Mobile Hydraulic Pumps T6*M

Denison Vane Technology, fixed displacement

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

Parker

ENGINEERING YOUR SUCCESS.

Contents

Parker Hannifin SAS
VPDE, Denison Vane Pumps
Vierzon - France

GREATER FLOW

Greater flow for the envelope size is achieved by increased displacement cam rings at high permissible speeds with atmospheric inlet
C → 3 to 31 GPM, 10 to 100 ml/rev.
D → 14 to 50 GPM, 48 to 158 ml/rev.
E → 42 to 72 GPM, 132 to 227 ml/rev.

HIGHER PRESSURE

Pressure ratings to 275 bar reduce size and cost of actuators, valves and lines, give extended life at reduced pressures.

BETTER EFFICIENCY

Better efficiency under load increases productivity, reduces heating and operating costs.

MOUNTING FLEXIBILITY

Up to 32 positions for double pumps and up to 128 for triple pumps: this reduces mounting costs and improves performance.

LOWER NOISE LEVELS

Increase operator safety and acceptance.

COMPLETE CONFORMITY

To SAE - J744c 2-bolt standards and to ISO 3019-1 (T6EDCS SAE E, T6EDCM ISO 3019/2) in the various keyed and splined shaft options offered.

CARTRIDGE DESIGN

Provides for drop-in assemblies. This allows easy conversion or renewal of serviceable elements in minutes at minimum expense and risk of contamination. The "C" & "D" cartridge pumps are birotational and indicated by "B" description in cartridge model number. Pump rotation is easy to change by changing position of cam ring on port plate dowel pin hole.

WIDER RANGE OF ACCEPTABLE VISCOSITIES

Viscosities from 2000 to 10 cSt permit colder starts and hotter running. The balanced design compensates for wear and temperature changes. At high viscosity or cold temperature, the rotor to side plates gap is well lubricated and improves mechanical efficiency.

FIRE RESISTANT FLUIDS

Including phosphate esters, chlorinated hydrocarbons, water glycols and invert emulsions may be pumped at higher pressures and with longer service life by these pumps.

GENERAL APPLICATIONS INSTRUCTIONS

1. Check speed range, pressure, temperature, fluid quality, viscosity and pump rotation.
2. Check inlet conditions of the pump, if it can accept application requirement.
3. Type of shaft : if it would support operating torque.
4. Coupling must be chosen to minimize pump shaft load (weight, misalignment).
5. Filtration : must be adequate for lowest contamination level.
6. Environment of pump : to avoid noise reflection, pollution and shocks.

Speed and pressure ratings

Size	Series	Theoretical Displacement Vi	Minimum Speed	Maximum Speed HF-0,HF-1 HF-2	Maximum Speed HF-3, HF-4 HF-5	Maximum Pressure HF-0, HF-2 Int.	Maximum Pressure HF-0, HF-2 Cont.	Maximum Pressure HF-1, HF-4, HF-5 Int	Maximum Pressure HF-1, HF-4, HF-5 Cont	Maximum Pressure HF-3 Int	Maximum Pressure HF-3 Cont
		ml/rev.	RPM	RPM	RPM	bar	bar	bar	bar	bar	bar
	B03	10,8									
	B05	17,2									
	B06	21,3									
	B08	26,4									
	B10	34,1									
CM CP	B12	37,1	400	2800	1800	275	240	210	175	175	140
	B14	46,0									
	B17	58,3									
	B20	63,8									
	B22	70,3									
	B25	79,3									
	B28	88,8		2500		210	160		160		
	B31	100,0									
	B14	47,6									
	B17	58,2									
	B20	66,0									
	B24	79,5									
DM DP	B28	89,7	400	2500	1800	240	210	210	175	175	140
	B31	98,3									
	B35	111,0									
	B38	120,3									
	B42	136,0									
	B45	145,7		2200							
	B50	158,0				210	160		160		
	042	132,3									
	045	142,4									
EM EP	050	158,5									
	052	164,8	400	2200	1800	240	210	210	175	175	140
	062	196,7									
	066	213,3									
	072	227,1									

HF-0, HF2 = Antiwear Petroleum Base
HF-1 = Non Antiwear Petroleum Base
HF-5 = Synthetic Fluids
HF-3 = Water in oil Emulsions
HF-4 = Water Glycols

For further information or if the performance characteristics outlined above do not meet your own particular requirements, please consult your local Parker office.

PRIMING AT STARTING

At first, start operation of the pump shaft at the lowest speed and at the lowest pressure to obtain priming. When a pressure relief valve is used at the outlet, it should be backed off to minimize return pressure.
When possible, an air bleed off should be provided in the circuit to facilitate purging of system air.
Never operate pump shaft at top speed and pressure without checking for completion of pump priming, and the fluid has no aeration disaerated.

Minimum allowable inlet pressure (bar absolute)

Cartridge		Speed RPM								Series
Size	Series	1200	1500	1800	2100	2200	2300	2500	2800	
	B03									B03
	B05						0,80	0,90		B05
	B06					0,80			1,00	B06
	B08				0,80					B08
	B10									B10
CM CP	B12	0,80	0,80	0,80			0,85	0,92		B12
	B14							0,95		B14
	B17					0,85			1,03	B17
	B20						0,90			B20
	B22				0,85	0,90		0,98	1,05	B22
	B25				0,90	0,95	0,95	1,05		B25
	B28					0,98	0,98	1,08		B28
	B31				0,85	0,90	1,00	1,11		B31
	B14				0,80	0,88	0,95	1,00		B14
	B17									B17
	B20									B20
	B24			0,80	0,82			1,10		B24
DM DP	B28	0,80	0,80		0,85	0,92	1,00	1,18		B28
	B31				0,90	0,95		1,23		B31
	B35				0,92	0,98	1,02	1,29		B35
	B38				0,95	1,00	1,05			B38
	B42					1,02	1,08			B42
	B45			0,85	0,98	1,05				B45
	B50				1,02	1,09				B50
	042				0,88					042
	045									045
EM EP	050	0,80	0,80	0,80	0,90	1,00				050
	052									052
	062			0,85	0,95					062
	066	0,85	0,85	0,95	1,00	1,09				066
	072			0,85		1,05				072

Inlet pressure is measured at inlet flange with petroleum base fluids at viscosity between 10 and 65 cSt. The difference between inlet pressure at the pump flange and atmospheric pressure must not exceed 0.2 bar to prevent aeration.

Multiply absolute pressure by 1,25 for HF-3, HF-4 fluids.
by 1,35 for HF-5 fluid.
by 1,10 for ester or rapeseed base.

Use highest cartridge absolute pressure for double & triple pump.

GENERAL CHARACTERISTICS

	Mounting standard	Weight without connector and bracket - kg	Moment of inertia $kgm^2 \times 10^{-4}$	SAE 4 bolts J518c - ISO/DIS 6162-1 - [4)] ISO/DIS 6162-2			
				Suction	Pressure		
T6CM	SAE J744c ISO/3019-1 SAE B	15,7	7,5	1.1/2"	1"		
T6CP	SAE J744c ISO/3019-1 SAE C	18,0	7,8	2"[4)]	1.1/4"[4)]		
T6D*		24,0	23,3	2"	1.1/4"		
T6E*		43,3	51,5	3"	1.1/2"		
T6CC*	SAE J744c ISO/3019-1 SAE B	26,0	14,9	2.1/2" or 3"	P1	P2	
					1"	1" or 3/4"	
T6DC*	SAE J744c ISO/3019-1 SAE C	36,6	30,4	3"	1.1/4"	1"	
T6EC*		55,0	73,4	3.1/2"	1.1/2"	1"	
T6ED*		66,0	73,4	4"	1.1/2"	1"1/4	
T6DCC*		61,0	37,3	4"	P1	P2	P3
					1.1/4"	1"	1" or 3/4"
T6EDC*	SAE "E" (T6EDCS) ISO/3019-2 (T6EDCM)	100,0	80,2	4"	1.1/2"	1.1/4"	1" or 3/4"

Parker Hannifin SAS
VPDE, Denison Vane Pumps
Vierzon - France

CALCULATION

To resolve			Performances required			
Volumetric displacement	Vi	[ml/rev.]	Requested flow	Q	[l/min]	60
Available flow	Q	[l/min]	Speed	n	[R.P.M.]	1500
Input power	P	[kW]	Pressure	p	[bar]	150

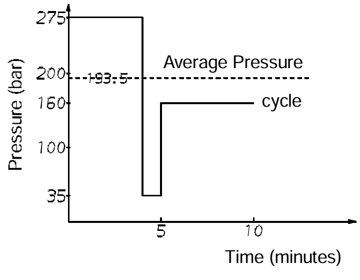
ROUTINE AND EXAMPLE

Routine :	Example :
1. First calculation $Vi = \frac{1000\,Q}{n}$	$Vi = \frac{1000 \times 60}{1500} = 40$ ml/rev
2. Choice Vi of pump immediately greater (see tabulation)	T6CM B14 Vi = 46 ml/rev.
3. Theoretical flow of this pump $Q_{theo.} = \frac{Vi \times n}{1000}$	$Q_{theo.} = \frac{46 \times 1500}{1000} = 69$ l/min
4. Find $Q_{per.}$ *leakage function of pressure* $Q_{per.} = f(p)$ *on curve at 10 or 24 cSt*	T6CM (page 10) : $Q_{per.}$ = 5 l/min at 150 bar, 24 cSt
5. Available flow $Q = Q_{theo.} - Q_{per.}$	Q = 69 - 5 = 64 l/min
6. Theoretical input power $P_{theo.} = \frac{Q_{theo.} \times p}{600}$	$P_{theo.} = \frac{69 \times 150}{600} = 17{,}3$ kW
7. Find ps hydrodynamic power loss on curve	T6CM (page10) : Ps at 1500 R.P.M., 150 bar = 1,5 kW
8. Calculation of necessary input power $P_{eff.} = P_{theo.} + Ps$	P = 17,3 + 1,5 = 18,8 kW
9. Results	Vi = 46,0 ml/rev $Q_{eff.}$ = 64,0 l/min $P_{eff.}$ = 18,8 kW } T6CM B14

These calculation steps must be followed for each application.

INTERMITTENT PRESSURE RATING

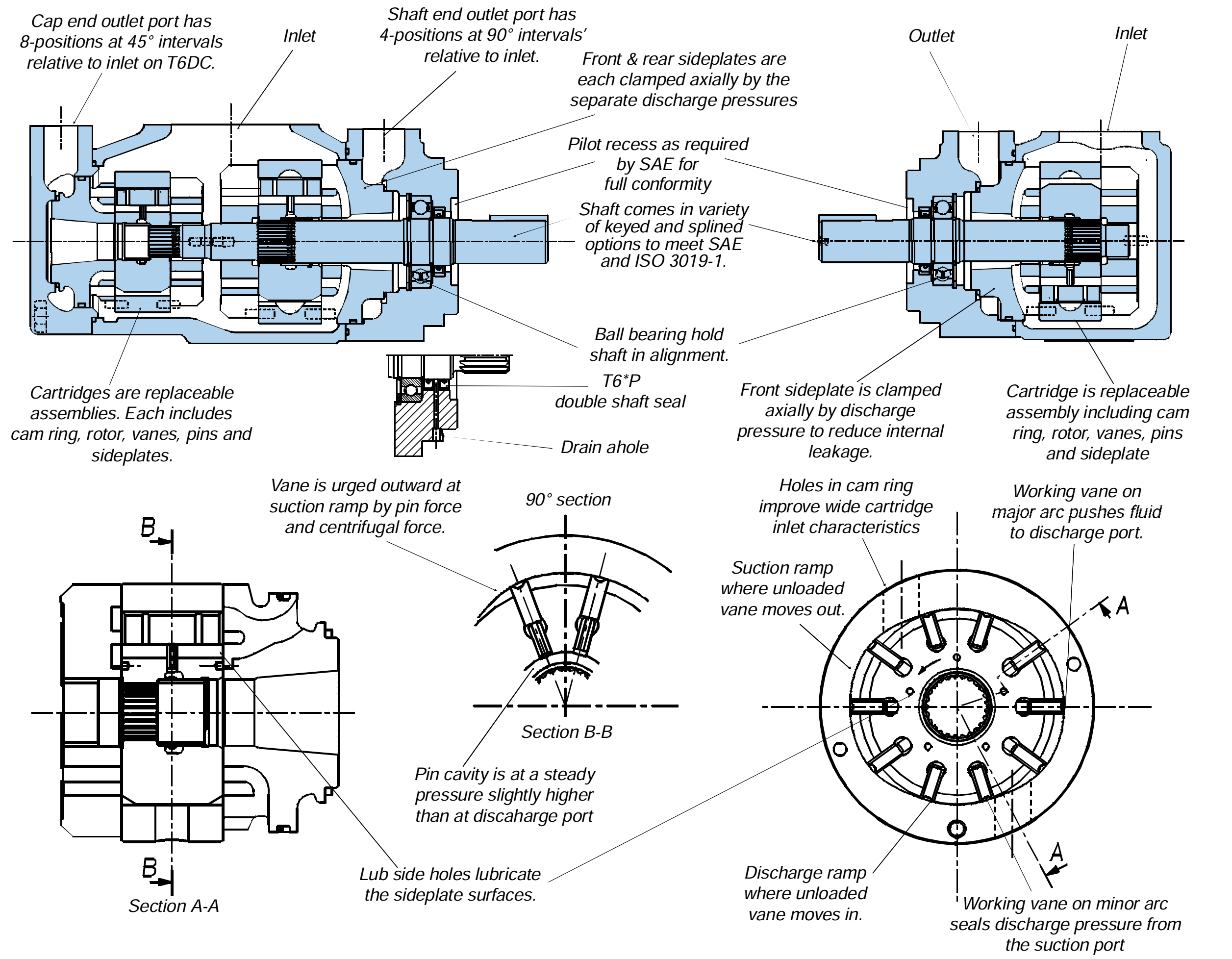
T6 units may be operated intermittently at pressures higher than the recommended continuous rating when the time weighted average of pressure is less than or equal to the continuous duty pressure rating.
This intermittent pressure rating calculation is only valid if other parameters; speed, fluid, viscosity and contamination level are respected.
For total cycle time higher than 15 minutes, please consult your Parker representative.



Example : T6CM - B14
Duty cycle 4 min. at 275 bar
1 min. at 35 bar
5 min. at 160 bar

$$\frac{(4 \times 275) + (1 \times 35) + (5 \times 160)}{10} = 193{,}5 \text{ bar}$$

193,5 bar is lower than 240 bar allowed as continuous pressure for T6CM - B14 with HF-0 fluid.



APPLICATION ADVANTAGES

- The high pressure capability to 275 bar, in the small envelope, reduces installation costs and provides extended life at reduced pressure.
- The high volumetric efficiency, typically 94%, reduces heat generation, and allows speeds down to 400 RPM at full pressure.
- The high mechanical efficiency, typically 94%, reduces energy consumption.
- The wide speed range from 400 RPM to 2800 RPM, combined with large size cartridge displacements, will optimize operation for the lowest noise level in the smallest envelope.
- The low speed 400 RPM, low pressure, high viscosity 2000 cSt allow application in cold environments with minimum energy consumption and without seizure risk.
- The low ripple pressure ± 2 bar reduces piping noise and increases life time of other components in the circuit.
- The high resistance to particle contamination because of the double lip vane increases pump life.
- The large variety of options (cam displacement, shaft, porting) allows customized installation.
- The shaft option T (SAE J718c), allows direct drive (at 540 or 1000 RPM) on tractors.
- The double shaft seal (T6*P version) and drain hole allow direct mounting onto gear boxes.

RECOMMENDED FLUIDS

Petroleum based antiwear R & O fluids.
These fluids are the recommended fluids for T6 series pumps. Maximum catalog ratings aand performance data are based on operation with these fluids. These fluids are covered by DENISON fluid specifications HF-0 and HF-2.

ACCEPTABLE ALTERNATE FLUIDS

The use of fluids other than petroleum based antiwear R & O fluids, requires that the maximum ratings of the pumps will be reduced. In some cases the minimum replenishment pressures must be increased. Consult specific sections for more details.

VISCOSITY

Max (cold start, low speed & pressure)	2000	mm^2/s (cSt)
Max (full speed & pressure)	108	mm^2/s (cSt)
Optimum (max. life)	30	mm^2/s (cSt)
Min (full speed & pressure for HF-1, HF-3, HF-4 & HF-5 fluids)	18	mm^2/s (cSt)
Min (full speed & pressure for HF-0 & HF-2 fluids)	10	mm^2/s (cSt)

VISCOSITY INDEX

90° min. higher values extend range of operating temperatures.

Maximum fluid temperature (θ) °C

HF-0, HF-1, HF-2	+ 100°
HF-3, HF-4	+ 50°
HF-5	+ 70°
Biodegradable fluids (esters & rapeseed base)	+ 65°

Minimum fluid temperature (θ) °C

HF-0, HF-1, HF-2, HF-5	- 18°
HF-3, HF-4	+ 10°
Biodegradable fluids (esters & rapeseed base)	- 20°

FLUID CLEANLINESS

The fluid must be cleaned before and during operation to maintain contamination level of NAS 1638 class 8 (or ISO 19/17/14) or better. Filters with 25 micron (or better ß10 ≥ 100) nominal ratings may be adequate but do not guarantee the required cleanliness levels. Suction strainers must be of adequate size to provide minimum inlet pressure specified. 100 mesh (149 micron) is the finest mesh recommended. Use oversize strainers or omit them altogether on applications which require cold starts or use fire resistant fluids.

OPERATING TEMPERATURES AND VISCOSITIES

Operating temperatures are a function of fluid viscosities, fluid type, and the pump. Fluid viscosity should be selected to provide optimum viscosity at normal operating temperatures. For cold starts the pumps should be operated at low speed and pressure until fluid warms up to an acceptable viscosity for full power operation.

WATER CONTAMINATION IN THE FLUID

Maximum acceptable content of water.
- 0,10 % for mineral base fluids.
- 0,05 % for synthetic fluids, crankcase oils, biodegradable fluids.

If amount of water is higher, then it should be drained off the circuit.

COUPLINGS AND FEMALE SPLINES

- The mating female spline should be free to float and find its own center. If both members are rigidly supported, they must be aligned within 0,15 TIR or less to reduce fretting. The angular alignment of two spline axes must be less than ± 0,05 per 25,4 radius.
- The coupling spline must be lubricated with a lithium molydisulfide grease or a similar lubricant.
- The coupling must be hardened to a hardness between 27 and 45 R.C.
- The female spline must be made to conform to the Class 1 fit as described in SAE-J498b (1971). This is described as a Flat Root Side Fit.

KEYED SHAFTS

Parker supplies the T6 series keyed shaft pumps with high strength heat-treated keys. Therefore, when installing or replacing these pumps, the heat-treated keys must be used in order to insure maximum life in the application. If the key is replaced it must be a heat-treated key between 27 and 34 R.C. hardness. The corners of the keys must be chamfered from 0,76 to 1,02 at 45° to clear radii in the key way.

NOTE

Alignment of keyed shafts must be within tolerances given for splined shafts.

SHAFT LOADS

These products are designed primarily for coaxial drives which do not impose axial or side loading on the shaft. Consult specific sections for more details.