

Vickers®

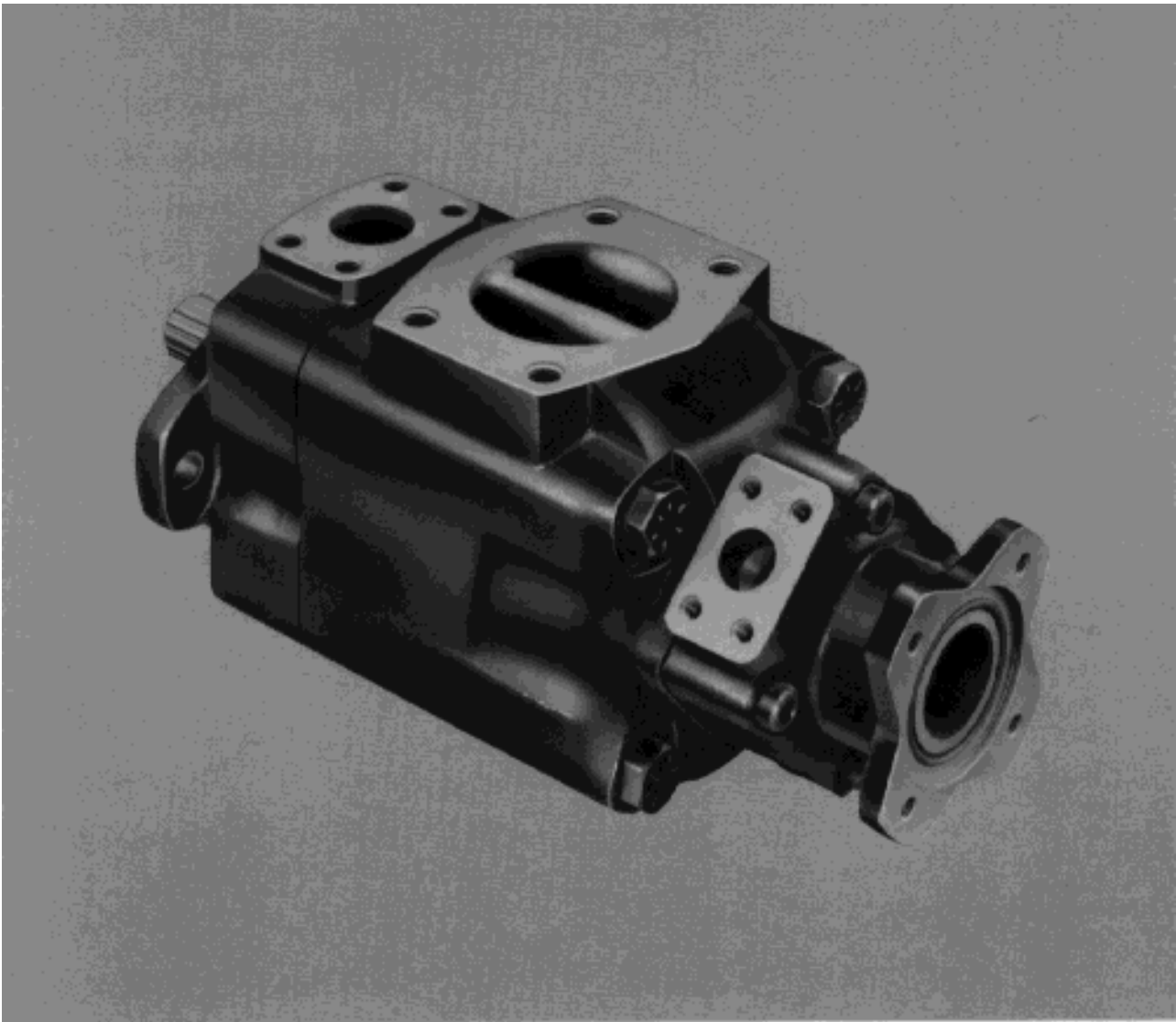
# Vane Pumps

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## Double Thru-drive Vane Pumps

High speed, high pressure VQT Series  
for mobile equipment



Released 7/93

# Introduction

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Double VQT high performance pumps are fixed displacement units that incorporate the proven design, quality manufacturing techniques, and operating features of other Vickers double vane pumps. Additionally, double VQT pumps have a rear flange and thru-shaft coupling for directly mounting and driving a third pump.

Double VQT pump displacements range from 81,6 to 193,4 cm<sup>3</sup>/r (4.98 to 11.80 in<sup>3</sup>/r) for the front-end pump, and from 40,1 to 67,5 cm<sup>3</sup>/r (2.45 to 4.12 in<sup>3</sup>/r) for the rear-end pump. Maximum speed ratings range from 2200 to 2500 rpm. Maximum pressures are 172 or 207 bar (2500 or 3000 psi). See page 3 for specific ratings of a given model.

## Features and Benefits

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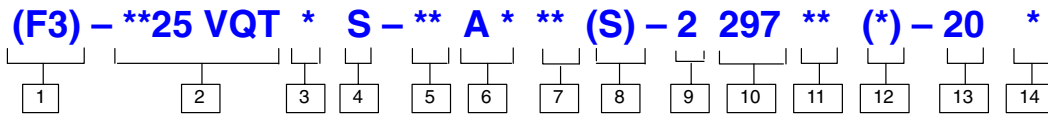
- Double VQT pump plus thru-driven unit serves three separate hydraulic circuits ... three pumps driven through single input shaft provide a simplified, compact, cost-effective installation.
- Double VQT pump displacement, mounting, and porting options, in combination with attributes of thru-driven third pump, meet requirements of many multiple-circuit applications.
- Rugged vane design concept automatically compensates for wear, assuring long, trouble-free, like-new performance.
- High operating pressure capability in compact package provides high power-to-weight ratio, resulting in a compact installation and a lower installed cost.
- Optimal axial and radial running clearances and internal lubrication – throughout entire operating pressure range – provide excellent cold-start capability and high volumetric efficiency. The result is a very durable pump with low operating cost.
- Primary pumping elements are in a cartridge, allowing for fast, simple, dependable replacement. A replacement cartridge provides new-pump performance and can be installed without removing pump from the installation.
- Key elements of pumping cartridge are hydrostatically or hydraulically balanced to minimize wear and maintain high volumetric efficiency. Hydraulic balancing prevents internally-induced shaft and bearing loads, assuring long life.

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# Model Codes



**1 F3 – Viton seals**  
Omit if not required

**2 Series designation**  
3525VQT (standard bearing)  
3625VQT (3525VQT with heavy duty bearing)  
4525VQT (standard bearing)

**3 Thru-drive (rear) 2-bolt mounting flange**  
A – SAE “A” flange  
B – SAE “B” adapter flange  
BP – SAE “B” spacer flange for Vickers PVE12, 19, or 21 pump

**4 Front mounting flange**  
S – SAE J-744 (127-2)

**5 Geometric displacement, shaft end pump**  
Code = SAE rating (USgpm) at 1200 rpm and 6,9 bar (100 psi)

Pump series	Code	cm <sup>3</sup> /r	in <sup>3</sup> /r
3*25VQT	25	82	4.98
	30	98	5.96
	35	113	6.88
	38	122	7.42
4525VQT	42	139	8.46
	50	162	9.90
	60	193	11.85

**6 Port connections**  
A – SAE 4-bolt flange  
AM – Metric 4-bolt flange (Flange pads stamped “M” for metric threads)

**7 Geometric displacement, cover end pump**  
Code = SAE rating (USgpm) at 1200 rpm and 6,9 bar (100 psi)

Pump series	Code	cm <sup>3</sup> /r	in <sup>3</sup> /r
**25VQT	12	40	2.45
	14	45	2.77
	17	55	3.37
	21	68	4.12

**8 Shaft seal assembly**  
S – Single seal  
– Omit for double seal

**9 Thru-drive coupling**  
2 – With spline for tandem pump

**10 Shaft**  
297 – Splined  
“C” size per SAE J744C  
32-4 per SAE J744 Oct 83

**11 Port position**  
(Viewed from cover end of pump)  
With no. 1 outlet opposite inlet  
AA – No. 2 outlet 135° CCW from inlet  
AB – No. 2 outlet 45° CCW from inlet  
AC – No. 2 outlet 45° CW from inlet  
AD – No. 2 outlet 135° CW from inlet

With no. 1 outlet 90° CCW from inlet  
BA – No. 2 outlet 135° CCW from inlet  
BB – No. 2 outlet 45° CCW from inlet  
BC – No. 2 outlet 45° CW from inlet  
BD – No. 2 outlet 135° CW from inlet

With no. 1 outlet in line with inlet  
CA – No. 2 outlet 135° CCW from inlet  
CB – No. 2 outlet 45° CCW from inlet  
CC – No. 2 outlet 45° CW from inlet  
CD – No. 2 outlet 135° CW from inlet

With no. 1 outlet 90° CW from inlet  
DA – No. 2 outlet 135° CCW from inlet  
DB – No. 2 outlet 45° CCW from inlet  
DC – No. 2 outlet 45° CW from inlet  
DD – No. 2 outlet 135° CW from inlet

**12 Thru-drive (rear) mounting flange position**  
(Viewed from cover end of pump)  
A – In line with no. 2 outlet port in all cases  
B – 90° from no. 2 outlet port in all cases  
– Omit for \*\*25VQTA models

**13 Design**  
Subject to change. Installation dimensions remain unchanged for designs 20 through 29.

**14 Rotation**  
(Viewed from shaft end of pump)  
L – Left hand (counterclockwise)  
R – Right hand (clockwise)

**NOTES:**  
State complete model number when ordering. Example: 3525VQTAS-25A12-2297CC-20R.  
Port flange kits with inch screws are available from Vickers and must be ordered separately.  
For port flange kits, or mounting, displacement, port, and shaft options other than coded above, contact your Vickers representative.

# Performance Data

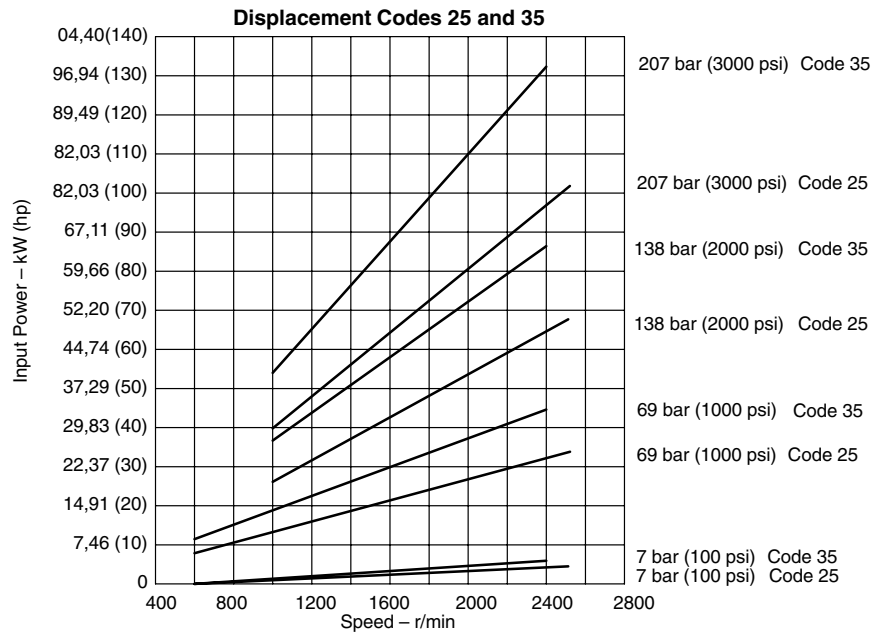
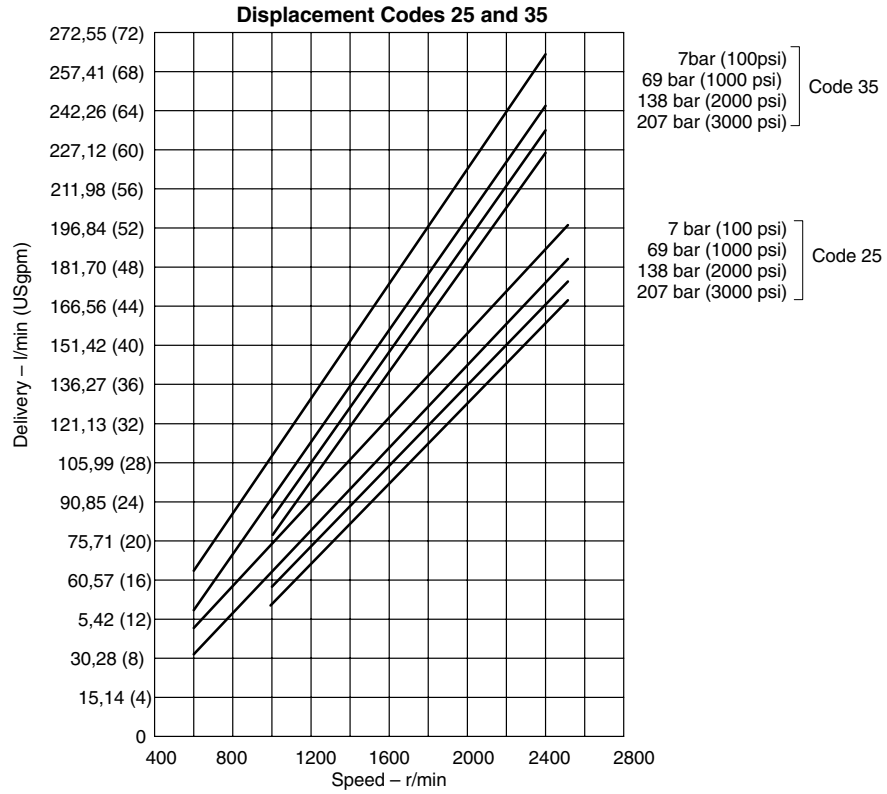
Model Series	Displacement Code (USgpm at 1200 r/min and 6,9 bar (100 psi))		Displacement cm <sup>3</sup> /rev (in <sup>3</sup> /rev)	Rated Speed r/min	Maximum Pressure bar (psi)	Typical Delivery at Max Speed and Pressure l/min (USgpm)	Typical Input Power at Maximum Speed and Pressure kW (hp)
	Front Pump	Rear Pump					
3*25VQT	25		82 (4.98)	2500	207 (3000)	170 (45)	75 (101)
	30		98 (5.96)	2500	207 (3000)	208 (55)	88 (117.5)
	35		113 (6.88)	2400	207 (3000)	227 (60)	98 (132)
	38		122 (7.42)	2400	207 (3000)	246 (65)	104 (140)
		12	40 (2.45)	2500	207 (3000)	79 (21)	38 (51)
		14	45 (2.77)	2500	207 (3000)	91 (24)	43 (58)
		17	55 (3.37)	2500	207 (3000)	117 (31)	51 (69)
		21	68 (4.12)	2500	207 (3000)	144 (38)	62 (83)
4525VQT	42		139 (8.46)	2200	172 (2500)	252 (66.5)	91 (122.5)
	50		162 (9.90)	2200	172 (2500)	299 (79)	105 (141)
	60		193 (11.80)	2200	172 (2500)	363 (96)	127 (170)
		12	40 (2.45)	2200	207 (3000)	68 (18)	33 (44)
		14	45 (2.77)	2200	207 (3000)	79 (21)	38 (51)
		17	55 (3,37)	2200	207 (3000)	100 (26.5)	45 (61)
		21	68 (4.12)	2200	207 (3000)	125 (33)	54 (73)

Performance constants:  
 SAE 10W Oil @ 82°C (180°F)  
 Pump inlet @ 0 psig (14.7 psia).

# Performance Data

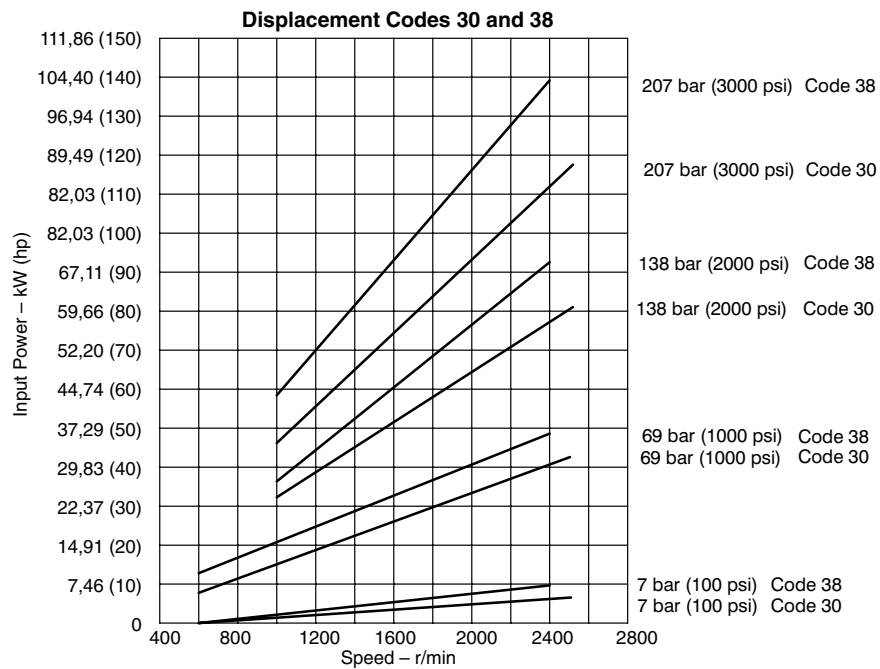
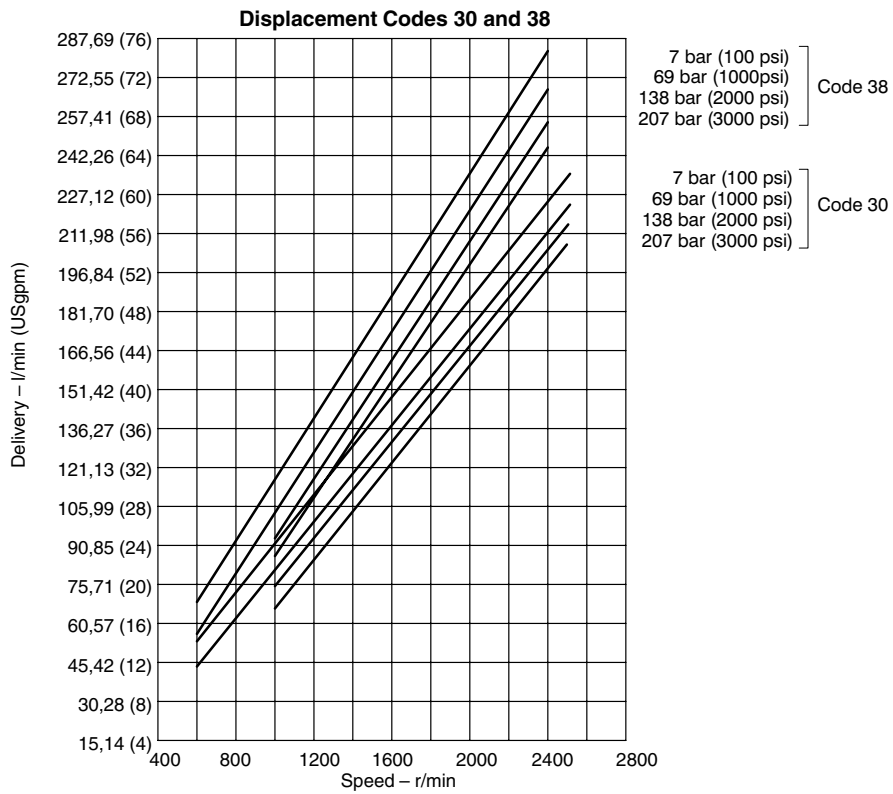
## Front pumps of 3\*25VQT

Performance constants:  
 SAE 10W oil at 83° C (180° F).  
 Pump inlet at 0 psig (14.7 psia  
 or 1 bar).



## Front pumps of 3\*25VQT

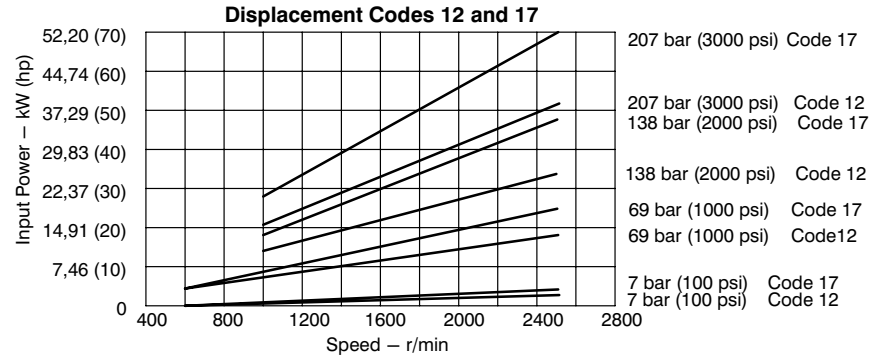
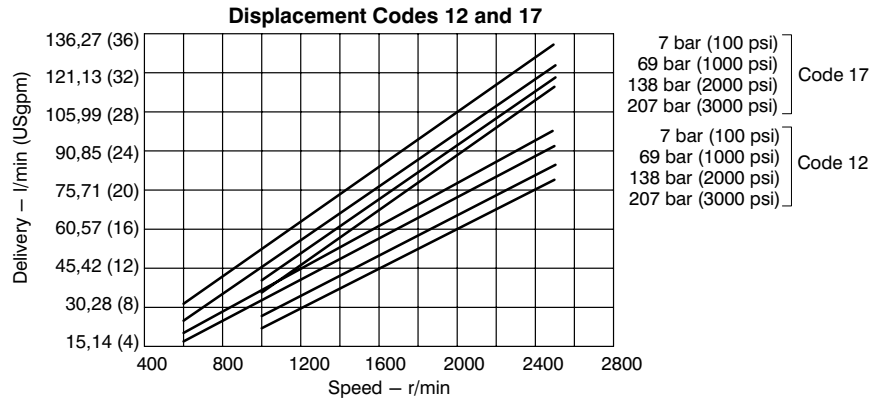
Performance constants:  
 SAE 10W oil at 83° C (180° F).  
 Pump inlet at 0 psig (14.7 psia  
 or 1 bar).



# Performance Data

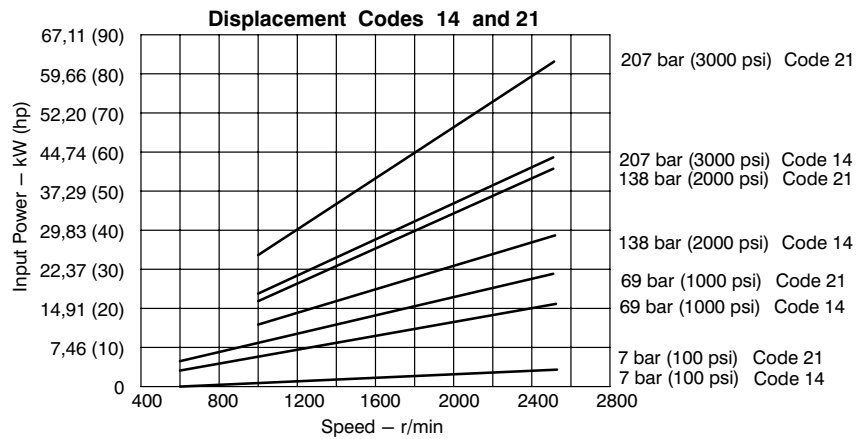
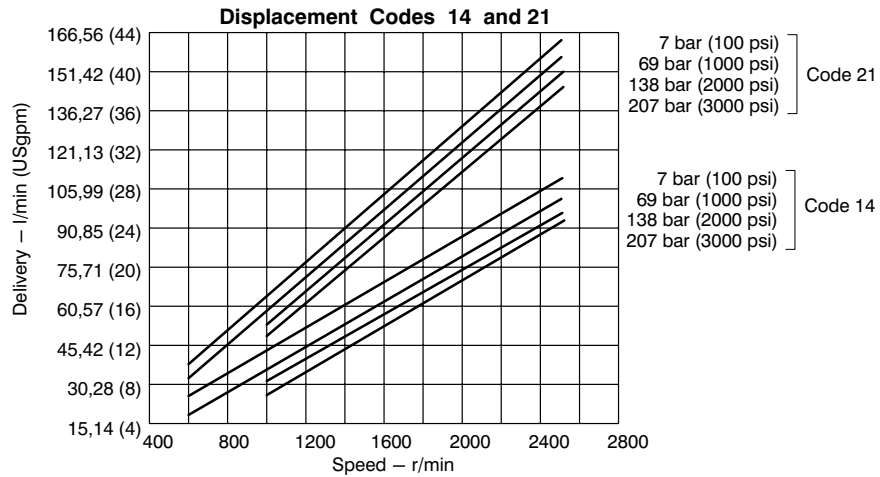
## Rear pumps of 3\*25VQT

Performance constants:  
 SAE 10W oil at 83° C (180° F).  
 Pump inlet at 0 psig (14.7 psia  
 or 1 bar).



## Rear pumps of 3\*25VQT

Performance constants:  
 SAE 10W oil at 83° C (180° F).  
 Pump inlet at 0 psig (14.7 psia  
 or 1 bar).



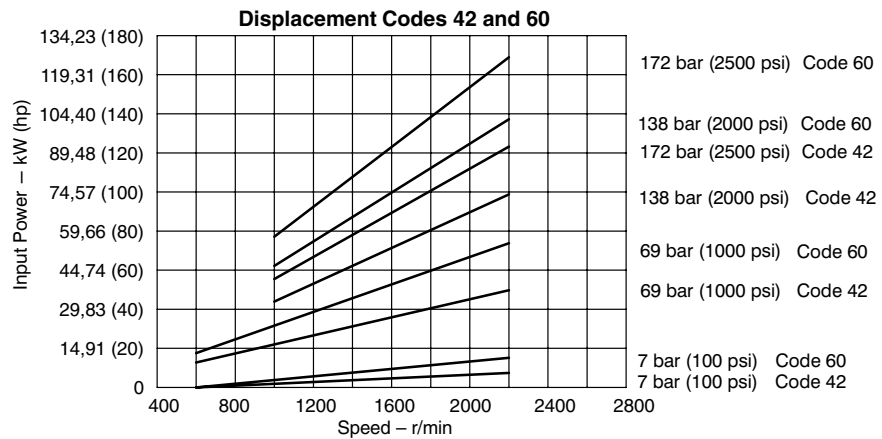
# Performance Data

## Front pumps of 4525VQT

Performance constants:

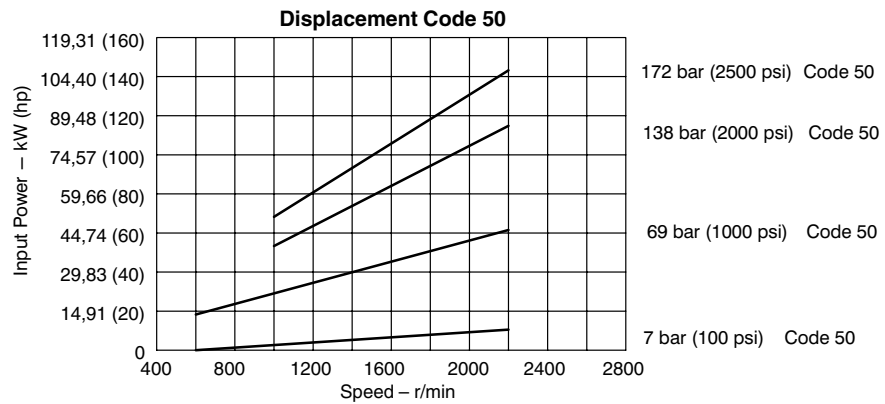
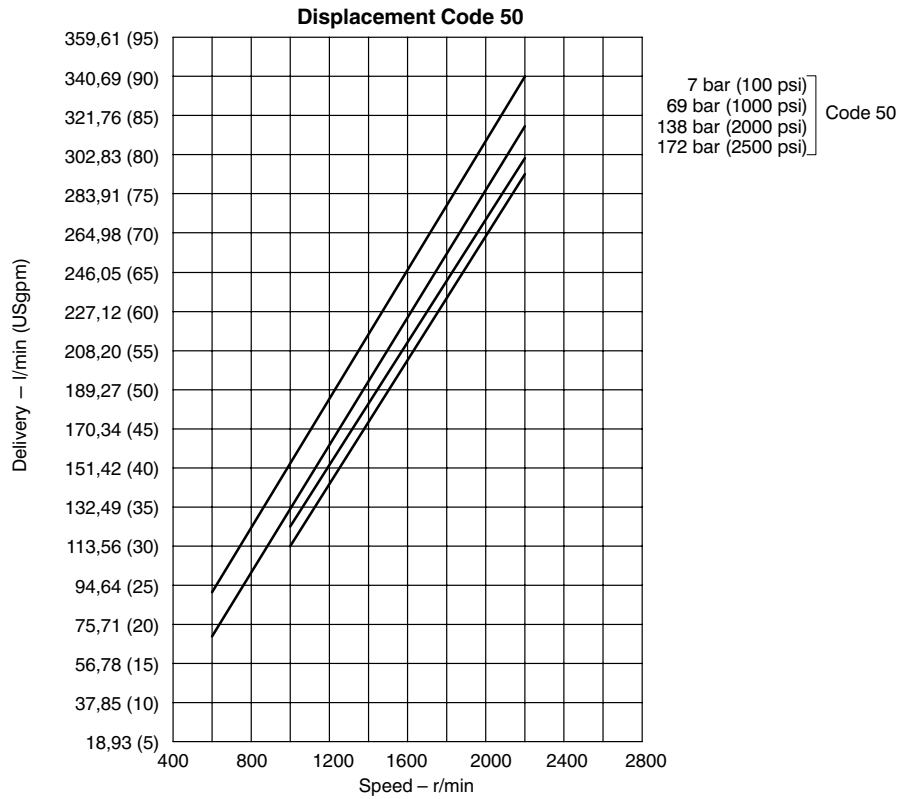
SAE 10W oil at 83° C (180° F).

Pump inlet at 0 psig (14.7 psia or 1 bar).



## Front pump of 4525VQT

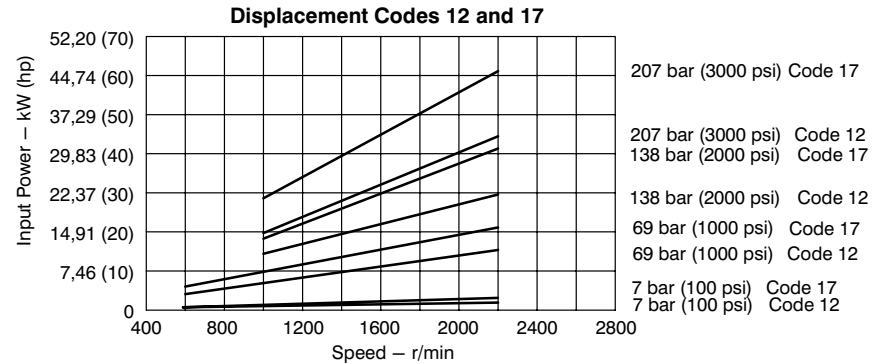
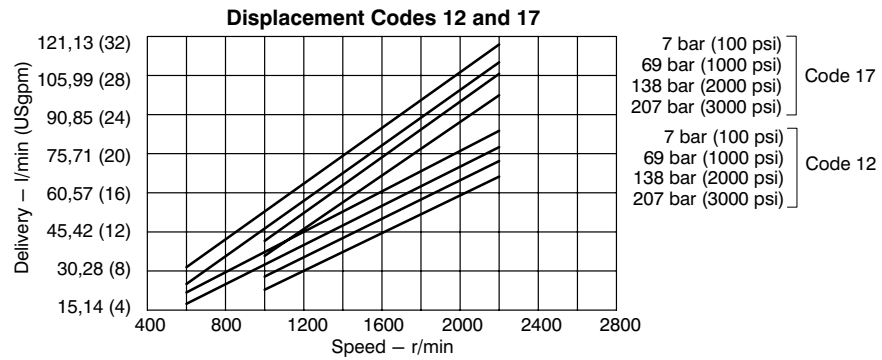
Performance constants:  
 SAE 10W oil at 83° C (180° F).  
 Pump inlet at 0 psig (14.7 psia  
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# Performance Data

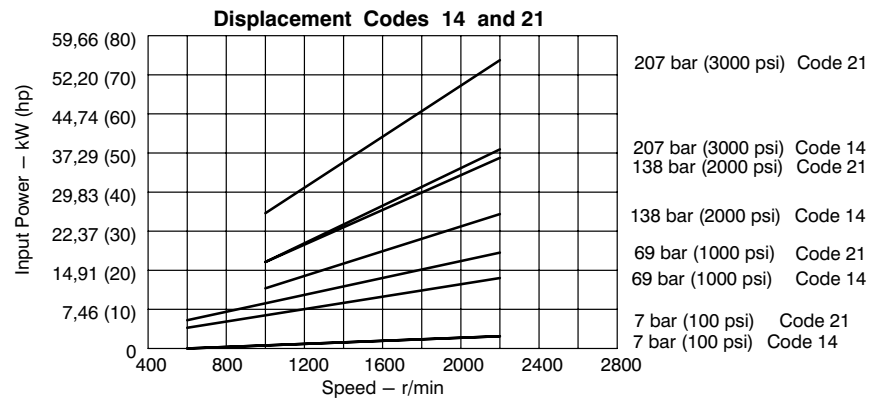
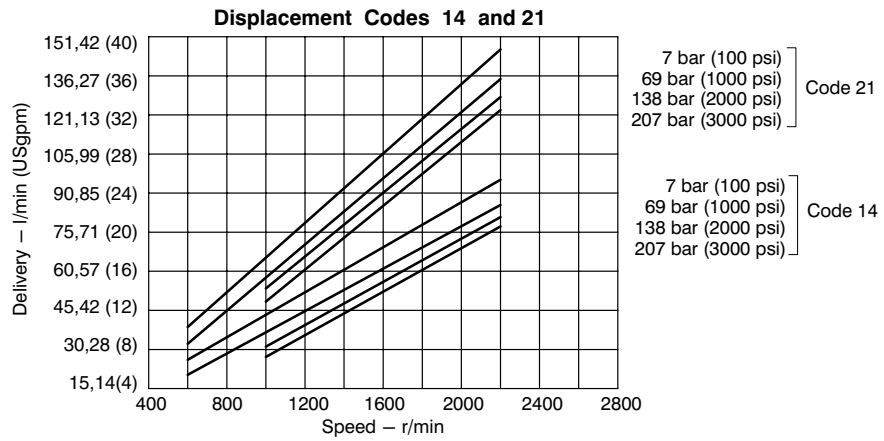
## Rear pumps of 4525VQT

Performance constants:  
 SAE 10W oil at 83° C (180° F).  
 Pump inlet at 0 psig (14.7 psia  
 or 1 bar).



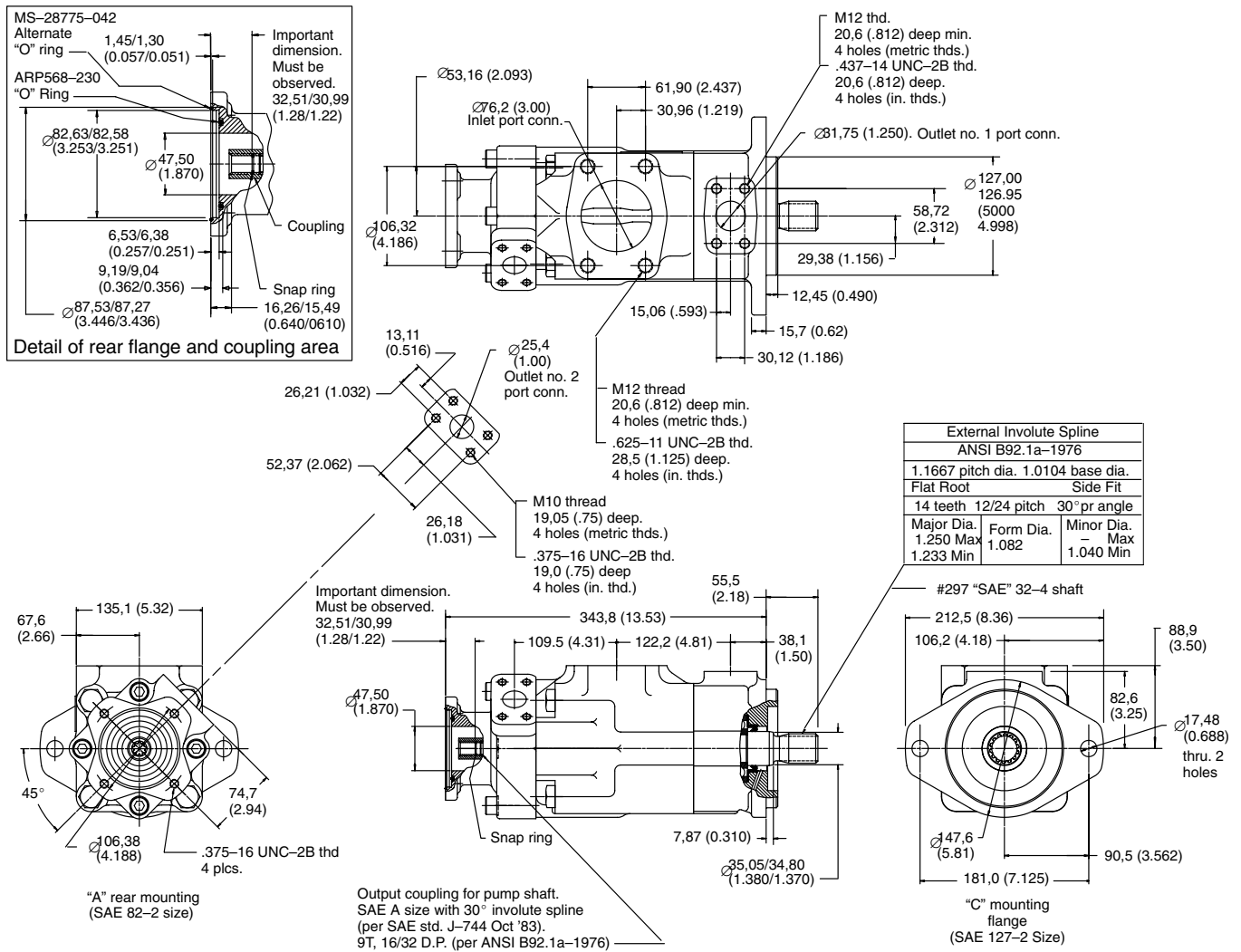
## Rear pumps of 4525VQT

Performance constants:  
 SAE 10W oil at 83° C (180° F).  
 Pump inlet at 0 psig (14.7 psia  
 or 1 bar).



# Installation Dimensions

## 3\*25VQT with SAE "A" rear mounting Millimeters (inches)

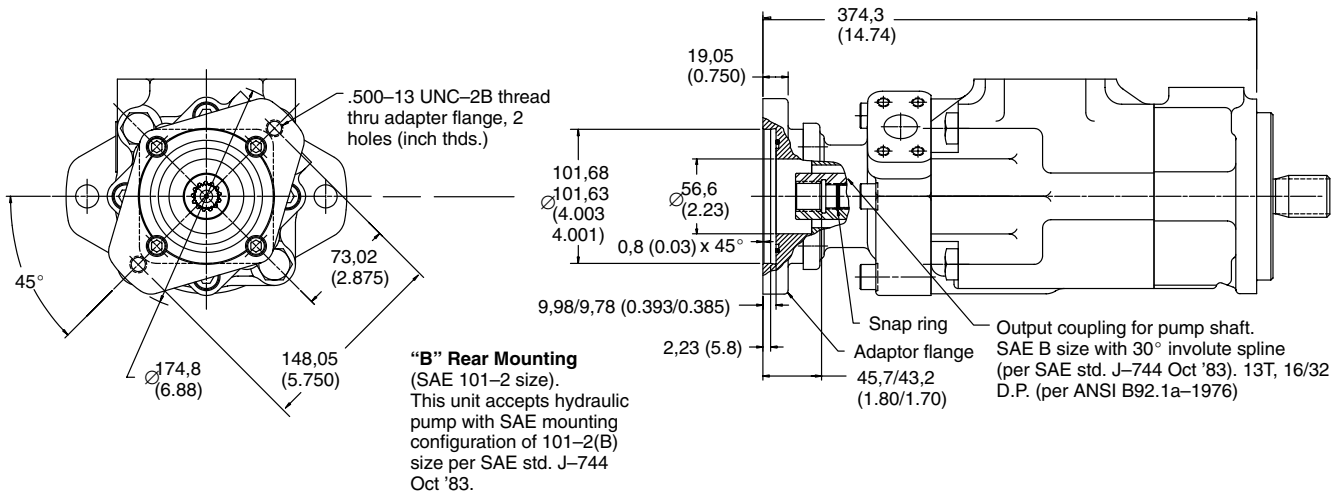
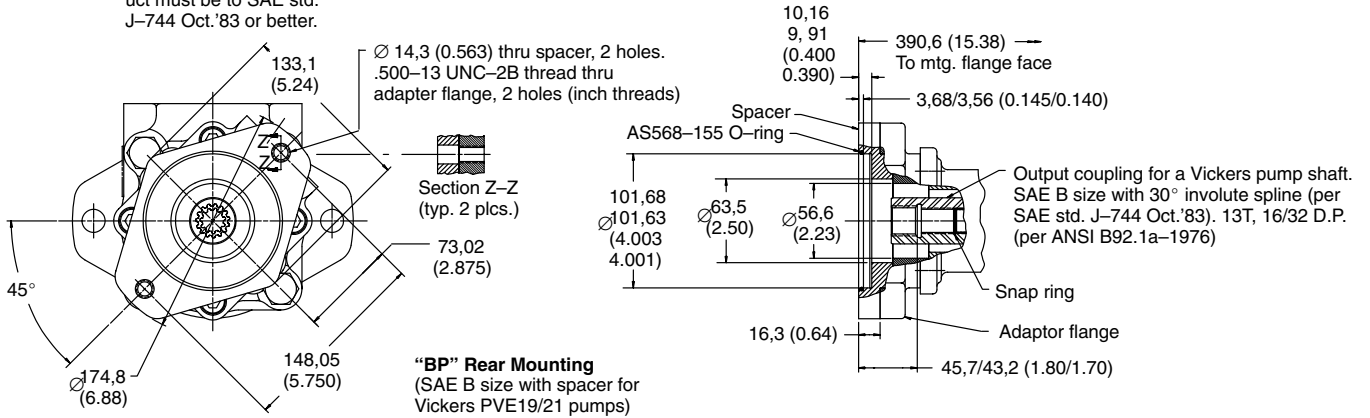


For SAE "B" and "BP" rear mounting dimensions, see following page.

# SAE "B" and "BP" rear mountings for 3\*25VQT

Millimeters (inches)

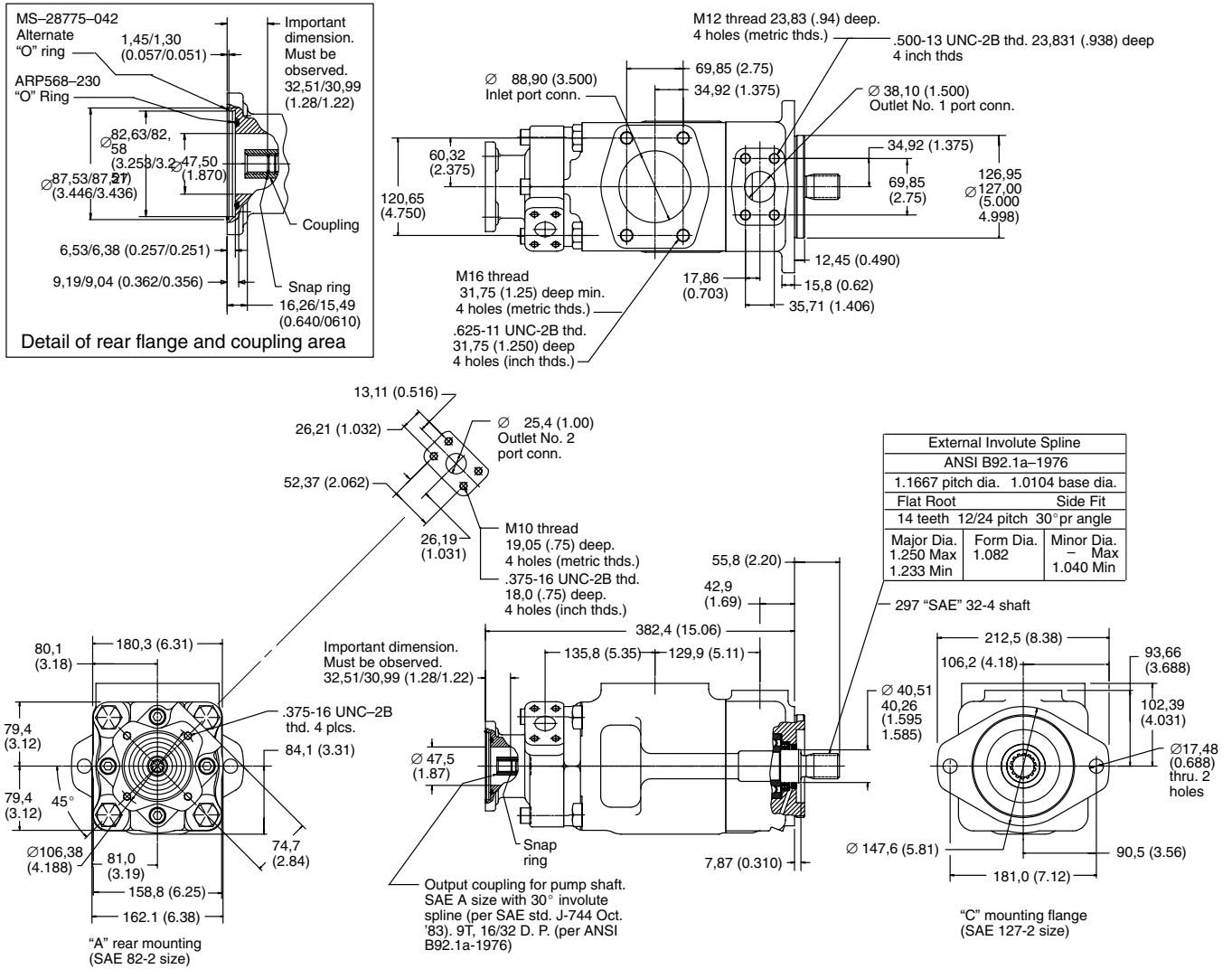
NOTE: Concentricity of shaft of attached product must be to SAE std. J-744 Oct.'83 or better.



For additional pump dimensions, see preceding page.

# Installation Dimensions

## 4525VQT with SAE "A" rear mounting Millimeters (inches)

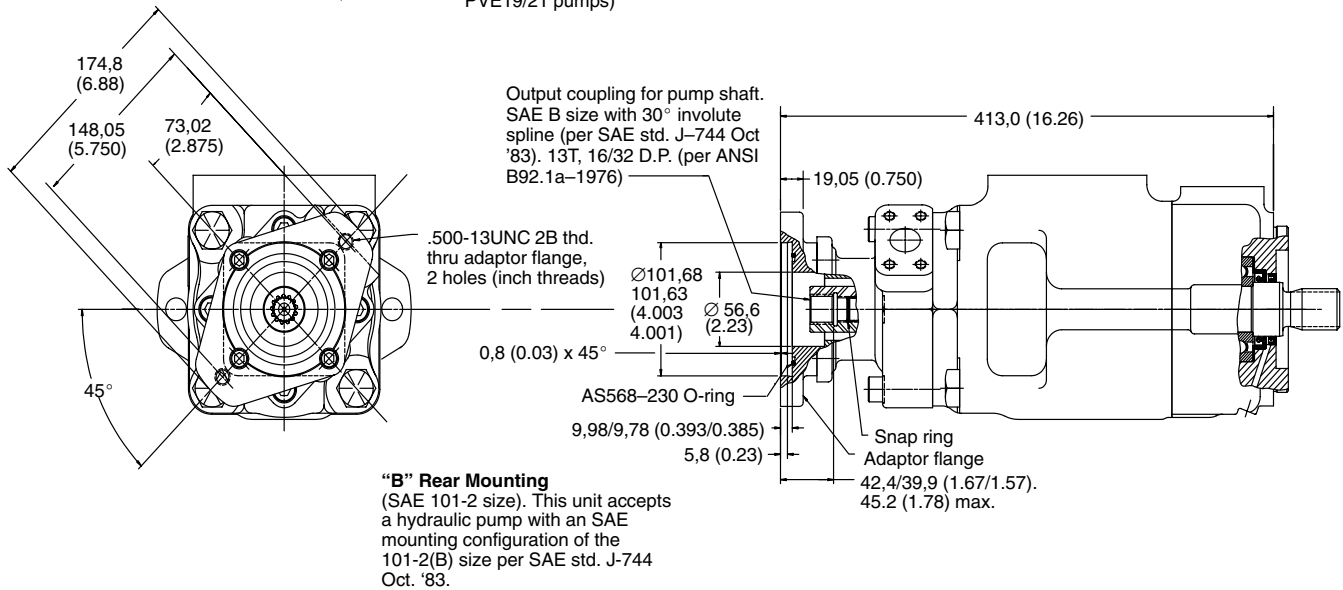
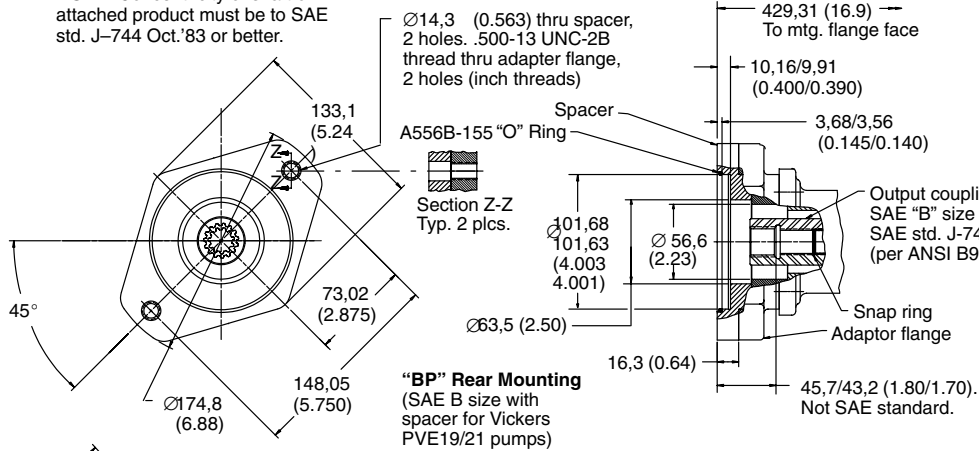


For SAE "B" and "BP" rear mounting dimensions, see following page.

## SAE "B" and "BP" rear mountings for 4525VQT

Millimeters (inches)

NOTE: Concentricity of shaft of attached product must be to SAE std. J-744 Oct.'83 or better.



For additional pump dimensions, see preceding page.

# Maximum Torque Loading for Direct Drives

As pictured at right, a coupled double VQT pump and thru-driven pump are essentially three pumps driven by one drive shaft. It is critical that the the sum of the torque required for each pumping section not exceed the maximum torque capability of the drive shaft.

Use the following procedure to ensure proper loading on the drive shaft:

1. Determine maximum operating torque of pumping section #1 from "Front Pump Torque Requirements" figure #1 or #2 at right.
2. Determine maximum operating torque of pumping section #2 from "Rear Pump Torque Requirements" figure #3 on facing page.
3. Determine maximum operating torque of thru-driven pump (pumping section #3) from its specific catalog data, or estimate the torque using the following formula:

$$\text{Torque} = (1.15 \times \text{displacement} \times \text{pressure}) \div 6.28$$

Note: Actual torque may be higher or lower than estimated.

4. Ensure the torque determined for the #3 pumping section does not exceed the "Maximum Thru-drive Torque" for the double VQT pump in figure #4 on facing page.
5. Sum all torque values from steps 1, 2 and 3 above. This value must not exceed the "Maximum Input Torque" value in figure #4 on facing page.

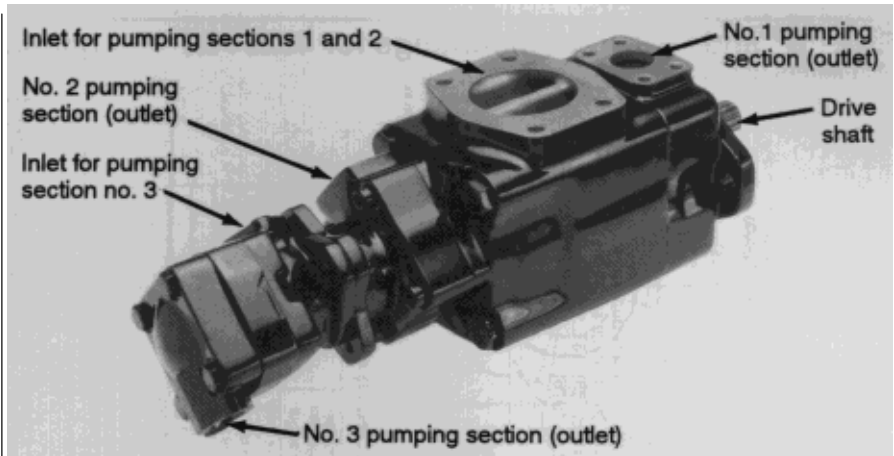


Figure 1

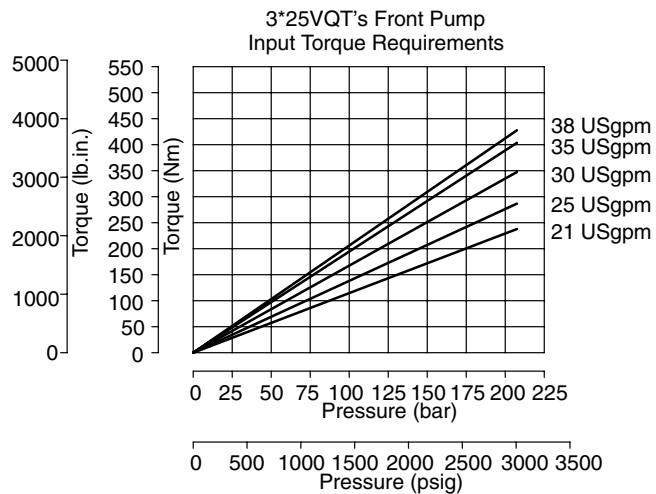
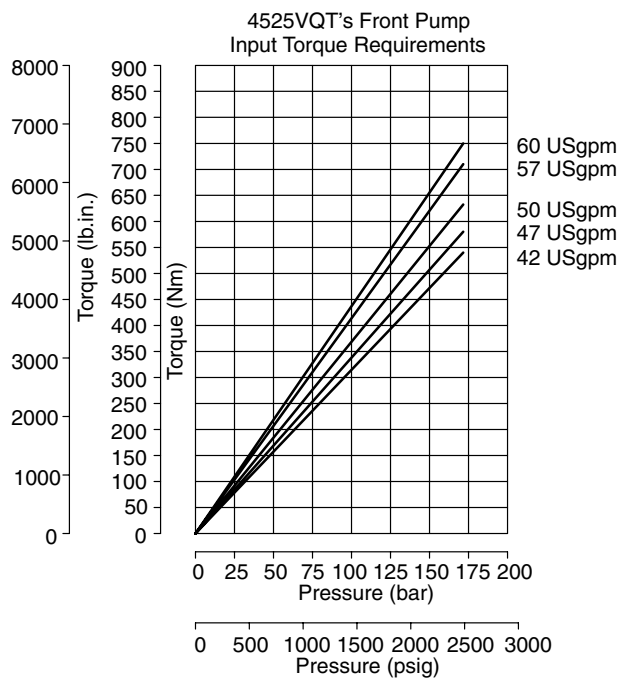
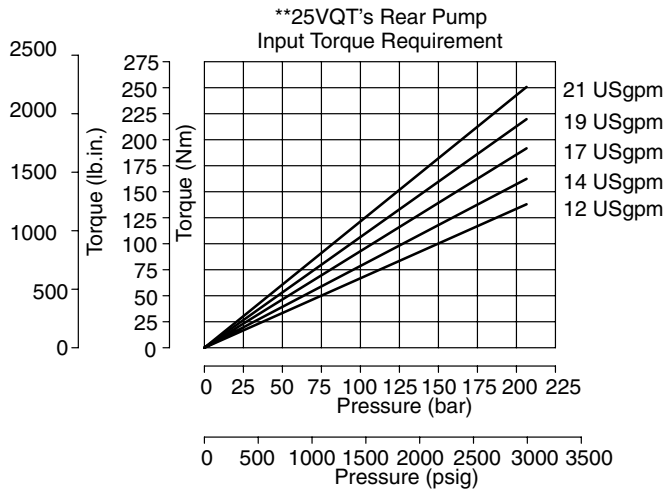


Figure 2



**Figure 3**



**Figure 4**

Model Series	Max. Torque – Nm (lb in)	
	Input †	Thru-drive
3*25VQTA	790 (7000)	131 (1160)
3*25VQTB	790 (7000)	316 (2800)
3*25VQTBP	790 (7000)	316 (2800)
4525VQTA	1017 (9000)	131 (1160)
4525VQTB	1017 (9000)	384 (3400)
4525VQTBP	1017 (9000)	384 (3400)

† Combined torque of Vickers thru-drive double pump and thru-driven pump.

**Typical Rear-mounted Pumps for \*\*25VQT Thru-drive Assemblies**

Mountng	Piston Pump Model Series	Shaft Code	Vane Pump Model Series	Shaft Code
SAE A	PVQ10/13	3	V10	11
			V20	62
SAE B	PVQ20/32	3	20V	151
	PVQ40/45	3	25V	11
	PVE12	2	V2020	11
	PVE19/21	9		

NOTE: Torque limits in Figure 4 must not be exceeded when applying the above Vickers pumps.

# Application Data

## Hydraulic fluids and temperature ranges

Use automotive type crankcase oil (designations SC, SD, SE or SF) per SAE J183 JUN86. Select a viscosity grade that will allow optimum viscosity, between 39 cSt (180 SUS) and 16cSt (80 SUS), to be achieved. Anti-wear hydraulic oils may be used if in accord with Vickers oil recommendation sheet M-2950-S.

Normal pump operation at rated conditions is based on the use of SAE 10W oil in the 38 to 82°C (100 to 180°F) range. Temperatures should not exceed 99°C (210°F), and oil viscosities must not be less than 10 cSt (60 SUS), because life expectancy of cartridge kits and elastomers will decrease.

When operating with SAE 10W oil in the 860 to 39 cSt (4000 to 180 SUS) range, pump speed and pressure should be limited to 50% or less of their respective rated values until the system has warmed up. Extreme caution must be used in starting units when fluid viscosities are greater than 860 cSt (4000 SUS). Care should be exercised to warm up the entire system. Remote cylinders and motors should be actuated during the warm-up process.

## Fluid cleanliness

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials and additives for protection against wear of components, elevated viscosity and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561; "Vickers Guide to Systemic Contamination Control," available from your local Vickers distributor or by contacting Vickers, Incorporated. Recommendations on filtration and the selection of products to control fluid condition are included in 561.

Recommended cleanliness levels, using petroleum oil under common conditions, are based on the highest fluid pressure levels in the system and are coded in the chart below. Fluids other than petroleum, severe service cycles or temperature extremes are cause for adjustment of these cleanliness codes. See Vickers publication 561 for exact details.


Vickers products, as any components, will operate with apparent satisfaction in fluids with higher cleanliness codes than those described. Other manufacturers will often recommend levels above those specified.

Experience has shown, however, that life of any hydraulic components is shortened in fluids with higher cleanliness codes than those listed below. These codes have been proven to provide a long trouble-free service life for the products shown, regardless of the manufacturer.

## Mounting and drive data

Mounting attitude should be horizontal. Consult your local Vickers representative if a different arrangement is required.

Direction of shaft rotation, viewed at the prime mover end, must be as indicated in the model designation on the pump.

 Click here and see "14" in Model Codes.

Inlet and outlet ports remain the same regardless of the direction of shaft rotation. Assembly change of internal parts is necessary when change of shaft rotation is required.

Direct coaxial drive through a flexible coupling is recommended. If drives imposing radial or axial loads are being considered, consult your Vickers representative for additional information.

Concentricity of the customer's female pilot diameter, relative to the effective axis of the female drive, must be within 0,10 mm (.004 in.) total indicator reading. Clearance between male and female pilot diameters must be 0,013 to 0,051 mm (.0005 to .0020 in.). The customer's mounting face, to which the pump is affixed, must be square to the axis of the female drive within 0,038 mm per mm (.0015 in. per in.).

Torque limitations for multiple pumps formed with a \*\*25VQT thru-drive are specified in Figure 4 on the preceding page.

## Cleanliness codes for petroleum oil usage

Product	System Pressure Level		
	< 2000 psi	2000-3000 psi	3000+ psi
Vane pumps, fixed	20/18/15	19/17/14	18/16/13
Vane pumps, variable	18/16/14	17/15/13	
Piston pumps, fixed	19/17/15	18/16/14	17/15/13
Piston pumps, variable	18/16/14	17/15/13	16/14/12
Directional valves	20/18/15	20/18/15	19/17/14
Proportional valves	17/15/12	17/15/12	15/13/11
Servo valves	16/14/11	16/14/11	15/13/10
Pressure/Flow controls	19/17/14	19/17/14	19/17/14
Cylinders	20/18/15	20/18/15	20/18/15
Vane motors	20/18/15	19/17/14	18/16/13
Axial piston motors	19/17/14	18/16/13	17/15/12
Radial piston motors	20/18/14	19/17/13	18/16/13

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### **Inlet pressure**

The pump has no case drain and is drained internally into its inlet.

Recommended inlet pressure is 0 to 0,34 bar (0 to 5 psig). Maximum inlet pressure is 1,4 bar (20 psi). Inlet depressions should not exceed 5" Hg (0,17 bar or 12.2 psia).

### **Start-up procedure**

Make sure the reservoir and circuit are clean and free of dirt/debris prior to filling.

Charge the reservoir with filtered oil. Fill to a level sufficient to prevent vortexing at the suction connection to the pump inlet. It is good practice to clean the system by flushing and filtering, using an external slave pump.

Before starting the pump, fill with fluid through one of the ports. If the pump is above the fluid level of the reservoir, it should be filled through its outlet ports. If the pump is mounted below the fluid level, the pump outlet fitting (or other downstream fitting or plug ) can be loosened to allow fluid to displace trapped air. It may be necessary to loosen the reservoir's fill cap to allow the fluid to flow freely. When a solid stream with no observed air begins to drain, the fitting should be retightened.

An air bleed valve in the outlet circuit is also recommended to remove air. If one is used, fill the pump before start-up.

In some cases, it may be possible to prime the pump by running the engine starter for 5 to 10 seconds with the throttle and/or ignition switch in the "off" position. It will be necessary to loosen a fitting or plug in the pump outlet to allow air to escape.

All controls should be placed in the neutral position so the pump is unloaded when started. Start the engine and run at low idle.

Once the pump is started it should prime within a few seconds. If the pump does not prime, check to make sure that there are no restrictions between the reservoir and the inlet to the pump, and that there are no air leaks in the inlet line and connections. Also check to make sure that trapped air can escape at the pump outlet.