

# VQ Series High Speed, High Pressure Pumps



Single 35VQ

Thru Drive 35VQT\*S

Double 3525VQ

Triple 4525VQSV10F

## Design Features

In all pumps, except the rear pump of triple pumps, fluid flow is developed in a cartridge which consists principally of a cam ring, rotor, ten vanes, and unique side plates and support plates. The bimetallic flexible side plates are located on each side of the rotor with their bronze face toward the rotor and their steel face toward the support plate. Two cavities in each support plate hold high pressure oil against the flexible side plate, thereby hydrostatically balancing the flexible plate and providing optimum clearance with the rotor.

## Performance

For a combination of maximum horsepower in a small package, high efficiency, serviceability and economy, Vickers "high output" pumps are unequalled anywhere in industry.

## Durability

Vickers high speed-high pressure pumps give more staying power – they last. Their workhorse ruggedness has been proved on the newest types of giant earth-moving equipment.

## Reliability & Efficiency

Axial and radial running clearances, along with lubricating oil film on the rotor and vanes, are optimized over the entire operating pressure range. Excellent cold-start capability and superior resistance to seizure make Vickers VQ pumps highly reliable and efficient.

## Replaceable Cartridge

The pump cartridge described under design features is easy to service and can normally be replaced in ten minutes or less, without removing the pump from its mounting. A small stock of cartridges can serve many pump models on a variety of vehicles.

## Hydraulic Balance

Pump inlet and outlet pressure chambers are diametrically opposed as shown in Figure 2. As a result, the rotor is hydraulically balanced. Bearings thus encounter no hydraulic loads, assuring long life.

Figure 3 shows an insert fitted into a slot in the vane. Outlet pressure is applied continuously only to the space between the vane and insert. Top and bottom areas of the vane are subject to either inlet or outlet pressure, depending upon the vane's location during rotor rotation. See Figure 2. Complete hydraulic balance is effected in the outlet pressure areas. Outward thrust by the vane in the inlet area is equal to the outlet pressure times the projected area of the end of the insert.

## Double Pumps

Double pumps provide a single power source capable of serving two separate hydraulic circuits, or of providing greater volume through the combined delivery of both sections. In either type of application, two pumps in a single housing result in a more compact, simple installation and can be driven through a single shaft coupling.

## Triple Pumps

Because triple pumps have three pumps in a single housing, they offer even more application versatility than do the double pumps described above.

## Thru-Drive Pumps

These versions of single and double pumps have a rear pad for directly mounting and driving an additional pump. Many different multi-pump arrangements are thus possible.

## Integral Valve Options

Single, double, and triple pumps are available with flow control and priority valve covers.

The flow control cover limits flow to the operating system to the desired maximum. Excess flow is diverted to tank. On double and triple pumps, the deliveries of the shaft-end and center pumps are proportional to speed.

The flow control cover also includes a relief valve to limit maximum operating pressure. Operating pressures of the shaft-end and center pumps of double and triple pumps must be controlled by separate, external relief valves.

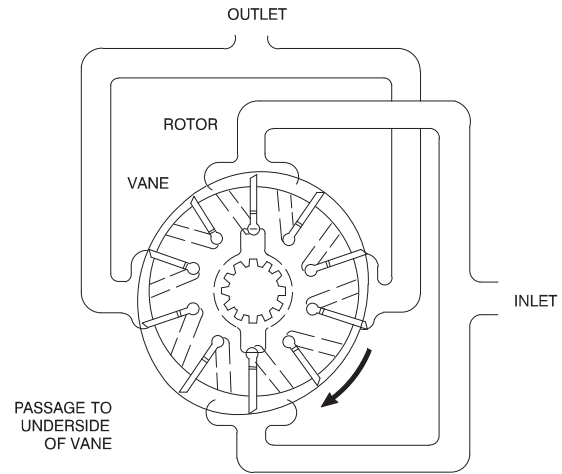


Figure 2

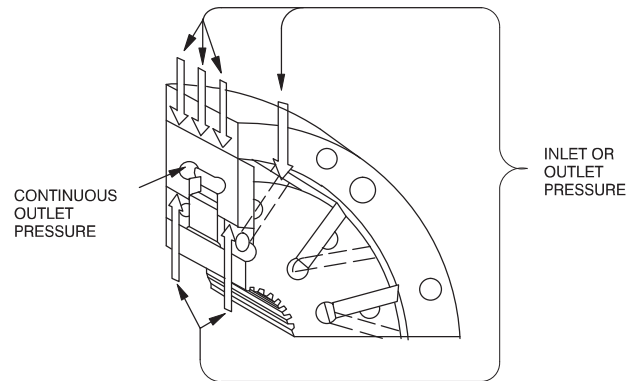


Figure 3

A typical application for the flow control is power steering, where it provides a constant supply of oil throughout the vehicle engine's mid to high speed range.

The priority valve cover maintains a nearly constant flow to a primary circuit and diverts remaining flow to a secondary circuit. The amount of flow going to the secondary circuit is determined by pump delivery. The primary circuit is protected by an integral relief valve, but an external relief valve must be provided for the secondary and any additional circuit.

# Single Pump Operating Specifications

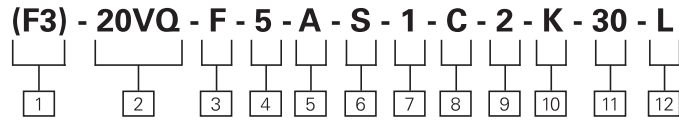
Model Series	Delivery USgpm @ 1200 r/min 7 bar (100 psi)	Displ. cm <sup>3</sup> /r (in <sup>3</sup> /r)	Max. r/min	Max. bar (psi)	Typical del. L/min (USgpm) @ max. speed & pressure	Typical input kW (hp) @ max. speed & pressure	Weight kg (lb)
20VQ	5	18,0 (1.10)	2700	210 (3000)	42,3 (11)	17,9 (24)	11,8 (26)
	8	27,4 (1.67)	2700	210 (3000)	65,4 (17)	26,1 (35)	
	11	36,4 (2.22)	2700	210 (3000)	88,5 (23)	35,4 (47.5)	
	12	39,5 (2.41)	2700	160 (2300)	98,1 (25.5)	28,4 (38)	
	14	45,9 (2.80)	2700	140 (2000)	115,4 (30)	29,1 (39)	
25VQ	12	40,2 (2.45)	2700	210 (3000)	88,5 (23)	41,0 (55)	14,5 (32)
	14	45,4 (2.77)	2700	210 (3000)	103,8 (27)	46,6 (62.5)	
	17	55,2 (3.37)	2500	210 (3000)	119,2 (31)	51,8 (69.5)	
	21	67,5 (4.12)	2500	210 (3000)	146,2 (38)	61,9 (83)	
35VQ	25	81,6 (4.98)	2500	210 (3000)	173,1 (45)	75,3 (101)	22,7 (50)
	30	97,7 (5.96)	2500	210 (3000)	211,5 (55)	87,7 (117.5)	
	35	112,8 (6.88)	2400	210 (3000)	230,8 (60)	98,5 (132)	
	38	121,6 (7.42)	2400	210 (3000)	250,0 (65)	104,4 (140)	
45VQ	42	138,7 (8.46)	2200	175 (2500)	255,8 (66.5)	91,4 (122.5)	34,1 (75)
	50	162,3 (9.90)	2200	175 (2500)	303,8 (79)	105,2 (141)	
	60	193,4 (11.80)	2200	175 (2500)	369,2 (96)	126,8 (170)	

Performance constants: SAE 10W fluid @ 82° C (180° F), and pump inlet @ 0 PSIG (14.7 PSIA)

**Note:** Outlet pressure must always be higher than inlet pressure.  
See page 7 for details.

# Model Codes

## Single Pump



**1 F3 – Viton seals**

Omit if not required.

**2 Intravane pump series**

**3 Integral valve options**

Omit if not required

- F** – Flow control and relief
- P** – Priority valve and relief

**4 Geometric displacement**

Code = SAE rating (USgpm) at  
1200 r/min, 7 bar (100 psi)

Code	cm <sup>3</sup> /r	in <sup>3</sup> /r
5	18,0	1.10
8	27,4	1.67
11	36,4	2.22
12	39,5	2.41
14	45,9	2.80

**5 Port connections**

Series	Code	Inlet	Outlets
20VQ	A	SAE 4-bolt flg.	SAE 4-bolt flg.
20VQ	AM*	Metric 4-bolt flg.	Metric 4-bolt flg.
20VQF&P	B	SAE Str. thd.	SAE Str. thd.
20VQF&P	C	SAE 4-bolt flg.	SAE Str. thd.

\* Same as code "A" port connections, except metric threads for fastening flanges.

**6 Mounting & shaft seal assembly**

- F** – Foot mount with single shaft seal
  - S** – Flange mount and double shaft seal
- Omit for flange mount with single shaft seal.

**7 Shaft type**

- 1** – Straight keyed
- 151** – Splined

**8 Outlet positions**

(Viewed from cover end of pump)

- A** – Opposite inlet port
- B** – 90° CCW from inlet
- C** – In line with inlet
- D** – 90° CW from inlet

**9 Controlled flow rate**

(20VQF & 20VQP)

- 3** – 11 L/min (3 USgpm)
- 4** – 15 L/min (4 USgpm)
- 6** – 23 L/min (6 USgpm)
- 7** – 27 L/min (7 USgpm)
- 8** – 30 L/min (8 USgpm)
- 10** – 38 L/min (10 USgpm)
- 11** – 42 L/min (11 USgpm)
- 12** – 45 L/min (12 USgpm)

**10 Relief valve setting**

(20VQF & 20VQP)  
bar (psi)

- |                      |                       |
|----------------------|-----------------------|
| <b>A</b> – 17 (250)  | <b>F</b> – 100 (1500) |
| <b>B</b> – 35 (500)  | <b>G</b> – 121 (1750) |
| <b>C</b> – 52 (750)  | <b>H</b> – 140 (2000) |
| <b>D</b> – 70 (1000) | <b>J</b> – 155 (2250) |
| <b>E</b> – 86 (1250) | <b>K</b> – 175 (2500) |

**11 Design**

Subject to change. Installation dimensions remain the same for designs –30 through –39.

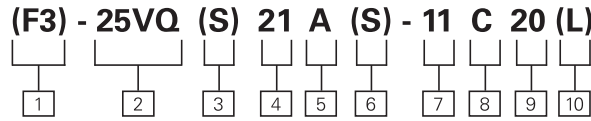
**12 Shaft Rotation**

(Viewed from shaft end of pump)  
**L** – Left hand or counterclockwise.  
Omit for right hand.

**NOTE:** For options other than listed above, i.e. shafts, ports, displacements, and mountings, contact your Vickers representative.

# Model Codes

## Single Pump



### 1 F3 - Viton seals

Omit if not required.

### 2 Intravane pump series

Standard bearing	Heavy duty bearing
25VQ	26VQ
35VQ	36VQ
45VQ	–

### 3 Pilot designation

S – SAE per ISO 3019/1 (SAE J744)  
Omit for standard pilot.

### 4 Geometric displacement

Code = SAE rating (USgpm) at 1200 r/min and 7 bar (100 psi)

#### Frame

Size	Code	cm <sup>3</sup> /r	in <sup>3</sup> /r
25V	12	40,2	2.45
	14	45,4	2.77
	17	55,2	3.37
	21	67,5	4.12
35V	25	81,6	4.98
	30	97,7	5.96
	35	112,8	6.88
	38	121,6	7.42
45V	42	138,7	8.46
	50	162,3	9.90
	60	193,4	11.80

### 5 Port connections

Series	Code	Inlet	Outlets
All	A	SAE 4-bolt flg.	SAE 4-bolt flg.
All	AM*	Metric 4-bolt flg.	Metric 4-bolt flg.
25VQ	B	SAE str. thd.	SAE str. thd.
25VQ	C	SAE 4-bolt flg.	SAE str. thd.
25VQ	D	SAE str. thd.	SAE 4-bolt flg.

\*Same as code "A" port connections, except metric threads for fastening flanges.

### 6 Mounting & shaft seal assembly

- F** – Foot mounting with single shaft seal
- S** – Flange mount and double shaft seal

Omit for flange mount with single shaft seal.

### 7 Shaft type

#### With standard pilot, single shaft seal

- 1** – Straight keyed
- 11** – Splined
- 86** – Straight keyed, heavy duty

#### With standard pilot, double shaft seal

- 123** – Splined (not available on 45VQ)
- 130** – Splined (for 45VQ only)

#### With SAE pilot, single or double shaft seal

- 203** – Straight keyed, heavy duty
- 297** – Splined

### 8 Outlet positions

(Viewed from cover end of pump)

- A** – Opposite inlet
- B** – 90° CCW from inlet
- C** – In line with inlet
- D** – 90° CW from inlet

### 9 Design

Subject to change. Installation dimensions remain the same for designs –20 through –29

### 10 Rotation

(Viewed from shaft end of pump)

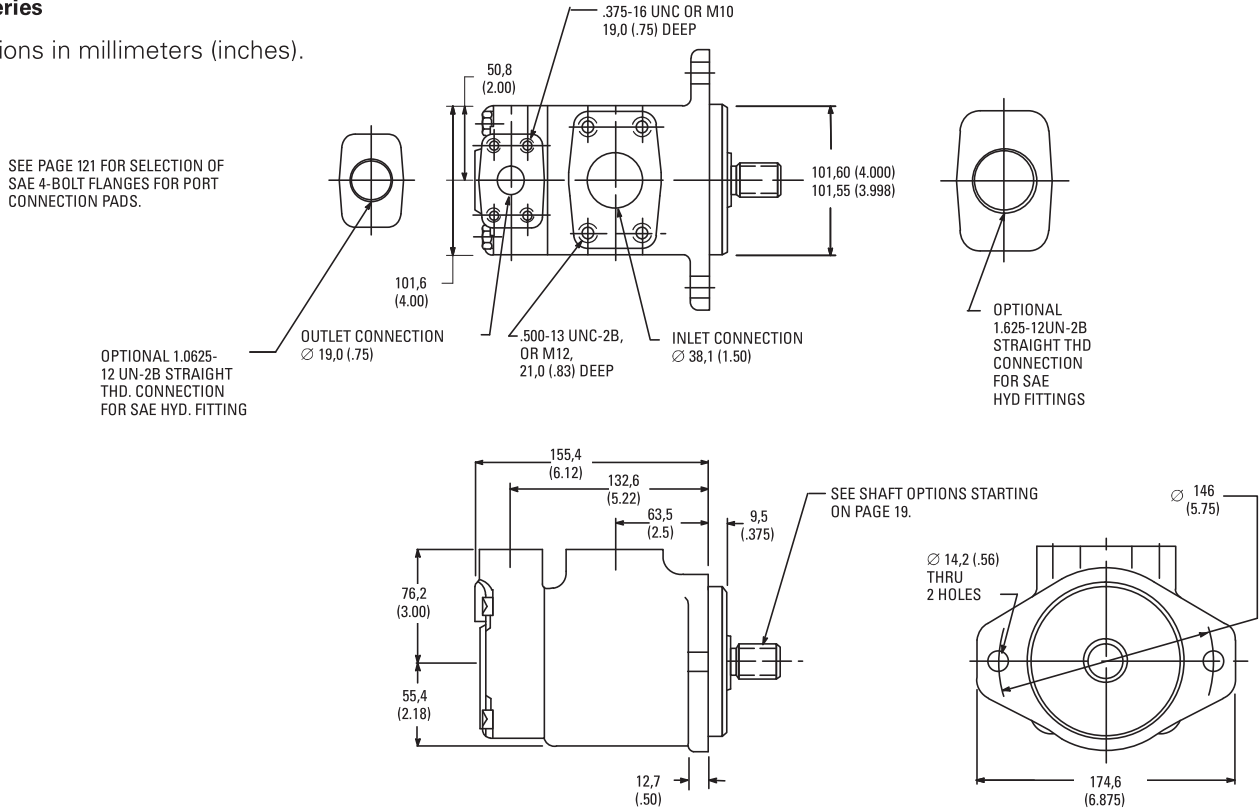
- L** – Left hand (counterclockwise)
- Omit for right hand.

**NOTE:** For options other than listed in the model code, i.e. shafts, ports, displacements and mountings, contact your Vickers representative.

# Installation Dimensions

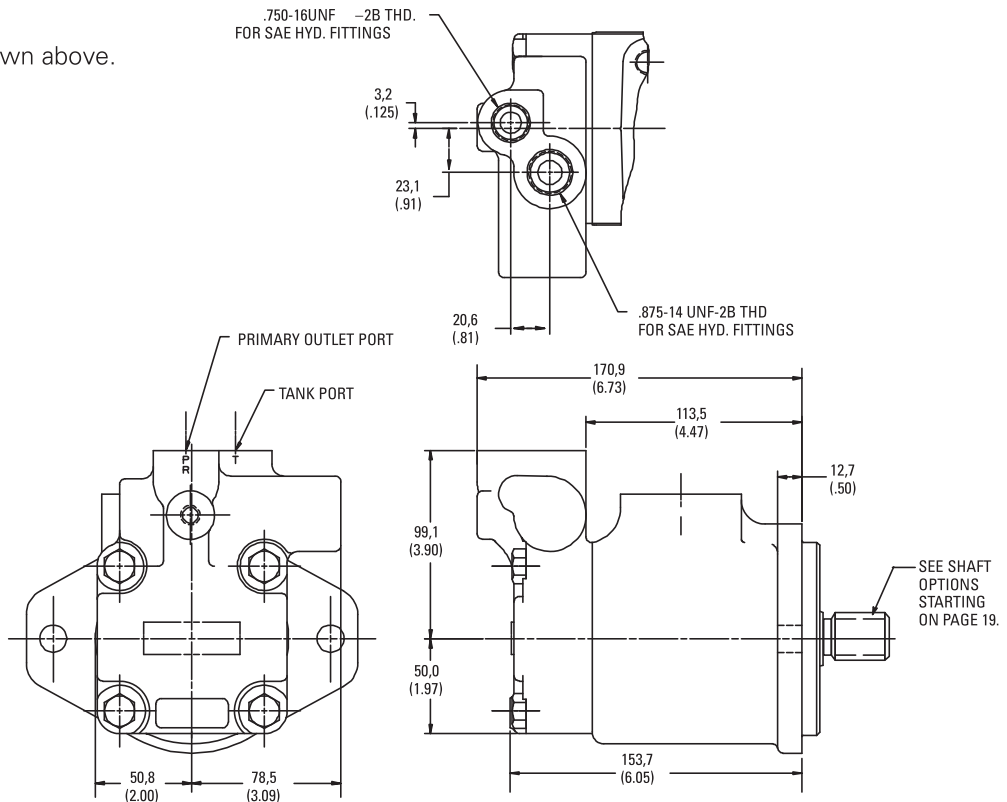
## 20VQ Series

Dimensions in millimeters (inches).



## 20VQF Series

Additional dimensions are shown above.

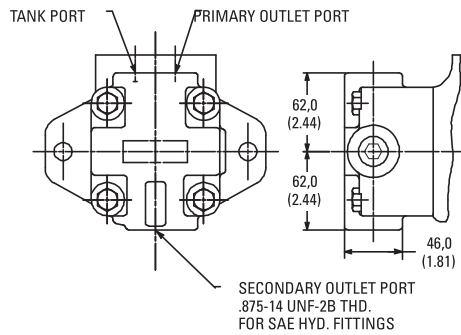
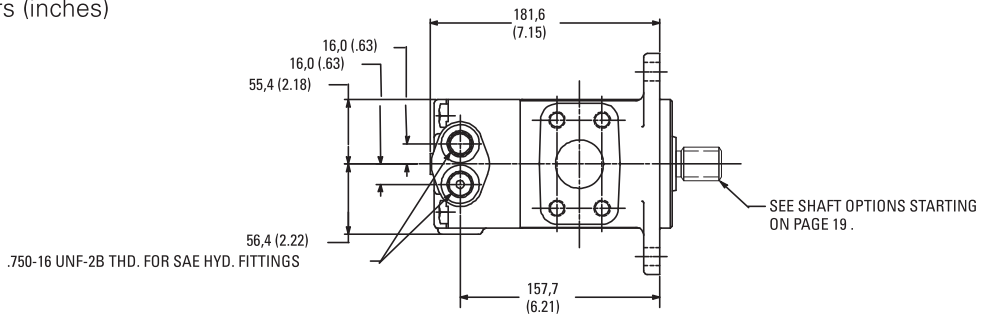


# Installation Dimensions

## 20VQP Series

Dimensions in millimeters (inches)

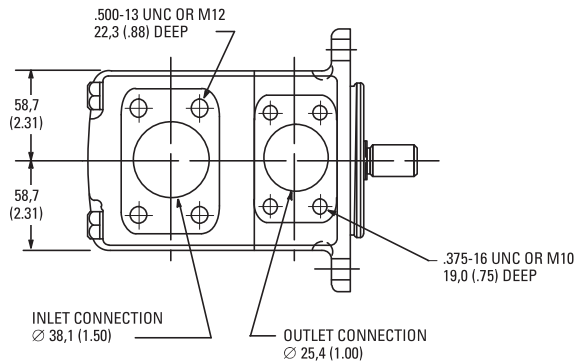
See preceding page for additional dimensions.



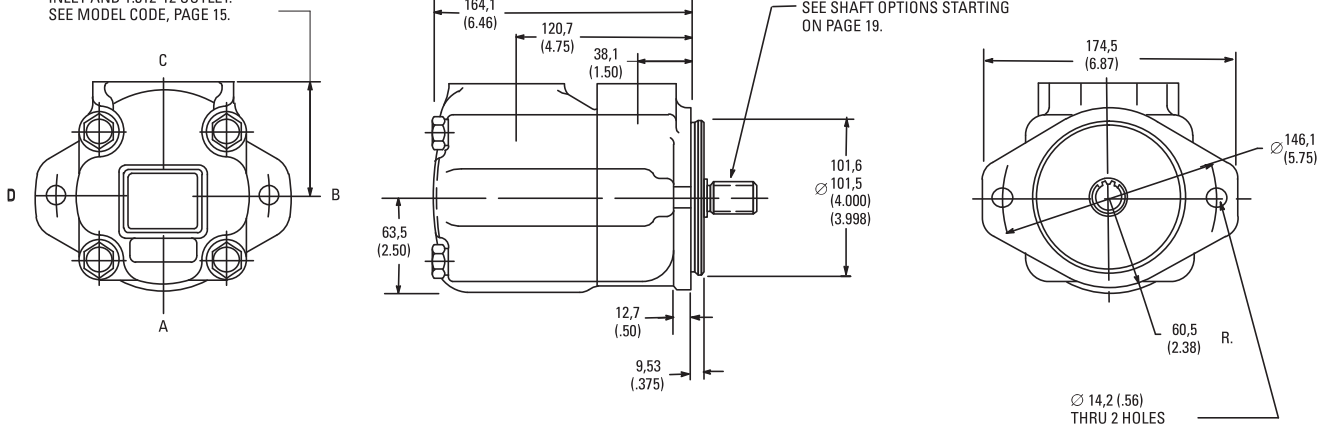
## 25VQ Series

Dimensions in millimeters (inches)

PORT CONNECTION PADS ARE FOR USE WITH 4-BOLT FLANGES. SEE PAGE 121 FOR SELECTION.



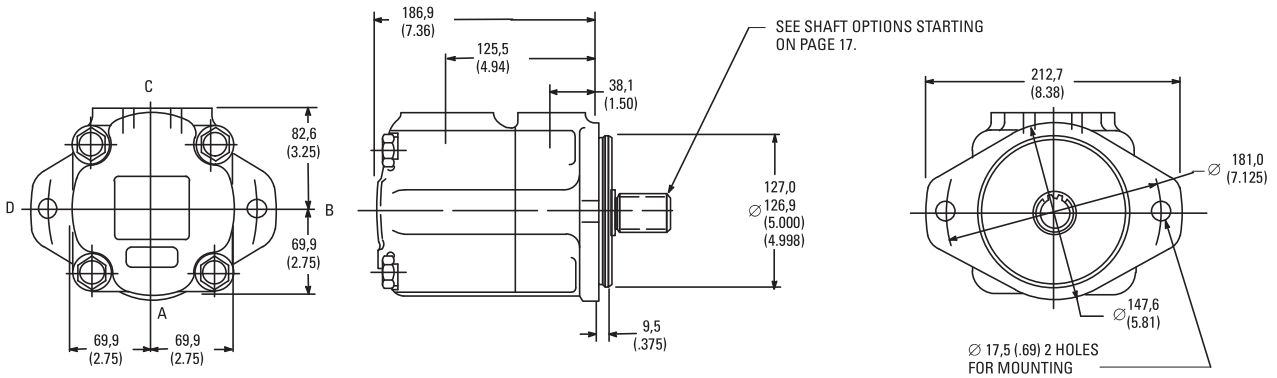
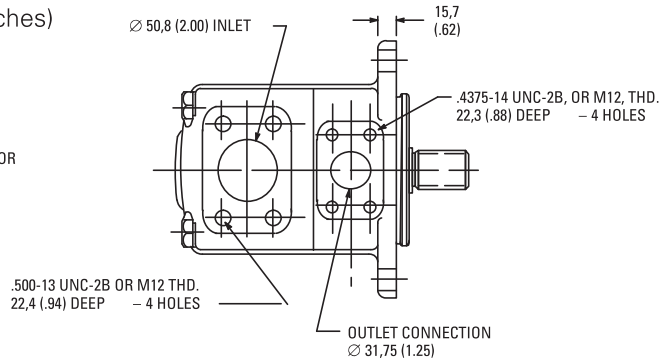
76,2 (3.00) FOR SAE 4-BOLT FLANGE PADS. 85,9 (3.38) FOR 1.875-12 STRAIGHT THREADED INLET AND 1.312-12 OUTLET. SEE MODEL CODE, PAGE 15.



### 35VQ Series

Dimensions in millimeters (inches)

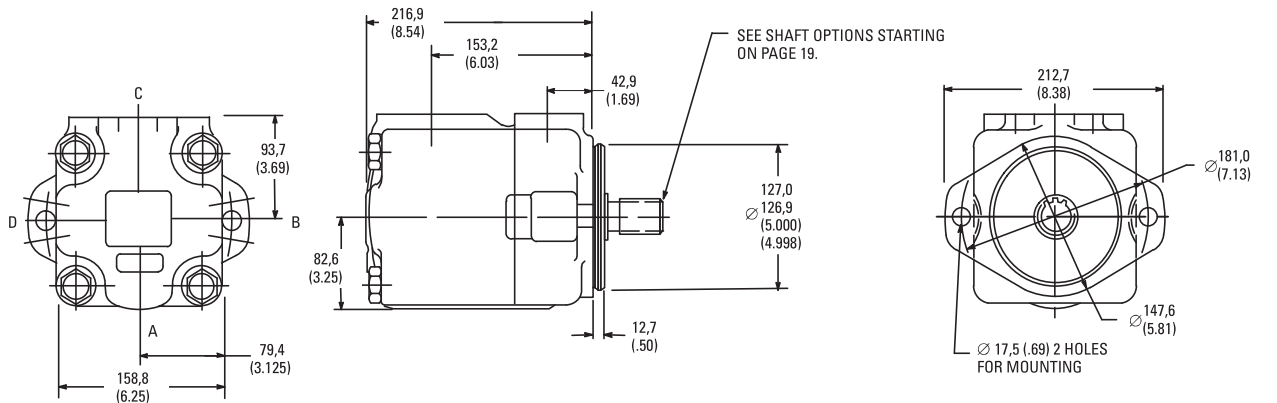
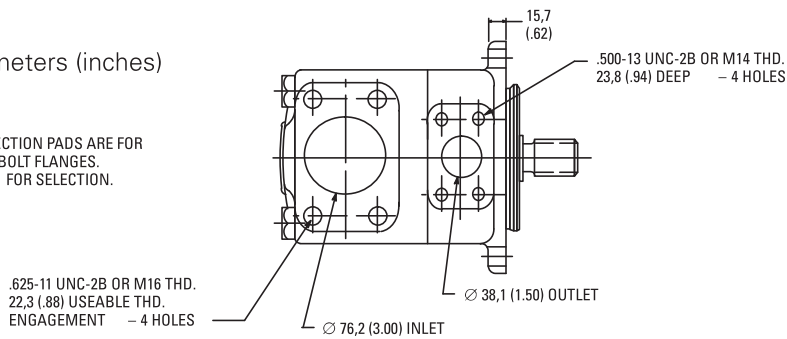
PORT CONNECTION PADS ARE FOR USE WITH 4-BOLT FLANGES. SEE PAGE 119 FOR SELECTION.



### 45VQ Series

Dimensions in millimeters (inches)

PORT CONNECTION PADS ARE FOR USE WITH 4-BOLT FLANGES. SEE PAGE 121 FOR SELECTION.

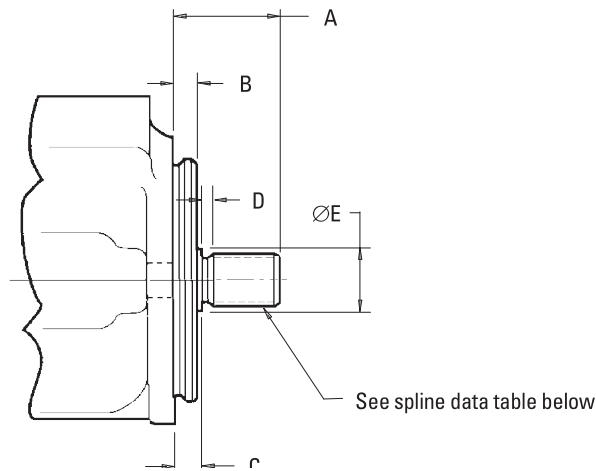




# Optional Shafts

## Splined Shafts

Dimensions in millimeters (inches)



Pump	Shaft Code	A	B	C	D	ØE	Spline Data (See below.)
20VQ, 20VQF, 20VQP	151	44,1 (1.62)	9,53 (.375)	11,9 (.468)	4,1 (.16)	27,8 (1.09)	A
	11	44,5 (1.75)	9,53 (.375)	11,1 (.437)	4,1 (.16)	27,8 (1.09)	A
25VQ	123	44,5 (1.75)	9,53 (.375)	15,7 (.62)	4,1 (.16)	27,8 (1.09)	A
	297	41,1 (1.62)	9,53 (.375)	7,9 (.31)	4,1 (.16)	27,8 (1.09)	C
35VQ	11	58,7 (2.31)	9,53 (.375)	11,1 (.437)	6,4 (.25)	35,1 (1.38)	D
	123	58,7 (2.31)	9,53 (.375)	15,2 (.60)	5,5 (.21)	35,1 (1.38)	D
	297	55,5 (2.19)	12,7 (.500)	7,9 (.31)	6,4 (.25)	35,1 (1.38)	E
45VQ	11	61,9 (2.44)	12,7 (.500)	14,3 (.565)	9,7 (.38)	39,6 (1.56)	D
	130	61,9 (2.44)	12,7 (.500)	15,2 (.60)	9,9 (.39)	40,4 (1.59)	D
	297	55,5 (2.19)	12,7 (.500)	7,9 (.31)	9,7 (.38)	39,6 (1.56)	E

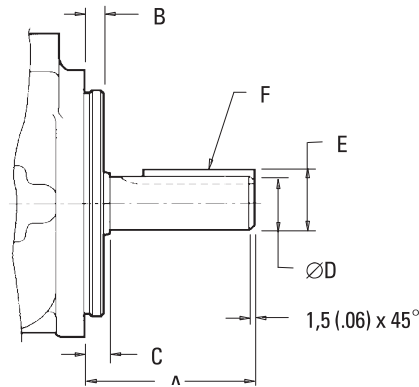
## Spline Data Table

(Involute splines from above chart)

Spline Data Reference	Number of Teeth	Pitch	Major Diameter	Form Diameter	Minor Diameter	Minor Diameter
A	13	16/32	22,17 (.873) 22,15 (.872)	19,03 (.749)	18,16 (.715)	Major dia. fit
C	13	16/32	21,8 (.858) 21,6 (.852)	19,03 (.749)	18,16 (.715)	Side fit
D	14	12/24	31,70 (1.248) 31,67 (1.247)	27,4 (1.08)	26,42 (1.040)	Major dia. fit
E	14	12/24	31,2 (1.229) 31,1 (1.223)	27,4 (1.08)	26,42 (1.040)	Side fit

## Straight Key Shafts

Dimensions in millimeters (inches)



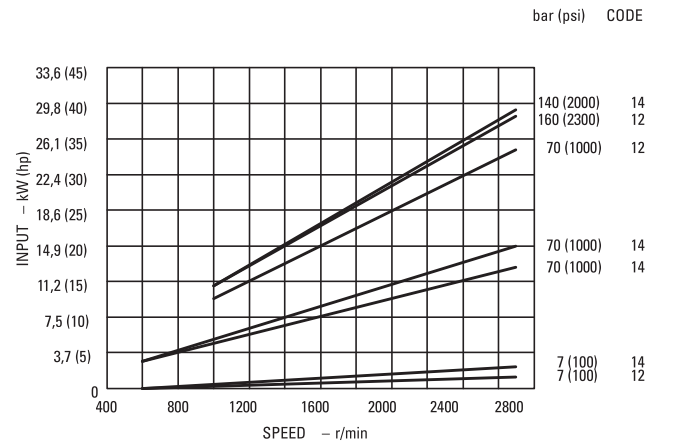
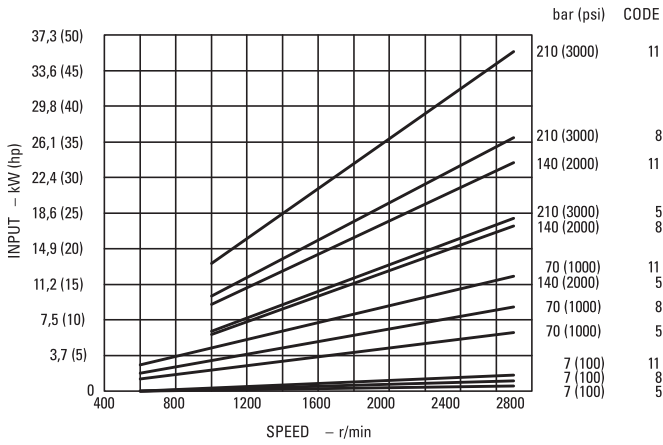
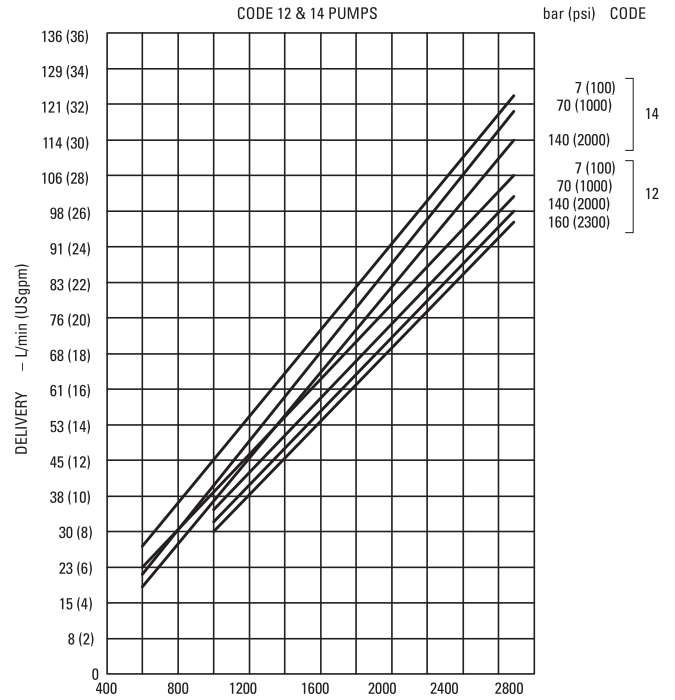
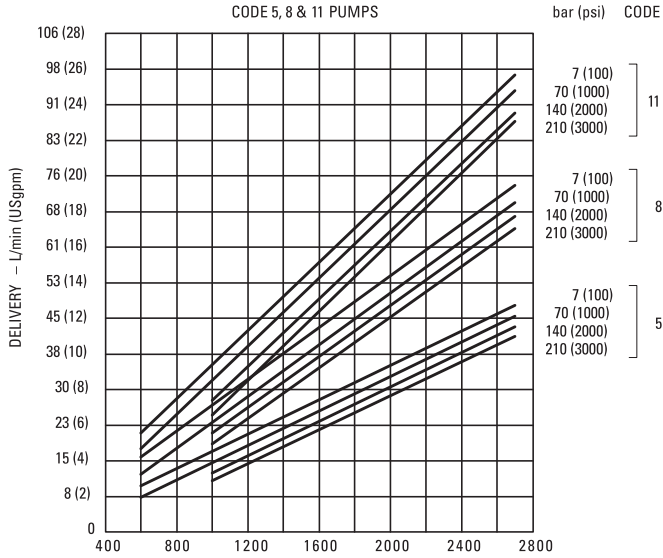
Pump	Shaft Code	A	B	C	ØD	E	F key width x length
20VQ, 20VQF, 20VQP	1	58,7 (2.31)	9,53 (.375)	11,9 (.468)	22,23 (.875) 22,20 (.874)	24,5 (.966) 24,4 (.961)	4,75 (.187) x 32 (1.25)
	1	58,7 (2.31)	9,53 (.375)	11,1 (.435)	22,23 (.875) 22,20 (.874)	24,5 (.966) 24,4 (.961)	4,75 (.187) x 32 (1.25)
25VQ	86	77,7 (3.06)	9,53 (.375)	11,1 (.435)	25,37 (.999) 25,35 (.998)	28,3 (1.11) 28,1 (1.10)	6,36 (.250) x 50,8 (2.00)
	203	77,7 (3.06)	9,53 (.375)	7,9 (.31) ▲	25,40 (1.00) 25,35 (.998)	28,20 (1.11) 27,94 (1.10)	6,36 (.250) x 49,2 (1.938)
35VQ	1	73,2 (2.88)	9,53 (.375)	11,1 (.435)	31,75 (1.250) 31,70 (1.248)	35,36 (1.39) 34,10 (1.38)	7,94 (.313) x 38,1 (1.50)
	86	85,9 (3.38)	9,53 (.375)	11,1 (.435)	34,90 (1.374) 34,87 (1.373)	38,6 (1.52) 38,3 (1.51)	7,92 (.312) x 54 (2.13)
45VQ	203	84,1 (3.31)	12,7 (.500)	7,9 (.31) ▲	34,90 (1.374) 34,87 (1.373)	38,6 (1.52) 38,3 (1.51)	7,92 (.312) x 54 (2.125)
	1	62,0 (2.44)	12,7 (.500)	14,22 (.560)	31,75 (1.250) 31,70 (1.248)	35,36 (1.39) 34,10 (1.38)	7,92 (.312) x 28,5 (1.12)
45VQ	86	87,4 (3.44)	12,7 (.500)	14,22 (.560)	38,07 (1.499) 38,05 (1.498)	42,4 (1.67) 42,1 (1.66)	9,53 (.375) x 50,8 (2.00)
	203	90,4 (3.56)	12,7 (.500)	7,9 (.31) ▲	38,07 (1.499) 38,05 (1.498)	42,4 (1.67) 42,1 (1.66)	9,53 (.375) x 57,1 (2.25)

▲ Shaft shoulder inside recess in pilot.

# Typical Performance

## 20VQ Single Pumps

Performance Constants:  
 SAE 10W fluid @ 82°C (180°F)  
 Pump inlet @ 0 psig (14.7 psia)



## 25VQ Single & 25VQT\*S Thru-drive Pumps

Performance Constants:  
 SAE 10W fluid @ 82° C (180° F)  
 Pump inlet @ 0 psig (14.7 psia)

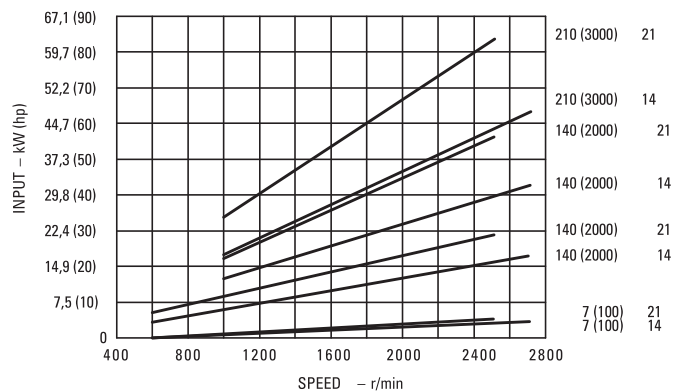
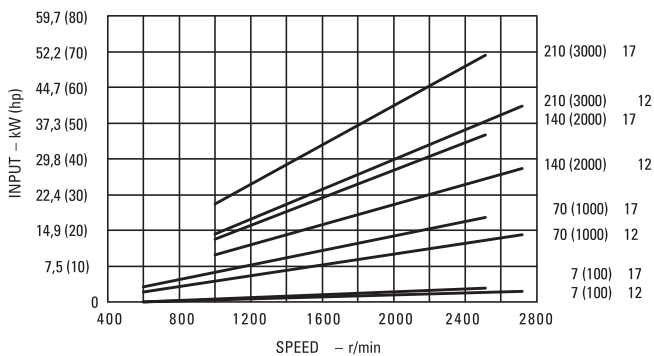
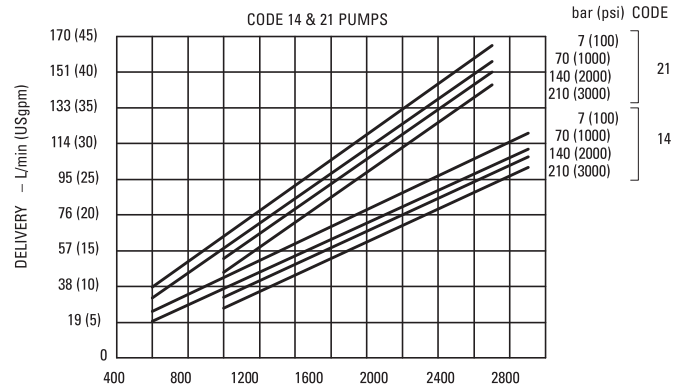
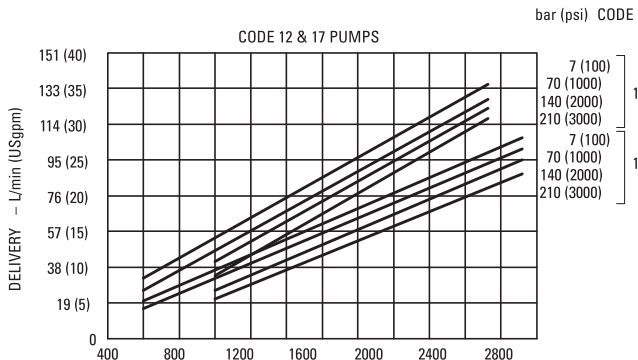
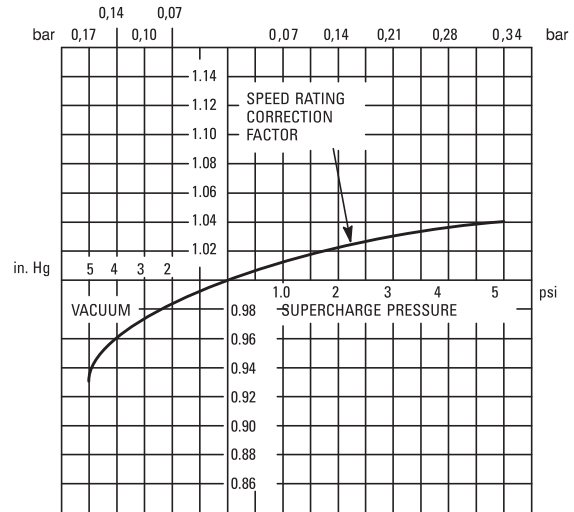
Maximum operating speeds shown on performance curves are for pumps operating at 0 psi inlet condition. To compute maximum operating speeds at other inlet conditions, use appropriate speed rating correction factor.

Example:

Max. speed @ 0 psi inlet      2700 r/min  
 Correction factor @ 5 in. Hg     $\times .93$   
 Max. speed @ 5 in. Hg inlet    2511 r/min

Pump inlet suction should not exceed 5 in. Hg vacuum. Positive pressure on inlet should not exceed 1,4 bar (20 psi).

MAXIMUM OPERATING SPEED CORRECTION FACTORS BASED ON PUMP INLET CONDITIONS



# Typical Performance

## 35VQ Single & 35VQT\*S Thru-drive Pumps

Performance Constants:  
 SAE 10W fluid @ 82° C (180° F)  
 Pump inlet @ 0 psig (14.7 psia)

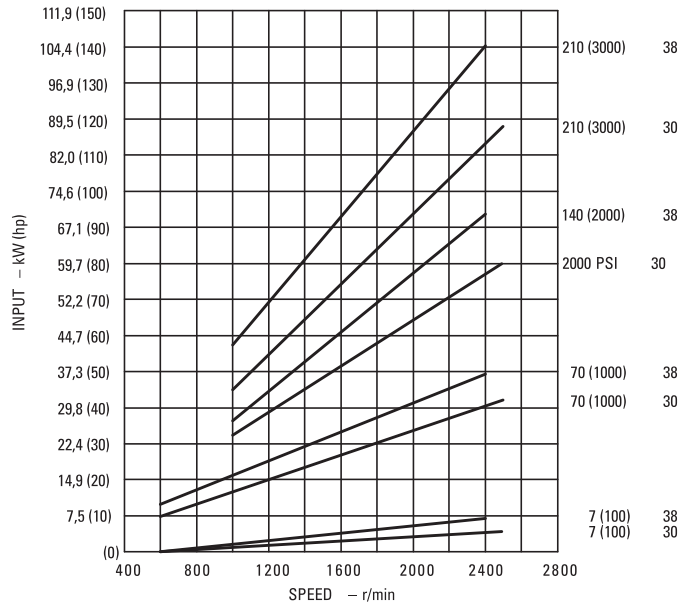
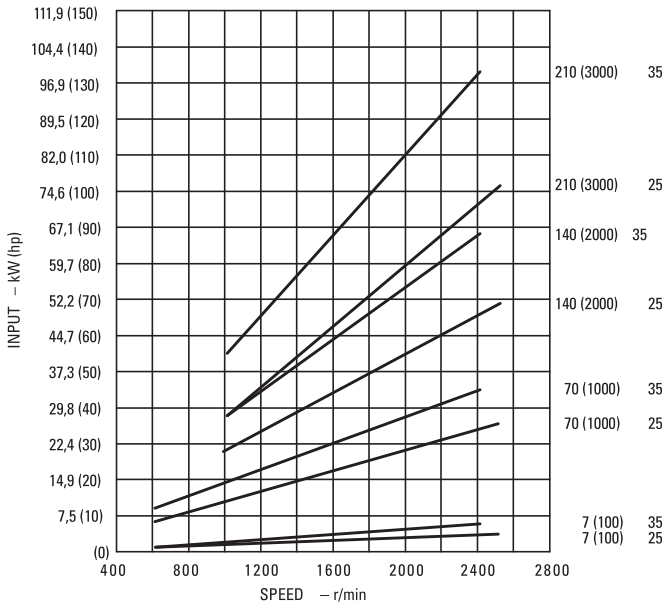
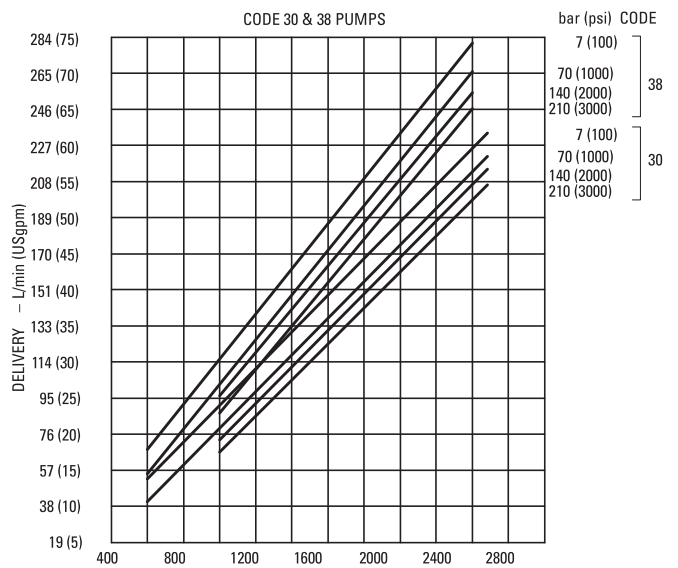
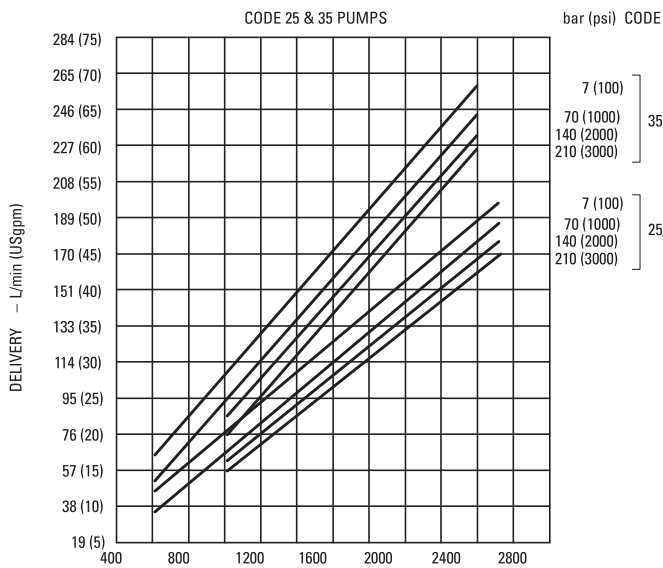
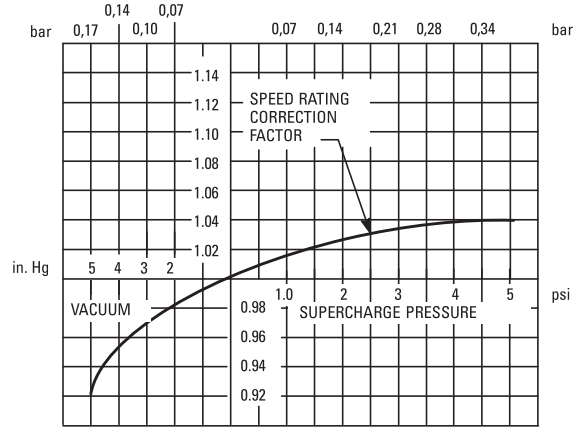
Maximum operating speeds shown on performance curves are for pumps operating at 0 psi inlet condition. To compute maximum operating speeds at other inlet conditions, use appropriate speed rating correction factor.

Example:

Max. speed @ 0 psi inlet      2500 r/min  
 Correction factor @ 5 in. Hg     $\times .92$   
 Max. speed @ 5 in. Hg inlet    2300 r/min

Pump inlet suction should not exceed 5 in. Hg vacuum. Positive pressure on inlet should not exceed 1,4 bar (20 psi).

MAXIMUM OPERATING SPEED CORRECTION FACTORS BASED ON PUMP INLET CONDITIONS



### 45VQ Single & 45VQT\*S Thru-drive Pumps

Performance Constants:  
 SAE 10W fluid @ 82° C (180° F)  
 Pump inlet @ 0 psig (14.7 psia)

Maximum operating speeds shown on performance curves are for pumps operating at 0 psi inlet condition. To compute maximum operating speeds at other inlet conditions, use appropriate speed rating correction factor.

Example:

Max. speed @ 0 psi inlet      2200 r/min  
 Correction factor @ 5 in. Hg     $\times .91$   
 Max. speed @ 5 in. Hg inlet    2002 r/min

Pump inlet suction should not exceed 5 in. Hg vacuum. Positive pressure on inlet should not exceed 1,4 bar (20 psi).

MAXIMUM OPERATING SPEED CORRECTION FACTORS BASED ON PUMP INLET CONDITIONS

