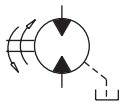
VELJAN

VANE MOTOR VANE PUMPS

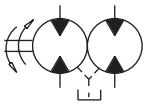
Contents

FEATURES

Veljan VM* series high speed, high pressure fixed displacement Vane Motors offer a wide choice of torque ratings, reversible shaft rotation, foot or flange mounting and choice of port locations.



Single Motor



Double Motor

HYDRAULICALLY BALANCED DESIGN

Veljan Vane Motors are hydraulically balanced to reduce wear and heat producing friction. The vane, rotor and cam ring are pressure balanced to increase life and efficiency over full speed range.

REPLACEABLE ROTARY KITS

The rotory kit assembly is easily replaceable. The torque capability of motors within the same series can be changed by changing the rotary kit or cam ring.

ROTATION

Motors may be stalled or reversed repeatedly under load without damage.

SPEED RANGE

Starting to maximum speed (4000 rpm) with full torque capability during acceleration. These motors can start smoothly at full load. To fully realize the smooth start characteristic, the designed maximum operating speed for single cartridge motors should be above 1200 rpm.

For optimum operating efficiency and life, minimum continuous operating speeds should be above 400 rpm, at differential pressure higher than 2000 psi (140 bar).

MOUNTING FLEXIBILITY

Ports and mounting conform to ISO-3019-1 standards, thus providing the most optimum mounting for connecting pipework.

LOW TORQUE RIPPLE AT LOW SPEED

While operating at very low speeds Veljan Vane Motors exhibit very low torque ripple.

HIGH EFFICIENCY

Veljan Vane Motors have high volumetric efficiency that is maintained throughout their operating life. The high starting torque efficiency of Vane Motors allow start under high load without pressure overshoots, jerks and high instantaneous horsepower loads. Efficiency varies with motor size, pressure, speed and fluid viscosity and temperature.

SEVERE DUTY VANE MOTORS

Veljan Vane Motors have been specially designed to suit severe duty application for pressure up to 3400 psi, high speed up to 4000 rpm and fluid lubricity. These are designated as VM4S series and recommended when both, pressure is over 2000 psi and speed is over 2000 rpm. They are also recommended for fluid viscosity below 25cSt and speed over 2000 rpm. VM4S motors have longer life at high efficiency.

FIRE RESISTANT FLUIDS

Easily used in the standard VM4S version of Vane Motors. These include phosphate or organic ester fluids and blends, water glycol solutions and water oil invert emulsions.

RELIABILITY

These high performance motors have been field proven on a wide variety of applications.

APPLICATIONS

These motors can be widely used in load hoist winch drives, swing drives, propulsion drives, traction drives, etc.

INTERNALLY DRAINED MOTORS
(VM4C1, VM4D1, VM4E1)

These motors may be alternately pressurized at ports A & B to 2500 psi (175 bar) max. Which ever port is at low pressure must not be subjected to more than 21psi (3.5bar) peak pressure 100 psi (7 bar)

EXTERNALLY DRAINED MOTORS

Single Cartridge Motors may be alternately pressurized at ports A & B to 2500 psi (175 bar) max. Which ever port is at low pressure should not be subject to more than 500 psi (35 bar).

PRESSURE, DRAIN PORT d, 3.5 bar max.

To ensure maximum motor performance in conjuction with your specific application, consult your Veljan representative if your application requires:

- Minimum speed of less than 100 rpm
- Overrunning loads
- Indirect drive
- Braking or retarding

SHAFTS

Veljan offers Vane Motors with option of keyed or splined shafts. Keyed shafts are supplied with high strength heat treated keys. If the key is replaced, it must be heat treated between 27 and 34 RC hardness. The corners of the keys must be chamfered 0.03" to 0.04" at 45° to clear radii in the key way. Alignment of keyed shaft must be within tolerances given for splined shaft.

Top

SHAFTS, COUPLINGS AND FEMALE SPLINES

- The shaft will accept a maximum misalignment of .002" TIR when the pump is foot mounted and .001" when flange mounted. The angular alignment of two spline axes must be Less than 0.1° (0.002' per 1").
- The coupling spline must be lubricated with a lithium molydi-sulfide grease or a similar lubricant.
- The coupling must be hardened to a hardness between 27 and 45 RC
- 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.

RECOMMENDED FLUIDS

PETROLEUM BASED ANTIWEAR R & O FLUIDS

These fluids are recommended fluids for VM4 series Vane Motors. Maximum catalog ratings and performance data are based on operation with these fluids.

ALTERNATE FLUIDS

The use of fluids other than petroleum based antiwear R & O fluids requires that the maximum ratings of the motors be reduced. In some cases the minimum replenishment pressures must be increased. Contact Veljan representative for more details.

VISCOSITY

Max (cold start, low speed & pressure)	862mm²/s(cSt)
Max (full speed & pressure)	108mm²/ s (cSt)
Optimum (max. life)	30mm²/ s (cSt)
Min (full speed & pressure)	10mm²/ s (cSt)

VISCOSITY INDEX

90 min. Higher values extend range of operating temperatures, and life time.
Fluid temperature (0º) F max. 353(+80ºC)min.255(-18ºC)

FLUID CLEANLINESS

The fluid must be cleaned before and during operation to maintain contamination level of NAS 1638 class 8 (or ISO 18/4)or better.

25 micron normal filters may be adequate but do not guarantee the required cleanliness levels.

REPLENISHMENT PRESSURE

The inlet port of the fluid motor must be supplied with minimum replenishment pressure as listed below to prevent cavitation During dynamic barking.

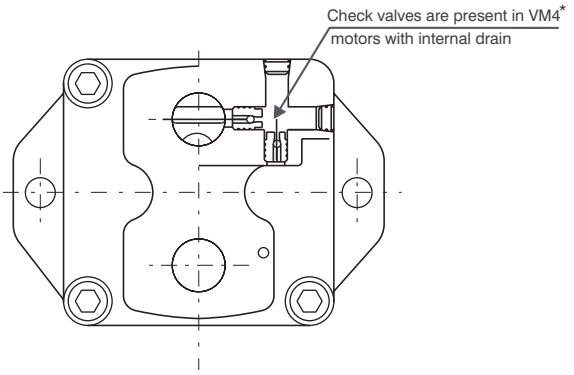
Series	Speed, rpm									
	500		1000		2000		3000		3600	
	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar
VM3B	8.7	0.6	14.5	1.0	27.6	1.9	50.8	3.5	84.2	5.8
VM4C/ VM4SC	10	0.7	20	1.4	45	3.1	80	5.5	135	9.3
VM4D/ VM4SD	10	0.7	20	1.4	45	3.1	80	5.5	135	9.3
VM4E/ VM4SE	20	1.4.	40	2.8	75	5.2	160	11.0	-	-

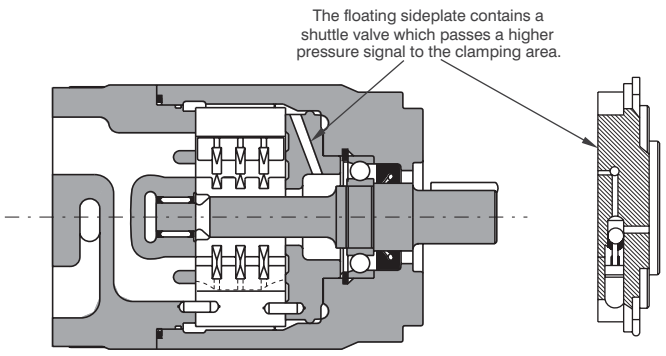
SHAFT LOADS

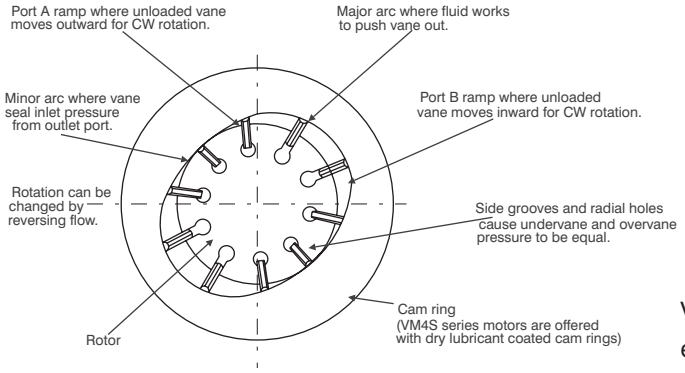
Axial or radial load are permissible. Both loads should not be applied simultaneously.

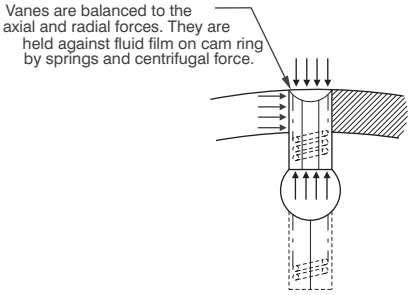
OPERATING TEMPERATURES AND VISCOSITIES

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









DESCRIPTION

Veljan Vane Motors are positive displacement, hydraulic balanced cartridge units, with drive speed dependent on the motor size and gpm delivery to the inlet port. The units are capable of operating at high speeds and high pressures, or higher speeds at lower pressures. These motors may be operated in either direction of rotation, reversed or stalled under load conditions without damage.

PRINCIPLE OF OPERATION

The operating principle of a Single Vane Motor is illustrated in the figure above. Rotation of the motor shaft is caused by differential pressure across the motor exerting a force against the vanes. This force is in effect tangential to the rotor and causes the rotor to turn, carrying the motor shaft with it.

Rotating kit

Vanes fitted in the slotted rotor slide radially and follow the elliptical contour of the cam ring and seal against it. The camring has two major and two minor radial sections joined by transitional sections called ramps. These cotours and the pressures exposed to them are balanced diametrically.

Direction of shaft rotation is governed by the direction of fluid flow through the port connections located in the body cover. These motors are reversible by reversing flow to and from the Ports.

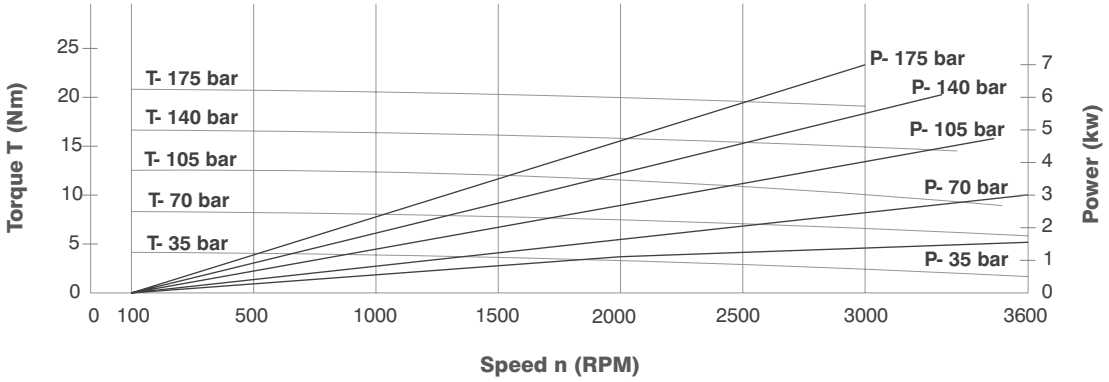
Light springs urge the vanes radially against the cam contour assuring a seal at zero speed so the motor can develop starting torque. The springs are assisted by centrifugal force at higher speeds. Radial grooves and holes through the vanes equalize radial hydraulic forces on the vanes at all times. Fluid enters and leaves the motor cartridge through openings 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 counterclockwise. The fluid film separates the rotor axially from the side port plate surfaces. The front side plate is clamped against the camring by the pressure, maintains optimum clearance to accommodate dimensional changes due to temperature and pressure. A 3-way shuttle valve in the side plate causes clamping pressure to equal the pressure in port A or B, whichever is higher.

Series		Mounting Standard (SAE J744c ISO/3019-1)	Weight lbs	Weight kgs	Option for inlet & outlet port SAE 4 bolt SAE threaded J 718c ISO/DIS 6162-1	Moment of Inertia lbsin²	Moment of Inertia Kg m² x 10^{-4}
VM3B		SAE - A	18	8	3/4" BSPP threaded	1.03	3.0
VM4C-VMC1	VM4SC-VMSC1	SAE - B	34	15	1"	2.7	7.9
VM4D-VMD1	VM4SD-VMSD1	SAE - C	60	27	1¼"	1.4	4.11
VM4E-VME1	VM4SE-VMSE1	SAE - C	99	45	2"	20.0	58.7

Note : Product details are liable to change without notice

Top

VM3B 009



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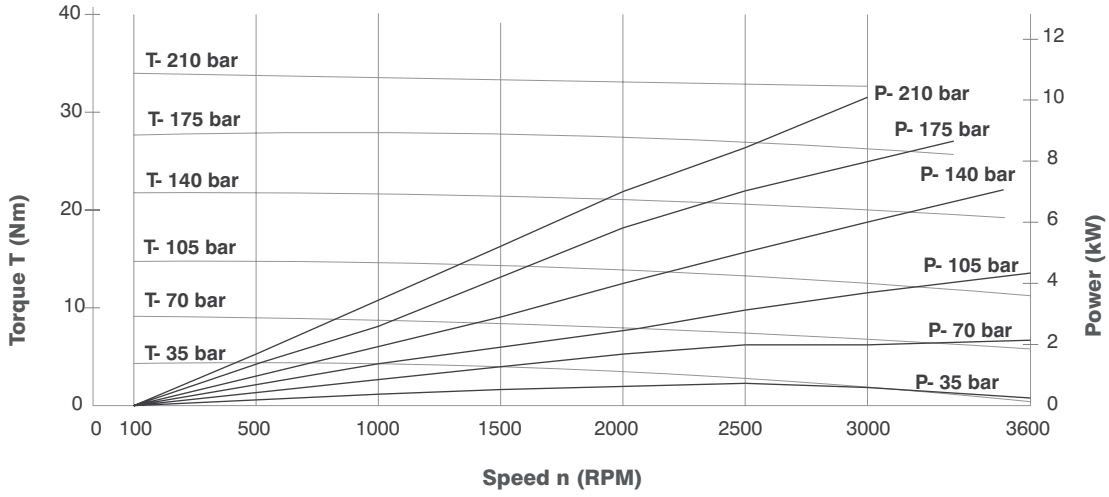

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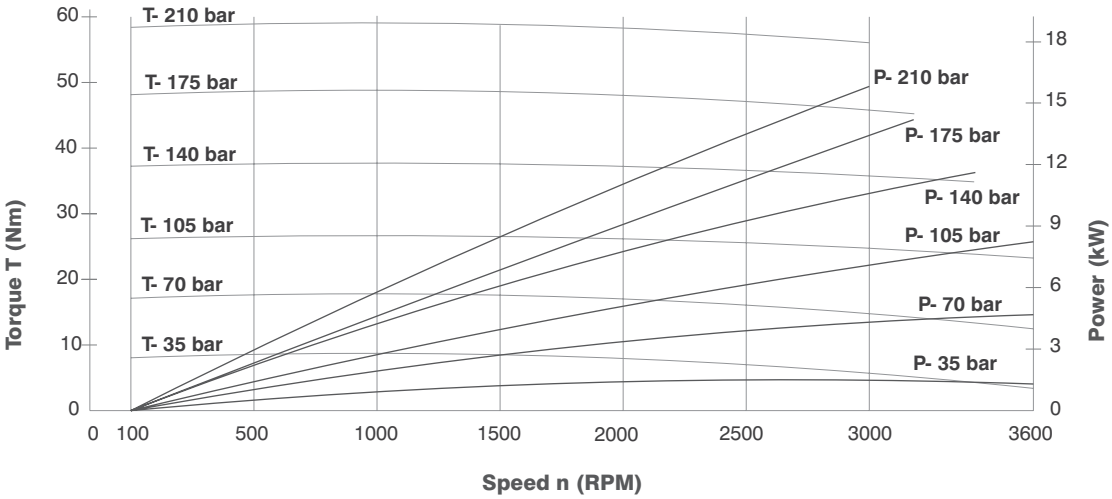

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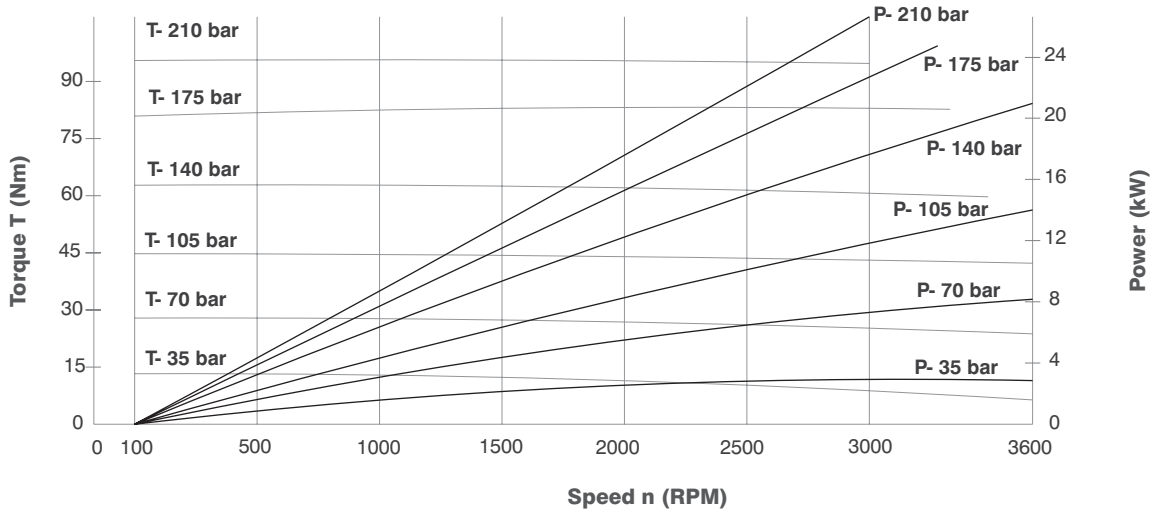
Top

VM3B 027



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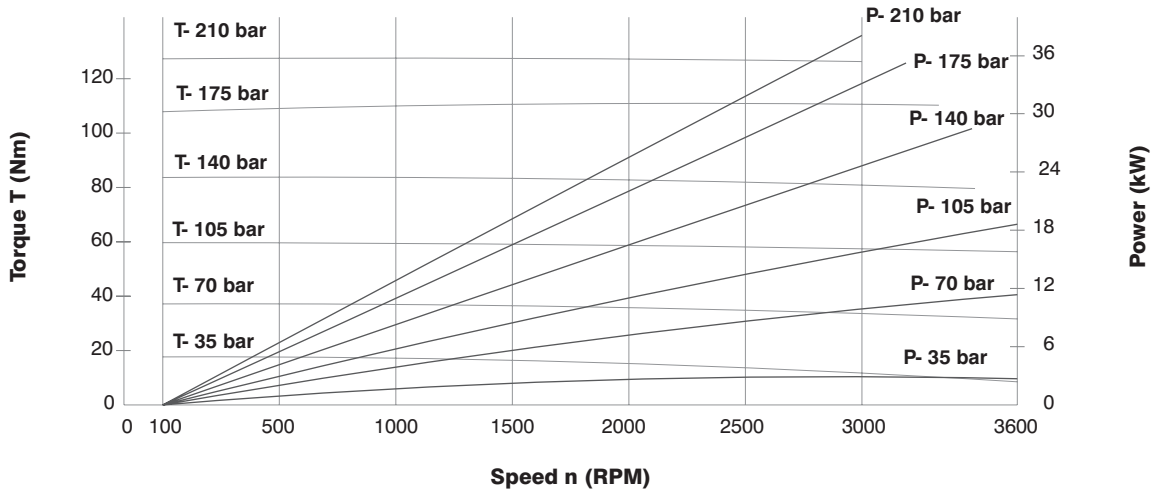

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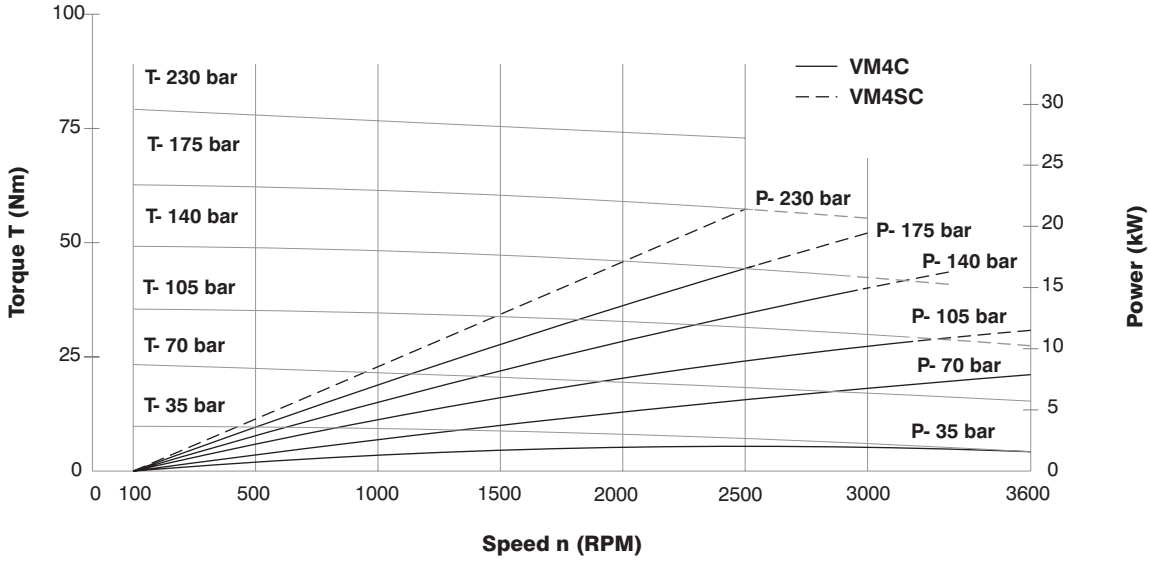

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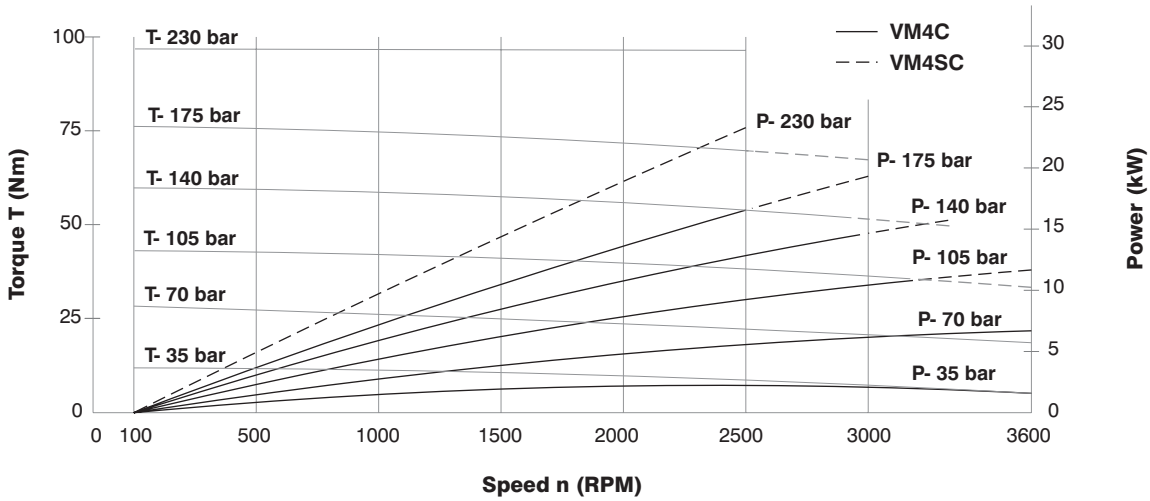

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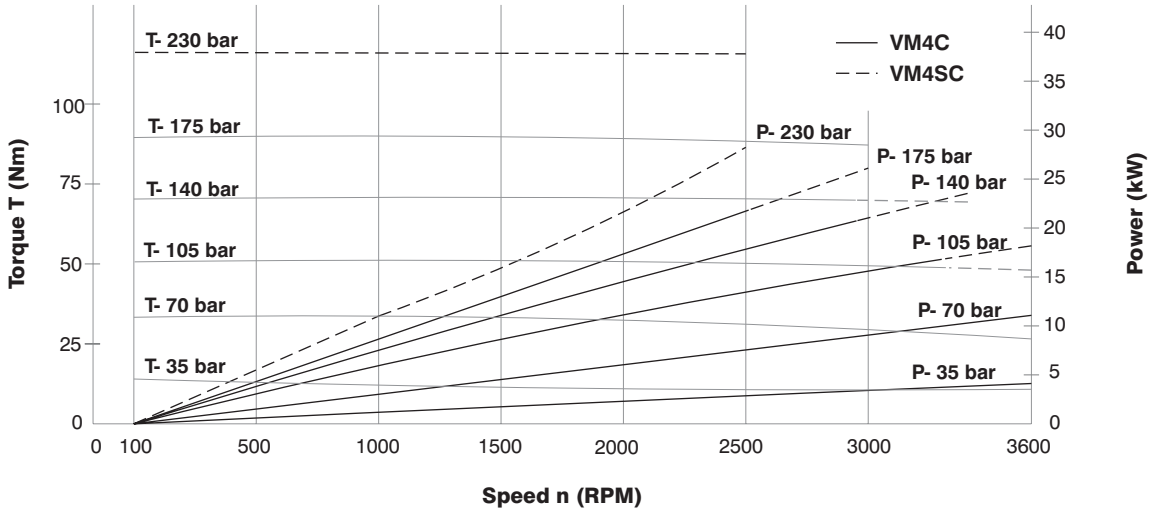

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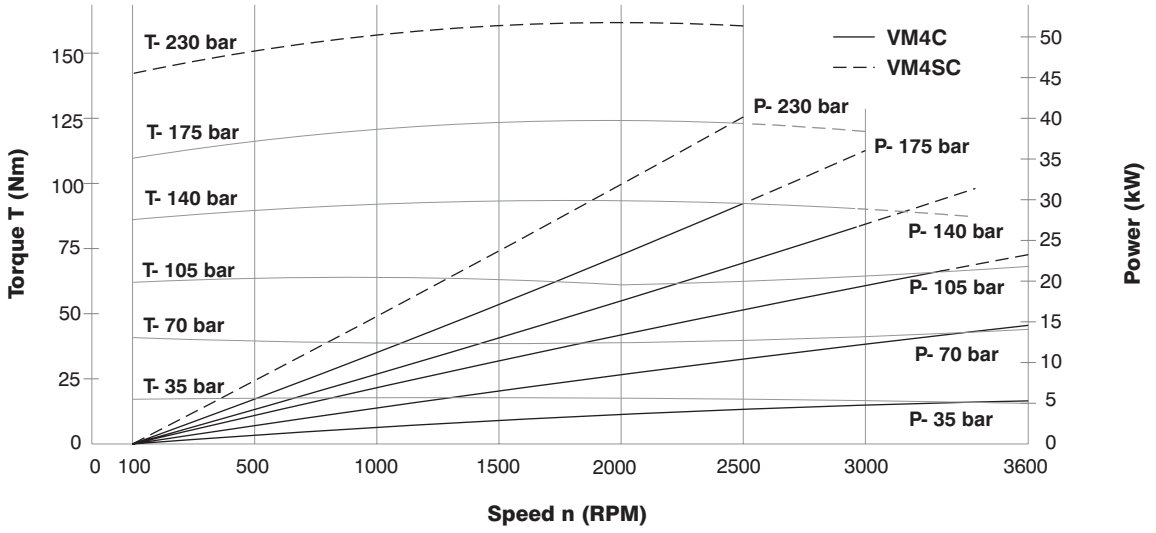

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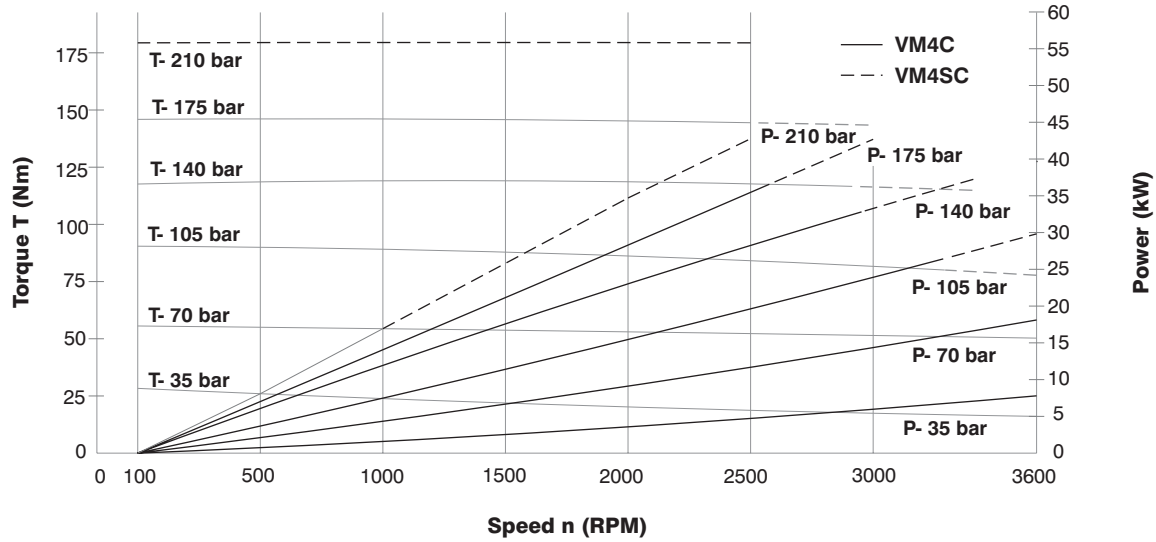

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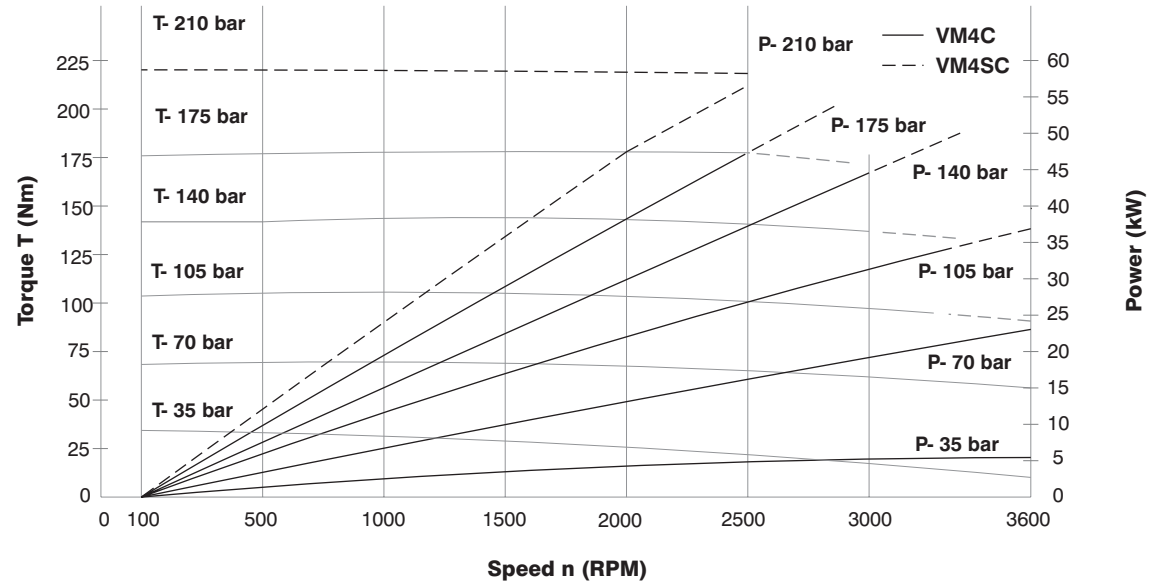

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Top

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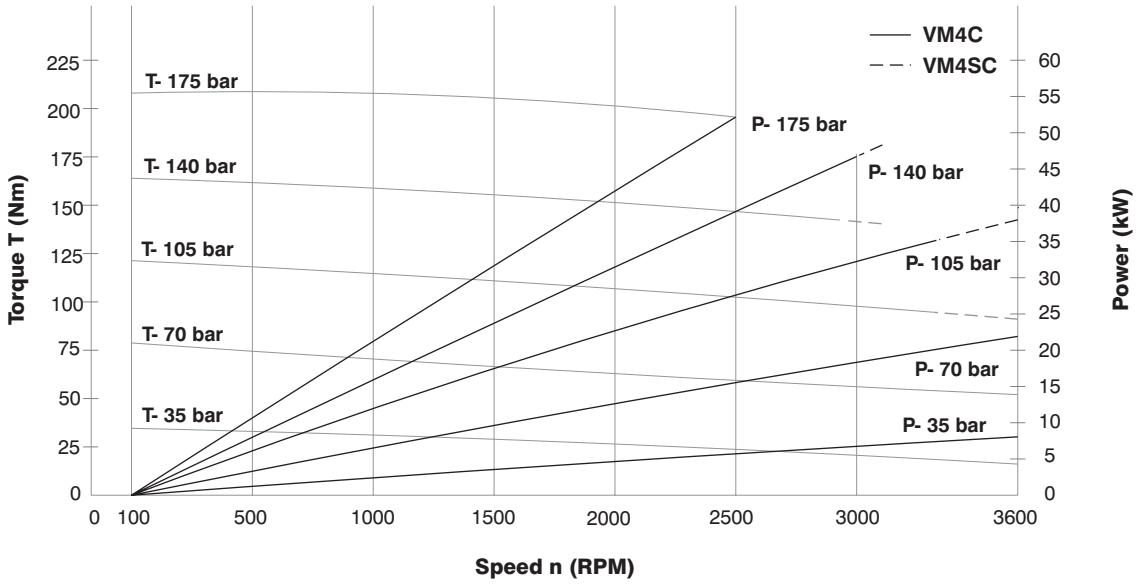

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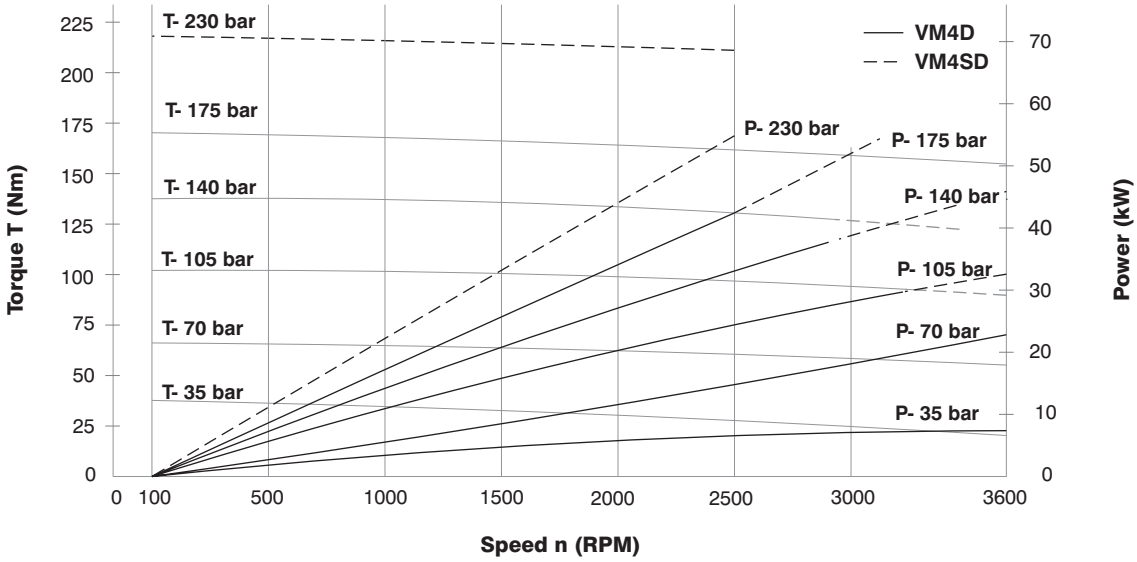

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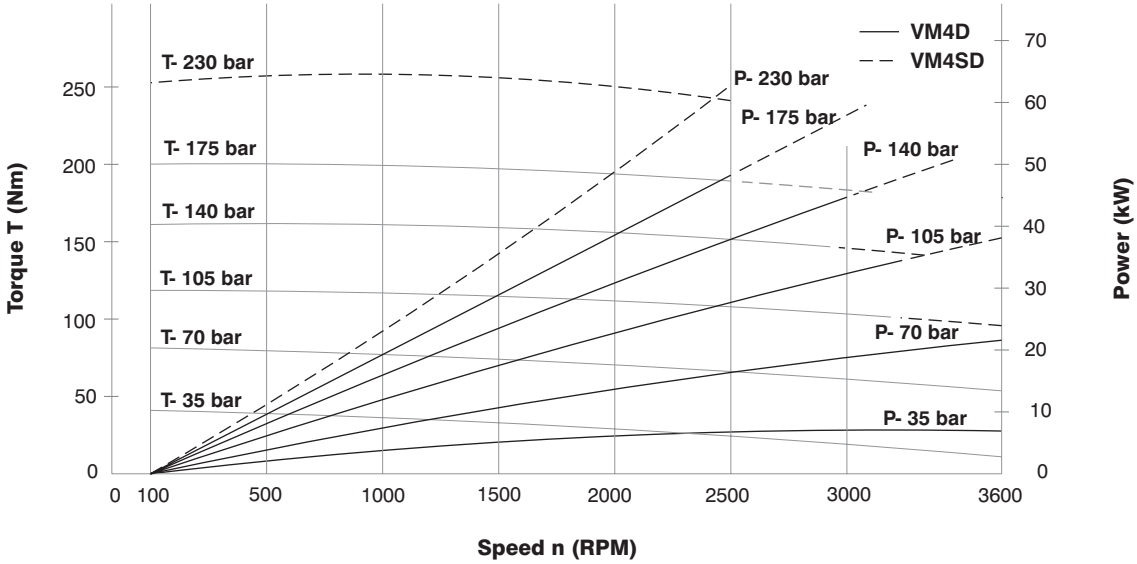

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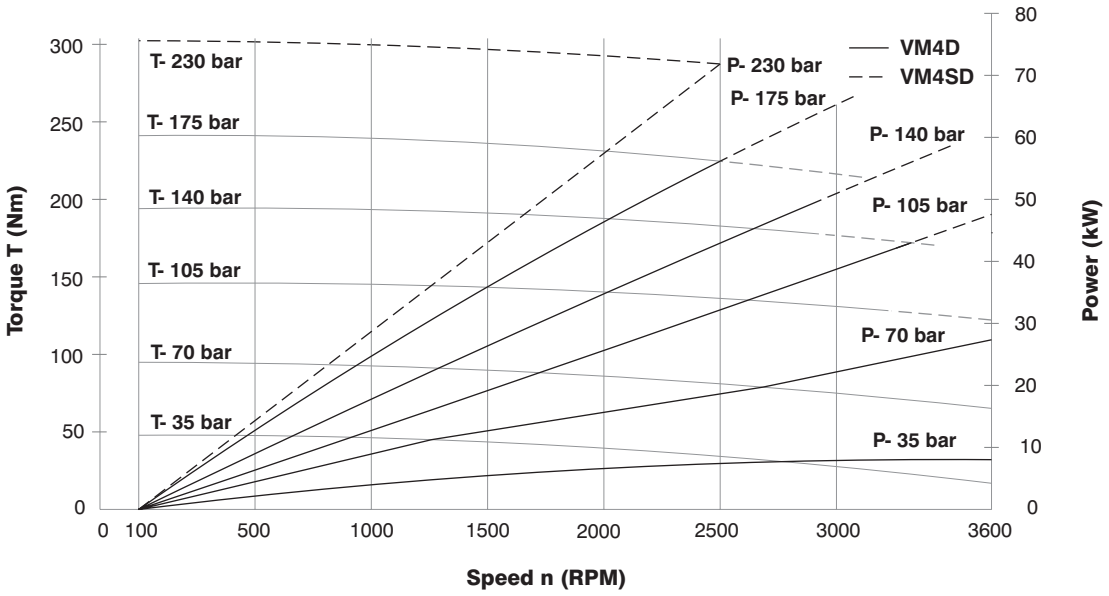

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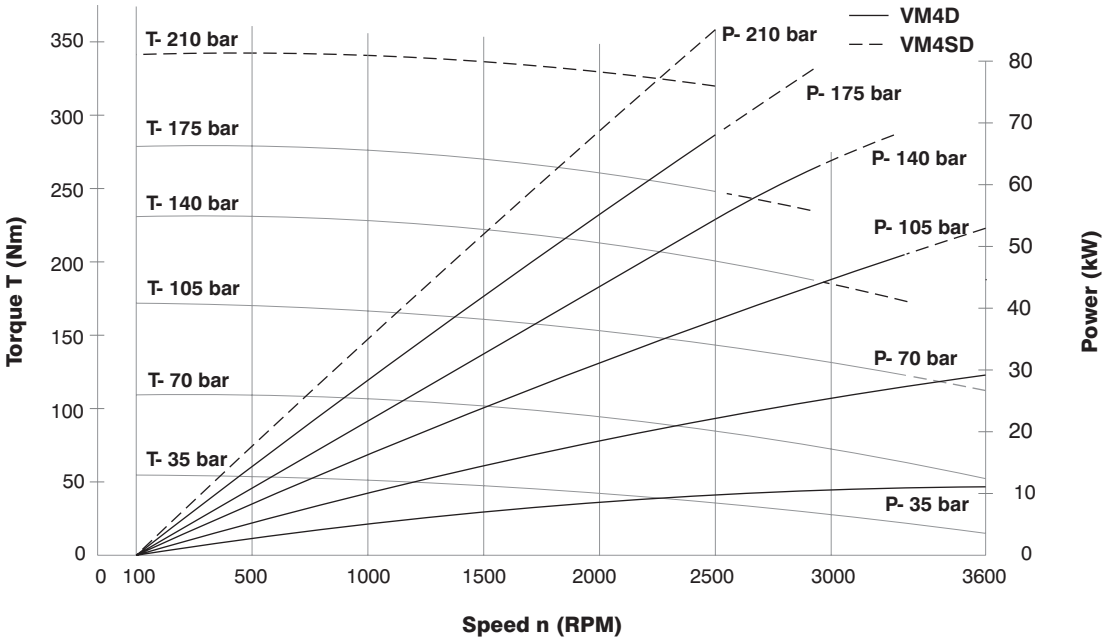

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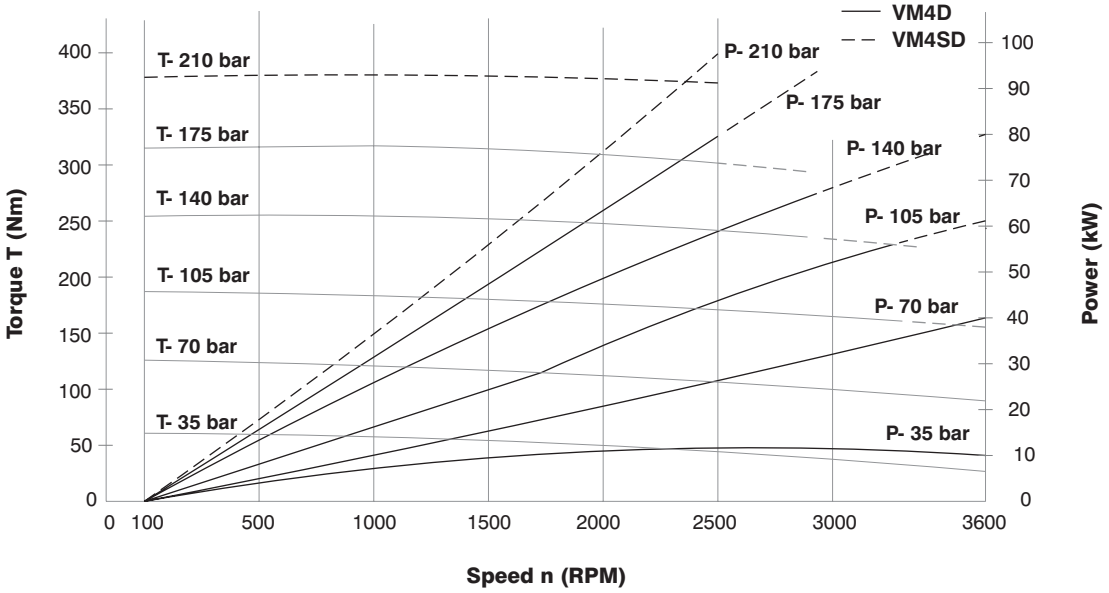

Note : Product details are liable to change without notice

Top

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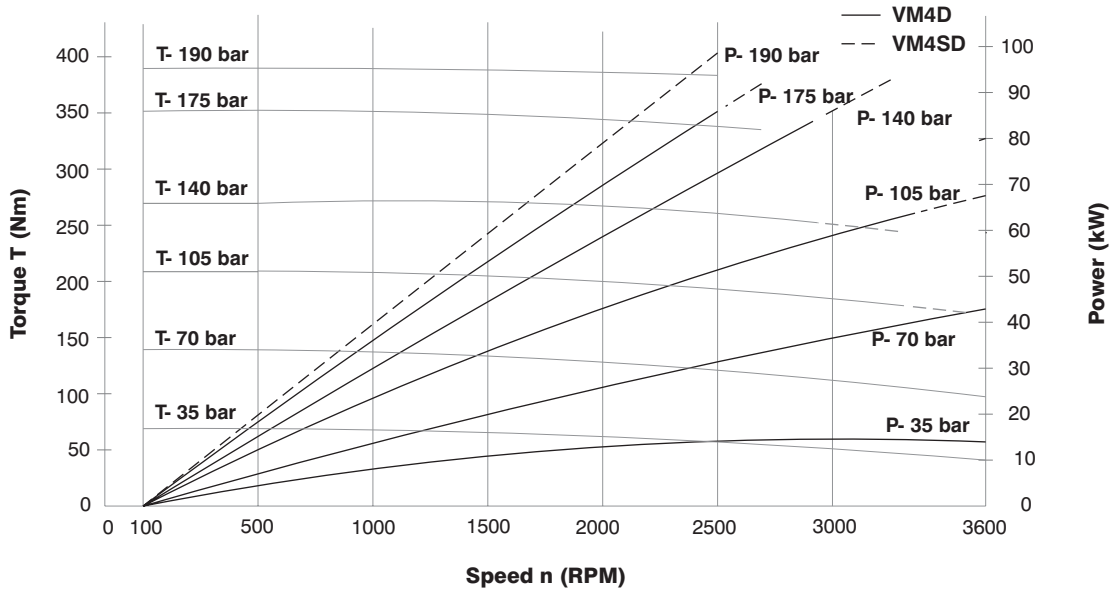

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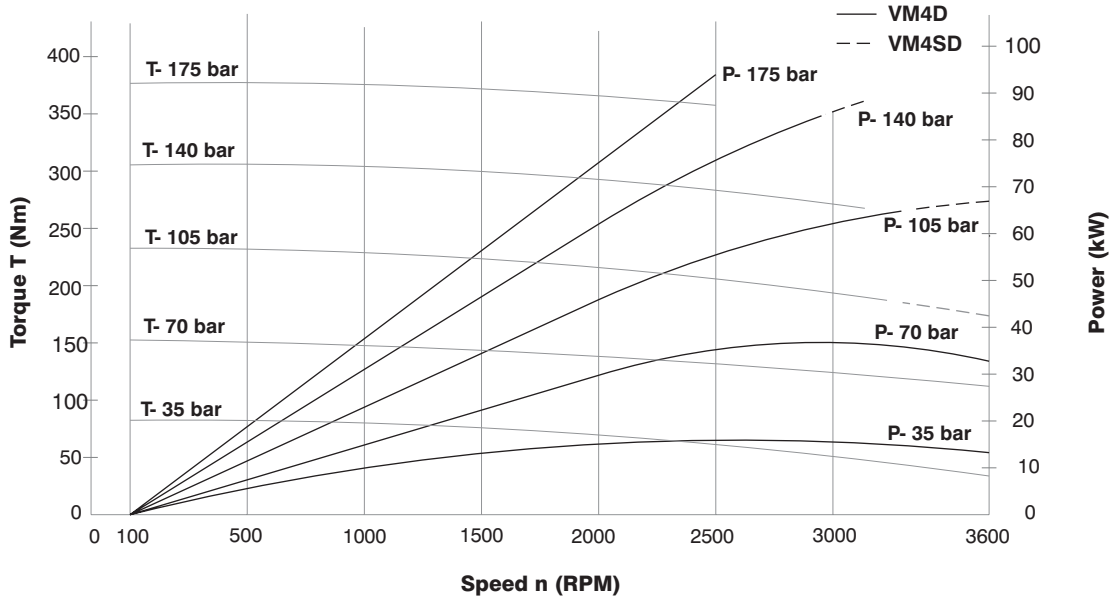

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Top

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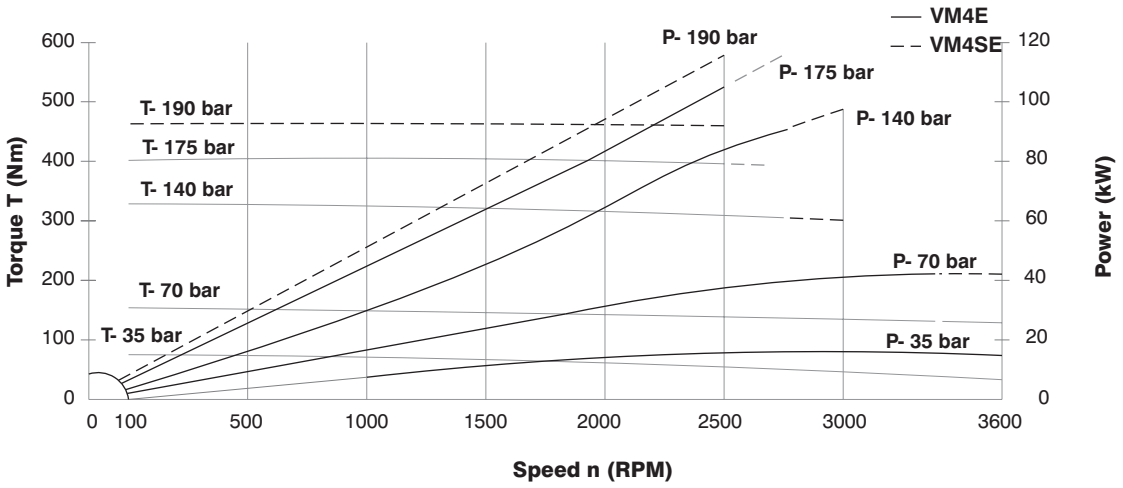

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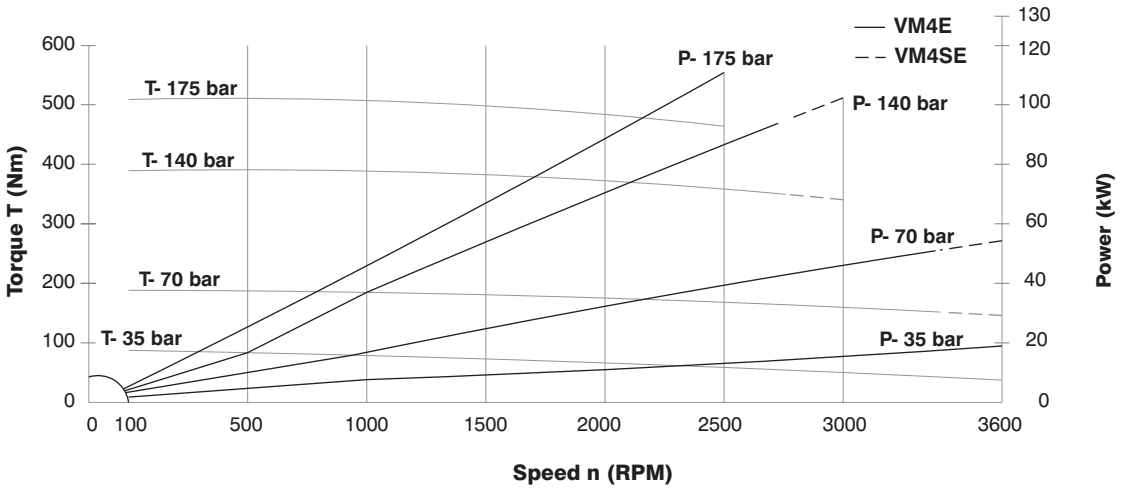

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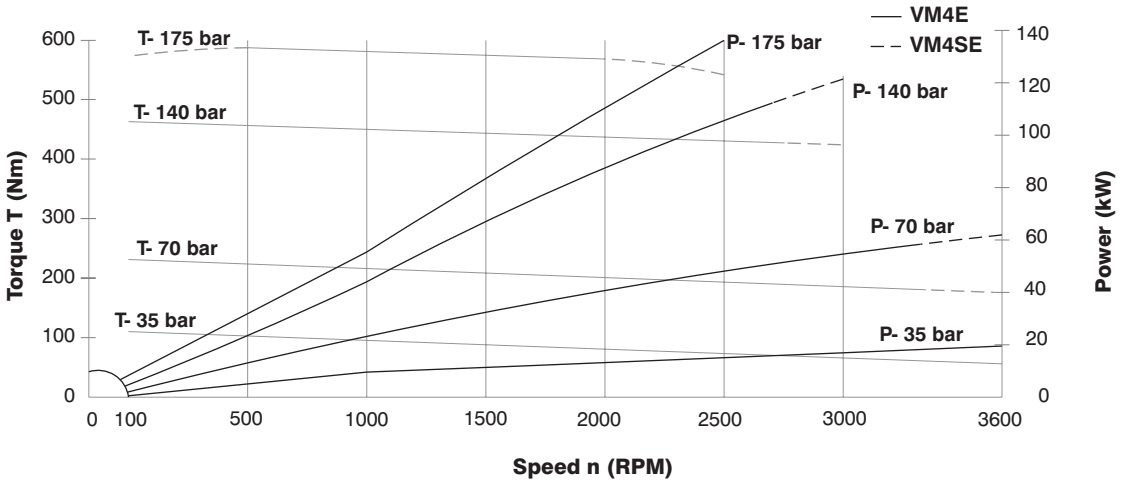


Series	Size	Displ.	Max. pressure					Operating pressure range drain	Max. speed for low loaded condition[1]	Max. speed for max. pressure ratings					
			HF-0 HF-2	HF-2A	HF-1	HF-3 HF-5	HF-4			HF-0, HF-2		HF-2A		HF-1	
										Cont.	Int. [2]	Cont.	Int. [2]	Cont.	Int. [2]
			bar	bar	bar	bar	bar	bar	RPM	RPM	RPM	RPM	RPM	RPM	RPM
VM3	B B1	009	175					1.5	4000	300	3600				
		012	210												
		018													
		027													
		036													
VM4	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	230	175	175	140								
		027													
		031													
		043													
		055	210	210											
		067													
		075	175	175											
	D D1	062	175	175	140				4000	2500	3600	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												

1) Low loaded condition 35 bar for VM3 and VM4, 80 bar max. for VM4S (see page 6).

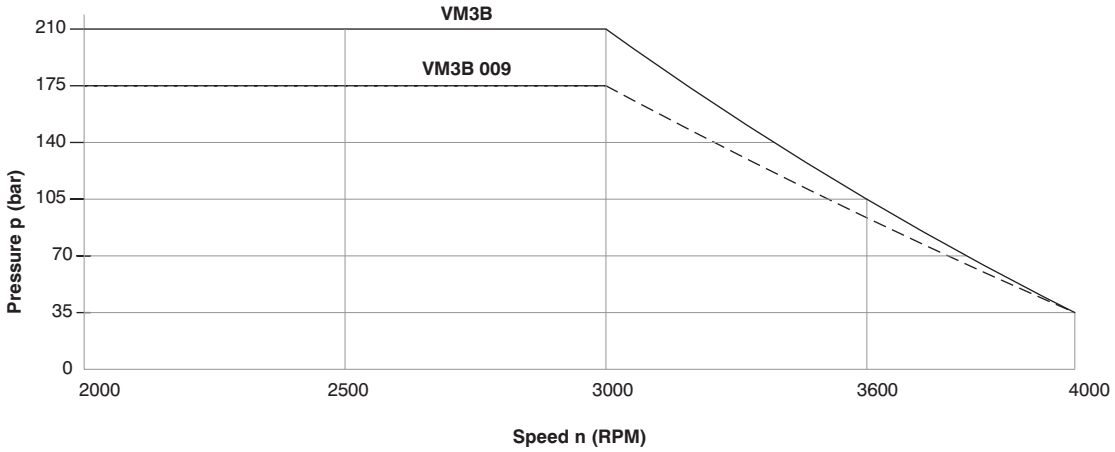
2) Intermittent speed - Do not exceed 6 seconds per minute of operation.

HF-0, HF-2 = Antiwear petroleum base. HF-2A = Crankcase. HF-1 = Now antiwear petroleum base. HF-5 = Synthetic fluids.

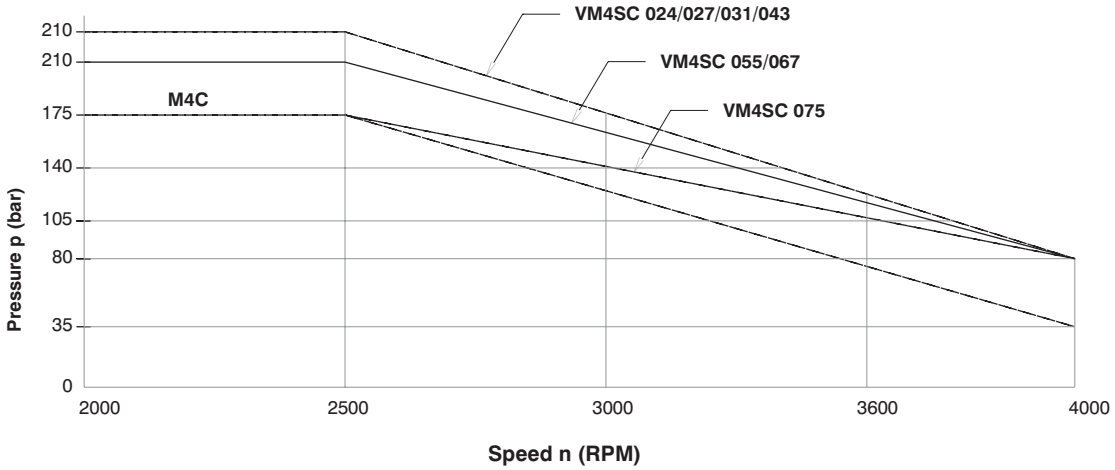
HF-3 = Water in oil emulsion. HF-4 = Water glycols.

Interal drain : All these motors may be equipped with internal drain. Then the model numbers will VM3B1, VM4C1, VM4SC1, VM4D1 VM4SD1, VM4E1, VM4SE1.

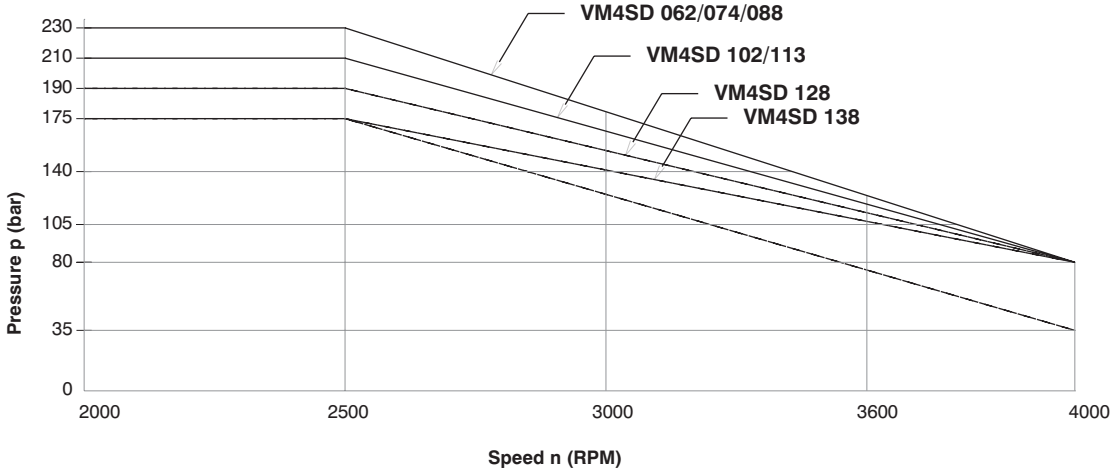
VM3B



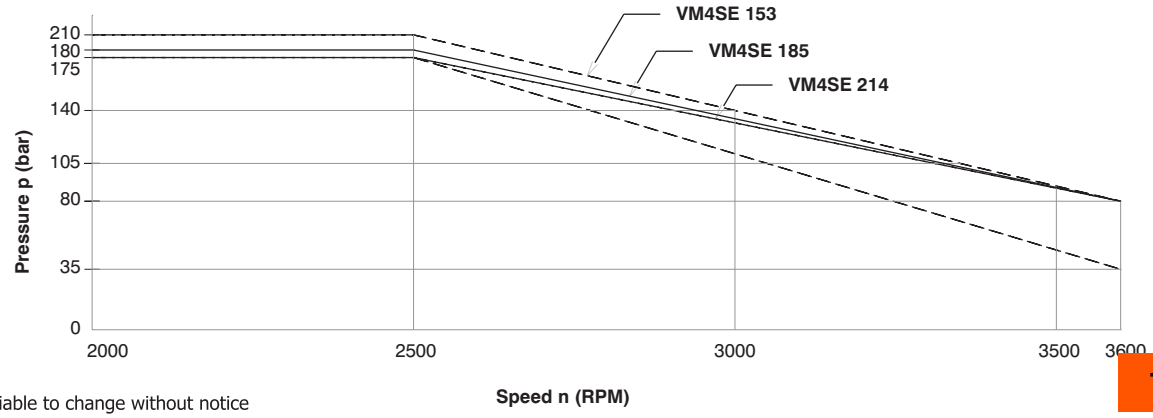
VM4C/M4SC



VM4D/M4SD



VM4E/M4SE



Top

Performances required

Torque	T (N. m.)	140
Pump flow (available)		
at 24 cSt	qve (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).

$$0.85 \times \frac{Q\,Ve \times p}{600} > \frac{T \times \pi n}{30 \times 1000}$$

$$0.85 \times \frac{115 \times 175}{600} > \frac{140 \times \pi \times 1500}{30 \times 1000}$$

$28.5 > 22$

Two ways of calculation :

2a. Calculate Vi from T required torque

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

3a. Motor choose from V_i immediately greater
VM4C 055 V_i = 58,8 ml/rev.

4a. Check real motor pressure for
T = 140 Nm. around 1500 RPM
VM4C 055 T=140 N.m n = 1500 RPM
p = 163 bar (see page B0-7)

5a. Flow loss VM4C 055 at 163 bar at 24 cSt
qv_S = 16 l/min
Real flow used by the motor :
$qv = qv_e - qv_s = 115 - 16 = 90$ l/min

6a. Real speed of the motor :

$$n = \frac{qv \times 1000}{V_i} = \frac{99 \times 1000}{58.8} = 1680 \text{ RPM}$$

Real performances

V_i = 58.8 ml/rev.
n = 1680 RPM
T = 140 Nm
p = 163 bar
} VM4C 055

2b. Calculate Vi from qv_e required torque

$$V_i = \frac{1000 \times 115}{1500} = 76.6 \text{ ml/rev.}$$

3b. Motor choose from V_i immediately smaller
VM4C 067 Vi = 71.1 ml/rev.

4a. Check motor press. with T = 140 Nm.
at 1500 RPM
VM4C 067 T=140 N.m n = 1500 RPM
p = 140 bar

5b. Flow loss VM4C 067 at 140 bar at 24 cSt
qv_S = 14 l/min
Real flow used by the motor :
$qv = qv_e - qv_S = 115 - 14 = 101$ l/min

6b. Real speed of the motor :

$$n = \frac{qv \times 1000}{V_i} = \frac{101 \times 1000}{71.1} = 1420 \text{ RPM}$$

Real performances

V_i = 71.1 ml/rev.
n = 1420 RPM
T = 140 Nm
p = 140 bar
} VM4C 067

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

Note:- *Performance characteristics shown are based on our laboratory test conditions and these may vary under different operating conditions. Product details are liable to change without prior notice.*

VM3B1

VM3B - 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 (no SAE)
3 - splined (SAE A)
4 - splined (SAE B)

Rotation

N - bi-directional

View from shaft end:

CW rotation A = inlet
B = outlet

CCW rotation A = outlet
B = inlet

Modifications

Port connections

00 = SAE threaded port
SAE drain

01 = SAE 4 bolt flange
BSPP drain

02 = BSPP threaded port
BSPP drain

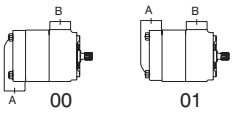
Seal class

1 - S1
4 - S4
5 - S5

Design letter

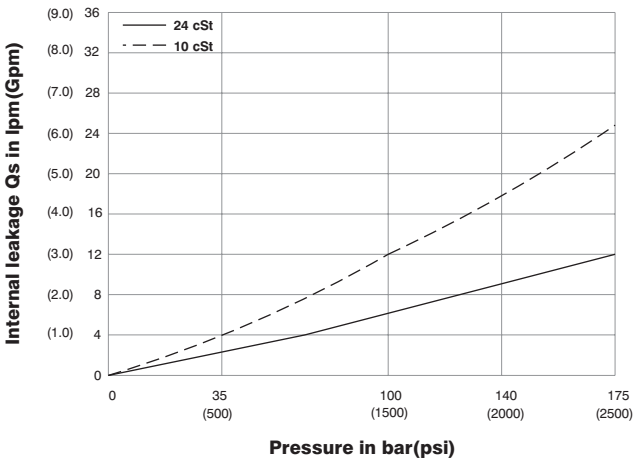
Porting combination

00 - standard

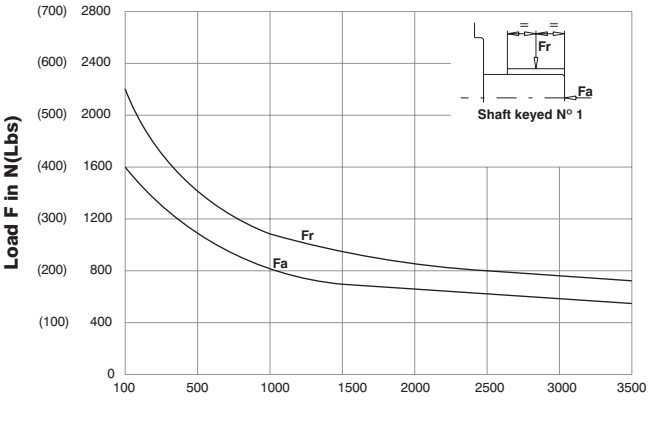


VM

INTERNAL LEAKAGE



PERMISSIBLE RADIAL AND AXIAL LOADS



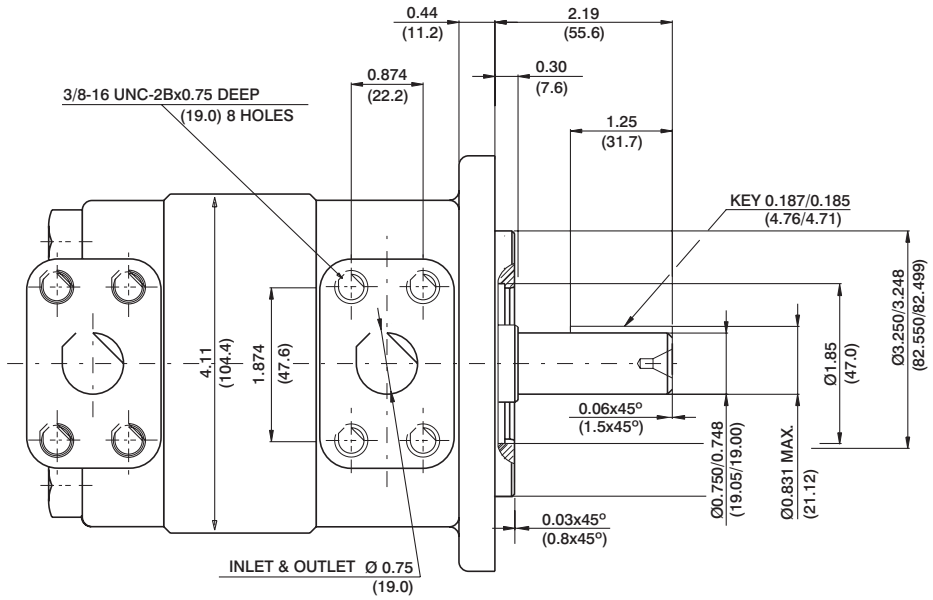
Do not apply **Fr** and **Fa** loads simultaneously

OPERATING CHARACTERISTICS - TYPICAL (24 cSt)

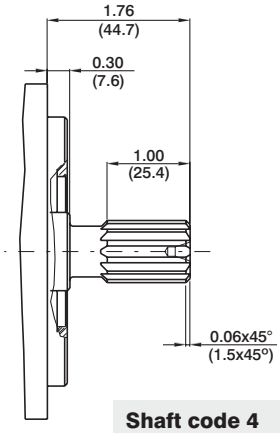
Model	Series	Volumetric Displacement Vi		Input flow at n = 2000 rpm				Torque T at n = 2000 rpm		Power output at n = 2000 rpm	
				Theoretical		at 175 bar (2500 psi)Δp		at 175 bar (2500 psi)Δp		at 175 bar (2500 psi)Δp	
		in³/rev	cm³/rev	GPM	l/min	GPM	l/min	in.lbf	Nm	HP	KW
VM3B	009	0.56	9.2	4.9	18.4	8.0	30.4	174.3	19.7	5.8	4.3
	012	0.75	12.3	6.5	24.6	9.7	36.6	236.3	26.7	7.8	5.8
	018	1.13	18.5	9.8	37.0	12.9	49.0	412.4	46.6	13.4	10.0
	027	1.70	27.8	14.7	55.6	17.8	67.6	680.5	77.4	21.8	16.3
	036	2.26	37.1	19.6	74.2	22.8	86.2	902.6	102.0	28.3	21.1

Note : Product details are liable to change without notice

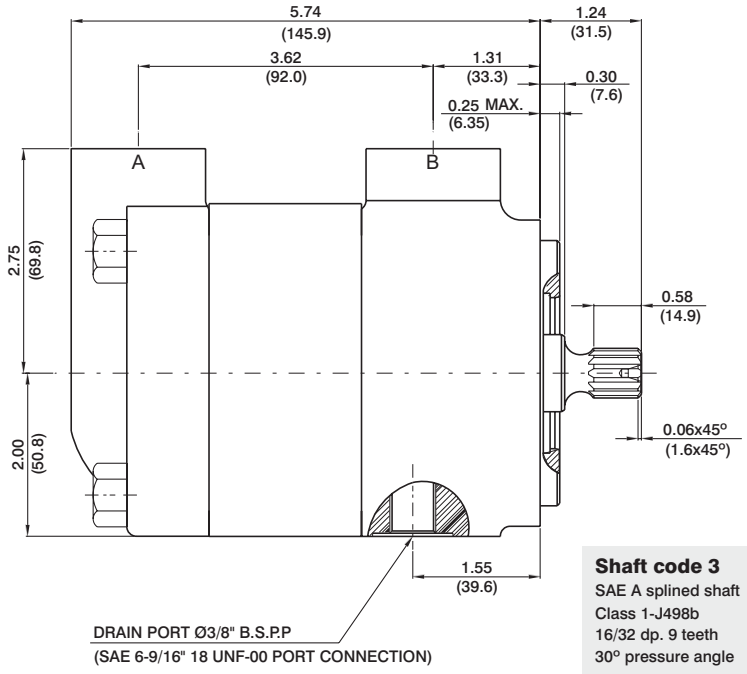
Top



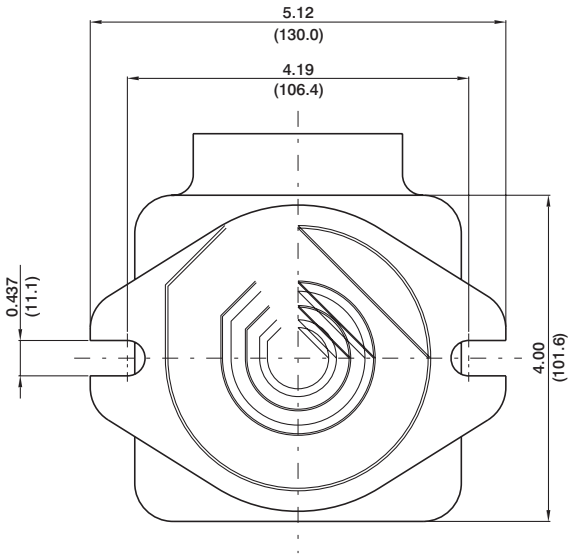
PORT CONNECTION 01

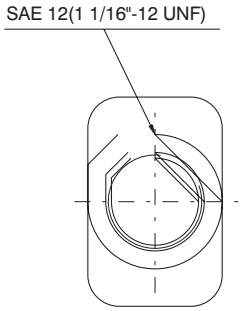


Shaft code 4
SAE B splined shaft
Class 1-J498b
16/32 dp. 13 teeth
30° pressure angle
flat root side fit

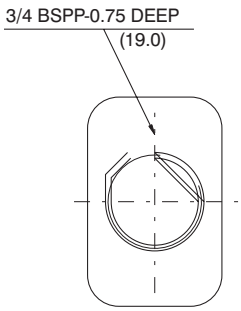


Shaft code 3
SAE A splined shaft
Class 1-J498b
16/32 dp. 9 teeth
30° pressure angle
flat root side fit





PORT CONNECTION 00



PORT CONNECTION 02

Note : Product details are liable to change without notice

Top

VELJAN

VM4*C - 1 - 067 - 1 N 00 - A 1 02 *

Series
*S = Severe duty motor
External Drain
(Omit for 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 (no SAE)
3 - splined (SAE B)

Rotation
N - Bi-directional

Modifications

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 (VM4C)
5 - S5 (VM4SC)

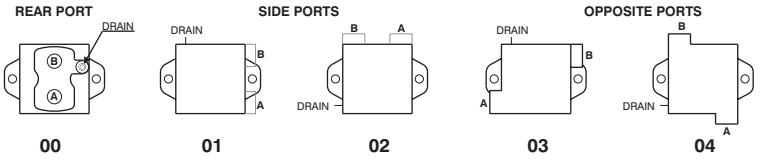
Design letter

Porting combination
00 - standard

VM4C1-VM4SC1 : Drain port is plugged

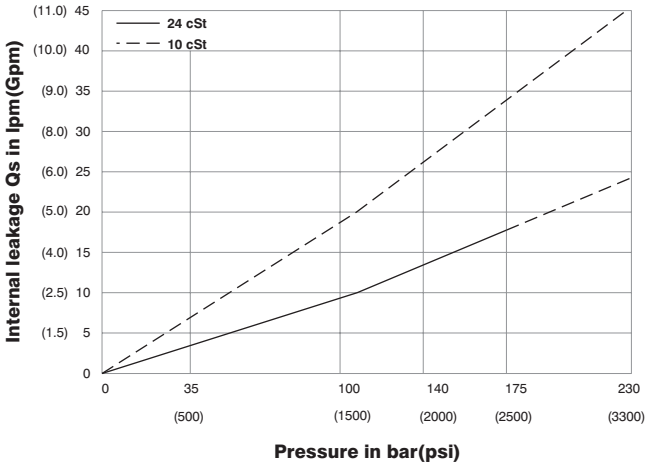
View from shaft end:
CW rotation A = inlet B = outlet
CCW rotation A = outlet B = inlet

Porting combination

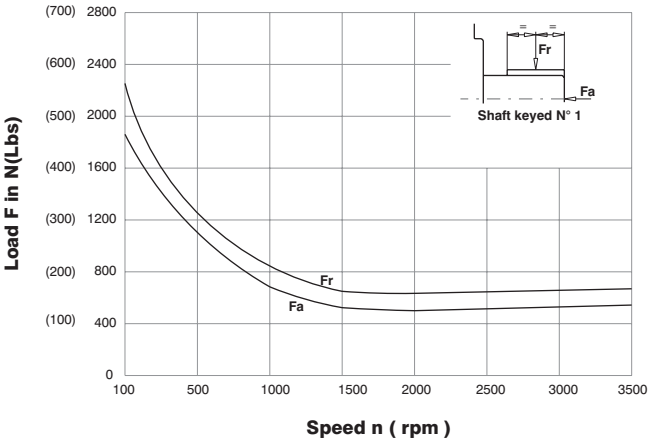


VM

INTERNAL LEAKAGE



PERMISSIBLE RADIAL AND AXIAL LOADS

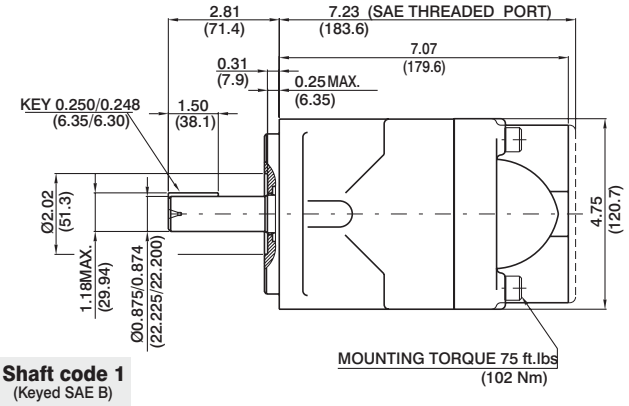


Do not apply **Fr** and **Fa** loads simultaneously

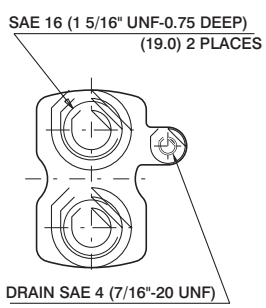
OPERATING CHARACTERISTICS - TYPICAL (24 cSt)

Model	Series	Volumetric Displacement Vi		Input flow at n = 2000 rpm				Torque T at n = 2000 rpm		Power output at n = 2000 rpm	
				Theoretical		at 175 bar (2500 psi)△p		at 175 bar (2500 psi)△p		at 175 bar (2500 psi)△p	
		in³/rev	cm³/rev	GPM	l/min	GPM	l/min	in.lbf	Nm	HP	KW
VM4C-VM4SC	024	1.49	24.4	13.0	49.0	17.7	67.0	535.4	60.5	17.0	12.7
	027	1.72	28.2	14.8	56.0	19.5	74.0	619.5	70.0	19.7	14.7
	031	2.11	34.5	18.5	69.0	23.2	87.0	768.0	86.8	24.0	18.0
	043	2.84	46.5	24.6	93.0	29.3	111.0	1062.0	120.0	33.6	25.1
	055	3.59	58.8	31.2	118.0	36.0	136.0	1318.6	149.0	41.8	31.2
	067	4.34	71.1	37.5	142.0	42.3	160.0	1504.5	170.0	47.7	35.6
	075	4.89	80.1	42.3	160.0	47.0	178.0	1752.2	198.0	55.6	41.5

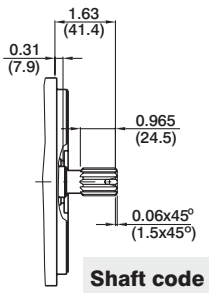
Top



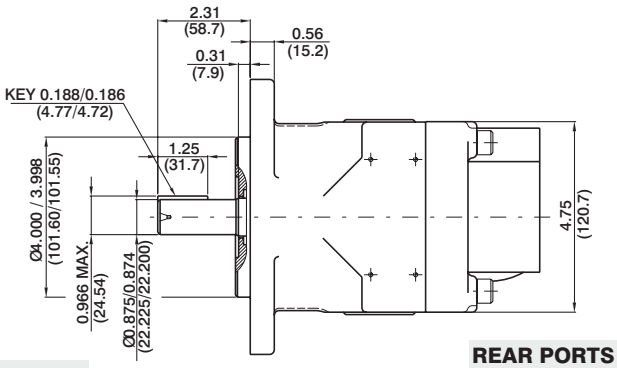
Shaft code 1
(Keyed SAE B)



SAE THREADED PORT

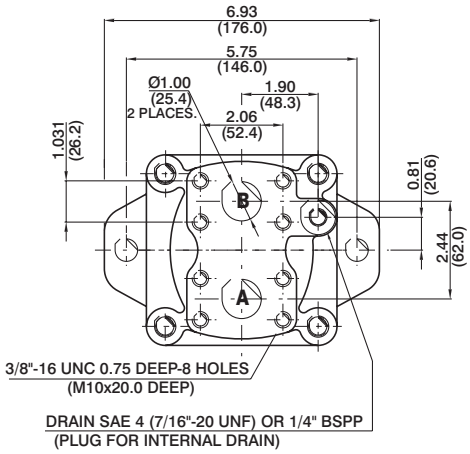


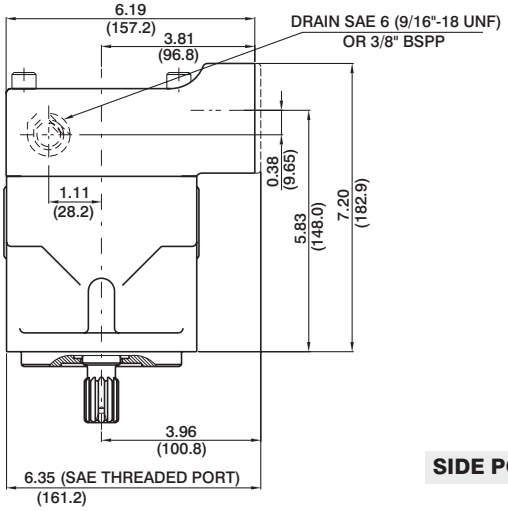
Shaft code 3
SAE B splined shaft
Class 1-J498b
16/32 dp. 13 teeth
30° pressure angle
flat root side fit



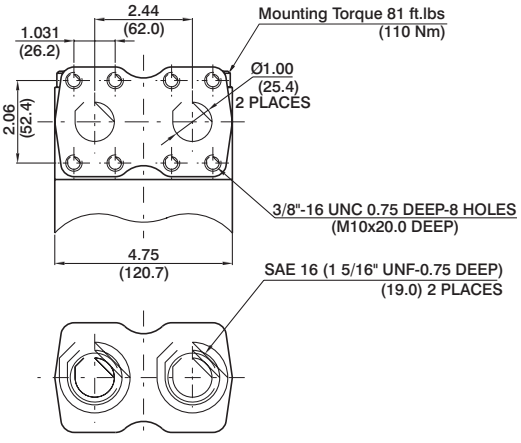
Shaft code 2
(Keyed no SAE)

REAR PORTS

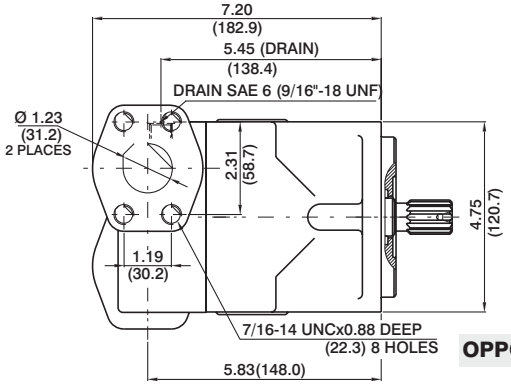




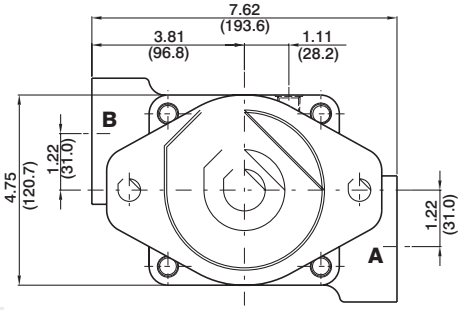
SIDE PORTS



SAE THREADED PORT



OPPOSITE PORTS



Note : Product details are liable to change without notice

Top

VELJAN

VM4*D - 1 - 138 - 1 N 00 - B 1 02 *

Series
*S = Severe duty motor
External Drain
(Omit for 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)
S - splined (SAE J718c)

Rotation
N - Bi-directional

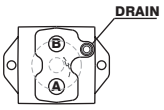
Modifications

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 (VM4D)
5 - S5 (VM4SD)

Design letter

Porting combination
00 - standard



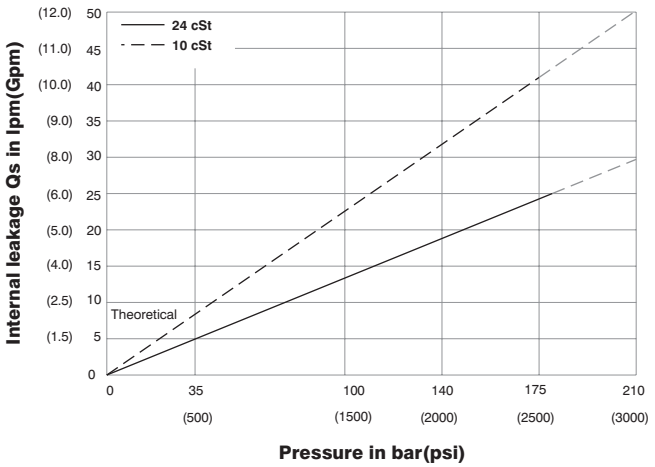
00

VM4D1-VM4SD1 : Drain port is plugged

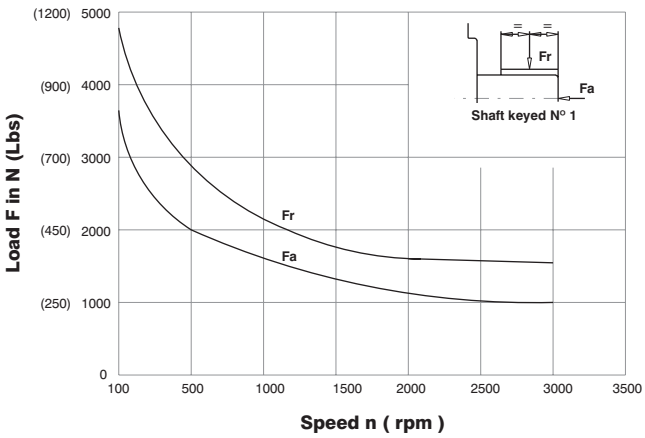
View from shaft end:
CW rotation A = inlet B = outlet
CCW rotation A = outlet B = inlet

VM

INTERNAL LEAKAGE



PERMISSIBLE RADIAL AND AXIAL LOADS

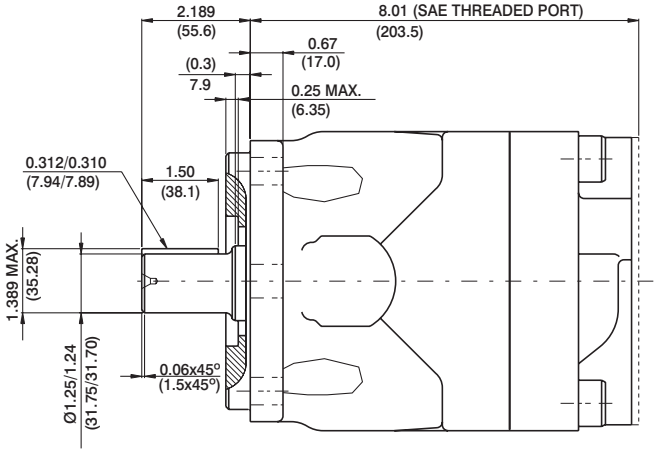


Do not apply **Fr** and **Fa** loads simultaneously

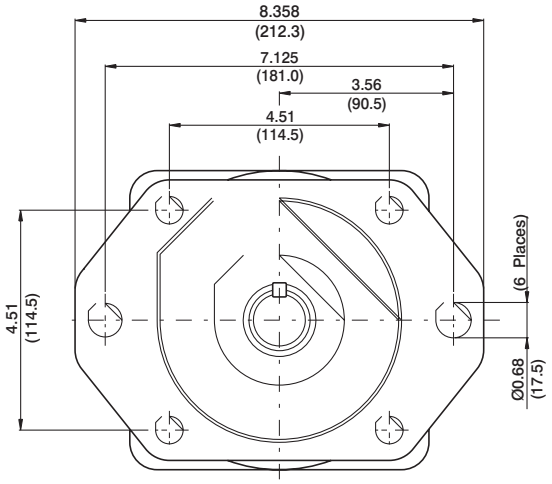
OPERATING CHARACTERISTICS - TYPICAL (24 cSt)

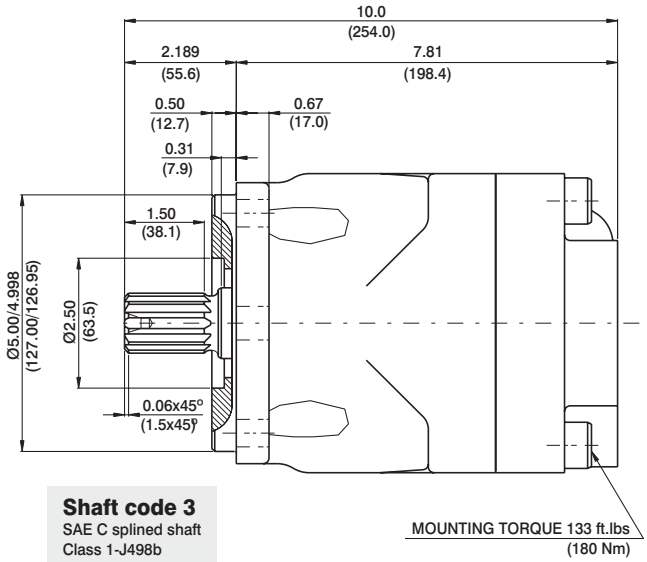
Model	Series	Volumetric Displacement Vi		Input flow at n = 2000 rpm				Torque T at n = 2000 rpm		Power output at n = 2000 rpm	
				Theoretical		at 175 bar (2500 psi)△p		at 175 bar (2500 psi)△p		at 175 bar (2500 psi)△ p	
		in³/rev	cm³/rev	GPM	l/min	GPM	l/min	in.lbf	Nm	HP	KW
VM4D-VM4SD	062	3.97	65.1	33.8	130.0	40.0	154.0	1460.0	165.0	46.4	34.6
	074	4.69	76.8	41.5	154.0	47.8	178.0	1770.0	200.0	56.2	41.9
	088	5.56	91.1	48.0	182.0	54.4	206.0	2088.5	236.0	66.2	49.4
	102	6.44	105.5	55.5	211.0	61.8	241.0	2336.3	264.0	74.1	55.3
	113	7.12	116.7	61.5	233.0	67.9	257.0	2655.0	300.0	84.2	62.8
	128	8.08	132.4	70.0	265.0	76.3	289.0	3009.0	340.0	95.5	71.2
	138	8.81	144.4	76.3	289.0	82.7	313.0	3292.0	372.0	104.5	77.9

Top

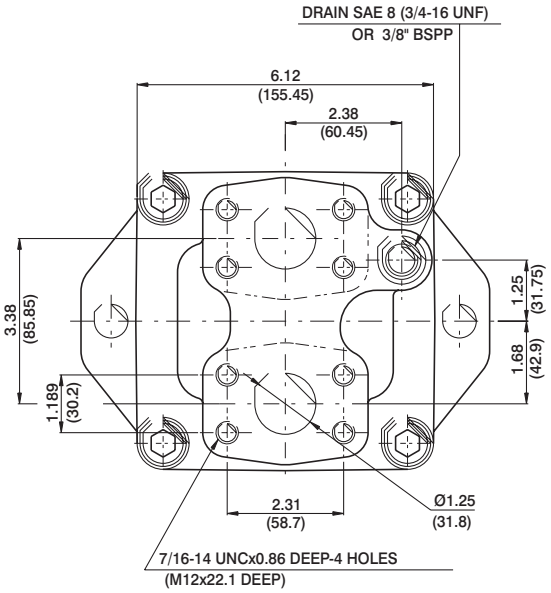


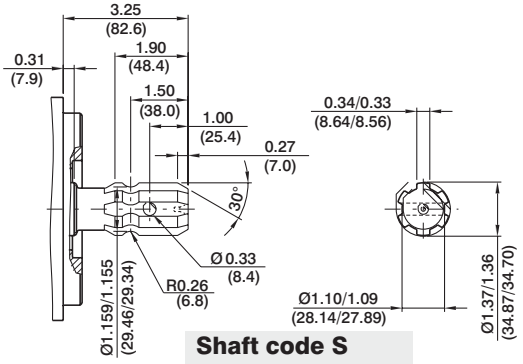
Shaft code 1
(Keyed SAE C)



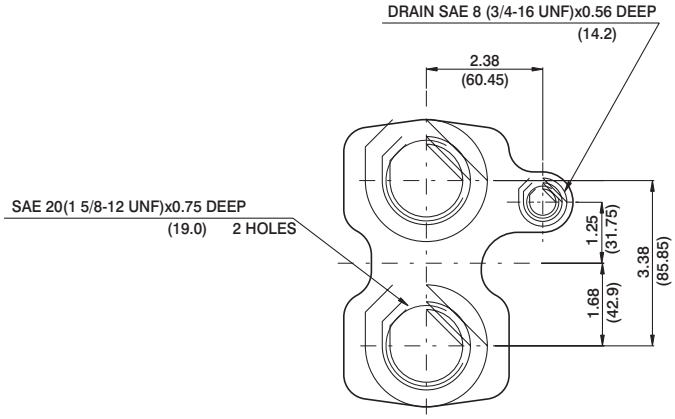


Shaft code 3
SAE C splined shaft
Class 1-J498b
12/24 dp. 14 teeth
30° pressure angle
Flat root side fit





Shaft code S
SAE J718C
540 rpm power take-off
For Farm Tractor application



SAE THREADED PORT

VELJAN

VM4*E - 1 - 214 - 1 N 00 - B 5 02 *

Series
*S = Severe duty motor
External Drain
(Omit for 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
VM4E1-VM4SE1 : Drain port is plugged

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

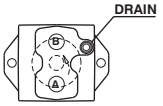
Modifications

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

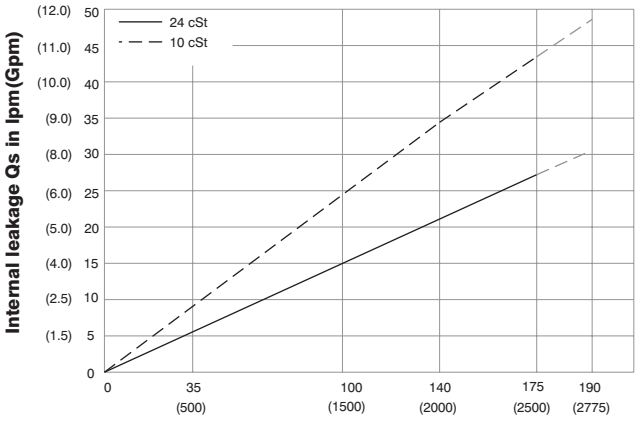
Design letter

Porting combination
00 - standard

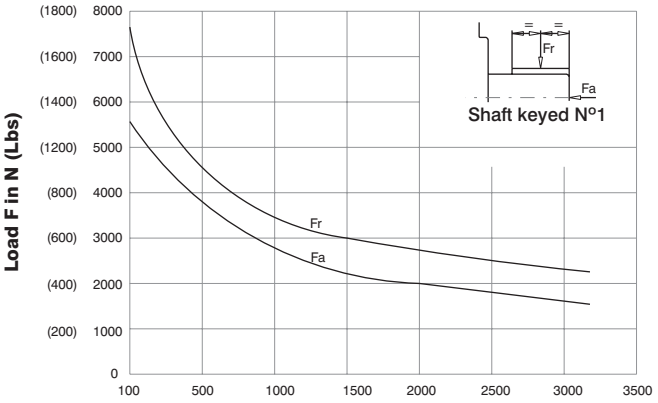


00

INTERNAL LEAKAGE



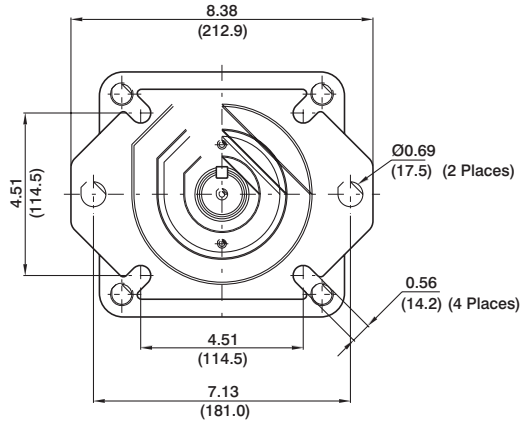
PERMISSIBLE RADIAL AND AXIAL LOADS

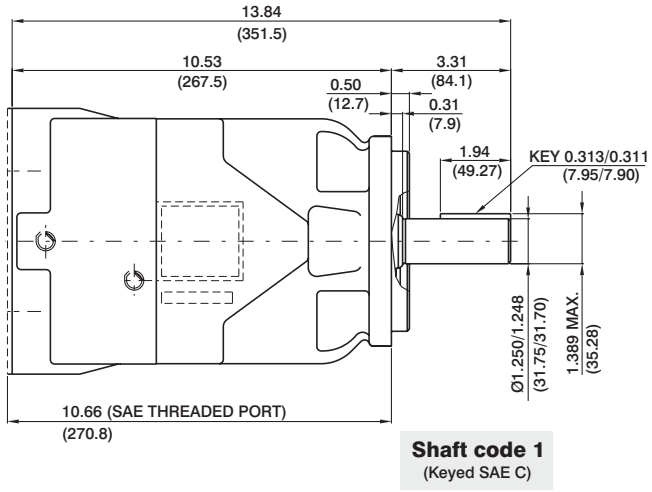


Do not apply **Fr** and **Fa** loads simultaneously

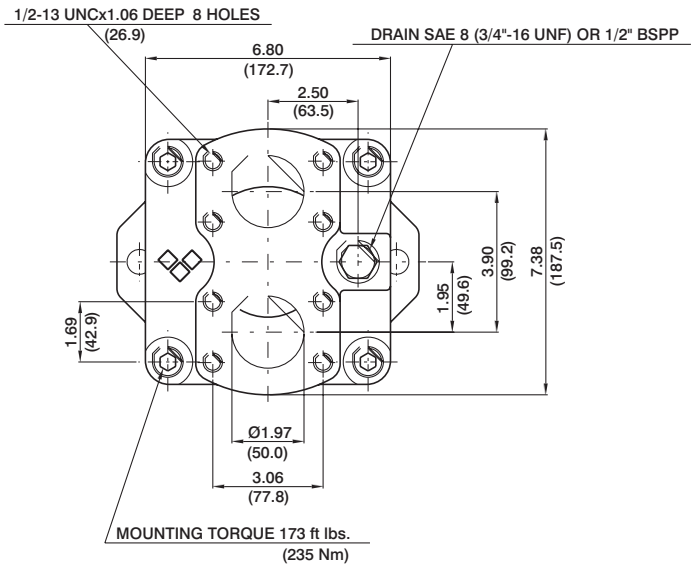
OPERATING CHARACTERISTICS - TYPICAL (24 cSt)

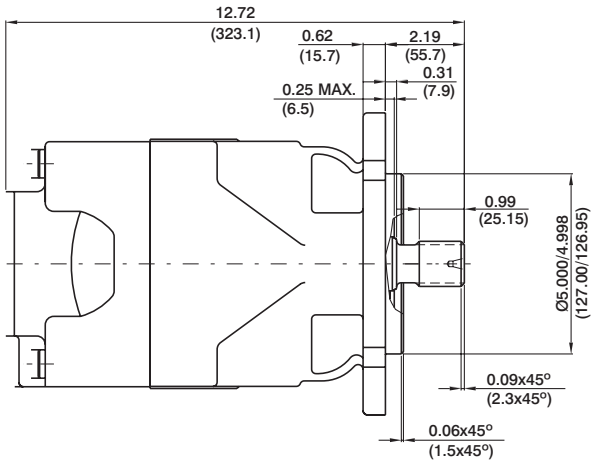
Model	Series	Volumetric Displacement Vi		Input flow at n = 2000 rpm				Torque T at n = 2000 rpm		Power output at n = 2000 rpm	
				Theoretical		at 175 bar (2500 psi)△p		at 175 bar (2500 psi)△p		at 175 bar (2500 psi) △p	
		in³/rev	cm³/rev	GPM	l/min	GPM	l/min	in.lbf	Nm	HP	KW
VM4E-VM4SE	153	9.67	158.5	83.7	316.4	90.6	343.0	3522.0	398.0	111.8	83.4
	185	11.69	191.6	101.2	382.5	108.0	409.0	4283.2	484.0	136.0	101.4
	214	13.55	222.0	117.3	443.4	124.2	470.0	5017.7	567.0	159.3	118.8



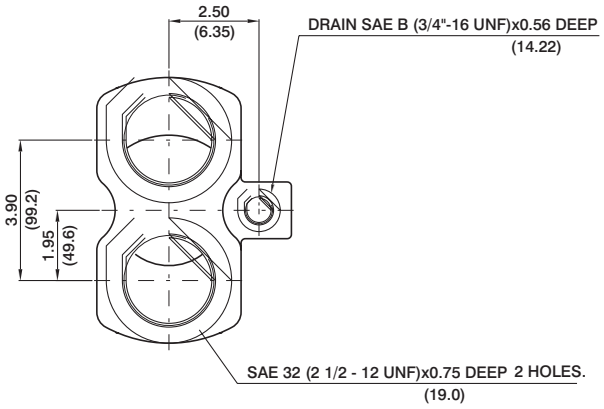


Shaft code 1
(Keyed SAE C)





Shaft code 3
SAE C splined shaft
Class 1-J498b
12/24 dp. 14 teeth
30° pressure angle
Flat root side fit



SAE THREADED PORT