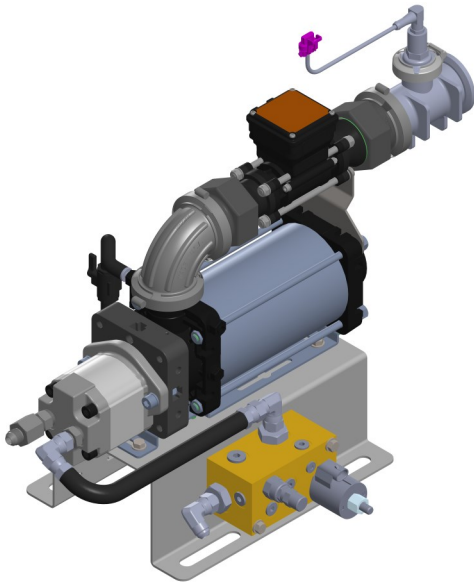




396-5482Y1

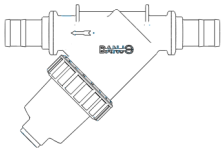
Multistage Centrifugal Pump Operational Manual



	Max Flow	Max GPA on 40' at	Max GPA on 60' at
MSP400	137	280	188

The MSP400 Pump comes in one model that provides 137 GPM max flow rate. At maximum flow, all hydraulic pumps use 8-9 GPM of hydraulic oil with our standard 4.0 CID motor.

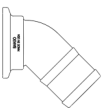
520-00-3200 MSP 400 2" FP Accessories Bag



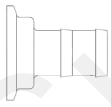
2" FP Strainer with 2" FP Hose Barb, Gaskets and Clamps
Install on Pump Inlet directly or in line before Inlet



2" T-Bolt Hose Clamp - Qty 3 - Strainer and Pump Inlet Connections



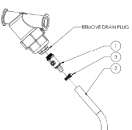
2" FP Manifold x 1 1/2" Hose Barb 45 - Optional substitute for Straight Barb on pump inlet



2" Manifold x 1-1/2" Hose Barb, Clamp and Gasket - Use for pump outlet plumbing



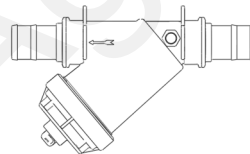
1 1/2" Hose Clamp - Use one on pump outlet hose



2" Strainer Drainer Kit



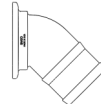
520-00-3210 MSP 400 3" Accessories Bag



3" Strainer with 3" Hose Barbs, 2" FP to 3" Coupler, Gaskets and Clamps
Install on Pump Inlet directly or in line before Inlet



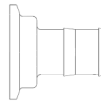
3" T-Bolt Hose Clamp - Qty 3 - Strainer and Pump Inlet Connections



3" Manifold x 3" Hose Barb, 45° - Optional substitute for straight hose barb on pump inlet



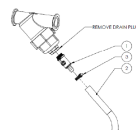
2" FP Manifold x 3" Manifold Coupler - Qty 1
Use to adapt pump inlet from 2" FP to 3"



2" Manifold x 1-1/2" Hose Barb, Clamp and Gasket - Use for pump outlet plumbing



1 1/2" Hose Clamp - Use one on pump outlet hose



3" Strainer Drainer Kit

NOTICE

Operator should read this manual before operating the system.

SurePoint Ag Systems



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Liquid

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& Parts



Safety

TAKE NOTE! THIS SAFETY ALERT SYMBOL FOUND THROUGHOUT THIS MANUAL IS USED TO CALL YOUR ATTENTION TO INSTRUCTIONS INVOLVING YOUR PERSONAL SAFETY AND THE SAFETY OF OTHERS. FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN INJURY OR DEATH.



**THIS SYMBOL MEANS
ATTENTION!**

BECOME ALERT!

YOUR SAFETY IS INVOLVED!

Note the use of the signal words DANGER, WARNING and CAUTION with the safety messages. The appropriate signal word for each has been selected using the following guidelines:



DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations typically for machine components which, for functional purposes, cannot be guarded.



WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.



CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE is used to address safety practices not related to personal safety.





Hydraulic Fluid and Equipment Safety

This system uses hydraulic equipment with hydraulic fluid under extremely high pressure.

Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin causing serious injury. Keep all hoses and connections in good serviceable condition. Failure to heed may result in serious personal injury or death. Avoid the hazard by relieving the pressure before disconnecting lines or performing work on the system.

Make sure hydraulic fluid connections are tight and all hydraulic hoses and lines are in good condition before applying pressure to the system. Use a piece of paper or cardboard, NOT BODY PARTS, to check for suspected leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. DO NOT DELAY!

Check hydraulic hoses and fittings frequently. Loose, broken, and missing hardware can cause equipment to not perform properly and can result in serious injury or death. Hydraulic systems can be hot and cause burns. Before working on any system, wait until the fluid has cooled.

If an accident occurs, see a doctor familiar with this type of injury immediately. Any fluid injected into the skin or eyes must be treated within a few hours or gangrene may result.

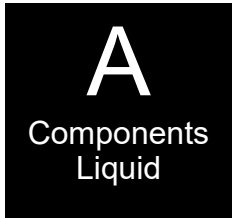


A Word to the Operator

It is YOUR responsibility to read and understand the safety messages in this manual. YOU are the key to safety.
SAFETY IS YOUR RESPONSIBILITY.

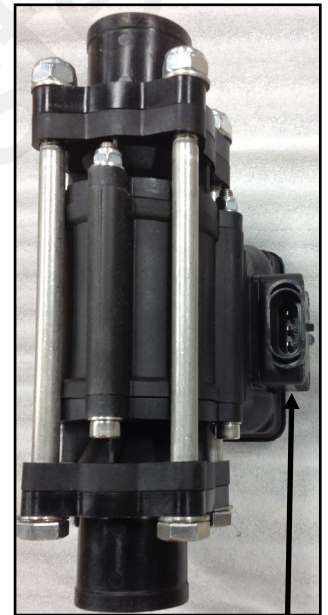
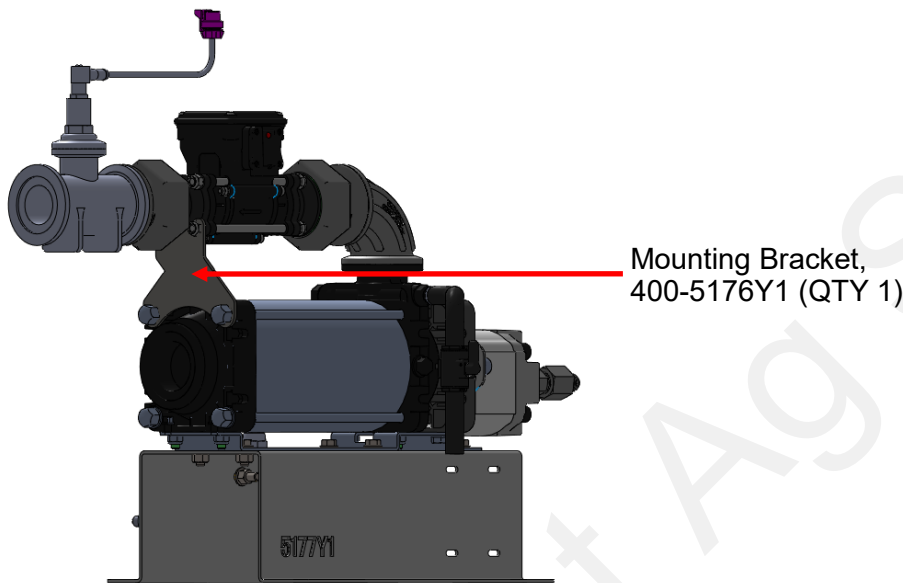
MSP400 Electromagnetic Flowmeter

8 - 158 GPM Flowmeter Included With Pump



-Before doing any arc welding on the implement, unplug the cable to the flowmeter, or damage to the flowmeter may result.

-Do not power wash the flowmeter. High pressure spray directed at the back edge of the face plate or at the wire connector may allow water into the flowmeter electronics.



The latest version of the SurePoint Electromagnetic flowmeter has a black molded body and an orange sticker. The meter has a molded in 3-pin SuperSeal connector for improved sealing.

Amp SuperSeal 3-pin connector
Use adapter 201-17842
to connect to 3-pin MP harness

Electromagnetic flowmeters are superior to traditional turbine flowmeters in two basic ways. First, they have no moving parts. This translates into no wear items or potential for contaminants to jam a spinning turbine.

Second, electromagnetic flowmeters detect the flow by electrically measuring the velocity of the liquid, which makes them independent of viscosity or density of the fluid measured. They are extremely accurate using the standard calibration number. **SurePoint still recommends you perform a catch test to verify the system is properly installed and configured.**

Flowmeter Model (black meter with orange label)	Flow Calibration	FPT Size	Flange Size
8 - 158 GPM	3000	2"	2"

Each flowmeter has a different diameter sensing element. Although the calibration numbers may be the same, the proper sized flowmeter must be used.

Pump Priming

The MSP400 Pump IS NOT SELF-PRIMING, the pump will need to be mounted below the tank to gravity prime or have a priming pump installed. Gravity prime is standard on pump

A

Components
Liquid

Why it is necessary to use a Priming Pump:

The MSP400 Pump comes with a factory installed priming line. This line can be used with a priming pump, and can be used as an air bleed when gravity priming. The MSP400 Pump is not self-priming, so having a way to prime it is required. Mounting the pump below the tank level for gravity priming, or using a priming pump are both viable options for priming the MSP400. This is not an optional step when owning and operating the MSP400. SurePoint offers an electric diaphragm priming pump kit that can be mounted directly to the MSP400 base. Using a priming pump allows for mounting flexibility. If you choose not to use a priming pump, you must mount the pump below the tank to allow gravity to prime your pump. Select the option that works best for you.

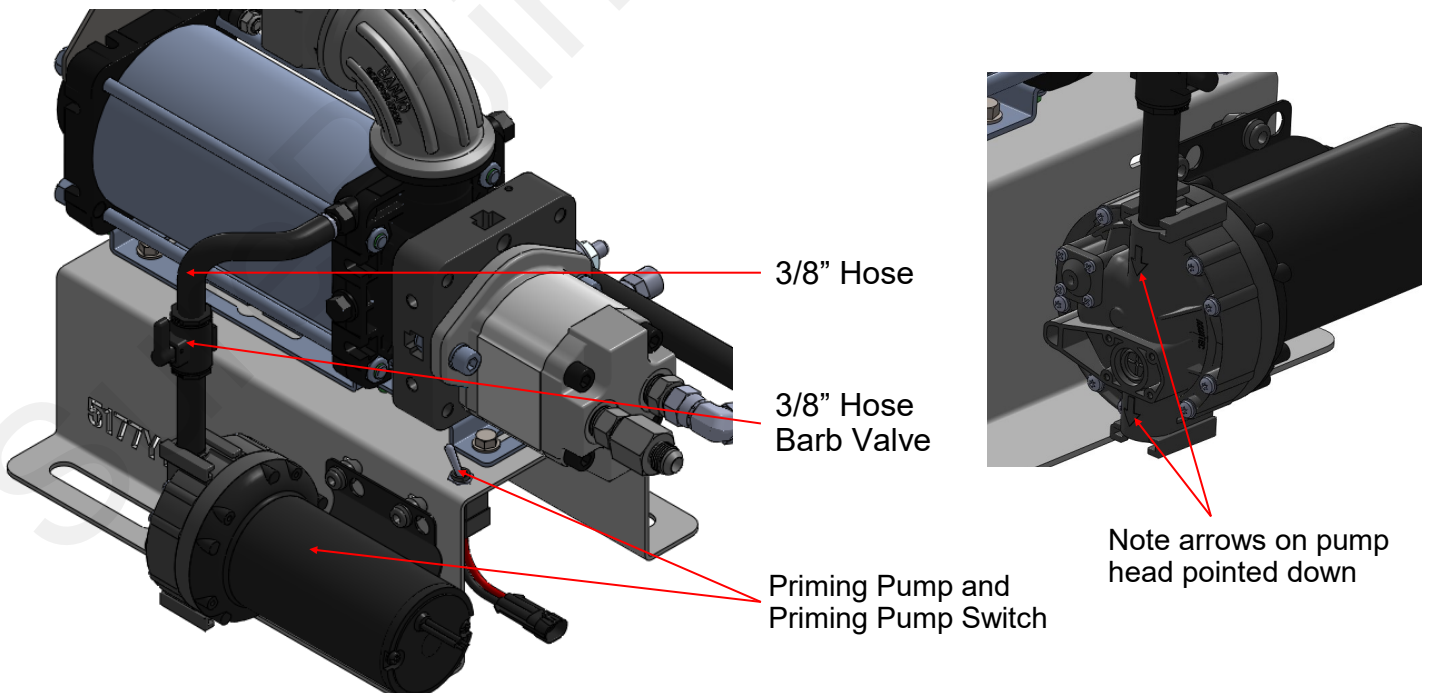


Running the MSP 400 Pump without properly priming will cause excessive wear and pump failure. DO NOT RUN THE PUMP DRY. Failure to comply will void pump warranty

Pump Priming (Priming Pump Option)

Using the 1/4" hardware provided, bolt the pump to the hole pattern on the pump base (shown below). Mount the pump switch on base bracket. Make sure the arrows on the pump head are pointing down to ensure the pump is creating suction to prime. Remove the plug from the priming port on the outlet block of the pump and replace it with the provided stem to hose barb quick connect fitting. Using the provided 3/8" hose, route the hose to the inlet of the priming pump. You will need to place the 3/8" hose barb valve between the priming pump inlet and the priming port on the pump and fasten it using size 6 hose clamps. Use the remaining 3/8" hose to go from the outlet of the priming pump to somewhere close to the ground so, when priming, the fertilizer will dump on the ground and not on the machine. When priming, turn on the priming switch, open the 3/8" valve, and run the pump until a steady stream of liquid comes out of the priming hose. Once a steady stream is coming out, close the 3/8" valve and turn off the priming switch. Your pump is then primed.

Be sure the priming hose does not become plugged with dirt or it will create issues when priming.



Pump Priming

The MSP400 Pump IS NOT SELF-PRIMING, the pump will need to be mounted below the tank to gravity prime or have a priming pump installed. Gravity prime is standard on pump

A

Components
Liquid

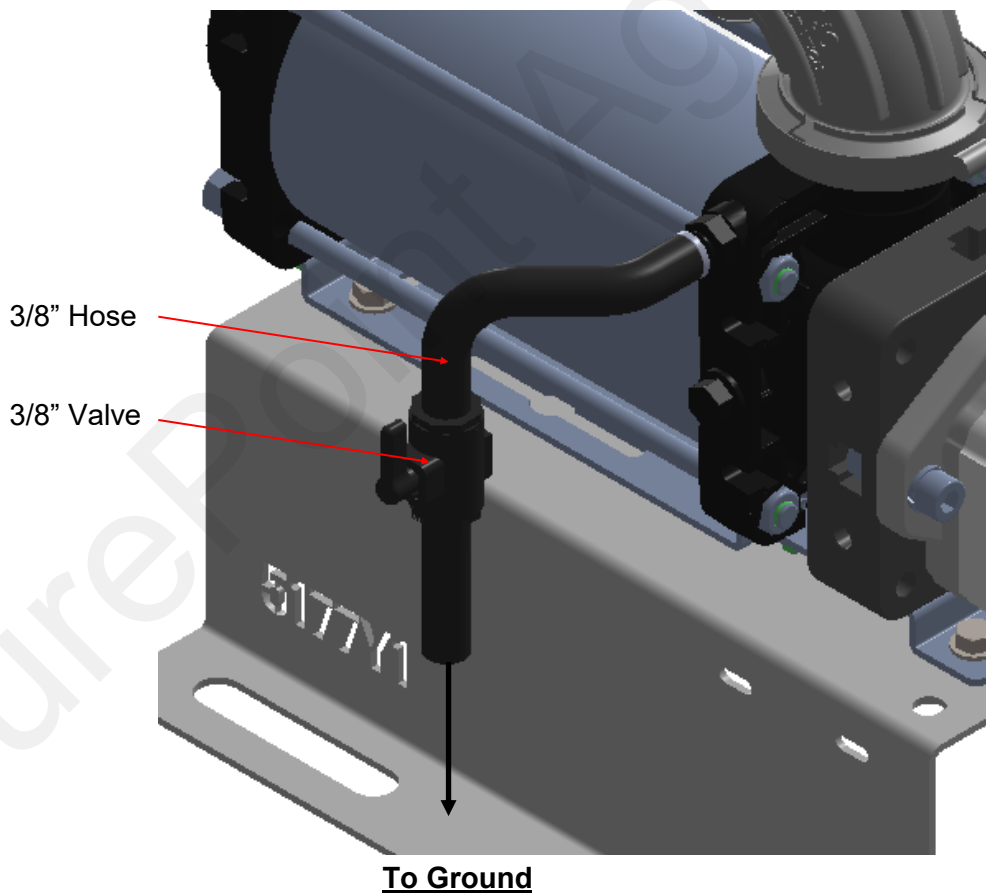


*Running the MSP 400 Pump without properly priming will cause excessive wear and pump failure. **DO NOT RUN THE PUMP DRY.** Failure to comply will void pump warranty*

Pump Priming (Gravity Prime Option):

Ensure your pump is mounted in a location that is at or below the tank liquid level. Using the provided 3/8" hose, route the hose to a spot that the 3/8" valve will be easily accessible. Place the valve and then route the remaining 3/8" hose to a spot where the liquid will spill on the ground and not on the machine. When priming the pump, ensure that the tank is full of liquid and the discharge valve is open. Open the 3/8" valve and allow the air to bleed from the pump until a constant liquid stream comes out of the 3/8" hose. Close the valve and your pump is then primed and ready to operate.

Be sure the priming hose does not become plugged with dirt or it will create issues when priming.

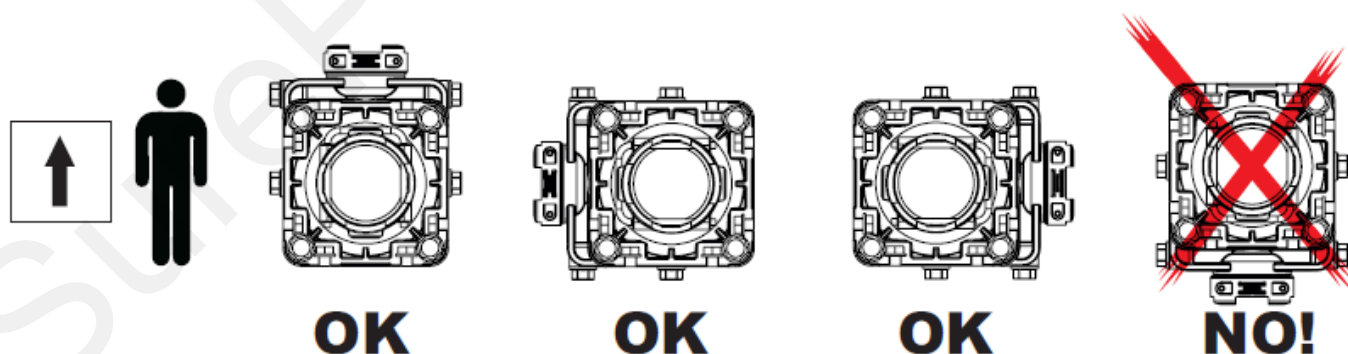


MSP400 Pump Installation

Mounting

1. Mount pump in your preferred location. The MSP400 needs to be mounted in a location that keeps the pump at or below the tank liquid level. This is necessary to keep the pump primed throughout operation.
2. When mounting the pump, refer to the diagram below. The pump can be mounted in many different configurations, but must never be mounted with the outlet pointing down.
3. SurePoint has U-Bolts available to mount the pump directly to multiple bar sizes shown below. Each U-bolt kit includes 1 bolt and 2 flange nuts.
4. If the U-Bolts will not work, order the universal backer plate kit, number 515-203000 which will clamp to any size tube from 4" - 8" wide.

Mounting Bar Size	Item Number	Item Description
3" x 3"	380-1022	1/2" U-bolt Kit - 1/2", fits 3" x 3" tube - (3" opening)
4" x 4"	380-1023	1/2" U-bolt Kit - 1/2", fits 4" x 4" tube - (4" opening)
4" x 6"	380-1015	1/2" U-bolt Kit - 1/2", fits 4" x 6" tube - (4" opening)
	380-1017	1/2" U-bolt Kit - 1/2", fits 6" x 4" tube - (6" opening)
5" x 7"	380-1014	1/2" U-bolt Kit - 1/2", fits 5" x 7" tube - (5" opening)
	380-1016	1/2" U-bolt Kit - 1/2", fits 7" x 5" tube - (7" opening)
6" x 7"	380-1018	1/2" U-bolt Kit - 1/2", fits 7" x 6" tube - (7" opening)
7" x 7"	380-1001	1/2" U-bolt Kit - 1/2", fits 7" x 7" tube - (7" opening)
6" x 10"	380-1021	1/2" U-bolt Kit - 1/2", fits 6" x 10" tube - (6" opening)
8" x 12"	380-1019	1/2" U-bolt Kit - 1/2", fits 8" x 12" tube - (8" opening)
8" x 16"	380-1020	1/2" U-bolt Kit - 1/2", fits 8" x 16" tube - (8" opening)

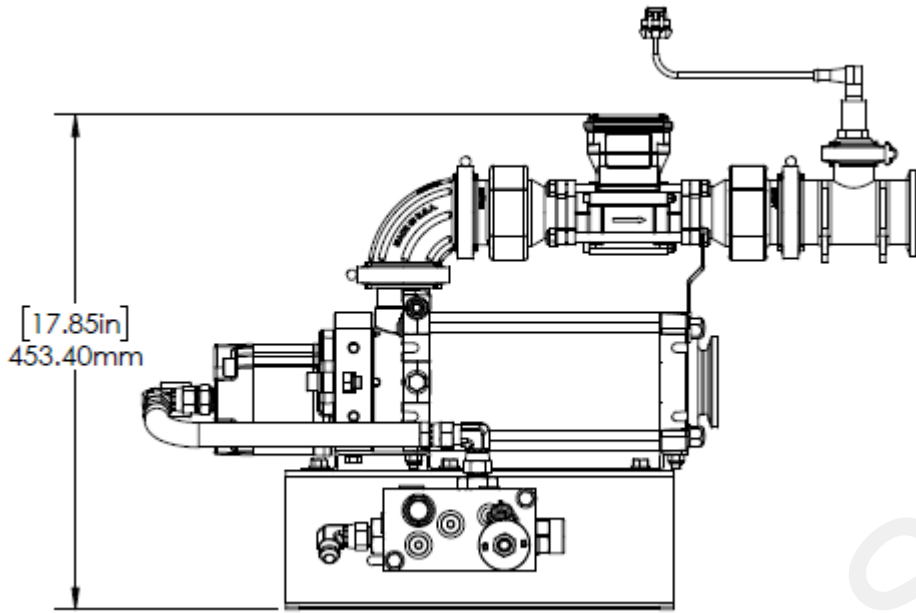


MSP400 Pump Installation

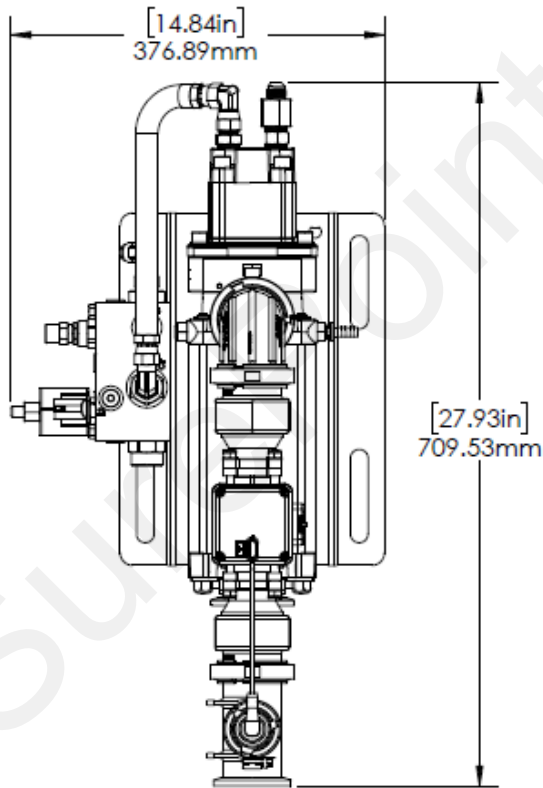
Mounting Dimensions

B

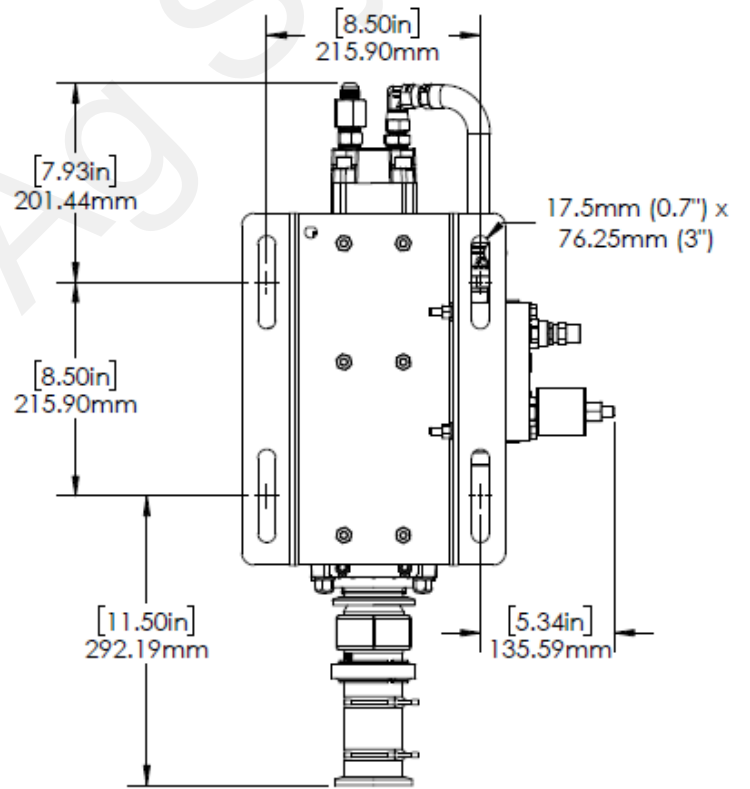
Installation
Overview



Side View



Top View



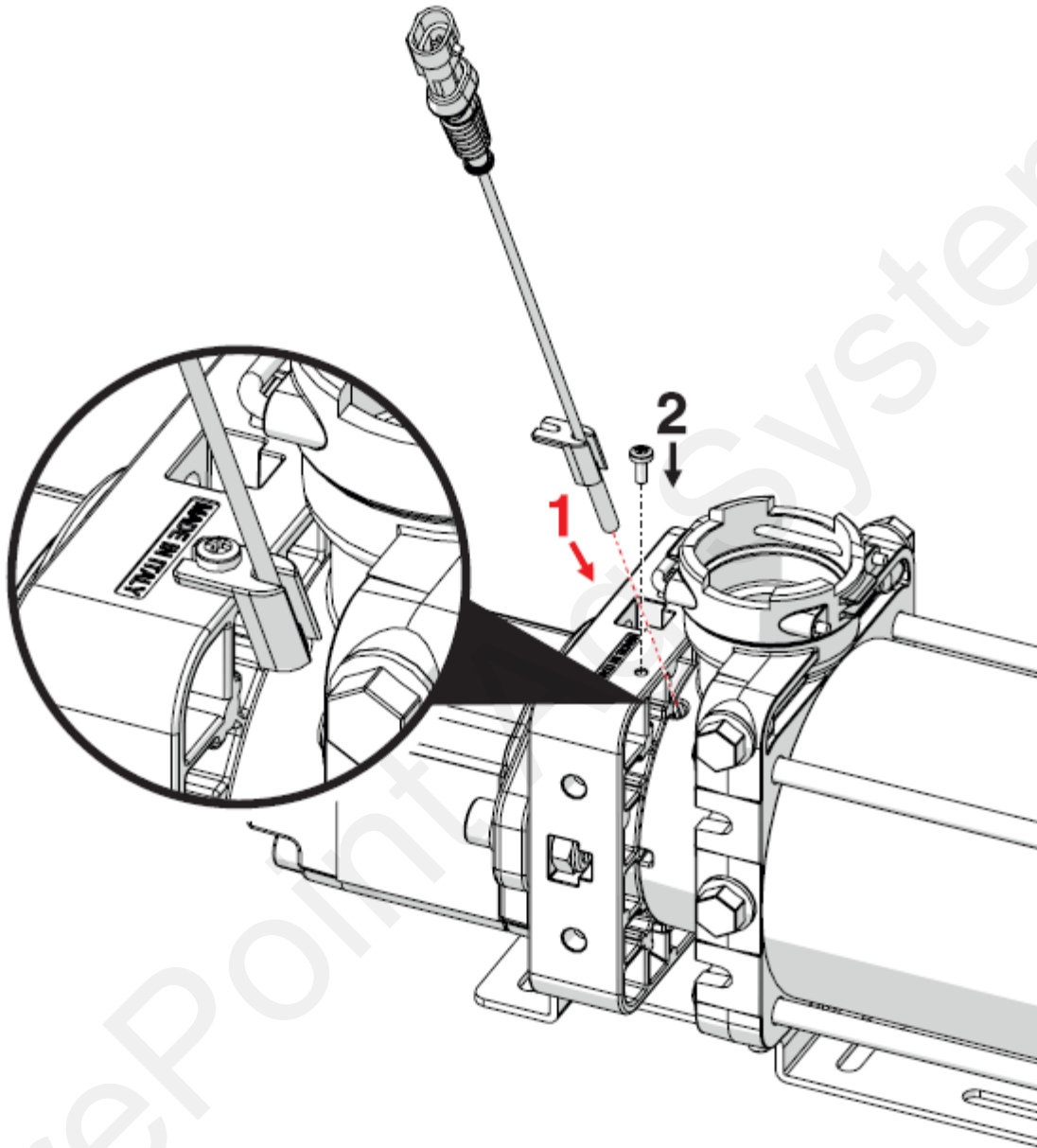
Bottom View

RPM Sensor Installation

Kit Number: 291-03-MSP400RPM

B

Installation
Overview



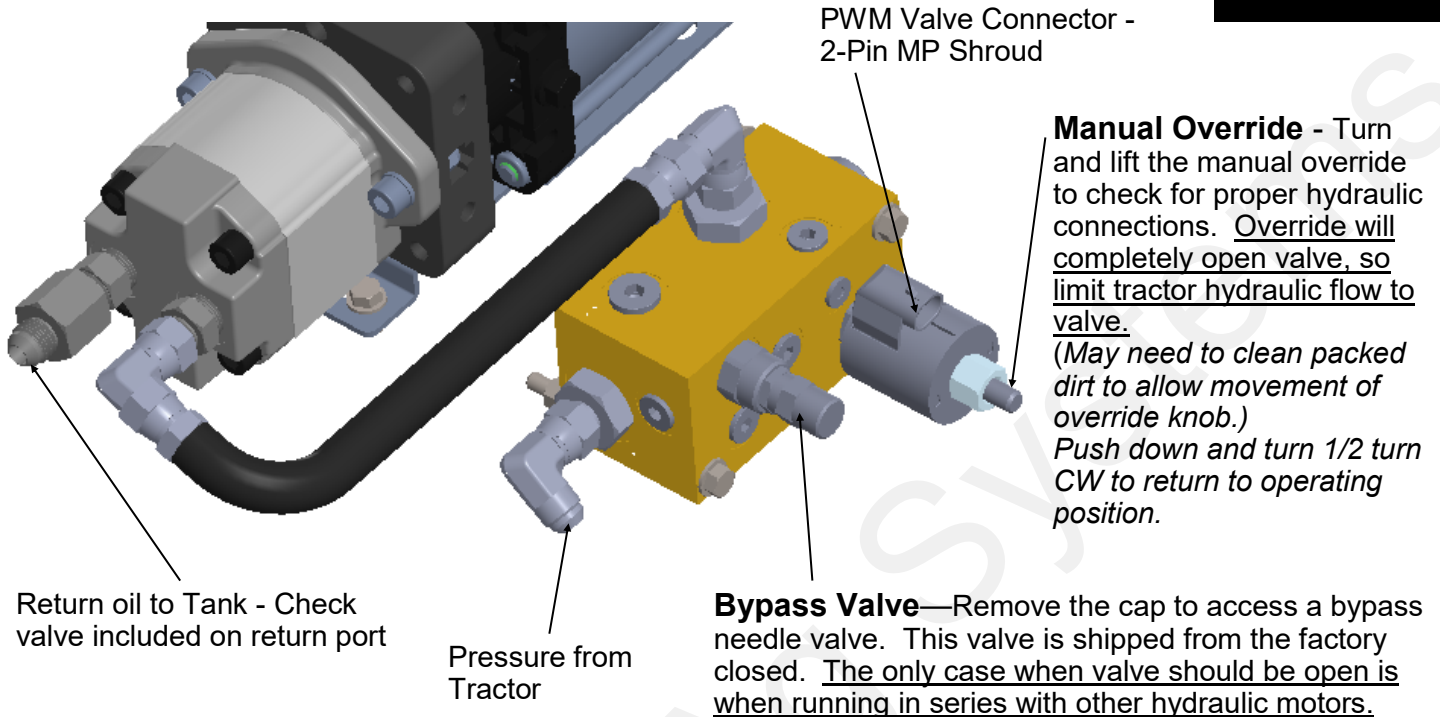
Installation Instructions:

1. Insert sensor fully in the specific hole on the flange until cable support is resting on the bearing support casting.
2. Using the provided screw, fasten the support to the bearing support casting.
3. Attach RPM sensor adapter harness (201-5502Y1) to the RPM sensor. Use this to adapt to the RPM Weatherpack connector on the pump final harness.

Hydraulic Connections PWM Valve

B


Installation
Overview



Manual Override - Turn and lift the manual override to check for proper hydraulic connections. Override will completely open valve, so limit tractor hydraulic flow to valve. (May need to clean packed dirt to allow movement of override knob.) Push down and turn 1/2 turn CW to return to operating position.

Bypass Valve—Remove the cap to access a bypass needle valve. This valve is shipped from the factory closed. The only case when valve should be open is when running in series with other hydraulic motors.

Depending on your tractor and exact hydraulic plumbing scenario your pump may turn very slowly when it should stop. To stop the pump completely, open the bypass valve slightly. (Always loosen the lock nut before adjusting the needle valve. Do not overtighten needle valve.)



DANGER

Hydraulic oil under extremely high pressure. Do not use hand or any other skin to check for or to stop hydraulic leaks. Be sure pressure is relieved before loosening hydraulic fittings. Replace worn hoses immediately. Seek medical care immediately if hydraulic oil is shot into the eye or the skin.

Pump Rotation Check Valve

A check valve is included on the outlet port of the hydraulic valve. This prevents the pump from running in the wrong direction. If run in the wrong direction, liquid will be pumped, however, the hydraulic valve will not be able to control the flow. The check valve can be identified by the Part Number 1108R stamped on it and a flow direction arrow.

How it Works with Power Beyond Hydraulics

This valve is designed to work with power beyond hydraulics. This configuration will not require a standard tractor remote hydraulic valve. First, remove the load sense plug and install a #6 male boss x #6 JIC adapter fitting, SurePoint PN 161-01-6MB-6MJ. Then run a 3/8" or 1/4" hydraulic hose back to the tractor. This hose will connect to the load sense port on the tractor. The bypass valve must be closed to use power beyond hydraulics. The load sense line will signal the tractor hydraulic system to supply the flow needed by the pump to meet your application rate. The SurePoint valve has an internal load sense check valve, which is required for power beyond hydraulics.

MSP400 Hydraulic Connections

B

Installation
Overview

Hydraulic Hose

SurePoint recommends 1/2" hydraulic hose for both pump inlet and outlet. The hoses will need #8 JIC female swivel fittings.

Where do I get hydraulic flow for my MSP400?

This question is often asked as many implements use up all the hydraulic connections on a tractor. SureFire has some recommendations as to what works best.

Best Option - Dedicated MSP400 Circuit

If you have a tractor remote available, attach the tractor remote valve directly to the MSP400 pressure and return ports. **DO NOT** try to avoid this method simply to save another set of hydraulic hoses running to the tractor. Operating the MSP400 on it's own circuit is the simplest for installation and operation. It guarantees the MSP400 won't negatively affect any other hydraulic components on your equipment.

Preferred

Alternate Option - In Series with John Deere CCS Fan or Bulk Fill Seed Fan

If you do not have a tractor remote valve available, this may be your best method. You can plumb the MSP400 after the seed distribution fan. If using this method, the SurePoint PWM bypass valve must be open (see previous page for instruction & picture). If bypass is left closed, the SurePoint valve will limit the speed of the seed distribution fan.

For example, the John Deere CCS fan uses around 7 GPM of oil. This will limit the MSP400 maximum flow (10 GPM oil necessary for maximum flow). See the charts on the next page for adjusted maximum pump flow. See section G for flow charts to determine your necessary flow rate. If you absolutely need the maximum flow in this case, SurePoint has an alternate motor (smaller displacement) to increase pump speed at 7 GPM oil flow.

DO NOT plumb the MSP400 in series with a vacuum fan. The vacuum fan uses just a few GPM of oil. Also, problems will be caused by excessive pressure at the vacuum fan motor.

Two Pumps

The preferred method is to plumb the two pumps in series. DO NOT plumb two pumps after the CCS fan. Excessive pressures may damage the CCS fan motor. Run the pressure line from tractor to first pump inlet. Plumb from the outlet of Pump 1 to the Inlet of Pump 2, then from Pump 2 outlet back to the tractor. Open the bypass needle valve on both pumps so each valve controls motor speed independently. Run the flow setting procedure on the next page to minimize the hydraulic flow based on the pump that requires more hydraulic motor flow.



! DANGER

Hydraulic oil under extremely high pressure. Do not use hand or any other skin to check for or to stop hydraulic leaks. Be sure pressure is relieved before loosening hydraulic fittings. Replace worn hoses immediately. Seek medical care immediately if hydraulic oil is shot into the eye or the skin.

MSP400 Hydraulic Oil Flow Requirements

*(Requirements for 4.0 CID Motor—standard SurePoint motor beginning in 2016—
Earlier motor was 4.9 CID which uses 20% more oil)*

B

Installation
Overview

Setting Tractor Hydraulic Remote Speed

The MSP400 pump requires a constant hydraulic oil flow from the tractor. A constant hydraulic oil flow of 7 GPM is desired to operate the MSP400. Do not try to operate pump under 5 GPM or you will see significant reduction in pump performance

Use this procedure to determine the correct setting on your tractor hydraulic flow.

1. Run the fertilizer system in the field at the maximum rate and ground speed.
2. Turn down the hydraulic flow slowly while watching the pump flow (Volume / Minute).
3. Observe when the Volume / Minute begins to drop.
4. Turn the hydraulic flow back up slightly.

MSP400		
Fertilizer Flow (GPM)	Hydraulic Oil Pressure (PSI)	Liquid Pressure at Pump (PSI)
27	1450	80
53	1650	90
80	1815	100
105	1950	115
137	1800	100

This setting will provide the MSP400 pump just enough oil for your application rate.

If running with the bypass open (only recommended when 2 motors are operated in series) this process will minimize the oil circulated in the bypass loop, leaving more oil flow for other hydraulic functions.

NOTICE

The pump is rated at a maximum of 4200 RPM. Spinning the pump over 4200 RPM may cause pump failure.

The system will spin the pump faster than that if precautions are not taken to limit the speed. This could happen if the strainer becomes plugged or blocked and the controller attempts to speed the pump up to achieve the desired Rate.

It could also happen if a high pressure situation occurs that opens the Pressure Relief Valve (PRV) and the pump speeds up to try to achieve the Rate.

Monitor the pump RPM. If the pump begins to speed up, check for a blocked strainer or other issue.

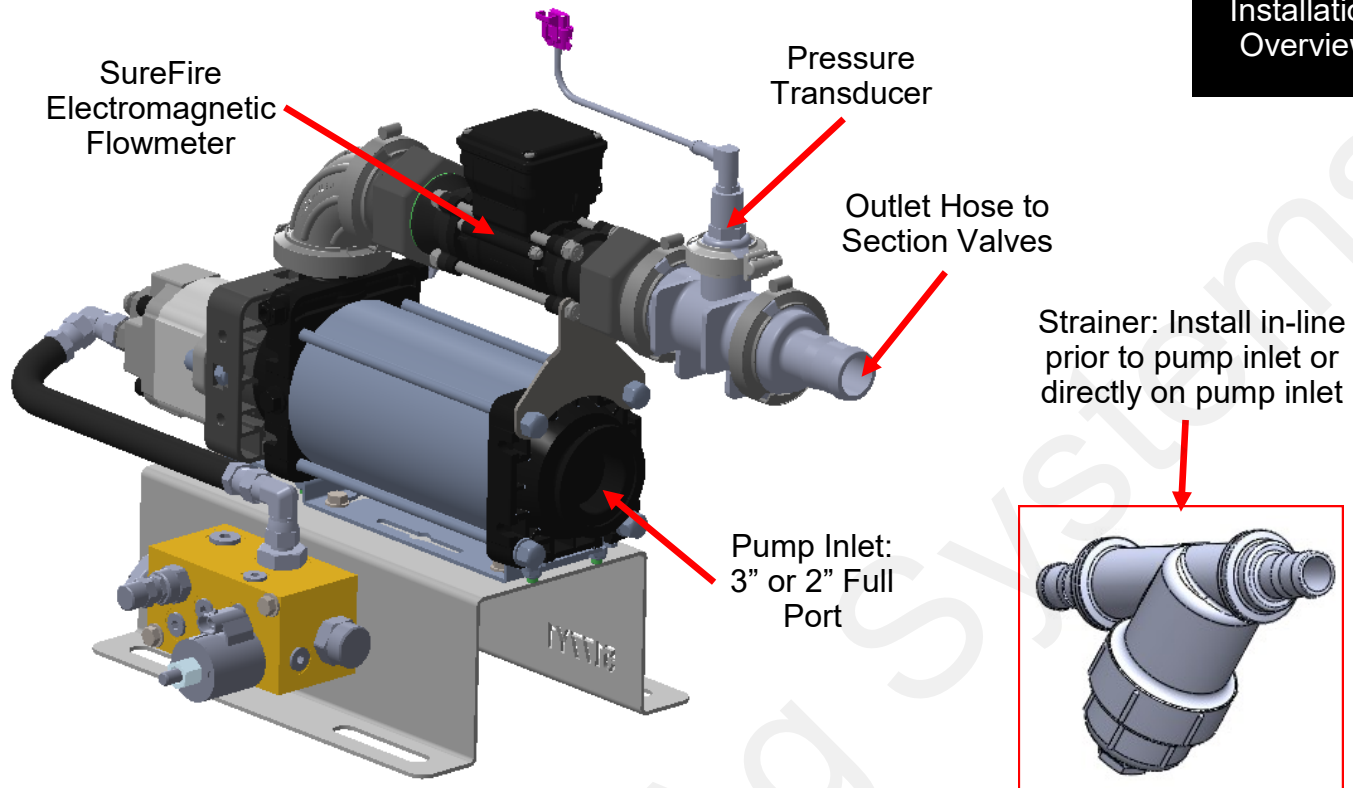
Set the Pump RPM High Limit and Maximum Pressure Alarm as shown in Section F of the system manual.

Another way to limit the maximum pump speed is to set the High PWM Limit just above what is needed for regular operation. If the pump tries to speed up above that, check for blocked strainer or other issue.

MSP400 Liquid Plumbing Connections

B

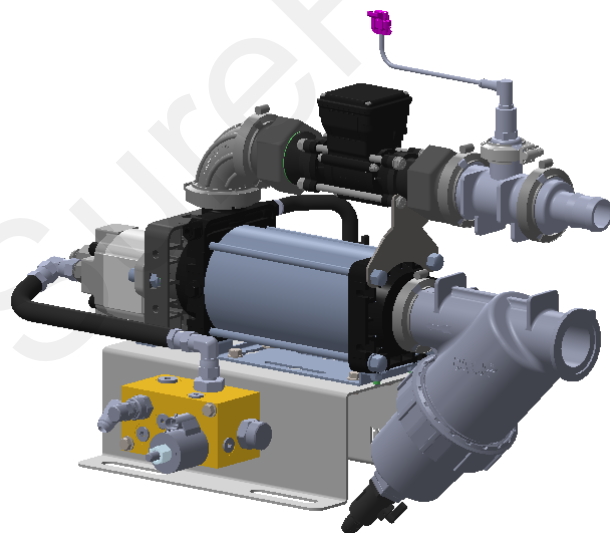
Installation
Overview



Inlet: The MSP400 is shipped with either a 2" Full Port hose barb or a 2" FP x 3" coupler and 3" hose barb depending on what your inlet selection is. Attach this to the hose from your supply tank and strainer. A 45 degree hose barb is included with either inlet selection for mounting flexibility.

Inlet Strainer: A 20 mesh strainer is included in the pump kit. The manifold strainer includes two hose barbs so it can be mounted anywhere in the inlet line. If space allows, the strainer can be mounted directly to the inlet plumbing assembly as shown below.

Outlet: The outlet is plumbed directly to the flowmeter. The outlet is a 1-1/2" hose barb. The outlet hose should be a minimum of 24" long with a gentle curve prior to any fittings for optimum flowmeter performance. The outlet will attach to your manifold(s) or section valves.



CAUTION

Check hoses, hose clamps, and liquid fittings regularly and repair or replace loose connections. Any obstructions to pump connections can cause pump to lose prime and run dry. Running pump dry can cause excessive wear and pump failure. DO NOT RUN PUMP DRY

Recommended Care and Maintenance

C

Maintenance
& Parts



Running the MSP 400 Pump without properly priming will cause excessive wear and pump failure. DO NOT RUN THE PUMP DRY. Failure to comply will void pump warranty

Winterization

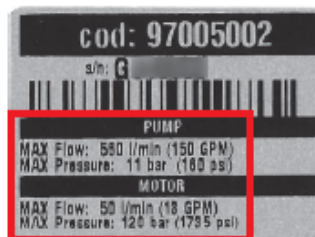
SurePoint recommends flushing your fertilizer pump and complete system with adequate amounts of water first. Next, use RV antifreeze to winterize your system by pumping an adequate amount through all components. At the beginning of the next season, begin with water to verify the system is in working order with no leaks.

CAUSE	MALFUNCTION	REMEDY
INSUFFICIENT water flowrate	◆ Hydraulic motor not suitable for the system	Refer to the data/diagrams table.
	Loss of air in the water suction line	Check and seal tubes and fittings.
	Water suction line below standard size or collapsed tube	Replace tube (ref. 'connection' section).
	Clogged water filters	Carry out an adequate maintenance (filter cartridge cleaning).
	Rotors clogged	Contact a Service Center to have the rotors checked and cleaned.
	Rotor seizure (dry running)	Contact a Service Center to have the rotors replaced.
	* Slack belts	Tension drive belts.
	* Worn out coupling	Change electromagnetic coupling assembly.
NO water flowrate	* Lack of power to the electromagnetic pulley	Check connection, fuse and actuator control.
	* Wrong pump rotation direction	Check drive rotation.
Hydraulic system (OIL) overheating	◆ Hydraulic motor not suitable for the system	Refer to the data/diagrams table.
	◆ Motor hydraulic tube insufficient size	Check the size of the tubes.

◆: only for models with hydraulic motor

*: only for models with pulley / sprocket drive

- Do not use the pump with pressure values above those indicated in the curves in par. 4.2. and in the label on the pump.



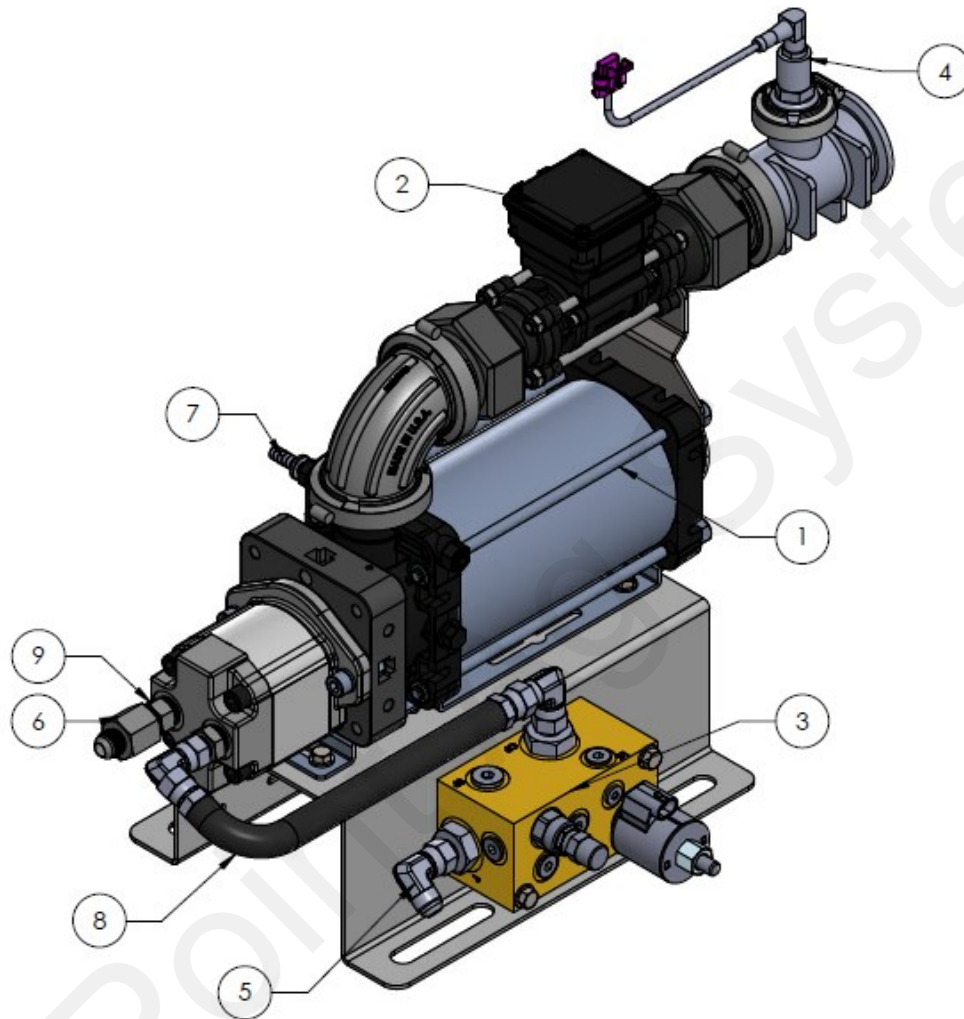
Pressure and flowrate data indicated on the pump

- DO NOT PUMP EXPLOSIVE OR INFLAMMABLE LIQUIDS SUCH AS GASOLINE, KEROSENE, FUEL OIL ETC. DO NOT USE IN EXPLOSIVE ATMOSPHERES.
- THE PUMP MUST BE USED ONLY WITH LIQUIDS COMPATIBLE WITH THE MATERIALS OF ITS COMPONENTS.
- Do not aim water jets at the equipment.
- Do not use solvents or fuel to clean the case outer surface.
- Only use ARAG genuine spare parts and accessories.

ARAG is not liable for serious personal injuries, damage to the system, to persons, animals or property caused by the non-observance of the above-mentioned rules, that will automatically void the warranty.

MSP400 Assembly and Part Breakdowns

Multistage Centrifugal Pump Complete Assembly
Kit: 504-01-MSP400



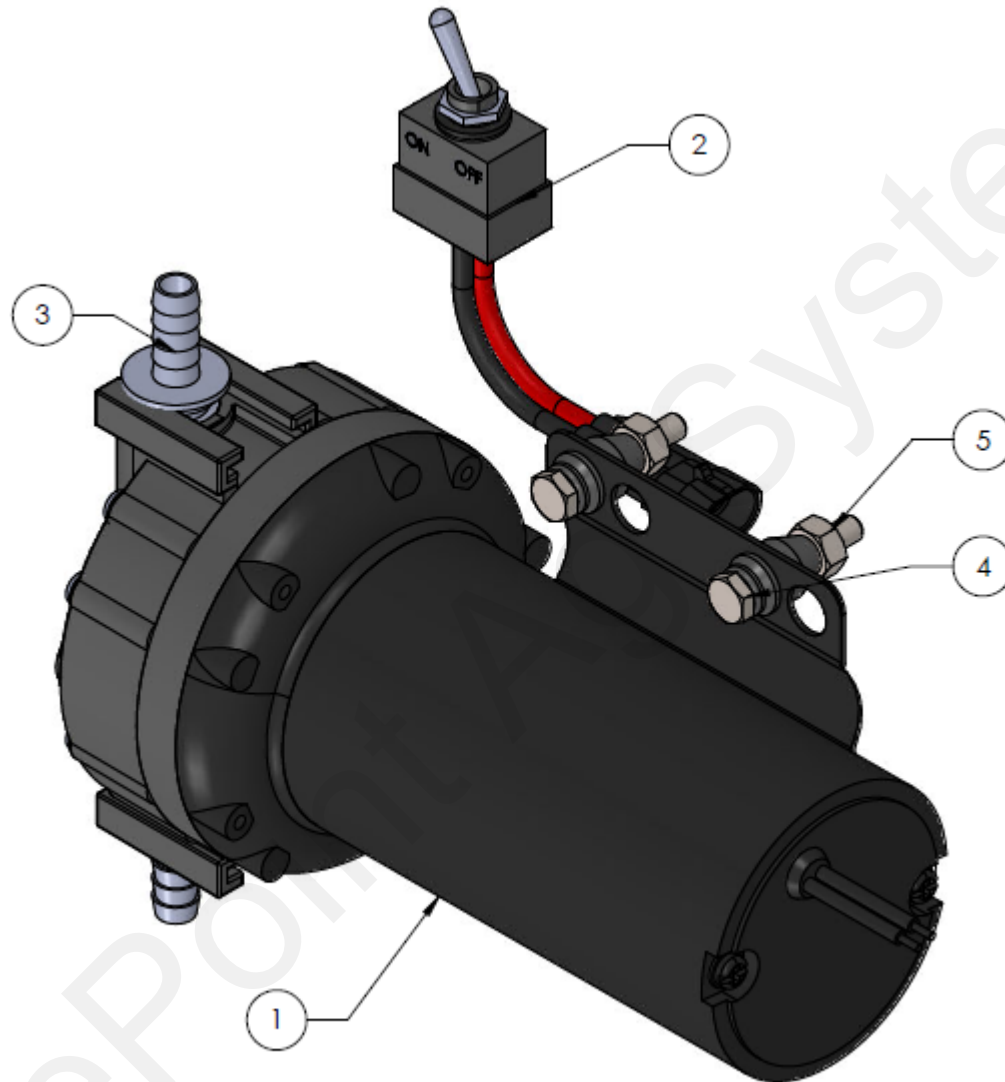
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	290-03-MSP400	Multistage Centrifugal Pump MSP400 - Pump Only	1
2	204-01-46221A65757	Electromagnetic Flow Meter 8 - 158 GPM	1
3	165-P15618A-3	PWM Hydraulic Valve Block - With Load Sense & Needle Valve	1
4	521-05-050150	3 Wire Pressure Sensor - 3 pin 150 Metri-Pack Connector	1
5	161-02-8MJ-8FJX-90	Elbow - #8 Female JIC x #8 Male JIC - 90 Degree	3
6	757-50715K176	Straight Hydraulic Adapter - 1/2" NPT Female x 1/2" JIC Male	1
7	Select Prime Option	Priming Pump or Gravity Prime Option (Gravity Prime Included)	1
8	163-01-3011-08	11" Hydraulic Hose Assembly - #8 Female JIC x #8 Female JIC	1
9	757-46105K67	Hydraulic Ball Check Valve (Male) - 1/2" NPTF x 1/2" NPTF	1
10	201-5502Y1	ARAG MSP400 RPM Sensor Adapter Cable	1

MSP400 Assembly and Part Breakdowns

Multistage Centrifugal Pump - Priming
Pump Kit
Kit: 504-01-200100

C

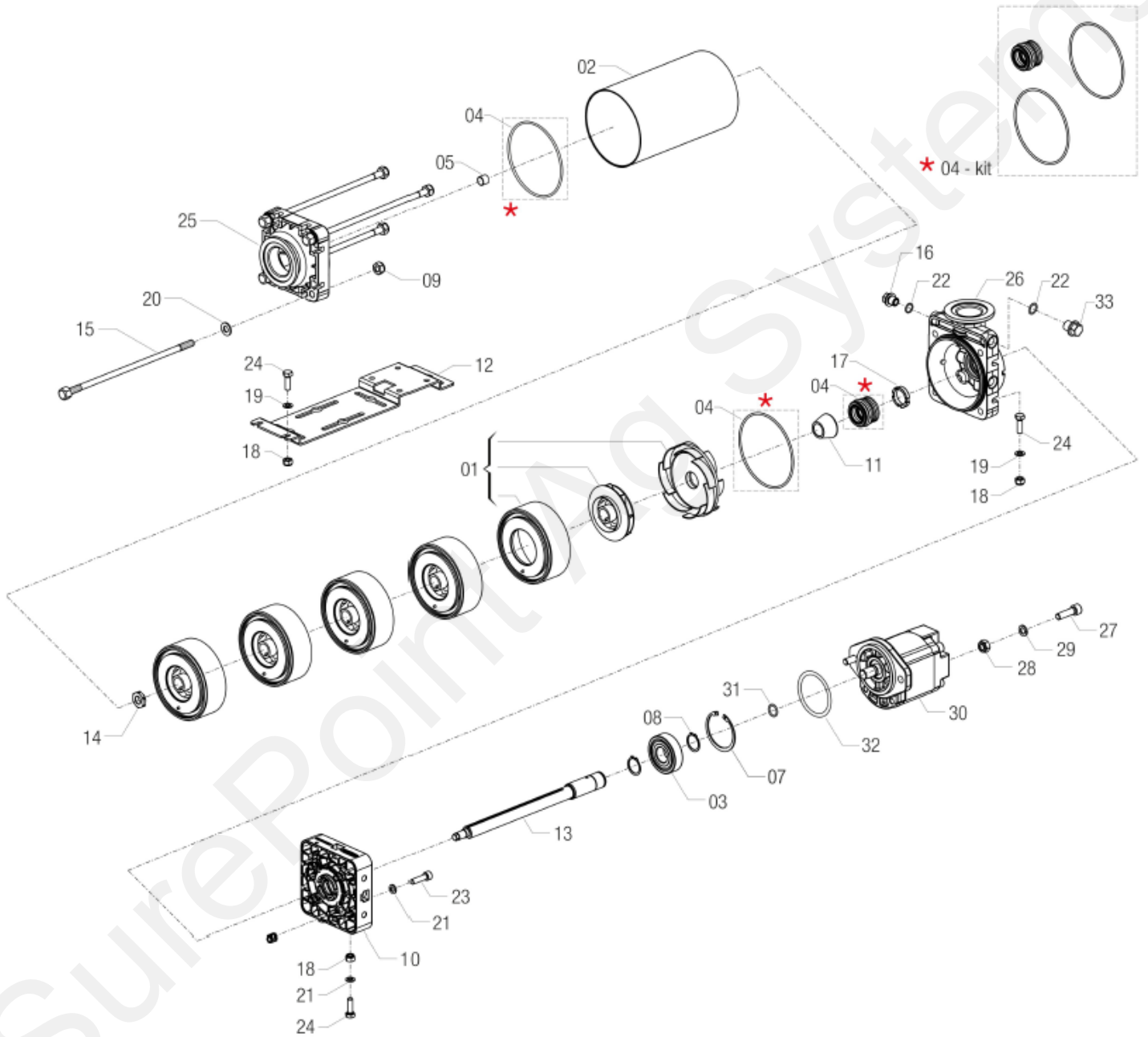
Maintenance
& Parts



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	290-01-5503-5.3-BPSS	5.3 GPM Electric Diaphragm Pump	1
2	201-5493Y1	Priming Pump Power Harness with Switch	1
3	708-5168836	Flo Jet O-Ring Quick Connect x 3/8" Hose Barb	2
4	300-040108-SS	1/4" x 1-1/2" Hex Head Bolts - SS	4
5	323-04-SS	1/4" Flange Nut	4
6	350-0605	#6 Stainless Steel Hose Clamp	3

MSP400 Assembly and Part Breakdowns

Multistage Centrifugal MSP400 Pump
P/N: 290-03-MSP400



MSP400 Assembly and Part Breakdowns

Multistage Centrifugal MSP400 Pump
P/N: 290-03-MSP400

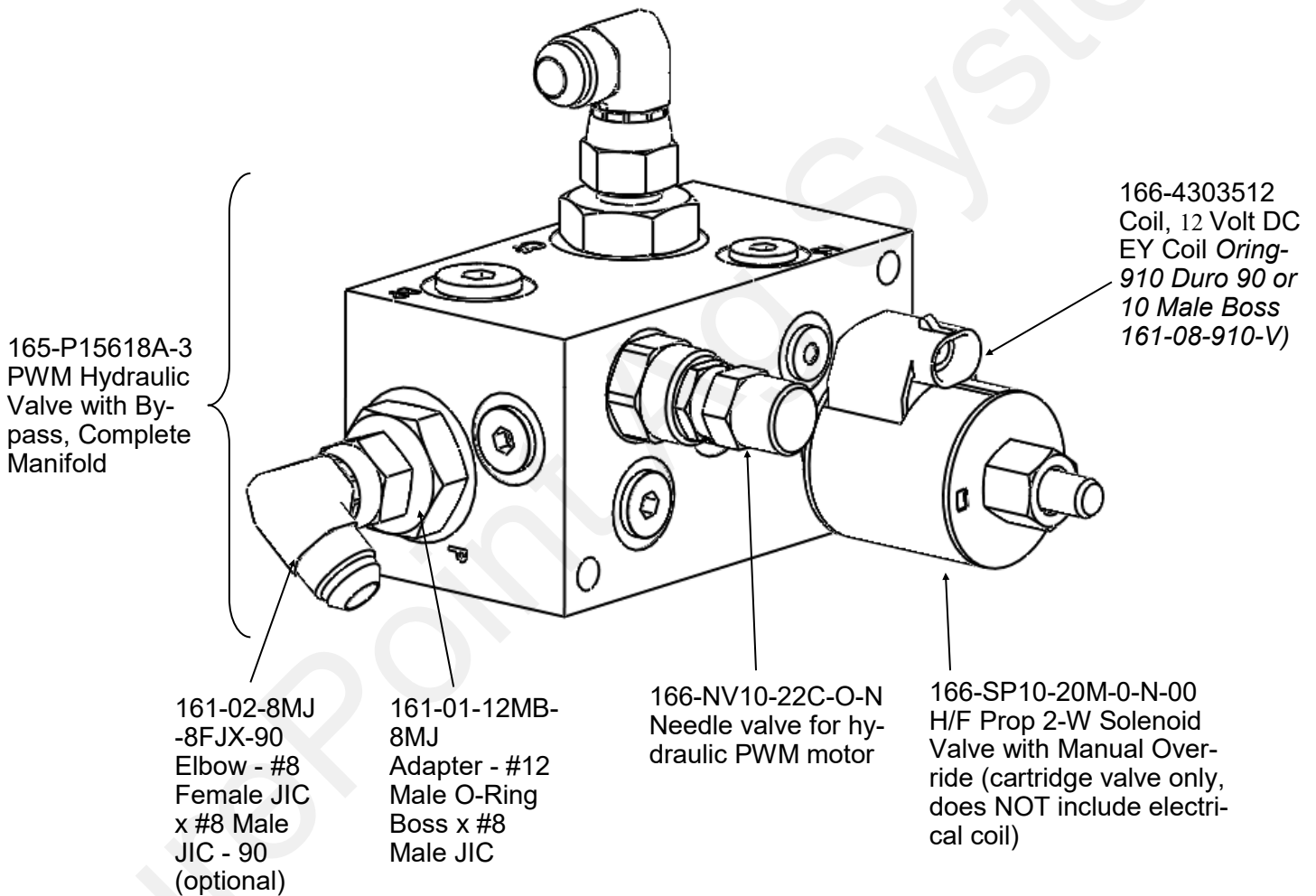


<u>Item</u>	<u>Part Number</u>	<u>Description</u>
1	290-03-970002.510	Impeller Kit MSP400 PP Pump
2	290-03-970050.040	Impeller Housing MSP400 Pump 5S
3	290-03-970000.061	Radial Ball Bearing 6305-2RS
4	290-03-970000.503	Tightening Kit
5	290-03-970000.081	Bushing IGUS XSM-1214-12
6		
7	290-03-B332Z2	Inner Snap Ring
8	290-03-B322X1	Outer Shaft Snap Ring
9	290-03-B12261	Self-Locking Nut M10
10	290-03-970000.060	Bearing Support
11	290-03-970000.080	Internal Spacer
12	290-03-970050.090	Fixing Bracket
13	290-03-970050.050	MSP400 Pump Shaft
14	290-03-970000.082	MSP400 Impeller Tightening Bolt
15	290-03-970050.091	Fixing Screws
16	290-03-970000.084	Cap
17	290-03-970000.083	Seal Spacer
18	290-03-B12251	Self-Locking Nut M8
19	290-03-B202H0	Flat Washer M8
20	290-03-B202J0	Flat Washer M10
21	290-03-B222H0	Washer Grover
22	290-03-G11015V	Viton O-Ring
23	290-03-V1C25L	Screw M8 x 30
24	290-03-V1M25K	Screw M8 x 25
25	290-03-970000.145	2" Full Port Clamp Adapter Pump Inlet
26	290-03-970000.140	2" Standard Port Clamp Adapter Pump Outlet
27	290-03-V1C26M	Screw M10 x 35
28	290-03-B12261	Self-Locking Nut M10
29	290-03-B222J0	Washer Grover M10
30	290-03-9700002.100	7.2CC Hydraulic Motor
31	290-03-G11094NB	NBR O-Ring
32	290-03-970000.062	Motor Seal
33	290-03-10320C08	Plug Fitting

PWM Valve and Motor Parts



- 164-FTA0994 4.0 CID motor (this is the standard motor beginning in 2016)
- 164-FTA1609 Same as 164-FTA0994, but with RPM Speed Sensor
- 164-FTA0925 4.9 CID Hydraulic Motor with PWM Valve and Bypass Valve, CW Rotation (includes all parts below EXCEPT hydraulic adapter fitting and elbows.)



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