Bent axis hydraulic motors

MSI
Series

HYDRO LEDUC

TOHLO®

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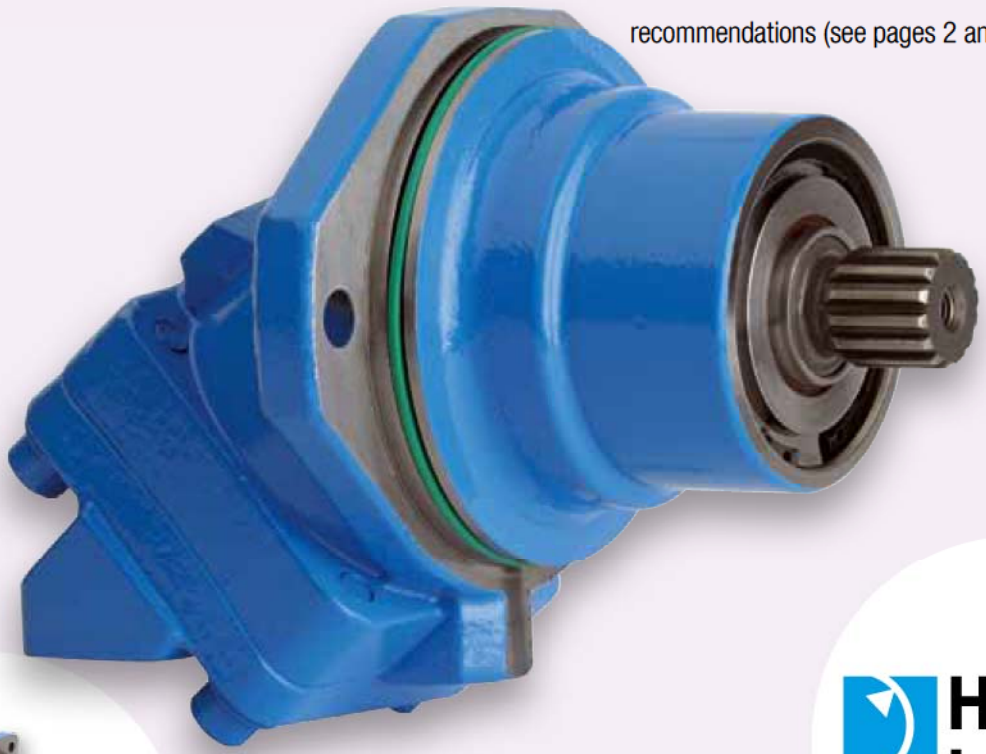
MSI series motors

LEDUC hydraulic motors of the MSI series are specifically designed for optimum integration into a receiving organ, and in particular a planetary gearbox. This association enables the same torque and speed to be achieved as with a low speed motor, for example. The MSI motors are of bent axis technology, with an angle of 40°.

They combine high performance and reduced size envelope:

- power per kilo: over 10 kW/kg;
- optimized weight and size;
- global efficiency over 90%.

The MSI are an excellent choice for all requirements in displacements from 32cc to 125cc (1.95 to 7.62 cu.in). Suitable for use in either closed or open loop systems, MSI motors are robust and offer long service life. To ensure the best service life from your motors, please take care to follow the installation and start-up recommendations (see pages 2 and 12).



HYDRO LEDUC also manufactures:
- ISO flange motors, the **M** series;
- SAE motors, the **MA** series.

Literature on request or on our website : www.hydroleduc.com.

HYDRO LEDUC

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Advantages of MSI series motors

Definition of function

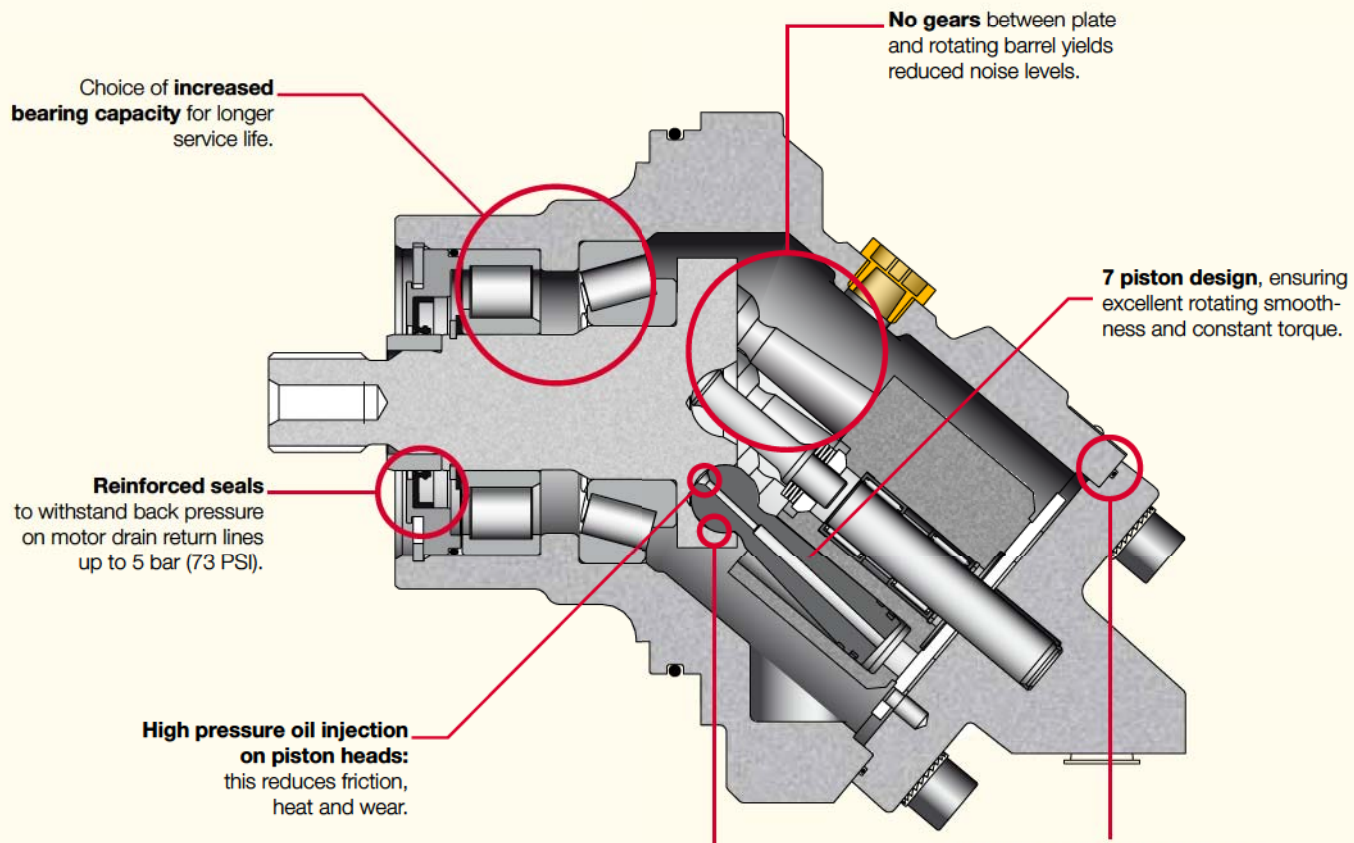
Hydraulic motors transform hydraulic flow into rotating speed and hydraulic pressure into mechanical torque.
Motor rotating speed is proportional to the flow which is supplied to it.
Torque produced is proportional to the hydraulic pressure the motor receives.

Main applications of hydraulic motors

Typical applications are those requiring high torque within a small size.
The hydraulic motor is essential for rotations where:
- mechanical solutions are complex or even impossible,
- electrical or pneumatic power sources are not available,
- environments are dangerous (i.e. risk of explosion or extreme temperatures).

Advantages of LEDUC motors

All structural components are made from similar materials resulting in consistent thermal expansion and exceptional reliability.



Operating conditions of MSI series motors

Hydraulic fluid

LEDUC motors are designed to be powered with mineral based hydraulic fluid. Using other fluids is possible but may require a modified motor. Please contact us with details of fluid.

Recommended viscosity:

- Ideally : between 15 and 200 cSt;
- Maximum range: between 5 and 1600 cSt.

Filtration of hydraulic fluid

The service life of the motor depends greatly on the quality and the cleanliness of the hydraulic fluid.

We recommend minimum cleanliness as follows:

- NAS 1638 class 9
- SAE class 6
- ISO/DIS 4406 class 18/15

Rotating speeds

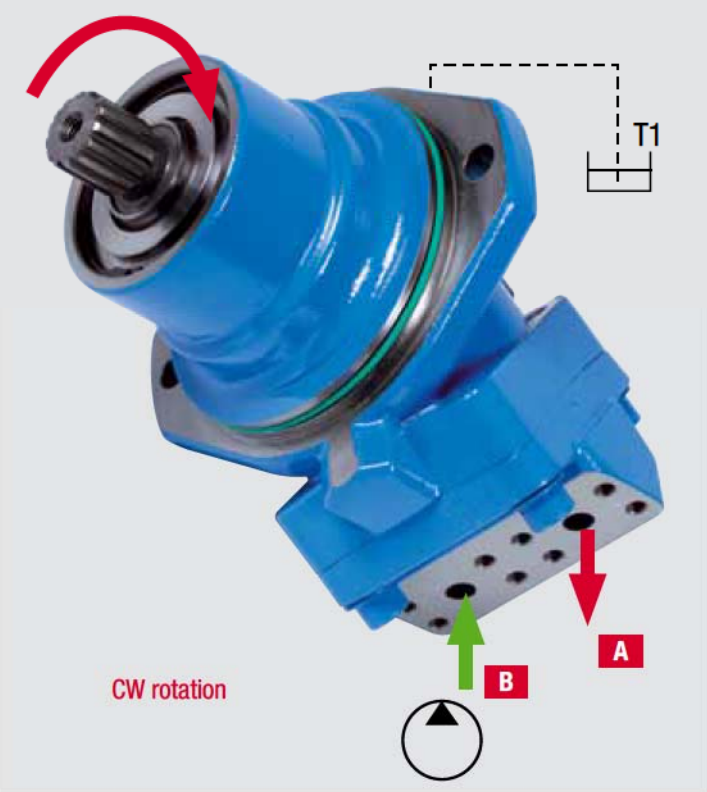
Minimum rotating speed to obtain continuous rotation is 200 rpm (however, in certain conditions, the motor can run at speeds as low as 50 rpm).
Maximum rotating speed is given for each model of motor.

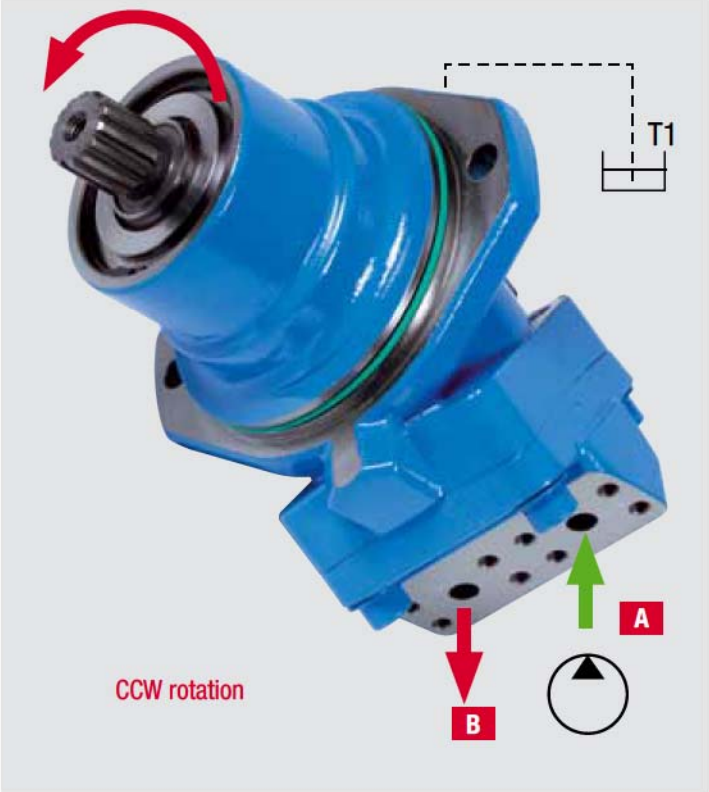
Installation positions

LEDUC motors are made to operate in all positions.
Important note : before start up, ensure the motor is filled with hydraulic fluid. (See section on installation and start-up, page 20).

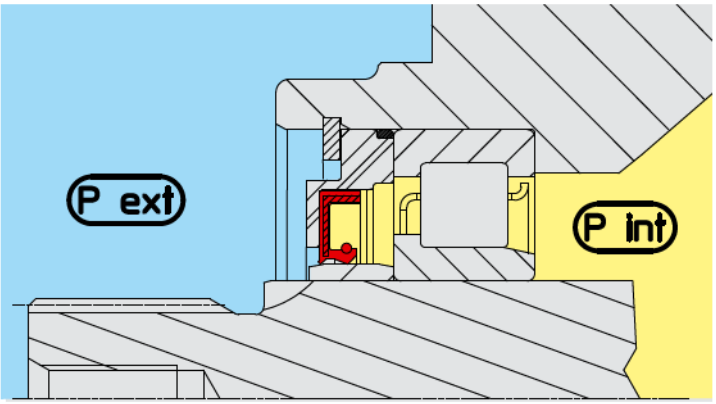
Direction of rotation

The motors rotate clockwise or counter-clockwise depending on the direction of hydraulic flow entering the motor.





Drain pressure



It is essential to drain the motor (T1) to avoid excessive pressures on the shaft seal.
Maximum acceptable internal pressure depends on motor rotating speed.

However, following these guidelines will avoid problems during operation:

- maximum internal pressure (**P int**) regardless of rotating speed (continuous): 4 bar (60psi);
- maximum internal pressure (**P int**) regardless of rotating speed (peak): 5.5 bar (80psi);
- minimum pressure in the motor housing: must be greater than ambient (external) pressure (**P ext**).

How to determine the correct motor for your application

Calculations using metric mechanical units:

N = rotating speed in rpm
C = torque in N.m
P = pressure supplied by the generator (hydraulic pump), in bar
ΔP = pressure difference between A and B, in bar
Disp. = displacement in cc
Q = flow in litres per minute
η = efficiency (%)

1. Torque supplied by the hydraulic motor

$$\text{Theoretical torque} = \frac{\text{Disp.} \times \Delta P}{20\,\pi} = C_{th}$$

Torque $C = C_{th} \times \eta\text{motor}$

For example: a 50cc motor with a ΔP of 250 bar will supply a theoretical torque of : 200 N.m.
Average global efficiency of the motor is 90%, actual torque is thus: 180 N.m

2. Rotating speed of the motor

The rotating speed of the hydraulic motor depends on the flow Q which goes through it, and on the displacement of the motor.

$$N = \frac{Q}{\text{Disp.}} \times 1000$$

How to determine the correct motor for your application

Calculations using imperial / US measurements:

N = rotating speed (rpm)
C = torque (in.lbs)
P = pressure supplied by the hydraulic pump, in psi
Δ P = pressure difference between A and B, in psi
Disp. = displacement (in^3/rev)
Q = flow (US GPM)
E = efficiency (%)

1. Torque supplied by the hydraulic motor

Theoretical torque $T_{th} = (\Delta P \times \text{Disp}) / 2\pi$

Actual torque = $T = T_{th} \times E$

For example a 3.07 in^3/rev motor with a Δ P of 3.625 psi will supply a theoretical torque of 1770 in.lbs
Average global efficiency of the motor is 90% , actual torque is thus: 1.594 in.lbs

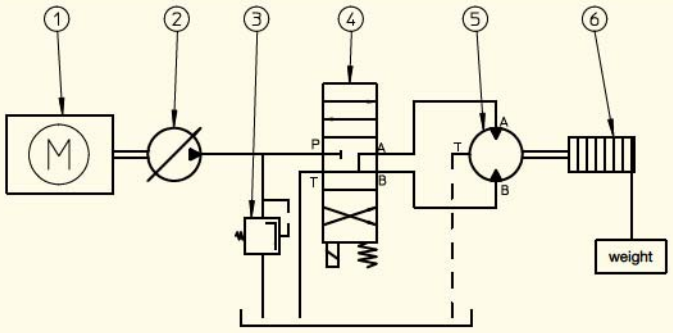
2. Rotating speed of the motor

The rotating speed of the hydraulic motor depends on the flow Q which goes through it, and on the displacement of the motor.

$N = (Q \times 231\ in^3/gal) / \text{Disp}$

Example

①	*Motor*
②	*Variable displacement pump*
③	*Pressure relief valve*
④	*Valve*
⑤	*Hydraulic motor*
⑥	*Winch and load*



The receiving organ (winch) ⑥
needs to rotate at N = 400 rpm and supply an actual torque of 200 N.m.
The hydraulic pump ① is capable of operating at pressure P up to 350 bar.

1. Calculating the displacement of the hydraulic motor:

$$C_{th} = \frac{\text{Disp.} \times \Delta P}{20\,\pi}$$ thus Disp. **Cy = 35.9 cc**

2. Calculating the flow Q which the pump needs to supply:

$$N = \frac{Q}{\text{Disp.}} \times 1000$$ thus **Q = 14.36 l/min**

In the LEDUC range,
choose a motor with a displacement of **32** cc or **41** cc.
Corresponding flow :
- for **32** cc motor, Q = 12.8 l/min
- for **41** cc motor, Q = 16.4 l/min

The receiving organ (winch) ⑥
needs to rotate at N = 400 rpm and supply an actual torque of 1770 in.lbs.
The hydraulic pump ① is capable of operating at pressure P up to 5075 psi.

1. Calculating the displacement of the hydraulic motor:
Disp = (T_{th} x 2π) / Δ P thus **Disp = 2.19 in^3**

2. Calculating the flow Q which the pump needs to supply:
Q = (N x Disp) / 231 in^3/gal thus **Q = 3.79 gpm**

In the LEDUC range,
choose a motor with a displacement of **1.95** in^3 or **2.5** in^3.
Corresponding flow :
- for **1.95** in^3 motor, Q = 3.38 gpm
- for **2.5** in^3 motor, Q = 4.33 gpm

Characteristics of the MSI series motors

MSI series motors are suitable for intensive long duty requirements.
Designed for both mobile and industrial installations.
Typical applications are:
- vehicle transmissions;
- high power crushers;
- forestry equipment;
- heavy duty winches.
- high power planetary gearboxes...

These motors are built to suit all applications to ISO standard 3019/2.

Displacement		Continuous max. speed(1)	Intermittent max. speed(1)	Max. flow absorbed		Torque		Torque at 5100 psi (350 bar)		Motor max./min. temperature*		Max. allowable pressure continuous/peak		weight	
cc	Cu.In	rpm	rpm	l/mn	gpm	m.N/bar	lbf.ft/psi	m.N	lbf ft	°C	°F	bar	psi	kg	lbs
32	1.95	6300	6900	202	53.4	0.5	0.0254	175	130	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	11.5	25
41	2.50	5600	6200	230	60.8	0.65	0.0330	227	168	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	11.5	25
50.3	3.07	5000	5500	252	66.6	0.8	0.0407	280	207	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	19	42
63	3.84	5000	5500	315	83.2	1	0.0508	350	259	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	19	42
80.4	4.90	4500	5000	362	95.6	1.27	0.0646	445	330	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	26	57
90	5.49	4500	5000	405	107	1.42	0.0725	499	370	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	26	57
108.3	6.61	4000	4400	435	115	1.7	0.0864	595	441	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	26	57
125	7.62	3400	4500	426	112.5	1.99	0.1010	695	512	– 25 / 110	– 13 / 230	400 / 450	5800 / 6525	33	72

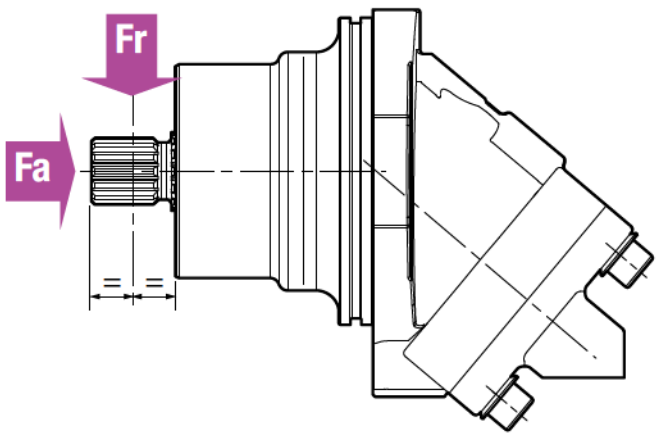
* for wider extreme temperatures, please contact us.
(1) for higher speeds, please contact us.
For special fluids, please contact us.

Acceptable forces applied to motor shaft

Fr : radial force measured at mid point of length of shaft.
Fa : axial force which tends to push the shaft inwards.

Displacement	cc	32	41	50.3	63	80.4	90	108.3	125
	Cu.In	1.95	2.50	3.07	3.84	4.90	5.49	6.61	7.62
Fr	N	6500	7000	4000	5000	6500	6700	7000	14500
	lbf	1462.5	1575	900	1125	1462.5	1507.5	1575	3260
Fa	N/psi* (N/bar)	2.06 (30)	2.75 (40)	2.75 (40)	3.44 (50)	4.14 (60)	4.62 (67)	5.52 (80)	5.93 (86)
	lbf / psi	0.46	0.62	0.62	0.77	0.93	1.03	1.23	1.33

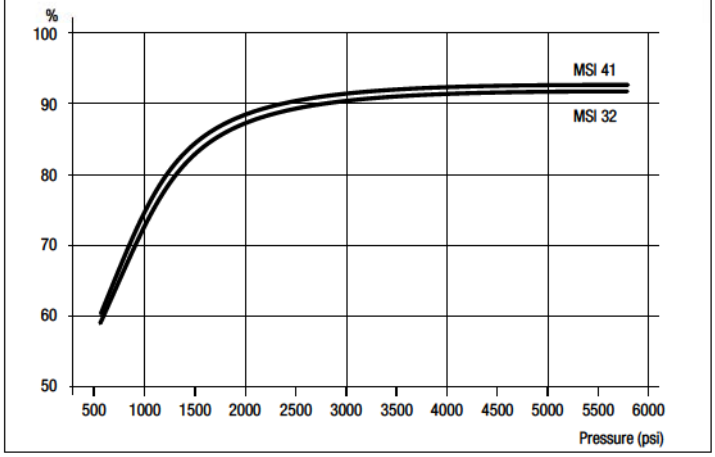
* differential pressure between A and B



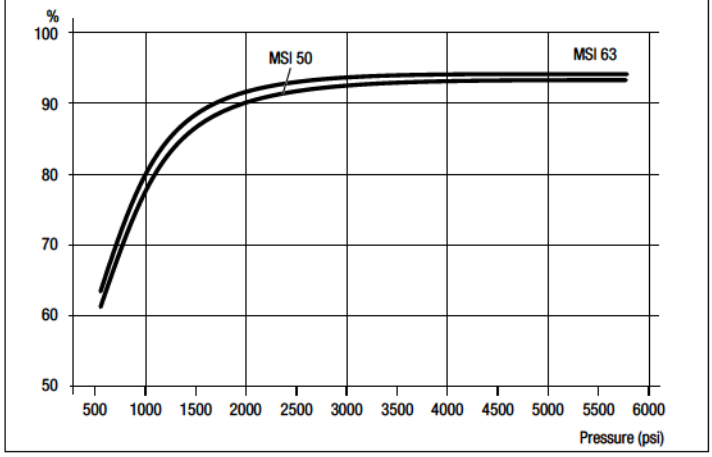
Efficiency of motors *f(displacement)*

N of motor = 1000 rpm
ISO46 fluid at 25°C

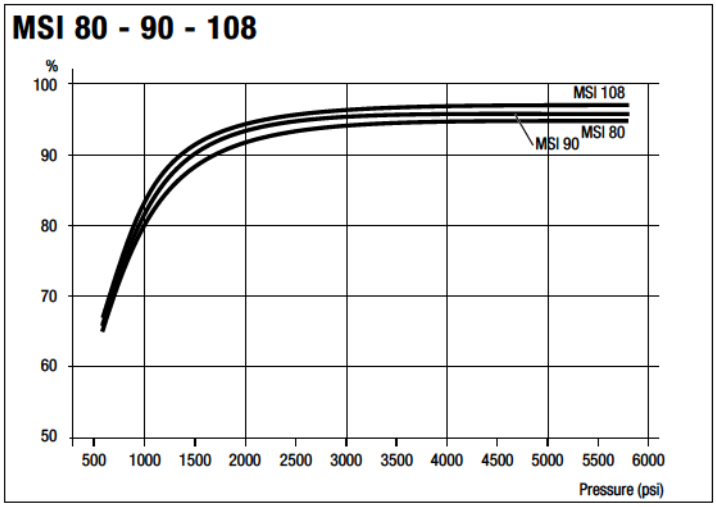
MSI 32 - 41



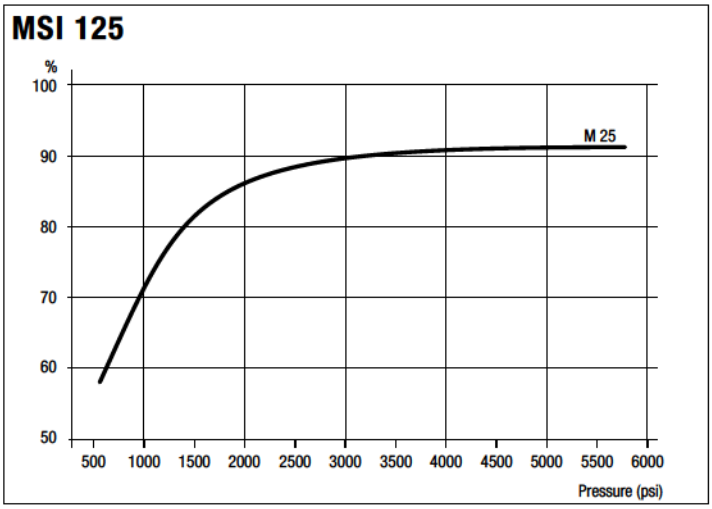
MSI 50 - 63



MSI 80 - 90 - 108



MSI 125



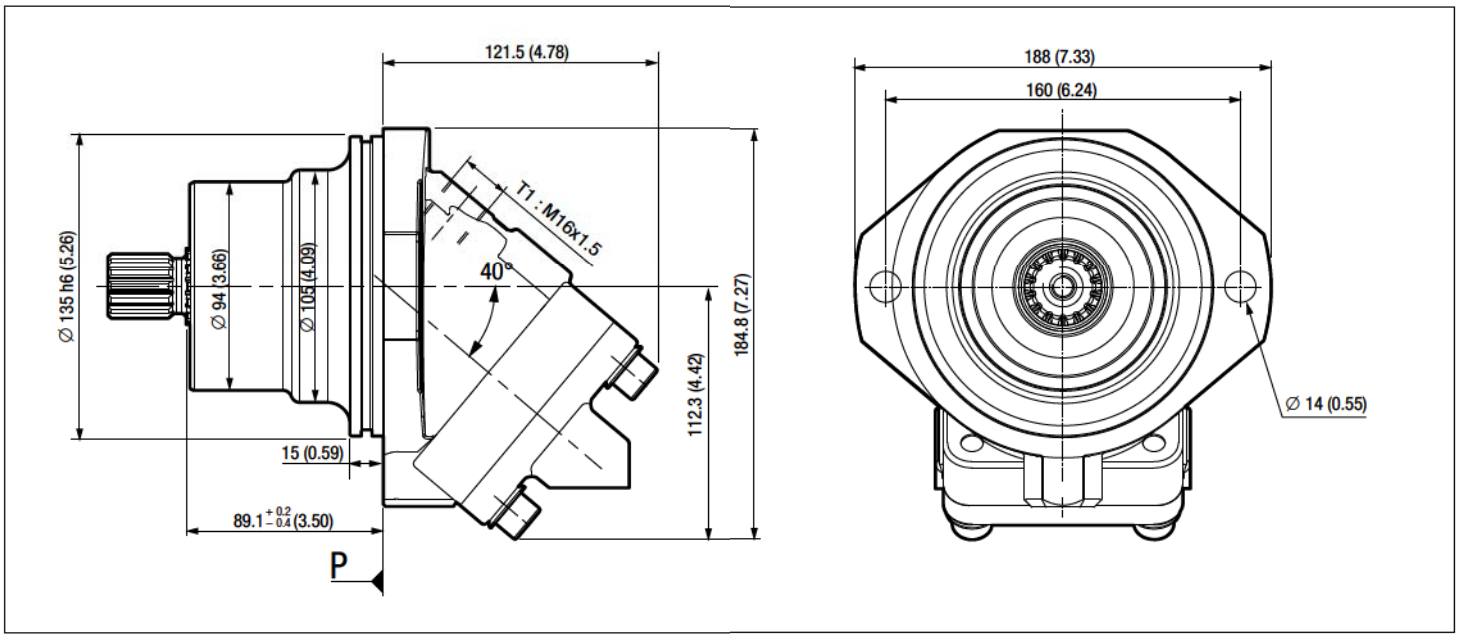
Order code system for MSI type motor

MSI	...	B	W1	L0	M1	.	.	SV
01	02	03	04	05	06	07	08	09

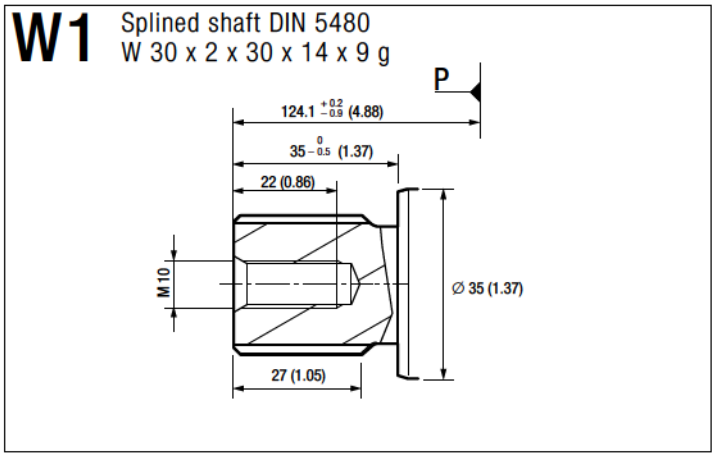
To obtain the code for your motor, complete the different parameters 02, 07 and 08 in the table on the left, according to the options you require (see table below).

	Motor									
01	semi-integrated motor									**MSI**
	Displacement									
02	cc	32	41	50	63	80	90	108	125	
	Mounting flange									
03	ISO 3019-2 2 bolt									**B**
	Shaft end	32	41	50	63	80	90	108	125	
04	DIN 5480 splined	w30	w30	w30	w30	w40	w40	w40	w45	**W1**
	Inlet ports A and B									
05	SAE flange ports, bottom									**L0**
	Drain ports T1 and T2	32	41	50	63	80	90	108	125	
06	-	1	1	1	1	1	1	1	1	**M1**
	Suitable for use of speed sensor									
07								yes		**1**
								no		**0**
	Speed sensor									
08								yes		**1**
								no		**0**
	Valves									
09								without		**SV**

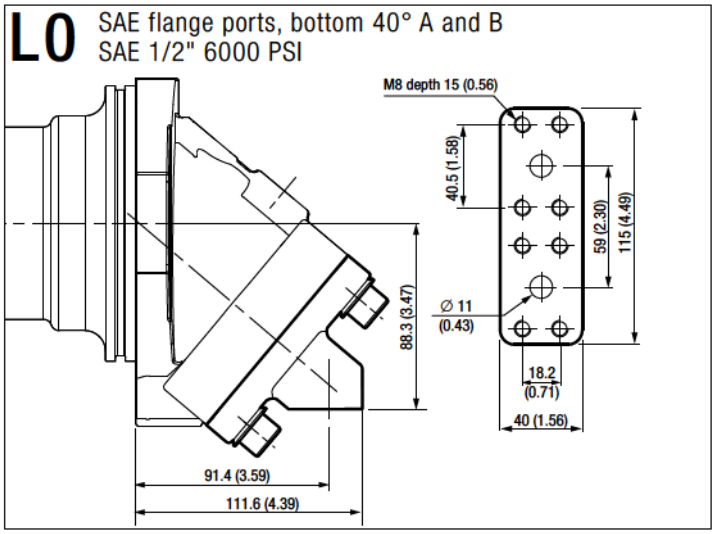
Dimensions



Shaft end

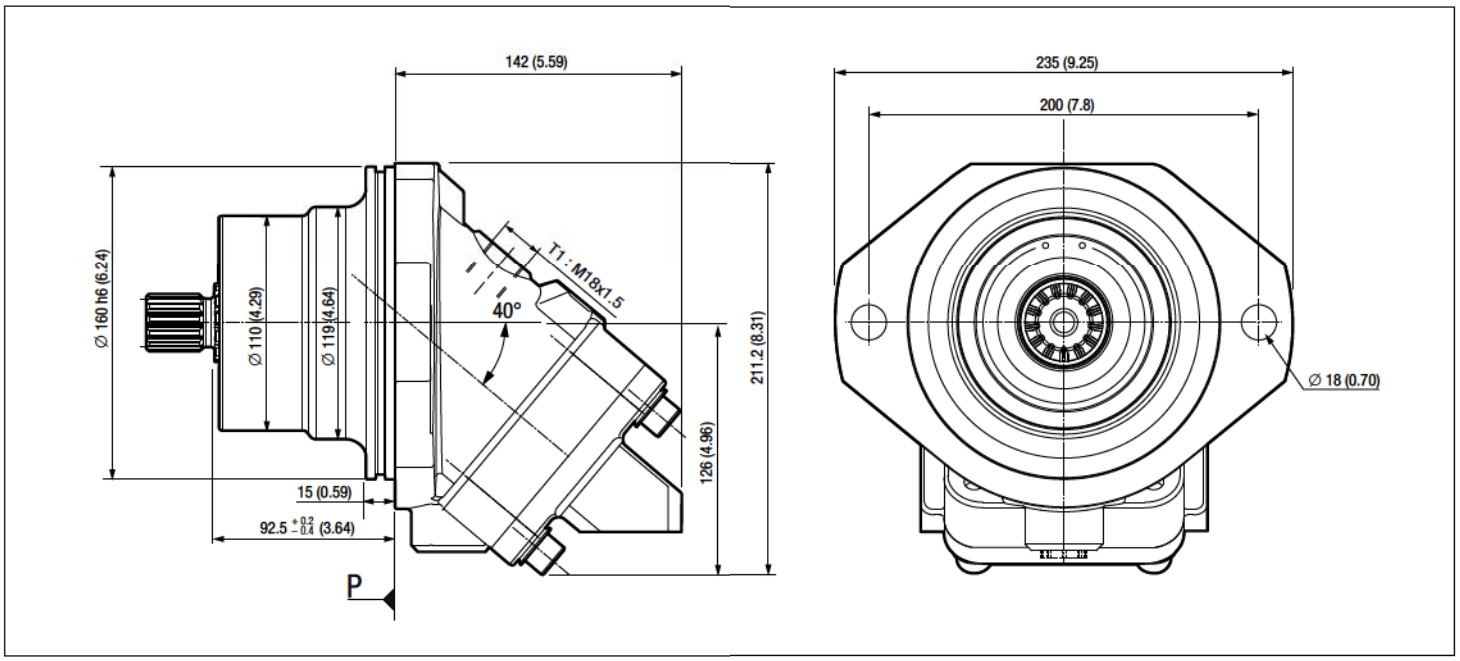


Inlet ports



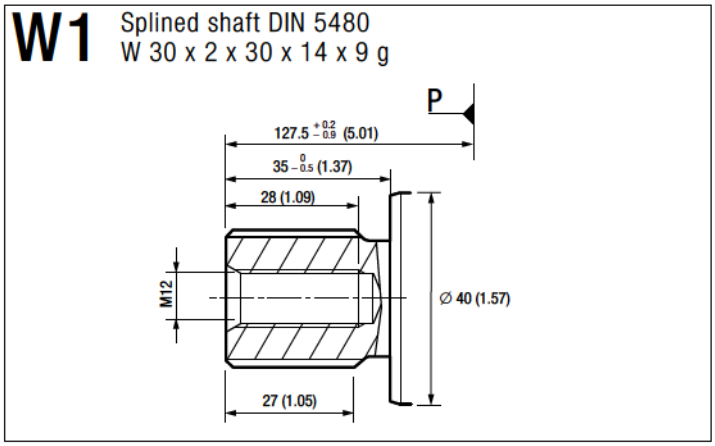
mm (inches) - Dimensions are given only as an indication.

Dimensions



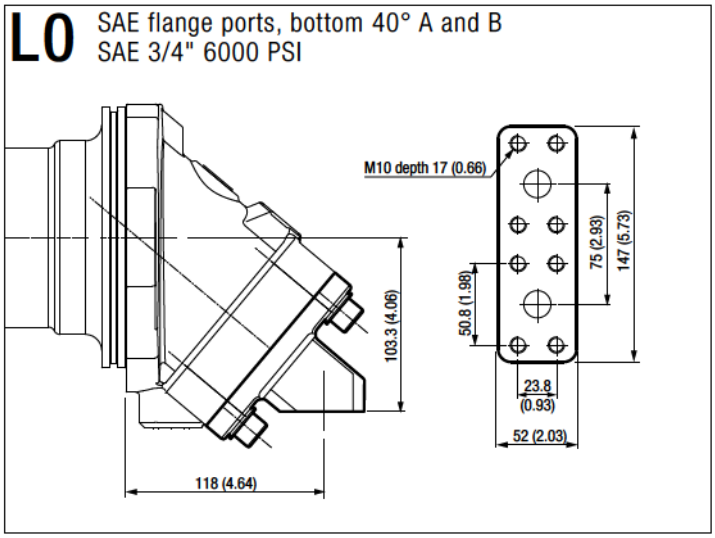
Shaft end

W1 Splined shaft DIN 5480
W 30 x 2 x 30 x 14 x 9 g



Inlet ports

L0 SAE flange ports, bottom 40° A and B
SAE 3/4" 6000 PSI



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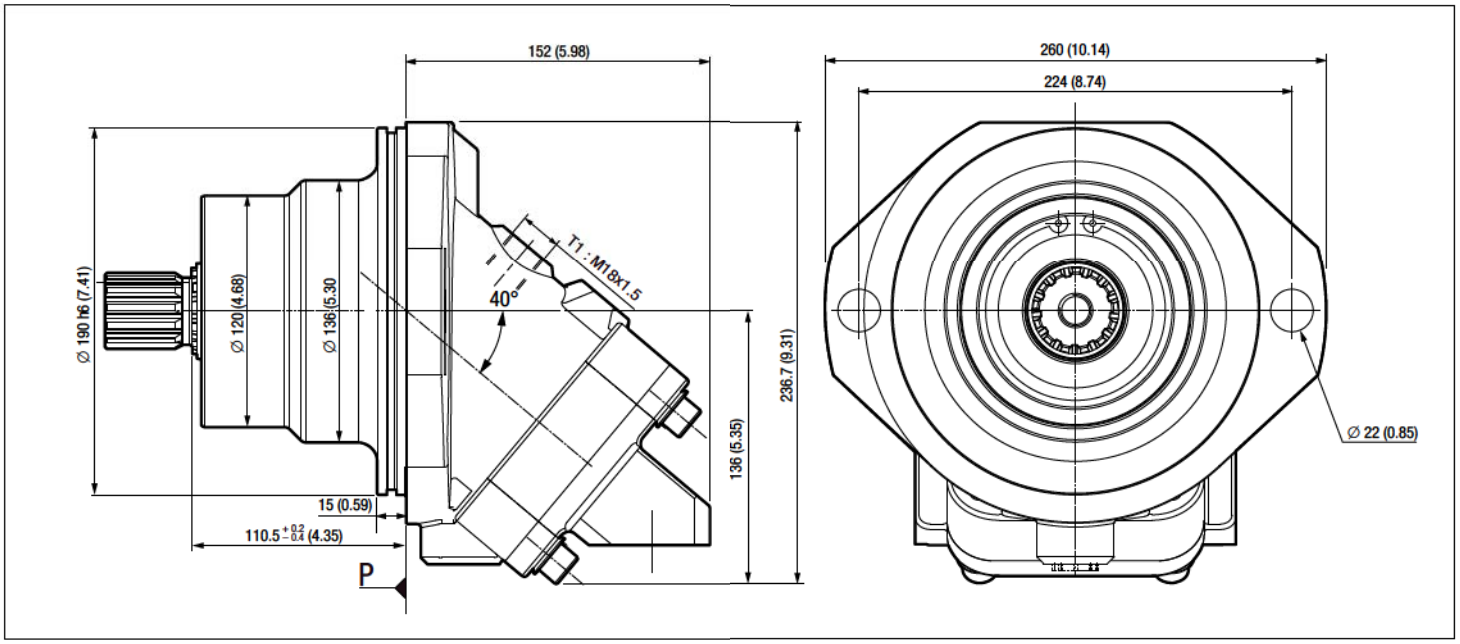
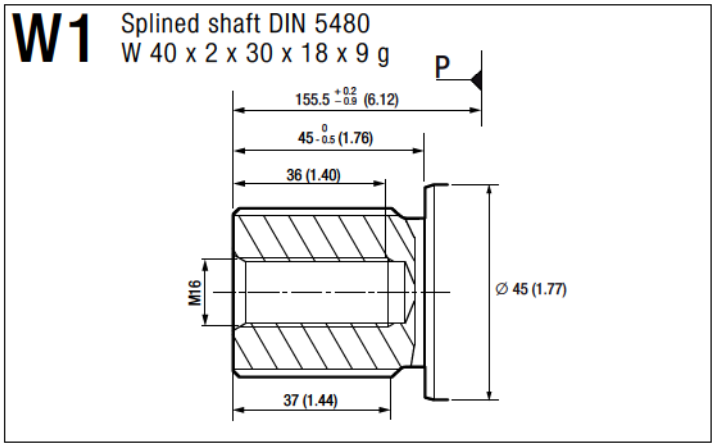
Dimensions



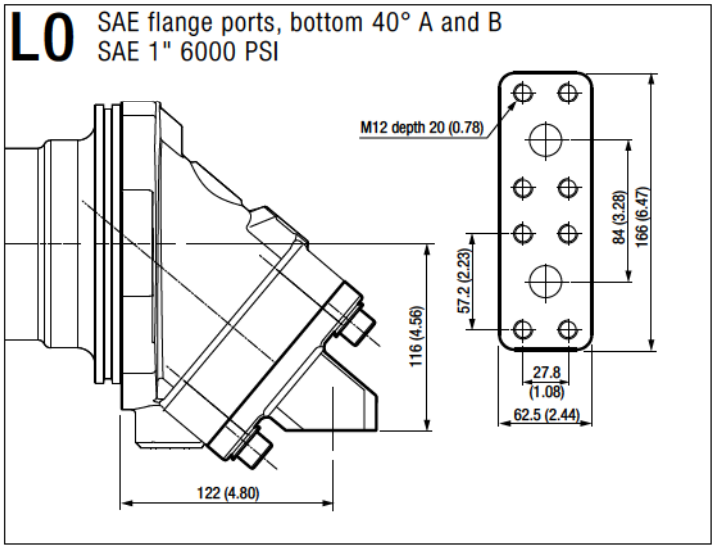
Shaft end

W1 Splined shaft DIN 5480
W 40 x 2 x 30 x 18 x 9 g



Inlet ports

L0 SAE flange ports, bottom 40° A and B
SAE 1" 6000 PSI



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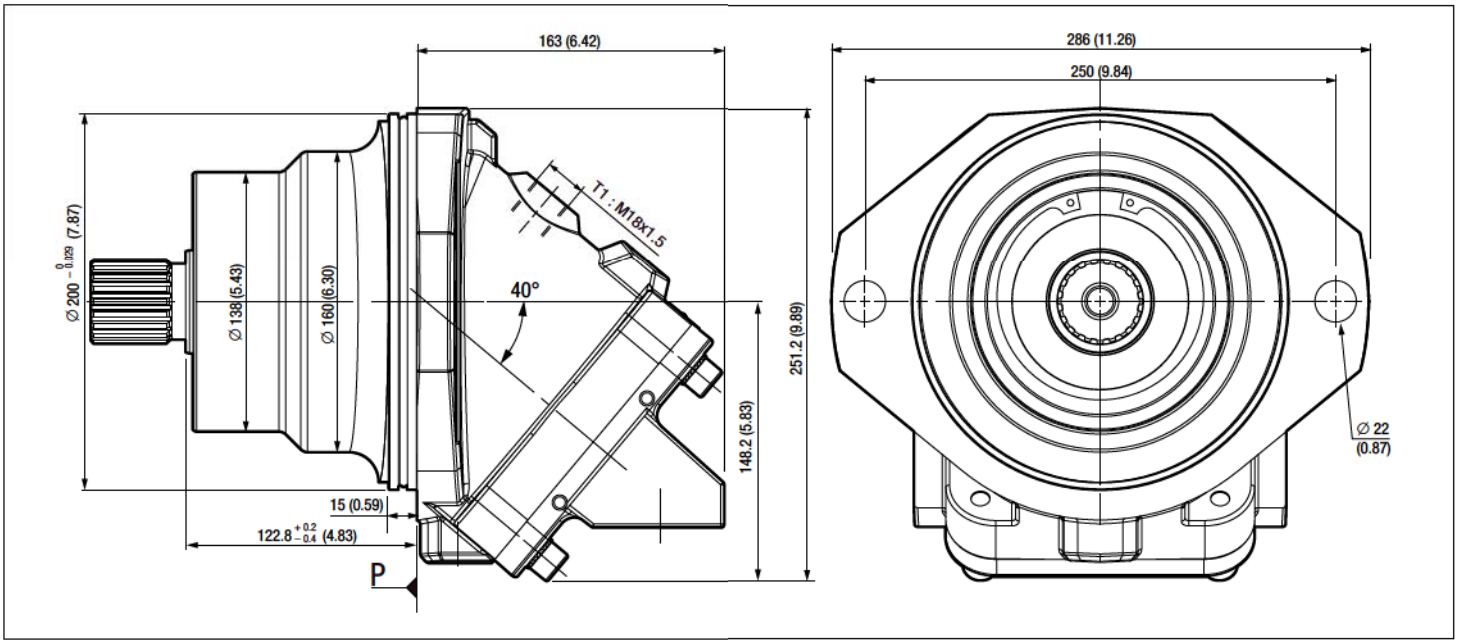
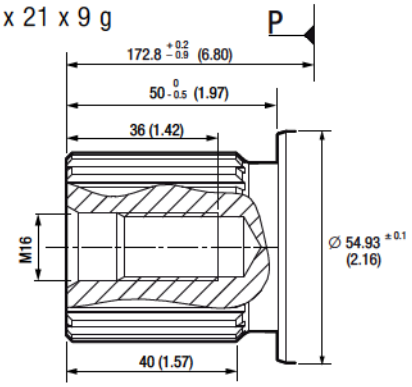
Dimensions



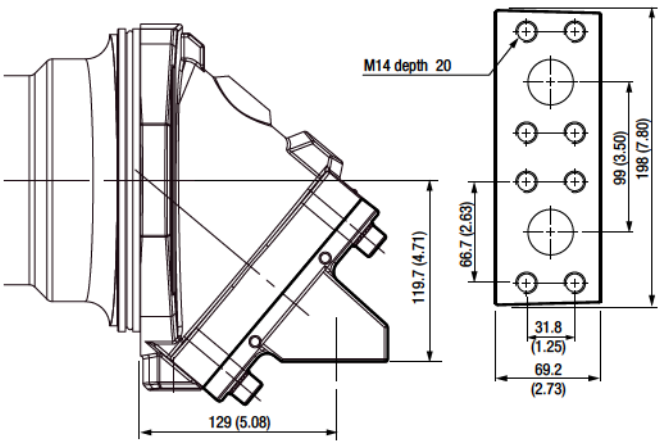
Shaft end

W1 Splined shaft DIN 5480
W 45 x 2 x 30 x 21 x 9 g



Inlet ports

L0 SAE flange ports, bottom 40° A and B
SAE J518 1»¼ 6000 PSI



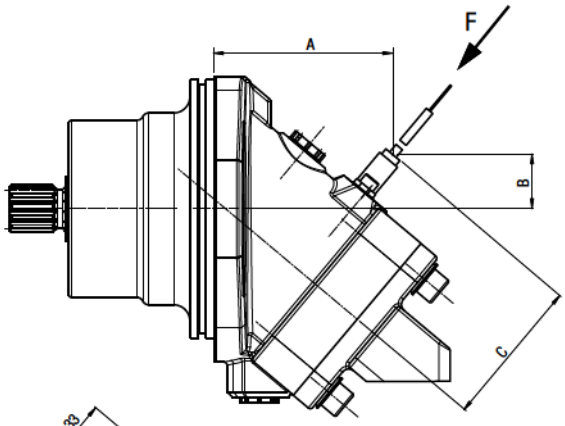
mm (inches) - Dimensions are given only as an indication.

Accessories

Speed sensor

The MSI series motors can be fitted with an induction type speed sensor, to measure rotating speed and also direction of rotation.
This accessory may only be used on motors which are suitably adapted to take it (see order code system on page 6, parameter no. 7).

HYDRO LEDUC reference: 093327.



	A mm (inches)	B mm (inches)	C mm (inches)	Sensor number of teeth**
MSI 32 - 41	95.9 (3.78)	33.15 (1.30)	93.8 (3.70)	**35**
MSI 50 - 63	118.4 (4.66)	39 (1.54)	101.3 (4)	**39**
MSI 80 - 90 - 108	126.2 (4.97)	42.9 (1.70)	106.3 (4.18)	**44**
MSI 125	137 (5.39)	41 (1.61)	116.4 (4.58)	**64**

Note: maximum tightening torque = 10 m.N (7 lbf ft)
For further information, please contact us.

** The MSI motors suitable for use with a speed sensor are fitted with a gear wheel on the barrel. When this barrel rotates, it produces a signal proportional to rotating speed, and which is picked up by the sensor.

Technical data for the sensor:

Supply voltage*	5…32 V DC
Current consumption	maximum 6 mA without load
Output frequency	0 Hz…20 kHz
Protection type	IP 69 k
Operating temperature	– 40°C…+ 125°C (– 104°F…+ 257°F)
Weight	around 65 g

* sensors for different supply voltage available on request.

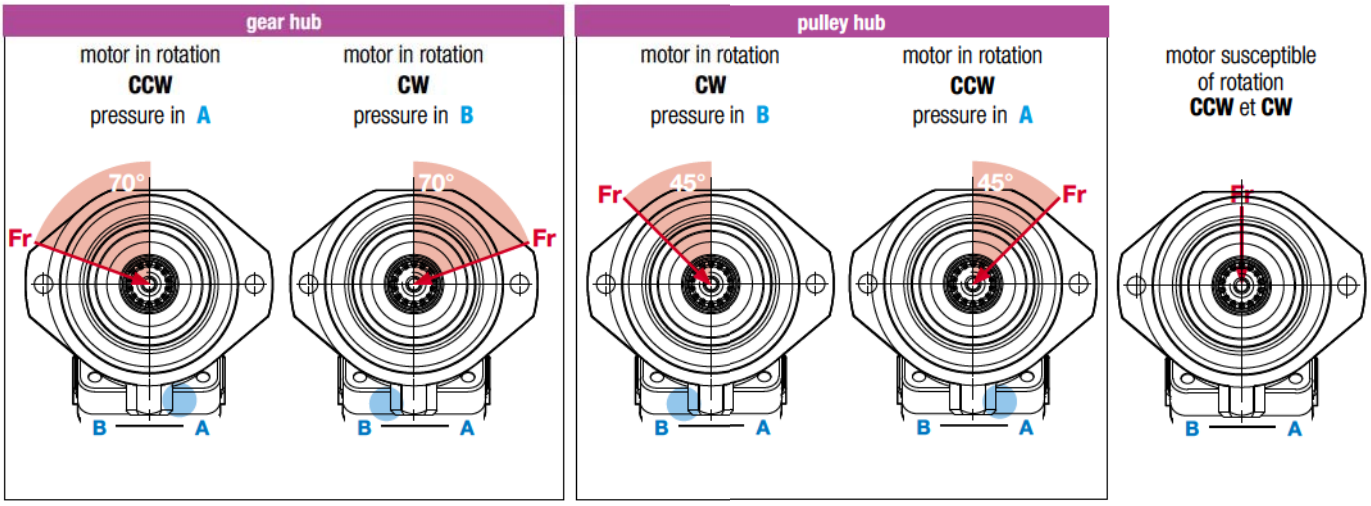
ATEX certification

LEDUC motors can be certified ATEX; please consult us.

Maximizing service life of bearings

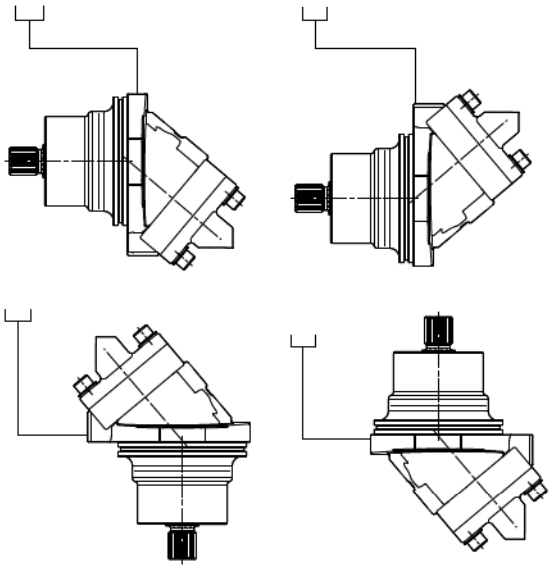
In cases where there is a radial force on motor shaft, keeping the direction of that force within the shaded areas shown below will improve service life of the motor.

For acceptable radial and axial forces, see page 4.



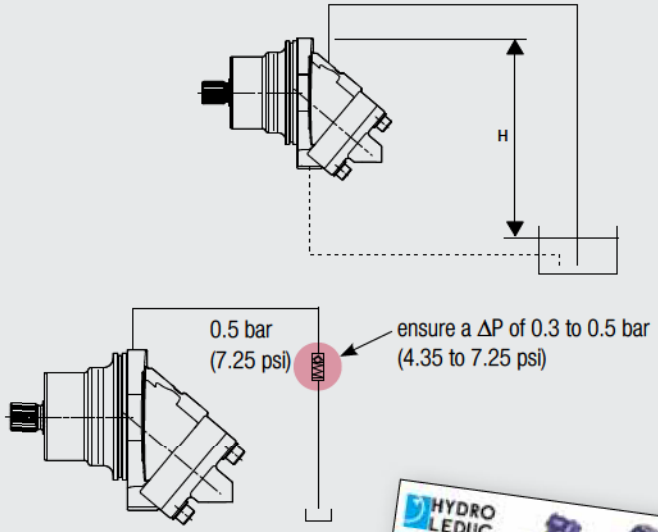
Mounting position of motors

LEDUC motors can be used in any position.



In installations where the position of the motor (H) is above the tank for the drain return, be sure the drain line is always submerged in fluid.

If this is not the case, it is necessary to add a check valve on the drain line following the figure below.



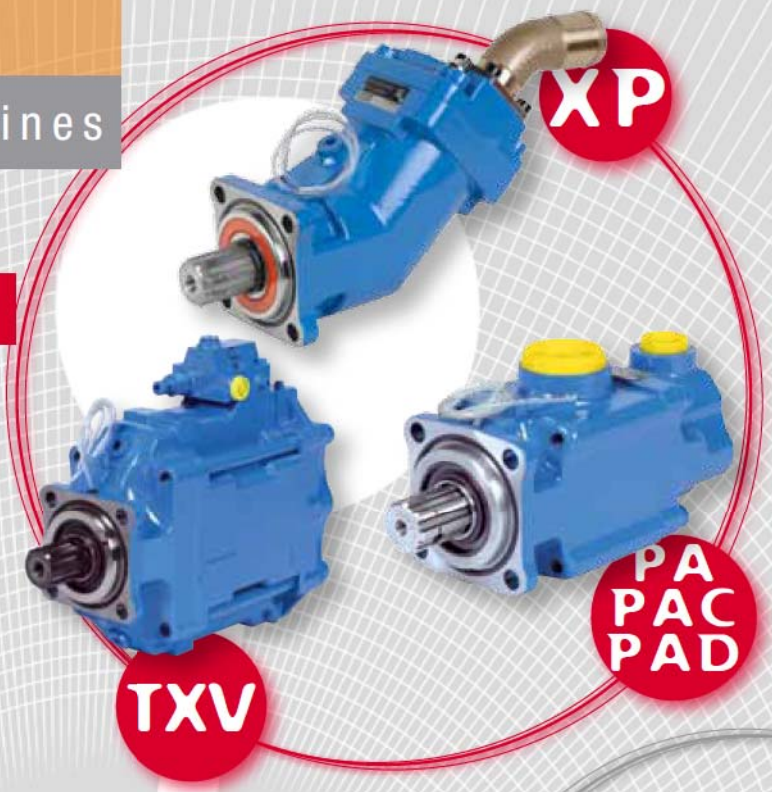
Operating conditions

See page 2.

Instructions for use

Each motor is supplied with an instruction leaflet, also available via e-mail on request mail@hydroleduc.com.

other product lines



piston **pumps** for trucks

HYDRO LEDUC offers 3 ranges of piston pumps perfectly suited to all truck, construction equipment, and PTO–mount applications.
Fixed and variable displacement from 12 to 150 cm^3 (0.73 to 9.25 Cu.In).

mobile and industrial **pumps**

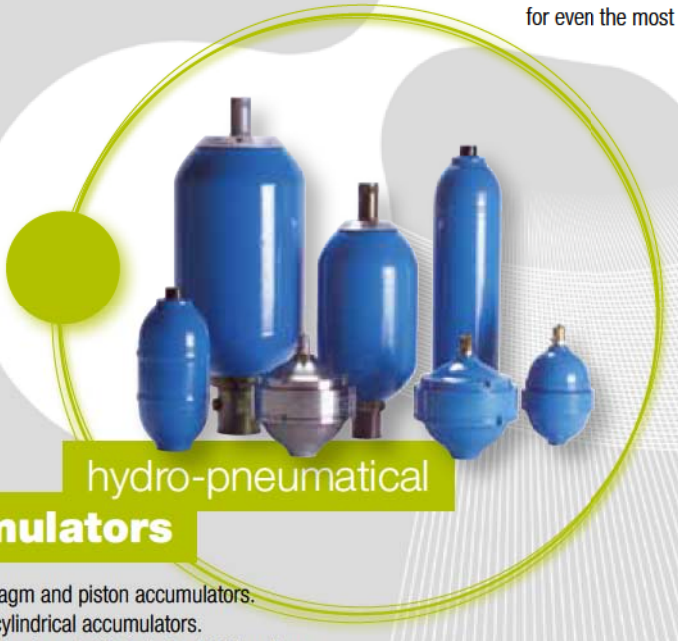
Fixed displacement pumps, the W series, and variable displacement pumps, the DELTA series. High pressure capabilities within minimal size.
W series: flanges to ISO 3019/2, shafts to DIN 5480.
DELTA series: SAE shafts and flanges.

micro-hydraulics

This is a field of exceptional HYDRO LEDUC know-how:

- axial and radial piston pumps, of fixed and variable displacement,
- axial piston micro-hydraulic motors,
- micro-hydraulic units incorporating pump, electric motors, valving, controls, etc.

To users of hydraulic components which have to be housed in extremely small spaces, HYDRO LEDUC offers complete, original and reliable solutions for even the most difficult environments.



hydro-pneumatical **accumulators**

Bladder, diaphragm and piston accumulators.
Spherical and cylindrical accumulators.
Volume capacities from 1.22 Cu.In to 13.21 gallons (20 cc to 50 liters).
Pressures up to 7250 psi (500 bar).
Accessories for use with hydraulic accumulators.

we are passionate about hydraulics...

HYDRO LEDUC

A dedicated R&D team means HYDRO LEDUC is able to adapt or create products to meet specific customer requirements. Working in close cooperation with the decision-making teams of its customers, HYDRO LEDUC optimizes proposals based on the specifications submitted.

A passion for hydraulics

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HYDRO LEDUC

SAS with capital of 4 065 000 euros

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