General information for pump operation

Pump installation
Maximator pumps can always be operated in any position, although the vertical position is effective in preserving the seals. For fault-free operation, the devices should be lined with fittings and tubings which are suitable for the desired pressure range. The connection sizes should never be reduced.

The connections of Maximator pumps are available as BSPP-threads and can be designed optionally as NPT threads. Both threads are suitable for pressures up to 1,050 bar (15,000 psi). For higher pressure applications, from 1,050 bar upwards, we recommend the use of Maximator high-pressure fittings.

We offer high-pressure connections in sizes 1/4“, 3/8“, 9/16“, 3/4“ and 1“ for pressures up to 7,000 bar. Depending on the pressure range, one distinguishes here between „medium pressure” (1,550 bar [22,500 psi]), „high pressure“ (4,500 bar [65,000 psi]) and „ultra-high pressure“ (7,000 bar [101,000 psi]).

Please consult the Maximator Valves, Fittings and Tubing catalog, chapter „Tools and Installation“ for more detailed information about the Maximator high-pressure connections.

Before starting operation
The connection for the compressed air drive is located on the spool cycling valve housing. Series S…D, G and GSF models have a second connection (marked by „X“) for direct pilot valve air for switching the pump on and off via solenoid valves with small nominal size.

Pilot-valve air must be connected upstream of a pressure controller for pumps using direct pilot air. If the direct pilot-valve air is not connected, the pump will not function.

Before starting operation, a compressed air filter with a water separator should be mounted in the air drive line in front of the pump. We offer the technical accessories to match each series under „air control unit C1, C2 or C3“.

As a rule, Maximator pumps do not require a compressed air oiler, as they are treated with special grease during assembly. An upstream connection of an oiler is recommendable if the pump is to be operated with very dry air and the duty cycle exceeds 50%.

After operating the pump with oiled compressed air, it is advisable to retain this variant for subsequent applications. Should you change to unoiled compressed air, the pump should be retreated with special grease.

Drive air
In order to ensure optimal durability for the seal and guide elements, the drive air should meet the specifications of quality grades from 3 to 4 (solids/ water / oil):

Air quality in accordance with ISO 8573-1		
Specification	**Value**	
max. compressed air purity of oil (class 4):	5	mg/m³
max. number of particles at 0,1 - 0,5 µm size (class 3):	90.000	pce.
max. number of particles at 1,0 - 5,0 µm size (class 3):	1.000	pce.
max. solids, particle concentration:	5	mg/m³
max. pressure dew point at moisture (Klasse 4):	+3	°C

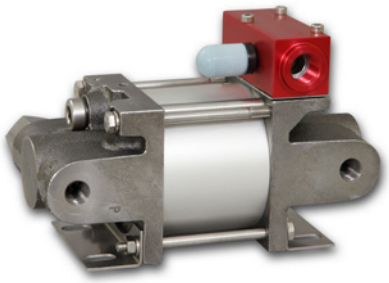
Recommended hydraulic oils
Proper operation and efficiency of the pumps is mainly depending on the quality of the used hydaulic liquid. We recommend hydraulic oils with a viscosity between 46 – 68 cst (DIN 51524 T2; DIN 51519). To prevent damage to both the inlet and outlet check valves and the high pressure seal, a filter with a mesh width below 100 µm must be fitted to the suction pipe.

Temperatures
The standard operating temperatures of Maximator pumps range between -20°C and +80°C. Pumps with sealing version -VE for water operation can be used at temperatures up to +60°C, with short-term operation possible up to +80°C.

Emission protection
Air-driven pumps can cause such emissions as noise or air contamination from the fluid. Persons located in the vicinity of running pumps should always wear protective glasses and, if necessary, ear protection.

Type designation
The type designations of Maximator pumps specify, as far as possible, the pressure ratio of the pump and contain information about the sealing version as well as additional options. Instructions regarding the order code can be found in the information on our individual pump series.

(14,500 psi)



MO...D-Pumps

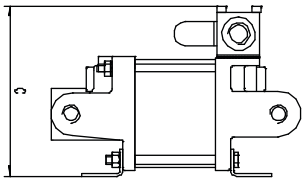
» Double-acting
» With one air drive piston
» Operating pressures of up to 1,000 bar (14,500 psi)

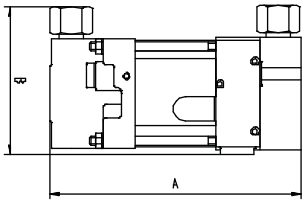
The MO...D pumps run with lower pulsation than the single-acting MO pumps and achieve an approx. 50% higher pump capacity.

- Standard pumps with side inlet only

- Special connections, e.g. with NPT thread
  Order code: MO37(D) – NPT
- Air control unit for MO(D) pumps, consisting of a filter/pressure regulator combination, control pressure gauge and shut-off valve
  Order code: MO37(D) with C1

Other options available on request.





Type	Pressure ratio*	Displ. Volume **		Outlet pressure ***		Flow capacity	Connections Air Drive	Inlet	Outlet	Dimensions in mm			Weight
		cm³	cu.inch	bar	psi	l/min ****	L	A	B	A	B	C	kg
MO22D	1:28	9.2	0.56	280	4060	3.91	3/8 BSPP	3/8 BSPP	1/4 BSPP	186	108	118	4.5
MO37D	1:46	5.6	0.34	460	6670	2.35	3/8 BSPP	3/8 BSPP	1/4 BSPP	186	108	118	4.5
MO72D	1:86	3.0	0.18	860	12470	1.24	3/8 BSPP	3/8 BSPP	1/4 BSPP	186	108	118	4.5
MO111D	1:130	2.0	0.12	1000	14500	0.82	3/8 BSPP	3/8 BSPP	1/4 BSPP	186	108	118	4.5
MO189D	1:220	1.2	0.07	1000	14500	0.49	3/8 BSPP	3/8 BSPP	1/4 BSPP	186	108	118	4.5

Pump design

Besides weight and dimensions, selecting the right pump for your application is based essentially on the required operating pressure as well as the pump capacity. Essentially, three different applications must be distinguished in order to calculate the pump capacity:

1. Continuous flow rate at defined pressure
With such applications, e.g. continuous cooling or flushing of systems, the pump capacity is generally calculated from the application.

2. Actuation of hydraulic cylinders
The decisive criteria here are: the fill volume of the cylinder, the cylinder actuation time and the number of actuations per minute. The following formula can be used to calculate the required pump capacity Q:

$$Q = \frac{A_Z \times h_z \times n}{\text{min}} \text{ in [l/min]}$$

A_Z = piston area cylinder in [dm²]
h_z = piston travel cylinder in [dm]
n = number of actuations per minute

3. Pressure test of test items with defined volumes
When executing a pressure test on components pressurised internally, the most important variables are the pressure build-up time, the volume of the test item, the modulus of compressibility of the test medium and the pressure.

The following applies for unfilled test items:

$$Q = \frac{V + (\chi \times \Delta P \times V)}{T_D} \text{ in [l/min]}$$

The following applies for prefilled test items:

$$Q = \frac{(\chi \times \Delta P \times V)}{T_D} \text{ in [l/min]}$$

V = test volume in [l]
χ = modulus of compressibility of test medium in [1/GPa] (e.g. water 0,5*1/GPa)
ΔP = test pressure in GPa (1000 bar = 0,1 GPa)
T_D = time for pressure build-up in [min]

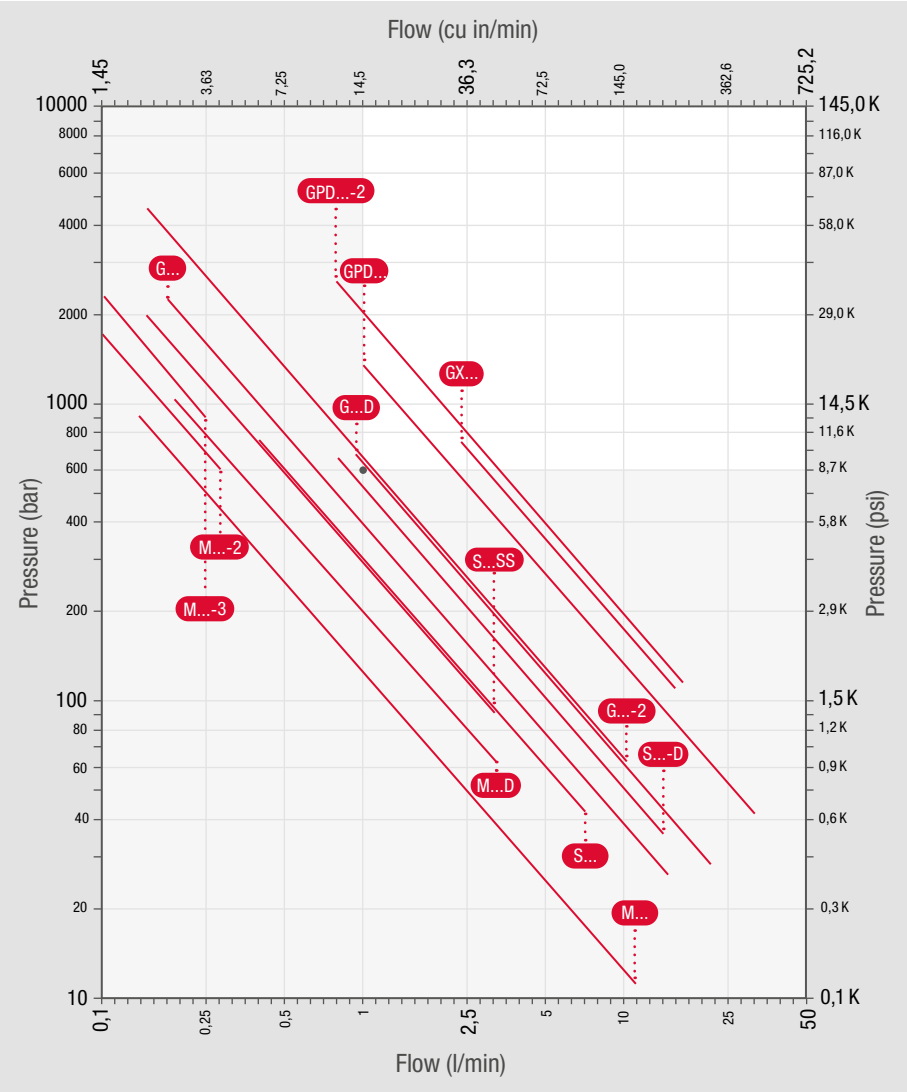
Pump selection

Selecting the must suitable pump is a two-step process:

Step 1: Selection of pump series
First you make a selection of the pump series in the diagram (right) based on the operating pressure and the pump capacity required for your application. The characteristics shown (diagonals) are based on an air drive pressure of 6 bar.

Example: The operating pressure of your example application is 600 bar and the pump capacity 1.0 l/min. The process parameter combination is marked in the diagram as a grey point. Only those pump series are suitable for your application whose characteristics are located in the window at the upper right of the point (rectangle in the diagram). In order to avoid over-dimensioning, select the pump series nearest to the point: in this case, the G...D pumps.

Step 2: Pump selection
The pump selection is now made based on the pump capacity tables on pages 27-33. In this example, the G150D would meet the desired performance parameters.



The performance data indicated here were determined with optimal flow cross-sections and the required volume flow for driving air.

MAXIMATOR Hydraulic Units

Components in modular design:		
1 Pump model	all M-, S-, G-, GX-, GPD- and DPD-Series pumps	
2 Air control unit	comprising combined filter pressure regulator, control pressure gauge and shut-off valve:	
	C1	for M-Series
	C1.5	for S-Series
	C2	for G-Series
	C3	for GX-, GPD- and DPD-Series
3 Air safety valve	SV mounted in the air line	
4 Tank sizes	6,5 liter, 13 liter, 30 liter, 70 liter, standard of aluminium, stainless steel on request	
5 Mobility of the packaged pump system	F	mobile (with wheels),
	T	portable (with handles),
	K	jack ring
6 Pressure gauge	Pressure range / Diameter of the housing (cl. 1.6/1.0/0.6, glycerine damped)	
7 Operating medium	O	Oil (tank of aluminium, components galvanized)
	W	Water (tank of aluminium, components of stainless steel)
	VA	Stainless steel (tank und components of stainless steel)
8 Relief valve	EV	with return line to the tank
9 Manifold block with pressure outlet(s)	A1	1 pressure outlet to
	A6	6 pressure outlets as maximum (depending on tank size)
	V	Option: Shut-off valve for each pressure outlet (AV1-AV6)
10 Other options:	SCHW	Float valve for automatic filling of the tank, i. e. from the water line
	SCHL	High pressure hose
	ZR	Additional return connection
11 Specials	on request	

Coding example:

G400-2/C2/SV/30/F/EV/0-7000(160)/W/AV2/VA, comprising:

G400-2 = MAXIMATOR air driven liquid pump Type G400-2

C2 = Air control unit „C2“, comprising:
- combined filter pressure regulator
- control pressure gauge 0–10 bar (ø 40 mm)
- shut-off valve

SV = Safety valve

30 = Tank size 30 liter

F = mobile (with wheels)

EV = Manually operated relief valve

0 – 7000 (160) = Pressure gauge 0 to 7000 bar, diameter 160 mm

W = for water service

AV2 = Manifold block with two pressure outlets and shut-off valves

VA = Tank of stainless steel