

Vickers®

Vane Pumps



VPF Series Vane Pumps

For Industrial and Mobile Applications

Displacements to 390 cm³/r (23.78 in³/r)

Pressures to 293 bar (4250 psi) – Speeds to 3000 r/min



VICKERS

Released 12/95

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Introduction

From the very beginning, Vickers has been at the forefront of fluid power technology. Our vane pumps have always been the standard against which all others are measured.

Now we proudly announce the VPF Series, our newest generation of state-of-the-art fixed displacement vane pumps. Compared to less advanced designs, they provide higher performance, higher pressure capability, and expanded displacements – all with comparable low noise characteristics.

With a wide variety of VPF single, VPF double, and VPFT single thru-drive pump configurations, there's sure to be a model ready to satisfy your most demanding requirements. In fact, the VPF's exceptional performance and pressure capabilities make it an excellent choice for both industrial and mobile applications. The VPF Series puts the latest in Vickers engineering expertise to work for you!

Performance

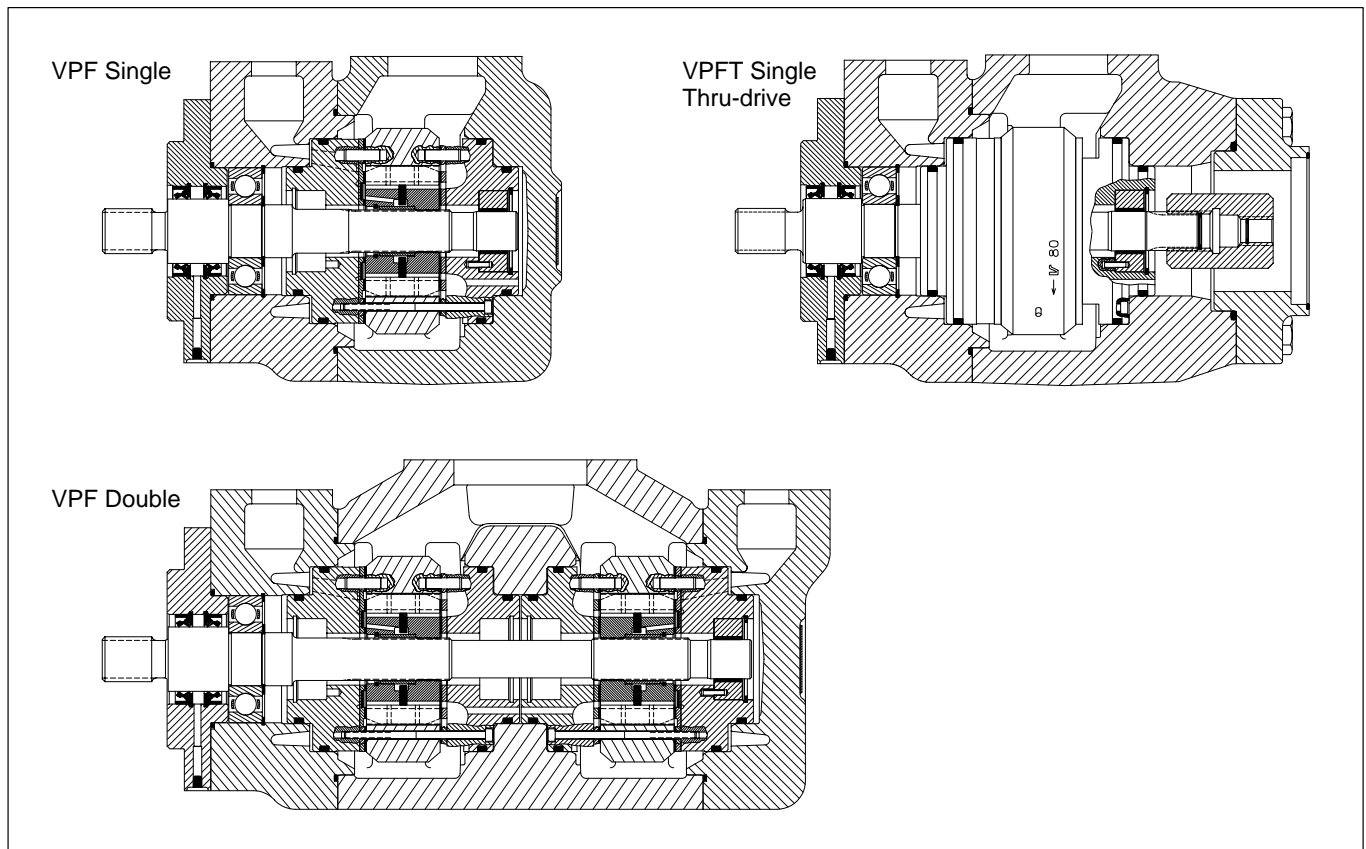
Vickers VPF pumps meet SAE and ISO standards. The three single-pump frame sizes – 25, 35 and 45 – are available in 18 flows ranging from 4.8 to 92.6 USgpm (@1800 rpm). Six double-pump configurations offer combined flows ranging from 9.7 to 185.3 USgpm. Continuous outlet pressures rated up to 293 bar (4250 psi) for industrial use, and 280 bar (4060 psi) for mobile use, are standard. Intermittent pressures up to 310 bar (4500 psi) are allowed.

Features and Benefits

- The VPF product line offers large diameter shafts that easily handle maximum pressures for exceptional shaft life.
- The twelve-vane design, with each vane completing two pumping events per revolution, provides greatly reduced output flow pulsations. This translates into quiet, vibration-free system designs.
- The heavy duty cast iron housing provides superior strength and sound suppression with negligible distortion.
- Double pumps are available in six different combinations and feature a single inlet with two discrete outlets – essentially two pumps in one.
- The unique design of the VPF allows for numerous configurations with different directions of rotation, inlet/outlet orientations, drives and mounting flanges.
- The versatile VPF is engineered to perform in both mobile and industrial applications under the harshest speed, temperature, and cyclical loading conditions.
- The removeable cartridge design makes it easy to modify the flow size. Installing a new, factory-tested cartridge kit gives you the equivalent of a brand new pump. In most cases, the cartridge can be replaced without even removing the pump from its mounting.
- Choice of SAE or ISO two-bolt mounting means compatibility with all popular mobile or industrial mounting arrangements.
- Changing the direction of rotation is quick and easy, thanks to the VPF's symmetrical cartridge design. This design also provides interchangeability between single and double pumps and simplifies cartridge selection and inventory.
- Four-bolt flange connections on all ports provide leak-free medium and high pressure hose or tube connections. This matches all current SAE and ISO standards
- The hydraulically balanced design of the VPF means there are no internal radial forces to load the shaft or bearings. In the absence of external radial and axial shaft loading, this balanced design assures virtually limitless shaft and bearing life.
- The positive shaft seal in the VPF is available as either a single seal for “dry mount” applications, or a double seal design for fluid separation on “wet mount” applications. Wet mounts, in which gear-box or other lubricant is always present, will provide extended shaft-spline life.

Introduction

Model Series	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Pressure bar (psi)		Maximum Operating Speed r/min	
		Industrial	Mobile	Industrial	Mobile
25VPF(T)	80 (4.88)	293 (4250)	280 (4060)		3000
35VPF(T)	135 (8.24)	262 (3800)	250 (3625)	1800	2400
45VPF(T)	195 (11.89)	262 (3800)	250 (3625)		2200
2525VPF	80 (4.88) shaft end 80 (4.88) cover end	293 (4250)	280 (4060)	1800	3000
3525VPF	135 (8.24) shaft end 80 (4.88) cover end	262 (3800)	250 (3625)		
3535VPF	135 (8.24) shaft end 135 (8.24) cover end	262 (3800)	250 (3625)	1800	2400
4525VPF	195 (11.89) shaft end 80 (4.88) cover end	262 (3800)	250 (3625)		
4535VPF	195 (11.89) shaft end 135 (8.24) cover end	262 (3800)	250 (3625)	1800	2200
4545VPF	195 (11.89) shaft end 195 (11.89) cover end	262 (3800)	250 (3625)		



Operational Recommendations

Cold starts

When operating with SAE 10W oil in the 860 to 54 cSt (4000 to 251 SUS) range, the pressure should be limited to 50% or less of its rated value until the system has warmed up; for mobile applications, the speed should also be limited to 50% or less. Extreme caution must be used when starting pumps when fluid viscosities are greater than 860 cSt (4000 SUS). Care should be exercised to warm up the entire system, including remote cylinders and motors.

High temperatures

Viscosities must not be less than the minimum values shown in the table below. Temperatures should not exceed 99°C (210°F) because the life expectancy of cartridge kits and elastomers will decrease.

Drive data

Pumps are assembled for right hand (clockwise) rotation or left hand (counterclockwise) rotation. Rotation is viewed from the shaft end. Inlet and outlet ports remain the same regardless of the direction of shaft rotation.

Pump drive

Direct coaxial drive is recommended. If drives imposing radial shaft loads are considered, please consult your Vickers representative.

Start-up procedure

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

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

Before starting the pump, fill with fluid through one of the ports. This is particularly important if the pump is above the fluid level of the reservoir.

When initially starting the pump, remove all trapped air from the system. This can be accomplished by loosening the pump outlet fittings or connections before starting the pump or by using an air bleed valve. All inlet connections must be tight to prevent air leaks. An air bleed valve is available for this purpose. (Refer to catalog 690).

CAUTION: – No Case Drain. The pump is drained internally into its inlet. System pressure at the pump inlet connection may not exceed 1,4 bar (20 psi).

CAUTION: – Low Outlet Pressure. Do not run a pump with the outlet pressure lower than the inlet pressure. This causes operating noise and vane instability.

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.

After the pump is primed, tighten the loose outlet connections, then operate for five to ten minutes unloaded to remove all trapped air from the circuit.

If reservoir has a sight gage, make sure the fluid is clear – not milky.

Inlet Pressure and Operating Temperature Requirements

Application	Recommended Operating Inlet Pressure – gauge bar (psi)	Maximum Positive Inlet Pressure – gauge bar (psi)	Minimum Inlet Pressure – absolute bar (psia)	Maximum Operating Temperature °C (°F)	Maximum Transient Operating Temperature °C (°F)
Industrial	0 to 0,35 (0 to 5.0)	1,4 (20)	0,83 (12.0)	66 (150)	74 (165)
Mobile	0 to 0,35 (0 to 5.0)	1,4 (20)	1,0 (14.5)	93 (200)	99 (210)

Viscosity Requirements

Application	Recommended Operating Viscosity Range cSt	Maximum Viscosity at Startup cSt	Minimum Viscosity cSt	
			Continuous	Intermittent
Industrial	13 to 54	865	13	10
Mobile	13 to 54	865	10	6.5

25VPF Typical Performance Data

Maximum Operating Pressure

Industrial – 293 bar (4250 psi)
Mobile – 280 bar (4060 psi)

Maximum Transient Pressure (peak < 0.5 sec)

310 bar (4500 psi)

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
010	10 (0.62)	1800	11,5 (3.0)	5,6 (7.5)	14,8 (3.9)	6,70 (9.0)
016	16 (0.98)	1800	20,4 (5.4)	8,8 (11.8)	25,5 (6.7)	10,6 (14.2)
025	25 (1.58)	1800	35,1 (9.3)	14,2 (19.05)	43,15 (11.4)	17,1 (22.9)
032	32 (1.96)	1800	44,5 (11.75)	17,6 (23.6)	54,4 (14.4)	21,2 (28.45)
040	40 (2.44)	1800	50,7 (13.4)	22,5 (30.1)	62,9 (16.6)	27,1 (36.3)
050	50 (3.05)	1800	65,8 (17.4)	28,2 (37.8)	80,9 (21.4)	33,8 (45.3)
063	63 (3.84)	1800	85,1 (22.5)	35,3 (47.4)	104,0 (27.5)	42,6 (57.1)
071	71 (4.33)	1800	97,15 (25.7)	40,0 (53.6)	119,0 (31.4)	48,0 (64.4)
080	80 (4.88)	1800	110,8 (29.3)	45,1 (60.5)	135,0 (35.6)	54,1 (72.5)

Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value.; i.e., actual flow must exceed 50% of theoretical flow.

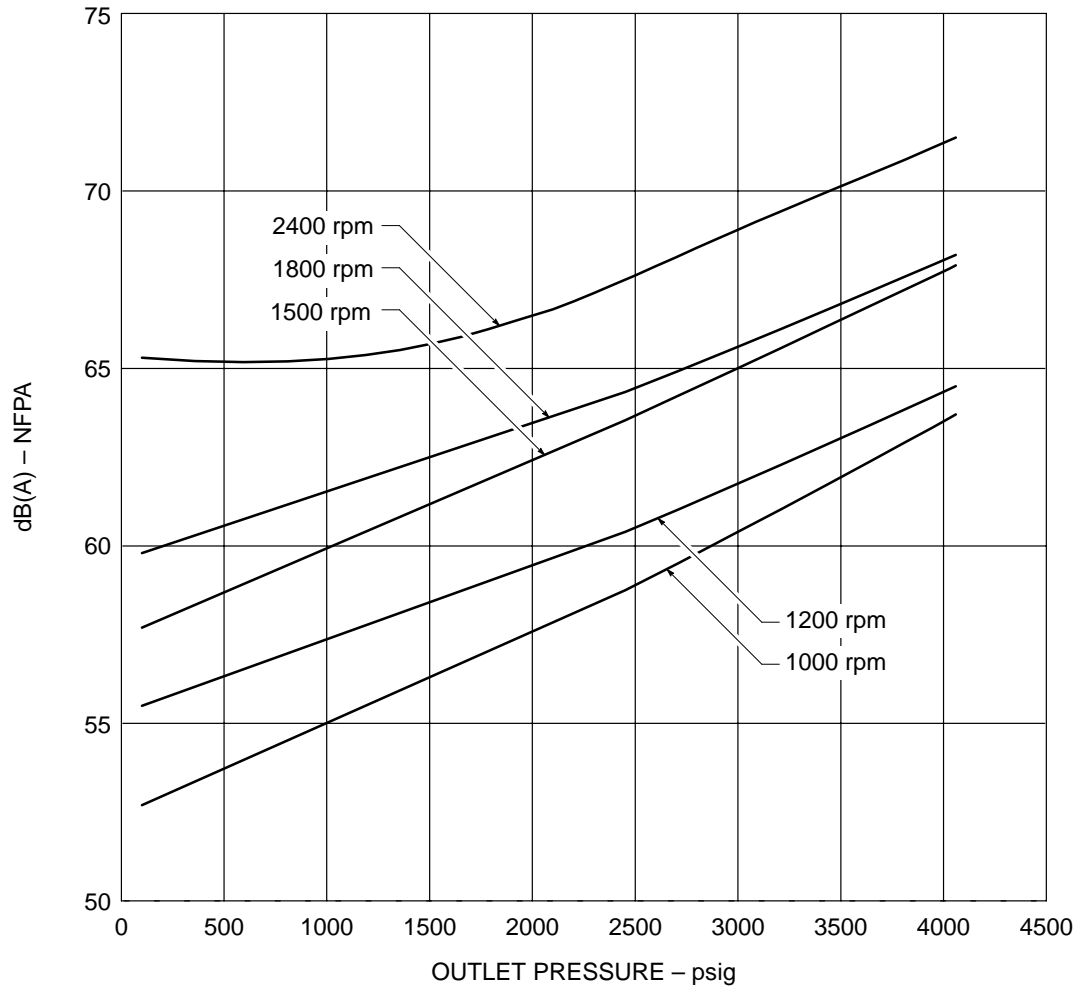
Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
010	10 (0.62)	3000	22,8 (6.0)	11,2 (15.0)
016	16 (0.98)	3000	40,5 (10.7)	17,7 (23.8)
025	25 (1.58)	3000	70,0 (18.5)	28,6 (38.3)
032	32 (1.96)	3000	88,7 (23.4)	35,5 (47.5)
040	40 (2.44)	2600	84,5 (22.4)	38,9 (52.2)
050	50 (3.05)	2600	110,8 (29.3)	48,7 (65.3)
063	63 (3.84)	2600	144,0 (38.1)	61,3 (82.2)
071	71 (4.33)	2600	165,0 (43.6)	69,0 (92.5)
080	80 (4.88)	2600	188,4 (49.8)	77,7 (104.2)

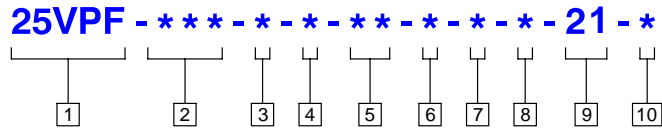
Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value.; i.e., actual flow must exceed 50% of theoretical flow.

25VPF Sound Data

120° F, SAE 10W oil, 0 psig inlet



25VPF Model Code



1 Series designation (frame size)

25VPF – 10 to 80 cm³/r
(0.62 to 4.88 in³/r)

2 Displacement

- 010 – 10 cm³/r (0.62 in³/r)
- 016 – 16 cm³/r (0.98 in³/r)
- 025 – 25 cm³/r (1.58 in³/r)
- 032 – 32 cm³/r (1.96 in³/r)
- 040 – 40 cm³/r (2.44 in³/r)
- 050 – 50 cm³/r (3.05 in³/r)
- 063 – 63 cm³/r (3.84 in³/r)
- 071 – 71 cm³/r (4.33 in³/r)
- 080 – 80 cm³/r (4.88 in³/r)

3 Port connection

- A – SAE 4-bolt flange (SAE J518)
- B – Metric 4-bolt flange (ISO 6162)

4 Flange mounting style

- A – SAE J744 101–2 (SAE B)
- B – ISO 3019/2 100A2HW
- C – SAE J744 127–2 (SAE C)
- D – ISO 3019/2 125A2HW

5 Shaft end

- 01 – SAE J744 25–1
(1.00 inch keyed shaft)
- 02 – SAE J744 25–4
(B–B splined shaft)
- 03 – ISO 3019/2 E25N
(25mm keyed shaft)
- 05 – SAE J744 32–1
(1.25 inch keyed shaft)
- 06 – SAE J744 32–4
(C splined shaft)
- 07 – ISO 3019/2 E32N
(32mm keyed shaft)
- 09 – SAE J744 22–4
(B splined shaft)

6 Shaft seal

- A – Single, primary
- B – Double, secondary (spring side out)
- C – Double, secondary (spring side in)

7 Seal type

- N – Standard, buna N
- V – Viton
- W – Buna N with Viton shaft seals

**8 Outlet port position
(viewed from cover end)**

- A – Outlet port opposite inlet port
- B – Outlet port 90° counterclockwise from inlet port
- C – Outlet port inline with inlet port
- D – Outlet port 90° clockwise from inlet port

9 Design level

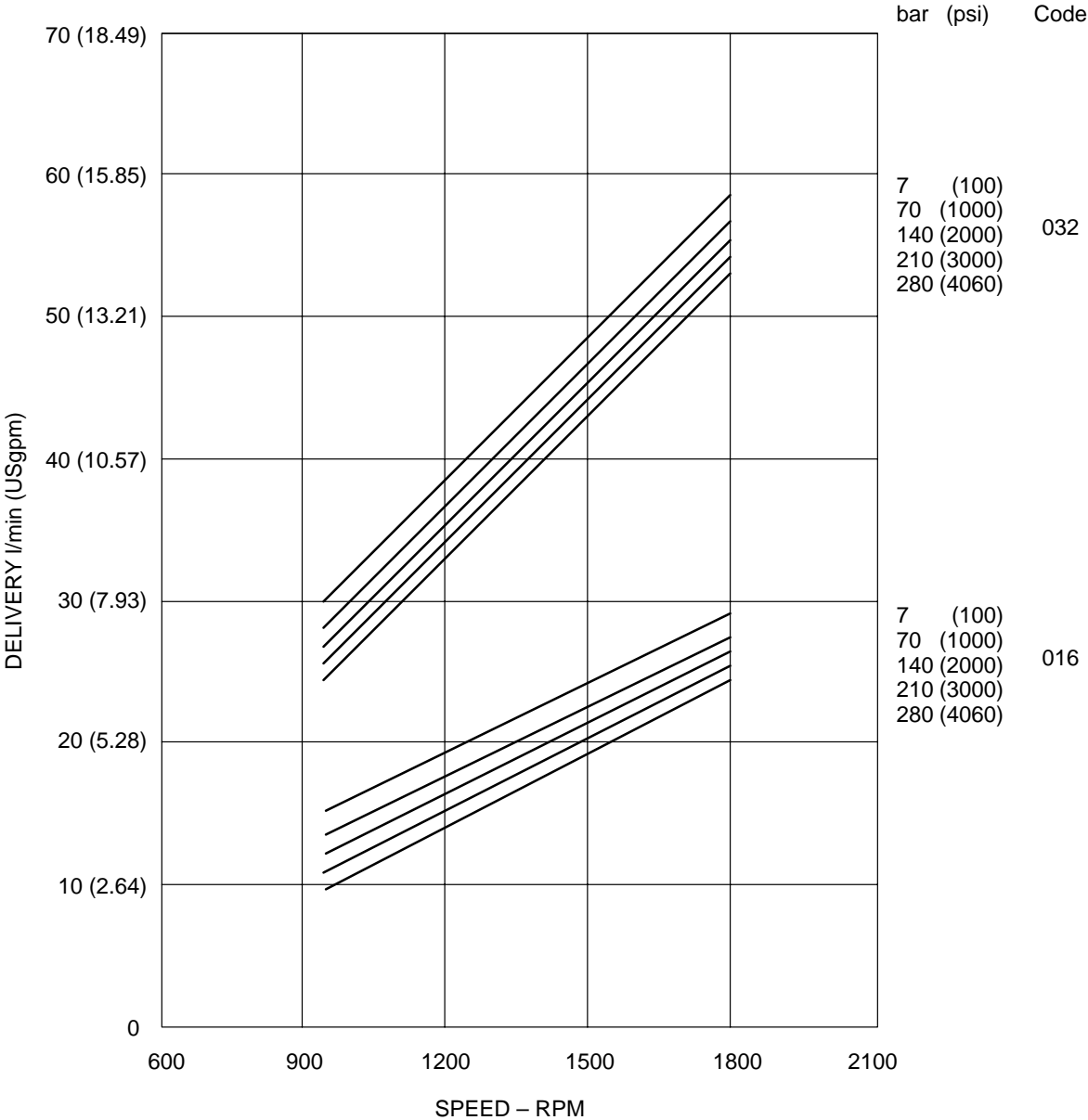
Subject to change. Dimensions remain the same for designs 20 through 29.

**10 Rotation
(viewed from shaft end)**

- R – Right hand (clockwise)
- L – Left hand (counterclockwise)

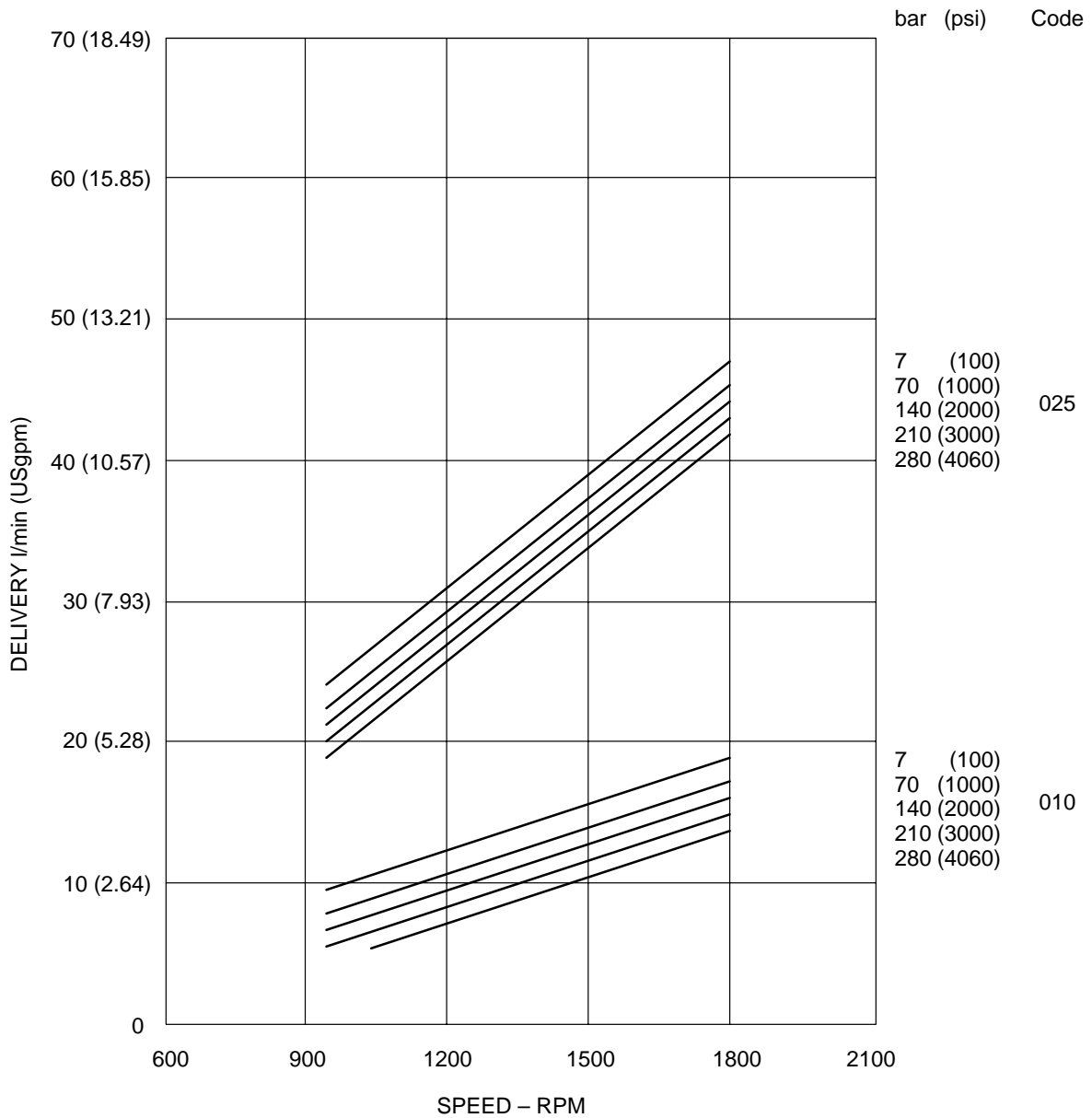
25VPF Typical Delivery – Industrial

Delivery of Code 032 and 016 Displacement Cartridges
 at 120° F, SAE 10W Oil, 0 psig Inlet



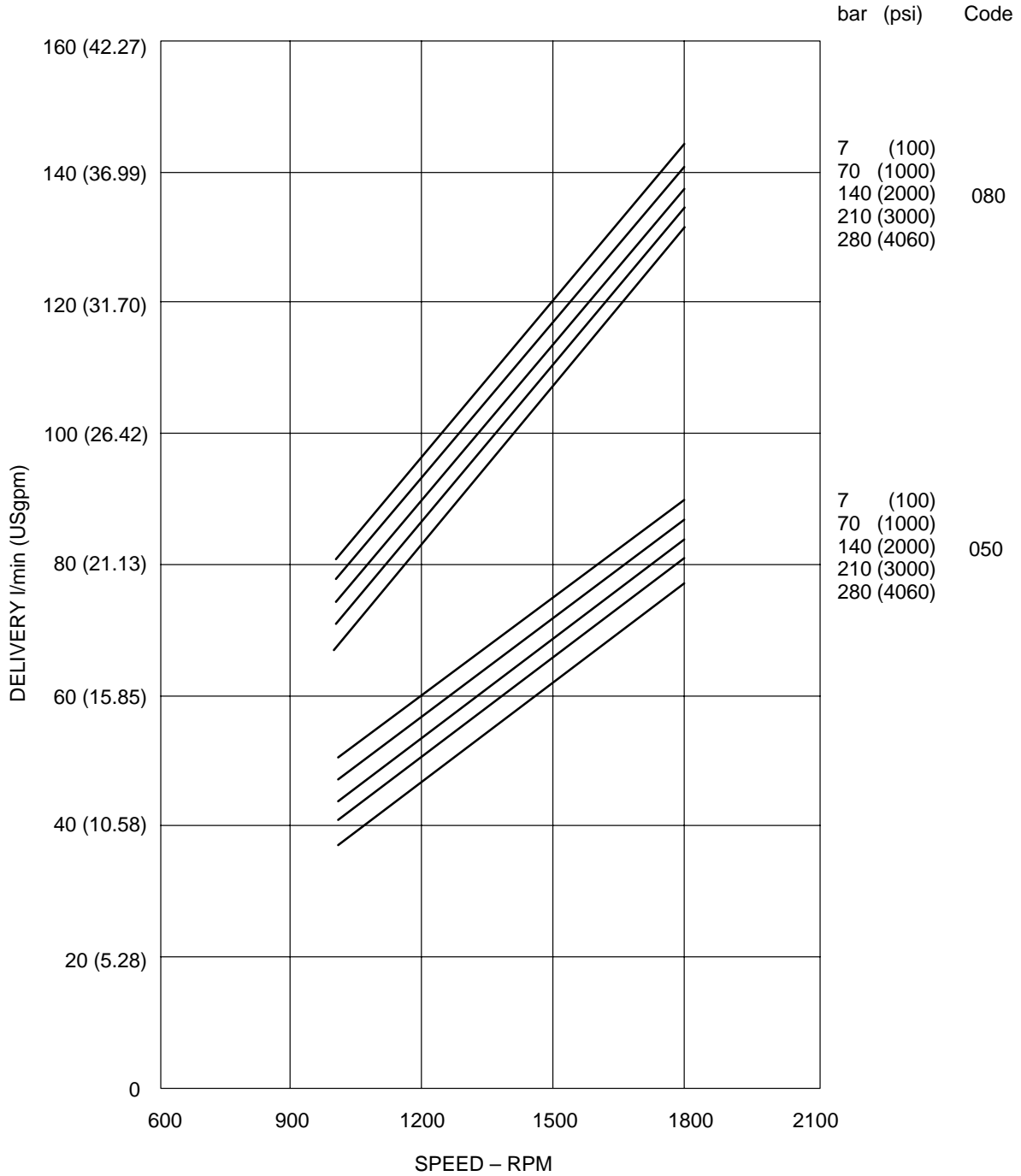
25VPF Typical Delivery – Industrial

Delivery of Code 025 and 010 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet



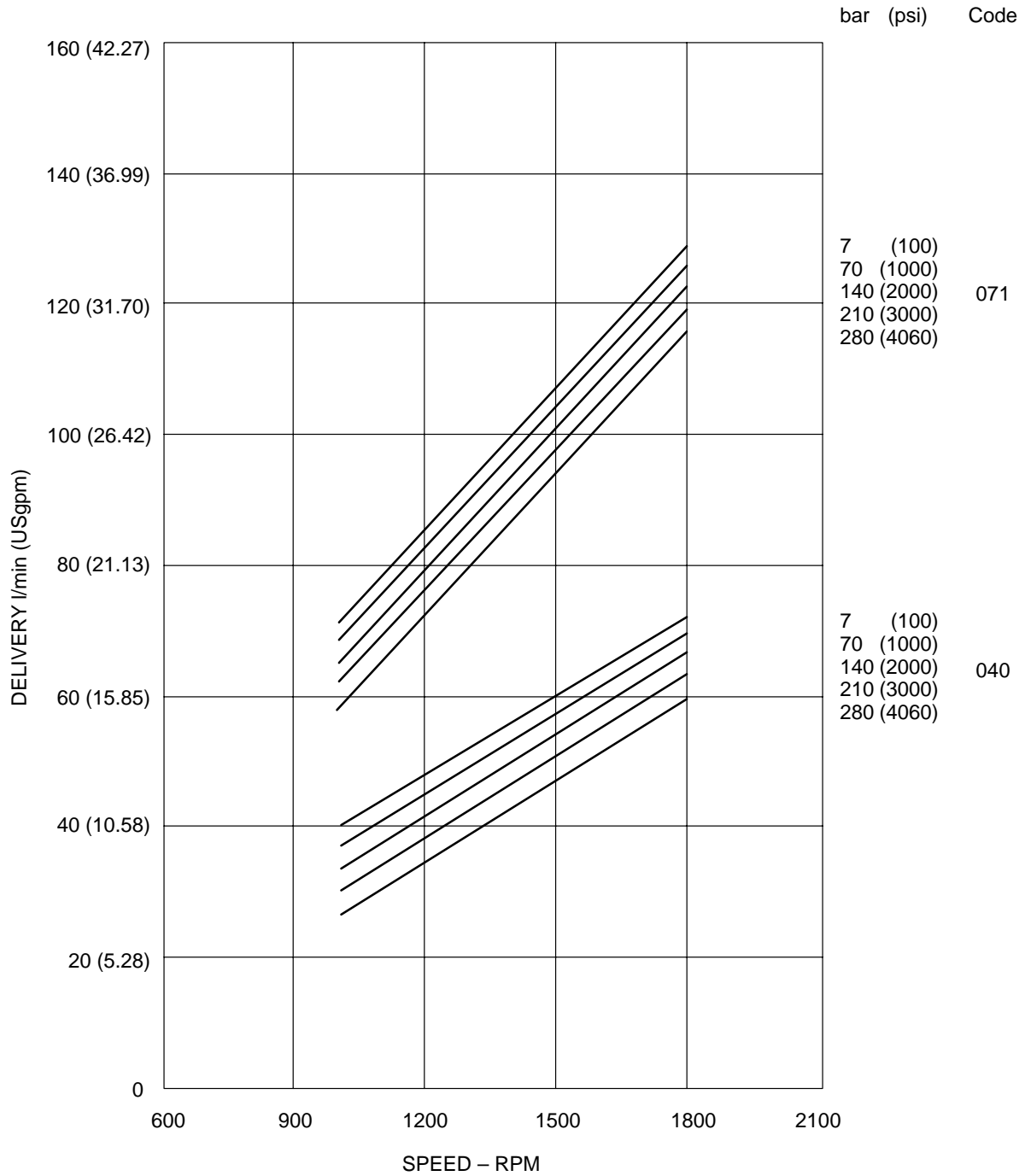
25VPF Typical Delivery – Industrial

**Delivery of Code 080 and 050 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



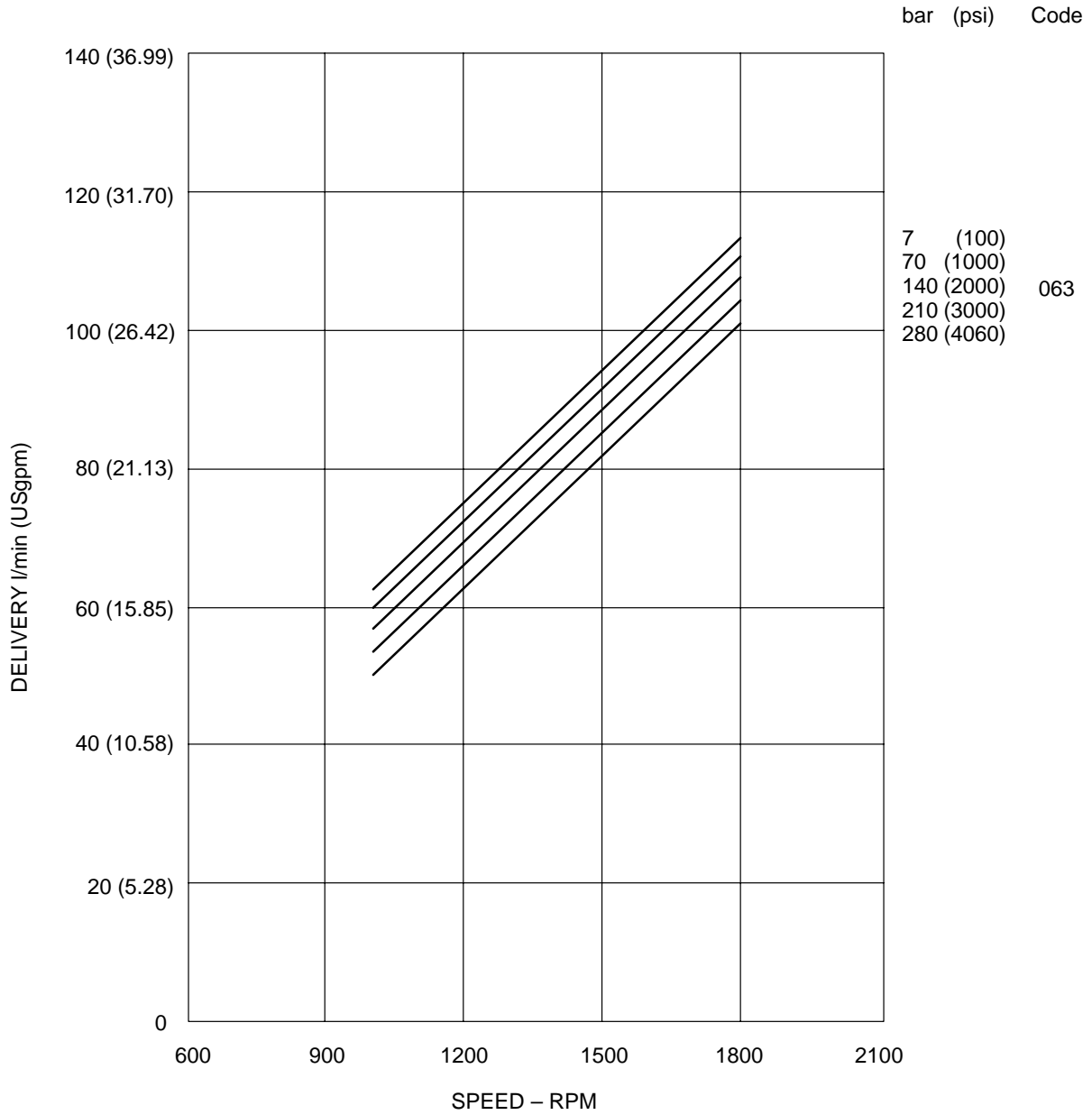
25VPF Typical Delivery – Industrial

**Delivery of Code 071 and 040 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



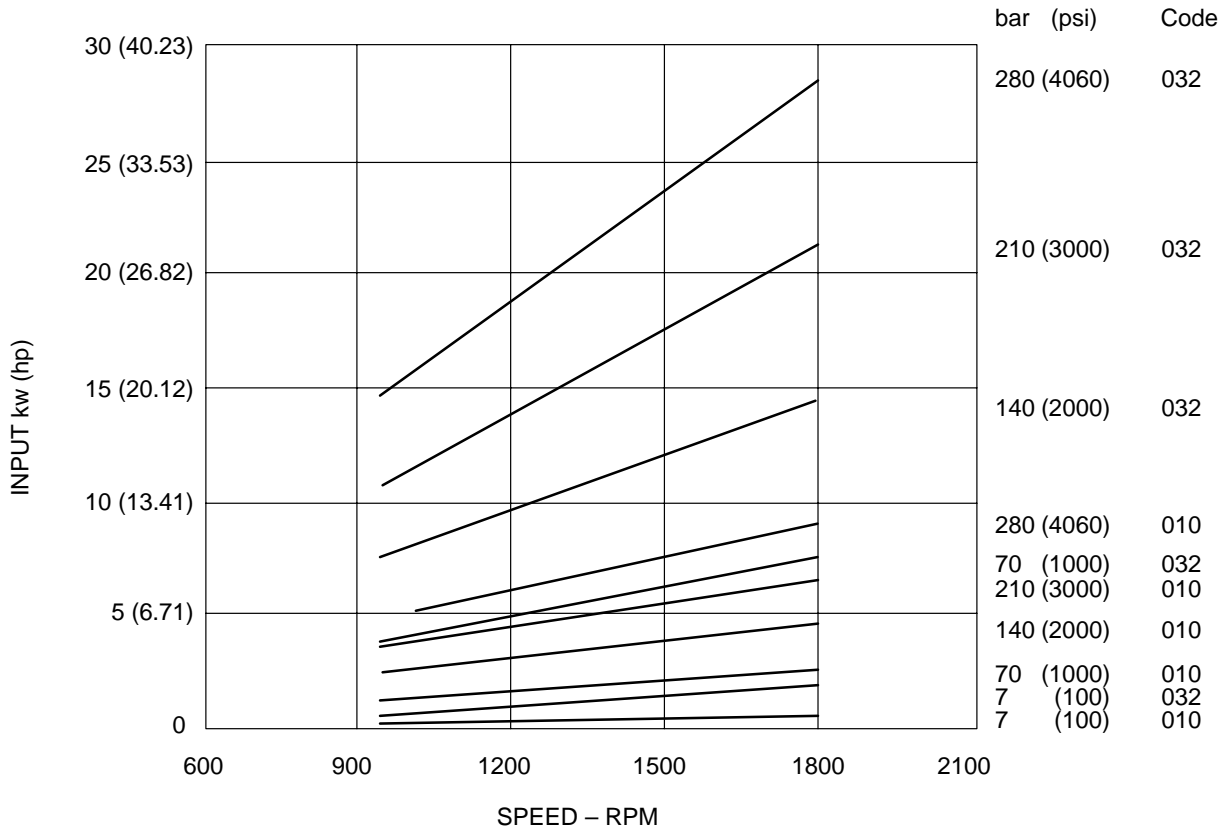
25VPF Typical Delivery – Industrial

Delivery of Code 063 Displacement Cartridge
at 120° F, SAE 10W Oil, 0 psig Inlet



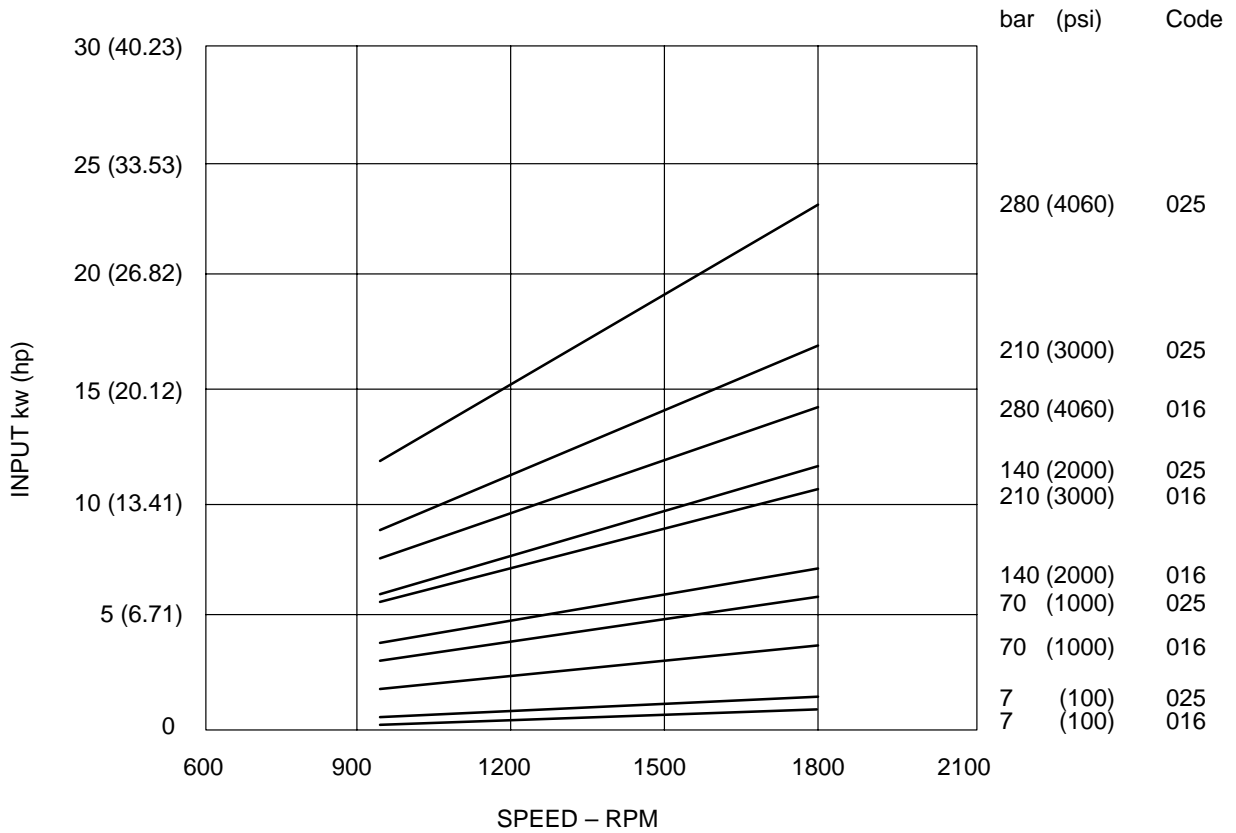
25VPF Typical Input Power – Industrial

Input Power of Code 032 and 010 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet



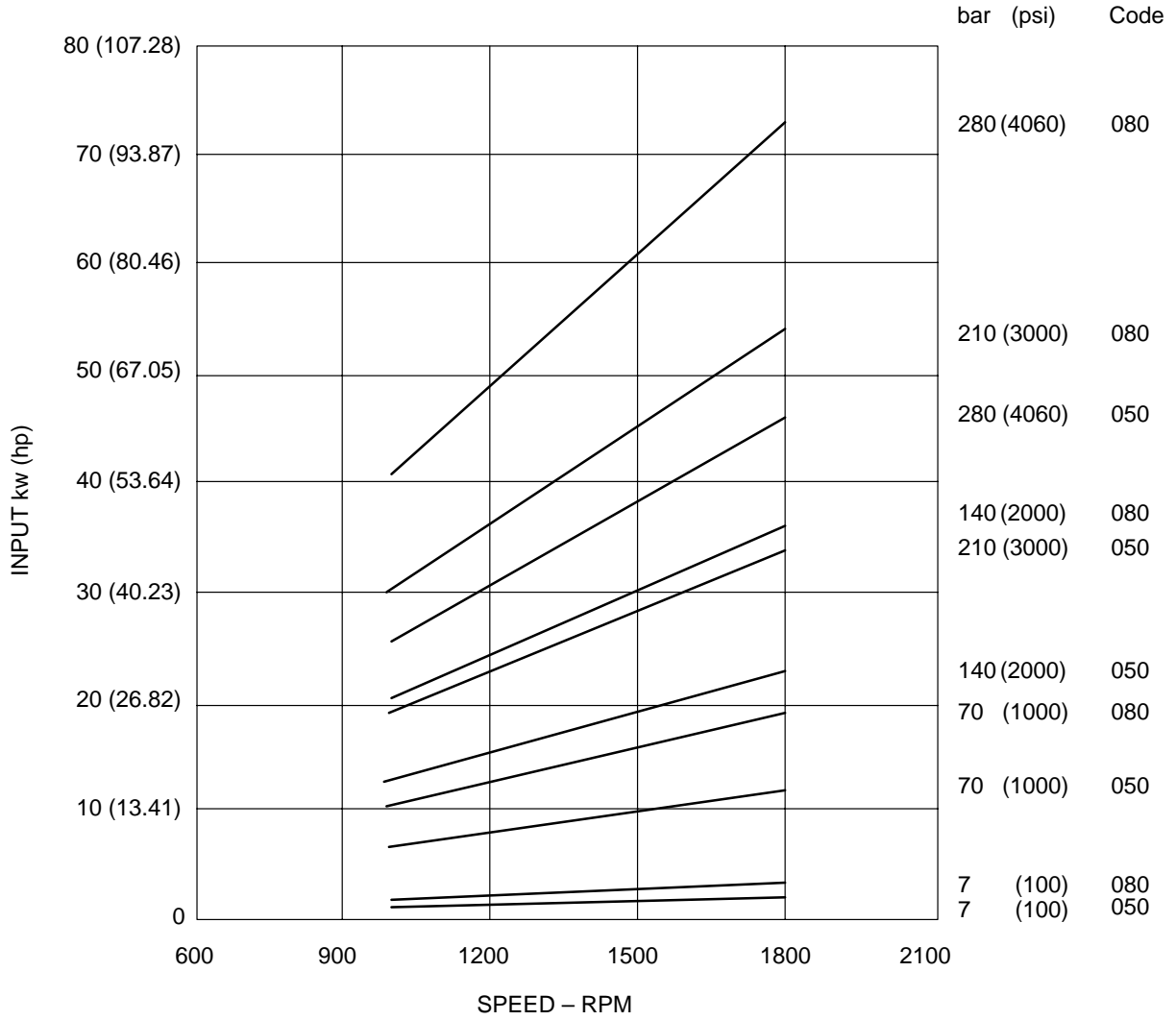
25VPF Typical Input Power – Industrial

**Input Power of Code 025 and 016 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



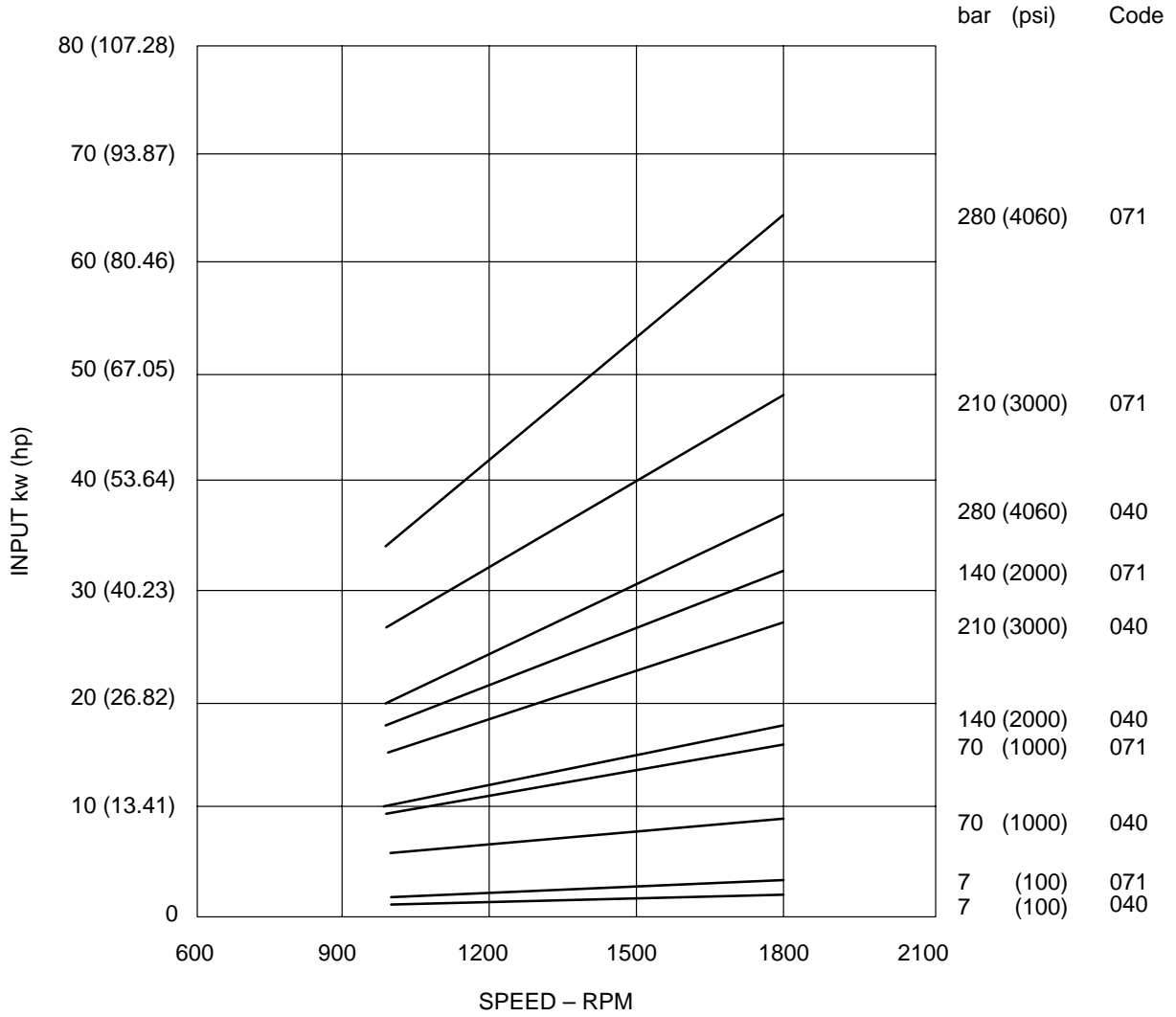
25VPF Typical Input Power – Industrial

**Input Power of Code 080 and 050 Displacement Cartridges
at 120° F, SAE Oil, 0 psig Inlet**



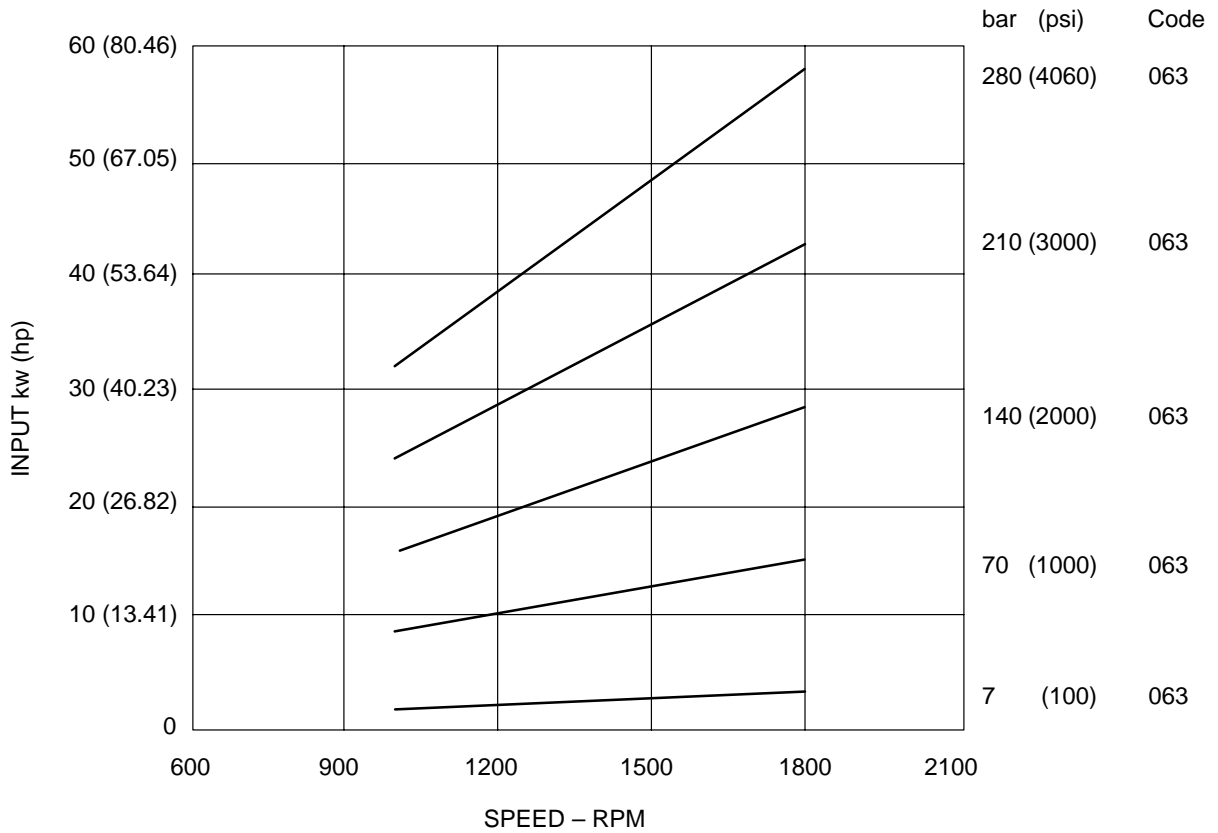
25VPF Typical Input Power – Industrial

**Input Power of Code 071 and 040 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



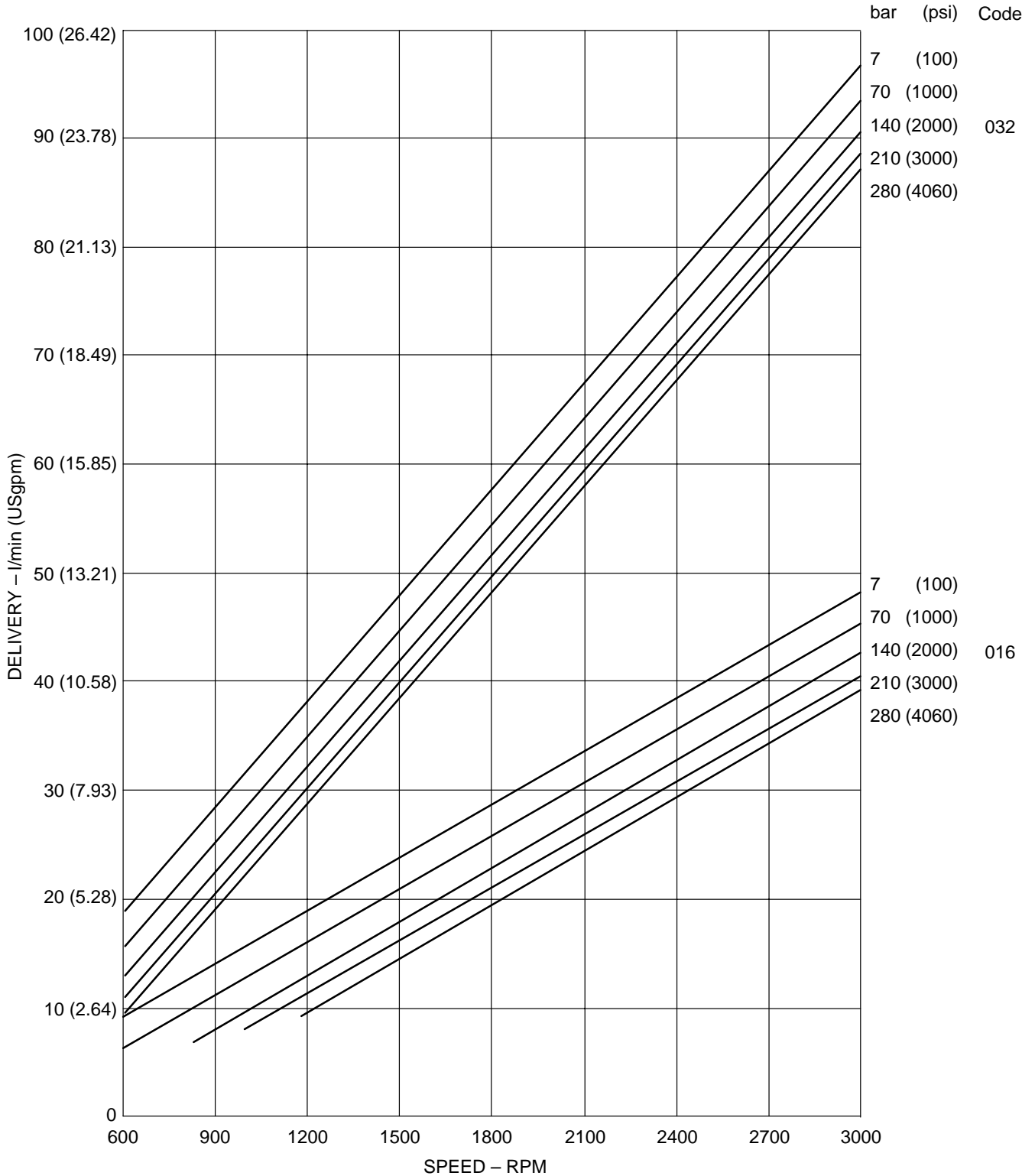
25VPF Typical Input Power – Industrial

**Input Power of Code 063 Displacement Cartridge
at 120° F, SAE 10W Oil, 0 psig Inlet**



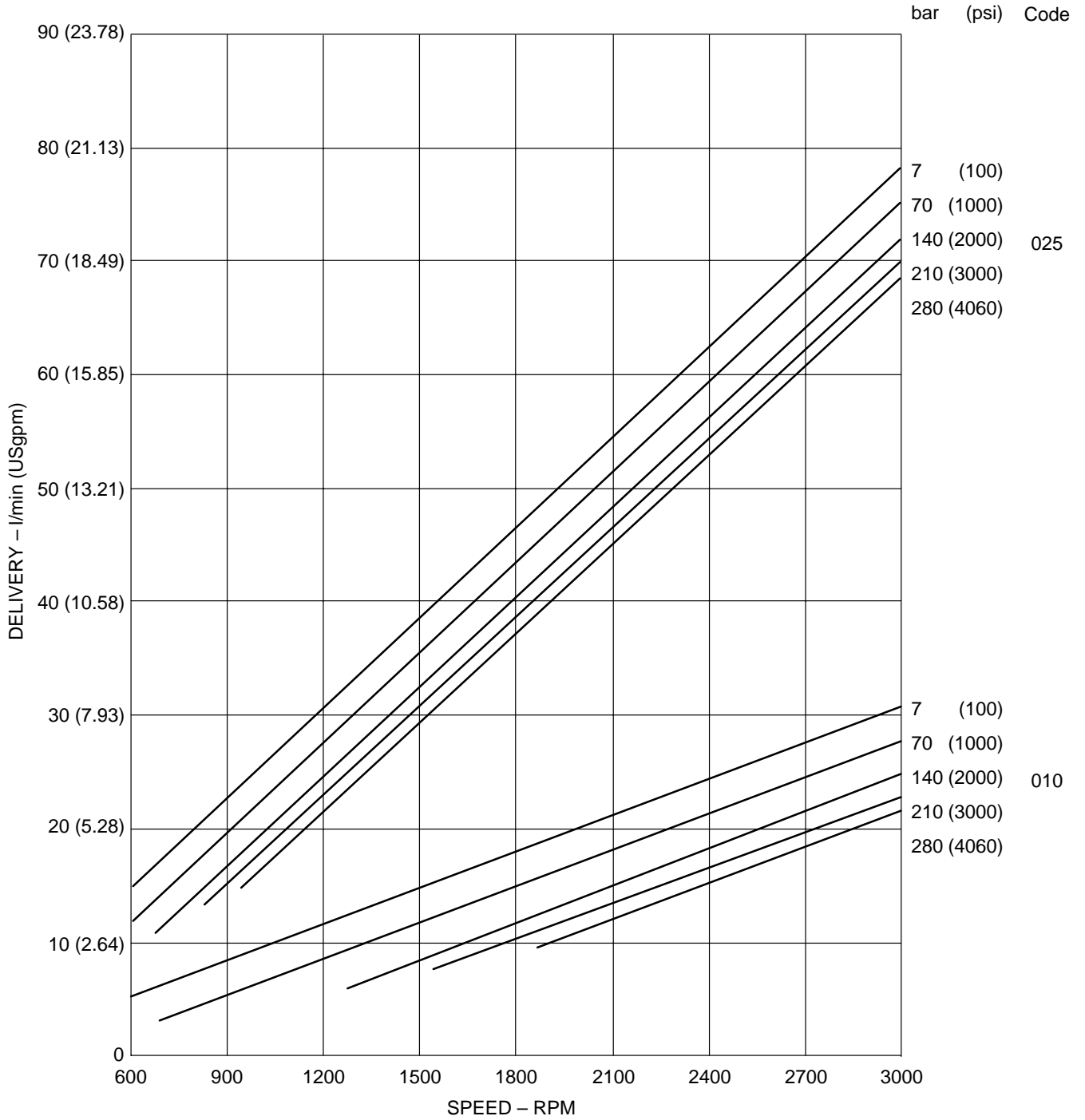
25VPF Typical Delivery – Mobile

Delivery of Code 032 and 016 Displacement Cartridges
at 180° F, SAE 10W Oil, 0 psig Inlet



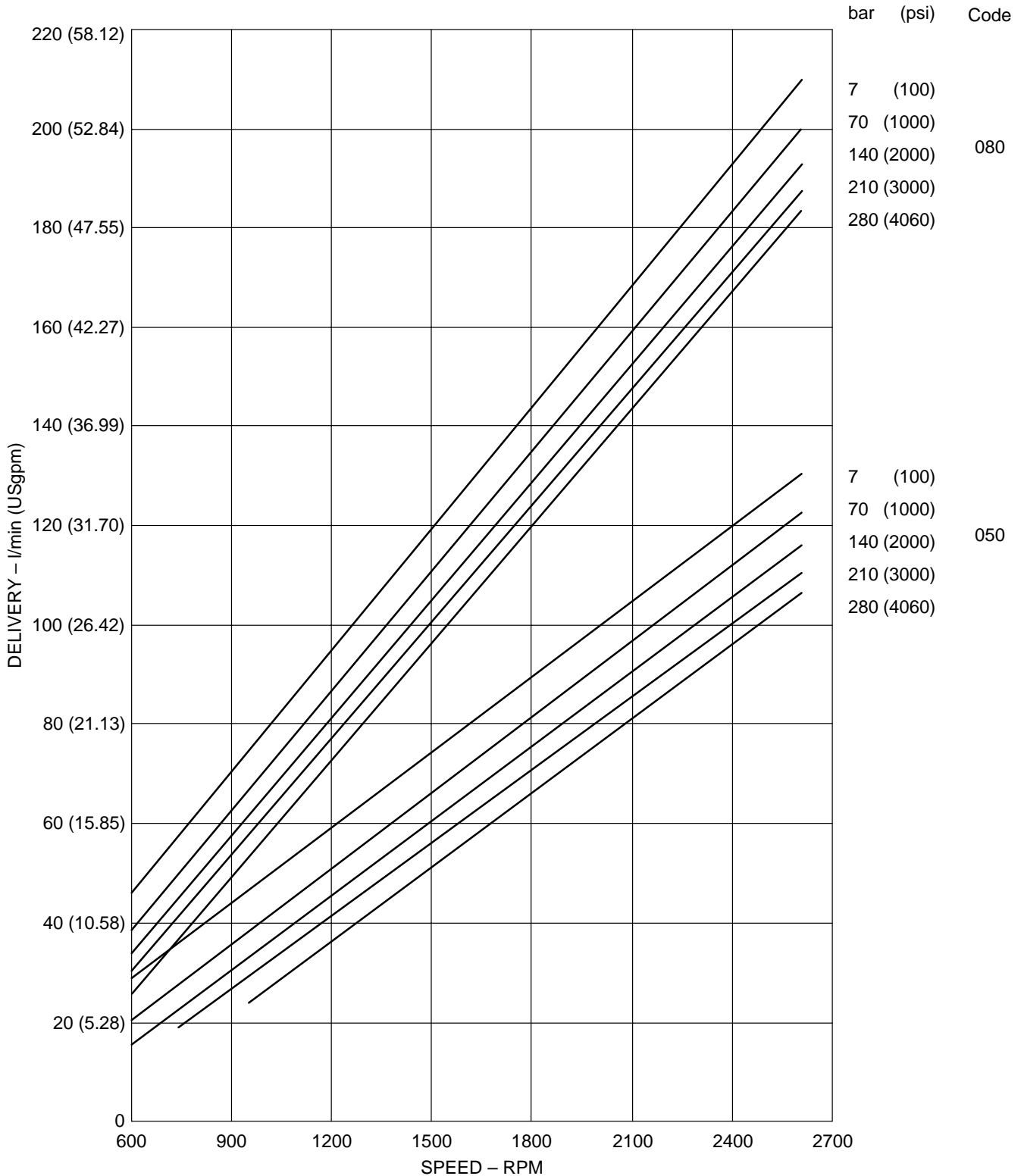
25VPF Typical Delivery – Mobile

**Delivery of Code 025 and 010 Displacement Cartridges
at 180° F, SAE 10W Oil, 0 psig Inlet**



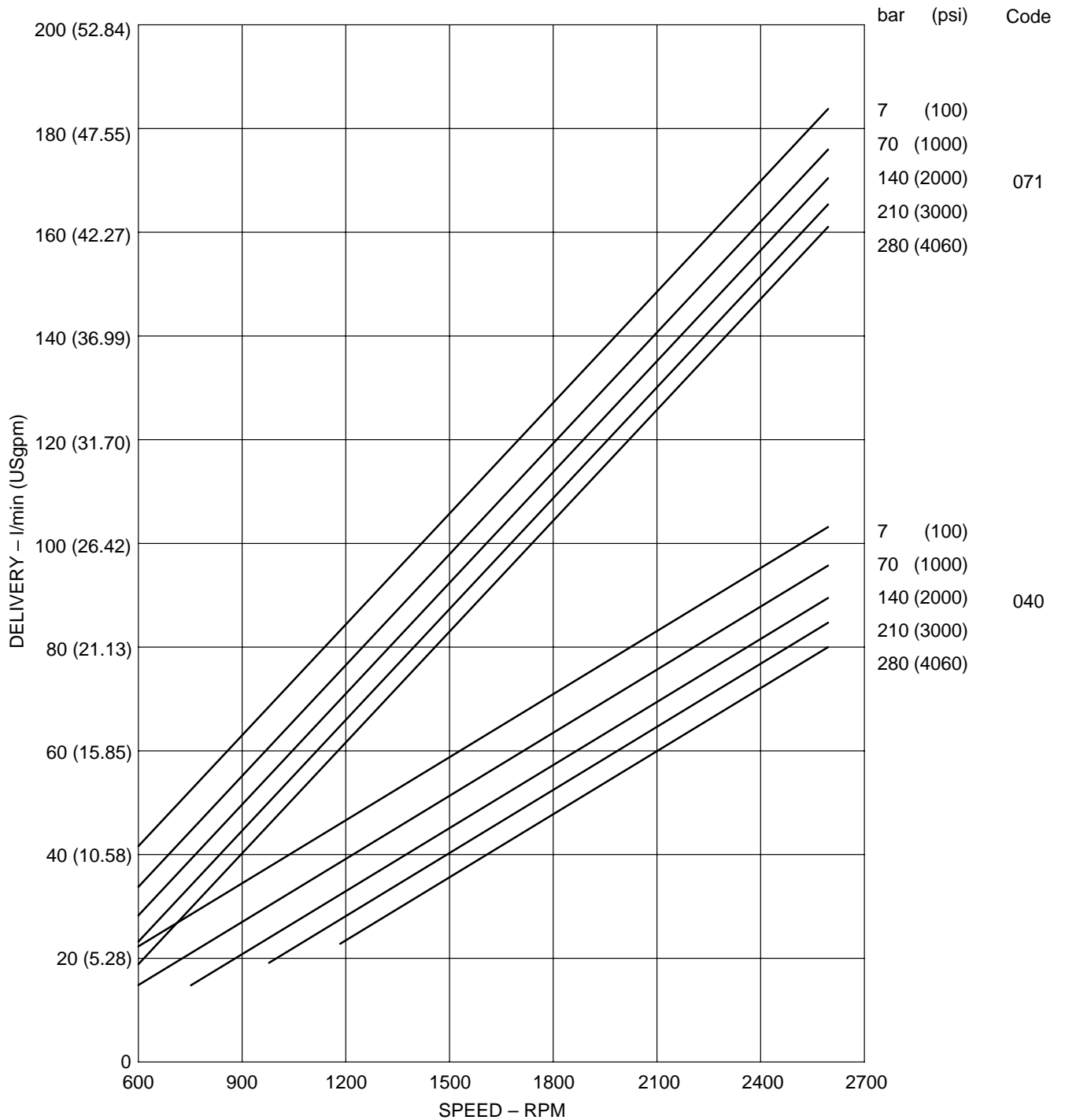
25VPF Typical Delivery – Mobile

Delivery of Code 080 and 050 Displacement Cartridges at 180° F, SAE 10W Oil, 0 psig Inlet



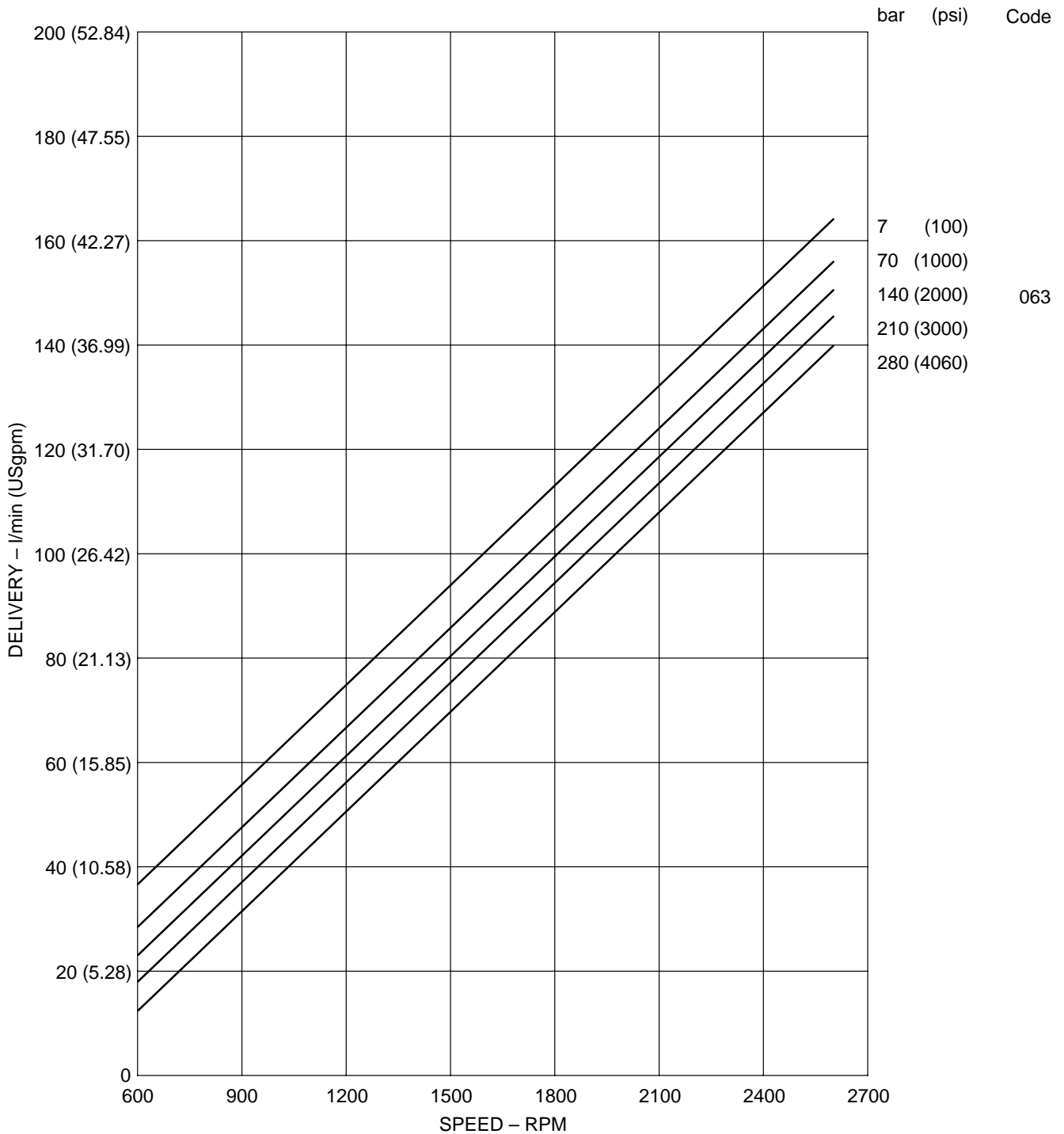
25VPF Typical Delivery – Mobile

Delivery of Code 071 and 040 Displacement Cartridges at 180°F, SAE 10W Oil, 0 psig Inlet



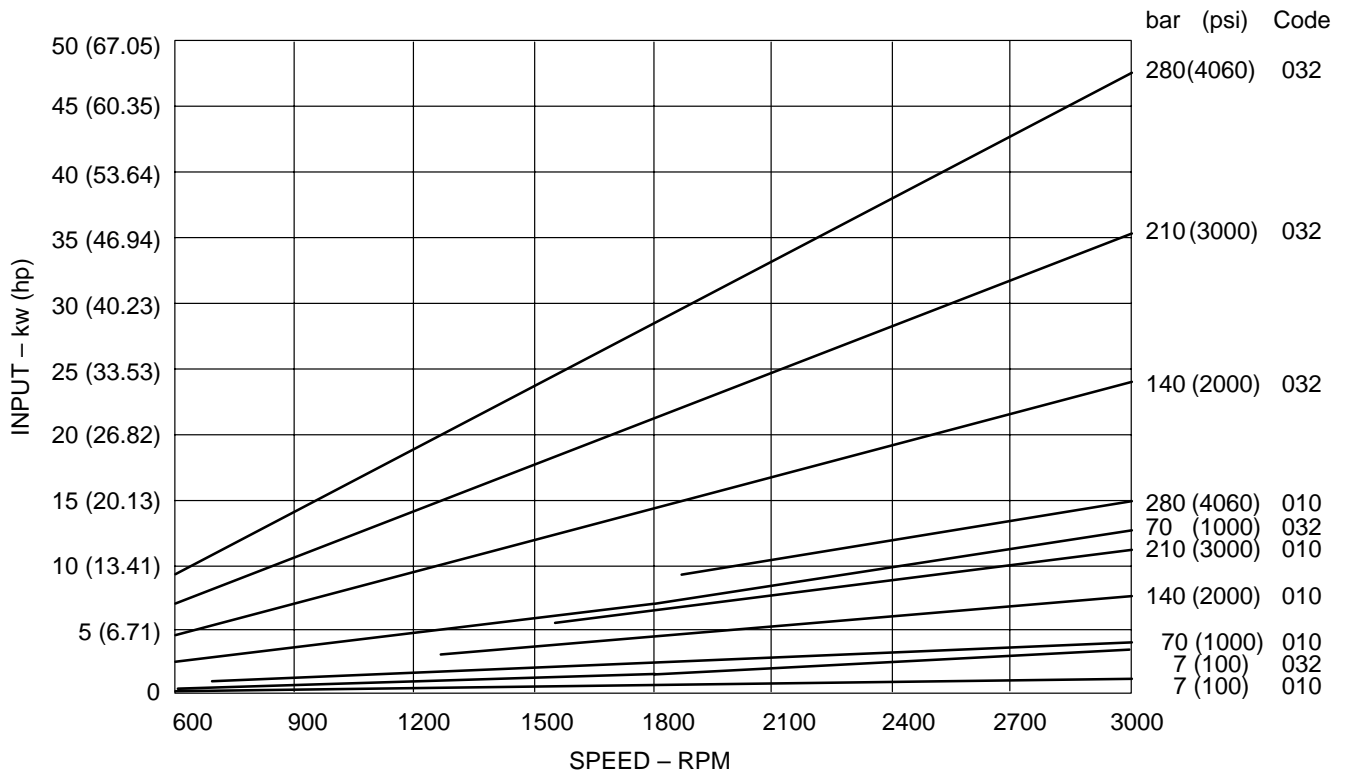
25VPF Typical Delivery – Mobile

Delivery of Code 063 Displacement Cartridge
at 180°F, SAE 10W Oil, 0 psig Inlet



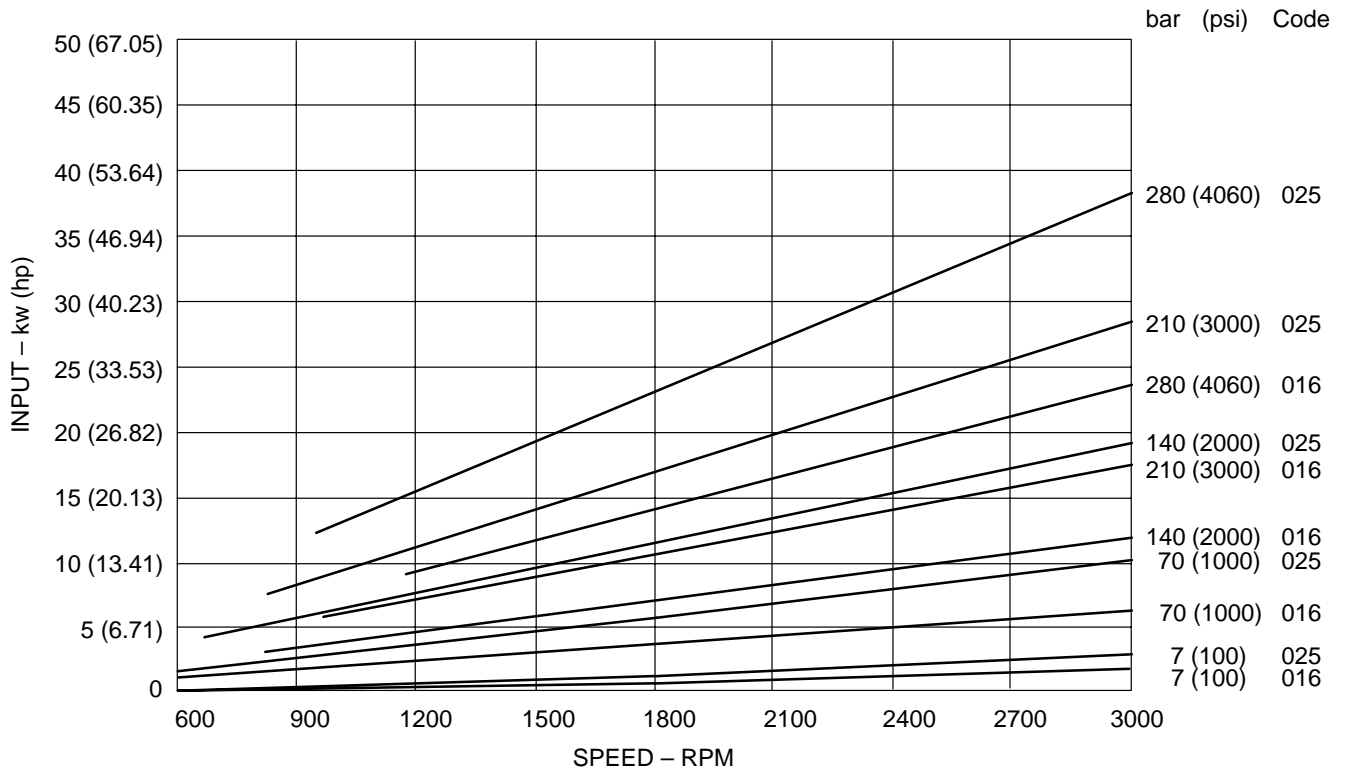
25VPF Typical Input Power – Mobile

Input Power of Code 032 and 010 Displacement Cartridges at 180°F, SAE 10W Oil, 0 psig Inlet



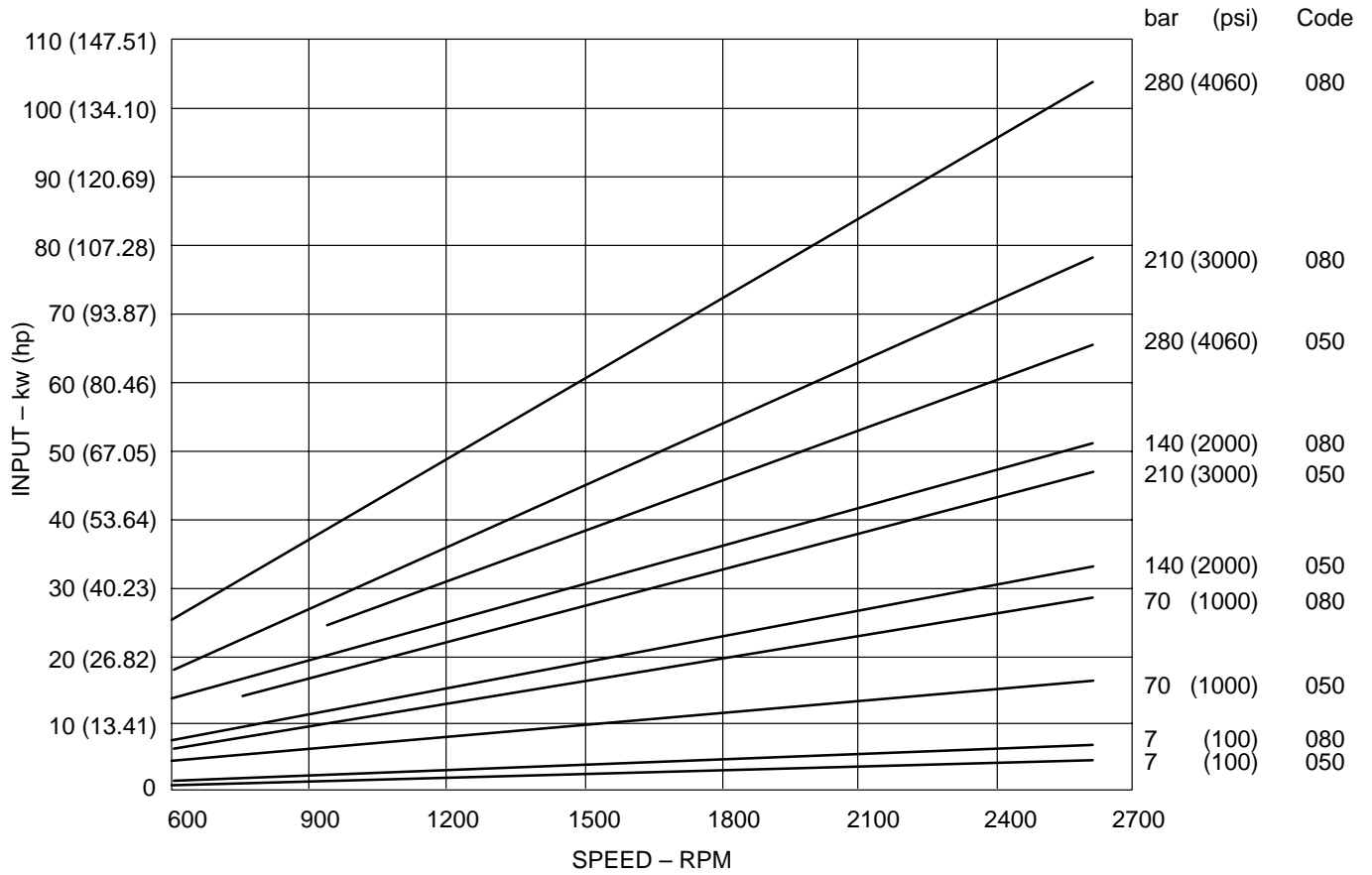
25VPF Typical Input Power – Mobile

**Input Power of Code 025 and 016 Displacement Cartridges
at 180°F, SAE 10W Oil, 0 psig Inlet**



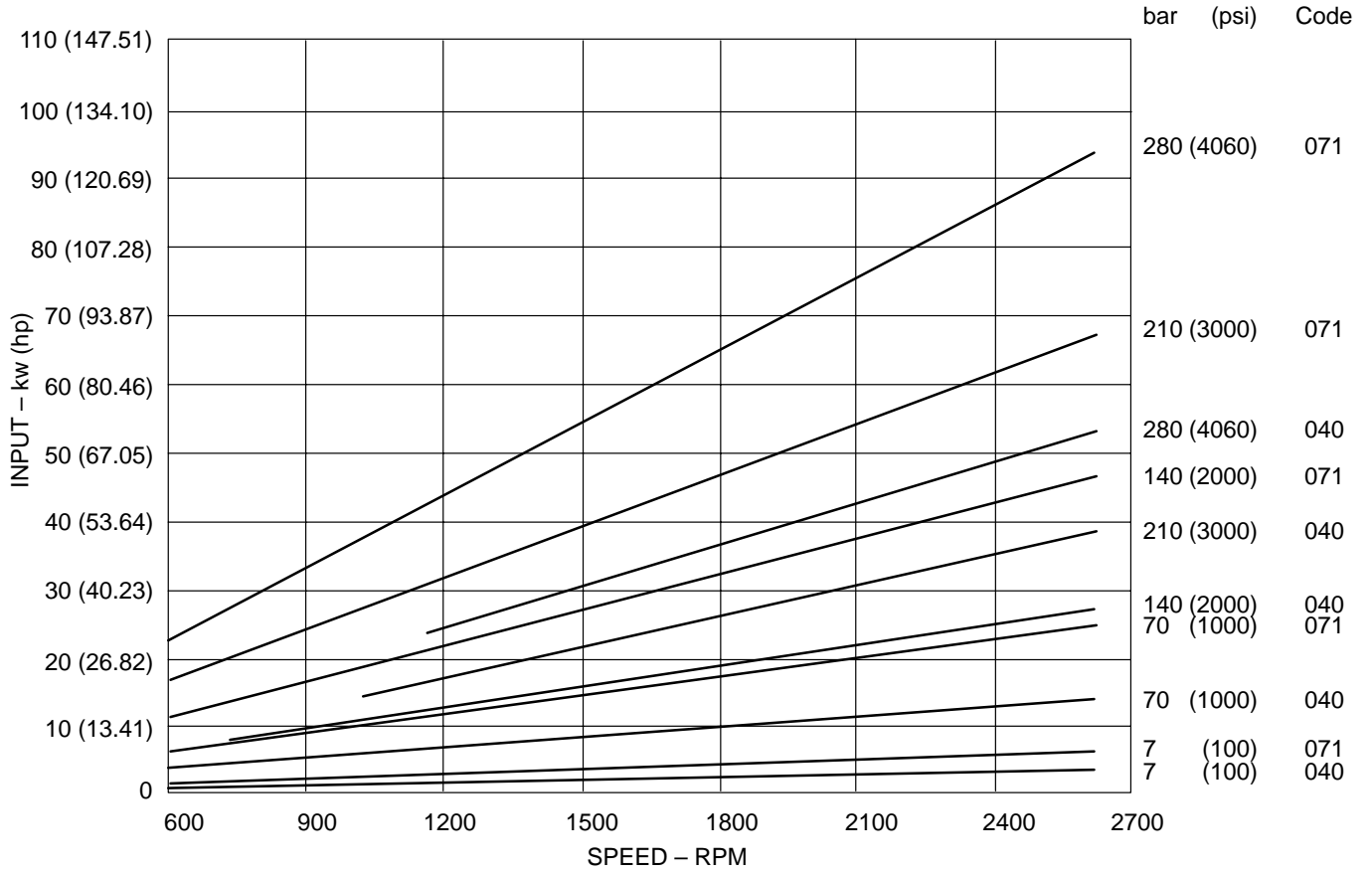
25VPF Typical Input Power – Mobile

Input Power of Code 080 and 050 Displacement Cartridges at 180°F, SAE 10W Oil, 0 psig Inlet



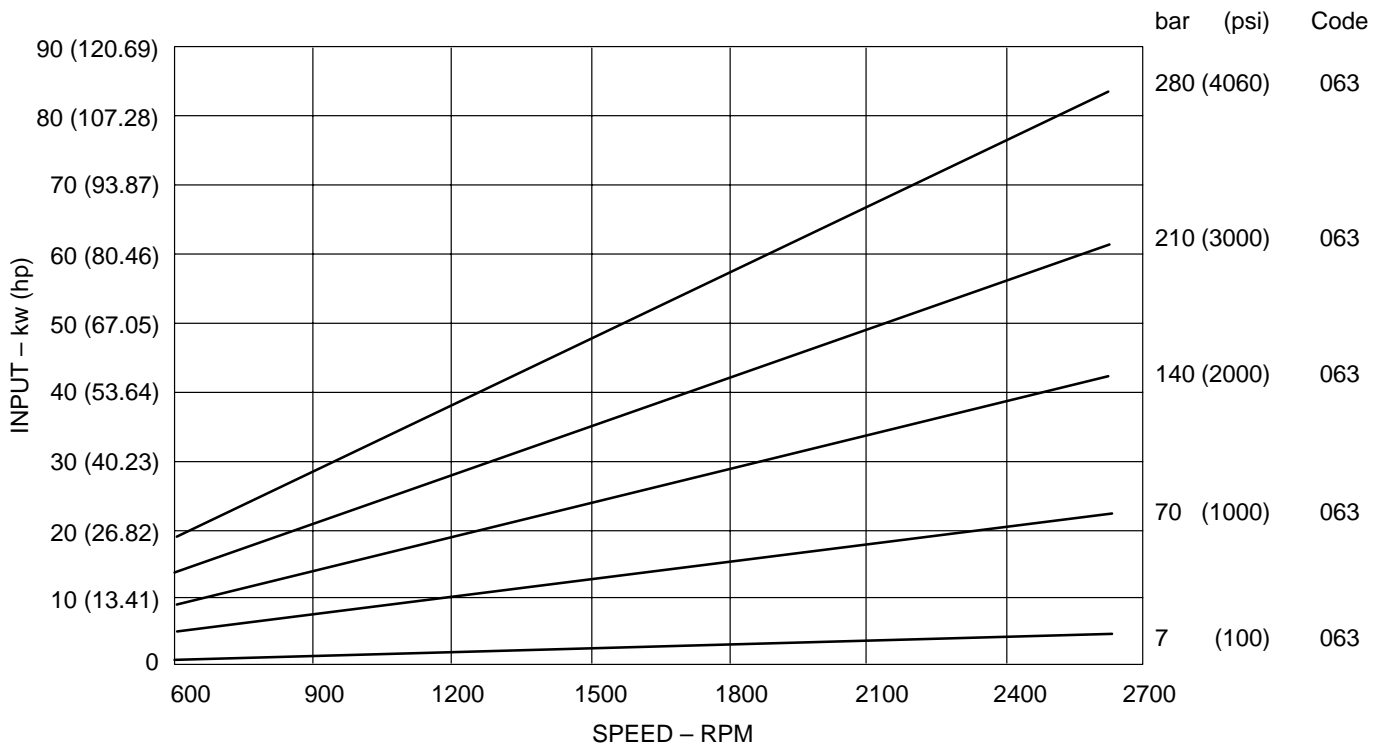
25VPF Typical Input Power – Mobile

Input Power of Code 071 and 040 Displacement Cartridges at 180°F, SAE 10W Oil, 0 psig Inlet



25VPF Typical Input Power – Mobile

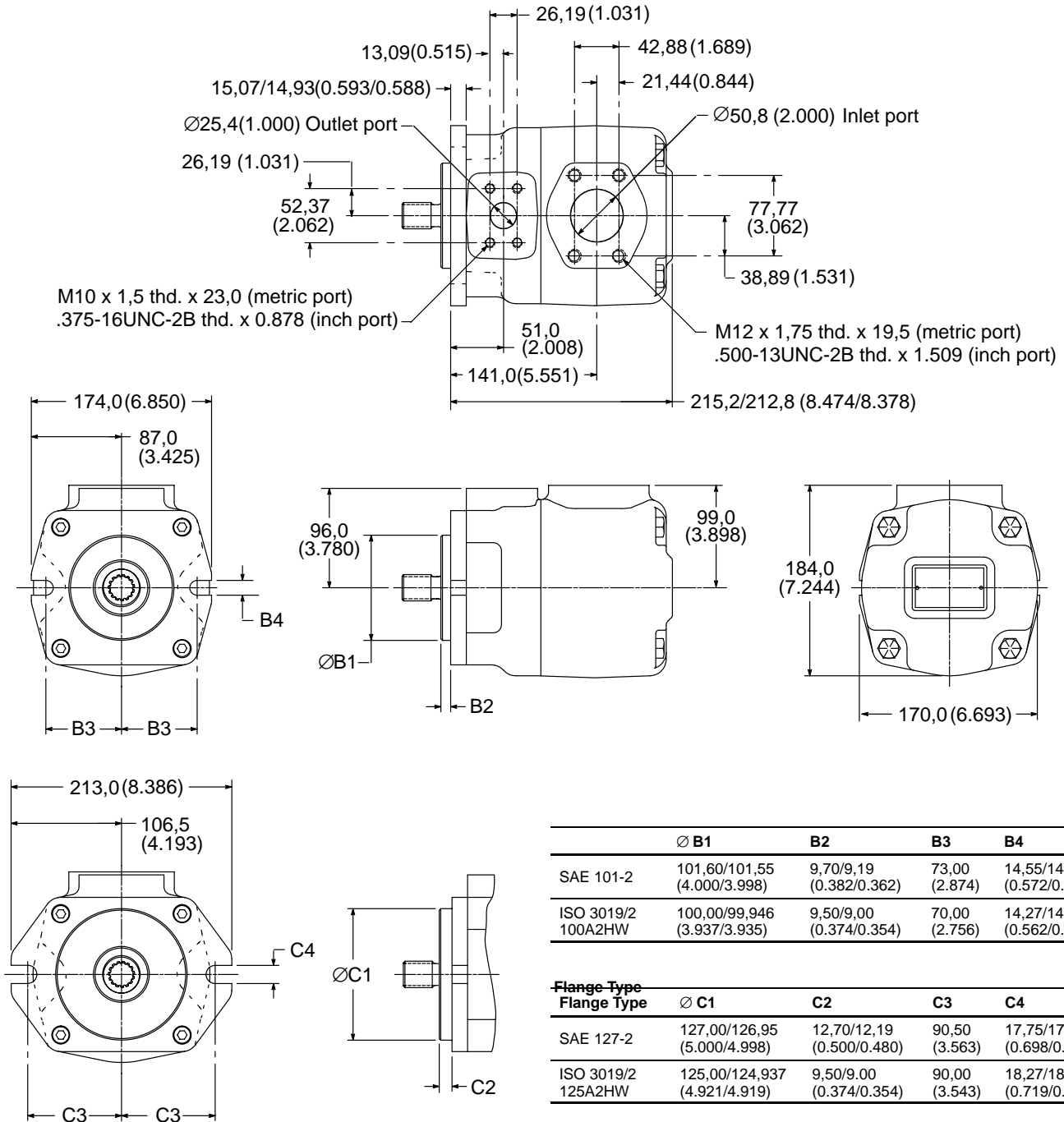
**Input Power of Code 063 Displacement Cartridge
at 180°F, SAE 10W Oil, 0 psig Inlet**



25VPF Installation Dimensions

Millimeters (inches)

 [Click here for shaft dimensions.](#)



35VPF Performance Data

Maximum Operating Pressure

Industrial – 262 bar (3800 psi)
 Mobile – 250 bar (3625 psi)

Maximum Transient Pressure (peak <0.5 sec)

276 bar (4000 psi)

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
090	90 (5.49)	1800	121,8 (32.2)	50,1 (67.1)	149 (39.4)	60,0 (80.4)
100	100 (6.10)	1800	136,8 (36.2)	55,7 (74.7)	167 (44.1)	66,6 (89.4)
112	112 (6.83)	1800	154,6 (40.9)	62,3 (83.5)	189 (49.8)	74,6 (100.0)
125	125 (7.63)	1800	174,4 (46.1)	69,6 (93.3)	212 (56.0)	83,3 (112.0)
135	135 (8.24)	1800	189,4 (50.1)	75,2 (100.8)	230 (60.8)	90,0 (120.7)

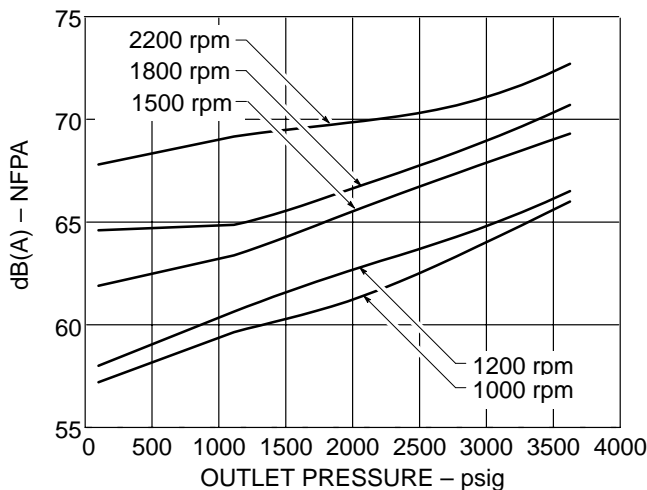
Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value.; i.e., actual flow must exceed 50% of theoretical flow.

Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

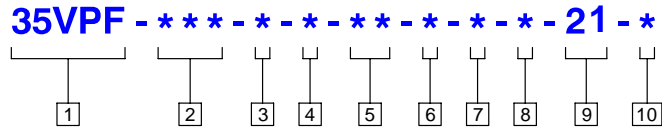
Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
090	90 (5.49)	2400	188,6 (49.9)	79,9 (107.1)
100	100 (6.10)	2400	212,4 (56.2)	89,0 (119.4)
112	112 (6.83)	2400	241,2 (63.8)	99,5 (133.4)
125	125 (7.63)	2400	272,6 (72.0)	111,0 (148.9)
135	135 (8.24)	2200	270 (71.4)	110,2 (147.7)

Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value.; i.e., actual flow must exceed 50% of theoretical flow.

Sound Data 120° F, SAE 10W oil, 0 psig inlet



35VPF Model Code



1 Series designation (frame size)

35VPF – 90 to 135 cm³/r
(5.49 to 8.24 in³/r)

2 Displacement

090 – 90 cm³/r (5.49 in³/r)
 100 – 100 cm³/r (6.10 in³/r)
 112 – 112 cm³/r (6.83 in³/r)
 125 – 125 cm³/r (7.63 in³/r)
 135 – 135 cm³/r (8.24 in³/r)

3 Port connection

A – SAE 4-bolt flange (SAE J518)
 B – Metric 4-bolt flange (ISO 6162)

4 Flange mounting style

A – SAE J744 127–2 (SAE C)
 B – ISO 3019/2 125A2HW
 C – SAE J744 152–2 (SAE D)
 D – ISO 3019/2 160A2HW

5 Shaft end

01 – SAE J744 32–1
(1.25 in keyed shaft)
 02 – SAE J744 32–4
(C splined shaft)
 03 – ISO 3019/2 E32N
(32mm keyed shaft)
 05 – SAE J744 38–1
(1.50 in keyed shaft)
 06 – SAE J744 38–4
(C–C splined shaft)
 07 – ISO 3019/2 E40N
(40mm keyed shaft)

6 Shaft seal

A – Single, primary
 B – Double, secondary (spring side out)
 C – Double, secondary (spring side in)

7 Seal type

N – Standard, buna N
 V – Viton
 W – Buna N with Viton shaft seals

**8 Outlet port position
(viewed from cover end)**

A – Outlet port opposite inlet port
 B – Outlet port 90° counterclockwise
from inlet port
 C – Outlet port inline with inlet port
 D – Outlet port 90° clockwise from
inlet port

9 Design level

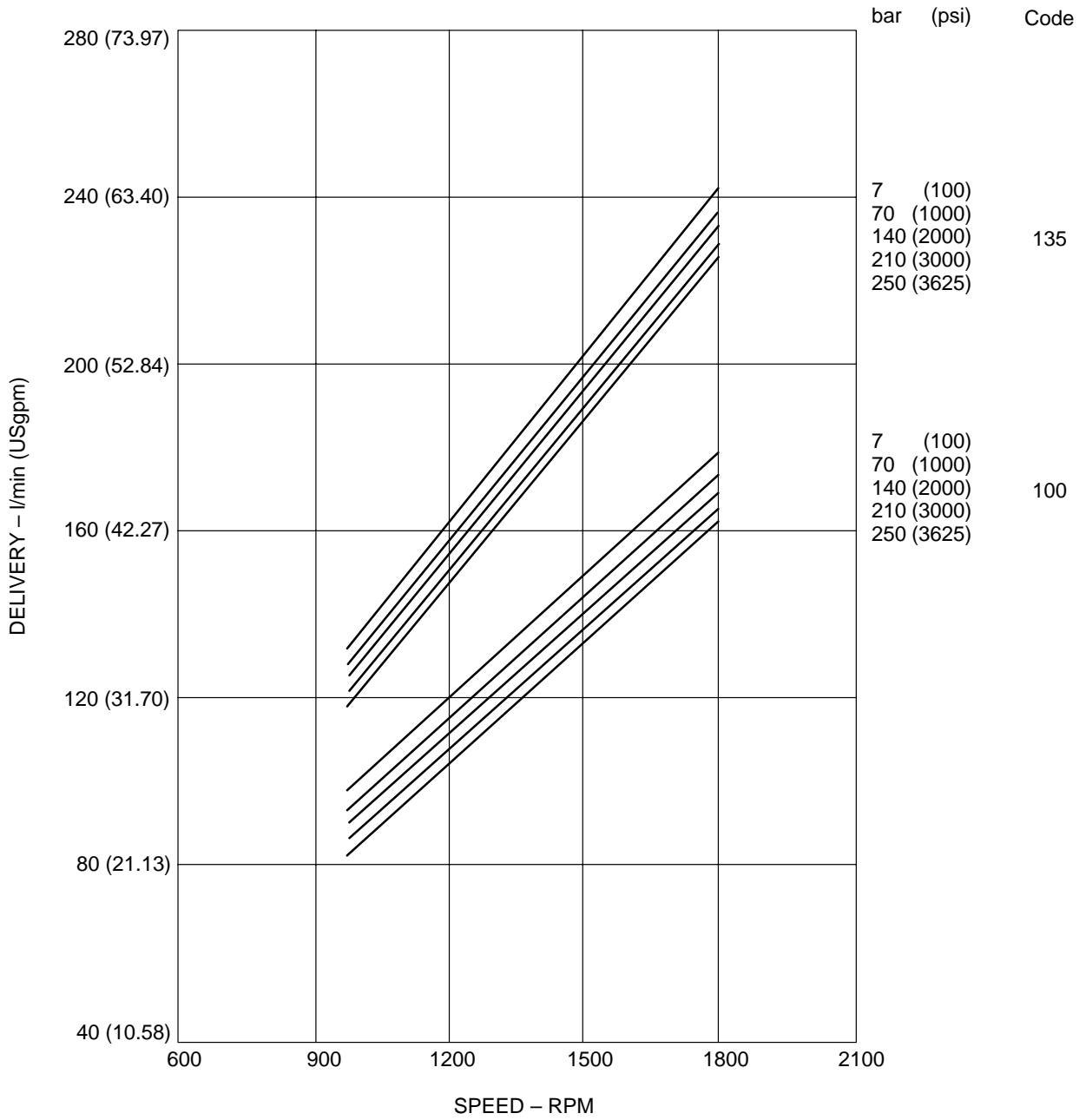
Subject to change. Dimensions remain the same for designs 20 through 29.

**10 Rotation
(viewed from shaft end)**

R – Right hand (clockwise)
 L – Left hand (counterclockwise)

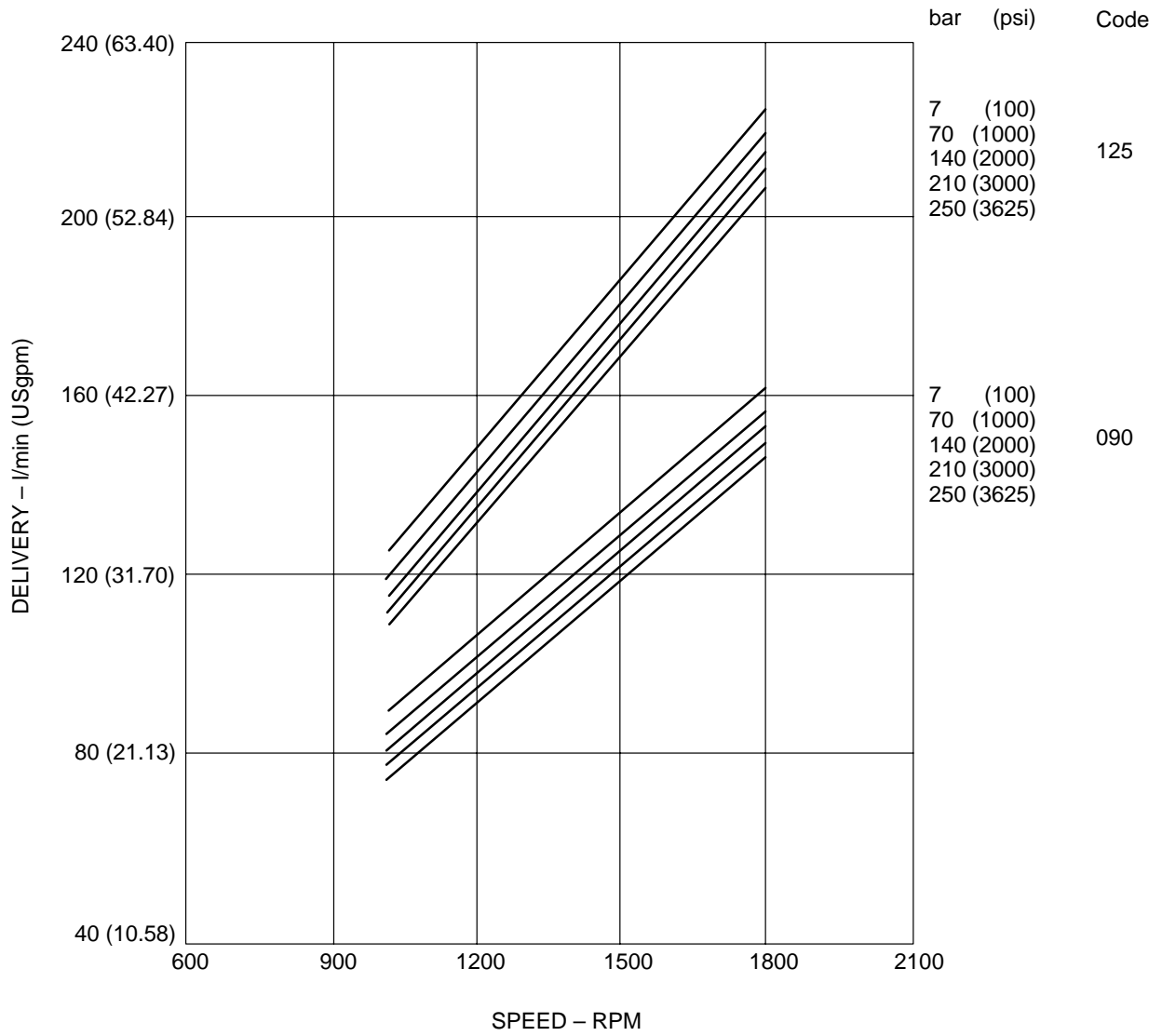
35VPF Typical Delivery – Industrial

Delivery of Code 135 and 100 Displacement Cartridges
 at 120° F, SAE 10W Oil, 0 psig Inlet



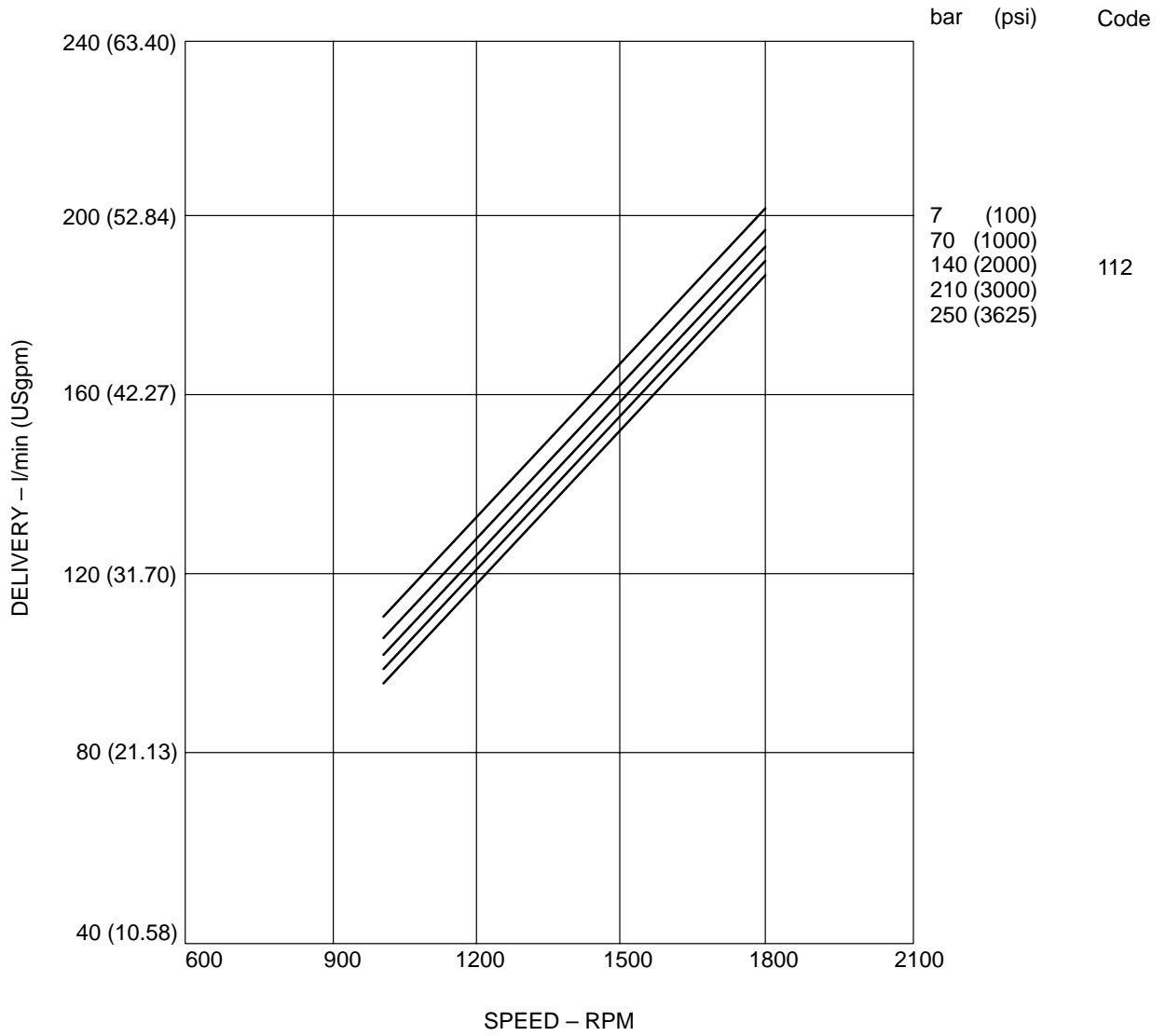
35VPF Typical Delivery – Industrial

**Delivery of Code 125 and 090 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



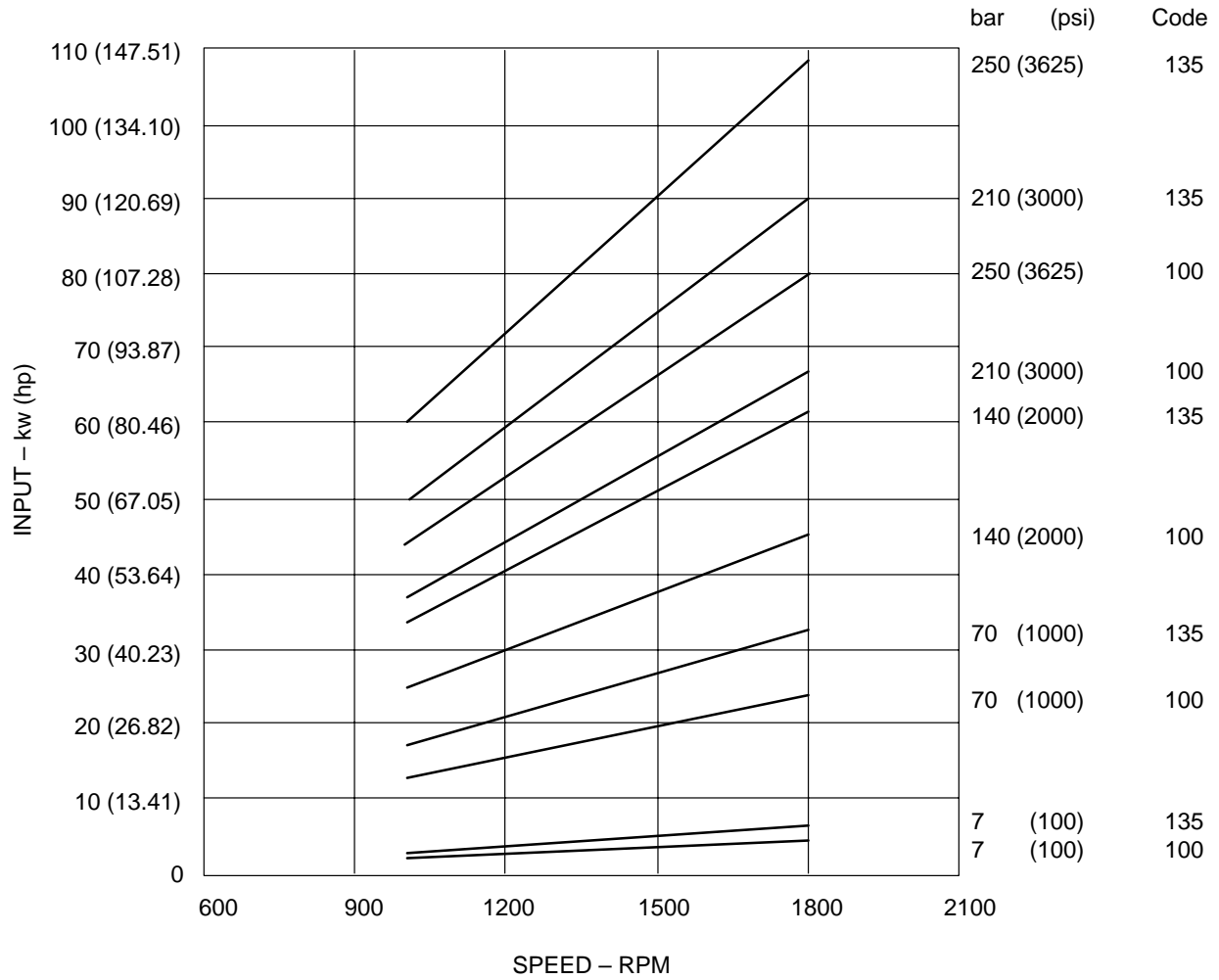
35VPF Typical Delivery – Industrial

Delivery of Code 112 Displacement Cartridge
at 120° F, SAE 10W Oil, 0 psig Inlet



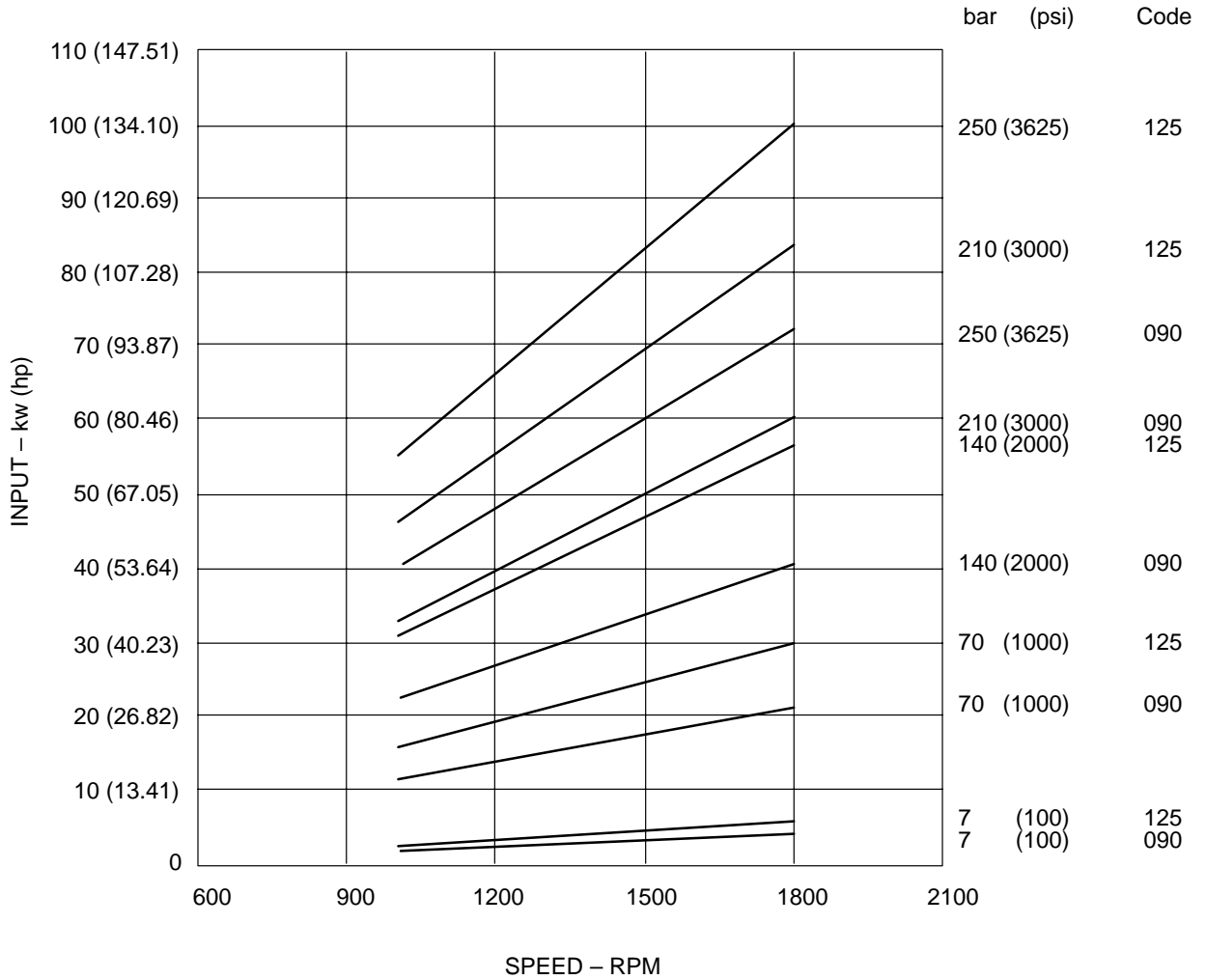
35VPF Typical Input Power – Industrial

Input Power of Code 135 and 100 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet



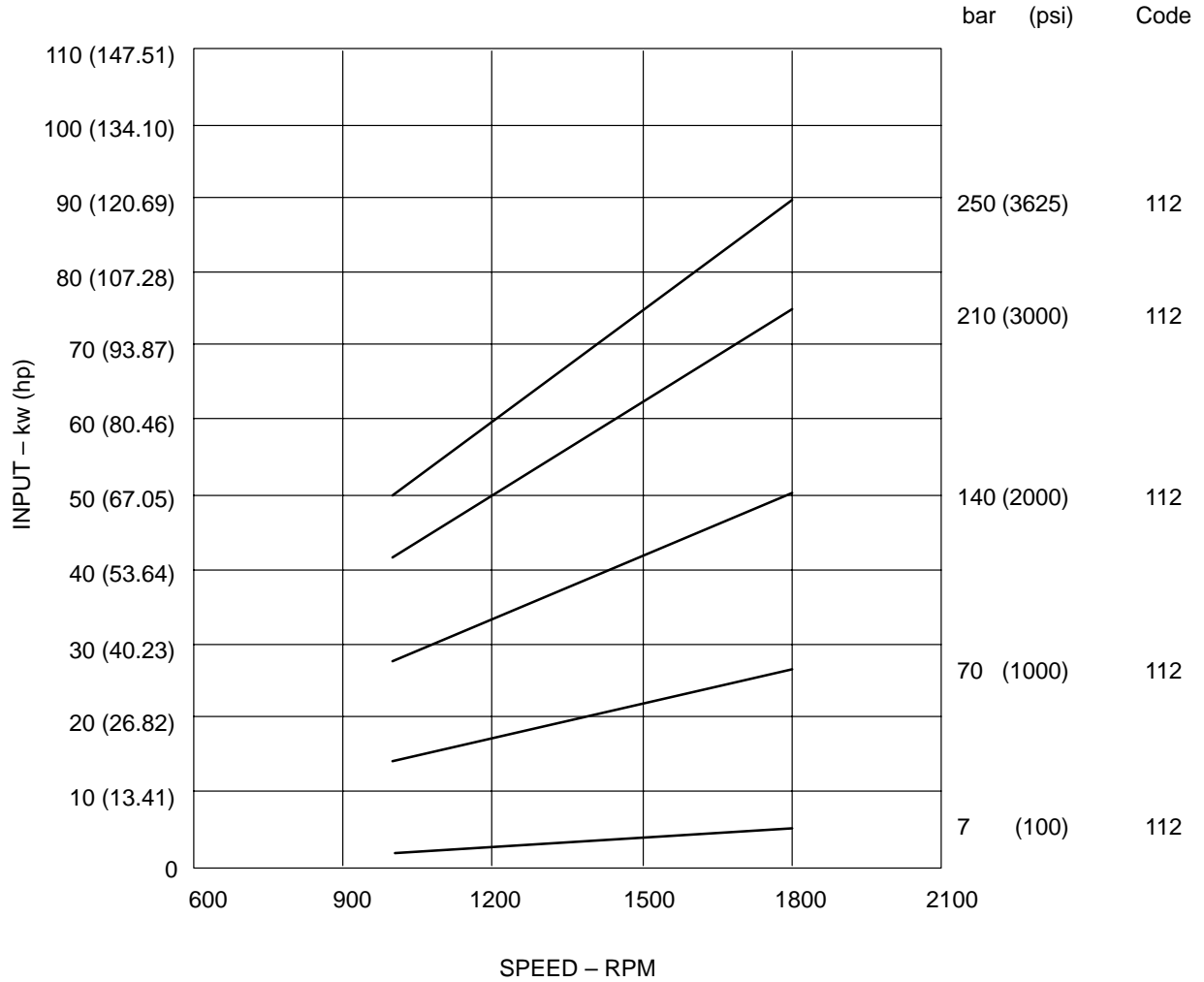
35VPF Typical Input Power – Industrial

**Input Power of Code 125 and 090 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



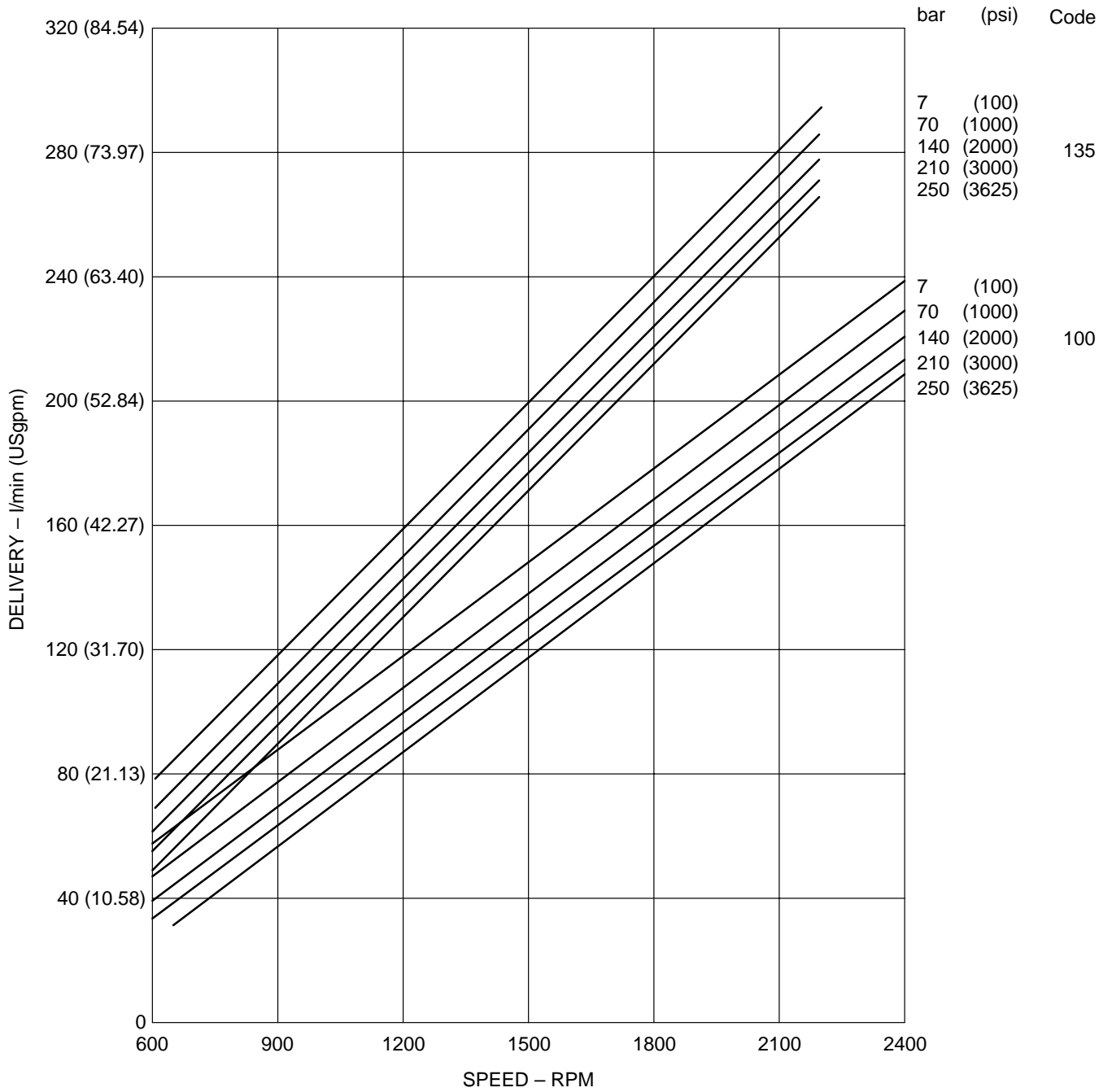
35VPF Typical Input Power – Industrial

**Input Power of Code 112 Displacement Cartridge
at 120° F, SAE 10W Oil, 0 psig Inlet**



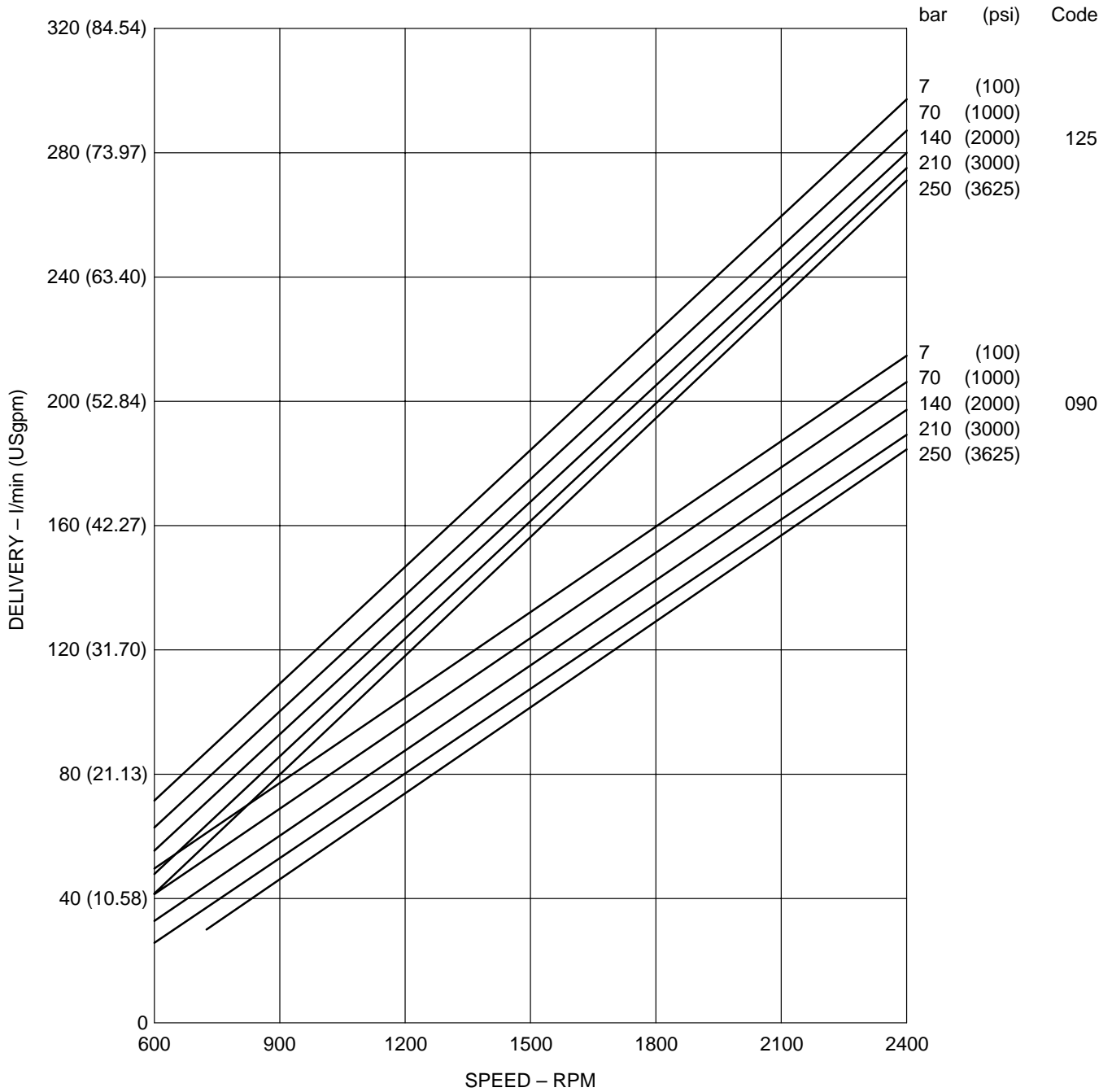
35VPF Typical Delivery – Mobile

Delivery of Code 135 and 100 Displacement Cartridges
at 180° F, SAE 10W Oil, 0 psig Inlet



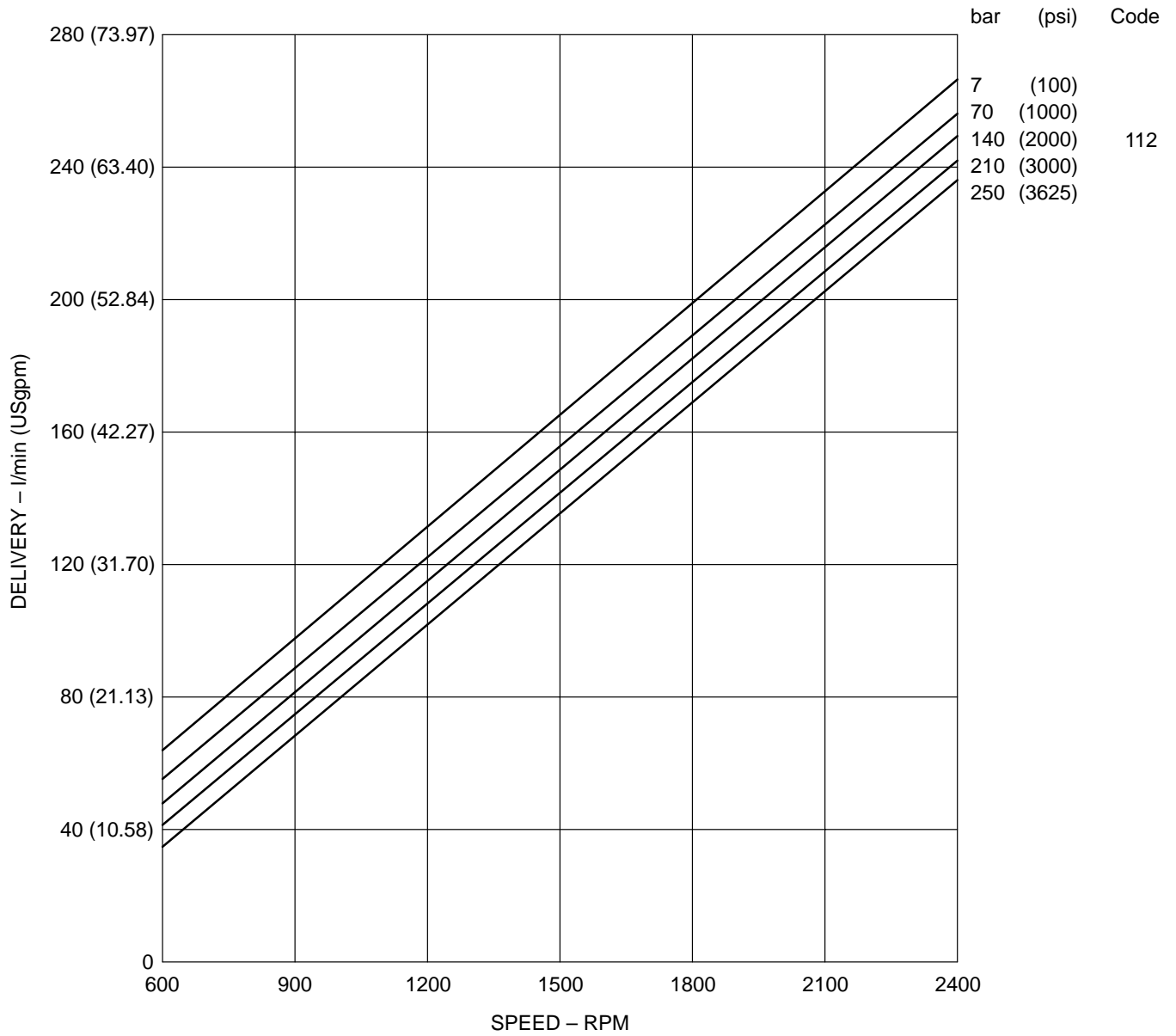
35VPF Typical Delivery – Mobile

Delivery of Code 125 and 090 Displacement Cartridges at 180° F, SAE 10W Oil, 0 psig Inlet



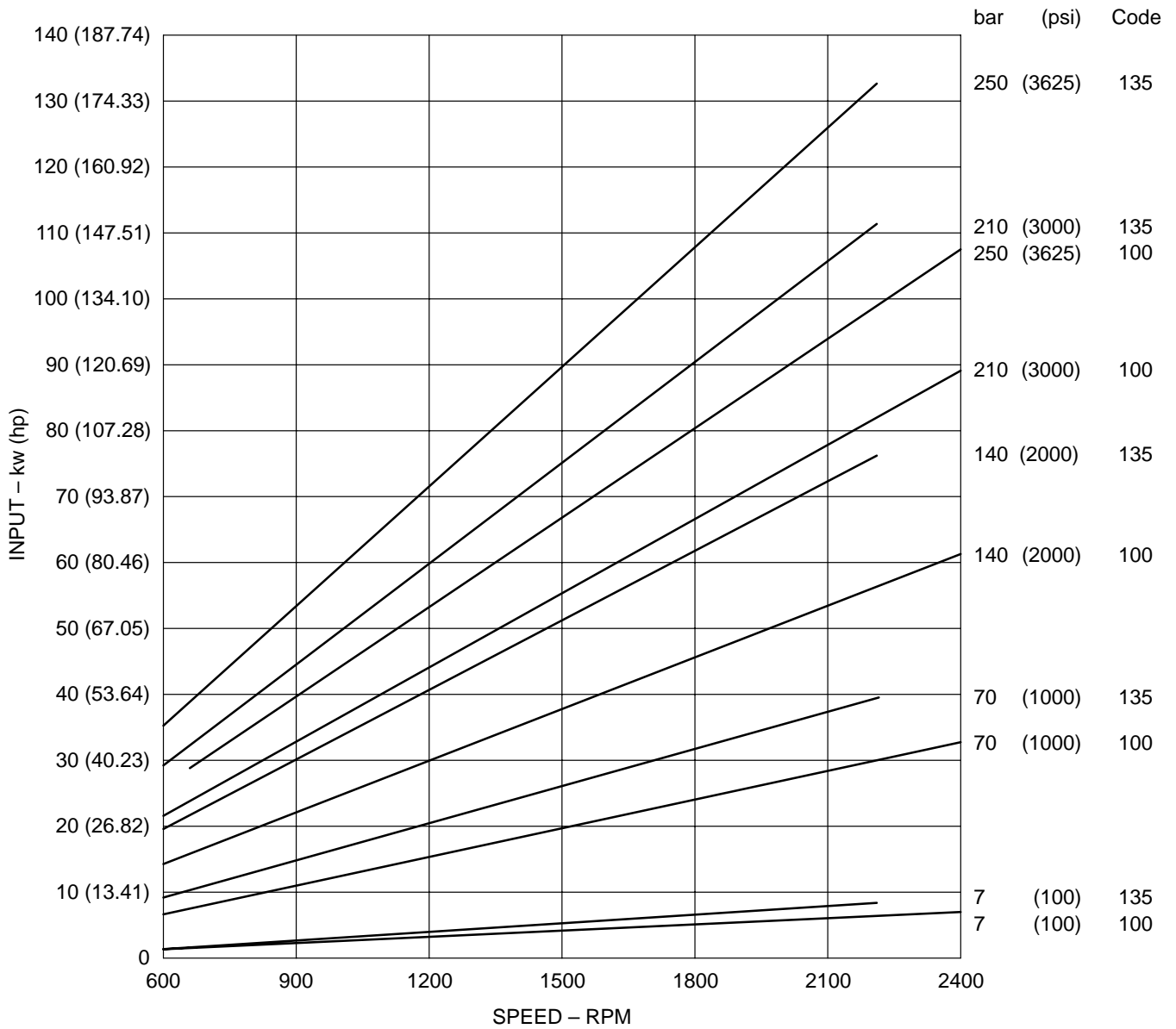
35VPF Typical Delivery – Mobile

**Delivery of Code 112 Displacement Cartridge
at 180° F, SAE 10W Oil, 0 psig Inlet**



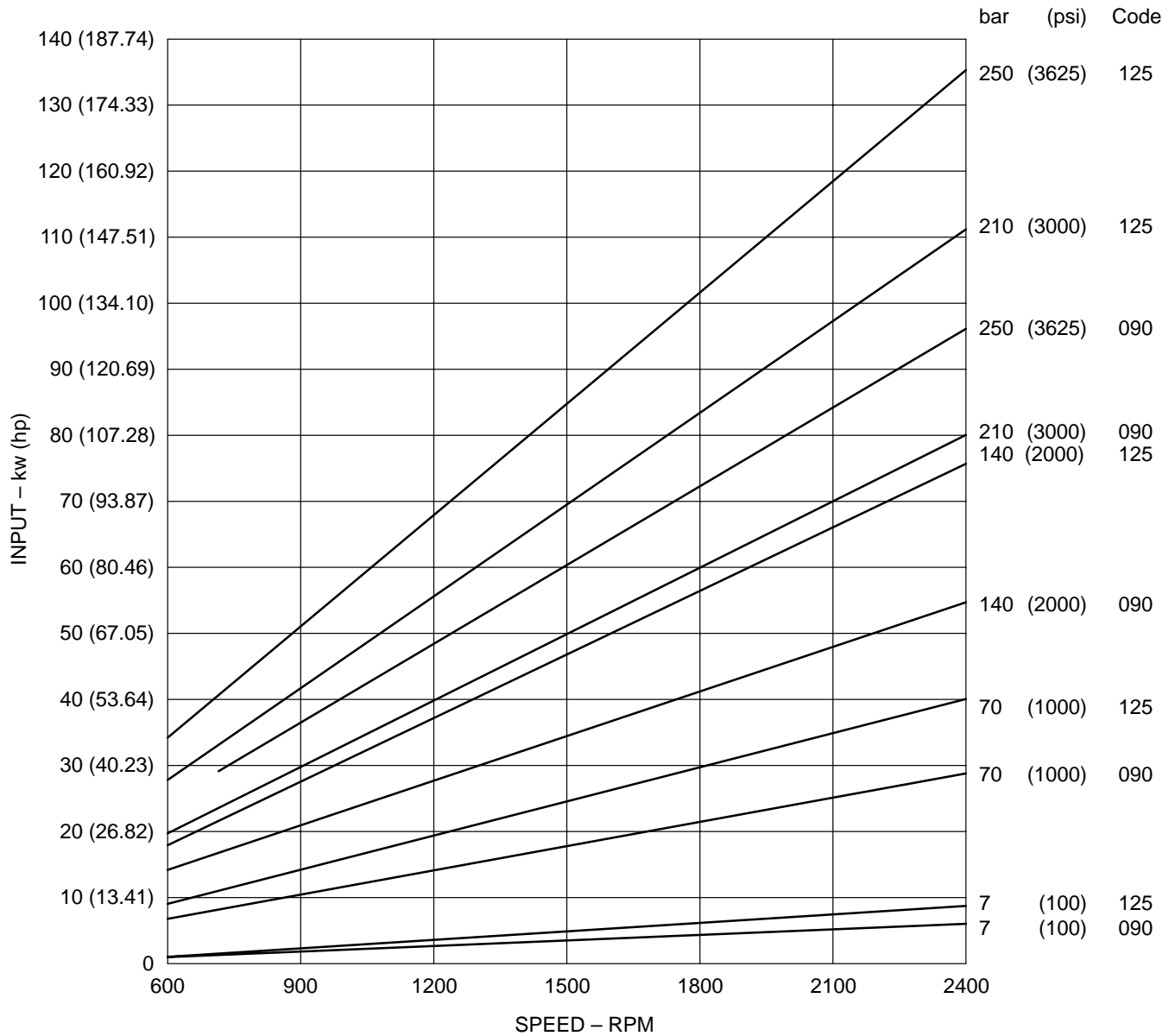
35VPF Typical Input Power – Mobile

**Input Power of Code 135 and 100 Displacement Cartridges
at 180° F, SAE 10W Oil, 0 psig Inlet**



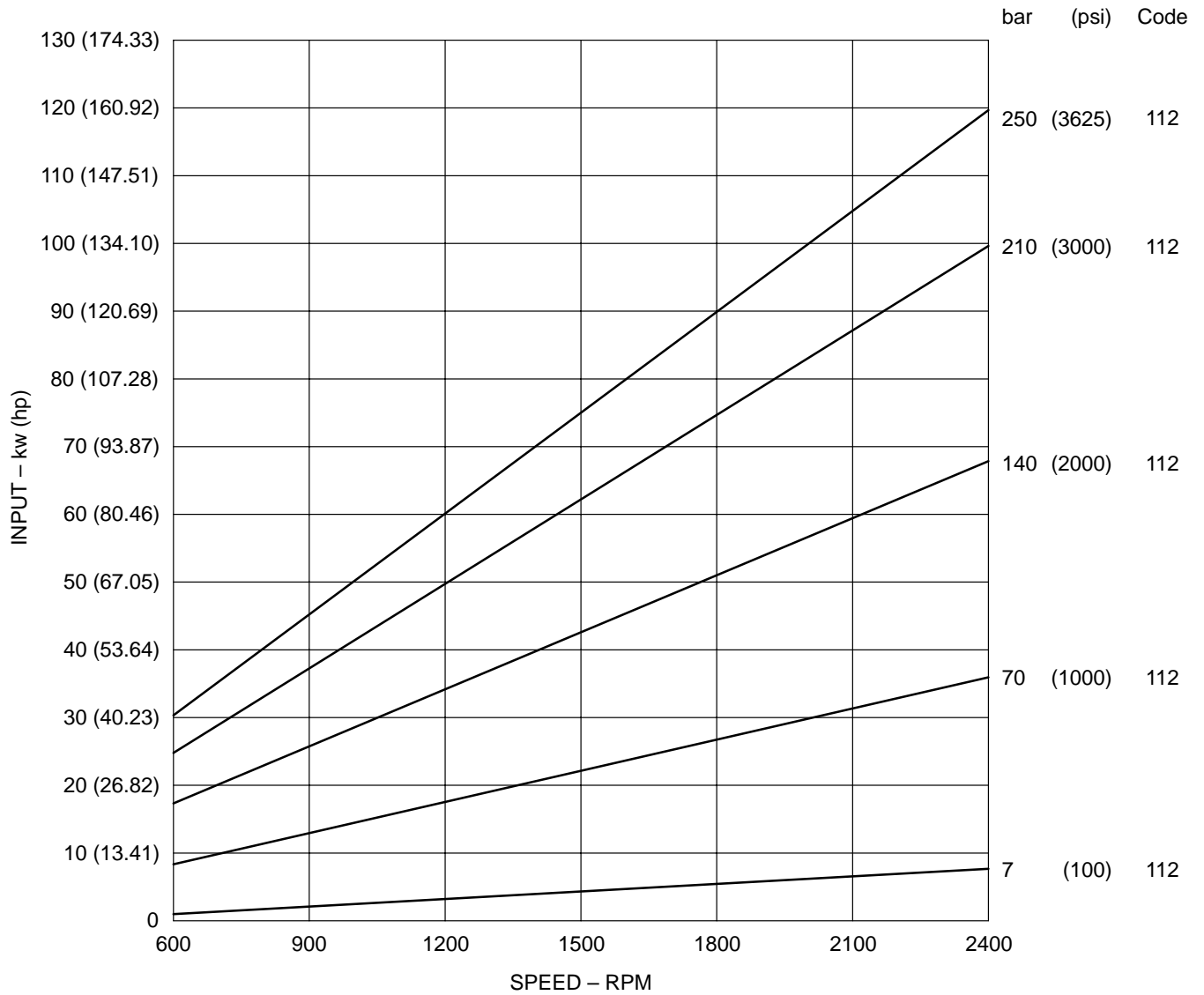
35VPF Typical Input Power – Mobile

**Input Power of Code 125 and 090 Displacement Cartridges
at 180° F, SAE 10W Oil, 0 psig Inlet**



35VPF Typical Input Power – Mobile

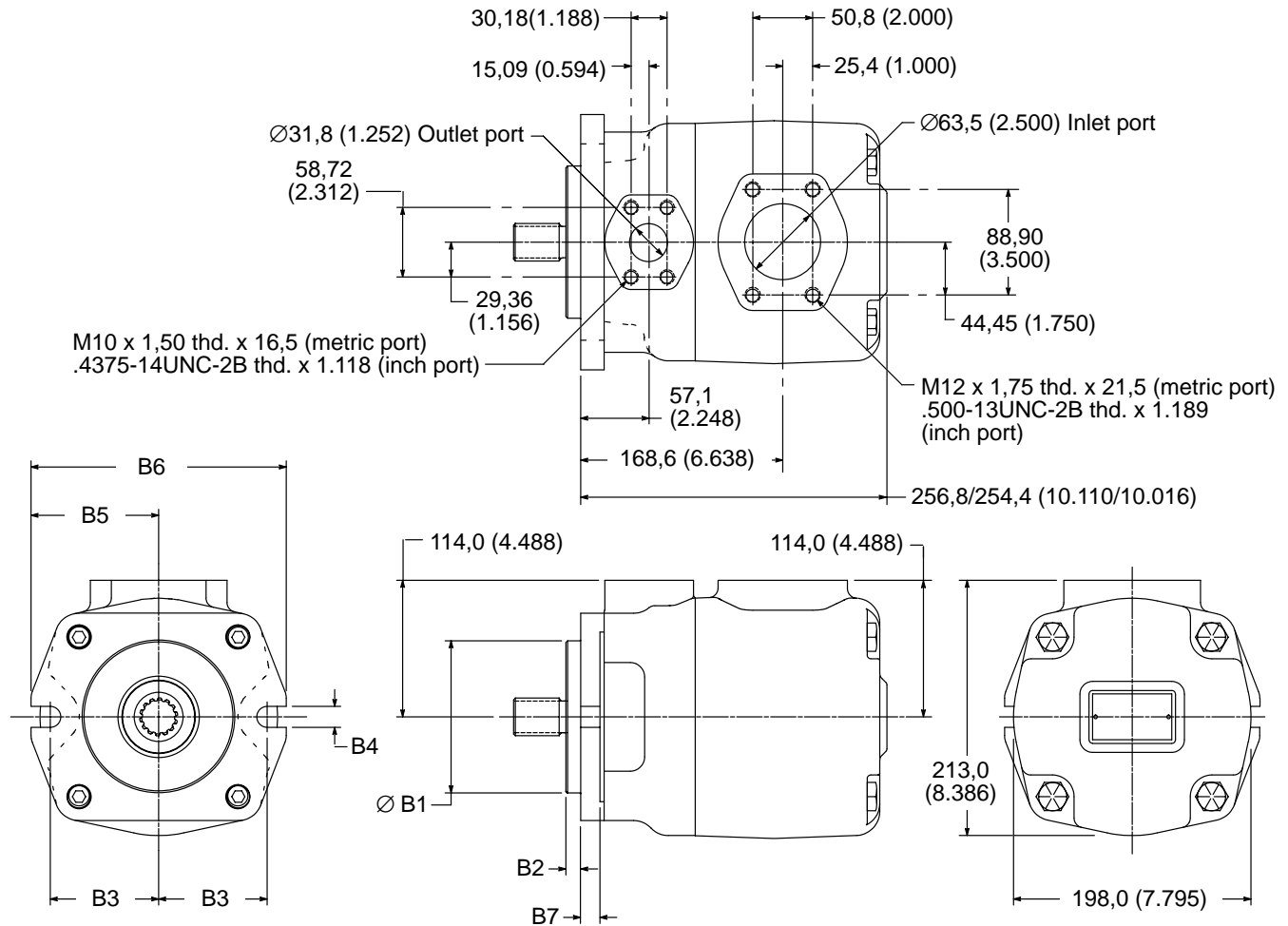
**Input Power of Code 112 Displacement Cartridge
at 180° F, SAE 10W Oil, 0 psig Inlet**



35VPF Installation Dimensions

Millimeters (inches)

[Click here for shaft dimensions.](#)



	Ø B1	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.918)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
SAE 152-2 Flange Type	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.296)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)

45VPF Typical Performance Data

Maximum Operating Pressure

Industrial – 262 bar (3800 psi)
 Mobile – 250 bar (3625 psi)

Maximum Transient Pressure (peak <0.5 sec)

276 bar (4000 psi)

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
140	140 (8.54)	1800	190,4 (50.3)	75,2 (100.8)	232,4 (61,4)	90,6 (121.5)
160	160 (9.76)	1800	220,3 (58.2)	85,9 (115.2)	268,4 (70.9)	103,6 (138.8)
180	180 (10.98)	1800	250,2 (66.1)	96,7 (129.6)	304,3 (80.4)	116,5 (156.2)
195	195 (11.89)	1800	272,2 (72.0)	104,7 (140.4)	331,2 (87.5)	126,2 (169.1)

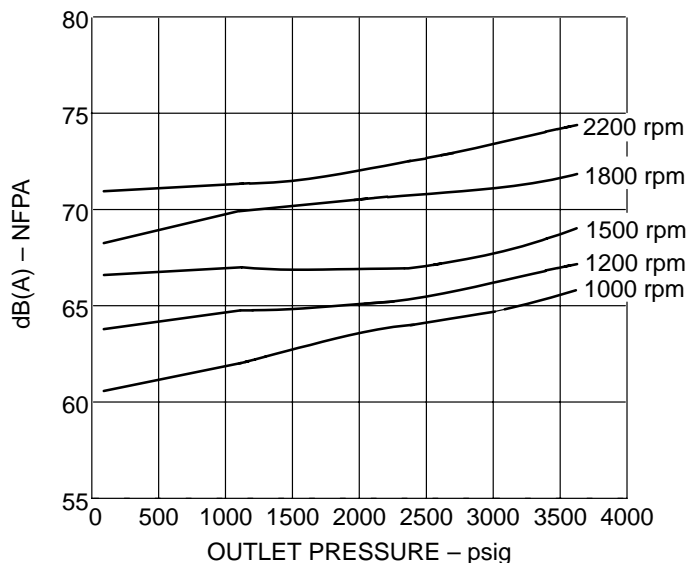
Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

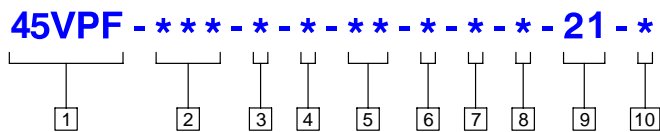
Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
140	140 (8.54)	2200	267,2 (70.6)	110,5 (148.1)
160	160 (9.76)	2200	311,2 (82.2)	126,2 (169.3)
180	180 (10.98)	2200	355,1 (93.8)	142.1 (190.5)
195	195 (11.89)	2200	388,0 (102.5)	153,8 (206.2)

Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Sound Data 120° F, SAE 10W oil, 0 psig inlet



45VPF Model Code



1 Series designation (frame size)

45VPF – 140 to 195 cm³/r
(8.54 to 11.89 in³/r)

2 Displacement

140 – 140 cm³/r (8.54 in³/r)
 160 – 160 cm³/r (9.76 in³/r)
 180 – 180 cm³/r (10.98 in³/r)
 195 – 195 cm³/r (11.89 in³/r)

3 Port connection

A – SAE 4-bolt flange (SAE J518)
 B – Metric 4-bolt flange (ISO 6162)

4 Flange mounting style

A – SAE J744 127–2 (SAE C)
 B – ISO 3019/2 125A2HW
 C – SAE J744 152–2 (SAE D)
 D – ISO 3019/2 160A2HW

5 Shaft end

01 – SAE J744 38–1
(1.50 inch keyed shaft)
 02 – SAE J744 38–4
(C-C splined shaft)
 03 – ISO 3019/2 E40N
(40mm keyed shaft)
 05 – SAE J744 44–1
(1.75 inch keyed shaft)
 06 – SAE J744 44–4
(D splined shaft)

6 Shaft seal

A – Single, primary
 B – Double, secondary (spring side out)
 C – Double, secondary (spring side in)

7 Seal type

N – Standard, buna N
 V – Viton
 W – Buna N with Viton shaft seals

**8 Outlet port position
(viewed from cover end)**

A – Outlet port opposite inlet port
 B – Outlet port 90° counterclockwise
from inlet port
 C – Outlet port in line with inlet port
 D – Outlet port 90° clockwise from
inlet port

9 Design level

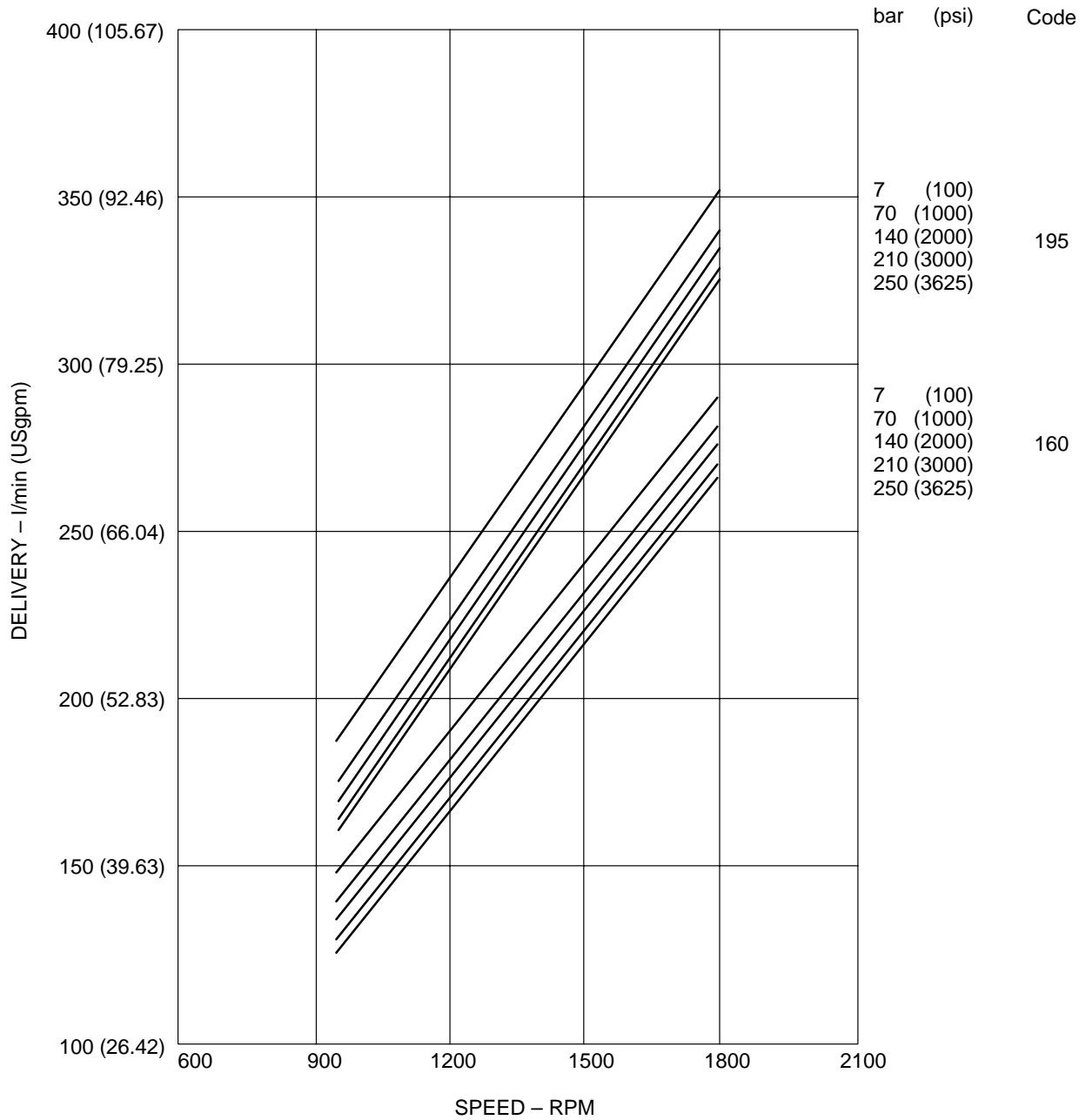
Subject to change. Dimensions remain
the same for designs 20 through 29.

**10 Rotation
(viewed from shaft end)**

R – Right hand (clockwise)
 L – Left hand (counterclockwise)

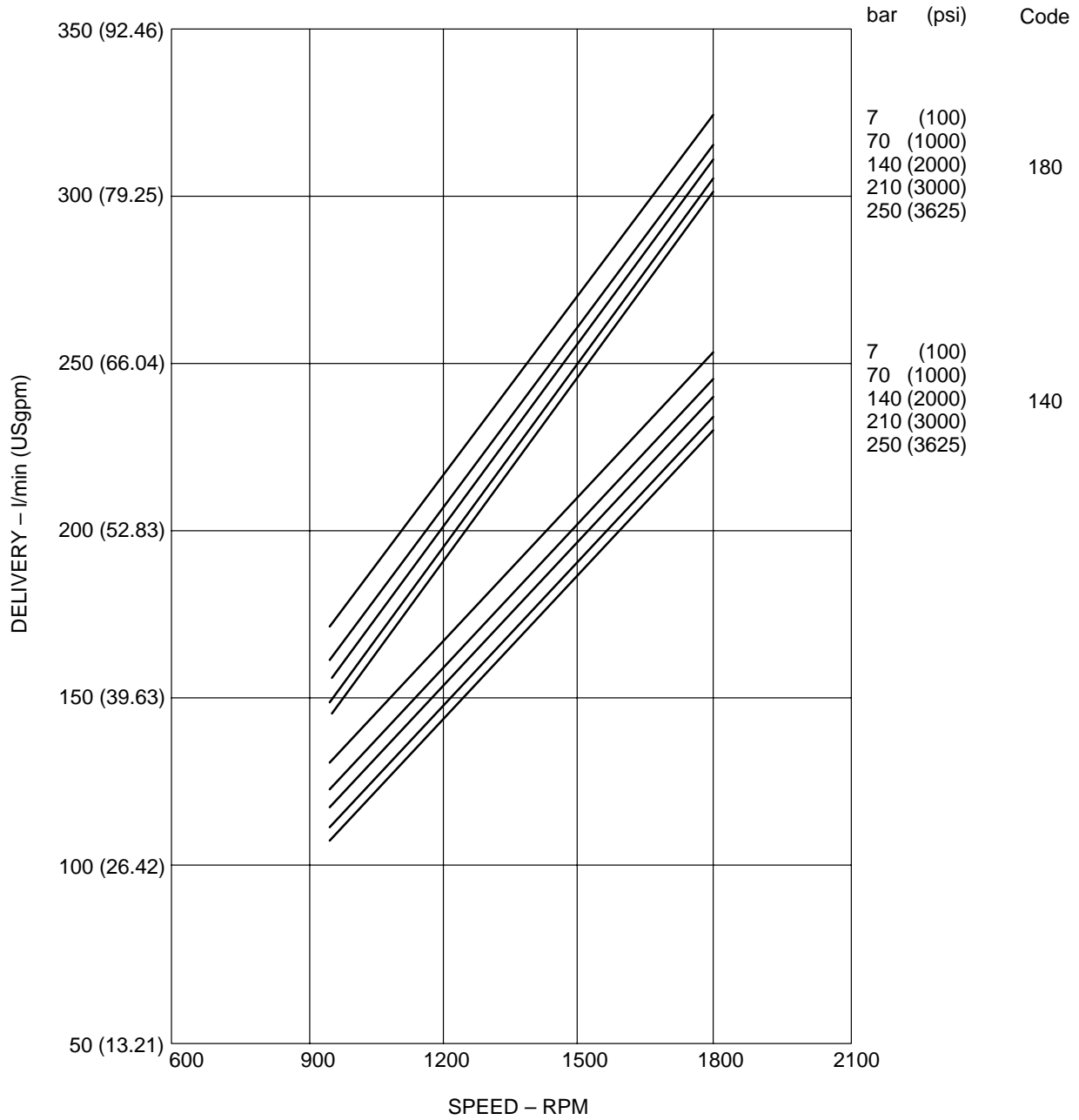
45VPF Typical Delivery – Industrial

Delivery of Code 195 and 160 Displacement Cartridges
 at 120° F, SAE 10W Oil, 0 psig Inlet



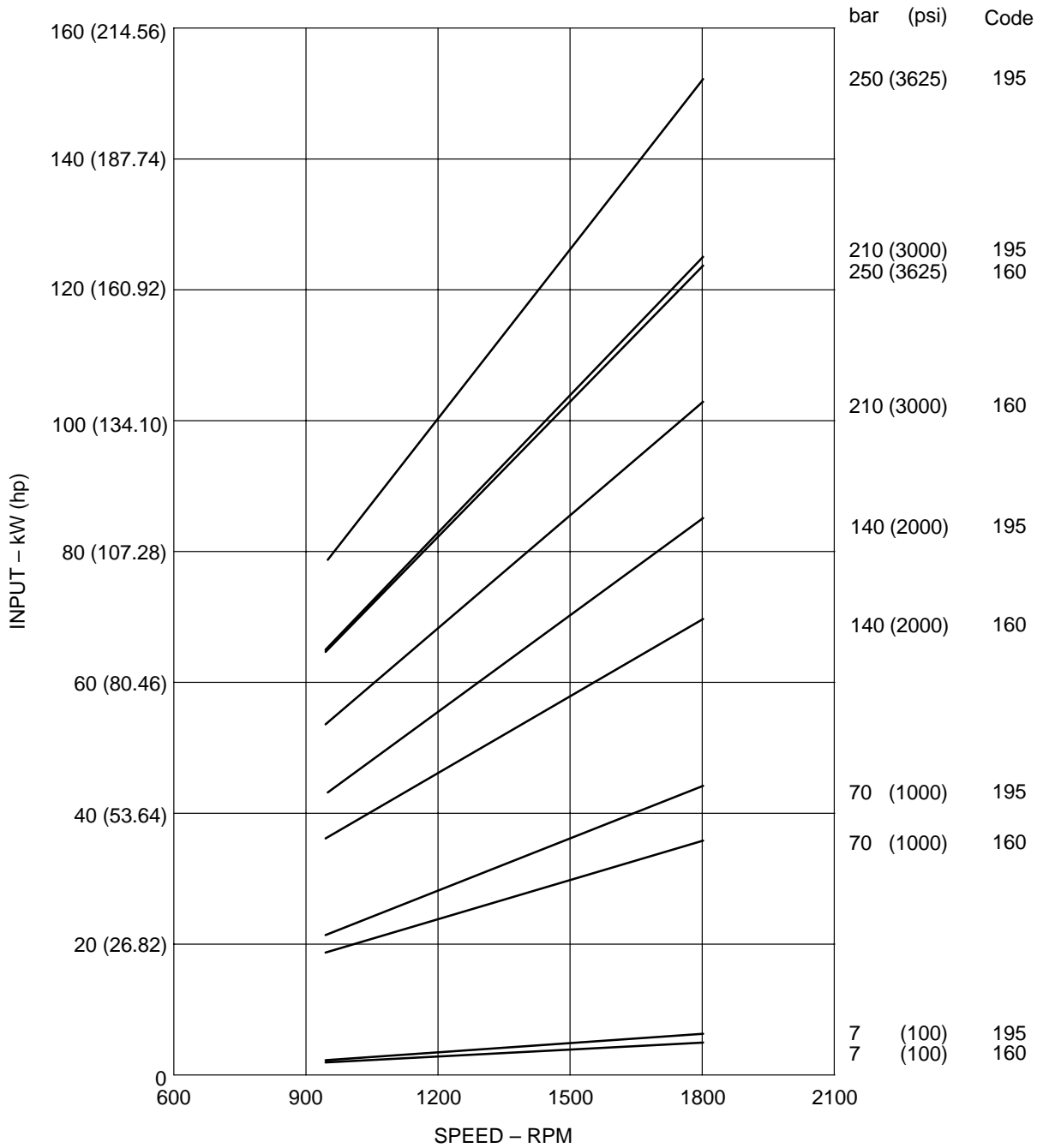
45VPF Typical Delivery – Industrial

**Delivery of Code 180 and 140 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



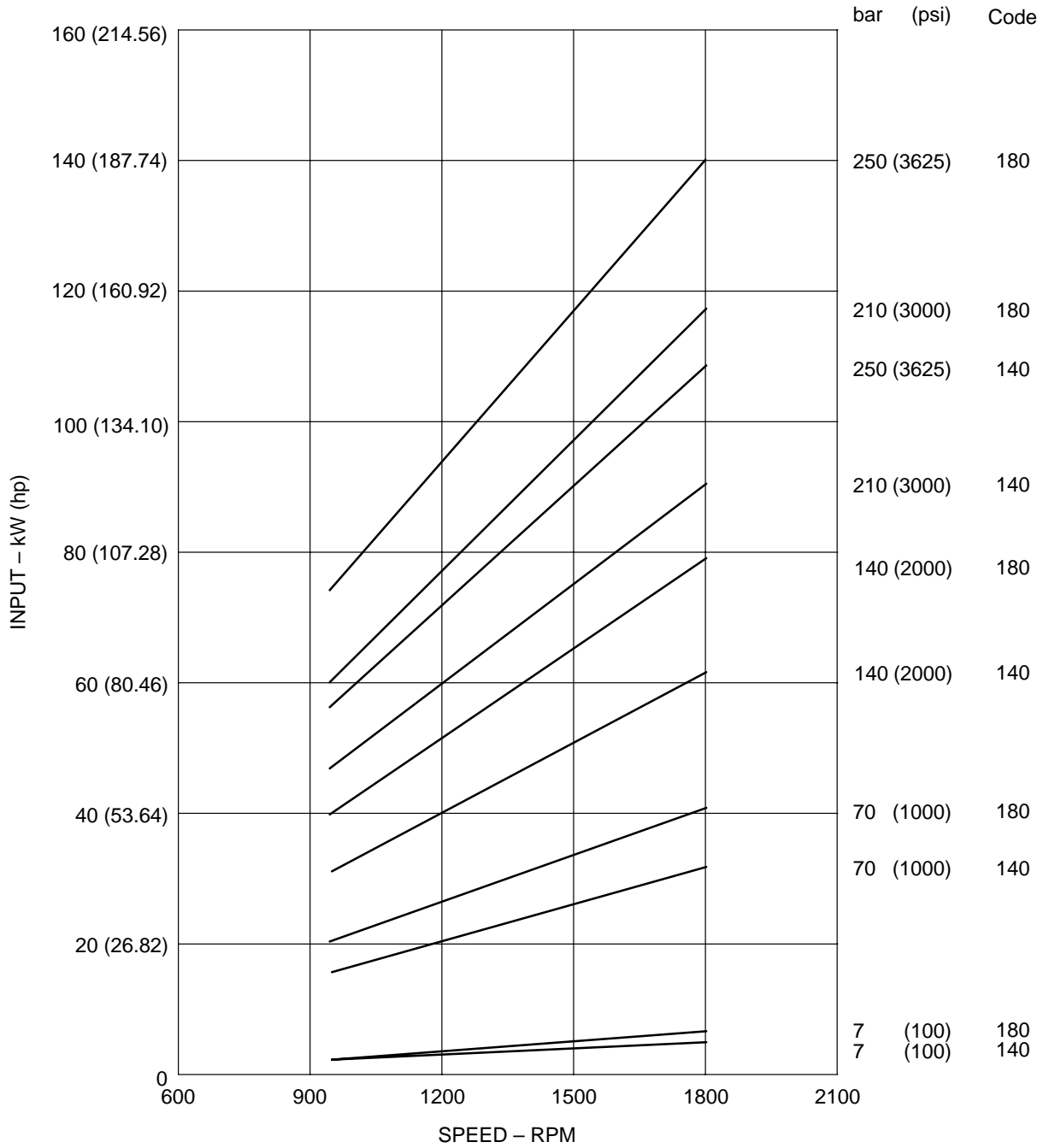
45VPF Typical Input Power – Industrial

**Input Power of Code 195 and 160 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



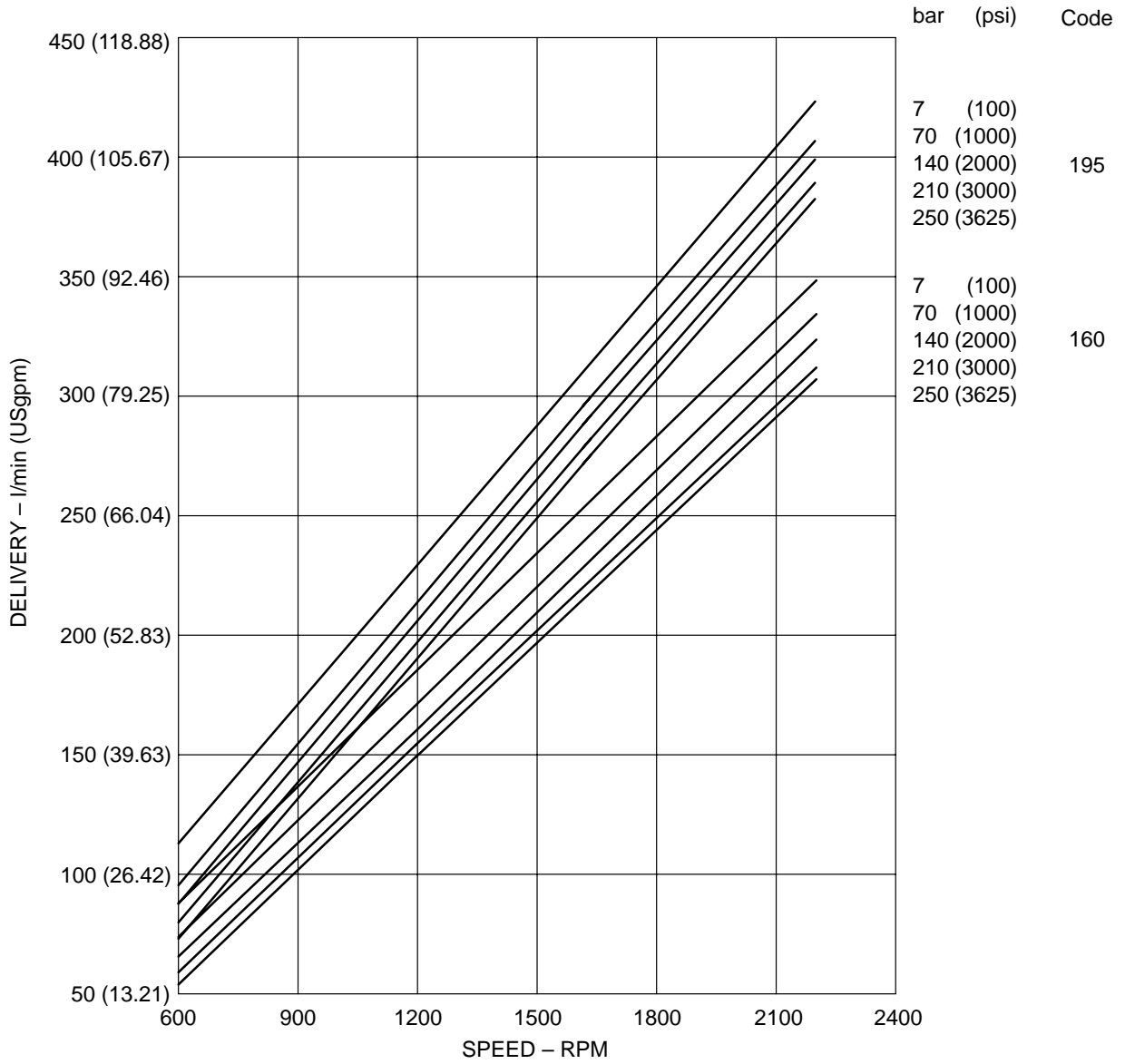
45VPF Typical Input Power – Industrial

**Input Power of Code 180 and 140 Displacement Cartridges
at 120° F, SAE 10W Oil, 0 psig Inlet**



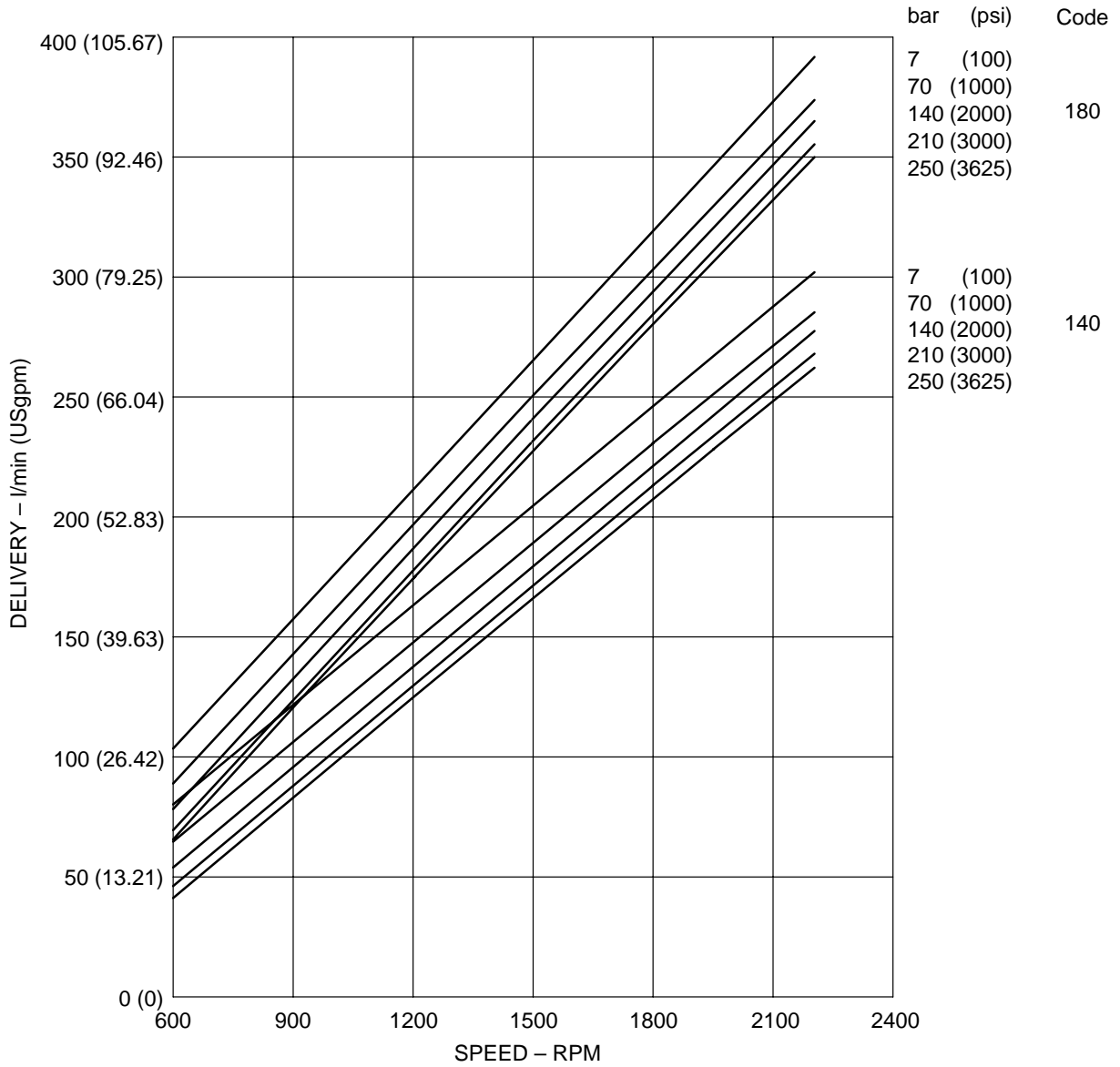
45VPF Typical Delivery – Mobile

Delivery of Code 195 and 160 Displacement Cartridges at 180° F, SAE 10W Oil, 0 psig Inlet



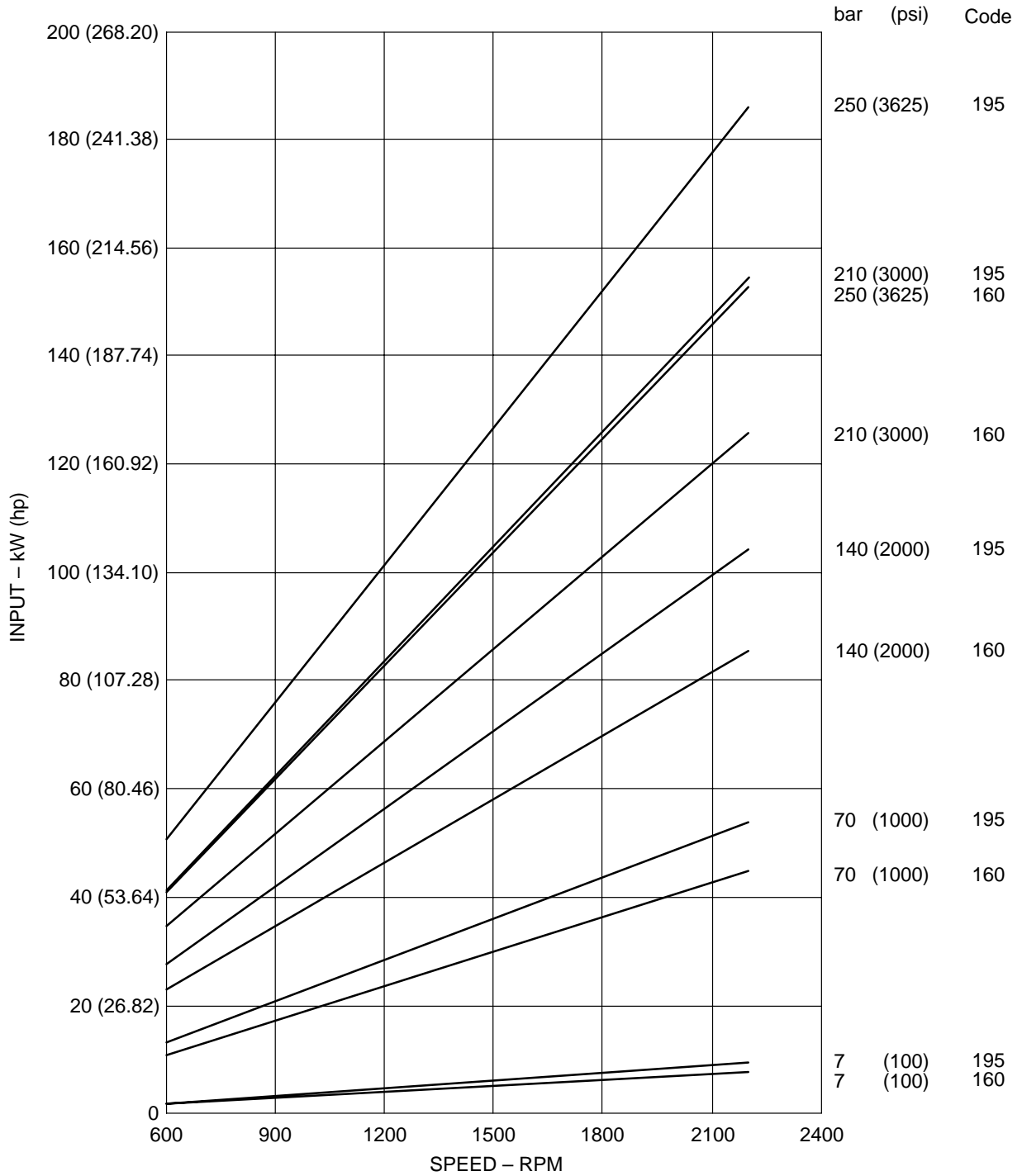
45VPF Typical Delivery – Mobile

Delivery of Code 180 and 140 Displacement Cartridges at 180° F, SAE 10W Oil, 0 psig Inlet



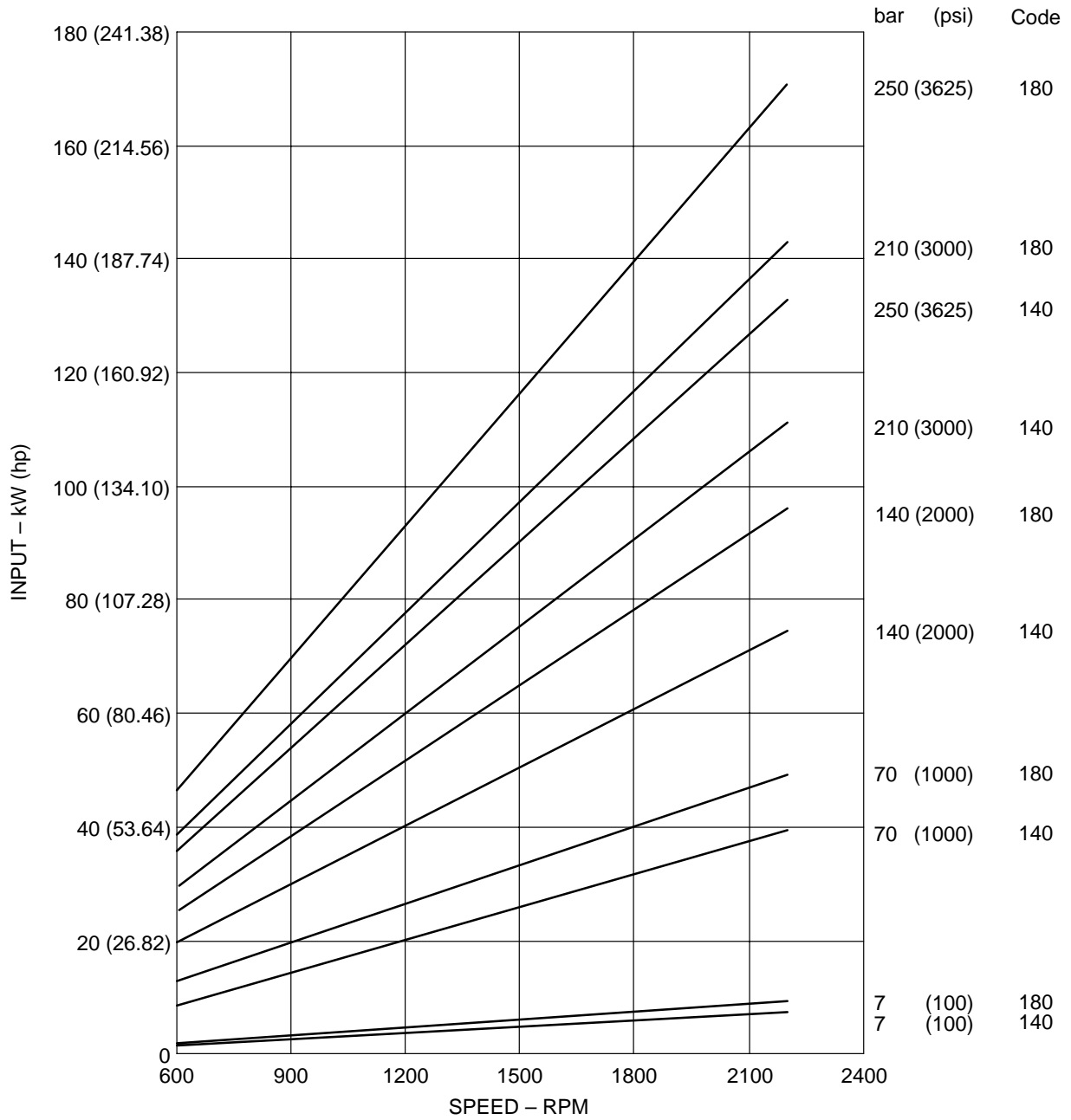
45VPF Typical Input Power – Mobile

Input Power of Code 195 and 160 Displacement Cartridges at 180° F, SAE 10W Oil, 0 psig Inlet



45VPF Typical Input Power – Mobile

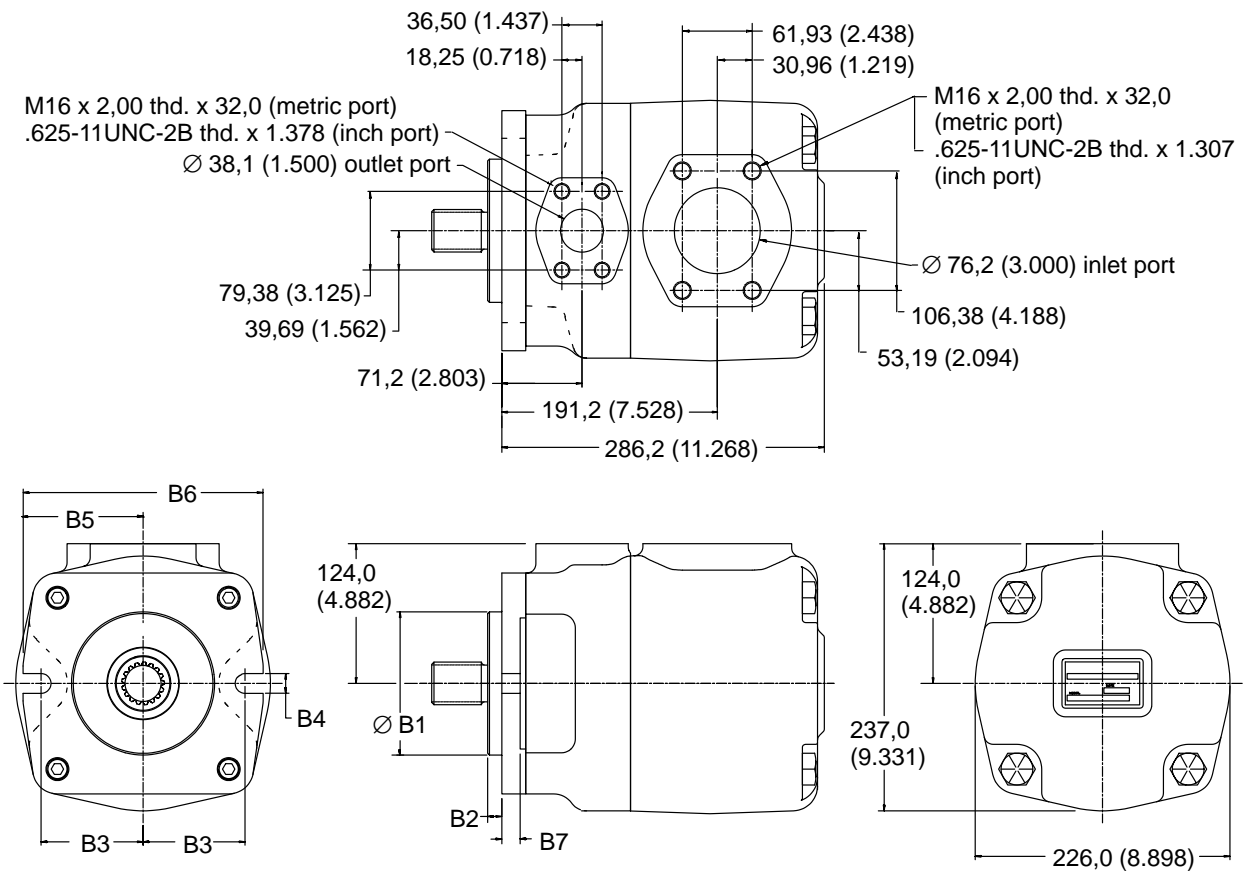
**Input Power of Code 180 and 140 Displacement Cartridges
at 180° F, SAE 10W Oil, 0 psig Inlet**



45VPF Installation Dimensions

Millimeters (inches)

 [Click here for shaft dimensions.](#)



Flange Type	Ø B1	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.918)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.296)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)

2525VPF Typical Performance Data

Maximum Operating Pressure

Industrial – 293 bar (4250 psi)
 Mobile – 280 bar (4060 psi)

Maximum Transient Pressure (peak < 0.5 sec)

310 bar (4500 psi)

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
010	10 (0.62)	1800	11,5 (3.0)	5,6 (7.5)	14,8 (3.9)	6,70 (9.0)
016	16 (0.98)	1800	20,4 (5.4)	8,8 (11.8)	25,5 (6.7)	10,6 (14.2)
025	25 (1.58)	1800	35,1 (9.3)	14,2 (19.05)	43,15 (11.4)	17,1 (22.9)
032	32 (1.96)	1800	44,5 (11.75)	17,6 (23.6)	54,4 (14.4)	21,2 (28.45)
040	40 (2.44)	1800	50,7 (13.4)	22,5 (30.1)	62,9 (16.6)	27,1 (36.3)
050	50 (3.05)	1800	65,8 (17.4)	28,2 (37.8)	80,9 (21.4)	33,8 (45.3)
063	63 (3.84)	1800	85,1 (22.5)	35,3 (47.4)	104,0 (27.5)	42,6 (57.1)
071	71 (4.33)	1800	97,15 (25.7)	40,0 (53.6)	119,0 (31.4)	48,0 (64.4)
080	80 (4.88)	1800	110,8 (29.3)	45,1 (60.5)	135,0 (35.6)	54,1 (72.5)

Notes:

Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Maximum speed rating for double pumps is limited to lowest speed rating of cartridges contained therein.

Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
010	10 (0.62)	3000	22,8 (6.0)	11,2 (15.0)
016	16 (0.98)	3000	40,5 (10.7)	17,7 (23.8)
025	25 (1.58)	3000	70,0 (18.5)	28,6 (38.3)
032	32 (1.96)	3000	88,7 (23.4)	35,5 (47.5)
040	40 (2.44)	2600	84,5 (22.4)	38,9 (52.2)
050	50 (3.05)	2600	110,8 (29.3)	48,7 (65.3)
063	63 (3.84)	2600	144,0 (38.1)	61,3 (82.2)
071	71 (4.33)	2600	165,0 (43.6)	69,0 (92.5)
080	80 (4.88)	2600	188,4 (49.8)	77,7 (104.2)

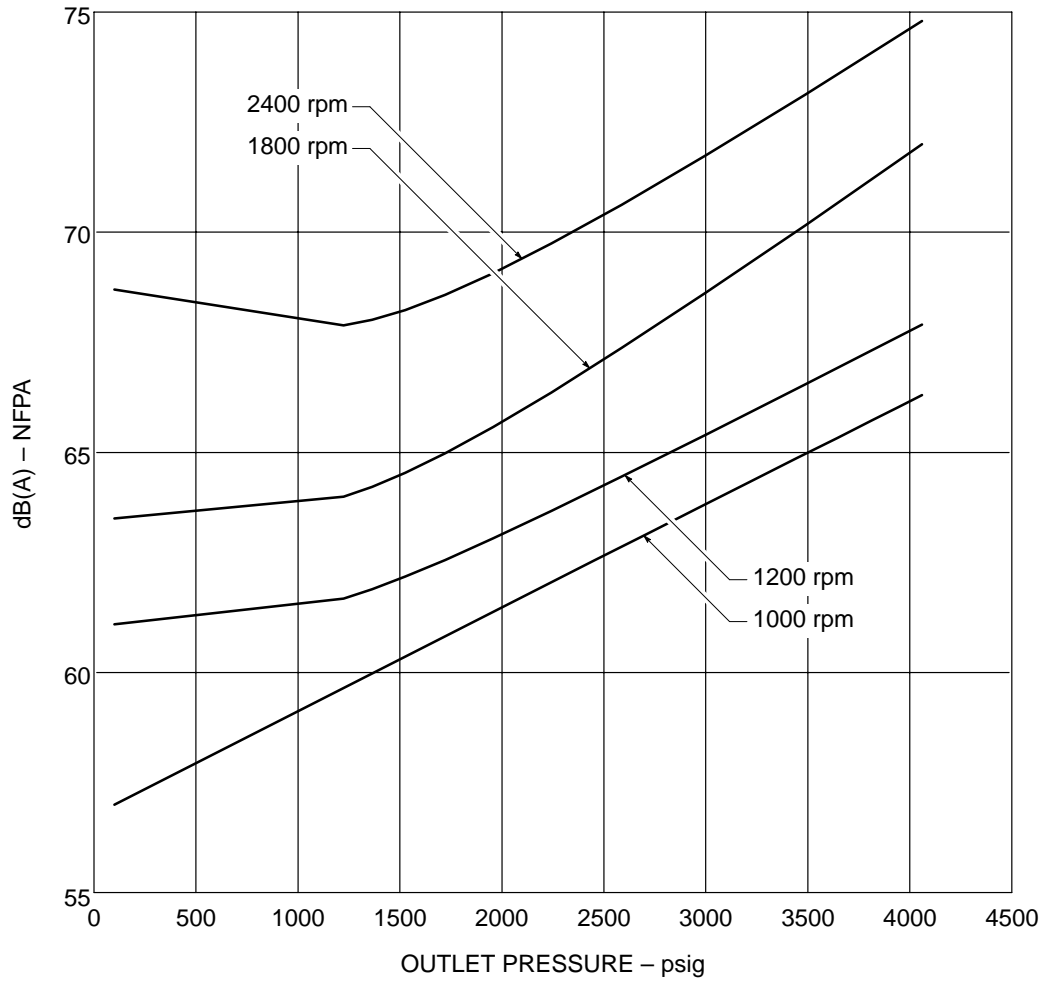
Notes:

Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Maximum speed rating for double pumps is limited to lowest speed rating of cartridges contained therein.

2525VPF Sound Data

120° F, SAE 10W oil, 0 psig inlet, both cartridges loaded

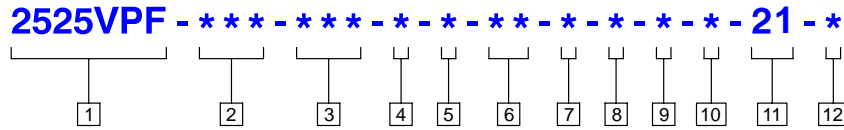


Delivery and Input Power

2525VPF delivery and input power can be determined from 25VPF curves.

[Click here for curves.](#)

2525VPF Model Code



1 Series designation (frame size)

2525VPF – 20 to 160 cm³/r
(1.24 to 9.76 in³/r)

2 Displacement – front section

- 010 – 10 cm³/r (0.62 in³/r)
- 016 – 16 cm³/r (0.98 in³/r)
- 025 – 25 cm³/r (1.58 in³/r)
- 032 – 32 cm³/r (1.96 in³/r)
- 040 – 40 cm³/r (2.44 in³/r)
- 050 – 50 cm³/r (3.05 in³/r)
- 063 – 63 cm³/r (3.84 in³/r)
- 071 – 71 cm³/r (4.33 in³/r)
- 080 – 80 cm³/r (4.88 in³/r)

3 Displacement – rear section

- 010 – 10 cm³/r (0.62 in³/r)
- 016 – 16 cm³/r (0.98 in³/r)
- 025 – 25 cm³/r (1.58 in³/r)
- 032 – 32 cm³/r (1.96 in³/r)
- 040 – 40 cm³/r (2.44 in³/r)
- 050 – 50 cm³/r (3.05 in³/r)
- 063 – 63 cm³/r (3.84 in³/r)
- 071 – 71 cm³/r (4.33 in³/r)
- 080 – 80 cm³/r (4.88 in³/r)

4 Port connection

- A – SAE 4-bolt flange (SAE J518)
- B – Metric 4-bolt flange (ISO 6162)

5 Flange mounting style

- A – SAE J744 101–2 (SAE B)
- B – ISO 3019/2 100A2HW
- C – SAE J744 127–2 (SAE C)
- D – ISO 3019/2 125A2HW

6 Shaft end

- 01 – SAE J744 25–1
(1.00 inch keyed shaft)
- 02 – SAE J744 25–4
(B–B splined shaft)
- 03 – ISO 3019/2 E25N
(25mm keyed shaft)
- 05 – SAE J744 32–1
(1.25 inch keyed shaft)
- 06 – SAE J744 32–4
(C splined shaft)
- 07 – ISO 3019/2 E32N
(32mm keyed shaft)

7 Shaft seal

- A – Single, primary
- B – Double, secondary (spring side out)
- C – Double, secondary (spring side in)

8 Seal type

- N – Standard, buna N
- V – Viton
- W – Buna N with Viton shaft seals

9 Outlet port no. 1 position (viewed from cover end)

- A – Outlet port no.1 opposite inlet port
- B – Outlet port no.1 90° counterclockwise from inlet port
- C – Outlet port no. 1 inline with inlet port
- D – Outlet port no.1 90° clockwise from inlet port

10 Outlet port no. 2 position (viewed from cover end)

- A – Outlet port no.2 opposite inlet port
- B – Outlet port no.2 90° counterclockwise from inlet port
- C – Outlet port no.2 inline with inlet port
- D – Outlet port no.2 90° clockwise from inlet port

11 Design level

Subject to change. Dimensions remain the same for designs 20 through 29.

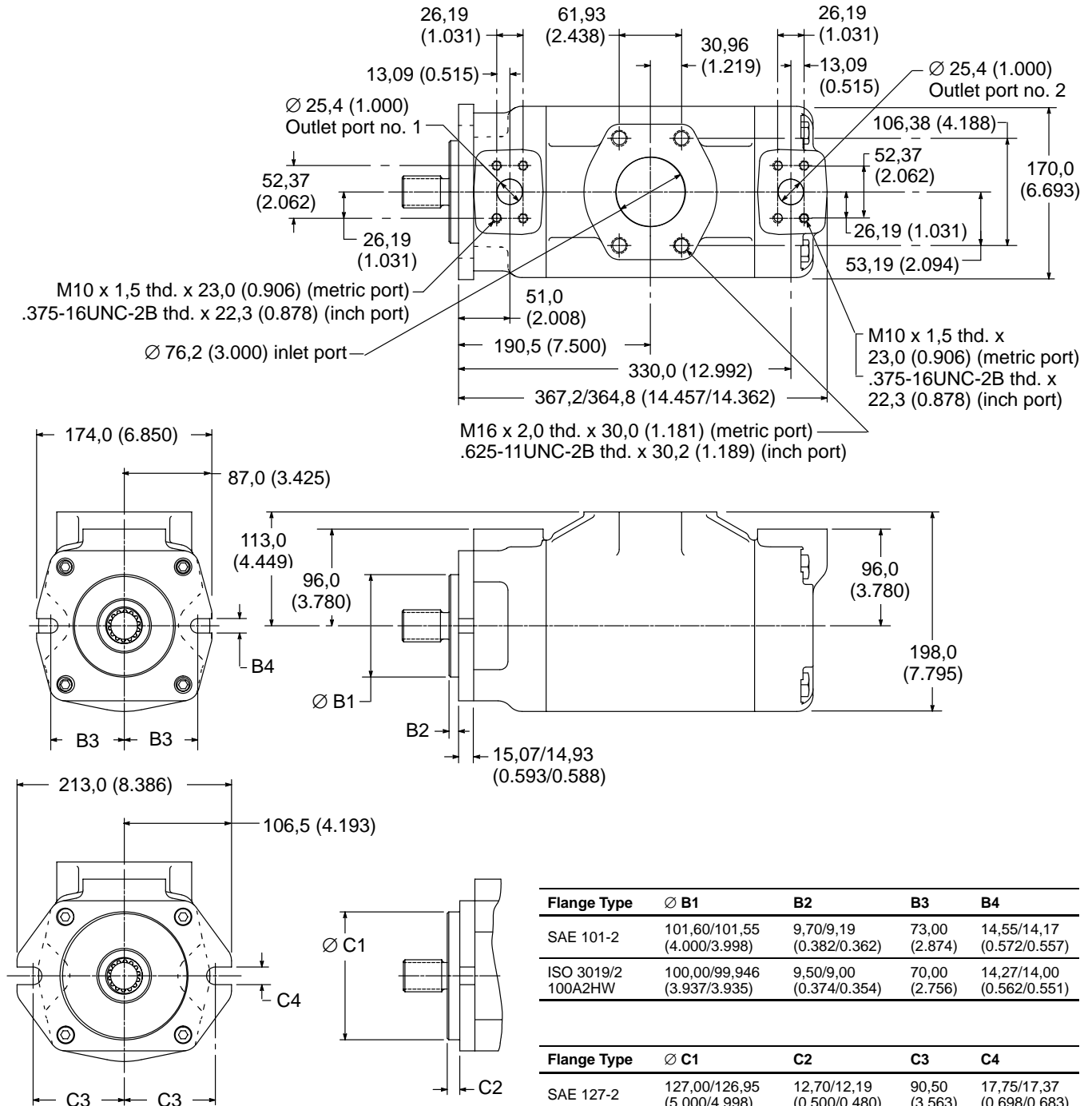
12 Rotation (viewed from shaft end)

- R – Right hand (clockwise)
- L – Left hand (counterclockwise)

2525VPF Installation Dimensions

Millimeters (inches)

 [Click here for shaft dimensions.](#)



Flange Type	$\varnothing B1$	B2	B3	B4
SAE 101-2	101,60/101,55 (4.000/3.998)	9,70/9,19 (0.382/0.362)	73,00 (2.874)	14,55/14,17 (0.572/0.557)
ISO 3019/2 100A2HW	100,00/99,946 (3.937/3.935)	9,50/9,00 (0.374/0.354)	70,00 (2.756)	14,27/14,00 (0.562/0.551)

Flange Type	$\varnothing C1$	C2	C3	C4
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)
ISO 3019/2 125A2HW	125,00/124,937 (4.921/4.919)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)

3525VPF and 3535VPF Typical Performance Data

Maximum Operating Pressure – Industrial

262 bar (3800 psi) for front section of 35**VPF, and for rear section of 3535VPF.

293 bar (4250 psi) for rear section of 3525VPF.

Maximum Operating Pressure – Mobile

250 bar (3625 psi) for front section of 35**VPF, and for rear section of 3535VPF.

280 bar (4060 psi) for rear section of 3525VPF.

Maximum Transient Pressure (peak <0.5 sec)

276 bar (4000 psi) for front section of 35**VPF, and for rear section of 3535VPF.

310 bar (4500 psi) for rear section of 3525VPF.

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
090	90 (5.49)	1800	121,8 (32.2)	50,1 (67.1)	149 (39.4)	60,0 (80.4)
100	100 (6.10)	1800	136,8 (36.2)	55,7 (74.7)	167 (44.1)	66,6 (89.4)
112	112 (6.83)	1800	154,6 (40.9)	62,3 (83.5)	189 (49.8)	74,6 (100.0)
125	125 (7.63)	1800	174,4 (46.1)	69,6 (93.3)	212 (56.0)	83,3 (112.0)
135	135 (8.24)	1800	189,4 (50.1)	75,2 (100.8)	230 (60.8)	90,0 (120.7)
010	10 (0.62)	1800	11,5 (3.0)	5,6 (7.5)	14,8 (3.9)	6,70 (9.0)
016	16 (0.98)	1800	20,4 (5.4)	8,8 (11.8)	25,5 (6.7)	10,6 (14.2)
025	25 (1.58)	1800	35,1 (9.3)	14,2 (19.05)	43,15 (11.4)	17,1 (22.9)
032	32 (1.96)	1800	44,5 (11.75)	17,6 (23.6)	54,4 (14.4)	21,2 (28.45)
040	40 (2.44)	1800	50,7 (13.4)	22,5 (30.1)	62,9 (16.6)	27,1 (36.3)
050	50 (3.05)	1800	65,8 (17.4)	28,2 (37.8)	80,9 (21.4)	33,8 (45.3)
063	63 (3.84)	1800	85,1 (22.5)	35,3 (47.4)	104,0 (27.5)	42,6 (57.1)
071	71 (4.33)	1800	97,15 (25.7)	40,0 (53.6)	119,0 (31.4)	48,0 (64.4)
080	80 (4.88)	1800	110,8 (29.3)	45,1 (60.5)	135,0 (35.6)	54,1 (72.5)

Notes:

Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Maximum speed rating for double pumps is limited to lowest speed rating of cartridges contained therein.

3525VPF and 3535VPF Typical Performance Data

Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
090	90 (5.49)	2400	188,6 (49.9)	79,9 (107.1)
100	100 (6.10)	2400	212,4 (56.2)	89,0 (119.4)
112	112 (6.83)	2400	241,2 (63.8)	99,5 (133.4)
125	125 (7.63)	2400	272,6 (72.0)	111,0 (148.9)
135	135 (8.24)	2200	270 (71.4)	110,2 (147.7)
010	10 (0.62)	3000	22,8 (6.0)	11,2 (15.0)
016	16 (0.98)	3000	40,5 (10.7)	17,7 (23.8)
025	25 (1.58)	3000	70.0 (18.5)	28,6 (38.3)
032	32 (1.96)	3000	88,7 (23.4)	35,5 (47.5)
040	40 (2.44)	2600	84,5 (22.4)	38,9 (52.2)
050	50 (3.05)	2600	110,8 (29.3)	48,7 (65.3)
063	63 (3.84)	2600	144,0 (38.1)	61,3 (82.2)
071	71 (4.33)	2600	165,0 (43.6)	69,0 (92.5)
080	80 (4.88)	2600	188,4 (49.8)	77,7 (104.2)

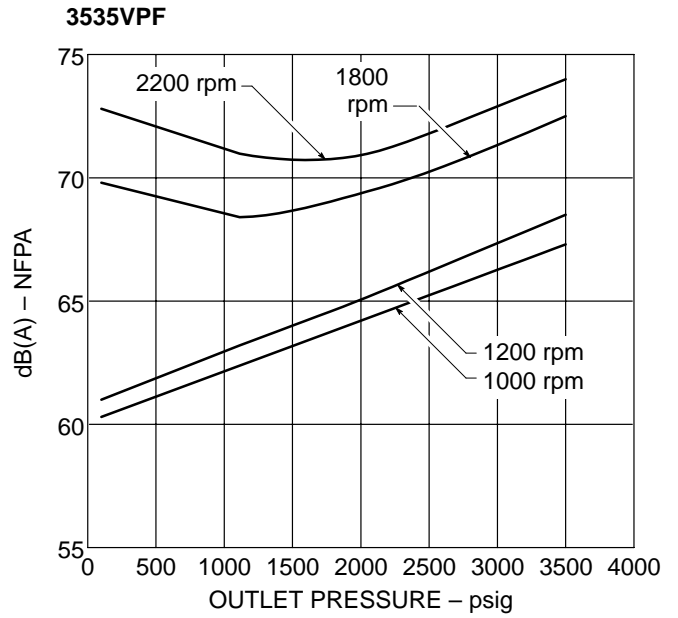
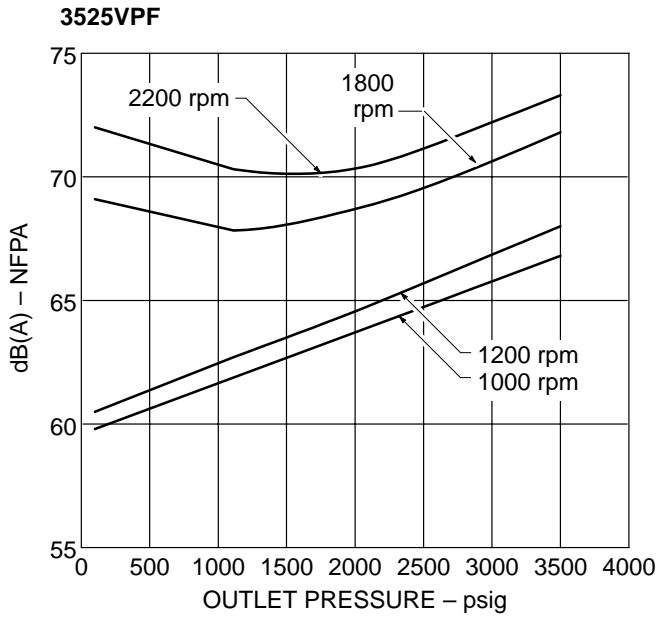
Notes:

Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Maximum speed rating for double pumps is limited to lowest speed rating of cartridges contained therein.

3525VPF and 3535VPF Sound Data

120° F, SAE 10W oil, 0 psig inlet, both cartridges loaded



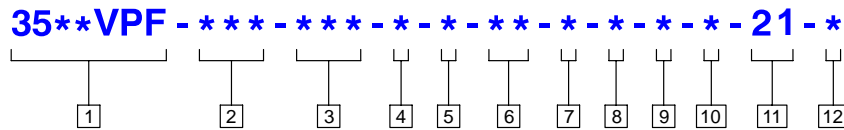
Delivery and Input Power

3525VPF and 3535VPF delivery and input power can be determined from 35VPF curves and 25VPF curves.

[Click here for 35VPF curves.](#)

[Click here for 25VPF curves.](#)

3525VPF and 3535VPF Model Codes



1 Series designation (frame size)

3525VPF – 100 to 215 cm³/r
(6.11 to 13.12 in³/r)

3535VPF – 180 to 270 cm³/r
(10.98 to 16.48 in³/r)

2 Displacement – front section

35**VPF

090 – 90 cm³/r (5.49 in³/r)
 100 – 100 cm³/r (6.10 in³/r)
 112 – 112 cm³/r (6.83 in³/r)
 125 – 125 cm³/r (7.63 in³/r)
 135 – 135 cm³/r (8.24 in³/r)

3 Displacement – rear section

**25VPF

010 – 10 cm³/r (0.62 in³/r)
 016 – 16 cm³/r (0.98 in³/r)
 025 – 25 cm³/r (1.53 in³/r)
 032 – 32 cm³/r (1.95 in³/r)
 040 – 40 cm³/r (2.44 in³/r)
 050 – 50 cm³/r (3.05 in³/r)
 063 – 63 cm³/r (3.84 in³/r)
 071 – 71 cm³/r (4.33 in³/r)
 080 – 80 cm³/r (4.88 in³/r)

**35VPF

090 – 90 cm³/r (5.49 in³/r)
 100 – 100 cm³/r (6.10 in³/r)
 112 – 112 cm³/r (6.83 in³/r)
 125 – 125 cm³/r (7.625 in³/r)
 135 – 135 cm³/r (8.24 in³/r)

4 Port connection

A – SAE 4-bolt flange (SAE J518)
 B – Metric 4-bolt flange (ISO 6162)

5 Flange mounting style

A – SAE J744 127–2 (SAE C)
 B – ISO 3019/2 125A2HW
 C – SAE J744 152–2 (SAE D)
 D – ISO 3019/2 160A2HW

6 Shaft end

01 – SAE J744 32–1
(1.25 in keyed shaft)
 02 – SAE J744 32–4
(C splined shaft)
 03 – ISO 3019/2 E32N
(32mm keyed shaft)
 05 – SAE J744 38–1
(1.50 in keyed shaft)
 06 – SAE J744 38–4
(C–C splined shaft)
 07 – ISO 3019/2 E40N
(40mm keyed shaft)

7 Shaft seal

A – Single, primary
 B – Double, secondary (spring side out)
 C – Double, secondary (spring side in)

8 Seal type

N – Standard, buna N
 V – Viton
 W – Buna N with Viton shaft seals

9 Outlet port no. 1 position (viewed from cover end)

A – Outlet port no. 1 opposite inlet port
 B – Outlet port no.1 90°
 counterclockwise from inlet port
 C – Outlet port no.1 in line with
 inlet port
 D – Outlet port no.1 90° clockwise from
 inlet port

10 Outlet port no. 2 position (viewed from cover end)

3525VPF

A – Outlet port no.2 135°
 counterclockwise from inlet port
 B – Outlet port no.2 45°
 counterclockwise from inlet port
 C – Outlet port no.2 45° clockwise from
 inlet port
 D – Outlet port no.2 135° clockwise
 from inlet port

3535VPF

A – Outlet port no.2 opposite inlet port
 B – Outlet port no.2 90°
 counterclockwise from inlet port
 C – Outlet port no.2 in line with
 inlet port
 D – Outlet port no.2 90° clockwise
 from inlet port

11 Design level

Subject to change. Dimensions remain
 the same for designs 20 through 29.

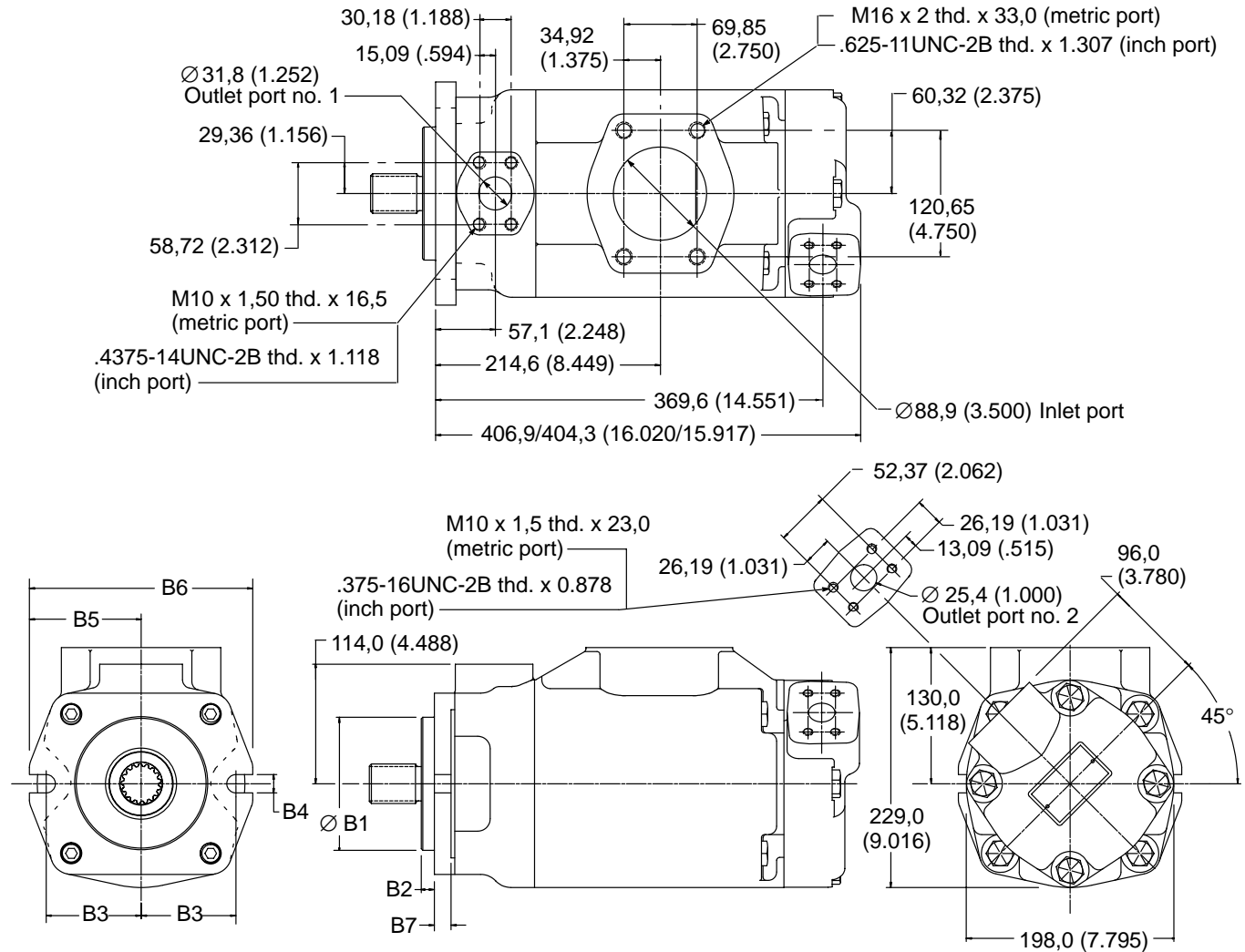
12 Rotation (viewed from shaft end)

R – Right hand (clockwise)
 L – Left hand (counterclockwise)

3525VPF Installation Dimensions

Millimeters (inches)

[Click here for shaft dimensions.](#)

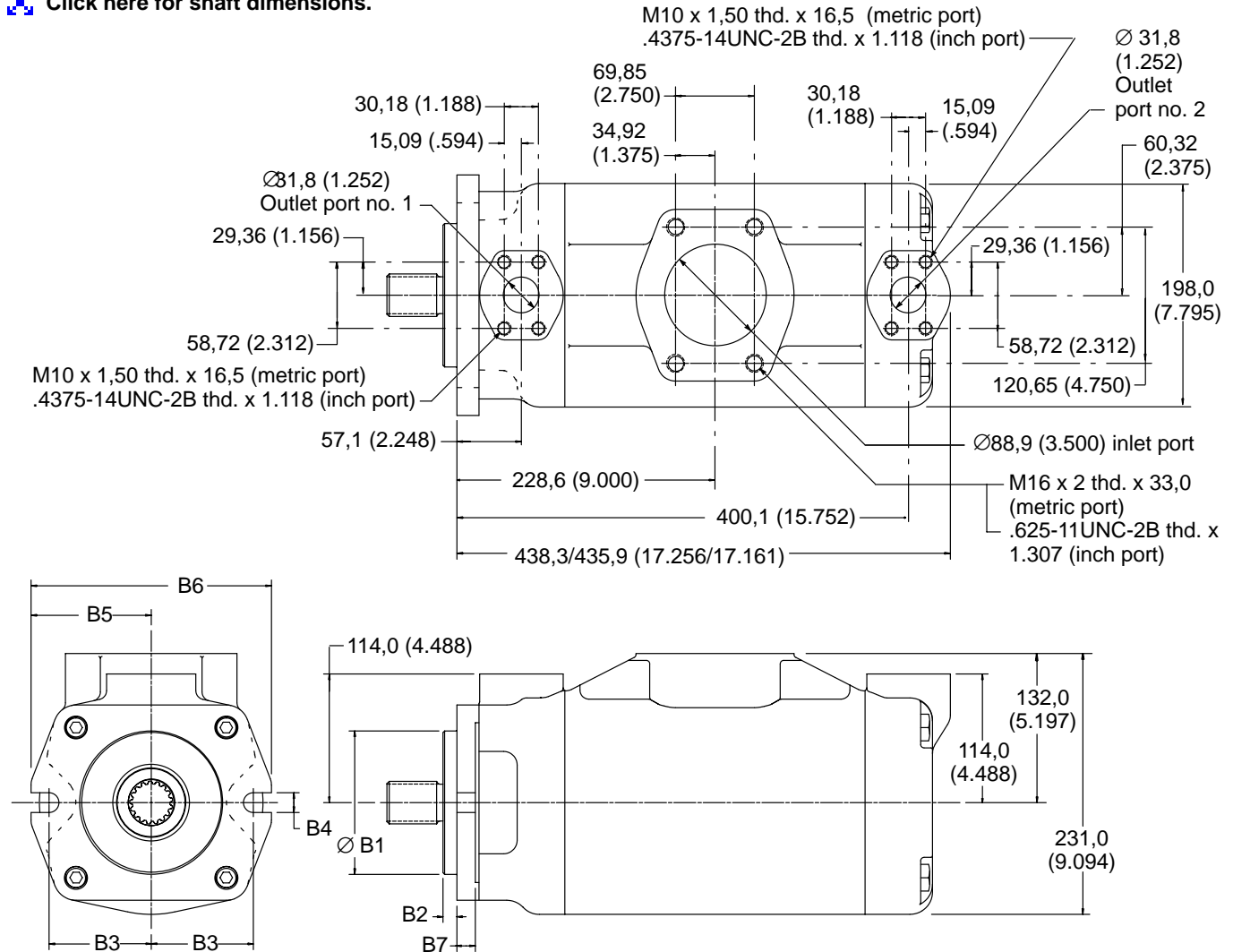


Flange Type	$\text{Ø} B1$	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.919)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.297)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)

3535VPF Installation Dimensions

Millimeters (inches)

[Click here for shaft dimensions.](#)



Flange Type	Ø B1	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.919)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.297)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)

4525VPF, 4535VPF, and 4545VPF Typical Performance Data

Maximum Operating Pressure – Industrial

262 bar (3800 psi) for front section of 45**VPF, and for rear section of 4535VPF and 4545VPF.

293 bar (4250 psi) for rear section of 4525VPF.

Maximum Operating Pressure – Mobile

250 bar (3625 psi) for front section of 45**VPF, and for rear section of 4535VPF and 4545VPF.

280 bar (4060 psi) for rear section of 4525VPF.

Maximum Transient Pressure (peak <0.5 sec)

276 bar (4000 psi) for front section of 45**VPF, and for rear section of 4535VPF and 4545VPF.

310 bar (4500 psi) for rear section of 4525VPF.

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
140	140 (8.54)	1800	190,4 (50.3)	75,2 (100.8)	232,4 (61,4)	90,6 (121.5)
160	160 (9.76)	1800	220,3 (58.2)	85,9 (115.2)	268,4 (70.9)	103,6 (138.8)
180	180 (10.98)	1800	250,2 (66.1)	96,7 (129.6)	304,3 (80.4)	116,5 (156.2)
195	195 (11.89)	1800	272,2 (72.0)	104,7 (140.4)	331,2 (87.5)	126,2 (169.1)
090	90 (5.49)	1800	121,8 (32.2)	50,1 (67.1)	149 (39.4)	60,0 (80.4)
100	100 (6.10)	1800	136,8 (36.2)	55,7 (74.7)	167 (44.1)	66,6 (89.4)
112	112 (6.83)	1800	154,6 (40.9)	62,3 (83.5)	189 (49.8)	74,6 (100.0)
125	125 (7.63)	1800	174,4 (46.1)	69,6 (93.3)	212 (56.0)	83,3 (112.0)
135	135 (8.24)	1800	189,4 (50.1)	75,2 (100.8)	230 (60.8)	90,0 (120.7)
010	10 (0.62)	1800	11,5 (3.0)	5,6 (7.5)	14,8 (3.9)	6,70 (9.0)
016	16 (0.98)	1800	20,4 (5.4)	8,8 (11.8)	25,5 (6.7)	10,6 (14.2)
025	25 (1.58)	1800	35,1 (9.3)	14,2 (19.05)	43,15 (11.4)	17,1 (22.9)
032	32 (1.96)	1800	44,5 (11.75)	17,6 (23.6)	54,4 (14.4)	21,2 (28.45)
040	40 (2.44)	1800	50,7 (13.4)	22,5 (30.1)	62,9 (16.6)	27,1 (36.3)
050	50 (3.05)	1800	65,8 (17.4)	28,2 (37.8)	80,9 (21.4)	33,8 (45.3)
063	63 (3.84)	1800	85,1 (22.5)	35,3 (47.4)	104,0 (27.5)	42,6 (57.1)
071	71 (4.33)	1800	97,15 (25.7)	40,0 (53.6)	119,0 (31.4)	48,0 (64.4)
080	80 (4.88)	1800	110,8 (29.3)	45,1 (60.5)	135,0 (35.6)	54,1 (72.5)

Notes:

Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Maximum speed rating for double pumps is limited to lowest speed rating of cartridges contained therein.

4525VPF, 4535VPF, and 4545VPF Typical Performance Data

Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
140	140 (8.54)	2200	267,2 (70.6)	110,5 (148.1)
160	160 (9.76)	2200	311,2 (82.2)	126,2 (169.3)
180	180 (10.98)	2200	355,1 (93.8)	142,1 (190.5)
195	195 (11.89)	2200	388,0 (102.5)	153,8 (206.2)
090	90 (5.49)	2400	188,6 (49.9)	79,9 (107.1)
100	100 (6.10)	2400	212,4 (56.2)	89,0 (119.4)
112	112 (6.83)	2400	241,2 (63.8)	99,5 (133.4)
125	125 (7.63)	2400	272,6 (72.0)	111,0 (148.9)
135	135 (8.24)	2200	270 (71.4)	110,2 (147.7)
010	10 (0.62)	3000	22,8 (6.0)	11,2 (15.0)
016	16 (0.98)	3000	40,5 (10.7)	17,7 (23.8)
025	25 (1.58)	3000	70,0 (18.5)	28,6 (38.3)
032	32 (1.96)	3000	88,7 (23.4)	35,5 (47.5)
040	40 (2.44)	2600	84,5 (22.4)	38,9 (52.2)
050	50 (3.05)	2600	110,8 (29.3)	48,7 (65.3)
063	63 (3.84)	2600	144,0 (38.1)	61,3 (82.2)
071	71 (4.33)	2600	165,0 (43.6)	69,0 (92.5)
080	80 (4.88)	2600	188,4 (4.98)	77,7 (104.2)


Notes:


Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.


Maximum speed rating for double pumps is limited to lowest speed rating of cartridges contained therein.

Delivery and Input Power

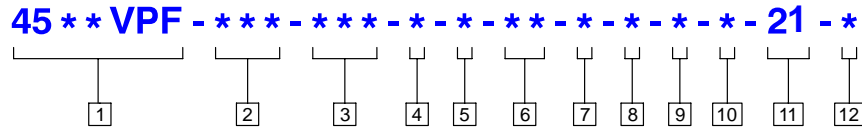
4525VPF, 4535VPF, and 4545VPF delivery and input power can be determined from 45VPF curves, 35VPF curves, and 25VPF curves.

 [Click here for 45VPF curves.](#)

 [Click here for 35VPF curves.](#)

 [Click here for 25VPF curves.](#)

4525VPF, 4535VPF, and 4545VPF Model Codes

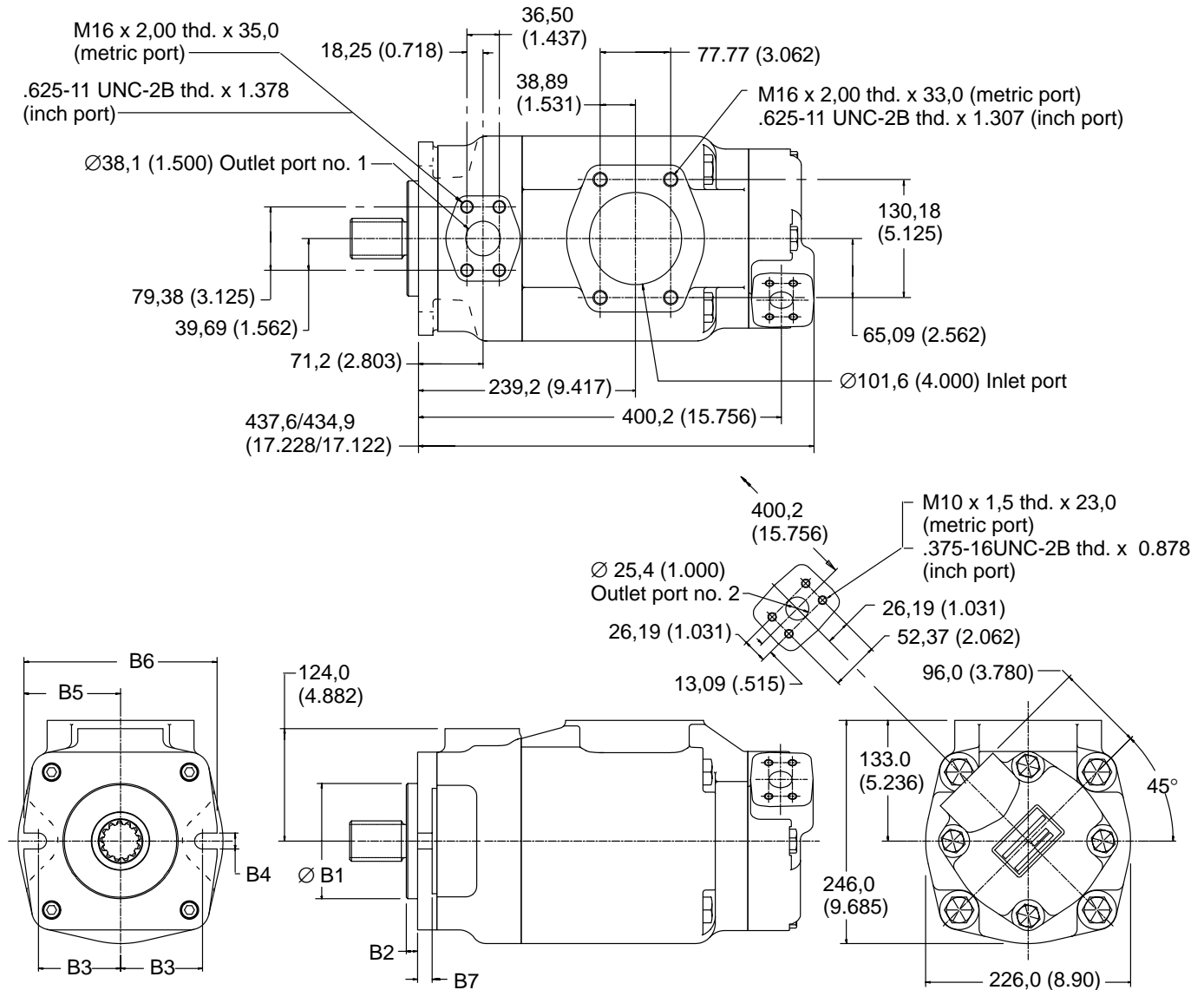


<p>1 Series designation (frame size)</p> <p>4525VPF – 150 to 275 cm³/r (9.16 to 16.77 in³/r)</p> <p>4535VPF – 230 to 330 cm³/r (14.03 to 20.13 in³/r)</p> <p>4545VPF – 280 to 390 cm³/r (17.08 to 23.78 in³/r)</p>	<p>**45VPF</p> <p>140 – 140 cm³/r (8.54 in³/r) 160 – 160 cm³/r (9.76 in³/r) 180 – 180 cm³/r (10.98 in³/r) 195 – 195 cm³/r (11.89 in³/r)</p> <hr/> <p>4 Port connection</p> <p>A – SAE 4-bolt flange (SAE J518) B – Metric 4-bolt flange (ISO 6162)</p>	<p>9 Outlet port no. 1 position (viewed from cover end)</p> <p>A – Outlet port no. 1 opposite inlet port B – Outlet port no.1 90° counterclockwise from inlet port C – Outlet port no.1 in line with inlet port D – Outlet port no.1 90° clockwise from inlet port</p>
<p>2 Displacement – front section</p> <p>45**VPF</p> <p>140 – 140 cm³/r (8.54 in³/r) 160 – 160 cm³/r (9.76 in³/r) 180 – 180 cm³/r (10.98 in³/r) 195 – 195 cm³/r (11.89 in³/r)</p>	<p>5 Flange mounting style</p> <p>A – SAE J744 127–2 (SAE C) B – ISO 3019/2 125A2HW C – SAE J744 152–2 (SAE D) D – ISO 3019/2 160A2HW</p>	<p>10 Outlet port no. 2 position (viewed from cover end)</p> <p>4525VPF and 4535VPF</p> <p>A – Outlet port no.2 135° counterclockwise from inlet port B – Outlet port no.2 45° counterclockwise from inlet port C – Outlet port no.2 45° clockwise from inlet port D – Outlet port no.2 135° clockwise from inlet port</p>
<p>3 Displacement – rear section</p> <p>**25VPF</p> <p>010 – 10 cm³/r (0.62 in³/r) 016 – 16 cm³/r (0.98 in³/r) 025 – 25 cm³/r (1.58 in³/r) 032 – 32 cm³/r (1.96 in³/r) 040 – 40 cm³/r (2.44 in³/r) 050 – 50 cm³/r (3.05 in³/r) 063 – 63 cm³/r (3.84 in³/r) 071 – 71 cm³/r (4.33 in³/r) 080 – 80 cm³/r (4.88 in³/r)</p>	<p>6 Shaft end</p> <p>01 – SAE J744 38–1 (1.50 inch keyed shaft) 02 – SAE J744 38–4 (C-C splined shaft) 03 – ISO 3019/2 E40N (40mm keyed shaft) 05 – SAE J744 44–1 (1.75 inch keyed shaft) 06 – SAE J744 44–4 (D splined shaft)</p>	<p>4545VPF only</p> <p>A – Outlet port no.2 opposite inlet port B – Outlet port no.2 90° counterclockwise from inlet port C – Outlet port no.2 in line with inlet port D – Outlet port no.2 90° clockwise from inlet port</p>
<p>**35VPF</p> <p>090 – 90 cm³/r (5.49 in³/r) 100 – 100 cm³/r (6.10 in³/r) 112 – 112 cm³/r (6.83 in³/r) 125 – 125 cm³/r (7.63 in³/r) 135 – 135 cm³/r (8.24 in³/r)</p>	<p>7 Shaft seal</p> <p>A – Single, primary B – Double, secondary (spring side out) C – Double, secondary (spring side in)</p>	<p>11 Design level</p> <p>Subject to change. Dimensions remain the same for designs 20 through 29.</p>
	<p>8 Seal type</p> <p>N – Standard, buna N V – Viton W – Buna N with Viton shaft seals</p>	<p>12 Rotation (viewed from shaft end)</p> <p>R – Right hand (clockwise) L – Left hand (counterclockwise)</p>

4525VPF Installation Dimensions

Millimeters (inches)

 [Click here for shaft dimensions.](#)

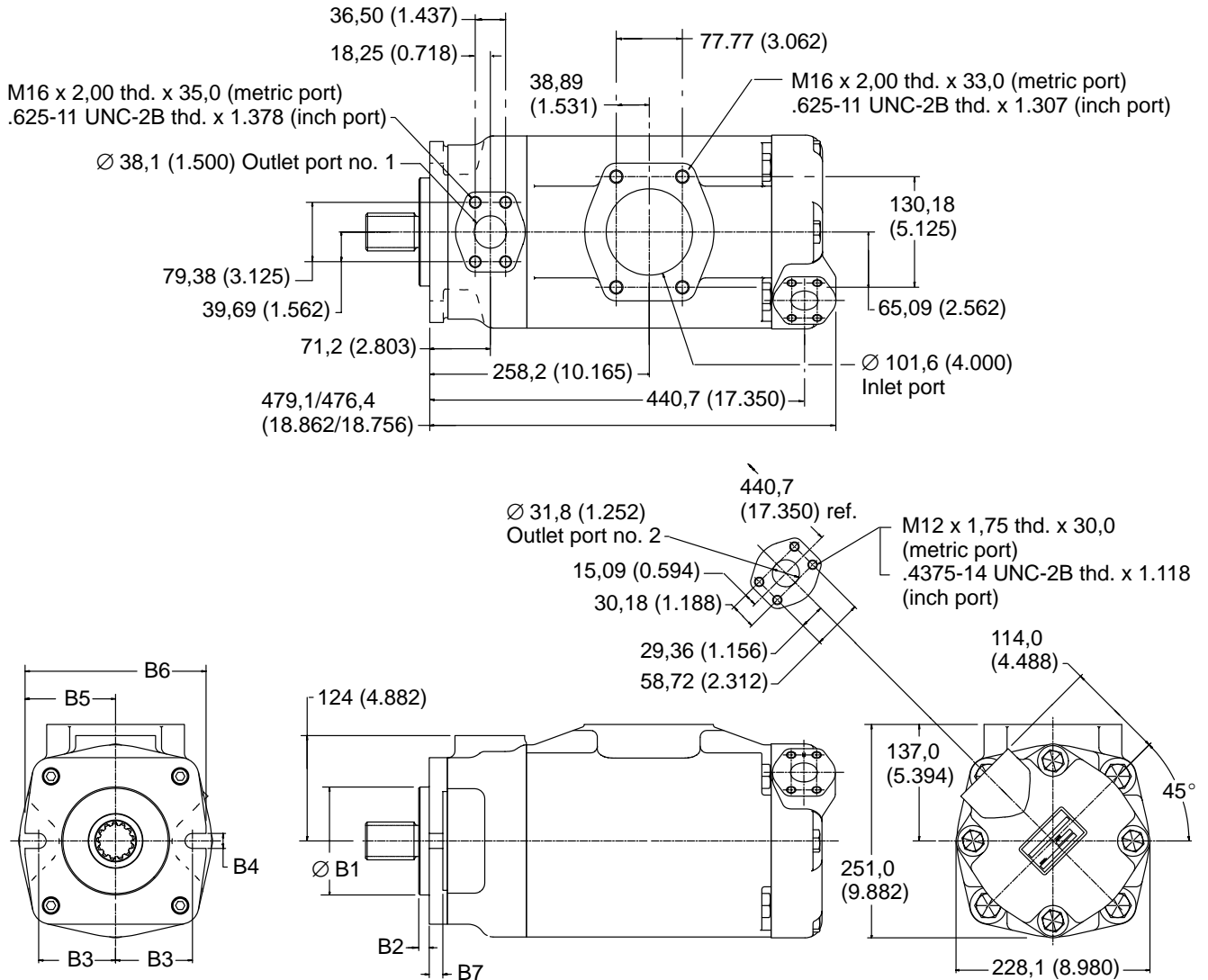


Flange Type	Ø B1	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.918)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.296)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)

4535VPF Installation Dimensions

Millimeters (inches)

 [Click here for shaft dimensions.](#)

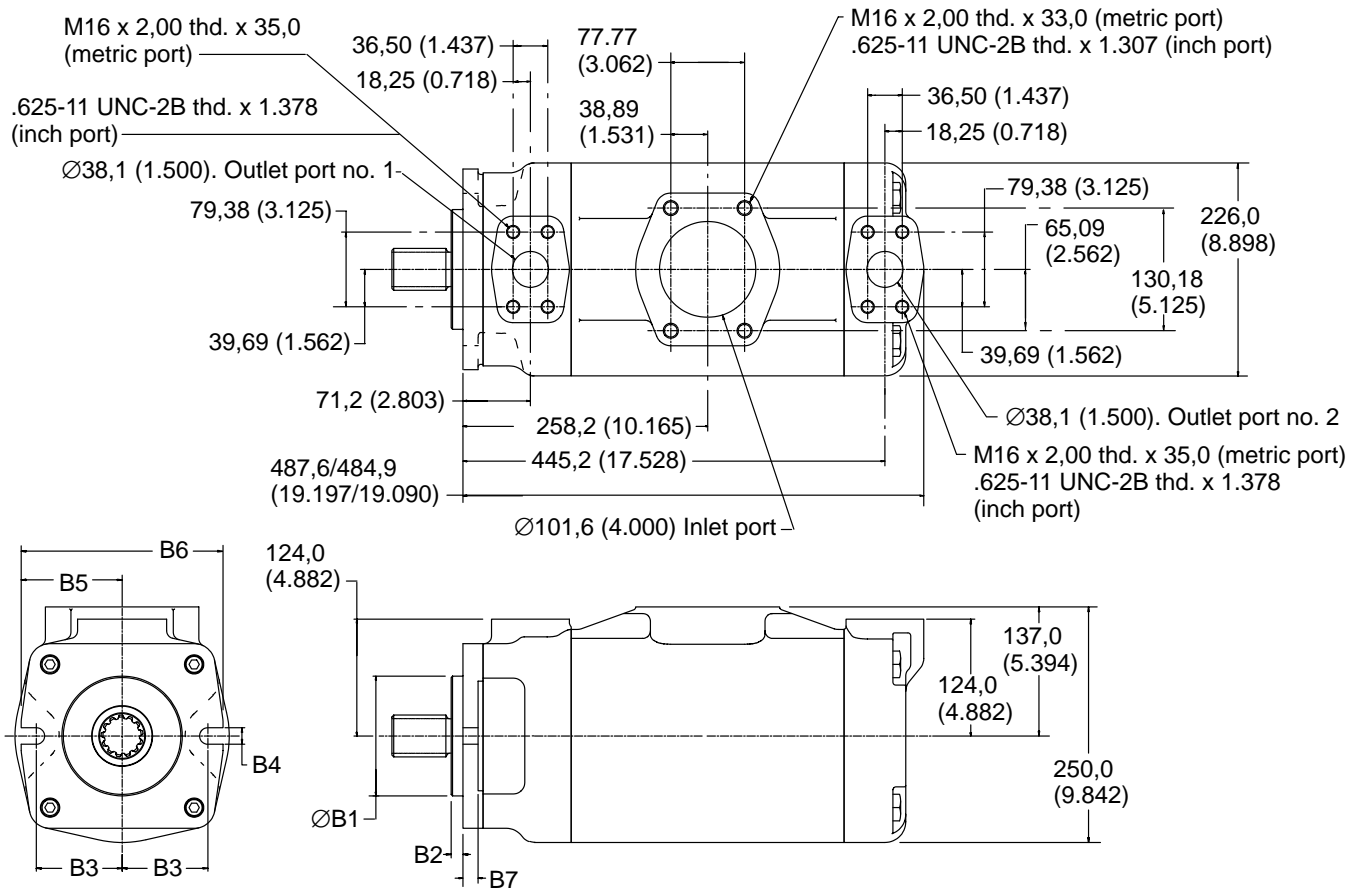


Flange Type	$\varnothing B1$	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.918)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.296)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)

4545VPF Installation Dimensions

Millimeters (inches)

[Click here for shaft dimensions.](#)



Flange Type	$\text{Ø} B1$	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.918)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.296)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)

25VPFT Typical Performance Data

Maximum Operating Pressure

Industrial – 293 bar (4250 psi)

Mobile – 280 bar (4060 psi)

Maximum Transient Pressure (peak < 0.5 sec)

310 bar (4500 psi)

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
010	10 (0.62)	1800	11,5 (3.0)	5,6 (7.5)	14,8 (3.9)	6,70 (9.0)
016	16 (0.98)	1800	20,4 (5.4)	8,8 (11.8)	25,5 (6.7)	10,6 (14.2)
025	25 (1.58)	1800	35,1 (9.3)	14,2 (19.05)	43,15 (11.4)	17,1 (22.9)
032	32 (1.96)	1800	44,5 (11.75)	17,6 (23.6)	54,4 (14.4)	21,2 (28.45)
040	40 (2.44)	1800	50,7 (13.4)	22,5 (30.1)	62,9 (16.6)	27,1 (36.3)
050	50 (3.05)	1800	65,8 (17.4)	28,2 (37.8)	80,9 (21.4)	33,8 (45.3)
063	63 (3.84)	1800	85,1 (22.5)	35,3 (47.4)	104,0 (27.5)	42,6 (57.1)
071	71 (4.33)	1800	97,15 (25.7)	40,0 (53.6)	119,0 (31.4)	48,0 (64.4)
080	80 (4.88)	1800	110,8 (29.3)	45,1 (60.5)	135,0 (35.6)	54,1 (72.5)

Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

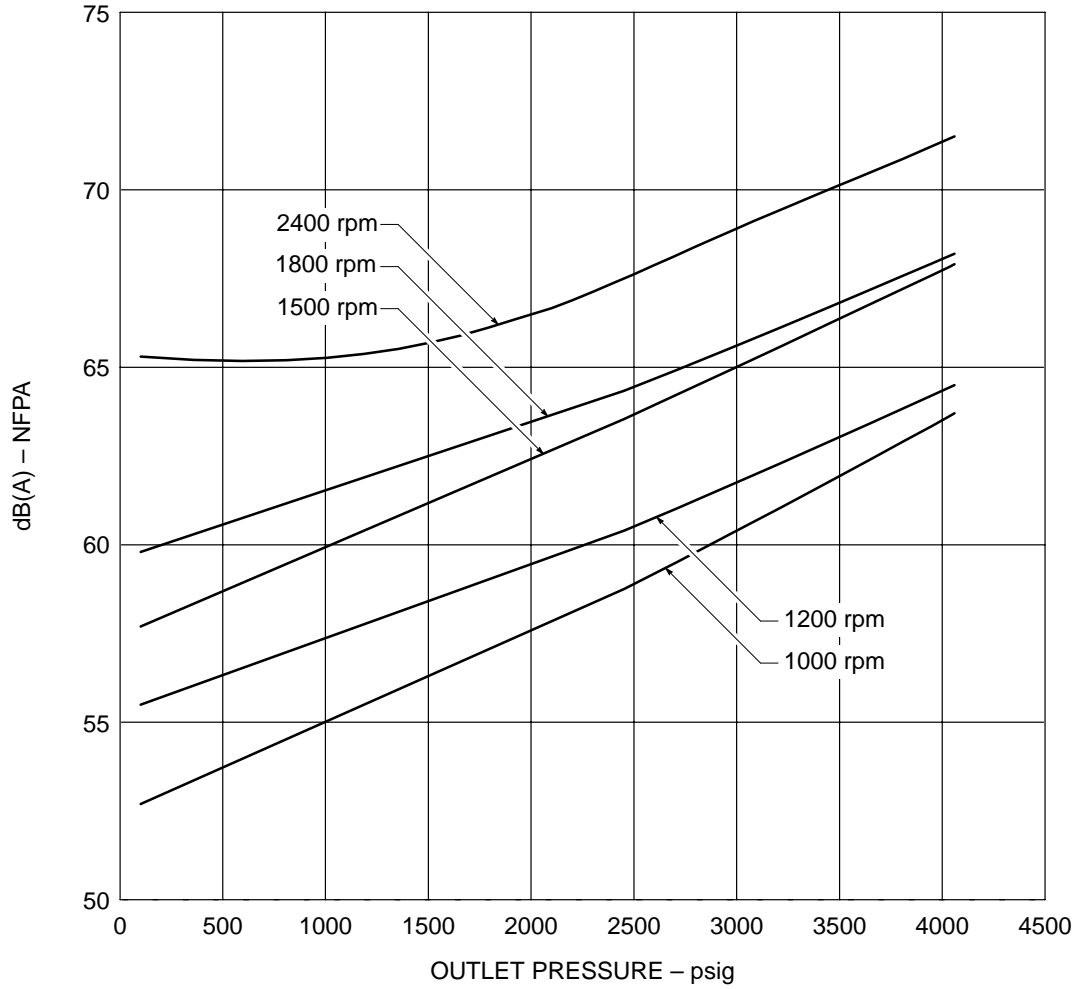
Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
010	10 (0.62)	3000	22,8 (6.0)	11,2 (15.0)
016	16 (0.98)	3000	40,5 (10.7)	17,7 (23.8)
025	25 (1.58)	3000	70,0 (18.5)	28,6 (38.3)
032	32 (1.96)	3000	88,7 (23.4)	35,5 (47.5)
040	40 (2.44)	2600	84,5 (22.4)	38,9 (52.2)
050	50 (3.05)	2600	110,8 (29.3)	48,7 (65.3)
063	63 (3.84)	2600	144,0 (38.1)	61,3 (82.2)
071	71 (4.33)	2600	165,0 (43.6)	69,0 (92.5)
080	80 (4.88)	2600	188,4 (49.8)	77,7 (104.2)

Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.


25VPFT Sound Data

120° F, SAE 10W oil, 0 psig inlet



Delivery and Input Power

25VPFT delivery and input power can be determined from 25VPF curves.

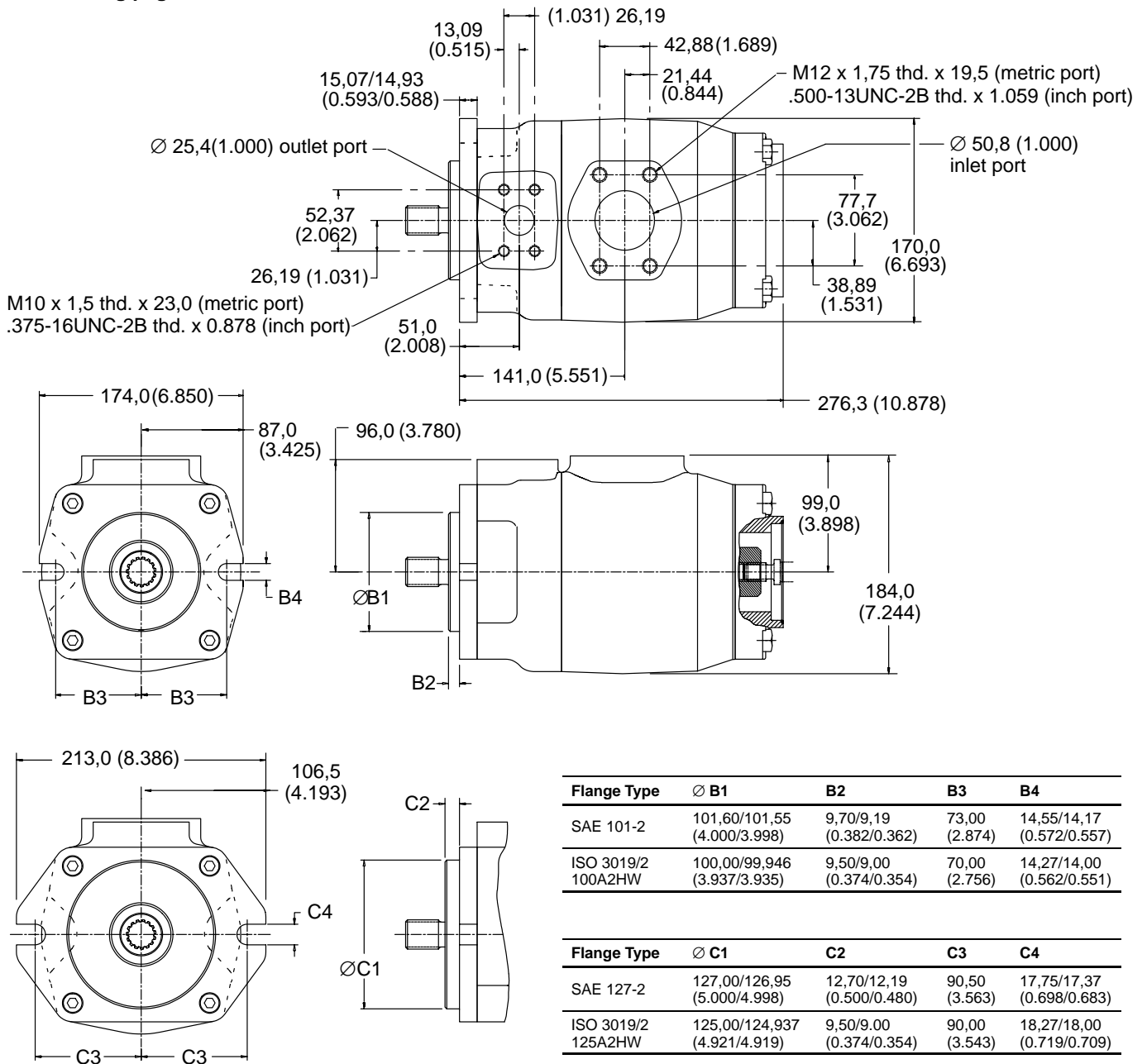
 [Click here for curves.](#)

25VPFT Installation Dimensions

Millimeters (inches)

[Click here for shaft dimensions.](#)

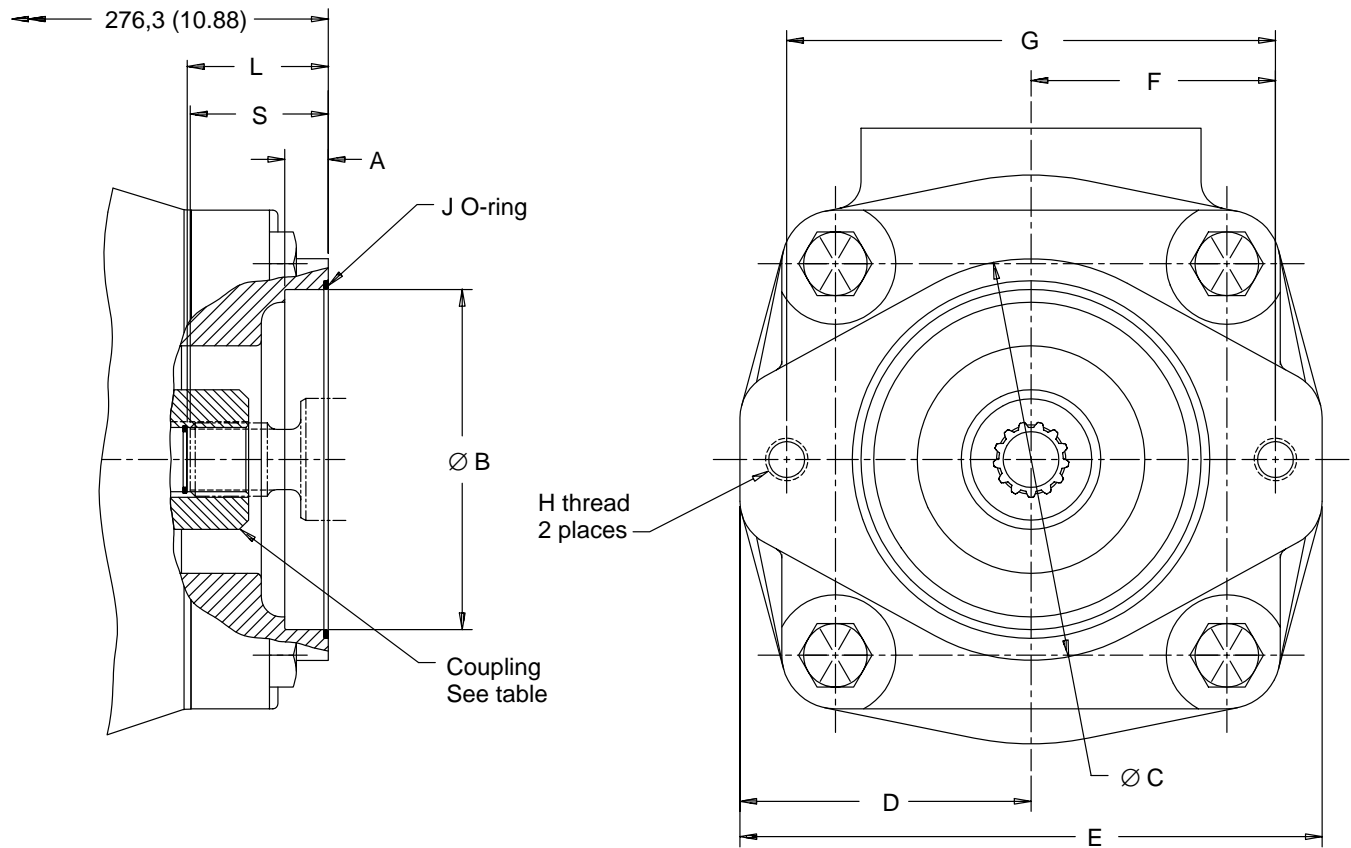
For rear mounting dimensions, see following page.



25VPFT Installation Dimensions

Millimeters (inches)

For other installation dimensions,
see preceding page.



Couplings

Coupling Code	Coupling Description	S Shaft Extension	L Min.
16	For pump shaft of SAE "A" size (per SAE std J744 Jul88) with a 9T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	32,8/31,2 (1.291/1.228)	33,1 (1.303)
22	For pump shaft of SAE "B" size (per SAE std J744 Jul88) with a 13T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	41,8/40,2 (1.646/1.583)	42,1 (1.657)
25	For pump shaft of SAE "B-B" size (per SAE std J744 Jul88) with a 15T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	46,8/45,2 (1.842/1.780)	46,9 (1.846)

Rear Flanges

Rear Mount Style Code	A	Ø B	Ø C	D	E	F	G	H	J
A (SAE A)	10,25 (0.403)	82,63/82,58 (3.253/3.251)	95,0 (3.740)	65,2 (2.567)	130,4 (5.134)	53,19 (2.094)	106,38 (4.188)	.375-16UNC-2B 19,0 (.748) min. deep	AS 568-042
B (SAE B)	13,00 (0.512)	101,68/101,63 (4.003/4.001)	120,0 (4.724)	87,0 (3.425)	174,0 (6.850)	73,02 (2.875)	146,05 (5.750)	.500-13UNC-2B thru	AS 568-045

35VPFT Performance Data

Maximum Operating Pressure

Industrial – 262 bar (3800 psi)
 Mobile – 250 bar (3625 psi)

Maximum Transient Pressure (peak <0.5 sec)

276 bar (4000 psi)

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE10W oil, 0 psig inlet

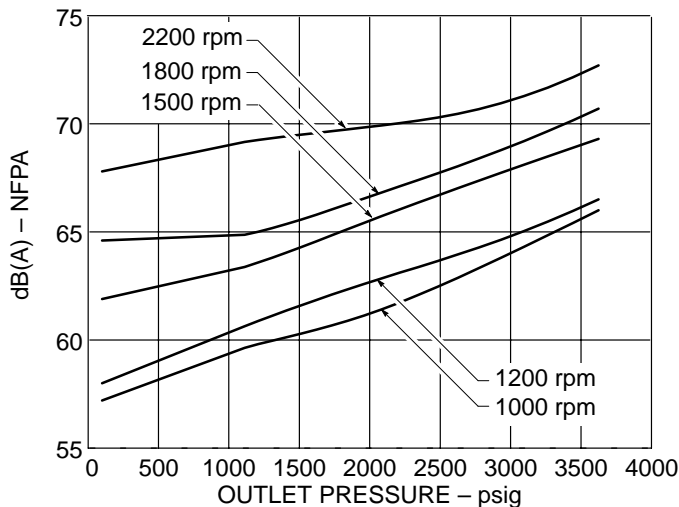
Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
090	90 (5.49)	1800	121,8 (32.2)	50,1 (67.1)	149 (39.4)	60,0 (80.4)
100	100 (6.10)	1800	136,8 (36.2)	55,7 (74.7)	167 (44.1)	66,6 (89.4)
112	112 (6.83)	1800	154,6 (40.9)	62,3 (83.5)	189 (49.8)	74,6 (100.0)
125	125 (7.63)	1800	174,4 (46.1)	69,6 (93.3)	212 (56.0)	83,3 (112.0)
135	135 (8.24)	1800	189,4 (50.1)	75,2 (100.8)	230 (60.8)	90,0 (120.7)

Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
090	90 (5.49)	2400	188,6 (49.9)	79,9 (107.1)
100	100 (6.10)	2400	212,4 (56.2)	89,0 (119.4)
112	112 (6.83)	2400	241,2 (63.8)	99,5 (133.4)
125	125 (7.63)	2400	272,6 (72.0)	111,0 (148.9)
135	135 (8.24)	2200	270 (71.4)	110,2 (147.7)

Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Sound Data 120° F, SAE 10W oil, 0 psig inlet

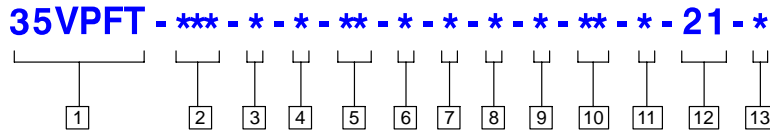


Delivery and Input Power

35VPFT delivery and input power can be determined from 35VPF curves.

[Click here for curves.](#)

35VPFT Model Code



1 Series designation (frame size)

35VPFT – 90 to 135 cm³/r
(5.49 to 8.24 in³/r)

2 Displacement

090 – 90 cm³/r (5.49 in³/r)
 100 – 100 cm³/r (6.10 in³/r)
 112 – 112 cm³/r (6.83 in³/r)
 125 – 125 cm³/r (7.63 in³/r)
 135 – 135 cm³/r (8.24 in³/r)

3 Port connection

A – SAE 4-bolt flange (SAE J518)
 B – Metric 4-bolt flange (ISO 6162)

4 Flange mounting style

A – SAE J744 127–2 (SAE C)
 B – ISO 3019/2 125A2HW
 C – SAE J744 152–2 (SAE D)
 D – ISO 3019/2 160A2HW

5 Shaft end

01 – SAE J744 32–1
(1.25 inch keyed shaft)
 02 – SAE J744 32–4
(C splined shaft)
 03 – ISO 3019/2 E32N
(32mm keyed shaft)
 05 – SAE J744 38–1
(1.50 inch keyed shaft)
 06 – SAE J744 38–4
(C-C splined shaft)
 07 – ISO 3019/2 E40N
(40mm keyed shaft)

6 Shaft seal

A – Single, primary
 B – Double, secondary (spring side out)
 C – Double, secondary (spring side in)

7 Seal type

N – Standard, buna N
 V – Viton
 W – Buna N with Viton shaft seals

8 Outlet port position (viewed from adapter end)

A – Outlet port opposite inlet port
 B – Outlet port 90° counterclockwise from inlet port
 C – Outlet port in line with inlet port
 D – Outlet port 90° clockwise from inlet port

9 Rear mount style

A – SAE J744 82–2 (SAE A)
 B – SAE J744 101–2 (SAE B)
 C – SAE J744 127–2 (SAE C)

10 Coupling

16 – SAE J744 16–4 (A spline)
 22 – SAE J744 22–4 (B spline)
 25 – SAE J744 25–4 (B-B spline)
 32 – SAE J744 32–4 (C spline)

11 Rear adapter flange orientation (viewed from adapter end)

A – Adapter flange 45° counterclockwise from mounting flange
 B – Adapter flange 45° clockwise from mounting flange

12 Design level


Subject to change. Dimensions remain the same for designs 20 through 29.

13 Rotation (viewed from shaft end)

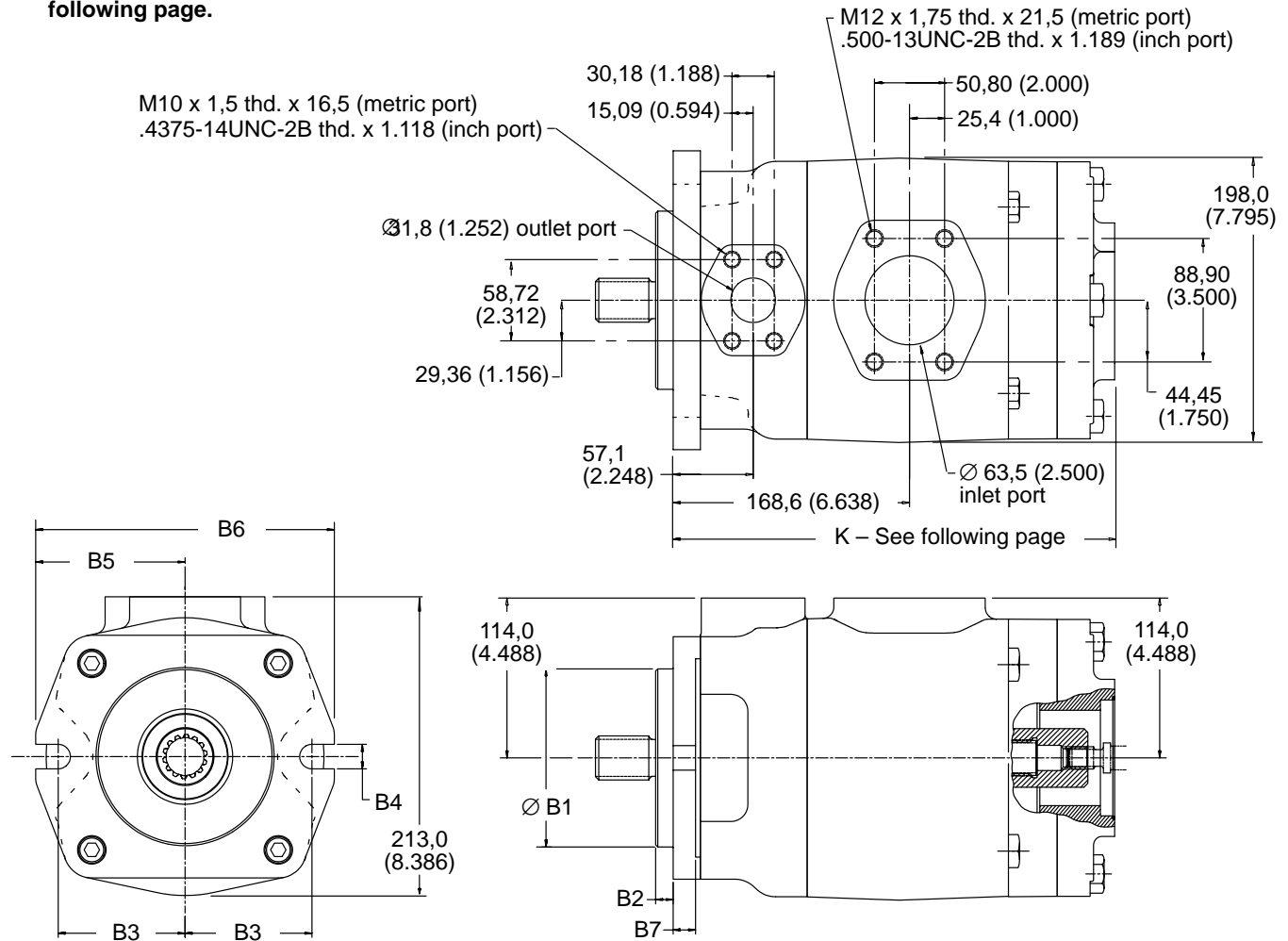
R – Right hand (clockwise)
 L – Left hand (counterclockwise)

35VPFT Installation Dimensions

Millimeters (inches)

 [Click here for shaft dimensions.](#)

For rear mounting dimensions, see following page.

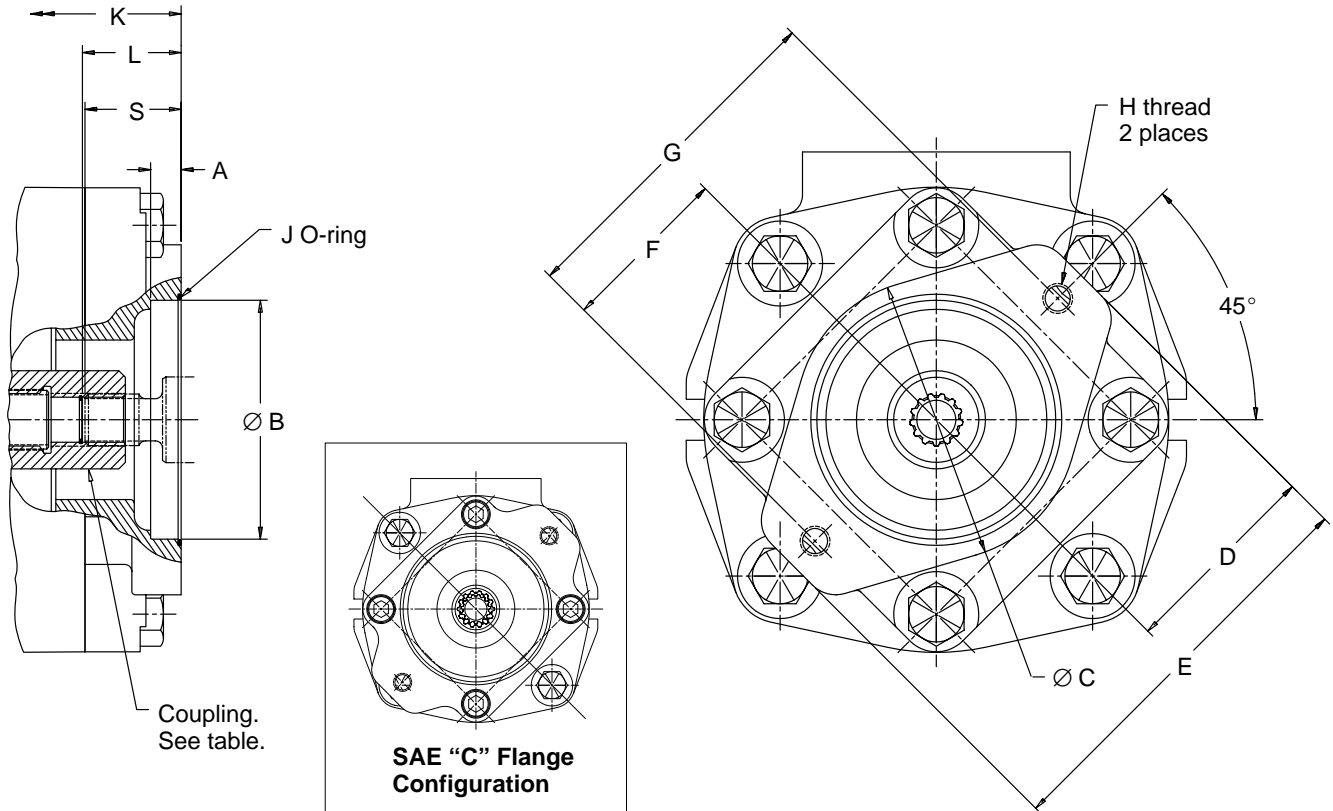


Flange Type	\varnothing B1	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.918)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,525/15,975 (0.651/0.629)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.296)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	19,525/19,475 (0.769/0.767)

35VPFT Installation Dimensions

Millimeters (inches)

For other 35VPFT installation dimensions, see preceding page.



Couplings

Coupling Code	Coupling Description	S Shaft Extension	L Min.
16	For pump shaft of SAE "A" size (per SAE std J744 Jul88) with a 9T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	32,8/31,2 (1.291/1.228)	33,05 (1.301)
22	For pump shaft of SAE "B" size (per SAE std J744 Jul88) with a 13T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	41,8/40,2 (1.646/1.583)	42,05 (1.656)
25	For pump shaft of SAE "B-B" size (per SAE std J744 Jul88) with a 15T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	46,8/45,2 (1.842/1.780)	47,10 (1.854)
32	For pump shaft of SAE "C" size (per SAE std J744 Jul88) with a 14T, 12/24 DP, 30° PA involute spline (per ANSI B92.1a 1976)	56,8/55,2 (2.236/2.173)	58,22 (2.292)

Rear Flanges

Mount Code	A	Ø B	Ø C	D	E	F	G	H	J	K
A (SAE A)	10,25 (0.403)	82,63/82,58 (3.253/3.251)	95,0 (3.740)	65,2 (2.567)	130,4 (5.134)	53,19 (2.094)	106,38 (4.188)	.375-16UNC-2B 19,0 (.748) min. depth	AS 568-042	314,9 (12.398)
B (SAE B)	13,00 (0.512)	101,68/101,63 (4.003/4.001)	120,0 (4.724)	87,0 (3.425)	174,0 (6.850)	73,02 (2.875)	146,05 (5.750)	.500-13UNC-2B thru	AS 568-045	314,9 (12.398)
C (SAE C)	16,00 (0.630)	127,08/127,03 (5.003/5.001)	NA – See inset.	106,5 (4.193)	213,0 (8.386)	90,49 (3.562)	180,98 (7.125)	.625-11UNC-2B thru	AS 568-049	325,6 (12.819)

45VPFT Performance Data

Maximum Operating Pressure

Industrial – 262 bar (3800 psi)
 Mobile – 250 bar (3625 psi)

Maximum Transient Pressure (peak <0.5 sec)

276 bar (4000 psi)

Industrial Displacement, Speed, Flow, and Power Ratings 120° F, SAE10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at 1500 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1500 rpm, 207 bar (3000 psi) kw (hp)	Output Flow at 1800 rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at 1800 rpm, 207 bar (3000 psi) kw (hp)
140	140 (8.54)	1800	260,0 (50.3)	75,2 (100.8)	232,4 (61,4)	90,6 (121.5)
160	160 (9.76)	1800	220,3 (58.2)	85,9 (115.2)	268,4 (70.9)	103,6 (138.8)
180	180 (10.98)	1800	250,2 (66.1)	96,7 (129.6)	304,3 (80.4)	116,5 (156.2)
195	195 (11.89)	1800	272,2 (72.0)	104,7 (140.4)	331,2 (87.5)	126,2 (169.1)

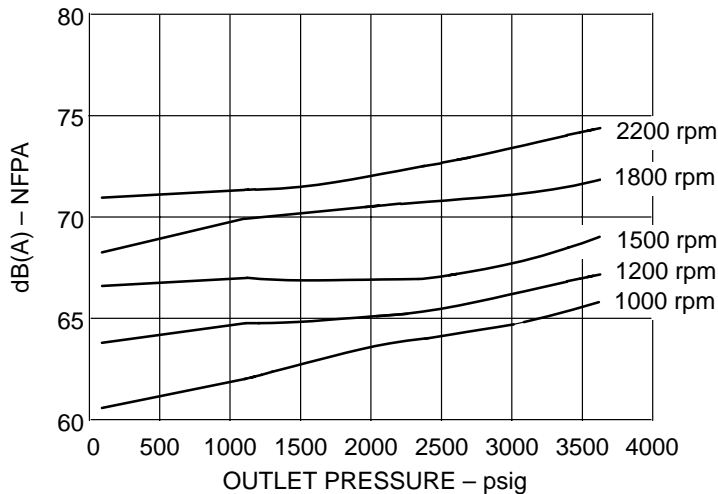
Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Mobile Displacement, Speed, Flow, and Power Ratings 180° F, SAE 10W oil, 0 psig inlet

Ring Size Code	Maximum Geometric Displacement cm ³ /r (in ³ /r)	Maximum Operating Speed rpm	Output Flow at Maximum rpm, 207 bar (3000 psi) l/min (USgpm)	Input Power at Maximum rpm, 207 bar (3000 psi) kw (hp)
140	140 (8.54)	2200	267,2 (70.6)	110,5 (148.1)
160	160 (9.76)	2200	311,2 (82.2)	126,2 (169.3)
180	180 (10.98)	2200	355,1 (93.8)	142,1 (190.5)
195	195 (11.89)	2200	388,0 (102.5)	153,8 (206.2)

Note: Do not operate at speeds, pressures, and/or viscosities where internal leakage exceeds 50% of theoretical value; i.e., actual flow must exceed 50% of theoretical flow.

Sound Data 120° F, SAE 10W oil, 0 psig inlet

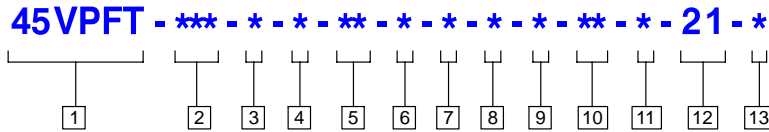


Delivery and Input Power

45VPFT delivery and input power can be determined from 45VPF curves.

[Click here for curves.](#)

45VPFT Model Code



1 Series designation (frame size)

45VPFT – 140 to 195 cm³/r
(8.54 to 11.89 in³/r)

2 Displacement

140 – 140 cm³/r (8.54 in³/r)
160 – 160 cm³/r (9.76 in³/r)
180 – 180 cm³/r (10.98 in³/r)
195 – 195 cm³/r (11.89 in³/r)

3 Port connection

A – SAE 4-bolt flange (SAE J518)
B – Metric 4-bolt flange (ISO 6162)

4 Flange mounting style

A – SAE J744 127–2 (SAE C)
B – ISO 3019/2 125A2HW
C – SAE J744 152–2 (SAE D)
D – ISO 3019/2 160A2HW

5 Shaft end

01 – SAE J744 38–1
(1.50 inch keyed shaft)
02 – SAE J744 38–4
(C-C splined shaft)
03 – ISO 3019/2 E40N
(40mm keyed shaft)
05 – SAE J744 44–1
(1.75 inch keyed shaft)
06 – SAE J744 44–4
(D splined shaft)

6 Shaft seal

A – Single, primary
B – Double, secondary (spring side out)
C – Double, secondary (spring side in)

7 Seal type

N – Standard, buna N
V – Viton
W – Buna N with Viton shaft seals

**8 Outlet port position
(viewed from adapter end)**

A – Outlet port opposite inlet port
B – Outlet port 90° counterclockwise
from inlet port
C – Outlet port in line with inlet port
D – Outlet port 90° clockwise from
inlet port

9 Rear mount style

A – SAE J744 82–2 (SAE A)
B – SAE J744 101–2 (SAE B)
C – SAE J744 127–2 (SAE C)

10 Coupling

16 – SAE J744 16–4 (A spline)
22 – SAE J744 22–4 (B spline)
25 – SAE J744 25–4 (B-B spline)
32 – SAE J744 32–4 (C spline)

**11 Rear adapter flange orientation
(viewed from adapter end)**

A – Adapter flange 45°
counterclockwise from
mounting flange
B – Adapter flange 45° clockwise from
mounting flange

12 Design level

Subject to change. Dimensions remain
the same for designs 20 through 29.

**13 Rotation
(viewed from shaft end)**

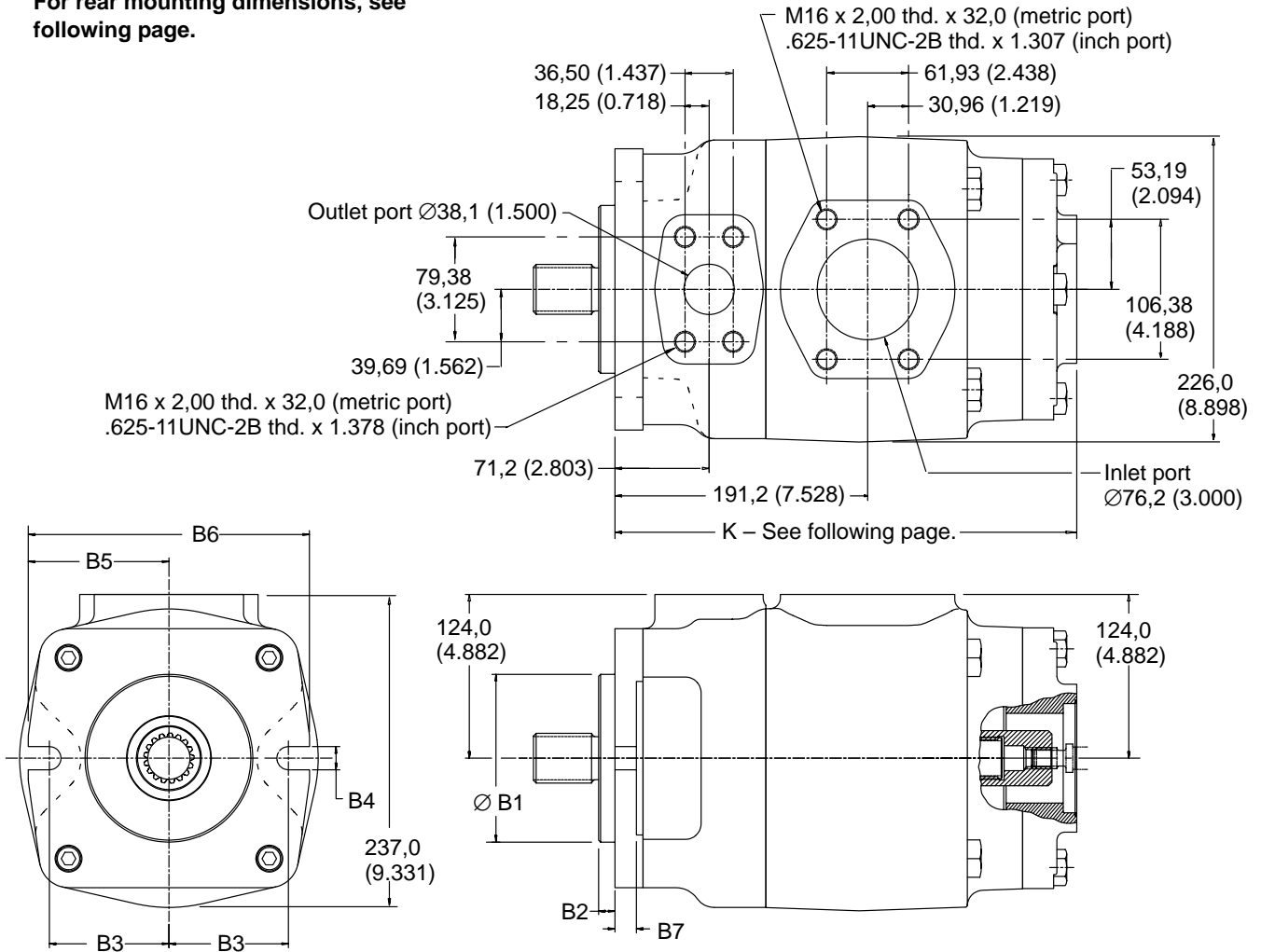
R – Right hand (clockwise)
L – Left hand (counterclockwise)

45VPFT Installation Dimensions

Millimeters (inches)

 [Click here for shaft dimensions.](#)

For rear mounting dimensions, see following page.

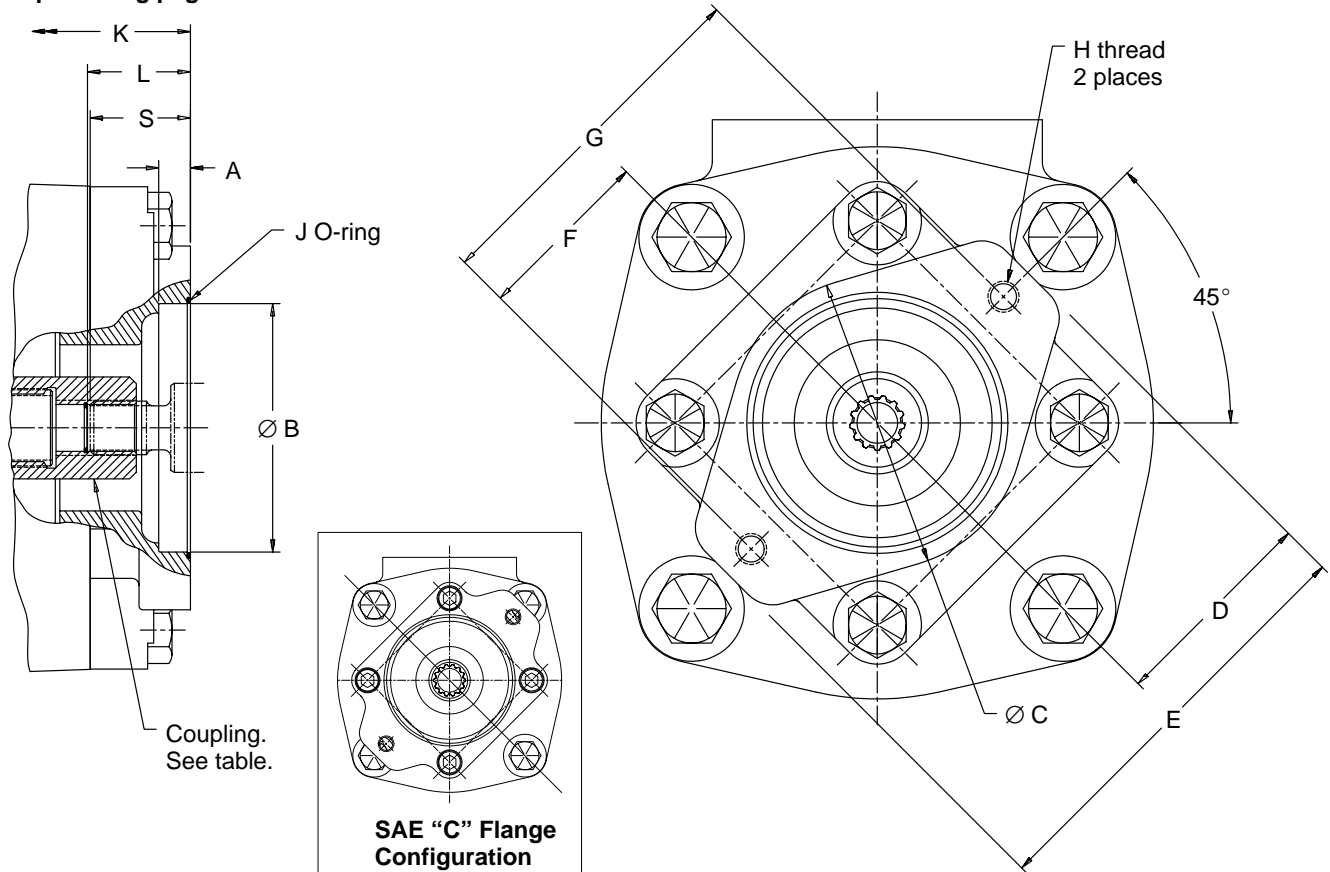


Flange Type	Ø B1	B2	B3	B4	B5	B6	B7
SAE 127-2	127,00/126,95 (5.000/4.998)	12,70/12,19 (0.500/0.480)	90,50 (3.563)	17,75/17,37 (0.698/0.683)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
ISO 3019/2 125A2HW	125,000/124,937 (4.921/4.918)	9,50/9,00 (0.374/0.354)	90,00 (3.543)	18,27/18,00 (0.719/0.709)	106,5 (4.193)	213,0 (8.386)	16,25/15,75 (0.640/0.620)
SAE 152-2	152,40/152,35 (6.000/5.998)	12,70/12,19 (0.500/0.480)	114,30 (4.500)	20,85/20,47 (0.822/0.807)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)
ISO 3019/2 160A2HW	160,000/159,937 (6.299/6.296)	9,50/9,00 (0.374/0.354)	112,00 (4.409)	22,33/22,00 (0.879/0.866)	133,3 (5.248)	266,6 (10.496)	21,30/21,15 (0.838/0.833)

45VPFT Installation Dimensions

Millimeters (inches)

For other 45VPFT installation dimensions, see preceding page.



Couplings

Coupling Code	Coupling Description	S Shaft Extension	L Min.
16	For pump shaft of SAE "A" size (per SAE std J744 Jul88) with a 9T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	32,8/31,2 (1.291/1.228)	33,07 (1.302)
22	For pump shaft of SAE "B" size (per SAE std J744 Jul88) with a 13T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	41,8/40,2 (1.646/1.583)	42,12 (1.658)
25	For pump shaft of SAE "B-B" size (per SAE std J744 Jul88) with a 15T, 16/32 DP, 30° PA involute spline (per ANSI B92.1a 1976)	46,8/45,2 (1.842/1.780)	47,19 (1.858)
32	For pump shaft of SAE "C" size (per SAE std J744 Jul88) with a 14T, 12/24 DP, 30° PA involute spline (per ANSI B92.1a 1976)	56,8/55,2 (2.236/2.173)	57,07 (2.247)

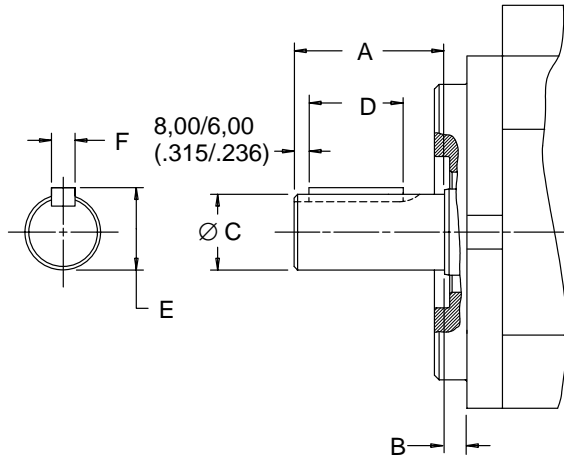
Rear Flanges

Mount Code	A	Ø B	Ø C	D	E	F	G	H	J	K
A (SAE A)	10,25 (0.403)	82,63/82,58 (3.253/3.251)	95,0 (3.740)	65,2 (2.567)	130,4 (5.134)	53,19 (2.094)	106,38 (4.188)	.375-16UNC-2B 19,0 (.748) min. depth	AS 568-042	349,5 (13.760)
B (SAE B)	13,00 (0.512)	101,68/101,63 (4.003/4.001)	120,0 (4.724)	87,0 (3.425)	174,0 (6.850)	73,02 (2.875)	146,05 (5.750)	.500-13UNC-2B thru	AS 568-045	349,5 (13.760)
C (SAE C)	16,00 (0.630)	127,08/127,03 (5.003/5.001)	NA – See inset.	106,5 (4.193)	213,0 (8.386)	90,49 (3.562)	180,98 (7.125)	.625-11UNC-2B thru	AS 568-049	360,2 (14.181)

Shaft Dimensions

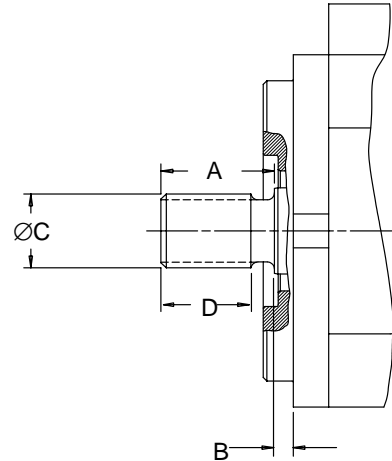
25VPF, 2525VPF, and 25VPFT

millimeters (inches)



Keyed Shafts

01, 03, 05, 07



Splined Shafts

02, 06, 09

Keyed Shaft	Shaft Designation	Dimensions					
		A	B	Ø C	D	E	F
01	SAE J744 25-1	70,00 (2.756)	8,80/7,20 (0.346/0.283)	25,40/25,35 (1.000/0.998)	49,23 (1.938)	28,23/27,97 (1.111/1.101)	6,375/6,350 (0.251/0.250)
03	ISO 3019/2 E25N	42,00 (1.654)	11,00/9,40 (0.433/0.370)	25,013/24,992 (0.985/0.984)	18,00 (0.709)	27,992/27,723 (1.102/1.091)	8,000/7,964 (0.315/0.314)
05	SAE J744 32-1	76,00 (2.992)	8,80/7,20 (0.346/0.283)	31,75/31,70 (1.250/1.248)	50,80 (2.000)	35,33/35,07 (1.390/1.381)	7,963/7,938 (0.314/0.313)
07	ISO 3019/2 E32N	58,00 (2.283)	11,00/9,40 (0.433/0.370)	32,027/32,002 (1.261/1.260)	34,00 (1.338)	35,002/34,738 (1.378/1.368)	10,000/9,964 (0.394/0.392)

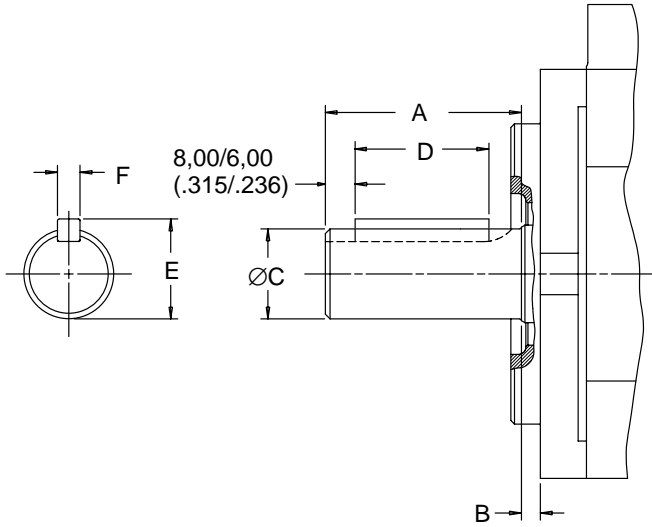
Splined Shaft	Shaft Designation	Dimensions				External Involute Spline Data (All splines are tolerance class 7, ANSI B92.1a-1976, flat root, side fit)		
		A	B	Ø C max.	D	Teeth	Pitch	PR Angle
02	SAE J744 25-4	38,00 (1.496)	8,80/7,20 (0.346/0.283)	24,99 (0.984)	28,00 (1.102)	15	16/32	30°
06	SAE J744 32-4	48,00 (1.890)	8,80/7,20 (0.346/0.283)	31,22 (1.229)	38,00 (1.496)	14	12/24	30°
09†	SAE J744 22-4	33,00 (1.299)	8,80/7,20 (0.346/0.283)	21,82 (0.859)	24,90 (0.980)	13	16/32	30°

† 09 shaft not available on 25VPFT thru-drive pumps.

Shaft Dimensions

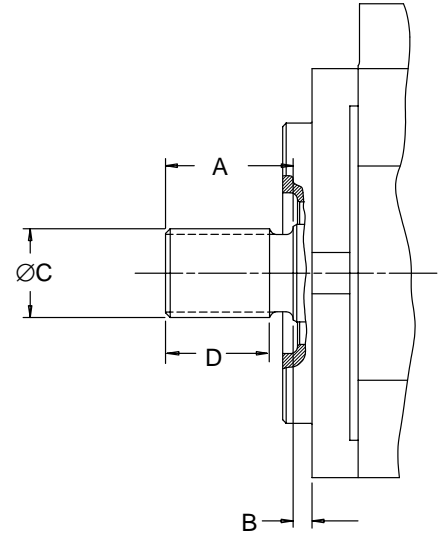
35VPF, 3525VPF, 3535VPF, and 35VPFT

millimeters (inches)



Keyed Shafts

01, 03, 05, 07



Splined Shafts

02, 06

Keyed Shaft	Shaft Designation	Dimensions					
		A	B	ØC	D	E	F
01	SAE J744 32-1	76,00 (2.992)	8,80/7,20 (0.346/0.283)	31,75/31,70 (1.250/1.248)	49,23 (1.938)	35,33/35,07 (1.391/1.381)	7,963/7,938 (0.314/0.313)
03	ISO 3019/2 E32N	58,00 (2.283)	11,00/9,40 (0.433/0.370)	32,027/32,002 (1.261/1.260)	34,00 (1.338)	35,002/34,738 (1.378/1.368)	10,000/9,964 (0.394/0.392)
05	SAE J744 38-1	83,00 (3.268)	8,80/7,20 (0.346/0.283)	38,10/38,05 (1.500/1.498)	57,15 (2.250)	42,40/42,14 (1.669/1.659)	9,550/9,525 (0.376/0.375)
07	ISO 3019/2 E40N	82,00 (3.228)	11,00/9,40 (0.433/0.370)	40,027/40,002 (1.576/1.575)	56,00 (2.205)	43,002/43,737 (1.693/1.722)	12,000/11,957 (0.472/0.471)

External Involute Spline Data

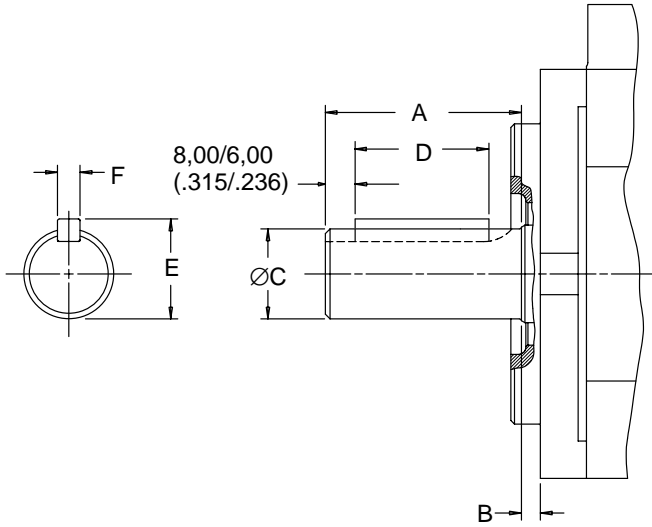
(All splines are tolerance class 7, ANSI B92.1a-1976, flat root, side fit)

Splined Shaft	Shaft Designation	Dimensions				Teeth	Pitch	PR Angle
		A	B	ØC max.	D			
02	SAE J744 32-4	48,00 (1.890)	8,80/7,20 (0.346/0.283)	31,22 (1.229)	38,00 (1.496)	14	12/24	30°
06	SAE J744 38-4	54,00 (2.126)	8,80/7,20 (0.346/0.283)	37,57 (1.479)	44,00 (1.732)	17	12/24	30°

Shaft Dimensions

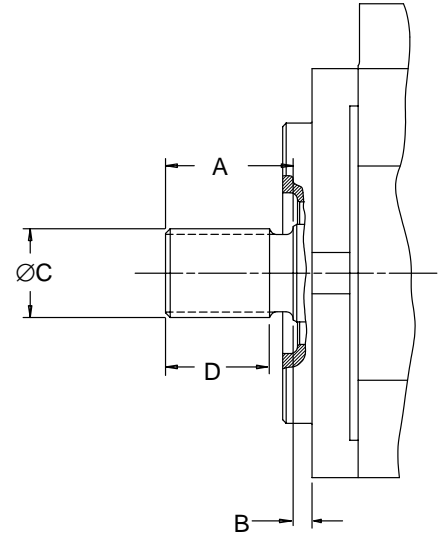
45VPF, 4525VPF, 4535VPF, 4545VPF, and 45VPFT

millimeters (inches)



Keyed Shafts

01, 03, 05



Splined Shafts

02, 06

Keyed Shaft	Shaft Designation	Dimensions					
		A	B	ØC	D	E	F
01	SAE J744 38-1	83,00 (3.268)	8,80/7,20 (0.346/0.283)	38,10/38,05 (1.500/1.498)	57,15 (2.250)	42,40/42,14 (1.669/1.659)	9,550/9,525 (0.376/0.375)
03	ISO 3019/2 E40N	82,00 (3.228)	11,00/10,00 (0.433/0.394)	40,027/40,002 (1.576/1.575)	56,00 (2.205)	43,002/42,737 (1.693/1.683)	12,000/11,957 (0.472/0.471)
05	SAE J744 44-1	92,00 (3.622)	8,80/7,20 (0.346/0.283)	44,45/44,40 (1.750/1.748)	57,15 (2.250)	49,43/49,17 (1.946/1.936)	11,137/11,112 (0.438/0.437)

Splined Shaft	Shaft Designation	Dimensions				External Involute Spline Data (All splines are tolerance class 7, ANSI B92.1a-1976, flat root, side fit)		
		A	B	ØC max.	D	Teeth	Pitch	PR Angle
02	SAE J744 38-4	54,00 (2.126)	8,80/7,20 (0.346/0.283)	37,57 (1.479)	44,00 (1.732)	17	12/24	30°
06	SAE J744 44-4	67,00 (2.638)	8,80/7,20 (0.346/0.283)	43,71 (1.721)	57,00 (2.244)	13	8/16	30°

Torque Loading for Direct Drives

For correct pump shaft selection, peak transient system pressure must be used to determine drive torque. The torque, taken from the graph below, must not exceed the torque limit in the shaft torque table.

Double pumps

When both cartridges are to be on-load together, the sum of their separate

torques must not exceed the torque limit in the table.

Example:

A 3525VPF-135-080 pump peaking at 250 bar (3625 psi) front section and 200 bar (2900 psi) rear section will require approximately 850 Nm (7523 lb-in) input torque. Therefore, all listed

shafts are acceptable except numbers 01 and 03.

Thru-drive pumps

When both the thru-drive pump and its rear-mounted pump are to be on-load together, the sum of the torques generated must not exceed the torque limit in the table.

Shaft Torque

Pump Series	Shaft No.	Maximum Input Torque Nm (lb-in)†	Maximum Thru-drive Torque Nm (lb-in)‡
25VPF, 2525VPF, or 25VPFT	01	407 (3600)	350 (3100)
	02	621 (5500)	
	03	407 (3600)	
	05	814 (7200)	
	06	814 (7200)	
	07	814 (7200)	
	09*	328 (2900)	
35VPF, 3525VPF, 3535VPF, or 35VPFT	01	814 (7200)	678 (6000)
	02	1017 (9000)	
	03	814 (7200)	
	05	1130 (10,000)	
	06	1130 (10,000)	
45VPF, 4525VPF, 4535VPF, 4545VPF, or 45VPFT	01	1130 (10,000)	1130 (10,000)
	02	1808 (16,000)	
	03	1130 (10,000)	
	05	1638 (14,500)	
	06	1808 (16,000)	
	06	1808 (16,000)	

* 09 shaft not available on 25VPFT thru-drive pumps.

† Combined torque of Vickers "VPFT" pump and thru-driven pump.

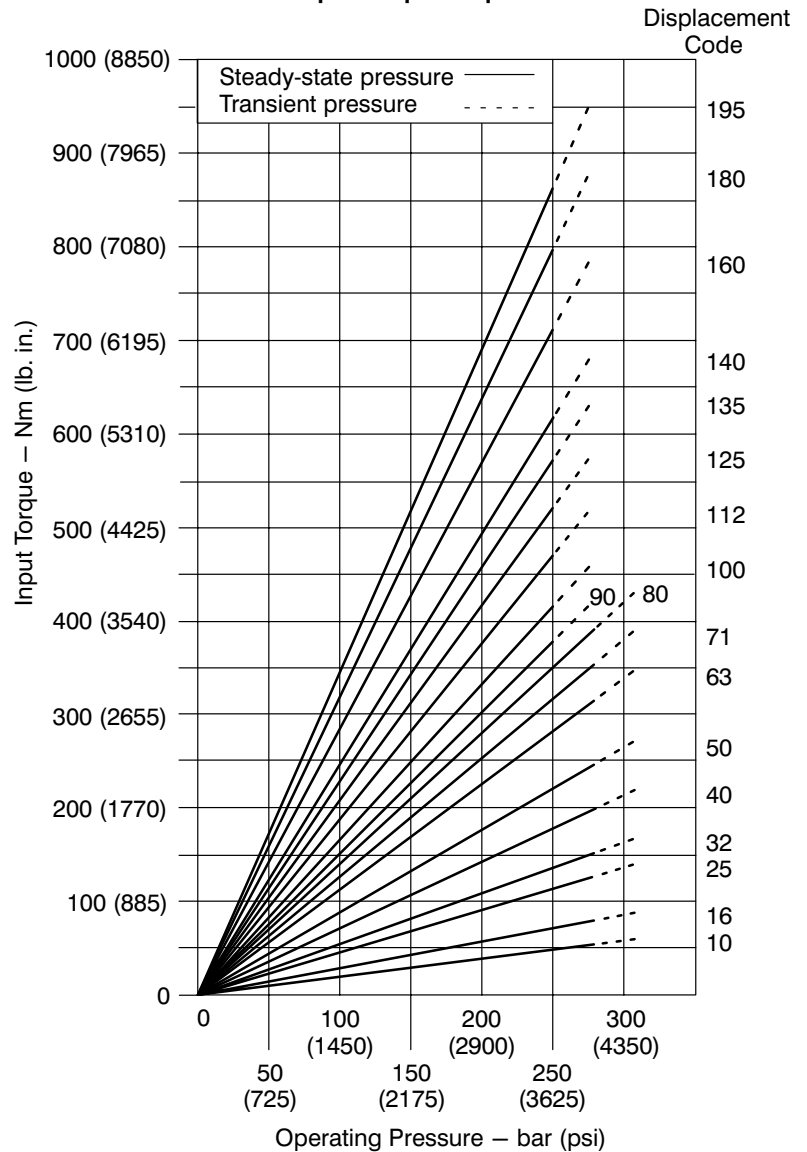
‡ Maximum torque of thru-driven pump.

NOTE

To realize the high input torque levels for keyed shafts (nos. 1, 3, 5 and 7), the corners of the key must be chamfered 0,76 to 1,02 mm x 45° to clear the radii in the keyway. Also, the key must be installed in the keyway 8,00/6,00 mm back from the end of the shaft.

Spline shaft ends (nos. 2, 6 and 9) must be lubricated by gearbox lubricant or anti-seizure grease to prevent spline wear and fretting.

Input Torque Requirement



Application Data

Weights

Model	Approximate Dry Weight kg (lbs.)
25VPF	34,5 (76)
35VPF	52,6 (116)
45VPF	78,5 (173)
2525VPF	59,0 (130.1)
3525VPF	82,1 (181)
3535VPF	88,9 (196)
4525VPF	108,4 (239)
4535VPF	125,0 (275.6)
4545VPF	129,3 (285)
25VPFT	43,2 (95.2)
35VPFT	64,1 (141.3)
45VPFT	88,6 (195.3)

Moments of Inertia

Model	Moment of Inertia Nm/sec ² (lb.in./sec ²)
25VPF (10 – 32 cm ³ /r)	0,00075 (0.0066)
25VPF (40 – 80 cm ³ /r)	0,00103 (0.0091)
35VPF	0,0025 (0.022)
45VPF	0,0050 (0.0441)
2525VPF	0,0019 (0.017)
3525VPF	0,0043 (0.038)
3535VPF	0,0047 (0.042)
4525VPF	0,0059 (0.0522)
4535VPF	0,0072 (0.0637)
4545VPF	0,00935 (0.0827)

Fluid Selection

Fluid in a hydraulic system performs the multiple functions of transmission of power, lubrication of components, and cooling. It is a vital factor in a hydraulic system and proper selection is a necessity for satisfactory operation and life of components.

Basic requirements of a good petroleum oil for hydraulic systems are:

- 1) sufficient anti-wear additives,
- 2) proper viscosity at the operating temperature, and
- 3) adequate rust and oxidation inhibitors.

A good quality fluid from reputable sources will provide these characteristics.

Two specific types of oil meet the requirements of modern hydraulic systems:

- Anti-wear type hydraulic oils that comply with the pump wear tests of ASTM-D-2882
- Automotive crankcase oils having the letter designations "SC", "SD", "SE", "SF", or "SG" per SAE J183 JUN89.

For additional information on the correct viscosity and proper selection of fluids for hydraulic systems, refer to Vickers publication 694.

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 component 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.

Product	System Pressure Level		
	psi		
	<2000	2000–3000	3000+
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