MOTORS

Technical Information

OML and OMM Orbital Motors

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White is a leading global provider of motor and steering solutions that power the evolution of mobile and industrial applications around the world.

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Chapter 1
General Information

Topics:

- *Speed*
- *Torque*
- *Output*

Speed, torque and output

The following 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 for each motor size.

- OML can be found under function diagrams.
- OMM can be found under function diagrams.

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".

Speed

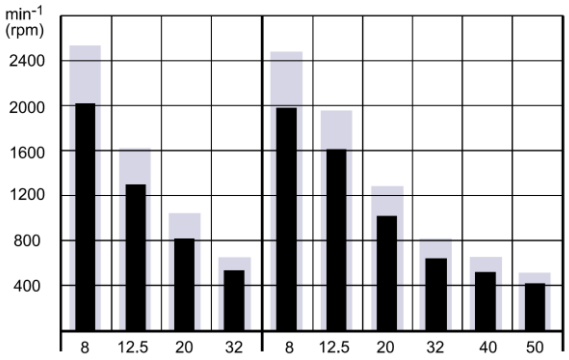


Figure 1 Speed

Torque

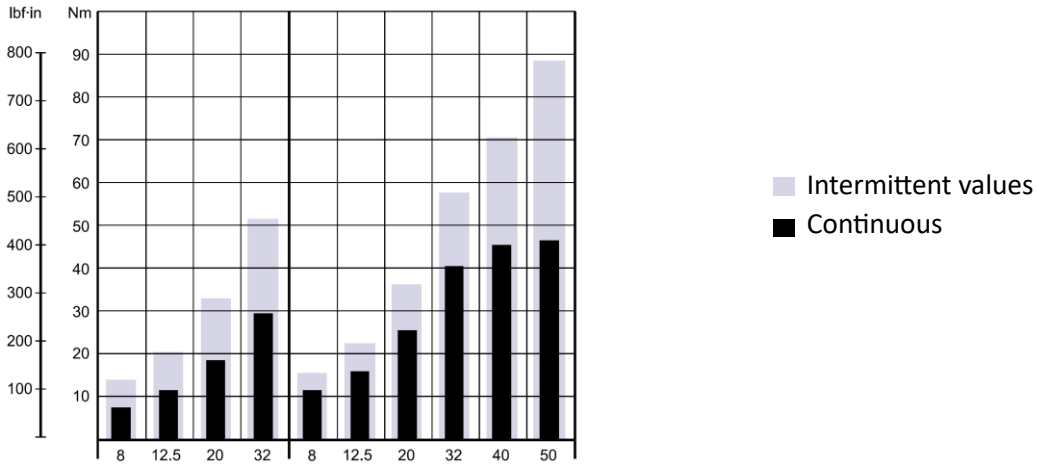


Figure 2 Torque

Output

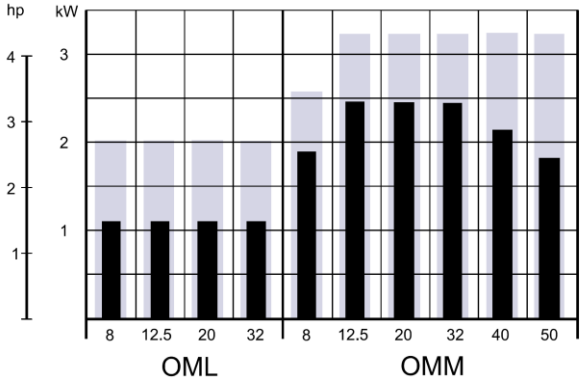


Figure 3 Output

Chapter 2
OML

Topics:

- *Technical data*
- *Shaft seal*
- *Oil flow*
- *Shaft load*
- *Function diagram*
- *Shaft*
- *Port thread version*
- *Dimensions*

Technical data

Type			OML	OML	OML	OML
Motor Size			8	12.5	20	32
Geometric displacement	cm^3		8.0	12.5	20.0	32.0
	[in^3]		*[0.49]*	*[0.77]*	*[1.22]*	*[1.96]*
Max. speed	cont.	*min^{-1}*	2000	1280	800	500
	int.[1)]		2500	1600	1000	625
Max. torque	cont.	*Nm*	7	11	18	29
		[lbf•in]	*[60]*	*[100]*	*[160]*	*[260]*
	int.[1)]	*Nm*	13	20	32	51
		[lbf•in]	*[120]*	*[180]*	*[280]*	*[450]*
Max. output	cont.	*kW*	1.1	1.1	1.1	1.1
		[hp]	*[1.5]*	*[1.5]*	*[1.5]*	*[1.5]*
	int.[1)]	*kW*	2.0	2.0	2.0	2.0
		[hp]	*[2.7]*	*[2.7]*	*[2.7]*	*[2.7]*
Max. pressure drop	cont.	*bar*	70	70	70	70 (55)[3]
		[psi]	*[1020]*	*[1020]*	*[1020]*	*[1020] [800][3]*
	int.[1)]	*bar*	125	125	125 (85)[3]	125 (55)[3]
		[psi]	*[1810]*	*[1810]*	*[1810] [800][3]*	*[1810] [800][3]*
	peak[2)]	*bar*	140	140	125 (85)[3]	140 (55)[3]
		[psi]	*[2030]*	*[2030]*	*[2030] [1230][3]*	*[2030] [800][3]*
Max. oil flow	cont.	*l/min*	16	16	16	16
		[US gal/min]	*[4.2]*	*[4.2]*	*[4.2]*	*[4.2]*
	int.[1)]	*l/min*	20	20	20	20
		[US gal/min]	*[5.3]*	*[5.3]*	*[5.3]*	*[5.3]*
Max. starting pressure with unloaded shaft	bar		4	4	4	6
	[psi]		*[60]*	*[60]*	*[60]*	*[90]*
Min. starting torque	at max. press. drop cont.	*Nm*	5	9	15	24
		[lbf•in]	*[45]*	*[80]*	*[135]*	*[210]*
	at max. press. drop int.[1)]	*Nm*	10	16	27	42
		[lbf•in]	*[90]*	*[140]*	*[240]*	*[370]*
Min. speed[4)]		*min^{-1} [rpm]*	50	50	50	50

Table 1 Technical data for OML with 16 mm and 5/8 in cylindrical shaft

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

2) *Peak load: the permissible values may occur for max. 1% of every minute.*

3) *Max. pressure drop in applications with a large moment of inertia and frequent stops or reversings.*

4) *Operation at lower speed may be slightly less smooth.*

Type			Max. inlet pressure
OML 8 - 32	bar *[psi]*	cont.	125 *[1810]*
		int.[1)]	140 *[2030]*
		peak[2)]	140 *[2030]*

Table 2 Max. inlet pressure

Shaft seal

Maximum permissible shaft seal pressure

OML has incorporated check valves which ensure that the pressure on the shaft seal never exceeds the pressure in the return line.

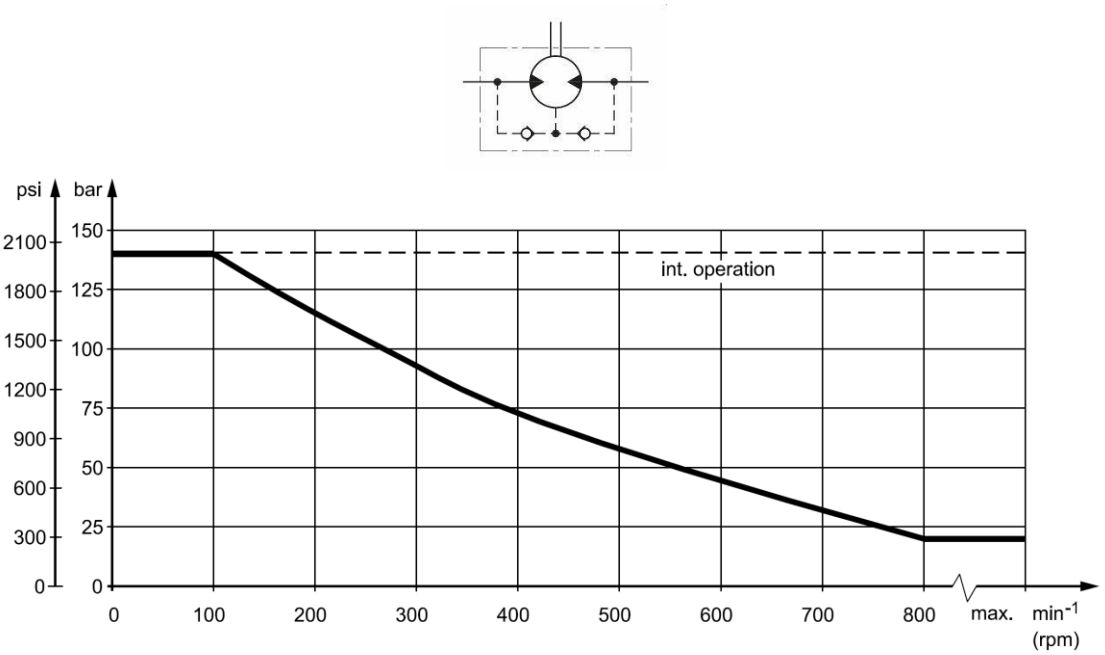


Figure 4 OML max. return pressure

Pressure Drop

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

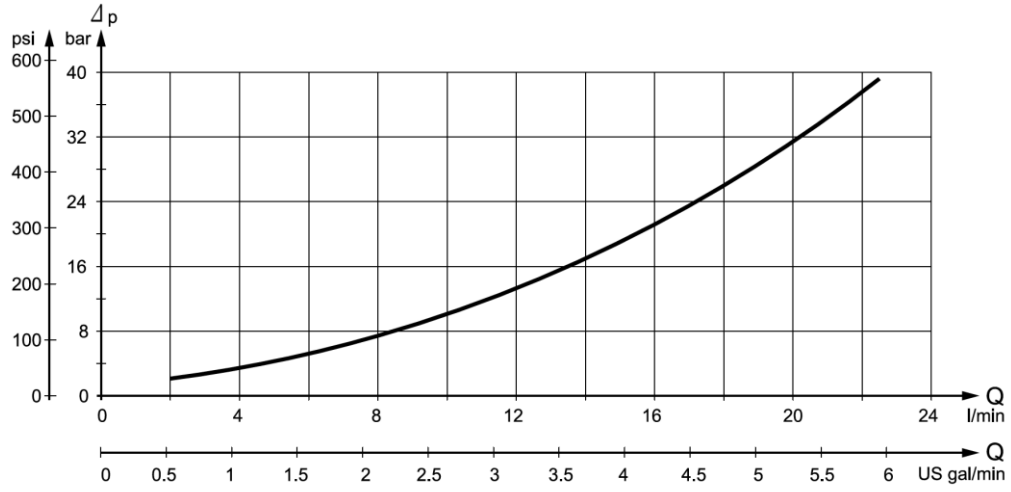


Figure 5 Pressure drop in motor

Oil flow

Direction of shaft rotation

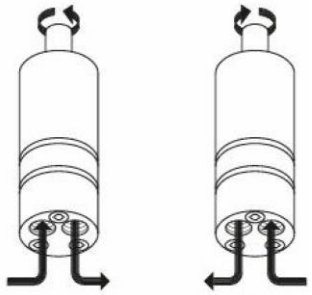


Figure 6 Direction of shaft rotation

Shaft load

Permissible shaft loads for OML

The permissible radial shaft load ($P_{rad.}$) is calculated from the distance (I) between the point of load and the mounting surface:

$$P_{rad.} = \frac{84500}{64.5 + l} \text{ N (l in mm; } l \leq 80)$$

$$P_{rad.} = \frac{748}{254 + l} \text{ lbf (l in inch; } l \leq 3.15)$$

The drawing shows the permissible radial load when I = 15 mm [0.59 in].
The calculated shaft load should never exceed the permissible value.

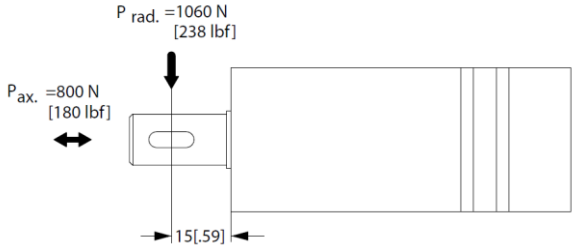
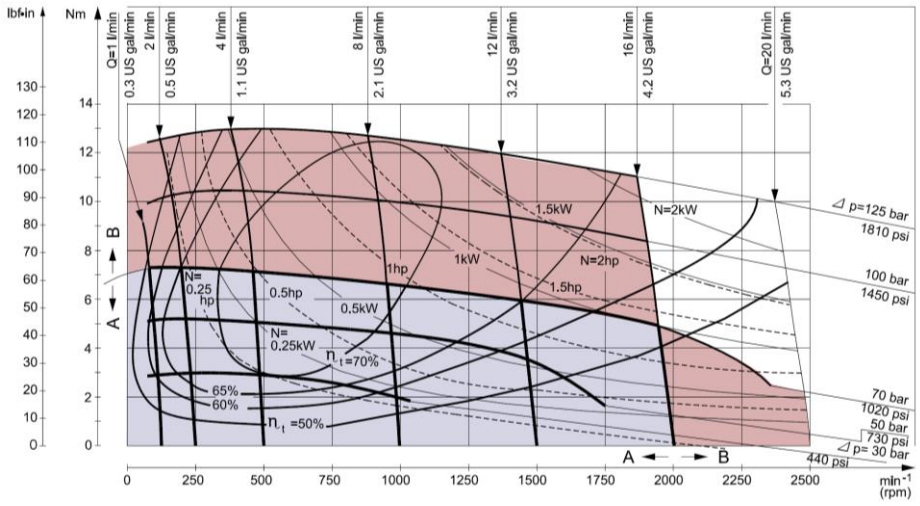


Figure 7 Permissible shaft loads for OML

Function diagram

OML 8 function diagram

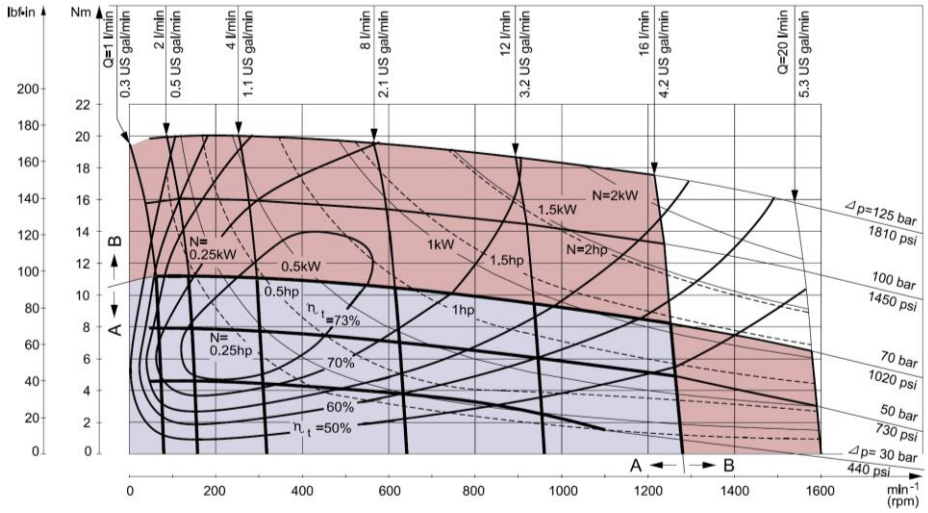


Continuous range

Intermittent range (max. 10% operation every minute)

Figure 8 OML 8 function diagram

OML 12.5 function diagram

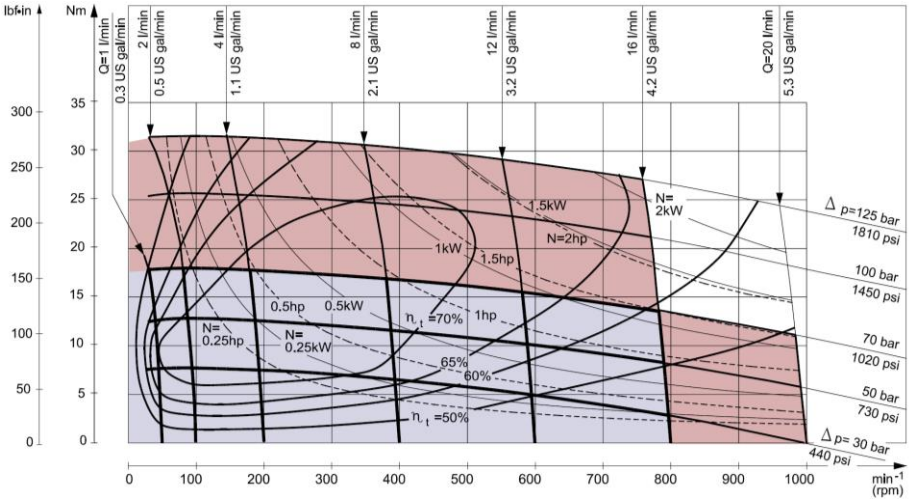


Continuous range

Intermittent range (max. 10% operation every minute)

Figure 9 OML 12.5 function diagram

OML 20 function diagram

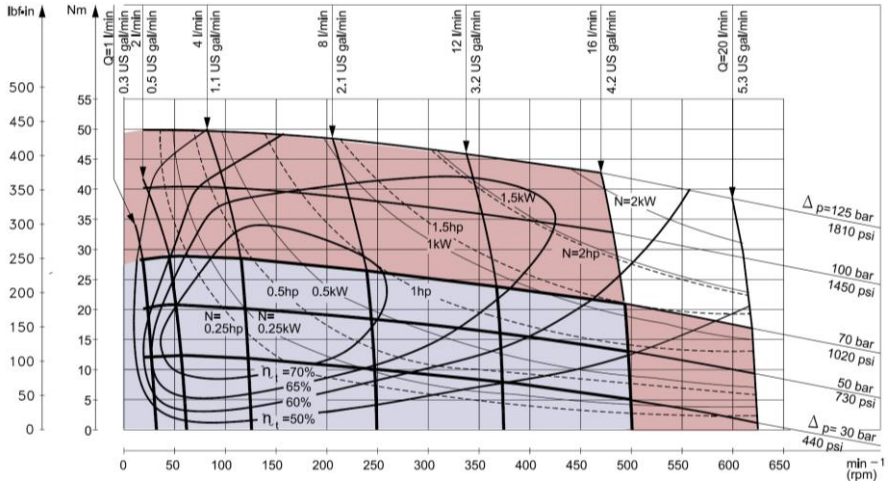


Continuous range

Intermittent range (max. 10% operation every minute)

Figure 10 OML 20 function diagram

OML 32 function diagram



Continuous range

Intermittent range (max. 10% operation every minute)

Figure 11 OML 32 function diagram

Shaft

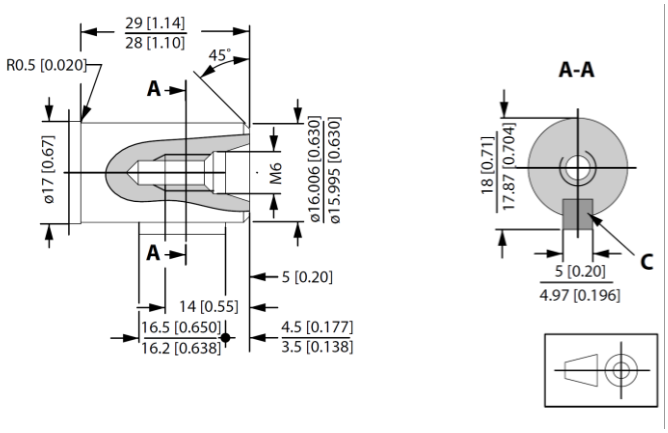
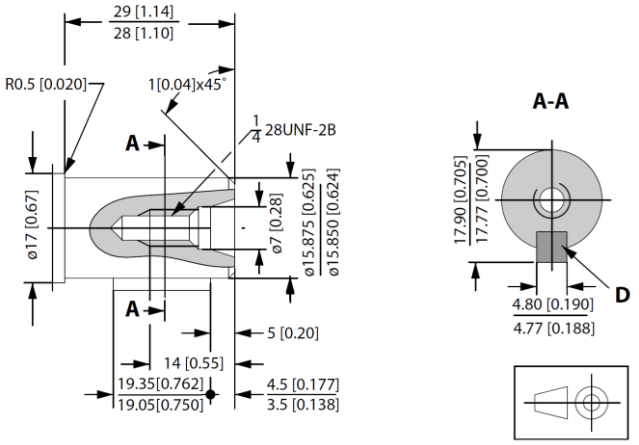
	A: Cylindrical 16 mm shaft
A		***A**: Cylindrical shaft 16 mm* ***C**: Parallel key A5 × 5 × 16 DIN 6885*
	Cylindrical shaft 5/8 in.	
B		***US version*** ***B**: Cylindrical shaft 5/8”* ***D**: Parallel key3/16 × 3/16 × 3/4 in B.S. 46*

Table 3 OML Shaft versions

Port thread version

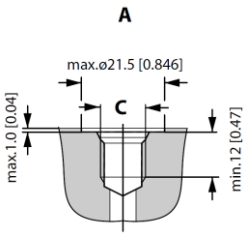
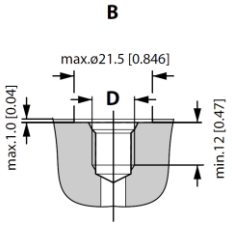
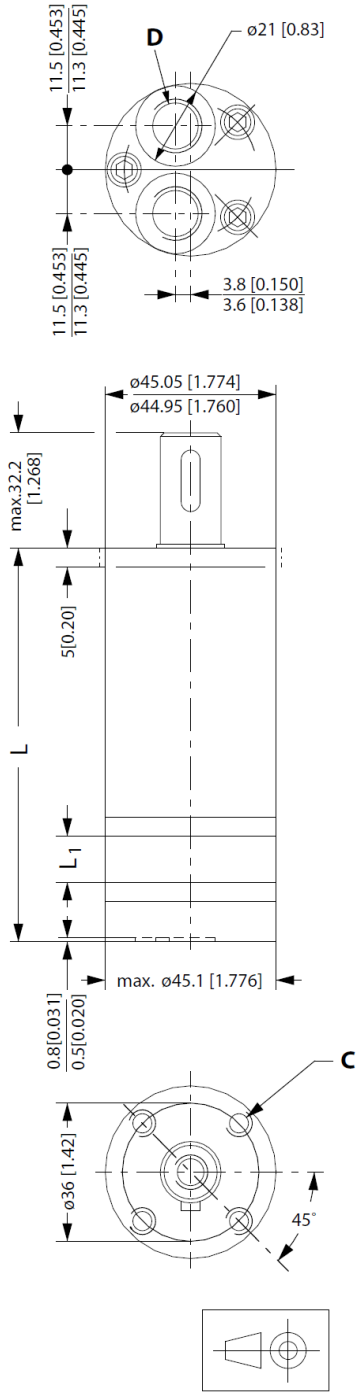
G main ports	
	**A:** G main ports **E:** ISO 228/1 - G1/4
UNF main ports	
	**B:** UNF main ports **F:** 7/8 - 14 UNF O-ring boss port

Table 4 OML Port thread version

Dimensions

OML End port, European version



C: M5; 15 mm [0.59 in] deep
D: G 1/4; 12 mm [0.47 in]

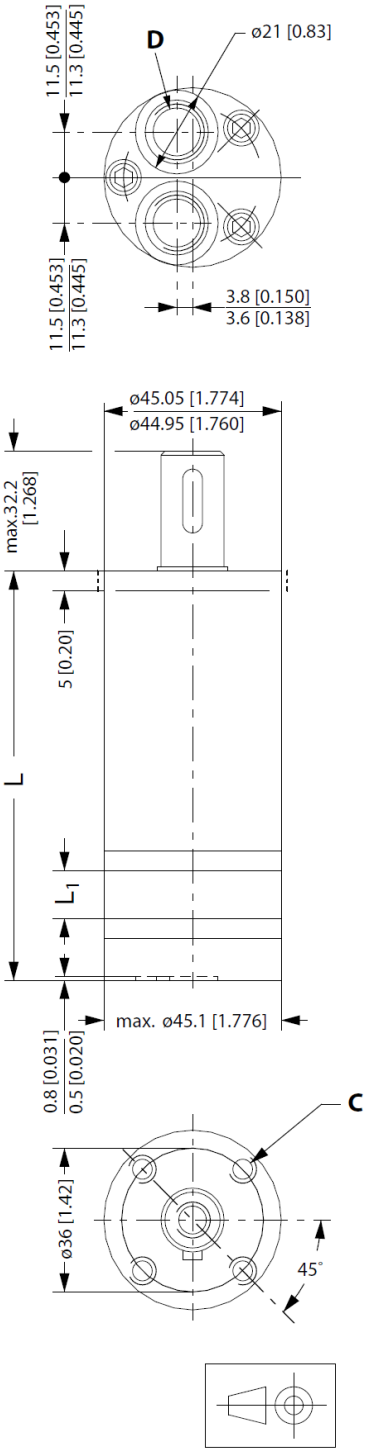
Figure 12 OML End Port EU version

Weight and dimensions

Type		OML			
		8	12.5	20	32
Length	L_{max} mm [in]	102.5	104.8	108.6	114.7
		[4.04]	*[4.13]*	*[4.28]*	*[4.53]*
	L_1 mm [in]	4.1	6.4	10.2	16.3
		[0.16]	*[0.25]*	*[0.40]*	*[0.64]*
Weight	*kg [lb]*	1.0	1.0	1.1	1.2
		[2.2]	*[2.2]*	*[2.4]*	*[2.6]*

Table 5 OML End port EU version weight and dimensions

OML End port , US version



C: *10 - 32 UNF; 15 mm [0.59 in] deep*
D: *7⁄16 - UNF; 12 mm [0.47 in] deep*

Figure 13 OML End port US version

Weight and dimensions

Type		OML			
		8	**12.5**	**20**	**32**
Length	**L_{max}** mm [in]	102.5	104.8	108.6	114.7
		[4.04]	*[4.13]*	*[4.28]*	*[4.53]*
	L_1 mm [in]	4.1	6.4	10.2	16.3
		[0.16]	*[0.25]*	*[0.40]*	*[0.64]*
Weight	*kg [lb]*	1.0	1.0	1.1	1.2
		[2.2]	*[2.2]*	*[2.4]*	*[2.6]*

Table 6 OML End port US version weight and dimensions

Chapter 3
OMM

Topics:

- *Technical data*
- *Shaft seal*
- *Oil flow*
- *Shaft load*
- *Function diagrams*
- *Shaft*
- *Port thread versions*
- *Dimensions*

Technical data

Type			OMM					
Motor Size			**8**	**12.5**	**20**	**32**	**40**	**50**
Geometric displacement		cm^3	8.2	12.5	19.9	31.6	39.8	70
		$[in^3]$	*[0.50]*	*[0.77]*	*[1.22]*	*[1.93]*	*[2.43]*	*[4.27]*
Max. speed	cont.	*min^{-1}*	1950	1550	1000	630	500	400
	int.[1)]		2450	1940	1250	800	630	500
Max. torque	cont.	*Nm*	11	16	25	40	45	46
		[lbf•in]	*[95]*	*[140]*	*[220]*	*[350]*	*[400]*	*[410]*
	int.[1)]	*Nm*	15	23	35	57	70	88
		[lbf•in]	*[135]*	*[200]*	*[310]*	*[500]*	*[620]*	*[780]*
Max. output	cont.	*kW*	1.8	2.4	2.4	2.4	2.2	1.8
		[hp]	*[2.4]*	*[3.2]*	*[3.2]*	*[3.2]*	*[3.0]*	*[2.4]*
	int.[1)]	*kW*	2.6	3.2	3.2	3.2	3.2	3.2
		[hp]	*[3.5]*	*[4.3]*	*[4.3]*	*[4.3]*	*[4.3]*	*[4.3]*
Max. pressure drop	cont.	*bar*	100	100	100	100	90	70
		[psi]	*[1450]*	*[1450]*	*[1450]*	*[1450]*	*[1310]*	*[1020]*
	int.[1)]	*bar*	140	140	140	140	140	140
		[psi]	*[2030]*	*[2030]*	*[2030]*	*[2030]*	*[2030]*	*[2030]*
	peak[2)]	*bar*	200	200	200	160	160	160
		[psi]	*[2900]*	*[2900]*	*[2900]*	*[2320]*	*[2320]*	*[2320]*
Max. oil flow	cont.	*l/min*	16	20	20	20	20	20
		[US gal/min]	*[4.2]*	*[5.3]*	*[5.3]*	*[5.3]*	*[5.3]*	*[5.3]*
	int.[1)]	*l/min*	20	25	25	25	25	25
		[US gal/min]	*[5.3]*	*[6.6]*	*[6.6]*	*[6.6]*	*[6.6]*	*[6.6]*
Max. starting pressure with unloaded shaft	bar		4	4	4	4	4	4
	[psi]		*[60]*	*[60]*	*[60]*	*[60]*	*[60]*	*[60]*
Min. starting torque	at max. press. drop cont.	*Nm*	7	12	21	34	38	41
		[lbf•in]	*[60]*	*[105]*	*[185]*	*[300]*	*[335]*	*[365]*
	at max. press. drop int.[1)]	*Nm*	10	17	29	48	62	79
		[lbf•in]	*[90]*	*[150]*	*[255]*	*[425]*	*[550]*	*[700]*
Min. speed[4)]		*min^{-1} [rpm]*	50	40	30	30	30	30

Table 7 OMM Technical data

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

[2)] Peak load: the permissible values may occur for max. 1% of every minute.

[3)] Operation at lower speeds may be slightly less smooth.

Type			Max. inlet pressure
OMM 8 - 50	bar *[psi]*	cont.	140 [2030]
		int.[1)]	175 [2538]
		peak[2)]	225 [3260]

Table 8 Max. inlet pressure

Shaft seal

Max. permissible shaft seal pressure

OMM with check valves and without use of drain connection:

- The pressure on the shaft seal never exceeds the pressure in the return line.

OMM with check valves and drain connection:

- The shaft seal pressure equals the pressure on the drain line.

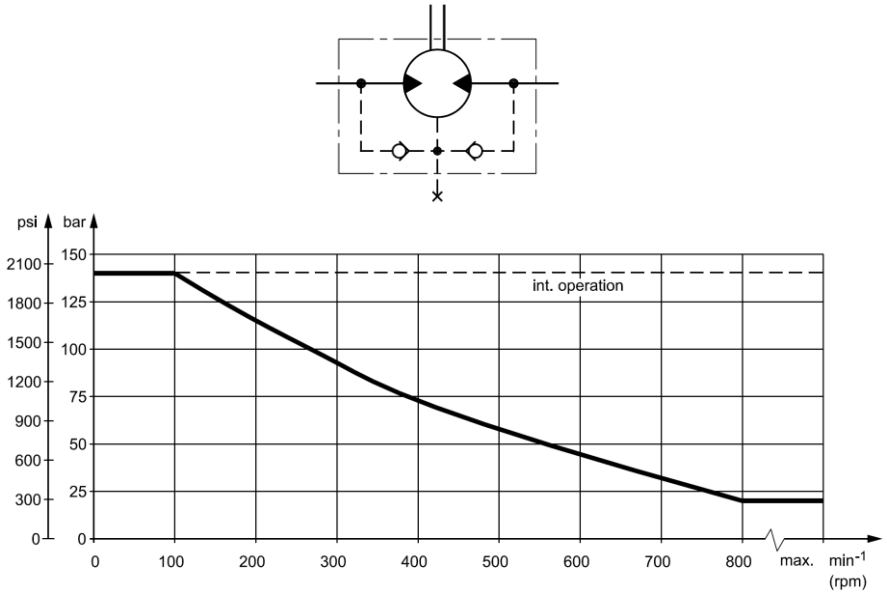


Figure 14 Max. return pressure without drain line or max. pressure in drain line

Pressure Drop

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

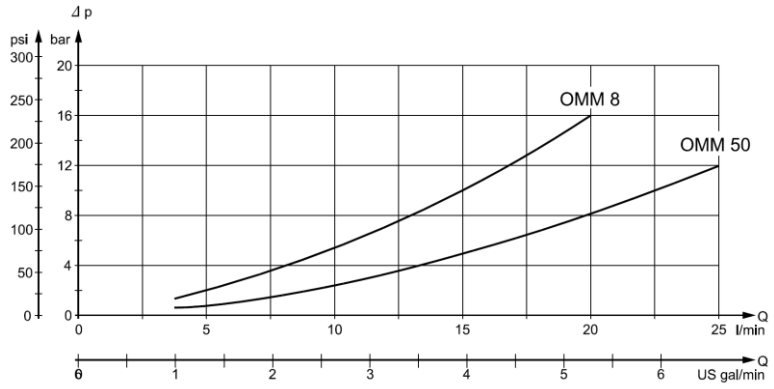


Figure 15 Pressure drop in OMM motor

Oil flow

Direction of shaft rotation

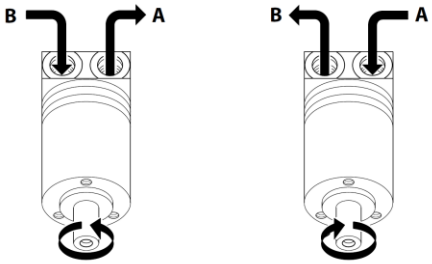


Figure 16 Direction of shaft rotation

Shaft load

Permissible shaft loads for OMM

The permissible radial shaft load ($P_{rad.}$) is calculated from the distance (I) between the point of load and the mounting surface.

$$P_{rad} = \frac{130.400}{61.5 + l} \text{ N } (l \text{ in } mm; l \leq 80mm)$$

$$P_{rad} = \frac{1.155}{2.42 + l} \text{ lbf } (l \text{ in } inch; l \leq 3.15 \text{ in})$$

The drawing shows permissible radial load when I= 20 mm [0.79 in].

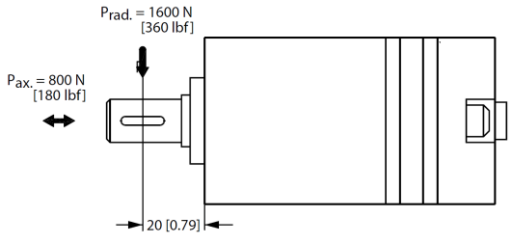
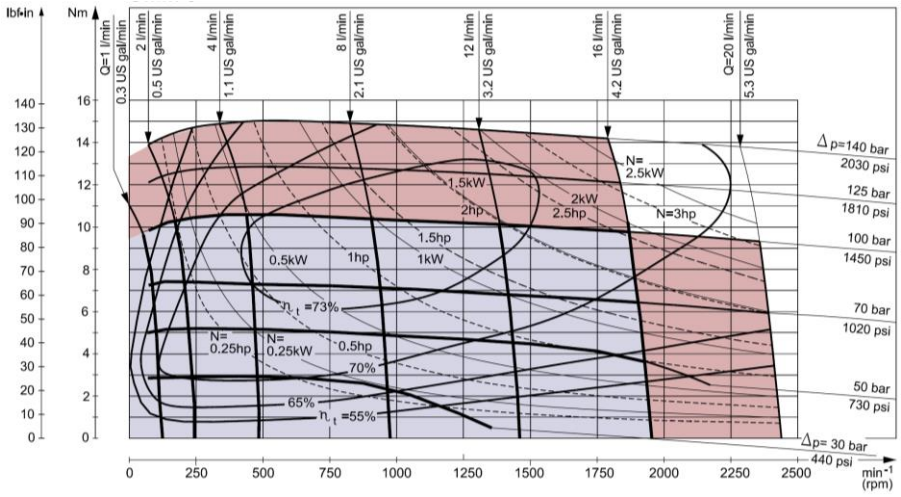


Figure 17 OMM Permissible shaft loads

The calculated shaft load should never exceed the permissible value.

Function diagrams

OMM 8 function diagram



Continuous range

Intermittent range (max. 10% operation every minute)

Figure 18 OMM 8 function diagram

OMM 12.5 function diagram

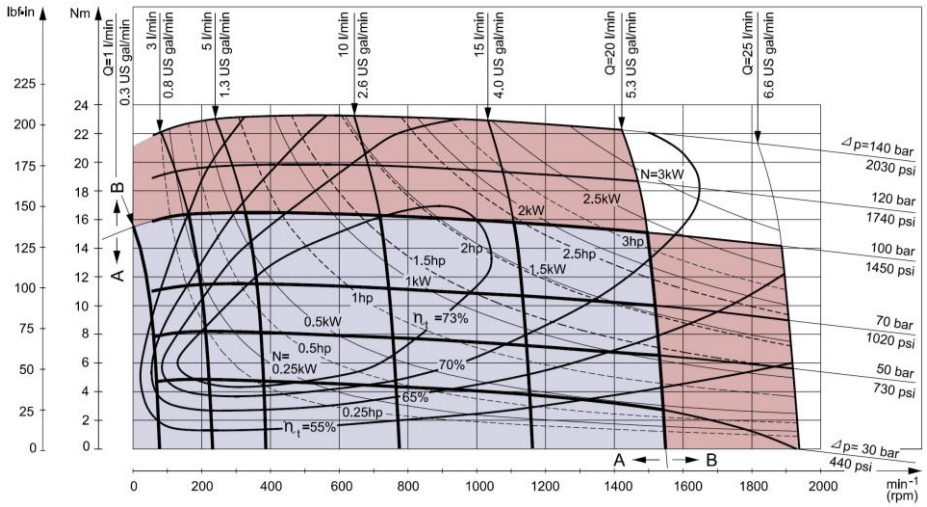


Figure 19 OMM 12.5 function diagram

Continuous range

Intermittent range (max. 10% operation every minute)

OMM 20 function diagram

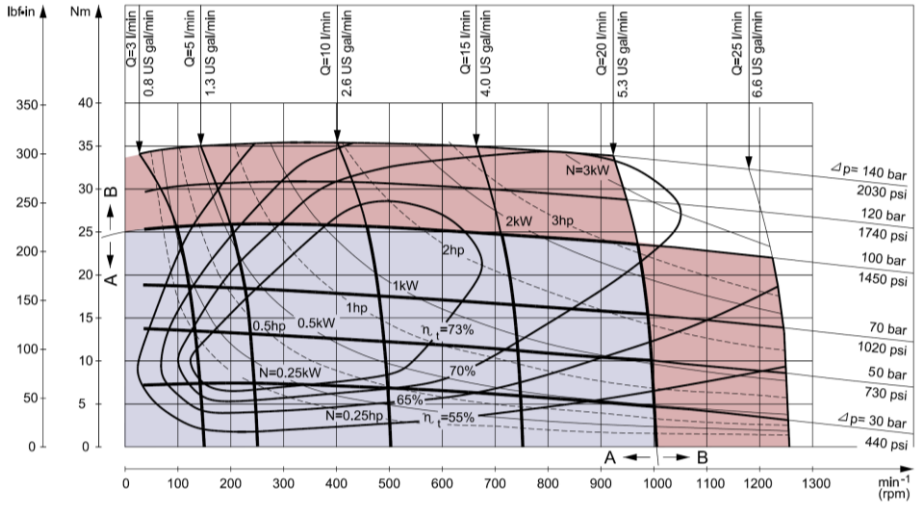


Figure 20 OMM 20 function diagram

Continuous range

Intermittent range (max. 10% operation every minute)

OMM 32 function diagram

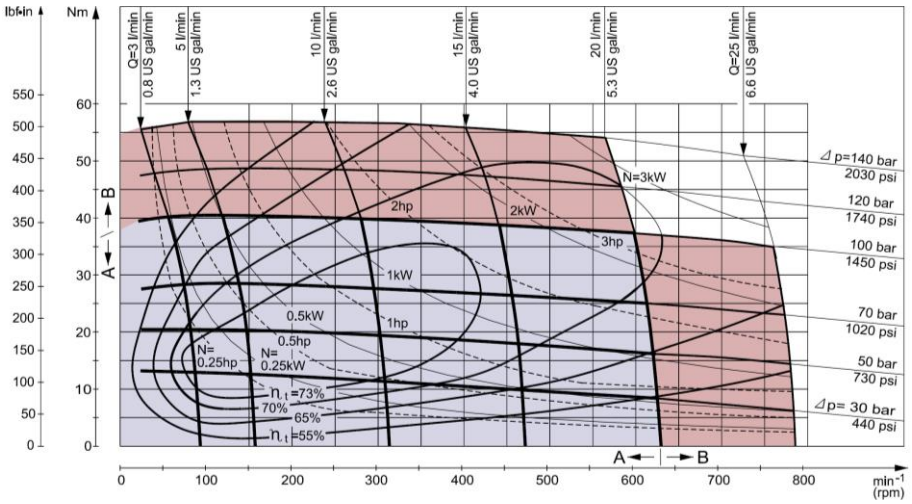
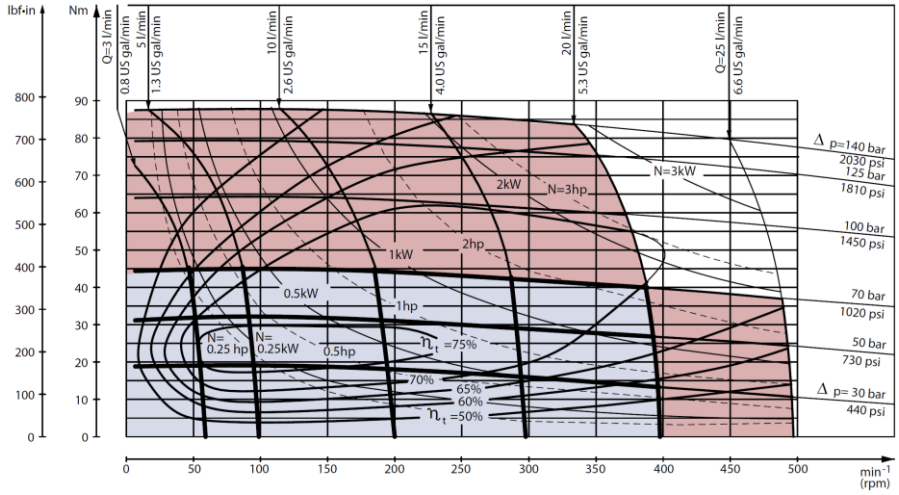


Figure 21 OMM 32 function diagram

Continuous range

Intermittent range (max. 10% operation every minute)

OMM 50 function diagram



Continuous range

Intermittent range (max. 10% operation every minute)

Figure 22 OMM 50 function diagram

Shaft

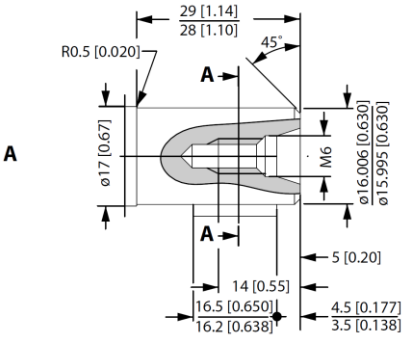
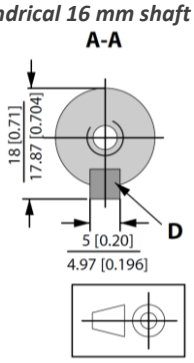
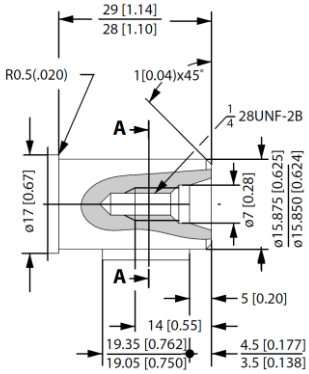
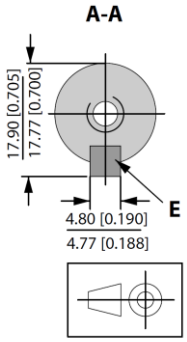
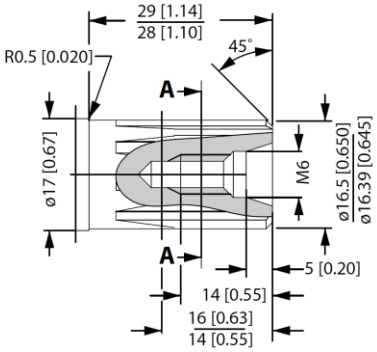
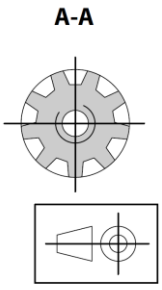
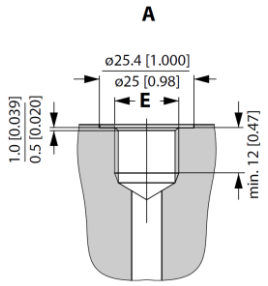
A: Cylindrical 16 mm shaft	
A  	***A**: Cylindrical shaft 16 mm [0.63 in]* ***C**: Parallel key A5 × 5 × 16 DIN 6885*
B: Cylindrical shaft 5/8 in	
B  	***US version*** ***B**: Cylindrical shaft 5/8”* ***D**: Parallel key3/16 × 3/16 × 3/4 in B.S. 46*
C: Involute splined shaft B17• 14	
C  	***C**: Involute splined shaft B17 • 14, DIN 5482* *Measurement 19.641 ± 0.04 mm over 3 mm pins deviates from DIN 5482*

Table 9 OMM shaft versions

Port thread versions

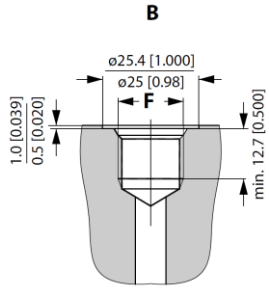
G main ports



A: G main ports

E: ISO 228/1 – G3/8

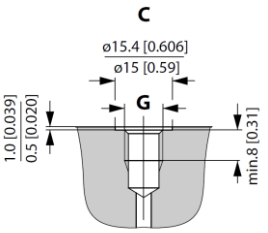
UNF main ports



B: UNF main ports

F: 9/16-18 UNF O-ring boss port

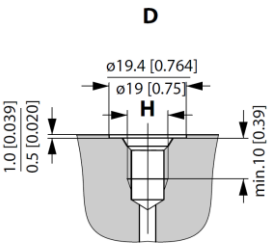
G drain ports



C: G main ports

G: ISO 228/1 – G1/8

UNF drain ports



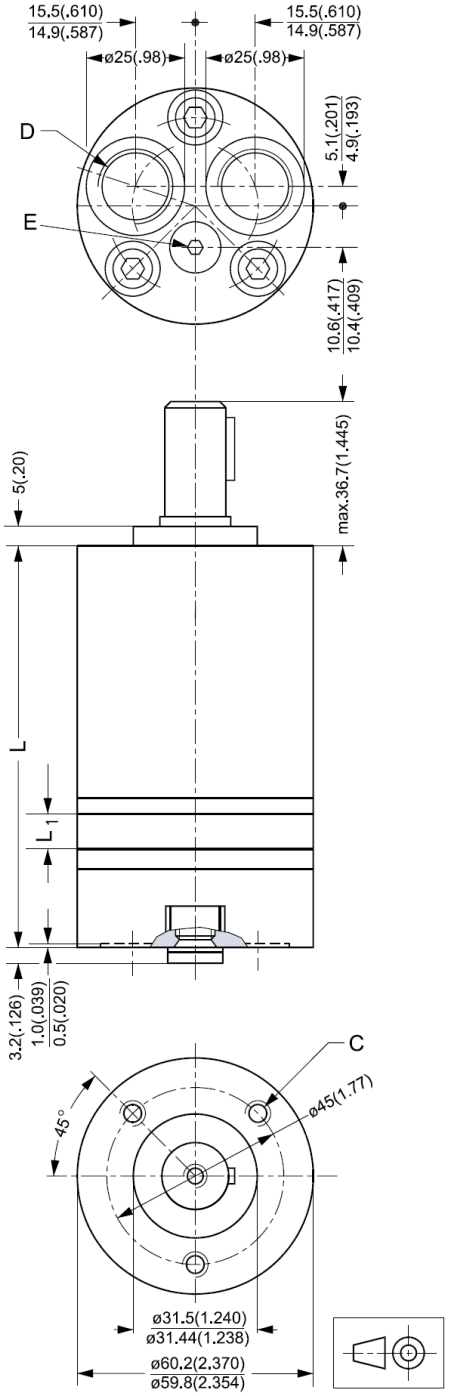
C: UNF drain ports

G: 3/8 – 24 UNF O-ring port

Table 10 OMM Port thread version

Dimensions

OMM end port, European version



***C**: M6; 10 mm [0.39 in] deep*
***D**: G 3⁄8; 12 mm [0.47 in] deep*
***E**: Drain connection G 1⁄8; 8 mm [0.39 in] deep*

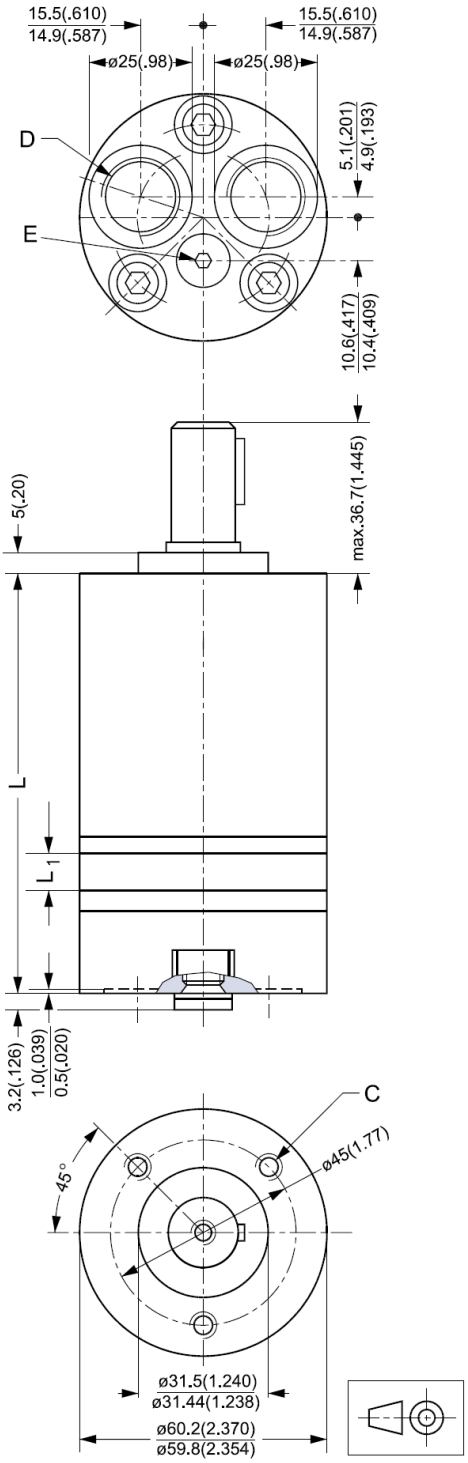
Figure 23 OMM end port EU version

Weight and dimensions

Type		OMM					
		8	12.5	20	32	40	50
Length	L_{max} mm [in]	104.0	106.0	109.0	114.0	118.0	122.0
		[4.09]	[4.17]	[4.29]	[4.49]	[4.65]	[4.80]
	L_1 mm [in]	3.5	5.5	8.5	13.5	17.0	21.5
		[0.14]	[0.22]	[0.33]	[0.53]	[0.67]	[0.85]
Weight	*kg [lb]*	1.9	2.0	2.1	2.2	2.3	2.4
		[4.2]	[4.4]	[4.6]	[4.8]	[5.1]	[5.3]

Table 11 OMM End port EU version weight and dimensions

OMM end port, US version



***C**: 1/ 4 - 28 UNF - 2B; min. 10 mm [0.39 in] deep*
***D**: 9⁄16 - 18 UNF; 12 mm [0.47 in] deep O-ring boss port*
***E**: 3⁄8 - 24 UNF; 8 mm [0.39 in] deep O-ring port*

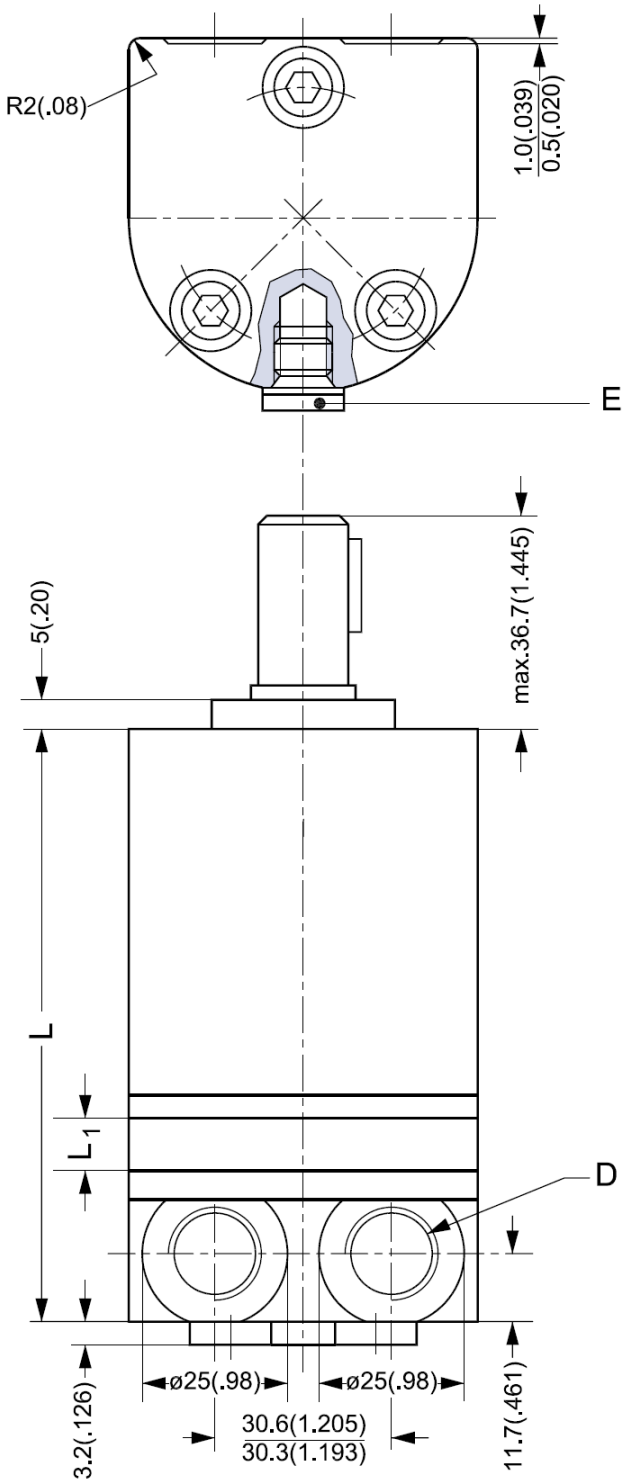
Figure 24 OMM end port US version

Weight and dimensions

Type		OMM					
		8	12.5	20	32	40	50
Length	L_{max} mm [in]	104.0	106.0	109.0	114.0	118.0	122.0
		[4.09]	[4.17]	[4.29]	[4.49]	[4.65]	[4.80]
	L_1 mm [in]	3.5	5.5	8.5	13.5	17.0	21.5
		[0.14]	[0.22]	[0.33]	[0.53]	[0.67]	[0.85]
Weight	*kg [lb]*	1.9	2.0	2.1	2.2	2.3	2.4
		[4.2]	[4.4]	[4.6]	[4.8]	[5.1]	[5.3]

Table 12 OMM End port US version weight and dimensions

OMM side port version, European version



***C**: M6; 10 mm [0.39 in] deep*
***D**: G 3⁄8; 12 mm [0.47 in] deep*
***E**: Drain connection G 1⁄8; 8 mm [0.39 in] deep*

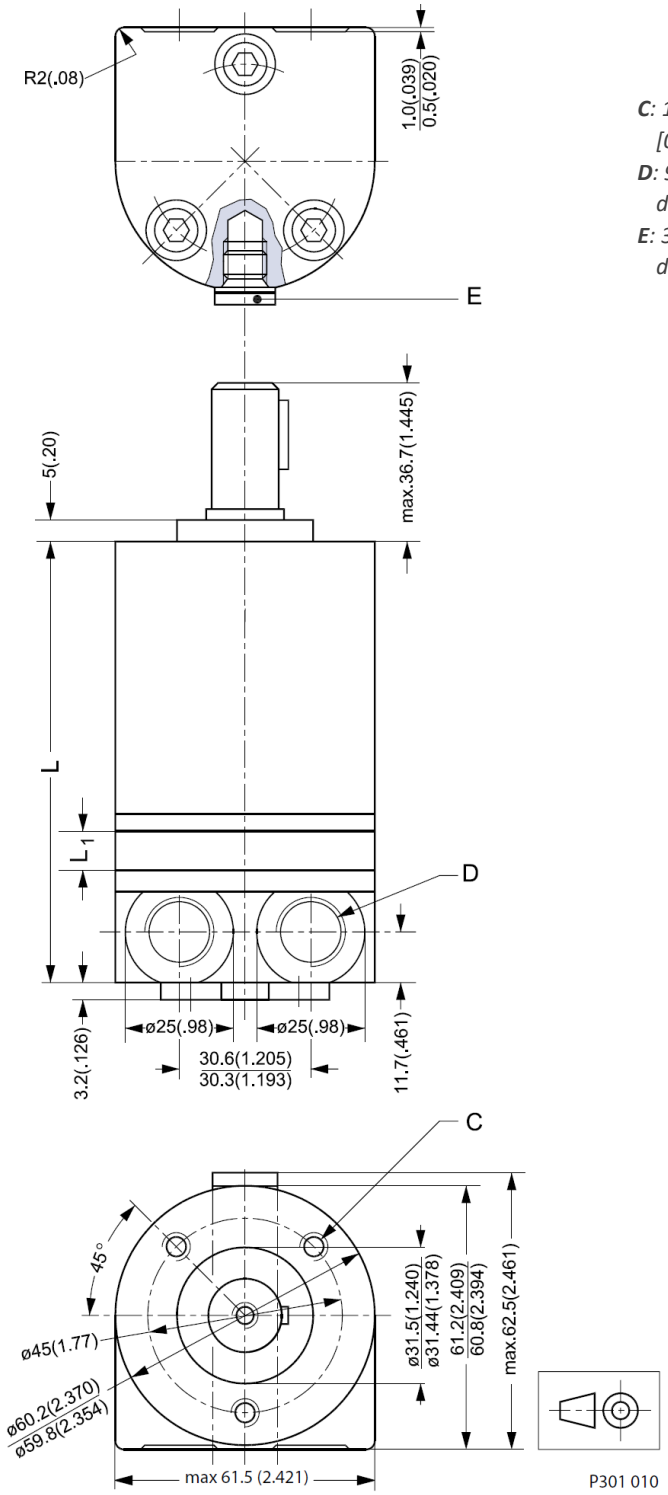
Figure 25 OMM side port version, EU version

Weight and dimensions

Type		OMM					
		8	**12.5**	**20**	**32**	**40**	**50**
Length	L_{max} mm [in]	104.0	106.0	109.0	114.0	118.0	122.0
		[4.09]	[4.17]	[4.29]	[4.49]	[4.65]	[4.80]
	L_1 mm [in]	3.5	5.5	8.5	13.5	17.0	21.5
		[0.14]	[0.22]	[0.33]	[0.53]	[0.67]	[0.85]
Weight	*kg [lb]*	1.9	2.0	2.1	2.2	2.3	2.4
		[4.2]	[4.4]	[4.6]	[4.8]	[5.1]	[5.3]

Table 13 OMM Side port EU version weight and dimensions

OMM side port, US version



***C**: 1/ 4 - 28 UNF - 2B; min. 10 mm [0.39 in] deep*
***D**: 9⁄16 - 18 UNF ; 12 mm [0.47 in] deep*
***E**: 3⁄8 - 24 UNF ; 8 mm [0.39 in] deep*

Figure 26 OMM side port US version

Weight and dimensions

Type		OMM				
		8	12.5	20	32	50
Length	L_{max} mm [in]	104.0	106.0	109.0	114.0	122.0
		[4.09]	[4.17]	[4.29]	[4.49]	[4.80]
	L_1 mm [in]	3.5	5.5	8.5	13.5	21.5
		[0.14]	[0.22]	[0.33]	[0.53]	[0.85]
Weight	*kg [lb]*	1.9	2.0	2.1	2.2	2.4
		[4.2]	[4.4]	[4.6]	[4.8]	[5.3]

Table 14 OMM side port US version weight and dimensions

Chapter 4
Accessories

Topics:

- *2 bolt flange kit, code no. 151G0211*

2 bolt flange kit, code no. 151G0211

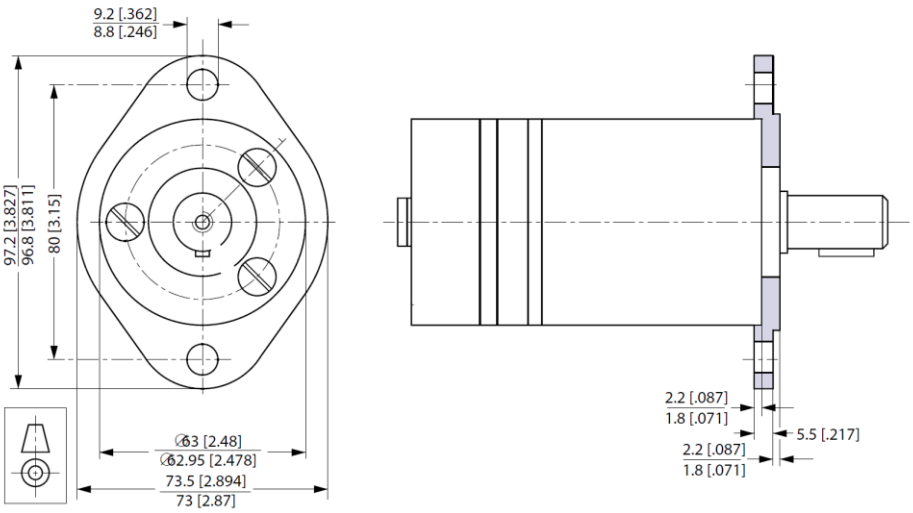


Figure 27 2 bolt flange kit 151G0211

Chapter 5
Hydraulic systems

Topics:

- *Installation of the Orbital Motors*
- *Starting up and running in the hydraulic system*
- *Operation*
- *Maintenance*

Installation of the Orbital Motors

About the design

- To ensure efficient operation all hydraulic components must be installed according to their individual instructions.
- The pump line must include a manometer connection.
- To ensure designed contact and minimize the tension all mounting flanges must be flat. Hydraulic lines must be fitted correctly to prevent air entrapment.

About the assembly

- Follow the mounting instructions printed on the inside of the cardboard box.
- To prevent contamination, do not dismantle the plastic plugs from the connection ports until the fittings are ready to be assembled.
- Check that there is full face contact between the motor mounting flange and the mating part.
- Do not force the motor into place when tightening the mounting screws.
- Avoid unsuitable sealing material on fittings such as pack twine, Teflon and others.
- Use only bonded seals, O-rings, steel washers and the like.
- When tightening the fittings never use a torque higher than the max. tightening torque stated in the instructions.
- Make sure that the cleanliness of the oil used is better than 20/16 (ISO 4406). Always use a filter for oil refilling.

Starting up and running in the hydraulic system

- Through a small-meshed filter fill up the tank with oil to the upper oil level mark.
- Start the drive engine, and if possible, let it work at its lowest speed. If the motor is provided with bleed screws, keep these open until the emerging oil is non-foaming.
- Check that all components are correctly connected (pump following the right direction of rotation etc.).
- In load-sensing systems, also make sure that the signal lines are bled.
- Indications of air in the hydraulic system:
  - oam in the tank
  - jerky movements of motor and cylinder
  - noise
- If required, refill with oil.
- Connect the system to a separate tank that includes a filter (fineness max. 10 µm) with twice the capacity of the max. oil flow. Let the entire system run without load (no pressure) for about 30 minutes.
- Do not load the system until it is all bled and clean.
- Check the tightness of the system and make sure that its performance is satisfactory.
- Change the oil filter, and if so required, refill with oil.

Operation

- Do not expose the motor to pressures, pressure drops and speeds above the max. values stated in the catalogue.
- Filter the oil to ensure that the contamination level 20/16 (ISO 4406) or better.

Maintenance

- When working with hydraulic systems, the main criteria of operating safety and endurance is careful maintenance.
- Always renew and replace oil, oil filters and air filters according to the instructions given by the respective manufacturers.
- Regularly check the condition of the oil.
- Frequently check system tightness and oil level.

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