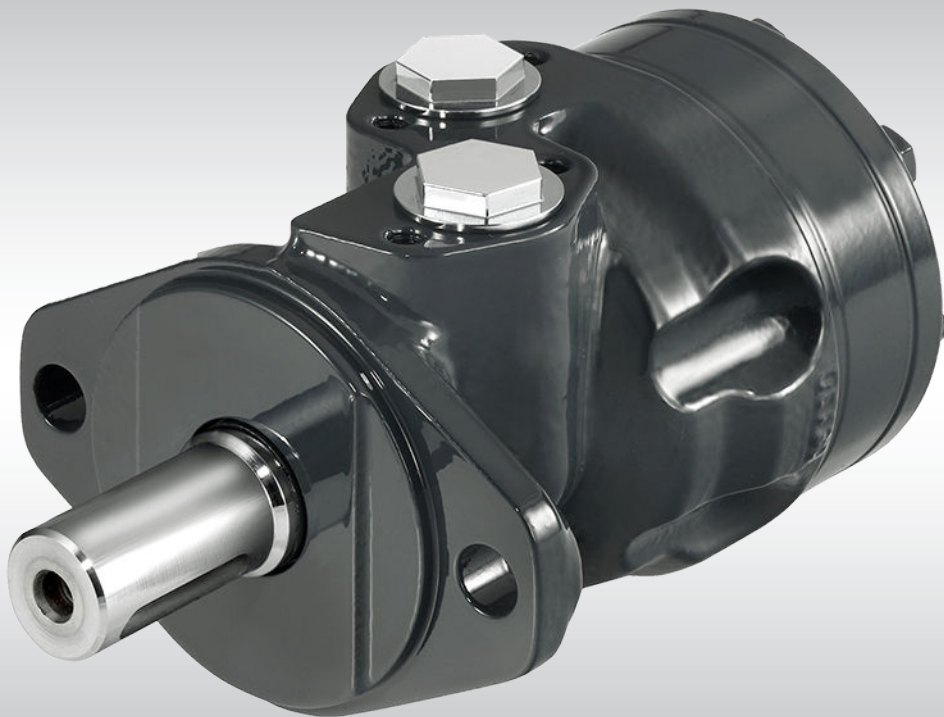




Technical Information
Orbital Motor
VMR



Revision history*Table of revisions*

Date	Changed	Rev
May 2014	Code number changed	CC
Mar 2014	Minor updates	CB
Feb 2014	Dimensions drawings updated again	CA
Feb 2014	Dimensions drawings updated	BA
Feb 2014	First version - DITA CMS	AA

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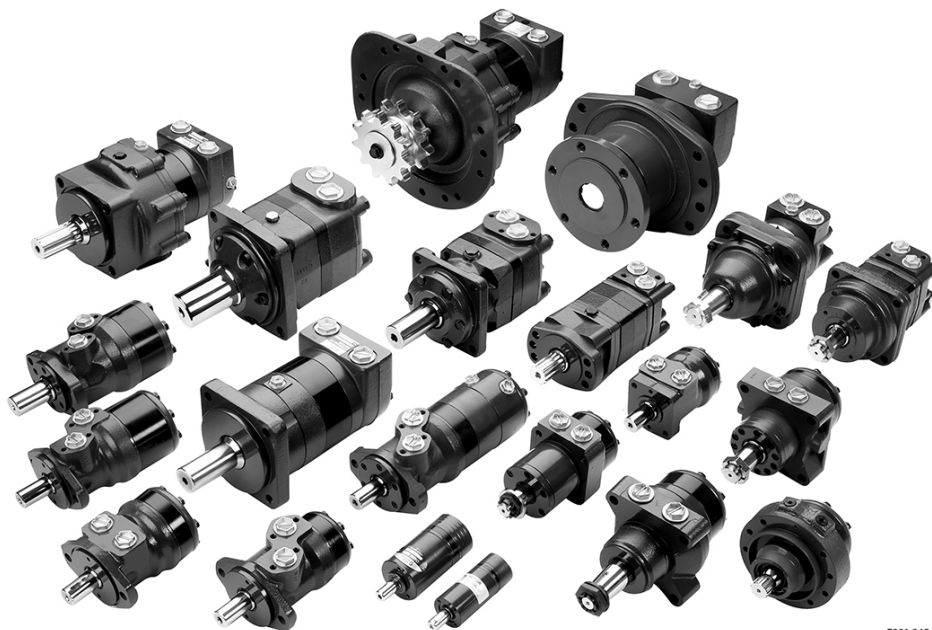
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A wide range of Orbital Motors

Characteristic, features and application areas of Orbital Motors



F301 245

Danfoss is a world leader within production of low speed orbital motors with high torque. We can offer more than 3000 different orbital motors, categorised in types, variants and sizes (incl. different shaft versions).

The motors vary in size (rated displacement) from 8 cm³ [0.50 in³] to 800 cm³ [48.9 in³] per revolution.

Speeds range up to approx. 2500 min⁻¹ (rpm) for the smallest type and up to approx. 600 min⁻¹ (rpm) for the largest type.

Maximum operating torques vary from 13 N•m [115 lbf•in] to 2700 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:

A wide range of Orbital Motors

- Motors with corrosion resistant parts
- Wheel motors with recessed mounting flange
- 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: TMT
- Technical data on large motors: TMV

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 VMR, 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.

VMR features

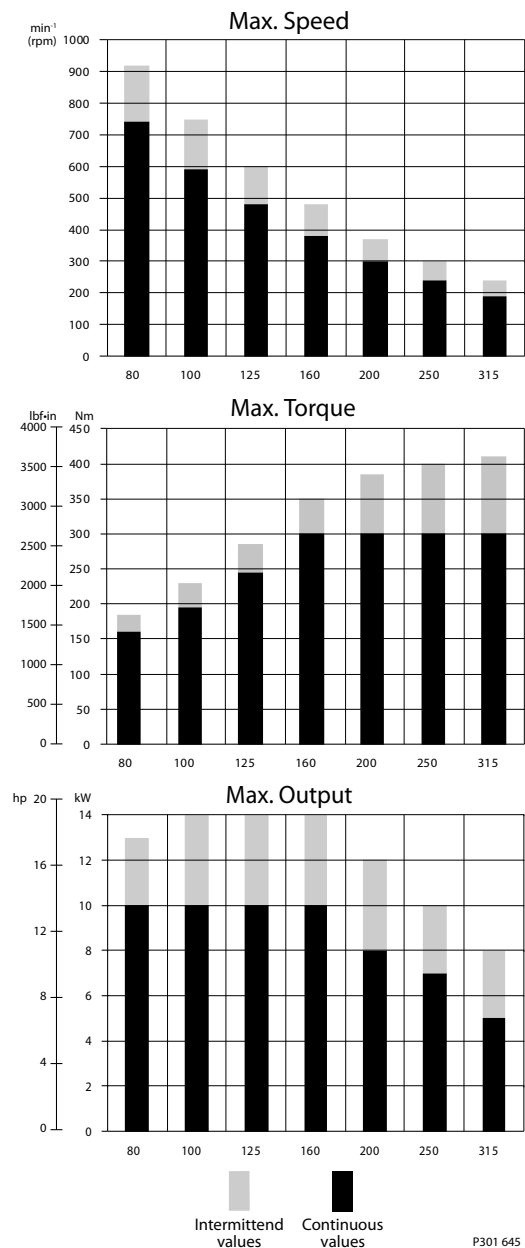
- High pressure shaft seal
- Proven orbital motor design
- 3-chamber motor design
- Suitable for medium and low duty

Speed, torque and output

Speed, torque and output

The bar diagrams, are useful for a quick selection of relevant motor size for the application. The final motor size can be determined by using the [function diagram](#).

The function diagrams are based on actual tests on a representative number of motors from our production. The diagrams apply to a return pressure between 5 and 10 bar [75 and 150 psi] when using mineral based hydraulic oil with a viscosity of 35 mm²/s [165 SUS] and a temperature of 50°C [120°F]. For further explanation concerning how to read and use the function diagrams, please consult the paragraph "Selection of motor size" in the technical information "General" 520L0232.



Technical Information VMR Orbital Motor

Versions

Versions and code numbers

Versions

Mounting flange	2 hole oval flange (A2 - flange)						Square flange (C-flange)		
Spigot diameter	Ø82.5 mm [3.25 in]						Ø44.4 mm [1.75 in]		
Bolt circle diameter (BC)	Ø106.4 mm [4.20 in]						Ø82.5 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	G1/2		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									
VMR 80	11136673	11125716	11141128	11141135	11144396	11144777	11144831*	11144431	
VMR 100	11136674	11125719	11141129	11141136	11144397	11144778	11144832*	11144432	
VMR 125	11136675	11125720	11141130	11141137	11144398	11144779	11144833*	11144433	
VMR 160	11136676	11125721	11141131	11141138	11144399	11144780	11144834*	11144434	
VMR 200	11136677	11125722	11141132	11141139	11144400	11144781	11144835	11144435	
VMR 250	11136678	11125723	11141133	11141140	11144401	11144822	11144836*	11144437	
VMR 315	11136679	11125724	11141134	11141141	11144402	11144823	11144837*	11144438	

* To be defined on request

Technical Information VMR Orbital Motor
Technical data
Technical data for VMR
Technical data for VMR with 25 mm, 1 in cylindrical and 1 in splined shaft

Type Motorsize			VMR 80	VMR 100	VMR 125	VMR 160	VMR 200	VMR 250	VMR 315
Geometric displacement	cm ³ [in ³]		80.3 [4.9]	99.8 [6.1]	124.1 [7.6]	155.4 [9.5]	198.2 [12.1]	248.1 [15.1]	310.1 [12.1]
Max. speed	min ⁻¹ [rpm]	cont.	740	590	480	380	300	240	190
		int. ¹⁾	920	750	600	480	370	300	240
Max. torque	Nm [lbf·in]	cont.	160 [1415]	195 [1725]	245 [2170]	300 [2365]	300 [2365]	300 [2365]	300 [2365]
		int. ¹⁾	185 [1635]	230 [2035]	285 [2520]	350 [3100]	385 [3410]	400 [3540]	410 [3630]
Max. output	kW [hp]	cont.	10 [13.4]	10 [13.4]	10 [13.4]	10 [13.4]	8 [10.7]	7 [9.4]	5 [6.7]
		int. ¹⁾	13 [17.4]	14 [18.8]	14 [18.8]	14 [18.8]	12 [16.1]	10 [13.4]	8 [10.7]
Max. pressure drop	bar [psi]	cont.	140 [2030]	140 [2030]	140 [2030]	140 [2030]	105 [1595]	90 [1160]	70 [1015]
		int. ¹⁾	165 [2395]	165 [2395]	165 [2395]	165 [2395]	140 [2195]	120 [1595]	100 [1450]
Max. oil flow	l/min [US gal/min]	cont.	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]
		int. ¹⁾	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]
Min starting torque	at max. Press-drop Nm [lbf·in]	cont.	120 [1060]	165 [1460]	205 [1815]	255 [2255]	295 [2610]	320 [2830]	360 [3185]
		int. ¹⁾	150 [1330]	205 [1815]	255 [2255]	320 [2830]	365 [3230]	410 [3630]	425 [3760]

Type			Max inlet pressure	Max inlet pressure with drain line
VMR 80-315	bar [psi]	cont.	165 [2395]	165 [2395]
		int. ¹⁾	185 [2695]	185 [2695]

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

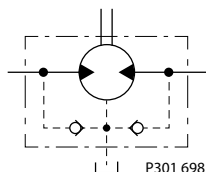
Recommendation:

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

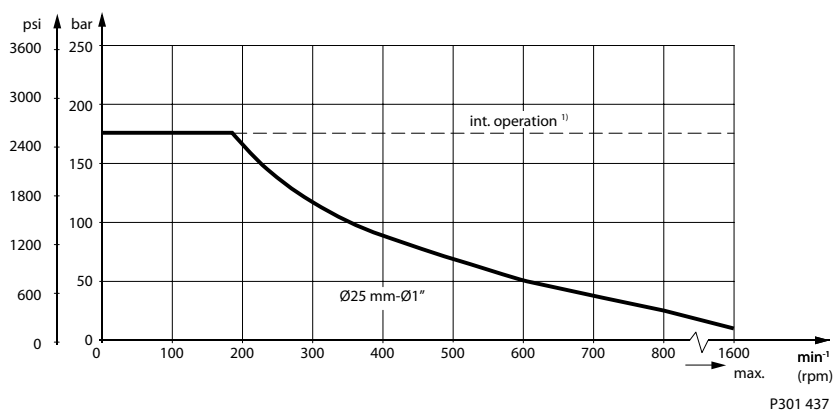
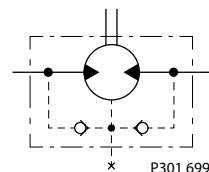
Shaft seal

VMR with High Pressure Shaft Seal (HPS)

VMR with check valves and drain connection: The shaft seal pressure equals the pressure in the drain line.



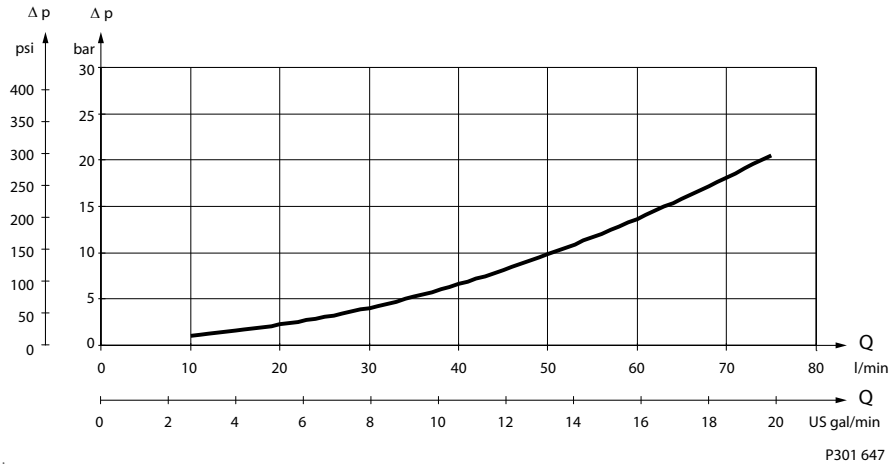
VMR with check valves and *without* drain connected: The shaft seal pressure equals the pressure in the return line + 10 bar [145 psi].



Please check motor pressure according to data under [Technical data for VMR](#).

Pressure drop

Pressure drop in motor



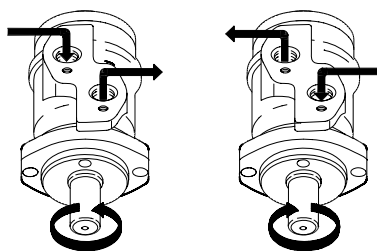
The curve applies to an unloaded motor shaft and an oil viscosity of 35 mm²/s [165 SUS]

Technical Information VMR Orbital Motor

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

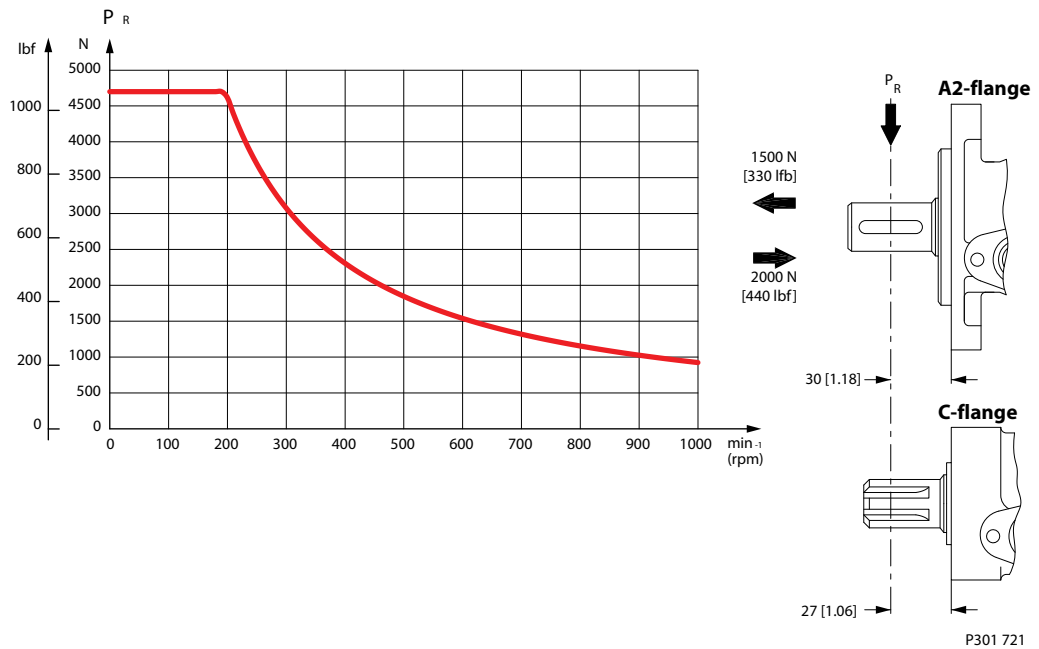
The permissible radial shaft load (P_R) depends on

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

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

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



P301 721

Function diagrams

Function diagrams

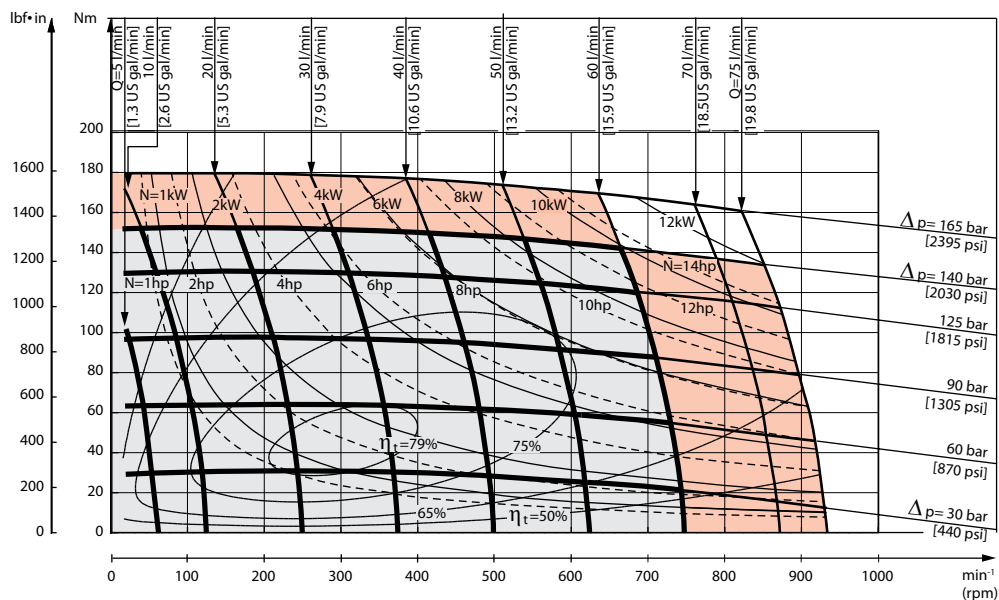
Explanation of function diagram use, basis and conditions can be found under [Speed, torque and output](#).

Light grey = Continuous range

Light red = Intermittent range (max. 10% operation every minute)

Intermittent pressure drop and oil flow must not occur simultaneously.

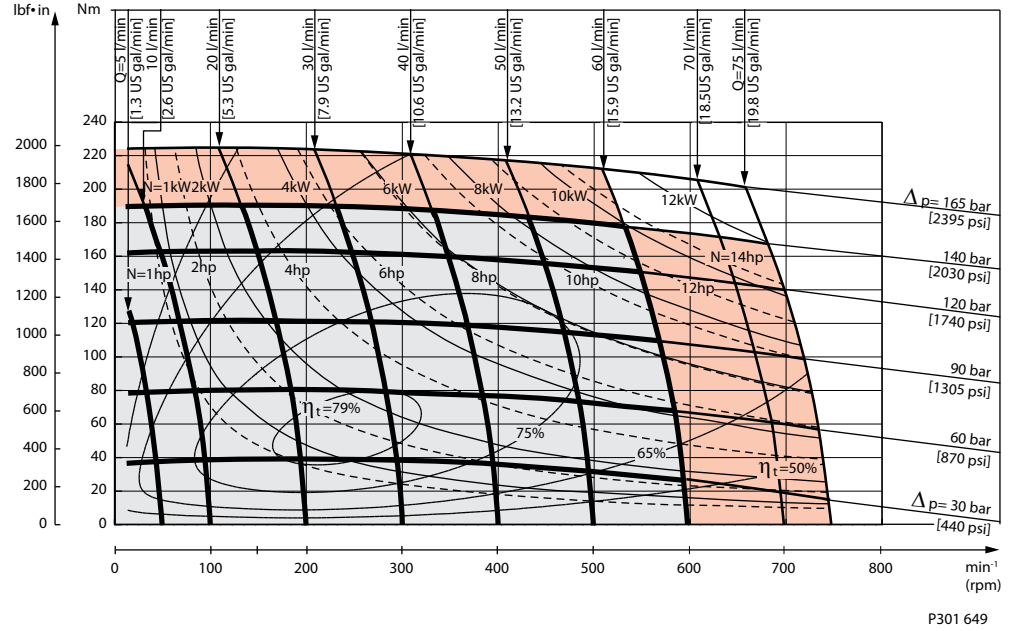
VMR 80 function diagram



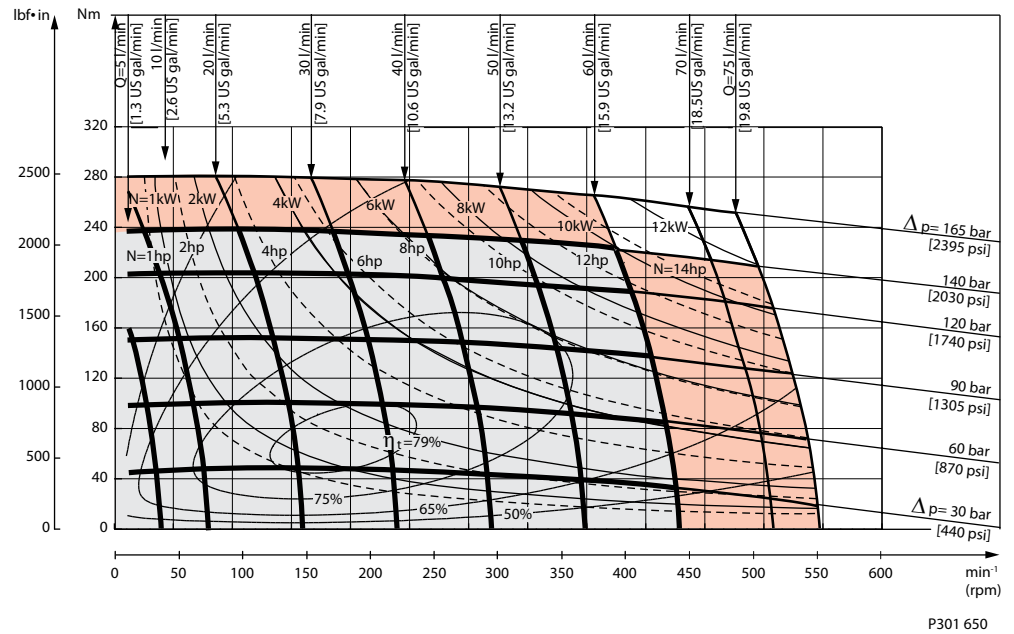
P301 648

Function diagrams

VMR 100 function diagram

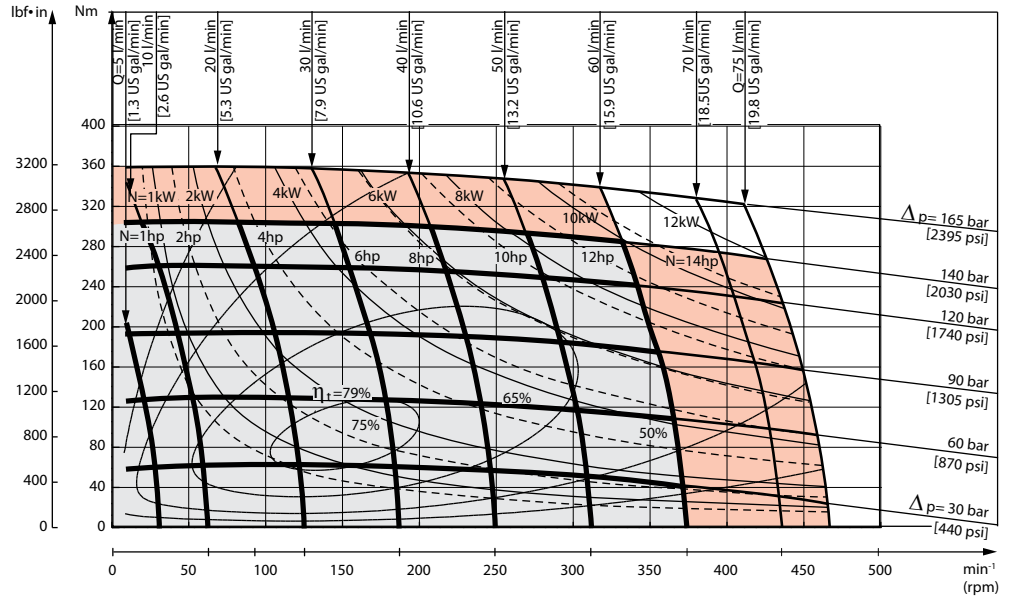


VMR 125 function diagram



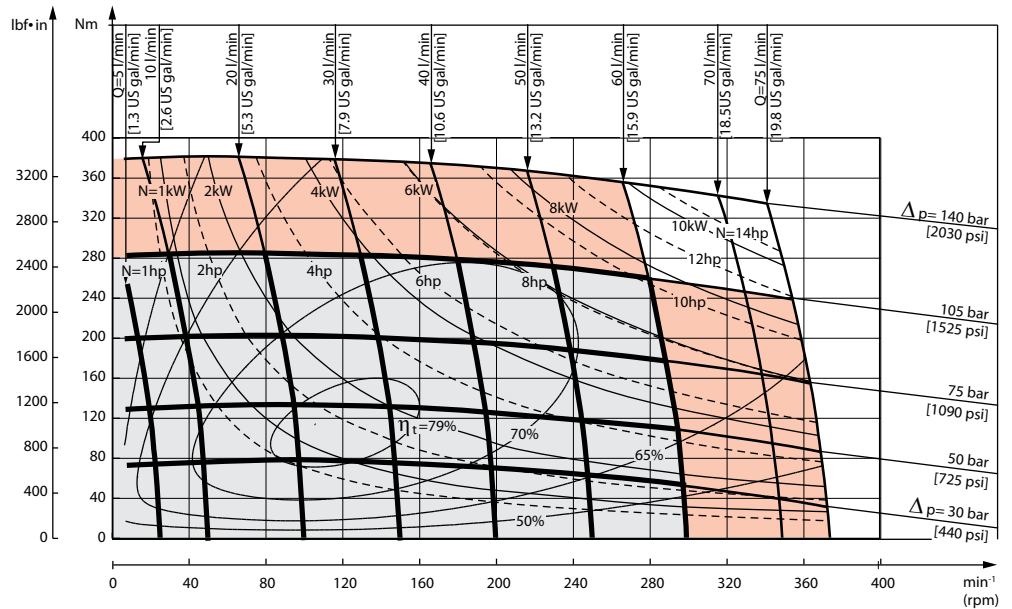
Function diagrams

VMR 160 function diagram



P301 651

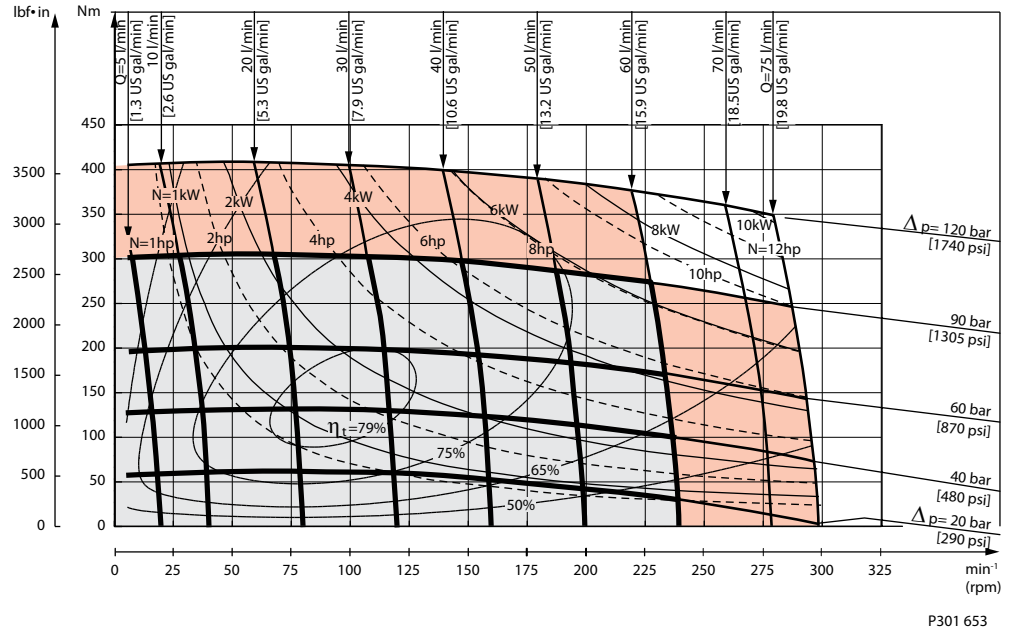
VMR 200 function diagram



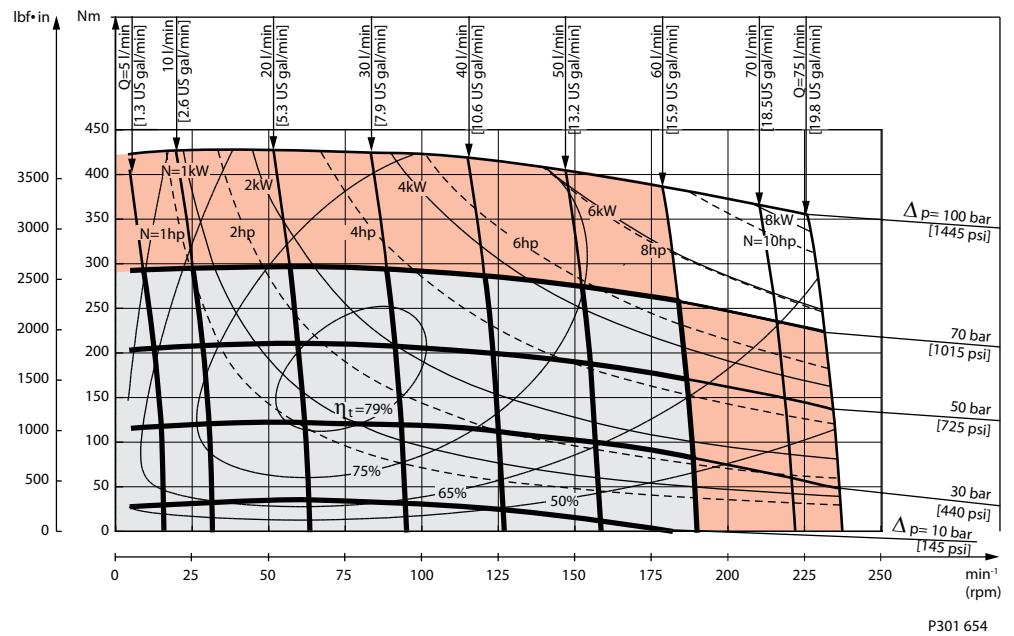
P301 652

Function diagrams

VMR 250 function diagram

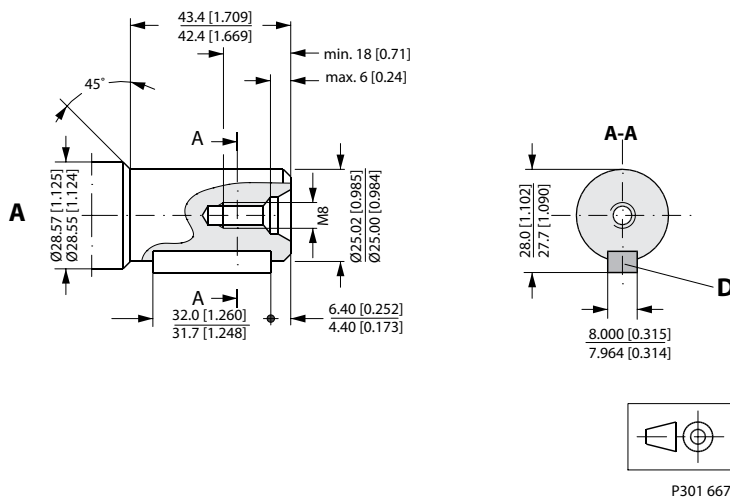


VMR 315 function diagram

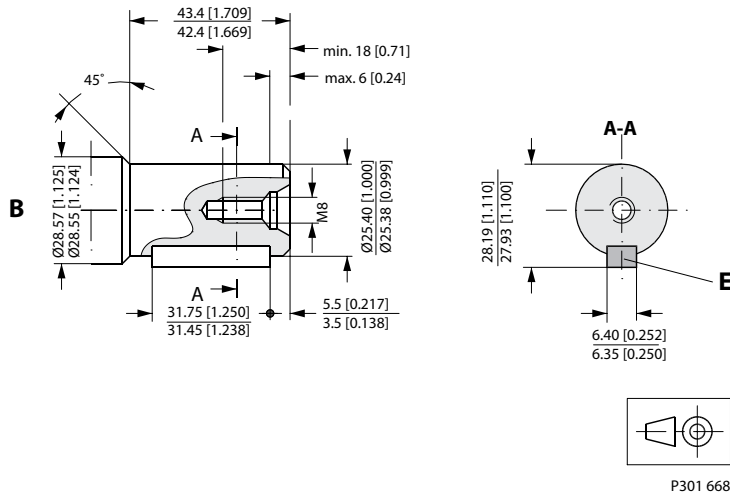


Shaft
Shaft version
EU version

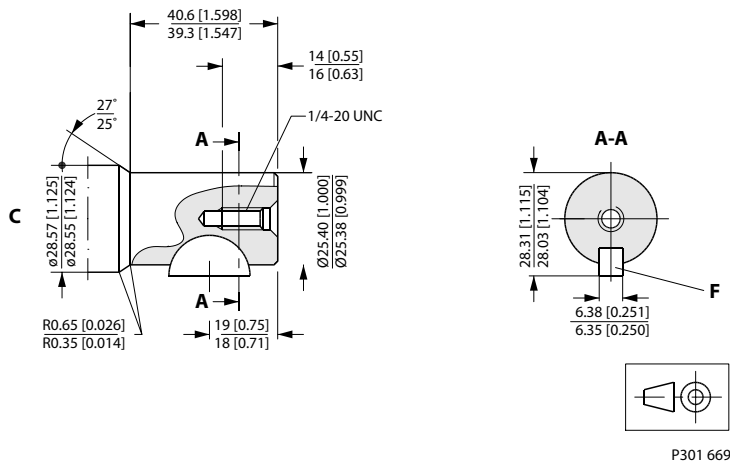
A: Cylindrical shaft
 25 mm
 D: Parallel key
 A 8 x 7 x 32
 DIN 6885


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 x 1 in
 SAE J502



Shaft

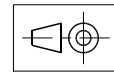
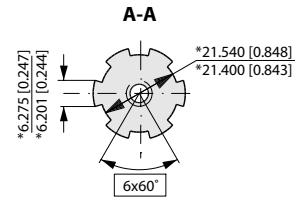
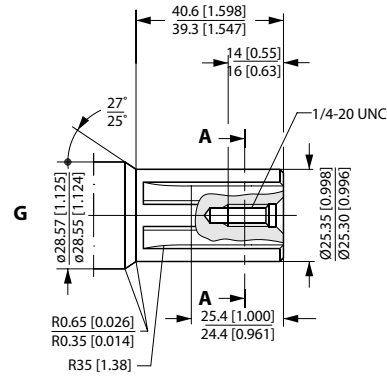
US version

G: Splined shaft

1 in

SAE 6B

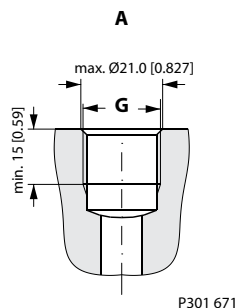
* Deviates from B.S. 2059 (SAE 6B)



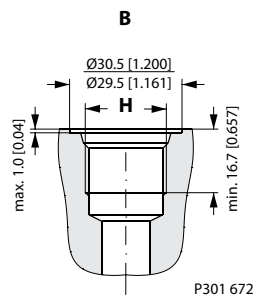
P301 670

Port

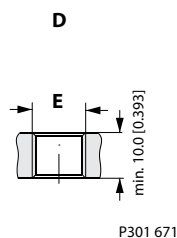
Port thread versions



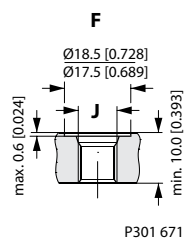
A: G main ports
G: ISO 228/1 - G1/2



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



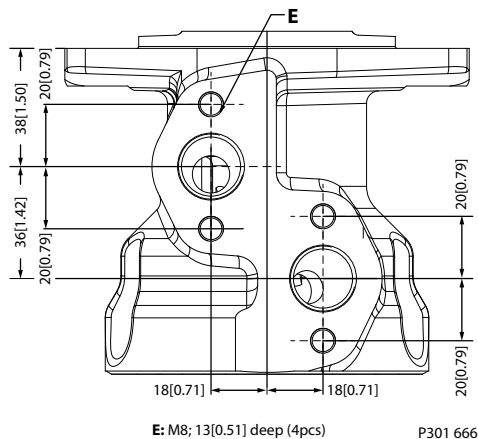
D: G drain port
E: ISO 228/1 - G1/4



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

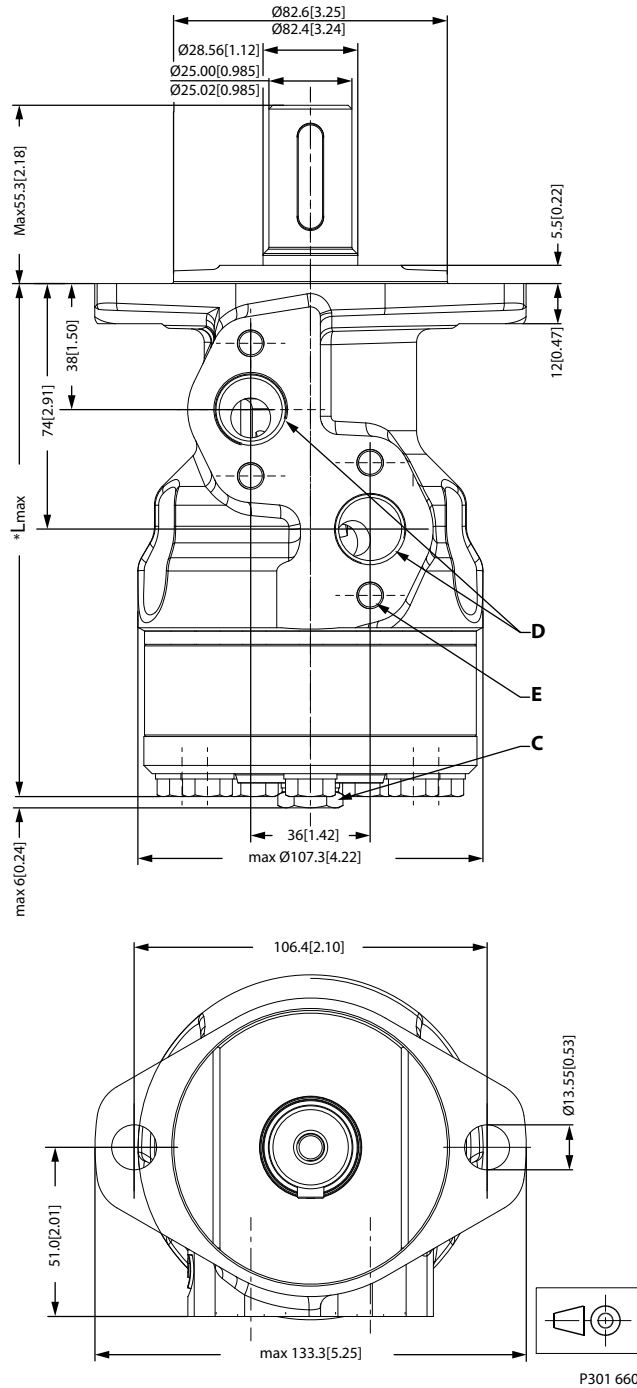
Manifold mount VMR

European version



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

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



C: Drain connection G1/4; Min. 10 [0.39] deep

D: G1/2; Min 15 [0.59] deep

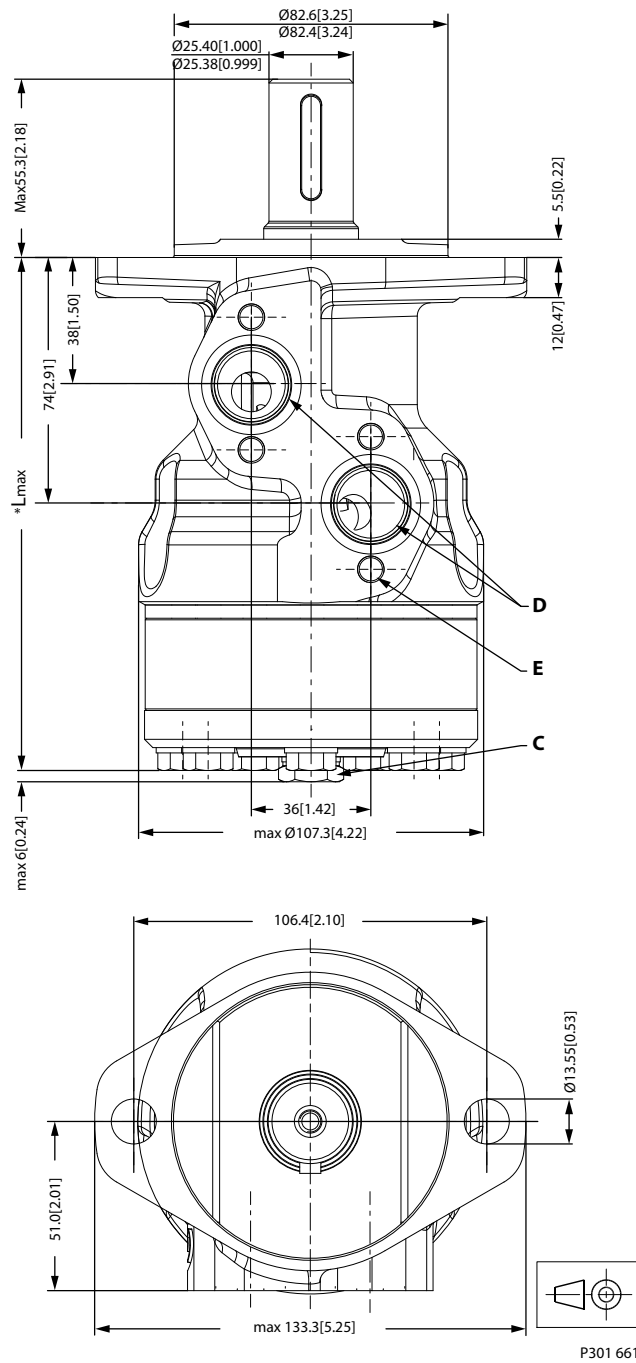
E: M8; 13 [0.51] deep (4 pcs)

Dimensions, VMR European version, cyl. 25 mm shaft, A2 flange and side ports***Weight and dimensions***

Type	*L_{max} mm [in]	Weight kg [lb]
VMR 80	max 143.1 [5.63]	6.3 [13.89]
VMR 100	max 143.1 [5.63]	6.3 [13.89]
VMR 125	max 146.7 [5.76]	6.4 [14.11]
VMR 160	max 150.9 [5.94]	6.7 [14.77]
VMR 200	max 156.9 [6.18]	6.9 [15.21]
VMR 250	max 163.9 [6.45]	7.3 [16.09]
VMR 315	max 172.6 [6.80]	7.7 [16-98]

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

VMR, 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

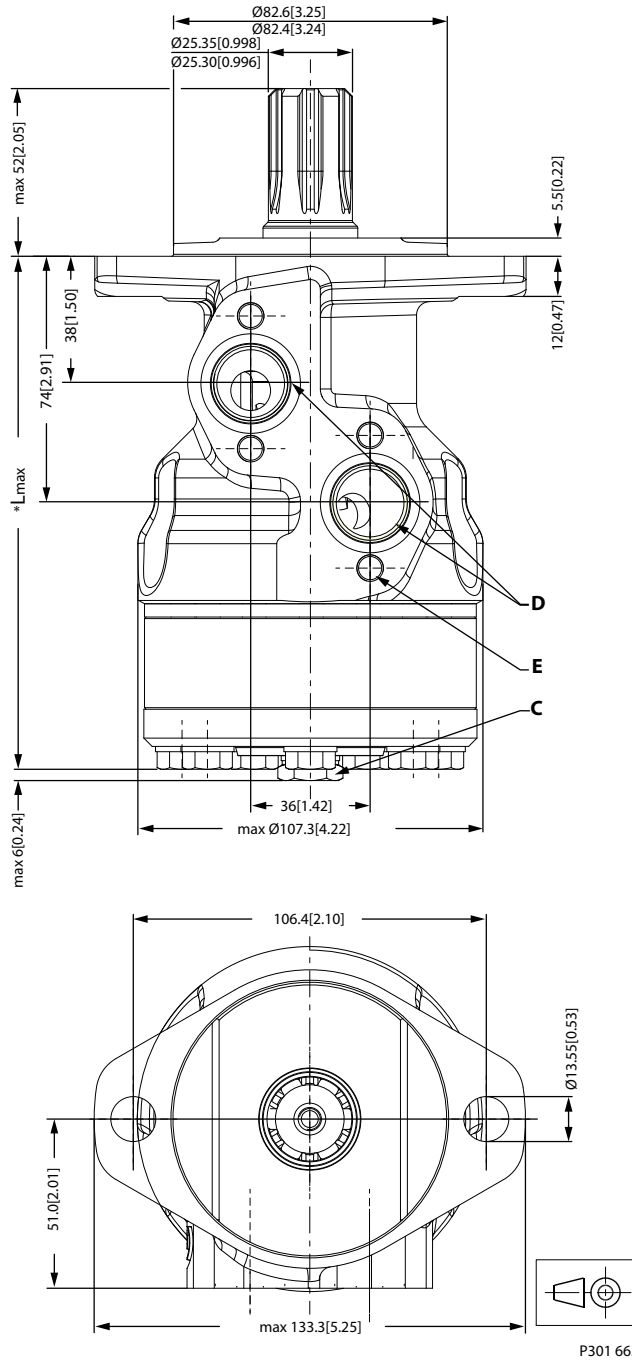
E: M8; 13 [0.51] deep (4 pcs)

Dimensions, VMR, cyl. 1 inch version, A2 flange and side ports***Weight and dimensions***

Type	*L_{max} mm [in]	Weight kg [lg]
VMR 80	max 143.1 [5.63]	6.3 [13.89]
VMR 100	max 143.1 [5.63]	6.3 [13.89]
VMR 125	max 146.7 [5.76]	6.4 [14.11]
VMR 160	max 150.9 [5.94]	6.7 [14.77]
VMR 200	max 156.9 [6.18]	6.9 [15.21]
VMR 250	max 163.9 [6.45]	7.3 [16.09]
VMR 315	max 172.6 [6.80]	7.7 [16.98]

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

VMR SAE version, 1 inch splined shaft, A2 flange



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

D: Port connection 7/814 UNF; 16.7 [0.66] deep

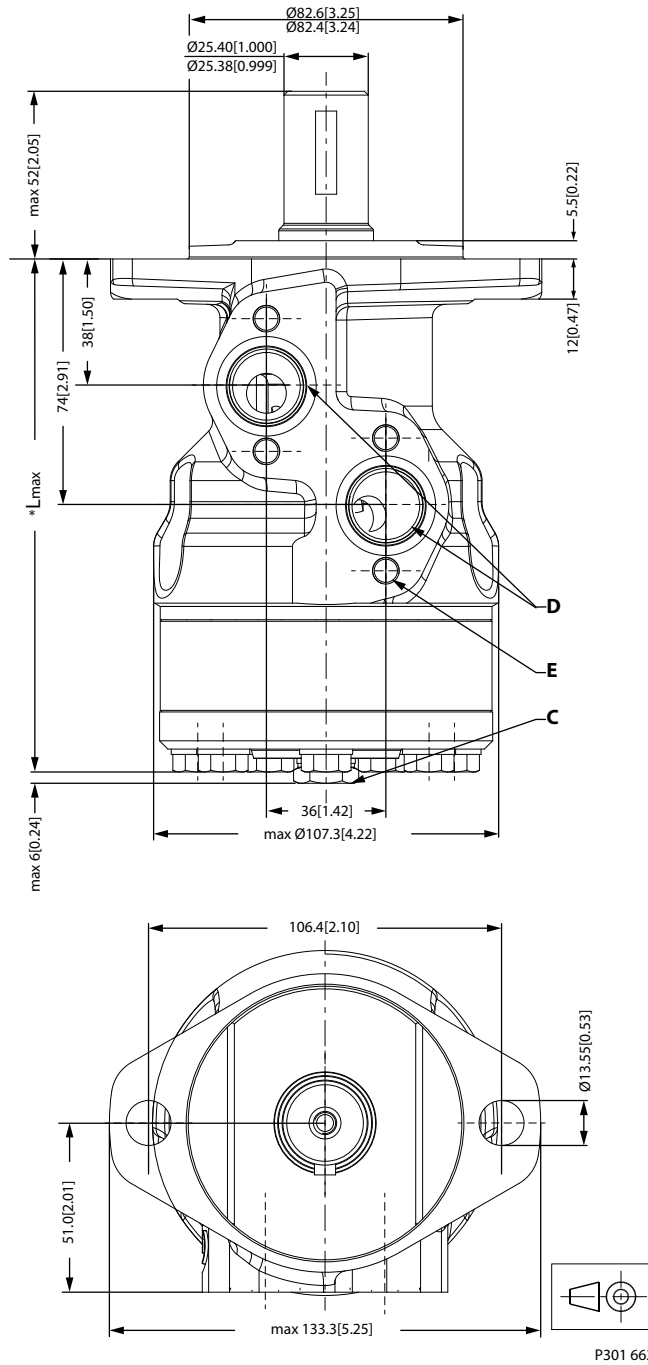
E: M8; 13 [0.51] deep (4 pcs)

Dimensions, VMR SAE version, 1 inch splined shaft, A2 flange and side ports***Weight and dimensions***

Type	*L_{max} mm [in]	Weight kg [lb]
VMR 80	max 143.1 [5.63]	6.3 [13.89]
VMR 100	max 143.1 [5.63]	6.3 [13.89]
VMR 125	max 146.7 [5.76]	6.4 [14.11]
VMR 160	max 150.9 [5.94]	6.7 [14.77]
VMR 200	max 156.9 [6.18]	6.9 [15.21]
VMR 250	max 163.9 [6.45]	7.3 [16.09]
VMR 315	max 172.6 [6.80]	7.7 [16.98]

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

VMR 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)

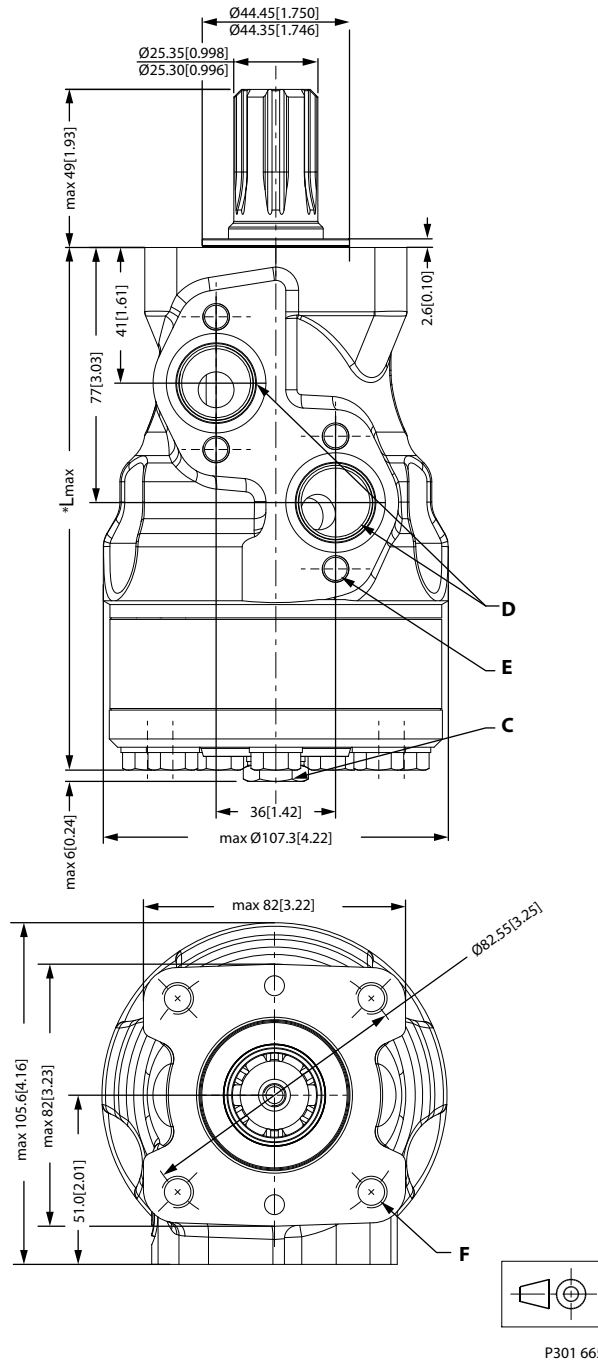
Dimensions, VMR SAE version, cyl. 1 inch shaft, Woodruff key, A2 flange and side ports

Weight and dimensions

Type	*L_{max} mm [in]	Weight kg [lb]
VMR 80	max 143.1 [5.63]	6.3 [13.98]
VMR 100	max 143.1 [5.63]	6.3 [13.98]
VMR 125	max 146.7 [5.76]	6.4 [14.11]
VMR 160	max 150.9 [5.94]	6.7 [14.77]
VMR 200	max 156.9 [6.18]	6.9 [15.21]
VMR 250	max 163.9 [6.45]	7.3 [16.09]
VMR 315	max 172.6 [6.80]	7.7 [16.98]

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

VMR 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)

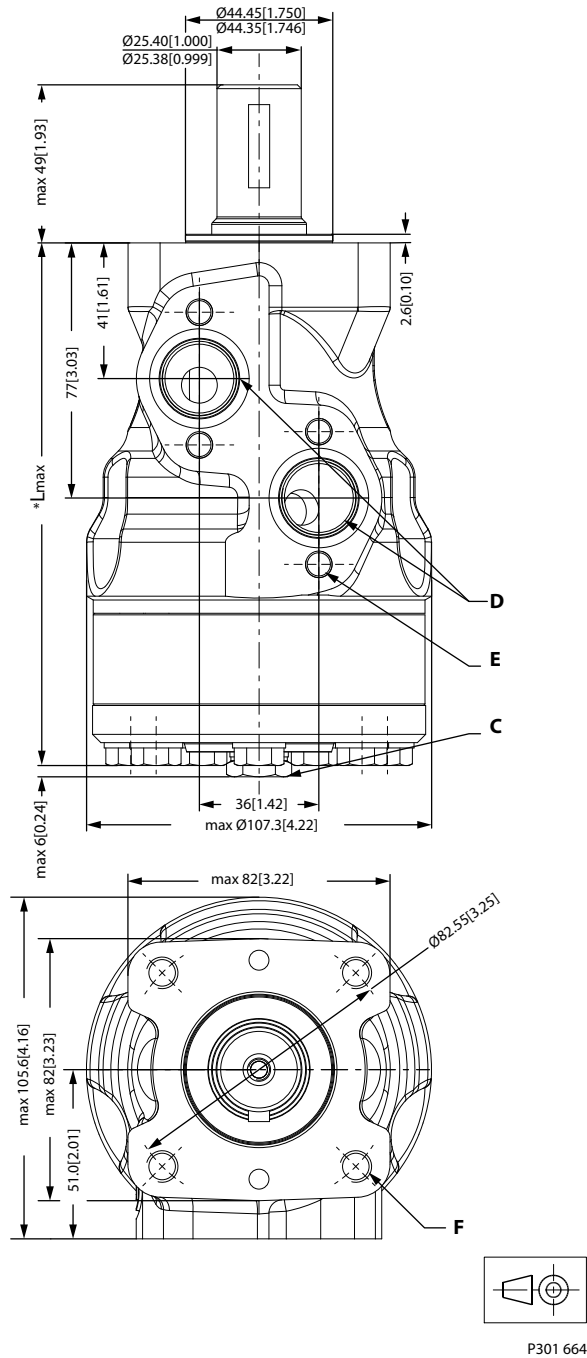
F: 3/8-16 UNC 26.5 [1.04] deep (4 pcs)

Dimensions, VMR SAE version, 1 inch splined shaft, C flange and side ports***Weight and dimensions***

Type	*L_{max} mm [in]	Weight kg [lb]
VMR 80	max 145.6 [5.73]	6.3 [13.89]
VMR 100	max 145.6 [5.73]	6.3 [13.89]
VMR 125	max 149.0 [5.87]	6.4 [14.11]
VMR 160	max 153.4 [6.04]	6.7 [14.77]
VMR 200	max 159.4 [6.28]	6.9 [15.21]
VMR 250	max 166.4 [6.55]	7.3 [16.09]
VMR 315	max 175.1 [6.89]	7.7 [16.98]

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

VMR 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 26.5 [1.04] deep (4 pcs)

Dimensions, VMR SAE version, cyl. 1 inch shaft, Woodruff key, C flange and side ports***Weight and dimensions***

Type	*L_{max} mm [in]	Weight kg [lb]
VMR 80	max 145.6 [5.73]	6.3 [13.89]
VMR 100	max 145.6 [5.73]	6.3 [13.89]
VMR 125	max 149.0 [5.87]	6.4 [14.11]
VMR 160	max 153.4 [6.04]	6.7 [14.77]
VMR 200	max 159.4 [6.28]	6.9 [15.21]
VMR 250	max 166.4 [6.55]	7.3 [16.09]
VMR 315	max 175.1 [6.89]	7.7 [16.98]



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