ENGINEERING
TOMORROW

Technical Information

Orbital Motor
VMP Series 2

powersolutions.danfoss.com

Revision history

Table of revisions

Date	Changed	Rev
March 2016	Updated to Engineering Tomorrow design	0204
January 2016	Technical data corrected	0203
May 2015	Technical data corrected	BB
Feb 2014	New dimension drawings. Converted to Danfoss layout _ DITA CMS	BA
May 2013	First version	AA

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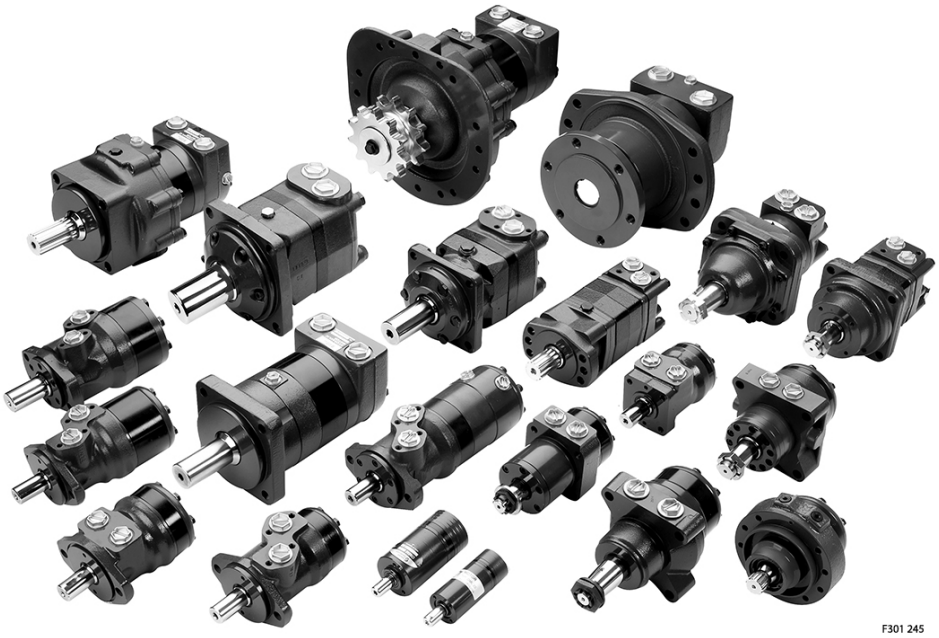
A wide range of Orbital Motors

Characteristic, features and application areas of Orbital Motors



Danfoss is a world leader within production of low speed orbital motors with high torque. We can offer more than 3,000 different orbital motors, categorised in types, variants and sizes (including different shaft versions).

The motors vary in size (rated displacement) from 8 cm^3 [0.50 in^3] to 800 cm^3 [48.9 in^3] per revolution.

Speeds range up to approximate 2,500 min^{-1} (rpm) for the smallest type and up to approximate 600 min^{-1} (rpm) for the largest type.

Maximum operating torques vary from 13 N•m [115 lbf•in] to 2,700 N•m [24,000 lbf•in] (peak) and maximum outputs are from 2.0 kW [2.7 hp] to 70 kW [95 hp].

Characteristic features of Danfoss Orbital Motors

- Smooth running over the entire speed range
- Constant operating torque over a wide speed range
- High starting torque
- High return pressure without the use of drain line (High pressure shaft seal)
- High efficiency
- Long life under extreme operating conditions
- Robust and compact design
- High radial and axial bearing capacity
- For applications in both open and closed loop hydraulic systems
- Suitable for a wide variety of hydraulics fluids

Technical features of Danfoss Orbital Motor

The programme is characterised by technical features appealing to a large number of applications and a part of the programme is characterised by motors that can be adapted to a given application. Adaptions comprise the following variants among others:

- Motors with corrosion resistant parts
- Wheel motors with recessed mounting flange

A wide range of Orbital Motors

- OMP, OMR- motors with needle bearing
- OMR motor in low leakage version
- OMR motors in a super low leakage version
- Short motors without bearings
- Ultra short motors
- Motors with integrated positive holding brake
- Motors with integrated negative holding brake
- Motors with integrated flushing valve
- Motors with speed sensor
- Motors with tacho connection
- All motors are available with black finish paint

The Danfoss Orbital Motors are used in the following application areas:

- Construction equipment
- Agricultural equipment
- Material handling & Lifting equipment
- Forestry equipment
- Lawn and turf equipment
- Special purpose
- Machine tools and stationary equipment
- Marine equipment

Survey of literature with technical data on Danfoss Orbital Motors

Detailed data on all Danfoss Orbital Motors can be found in our motor catalogue, which is divided into more individual subcatalogues:

- General information on Danfoss Orbital Motors: function, use, selection of orbital motor, hydraulic systems, etc.
- Technical data on small motors: OML and OMM
- Technical data on medium sized motors: OMP, OMR, OMH
- Technical data on medium sized motors: DH and DS
- Technical data on medium sized motors: OMEW
- Technical data on medium sized motors: VMP
- Technical data on medium sized motors: VMR
- Technical data on large motors: OMS, OMT and OMV
- Technical data on large motors: TMK
- Technical data on large motors: TMT
- Technical data on large motors: TMTHW
- Technical data on large motors: TMVW

A general survey brochure on Danfoss Orbital Motors gives a quick motor reference based on power, torque, speed and capabilities.

Data survey

Introduction

By introducing the VMP, Danfoss is introducing an Orbital Motor in the new V-Series. In order to meet the demands for motors that have the right duty cycle and efficiency capabilities for a given function, Danfoss now has 3 Orbital Motor Series:

T-Series – The Highest Torque

Leading performance with a long lifetime makes light work of the heaviest duties. Offering pressure capability up to 350 bar [5076 psi] and high starting torque, the T-Series is the energy-efficient choice for the toughest working environments.

O-Series – The Flexible Choice

The O-Series is flexible beyond compare. Delivering premium power across the board, these motors cover small to large, medium to heavy-duty needs with pressure capability up to 275 bar [3990 psi]. Robust, reliable and designed to fulfill the latest emissions standards.

V-Series – The Core Solution

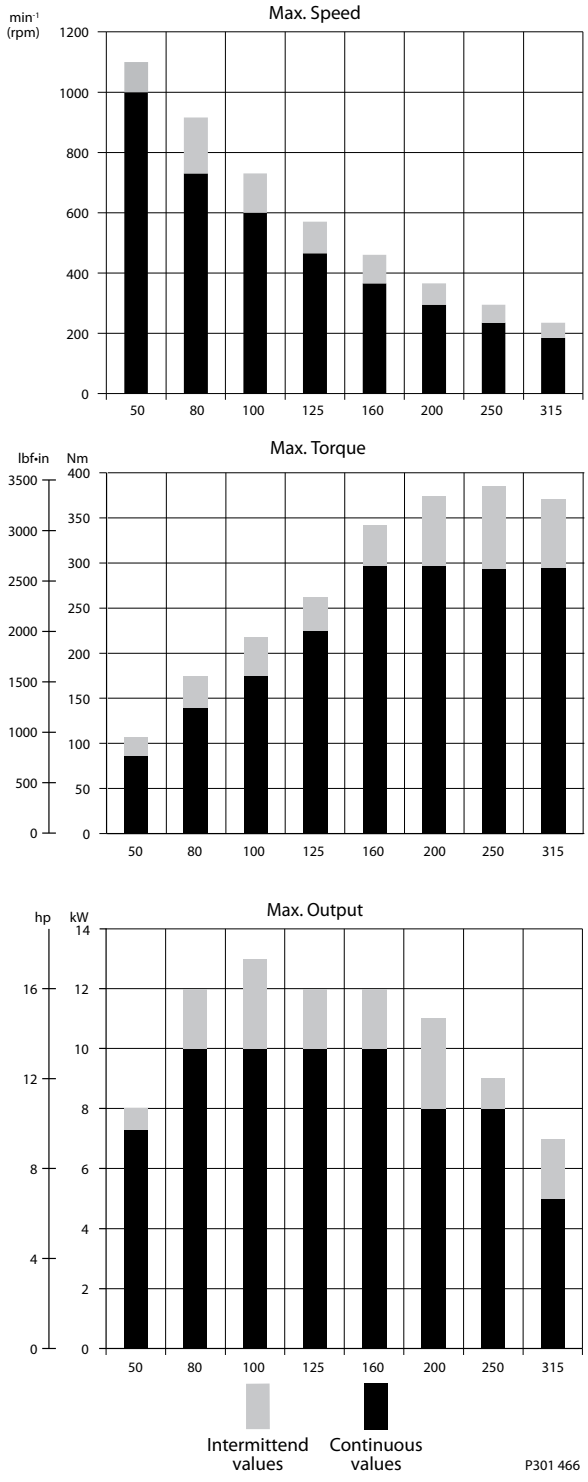
The V-Series is your quality benchmark in the medium duty market. Based on proven technology, these reliable motors will reduce your overall system costs while adding value to your machine. Perfect for many tasks.

VMP features

- High pressure shaft seal
- Proven orbital motor design
- 3-chamber motor design
- Suitable for medium and low duty

Speed, torque and output

Speed, torque and output



Versions

Versions and code numbers

Versions

Mounting flange	**2 hole oval flange (A2 - flange)**						**Square flange (C-flange)**	
Spigot diameter	**Ø 82.5 mm [3.25 in]**						**Ø 44.4 mm [1.75 in]**	
Bolt circle diameter (BC)	**Ø 106.4 mm [4.20 in]**						**Ø 82.5 mm [3.25 in]**	
Shaft	Cyl. 25 mm Parallel key DIN 6885		Cyl. 1 in Parallel key BS 46		Splined, 1 in SAE 6B	Cyl. 1 in, Woodruff key	Splined 1 in SAE 6B	Cyl. 1 in, Woodruff key
Thread in shaft	M8 18 [0.71] deep		M8 18 [0.71] deep		1/4-20 UNC 14 [0.55] deep	1/4-20 UNC 14 [0.55] deep	1/4-20 UNC 14 [0.55] deep	1/4-20 UNC 14 [0.55] deep
Port size	G 1/2		7/8-14 UNF		7/8-14 UNF	7/8-14 UNF	7/8-14 UNF	7/8-14 UNF
Drain port	G1/4	G1/4	7/16-20 UNF	7/16-20 UNF	7/16-20 UNF	7/16-20 UNF	7/16-20 UNF	7/16-20 UNF
European version	X	X						
US version			X	X	X	X	X	X
Check valve	X	X	X	X	X	X	X	X
Painted Black		X		X				
Code numbers								
VMP 50	11174240	11174219	11174281	11174290	11174336	11174450	11174478	11174328
VMP 80	11174241	11174220	11174282	11174291	11174337	11174462	11174479	11174351
VMP 100	11174242	11174221	11174283	11174292	11174338	11174463	11174480	11174352
VMP 125	11174243	11174252	11174284	11174293	11174339	11174464	11174481	11174353
VMP 160	11174244	11174239	11174285	11174294	11174340	11174465	11174482	11174354
VMP 200	11174216	11174253	11174287	11174295	11174341	11174466	11174483	11174355
VMP 250	11174217	11174254	11174288	11174296	11174342	11174467	11174484	11174356
VMP 315	11174218	11174255	11174289	11174297	11174343	11174468	11174485	11174357

Technical data

Technical data for VMP

Technical data for VMP with 25 mm, 1 in cylindrical and 1 in splined shaft

Type Motorsize			**VMP 50**	**VMP 80**	**VMP 100**	**VMP 125**	**VMP 160**	**VMP 200**	**VMP 250**	**VMP 315**
Geometric displacement	cm^3		48.6	77.8	97.3	125.0	155.7	194.6	242.3	306.1
	[in^3]		[2.97]	[4.76]	[5.95]	[7.65]	[9.53]	[11.91]	[14.83]	[18.73]
Max. speed	min^{-1} [rpm]	cont.	1000	730	600	465	365	295	235	185
		int.*	1100	915	730	570	460	365	295	235
Max. torque	Nm [lbf•in]	cont.	85 [750]	140 [1240]	175 [1550]	225 [1990]	290 [2565]	290 [2565]	290 [2565]	290 [2565]
		int.*	110 [975]	170 [1505]	215 [1900]	260 [2300]	340 [3010]	370 [3275]	385 [3405]	370 [3275]
Max. output	kW [hp]	cont.	7.3 [9.8]	10 [13.4]	11 [14.8]	10 [13.4]	10 [13.4]	8 [10.7]	8 [10.7]	5 [6.7]
		int.*	8.0 [10.7]	12 [16]	13 [17.5]	12 [16]	12 [16]	11 [14.8]	9 [14.8]	7 [9.4]
Max. pressure drop	bar [psi]	cont.	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	115 [1670]	90 [1305]	75 [1090]
		int.*	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	130 [2180]	125 [1810]	100 [1450]
Max. oil flow	l/min [US gal/ min]	cont.	50 [13.2]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]
		int.*	55 [14.5]	75 [19.8]	75 [19.8]	75 [19.8]	75 [19.8]	75 [19.8]	75 [19.8]	75 [19.8]
Max. starting pressure with unloaded shaft	bar [psi]		10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	7 [100]	7 [100]	7 [100]
Min starting torque	at max. Press-drop Nm [lbf•in]	cont.	70 [620]	135 [1195]	160 [1415]	200 [1770]	270 [2390]	250 [2210]	245 [2170]	255 [2255]
		int.*	90 [795]	160 [1195]	200 [1770]	260 [2300]	340 [3010]	340 [3010]	340 [3010]	340 [3010]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.

Type			**Max inlet pressure**	**Max inlet pressure with drain line**
VMP 50-315	bar [psi]	cont.	175 [2540]	175 [2540]
		int.*	200 [2900]	200 [2900]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.

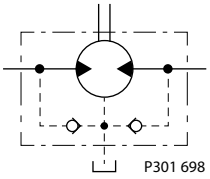
Recommendation:

To assure best motor performance, run motor for approximatley one hour at 30% of rated pressure before running at full load.

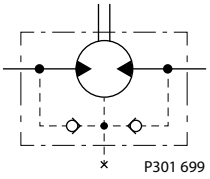
Shaft seal

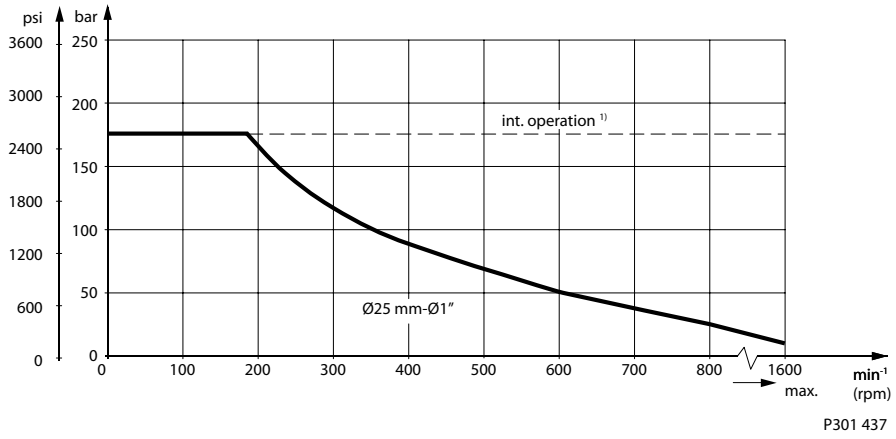
VMP with High Pressure Shaft Seal (HPS)

VMP with check valves and drain connected: The shaft seal pressure equals the pressure in the drain line.



VMP with check valves and *without* drain connected: The shaft seal pressure equals the pressure in the return line + 10 bar [145 psi].

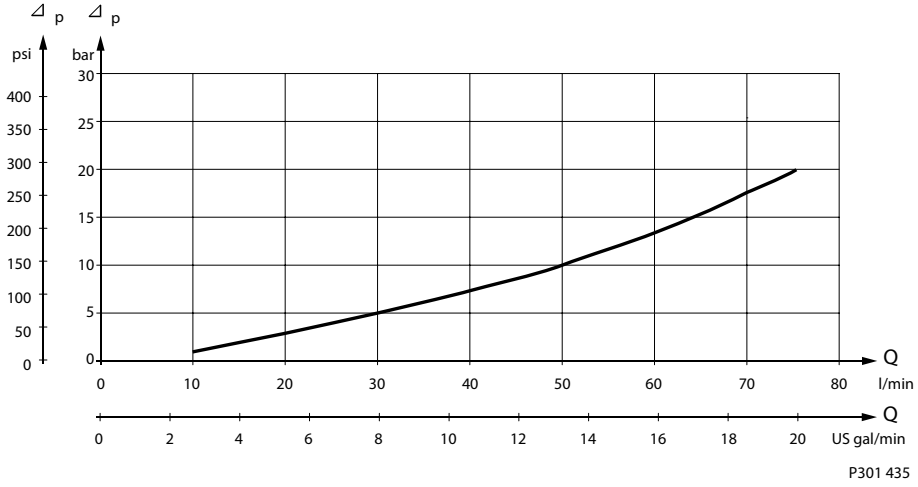




Please check motor pressure according to data under *Technical data for VMP*.

Pressure drop

Pressure drop in motor



The curve applies to an unloaded motor shaft and an oil viscosity of 35 mm^2/s [165 SUS]

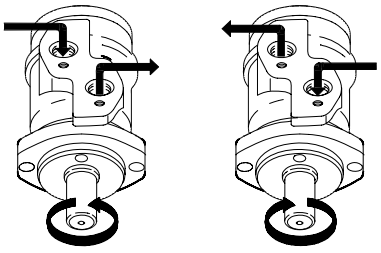
Oil flow

Oil flow in drain line

The table shows the max. oil flow in the drain line at a return pressure less than 5-10 bar [75-150 psi].

Pressure drop bar [psi]	Viscosity mm^2/s [SUS]	Oil flow in drain line l/min [US gal/min]
100 [1450]	20 [100]	2.5 [0.66]
	35 [165]	1.8 [0.78]
140 [2030]	20 [100]	3.5 [0.93]
	35 [165]	2.8 [0.74]

Direction of shaft rotation



151-1836.10 L

Shaft load

Permissible shaft load

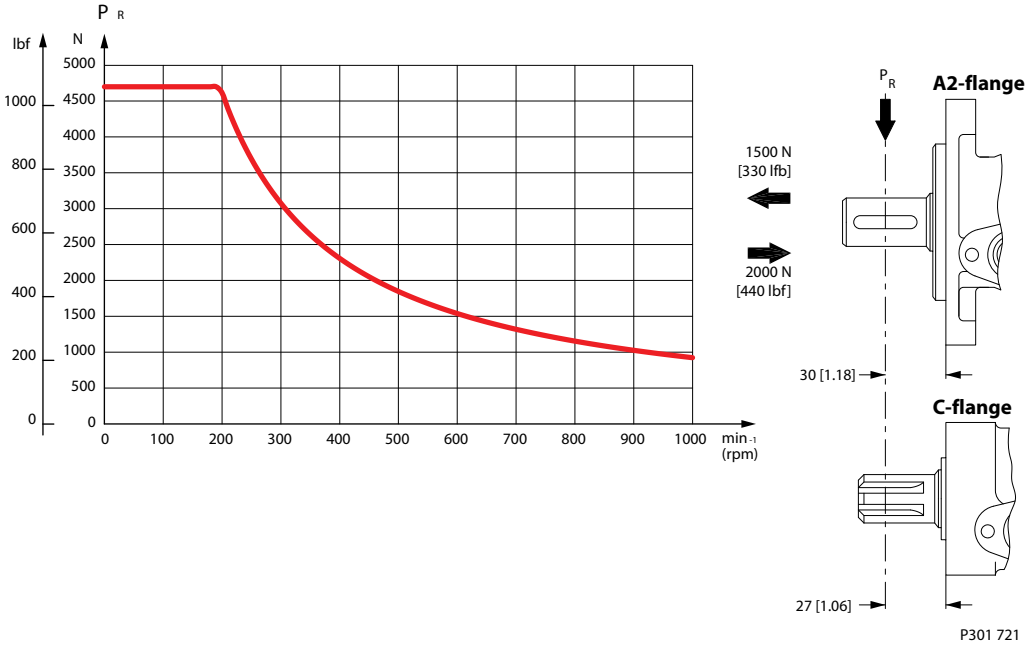
The permissible radial shaft load (P_R) depends on

- n = Speed (min^{-1})
- L = Distance from the point of load to the mounting flange (mm, in)

	A2-flange	C-flange
Permissible shaft load (P_R) - L in mm	$\frac{800}{n} \cdot \frac{150000\ N^*}{100 + L}$	$\frac{800}{n} \cdot \frac{150000\ N^*}{103 + L}$
Permissible shaft load (P_R) - L in inch	$\frac{800}{n} \cdot \frac{1330\ lbf^*}{3.94 + L}$	$\frac{800}{n} \cdot \frac{1330\ lbf^*}{4.06 + L}$

* $n \geq 200\ min^{-1}$ [rpm]; $L \leq 55$ mm [2.2 in]

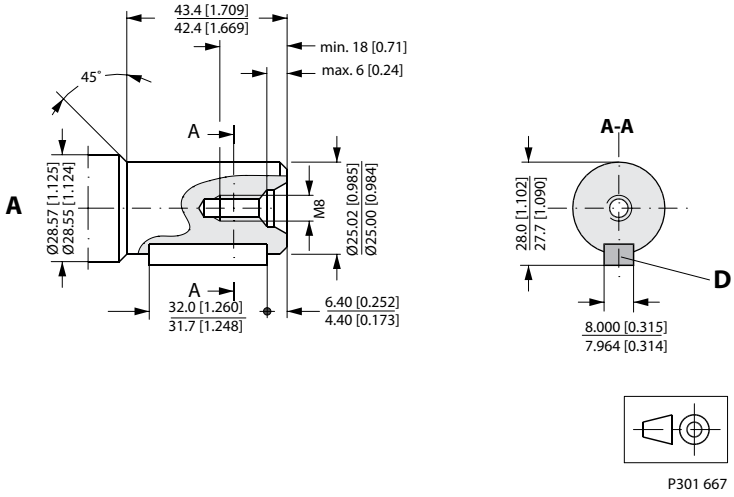
$n < 200\ min^{-1}$ [rpm]; = > $P_{Rmax} = 4615$ N [1037 lbf]



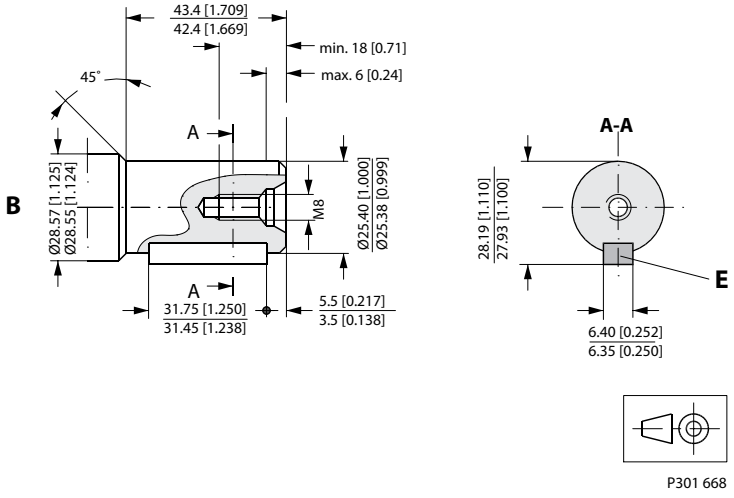
Shaft

Shaft version

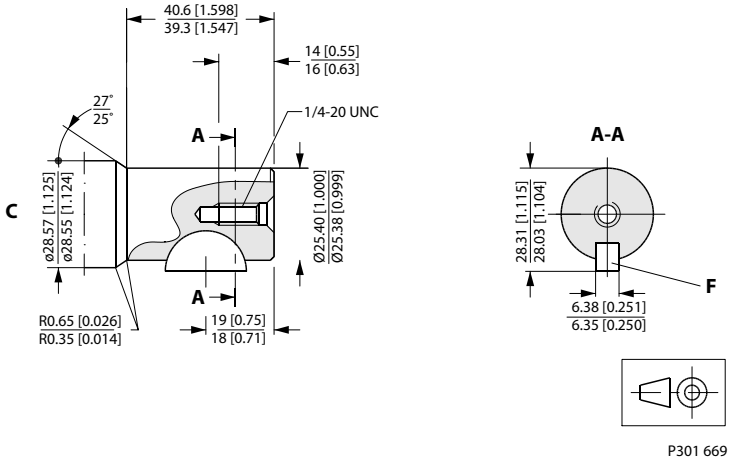
EU version
A: Cylindrical shaft
25 mm
D: Parallel key
A 8 x 7 x 32
DIN 6885



EU version
B: Cylindrical shaft
1 in
E: Parallel key
1/4 x 1/4 x 1 1/4 in
B.S. 46

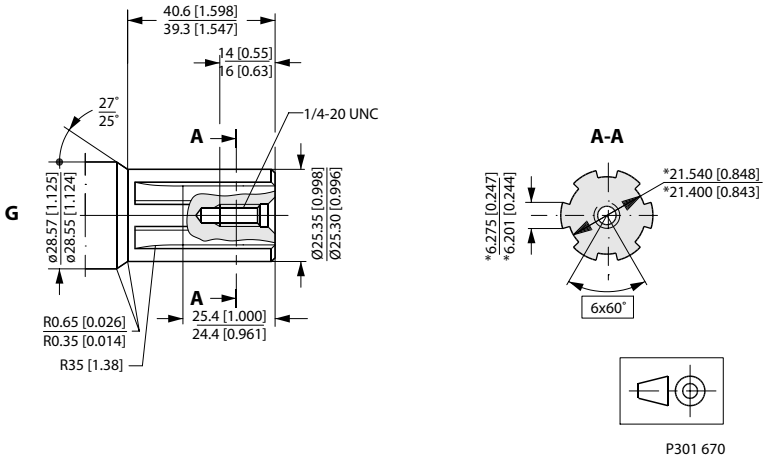


US version
A: Cylindrical shaft
1 in
F: Woodruff key
1/4 × 1 in
SAE J502



Shaft

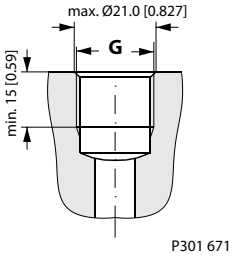
US version
G: Splined shaft
1 in
SAE 6B
* Deviates from B.S. 2059
(SAE 6B)



Port

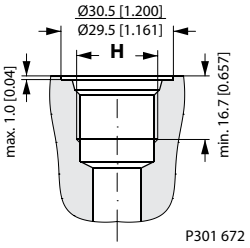
Port thread versions

A



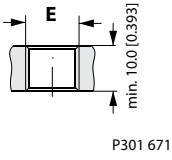
A: G main ports
G: ISO 228/1 - G1/2

B



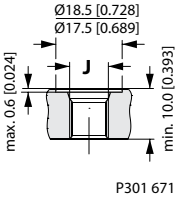
B: UNF main ports
H: 7/8 - 14 UNF O-ring boss port

D



D: G drain port
E: ISO 228/1 - G1/4

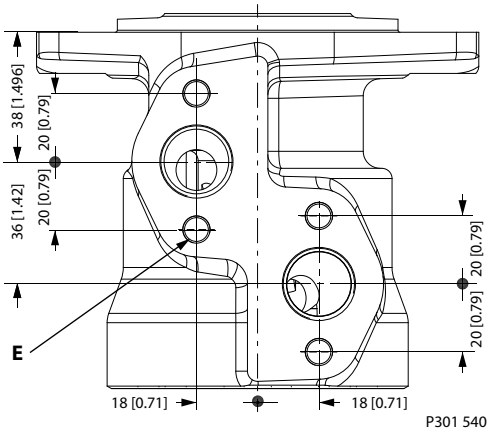
F



F: UNF drain port
J: 7/16 - 20 UNF O-ring boss port

Manifold mount VMP

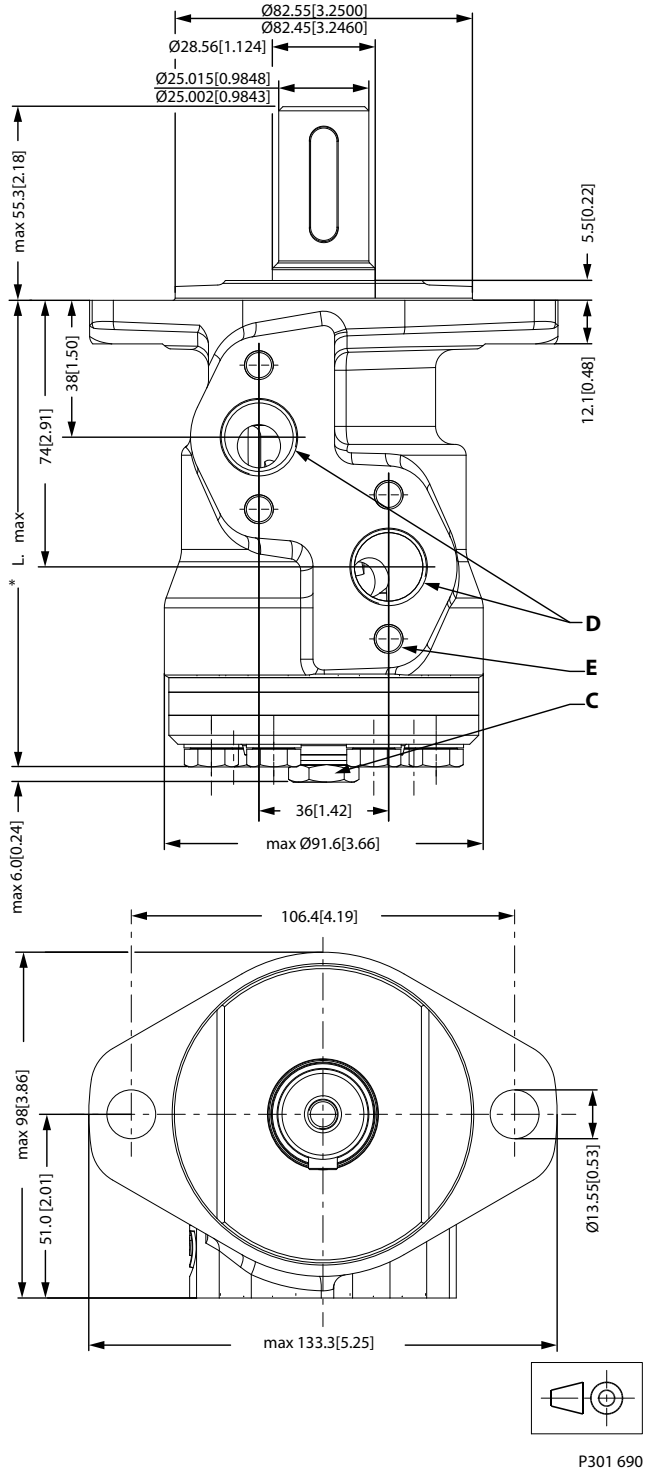
European version



E: M8; 13 [0.51] deep (4 pcs)

Dimensions, VMP European version, cyl. 25 mm shaft, A2 flange and side ports

VMP European version, cyl. 25 mm shaft, A2 flange



C: Drain connection G 1/4; Min. 10 [0.39] deep

D: G 1/2; Min 15 [0.59] deep

E: M8; 13 [0.51] deep (4 pcs)

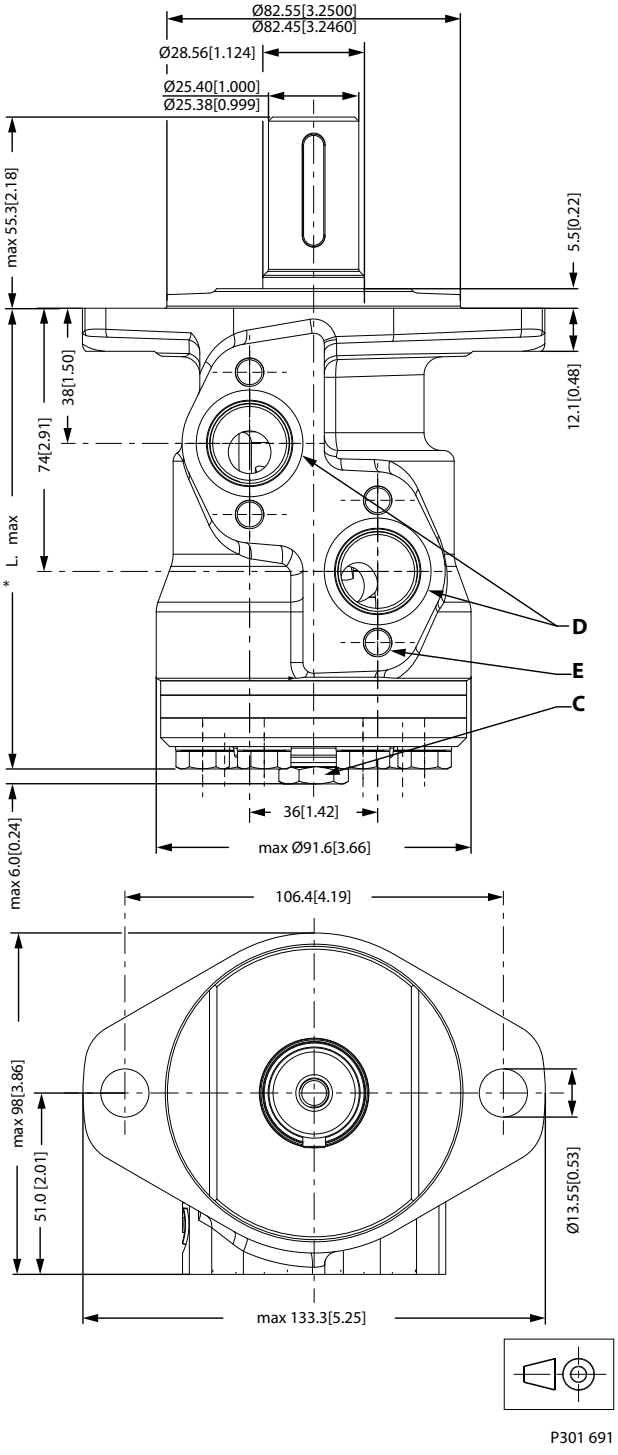
Dimensions, VMP European version, cyl. 25 mm shaft, A2 flange and side ports

Weight and dimensions

Type	*L_{max} mm [in]	Weight kg [lb]
VMP 50	max 132.0 [5.20]	4.9 [10.8]
VMP 80	max 136.0 [5.35]	5.0 [11.0]
VMP 100	max 138.5 [5.45]	5.2 [11.5]
VMP 125	max 142.2 [5.60]	5.3 [11.7]
VMP 160	max 146.3 [5.76]	5.5 [12.1]
VMP 200	max 151.5 [5.96]	5.7 [12.6]
VMP 250	max 158.0 [6.22]	5.9 [13.0]
VMP 315	max 166.5 [6.56]	6.2 [13.7]

Dimensions, VMP, cyl. 1 inch version, A2 flange and side ports

VMP, cyl. 1 inch version, A2 flange



C: Drain connection 7/16-20 UNF; Min. 10 [0.39] deep

D: Port connection 7/8-14 UNF; 16.7 [0.66] deep

E: M8; 13 [0.51] deep (4 pcs)

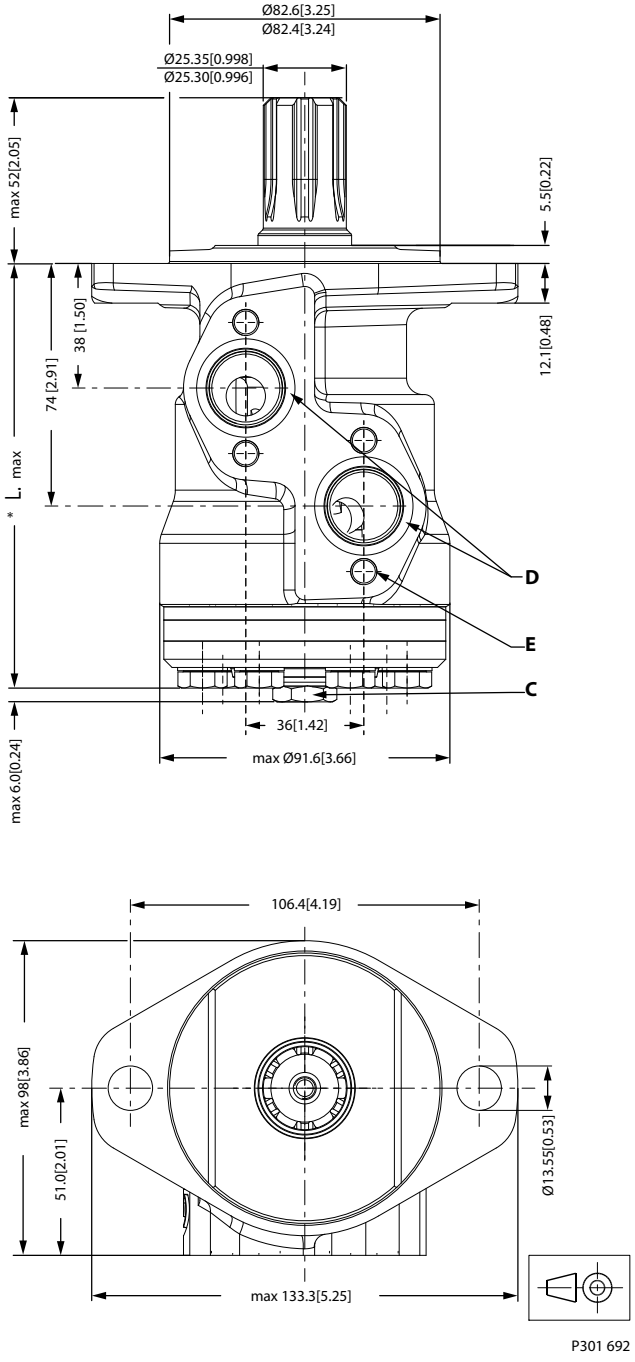
Dimensions, VMP, cyl. 1 inch version, A2 flange and side ports

Weight and dimensions

Type	*L_{max} mm [in]	Weight kg [lb]
VMP 50	max 132.0 [5.20]	4.9 [10.8]
VMP 80	max 136.0 [5.35]	5.0 [11.0]
VMP 100	max 138.5 [5.45]	5.2 [11.5]
VMP 125	max 142.2 [5.60]	5.3 [11.7]
VMP 160	max 146.3 [5.76]	5.5 [12.1]
VMP 200	max 151.5 [5.96]	5.7 [12.6]
VMP 250	max 158.0 [6.22]	5.9 [13.0]
VMP 315	max 166.5 [6.56]	6.2 [13.7]

Dimensions, VMP SAE version, 1 inch splined shaft, A2 flange and side ports

VMP SAE version, 1 inch splined shaft, A2 flange



C: Drain connection 7/16-20 UNF; Min. 10 [0.39] deep

D: Port connection 7/8-14 UNF; 16.7 [0.66] deep

E: M8; 13 [0.51] deep (4 pcs)

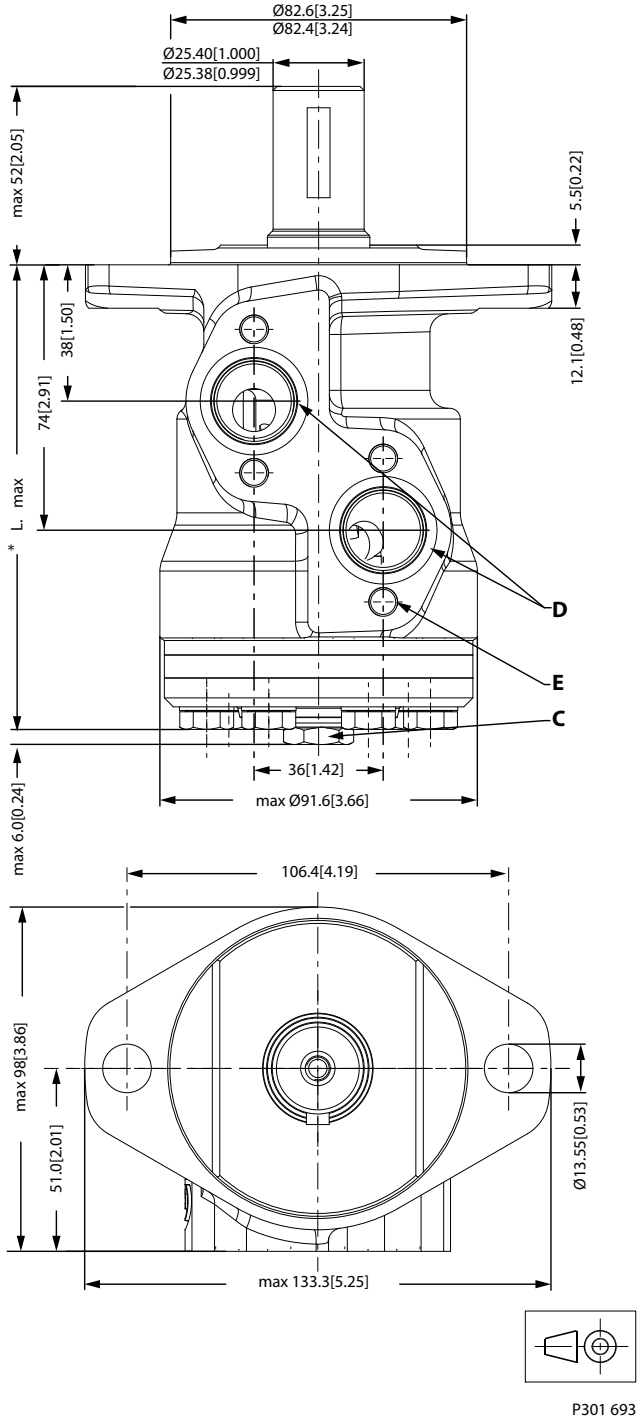
Dimensions, VMP SAE version, 1 inch splined shaft, A2 flange and side ports

Weight and dimensions

Type	*L_{max} mm [in]	Weight kg [lb]
VMP 50	max 132.0 [5.20]	4.9 [10.8]
VMP 80	max 136.0 [5.35]	5.0 [11.0]
VMP 100	max 138.5 [5.45]	5.2 [11.5]
VMP 125	max 142.2 [5.60]	5.3 [11.7]
VMP 160	max 146.3 [5.76]	5.5 [12.1]
VMP 200	max 151.5 [5.96]	5.7 [12.6]
VMP 250	max 158.0 [6.22]	5.9 [13.0]
VMP 315	max 166.5 [6.56]	6.2 [13.7]

Dimensions, VMP SAE version, cyl. 1 inch shaft, Woodruff key, A2 flange and side ports

VMP SAE version, cyl. 1 inch shaft, Woodruff key, A2 flange



C: Drain connection 7/16-20 UNF; Min. 10 [0.39] deep

D: Port connection 7/8-14 UNF; 16.7 [0.66] deep

E: M8; 13 [0.51] deep (4 pcs)

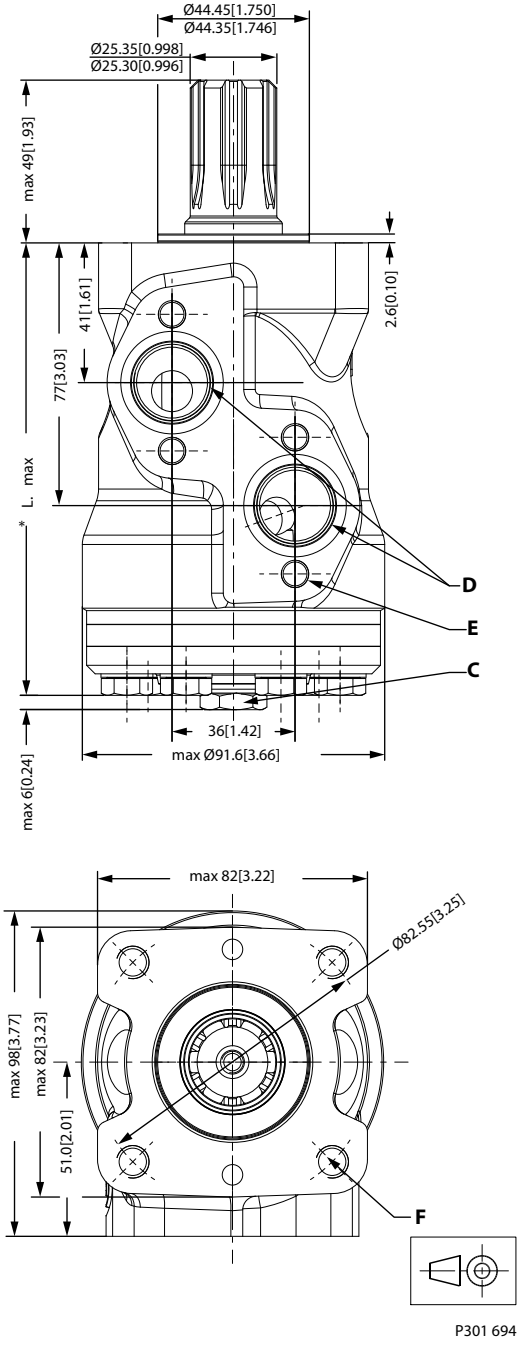
Dimensions, VMP SAE version, cyl. 1 inch shaft, Woodruff key, A2 flange and side ports

Weight and dimensions

Type	*L_{max} mm [in]	Weight kg [lb]
VMP 50	max 132.0 [5.20]	4.9 [10.8]
VMP 80	max 136.0 [5.35]	5.0 [11.0]
VMP 100	max 138.5 [5.45]	5.2 [11.5]
VMP 125	max 142.2 [5.60]	5.3 [11.7]
VMP 160	max 146.3 [5.76]	5.5 [12.1]
VMP 200	max 151.5 [5.96]	5.7 [12.6]
VMP 250	max 158.0 [6.22]	5.9 [13.0]
VMP 315	max 166.5 [6.56]	6.2 [13.7]

Dimensions, VMP SAE version, 1 inch splined shaft, C flange and side ports

VMP SAE version, 1 inch splined shaft, C flange



C: Drain connection 7/16-20 UNF; Min. 10 [0.39] deep

D: Port connection 7/8-14 UNF; 16.7 [0.66] deep

E: M8; 13 [0.51] deep (4 pcs)

F: 3/8-16 UNC 15 [0.59] deep (4 pcs)

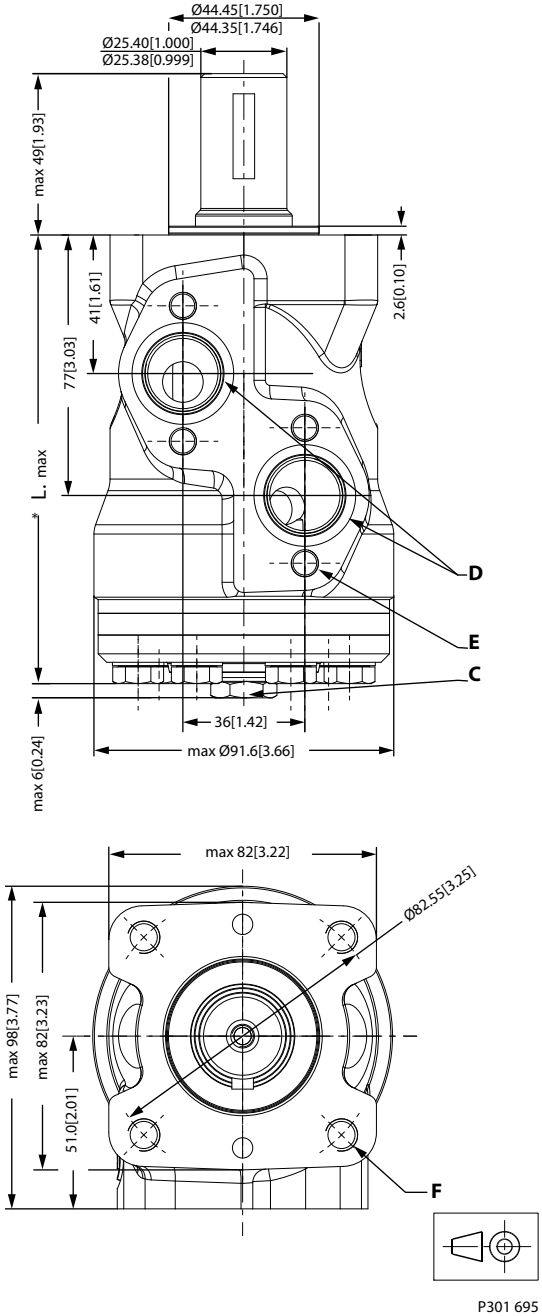
Dimensions, VMP SAE version, 1 inch splined shaft, C flange and side ports

Weight and dimensions

Type	*L_{max} mm [in]	Weight kg [lb]
VMP 50	max 134.9 [5.31]	4.9 [10.8]
VMP 80	max 138.8 [5.46]	5.0 [11.0]
VMP 100	max 141.4 [5.57]	5.2 [11.5]
VMP 125	max 145.1 [5.71]	5.3 [11.7]
VMP 160	max 149.2 [5.87]	5.5 [12.1]
VMP 200	max 154.4 [6.08]	5.7 [12.6]
VMP 250	max 160.9 [6.33]	5.9 [13.0]
VMP 315	max 169.3 [6.67]	6.2 [13.7]

Dimensions, VMP SAE version, cyl. 1 inch shaft, Woodruff key, C flange and side ports

VMP SAE version, cyl. 1 inch shaft, Woodruff key, C flange



C: Drain connection 7/16-20 UNF; Min. 10 [0.39] deep

D: Port connection 7/8-14 UNF; 16.7 [0.66] deep

E: M8; 13 [0.51] deep (4 pcs)

F: 3/8-16 UNC 15 [0.59] deep (4 pcs)

Dimensions, VMP SAE version, cyl. 1 inch shaft, Woodruff key, C flange and side ports

Weight and dimensions

Type	*L_{max} mm [in]	Weight kg [lb]
VMP 50	max 134.9 [5.31]	4.9 [10.8]
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