



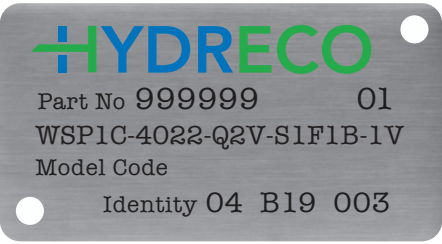
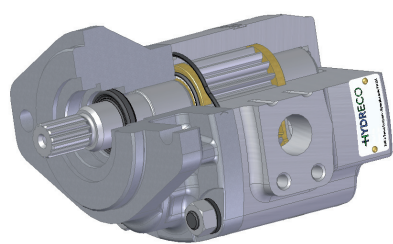
WSP40

EXTERNAL GEAR PUMPS

12 to 50 cc/rev 350 bar



TECHNICAL CATALOGUE



OPERATING PARAMETERS

World Series pumps use a purpose designed form of spur gear which reduces the amount of fluid borne noise generated by the pump and hence transmitted into the hydraulic system. This results in a reduction in the amount of airborne noise emitted from the machine.

World Series pumps are highly efficient and are designed to provide high performance levels and long life when operated within the parameters shown below. For operation outside these parameters please consult your Hydreco Hydraulics representative.

Max outlet port pressures	350 rated - 360 peak	
Inlet port pressures	0.7 - 3 bar abs	
Speed Range	All models	450 - 3000 rev/min
Temperature	Minimum at start-up	-40°C (-40°F)
	Maximum continuous	+80°C (+176°F)
	Maximum intermittent	+100°C (+212°F)
Viscosity	Maximum at start-up	2000 mm²/sec (9,000 SSU)
	Maximum continuous	250 mm²/sec (1150 SSU)
	Minimum continuous	10 mm²/sec (60 SSU)
	Optimum	15-25 mm²/sec (78-124 SSU)
Fluid Cleanliness	To ISO4406 solid contaminant	
	Start-up period	21/17
	Maximum in service	19/15
	Optimum	16/11
	Maximum water	0.1%
Fluid Velocity	Maximum in INLET line	2.5 m/sec (8 ft/sec)
	Recommended in INLET line	1.5 m/sec (5 ft/sec)
Shaft Loads	Maximum axial load	250 N (56 lb)
	Maximum radial load	500 N (112 lb)
Fluids	All data is quoted for mineral oils HM and HV.	
	For fire resistant and environmentally aware fluids please contact your Hydreco Hydraulics representative.	
Rotation	Clockwise or Anti-clockwise viewed from shaft end (not reversible).	

SUPER QUIET, HIGH PERFORMANCE HYDRAULIC PUMPS

World Series pumps incorporate a purpose designed form of spur gear technology to give the highest performance with lowest noise levels.

The purpose designed form of spur gear reduces the effects of flow and pressure ripple to significantly reduce generated noise while large diameter shafts and bearings combined with rigidly aligned cast iron housings ensure long life in the most arduous applications.

Accuracy of components and pressure compensated side plates ensure that high performance levels are maintained.

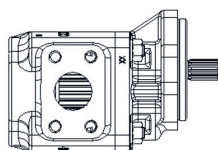
A RANGE OF SINGLE AND MULTIPLE PUMPS

Pump elements are available with displacements from 12 to 50 cm³/rev (0.73 to 3.05 in³/rev) for maximum continuous operating pressures upto 350 bar.

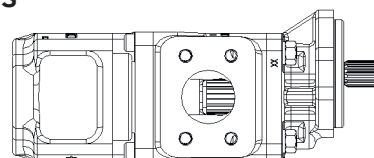
Pumps can be supplied as single, double, triple or quadruple units. There is a limit on the combinations that are available in doubles, triples and quadruples.

Please discuss your specific requirements with your local Hydreco Hydraulics representative.

SINGLE PUMPS



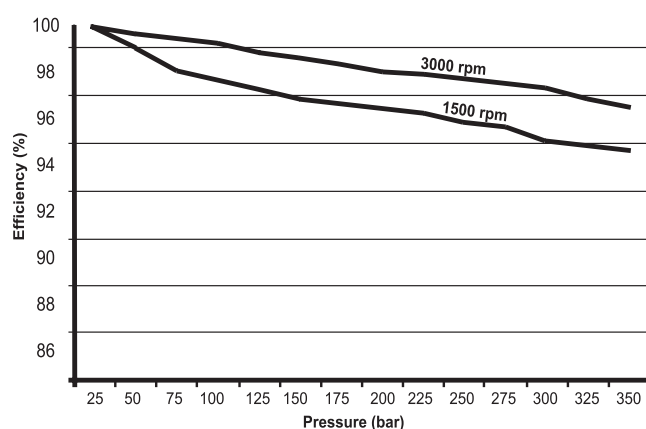
DOUBLE PUMPS



DISPLACEMENT RANGE

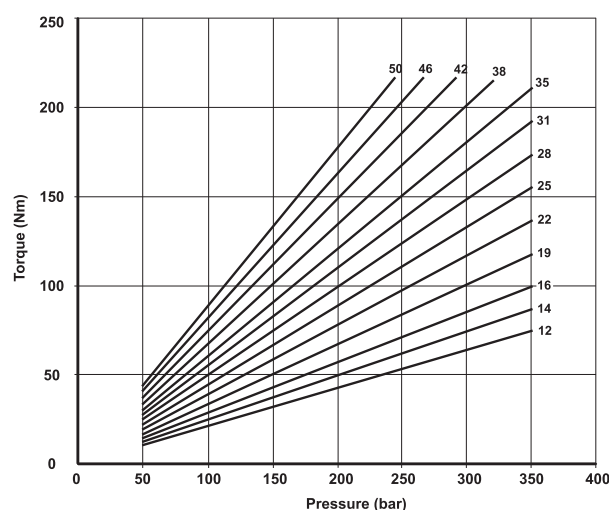
Model	Displacement cm ³ /rev (in ³ /rev)	Rated Pressure bar (psi)	Peak Pressure bar (psi)	Speed	
				Max	Min
				rpm	rpm
4012	12.0 (0.73)	350 (5075)	360 (5220)	3300	450
4014	14.0 (0.85)	350 (5075)	360 (5220)	3300	450
4016	16.0 (0.98)	350 (5075)	360 (5220)	3300	450
4019	19.0 (1.16)	350 (5075)	360 (5220)	3300	450
4022	22.0 (1.34)	350 (5075)	360 (5220)	3300	450
4025	25.0 (1.53)	350 (5075)	360 (5220)	3300	450
4028	28.0 (1.71)	350 (5075)	360 (5220)	3300	450
4031	31.0 (1.89)	350 (5075)	360 (5220)	3300	450
4034	34.0 (2.07)	350 (5075)	360 (5220)	3300	450
4038	38.0 (2.32)	315 (4570)	353 (5115)	3300	450
4042	42.0 (2.56)	290 (4200)	325 (4710)	3300	450
4046	46.0 (2.81)	275 (3400)	308 (4465)	3300	450
4050	50.0 (3.05)	240 (3480)	269 (3900)	3300	450

VOLUMETRIC EFFICIENCIES



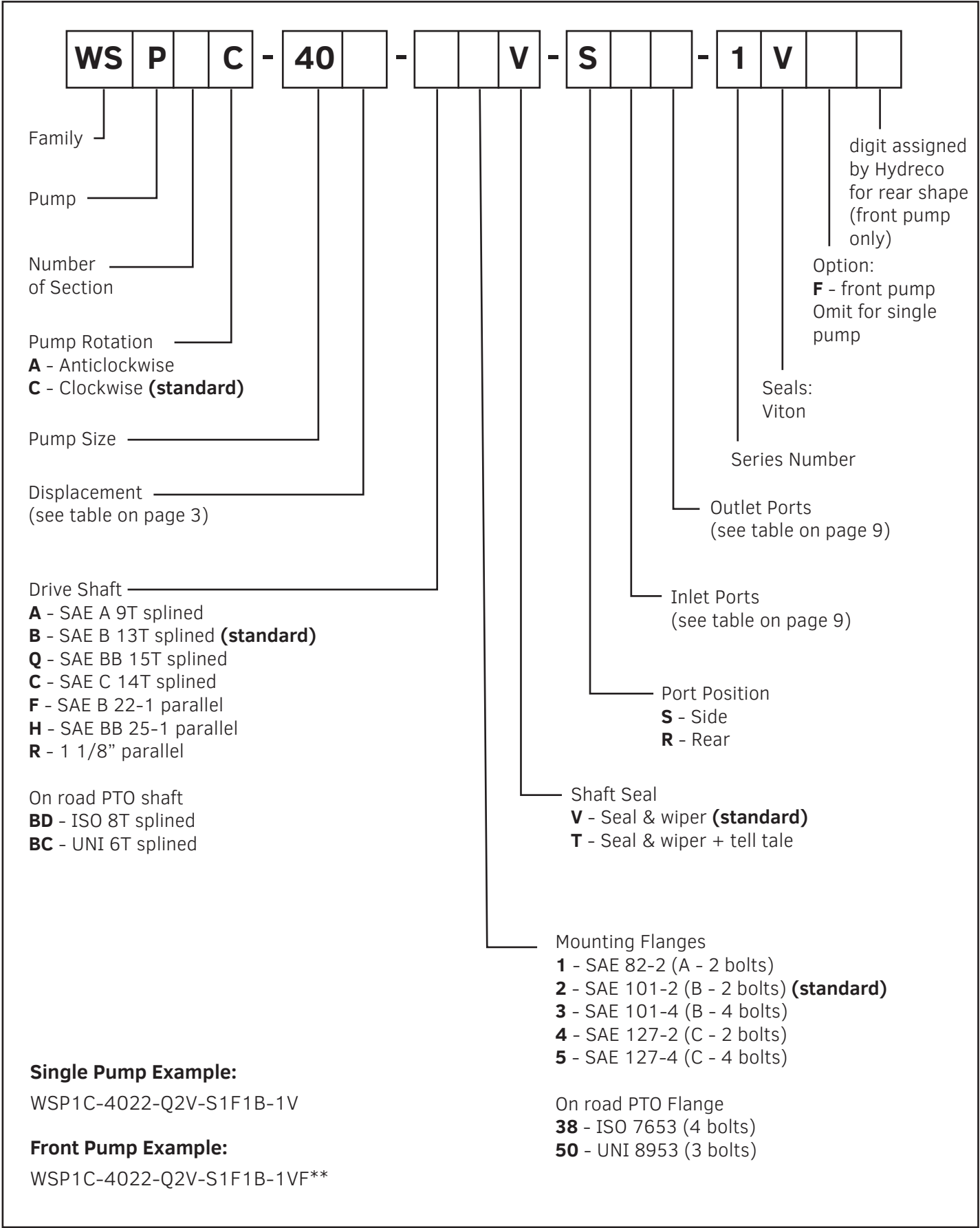
NOTE: These are actual volumetric efficiencies measured on a 34 cc/rev pump. Efficiencies for pumps at other displacements will vary up or down from this curve.

TORQUE CURVE

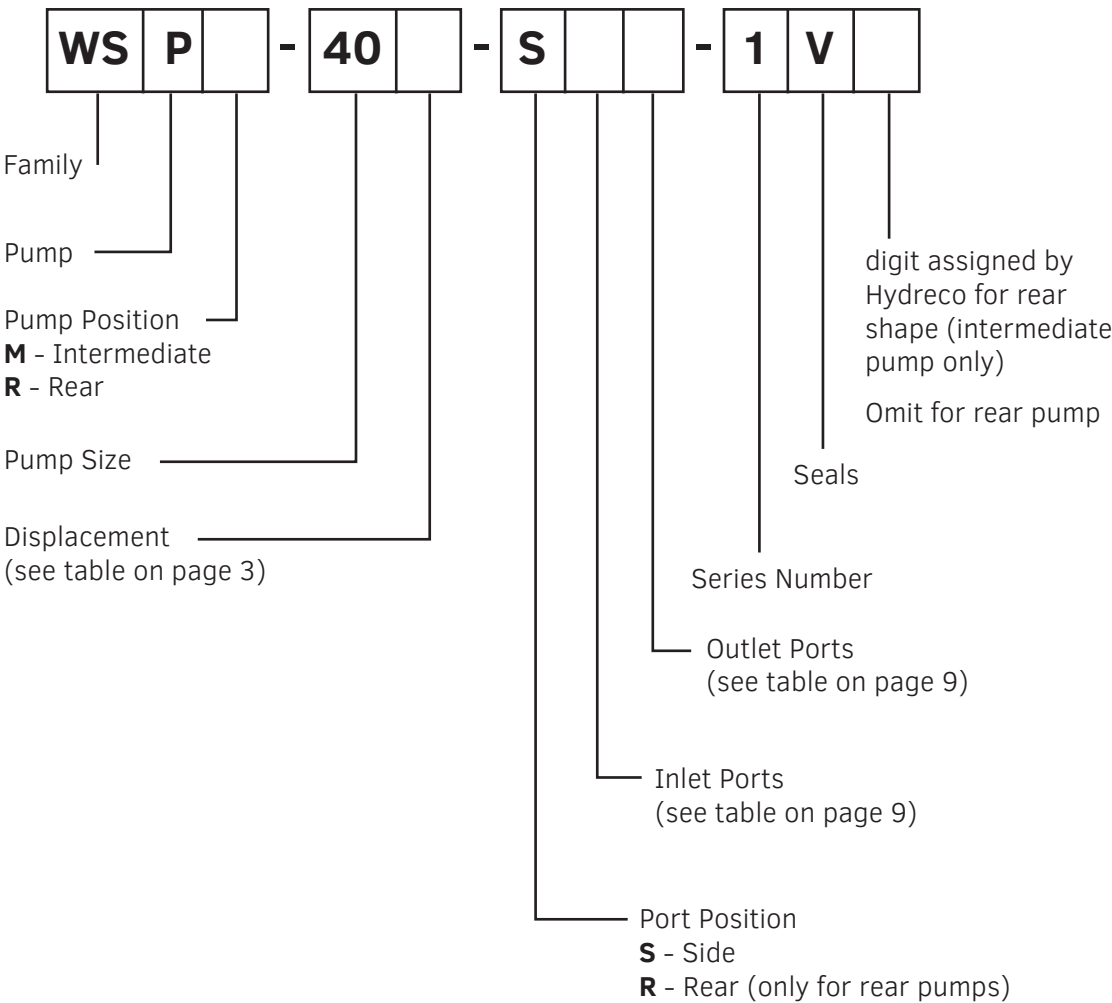


NOTE: this is typical torque data with an assumed mechanical efficiency of 90%

Identification code for single and front pump



Identification code for multiple pumps



Identification code for double pumps

Identification Code + Identification Code
Front Pump Rear Pump

Example: WSP2C-4022-Q2V-S1F1B-1VF** + WSPR-4022-S1F1B-1V

Identification code for triple pumps

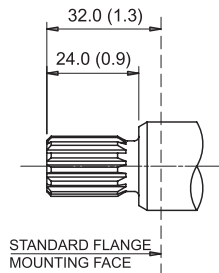
Identification Code + Identification Code + Identification Code
Front Pump Intermediate Pump Rear Pump

Example: WSP3C-4022-Q2V-S1F1B-1VF** + WSPM-4022-S1F1B-1V** + WSPR-4022-S1F1B-1V

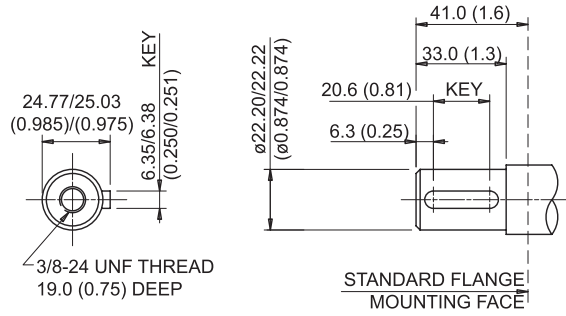
SHAFT OPTIONS

Code **A** SAE 26-4 (A) 5/8" spline

Involute Spline
9 teeth
16/32 DP
Flat root, side fit
30 deg pressure angle
Major dia 15.44/15.34
(0.608/0.604)



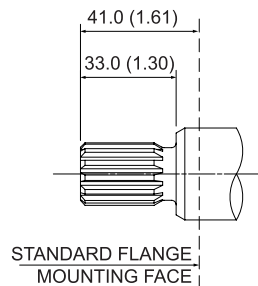
$p \times D = 5200$ (bar x cm³/rev)*
 $p \times D = 4600$ (psi x cu.in/rev)*
T = 92 Nm T = 68 lb.ft

Code **F** SAE 22-1 (B) 7/8" parallel

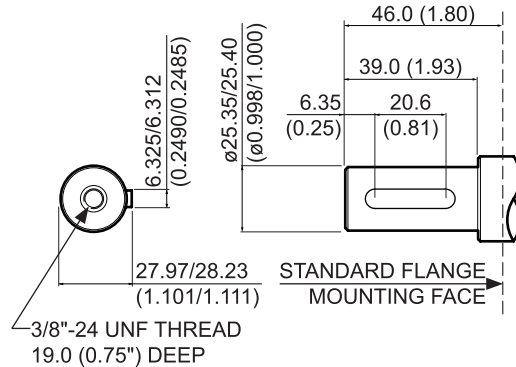
$p \times D = 14226$ (bar x cm³/rev)*
 $p \times D = 12590$ (psi x cu.in/rev)*
T = 252 Nm T = 186 lb.ft

Code **B** SAE 22-4 (B) 7/8" spline

Involute Spline
13 teeth
16/32 DP
Flat root, side fit
30 deg pressure angle
Major dia 21.79/21.69
(0.858/0.854)



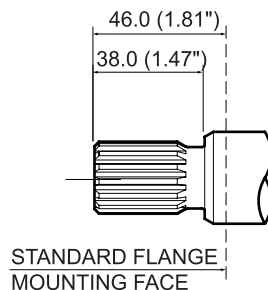
$p \times D = 14226$ (bar x cm³/rev)*
 $p \times D = 12590$ (psi x cu.in/rev)*
T = 252 Nm T = 186 lb.ft

Code **H** SAE 25-1 (BB) 1" parallel

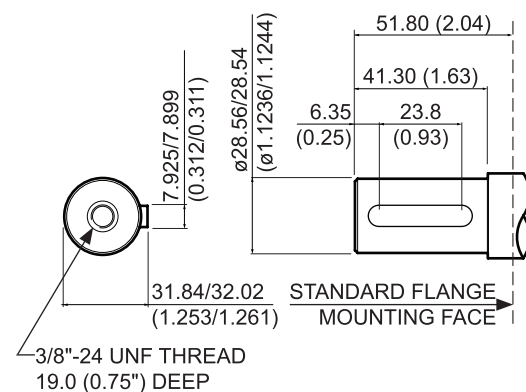
$p \times D = 22450$ (bar x cm³/rev)*
 $p \times D = 19869$ (psi x cu.in/rev)*
T = 397 Nm T = 293 lb.ft

Code **Q** SAE 25-4 (BB) 1" spline

Involute Spline
15 teeth
16/32 DP
Flat root, side fit
30 deg pressure angle
Major dia 24.87/24.97
(0.979/0.983)



$p \times D = 22450$ (bar x cm³/rev)*
 $p \times D = 19869$ (psi x cu.in/rev)*
T = 397 Nm T = 293 lb.ft

Code **R** 1 1/8" parallel

$p \times D = 31000$ (bar x cm³/rev)*
 $p \times D = 27435$ (psi x cu.in/rev)*
T = 609 Nm T = 449 lb.ft

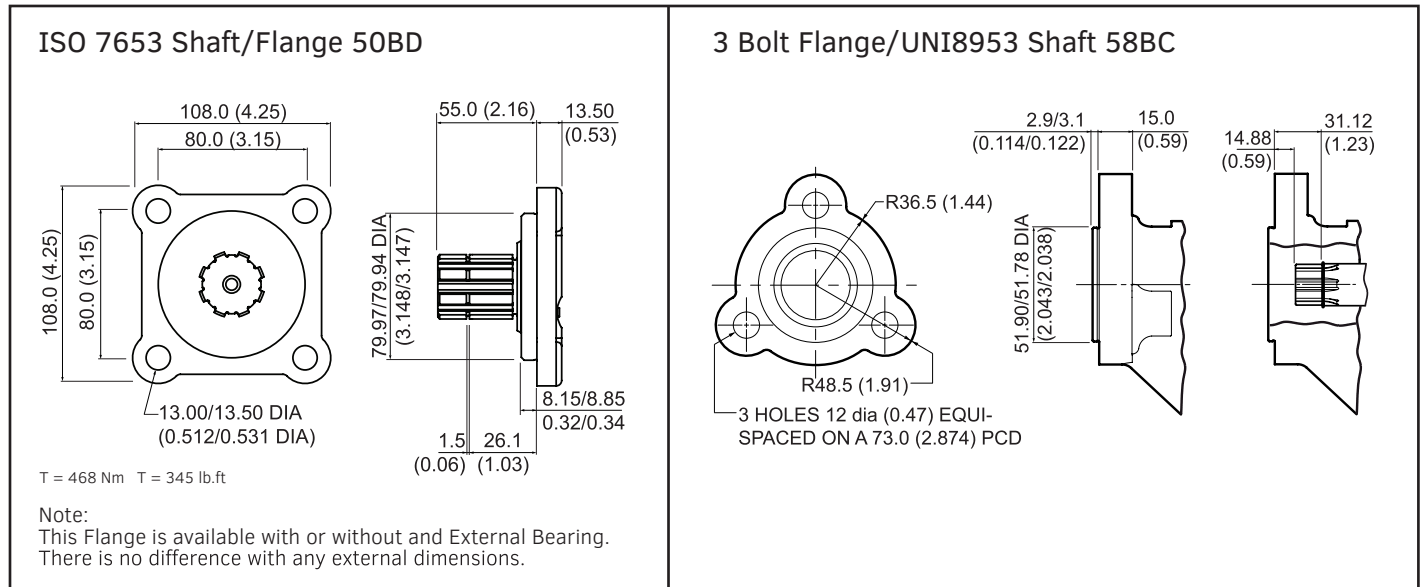
* p = pressure, D = displacement. The stated values must not be exceeded.

Note: For multiple pumps the sum of the p x D or torque values must not exceed the stated value.

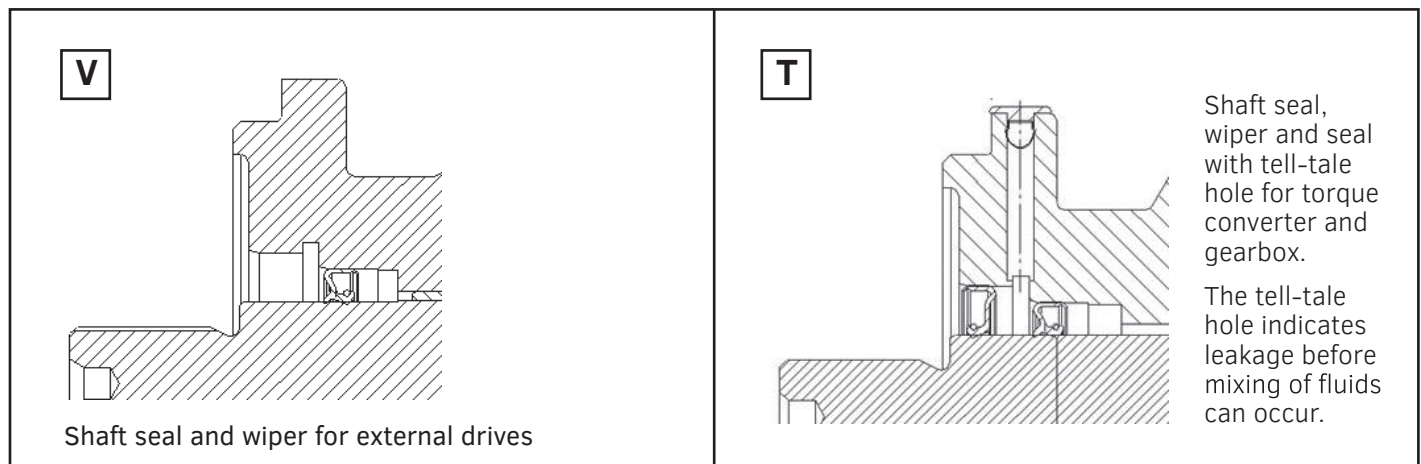
FLANGES OPTIONS

Code 1 SAE 82-2 (A - 2 bolt) 130.0 (5.12) 106.4 (4.19) R47.5 (1.87) 10.97/11.37 DIA (0.432/0.447 DIA) 16.0 (0.63) 5.7/6.7 (0.22/0.26) 82.50/82.55 DIA (3.248/3.250)	Code 2 SAE 101-2 (B - 2 bolt) 174.0 (6.85) 146.0 (5.75) R60 (2.4 RAD) 14.17/14.55 DIA (0.558/.572 DIA) 8.9 / 9.9 (0.35/0.39) 16.0 (0.63) 101.55/101.60 DIA (3.998/4.000) O'Ring Sealed Spigot Option
Code 3 SAE 101-4 (B - 4 bolt) 118.0 (4.65) 89.8 (3.54) 14.17/14.55 DIA (0.558/.572 DIA) 8.9/9.9 (0.35/0.39) 16.0 (0.63) 101.55/101.60 DIA (3.998/4.000) O'Ring Sealed Spigot Option	Code 4 SAE 127-2 (C - 2 bolt) 213.0 (8.38) 181.0 (7.13) R74 (2.91) 17.37/17.75 DIA (0.684/0.699 DIA) 16.0 (0.63) 8.9/9.9 (0.35/0.39) 126.95/127.0 DIA (4.998/5.000 DIA)
Code 5 SAE 127-4 (C - 4 bolt) 146.5 (5.77) 114.5 (4.51) 14.17/14.55 DIA (0.558/.572 DIA) 16.0 (0.63) 8.9/9.9 (0.35/0.39) 126.95/127.0 DIA (4.998/5.000 DIA)	

50BD ON ROAD PTO SHAFT AND FLANGES OPTIONS



FLANGE / SHAFT SEAL



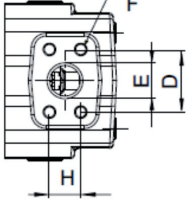
Please refer to hydreco sales Dept. for other flange and shaft seal options.

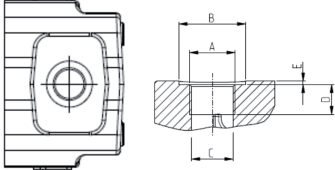
SHAFTS & FLANGES

PUMP SIZE	FLANGES availability		Drive Shafts availability						
			Splined			Parallel			On Road Shafts
	Code	Description	A	B	Q	F	H	R	BD BC
WSP40	1	SAE 82-2 (A - 2 bolt)	○	○	○	○	○	○	- -
	2	SAE 101-2 (B - 2 bolt)	○	●	○	○	○	○	- -
	3	SAE 101-4 (B - 4 bolt)	○	○	○	○	○	○	- -
	4	SAE 127-2 (C - 2 bolt)	○	○	○	○	○	○	- -
	5	SAE 127-4 (C - 4 bolt)	○	○	○	○	○	○	- -
	50	ISO 7653 (on road)	-	-	-	-	-	-	● -
	58	UNI 8953 (on road)	-	-	-	-	-	-	- ●

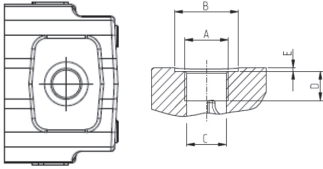
●	Standard
○	Available on Request
-	Not Available

PORT DETAILS

SAE FLANGED PORTS (3000 PSI series) Compliant with SAE J518	Ordering Code	Port Size	Dimension				Preferred Ports		
			E	D	H	F	Displacement	IN	OUT
	1A	1/2"	12.7	38.1	17.48	M8x1.25	12	1D	1A
	1B	3/4"	19.05	47.63	22.23	M10x1.5	14	1D	1A
	1D	1"	25.4	52.37	26.19	M10x1.5	16	1D	1A
	1F	1 1/4"	31.75	58.72	30.18	M10x1.5	19	1D	1A
	1H	1 1/2"	38.1	69.85	35.71	M12x1.75	22	1F	1B
							25	1F	1B
							28	1F	1B
							32	1F	1B
							34	1F	1B
							38	1K	1F
							42	1K	1F
							46	1K	1F
							50	1K	1F

BSP THREADED PORTS Compliant with ISO 228	Ordering Code	Port Size	Dimension				Preferred Ports		
			B	C	D	E	Displacement	IN	OUT
	3A	1/2"	38.1	19.05	19.05	0.5	12	3D	3A
	3B	3/4"	47.63	24.59	22.23	0.5	14	3D	3A
	3D	1"	50.8	30.94	25.4	0.5	16	3D	3A
	3F	1 1/4"	66.68	39.29	28.58	0.5	19	3D	3A
	3H	1 1/2"	76.2	45.24	28.58	0.5	22	3F	3B
	3K	2"	76.2	57.15	31.75	0.5	25	3F	3B
							28	3F	3B
							32	3F	3B
							34	3F	3B
							38	3H	3D
							42	3H	3D
							46	3H	3D
							50	3H	3D

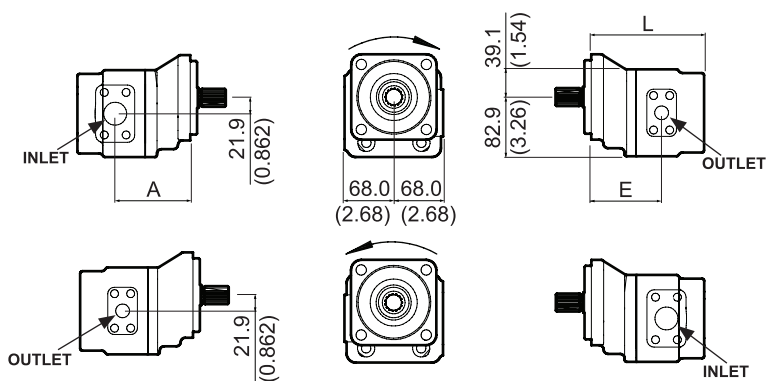
Imperial threaded options also available. Please refer to Hydreco for details.

UNF THREADED PORTS with O-Ring Compliant with SAE J1926	Ordering Code	Port Size	Dimension				Preferred Ports		
			B	C	D	E	Displacement	IN	OUT
	4A	1/2" UNF "O" Ring	23.01	11.49	19.05	1.5	12	4E	4C
	4B	3/4" UNF "O" Ring (= #8)	30.18	17.5	19.05	1.5	14	4E	4C
	4C	7/8" UNF "O" Ring (= #10)	34.14	20.48	19.05	1.5	16	4E	4C
	4D	1" UNF "O" Ring	38.48	23.34	19.05	1.5	19	4E	4C
	4E	1 1/16" UNF "O" Ring (= #12)	41.28	24.92	19.05	1.5	22	4J	4E
	4F	1 1/4" UNF "O" Ring	46.49	29.69	19.05	1.5	25	4J	4E
	4G	1 5/16" UNF "O" Ring (= #16)	48.51	31.27	19.05	1.5	28	4J	4E
	4J	1 5/8" UNF "O" Ring (= #20)	57.67	39.22	19.05	1.5	32	4J	4E
							34	4J	4E
							38	4J	4G
							42	4J	4G
							46	4J	4G
							50	4J	4G

Imperial threaded options also available. Please refer to Hydreco for details.

NOTE: Please refer to Hydreco in case of different dimensions/machining port requirements and common suction option.

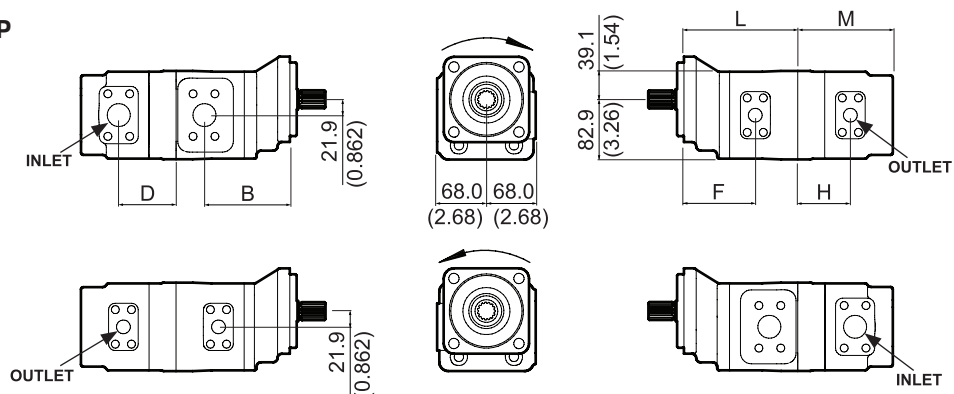
SINGLE PUMP



CLOCKWISE

ANTICLOCKWISE

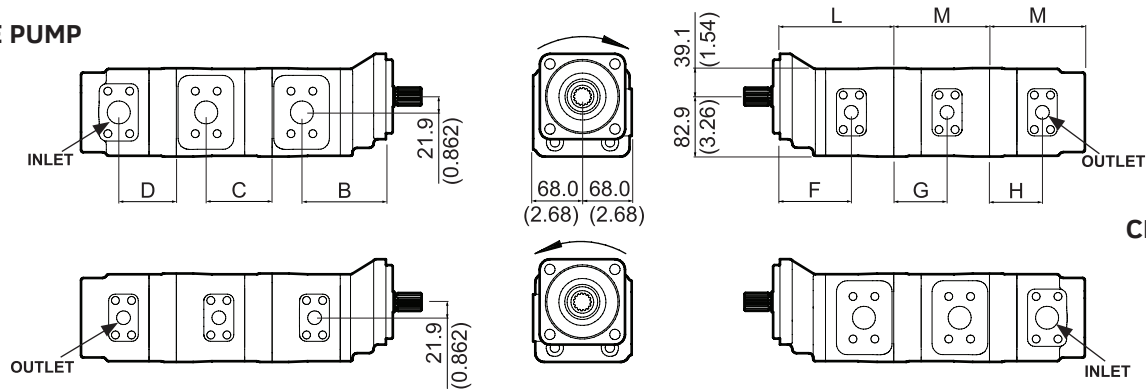
DOUBLE PUMP



CLOCKWISE

ANTICLOCKWISE

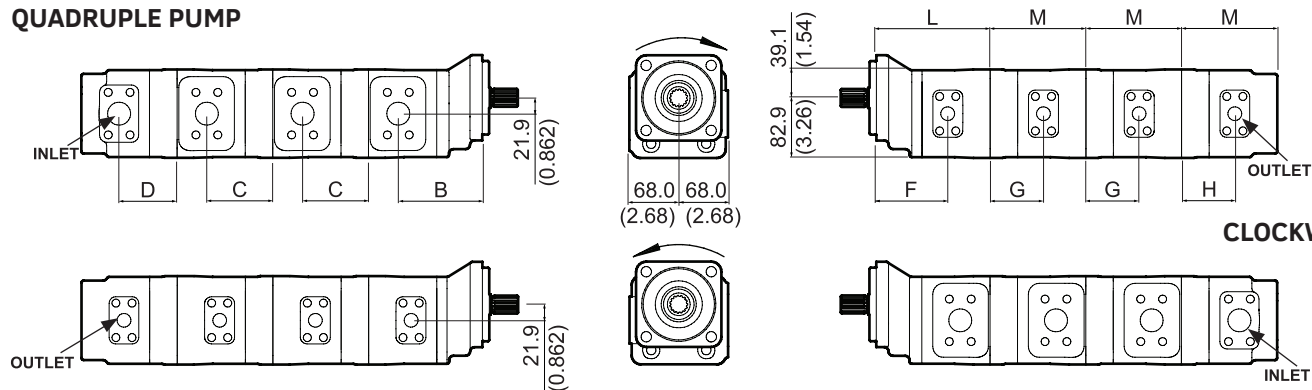
TRIPLE PUMP



CLOCKWISE

ANTICLOCKWISE

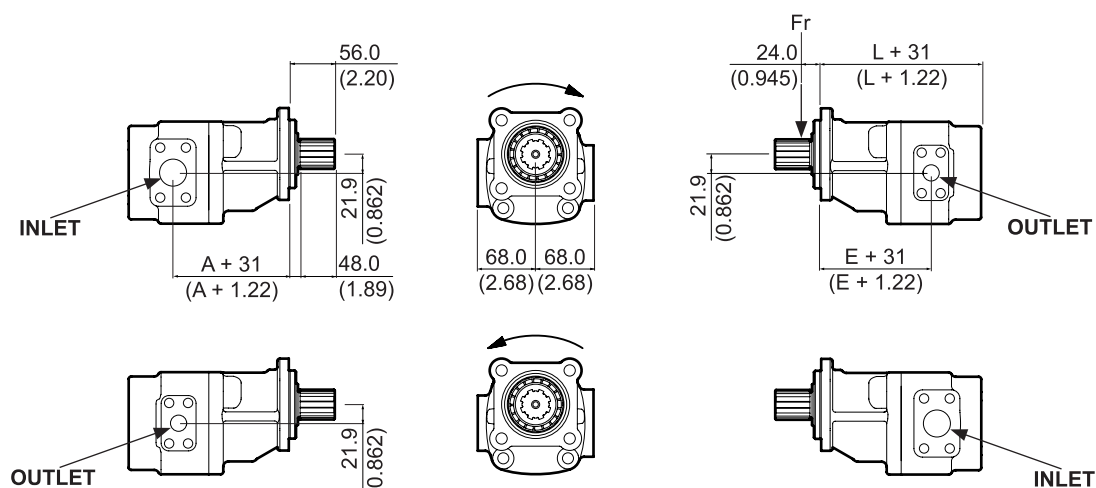
QUADRUPLE PUMP



CLOCKWISE

ANTICLOCKWISE

50BD: OUTBOARD BEARING OPTION

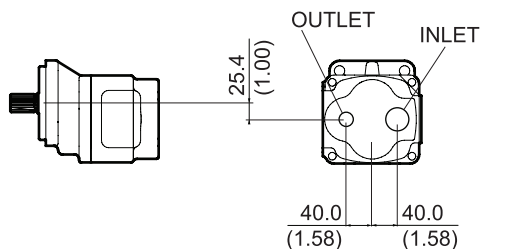


Maximum Radial Load (Fr) at 24.0 (0.945) from Mounting Face = 9000N (2025 lbf)

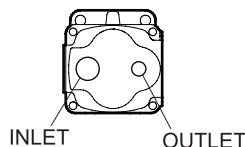
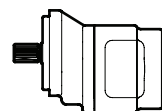
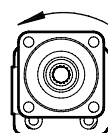
The Outboard Bearing option is only available with the ISO 7653 Mounting Flange

REAR PORT OPTION

CLOCKWISE



ANTICLOCKWISE



Rear Ports are available on Single Pumps and on the Rear Pump Section of Multiple Pump assemblies.

Only threaded ports are available.

The provision of rear ports may be limited on higher speed, larger displacement applications where risk of inlet cavitation may be a risk.

Maximum Inlet Port Size - 1-1/4" BSP or 1-5/16" UNF
Maximum Outlet Port Size - 1" BSP or 1-1/16" UNF

TABLE OF DIMENSIONS

Dimension Reference	Displacement - cc/rev (in ³ /rev)												
	12 (0.73)	14 (0.85)	16 (0.98)	19 (1.16)	22 (1.34)	25 (1.53)	28 (1.71)	31 (1.89)	34 (2.07)	38 (2.32)	42 (2.56)	46 (2.81)	50 (3.05)
A	89.3 (3.517)	91.5 (3.603)	93.7 (3.690)	97.0 (3.819)	91.9 (3.616)	95.1 (3.746)	98.4 (3.875)	101.7 (4.004)	105.0 (4.134)	96.9 (3.813)	101.2 (3.986)	105.6 (4.158)	110.0 (4.331)
B	97.3 (3.832)	99.5 (3.918)	101.7 (4.005)	105.0 (4.134)	102.9 (4.049)	106.1 (4.179)	109.4 (4.308)	112.7 (4.437)	116.0 (4.567)	109.4 (4.305)	113.7 (4.478)	118.1 (4.650)	122.5 (4.823)
C	72.3 (2.848)	74.5 (2.934)	76.7 (3.020)	80.0 (3.150)	77.9 (3.065)	81.1 (3.194)	84.4 (3.324)	87.7 (3.453)	91.0 (3.583)	84.4 (3.321)	88.7 (3.494)	93.1 (3.666)	97.5 (3.839)
D	64.3 (2.533)	66.5 (2.619)	68.7 (2.705)	72.0 (2.835)	66.9 (2.632)	70.1 (2.716)	73.4 (2.891)	76.7 (3.020)	80.0 (3.150)	71.9 (2.829)	76.2 (3.001)	80.6 (3.174)	85.0 (3.346)
E	81.8 (3.222)	84.0 (3.308)	86.2 (3.394)	89.5 (3.524)	85.4 (3.360)	88.6 (3.490)	91.9 (3.619)	95.2 (3.748)	98.5 (3.878)	88.9 (3.498)	93.2 (3.671)	97.6 (3.843)	102.0 (4.016)
F	82.3 (3.241)	84.5 (3.328)	86.7 (3.414)	90.0 (3.543)	85.4 (3.360)	88.6 (3.490)	91.9 (3.619)	95.2 (3.748)	98.5 (3.878)	88.9 (3.498)	93.2 (3.671)	97.6 (3.843)	102.0 (4.016)
G	57.3 (2.257)	59.5 (2.344)	61.7 (2.430)	65.0 (2.559)	60.4 (2.376)	63.6 (2.506)	66.9 (2.635)	70.2 (2.765)	73.5 (2.894)	63.9 (2.514)	68.2 (2.686)	72.6 (2.859)	77.0 (3.031)
H	57.3 (2.257)	59.5 (2.344)	61.7 (2.430)	65.0 (2.559)	60.4 (2.376)	63.6 (2.506)	66.9 (2.635)	70.2 (2.764)	73.5 (2.894)	63.9 (2.514)	68.2 (2.686)	72.6 (2.859)	77.0 (3.031)
L	133.0 (5.238)	135.2 (5.324)	137.4 (5.410)	140.7 (5.539)	144.0 (5.669)	147.3 (5.798)	150.6 (5.928)	153.8 (6.057)	157.1 (6.187)	161.5 (6.359)	165.9 (6.532)	170.3 (6.704)	174.7 (6.877)
M	108.0 (4.253)	110.2 (4.340)	112.4 (4.426)	115.7 (4.555)	119.0 (4.685)	122.3 (4.814)	125.6 (4.943)	128.8 (5.073)	132.1 (5.202)	136.5 (5.375)	140.9 (5.547)	145.3 (5.720)	149.7 (5.892)

NOTE: The data in the table above is based on using standard Mounting Flanges and a standard interface Adaptor (on multiple pump builds).

For other or non standard components please contact your local hydreco Hydraulics representative for advice.

MULTIPLE PUMPS

TIPS FOR DEALERS

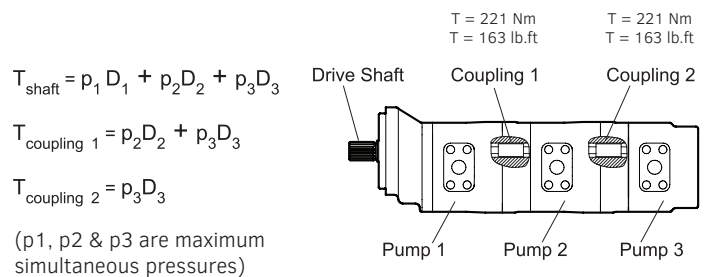
Multiple pumps with aluminium pumps as rear pump are available with different ranges of displacements and maximum operating pressures.

Please refer to Hydreco for details on available configurations.

MULTIPLE PUMPS - TORQUE LIMITS

Multiple pump combinations may be limited by the torque capacity of the drive shaft and couplings. The torque factors listed in the table below must not be exceeded. The examples assume all pump sections are loaded simultaneously, but in any application this may not be the case, so it is important to understand the operating parameters on any machine.

Code	Shaft Type	T = pD Maximum	
		bar x cm ³ /rev	bar x in ³ /rev
B	SAE 22-4 (B) 7/8" Spline	14226	12590
F	SAE 22-1 (B) 7/8" Parallel	14226	12590
Q	SAE 25-4 (B) 1" Spline	22450	19869
H	SAE 25-1 (B) 1" Parallel	22450	19869
R	1 1/8" Parallel	31000	27435
BD	ISO 7653	45566	40326
BC	UNI 8953	14226	12590
	Coupling 40 - 40	12500	11063



FLOW RATE

Metric Units

Flow (l/min) = Speed (rpm) x Displacement (cc/rev) / 1000

Imperial Units

Flow (USGPM) = Speed (rpm) x Displacement (cu.in/rev) x 0.004329

FLUID VELOCITY

Metric Units

Velocity (m/s) = 21.22 x Q / D²

Q = flow rate (L/min)

D = Pipe bore (mm)

Imperial Units

Velocity (ft/s) = 0.408 x Q / D²

Q = flow rate (USGPM)

D = Pipe bore (in)

TORQUE

Metric Units

Theoretical Torque (Nm) = Pressure (bar) x Displacement (cc/rev) / (20 x Pi)

Actual Torque Nm
(90% Mech Efficiency) = Pressure (bar) x Displacement (cc/rev) / (20 x Pi x 0.9)

Imperial Units

Theoretical Torque (lbf.ft) = Pressure (psi) x Displacement (cu in/rev) / 75.36

Actual Torque Nm = Pressure (bar) x Displacement (cc/rev) / (75.36 x 0.9)

POWER

Metric Units

Power (KW) = Torque (Nm) x angular speed (rad/sec)
= Torque x speed (rpm) x 0.1047

Imperial Units

Power (hp) = torque (ft lbs) x speed (rpm) / 5,252

FLUIDS

Designation	Fluid Type	Rated Pressure	Max Speed	Fluid Temperature limits	
		bar	rpm	°C min	°C max
HM / HV	Mineral based hydraulic Fluid	350	3300	-20	+80
HFA	Oil in water emulsion	75	1500	10*	60*
HFB	Water in oil emulsion	130	1500	10*	65*
HFC	Water glycol	175	1500	0*	65*
HFD	Phosphate ester	Refer to Hydreco	Refer to Hydreco	Refer to Hydreco	Refer to Hydreco
HETG	Triglyceride based fluid	Refer to Hydreco	Refer to Hydreco	Refer to Hydreco	Refer to Hydreco
HEES	Synthetic ester fluid	Refer to Hydreco	Refer to Hydreco	Refer to Hydreco	Refer to Hydreco
*Note - may be further limited by fluid supplier					

INLET CONDITIONS

It is essential that pumps are installed so that they can always fill with fluid.

'QX5' Series pump inlet porting is designed to facilitate full volume fill but the following machine design recommendations should be followed.

- n Never run pumps dry - particular care should be taken to open any shut-off valves.
- n Use large diameter pipes and fittings and avoid sharp bends and long lengths.

Inlet fluid velocity should not exceed 2.5 m/sec (8.0 ft/sec) calculated by:

$$V = \frac{21.22Q}{D^2} \text{ m/sec where } \begin{array}{l} V = \text{velocity (m/sec)} \\ Q = \text{flow rate (l/min)} \\ D = \text{bore diameter (mm)} \end{array} \quad V = \frac{0.408Q}{D^2} \text{ ft/sec where } \begin{array}{l} V = \text{velocity (ft/sec)} \\ Q = \text{flow rate (US gal/min)} \\ D = \text{bore diameter (inches)} \end{array}$$

- n If possible mount the pump below the lowest level of fluid in the tank. If necessary prime the pump on start-up.
- n Ensure that inlet lines are airtight.
- n Particular care should be taken where high speeds and/or high fluid viscosities are involved.

As a general rule pressure at the pump inlet should not be less than 0.8 bar absolute (6" Hg depression) at normal viscosity of 23 mm²/sec (110 SSU) at maximum operating speed.

Hydreco Hydraulics' engineers will be pleased to advise on any installation

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