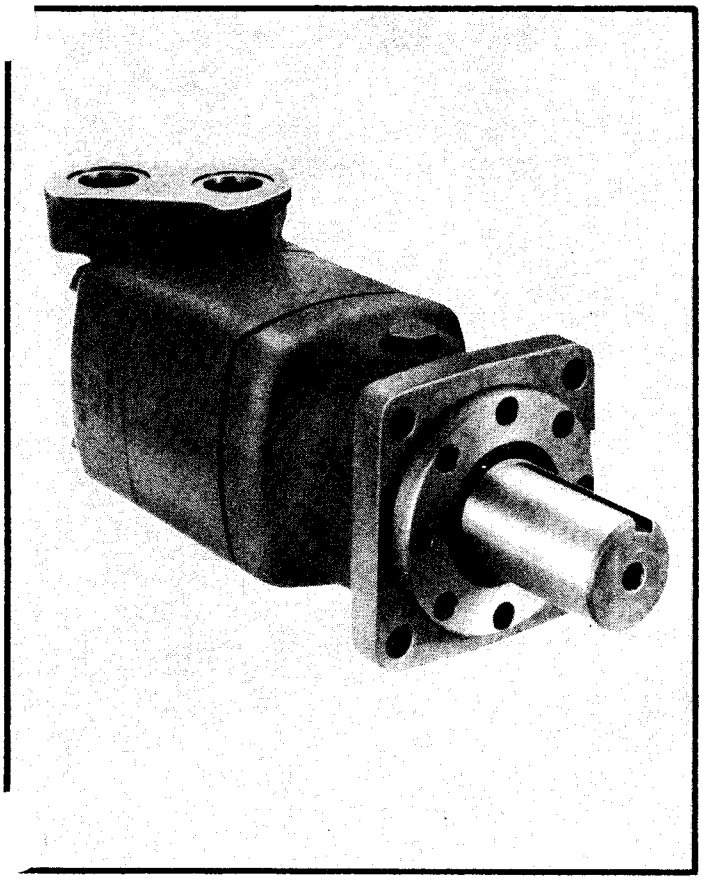


CHAR-LYNN®
HYDRAULIC MOTOR
OPERATOR'S MANUAL
NO. 8-110

Char-Lynn Operator's Manual 10,000 Series Motors

EATON
Fluid Power
Products

Motor Record

RECORDING THIS INFORMATION
NOW MAY SAVE TROUBLE LATER.

MOTOR MODEL NO._____
MOTOR SERIAL NO._____
DATE OF PURCHASE_____
DEALER'S NAME _____

TABLE OF CONTENTS

HYDRAULIC MOTORS

A hydraulic motor is a device that converts fluid energy into mechanical energy. A hydraulic pump, which is driven mechanically, draws in fluid from a reservoir and pumps it to a motor converting mechanical energy to fluid energy. The fluid from the pump causes the motor output shaft to rotate and so drives its load by a mechanical link. The speed of the motor shaft is determined by the amount of fluid flowing through the motor (gallons per minute—gpm). Output torque, is produced by fluid under pressure operating against the displacement element (Geroler).® Displacement is the volume of fluid required to produce one revolution of a pump or motor output shaft. It is usually measured in cubic inches per revolution (cu. in./rev.). Char-Lynn®motor displacement is determined by the width of the Geroler.

Pressure (PSI) produces torque (lb. in.).
Amount of Flow (GPM) determines Speed (RPM).

DISPLACEMENT — 1 Gallon= 231 cubic inches.

Formula for figuring theoretical torque—

$$T = \frac{\text{Pressure (psi)} \times \text{Displacement (cu. in.)}}{2\pi}$$

EXAMPLE
How much torque will a 10,000 Series, 40 cubic inch displacement motor produce at 1500 psi?

$$T = \frac{1500 \times 40}{6.28} = \frac{60{,}000}{6.28} = 9554 \text{ lb. in.}$$

This torque is theoretical. For actual torque, multiply by a percentage factor based on the efficiency of the motor. 10,000 Series motors have mechanical efficiencies averaging 85%.

Actual torque = 9554 x 85% = 8121 lb. in.

4 Introduction

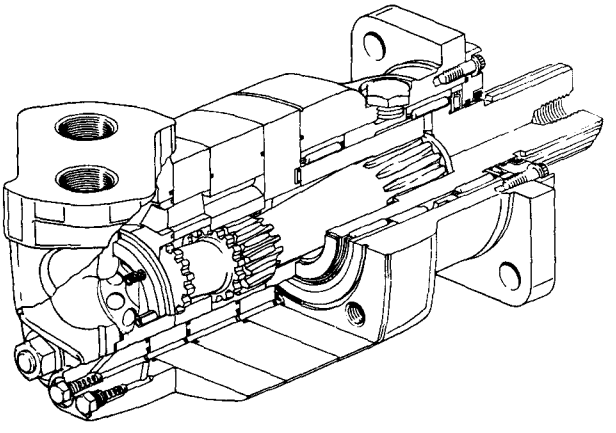
CHAR-LYNN® 10,000 SERIES MOTOR

The 10,000 Series Motors are simple in design, compact and powerful. Using the same basic principle as the other Char-Lynn hydraulic motors, they provide high torque and low speeds through an effective 8:1 internal reduction. Few moving parts, all self lubricated using the hydraulic system fluid, minimize friction and wear within the motor. All motors are individually tested to insure the highest possible quality.

This manual has been prepared to help install the motor in a manner that will help to obtain long and useful life. For more information concerning the servicing of the motor, a Repair Manual is available which gives complete disassembly and reassembly instructions plus other pertinent information about the repair of the motor.

If you have any questions which are not answered in these manuals, contact your local representative or the Eaton Corporation, Minneapolis Division.

CUTAWAY DIAGRAM



SPECIFICATIONS

Displacement (cu. in./rev.)		20.65	29.22	40.55	57.36
Speed (RPM)	Continuous Flow and Pressure	480	340	240	175
	Peak Flow and Continuous Pressure	650	460	330	235
Flow (GPM)	Continuous	45	45	45	45
	Peak	60	60	60	60
Torque (lb. in.)	Running @ Continuous Flow and Pressure	7400	10,500	10,200	10,000
	Running @ Continuous Flow and Peak Pressure	11,200	15,900	16,400	15,200
	Starting	90% of running at the same pressure			
Pressure (△ PSI)	Continuous	2500	2500	1750	1250
	Peak	3750	3750	2750	1850
	Peak Back Pressure without External Case Drain*	1000	1000	1000	1000

***For continuous back pressure over 300 PSI use an external case drain. Install case drain lines to provide a 100 to 150 PSI case pressure.**

Maximum inlet pressure 3750 PSI. Do not exceed △ PSI rating above

Maximum return pressure 3750 PSI. Do not exceed △ PSI rating above

Peak conditions assumed to be less than 10% of every minute

Recommended maximum system operating temperature 180° F

Recommended viscosity range 100 SSU to 200 SSU at operating temperature

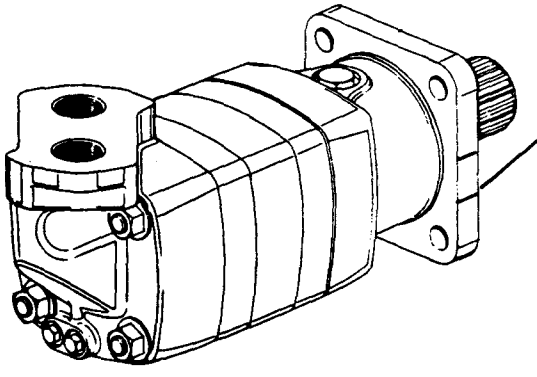
Recommended filtration 10 micron

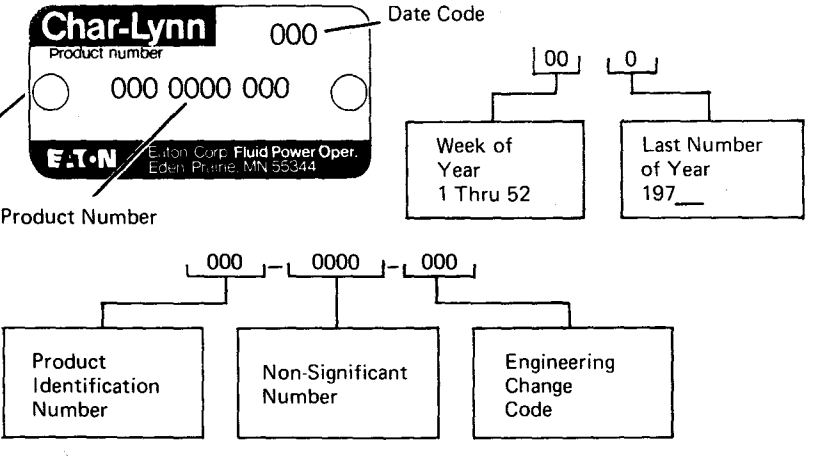
Always use external case drain in closed loop circuits

For performance beyond ratings above, contact Char-Lynn sales department

To assure optimum motor life, run motor for approximately one hour at 30% of rated pressure before application of full load. Be sure motor is properly filled with fluid prior to any load applications.

MOTOR IDENTIFICATION





Standard Motor 119–
Wheel Motor 120–
Bearingless Motor 121–

MOTOR IDENTIFICATION

Type of Motor	Type of Shaft	Port Connectors	Displacement (cu. in./rev.) and Product Number			
			20.65	29.22	40.55	57.36
Standard	Straight	13/16" Threaded	119-1028	119-1029	119-1030	119-1031
		1¼" Split Flange	119-1040	119-1041	119-1042	119-1043
	Splined	13/16" Threaded	119-1032	119-1033	119-1034	119-1035
		1¼" Split Flange	119-1044	119-1045	119-1046	119-1047
	Tapered	13/16" Threaded	119-1036	119-1037	119-1038	119-1039
		1¼" Split Flange	119-1048	119-1049	119-1050	119-1051
Wheel	Straight	13/16" Threaded	120-1005	120-1006	120-1007	120-1008
		1¼" Split Flange	120-1017	120-1018	120-1019	120-1020
	Splined	13/16" Threaded	120-1009	120-1010	120-1011	120-1012
		1¼" Split Flange	120-1021	120-1022	120-1023	120-1024
	Tapered	13/16" Threaded	120-1013	120-1014	120-1015	120-1016
		1¼" Split Flange	120-1025	120-1026	120-1027	120-1028
Bearingless		13/16" Threaded	121-1007	121-1008	121-1009	121-1010
		1¼" Split Flange	121-1011	121-1012	121-1013	121-1014

HYDRAULIC CIRCUITS

Hydraulic motor circuits can be reduced to 3 basic types. The single motor circuit, series circuit and parallel circuit (both of the later types incorporating 2 or more motors). The figures below illustrate these circuit.

SINGLE MOTOR CIRCUIT

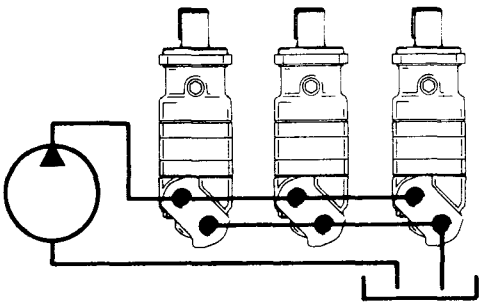
A 3-way open center valve can be used to start and stop the motor. When the valve is moved to the stop position, the motor is allowed to "coast" to a stop. A 4-way valve can be used if the motor is to be reversed.

PARALLEL MOTOR CIRCUIT

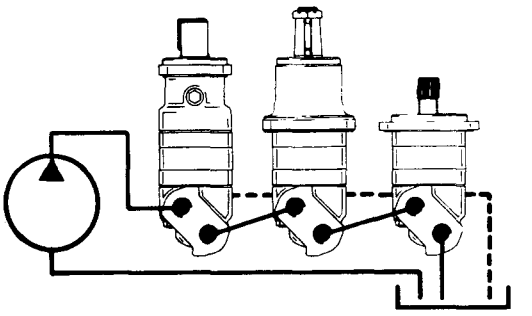
The 2 or more motors hooked in parallel share the same oil supply. With equal loads, two motors in parallel will operate at ½ the speed of a single motor at the same GPM. Torque will remain constant. 10,000 Series motors will operate satisfactorily in this type installation with no back pressure.

SERIES MOTOR CIRCUIT

The 2 or more motors in series will divide pump pressure according to the load on each, but will operate at approximately equal speed. An external case drain is required whenever 2 or more motors are used in series. See page 22.



Parallel Connection



Series Connection

THE RESERVOIR

Reservoir size varies with the type of circuit and the application. A ratio of 1:1* is adequate to supply most systems and maintain the proper temperature. This temperature should be around 120° with 180° considered the absolute maximum!

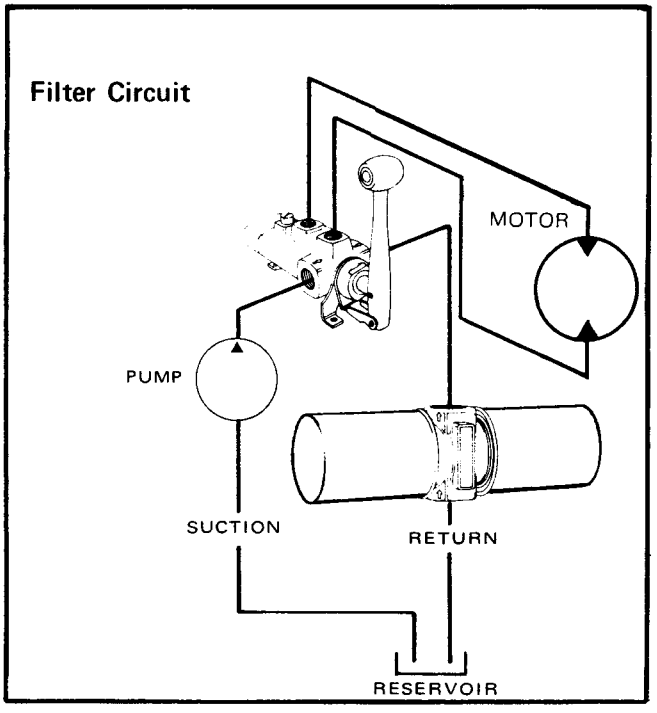
If oil temperatures go beyond this range, a larger reservoir or heat exchanger should be added to the circuit. Black iron pipes can be used to replace hoses in some instances. These help keep the temperatures down and also give a more economical installation. The pipe should be in accordance with recognized pressure maximums i.e. STD., XH or XXH.

*1 GALLON OF RESERVOIR CAPACITY FOR EACH GPM PUMPED.

THE FILTER

This motor is sensitive to contamination because of close part tolerances. Therefore, it is very important that adequate filtration is included in the system. A 10 micron filter is recommended. It should be installed in the return line. Welding slag, dirt, or sand in a new reservoir can cause contamination throughout the system at start-up. Be sure to flush out the reservoir through the filtering system without the motor and other components.

Filter Circuit



THE FLUID IN A HYDRAULIC MOTOR SYSTEM

The following are the recommended procedures for selecting the proper hydraulic fluid for use in Char-Lynn® Motors. Select a major brand industrial PREMIUM QUALITY (anti-wear type) hydraulic oil to provide viscosity between 100–200 SSU at operating temperature. Premium hydraulic oils with viscosity indexes of 95 or above will provide the following temperature ranges:

INDUSTRY IDENTIFICATION VISCOSITY GRADE	OPERATING TEMPERATURE	VISCOSITY
150 SSU	122° F	100 SSU
	84° F	200 SSU
225 SSU	140° F	100 SSU
	107° F	200 SSU
300 SSU	150° F	100 SSU
	116° F	200 SSU
450 SSU	165° F	100 SSU
	130° F	200 SSU
600 SSU	182° F	100 SSU
	145° F	200 SSU

THE FLUID IN A HYDRAULIC MOTOR SYSTEM

If, because of necessity or convenience it is desirable to use an automotive engine oil, multi-viscosity oils of SE rating which will provide viscosity between 100 and 200 SSU at operating temperature can be used. These will provide proper viscosity over a wide range. For example:

SAE VISCOSITY GRADE	OPERATING TEMPERATURE	VISCOSITY
10W–30	160° F	100 SSU
	120° F	200 SSU
10W–40	190° F	100 SSU
	140°	200 SSU

The above recommendations cover the normal system operating temperatures.

If in doubt as to proper grade and types of oils to use, Eaton distributors or representatives can supply pertinent information or contact Eaton Corporation, Fluid Power Operations, Minneapolis Division, 15151 Highway 5, Eden Prairie, Minnesota, 55344.

Synthetic fluids or other non-petroleum based fluids can be used. However where such fluids are required because of fire hazard or other specifications, the motor performance may have to be de-rated, the operating temperature and pressure limited or seals may require changing because of incompatability with the fluid. Consult Char-Lynn® product distributors.

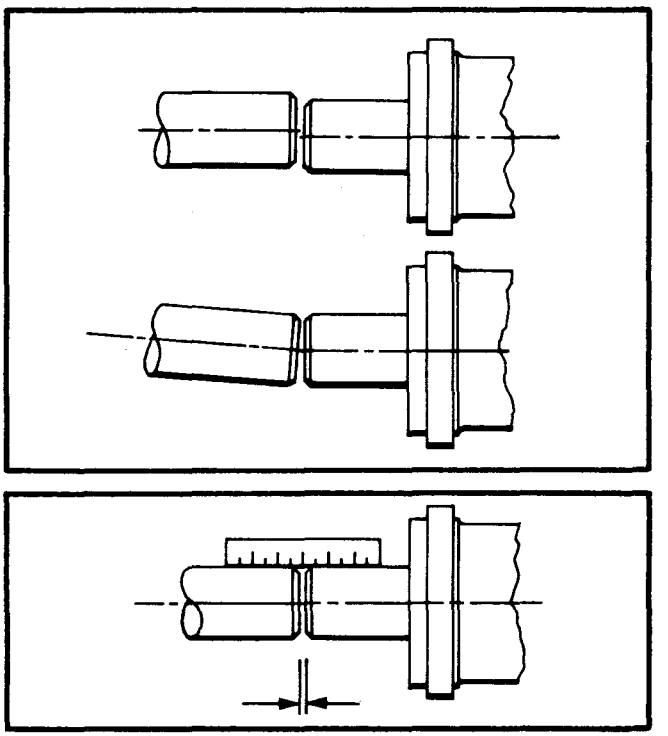
Do not use propriety additives such as viscosity increasers or friction eliminators.

12 Installation

SHAFT ALIGNMENT

Avoid poor installation practices which lead to shaft misalignment. The motors are adequately designed to withstand substantial side and thrust loads, but to impose an unnecessary continuous force on the motor shaft can accelerate wear and reduce the work life of the motor and coupling.

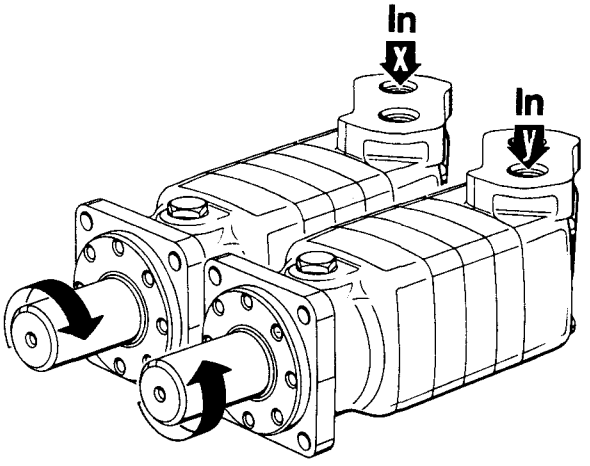
As shown here, there are two types of misalignment problems. For most applications, a 6" scale and visual inspection can determine the correct alignment. For example, place one half of the scale's edge up against the motor shaft. The other half of the scale on the output shaft. If the two shafts are aligned, the edge of the scale will be one continuous solid line between both shafts. If the shafts are not aligned, there will be a visible gap between the scale's edge and the output shaft. This visual method of checking alignment is shown in the bottom Figure.



SHAFT ROTATION

The ports in the 10,000 Series Motors are 1-5/16" –20 UN straight thread fittings, or 1-1/4" SAE split flange fittings.
The motors operate equally well in either direction, depending on which port is connected to pressure.

These motors are set at the factory to rotate in a clockwise direction when pressurized as shown. The direction of rotation can be reversed simply by reversing the oil lines. If for some reason this is impossible, the position and relation of the valve and Geroler must be changed to effect reversal. The procedure for this is outlined in the 10,000 Series Motor Repair Manual.



Rotation – Viewed from shaft end
Port X pressurized – Clockwise (CW)
Port Y pressurized – Counter clockwise (CCW)

14 Installation

RADIAL LOAD CHARACTERISTICS

These curves indicate the radial load capacity of the 10,000 Series Motors (Except the Bearingless Motors) depending on the location of the radial load.

The curves are based on 2000 hour B-10 bearing life at 100 RPM. To determine the allowable radial load for speeds other than 100 RPM multiply the load values given on the bearing curves by the following factors:

RPM	Multiplication Factor
50	1.23
100	1.00
200	0.81
300	0.72
400	0.66
500	0.62
600	0.58

Example: If the load is centered 2 inches from 0 (see example coordinate line on curve), the maximum load at 100 RPM would be 5400 lb. At the same location at 200 RPM maximum load would be 4374 lb.

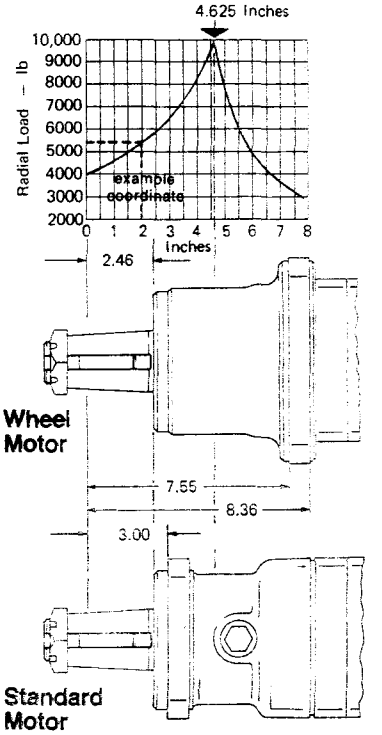
5400 lb x 0.81 = 4374 lb

Thrust Load Characteristics—Either direction

Standard Motor ..... 2000 lb

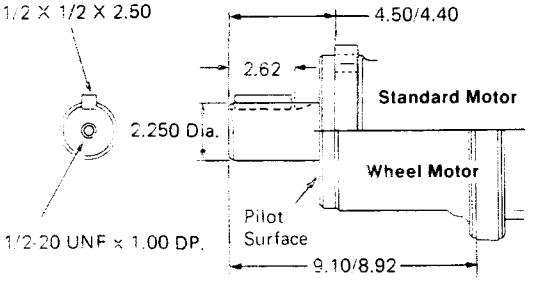
Wheel Motor ..... 2000 lb

The maximum radial load at 100 RPM is 9900 pounds applied 4.625 inches from 0.

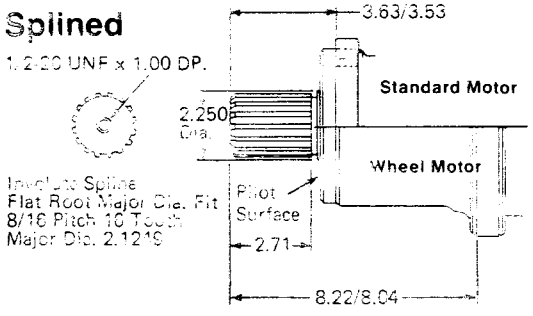


Dimension Data-Shafts

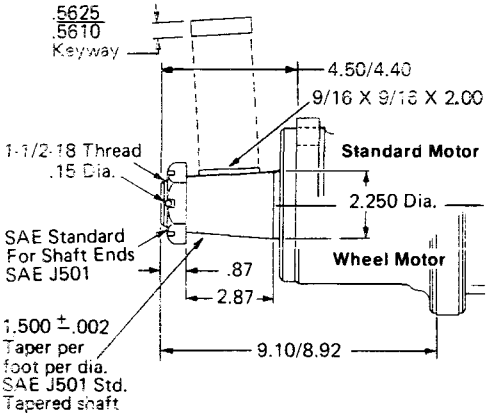
Straight

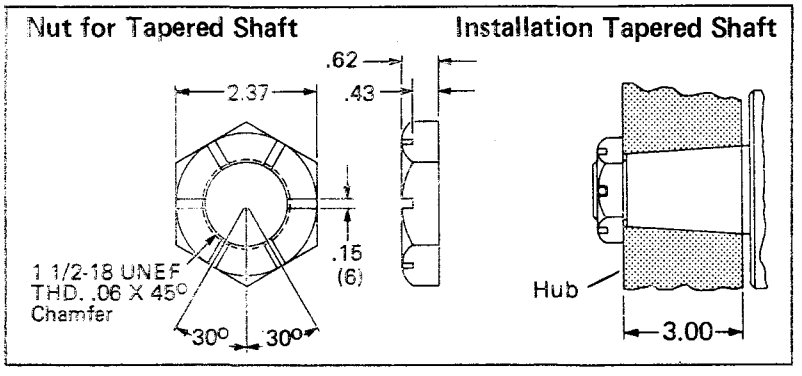


Splined



Tapered

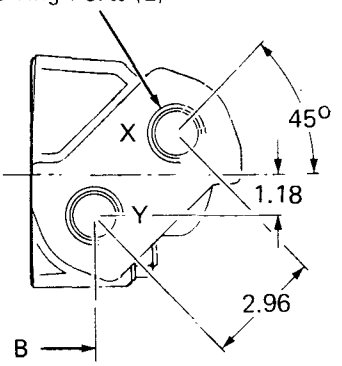




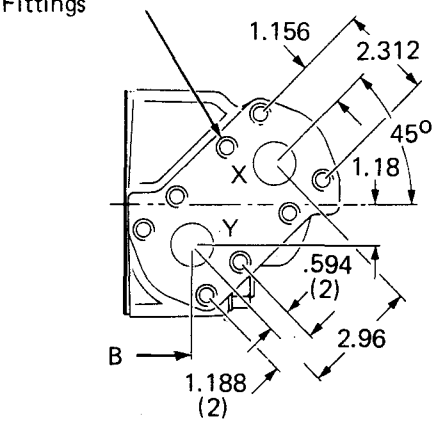
16 Installation

Dimension Data-Ports

SAE 1-5/16 – 12UN - 2B Straight Thread O-ring Ports (2)



7/16-14 UNC (8 Holes) For SAE 1-1/4" Split Flange Fittings

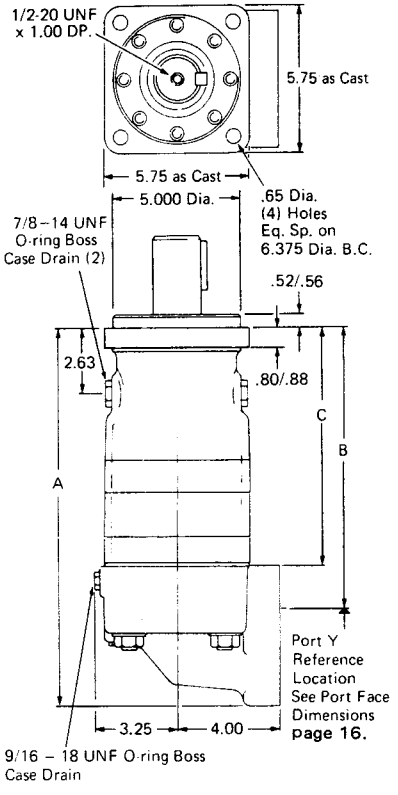


DIMENSIONS AND MOUNTING DATA

STANDARD MOTOR

Disp. cu. in. rev.	A	B	C±.12
20.65	14.92	11.10	9.43
29.22	15.44	11.62	9.95
40.55	15.44	11.62	9.95
57.36	16.17	12.35	10.68

See pages 15 and 16 for shaft and port dimensions.

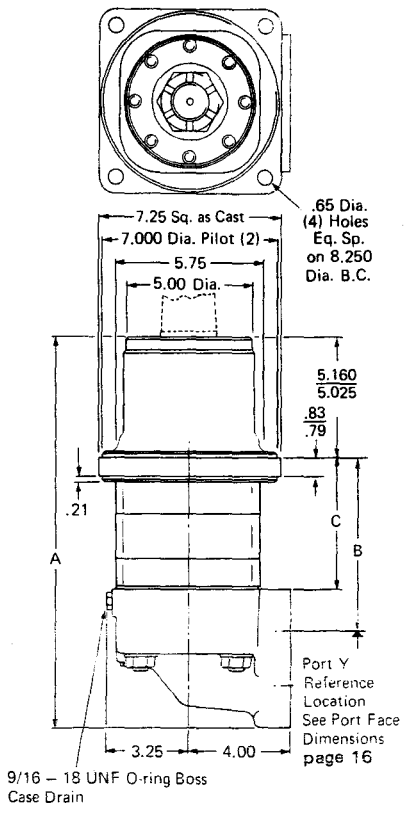


DIMENSIONS AND MOUNTING DATA

WHEEL MOTOR

Disp. cu. in. rev.	A	B	C±.12
20.65	15.50	6.56	4.85
29.22	16.00	7.06	5.37
40.55	16.00	7.06	5.37
57.36	16.75	7.81	6.10

See pages 15 and 16 for shaft and port dimensions.

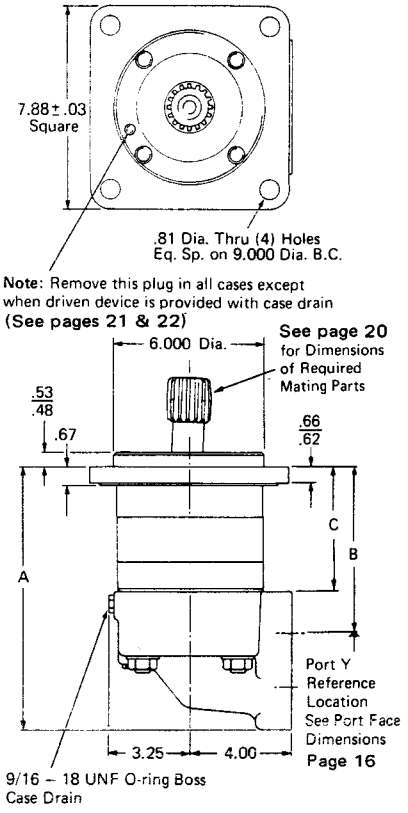


DIMENSIONS AND MOUNTING DATA

BEARINGLESS MOTOR

Disp. cu. in. / rev.	A	B	C±.12
20.65	10.02	6.20	4.53
29.22	10.54	6.72	5.05
40.55	10.54	6.72	5.05
57.36	11.27	7.45	5.78

See page 16 for port dimensions.
See page 20 and 21 for installation instructions.



DIMENSION AND MOUNTING DATA

BEARINGLESS MOTOR

Installation Information

1. Recommended pilot diameter 6.001/6.003 diameter.
2. Pitch diameter of spline in mating part 1.6000 to be concentric to 6.001 pilot diameter within .010 T.I.R.
3. Recommended material and heat treat for internal spline: 8620-H steel hardness at .004 to .020 below surface of spline to be RC-58-62 minimum. Hardness at .030 below surface of spline to be RC-50.
4. End of motor shaft must be retained by hardened mating part.
5. Mounting surface of mating assembly to be flat within .003 T.I.R. and perpendicular to internal spline pitch diameter within .003 T.I.R.

Internal Involute Spline Data
(American National Standards Institute
ANSI B 92.1-1970)

Flat Root Side Fit

Number of Teeth	16
Spline Pitch	10/20
Pressure Angle	30°
Base Diameter	1.385641
Pitch Diameter	1.6000
Major Diameter	1.7390 Max.
Form Diameter	1.704
Minor Diameter	1.507/1.502

Circular Space Width

Max. Actual	.1612
Min. Effective	.1571
Max. Measurement Between Pins	1.3555
Pin Diameter	.1728

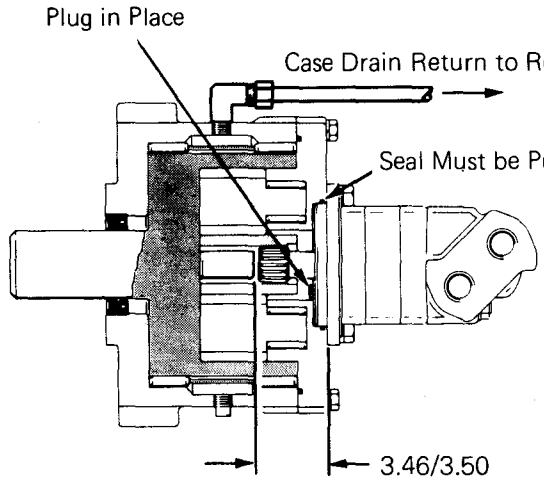
DIMENSIONS AND MOUNTING DATA

BEARINGLESS MOTOR

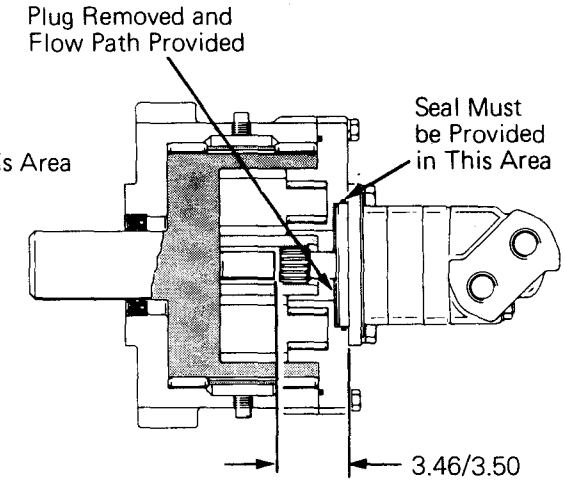
The bearingless motor features an internal check valve system (to regulate case pressure) and an external case drain connection. The drive mates with a standard SAE internal involute spline.

The driven mechanism must be capable of operating with the fluid of the hydraulic system. A case drain port is recommended on the driven mechanism.

Always use an external case drain when used in a closed loop system or when intermittent system back pressure exceeds 1000 PSI.



External Case Drain Line in Driven Mechanism



Internal Check Valve System in Motor

22 Installation

CASE DRAIN

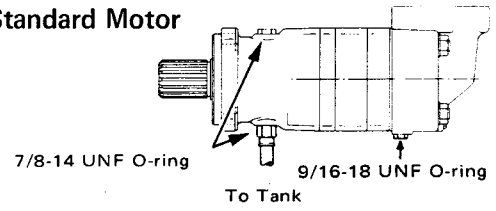
An external case drain is recommended when intermittent back pressure exceeds 300 PSI, and is required when intermittent back pressure exceeds 1000 PSI.

To install case drain on standard motor, remove one of the 7/8-14 boss plugs, or use 9/16-18 UNF o-ring port. Install case line as shown. You can use tubing, pipe, or hose for this line, providing they have at least 1/4" inside diameter.

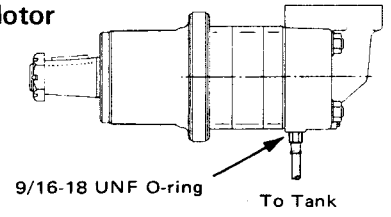
On the wheel motor the case drain is located in the valve housing opposite the shaft end and requires a 9/16-18 UNF o-ring fitting.

On the bearingless motor, we recommend a case drain be provided on the driven device. When this is not possible remove the plug from the mounting flange, and install a case drain in the motor housing as shown. This requires a 9/16-18 UNF o-ring fitting.

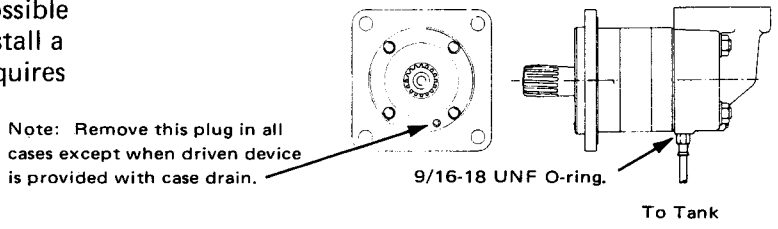
Standard Motor



Wheel Motor



Bearingless Motor



A Char-Lynn® hydraulic motor is built to extremely high standards and should be treated as such. It should be returned to your nearest service center or to the factory if in need of repair. Trained personnel repair and test returned motors so that they meet the highest quality repair and test standards. Upon request, before repairs are made, the owner will be notified of the cost and probable cause of the failure.

INSURE TROUBLE–FREE SERVICE

The Char-Lynn hydraulic motor was designed and is manufactured to very strict tolerances and assembled under closely controlled conditions. If properly installed and with a minimum of attention it will give long trouble-free service.

- ****Avoid nuisance fluid-leaks. Typical causes are: dirty, scratched, bowed or inadequately bolted joints; vibrating, unsupported lengths of flexible and rigid piping. The cure: careful assembly, proper seals, periodic inspection. Only compatible seal materials (resistant to fluid and temperatures involved) should be used.
- ****Eliminate vacuum leaks in suction lines to pumps. Suction leaks lead to noisy pump operation, cavitation, and early pump failure.
- ****Avoid shock–limit the rate of pressure build-up. Be sure relief valves are adjusted properly. Avoid chatter, sudden pressure surges, and higher-than-needed working pressures. Pressure and flow are energy–use them efficiently.
- ****Be aware of temperatures. Use oils that will not be too heavy when cold or too light when hot. Either may affect operation and lubrication. (See pages 10 and 11).
- ****Include adequate filtration in the system (10 micron filter.)