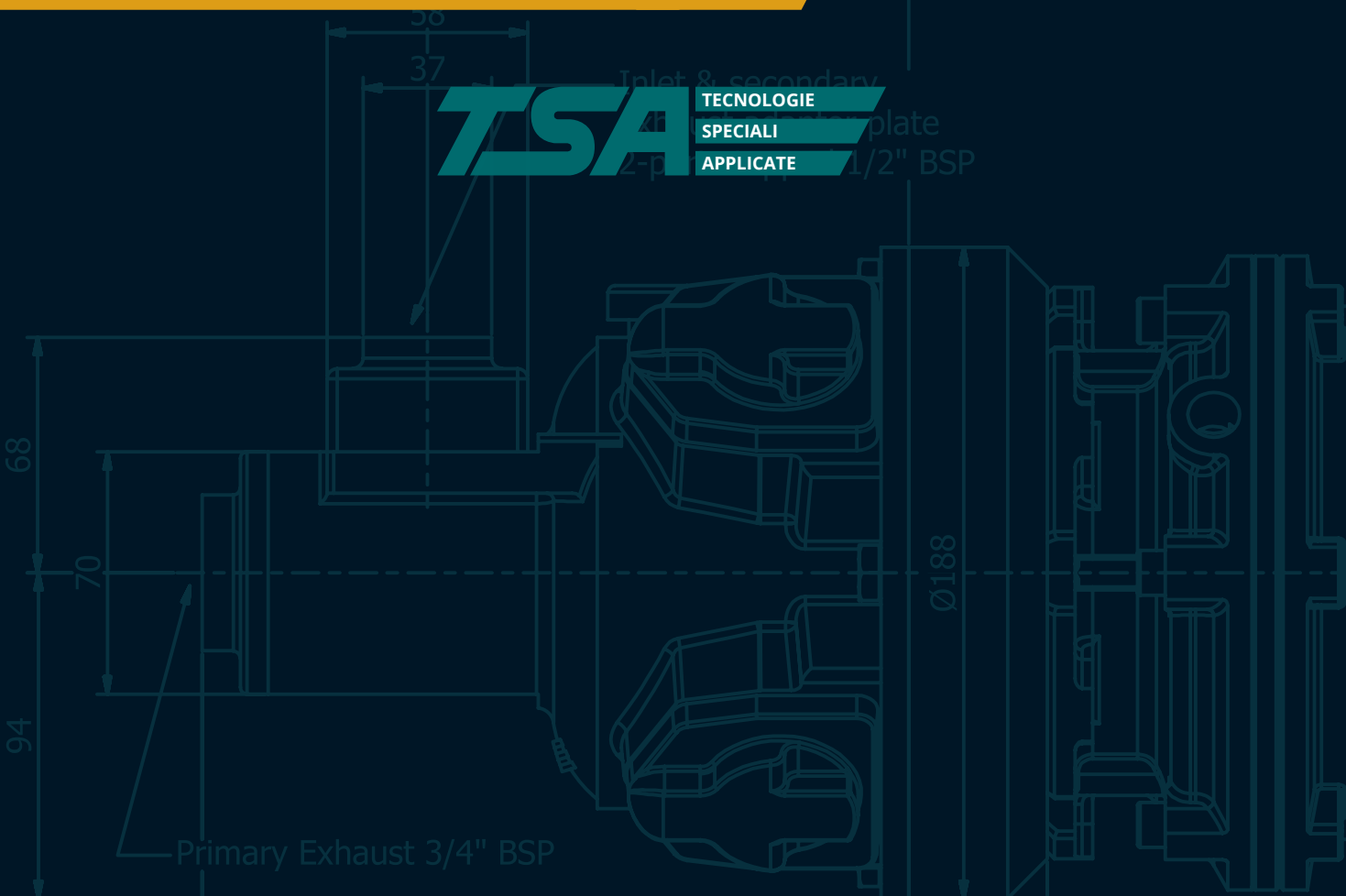


TSA

TECNOLOGIE
SPECIALI
APPLICATE



GEAR-MOTORS



**RADIAL PISTON
PNEUMATIC GEAR MOTORS**

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TSA

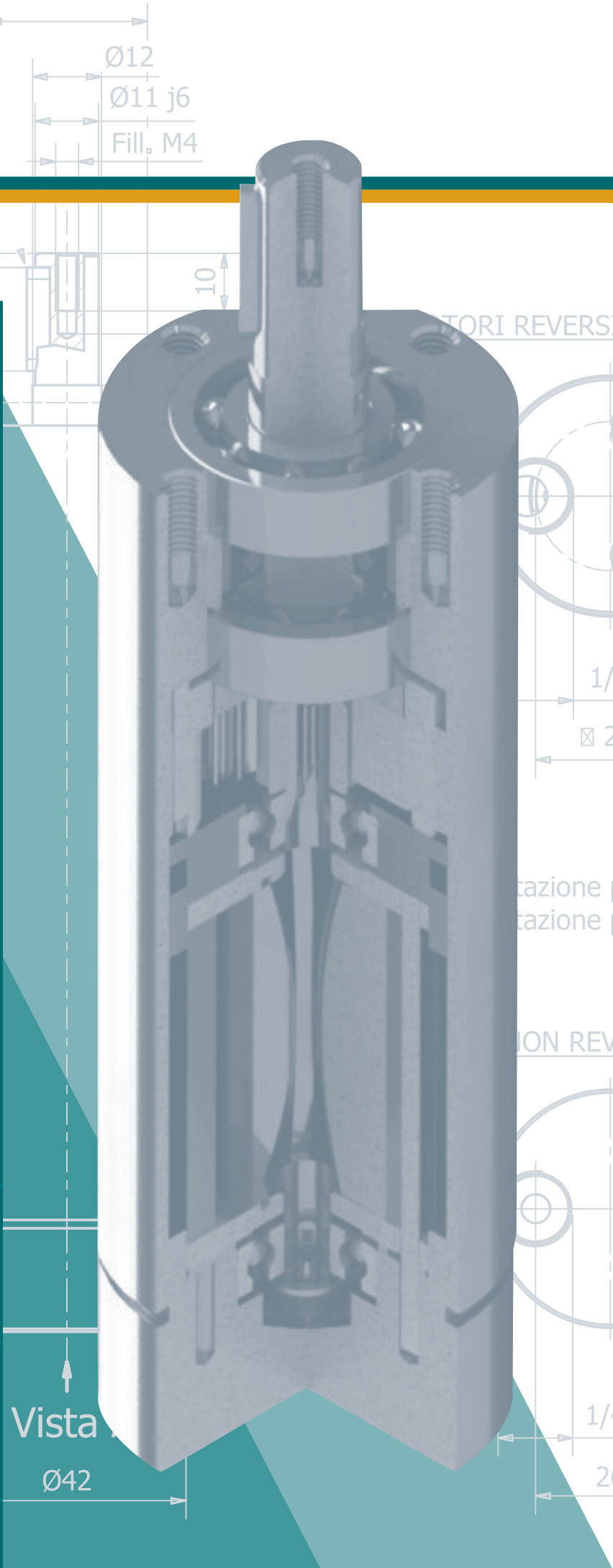
SPECIAL APPLIED TECHNOLOGIES

TSA founded in 1984, for over 30 years has been designing, manufacturing and distributing pneumatic motors, articulated arms for torque reaction, assembling systems and special equipment.

Its technical design office is in charge of studying all of the required characteristics to guarantee maximum reliability and high productivity, according to modern ergonomic principles. Product quality and safety are now a consolidated standard for TSA.

Just-in-time deliveries, a wide, flexible range of products, including diversified motors and arms, an efficient spare parts warehouse and effective before- and after sales: these are the services offered by TSA to its customers. Thanks to its constant commitment and to the professionalism of its technicians,

TSA has gained the trust of major companies on the market. Its aim is to meet customer requirements in all respects: **QUALITY, PERFORMANCE AND COST EFFECTIVENESS.**



CHARACTERISTICS OF PNEUMATIC MOTORS

The outlet power of a pneumatic motor varies depending on its speed and torque.

The performance levels of a pneumatic motor depend on the inlet air pressure level measured at the entry point in the motor; this means that it is sufficient to regulate the incoming air to substantially change the torque and speed values in a pneumatic motor.

The choice of a pneumatic motor is based on three fundamental parameters: POWER, SPEED and TORQUE.

POWER

Pneumatic motors produce a characteristic power curve whose maximum value is obtained at approximately 50% of idle speed. The resulting torque is known as maximum power torque.

SPEED

By idle speed in a pneumatic motor reference is made to a moment when there is no load on the outlet shaft, therefore no torque is produced

(moment of force). If the load on the shaft is increased, the speed is reduced in a way which is inversely proportional to the torque.

SPEED

The speed at maximum power is reached when the motor reaches its torque at maximum power.

TORQUE AT MAXIMUM SPEED

The maximum speed torque is reached at approximately 50% of the idle speed of the motor, which equals its maximum power.

STARTING TORQUE

The starting torque is the torque provided by a motor to the loaded shaft when it is started with the maximum air inlet.

STALL TORQUE

The stall torque is the torque provided by a motor to the shaft during its rotation until it stops completely.

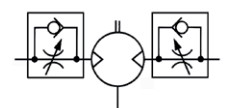
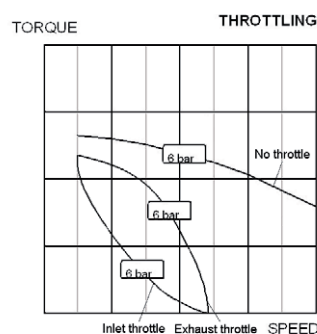
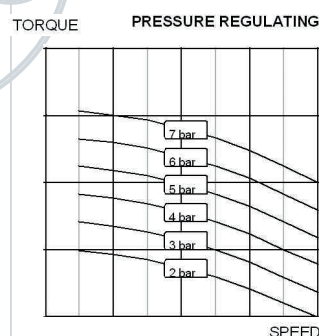
WAYS OF CHANGING THE MOTOR'S PERFORMANCE

The speed and torque in a pneumatic motor can be adjusted by regulating the pressure or throttling the air flow.

PRESSURE REGULATING

The speed and power can also be reduced by installing a pressure regulator. A pressure regulator, always connected on the entry hole, keeps the inlet air pressure to the motor in check. A pressure regulating system affects the output torque on the shaft, thus making it easier to control

the starting torque. If the speed and torque need to be controlled, the best configuration consists in a pressure regulator to the motor inlet and a check valve for the exhaust flow. This means that each point in the speed-torque diagram can be established in a precise way.



THROTTLING METHOD
Inlet choking, bi-directional motor

INLET AIR CONDITIONS

CONSUMPTION

The air consumption in a pneumatic motor is proportional to the speed, therefore it reaches its peak at idle speed.

Air consumption is measured in NI/s, however the conventional unit is l/s.

AIR QUALITY

In order to ensure optimal working conditions for pneumatic motors it is necessary to guarantee the appropriate air inlet and exhaust at all times. In order to ensure its proper operation it is advisable to install an air treatment unit (5-micron filter, regulator and lubricator, unless the motor requires no lubrication), as appropriate for the specific motor.

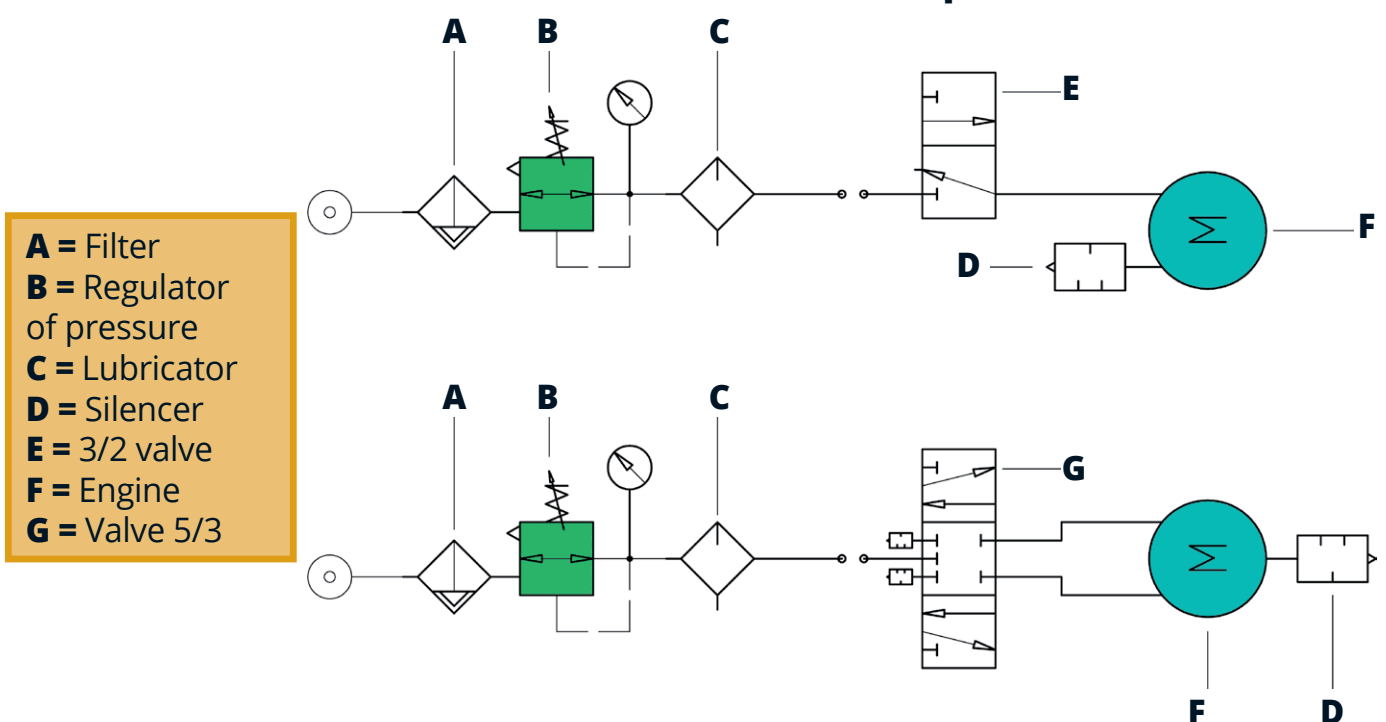
AIR PIPELINE LIMITATIONS

Any limitations in the air inlet line on the motor are bound to reduce its performance levels. Therefore it is especially important to make sure that the required air pressure is available to the motor at all times while it is being operated. Always check the air inlet because if the pipeline is too narrow this might

cause a pressure drop. The air exhaust pipe needs to be larger than the inlet pipe. It is advisable to connect the exhaust pipes to a suitable oil separator filter with an incorporated silencer, in order to allow for appropriate lubrication without the room becoming saturated with polluted air.

PNEUMATIC DIAGRAM (POWER – MOTOR CONTROL)

Non-reversible motor operation with 3/2 valve



Non-reversible motor operation with 5/3 closed-center valve

PNEUMATIC GEARBOXES WITH RADIAL PISTONS

The epicyclic gears which we use in gearboxes have an excellent Weight/Power ratio, performance, they are very small with the same output torque yield, as well as sturdy and long-lasting. Based on many years' experience of the best gear manufacturers, T.S.A. can deliver a wide range of epicyclic pneumatic gearboxes. This section only includes tables with reduction ratio and performance levels because

there are many configurations which can be obtained: coupling with co-axial or orthogonal gearboxes, coaxial with floor fixing, gearboxes with brakes etc.; therefore, if you need sized drawings for our products, please refer to our technical office which, depending on your specific requirement, will recommend the most suitable solution.

PNEUMATIC MOTOR TECHNICAL CHARACTERISTICS

Pneumatic motors are provided with the following surface finish specifications:

Molten cast iron pneumatic motors:

- Elimination of foundry burrs using mechanical removal systems.
- Precise shot-peening.
- Painting.

Certification:

- All pneumatic motors are certified according to the European Directives ATEX II cat. 2 G & D T5 and ATEX I M2.

Painting specifications:

Black Epoxy-polyester RAL9005. Product used: thermally hardening powder with a polyester resin base modified with epoxy resin.

KEY TO SYMBOLS

T2 [Nm]	Output torque
T2MAX [Nm]	Maximum torque
Fa din [N]	Dynamic axial load
Fa max [N]	Maximum axial load
Fr [N]	Radial load

GEARBOX TEMPERATURES

Temperature [°C]

The ideal operating temperature ranges between 50 °C e 70 °C. For short periods of time you can reach 80 °C. The best solution in order to keep the temperature under control is to use an auxiliary heat exchange system. For very low room temperatures,

below -15 °C, or in the case of operating temperatures which exceed 80 °C, it is necessary to use suitable oils, as well as special gaskets and materials, which may be supplied on request. In any case we suggest referring to the Technical Department at TSA.

PISTON ENGINE TEMPERATURES

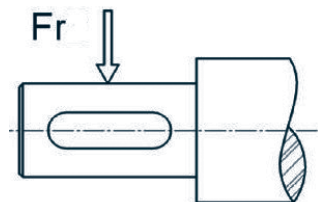
Temperature [°C]

The ideal operating temperature ranges between -20 °C and +80 °C. For every low room temperature, below -20 °C, or in the case of operating temperatures which exceed 80 °C, it is necessary to use suitable

oils, as well as special gaskets and materials, which may be supplied on request. In any case we suggest referring to the Technical Department at TSA.

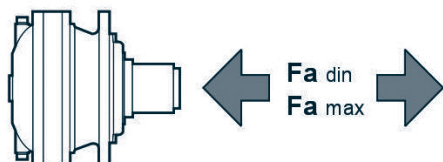
AXIAL RADIAL LOADS

Radial loads admissible



Models	Flanged Fr [N]	On base Fr [N]
E18	10.000	7.000
E22	40.000	35.000
E27	80.000	50.000
E28	90.000	55.000
E32	100.000	60.000
E34	110.000	-

Axial loads admissible



Models	Flangeded		On base	
	Fadin [N]	Famax [N]	Fadin [N]	Famax [N]
E18	9.000	9.000	6.000	6.000
E22	35.000	60.000	25.000	25.000
E27	100.000	100.000	40.000	40.000
E28	50.000	90.000	30.000	30.000
E32	80.000	90.000	35.000	35.000
E34	100.000	100.000	-	-

GEARBOX LUBRICANTS

Our gearboxes are provided without any lubricant; the lubricant thus needs to be chosen by the user following the guidelines contained in the relevant use and maintenance manual.

PISTON ENGINE LUBRICANTS

The motors are provided without any lubricant; the lubricant thus needs to be chosen by the user following the guidelines contained in the relevant use and maintenance manual.

ORDER CODE

**PNEUMATIC
MOTOR**

**SIZE
ADAPTER**
E18 - E22 - E27
E28 - E32 - E34

RAPPORT
3-4-7-8-10-14-17
20-22-25-31-36
56-61-65-70-80-85

VALVE

00 - BSP
10 - NPT
20 - Total head:
clockwise drop (BSP)
30 - Total head:
anticlockwise drop (BSP)
40 - Total head:
clockwise drop (NPT)
50 - Total head:
anticlockwise drop (NPT)

MP - 165 - E18 - F - 3 - A - 00

POWER

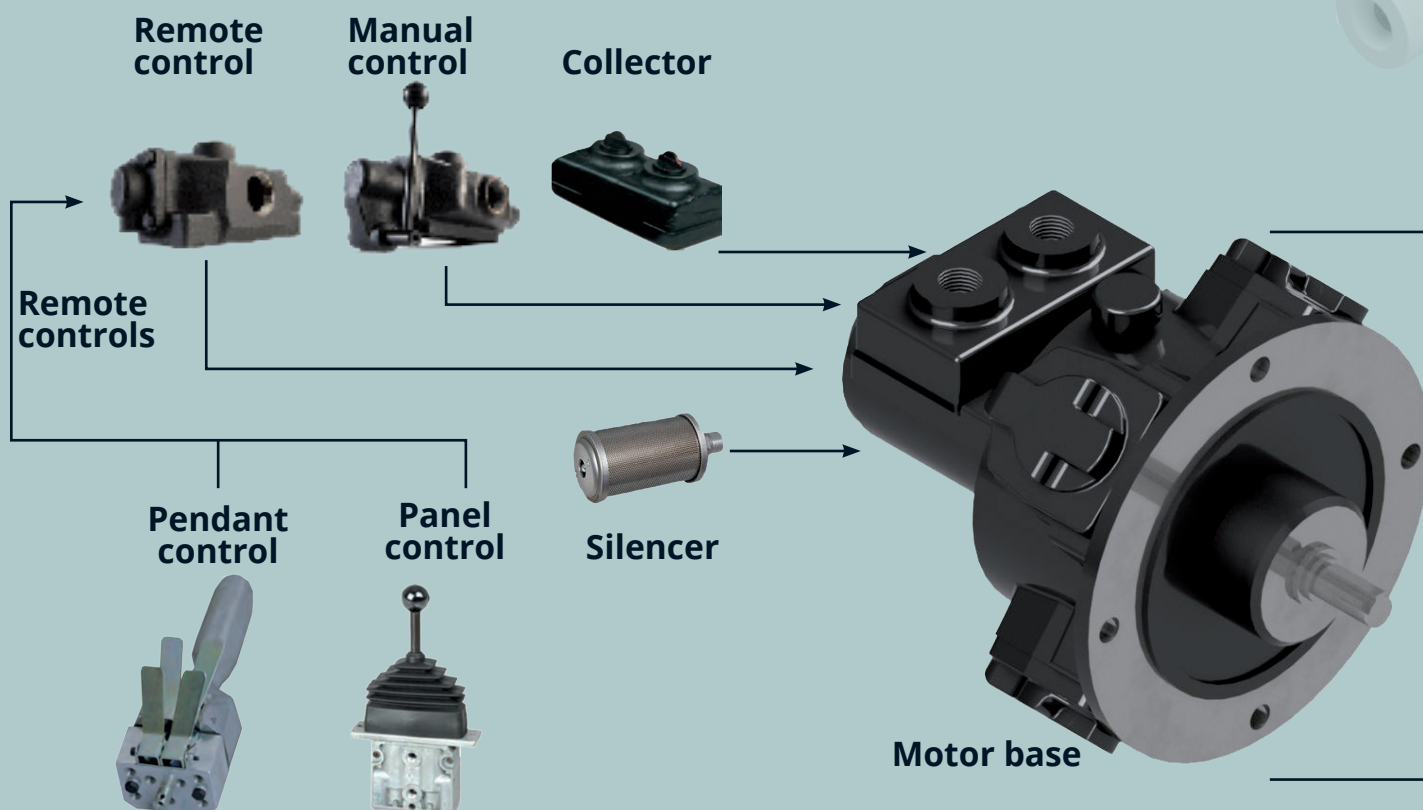
165 1,6 KW / 2,3 HP
400 3,4 KW / 4,7 HP
850 6,1 KW / 8,3 HP
1450 12,5 KW / 17,1 HP
2250 19,7 KW / 26,8 HP
3000 18,3 KW / 24,9 HP

FORMA COSTRUTTIVA

F - Flanged
FR - Flanged + brake
FV - Flanged with control
FVR - Flanged with control + brake
P - On base
PR - On base + brake
PV - On base with control
PVR - On base with control + brake

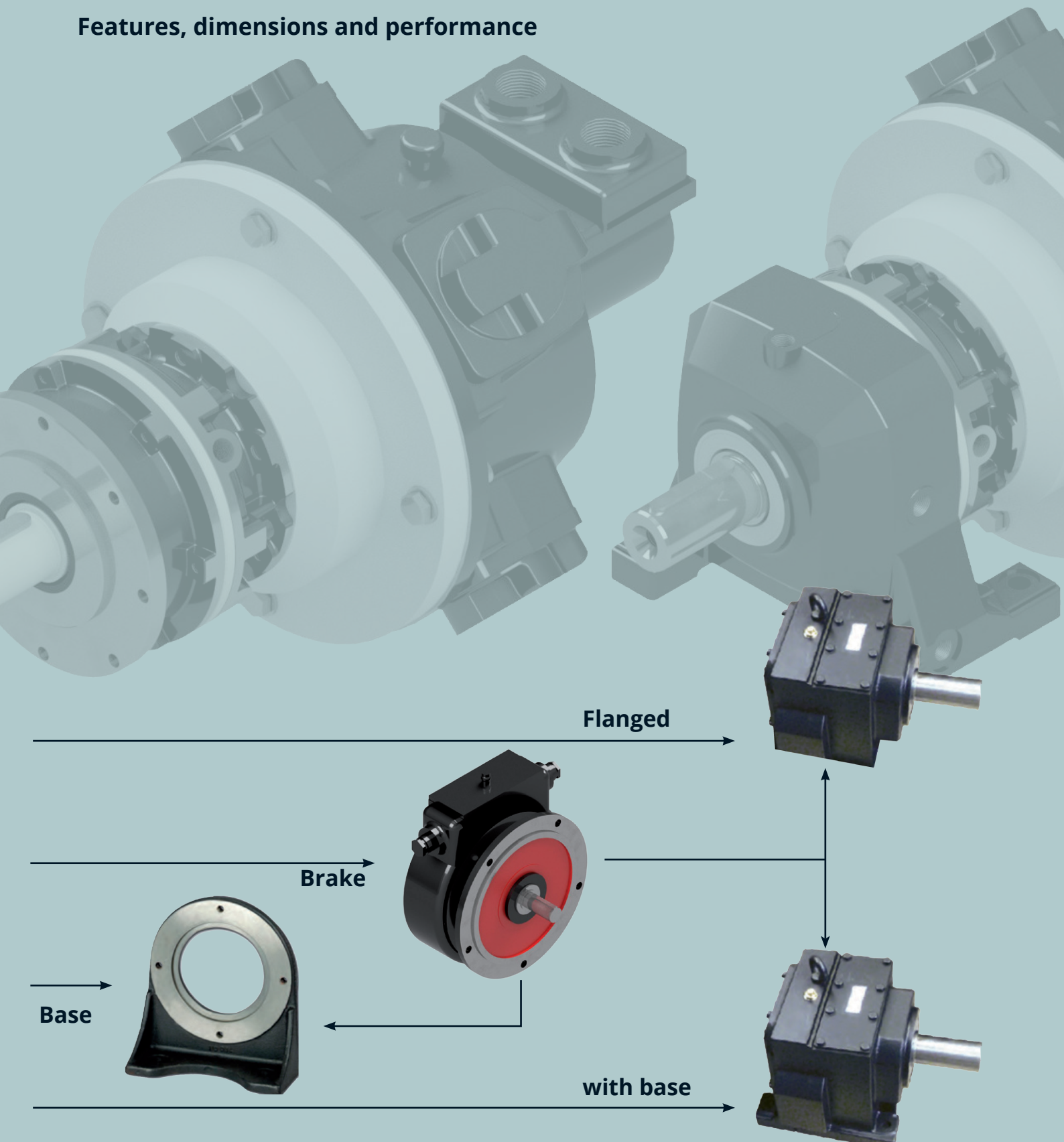
VALVE OPTIONS

A - Collector
H - Handheld
check valve (HCV)
R - Remote
check Valve (RCV)
X - No valve
No collector



RADIAL PISTON PNEUMATIC GEAR MOTORS

Features, dimensions and performance



SERIES MP165E...- HP 1,5 KW 1,1

PERFORMANCE AND DIMENSIONS								
MODELS		Speed RPM max. power 6 bar	Power		Torque max. power	Air consumption	Weight flangeded	Weight on base
flangeded	on base	RPM	KW	HP	Nm	l/sec	Kg.	Kg.
MP165E18F 3	MP165E18P 3	591	1,1	1,5	17	25	26	30
MP165E18F 4	MP165E18P 4	455	1,1	1,5	22	25	26	30
MP165E18F 7	MP165E18P 7	288	1,1	1,5	34	25	26	30
MP165E18F 10	MP165E18P 10	190	1,1	1,5	52	25	26	30
MP165E18F 14	MP165E18P 14	134	1,1	1,5	74	25	30	31,5
MP165E18F 22	MP165E18P 22	85	1,1	1,5	117	25	30	31,5
MP165E18F 31	MP165E18P 31	65	1,1	1,5	152	25	30	31,5
MP165E18F 65	MP165E18P 65	30	1,1	1,5	325	25	34	33
MP165E18F 80	MP165E18P 80	25	1,1	1,5	396	25	34	33

AVAILABLE VERSIONS

MP165E18F	flangeded
MP165E18FV	flangeded with control
MP165E18P	on base
MP165E18PV	on base with control

ENGINE OIL LUBRICATION

PISTON PENUMATIC:

Horizontal 330 ml Vertical 450 ml.

Use a good quality hydraulic oil with a viscosity of 100cSt (460SSU) at 40 °.

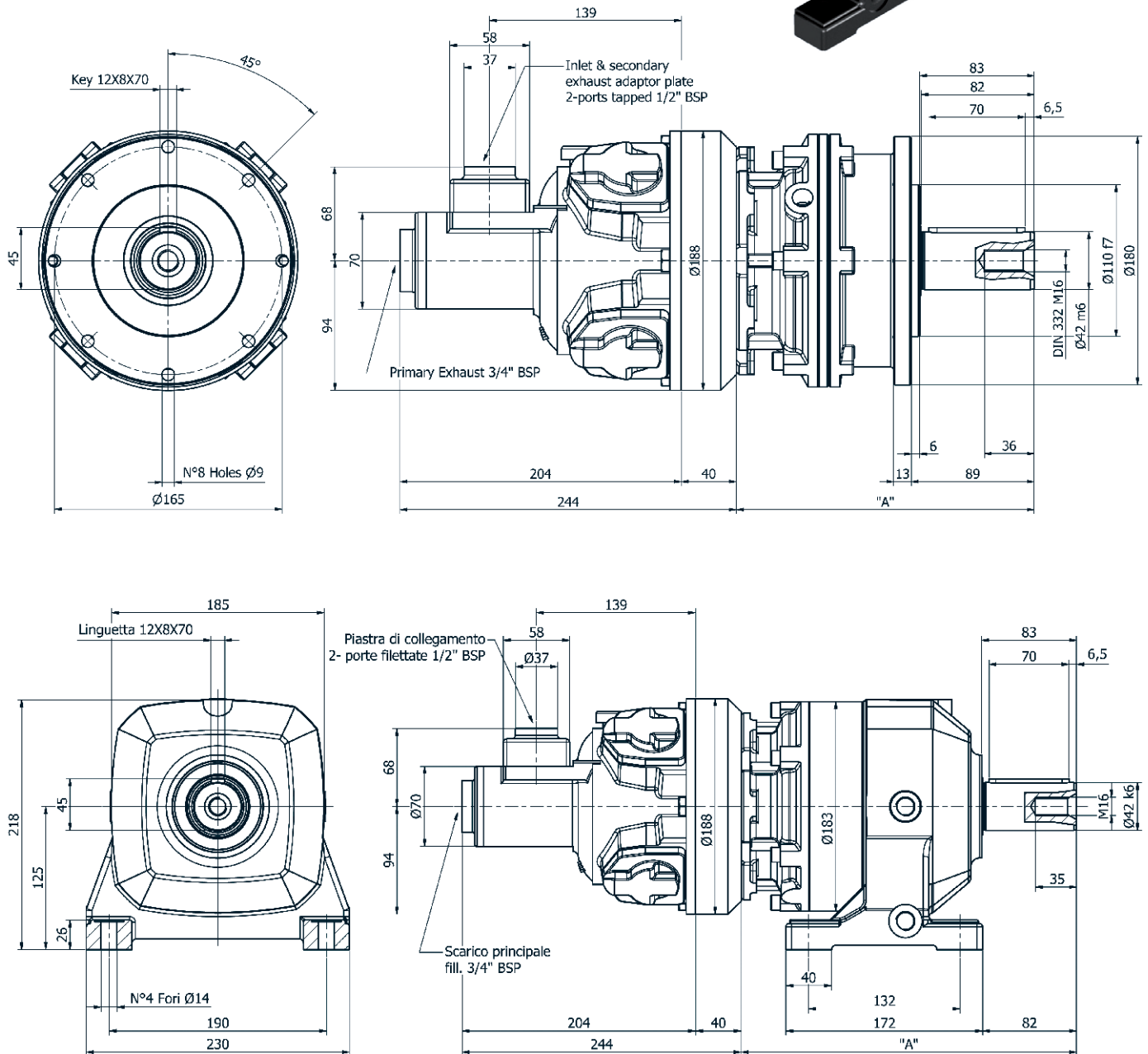
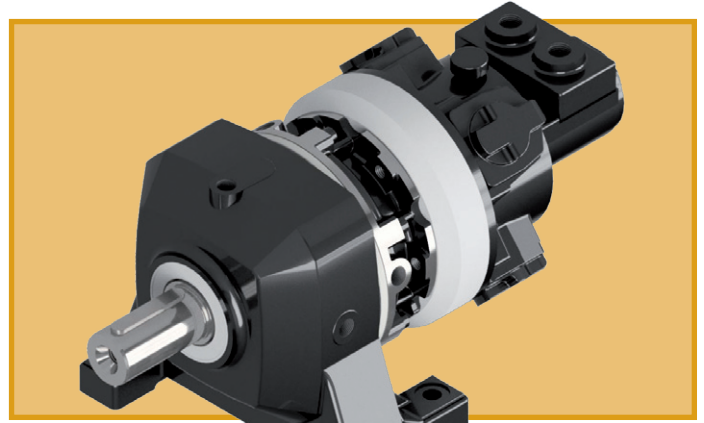
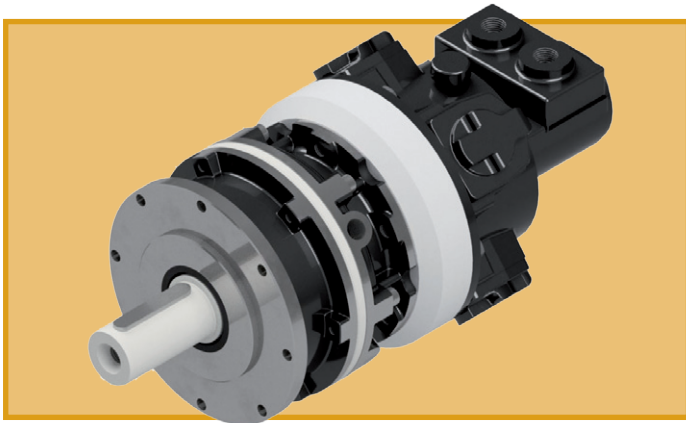
NETWORK AIR FILTERING AND LUBRICATION:

Use a 64 micron or better filter. Choose the lubricator according to the required flow rate. Inject the oil into the connections before starting the engine.

Lubrication: 3-4 drops / 1 in continuous service
6-10 drops / 1 'in intermittent service

EXERCISE TEMPERATURE:

from -20 ° C to + 80 ° C



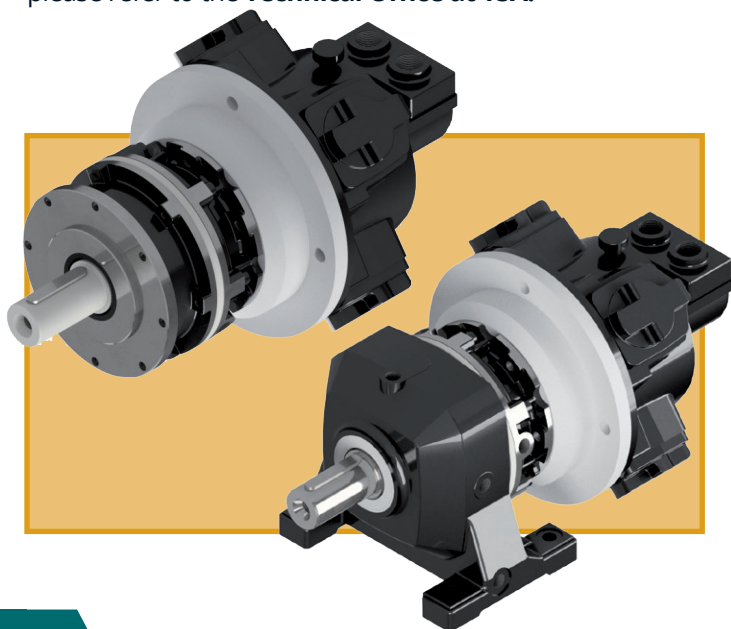
SERIES MP400E...- HP 3,8 KW 2,8

PERFORMANCE AND DIMENSIONS								
MODELS		Speed RPM max. power 6 bar	Power		Torque max. power	Air consumption	Weight flangeded	Weight on base
flangeded	on base	RPM	KW	HP	Nm	l/sec	Kg.	Kg.
MP400E18F 3	MP400E18P 3	562	2,8	3,8	44	76	39	43
MP400E18F 4	MP400E18P 4	432	2,8	3,8	57	76	39	43
MP400E18F 7	MP400E18P 7	273	2,8	3,8	90	76	39	43
MP400E22F 10	MP400E22P 10	180	2,8	3,8	136	76	56	69,5
MP400E22F 14	MP400E22P 14	128	2,8	3,8	192	76	56	69,5
MP400E22F 22	MP400E22P 22	80	2,8	3,8	304	76	56	69,5
MP400E22F 31	MP400E22P 31	61	2,8	3,8	396	76	56	69,5
MP400E22F 61	MP400E22P 61	31	2,8	3,8	796	76	64	71
MP400E22F 80	MP400E22P 80	24	2,8	3,8	1000	76	75	85

AVAILABLE VERSIONS

MP400E18F flangeded
 MP400E18FV flangeded with control
 MP400E18P on base
 MP400E18PV on base with control

For drawings with levels,
 please refer to the **Technical Office at TSA.**



ENGINE OIL LUBRICATION

PISTON PENUMATIC:

Horizontal 330 ml Vertical 450 ml.

Use a good quality hydraulic oil with a viscosity of 100cSt (460SSU) at 40 °.

NETWORK AIR FILTERING AND LUBRICATION:

Use a 64 micron or better filter. Choose the lubricator according to the required flow rate. Inject the oil into the connections before starting the engine.

Lubrication: 3-4 drops / 1 in continuous service
 6-10 drops / 1 in intermittent service

EXERCISE TEMPERATURE:

from -20 ° C to + 80 ° C

SERIES MP850E...- HP 8,2 KW 6,1

PERFORMANCE AND DIMENSIONS								
MODELS		Speed RPM max. power 6 bar	Power		Torque max. power	Air consumption	Weight flangeded	Weight on base
flangeded	on base	RPM	KW	HP	Nm	l/sec	Kg.	Kg.
MP850E18F 3	MP850E18P 3	532	6,1	8,2	104	131	61	65
MP850E18F 4	MP850E18P 4	410	6,1	8,2	136	131	61	65
MP850E18F 7	MP850E18P 7	259	6,1	8,2	208	131	61	65
MP850E22F 10	MP850E22P 10	171	6,1	8,2	312	131	78	91,5
MP850E22F 14	MP850E22P 14	133	6,1	8,2	405	131	78	91,5
MP850E22F 20	MP850E22P 20	85	6,1	8,2	630	131	78	91,5
MP850E22F 31	MP850E22P 31	59	6,1	8,2	930	131	96	102
MP850E28F 56	MP850E28P 56	33	6,1	8,2	1600	131	126	134
MP850E32F 85	MP850E32P 85	20	6,1	8,2	2600	131	164	188

AVAILABLE VERSIONS

MP850E18F flangeded
MP850E18FV flangeded with control
MP850E18P on base
MP850E18PV on base with control

For drawings with levels,
please refer to the **Technical Office at TSA.**



ENGINE OIL LUBRICATION

PISTON PNEUMATIC:

Horizontal 330 ml Vertical 450 ml.

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6-10 drops / 1 in intermittent service

EXERCISE TEMPERATURE:

from -20 ° C to + 80 ° C

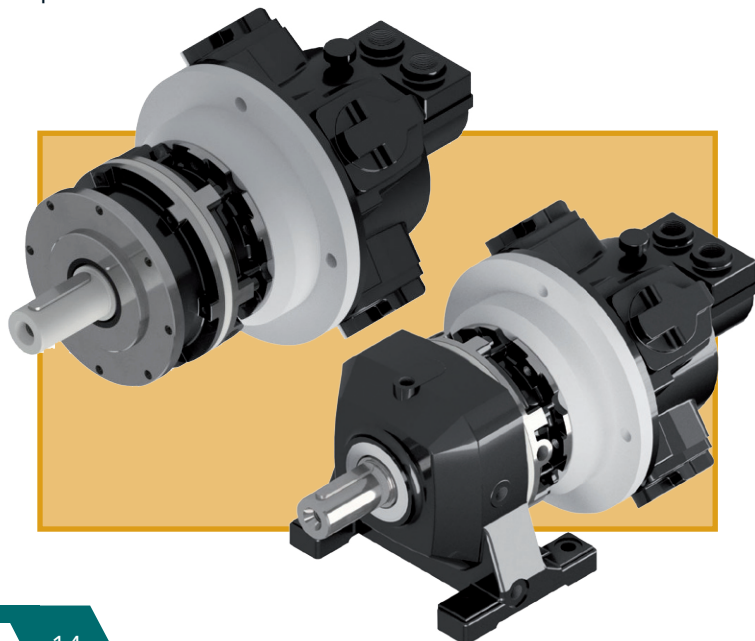
SERIES M1450E...- HP 14,1 KW 10,5

PERFORMANCE AND DIMENSIONS								
MODELS		Speed RPM max. power 6 bar	Power		Torque max. power	Air consumption	Weight flangeded	Weight on base
flangeded	on base	RPM	KW	HP	Nm	l/sec	Kg.	Kg.
MP1450E22F3	MP1450E22P3	519	10,5	14,1	180	190		
MP1450E22F4	MP1450E22P4	387	10,5	14,1	240	190		
MP1450E22F7	MP1450E22P7	220	10,5	14,1	435	190		
MP1450E22F10	MP1450E22P10	148	10,5	14,1	646	190		
MP1450E22F14	MP1450E22P14	110	10,5	14,1	867	190		
MP1450E22F17	MP1450E22P17	94	10	13,4	1020	190		
MP1450E32F20	MP1450E32P20	76	10	13,4	1260	190		
MP1450E32F25	MP1450E32P25	65	10	13,4	1468	190		
MP1450E32F36	MP1450E32P36	43	10	13,4	2196	190		
MP1450E27F70	MP1450E27P70	22	10	13,4	4200	190		

AVAILABLE VERSIONS

MP1450E22F flangeded
 MP1450E22FV flangeded with control
 MP1450E22P on base
 MP1450E22PV on base with control

For drawings with levels,
 please refer to the **Technical Office at TSA.**



ENGINE OIL LUBRICATION

PISTON PNEUMATIC:

Horizontal 330 ml Vertical 450 ml.

Use a good quality hydraulic oil with a viscosity of 100cSt (460SSU) at 40 °.

NETWORK AIR FILTERING AND LUBRICATION:

Use a 64 micron or better filter. Choose the lubricator according to the required flow rate. Inject the oil into the connections before starting the engine.

Lubrication: 3-4 drops / 1 in continuous service
 6-10 drops / 1 in intermittent service

EXERCISE TEMPERATURE:

from -20 ° C to + 80 ° C

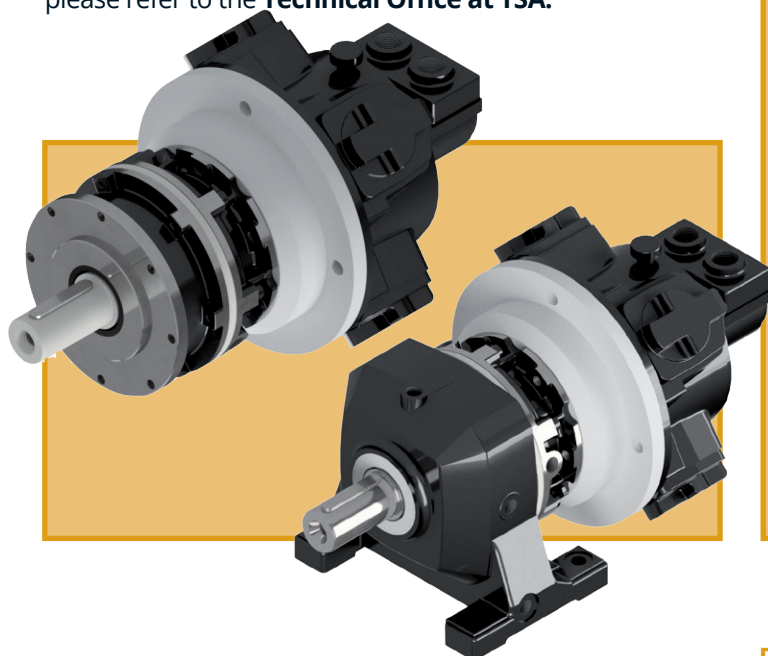
SERIES MP2250E...- HP 21,9 KW 16,3

PERFORMANCE AND DIMENSIONS								
MODELS		Speed RPM max. power 6 bar	Power		Torque max. power	Air consumption	Weight flangeded	Weight on base
flangeded	on base	RPM	KW	HP	Nm	l/sec	Kg.	Kg.
MP2250E22F3	MP2250E22P3	328	16,3	21,9	455	320	151	
MP2250E22F4	MP2250E22P4	278	16,3	21,9	536	320	151	
MP2250E32F8	MP2250E32P8	132	16,3	21,9	1130	320	215	
MP2250E27F22	MP2250E27P22	52	15,5	20,7	2850	320	238	
MP2250E34F31	MP2250E34P31	37	15,5	20,7	3900	320	305	
MP2250E34F36	MP2250E34P36	32	15,5	20,7	4680	320	305	

AVAILABLE VERSIONS

MP2250E22F flangeded
MP2250E22FV flangeded with control
MP2250E22P on base
MP2250E22PV on base with control

For drawings with levels,
please refer to the **Technical Office at TSA.**



ENGINE OIL LUBRICATION PISTON PENUMATIC:

Horizontal 330 ml Vertical 450 ml.
Use a good quality hydraulic oil with a viscosity of 100cSt (460SSU) at 40 °.

NETWORK AIR FILTERING AND LUBRICATION:

Use a 64 micron or better filter. Choose the lubricator according to the required flow rate. Inject the oil into the connections before starting the engine.

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6-10 drops / 1 in intermittent service

EXERCISE TEMPERATURE:

from -20 ° C to + 80 ° C

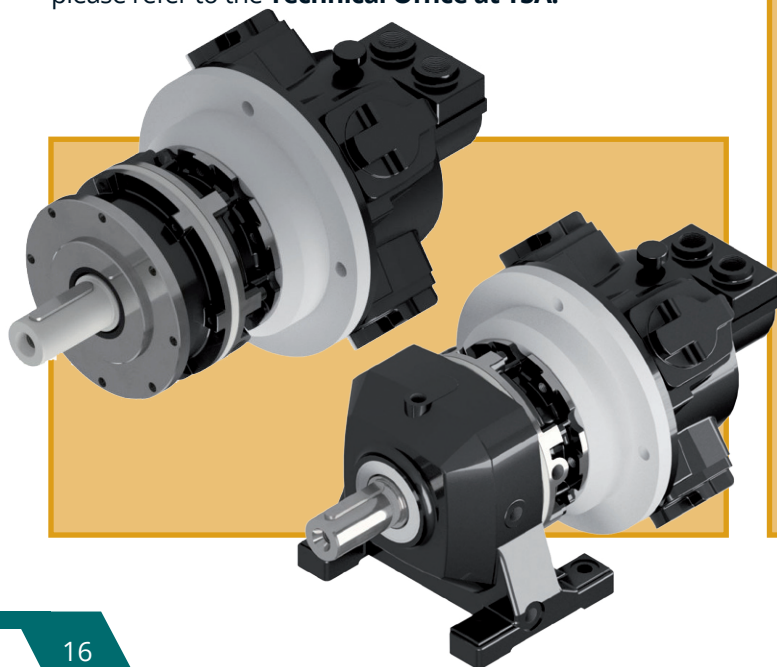
SERIES M3000E...- HP 21,9 KW 16,3

PERFORMANCE AND DIMENSIONS								
MODELS		Speed RPM max. power 6 bar	Power		Torque max. power	Air consumption	Weight flangeded	Weight on base
flangeded	on base	RPM	KW	HP	Nm	l/sec	Kg.	Kg.
MP3000E22F3	MP3000E22P3	328	16,3	21,9	455	320	161	
MP3000E22F4	MP3000E22P4	278	16,3	21,9	536	320	161	
MP3000E32F8	MP3000E32P8	132	16,3	21,9	1130	320	225	
MP3000E27F22	MP3000E27P22	52	15,5	20,7	2850	320	248	
MP3000E34F31	MP3000E34P31	37	15,5	20,7	3900	320	315	
MP3000E34F36	MP3000E34P36	32	15,5	20,7	4680	320	315	

AVAILABLE VERSIONS

MP3000E22F flangeded
 MP3000E22FV flangeded with control
 MP3000E22P on base
 MP3000E22PV on base with control

For drawings with levels,
 please refer to the **Technical Office at TSA.**



ENGINE OIL LUBRICATION

PISTON PNEUMATIC:

Horizontal 330 ml Vertical 450 ml.

Use a good quality hydraulic oil with a viscosity of 100cSt (460SSU) at 40 °.

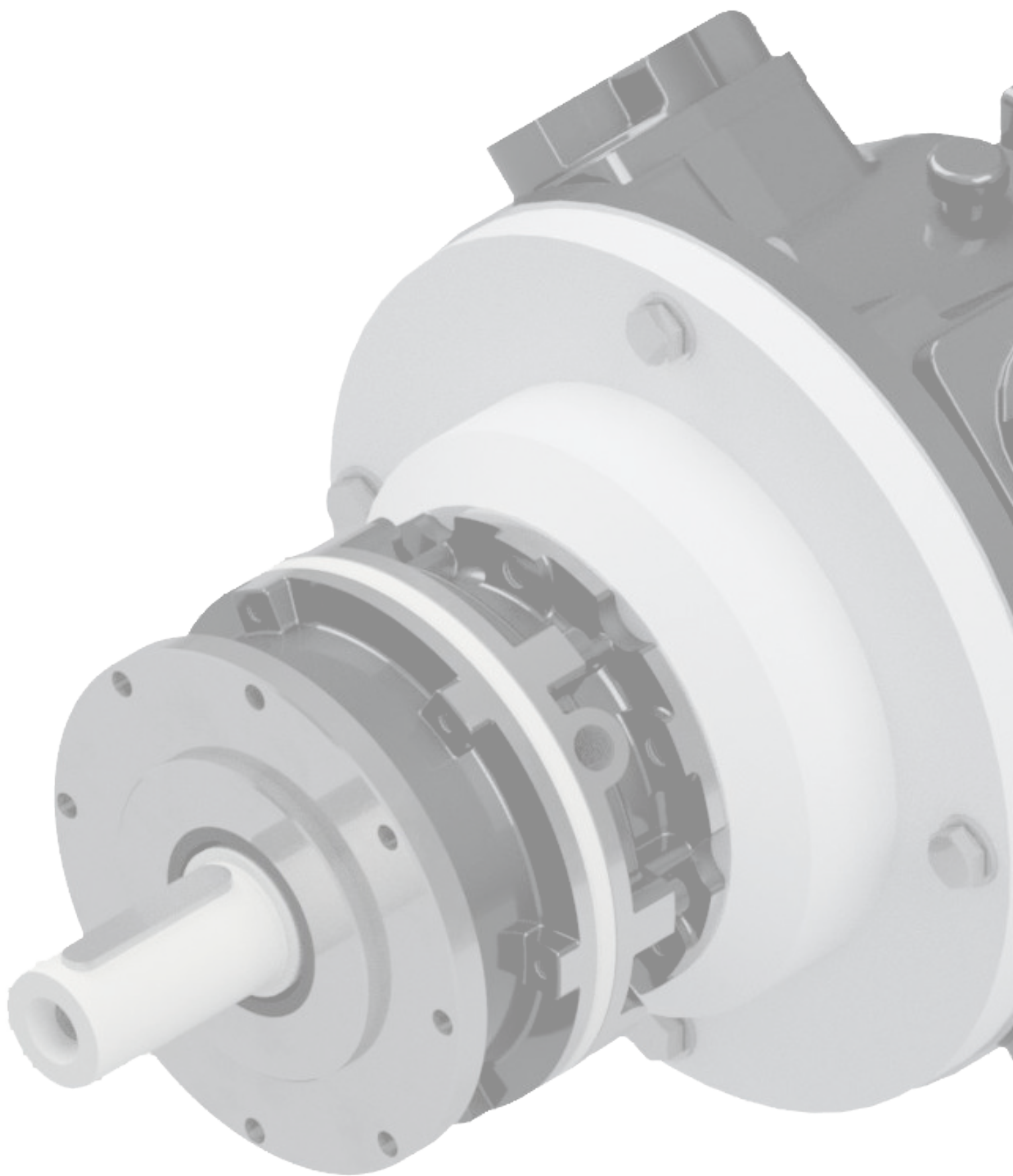
NETWORK AIR FILTERING AND LUBRICATION:

Use a 64 micron or better filter. Choose the lubricator according to the required flow rate. Inject the oil into the connections before starting the engine.

Lubrication: 3-4 drops / 1 in continuous service
 6-10 drops / 1 in intermittent service

EXERCISE TEMPERATURE:

from -20 ° C to + 80 ° C



PNEUMATIC ACCESSORIES

TSA offers a pneumatic component programme for air treatment and control of pneumatic motors on premium brands, including SMC, BOSCH, NORGREN, WILKERSON. This programme consists of air treatment units, valves and silencers. The available connections range from G1/4" to G2".

AIR TREATMENT UNITS

All of the filters used have automated condensation discharge, the FRL units are installation-ready and fitted with a pressure gauge.

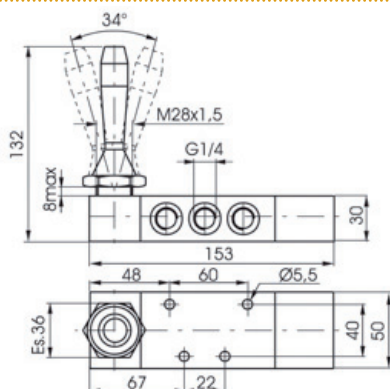
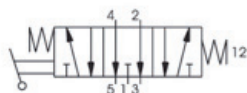
Models	TFRL3/8	TFRL1/2	TFRL3/4	TFRL1	TFRL2
Connection	3/8"	1/2"	3/4"	1"	2"
Max. operating pressure	10 Bar	10 Bar	10 Bar	10 Bar	20 Bar
Max. operating temperature	-5 a +60°C				
Standard filtration rate	8 Micron				
Flow rate in l/sec	56,6	63,2	67,5	149	660



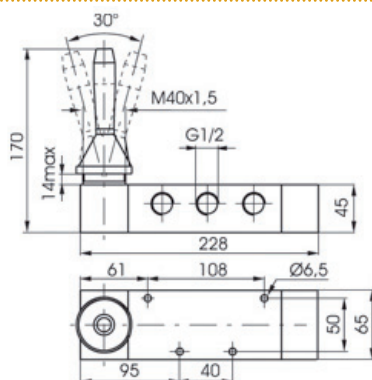
MANUAL OR PNEUMATIC CONTROL VALVES

Easy and quick to install, the default valves fitted on TSA pneumatic motors are 5-way 3-position valves with centres open in idle position, with lever or pneumatic control.

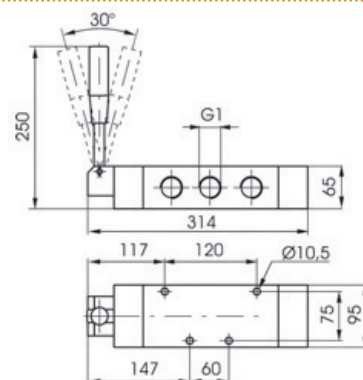
MODELS	VCM1/4	VCM1/2	VCM1	VCP1/4	VCP1/2	VCP1
Connection	G1/4"	G1/2"	G1"	G1/4"	G1/2"	G1"
Fluido	Filtered and lubricated air					
Max. operating pressure	10 bar					
temperature	-5°C +70°C					
Flow rate at 6 bar with $\Delta p = 1 \text{ NI / min}$	1280	3500	6500	1280	3000	6500
Ø Nominal passage	8mm	15mm	20mm	8mm	15mm	20mm
Body	Aluminum					
Kg.	0,7	2	5	0,6	1,7	4,2
Minimum pilot pressure	-	-	-	3 bar	3 bar	3 bar
Pilot connection	-	-	-	G1/8"	G1/8"	G1/8"



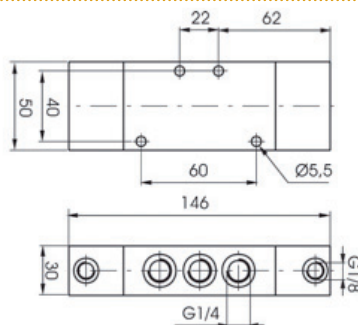
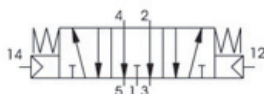
VCM1/4



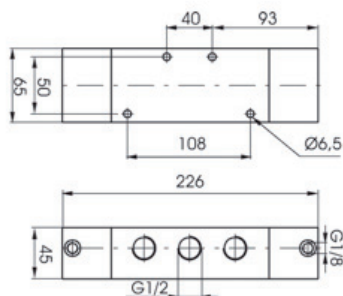
VCM1/2



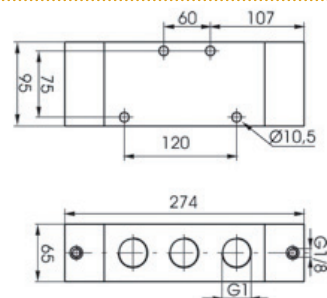
VCM1



VCP1/4



VCP1/2



VCP1

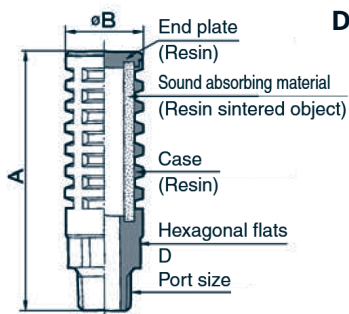
SILENCERS

All motors are fitted with a threaded exhaust gate, which makes it possible to add a silencer in order to reduce the noise level. It is also possible to add another hose between exhaust and silencer which will further reduce the noise level.

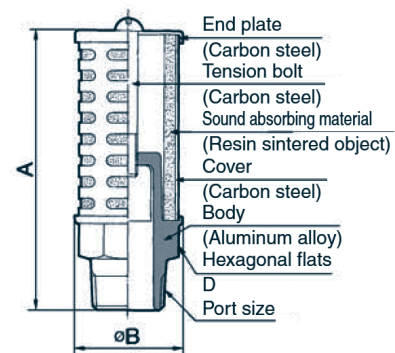


Models	S1/4	S3/8	S1/2	S3/4	S1	S1 1/4
Connection	¼ NPT	3/8 NPT	½ NPT	¾ NPT	1 NPT	1 ¼ NPT
Noise dB reduction	>30 dB(A)					
Fluid	compressed air					
Operating temperature	+5° C – 60° C					
Body	Plastic	Plastic	Plastic	Steel + Plastic	Steel + Plastic	Steel + Plastic

Dimensions S1/4 – S1/2



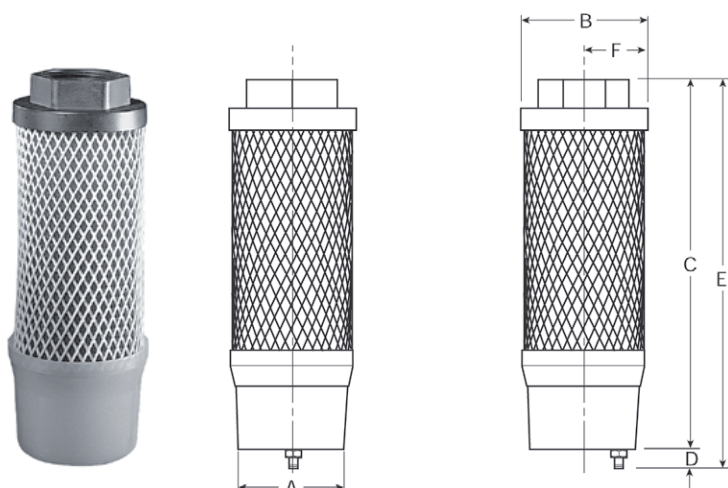
Dimensions S3/4 – S1 1/4



Dimensions	S1/4	S3/8	S1/2	S3/4	S1	S1 1/4
A	63	84	92	107	127	186
B	22	25	30	46	50	74
D	19	22	27	36	41	50

DISSOLATOR / SILENCER FILTER

Models	XMC-C4-000	XMC-C8-000	XMC-CB-000	S3/4	S1	S1 1/4
Connection	½ G	1 G	1 - 1/2 G	107	127	186
Bath capacity	2.2 fl. oz.	5 fl. oz.	5 fl. oz.	46	50	74
Drain	Manual	22	27	36	41	50
oiling	99.9%					
Operating temperature	2° C – 50° C					
Sound reduction	25 dB(A)					
Kg.	0.4					



CONSTRUCTION MATERIALS

Threaded cover	Nylon
Filter element	
Primary	borosilicate cloth
Secondary	PVC fiber
Oil cover of waste	Plastic
Sleeve support	Plastic

Model	A	B	C	D	E	F
XMC-C4-000	51	60	100	10	150.9	30
XMC-C8-000	51	60	148	10	198.9	30
XMC-CB-000	76	87	208	11	284	-

PNEUMATIC MOTORS



GEAR-MOTORS



TELESCOPIC BOOMS

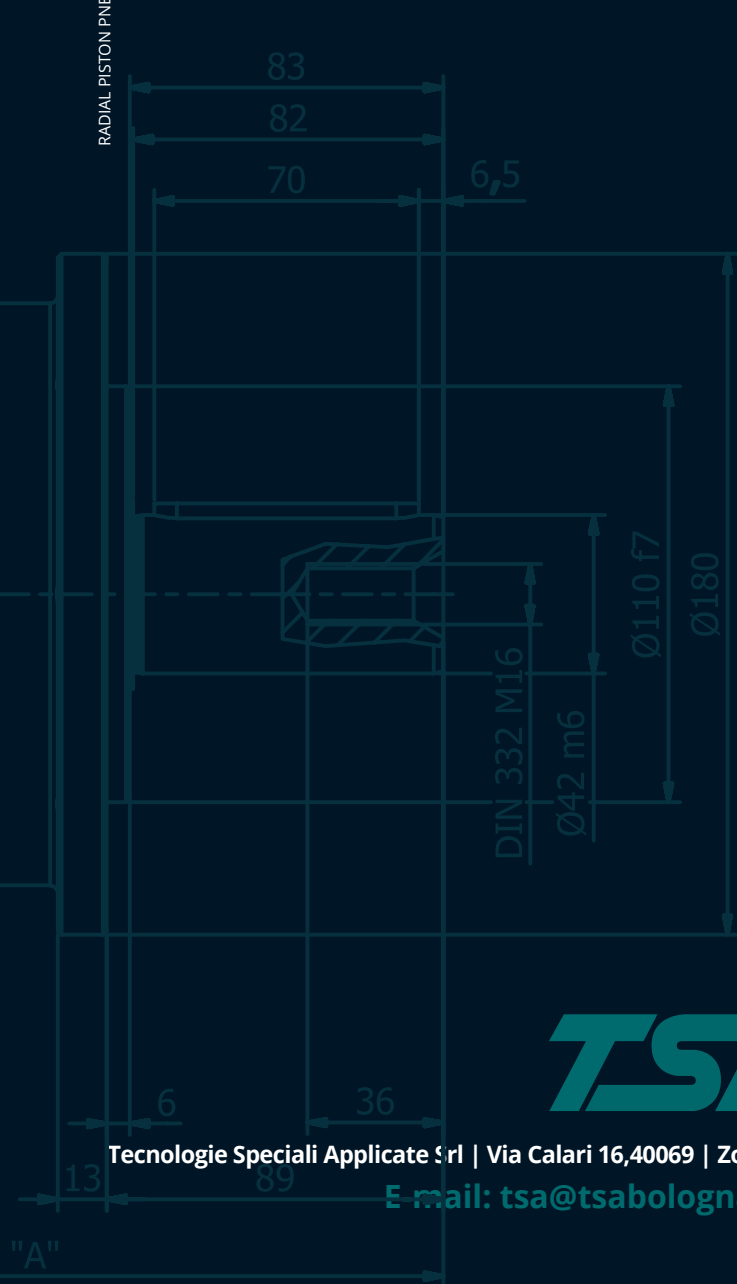


ARTICULATED BOOMS



ACCESSORIES





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