RASOR'S
PENUMATIC MOTORS
INSTALLATION & MAINTENANCE
INSTRUCTIONS

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PERFORMANCE AND TECHNICAL FEATURES OF AIR MOTOR

Performance of an air motor is dependent on the pressure measured at the motor inlet. However by simply regulating the inlet air through the pressure and/or the load air can achieve modification proportionally for torque and speed.

Optimal performance of Rasor air motor can be obtained operating with a supply pressure of 6.3 bar (ISO 2787).

The main features of air motor are:

- MAXIMUM POWER, KW
- SPEED AT POINT OF MAXIMUM POWER, RPM
- TORQUE AT MAXIMUM POWER, RPM
- STALL TORQUE, NM
- FREE SPEED, RPM
- AIR CONSUMPTION AT MAXIMUM POWER, L/S

POWER

The power of air motor results from the torque multiplied by the speed.
Each air motor have its own performance curve which max value is obtained when reaching about the 50% of free speed.
The resulted value of torque is called speed at point of maximum power.
The power required at the working point is calculated by:

$$P = (\Pi \times M \times n)/30$$

Where, P = Power (in KW), M = Torque (in Nm), n = Speed (in r/min)

SPEED

Each air motor has a free speed which comes by introducing one or more reduction gear, depending on the desired reduction ratio, between the drive unite the exit shaft.

At maximum speed (free speed), the torque detected on the outlet motor is null while, increasing the load applied on the shaft, the speed decreases inversely proportionally to the torque (see the above chart)

TORQUE AT MAXIMUM SPEED, STARTING TORQUE AND STALL TORQUE

The **torque at maximum speed** is achieved at 50% of the free speed which correspond to the maximum power of the motor (see chart A);
The **starting torque** is the torque supplied by the motor to the shaft under load and with maximum air feed (see chart A);
The **stall torque** is the torque supplied by the motor to the shaft when it is blocked during its rotation.
Approximately the stall torque is double than the toque at maximum power.

HOW TO CHOOSE AN AIR MOTOR – FACTORS FOR OPTIMAL MOTOR SELECTION

For an optimal decision regarding air motor type it is necessary to understand the required motor's efficiency to achieve the desired result.
Motor's efficiency is given by the output speed vs. torque.

FOR EXAMPLE

To operate at 1000RPM with a torque of 2.5Nm it is required a non-reversible air motor.

It is necessary to refer to the performance curve of each model and to identify our example i.e. the one showed with the orange mark in the aside chart.

The choice of the proper motor is visible where the motor efficiency is closer to the torque at the max power (shown with a red mark in the chart).

If necessary, one of the method to understand the desidered motor efficiency is to adjust the inlet pressure applying the coefficient change of the performance parameter of the motor (see table 1 in next page).
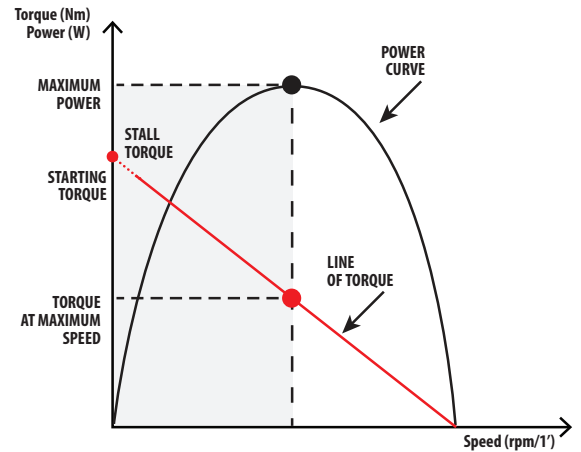
TORQUE – OUTPUT POWER BASED ON SPEED (UNDER AN INLET PRESSURE OF 6.3 BAR)
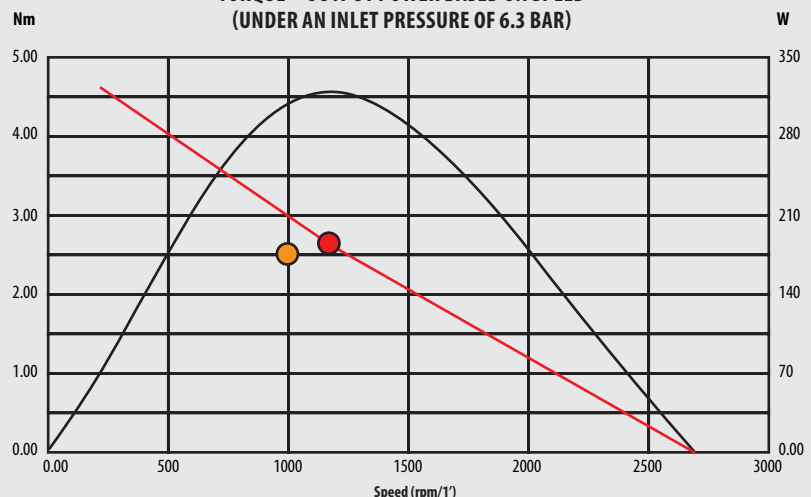
ADJUSTMENT OF THE MOTOR PERFORMANCE FEATURES

The performance features can be continuously adjusted through a pressure or air load regulator that decrease or increase the air quantity delivered to the motor.

The consequence is a decrease or increase of the values for power, torque and speed calculated through the coefficients mentioned in Table 1 here below.

There are two options available to adjust the motor efficiency:
. by a **pressure control valve** installed before the inlet air fitting so to control the torque stall
. by an **air control valve** installed on the air outlet fitting so to keep high take-off torque and adjust the motor speed

| Pressure (bar)	Power	Torque	Speed	Consumption
7	1,21	1,17	1,03	1,15
6	1,00	1,00	1,00	1,00
5	0,77	0,83	0,95	0,82
4	0,55	0,67	0,87	0,65
3	0,97	0,50	0,74	0,47

AIR SUPPLY AND CONSUMPTION

The pneumatic motor air consumption is maximum when the motor runs at no-load speed.

To achieve the performance as mentioned in the instruction manual it is necessary to guarantee the proper air supply and discharge and to follow below advises:

- Comply always with the **air flow pipes dimensions as suggested by Rasor**
- it is recommended that **air outlet pipe dimeter** is of bigger size than air inlet pipe diameter
- in case of reversibile air motor it is necessary to ensure that both air fittings allow alternatively the air inlet and discharge i.e. one of the inlet pipe will not be left free for air flow out.
- **avoid to install joint or quick couplings** which reduce the air flow
- it is always **recommended to install a FRL set** (filter + pressure valve + lubricator) suitable to the motor consumption.
- It is recommended to connect the discharge pipes to a proper **oil separator filter with built-in silencer** that in addition to break down the sound pressure level also allow to make a proper motor lubrication without emitting atomized exhaust air into the operating enviroment and the oil to be collected and reused.

Pneumatic flow chart (power supply and motor drive)

Non-reversible motor

Reversible motor
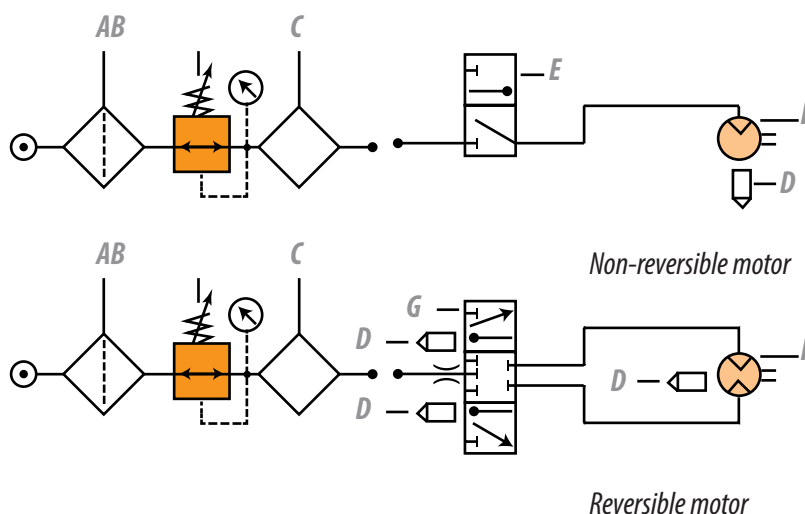
A = filter
B = pressure valve
C = lubricator
D = Silencer
E = 3/2 Valve
F = Air motor
G = 5/3 Valve

INSTALLING YOUR AIR MOTOR

AIRLINES

The recommended dimensions of airlines is given in the introductory section to each motor type. Note that exhaust hose is larger than the inlet hose.

The recommendations are valid for hose lengths of up to 3 metres. For distances between 3 and 15 metres select a hose diameter one size up, and for distances between 15 and 50 metres select a hose diameter two sizes up.

It is important to note that the output of the motor will be reduced if these guidelines are not followed.

AIR PREPARATION

To ensure reliable service an air filter and lubricator should be fitted into the inlet airline - within 5 metres from the motor.

It is recommended that a pressure regulator is also incorporated into the air preparation package. This has the function of maintaining the desired working pressure, and can be used to modify the motor's output to meet the needs of the application.

When selecting an air preparation package, ensure all components have a flow capacity sufficient to meet the requirements of the motor. A typical arrangement of an air preparation installation is shown below.

AB   *C*

A = filter
B = Pressure regulator
C = Oil fog lubricatior
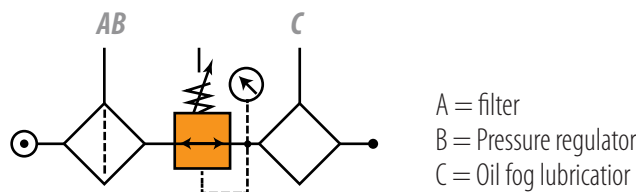
LUBRICATION

Atlas Copco air motors LZB 14, 22 and LZB 33/34 are available as standard in lubricated free versions. To achieve optimum service life and performance of the lubricated airmotors they should be supplied with 50 mm³ of oil for each cubic metre (1000 litres) of air consumed (1 drop = 15 mm³).

Insufficient lubrication will result in accelerated vane wear and a reduction in performance.

The following example shows how to calculate the lubrication required by a motor running at a known output.

EXAMPLE:

A non-reversible motor running at maximum output consumes 9,8 litres/sec of air.
In one minute it consumes 656 litres of air, therefore the lubrication required is:

$$\frac{656}{1000} \times 50 = 32,8 \text{ mm}^3/\text{min}$$

If an oil-fog lubricator was to be used it should be set to deliver 3 drops of oil a minute (1 drop = 15 mm³).

The lubrication oil selected should have a viscosity which lies between 50 and 300 x 10^6 m²/s at the motor's working temperature.
However, if it is necessary to reduce the level of oil exhauset from the motor, and a piped-away or filtered exhaust is not acceptable, then the lubrication level can be reduced.
Although this will effect the motor, the performance may still be acceptable. Table shows how reduced lubrication can affect service life and output.

Quantità lubrificante (mm³ olio m³)	Vita del motore (ore)	Potenza in uscita (%)
50	1000-3000	100
10	500-1000	100
1	200-500	90
0.1	100-300	80
0	10-30	30

1 drop of oil is appr. 15 mm³

If the supply air is very dry the idling speed of the lubrication free motors may degrade somewhat after running for longer periods, a decrease of 10-15% may be noticeable. The power of the motors is, however, generally not affected. To guarantee longer service intervals the lubricated, standard motors are still the best choice.