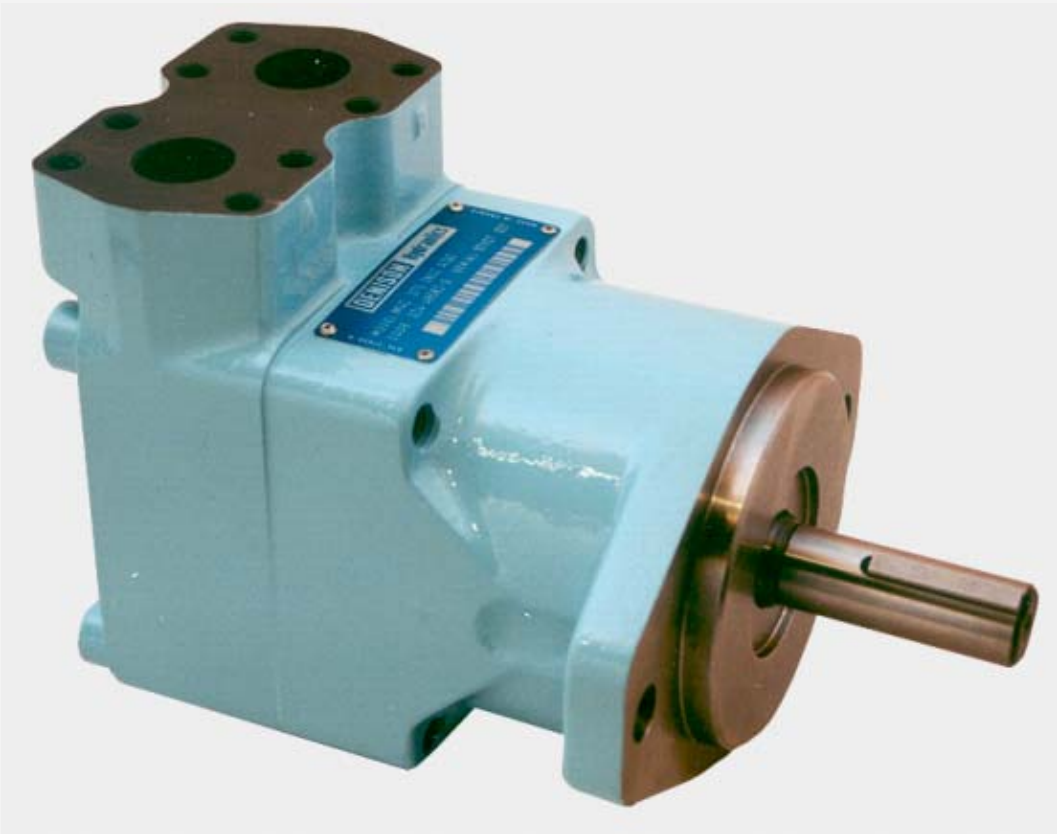
Vane motors
single & double
M3B - M4 / M4S series



Publ. 2 - EN1700 - A 01 / 02 / 3000 / FB Replaces : 2 - EN 157 - B L13 - 21700 - 1

DENISON Hydraulics

CONTENTS - M3* AND M4* SERIES

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

HIGH STARTING TORQUE EFFICIENCY

The high starting torque efficiency of vane type motors makes them especially applicable in load hoist winch drives, swing drives and propulsion drives. This high starting torque efficiency allows the motor to start under high load without pressure overshoots, jerks and high instantaneous horsepower loads.

HIGH VOLUMETRIC EFFICIENCY

Vane motors begin life with high volumetric efficiency and maintain that efficiency throughout their operating life.

LOW TORQUE RIPPLE AT LOW SPEED

When operating at very low speeds on applications such as swing and load hoist drives, the vane motor exhibits very low torque ripple.

2 AND 3-SPEED VERSIONS AVAILABLE

The M4DC, because of its unequal size cartridges, allows the use of-3 speed operation. This makes them more applicable in traction drive circuits to replace manually shifted gear-boxes. 2-speed motors are available in a wider range of ratios than standard gear motors.

BALANCED DESIGN

Vane, rotor and cam ring are pressure balanced to increase life and efficiency over full speed range.

INTERCHANGEABLE ROTATING GROUPS

Rotating groups may be easily replaced to renew the motor or change displacement to suit altered requirements for speed or torque.

REVERSIBLE ROTATION

The motors may be stopped or reversed repeatedly and rapidly driving or braking the connected shaft load at controlled torque levels.

WIDE SPEED RANGE

Starting to maximum RPM, with full torque capability during acceleration.

PORTS AND MOUNTING

Conform fully to SAE J744c (ISO-3019-1) standards to simplify refitting and installation.

FIRE RESISTANT FLUIDS

Are easily used in the standard M3B and M4* versions of these motors. These include phosphate or organic ester fluids and blends, water-glycol solutions and water-oil invert emulsions.

M3B AND M4* SERIES MOTORS

The M3B and M4* have been designed especially for severe duty applications which require high pressure up to 230 bar, high speed up to 4000 RPM and low fluid lubricity (HF-1, HF-2A, HF-3, HF-4, HF-5).

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Series	Size	Displ.	Theor. Displ. V_i	Torque T	Power at 100 Rev/min	Torque T	Power P
						n = 2000 RPM at Δ p 175 bar	
			ml/rev.	Nm/bar	kW/bar	N.m	kW
M3	B B1	009	9,2	0,130	0,0015	19,7	4,3
		012	12,3	0,186	0,0020	26,7	5,8
		018	18,5	0,304	0,0032	46,6	10,0
		027	27,8	0,485	0,0050	77,4	16,3
		036	37,1	0,624	0,0065	102,0	21,1
M4	C C1 SC SC1	024	24,4	0,39	0,0040	60,5	12,7
		027	28,2	0,45	0,0047	70,0	14,7
		031	34,5	0,55	0,0058	86,8	18,0
		043	46,5	0,74	0,0078	120,0	25,1
		055	58,8	0,93	0,0098	149,0	31,2
		067	71,1	1,13	0,0120	170,0	35,6
		075	80,1	1,27	0,0130	198,0	41,5
	D D1 SD SD1	062	65,1	1,04	0,0110	165,0	34,6
		074	76,8	1,22	0,0130	200,0	41,9
		088	91,1	1,45	0,0150	236,0	49,4
		102	105,5	1,68	0,0180	264,0	55,3
		113	116,7	1,86	0,0200	300,0	62,8
		128	132,4	2,11	0,0220	340,0	71,2
		138	144,4	2,30	0,0240	372,0	77,9
	E E1 SE/SE1	153	158,5	2,52	0,0260	398,0	83,4
		185	191,6	3,05	0,0320	484,0	101,4
		214	222,0	3,53	0,0370	567,0	118,8
	DC DC1 SDC SDC1	See M4C/C1/SC/SC1 and M4D/D1/SD/SD1					

Internal drain : All these motors may be equiped with internal drain. Then the model numbers will be M3B1, M4C1, M4SC1, M4D1, M4SD1, M4E1, M4SE1, M4DC1, M4SDC1.

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

GENERAL CHARACTERISTICS

	Mounting standard	Weight without connector and bracket - kg	Moment of inertia $kgm^2 \times 10^{-4}$	Option for inlet and outlet port	
M3B	SAE J744c ISO/3019-1 SAE A	8,0	3,0	SAE threaded SAE 4 bolt J718c ISO/DIS 6162-1 - 3/4" BSPP threaded	
M4C/SC	SAE J744c ISO/3019-1 SAE B	15,4	7,9	SAE threaded SAE 4 bolt J718c ISO/DIS 6162-1 - 1"	
M4D/SD	SAE J744c ISO/3019-1 SAE C	27,0	21,8	SAE threaded SAE 4 bolt J718c ISO/DIS 6162-1 - 1"1/4	
M4E/SE	SAE J744c ISO/3019-1 SAE C	45,0	58,5	SAE threaded SAE 4 bolt J718c ISO/DIS 6162-1 - 2"	
M4DC/SDC	SAE J744c ISO/3019-1 SAE C	40,0	29,4	SAE 4 bolt J718c ISO/DIS 6162-1 - 1"1/4	**P2 = See M4C/M4SC**

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

MAXIMUM SPEED, PRESSURE RATINGS - M3B AND M4* SERIES

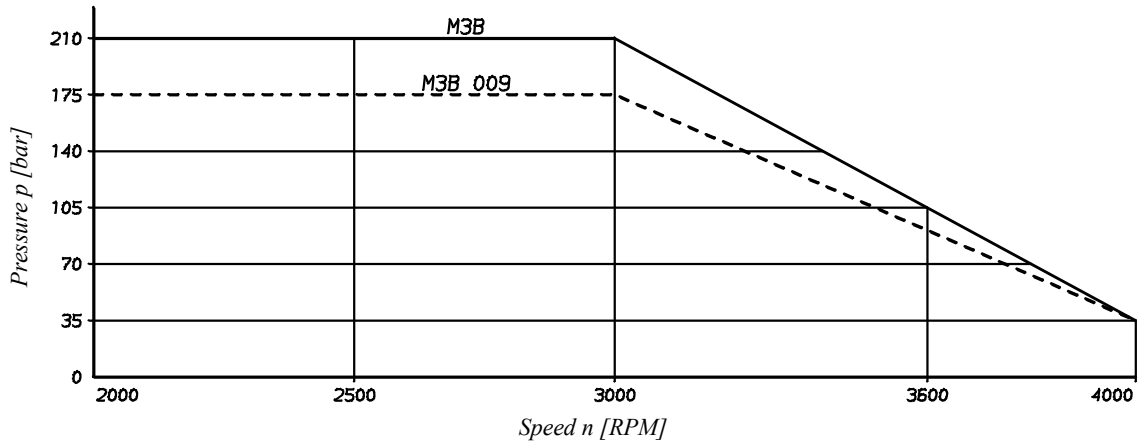
Series	Size	Displ.	Max. pressure					Operating pressure range drain	Max. speed for low loaded condition [1]	Max. speed for max. pressure ratings					
			HF-0 HF-2	HF-2A	HF-1	HF-3 HF-5	HF-4			HF-0, HF-2		HF-2A		HF-1	
										Cont.	Int.[2]	Cont.	Int.[2]	Cont.	Int.[2]
			bar	bar	bar	bar	bar	bar	RPM	RPM	RPM	RPM	RPM	RPM	RPM
M3	B B1	009	175					1,5	4000	3000	3600				
		012	210												
		018													
		027													
		036													
M4	C C1	024	175	175	175			3,5	4000	2500	3600	2500	3000	2000	2500
		027													
		031													
		043													
		055													
		067													
		075													
	SC SC1	024	230	210	175	175	140								
		027													
		031													
		043													
		055	210	210											
		067													
		075	175	175											
	D D1	062	175	175	140				4000	2500	3000	2500	2800	2000	2500
		074													
		088													
		102													
		113													
		128													
		138													
	SD SD1	062	230	190	140	140	140								
		074													
		088													
		102	210	190											
		113													
		128	190	190											
		138	175	175											
	E E1	153	175	175	140				3600	2500	3000	2500	2800	1800	2200
		185													
		214													
	SE SE1	153	190	175	140	140	140								
		185	180												
		214	175												
	DC DC1	All models	175	175	140				4000	2500	3000	2500	2800	2000	2500
	SDC SDC1	D-062 at 088	230	190	140	140	140								
		C-024 at 043													
		D-102	210	190											
		D-113													
		C-055													
		C-067													
		D-128	175	175											
		D-138													
		C-075													

1) Low loaded condition 35 bar for M3 and M4, 80 bar max. for M4S (see page 6).
2) Intermittent speed - Do not exceed 6 seconds per minute of operation.
HF-0, HF-2 = Antiwear petroleum base. HF-2A = Crankcase. HF-1 = Non antiwear petroleum base. HF-5 = Synthetic fluids.
HF-3 = Water in oil emulsions. HF-4 = Water glycols.
Internal drain : All these motors may be equiped with internal drain. Then the model numbers will be M3B1, M4C1, M4SC1, M4D1, M4SD1, M4E1, M4SE1, M4DC1, M4SDC1.

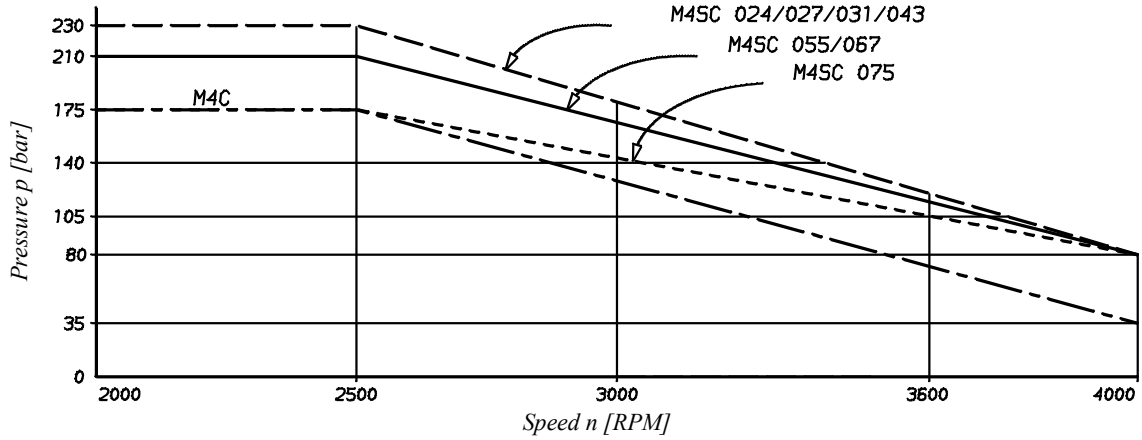
Parker Hannifin
Denison Vane Pump Division
Vierzon - France

MAX. SPEED AND MAX. CONTINUOUS PRESSURE - M3B AND M4* SERIES

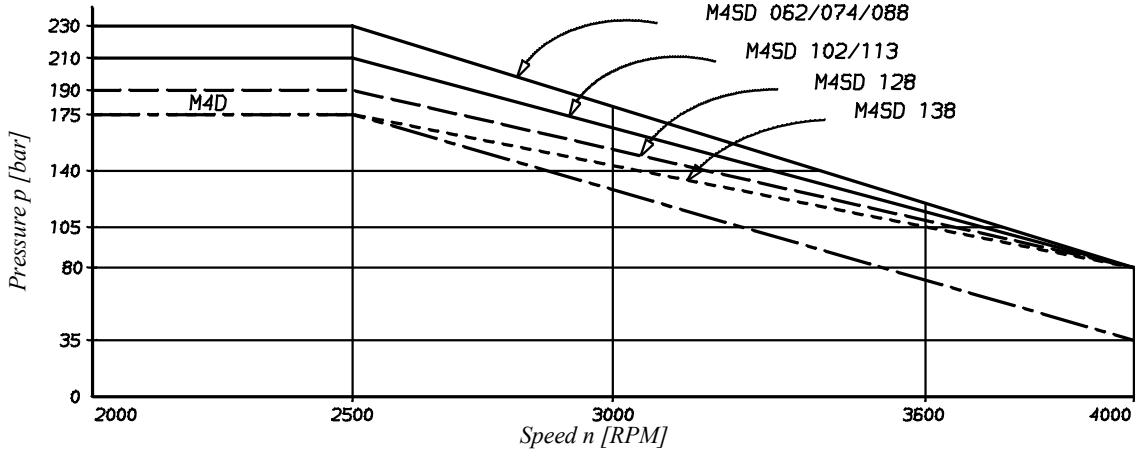
M3B



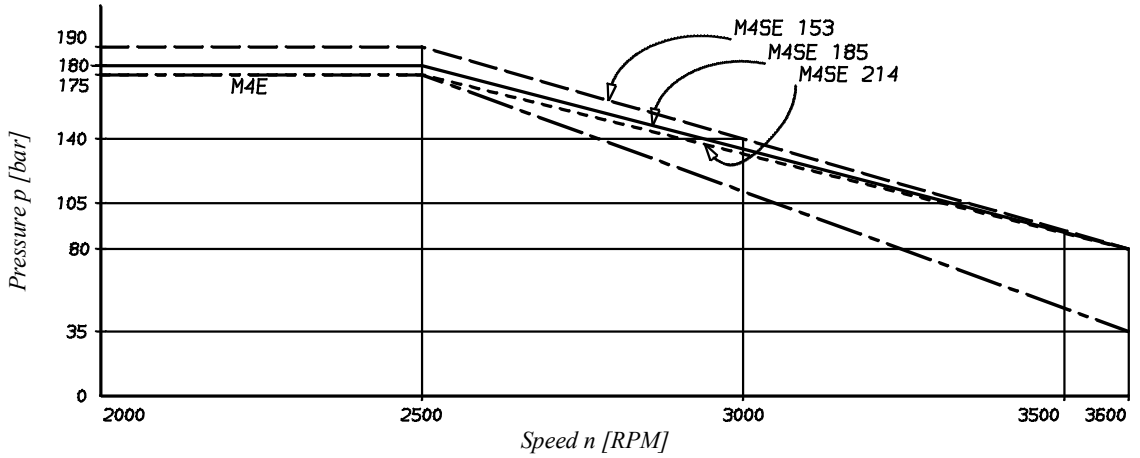
M4C/M4SC



M4D/M4SD



M4E/M4SE



Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Performances required			
Torque	*T*	*[N.m.]*	*140*
Pump flow (available) at 24 cSt	q_{Ve}	*[l/min]*	*115*
Speed	*n*	*[RPM]*	*1500*
Pressure	*p*	*[bar]*	*175*

1. Check if available power is compatible with required power (0.85 estimated overall efficiency).

$$0.85 \ x \ \frac{Q_{Ve} \ x \ p}{600} \geq \frac{T \ x \ \pi \ n}{30 \ x \ 1000}$$

$$0.85 \ x \ \frac{115 \ x \ 175}{600} \geq \frac{140 \ x \ \pi \ x \ 1500}{30 \ x \ 1000}$$

$28,5 > 22$

Two ways of calculation :

2a.Calculate V_i from T required torque

$$V_i = \frac{20 \ \pi \ x \ T}{p} = \frac{20 \ \pi \ x \ 140}{175} = 50,26 \ ^{ml}/_{rev.}$$

3a. Motor choose from V_i immediately greater
M4C 055 V_i = 58,8 ml/rev.

4a. Check real motor pressure for T = 140 Nm. around 1500 RPM
M4C 055 T = 140 N.m n = 1500 RPM
p = 163 bar (see page 15)

5a. Flow loss M4C 055 at 163 bar at 24 cSt
q_{Vs} = 16 l/min (see page 22)
Real flow used by the motor :
$q_V = q_{Ve} - q_{Vs} = 115 - 16 = 99$ l/min

6a. Real speed of the motor :

$$n = \frac{q_V \ x \ 1000}{V_i} = \frac{99 \ x \ 1000}{58,8} = 1680 \ RPM$$

Real performances
V_i = 58,8 ml/rev.
n = 1680 RPM
T = 140 Nm.
p = 163 bar
} *M4C 055*

2b. Calculate V_i from q_{Ve} available flow

$$V_i = \frac{1000 \ x \ 115}{1500} = 76,6 \ ^{ml}/_{rev.}$$

3b. Motor choose from V_i immediately smaller
M4C 067 V_i = 71,1 ml/rev. (see page 22)

4b. Check motor press. with T = 140 Nm. at 1500 RPM
M4C 067 T = 140 Nm. n = 1500 RPM
p = 140 bar (see page 15)

5b. Flow loss of M4C 067 at 140 bar at 24 cSt
q_{Vs} = 14 l/min (see page 22)
Real flow used by the motor :
$q_V = q_{Ve} - q_{Vs} = 115 - 14 = 101$ l/min

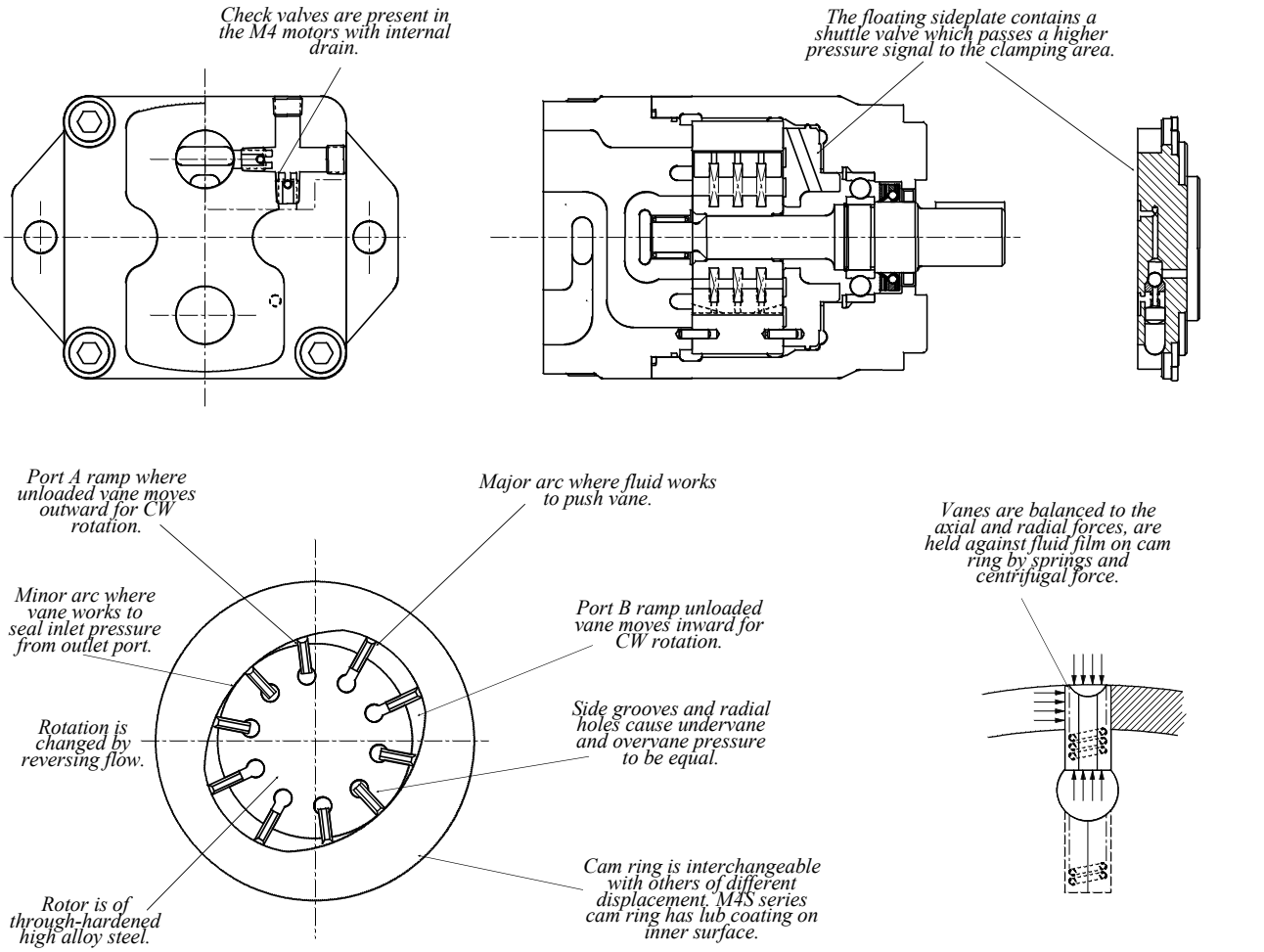
6b. Real speed of the motor :

$$n = \frac{q_V \ x \ 1000}{V_i} = \frac{101 \ x \ 1000}{71,1} = 1420 \ RPM$$

Real performances
V_i = 71,1 ml/rev.
n = 1420 RPM
T = 140 Nm.
p = 140 bar
} *M4C 067*

In each case always choose the smallest motor which will operate at the highest speed and pressure, and offers the most efficient solution.

Parker Hannifin
Denison Vane Pump Division
Vierzon - France



OPERATION - SINGLE CARTRIDGE

- The motor shaft is driven by the rotor. Vanes, closely fitted into the rotor slots move radially to seal against the cam ring. The ring has two major and two minor radial sections joined by transitional sections called ramps. These contours and the pressures exposed to them are balanced diametrically.
- Light springs urge the vanes radially against the cam contour assuring a seal at zero speed so the motor can develop starting torque. The springs are assisted by centrifugal force at higher speeds. Radial grooves and holes through the vanes equalize radial hydraulic forces on the vanes at all times. Fluid enters and leaves the motor cartridge through opening in the side plates at the ramps. Each motor port connects to two diametrically opposed ramps. Pressurized fluid entering at Port A torques the rotor clockwise. The rotor transports it to the ramp openings which connect to Port B from which it returns to the low pressure side of the system. Pressure at Port B torques the rotor counter-clockwise.
- The rotor is separated axially from the sideplate surfaces by the fluid film. The front sideplate is clamped against the cam ring by the pressure, maintains optimum clearance as dimensions change with temperature and pressure. A 3-way shuttle valve in the sideplate causes clamping pressure in Port A or B, whichever is the highest.
- Materials are chosen for long life efficiency. Vanes, rotor and cam ring are made out of hardened high alloy steels. Cast semi-steel sideplates are chemically etched to have a fine crystalline surface for good lubrication at start-up.

PORTS
EXTERNALLY DRAINED
SINGLE CARTRIDGE MOTORS

These motors may be alternately pressurized at Ports A & B to 230 bar max. Whichever port is at low pressure should not be subjected to more than 35 bar. If it is necessary to exceed these limitations, please contact DENISON Hydraulics for application assistance.

INTERNALLY DRAINED
TANDEM CARTRIDGE MOTORS

These motors must have a drain line connected to the center housing drain connection of sufficient size to prevent back pressure in excess of 3,5 bar, and returned to the reservoir below the surface of the oil as far away from the supply pump suction as possible. Model M4DC1 does not require an external drain line, howewer the outlet pressure must not exceed 3,5 bar.

INTERNALLY DRAINED MOTORS
(M4C1, M4D1, M4E1, M4DC1)

May be alternately pressurized at Ports A & B to 230 bar max. Whichever port is at low pressure must not be subjected to more than 1,5 bar for M3B, 3,5 bar for M4* (pressure peak 7 bar).
To insure maximum motor performance in conjunction with your specific application, consult your DENISON Hydraulics Representative if your application requires :

- minimum speed of less than 100 RPM,
- indirect drive,
- overrunning loads,
- braking or retarding.

M4S SEVERE DUTY MOTORS

M4S motors are recommended to be used when back pressure is over 140 bar and speed is over 2000 RPM. They are also recommended when fluid viscosity can be under 25 cSt and speed over 2000 RPM. For such severe duty applications M4S motors will exhibity longer life time at high efficiency.

RECOMMENDED FLUIDS

Petroleum based antiwear R & O fluids.
These fluids are the recommended fluids for M3B and M4* series motors. Maximum catalog ratings and performance data are based on operation with these fluids. These fluids are covered by DENISON Hydraulics HF-0 and HF-2 specifications.

ACCEPTABLE ALTERNATE FLUIDS

Acceptable alternate fluids :
The use of fluids other than petroleum based antiwear R & O fluids requires that the maximum ratings of the motors will be reduced. In some cases, the minimum replenishment pressures must be increased. Refer to the following chart and the operating characteristics chart for each M3B and M4* motor model for specific details of the reduced ratings.

VISCOSITY

Max. (cold start, low speed & pressure)	860 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 fluid)	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 and life time.

Maximum fluid temperature (θ) °C	
HF-0, HF-1, HF-2	+ 100°
Minimum fluid temperature (θ) °C	
HF-0, HF-1, HF-2	- 18°

FLUID CLEANLINESS

The fluid must be cleaned before and during operation to maintain contamination level of NAS 1638 class 8 (or ISO 18/14) or better. Filters with 25 micron (or better, ß10 ≥ 100) nominal ratings may be adequate but do not guarantee the required cleanliness levels.

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.

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

SPLINED SHAFTS
COUPLINGS 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 ± 0,002 mm/mm.
- 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 HRc.
- The female spline must be made to confom to the Class 1 fit as described in SAE-J498b (1971). This is described as a Flat Root Side Fit.

KEYED SHAFT

DENISON Hydraulics supplies the M3B and M4* series keyed shaft motors with high strength heat-treated keys. Therefore, when installing or replacing these motors, the heat-treated keys must be used in order to ensure 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 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

Axial or radial load are permissible. Consult specific sections for more details.

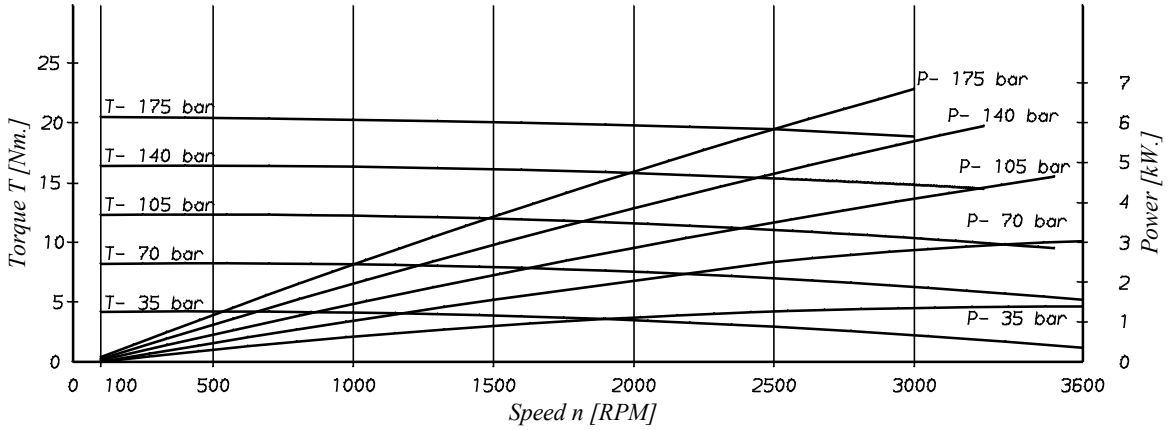
MINIMUM REPLENISHMENT PRESSURE (BAR)

Series	Speed [RPM] - Oil viscosity = 32 cSt				
	500	1000	2000	3000	3600
M3B	0,6	1,0	1,9	3,5	5,8
M4C/SC	0,7	1,4	3,1	5,5	9,3
M4D/SD	0,7	1,4	3,1	5,5	9,3
M4E/SE	1,4	2,8	5,2	11,0	
M4DC/SDC					
2-C-DC	1,7	3,8	10,0	22,4	28,3
2-D-DC	1,1	1,7	5,5	10,7	15,1
3-D-C-DC	1,7	3,8	10,0	22,4	28,3

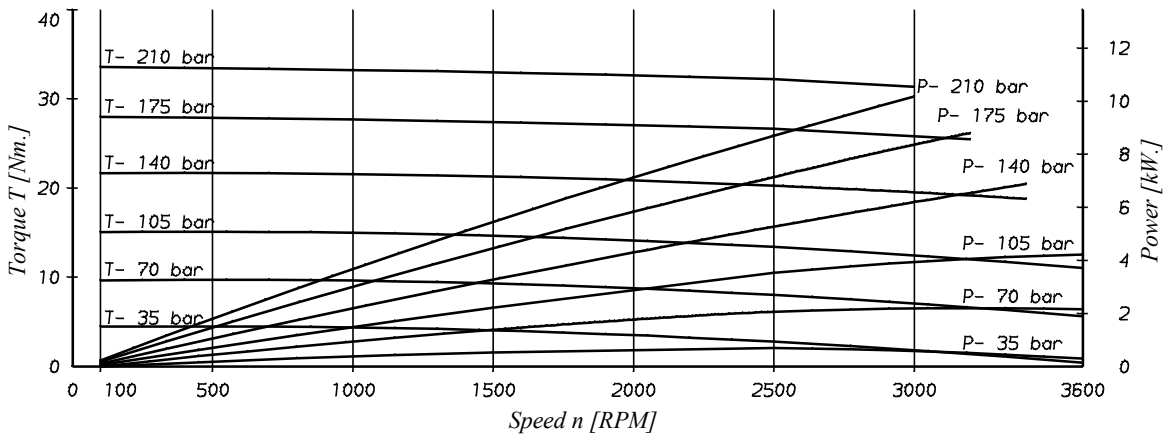
The inlet port of the fluid motor must be supplied with replenishment pressure as listed above to prevent cavitation during dynamic braking. These pressures should be multiplied by a coefficient of 1,5 for M4S motors used with fire resistant fluids (HF-3, HF-4, HF-5).
Replenishment pressure for tandem 2 & 3-speed motors must be provided during periods when the motor is dynamic braking, shutting down or coasting. When the motor is operating in the high speed mode and the nonworking cartridge is at low pressure, it is necessary to create a back pressure, as listed above, at the motor discharge port. The above mentioned minimum replenishment pressure chart is for maximum displacement cartridges. Smaller cartridges require lower minimum pressures.
Contact DENISON Hydraulics for further information.

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

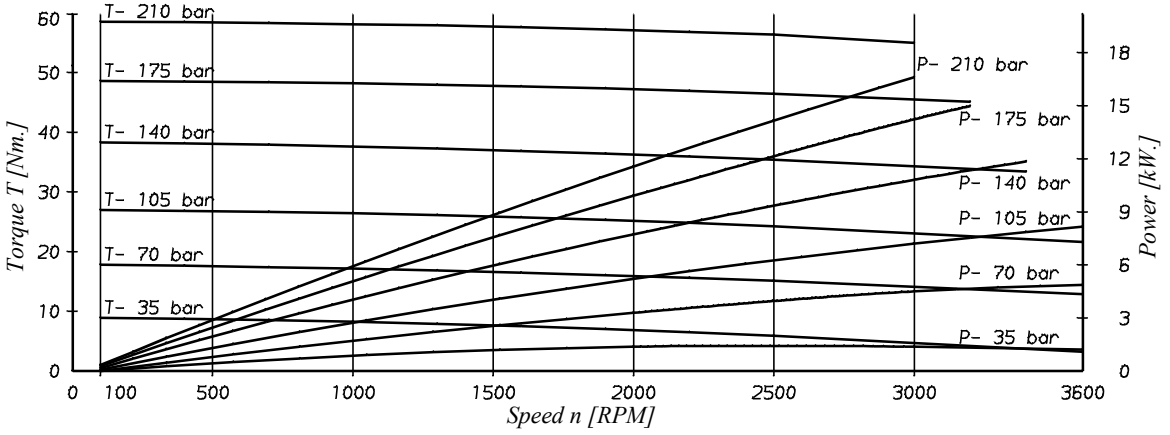
M3B 009



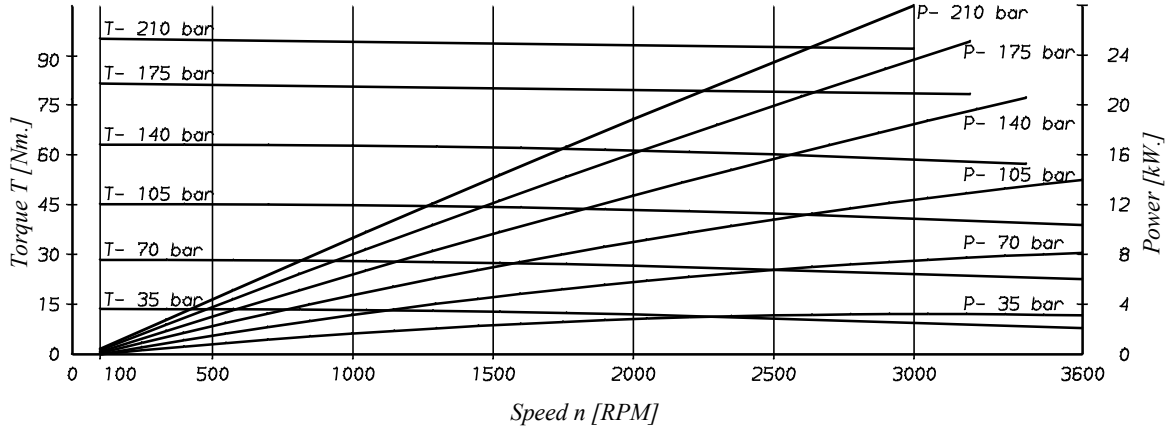
M3B 012



M3B 018

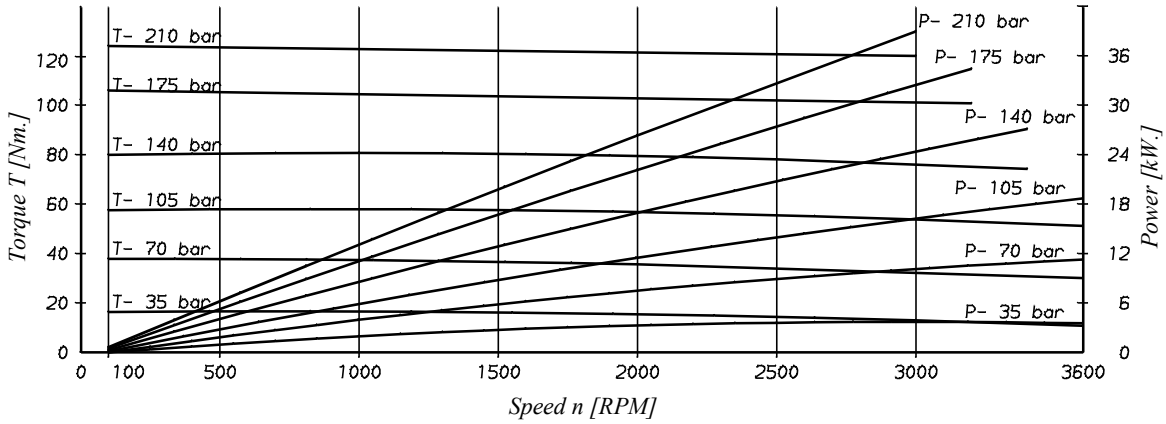


M3B 027



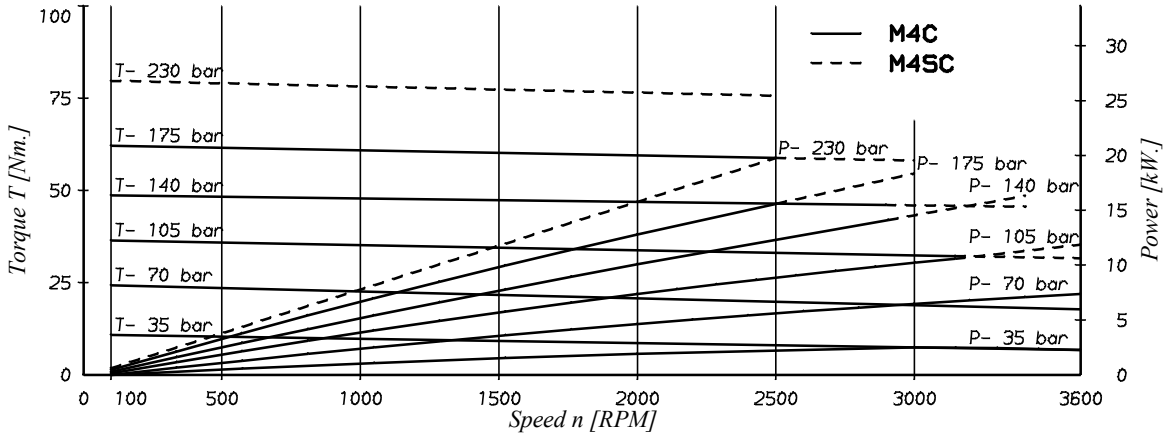
Parker Hannifin
Denison Vane Pump Division
Vierzon - France

M3B 036

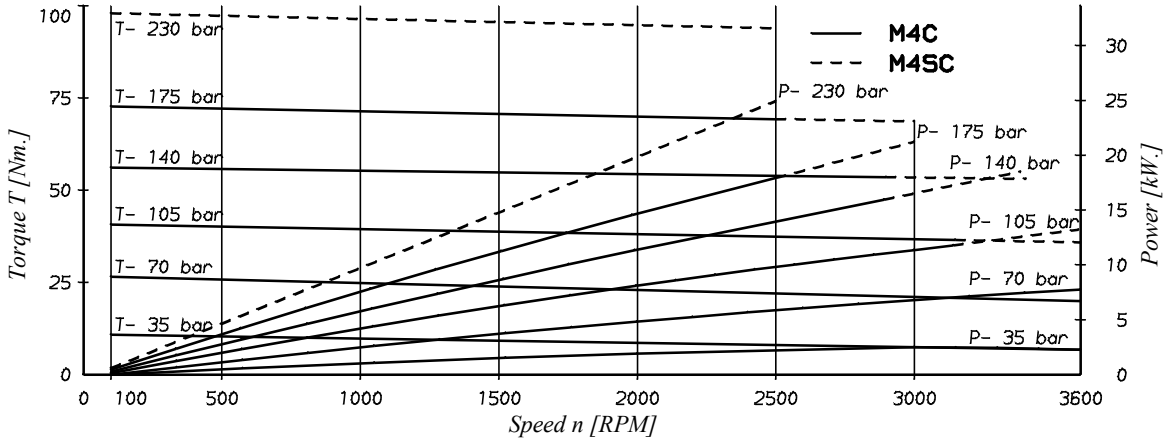


Parker Hannifin
Denison Vane Pump Division
Vierzon - France

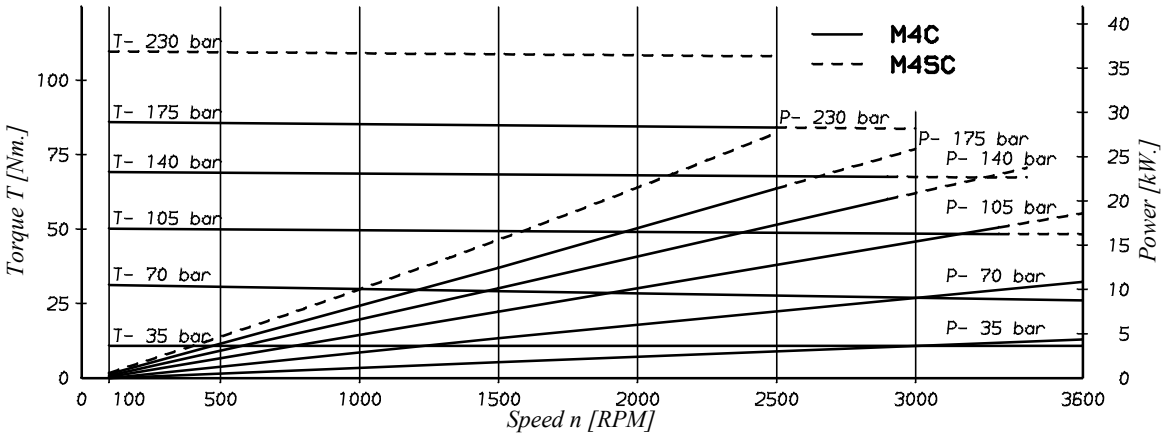
M4C 024



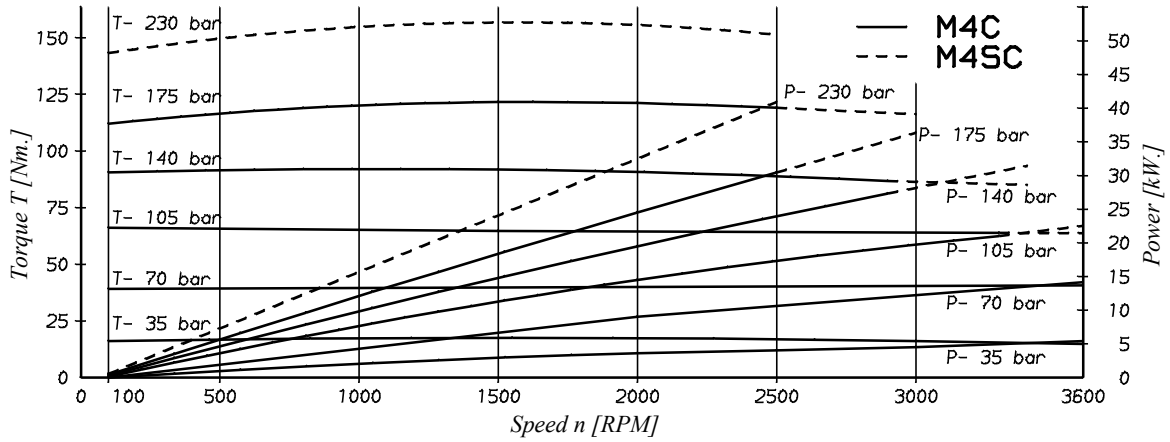
M4C 027



M4C 031

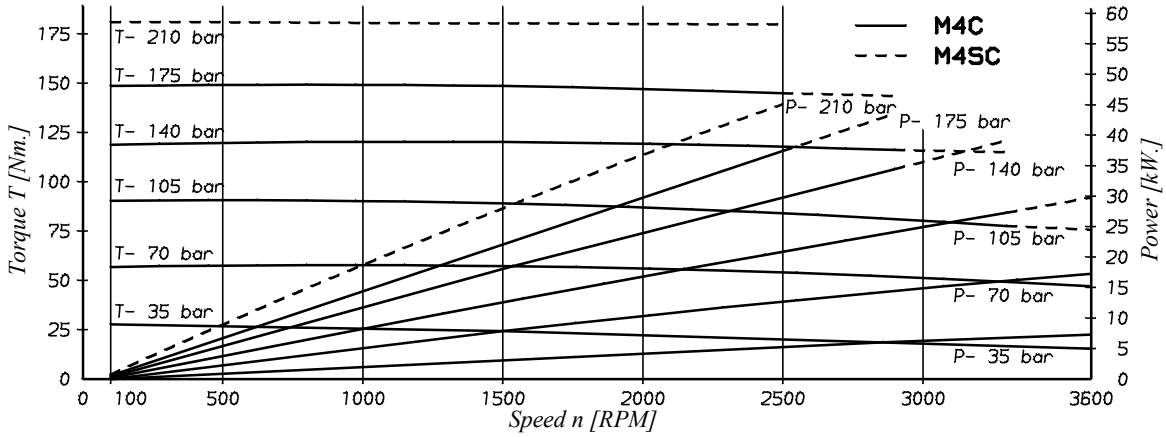


M4C 043

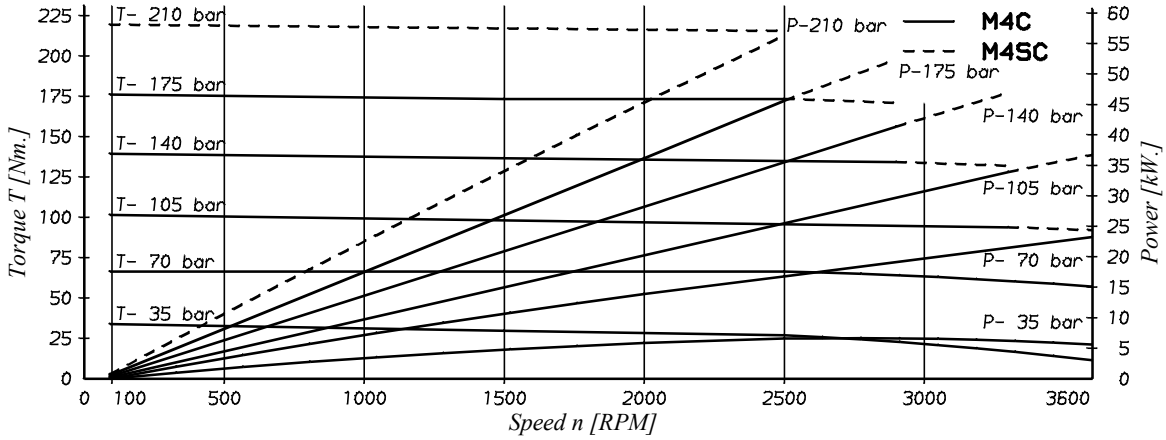


Parker Hannifin
Denison Vane Pump Division
Vierzon - France

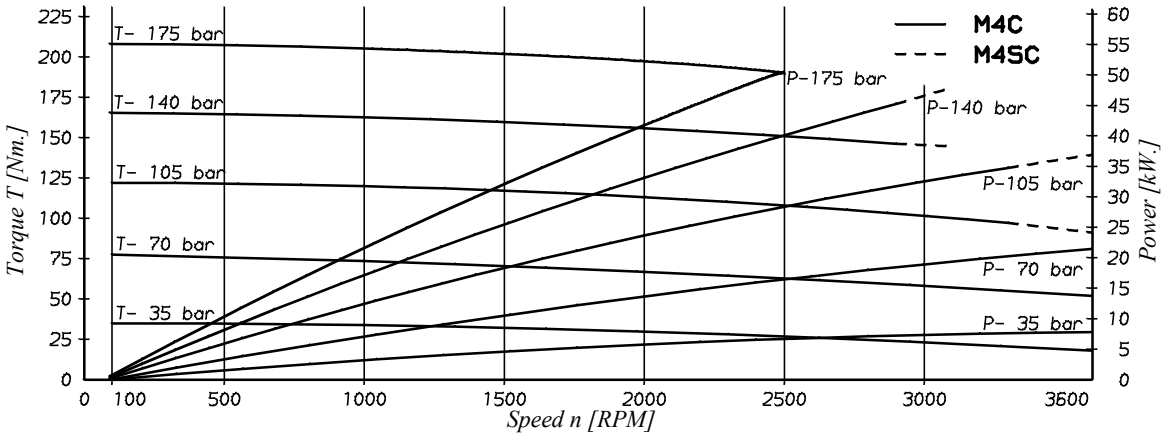
M4C 055



M4C 067

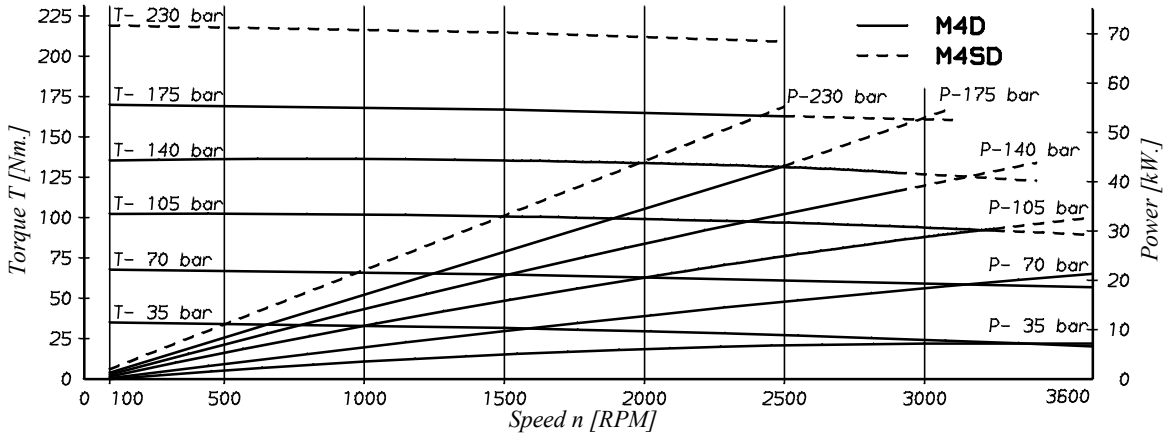


M4C 075

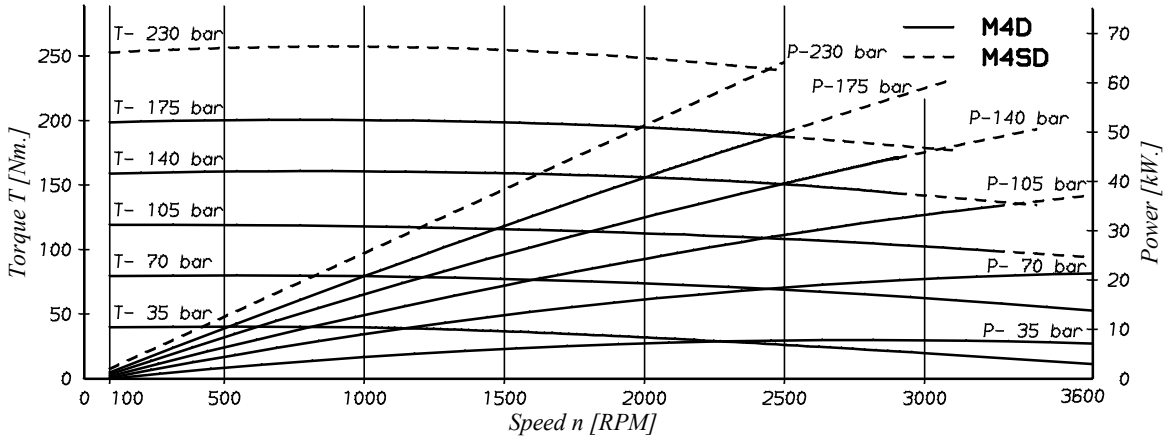


Parker Hannifin
Denison Vane Pump Division
Vierzon - France

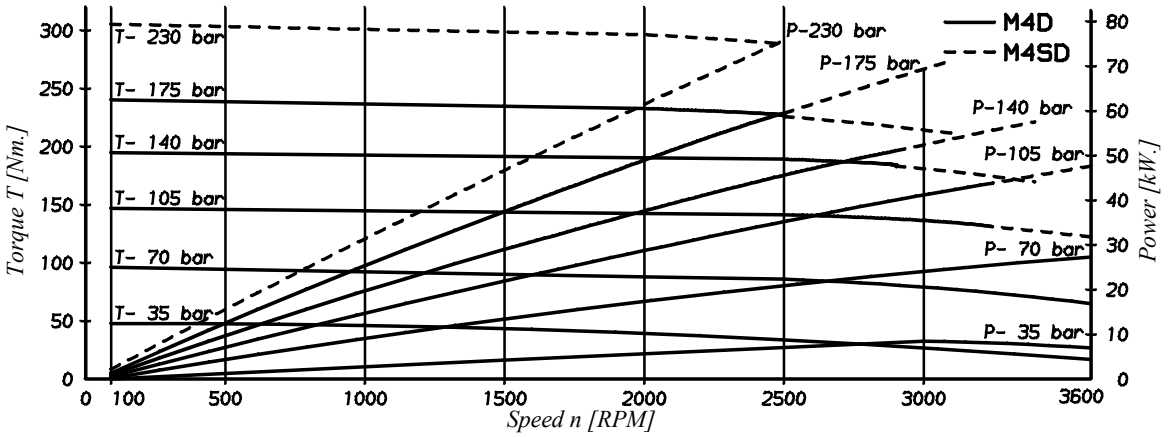
M4D 062



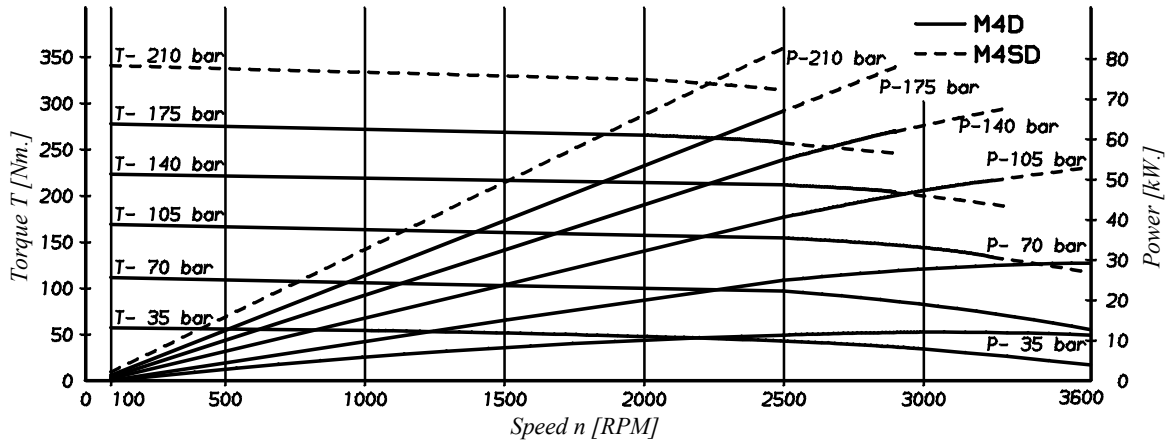
M4D 074



M4D 088

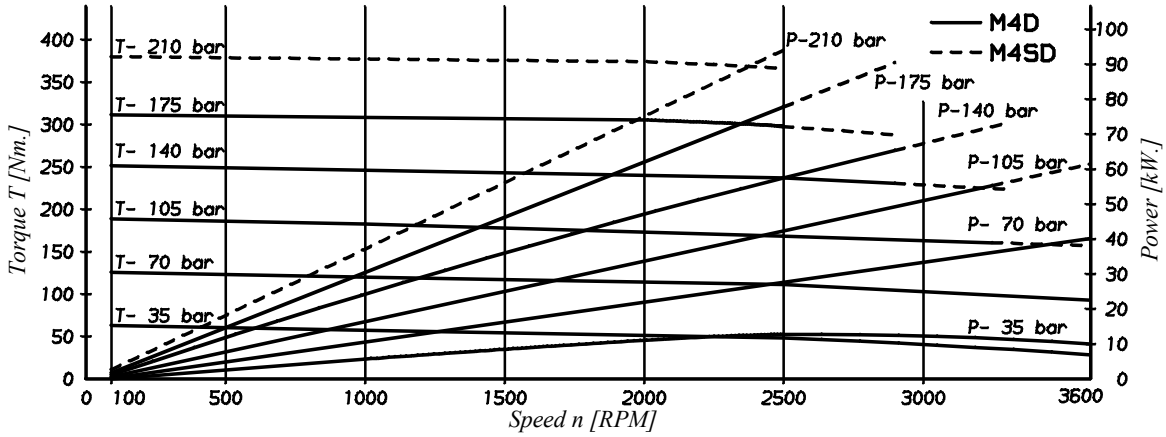


M4D 102

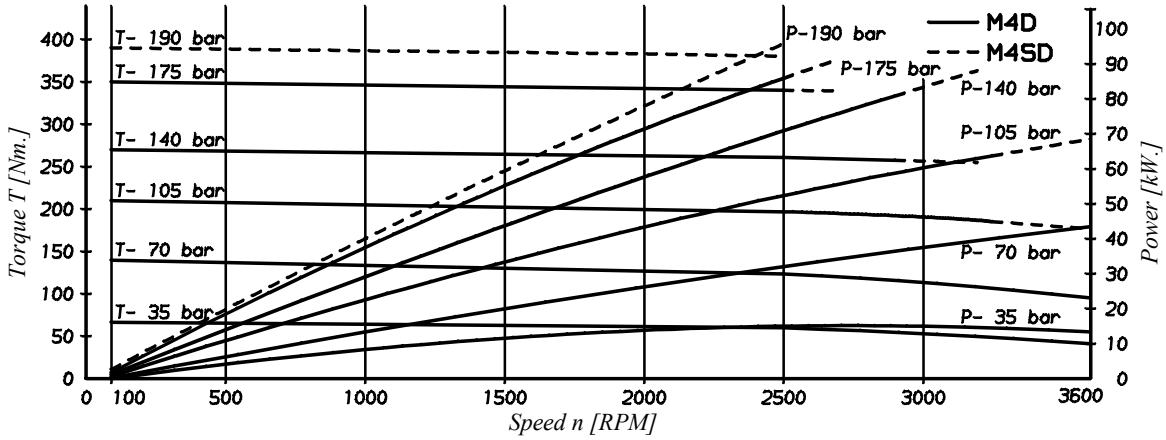


Parker Hannifin
Denison Vane Pump Division
Vierzon - France

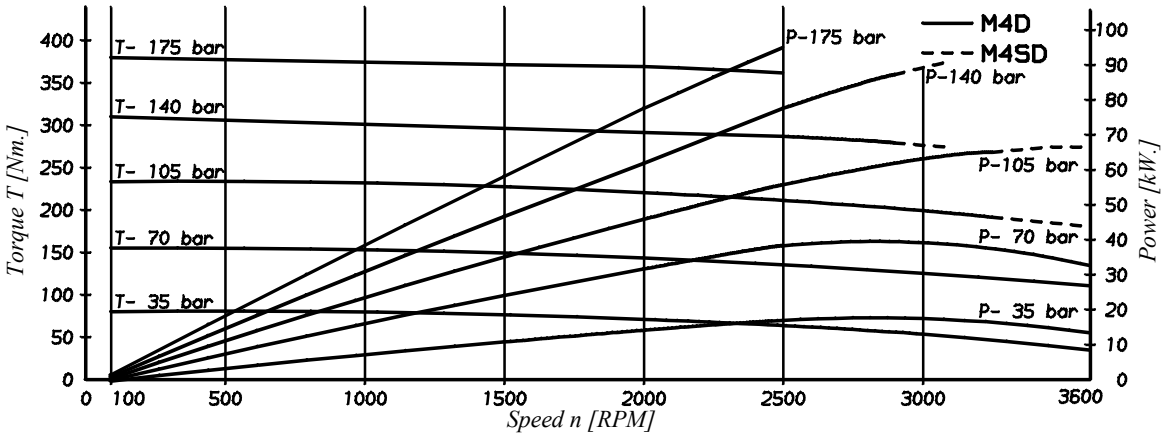
M4D 113



M4D 128

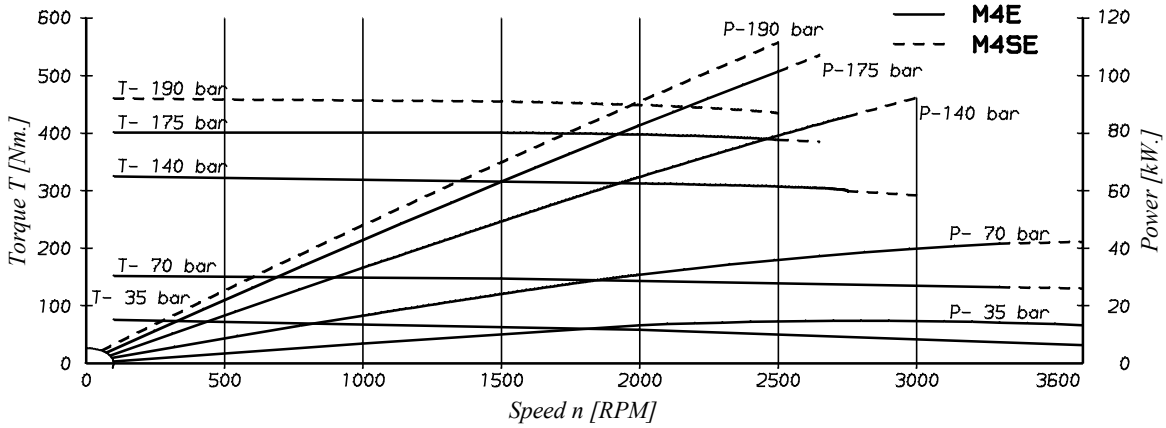


M4D 138

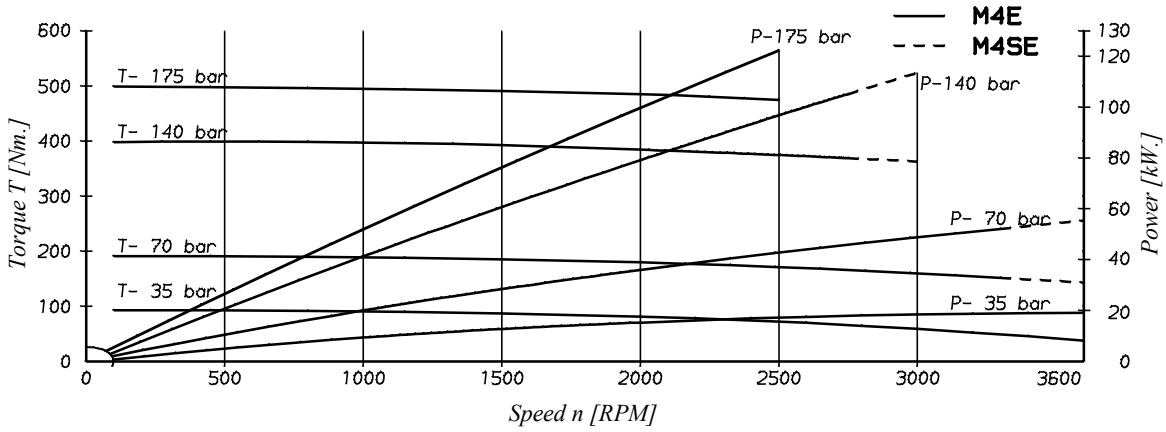


Parker Hannifin
Denison Vane Pump Division
Vierzon - France

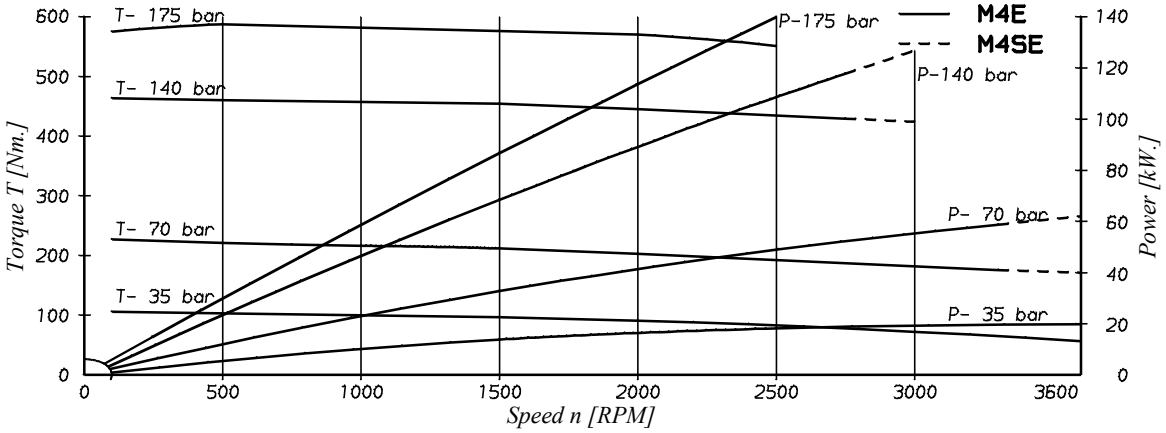
M4E 153



M4E 185



M4E 214



Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Model No. M3B1 / M3B - 036 - 1 N 00 - B 1 01 ..

Series external drain

Series internal drain

Torque
009 = 0,130 Nm/bar
012 = 0,186 Nm/bar
018 = 0,304 Nm/bar
027 = 0,485 Nm/bar
036 = 0,624 Nm/bar

Type of shaft
1 = keyed (non SAE)
3 = splined (SAE A)
4 = splined (SAE B)

Rotation
N = bi-directional

Porting combination
00 = standard

Design letter

Seal class
1 = S1 - BUNA N
4 = S4 - EPDM
5 = S5 - VITON

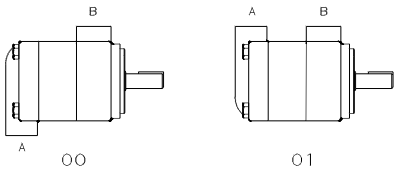
Port connections
00 = SAE threaded port
SAE drain
01 = SAE 4 bolt flange
BSPP drain
02 = BSPP threaded port
BSPP drain

Modification

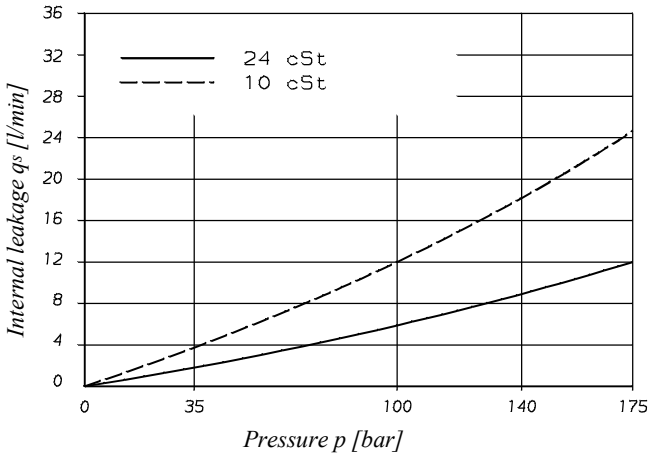
View from shaft end :

CW rotation A = inlet B = outlet

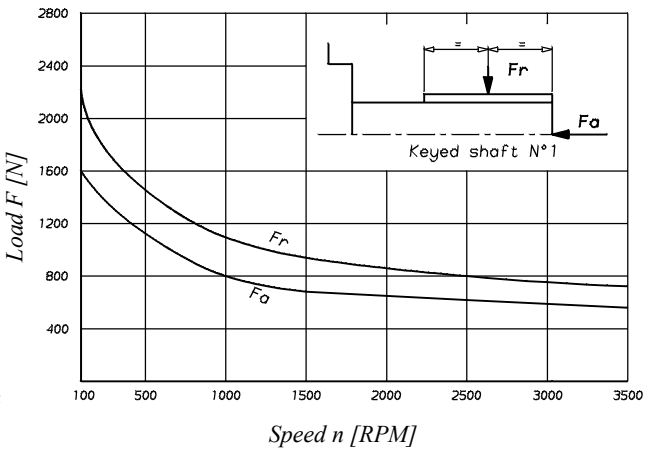
CCW rotation A = outlet B = inlet



INTERNAL LEAKAGE



PERMISSIBLE RADIAL AND AXIAL LOADS

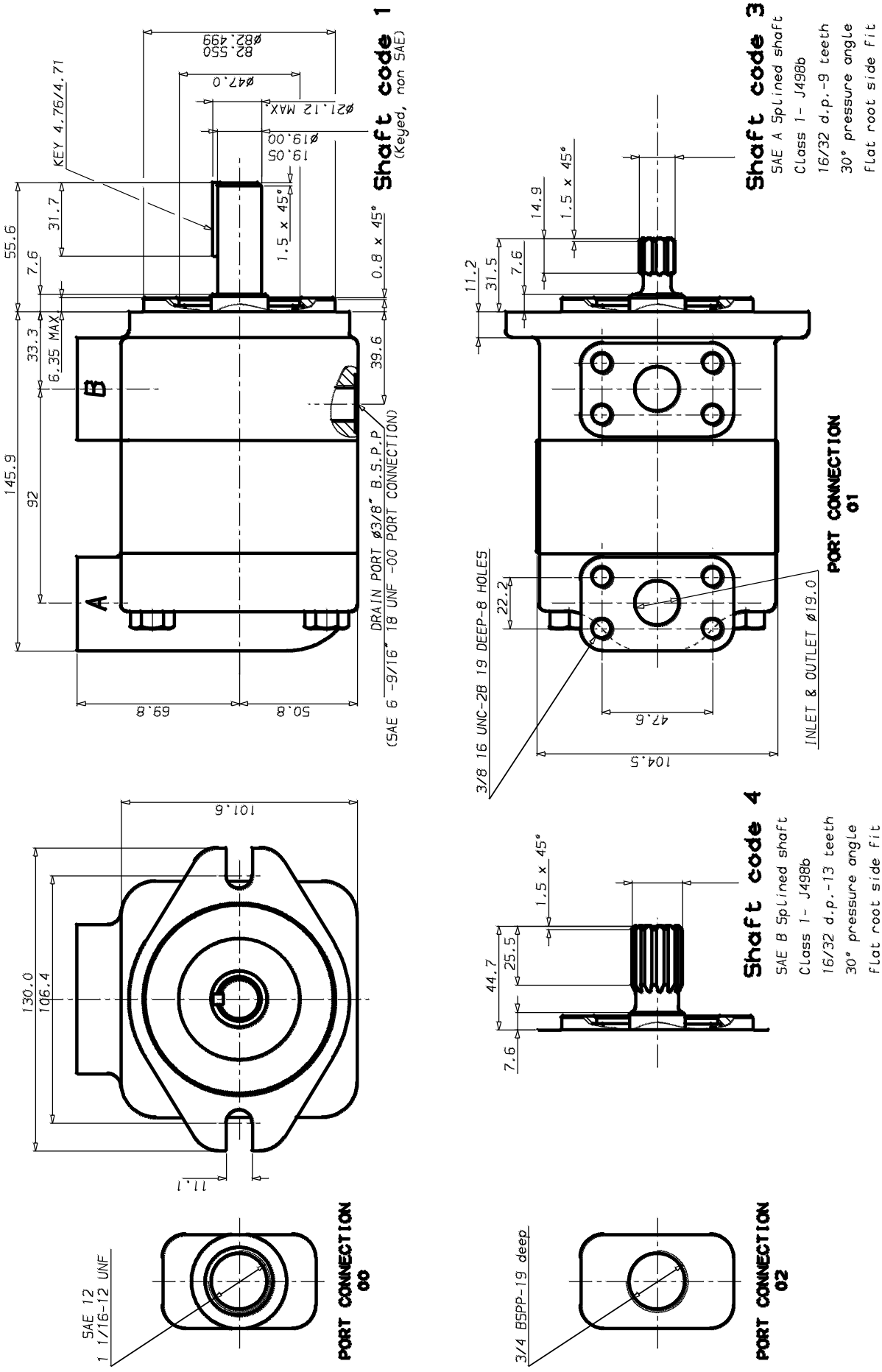


Do not apply Fr and Fa loads simultaneously

OPERATING CHARACTERISTICS - TYPICAL [24 cSt]

Model	Volumetric displacement V_i	Input flow at n = 2000 RPM		Torque T at n = 2000 RPM	Power output at n = 2000 RPM
		Theorical	at 175 bar Δ p	at 175 bar Δ p	at 175 bar Δ p
	ml/rev.	l/min	l/min	Nm	kW
M3B 009	9,2	18,4	30,4	19,7	4,3
M3B 012	12,3	24,6	36,6	26,7	5,8
M3B 018	18,5	37,0	49,0	46,6	10,0
M3B 027	27,8	55,6	67,6	77,4	16,3
M3B 036	37,1	74,2	86,2	102,0	21,1

Parker Hannifin
Denison Vane Pump Division
Vierzon - France



Parker Hannifin
Denison Vane Pump Division
Vierzon - France

ORDERING CODE - M4C - M4SC SERIES

Model No. M4*C1 / M4*C - 067 - 1 - N - 00 - A - 1 - 02 - ..

Series external drain

Series internal drain

Torque
024 = 0,39 Nm/bar
027 = 0,45 Nm/bar
031 = 0,55 Nm/bar
043 = 0,74 Nm/bar
055 = 0,93 Nm/bar
067 = 1,13 Nm/bar
075 = 1,27 Nm/bar

Type of shaft
1 = keyed (SAE B)
2 = keyed (non SAE)
3 = splined (SAE B)

Rotation
N = bi-directional

Modification

Port connections
01 = SAE threaded port
SAE drain
02 = SAE 4 bolt flange
UNC threaded - SAE drain
04 = SAE 4 bolt flange
UNC threaded - BSPP drain
M4 = SAE 4 bolt flange
metric threaded - BSPP drain

Seal class
1 = S1 (M4C)
5 = S5 (M4SC)

Design letter

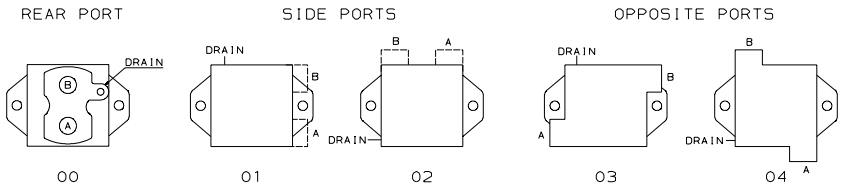
Porting combination
00 = standard

* = S = *Severe duty motor.*

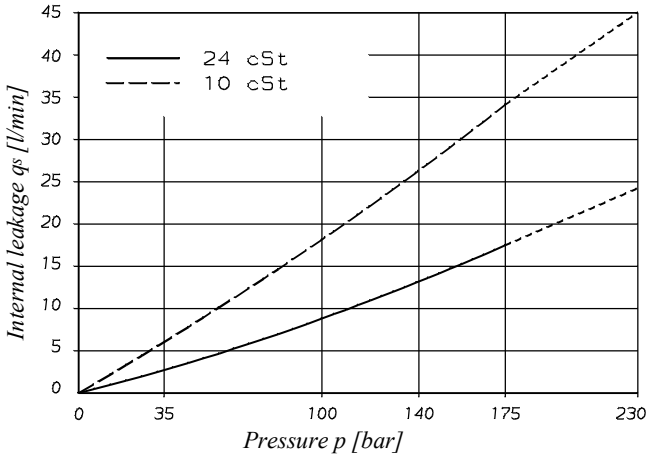
M4C1 - M4SC1 : Drain port is plugged.

View from shaft end :
CW rotation A = inlet
B = outlet
CCW rotation A = outlet
B = inlet

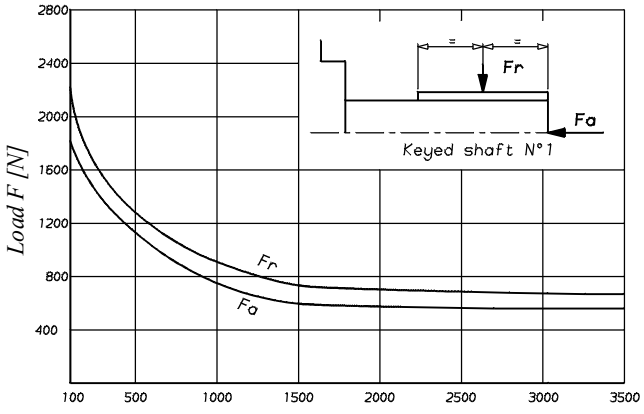
Porting combination



INTERNAL LEAKAGE



PERMISSIBLE RADIAL AND AXIAL LOADS

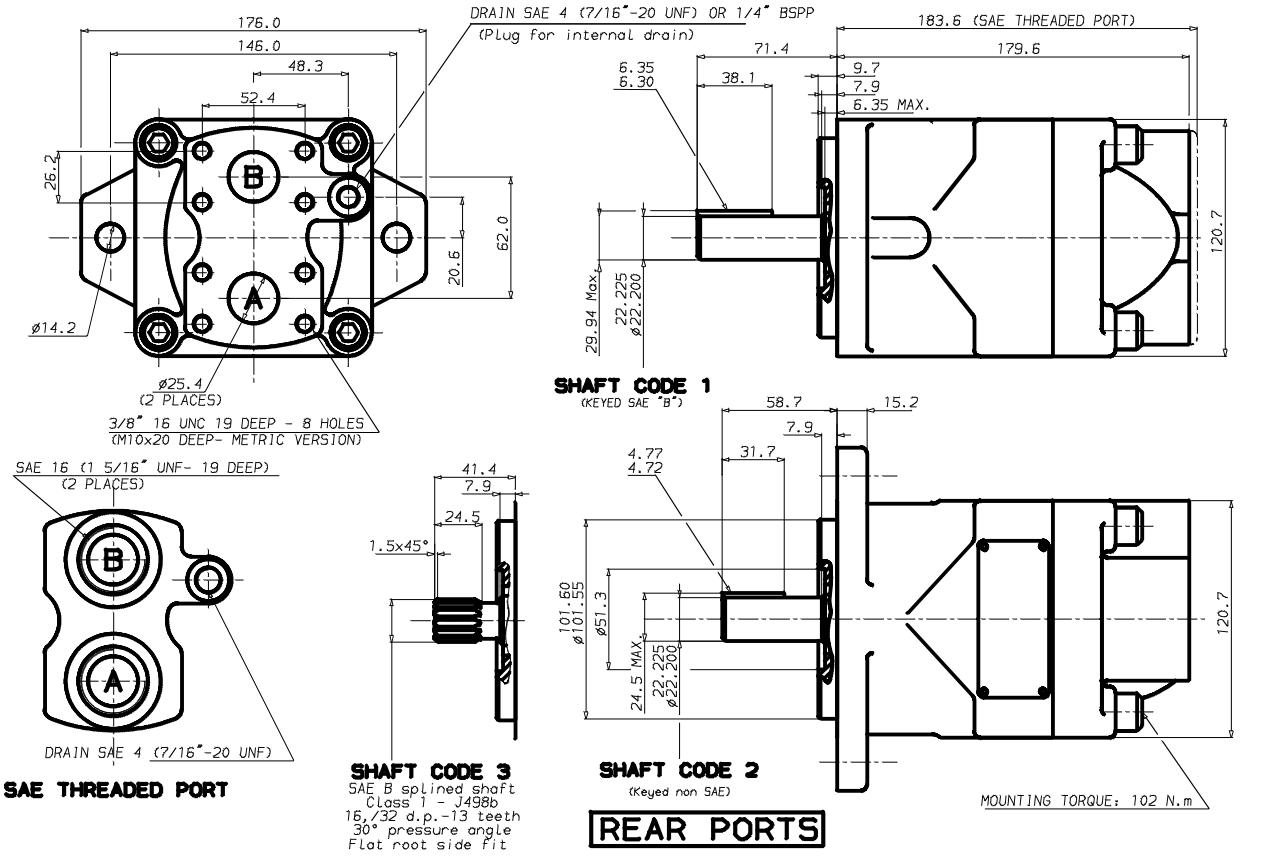


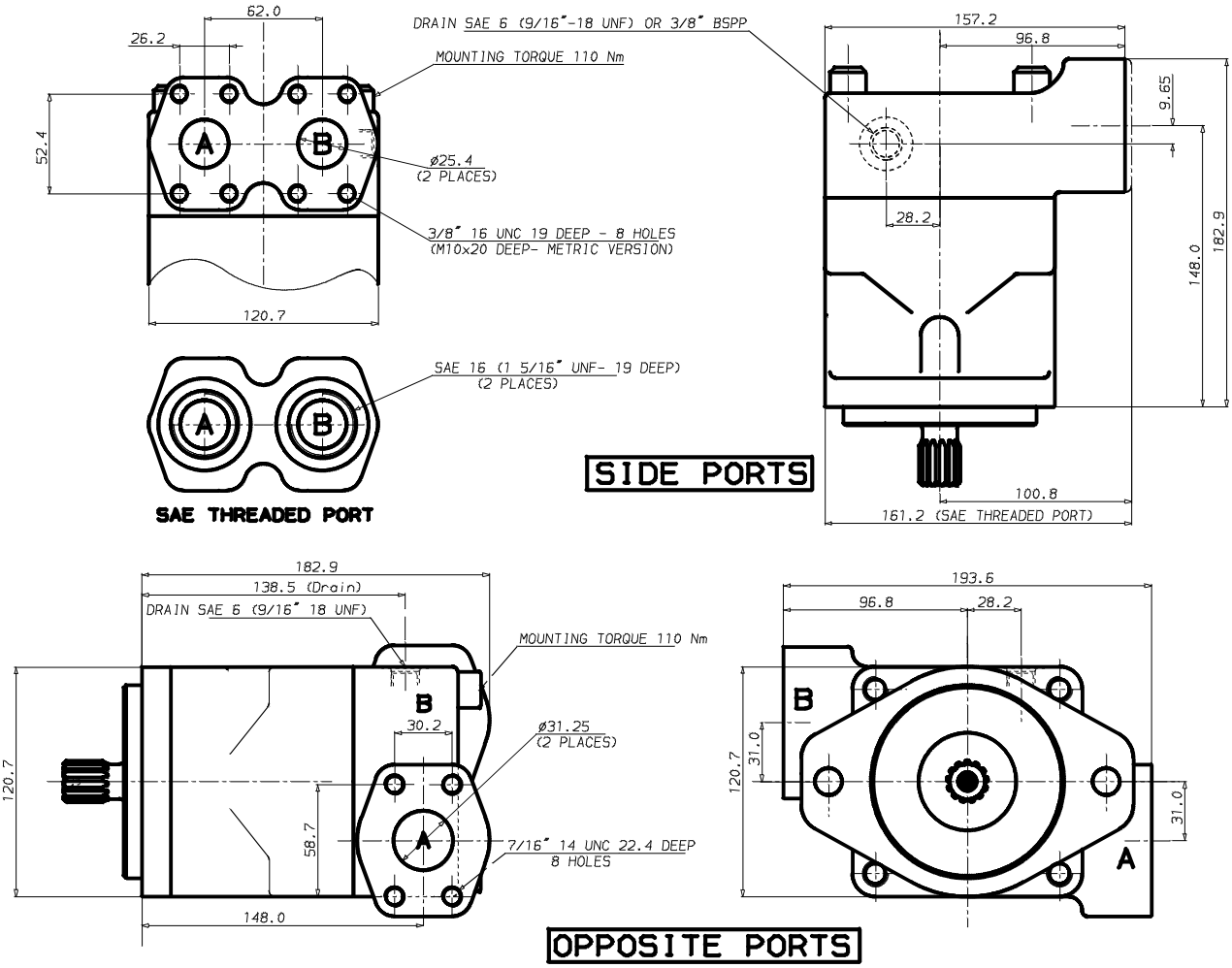
Do not apply Fr and Fa loads simultaneously

OPERATING CHARACTERISTICS - TYPICAL [24 cSt]

Model	Volumetric displacement V_i	Input flow at n = 2000 RPM		Torque T at n = 2000 RPM	Power output at n = 2000 RPM
		Theorical	at 175 bar Δ p	at 175 bar Δ p	at 175 bar Δ p
	ml/rev.	l/min	l/min	Nm	kW
M4C - M4SC 024	24,4	49,0	67,0	60,5	12,7
M4C - M4SC 027	28,2	56,0	74,0	70,0	14,7
M4C - M4SC 031	34,5	69,0	87,0	86,8	18,0
M4C - M4SC 043	46,5	93,0	111,0	120,0	25,1
M4C - M4SC 055	58,8	118,0	136,0	149,0	31,2
M4C - M4SC 067	71,1	142,0	160,0	170,0	35,6
M4C - M4SC 075	80,1	160,0	178,0	198,0	41,5

Parker Hannifin
Denison Vane Pump Division
Vierzon - France





Parker Hannifin
Denison Vane Pump Division
Vierzon - France

ORDERING CODE - M4D - M4SD SERIES

Model No. M4*D1
M4*D - 138 - 1 N 00 - B 1 02 ..

Series external drain

Series internal drain

Torque
062 = 1,04 Nm/bar
074 = 1,22 Nm/bar
088 = 1,45 Nm/bar
102 = 1,68 Nm/bar
113 = 1,86 Nm/bar
128 = 2,11 Nm/bar
138 = 2,30 Nm/bar

Type of shaft
1 = keyed (SAE C)
3 = splined (SAE C)

Rotation
N = bi-directional

Modification

Port connections
01 = SAE threaded port
SAE drain
02 = SAE 4 bolt flange
UNC threaded - SAE drain
04 = SAE 4 bolt flange
UNC threaded - BSPP drain
M4 = SAE 4 bolt flange
metric threaded - BSPP drain

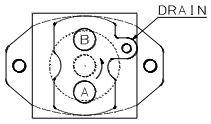
Seal class
1 = S1 (M4D)
5 = S5 (M4SD)

Design letter

Porting combination
00 = standard

* = *S = Severe duty motor.*

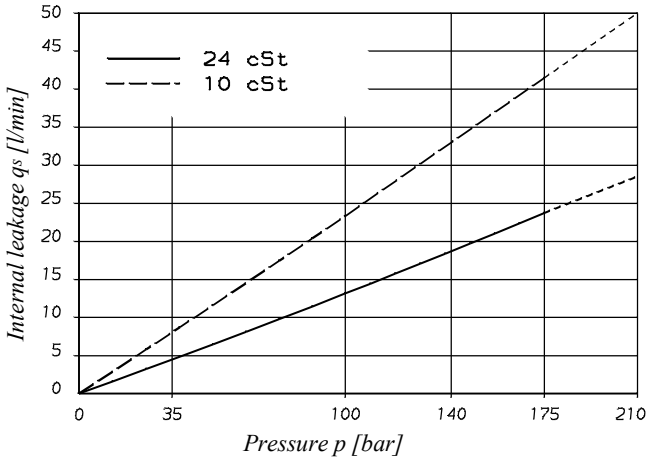
M4D1 - M4SD1 : Drain port is plugged.



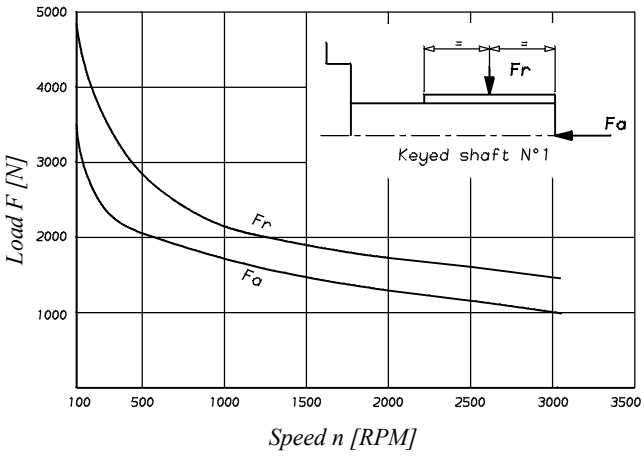
OO

View from shaft end :
CW rotation A = inlet B = outlet
CCW rotation A = outlet B = inlet

INTERNAL LEAKAGE



PERMISSIBLE RADIAL AND AXIAL LOADS

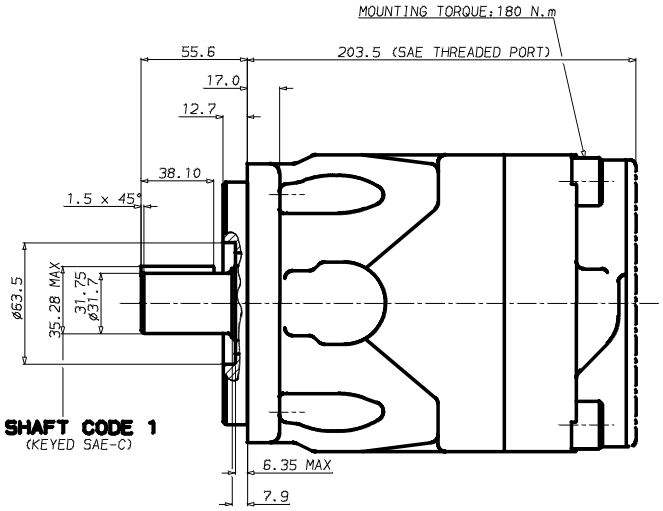


Do not apply Fr and Fa loads simultaneously

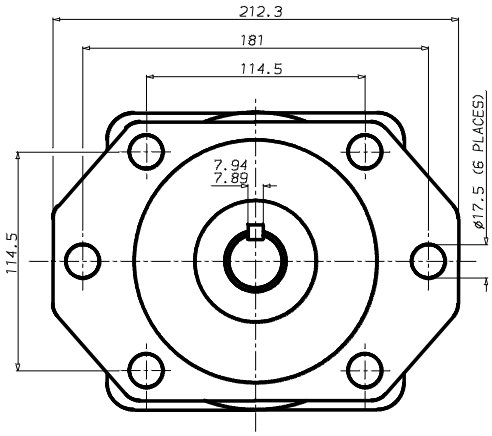
OPERATING CHARACTERISTICS - TYPICAL [24 cSt]

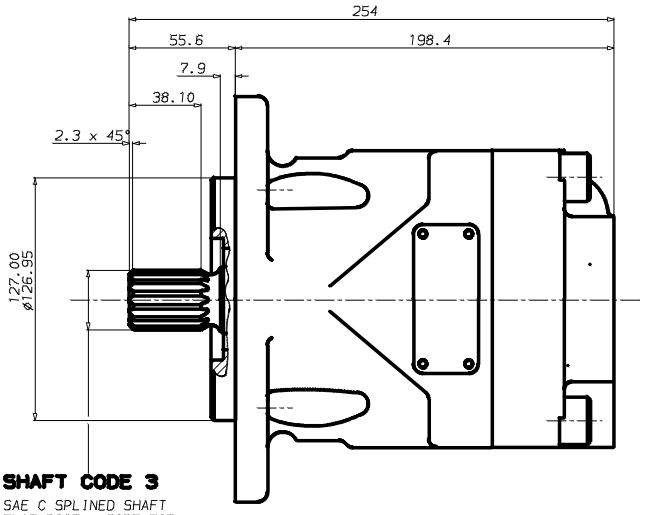
Model	Volumetric displacement V_i	Input flow at n = 2000 RPM		Torque T at n = 2000 RPM	Power output at n = 2000 RPM
		Theorical	at 175 bar Δ p	at 175 bar Δ p	at 175 bar Δ p
	ml/rev.	l/min	l/min	Nm	kW
M4D - M4SD 062	65,1	130,0	154,0	165,0	34,6
M4D - M4SD 074	76,8	154,0	178,0	200,0	41,9
M4D - M4SD 088	91,1	182,0	206,0	236,0	49,4
M4D - M4SD 102	105,5	211,0	241,0	264,0	55,3
M4D - M4SD 113	116,7	233,0	257,0	300,0	62,8
M4D - M4SD 128	132,4	265,0	289,0	340,0	71,2
M4D - M4SD 138	144,4	289,0	313,0	372,0	77,9

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

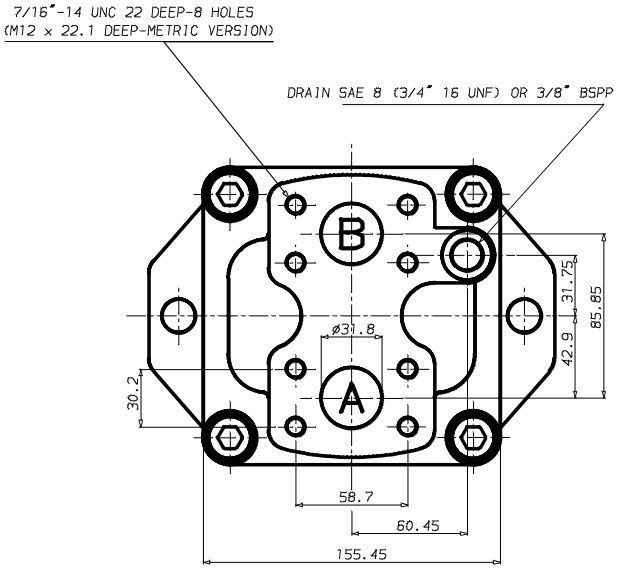


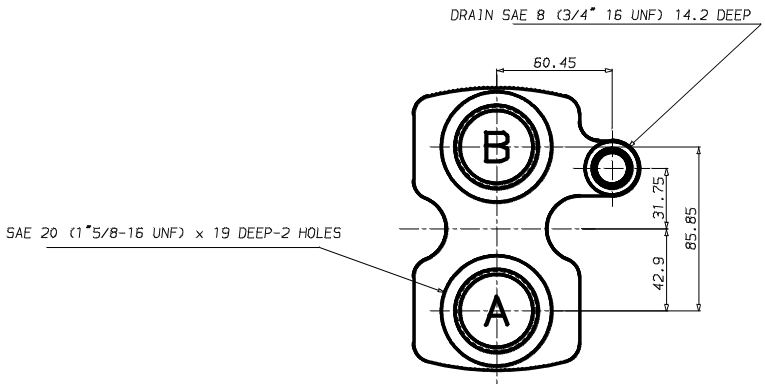
SHAFT CODE 1
(KEYED SAE-C)





SHAFT CODE 3
SAE C SPLINED SHAFT
FLAT ROOT - SIDE FIT
J498b-CLASS: 1-PITCH: 12/24
14 TEETH-PRESSURE ANGLE: 30°





SAE THREADED PORT

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Model No. M4*E1

M4*E - 214 - 1 N 00 - B 5 02 ..

Series external drain

Series internal drain

Torque
153 = 2,52 Nm/bar
185 = 3,05 Nm/bar
214 = 3,53 Nm/bar

Type of shaft
1 = keyed (SAE C)
3 = splined (SAE C)

Rotation
N = bi-directional

* = S = *Severe duty motor.*

M4E1 - M4SE1 : Drain port is plugged.

View from shaft end :

CW rotation	A = inlet	CCW rotation	A = outlet
	B = outlet		B = inlet

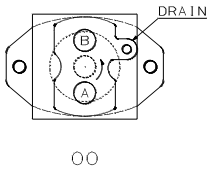
Modification

Port connections
01 = SAE threaded port
SAE drain
02 = SAE 4 bolt flange
UNC threaded - SAE drain
04 = SAE 4 bolt flange
UNC threaded - BSPP drain

Seal class
5 = S5

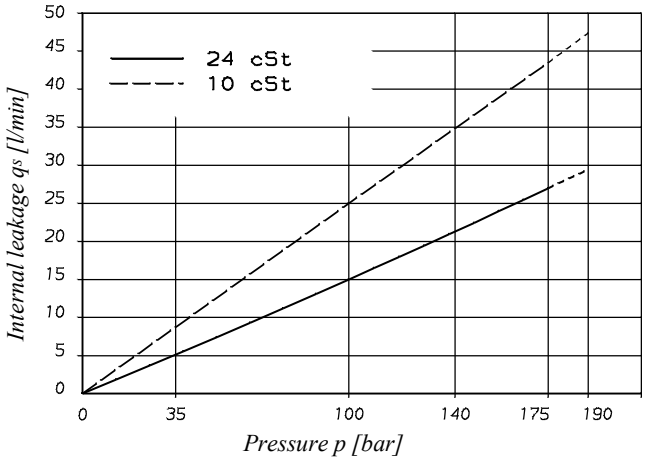
Design letter

Porting combination
00 = standard

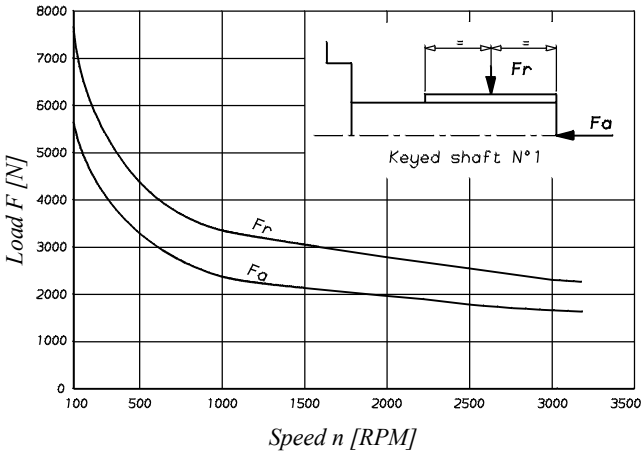


00

INTERNAL LEAKAGE



PERMISSIBLE RADIAL AND AXIAL LOADS

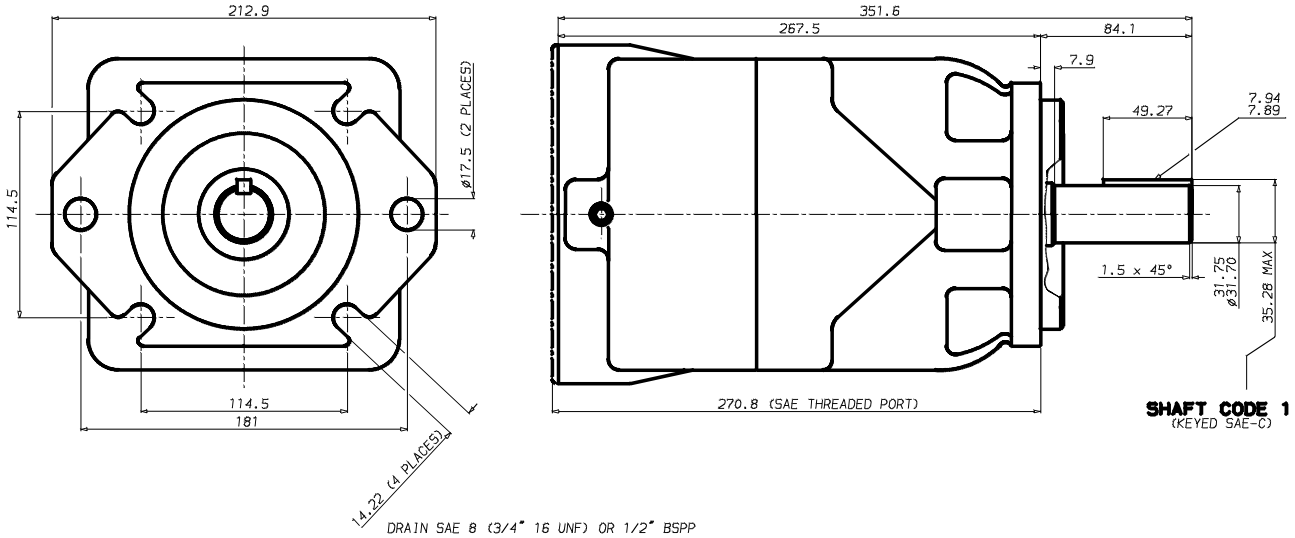


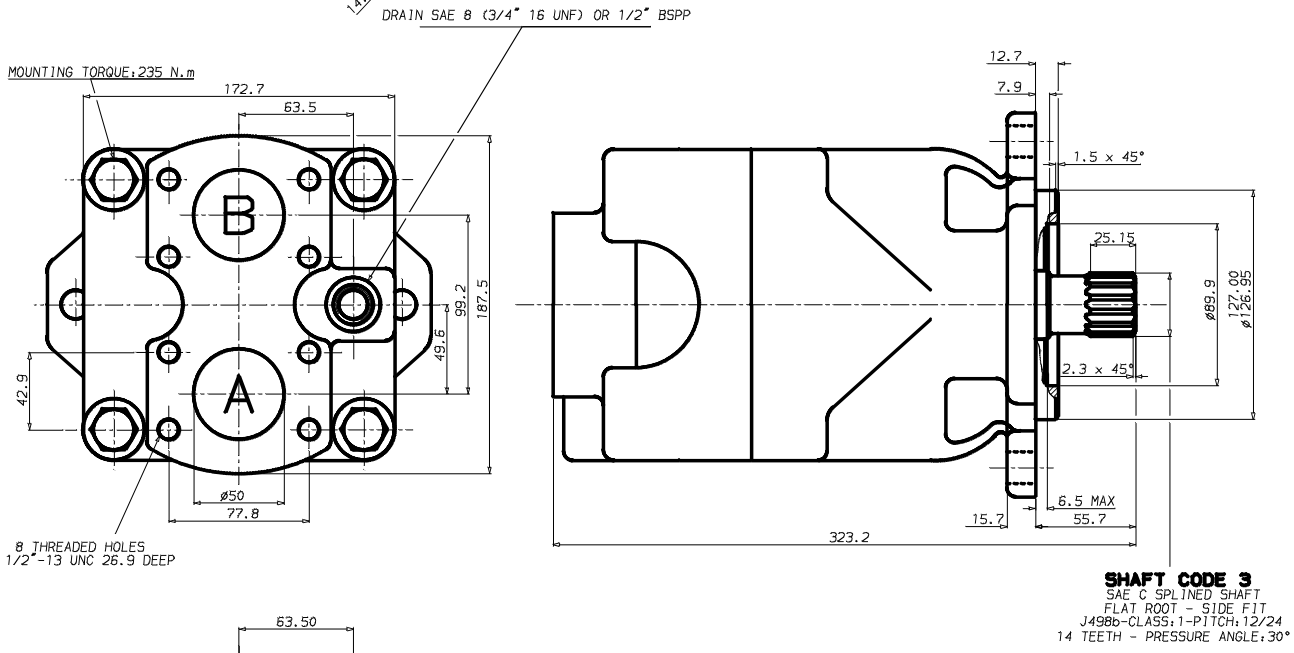
Do not apply Fr and Fa loads simultaneously

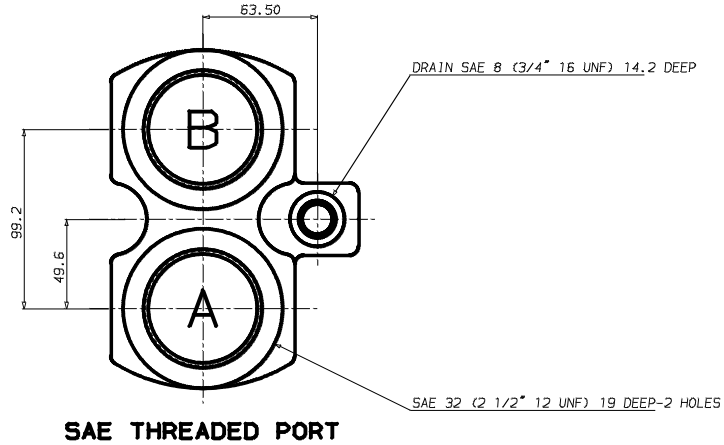
OPERATING CHARACTERISTICS - TYPICAL [24 cSt]

Model	Volumetric displacement V_i	Input flow at n = 2000 RPM		Torque T at n = 2000 RPM	Power output at n = 2000 RPM
		Theorical	at 175 bar Δ p	at 175 bar Δ p	at 175 bar Δ p
	ml/rev.	l/min	l/min	Nm	kW
M4E - M4SE 153	158,5	317,0	343,0	398,0	83,4
M4E - M4SE 185	191,6	383,0	409,0	484,0	101,4
M4E - M4SE 214	222,0	444,0	470,0	567,0	118,8

Parker Hannifin
Denison Vane Pump Division
Vierzon - France







SAE THREADED PORT

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Model No. M4*DC1
M4*DC - 138 - 031 - 1 N 00 - B 1 02 00 ..

Series external drain

Series internal drain

Torque for A1 - B1
062 = 1,04 Nm/bar
074 = 1,22 Nm/bar
088 = 1,45 Nm/bar
102 = 1,68 Nm/bar
113 = 1,86 Nm/bar
128 = 2,11 Nm/bar
138 = 2,30 Nm/bar

Torque for A2 - B2
024 = 0,39 Nm/bar
027 = 0,45 Nm/bar
031 = 0,55 Nm/bar
043 = 0,74 Nm/bar
055 = 0,93 Nm/bar
067 = 1,13 Nm/bar
075 = 1,27 Nm/bar

Type of shaft
1 = keyed (SAE C)
3 = splined (SAE C)

Modification

No control

Port connections (P2)
01 = SAE threaded SAE drain
02 = SAE 4 bolt flange SAE drain
04 = SAE 4 bolt flange BSPP drain

Seal class
1 = S1 (M4DC)
5 = S5 (M4SDC)

Design letter

Porting combination
See below

Rotation
N = bi-directional

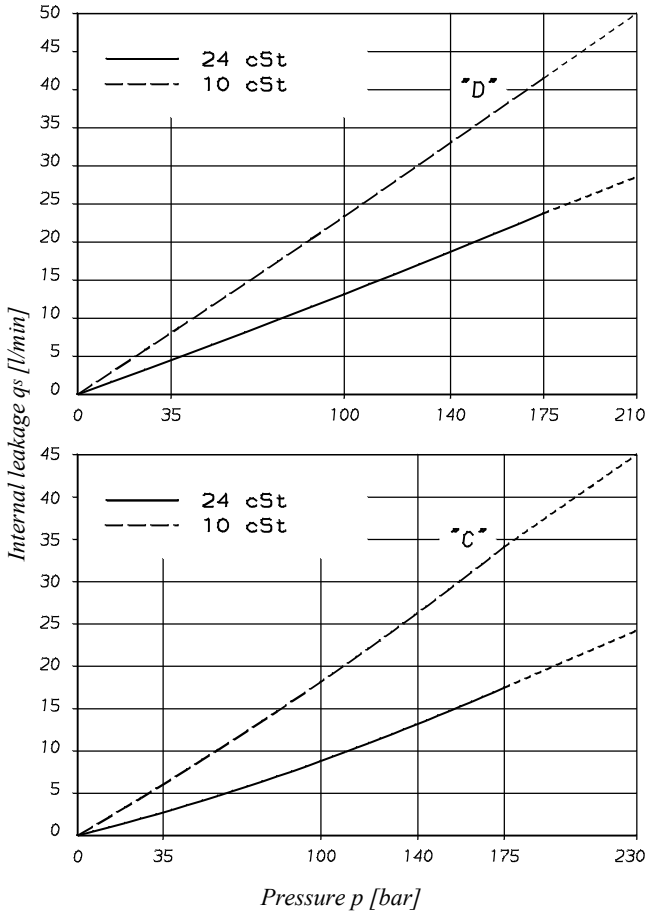
* = S = *Severe duty motor.*

M4DC1 - M4SDC1 : Drain port is plugged.

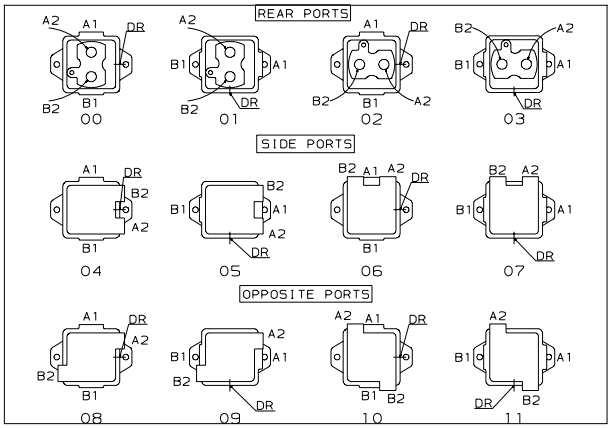
View from shaft end :

CW rotation		CCW rotation	
	A = inlet		A = outlet
	B = outlet		B = inlet

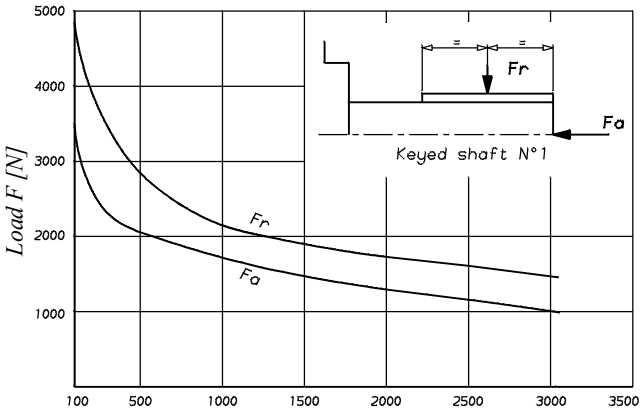
INTERNAL LEAKAGE



PORTING COMBINATION

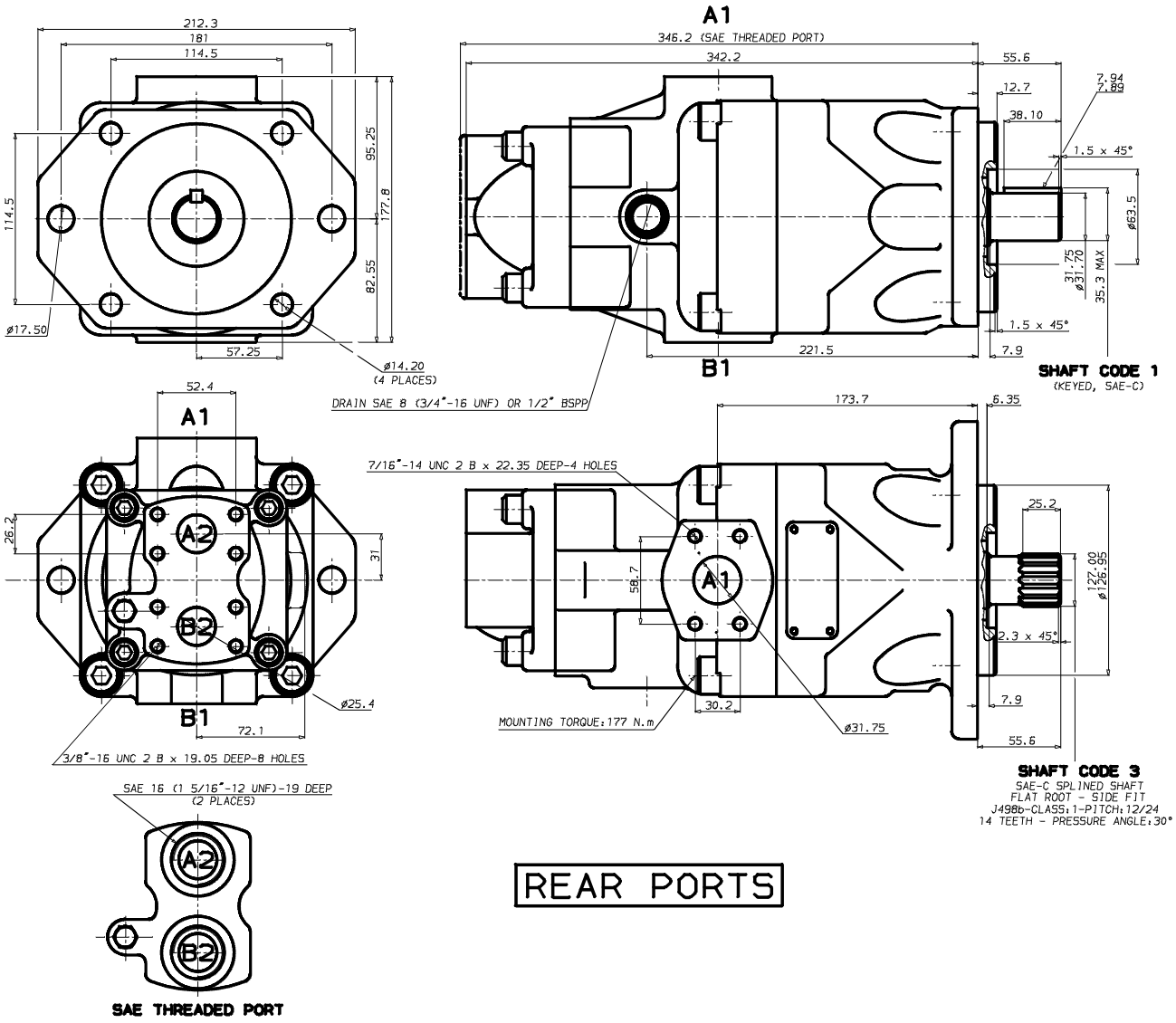


PERMISSIBLE RADIAL AND AXIAL LOADS



Do not apply Fr and Fa loads simultaneously

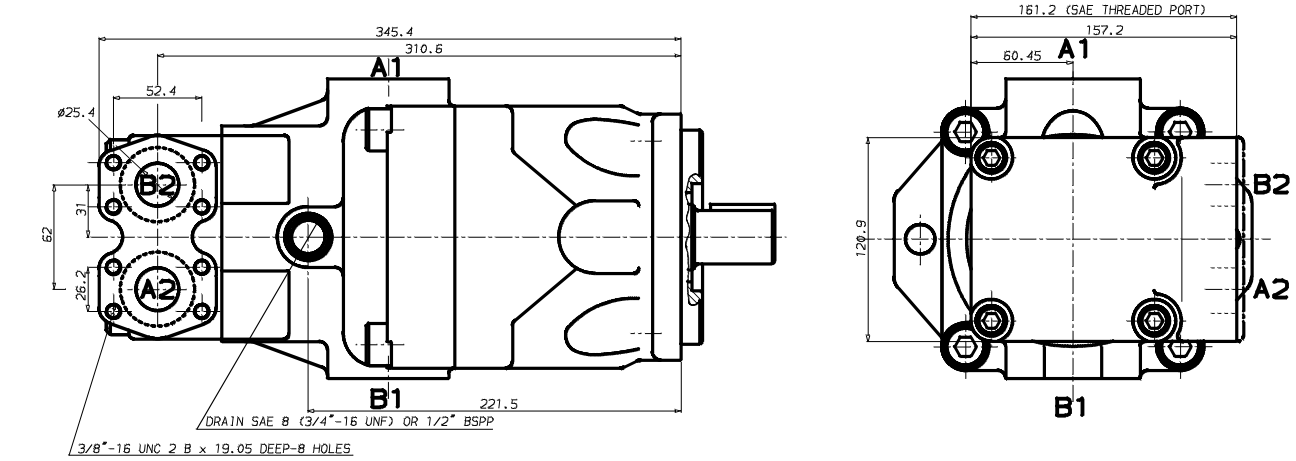
Parker Hannifin
Denison Vane Pump Division
Vierzon - France

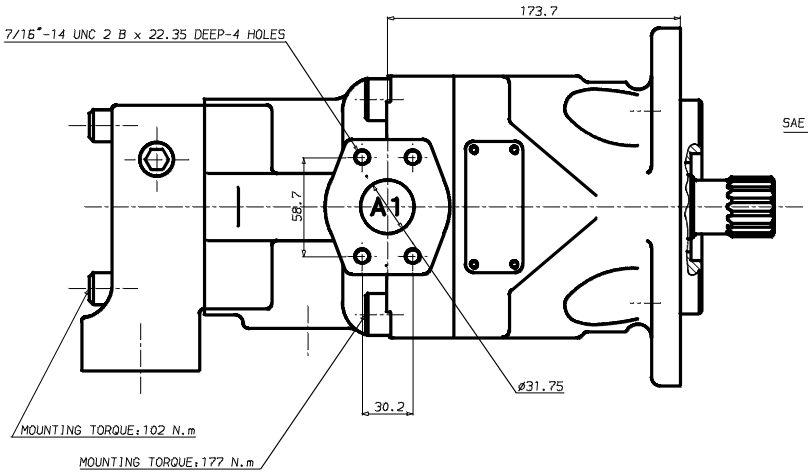


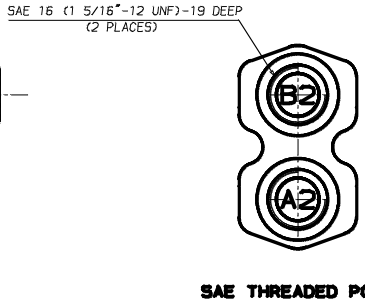
OPERATING CHARACTERISTICS - TYPICAL [24 cSt]

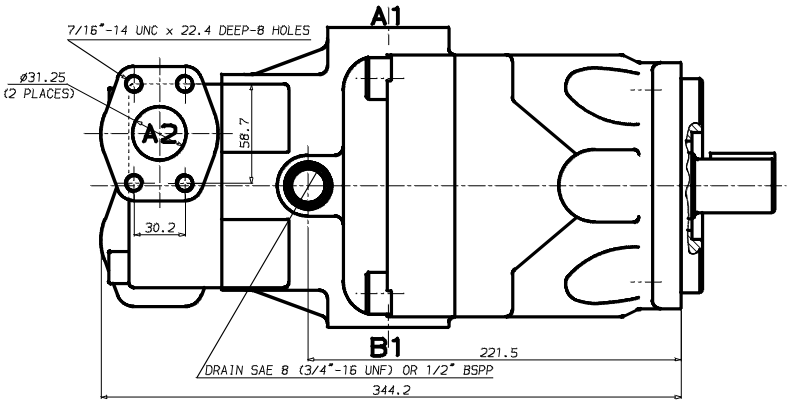
Model	Volumetric displacement V_i	Input flow at n = 2000 RPM		Torque T at n = 2000 RPM	Power output at n = 2000 RPM
		Theorical	at 175 bar Δ p	at 175 bar Δ p	at 175 bar Δ p
	ml/rev.	l/min	l/min	Nm	kW
M4D - M4SD 062	65,1	130,0	154,0	165,0	34,6
M4D - M4SD 074	76,8	154,0	178,0	200,0	41,9
M4D - M4SD 088	91,1	182,0	206,0	236,0	49,4
M4D - M4SD 102	105,5	211,0	241,0	264,0	55,3
M4D - M4SD 113	116,7	233,0	257,0	300,0	62,8
M4D - M4SD 128	132,4	265,0	289,0	340,0	71,2
M4D - M4SD 138	144,4	289,0	313,0	372,0	77,9
M4C - M4SC 024	24,4	49,0	67,0	60,5	12,7
M4C - M4SC 027	28,2	56,0	74,0	70,0	14,7
M4C - M4SC 031	34,5	69,0	87,0	86,8	18,0
M4C - M4SC 043	46,5	93,0	111,0	120,0	25,1
M4C - M4SC 055	58,8	118,0	136,0	149,0	31,2
M4C - M4SC 067	71,1	142,0	160,0	170,0	35,6
M4C - M4SC 075	80,1	160,0	178,0	198,0	41,5

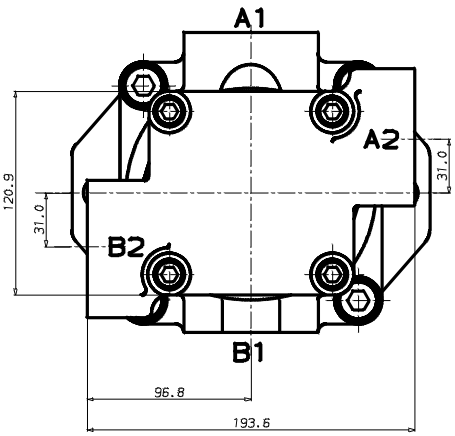
Parker Hannifin
Denison Vane Pump Division
Vierzon - France

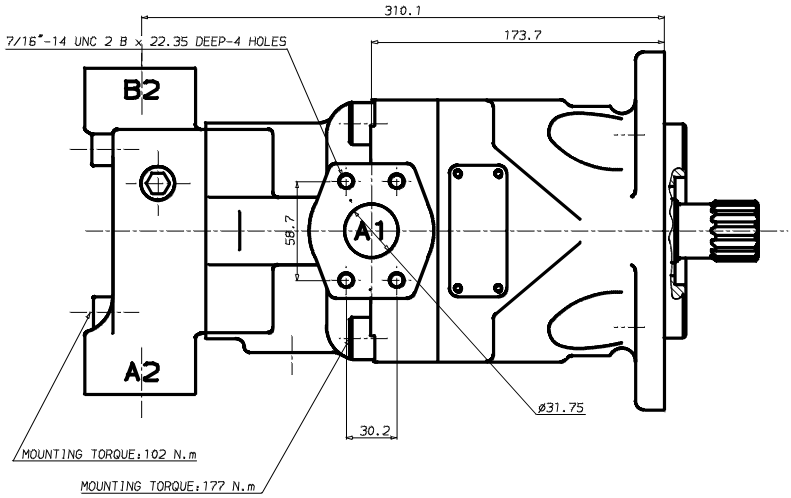












OPPOSITE PORTS

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Parker Hannifin
Denison Vane Pump Division
Vierzon - France