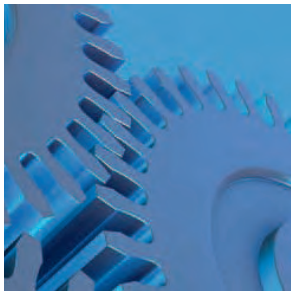
DEPRAG

Air Motors

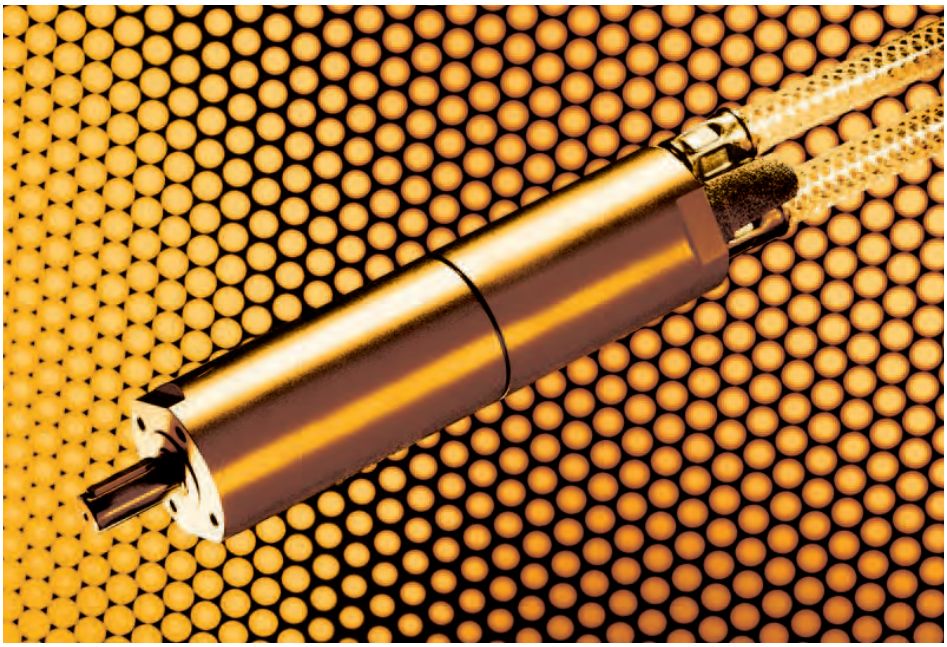


compact

Ex CE II 2 GD c IIC T6 (80°C) X

stainless steel light robust overload safe

reversible sterilisable service friendly



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OVERVIEW




Fields of application

Diverse design models, simple construction, light performance weight, high speed ranges and explosion safety – this ensures that air motors can be used in a wide spectrum of applications.
DEPRAG air motors – whether vane motors, turbine motors or tooth-gear motors – are employed in almost all sectors of industry.

Medical technology pharmaceutical industry
- sterilisable
- light – small
- high performance
- reliable
- long life-span
- oil-free operable
- easy maintenance

Food processing industry
- food industry conform
- sealed
- resistant to cleaning agents
- oil-free operable
- highest reliability

Ship building, underwater usage
- ATEX conform
- high performance
- robust
- easy maintenance

Paper industry
- stainless steel design
- high performance
- reliable
- long life-span
- easy maintenance

Foundries, iron works and power plants
- ATEX conform
- high performance
- long life-span
- easy maintenance
- robust

Machine construction
- non-corrosive
- insensitive to vibrations
- ATEX conform
- robust
- easy maintenance

Automobile industry
- ATEX conform
- high performance
- long life-span
- easy maintenance
- robust

Chemical industry
- ATEX conform
- resistant to cleaning agents
- insensitive to acids
- high performance
- long life-span
- easy maintenance

Air tools
- ergonomic
- robust
- easy maintenance
- long life-span
- high performance
- oil-free operable

Agitator motors, transport and materials handling technology and much more…

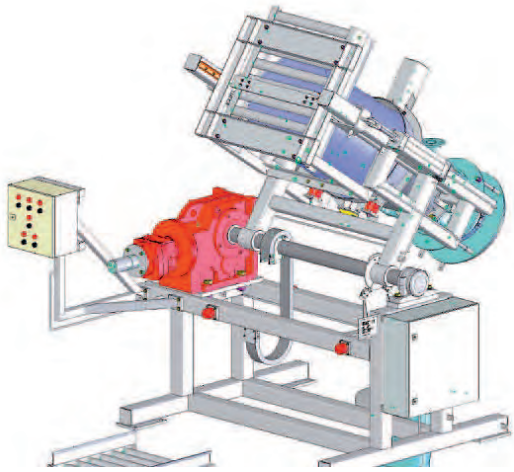
We have the right custom made drive solution for your individual application … no matter whether air vane motor, tooth-gear motor or turbine … irrespective of your required material, we will provide you with the best value for money customisation.

High performance in the smallest of spaces…

is achieved by the resilient air motor which drives the milling head of a sanitation robot under the extreme conditions of drain sanitation.

ATEX conform complete system: Air motor - brake - gear

Wilfried Beer, managing partner
of Beer Fördertechnik:
”By using this complete system for my vat drainage equipment I can save myself enormous additional construction and manufacturing expenses because the brakes which provide the safety for my mechanism are already integrated.”



Advantages of Air Motors

Air motors are safe and robust drive systems, which come into play when a high performance and overload safe drive is required. Always ready for action long after traditional drive technology has stopped spinning!

safe
for use in potentially explosive environments

sealed
even for underwater usage

insensitive to acids

sterilisable
for repeated use in clean-rooms

resistant to cleaning agents
and suitable for the high standards of the food processing industry

light and compact
only 1/5 of the weight and 1/3 of the size of an electric motor of equivalent power

insensitive to vibrations

insensitive to heat

insensitive to dust

overload safe
can be loaded to standstill with no damages

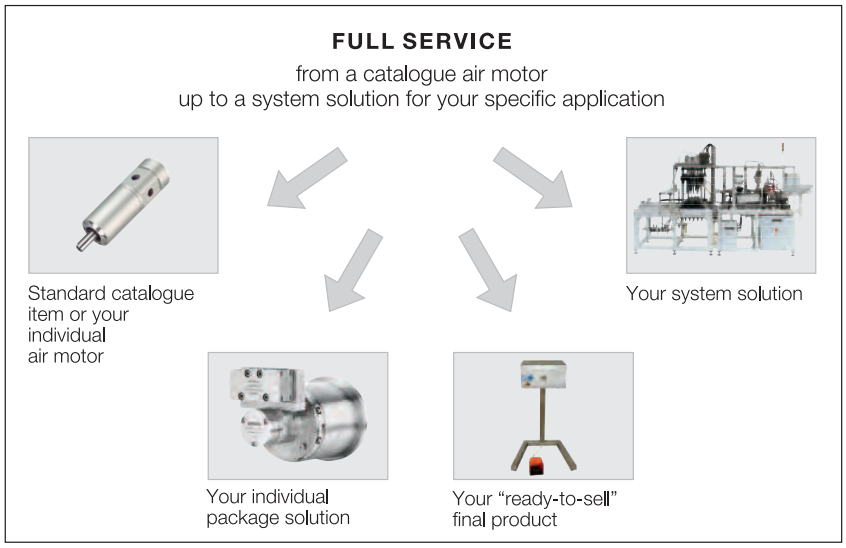
reversible
can be set in both rotational directions

easy to control
smoothly controlled by altering the pressure or air quantity (throttling)

What distinguishes DEPRAG Air Motors from the rest?

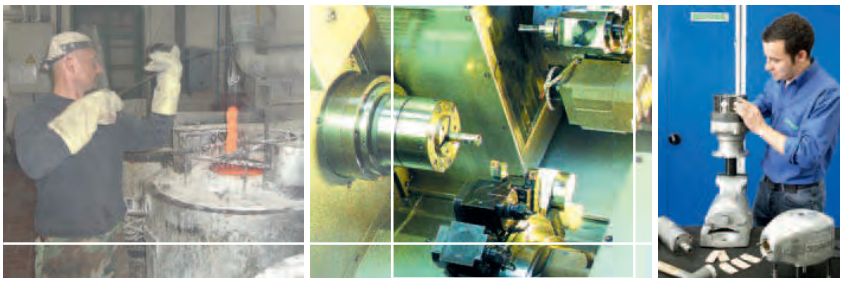
FULL SERVICE

Whether you need an integrated motor from our comprehensive programme catalogue, your own individual air motor, a package solution, a ready-to-sell end product or a fully automated assembly system – DEPRAG is your business partner.



SHORT DELIVERY TIMES

Due to our large amount of in-house production we are able to deliver fast and flexibly at short notice, even when dealing with smaller quantities.



Large amount of in-house production – on-site salt bath heat treatment facility

EASY MAINTENANCE

We offer a patented vane exchange system for our Basic Line product line. There is no need to dismantle the motor during vane exchange, thus saving valuable production time!

Patented vane exchange system

LONG LIFE-SPAN

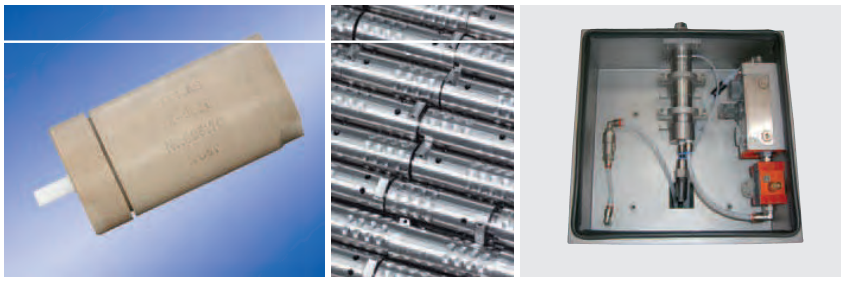
A wide product range of stainless steel motors, the use of DEPRAG high performance vanes as well as a specific surface coating on our materials, all this ensures your motor's long life-span.

Motor-gear-valve, a system for the paper industry made of stainless steel; sealed stainless steel motors and high performance vanes

What distinguishes DEPRAG Air Motors from the rest?

FLEXIBILITY

As well as wide-ranging stainless steel and Basic Line standard programmes, we offer flexible choice of materials, e.g. ceramic, or designs tailored to meet your needs.



Innovative materials, e.g. ceramic motor; customer specific package solutions

APPLICATION CONSULTANCY

Our application engineers advise you in selecting the most suitable drive system for your application. If you would like to test or replace your existing drive, we are happy to check it in our innovative performance testing facility.

Performance testing facility; professional guidance from our engineers

SERVICE AND MAINTENANCE

We will gladly carry out regular maintenance on your air motor. Ask about our maintenance offer. Appropriate service and maintenance kits for our motors are also available.

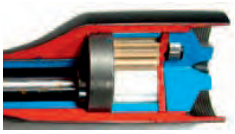
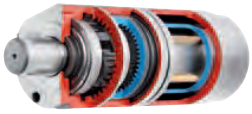
Worldwide service

GREAT VALUE CUSTOMISATION

Our standard programme features a high variety of different designs.
Planetary gears, spur gears or worm gears are optionally available for all our motors. On the basis of our modular principle we also provide individually customised products at an attractive price/performance ratio.

Individually customised products at an attractive price

Our Product spectrum

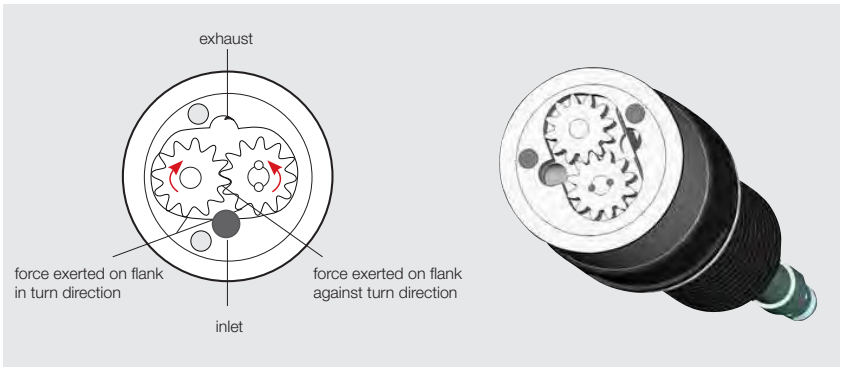
Product spectrum:	Advantages:	Our product lines:
Tooth-Gear Motors  	• speeds up to approx. 100,000 rpm • oil-free • no wear parts • low noise level • suitable for continuous use	Tooth-gear motors are developed individually to fit your requirements.
Turbines  	• speeds up to approx. 120,000 rpm • oil-free • no wear parts • optimum power to weight ratio • low air consumption	Turbine production according to your specific application.
Air Vane Motors  	• speeds up to approx. 60,000 rpm • compact & light • ATEX conform • overload safe • robust & powerful	• Basic Line • Advanced Line • Power Line • Individual Line • Grinding, milling & drill motors • Brake motors

Product spectrum: Tooth-Gear Motors

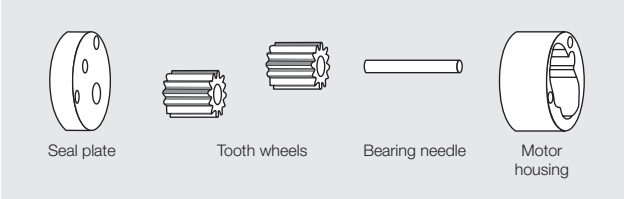
Our tooth-gear motors provide made-to-measure drive solutions for your individual application needs.

Function of the Tooth-Gear Motor

Tooth-gear motors consist of two tooth wheels which turn with little play within a housing. One wheel is connected to rotate with the drive shaft, the other generates torque. Force is exerted on two flanks in the turn direction and one flank against the turn direction. Exhaust air builds up in chambers between the tooth flanks and housing wall, then is guided to the exhaust side and rotational movement is generated.



Structure of a Tooth-Gear Motor



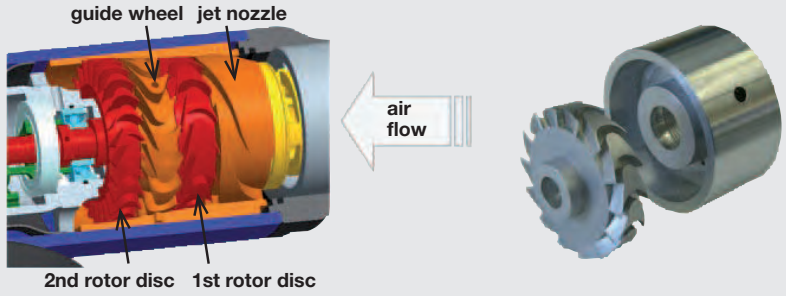
DEPRAG tooth-gear motors are oil-free operated.

Product spectrum: Turbines

Our turbine drives offer the ideal drive solution for high speed ranges.
From turbine design and prototype production up to series manufacture, a tailor-made drive solution is available for your individual application.

Structure and function of the DEPRAG Turbine

Conversion of pressure energy to kinetic energy in the jet nozzle. Most of the kinetic energy is transformed within the first rotor disc. The fixed guide wheel alters the air flow. The residual energy is transformed in the second rotor disc.



The turbine is a turbo machine which does not need tangential sealing. Turbine operation with oil-free air therefore causes absolutely no wear.
Turbo machines use pneumatic energy optimally. Therefore the air requirements sink to a third in comparison with the air vane motor. The performance to weight ratio [kg/kW] is only half as large.

Our turbine drives are found in high performance grinding machines:

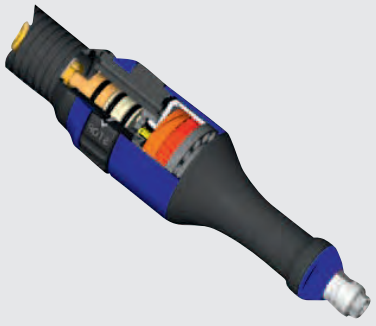
Example: Turbine grinding machine

This turbine grinding machine was the first worldwide two level Curtis-Turbine to be used in air tools.

In comparison to the multi-level reaction turbine, a two level Curtis-Turbine is simply constructed and is therefore extremely good value for money.

Turbine grinding machine
Power: **2.2 kW**
Idle Speed: **12,200 rpm**
Weight: **1.8 kg**

The decisive advantage of this application is the extremely low weight of the turbine grinding machine of 1.8 kg combined with a power rating of 2.2 kW. Electric grinding machines with the same power rating have a weight of approx. 5.7 kg.



Turbine grinding machine
Power: **250 W**
Idle Speed: **70,000 rpm**

Product spectrum: Air Vane Motors

Basic Line

Our great value for money model for use in non-critical production environments.
Additional benefit:
You save production time with our patented vane exchange system!

Power range:
200, 400 and 600 W
Your advantages:
- ATEX certified
- patented vane exchange system
- wide speed range
- reversible
- robust design

Advanced Line

Our product line of stainless steel motors stands out from the rest with its comprehensive range of sealed, oil-free operable, non-corrosive air motors. Particularly suitable for use in the paper industry, food processing industry, for medical technology and much more…

Power range:
20 - 1200 W
Your advantages:
- ATEX certified
- non-corrosive
- oil-free operable
- sealed
- reversible
- integrated brake design
- high performance, small size

Power Line

Our product line of high performance bracket and flange motors also features wide versatility. The high starting torque with an unparalleled low performance weight, the robust and reliable design are all clear advantages in comparison with an electric drive.

Power range:
1.6 - 18 kW
Your advantages:
- high performance
- high starting torque
- low performance weight
- robust, reliable design
- long life-span

Individual Line

Individual customisation
We offer a comprehensive programme of bracket and flange motors, as well as various drive spindle options.

During the design stages of your machine or system, due to space limitations specific connection and fixture requests often arise.

We will be glad to provide you with a great value customised spindle design or fixture according to your requirements and drawings.

Your advantage:
Individually customised products at an attractive price.

DEPRAG Air Vane Motors for special applications

Drill Motors

Our efficient drill motors with slim design allow the smallest of drill spacings when using multi-spindle units, such as for the construction of windows.

Power range:
170 - 600 W
Speed range:
150 - 24,000 rpm
Your advantages:
- high precision drill chuck with taper fitting

Milling Motors

Our durable milling motors are particularly suitable for robot applications:
space saving and high performance with high speed ranges.

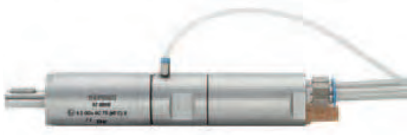
Power range:
250 - 400 W
Speed range:
max. 20,000 rpm
Your advantages:
- robust and precise bearing
- high running precision

Grinding Motors

Our grinding motors programme offers the advantages of the reliable handheld DEPRAG air grinding machines as an integrated version for your machine.
The robust steel housing guarantees high precision and operational safety.

Power range:
150 - 400 W
Speed range:
20,000 - 47,000 rpm
Your advantages:
- high precision collet for various shaft diameters
- high running accuracy

Motors with Integrated Brake System



for the series 67 and 68 available from 200 W – 3.6 kW.

Advantage of planetary gears:
- effective holding of a large centrifugal mass
- automatic brake by pressure drop
- drive spindle can be held in position without air consumption

Gear Motors

Due to high speeds, gears which are suited to a particular torque / speed are often required.

The DEPRAG product spectrum consists of numerous gear motors with precision planetary gears for high torque for very small sizes, spur gears or worm gears to transfer high torque at low speeds.

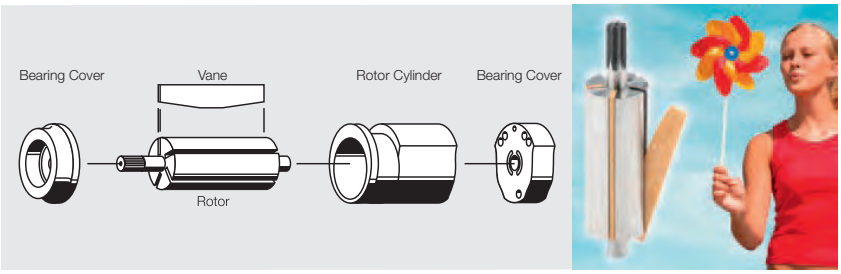
Advantages of planetary gears:
- compact design
- high degree of efficiency
- optional installation position
- gear ratio 5 - 50

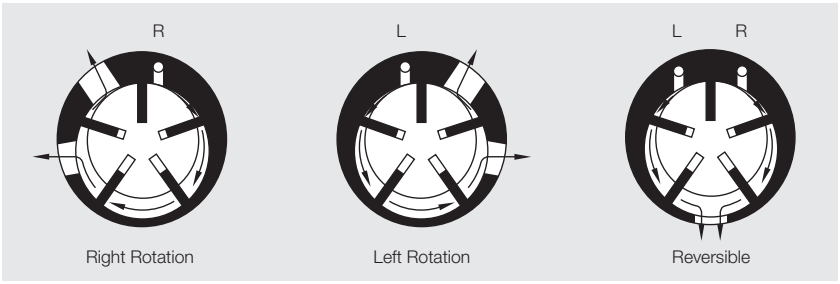
Advantages of spur gears:
- good value for money
- gear ratio: optional (i = 7 - 238)

Advantages of worm gears:
- good value for money
- compact design
- high gear ratio possible in one step from 14 - 80
- self-locking

Function of the DEPRAG Air Vane Motors

All vane motors essentially consist of the rotor, which circulates in an eccentrically offset perforation of the rotor cylinder. Because of this eccentrically offset perforation, the vanes form working-chambers, the volume of which increases in the turn direction. Because the expansion of the compressed supply air, the pressure energy is converted into kinetic energy, and therefore, results into the rotation of the rotor.



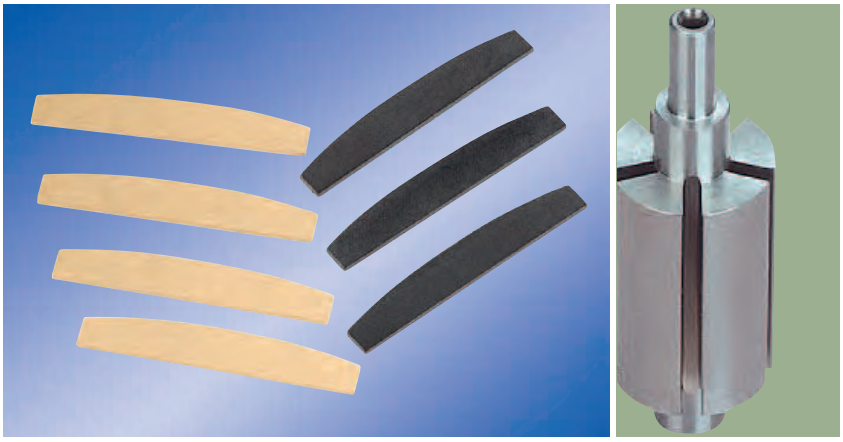


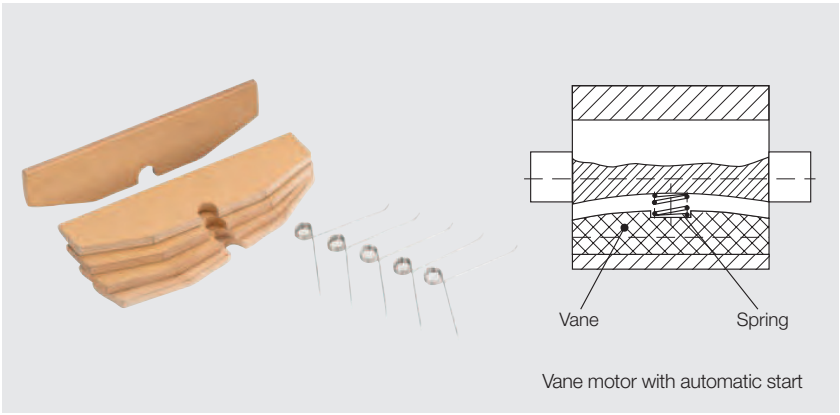
For motors with one turn direction, an increased turn angle for the expansion of the air is available. Therefore, these motors reach a somewhat higher efficiency.

The total efficiency-grade is essentially defined by the leak-loss on the front end of the motor. Highest production tolerances (≤ 0.01 mm) are essential for the unique performance density of the DEPRAG vane motor.

Depending on application requirement, the rotor contains 3 to 6 vanes. A higher vane quantity results in a greater start safety at higher friction losses. The tangential array of the vanes, provides a larger vane height and with it higher motor endurance. Virtually all DEPRAG motors include a specialized surface treatment of the rotor cylinder, which increases the vane life span.

In practice, vane motors have shown to keep a relatively constant orbital speed, which is, according to motor design, between 25 and 30 m/sec. The idle speed of a motor essentially depends on the motor-diameter.





Vane motor with automatic start

Starting conditions
During the operation of an air motor, the vanes are pressed against the wall of the rotor cylinder by the centrifugal force, which seals the working chambers against each other. If there are special requests in regard to the start-torque, suitable measures must be met to guarantee an automatic start.
For example:
– spring-loaded vanes
– pin-guided vanes
– thrust-rings
– vacuum induction, etc.
With the above options, it is possible to achieve a start-torque, which is approximately 1.5fold of the nominal torque.

Oil-free operation and explosion prevention

Oil-free operation
All DEPRAG stainless steel motors from series 67 are suitable for oil-free operation. They fulfil the special requirements of the food processing industry and are equally suitable for application in clean-rooms.

It must be noted that oil-free operation can reduce the output of the motor by 10-15 % depending on design.

In regard to air quality according to ISO 8573-1, we recommend:

	Cl.	Residue of Oil Content		Residue of Dust			Residue of Water		
		mg/m³	oz./cu.ft.	particle size mm	mg/m³	oz./cu.ft.	pressure dew-point °C	g/m³	oz./cu.ft.
Dry Air	3	1	$1.03 \cdot 10^{-6}$	0.005	5	$5.14 \cdot 10^{-6}$	-20	0.88	$0.90 \cdot 10^{-3}$
Lubricated Air	4	5	$5.14 \cdot 10^{-6}$	0.015	8	$1.03 \cdot 10^{-6}$	+3	6	$6.17 \cdot 10^{-3}$

Operation with lubricated air
Lubricated operation always improves a motors life span and operational behavior. For a correct air preparation, dryers and maintenance-units, existing of filter and oiler, are available.

Ex certification
Up to now, the use of air motors in potentially explosive environments has been possible without limitations.
A related certification was not necessary.
With the guideline 94/EG, better known as ATEX 100, the qualification of air motors for the use in EX-environments must now be proven.

A Type Certification of an independent checking institution will ensure the approved use of the motors of the series 67 for the field "Not Mining" in zone 1 (gas or dust contaminated environment), for mediums within the explosion group IIC, with an approved surface temperature of 80, 95 or 130°C.

Our motors from the series 63 (Basic Line) and our stainless steel motors of the series 67 (Advanced Line) are ATEX conform and carry the following markings:

Series 63:
- II2GD c IIC T4 (130°C) for a power of 200 to 600 W

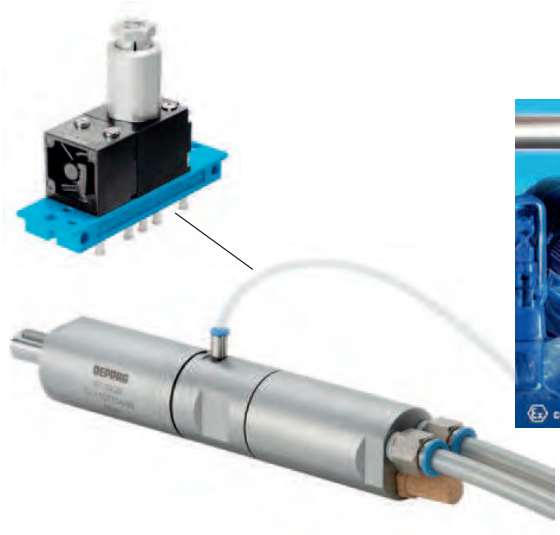
Series 67:
- II2GD c IIC T6 (80°C) for a power of 90 to 600 W

and
- II2GD c IIC T5 (95°C) for a power of 1200 W.

NEW

The world's first ATEX conform complete system consists of a 1.2 kW air motor, a holding brake and a planetary gear and is available from DEPRAG as standard.

The brake is controlled by a separate air inlet (p>5 bar) aided by a safety value, which is included in delivery.



Comparison of drive principles

	Hydraulic Motor	Air Motor	Electric Motor
+	• may be loaded until full standstill • overload safe • operationally safe (dust, gas, water) • weight • high power density • output-to-size ratio	• may be loaded until full standstill • overload safe • torque increase at mounting load • low installation cost • maintenance friendly • explosion proof • operationally safe (dust, gas, water) • low weight and small size • high power density • can be sterilized	• cost • total used energy • noise level • maintenance intervals • adjustability
−	• danger of oil leakage • hydraulic pack necessary • high installation costs	• total used energy • noise level • maintenance intervals	• risk of failure at overload • safety risk of any electrical installation • high weight • large size

Comparison
Air Motor / Electric Motor

Frequently, the unfavorable total energy use is seen as a disadvantage of the air motor. That the air motor has nevertheless asserted itself in the entire drive technology as an essential alternative, emphasizes its numerous advantages. When compared with the total cost estimate of the machine, the energy consumption plays no crucial role, especially when small drives with low duty cycles are used.

Design size

The main advantage of the air motor is its high performance density, which is only about 1/5th of the mass or 1/3rd of the size of an electric motor of comparable performance. This is particularly important with all hand-held machines, but also with robotic-systems or CNC-machines, where the drive has to be indexed.

Power characteristics

The power output performance of the air motor is virtually constant over broad speed ranges. It can also be operated in a wide field of alternating loads. The power output can be easily adjusted by changing the operating-pressure, and the speed is perpetually variable, by the reduction of air volume.

Load capacity

The air motor can easily be loaded to a full standstill; it even tolerates a negative turn direction if the load is increased. The motor always reaches its full power output and there will be no damage to the motor! The air motor starts again immediately, once the load is removed and this consecutively, even when motor operates without a pause.

Temperature behaviour

Expanding air cools the motor when the load is increased. Only when idling, a rise in temperature may occur. The motor is therefore temperature insensitive and overheating through over load is practically impossible.

Safety

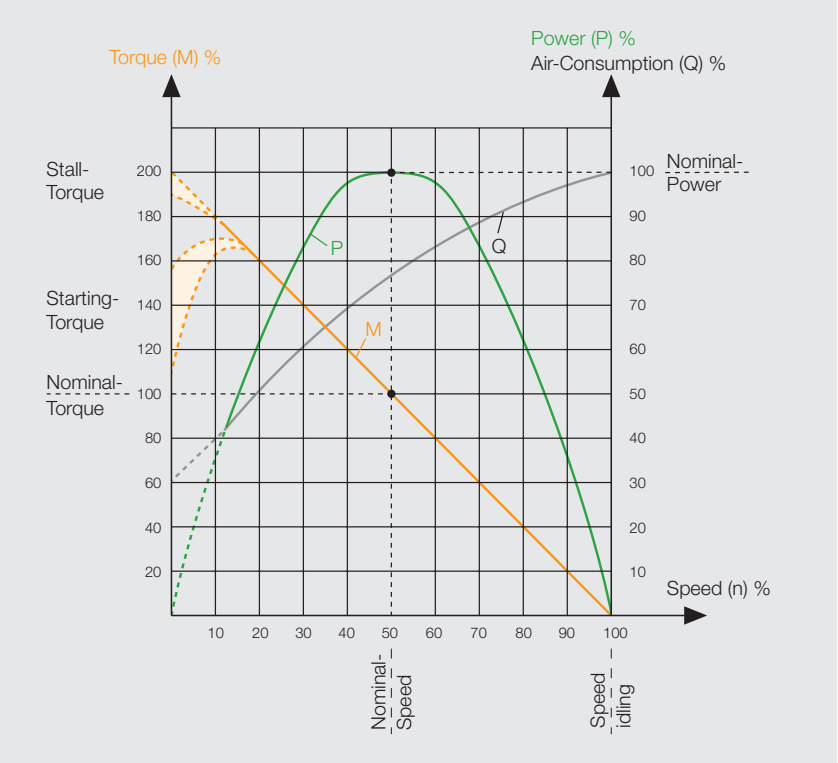
Air is an unproblematic energy carrier. There are no dangers from electricity or temperature increases e.g. in potentially explosive environments.

Maintenance

Air operated drives are extremely robust. The internal overpressure prevents the penetration of dust or dirt. Only the low cost vanes need to be exchanged as wear parts. Necessary repairs are simple and can be done easily and safely by a trained maintenance person. No electricity specialist is necessary.

Further details and valuable hints can be taken from our leaflet D 0090 E „Preventive maintenance and repair of air-operated tools."

Characteristic curve of the Air Vane Motor



Characteristics of the air vane motor

Performance

A parabolic performance curve results from the linear torque process, with the maximum output at nominal speed. This output maximum is identified according to the nominal speed, as the nominal power output. Each operating point below the nominal power output is reached with 2 speeds, which lie symmetrically to the output maximum. Therefore, the air motor cannot be selected for performance alone, but in the first place according to the necessary torque, as well as the corresponding speed.

Torque

The torque of unadjusted vane motors increases, at constant operating pressure, almost linearly with decreasing speed. The air motor can easily be loaded to a full standstill, where it reaches the so-called stationary or stall torque. The theoretical stall torque corresponds approximately to double the nominal torque, reduced by the standstill loss, in practice to about 1.9fold of the nominal torque.

The so-called startup or starting torque against the load, is lower than the stall torque. It depends on the vane array at the start-up time. The fluctuation amounts to approximately 100 to 150 % of the nominal torque.

Speed

With vane motors, speeds of up to 80,000 rpm can be reached.

The idle speed of an air motor can be set in a wide speed range of approx. 15 - 100 %

Air consumption

The air and with it the energy consumption, is determined by the leak loss and the output from chamber volume, chamber number and speed. The air consumption increases with the speed and reaches its maximum with the unloaded speed. Vane motors usually cite a specific air consumption per kilowatt of 1.4 m^3/min at smaller motors, up to 1 m^3/min at bigger motors.

Selecting an Air Motor for your application

Are you looking for a suitable motor for your construction?

The following guide will help you to avoid annoying mistakes which could drive up running costs later.

This is the correct procedure for selecting your drive:

STEP 1:

WHICH DRIVE PRINCIPLE IS SUITABLE FOR YOUR APPLICATION?

Air motors are available in various designs. The deciding factor in your choice is the application and the intended operating life-span.

The air vane motor is suitable for regular operating cycles.
However tooth-gear motors or turbines are more suitable for continuous operation (24 hour, non-stop) of the planned machine.

Speeds:
Turbines and tooth-gear motors rotate in the upper speed range (up to 140,000 rpm). Air vane motors are available for very small speeds e. g. 16 rpm.

Oil-free operation
is an option for all three basic principles. It is available for all Advanced Line motors of the series 67 taking into consideration the possible reduction of power 10 - 20 %.

STEP 2:

WHICH MOTOR MATERIAL IS SUITABLE FOR YOUR APPLICATION?

The material and design of the motor is decided according to your individual application. DEPRAG offers much more than the catalogue standards with drive solutions adapted to your application, so that your motor provides reliable service for you for as long as possible.

Normal production operation

A cast iron motor is the right choice for normal stationary operation with dry surrounding air. In this case a broad range of DEPRAG Basic Line motors is available.
A variety of lightweight grinding, milling and drill motors with compact designs are available for non-stationary applications.

Paper industry

For use in the paper industry a stainless steel design is required. DEPRAG Advanced Line motors satisfy the high demands of this field.

Food processing industry

In the food processing industry air motors must withstand harsh cleaning agents and steam. Stainless steel motors are specially sealed for this application and the sealants are designed with hard-wearing material.

Chemical industry

In the chemical industry motors must withstand aggressive chemicals. In this field requirements for explosion safety are particularly high. Your DEPRAG stainless steel motor fulfils ATEX standards and is additionally sealed.

Underwater usage

For underwater applications the deciding factor is how you want to use your motor and at which depth.
If you need your motor to start above water and then be lowered to a depth of 20 m, then a DEPRAG stainless steel motor from the Advanced Line programme is suitable.
If the motor should begin running under the water surface then a standard motor can be lowered to a depth of max. 5 m.

Do you have higher expectations?
In this case we offer further measures, such as additional sealants, coatings of the inner components, etc.

Medical technology Pharmaceutical industry

Air motors in the medical and pharmceutical industries work in sterile conditions.
Special materials ensure a long life-span despite frequent sterilisation of the complete motor.

Potentially explosive areas

In potentially explosive environments air motors are the first choice due to their design and functionality. The expanding compressed air cools the motor as it works. However extra combination with gears and brakes could increase risks. Therefore for this application DEPRAG offers the world's first ATEX conform complete system of air motor, brake equipment and gears.

Have you found your application?

We are happy to advise you in your individual application needs.

Example:
An air motor made of glass ceramic – a non-ferritic drive system for use in magnet resonance therapy.

STEP 3:

HOW DO YOU CALCULATE THE MOTOR POWER TAKING THE APPLICATION CONDITIONS INTO CONSIDERATION?

The correct calculation of your required drive is influenced by the required torque, the optimal working range of your air motor, the necessary motor power and possibly any application conditions which affect performance.

(1) Rotational direction

Determine the required rotational direction:
- clockwise
- anti-clockwise
- reversible

(2) Optimal working range of the Air Motor

Air motors function in a very broad working range which can be decisively influenced by the amount of supplied air and the air pressure.

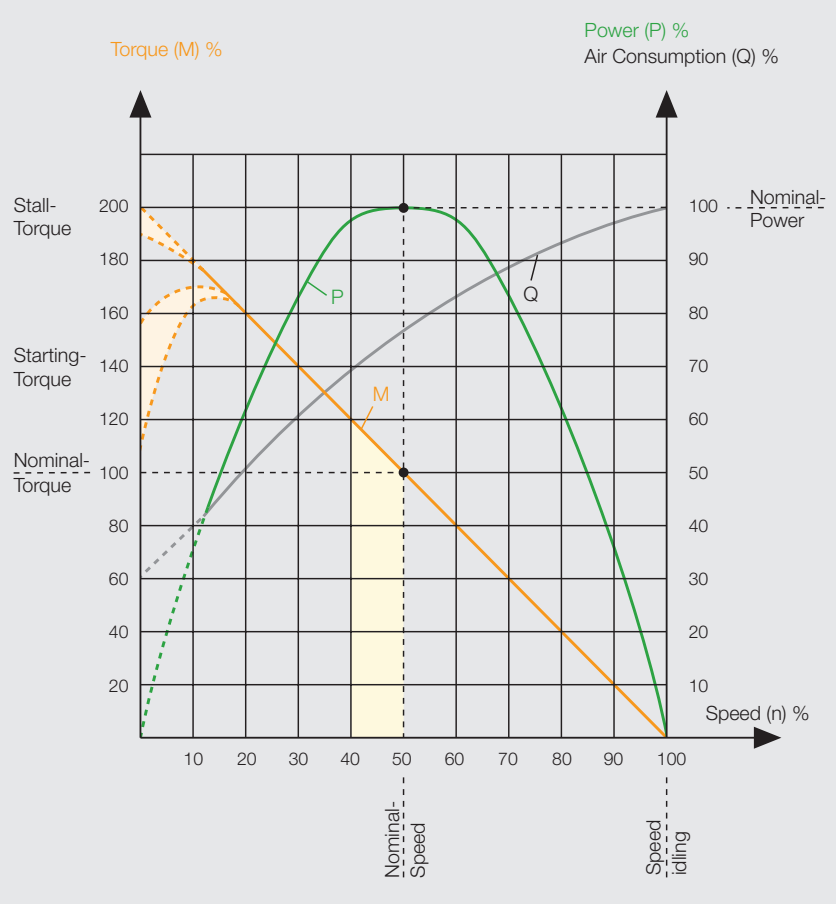
Next determine the working position for your motor:
Which nominal torque and which speed (when loaded) do you want to reach?

The most economical operation of the air motor (least wear, least air consumption, etc.) is reached by running close to nominal speed.

By torque of M = 0, the maximum speed (idle speed) reached.

Shortly before standstill ($n \rightarrow 0$), the air motor reaches its maximum torque ($M_{max} \approx 2 \times M_O$).

At nominal speed (n_n), i. e. in the middle of the speed range, the air motor reaches its maximum power output (P_{max}).



= optimal working range of the air motor

(3) Calculating the motor power

Next calculate the basic performance data of your motor, which will be adjusted in connection with your framework conditions (operating pressure available, opening cross-section, oil-free operation).

$$P = \frac{M \times n}{9550}$$

P = Power Output in kW
M = Nominal Torque in Nm
n = Nominal Speed in rpm

Power [HP] = P [kW] x 1.34
Torque [in.lbs] = M [Nm] x 8.85

(4) Allowing for performance influencing application conditions

All performance specifications of DEPRAG air motors are based on an operating pressure of 6 bar. Operating pressure means the flow pressure directly at the motor.

The catalogue specified inner opening cross-section of the supply hose (and all connection pieces and valves) as well as the length of the supply hose (max. 3 metres) of each motor influences the performance calculation.

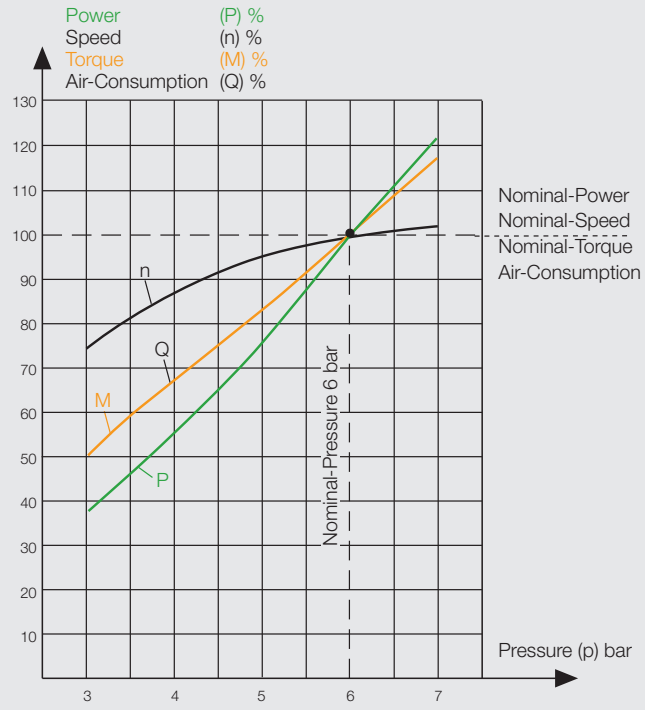
The catalogue specifications are also based on lubricated operation. Oil-free operation results in reduced performance (see subsection “c”).

Selecting an Air Motor for your application

If your application conditions differ from this basic data then the performance data of your motor should be corrected as follows:

a) Allowing for a different operating pressure

To adapt the differences in operating pressure you can either use the correctional diagram on the right or the correctional table.



Pressure (p) bar / PSI	Power (P) %	Speed (n) %	Torque (M) %	Air-Consumpt. (Q) %
7 / 99	121	103	117	117
6 / 85	100	100	100	100
5 / 71	77	95	83	83
4 / 57	55	87	67	67
3 / 42	37	74	50	50

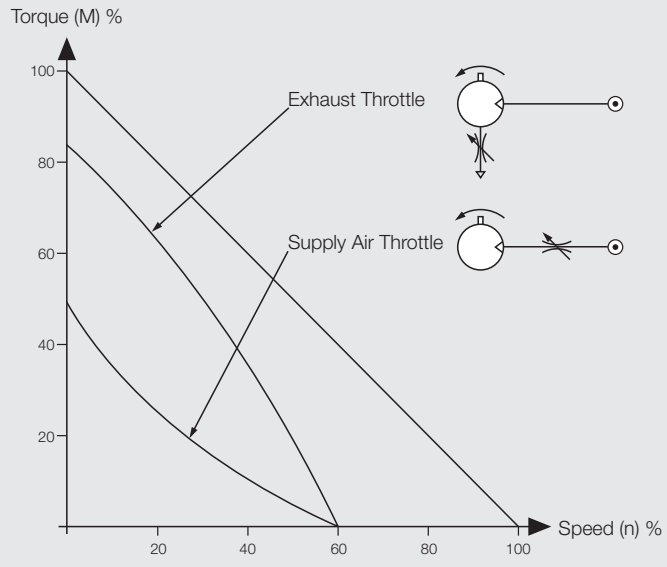
Influences of the operating pressure

b) Allowing for opening cross-section

Every size reduction of the opening cross-section, whether of the supply hose itself or connection pieces, affects the amount of supplied air. On a standard motor you can adapt the amount of air to fit your needs by throttling if required.

For all our motors there is a characteristic line available. Just ask us to provide one!

By throttling you reduce the speed of your motor and simultaneously, the required torque: that means that you reduce the motor performance. By exhaust throttling, on the other hand, you can set the speed of the motor without great loss of the torque.



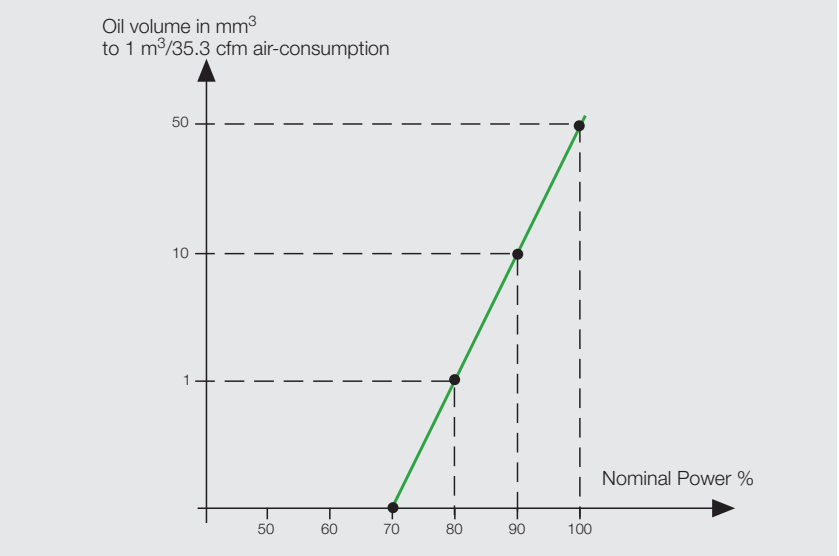
Influence of the air quantity

c) Allowing for oil-free operation

The optimal life-span and performance of an air motor is reached by 1-2 drops of oil per 1m³ air consumption.

The air consumption data for each motor can be taken from the brochure.

For oil-free operation an additional performance loss of 10 - 20 % must be calculated.



Are you having trouble determining your performance data?
Contact our application consultants – they will be glad to help you!

Would you like to calculate the performance data of your existing drive?
We offer a comprehensive testing service to determine the performance data of your existing drives (air motors, hydraulic or electric drives, grinding machines, drill machines, etc.).

Using our modern test facility we can determine performance parameters, speed, torque, operating pressure, air consumption and air humidity in

Speed range of: 0 - 12,000 rpm and
torque range of: 0 - 500 Nm

with accuracy of 0.1 % of the nominal torque.

STEP 4:

HOW DO YOU INTEGRATE THE AIR MOTOR INTO YOUR COMPLETE SYSTEM?

Once you have chosen your air motor you can add extra components which are available from DEPRAG's standard programme.

(1) Integrated brake equipment

Both of the following requirements can be fulfilled using DEPRAG's standard systems:
For example, the brake can be used as a holding brake to fix the position of a vat during a tilting procedure, or as an operating brake to bring a centrifugal mass to standstill.

(2) Integrated gear solution

A complete solution is often better value for money than searching for a gear solution yourself. DEPRAG offers a comprehensive range of motors with integrated planetary gears, worm gears or spur gears.

A worm gear is recommended when your system's gears need to be selflocking. A planetary gear allows a changeable installation position for smaller sizes.

Even if you can not find the right model in our catalogue, we have lots of great value special solutions available.

(3) Fixture and connection size

We offer numerous individual fixture options as well as those in our catalogue, so that our motor fits perfectly into your machine.
Tell us your requirements, we can implement them for you at low-cost.

(4) Technical examination

How does the power of your planned system affect the motor's drive spindle?
The maximum allowable axial and radial loads can be found in our brochures.

STEP 5:

HOW CAN YOU ENSURE LONG LIFE-SPAN AND HIGH PERFORMANCE OF YOUR MOTOR?

Air motors are extremely high performance machines and therefore have a long-life-span and are robust.

Adhering to the following framework conditions ensures the highest possible life-span and best performance of a motor:

- keep to the recommended air quality (dry supply air, free of particles)
- optimum life-span and best performance is achieved with 1-2 drops of oil per 1 m^3 air consumption
- keep to the recommended maintenance intervals (for oil-free operation please allow for shorter periods between maintenance intervals)
- sufficient opening cross-section of the air supply hose and the connection fittings
- maximum length of the air hose 3 metres
- operate the motor within its optimal working range, i.e. near to nominal speed

How frequently an air motor should be maintained is dependent on many factors. The application environment and conditions play an important role, also the size of gears or torque range. Additionally the duty cycle of the motor must be considered.

Here is a useful tip to remember when your motor will not be used for a long time: add a drop of oil to the air inlet and let the motor run for 5-10 seconds. Then the motor is well prepared for standstill or storage and will run again easily when restarted.

STEP 6:

HOW CAN YOU DETERMINE THE PURCHASING AND RUNNING COSTS?

The purchase price is the main factor to consider when buying a new drive system.

However, the follow-up costs must not be forgotten.

The operating costs for maintenance and service should also be taken into account when deciding to buy an air motor.

The cost of running the motor depends on air consumption. The correct choice of motor sets you on the right path for low running costs. The closer the motor is running to its nominal speed, (50 % of idle speed) i.e. the maximum performance of the motor is reached, the more efficiently the air will be used.

Replacement parts and maintenance kits

Already when planning and selecting new equipment the question of fast availability of replacement parts and their price arises.
DEPRAG air motors stand out from the rest because of their extremely competitive replacement parts.

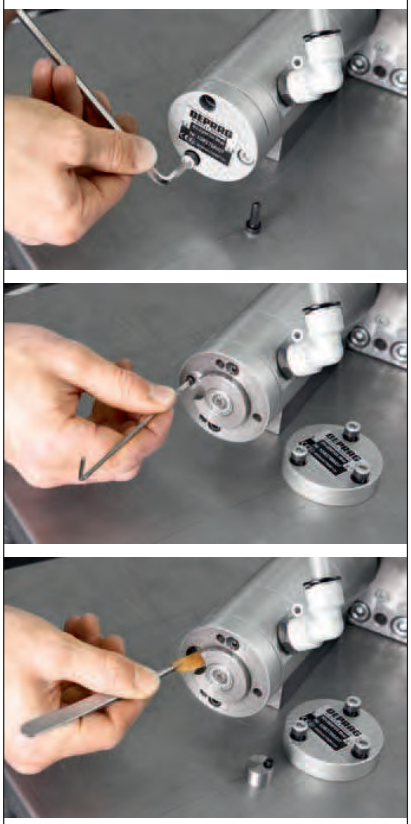
Maintenance and repair service

DEPRAG additionally provides a package offer for maintenance and repairs which makes your follow-up costs easily calculable.

Time is money – how easy is it to maintain your motor?

The DEPRAG Basic Line motor is particularly service friendly:
Due to our patented vane exchange system the air motor's vanes can be exchanged directly on the machine with just a few movements. Lengthy periods of standstill because of maintenance work on your machine are eliminated.

Patented Vane Exchange System



Exchange the vanes directly on the machine – fast and convenient

Do you need support in selecting the right drive system?

Tell us your operational conditions and our application consultants will be happy to help:

Application:			
In what kind of environment will the motor be installed?	**ATEX requirement / explosion safety?**	☐ **yes**	☐ **no**
	if yes, which safety class:		
	food industry conform?	☐ **yes**	☐ **no**
	sterilisable?	☐ **yes**	☐ **no**
	acid resistant?	☐ **yes**	☐ **no**
	steam resistant?	☐ **yes**	☐ **no**
Application conditions:	**constant operation (24 hrs, non-stop)**	☐ **yes**	☐ **no**
	duty cycle in hrs/day:		
	days/year:		
	cycle time (s):		
	non-stalling?	☐ **yes**	☐ **no**
	self-locking?	☐ **yes**	☐ **no**
Required turn direction:	☐ **left** ☐ **right** ☐ **reversible** (view from air inlet)		
Motor performance:	**power:**		**W**
	nominal torque:		**Nm**
	nominal speed:		**rpm**
Performance influencing application conditions:	**operating pressure (at motor inlet):**		**bar**
	operation with lubricated air possible?	☐ **yes**	☐ **no**
	smallest opening cross-section of connection pieces and hoses?		**mm**
External motor design:	☐ **standard steel** ☐ **non-corrosive** ☐ **aluminium** ☐ **plastic** ☐ **ceramic** **other:**		
Drive spindle design:	**fixture requirements:** (e. g. splined shafts, square end, hexagonal, collet, drill chuck taper, etc.)		
	required dimensions:		
Motor fixture design:	**fixture requirements:** (bracket, flange, etc.)		
	required dimensions:		
Additional components:	☐ **holding brake** ☐ **operational brake**		
	gears:		
Price expectations:			
Annual requirement:			

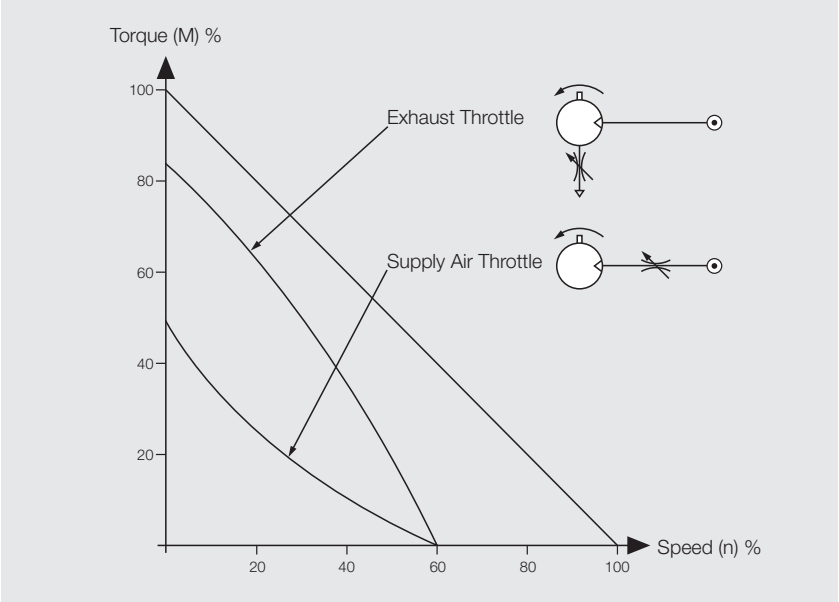
Regulating the speed by operating pressure or air quantity

Regulation

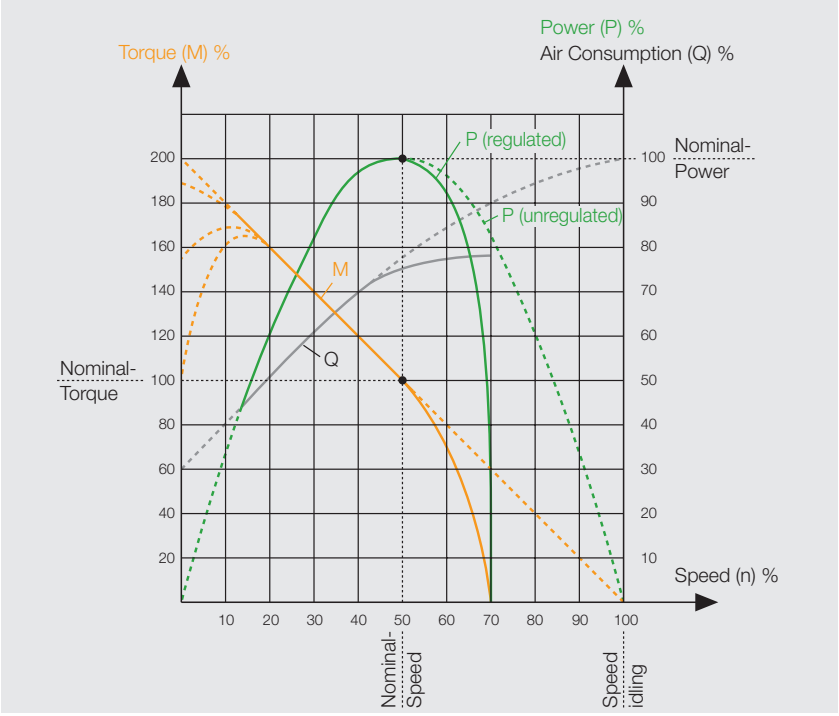
The required torque and speed values of the operating point can be adjusted by a simple pressure regulation. The flow pressure of a perfectly selected motor, should lie between 4 and maximum 6.3 bar.

In practice, the optimal operating point is reached by an overlaid regulation of pressure and air volume. Either an exhaust or supply air throttling can be used for air regulation. Supply air throttling leads to a concave, and exhaust air throttling to a convex torque / speed. Reversible motors have to be used with throttle-valves instead of throttles.

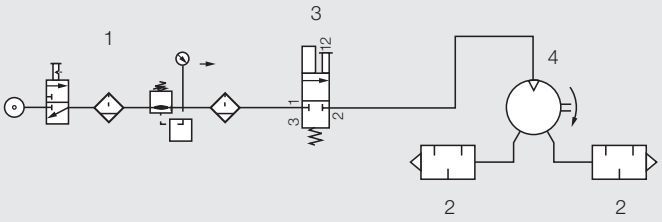
The speed of the motor changes not only with the pressure regulation but also when the load changes. With complete load removal, the speed increases up to the speed idling. This high speed is not allowable for all drive requirements. For those cases, regulators are integrated for speed limitation. Motors with a speed regulator decrease the speed from speed idling to nominal power output by 10-30 %.



Torque / speed reaction with air regulation

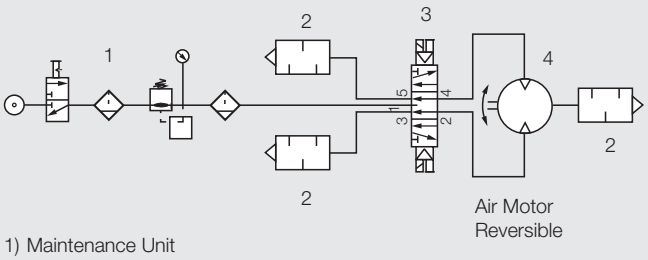


Characteristics comparison of the unregulated and the regulated air motor



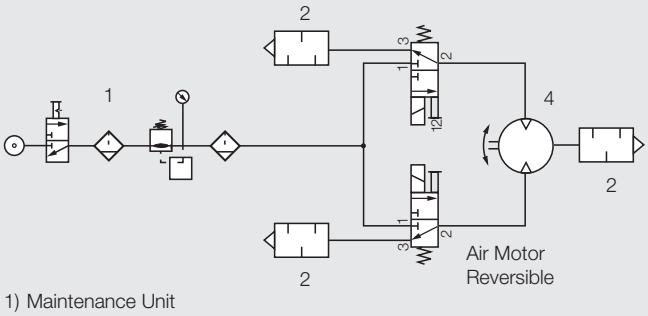
1) Maintenance Unit
(filter with water separator, pressure regulating valve and oiler)
2) Silencer
3) 2/2-way valve
4) Motor

Air Motor
Right-/Left-Rotation



1) Maintenance Unit
(filter with water separator, pressure regulating valve and oiler)
2) Silencer
3) 5/3-way valve
4) Motor

Air Motor
Reversible



1) Maintenance Unit
(filter with water separator, pressure regulating valve and oiler)
2) Silencer
3) 2 x 3/2-way valves
4) Motor

Air Motor
Reversible

Diagram for connection of compressed air motors

Connection lines:

Control

For the control of air motors with one turn direction, a simple 2/2-way valve is used. A simple two-way valve can also control motors with two turn directions, provided the motor has an integrated hand-reverse-lever. Otherwise a 5/3-way valve is necessary, so that the respectively unused rotor side can be exhausted. As an alternative, two 3/2-way valves are also possible. In every case, it is important that the selected valve has a sufficiently large airflow capacity.