SPX Hydraulic Technologies
5885 11th Street
Rockford, IL 61109-3699 USA
powerteam.com

Tech Services: +1 800 477 8326
Fax: +1 800 765 8326
Order Entry: +1 800 541 1418
Fax: +1 800 288 7031

Operating Instructions for:

MCS Series

MOTION CONTROL SYSTEM

⚠WARNING

These operating instructions must be read and thoroughly understood for the safe commissioning, operation, and maintenance of the Motion control system. The following procedures must be performed by qualified, trained personnel who are familiar with this equipment. While every attempt has been made to ensure clarity, the intent of this document is to provide basic guidance and it is the responsibility of the end user to review each application thoroughly for suitable usage. Users should utilize sound engineering judgment prior to, and during, product operation. Failure to comply may result in damage, injury, or death.

Form No. 1000773
Rev. 0 August 12, 2014

TABLE OF CONTENTS

SUBJECT	PAGE
GLOSSARY	4
DESCRIPTION	6
SAFETY SYMBOLS AND DEFINITIONS	8
SAFETY PRECAUTIONS	8
• PUMP	10
• ELECTRIC DRIVEN MOTOR	10
• HOSES	10
• CYLINDER	11
• ELECTRIC CONTROL UNIT	12
GENERAL OVERVIEW	13
• CYLINDER APPROACH TO LOAD	16
TRANSPORTATION	17
UNPACKING	17
OPERATING INSTRUCTIONS	19
1. Setup	19
2. Components	19
3. Documentation	19
4. Installation	19
5. Cylinders	19
6. Linear Displacement Sensors	20
7. Hydraulic Connections	20
8. Electric Connections	20
9. Important	21
SETUP AND STARTUP	21
ALARMS AND HOW TO RESET	35
GENERAL MAINTENANCE	37
1. System Evaluation	37
2. Inspection	37
3. Periodic Cleaning	37
4. Hydraulic Fluid Level	37
5. Hose Connections	38
6. Storage	38
TROUBLESHOOTING GUIDE	39
SCHEMATICS	42

Form No. 1000773
Rev. 0 August 12, 2014

TABLE OF CONTENTS

COMPONENT SPECIFIC DATA SHEETS 43

ANNEX 44

1. SPX cylinder size and square centimeter (aera) table 44

2. Motion Control System Checklist 44

3. Declaration of Conformity 46

POWER TEAM FACILITIES 47

Form No. 1000773
Rev. 0 August 12, 2014

GLOSSARY

In the context of this Instruction sheet, the following words have the meaning as described:

Accuracy	Difference in measurement unit (usually mm or inch) between the load movement of the leading vs the lagging lifting point.
Actuation time	Time period during which the spool of the directional valve as well as the spool of a 2-position-2-way valve to at least one hydraulic circuit is energized.
Displacement mode	Operational mode in which the PLC unit determines the Actuation time of each 2-position-2-way valve and thus keep the movement of the load within the preset accuracy.
Displacement sensor	Device to measure the movement of the load as a result of the application of forces generated by hydraulic cylinders
Forced zero	Starting point of the controlled load movement achieved by pressing the "Reset" button. For Displacement mode only
Hydraulic circuit	Hydraulic Cylinder connected to a 2-way-2-position valve and the return line of the pump unit via a hydraulic hose
Lifting point	The location on the load where force generated by hydraulic cylinders is applied
Manual mode	The operator is solely responsible and in control of the movement of each cylinder while using manual mode!
⚠WARNING	Operational mode in which the PLC unit does NOT have any automated control function.
Measuring system	Set of analog displacement sensor, sensor cable and analog pressure sensor, one each per hydraulic circuit
Motion Control	Any type of movement or translocation of a heavy load by means of forces generated by hydraulic cylinders operated by and under the control of a PLC-based control system

Form No. 1000773
Rev. 0 August 12, 2014

PLC unit — Programmable Logic Controller composed of analog input channels,
digital output channels and computing capabilities to control the advance and retract operation of hydraulic cylinders within specific parameters of accuracy and repeatability.

Pressure mode — Operational mode in which the PLC unit controls the pressure applied to each hydraulic circuit against a maximum pressure value.

⚠WARNING — There is NO control of the actual movement of the load in this mode.

Pressure sensor — Device to measure the oil-pressure within the hydraulic circuit, one per hydraulic circuit (motion point).

Pump unit — Assembly of a hydraulic pump mounted on a reservoir with valves and pressure sensors.

Sensor cable — Shielded cable between the Displacement sensor and the PLC unit as
carrier for the analog signal generated by the Displacement sensor.

Target — Total movement of the load that shall be achieved simultaneously at all
lifting points under the control of the PLC unit.

Form No. 1000773
Rev. 0 August 12, 2014

DESCRIPTION

Motion control is all about precision and control of a mass in motion; precision in the measurement of movements and control over the energies involved.

Whether it is a bridge, a building or any other kind of heavy load; lifting, lowering, tilting or positioning of such a load can be carried out completely automatically with a high degree of accuracy when using the SPX® Power Team® Motion Control System.

The PLC-controlled system includes a combination of digital actuation and digital control that provides significant advantages including time savings, repeatability, and extremely low internal stress in the object being moved.

In the standard configuration, a state-of-the-art A/D measurement system captures the displacement of the load during the movement process, in increments of less than two hundreths of a millimeter. Those digital signals are then processed by the PLC, utilizing powerful algorithms, to generate the digital output used by the hydraulic system.

With system performance being driven by extremely short duration actuation times for specifically selected valves, only small units of oil are directed to the selected hydraulic cylinders at any given moment. With this "partitioning" of the hydraulic oil, the hydraulic system becomes a virtual digital hydraulic system with all advantages of checkability and control over the movement of the load.

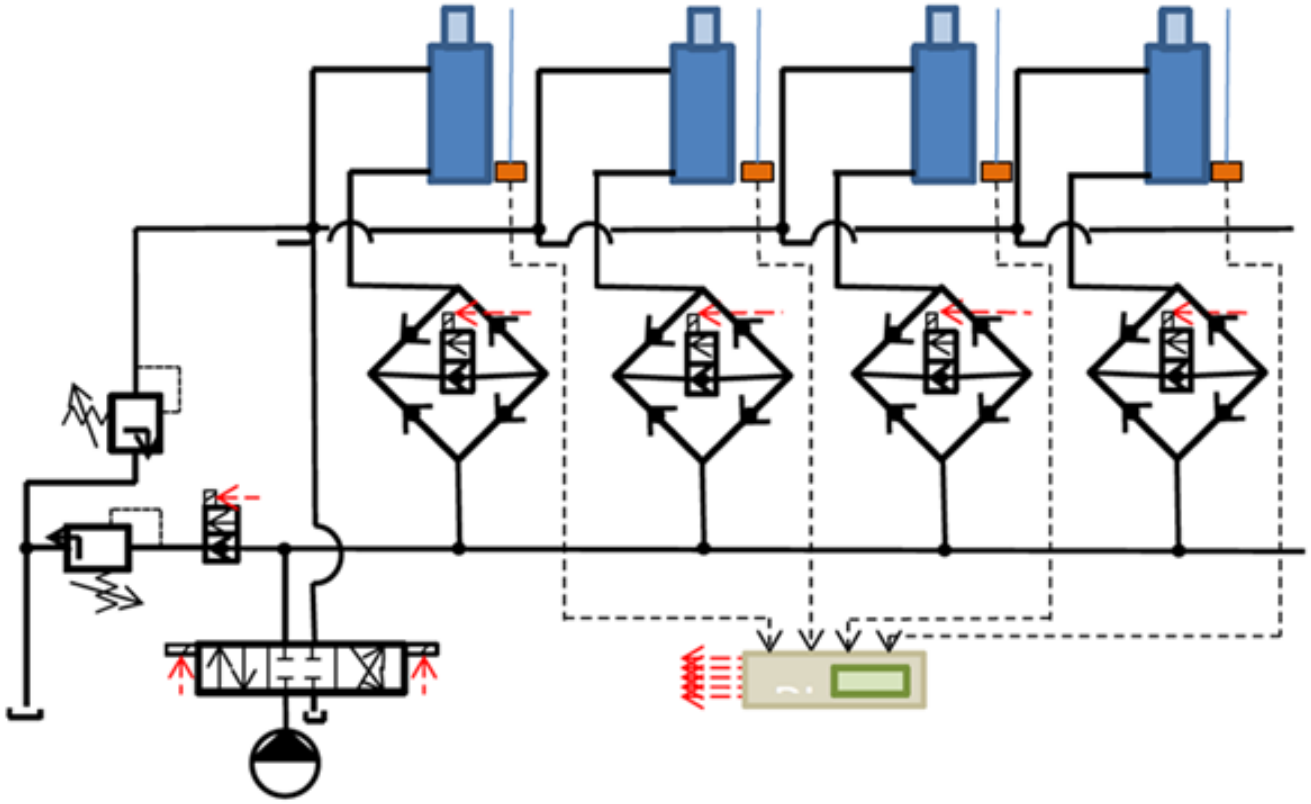
Subsequently, with all movement points being synchronized and under full control, no additional stresses are induced into the object being moved due to bending, torsion or shifting loads.

Measurements are taken and calculations are made utilizing a Best Developed
Available Technology (BDAT) PLC. Using the BDAT-PLC allows the operator to focus on monitoring the movement without having to interfere or even take long-lasting manual interventions. This creates the basis for significant time savings compared to traditional methods of moving heavy loads.

Improved control in applications that involve the same movement repeatedly, such as self-climbing formworks, strand-lift or stage-lift operations, is due to the functionality of the PLC software and the operational features provided by the HMI (Human Machine Interface).

The same factors also allow for an automated documentation of the movement including pressure (force) on the various cylinders, a time signal and all operator actions taken via the HMI (Human
Machine Interface).

Form No. 1000773
Rev. 0 August 12, 2014



The motion control system is a PLC-based eight lift point (expandable) motion control system which allows for accurate and reliable control of multiple hydraulic cylinders to accomplish the lifting / lowering / pushing / etc. of almost any size load. The PLC software controls valves
feeding each hydraulic cylinder in a way that will keep the load-movement synchronized within the preset tolerance range, regardless of the actual load distribution within the hydraulic circuit.

• One hydraulic setup suits both single and double-acting cylinders under different pressure - different load – in each circuit

NOTE: When using single - acting cylinders, an overcenter, or other appropriate valve should be used as safety in the event of hose break.

• Controlled cylinder movement in both directions: advance and retract

• Complete Motion Control System package consists of the following modules
- Controller
- Measuring System
- Pump Unit
- Valve System
- Electrics/Electronics

Form No. 1000773
Rev. 0 August 12, 2014

SAFETY SYMBOLS AND DEFINITIONS

The safety signal word designates the degree or level of hazard seriousness.

[**IMPORTANT:** This guide cannot cover every hazard or situation so always do the job with **SAFETY FIRST** in mind.]

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

IMPORTANT: Important is used when action or lack of action can cause equipment failure, either immediate or over a long period of time.

SAFETY PRECAUTIONS

⚠ DANGER

In order to take the necessary actions to avoid an accident with or any damage to the MCS motion control system, or the load being positioned, note:

Create a lifting plan that includes:

- Who is involved and what their responsibilities are.
- What the lift objectives are and what are actions and their sequence in order to achieve the lift.
- When the lift will take place, over what time frame .
- Where the lift takes place and where critical lift or reaction points are located.
- A comprehensive safety plan.
- Local special conditions (legal, environmental, geographical, etc.)

Before putting the motion control system into operation, the operator shall analyze the lift application for all foreseeable risks, their likelihood to occur, and the potential consequences of the identified risks as per ISO 31000 and ISO/IEC 31010 in their actual
current version.

Create a lifting log documenting the lifting job as per annex **XX** of this manual.

- Read and understand the Operating Manual before operating this equipment. For the latest version of the instruction please visit the “Resources” page on our Website (www.PowerTeam.com)
- **IMPORTANT:** For instructions specific to the various system components refer to the related individual manufacturer’s instructions that have been included with the MCS.
- **IMPORTANT:** The following procedures must be performed by qualified, trained personnel who are familiar with this equipment. Operators must read and understand all safety precautions and operating instructions included with the MCS Motion

Control System. If the operator cannot read these instructions, operating instructions and safety precautions must be read and discussed in the operator's native language.

- The motion control system is designed for general use in normal environments. These products are not designed for lifting and moving in special work environments such as: explosive, flammable, or corrosive. Only the user can decide the suitability of this

system for use in these conditions or extreme environments. Power Team will supply information necessary to help make these decisions. Consult your nearest Power Team facility.

- Safety glasses and hearing protection must be worn at all time by the operator and anyone within sight of the unit. Additional personal protection equipment may include: face shield, goggles, gloves, apron, hard hat, and safety shoes.
- The owner of this motion control system must ensure that safety-related decals are installed, maintained, and replaced if they become difficult to read or understand.
- Disconnect electrical power prior to opening electrical cabinet.

⚠CAUTION To prevent operator error, perform all of the following steps to develop a lift plan for therequirements including and especially concentrating on the controlled movement with an assistant

operator whose sole task it is to double-check and verify any input and operational action taken by the main operator.

IMPORTANT: All movements to be performed by the Motion Control System must be ordered and approved by the person responsible at the job site. SPX Power Team will assist in operating the Motion Control System, but cannot be responsible for static or strength calculations of the structure or load to be moved.

⚠WARNING After setting up the MCS, the system needs to be tested for correct mapping of circuit number on the screen versus displacement sensors and correlation with the 2-way valves. Extend each displacement sensor individually for approximately 100 mm and verify the displacement

indication on the screen to show the same change of values. Set the system into “Manual” mode and activate each circuit one by one. Verify the function of the related 2-way valve by checking the

movement of the spool-core.

Form No. 1000773
Rev. 0 August 12, 2014

PUMP

⚠WARNING

- Do not exceed the hydraulic pressure rating noted on the pump nameplate or tamper with the pump's internal high pressure relief valve. Creating pressure beyond rated capacities can result in personal injury.
- Retract all cylinders in the system before adding fluid to prevent overfilling the pump reservoir. An over-fill can cause personal injury due to excess reservoir pressure created when cylinders are retracted.

ELECTRIC-DRIVEN MOTOR

⚠WARNING

Electrical work must be performed and tested by a qualified electrician per local directives and standards.

- Disconnect the pump from the power supply and relieve pressure before removing the motor case cover, or performing maintenance or repair.
- Check the total amperage draw for the electrical circuit you will be using. For example: Do not connect a pump that may draw 25 amps to a 20 amp fused electrical circuit.
- Never use an ungrounded power supply with this unit.
- Changing the voltage is an involved and, if incorrectly performed, hazardous procedure. Consult the manufacturer for specific information before attempting rewiring.
- Wire pump motors for counterclockwise rotation when viewed from the shaft end of the motor.
- Do not attempt to increase the power line capacity by replacing a fuse with another fuse of higher value. Overheating the power line may result in fire.
- Exposing electric pumps to rain or water could result in an electrical hazard.
- Avoid conditions that can cause damage to the power cord, such as abrasion, crushing, sharp cutting edges, or corrosive environment. Damage to the power cord can cause an electrical hazard.

HOSES

⚠WARNING

- Before operating the pump, tighten all hose connections using the correct tools. Do not over-tighten. Connections should be only secure and leak-free. Over-tightening can cause premature thread failure or high pressure fittings to split at pressures lower than their rated maximum operating pressure.

Form No. 1000773
Rev. 0 August 12, 2014

- Should a hydraulic hose rupture, burst, or need to be disconnected, immediately depress the **RED** emergency E – Stop Button to shut off the pump. Never attempt to grasp a leaking hose under pressure with your hands. The force of escaping hydraulic fluid could cause serious injury.
- Do not subject the hose to potential hazard, such as fire, sharp surfaces, heavy impact, or extreme heat or cold. Do not allow the hose to kink, twist, curl, or bend so tightly that the fluid flow within the hose is blocked or reduced. Periodically inspect the hose for wear, because any of these conditions can damage the hose and possibly result in personal injury.
- Do not use the hose to move attached equipment. Stress can damage the hose and possibly cause personal injury.
- Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive material such as creosote-impregnated objects and some paints. Consult the manufacturer before painting a hose. Never paint the couplers. Hose deterioration due to corrosive materials may result in personal injury.

CYLINDER

⚠ DANGER

- Do not exceed rated capacities of the cylinders. Excess pressure may result in personal injury.
- Cylinders should be arranged, as much as practical, to evenly distribute the load to each cylinder.
- Avoid off-center loads that could damage the cylinder and/or cause loss of the load.
- Read and understand all safety and warning decals and instructions for devices attached.
- Inspect each cylinder and coupler before each shift or usage to prevent unsafe conditions from developing.
- Do not use cylinders if they are damaged, altered or in poor condition.
- Do not use cylinders with bent or damaged couplers or damaged port threads.
- With the MCS, the use of an extension with a hydraulic cylinder is prohibited.
- Avoid pinch points or crush points that can be created by the load or parts of the cylinder.
- To help prevent material fatigue if the cylinder is to be used in a continuous application, the load should not exceed 80% of the rated capacity or stroke.
- Cylinder must be on a stable base which is able to support the load while pushing or lifting.
- To help prevent personal injury, use shims, friction material or constraints to prevent slippage of the base or load.
- Do not set poorly-balanced or off-center loads on a cylinder. The load can tip or the cylinder can “kick out” and cause personal injury.
- Do not use the locking collar on a threaded piston as a stop. The threads may shear resulting in loss of the load, Dammage to equipment and personal injury.

Form No. 1000773
Rev. 0 August 12, 2014

- Because this system is used to lift or lower loads, be certain that the load is under operator control at all times and that others are clear of the load.
- Never Rapidly drop the load in an uncontrolled manner.
- As the load is lifted, use mechanical blocking and cribbing to guard against a falling load.
- To help prevent personal injury, do not allow personnel to go under or work on a load before it is properly cribbed or blocked. All personnel must be clear of the load before and during lowering.
- Never use extreme heat to disassemble a hydraulic cylinder or ram. Metal fatigue and/or seal damage will result and can lead to unsafe operating conditions.

IMPORTANT

- Keep the cylinders clean at all times.
- While at a job site, when the cylinder is not in use, keep it fully retracted and upside down.
- Use an approved, high-grade pipe thread sealant to seal all hydraulic connections. PTFE tape can be used if only one layer of tape is used and it is applied carefully (two threads back) to prevent the tape from being pinched by the coupler and broken off inside the pipe end. Any loose pieces of tape could travel through the system and obstruct the flow of fluid or cause jamming of precision-fit parts.
- Always use protective covers on disconnected quick couplers.
- Limiting the stroke on spring return cylinders will prolong spring life.
- Limiting the stroke and pressure on all cylinders will prolong their life.

ELECTRICAL CONTROL UNIT

⚠WARNING

If the HMI(Human machine interface) touch screen becomes unreadable at any time during operation of the MCS system, depress the **RED** emergency stop button **IMMEDIATELY** to stop system operation until trouble shooting of malfunction can be performed.

To prevent personal injury,

Electrical work must be performed by a qualified electrican per local directives and standards.

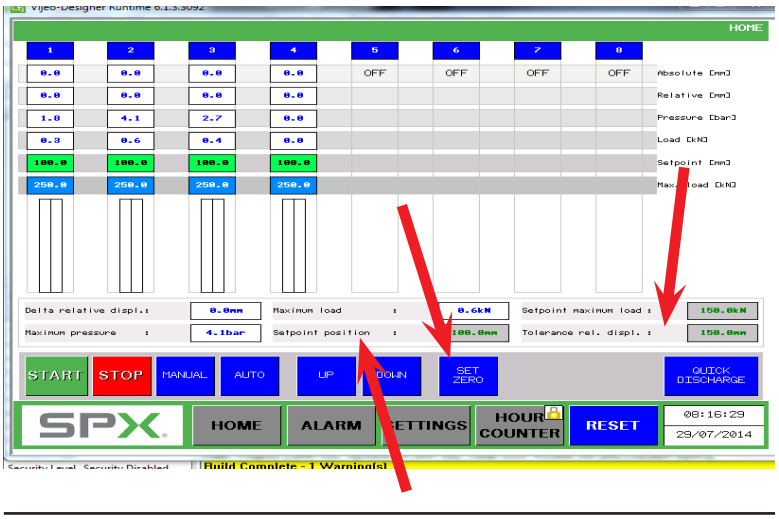
- Disconnect the electrical control cabinet control unit from the power supply before removing the cover of the control unit or performing maintenance or repair on electrical components.
- Some electronic components inside the electrical control unit are sensitive to static charges. Always use an anti-static wrist band connected to the ground-earth bar inside the electrical Control unit before performing any maintenance or repair work on those electronic components.

Form No. 1000773
Rev. 0 August 12, 2014

GENERAL OVERVIEW

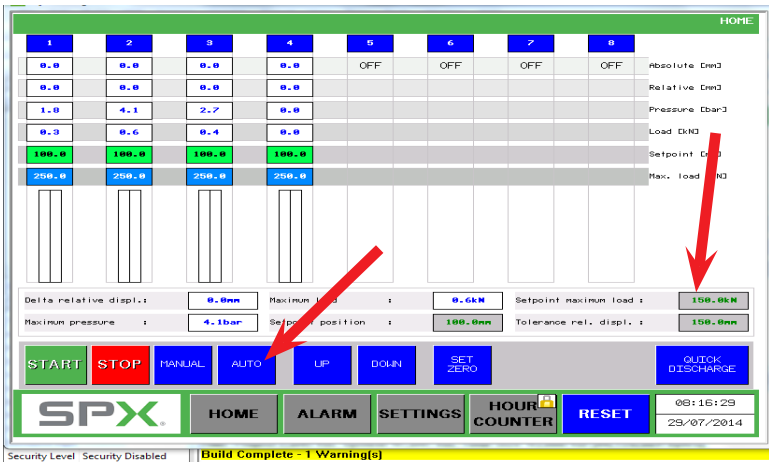
(Detailed setup, start up and Operating Instructions begin on page 20)

- On the HMI touch screen, push the “Set Zero” button to set the readings of all displacement sensors to “Forced Zero” This defines the starting point of the synchronized movement.



- Enter the allowed maximum difference between the leading and the lagging lift point (Tolerance Rel. Displ.). Make sure you observe the unit-setting you have chosen earlier. Enter the target stroke all lift points shall reach simultaneously under "Setpoint Position".

- **IMPORTANT:** As a background safety-check, the system will continuously monitor the pressure in each cylinder and compare it to a pre-set maximum pressure value. Enter this max pressure value per cylinder. This value shall be calculated based on the cylinder capacity and the expected / predicted load at the referring Lifting point.



- On the HMI, set the operation mode to “Auto”.

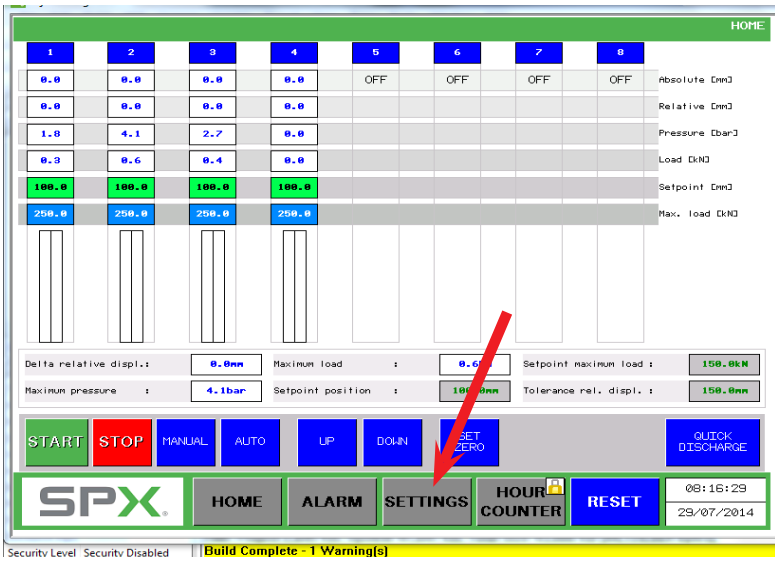
NOTE: It is suggested that for the first run, the duration **"ON"** be set at 40 ms, the duration **"OFF"** be set at 20 to 30 ms, and the release quick discharge pressure be set at 50 bar.

- As you select each cylinder, you will be required to input data for each of the cylinder’s relative to pressure at 4 and 20 mAmps, and maximum load and maximum pressure.

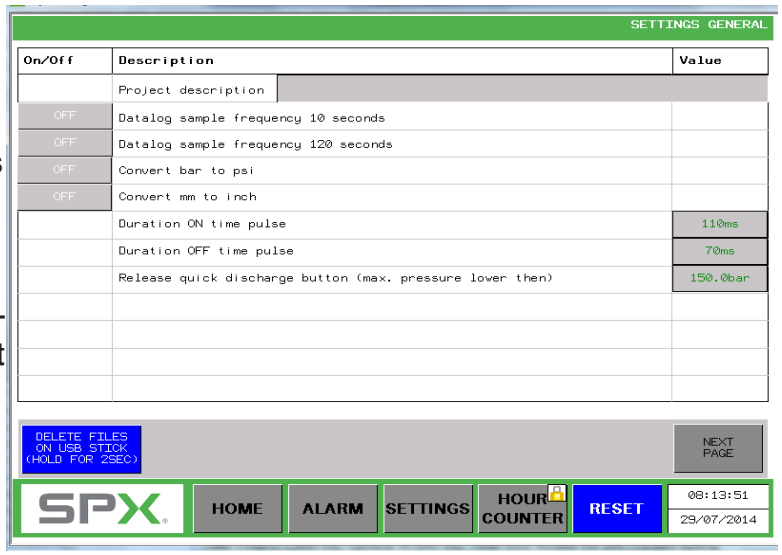
- Back on the home screen, you must set the parameters of set point position, set point maximum load, and tolerance for relative displacement. The set point position target has to be greater than the relative position of the cylinder’s in order to move the load up or down.

  NOTE: For the first test of lifting the platform, set the set point target at 25 mm. Before performing lift, manually measure the platform height at each active cylinder. Record the data for each cylinder.

- Enter the time increment value that the 2-way valves shall be operated within. Start with a short time value (e.g. 50 ms). Depending on the size and capacity of the cylinders, the length of the hoses and the pressure level needed for lifting, this time can be too short to allow for a reasonable lifting speed. Gradually increase the time during the operation and monitor the resulting overall accuracy. Too long of an Actuation time will cause the cylinders to advance or retract in too large of steps, subsequently exceeding the preset tolerance. In this case the PLC software will stop the operation, close all valves, and display an alarm on the screen of the HMI



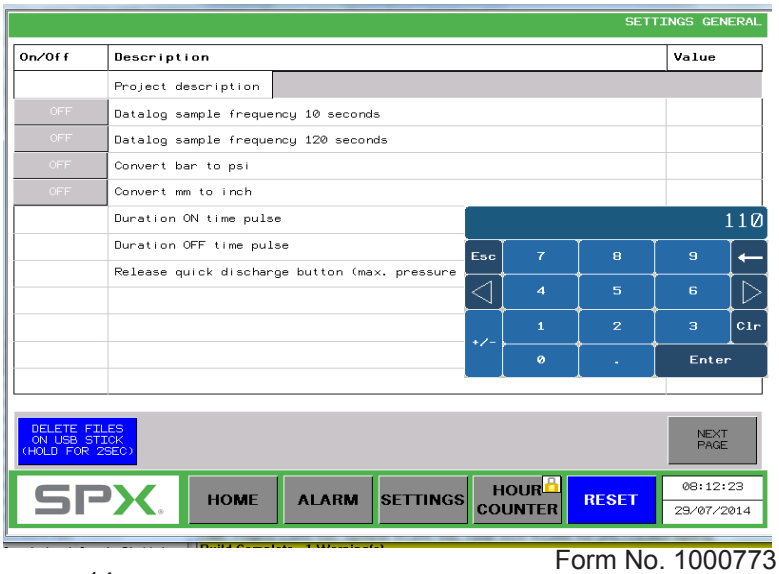
- Check all data and settings. Take notes of your settings in a Log-file as shown in Annex 1 of this instruction sheet.



- The PLC will perform a system integrity check to avoid using settings that are contradictory or might lead to a dangerous situation.

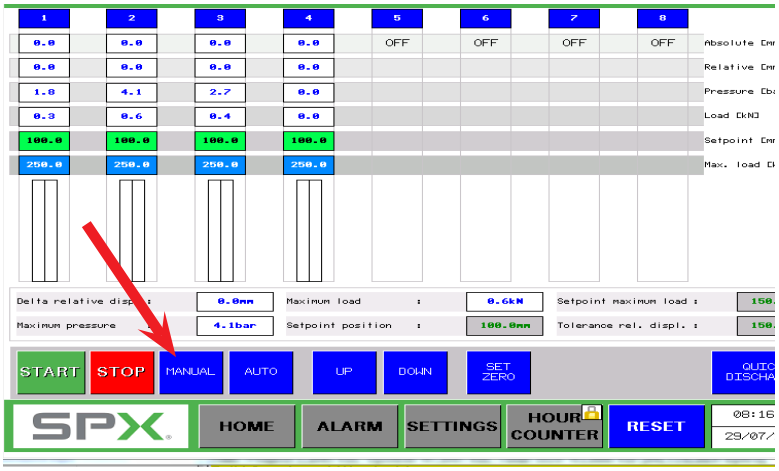
- On the home screen, confirm the cylinder selection that you will be using in the auto operation mode. They should be the same cylinder's that were originally set up in the Manual mode.The cylinders should be moved to a position that is not in contact with load to be lifted.

- On the first screen you'll need to establish the duration **"ON"** and the duration **"OFF"** times, as well as the release quick discharge pressure. You will establish these through drop down menus as described before.

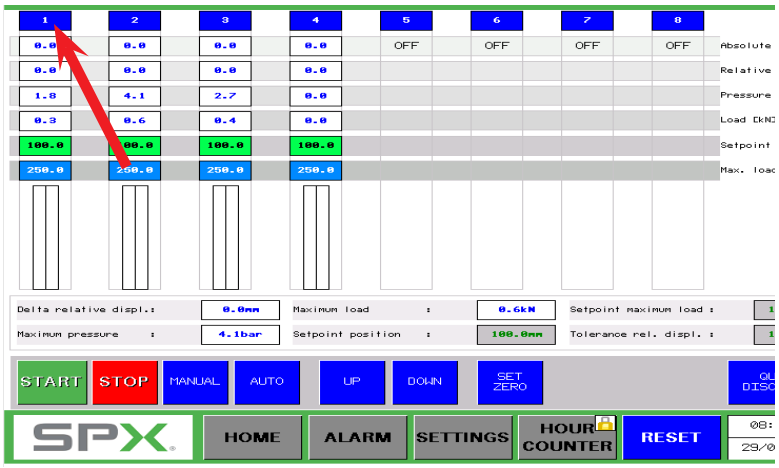


- Touch the auto button on the home screen. The pump will turn on.

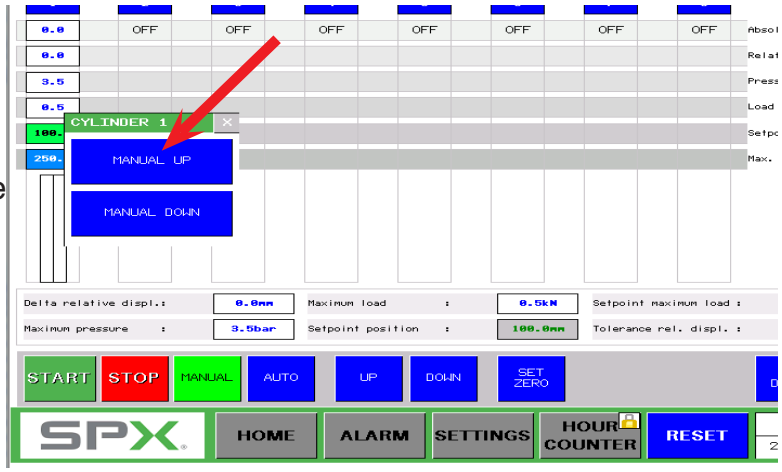
- **ON THE HOME SCREEN** select Manual mode of operation by pressing the Manual button on the screen. At this point the hydraulic pump turns on. No pressure is building in the system as the pump flows back to tank.



- To select a specific cylinder to raise, touch the numbered blue box at the top of the screen that corresponds to the cylinder you wish to move.



- Using the up and down buttons on the touchscreen that appear once a cylinder is selected will independently
manually raise and lower each active cylinder. This movement should be performed intermittently raising the cylinder piston rod 1 or 2 inches at a time until it gently touches the load to be lifted.



(SEE NOTES ON NEXT PAGE)

CYLINDER APPROACH TO LOAD

(Set the system into Manual mode)

⚠WARNING

There is NO control of the actual movement of the load in the manual mode! Set the maximum pressure to a setting that allows the plunger of each cylinder to move. However, this pressure setting must be low enough such that the cylinder cannot move the load, but only make firm contact with the load to be lifted.

⚠WARNING

During this operation the plunger of each cylinder will come into contact with the lifting point of the load. This can cause a pinch point. Make sure all personnel stand clear from moving plungers.
IMPORTANT: Too high of a pressure setting can cause a cylinder to start moving the load and cause unduly stress or even damage to the structure to be moved. Activate each circuit one by one until the plunger is in full contact with the load and the pre-set max pressure has been reached.

- **NOTES:** While in Manual operation mode only one cylinder may be operated at a time. System pressure should be low enough, there will be cylinder movement, but not high enough to allow the load to be lifted.

- Depending upon the length of hoses and the size of the cylinder's used as well as the length of the initial stroke it may be necessary to add additional oil to the tank.

- In any circumstance it is recommended to use pre filled hydraulic hoses with the same oil as the rest of the system before any lift is performed.

- While manually raising a cylinder, disconnect the connector wire from the position sensor at that cylinder and confirm that an alarm response is received and the system stops operating.

- Reattach the cable and touch re-set button on home page to continue testing.

Form No. 1000773
Rev. 0 August 12, 2014

TRANSPORTATION

Before transporting the MCS, make sure the system is switched off and all hydraulic pressure has been bled from the system. Remove all oil from the reservoir. Always disconnect all hydraulic and electric connections before attempting to move the MCS unit. After disconnecting hydraulic hoses re-install the dust covers on quick disconnects as well as hose fittings to prevent contamination from entering the hydraulic system.

For short on-site distances, always transport the control unit in a cradle or lifting device rated for the weight of the unit. Secure the unit against tipping over. Move the MCS unit by means of the lifting eyes attached to the frame or a forklift type vehicle using the side or end fork locations. Always move the MCS in an upright position.

For long distance transport, use an appropriately rated forklift and slowly place the MCS into the shipping container in which the MCS was delivered to the job site. Make certain all additional hardware and accessory items are securely stored within the shipping container prior to shipment.

UNPACKING

When unpacking, make sure the MCS is located on a stable, flat, leveled surface that will support the weight of the MCS. Carefully open the shipping container and arrange for its storage. Save the shipping container as it is re-useable. With a forklift that is rated to safely move the MCS, slowly remove the MCS from its shipping container. Save the shipping container as it is re-useable

Once the MCS is removed from the shipping container, locate the MCS on a flat, stable surface that is sufficient to withstand the weight of the MCS system without deforming the surface upon which it is resting.

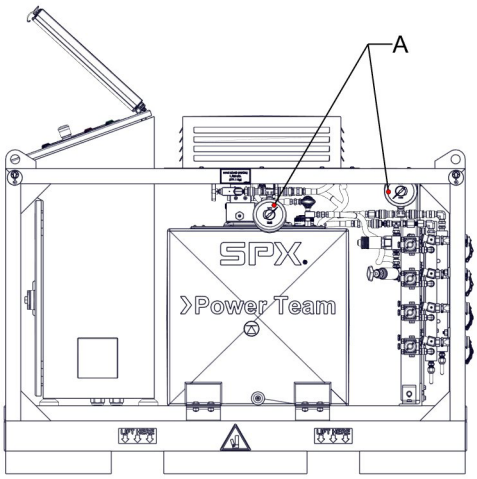
Check the completeness of the Motion Control System:

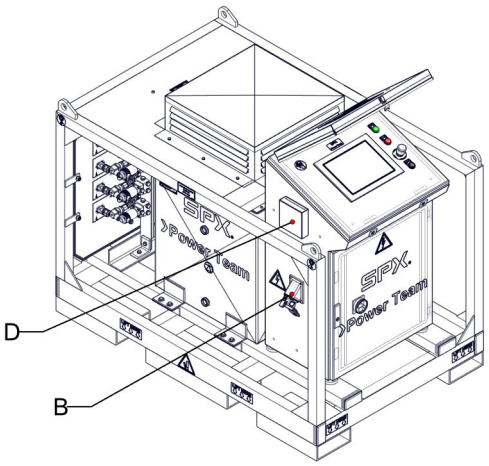
- Pump unit
- Control unit
- Displacement sensors (contained in two small cases – NOTE: The electrical control unit cabinet door key is included in one of these cases)
- Sensor cables (contained in one large case)
- Hoses (may not be included as part of the MCS control and may be packaged separately)
- Cylinders (may not be included as part of the MCS control and may be packaged separately)

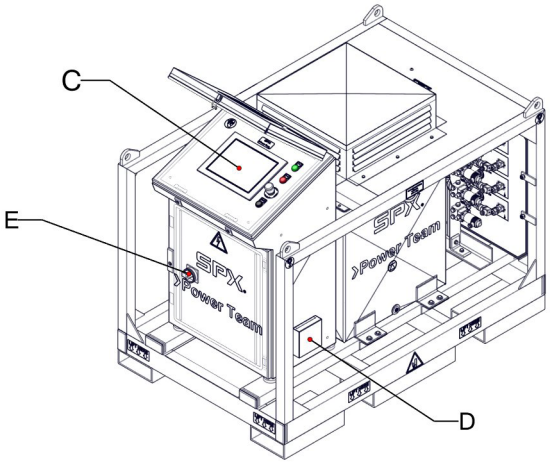
Check that all components are clean and without visible damage. Cable and hose connection points should be protected from environmental humidity and dust by protective covers installed on the unit. Confirm that the covers are in place and should remain in place until unit is ready to use.

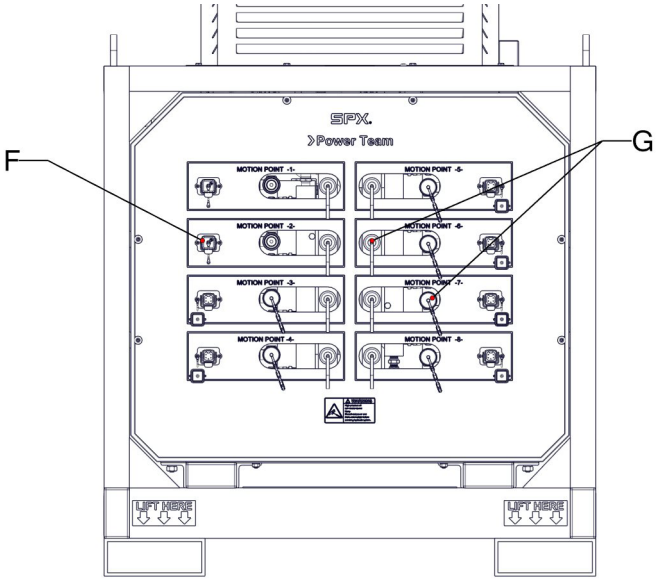
Check and confirm that the following items are undamaged and in good condition:

A. Pressure Gauges
B. Electrical Plug Outlet
C. HMI (Tough Screen)
D. External Cabinet Vents
E. Door Switch
F. Displacement Sensor Connectors
G. Hose Connection Quick Couplers









OPERATING INSTRUCTIONS

1. SET UP

Begin by visually checking the MCS unit, cables, sensors, cylinders and connectors (electrical with cables and hydraulic hoses) to confirm the integrity of all components and that there is no visible signs of damage.

2. COMPONENTS

⚠WARNING

Make sure that all components such as hoses, couplers, and cylinders are rated for for the maximum operating pressure provided by the pump unit (700 bar).

3. DOCUMENTATION

IMPORTANT: To avoid operator error and to document the performance of each operational step it is recommended that the operator fills in a checklist as shown in Annex 1 of this
instruction sheet during the Motion Control System operation.

4. INSTALLATION

Mechanicals set up

- Fill Reservoir with 40 Gallons (150L) of Power team hydraulic oil (Part Nos. 9616, 9636, 9637, 9638)

- Once the MCS has been moved into place, with no power cord attached, begin to physically connect the cylinders to of the MCS with the appropriate hoses. Position the magnetic bases of the position sensors by the appropriate cylinders and attach the appropriate cable to each position sensor and its respective connector on the MCS face plate.

5. CYLINDERS

- **IMPORTANT:** When placing the cylinders under the load to be lifted, the cylinders should be placed on a surface that is capable of supporting a minimum of 1.5 times the rated cylinder capacity without surface deformation. For example, use properly sized load-distributing steel plates in order to remain below maximum local surface loading conditions. Failure to do so may result in surface deformation that may lead to an unsuccessful lift, personal injury and damage to the structure being lifted.

- In addition to ground level surface support, make sure that the support point on the load to be lifted is capable of withstanding and distributing the lifting forces without deformation to the lift point itself.

- A review of each lift point's estimated load should be performed, so that when selecting and sizing cylinders for the lift, it is recommended that the load on the cylinder at each lifting point should not exceed 80% of the rated cylinder capacity.

6. LINEAR DISPLACEMENT SENSORS

Mounting position

- The displacement sensor must be firmly mounted as close as practical to the lift cylinder in a position which allows free cable movement and where damage to the sensor or cable from foreign objects is unlikely. The sensor will operate in any orientation. Where string cable
contamination by oil, water or particulate matter is possible, the sensor should be mounted in the vertical plane with the cable pointing down. Where necessary a sensor shield should be incorporated in the mounting assembly to protect the sensor from falling
solids or liquid media. It is also good practice to mount the sensor onto or close by a rigid part of the machine or system. Never let the sensor cables snap back into the sensor. It may damage the sensor. When mounting the position sensor make sure the linear travel of the cable is at 90 degrees to the sensor body surface.

- **IMPORTANT:** Any deviation from the 90 degree angle will reduce the life of the cable and cable outlet, and may affect the linear position readout.

- **CAUTION:** As a regular occurrence, moving heavy loads is typically performed during night time with limited visibility. Make sure that each lifting point and especially the location of the electrical control unit and pump unit has sufficient lighting. As a general rule always protect the electrical control unit from environmental influences such as rain, dust, vibration , heat, the physical damage ,etc.

Form No. 1000773
Rev. 0 August 12, 2014

7. HYDRAULIC CONNECTIONS (See Photos On Pages 21-23)

- Connect the cylinders to the pump unit with the appropriate length and pressure rated hoses.
- Clean the areas around the fluid ports of the pump and cylinders.
- Clean all hose ends, couplers or union ends.
- Remove the protective covers from the hydraulic quick connects.
- Connect the hose assembly to the lift point hydraulic outlet, and connect the opposite end of the hose to the cylinder.
- Throughout the entire lift operation, periodically check each connection for loose couplings, leaks, or problems.

8. ELECTRIC CONNECTIONS (See Photos On Pages 22-24)

- Connect the individual displacement sensor cables to the each sensor. Run the cable back to the MCS and connect the cable to the appropriate lift point connector.
- Double check the reference between the displacement sensor and lifting point.
- Clean the areas around the electrical connections on the displacement sensors.
- Remove protective covers and clean all connectors with a dry cloth.
- Affix the screw connections to the displacement sensors.
- A power cord connector is provided with the MCS unit. Attach the connector to an approprite sized electrical cable in conformance with all local and national electrical codes. All work must be performed by a qualified electrican.
- Connect the control box power cord to an appropriate power source.

9. IMPORTANT: Never run the pump on long, light gauge extension cords.

- To prevent equipment damage and a potentially hazardous condition, the correct voltage is required for the pump to operate. Verify the voltage rating on the pump name plate matches the outlet or power source you are using. Low voltage may cause: an overheated motor; a motor that fails to start under load; motor surging when trying to start; or a stalled motor before maximum pressure is reached. The motor nameplate can be accessed by removing the motor shroud on top of the MCS unit.

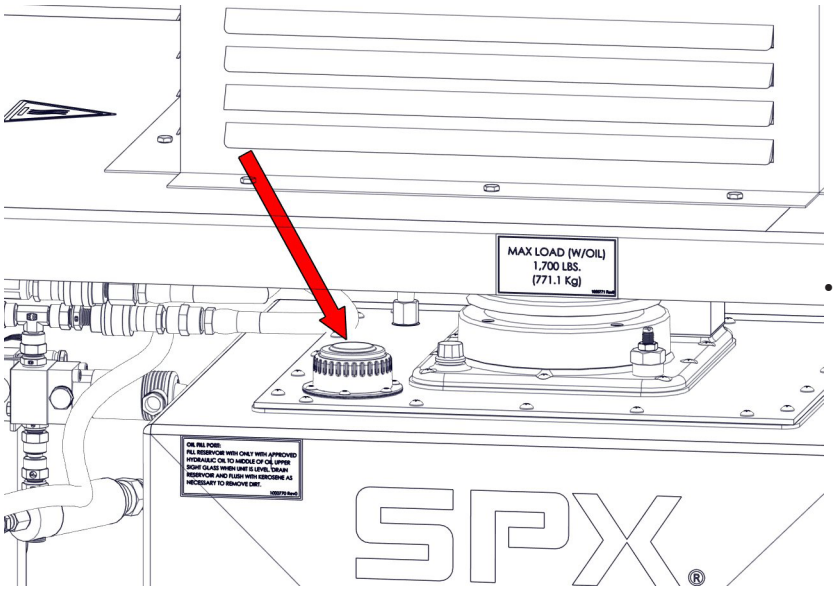
NOTE: After installing cylinders, hoses, sensors, and cables; have a second individual verify each hose and sensor cable connection for - 1) correct lift point and - 2) confirm connections are tight.

Form No. 1000773
Rev. 0 August 12, 2014

SET UP AND START UP

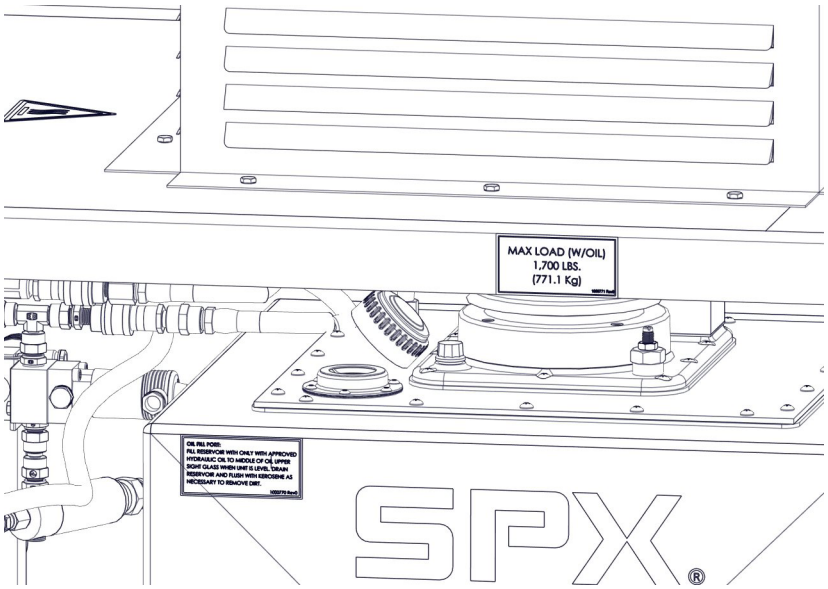
Note : Prior to setting up and starting the MCS perform a multiperson safety walk around to :

- Ensure cables and hoses will not be crushed/ pinched/ cut, during lift/ lower cycle.
- Ensure that all lift participants have knowledge of the safety plan.
- Confirm that there are no obstructions (i.e., overhead power cables, trees, other structures, etc.) that may interfere with the lift/ lower cycle.

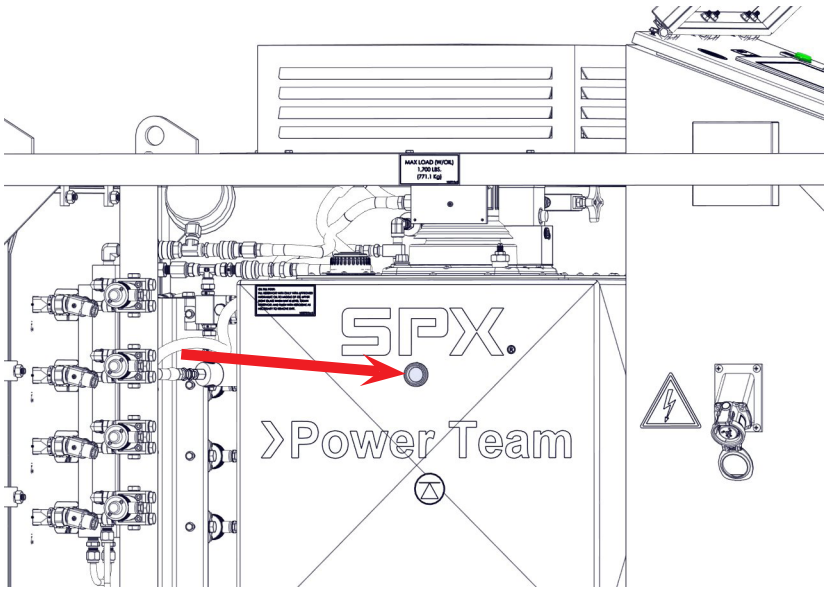


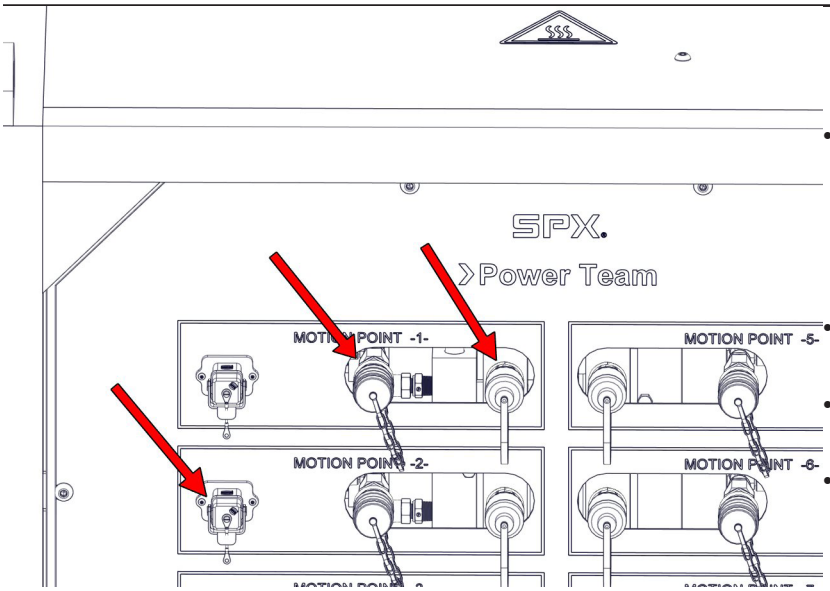
- **FILL WITH OIL:** Begin by locating the reservoir oil filler tube, located next to hydraulic pump.

- With a lint free cloth, clean around the reservoir oil filler tube. Open fill tube cover by turning counter-clockwise and fill reservoir with 40 Gallons filtered Power Team oil (part numbers 9616, 9636, 9637 9638)

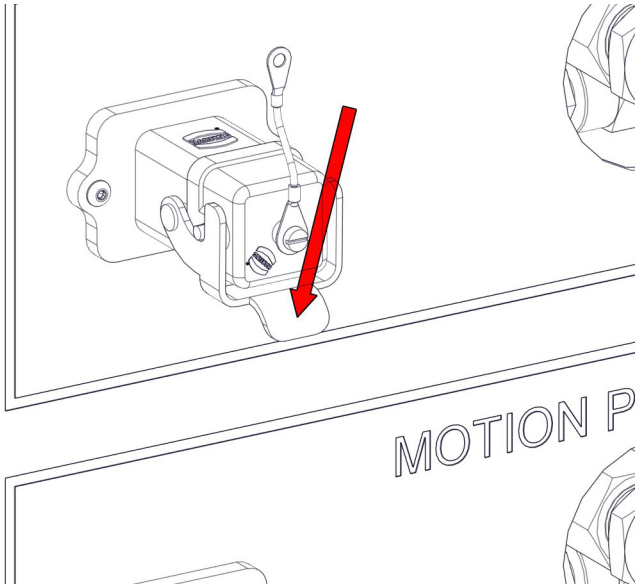


- When the reservoir is filled with 40 gallons, the oil level should be visible at mid-level in the sight gauge
- Location of the reservoir sight gauge by the electrical power plug (See Location At right)





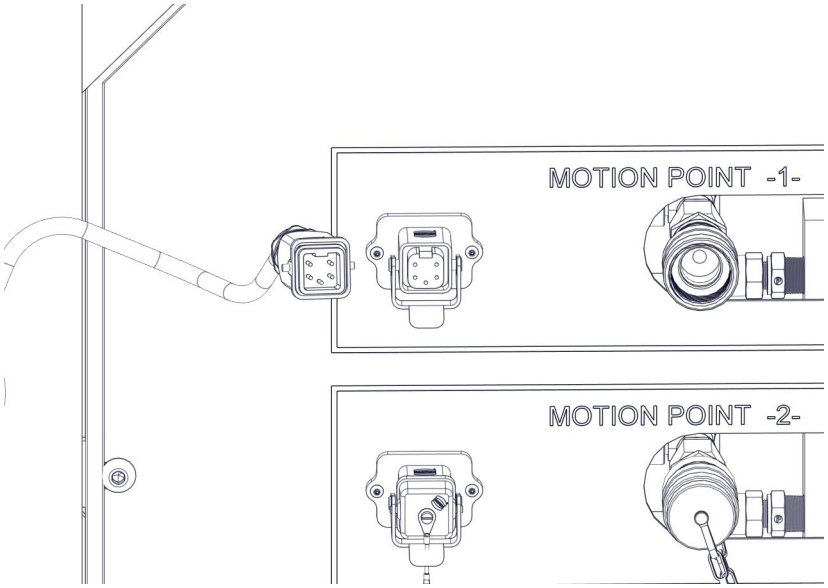
- There is one 25599 male quick disconnect coupler and one 25600-1 female quick disconnect coupler for each “Motion Point”. (Lift point)
- **(Left Side)** - Displacement sensor cable connector.
- **(Center)** - 25600-1 female quick disconnect coupler.
- **(Right Side)** - 25599 male quick disconnect coupler.

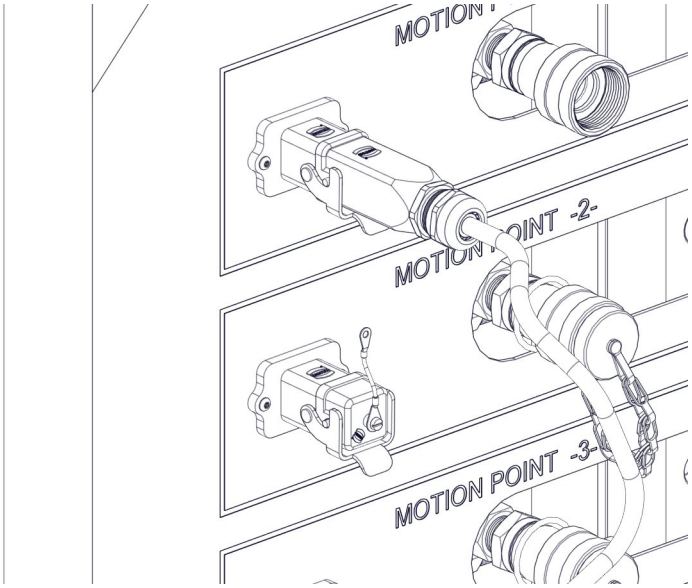


- To install the position sensor electrical cables, press down on the connector cover retaining bracket to remove the connector cover. This will allow you to connect the sensor cable to the connector.

Form No. 1000773
Rev. 0 August 12, 2014

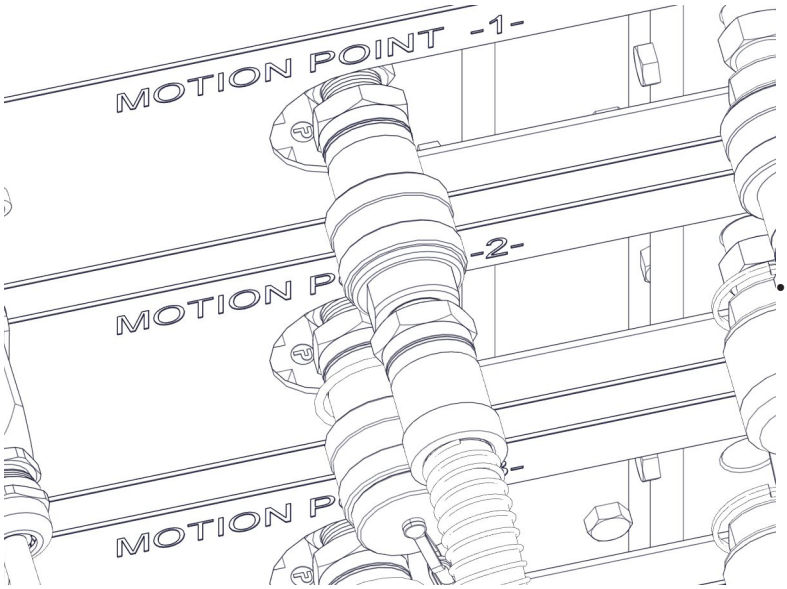
- The connector is a five pin connector with a slotted groove that will help assure installation of the mating connector in the correct position. Do NOT force the connectors together. Although a snug fit, the connectors should be easy to assemble. If not, check for bent pins in the connector on the cable end.
- Installation groove mates with tab in mating connector
- Attach the five pin connector on the sensor cable to the mating connector on the MCS faceplate.





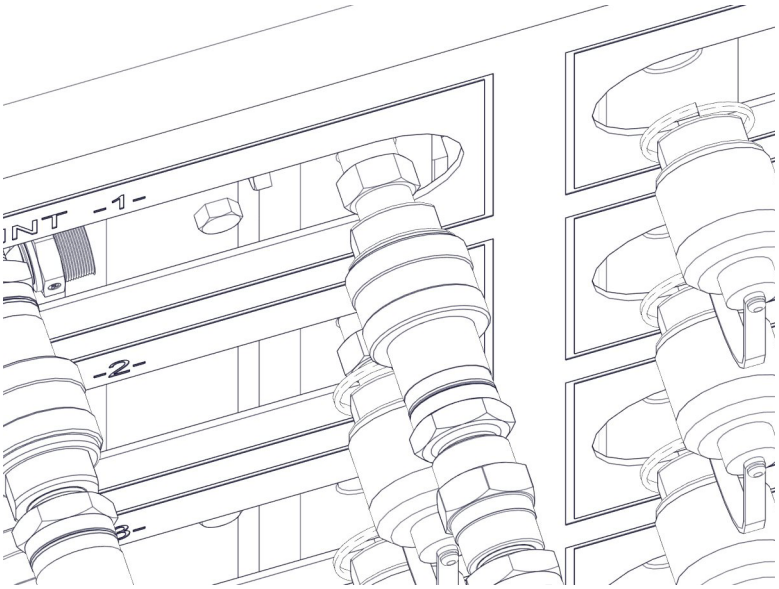
- Once the connector is installed, flip up the retaining bracket to securely hold the connector in place. This helps protect the connector assembly from becoming disengaged by vibration, or pulls on the cable during MCS operation.

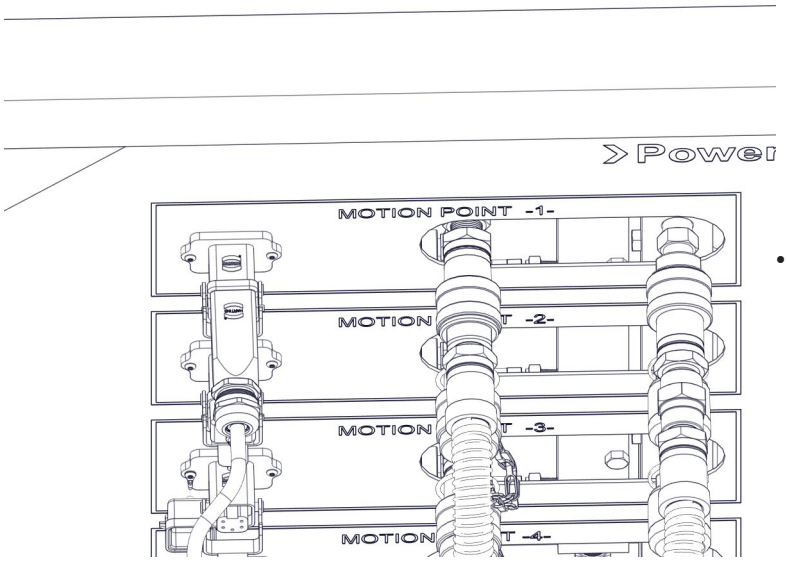
Form No. 1000773
Rev. 0 August 12, 2014



- Install the extend hoses from the base of the cylinder to the female quick disconnect - 25600-1 at each lift motion point to be tested.

- Install the retract hoses from the rod end of cylinder to the male quick disconnect - 25599 at each lift motion point to be tested.

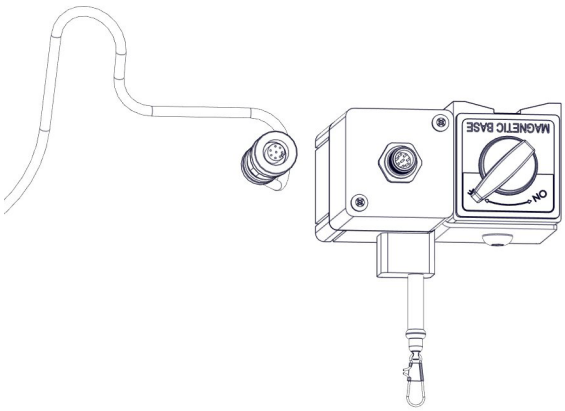


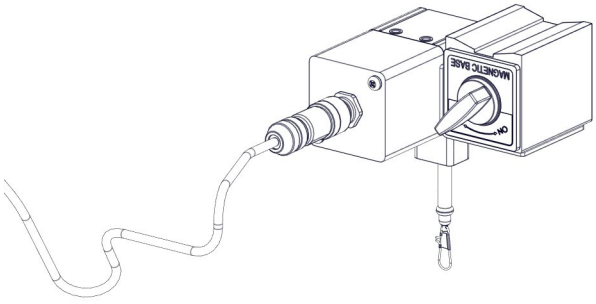


- This section of the front panel shows completed installation of hoses and electrical cables. Begin to install the hoses and cables as outlined in the following steps.

The linear displacement sensors included with the MCS are used to determine the relative position of each sensor with respect to all other linear sensors, with the MCS providing incremental adjustments to keep all cylinders within a predetermined range. The sensors are assembled to magnetic bases that allow each sensor to be attached to the load being lifted close to the cylinder that sensor represents. The sensors should be mounted as close as practical to each lift cylinder used in the lifting process.

Attach the displacement sensors close to each lifting point. Preferably hang the displacement sensors upside down underneath the load for additional protection of the displacement sensors against mechanical impact and water intrusion. Attach a small chain or similar means to the displacement sensor's cord and affix it to the cylinder foundation. Make sure that the displacement sensor's cord is pulled out several mm with the chain under slight tension in order to set an accurate "zero" point for the relative displacement measurements.



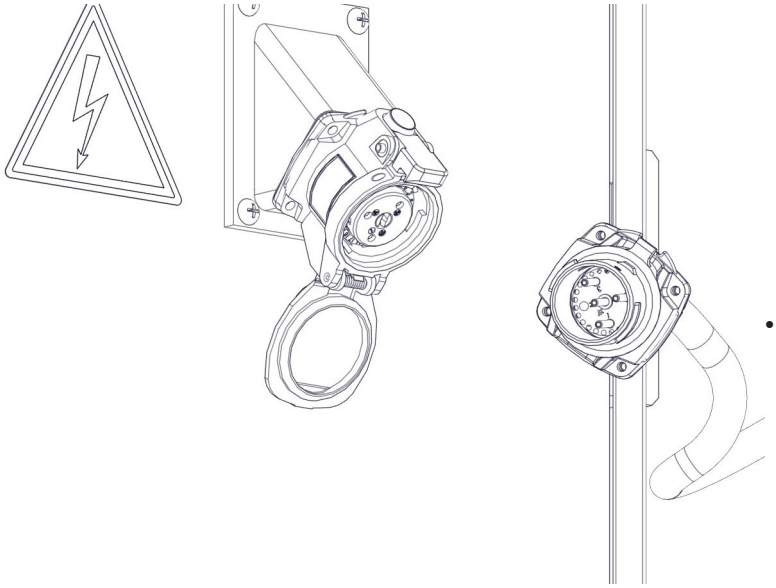


- If not already attached, attach the opposite end of the sensor cable (with the "8" pin screw-on connector) to the displacement sensor at each lift point. Make sure that the cable is connected to the sensor on the cylinder that MATCHES the hose connections for the lift motion point to be tested. Gently screw the connector onto the displacement sensor and hand tighten only in order to prevent damage to the sensor.

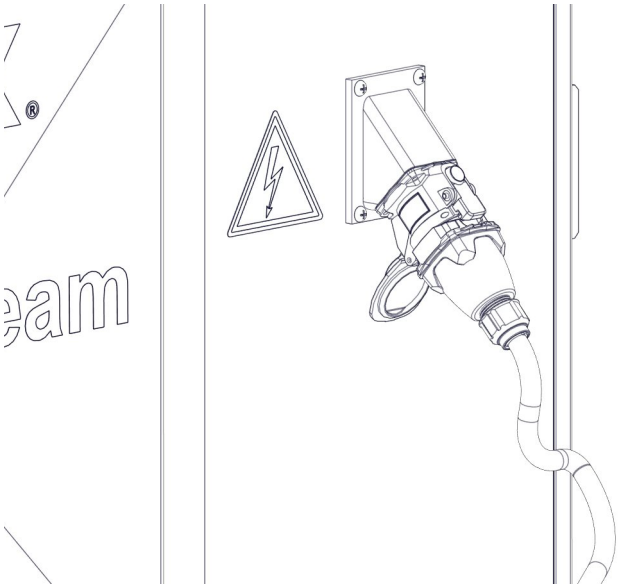
- **NOTE:** Prefered orientation is with sensor wire vertically down (as shown on left).

- Once all of the hydraulic hoses and sensor cables are attached, power can be supplied to the electronic control cabinet.

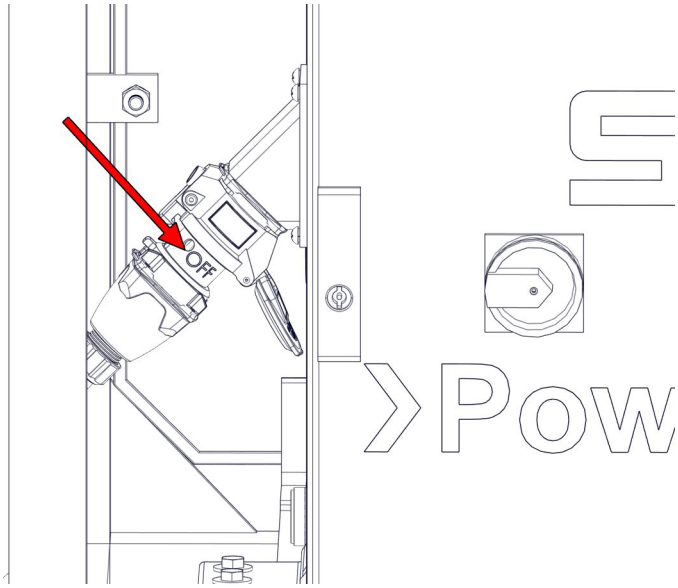
- **NOTE:** Avoid releasing the the sensor retractable wire and letting it freely snap back to his neutral position. this can cause dammage to the calibration and functionality of the displacement sensor.



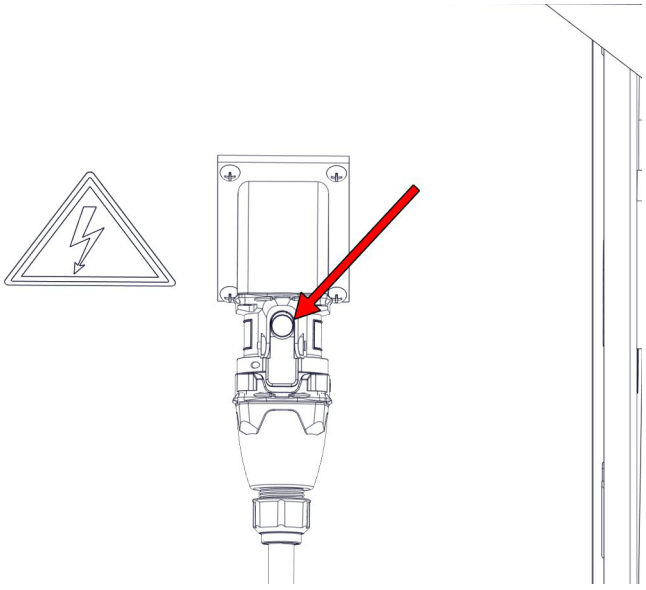
- Orient the pins in the plug with the pins in the receptacle. While installing, it will take a small “clockwise” turn to get the plug oriented correctly



- After slight clockwise turn and pins start to enter, push firmly on the plug to get it to latch with the black lever.

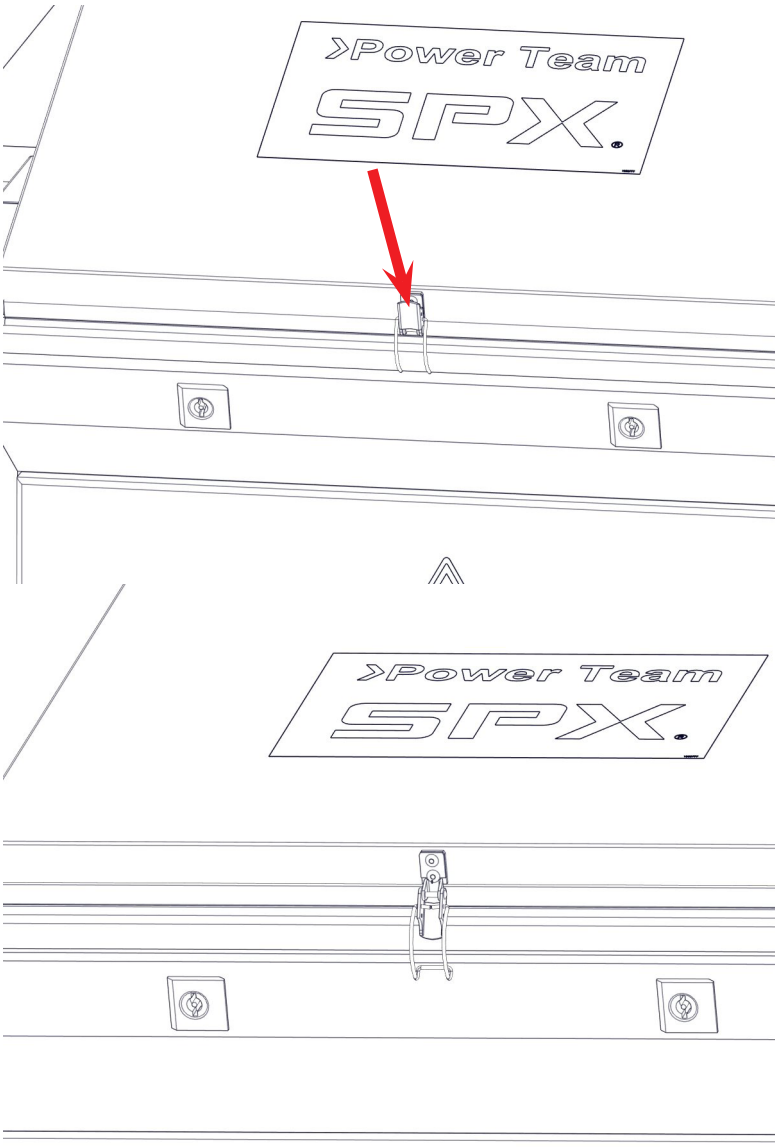


- If you still see the word “**OFF**” visible on the plug, the plug is **NOT LATCHED** and the **POWER IS NOT CONNECTED!**

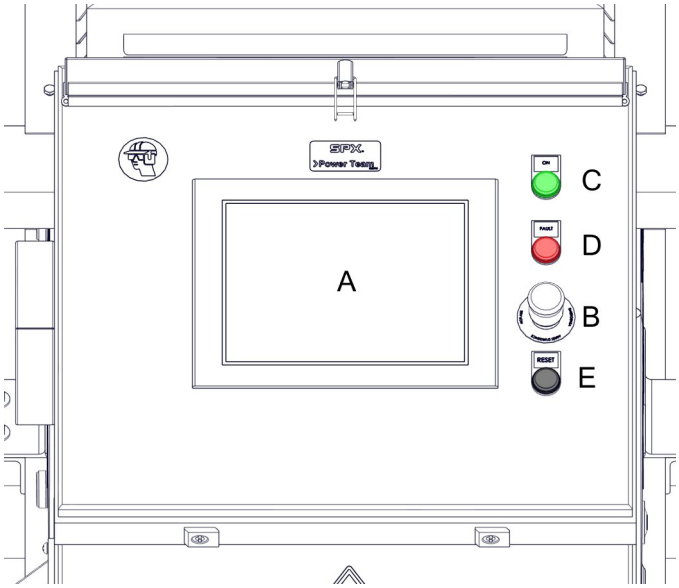


- Once connected, attach the opposite end of the power cable to the 230 VAC source. In the event you need to disconnect the plug and cable assembly, simply press the RED button. The connector latch is spring loaded and will quickly release the plug.

- Open the top cover to the MCS by gently pressing down on the cover latch. Pull the wire clasp forward and out from under the latch point. You will now be able to lift the cover. Slowly raise the cover to its full open position.

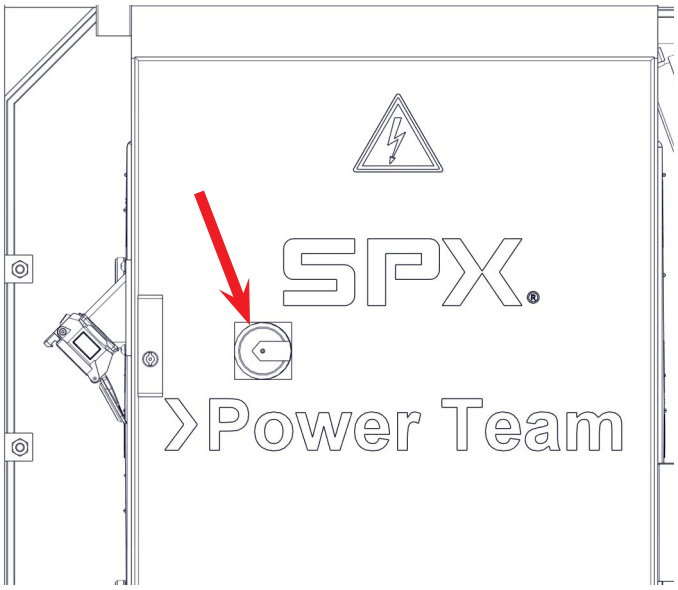


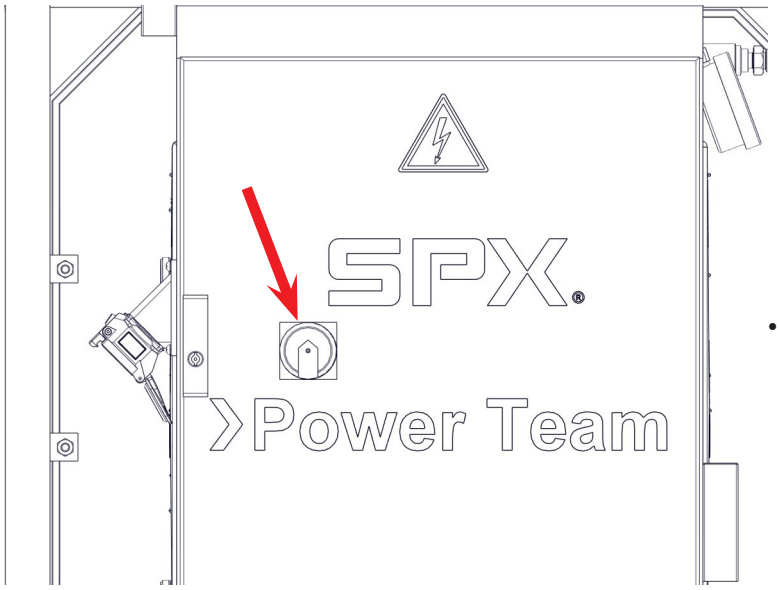
Form No. 1000773
Rev. 0 August 12, 2014



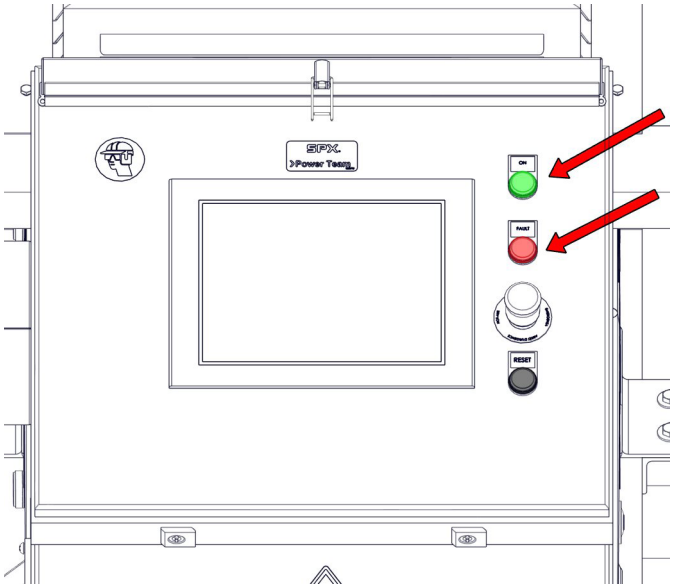
- A = HMI (human-machine interface) touch activated screen
- B = Emergency E-Stop button that shuts off pump **BUT DOES NOT SHUT OFF POWER** to the electrical control unit.
- C = GREEN power “ON” light
- D = RED light indicating E-stop is activated
- E = BLACK button for re-setting system after E-stop button disengaged

- The Power Switch is in the front door of the electrical cabinet – shown to the right in the horizontal OFF position.





- Turn Power Switch 1/4 turn clockwise to turn on electrical console the electrical switch will now be in the vertical position.



- At this point, the HMI (Human-Machine-Interface) screen starts to power on, the **GREEN** power light and the **RED** Emergency E-stop light are activated.
- During the opening sequence, you will see a blank BLUE screen which is normal. This will change and the HMI will soon switch over to the SPX page.

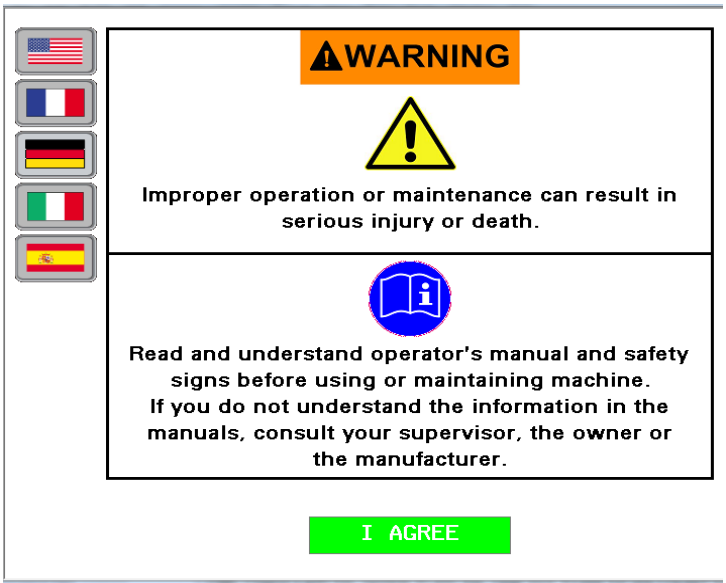
- At this point, the MCS controller is running through its diagnostics. This may take up to a minute or more. Once completed, the program will switch to the next page – the WARNING screen.

SPX
Power Team

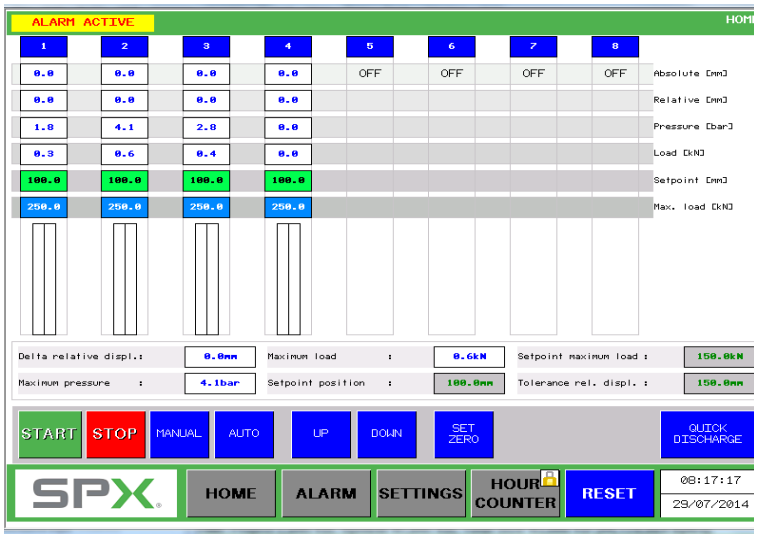
Albert Thijsstraat 12
6471 WX Eygelshoven
The Netherlands

Tel: 31 (45) 5678877
Fax: 31 (45) 5678878

www.spxhydraulictech.com

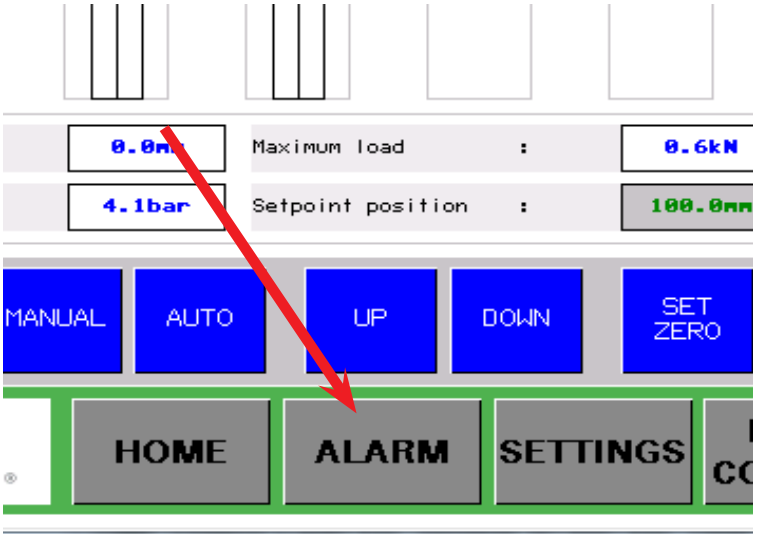


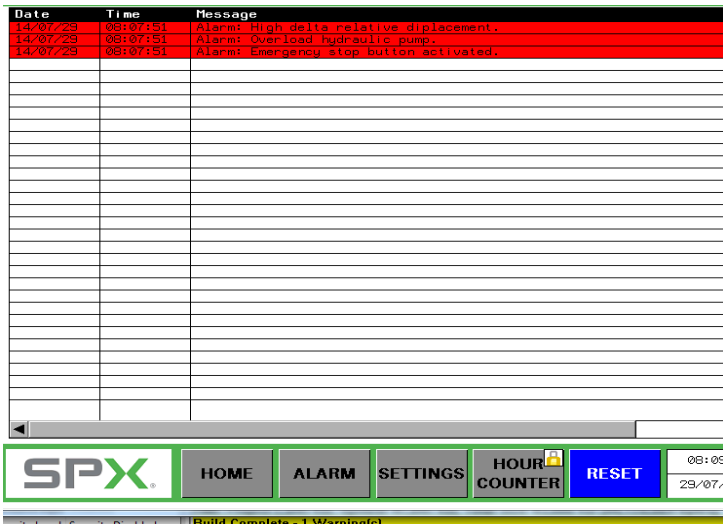
- This page requires you, the operator, to read and understand the operator's manual before proceeding.
- The HMI is a touch screen. Once you reach this screen, simply press the "I AGREE" icon on the screen and the screen will transition to the "HOME" page. When you have read and understand the operating instructions, simply place your finger on the screen and press the "**I AGREE**" icon



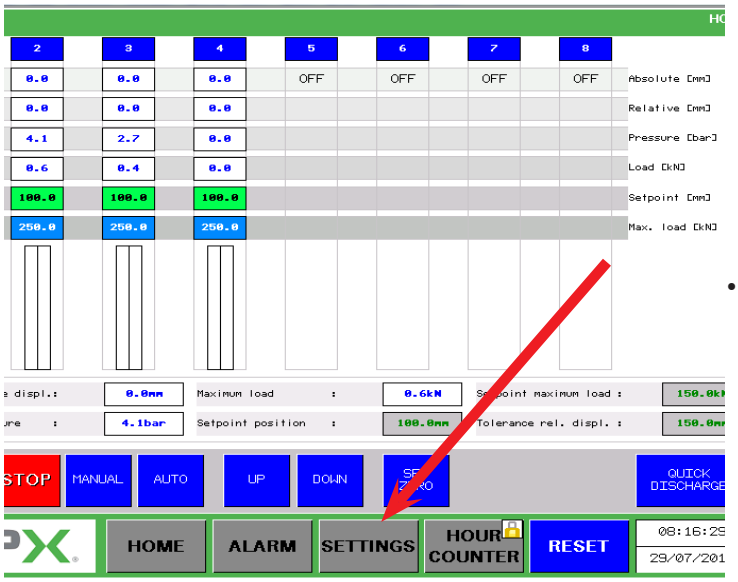
- **HOME PAGE**: This page highlights all activities during the use of the MCS. For each cylinder in use, the cylinder's performance is captured and shown on this screen.
- **NOTE**: the yellow and red **ALARM ACTIVE** message in the upper left of the screen.

- To diagnose and eliminate the active alarms, press the **ALARM** icon at the middle bottom of the **HOME** page. This will take you directly to the alarm message page.



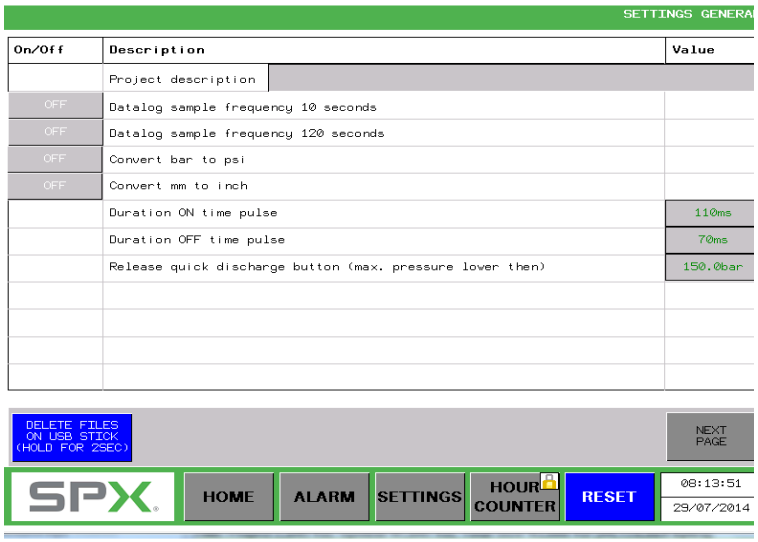


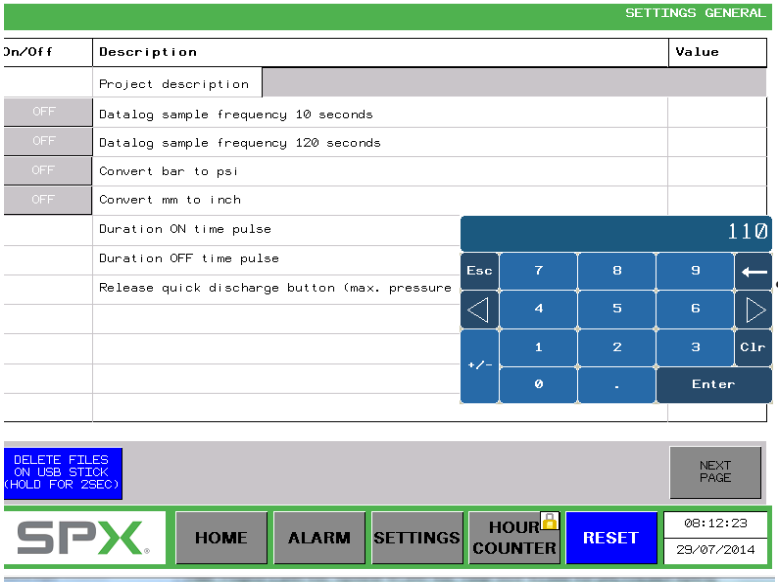
- The alarm message page will list all of the alarms present since starting the MCS unit. The following diagnostics page will help you to identify and remove all of these alarms.
- The MCS is equipped with a SIL-level 3 safety relay. Thus, after the initial startup of the system, at least the following two Alarm messages will show :
- **Overload hydraulic pump**
- **Emergency stop button activated**
- Push the black Reset button on the right hand side of the console followed by the Reset button on the touchscreen to cancel both alarms out.



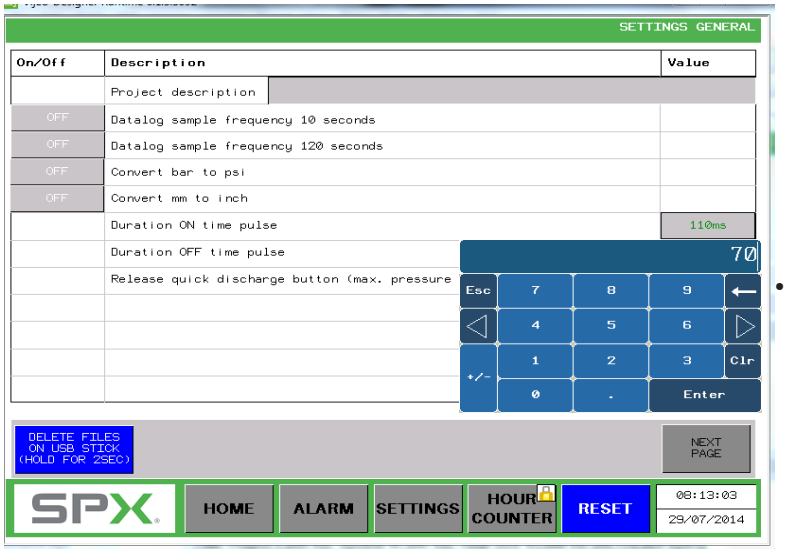
- Once all of the alarms have been re-set you can proceed to setting up the cylinder parameters. This will be accomplished by pressing the **SETTINGS** button in the middle bottom of the touch screen.

- **NOTE**: this step can also be performed before all of the alarms are re-set. On the first **SETTINGS** page , you enter the solenoid “ON” time, solenoid “OFF” time and the Release Quick Discharge pressure (the Quick Discharge can be activated at all system pressures below this point)



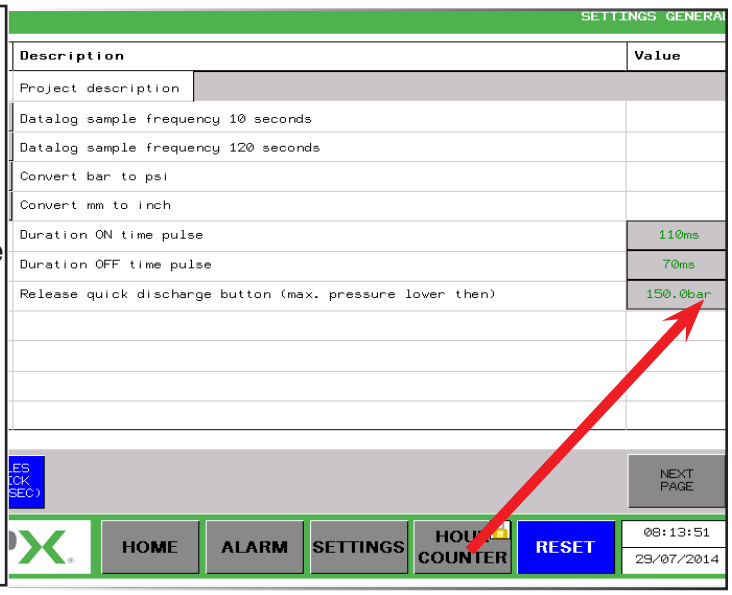


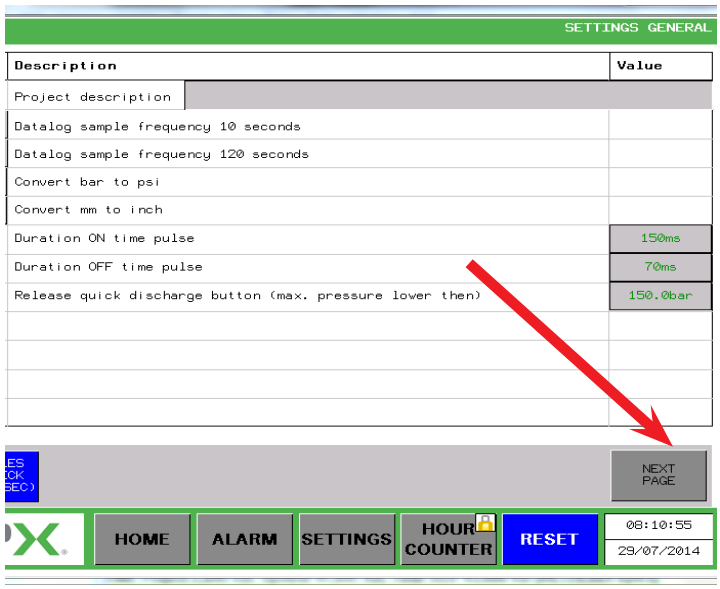
- By pressing the box for the ON time value, a keypad will come up on the screen which will allow you to enter the ON time. In the example above it shows 110 msec. Press enter and the value is placed in the program.



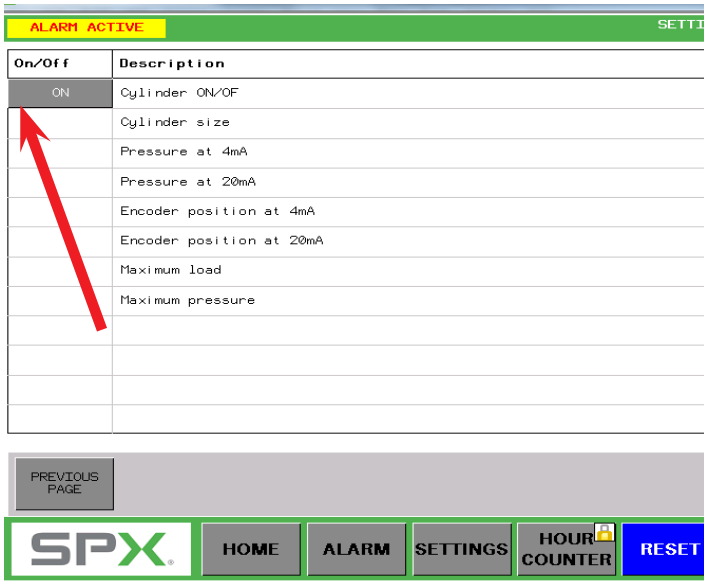
- Do the same for the OFF time. Press the OFF time box and a keypad will be highlighted on the screen, enabling you to enter the OFF time. Press enter to have the time placed in the program.

- The last item on this page to enter is the Quick Discharge “maximum operating pressure”. By touching the pressure box on the screen, you will get the keypad that will allow you to enter the quick discharge pressure. Press **ENTER** to have the value placed into the program.



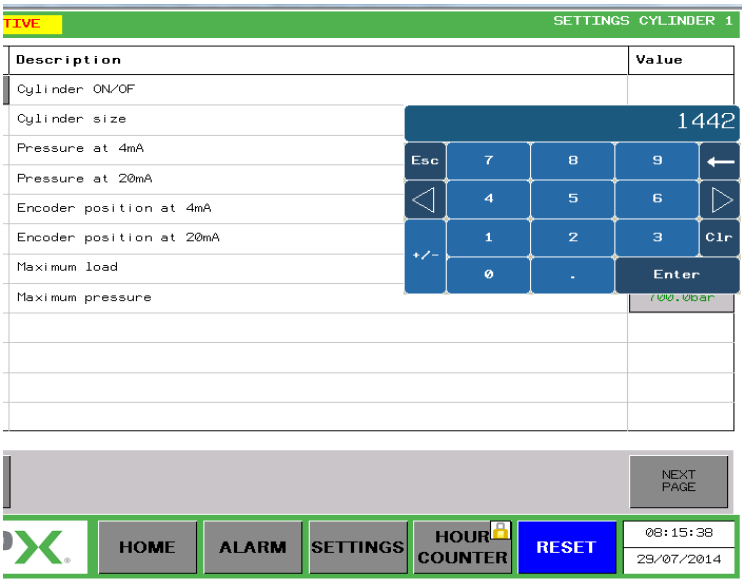


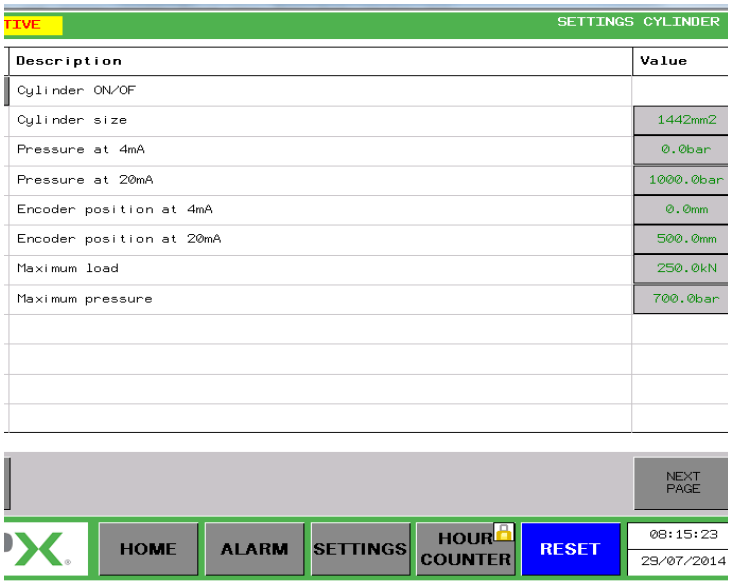
- Once the initial parameters are entered, you will begin to set up each cylinder. To do this, press **NEXT PAGE** as shown in the picture. This will take you to Cylinder #1 data entry page. By continuing to press next you will be able to turn on or off each of the individual cylinder’s or lift points. This will enable you to select 4 points, 5 points, 6 points etc., up to 8 points of lift/lowering.



- In the upper left hand corner of the screen you will see on / off This enables you to select that particular cylinder and place it on or off. The first parameter that is established is the cylinder's size and this is the cross sectional area of the cylinder in mm² By touching the screen for the cylinder's size, the keypad will come up. Using the keypad enter the area for the cylinder. Be sure to press the ENTER key when complete in order to store this data in the program.

- In this example you will see 1442 mm² for cylinder size. Once the data has been entered on the screen press the enter key on the keypad.



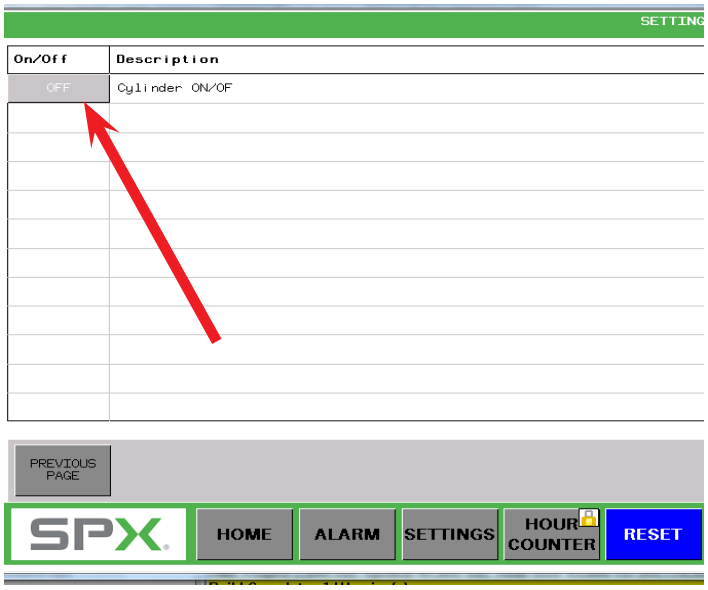


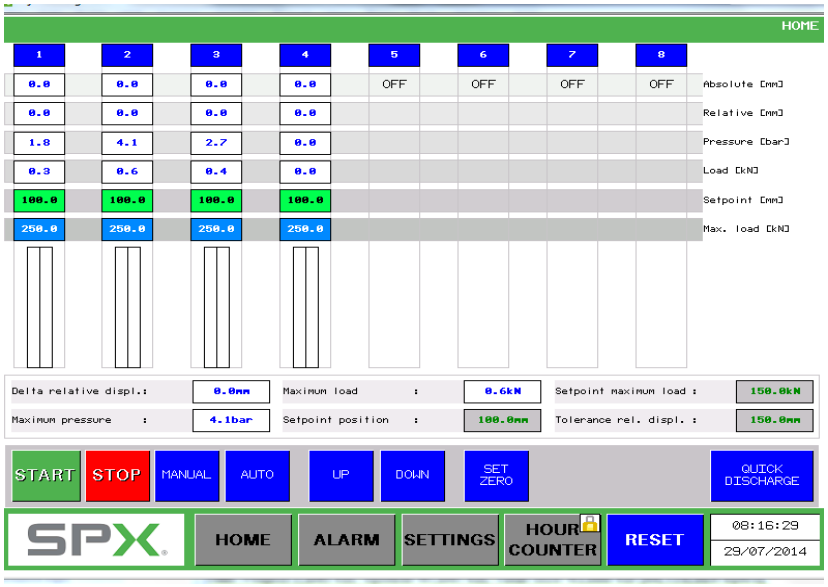
- Continuing down the screen enter the pressure at four milliamps. This would be equal to zero bar. Enter the pressure at 20 milliamps and this would be 1000 bar. The encoders used are the string pot sensors and the encoder position at four mAmps is equal to zero mm. The encoder position at 20 mAmps is 500 mm. The maximum load that is permissible would be entered in kiloNewtons and the maximum pressure the system should see would be 700 bar.

- After each entry, be sure to press the **ENTER** key so the data is stored in the program. You can modify this data at any time. However, once the data is entered and the lift has commenced, you should not attempt to change the data in the program.

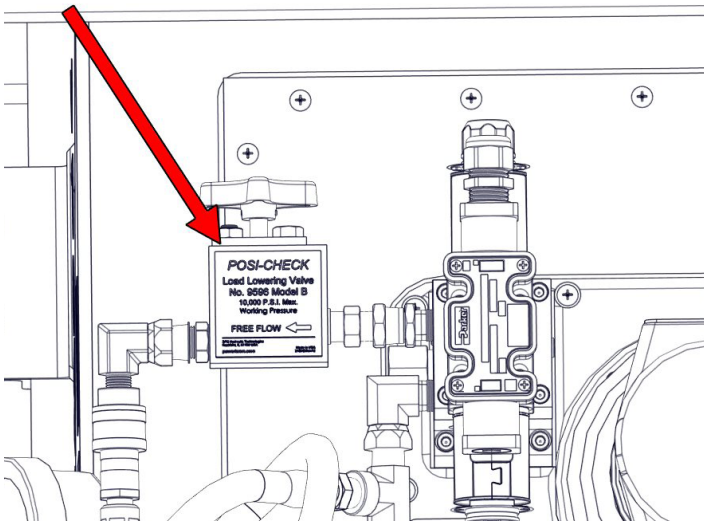
- For the initial setup, it will be necessary to enter all of the data for each of the cylinders you will be using for the lift. You can advance page by page by touching the screen in the bottom right hand corner where it says **NEXT PAGE**

- If you go to the next cylinder and it is off, just press the **OFF** button in the upper left hand portion of the screen to turn the cylinder **ON**. On the **HOME** page, you can readily see which cylinders (LIFT POINTS) are **ON** and which cylinders (LIFT POINTS) have been turned **OFF**.





- Here you can see that Cylinders 1, 2, 3 and 4 are **ON**, while Cylinders 5, 6, 7, and 8 are **OFF**.



- The load lowering valve is located by the Electric Motor valves stacked on top of the reservoir. It is used to control the rate of descent in lowering the load.The initial set is 0.2 open.
- Close the adjustments completely then reopen one 16th to one 8th turn, this should be used as a baseline from which to observe lowering performance.
- If Lowering speed is too slow, open the adjustments by turning the handle counter-clockwise in one 16th turn increments.

ALARMS AND HOW TO RESET

- **Emergency E-stop button Alarm** - pull up on E-Stop Button to ensure it is not engaged, and then press the **BLACK** reset button right below the E-stop button.

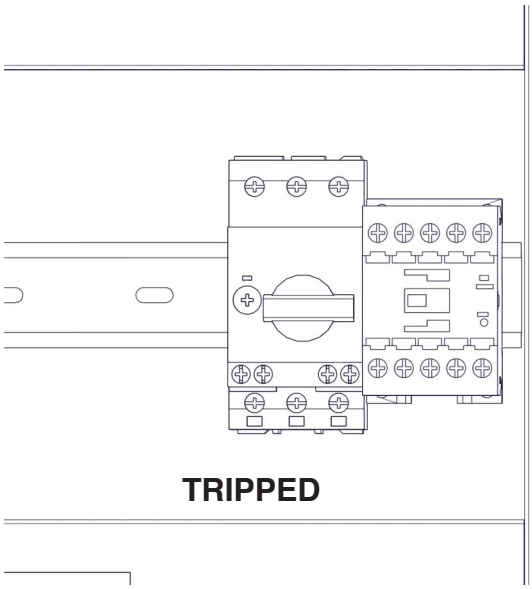
- **Wire Break Encoder Alarm** - review the alarm to determine which cylinder exhibits this alarm. Check to ensure that the wire is attached to the sensor and the face plate attachment point for the appropriate cylinder number. If okay, press the blue **RESET** button on bottom right of home page. If alarm still exists, replace the cable.

- **Wire Break Pressure Sensor Alarm** - review the alarm to determine which cylinder exhibits this alarm. Check to ensure that the wire is attached to the pressure transducer for the appropriate cylinder number. If okay, press the blue **RESET** button on bottom right of home page. If alarm still exists, contact Engineering - this may be issue in Electrical Control Cabinet.

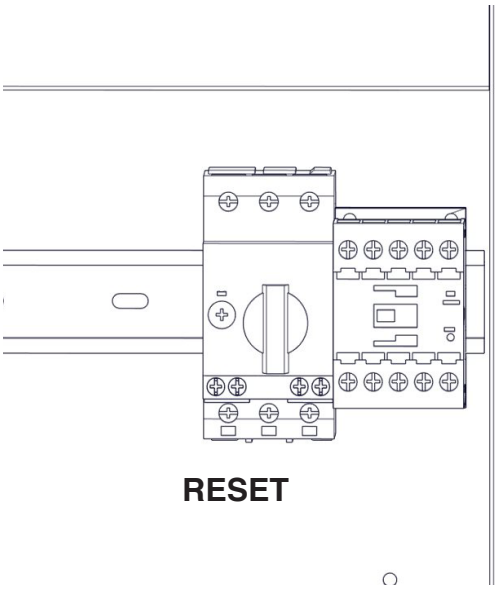
- **Pump Overpressure Alarm** - review the alarm to determine which cylinder and check the load shown on the screen is not higher than the maximum load input as a variable. Press the blue **RESET** button to erase the alarm. If the alarm still exists, review maximum load variable for correct data.

- **Overload Hydraulic Pump Alarm (cont.)** - the overload relay/breaker inside the Electrical Control unit may have “tripped”.

Form No. 1000773
Rev. 0 August 12, 2014



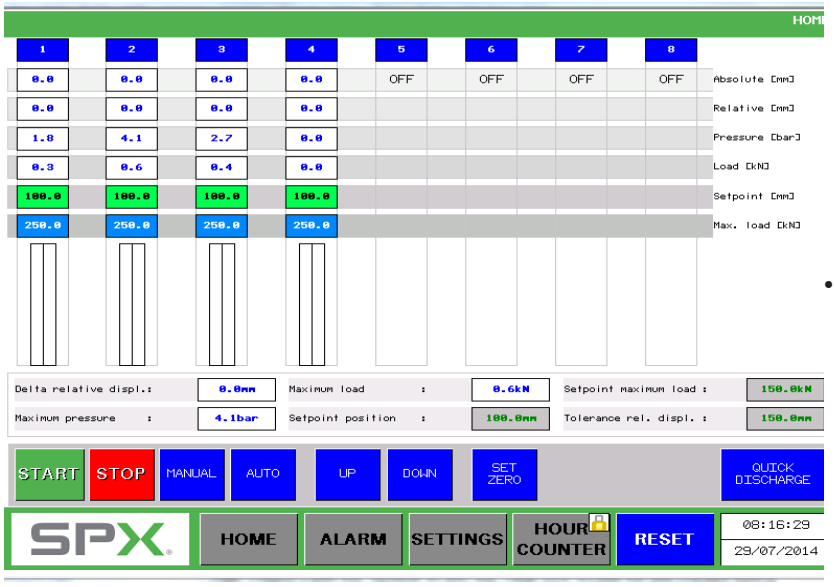
TRIPPED



RESET

- **Hose Break Alarm** - review the alarm to determine which cylinder has alarmed out, and check that the hoses are connected to the appropriate cylinder and quick disconnect on the face plate, and that the quick disconnects are tightened correctly. Confirm that there is no visible leakage. If leaking, replace the hose. If not leaking, press the blue **RESET** button on the **HOME** page. If alarm still exists, contact SPX Hydraulic Technologies for assistance.

- With each action to resolve an alarm, press the blue **RESET** button. The picture of the screen that follows shows that there are no alarms when all alarms have been resolved.



- This is an example of the screen showing that there are no alarms. (no yellow box in upper left corner). All alarms have been reset.

GENERAL MAINTENANCE

⚠WARNING

To prevent personal injury:

- Disconnect the unit from the power source before performing maintenance or repair procedures.
- Repairs and maintenance are to be performed in a dust-free area by a qualified technician.

1. SYSTEM EVALUATION

- The components of your hydraulic system — pump, hoses, and couplings - all must be:
- Rated for the same maximum operating pressure.
- Correctly connected.
- Compatible with the hydraulic fluid used:

  A system that does not meet these requirements can fail, possibly resulting in serious injury. If you are in doubt about the components of your hydraulic system, contact Power Team
  Technical Support

2. INSPECTION

- Keep a dated and signed inspection record of the equipment. Before each use, the operator or other designated personnel should visually inspect for the following conditions:
- Excessive wear, bending, damage, or insufficient thread engagement.
- Leaking hydraulic fluid.
- Loose bolts, cap screws, or pipe plugs.
- Bent or damaged couplers or port threads.

3. PERIODIC CLEANING

⚠WARNING

- Contamination of the hydraulic fluid could cause the valve to malfunction
  Establish a routine to keep the hydraulic system as free from dirt as possible.
- Seal unused couplers with dust covers.
- Keep hose connections free of dirt and grime.
- Use only Power Team hydraulic fluid. Replace the hydraulic fluid as recommended, or sooner if the fluid becomes contaminated. Never exceed 300 hours of use between fluid changes.

4. HYDRAULIC FLUID LEVEL

- Check the fluid level in the reservoir after each 10 hours of use. The fluid level should be level with the bottom of the fill hole when all cylinders are retracted and the unit is in the upright (vertical) position.

Form No. 1000773
Rev. 0 August 12, 2014

- Drain, flush, and refill the reservoir with an approved Power Team hydraulic fluid after 100 hours of use. The frequency of fluid changes depends upon general working conditions, severity of use, the overall cleanliness, and care given to the pump. Fluid should be changed more frequently when the system is not operated regularly.

5. HOSE CONNECTIONS

⚠CAUTION

- To prevent personal injury from leaking hydraulic fluid, seal all hydraulic connections with a high-quality, non-hardening, pipe thread sealant.

- Pipe thread sealant tape can be used to seal hydraulic connections if only one layer of tape is used. Apply tape carefully, two threads back, to prevent it from being pinched by the coupler and broken off inside the system. Loose pieces of tape could travel through the system and obstruct the flow of fluid or cause interference of precision-fit parts.

6. STORAGE

- The original shipping crate is a convenient storage container for the MCS. Prior to placing the MCS back into the shipping crate, replace all dust covers on each lift point quick disconnect. Place each of the position sensors in one of the two plastic cases. Place each sensor cable in one of the cloth bags provided, and pack each of the bags into the large storage case.Remove oil from the pump reservoir.

- Using an appropriately rated forklift truck, slowly slide the MCS back into its shipping container. Once the MCS has been secured within the container, place the sensor and cable cases in the shipping crate. At this point the shipping crate can be closed up for storage.

- Cylinder and hoses should be stored / maintained separately.

- Store the MCS unit in a dry, well-protected area where it will not be exposed to corrosive vapors, dust, or other harmful elements. If the MCS unit has been stored for an extended period of time, it must be thoroughly inspected before it is used.

Form No. 1000773
Rev. 0 August 12, 2014

TROUBLESHOOTING GUIDE

⚠WARNING To prevent personal injury, repair work or troubleshooting must be performed by qualified personnel who are familiar with this equipment.

Disconnect the power supply before removing the electrical cover. Electrical work should be performed by a qualified electrician.

- Plug the outlet ports of the pump when checking for leakage to determine if the leakage is in the pump, in the cylinder, or in the tool / hose.
- Check for system leaks by using a hand pump to apply pressure to the suspect area. Watch for leaking fluid and follow it back to its source. Never use your hand or other body parts to check for a possible leak.

NOTES:

- For a detailed parts list or to locate a Power Team Authorized Hydraulic Service Center, contact your nearest Power Team facility.

PROBLEM	CAUSE	SOLUTION
PLC unit does not power up	1. Control system not Powered	1. Turn key-lock into "ON" position.
	2. Unit is not plugged in.	2. Plug in unit.
	3. No voltage supply.	3. Check line voltage.
	4. Circuit breaker tripped because total amperage draw too high for existing circuit.	4. Use an alternate circuit with sufficient power supply
Electric motor will not shut off.	1. Defective motor controls.	1. Disconnect unit from power supply; contact a Power Team Service Center.
Electric motor stalls, surges, overheats, or will not start under load.	1. Low voltage	1. Refer to electric pump instruction sheet
Electrical overload protector keeps tripping.	1. Wired incorrectly.	1. Disconnect unit from power source; have qualified electrician review motor and circuit wiring.

Form No. 1000773
Rev. 0 August 12, 2014

PROBLEM	CAUSE	SOLUTION
Pump is not delivering fluid, or delivers only enough fluid to advance connected components partially or erratically or operation to slow	1. Fluid level too low.	1. Add fluid; refer to filling the pump reservoir in Initial Setup section.
	2. Loose-fitting coupler to component.	2. Verify quick-disconnect couplings are completely coupled. Couplers may need to be replaced because ball check does not stay open due to wear.
	3. Air in system.	3. Refer to Initial Setup in this manual to bleed air from system.
	4. Air leak in suction line.	4. Check and tighten suction line.
	5. Dirt in pump or filter plugged.	5. Clean pump filter. If problem persists, disconnect from power supply contact authorized Power Team service center.
	6. Cold fluid or fluid too heavy. (Hydraulic fluid is of a higher viscosity than necessary)	6. Drain, flush, and refill reservoir using a lighter weight fluid. Refer to General Maintenance section.
	7. Vacuum in reservoir.	7. Clean plugged vent in filler plug.
Pump builds pressure but cannot maintain pressure.	1. Fluid leakage.	1. Look for external leaks. If no fluid leakage is visible, the problem is internal. Seal leaking pipe fittings with PTSC.
	2. Leaking pressure switch seal.	2. Replace pressure switch.
Pump does not build to full pressure. .	1. Faulty pressure gauge.	1. Replace pressure gauge.
	2. Check for external leakage.	2. Seal faulty pipe fittings with pipe sealant.
	3. Check external pressure regulator. Check relief valve setting.	3. Refer to Adjusting the Pressure Regulating Valve.

Form No. 1000773
Rev. 0 August 12, 2014

PROBLEM	CAUSE	SOLUTION
Erratic action	1. Air in system.	1. Check for leaks. Refer to bleeding procedure.
	2. Internal leakage in attached components.	2. Refer to manufacturer's information for attached component
	3. Attached component sticking or binding.	3. Refer to manufacturer's information for attached component.
	4. Malfunctioning valve.	4. Verify connections. Contact authorized Power Team Service Center.

Form No. 1000773
Rev. 0 August 12, 2014

SCHEMATICS

COMPONENT SPECIFIC DATA SHEETS

PRESSURE TRANSDUCERS

PRESSURE RANGE . . . . . .0 BAR TO 1000 BAR

HYDRAULIC CONNECTION. . . . . .G 1/4 A(BSPP), DIN 3852E

ELECTRICAL CONNECTON. . . . . .PLUG CONFORMING TO EN 175 301-803A (1.5mm , EXTERNAL CABLE Ø6-8mm)

OUTPUT CURRENT. . . . . .4 - 20 mAmp

POSITION SENSORS

MEASUREMENT RANGE. . . . . 0mm to 500mm

ELECTRICAL CONNECTION. . . . . MALE, 8 PIN SOCKET MIZ

OUTPUT CURRENT. . . . . 4 - 20 mAmp

HYDRAULIC PUMP

PE55 VANGUARD. . . . . .230 VAC

OUTPUT. . . . . .0.9 l/min @ 700 bar

Form No. 1000773
Rev. 0 August 12, 2014

ANNEX

1. SPX CYLINDER SIZE AND SQUARE CENTIMETER (AERA) TABLE

CYL TONS	CYL BORE IN INCHES	SQUARE CM
5	1.125	6.413
10	1.688	14.429
15	2.000	20.268
25	2.563	33.273
55	3.750	71.256
75	4.500	102.609
100	5.125	133.091

2. MOTION CONTROL SYSTEM CHECKLIST

1. Safety Information:
   a. Have you read and do you understand the Operating Instructions?
   b. Have you created a formal lift plan per ISO 31000 and ISO/IEC 31010?
   c. Have you formally trained those operators that will be involved with the lift?
   d. Have you confirmed that the load to be lifted will be a static load, not dynamic?

2. Unpacking and Physical Set-up:
   a. Re-usable crate – sequence for uncrating with care for re-use
   b. The electrical
      1. Power cable
      2. Use of generator
   c. The Hydraulics
      1. Adding oil
   d. The sensors
      1. Magnets
      2. Cable attachment
      3. Position of sensors
   e. Cables
      1. Protective enclosures for sensors
      2. Cables individually bagged
   f. Manual override locations
   g. Pressure control locations
   h. Load lowering valve – location and initial setting
   i. Cylinders
   j. Any ancillary devices
   k. Key to electrical cabinet – where is it?

Form No. 1000773
Rev. 0 August 12, 2014

3. Power Up – what to expect:
   a. Error signals
   b. Selecting operational parameters
   c. Which button does what
   d. A walk through each of the screens
   e. Jogging the pump to see if it functions okay (pressure? – where?)
   f. Turning lift points on or off – are they all needed?

4. Setting the variables:
   a. Which screen
   b. Which variable
   c. How to calculate
   d. Where to start

5. Establishing the lift:
   a. Set Δ limit for linear position sensors (where and how much)
   b. Bringing the cylinders up to structure (plates for stability) – manual mode
   c. Consider lift in stages
   d. Use of mechanical supports
   e. Safeties in the system
   f. Emergency E-Stop - do not wander too far
   g. If any questions - STOP and get the answers

6. Start of lift
   a. Pay attention to each of the lift points
   b. Is the load moving smoothly
   c. Are there any unusual sounds
   d. Is the load tilting
   e. Observe cylinder foundations – make sure they remain stable

7. Lowering upon completion of lift
   a. Load Lowering valve
   b. Speed at which to lower
   c. If settling occurs
   d. May need to manually lower at “what” point?

8. Disconnecting
   a. Electrical power
   b. Sensors
   c. Hydraulics

9. Re-Crating
   a. Reusable crate

3. DECLORATION OF CONFORMITY

EC DECLARATION OF CONFORMITY

We declare under our sole responsibility that our

Motion Control System MCS-x

to which this declaration relates are in conformity with the following:

EN, EN-ISO, ISO standards	Title
Per the provisions of the Machinery Safety Directive	**2006/42 EC**
EN_ISO 12100:2011	Safety of machinery, basic concepts, general principles for design, risk assessment & risk reduction
EN 4413:2010	Hydraulic Fluid Power – general rules and safety requirements for systems & their components
Per the provisions of the EMC Directive	**2004/108 EC**
EN_61000-4-2:2001	Electromagnetic Discharge Immunity test
EN_61000-4-3:2001	Radiated, Radio Frequency, Electromagnetic Field Immunity test
EN_61000-4-4:2001	Electrical Fast Transient / Burst Immunity test
EN_61000-4-5:2001	Surge immunity test
EN_61000-4-6:2001	Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
EN_61000-4-11:2001	Voltage Dip and Interrupt test
EN55011_2007	Industrial, Scientific and Medical (ISM) Radio Frequency Equipment-Electromagnetic Disturbance Characteristics-Limits and Methods of Measurement
Per the provisions of the Low Voltage Directive	**2006/95 EC**
EN_60204-1	Safety of Machinery –Electrical equipment of machines – Part 1 General requirements
Per the provisions of the RoHS Directive	**2011/65 EU**
	Restriction of the use of certain hazardous substances in electrical and electronic equipment

SPX Hydraulic Technologies
5885 11th Street
Rockford, IL 61109-3699
United States of America

We, the undersigned, hereby declare that the equipment specified conforms to the above European Communities Directive(s) and Standard(s).

SPX Hydraulic Technologies
Christophe Bouvet
Andreas J. Klemm
SPX Hydraulic Technologies
Albert Thijsstraat 12
NL-6471 WX Eygelshoven
The Netherlands

The Netherlands April 02, 2013

Christophe Bouvet, Managing Director

Andreas J. Klemm, Appl.Eng. Manager

Form No 10_____
Rev 1 Jan 2, 2013

POWER TEAM FACILITIES

Rockford, Illinois USA
Customer Service/Order Entry
Tel: +1 800 541 1418
Fax: +1 800 288 7031

Technical Services
Tel: + 1 800 477 8326
Fax: + 1 800 765 8326
info@powerteam.com

European Headquarters
Tel: +31 45 567 8877
Fax: +31 45 567 8878
infoeurope@powerteam.com

Shanghai, China
Tel: +86 21 2208 5888
Fax: +86 21 2208 5682
infochina@powerteam.com

Asia Pacific Headquarters
Tel: +65 6265 3343
Fax: +65 6265 6646
infoasia@powerteam.com

California Proposition 65 Warning

This product contains or may contain chemical(s) known to the state of California to cause cancer or other reproductive effects.

Form No. 1000773
Rev. 0 August 12, 2014