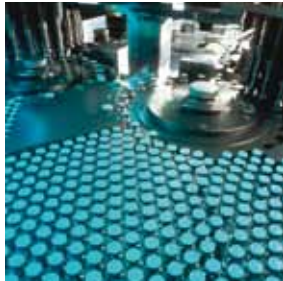


aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



Pneumatic Rotary Actuators & Airmotors

Catalogue PDE2613TCUK July 2011



ENGINEERING YOUR SUCCESS.

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**WARNING**

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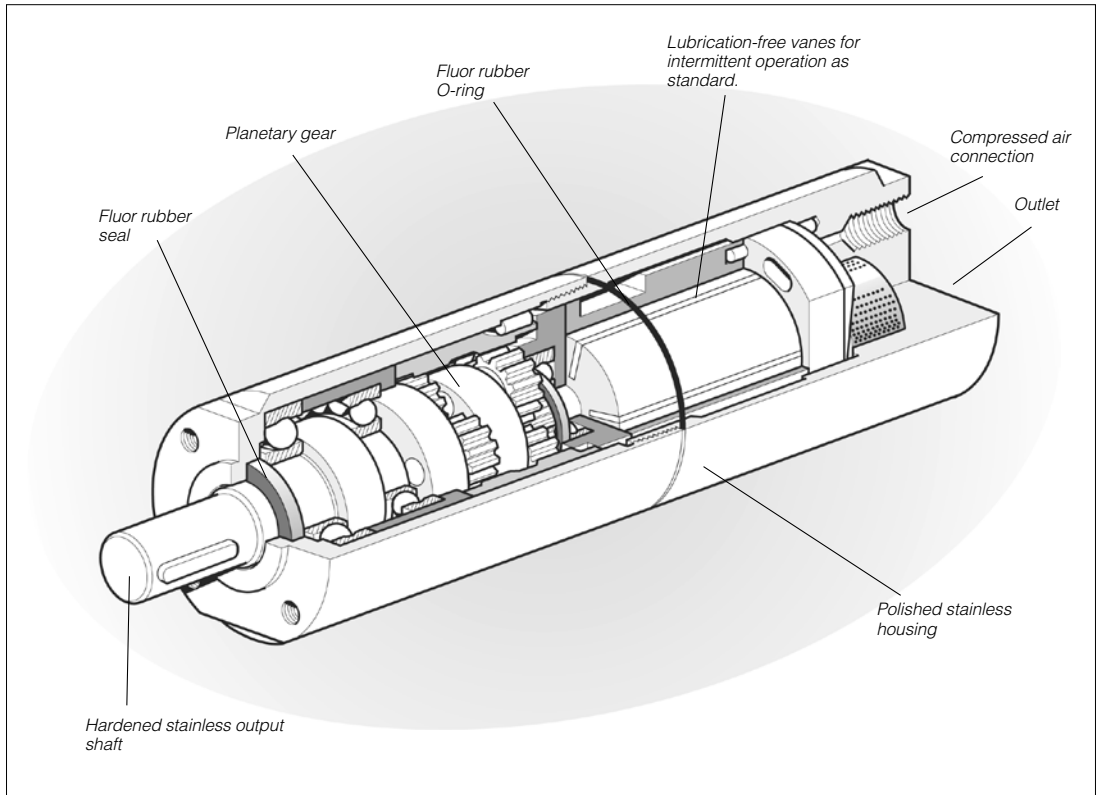
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Stainless Steel Air Motors

P1V-S Series



Stainless steel air motors, P1V-S Series

P1V-S is a range of air motors with all external components made of stainless steel, which means that they can be used in food grade applications, and in all other applications where there is a risk of corrosion.

The range contains seven different sizes, with powers ranging from 20 to 1 200 Watts, and speeds from 5 to 24 000 rpm. The air motor and planetary reduction gear are built into a polished stainless steel housing, which is sealed by a fluor rubber O-ring. The output shaft, which is made of polished stainless steel, is also sealed by a fluor rubber seal.

Consideration for achieving a clean, hygienic design was given early on in the development of this range of air motors. Thanks to the cylindrical shape, there are no pockets which can accumulate dirt or bacteria.

Additionally, the two halves of the motor body are sealed with an o-ring to prevent contamination.

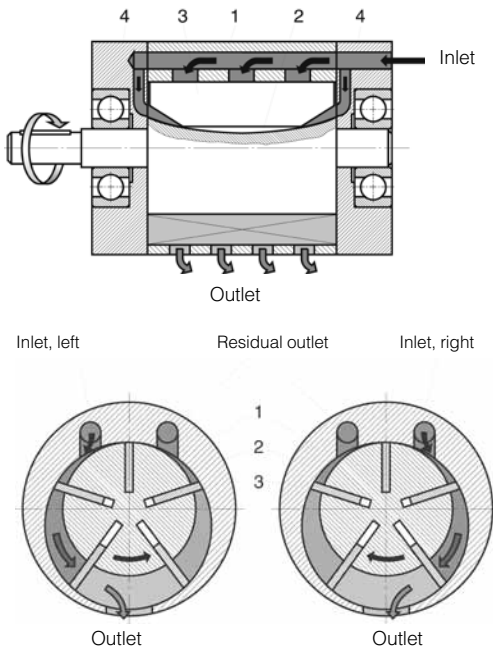
The choice of materials reflects the fact that aggressive cleaning materials are used in food grade applications.

The P1V-S series is designed to be operated in intermittent intervals under non-lubrication conditions. For this reason, no particles of lubricant escape with the exhaust air and the service costs are reduced. This means that the motors can be used directly in food grade applications. The planetary gear, which has one or more reduction stages, is lubricated with an USDA-H1 standard grease, approved for use in food grade applications.



Products particularly suitable for the food industry.

Principles of motor operation



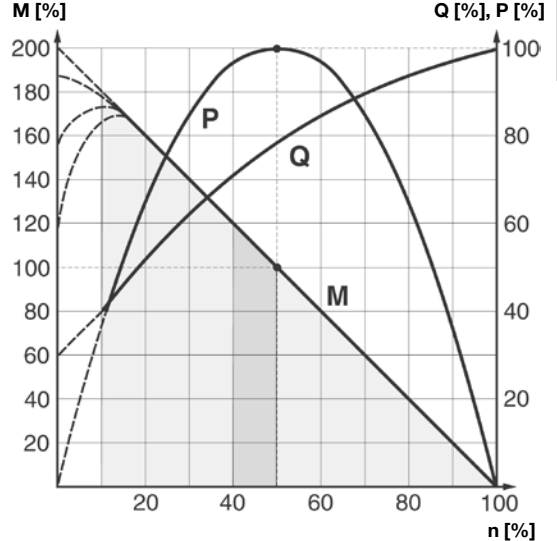
- 1 Rotor cylinder
- 2 Rotor
- 3 Vanes
- 4 End piece with bearing

There are a number of designs of air motors. Parker Hannifin has chosen to use the vane rotor design, because of its simple design and reliable operation. The small external dimensions of vane motors make them suitable for all applications. The complete unit consists of a motor built together with a planetary reduction gear to give the required speed and torque at the output shaft.

The design of a vane air motor consists of a rotor which incorporates a given number of vanes all enclosed within a cylinder. The cylinder will include three ports; an inlet pressure port, an exhaust port and a residual port. Reliable starting is ensured by the fact that the inlet air presses the vanes against the cylinder wall prior to rotation. During operation, the vanes are pressed outwards by centrifugal force. The air pressure always acts at right angles to the vane surface, which means that the available torque is determined by the surface area of the vanes and by the air pressure. As each vane reached its lowest point air is released through the exhaust port. As the rotation continues air may be trapped and compressed between vanes. This compressed air is released through the residual port. The residual port doubles as the pressure port when the motor is operated in the reverse direction.

Torque, power and air consumption graphs

The performance characteristics of each motor are shown in



The curve is for 6 bar
P = power **Q = air consumption**
M = torque **n = speed**

Possible working range of motor.
Optimum working range of motor.
 Higher speeds = more vane wear
 Lower speeds with high torque = more gearbox wear

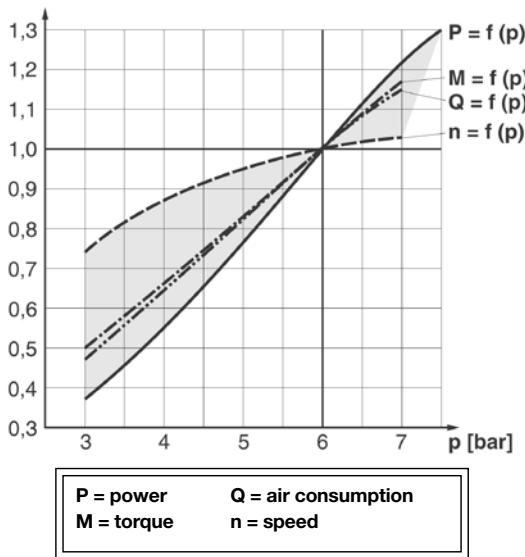
a family of curves as above, from which torque, power and air consumption can be read off as a function of speed. Power is zero when the motor is stationary and also when running at free speed (100%) with no load. Maximum power (100%) is normally developed when the motor is braked to approximately half the free speed (50%).

Torque at free speed is zero, but increases as soon as a load is applied, rising linearly until the motor stalls. As the motor can stop with the vanes in various positions, it is not possible to specify an exact starting torque. However, a minimum starting torque is shown in all tables.

Air consumption is greatest at free speed, and decreases with decreasing speed, as shown in the above diagram.

Correction diagram

Correction factor

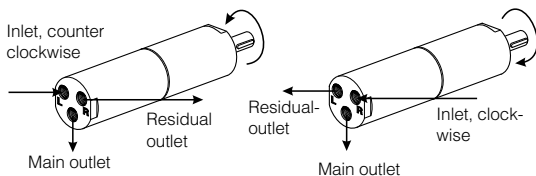


All catalogue data and curves are specified at a supply pressure of 6 bar (in the inlet port). This diagram shows the effect of pressure on speed, torque, power and air consumption.

Start off on the curve at the pressure used and then look up to the lines for power, torque, air consumption or speed. Read off the correction factor on the Y axis for each curve and multiply this by the specified catalogue data in the table or data read from the torque and power graphs.

Example: at 4 bar supply pressure, the power is only 0,55 x power at 6 bar supply pressure.

This example shows how rapidly the power rating of a motor decreases as the supply pressure is reduced. Therefore, it is critical to ensure that the proper pressure is supplied at the inlet port of the motor.

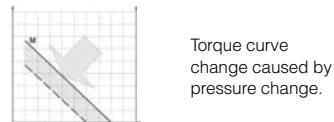
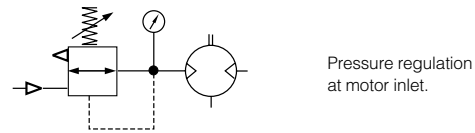
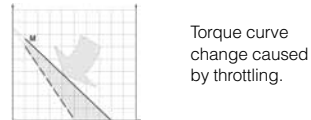
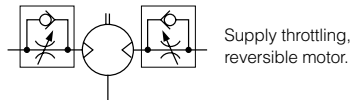
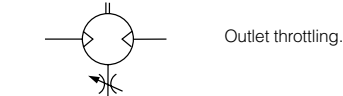
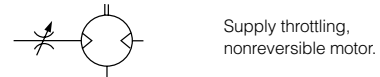


Direction of motor rotation

The direction of rotation of reversible motors is controlled by supplying inlet L or inlet R with compressed air. Air motors can be stopped and started continually without damage.

As the motor begins to rotate air is trapped between the vanes and is compressed. This air is exhausted through the exhaust port. As the rotor continues its rotation, trapped air is compressed and exhausted through the residual port. If this air is not exhausted, the motor will be braked and maximum

power will not be obtained.



Speed regulation

Throttling

The most common way to reduce the speed of a motor is to install a flow control in the air inlet. When the motor is used in applications where it must reverse and it is necessary to restrict the speed in both directions, flow controls with integral non-return function should be used in both directions. Restriction may also be applied to the main outlet which will control the speed in both directions.

Inlet throttling

If the inlet air is restricted, the air supply is restricted and the free speed of the motor falls, but there is full pressure on the vanes at low speeds. This means full torque is available from the motor at low speed, despite the low air flow.

Since the torque curve becomes "steeper", this also means that we get a lower torque at any given speed than would be developed at full air flow.

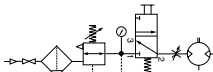
Pressure regulation

The speed and torque can also be regulated by installing a pressure regulator in the inlet pipe. When the motor is constantly supplied with air at lower pressure and the motor is braked, it develops a lower torque on the output shaft.

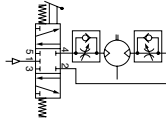
In brief: *Inlet throttling* gives reduced speed in one direction but maintains torque when braked. *The torque curve becomes steeper.* A restriction in the main inlet gives reduced speed in both directions but maintains torque when braked. *The torque curve becomes steeper.* *Pressure regulation* in the inlet cuts torque when the motor is braked, and also reduces speed. *The torque curve is moved parallel.*

Air supply

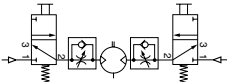
The air supplying the motor must be filtered and regulated.



Shut-off, filtering, pressure regulation and control valve



Reversible motor with 5/3 control valve



Reversible motor with two 3/2 control valves

irectional valves are needed to control the pressurized air which will cause the motor to rotate. These valves can be equipped with several means of actuation, such as electric, manual or pneumatic control. When the motor is used in a non-reversible application, it is sufficient to use a 2/2 or 3/2 valve for supply. Either one 5/3 or two 3/2 valves are needed for a reversible motor, to ensure that the motor gets its compressed air and the residual outlet is vented. A flow control can be installed in the inlet pipe to regulate the motor speed if the motor is not used as a reversible motor. One flow control with by-pass is needed to regulate each direction of rotation if the motor is used as a reversible motor. The built-in check valve will then allow air from the residual air outlet to escape through the outlet port in the control valve.

The compressed air supply must have sufficiently large pipes and valves to give the motor maximum power. The motor needs 6 bar at the supply port all the time. A reduction of pressure to 5 bar reduces the power developed to 77%, and to 55% at 4 bar.

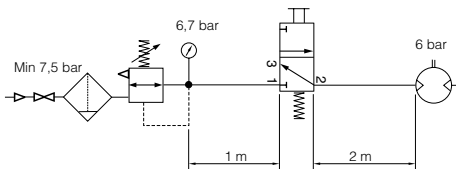
Choice of components for air supply

Since the supply pressure at the air motor inlet port is of considerable importance for obtaining the power, speed and torque quoted in the catalogue, the recommendations below should be observed.

The following data must be complied with:

- Supply pressure to air treatment unit: Min 7,5 bar
- Gauge pressure: 6,7 bar
- Pipe length between air treatment unit and valve: Max 1 m
- Pipe length between valve and air motor: Max 2 m
- The pressure drop through air treatment unit - pipe - valve - pipe means that 6 bar pressure is obtained at the motor inlet port.

Please refer to the correction diagram on page 7, which shows what lower supply pressure means for power, speed and torque.



The table can be used as follows:

If you are using only one motor with each air treatment unit and valve, simply follow the table. If you are using more than one motor with the same air treatment unit: read the table values for selecting the air treatment unit and add them together, and select a suitable air treatment unit from the table showing air flows per treatment unit. Then read the values for selecting the valve from the bottom of the table, and select a suitable valve from the table showing air flows per valve family.

The air treatment units have the following flows in NI/Min at 7,5 bar supply pressure and 0,8 bar pressure drop

FRL series	Air flow in NI/Min
P3A, Mini Modular	400
P3D, Junior Modular	950
P3K, Moduflex FRL, 60 Series	2300
P3E, Maxi Modular	3000
P3N, 1" Modular	7500
Standard series FRL, 11/2"	9200
Stainless series FRL PF G1/4	530
Stainless series FRL PF G1/2	1480

Valve series with respective flows in NI/minute

Valve series	Qn in NI/Min
Valvetronic Solstar	33
Interface PS1	100
Valvetronic Interface 2000	100
B2 Series	168
Adex A05	173
Moduflex size 1, (2 x 3/2)	220
Valvetronic PVL-B 5/3 closed centre, 6 mm push in	290
Moduflex size 1, (4/2)	320
B43 Manual and mechanical	340
Valvetronic PVL-B 2 x 2/3, 6 mm push in	350
Valvetronic PVL-B 5/3 closed centre, G1/8	370
Compact Isomax DX02	385
Valvetronic PVL-B 2 x 3/2 G1/8	440
Valvetronic PVL-B 5/2, 6 mm push in	450
Valvetronic PVL-B 5/3 vented centre, 6 mm push in	450
Moduflex size 2, (2 x 3/2)	450
Flowstar P2V-A	520
Valvetronic PVL-B 5/3 vented centre, G1/8	540
Valvetronic PVL-B 5/2, G1/8	540
Valvetronic PVL-C 2 x 3/2, 8 mm push in	540
Adex A12	560
Valvetronic PVL-C 2 x 3/2 G1/8	570
Compact Isomax DX01	585
Valvetronic PVL-C 5/3 closed centre, 8 mm push in	700
Valvetronic PVL-C 5/3 vented centre, G1/4	700
VIKING P2L-A	760
B3 Series	780
Valvetronic PVL-C 5/3 closed centre, G1/4	780
Moduflex size 2, (4/2)	800
Valvetronic PVL-C 5/2, 8 mm push in	840
Valvetronic PVL-C 5/3 vented centre, 8 mm push in	840
Valvetronic PVL-C 5/2, G1/4	840
VIKING P2L-B	1020
Flowstar P2V-B	1090
ISOMAX DX1	1150
B53 Manual and mechanical	1160
B4 Series	1170
Airline Isolator Valve VE22/23	1470
ISOMAX DX2	2330
VIKING P2L-D	2880
ISOMAX DX3	4050
Airline Isolator Valve VE42/43	5520
Airline Isolator Valve VE82/83	13680

Air motors

Air motor	P1V-S002	P1V-S008	P1V-S012	P1V-S020	P1V-S030	P1V-S060	P1V-S120
Air flow required, NI/s	1,7	3,8	5,0	6,3	8,0	14,5	27
Air flow required, NI/min	102	230	300	380	480	870	1620
Min. internal diameter of pipe, mm	4	4	6	10	10	12	19
Choice of air treatment unit: recommended min. air flow in litres/minute at 7,5 bar air supply and 0,8 bar pressure drop							
	110						
		255					
			330				
				420			
					530		
						960	
							1780
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).							
	123						
		280					
			360				
				440			
					660		
						1080	
							2160

Drilling motors

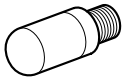
Drilling motor	P1V-S008	P1V-S017	P1V-S025	P1V-S040			
Air flow required, NI/s	3,8	5,0	6,3	8,0			
Air flow required, NI/min	230	300	380	480			
Min. internal diameter of pipe, mm	4	6	6	10			
Choice of air treatment unit: recommended min. air flow in litres/minute at 7,5 bar air supply and 0,8 bar pressure drop							
	255						
		330					
			420				
				530			
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).							
	280						
		360					
			440				
				580			

Grinding and milling motors

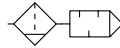
Motor	Grinding P1V-S009	Grinding P1V-S020	Milling P1V-S040				
Air flow required, NI/s	2,0	6,3	8,0				
Air flow required, NI/min	120	380	480				
Min. internal diameter of pipe, mm	4	6	10				
Choice of air treatment unit: recommended min. air flow in litres/minute at 7,5 bar air supply and 0,8 bar pressure drop							
	135						
		420					
			530				
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).							
	145						
		440					
			580				

Silencing

Outlet silencer



Central silencer



The noise from an air motor consists of both mechanical noise and a pulsating noise from the air flowing out of the outlet. The installation of the motor has a considerable effect on mechanical noise. It should be installed so that no mechanical resonance effects occur. The outlet air creates a noise level which can amount to 108 dB(A) if the air is allowed to exhaust freely into the atmosphere. To reduce noise levels, various types of outlet silencer are used. The most common type screws directly into the outlet port of the motor. A wide range of silencers are available. Many are made of sintered brass or sintered plastic. Since the motor function causes the exhaust air to pulsate, it is a good idea to allow the air to exhaust into some kind of chamber first, which reduces the pulsations before they reach the silencer. The best silencing method is to connect a soft hose to a central silencer allowing the speed of the air to reduce as much as possible.

NOTE! Remember that if a silencer is too small or is blocked, back pressure is generated on the outlet side of the motor, which in turn reduces the motor power.

Sound levels

Sound levels are measured at free speed with the measuring instrument positioned 1 m away from the air motor, see the table below

Air motor	Free outlet	With outlet	Exhaust air removed
	dB (A)	silencer dB (A)	with pipes to another room dB (A)
P1V-S002	98	-	74
P1V-S008	95	-	71
P1V-S012	99	92	70
P1V-S020	100	88	71
P1V-S030	103	91	70
P1V-S060	103	94	76
P1V-S120	108	95	87

Drilling, milling and grinding motor	With integrated outlet silencer	Exhaust air removed
	dB (A)	with pipes to another room dB (A)
P1V-S008	85	71
P1V-S009	72	-
P1V-S017	74	70
P1V-S025	76	71
P1V-S040	77	70

Compressed air quality

Oil and oil mist are avoided whenever possible to ensure a clean work environment. In addition, purchasing, installation and maintenance of oil mist equipment can be expensive. All users in all industries now try to avoid using components which have to be lubricated.

The P1V-S motor is equipped with vanes for intermittent lubrication free operation as standard, which is the most common application of air motors. The motor is also available with optional hard vanes for continuous lubrication-free operation (option "C").

The P1V-S motor is equipped as standard with food grade grease in the planetary gearbox. An oil which is approved by the food industry is also available if supplementary lubrication is required.

Working pressure

Max 7 bar (max 6 bar


in explosive atmospheres 

-30 °C to +100 °C

Working temperature

Ambient temperature

-20 °C to +40 °C

in explosive atmospheres 

Medium

40 µm filtered, oil mist or

dry unlubricated compressed air

Dry unlubricated compressed air



If unlubricated compressed air is used, the compressed air should comply with the purity standards below in order to guarantee the longest possible overall service life. If the unlubricated compressed air has a high water content, condensation forms inside the motor, causing corrosion in all internal components. A ballbearing can be destroyed in a remarkably short time if it comes into contact with a single water droplet.

For indoor use, we recommend ISO8573-1 purity class 3.4.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, refrigerant air dryers and air filters.

For indoor/outdoor use, we recommend ISO8573-1 purity class 1.2.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, adsorption dryers and dust filters.

Oil mist



If oil mist is used (approx. 1 drop of oil per m³ of compressed air), the oil not only acts as a lubricant but also protects against corrosion. This means that compressed air with a certain water content may be used without causing corrosion problems inside the motor.

ISO8573-1 purity class 3.-.5 may be used without difficulty.

The following oils are recommended for use in the foodstuffs industry: Shell Cassida Fluid HF 32 or Klüberoil 4 UH 1-32

ISO 8573-1 purity classes

Quality class	Contaminants		Water max. pressure dew point (°C)	Oil max. concentration (mg/m ³)
	particle size (µm)	max. concentration (mg/m ³)		
1	0,1	0,1	-70	0,01
2	1	1	-40	0,1
3	5	5	-20	1,0
4	15	8	+3	5,0
5	40	10	+7	25
6	-	-	+10	-

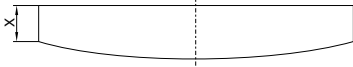
For example: compressed air to purity class 3.4.3

This means a 5 µm filter (standard filter), dew point +3 °C (refrigerant cooled) and an oil concentration of 1,0 mg oil/m³ (as supplied by a standard compressor with a standard filter).

Service interval



The first service is due after approximately 500 hours of operation. After the first service, the service interval is determined by the degree of vane wear*. The table below shows new dimensions and the minimum dimensions of worn vanes.



Air motor	Dimensions on new vanes X [mm]	Minimum dimensions on vane X [mm]
P1V-S002	3,3	3,0
P1V-S008	4,3	4,0
P1V-S012	4,2	3,3
P1V-S020	6,5	5,8
P1V-S030	6,8	6,0
P1V-S060	9,0	6,0
P1V-S120	14,7	14,2

Drilling, milling and grinding motor	New dimensions X [mm]	Minimum dimensions X [mm]
P1V-S008	4,3	4,0
P1V-S017	4,2	3,3
P1V-S025	6,5	5,8
P1V-S040	6,8	6,0

The following normal service intervals should be applied to in order to guarantee problem-free operation in air motors working continuously at load speeds*.

Intermittent lubrication-free operation of motors with standard vanes

Duty cycle :	70%
Max. duration of intermittent use :	15 minutes
Filtration 40 µm :	750 hours of operation*
Filtration 5 µm :	1 000 hours of operation*

Continuous operation of motors with standard vanes, with lubrication

Duty cycle :	Continuous
Quantity of oil :	1 drop per m ³ of air
Filtration 40 µm :	1 000 hours of operation*
Filtration 5 µm :	2 000 hours of operation*

NOTE! After 1000 hours of operation, the grease in the planetary gearbox must be changed

Continuous lubrication-free operation of motors equipped with hard vanes (option C)

Duty cycle :	Continuous
Filtration 40 µm :	750 hours of operation*
Filtration 5 µm :	1000 hours of operation*


CE marking

The air motors are supplied as "Components for installation" – the installer is responsible for ensuring that the motors are installed safely in the overall system. Parker Pneumatic guarantees that its products are safe, and as a supplier of pneumatic equipment we ensure that the equipment is designed and manufactured in accordance with the applicable EU directive.

Most of our products are classed as components as defined by various directives, and although we guarantee that the components satisfy the fundamental safety requirements of the directives to the extent that they are our responsibility, they do not usually carry the CE mark. Nevertheless, most P1V-S motors carry the CE mark because they are ATEX certified (for use in explosive atmospheres).

The following are the currently applicable directives:

- Machinery Directive(essential health and safety requirements relating to the design and structure of machines and safety components)
- EMC Directive
- Simple Pressure Vessels Directive
- Low Voltage Directive
- ATEX Directive (ATEX = ATmosphere EXplosive)

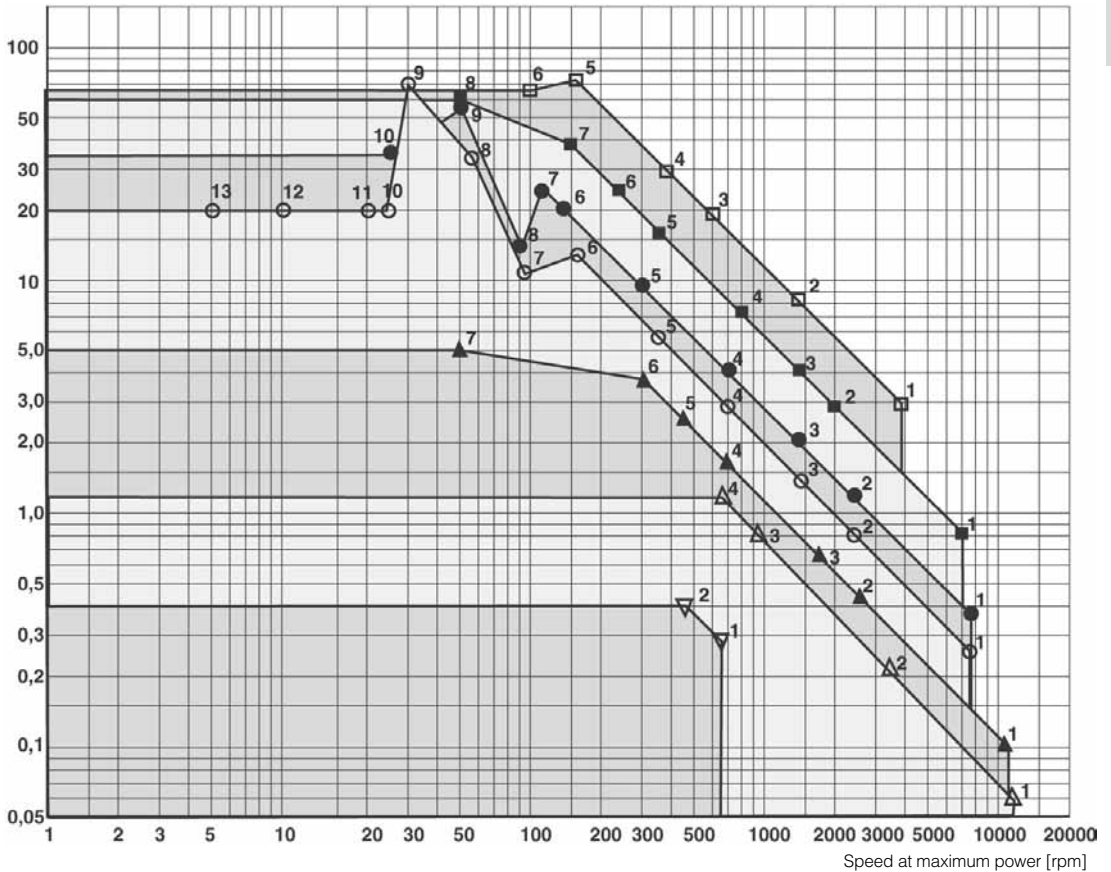


* The specified hours of operation apply when the motor is running at the speed corresponding to maximum power (load speed). This is approximately half free speed. If the motor operates at higher speeds, the service interval is shorter. If the motor operates at lower speeds, the service interval is longer.



Choice of air motor

Torque at maximum power [Nm]



The motor to be used should be selected by starting with the torque needed at a specific shaft speed. In other words, to choose the right motor, you have to know the required speed and torque. Since maximum power is reached at half the motor's free speed, the motor should be chosen so that the operating point is as close as possible to the maximum power of the motor.

The design principle of the motor means that higher torque is generated when it is braked, which tends to increase the speed, etc. This means that the motor has a kind of speed self-regulation function built in.

Use the above graph to choose the correct motor size. The graph contains the points for the maximum torque of each motor at maximum output. Add your operating point to the graph, then select a marked point above and to the right of your point.

Then use the correct working diagram of the chosen motor to get more detailed technical data. Always select a motor whose requisite technical data are in the shaded area. Also use the correction diagram to find out what operation with different supply pressures would mean for the motor.

Tip: Select a motor which is slightly too fast and powerful, then regulate its speed and torque with a pressure regulator and/or throttle to achieve the optimum working point.

Air motors in diagram above

- ▽ 1 P1V-S002A0130
- ▽ 2 P1V-S002A0095

20 Watt



P1V-S002A

- △ 1 P1V-S008A0Q00
- △ 2 P1V-S008A0700
- △ 3 P1V-S008A0190
- △ 4 P1V-S008A0130

80 Watt



P1V-S008A

- ▲ 1 P1V-S012A0N00, P1V-S012D0N00
- ▲ 2 P1V-S012A0550, P1V-S012D0550
- ▲ 3 P1V-S012A0360, P1V-S012D0360
- ▲ 4 P1V-S012A0140, P1V-S012D1400
- ▲ 5 P1V-S012A0090, P1V-S012D0090
- ▲ 6 P1V-S012A0060, P1V-S012D0060
- ▲ 7 P1V-S012A0010, P1V-S012D0010

120 Watt



P1V-S012A



P1V-S012D

- 1 P1V-S020A0E50, P1V-S020D0E50
- 2 P1V-S020A0460, P1V-S020D0460
- 3 P1V-S020A0240, P1V-S020D0240
- 4 P1V-S020A0140, P1V-S020D0140
- 5 P1V-S020A0070, P1V-S020D0070
- 6 P1V-S020A0035, P1V-S020D0035
- 7 P1V-S020A0018, P1V-S020D0018
- 8 P1V-S020A0011
- 9 P1V-S020A0006
- 10 P1V-S020A0005, P1V-S020D0005
- 11 P1V-S020A0002
- 12 P1V-S020A0001
- 13 P1V-S020A00005

200 Watt



P1V-S020A



P1V-S020D

- 1 P1V-S030A0E50, P1V-S030D0E50
- 2 P1V-S030A0460, P1V-S030D0460
- 3 P1V-S030A0240, P1V-S030D0240
- 4 P1V-S030A0140, P1V-S030D0140
- 5 P1V-S030A0060, P1V-S030D0060
- 6 P1V-S030A0028, P1V-S030D0028
- 7 P1V-S030A0023
- 8 P1V-S030A0018, P1V-S030D0018
- 9 P1V-S030A0010
- 10 P1V-S030A0005, P1V-S030D0005

300 Watt



P1V-S030A



P1V-S030D

- 1 P1V-S060A0E00
- 2 P1V-S060A0400
- 3 P1V-S060A0270
- 4 P1V-S060A0170
- 5 P1V-S060A0072
- 6 P1V-S060A0048
- 7 P1V-S060A0030
- 8 P1V-S060A0010

600 Watt



P1V-S060A

- 1 P1V-S120A0800
- 2 P1V-S120A0270
- 3 P1V-S120A0110
- 4 P1V-S120A0078
- 5 P1V-S120A0032
- 6 P1V-S120A0012

1200 Watt



P1V-S120A

Technical data



Working pressure	Max 7 bar (max 6 bar in explosive atmospheres)	
Working temperature	-30 °C to +100 °C	
Ambient temperature	-20 °C to +40 °C	
Medium	in explosive atmospheres	
	40 µm filtered, oil mist or dry un lubricated compressed air	

Table and diagram data

All values are typical values, with a tolerance of ±10%

Option

Other variants on request

Material specification

Planetary gearbox for:

P1V-S060A0010 /30 /48

P1V-S120A0012 /32 Stainless steel, X46Cr13

Planetary gearbox for last planet stage incl. installation flange

P1V-S020A0011 /06

P1V-S030A0023 /10 Black oxidised steel (not stainless)

All other housings Stainless steel, X12CrMoS17

Spindle* Hardened stainless steel, X20Cr13

Key* Hardened stainless steel
X6CrNiMoTi17-12-2

External seal Fluor rubber, FPM

Internal steel parts High grade steel (not stainless)

Planetary gear grease USDA-h1 approved

* P1V-S020A0011/06 and P1V-S030A0023/10

Key and Shaft High grade steel (not stainless)

Screws in housing
in last planet stage Surface treated steel (not stainless)

Flange bracket Stainless steel, X12CrMoS17

Foot bracket Stainless steel, X5CrNi18

Screws for bracket Stainless steel DIN A2

Choice of vanes**0 = Standard**

Standard vanes = These motors are of the vane type for intermittent lubrication-free operation. They can operate 70% of the time for up to 15 minutes without lubrication. With lubrication, these motors can operation 100% of the time.

Z = Spring loaded (standard) vanes

Standard vanes = These motors are of the vane type for intermittent lubrication-free operation. They can operate 70% of the time for up to 15 minutes without lubrication. With lubrication, these motors can operation 100% of the time.

Spring loaded vanes = All vanes are spring loaded to ensure that they remain pressed against the cylinder when the motor stops. The spring loaded vane option also prevents the vanes from sliding down in their track if vibration is introduced. The spring loaded vanes therefore provide a higher starting torque, improved starting and low speed characteristics, because the leakage over the vanes is reduced to a minimum.

C = Vanes for continuous lubrication-free operation

C vanes = This motor is equipped with vanes for continuous lubrication-free operation. (To obtain the longest possible service life, we recommend no oil in the air.)

M = Multi (combination of Z+C)

C vanes = This motor is equipped with vanes for continuous lubrication-free operation. (To obtain the longest possible service life, we recommend no oil in the air.)

Spring loaded vanes = All vanes are spring loaded to ensure that they remain pressed against the cylinder when the motor stops. The spring loaded vane option also prevents the vanes from sliding down in their track if vibration is introduced. The spring loaded vanes therefore provide a higher starting torque, improved starting and low speed characteristics, because the leakage over the vanes is reduced to a minimum.

A

Order key

A

P1V-S **020** **A** **0** **E50**

Motor size	
002	20 W
008	80 W
012	120 W
020	200 W
030	300 W
060	600 W
120	1200 W

Function	
A	Keyed shaft, reversible
D	Threaded shaft, reversible

Optional functions	
0	Standard
C*	Continuous lubrication-free operation
Z*	Spring loaded vanes
M*	Multi: combination of C+Z
D**	Standard with brake
E**	Option C with brake
F**	Option Z with brake
G**	Option M with brake

Free speed per min	
0005	5
001	10
999	9990
A00	10000
E00	14000
E50	14500
N00	22000
Q00	24000

Air motor range	
P1V-S	Stainless vane motor

* Not for P1V-S002 and P1V-S008
 ** Only for P1V-S020 and P1V-S030



Introduction to the ATEX directive

Explosive atmospheres

Directive 94/9/EC defines an explosive atmosphere as a mixture of:

- a) **flammable substances** – gases, vapours, mists or dusts
- b) with **air**
- c) under specific **atmospheric conditions**
- d) in which, after ignition has occurred, combustion spreads to the entire flammable mixture
(NB: with regard to dust, it may be that not all dust is combusted after ignition has occurred)

An atmosphere with the potential to become an explosive atmosphere during operating conditions and/or under the influence of the surroundings is defined as a **potentially explosive atmosphere**. Products covered by directive 94/9/EC are defined as intended for use in potentially explosive atmospheres.

Harmonised European ATEX standard

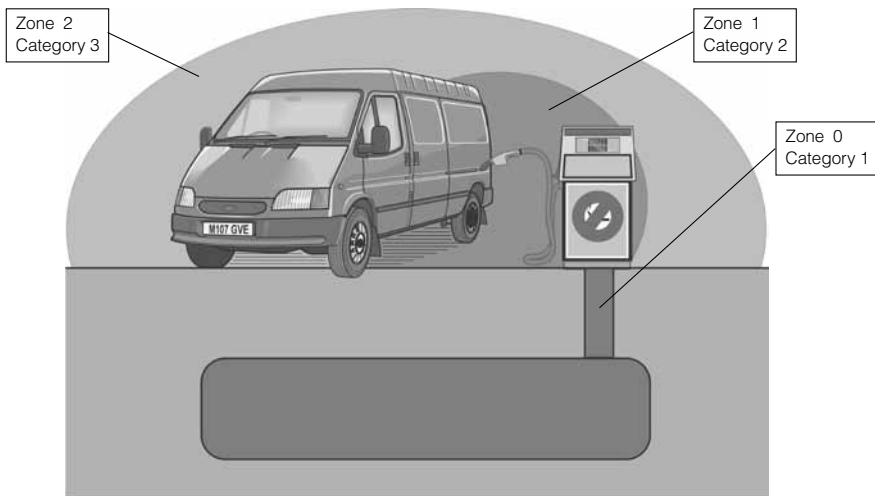
The European Union has adopted two harmonised directives in the

field of health and safety. The directives are known as ATEX 100a and ATEX 137.

Directive ATEX 100a (94/9/EC) lays down minimum safety requirements for products intended for use in potentially explosive atmospheres in European Union member states. Directive ATEX 137 (99/92/EC) defines minimum requirements for health and safety at the workplace, for working conditions and for the handling of products and materials in potentially explosive atmospheres. This directive also divides the workplace into **zones** and defines criteria by which products are **categorised** within these zones.

The table below describes the **zones** in an installation where there is a potential for explosive atmospheres. The **owner** of the installation must analyse and assess the area in which the explosive gas/dust mixture may occur, and if necessary must divide it into **zones**. This process of zoning then allows the correct plant and equipment to be selected for use in the area.

The ATEX directive has been in force throughout the European Union since 1 July 2003, replacing the existing divergent national and European legislation relating to explosive atmospheres.



Zones		Presence of potentially explosive atmosphere	Type of risk
Gas G	Dust D		
0	20	Present continuously or for long periods	Permanent
1	21	Likely to occur in normal operation occasionally	Potential
2	22	Not likely to occur in normal operation but, if it does occur, will persist for a short period only	Minimal

Please note that for the first time, the directive covers mechanical, hydraulic and pneumatic equipment and not just electrical equipment as before.

With regard to the **Machinery directive** 98/37/EC, note that a number of external requirements in 94/9/EC refer to hazards arising from potentially explosive atmospheres, where the Machinery directive only con-

tains general requirements relating to explosion safety (Annex I 1.5.7). As a result, directive 94/9/EC (ATEX 100a) takes precedence over the Machinery directive with regard to explosion protection in potentially explosive atmospheres. The requirements in the Machinery directive are applicable to all other risks relating to machinery.

Levels of protection for the various equipment categories

The various equipment categories must be capable of operating in accordance with the manufacturer’s operating specifications at defined levels of protection.

Definition of groups (EN 1127-1)

Group I Equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by flammable vapours and/or flammable dusts.

Level of protection	Category		Type of protection	Operating specifications
	Group I	Group II		
Very high	M1		Two independent means of protection or safety, ensuring that the equipment remains functional even in the event of two faults occurring independently of each other	The equipment remains energised and functional even with an explosive atmosphere present
Very high		1	Two independent means of protection or safety, ensuring that the equipment remains functional even in the event of two faults occurring independently of each other	The equipment remains energised and functional in zones 0, 1, 2 (G) and/or zones 20, 21, 22 (D)
High	M2		Protection suitable for normal operation and severe operating conditions	The equipment is de-energised in the event of an explosive atmosphere
High		2	Protection suitable for normal operation and frequent faults, or equipment in which faults normally have to be taken into account	The equipment remains energised and functional in zones 1, 2 (G) and/or zones 21, 22 (D)
Normal		3	Protection suitable for normal operation	The equipment remains energised and functional in zones 2 (G) and/or zones 22 (D)

Group II Equipment intended for use in other places exposed to explosive atmospheres.

G = gas and D = dust

Temperature classes

Group	I mines, combustible vapours		II other potentially explosive atmospheres (gases, dust)					
	M1	M2	1		2		3	
Category								
Atmosphere*			G	D	G	D	G	D
Zone			0	20	1	21	2	22

Classification of flammable gases and vapours on the basis of ignition temperature

Declaration of conformity

The product catalogues contain copies of the declaration of conformity demonstrating that the product meets the requirements of directive 94/9/EC.

Temperature class	Ignition temperature °C
T1	Over 450
T2	(300) – 450
T3	(200) – 300
T4	(135) – 200
T5	(100) – 135
T6	(85) - 100

The declaration is only valid in conjunction with the instructions contained in the installation manual relating to the safe use of the product throughout its service life.

The instructions relating to the conditions in the surrounding area are particularly important, as the certificate is invalidated if the instructions are found not to have been adhered to during operation of the product. If there is any doubt as to the validity of the certificate of conformity, contact Parker Hannifin customer service.

downloaded from www.parker.com/euro_pneumatic.

This document must be made accessible in a suitable place near where the product is installed. It is used as a reference for all personnel authorised to work with the product throughout its service life.

We, the manufacturer, reserve the right to modify, extend or improve the installation manual in the interests of the users.

Operation, installation and maintenance

The installation manual of the product contains instructions relating to the safe storage, handling, operation and servicing of the product. The manual is available in different languages, and can be

For more information about ATEX see EUs homepage: <http://europa.eu.int/comm/enterprise/atex/>



Additional safety instructions for installation in explosive atmospheres

Serious, even fatal, damage or injury may be caused by the hot moving parts of the P1V-S motors in the presence of explosive gas mixtures and concentrations of dust.

All installation, connection, commissioning, servicing and repair work on P1V-S motors must be carried out by qualified personnel taking account of the following

- These instructions
- Notices on the motor
- All other planning documents, commissioning instructions and connection diagrams associated with the application.
- Provisions and requirements specific to the application
- Applicable national/international regulations (explosion protection, safety and accident prevention)

Real life applications

P1V-S motors are designed to provide rotary movement in industrial applications, and should only be used in accordance with the instructions in the technical specifications in the catalogue, and within the operating range indicated on the motor housing. The motors meet the applicable standards and requirements of the Machinery Directive 94/9/EC (ATEX)

The motors must not be used as brakes in explosive atmospheres.

Braking involves driving the motor against the direction of rotation for which the motor is supplied with compressed air. The motor is then operating as a compressor, and there is a corresponding increase in temperature.

The motors must **not** be used underground in mines susceptible to firedamp and/or combustible dust. The motors are intended for use in areas in which explosive atmospheres caused by gases, vapours or mists of combustible liquids, or air/dust mixtures may be expected to occur during normal use (infrequently)

Checklist

Before using the motors in a potentially explosive atmosphere, you should check the following:

Do the motor specifications match the classification of the area of use in accordance with Directive 94/9/EG (previously ATEX 100a)

- Equipment group
 - Equipment category
 - Zone
 - Temperature class
 - Max. surface temperature
1. When installing the motor, is it certain that there is no potentially explosive atmosphere, oil, acids, gases, vapours or radiation?
 2. Is the ambient temperature as specified in the technical data in the catalogue at all times?
 3. Is it certain that the P1V-S motor is adequately ventilated and that no additional heat is added (for example in the shaft connection)?
 4. Are all the driven mechanical components ATEX certified?

Installation requirements in potentially explosive atmospheres

- The temperature of the supply air must not exceed the ambient temperature.
- The P1V-S may be installed in any position.
- An air treatment unit must be attached to the inlet of the P1V-S air motor.
- In a potentially explosive atmosphere, none of the motor ports may be blocked because this may cause an increase in temperature. The air from the port must be taken to the silencer or, preferably, outside the potentially explosive area.
- The P1V-S motor must be connected to ground at all times, through its support, a metallic tube or separate conductor.
- The outlet of the P1V-S motor must not open within a potentially explosive area, but must be passed to the silencer or, preferably, removed and released outside the potentially explosive area.
- The P1V-S motor may only drive units that are ATEX certified.
- Ensure that the motor is not exposed to forces greater than those permitted in accordance with the catalogue.

Measuring the temperature on the outside of the P1V-S motor (only when used in potentially explosive areas)

During the commissioning process, it is essential to measure temperature increases at the indicated positions on the outside of the P1V-S motor.

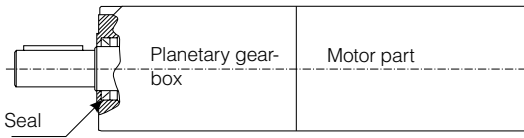
These measurements can be taken using standard thermometers.

Checking the motor during operation

The motor must be kept clean on the outside, and a layer of dirt thicker than 5 mm must never be allowed to form. Strong solvents should not be used for cleaning, because they can cause the seal (material NBR/FPM) around the drive shaft to swell, potentially increasing the temperature.

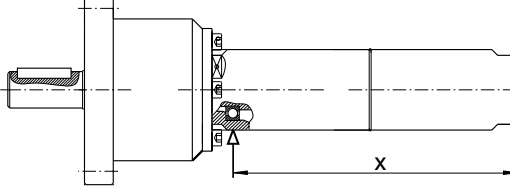
For the P1V-S012, P1V-S020, P1V-S030 and P1V-S060 series

The temperature is measured on the metal surface next to the seal around the output shaft on all P1V-S012, P1V-S020,



P1V-S030 and P1V-S060 motors

Motors P1V-S020A0011, P1V-S020A0006,



P1V-S030A0023 and P1V-S030A0010

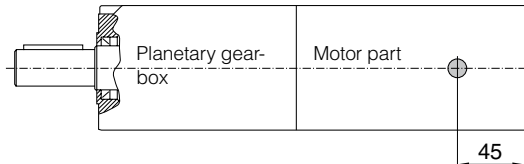
Motor	x [mm]
P1V-S020A0011	133
P1V-S020A0006	133
P1V-S030A0023	146
P1V-S030A0010	147.5

The maximum temperature is reached after approximately 1,5 hours of operation, and the difference in temperature between the motor and the ambient temperature must not exceed 40 °C.

If the temperature difference at the seal of a P1V-S012, P1V-S020, P1V-S030 or P1V-S060 exceeds 40 °C, you should stop the motor immediately and contact Parker Hannifin.

The following applies to the P1V-S120 series:

The temperature is measured on the metal surface at a point 45 mm from the port end of the motor housing, on all



P1V-S120.

The maximum temperature is reached after approximately 1,5 hours of operation, and the difference in temperature between the motor and the ambient temperature must not exceed 55 °C.

If the temperature difference at this point on a P1V-S120 exceeds 55 °C, you should stop the motor immediately and contact Parker Hannifin.

Marking of products

For all P1V-S012, P1V-S020, P1V-S030 and P1V-S060



For the P1V-S120



Communauté Européenne = EU

CE marking shows that as a manufacturer, Parker Hannifin meets the guidelines specified by the EU



Ex means that this product is intended for use in a potentially explosive area

II

stands for the equipment group (I = mines and II = other places liable to be endangered)

2GD

stands for equipment category

2G means the equipment can be used in zones 1 and 2 where there is a risk involving gas, vapour or mist of combustible liquids and **2D** in zones 21 and 22 where there is a risk involving dust.

2GD means the equipment can be used in zones 1, 2, 21 and 22.

c

Safe design (prEN 13463-5)

IIC

Explosion group, P1V-S air motors are tested to the highest standards in terms of test gases, and can be installed in the presence of all gases without restriction.

T6

If equipment is in temperature class **T6**, the maximum surface temperature must not exceed 85 °C. (To guarantee this, the product has been tested to ensure that the maximum is 80 °C. This provides a safety margin of 5 °K.)

T5

If equipment is in temperature class **T5**, the maximum surface temperature must not exceed 100 °C. (To guarantee this, the product has been tested to ensure that the maximum is 95 °C. This provides a safety margin of 5 °K.)

(80 °C)

Maximum permitted surface temperature on the motor in atmospheres containing potentially explosive dust.

X

Note special conditions

Test certificate number IBExU04ATEXB004 X from IBExU Institut für Sicherheitstechnik GmbH, D-09599 Freiberg, Germany

NOTE! All technical data is based on a working pressure of 6 bar.



Data for reversible air motor with keyed shaft, P1V-S002A series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,02	1300	650	0,29	0,44	1,7	M5	3	0,16	P1V-S002A0130
0,02	950	475	0,40	0,60	1,7	M5	3	0,16	P1V-S002A0095

NOTE! Not with vane options C, Z or M.
The P1V-S002A and P1V-S008A require oil mist for lubricating the gearbox.

NOTE! All technical data is based on a working pressure of 6 bar.



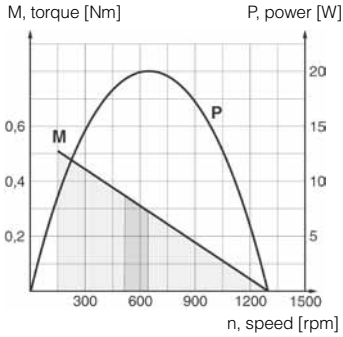
Data for reversible air motor with keyed shaft, P1V-S008A series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,08	24000	12000	0,06	0,09	3,5	M8x0,75*	4	0,22	P1V-S008A0Q00
0,08	7000	3500	0,22	0,33	3,5	M8x0,75*	4	0,22	P1V-S008A0700
0,08	1900	950	0,80	1,20	3,5	M8x0,75*	4	0,22	P1V-S008A0190
0,08	1300	650	1,20	1,80	3,5	M8x0,75*	4	0,22	P1V-S008A0130

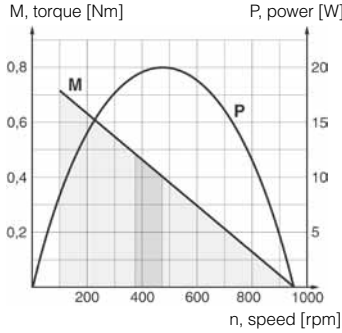
* 3 push in nipples (F28PMB6M8SP) for plastic pipe Ø6/4 supplied

NOTE! Not with vane options C, Z or M.
The P1V-S002A and P1V-S008A require oil mist for lubricating the gearbox.

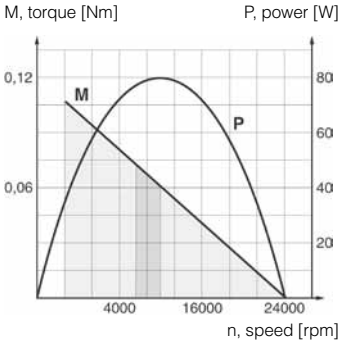
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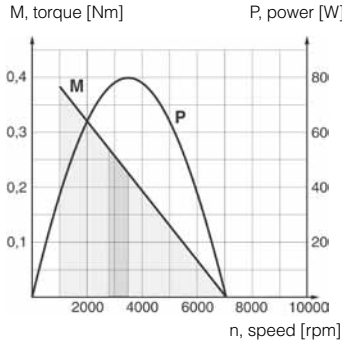
P1V-S002A0095



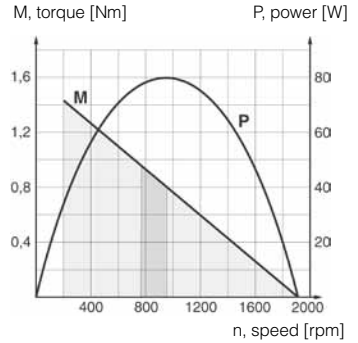
P1V-S008A0N00



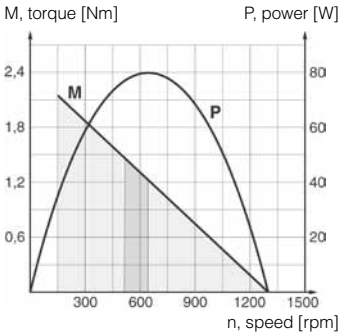
P1V-S008A0700




P1V-S008A0190



P1V-S008A0130



 Possible working range of motor.

 Optimum working range of motor.

Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

NOTE! All technical data is based on a working pressure of 6 bar.

CE  II2 GD c IIC T6 (80 °C) X



Data for reversible air motor with keyed shaft, P1V-S012A series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,120	22000	11000	0,10	0,15	5,0	G1/8	6	0,350	P1V-S012A0N00
0,120	5500	2750	0,42	0,63	5,0	G1/8	6	0,350	P1V-S012A0550
0,120	3600	1800	0,64	0,95	5,0	G1/8	6	0,350	P1V-S012A0360
0,120	1400	700	1,64	2,40	5,0	G1/8	6	0,400	P1V-S012A0140
0,120	900	450	2,54	3,80	5,0	G1/8	6	0,400	P1V-S012A0090
0,120	600	300	3,82	5,00*	5,0	G1/8	6	0,400	P1V-S012A0060
0,090	100	50	5,00*	5,00*	5,0	G1/8	6	0,450	P1V-S012A0010

* Max permitted torque

In all P1V-S012 motors, torques exceeding 5 Nm may cause damage to the gearbox (e.g. when driving against a fixed stop or large oscillating weight)

CE  II2 GD c IIC T6 (80 °C) X



Data for reversible air motor with threaded shaft, P1V-S012D series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,120	22000	11000	0,10	0,15	5,0	G1/8	6	0,350	P1V-S012D0N00
0,120	5500	2750	0,42	0,63	5,0	G1/8	6	0,350	P1V-S012D0550
0,120	3600	1800	0,64	0,95	5,0	G1/8	6	0,350	P1V-S012D0360
0,120	1400	700	1,64	2,40	5,0	G1/8	6	0,400	P1V-S012D0140
0,120	900	450	2,54	3,80	5,0	G1/8	6	0,400	P1V-S012D0090
0,120	600	300	3,82	5,00*	5,0	G1/8	6	0,400	P1V-S012D0060
0,090	100	50	5,00*	5,00*	5,0	G1/8	6	0,450	P1V-S012D0010

* Max permitted torque

In all P1V-S012 motors, torques exceeding 5 Nm may cause damage to the gearbox (e.g. when driving against a fixed stop or large oscillating weight)

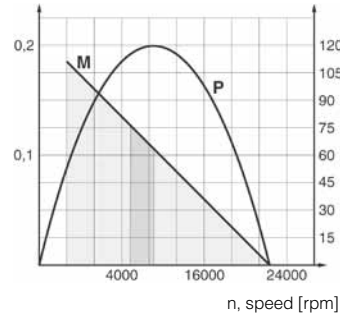
NOTE!

The P1V-S012D with threaded shaft may be reversed, but when operated anticlockwise, there is a risk that the driven unit may disconnect if it is not locked properly.

P1V-S012A0N00

P1V-S012D0N00

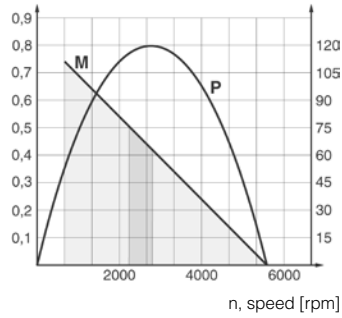
M, torque [Nm] P, power [W]



P1V-S012A0550

P1V-S012D0550

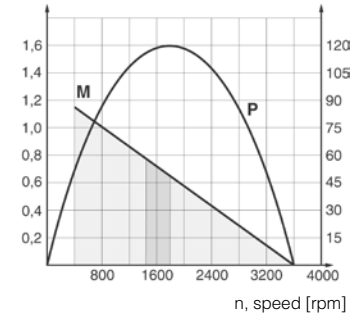
M, torque [Nm] P, power [W]



P1V-S012A0360

P1V-S012D0360

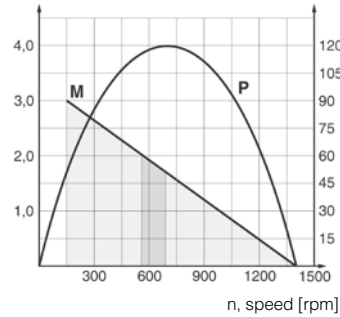
M, torque [Nm] P, power [W]



P1V-S012A0140

P1V-S012D0140

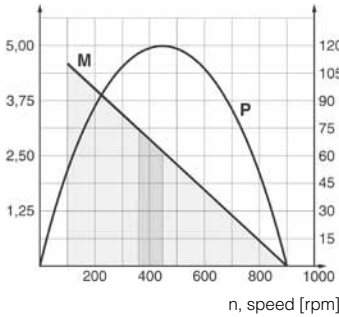
M, torque [Nm] P, power [W]



P1V-S012A0090

P1V-S012D0090

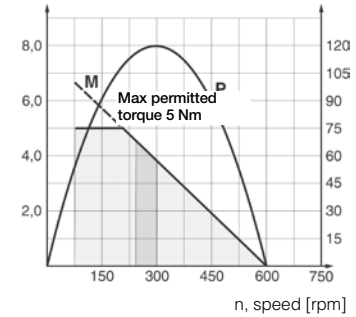
M, torque [Nm] P, power [W]



P1V-S012A0060

P1V-S012D0060

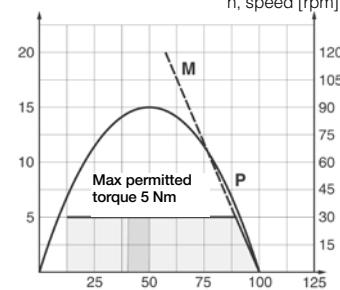
M, torque [Nm] P, power [W]





P1V-S012A0010

P1V-S012D0010

M, torque [Nm] P, power [W]



 Possible working range of motor.

 Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

NOTE! All technical data is based on a working pressure of 6 bar.

CE Ex II2 GD c IIC T6 (80 °C) X



Data for reversible air motor with keyed shaft, P1V-S020A series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,200	14500	7250	0,26	0,40	6,3	G1/8	10	0,700	P1V-S020A0E50
0,200	4600	2300	0,80	1,20	6,3	G1/8	10	0,750	P1V-S020A0460
0,200	2400	1200	1,60	2,40	6,3	G1/8	10	0,750	P1V-S020A0240
0,200	1400	700	2,70	4,10	6,3	G1/8	10	0,850	P1V-S020A0140
0,200	700	350	5,40	8,20	6,3	G1/8	10	0,850	P1V-S020A0070
0,200	350	160	12,00	18,00	6,3	G1/8	10	0,850	P1V-S020A0035
0,100	180	90	10,50	15,00	4,5	G1/8	10	0,850	P1V-S020A0018
0,200	110	55	33,00	49,50	6,3	G1/8	10	3,000	P1V-S020A0011
0,200	60	30	72,00	108,00*	6,3	G1/8	10	3,000	P1V-S020A0006
0,180	50	25	20,00*	20,00*	6,3	G1/8	10	0,950	P1V-S020A0005
0,180	20	–	20,00*	20,00*	6,3	G1/8	10	0,950	P1V-S020A0002
0,180	10	–	20,00*	20,00*	6,3	G1/8	10	1,050	P1V-S020A0001
0,180	5	–	20,00*	20,00*	6,3	G1/8	10	1,050	P1V-S020A00005

* Max permitted torque

CE Ex II2 GD c IIC T6 (80 °C) X



Data for reversible air motor with threaded shaft, P1V-S020D series

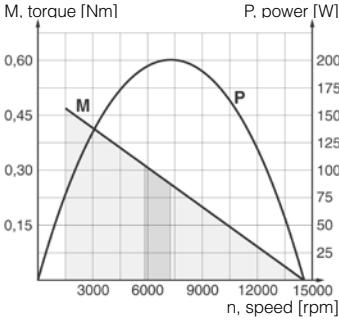
Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,200	14500	7250	0,26	0,40	6,3	G1/8	10	0,700	P1V-S020D0E50
0,200	4600	2300	0,80	1,20	6,3	G1/8	10	0,750	P1V-S020D0460
0,200	2400	1200	1,60	2,40	6,3	G1/8	10	0,750	P1V-S020D0240
0,200	1400	700	2,70	4,10	6,3	G1/8	10	0,850	P1V-S020D0140
0,200	700	350	5,40	8,20	6,3	G1/8	10	0,850	P1V-S020D0070
0,200	350	160	12,00	18,00	6,3	G1/8	10	0,850	P1V-S020D0035
0,100	180	90	10,50	15,00	4,5	G1/8	10	0,850	P1V-S020D0018
0,180	50	25	20,00*	20,00*	6,3	G1/8	10	0,950	P1V-S020D0005

* Max permitted torque

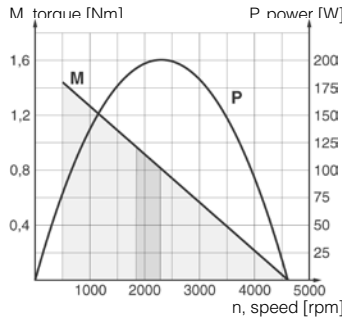
NOTE!

The P1V-S020D with threaded shaft may be reversed, but when operated anticlockwise, there is a risk that the driven unit may disconnect if it is not locked properly.

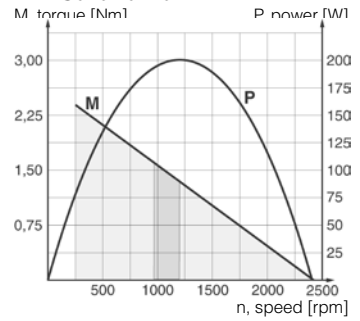
**P1V-S020A0E50
P1V-S020D0E50**



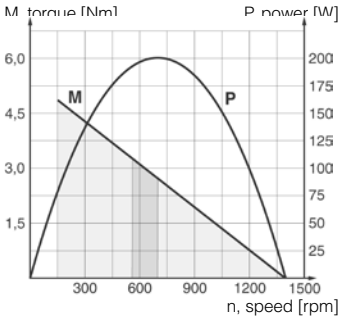
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P1V-S020D0460**



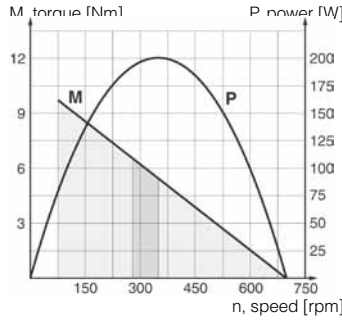
**P1V-S020A0240
P1V-S020D0240**



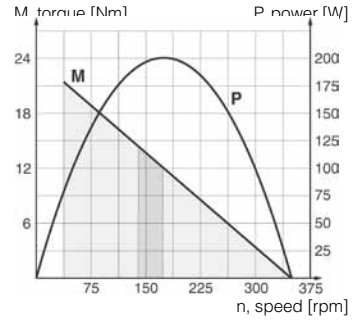
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P1V-S020D0140**



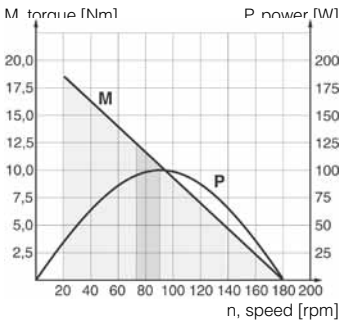
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P1V-S020D0070**



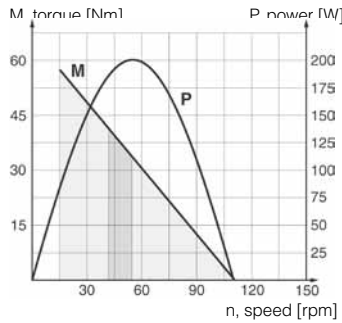
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P1V-S020D0035**



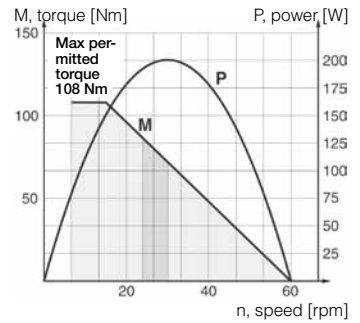
**P1V-S020A0018
P1V-S020D0018**



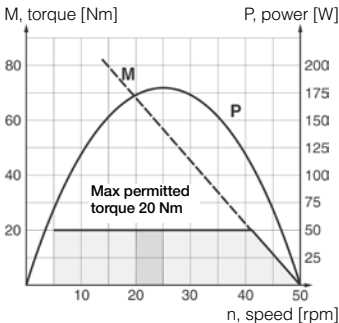
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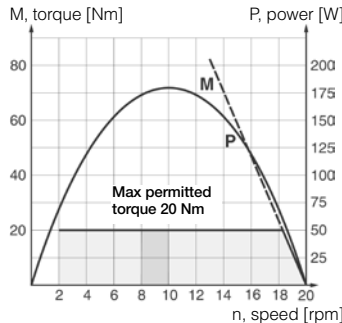
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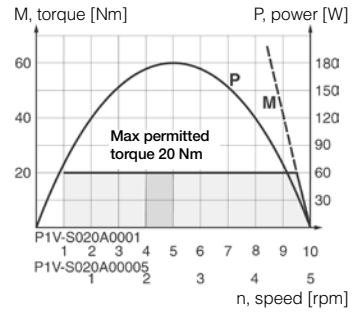
**P1V-S020A0005
P1V-S020D0005**



P1V-S020A0002



**P1V-S020A0001
P1V-S020A00005**



Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

NOTE! All technical data is based on a working pressure of 6 bar.

CE II2 GD c IIC T6 (80 °C) X

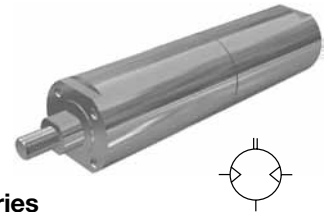


Data for reversible air motor with keyed shaft, P1V-S030A series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,300	14500	7250	0,40	0,60	8,0	G1/4	10	1,000	P1V-S030A0E50
0,300	4600	2300	1,20	1,90	8,0	G1/4	10	1,050	P1V-S030A0460
0,300	2400	1200	2,40	3,60	8,0	G1/4	10	1,050	P1V-S030A0240
0,300	1400	700	4,10	6,10	8,0	G1/4	10	1,100	P1V-S030A0140
0,300	600	300	9,60	14,30	8,0	G1/4	10	1,150	P1V-S030A0060
0,300	280	140	20,50	26,00	8,0	G1/4	10	1,150	P1V-S030A0028
0,300	230	115	24,00	36,00	8,0	G1/4	10	3,300	P1V-S030A0023
0,130	180	90	13,80	21,00	4,7	G1/4	10	1,150	P1V-S030A0018
0,300	100	50	57,00	85,50	8,0	G1/4	10	3,300	P1V-S030A0010
0,280	50	25	36,00*	36,00*	8,0	G1/4	10	1,250	P1V-S030A0005

* Max permitted torque

CE II2 GD c IIC T6 (80 °C) X



Data for reversible air motor with threaded shaft, P1V-S030D series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,300	14500	7250	0,40	0,60	8,0	G1/4	10	1,000	P1V-S030D0E50
0,300	4600	2300	1,20	1,90	8,0	G1/4	10	1,050	P1V-S030D0460
0,300	2400	1200	2,40	3,60	8,0	G1/4	10	1,050	P1V-S030D0240
0,300	1400	700	4,10	6,10	8,0	G1/4	10	1,100	P1V-S030D0140
0,300	600	300	9,60	14,30	8,0	G1/4	10	1,150	P1V-S030D0060
0,300	280	140	20,50	26,00	8,0	G1/4	10	1,150	P1V-S030D0028
0,130	180	90	13,80	21,00	4,7	G1/4	10	1,150	P1V-S030D0018
0,280	50	25	36,00*	36,00*	8,0	G1/4	10	1,250	P1V-S030D0005

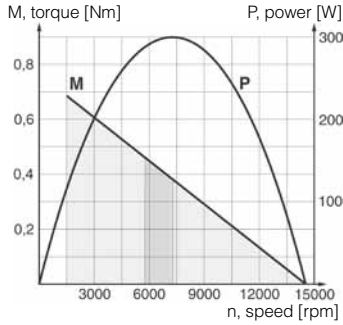
* Max permitted torque

NOTE!

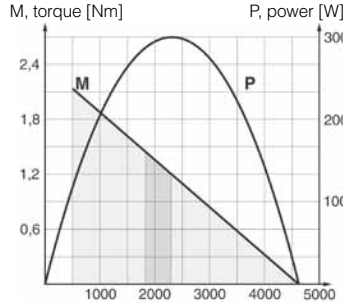
The P1V-S030D with threaded shaft may be reversed, but when operated anticlockwise, there is a risk that the driven unit may disconnect if it is not locked properly.

A

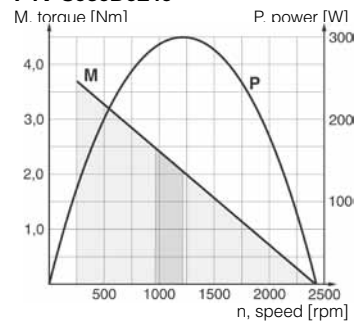
**P1V-S030A0E50
P1V-S030D0E50**



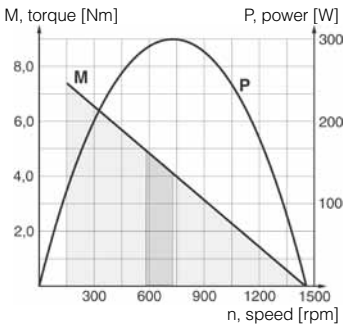
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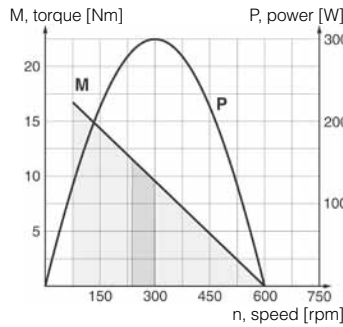
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P1V-S030D0240**



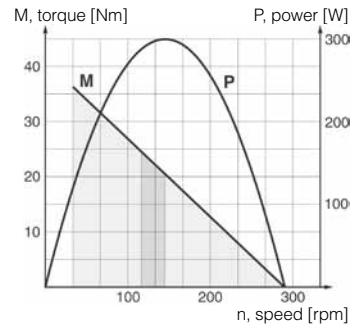
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P1V-S030D0140**



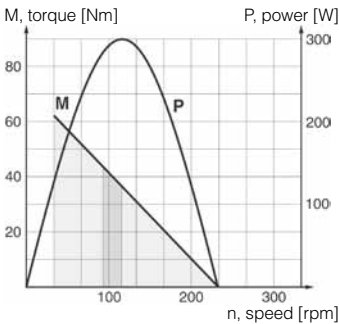
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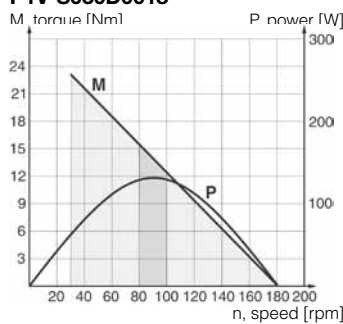
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P1V-S030D0028**



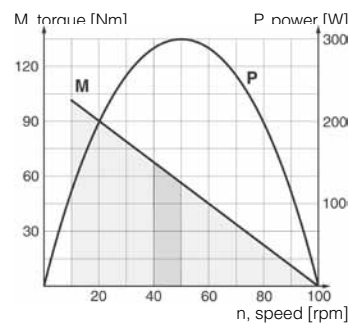
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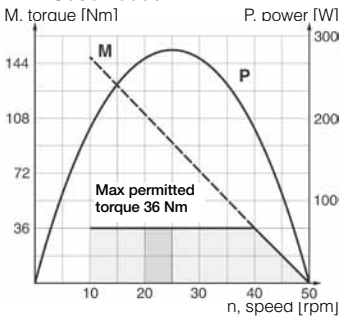
**P1V-S030A0018
P1V-S030D0018**



P1V-S030A0010



**P1V-S030A0005
P1V-S030D0005**



 Possible working range of motor.

 Optimum working range of motor.

Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

NOTE! All technical data is based
on a working pressure of 6 bar.



CE II2 GD c IIC T6 (80 °C) X

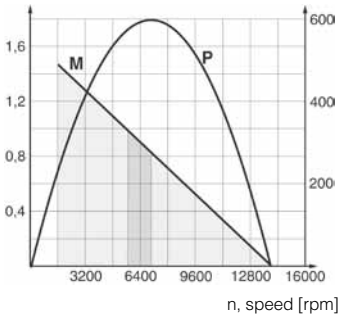
Data for reversible air motor with keyed shaft, P1V-S060A series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,600	14000	7000	0,82	1,23	14,5	G3/8	12	2,000	P1V-S060A0E00
0,600	4000	2000	2,90	4,30	14,5	G3/8	12	2,100	P1V-S060A0400
0,600	2700	1350	4,20	6,40	14,5	G3/8	12	2,100	P1V-S060A0270
0,600	1700	850	6,70	10,10	14,5	G3/8	12	2,100	P1V-S060A0170
0,600	720	360	15,90	24,00	14,5	G3/8	12	2,200	P1V-S060A0072
0,600	480	240	23,90	36,00	14,5	G3/8	12	2,200	P1V-S060A0048
0,600	300	150	38,20	57,00	14,5	G3/8	12	2,300	P1V-S060A0030
0,300	100	50	60,00*	60,00*	13,0	G3/8	12	2,300	P1V-S060A0010

* Max permitted torque

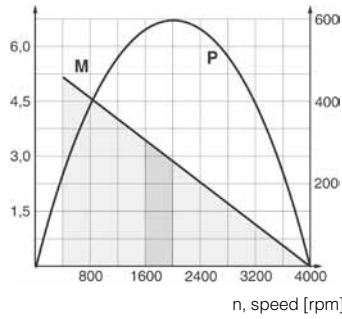
P1V-S060A0E00,

M, torque [Nm] P, power [W]



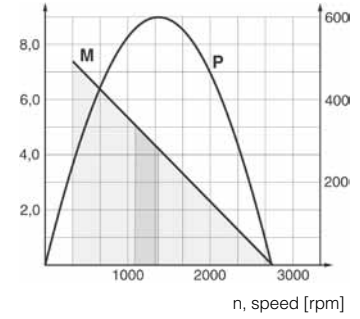
P1V-S060A0400

M, torque [Nm] P, power [W]



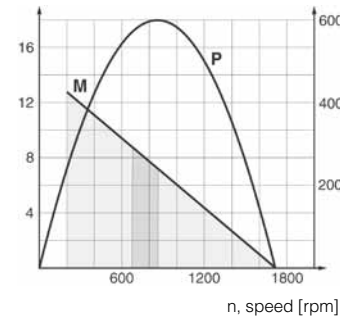
P1V-S060A0270

M, torque [Nm] P, power [W]



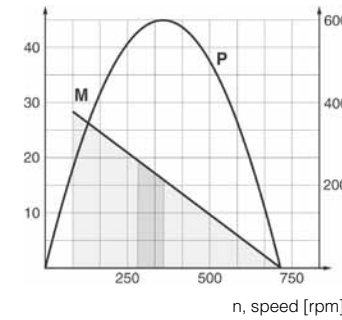
P1V-S060A0170,

M, torque [Nm] P, power [W]



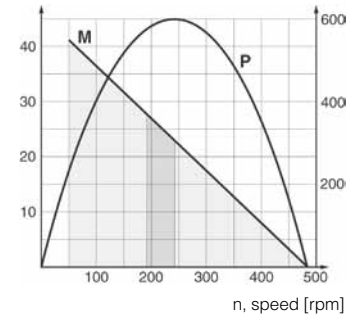
P1V-S060A0072

M, torque [Nm] P, power [W]



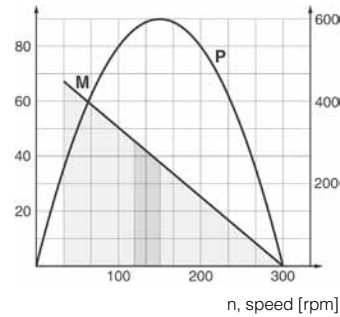
P1V-S060A0048

M, torque [Nm] P, power [W]



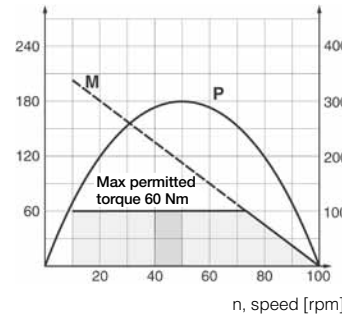
P1V-S060A0030


M, torque [Nm] P, power [W]




P1V-S060A0010

M, torque [Nm] P, power [W]




 Possible working range of motor.

 Optimum working range of motor.

Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

NOTE! All technical data is based
on a working pressure of 6 bar.

CE  II2 GD c IIC T5 (95 °C) X



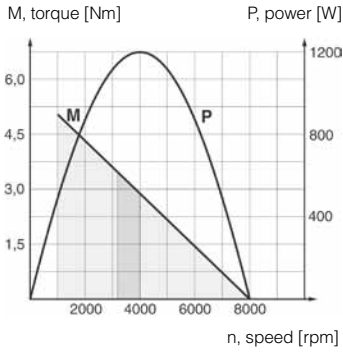
A

Data for reversible air motor with keyed shaft, P1V-S120A series

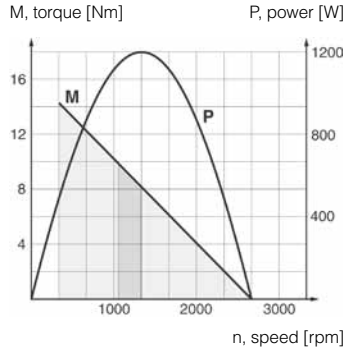
Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
1,200	8000	4000	2,90	4,30	27	G3/4	19	5,5	P1V-S120A0800
1,200	2700	1350	8,50	12,70	27	G3/4	19	5,5	P1V-S120A0270
1,200	1100	550	21,00	31,00	27	G3/4	19	5,5	P1V-S120A0110
1,200	780	390	29,40	44,00	27	G3/4	19	5,6	P1V-S120A0078
1,200	320	160	71,60	107,00	27	G3/4	19	5,6	P1V-S120A0032
0,700	200	100	66,90	110,00*	19	G3/4	19	5,6	P1V-S120A0012

* Max permitted torque

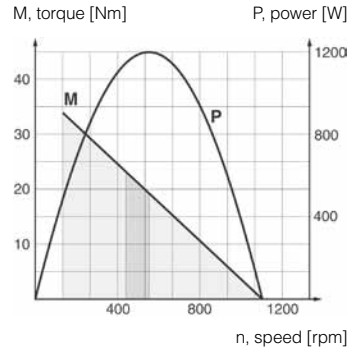
P1V-S120A0800



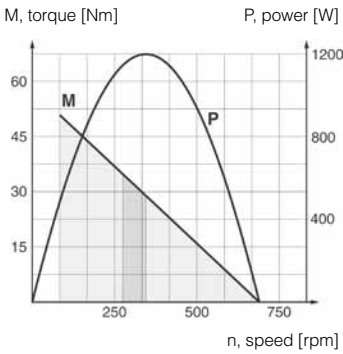
P1V-S120A0270,



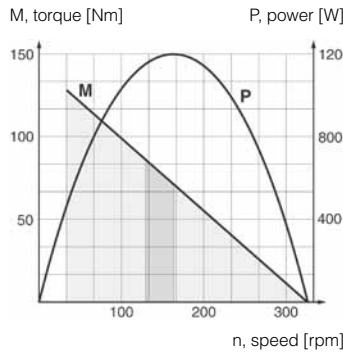
P1V-S120A0110



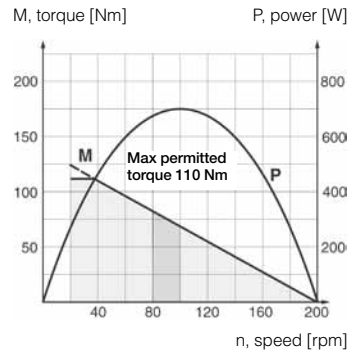
P1V-S120A0078





P1V-S120A0032



P1V-S120A0012

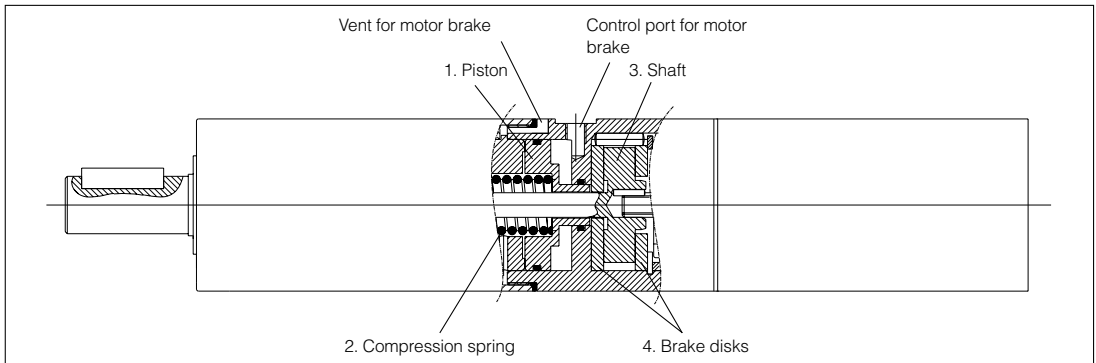


 **Possible working range of motor.**

 **Optimum working range of motor.**

Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

Brake motor



Brake motors

Applications

The integrated brake is a spring-loaded disk brake, which is released at a minimum air pressure of 5 bar. The brake is applied in the absence of pressure. As soon as the control port for the brake is placed under pressure, the piston (1) is pressurised and the spring (2) is compressed. The motor can now start and the torque is passed to the shaft (3). The ventilation air from the brake is connected with the atmosphere. In order to brake the motor, the control air to the brake is simply vented. The piston (1) is pushed to the right by the spring (2), and the axle (3) is jammed between the two brake disks (4).

The technology and the size of air motors with integrated running and stationary brake make them ideal applications requiring repeated precise positioning. The motor can also be kept stationary in a specific position, and the stopping time for a rotating weight can be shortened significantly. Another typical application for brake motors is when the output shaft needs to be held in one position when the motor stops delivering torque. The brake can handle more than 1500 braking operations per hour at maximum braking torque.

Disassembly and reassembly

Detach the connections with the motor and gearbox. Pull off the motor and gearbox part. The brake disks can be lifted off after the lock ring has been removed.

Service and maintenance

After 20 000 braking operations as a stationary brake or 10 000 braking operations as an operating brake, the brake must be disassembled in order to check for wear.

Warning:

If the number of braking operations is exceeded, the degree of wear might be greater than permitted and the braking effect might be lost. If this happens, you simply need to replace the worn brake linings. Tests show that the brake lining needs to be replaced after approx. 90 000 braking cycles

NOTE!

Brake motors must only ever be supplied with unlubricated air, otherwise there is a risk of oil from the supply air getting into the brake unit, resulting in poor brake performance or no braking effect.

Technical data

Min braking torque for different motor types
Motor size P1V-S020, 200 watt

Braking motor	Motor max torque, specified Nm	Brake min braking torque, theoretical Nm	Gearbox max torque, permitted Nm
P1V-S020A/DDE50	0,52	1,0	1,0
P1V-S020A/DD460	1,6	3,43	3,43
P1V-S020A/DD240	3,2	6,66	6,66
P1V-S020A/DD140	5,4	11,8	11,8
P1V-S020A/DD070	10,8	22,86	14,0
P1V-S020A/DD035	20,0	44,4	20,0
P1V-S020A/DD018	20,0	44,4	20,0
P1V-S020A/D011	66,0	137,2	108,0
P1V-S020A/D006	144,0	266,4	108,0
P1V-S020A/DD005	20,0*	44,4	20,0
P1V-S020A/D002	20,0*	44,4	20,0
P1V-S020A/D001	20,0*	44,4	20,0
P1V-S020A/D0005	20,0*	44,4	20,0

Motor size P1V-S030, 300 watt

Braking motor	Motor max torque, specified Nm	Brake min braking torque, theoretical Nm	Gearbox max torque, permitted Nm
P1V-S030A/DDE50	0,8	1,0	1,0
P1V-S030A/DD460	2,4	3,43	3,43
P1V-S030A/DD240	4,8	6,66	6,66
P1V-S030A/DD140	8,2	11,8	11,8
P1V-S030A/DD060	19,2	20,6	14,0
P1V-S030A/DD028	41,0	40,0	36,0
P1V-S030A/D023	48,0	70,8	108,0
P1V-S030A/D010	114,0	123,6	108,0
P1V-S030A/DD005	36,0*	40,0	36,0

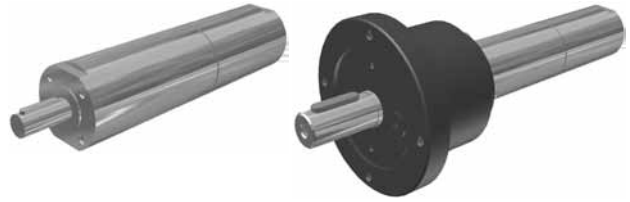
* Warning:

The permitted torque for the specific gearbox must not be exceeded!

Brake release

Minimum pressure for brake release: 5 bar

NOTE! All technical data is based on a working pressure of 6 bar.

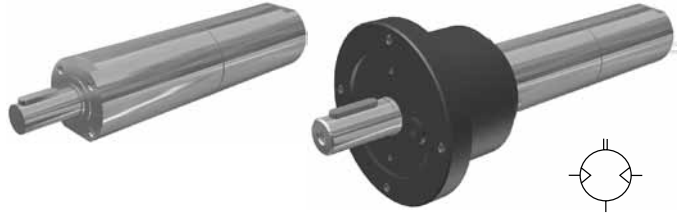


Data for reversible brake motor with keyed shaft, P1V-S020AD series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,200	14500	7250	0,26	0,40	6,3	G1/8	10	1,000	P1V-S020ADE50
0,200	4600	2300	0,80	1,20	6,3	G1/8	10	1,050	P1V-S020AD460
0,200	2400	1200	1,60	2,40	6,3	G1/8	10	1,050	P1V-S020AD240
0,200	1400	700	2,70	4,10	6,3	G1/8	10	1,150	P1V-S020AD140
0,200	700	350	5,40	8,20	6,3	G1/8	10	1,150	P1V-S020AD070
0,200	350	160	12,00	18,00	6,3	G1/8	10	1,150	P1V-S020AD035
0,100	180	90	10,50	15,00	4,5	G1/8	10	1,150	P1V-S020AD018
0,200	110	55	33,00	49,50	6,3	G1/8	10	3,300	P1V-S020AD011
0,200	60	30	72,00	108,00*	6,3	G1/8	10	3,300	P1V-S020AD006
0,180	50	25	20,00*	20,00*	6,3	G1/8	10	1,250	P1V-S020AD005
0,180	20	–	20,00*	20,00*	6,3	G1/8	10	1,250	P1V-S020AD002
0,180	10	–	20,00*	20,00*	6,3	G1/8	10	1,350	P1V-S020AD001
0,180	5	–	20,00*	20,00*	6,3	G1/8	10	1,350	P1V-S020AD0005

* Max permitted torque

NOTE! All technical data is based on a working pressure of 6 bar.



A

Data for reversible brake motor with keyed shaft, P1V-S030AD series

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0,300	14500	7250	0,40	0,60	8,0	G1/4	10	1,350	P1V-S030ADE50
0,300	4600	2300	1,20	1,90	8,0	G1/4	10	1,400	P1V-S030AD460
0,300	2400	1200	2,40	3,60	8,0	G1/4	10	1,400	P1V-S030AD240
0,300	1400	700	4,10	6,10	8,0	G1/4	10	1,450	P1V-S030AD140
0,300	600	300	9,60	14,30	8,0	G1/4	10	1,500	P1V-S030AD060
0,300	280	140	20,50	26,00	8,0	G1/4	10	1,500	P1V-S030AD028
0,300	230	115	24,00	36,00	8,0	G1/4	10	3,650	P1V-S030AD023
0,300	100	50	57,00	85,50	8,0	G1/4	10	3,650	P1V-S030AD010
0,280	50	25	36,00*	36,00*	8,0	G1/4	10	1,600	P1V-S030AD005

* Max permitted torque

Order key

P1V-S

Air motor range	
P1V-S	Stainless

4

Accessories	
4	Bracket



012

Motor size	
002	20 W
008	80 W
012	120 W
020	200 W
030	300 W
060	600 W
120	1200 W

B

Bracket	
B	Flange bracket
F	Foot bracket
C	Foot bracket, large

Installation brackets for P1V-S

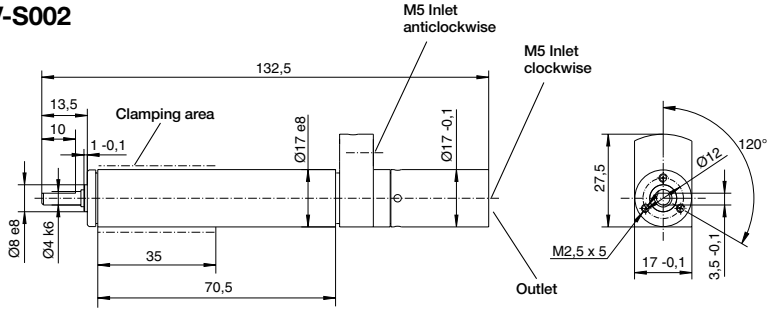
Type	For air motor	For drilling motor	Weight Kg	Order code
Flange bracket				
	P1V-S002		0,04	P1V-S4002B
	P1V-S008	P1V-S008	0,04	P1V-S4008B
	P1V-S012		0,05	P1V-S4012B
	P1V-S020	P1V-S025	0,09	P1V-S4020B
	P1V-S030	P1V-S040	0,12	P1V-S4030B
	P1V-S060		0,25	P1V-S4060B
	P1V-S120		0,60	P1V-S4120B
Foot bracket				
	P1V-S008	P1V-S008	0,08	P1V-S4008F
	P1V-S012		0,09	P1V-S4012F
	P1V-S020	P1V-S025	0,11	P1V-S4020F
	P1V-S020A0011		0,55	P1V-S4020C
	P1V-S020A0006			
	P1V-S030A0023			
	P1V-S030A0010			
	P1V-S030	P1V-S040	0,11	P1V-S4030F
	P1V-S060		0,30	P1V-S4060F
	P1V-S120		0,80	P1V-S4120F

All brackets supplied with fastening screws for the motor.

A

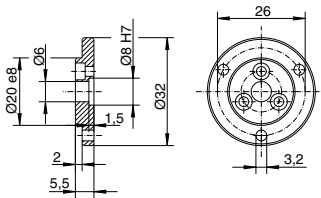
Dimensions

Motor P1V-S002



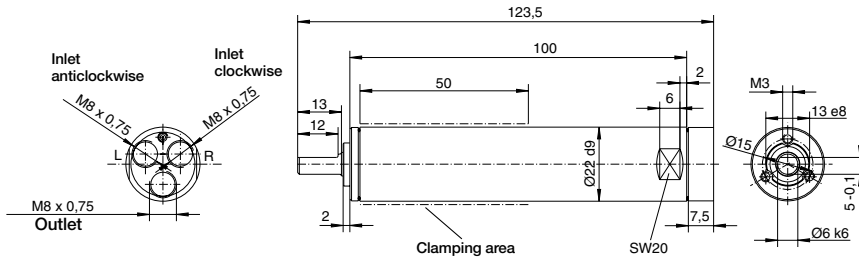
Flange bracket for motor P1V-S002

P1V-S4002B



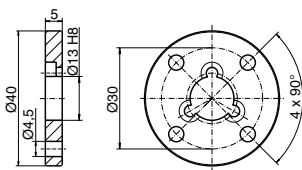
Dimensions

Motor P1V-S008



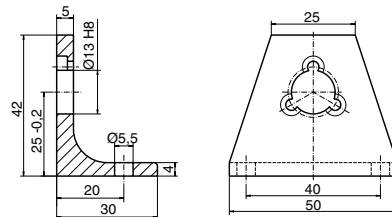
Flange bracket for motor P1V-S008

P1V-S4008B



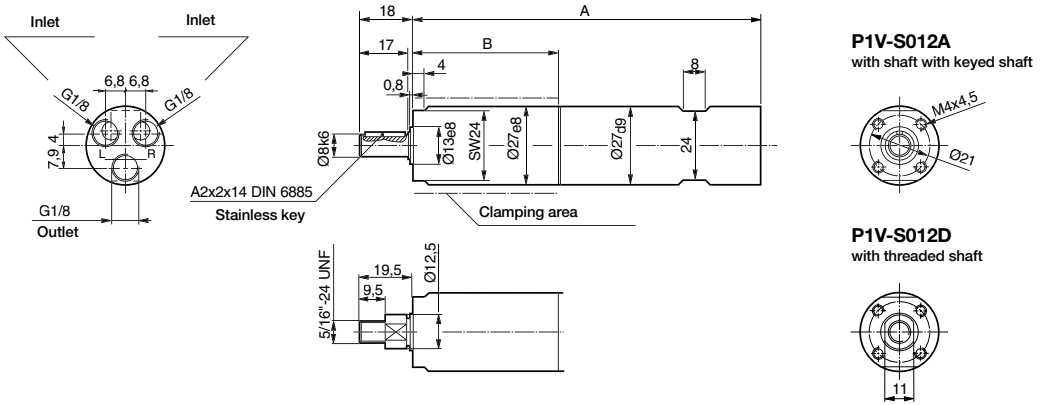
Foot bracket for motor P1V-S008

P1V-S4008F



Dimensions

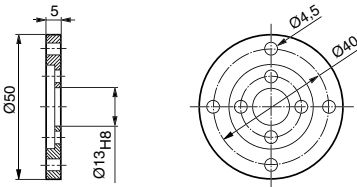
Motor P1V-S012



	A	B
P1V-S012A0N00, P1V-S012D0N00	117.0	46.5
P1V-S012A0550, P1V-S012D0550	117.0	46.5
P1V-S012A0360, P1V-S012D0360	117.0	46.5
P1V-S012A0140, P1V-S012D0140	129.5	59.0
P1V-S012A0090, P1V-S012D0090	129.5	59.0
P1V-S012A0060, P1V-S012D0060	129.5	59.0
P1V-S012A0010, P1V-S012D0010	142.0	71.5

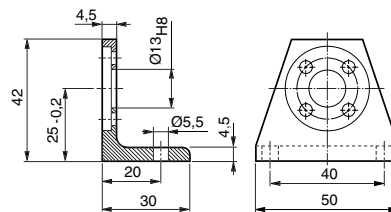
Flange bracket for motor P1V-S012

P1V-S4012B

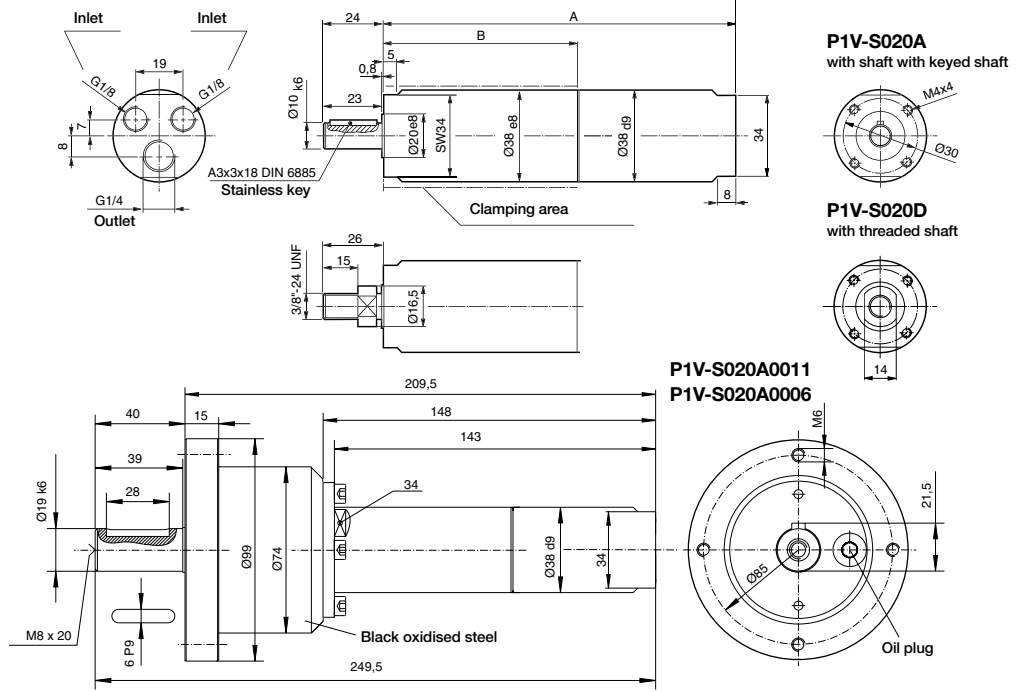


Foot bracket for motor P1V-S012

P1V-S4012F



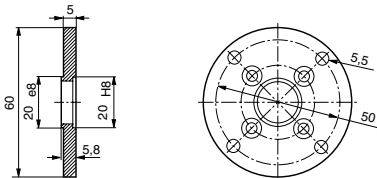
Motor P1V-S020



	A	B
P1V-S020A0E50, P1V-S020D0E50	127	63,5
P1V-S020A0460, P1V-S020D0460	127	63,5
P1V-S020A0240, P1V-S020D0240	127	63,5
P1V-S020A0140, P1V-S020D0140	143	79,5
P1V-S020A0070, P1V-S020D0070	143	79,5
P1V-S020A0035, P1V-S020D0035	143	79,5
P1V-S020A0018, P1V-S020D0018	143	79,5
P1V-S020A0005, P1V-S020D0005	159	95,5
P1V-S020A0002	159	95,5
P1V-S020A0001	175	111,5
P1V-S020A00005	175	111,5

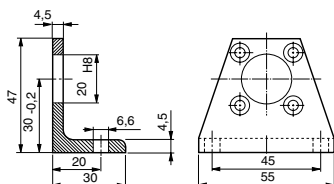
Flange bracket for motor P1V-S020

P1V-S4020B



Foot bracket for motor P1V-S020

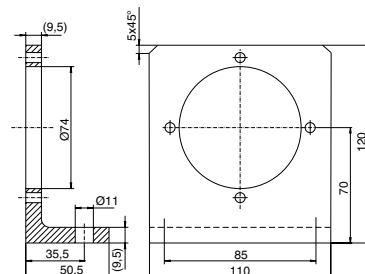
P1V-S4020F



Foot bracket for motor

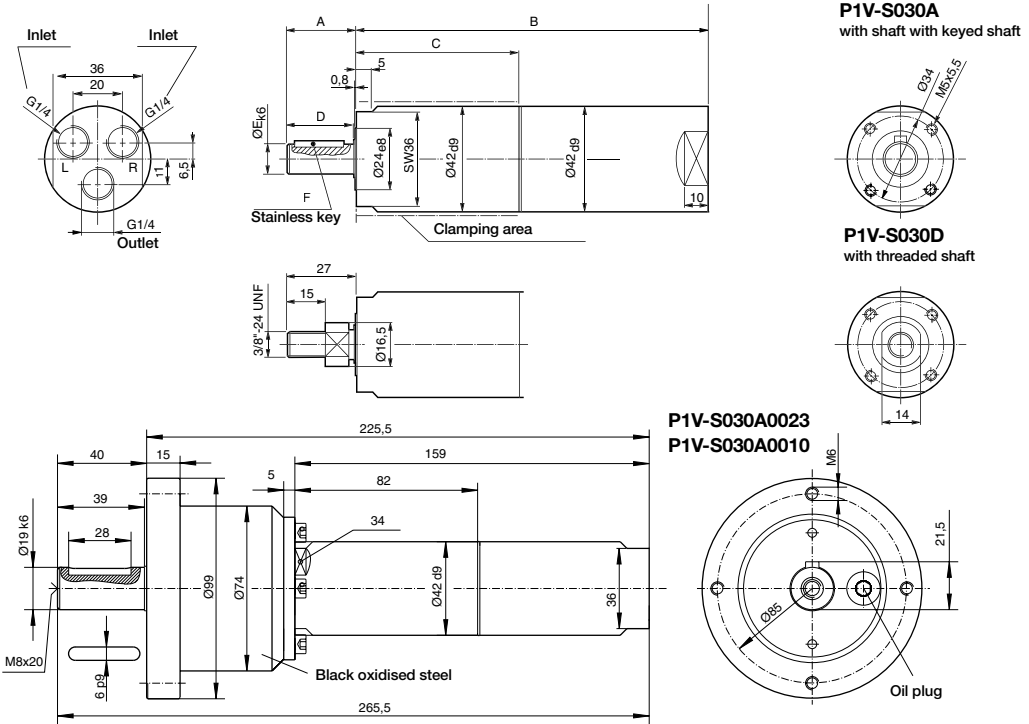
P1V-S020A0011 and P1V-S020A0006

P1V-S4020C



Motor P1V-S030

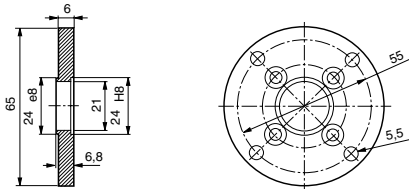
A



	A	B	C	D	E	F
P1V-S030A0E50, P1V-S030D0E50	28,5	143	66	27	12	A4x4x20 DIN 6885
P1V-S030A0460, P1V-S030D0460	28,5	143	66	27	12	A4x4x20 DIN 6885
P1V-S030A0240, P1V-S030D0240	28,5	143	66	27	12	A4x4x20 DIN 6885
P1V-S030A0140, P1V-S030D0140	28,5	159	82	27	12	A4x4x20 DIN 6885
P1V-S030A0060, P1V-S030D0060	32,0	159	82	30	14	A5x5x20 DIN 6885
P1V-S030A0028, P1V-S030D0028	32,0	159	82	30	14	A5x5x20 DIN 6885
P1V-S030A0018, P1V-S030D0018	32,0	159	82	30	14	A5x5x20 DIN 6885
P1V-S030A0005, P1V-S030D0005	32,0	164	82	30	14	A5x5x20 DIN 6885

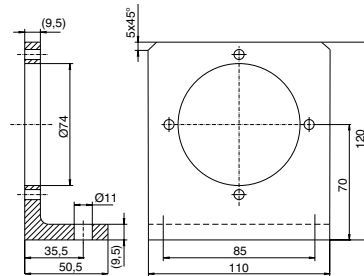
Flange bracket for motor P1V-S030

P1V-S4030B



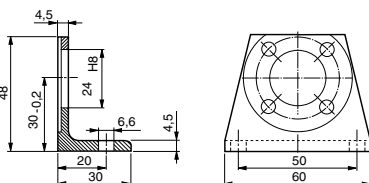
Foot bracket for motor

P1V-S030A0023 and P1V-S030A0010
P1V-S4020C



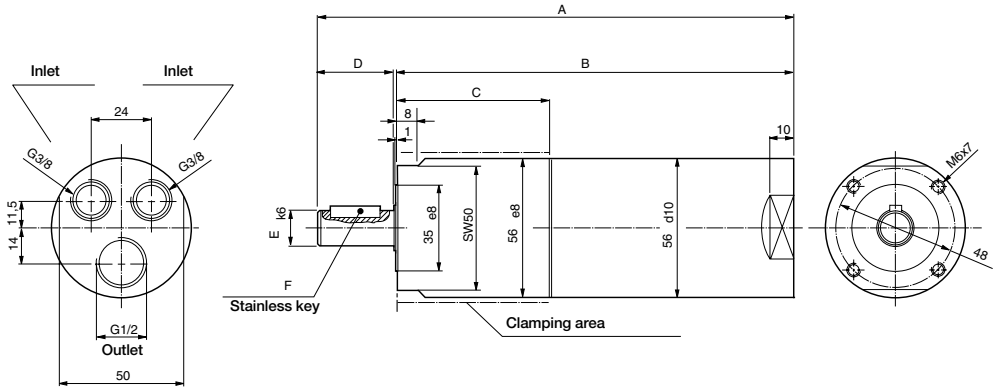
Foot bracket for motor P1V-S030

P1V-S4030F



Motor P1V-S060

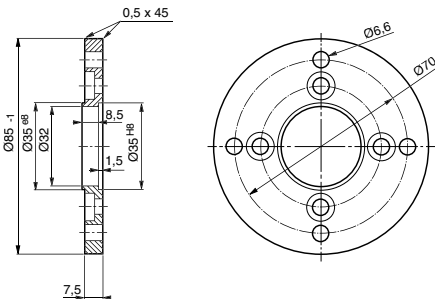
A



	A	B	C	D	E	F
P1V-S060A0E00	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0400	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0270	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0170	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0072	212	180	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0048	212	180	80,4	30	19	A6x6x22 DIN 6885
P1V-S060A0030	217	180	80,4	35	19	A6x6x22 DIN 6885
P1V-S060A0010	217	180	80,4	35	19	A6x6x22 DIN 6885

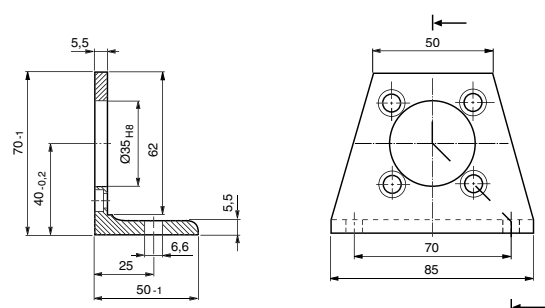
Flange bracket for motor P1V-S060

P1V-S4060B



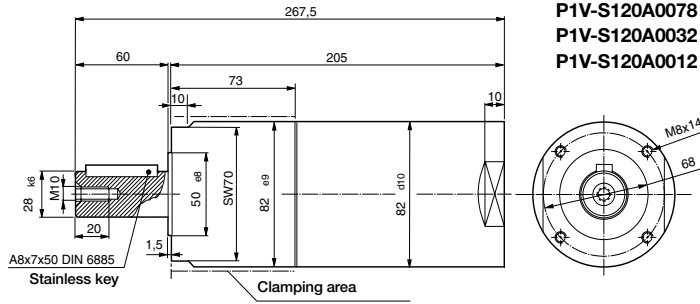
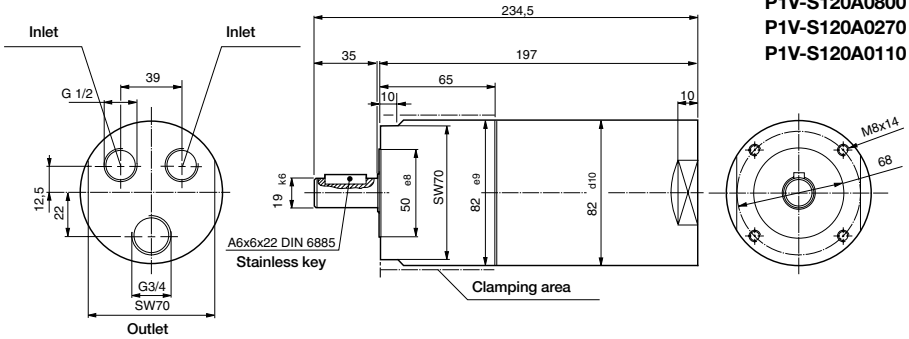
Foot bracket for motor P1V-S060

P1V-S4060F



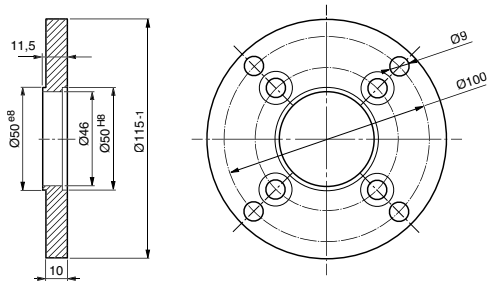
Motor P1V-S120

A



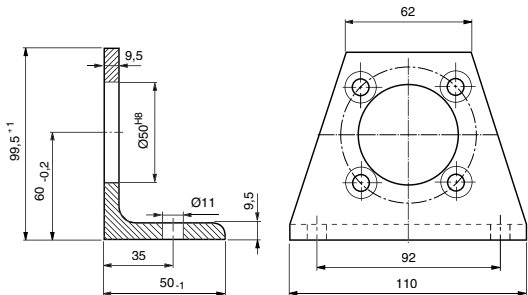
Flange bracket for motor P1V-S120

P1V-S4120B

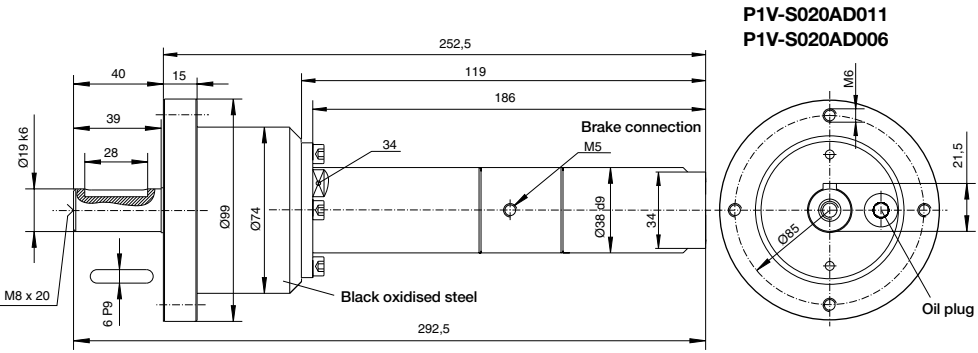
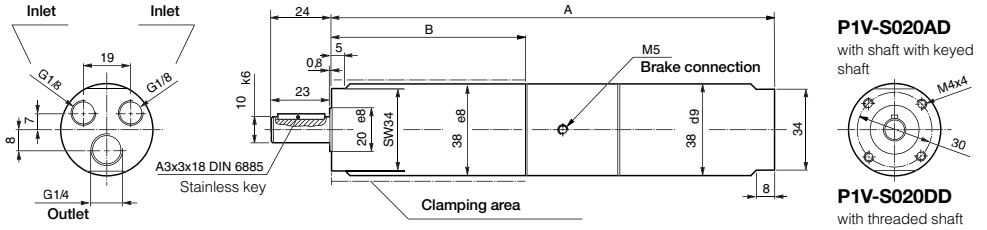


Foot bracket for motor P1V-S120

P1V-S4120F

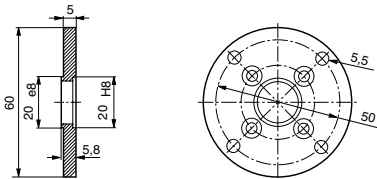


Brake motor P1V-S020

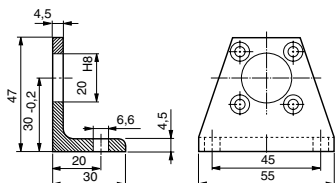


	A	B
P1V-S020ADE50	170	63.5
P1V-S020AD460	170	63.5
P1V-S020AD240	170	63.5
P1V-S020AD140	186	79.5
P1V-S020AD070	186	79.5
P1V-S020AD035	186	79.5
P1V-S020AD018	186	79.5
P1V-S020AD005	202	95.5
P1V-S020AD002	202	95.5
P1V-S020AD001	218	111.5
P1V-S020AD0005	218	111.5

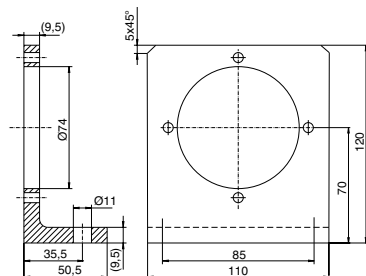
Flange bracket for motor P1V-S020
P1V-S4020B



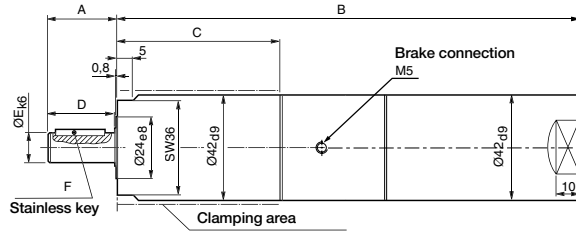
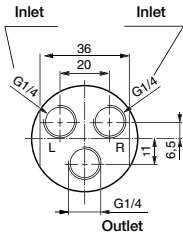
Foot bracket for motor P1V-S020
P1V-S4020F



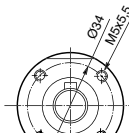
Foot bracket for motor
P1V-S020AD0011 and P1V-S020AD0006
P1V-S4020C



Brake motor P1V-S030

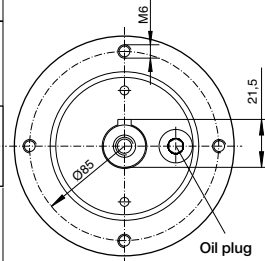
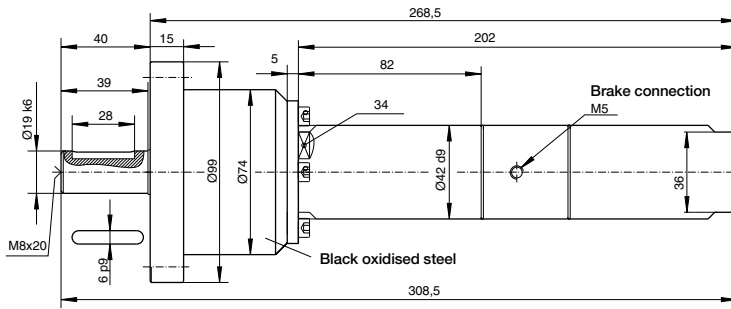


P1V-S030A
with shaft with keyed shaft



P1V-S030D
with threaded shaft

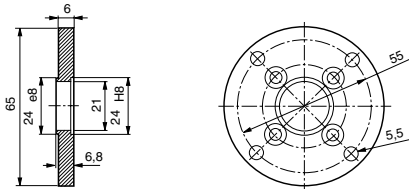
P1V-S030AD023
P1V-S030AD010



	A	B	C	D	E	F
P1V-S030ADE50	28,5	186	66	27	12	A4x4x20 DIN 6885
P1V-S030AD460	28,5	186	66	27	12	A4x4x20 DIN 6885
P1V-S030AD240	28,5	186	66	27	12	A4x4x20 DIN 6885
P1V-S030AD140	28,5	202	82	27	12	A4x4x20 DIN 6885
P1V-S030AD060	32,0	202	82	30	14	A5x5x20 DIN 6885
P1V-S030AD028	32,0	202	82	30	14	A5x5x20 DIN 6885
P1V-S030AD005	32,0	207	82	30	14	A5x5x20 DIN 6885

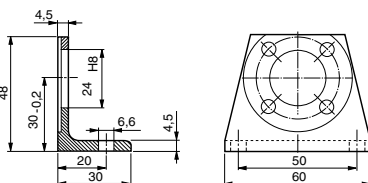
Flange bracket for motor P1V-S030

P1V-S4030B



Foot bracket for motor P1V-S030

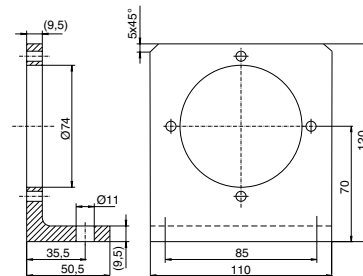
P1V-S4030F



Foot bracket for motor

P1V-S030AD0023 and P1V-S030AD0010

P1V-S4020C





Drilling, milling and grinding motors

A large number of drilling motors, milling motors and grinding motors have been developed using the P1V-S as the base motor in order to make it easier to install air motors in machining applications. These motors are all equipped with standard vanes for intermittent lubrication-free operation, although it is recommended to use oil mist if you are planning to operate them for extended periods.

NOTE! These motors are not made of 100% stainless steel.

Drilling motors are available with power ratings of 80, 170, 250 and 400 Watts, and several different speeds for the machining of a range of materials. They can be fitted with collet chucks, drill chucks and quick-release chucks. Many of them also have accessories allowing the exhaust air to be removed.

The milling motor, with a power rating of 400 Watts, runs at a relatively high speed, and is fitted with a collet chuck for a shaft diameter of 8 mm. It is equipped with strong bearings able to handle greater shear forces on the spindle.

The grinding motor, with a power rating of 200 Watts, is fitted with a collet chuck for a shaft diameter of 8 mm and runs at a relatively high speed. It is equipped with strong bearings able to handle greater shear forces on the spindle.

The design principle of the 90 Watt grinding motor is different from the others. The turbine principle means that high speeds are possible without the need for lubrication.

Feed movement in drilling, milling and grinding motors

A slow and even feed movement is necessary in machining applications. During drilling, the feed must not uncontrollably speed up once the drill breaks through the material. One good way of solving the problem is to use a pneumatic cylinder for the feed, which is able to provide force during drilling and a rapid approach before the actual drilling phase. Feed during the drilling phase is controlled using a hydraulic brake cylinder (HYDROCHECK) fitted in parallel with the pneumatic cylinder. This provides even, slow and safe feed movement, without the risk of the uncontrolled feed described above.

Technical data:

Working pressure: Max 7 bar
 Working temperature: -30 °C to +100 °C
 Medium: 40 µm filtered oil mist (unlubricated for grinding motor P1V-S009)

Other technical data
 See table for each motor

Material specification

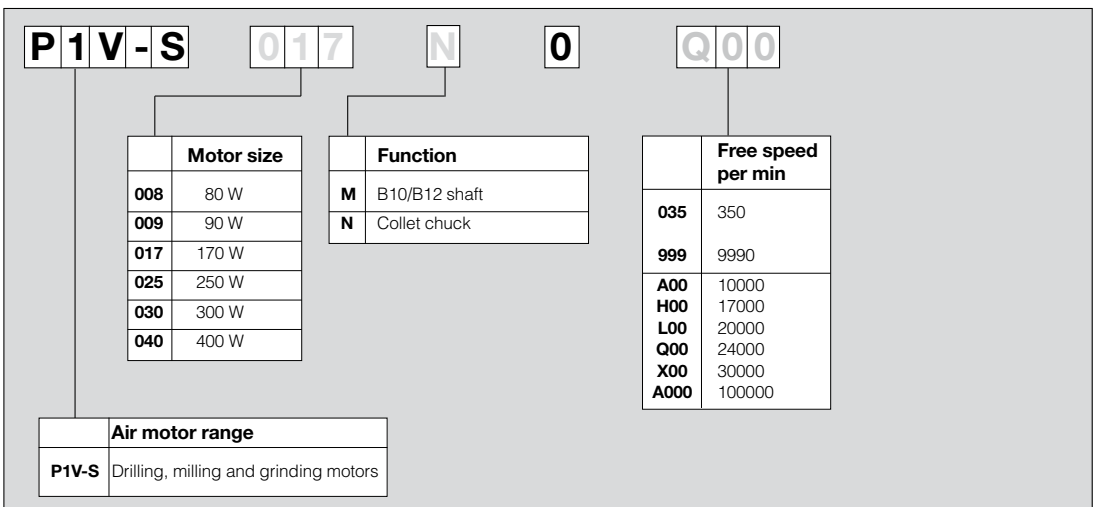
Drilling motors P1V-S008N, P1V-S025N/M, P1V-S040M, milling motor P1V-S040N and grinding motor P1V-S020N
 Housing: Stainless steel, X12Cr13
 Shaft, collet chuck: Hardened steel (not stainless)
 Shaft for drill chuck: Hardened and tempered steel (not stainless)

Drilling motors P1V-S017N/M and grinding motor P1V-S009N
 Housing: High grade steel (not stainless)
 Shaft, collet chuck: Hardened steel (not stainless)
 Shaft for drill chuck: Hardened and tempered steel (not stainless)

All internal parts: High grade steel (not stainless)

Accessories: Surface treated steel, plastic aluminium

Order key



Standard speeds for HSS spiral drills

Average speed Material	Drilling Ømm									
	1	2	3	4	5	6	7	8	9	10
35 m/min Unalloyed steel up to 500 N/mm ²	11000	5500	3700	2800	2200	1900	1600	1400	1200	1100
28 m/min Unalloyed steel from 500 to 700 N/mm ²	8800	4400	3000	2200	1800	1500	1300	1100	975	880
25 m/min Unalloyed steel over 700 N/mm ²	7800	3900	2600	2000	1600	1300	1100	975	865	780
14 m/min Alloyed steel from 700 to 900 N/mm ²	4400	2200	1500	1100	880	735	630	550	490	440
11 m/min Alloyed steel from 900 to 1100 N/mm ²	3400	1700	1100	850	680	570	485	425	380	340
7 m/min Stainless steel	2200	1100	730	550	440	365	315	275	245	220
22 m/min Cast iron up to 180 N/mm ²	7000	3500	2300	1700	1400	1200	1000	875	780	700
12 m/min Cast iron over 180 N/mm ²	3800	1900	1300	950	760	630	540	475	420	380
50 m/min Copper, red metal, bronze, brass	16000	8000	5300	4000	3200	2700	2300	2000	1800	1600
90 m/min Rough light-alloy metal, screw brass ²	28000	14000	9000	7000	5600	4800	4000	3500	3100	2800
165 m/min Hardened light-alloy metal	52000	26000	17300	13000	10400	8700	7400	6500	5800	5200
210 m/min Magnesium alloy ¹	66000	33000	22000	16500	13200	11000	9400	8300	7400	6600

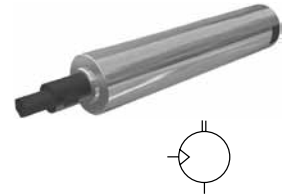
- 1 Speeds for processing two-component plastics, cardboard or plastic-coated fabrics plaster, HSS drills must not be used - use a high-speed steel drill fitted with a hard metal K10 instead
- 2 double the values for thermoplastics

Drilling motor P1V-S008N

Our smallest and most versatile drilling motor for small-scale drilling operations. The standard collet chuck is for 3 mm shaft diameter.

For other diameters, select a different collet chuck as an accessory.

The motor has a port for a 6 mm hose to remove the exhaust air to a silencer.



Data for drilling motor P1V-S008N

Max power	Free speed	Version	Drilling in steel	Drilling in aluminium	Air consumption at max power	Conn. Min pipe ID	Weight	Order code	
kW	rpm		mm	mm	l/s	mm	Kg		
0,080	24000	Collet chuck 3 mm	-	3	3,8	M8 x 0,75*	4	0,20	P1V-S008N0Q00
0,080	7000	Collet chuck 3 mm	3	3	3,8	M8 x 0,75*	4	0,20	P1V-S008N0700
0,080	1900	Collet chuck 3 mm	3	3	3,8	M8 x 0,75*	4	0,22	P1V-S008N0190
0,080	1300	Collet chuck 3 mm	3	3	3,8	M8 x 0,75*	4	0,22	P1V-S008N0130

* 2 push in nipples (F28PMB6M8SP) for plastic pipe Ø6/4 supplied

Accessories for drilling motor P1V-S008N

Name	Order code
Collet chucks	
Collet chuck Ø2 mm	P1V-6/314693
Collet chuck Ø3 mm	
Standard	
Collet chuck Ø3/32"	P1V-6/314694
Collet chuck Ø1/8"	P1V-6/314407

NOTE! All technical data is based on a working pressure of 6 bar.

Drilling motor P1V-S017N

A small drilling motor for small-scale, lighter drilling operations.

The standard collet chuck is for 6 mm shaft diameter.

For other diameters, select a different collet chuck as an accessory.

The motor has a built-in silencer for exhaust air. If lower noise levels are required, or if you want the exhaust air to be collected, the relevant accessories are available.

**Data for drilling motor P1V-S017N**

Max power	Free speed	Version	Drilling in steel	Drilling in aluminium	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm		mm	mm	l/s		mm	Kg	
0,170	24000	Collet chuck 6 mm	-	4	5,0	G1/4o	6	0,38	P1V-S017N0Q00
0,170	6000	Collet chuck 6 mm	3	5	5,0	G1/4o	6	0,38	P1V-S017N0600
0,170	4000	Collet chuck 6 mm	4	6	5,0	G1/4o	6	0,38	P1V-S017N0400
0,170	1500	Collet chuck 6 mm	4	6	5,0	G1/4o	6	0,38	P1V-S017N0150
0,170	1000	Collet chuck 6 mm	4	6	5,0	G1/4o	6	0,38	P1V-S017N0100
0,170	660	Collet chuck 6 mm	4	6	5,0	G1/4o	6	0,38	P1V-S017N0066

Accessories for drilling motor P1V-S017N

Name	Order code
Collet chucks	
Collet chuck Ø3 mm	P1V-6/312681
Collet chuck Ø4 mm	P1V-6/312684
Collet chuck Ø5 mm	P1V-6/312686
Collet chuck Ø6 mm	
Standard	
Collet chuck Ø1/8"	P1V-6/312682
Collet chuck Ø1/4"	P1V-6/312689
Other accessories	
Outlet hose	P1V-6/806112
Seal for outlet hose	P1V-6/823221
Outlet connection parallel	P1V-6/302923A

NOTE! All technical data is based on a working pressure of 6 bar.

Drilling motor P1V-S017M

A small drilling motor for small-scale, lighter drilling operations.

Select drill chucks as accessories.

The motor has a built-in silencer for exhaust air. If lower noise levels are required, or if you want the exhaust air to be collected, the relevant accessories are available.

**Data for drilling motor P1V-S017M**

Max power	Free speed	Version	Drilling in steel	Drilling in aluminium	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm		mm	mm	l/s		mm	Kg	
0,170	6000	For drill chuck B10	3	5	5,0	G1/4o	6	0,38	P1V-S017M0600
0,170	4000	For drill chuck B10	4	6	5,0	G1/4o	6	0,38	P1V-S017M0400
0,170	1500	For drill chuck B10	4	6	5,0	G1/4o	6	0,38	P1V-S017M0150
0,170	1000	For drill chuck B10	4	6	5,0	G1/4o	6	0,38	P1V-S017M0100
0,170	660	For drill chuck B10	4	6	5,0	G1/4o	6	0,38	P1V-S017M0066

Accessories for drilling motor P1V-S017M

Name	Order code
Standard drill chuck	
Diameters 0,5 – 6 mm/B10	P1V-6/804655
Other accessories	
Outlet hose	P1V-6/806112
Seal for outlet hose	P1V-6/823221
Outlet connection parallel	P1V-6/302923A

NOTE! All technical data is based on a working pressure of 6 bar.

Drilling motor P1V-S025N

A small drilling motor for moderately heavy drilling operations.

The standard collet chuck is for 6 mm shaft diameter.

For other diameters, select a different collet chuck as an accessory.

The motor has a built-in silencer for exhaust air. If lower noise levels are required, or if you want the exhaust air to be collected, the relevant accessories are available.



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**Data for drilling motor P1V-S025N**

Max power kW	Free speed rpm	Version	Drilling in steel mm	Drilling in aluminium mm	Air consumption at max power l/s	Conn.	Min pipe ID mm	Weight Kg	Order code
0,250	17000	Collet chuck 6 mm	-	6	6,3	G1/4o	6	0,80	P1V-S025N0H00
0,250	4800	Collet chuck 6 mm	4	6	6,3	G1/4o	6	0,80	P1V-S025N0480
0,250	2500	Collet chuck 6 mm	6	6	6,3	G1/4o	6	0,80	P1V-S025N0250
0,250	1400	Collet chuck 6 mm	6	6	6,3	G1/4o	6	0,80	P1V-S025N0140
0,250	700	Collet chuck 6 mm	6	-	6,3	G1/4o	6	0,80	P1V-S025N0070
0,250	350	Collet chuck 6 mm	6	-	6,3	G1/4o	6	0,80	P1V-S025N0035

Accessories for drilling motor P1V-S025N

Name	Order code
Collet chucks	
Collet chuck Ø3 mm	P1V-6/312681
Collet chuck Ø4 mm	P1V-6/312684
Collet chuck Ø5 mm	P1V-6/312686
Collet chuck Ø6 mm	
Standard	
Collet chuck Ø1/8"	P1V-6/312682
Collet chuck Ø1/4"	P1V-6/312689
Other accessories	
Outlet connection straight	P1V-6/313179A
Outlet hose Ø23 x 28 mm 0,75 m long	P1V-6/806110
Outlet connection parallel	P1V-6/388378A

NOTE! All technical data is based on a working pressure of 6 bar.

Drilling motor P1V-S025M

A small drilling motor for moderately heavy drilling operations.

Select drill chucks or quick-release chucks as accessories as necessary.

The motor has a built-in silencer for exhaust air. If lower noise levels are required, or if you want the exhaust air to be collected, the relevant accessories are available.

**Data for drilling motor P1V-S025M**

Max power kW	Free speed rpm	Version	Drilling in steel mm	Drilling in aluminium mm	Air con- sumption at max power l/s	Conn.	Min pipe ID mm	Weight Kg	Order code
0,250	17000	For drill chuck B12	-	6	6,3	G1/4o	6	0,80	P1V-S025M0H00
0,250	4800	For drill chuck B12	4	6	6,3	G1/4o	6	0,80	P1V-S025M0480
0,250	2500	For drill chuck B12	6	8	6,3	G1/4o	6	0,80	P1V-S025M0250
0,250	1400	For drill chuck B12	8	10	6,3	G1/4o	6	0,80	P1V-S025M0140
0,250	700	For drill chuck B12	10	-	6,3	G1/4o	6	0,80	P1V-S025M0070
0,250	350	For drill chuck B12	10	-	6,3	G1/4o	6	0,80	P1V-S025M0035

Accessories for drilling motor P1V-S025M

Name	Order code
Standard drill chuck	
Diameters 0,8 – 10 mm/B12	P1V-6/804650
Quick-release chuck	
Diameters 0,5 – 8 mm/B12	P1V-6/804661
Other accessories	
Outlet connection straight	P1V-6/3131179A
Outlet hose Ø23 x 28 mm 0,75 m long	P1V-6/806110
Outlet connection parallel	P1V-6/388378A

NOTE! All technical data is based
on a working pressure of 6 bar.

Drilling motor P1V-S040M

Our large drilling motor is used for small-scale heavy drilling operations requiring considerable feed force.

Select drill chucks or quick-release chucks as accessories as necessary.

The motor has a built-in silencer for exhaust air. If lower noise levels are required, or if you want the exhaust air to be collected, the relevant accessories are available.



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Data for drilling motor P1V-S040M

Max power	Free speed	Version	Drilling in steel	Drilling in aluminium	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm		mm	mm	l/s		mm	Kg	
0,400	17000	For drill chuck B12	-	6	8,0	G1/4o	6	0,80	P1V-S040M0H00
0,400	4800	For drill chuck B12	4	6	8,0	G1/4o	6	0,80	P1V-S040M0480
0,400	2500	For drill chuck B12	6	8	8,0	G1/4o	6	0,80	P1V-S040M0250
0,400	1400	For drill chuck B12	8	10	8,0	G1/4o	6	0,80	P1V-S040M0140

Accessories for drilling motor P1V-S040M

Name	Order code
Standard drill chuck Diameters 0,8 – 10 mm/B12	P1V-6/804650
Quick-release chuck Diameters 0,5 – 8 mm/B12 (Cannot be used for drilling motor P1V-S040M0H00)	P1V-6/804661
Other accessories	
Outlet connection straight	P1V-6/3131179A
Outlet hose Ø23 x 28 mm 0,75 m long	P1V-6/806110
Outlet connection parallel	P1V-6/388378A

NOTE! All technical data is based on a working pressure of 6 bar.

Milling motor P1V-S040N

This motor was designed for milling plastic components, but it can also be used for milling other materials.

The motor has a built-in silencer for exhaust air. If lower noise levels are required, or if you want the exhaust air to be collected, the relevant accessories are available.

**Data for drilling motor P1V-S040N**

Max power	Free speed	Version	Milling of plastic mill dia. max mm	Milling of wood milldia. max mm	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm				l/s		mm	Kg	
0,400	20000	Collet chuck 8 mm	8	10	5,0	G1/4o	6	0,80	P1V-S040N0L00

Accessories for drilling motor P1V-S040N

Name	Order code
Collet chucks	
Collet chuck Ø3 mm	P1V-6/312690
Collet chuck Ø4 mm	P1V-6/312692
Collet chuck Ø5 mm	P1V-6/312693
Collet chuck Ø6 mm	P1V-6/312694
Collet chuck Ø8 mm	
Standard	
Collet chuck Ø1/8"	P1V-6/312691
Collet chuck Ø1/4"	P1V-6/312695
Other accessories	
Outlet connection straight	P1V-6/3131179A
Outlet hose Ø23 x 28 mm 0,75 m long	P1V-6/806110
Outlet connection parallel	P1V-6/388378A

NOTE! All technical data is based on a working pressure of 6 bar.

Grinding motor P1V-S009N

The grinding motor is used for small-scale point grinding and small-scale milling where the high speed is an advantage. It has proved to be very useful for drilling small holes and milling thin slits in PCBs in the electronics industry. In this application, the high speed means that the holes and slits are free of burrs on the underside.



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Data for grinding motor P1V-S009N

Max power	Free speed	Version	Point grinding diam. max	Milling diam. max	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm		mm	mm	l/s		mm	Kg	
0,090	100000	Collet chuck 3 mm	5	3	2,0	Pipe 6/4	4	0,3	P1V-S009N0A000

NOTE! All technical data is based on a working pressure of 6 bar.

Grinding motor P1V-S020N

This grinding motor is used when larger-scale point grinding is required. The motor can also be used for light milling operations. The motor has a built-in silencer for exhaust air.



Data for grinding motor P1V-S020N

Max power	Free speed	Version	Point grinding diam. max	Milling diam. max	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm		mm	mm	l/s		mm	Kg	
0,200	30000	Collet chuck 6 mm	25	10	6,3	G1/4o	6	0,5	P1V-S020N0X00

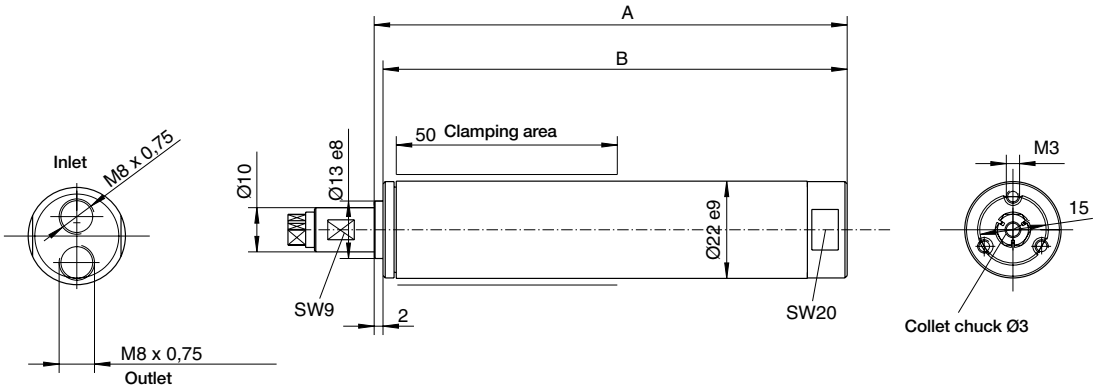
Accessories for grinding motor P1V-S020N

Name	Order code
Collet chucks	
Collet chuck Ø3 mm	P1V-6/312681
Collet chuck Ø4 mm	P1V-6/312684
Collet chuck Ø5 mm	P1V-6/312686
Collet chuck Ø6 mm	
Standard	
Collet chuck Ø1/8"	P1V-6/312682
Collet chuck Ø1/4"	P1V-6/312689

NOTE! All technical data is based on a working pressure of 6 bar.

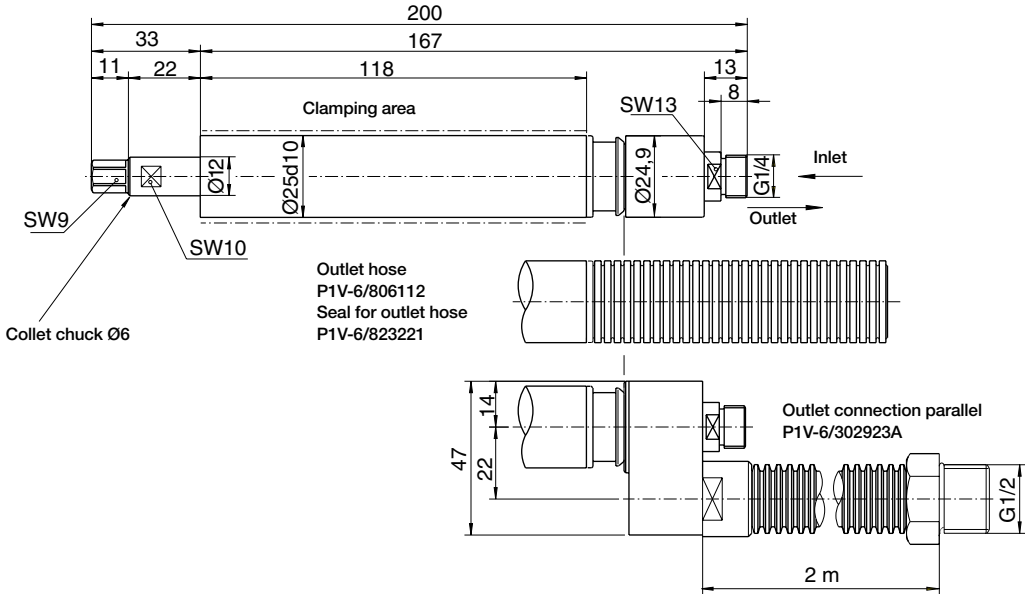
Drilling motor P1V-S008N

A



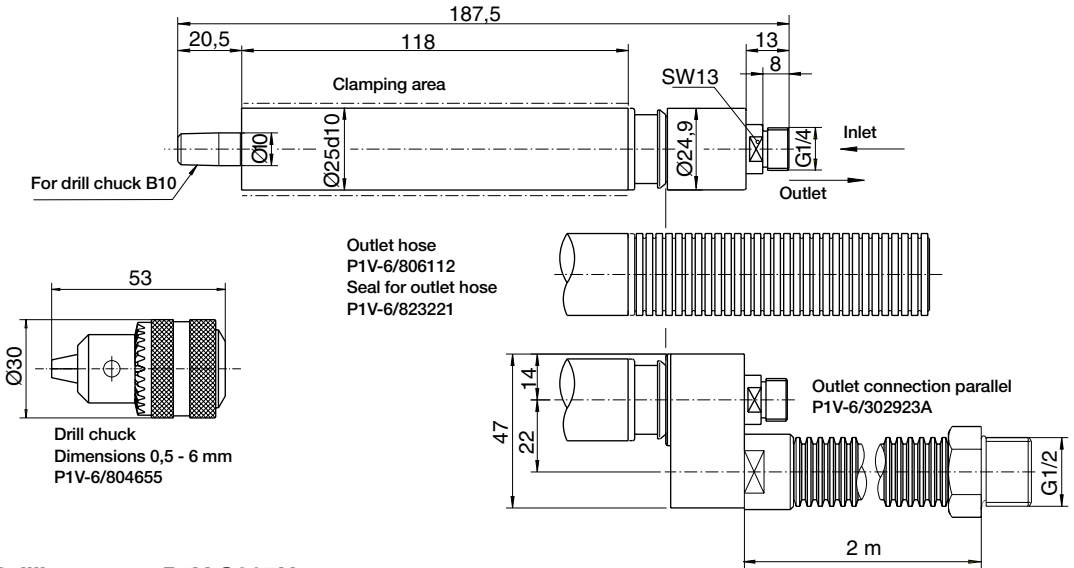
	A	B
P1V-S008N0Q00, P1V-S008N0700	98	96
P1V-S008N0190, P1V-S008N0130	107	105

Drilling motor P1V-S017N

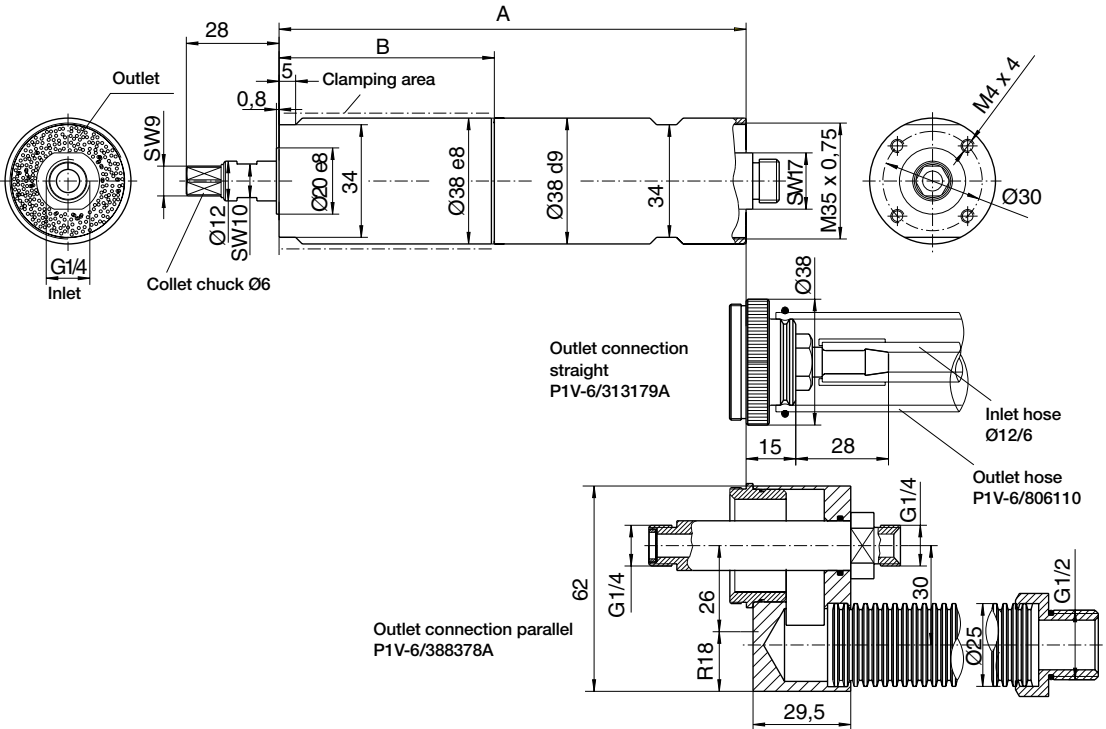


A

Drilling motor P1V-S017M

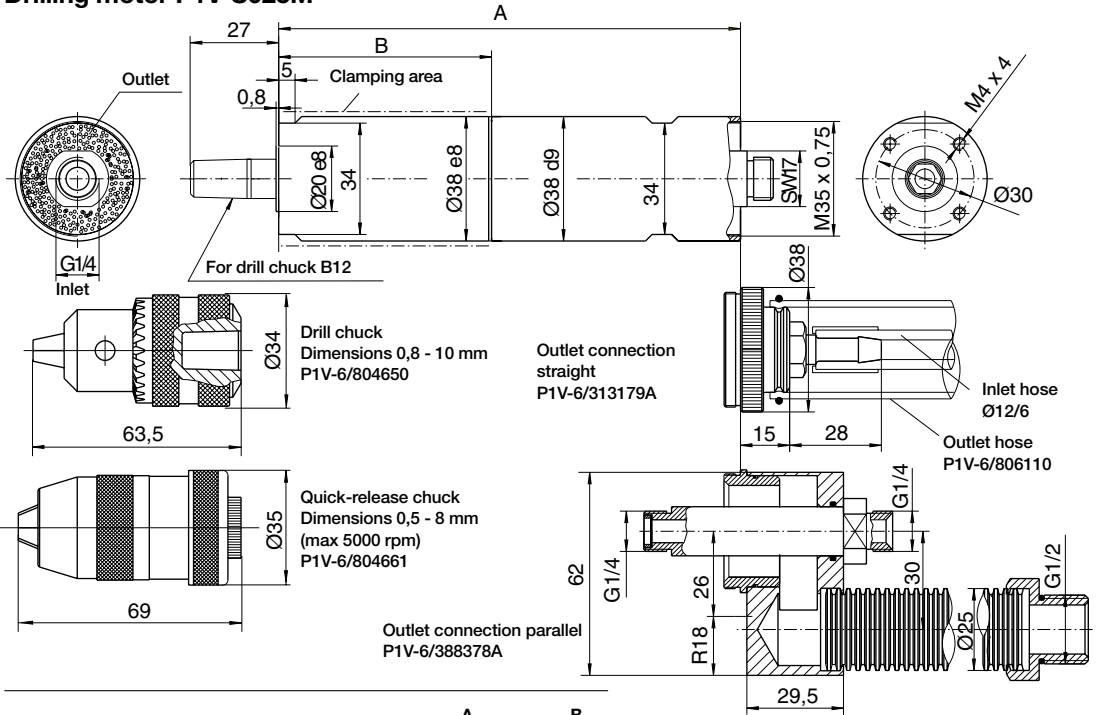


Drilling motor P1V-S025N



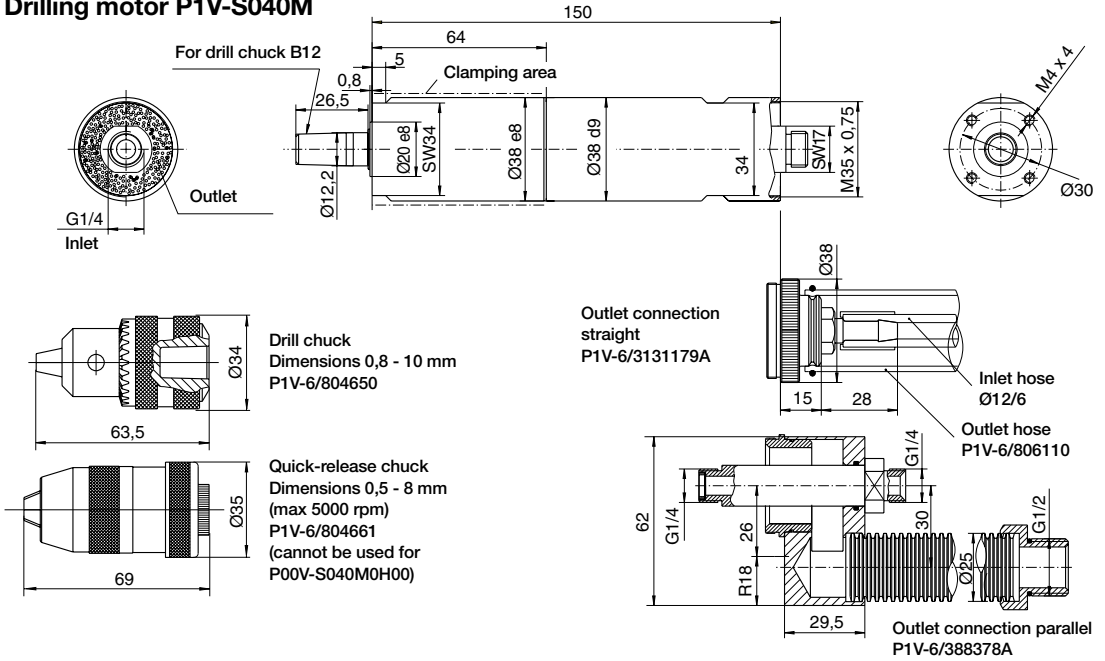
	A	B
P1V-S025N0H00, P1V-S025N0480, P1V-S025N0250	141	65
P1V-S025N0140, P1V-S025N0070, P1V-S025N0035	157	81

Drilling motor P1V-S025M



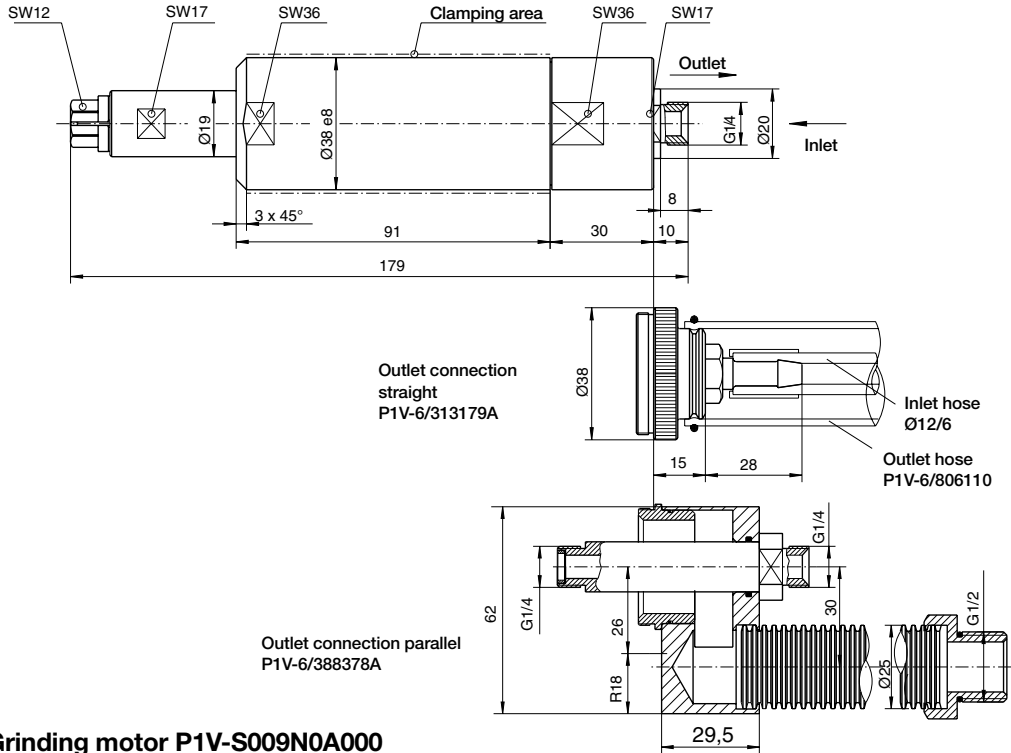
	A	B
P1V-S025M0H00, P1V-S025M0480, P1V-S025M0250	141	65
P1V-S025M0140, P1V-S025M0070, P1V-S025M0035	157	81

Drilling motor P1V-S040M

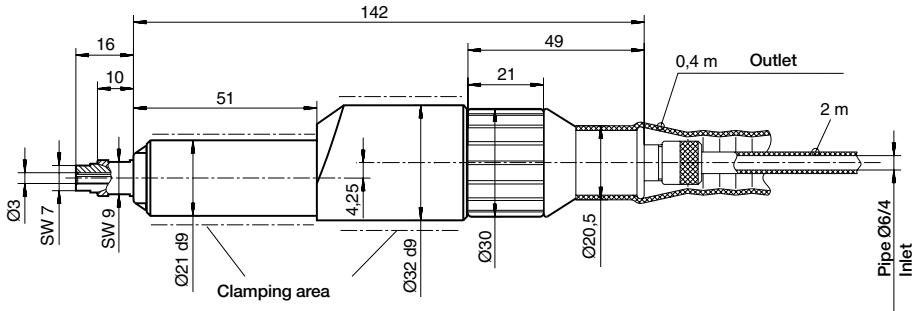




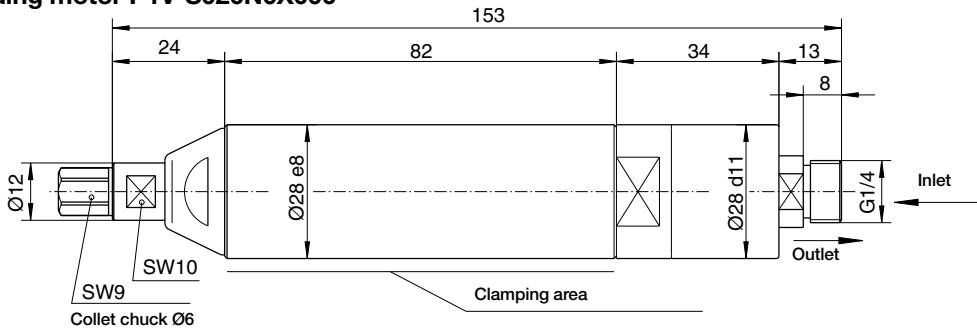
Milling motor P1V-S040N



Grinding motor P1V-S009N0A000



Grinding motor P1V-S020N0X000



Theoretical calculations

This section provides you with the background you need in order to select the right air motor for common applications. The first four parts explain the direct physical relationships between:

Force - Torque - Speed - Power Requirement

Before selecting an air motor, you need to know the torque required by the application at the necessary speed. Sometimes, the torque and the speed are not known but the power requirement and the speed of movement are. You can use the following formulas to calculate the speed and torque.

Power

The power requirement is always calculated in N.

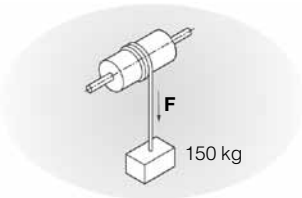
Formula:

$$F = m \times g$$

F = power in N

m = mass in kg

g = gravitation (9,81) in r



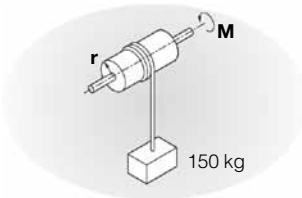
In this example, the mass is 150 kg

$$F = 150 \times 9,81 \text{ N}$$

$$F = 1470 \text{ N}$$

Torque

Torque is the force applied to produce rotational motion (rotational force) or the force applied in the opposite direction. It is the product of the rotational force F and the distance from the pivot point (radius or moment arm)



Formula:

$$M = m \times g \times r$$

M = torque in Nm

m = mass in kg

g = gravitation (9,81) in n/s-

r = radius or moment arm in m

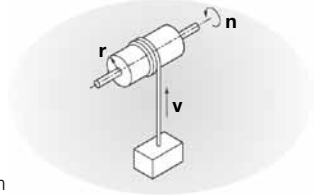
In this example, the drum diameter is 300 mm, which means the radius $r = 0,15$ m, and the mass is 150kg.

$$M = 150 \times 9,81 \times 0,15 \text{ Nm}$$

$$M = 221 \text{ Nm}$$

Speed

The required motor speed can be calculated if the speed of movement and the radius (diameter) are known.



$$n = v \times 60 / (2 \times \pi \times r)$$

n = motor speed in rpm

v = speed of movement in m/sec

r = radius in m

π = constant (3,14)

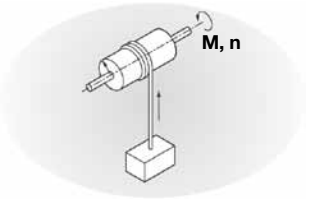
In this example, the speed of movement is 1,5 m/s and the drum diameter is 300 m (radius $r = 0,15$ m)

$$n = 1,5 \times 60 / (2 \times \pi \times 0,15) \text{ rpm}$$

$$n = 96 \text{ rpm}$$

Power Requirement

The power requirement can be calculated if the motor speed and torque are known.



$$P = M \times n / 9550$$

P = power in kW

M = torque in Nm

n = rpm

9550 = conversion factor

In this example, a torque of 1,25 Nm is required at a speed of 1500 rpm.

$$P = 1,25 \times 1500 / 9550$$

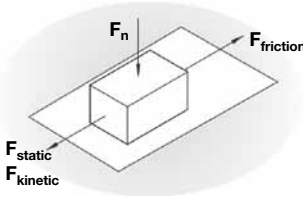
$$P = 0,196 \text{ kW or approx. 200 Watt}$$



Frictional Forces between two Objects

A frictional force always occurs between two objects with surfaces in contact with each other. It is always exerted against the direction of movement.

The frictional force is either static or kinetic. When selecting an air motor, we need to consider the larger of the two forces, static or kinetic.



The size of the static frictional force or the kinetic frictional force is the product of the normal force F_n and the coefficient of static friction (μ_0), or the product of the normal force F_n and the coefficient of kinetic friction (μ).

The size of the contact surface between the objects is irrelevant.

Formula:

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

$$F_n = m \times g$$

F_{static} = static friction in N

F_{kinetic} = kinetic friction in N

F_n = force from object in N

m = mass in kg

g = gravitation (9,81) in m/s²

Material		Coefficient of static friction μ_0	
		Dry	Lubricated
Bronze	Bronze	0,28	0,11
Bronze	Grey iron	0,28	0,16
Grey iron	Grey iron	-	0,16
Steel	Bronze	0,27	0,11
Steel	Ice	0,027	-
Steel	Grey iron	0,20	0,10
Steel	Steel	0,15	0,10
Steel	White metal	-	-
Wood	Ice	-	-
Wood	Wood	0,65	0,16
Leather	Grey iron	0,55	0,22
Brake lining	Steel	-	-
Steel	Nylon (polyamide)	-	-

Material		Coefficient of kinetic friction μ	
		Dry	Lubricated
Bronze	Bronze	0,2	0,06
Bronze	Grey iron	0,21	0,08
Grey iron	Grey iron	-	0,12
Steel	Bronze	0,18	0,07
Steel	Ice	0,014	-
Steel	Grey iron	0,16	0,05
Steel	Steel	0,10	0,05
Steel	White metal	0,20	0,04
Wood	Ice	0,035	-
Wood	Wood	0,35	0,05
Leather	Grey iron	0,28	0,12
Brake lining	Steel	0,55	0,40
Steel	Nylon (polyamide)	0,5	0,10

Example: A steel component with a weight of 500 kg is to be pulled across bronze plate without lubrication. What will the frictional force be when the component moves?

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

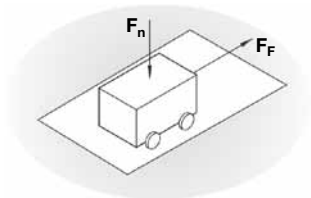
$$F_{\text{static}} = 500 \times 9,81 \times 0,27 = 1324 \text{ N}$$

$$F_{\text{kinetic}} = 500 \times 9,81 \times 0,18 = 883 \text{ N}$$

The static frictional force should always be compared with the force provided by the motor when it starts.

Kinetic Resistance

Kinetic resistance is a term expressing the total resistance, consisting of rolling resistance and the frictional force in the bearing



Formula:

$$F_F = \mu_F \times F_n$$

F_F = kinetic resistance in N

μ_F = coefficient of kinetic resistance

F_n = force from object in N

Coefficient of kinetic resistance:

Object	Coefficient of kinetic resistance
Railway vehicle on steel rails	0,0015 to 0,0030
Vehicle with rubber wheel on asphalt	0,015 to 0,03

Example:

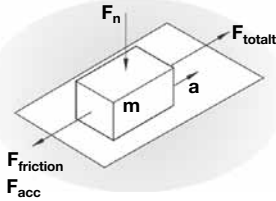
A railway carriage with a weight of 2 tonnes is to move over flat rails. What will the kinetic resistance be?

$$F_F = \mu_F \times F_n$$

$$F_F = 0,0030 \times 2 \times 1000 \times 9,81$$

$$F_F = 4,86 \text{ N}$$

Moving a component over a base, with friction between them



The force required to move the component consists of two parts - a frictional force to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{friction}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{friction}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

F_{friction} = frictional force in N (either F_{static} or F_{kinetic} depending on which is the greater force)

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A steel component weighing 500 kg is to be pulled over a dry steel plate with an acceleration of $0,1 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic}} + F_{\text{acc}}$$

$$F_{\text{tot}} = F_{\text{kinetic}} + m \times a$$

$$F_{\text{tot}} = F_n \times \mu + m \times a$$

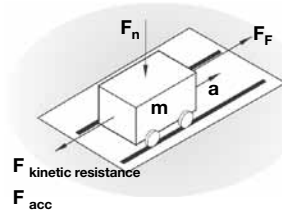
$$F_{\text{tot}} = 500 \times 9,81 \times 0,15 + 500 \times 0,1$$

$$F_{\text{tot}} = 735,75 + 50$$

$$F_{\text{tot}} = 785,75 \text{ N}$$

Answer: A force of 780 N is required to produce this movement.

Moving a carriage over rails, with kinetic resistance between them



The force required to move the component consists of two parts - a kinetic resistance to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

$F_{\text{kinetic resistance}}$ = total kinetic resistance in N

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A carriage weighing 2500 kg is to be pulled over steel rails with an acceleration of $0,2 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{tot}} = \mu_F \times F_N + m \times a$$

$$F_{\text{tot}} = 0,0030 \times 2500 \times 9,81 + 2500 \times 0,2$$

$$F_{\text{tot}} = 6,1 + 500$$

$$F_{\text{tot}} = 506 \text{ N}$$

Answer: A force of 510 N is required to produce this movement.

In practice

These calculations only produce values as they would be under optimum conditions. There must be no inclines in either direction. In applications using carriages, the rails must be perfectly flat without any inclines, the wheels must be perfectly round and there must be nothing on the rails (grains of sand, etc.). There must also be no effects from wind, etc.

In addition, there is always uncertainty with regard to the compressed air supply. How can we guarantee a pressure of 6 bar to the inlet port of the air motor?

Tip: calculate the required theoretical values for the air motor and assume a safety factor of 10 for the frictional force or kinetic resistance, and add this to the acceleration force. If the motor proves to be too powerful in practice, the supply air can always be regulated by throttling or pressure regulation. If you select a motor that is not powerful enough, on the other hand, the only option is to replace it.



Permitted shaft loadings

Air and brakemotors

Max. permitted load on output shaft for motors (based on 10 000 000 rpm at input shaft with 90 % probable service life for ball bearings).

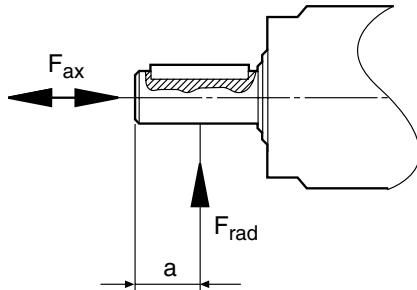


Fig 1: Load on output shaft for basic motor with keyed shaft.

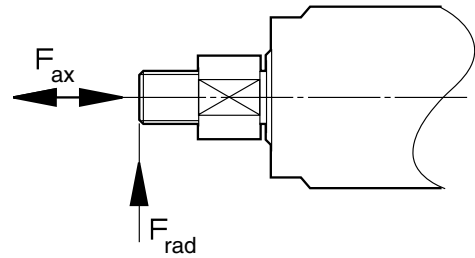


Fig. 2: Load on output shaft for basic motor with threaded shaft.

Keyed shaft

Order code	F _{ax} [N]	F _{rad} [N]	a [mm]
P1V-S002A	140	180	6
P1V-S008A	200	220	7
P1V-S012A	380	160	9
P1V-S020A	570	720	12
P1V-S020A0011	1100	1200	22
P1V-S020A0006	1100	1200	22
P1V-S030A0023	1100	1200	22
P1V-S030A0010	1100	1200	22
P1V-S030A0E50	570	1130	14
P1V-S030A0460	570	1130	14
P1V-S030A0240	570	1130	14
P1V-S030A0140	570	1130	14
P1V-S030A0060	790	1070	15
P1V-S030A0028	790	1070	15
P1V-S030A0018	790	1070	15
P1V-S030A0005	790	1070	15
P1V-S060A0E00	1110	1300	15
P1V-S060A0400	1110	1300	15
P1V-S060A0270	1110	1300	15
P1V-S060A0170	1110	1300	15
P1V-S060A0072	1110	1300	15
P1V-S060A0048	1130	2090	18
P1V-S060A0030	1130	2090	18
P1V-S060A0010	1130	2090	18
P1V-S120A0800	2330	2260	18
P1V-S120A0270	2330	2260	18
P1V-S120A0110	2330	2260	18
P1V-S120A0078	2330	2700	30
P1V-S120A0032	2330	2700	30
P1V-S120A0012	2330	2700	30

Threaded shaft

Order code	F _{ax} [N]	F _{rad} [N]
P1V-S012D	380	110
P1V-S020D	570	450
P1V-S030D0E50	570	860
P1V-S030D0460	570	860
P1V-S030D0240	570	860
P1V-S030D0140	570	860
P1V-S030D0060	790	820
P1V-S030D0028	790	820
P1V-S030D0018	790	820
P1V-S030D0005	790	820

F_{rad} = Radial loading (N)
 F_{ax} = Axial loading (N)

Permitted shaft loadings

Drilling, milling and grinding motors

Max. permitted load on output shaft for motors (based on 10 000 000 rpm at input shaft with 90 % probable service life for ball bearings).

Drilling motors with collet chuck

Order code	F_{ax} [N]	F_{rad} [N]	a [mm]
P1V-S008N	200	75	25
P1V-S017N	380	50	25
P1V-S025N	750	260	25

Drilling motors with drill chuck

Order code	F_{ax} [N]	F_{rad} [N]	a [mm]
P1V-S017M	380	35	60
P1V-S025M	380	150	70
P1V-S040M	750	150	70

Milling motor

Order code	F_{ax} [N]	F_{rad} [N]	a [mm]
P1V-S040N*	30	250	25

Grinding motors

Order code	F_{ax} [N]	F_{rad} [N]	a [mm]
P1V-S009N*	2	10	25
P1V-S020N*	16	70	25

F_{rad} = Radial loading (N)

F_{ax} = Axial loading (N)

* For the milling motor and grinding motor, these loadings are calculated for 1000 hours of operation

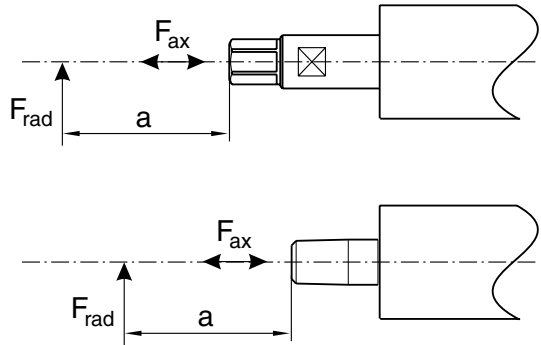
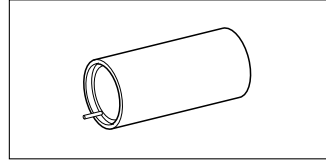
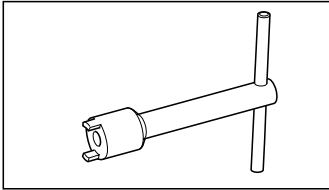


Fig 3: Load on output shaft for drilling, milling and grinding motors.



Service kits for P1V-S motors

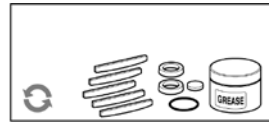
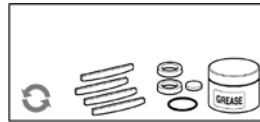
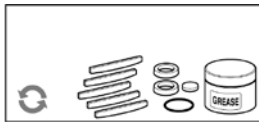
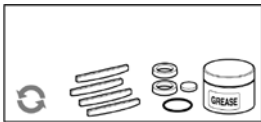
The following kits are available for the basic motors, consisting of vanes, (springs), silencers, O-rings, seals and 50 g of grease: (USDA-H1 approved):



Installation tools

For motor	Order code
P1V-S012	8204160049

For motor	Order code
P1V-S020, P1V-S030	8204160112



Service kit, vanes for intermittent lubrication-free operation

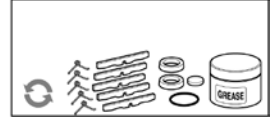
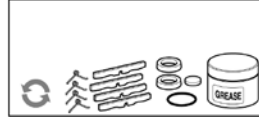
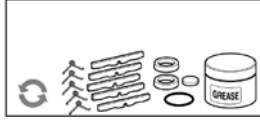
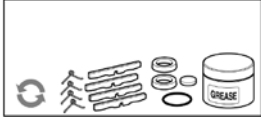
For motor	Order code
P1V-S002A	P1V-6/446083A
P1V-S008A	P1V-6/446084A
P1V-S012A/D0 (to serial no 948688)	9121720601
P1V-S012A/D0 (from serial no 948689)	9121720636
P1V-S020A/D0	9121720602
P1V-S030A/D0	9121720603
P1V-S060A0E00	9121720604
P1V-S060A0400	9121720604
P1V-S060A0270	9121720604
P1V-S060A0170	9121720604
P1V-S060A0072	9121720604
P1V-S060A0048	9121720605
P1V-S060A0030	9121720605
P1V-S060A0010	9121720605
P1V-S120A0800	9121720606
P1V-S120A0270	9121720606
P1V-S120A0110	9121720606
P1V-S120A0078	9121720607
P1V-S120A0032	9121720607
P1V-S120A0012	9121720607

Service kit, vanes for continuous lubrication-free operation, Option "C"

For motor	Order code
P1V-S012A/DC (to serial no 948688)	9121720608
P1V-S012A/DC (from serial no 948689)	9121720637
P1V-S020A/DC	9121720609
P1V-S030A/DC	9121720610
P1V-S060ACE00	9121720611
P1V-S060AC400	9121720611
P1V-S060AC270	9121720611
P1V-S060AC170	9121720611
P1V-S060AC072	9121720611
P1V-S060AC048	9121720612
P1V-S060AC030	9121720612
P1V-S060AC010	9121720612
P1V-S120AC800	9121720613
P1V-S120AC270	9121720613
P1V-S120AC110	9121720613
P1V-S120AC078	9121720614
P1V-S120AC032	9121720614
P1V-S120AC012	9121720614

Service kits for P1V-S motors

The following kits are available for the basic motors, consisting of vanes, (springs), silencers, O-rings, seals and 50 g of grease: (USDA-H1 approved):



Service kit, spring-loaded vanes for intermittent lubrication-free operation Option "Z"

For motor	Order code
P1V-S012A/DZ (to serial no 948688)	9121720615
P1V-S012A/DZ (from serial no 948689)	9121720638
P1V-S020A/DZ	9121720616
P1V-S030A/DZ	9121720617
P1V-S060AZE00	9121720618
P1V-S060AZ400	9121720618
P1V-S060AZ270	9121720618
P1V-S060AZ170	9121720618
P1V-S060AZ072	9121720618
P1V-S060AZ048	9121720619
P1V-S060AZ030	9121720619
P1V-S060AZ010	9121720619
P1V-S120AZ800	9121720620
P1V-S120AZ270	9121720620
P1V-S120AZ110	9121720620
P1V-S120AZ078	9121720621
P1V-S120AZ032	9121720621
P1V-S120AZ012	9121720621

Service kit, spring-loaded vanes for continuous lubrication-free operation Option "M"

For motor	Order code
P1V-S012A/DM (to serial no 948688)	9121720622
P1V-S012A/DM (from serial no 948689)	9121720639
P1V-S020A/DM	9121720623
P1V-S030A/DM	9121720624
P1V-S060AME00	9121720625
P1V-S060AM400	9121720625
P1V-S060AM270	9121720625
P1V-S060AM170	9121720625
P1V-S060AM072	9121720625
P1V-S060AM048	9121720626
P1V-S060AM030	9121720626
P1V-S060AM010	9121720626
P1V-S120AM800	9121720627
P1V-S120AM270	9121720627
P1V-S120AM110	9121720627
P1V-S120AM078	9121720628
P1V-S120AM032	9121720628
P1V-S120AM012	9121720628

Service kit for brake module for brake motors

For motor	Order code
P1V-S020AD and P1V-S030AD	P1V-6/446096A

Comment: To perform a full service on a brake motor, you will need a normal service kit as well as a service kit for the brake module

Service kits for drilling, milling and grinding motors

The following kits are available for the motors, consisting of vanes, (springs), silencers, O-rings, seals and 50 g of grease: (USDA-H1 approved):

A

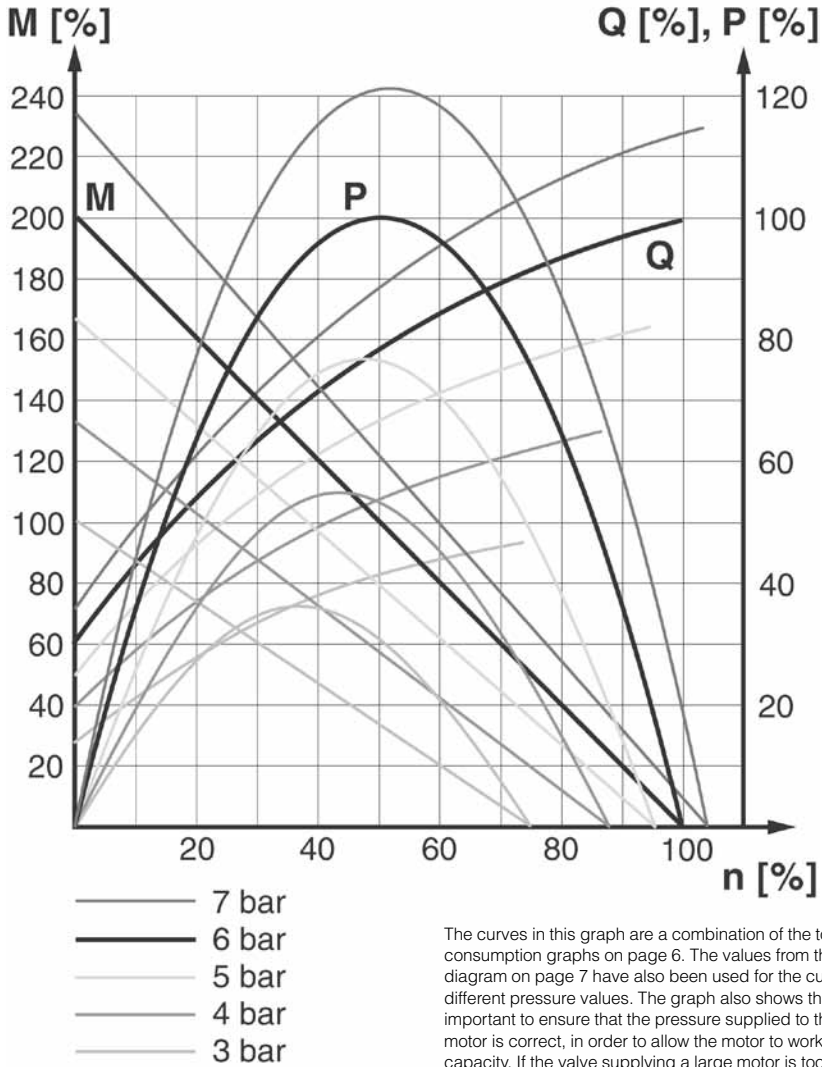


Service kit

For drilling motor	Order code
P1V-S008N	P1V-6/446085A
P1V-S017N/M	P1V-6/446086A
P1V-S025N/M	P1V-6/446087A
P1V-S040M	P1V-6/446088A
For milling motor	Order code
P1V-S040N	P1V-6/446088A
For grinding motor	Order code
P1V-S020N	P1V-6/446090A

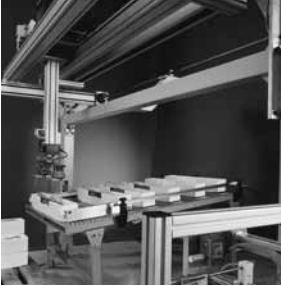
Torque, power and air consumption graphs

A



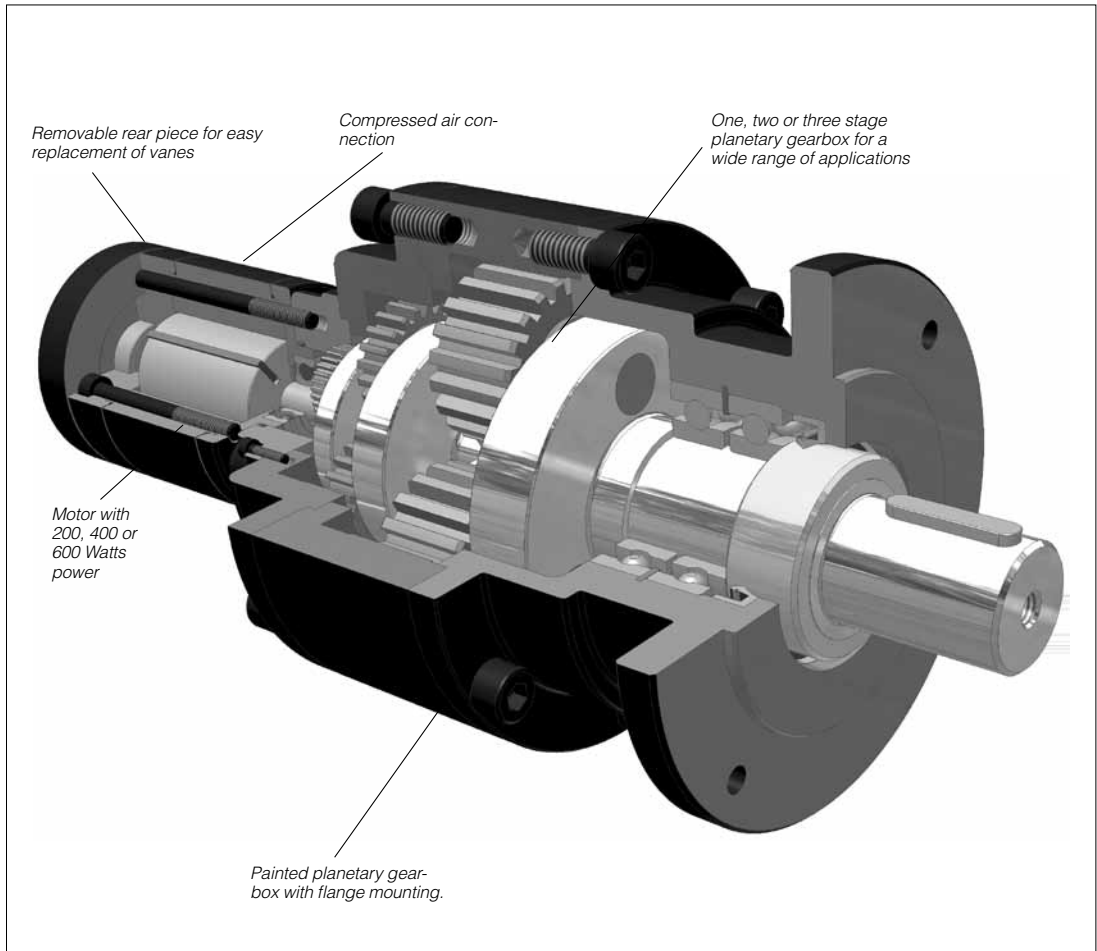
P = power	Q = air consumption
M = torque	n = speed

The curves in this graph are a combination of the torque, power and air consumption graphs on page 6. The values from the correction diagram on page 7 have also been used for the curves for the different pressure values. The graph also shows that it is very important to ensure that the pressure supplied to the inlet port of the motor is correct, in order to allow the motor to work at maximum capacity. If the valve supplying a large motor is too small, or if the supply line is underspecified, the pressure at the inlet port may be so low that the motor is unable to do its work. One solution would be to upgrade the valve and supply system, or alternatively you could replace the motor with a smaller motor with lower air consumption. The result would be increased pressure at the inlet port, which means that the smaller motor could carry out the necessary work. However, you may need to select a smaller motor with a lower free speed in order to obtain sufficient torque at the outgoing shaft.



Robust Air Motors

P1V-M Series



Robust Air Motors, Series P1V-M

P1V-M is a series of air motors, with planetary gearbox and motor made of black varnished steel. Its robustness makes it suitable for all normal air motor applications.

The range contains three different sizes with power ratings of 200, 400 or 600 Watts, shaft speeds ranging from 29 rpm to 10000 rpm, and torques up to 401 Nm at maximum power (more than 800 Nm torque if the motor is braked to stationary).

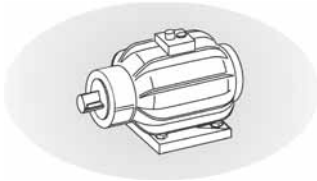
The standard range includes a total of 27 versions, covering all possible requirements for these power ratings.

The motor and gearbox are built to be extremely strong, making the motors suitable for applications requiring considerable robustness. The gearbox is of the planetary type, permanently lubricated with grease. The flange mounting is cast as an integral part of the case, and give, together with the foot bracket,

plenty of opportunity for simple and robust installation. To extract high torques at low speeds, the gearboxes have been made strong enough to withstand motor braking to stationary without being damaged.

A new design principle has made service activities quicker and easier than for any comparable motor. Servicing involves loosening the screws holding the rear piece to the motor, removing the worn vanes from the back and inserting the new vanes.

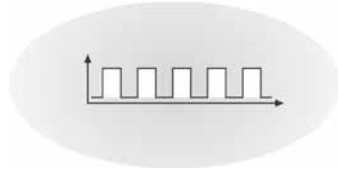
Unlike traditional air motors, there is no need to fully open the P1V-M for servicing, making the process much easier.



Air motors have much smaller installation dimensions than corresponding electric motors.



Air motors can be loaded until they stall, without damage. They are designed to be able to withstand the toughest heat, vibration, impact etc.



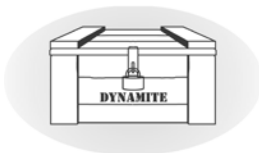
Air motors can be stopped and started continually without damage.



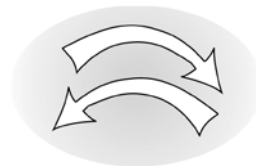
The simple design principle of air motors makes them very easy to service.



The weight of an air motor is several times less than corresponding electric motors.



Air motors can be used in the harshest environments.



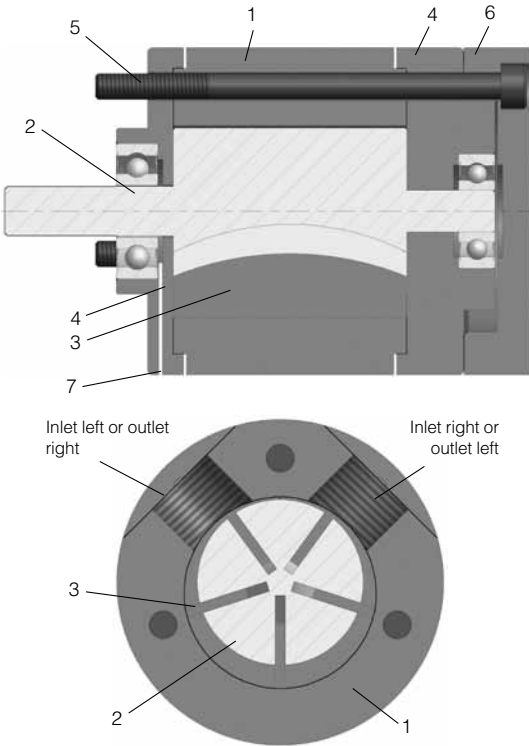
The motors are reversible as standard.



The reliability of air motors is very high, thanks to the design and the low number of moving parts.

B

Principles of air motor function



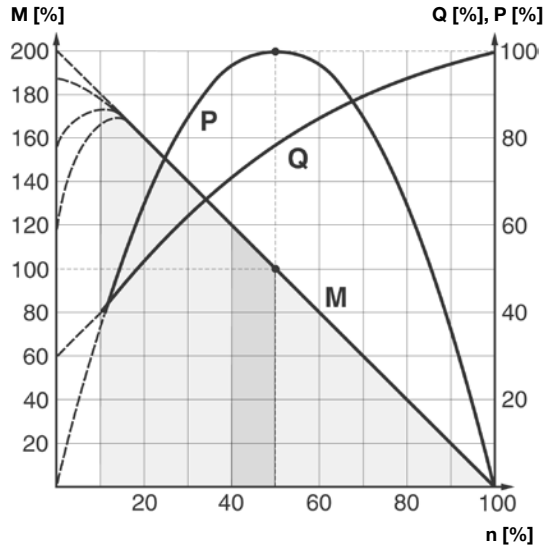
- 1 Rotor cylinder
- 2 Rotor
- 3 Vanes
- 4 End piece with bearing
- 5 Mounting screw for motor
- 6 Removable rear piece
- 7 Pressure unloading

There are a number of designs of air motor. Parker Pneumatic has chosen to use the vane rotor design, because of its simple design and reliable operation. The small external dimensions of vane motors make them suitable for all applications.

The principle of the vane motor is that a rotor with a number of vanes is enclosed in a rotor cylinder. The motor is supplied with compressed air through one connection and air escapes from the other connection. The air pressure always bears at right angles against a surface. This means that the torque of the motor is a result of the vane surfaces and the air pressure.

Torque, power and air consumption graphs

The performance characteristics of each motor are shown in



The curve is for 6 bar
P = power **Q = air consumption**
M = torque **n = speed**

- Possible working range of motor.
- Optimum working range of motor.
 Higher speeds = more vane wear
 Lower speeds with high torque = more gearbox wear

a family of curves as above, from which torque, power and air consumption can be read off as a function of speed. Power is zero when the motor is stationary and also when running at free speed (100%) with no load. Maximum power (100%) is normally developed when the motor is braked to approximately half the free speed (50%).

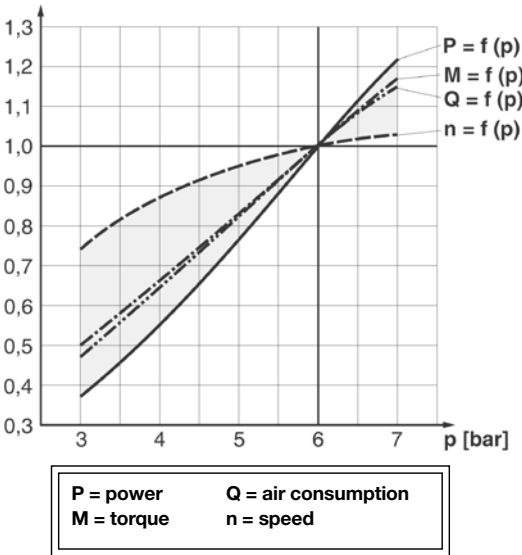
Torque at free speed is zero, but increases as soon as a load is applied, rising linearly until the motor stalls. As the motor can stop with the vanes in various positions, it is not possible to specify an exact starting torque. However, a minimum starting torque is shown in all tables.

Air consumption is greatest at free speed, and decreases with decreasing speed, as shown in the above diagram.

Correction diagram

All catalogue data and curves are specified at a supply pressure of 6 bar to the motor.

Correction factor



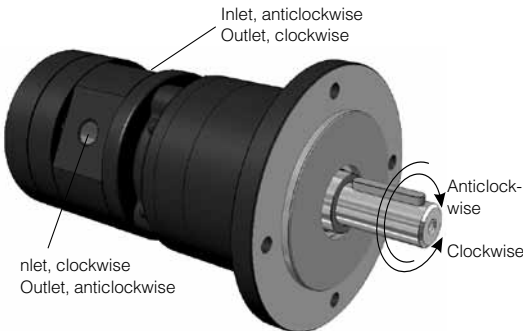
sure of 6 bar to the motor. This diagram shows the effect of pressure on speed, specified torque, power and air consumption.

Start off on the curve at the pressure used and then look up to the lines for power, torque, air consumption or speed. Read off the correction factor on the Y axis for each curve and multiply this by the specified catalogue data in the table, or data read from the torque and power graphs.

Example: at 4 bar supply pressure, the power is only 0.55 x power at 6 bar supply pressure.

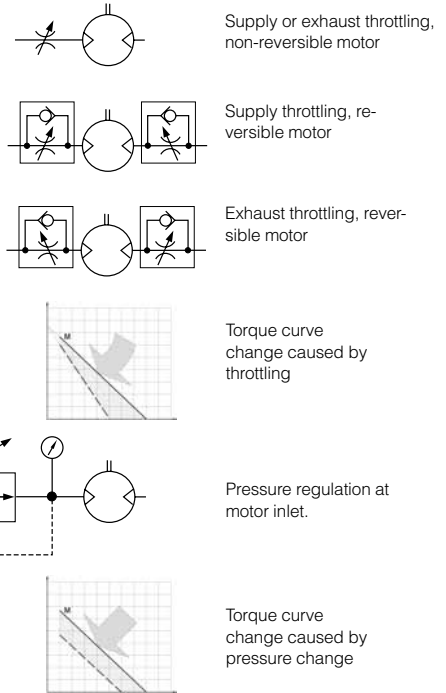
This example shows how strongly power falls if supply pressure is reduced. You must therefore ensure that the motor is supplied through pipes of sufficient diameter to avoid pressure drop.

Direction of motor rotation



The direction of rotation of reversible motors is controlled by supplying inlet L or inlet R with compressed air. The motor can be stopped and started continually without damage occurring.

Speed regulation



Throttling

The most common way to reduce the speed of a motor is to install a flow control valve in the air inlet. When the motor is used in applications where it must reverse and it is necessary to restrict the speed in both directions, flow control valves with by-pass should be used in both directions.

Inlet throttling

If the inlet air is restricted, the air supply is restricted and the free speed of the motor falls, but there is full pressure on the vanes at low speeds. This means that we get full torque from the motor at low speeds despite the low air flow.

Since the torque curve becomes "steeper", this also means that we get a lower torque at any given speed than would be developed at full air flow.

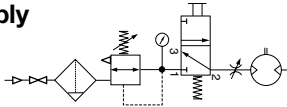
Pressure regulation

The speed and torque can also be regulated by installing a pressure regulator in the inlet pipe. This means that the motor is constantly supplied with air at lower pressure, which means that when the motor is braked, it develops a lower torque on the output shaft.

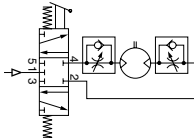
In brief: *Inlet throttling* gives reduced speed in one direction but maintains torque when braked. *The torque curve becomes steeper.* *Pressure regulation* in the inlet cuts torque when the motor is braked, and also reduces speed. *The torque curve is moved parallel.*

The direction of rotation of reversible motors is obtained by supplying inlet L or inlet R with compressed air. The motor can be stopped and started continually without damage occurring.

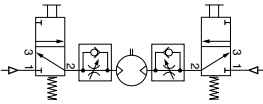
Air supply



Shut-off, filtering, pressure regulation and control valve



Reversible motor with 5/3 control valve



Reversible motor with two 3/2 control valves

The air supplying the motor must be filtered and regulated. Directional valves are needed to provide it with air, to get the motor to rotate when we want it to. These valves can be equipped with several means of actuation, such as electric, manual or pneumatic control. When the motor is used in a nonreversible application, it is sufficient to use a 2/2 or 3/2 valve for supply. Either one 5/3 or two 3/2 valves are needed for a reversible motor, to ensure that the motor receives compressed air and the residual air outlet is vented. A flow control valve can be installed in the supply pipe to regulate the motor speed if the motor is not used as a reversible motor. One flow control valve with by-pass is needed to regulate each direction of rotation if the motor is used as a reversible motor. The built-in check valve will then allow air from the residual air outlet to escape through the outlet port in the control valve.

The compressed air supply must have sufficiently large pipes and valves to give the motor maximum power. The motor needs 6 bar at the supply port all the time. A reduction of pressure to 5 bar reduces the power developed to 77%, and to 55% at 4 bar.

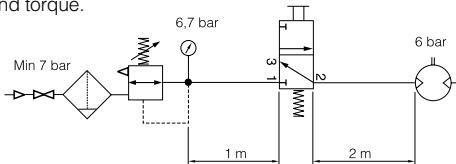
Choice of components for air supply

Since the supply pressure at the air motor inlet port is of considerable importance for obtaining the power, speed and torque quoted in the catalogue, the recommendations below should be observed.

The following data must be complied with:

- Supply pressure to air treatment unit: Min 7.5 bar
- Manometer pressure: 6.7 bar
- Pipe length between air treatment unit and valve: max. 1 m
- Pipe length between valve and air motor: max. 2 m
- The pressure drop through air treatment unit - pipe - valve - pipe means that 6 bar pressure is obtained at the motor supply port.

Please refer to the correction diagram on page 7, which shows the effect of lower supply pressure in terms of power, speed and torque.



The table can be used as follows:

If you are using only one motor with each air treatment unit and valve, simply follow the table. If you are using more than one motor with the same air treatment unit: read the table values for selecting the air treatment unit and add them together, and select a suitable air treatment unit from the table showing air flows per treatment unit. Then read the values for selecting the valve from the bottom of the table, and select a suitable valve from the table showing air flows per valve family.

The air treatment units have the following flows in NI/Min at 7.5 bar supply pressure and 0.8 bar pressure drop

FRL series	Air flow in NI/Min
P3H, Moduflex FRL, 40 Series, G1/4	550
P3K, Moduflex FRL, 60 Series, G1/2	1310
P3M, Moduflex FRL, 80 Series, G1	2770
Standard series FRL, G11/2	9200
Stainless series FRL PF, G1/4	530
Stainless series FRL PF, G1/2	1480

Valve series with respective flows in NI/minute

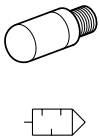
Valve series	Qn in NI/Min
Valvetronic Solstar	33
Interface PS1	100
Adex A05	173
Moduflex size 1, (2 x 3/2)	220
Valvetronic PVL-B 5/3 closed centre, 6 mm push in	290
Moduflex size 1, (4/2)	320
B43 Manual and mechanical	340
Valvetronic PVL-B 2 x 2/3, 6 mm push in	350
Valvetronic PVL-B 5/3 closed centre, G1/8	370
Compact Isomax DX02	385
Valvetronic PVL-B 2 x 3/2 G1/8	440
Valvetronic PVL-B 5/2, 6 mm push in	450
Valvetronic PVL-B 5/3 vented centre, 6 mm push in	450
Moduflex size 2, (2 x 3/2)	450
Flowstar P2V-A	520
Valvetronic PVL-B 5/3 vented centre, G1/8	540
Valvetronic PVL-B 5/2, G1/8	540
Valvetronic PVL-C 2 x 3/2, 8 mm push in	540
Adex A12	560
Valvetronic PVL-C 2 x 3/2 G1/8	570
Compact Isomax DX01	585
VIKING Xtreme P2LAX	660
Valvetronic PVL-C 5/3 closed centre, 8 mm push in	700
Valvetronic PVL-C 5/3 vented centre, G1/4	700
B3-Series	780
Valvetronic PVL-C 5/3 closed centre, G1/4	780
Moduflex size 2, (4/2)	800
Valvetronic PVL-C 5/2, 8 mm push in	840
Valvetronic PVL-C 5/3 vented centre, 8 mm push in	840
Valvetronic PVL-C 5/2, G1/4	840
Flowstar P2V-B	1090
ISOMAX DX1	1150
B53 Manual and mechanical	1160
B4-Series	1170
VIKING Xtreme P2LXB	1290
B5-Series, G1/4	1440
Airline Isolator Valve VE22/23	1470
ISOMAX DX2	2330
VIKING Xtreme P2LCX, G3/8	2460
VIKING Xtreme P2LDX, G1/2	2660
ISOMAX DX3	4050
Airline Isolator Valve VE42/43	5520
Airline Isolator Valve VE82/83	13680

Choice of components for air supply

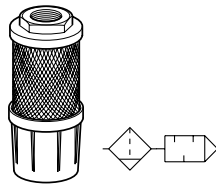
Motor	P1V-M020	P1V-M040	P1V-M060			
Air flow required, NI/s	6,5	9,5	15,0			
Air flow required, NI/min	390	570	900			
Min. internal diameter of pipe, mm	10	12	12			
Choice of air treatment unit: recommended min. air flow in litres/minute at 7.5 bar air supply and 0.8 bar pressure drop						
	430					
		630				
			990			
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).						
	470					
		690				
			1080			

Silencing

Exhaust silencer



Central silencer



The noise from an air motor consists of both mechanical noise and a pulsating noise from the air flowing out of the outlet. The installation of the motor has a considerable effect on mechanical noise. It should be installed so that no mechanical resonance effects can occur. The outlet air creates a noise level which can amount to 115 dB(A) if the air is allowed to exhaust freely into the atmosphere. Various types of exhaust silencers are used to reduce this level. The most common type screws directly onto the exhaust port of the motor, and a wide range of versions is available made of sintered brass or sintered plastic. Since the motor function causes the exhaust air to pulsate, it is a good idea to allow the air to exhaust into some kind of chamber first, which reduces the pulsations before they reach the silencer. The best silencing method is to connect a soft hose to a central silencer with the largest possible area, to reduce the speed of the out-flowing air as far as possible.

NOTE! Remember that if a silencer is too small or is blocked, back pressure is generated on the outlet side of the motor, which in turn reduces the motor power.

Sound levels

Sound levels are measured at free speed with the measuring instrument positioned 1 m away from the air motor, see the table below

Air motor	Free exhaust dB (A)	With exhaust silencer dB (A)	Exhaust air removed with pipes to another room dB (A)
P1V-M020	107	97	74
P1V-M040	107	98	80
P1V-M060	107	99	82

CE marking

The air motors are supplied as "Components for installation" – the installer is responsible for ensuring that the motors are installed safely in the overall system. Parker Pneumatic guarantees that its products are safe, and as a supplier of pneumatic equipment we ensure that the equipment is designed and manufactured in accordance with the applicable EU directive.

Most of our products are classed as components as defined by various directives, and although we guarantee that the components satisfy the fundamental safety requirements of the directives to the extent that they are our responsibility, they do not usually carry the CE mark. Nevertheless, most P1V-S motors carry the CE mark because they are ATEX certified (for use in explosive atmospheres).

The following are the currently applicable directives:

- Machinery Directive (essential health and safety requirements relating to the design and structure of machines and safety components)
- EMC Directive
- Simple Pressure Vessels Directive
- Low Voltage Directive
- ATEX Directive (ATEX = ATmosphere EXplosive)

Compressed air quality

The P1V-M motor is equipped with vanes for intermittent lubrication free operation as standard, which is the most common application of air motors.

Working pressure	Max 7 bar
Working temperature	-30 °C to +100 °C
Medium	40 µm filtered, oil mist or dry unlubricated compressed air

Dry unlubricated compressed air



If unlubricated compressed air is used, the compressed air should comply with the purity standards below in order to guarantee the longest possible overall service life. If the unlubricated compressed air has a high water content, condensation forms inside the motor, causing corrosion in all internal components. A ballbearing can be destroyed in a remarkably short time if it comes into contact with a single water droplet.

For indoor use, we recommend ISO8573-1 purity class 3.4.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, refrigerant air dryers and air filters.

For indoor/outdoor use, we recommend ISO8573-1 purity class 1.2.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, adsorption dryers and dust filters.

Oil mist



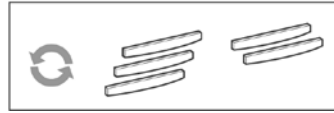
If oil mist is used (approx. 1 drop of oil per m³ of compressed air), the oil not only acts as a lubricant but also protects against corrosion. This means that compressed air with a certain water content may be used without causing corrosion problems inside the motor. ISO8573-1 purity class 3.-5 may be used without difficulty.

ISO 8573-1 purity classes

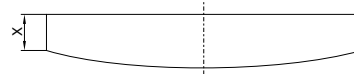
Quality class	Contaminants		Water max. pressure dew point (°C)	Oil max. concentration (mg/m³)
	particle size (µm)	max. concentration (mg/m³)		
1	0,1	0,1	-70	0,01
2	1	1	-40	0,1
3	5	5	-20	1,0
4	15	8	+3	5,0
5	40	10	+7	25
6	-	-	+10	-

For example: compressed air to purity class 3.4.3 This means a 5 µm filter (standard filter), dew point +3 °C (refrigerant cooled) and an oil concentration of 1,0 mg oil/m³ (as supplied by a standard compressor with a standard filter).

Service interval



The first service is due after approximately 500 hours of operation. After the first service, the service interval is determined by the degree of vane wear*. The table below shows new dimensions and the minimum dimensions of worn vanes.



Air motor	Dimensions on new vanes X [mm]	Minimum dimensions on vane X [mm]
P1V-M020	8,5	6,5
P1V-M040	7,0	5,0
P1V-M060	8,0	6,0

The following normal service intervals should be applied to in order to guarantee problem-free operation in air motors working continuously at load speeds*.


Intermittent lubrication-free operation of motors with standard vanes

Duty cycle :	70%
Max. duration of intermittent use :	15 minutes
Filtration 40 µm :	750 hours of operation*
Filtration 5 µm :	1 000 hours of operation*

Continuous operation of motors with standard vanes, with lubrication

Duty cycle :	Continuous
Quantity of oil :	1 drop per m³ of air
Filtration 40 µm :	1 000 hours of operation*
Filtration 5 µm :	2 000 hours of operation*

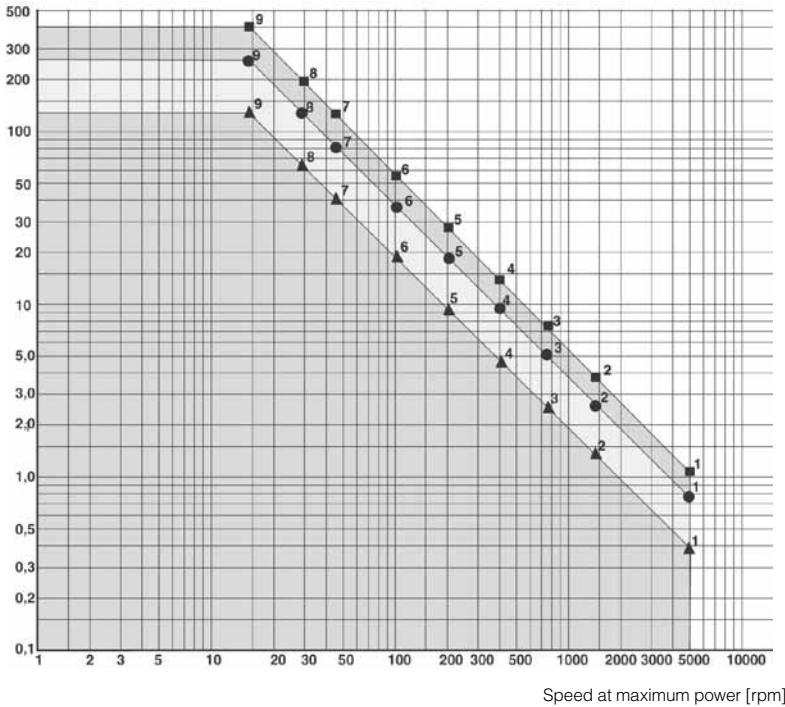
NOTE! The grease in the planetary gearbox must be checked once in a year and be changed if necessary. (Molycote BR2+)



* The specified hours of operation apply when the motor is running at the speed corresponding to maximum power (load speed). This is approximately half free speed. If the motor operates at higher speeds, the service interval is shorter. If the motor operates at lower speeds, the service interval is longer.

Choice of air motor

Torque at maximum power [Nm]



The motor to be used should be selected by starting with the torque needed at a specific shaft speed. In other words, to choose the right motor, you have to know the required speed and torque. Since maximum power is reached at half the motor's free speed, the motor should be chosen so that the operating point is as close as possible to the maximum power of the motor.

The design principle of the motor means that higher torque is generated when it is braked, which tends to increase the speed, etc. This means that the motor has a kind of speed self-regulation function built in.

Use the above graph to choose the correct motor size. The graph contains the points for the maximum torque of each motor at maximum output. Add your operating point to the graph, then select a marked point above and to the right of your point.

Then use the correct working diagram of the chosen motor to get more detailed technical data. Always select a motor whose requisite technical data are in the shaded area. Also use the correction diagram to find out what operation with different supply pressures would mean for the motor.

Tip: Select a motor which is slightly too fast and powerful, then regulate its speed and torque with a pressure regulator and/or throttle to achieve the optimum working point.

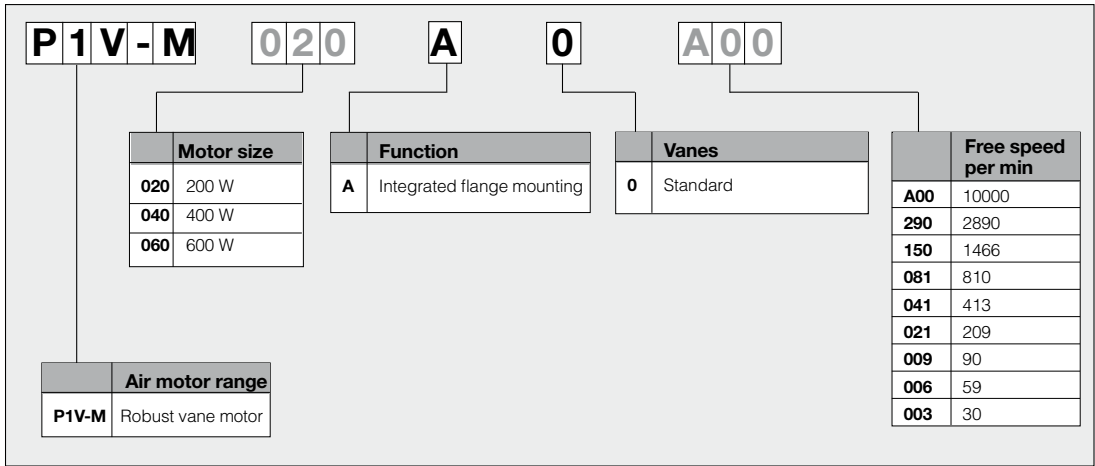
Air motors in diagram above

- ▲ 1 P1V-M020A0A00
- ▲ 2 P1V-M020A0A290
- ▲ 3 P1V-M020A0A150
- ▲ 4 P1V-M020A0A081
- ▲ 5 P1V-M020A0A041
- ▲ 6 P1V-M020A0A021
- ▲ 7 P1V-M020A0A009
- ▲ 8 P1V-M020A0A006
- ▲ 9 P1V-M020A0A003

- 1 P1V-M040A0A00
- 2 P1V-M040A0A290
- 3 P1V-M040A0A150
- 4 P1V-M040A0A081
- 5 P1V-M040A0A041
- 6 P1V-M040A0A021
- 7 P1V-M040A0A009
- 8 P1V-M040A0A006
- 9 P1V-M040A0A003

- 1 P1V-M060A0A00
- 2 P1V-M060A0A290
- 3 P1V-M060A0A150
- 4 P1V-M060A0A081
- 5 P1V-M060A0A041
- 6 P1V-M060A0A021
- 7 P1V-M060A0A009
- 8 P1V-M060A0A006
- 9 P1V-M060A0A003

Order key



Technical data

Working pressure Max 7 bar
 Working temperature -30 °C to +100 °C
 Medium Filtered dry air and oil mist, purity class ISO 8573-1 class 3.-.5 for indoor use and with a dew point lower than ambient temperature for outdoor use.

Material specification

Planetary gearbox Painted cast iron/Aluminium
 Motor housing Painted steel
 Shaft Hardened steel
 Key Hardened steel
 External seal Fluor rubber, FPM
 Internal steel parts High grade steel
 Gearbox lubrication Grease

Table and diagram data

All values are typical values, with a tolerance of ±10%

P1V-M motors are of the vane type for intermittent lubrication-free operation. They can operate 70% of the time for up to 15 minutes without lubrication. With lubrication, these motors can operation 100% of the time.

Permitted shaft loadings

Basic motors

Max. permitted load on output shaft for basic motors (based on 10,000 rpm at input shaft with 90 % probable service life for ball bearings).

Shaft with key slot

Order code	Fax	Frad	a	Bearing service life [hours]
	[N]	[N]	[mm]	
Motor P1V-M0●●●●A00				
Motor P1V-M0●●●●290				
Motor P1V-M0●●●●150				
High speed	93	140	15	20000
	93	120	15	30000
	93	110	15	40000
Low speed	93	160	15	20000
	93	150	15	30000
	93	140	15	40000
Motor P1V-M0●●●●081				
Motor P1V-M0●●●●041				
Motor P1V-M0●●●●021				
High speed	150	200	15	20000
	150	175	15	30000
	150	170	15	40000
Low speed	260	345	15	20000
	260	290	15	30000
	260	275	15	40000
Motor P1V-M0●●●●009				
Motor P1V-M0●●●●006				
Motor P1V-M0●●●●003				
High speed	450	625	15	20000
	450	550	15	30000
	450	500	15	40000
Low speed	850	1000	15	20000
	850	1100	15	30000
	850	1250	15	40000

F_{rad} = Radial loading (N)

F_{ax} = Axial loading (N)

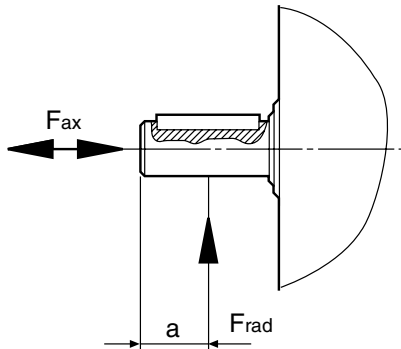
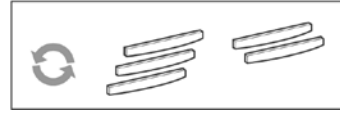


Fig 1: Load on output shaft for basic motor with shaft with key slot.

Service kits for P1V-M motors

The following kits are available for the basic motors, consisting of vanes and O-ring:



Service kit

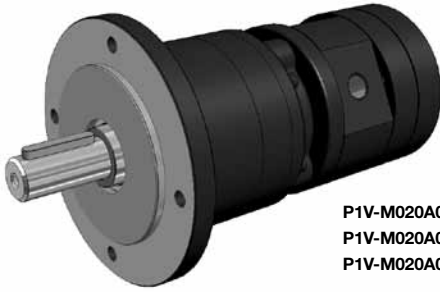
For motor	Order code
P1V-M020	P1V-6/831297A
P1V-M040	P1V-6/831298A
P1V-M060	P1V-6/831299A

Spare parts

New basic motors	Order code
P1V-M020	P1V-M020M
P1V-M040	P1V-M040M
P1V-M060	P1V-M060M

New gearboxes with flange	Order code
A0A00	P1V-MGA00
A0290	P1V-MG290
A0150	P1V-MG150
A0081	P1V-MG081
A0041	P1V-MG041
A0021	P1V-MG021
A0009	P1V-MG009
A0006	P1V-MG006
A0003	P1V-MG003

NOTE! All technical data is based on a working pressure of 6 bar.



P1V-M020A0A00
P1V-M020A0290
P1V-M020A0150



P1V-M020A0081
P1V-M020A0041
P1V-M020A0021



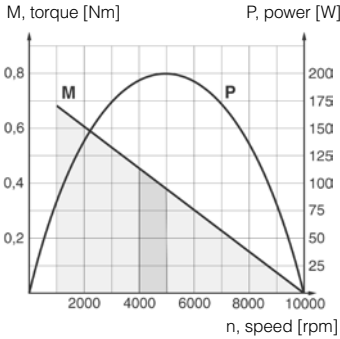
P1V-M020A0009
P1V-M020A0006
P1V-M020A0003

Data for P1V-M020A, 200 watt motor with flange

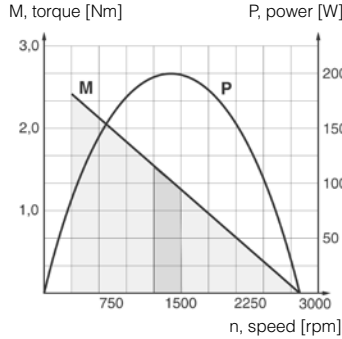


Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	r/Min	r/Min	Nm	Nm	l/s		mm	Kg	
0,200	10 000	5 000	0,38	0,57	6,5	G1/8	10	1,94	P1V-M020A0A00
0,200	2 890	1 445	1,31	1,97	6,5	G1/8	10	1,94	P1V-M020A0290
0,200	1 466	733	2,59	3,89	6,5	G1/8	10	1,94	P1V-M020A0150
0,200	810	405	4,69	7,04	6,5	G1/8	10	2,94	P1V-M020A0081
0,200	413	206	9,20	13,81	6,5	G1/8	10	2,94	P1V-M020A0041
0,200	209	105	18,14	27,21	6,5	G1/8	10	2,94	P1V-M020A0021
0,200	90	45	42,34	63,50	6,5	G1/8	10	7,44	P1V-M020A0009
0,200	59	29	64,76	97,15	6,5	G1/8	10	7,44	P1V-M020A0006
0,200	30	15	126,99	190,48	6,5	G1/8	10	7,44	P1V-M020A0003

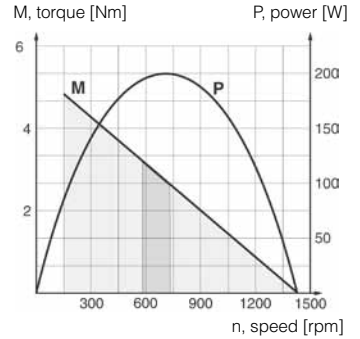
P1V-M020A0A00



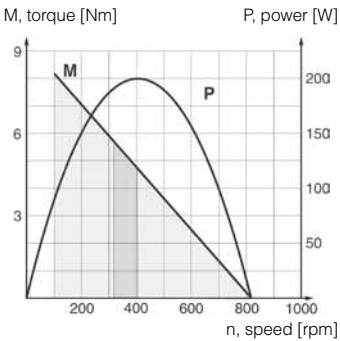
P1V-M020A0290



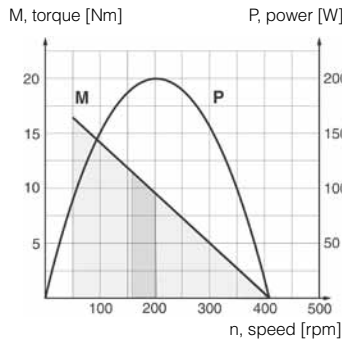
P1V-M020A0150



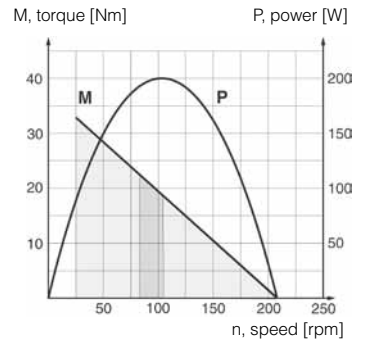
P1V-M020A0081



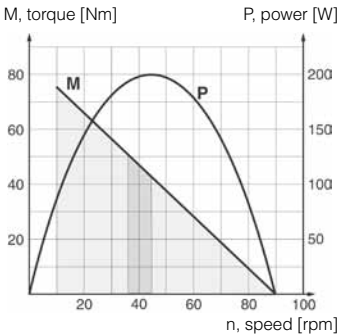
P1V-M020A0041



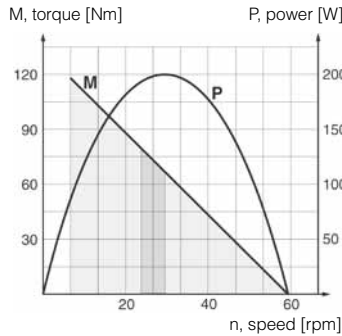
P1V-M020A0021



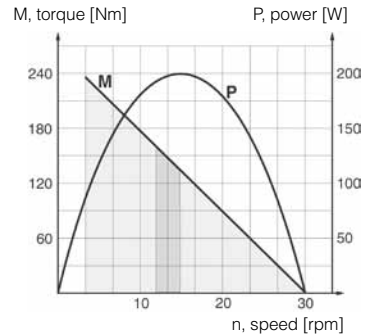
P1V-M020A0009



P1V-M020A0006



P1V-M020A0003



Possible working range of motor.

Optimum working range of motor.

Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

B

NOTE! All technical data is based on a working pressure of 6 bar.



P1V-M040A000
P1V-M040A0290
P1V-M040A0150



P1V-M040A0081
P1V-M040A0041
P1V-M040A0021



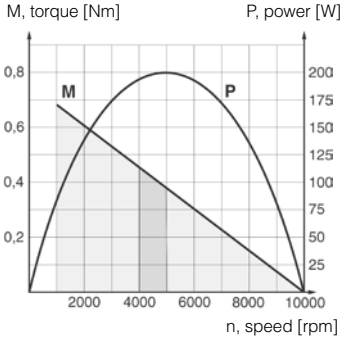
P1V-M040A0009
P1V-M040A0006
P1V-M040A0003

Data for P1V-M040A, 400 watt motor with flange

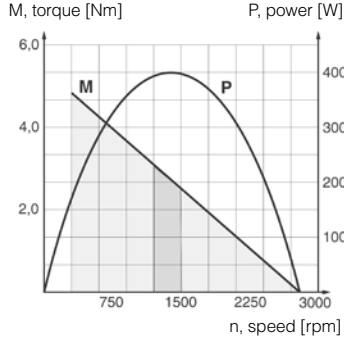


Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	r/Min	r/Min	Nm	Nm	l/s		mm	Kg	
0,400	10 000	5 000	0,76	1,15	9,5	G3/8	12	2,32	P1V-M040A0A00
0,400	2 890	1 445	2,63	3,98	9,5	G3/8	12	2,32	P1V-M040A0290
0,400	1 466	733	5,18	7,84	9,5	G3/8	12	2,32	P1V-M040A0150
0,400	810	405	9,39	14,20	9,5	G3/8	12	4,32	P1V-M040A0081
0,400	413	206	18,41	27,85	9,5	G3/8	12	4,32	P1V-M040A0041
0,400	209	105	36,28	54,90	9,5	G3/8	12	4,32	P1V-M040A0021
0,400	90	45	84,67	128,12	9,5	G3/8	12	7,82	P1V-M040A0009
0,400	59	29	129,53	195,99	9,5	G3/8	12	7,82	P1V-M040A0006
0,400	30	15	253,98	384,31	9,5	G3/8	12	7,82	P1V-M040A0003

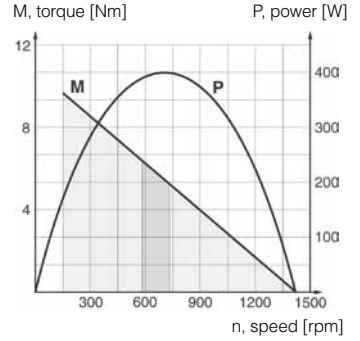
P1V-M040A0A00



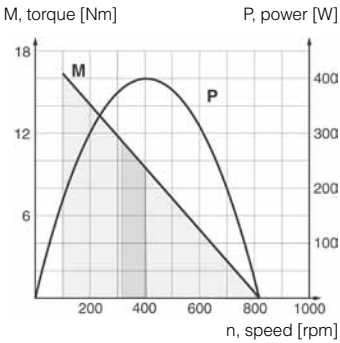
P1V-M040A0290



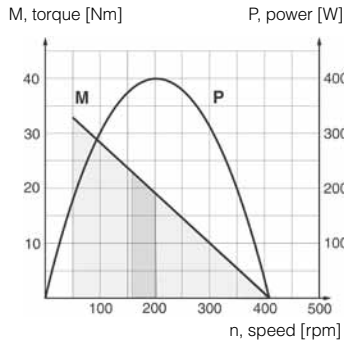
P1V-M040A0150



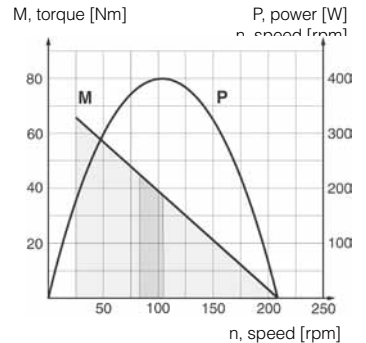
P1V-M040A0081



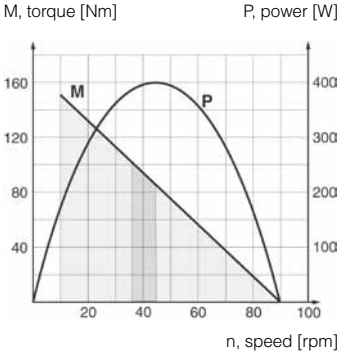
P1V-M040A0041



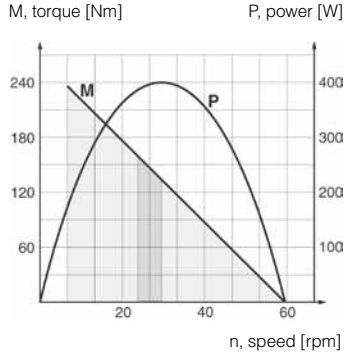
P1V-M040A0021



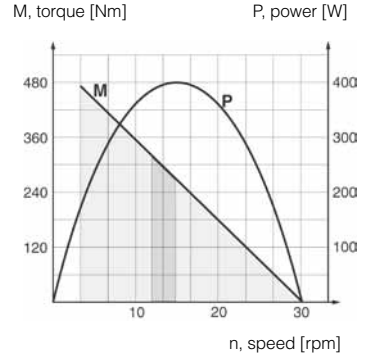
P1V-M040A0009




P1V-M040A0006



P1V-M040A0003

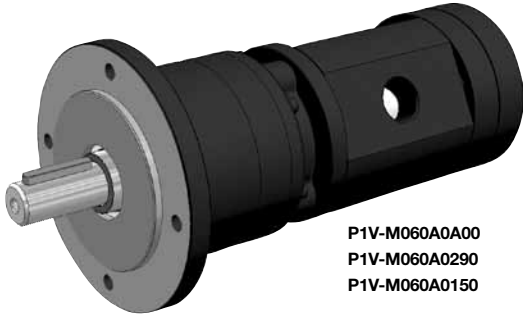


 Possible working range of motor.

 Optimum working range of motor.

Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

NOTE! All technical data is based on a working pressure of 6 bar.



P1V-M060A0A00
P1V-M060A0290
P1V-M060A0150



P1V-M060A0081
P1V-M060A0041
P1V-M060A0021



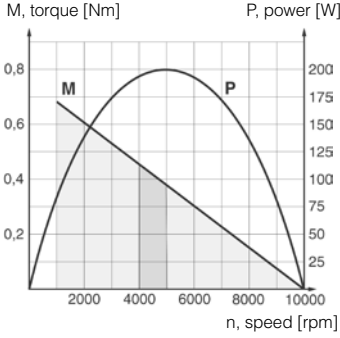
P1V-M060A0009
P1V-M060A0006
P1V-M060A0003

Data for P1V-M060A, 600 watt motor with flange

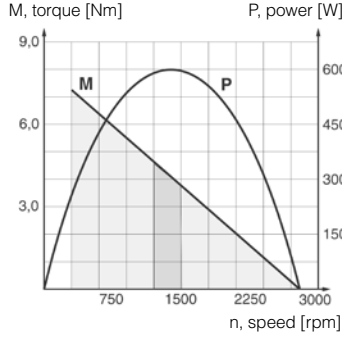


Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	r/Min	r/Min	Nm	Nm	l/s		mm	Kg	
0,600	10 000	5 000	1,14	1,71	15,0	G3/8	12	5,59	P1V-M060A0A00
0,600	2 890	1 445	3,94	5,92	15,0	G3/8	12	5,59	P1V-M060A0290
0,600	1 466	733	7,77	11,66	15,0	G3/8	12	5,59	P1V-M060A0150
0,600	810	405	14,08	21,12	15,0	G3/8	12	6,59	P1V-M060A0081
0,600	413	206	27,61	41,42	15,0	G3/8	12	6,59	P1V-M060A0041
0,600	209	105	54,42	81,64	15,0	G3/8	12	6,59	P1V-M060A0021
0,600	90	45	127,01	190,51	15,0	G3/8	12	11,09	P1V-M060A0009
0,600	59	29	194,29	291,44	15,0	G3/8	12	11,09	P1V-M060A0006
0,600	30	15	380,97	571,45	15,0	G3/8	12	11,09	P1V-M060A0003

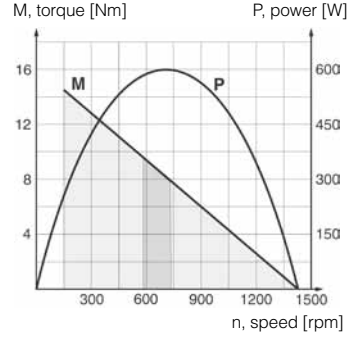
P1V-M060A0A00



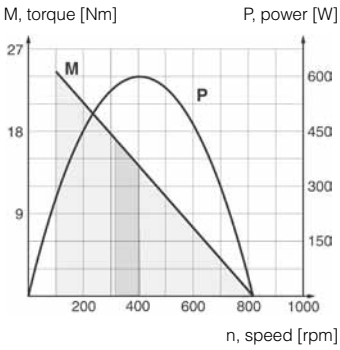
P1V-M060A0290



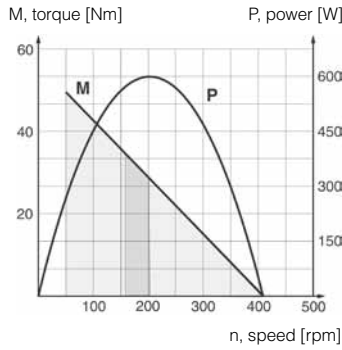
P1V-M060A0150



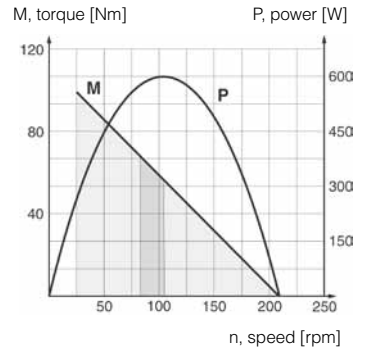
P1V-M060A0081



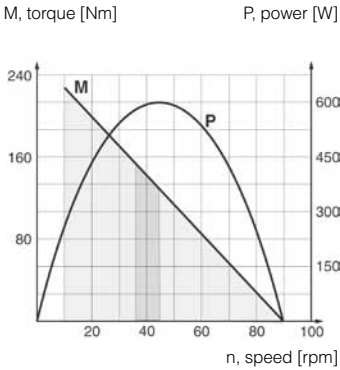
P1V-M060A0041



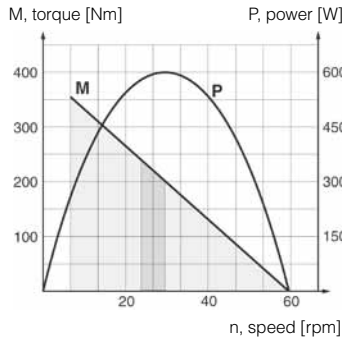
P1V-M060A0021



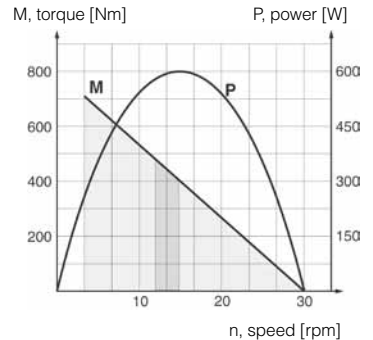
P1V-M060A0009



P1V-M060A0006



P1V-M060A0003



Possible working range of motor.

Optimum working range of motor.

Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

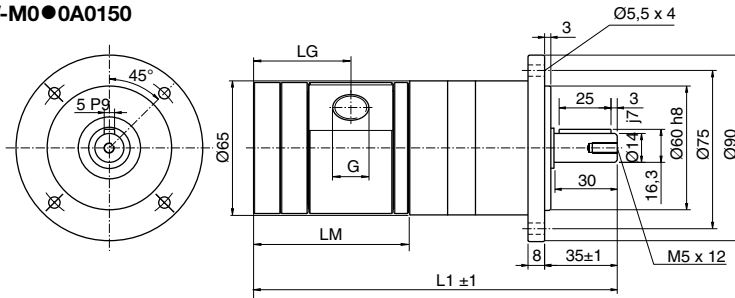
Dimensions

Motor P1V-M0●0A0A00

Motor P1V-M0●0A0290

Motor P1V-M0●0A0150

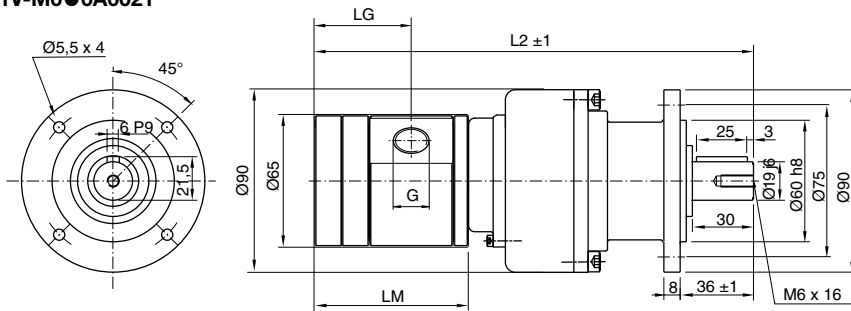
B



Motor P1V-M0●0A0081

Motor P1V-M0●0A0041

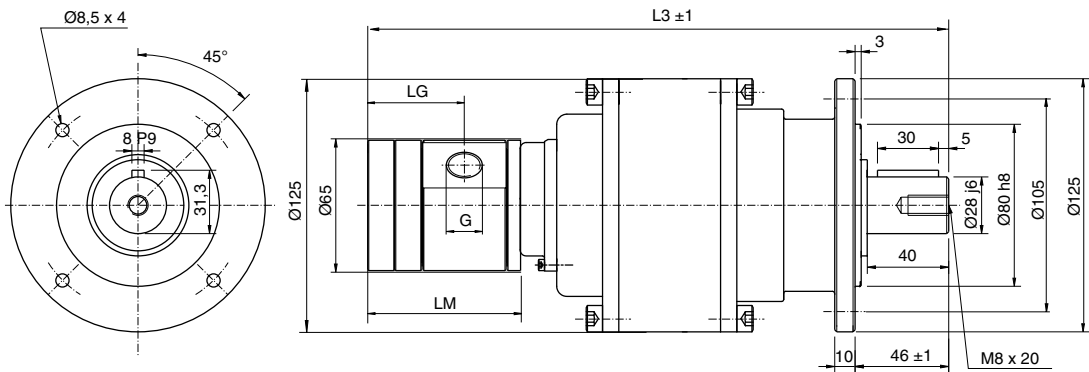
Motor P1V-M0●0A0021



Motor P1V-M0●0A0009

Motor P1V-M0●0A0006

Motor P1V-M0●0A0003



Motor type	G	LG	LM	L1	L2	L3
P1V-M020A	G1/8	39,0	57,5	160,5	197,5	267,5
P1V-M040A	G3/8	49,0	77,5	180,5	217,5	287,5
P1V-M060A	G3/8	56,5	92,0	195,0	232,0	302,0

Foot brackets for P1V-M

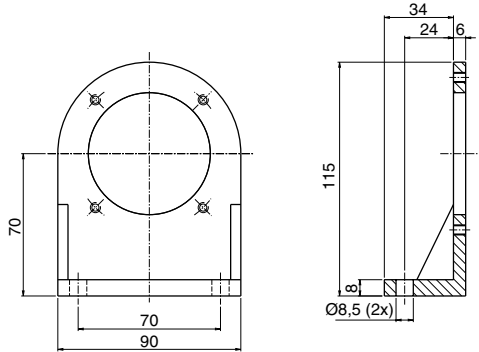
Type	For air motor	Weight	Order code Kg
Foot bracket	P1V-M0•0A0A00	0,63	P1V-MF1
	P1V-M0•0A0290		
	P1V-M0•0A0150		
	P1V-M0•0A0081		
	P1V-M0•0A0041		
	P1V-M0•0A0021	1,70	P1V-MF2
	P1V-M0•0A0009		
	P1V-M0•0A0006		
	P1V-M0•0A0003		



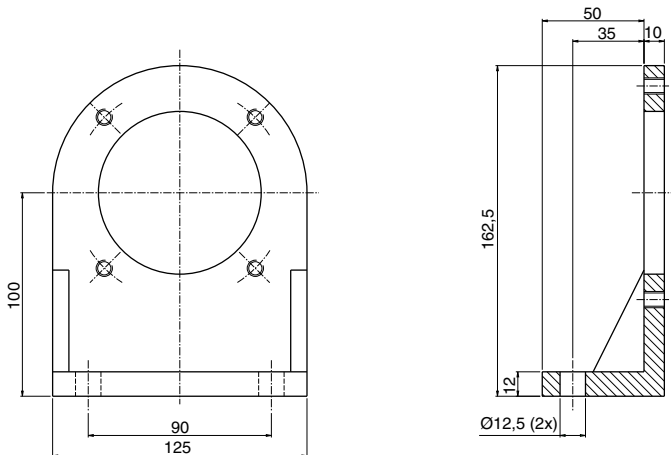
All brackets supplied with fastening screws for the motor.

Dimensions

P1V-MF1



P1V-MF2



Theoretical calculations

This section provides you with the background you need in order to select the right air motor for common applications. The first four parts explain the direct physical relationships between:

Force - Torque - Speed - Power Requirement

Before selecting an air motor, you need to know the torque required by the application at the necessary speed. Sometimes, the torque and the speed are not known but the power requirement and the speed of movement are. You can use the following formulas to calculate the speed and torque.

Power

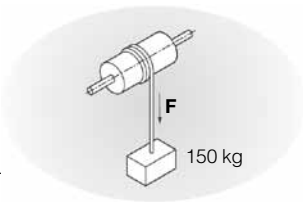
The power requirement is always calculated in N.

Formula:
 $F = m \times g$

F = power in N
 m = mass in kg
 g = gravitation (9,81) in r

In this example, the mass is 150 kg

$F = 150 \times 9,81$ N
 $F = 1470$ N



Torque

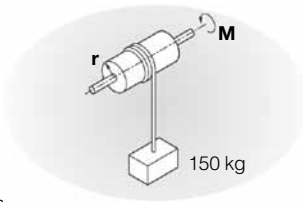
Torque is the force applied to produce rotational motion (rotational force) or the force applied in the opposite direction. It is the product of the rotational force F and the distance from the pivot point (radius or moment arm)

Formula:
 $M = m \times g \times r$

M = torque in Nm
 m = mass in kg
 g = gravitation (9,81) in n/s-
 r = radius or moment arm in m

In this example, the drum diameter is 300 mm, which means the radius $r = 0,15$ m, and the mass is 150kg.

$M = 150 \times 9,81 \times 0,15$ Nm
 $M = 221$ Nm



Speed

The required motor speed can be calculated if the speed of movement and the radius (diameter) are known.

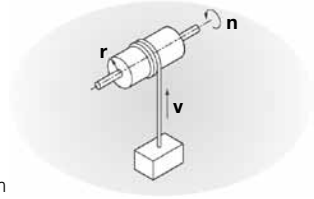
$$n = v \times 60 / (2 \times \pi \times r)$$

n = motor speed in rpm
 v = speed of movement in m/sec
 r = radius in m
 π = constant (3,14)

In this example, the speed of movement is 1,5 m/s and the drum diameter is 300 m (radius $r = 0,15$ m)

$$n = 1,5 \times 60 / (2 \times \pi \times 0,15) \text{ rpm}$$

$$n = 96 \text{ rpm}$$



Power Requirement

The power requirement can be calculated if the motor speed and torque are known.

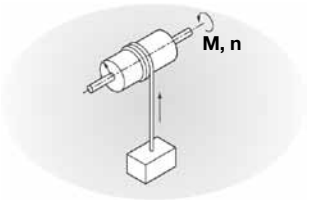
$$P = M \times n / 9550$$

P = power in kW
 M = torque in Nm
 n = rpm
 9550 = conversion factor

In this example, a torque of 1,25 Nm is required at a speed of 1500 rpm.

$$P = 1,25 \times 1500 / 9550$$

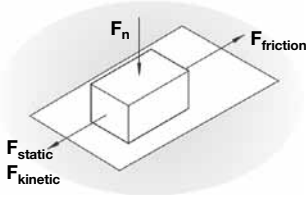
$$P = 0,196 \text{ kW or approx. } 200 \text{ Watt}$$



Frictional Forces between two Objects

A frictional force always occurs between two objects with surfaces in contact with each other. It is always exerted against the direction of movement.

The frictional force is either static or kinetic. When selecting an air motor, we need to consider the larger of the two forces, static or kinetic.



The size of the static frictional force or the kinetic frictional force is the product of the normal force F_n and the coefficient of static friction (μ_0), or the product of the normal force F_n and the coefficient of kinetic friction (μ).

The size of the contact surface between the objects is irrelevant.

Formula:

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

$$F_n = m \times g$$

F_{static} = static friction in N

F_{kinetic} = kinetic friction in N

F_n = force from object in N

m = mass in kg

g = gravitation (9,81) in m/s²

Material		Coefficient of static friction μ_0	
		Dry	Lubricated
Bronze	Bronze	0,28	0,11
Bronze	Grey iron	0,28	0,16
Grey iron	Grey iron	-	0,16
Steel	Bronze	0,27	0,11
Steel	Ice	0,027	-
Steel	Grey iron	0,20	0,10
Steel	Steel	0,15	0,10
Steel	White metal	-	-
Wood	Ice	-	-
Wood	Wood	0,65	0,16
Leather	Grey iron	0,55	0,22
Brake lining	Steel	-	-
Steel	Nylon (polyamide)	-	-

Material		Coefficient of kinetic friction μ	
		Dry	Lubricated
Bronze	Bronze	0,2	0,06
Bronze	Grey iron	0,21	0,08
Grey iron	Grey iron	-	0,12
Steel	Bronze	0,18	0,07
Steel	Ice	0,014	-
Steel	Grey iron	0,16	0,05
Steel	Steel	0,10	0,05
Steel	White metal	0,20	0,04
Wood	Ice	0,035	-
Wood	Wood	0,35	0,05
Leather	Grey iron	0,28	0,12
Brake lining	Steel	0,55	0,40
Steel	Nylon (polyamide)	0,5	0,10

Example: A steel component with a weight of 500 kg is to be pulled across bronze plate without lubrication. What will the frictional force be when the component moves?

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

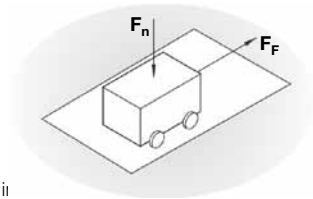
$$F_{\text{static}} = 500 \times 9,81 \times 0,27 = 1324 \text{ N}$$

$$F_{\text{kinetic}} = 500 \times 9,81 \times 0,18 = 883 \text{ N}$$

The static frictional force should always be compared with the force provided by the motor when it starts.

Kinetic Resistance

Kinetic resistance is a term expressing the total resistance, consisting of rolling resistance and the frictional force in the bearing



Formula:

$$F_F = \mu_F \times F_n$$

F_F = kinetic resistance in N

μ_F = coefficient of kinetic resistance

F_n = force from object in N

Coefficient of kinetic resistance:

Object	Coefficient of kinetic resistance
Railway vehicle on steel rails	0,0015 to 0,0030
Vehicle with rubber wheel on asphalt	0,015 to 0,03

Example:

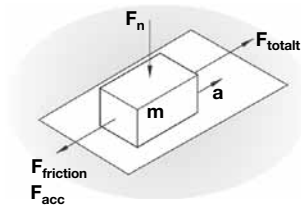
A railway carriage with a weight of 2 tonnes is to move over flat rails. What will the kinetic resistance be?

$$F_F = \mu_F \times F_n$$

$$F_F = 0,0030 \times 2 \times 1000 \times 9,81$$

$$F_F = 4,86 \text{ N}$$

Moving a component over a base, with friction between them



The force required to move the component consists of two parts - a frictional force to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{friction}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{friction}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

F_{friction} = frictional force in N (either F_{static} or F_{kinetic} depending on which is the greater force)

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A steel component weighing 500 kg is to be pulled over a dry steel plate with an acceleration of $0,1 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic}} + F_{\text{acc}}$$

$$F_{\text{tot}} = F_{\text{kinetic}} + m \times a$$

$$F_{\text{tot}} = F_n \times \mu + m \times a$$

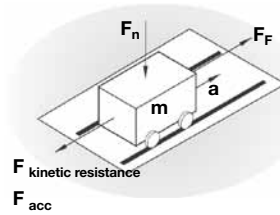
$$F_{\text{tot}} = 500 \times 9,81 \times 0,15 + 500 \times 0,1$$

$$F_{\text{tot}} = 735,75 + 50$$

$$F_{\text{tot}} = 785,75 \text{ N}$$

Answer: A force of 780 N is required to produce this movement.

Moving a carriage over rails, with kinetic resistance between them



The force required to move the component consists of two parts - a kinetic resistance to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

$F_{\text{kinetic resistance}}$ = total kinetic resistance in N

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A carriage weighing 2500 kg is to be pulled over steel rails with an acceleration of $0,2 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{tot}} = \mu_F \times F_N + m \times a$$

$$F_{\text{tot}} = 0,0030 \times 2500 \times 9,81 + 2500 \times 0,2$$

$$F_{\text{tot}} = 6,1 + 500$$

$$F_{\text{tot}} = 506 \text{ N}$$

Answer: A force of 510 N is required to produce this movement.

In practice

These calculations only produce values as they would be under optimum conditions. There must be no inclines in either direction. In applications using carriages, the rails must be perfectly flat without any inclines, the wheels must be perfectly round and there must be nothing on the rails (grains of sand, etc.). There must also be no effects from wind, etc.

In addition, there is always uncertainty with regard to the compressed air supply. How can we guarantee a pressure of 6 bar to the inlet port of the air motor?

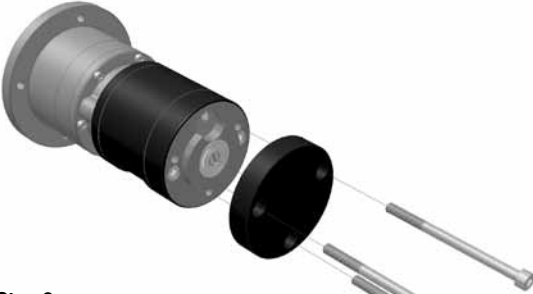
Tip: calculate the required theoretical values for the air motor and assume a safety factor of 10 for the frictional force or kinetic resistance, and add this to the acceleration force. If the motor proves to be too powerful in practice, the supply air can always be regulated by throttling or pressure regulation. If you select a motor that is not powerful enough, on the other hand, the only option is to replace it.

P1V-M Service – Easier - Faster - Cheaper

Replacing vanes - step by step.

Step 1.

Remove the rear piece.



Step 2.

Remove the inspection plug.



Step 3.

Use a screwdriver to rotate the motor until you can see a vane in the centre of the inspection hole.



Step 4.

Remove the old vane and replace it with a new one.



Repeat steps 3 and 4 until all the vanes have been replaced.

Step 5.

Replace the inspection plug.



Step 6.

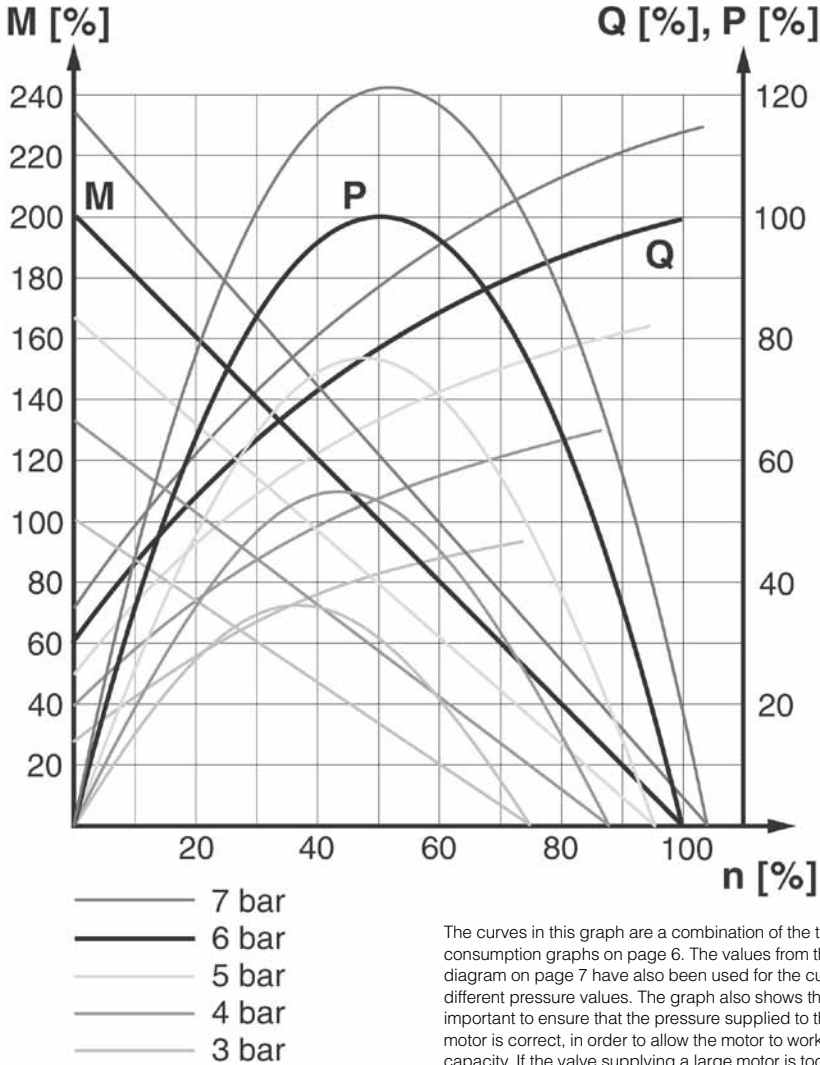
Replace the rear piece.



Replacing vanes with motor still fitted to the machine

The P1V-M motor has been developed to allow the vanes to be replaced without the need to remove the motor from the machine. This makes vane replacement easier, quicker and cheaper, while minimising stoppages.

Torque, power and air consumption graphs



P = power	Q = air consumption
M = torque	n = speed

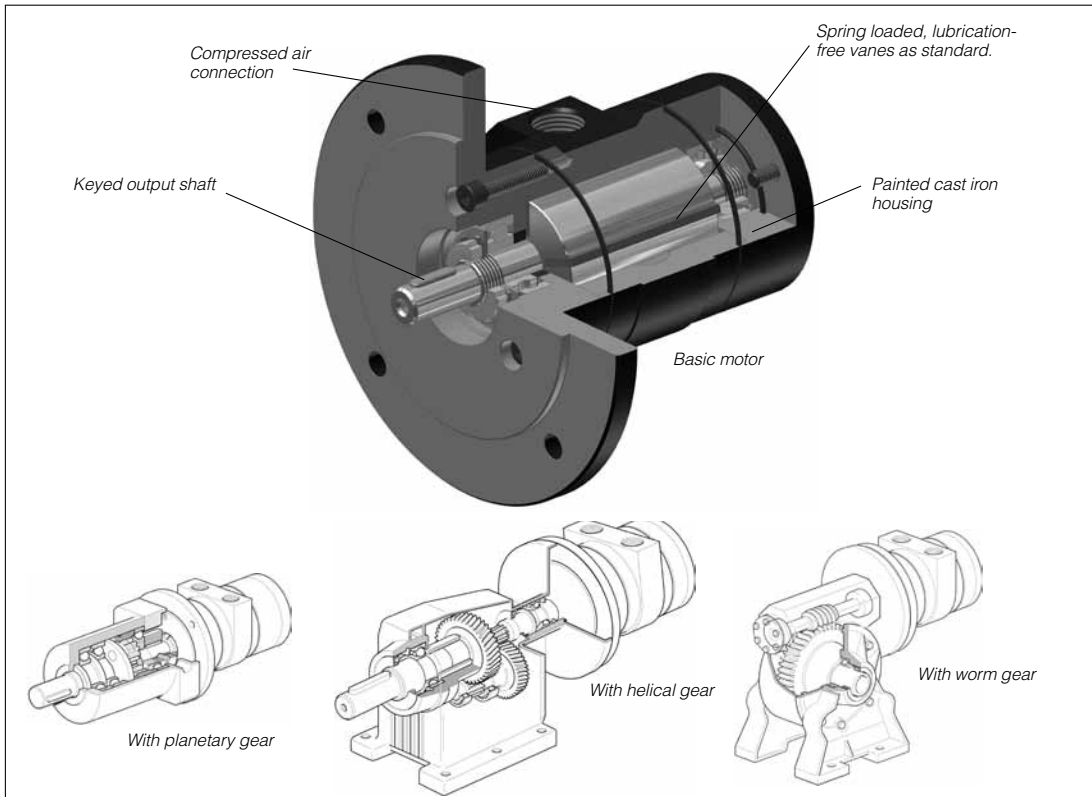
The curves in this graph are a combination of the torque, power and air consumption graphs on page 6. The values from the correction diagram on page 7 have also been used for the curves for the different pressure values. The graph also shows that it is very important to ensure that the pressure supplied to the inlet port of the motor is correct, in order to allow the motor to work at maximum capacity. If the valve supplying a large motor is too small, or if the supply line is underspecified, the pressure at the inlet port may be so low that the motor is unable to do its work. One solution would be to upgrade the valve and supply system, or alternatively you could replace the motor with a smaller motor with lower air consumption. The result would be increased pressure at the inlet port, which means that the smaller motor could carry out the necessary work. However, you may need to select a smaller motor with a lower free speed in order to obtain sufficient torque at the outgoing shaft.



C

Air Motors

P1V-A Series



Air Motors, Series P1V-A

P1V-A is a range of reversible air motors intended for heavy and demanding applications. The motor housings are made from painted cast iron, and the components sealed to permit operation in damp and dirty environments.

The range contains three different sizes, P1V-A160, P1V-A260 and P1V-A360, with power ratings of 1600, 2600 or 3600 Watts. The basic motors can be supplied with built-in gearboxes, either planetary, helical or worm drive, to provide the correct speed of rotation and torque, and the correct installation mountings.

Basic motor

All pneumatic motors are equipped with spring loaded vanes as standard, which gives the motors very good starting and low speed running characteristics. They are also equipped with vanes for intermittent lube-free operation as standard. 100% lubrication-free vanes are obtainable as options. The simple construction of the motors makes them very reliable, with long service life and they are easy to service.

Motors with planetary gears

A P1V-A combined with a planetary gear has small installation dimensions, low weight in relation to performance, free installation position, flange mounting as standard, in line output shaft and high efficiency. They are available with shaft speeds ranging from 95 rpm to 1200 rpm, with torques ranging from 16 Nm to 160 Nm.

Motors with helical gears

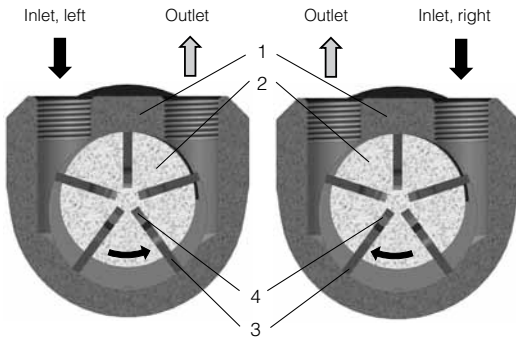
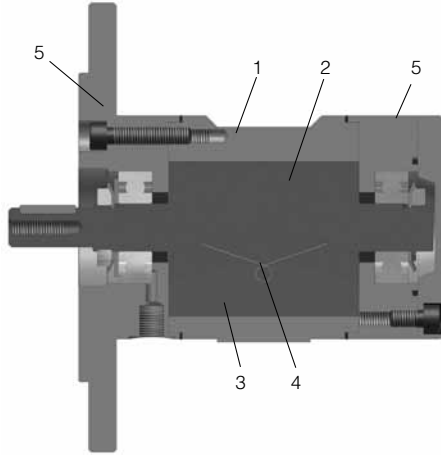
A P1V-A combined with a helical gear has high efficiency, simple installation with flange or foot, and competitive pricing. They are available with shaft speeds ranging from 25 rpm to 1050 rpm, with torques ranging from 23 Nm to 1800 Nm. Oil-bath gears mean that the installation position must be decided beforehand. The installation position governs the amount of oil in the gear and the location of filling and drain plugs.

Motors with worm gears

A P1V-A combined with a worm drive gear has the following characteristics: gearboxes with high gear ratios are self-locking, which means that they can be used to maintain the output shaft in position, simple installation with the flange on the left or right sides or with a foot, small installation dimensions and competitive pricing. They are available with shaft speeds ranging from 62 rpm to 500 rpm, with torques ranging from 38 Nm to 670 Nm. Oil-bath gears mean that the installation position must be decided beforehand. The installation position governs the amount of oil in the gear and the location of filling and drain plugs.

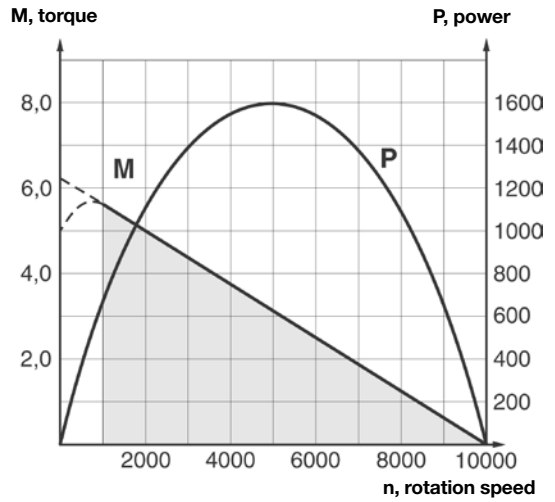


Products specially designed for mobile applications



- 1 Rotor cylinder
- 2 Rotor
- 3 Vanes
- 4 Spring
- 5 End piece with bearing

Torque and power graphs



There is a graph for each motor, where torque and power can be read off as functions of speed. When the motor is stationary without air and when it rotates without load on the output spindle (free speed), it does not develop any power. Maximum power is normally developed when the motor is braked to half the free speed.

At the free speed, the specified torque is zero, but as soon as the motor is braked, the torque increases linearly until the motor stalls.

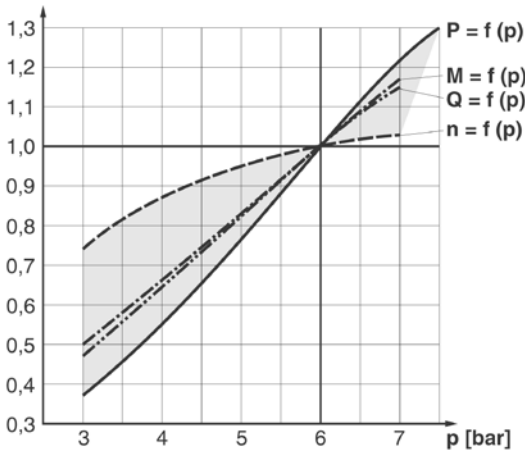
Since the motor can then stop with the vanes in various positions, it is not possible to specify an exact start torque, but a minimum start torque is specified in all tables

There are a number of designs of an air motor. We have chosen to use the vane rotor design, however, because of its simple design and reliable operation. The small external dimensions of vane motors make them very easy to build into all applications.

The principle of the vane motor is that a rotor is provided with a number of vanes and is enclosed in a so-called rotor cylinder. The motor is supplied with compressed air through one connection and air escapes from the other connection. To give reliable starting, the springs press the vanes against the rotor cylinder. The air pressure always bears at right angles against a surface. This means that the torque of the motor is a result of the vane surfaces and the air pressure.

Correction diagrams

Correction factor



P = power
M = torque
Q = air consumption
n = speed

All catalogue data and curves are specified at a supply pressure of 6 bar to the motor. This diagram shows the effect of pressure on speed, specified torque, power and air consumption.

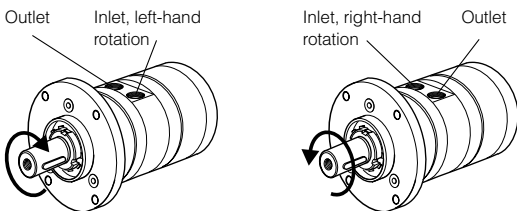
Start off on the curve at the pressure used and then look up to the lines for power, torque and air consumption. Read off the correction factor on the Y axis for each curve and multiply this by the specified catalogue data in the table, or data read from the torque and power graphs.

Example: at 4 bar supply pressure, the power is only 0.55 x power at 6 bar supply pressure.

This example shows how strongly power falls if supply pressure is reduced. You must therefore ensure that the motor is supplied through pipes of sufficient diameter to avoid pressure drop.

Direction of motor rotation

The direction of rotation of reversible motors is obtained by supplying inlet L or inlet R with compressed air. The motor can be stopped and started continually without damage occurring.



Correction diagrams

All catalogue data and curves are specified at a supply

The most common way to reduce the speed of a motor is to install a flow control valve in the air inlet. When the motor is used in applications where it must reverse and it is necessary to restrict the speed in both directions, flow control valves with by-pass should be used in both directions.

Inlet throttling

If the inlet air is restricted, the air supply is restricted and the free speed of the motor falls, but there is full pressure on the vanes at low speeds. This means that we get full torque from the motor at low speeds despite the low air flow.

Since the torque curve becomes "steeper", this also means that we get a lower torque at any given speed than would be developed at full air flow.

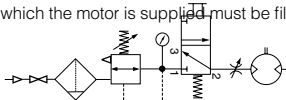
Pressure regulation

The speed and torque can also be regulated by installing a pressure regulator in the inlet pipe. This means that the motor is constantly supplied with air at lower pressure, which means that when the motor is braked, it develops a lower torque on the output shaft.

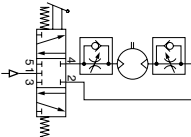
In brief: Inlet throttling gives reduced speed in one direction but maintains torque when braked. The torque curve becomes steeper. Pressure regulation in the inlet cuts torque when the motor is braked, and also reduced speed. The torque curve is moved parallel.

Air supply

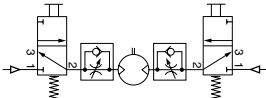
The air with which the motor is supplied must be filtered and regula-



Shut-off, filtering, pressure regulation and control valve



Reversible motor with 5/3 control valve



Reversible motor with two 3/2 control valves

ted. Directional valves are needed to provide it with air, to get the motor to rotate when we want it to. These valves can be equipped with several means of actuation, such as electric, manual and pneumatic control. When the motor is used in a non-reversible application, it is sufficient to use a 2/2 or 3/2 valve for supply. Either one 5/3 or two 3/2 valves are needed for a reversible motor, to ensure that the motor receives compressed air and the residual air outlet is vented. A flow control valve can be installed in the supply pipe to regulate the motor speed if the motor is not used as a reversible motor. One flow control valve with by-pass is needed to regulate each direction of rotation if the motor is used as a reversible motor. The built-in check valve will then allow air from the residual air outlet to escape through the outlet port in the control valve.

The compressed air supply must have sufficiently large pipes and valves to give the motor maximum power. The motor needs 6 bar at the supply port all the time. A reduction of pressure to 5 bar reduces the power developed to 77%, and to 55% at 4 bar.

Choice of components for air supply

Since the supply pressure at the air motor inlet port is of considerable importance for obtaining the power, speed and torque quoted in the catalogue, the recommendations below should be observed.

The following data must be complied with:

Supply pressure: 7 bar

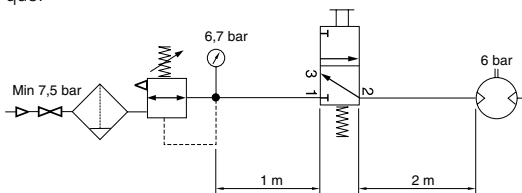
Regulator pressure setting: 6.7 bar

Pipe length between air treatment unit and valve: max. 1 m

Pipe length valve and air motor: max. 2 m

The pressure drop through the air preparation unit, pipe, valve and pipe means that 6 bar pressure is obtained at the motor supply port.

Please refer to the correction diagram on page 7, which shows what lower supply pressure means for power, speed and torque.



The table can be used as follows:

If you are using only one motor with each air treatment unit and valve, simply follow the table. If you are using more than one motor with the same air treatment unit: read the table values for selecting the air treatment unit and add them together, and select a suitable air treatment unit from the table showing air flows per treatment unit. Then read the values for selecting the valve from the bottom of the table, and select a suitable valve from the table showing air flows per valve family.

The air treatment units have the following flows in NI/Min at 7,5 bar supply pressure and 0,8 bar pressure drop

FRL series	Air flow in NI/Min
P3A, Mini Modular	400
P3D, Junior Modular	950
P3K, Moduflex FRL, 60 Series	2300
P3E, Maxi Modular	3000
P3N, 1" Modular	7500
Standard series FRL, 11/2"	9200
Stainless series FRL PF G1/4	530
Stainless series FRL PF G1/2	1480

Valve series with respective flows in NI/minute

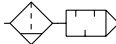
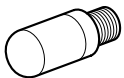
Valve series	Qn in NI/Min
Valvetronic Solstar	33
Interface PS1	100
Valvetronic Interface 2000	100
B2 Series	168
Adex A05	173
Moduflex size 1, (2 x 3/2)	220
Valvetronic PVL-B 5/3 closed centre, 6 mm push in	290
Moduflex size 1, (4/2)	320
B43 Manual and mechanical	340
Valvetronic PVL-B 2 x 2/3, 6 mm push in	350
Valvetronic PVL-B 5/3 closed centre, G1/8	370
Compact Isomax DX02	385
Valvetronic PVL-B 2 x 3/2 G1/8	440
Valvetronic PVL-B 5/2, 6 mm push in	450
Valvetronic PVL-B 5/3 vented centre, 6 mm push in	450
Moduflex size 2, (2 x 3/2)	450
Flowstar P2V-A	520
Valvetronic PVL-B 5/3 vented centre, G1/8	540
Valvetronic PVL-B 5/2, G1/8	540
Valvetronic PVL-C 2 x 3/2, 8 mm push in	540
Adex A12	560
Valvetronic PVL-C 2 x 3/2 G1/8	570
Compact Isomax DX01	585
Valvetronic PVL-C 5/3 closed centre, 8 mm push in	700
Valvetronic PVL-C 5/3 vented centre, G1/4	700
VIKING P2L-A	760
B3 Series	780
Valvetronic PVL-C 5/3 closed centre, G1/4	780
Moduflex size 2, (4/2)	800
Valvetronic PVL-C 5/2, 8 mm push in	840
Valvetronic PVL-C 5/3 vented centre, 8 mm push in	840
Valvetronic PVL-C 5/2, G1/4	840
VIKING P2L-B	1020
Flowstar P2V-B	1090
ISOMAX DX1	1150
B53 Manual and mechanical	1160
B4 Series	1170
Airline Isolator Valve VE22/23	1470
ISOMAX DX2	2330
VIKING P2L-D	2880
ISOMAX DX3	4050
Airline Isolator Valve VE42/43	5520
Airline Isolator Valve VE82/83	13680

Air motors

Air motor	P1V-A160	P1V-A260	P1V-A360	
Air flow required, NI/s	32	60	80	
Air flow required, NI/min	1920	3600	4800	
Min pipe ID, inlet mm	19	19	22	
Min pipe ID outlet mm	19	25	32	
Choice of air treatment unit: recommended min. air flow in litres/minute at 7,5 bar air supply and 0,8 bar pressure drop				
	2100			
		4000		
			5300	
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).				
	2300			
		4300		
			5800	

Silencing

The noise from a air motor consists of both mechanical noise and a pulsating noise from the air Exhaust silencer
Central silencer



flowing out of the outlet. The installation of the motor has a considerable effect on mechanical noise. It should be installed so that no mechanical resonance effects can occur. The outlet air creates a noise level which can amount to 115 dB(A) if the air is allowed to exhaust freely into the atmosphere. Various types of exhaust silencers are used to reduce this level. The most common type screws directly onto the exhaust port of the motor. Since the motor function causes the exhaust air to pulsate, it is a good idea to allow the air to exhaust into some kind of chamber first, which reduces the pulsations before they reach the silencer. The device which gives best silencing is to connect a soft plastic hose to a large central silencer which has the largest possible area, to reduce the speed of the out-flowing air as far as possible.

NOTE! Remember that a silencer which is too small or is blocked, generates back pressure on the outlet side of the motor, which reduces the motor power.

Sound levels

Sound levels are measured at free speed with the measuring instrument positioned 1 m away from the air motor, see the table below

Air motor	Free outlet	With outlet silencer	Exhaust air removed with pipes to another room
	dB (A)	dB (A)	dB (A)
P1V-A160	xx	xx	xx
P1V-A260	xx	xx	xx
P1V-A360	xx	xx	xx

CE marking

The air motors are supplied as "Components for installation" – the installer is responsible for ensuring that the motors are installed safely in the overall system. Parker Pneumatic guarantees that its products are safe, and as a supplier of pneumatic equipment we ensure that the equipment is designed and manufactured in accordance with the applicable EU directive.

Most of our products are classed as components as defined by various directives, and although we guarantee that the components satisfy the fundamental safety requirements of the directives to the extent that they are our responsibility, they do not usually carry the CE mark. Nevertheless, most P1V-S motors carry the CE mark because they are ATEX certified (for use in explosive atmospheres).

The following are the currently applicable directives:



- Machinery Directive(essential health and safety requirements relating to the design and structure of machines and safety components)
- EMC Directive
- Simple Pressure Vessels Directive
- Low Voltage Directive
- ATEX Directive (ATEX = ATmosphere EXplosive)

Compressed air quality

Oil and oil mist are avoided whenever possible to ensure a clean work environment. In addition, purchasing, installation and maintenance of oil mist equipment can be expensive. All users in all industries now try to avoid using components which have to be lubricated.

The P1V-S motor is equipped with vanes for intermittent lubrication free operation as standard, which is the most common application of air motors. The motor is also available with optional hard vanes for continuous lubrication-free operation (option "C").

The P1V-S motor is equipped as standard with food grade grease in the planetary gearbox. An oil which is approved by the food industry is also available if supplementary lubrication is required.


Working pressure	Max 7 bar (max 6 bar in explosive atmospheres) 
Working temperature	-30 °C to +100 °C
Ambient temperature	-20 °C to +40 °C
Medium	in explosive atmospheres  40 µm filtered, oil mist or dry unlubricated compressed air

Dry unlubricated compressed air 

If unlubricated compressed air is used, the compressed air should comply with the purity standards below in order to guarantee the longest possible overall service life. If the unlubricated compressed air has a high water content, condensation forms inside the motor, causing corrosion in all internal components. A ballbearing can be destroyed in a remarkably short time if it comes into contact with a single water droplet.

For indoor use, we recommend ISO8573-1 purity class 3.4.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, refrigerant air dryers and air filters.

For indoor/outdoor use, we recommend ISO8573-1 purity class 1.2.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, adsorption dryers and dust filters.

Oil mist 
If oil mist is used (approx. 1 drop of oil per m³ of compressed air), the oil not only acts as a lubricant but also protects against corrosion. This means that compressed air with a certain water content may be used without causing corrosion problems inside the motor.
ISO8573-1 purity class 3.-.5 may be used without difficulty.

The following oils are recommended for use in the foodstuffs industry: Shell Cassida Fluid HF 32 or Klüberoil 4 UH 1-32

ISO 8573-1 purity classes

Quality class	Contaminants		Water max. pressure dew point (°C)	Oil max. concentration (mg/m ³)
	particle size (µm)	max. concentration (mg/m ³)		
1	0,1	0,1	-70	0,01
2	1	1	-40	0,1
3	5	5	-20	1,0
4	15	8	+3	5,0
5	40	10	+7	25
6	-	-	+10	-

For example: compressed air to purity class 3.4.3
This means a 5 µm filter (standard filter), dew point +3 °C (refrigerant cooled) and an oil concentration of 1,0 mg oil/m³ (as supplied by a standard compressor with a standard filter).

Lubrication and service life

Oil and oil mist are things which one tries to avoid to get the best possible working environment. In addition, purchasing, installation and maintenance of oil mist equipment costs money and, above all, time to achieve optimum lubrication effect. Users in all industries now try to avoid using components which have to be lubricated.

The P1V-A motor is equipped with vanes for intermittent operation as standard, which is the most common application of air motors. The motor is also available with optional hard vanes for continuous lubrication-free operation (option "C").

Service interval



The first service is due after approximately 500 hours of operation. After the first service, the service interval is determined by the degree of vane wear*. The table below shows new dimensions and the minimum dimensions of worn vanes.



Air motor	Dimensions on new vanes X [mm]	Minimum dimensions on vane X' [mm]
P1V-A160	xx	xx
P1V-A260	xx	xx
P1V-A360	xx	xx

The following normal service intervals should be applied to in order to guarantee problem-free operation in air motors working continuously at load speeds*.

Intermittent lubrication-free operation of P1V-A standard motors

Duty cycle	70%
Max. duration of intermittent use	15 minutes
Filtering 40 µm	app. 750 hours operation
Filtering 5 µm	app. 1,000 hours operation

Continuous operation of P1V-A standard motors, with lubrication

Oil volume	1 drop oil/Nm ³
Filtering 40 µm	app. 1,000 hours operation
Filtering 5 µm	app. 2,000 hours operation

Continuous lubrication-free operation of P1V-A motors equipped with hard vanes (option "C")

Filtering 40 µm	app. 750 hours operation
Filtering 5 µm	app. 1,000 hours operation



Choice of air motor, general

The motor to be used should be selected by starting with the torque needed at a specific spindle speed. In other words, to choose the right motor, you have to know the required speed and torque. Since maximum power is reached at half the motor's free speed, the motor should be chosen so that the point aimed at is as close as possible to the maximum power of the motor.

The design principle of the motor means that higher torque is generated when it is braked, which tends to increase the speed, etc. This means that the motor has a kind of speed self-regulation function built in.

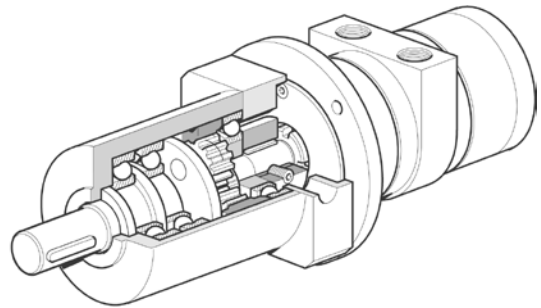
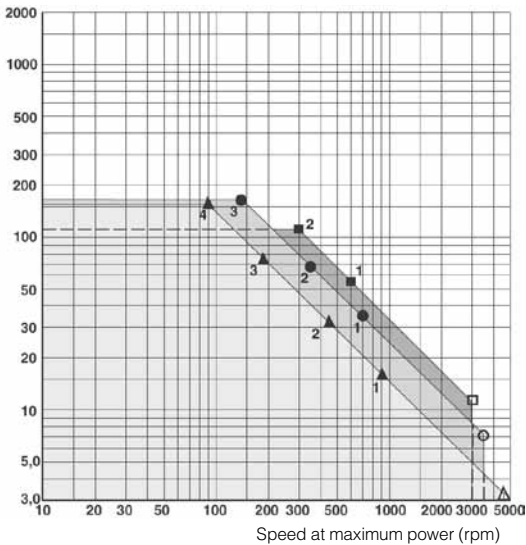
Use the following graph to choose the correct motor size and the correct type of gear as appropriate. The graph contains the points for the maximum torque of each motor at maximum power. Put in your point on the graph and select a marked point above and to the right of the point you need.

Then check the characteristic graph of each motor to find more accurate technical data. Always select a motor where the data required is in the grey field. Also use the correction diagram to see what it would mean to use different air supply pressures with the motor.

Tip: Select a motor which is slightly too fast and powerful, regulate its speed and torque with a pressure regulator and/or restriction to achieve the optimum working point. The output shaft is always in the centre of the gearbox. Small installation dimensions relative to the torque provided. The gears are lubricated by grease, which means that it can be installed in all conceivable positions

Choice of motors with planetary gears

Planetary gears are characterised by high efficiency, low moment of inertia and can offer high gear ratios. The output Torque at maximum power (Nm)



shaft is always in the centre of the gearbox. Small installation dimensions relative to the torque provided. The gears are lubricated by grease, which means that it can be installed in all conceivable positions.

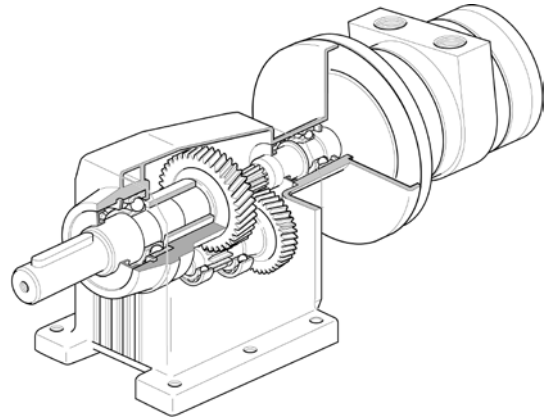
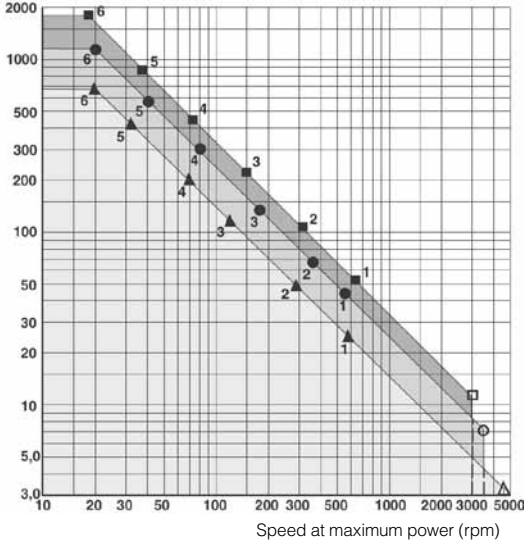
- Small installation dimensions
- Free installation position
- Simple flange installation
- Low weight
- Output shaft in centre
- High efficiency

Air motors in diagram above

△	P1V-A160A0900, please refer to page 15
▲ 1	P1V-A160B0120, please refer to page 16
▲ 2	P1V-A160B0060, please refer to page 16
▲ 3	P1V-A160B0019, please refer to page 16
▲ 4	P1V-A160B0010, please refer to page 16
○	P1V-A260A0700, please refer to page 15
● 1	P1V-A260B0120, please refer to page 16
● 2	P1V-A260B0060, please refer to page 16
● 3	P1V-A260B0019, please refer to page 16
□	P1V-A360A0600, please refer to page 15
■ 1	P1V-A360B0096, please refer to page 16
■ 2	P1V-A360B0048, please refer to page 16

Choice of motors with helical gears

Torque at maximum power (Nm)



Helical gears are characterised by high efficiency. Several reduction stages permit relatively high gear ratios. Central output shaft and simple installation with flange or foot.

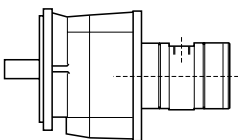
Oil-bath gearboxes mean that the installation position must be decided in advance. The installation position determines the volume of oil in the gearbox and location of oil filling and drain plugs.

- High efficiency
 - Simple flange or foot installation
 - Relatively low price
- Installation position must be chosen in advance
- Higher weight than planetary or worm drive gears.

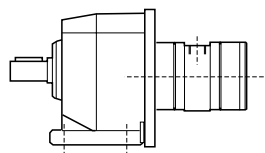
Air motors in diagram above

- △ P1V-A160A0900, please refer to page 15
 - ▲ 1 P1V-A160•0066••, Choose installation below
 - ▲ 2 P1V-A160•0032••, Choose installation below
 - ▲ 3 P1V-A160•0014••, Choose installation below
 - ▲ 4 P1V-A160•0008••, Choose installation below
 - ▲ 5 P1V-A160•0004••, Choose installation below
 - ▲ 6 P1V-A160•0003••, Choose installation below
-
- P1V-A260A0700, please refer to page 15
 - 1 P1V-A260•0080••, Choose installation below
 - 2 P1V-A260•0052••, Choose installation below
 - 3 P1V-A260•0025••, Choose installation below
 - 4 P1V-A260•0011••, Choose installation below
 - 5 P1V-A260•0006••, Choose installation below
 - 6 P1V-A260•0003••, Choose installation below
-
- P1V-A360A0600, please refer to page 15
 - 1 P1V-A360•0105••, Choose installation below
 - 2 P1V-A360•0052••, Choose installation below
 - 3 P1V-A360•0025••, Choose installation below
 - 4 P1V-A360•0013••, Choose installation below
 - 5 P1V-A360•0006••, Choose installation below
 - 6 P1V-A360•0003••, Choose installation below

Installation, flange mounting

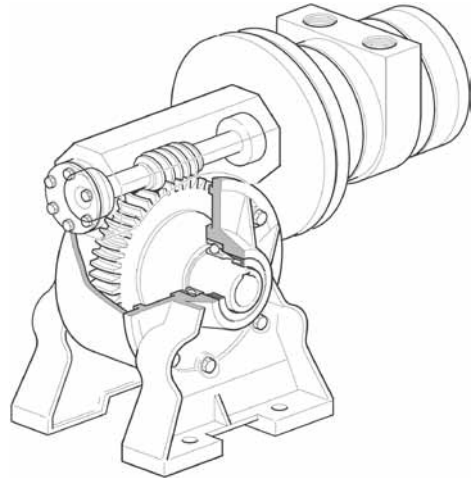
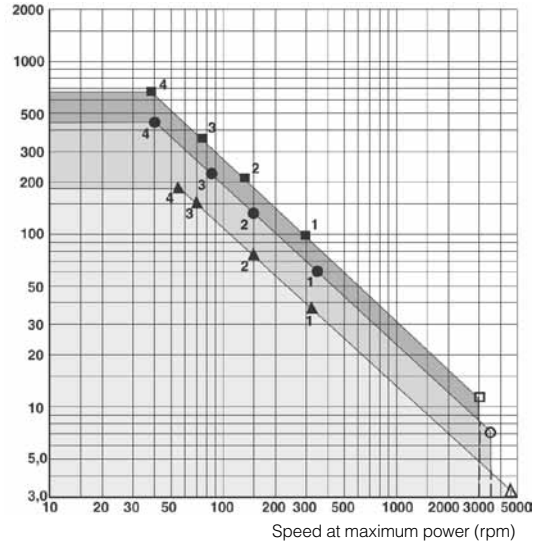


Installation, foot mounting



Choice of motors with worm gears

Torque at maximum power (Nm)



Worm gears are characterised by relatively simple technical construction, with a worm and pinion. This can give a large gear ratio and small dimensions. The efficiency of a worm drive gear is considerably lower than for planetary or helical gears. The design principle of worm drive gears makes them self-locking at higher gear ratios (the output shaft is "locked").

The output shaft comes out at an angle of 90° to the motor spindle. Installation is simple, with a flange on the left or right side, or with a foot. The gearbox is equipped as standard with a hollow output shaft with a key slot. Loose shafts with key can put the output shaft on the right, left, or on both sides.

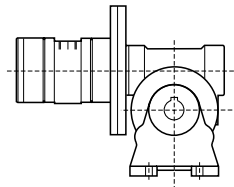
Oil-bath gearboxes mean that the installation position must be decided in advance. The installation position determines the volume of oil in the gearbox and location of oil filling and drain plugs.

- Low weight in relation to gear ratio
- Non-reversible at high gear ratios
- Relatively low price
- Relatively low efficiency
- Installation position must be decided in advance
- Output shaft at 90° to motor spindle

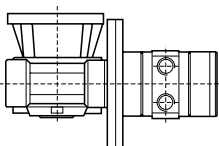
Air motors in diagram above

- ▲ P1V-A160A0900, please refer to page 15
- ▲ 1 P1V-A160•0043••, Choose installation below
- ▲ 2 P1V-A160•0020••, Choose installation below
- ▲ 3 P1V-A160•0010••, Choose installation below
- ▲ 4 P1V-A160•0008••, Choose installation below
- P1V-A260A0700, please refer to page 15
- 1 P1V-A260•0050••, Choose installation below
- 2 P1V-A260•0022••, Choose installation below
- 3 P1V-A260•0013••, Choose installation below
- 4 P1V-A260•0008••, Choose installation below
- P1V-A360A0600, please refer to page 15
- 1 P1V-A360•0050••, Choose installation below
- 2 P1V-A360•0022••, Choose installation below
- 3 P1V-A360•0013••, Choose installation below
- 4 P1V-A360•0006••, Choose installation below

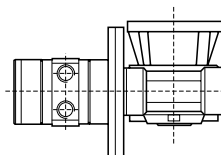
Installation, foot mounting



Installation, flange mounting, left-hand



Installation, flange mounting, right-hand



Technical data

Working pressure	Max 7 bar
Working temperature	-30 °C to +100 °C
Medium	40 µm filtered air with or without oil mist

Design data

Basic motor

- Robust design with few components
- Spring loaded vanes as standard give good starting and low speed characteristics
- Keyed output shaft
- Reversible operation

Planetary gear

- Precision made gears with efficiency over 95%
- Sealed, permanently grease lubrication gives free installation position
- Compact installation and low weight
- Central output shaft

Helical gear

- Two versions available, with flange or foot
- High efficiency, 90 to 95%
- Oil-bath gearboxes mean that the installation position must be decided in advance. The installation position determines the volume of oil in the gearbox and location of oil filling and drain plugs.

Worm gear

- Available in three versions, for installation with left-hand flange, right-hand flange or foot mounting.
- Compact size and low weight
- Self-locking in higher ratios
- Output shaft at 90° angle to motor spindle
- Hollow output shaft with key slot. Single-ended or "through" twin shaft as options.
- Oil-bath gearboxes mean that the installation position must be decided in advance. The installation position determines the volume of oil in the gearbox and location of oil filling and drain plugs.

Table and diagram data

All values are typical values, with a tolerance of $\pm 10\%$

Options

Other variants on request.

Material specification

Basic motor

Housing	Cast iron, synthetic paint, black
Spindle, rotor	High grade steel
Key	Hardened steel
O-rings	Nitrile rubber, NBR
Screws	Zinc-coated steel

Planetary gear

Housing	Alloy steel, synthetic paint, black
Shaft	High grade steel
Key	Hardened steel
Shaft seals	Nitrile rubber, NBR
Screws	Zinc-coated steel

Helical gear

Housing	Aluminium or cast iron, synthetic paint, black
Shaft	High grade steel
Key	Hardened steel
Shaft seals	Nitrile rubber, NBR
Screws	Zinc-coated steel

Worm drive gear

Housing	Aluminium or cast iron, synthetic paint, black
Shaft	High grade steel
Key	Hardened steel
Pinion	Chill cast phosphor bronze
Worm	Alloyed, hardened steel
Shaft seals	Nitrile rubber, NBR
Screws	Zinc-coated steel

Accessories

Keyed shafts for worm gear

Shaft	High grade steel
Key	Hardened steel

Order key

P1V-A	160	E	0	066	B6
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Motor size	
160	1600 W
260	2600 W
360	3600 W

Function	
A	Basic motor without gear-box, keyed shaft
B	With planetary gear, keyed shaft
D	With helical gear, flange, keyed shaft
E	With helical gear, foot, keyed shaft
F	With worm gear, flange left, hollow shaft with key slot
G	With worm gear, flange right, hollow shaft with key slot
H	With worm gear, foot, hollow shaft with key slot

Free/max speed per min	
000	0000
900	9000

Installation position	
-	Free installation
Horizontal installation	
B3	Installation position B3
B5	Installation position B5
B6	Installation position B6
B7	Installation position B7
B8	Installation position B8
Vertical installation	
V1	Installation position V1
V3	Installation position V3
V5	Installation position V5
V6	Installation position V6

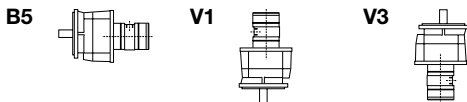
Optional functions	
0	Standard
C	Lubrication-free, continuous operation

Air motor family	
P1V-A	Large vane motor, reversible

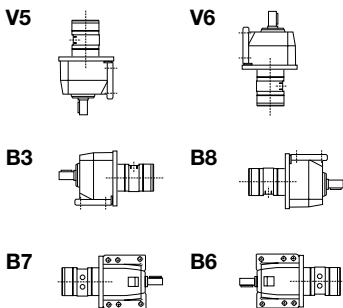
A: Free installation positions, basic motor

B: Free installation positions, planetary gear

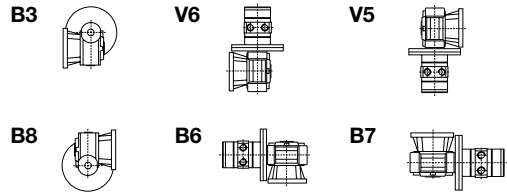
D: Free installation positions, helical gear and flange



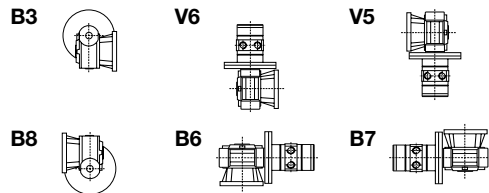
E: Installation positions, helical gear and foot



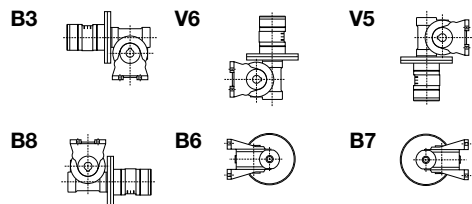
F: Installation pos., worm gear and flange, left-hand



G: Installation pos., worm gear and flange, right-hand



H: Installation positions, worm gear and foot



NOTE! All technical data are based on a working pressure of 6 bar.



A: Basic motor with keyed shaft

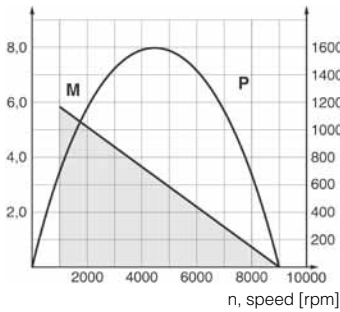
Max power	Free speed*	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Connection	Min pipe ID inlet/outlet	Weight Kg	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm		
Series P1V-A160									
1,600	9000	4500	3,3	5,0	32	G1/2	19/19	4,2	P1V-A160A0900
Series P1V-A260									
2,600	7000	3500	7,1	11,0	60	G3/4	19/25	7,9	P1V-A260A0700
Series P1V-A360									
3,600	6000	3000	11,5	17,0	80	G1	22/32	16,0	P1V-A360A0600

* Idling speed

P1V-A160A0900

M, torque [Nm]

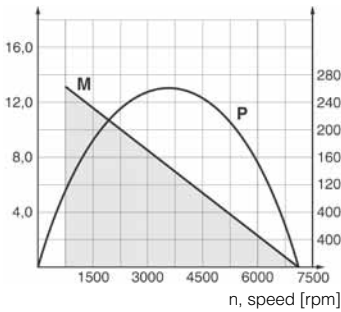
P, power [W]



P1V-A260A0700

M, torque [Nm]

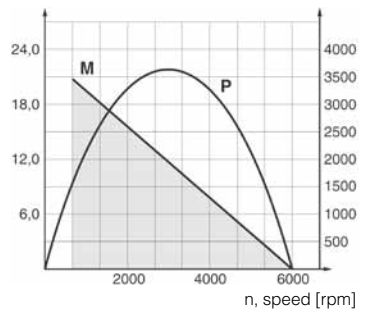
P, power [W]



P1V-A360A0600

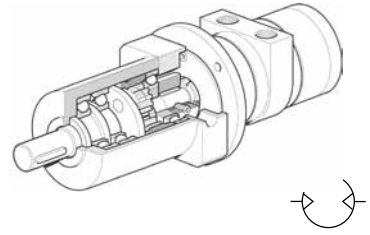
M, torque [Nm]

P, power [W]



Working range of motor

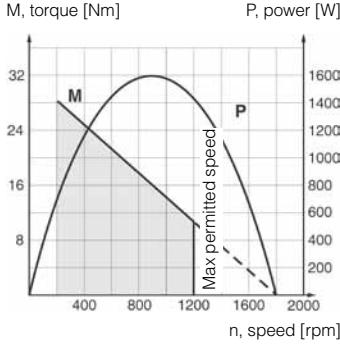
NOTE! All technical data are based on a working pressure of 6 bar.



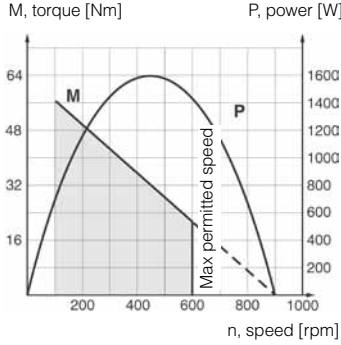
B: Motor with planetary gear, flange mounting. Free installation position

Max power kW	Max speed rpm	Speed at max power rpm	Torque at max power Nm	Min start torque Nm	Max permitted torque Nm	Air consumption at max power l/s	Connection	Min pipe ID inlet/ outlet mm	Weight Kg	Order code
Series P1V-A160										
1,600	1200	900	16	24	190	32	G1/2	19/19	8,3	P1V-A160B0120
1,600	600	450	32	48	190	32	G1/2	19/19	8,3	P1V-A160B0060
1,600	190	180	77	116	480	32	G1/2	19/19	15,4	P1V-A160B0019
1,600	95	90	153	230	480	32	G1/2	19/19	15,4	P1V-A160B0010
Series P1V-A260										
2,600	1200	700	34	51	190	60	G3/4	19/25	12,0	P1V-A260B0120
2,600	600	350	67	101	190	60	G3/4	19/25	12,0	P1V-A260B0060
2,600	190	140	160	240	480	60	G3/4	19/25	13,0	P1V-A260B0019
Series P1V-A360										
3,600	960	600	55	83	480	80	G1	22/32	25,5	P1V-A360B0096
3,600	480	300	110	165	480	80	G1	22/32	25,5	P1V-A360B0048

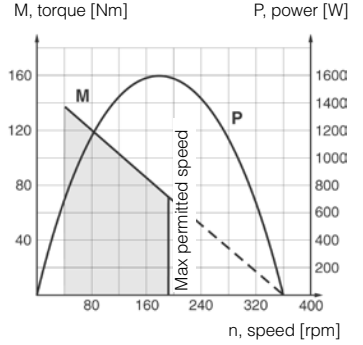
P1V-A160B0120



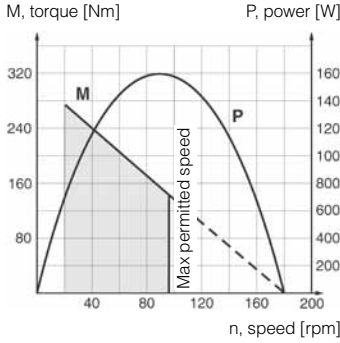
P1V-A160B0060



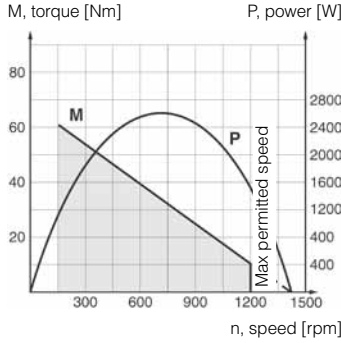
P1V-A160B0019



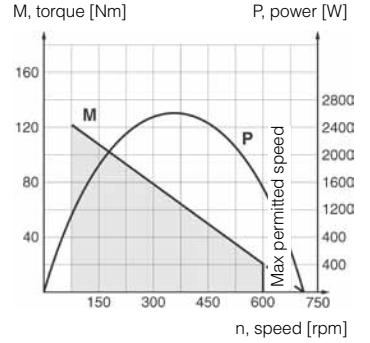
P1V-A160B0010



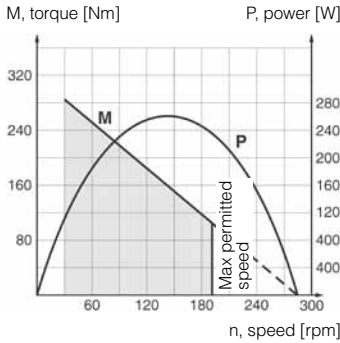
P1V-A260B0120



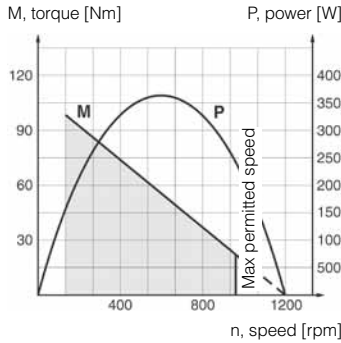
P1V-A260B0060



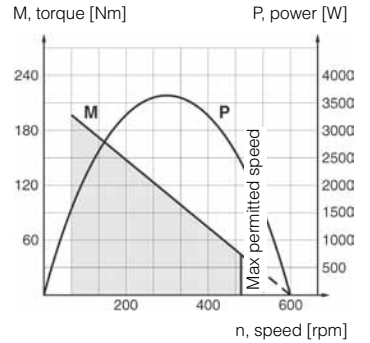
P1V-A260B0019



P1V-A360B0096

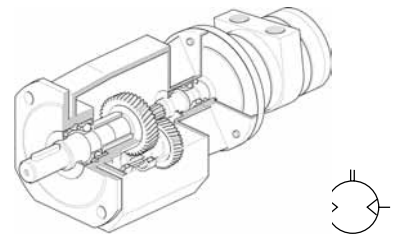


P1V-A360B0048



Working range of motor

NOTE! All technical data are based on a working pressure of 6 bar.



D: Motor with helical gear, flange mounting

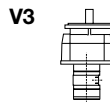
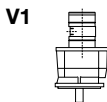
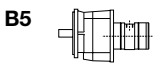
Max power kW	Max speed rpm	Speed at max power rpm	Torque at max power Nm	Min start torque Nm	Max permitted torque Nm	Air consumption at max power l/s	Connection	Min pipe ID inlet/ outlet mm	Weight Kg	Order code
Series P1V-A160										
1,600	660	590	23	35	70	32	G1/2	19/19	9,5	P1V-A160D0066••
1,600	320	280	49	74	125	32	G1/2	19/19	11,5	P1V-A160D0032••
1,600	140	120	113	170	200	32	G1/2	19/19	14,0	P1V-A160D0014••
1,600	80	70	200	300	430	32	G1/2	19/19	29,0	P1V-A160D0008••
1,600	37	32	415	623	750	32	G1/2	19/19	42,5	P1V-A160D0004••
1,600	25	20	685	1028	1200	32	G1/2	19/19	62,5	P1V-A160D0003••
Series P1V-A260										
2,600	800	565	42	63	70	60	G3/4	19/25	13,8	P1V-A260D0080••
2,600	520	365	65	98	125	60	G3/4	19/25	15,8	P1V-A260D0052••
2,600	250	175	135	203	200	60	G3/4	19/25	18,5	P1V-A260D0025••
2,600	110	80	302	453	430	60	G3/4	19/25	34,0	P1V-A260D0011••
2,600	60	40	565	848	750	60	G3/4	19/25	47,0	P1V-A260D0006••
2,600	30	20	1020	1530	1200	60	G3/4	19/25	67,0	P1V-A260D0003••
Series P1V-A360										
3,600	1050	625	52	78	125	80	G1	22/32	24,5	P1V-A360D0105••
3,600	520	310	105	158	125	80	G1	22/32	24,5	P1V-A360D0052••
3,600	250	150	215	323	430	80	G1	22/32	42,5	P1V-A360D0025••
3,600	125	74	440	660	750	80	G1	22/32	54,5	P1V-A360D0013••
3,600	62	37	850	1275	1200	80	G1	22/32	75,5	P1V-A360D0006••
3,600	30	18	1800	2700	4000	80	G1	22/32	149,5	P1V-A360D0003••

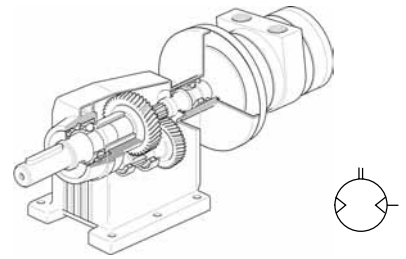
Note!

•• specify installation position in the order no. as in the illustrations below.

Example: **P1V-A160D0066B5**

D: Installation positions, helical gears and flange



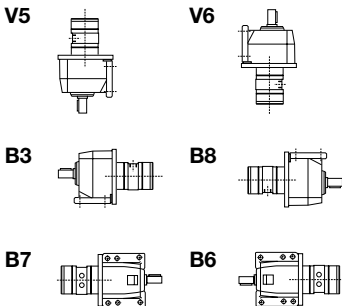


E: Motor with helical gear, foot mounting

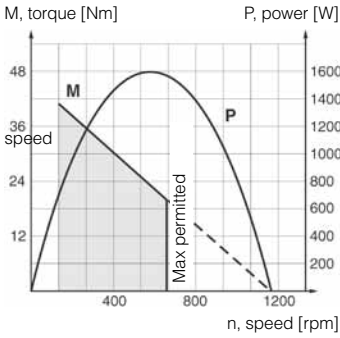
Max power kW	Max speed rpm	Speed at max power rpm	Torque at max power Nm	Min start torque Nm	Max permitted torque Nm	Air consumption at max power l/s	Connection	Min pipe ID inlet/ outlet mm	Weight Kg	Order code
Series P1V-A160										
1,600	660	590	23	35	70	32	G1/2	19/19	9,8	P1V-A160E006●●
1,600	320	280	49	74	125	32	G1/2	19/19	11,5	P1V-A160E0032●●
1,600	140	120	113	170	200	32	G1/2	19/19	14,5	P1V-A160E0014●●
1,600	80	70	200	300	430	32	G1/2	19/19	31,2	P1V-A160E0008●●
1,600	37	32	415	623	750	32	G1/2	19/19	44,5	P1V-A160E0004●●
1,600	25	20	685	1028	1200	32	G1/2	19/19	65,2	P1V-A160E0003●●
Series P1V-A260										
2,600	800	565	42	63	70	60	G3/4	19/25	13,8	P1V-A260E0080●●
2,600	520	365	65	98	125	60	G3/4	19/25	15,8	P1V-A260E0052●●
2,600	250	175	135	203	200	60	G3/4	19/25	18,5	P1V-A260E0025●●
2,600	110	80	302	453	430	60	G3/4	19/25	34,0	P1V-A260E0011●●
2,600	60	40	565	848	750	60	G3/4	19/25	47,0	P1V-A260E0006●●
2,600	30	20	1020	1530	1200	60	G3/4	19/25	67,0	P1V-A260E0003●●
Series P1V-A360										
3,600	1050	625	52	78	125	80	G1	22/32	24,5	P1V-A360E0105●●
3,600	520	310	105	158	125	80	G1	22/32	24,5	P1V-A360E0052●●
3,600	250	150	215	323	430	80	G1	22/32	42,5	P1V-A360E0025●●
3,600	125	74	440	660	750	80	G1	22/32	54,5	P1V-A360E0013●●
3,600	62	37	850	1275	1200	80	G1	22/32	75,5	P1V-A360E0006●●
3,600	30	18	1800	2700	4000	80	G1	22/32	149,5	P1V-A360E0003●●

Note!
 ●● specify installation position in the order no. as in the illustrations below.
Example: P1V-A160E006V5

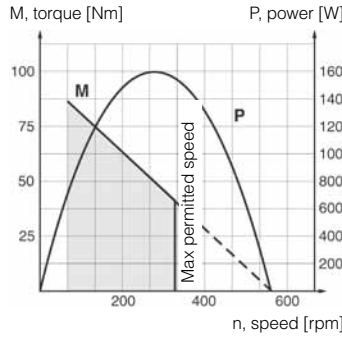
E: Installation positions, helical gears and flange



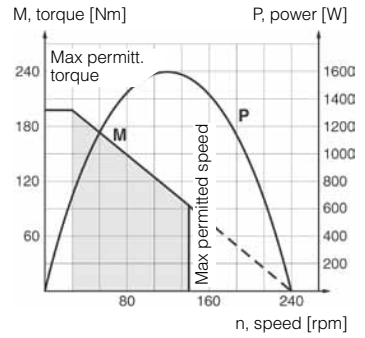
P1V-A160D0066••
P1V-A160E0066••



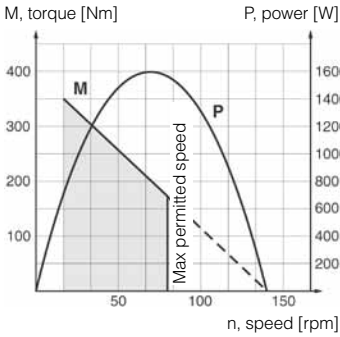
P1V-A160D0032••
P1V-A160E0032••



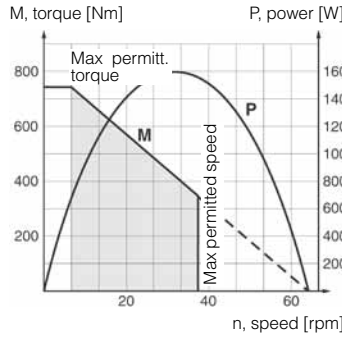
P1V-A160D0014••
P1V-A160E0014••



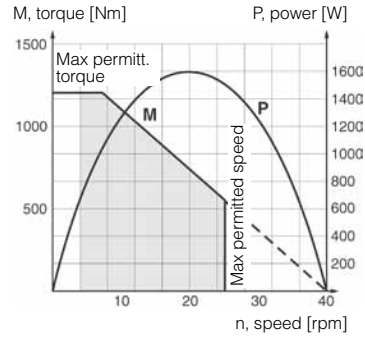
P1V-A160D0008••
P1V-A160E0008••



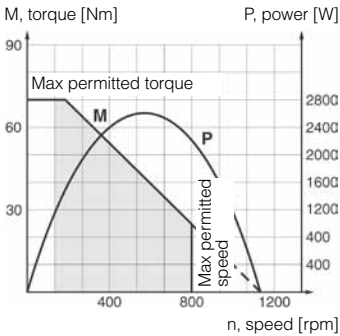
P1V-A160D0004••
P1V-A160E0004••



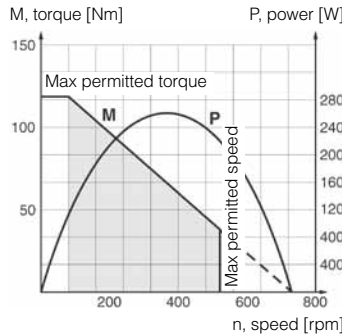
P1V-A160D0003••
P1V-A160E0003••



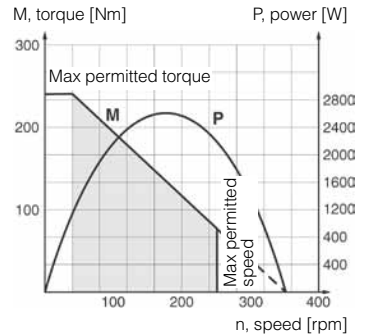
P1V-A260D0060••
P1V-A260E0060••



P1V-A260D0052••
P1V-A260E0052••

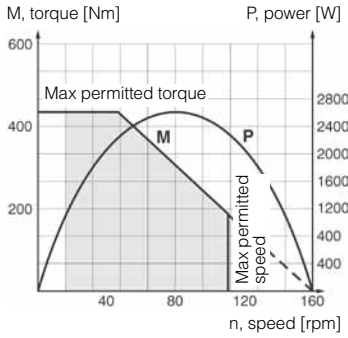


P1V-A260D0025••
P1V-A260E0025••

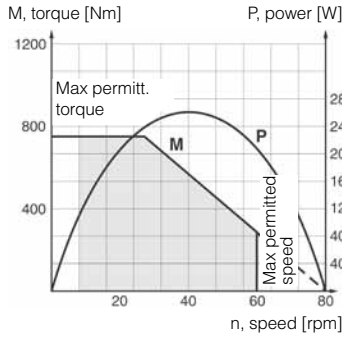


 Working range of motor

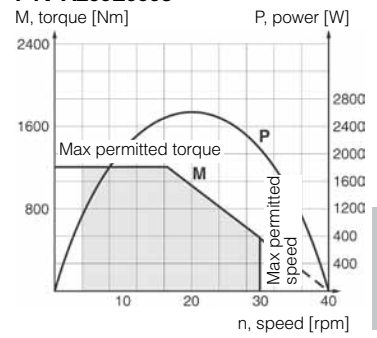
P1V-A260D0011••
P1V-A260E0011••



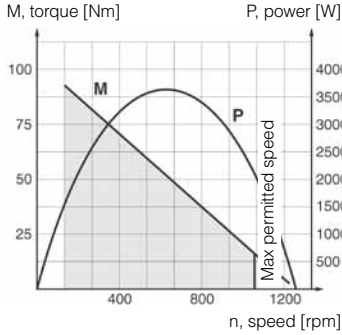
P1V-A260D0006••
P1V-A260E0006••



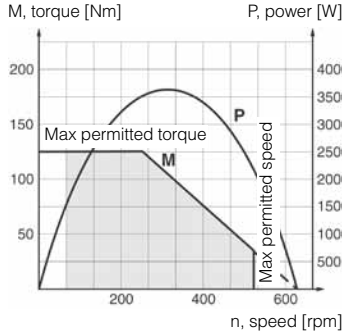
P1V-A260D0003••
P1V-A260E0003••



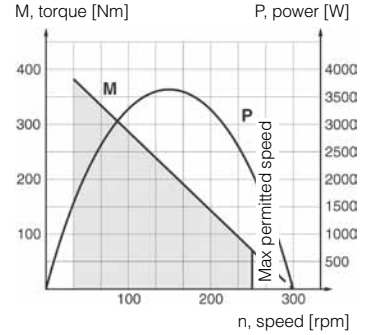
P1V-A360D0105••
P1V-A360E0105••



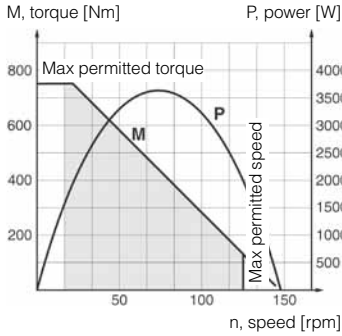
P1V-A360D0052••
P1V-A360E0052••



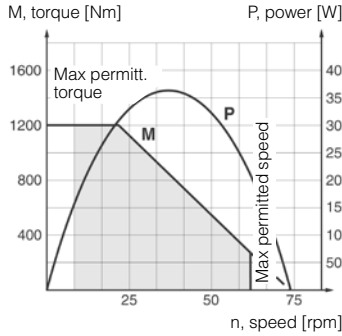
P1V-A360D0025••
P1V-A360E0025••



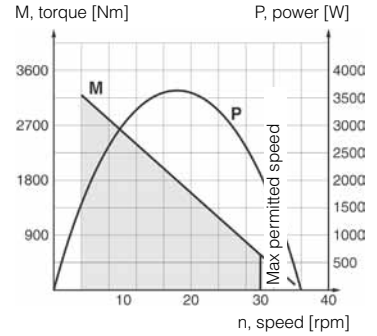
P1V-A360D0013••
P1V-A360E0013••



P1V-A360D0006••
P1V-A360E0006••

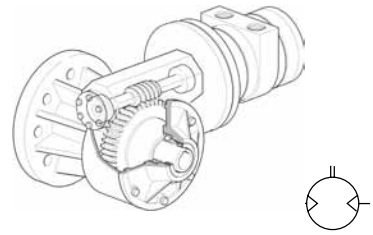


P1V-A360D0003••
P1V-A360E0003••



 Working range of motor

NOTE! All technical data are based on a working pressure of 6 bar.



F: Motor with worm gear, flange mounting left-hand

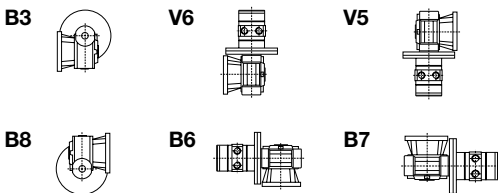
Max power kW	Max speed 1/min	Speed at max power 1/min	Torque at max power Nm	Min start torque Nm	Max permitted torque Nm	Types of self-locking	Air consumption at max power l/s	Connection	Min pipe ID inlet/outlet mm	Weight Kg	Order code
Series P1V-A160											
1,600	430	320	38	57	88	1	32	G1/2	19/19	7,2	P1V-A160F0043••
1,600	200	150	76	114	180	2	32	G1/2	19/19	10,2	P1V-A160F0020••
1,600	95	70	150	225	430	3	32	G1/2	19/19	20,5	P1V-A160F0010••
1,600	75	55	178	267	430	3	32	G1/2	19/19	20,5	P1V-A160F0008••
Series P1V-A260											
2,600	500	350	60	90	88	1	60	G3/4	19/25	11,0	P1V-A260F0050••
2,600	220	150	137	206	430	1	60	G3/4	19/25	21,0	P1V-A260F0022••
2,600	125	85	220	330	430	2	60	G3/4	19/25	21,0	P1V-A260F0013••
2,600	62	40	414	621	1500	3	60	G3/4	19/25	57,0	P1V-A260F0008••
Series P1V-A360											
3,600	500	300	100	150	180	1	80	G1	22/32	22,5	P1V-A360F0050••
3,600	220	130	222	333	430	1	80	G1	22/32	33,0	P1V-A360F0022••
3,600	125	75	368	552	800	2	80	G1	22/32	49,0	P1V-A360F0013••
3,600	62	37	670	1005	1500	3	80	G1	22/32	65,5	P1V-A360F0006••

Note!

•• specify installation position in the order no. as in the illustrations below.

Example: P1V-A160F0066B3

F: Installation positions, worm gear and flange, left-hand



Self-locking

Dynamic self-locking means that the force acting on the output shaft of the gear can not turn the gear further when the air motor is stopped. Dynamic self-locking is only possible when the gear ratio is high, and at low speeds. None of our worm drive gears are completely self-locking in dynamic conditions.

Static self-locking means that the force acting on the output shaft of the gear can not begin to turn the shaft.

When loads with considerable momentum are driven, it is necessary to have a braking time sufficient to stop the gearbox from being overloaded. It is extremely important that the maximum permitted torque is not exceeded.

Tip: Braking of the air motor can be arranged by either slowly restricting the air supply to the motor until it is completely shut off, or by slowly reducing the supply pressure to zero.

Types of Self-locking

1. Static, not self-locking
2. Static, self-locking - quicker return under vibration - not dynamically self-locking
3. Static, self-locking - return only possible under vibration - good dynamic self-locking

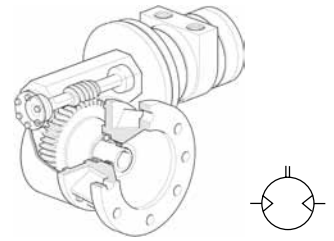
NOTE!

As standard, the motor has a hollow shaft with key slot. Single-ended and double-ended shafts with keys are available as accessories.



Important!

Since it is practically impossible to guarantee total self-locking, an external brake must be used to guarantee that vibration can not cause an output shaft to move.



F: Motor with worm gear, flange mounting right-hand

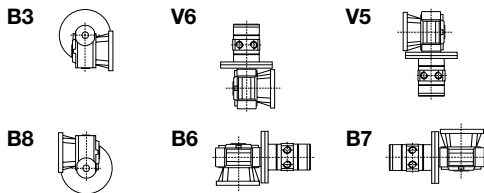
Max power	Max speed	Speed at max power	Torque at max power	Min start torque	Max permitted torque	Types of self-locking	Air consumption at max power	Connection	Min pipe ID inlet/outlet	Weight	Order code
kW	1/min	1/min	Nm	Nm	Nm		l/s		mm	Kg	
Series P1V-A160											
1,600	430	320	38	57	88	1	32	G1/2	19/19	7,2	P1V-A160F0043**
1,600	200	150	76	114	180	2	32	G1/2	19/19	10,2	P1V-A160F0020**
1,600	95	70	150	225	430	3	32	G1/2	19/19	20,5	P1V-A160F0010**
1,600	75	55	178	267	430	3	32	G1/2	19/19	20,5	P1V-A160F0008**
Series P1V-A260											
2,600	500	350	60	90	88	1	60	G3/4	19/25	11,0	P1V-A260F0050**
2,600	220	150	137	206	430	1	60	G3/4	19/25	21,0	P1V-A260F0022**
2,600	125	85	220	330	430	2	60	G3/4	19/25	21,0	P1V-A260F0013**
2,600	62	40	414	621	1500	3	60	G3/4	19/25	57,0	P1V-A260F0008**
Series P1V-A360											
3,600	500	300	100	150	180	1	80	G1	22/32	22,5	P1V-A360F0050**
3,600	220	130	222	333	430	1	80	G1	22/32	33,0	P1V-A360F0022**
3,600	125	75	368	552	800	2	80	G1	22/32	49,0	P1V-A360F0013**
3,600	62	37	670	1005	1500	3	80	G1	22/32	65,5	P1V-A360F0006**

Note!

•• specify installation position in the order no. as in the illustrations below.

Example: P1V-A160G0066B3

G: Installation positions, worm gear and flange, right-hand



Self-locking

Dynamic self-locking means that the force acting on the output shaft of the gear can not turn the gear further when the air motor is stopped. Dynamic self-locking is only possible when the gear ratio is high, and at low speeds. None of our worm drive gears are completely self-locking in dynamic conditions.

Static self-locking means that the force acting on the output shaft of the gear can not begin to turn the shaft.

When loads with considerable momentum are driven, it is necessary to have a braking time sufficient to stop the gearbox from being overloaded. It is extremely important that the maximum permitted torque is not exceeded.

Tip: Braking of the air motor can be arranged by either slowly restricting the air supply to the motor until it is completely shut off, or by slowly reducing the supply pressure to zero.

Types of Self-locking

1. Static, not self-locking
2. Static, self-locking - quicker return under vibration - not dynamically self-locking
3. Static, self-locking - return only possible under vibration - good dynamic self-locking

NOTE!

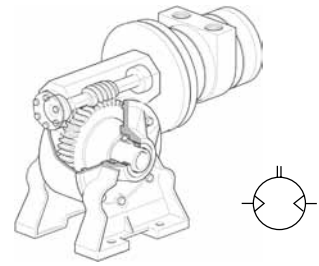
As standard, the motor has a hollow shaft with key slot. Single-ended and double-ended shafts with keys are available as accessories.



Important!

Since it is practically impossible to guarantee total self-locking, an external brake must be used to guarantee that vibration can not cause an output shaft to move.

NOTE! All technical data are based on a working pressure of 6 bar.



H: Motor with worm gear, foot mounting

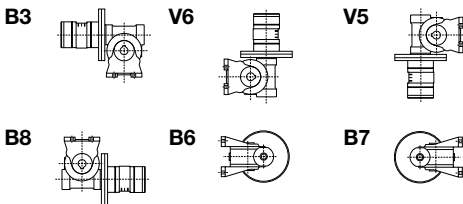
Max power kW	Max speed 1/min	Speed at max power 1/min	Torque at max power Nm	Min start torque Nm	Max permitted torque Nm	Types of self-locking	Air consumption at max power l/s	Connection	Min pipe ID inlet/outlet mm	Weight Kg	Order code
Series P1V-A160											
1,600	430	320	38	57	88	1	32	G1/2	19/19	7,2	P1V-A160H0043**
1,600	200	150	76	114	180	2	32	G1/2	19/19	10,2	P1V-A160H0020**
1,600	95	70	150	225	430	3	32	G1/2	19/19	20,5	P1V-A160H0010**
1,600	75	55	178	267	430	3	32	G1/2	19/19	20,5	P1V-A160H0008**
Series P1V-A260											
2,600	500	350	60	90	88	1	60	G3/4	19/25	11,0	P1V-A260H0050**
2,600	220	150	137	206	430	1	60	G3/4	19/25	21,0	P1V-A260H0022**
2,600	125	85	220	330	430	2	60	G3/4	19/25	21,0	P1V-A260H0013**
2,600	62	40	414	621	1500	3	60	G3/4	19/25	57,0	P1V-A260H0008**
Series P1V-A360											
3,600	500	300	100	150	180	1	80	G1	22/32	22,5	P1V-A360H0050**
3,600	220	130	222	333	430	1	80	G1	22/32	33,0	P1V-A360H0022**
3,600	125	75	368	552	800	2	80	G1	22/32	49,0	P1V-A360H0013**
3,600	62	37	670	1005	1500	3	80	G1	22/32	65,5	P1V-A360H0006**

Note!

** specify installation position in the order no. as in the illustrations below.

Example: **P1V-A160H0066B3**

H: Installation positions, worm gear and foot



Self-locking

Dynamic self-locking means that the force acting on the output shaft of the gear can not turn the gear further when the air motor is stopped. Dynamic self-locking is only possible when the gear ratio is high, and at low speeds. None of our worm drive gears are completely self-locking in dynamic conditions.

Static self-locking means that the force acting on the output shaft of the gear can not begin to turn the shaft.

When loads with considerable momentum are driven, it is necessary to have a braking time sufficient to stop the gearbox from being overloaded. It is extremely important that the maximum permitted torque is not exceeded.

Tip: Braking of the air motor can be arranged by either slowly restricting the air supply to the motor until it is completely shut off, or by slowly reducing the supply pressure to zero.

Types of Self-locking

1. Static, not self-locking
2. Static, self-locking - quicker return under vibration - not dynamically self-locking
3. Static, self-locking - return only possible under vibration - good dynamic self-locking

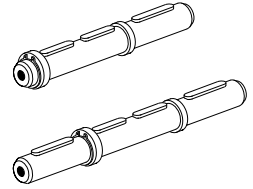
NOTE!

As standard, the motor has a hollow shaft with key slot. Single-ended and double-ended shafts with keys are available as accessories.


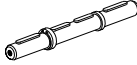


Important!

Since it is practically impossible to guarantee total self-locking, an external brake must be used to guarantee that vibration can not cause an output shaft to move.



Shaft with keys for P1V-A with worm gear

Motor type	Single-ended shaft Order code	Weight kg	Double-ended shaft Order code	Weight kg
				
Serie P1V-A160				
P1V-A160□0043●●	9121 5102-42	0,60	9121 5102-47	0,77
P1V-A160□0020●●	9121 5102-43	0,75	9121 5102-48	0,95
P1V-A160□0010●●	9121 5102-44	1,60	9121 5102-49	2,00
P1V-A160□0008●●	9121 5102-44	1,60	9121 5102-49	2,00
Serie P1V-A260				
P1V-A260□0050●●	9121 5102-42	0,60	9121 5102-47	0,77
P1V-A260□0022●●	9121 5102-44	1,60	9121 5102-49	2,00
P1V-A260□0013●●	9121 5102-44	1,60	9121 5102-49	2,00
P1V-A260□0008●●	9121 5102-46	3,20	9121 5102-51	4,10
Serie P1V-A360				
P1V-A360□0050●●	9121 5102-43	0,75	9121 5102-48	0,95
P1V-A360□0022●●	9121 5102-44	1,60	9121 5102-49	2,00
P1V-A360□0013●●	9121 5102-45	2,80	9121 5102-50	3,60
P1V-A360□0006●●	9121 5102-46	3,20	9121 5102-51	4,10

□ Motor with worm gear (functions F, G and H)

●● Installation position, optional

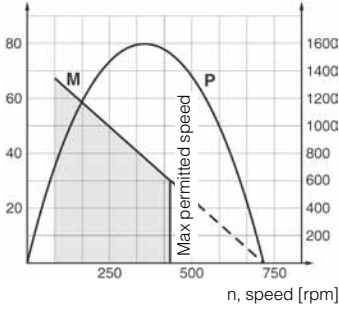
P1V-A160F0043••

P1V-A160G0043••

P1V-A160H0043••

M, torque [Nm]

P, power [W]



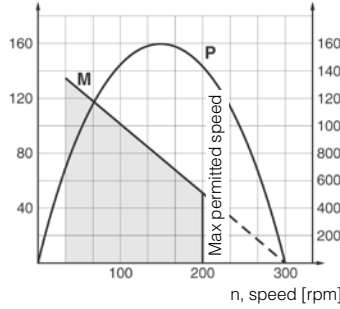
P1V-A160F0020••

P1V-A160G0020••

P1V-A160H0020••

M, torque [Nm]

P, power [W]



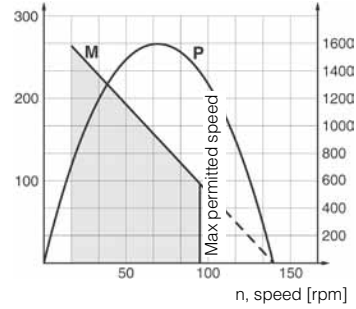
P1V-A160F0010••

P1V-A160G0010••

P1V-A160H0010••

M, torque [Nm]

P, power [W]



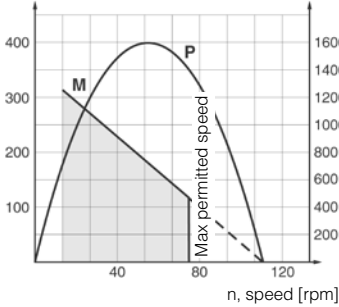
P1V-A160F0008••

P1V-A160G0008••

P1V-A160H0008••

M, torque [Nm]

P, power [W]



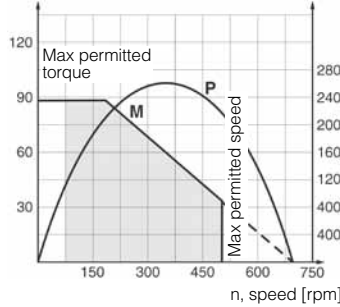
P1V-A260F0050••

P1V-A260G0050••

P1V-A260H0050••

M, torque [Nm]

P, power [W]



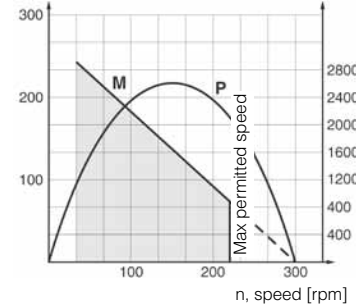
P1V-A260F0022••

P1V-A260G0022••

P1V-A260H0022••

M, torque [Nm]

P, power [W]



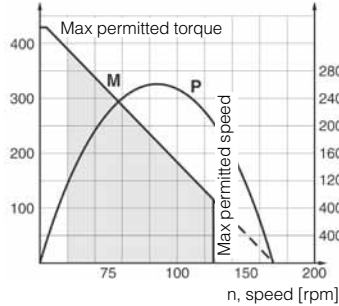
P1V-A260F0013••

P1V-A260G0013••

P1V-A260H0013••

M, torque [Nm]

P, power [W]



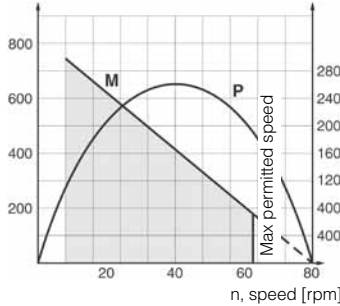
P1V-A260F0008••

P1V-A260G0008••

P1V-A260H0008••

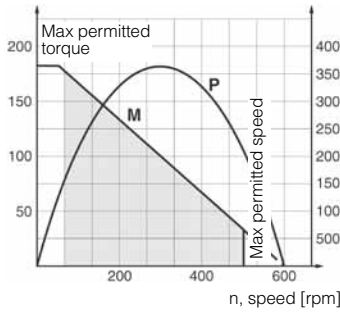
M, torque [Nm]

P, power [W]

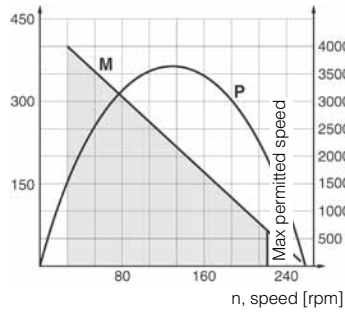


 Working range of motor

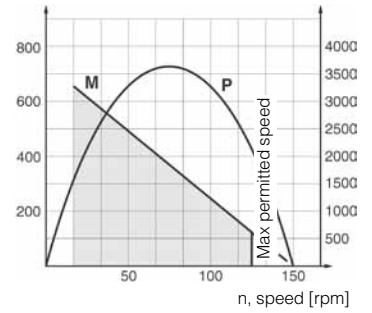
P1V-A360F0050••
P1V-A360G0050••
P1V-A360H0050••
 M, torque [Nm] P, power [W]



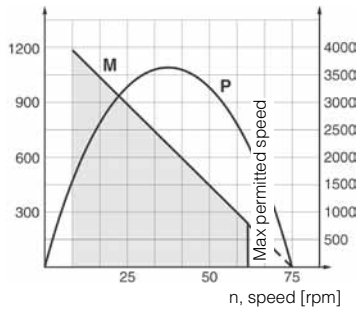
P1V-A360F0022••
P1V-A360G0022••
P1V-A360H0022••
 M, torque [Nm] P, power [W]



P1V-A360F0013••
P1V-A360G0013••
P1V-A360H0013••
 M, torque [Nm] P, power [W]



P1V-A360F0006••
P1V-A360G0006••
P1V-A360H0006••
 M, torque [Nm] P, power [W]

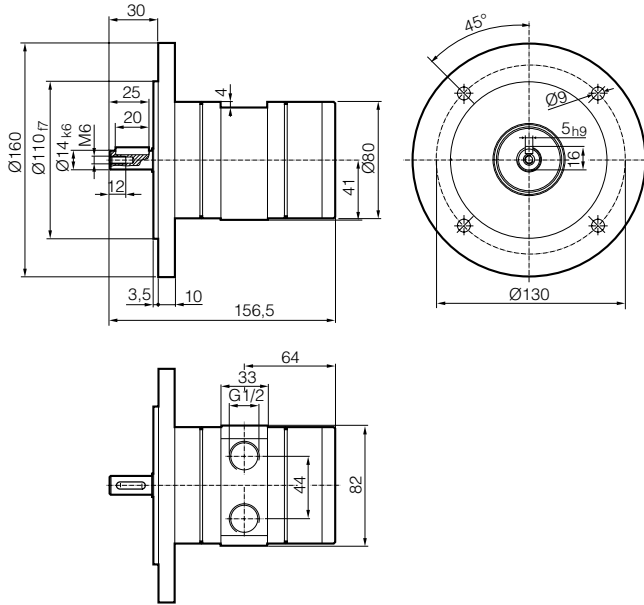


 Working range of motor

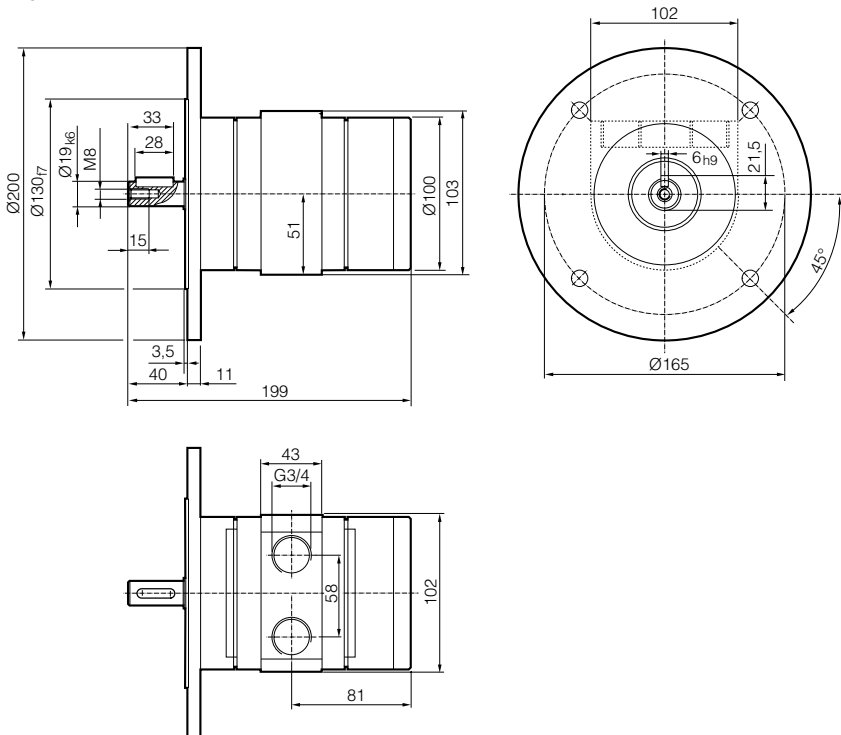


Dimensions (mm)

Motor P1V-A160A0900
Flange IEC 71 A B5



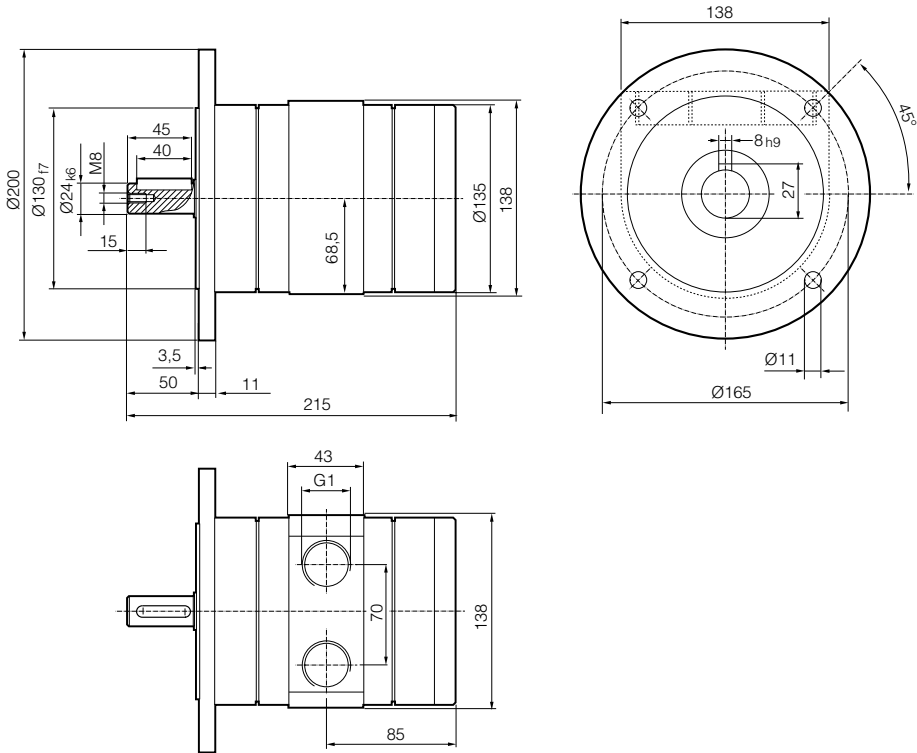
Motor P1V-A260A0700
Flange IEC 80 A B5



Dimensions (mm)

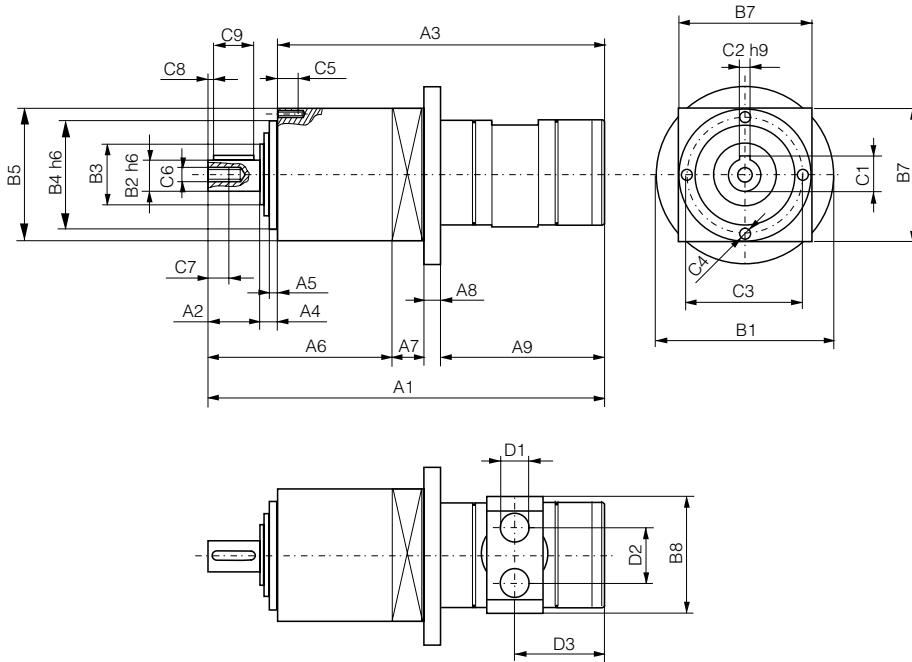
Motor P1V-A360A0600

Flange IEC 90 A B5



Dimensions (mm)

Motor with planetary gear

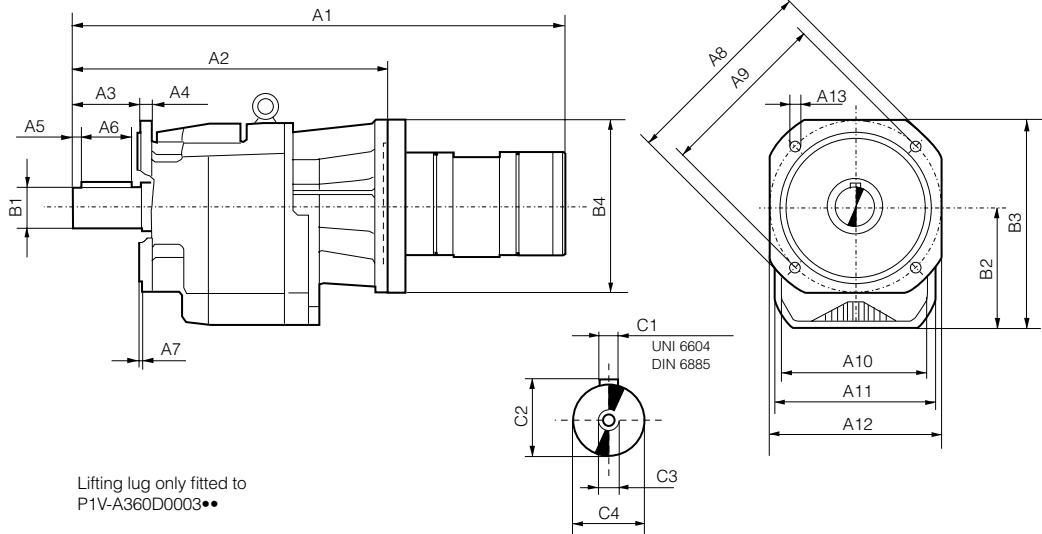


Order code	A1	A2	A3	A4	A5	A6	A7	A8	A9	B1	B2	B3	B4	B5	B6
P1V-A160B0120	274,5	36	228,5	10	5	126,0	22	10	116,5	160	22	40	68	90	80
P1V-A160B0060	274,5	36	228,5	10	5	126,0	22	10	116,5	160	22	40	68	90	80
P1V-A160B0019	359,0	58	289,0	12	5	204,5	28	10	116,5	160	32	50	90	120	80
P1V-A160B0010	359,0	58	289,0	12	5	204,5	28	10	116,5	160	32	50	90	120	80
P1V-A260B0120	317,0	36	271,0	10	6	126,0	32	11	148,0	200	22	40	68	90	100
P1V-A260B0060	317,0	36	271,0	10	6	126,0	32	11	148,0	200	22	40	68	90	100
P1V-A260B0019	391,5	58	321,5	12	6	204,5	28	11	148,0	200	32	50	90	120	100
P1V-A360B0096	375,0	58	305,0	12	6	172,0	38	11	154,0	200	32	50	90	120	135
P1V-A360B0048	375,0	58	305,0	12	6	172,0	38	11	154,0	200	32	50	90	120	135

Order code	B7	B8	C1	C2	C3	C4	C5	C6	C7	C8	C9	D1	D2	D3
P1V-A160B0120	120	85	24,5	6	80	M6	12	M8	13	2	32	G1/2	44	64
P1V-A160B0060	120	85	24,5	6	80	M6	12	M8	13	2	32	G1/2	44	64
P1V-A160B0019	120	85	35,0	10	108	M8	16	M12	22	4	50	G1/2	44	64
P1V-A160B0010	120	85	35,0	10	108	M8	16	M12	22	4	50	G1/2	44	64
P1V-A260B0120	140	102	24,5	6	80	M6	12	M8	13	2	32	G3/4	58	81
P1V-A260B0060	140	102	24,5	6	80	M6	12	M8	13	2	32	G3/4	58	81
P1V-A260B0019	140	102	35,0	10	108	M8	16	M12	22	4	50	G3/4	58	81
P1V-A360B0096	140	138	35,0	10	108	M8	16	M12	22	4	50	G1	70	85
P1V-A360B0048	140	138	35,0	10	108	M8	16	M12	22	4	50	G1	70	85

Dimensions (mm)

Motor with helical gear, flange mounting



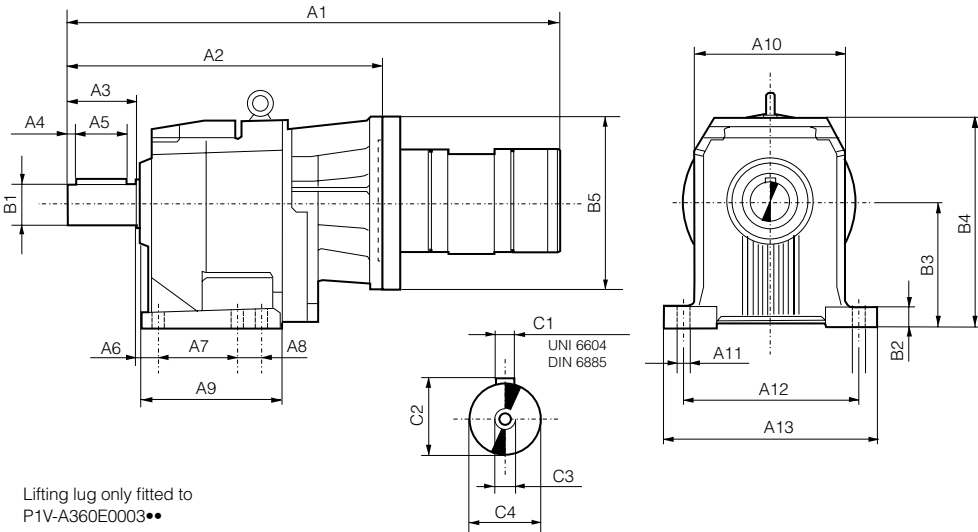
Lifting lug only fitted to P1V-A360D0003••

Order code	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	B1	B2	B3
P1V-A160D0066••	370,5	244	40	8	5	30	3,0	140	115	95f7	95	105	9,5	20	82	138,0
P1V-A160D0032••	399,5	273	50	10	5	40	3,5	160	130	110f7	110	135	9,5	25	92	159,5
P1V-A160D0014••	433,5	307	60	12	5	50	3,5	200	165	130f7	130	150	11,5	30	108	183,0
P1V-A160D0008••	463,5	337	70	13	5	60	4,0	250	215	180f7	155	210	14,0	35	128	233,0
P1V-A160D0004••	559,5	433	80	16	5	70	5,0	300	265	230f7	185	260	14,0	40	152	282,0
P1V-A160D0003••	601,5	475	100	16	5	90	5,0	300	265	230f7	210	260	14,0	50	190	320,0
P1V-A260D0080••	423,0	264	40	8	5	30	3,0	140	115	95f7	95	105	9,5	20	82	138,0
P1V-A260D0052••	451,0	292	50	10	5	40	3,5	160	130	110f7	110	135	9,5	25	92	159,5
P1V-A260D0025••	486,0	327	60	12	5	50	3,5	200	165	130f7	130	150	11,5	30	108	183,0
P1V-A260D0011••	515,0	356	70	13	5	60	4,0	250	215	180f7	155	210	14,0	35	128	233,0
P1V-A260D0006••	612,0	453	80	16	5	70	5,0	300	265	230f7	185	260	14,0	40	152	282,0
P1V-A260D0003••	634,0	475	100	16	5	90	5,0	300	265	230f7	210	260	14,0	50	190	320,0
P1V-A360D0105••	458,0	292	50	10	5	40	3,5	160	130	110f7	110	135	9,5	25	92	159,5
P1V-A360D0052••	458,0	292	50	10	5	40	3,5	160	130	110f7	110	135	9,5	25	92	159,5
P1V-A360D0025••	521,0	356	70	13	5	60	4,0	250	215	180f7	155	210	14,0	35	128	233,0
P1V-A360D0013••	547,0	382	80	16	5	70	5,0	300	265	230f7	185	260	14,0	40	152	282,0
P1V-A360D0006••	640,0	475	100	16	5	90	5,0	300	265	230f7	210	260	14,0	50	190	320,0
P1V-A360D0003••	699,0	534	140	20	15	110	5,0	400	350	300f7	320	350	18,0	80	247	424,0

Order code	B4	C1	C2	C3	C4
P1V-A160D0066••	160	6x6x30	22,5	M8x19	20 h6
P1V-A160D0032••	160	8x7x40	28,0	M8x19	25 h6
P1V-A160D0014••	160	8x7x50	33,0	M10x22	30 h6
P1V-A160D0008••	160	10x8x60	38,0	M10x22	35 h6
P1V-A160D0004••	160	12x8x70	43,0	M12x28	40 h6
P1V-A160D0003••	160	14x9x90	53,5	M16x36	50 h6
P1V-A260D0080••	200	6x6x30	22,5	M8x19	20 h6
P1V-A260D0052••	200	8x7x40	28,0	M8x19	25 h6
P1V-A260D0025••	200	8x7x50	33,0	M10x22	30 h6
P1V-A260D0011••	200	10x8x60	38,0	M10x22	35 h6
P1V-A260D0006••	200	12x8x70	43,0	M12x28	40 h6
P1V-A260D0003••	200	14x9x90	53,5	M16x36	50 h6
P1V-A360D0105••	200	8x7x40	28,0	M8x19	25 h6
P1V-A360D0052••	200	8x7x40	28,0	M8x19	25 h6
P1V-A360D0025••	200	10x8x60	38,0	M10x22	35 h6
P1V-A360D0013••	200	12x8x70	43,0	M12x28	40 h6
P1V-A360D0006••	200	14x9x90	53,5	M16x36	50 h6
P1V-A360D0003••	200	22x14x110	85,0	M20x42	80 h6

Dimensions (mm)

Motor with helical gear, foot mounting



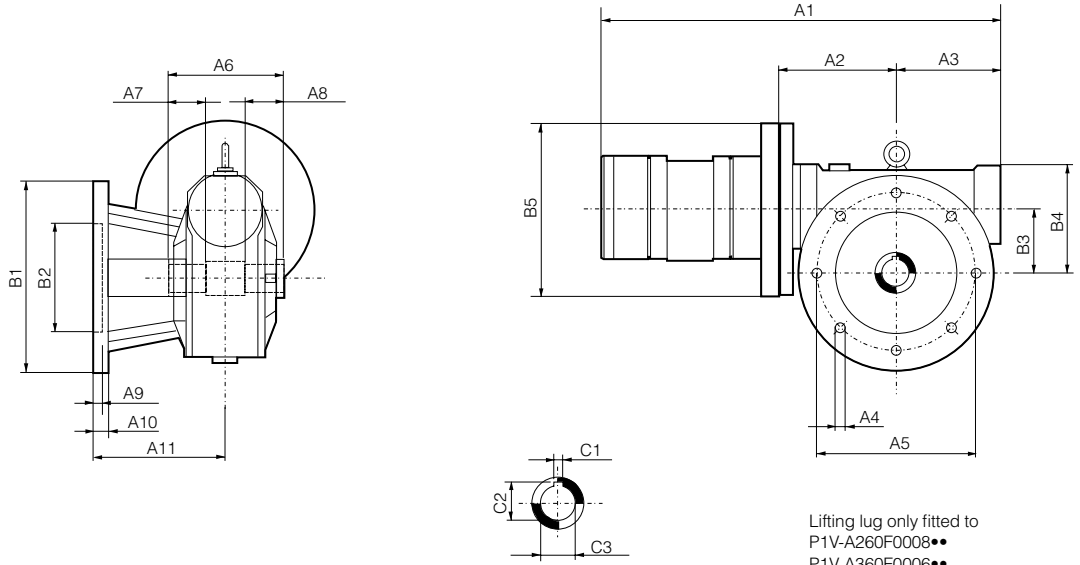
Lifting lug only fitted to
P1V-A360E0003••

Order code	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	B1	B2	B3
P1V-A160E0066••	370,5	244	40	5	30	18	50	37,0	107,0	95	9	110	130	20	15	85
P1V-A160E0032••	399,5	273	50	5	40	18	60	47,5	137,0	110	11	130	155	25	17	100
P1V-A160E0014••	433,5	307	60	5	50	18	70	60,0	156,0	130	11	160	190	30	20	110
P1V-A160E0008••	463,5	337	70	5	60	20	105	44,5	185,5	155	14	180	216	35	18	130
P1V-A160E0004••	559,5	433	80	5	70	25	110	46,0	200,0	185	18	225	270	40	22	155
P1V-A160E0003••	601,5	475	100	5	90	25	145	35,0	222,0	210	18	250	300	50	25	195
P1V-A260E0080••	413,0	244	40	5	30	18	50	37,0	107,0	95	9	110	130	20	15	85
P1V-A260E0052••	451,0	292	50	5	40	18	60	47,5	137,0	110	11	130	155	25	17	100
P1V-A260E0025••	486,0	327	60	5	50	18	70	60,0	156,0	130	11	160	190	30	20	110
P1V-A260E0011••	515,0	356	70	5	60	20	105	44,5	185,5	155	14	180	216	35	18	130
P1V-A260E0006••	612,0	453	80	5	70	25	110	46,0	200,0	185	18	225	270	40	22	155
P1V-A260E0003••	654,0	495	100	5	90	25	145	35,0	222,0	210	18	250	300	50	25	195
P1V-A360E0105••	457,0	292	50	5	40	18	60	47,5	137,0	110	11	130	155	25	17	100
P1V-A360E0052••	457,0	292	50	5	40	18	60	47,5	137,0	110	11	130	155	25	17	100
P1V-A360E0025••	521,0	356	70	5	60	20	105	44,5	185,5	155	14	180	216	35	18	130
P1V-A360E0013••	547,0	382	80	5	70	25	110	46,0	200,0	185	18	225	270	40	22	155
P1V-A360E0006••	660,0	495	100	5	90	25	145	35,0	222,0	210	18	250	300	50	25	195
P1V-A360E0003••	699,0	534	140	15	110	33	210	—	277,0	320	26	370	440	80	35	250

Order code	B4	B5	C1	C2	C3	C4
P1V-A160E0066••	141	160	6x6x30	22,5	M8x19	20 h6
P1V-A160E0032••	166	160	8x7x40	28,0	M8x19	25 h6
P1V-A160E0014••	181	160	8x7x50	33,0	M10x22	30 h6
P1V-A160E0008••	223	160	10x8x60	38,0	M10x22	35 h6
P1V-A160E0004••	278	160	12x8x70	43,0	M12x28	40 h6
P1V-A160E0003••	316	160	14x9x90	53,5	M16x36	50 h6
P1V-A260E0080••	141	200	6x6x30	22,5	M8x19	20 h6
P1V-A260E0052••	166	200	8x7x40	28,0	M8x19	25 h6
P1V-A260E0025••	181	200	8x7x50	33,0	M10x22	30 h6
P1V-A260E0011••	223	200	10x8x60	38,0	M10x22	35 h6
P1V-A260E0006••	278	200	12x8x70	43,0	M12x28	40 h6
P1V-A260E0003••	316	200	14x9x90	53,5	M16x36	50 h6
P1V-A360E0105••	166	200	8x7x40	28,0	M8x19	25 h6
P1V-A360E0052••	166	200	8x7x40	28,0	M8x19	25 h6
P1V-A360E0025••	223	200	10x8x60	38,0	M10x22	35 h6
P1V-A360E0013••	278	200	12x8x70	43,0	M12x28	40 h6
P1V-A360E0006••	316	200	14x9x90	53,5	M16x36	50 h6
P1V-A360E0003••	420	200	22x14x110	85,0	M20x42	80 h6

Dimensions (mm)

Motor with worm gear, flange mounting, left-hand



Lifting lug only fitted to
P1V-A260F0008••
P1V-A360F0006••

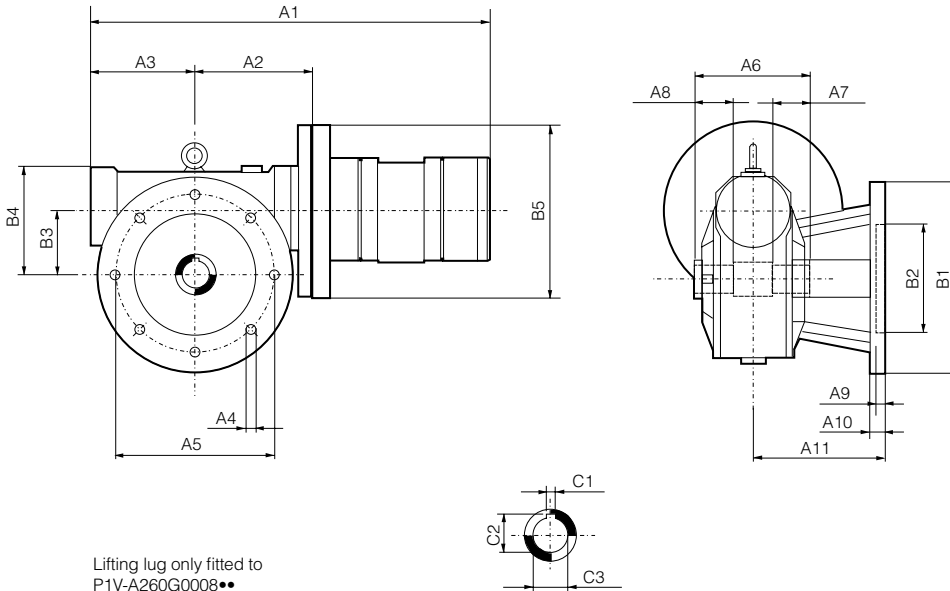
As standard, the motor has a hollow shaft with key slot.

Order code	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3
P1V-A160F0043••	259,5	70	63	10,5	90	82	22,5	22,5	10	12	85,0	125	70 H8	49,50
P1V-A160F0020••	301,5	95	80	10,5	130	120	40,0	40,0	8	11	116,0	180	115 H8	62,17
P1V-A160F0010••	362,5	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A160F0008••	362,5	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A260F0050••	292,0	70	63	10,5	90	82	22,5	22,5	10	12	85,0	125	70 H8	49,50
P1V-A260F0022••	395,0	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A260F0013••	395,0	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A260F0008••	498,0	185	154	16,0	255	165	52,5	52,5	18	20	197,5	320	180 H8	130,00
P1V-A360F0050••	340,0	95	80	10,5	130	120	40,0	40,0	8	11	116,0	180	115 H8	62,17
P1V-A360F0022••	401,0	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A360F0013••	456,0	153	138	13,5	230	155	45,0	45,0	18	20	179,5	280	170 H8	110,10
P1V-A360F0006••	504,0	185	154	16,0	255	165	52,5	52,5	18	20	197,5	320	180 H8	130,00

Order code	B4	B5	C1	C2	C3
P1V-A160F0043••	80,0	160	8 H8	28,3	25 H7
P1V-A160F0020••	98,5	160	8 H8	28,3	25 H7
P1V-A160F0010••	138,0	160	10 H8	38,3	35 H7
P1V-A160F0008••	138,0	160	10 H8	38,3	35 H7
P1V-A260F0050••	80,0	200	8 H8	28,3	25 H7
P1V-A260F0022••	138,0	200	10 H8	38,3	35 H7
P1V-A260F0013••	138,0	200	10 H8	38,3	35 H7
P1V-A260F0008••	195,0	200	14 H8	48,8	45 H7
P1V-A360F0050••	98,5	200	8 H8	28,3	25 H7
P1V-A360F0022••	138,0	200	10 H8	38,3	35 H7
P1V-A360F0013••	169,0	200	12 H8	45,3	42 H7
P1V-A360F0006••	195,0	200	14 H8	48,8	45 H7

Dimensions (mm)

Motor with worm gear, flange mounting, right-hand



Lifting lug only fitted to
P1V-A260G0008••
P1V-A360G0006••

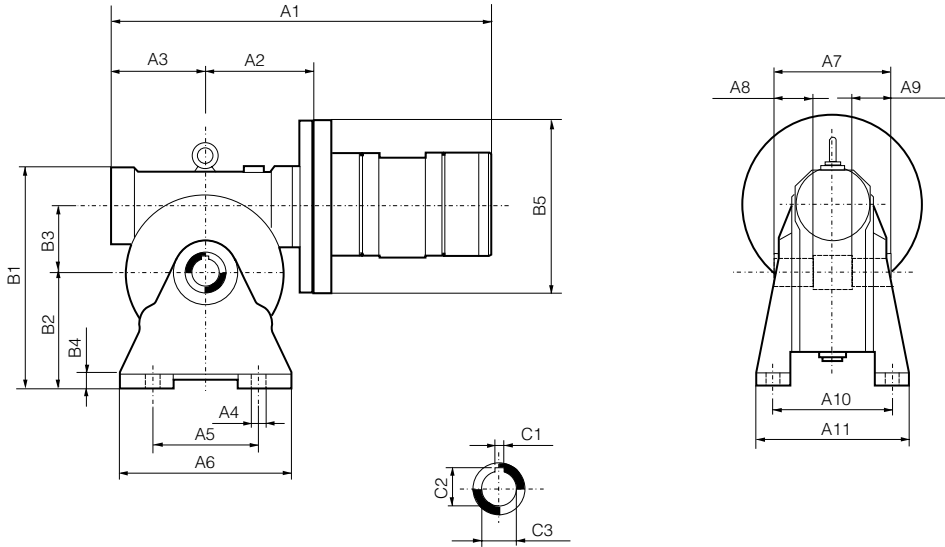
As standard, the motor has a hollow shaft with key slot.

Order code	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3
P1V-A160G0043••	259,5	70	63	10,5	90	82	22,5	22,5	10	12	85,0	125	70 H8	49,50
P1V-A160G0020••	301,5	95	80	10,5	130	120	40,0	40,0	8	11	116,0	180	115 H8	62,17
P1V-A160G0010••	362,5	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A160G0008••	362,5	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A260G0050••	292,0	70	63	10,5	90	82	22,5	22,5	10	12	85,0	125	70 H8	49,50
P1V-A260G0022••	395,0	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A260G0013••	395,0	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A260G0008••	498,0	185	154	16,0	255	165	52,5	52,5	18	20	197,5	320	180 H8	130,00
P1V-A360G0050••	340,0	95	80	10,5	130	120	40,0	40,0	8	11	116,0	180	115 H8	62,17
P1V-A360G0022••	401,0	126	110	12,5	176	140	45,0	45,0	15	15	151,0	210	152 H8	86,90
P1V-A360G0013••	456,0	153	138	13,5	230	155	45,0	45,0	18	20	179,5	280	170 H8	110,10
P1V-A360G0006••	504,0	185	154	16,0	255	165	52,5	52,5	18	20	197,5	320	180 H8	130,00

Order code	B4	B5	C1	C2	C3
P1V-A160G0043••	80,0	160	8 H8	28,3	25 H7
P1V-A160G0020••	98,5	160	8 H8	28,3	25 H7
P1V-A160G0010••	138,0	160	10 H8	38,3	35 H7
P1V-A160G0008••	138,0	160	10 H8	38,3	35 H7
P1V-A260G0050••	80,0	200	8 H8	28,3	25 H7
P1V-A260G0022••	138,0	200	10 H8	38,3	35 H7
P1V-A260G0013••	138,0	200	10 H8	38,3	35 H7
P1V-A260G0008••	195,0	200	14 H8	48,8	45 H7
P1V-A360G0050••	98,5	200	8 H8	28,3	25 H7
P1V-A360G0022••	138,0	200	10 H8	38,3	35 H7
P1V-A360G0013••	169,0	200	12 H8	45,3	42 H7
P1V-A360G0006••	195,0	200	14 H8	48,8	45 H7

Dimensions (mm)

Motor with worm gear, foot mounting



Lifting lug only fitted to
 P1V-A260H0008••
 P1V-A360H0006••

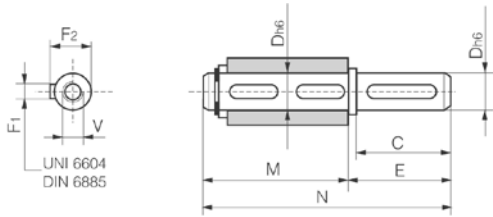
As standard, the motor has a hollow shaft with key slot.

Order code	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3
P1V-A160H0043••	259,5	70	63	8,5	63	110	82	22,5	22,5	98,5	124	162	82	49,50
P1V-A160H0020••	301,5	95	80	10,5	95	140	120	40,0	40,0	111,0	143	199	100	62,17
P1V-A160H0010••	362,5	126	110	11,0	140	220	140	45,0	45,0	146,0	186	280	142	86,90
P1V-A160H0008••	362,5	126	110	11,0	140	220	140	45,0	45,0	146,0	186	280	142	86,90
P1V-A260H0050••	292,0	70	63	8,5	63	110	82	22,5	22,5	98,5	124	162	82	49,50
P1V-A260H0022••	395,0	126	110	11,0	140	220	140	45,0	45,0	146,0	186	280	142	86,90
P1V-A260H0013••	395,0	126	110	11,0	140	220	140	45,0	45,0	146,0	186	280	142	86,90
P1V-A260H0008••	498,0	185	154	16,0	220	310	165	52,5	52,5	191,0	245	398	195	130,00
P1V-A360H0050••	340,0	95	80	10,5	95	140	120	40,0	40,0	111,0	143	199	100	62,17
P1V-A360H0022••	401,0	126	110	11,0	140	220	140	45,0	45,0	146,0	186	280	142	86,90
P1V-A360H0013••	456,0	138	153	12,5	200	270	155	45,0	45,0	181,0	220	339	170	110,10
P1V-A360H0006••	504,0	185	154	16,0	220	310	165	52,5	52,5	191,0	245	398	195	130,00

Order code	B4	B5	C1	C2	C3
P1V-A160H0043••	12	160	8 H8	28,3	25 H7
P1V-A160H0020••	12	160	8 H8	28,3	25 H7
P1V-A160H0010••	14	160	10 H8	38,3	35 H7
P1V-A160H0008••	14	160	10 H8	38,3	35 H7
P1V-A260H0050••	12	200	8 H8	28,3	25 H7
P1V-A260H0022••	14	200	10 H8	38,3	35 H7
P1V-A260H0013••	14	200	10 H8	38,3	35 H7
P1V-A260H0008••	18	200	14 H8	48,8	45 H7
P1V-A360H0050••	12	200	8 H8	28,3	25 H7
P1V-A360H0022••	14	200	10 H8	38,3	35 H7
P1V-A360H0013••	15	200	12 H8	45,3	42 H7
P1V-A360H0006••	18	200	14 H8	48,8	45 H7

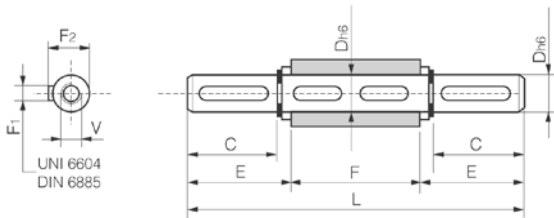
Dimensions (mm)

Shaft with keys for P1V-A motor with worm gear



Single-ended shaft

Order code	C	D	E	F1	F2	M	N	V
9121 5102-42	60	25	65	8	28,0	89	154	M8x20
9121 5102-43	60	25	65	8	28,0	127	192	M8x20
9121 5102-44	60	35	65	10	38,0	149	214	M10x25
9121 5102-45	75	42	80	12	45,0	164	244	M12x32
9121 5102-46	80	45	85	14	48,5	176	261	M12x32



Double-ended shaft

Order code	C	D	E	F	F1	F2	L	V
9121 5102-47	60	25	63,20	82	8	28,0	208,4	M8x20
9121 5102-48	60	25	63,20	120	8	28,0	246,4	M8x20
9121 5102-49	60	35	64,00	140	10	38,0	268,0	M10x25
9121 5102-50	75	42	79,25	155	12	45,0	313,5	M12x32
9121 5102-51	80	45	84,75	165	14	48,5	334,5	M12x32

Permitted shaft loadings

Basic motors

Max permitted load on output shaft for basic motors (based on 10,000,000 revolutions of the output shaft, with 90% probable service life for ball bearings).

	F_{ax} N	F_{rad} N	a mm
P1V-A160A0900	600	1000	15
P1V-A260A0700	700	1400	20
P1V-A360A0600	900	1900	25

F_{rad} = Radial loading (N)

F_{ax} = Axial loading (N)

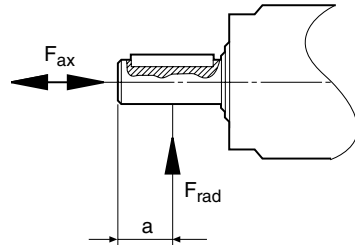


Fig. 1: Loading on output shaft.

Motors with planetary gears

The following calculations should be used to determine the loading on the output shaft bearing, if a service life of 10,000,000 revolutions of the output shaft is to be obtained with 90% probability.

$$F_{ax} = \max 0,24 \times F_{rad}$$

$$M = \pm F_{ax} \times r \pm F_{rad} \times (X + K)$$

Where M and K are found in the table below

	M Nm	K N
P1V-A160B120	2651	0,031
P1V-A160B060	2651	0,031
P1V-A160B019	7385	0,040
P1V-A160B010	7385	0,040
P1V-A260B120	2651	0,031
P1V-A260B060	2651	0,031
P1V-A260B019	7385	0,040
P1V-A360B096	7385	0,040
P1V-A360B048	7385	0,040

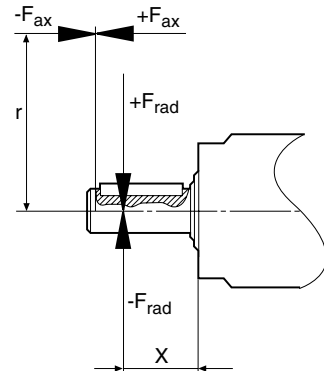


Fig 2: Load and braking torque on output shaft of planetary gear

- M Max. torque loading on output shaft (Nm)
- r Distance from centre of output shaft to axial load (m)
- X Distance from collar to radial load (m)
- F_{rad} Radial loading (N)
- F_{ax} Axial loading (N)

Motors with helical gear or worm gear

Radial forces

Depending on the application, the drive shaft of the gearbox can be subjected to various radial forces, which can be calculated as follows:

$$F_{rad} = 2000 \times M \times K_r / d$$

- F_{rad} Radial force (N)
- M Torque (Nm)
- d Diameter of wheel, pulley, sprocket or gear wheel (mm)
- $K_r = 1$ Sprocket constant
- $K_r = 1.25$ Gear wheel constant
- $K_r = 1.5 - 2.5$ Vee-belt pulley constant

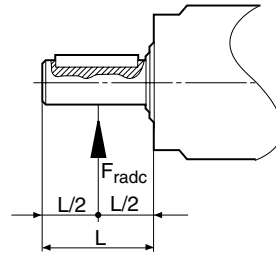


Fig. 3: Force applied at centre of shaft

Depending on the point of application of the force (please refer to the adjacent figure), the following two cases are found:

- a. The force is applied to the centre of the output shaft, as in figure 3. This value can be read off on the table below, where consideration must be given to the following:

$$F_{radc} \leq F_{rt}$$

- b. The force is applied at a distance x, as in figure 4. This value can be calculated as follows:

$$F_{radx} = F_{rt} \times a / (b + X) \quad \text{gäller för } L/2 < X < c$$

- F_{rt} Permissible radial force on centre of output-shaft (N)
- a Gear constant
- b Gear constant
- c Gear constant
- X Distance from shoulder on shaft to point of application of force (mm)

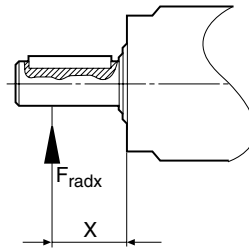


Fig. 4: Force applied at distance X

All values are found in the table below. The following should be considered, however:

$$F_{radc} \leq F_{radx}$$

Axial forces

The maximum permissible axial force can be calculated as follows:

$$F_{ax} = F_{rt} \times 0,2$$

Table, Motor with helical gear

Motor	a	b	c	F_{rt} N
P1V-A160p0066••	46,0	26,0	450	1130
P1V-A160p0032••	54,5	29,5	550	2480
P1V-A160p0014••	60,5	30,5	750	4710
P1V-A160p0008••	69,0	34,0	850	6620
P1V-A160p0004••	80,5	40,5	900	10000
P1V-A160p0003••	98,5	48,5	1000	16000
P1V-A260p0080••	46,0	26,0	450	660
P1V-A260p0052••	54,5	29,5	550	2110
P1V-A260p0025••	60,5	30,5	750	3850
P1V-A260p0011••	69,0	34,0	850	5660
P1V-A260p0006••	80,5	40,5	900	10000
P1V-A260p0003••	98,5	48,5	1000	16000
P1V-A360p0105••	54,5	29,5	550	1640
P1V-A360p0052••	54,5	29,5	550	2110
P1V-A360p0025••	69,0	34,0	850	4280
P1V-A360p0013••	80,5	40,5	900	6890
P1V-A360p0006••	98,5	48,5	1000	16000
P1V-A360p0003••	131,0	61,0	1500	35000

Table, Motor with worm gear

Motor	a	b	F_{rt} N
P1V-A160p0043••	99	69	3450
P1V-A160p0020••	132	102	4700
P1V-A160p0010••	147	117	7000
P1V-A160p0008••	147	117	7000
P1V-A260p0050••	99	69	3450
P1V-A260p0022••	147	117	7000
P1V-A260p0013••	147	117	7000
P1V-A260p0008••	182	142	13800
P1V-A360p0050••	132	102	4700
P1V-A360p0022••	147	117	7000
P1V-A360p0013••	171	134	8000
P1V-A360p0006••	182	142	13800

Service kits for basic motor

The following kits are available for the basic motors, consisting of vanes, O-rings and springs:

Service kit, vanes for intermittent lubrication-free operation

For motor	Order code
P1V-A160A0900	9121 7206-30
P1V-A260A0700	9121 7206-31
P1V-A360A0600	9121 7206-32

Service kit, vanes for continuous lubrication-free operation, option "C"

For motor	Order code
P1V-A160AC900	9121 7206-33
P1V-A260AC700	9121 7206-34
P1V-A360AC600	9121 7206-35

C

Theoretical calculations

This section provides you with the background you need in order to select the right air motor for common applications. The first four parts explain the direct physical relationships between:

Force - Torque - Speed - Power Requirement

Before selecting an air motor, you need to know the torque required by the application at the necessary speed. Sometimes, the torque and the speed are not known but the power requirement and the speed of movement are. You can use the following formulas to calculate the speed and torque.

Power

The power requirement is always calculated in N.

Formula:

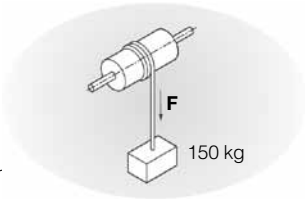
$$F = m \times g$$

F = power in N
m = mass in kg
g = gravitation (9,81) in r

In this example, the mass is 150 kg

$$F = 150 \times 9,81 \text{ N}$$

$$F = 1470 \text{ N}$$



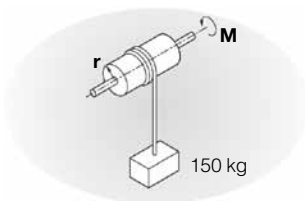
Torque

Torque is the force applied to produce rotational motion (rotational force) or the force applied in the opposite direction. It is the product of the rotational force F and the distance from the pivot point (radius or moment arm)

Formula:

$$M = m \times g \times r$$

M = torque in Nm
m = mass in kg
g = gravitation (9,81) in n/s-
r = radius or moment arm in m



In this example, the drum diameter is 300 mm, which means the radius $r = 0,15 \text{ m}$, and the mass is 150kg.

$$M = 150 \times 9,81 \times 0,15 \text{ Nm}$$

$$M = 221 \text{ Nm}$$

Speed

The required motor speed can be calculated if the speed of movement and the radius (diameter) are known.

$$n = v \times 60 / (2 \times \pi \times r)$$

n = motor speed in rpm

v = speed of movement in m/sec

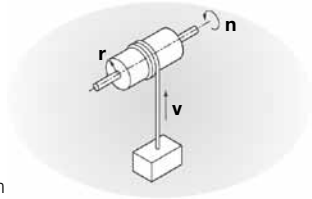
r = radius in m

π = constant (3,14)

In this example, the speed of movement is 1,5 m/s and the drum diameter is 300 m (radius $r = 0,15 \text{ m}$)

$$n = 1,5 \times 60 / (2 \times \pi \times 0,15) \text{ rpm}$$

$$n = 96 \text{ rpm}$$



Power Requirement

The power requirement can be calculated if the motor speed and torque are known.

$$P = M \times n / 9550$$

P = power in kW

M = torque in Nm

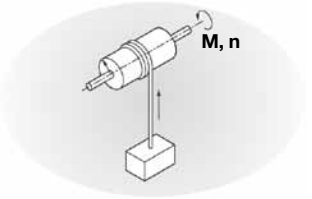
n = rpm

9550 = conversion factor

In this example, a torque of 1,25 Nm is required at a speed of 1500 rpm.

$$P = 1,25 \times 1500 / 9550$$

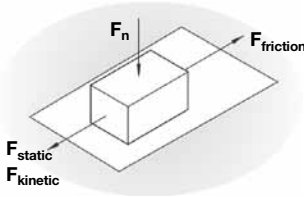
$$P = 0,196 \text{ kW or approx. 200 Watt}$$



Frictional Forces between two Objects

A frictional force always occurs between two objects with surfaces in contact with each other. It is always exerted against the direction of movement.

The frictional force is either static or kinetic. When selecting an air motor, we need to consider the larger of the two forces, static or kinetic.



The size of the static frictional force or the kinetic frictional force is the product of the normal force F_n and the coefficient of static friction (μ_0), or the product of the normal force F_n and the coefficient of kinetic friction (μ).

The size of the contact surface between the objects is irrelevant.

Formula:

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

$$F_n = m \times g$$

- F_{static} = static friction in N
- F_{kinetic} = kinetic friction in N
- F_n = force from object in N
- m = mass in kg
- g = gravitation (9,81) in m/s²

Material		Coefficient of static friction μ_0	
		Dry	Lubricated
Bronze	Bronze	0,28	0,11
Bronze	Grey iron	0,28	0,16
Grey iron	Grey iron	-	0,16
Steel	Bronze	0,27	0,11
Steel	Ice	0,027	-
Steel	Grey iron	0,20	0,10
Steel	Steel	0,15	0,10
Steel	White metal	-	-
Wood	Ice	-	-
Wood	Wood	0,65	0,16
Leather	Grey iron	0,55	0,22
Brake lining	Steel	-	-
Steel	Nylon (polyamide)	-	-

Material		Coefficient of kinetic friction μ	
		Dry	Lubricated
Bronze	Bronze	0,2	0,06
Bronze	Grey iron	0,21	0,08
Grey iron	Grey iron	-	0,12
Steel	Bronze	0,18	0,07
Steel	Ice	0,014	-
Steel	Grey iron	0,16	0,05
Steel	Steel	0,10	0,05
Steel	White metal	0,20	0,04
Wood	Ice	0,035	-
Wood	Wood	0,35	0,05
Leather	Grey iron	0,28	0,12
Brake lining	Steel	0,55	0,40
Steel	Nylon (polyamide)	0,5	0,10

Example: A steel component with a weight of 500 kg is to be pulled across bronze plate without lubrication. What will the frictional force be when the component moves?

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

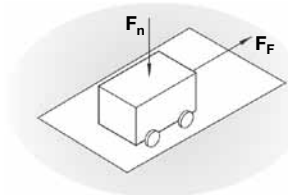
$$F_{\text{static}} = 500 \times 9,81 \times 0,27 = 1324 \text{ N}$$

$$F_{\text{kinetic}} = 500 \times 9,81 \times 0,18 = 883 \text{ N}$$

The static frictional force should always be compared with the force provided by the motor when it starts.

Kinetic Resistance

Kinetic resistance is a term expressing the total resistance, consisting of rolling resistance and the frictional force in the bearing



Formula:

$$F_F = \mu_F \times F_n$$

- F_F = kinetic resistance in N
- μ_F = coefficient of kinetic resistance
- F_n = force from object in N

Coefficient of kinetic resistance:

Object	Coefficient of kinetic resistance
Railway vehicle on steel rails	0,0015 to 0,0030
Vehicle with rubber wheel on asphalt	0,015 to 0,03

Example:

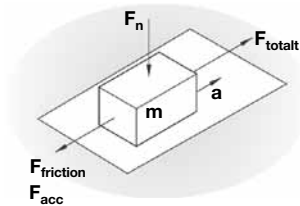
A railway carriage with a weight of 2 tonnes is to move over flat rails. What will the kinetic resistance be?

$$F_F = \mu_F \times F_n$$

$$F_F = 0,0030 \times 2 \times 1000 \times 9,81$$

$$F_F = 4,86 \text{ N}$$

Moving a component over a base, with friction between them



The force required to move the component consists of two parts - a frictional force to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{friction}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{friction}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

F_{friction} = frictional force in N (either F_{static} or F_{kinetic} depending on which is the greater force)

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A steel component weighing 500 kg is to be pulled over a dry steel plate with an acceleration of $0,1 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic}} + F_{\text{acc}}$$

$$F_{\text{tot}} = F_{\text{kinetic}} + m \times a$$

$$F_{\text{tot}} = F_n \times u + m \times a$$

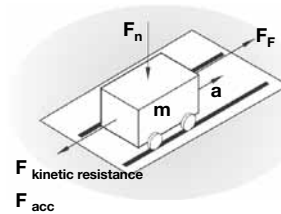
$$F_{\text{tot}} = 500 \times 9,81 \times 0,15 + 500 \times 0,1$$

$$F_{\text{tot}} = 735,75 + 50$$

$$F_{\text{tot}} = 785,75 \text{ N}$$

Answer: A force of 780 N is required to produce this movement.

Moving a carriage over rails, with kinetic resistance between them



The force required to move the component consists of two parts - a kinetic resistance to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

$F_{\text{kinetic resistance}}$ = total kinetic resistance in N

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A carriage weighing 2500 kg is to be pulled over steel rails with an acceleration of $0,2 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{tot}} = u_F \times F_N + m \times a$$

$$F_{\text{tot}} = 0,0030 \times 2500 \times 9,81 + 2500 \times 0,2$$

$$F_{\text{tot}} = 6,1 + 500$$

$$F_{\text{tot}} = 506 \text{ N}$$

Answer: A force of 510 N is required to produce this movement.

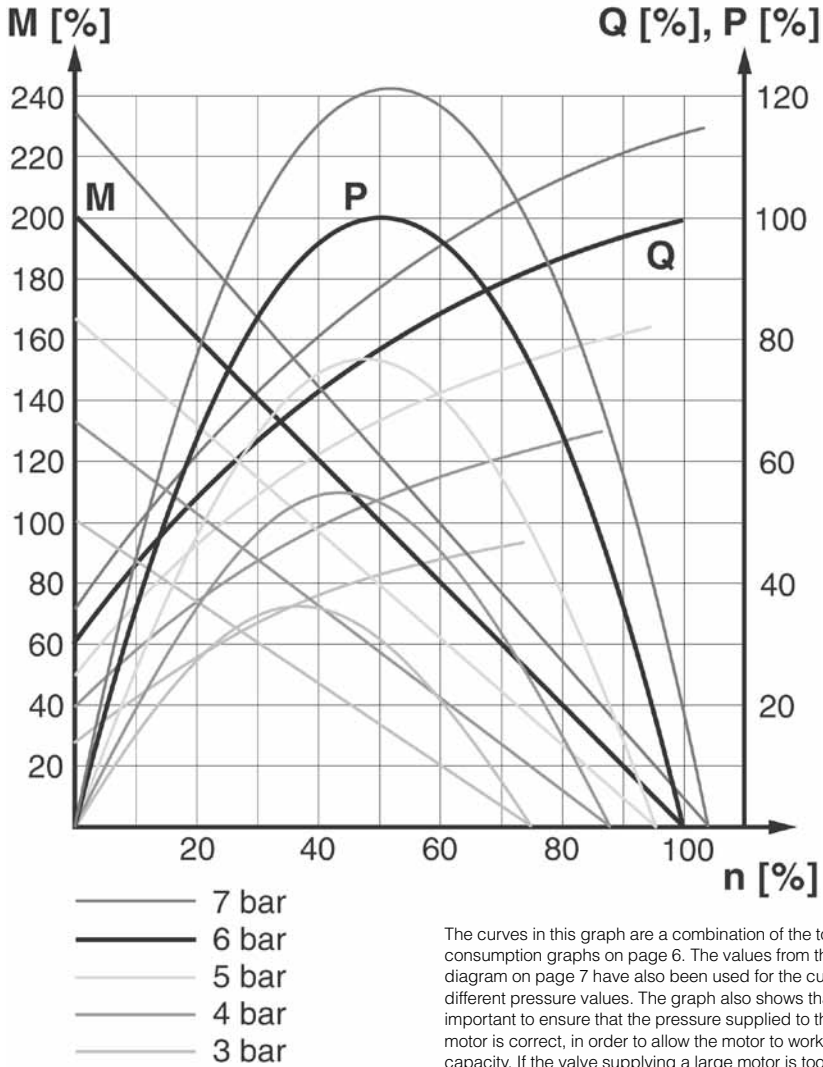
In practice

These calculations only produce values as they would be under optimum conditions. There must be no inclines in either direction. In applications using carriages, the rails must be perfectly flat without any inclines, the wheels must be perfectly round and there must be nothing on the rails (grains of sand, etc.). There must also be no effects from wind, etc.

In addition, there is always uncertainty with regard to the compressed air supply. How can we guarantee a pressure of 6 bar to the inlet port of the air motor?

Tip: calculate the required theoretical values for the air motor and assume a safety factor of 10 for the frictional force or kinetic resistance, and add this to the acceleration force. If the motor proves to be too powerful in practice, the supply air can always be regulated by throttling or pressure regulation. If you select a motor that is not powerful enough, on the other hand, the only option is to replace it.

Torque, power and air consumption graphs



P = power **Q = air consumption**
M = torque **n = speed**

The curves in this graph are a combination of the torque, power and air consumption graphs on page 6. The values from the correction diagram on page 7 have also been used for the curves for the different pressure values. The graph also shows that it is very important to ensure that the pressure supplied to the inlet port of the motor is correct, in order to allow the motor to work at maximum capacity. If the valve supplying a large motor is too small, or if the supply line is underspecified, the pressure at the inlet port may be so low that the motor is unable to do its work. One solution would be to upgrade the valve and supply system, or alternatively you could replace the motor with a smaller motor with lower air consumption. The result would be increased pressure at the inlet port, which means that the smaller motor could carry out the necessary work. However, you may need to select a smaller motor with a lower free speed in order to obtain sufficient torque at the outgoing shaft.



C



Large Air Motors

P1V-B Series

Note: All technical data is based on a working pressure of 6 bar.



Large Air Motors

These large motors are designed for use in the most arduous applications, requiring considerable power, torque, robustness and reliability

Data for reversible air motor

Max power	Free speed	Speed at max power	Torque at max power	Min start torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
5,1	600	300	160	240	103	G1	25	30	P1V-B510A0060
9	1600	800	107	160	167	G1	25	36	P1V-B900B0160
9	800	400	215	320	167	G1	25	36	P1V-B900B0080
18	6000	3000	57	85	334	G2	43	53	P1V-BJ00C0600

Technical data:

Working pressure Max 7 bar
 Working temperature -30 °C to +100 °C
 Medium Filtered dry air and oil mist, purity class ISO 8573-1 class 3.-.5 for indoor use and with a dew point lower than ambient temperature for outdoor use

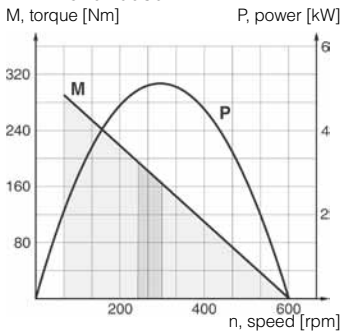
Material specification

Motor housing Painted steel
 Output shaft Hardened steel

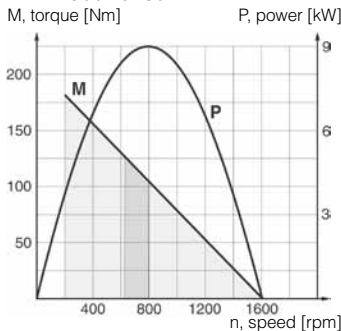
Table and diagram data

All values are typical values, with a tolerance of +/- 10%

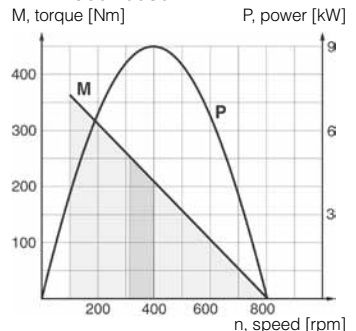
P1V-B510A0060



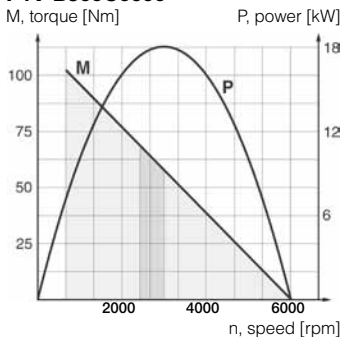
P1V-B900B0160



P1V-B900B0080



P1V-BJ00C0600

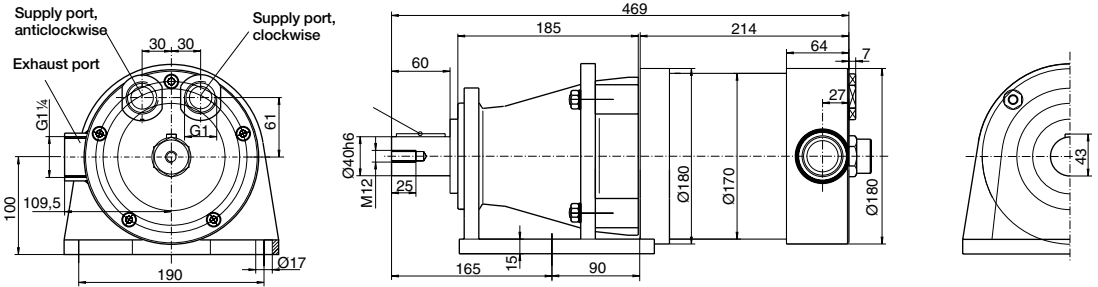


Possible working range of motor.

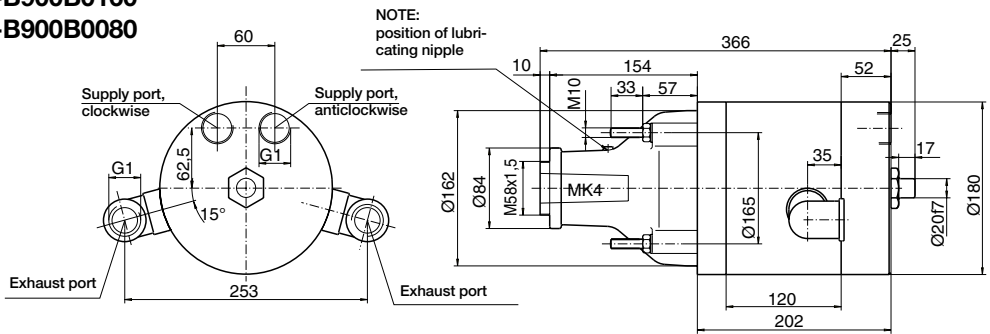
Optimum working range of motor.

Higher speeds = more vane wear
 Lower speeds with high torque = more gearbox wear

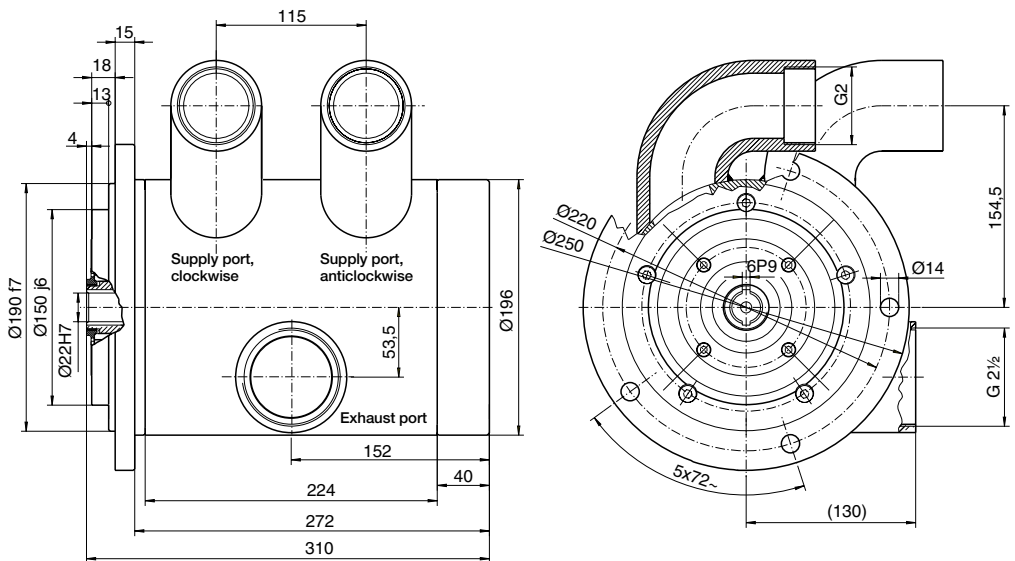
P1V-B510A0060



P1V-B900B0160
P1V-B900B0080

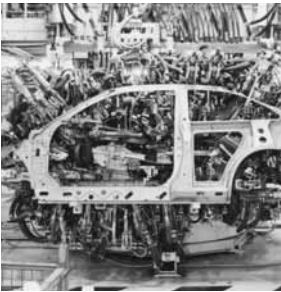
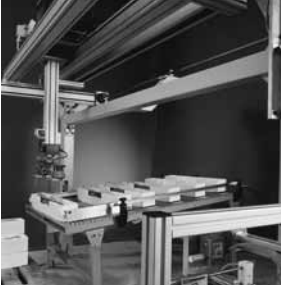


P1V-BJ00C0600



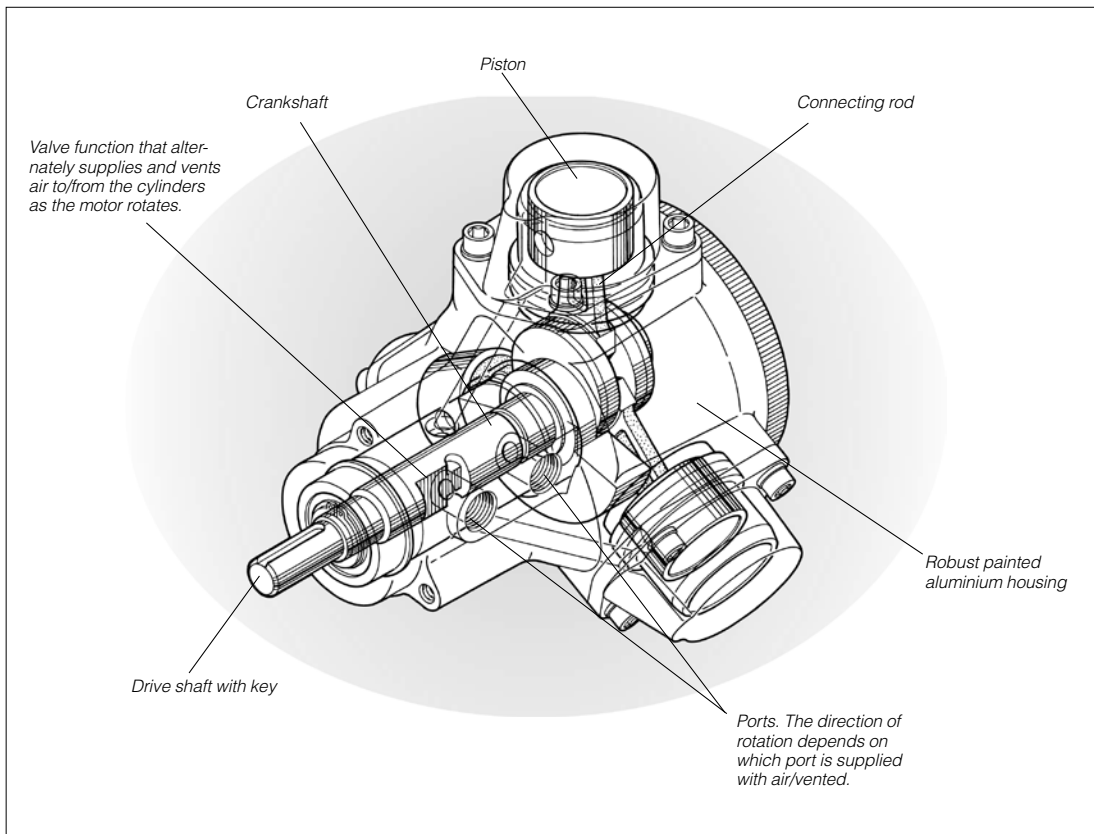
D

D



Radial Piston Air Motors

P1V-P Series



Radial piston air motors P1V-P

P1V-P is a range of air motors using the radial piston principle. Radial piston motors can operate at a low speed while delivering high torque.

The low speed keeps the noise level to a minimum, making this type of motor suitable for all applications that are subject to stringent noise level requirements.

The range includes three basic motors with 73.5, 125 and 228 watt power at 5 bar supply pressure. They can also be supplied with alternative flanges or foot brackets.

Various gearboxes are also available for these motors, to provide the right speed and torque for every application.

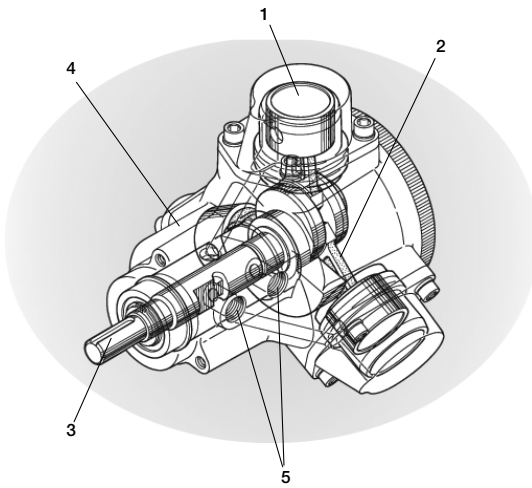
Almost every motor is also available in a model

equipped with a spring-loaded braking unit, which releases its braking effect in response to a compressed air signal.

The P1V-P motors have an extremely robust structure, with a housing made of painted cast aluminium, and a strong outgoing keyed shaft made of steel.

The medium used by the P1V-P is oil mist. This makes the motors unique in that they require no servicing at all, apart from ensuring that the correct air quality is supplied.

Principles of radial piston motor operation



- 1 Piston
- 2 Connection rod
- 3 Shaft
- 4 Motor housing
- 5 Connection ports

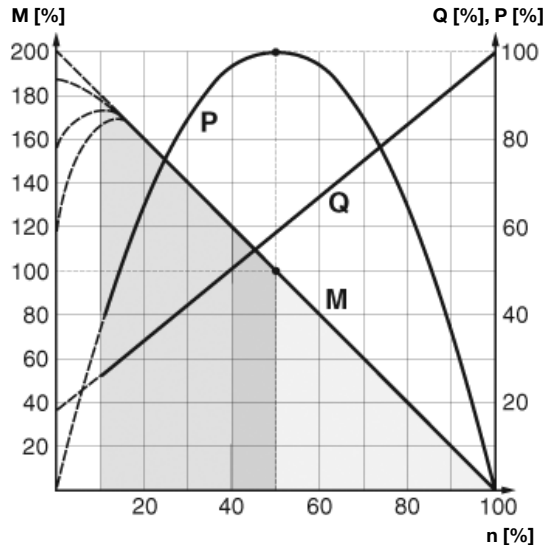
Air motors come in a wide range of different designs. For these motors, we have chosen the radial piston principle because of the low speed, high torque, low noise level and long service life with no service intervals.

Their compact dimensions and low weight mean these motors are easy to install in virtually all applications.

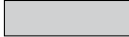


The P1V-P motors can also be fitted with a choice of gearboxes with different gear ratios, to produce the desired speed and torque at the outgoing shaft for every application.

The motor is supplied with air at either port A or port B depending on the desired direction of rotation. If air is supplied to port A, port B is used as the exhaust port. To change the direction of rotation, air is supplied to port B and port A then acts as the exhaust port. The supply air from port A or B is distributed to the pistons (1) by means of the rotating valve function on the outgoing shaft (3). The pistons (1) are attached to the outgoing shaft (3) by means of the connecting rods (2), and the exhaust air from each cylinder is also passed back to port A or B via the rotating valve.

Torque, power and air consumption graphs



P = power Q = air consumption
M = torque n = speed

-  Possible working range of motor.
-  Optimum working range of motor.
-  Working range with shorter service life

The performance characteristics of each motor are shown in a family of curves as above, from which torque, power and air consumption can be read off as a function of speed. Power is zero when the motor is stationary and also when running at free speed (100%) with no load. Maximum power (100%) is normally developed when the motor is braked to approximately half the free speed (50%).

Torque at free speed is zero, but increases as soon as a load is applied, rising linearly until the motor stalls.

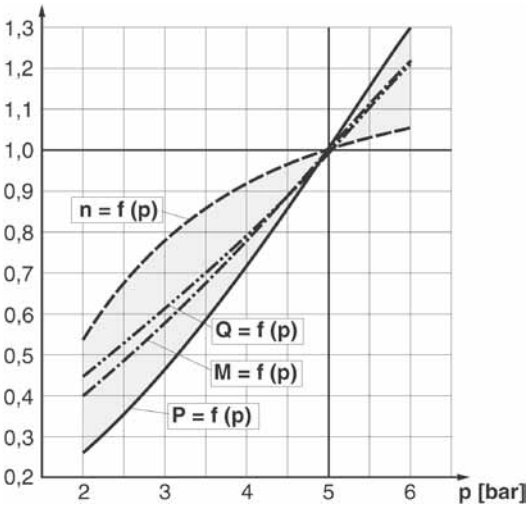
As the motor can stop with the pistons in various positions, it is not possible to specify an exact starting torque. However, a minimum starting torque is shown in all tables.

Air consumption is greatest at free speed, and decreases with decreasing speed, as shown in the above diagram.

The radial piston motor should not be used at speeds higher than the load speed (speed at maximum power), as this significantly reduces the service life.

Correction diagram

Correction factor



P = power **Q = air consumption**
M = torque **n = speed**

All catalogue data and curves are specified at a supply pressure of 6 bar (in the inlet port). This diagram shows the effect of pressure on speed, torque, power and air consumption.

Start off on the curve at the pressure used and then look up to the lines for power, torque, air consumption or speed. Read off the correction factor on the Y axis for each curve and multiply this by the specified catalogue data in the table or data read from the torque and power graphs.

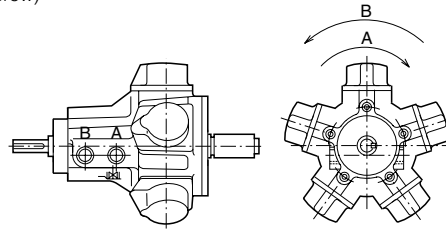
Example: at 4 bar supply pressure, the power is only 0,55 x power at 6 bar supply pressure.

This example shows how rapidly the power rating of a motor decreases as the supply pressure is reduced. Therefore, it is critical to ensure that the proper pressure is supplied at the inlet port of the motor.

Direction of motor rotation

Basic motor- also with brake

The rotation direction on the output shaft is seen from the back of the motor (right -hand rotation = the motor can be used as a screwdriver to assemble one standard right- hand threaded screw)

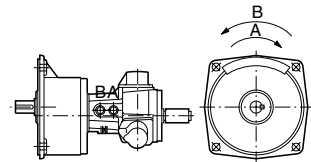


A port = Inlet, counter clockwise
 B port = Inlet, clockwise

Motor with gearbox

Motors equipped with gearboxes with low ratios (with or without brakes) works with rotation directions like the basic motors.

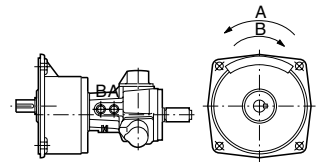
Motor	Ratio
P1V-P007**0440	5
P1V-P007**0220	10
P1V-P007**0147	15
P1V-P007**0110	20
P1V-P012**0360	5
P1V-P012**0180	10
P1V-P012**0120	15
P1V-P012**0090	20
P1V-P012**0060	30
P1V-P012**0050	40
P1V-P023**0300	5
P1V-P023**0150	10
P1V-P023**0100	15
P1V-P023**0075	20
P1V-P023**0050	30
P1V-P023**0038	40



A port = Inlet, counter clockwise
 B port = Inlet, clockwise

All other P1V-P motors with higher ratios in the gearboxes to get the lowest speed and the highest torques are equipped with one more stage in the gearbox. This makes the direction of the rotation is opposite to the basic motors and the motors equipped with gearboxes with low ratios.

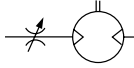
Motor	Ratio
P1V-P012**0040	50
P1V-P012**0030	60
P1V-P012**0022	80
P1V-P012**0018	100
P1V-P012**0015	120
P1V-P012**0012	160
P1V-P012**0009	200
P1V-P023**0030	50
P1V-P023**0025	60
P1V-P023**0018	80
P1V-P023**0015	100
P1V-P023**0012	120
P1V-P023**0009	160
P1V-P023**0007	200



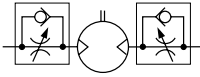
A port = Inlet, clockwise
 B port = Inlet, counter clockwise

Speed regulation

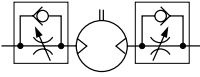
Throttling



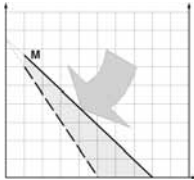
Supply or outlet throttling, nonreversible motor.



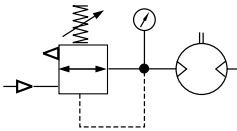
Supply throttling, reversible motor.



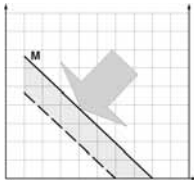
Outlet throttling, reversible motor.



Torque curve change caused by throttling.



Pressure regulation at motor inlet.



Torque curve change caused by pressure change.

The most common way to reduce the speed of a motor is to install a flow control in the air inlet. When the motor is used in applications where it must reverse and it is necessary to restrict the speed in both directions, flow controls with integral non-return function should be used in both directions.

Restriction may also be applied to the main outlet which will control the speed in both directions.

Inlet throttling

If the inlet air is restricted, the air supply is restricted and the free speed of the motor falls, but there is full pressure on the vanes at low speeds. This means full torque is available from the motor at low speed, despite the low air flow.

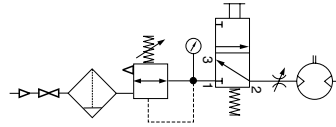
Since the torque curve becomes "steeper", this also means that we get a lower torque at any given speed than would be developed at full air flow.

Pressure regulation

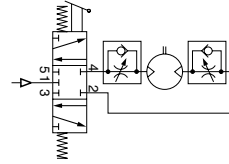
The speed and torque can also be regulated by installing a pressure regulator in the inlet pipe. When the motor is constantly supplied with air at lower pressure and the motor is braked, it develops a lower torque on the output shaft.

In brief: *Inlet throttling* gives reduced speed in one direction but maintains torque when braked. *The torque curve becomes steeper.* A restriction in the main inlet gives reduced speed in both directions but maintains torque when braked. *The torque curve becomes steeper.* Pressure regulation in the inlet cuts torque when the motor is braked, and also reduces speed. *The torque curve is moved parallel.*

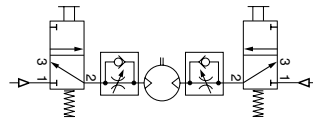
Air supply



Shut-off, filtering, pressure regulation and control valve



Reversible motor with 5/3 control valve



Reversible motor with two 3/2 control valves

The air supplying the motor must be filtered and regulated. Directional valves are needed to control the pressurized air which will cause the motor to rotate. These valves can be equipped with several means of actuation, such as electric, manual or pneumatic control. When the motor is used in a non-reversible application, it is sufficient to use a 2/2 or 3/2 valve for supply. Either one 5/3 or two 3/2 valves are needed for a reversible motor, to ensure that the motor gets its compressed air and the exhaust is vented. A flow control can be installed in the inlet pipe to regulate the motor speed if the motor is not used as a reversible motor. One flow control with by-pass is needed to regulate each direction of rotation if the motor is used as a reversible motor. The built-in check valve will then allow air from the exhaust to escape through the outlet port in the control valve.

The compressed air supply must have sufficiently large pipes and valves to give the motor maximum power. The motor needs 5 bar at the supply port all the time. A reduction of pressure to 4 bar reduces the power developed to 73%, and to 48% at 3 bar.



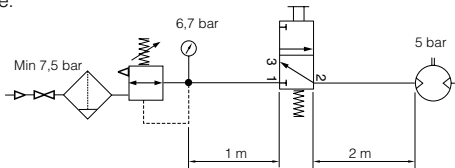
Choice of components for air supply

Since the supply pressure at the air motor inlet port is of considerable importance for obtaining the power, speed and torque quoted in the catalogue, the recommendations below should be observed.

The following data must be complied with:

- Supply pressure to air treatment unit: Min 7,5 bar
- Gauge pressure: 6,7 bar
- Pipe length between air treatment unit and valve: Max 1 m
- Pipe length between valve and air motor: Max 2 m
- The pressure drop through air treatment unit - pipe - valve - pipe means that 5 bar pressure is obtained at the motor inlet port.

Please refer to the correction diagram on page 7, which shows what lower supply pressure means for power, speed and torque.



The table can be used as follows:

If you are using only one motor with each air treatment unit and valve, simply follow the table. If you are using more than one motor with the same air treatment unit: read the table values for selecting the air treatment unit and add them together, and select a suitable air treatment unit from the table showing air flows per treatment unit. Then read the values for selecting the valve from the bottom of the table, and select a suitable valve from the table showing air flows per valve family.

The air treatment units have the following flows in NI/Min at 7,5 bar supply pressure and 0,8 bar pressure drop

FRL series	Air flow in NI/Min
P3H, Moduflex FRL, 40 Series, G1/4	550
P3K, Moduflex FRL, 60 Series, G1/2	1310
P3M, Moduflex FRL, 80 Series, G1	2770
Standard series FRL, G11/2	9200
Stainless series FRL PF, G1/4	530
Stainless series FRL PF, G1/2	1480

Valve series with respective flows in NI/minute

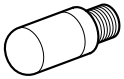
Valve series	Qn in NI/Min
Valvetronic Solstar	33
Interface PS1	100
Adex A05	173
Moduflex size 1, (2 x 3/2)	220
Valvetronic PVL-B 5/3 closed centre, 6 mm push in	290
Moduflex size 1, (4/2)	320
B43 Manual and mechanical	340
Valvetronic PVL-B 2 x 2/3, 6 mm push in	350
Valvetronic PVL-B 5/3 closed centre, G1/8	370
Compact Isomax DX02	385
Valvetronic PVL-B 2 x 3/2 G1/8	440
Valvetronic PVL-B 5/2, 6 mm push in	450
Valvetronic PVL-B 5/3 vented centre, 6 mm push in	450
Moduflex size 2, (2 x 3/2)	450
Flowstar P2V-A	520
Valvetronic PVL-B 5/3 vented centre, G1/8	540
Valvetronic PVL-B 5/2, G1/8	540
Valvetronic PVL-C 2 x 3/2, 8 mm push in	540
Adex A12	560
Valvetronic PVL-C 2 x 3/2 G1/8	570
Compact Isomax DX01	585
VIKING Xtreme P2LAX	660
Valvetronic PVL-C 5/3 closed centre, 8 mm push in	700
Valvetronic PVL-C 5/3 vented centre, G1/4	700
B3-Series	780
Valvetronic PVL-C 5/3 closed centre, G1/4	780
Moduflex size 2, (4/2)	800
Valvetronic PVL-C 5/2, 8 mm push in	840
Valvetronic PVL-C 5/3 vented centre, 8 mm push in	840
Valvetronic PVL-C 5/2, G1/4	840
Flowstar P2V-B	1090
ISOMAX DX1	1150
B53 Manual and mechanical	1160
B4-Series	1170
VIKING Xtreme P2LBX	1290
B5-Series, G1/4	1440
Airline Isolator Valve VE22/23	1470
ISOMAX DX2	2330
VIKING Xtreme P2LCX, G3/8	2460
VIKING Xtreme P2LDX, G1/2	2660
ISOMAX DX3	4050
Airline Isolator Valve VE42/43	5520
Airline Isolator Valve VE82/83	13680

Air motors

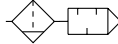
Air motor	P1V-P007	P1V-P012	P1V-P023
Air flow required, NI/s	3,34	4,34	6,67
Air flow required, NI/min	200	260	400
Min. internal diameter of pipe, mm	6	10	10
Choice of air treatment unit: recommended min. air flow in litres/minute at 7,5 bar air supply and 0,8 bar pressure drop			
	150		
		210	
			300
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).			
	200		
		260	
			400

Silencing

Outlet silencer



Central silencer



The noise from an air motor consists of both mechanical noise and a pulsating noise from the air flowing out of the outlet. The installation of the motor has a considerable effect on mechanical noise. It should be installed so that no mechanical resonance effects occur. The outlet air creates a noise level which can amount to 100 dB(A) if the air is allowed to exhaust freely into the atmosphere. To reduce noise levels, various types of outlet silencers are used. The most common type screws directly into the outlet port of the motor. A wide range of silencers are available. Many are made of sintered brass or sintered plastic. Since the motor function causes the exhaust air to pulsate, it is a good idea to allow the air to exhaust into some kind of chamber first, which reduces the pulsations before they reach the silencer. The best silencing method is to connect a soft hose to a central silencer allowing the speed of the air to reduce as much as possible.

NOTE! Remember that if a silencer is too small or is blocked, back pressure is generated on the outlet side of the motor, which in turn reduces the motor power.

Sound levels

Sound levels are measured at free speed with the measuring instrument positioned 1 m away from the air motor, see the table below

Air motor	Free outlet	With outlet	Exhaust air removed with pipes to another room
	dB (A)	dB (A)	
P1V-P007	95	75	69
P1V-P012	100	80	72
P1V-P023	100	80	72

Compressed air quality

To get the very best reliability of service and longest service life on the P1VP motor with a minimum of environment influence is

it necessary to fulfil following points

- The motor has to be supplied with clean compressed air
- The motor has to be supplied with dry compressed air
- The motor has to be supplied with lubricated compressed air

All exhaust air has to be taken away to central silencer to get the sound level down and to reduce the amount of dangerous oil mist in the exhaust air to a minimum. Oil and oil mist are things which one tries to avoid, to ensure clean working environment.

Working pressure :	Max 5 bar
Working temperature :	-10 to +70 °C
Medium :	Min 40 µm filtered, oil mist compressed air

Dry lubricated compressed air



To get minimum of production disturbance and as long service intervals and total service life as possible is it necessary for you as user to supply the P1V-P Air Motors with dry, clean and lubricated compressed air.

As to the quantity of lubrication is 2 to 3 drops of oil/minute appropriate.

For indoor use, we recommend ISO8573-1 purity class 3.4.4. To achieve this, compressors must be fitted with aftercoolers, oil filters, refrigerant air dryers, air filters and lubricators.

For indoor/outdoor use, we recommend ISO8573-1 purity class 1.2.4. To achieve this, compressors must be fitted with aftercoolers, oil filters, adsorption dryers, dust filters and lubricators.


The following oils are recommended for use in the industry : Type ISO VG32 shall be used.

ISO 8573-1 purity classes

Quality class	Contaminants		Water max. pressure dew point (°C)	Oil max. concentration (mg/m³)
	particle size (µm)	max. concentration (mg/m³)		
1	0,1	0,1	-70	0,01
2	1	1	-40	0,1
3	5	5	-20	1,0
4	15	8	+3	5,0
5	40	10	+7	25
6	-	-	+10	-

For example: compressed air to purity class 3.4.4

This means a 5 µm filter (standard filter), dew point +3 °C (refrigerant cooled) and an oil concentration of 5,0 mg oil/m³.



If the motor is works with higher speed than the speed by max output power will the service life be shorten.

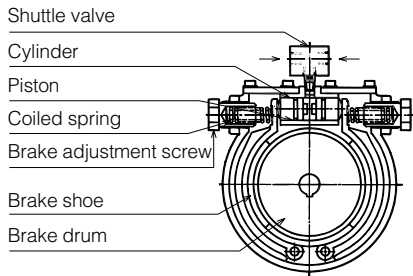
P1V-P Air Motors with brake

P1V-P Air Motors can be braked by closing the supply/exhaust air. This gives a brake torque corresponding the average start torque if piping distance between valve and motor is short. Air Motors with powerful brake is necessary if torque is applied from load side, P1V-P with built on brake can be used in those cases.

Features

1. Non-fase adjustment is available for torque as needed
2. Simple design with little trouble and long life
3. The design makes the complete motor with brake to get a low weight

It is load-working type double lock air brake with brake force



turned out by pushing force of coiled spring and release conducted by air pressure as usual. Brake shoe is opened from drum as piston for release works after air pressure is applied to supply port of air motor and simultaneously to brake cylinder.

When the rotation of motor is stopped and air pressure is exhausted, the air pressure of the brake cylinder is also exhausted instantly, and brake shoe is pushed to drum with pushing force of the coiled spring. The adjustment of brake torque is conducted with brake adjusting screw from the outside according to the necessary torque.

CE marking

The air motors are supplied as "Components for installation" – the installer is responsible for ensuring that the motors are installed safely in the overall system.

Parker Hannifin guarantees that its products are safe, and as a supplier of pneumatic equipment we ensure that the equipment is designed and manufactured in accordance with the applicable EU directive.

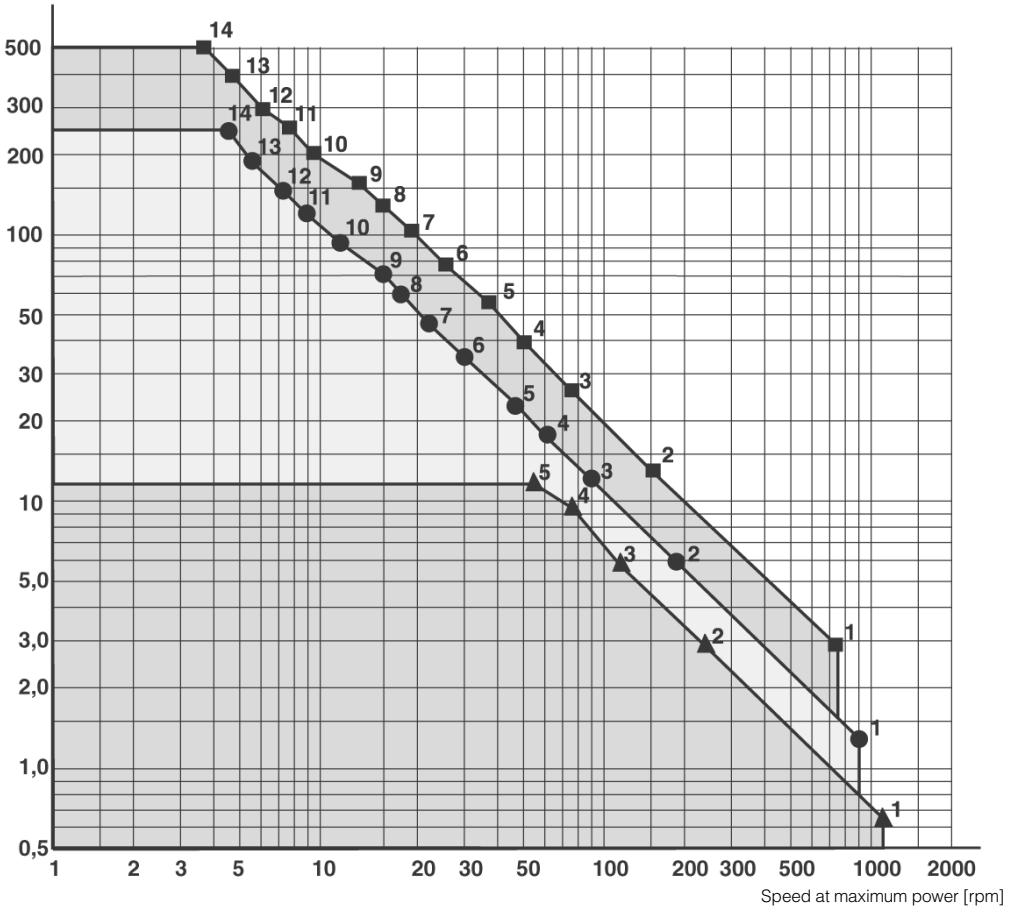
Most of our products are classed as components as defined by various directives, and although we guarantee that the components satisfy the fundamental safety requirements of the directives to the extent that they are our responsibility, they do not usually carry the CE mark.

The following are the currently applicable directives:

- Machinery Directive (essential health and safety requirements relating to the design and structure of machines and safety components)
- EMC Directive
- Simple Pressure Vessels Directive
- Low Voltage Directive
- ATEX Directive (ATEX = ATmosphere EXplosive)

Choice of air motor

Torque at maximum power [Nm]



The motor to be used should be selected by starting with the torque needed at a specific shaft speed. In other words, to choose the right motor, you have to know the required speed and torque. Since maximum power is reached at half the motor's free speed, the motor should be chosen so that the operating point is as close as possible to the maximum power of the motor.

The design principle of the motor means that higher torque is generated when it is braked, which tends to increase the speed, etc. This means that the motor has a kind of speed self-regulation function built in.

Use the above graph to choose the correct motor size. The graph contains the points for the maximum torque of each motor at maximum output. Add your operating point to the graph, then select a marked point above and to the right of your point.

Then use the correct working diagram of the chosen motor to get more detailed technical data. Always select a motor whose requisite technical data are in the yellow area. Also use the correction diagram to find out what operation with different supply pressures would mean for the motor.

Tip: Select a motor which is slightly too fast and powerful, then regulate its speed and torque with a pressure regulator and/or throttle to achieve the optimum working point.

E

Air motors

- ▲ 1 Basic P1V-P007A02200, Flange P1V-P007B02200, Foot P1V-P007F02200
 - ▲ 2 Flange P1V-P007B00440, Foot P1V-P007F00440
 - ▲ 3 Flange P1V-P007B00220, Foot P1V-P007F00220
 - ▲ 4 Flange P1V-P007B00147, Foot P1V-P007F00147
 - ▲ 5 Flange P1V-P007B00110, Foot P1V-P007F00110
- Graphs for each motor, see page 17 and 22

P1V-P007



- 1 Basic P1V-P012A01800, Flange P1V-P012B01800, Foot P1V-P012F01800 or these as brake motors Basic P1V-P012AB1800, Flange P1V-P012BB1800, Foot P1V-P012FB1800
 - 2 Flange P1V-P012B00360, Foot P1V-P012F00360 or these as brake motors Flange P1V-P012BB0360, Foot P1V-P012FB0360
 - 3 Flange P1V-P012B00180, Foot P1V-P012F00180 or these as brake motors Flange P1V-P012BB0180, Foot P1V-P012FB0180
 - 4 Flange P1V-P012B00120, Foot P1V-P012F00120 or these as brake motors Flange P1V-P012BB0120, Foot P1V-P012FB0120
 - 5 Flange P1V-P012B00090, Foot P1V-P012F00090 or these as brake motors Flange P1V-P012BB0090, Foot P1V-P012FB0090
 - 6 Flange P1V-P012B00060, Foot P1V-P012F00060 or these as brake motors Flange P1V-P012BB0060, Foot P1V-P012FB0060
 - 7 Flange P1V-P012B00050, Foot P1V-P012F00050 or these as brake motors Flange P1V-P012BB0050, Foot P1V-P012FB0050
 - 8 Flange P1V-P012B00040, Foot P1V-P012F00040 or these as brake motors Flange P1V-P012BB0040, Foot P1V-P012FB0040
 - 9 Flange P1V-P012B00030, Foot P1V-P012F00030 or these as brake motors Flange P1V-P012BB0030, Foot P1V-P012FB0030
 - 10 Flange P1V-P012B00022, Foot P1V-P012F00022 or these as brake motors Flange P1V-P012BB0022, Foot P1V-P012FB0022
 - 11 Flange P1V-P012B00018, Foot P1V-P012F00018 or these as brake motors Flange P1V-P012BB0018, Foot P1V-P012FB0018
 - 12 Flange P1V-P012B00015, Foot P1V-P012F00015 or these as brake motors Flange P1V-P012BB0015, Foot P1V-P012FB0015
 - 13 Flange P1V-P012B00012, Foot P1V-P012F00012 or these as brake motors Flange P1V-P012BB0012, Foot P1V-P012FB0012
 - 14 Flange P1V-P012B00009, Foot P1V-P012F00009 or these as brake motors Flange P1V-P012BB0009, Foot P1V-P012FB0009
- Graphs for each motor, see page 17, 22 and 23

P1V-P012



- 1 Basic P1V-P023A01500, Flange P1V-P023B01500, Foot P1V-P023F01500 or these as brake motors Basic P1V-P023AB1500, Flange P1V-P023BB1500, Foot P1V-P023FB1500
 - 2 Flange P1V-P023B00300, Foot P1V-P023F00300 or these as brake motors Flange P1V-P023BB0300, Foot P1V-P023FB0300
 - 3 Flange P1V-P023B00150, Foot P1V-P023F00150 or these as brake motors Flange P1V-P023BB0150, Foot P1V-P023FB0150
 - 4 Flange P1V-P023B00050, Foot P1V-P023F00050 or these as brake motors Flange P1V-P023BB0100, Foot P1V-P023FB0100
 - 5 Flange P1V-P023B00075, Foot P1V-P023F00075 or these as brake motors Flange P1V-P023BB0075, Foot P1V-P023FB0075
 - 6 Flange P1V-P023B00050, Foot P1V-P023F00050 or these as brake motors Flange P1V-P023BB0050, Foot P1V-P023FB0050
 - 7 Flange P1V-P023B00038, Foot P1V-P023F00038 or these as brake motors Flange P1V-P023BB0038, Foot P1V-P023FB0038
 - 8 Flange P1V-P023B00030, Foot P1V-P023F00030 or these as brake motors Flange P1V-P023BB0030, Foot P1V-P023FB0030
 - 9 Flange P1V-P023B00025, Foot P1V-P023F00025 or these as brake motors Flange P1V-P023BB0025, Foot P1V-P023FB0025
 - 10 Flange P1V-P023B00018, Foot P1V-P023F00018 or these as brake motors Flange P1V-P023BB0018, Foot P1V-P023FB0018
 - 11 Flange P1V-P023B00015, Foot P1V-P023F00015 or these as brake motors Flange P1V-P023BB0015, Foot P1V-P023FB0015
 - 12 Flange P1V-P023B00012, Foot P1V-P023F00012 or these as brake motors Flange P1V-P023BB0012, Foot P1V-P023FB0012
 - 13 Flange P1V-P023B00009, Foot P1V-P023F00009 or these as brake motors Flange P1V-P023BB0009, Foot P1V-P023FB0009
 - 14 Flange P1V-P023B00007, Foot P1V-P023F00007 or these as brake motors Flange P1V-P023BB0007, Foot P1V-P023FB0007
- Graphs for each motor, see page 17, 22 and 23

P1V-P023



Technical data

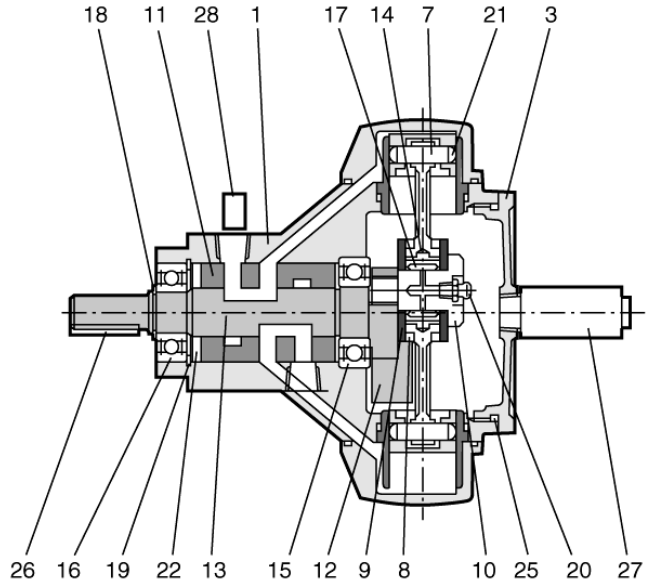
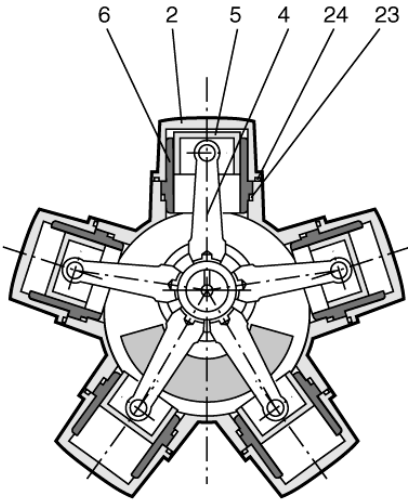
Working pressure	Max 6 bar
Working temperature	-10 °C to +70 °C
Medium	Oil mist, dry compressed air purity class 3.4.4 according to ISO8573-1
Gearboxes	Grease lubricated

Table and diagram data

All values are typical values, with a tolerance of ±10%

P1V-P023

P1V-P007 and P1V-P012



E

Order key

P1V-P	012	F	B	0060																															
<table border="1"> <thead> <tr> <th colspan="2">Motor size</th> </tr> </thead> <tbody> <tr> <td>007</td> <td>74 W</td> </tr> <tr> <td>012</td> <td>125 W</td> </tr> <tr> <td>023</td> <td>228 W</td> </tr> </tbody> </table>		Motor size		007	74 W	012	125 W	023	228 W	<table border="1"> <thead> <tr> <th colspan="2">Function</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Basic motor</td> </tr> <tr> <td>B</td> <td>Flange version</td> </tr> <tr> <td>F</td> <td>Foot version</td> </tr> </tbody> </table>		Function		A	Basic motor	B	Flange version	F	Foot version	<table border="1"> <thead> <tr> <th colspan="2">Function</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Standard</td> </tr> <tr> <td>B</td> <td>Brake</td> </tr> </tbody> </table>	Function		0	Standard	B	Brake	<table border="1"> <thead> <tr> <th colspan="2">Free speed/min</th> </tr> </thead> <tbody> <tr> <td>2200</td> <td>2200</td> </tr> <tr> <td>- -</td> <td></td> </tr> <tr> <td>0007</td> <td>7</td> </tr> </tbody> </table>	Free speed/min		2200	2200	- -		0007	7
Motor size																																			
007	74 W																																		
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<table border="1"> <thead> <tr> <th colspan="2">Air motor range</th> </tr> </thead> <tbody> <tr> <td>P1V-P</td> <td>Radial piston motor</td> </tr> </tbody> </table>		Air motor range		P1V-P	Radial piston motor																														
Air motor range																																			
P1V-P	Radial piston motor																																		

NOTE! All technical data is based on a working pressure of 5 bar.



Data for reversible basic motor

Max Speed power at max power	Torque at max power	Min start torque	Stall torque	Brake torque	Air con- sumption at max power	Conn.	Min pipe ID	Weight	Order code	
kW	rpm	Nm	Nm	Nm	l/s		mm	Kg		
0,0735	1100	0,637	0,686	1,18	-	3,34	G1/4	6	1,45	P1V-P007A02200
0,125	900	1,37	1,96	2,94	-	4,34	G1/4	10	2,5	P1V-P012A01800
0,228	750	2,94	4,71	5,88	-	6,67	G3/8	10	4,6	P1V-P023A01500

Data for reversible basic motor with flange

Max Speed power at max power	Torque at max power	Min start torque	Stall torque	Brake torque	Air con- sumption at max power	Conn.	Min pipe ID	Weight	Order code	
kW	rpm	Nm	Nm	Nm	l/s		mm	Kg		
0,0735	1100	0,637	0,686	1,18	-	3,34	G1/4	6	1,45	P1V-P007B02200
0,125	900	1,37	1,96	2,94	-	4,34	G1/4	10	2,5	P1V-P012B01800
0,228	750	2,94	4,71	5,88	-	6,67	G3/8	10	4,6	P1V-P023B01500

Data for reversible basic motor with foot

Max Speed power at max power	Torque at max power	Min start torque	Stall torque	Brake torque	Air con- sumption at max power	Conn.	Min pipe ID	Weight	Order code	
kW	rpm	Nm	Nm	Nm	l/s		mm	Kg		
0,0735	1100	0,637	0,686	1,18	-	3,34	G1/4	6	1,45	P1V-P007F02200
0,125	900	1,37	1,96	2,94	-	4,34	G1/4	10	2,5	P1V-P012F01800
0,228	750	2,94	4,71	5,88	-	6,67	G3/8	10	4,6	P1V-P023F01500

NOTE! All technical data is based on a working pressure of 5 bar.



Data for reversible basic motor with brake

Max power kW	Speed rpm	Torque at max power Nm	Min start torque Nm	Stall torque Nm	Brake torque Nm	Air consumption at max power l/s	Conn.	Min pipe ID mm	Weight Kg	Order code
0,125	900	1,37	1,96	2,94	3,24	4,34	G1/4	10	4,4	P1V-P012AB1800
0,228	750	2,94	4,71	5,88	6,47	6,67	G3/8	10	7,8	P1V-P023AB1500

Data for reversible basic motor with brake and flange

Max power kW	Speed rpm	Torque at max power Nm	Min start torque Nm	Stall torque Nm	Brake torque Nm	Air consumption at max power l/s	Conn.	Min pipe ID mm	Weight Kg	Order code
0,125	900	1,37	1,96	2,94	3,24	4,34	G1/4	10	4,4	P1V-P012BB1800
0,228	750	2,94	4,71	5,88	6,47	6,67	G3/8	10	7,8	P1V-P023BB1500

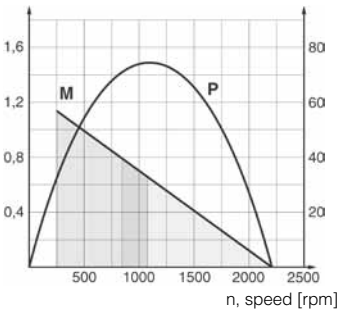
Data for reversible basic motor with brake and foot

Max power kW	Speed rpm	Torque at max power Nm	Min start torque Nm	Stall torque Nm	Brake torque Nm	Air consumption at max power l/s	Conn.	Min pipe ID mm	Weight Kg	Order code
0,125	900	1,37	1,96	2,94	3,24	4,34	G1/4	10	5,2	P1V-P012FB1800
0,228	750	2,94	4,71	5,88	6,47	6,67	G3/8	10	9,4	P1V-P023FB1500

P1V-P0072200**

M, torque [Nm]

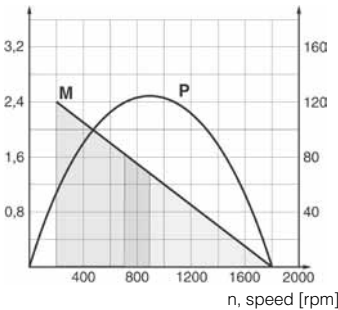
P, power [W]



P1V-P0121800**

M, torque [Nm]

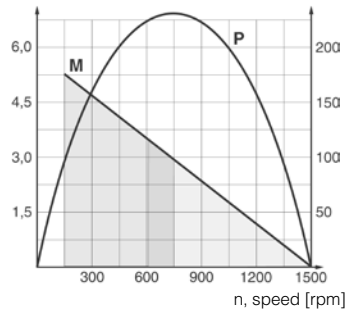
P, power [W]



P1V-P0231500**

M, torque [Nm]

P, power [W]



- Possible working range of motor.
- Optimum working range of motor.
- Working range with shorter service life.

NOTE! All technical data is based on a working pressure of 5 bar.



Data for reversible motor with gearbox and flange

Max Speed power at max power kW	Max rpm	Torque at max power Nm	Min start torque Nm	Stall torque Nm	Brake torque Nm	Air con- sumption at max power l/s	Conn.	Min pipe ID mm	Weight Kg	Order code
0,0662	220	2,84	2,94	4,90	-	3,34	G1/4	6	4,0	P1V-P007B00440
0,0662	110	5,69	5,88	9,81	-	3,34	G1/4	6	4,0	P1V-P007B00220
0,0662	73,3	8,53	8,83	15,7	-	3,34	G1/4	6	4,0	P1V-P007B00147
0,0662	55	11,5	11,8	20,6	-	3,34	G1/4	6	4,0	P1V-P007B00110
0,110	180	5,88	8,83	12,7	-	4,34	G1/4	10	6,7	P1V-P012B00360
0,110	90	11,8	17,7	26,5	-	4,34	G1/4	10	6,7	P1V-P012B00180
0,110	60	17,7	26,5	39,2	-	4,34	G1/4	10	6,7	P1V-P012B00120
0,110	45	23,5	35,3	53,0	-	4,34	G1/4	10	6,7	P1V-P012B00090
0,110	30	35,3	53,0	78,5	-	4,34	G1/4	10	8,7	P1V-P012B00060
0,110	22,5	47,1	70,6	106	-	4,34	G1/4	10	8,7	P1V-P012B00050
0,110	18	58,8	79,4	132	-	4,34	G1/4	10	8,7	P1V-P012B00040
0,110	15	70,6	106	157	-	4,34	G1/4	10	8,7	P1V-P012B00030
0,110	11,2	93,2	139	206	-	4,34	G1/4	10	8,7	P1V-P012B00022
0,103	9	118	175	250	-	4,34	G1/4	10	11,7	P1V-P012B00018
0,103	7,5	137	206	300	-	4,34	G1/4	10	11,7	P1V-P012B00015
0,103	5,6	176	261	373	-	4,34	G1/4	10	11,7	P1V-P012B00012
0,103	4,5	233	350	500	-	4,34	G1/4	10	11,7	P1V-P012B00009
0,199	150	12,7	20,6	26,5	-	6,67	G3/8	10	10,5	P1V-P023B00300
0,199	75	26,5	41,2	53,0	-	6,67	G3/8	10	10,5	P1V-P023B00150
0,199	50	39,2	61,8	79,4	-	6,67	G3/8	10	10,5	P1V-P023B00100
0,199	37,5	53,0	82,4	106	-	6,67	G3/8	10	10,5	P1V-P023B00075
0,199	25	78,5	124	159	-	6,67	G3/8	10	14,0	P1V-P023B00050
0,199	18,7	106	165	212	-	6,67	G3/8	10	14,0	P1V-P023B00038
0,199	15	132	206	265	-	6,67	G3/8	10	14,0	P1V-P023B00030
0,199	12,5	157	247	318	-	6,67	G3/8	10	14,0	P1V-P023B00025
0,199	9,3	203	314	402	-	6,67	G3/8	10	14,0	P1V-P023B00018
0,191	7,5	250	392	490	-	6,67	G3/8	10	20,5	P1V-P023B00015
0,191	6,2	300	471	598	-	6,67	G3/8	10	20,5	P1V-P023B00012
0,191	4,6	396	628	785	-	6,67	G3/8	10	20,5	P1V-P023B00009
0,191	3,7	500	785	981	-	6,67	G3/8	10	20,5	P1V-P023B00007

NOTE! All technical data is based on a working pressure of 5 bar.



Data for reversible motor with gearbox and foot

Max Speed power at max power kW	rpm	Torque at max power Nm	Min start torque Nm	Stall torque Nm	Brake torque Nm	Air con- sumption at max power l/s	Conn.	Min pipe ID mm	Weight Kg	Order code
0,0662	220	2,84	2,94	4,90	-	3,34	G1/4	6	3,5	P1V-P007F00440
0,0662	110	5,69	5,88	9,81	-	3,34	G1/4	6	4,0	P1V-P007F00220
0,0662	73,3	8,53	8,83	15,7	-	3,34	G1/4	6	3,5	P1V-P007F00147
0,0662	55	11,5	11,8	20,6	-	3,34	G1/4	6	3,5	P1V-P007F00110
0,110	180	5,88	8,83	12,7	-	4,34	G1/4	10	6,2	P1V-P012F00360
0,110	90	11,8	17,7	26,5	-	4,34	G1/4	10	6,2	P1V-P012F00180
0,110	60	17,7	26,5	39,2	-	4,34	G1/4	10	6,2	P1V-P012F00120
0,110	45	23,5	35,3	53,0	-	4,34	G1/4	10	6,2	P1V-P012F00090
0,110	30	35,3	53,0	78,5	-	4,34	G1/4	10	8,2	P1V-P012F00060
0,110	22,5	47,1	70,6	106	-	4,34	G1/4	10	8,2	P1V-P012F00050
0,110	18	58,8	79,4	132	-	4,34	G1/4	10	8,2	P1V-P012F00040
0,110	15	70,6	106	157	-	4,34	G1/4	10	8,2	P1V-P012F00030
0,110	11,2	93,2	139	206	-	4,34	G1/4	10	8,2	P1V-P012F00022
0,103	9	118	175	250	-	4,34	G1/4	10	11,2	P1V-P012F00018
0,103	7,5	137	206	300	-	4,34	G1/4	10	11,2	P1V-P012F00015
0,103	5,6	176	261	373	-	4,34	G1/4	10	11,2	P1V-P012F00012
0,103	4,5	233	350	500	-	4,34	G1/4	10	11,2	P1V-P012F00009
0,199	150	12,7	20,6	26,5	-	6,67	G3/8	10	10,0	P1V-P023F00300
0,199	75	26,5	41,2	53,0	-	6,67	G3/8	10	10,0	P1V-P023F00150
0,199	50	39,2	61,8	79,4	-	6,67	G3/8	10	10,0	P1V-P023F00100
0,199	37,5	53,0	82,4	106	-	6,67	G3/8	10	10,0	P1V-P023F00075
0,199	25	78,5	124	159	-	6,67	G3/8	10	13,5	P1V-P023F00050
0,199	18,7	106	165	212	-	6,67	G3/8	10	13,5	P1V-P023F00038
0,199	15	132	206	265	-	6,67	G3/8	10	13,5	P1V-P023F00030
0,199	12,5	157	247	318	-	6,67	G3/8	10	13,5	P1V-P023F00025
0,199	9,3	203	314	402	-	6,67	G3/8	10	13,5	P1V-P023F00018
0,191	7,5	250	392	490	-	6,67	G3/8	10	20,0	P1V-P023F00015
0,191	6,2	300	471	598	-	6,67	G3/8	10	20,0	P1V-P023F00012
0,191	4,6	396	628	785	-	6,67	G3/8	10	20,0	P1V-P023F00009
0,191	3,7	500	785	981	-	6,67	G3/8	10	20,0	P1V-P023F00007

E

NOTE! All technical data is based on a working pressure of 5 bar.



Data for reversible motor with gearbox, brake and flange

Max Speed	Max power	Torque at max power	Min start torque	Stall torque	Brake torque	Air consumption at max power	Conn.	Min pipe ID	Weight	Order code
0,110	180	5,88	8,83	12,7	14,7	4,34	G1/4	10	8,0	P1V-P012BB0360
0,110	90	11,8	17,7	26,5	29,4	4,34	G1/4	10	8,0	P1V-P012BB0180
0,110	60	17,7	26,5	39,2	44,1	4,34	G1/4	10	8,0	P1V-P012BB0120
0,110	45	23,5	35,3	53,0	58,8	4,34	G1/4	10	8,0	P1V-P012BB0090
0,110	30	35,3	53,0	78,5	88,3	4,34	G1/4	10	10,0	P1V-P012BB0060
0,110	22,5	47,1	70,6	106	118	4,34	G1/4	10	10,0	P1V-P012BB0050
0,110	18	58,8	79,4	132	147	4,34	G1/4	10	10,0	P1V-P012BB0040
0,110	15	70,6	106	157	177	4,34	G1/4	10	10,0	P1V-P012BB0030
0,110	11,2	93,2	139	206	235	4,34	G1/4	10	10,0	P1V-P012BB0022
0,103	9	118	175	250	283	4,34	G1/4	10	11,7	P1V-P012BB0018
0,103	7,5	137	206	300	339	4,34	G1/4	10	13,0	P1V-P012BB0015
0,103	5,6	176	261	373	453	4,34	G1/4	10	13,0	P1V-P012BB0012
0,103	4,5	233	350	500	567	4,34	G1/4	10	13,0	P1V-P012BB0009
0,199	150	12,7	20,6	26,5	29,4	6,67	G3/8	10	13,5	P1V-P023BB0300
0,199	75	26,5	41,2	53,0	58,8	6,67	G3/8	10	13,5	P1V-P023BB0150
0,199	50	39,2	61,8	79,4	88,3	6,67	G3/8	10	13,5	P1V-P023BB0100
0,199	37,5	53,0	82,4	106	118	6,67	G3/8	10	13,5	P1V-P023BB0075
0,199	25	78,5	124	159	177	6,67	G3/8	10	17,0	P1V-P023BB0050
0,199	18,7	106	165	212	235	6,67	G3/8	10	17,0	P1V-P023BB0038
0,199	15	132	206	265	294	6,67	G3/8	10	17,0	P1V-P023BB0030
0,199	12,5	157	247	318	353	6,67	G3/8	10	17,0	P1V-P023BB0025
0,199	9,3	203	314	402	471	6,67	G3/8	10	17,0	P1V-P023BB0018
0,191	7,5	250	392	490	549	6,67	G3/8	10	24,5	P1V-P023BB0015
0,191	6,2	300	471	598	657	6,67	G3/8	10	24,5	P1V-P023BB0012
0,191	4,6	396	628	785	873	6,67	G3/8	10	24,5	P1V-P023BB0009
0,191	3,7	500	785	981	1100	6,67	G3/8	10	24,5	P1V-P023BB0007

NOTE! All technical data is based
on a working pressure of 5 bar.

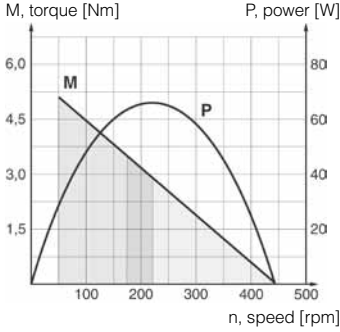


Data for reversible motor with gearbox, brake and foot

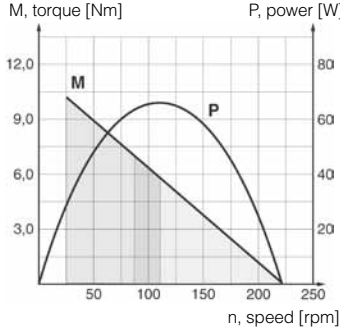
Max Speed	power at max	Torque	Min	Stall	Brake	Air con-	Conn.	Min pipe	Weight	Order code
kW	rpm	Nm	Nm	Nm	Nm	l/s		mm		
0,110	180	5,88	8,83	12,7	14,7	4,34	G1/4	10	8,5	P1V-P012FB0360
0,110	90	11,8	17,7	26,5	29,4	4,34	G1/4	10	8,5	P1V-P012FB0180
0,110	60	17,7	26,5	39,2	44,1	4,34	G1/4	10	8,5	P1V-P012FB0120
0,110	45	23,5	35,3	53,0	58,8	4,34	G1/4	10	8,5	P1V-P012FB0090
0,110	30	35,3	53,0	78,5	88,3	4,34	G1/4	10	10,5	P1V-P012FB0060
0,110	22,5	47,1	70,6	106	118	4,34	G1/4	10	10,5	P1V-P012FB0050
0,110	18	58,8	79,4	132	147	4,34	G1/4	10	10,5	P1V-P012FB0040
0,110	15	70,6	106	157	177	4,34	G1/4	10	10,5	P1V-P012FB0030
0,110	11,2	93,2	139	206	235	4,34	G1/4	10	10,5	P1V-P012FB0022
0,103	9	118	175	250	283	4,34	G1/4	10	13,5	P1V-P012FB0018
0,103	7,5	137	206	300	339	4,34	G1/4	10	13,5	P1V-P012FB0015
0,103	5,6	176	261	373	453	4,34	G1/4	10	13,5	P1V-P012FB0012
0,103	4,5	233	350	500	567	4,34	G1/4	10	13,5	P1V-P012FB0009
0,199	150	12,7	20,6	26,5	29,4	6,67	G3/8	10	13,0	P1V-P023FB0300
0,199	75	26,5	41,2	53,0	58,8	6,67	G3/8	10	13,0	P1V-P023FB0150
0,199	50	39,2	61,8	79,4	88,3	6,67	G3/8	10	13,0	P1V-P023FB0100
0,199	37,5	53,0	82,4	106	118	6,67	G3/8	10	13,0	P1V-P023FB0075
0,199	25	78,5	124	159	177	6,67	G3/8	10	16,5	P1V-P023FB0050
0,199	18,7	106	165	212	235	6,67	G3/8	10	16,5	P1V-P023FB0038
0,199	15	132	206	265	294	6,67	G3/8	10	16,5	P1V-P023FB0030
0,199	12,5	157	247	318	353	6,67	G3/8	10	16,5	P1V-P023FB0025
0,199	9,3	203	314	402	471	6,67	G3/8	10	16,5	P1V-P023FB0018
0,191	7,5	250	392	490	549	6,67	G3/8	10	24,0	P1V-P023FB0015
0,191	6,2	300	471	598	657	6,67	G3/8	10	24,0	P1V-P023FB0012
0,191	4,6	396	628	785	873	6,67	G3/8	10	24,0	P1V-P023FB0009
0,191	3,7	500	785	981	1100	6,67	G3/8	10	24,0	P1V-P023FB0007

E

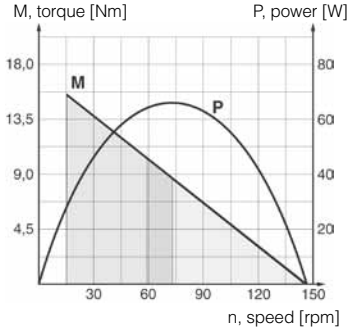
P1V-P0070440**



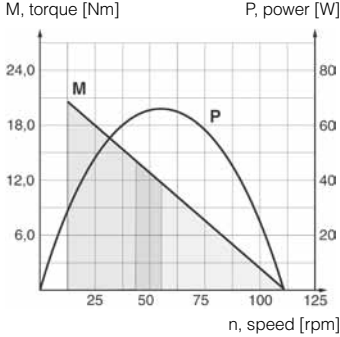
P1V-P0070220**



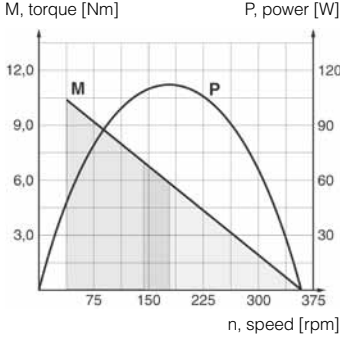
P1V-P0070147**



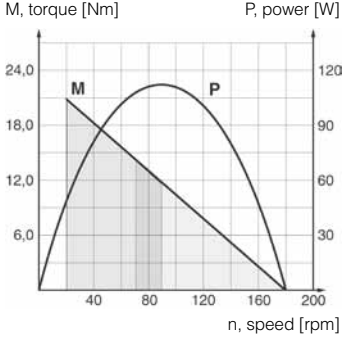
P1V-P0070110**



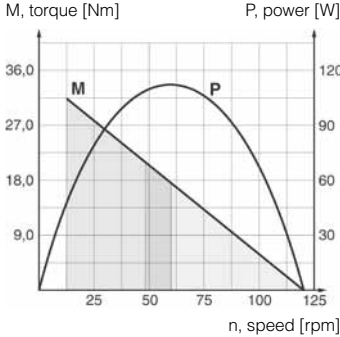
P1V-P0120360**



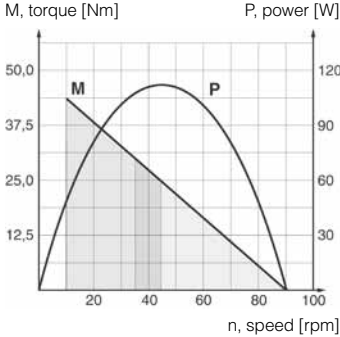
P1V-P0120180**



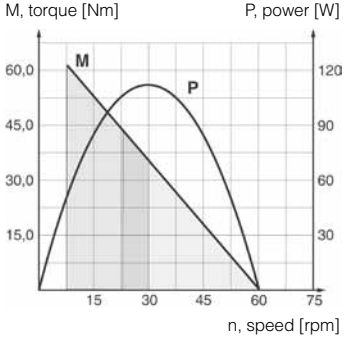
P1V-P0120120**



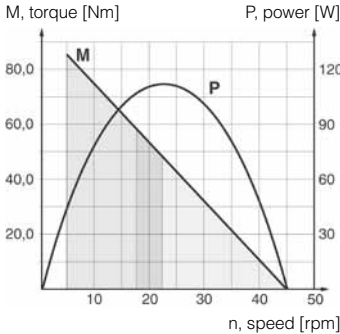
P1V-P0120090**






P1V-P0120060**

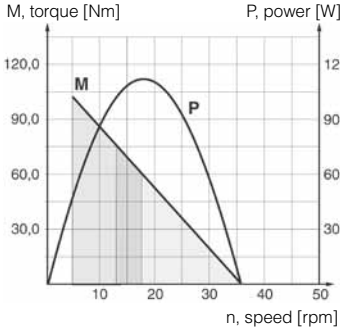


P1V-P0120050**

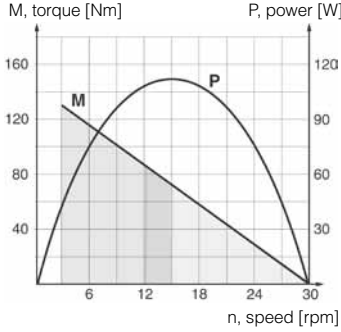


-  Possible working range of motor.
-  Optimum working range of motor.
-  Working range with shorter service life.

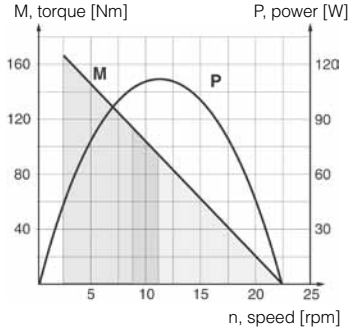
P1V-P0120040**



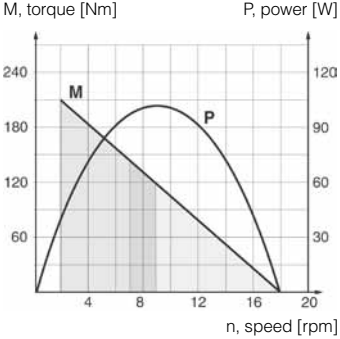
P1V-P0120030**



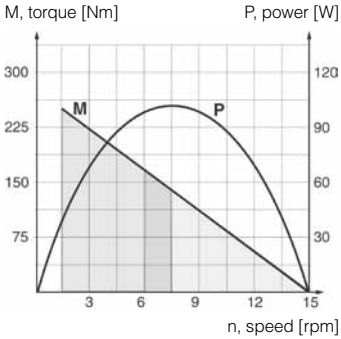
P1V-P0120022**



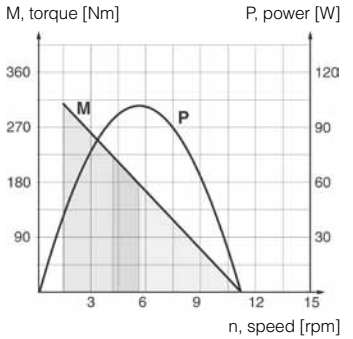
P1V-P0120018**



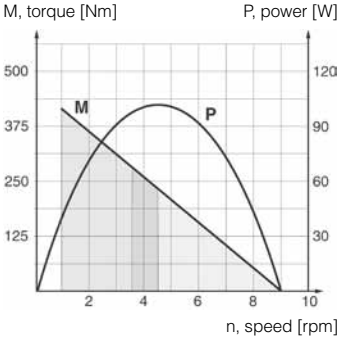
P1V-P0120015**



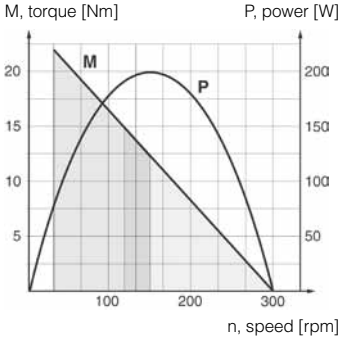
P1V-P0120012**



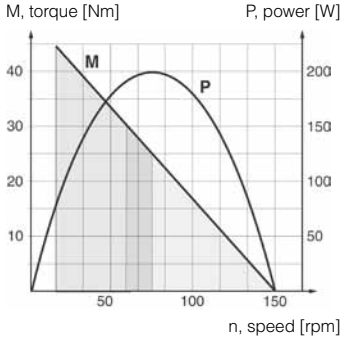
P1V-P0120009**



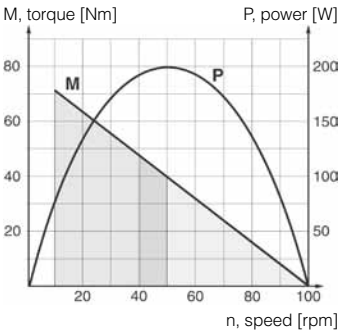
P1V-P0230300**



P1V-P0230150**



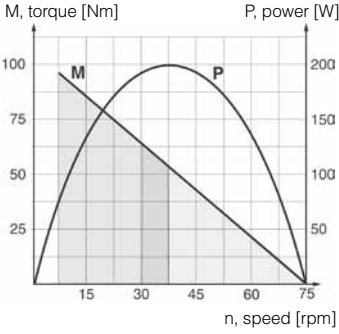
P1V-P0230100**



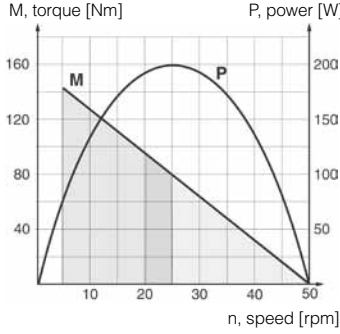
- Possible working range of motor.
- Optimum working range of motor.
- Working range with shorter service life.

E

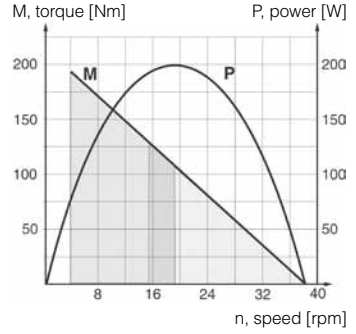
P1V-P0230075**



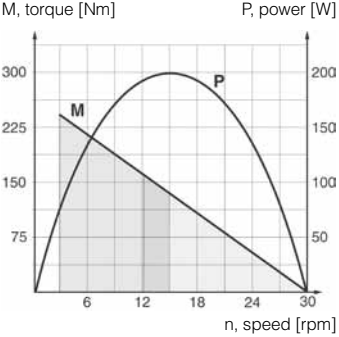
P1V-P0230050**



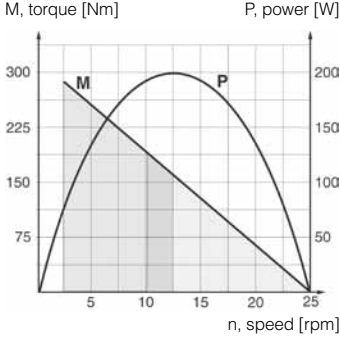
P1V-P0230038**



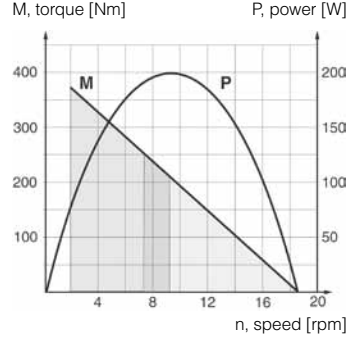
P1V-P0230030**



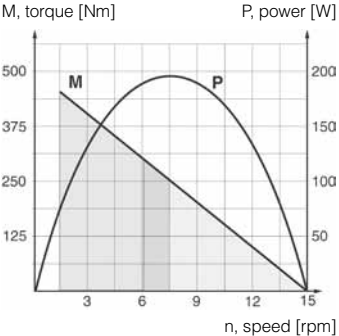
P1V-P0230025**



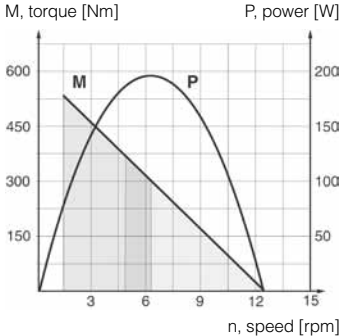
P1V-P0230018**



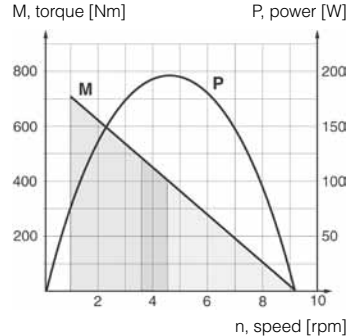
P1V-P0230015**



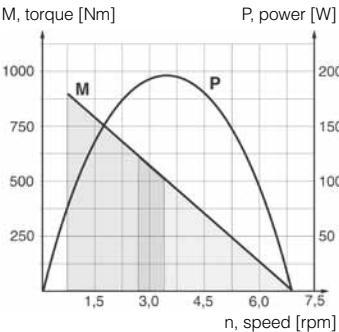
P1V-P0230012**



P1V-P0230009**



P1V-P0230007**

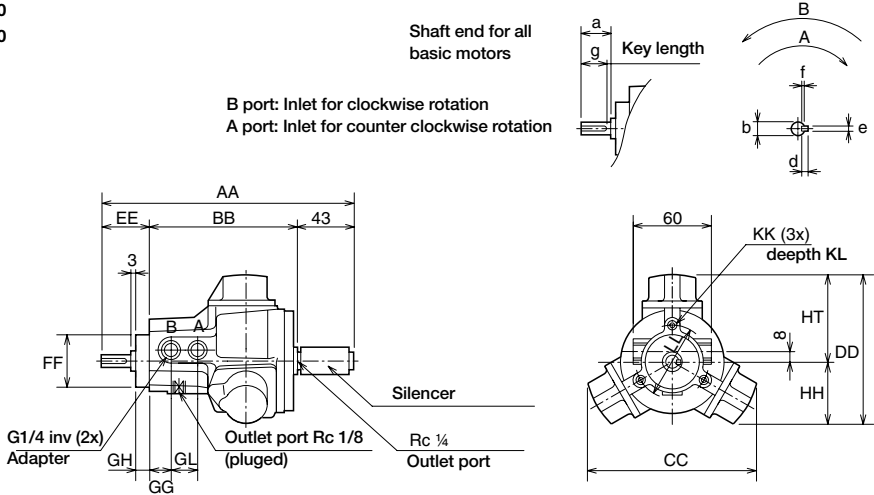


- Possible working range of motor.
- Optimum working range of motor.
- Working range with shorter service life.

Reversible basic motor

P1V-P007A02200

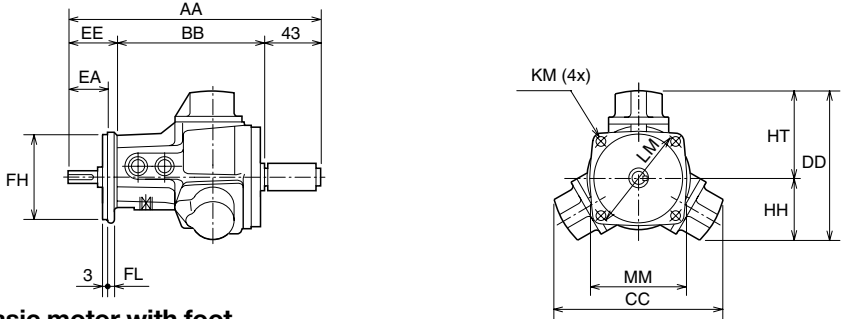
P1V-P012A01800



Reversible basic motor with flange

P1V-P007B02200

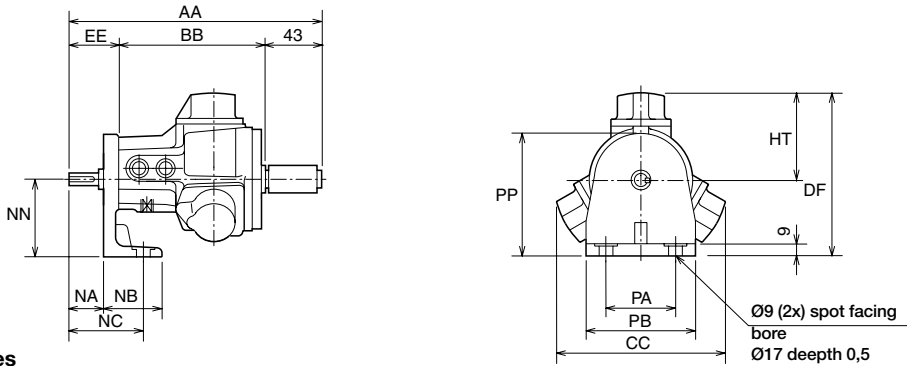
P1V-P012B01800



Reversible basic motor with foot

P1V-P007F02200

P1V-P012F01800



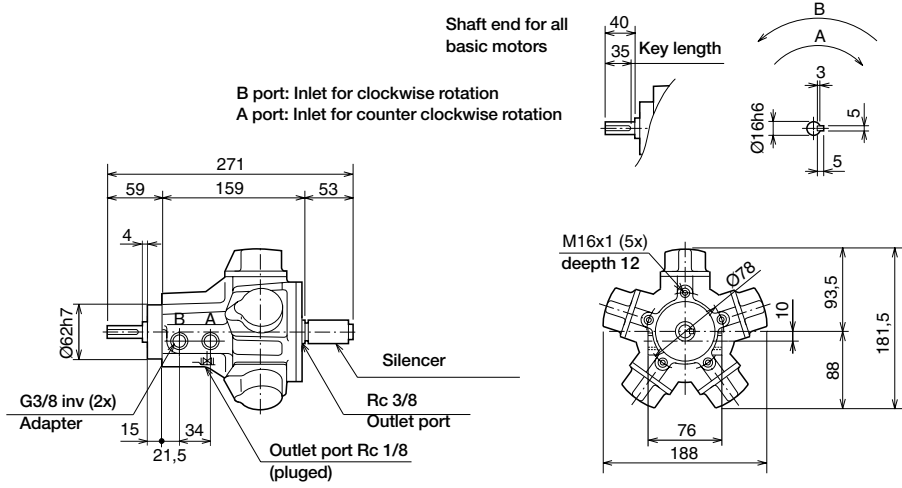
Dimension tables

Motor	AA	BB	CC	DD	DF	EA	EE	FF	FH	FL	GG	GH	GL	HH	HT	KK	KL	KM
P1V-P007*02200	192	113	130	115	127	29	36	Ø42h7	Ø68h7	5	17	10	20	48	67	M5x0,8	8	Ø6
P1V-P012*01800	225	137	164	142	152	36	45	Ø48h7	Ø78h7	7	19	12	28	60	82	M6x1	12	Ø7

Motor	Shaft end									a	b	d	e	f	g	
	LL	LM	MM	NA	NB	NC	NN	PA	PB							PP
P1V-P007*02200	Ø55	Ø80	72	26	45	56	60+/-0,1	50	80	94	23	Ø10h6	3	3	1,8	20
P1V-P012*01800	Ø62	Ø92	86	33	50	63	70+/-0,1	70	100	110	30	Ø12h6	4	4	2,5	27

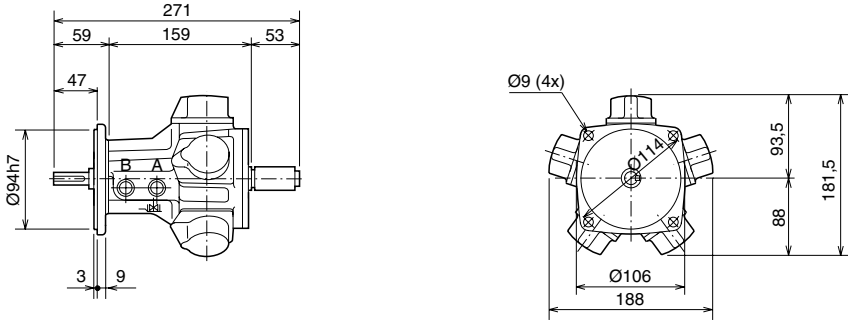
Reversible basic motor

P1V-P023A01500



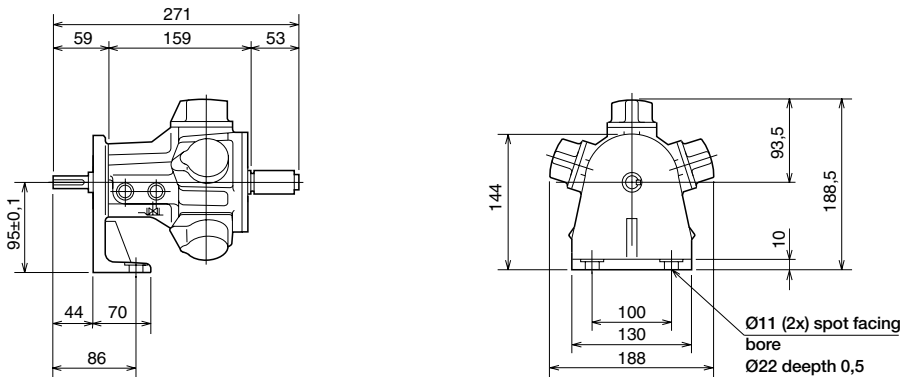
Reversible basic motor with flange

P1V-P023B01500



Reversible basic motor with foot

P1V-P023F01500

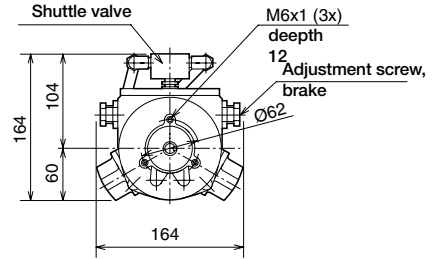
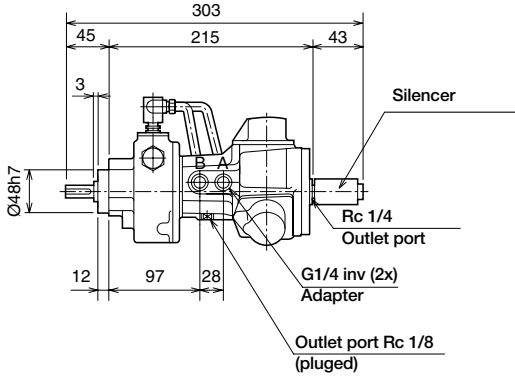
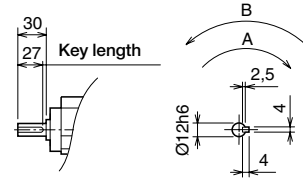


Reversible basic motor with brake

P1V-P012AB1800

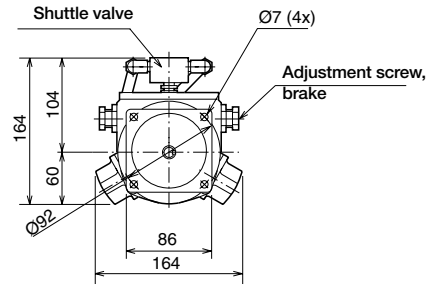
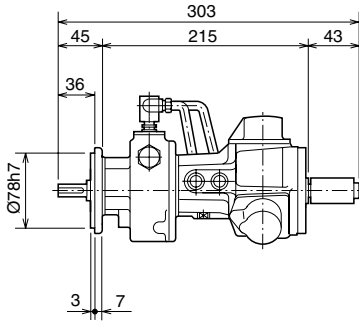
Shaft end for all basic motors

B port: Inlet for clockwise rotation
A port: Inlet for counter clockwise rotation



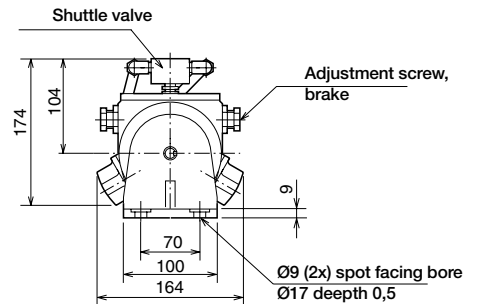
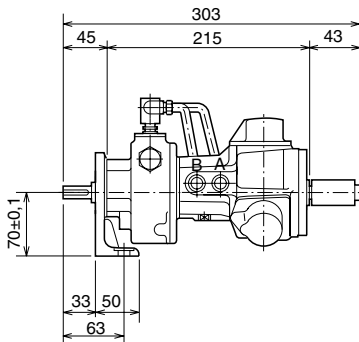
Reversible basic motor with brake and flange

P1V-P012BB1800



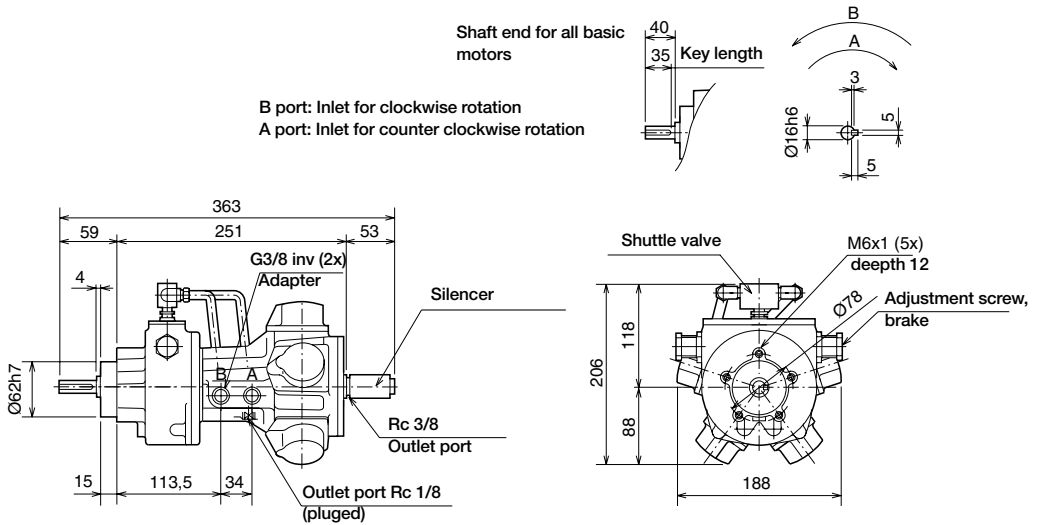
Reversible basic motor with brake and foot

P1V-P012FB1800



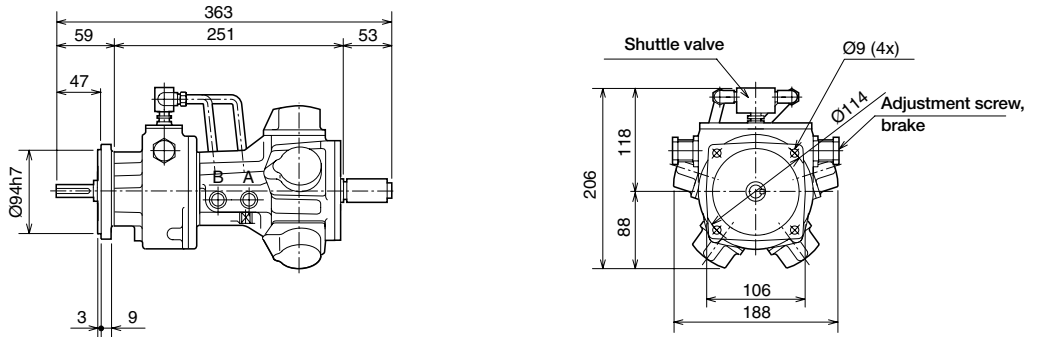
Reversible basic motor with brake

P1V-P023AB1500



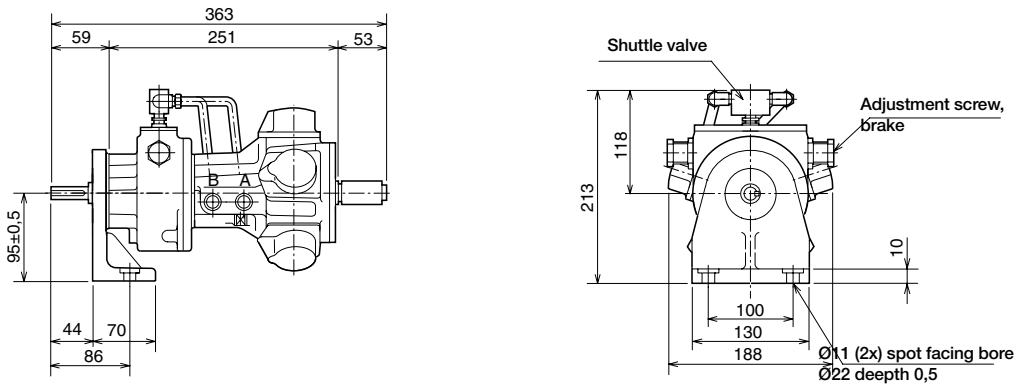
Reversible basic motor with brake and flange

P1V-P023BB1500



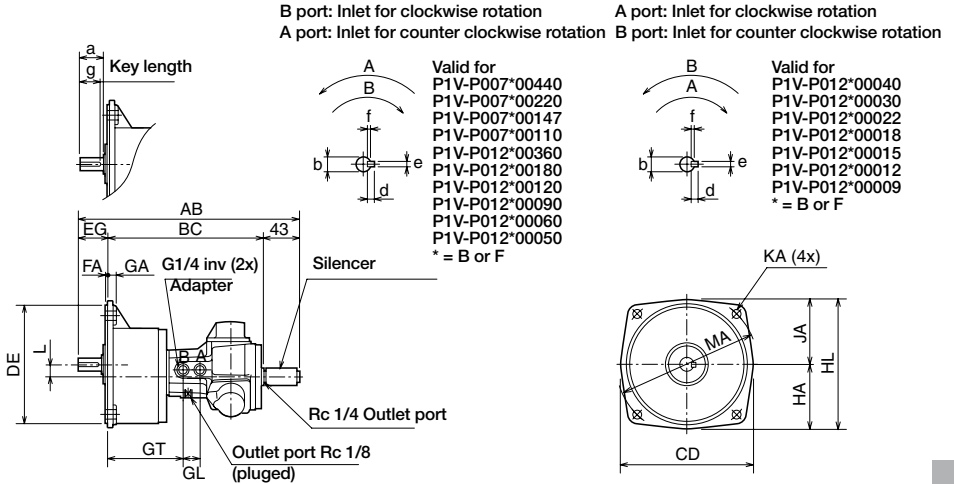
Reversible basic motor with brake and foot

P1V-P023FB1500



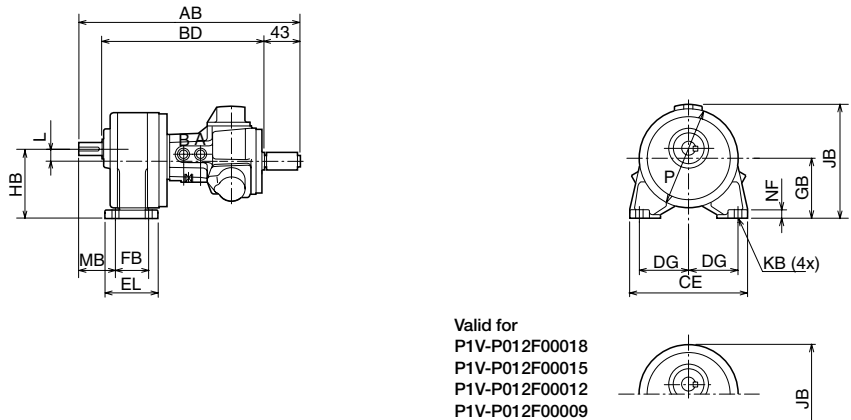
Reversible motor with gearbox and flange

- P1V-P007B00440
- P1V-P007B00220
- P1V-P007B00147
- P1V-P007B00110
- P1V-P012B00360
- P1V-P012B00180
- P1V-P012B00120
- P1V-P012B00090
- P1V-P012B00060
- P1V-P012B00050
- P1V-P012B00040
- P1V-P012B00030
- P1V-P012B00022
- P1V-P012B00018
- P1V-P012B00015
- P1V-P012B00012
- P1V-P012B00009



Reversible motor with gearbox and foot

- P1V-P007F00440
- P1V-P007F00220
- P1V-P007F00147
- P1V-P007F00110
- P1V-P012F00360
- P1V-P012F00180
- P1V-P012F00120
- P1V-P012F00090
- P1V-P012F00060
- P1V-P012F00050
- P1V-P012F00040
- P1V-P012F00030
- P1V-P012F00022
- P1V-P012F00018
- P1V-P012F00015
- P1V-P012F00012
- P1V-P012F00009



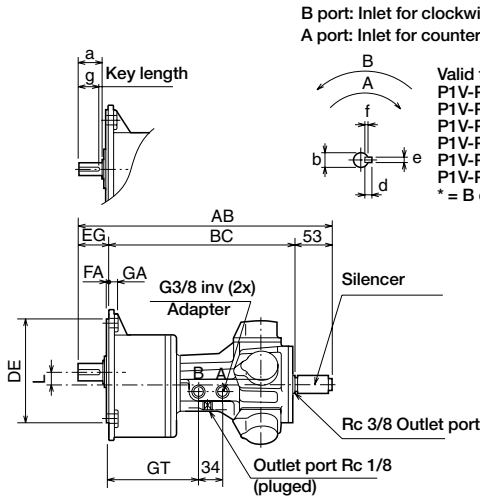
Dimension tables

Motor	AB	BC	BD	CD	CE	DE	DG	EG	EL	FA	FB	GA	GB	GL	GT	HA	HB	HL	
P1V-P007*00440 P1V-P007*00220																			
P1V-P007*00147 P1V-P007*00110	272	194	199	154	134	Ø145	h7	55	35	64	3	40	10	68,5	20	98	80,0	85	157,0
P1V-P012*00360 P1V-P012*00180																			
P1V-P012*00120 P1V-P012*00090	323	233	240	164	154	Ø148	h7	65	47	90	4	65	12	71,0	28	115	89,0	90	171,5
P1V-P012*00060 P1V-P012*00050																			
P1V-P012*00040 P1V-P012*00030																			
P1V-P012*00022	340	247	252	186	175	Ø170	h7	70	50	125	4	90	15	86,5	28	128	105,5	110	199,0
P1V-P012*00018 P1V-P012*00015																			
P1V-P012*00012 P1V-P012*00009	360	257	262	215	208	Ø180	h7	85	60	168	4	130	15	101,5	28	139	126,5	130	234,0

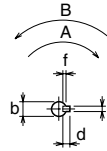
Motor	JA	JB	KA	KB	L	MA	MB	NF	P	Shaft end									
										a	b	d	e	f	g				
P1V-P007*00440 P1V-P007*00220																			
P1V-P007*00147 P1V-P007*00110	77,0	135,5	Ø11	Ø9	16,5	Ø170	45	10	Ø112	30	Ø18h6	6	6	3,5	27				
P1V-P012*00360 P1V-P012*00180																			
P1V-P012*00120 P1V-P012*00090	82,5	153,0	Ø11	Ø11	19,0	Ø185	55	12	Ø125	40	Ø22h6	6	6	3,5	35				
P1V-P012*00060 P1V-P012*00050																			
P1V-P012*00040 P1V-P012*00030																			
P1V-P012*00022	94,0	169,0	Ø11	Ø11	23,5	Ø215	65	15	Ø152	45	Ø28h6	7	8	4	40				
P1V-P012*00018 P1V-P012*00015																			
P1V-P012*00012 P1V-P012*00009	107,5	198,0	Ø13	Ø13	28,5	Ø250	70	18	Ø184	55	Ø32h6	8	10	5	50				

Reversible motor with gearbox and flange

- P1V-P023B00300
- P1V-P023B00150
- P1V-P023B00100
- P1V-P023B00075
- P1V-P023B00050
- P1V-P023B00038
- P1V-P023B00030
- P1V-P023B00025
- P1V-P023B00018
- P1V-P023B00015
- P1V-P023B00012
- P1V-P023B00009
- P1V-P023B00007

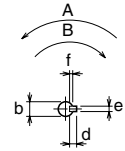


B port: Inlet for clockwise rotation
A port: Inlet for counter clockwise rotation

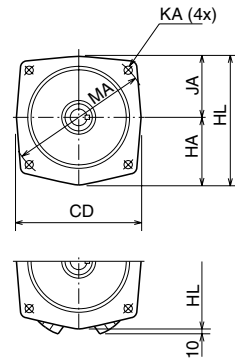


Valid for
P1V-P023*00300
P1V-P023*00150
P1V-P023*00100
P1V-P023*00075
P1V-P023*00050
P1V-P023*00038
* = B or F

A port: Inlet for clockwise rotation
B port: Inlet for counter clockwise rotation



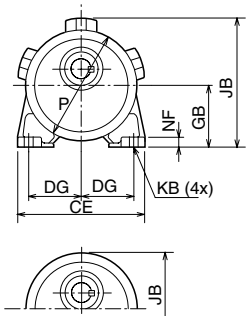
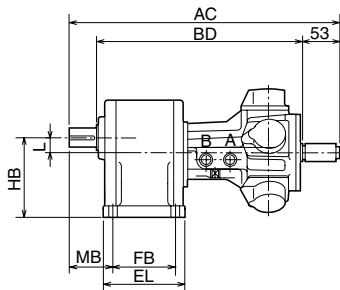
Valid for
P1V-P023*00030
P1V-P023*00025
P1V-P023*00018
P1V-P023*00015
P1V-P023*00012
P1V-P023*00009
P1V-P023*00007
* = B or F



Valid for
P1V-P023B00300
P1V-P023B00150
P1V-P023B00100
P1V-P023B00075

Reversible motor with gearbox and foot

- P1V-P023F00300
- P1V-P023F00150
- P1V-P023F00100
- P1V-P023F00075
- P1V-P023F00050
- P1V-P023F00038
- P1V-P023F00030
- P1V-P023F00025
- P1V-P023F00018
- P1V-P023F00015
- P1V-P023F00012
- P1V-P023F00009
- P1V-P023F00007



Valid for
P1V-P023F00015
P1V-P023F00012
P1V-P023F00009
P1V-P023F00007

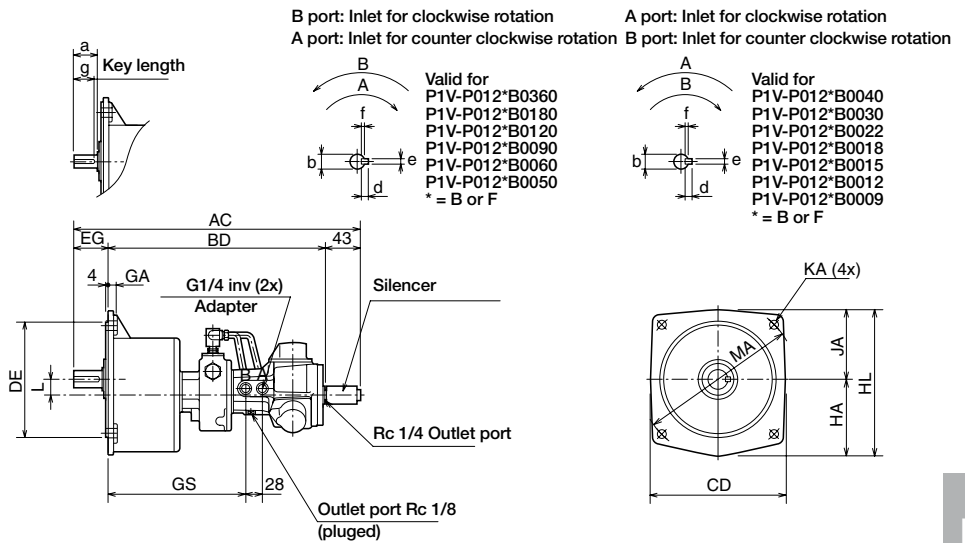
Dimension tables

Motor	AB	AC	BC	BD	CD	CE	DE	DG	EG	EL	FA	FB	GA	GB	GT	HA	HB	HL
P1V-P023*00300 P1V-P023*00150																		
P1V-P023*00100 P1V-P023*00075	374	-	271	276	186	175	Ø170h7	70	50	125	4	90	15	86,5	133	105,5	110	198,5
P1V-P023*00050 P1V-P023*00038																		
P1V-P023*00030 P1V-P023*00025																		
P1V-P023*00018	403	-	290	295	215	208	Ø180h7	85	60	168	4	130	15	101,5	152	126,5	130	234,0
P1V-P023*00015 P1V-P023*00012																		
P1V-P023*00009 P1V-P023*00007	431	428	307	310	270	254	Ø230h7	105	71	196	5	150	18	116,0	170	149,0	150	284,0

Motor	Shaft end														
	JA	JB	KA	KB	L	MA	MB	NF	P	a	b	d	e	f	g
P1V-P023*00300 P1V-P023*00150															
P1V-P023*00100 P1V-P023*00075	93,0	180,0	Ø11	Ø11	23,5	Ø215	65	15	Ø152	45	Ø28h6	7	8	4	40
P1V-P023*00050 P1V-P023*00038															
P1V-P023*00030 P1V-P023*00025															
P1V-P023*00018	107,5	198,0	Ø13	Ø13	28,5	Ø250	70	18	Ø184	55	Ø32h6	8	10	5	50
P1V-P023*00015 P1V-P023*00012															
P1V-P023*00009 P1V-P023*00007	135,0	230,0	Ø18	Ø15	23,5	Ø310	90	20	Ø218	65	Ø40h6	8	12	5	60

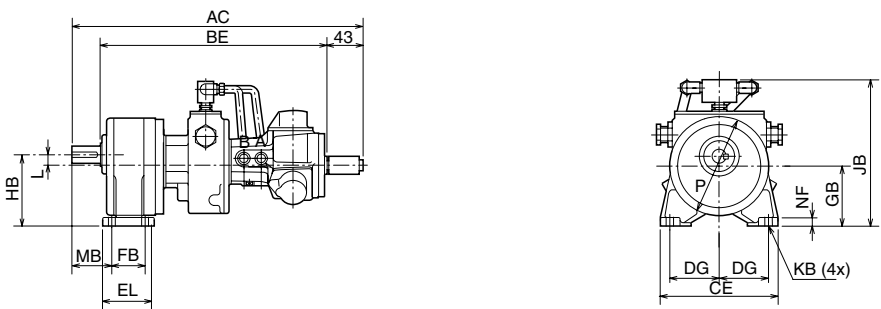
Reversible motor with gearbox, brake and flange

- P1V-P012BB0360
- P1V-P012BB0180
- P1V-P012BB0120
- P1V-P012BB0090
- P1V-P012BB0060
- P1V-P012BB0050
- P1V-P012BB0040
- P1V-P012BB0030
- P1V-P012BB0022
- P1V-P012BB0018
- P1V-P012BB0015
- P1V-P012BB0012
- P1V-P012BB0009



Reversible motor with gearbox, brake and foot

- P1V-P012FB0360
- P1V-P012FB0180
- P1V-P012FB0120
- P1V-P012FB0090
- P1V-P012FB0060
- P1V-P012FB0050
- P1V-P012FB0040
- P1V-P012FB0030
- P1V-P012FB0022
- P1V-P012FB0018
- P1V-P012FB0015
- P1V-P012FB0012
- P1V-P012FB0009



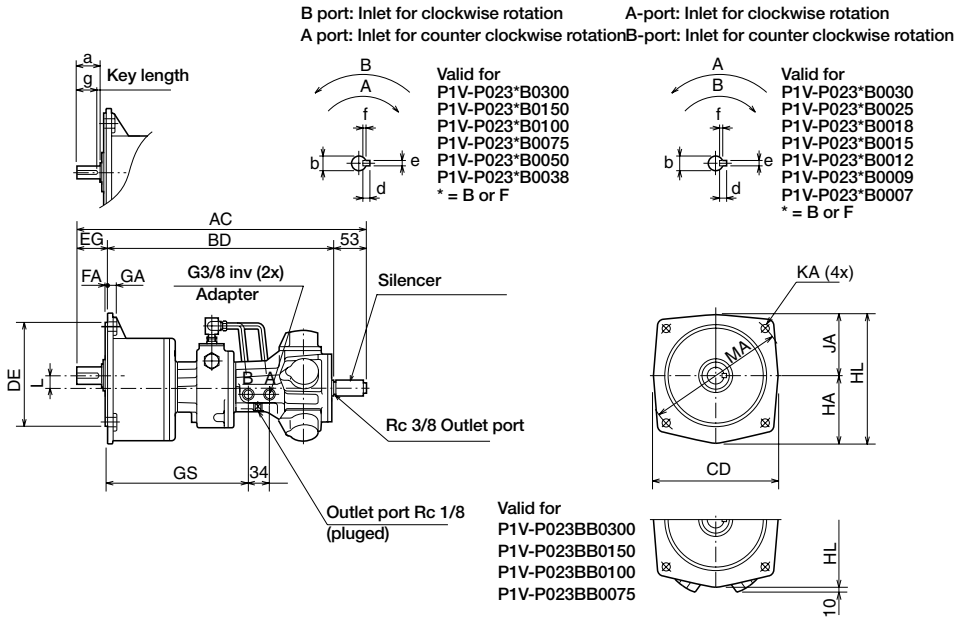
Dimension tables

Motor	AC	BD	BE	CD	CE	DE	DG	EG	EL	FB	GA	GB	GS	HA	HB	HL
P1V-P012*B0360 P1V-P012*B0180																
P1V-P012*B0120 P1V-P012*B0090	401	311	318	164	154	∅148h7	65	47	90	65	12	71,0	193	89,0	90	174,0
P1V-P012*B0060 P1V-P012*B0050																
P1V-P012*B0040 P1V-P012*B0030																
P1V-P012*B0022	417	324	329	186	175	∅170h7	70	50	125	90	15	86,5	206	105,5	110	198,5
P1V-P012*B0018 P1V-P012*B0015																
P1V-P012*B0012 P1V-P012*B0009	438	335	340	215	208	∅180h7	85	60	168	130	15	101,5	217	126,5	130	234,0

Motor	JA	JB	KA	KB	L	MA	MB	NF	P	a	b	d	e	f	g
P1V-P012*B0360 P1V-P012*B0180															
P1V-P012*B0120 P1V-P012*B0090	82,5	175	∅11	∅11	19,0	∅185	55	12	∅125	40	∅22H6	45	∅28h6	7	8
P1V-P012*B0060 P1V-P012*B0050															
P1V-P012*B0040 P1V-P012*B0030															
P1V-P012*B0022	93,0	191	∅11	∅11	23,5	∅215	65	15	∅152	45	∅28H6	55	∅32h6	8	10
P1V-P012*B0018 P1V-P012*B0015															
P1V-P012*B0012 P1V-P012*B0009	107,5	206	∅13	∅13	28,5	∅250	70	18	∅184	55	∅32H6	65	∅40h6	8	12

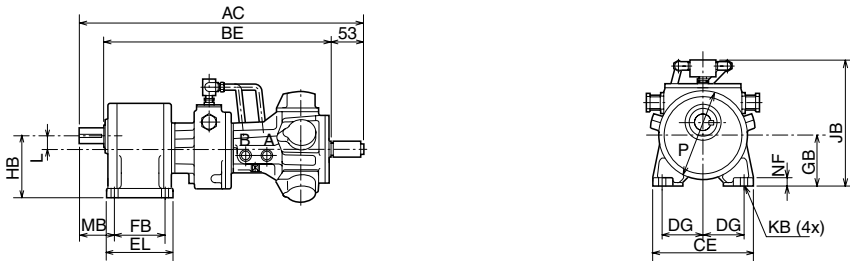
Reversible motor with gearbox, brake and flange

- P1V-P023BB0300
- P1V-P023BB0150
- P1V-P023BB0100
- P1V-P023BB0075
- P1V-P023BB0050
- P1V-P023BB0038
- P1V-P023BB0030
- P1V-P023BB0025
- P1V-P023BB0018
- P1V-P023BB0015
- P1V-P023BB0012
- P1V-P023BB0009
- P1V-P023BB0007



Reversible motor with gearbox, brake and foot

- P1V-P023FB0300
- P1V-P023FB0150
- P1V-P023FB0100
- P1V-P023FB0075
- P1V-P023FB0050
- P1V-P023FB0038
- P1V-P023FB0030
- P1V-P023FB0025
- P1V-P023FB0018
- P1V-P023FB0015
- P1V-P023FB0012
- P1V-P023FB0009
- P1V-P023FB0007



Dimension tables

Motor	AC	BD	BE	CD	CE	DE	DG	EG	EL	FA	FB	GA	GB	GS	HA	HB	HL
P1V-P023*B0300 P1V-P023*B0150						Ø170h7	70	50	125	4	90	15	86,5	225	105,5	110	198,5
P1V-P023*B0100 P1V-P023*B0075	466	363	368	186	175												
P1V-P023*B0050 P1V-P023*B0038						Ø180h7	85	60	168	4	130	15	101,5	244	126,5	130	234,0
P1V-P023*B0030 P1V-P023*B0025																	
P1V-P023*B0018	495	382	387	215	208												
P1V-P023*B0015 P1V-P023*B0012						Ø230h7	105	71	196	5	150	18	116,0	259	149,0	150	284,0
P1V-P023*B0009 P1V-P023*B0007	520	396	402	270	254												

Motor	Shaft end														
	JA	JB	KA	KB	L	MA	MB	NF	P	a	b	d	e	f	g
P1V-P023*B0300 P1V-P023*B0150															
P1V-P023*B0100 P1V-P023*B0075	493,0	205	Ø11	Ø11	23,5	Ø215	65	15	Ø152	45	Ø28H6	7	8	4	40
P1V-P023*B0050 P1V-P023*B0038															
P1V-P023*B0030 P1V-P023*B0025															
P1V-P023*B0018	107,5	220	Ø13	Ø13	28,5	Ø250	70	18	Ø184	55	Ø32H6	8	10	5	50
P1V-P023*B0015 P1V-P023*B0012															
P1V-P023*B0009 P1V-P023*B0007	135,0	234	Ø18	Ø15	34,0	Ø310	90	20	Ø218	65	Ø40H6	8	12	5	60

Theoretical calculations

This section provides you with the background you need in order to select the right air motor for common applications. The first four parts explain the direct physical relationships between:

Force - Torque - Speed - Power Requirement

Before selecting an air motor, you need to know the torque required by the application at the necessary speed. Sometimes, the torque and the speed are not known but the power requirement and the speed of movement are. You can use the following formulas to calculate the speed and torque.

Power

The power requirement is always calculated in N.

Formula:

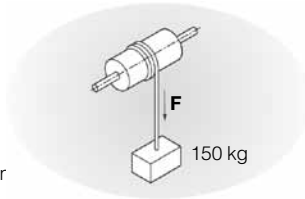
$$F = m \times g$$

F = power in N
m = mass in kg
g = gravitation (9,81) in r

In this example, the mass is 150 kg

$$F = 150 \times 9,81 \text{ N}$$

$$F = 1470 \text{ N}$$



Torque

Torque is the force applied to produce rotational motion (rotational force) or the force applied in the opposite direction. It is the product of the rotational force F and the distance from the pivot point (radius or moment arm)

Formula:

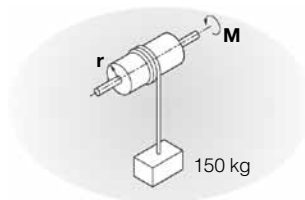
$$M = m \times g \times r$$

M = torque in Nm
m = mass in kg
g = gravitation (9,81) in n/s^2
r = radius or moment arm in m

In this example, the drum diameter is 300 mm, which means the radius $r = 0,15 \text{ m}$, and the mass is 150kg.

$$M = 150 \times 9,81 \times 0,15 \text{ Nm}$$

$$M = 221 \text{ Nm}$$



Speed

The required motor speed can be calculated if the speed of movement and the radius (diameter) are known.

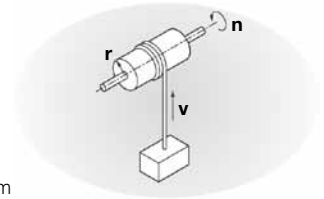
$$n = v \times 60 / (2 \times \pi \times r)$$

n = motor speed in rpm
v = speed of movement in m/sec
r = radius in m
 π = constant (3,14)

In this example, the speed of movement is 1,5 m/s and the drum diameter is 300 m (radius $r = 0,15 \text{ m}$)

$$n = 1,5 \times 60 / (2 \times \pi \times 0,15) \text{ rpm}$$

$$n = 96 \text{ rpm}$$



Power Requirement

The power requirement can be calculated if the motor speed and torque are known.

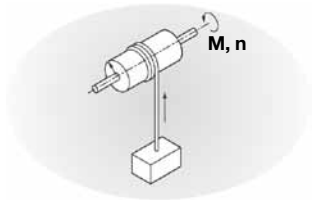
$$P = M \times n / 9550$$

P = power in kW
M = torque in Nm
n = rpm
9550 = conversion factor

In this example, a torque of 1,25 Nm is required at a speed of 1500 rpm.

$$P = 1,25 \times 1500 / 9550$$

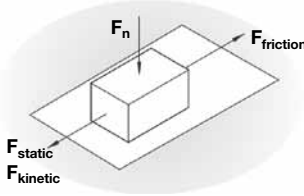
$$P = 0,196 \text{ kW or approx. } 200 \text{ Watt}$$



Frictional Forces between two Objects

A frictional force always occurs between two objects with surfaces in contact with each other. It is always exerted against the direction of movement.

The frictional force is either static or kinetic. When selecting an air motor, we need to consider the larger of the two forces, static or kinetic.



The size of the static frictional force or the kinetic frictional force is the product of the normal force F_n and the coefficient of static friction (μ_0), or the product of the normal force F_n and the coefficient of kinetic friction (μ).

The size of the contact surface between the objects is irrelevant.

Formula:

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

$$F_n = m \times g$$

- F_{static} = static friction in N
- F_{kinetic} = kinetic friction in N
- F_n = force from object in N
- m = mass in kg
- g = gravitation (9,81) in m/s^2

Material		Coefficient of static friction μ_0	
		Dry	Lubricated
Bronze	Bronze	0,28	0,11
Bronze	Grey iron	0,28	0,16
Grey iron	Grey iron	-	0,16
Steel	Bronze	0,27	0,11
Steel	Ice	0,027	-
Steel	Grey iron	0,20	0,10
Steel	Steel	0,15	0,10
Steel	White metal	-	-
Wood	Ice	-	-
Wood	Wood	0,65	0,16
Leather	Grey iron	0,55	0,22
Brake lining	Steel	-	-
Steel	Nylon (polyamide)	-	-

Material		Coefficient of kinetic friction μ	
		Dry	Lubricated
Bronze	Bronze	0,2	0,06
Bronze	Grey iron	0,21	0,08
Grey iron	Grey iron	-	0,12
Steel	Bronze	0,18	0,07
Steel	Ice	0,014	-
Steel	Grey iron	0,16	0,05
Steel	Steel	0,10	0,05
Steel	White metal	0,20	0,04
Wood	Ice	0,035	-
Wood	Wood	0,35	0,05
Leather	Grey iron	0,28	0,12
Brake lining	Steel	0,55	0,40
Steel	Nylon (polyamide)	0,5	0,10

Example: A steel component with a weight of 500 kg is to be pulled across bronze plate without lubrication. What will the frictional force be when the component moves?

$$F_{\text{static}} = F_n \times \mu_0$$

$$F_{\text{kinetic}} = F_n \times \mu$$

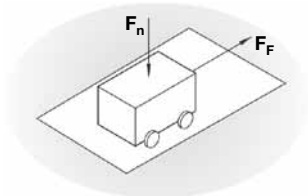
$$F_{\text{static}} = 500 \times 9,81 \times 0,27 = 1324 \text{ N}$$

$$F_{\text{kinetic}} = 500 \times 9,81 \times 0,18 = 883 \text{ N}$$

The static frictional force should always be compared with the force provided by the motor when it starts.

Kinetic Resistance

Kinetic resistance is a term expressing the total resistance, consisting of rolling resistance and the frictional force in the bearing



Formula:

$$F_F = \mu_F \times F_n$$

- F_F = kinetic resistance in N
- μ_F = coefficient of kinetic resistance
- F_n = force from object in N

Coefficient of kinetic resistance:

Object	Coefficient of kinetic resistance
Railway vehicle on steel rails	0,0015 to 0,0030
Vehicle with rubber wheel on asphalt	0,015 to 0,03

Example:

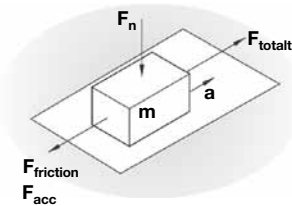
A railway carriage with a weight of 2 tonnes is to move over flat rails. What will the kinetic resistance be?

$$F_F = \mu_F \times F_n$$

$$F_F = 0,0030 \times 2 \times 1000 \times 9,81$$

$$F_F = 4,86 \text{ N}$$

Moving a component over a base, with friction between them



The force required to move the component consists of two parts - a frictional force to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{friction}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{friction}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

F_{friction} = frictional force in N (either F_{static} or F_{kinetic} depending on which is the greater force)

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A steel component weighing 500 kg is to be pulled over a dry steel plate with an acceleration of $0,1 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic}} + F_{\text{acc}}$$

$$F_{\text{tot}} = F_{\text{kinetic}} + m \times a$$

$$F_{\text{tot}} = F_n \times u + m \times a$$

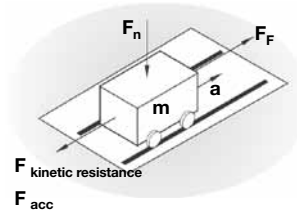
$$F_{\text{tot}} = 500 \times 9,81 \times 0,15 + 500 \times 0,1$$

$$F_{\text{tot}} = 735,75 + 50$$

$$F_{\text{tot}} = 785,75 \text{ N}$$

Answer: A force of 780 N is required to produce this movement.

Moving a carriage over rails, with kinetic resistance between them



The force required to move the component consists of two parts - a kinetic resistance to move the component over the base, and an acceleration force

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{acc}} = m \times a$$

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + m \times a$$

F_{tot} = the total force required in order to move the object in N

$F_{\text{kinetic resistance}}$ = total kinetic resistance in N

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A carriage weighing 2500 kg is to be pulled over steel rails with an acceleration of $0,2 \text{ m/s}^2$. What is the total force required to produce this movement?

$$F_{\text{tot}} = F_{\text{kinetic resistance}} + F_{\text{acc}}$$

$$F_{\text{tot}} = u_f \times F_n + m \times a$$

$$F_{\text{tot}} = 0,0030 \times 2500 \times 9,81 + 2500 \times 0,2$$

$$F_{\text{tot}} = 6,1 + 500$$

$$F_{\text{tot}} = 506 \text{ N}$$

Answer: A force of 510 N is required to produce this movement.

In practice

These calculations only produce values as they would be under optimum conditions. There must be no inclines in either direction. In applications using carriages, the rails must be perfectly flat without any inclines, the wheels must be perfectly round and there must be nothing on the rails (grains of sand, etc.). There must also be no effects from wind, etc.

In addition, there is always uncertainty with regard to the compressed air supply. How can we guarantee a pressure of 6 bar to the inlet port of the air motor?

Tip: calculate the required theoretical values for the air motor and assume a safety factor of 10 for the frictional force or kinetic resistance, and add this to the acceleration force. If the motor proves to be too powerful in practice, the supply air can always be regulated by throttling or pressure regulation. If you select a motor that is not powerful enough, on the other hand, the only option is to replace it.

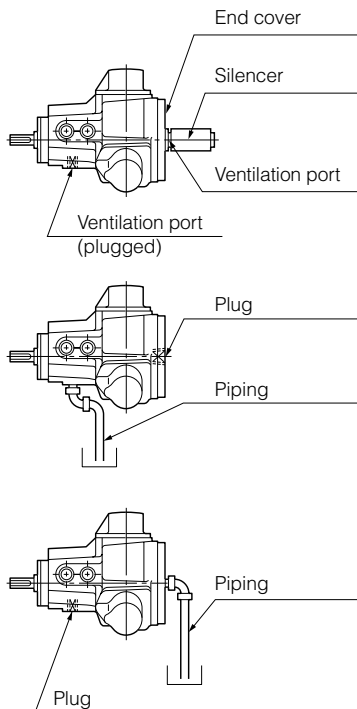
Installation instructions

Mounting

P1V-P Air Motors can be built-in in all positions. It is important to get the output spindle in centre to the driven part to avoid unnecessary axial or side load on the motor. Axial couplings are recommended to be used between the motor and the driven part to get the longest possible service life on the P1V-P Motor.

Ventilation port

- Ventilation port is to remove air pressure in the Air Motor. It shall always be kept open. If it is plugged will the internal pressure in the motor increase, resulting in reduction of the output power. Further, a trouble of come-off of the end cover will be caused.
- When delivered the silencer is not mounted on the ventilation port. It has to be assembled before start of the motor.
- When the motor is running can dirty and/or air with oil mist come out of the ventilation port. To avoid it to come out in the air in the surroundings creating environmental problems will it be necessary to take it away to one dirt/oil exhaust filter.



Piping

- The pneumatic equipment (filter, regulator, lubricator, directional control valve, speed control valves....) has to be mounted as closed as possible to the P1V-P motor.
- Trouble of pneumatic equipment is mainly caused by foreign matters included dust, chips, scrap of tape seal, rust etc. Before piping, the piping shall be cleaned with compressed.
- For piping bore and pneumatic equipment (filter, regulator, directional control valve etc.) bore corresponding to the air consumption of the air motor has to be used to avoid pressure drop in the inlet port of the motor. When pipe or pneumatic equipment with smaller bore are used will the inlet pressure of the motor be too low and the performance will decrease. Piping with larger bores than the port connection is preferred.
- Clean, dry and lubricated compressed air has to be used (see the chapter "Compressed air quality on page 10)
- Use one as effective silencer as possible on the exhaust air. One silencer/oil absorption filter is preferred.
- All components on the exhaust side has to be enough large to avoid backpressure to the motor. Backpressure will reduce the output performance of the motor.
- Be sure to use one motor with the right speed for the application. The motor has to work with a speed of 20 – 50% of the free speed. A lower speed will not give a stable function and a higher speed will increase the internal wear.

Lubrication

- P1V-P has to be supplied with lubricated compressed air.
- Oil for air tools type VG32 has to be used.
- 2 – 3 drops/minute from the lubricator gives the right amount of oil.

NOTE!

Insufficient lubrication will cause troubles such as shortening of life and seizure of rotary valve, piston and sleeve. Mount an air lubricator as close to the motor as possible.

Permitted shaft loadings

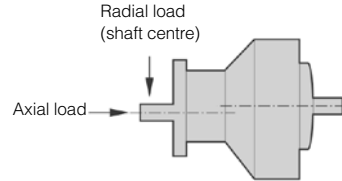
Max. permitted load on output shaft for motors according to tables below.

Basic motors - also with brake

Motor	Radial load [N]	Axial load [N]
P1V-P007**2200	98	59
P1V-P012**1800	137	98
P1V-P023**1500	196	137

**

- A0 = Basic motor
 B0 = Basic motor with flange
 F0 = Basic motor with foot
 AB = Basic motor - with brake
 BB = Basic motor with flange - with brake
 FB = Basic motor with foot - with brake

**Motor with gearbox and mountings - also with brake**

Motor	Radial load [N]	Axial load [N]
P1V-P007**0440	245	147
P1V-P007**0220	539	245
P1V-P007**0147	785	343
P1V-P007**0110	1080	441
P1V-P012**0360	392	245
P1V-P012**0180	785	343
P1V-P012**0120	1080	539
P1V-P012**0090	1370	686
P1V-P012**0060	2160	1130
P1V-P012**0050	2260	1230
P1V-P012**0040	2350	1320
P1V-P012**0030	2450	1370
P1V-P012**0022	1550	1470
P1V-P012**0018	4610	2260
P1V-P012**0015	4710	2550
P1V-P012**0012	5000	2840
P1V-P012**0009	5100	3140
P1V-P023**0300	490	294
P1V-P023**0150	981	441
P1V-P023**0100	1370	637
P1V-P023**0075	1770	834
P1V-P023**0050	3970	1420
P1V-P023**0038	4170	1570
P1V-P023**0030	4320	1670
P1V-P023**0025	4410	1810
P1V-P023**0018	4510	1960
P1V-P023**0015	6470	2550
P1V-P023**0012	6620	2750
P1V-P023**0009	6910	2940
P1V-P023**0007	7060	3140

**

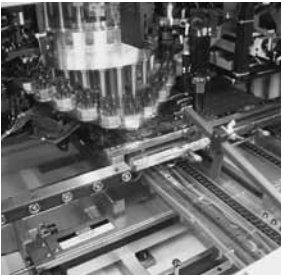
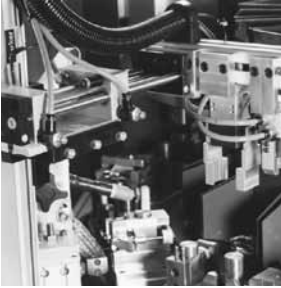
För P1V-P007, P1V-P012 and P1V-P023

- B0 = Motor with gearbox and flange
 F0 = Motor with gearbox and foot

För P1V-P012 and P1V-P023

- BB = Motor with gearbox and flange - with brake
 FB = Motor with gearbox and foot - with brake

E

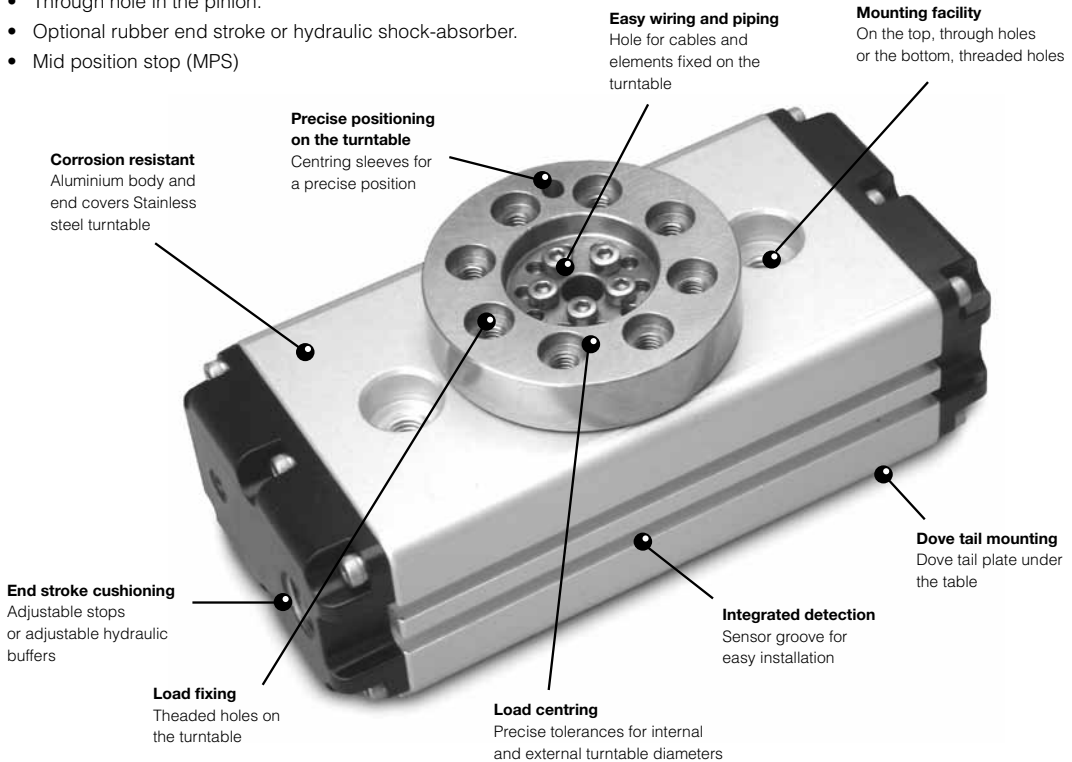


Rotary Table Units

P5W Series

Features

- Rack and pinion patented movement.
- Continuously adjustable stroke.
- Large ball bearings on the shaft.
- Through hole in the pinion.
- Optional rubber end stroke or hydraulic shock-absorber.
- Mid position stop (MPS)



Technical data

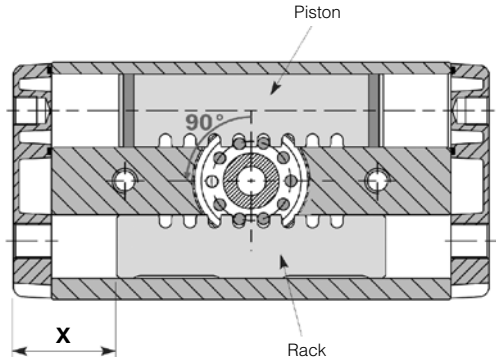
Size	10	12	20	25	35	45	63
Min. Max. pressure operation (bar)				1,5 to 8			
Operating temperature (°C)				+5 to +60			
Theoretical torque at 6 bar (Ncm)	28	56	198	397	779	1669	3926
Max. rotation torque (Nm)*	0,3	0,6	2	4	8	17	39
Rotation angle (°)	0 to 190						
Rotation time without load (Secs)	0.05	0.06	0.11	0.19	0.08	0.16	0.23
Max working frequency (Hz)	3	3	2	2	2	2	1
Type of drive	Rack-pinion						
Piston diameter (mm)	10	12	20	25	35	45	63
Axial load (N)	232	375	650	800	800	1075	1550
Radial load (N)	279	450	780	960	960	1290	1860
Repeatability (°)	± 0.02						
Operation	Filtered dry air, lubricated or not						
Cycle air consumption (cm ³)	3.3	6.3	23	45	92	230	520
Connection	M5	M5	M5	G1/8	G1/8	G1/4	G1/4
Central hole diameter (mm)	5	6	8	10	12	18	20
Diameter hydraulic buffer	M8 x 1	M10 x 1	M12 x 1	M12 x 1	M14 x 1.5	M20 x 1.5	M25 x 1.5
Weight (kg)	0,3	0,5	1,00	1,8	2,7	5,7	9,2

*At 6 bar pressure

Accessories

For the stroke adjustment use hydraulic shock-absorbers, rubber dampers, according to the kinetic energy the units have to bear.

NEVER USE THE ROTARY UNIT WITHOUT STROKE ADJUSTERS



The table shows the codes of the suitable shock-absorbers and rubber dampers.

Shock-absorbers and Dampers available

Size		Hydraulic shock-absorbers Order code	Rubber Dampers Order code		X for 90° [mm]	Y for 1° [mm]
10	M8x1	MC10MH	P5WCM10B	(L=30 mm)	18.5	0.1047
12	M10x1	TK10M-6-1	P5WCM12B	(L=30 mm)	24.0	0.1417
20	M12x1	MC75M-3-NB-111	P5WCM20B	(L=35 mm)	27.5	0.1802
25	M12x1	MC75M-3-NB-111	P5WCM20B	(L=35 mm)	35.5	0.2317
35	M14x1.5	MC150MH2			37.0	0.2296
45	M20x1.5	MC225MH2			53.5	0.2976
63	M25x1.5	MC600MH2			60.0	0.3571

Mid position stop units

Mid position stop units are also available, to stop the rack by a larger pneumatic piston in the middle of its stroke (90°)



From the table above:

X for 90° = Minimum length of end stroke device required to achieve 90° rotation.

Y for 1° = Rack stroke for each 1° of rotation.

By using the accessories in the table above it is possible to reduce the rotation angle to 90°. If a larger stroke reduction is required then it is necessary to check if a longer end stroke device is required.

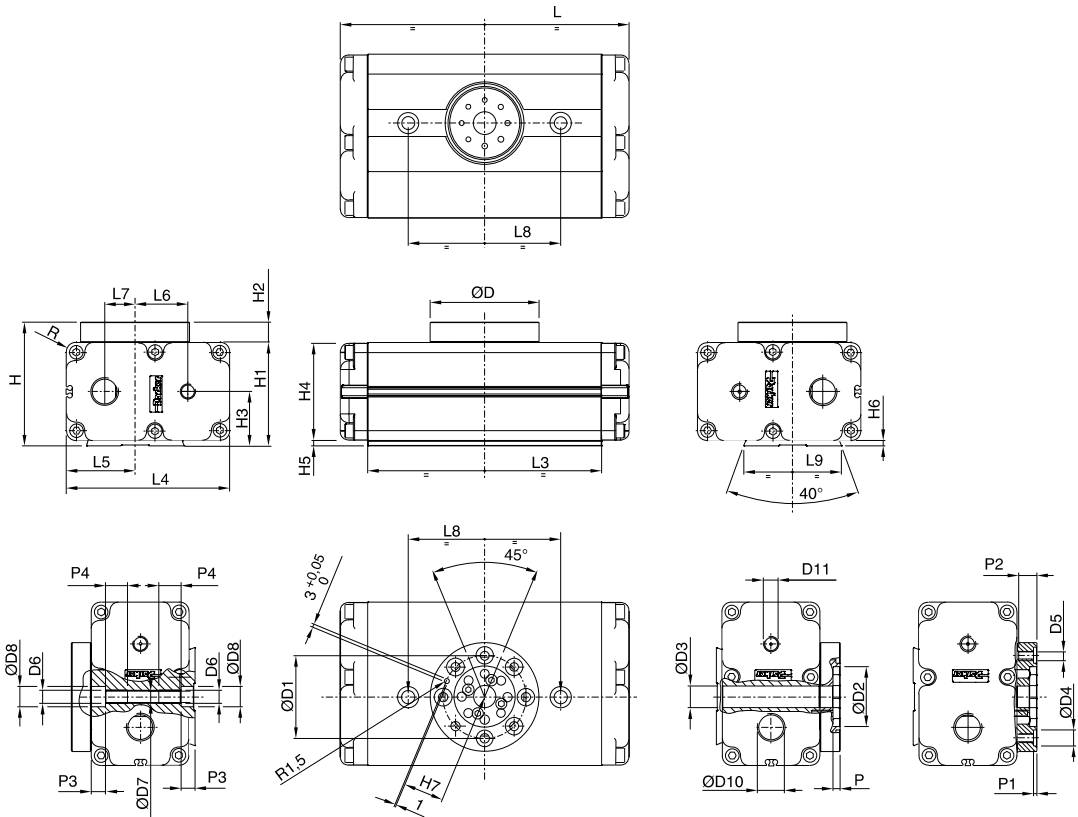
Example:

If a 70° rotation is required on a size 63 unit the dimension for X will be:

$$X = X \text{ for } 90^\circ + ((90 - 70) \times Y \text{ for } 1^\circ)$$

$$X = 60.0\text{mm} + (20 \times 0.3571) = 67.1\text{mm}.$$

Dimensions



Stroke	L	L3	L4	L5	L6	L7	L8	L9	D	D1	D2	D3	D4	D5	D6	D7	D8	D10	D11
Ø mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
10	81	65	38	19	10	9	50	40	32	23	-	5	7	M4	M5	4,3	9	M8x1	M5
12	108	88	50	25	13	13	59	40	45	31,5	22	6	7	M4	M6	5,2	11	M10x1	M5
20	130	110	65	32,5	16	13,5	72	56	45	31,5	22	8	7	M4	M6	5,2	11	M12x1	M5
25	162	136	80	40,5	24	18	86	70	65	50	37	10	9	M5	M8	6,8	15	M12x1	G1/8
35	170	140	100	47	28,5	17,5	86	70	65	50	37	12	9	M5	M8	6,8	15	M14x1,5	G1/8
45	230	180	120	56	37	26	140	90	100	76	55	18	15	M8	M12	10,5	19	M20x1,5	G1/4
63	265	215	150	63	48,5	28	140	90	100	76	55	20	15	M8	M12	10,5	19	M25x1,5	G1/4

Stroke	H	H1	H2	H3	H4	H5	H6	H7	P	P1	P2	P3	P4	R
Ø mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
10	35	27	8	16	21,5	5,25	5	-	-	2,5	6,5	6	10	2,75
12	47	37	10	21	31	5,5	5	15,25	4	2,5	8	6	12	3,5
20	54	44	10	24,5	38	5,5	5	15,25	4	2,5	8	6	12	4,5
25	64	50	14	27,5	44	5,5	5	24,5	5	3	12	10	18	5
35	76	62	14	33,5	55	5,5	5	24,5	5	3	12	10	18	7
45	95,5	77	18,5	41	70	5,5	5	37,5	7	3,5	16	13	24	7
63	113,5	95	18,5	50	88	5,5	5	37,5	7	3,5	16	13	24	9

Compressed air supply

Compressed air from the working valve is connected to the rotary module end covers

The compressed air system must be fitted with a soft start valve to prevent uncontrolled movements and damage.

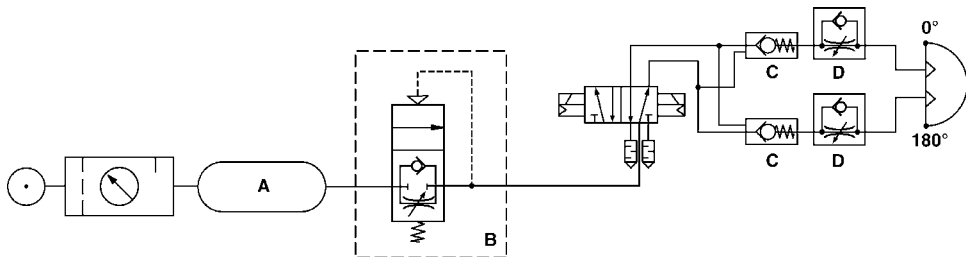
Connection diagram

The compressed air must be filtered from 5 - 40µm.
 Maintain the medium selected at the start, lubricated or not for the complete service life of the unit.



Note the following during installation:

- A A non-return valve and an air volume are used to prevent pressure variations and sudden pressure loss to the soft start valve.
- B A soft start valve is used to prevent uncontrolled movements on start-up.
- C Pilot controlled non-return valves are used to prevent pressure loss in the rotary module.
- D Flow control valves with by-pass are used for speed control of the rotary movements.



F

Safety loads

Check the table for maximum permitted loads. Excessive loads or kinetic energy can damage the unit, cause functioning troubles and endanger the safety of the operator.

A [N] is the maximum axial load, compressive and tractive.

R [N] is the maximum radial load.

M [Nm] is the maximum bending torque.

J [kgcm²] is the moment of inertia of the rotating loads.

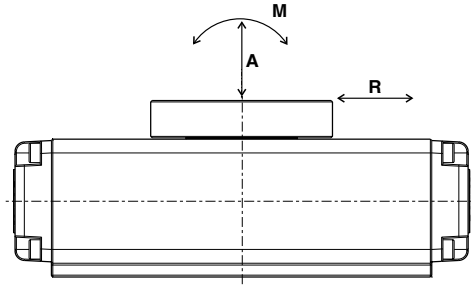
t [s] is the indexing time.

On the graph of kinetic energy, the point of intersection of J and t values, must be down the characteristic curve of the selected unit.

Use flow controllers (not supplied) to obtain the correct speed.

Permitted loads and torques

Size Ø mm	A N	R N	M Nm
10	232	279	4,7
12	375	450	9,7
20	650	780	22
25	800	960	34
35	800	960	42
45	1075	1290	84
63	1550	1860	143



Safety instructions

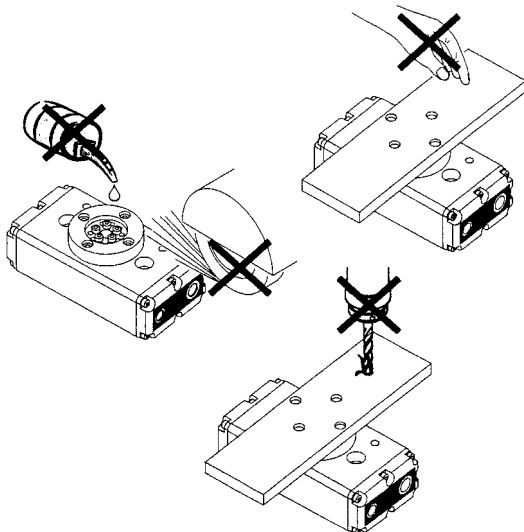
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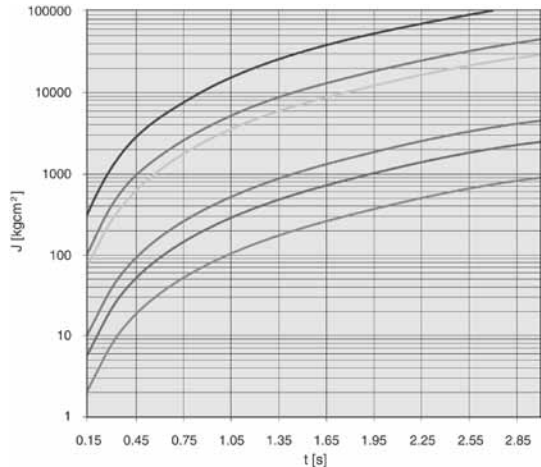
Caution !

Avoid the unit coming into contact with the following media: corrosive coolants, emery powder or glowing sparks.

Make sure that nobody can place his/her hand in the area of the rotating load and there are no objects on its path. The swivelling unit must not run before the whole machine, on which it is mounted, complies with the laws or safety norms of your country.



Kinetic energy

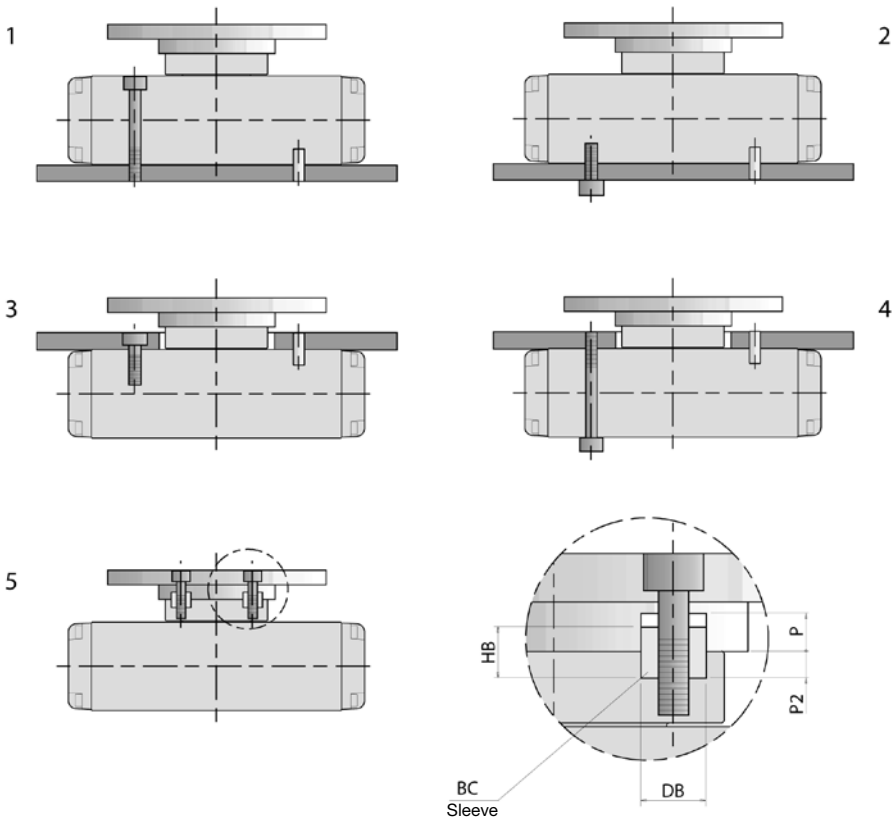


- RT-63
- RT-45
- RT-35
- RT-25
- RT-20
- RT-12
- RT-10

Mounting

The swiveling unit can be fastened to a static or a moving part. When on a moving part, you must pay attention to the forces created by inertia over the unit and its load.

Use the two sleeves provided in the packaging, to center the rotating load on the pinion.



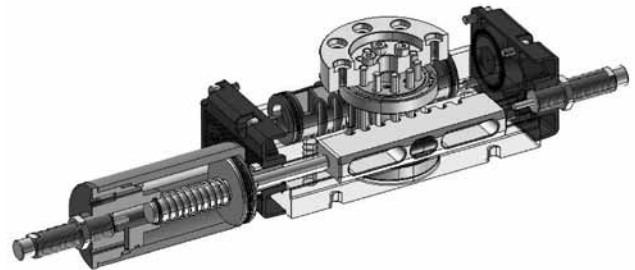
Sleeves for rotary table

Stroke	DB	HB	P	P2	Order code
Ø mm	h8 mm	±0,1 mm	mm	mm	
10	Ø7	5	3	2,5	P5WCM10S
12	Ø7	5	3	2,5	P5WCM10S
20	Ø7	5	3	2,5	P5WCM10S
25	Ø9	6	3,5	3	P5WCM25S
35	Ø9	6	3,5	3	P5WCM25S
45	Ø15	7	4	3,5	P5WCM45S
63	Ø15	7	4	3,5	P5WCM45S



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Mid position stop units series

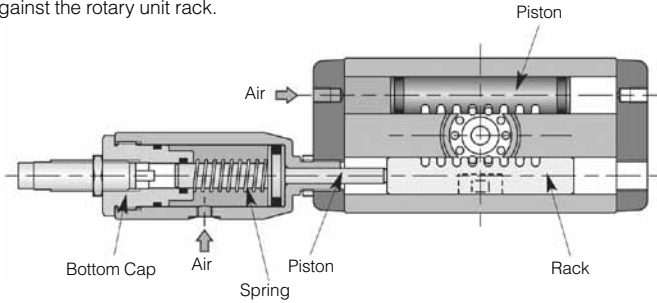


Technical data

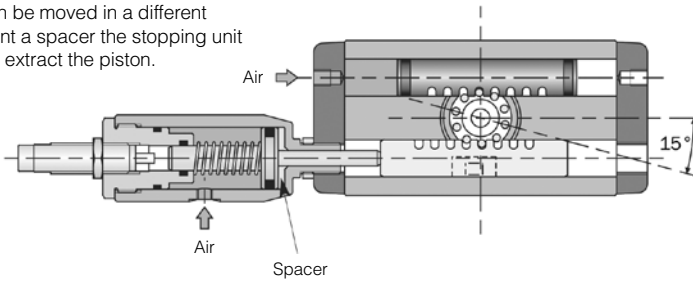
Size	10	12	20	25	35	45	63
Medium	Filtered dry air, lubricated or not						
Maximum pressure range (bar)	8						
Temperature range (°C)	5°C - +60°C						
Stroke 90° (mm)	9.42	12.75	16.22	20.85	20.66	26.78	32.14
Piston bore (mm)	15	20	30	35	50	63	80
Consumption each stroke (cm ³)	2	7	21	37	74	154	339
Weight (kg)	0.055	0.10	0.19	0.30	0.45	1.00	1.68
To be used with base unit (size)	10	12	20	25	35	45	63

Mid position stop operating principle

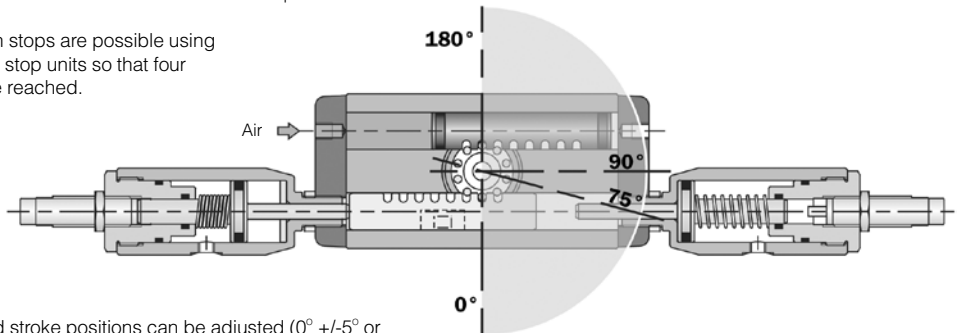
The Mid position stop unit is a stroke reducer, acting against the rack of the rotary table unit by a piston rod. The stopping unit piston bore is larger than the rotary unit and pressurised at the same pressure it stops in the middle of the rotary unit stroke. When not pressurised a spring keeps the stopping unit piston rod against the rotary unit rack.



The stopping unit stroke can be modified by spacers in front of the piston so that the mid position stop can be moved in a different position. To mount a spacer the stopping unit must be open to extract the piston.



Two mid position stops are possible using two mid position stop units so that four positions can be reached.

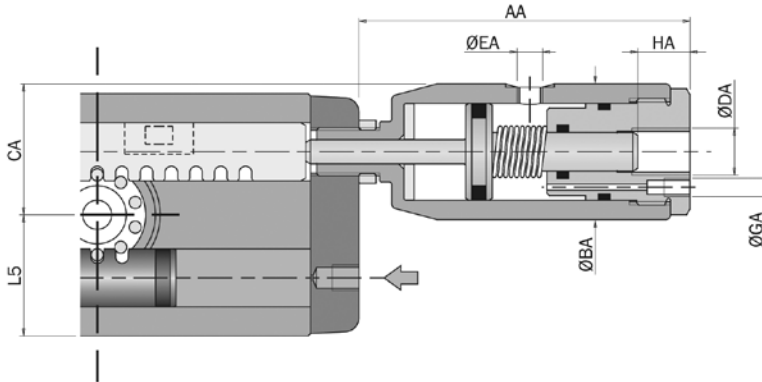


The external end stroke positions can be adjusted ($0^\circ \pm 5^\circ$ or $180^\circ \pm 5^\circ$) by the same end stroke devices used in the rotary unit (shock-adsorbers, rubber bumpers, grub screws). The mid position stop can be adjusted ($90^\circ \pm 5^\circ$) by moving the whole mid position stop unit body.



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Mid position stop unit dimensions



	Size - 10	Size - 12	Size - 20	Size - 25	Size - 35	Size - 45	Size - 63
AA	48.8	68.3	85.3	97.8	96	124.6	143.6
BA	Ø 23	Ø 28	Ø 36	Ø 44	Ø 56	Ø 70	Ø 89
CA	20.5	27	34	42.5	50	61	71.5
DA	M8x1	M10x1	M12x1	M12x1	M14x1.5	M20x1.5	M25x1.5
EA	(n°3) M5	(n°3) M5	/	/	/	/	/
GA	/	/	M5	M5	G1/8	G1/4	G1/4
L5	19	25	32.5	40.5	53	64	87
HA	7.2	10.7	11.8	14	15.9	21.7	27.4

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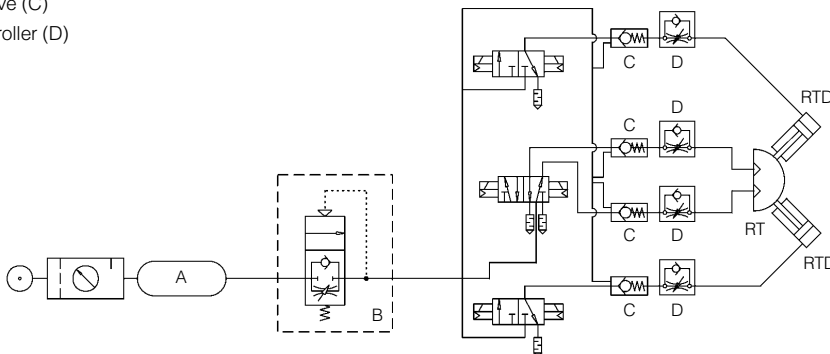
Pneumatic circuit

Possible problems on a compressed air circuit:

- 1 - Pressure variation.
- 2 - Pressurised with empty cylinder.
- 3 - Sudden pressure black-out.
- 4 - Excessive speed.

Possible solutions:

- 1 - Compressed air storage (A)
- 2 - Start-up valve (B)
- 3 - Safety valve (C)
- 4 - Flow controller (D)



Order codes



Rotary table

Must be fitted with either external cushioning or other cushioning

Size Ø mm	Connection	Weight kg	Order code
10	M5	0,234	P5WCM10NMN0190B
12	M5	0,557	P5WCM12NMN0190B
20	M5	0,966	P5WCM20NMN0190B
25	G1/8	1,682	P5WCM25NMN0190B
35	G1/8	2,473	P5WCM35NMN0190B
45	G1/4	5,252	P5WCM45NMN0190B
63	G1/4	8,184	P5WCM63NMN0190B

Cushioning

Size Ø mm	Thread	Weight kg	Hydraulic shock absorbers Order code	Weight kg	Rubber dampers Order code
10	M8x1	0.008	MC10MH	0.009	P5WCM10B
12	M10x1	0.014	TK10M-6-1	0.016	P5WCM12B
20	M12x1	0.030	MC75M-3-NB-111	0.028	P5WCM20B
25	M12x1	0.030	MC75M-3-NB-111	0.028	P5WCM20B
35	M14x1,5	0.008	SC190-M-4-NB		–
45	M20x1,5	0.15	MC225MH2		–
63	M25x1,5	0.26	MC600MH2		–

Mid position stop

Size Ø mm	Weight kg	Intermediate stop Order code
10	0.055	P5WCM10M
12	0.100	P5WCM12M
20	0.190	P5WCM20M
25	0.300	P5WCM25M
35	0.450	P5WCM35M
45	1.000	P5WCM45M
63	1.675	P5WCM63M

Magnetic sensors

All switches are normally open (NO) in the unswitched position. When introduced to the magnetic field, the switch closes. Switches are designed for simple flush mounting without the need for additional brackets.




Features

- Integrated LED
- Compact robust design
- Integrated flying lead
- Optional plug-in connector
- Simple quick connection

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Order codes

Function	Cable/contact	Weight kg	Order code
Electronic sensor, 10 - 30 V DC			
			
Type PNP , normally open	2,5 m PUR-cabel	0,007	P8S-SPFL3
Type NPN , normally open	2,5 m PUR-cabel	0,007	P8S-SNFL3
Type PNP , normally open	0,3 m M8 / Snap-in	0,013	P8S-SPSH3
Type NPN , normally open	0,3 m M8 / Snap-in	0,013	P8S-SNSH3

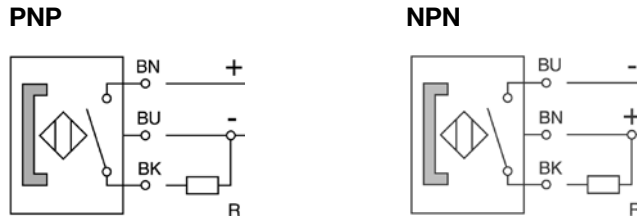
Technical data

	Order code			
	P8S-SPFL3	P8S-SNFL3	P8S-SPSH3	P8S-SNSH3
Cable length (m)	2.5	2.5	0.3	0.3
Connector	Flying cable	Flying cable	Plug-in male M8	Plug-in male M8
Type	PNP N.O.	NPN N.O.	PNP N.O.	NPN N.O.
Supply voltage (Vdc)	3+ max 30			
Switching frequency (kHz)	200			
Switching current (A)	0.2			
Power (W)	max. 6			
Switching voltage (Vdc)	< 1			
Response time 'ON' (µs)	0.8			
Response time 'OFF' (µs)	0.3			
Working temperature (°C)	-10 to +70			
Inverse polarity protection	Yes			
Short circuit protection	Yes			
Life time (imp.)	10°			
Protection	IP67			
Body	Polyamid PA12			
Cable	Flat in PUR CEI20/22 II			

Dimensions (mm)



Wiring diagrams



Connecting cables with one connector

The cables have an integral snap-in female connector.



Type of cable	Cable length/connector	Weight kg	Order code
Cables for sensors, complete with female connector			
Cable, Flex PVC	3 m, 8 mm round connector	0,07	9126344341
Cable, Flex PVC	10 m, 8 mm round connector	0,21	9126344342
Cable, Super Flex PVC	3 m, 8 mm round connector	0,07	9126344343
Cable, Super Flex PVC	10 m, 8 mm round connector	0,21	9126344344
Cable, Polyuretan	3 m, 8 mm round connector	0,01	9126344345
Cable, Polyuretan	10 m, 8 mm round connector	0,20	9126344346
Cable, Polyuretan	3 m, M12 connector	0,07	9126344348
Cable, Polyuretan	10 m, M12 connector	0,20	9126344349

Cable connectors



Connector	Weight kg	Order code
M8 connector	0,017	P8CS0803J
M12 connector	0,022	P8CS1204J

Ready to use connecting cables with connectors at each end

As accessories the system comprises a large number of different cables in order to meet all requirements that may arise and to make the installation simple, fast and reliable.

Cables with moulded 8 mm snap-in round contacts in both ends. The cables are available in two types, one with a straight male and female connectors respectively, and one with a straight 3-pole male connector in one end and an angled 3-pole female connector in the other end.



Technical data

Contacts

Moulded 8 mm snap-in male/female contacts.

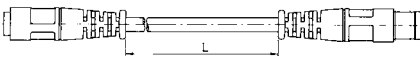
Enclosure IP67

Cable

Conductor 3x0,25 mm² (32x0,10 mm²)

Sheath PVC/PUR

Colour Black



Cables with straight 3-pole male and female connectors respectively. Cables with a straight 3-pole male connector in one end and an angled 3-pole female connector in the other end.



Description	Weight kg	Order code
Cable with straight contacts, 0,2 m	0,02	9121717014
Cable with straight contacts, 0,3 m	0,02	9121717015
Cable with straight contacts, 0,5 m	0,03	9121717016
Cable with straight contacts, 1,0 m	0,03	9121717017
Cable with straight contacts, 2,0 m	0,05	9121717018
Cable with straight contacts, 3,0 m	0,07	9121717019
Cable with straight contacts, 5,0 m	0,12	9121717020
Cable with straight contacts, 10 m	0,23	9121717021

Description	Weight kg	Order code
Cable + straight and angled connectors, 0,2 m	0,02	9121717022
Cable + straight and angled connectors, 0,3 m	0,02	9121717023
Cable + straight and angled connectors, 0,5 m	0,03	9121717024
Cable + straight and angled connectors, 1,0 m	0,03	9121717025
Cable + straight and angled connectors, 2,0 m	0,05	9121717026
Cable + straight and angled connectors, 3,0 m	0,07	9121717027
Cable + straight and angled connectors, 5,0 m	0,12	9121717028
Cable + straight and angled connectors, 10 m	0,23	9121717029

Connection block Valvetronic 110

The Valvetronic 110 is a connection block that can be used for collecting signals from sensors at various points on a machine and connecting them to the control system via a multicore cable. Valvetronic 110 can also be used for central connection of the multi-core cable to the outputs of a control system, and can be laid to a machine where the output signals can be connected. The connection block has ten 8 mm snap-in circular connectors and a multi-core cable which is available in lengths of 3 or 10 m. The connections on the block are numbered from 1 to 10. Blanking plugs are available for unused connections, as labels for marking the connections of each block.



Technical data

Connections:

Ten 3-pole numbered 8 mm round snap-in female contacts
Input block



- Pin 1 Common, +24 VDC
- Pin 2 Input signal
- Pin 3 Common, 0V

Output block



- Pin 1 Common, GND
- Pin 2 Output signal
- Pin 3 Common, 0V

Electrical data:

Voltage 24 VDC (max. 60 V AC/75 V DC)
Insulation group according to DIN 0110 class C
Load max. 1 A per connection
total max. 3 A

Cable:

Length 3 m or 10 m
Type of cable LifYY11Y
Conductor 12
Area 0.34 mm²
Colour marking According to DIN 47 100

Mechanical data

Enclosure IP 67, DIN 40050 with fitted contacts and/or blanking plugs.
Temperature -20 °C to +70 °C




Material

Body PA 6,6 VD according to UL 94
Contact holder PBTP
Snap-in ring LDPE
Moulding mass Epoxy
Seal NBR
Screws Plated steel

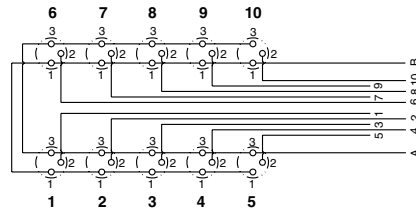
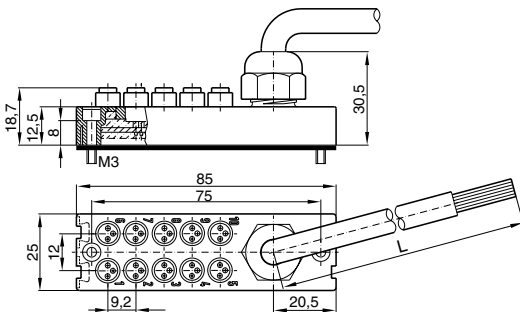
Industrial durability

Good chemical and oil resistance. Tests should be performed in aggressive environments.

Ordering data

Description	Weight kg	Order code
 Connection block Valvetronic 110 with 3 m cable Connection block Valvetronic 110 with 10 m cable	0,32 0,95	9121719001 9121719002
 Blanking plugs (pack of 10) Use blanking plugs to close unused connections.	0,02	9121719003
 Labels (pack of 10) White labels to insert in grooves on the side of the connection	0,02	9121719004

Dimensions and wiring diagrams

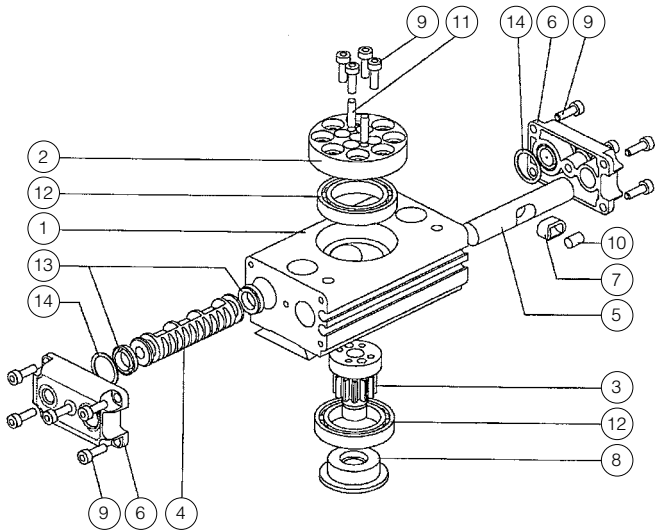


Conductor Colour	Input	Output
1 Pink	Signal 1	Signal 1
2 Grey	Signal 2	Signal 2
3 Yellow	Signal 3	Signal 3
4 Green	Signal 4	Signal 4
5 White	Signal 5	Signal 5
6 Red	Signal 6	Signal 6
7 Black	Signal 7	Signal 7
8 Violet	Signal 8	Signal 8
9 Grey-Pink	Signal 9	Signal 9
10 Red-Blue	Signal 10	Signal 10
A Blue	0 V	0 V
B Brown	+24 V	PE

Rotary table units repair kits

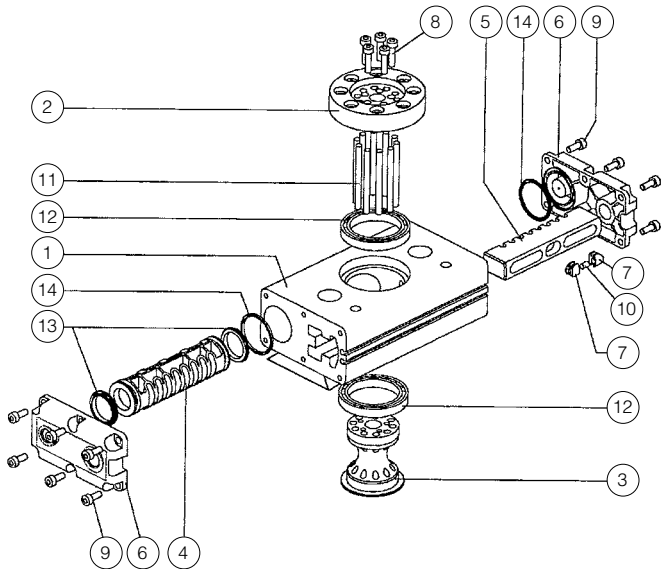
Parts - Size 10

1	Housing
2	Disc
3	Shaft
4	Piston
5	Rack
6	End cap
7	Magnetic housing
8	Slotted round nut
9	Screw
10	Magnet
11	Dowel pin
12	Ball bearing
13	Dynamic gasket
14	O-ring



Parts - Sizes 12 - 63

1	Housing
2	Disc
3	Shaft
4	Piston
5	Rack
6	End cap
7	Magnetic housing
8	Screw
9	Screw
10	Magnet
11	Dowel pin
12	Ball bearing
13	Dynamic gasket
14	O-ring



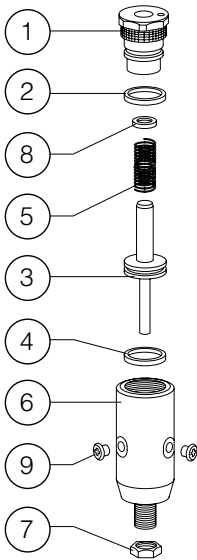
Repair kits

Size	Order code
10	P5WCM10N6RM
12	P5WCM12N6RM
20	P5WCM20N6RM
25	P5WCM25N6RM
35	P5WCM35N6RM
45	P5WCM45N6RM
63	P5WCM63N6RM

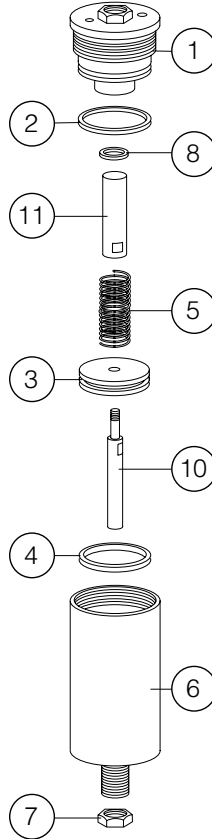
Each kit contains two 'O' rings and two dynamic gasket seals.

Mid position stop unit repair kits

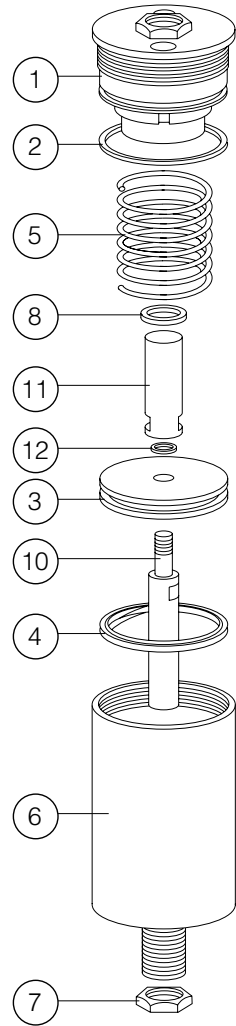
1	Bottom cap
2	O-Ring
3	Piston
4	Gasket
5	Spring
6	Body
7	Nut
8	O-Ring
9	Plug
10	Piston rod
11	End stroke stopper
12	O-ring



Sizes 10 & 12



Sizes 20 & 25



Sizes 35, 45 & 63

Repair kits

Size	Order code
10	P5WCM10M6RM
12	P5WCM12M6RM
20	P5WCM20M6RM
25	P5WCM25M6RM
35	P5WCM35M6RM
45	P5WCM45M6RM
63	P5WCM63M6RM

Each kit contains 'O' rings and gasket seal.

Spare Parts

Repair kits for rotary unit

Size	Order code
10	P5WCM10N6RM
12	P5WCM12N6RM
20	P5WCM20N6RM
25	P5WCM25N6RM
35	P5WCM35N6RM
45	P5WCM45N6RM
63	P5WCM63N6RM

Each kit contains two 'O' rings and two dynamic gasket seals.

Repair kits for mid position stop unit

Size	Order code
10	P5WCM10M6RM
12	P5WCM12M6RM
20	P5WCM20M6RM
25	P5WCM25M6RM
35	P5WCM35M6RM
45	P5WCM45M6RM
63	P5WCM63M6RM

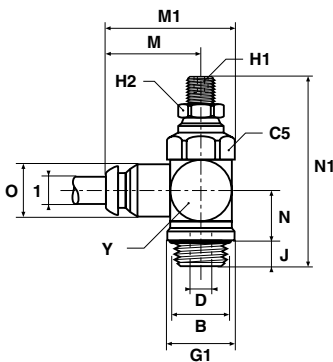
Each kit contains 'O' rings and gasket seal.

Sleeve for rotary unit

Size	Order code
10	P5WCM10S
12	P5WCM10S
20	P5WCM10S
25	P5WCM25S
35	P5WCM25S
45	P5WCM45S
63	P5WCM45S

F

Flow controllers



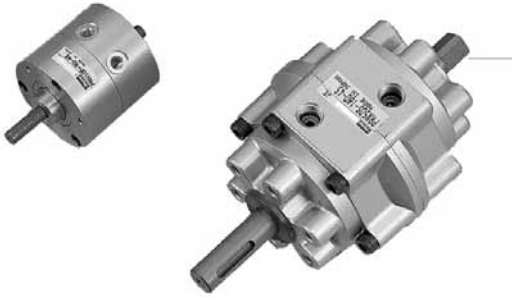
Exhaust flow control

Order code	C5	D	G1	H1	H2	J	M	M1	N	N1	O	Y
PTFL8PB4M5**	8	1,65	10,0	1,5	8	4	19,5	24,5	6,3	28,5	10	10
PTFL4PB4-1/8	14	3,00	14,4	2,0	7	6	22,0	30,1	10,7	43,7	10	14
PTFL4PB6-1/8	14	3,20	14,4	2,0	7	6	23,5	31,6	10,7	43,7	12	14
PTFL4PB6-1/4	17	5,20	18,4	4,0	11	7	25,0	34,9	13,8	51,8	12	17
PTFL4PB8-1/8	14	3,20	14,4	2,0	7	6	25,0	33,1	10,7	43,7	14	14
PTFL4PB8-1/4	17	5,20	18,4	4,0	11	7	28,5	38,3	13,8	51,8	14	17



Pneumatic Rotary Actuators

PRO-PRN Series



Rotary actuators are an efficient and easy way to generate torque from compressed air, in a very compact size. They are ideal for the compact applications in a wide range of industries such as, packaging, process, electronics etc.

Wide range

A full range of 9 sizes is available, the 8 largest sizes are single or double vane type (with double effective torque). For the PRN High Torque, a series of customized cushion units (CRN) are available for high energy applications.

Easy-to-use oscillating angles

Two oscillation reference points of 45° and 90° and three oscillating angles of 90° 180° and 270° are featured on the PRN ranges to match the most frequently uses. On the PRO range, the oscillation angle can be adjusted to the exact requirement.

Stable operation

The unique sealing design minimises leakages. It assures low speed oscillation and stable, smooth operation even at low operating pressures and speeds.

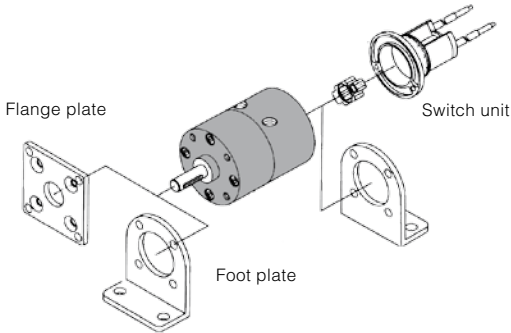
Durability to high operating temperatures

Dry dehumidified air may supply the rotary actuators within operating temperature range of -5°C to 80°C (PRN range -5°C to +60°C).

Outstanding durability

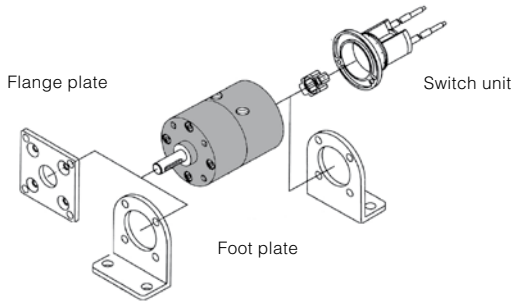
A solid vane shaft and built-in damper are combined with a unique sealing design to ensure outstanding durability. PRN50 and higher models are able to operate much greater loads with the incorporation of a Hydro-cushion.

PRO Miniature Rotary Actuators (adjustable oscillating angle)



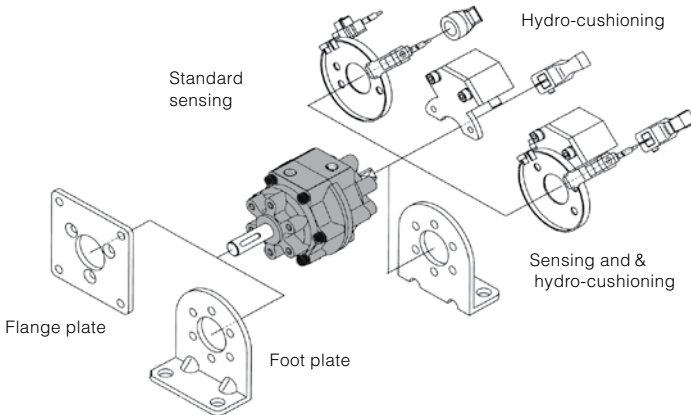
Vane	Model	Effective torque (N.cm at 6 bar)
Single vane	PROA3S	38
	PROA10S	120
	PROA20S	210
	PRO30SE	410
Double Vane	PROA3D	86
	PROA10D	254
	PROA20D	470
	PRO30DE	950

PRN Miniature Rotary Actuators (fixed oscillating angle)



Vane	Model	Effective torque (N.cm at 6 bar)
Single vane	PRNA1S	15,6
	PRNA3S	38
	PRNA10S	120
	PRNA20S	210
	PRN30SE	410
Double Vane	PRNA1D	34,7
	PRNA3D	86
	PRNA10D	254
	PRNA20D	470
	PRN30DE	950

PRN High Torque (fixed oscillating angle)



Vane	Model	Effective torque (N.cm at 6 bar)
Single vane	PRN50SE	590
	PRN150SE	1800
	PRN300SE	3450
	PRN800SE	12300
Double Vane	PRN50DE	1280
	PRN150DE	4150
	PRN300DE	8300
	PRN800DE	24700



PRO Miniature series - Adjustable oscillating angle - Order Codes

Standard models



Order code	Torque at 6 bar (N.cm)	Oscillating angle
Single vane		
PROA3S-0-90	38	30 to 180°
PROA10S-0-90	120	30 to 180°
PROA20S-0-90	210	30 to 180°
PRO30SE-0-45	410	30 to 270°

Double vane		
PROA3D-0-45	86	30 to 90°
PROA10D-0-45	254	30 to 90°
PROA20D-0-45	470	30 to 90°
PRO30DE-0-45	950	30 to 90°

Note : Rotary actuators with variable oscillating angle are shipped with fixed reference point stopper. The angle setting stopper is attached but not fixed. This must be fixed securely before use.

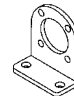
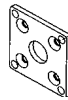
Oscillation starting point and oscillation angle

PROA3S, PROA10S, PROA20S
Oscillating reference point at 90°

PRO30SE
Oscillating reference point at 45°

PROA3D, PROA10D, PROA20D, PRO30DE J& Oscillating reference point at 45°

Rotary Actuator mountings

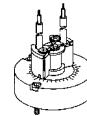


For Rotary Actuator	Flange mounting	Foot mounting
PROA3S/D	PRN3-P	PRN3-L
PROA10S/D	PRN10-P	PRN10-L
PROA20S/D	PRN20-P	PRN20-L
PRO30SE/DE	PRN30-P	PRN30-L

The mountings are provided with set screws

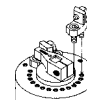
Switch units

Variable switch position, solid state NPN or PNP.



For Rotary Actuator	NPN	PNP
PROA3S/D	FR-3PRO	FP-3PRO
PROA10S/D	FR-10PRO	FP-10PRO
PROA20S/D	FR-20PRO	FP-20PRO
PRO30SE/DE	FR-30PRO	FP-30PRO

Protective cover and stopper unit



For Rotary Actuator	Protective cover	Stopper unit
PROA3S/D	PRO3-K	RO3-U
PROA10S/D	PRO10-K	RO10-U
PROA20S/D	PRO20-K	RO20-U
PRO30SE/DE	PRO30-K	RO30-U

Maintenance kits

The maintenance kit consists in the vane shaft, shoe seal and shaft O'rings

For Rotary Actuator	Single vane	Double vane	
PROA3S	PRNA3S-PS	PROA3D	PRNA3D-PS
PROA10S	PRNA10S-PS	PROA10D	PRNA10D-PS
PROA20S	PRNA20S-PS	PROA20D	PRNA20D-PS
PRO30SE	PRN30S-PS	PRO30DE	PRN30D-PS

PRO Miniature series - Adjustable oscillating angle - Technical data

Technical specification

PRO Rotary Actuators Vane	Unit	PROA3S Single vane	PROA10S	PROA20S	PRO30SE
Air condition		Filtered (5µ) lubricated or non-lubricated			
Oscillating angle	°	30 to 180	30 to 180	30 to 180	30 to 270
Oscillating reference point	°	90	90	90	45
Port size		M5	M5	M5	G1/8
Minimum operating pressure	bar	1,0	1,0	0,8	1,0
Operating pressure	bar	2 to 7	2 to 7	2 to 10	2 to 10
Operating temperature	°C	-5 to 80	-5 to 80	-5 to 80	-5 to 60
Maximum operating frequency	cycles/mn	150 (at 180°)	150 (at 180°)	120 (at 180°)	90 (at 270°)
Internal volume	cm ³	4	12	21	43
Allowable radial load	N	40	50	300	400
Allowable thrust load	N	4	4	25	30
Allowable energy	mJ	1	2	3	7
Weight	kg	0,085	0,170	0,280	0,510
PRO Rotary Actuators Vane	Unit	PROA3D Double vane	PROA10D	PROA20D	PRO30DE
Air condition		Filtered (5µ) lubricated or non-lubricated			
Oscillating angle	°	30 to 90	30 to 90	30 to 90	30 to 90
Oscillating reference point	°	45	45	45	45
Port size		M5	M5	M5	G1/8
Minimum operating pressure	bar	0,7	0,7	0,6	0,8
Operating pressure	bar	2 to 7	2 to 7	2 to 10	2 to 10
Operating temperature	°C	-5 to 80	-5 to 80	-5 to 80	-5 to 60
Maximum operating frequency	cycles/mn	240 (at 90°)	240 (at 90°)	180 (at 90°)	180 (at 90°)
Internal volume	cm ³	2,8	8,1	15	34
Allowable radial load	N	40	50	300	400
Allowable thrust load	N	4	4	25	30
Allowable energy	mJ	1	2	3	7
Weight	kg	0,087	0,180	0,290	0,530

Notes :

- The allowable energy differs from that of PRN series.
- Maximum operating frequency is given at 5 bar operating pressure (unloaded).
- Make sure to use the PRO rotary actuators within the allowable energy. Check if the required energy is lower than the allowable energy. If not, use end stoppers directly on the load.
- The PRO with keyways are provided with keys.

Materials specification

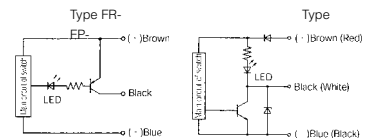
	PROA3, PROA10, PROA20	PRO30
Body	Aluminium alloy	Aluminium alloy
Solid vane shaft	Steel + resin + Hydr. Nitrile	Steel + resin + Nitrile
Shoe	Resin	Resin
Shoe seal	Hydrogenated Nitrile	Nitrile
O-ring	Hydrogenated Nitrile	Nitrile
Screws, claw, stoppers, locknut	Steel	Steel

Effective torque (N.cm)

Model n°	Operating pressure (bar)								
	2	3	4	5	6	7	8	9	10
Single vane									
PROA3S	10	17	24	31	38	45	-	-	-
PROA10S	35	56	75	98	120	139	-	-	-
PROA20S	59	95	133	170	210	249	287	326	368
PRO30SE	110	180	250	319	410	480	580	650	720
Double vane									
PROA3D	25	39	54	71	86	101	-	-	-
PROA10D	76	117	162	211	254	303	-	-	-
PROA20D	140	222	306	388	470	553	633	717	807
PRO30DE	270	440	600	770	950	1120	1299	1480	1660

Switch units specification

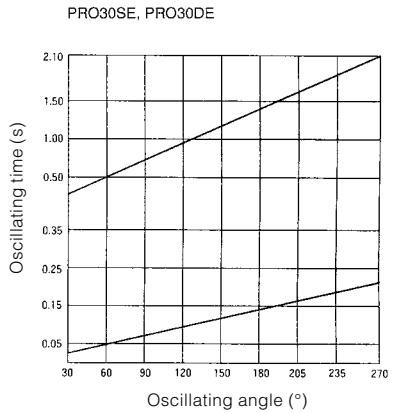
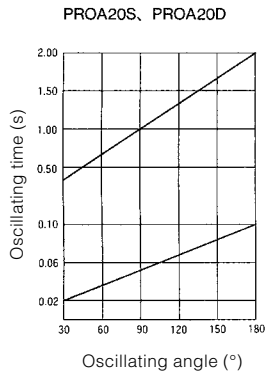
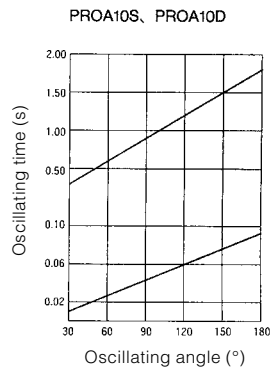
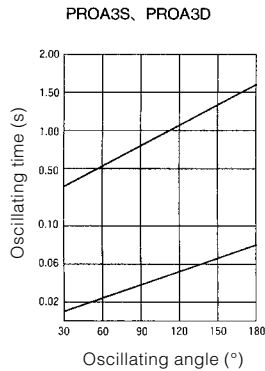
Switch unit type	FR-	FP-
Application	Relay, PLC, IC circuit	Relay, PLC, IC circuit
Output method	NPN	PNP
Mounting	Switch position adjustable	
Operating voltage	DC5~30V	DC10~30V
Operating current	5 to 200mA	5 to 200mA
Indicating lamp	Lights up at ON Consumption	
20mA at	24V	14mA at 24V
10mA at 12V	7mA at 12V	4mA at 5V
Max.leakage current	10 µA	
Internal voltage drop	1,5 V	
Average operating time	1 ms	
Shock resistance	490m/s ²	
Operating temperature	5 to 60°C	
Protection	IP67	
Lead wire	1 m, 3 core, oil resistant	
Response range	23°±7°	
Hysteresis	Approx. 2°	



PRO Miniature series - Adjustable oscillating angle - Technical data (cont)

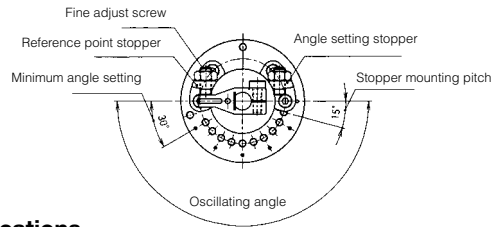
Oscillating time range

Note : The PRO rotary actuators must be operated within the range of the charts shown; otherwise, they exhibit a stick-slip motion.



Setting the oscillation angle

The rotary actuators are delivered with the reference point stopper fixed and the angle setting stopper non fixed. The angle setting stopper has to be set in position according to the angle required, it can be attached at intervals of 15°.



Oscillating angle setting and external stopper specifications

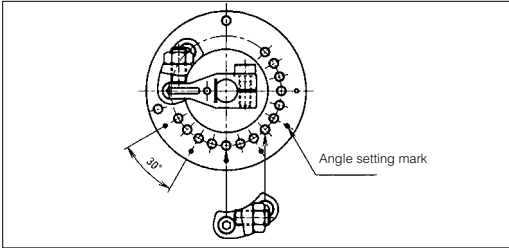
Model n°	PROA3S	PROA10S	PROA20S	PRO30SE	PROA3D	PROA10D	PROA20D	PRO30DE
Oscillation angle setting range	30 to 180°	30 to 180°	30 to 180°	30 to 270°	30 to 90°	30 to 90°	30 to 90°	30 to 90°
Oscillating reference point	90°	90°	90°	45°	45°	45°	45°	45°
Minimum angle setting	30°	30°	30°	30°	30°	30°	30°	30°
Maximum angle setting	180°	180°	180°	270°	90°	90°	90°	90°
Pitch for angle setting	15°	15°	15°	15°	15°	15°	15°	15°
Fine adjustment range								
Angle	-9° to +6°	-9° to +6°	-9° to +6°	-9° to +6°	-9° to +6°	-9° to +6°	-9° to +6°	-9° to +6°
Oscillating ref point	±3°	±3°	±3°	±3°	-1° to +3°	±3°	±3°	±3°
At max angle setting	-9° to +6°	-9° to +6°	-9° to +6°	-9° to +3°	-9° to +1°	-9° to +3°	-9° to +3°	-9° to +3°

PRO Miniature series - Adjustable oscillating angle

Setting the oscillation angle (cont.)

When the angle setting equals the stopper mounting pitch (15°)

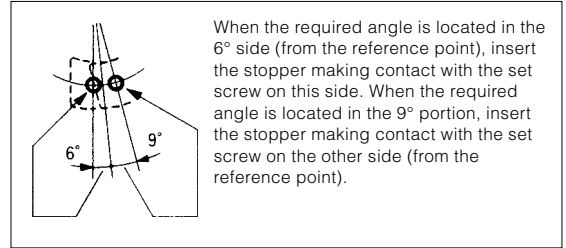
1. Place the stopper into the tapped hole corresponding to the intended angle and fix it. When mounting the stopper, use the angle setting marks provided every 30°, near the tapped hole.



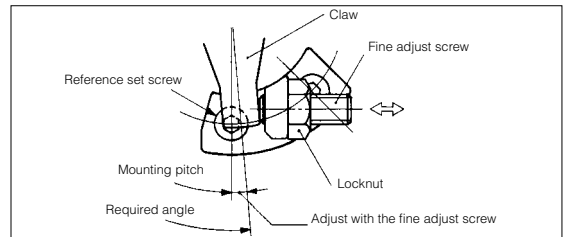
2. Then, rotate the fine adjust screws on the reference point stopper and the angle setting stopper until the correct angle is obtained. After completing the angle setting, the locknut must be tightened.

When the angle setting lies between two 15° stops

1. When the required angle lies between two 15° stops, fix the stopper into the tapped holes as shown in the diagram herebelow.



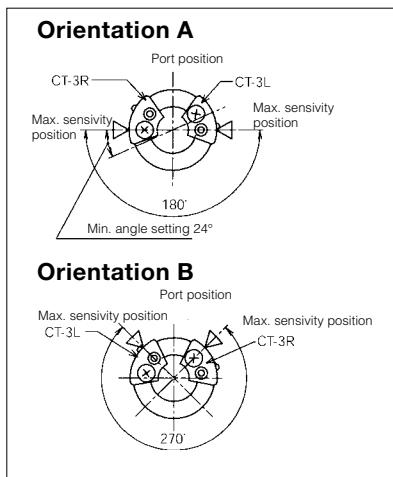
2. Then, rotate the fine adjust screw fitted to the stopper to obtain the required angle. After completing the angle setting, the locknut must be tightened.



Switch mounting orientation

The 2 types of switches (-3L and -3R) included in the switch unit have to be oriented in accordance to the table and diagrams herebelow :

Oscillating angle	Orientation of switches
30° to 186°	A
187° to 270°	B



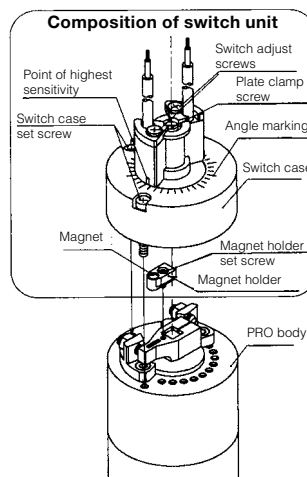
Setting the switch position

Mount the switch unit on the body using the set of screws. For clamping torque, refer to the table below

Model	Clamping torque (N.cm)
PROA3S/D	6 to 10
PROA10S/D	10 to 20
PROA20S/D and PRO30SE/DE	20 to 30

Adjusting the switch :& position

Loosen the switch adjust screws, make the point, at which the highest sensitivity is obtained, match with the angle marking equivalent to the actuator setting, and retighten the switch adjust screws torque of 40 to 50 N.cm. Since the angle markings are provided just for reference, make a final adjustment by checking if the LED is on.

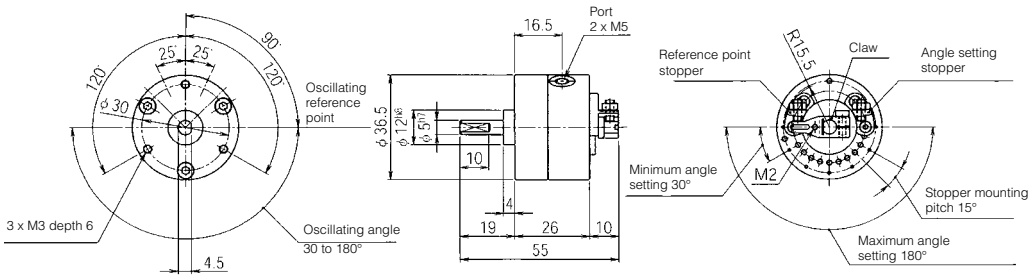


Replacing the switch

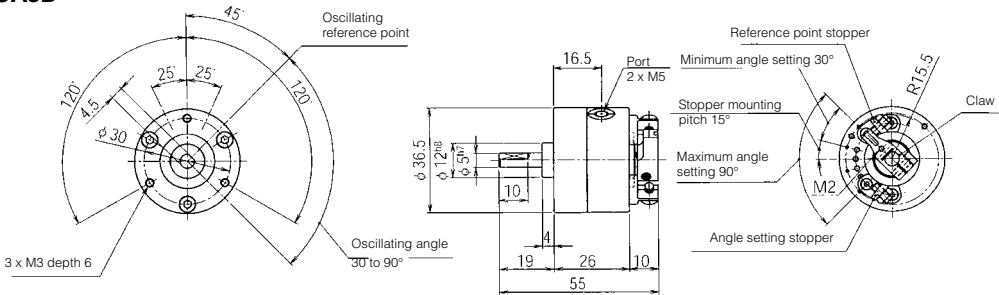
To remove the switch, remove the switch adjust screws and plate clamp screw. To mount a switch, reverse the procedure for removal. Adjust the switch position after completion of mounting.

PRO Miniature series - Adjustable oscillating angle - Dimensions (mm)

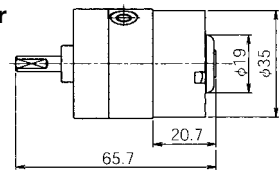
PROA3S



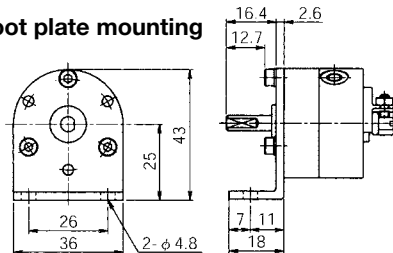
PROA3D



With protection cover

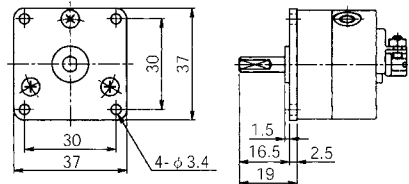


With foot plate mounting



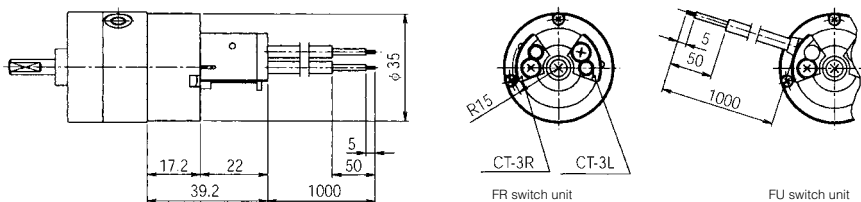
Note : A foot plate can be fitted turned by steps of 60° from the original position

With flange plate mounting



Note : A flange plate can be fitted turned by steps of 120° from the original position

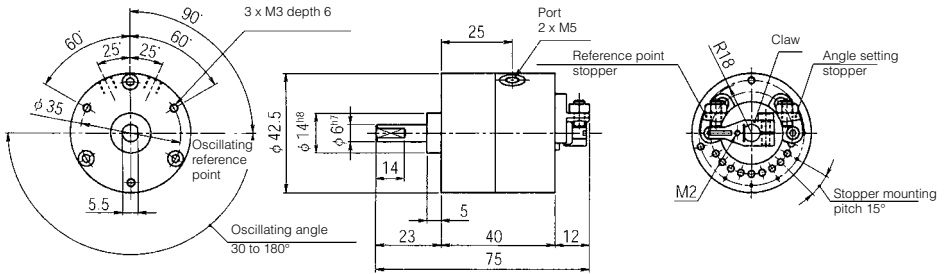
With switch unit (variable switch position)



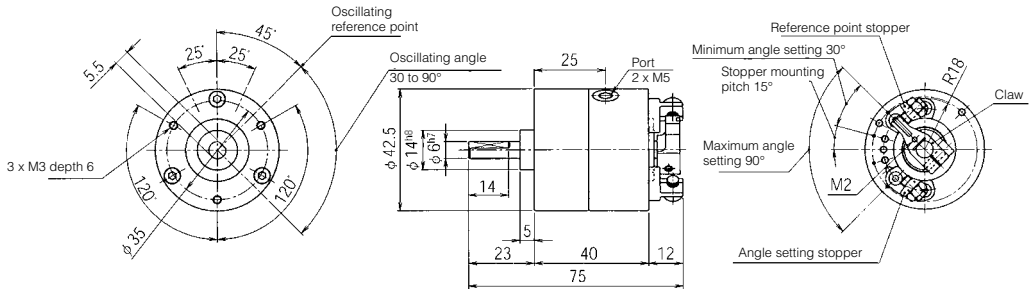
Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

PRO Miniature series - Adjustable oscillating angle - Dimensions (mm)

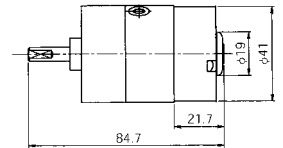
PROA10S



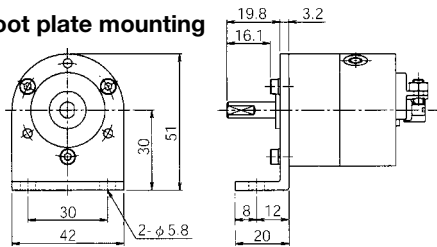
PROA10D



With protection cover

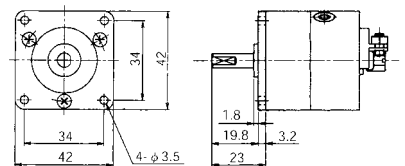


With foot plate mounting



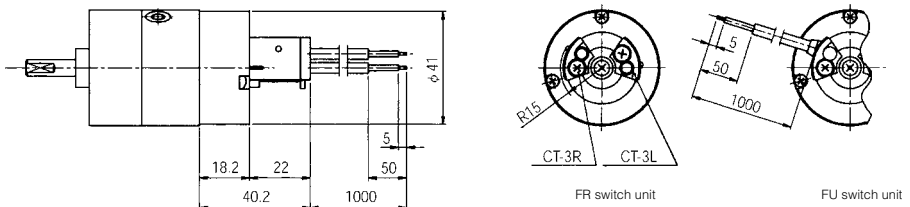
Note : A foot plate can be fitted turned by steps of 60° from the original position

With flange plate mounting



Note : A flange plate can be fitted turned by steps of 120° from the original position

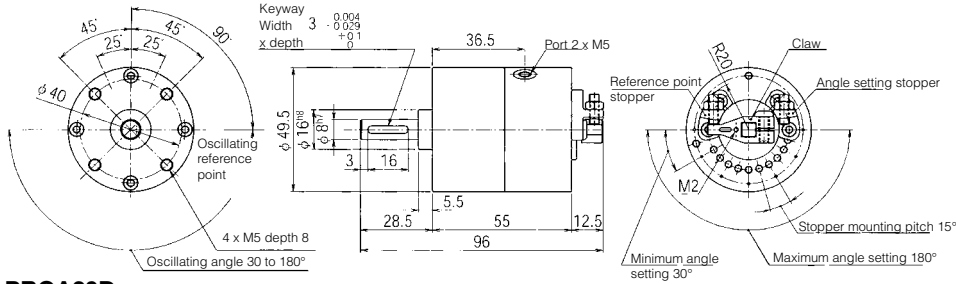
With switch unit (variable switch position)



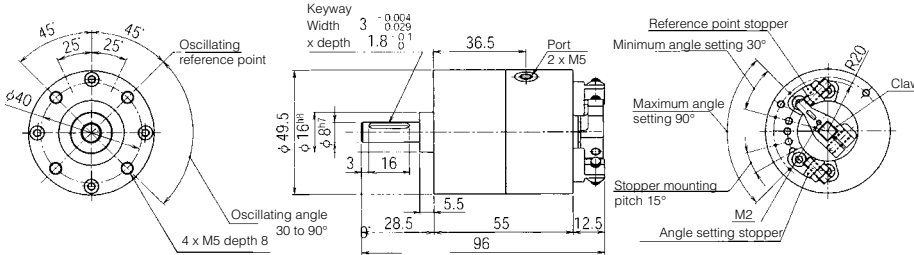
Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

PRO Miniature series - Adjustable oscillating angle - Dimensions (mm)

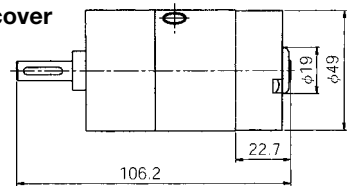
PROA20S



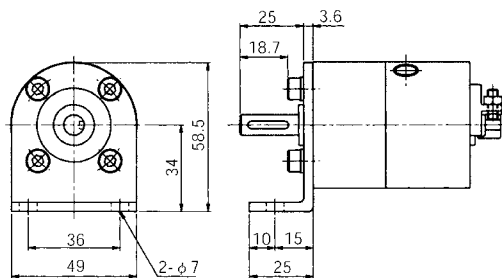
PROA20D



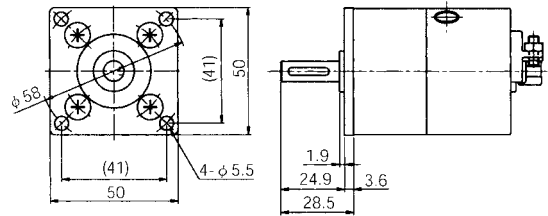
With protection cover



With foot plate mounting

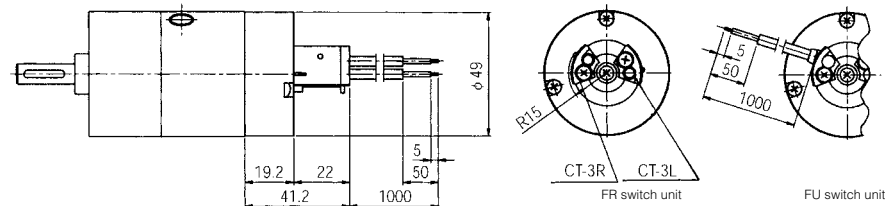


With flange plate mounting



Note : A foot plate can be fitted turned by steps of 90° from the original position

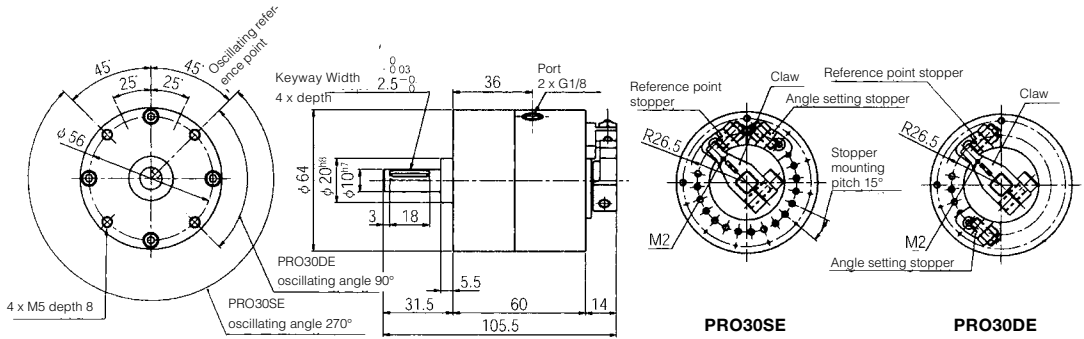
With switch unit (variable switch position)



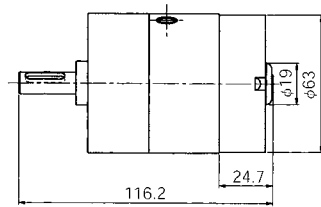
Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

PRO Miniature series - Adjustable oscillating angle - Dimensions (mm)

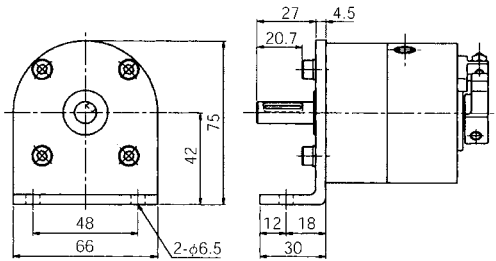
PROA30SE & DE



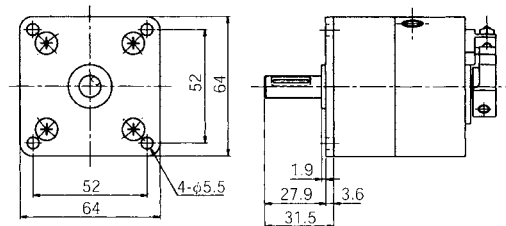
With protection cover



With foot plate mounting

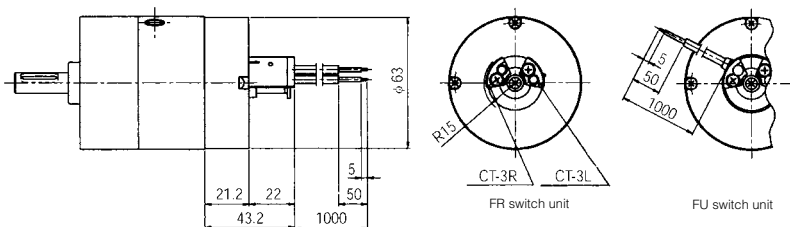


With flange plate mounting



Note : A foot plate can be fitted turned by steps of 60° from the original position

With switch unit (variable switch position)



Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

PRN Miniature series - Fixed oscillating angle - Order Codes

Standard models



	Torque 6 bar	Oscillating angle 90°	180°	270°	Oscillating reference point 45° 90°
Single vane (N.cm)					
PRNA1S	15,6	PRNA1S-90-90	PRNA1S-180-90		X
PRNA3S	38	PRNA3S-90-90	PRNA3S-180-90		X
PRNA10S	120	PRNA10S-90-90	PRNA10S-180-90		X
PRNA20S	210	PRNA20S-90-90	PRNA20S-180-90		X
PRN30SE	410	PRN30SE-90-45	PRN30SE-180-45	PRN30SE-270-45	X
Double vane					
PRNA1D	34,7	PRNA1D-90-45			X
PRNA3D	86	PRNA3D-90-45			X
PRNA10D	254	PRNA10D-90-45			X
PRNA20D	470	PRNA20D-90-45			X
PRN30DE	950	PRN30DE-90-45			X

Rotary Actuator mountings



Rotary Actuator
PRNA1S/D
PRNA3S /D
PRNA10S/ D
PRNA20S/D
PRN30SE/DE

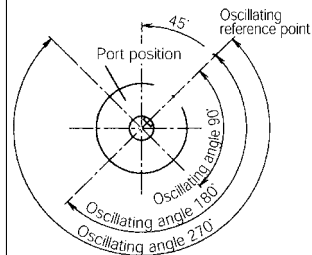
Flange mounting
PRN1-P
PRN3-P
PRN10-P
PRN20-P
PRN30-P

Foot mounting
PRN1-L
PRN3-L
PRN10-L
PRN20-L
PRN30-L

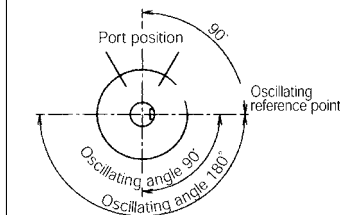
The mountings are provided with set screws

Oscillation starting point and oscillation angle

PRNA1D, PRNA3D, PRNA10D
PRNA20D, PRN30SE/DE
 Oscillating reference point at 45°



PRNA1S, PRNA3S, PRNA10S,
PRNA20S
 Oscillating reference point at 90°



Switch units

Variable switch position, solid state NPN or PNP.



For Rotary Actuator
PRNA1S/D
PRNA3S/D
PRNA10S/D
PRNA20S/D
PRN30SE/DE

NPN
FR-1PRNA
FR-3PRNA
FR-10PRN
FR-20PRN
FR-30PRN

PNP
FP-1PRNA
FP-3PRNA
FP-10PRN
FP-20PRN
FP-30PRN

Maintenance kits

The maintenance kit consists in the vane shaft, shoe seal and shaft O'rings

For Rotary Actuator

Single vane
PRNA1S
PRNA3S
PRNA10S
PRNA20S
PRN30SE

PRNA1S-PS
PRNA3S-PS
PRNA10S-PS
PRNA20S-PS
PRN30S-PS

Double vane
PRNA1D
PRNA3D
PRNA10D
PRNA20D
PRN30DE

PRNA1D-PS
PRNA3D-PS
PRNA10D-PS
PRNA20D-PS
PRN30D-PS

PRN Miniature series - Technical data

Technical specification

PRN Rotary Actuators	Unit	PRNA1S	PRNA3S	PRNA10S	PRNA20S	PRN30SE
Vane		Single vane				
Air condition						
Oscillating angle	°	90 / 180 / 270	90 / 180 / 270	90 / 180 / 270	90 / 180 / 270	90 / 180 / 270
Oscillating reference point	°	45, 90/45, 90/45	45, 90/45, 90/45	45, 90/45, 90/45	45, 90/45, 90/45	45
Port size		M5	M5	M5	M5	G1/8
Minimum operating pressure	bar	1,0	1,0	1,0	0,8	1,0
Operating pressure	bar	2 to 7	2 to 7	2 to 7	2 to 10	2 to 10
Operating temperature	°C	-5 to 80	-5 to 80	-5 to 80	-5 to 80	-5 to 60
Maximum operating frequency	cycles/mn	300 / 180 / 96	240 / 150 / 60	240 / 150 / 90	210 / 120 / 60	180 / 90 / 60
Internal volume	cm ³	1,4 // 1,4 / 1,5	3,4 / 3,4 / 4	9,8 / 9,8 / 12	17 / 17 / 21	37 / 37 / 43
Allowable radial load	N	30	40	50	300	400
Allowable thrust load	N	3	4	4	25	30
Allowable energy	mJ	0,6	1,5	3	15	25
Weight	kg	0,036	0,070	0,140	0,250	0,47 / 0,47 / 0,46
PRN Rotary Actuators	Unit	PRNA1D	PRNA3D	PRNA10D	PRNA20D	PRN30DE
Vane		Double vane				
Air condition						
Oscillating angle	°	90	90	90	90	90
Oscillating reference point	°	45	45	45	45	45
Port size		M5	M5	M5	M5	G1/8
Minimum operating pressure	bar	0,8	0,7	0,7	0,6	0,8
Operating pressure	bar	2 to 7	2 to 7	2 to 7	2 to 10	2 to 10
Operating temperature	°C	-5 to 80	-5 to 80	-5 to 80	-5 to 80	-5 to 60
Maximum operating frequency	cycles/mn	300	240	240	180	180
Internal volume	cm ³	1,1	2,8	8,1	15,0	34,0
Allowable radial load	N	30	40	50	300	400
Allowable thrust load	N	3	4	4	25	30
Allowable energy	mJ	0,6	1,5	3	15	25
Weight	kg	0,037	0,072	0,140	0,260	0,480

Notes :

- Maximum operating frequency is given at 5 bar operating pressure (unloaded).
- Make sure to use the PRN rotary actuators within the allowable energy. Check if the required energy is lower than the allowable energy. If not, use end stoppers directly on the load.
- The PRN with keyways are provided with keys.

Materials specification

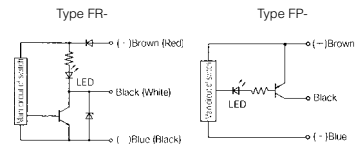
PRN	PRNA3, PRNA10, PRNA20	PRNA1, PRN30
Body	Aluminium alloy	Aluminium alloy
Solid vane shaft	Steel + resin + Hydr. Nitrile	Steel + resin + Nitrile
Shoe	Resin	Resin
Shoe seal	Hydrogenated Nitrile	Nitrile
O-ring	Hydrogenated Nitrile	Nitrile
Screws, claw, stoppers, locknut	Steel	Steel

Effective torque (N.cm)

Model n°	Operating pressure (bar)									
	2	3	4	5	6	7	8	9	10	
Single vane										
PRNA1S	4,9	7,6	10,1	12,9	15,6	18,5	-	-	-	
PRNA3S	10	17	24	31	38	45	-	-	-	
PRNA10S	35	56	75	98	120	139	-	-	-	
PRNA20S	59	95	133	170	210	249	287	326	368	
PRN30SE	110	180	250	319	410	480	580	650	720	
Double vane										
PRNA1D	10,4	16,5	22,5	28,6	34,7	41,1	-	-	-	
PRNA3D	25	39	54	71	86	101	-	-	-	
PRNA10D	76	117	162	211	254	303	-	-	-	
PRNA20D	140	222	306	388	470	553	633	717	807	
PRN30DE	270	440	600	770	950	1120	1299	1480	1660	

Switch units specification

Switch unit type	FR-	FP-
Application	Relay, PLC, IC circuit	
Output method	NPN	PNP
Mounting	Switch position adjustable	
Operating voltage	DC5~30V	DC10~30V
Operating current	5 to 200mA	5 to 200mA
Indicating lamp	Lights up at ON	Consumption
20mA at	24V	14mA at 24V
10mA at 12V	7mA at 12V	4mA at 5V
Max.leakage current	10 µA	
Internal voltage drop	1,5 V	
Average operating time	1 ms	
Shock resistance	490m/s ²	
Operating temperature	5 to 60°C	
Protection	IP67	
Lead wire	1 m, 3 core, oil resistant	
Response range	23°±7°	
Hysteresis	Approx. 2°	



PRN Miniature series - Technical data

Oscillating Time range

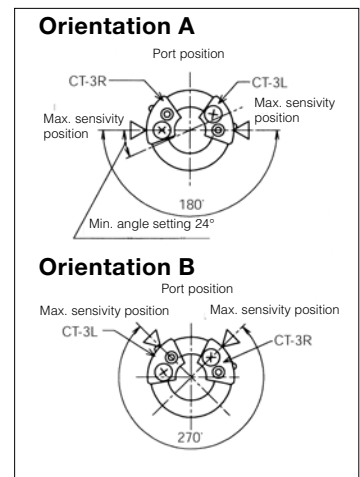
Model n°	Oscillation time range (s)		
	90°	180°	270°
PRNA1S	0,03 - 0,60	0,06 - 1,20	0,09 - 1,80
PRNA3S	0,04 - 0,80	0,08 - 1,60	0,12 - 2,40
PRNA10S	0,045 - 0,90	0,09 - 1,80	0,135 - 2,70
PRNA20S	0,05 - 1,00	0,10 - 2,00	0,15 - 3,00
PRN30SE	0,07 - 0,70	0,14 - 1,40	0,21 - 2,10
PRNA1D	0,03 - 0,60	0,06 - 1,20	0,09 - 1,80
PRNA3D	0,04 - 0,80	0,08 - 1,60	0,12 - 2,40
PRNA10D	0,045 - 0,90	0,09 - 1,80	0,135 - 2,70
PRNA20D	0,05 - 1,00	0,10 - 2,00	0,15 - 3,00
PRN30DE	0,07 - 0,70	0,14 - 1,40	0,21 - 2,10

Note : Operate the PRN rotary actuators within the range of duration mentioned in the above charts. Otherwise, the rotary actuator may move in stick-slip motion.

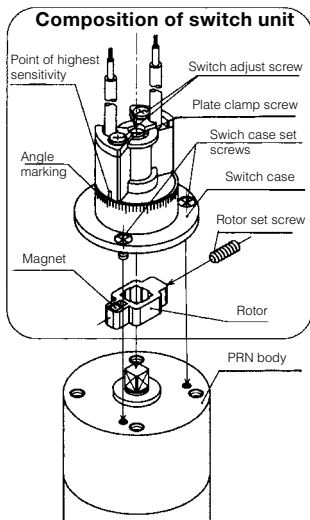
Switch mounting orientation

The 2 types of switches (-3L and -3R) included in the switch unit have to be oriented in accordance to the table herebelow :

Oscillating angle	Orientation of switches
30° and 180°	A
270°	B



Setting the switch unit



Mount the switch unit on the body using the set of screws. For clamping torque, refer to the table below :

Model	Clamping torque (N.cm)
PRNA1S /D	20 to 30
PRNA3S/D	20 to 30
PRNA10S/D	20 to 30
PRNA20S/D	20 to 30
PRN30SE/DE	20 to 30

Adjusting the switch position

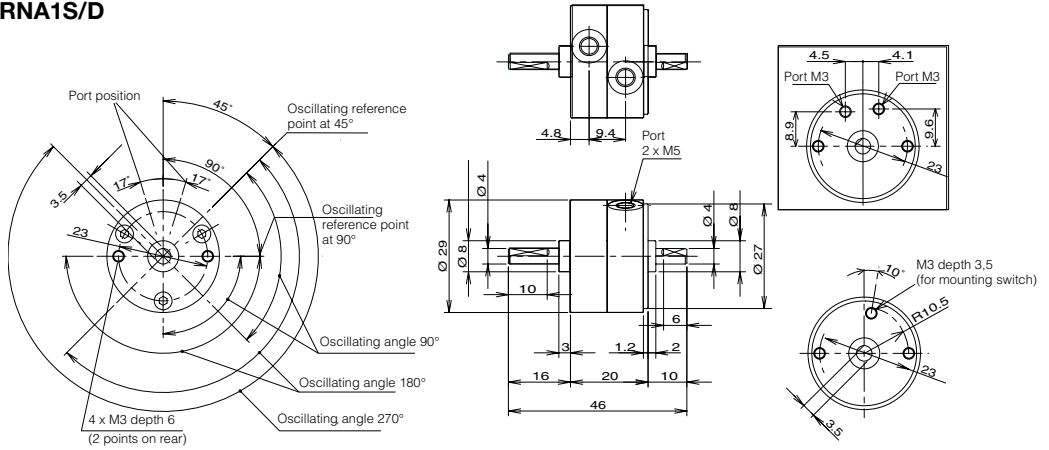
Loosen the switch adjust screws, make the point, at which the highest sensitivity is obtained, match with the angle marking equivalent to the actuator setting, and retighten the switch adjust screws at a clamping torque of 40 to 50 N.cm. Since the angle markings are provided just for reference, make a final adjustment by checking if the LED is on.

Replacing the switch

To remove the switch, remove the switch adjust screws and plate clamp screw. To mount a switch, reverse the procedure for removal. Adjust the switch position after completion of mounting.

PRN Miniature series - Dimensions (mm)

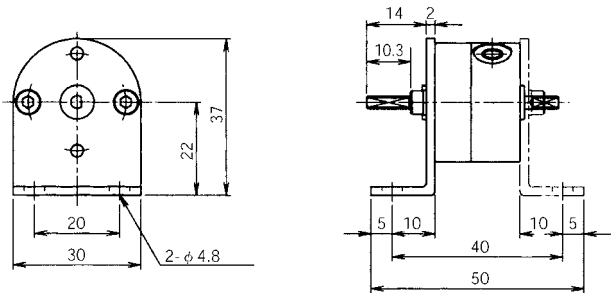
PRNA1S/D



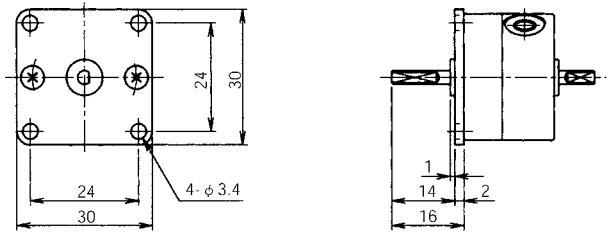
With foot plate mounting

Note :

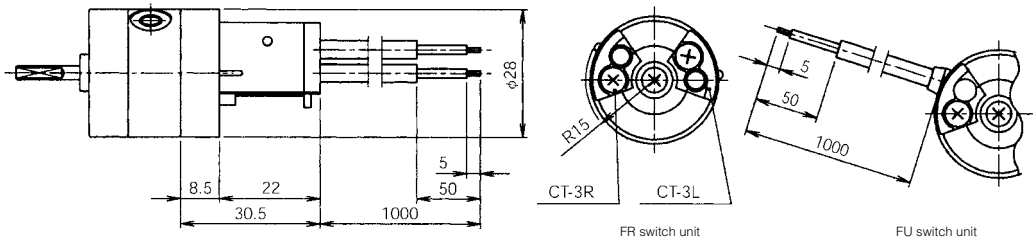
A foot plate can be fitted turned by steps of 90° from the original position.
Short shaft side : Example with 2 pcs.



With flange plate mounting



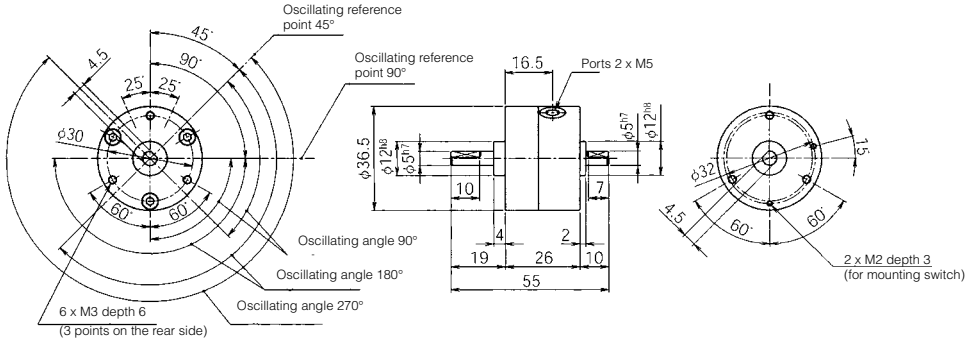
With switch unit (variable switch position)



Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

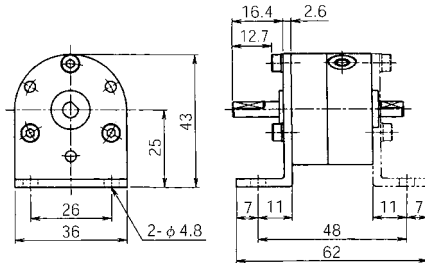
PRN Miniature series - Dimensions (mm)

PRNA3S/D



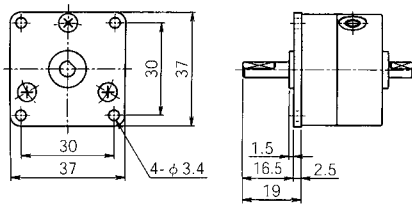
With foot plate mounting

Note :
A foot plate can be fitted turned by steps of 90° from the original position.
Short shaft side : Example with 2 pcs.

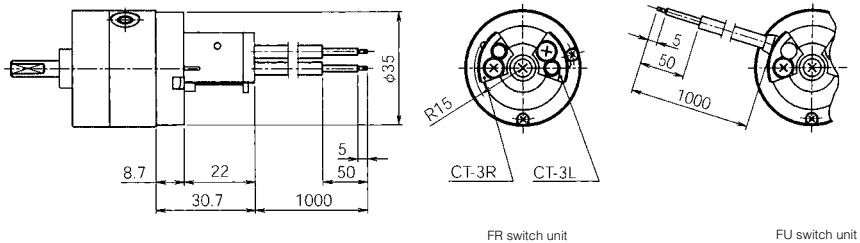


With flange plate mounting

Note :
A flange plate can be fitted turned by steps of 120° from the original position.



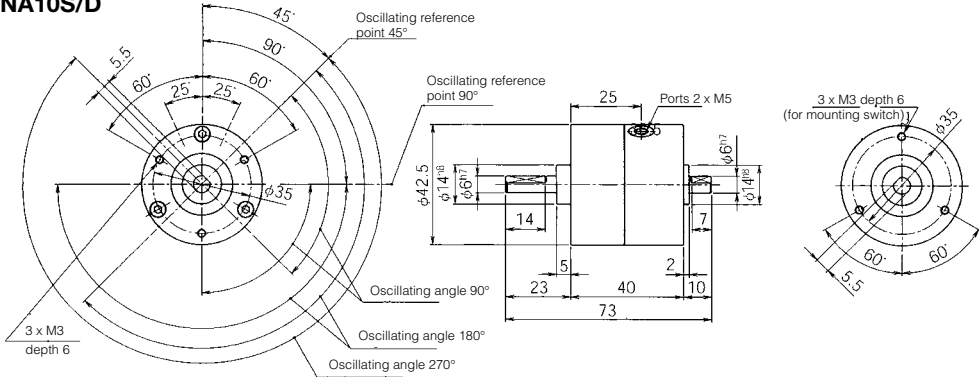
With switch unit (variable switch position)



Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

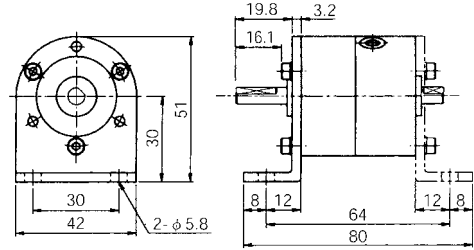
PRN Miniature series - Dimensions (mm)

PRNA10S/D



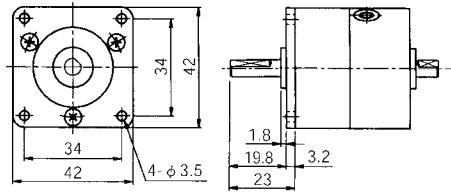
With foot plate mounting

Note :
 A foot plate can be fitted turned by steps of 60° from the original position.
 Short shaft side : Example with 2 pcs.

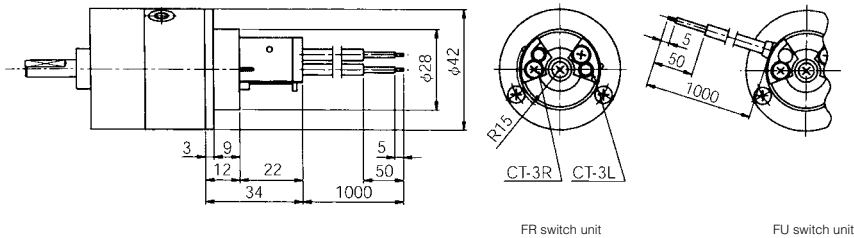


With flange plate mounting

Note :
 A flange plate can be fitted turned by steps of 120° from the original position



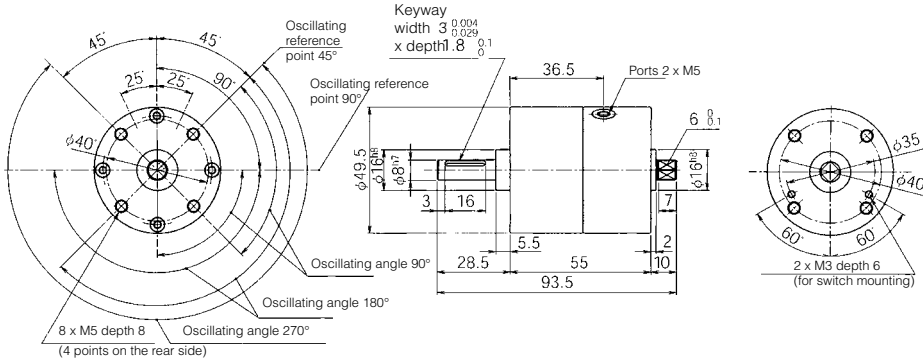
With switch unit (variable switch position)



Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

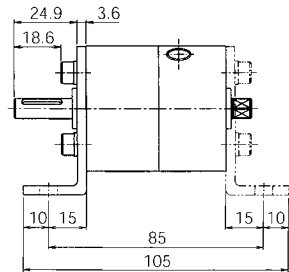
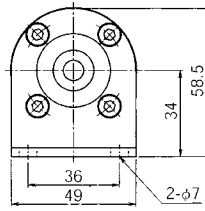
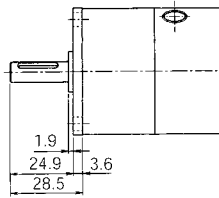
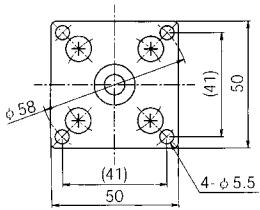
PRN Miniature series - Dimensions (mm)

PRNA20S/D



With flange plate mounting

With foot plate mounting

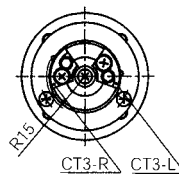
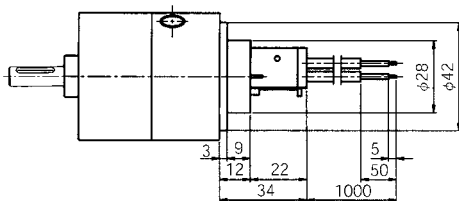


Note :

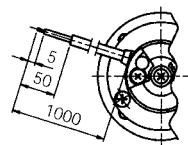
A foot plate can be fitted turned by steps of 90° from the original position.

Short shaft side : Example with 2 pcs.

With switch unit (variable switch position)



FR switch unit

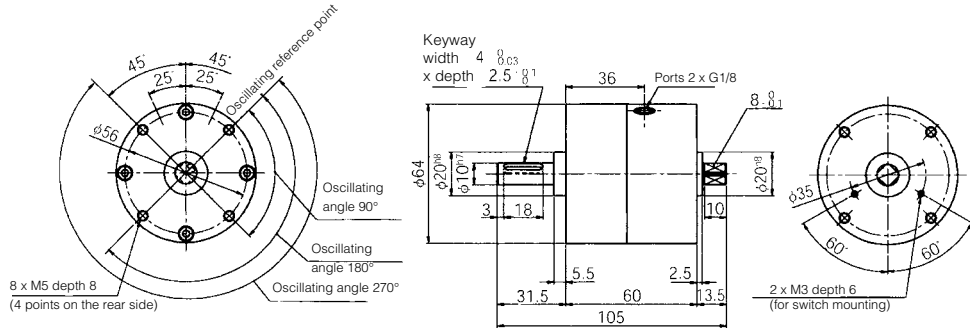


FU switch unit

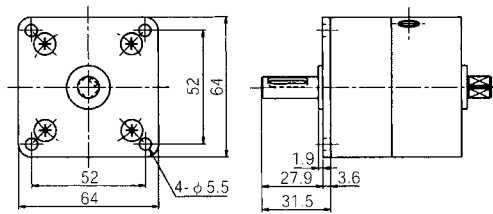
Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

PRN Miniature series - Dimensions (mm)

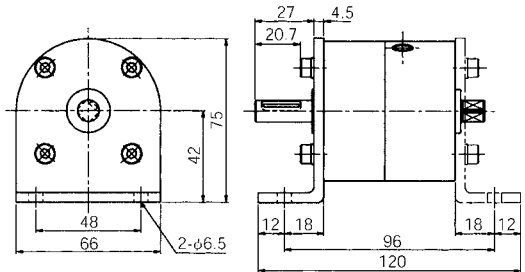
PRN30SE/DE



With flange plate mounting



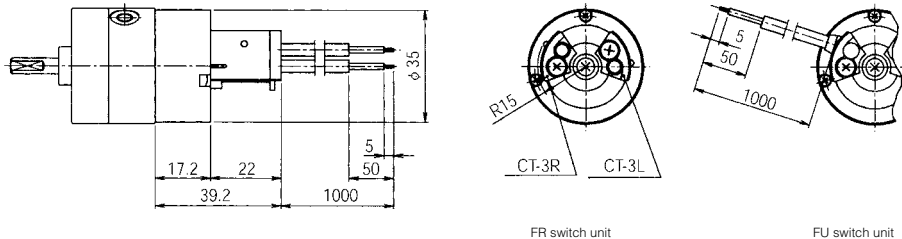
With foot plate mounting



Note :

A foot plate can be fitted turned by steps of 90° from the original position.
 Short shaft side : Example with 2 pcs.

With switch unit (variable switch position)



Note : For switch unit-mounting hardware combinations, refer to the required dimensions in each fig.

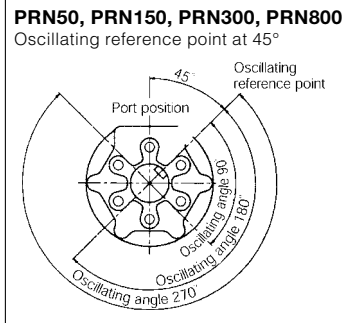
PRN High Torque range - Fixed oscillating angle - Order Codes

Standard models



Model	Torque at 6 bar (N.cm)	Oscillating angle		
Single vane (reference point 45°)		90°	180°	270°
PRN50SE	590	PRN50SE-90-45	PRN50SE-180-45	PRN50SE-270-45
PRN150SE	1800	PRN150SE-90-45	PRN150SE-180-45	PRN150SE-270-45
PRN300SE	3450	PRN300SE-90-45	PRN300SE-180-45	PRN300SE-270-45
PRN800SE	12300	PRN800SE-90-45	PRN800SE-180-45	PRN800SE-270-45
Double vane (reference point 45°)				
PRN50DE	1280	PRN50DE-90-45		
PRN150DE	4150	PRN150DE-90-45		
PRN300DE	8300	PRN300DE-90-45		
PRN800DE	24700	PRN800DE-90-45		

Oscillation starting point and oscillation angle



Rotary Actuator mountings

The mountings are provided with set screws



Rotary actuator	Flange mounting	Foot mounting
PRN50SE/DE	PRN50-P	PRN50-L
PRN150SE/DE	PRN150-P	PRN150-L
PRN300SE/DE	-	PRN300-L
PRN800SE/DE	-	PRN800-L

Switch unit



Variable switch position, reed type or solid state type (NPN or PNP).

Hydro-cushion



Hydraulic cushion is used when the inertial energy exceeds that allowable by the actuator.

Maintenance kits

The maintenance kit consists in the vane shaft, shoe seal and shaft O'rings

For Rotary Actuator

Single vane		Double vane	
PRN50SE	PRN50S-PS	PRN50DE	PRN50D-PS
PRN150SE	PRN150S-PS	PRN150DE	PRN150D-PS
PRN300SE	PRN300S-PS	PRN300DE	PRN300D-PS
PRN800SE	PRN800S-PS	PRN800DE	PRN800D-PS

PRN High Torque range - Technical data

Technical specification

PRN High Torque Vane	Unit	PRN50SE Single vane	PRN150SE Single vane	PRN300SE Single vane		
Air condition		Filtered (5µ) lubricated or non-lubricated				
Oscillating angle	°	90 / 180 / 270	90 / 180 / 270		90 / 180 / 270	
Oscillating reference point	°	45 / 45,40 / 45	45 / 45,40 / 45		45 / 45,40 / 45	
Port size		G1/8	G1/4		G3/8	
Minimum operating pressure	bar	1,0	0,8		0,8	
Operating pressure	bar	2 to 10	2 to 10		2 to 10	
Operating temperature	°C	5 to 60	5 to 60		5 to 60	
Maximum operating frequency	cycles/mn	180 / 90 / 60	120 / 80 / 50		90 / 60 / 40	
Internal volume	cm ³	51 / 51 / 61	146 / 146 / 179		244 / 283 / 352	
Allowable radial load	N	588	1 176		1 960	
Allowable thrust load	N	44,1	88,2		147,0	
Allowable energy	mJ	49,0	225,4		1 078,0	
Weight	kg	0,82 / 0,79 / 0,73	2,00 / 1,90 / 1,70		3,70 / 3,70 / 3,70	
PRN High Torque Vane	Unit	PRN800SE Single vane	PRN50DE Double vane	PRN150DE Double vane	PRN300DE Double vane	PRN800DE Double vane
Air condition		Filtered (5µ) lubricated or non-lubricated				
Oscillating angle	°	90 / 180 / 270	90	90	90	90
Oscillating reference point	°	45 / 45,40 / 45	45	45	45	45
Port size		G1/2	G1/8	G1/4	G3/8	G1/2
Minimum operating pressure	bar	0,5	0,8	0,6	0,6	0,5
Operating pressure	bar	2 to 10	2 to 10	2 to 10	2 to 10	2 to 10
Operating temperature	°C	5 to 60	5 to 60	5 to 60	5 to 60	5 to 60
Maximum operating frequency	cycles/mn	65 / 45 / 30	180	120	90	65
Internal volume	cm ³	754 / 869 / 1 036	42	127	244	754
Allowable radial load	N	4 900	588	1 176	1 960	4 900
Allowable thrust load	N	490,0	44,1	88,2	147,0	490,0
Allowable energy	mJ	3 920,0	49,0	225,4	1 078,0	3 920,0
Weight	kg	12,70 / 12,20 / 11,20	0,82	2,00	4,30	12,70

Notes :

- Maximum operating frequency is given at 5 bar operating pressure (unloaded).
- Make sure to use the PRN rotary actuators within the allowable energy. Check if the required energy is lower than the allowable energy. If not, use a CRN hydro-check (refer to page 25) or end stoppers directly on the load.
- The PRN with keyways are provided with keys.

Materials specification

PRN	PRN50, PRN150	PRN300	PRN800
Body	Aluminium die casting alloy	Aluminium alloy	Aluminium alloy
Solid vane shaft	Structural steel alloy + Nitrile	Structural steel alloy + Nitrile	Structural steel alloy + Nitrile
Shoe	Zinc die casting alloy	Zinc die casting alloy	Zinc die casting alloy
Shoe seal	Nitrile	Nitrile	Nitrile
Damper	Uréthane	Uréthane	Uréthane
Bearing	-	-	Steel bearing
O-ring	Nitrile	Nitrile	Nitrile
Cover plate	-	-	Structural carbon steel
Screws, claw, stoppers, locknut	Steel	Steel	Steel

Effective torque (N.cm)

Model n°	Operating pressure (bar)									
	2	3	4	5	6	7	8	9	10	
Single vane PRN50SE	125	259	369	479	590	700	829	950	1060	
PRN150SE	550	850	1150	1500	1800	2100	2400	2730	3050	
PRN300SE	1050	1650	2250	2850	3450	4050	4600	5180	5750	
PRN800SE	3780	5910	8100	10200	12300	14400	16600	18600	20500	
Double vane PRN50DE	330	579	829	1040	1280	1510	1760	2010	2250	
PRN150DE	1250	1900	2700	3500	4150	4800	5500	6200	6900	
PRN300DE	2550	3900	5400	6800	8300	9700	11000	12400	13700	
PRN800DE	7740	12000	16100	20600	24700	28800	33200	37100	41100	

Oscillating time range (s)

	Oscillating angle		
	90°	180°	270°
PRN50	0.08~0.8	0.16~1.6	0.24~2.4
PRN150	0.12~1.2	0.24~2.4	0.36~3.6
PRN300	0.16~1.6	0.32~3.2	0.48~4.8
PRN800	0.22~2.2	0.44~4.4	0.66~6.6

PRN High Torque range - Sensing

Order Codes



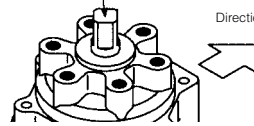
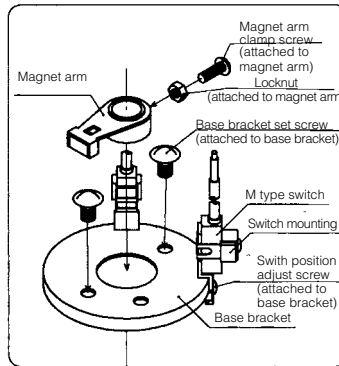
The switch unit consists in a 3-part mounting hardware combined with either a reed type or a solid state type sensors.

- The 3 parts hardware are to be ordered separately :
- Base bracket
 - Magnet arm
 - Switch mounting (except for PRN800)
- Switch units used with hydro-cushion

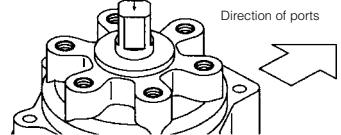
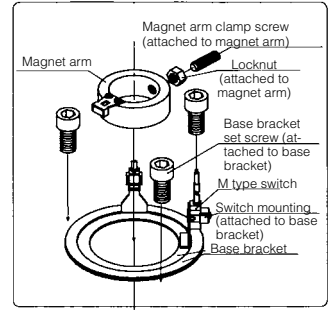
Standard mounting hardware for PRN

Rotary actuator	Base bracket	Magnet arm	Switch mounting
PRN50SE/DE	FM50-B	FM50-A	FM50-K
PRN150SE/DE	FM150-B	FM150-A	FM50-K
PRN300SE/DE	FM300-B	FM300-A	FM300-K
PRN800SE/DE	FM800-B	FM800-A	-

PRN50, PRN150, PRN300

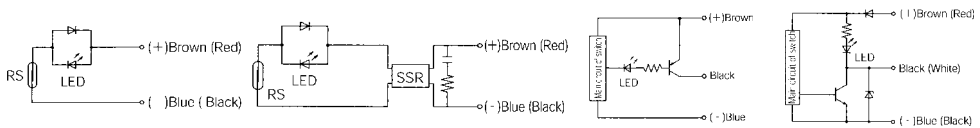


PRN800



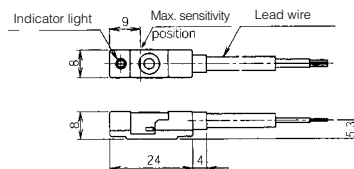
Technical data

	MA-1	MA-2L	MA-2H	MT-3	MTP-3
Application	Relay, PLC	Relay	Relay	Relay, PLC, IC circuit	Relay, PLC, IC circuit
Output method	Reed switch	Reed switch	Reed switch	NPN	PNP
Operating voltage (V)	AC100 - DC24	AC100/110	AC200/220	DC 5 to 30	DC 10 to 30
Operating current (mA)	5 to 45	5 to 150	5 to 150	5 to 200	5 to 200
Indicating lamp	Red LED up at ON 4,5VA-1W	Red LED up at ON 4,5VA	Red LED up at ON 4,5VA	Red LED up at ON 20 mA at 24V 10 mA at 12V 4 mA at 5V	Yellow LED up at ON 20 mA at 24V 10 mA at 12V
Consumption		Surge suppressor	Surge suppressor	1,5 V or less 10 µA	1,5 V or less 10 µA
Internal voltage drop	2 V or less	-	-	1 ms	1 ms
Max. leak current	-	-	-	490 m/s ²	490 m/s ²
Average operating time	1 ms	1 ms	1 ms	5 to 60 °C	5 to 60 °C
Shock resistance	294 m/s ²	294 m/s ²	294 m/s ²	IP67	IP67
Operating temperature	5 to 60 °C	5 to 60 °C	5 to 60 °C	1 m, 3-core, oil resistant	1 m, 3-core, oil resistant
Protection	IP67	IP67	IP67		
Lead wire	1 m, 2-core	1 m, 2-core	1 m, 2-core		

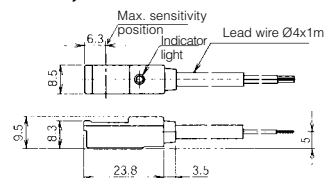


Dimensions (mm)

MA-1, MA-2

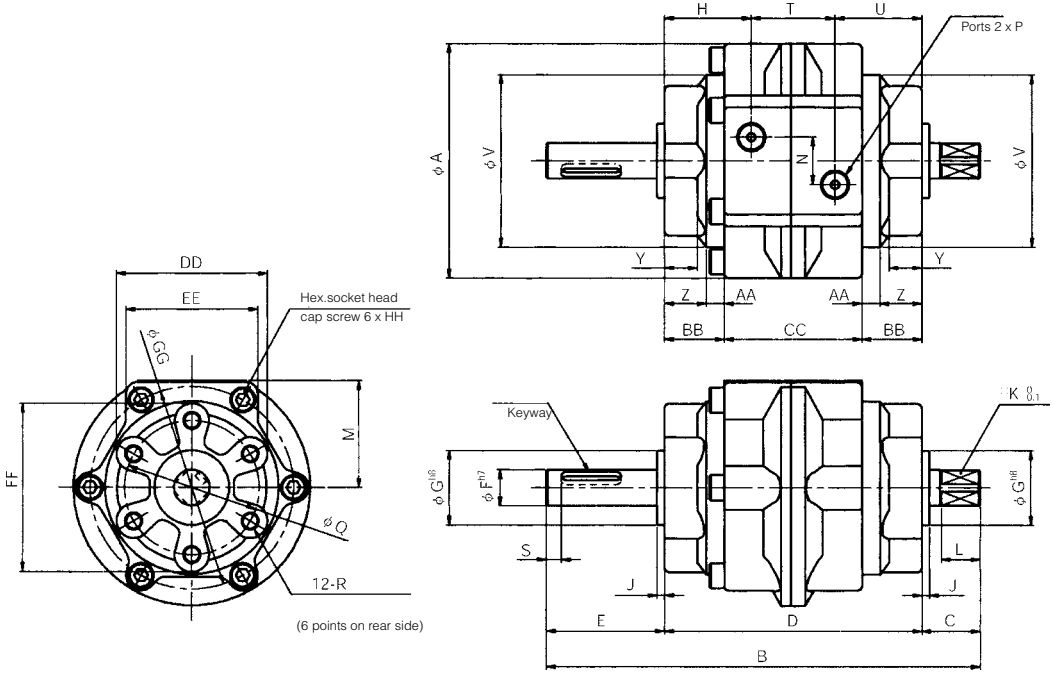


MT-3, MTP-3



PRN High Torque range - Dimensions (mm)

Standard model

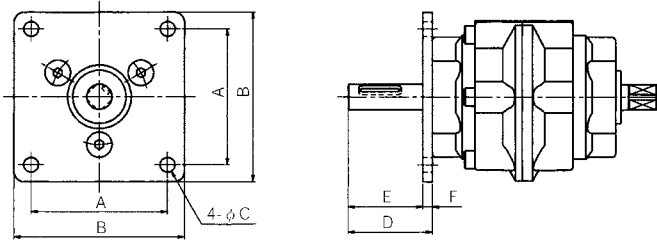


Type	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
PRN50	79,0	145	19,5	86	39,5	12	25	29,0	2,5	10	13	36	16	G1/8	45	M6x1 depth 9	5	28
PRN150	110,0	180	23,5	103	53,5	17	30	34,5	3,0	13	16	51	24	G1/4	70	M8x1,25 depth 12	5	34
PRN300	141,5	220	30,0	125	65,0	25	45	41,5	3,5	19	22	66	32	G3/8	80	M10x1,5 depth 15	5	42
PRN800	196,0	285	44,5	171	69,5	40	70	53,5	4,5	32	35	90	44	G1/2	120	M12x1,75 depth 18	10	64

Type	U	V	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	Keyway WxDxL
PRN50	29,0	58,0	11,0	14,0	6,0	20,0	46	51,0	44,0	57,0	68,0	M5x30 L	4 ⁰ _{-0,030} x 2,5 ^{+0,1} ₀ x 20
PRN150	34,5	85,2	10,5	15,5	8,0	23,5	56	75,0	61,0	85,0	97,0	M6x35 L	5 ⁰ _{-0,030} x 3 ^{+0,1} ₀ x 36
PRN300	41,5	110,0	13,0	17,5	10,0	27,5	70	88,5	78,0	98,5	125,0	M8x45 L	7 ⁰ _{-0,036} x 4 ^{+0,1} ₀ x 40
PRN800	53,5	152,0	14,5	21,1	11,4	32,5	106	130,0	110,0	145,0	173,0	M12x70 L	12 ⁰ _{-0,043} x 5 ^{+0,2} ₀ x 40

PRN High Torque range - Dimensions (mm)

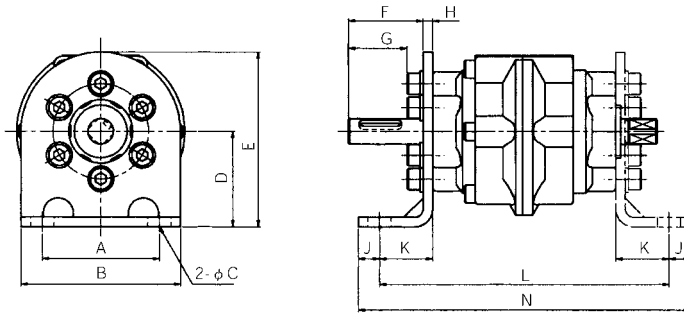
With flange plate



Type	A	B	C	D	E	F
PRN50	64	80	7	39,5	35,0	4,5
PRN150	88	110	9	53,5	47,5	6,0

Note : A flange plate can be fitted turned by steps of 60° from the original position

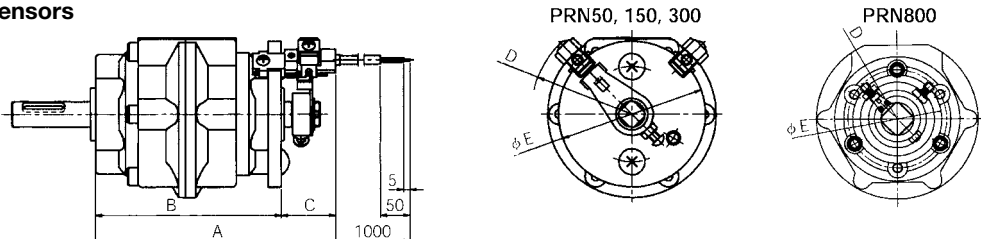
With foot plate



Type	A	B	C	D	E	F	G	H	J	K	L	N
PRN50	55	75	11	45	82,5	35,0	27,5	4,5	10	25	136	156
PRN150	80	110	13	65	115,0	43,5	33,5	10,0	12	28	159	183
PRN300	100	140	15	80	135,0	53,0	40,5	12,0	13	32	189	215
PRN800	140	200	15	110	200,0	54,5	39,5	15,0	15	35	241	271

Note: A foot plate can be fitted turned by steps of 60° from the original position
Short shaft side : Example with 2 pcs

With sensors



Type	A	B	C	D	E
PRN50	115,0	87,2	25,5	R47	69
PRN150	131,7	104,2	27,5	R61	97
PRN300	161,2	126,2	35,0	R69	113
PRN800	215,5	174,2	41,3	R60	108

PRN High Torque range with Hydro-cushion

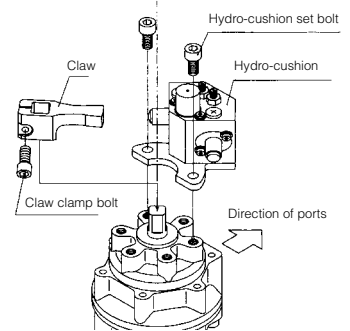
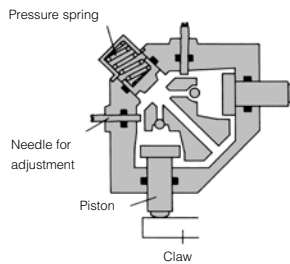
Order Codes

Hydraulic cushion for PRN high torque. Use these cushions when the inertial energy exceed the allowable energy of the PRN rotary actuator.



Rotary Actuator	Hydro-cushion	Claw for hydro-cushion - Oscillating angle		
		90°	180°	270°
Single vane				
PRN50SE	CRN50	CRN50-90-45-T	CRN50-180-45-T	CRN50-270-45-T
PRN150SE	CRN150	CRN150-90-45-T	CRN150-180-45-T	CRN150-270-45-T
PRN300SE	CRN300	CRN300-90-45-T	CRN300-180-45-T	CRN300-270-45-T
PRN800SE	CRN800	CRN800-90-45-T	CRN800-180-45-T	CRN800-270-45-T
Double vane				
PRN50DE	CRN50	CRN50-90-45-T		
PRN150DE	CRN150	CRN150-90-45-T		
PRN300DE	CRN300	CRN300-90-45-T		
PRN800DE	CRN800	CRN800-90-45-T		

Principle of operation



Specification

	Unit	CRN50	CRN150	CRN300	CRN800
Applicable Rotary Actuator		PRN50	PRN150	PRN300	PRN800
Load range	kg x cm ²	981	2942	5884	19613
Maximum absorption energy	mJ	2942	9807	19613	58840
Max. collision angular velocity	°/s	850	750	650	550
Max. energy capacity per mn	mJ/mn	19613	70613	137293	353039
Operating temperature	°C	5 to 50	5 to 50	5 to 50	5 to 50
Absorbing angle (one end)	°	11	12	14	15
Weight	kg	0,240	0,420	0,780	1,620

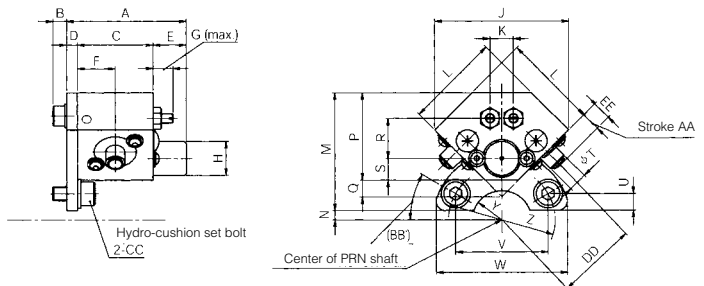
Note :

Energy capability per mn = Absorbing energy x 2N

N: Operation frequency (cycle/mn)

When a rotary actuator is used with a hydro-cushion, keep an operating pressure of 3 bar or more.

Dimensions (mm)



Model N°	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	Y	Z	AA	BB	CC	DD	EE
CRN50	50,5	6,0	32	4,5	14	16	8,5	14,4	56,6	9,9	40	50	4	37	7,1	17,0	9,2	8	7,2	39,0	56	R12,5	R45	6,5	30	M6x12	34	8,0
CRN150	56,5	7,2	36	4,5	16	18	8,5	18,4	70,7	11,3	50	62	9,5	49	8,4	25,5	11,4	10	8,0	60,6	80	R15	R70	10,0	30	M8x16	46	12,0
CRN300	62,5	7,2	42	4,5	16	21	12,0	22,5	91,9	12,7	65	87	8	61	14,2	33,2	14,1	12	12,0	69,2	95	R22,5	R80	15,0	30	M10x20	62	18,0
CRN800	73,0	7,2	50	6,0	17	25	12,0	32,5	127,0	14,2	90	118	17	82	24,7	46,7	20,6	16	13,0	103,9	130	R35	R120	24,0	30	M12x20	90	27,5



PRN High Torque range with Hydro-cushion - Sensors

Order Codes

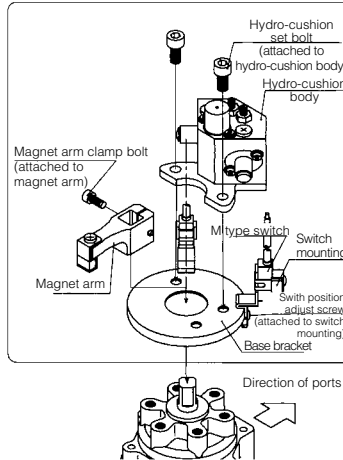
Standard mounting hardware for PRN

Rotary actuator	Base Bracket	Magnet arm - Oscillating angle			Switch mounting
		90°	180°	270°	
PRN50SE	FM50-B	FC50-90-45-T	FC50-180-45-T	FC50-270-45-T	FC50-K
PRN150SE	FM150-B	FC150-90-45-T	FC150-180-45-T	FC150-270-45-T	FC50-K
PRN300SE	FM300-B	FC300-90-45-T	FC300-180-45-T	FC300-270-45-T	FC300-K
PRN800SE*	CRN800-FC	FC800-90-45-T	FC800-180-45-T	FC800-270-45-T	-
PRN50DE	FM50-B	FC50-90-45-T			FC50-K
PRN150DE	FM150-B	FC150-90-45-T			FC50-K
PRN300DE	FM300-B	FC300-90-45-T			FC300-K
PRN800DE*	CRN800-FC	FC800-90-45-T			-

The switch unit used with a CRN hydro-cushion consists in a 3-part mounting hardware combined with either a reed type or a solid state type sensors. The 3 parts hardware are to be ordered separately :

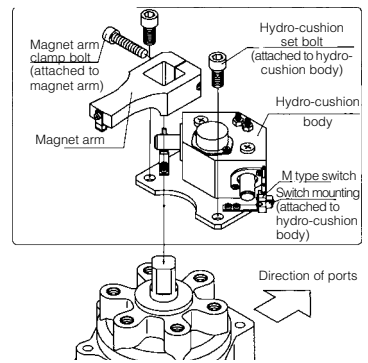
- Base bracket
- Magnet arm
- Switch mounting (except for PRN800)

PRN50, PRN150, PRN300



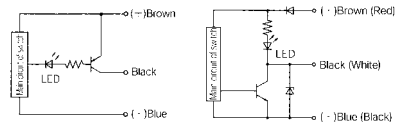
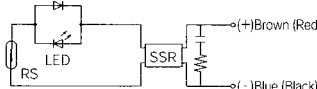
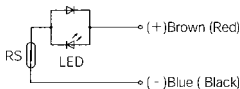
PRN800

* When used with sensors, order CRN800-FC with included sensors mountings



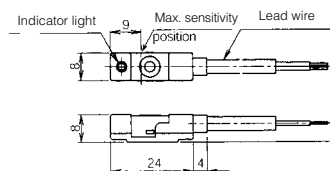
Technical data

	MA-1	MA-2L	MA-2H	MT-3	MTP-3
Application	Relay, PLC	Relay	Relay	Relay, PLC, IC circuit	Relay, PLC, IC circuit
Output method	Reed switch	Reed switch	Reed switch	NPN	PNP
Operating voltage (V)	AC100 - DC24	AC100/110	AC200/220	DC 5 to 30	DC 10 to 30
Operating current (mA)	5 to 45	5 to 150	5 to 150	5 to 200	5 to 200
Indicating lamp	Red LED up at ON 4,5VA - 1W	Red LED up at ON 4,5VA	Red LED up at ON 4,5VA	Red LED up at ON 20mA at 24V 10mA at 12V	Yellow LED up at ON 20mA at 24V 10mA at 12V
Consumption				Surge suppressor 1,5 V or less 10 µA	Surge suppressor 1,5 V or less 10 µA
Internal voltage drop	2 V or less	-	-	Surge suppressor 1,5 V or less	Surge suppressor 1,5 V or less
Max. leak current	-	-	-	10 µA	10 µA
Average operating time	1 ms	1 ms	1 ms	1 ms	1 ms
Shock resistance	294 m/s ²	294 m/s ²	294 m/s ²	490 m/s ²	490 m/s ²
Operating temperature	5 to 60 °C	5 to 60 °C	5 to 60 °C	5 to 60 °C	5 to 60 °C
Protection	IP67	IP67	IP67	IP67	IP67
Lead wire	1 m, 2-core	1 m, 2-core	1 m, 2-core	1 m, 3-core, oil resistant	1 m, 3-core, oil resistant

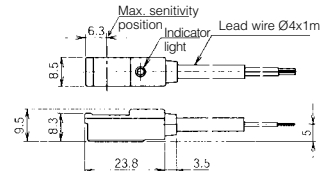


Dimensions (mm)

MA-1, MA-2

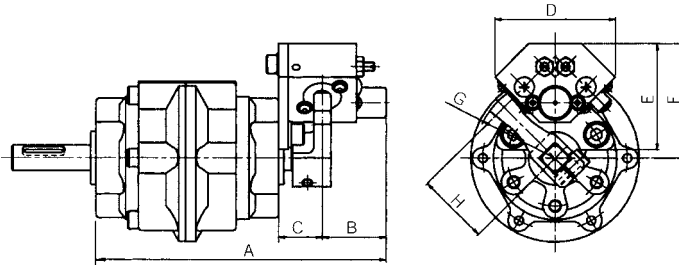


MT-3, MTP-3



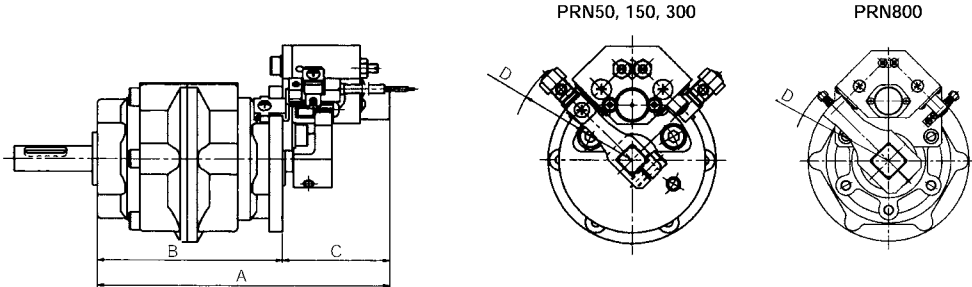
PRN High Torque range with Hydro-cushion - Dimensions (mm)

PRN with hydro-cushion



Type	A	B	C	D	E	F	G	H
PRN50	136,5	30	20,5	56	50	54,0	R38	34
PRN150	159,5	34	22,5	80	62	71,5	R51	46
PRN300	187,5	37	25,5	95	87	96,0	R68	62
PRN800	244,0	42	31,0	130	118	135,0	R78	90

PRN with hydro-cushion and switch unit



Type	A	B	C	D
PRN50	137,7	87,2	50,5	R58,2
PRN150	160,7	104,2	56,5	R72,2
PRN300	188,7	126,2	62,5	R88,2
PRN800	244,0	174,2	69,8	R118,5

Note : For switch unit mounting hardware or hydro-cushion combinations, refer to the required dimensions in each fig.

Selecting a pneumatic Rotary Actuator

Step 1 : Selecting the size of the Rotary Actuator

When a simple static force is required (such as clamping force)

1. Determine the required force, arm length from actuator and operating pressure.

Required force F(N)
 Arm length from actuator l (m)
 Operating pressure P(bar)

2. Calculate the required torque

$T_s = F \times l$ (N.m)
 Required force F(N)
 Arm length from actuator l (m)

3. Compare the effective torque T_h of the actuator under the operating pressure with the required one T_s .

Select a rotary actuator with : $T_h > T_s$

When a the load is moving

The required torque for moving a load is the total of resistance torque and acceleration torque. The resistance torque is the sum of friction, gravity and external force and torques. The acceleration torque is provided to accelerate the load to certain speed against inertia.

1. Calculating the resistance torque T_r

a) Determine the resistance force, arm length from actuator and operating pressure.

Required force F(N)
 Arm length from actuator l (m)
 Operating pressure P(bar)

b) Calculate the resistance torque T_r

$T_r = k \times F \times l$ (N.m)
 k = 2 when there is no load variation
 k = 5 when there is a load variation

Note : When there is a load variation, if $k < 5$, the angular velocity increases and thus smooth operation cannot be obtained

2. Calculating the acceleration torque T_a

a) Determine the oscillating angle and oscillating time t.

Oscillating time is the time required for the vane to operate from starting point to the oscillation end.

Oscillating angle (rad) $90^\circ = 1.5708$ rad
 $180^\circ = 3.1416$ rad
 $270^\circ = 4.7124$ rad

Oscillating time t (s)

b) Calculate the moment of inertia

The moment of inertia is determined from the shape and the mass of the load.

Moment of inertia J (kg.m²)

c) Calculating angular acceleration

$\alpha = \theta / t^2$ (rad/s²)
 θ (rad) : Oscillating angle
 t (s) : Oscillating time

d) Calculating acceleration torque T_a


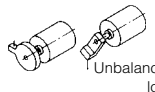


$T_a = 5 \times J \times \alpha$ (N.m)
 J : Moment of inertia of the load (kg.m²)
 α : Angular acceleration (rad/s²)

3. Calculating the required torque T_s

$T_s = T_r + T_a$ (N.m)
 T_r : Resistance torque (N.m)
 T_a : Acceleration torque (N.m)

4. Compare the effective torque T_h of the actuator under the operating pressure with the required one T_s .

Select a rotary actuator with : $T_h > T_s$

Calculating the resistance torque	Horizontal load	Vertical load
Required	Load resistance exists External force  Balanced load Unbalanced load	Load resistance exists External force  Unbalanced load Gravity Balanced load Unbalanced load
	No load resistance exists Balanced load Unbalanced load 	No load resistance exists  Balanced load
Not required		

Selecting a pneumatic Rotary Actuator

Step 2 : Checking the oscillating time

Step 3 : Checking the allowable energy

On the inertia matter, use the rotary actuator so that the inertial energy is lower than the allowable energy of the rotary actuator. Check as indicated here after :

1. Calculate the angular velocity ω

$$\omega = \theta / t \text{ (rad/s)}$$

θ (rad) : Oscillating angle

t (s) : Oscillating time

2. Calculate the inertial energy of the load E

$$E = 1/2 \times J \times \omega^2 \text{ (J)}$$

J : Moment of inertia of the load (kg.m²)

ω : Angular velocity (rad/s)

3. Check if the inertial energy E is within the allowable energy indicated in the specifications of each actuator.

Note :

If the inertial energy exceeds the allowable energy, the actuator may be damaged. Therefore, it is necessary to take the following measures :

- Select a larger size the allowable energy of which is higher than the energy required
- Slow down the oscillating time
- Use a hydro-cushion CRN (high torque PRN)
- Fit a cushion or other shock absorber directly on the load side.

Selecting a hydro-cushion CRN

1. Calculate the moment of inertia by the shape and mass of the load, and make sure that it is within the allowable energy of the hydro-check

2. Make sure that the collision angular velocity is less than the maximum allowable

$$\omega_0 = 1,2 \times \omega \text{ (°/s)}$$

ω : Mean angular velocity (°/s)

3. Calculate the collision energy from the load and the collision angular velocity

$$E1 = 1/2 \times J \times \omega_0^2 \text{ (J)}$$

J : Moment of inertia (kg.m²)

ω_0 : Collision angular velocity (rad/s) 1° = 0.0174 rad

4. Find the energy generated from the torque of the actuator

$$E2 = 1/2 \times T \times \theta \text{ (J)}$$

T : Torque of the rotary actuator (N.m)

θ : Absorbtion angle of the cushion (one side)

5. Check that E1 + E2 is equal or less than the maximum absorbstion energy

6. Find the energy per minute from the operation frequency

$$Em = 2 \times N \times (E1+E2) \text{ (J/mn)}$$

N : operation frequency (mn)

7. Make sure that Em is equal or less than the maximum energy capacity per mn

Reference data for selecting HI-ROTOR

Calculating the moment of inertia

Shape	Sketch	Requirement	Inertia moment I (kgcm ²)	Radius of gyration	Remarks
Disc		Diameter d (cm) Mass m (kg)	$I = m \cdot \frac{d^2}{8}$	$\frac{d^2}{8}$	
Stepped disc		Diameter d ₁ (cm) d ₂ (cm) Mass portion d ₁ m ₁ (kg) portion d ₂ m ₂ (kg)	$I = m_1 \cdot \frac{d_1^2}{8} + m_2 \cdot \frac{d_2^2}{8}$	-	When portion d ₂ is much smaller than portion d ₁ , value of d ₂ is negligible.
Bar (with rotating center at the end)		Bar length l (cm) Mass m (kg)	$I = m \cdot \frac{l^2}{3}$	$\frac{l^2}{3}$	If the ratio of the bar width : length is over 0.3, use formula for rectangle.
Rectangular parallelepiped		Side length a (cm) b (cm) Distance between the center of gravity and rotation l (cm) Mass m (kg)	$I = m \left(l^2 + \frac{a^2+b^2}{12} \right)$	$l^2 + \frac{a^2+b^2}{12}$	
Bar (with rotating center at the center)		Bar length l (cm) Mass m (kg)	$I = m \cdot \frac{l^2}{12}$	$\frac{l^2}{12}$	If the ratio of the bar width : length is over 0.3, use formula for rectangle.
Rectangular parallelepiped		Side length a (cm) b (cm) Mass m (kg)	$I = m \cdot \frac{a^2+b^2}{12}$	$\frac{a^2+b^2}{12}$	
Concentrated load		Shape of concentrated load Disc Diameter of disc d (cm) Arm length l (cm) Mass of concentrated load m ₁ (kg) Mass of arm m ₂ (kg)	$I = m_1 \cdot l^2 + m_1 \cdot K_1^2 + \frac{m_2 l^2}{12}$ Case of disc $K_1^2 = \frac{d^2}{8}$	K ₁ ² : Select from above this column	If m ₂ is much smaller than m ₁ , assume m ₂ to be 0 for calculation.

How to convert the inertia of load applied through gears "I_L" for HI-ROTOR's shaft

Gear		Gear HI-ROTOR side a Load side b Inertia moment of load I _L (kgcm ²)	Inertia moment of load HI-ROTOR's shaft $I_H = \left(\frac{a}{b}\right)^2 I_L$	-	When a large gear is required, it is necessary to take inertia moment of gear into consideration.
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Rotary Actuators - Common instructions

Installation



Warning

The Rotary Actuators should be installed according to the rules of safe use of compressed air and the general rules relating to systems, especially the European Machinery Directive.

Do not apply excessive stress to the shaft.

1. Heavy thrust load should be avoided

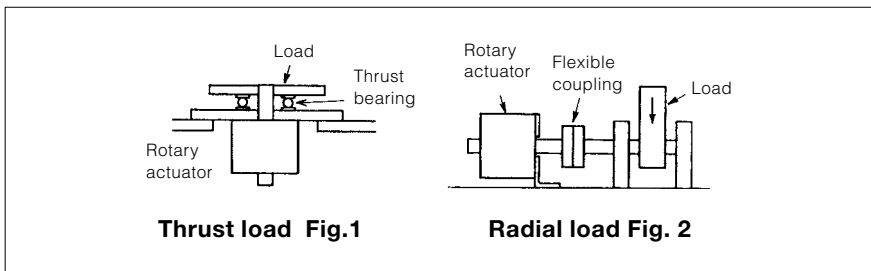
When the thrust load is higher than the allowable thrust load prescribed in the specifications, please use a bearing as shown in fig. 1.

2. Heavy radial loads should be avoided

When the radial load is higher than the allowable radial load prescribed in the specifications, please use flexible coupling as shown in fig. 2.

3. Check the allowable energy

If the impact energy is higher than the allowable energy, use a CRN hydro-cushion or external stoppers operating directly on the load.



Do not hit the shaft when the body is fixed or the body when the shaft is fixed.

When mounting a load or couplings on the shaft, set the rotary actuator in such a way that the body does not receive any force, as shown in the Fig. 3.

Lubrication

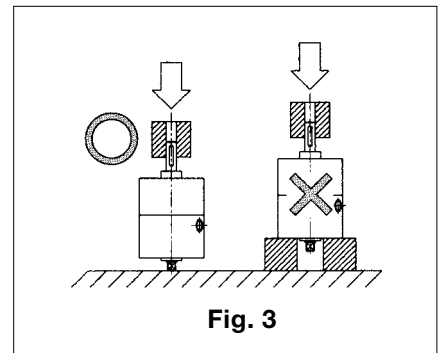


Caution

The rotary actuators listed in this catalogue operate non-lubricated.

This product is design to be used with non-lubricated air, however, they may be used with or without lubricated air. When used with lubricated air, this must be continued as the original lubricant may have run off, which could result in operation failure.

When using a lubricant, Class 1 turbine oil ISO VG32 (containing additive) is recommended. Do not use spindle oil and machine oil, that may damage the seals.

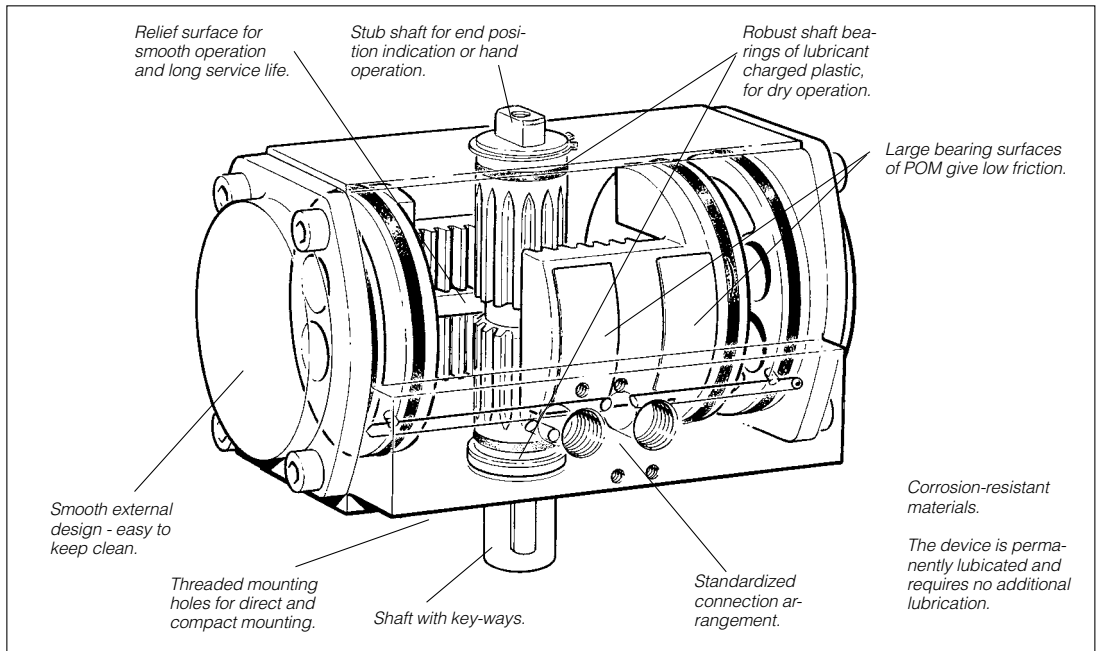


G



Pneumatic Rotary Actuators

RA Series



Pneumatic rotary actuator RA

The RA is a double-acting rotary actuator of very compact design. It has a high torque and small installation dimensions. The actuator has double pistons, which transmit the turning moment to the output shaft. The toothed piston rods act on the output shaft in a rack-and-pinion type arrangement. Each piston and toothed rod is of integral construction. The rack-and-pinion type arrangement gives an even turning moment throughout the rotation movement.

The drive shaft is robustly supported in bushings of self-lubricating plastic. There are key-ways on the output end of the shaft, while the opposite end of the shaft has a stub that can be used to accommodate end-position indication, or to facilitate hand operation of the actuator. The turning limits of the rotary actuator should be determined by external stop lugs, in order to protect the unit from the effects of excessive load inertia.

Compressed air is fed into the piston chambers via a connection plate and drilled galleries in the central part and end covers. The connection plate is fitted to a standardized connection arrangement on one of the long sides of the unit. This means that the end covers are completely smooth, without any protruding parts.

The RA rotary actuator has a cylinder block of natural anodized aluminium, with end covers of black anodized aluminium. The unit is available in 5 different sizes, covering a turning-moment range of 20 to 200 Nm. As standard, all sizes are available with a turning angle of either 90° or 180°.

Technical data

Working medium	dry, filtered compressed air
Working pressure	max. 10 bar
Working temperature	-20 °C to +80 °C

Prelubricated, further lubrication is not normally necessary. If additional lubrication is introduced it has to be continued.

Ordering information for RA

Angle	Order code
90°	RA2-90
180°	RA2-180
90°	RA4-90
180°	RA4-180
90°	RA8-90
180°	RA8-180
90°	RA12-90
180°	RA12-180
90°	RA20-90
180°	RA20-180

Material specification

Cylinder block/end covers	Anodized aluminium, natural/black
Pistons	Aluminium
Relief surface bars	Stainless steel
Shaft	Zinc-plated steel
End cover screws	Zinc-plated steel
Seals	Nitrile rubber, NRB
Piston bearings	POM



Important

Before attempting any external or internal work on the rotary actuator or any connected components, make sure the rotary actuator is vented and disconnect the air supply in order to ensure isolation of the air supply.

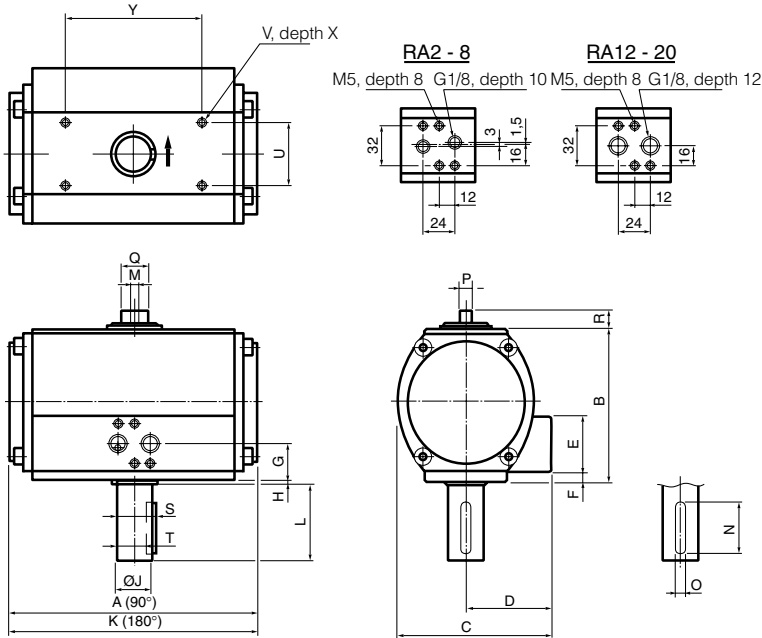
Note

Air quality is essential for maximum cylinder service life (see ISO 8573).

Note

All technical data in this catalogue is typical data only.

Dimensions



Designation	A	B	C	D	E	F	G	H	ØJh8	K	L	M	N	O	P
RA2	114,5	73,0	75,5	43,5	41	-	20,5	4	14	169	30	M6	19	5	7,5
RA4	133,0	90,5	87,5	47,5	41	-	20,5	4	19	215	40	M6	31	6	7,5
RA8	172,0	109,0	105,0	57,0	42	7,5	28,5	4	19	245	40	M8	31	6	11,5
RA12	194,0	118,5	121,0	67,0	43	8,0	29,5	5	28	295	60	M8	48	8	11,5
RA20	218,0	140,5	136,5	72,0	43	8,0	29,5	5	28	337	60	M8	48	8	11,5

Designation	Q	R	S	T	U	V	X	Y
RA2	13	10,0	16,0	11,0	32	M5	8	50
RA4	15	11,0	21,5	15,5	32	M5	8	73
RA8	17	13,5	21,5	15,5	40	M6	10	90
RA12	20	15,0	31,0	24,0	49	M6	10	107
RA20	25	15,0	31,0	24,0	60	M6	10	120

Table of moments at 6 bar

Designation	Moment in Nm
RA2	22,8
RA4	45,0
RA8	81,7
RA12	134,0
RA20	224,0

Air consumption

Free air consumption in NI per double stroke at 600 kPa (6 bar).

Rotary actuator, type/ Turning angle	RA2	RA4	RA8	RA12	RA20
RA/90°	1,8	3,2	5,9	7,8	14,9
RA/180°	3,6	6,4	11,8	15,6	30

Spare parts

Designation	Order code
Mounting plate for VGD15 seal kits/spare kits:	9127 3864-01
RA-2-SS	9121 6799-20
RA-4-SS	9121 6799-21
RA-8-SS	9121 6799-22
RA-12-SS	9121 6799-23
RA-20-SS	9121 6799-24

Variants available on request:

- Single-acting rotary actuator with spring return for 90°
- Non-standard turning angle
- Other surface treatments

H



Rotary Actuators

Series VRS / VRA

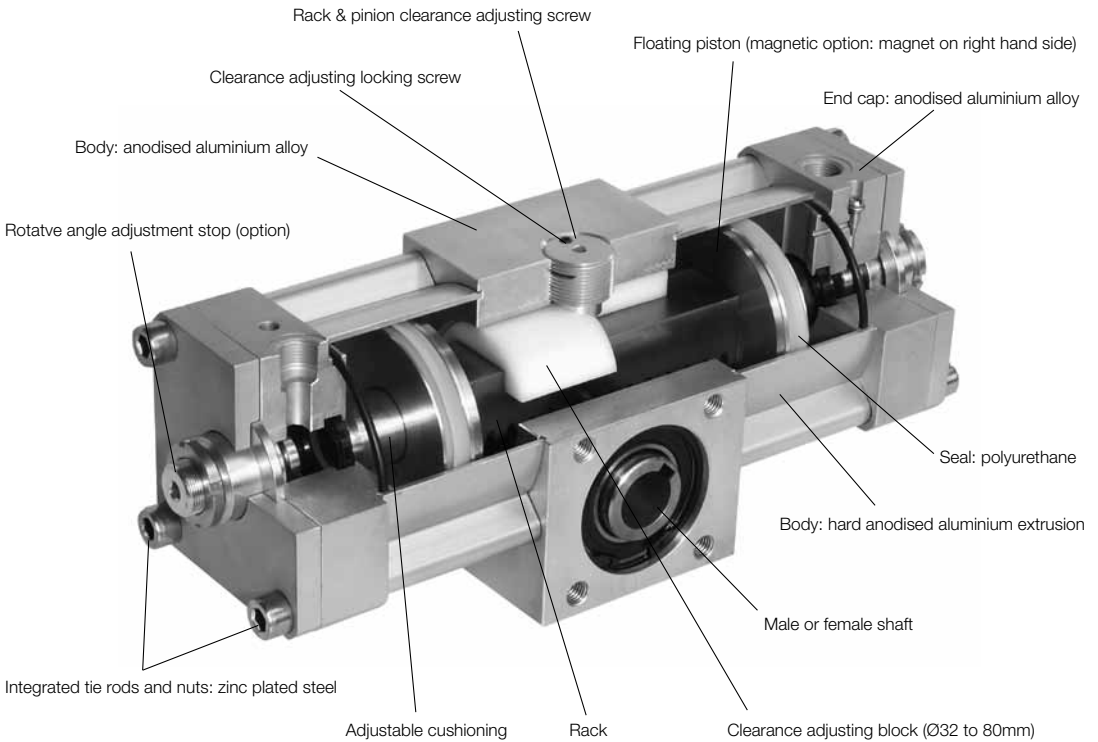
Sizes 32, 40, 50, 63, 80, 100 & 125mm

Rotation 96°, 186° and 366°



- Transforms the rectilinear motion of 2 single acting opposite cylinders into rotary motion via a rack and pinion drive contained within the cylinder body.
- Various tasks can be handled by use of a torque cylinder, including gate opening and closing, clamping and agitation of fluids and raw materials.
- Key points of the VRS / VRA cylinder design
 - lightweight materials (aluminium alloy)
 - accuracy in motion (cushioning, clearance compensation - bores up to 80mm)
 - long life (floating piston, nitrile seals, adjustable cushions)
 - good resistance to corrosion
 - easy cleaning (extruded body)
- Operates with dry, lubricated or non lubricated air
- The range includes bores from Ø32 to 125mm with rotative angles of 96°, 186° and 366°
- Magnetic piston versions can be fitted with P8S sensors and brackets
- Several options are available; rotative angle adjustable stop, male shaft or female shaft (through)

VRS standard version (Ø32 to 125mm)



VRA version (Ø32 to 80mm) for corrosive environment

- Aluminium blanking plate for the clearance adjustment screw
- Rack and pinion gear contained in waterproof enclosure (silicone seal)
- Stainless steel waterproof ball bearings
- Stainless steel pinion
- Stainless steel circlips, internal tie rods and screws
- Optional Magnetic version



Material specification

	VRS	VRA
Rack	XC40 steel	XC40 steel
Floating piston	Aluminium	Aluminium
Magnet (**M version)	Magnetic elastomer	Magnetic elastomer
Piston seals	Polyurethane	Polyurethane
Rack and pinion gear seals		Silicone
Body	Anodised aluminium	Anodised aluminium
Integrated tie rods, nuts, circlips, screws	Zinc plated steel	303 stainless steel
Body	Hard anodised aluminium extrusion	Hard anodised aluminium extrusion
End caps	Anodised aluminium	Anodised aluminium
Male or female transmission shaft	XC40 steel	304 stainless steel (female)
Cushion sleeve	Brass	Brass
Clearance adjusting block (Ø 32 to 80mm)	Acetal	Acetal
Adjusting screw blanking plate		Aluminium + silicone seal

Condition of use

	Ø 32 to 80mm	Ø 100 and 125mm
Temperature range	-10°C to +60°C (14°F to 140°F)	
Pressure range (bar)	0.5 to 10 7 to 145 psi)	0.3 to 10 (4 to 145 psi)
Air condition	Filtered air 40µ, lubricated or non lubricated, dry or non dry	

Theoretical torque

Ø Bore Module	Pinion ØPm	Torque (N.m)					mm
		2 bar	4 bar	6 bar	8 bar	10 bar	
32	1.5	20	2.4	4.8	7.2	9.6	12
40	2	40	5.0	10.0	15.0	20.0	25
50	2	40	8.0	16.0	24.0	32.0	40
63	3	54	17.0	34.0	51.0	68.0	85
80	3	54	27.0	54.0	81.0	108.0	135
100	5	75	58.0	116.0	174.0	232.0	290
125	5	75	92.0	184.0	276.0	368.0	460

The table above shows the theoretical torque at different pressures. A maximum efficiency of 80% should be assured due to functional losses.

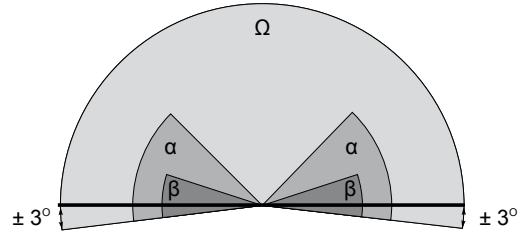
Technical data

Bore (mm)		32	40	50	63	80	100	125
Maximum load (N)	Axial	110	350	350	1050	1050	2500	2500
	Radial	35	220	220	900	900	2000	2000
Cushion angle (°)		50	45	45	32	32	30	30
Nominal moment of inertia (kg.m ²)		0.003	0.01	0.02	0.1	0.2	0.3	0.4
Rotative angle (-1°)		96°, 186°, 366°						
Angular tolerance		0°10'	0°10'	0°10'	0°10'	0°10'	1°	1°

Technical data

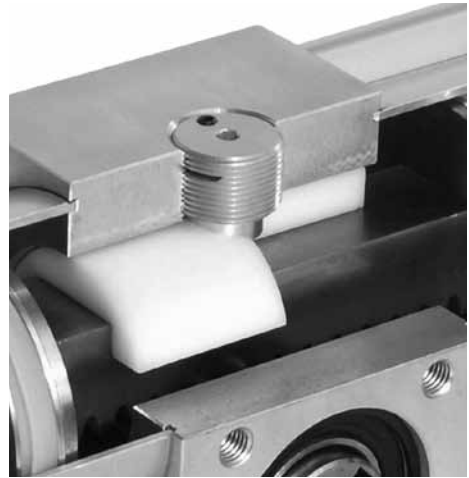
Rotative angle adjustable stop and cushion angle

Ø Cylinder bore (mm)		32	40	50	63	80	100	125
		96°	96°	96°	96°	96°	96°	96°
Rotative angle	Ω	186°	186°	186°	186°	186°	186°	186°
		366°	366°	366°	366°	366°	366°	366°
Cushion angle	α	50°	45°	45°	32°	32°	30°	30°
Adjustable angle	β	15°	15°	15°	15°	15°	15°	15°
(R option: Adjustable stop)								



Maintenance

After 2 million cycles in nominal moment of inertia conditions, the cylinder should be dismantled and seals replaced. When assembling, grease gear and rack with ESSO GP GREASE or equivalent. Adjust clearance of gear and rack (Ø 32 to 80 cylinder bore) with the screw (1) in order to obtain the following minimum operating pressures (unloaded cylinder), then secure the adjustment with the screw (2).



Backlash adjustment

Ø Bore (mm)	Minimum operating pressure
Ø 32 and 40	0.5 bar (7 psi)
Ø 50 and 63	0.4 bar (6 psi)
Ø 80	0.3 bar (4 psi)

Weight - kg (lbs)

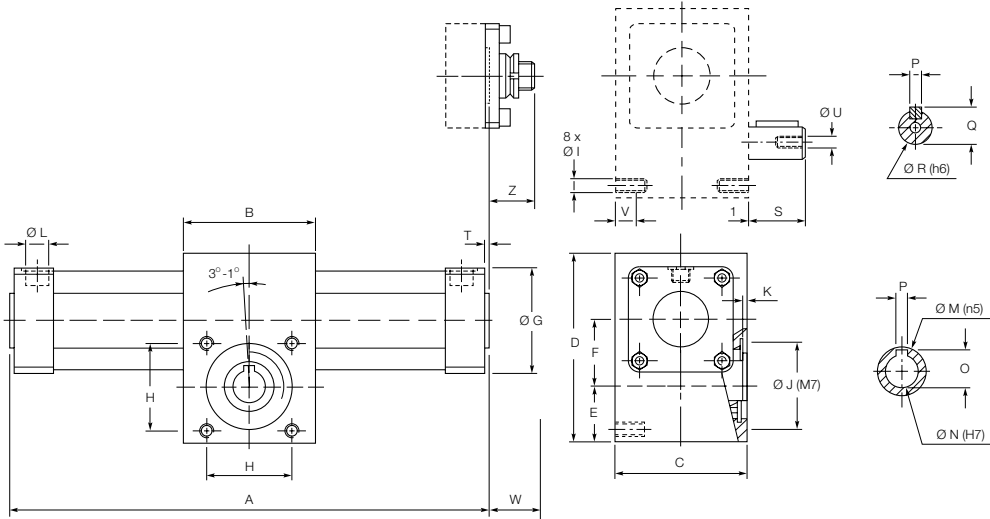
Standard cylinder : Female shaft, 0° rotation, magnetic or non magnetic

Bore (mm)	32	40	50	63	80	100	125
Standard cylinder	1.30 (2.9)	2.20 (4.8)	2.50 (5.5)	5.30 (11.7)	6.20 (13.7)	15.70 (34.6)	17.80 (39.2)
For male shaft	0.10 (0.2)	0.20 (0.4)	0.20 (0.4)	0.45 (1.0)	0.45 (1.0)	1.50 (3.3)	1.50 (3.3)
For one adjustable stop	0.15 (0.3)	0.25 (0.5)	0.35 (0.8)	0.35 (0.8)	0.40 (0.9)	1.00 (2.2)	1.00 (2.2)
Per 90° of rotation	0.10 (0.2)	0.30 (0.7)	0.40 (0.9)	0.70 (1.5)	0.80 (1.8)	2.00 (4.4)	2.30 (5.0)

Example : VRM050-186FRN Weight = 2.5 + 0.35 x 1 + 0.40 x 2 = 3.65 kg
(5.5 + 0.77 x 1 + 0.88 x 2 = 8.04 lbs)

Dimensions (mm)

Cylinder bores Ø 32 to 80mm



The location of the shaft key is indicated when the pistons are on the left.
First rotation as indicated (clockwise).

Ω : Rotative angle 96°, 186° or 360°

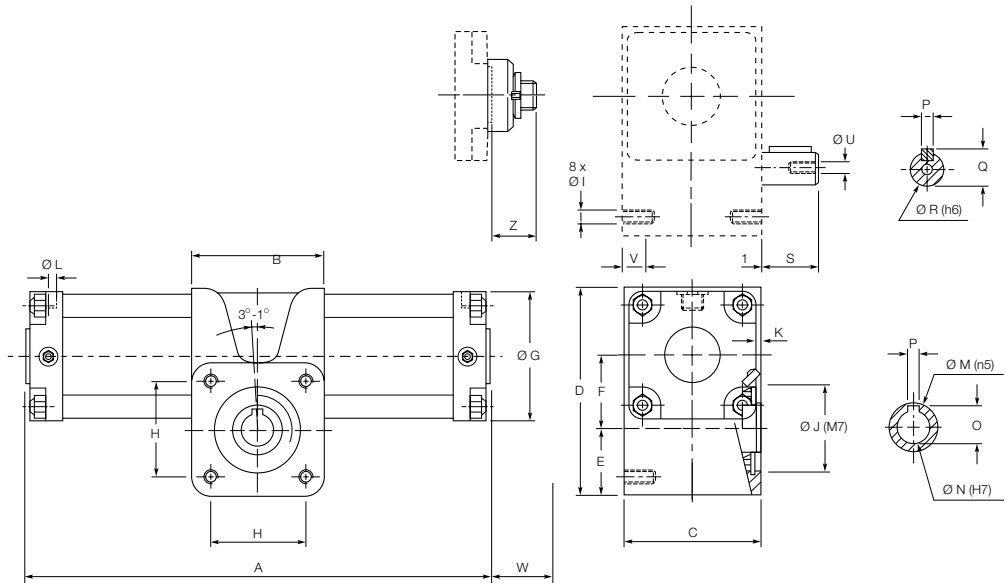
Ø	A*	B	C	D	E	F	G	H	I	J	K	L
32	128 + 0.523 Ω	50	50	72	25.0	24.0	45	35	M6	35	2.0	G1/8"
40	163 + 0.6981 Ω	65	65	95	32.5	29.5	52	47	M8	47	3.0	G1/4"
50	163 + 0.6981 Ω	65	65	95	32.5	29.5	65	47	M8	47	3.0	G1/4"
63	209 + 0.9424 Ω	95	95	126	40.0	38.0	75	62	M10	62	3.5	G3/8"
80	209 + 0.9424 Ω	95	95	126	40.0	38.0	95	62	M10	62	3.5	G3/8"

Ø	M	N	O	P	Q	R	S	T	U	V	W*	Z
32	17	10	11.7	4	13.5	12	20	2	M4 x 10	10	22	31
40	25	15	17.2	5	18.0	16	30	3	M5 x 15	12	24	35
50	25	15	17.2	5	18.0	16	30	3	M5 x 15	12	29	35
63	35	24	27.2	8	27.0	24	40	3	M8 x 20	15	32	32
80	35	24	27.2	8	27.0	24	40	3	M8 x 20	15	32	32

* Add W to A for the magnetic version (magnet on right hand side as standard).

Dimensions (mm)

Cylinder bores \varnothing 100 to 125mm



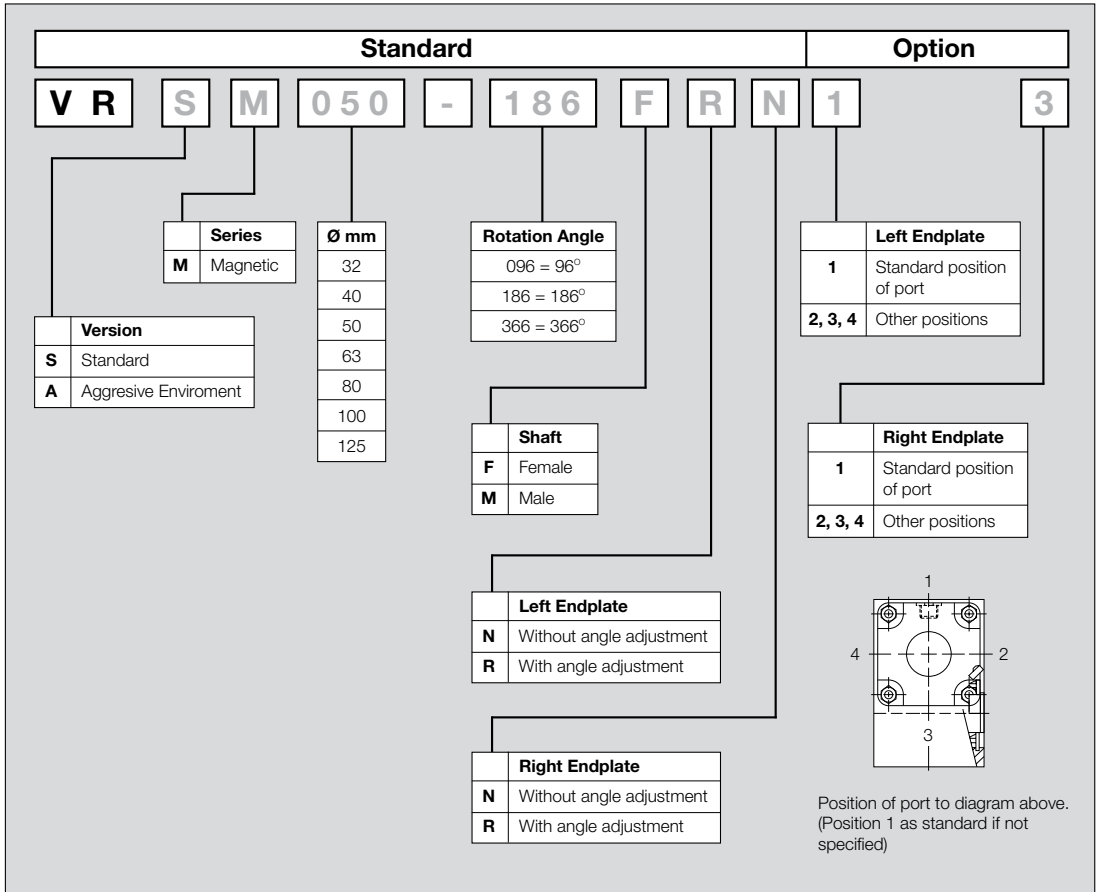
The location of the shaft key is indicated when the pistons are on the left.
First rotation as indicated (clockwise).

Ω : Rotative angle 96°, 186° or 360°

\varnothing	A*	B	C	D	E	F	G	H	I	J	K	L
100	304 + 1309 Ω	130	142	188	64.0	53.5	115	90	M14	90	4.5	G1/2"
125	304 + 1309 Ω	130	142	188	64.0	53.5	140	90	M14	90	4.5	G1/2"
\varnothing	M	N	O	P	Q	R	S	U	V	W*	Z	
100	55	35	38.7	10	38.5	35	50	M12 x 20	24	4	38	
125	55	35	38.7	10	38.5	35	50	M12 x 20	24	4	38	

* Add W to A for the magnetic version (magnet on right hand side as standard).

Ordering references



Maintenance - Seal kit

Bore (mm)	32	40	50	63	80	100	125
Actuator VRS / VRSM	JJVR032	JJVR040	JJVR050	JJVR063	JJVR080	JJVR100	JJVR125
Actuator VRA / VRAM	JJVRA032	JJVRA040	JJVRA050	JJVRA063	JJVRA080		

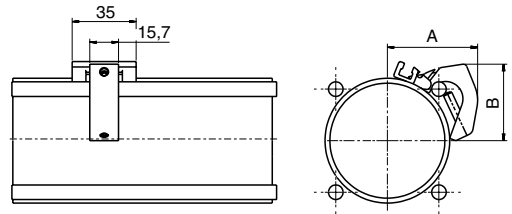
Sensors

VRSM and VRAM cylinders can be fitted with sensors.
These sensors use the following mounting bracket.

Ø Bore (mm)	32	40	50	63	80	100	125
Mounting bracket	P8S-TMA0X*						
A	35	39	48	50	58	70	
B	30	35	42	48	56	65	

Note: Mounting brackets and sensors must be ordered separately

* Please consult Technical Department for 125mm bore.



Electronic sensors

The new electronic sensors are "Solid State", i.e. they have no moving parts at all. They are provided with short-circuit protection and transient protection as standard. The built-in electronics make the sensors suitable for applications with high on and off switching frequency, and where very long service life is required.

Technical data

Design	GMR (Giant Magnetic Resistance) magneto-resistive function
Installation	From side, down into the sensor groove, so-called drop-in
Outputs	PNP, normally open (also available in NPN design, normally closed, on request)
Voltage range	10-30 VDC 10-18 V DC, ATEX sensor
Ripple	max 10%
Voltage drop	max 2,5 V
Load current	max 100 mA
Internal consumption	max 10 mA
Actuating distance	min 9 mm
Hysteresis	max 1,5 mm
Repeatability accuracy	max 0,2 mm
On/off switching frequency	max 5 kHz
On switching time	max 2 ms
Off switching time	max 2 ms
Encapsulation	IP 67 (EN 60529)
Temperature range	-25 °C to +75 °C -20 °C to +45 °C, ATEX sensor
Indication	LED, yellow
Material housing	PA 12
Material screw	Stainless steel
Cable	PVC or PUR 3x0.25 mm ² see order code respectively

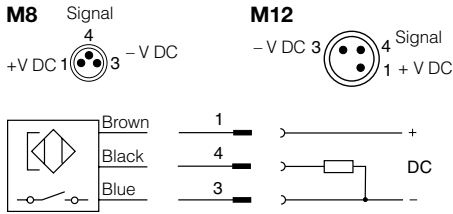
Reed sensors

The sensors are based on proven reed switches, which offer reliable function in many applications. Simple installation, a protected position on the cylinder and clear LED indication are important advantages of this range of sensors.

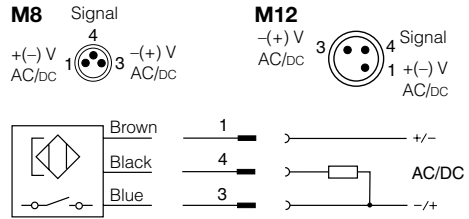
Technical data

Design	Reed element
Mounting	From side, down into the sensor groove, so-called drop-in Normally open , or normally closed
Output	
Voltage range	10-30 V AC/DC or 10-120 V AC/DC 24-230 V AC/DC
Load current	max 500 mA for 10-30 V or max 100 mA for 10-120 V max 30 mA for 24-230 V
Breaking power (resistive)	max 6 W/VA
Actuating distance	min 9 mm
Hysteresis	max 1,5 mm
Repeatability accuracy	0,2 mm
On/off switching frequency	max 400 Hz
On switching time	max 1,5 ms
Off switching time	max 0,5 ms
Encapsulation	IP 67 (EN 60529)
Temperature range	-25 °C to +75 °C
Indication	LED, yellow
Material housing	PA12
Material screw	Stainless steel
Cable	PVC or PUR 3x0.14 mm ² see order code respectively

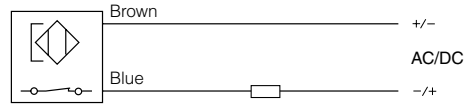
Electronic sensors



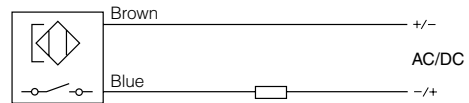
Reed sensors



P8S-GCFPX

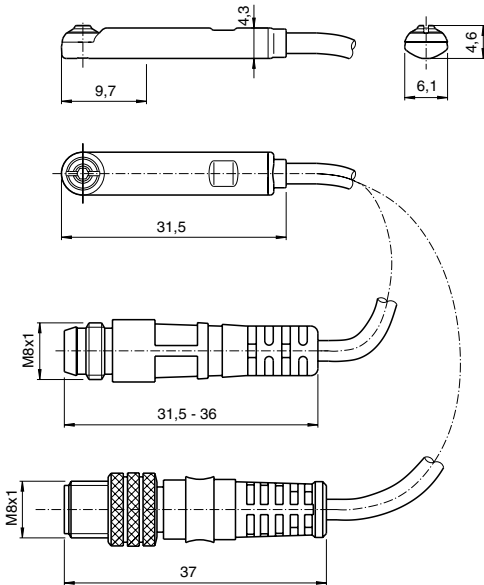


P8S-GRFLX / P8S-GRFLX2




Dimensions

Sensors



Ordering data

Output/function	Cable/connector	Weight kg	Order code
Electronic sensors , 10-30 V DC			
PNP type, normally open	0,27 m PUR-cable and 8 mm snap-in male connector	0,007	P8S-GPSHX
PNP type, normally open	1,0 m PUR-cable and 8 mm snap-in male connector	0,013	P8S-GPSCX
PNP type, normally open	1,0 m PUR-cable and M8 screw male connector	0,013	P8S-GPCCX
PNP type, normally open	0,27 m PUR-cable and M12 screw male connector	0,015	P8S-GPMHX
PNP type, normally open	3 m PVC-cable without connector	0,030	P8S-GPFLX
PNP type, normally open	10 m PVC-cable without connector	0,110	P8S-GPFTX
Electronic sensor 18-30 V DC			
ATEX-certified			
			
Type PNP , normally open	3 m PVC-cable without connector	0,030	P8S-GPFLX/EX
Reed sensors , 10-30 V AC/DC			
Normally open	0,27 m PUR-cable and 8 mm snap-in male connector	0,007	P8S-GSSHX
Normally open	1,0 m PUR-cable and 8 mm snap-in male connector	0,013	P8S-GSSCX
Normally open	1,0 m PUR-cable and M8 male connector	0,013	P8S-GSCCX
Normally open	0,27 m PUR-cable and M12 screw male connector	0,015	P8S-GSMHX
Normally open	1,0 m PUR-cable and M12 screw male connector	0,023	P8S-GSMCX
Normally open	3 m PVC-cable without connector	0,030	P8S-GSFLX
Normally open	10 m PVC-cable without connector	0,110	P8S-GSFTX
Normally closed	5m PVC-cable without connector ¹⁾	0,050	P8S-GCFPX
Reed sensors, 10-120 V AC/DC			
Normally open	3 m PVC-cable without connector	0,030	P8S-GRFLX
Reed sensorer, 24-230 V AC/DC			
Normally open	3 m PVC-cable without connector	0,030	P8S-GRFLX2

1) Without LED

Adapter for tie-rod design

Description	Weight kg	Order code
Double jointed adapter for bore Ø 32 to 125 mm	0,07	P8S-TMA0X



Connecting cables with one connector

The cables have an integral snap-in female connector.



Type of cable	Cable/connector	Weight kg	Order code
Cables for sensors, complete with one female connector			
Cable, Flex PVC	3 m, 8 mm Snap-in connector	0,07	9126344341
Cable, Flex PVC	1 0 m, 8 mm Snap-in connector	0,21	9126344342
Cable, Super Flex PVC	3 m, 8 mm Snap-in connector	0,07	9126344343
Cable, Super Flex PVC	10 m, 8 mm Snap-in connector	0,21	9126344344
Cable, Polyurethane	3 m, 8 mm Snap-in connector	0,01	9126344345
Cable, Polyurethane	10 m, 8 mm Snap-in connector	0,20	9126344346
Cable, Polyurethane	5 m, M12 screw connector	0,07	9126344348
Cable, Polyurethane	10 m, M12 screw connector	0,20	9126344349

Male connectors for connecting cables

Cable connectors for producing your own connecting cables. The connectors can be quickly attached to the cable without special tools. Only the outer sheath of the cable is removed. The connectors are available for M8 and M12 screw connectors and meet protection class IP 65.



Connector	Weight kg	Order code
M8 screw connector	0,017	P8CS0803J
M12 screw connector	0,022	P8CS1204J

Ready to use connecting cables with connectors at each end

As accessories the system comprises a large number of different cables in order to meet all requirements that may arise and to make the installation simple, fast and reliable. Cables with moulded 8 mm snap-in round contacts in both ends. The cables are available in two types, one with a straight male and female connectors respectively, and one with a straight 3-pole male connector in one end and an angled 3-pole female connector in the other end.



Technical data

Contacts

Moulded 8 mm snap-in male/female contacts.

Enclosure IP67

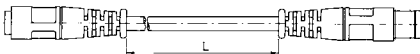
Cable

Conductor 3x0,25 mm² (32x0,10 mm²)

Sheath PVC/PUR

Colour Black

Cables with straight 3-pole male and female connectors respectively.



Cables with a straight 3-pole male connector in one end and an angled 3-pole female connector in the other end.



Designation	Weight kg	Order code
Cable with straight contacts, 0,2 m	0,02	9121717014
Cable with straight contacts, 0,3 m	0,02	9121717015
Cable with straight contacts, 0,5 m	0,03	9121717016
Cable with straight contacts, 1,0 m	0,03	9121717017
Cable with straight contacts, 2,0 m	0,05	9121717018
Cable with straight contacts, 3,0 m	0,07	9121717019
Cable with straight contacts, 5,0 m	0,12	9121717020
Cable with straight contacts, 10 m	0,23	9121717021

Designation	Weight kg	Order code
Cable with straight and angled connectors, 0,2 m	0,02	9121717022
Cable with straight and angled connectors, 0,3 m	0,02	9121717023
Cable with straight and angled connectors, 0,5 m	0,03	9121717024
Cable with straight and angled connectors, 1,0 m	0,03	9121717025
Cable with straight and angled connectors, 2,0 m	0,05	9121717026
Cable with straight and angled connectors, 3,0 m	0,07	9121717027
Cable with straight and angled connectors, 5,0 m	0,12	9121717028
Cable with straight and angled connectors, 10 m	0,23	9121717029

Connection block Valvetronic 110

The Valvetronic 110 is a connection block that can be used for collecting signals from sensors at various points on a machine and connecting them to the control system via a multicore cable. Valvetronic 110 can also be used for central connection of the multi-core cable to the outputs of a control system, and can be laid to a machine where the output signals can be connected. The connection block has ten 8 mm snap-in circular connectors and a multi-core cable which is available in lengths of 3 or 10 m. The connections on the block are numbered from 1 to 10. Blanking plugs are available for unused connections, as labels for marking the connections of each block.



Technical data

Connections:

Ten 3-pole numbered 8 mm round snap-in female contacts

Input block



- Pin 1 Common, +24 VDC
- Pin 2 Input signal
- Pin 3 Common, 0V

Output block



- Pin 1 Common, GND
- Pin 2 Output signal
- Pin 3 Common, 0V

Electrical data:

Voltage 24 VDC (max. 60 V AC/75 V DC)
 Insulation group according to DIN 0110 class C
 Load max. 1 A per connection
 total max. 3 A

Cable:

Length 3 m or 10 m
 Type of cable LifYY11Y
 Conductor 12
 Area 0.34 mm²
 Colour marking According to DIN 47 100

Mechanical data

Enclosure IP 67, DIN 40050 with fitted contacts and/or blanking plugs.
 Temperature -20 °C to +70 °C

Material

Body PA 6,6 VD according to UL 94
 Contact holder PBTP
 Snap-in ring LDPE
 Moulding mass Epoxy
 Seal NBR
 Screws Plated steel

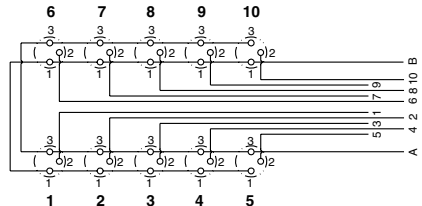
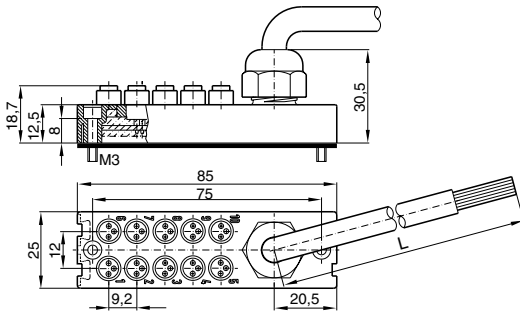
Industrial durability

Good chemical and oil resistance. Tests should be performed in aggressive environments.

Ordering data

	Designation	Weight kg	Order code
	Connection block Valvetronic 110 with 3 m cable	0,32	9121719001
	Connection block Valvetronic 110 with 10 m cable	0,95	9121719002
	Blanking plugs (pack of 10) Use blanking plugs to close unused connections.	0,02	9121719003
	Labels (pack of 10) White labels to insert in grooves on the side of the connection	0,02	9121719004

Dimensions and wiring diagrams



Conductor	Colour	Input	Output
1	Pink	Signal 1	Signal 1
2	Grey	Signal 2	Signal 2
3	Yellow	Signal 3	Signal 3
4	Green	Signal 4	Signal 4
5	White	Signal 5	Signal 5
6	Red	Signal 6	Signal 6
7	Black	Signal 7	Signal 7
8	Violet	Signal 8	Signal 8
9	Grey-Pink	Signal 9	Signal 9
10	Red-Blue	Signal 10	Signal 10
A	Blue	0 V	0 V
B	Brown	+24 V	PE





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Pneumatic Rotary Actuators

PV Series - Vane type

How do vane rotary actuators work



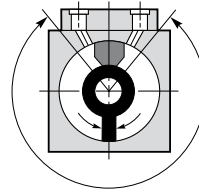
Vane actuators provide the maximum amount of output torque from the smallest possible envelope size. They convert pneumatic pressure into rotary motion for a wide variety of industrial applications.

A short cylindrical chamber encloses a vane attached to a central shaft. Air pressure is applied to one side of the vane. The opposite side of the vane is connected to exhaust. This produces rotation of the vane and thus the central shaft. Due to vane actuator design there will always be some internal bypass in these units and therefore they should not be used as a brake or to support loads.

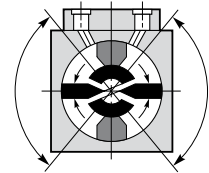
Two basic styles are available. Single vane models have a maximum rotation of 280°, while the double vane units produce twice the torque output from identical envelope dimensions and have a maximum rotation of 100°.

Technical information

Type		Double acting actuator
Standard Rotation (tolerance $\pm 1^\circ$)	Single vane	0 to 275°, size 10 to 11
	Double vane	0 to 280°, size 22 to 23
	Single vane	0 to 95°, size 10 to 11
	Double vane	0 to 100°, size 22 to 33
Temperature		-10°C to +80°C
Air supply		Lubricated or non-lubricated
Pressure range		2 to 10 bar max



Single vane
280° rotation



Double vane
100° rotation

Materials:

End cap	: Hard anodised aluminium
Tubing	: Hard anodised aluminium smooth profile
Shaft	: Stainless steel
Bearing	: PTFE coated bearing
Vane	: Hard anodised aluminium extrusion
Seals	: Nitrile

Through rod facility size 22 and 33

The two larger sizes of Vane Actuators are through rod as standard. The through rod facility enables linkages to be connected to both ends of the unit, maximising the design flexibility.

This also enables the unit to be equipped with a kit providing full adjustment of the angle of rotation. The kit can be supplied complete with or without inductive sensors.

These options can be assembled when ordered the actuator or can be added later.

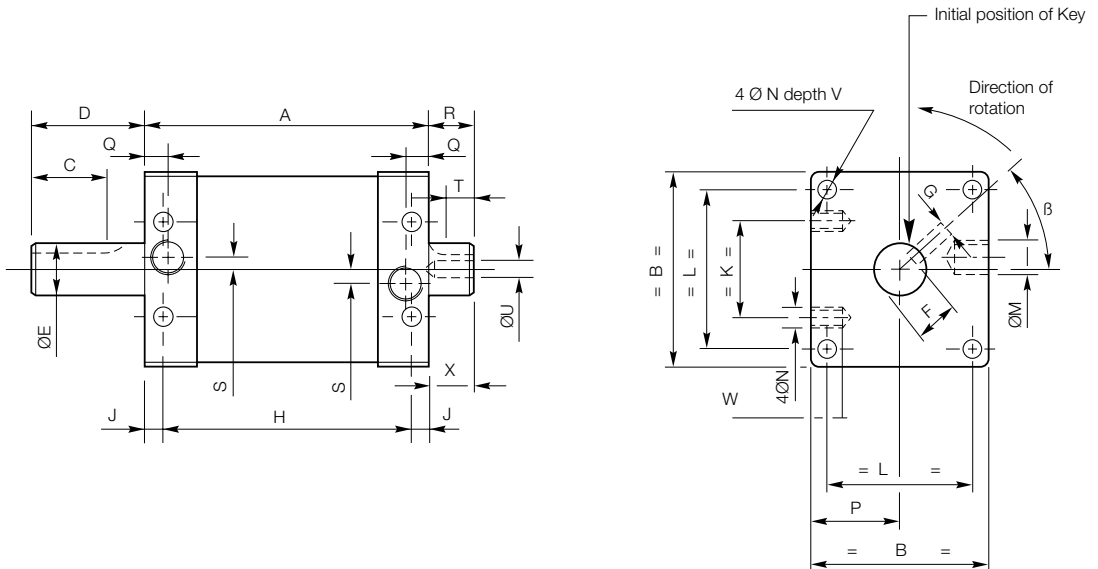
Technical Information

Size	Max rotation (o)	Torque Nm			Max. breakaway pressure (bar)	Max. radial load (N)	Max. thrust load (N)	Unit weight (kg)	Adjustment kit weight (kg)
		3 bar	5 bar	6 bar					
10	275	0.25	0.49	0.69	1.7	40	15	0.16	-
	95	0.54	1.09	1.47					
11	275	0.54	1.09	1.47	1.3	40	15	0.20	-
	95	1.28	2.40	3.05					
22	280	2.46	4.92	6.39	1.0	100	40	0.70	0.35
	100	5.90	10.92	13.27					
33	280	5.90	11.47	14.47	1.0	200	70	1.60	0.45
	100	13.76	25.12	30.96					

Note: PV series vane actuators have a permissible bypass leakage rate of 0.1 dm³/s at 7 bar.

The choice of the size depends upon the pressure and the external constraints - a safety factor of 30% is required for the selection.

Basic dimensions



β = 42.5° for sizes 10 & 11
40° for sizes 22 & 33

Size	A	B	C	D	ØE (f7)	F	G (P9)	H	J	K	L	ØM	N	P	Q	R	S	T	ØU	V	W	X
10	35	41	15.5	22	8	6.8	2	25	5	19	31	M5	M4	20.5	5	1	4.2	-	-	6	8	-
11	51	41	15.5	22	8	6.8	2	41	5	19	31	M5	M4	20.5	5	1	4.2	-	-	6	8	-
22	82	63.5	25.5	36	12	9.5	4	69	6.5	32	51	G1/8	M6	31.8	8	18	0	10	M5	11	10	15
33	112	76	30	45	20	16.5	6	98	7	38	62	G1/4	M8	38.0	9	18	0	11	M6	11	12	15



Vane actuator with angle adjustment size 22 and 33

The kit is assembled at the rear of the actuator and provides adjustment of:-

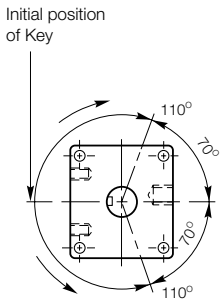
-0 to 100° for the double vane actuator

-0 to 220° for the single vane actuator

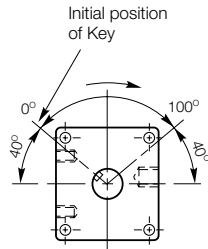
End stop cushioning is provided by buffers

Inductive sensors M8 with 90° plug-in and LED facility (PNP or NPN) can be added to the kit for end stop detection.

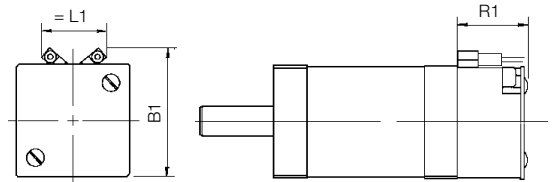
The angle adjustment is attained by moving the end stops at the rear of the actuator. To facilitate this adjustment there is a position indicating disk on the rear face of the unit.



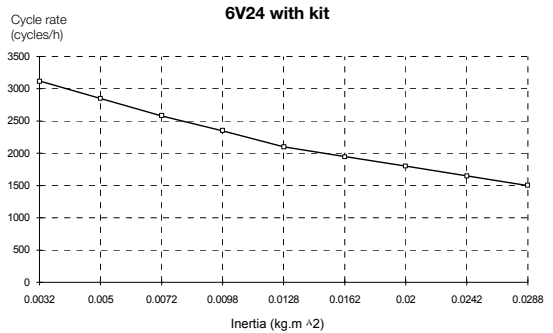
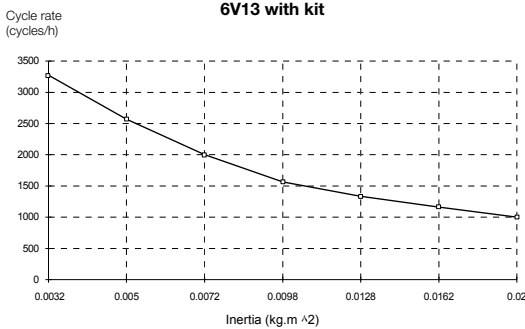
One vane only
Maximum rotation 220° ± 1°



Double vane
Maximum rotation 100° ± 1°



Ref	B1	L1	R1
22	77	50	40.5
33	88	44	40.5



Inertia calculation

$I = M \times d^2$
 $I = \text{kg} \cdot \text{m}^2$
 $d = \text{meter} \quad M = \text{kg}$

Note: Maximum length of lever: Size 22 = 50 mm (d)
Size 33 = 60 mm (d)

How to order

Part nos. basic units

Size	Part no.	Max. rotation	Type	Shaft
10	6V5100010F-275	275 ^o	Single	Not Through Rod
	6V5100010F-095	95 ^o	Double	
11	6V5200010F-275	275 ^o	Single	
	6V5200010F-095	95 ^o	Double	
22	6V1300030F-275	280 ^o	Single	Through Rod
	6V1300030F-095	100 ^o	Double	
33	6V2400030F-275	280 ^o	Single	
	6V2400030F-095	100 ^o	Double	

Part nos. basic units

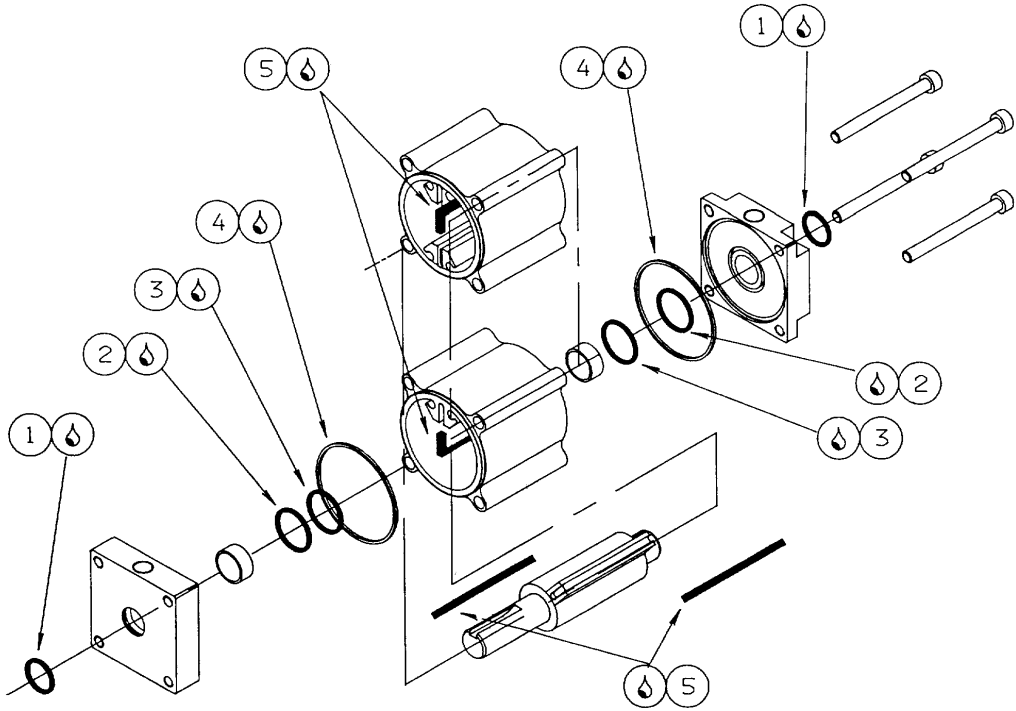
Size	Part no.	Max. rotation	Type	Options
22	6V1357630F-220	220 ^o	Single	Angle adjustment kit
	6V1357730F-100	100 ^o	Double	
	6V1357635F-220	220 ^o	Single	As above + PNP Sensors + plug
	6V1357735F-100	100 ^o	Double	
	6V1357636F-220	220 ^o	Single	As above + NPN Sensors + plug
	6V1357736F-100	100 ^o	Double	
33	6V2457630F-220	220 ^o	Single	Angle adjustment kit
	6V2457730F-100	100 ^o	Double	
	6V2457635F-220	220 ^o	Single	As above + PNP Sensor + plug
	6V2457735F-100	100 ^o	Double	
	6V2457636F-220	220 ^o	Single	As above + NPN Sensor + plug
	6V2457736F-100	100 ^o	Double	


Part nos. angle adjustment and sensor kits

Size	Part no.	Options
22	6V03570	Angle adjustment kit
	6V03575	Angle adjustment kit with sensors PNP
	6V03576	Angle adjustment kit with sensors NPN
33	6V04570	Angle adjustment kit
	6V04575	Angle adjustment kit with sensors PNP
	6V04576	Angle adjustment kit with sensors NPN

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Repair Kits



 Lubricate with grease Parker ref : **3099**

Size	Type	Part no.	Components				
			1 Shaft seal	2 Teflon seal	3 Shoulder seal	4 'O' ring	5 Vane seal
10	Single	PSK-PV10	2	2	2	2	2
10	Double	PSK-PV10D	2	2	2	2	4
11	Single	PSK-PV11	2	2	2	2	2
11	Double	PSK-PV11D	2	2	2	2	4
22	Single	PSK-PV22	2	2	2	2	2
22	Double	PSK-PV22D	2	2	2	2	4
33	Single	PSK-PV33	2	2	2	2	2
33	Double	PSK-PV33D	2	2	2	2	4

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Control Devices

A complete range of pneumatic valves

The central image is a product catalog box for Parker's 'Valves & Logic Processing' line. The box is white with a black and grey design. It features several images of various pneumatic valves and solenoid actuators. Text on the box includes 'Valves & Logic Processing', 'Catalogue PDE2614TCUK - 01 November 2008', and the Parker logo. The box is surrounded by several circular and rectangular inset images showing different types of valves and their application in industrial settings, such as bottling plants and manufacturing facilities.

Parker is the world leader in motion and control technologies, providing systematic, precision-engineered solutions for a wide variety of, industrial markets. Throughout the world, Parker Hannifin is working together with companies to make their machines more reliable and more productive. Parker products are in operation on satellites orbiting the earth: in machine tools and mobile plant; on oil rigs and refineries; in hospitals and laboratories. In fact, wherever there are

machines that depend on motion or fluid control, you will find innovative and reliable Parker components and systems.

The Parker range of control devices is much more than just valves, we have within our product programme field bus enabled valve systems, limit switches, logic process components, two hand control units, metal valves for arduous applications and ultra lightweight plastic valves.

General Lightweight Applications & Individual/ Multiple Field Bus Connections

P2M Moduflex Valves



- High flow, compact size.
- Mixable valve sizes.
- Stand alone valves, modular islands with individual, multiconnector or bus connections.
- Integrated selectable internal or external pilot supply and exhaust.
- Optional peripheral modules.
- Push-in connection.

Valve Islands

PVL-C10



- Compact lightweight, high flow valves
- 2 x 3/2, 5/2 or 5/3 configuration
- Push-in Ø8mm or G1/4 threaded connections
- High performance 15mm solenoids
- Stacking type modules with DIN rail mounting
- Bus protocols: Interbus S, Profibus DP, Devicenet, ASI.

Miniature Valves

ADEX Directional Control Valves



- 2 sizes: M5 and 1/8"
- Compact body with large flow
- Quick response time, faster than 10ms
- Expected life time more than 50,000,000 cycles
- Low power consumption only 0.6W
- Optional multipin connector manifold
- Manual override

Stackable Inline Lightweight Valve

Interface 2000



- 3/2 or 4/2 configuration
- Push-in connections Ø4mm and Ø6mm
- High performance 15mm solenoids
- Electrical connection : Cable gland, Sub D25 or Industrial connector
- Bus protocols: Interbus S, Profibus DP, Devicenet, ASI.

Poppet Valve for Enclosures

PS1 Interface



- High speed poppet valve
- Push-in connection
- Built-in terminal block
- Pneumatic output indicator
- DIN rail mounting

Industrial Applications

B Series Valves



- 2 sizes: 1/8" and 1/4"
- Compact size
- Inlet-exhaust-mounting facility
- Fast response, high flow
- Integrated mounting holes
- Wear compensating seal system
- DIN rail mountable manifolds

Valve Islands

PVL-B10



- Compact lightweight, high flow valves
- 2 x 3/2, 5/2 or 5/3 configuration
- Push-in Ø6mm or G1/8 threaded connections
- High performance 15mm solenoids
- Stacking type modules with DIN rail mounting
- Bus protocols: Interbus S, Profibus DP, Devicenet, ASI.

Stackable Inline Lightweight Valve

PVL Compact Valves



- High flow, compact size
- Push-in or threaded connection
- DIN rail or block mounting
- Light weight construction

Heavy Duty Applications / Mobile

Viking Xtreme Metal Spool Valves



- 4 sizes: G1/8, G1/4, G3/8 and G1/2.
- Wide operating temperature range
- Compact design with good corrosion resistance.
- Wide range of 5/2 and 5/3 versions.
- High and low temperature versions available for transport applications.

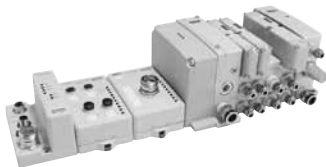
Heavy Duty Applications / Multiple Connection and Plug-in

Isomax Valves - ISO 15407 / ISO 5599



- Size 1, 2 and 3 ISO 5599-1
- Size 01 and 02 (26 and 18 mm) ISO 15407-1
- Ceramic technology for long live operation
- From vacuum up to 12 bar applications
- Internal or external pilot supply with same valves
- Pressure supply possible on exhaust port

ISYS Valves - ISO 15407 / ISO 5599



- Size 1, 2 and 3 ISO 5599-1 / 2
- Size 01 and 02 ISO 15407-1 / 2
- Excellent reliability, long life in excess of 30 million operations.
- Complete range, plug-in and non-plug-in
- WCS Spool technology

Hi Flow Valves

P2V Flowstar Valves ISO 15407-1



- Compact high flow design
- To VDMA 24563, ISO 15407-1 standard
- 5/2 & 5/3 configurations
- 18mm & 26mm body widths
- Single sub-base or manifold mounted
- Air pilot and solenoid actuators
- Suitable for Food Industry applications.

Ceramic Valves

PVD Everdure



- Available in 3 sizes
- 4/2 Directional control valves
- 3/2 dump valves & 2/2 slow start valves
- Stand alone or manifolds.
- Built-in manual override
- Ceramic slide provides extremely long life
- DIN rail mounting.

Metal Spool Valves

Midget Spool Valves



- G1/8 body ported
- Rugged die cast body
- 3/2 & 5/2 configurations
- Stainless steel spool
- Viton body seals as standard
- Integral mounting holes
- Manual, mechanical and automatic actuators.

Metal Spool Valves

Intermediate Spool Valves



- G1/4 body ported
- Rugged die cast body
- 3/2, 5/2 & 5/3 configurations
- Stainless steel spool
- Viton body seals as standard
- Integral mounting holes
- Manual, mechanical and automatic actuators.

Push Button Actuators

PXB Push Buttons



- Facia mounted operators
- 3/2 NO or NC versions
- Pneumatic valves combinable with electrical switches
- Modular construction
- Wide choice of actuators.

Heavy Duty Applications

VA - Brass bodied spool valves



- Rugged valves for heavy duty applications
- Large and robust actuators for easy operation
- Excellent corrosion resistance
- Integral mounting holes
- Panel mounting versions

Limit Switches

PXC Limit Switches



- 3/2 Nc spring return as standard
- Ø4mm, M5 & G1/8 ported versions
- Miniature and Compact designs
- Wide choice of actuators include levers, rollers & ultra light whisker types.

Metal Poppet Valves

Mini Poppet Valves



- M5 body ported
- 3/2 NC spring return as standard
- Manual and mechanical actuators
- Light actuation forces.

Midget Poppet Valves



- G1/8 body ported poppet design
- 3/2 NC spring return as standard
- Manual, mechanical and air pilot actuators
- Light actuation forces
- Integral mounting holes.

Heavy Duty Poppet Valves



- G3/8 & G1/2 body ported
- 2/2 & 3/2 NC spring return as standard
- High flow poppet design
- Manual and mechanical and solenoid actuators
- Light actuation forces
- Integral mounting holes.

Heavy Duty Valves

VE Heavy Duty Isolator Valves



- G1/4, G1/2 & G1 versions
- 2/2 or 3/2 option
- Inline installation
- High flow
- Suitable as a remotely controlled main shut off valve.
- Air or solenoid pilot

Lockout Valves

LV Series Lockout Valves



- G1/4 - G1 Ported emergency shut-off valves
- High flow G1 exhaust port
- Manually operated
- High visibility, rugged aluminium body
- Detented spool with padlock 'lockout' facility.

Processing Modules

Two Hand Control Units



- Ergonomic design
- Robust polymer or metal enclosure
- Meets requirements for protection against accidental operation and tampering
- Metal enclosure features a wrist rest bar which prevents illness due to repetitive actions
- Conforms to EN574 and EN954-1 requirements

Shut Off Valves

Ball Valves and Sliding Sleeve Valves



Ball Valves

- 3 distinct series
- Vented and non vented
- Bubble tight shut-off
- Positive 90 ° movement
- Wide variety of fluids

Sliding sleeve valves

- Linear sleeve operated
- 3/2 valve
- Simple airline isolation
- Compact
- Minimum space for valve operation

Processing Modules

Logic Control



- Complete range of logic processing modules
- Stand alone or stackable and combinable units
- Ultra fast response times
- Visual indication
- DIN rail mounting.

Air Preparation & Airline Accessories



Parker is the world leader in motion and control technologies, providing systematic, precision-engineered solutions for a wide variety of, industrial markets. Throughout the world, Parker Hannifin is working together with companies to make their machines more reliable and more productive. Parker products are in operation on satellites orbiting the earth: in machine tools and mobile plant; on oil rigs and refineries; in hospitals and laboratories. In fact, wherever there

are machines that depend on motion or fluid control, you will find innovative and reliable Parker components and systems.

Global Air Preparation System



- Space saving integral gauge (P31 size only)
- Manifold style regulators available
- OSHA compliant shut-off valves
- Soft-Start & Quick Dump valves
- Electronic Proportional Regulator

Moduflex Dry Air System



- Designed in accordance with ASME VIII Div.1, approved to CSA/UL/CRN and fully CE Marked
- (PED, EMC, LVD) as standard.
- Flexible installation utilising the multiple in-line inlet & outlet connection ports.
- Can be Floor, Bench or Wall/Canopy mounted.
- Noise level less than 70dB(A).

Stainless Steel FRLs



- 316 Stainless steel FRL design to withstand harsh, corrosive environments
- Suitable for Marine & Offshore applications
- Chemical / Petroleum and process industries
- Coalescing filters are designed for removing oil and water aerosols down to 0.01µ

Moduflex Proportional Technology



- Very fast response times
- Accurate output pressure
- Micro parameter settings
- Selectable I/O parameters
- Quick, full flow exhaust.
- LED display indicates output pressure
- Auto enable function

Moduflex AirGuard Protection System



- Maintenance friendly, Repair possible while plant is still operating.
- Reliable and tamperproof, No adjustment necessary.
- Complies with EU current standard EN 983 - § 5.3.4.3.2.
- Complies with the 2009 ISO4414 (5.4.5.11.1)

P3N 1" Modular Hi Flow FRLs



- Self relieving feature plus balanced poppet provides quick response and accurate pressure regulation.
- Port blocks available to provide G3/4 and G11/2 port extension to G1 ported bodies.
- Proportional oil delivery over a wide range of air flows

Moduflex Compressed Air Filters



- Tested in accordance with ISO 8573.9
- High liquid removal efficiencies at all flow conditions
- Low pressure losses for low operational costs
- Multiple port sizes for a given flow rate provides increased flexibility during installation
- Suitable for variable flow compressors

Miniature FRL Series



- Compact body ported units.
- Port sizes G1/8 and G1/4.
- Unique deflector plate ensuring maximum water and particulate removal.
- Solid control piston with lip seal for extended life.
- Proportional oil delivery over a wide range of air flows.

High Precision Regulators



- High repeatability
- High relief capacity on R220 model
- High flow capacity on R230 model

Linear Actuator Products

A complete range of pneumatic actuators

Actuator Products
A complete range of pneumatic actuators
Catalogue PDE2612TCUK-01, November 2005

Parker
KEEPING YOU...

Parker is the world leader in motion and control technologies, providing systematic, precision-engineered solutions for a wide variety of, industrial markets. Throughout the world, Parker Hannifin is working together with companies to make their machines more reliable and more productive. Parker products are in operation on satellites orbiting the earth; in machine tools and mobile plant; on oil rigs and refineries; in hospitals and laboratories. In fact, wherever there are machines that depend on motion or fluid control, you will find innovative and reliable Parker components and systems.

The Parker range of actuators encompasses both linear and rotary motion. Compact and lightweight designs, versions specifically for the food industry both in aluminium and stainless steel and products for arduous applications in harsh environments are all featured.

Minimum Space Applications

P1G Compact Cylinders



- Ø6, 10 & 16mm Bore sizes
- Non-lube operation
- Corrosion resistant design
- Integral mounting thread
- Compact construction
- Single acting as standard.

Clamping & Locking Operations

C05 Short Stroke Cylinders



- Ø8 - 63mm bore sizes
- Short stroke providing high clamping force
- Compact dimensions for confined spaces
- Single and double acting
- Simple installation and mounting.

Light Duties in Packaging, Food and Textile

P1A Mini ISO Cylinders



- Ø10 - 25mm Bore size to ISO 6432
- Magnetic piston as standard
- End stroke buffers for long service life
- Adjustable cushioning Ø16 - 25mm Bore sizes
- Complete range of mountings & sensors
- Piston rod guidance units available.

Confined Space Applications

P1J Compact Cylinders



- Ø12 - 63mm
- Stroke lengths up to 100mm
- Single and double acting
- Magnetic piston as standard
- Compact dimensions for confined spaces
- Complete range of mountings & sensors.

Flexible Porting Options

P1M Cylinders



- Ø12 - 100mm
- Stroke lengths up to 500mm
- Single and double acting
- Magnetic piston as standard
- Flexible porting options
- Complete range of mountings & sensors.

Harsh Environments / Food Industry

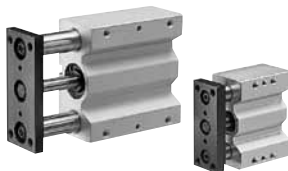
P1S Stainless Steel Cylinders



- All stainless steel design
- Mini ISO 6432 Ø10 - 25mm Bore sizes
- Standard ISO 6431 Ø32 - 125mm Bore sizes
- Magnetic piston as standard
- Clean design ideal for washdown
- Adjustable end cushioning.
- Initial lubrication with food grade grease.

Resistance to Side Load

P5T Compact Cylinders



- Ø12 - 100mm bore size
- Complete cylinder with integral guidance
- Plain bearing or twin recirculating bearings
- End stop cushioning as standard
- Magnetic as standard
- Flexible porting and mounting
- Standard strokes 10 - 200mm

Light Duty Applications

P1K Cylinders



- Ø32 - 125mm Bore sizes
- Single and double acting
- Clean line profile design
- Designed for dry piston rod operation
- End stroke buffers for long service life
- Position sensing versions.

Short Stroke, High Thrust Single Acting Applications

Air Bellows



- 10 sizes Ø70 - 660mm
- Strokes from 45 - 430mm
- High thrust frictionless movement
- Single, double or triple convolutions
- Maintenance free.

Linear Actuator Products

General Industrial & Food Industry Versions

P1D ISO/VDMA Cylinders



- Ø32 - 125mm Bore size ISO/VDMA standard
- Double acting with adjustable end cushioning
- Magnetic piston as standard
- Flexible porting option
- Non-lube operation
- 'Clean' version for food industry
- Complete range of sensors and mountings

Clamping & Tightening

Hydraulic Clamp Cylinders



- Single acting cylinders with built-in hydro-pneumatic intensifier
- Compact size with large clamping forces up to 2700 daN (depending on air pressure)
- Operated using a compressed air supply, no special installation required
- Easy adjustment through a fully threaded body
- Simple and rapid installation

Gripping for most applications

P5G-C Robotic Grippers



- 4 sizes available
- Parallel or angular action
- Square jaw carriers
- One or two magneto-inductive sensor can be mounted on all sizes to provide signal to monitor gripper opening and closing.

Demanding Environments

P1E VDMA 24562 Cylinders



- Ø160 - 200mm Bore sizes VDMA standard
- Double acting with adjustable end cushioning
- Magnetic piston as standard
- Non-lube operation
- Tie rod construction
- Complete range of mountings & sensors.

Clamping, Riveting & Punching Applications

C0D - C0P Thrust Cylinders



- Short stroke high thrust design
- Compact dimensions
- Diaphragm or piston versions
- Single or double acting.

Hydraulic Damping Cylinder

Hydrockecks



- Range of imperial sizes
- Gives smooth control feeds
- Strokes up to 450mm

Door Actuation, Special Purpose Machinery

Rodless Cylinders



- High precision cushioning
- Flexible porting
- High efficiency sealing technology
- Integral sensor slot with enhancement strip
- Heavy load carrying capability

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 00800 27 27 5374.



AEROSPACE

Key Markets

- Aircraft engines
- Business & general aviation
- Commercial transports
- Land-based weapons systems
- Military aircraft
- Missiles & launch vehicles
- Regional transports
- Unmanned aerial vehicles

Key Products

- Flight control systems & components
- Fluid conveyance systems
- Fluid metering delivery & atomization devices
- Fuel systems & components
- Hydraulic systems & components
- Inert nitrogen generating systems
- Pneumatic systems & components
- Wheels & brakes



CLIMATE CONTROL

Key Markets

- Agriculture
- Air conditioning
- Food, beverage & dairy
- Life sciences & medical
- Precision cooling
- Processing
- Transportation

Key Products

- CO₂ controls
- Electronic controllers
- Filter driers
- Hand shut-off valves
- Hose & fittings
- Pressure regulating valves
- Refrigerant distributors
- Safety relief valves
- Solenoid valves
- Thermostatic expansion valves



ELECTROMECHANICAL

Key Markets

- Aerospace
- Factory automation
- Food & beverage
- Life science & medical
- Machine tools
- Packaging machinery
- Paper machinery
- Plastics machinery & converting
- Primary metals
- Semiconductor & electronics
- Textile
- Wire & cable

Key Products

- A/CDC drives & systems
- Electric actuators
- Controllers
- Gantry robots
- Gearheads
- Human machine interfaces
- Industrial PCs
- Inverters
- Linear motors, slides and stages
- Precision stages
- Stapler motors
- Servo motors, drives & controls
- Structural extrusions



FILTRATION

Key Markets

- Food & beverage
- Industrial machinery
- Life sciences
- Marine
- Mobile equipment
- Oil & gas
- Power generation
- Process
- Transportation

Key Products

- Analytical gas generators
- Compressed air & gas filters
- Condition monitoring
- Engine air, fuel & oil filtration & systems
- Hydraulic, lubrication & coolant filters
- Process, chemical, water & microfiltration filters
- Nitrogen, hydrogen & zero air generators



FLUID & GAS HANDLING

Key Markets

- Aerospace
- Agriculture
- Bulk chemical handling
- Construction machinery
- Food & beverage
- Fuel & gas delivery
- Industrial machinery
- Mobile
- Oil & gas
- Transportation
- Welding

Key Products

- Brass fittings & valves
- Diagnostic equipment
- Fluid conveyance systems
- Industrial hose
- PTFE & PFA hose, tubing & plastic fittings
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects



HYDRAULICS

Key Markets

- Aerospace
- Aerial lift
- Agriculture
- Construction machinery
- Forestry
- Industrial machinery
- Mining
- Oil & gas
- Power generation & energy
- Truck hydraulics

Key Products

- Diagnostic equipment
- Hydraulic cylinders & accumulators
- Hydraulic motors & pumps
- Hydraulic systems
- Hydraulic valves & controls
- Power take-offs
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects



PNEUMATICS

Key Markets

- Aerospace
- Conveyor & material handling
- Factory automation
- Food & beverage
- Life science & medical
- Machine tools
- Packaging machinery
- Transportation & automotive

Key Products

- Air preparation
- Compact cylinders
- Field bus valve systems
- Grippers
- Guided cylinders
- Manifolds
- Miniature fluids
- Pneumatic accessories
- Pneumatic actuators & grippers
- Pneumatic valves and controls
- Rodless cylinders
- Rotary actuators
- Tie rod cylinders
- Vacuum generators, cups & sensors



PROCESS CONTROL

Key Markets

- Chemical & refining
- Food, beverage & dairy
- Medical & dental
- Microelectronics
- Oil & gas
- Power generation

Key Products

- Analytical sample conditioning products & systems
- Fluoropolymer chemical delivery fittings, valves & pumps
- High purity gas delivery fittings, valves & regulators
- Instrumentation fittings, valves & regulators
- Medium pressure fittings & valves
- Process control manifolds



SEALING & SHIELDING

Key Markets

- Aerospace
- Chemical processing
- Consumer
- Energy, oil & gas
- Fluid power
- General industrial
- Information technology
- Life sciences
- Military
- Semiconductor
- Telecommunications
- Transportation

Key Products

- Dynamic seals
- Elastomeric o-rings
- EM shielding
- Extruded & precision-cut, fabricated elastomeric seals
- Homogeneous & inserted elastomeric shapes
- High temperature metal seals
- Metal & plastic retained composite seals
- Thermal management

ENGINEERING YOUR SUCCESS.



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