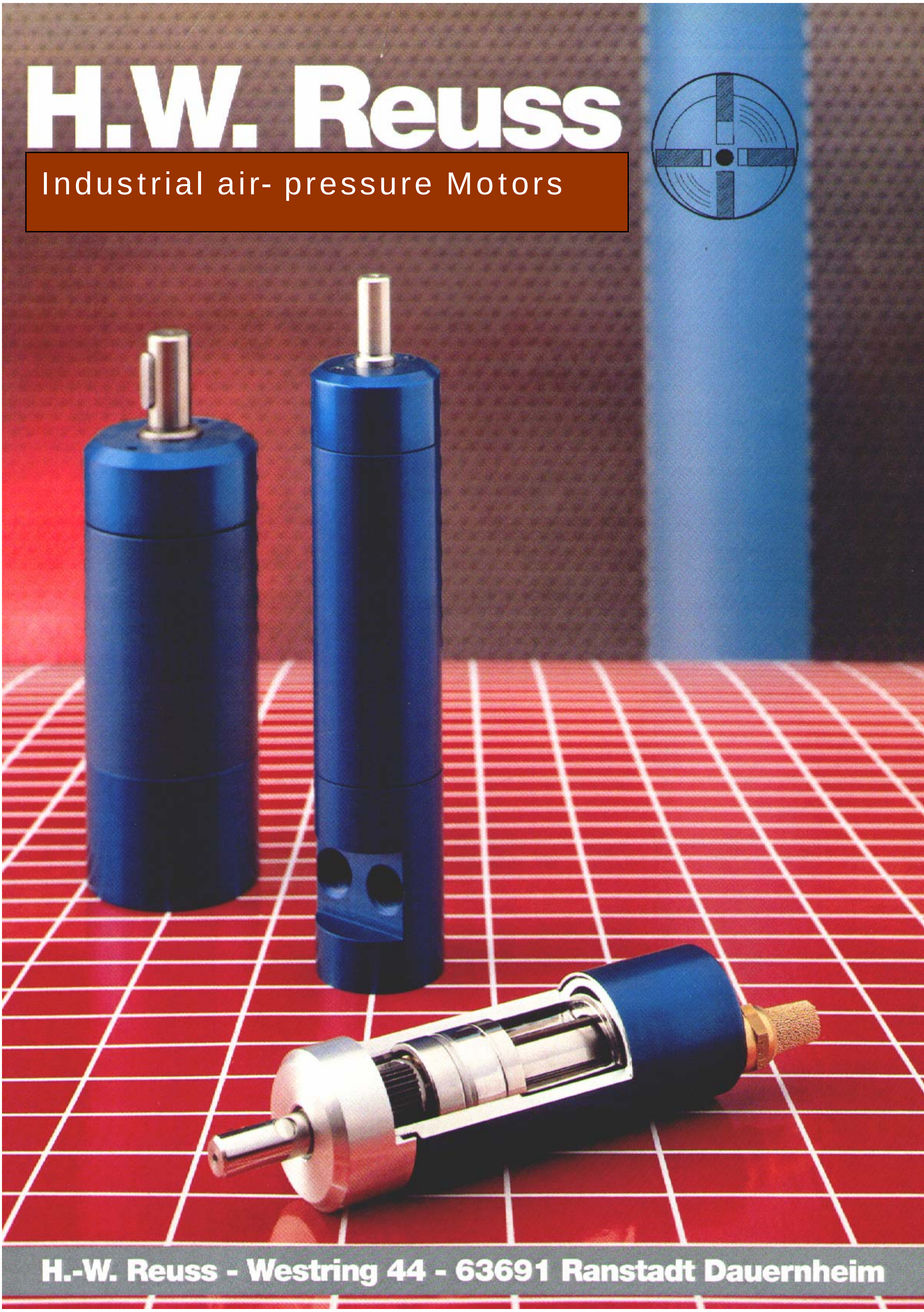
H.W. Reuss

Industrial air- pressure Motors



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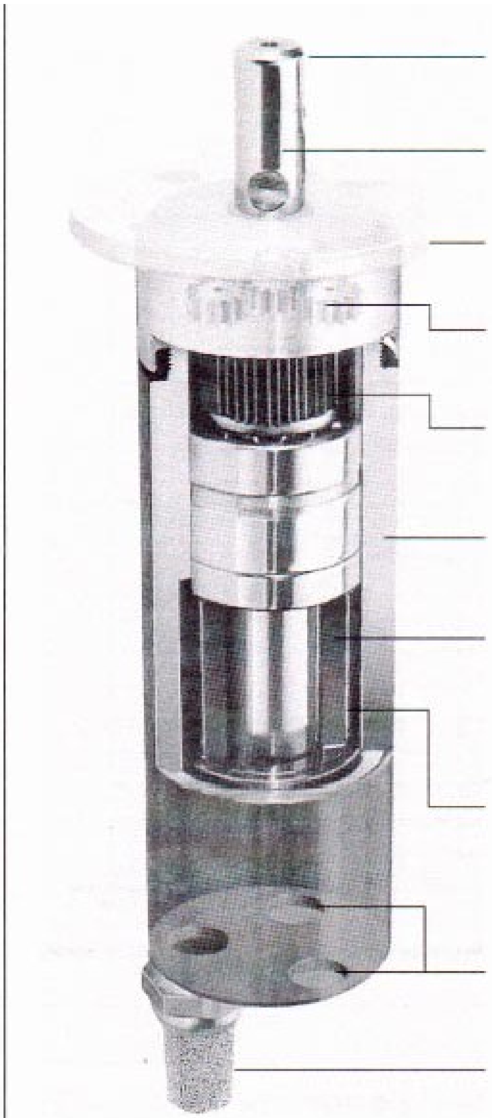
Vane Compressed Air Motors

Introducing the Compressed Air Motor

The compressed air motor is one of the most robust and universal motors that are available today.
Its technical qualities and characteristics make them one of the most sought out motors in market.

- The compressed air motor has a greater power density than other non-air motors.
- Compressed air motors are very compact and have an excellent weight-to-performance ratio. Its dimensions are on average 1/3 of an electro-motor.
- Can be run with the highest load and on full torque to the point of a standstill and not cause any damage. Also has a limitless on/off-switching rate.
- Torque, speed and turn direction are simple and easy to adjust. Speed and torque can easily be regulated either by air pressure or air volume. Complicated and expensive drive mechanisms are a thing of the past!
- The air motor allows for unlimited switching. This is possible even at maximal output. Should the air motor become overloaded then the speed will automatically adjust until a balance between the motor and speed has occurred.
- Power will automatically be adjusted to the load.
- A wide speed range can easily be regulated via throttling.
- Air motors are ideal for dangerous applications or applications that may be dangerous to man. The air pressure in the motor is always greater than environmental pressure. Cycles that may lead to a loss of air will not cause an intake of any foreign elements (e.g. dust, small particles). These motors are also suitable for under water application!
- (please inquire for more details on underwater applications)
- Soft Start Up performance applies little stress to components actuated by the motor.
- Indifferent to electrical disruptions and will not cause any.
- Outputs its highest torque when needed to most: During Start up.
- Air motors are not sensitive to dust, moisture or changes in temperature.
- Vane Air motors consist of only a few moving parts and the only consumable items are the vanes. Therefore, the motors have a long life and only require minimal maintenance.



1. Motor Shaft Material 1 .435

2. Key DIN 6885 included

3. **Mounting flange** (Not included – to be ordered extra)

4. Sprockets special bearings used

5. Planetary Gears hardened

6. Housing made from Aluminum (anodizing available)

7.Vane assembly High tech material is extremely robust and affords almost no maintenance

8. Surfaces High precision machining of cylinder surface ensures extreme durability and lifetime.

9. Air Connections for clockwise or counter-clockwise rotation

10. Silencer connection already equipped for possible exhaust line

(Dissected side view of vane air motor)

The motor consists of the rotor with the vanes, cylinder and bearing plates. The rotor is eccentrically mounted to the cylinder bore allowing for a sickle-shaped working chambers.
The fins inserted lengthwise in slots move in radial direction and constitute large expansion chambers. In order to achieve the desired data a planetary gearbox is installed.

Performance

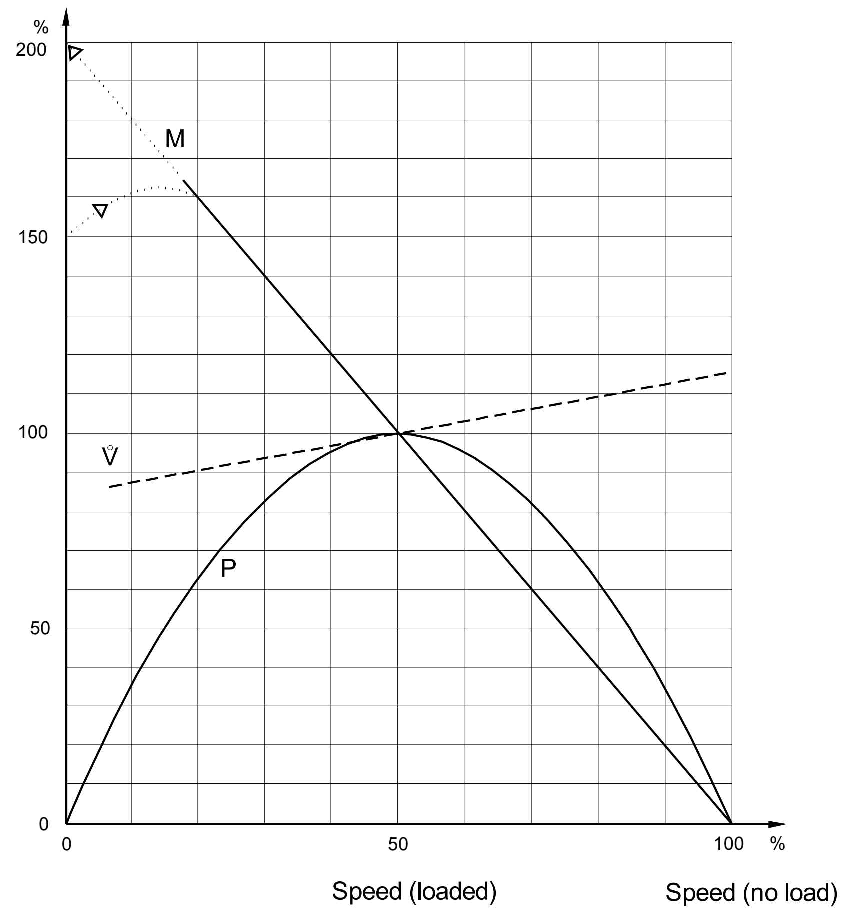
While operating, centrifugal force is pressing the vanes against the cylinder wall, causing the appropriate seal between various chambers. This seal is necessary during the start-up process. Therefore the vanes are spring-loaded and pressing the fins against the cylinder wall even the motor is at standstill.
Result: The Expansion chambers remain intact even at standstill.

Advantage compared to conventional motors with air channels, our motors guaranty 100% start up even with low air pressure.

Stall momentum =
approx. 2 x torque

Min. start up momentum =
approx. 1.5 x torque

M = Torque (Nm)
V = Air consumption (m³/min
P = Power (kw)



All Vane Air motors have the same characteristic performance curve.

This diagram shows the performance and torque curves of the step-less air motor. Power, torque and air consumption are referenced to speed.

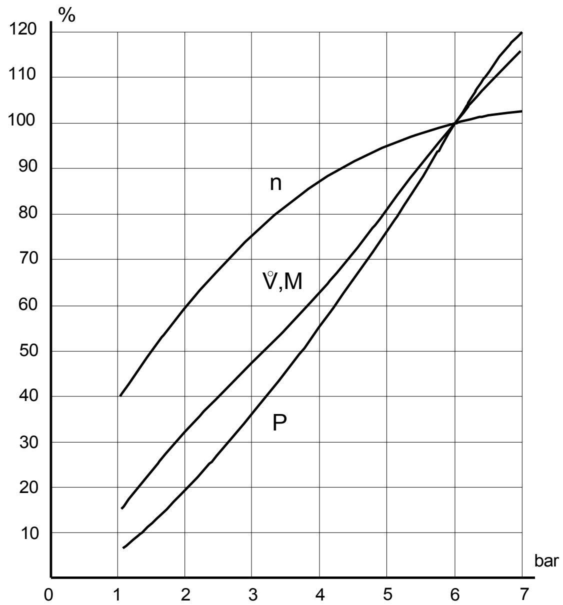
Peak power is reached at approximately half of no-load speed. If the motor is loaded down, then torque will increase whereby the power will decrease until the value of zero is reached at stand still. The highest torque value will be reached near standstill (200% of the nominal torque value). On the contrary, the start-up momentum will reach approximately 150% of the nominal torque momentum. This behavior needs to be accounted for, if a DLM- motor is used in a situation where the motor is loaded down during start up.

The operating speed **decreases** with **increasing** load. This can be a big benefit:

It means that the motor has a form of self-regulation of speed, whereby a fixed speed would lead to a stall-out situation.
Each motor has its own characteristics. Its respective graphs allow a read-out of power and torque referenced to speed.
The graph will also allow the speed to be read out if the motor load is known.

Operating Pressure

Torque, power , and air consumption graphs



n = rotation per minute (rpm)
V = Air consumption (m³/min)
M = Torque (Nm)
P = Power (kw)

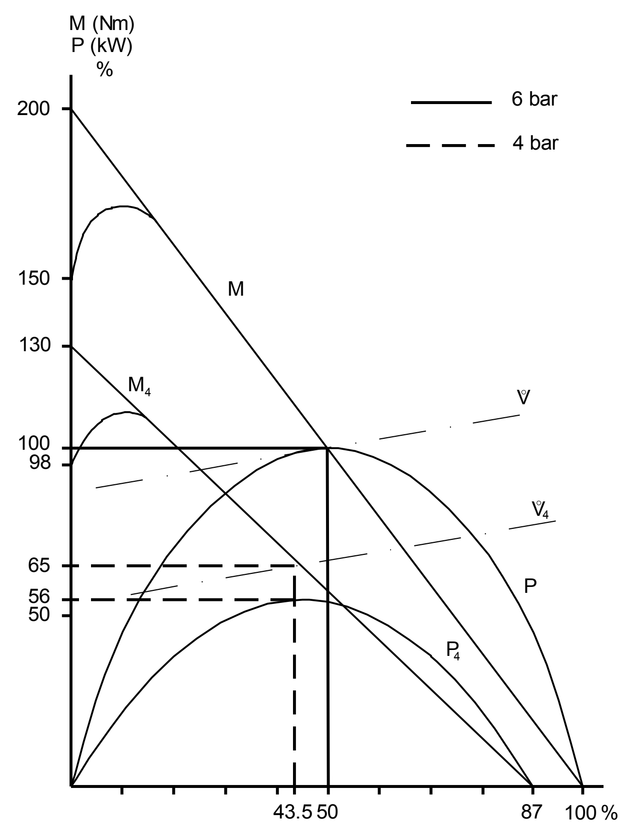
Operating Pressure bar	Power	Speed at max. output	Torque at max. output	Air Consumpt.
7	1.20	1.04	1.15	1.15
6	1.00	1.00	1.00	1.00
5	0.75	0.96	0.81	0.81
4	0.55	0.87	0.63	0.63
3	0.36	0.75	0.47	0.47

All technical data listed in catalogues are referenced to an operating air pressure of 6 bar.

For some applications 6 bar air pressure is not available. In such cases the motor power needs to be recalculated. This graph shows approximate values of speed, power, torque and air consumption in relation to the air pressure.

The graph to the right explains the change in output power when air pressure is reduced from 6 bar to 4 bar.

Operating with an air pressure of 6 bar all motors have a relative value of 100%.
If the input pressure is reduced to 4 bar, speed will be approx. 87%, air consumption and torque approx. 65%, whereby the power is 56% of the nominal value.



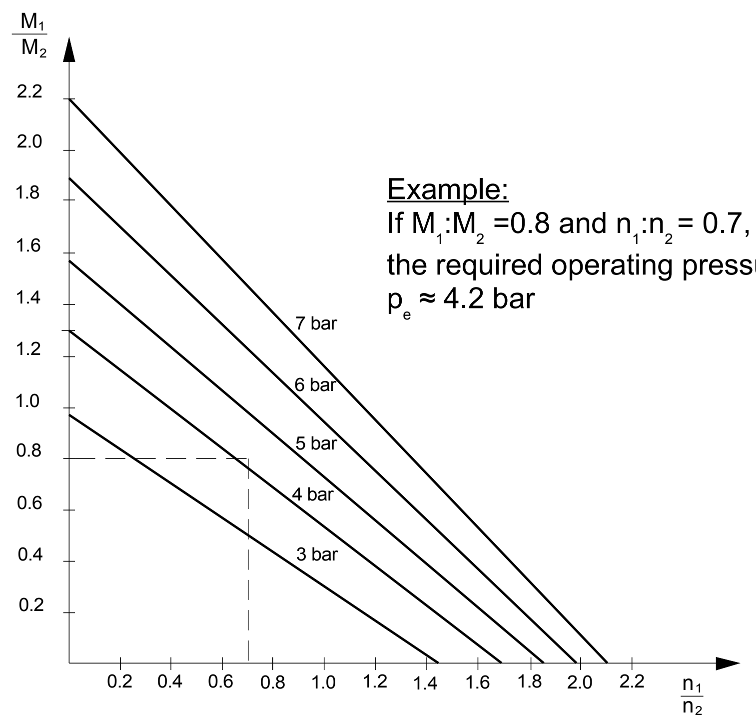
Setting Operating Pressure

Setting the operating pressure for torque and/or speed (rpm)

The following diagram can be used for calculating the operating air pressure. The M_2 and n_2 values can be derived from the technical data of each motor.

M_1 = required torque
n_1 = required rpm
M_2 = rated torque
n_2 = rated rpm

Calculate ratios M_1:M_2 and n_1:n_2 and apply results to diagram.
The intersection of both values represents the operating pressure.



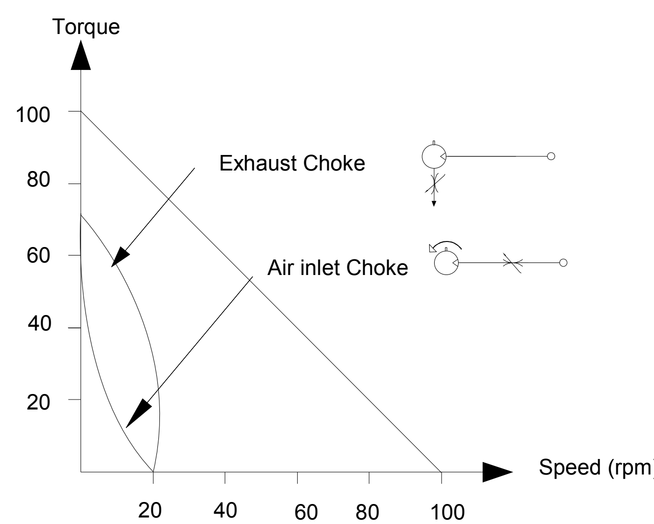
Example:
If M_1:M_2 =0.8 and n_1:n_2 = 0.7, then the required operating pressure is $p_e \approx 4.2$ bar

Motor Choke

Exhaust Choke should be applied when high starting torque is to be maintained and speed is to be reduced.

Inlet Choke should be applied when high starting torque is of secondary importance and the speed is Advantage with this setting: Air consumption is reduced.

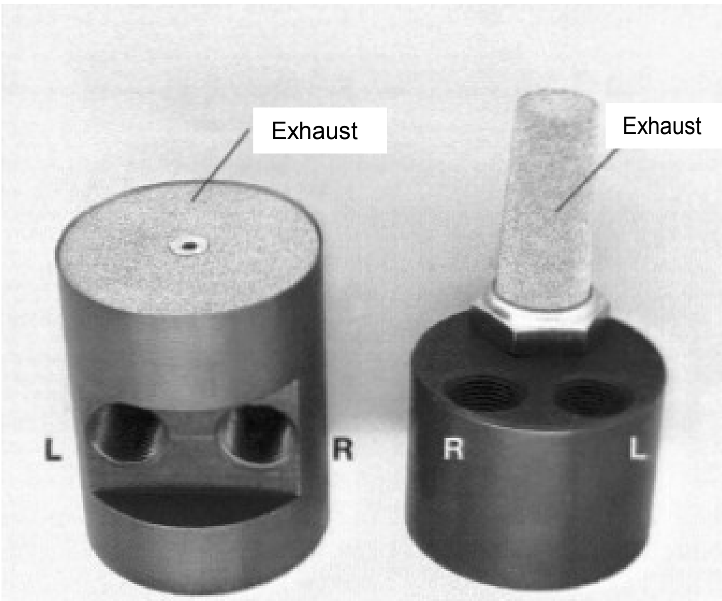
With the choke, motor speed can be adjusted between 20 –100 %.



Connecting up

Available Options

Image 1 Image 2



Exhaust with sintered metal disk to rear
(Image 1)
Order as (-20) type

Exhaust via silencer to rear or via exhaust hose
(Image 2)
Standard type is (-10)

L = Left hand
R = Right hand
A = Exhaust

Non-Reversible Motor
Connect air line to the inlet. Turn direction for the standard motor is clockwise from rear (inlet R). An exhaust line can be installed in place of the silencer (image 2)
All models equipped with a standard air connection have a 3rd port. This port has no function and can be closed up with a plug.

Reversible Motor
Connect the air lines to the port for the required turn direction. Do not close up the unused port, as this port is for exhausting residual air.

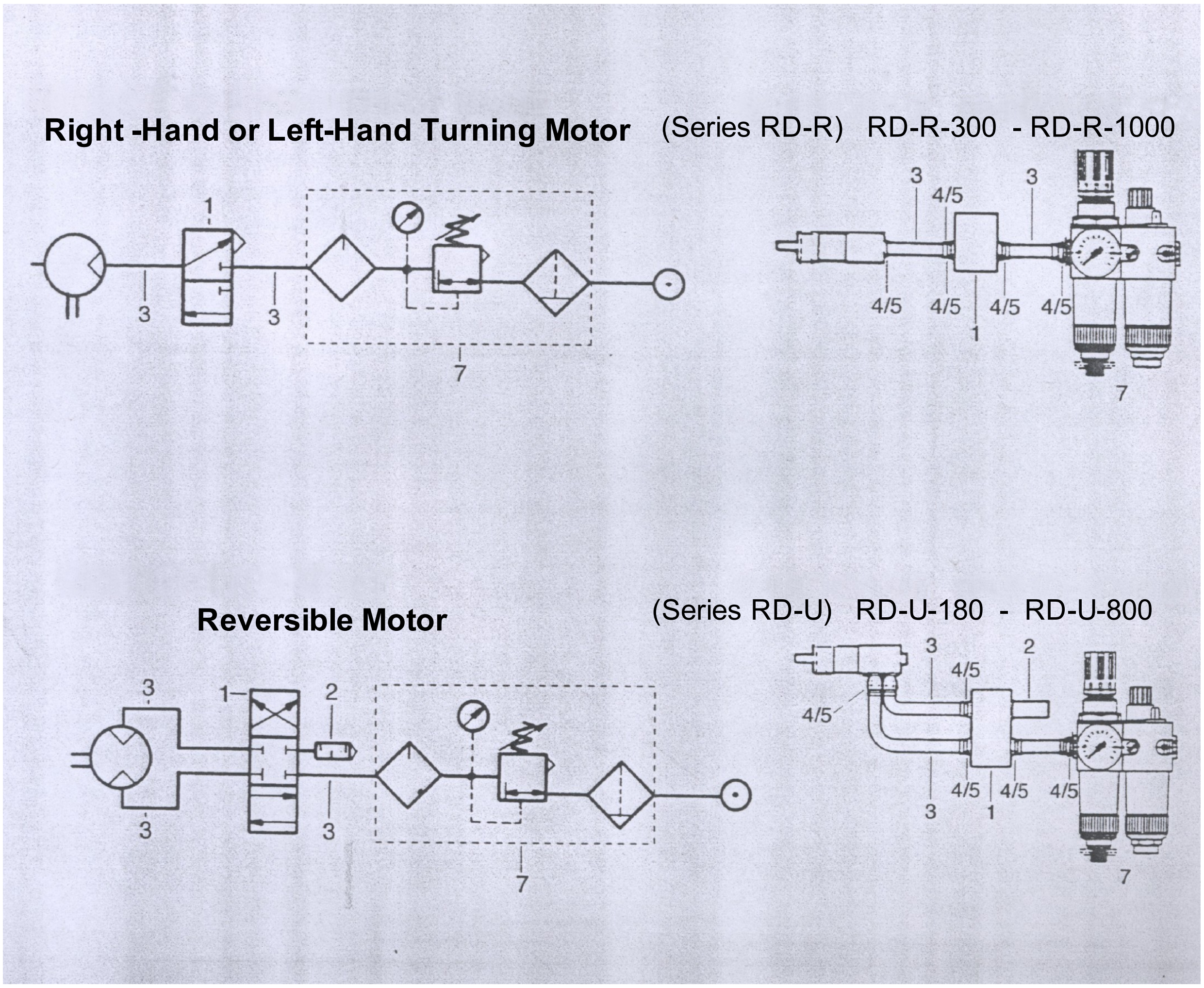
Mounting Position of Air Vane Motors

Air vane motors can be mounted in any position.
Optional mounting flanges and tail brackets are available for all motors.

Installation

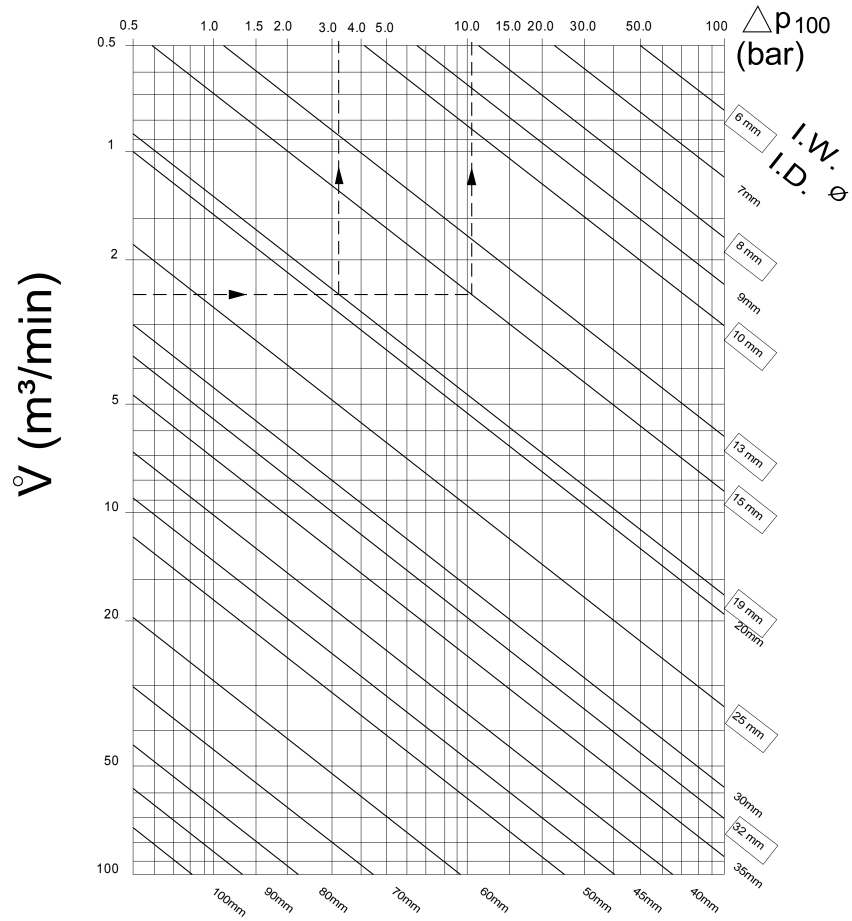
For optimal performance it is necessary to have the motor installed properly by a skilled professional. The following graph shows recommended values for air supply lines, valves and air service units. (see choice of components for air supply)
The most common way of reducing air motor speed is by installing a flow control valve. An oiler should be mounted not more than 5-meters away from the motor. Due to the compact size of the motor small fittings must be used.
For air supply lines longer than 5 meters utilize the next size up (see graph for pressure loss in long lines).
Lines connected to the exhaust port should be one size large than the pressure lines.

Installation Guide



Motor Types		RD-R-300 RD-U-180	RD-R-550 RD-U-400	RD-R-1000 RD-U-800
Item	**Designation**	**Ordering-No.**	**Ordering-No.**	**Ordering-No.**
1	2/2 or 3/2 way Valve	028-5001	042-5001	110-5001
2	Silencer (MU)	028-5002	042-5002	110-5002
3	Air hose (length as needed)	028-5003	042-5003	110-5003
4	Hose clamp	028-5004	042-5004	110-5004
5	Threaded socket	028-5005	042-5005	110-5005
6	Threaded socket	028-5006	042-5006	110-5006
7	Air maintenance kit	028-5007	042-5007	110-5007

Calculating Pressure Loss in Lines



Formula for calculating Δp at length l (m):

$$\Delta p \text{ loss} = \frac{\Delta p\ 100\ (\text{bar}) * l\ (\text{m})}{100}$$

Example: Air volume V = 2.5 m³/min
Line I.D. = 15 mm
Line length l = 8 m

wanted value: Δp loss

Δp 100 = 11.5 bar (from graph)

$$\Delta p \text{ loss} = \frac{11.5 \text{ bar } * 8 \text{ m}}{100} = 0.92 \text{ bar}$$

If pressure loss is too great, select the next larger line size (I.D. =19 mm). The pressure loss is now calculated as follows:

Δp 100 = 3.4 bar (from graph)

$$\Delta p \text{ loss} = \frac{3.4 \text{ bar } * 8 \text{ m}}{100} = 0.272 \text{ bar}$$

The values in above graph are referenced to a straight air line 100 m long and at an air pressure of 6 bar.

Einheitenumrechnung / conversion table

1 mm	0,0394 in
1 kg	2,205 lb
1 N	0,225 lb_f
1 Nm	8,85 in lb / 0,738 ft-lb
1 kW	1,36 PS