



DC MOTOR/PUMP CAPABILITIES GUIDE _____

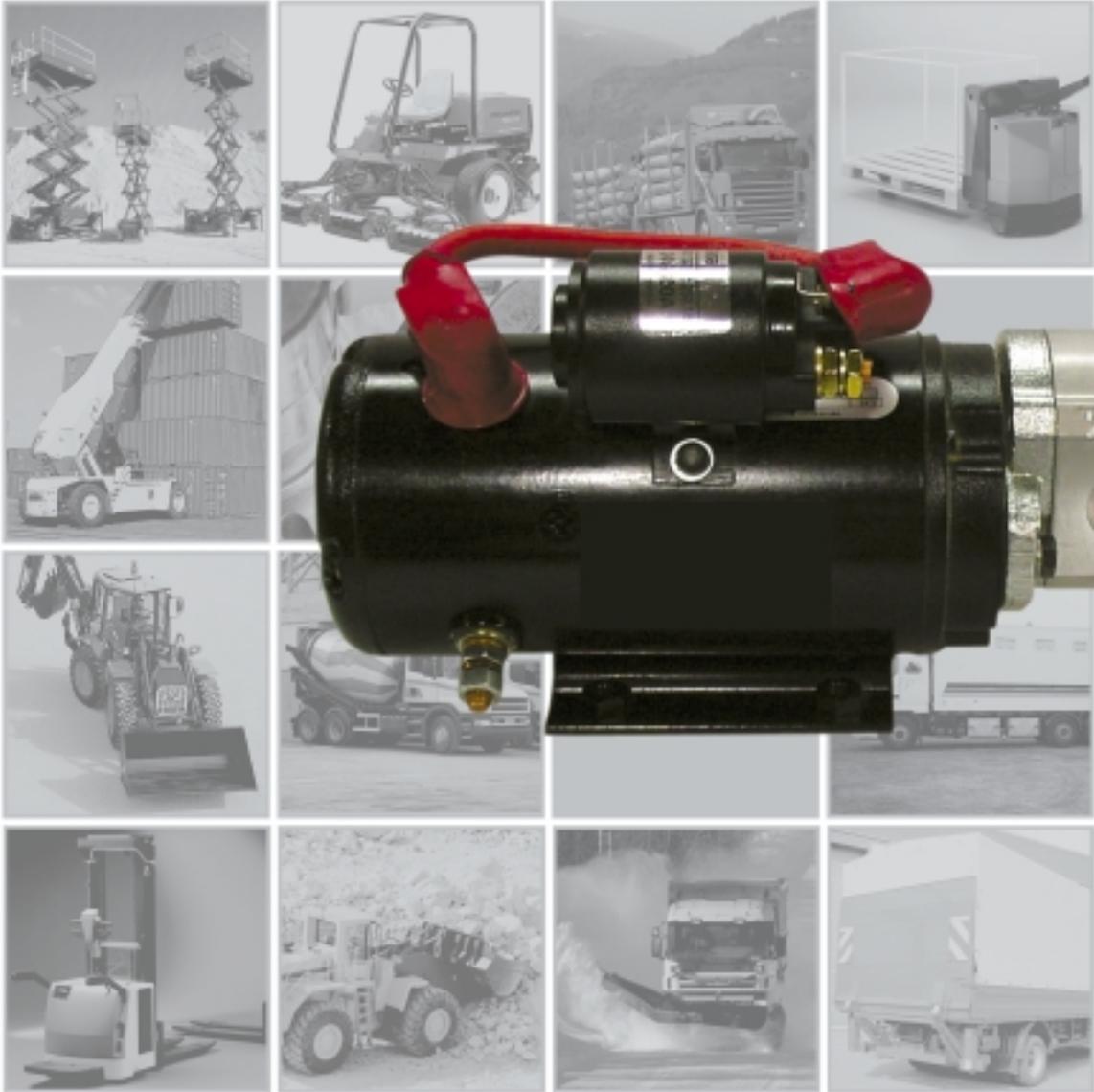


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INNOVATORS IN D.C. MOTOR/PUMP TECHNOLOGY

A Haldex D.C. motor/hydraulic pump assemblies are compact, versatile hydraulic power systems which include a pump and a D.C. motor. Numerous control valves can be incorporated in the basic packages to meet a wide variety of system requirements. These systems are typically applied in mobile applications where a common reservoir is accessible.

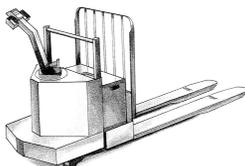
Haldex' expertise in designing, applying and producing D.C. motor/hydraulic pump assemblies is highly regarded within the industries that we serve. We are considered a source of knowledge in this area by the material handling industry, aerial lift industry and the construction equipment industry, among others.

Material Handling Industry

The Material Handling Industry relies on Haldex' knowledge and experience for applications such as lift, tilt, power steering and auxiliary functions on many types of industrial lift trucks. These motor/pump units can be designed for pallet trucks that require separate motor, pump and reservoir packages. These units provide primary hydraulic power for lifting and other functions.

They can also be designed for high reach stackers that require separate motor, pump and reservoir packages as well. They provide primary hydraulic power for lifting and, under certain applications, can provide secondary power for fork carriage extension or side-to-side shift operation.

Narrow aisle or 3-wheel sit down forklifts also typically require separate motor/pump and reservoir packages. These units provide primary hydraulic power for lifting and vehicle steering along with secondary power for fork carriage extension or side-to-side shift operation.



Aerial Lift Industry

The Aerial Lift Industry also relies on Haldex' long history of success in applying D.C. motor/pump assemblies for its equipment. Our systems are well suited for auxiliary / secondary lowering requirements for off-highway vehicles, lift platforms, or boom applications where the primary hydraulic source becomes nonfunctional or unavailable. They may also be used for minor jib or basket adjustments by the operator.

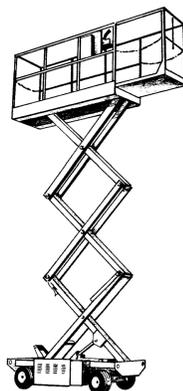
These motor/pump units are also designed for scissor and boom lift vehicles as the primary power source. These units provide hydraulic power to propel, raise and steer the vehicles.

Construction Industry

In the Construction Equipment Industry, we are called upon for assistance with traction drive applications as well as the lift functions for aerial devices.

Also, many construction machines require a supplemental source of hydraulic power when the primary source becomes nonfunctional or unavailable. Examples of these include large hoists, cranes and wheel loaders. Haldex' D.C. motor/hydraulic pump assemblies are ideally suited to meet these needs.

Haldex' D.C. motor construction is also well suited for applications in off-highway equipment where the conditions are harsh and rugged performance is required. For example, power units can be constructed with heavy duty start switches and insulated wiring boots.



The mating of a D.C. motor and hydraulic pump into an assembly and the application of these assemblies is dependent on a diverse set of variables. Each application varies in complexity. Complete knowledge of the unique characteristics of individual D.C. motors is essential and, of course, expert knowledge of individual hydraulic pump performance is necessary. But the merging of D.C. motors and hydraulic pumps is a technology all its own. And, it is in this area that Haldex excels.

Why Specify Haldex?

Specifying a complete D.C. motor/hydraulic pump assembly ensures system reliability. All Haldex' D.C. motor/pump assemblies are tested for proper coupling engagement, balance motor armature, amp. draw at rated voltage and flow at specified pressure.

The Intent of this Catalog . . .

This catalog draws on our extensive experience to illustrate the range of Haldex D.C. motor/hydraulic pump capabilities. Included are performance curves and dimensional drawings. This catalog will present various types of D.C. motors available and the extensive selection of Haldex pumps available to be applied with them.



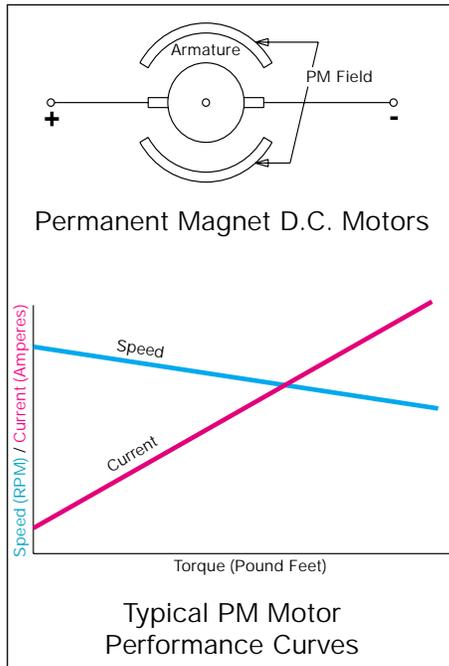
MOTOR FEATURES OFFERED

MOTORS . . .

Haldex offers an extensive range of D.C. motors from 12 to 48 volts. The two motor designs that are incorporated in the majority of our applications are the permanent magnet type and the wound field type. Under these broad categories, there are numerous combinations of voltages, frame sizes and duty ratings available.

Permanent Magnet

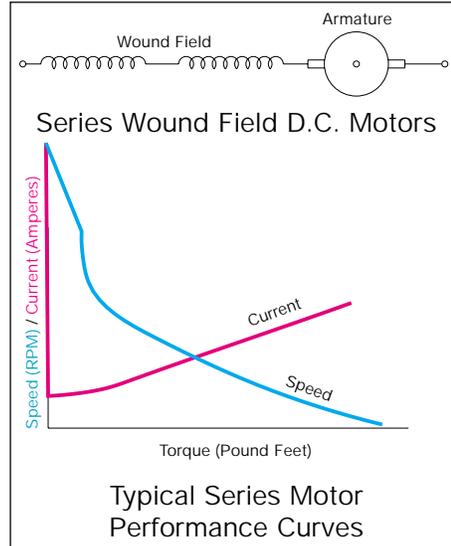
Motors with permanent magnet excitation are characterized by simple design. Because the magnetic field is created by permanent magnets, excitation of the motor is constant under all operating conditions. The speed variation vs. torque will remain relatively consistent over the motor's operating range.



Permanent magnet motors generally run at a nominal speed of 1800 RPM (although other speeds are available). These motors have a lower stall torque than wound field motors, but are more efficient and exhibit superior thermal characteristics which make them more suitable for continuous duty applications. Some of the most common applications of permanent magnet motors are power steering and fuel systems.

Series Wound Field

In Series-Wound Field motors, the excitation and armature windings are both electrically operated with the current passing through the armature. Series Wound motors, therefore, develop high initial torque which decreases sharply as the motor speed increases.



Wound field motors are higher speed motors which exhibit a very high stall torque. Their thermal characteristics are such that they can generate higher power levels for short periods of time. Wound field motors are available with different duty ratings. At Haldex these motors are classified as standard duty (usually single terminal motor, totally enclosed non-ventilated (TENV), with sleeve type bearing and 4½ inch diameter), medium duty (usually has ball bearing in rear housing, U.L. approved, totally enclosed non-ventilated (TENV), 4½ inch diameter motor and duty cycle is somewhat longer than standard depending on application) and heavy duty (usually 2 terminal, 5 inch diameter motor, open ventilated fan cooled (OVFC), exhibiting longer duty cycles, depending on application).

The above are distinguished by motor diameter or frame size, and the ability to dissipate heat at different current levels over a specific time interval. In general, wound field motors are used in applications where the loads are higher and greater speed is required but only on an intermittent basis. Wound field motors are load sensitive and speed will vary with the applied load; performance curves are required to determine the output at a given point. Applications include lift functions on aerial devices and material handling equipment as well as auxiliary power steering on construction equipment.

Listed below are the standard features available on Haldex' D.C. motors. A brief explanation of these features is also included for each section.

Voltage

Haldex offers a full range of D.C. motor capabilities from 12 to 48 volts.

Single or Double Terminal

Haldex offers single terminal motors where the motor is internally grounded. Cost savings is achieved by eliminating additional wiring. We also offer double terminal motors where an external ground is required.

Several Sizes and Construction

We offer the standard 4½ inch diameter motors as well as 3 and 5 inch diameter. Available features include open drip proof, thermal protection and sealed designs.

Start Switches

Haldex offers start switches which can be mounted in a variety of locations to suit your applications. We offer 3 terminal and 4 terminal (U.L.) switches in heavy duty designs, with or without boots.

Various Mounts

Haldex offers a number of standard motor mounting brackets and will work to meet your specific mounting requirements. Shown here are foot mounts, pump/stator mounts, and horseshoe mounts.

U.L. Approval

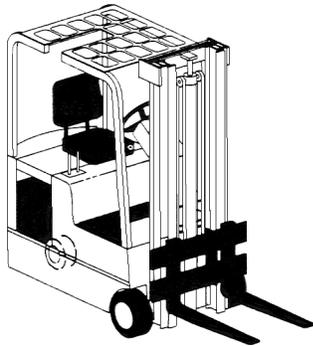
Haldex can provide Direct Current electric motors intended for use in the electric battery powered industrial truck market. These motors are intended to comply with the requirements of UL 583 for Type E, ES or EE industrial trucks.



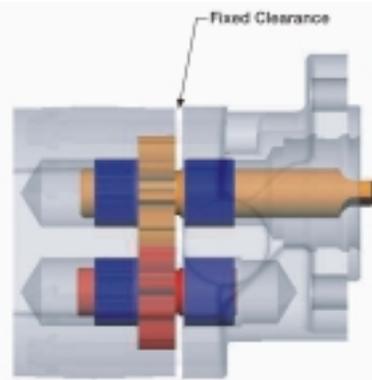
PUMP FEATURES OFFERED

PUMPS . . .

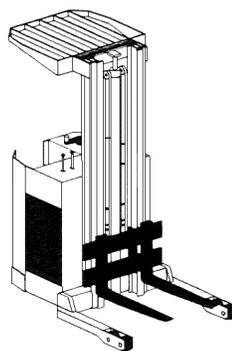
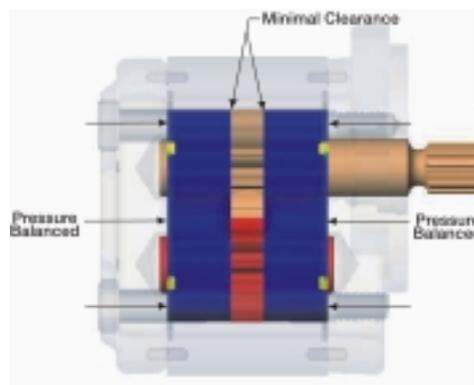
The Haldex line of high quality cast iron and aluminum bodied gear pumps range in size from .065 in.³/rev. to 2.40 in.³/rev. (1.06 to 39.32 cc) displacements. The two pump styles offered are fixed clearance and pressure balanced. These two pump styles differ in design and in the volumetric efficiency they exhibit under various conditions.



Volumetric efficiency is the actual flow a pump produces relative to the theoretical (or maximum) flow it could produce if it had no internal losses. The two major leak paths that determine volumetric efficiency in a gear pump are between the gear tips and the housing, and between the gear faces and the housing. Reducing the leakage over the gear tips is a function of being able to hold component parts to precise and exacting tolerances. We have demonstrated over many years that we have the equipment and expertise to consistently provide the required precision in the fabrication of the components used in our gear pumps.

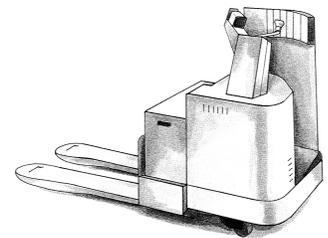


To reduce the leakage between the gear face and the housing, the pressure balanced design has been developed. This design incorporates floating bearing blocks in the pump housing on the sides of the gear faces. As pressure is developed by resistance to the pump's flow, it creates a hydraulic force which tends to push the bearing blocks away from the gear faces. However, this force is balanced by an opposite pressure which is applied on the opposite side of the block via a port behind the block. As the pressure level increases, the opposite pressure on the block increases to insure that the clearance between the bearing block and the gear face is the smallest possible without creating excess friction which would effect the mechanical efficiency of the pump. Pressure balanced pumps are well suited for applications where lower viscosity fluids, higher temperatures, or higher pressures and duty cycles are encountered.



Choosing a Pump . . .

Choosing the type of pump is determined by a number of factors that are inter-related. The system pressure requirement may completely dictate the type of pump required and the motor may have to be sized accordingly. When the selection of a pump type is not dictated, overall efficiency (as it relates to choosing the most economical D.C. motor and the cost of operating the vehicle) must be considered. In many cases, where high pressure, high duty cycle or low viscosity fluid are not factors, a fixed clearance pump is the most economical design to use. These units are less expensive, and their volumetric efficiencies at low to moderate pressures are comparable to pressure balanced pumps.



In applications where fixed clearance pump efficiency is not adequate, the pressure balanced design may be desired because of the higher volumetric efficiency. Higher volumetric efficiency on the pump side typically results in faster machine cycle speeds. Cycle speed is important in most battery powered mobile equipment applications because battery life is rated in amp./hours. The less time that amps are being drawn from a battery pack, the longer the battery pack will last before recharge or replacement. In most applications, overall efficiency of pressure balanced pumps is higher than that of fixed clearance pumps. The understanding of how the overall efficiency of a pump varies based on different application parameters is critical to the selection of the optimum D.C. motor for a specific motor/pump application. Haldex has many years of experience in this area.

PUMP FEATURES OFFERED (Cont.)

Listed below are the standard features available on Haldex' pumps. A brief explanation of these features is also included.

GC Series

Fixed Clearance Pumps

Haldex GC Series hydraulic pumps are high-efficiency cast iron gear pumps designed for reliability and long-life performance under rugged conditions. GC Series pumps are built with cast iron bodies and hardened steel gears. They are suitable for use in a wide variety of applications.

W Series

Pressure Balanced Pumps

The pressure balanced W Series hydraulic pump offers outstanding performance, flexibility, high efficiency, low noise performance and a variety of options to suit a wide range of equipment needs. It features a through-bore bushing type design construction.

Split Gear Pumps

A Split Gear pump incorporates two gears offset by one tooth to obtain the desired displacement. By offsetting the teeth of the gears, the number of pressure pulses is increased and the magnitude of these pulses is decreased; therefore, reducing any noise caused by the pump.

Multiple Pumps

Multiple pumps provide multiple hydraulic functions from one power source at a significantly lower cost than separate pumps. Some can also be sealed between sections to allow for independent circuit operation without mixing hydraulic fluids.

High/Low Pumps

Two-Stage High/Low pumps provide two section flow for high speed positioning, and unload one section of the pump at a predetermined pressure to provide a maximum working pressure.

Pressure Balanced Pumps

This design incorporates floating bearing blocks in the pump housing on the sides of the gear faces. As pressure is developed by the pump, it creates a hydraulic force which tends to push the bearing blocks away from the gear faces. However, this hydraulic force is balanced by an opposite pressure which is applied on the block via a port behind the block. As

the pressure level increases, the opposite pressure on the block increases to insure that the clearance between the bearing block and the gear face is at the smallest possible increment without creating excess friction which would decrease the mechanical efficiency of the pump.

Adjustable Relief Valve

Haldex' external gear pumps are available with integral adjustable relief valves. Tamper proof versions are also available.

Check Valve

Haldex' external gear pumps can incorporate integral check valves. All Haldex' check valves feature hardened steel seats.

Solenoid L-H-L Valve

Haldex' external gear pumps can incorporate lift-hold-lower valve circuits, integral to the pump housing and electronically actuated by either a 12, 24, 36 or 48 volt D.C. UL approved coils.

Unload Valve

Haldex' external gear pumps can be designed with an unload valve to optimize system performance and vehicle operation.

Solenoid w/Manual Override

The solenoid actuated valve option can include a manual override feature to allow for manual actuation of the valve.

Load Sense Valve

Load Sensing is a hydraulic circuit configuration which allows the load, as sensed at the control valve, to modulate pump output in relation to system demand. Controlling both flow and pressure at the pump allows for a significant reduction in valving losses and circuit inefficiencies. This provides many of the operational benefits of a piston pump with the performance, reliability and cost advantages of a gear pump.

SAE Side/Rear Ports

Haldex' standard porting is SAE (Straight Thread O-Ring) side ports. This type of port offers greater resistance to leakage and is more serviceable than other port styles. SAE rear ports are also available.

Inlet Tubes

Oversized inlet tubes are available on Haldex pumps to ensure proper fill and fluid inlet conditions.

Drive Systems . . .

The other critical element to be considered when specifying a D.C. motor/pump unit for your application is the drive system. Drive system failure is known to be a significant problem in many D.C. motor/pump applications today. Haldex has both the product and a wealth of application expertise in this area to ensure that your D.C. motor/pump unit incorporates the correct drive system for your application requirements. The following descriptions define the four (4) drive systems available for Haldex D.C. motor/pump units.

Tang Drive System

A .171" wide tang for GC pumps and a .244" wide tang for PB (Pressure Balanced) pumps are the most durable standard tang drives offered. These wider tangs provide greater tang / shaft engagement, thereby reducing the play between the shaft and tang. Reduced play results in reduced wear of the tang during motor starts and longer drive system life.

Extended Duty Tang Drive System

For higher duty cycle or high torque applications, we have developed the Haldex' extended duty tang drive. This innovative drive reduces axial play between tang and shaft to a minimum by means of a wave washer placed behind the ball bearing on the shaft. This washer keeps a constant spring load on the shaft to ensure maximum tang engagement at all times.

Flexible Coupling Drive System

This drive system eliminates all metal to metal contact by means of a rubber spider which engages inside two metal coupling housings. The material Haldex has selected for its flexible drive coupling exhibits superior resistance to deformation and wear. This system provides maximum torque transfer and quiet operation and is primarily used for continuous duty applications.

SAE 9 Tooth Spline Drive System

This drive system allows for direct pump/motor spline connection to distribute higher torque and duty cycle operation with lower noise levels emitted from the pump/motor combination.

PRODUCT/FEATURE MATRIX

Numbers represent page numbers in this catalog where you can find examples of your desired product features for your market, vehicle and application.

Market	Aerial Lift		Material Handling		Construction
Vehicle	Boom	Scissors/ Boom	Pallet/ Stacker	3-Wheel Sit Down	Various
Application	APU	Lift/ Propel/ Steer	Lift	Power Steering	Power Steering

Product Features

Motors	Voltage	12		9,10,11,12,13,15		24	30	
		24		14	17,18,19,21,22	25,27	29,31	34,35,36,37,38,39,40
		36					32	
		48			20		32	
	Terminals	Single		9,10				
		Double		11,12,13,14,15	17,18,19,20,21,22	24,25,27	29,30,31,32	34,35,36,37,38,39,40
	Design	Permanent Magnet			20,21		32	
		Wound Field		9,10,11,12,13,14,15	17,18,19,22	24,25,27	29,30,31	34,35,36,37,38,39,40
	Duty Cycle	Low		9,10,15				
		Medium		11,12,13,14		24,25		
		Extended			17,18,19,20,21,22	27	29,30,31	34,35,36,37,38,39,40
		Continuous					32	
	Construction	Standard 4.5"		9,10,11,12,13,14		24,25		
		3"		15				
5"				17,18,19,22	27	29,30,31,32	34,35,36,37,38,39,40	
Open Drip Proof				17,18,19,21,22	27	29,30,31,32		
Sealed				20			34,35,36,37,38,39,40	
Thermal Protection				20				
Approvals	UL		11,12,13,14,15	17,18,19,22	24,25,27	29,30,31		
Controls	Start Switch	3 Terminal		10				
		4 Terminal (UL)		12,13,14		24,25,27	34,36,37,40	
		Heavy Duty w/Boots		10		27	36,37,40	
		w/o Boots		12,13,14		25,27	37,40	
Mounting	Foot Mount		13	17,18,19,20,21,22	25,27	29,30,31,32	34,35,36,37,38,39,40	
	Pump/Stator		15					
	Horseshoe		9,10,11,12		24			
Pumps	Type	GC		9,10,11,12,13,14,15	17,18,19,20,21,22	24,25,27	29,30	
		Split Gear					32	
		W600						34
		W900						35,36,37,38,39,40
		High/Low						
		Pressure Balanced					31	
	Sections	Single		9,10,11,12,13,14,15	17,18	24,25,27	29,30,31,32	34,35,36,37,38,40
		Multiple			19,20,21,22			39
			Sealed Between Sections					39
	Valves	Relief Valve		9,10,11,12,13,14,15	21	24,25,27	30,31,32	34,37
		Check Valve		9,10,11,12,13,14	21	25,27	30,31	
		Solenoid L-H-L				27		
		Unload			21			
		Solenoid w/Man. Override					31	
		Sol. Vlv Cavity w/Steel Plug Load Sense		14				38,39,40
	Shafts	Tang		9,10,11,12,13,14		24,25,27	29,30,31	
		Direct Drive Tang		15	17			
		Flex Coupling			18,19,20,21,22		32	
SAE 9 Tooth Spline							34,35,36,37,38,39,40	
Ports	Side		9,10,11,12,13,14,15	17,18,19,20,21,22	24,25,27	29,30,31,32	34,36,37,38,39,40	
	Rear						35	
	Inlet Tube					29,32		

BOOM LIFTS

Secondary Lowering Auxiliary Power Units

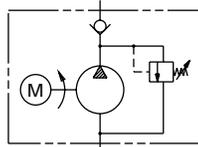
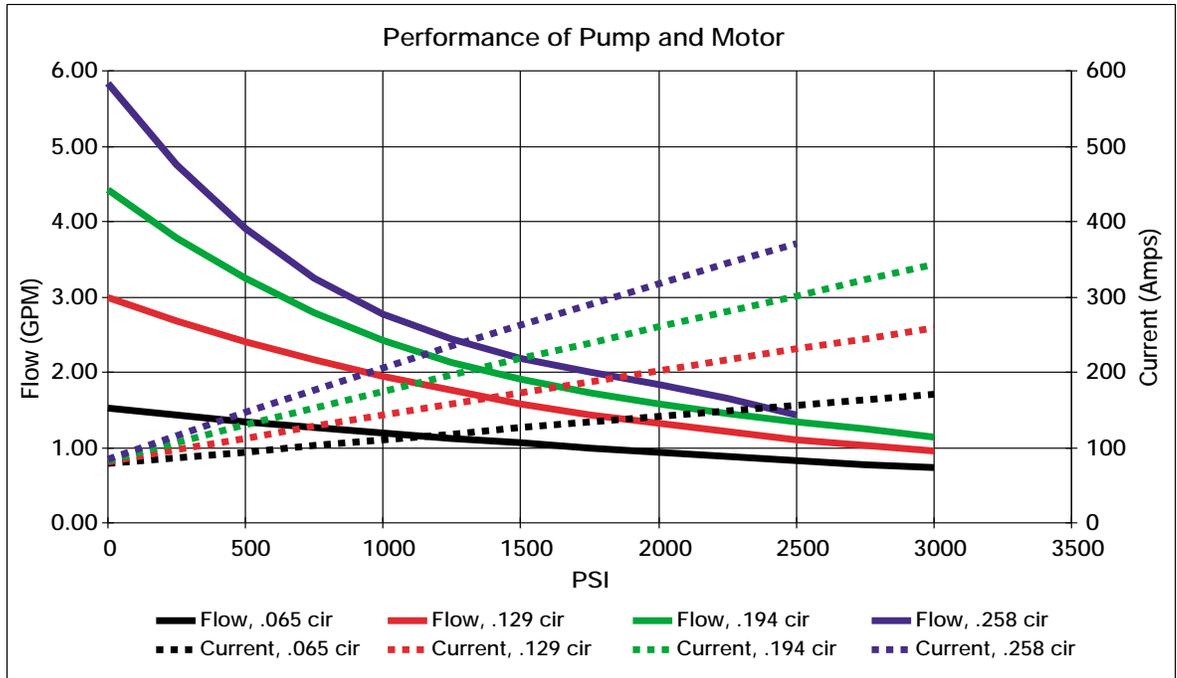


These pump and motor power units are designed for applications requiring auxiliary hydraulic power. Typical applications are for truck, mobile crane and boom equipment. These power units are well suited for auxiliary / secondary lowering requirements for off-highway vehicles, lift platforms, or boom applications when the primary hydraulic source becomes disabled or nonfunctional. They may also be used for minor positioning adjustments by the operator.

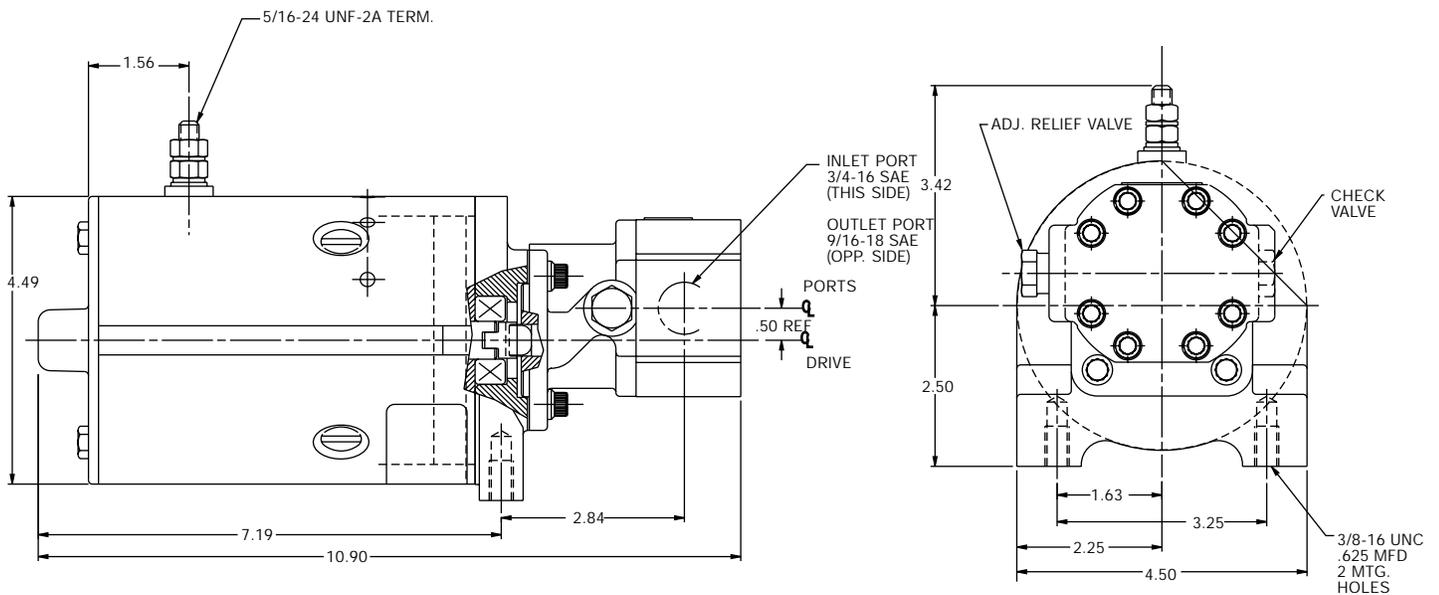
Unit complexity can range from a simple pump and motor unit without any valving, to units that incorporate pressure holding check valves and over-pressurization protecting relief valves. Units range in size from light duty 3 inch motors to medium duty 4.5 inch motors.

Motor: 12 Volt DC, 1 Terminal, Wound Field, Low Duty, Standard 4.5" Motor, No Start Switch, with "Horseshoe" Mounting

Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Tang Drive

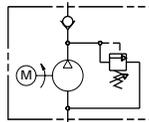
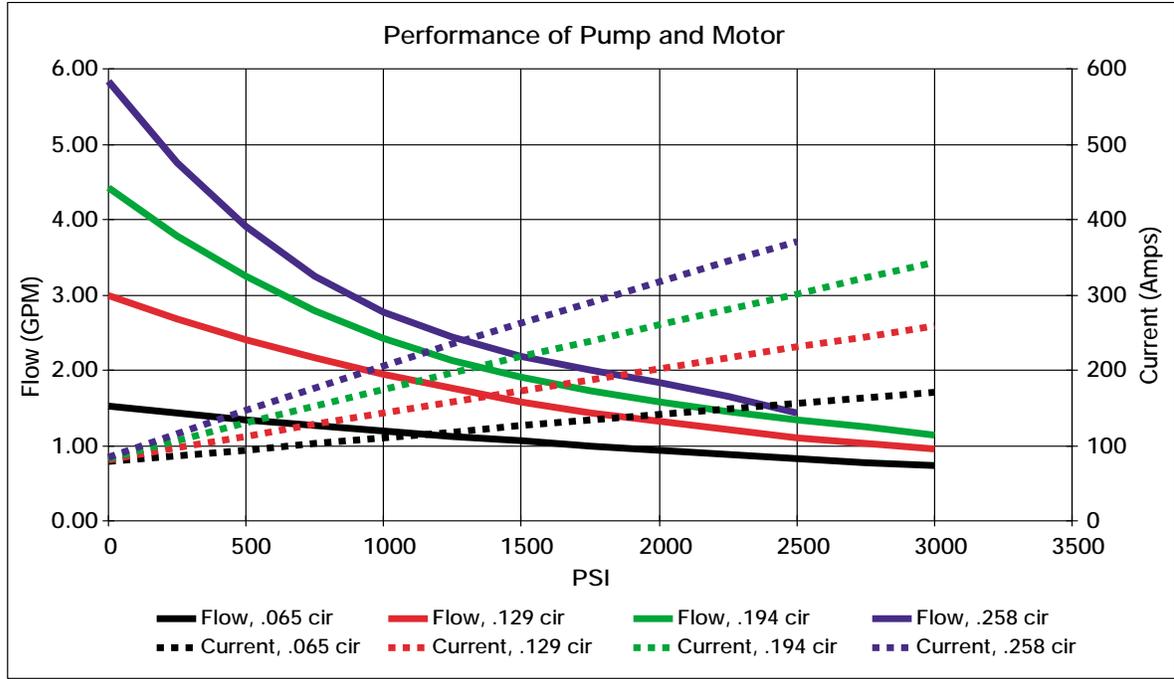


HYDRAULIC SCHEMATIC

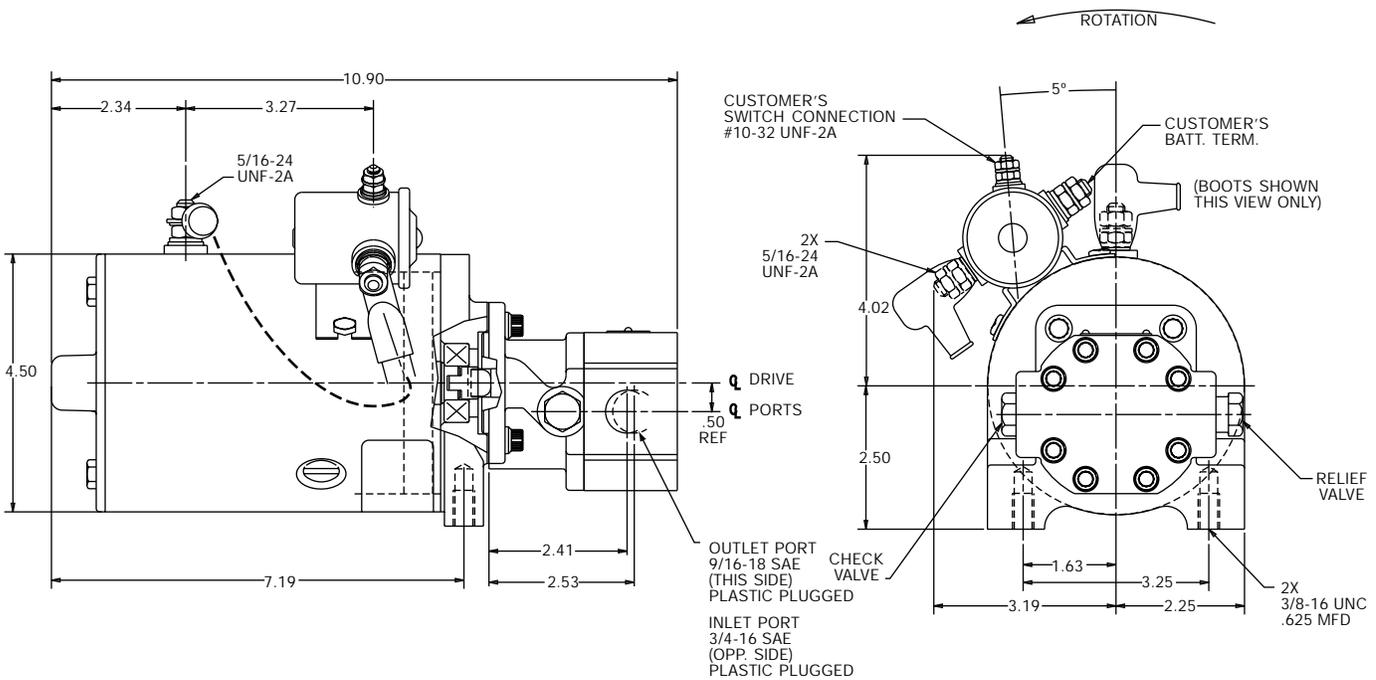


Motor: 12 Volt DC, 1 Terminal, Wound Field, Low Duty, Standard 4.5" Motor, 3 Terminal Start Switch with Boots, and "Horseshoe" Mounting

Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Tang Drive

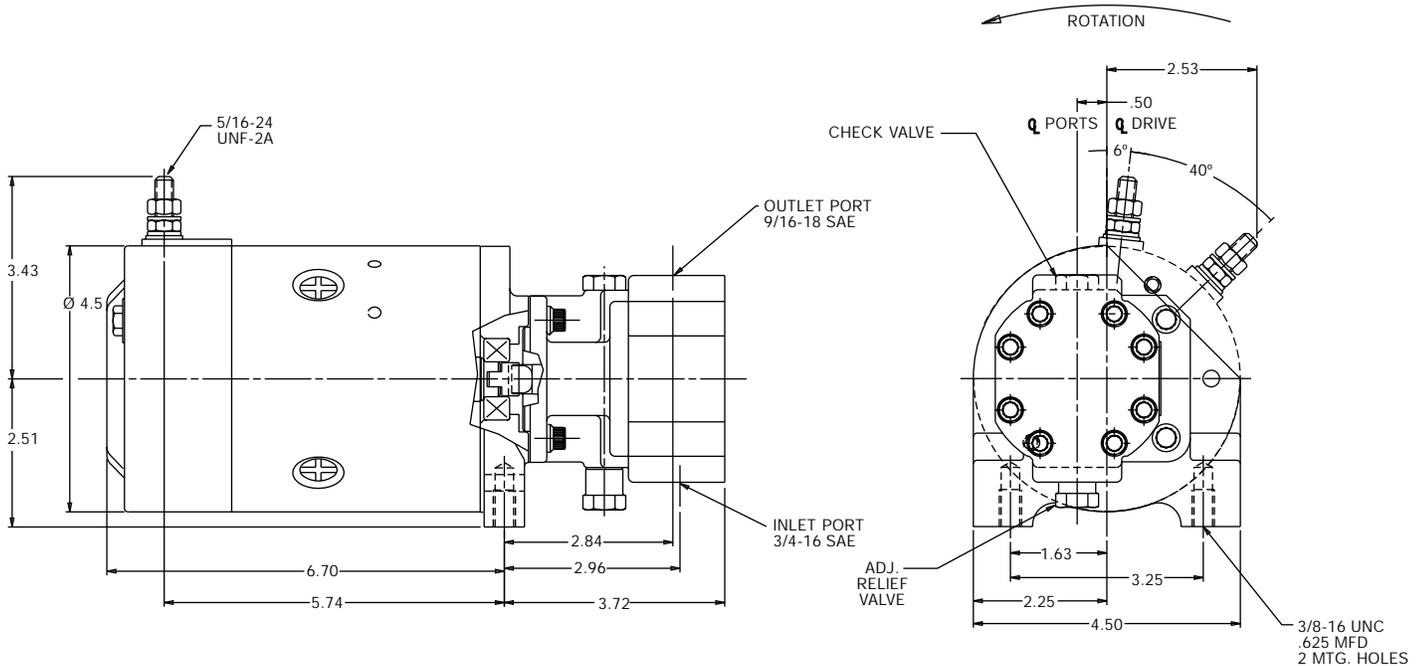
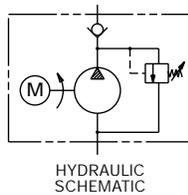
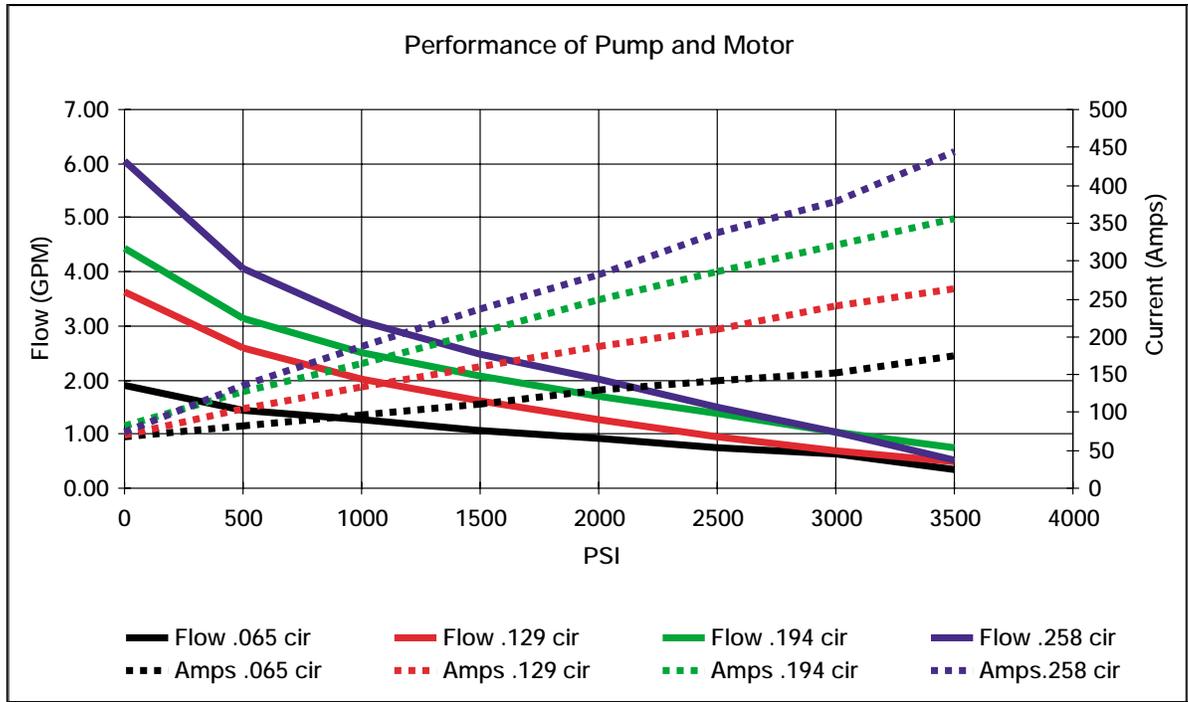


HYDRAULIC SCHEMATIC



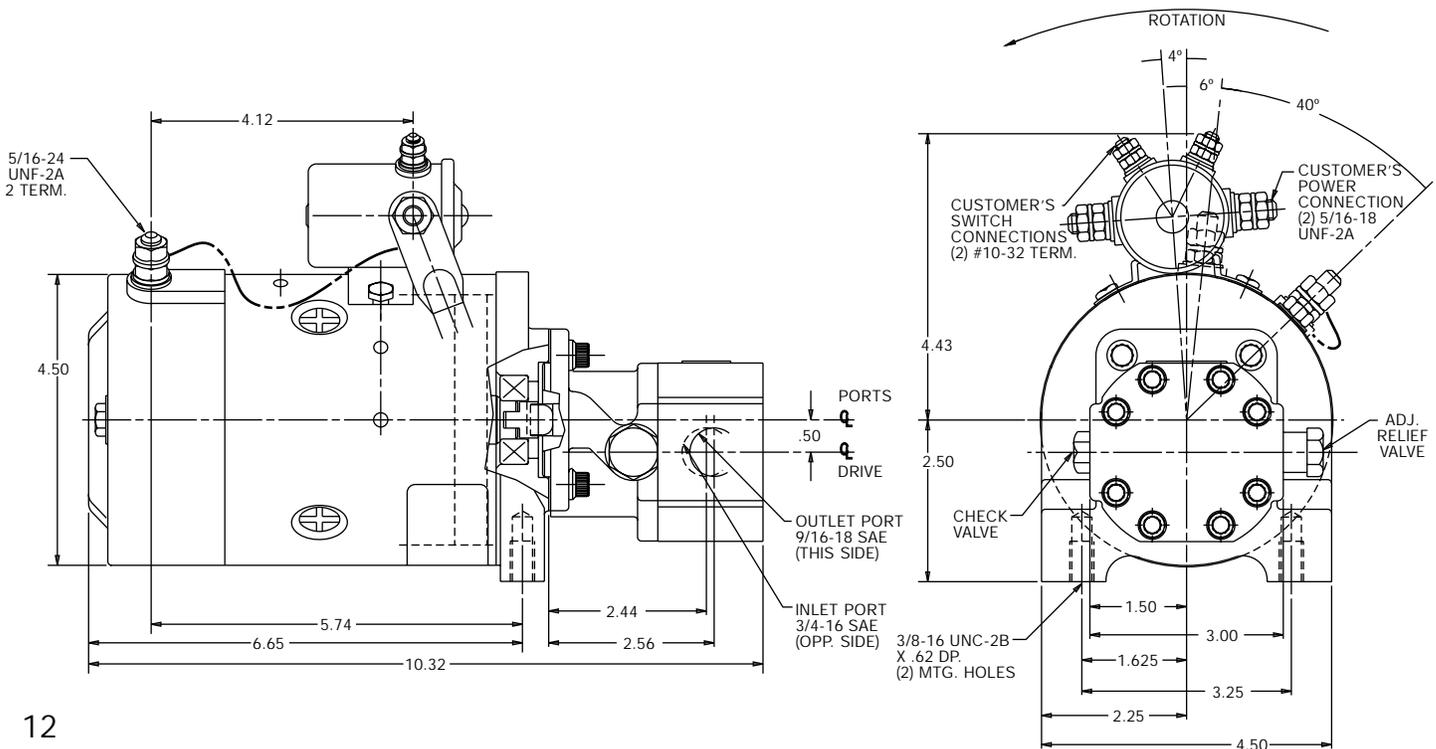
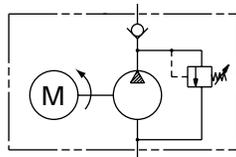
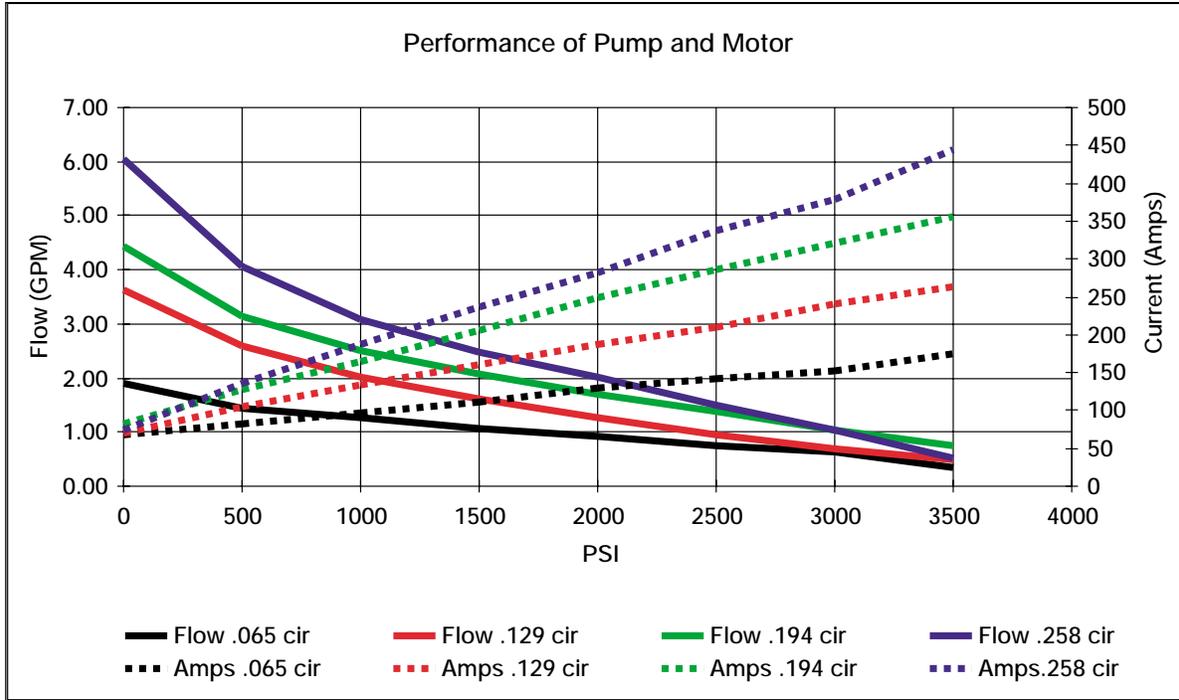
Motor: 12 Volt DC, 2 Terminal, Wound Field, Medium Duty, Standard 4.5" Motor, UL Approved, No Start Switch, with "Horseshoe" Mounting

Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Tang Drive



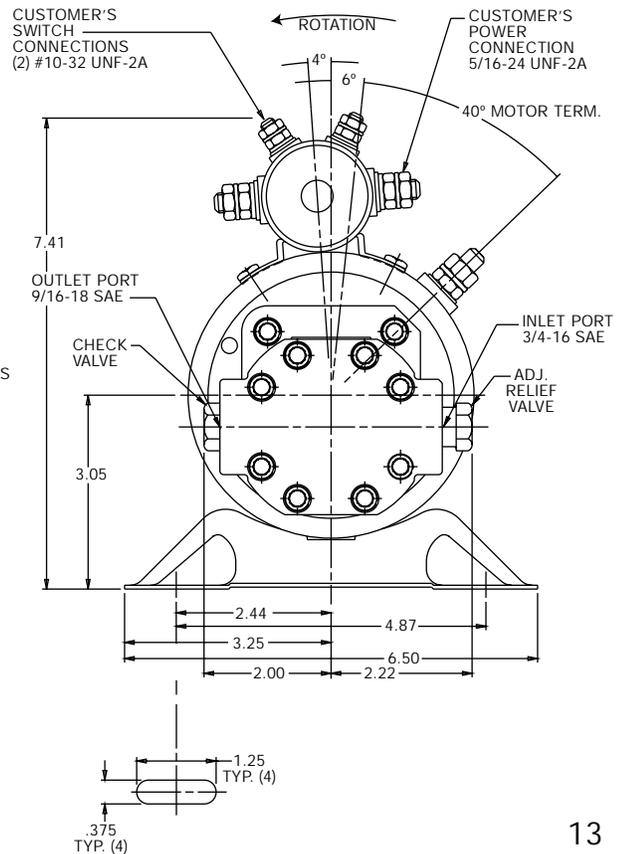
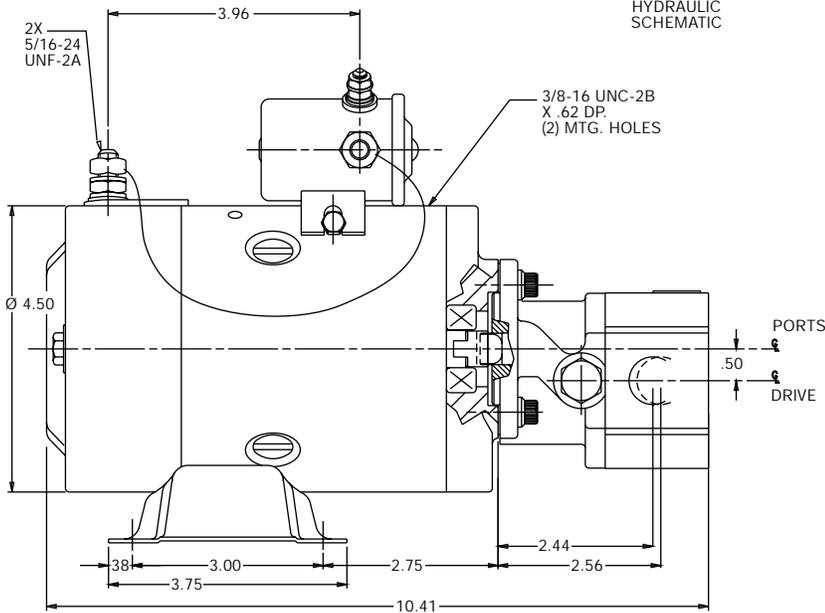
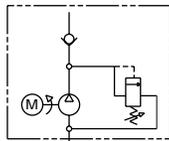
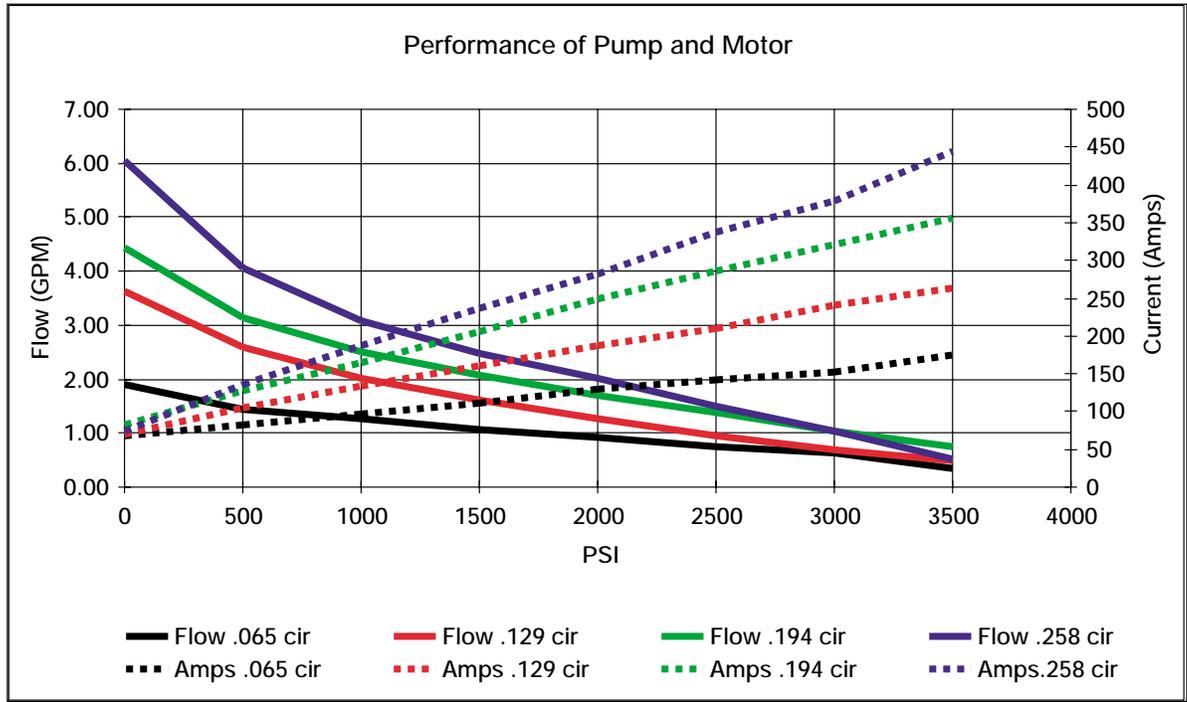
Motor: 12 Volt DC, 2 Terminal, Wound Field, Medium Duty, Standard 4.5" Motor, UL Approved, 4 Terminal Start Switch with No Boots, and "Horseshoe" Mounting

Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Tang Drive



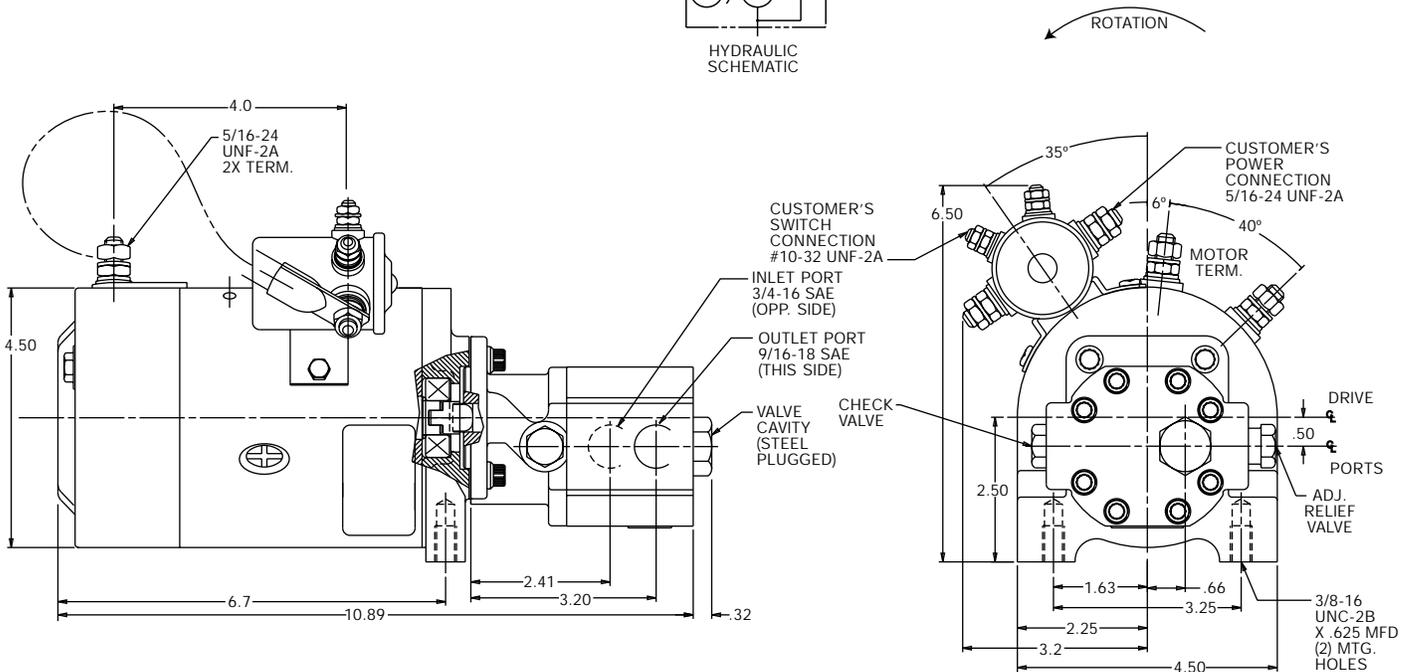
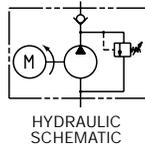
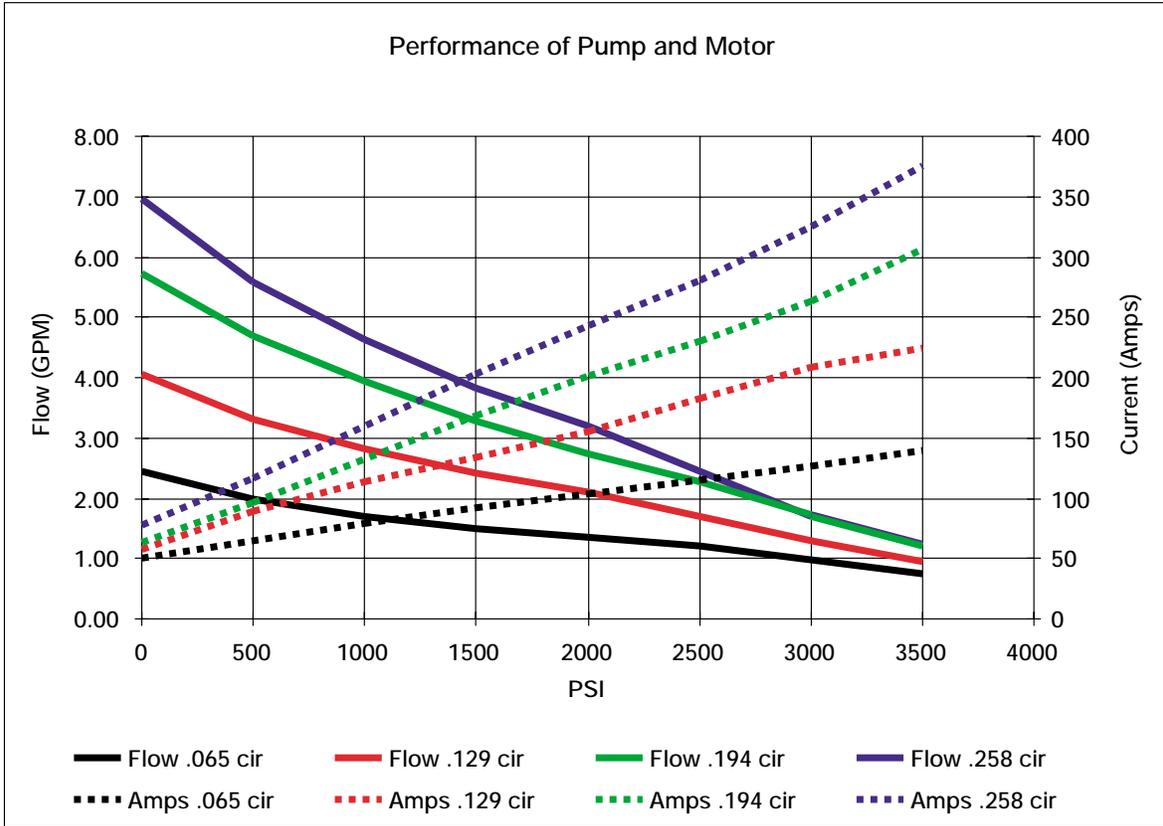
Motor: 12 Volt DC, 2 Terminal, Wound Field, Medium Duty, Standard 4.5" Motor, UL Approved, 4 Terminal Start Switch with No Boots, and Motor Foot Mounting

Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Tang Drive



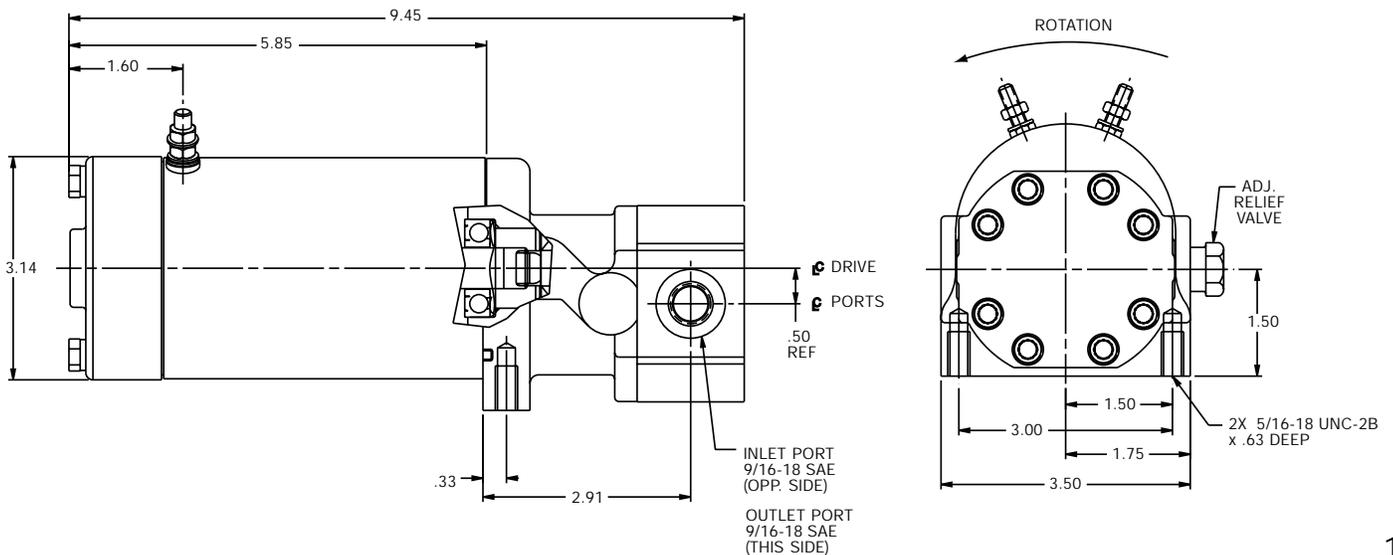
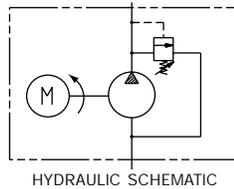
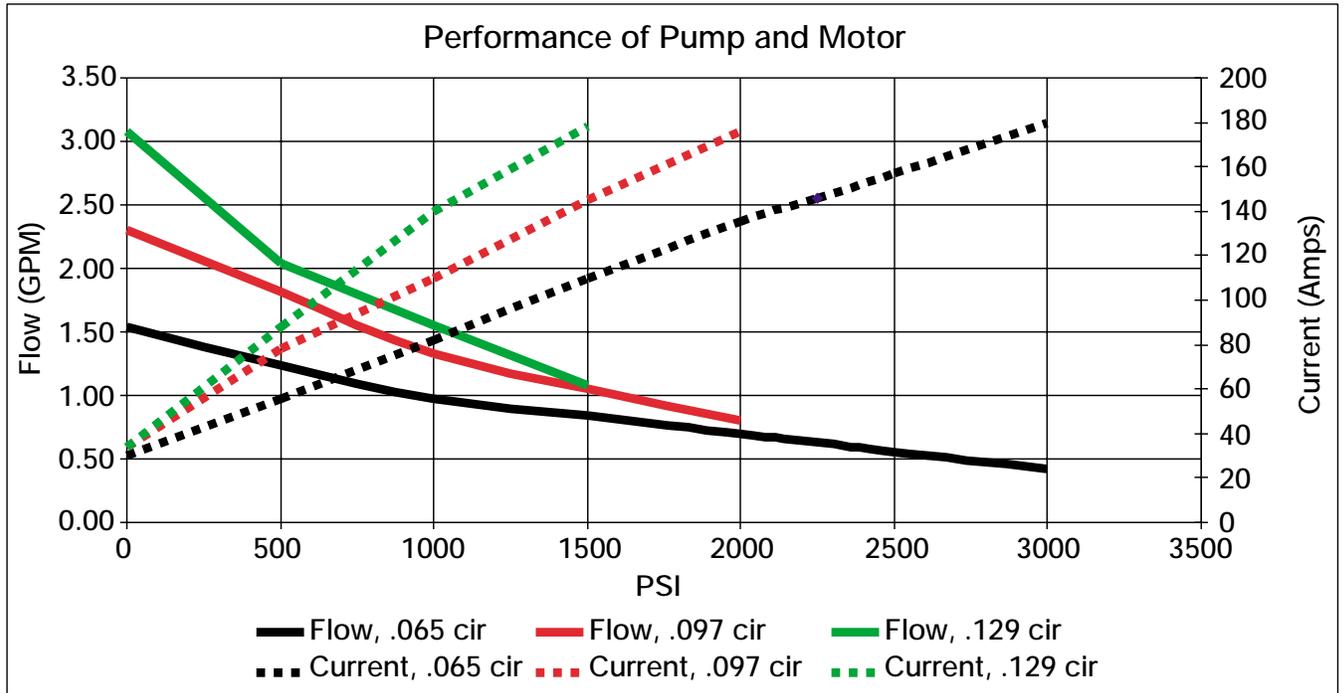
Motor: 24 Volt DC, 2 Terminal, Wound Field, Medium Duty, Standard 4.5" Motor, UL Approved, 4 Terminal Start Switch with No Boots, and "Horseshoe" Mounting.

Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Solenoid Valve Cavity w/ Steel Plug, Tang Drive



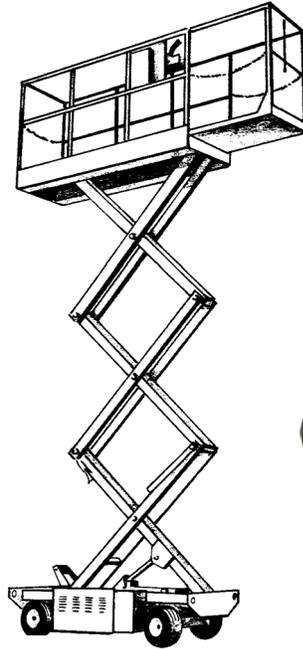
Motor: 12 Volt DC, 2 Terminal, Wound Field, Light Duty, 3" Motor, No Start Switch, Integrated Pump Stator Mounting, UL Approved

Pump: GC Series Pump, Single Section, Relief Valve, Direct Drive



AERIAL LIFTS

Scissor & Boom Lifts (Primary Power)

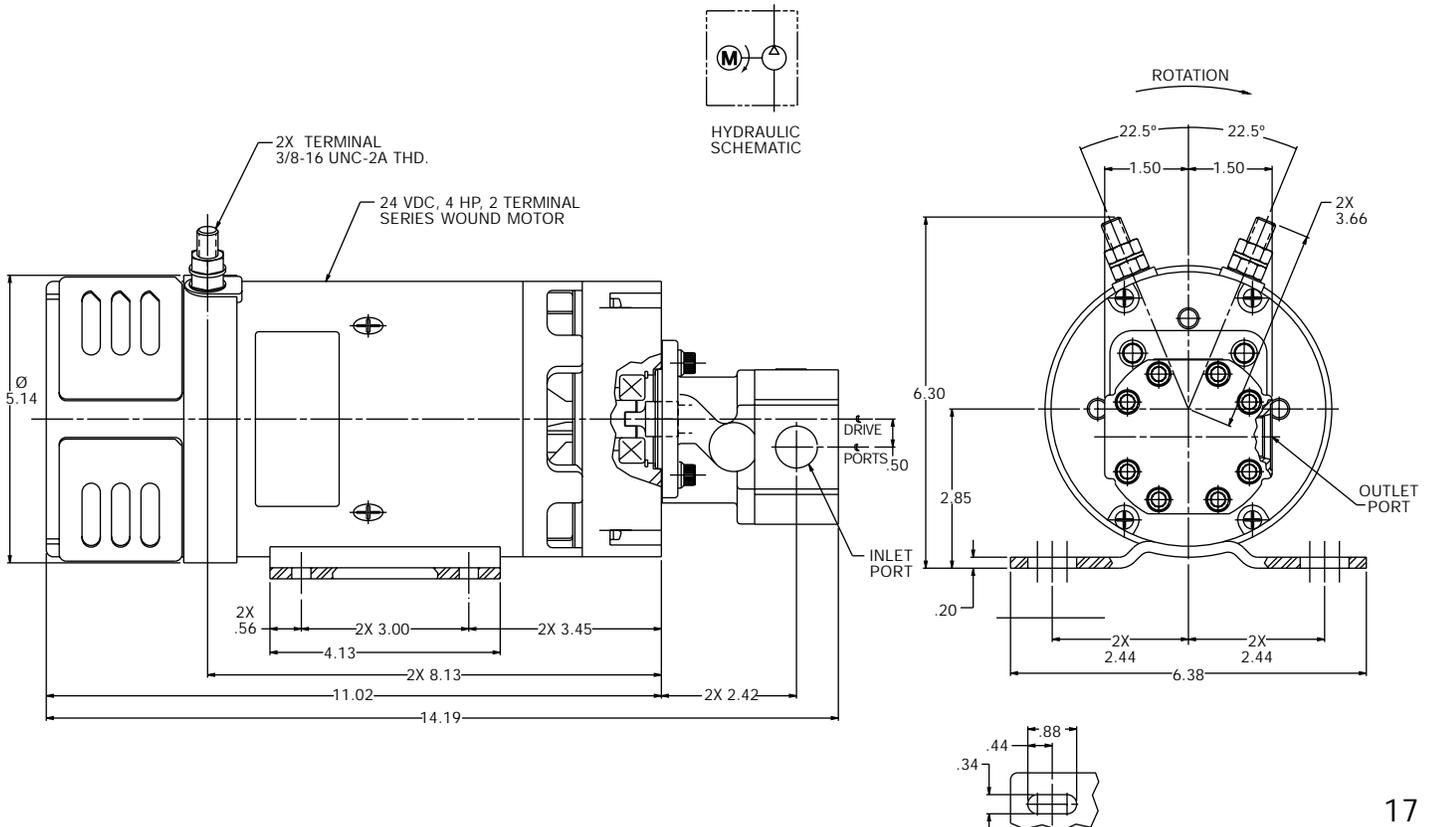
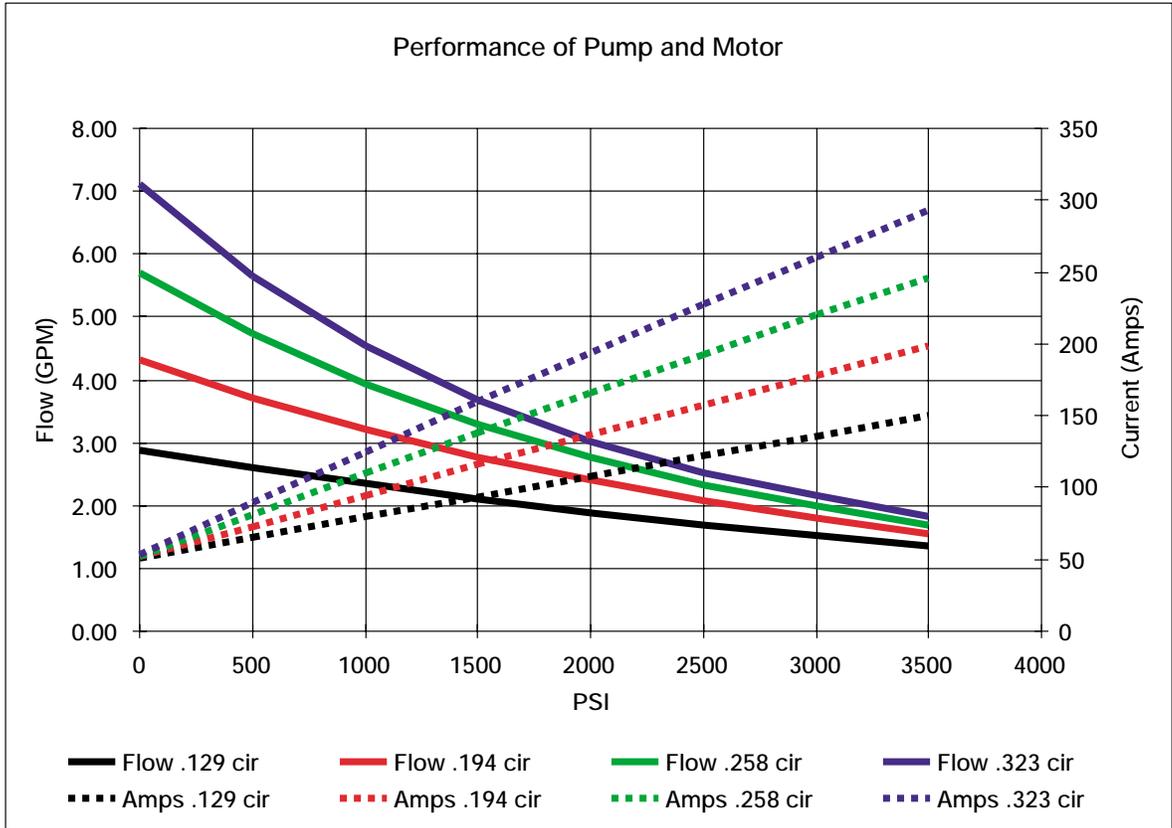


These pump and motor units are designed for scissor and boom lift vehicles for primary power applications. These units provide hydraulic power to propel, raise and steer the vehicles. Pumping requirement may be provided for by single or multiple sections. The pump may be supplied with a tube inlet or other standard inlet porting. Electrical D.C. motors may be provided in 24, 36 or 48 volt combinations. The units may be equipped with pressure holding check valves, over-pressurization protecting relief valves, or even pressure unloading valves to optimize system operation.

Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Open Drip Proof, UL Approved, No Start Switch, Motor Foot Mounting

Pump: GC Series Pump, Single Section, No Valves, Direct Tang

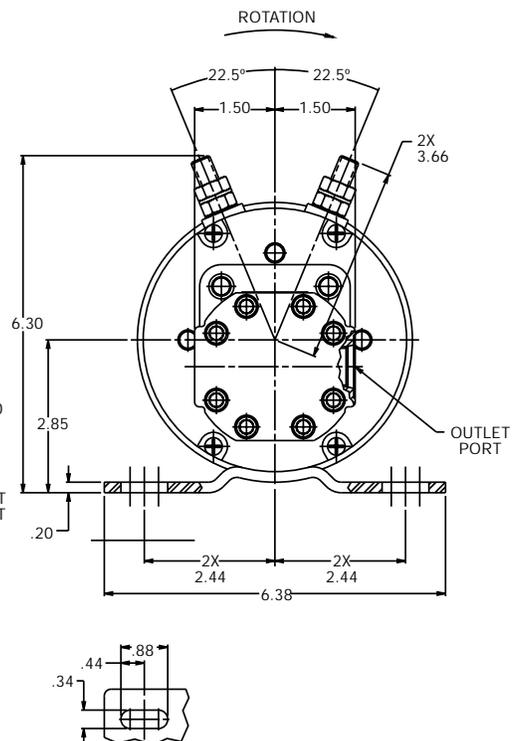
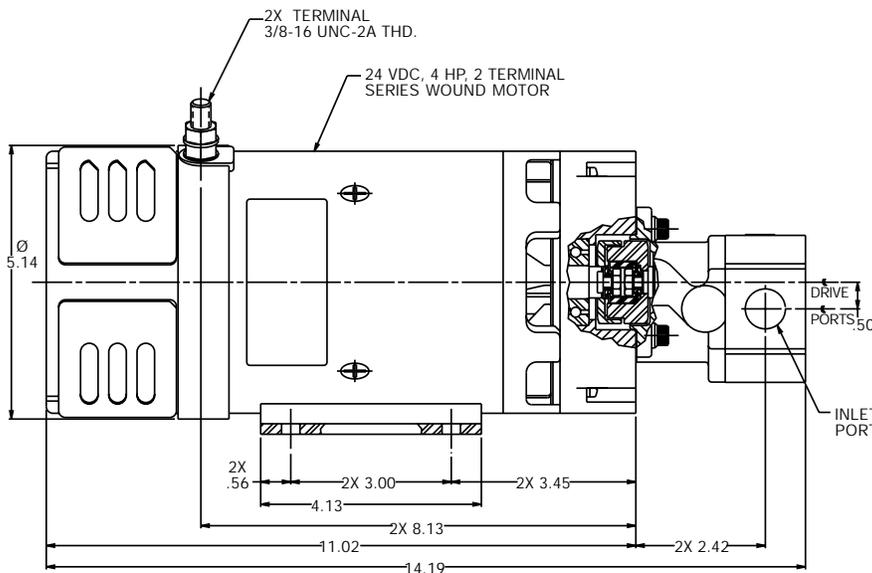
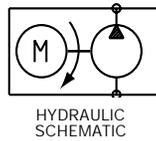
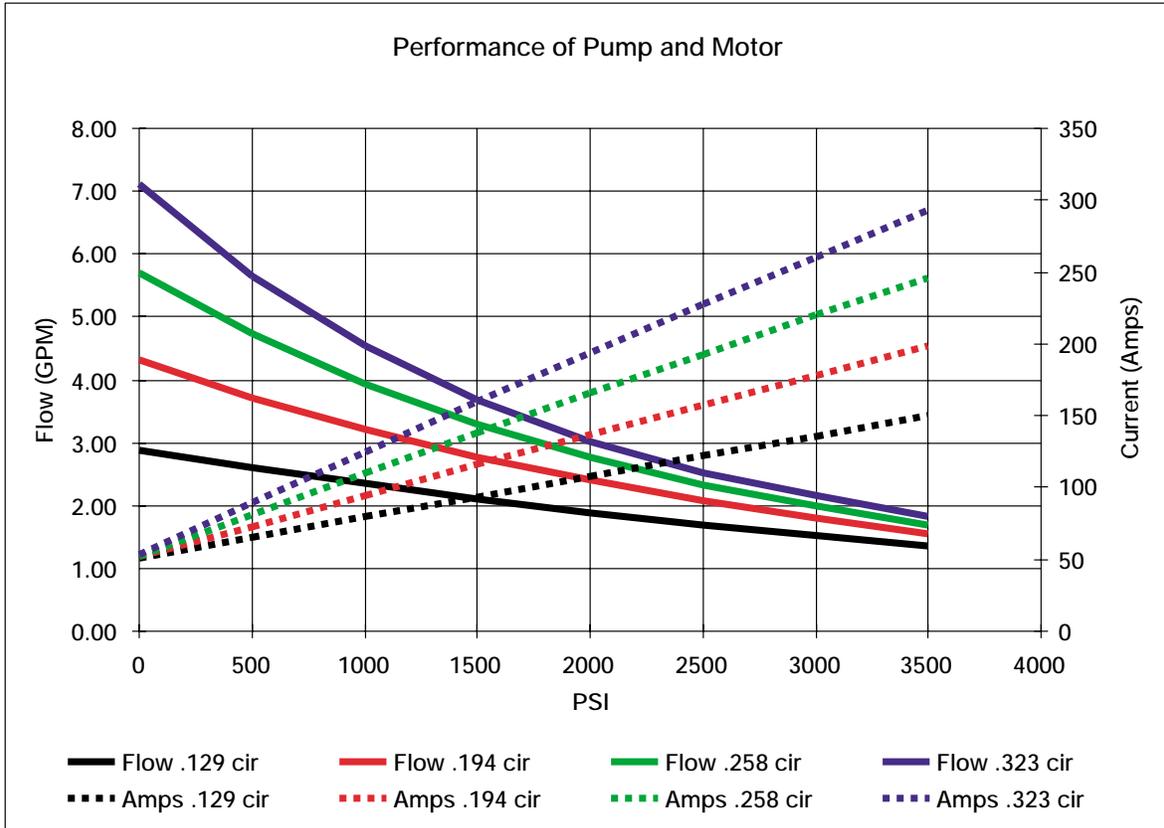
NOTE: Slippage could occur at higher pressures. You may need to specify a PB (Pressure Balanced) pump for improved flow at higher pressures for the larger displacement pumps (.226 in.³ and up).



Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Open Drip Proof, UL Approved, No Start Switch, Motor Foot Mounting

Pump: GC Series Pump, Single Section, No Valves, Flex Coupling Drive for Low Noise Operation

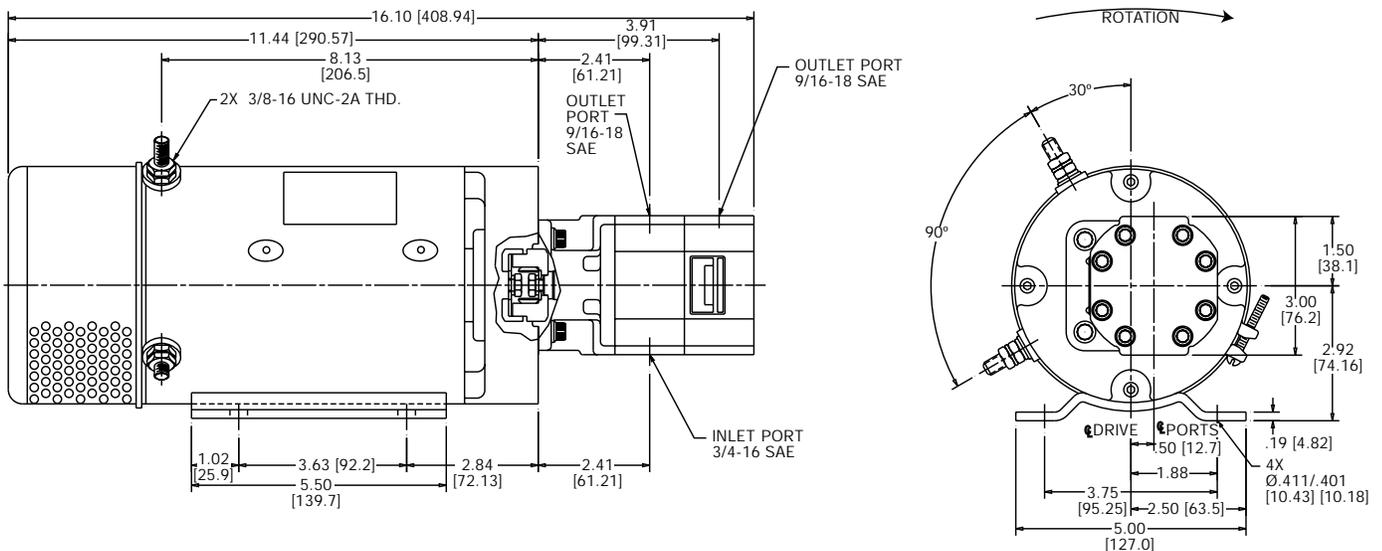
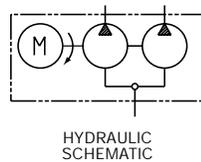
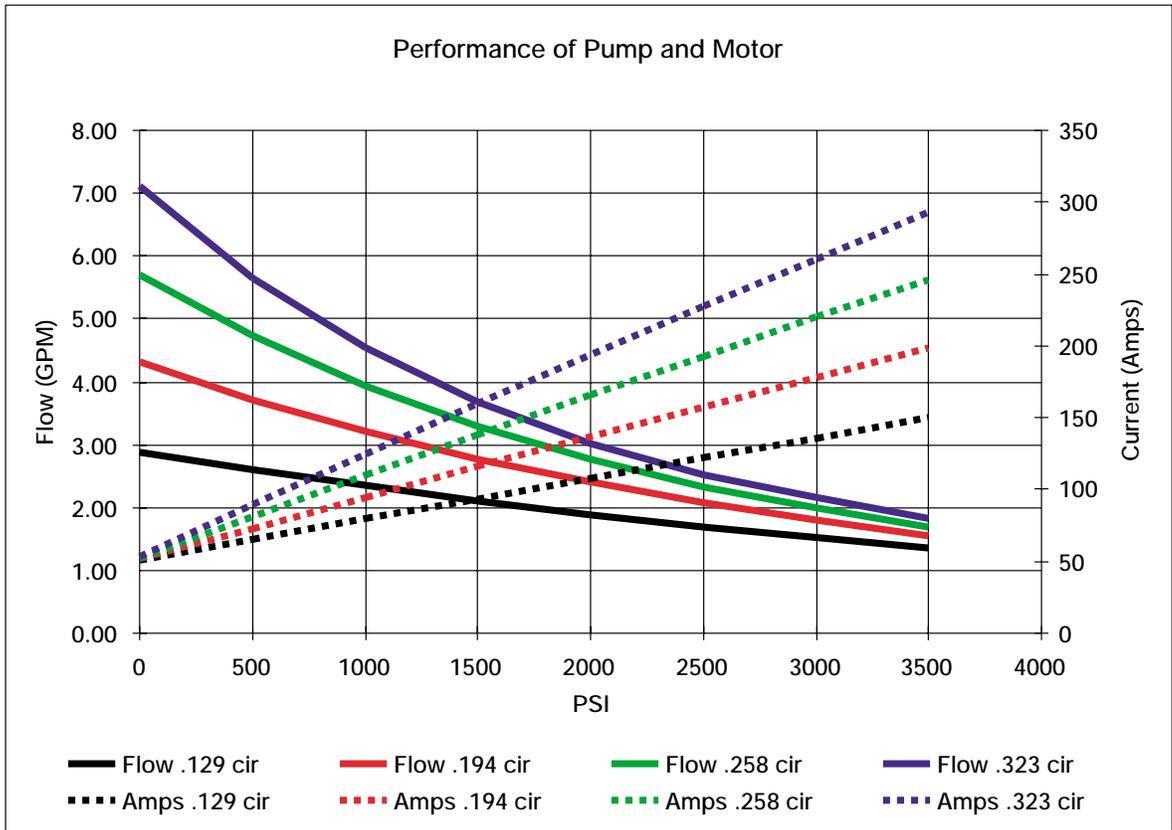
NOTE: Slippage could occur at higher pressures. You may need to specify a PB (Pressure Balanced) pump for improved flow at higher pressures for the larger displacement pumps (.226 in.³ and up).



Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Open Drip Proof, UL Approved, No Start Switch, Motor Foot Mounting

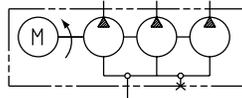
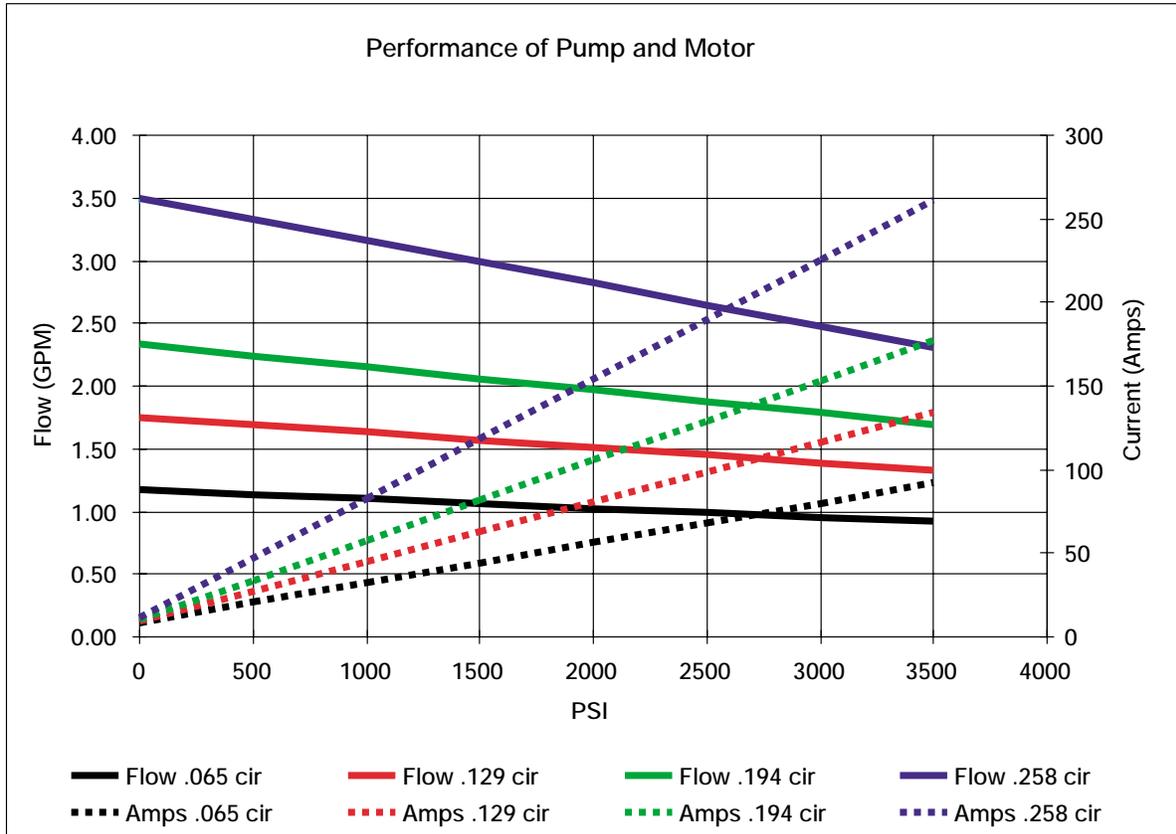
Pump: GC Series Pump, Two Section, No Valves, Flex Coupling Drive for Low Noise Operation

NOTE: Slippage could occur at higher pressures. You may need to specify a PB (Pressure Balanced) pump for improved flow at higher pressures for the larger displacement pumps (.226 in.³ and up).

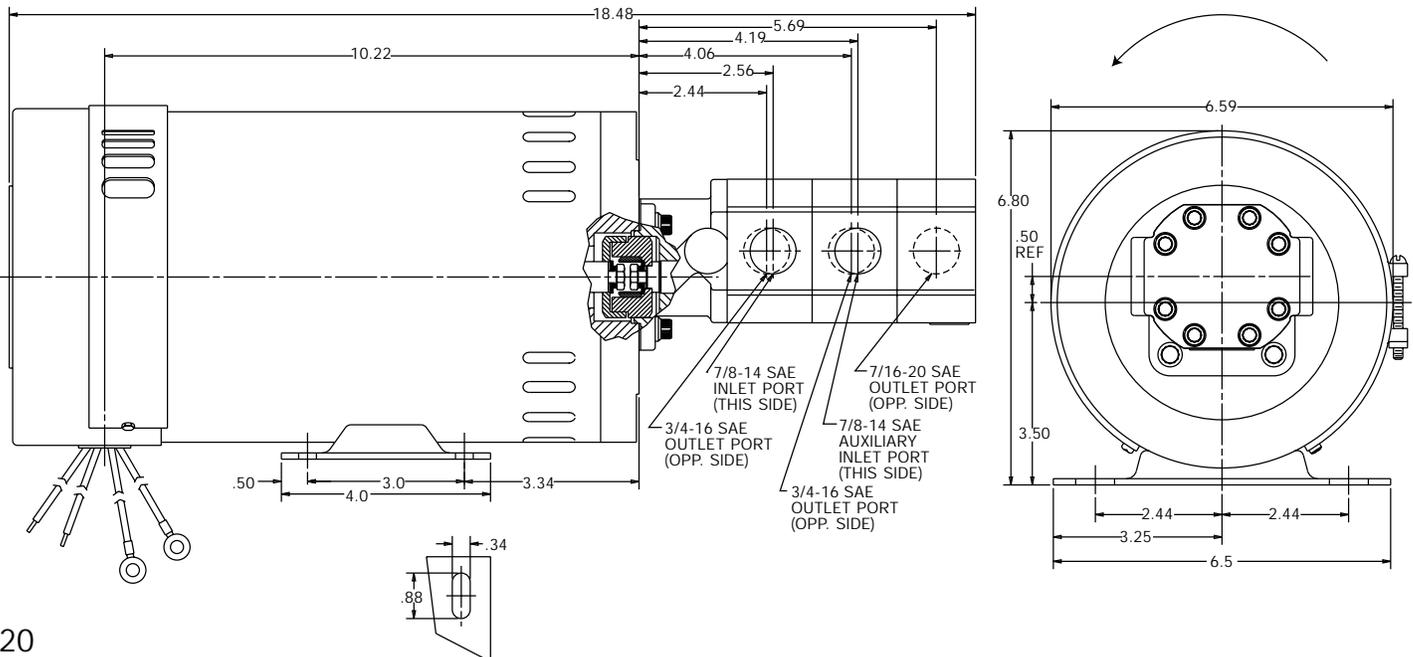


Motor: 48 Volt DC, 2 Terminal, Permanent Magnet, Extended Duty, Thermal Overload Protection, Motor Foot Mounting

Pump: GC Series Pump, Three Section, No Valves, Flex Coupling Drive for Low Noise Operation

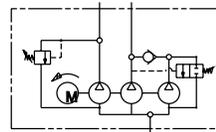
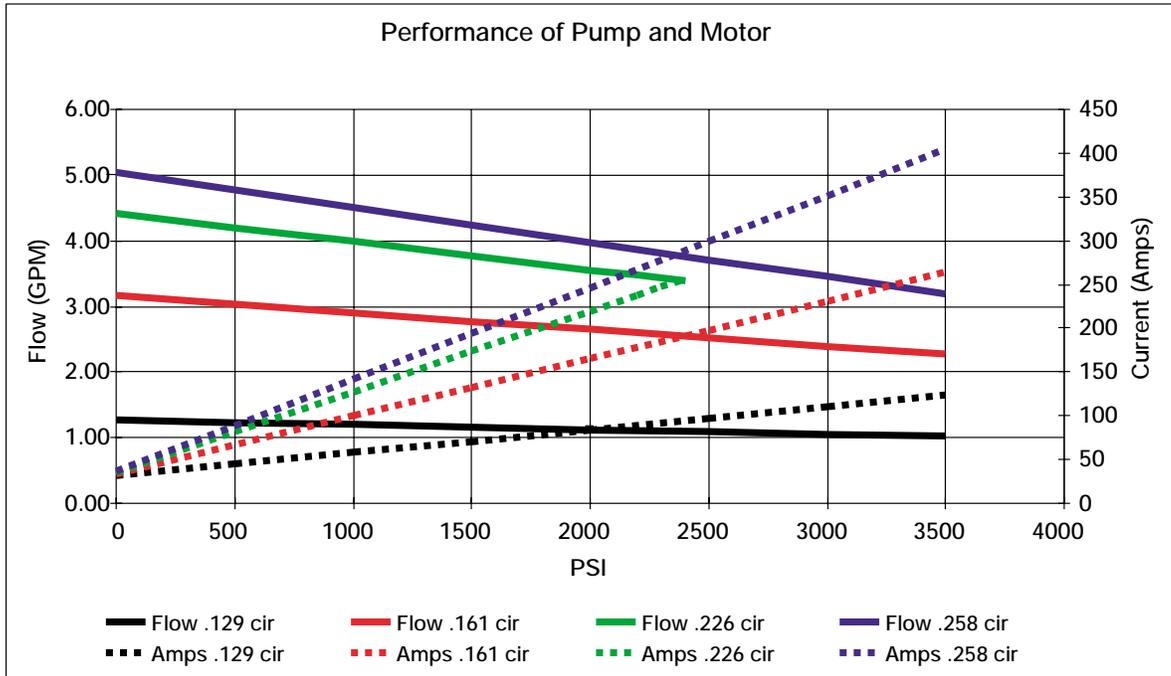


HYDRAULIC SCHEMATIC

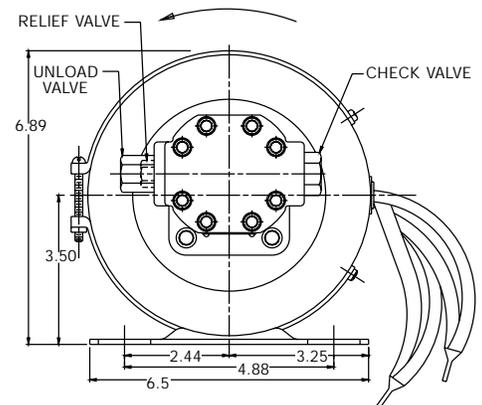
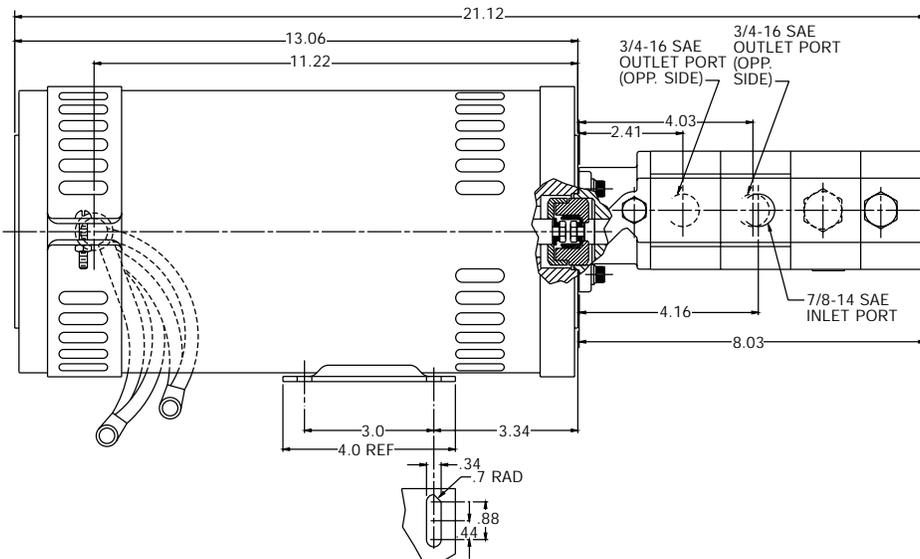


Motor: 24 Volt DC, 2 Terminal, Permanent Magnet, Extended Duty, Open Drip Proof, No Start Switch, Motor Foot Mounting

Pump: GC Series Pump, Three Section, Relief Valve, Check Valve, Unload Valve, Flex Coupling Drive for Low Noise Operation



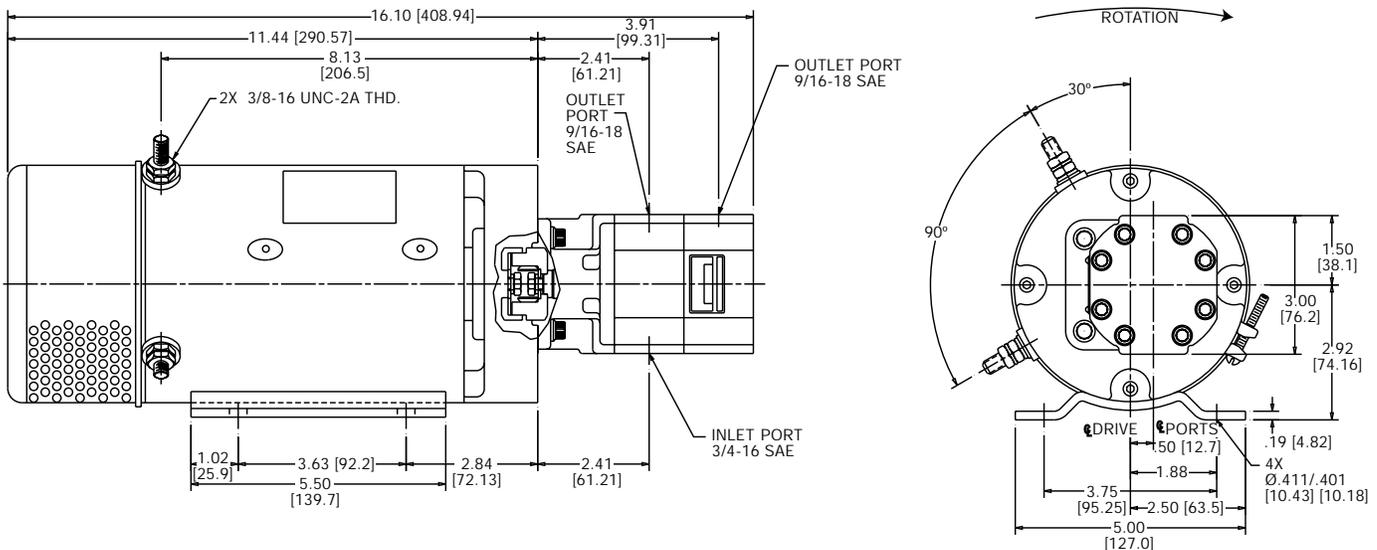
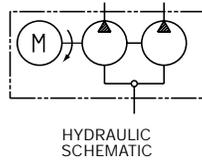
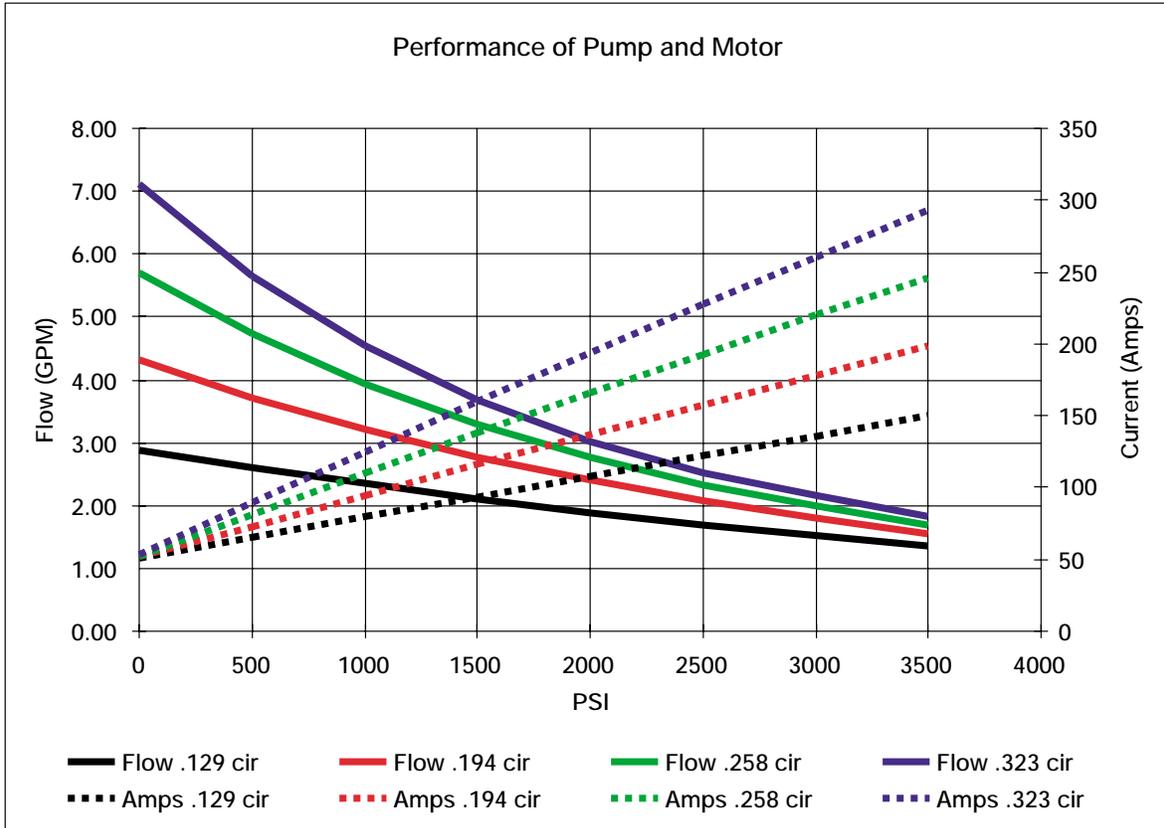
HYDRAULIC SCHEMATIC



Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Open Drip Proof, UL Approved, No Start Switch, Motor Foot Mounting

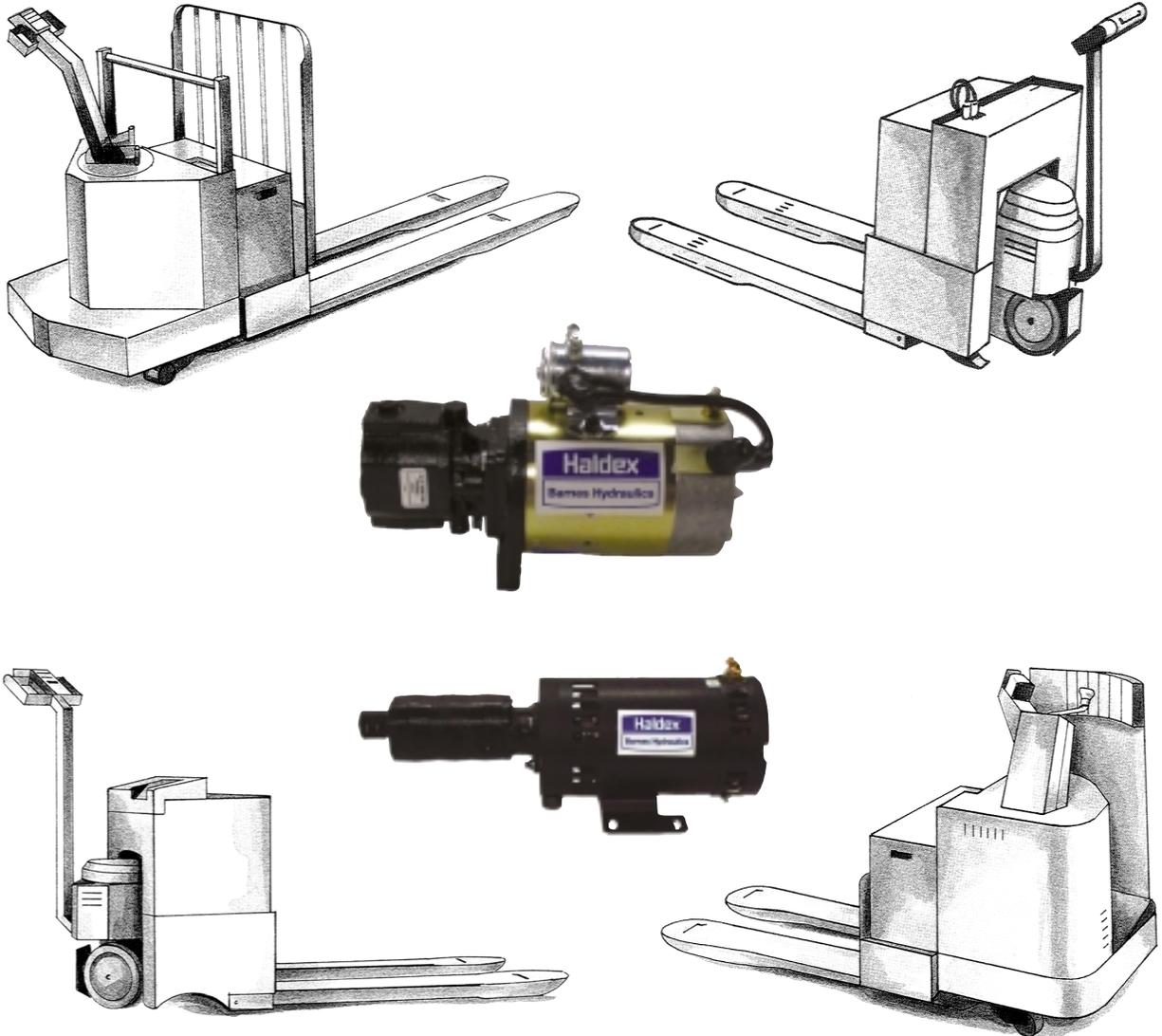
Pump: GC Series Pump, Two Section, No Valves, Flex Coupling Drive for Low Noise Operation

NOTE: Slippage could occur at higher pressures. You may need to specify a PB (Pressure Balanced) pump for improved flow at higher pressures for the larger displacement pumps (.226 in.³ and up).



MATERIAL HANDLING

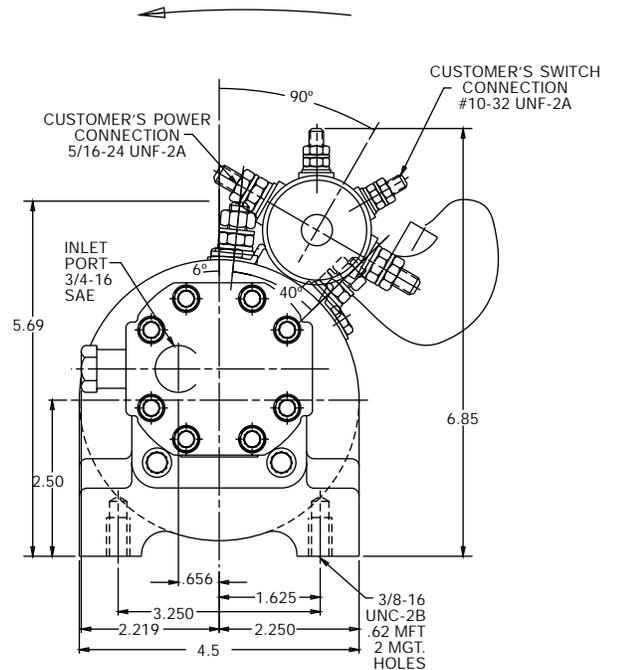
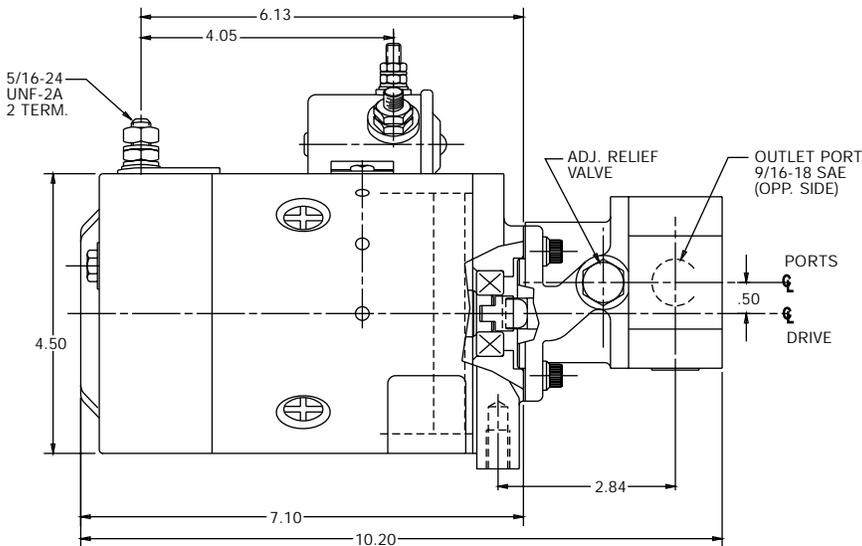
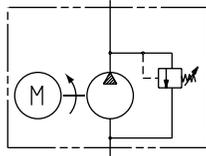
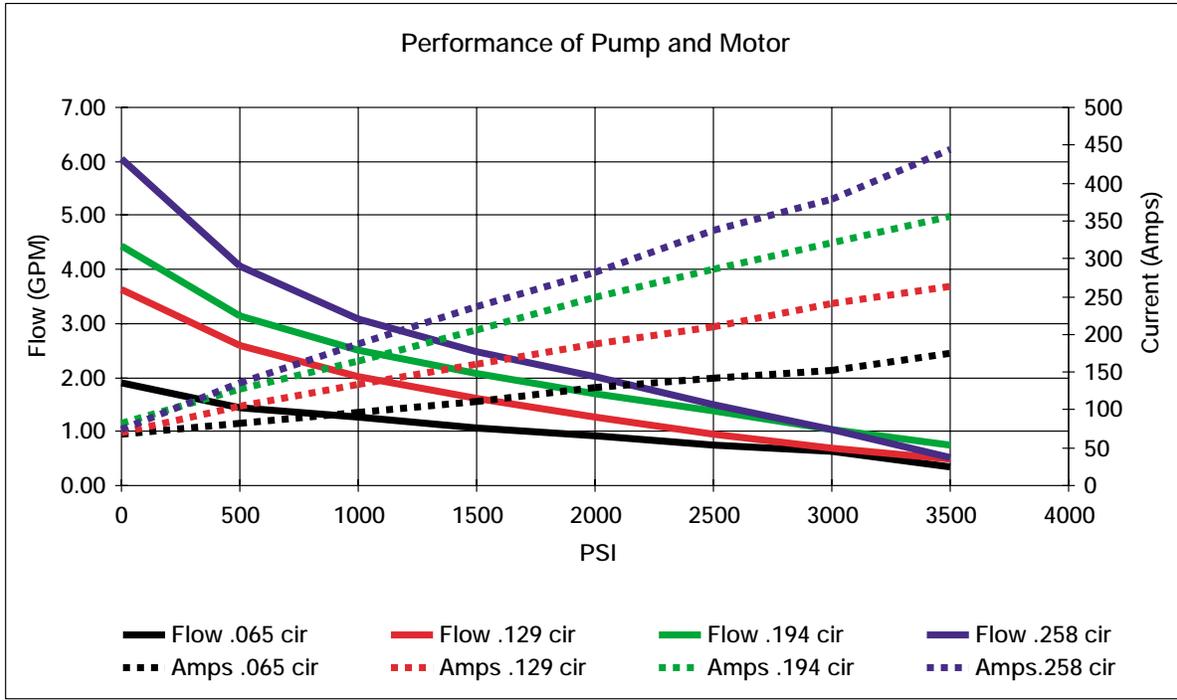
Forklifts (Pallet Trucks)



These pump and motor power units are designed for the Material Handling market for pallet trucks that require separate motor, pump and reservoir packages. They are available in both 12 and 24 volt motor options that comply with the requirements of UL583. The units provide primary hydraulic power for lifting. Power units are available with valving that incorporates pressure holding check valves, solenoid operated directional control valves and over-pressurization protecting relief valves.

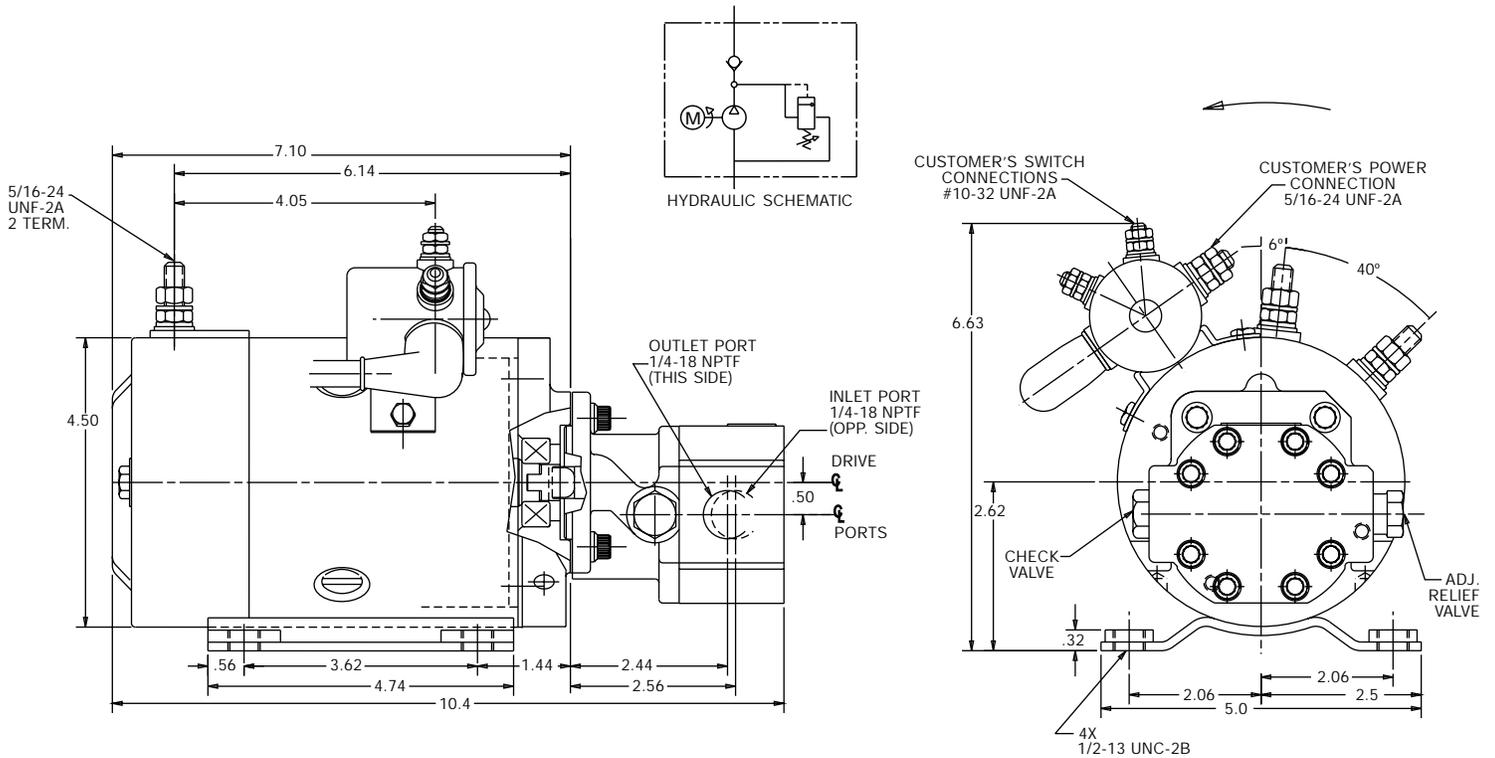
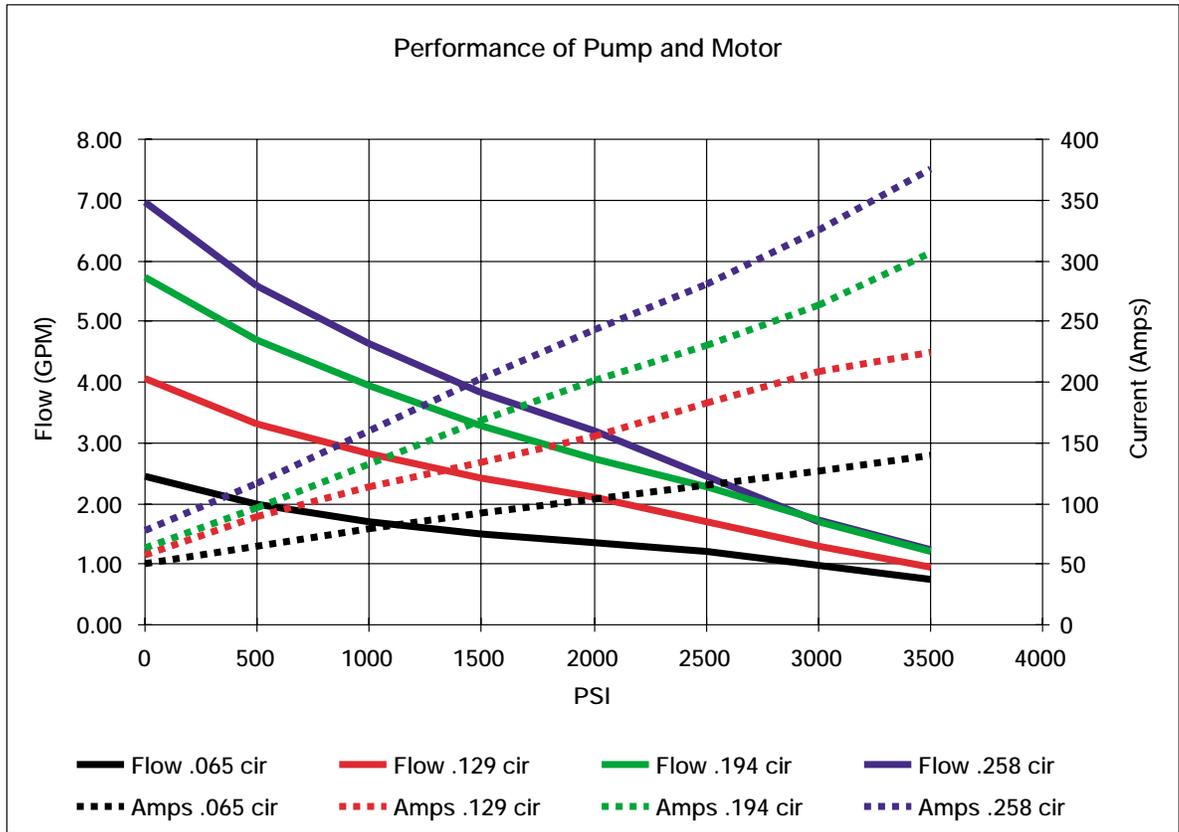
Motor: 12 Volt DC, 2 Terminal, Wound Field, Medium Duty, Standard 4.5" Motor, UL Approved, Start Switch, and "Horseshoe" Mounting

Pump: GC Series Pump, Single Section, Relief Valve, Tang Drive



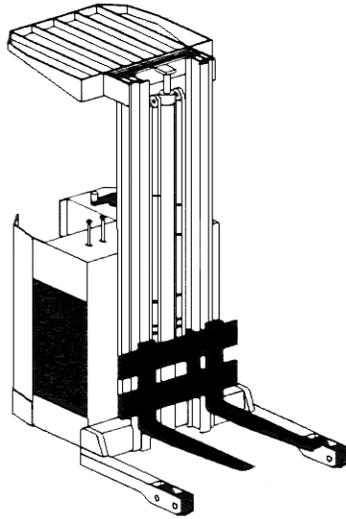
Motor: 24 Volt DC, 2 Terminal, Wound Field, Medium Duty, Standard 4.5" Motor, UL Approved, 4 Terminal Start Switch with Boots, Motor Foot Mounting with Weld Nuts

Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Tang Drive



MATERIAL HANDLING

Forklifts (Stackers)

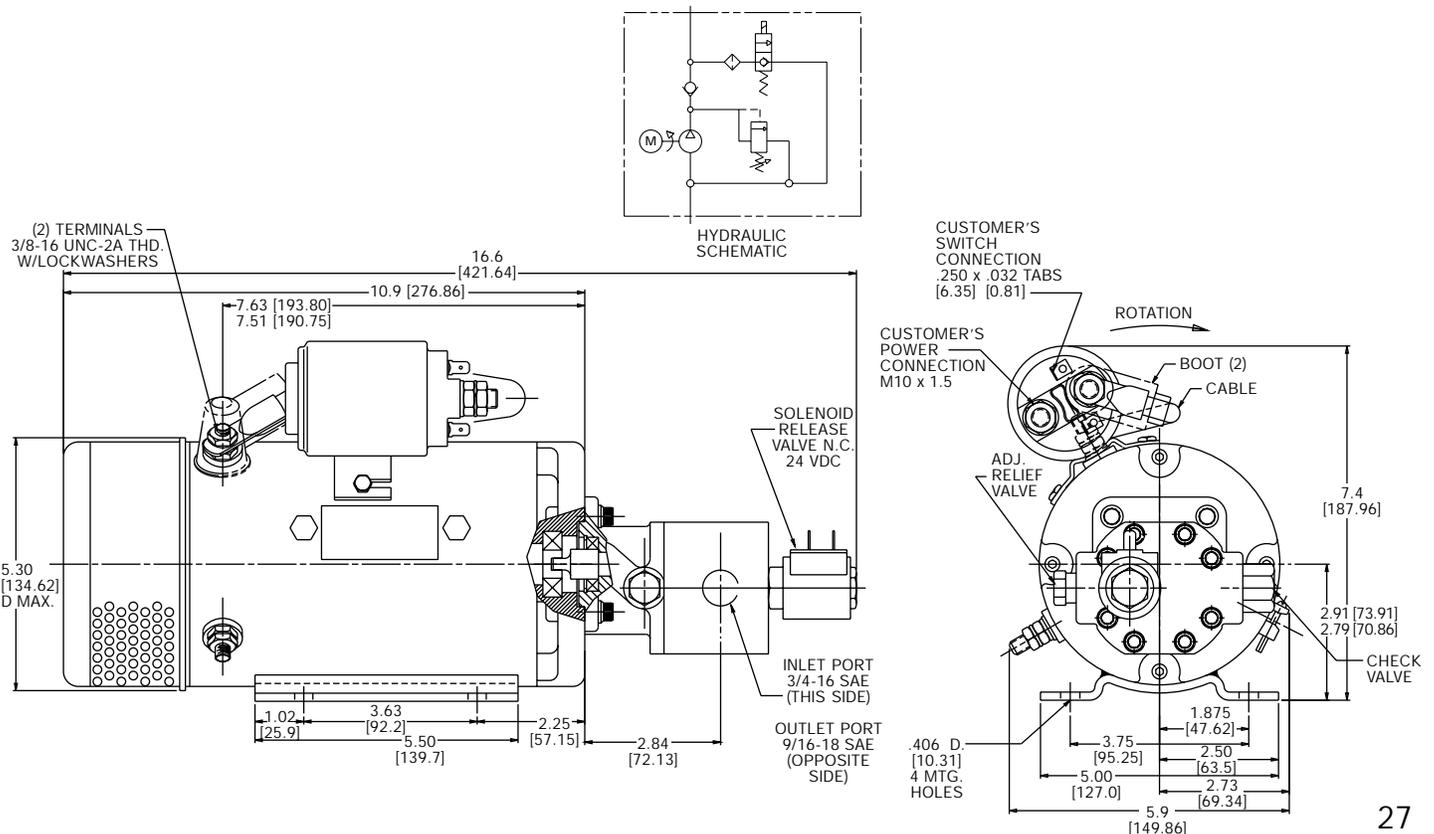
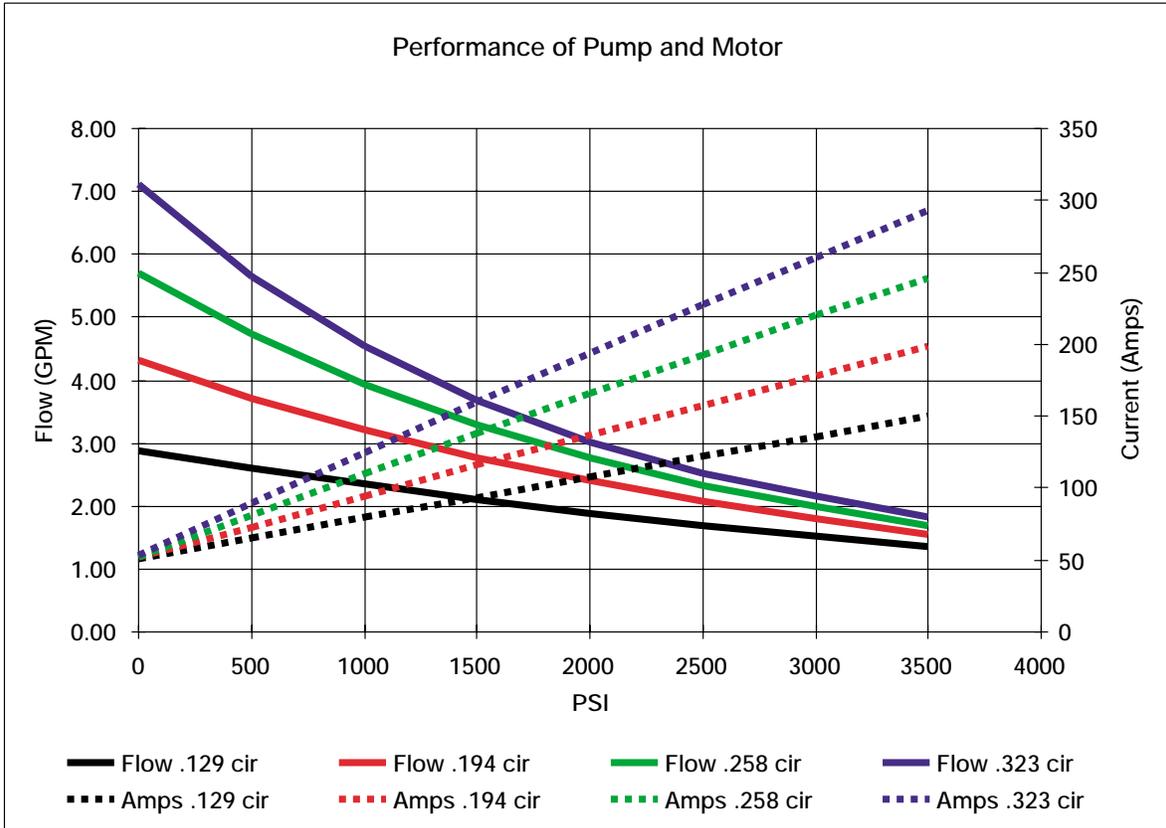


These pump and motor power units are designed for the Material Handling market for high reach stackers that require separate motor, pump and reservoir packages. They are available in 12 to 48 volt motor options which comply with the requirements of UL583. The units provide primary hydraulic power for lifting and, under certain applications, can provide secondary power for fork carriage extension or side-to-side shift operation. Power units are available with valving that incorporates pressure holding check valves, solenoid operated directional control valves and over-pressurization protecting relief valves.

Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Open Drip Proof, UL583 Approved, Heavy Duty 4 Terminal Start Switch with Boots, Motor Foot Mounting

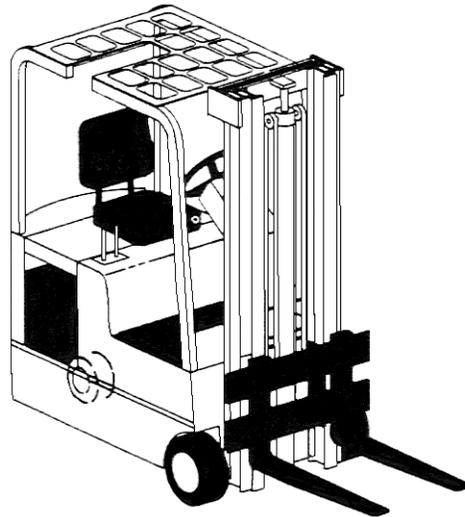
Pump: GC Series Pump, Single Section, Relief Valve, Check Valve, Solenoid Lift-Hold-Lower Valve, Tang Drive

NOTE: Slippage could occur at higher pressures. You may need to specify a PB (Pressure Balanced) pump for improved flow at higher pressures for the larger displacement pumps (.226 in.³ and up).



MATERIAL HANDLING

Forklifts (Narrow Aisle or 3-Wheel Sit Down)

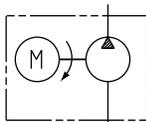
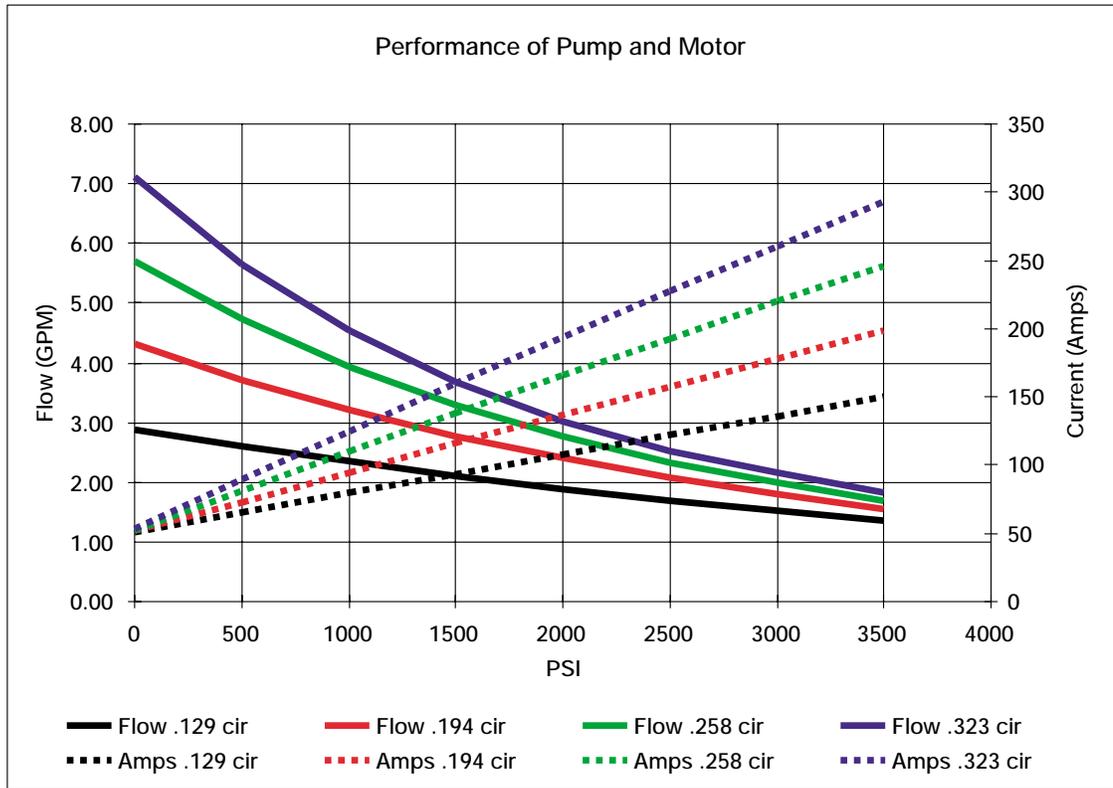


These pump and motor power units are designed for the Material Handling market for narrow aisle or 3-wheel sit down forklifts that require separate motor, pump and reservoir packages. They are available in 12 to 48 volt motor options which comply with the requirements of UL583. These units provide primary hydraulic power for lifting and vehicle steering along with secondary power for fork carriage extension or side-to-side shift operation. Power units are available with valving that incorporates pressure holding check valves and over-pressurization protecting relief valves.

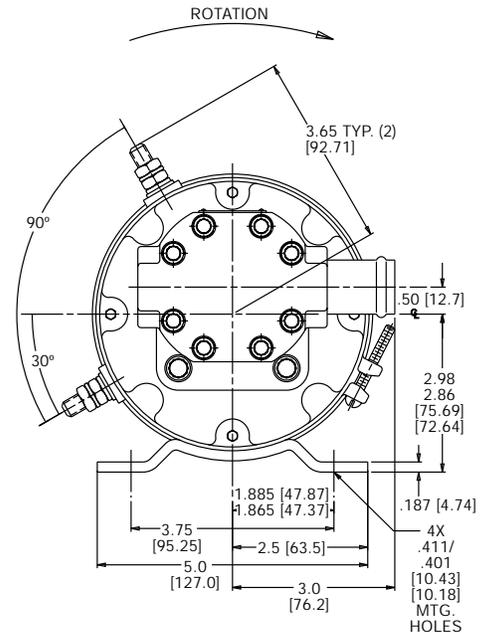
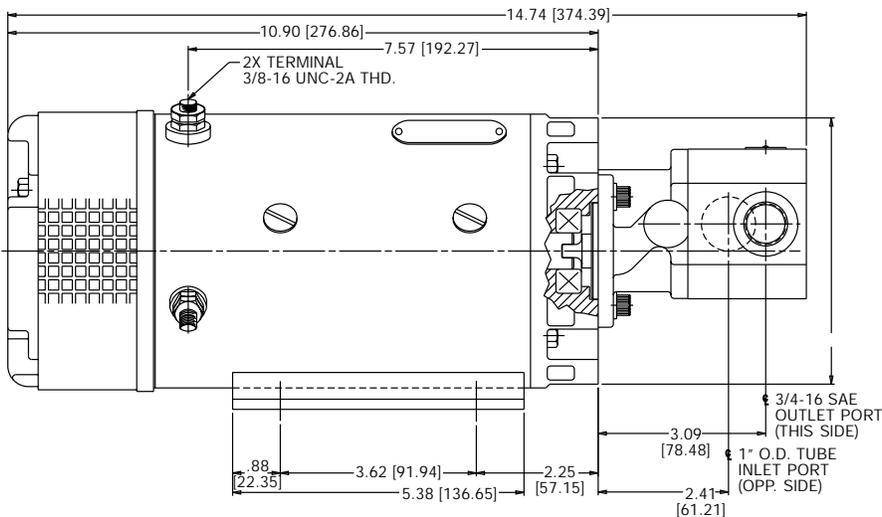
Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, 5" Motor, UL Approved, Open Drip Proof, No Start Switch, Motor Foot Mounting

Pump: GC Series Pump, Single Section, Tang Drive, Inlet Tube

NOTE: Slippage could occur at higher pressures. You may need to specify a PB (Pressure Balanced) pump for improved flow at higher pressures for the larger displacement pumps (.226 in.³ and up).

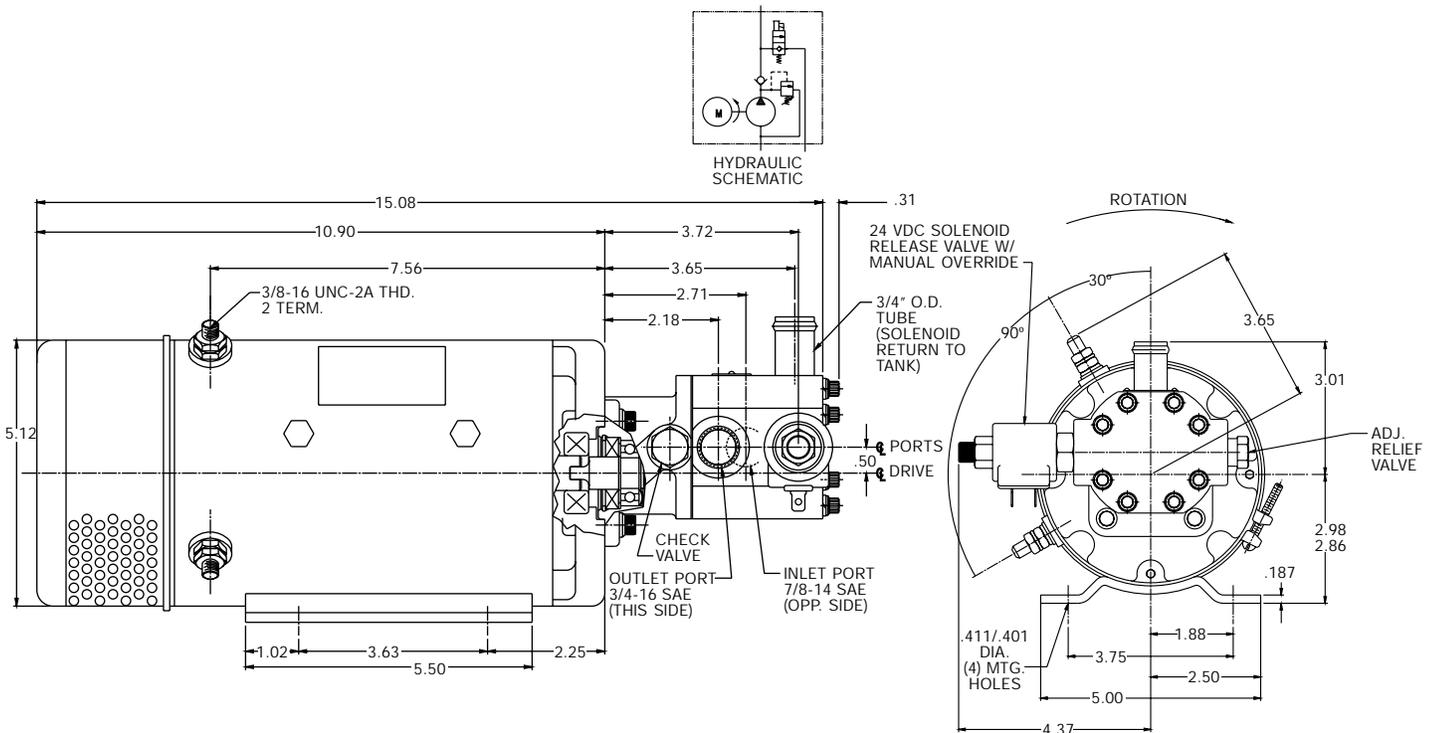
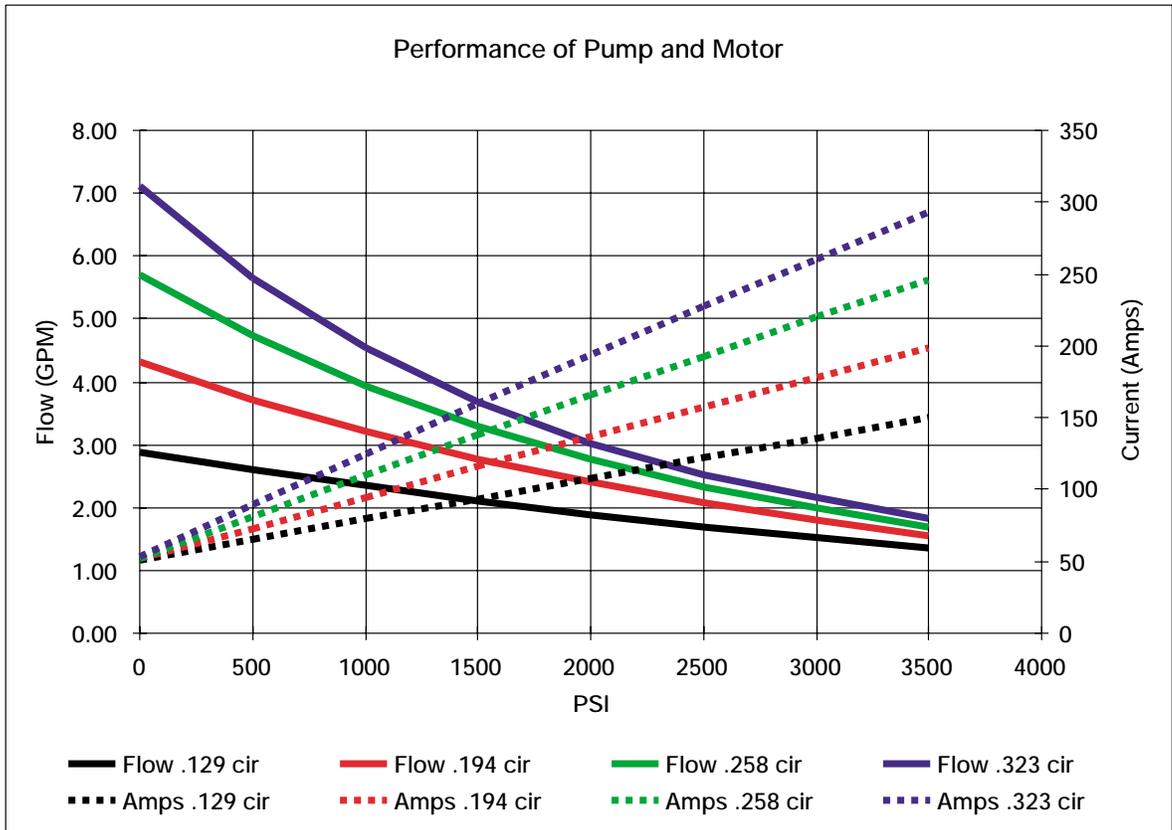


HYDRAULIC SCHEMATIC



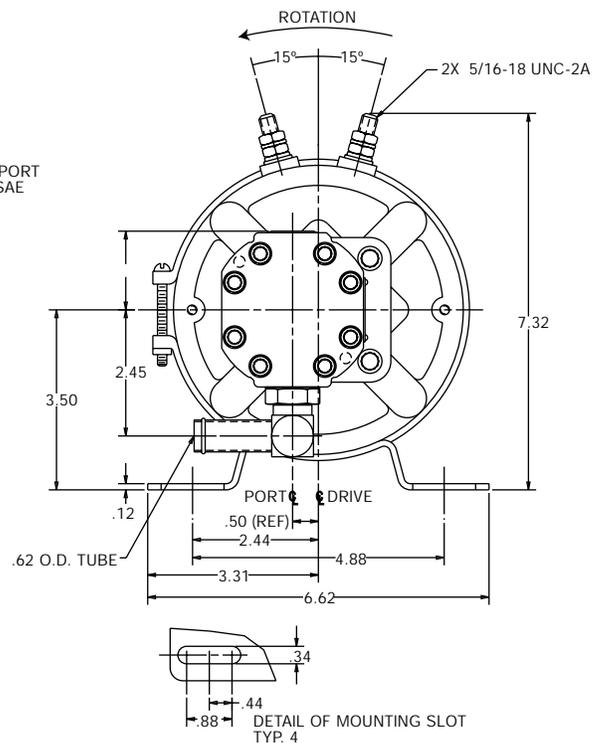
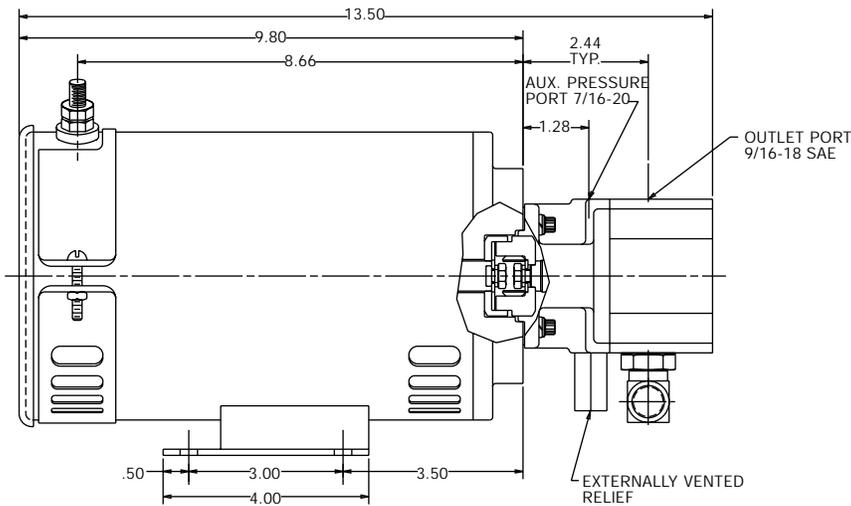
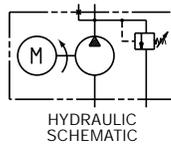
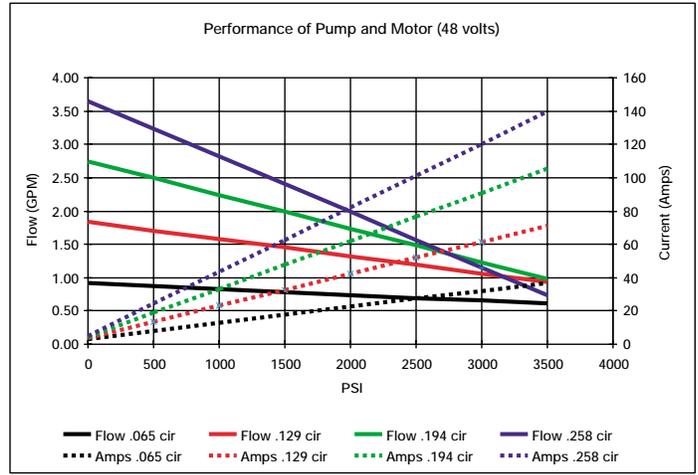
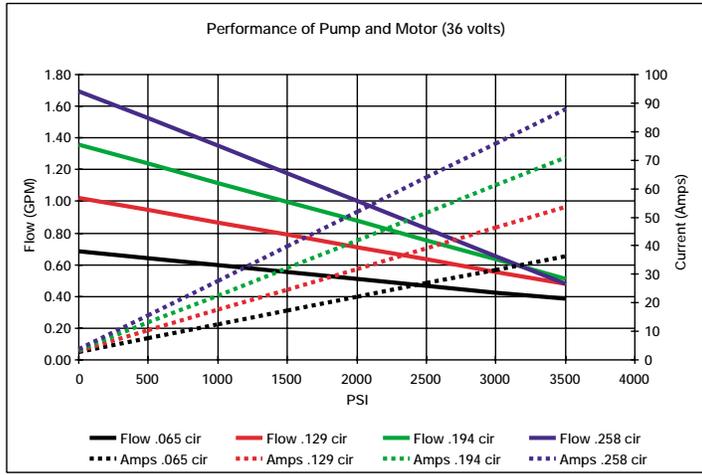
Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Open Drip Proof, UL Approved, No Start Switch, Motor Foot Mounting

Pump: PB Series Pump, Single Section, Check Valve, Relief Valve, Solenoid Release Valve with Manual Override (L-H-L), Tang Drive



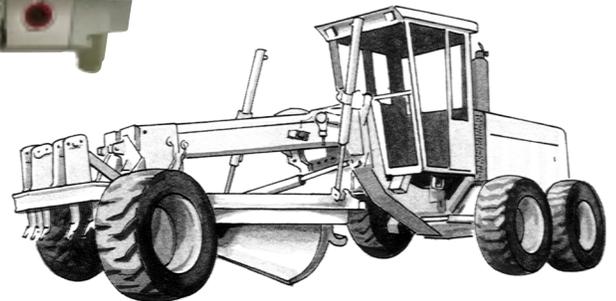
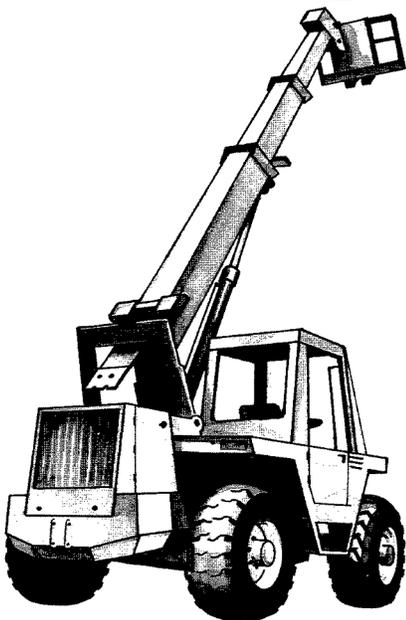
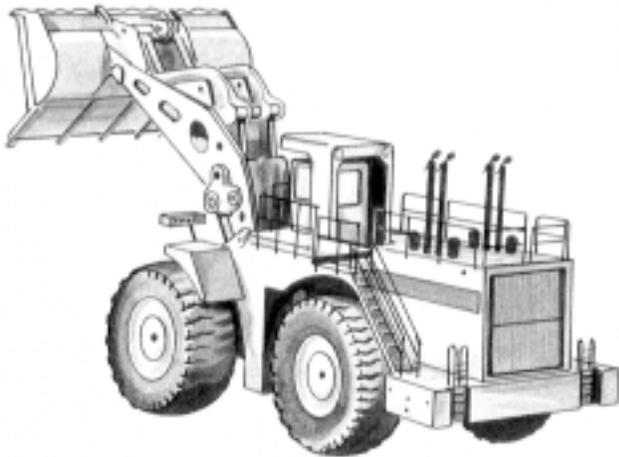
Motor: 36/48 Volt DC, 2 Terminal, Externally Vented, Permanent Magnet Motor, Continuous Duty, Open Drip Proof, Motor Foot Mounting

Pump: Single Section Split Gear Pump, Relief Valve, Check Valve, Flex Coupling Drive for Low Noise Operation



CONSTRUCTION

Supplemental Steering

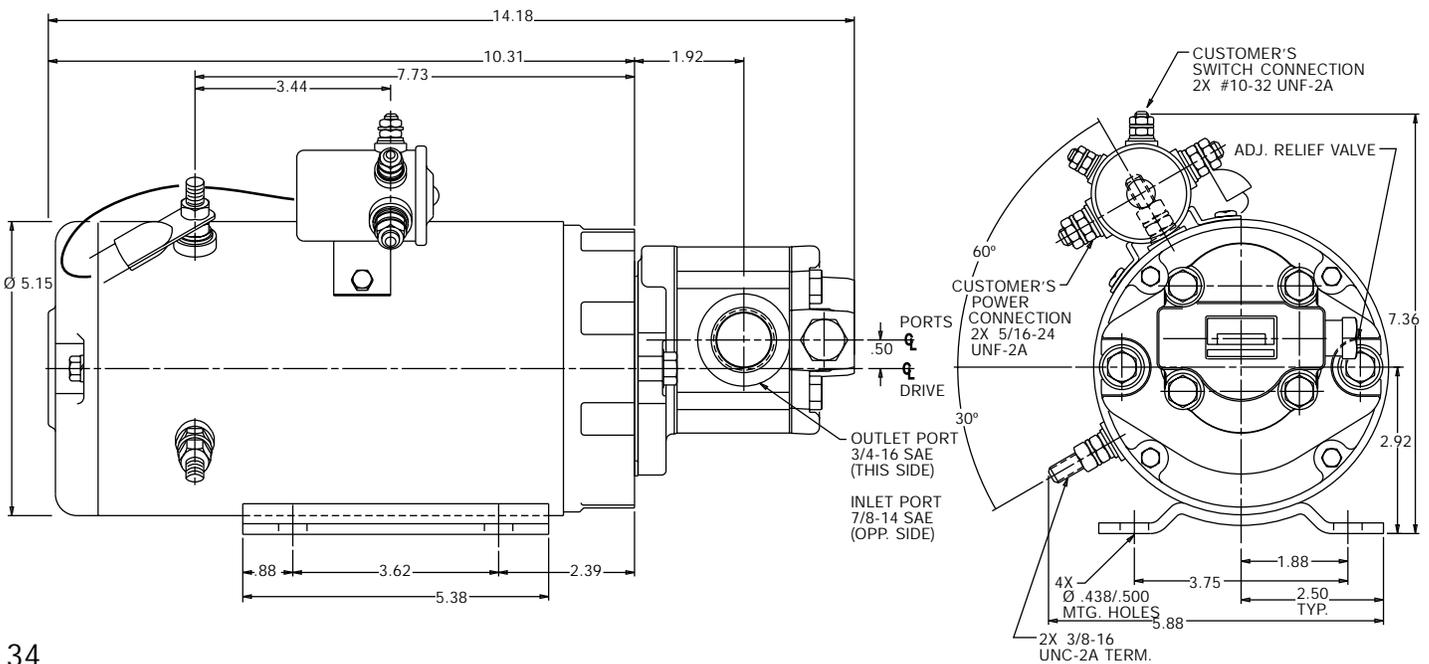
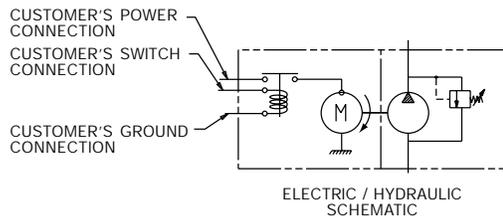
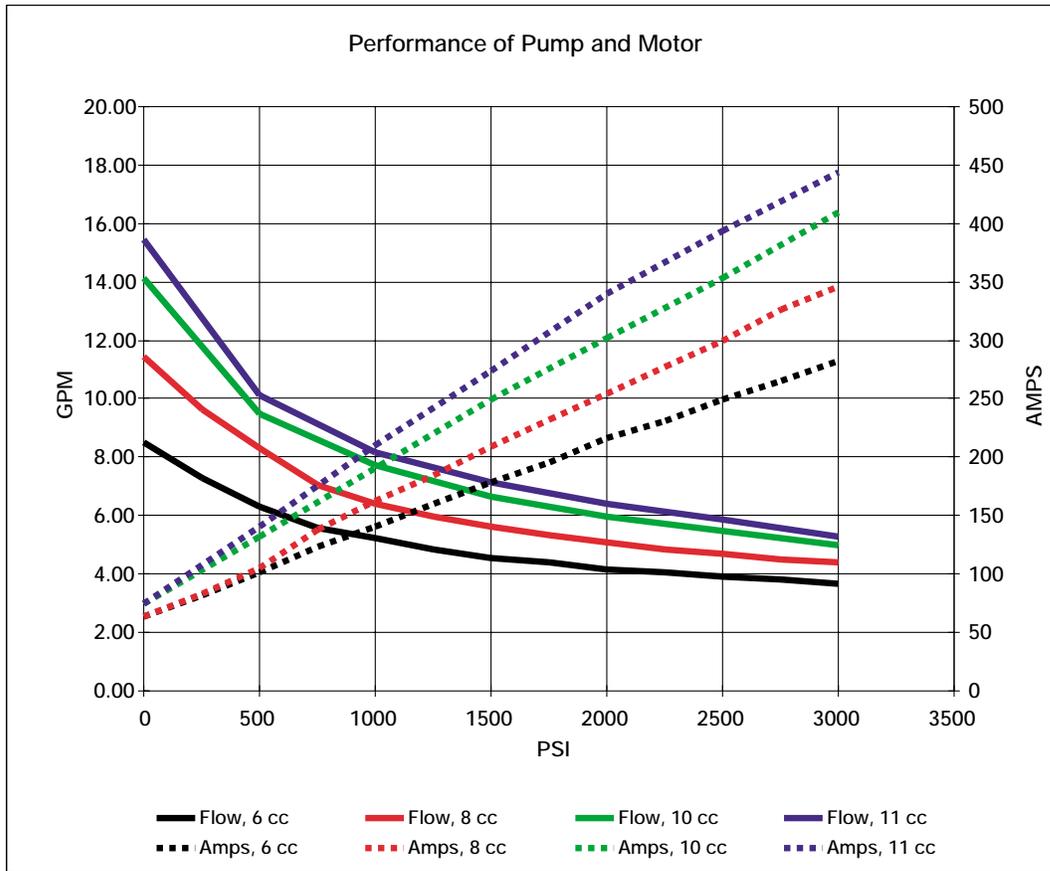


These pump and motor power units are designed for applications requiring a secondary source for supplying steering when the primary source becomes nonfunctional.

The pumps are available in single or multiple section, designed with optional priority load sense in the rear valve cover. Motor construction is suited for applications in off-highway equipment where the conditions are harsh, and rugged performance is required. Power units can be constructed with heavy duty start switches and insulated wiring boots.

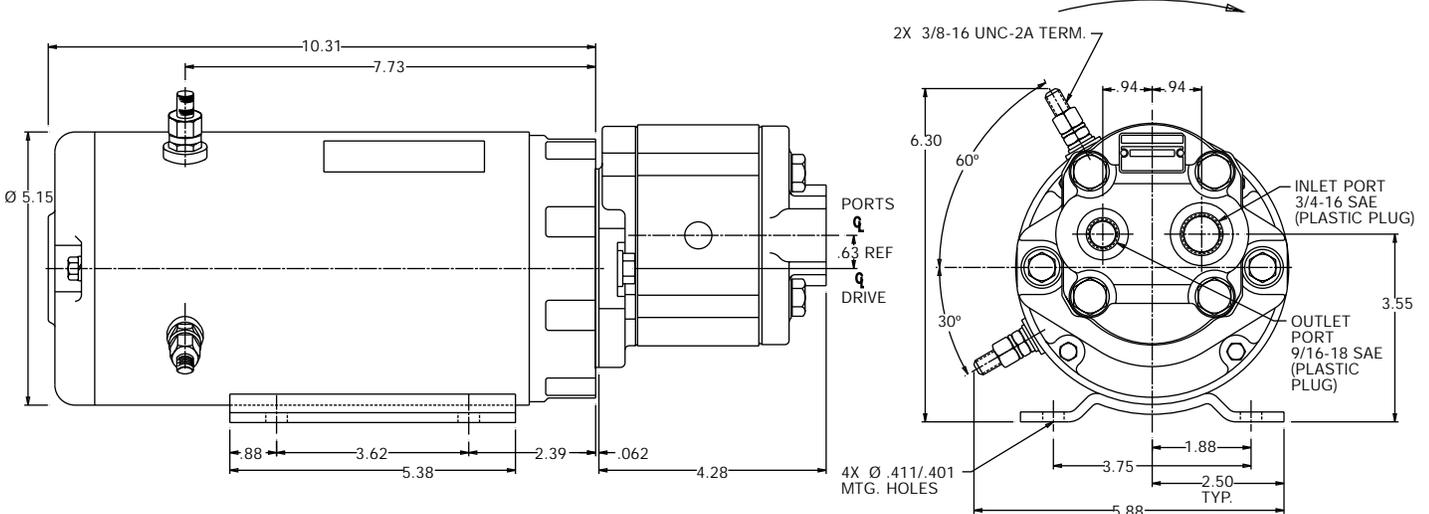
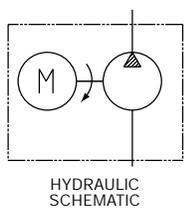
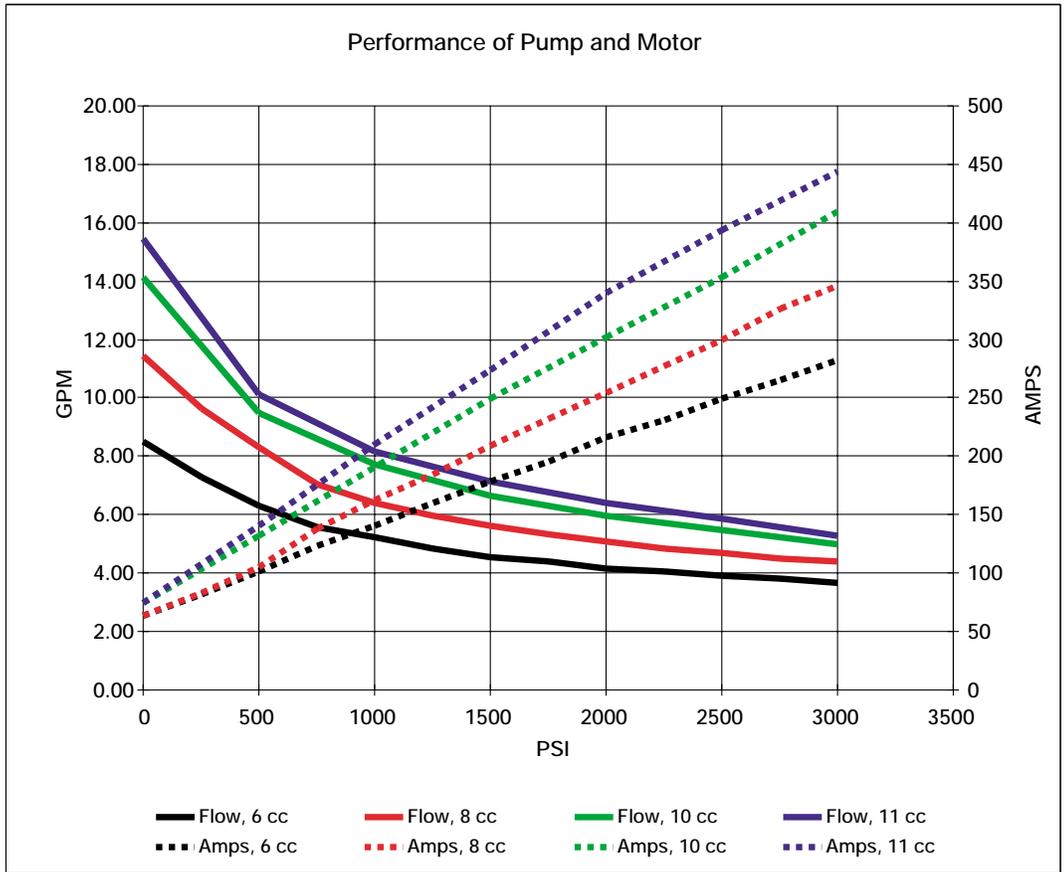
Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Sealed Motor, Motor Foot Mounting

Pump: W600 Series Pump, Single Section, 9 Tooth Spline, Adjustable Relief Valve, Side Inlet/Outlet Porting



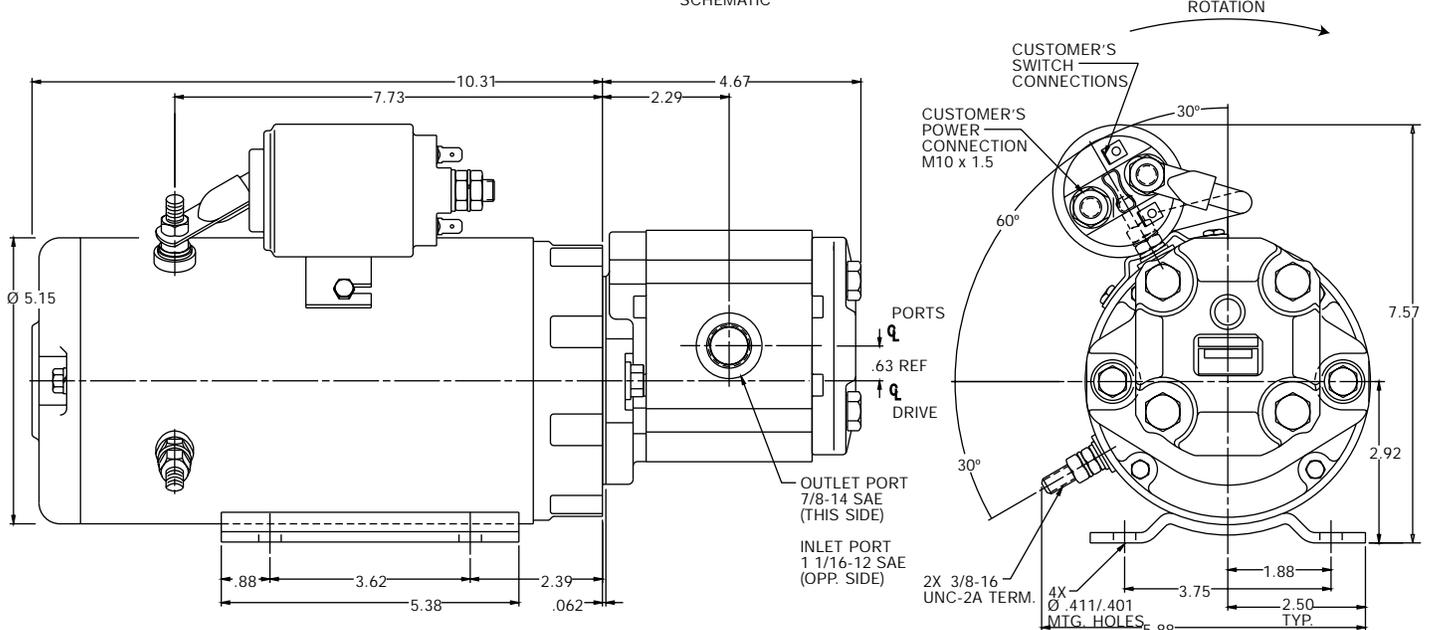
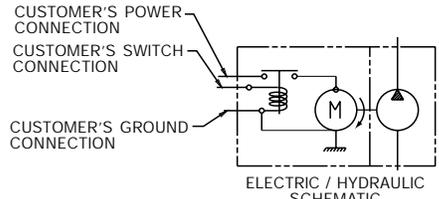
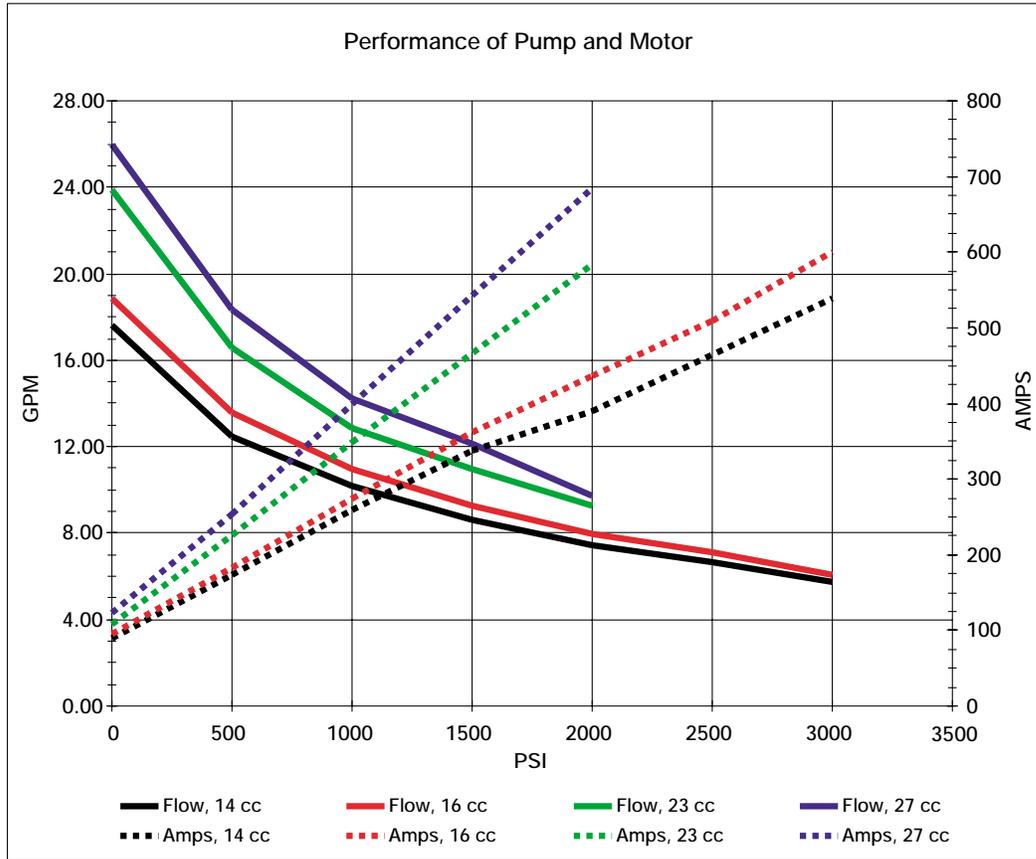
Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Sealed Motor, No Start Switch, Motor Foot Mounting

Pump: W900 Series Pump, Single Section, 9 Tooth Spline, No Valves, Rear Inlet/Outlet



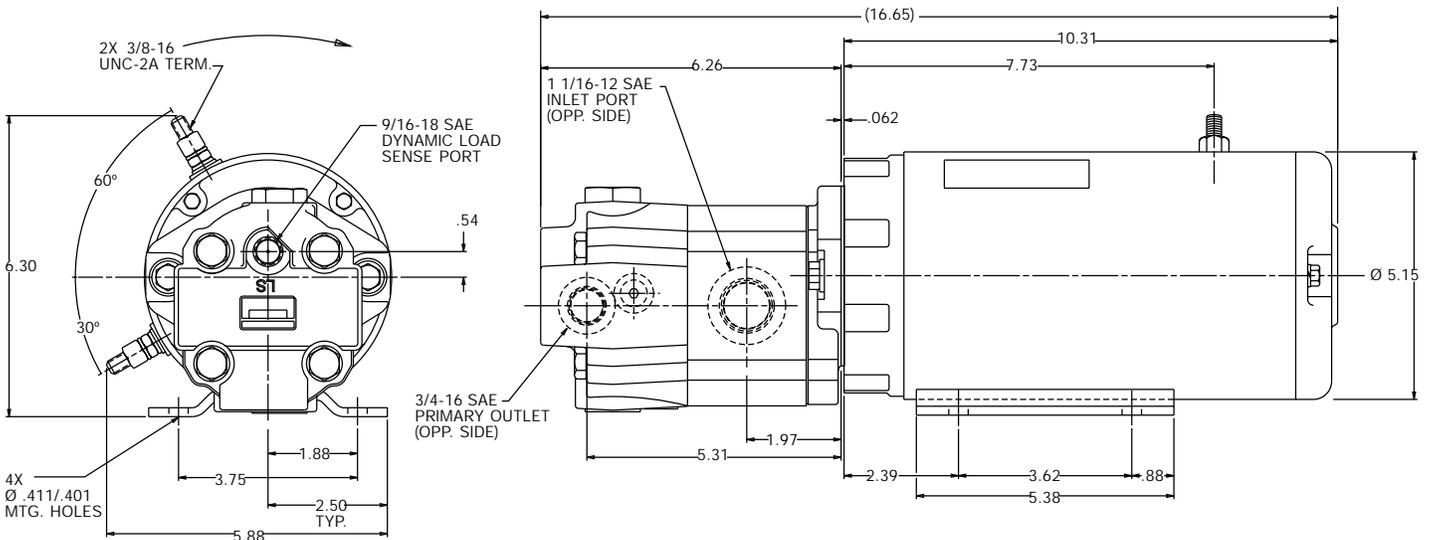
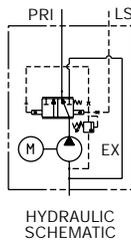
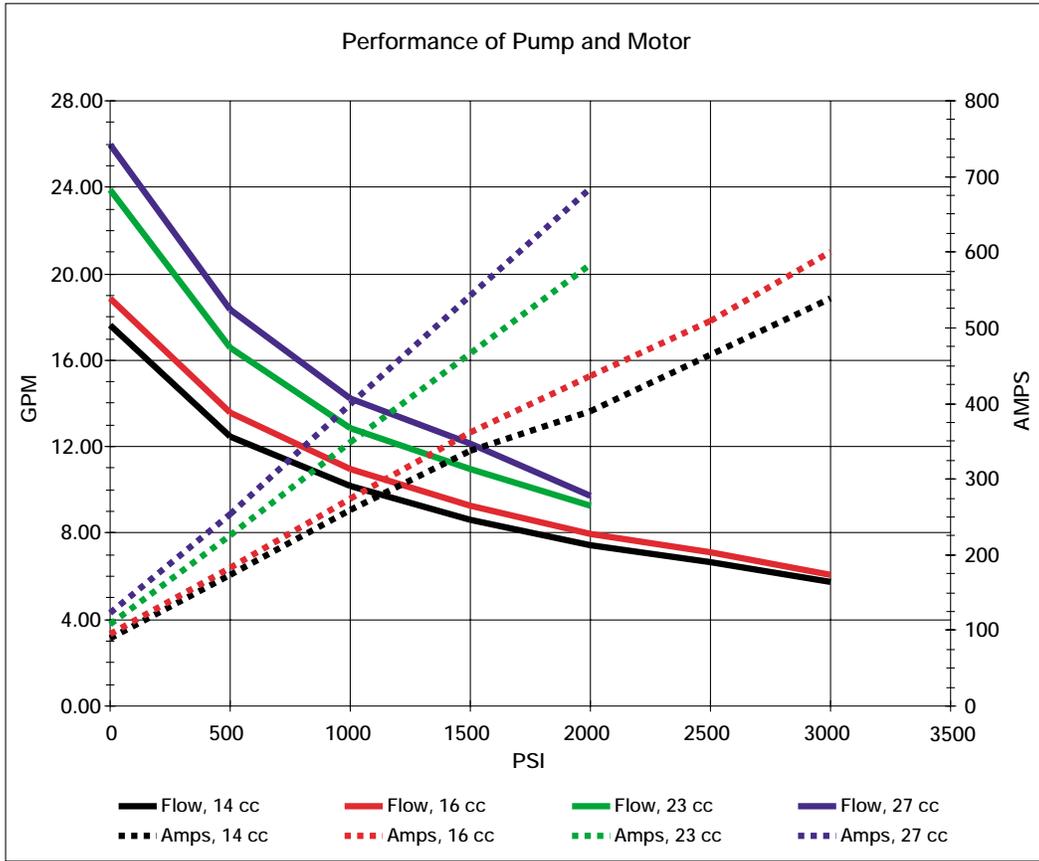
Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Sealed Motor, Heavy Duty
4 Terminal Start Switch Without Boots, Motor Foot Mounting

Pump: W900 Series Pump, Single Section, 9 Tooth Spline, No Valves, Side Inlet/Outlet



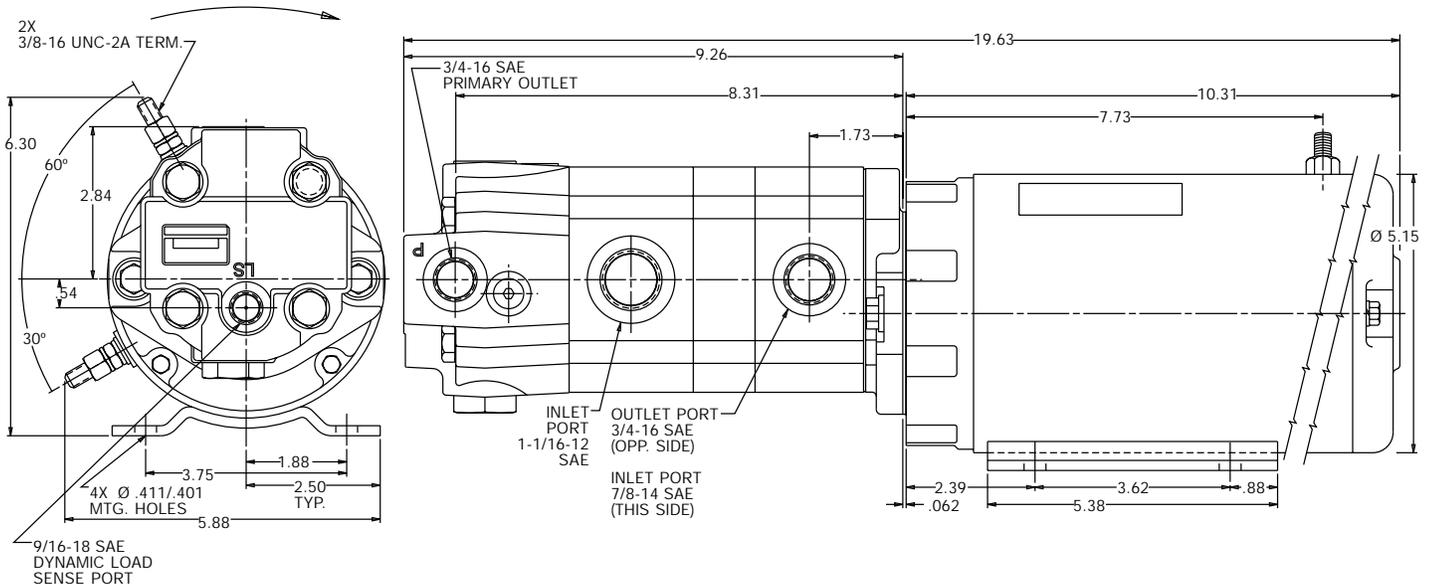
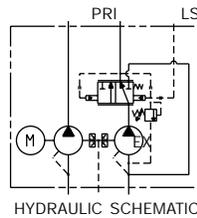
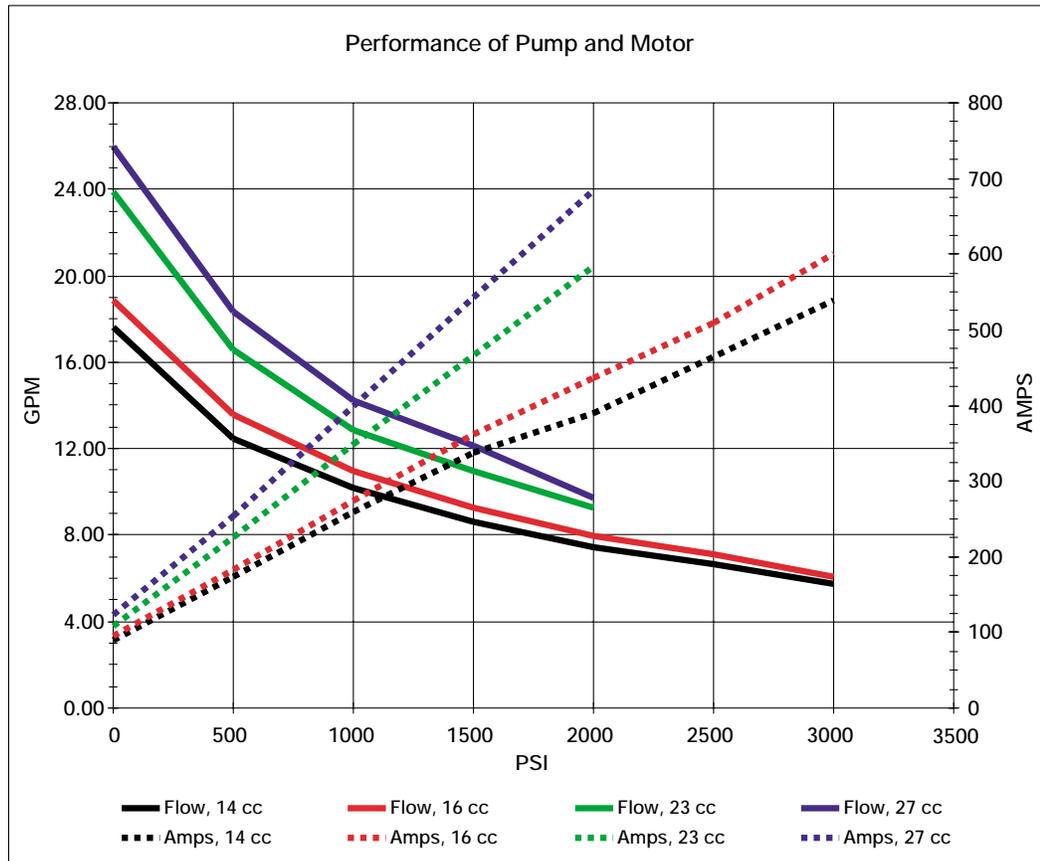
Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Sealed Motor, No Start Switch, Motor Foot Mounting

Pump: W900 Series Pump, Single Section, 9 Tooth Spline, Side Inlet/Outlet, Priority Load Sense in Rear Valve Cover



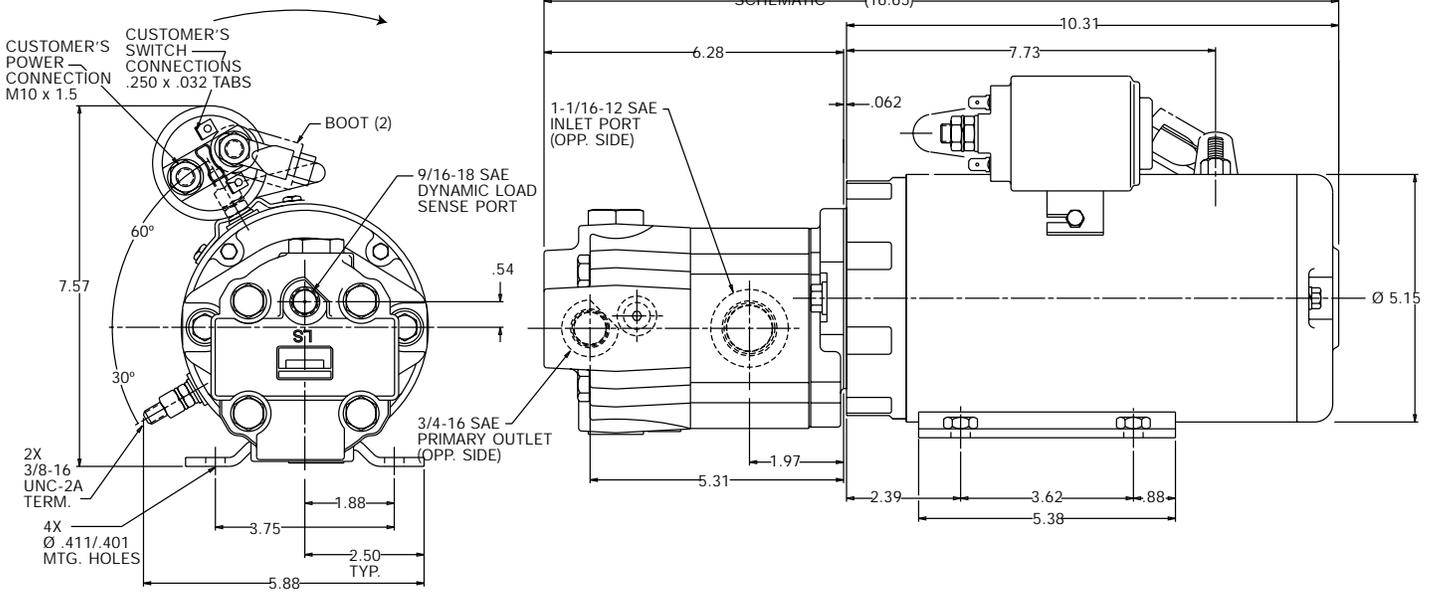
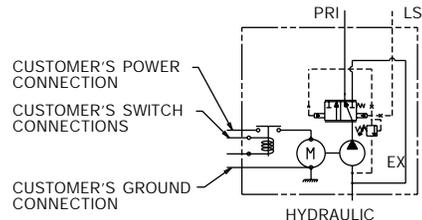
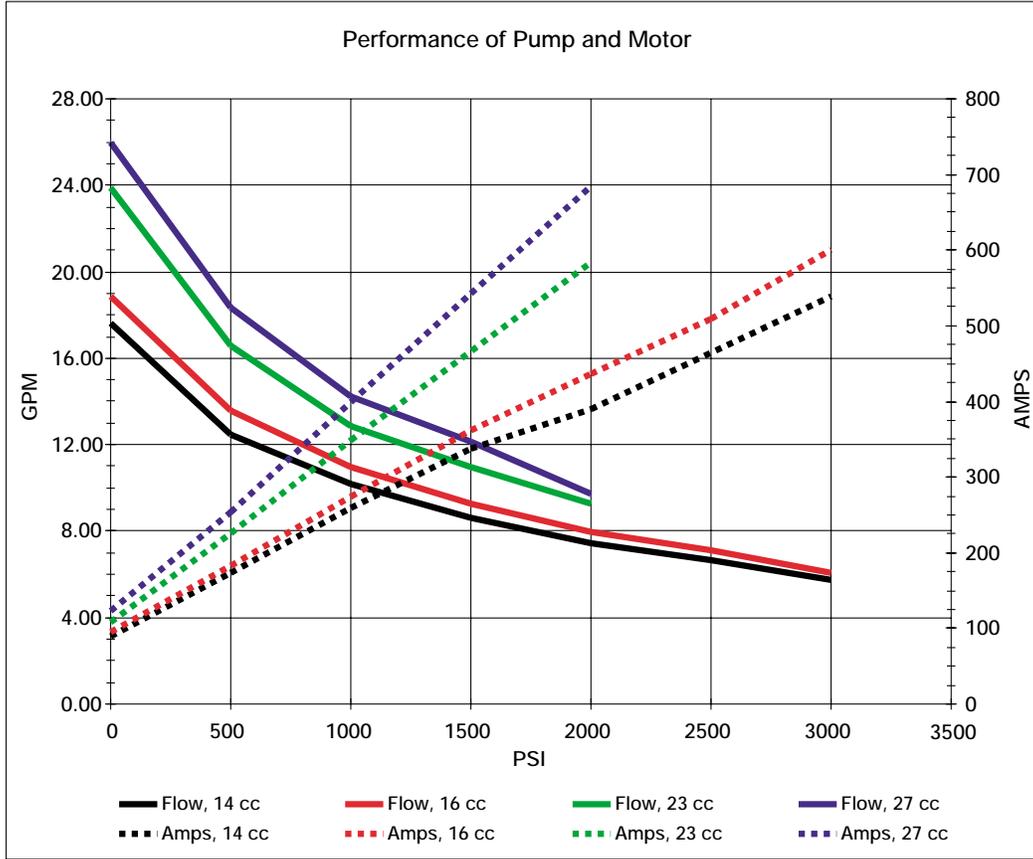
Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Sealed Motor, No Start Switch, Motor Foot Mounting

Pump: W900 Series Pump, Two Section (Sealed Between Sections), 9 Tooth Spline, Side Inlet/Outlet, Priority Load Sense in Rear Valve Cover



Motor: 24 Volt DC, 2 Terminal, Wound Field, Extended Duty, Sealed Motor, Heavy Duty
 4 Terminal Start Switch with Boots, Motor Foot Mounting

Pump: W900 Series Pump, Single Section, 9 Tooth Spline, Side Inlet/Outlet,
 Priority Load Sense in Rear Valve Cover



Only Haldex offers this extensive range of pumps, hydraulic motors, power units and flow dividers worldwide.

GC Series Hydraulic Pumps

Compact cast iron gear pumps with a wide variety of integrated options provide custom systems capability and high-efficiency performance. Displacements from 0.065 to 0.711 cu. in. (1.066 to 11.65 cc) per revolution. Pressures to 4,000 psi (275 Bar).

W Series Gear Pumps

Highly efficient pumps feature 4,000 psi continuous operation, speed range from 500 to 4,000 rpm, low noise operation and overall efficiency greater than 90%. Displacements from .183 to 3.05 cu. in. (3 to 50 cc) per revolution. Other features include SAE, ISO and DIN shafts, flanges and ports; integrated valves and multiple pump configurations.

G20-LS/G-30LS Load Sense Variable Discharge Gear Pumps

Offers the horsepower conservation of a load sense system and the low cost reliability of a gear pump. Featuring cast iron construction and 4,000 psi continuous operation for severe-duty applications. Displacements from 1.41 to 9.82 cu. in. (23 to 161 cc).

G20 & G30 Series Gear Pumps

Rugged cast iron pumps offer high performance for severe-duty applications. Available in single, multiple and through-drive versions. Displacements from 1.41 to 9.82 cu. in. (23 to 161 cc) per revolution. Pressures to 4,000 psi (275 Bar) continuous.

G20 / G30 Specialty Products

- G20-DM Pump/Motor Series, G20 series pump with direct mount motor options. Motor options --- 7.5 HP, 10 HP, and 15 HP and displacements from 1.41 to 2.94 cu. in. (23 to 48 cc) for pump/motor units. Integral manifold options also available.
- G20 / G30 PTO Pump Series. Specifically designed pump options and features for PTO (power take off) applications. Displacements from 1.41 to 9.82 cu. in. (23 to 161 cc).
- G20 / G30 two section flow dividers. Displacements from 1.41 to 9.82 cu. in. (23 to 161 cc) per section. Pressures to 4,000 psi continuous (275 Bar).

Gerotor Pumps

High-efficiency, low-maintenance design with quiet operation and uniform flow. Extremely tolerant of contamination. Displacements from 0.05 to 8.29 cu. in. (0.8 to 135.8 cc) per revolution. Pressures to 2,000 psi (136 Bar).

GC-9500 AC Hydraulic Power Units

AC power units offering the ultimate in design versatility and ordering flexibility. It can be ordered completely assembled or in kits. Standard options include: motors (1/2-5 hp, TEFC, open, and drip-proof); 4 reservoirs (5,10, 15 and 20 gal.); and pumps (pressure balanced and high/low with flows to 28 gpm and pressures to 3500 psi).

HE AC & DC Hydraulic Power Packs

Self-contained modular power systems in fully assembled or kit form; wide range of standard or high efficiency pumps, motors, switches, mounts, valves, and reservoirs. Custom options also available. Pressures to 4,000 psi (276 Bar). Flows from 0.20 to 7.0 GPM.

Hydraulic Motors

Available in the GC, W and G20 Series in unidirectional and birotational configurations. Motors available with modular valve, bearing, seal and shaft options for maximum flexibility. Displacements from 0.065 to 5.30 cu. in. (1.06 to 87.0 cc) per revolution. Pressures to 4,000 psi (275 Bar).

Two-Stage Hydraulic Pumps

External gear pumps designed for high-speed positioning combined with maximum working pressure. High-pressure displacements from 0.258 to 1.395 cu. in. (4.23 to 22.86 cc) per revolution. Pressures to 4,000 psi (275 Bar). Flows from 5 to 28 GPM.

Rotary Flow Dividers

Rotary-gear units up to four sections for synchronized operation of multiple cylinders or motors, proportional division of output or intensified flow. Single-section displacements from 0.065 to 0.813 cu. in. (1.0 to 13.32 cc) per revolution. Pressures to 4,500 psi (306 Bar).

Call us for more information

For application assistance or detailed literature on any Haldex product line, call us toll-free: 1-800-572-7867. Visit our web site: <http://www.hbus.haldex.com> E-mail us: sales@hbus.haldex.com





PRODUCT RANGE

He Power Packs
12/24/48 VDC 0.8 – 3.5 kW and
0.75 – 3 kW AC modular power
packs

Pressure Switches
5 - 350 bar, connecting/
disconnecting

He Classic Power Packs
12/24/48 VDC modular
powerpacks in weatherproof
boxes

W300 Hydraulic pumps
0.8 – 5.7 cc/section 230 bar

W600 Hydraulic pumps
4 – 12 cc/section 276 bar

WM600 Hydraulic motors
4 – 12 cc/section 276 bar

W900 Hydraulic pumps
5 – 31 cc/section 276 bar

WM900 Hydraulic motors
5 - 31 cc/section 276 bar

WQ900 The quiet pump
5 - 23 cc/section 230 bar

W1500 Hydraulic pumps
19 - 50 cc/section 276 bar

WM1500 Hydraulic motors
19 - 50 cc/section 276 bar

G25 Hydraulic pumps
23 – 87 cc/section 250 bar

GM25 Hydraulic motors
23 – 87 cc/section 250 bar

GPA Internal Gear pumps
1.7 – 63 cc/section 100 bar

GC Hydraulic pumps / fluid motors
1.06 – 11.65 cc/section 276 bar

II-Stage Hydraulic pumps
4.2 – 22.8 cc/section 276 bar

Rotary Flow Dividers
3.8 – 13.3 cc/section 300 bar

D Hydraulic pumps
3.8 - 22.9 cc/section 207 bar

G20/G30 Hydraulic pumps
23 – 161 cc/section 276 bar

GM20/GM30 Hydraulic motors
23 – 161 cc/section 276 bar

G20/G30 (LS) Hydraulic pumps
23 – 161 cc/section 276 bar

Transmission pumps

Fuel pumps

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