# Falcon Global

## Liftboat Hulls H1028 / H1029

## Hydraquip Custom Systems, Inc.
Hydraulic Jacking System and Electrical Controls
Hydraquip CSI Job 4680

Maintenance and Operations Manual


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# Section 1 - Warnings

This document is intended to familiarize the operators with the hydraulic and electrical controls of the Jacking System provided by Hydraquip CSI. The operators of this system must operate the Jacking System in accordance with all instructions contained in the complete vessel operating manual as provided by the shipyard and vessel designer. The jacking system should only be operated only under conditions and criteria set forth in the vessel operating manual.

This section deals with warnings that equipment operators of this unit should be made aware of. These include:

## Hydraulics

The hydraulic system provides hydraulic oil at specific flows and pressures to be utilized for control purposes of equipment. Due to the inherent nature of this system, the pressure provided by this unit can be dangerous if care is not taken to assure that the danger is contained. The unit has been designed for operating pressures as stated in the required specifications. These specifications require operating pressures of up to 4500 PSI. Any connections to this unit should be capable of containing these pressures during any normal operation. Care should also be taken to observe pressure gauge readings when working on this unit. All pressure must be drained from the system prior to working on system. Avoid performing any service work on the Jacking System while the vessel is in an elevated condition. Lock Out and Tag Out procedures must be utilized prior to working on the system. All of the adjustable flow and pressure settings have been preset in accordance with the requirements of the system and must not be changed without consent of Hydraquip CSI.

The hydraulic oil in the systems should be selected with properties that are compatible and recommended by the component manufacturers. The hydraulic system was originally filled by the Shipyard with Shell Tellus 46. Material Safety Data Sheets should be obtained and read carefully prior to any work around the fluid.

## Electrical

The electrical control system provides the operator the ability to smoothly and easily control the position of the legs. The integrated Jacking alarm system generates local alarms for various jacking alarm conditions. Electrical components included in the jacking system may utilize HIGH VOLTAGES (up to 690VAC). Extreme caution should be exercised when interacting with live electrical equipment. Only qualified personnel should attempt electrical maintenance and troubleshooting. Standard Lock Out and Tag Out procedures are required prior to working on this system.

# Section 2 - Component Descriptions

This Sub-section contains descriptions of major components used in the hydraulic within the Jacking system. These following components are listed in the system drawings included in section 7:

## Electric Motors

The 8 electric motors (2 per Hydraulic Power Unit) are manufactured by WEG. The motors are 300 HP, 690 VAC, 3 phase at 60 Hz, 1787RPM and are ABS Approved for Essential Services. The motors are the prime movers in the system; they convert electrical power into rotational energy providing mechanical power to respective jacking and supercharge pumps required to provide hydraulic power and control flow to properly operate the system. Electrical Motor Power and control is via dedicated Reduced Voltage Soft Starters.

## Hydraulic Pumps

The 8 hydraulic pumps (6 per Hydraulic Power Unit) are Sauer Danfoss (Sundstrand) part number 83042611 (90L250KT5CD80T4C8K03NNN292924). They are an axial piston, closed loop pump providing approximately 115 GPM maximum flow and pressure up to 4500 PSI. The pumps are controlled electronically by an "EDC" – Electrical Displacement Control. If no electrical signal is sent to the pumps, they are in Neutral. If the operator strokes the joystick forward, the pumps stroke in one direction, generating flow and causing the legs to go up. If the operator strokes the joysticks in the opposite direction, the pumps stroke in the opposite direction, generating flow and causing the legs to go down. The pumps have built in "Multi-function valves" which are used to limit the pumps maximum output pressure. These are set by Hydraquip CSI. Refer to hydraulic schematic drawing package for specific settings. The charge pumps internal to the pump provide hydraulic pressure needed to operate the pump controls and several auxiliary functions. The charge pressure relief valves are set by the Hydraquip CSI at 450 psi. For a complete system schematic, see drawing number 4680-*1000*. A "one-line" piping diagram is provided on drawing *4680-1100*.

## Hydraulic Supercharge Pumps

The 8 hydraulic supercharge pumps (8 per Hydraulic Power Unit) are Geartek part number *D35L-1C*. It is a fixed displacement gear pump providing approximately 53 GPM flow each and pressure up to 450 PSI. The pumps are used to make up leakage in the closed loop pumps and motors, and to provide fresh, cool oil in the closed loop piping. The supercharge pumps also provide flow to operate release the brakes and operate the 2-

speed displacement controls on the hydraulic motors.

## Hydraulic Motors

The (68) hydraulic motors are Sauer Danfoss (Sundstrand) part numbers
(60) H1B080AHEHENBTAVNANNNNNNN041Z00NNN (no position pickup device) and
(8) H1B080AHEHENBTAVSASPNNNNN041Z00NNN (includes position pickup device). They are a bent axis type, two speed, and variable displacement (80 cc) closed loop motor capable of pressures up to 6960 PSI. The (8) differ from the other (60) of the total (68) motors in that they have sensors to monitor motor speed and position. The torque produced by the hydraulic motor is transmitted through the planetary gearbox to the rack and pinion, and moves the leg. The motors operate at full displacement during Normal Jacking in order to provide maximum torque. The motors are shifted hydraulically to minimum displacement during Leg Tagging in order to provide higher speed at a lower torque.

## Jacking Manifolds

Each Hydraulic Power Unit has two Main Jacking Pumps. The pumps are connected together through the Jacking Manifold for each leg. The manifold allows the pumps to operate together when they are running, as well as to isolate a pump from the system when it is not running. The Jacking Manifolds also contain the Two-Speed valves, Brake Release valves, Supercharge Pump Relief valves, Hot-Oil Shuttle and Relief valves, and the system High Pressure Cross Port Relief valves. These valves are mounted in the manifold to facilitate ease of adjustment as well as to reduce the amount of shipboard piping.

## Motor 2-Speed Valves

The two motor 2-speed valves are Wandfluh part numbers *S22100-S1265-G24* and *S2210-G24*. A set of these valves are included in each Jacking Manifold. When the valves are energized, pressure is sent to the X1 ports on the hydraulic motors on the respective leg, causing the motors to shift to low displacement. The motors will then operate in a higher speed/lower torque mode. This allows the legs to be raised or lowered at leg tag speed. (ONLY TO BE USED DURING LEG TAGGING WHILE VESSEL IS FLOATING.) When the valves are de-energized, they return to their normal state, and the motors shift back to maximum displacement, delivering maximum torque.

**WARNING**

DO NOT attempt to lift or lower the vessel in Leg Tag Speed. Tag Speed system is designed to move legs only while vessel is afloat.

## Brake Release Valves

The brake release valves are Wandfluh part numbers *S22100-S1265-G24* and *S2210-G24*. A set of these valves are included in each Jacking Manifold. When the valves are energized, pressure is sent to the brakes on the respective leg, causing the brakes to release. When the valves are de-energized, the valves return to their normal state, and drain the brakes back to tank. This sets the brakes, and holds the legs in a parked position.

## Hydrostatic Pressure Filters

The (16) high pressure filters (12 per Hydraulic Power Unit) for the system are Schroeder part number HS60-13HZ5-F24-D13. These high pressure, high flow, hydrostatic filters are used to clean the oil in the closed loop. They protect the pumps and motors by removing small particles from the oil. Each filter is equipped with a bypass, which allows fluid to flow past the filter when the elements become clogged. Elements should be changed every 6 months, or as indicated by the visual indicator on each filter. Each filter element part number *13HZ5*.

## Supercharge Pressure Filters

The supercharge pressure filters (2 per Hydraulic Power Unit) are Donaldson part number *HPK04*. They are used to filter the supercharge oil from the supercharge pumps to each main manifold. Each filter is equipped with a bypass, which allows fluid to flow past the filter when the elements become clogged. Elements should be changed every 6 months or as indicated by the visual indicator on each filter. Each filter requires 1 element, Donaldson part numbers *P164166.*

## Charge Pressure Filters

The 8 charge pressure filters (2 per Hydraulic Power Unit) are Donaldson part number *HPK04.* They are used to filter the charge oil from the Jacking pump prior to the oil entering the pump control. Each filter is equipped with a bypass, which allows fluid to flow past the filter when the elements become clogged. Elements should be changed every 6 month or as indicated by visual indicator on each filter. Each filter requires 1 element, Donaldson part numbers *P164166*.

## Reservoir Breather Filters

The reservoir breathers (2 per Hydraulic Power Unit) are located on top of the reservoir. The filter is an Eaton Vickers BR110. This device filters the air and removes water as air passes in and out of the hydraulic reservoir. These components are shipped loose with the HPU and must be installed prior to commissioning.

## Return Filters

The 8 return filters (2 per Hydraulic Power Unit) are Hydac part numbers *RFW/HC660DN149B1.1/16A1.5-B2 and RFBN/HC660DN10B1.1/16B1* they are used to filter the motor case oil from the motors on each leg and the return oil from the cooler. Each filter is equipped with a bypass, which allows fluid to flow past the filter when the elements become clogged. Elements should be changed every 6 months or as indicated by the visual indicator on each filter. Each filter requires 1 elements, Hydac part numbers 660-R-149-W/HC, and 660-R-10-BN/HC.

## Suction Filters

The 4 suction filters (1 per Hydraulic Power Unit) are Hydac part number *SFW/HC1300FW25UE1.1/16B0.2*. They are used to filter the oil from the reservoir, entering the jacking and supercharge pumps. Each filter is equipped with a bypass, which allows fluid to flow past the filter when the elements become clogged. Elements should be changed every 6 months.

## Cross Port Relief Valves

The cross port relief valves are Sun part number *RDJA-LCN*. These valves are located in the main manifolds. The relief valves for each leg are used to remove pressure spikes in the system and prevent over pressurization of the system. The relief valves are set by HCSI and are capable of bypassing full pump flow. Refer to hydraulic schematic drawing package for specific settings.

## Pilot Operated Check Valves

Wandfluh part numbers *CD40-20/05/1.0*, *D40433* and *APC32060b-V1*. When approximately 90 PSI from the charge pump is applied to the 3 way / 2 pos. valve, the valve shifts, venting the spring chamber of the check valve to tank. This allows main flow

to and from the main work ports of the manifold supplying the motors. This is a redundant system as one charge pump on each pump drive supplies pilot pressure to a corresponding set of valves on each manifold. When charge pressure from one pump is lost, the corresponding valves close, blocking the flow to and from the main work ports of the manifold; however, the other pump(s) will continue to supply pilot pressure to its' corresponding set of valves so that the leg is still operational at reduced speed. This system ensures that only pumps that are active and have developed charge pressure are connected to the Jacking circuit.

## Hot Oil Shuttle Valves

Sun part number *DSIH-XHN*. The hot oil shuttle located in the jacking manifold continuously bleeds a specified volume of oil from the closed loop circuit when the pumps are stroked. This oil is replenished by the charge pump. The oil is bled through a pressure compensated flow control valve set by the Hydraquip CSI at 15gpm, Sun p/n *FDEA-LAN-15GPM*.

## Supercharge Relief Valve

Sun part number *RPIC-LNN*. The supercharge relief valve limits the maximum pressure of the supercharge pumps. There is (1) valve included in each Jacking Manifold. They are set at 450 psi.

Additional components in the Jacking Manifolds include gauges test points, isolation ball valves, pressure transducers, etc.... which are listed in the Hydraulic System Bill of Materials and can be found in Section 7.

## Heat Exchanger

Hayden part number HAY048966-XA. The heat exchanger is an air to oil unit used to help dissipate the heat generated by the hydraulic system. The heat exchanger will be running any time the electric motors are running on the HPU. The heat exchanger fan is operated by a 2hp electric motor. There is also a check valve with a 65 psi spring that acts as a pressure relief valve. Should the pressure in the heat exchanger circuit rise above 65 psi the check valve will open, allowing the fluid to bypass the heat exchanger. There are (2) heat exchangers mounted on each HPU. Each HPU incorporates 4 heat exchangers. 3 of the 4 heat exchangers are connected to the loop flushing circuit that cools oil from the loop flushing valves mounted to the hydraulic motor manifolds. These heat exchangers cool oil from the closed loop hydraulic circuit. The remaining heat exchanger is connected to a circuit in the reservoir, and is used to cool the oil in the reservoir.

## Brakes

The parking brakes are manufactured by Mico. They are ABS approved, part number 13-547-508-ABS. The brakes are spring applied, pressure to release. The brakes are static brakes only and are not meant to slow or stop the vessel when it is moving. The hydraulic and electrical control systems are designed to release the brakes only when the system is prepared to start moving the vessel. Upon loss of hydraulic pressure, or control power, the brakes will automatically set.

## Planetary Gearboxes

Fairfield part number S350A1441736. The planetary gearboxes provide the necessary gear reduction to convert the rotational energy of the hydraulic motors to the appropriate speed and torque output necessary to raise and lower the vessel. Included with the planetary gearboxes are bearing endcaps, pinions, and pinion retaining bolts. **THE GEARBOXES MUST BE FILLED TO THE CENTERLINE WITH GEAR OIL. OPERATING GEARBOXES WITHOUT APPROPRIATE GEAR OIL WILL RESULT IN FAILURE OF GEARBOXES. The gearboxes were filled with Shell Spirax S2 A 80W90.**

# Hydraulic Settings

The settings shown below were preset during final system testing at Hydraquip CSI and should not be adjusted from these settings.

| | |
|---|---|
| Charge Pump Relief Valve: | 450 psi |
| Supercharge Pump Relief Valve: | 450 psi |
| Loop Flushing Relief Valve: | 15 gpm |
| Crossport System Relief Valves: | 4500 psi |
| Pump Multi-Function Relief Valve: | 4500 psi |

# Jacking System Vessel Parameters:

| | |
|---|---|
| Maximum Normal Jacking Vessel Weight: | 4572MT (By MiNO Marine, Naval Architects) |
| Number of Legs: | 4 |
| Number of Planetary Gearboxes per Leg: | 17 |
| Number of Racks per Leg: | 2 |
| Planetary Gearbox Reduction Ratio: | 374:1 |
| Planetary Gearbox Pinion Pitch Diameter: | 9.0 in |
| Planetary Gearbox Max Normal Jacking Rating (ABS): | 738.MT |
| Planetary Gearbox Max Normal Holding Rating (ABS): | 86.7MT |
| Planetary Gearbox Max Storm Holding Rating (ABS): | 110.9MT |

# Jacking System Hydraulic System Parameters:

Number of Hydraulic Power Units: 4
Hydraulic Power Unit Configuration: Redundant electric motor/ hydraulic pump assemblies per power unit
Hydraulic Power Unit Horsepower: (2) 300HP electric motors per power unit, total 2400HP

# Jacking Hydraulic Description

The Hydraulic Jacking system is powered by a pair of redundant pumps per chord. There is a power unit dedicated to each of the four legs, and are located adjacent to each leg. Each power unit has (2) 300HP electric motors providing system power. The electric motors operate the main hydraulic pumps used to provide hydraulic power to the system. The pumps for each chord are connected in parallel and redundant. In other words, the flow from both pumps per chord is combined through our standard Jacking System main manifold. The system has equal Jacking weight capacity from any one electric motor, but is normally operated with all six electric motors per leg running for optimal Jacking speed.

The flow from each pair of pumps dedicated to each chord is routed to hydraulic manifolds. The manifolds serve to combine the flow from the pair of pumps to send hydraulic oil to power the hydraulic motors driving the pinions through the planetary gearboxes mounted on the leg towers. The manifold also serves to automatically isolate a pump from the system if the pump is not operating properly. This allows for uninterrupted operation on one pump (one electric motors), at one half (1/2) jacking speed. The pumps used are Sauer Danfoss 90 Series closed loop hydrostatic pumps, which were also used and approved on all of the above listed previous systems. The Main Jacking Manifolds are Hydraquip CSI's standard design, and were also used and approved on all of the above listed systems. The manifold also contains the following functions:

- High pressure crossport relief valve protection in the main pressure lines between the pumps and the motors.
- Supercharge pressure relief valve used to limit the maximum pressure in the supercharge circuit.
- Brake release valves. These valves send supercharge pressure to the brakes on the hydraulic motor in order to release them. The brakes are spring applied, pressure to release so that upon loss of hydraulic pressure they will automatically set upon loss of hydraulic pressure.
- Two-speed valve used to send a pilot oil signal to the hydraulic motors to change to high speed/low torque configuration for Leg Tagging Mode.
- Loop flushing shuttle and relief valves. This is used to bleed a small amount of oil from the high pressure loop to be replaced by the supercharge pump. This ensures that cooler oil from the reservoir is always entering the closed loop circuit.
- Pump isolation poppet style pilot operated check valves. These valves are used to allow a jacking pump to be connected to the system if, and only if, the pump is operating and has developed sufficient charge pressure to operate properly.

The hydraulic pumps are Sauer Danfoss 90 Series closed loop hydrostatic piston pumps, complete with integral charge pump, electronic displacement control (with manual override operator), pressure compensators (pressure limiters) on both A and B ports, and crossport relief valves. The pressure compensators will limit the maximum pressure that the pumps can develop, with further protection provided by both the internal pump cross port relief valves as well as the crossport relief valves in the main jacking manifolds.

The hydraulic motors are Sauer Danfoss H1 Series bent axis piston motors, with a 2-position displacement control. The motors are defaulted to maximum displacement to allow for maximum development of torque. Upon receipt of a pilot signal from the main jacking manifold, the motors will shift to a minimum displacement setting, allowing for higher speed operation at lower torque. This mode is only used while traversing the legs for tagging (legs not touching bottom). The motors have counterbalance valve manifolds mounted directly to the main ports of the motors. Counterbalance valves are used in both directions of travel to ensure that the weight of the legs or the weight of the boat cannot cause movement of the hydraulic motors without being “driven” by the hydraulic system pressure from the pumps. Upon loss of pressure, the counterbalance valves will close, hydraulically locking the motors in place, up to their pressure setting.

The brakes are mounted between the hydraulic motors and the planetary gearboxes. The brakes are spring applied and pressure to release. They are meant to provide static braking only. The brakes cannot release without sufficient hydraulic pressure being supplied to them from the supercharge pumps, via the main jacking manifolds. Please note that without sufficient charge pressure, the pumps cannot deliver flow to the motors either. The brakes are the Mico units previously approved and used on the above listed

systems.

The planetary gearboxes, outboard bearing endcap, and associated pinions are mounted to the leg tower. They are the Fairfield Type Approved units as used on previously approved systems.

# Section 4 - Operation & Maintenance

This section deals with the operation of the hydraulic jacking system and controls.

## Operation

The operation of the hydraulic system begins with a check of the fluid condition. Any oil put into the system must meet ISO 4406 17/14 specifications. Adequate fluid should be present as indicated by the level gauge on the reservoir. The fluid temperature should be below 180 degrees Fahrenheit. The quality of the fluid should always be maintained by routine replacement of the filter elements in the system. The oil condition should also be analyzed every 6 months to verify compliance with the ISO 4406 17/14 requirement.

## Startup Checklist

**1.** The purpose of this procedure is to provide a guideline to assist with startup of a Hydraquip CSI Jacking System.

### 2. Reference

See current revisions of all system drawing applicable to this system. Contact Hydraquip CSI St. Rose for any drawings required.

### 3. System Pre-checks

3.1 Verify that gearboxes, pinions and endcaps have been installed and aligned in accordance with suppliers' procedures. (Primary Gearbox supplied by others.)

3.2 Verify that all secondary gearboxes have been filled with gear oil (Shell Spirax S2 A80W90) to proper fill height. Contact Hydraquip CSI for alternate acceptable lubricants.

3.3 Fill the case of each brake with 4oz of clean hydraulic oil.

3.4 Fill the case of each hydraulic motor with hydraulic oil.

3.5 Verify that all piping has been installed, pickled, flushed, and pressure tested in accordance with system drawings.

3.6 Verify proper routing of all piping between HPU (hydraulic power unit) and leg motors in accordance with system drawings.

3.7 Verify that all piping and hose connections are tight.

3.8 Verify that HPU has been properly mounted and is ready for operation.

3.9 Verify that HPU reservoir has been filled with filtered hydraulic oil, Shell Tellus S2 V46. Contact Hydraquip CSI for approval of alternate hydraulic fluid. Oil must be at a cleanliness level of NAS 1638 Class 8 or better (ISO 17/14 or better). Reservoir levels must be monitored during startup process and reservoir filled with clean (NAS 1638 Class 8) oil as needed.

3.10 Fill case drain of main jacking pumps with clean hydraulic oil.

3.11 Verify that suction ball valves for each main jacking pump and each supercharge pump are open. Valve handles should be tied open with “zip ties” to help prevent inadvertent closing. Operating pumps with closed suction line valves will damage the pumps and may cause significant damage to jacking system.

3.12 Verify that all instrumentation shut off valves are open.

3.13 Verify that all instrumentation wiring is connected in accordance with system drawings.

3.14 Verify that all 3 phase power wiring is connected in accordance with system drawings.

3.15 Verify that all circuit breakers in Power Transfer and CPU panels are closed.

3.16 Verify that all circuit breakers in Leg HPU Control Panels are closed.

3.17 Verify that all circuit breakers (if equipped) in main jacking Motor Starters are closed.

3.18 Verify that all circuit breakers (if equipped) in HPU Heat Exchanger motor starter panels are closed.

3.19 Verify that E-Stop pushbuttons (if equipped) on Leg HPU Control panels are not pressed.

3.20 Verify that E-Stop pushbutton Bridge Jacking Control Panel is not pressed.

3.21 Verify that the Emergency Jacking Panels located at the Legs are OFF and that Keys are secured at the Wheelhouse.

3.22 Verify that the Emergency Jacking Panel Power Selectors are in the NORMAL position and that keys are secured at the Wheelhouse.

3.23 Verify that the Motor Starter Panels are in the Automatic Selection if operation from the Wheelhouse is planned.

3.24 Verify that ALL Jacking System Hydraulic components are ABOVE 0°C prior to Jacking operations.

## 4. System Startup

**Initial startup and verification of system operation should take place prior to legs being installed in the vessel. The vessel shall be in a safe condition to operate and at this point should not be dependent upon the jacking system to hold the vessel or legs.**

4.1 All unnecessary personnel shall be clear of HPU, legs and associated piping prior to startup. Personnel shall be strategically located around system being operated for observation of any anomalies. System must be immediately shut down upon any issues that arise.

4.2 Turn both 3 phase power and control power on feeding the system.

4.3 Verify proper operation and communication of Jacking Control System.

4.4 At each HPU, test direction of rotation of heat exchanger(s) fan by jogging local switch at HPU heat exchanger motor starter panel. If rotation is incorrect, lock out power to heat exchanger motor starter and correct wiring as needed. If rotation is correct, place switch(es) in Remote/Auto position.

4.5 At each HPU, test direction of rotation of each main jacking pump electric motor by jogging local switch at HPU soft motor starter panel. If rotation is incorrect, lock out power to motor starter and correct wiring as needed. If rotation is correct, place switch(es) in Remote/Auto position. Repeat for each electric motor on each HPU.

4.6 From Bridge Control Panel, start an electric motor. Have personnel observe locally at the HPU gage panel, and on the bridge control screen that charge pressure for the pump being rises to approximately 350psi on pump being operated. Supercharge pressure should rise to approximately 400-500psi also. Pressure will be erratic as system and piping is filled with oil. System and piping should be monitored for leaks at this time. If there are any leaks, system must be shut down with proper lockout / tagout procedure. Upon repair of any leaks, restart system. Repeat this step for each hydraulic pump/motor group in each hydraulic power unit.

4.7 Confirm that heat exchanger(s) are operating.

4.8 Prior to rotating pinions, the brakes must be bled. With the hydraulic power unit running, Hydraquip CSI personnel are to manually energize the brake solenoid valves. Verify on both the local mechanical gage and on the bridge screen that brake pressure rises to supercharge setting. Starting with lower brakes, crack the brake bleed fitting until all air is pumped out of brake. Repeat on each brake until upper most brake has been bled. Repeat this process for each leg tower.

4.9 Prior to rotating pinions, it is suggested that the two speed variable motor line be bled. With the hydraulic power unit running, Place the Mode Selector Switch on the Jacking Control Panel in the Tag position. Starting with lower hydraulic motors, crack the VM hose fitting at the hydraulic motor until all air is pumped out of the line. Repeat on each motor until upper most motors have been bled. Repeat this process for each leg tower.

4.10 Start pumps on one HPU in order to rotate pinions. From the Jacking Control Panel, place Mode Selector Switch in Normal and move joystick for one leg partially away from the center position. Verify that brake pressure rises accordingly. Verify that pinions on that leg are rotating in proper direction in accordance with direction of travel of joystick movement. Verify this in each direction of joystick travel. Please note that pinions on opposite sides of the leg / rack must counter-rotate for proper leg travel. If direction of rotation of pinions does not match joystick direction for Boat Up/Down, Hydraquip CSI personnel will correct direction in control system. Verify that all pinions rotate to insure that each brake is properly releasing. Since the pinions are “free spinning” at this point, some pinions may rotate faster than others. The operator shall limit the amount the joystick is pushed to insure that no individual motors exceed their speed limit. The system will fill all of the piping and components between the HPU and leg towers during this operation, requiring oil to be added to the reservoir to maintain proper oil level. Repeat this operation for each leg tower.

4.11 While the pinions are spinning, move the Mode Selector Switch to the Tag position. Confirm that pinion speed increases. Return switch to Normal position. Repeat this operation for each leg tower.

4.12 Once legs are installed and the vessel is floating and in a safe condition to jack, the legs may be moved. At this time, confirm that the leg position indication system is operational. With leg raised to its uppermost position, the leg position indication system must be zeroed to indicate proper leg position. With Mode Selector Switch in Normal position, move a joystick for one of the legs in the Boat Up / Leg Down direction. Verify that leg indication system is operating properly, and is reporting correct length of leg travel.

4.13 The legs can be cycled up and down at this time to insure proper operation of jacking system. System should be operated in both Normal and Tag modes. Operational pressure and leg travel speeds should be recorded at this time and reported to Hydraquip CSI Engineering. It is up to the operator of the jacking system to monitor the position of the legs to insure that the legs are not pulled into the hull such that the pads cause damage to the hull. The jacking system does NOT automatically stop the legs as the pads approach the hull.

4.14 Once the jacking system proper operation has been verified, the jacking system is ready to jack the weight of the vessel. Jacking the vessel, or anything other than just the legs, MUST be done with the Mode Selector Switch on the Jacking Control Panel in the Normal position. The system is NOT designed to jack the weight of the vessel in Tag mode. Attempting to jack the vessel in Tag mode may result in damage to the jacking system or the vessel itself.

4.15 Once legs have successfully traveled their entire length at no load, alignment verified, and bolt torque checked, system may be used to jack vessel in normal operation. System operator shall react properly to all other system warnings in the Jacking system.

4.16 The Hydraquip CSI jacking system is designed to deliver the torque required to provide the lifting forces as described in our quotation. Dependent upon the specific contract this torque may, or may not, include a reduction in efficiency for the rack to pinion gear interface, as well as the friction between the leg and tower. It is up to the Designer/Builder to verify if a higher allowance is needed to account for the frictional losses between the leg and the tower. The Designer/Builder is responsible to take into account any effects on the ability of the jacking system to lift the boat based on variances in vessel weight, variances in center of gravity of weight being lifted. The final condition of the geometry and surface finish of the gear rack, and environmental conditions, any loads applied to the pinion outside of the stated ratings will impact the life of the jacking system. It is understood and required that operation and design of the vessel will not exceed the stated capacity of the Hydraquip CSI jacking system.

4.18 The vessel must never be jacked to a condition that creates an air gap larger than the air gap approved by ABS, or other governing organization.

# Maintenance

This portion of the section deals with the required maintenance of the hydraulic system.

Filters and Fluids - One of the most important aspects of hydraulic power unit maintenance is the monitor and care of the hydraulic fluid. This is the "blood" of the system and should be maintained at proper cleanliness, temperatures and levels. In order to do so, routine replacement of all filter elements is necessary. The 1991 version of the "Fluid Power Lightning Reference Manual" states that 85% of the potential causes of hydraulic system failures can be attributed to inadequate fluid quality.

The required replacement interval depends on the operation and duty cycle of the system. The elements should routinely be replaced every 180 days or 80 hours of operation, whichever comes first. The fluid should be analyzed annually, regardless of the apparent condition to verify that the ISO 4406 18/13 requirement is being met.

In summation, the elements should be replaced as follows,

| |
|---|
| After the first 8 hours of operation |
| Every 180 days |
| Every 80 hours of operation |

**Tips on maintaining the filters include,**

- Set up a filter maintenance schedule and follow it diligently.
- Inspect filter elements that have been removed from the system for signs of failure, which may indicate the need for shortening the service interval and the possibility of other system problems.
- Do not return to the system any fluid which has leaked out.
- Always keep the supply of fresh fluid covered tightly.
- Use clean containers, hoses, and funnels when filling the reservoir. Always filter any new oil, even if the oil is in new containers, prior to filling the reservoir.
- Use common sense precautions to prevent entry of dirt into components that have been temporarily removed from the circuit.
- Make sure that the filler/breather cap on the reservoir is properly fastened.

- Do not run the system unless all normally provided filtration devices are in place.

- Make certain that the fluid used in the system is the type recommended in by the manufacturer.

Hydraulic Pump - The hydraulic pumps should be visually inspected prior to each system operation. Safe and reliable operation relies on temperature and quality of the hydraulic fluid as well as the operational speed and the suction characteristics. As long as proper oil levels are maintained in the reservoir and filter replacement is done properly, the hydraulic pump should function properly. See maintenance comments in Section 8 Cut Sheets for Hydraulic Pump Maintenance.

Hydraulic Motor – The hydraulic motors should be visually inspected prior to each system operation. Safe and reliable operation relies on temperature and quality of the hydraulic fluid as well as the operational speed and the suction characteristics. As long as proper oil levels are maintained in the reservoir and filter replacement is done properly, the hydraulic motors should function properly. See maintenance comments in Section 8 Cut Sheets for Hydraulic Motor Maintenance.

Brakes – The hydraulic released brakes should be visually inspected prior to each system operation. Safe and reliable operation relies on temperature and quality of the hydraulic fluid as well as the operational speed and the suction characteristics. See maintenance comments in Section 8 Cut Sheets for Brake Maintenance.

Gearboxes – The Gearboxes should be visually inspected prior to each system operation. The gear oil should be drained and replace annually. See maintenance comments in Section 8 Cut Sheets for Gearbox Maintenance.

General – Routinely, the overall system should be inspected visually. Any detected hydraulic leaks should be corrected immediately. Any physical damage or deterioration to components including hoses, wires and electrical conduit should be corrected. This form of inspection should be done daily.

# Jacking System Electrical and Control Components

This Sub-section contains descriptions of major Electrical and Control components utilized within the Jacking system.

## Jacking System Electrical Control System Summary

The Jacking System utilizes PLC logic, dedicated processors and redundant communication techniques to control:

- Brake system engagement/disengagement timing coordinated joystick action, Jacking speed selection and Hydraulic system readiness.
- "Syncro" system control which synchronizes single joystick control of all legs.
- Pump displacement commands (for speed and direction of leg travel) to Electronic Displacement Controllers (EDC) coordinated from joystick position, Jacking speed selection and Hydraulic system readiness.
- Management of Jacking system indication lamps and horns
- Management of Jacking system touch screen Human Machine Interface (HMI); two HMI display most system data and conditions.
- Pump Programmable Controllers process individual joystick pump signals to become manipulated and disseminated via enabling of dedicated programmable controllers; actual signals from the dedicated pump programmable controllers terminate directly upon the respective– pump electronic displacement controls (EDC).
- System accepts feedback signals from pulse pickup modules mounted on specific hydraulic motors of each leg; feedback data utilization becomes calculated leg extension distance beneath the hull. This calculated distance becomes subsequently displayed upon the HMI interactive touch screen panel.

## Jacking System Motor Starter Summary

The motor starters used on this system are Soft Start type, used to reduce the demands upon the ships generators upon initial startup. The motor starters are equipped with the soft start module, three phase power disconnect, a bypass contactor, motor circuit protector, motor overload module, current transformers and local controls. The motor circuit protector and overload modules have be preset during system testing to appropriate values for the electric motors in use. The ramp times of the soft start module have also been adjusted to provide smooth startup of the electric motors. The local controls include:

- Normal / Bypass Key Switch
- Hand / Off / Auto Switch
- Start Pushbutton
- Stop Pushbutton

- Motor Running Lamp
- Fault Lamp

The Normal / Bypass Key Switch should always be placed in the Normal position. The Bypass Switch will bypass the soft start feature and will use the bypass across the line contactor AND WILL CREATE MAXIMUM CURRENT INRUSH OF THE MOTORS. This can be used upon soft starter failure. Replace soft starter module as soon as possible.

The Hand / Off / Auto Switch allows for different modes of operation. The Off position disallows starting of the electric motor. The Local position allows the electric motor to be started and stopped locally utilizing the Start and Stop pushbuttons. The position of the switch during normal operation will be Auto. This will allow the motor starter to be controlled from the Jacking System Bridge Control Panel.

The motor starter also provides the following information to the Jacking Control System:

- 690 Volts AC present
- Motor Overload condition
- Motor Starter fault
- Motor Run indication

# Jacking Control System Description

The electrical control system provided by Hydraquip CSI consists of programmable and adjustable control systems to allow for coordination between Jacking System Hydraulic Power Units, hydraulic manifolds, pump controls, safety and alarm systems, and operator controls for operation of the Jacking System. The control system includes PLC (Programmable Logic Controller) units with Profibus and Profinet Industrial Ethernet capability to connect the Jacking Operator Controls at the wheel house to the controls in each of the hydraulic power units. The PLC data system communicates directly with interactive touch screen panels (HMI). The PLC communicates with each of the local control panels (LP) located on the hydraulic power units. The joysticks send signals to Programmable EDC/PWM Pump Controllers, designed specifically to interface with and control the pumps driving the hydraulic system for each leg. There is a joystick dedicated to each leg and a single control joystick for synchronization of all legs as described below.

The Jacking System utilizes PLC logic to control the brake system engagement and disengagement timing in coordination with a variety of factors including joystick action, speed selection, and system readiness. The system also controls running of each of the electric motors on the hydraulic power units, the "Syncro" system for single joystick control of all legs, the pump displacement changes for speed and direction of leg travel, indication lamps and horns and displays to the touch screen panels of all system data and conditions. The electric motors are started with "Soft Start" motor controllers used to minimize the current inrush demands on the ships generators. The PLC allows joystick pump signals to proceed and be manipulated via enabling of the pump programmable controllers. The actual signals from the pump programmable controllers are terminated directly on the pump electronic displacement controls (EDC.) Proper programming delivers smooth and safe movement and coordinated brake signal delivery to each leg for action. The system also accepts feedback signals from pulse pickup units mounted on the hydraulic motors driving the legs to calculate and display the distance the leg has extended or retracted below the hull upon the interactive touch screen panel.

**The Jacking System consists of several electrical panels, including:**

- HPU Control Panel (LP) contains PLC, Pump controllers, and network communication modules and acts as the main termination point for most devices on each of the power units. The PLC and assorted controllers communicate with soft starters, other PLC and controllers shipwide via a redundant Profinet Industrial Ethernet ring, CAN bus and Profibus Networks. There is one HPU Control Panel (LP) per Power Unit.

- Emergency Jacking Panel (EJP) mounted remotely that provides all operator interface devices needed to operate each leg individually in an emergency situation. Each panel contains a key switch to enable the EJP, another key switch

for selection of electrical power source, a HMI which provides leg depth data and accepts leg movement commands.

- Pilot House PLC Panel (PP) contains the PLC used to control the jacking system. The Touch Screens receive power and connect to the data network here. Logic for synchronization and speed functions are located here.

- Pilot House Control Panels (PC-A and PC-B) mounted on the bridge console that provides all operator interface devices needed to operate the Jacking System. This includes the individual leg joysticks, Syncro joystick, mode/speed selector switch, keyed power switch, electric motor start and stop switches, appropriate indicating lamps and audible alarm.

- Power Transfer Panel (TP) contains an international UPS and a secondary power supply from the emergency switchboard used to supply emergency backup power in the event that main electrical power and UPS fail.

- Jacking Control Panel Touch Screens (TS) are mounted in the bridge and provide graphical display and various control of Jacking System operating and alarm parameters. The touch screen can be switched among assorted pages. See *Pilot House HMI and Alarm Summary* section for more information.

- Jacking System Bridge Control Panel (PCA) is the main physical interface with the jacking system for command joysticks, operator switches, indicating lamps, etc. See *Jacking System Bride Control Panel* section for more information.

- Jacking System HPU Motor Start/Stop Control Panel (PCB) is the physical interface to start and stop HPU motors remotely. See *Jacking System HPU Motor Start/Stop Control Panel* for more information.

**Power Supply Arrangement/Availability Indication:**

This Jacking Control System is normally powered by the 220VAC via the ship's generators and power management system. An international UPS distributes 220VAC to all sub panels in the control system. The 220VAC supply is then converted to 24VDC at each panel via dual redundant 120VAC/220VAC to 24VDC power supplies for use in the Jacking Control System. 24VDC power supplies are located in each of the leg HPU Control Panels and in the Pilot House Control Panel. For additional redundancy, a Power Transfer Panel (TP) is supplied and located in Electronics Room. This Transfer Panel contains the International Uninterruptible Power Supply (UPS) and relay logic to utilize Main or Emergency Ship power. The UPS (Uninterruptible Power Supply) source of power is ships generators. Upon loss of ships 220VAC power, the UPS will provide

backup power for approximately 60 minutes, depending upon load placed upon the system. Upon exhaustion of UPS or UPS failure, the Power Transfer panel will automatically switch to secondary power supply from the emergency switchboard used to supply emergency backup power. The Power Transfer Panel distributes AC voltage to all HPU Control Panels and Pilot House Control Panel.

## Electric Motor Operation

The pumps are an axial piston, closed loop, electrically controlled pumps. To begin normal operation, start all electric motors. Because of this, the prime movers will take several seconds to come up to speed. The pumps will begin to turn, and the charge pressure will begin to build to approximately 31 bar and supercharge pressure will rise to approximately 31 bar. The operator will receive a “System Ready” lamp on the panel. It is now safe to operate each leg via the joystick controls. Each pump will provide flow of up to approximately 105GPM (for Normal Jacking) at the required load pressure up to approximately 275 bar. Each leg uses two pumps, providing a combined flow of approximately 210 GPM.

## Loss of One Electric Motor (Emergency) Operation

The system can also be run with only one electric motor in emergency situations. Start the good motor. The operator will receive a “System Ready” lamp on the panel. It is now safe to operate each leg via the joystick controls. Since only one motor is running, leg speed will be reduced approximately 50%. Syncro operation will be systemically disallowed by the control system if ALL legs DO NOT have a balanced number of electrical motor/pumpsets successfully operating and reporting to the system. This CAN be overridden IF necessary but vessel WILL NOT jack at level speeds.

# Pilot House HMI and Alarm Summary

Two HMI interactive touch screens are located in the bridge providing graphical display and control of operating and alarm parameters of the Jacking System. The touch screens can be switched among assorted pages and will monitor the following Jacking System functions.

Operation Page is the primary screen used to monitor normal operation of the Jacking System. Monitoring will show:

PortFWD/PortAFT/StbdFWD/StbdAFT System Ready
PortFWD/PortAFT/StbdFWD/StbdAFT Motors Running
PortFWD/PortAFT/StbdFWD/StbdAFT Motor Power Consumption
PortFWD/PortAFT/StbdFWD/StbdAFT Leg Jacking Pressure
PortFWD/PortAFT/StbdFWD/StbdAFT Charge (Pilot Control) Pressure
PortFWD/PortAFT/StbdFWD/StbdAFT Brake Pressure
PortFWD/PortAFT/StbdFWD/StbdAFT Leg Up/Down
PortFWD/PortAFT/StbdFWD/StbdAFT Leg Elevation
PortFWD/PortAFT/StbdFWD/StbdAFT Load Value
Main/Emergency Power
Speed Mode – Normal/Tag Legs/Preload
Syncro Mode
Preload Mode
PortFWD/PortAFT/StbdFWD/StbdAFT Hydraulic Tank Temperature
PortFWD/PortAFT/StbdFWD/StbdAFT Hydraulic Tank Level
Brake Lock Indication
Local Alarm Indication

Position/Running Indication:

The position and direction of travel of each leg is indicated on the Jacking System Touch Screen. Two PPU (Pulse Pickup Unit) are mounted in two of the hydraulic motors on each leg. These PPU are used to measure distance and direction of travel (Leg Up/Leg Down). This information is displayed as Leg Up or Leg Down indication for each leg when they are moving.

Alarm Window:
Located at the bottom of Operation Page. This window will resemble a “typical alarm panel”, listing all monitored points. The operator will be able to acknowledge alarms from this screen.

Jacking Control System will close a dry contact to the ship’s Alarm Management

System (AMS) if any of the “major” jacking system alarms become active AND remain un-acknowledged for more than 30 seconds. This alarm is usually referred to as the “jacking system trouble” alarm or the “jacking common” alarm.

**Monitored alarms include:**

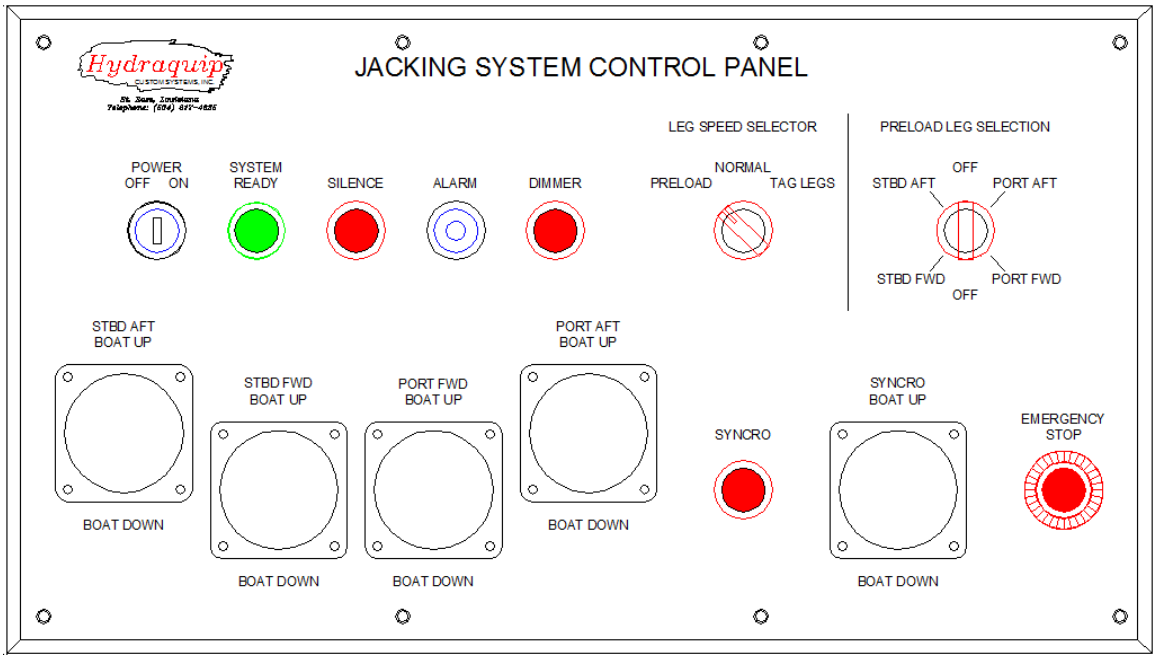
| ALARM LIST FOR H1028 AND H1029 VESSELS |
|---|
| 1 THE PORT AFT LEG HYDRAULIC FLUID LEVEL IS LOW |
| 2 THE STBD AFT LEG HYDRAULIC FLUID LEVEL IS LOW |
| 3 THE STBD FWD LEG HYDRAULIC FLUID LEVEL IS LOW |
| 4 THE PORT AFT BRAKE CIRCUIT BREAKER IS OFF OR TRIPPED |
| 5 THE STBD AFT BRAKE CIRCUIT BREAKER IS OFF OR TRIPPED |
| 6 THE STBD FWD BRAKE CIRCUIT BREAKER IS OFF OR TRIPPED |
| 7 THE PORT AFT VARIABLE SPEED CIRCUIT BREAKER IS OFF OR TRIPPED |
| 8 THE STBD AFT VARIABLE SPEED CIRCUIT BREAKER IS OFF OR TRIPPED |
| 9 THE STBD FWD VARIABLE SPEED CIRCUIT BREAKER IS OFF OR TRIPPED |
| 10 THE PORT AFT MOTOR 1 START REQUEST HAS FAILED |
| 11 THE PORT AFT MOTOR 2 START REQUEST HAS FAILED |
| 12 THE STBD AFT MOTOR 1 START REQUEST HAS FAILED |
| 13 THE STBD AFT MOTOR 2 START REQUEST HAS FAILED |
| 14 THE STBD FWD MOTOR 1 START REQUEST HAS FAILED |
| 15 THE STBD FWD MOTOR 2 START REQUEST HAS FAILED |
| 16 THE PORT AFT MOTOR 1 IS IN FAULT OR OVERLOAD CONDITIONS |
| 17 THE PORT AFT MOTOR 2 IS IN FAULT OR OVERLOAD CONDITIONS |
| 18 THE STBD AFT MOTOR 1 IS IN FAULT OR OVERLOAD CONDITIONS |
| 19 THE STBD AFT MOTOR 2 IS IN FAULT OR OVERLOAD CONDITIONS |
| 20 THE STBD FWD MOTOR 1 IS IN FAULT OR OVERLOAD CONDITIONS |
| 21 THE STBD FWD MOTOR 2 IS IN FAULT OR OVERLOAD CONDITIONS |
| 22 THE PORT AFT MOTOR 1 HAS LOW OR NO VOLTAGE |
| 23 THE PORT AFT MOTOR 2 HAS LOW OR NO VOLTAGE |
| 24 THE STBD AFT MOTOR 1 HAS LOW OR NO VOLTAGE |
| 25 THE STBD AFT MOTOR 2 HAS LOW OR NO VOLTAGE |
| 26 THE STBD FWD MOTOR 1 HAS LOW OR NO VOLTAGE |
| 27 THE STBD FWD MOTOR 2 HAS LOW OR NO VOLTAGE |
| 28 PORT AFT SUPERCHARGE PRESSURE IS TOO LOW |
| 29 STBD AFT SUPERCHARGE PRESSURE IS TOO LOW |
| 30 STBD FWD SUPERCHARGE PRESSURE IS TOO LOW |
| 31 PORT AFT TANK TEMPERATURE IS TOO HIGH |
| 32 STBD AFT TANK TEMPERATURE IS TOO HIGH |
| 33 STBD FWD TANK TEMPERATURE IS TOO HIGH |
| 34 PORT AFT DC POWER SUPPLY #1 IS FAULTY |
| 35 PORT AFT DC POWER SUPPLY #2 IS FAULTY |
| 36 STBD AFT DC POWER SUPPLY #1 IS FAULTY |
| 37 STBD AFT DC POWER SUPPLY #2 IS FAULTY |
| 38 STBD FWD DC POWER SUPPLY #1 IS FAULTY |
| 39 STBD FWD DC POWER SUPPLY #2 IS FAULTY |
| 40 PORT AFT SYSTEM PRESSURE IS LOWER THAN EXPECTED |
| 41 STBD AFT SYSTEM PRESSURE IS LOWER THAN EXPECTED |
| 42 STBD FWD SYSTEM PRESSURE IS LOWER THAN EXPECTED |
| 43 PORT AFT CHARGE PRESSURE AT HPU#1 IS LOWER THAN EXPECTED |
| 44 PORT AFT CHARGE PRESSURE AT HPU#2 IS LOWER THAN EXPECTED |

| |
|---|
| 45 STBD AFT CHARGE PRESSURE AT HPU#1 IS LOWER THAN EXPECTED |
| 46 STBD AFT CHARGE PRESSURE AT HPU#2 IS LOWER THAN EXPECTED |
| 47 STBD FWD CHARGE PRESSURE AT HPU#1 IS LOWER THAN EXPECTED |
| 48 STBD FWD CHARGE PRESSURE AT HPU#2 IS LOWER THAN EXPECTED |
| 49 PORT AFT BRAKE PRESSURE IS LOWER THAN EXPECTED |
| 50 STBD AFT BRAKE PRESSURE IS LOWER THAN EXPECTED |
| 51 STBD FWD BRAKE PRESSURE IS LOWER THAN EXPECTED |
| 52 PORT AFT EMERGENCY PANEL IS ON!! |
| 53 STBD AFT EMERGENCY PANEL IS ON!! |
| 54 STBD FWD EMERGENCY PANEL IS ON!! |
| 55 MAIN 220V AC POWER TO JACKING CONTROLS IS LOST- CHECK MAIN SUPPLY! |
| 56 BACKUP 220V AC POWER TO JACKING CONTROLS IS LOST- CHECK BYPASS SUPPLY! |
| 57 UPS UNIT IS NOT SUPPLYING POWER -- 220V AC INPUT HEALTHY!! CHECK UPS SWITCH! |
| 58 UPS UNIT IS NOT SUPPLYING POWER -- CHECK UPS BATTERY OR SWITCH POSITION! |
| 59 THE PORT FWD MOTOR 1 START REQUEST HAS FAILED |
| 60 THE PORT FWD MOTOR 2 HAS LOW OR NO VOLTAGE |
| 61 WARNING THE PORT AFT "A" STARTER IS NOT IN AUTO! |
| 62 WARNING THE PORT AFT "B" STARTER IS NOT IN AUTO! |
| 63 WARNING THE STBD AFT "A" STARTER IS NOT IN AUTO! |
| 64 WARNING THE STBD AFT "B" STARTER IS NOT IN AUTO! |
| 65 WARNING THE STBD FWD "A" STARTER IS NOT IN AUTO! |
| 66 WARNING THE STBD FWD "B" STARTER IS NOT IN AUTO! |
| 67 THE PORT FWD VARIABLE SPEED CIRCUIT BREAKER IS OFF OR TRIPPED |
| 68 PORT FWD TANK TEMPERATURE IS TOO HIGH |
| 69 THE PORT FWD MOTOR 2 START REQUEST HAS FAILED |
| 70 PORT FWD DC POWER SUPPLY #1 IS FAULTY |
| 71 PORT FWD DC POWER SUPPLY #2 IS FAULTY |
| 72 THE PORT FWD BRAKE CIRCUIT BREAKER IS OFF OR TRIPPED |
| 73 THE PORT FWD MOTOR 1 IS IN FAULT OR OVERLOAD CONDITIONS |
| 74 THE PORT FWD MOTOR 2 IS IN FAULT OR OVERLOAD CONDITIONS |
| 75 PORT FWD SUPERCHARGE PRESSURE IS TOO LOW |
| 76 THE PORT FWD MOTOR 1 HAS LOW OR NO VOLTAGE |
| 77 WARNING!! THE VESSEL IS LISTING AT LEAST 1.5 DEGREES FROM LEVEL |
| 78 WARNING!! THE VESSEL IS LISTING AT LEAST 2.0 DEGREES FROM LEVEL |
| 79 DC POWER SUPPLY #2 AT JOYSTICK STATION IS FAULTY! |
| 80 PORT FWD CHARGE PRESSURE AT HPU#1 IS LOWER THAN EXPECTED |
| 81 PORT FWD CHARGE PRESSURE AT HPU#2 IS LOWER THAN EXPECTED |
| 82 DC POWER SUPPLY #1 AT JOYSTICK STATION IS FAULTY! |
| 83 PORT FWD EMERGENCY PANEL IS ON!! |
| 84 WARNING THE PORT FWD "A" STARTER IS NOT IN AUTO! |
| 85 PORT FWD BRAKE PRESSURE IS LOWER THAN EXPECTED |
| 86 PORT FWD SYSTEM PRESSURE IS LOWER THAN EXPECTED |
| 87 THE PORT FWD LEG HYDRAULIC FLUID LEVEL IS LOW |
| 88 PORT FWD ELECTRIC MOTOR A IS BECOMING OVERLOADED - SLOW DOWN! |
| 89 PORT FWD ELECTRIC MOTOR B IS BECOMING OVERLOADED - SLOW DOWN! |
| 90 PORT AFT ELECTRIC MOTOR A IS BECOMING OVERLOADED - SLOW DOWN! |
| 91 PORT AFT ELECTRIC MOTOR B IS BECOMING OVERLOADED - SLOW DOWN! |
| 92 STBD FWD ELECTRIC MOTOR A IS BECOMING OVERLOADED - SLOW DOWN! |
| 93 STBD FWD ELECTRIC MOTOR B IS BECOMING OVERLOADED - SLOW DOWN! |
| 94 STBD AFT ELECTRIC MOTOR A IS BECOMING OVERLOADED - SLOW DOWN! |
| 95 STBD AFT ELECTRIC MOTOR B IS BECOMING OVERLOADED - SLOW DOWN! |
| 96 WARNING THE PORT FWD "B" STARTER IS NOT IN AUTO! |

Please see HMI details in separate section below for more information.

# Jacking System Bridge Control Panel

The Jacking System Bridge Control Panel is the main physical interface with the jacking system for command joysticks, operator switches, indicating lamps, etc.




Functions from the Jacking System Bridge Control Panel include:

- **On/Off Power Switch** – Key switch used to power the jacking control system ON and OFF. Note that this switch controls 24VDC power from the DC supply on the Pilot House PLC panel directly, and VDC supply in each of the leg HPU Control Panels (LP) via relays. It does not switch the 110VAC feeding these power supplies. Care should be taken to insure that all power is removed from the panel when troubleshooting.

- **E-Stop** – Removes 24VDC power from the Pilot house PLC panel (PP), subsequently disrupting the electrical trigger signals to the power systems of the individual HPU Control Panels (LP) thus forcing electrical functions to return to their neutral conditions, brakes set, motors shut down, etc.

- **System Ready Lamp** – The system ready lamp is illuminated on the control panel (and displayed on the touchscreen) when at a minimum, one electrical motor pump set is energized and are producing sufficient charge pressure (14 bar); Furthermore, circuit breakers for brake solenoids and variable speed solenoids must be closed. On four legged vessels the system ready lamp also requires all legs to have balanced pump set conditions. (Individual leg system ready conditions are displayed upon the

HMI) Brakes cannot be released, and pump displacement commands cannot be sent, during SYNCRO without a "system ready lamp." (The same conditions on a per leg basis must be present in order to release brakes or command pumps.)

- **Alarm/Silence Pushbutton/Lamp** – This lamp/pushbutton becomes illuminated when certain alarms or notifications become active. Specific alarms will cause the Sonalert horn to become energized. When the Sonalert horn is energized longer than 30 seconds the system will close a contact to the AMS. The pushbutton lamp and Sonalert horn will become de-energized upon pushbutton activation. Alarms displayed on the HMI will also become acknowledged.

- **Speed Mode Switch** – The speed mode switch is used to select the various jacking modes.

- **Operating Speeds** –

  Normal Speed is set to the full lifting capability of the vessel, and should be used to jack the vessel UP and DOWN.

  Leg Tag Speed is set to a faster rate, as much as fifty percent, but DOES NOT HAVE FULL LIFTING CAPABILITY and should only be used to lower or raise the legs, without the full weight of the vessel. **Never attempt to lift or lower the vessel in Leg Tag Speed.**

  Preload Speed is a completely different program algorithm, and is covered elsewhere in this manual. This setting is only used to preload the vessel; Normal and tag speed operations are defeated if this mode is selected.

- **Preload Leg Selector Switch -** This 3-way switch selects which pair of diagonal legs will be preloaded; Port Forward and Starboard Aft OR Starboard Forward and Port Aft.

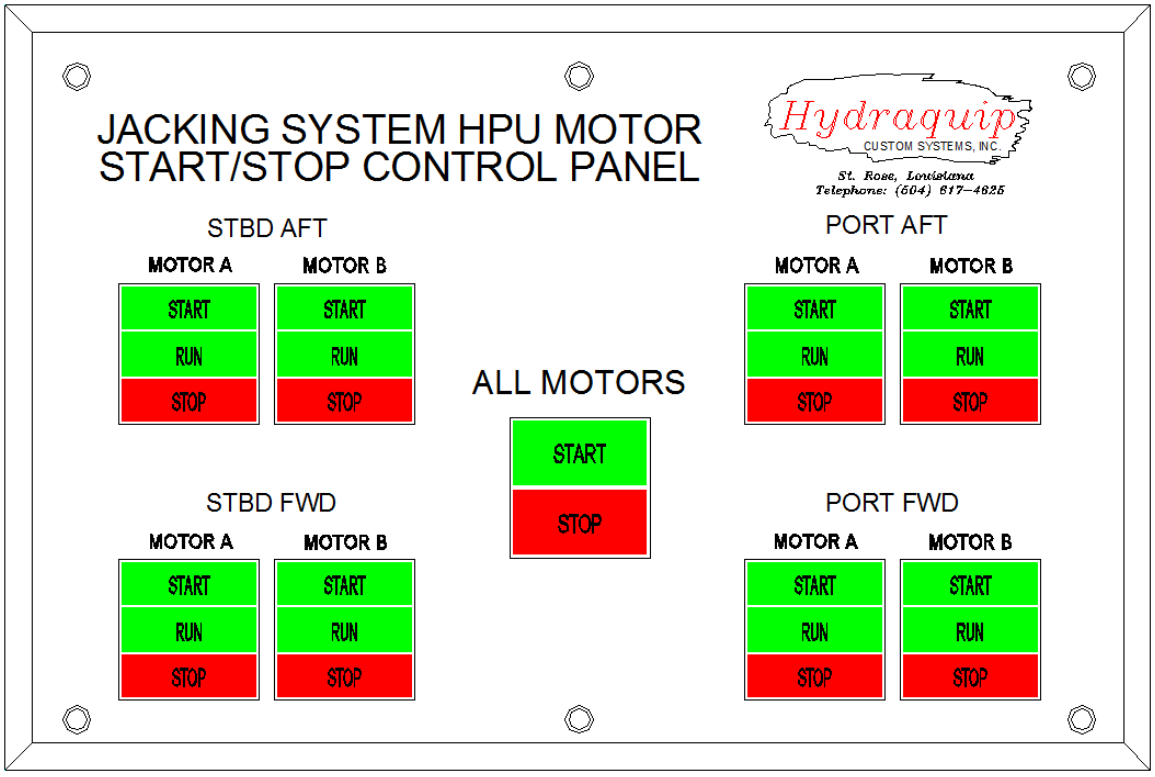
- **PF/PA/SA/SF Joysticks** – The joysticks produce signals to the control system to be utilized by the EDC/PWM digital pump controllers. The joysticks are proportional, such that a small movement on the joystick corresponds to a slower jacking speed. The operator is able to "feather" the system using these joysticks.

- **Syncro Pushbutton** – The Syncro pushbutton when pushed will become illuminated, if syncro conditions are met to set control of all four legs to the Syncro joystick.

- **Syncro Joystick** – The Syncro joystick produces parallel signals to all leg controllers, allowing the four legs to be operated at relatively the same speed.
- **Dimmer** – The dimmer pushbutton is used to control the brightness of all lamps on the control panel.

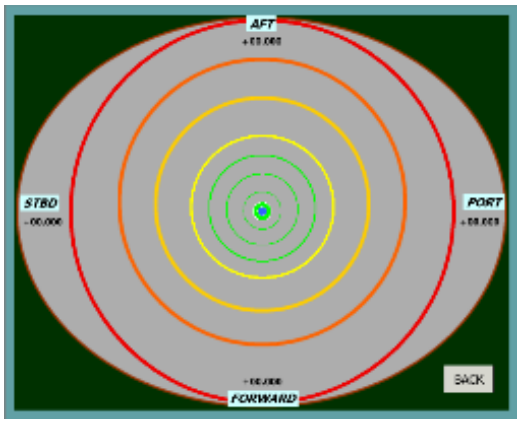
# Jacking System HPU Motor Start / Stop Control Panel

The Motor Start and Motor Stop pushbuttons are used to start and stop each of the electric motors on the leg HPU's. They are labeled PF-A and PF-B for the Port Forward HPU, PA-A and PA-B for the Port Aft HPU, SF-A and SF-B for the Starboard Forward HPU and SA-A, SA-B for the Starboard Aft HPU. There is also a Start All and Stop All pushbutton. Pressing the Start All pushbutton will sequentially start all eight HPU electric motors. Even though soft start motor starters are used in this system, the customer should verify the shipboard generator has sufficient capacity to meet the electrical demand of starting all motors simultaneously. The Stop All pushbutton simultaneously stops all electric motors currently running.



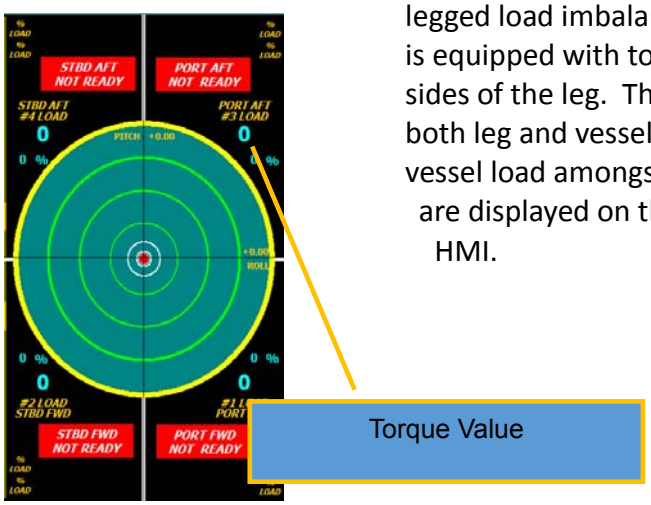
# Special Features of Control System

- **Inclinometer** – the inclinometer system provides visual indication of vessel trim to the jacking system operator and functions as a vessel tilt alarm.
    - Features
        - Consists of two sensors – one measuring pitch and one measuring roll




        - Operates through the PLC which is always powered up.
        - Measures through a range of -10° through 10° from horizontal setting
        - Resolution greater than 0.05°
        - Twin screens resolved as a “Bubble” tracking toward higher elevations
        - Digital elevation values displayed
        - Central indicator located on the main Operation Page of the HMI
    - Larger resolution page available via navigation button of HMI
    - Interfaces
        - Trim values +/-1.5° from horizontal will result in the following actions:
            - Dry contact closure to the AMS system @ 1.5° tilt alarm
            - Sonalert horn energized (cannot be silenced)
            - Alarm lamp becomes illuminated (cannot be acknowledged)
            - Alarm screen displays 1.5° alarm indication on HMI
        - Trim values +/-2.0° from horizontal will result in the following actions:
            - Dry contact closure to the AMS system @ 2.0° tilt alarm
            - Sonalert horn energized (cannot be silenced)
            - Alarm lamp becomes illuminated (cannot be acknowledged)
            - Alarm screen displays 2.0° alarm indication on HMI
        - Overrides
            - If the vessel is in challenging seas the alarm will likely encounter many nuisance alarms above 1.5° - the operator can silence this alarm for ONE period
            - If the vessel requires an intentional period of excessive tilt the operator can silence alarm for ONE period.
            - The override is self-reset following the end of system ready

- **Leg Load Assistance** – Four legged self-elevating vessels are highly prone to cross legged load imbalance conditions. The system is equipped with torque transducers on both sides of the leg. This allows the system to read both leg and vessel forces to help balance the vessel load amongst the four legs. These values are displayed on the center section of the HMI.




- **Password Protection** – Many features are password protected for the safety of the system and the operators – the owner and builder have these password lists. Some features have passwords that are only accessible by the OEM in emergencies.

- **Alarm Logging** – Alarms that appear on the alarm screen are logged to a special log page inside the HMI – this is located on the lower left of the Overrides Page for operator convenience. (see *Override Page* information elsewhere in this manual for details)

- **Brake Bleed Assistance** – Special password protected and self-resetting page is available in the HMI to assist the operator in the bleeding of brakes. This system does NOT require regular brake bleeding unless the brakes exhibit tendencies to release too slowly; this will occur more frequently when the system is new or has been serviced allowing air into the braking system hydraulic circuits. This special page can be found on the Brake Lock Page. (see *Brake Lock Page* information elsewhere in this manual for details)

- **Leg Distance Measurement** – The system is equipped with Sensors on all legs to help measure distance travelled beneath the hull. While accurate and dependable, care should be exercised to keep wiring sound and calibration checked. We suggest resetting the values to zero when storing the legs for movement to avoid errors that can creep in due to inefficiencies in the rack mesh. (see *Leg Counter Page* information elsewhere in this manual for details)

- **Automatic Motor Initialization** – Depressing "Start ALL motors" will commence an automated sequence to initialize start commands to all motor starters; delays from the PMS system WILL create significant variance in start times as each motor must start singularly to minimize impacts on vessel power supplies and generators.

- **Alarm Management Interface** – In addition to the Tilt alarm contacts described above the system will ALSO close a dry contact to the AMS system if any of the "major" jacking system alarms become active AND remain un-acknowledged for more than 30 seconds. The actual trigger is the horn circuit which means that acknowledging the alarm will both stop the horn AND remove the signal to the AMS – this alarm is usually referred to as the "jacking system trouble" alarm or the "jacking common" alarm.

- **Emergency Jacking Panels** – See description in the emergency section of this manual.

- **Runtime Meters** – These are available to assist the operator in tracking the operational times of the Jacking System for accurate periods needed for filter changes or oil changes. One meter is Non-Resettable. These are accessible from the Leg Counter Page. (see the *Runtime Information Page* description for more details)

- **Electrical Motor Operational Data** – This system utilizes a Modbus linear ring to observe all operational data of the electrical motors – the items displayed include voltage available, amperage as a function of load percentage and NOT actual amps; this assists the operator in knowing a 0-100% value of load without needed to know FLA of the Electrical motors. These displays are located on the main Operation Page. (see *Operation Page* section for more information)

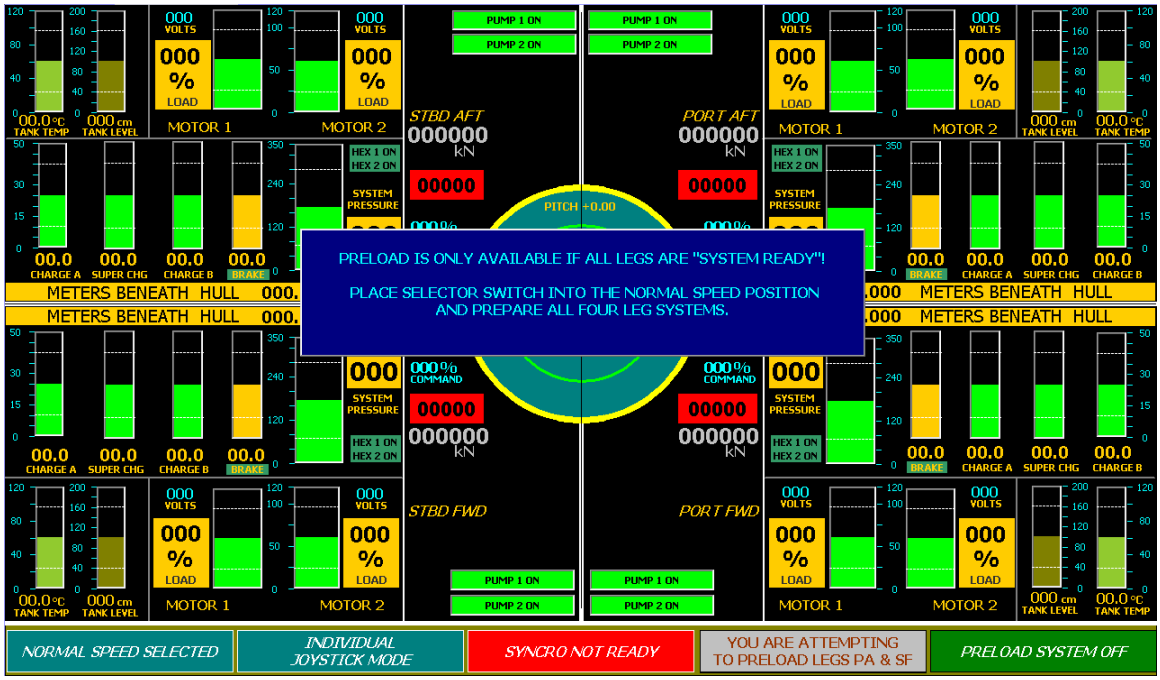
- **Electrical Motor Heater Control** – Override Page exists to defeat the condensation heaters located in the main electrical motors if needed for any reason. Common reasons for this system are short circuits and high ambient temperatures with low RH. (see the *Electrical Motor Heater Page* information for more details)

- **Preload System –** Utilization of torque sensors provides assistance in properly preloading vessel. See *Preload Operation* section of manual for more information and instructions.

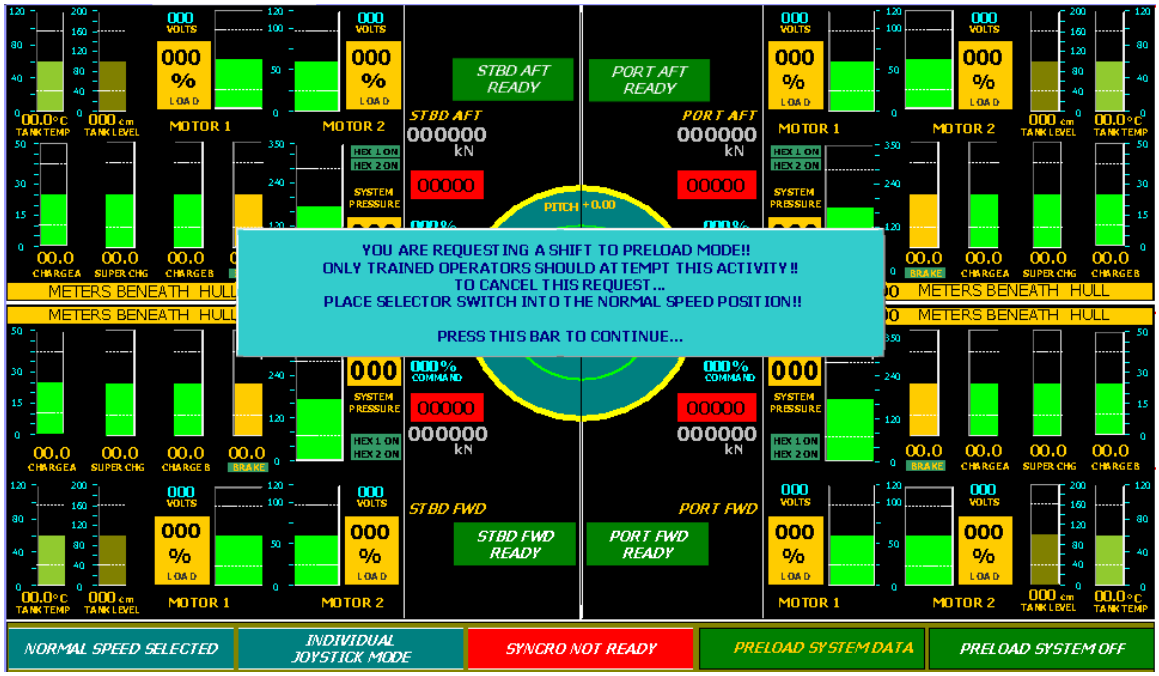
# Preload Operation

Four legged vessels typically preload in a different style than three legged vessels. The vessel raises TWO diagonal legs UP from the tagged position on the sea floor in order to apply preload pressure forces to the OTHER two “preloaded” legs. Preloading is often done manually but this system has a semi-automatic method to conduct the very important preload procedure.

The procedure is as follows:
Select the “Preload Mode” and after a short delay the HMI will display the following screen IF ALL LEGS are NOT successfully in System Ready condition:

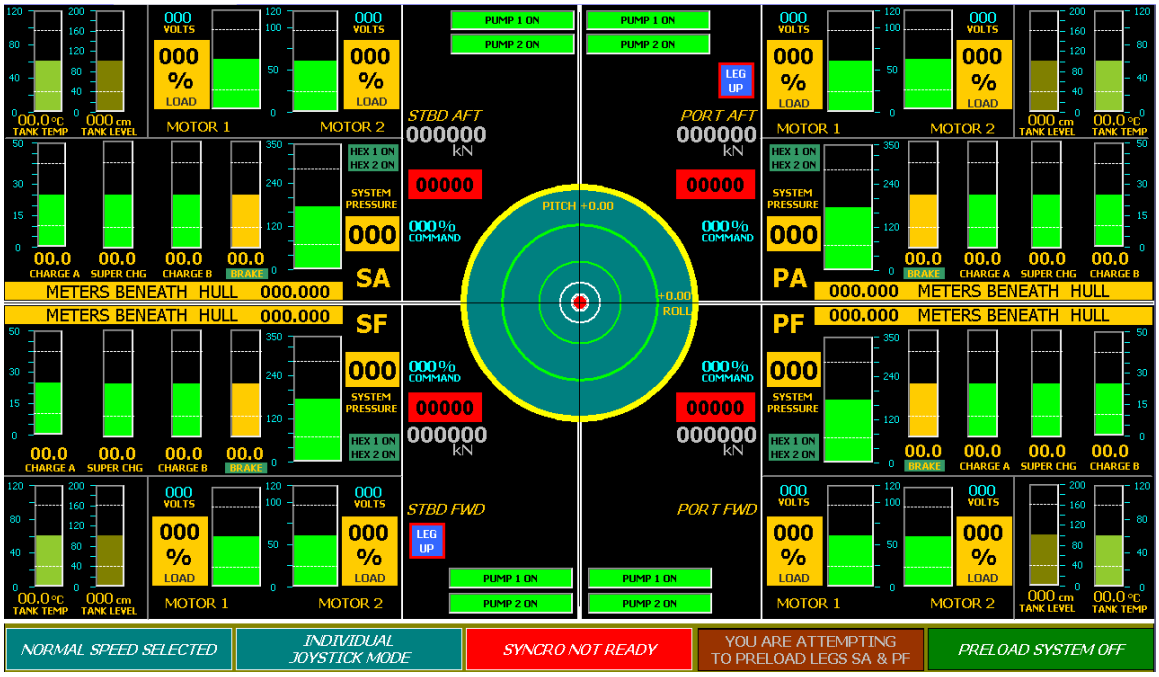


IF all legs are ready the following screen will become displayed:

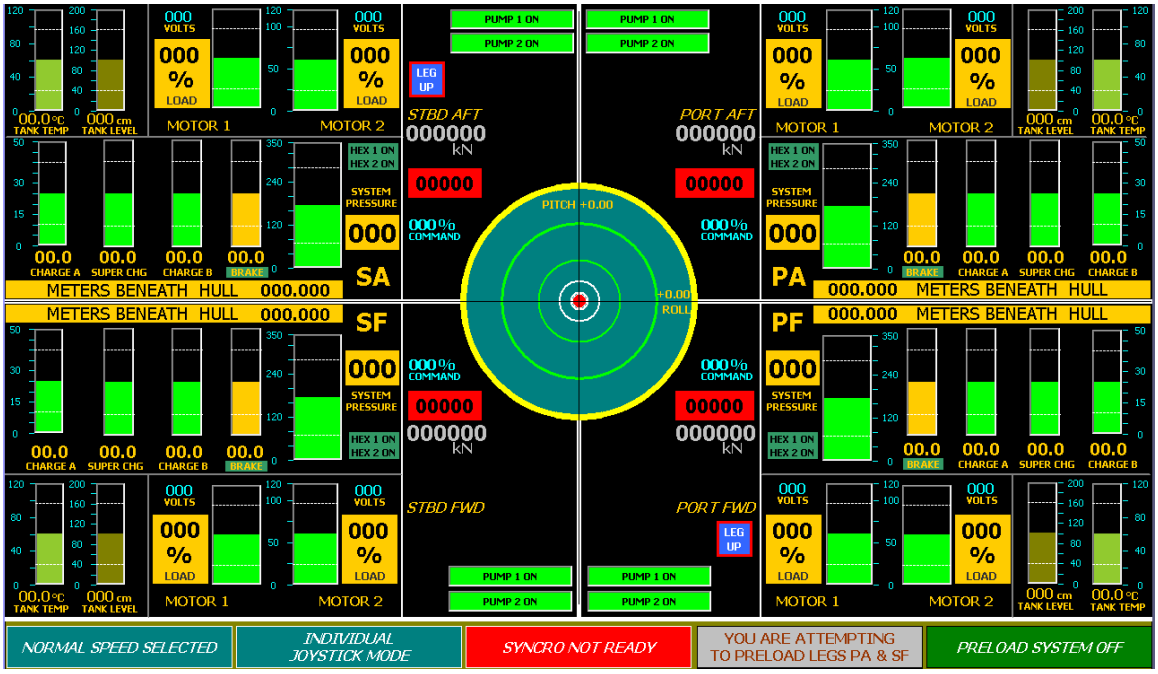


- The operator will use the Preload Leg Selector Switch located on Jacking System Control Panel to select which DIAGONAL pair of legs to become preloaded.
  EITHER:
  - Preloading Legs SA and PF OR
  - Preloading Legs PA and SF

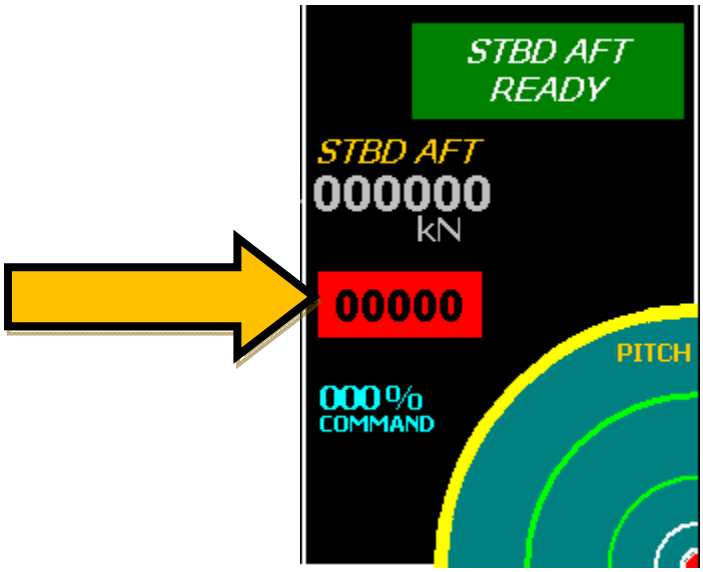
- Assuming a selection of Preloading Legs SA and PF will result in this screen becoming displayed:



- Assuming a selection of Preloading Legs PA and SF will result in this screen becoming displayed:



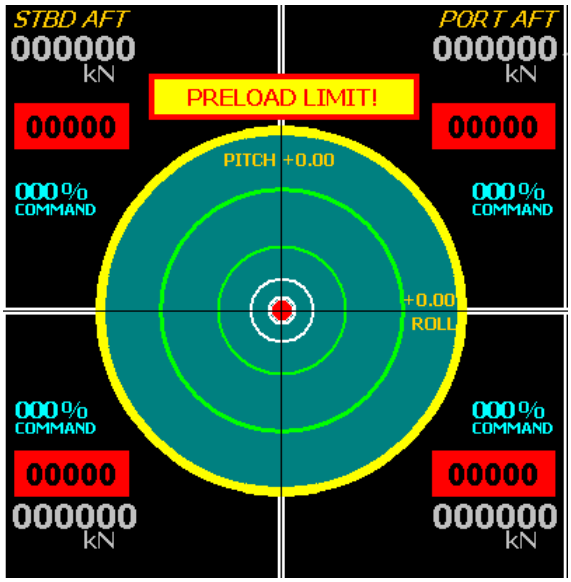

- MAX LOAD values will appear for each preloading leg. Operator will then enter MAX LOAD value for preloading leg by pressing the numerical MAX LOAD value.



- A numerical keypad will appear:


- Press ENTER key (□) to accept new value.

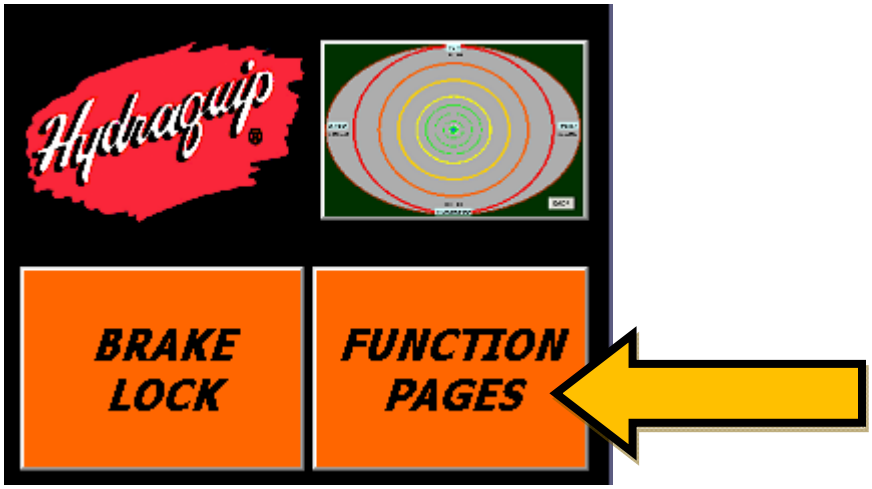
- The system is now ready for Preload action:
  - ALL individual leg Joysticks are turned OFF.
  - ONLY the Syncro joystick is active AND only in the BOAT UP – LEG DOWN direction.
  - Syncro mode becomes active and cannot be defeated by the individual leg joysticks.
  - The operator begins to move the syncro joystick in the normal fashion
  - The brakes release normally.
  - The Two diagonal legs that are indicated to go UP begin to raise as the pressure quickly increases on the two preload legs until the target value is reached.
  - The commands are then defeated automatically – the pressure abates – the brakes become set and the **<u>preload limit indicator</u>** becomes illuminated on the HMI as shown here:

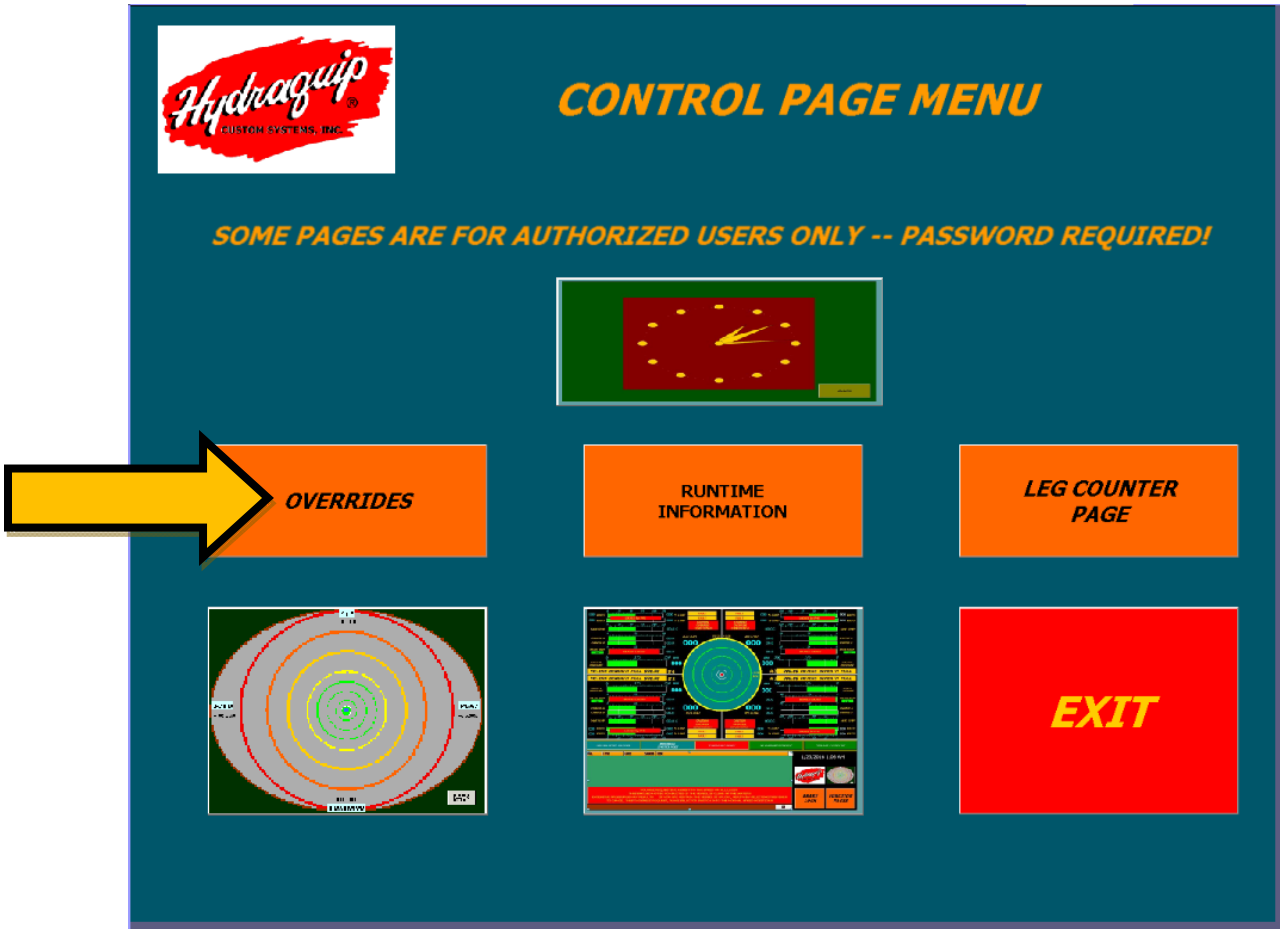


- The operator now waits as the vessel penetrates and then repeats the process on the same diagonal or the opposite diagonal as needed until proper penetration and vessel trim are attained.
- During the process each subsequent preload setup requires a reset of the preload system as indicated on the HMI.
- Placing the mode selector into normal speed and then back to preload will reset the system.
- The preload limit is reached when EITHER preloading legs reaches user entered limit.

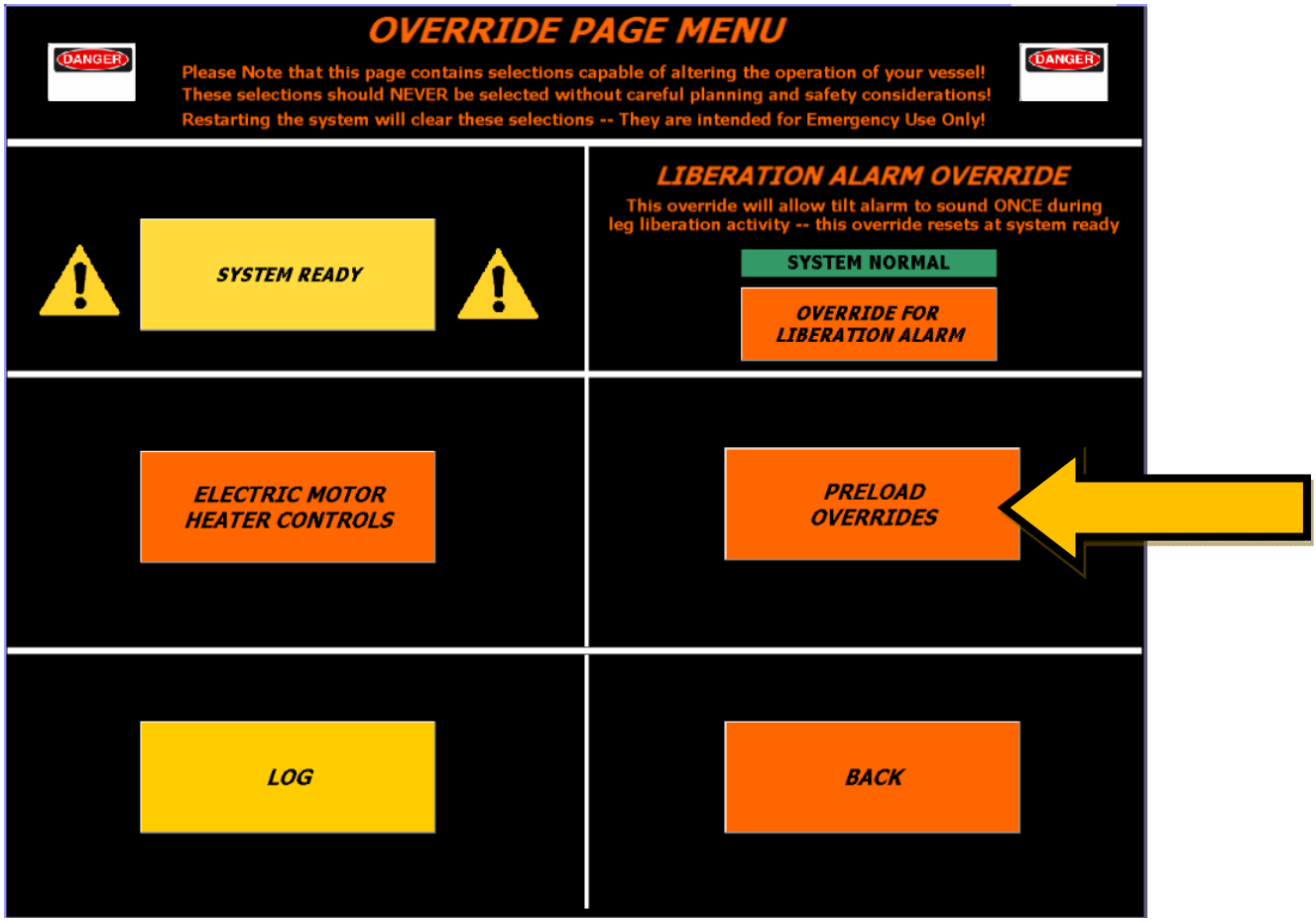
## Preload Calculation Method

- Operator has ability to use hydraulic pressure readings to calculate preload values upon torque transducer failure.
- Select ***Function Pages*** from Main Operation Page

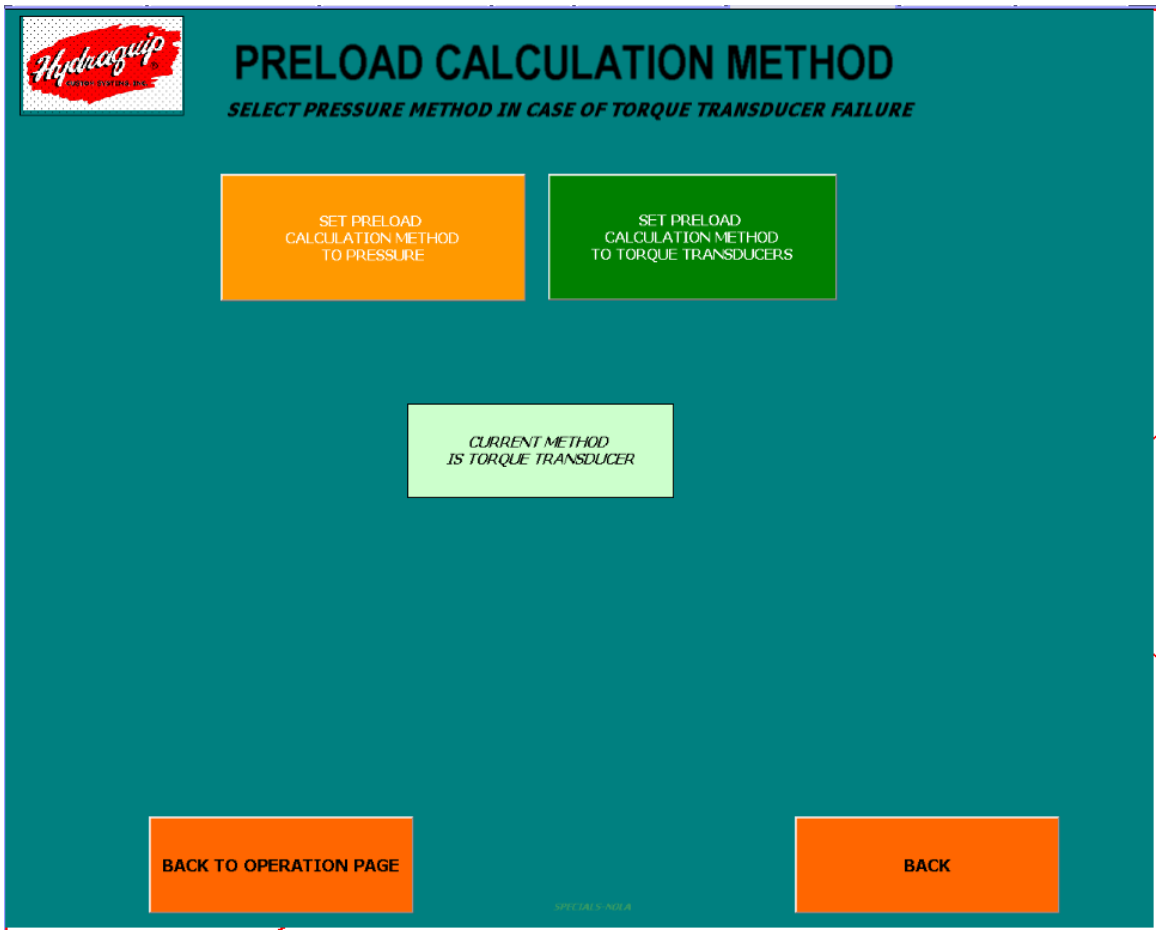




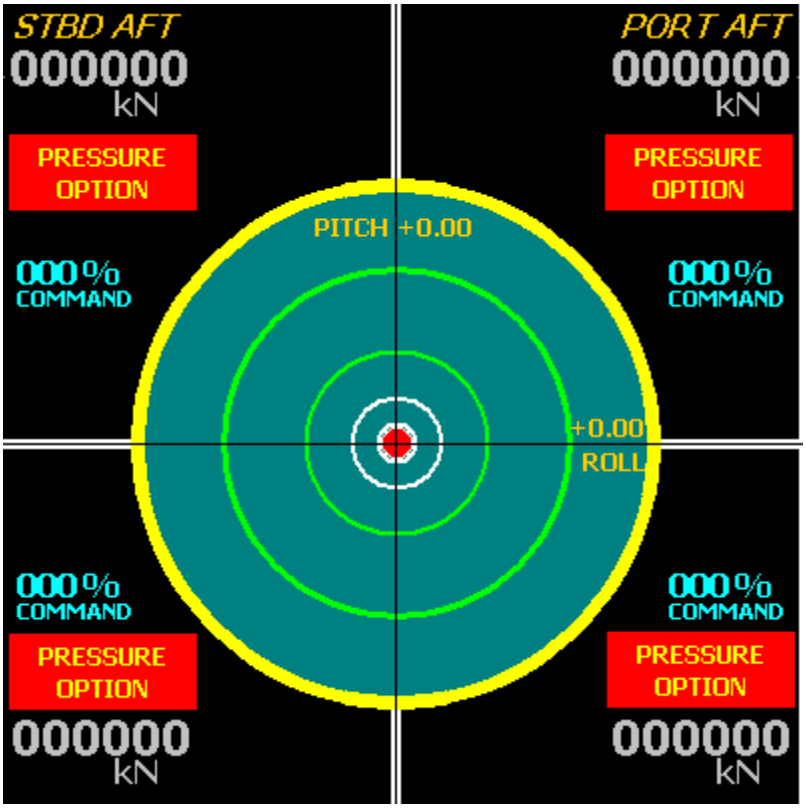

- Select ***Overrides***




- Select ***Preload Overrides***




- Select desired calculation method then return to Operation Page
- “Pressure Option” is displayed on Operation Page:




- Preload Limit is set to **200 bar** system pressure for system and vessel protection.
- ***ATTENTION**:*
    - *Preload Pressure Calculation Method is not a truly accurate representation of leg load and should ONLY be used as a guide for preloading vessel when torque transducers have failed.* ***Additional caution and attention should be used when preloading with this method.*** *Contact OEM for replacement transducers right away.*

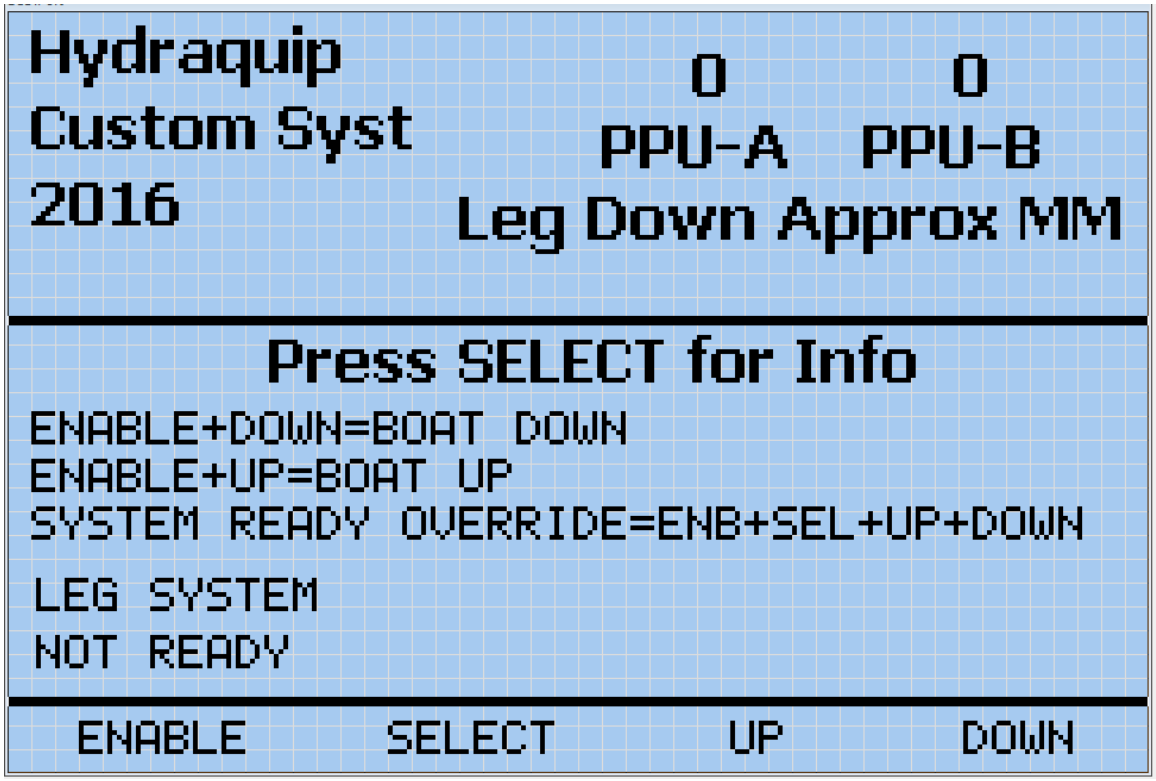
# Emergency Operation (Loss of Primary Controls)

If the controls in the Pilot House are rendered inoperable, the system will lose the command signals which will cause the system control valves to deenergize. Without a command signal, the valves directing pressure to the gearbox piping and brakes will be shut off and all jacking function will stop. There will be no pressure to (a) release the brakes or (b) turn the pinions. In this situation, there are two ways to resume jacking functions.

- Emergency Jacking Panel (EJP) located on deck near each leg.
    - 

    - The EJP operates the leg it is located near via (2) key switches and (1) HMI
        - The right-hand key switch is a 2 position Normal/Emergency that enables the EJP. In the System Normal position, the Pilot House jacking controls are active. In the Emergency position, only local controls at the EJC can be used to operate the jacking system.
        - The second key switch is a power selector. The operator can choose to engage Normal power Supply from the Jacking system distribution, Aux power from Motor Starter bank A, or Aux power from Motor Starter bank B.
        - Power Source Lamps indicate which power sources are available. Lamps illuminate when associated power is available for emergency use.
            - ***NOTE**: 690VAC supply to Jacking System HPU must be available in order to start electric motors.*

- All emergency jacking activity at each leg is commanded by the local HMI shown below:
  - Information available on screen dependent upon activity selected
  - Display meters below hull.
  - Instructions on button usage
  - System Ready information
  - Directional movement information
  - Brake release command status
- Command buttons:
  - “Enable”
  - “Select”
  - “Up”
  - “Down”
- Combinations of simultaneous button presses required for assorted results:
  - “Select” only--- will display instructions.
  - “Enable” + “Down” --- will command boat down leg up movement.
  - “Enable” + “Up” --- will command boat up leg down movement.



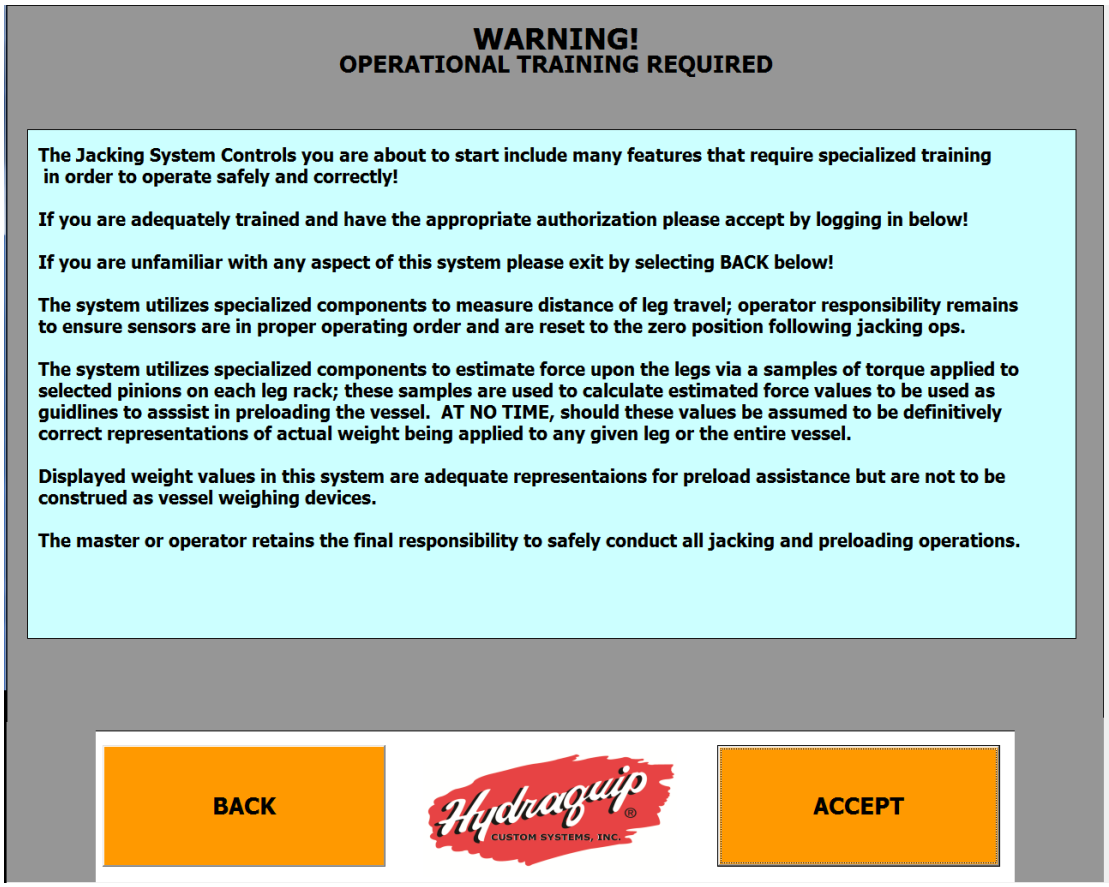
**There is NO SYNCRO MODE while using the Emergency Jacking Controls.**

- Additional emergency mechanical controls include the brake and jacking valves located on the HPU. These valves can also be operated manually by depressing the solenoid override switches on the end of the control valve. The brake valve must be energized to allow jacking to resume when actuating the system locally from the HPU.

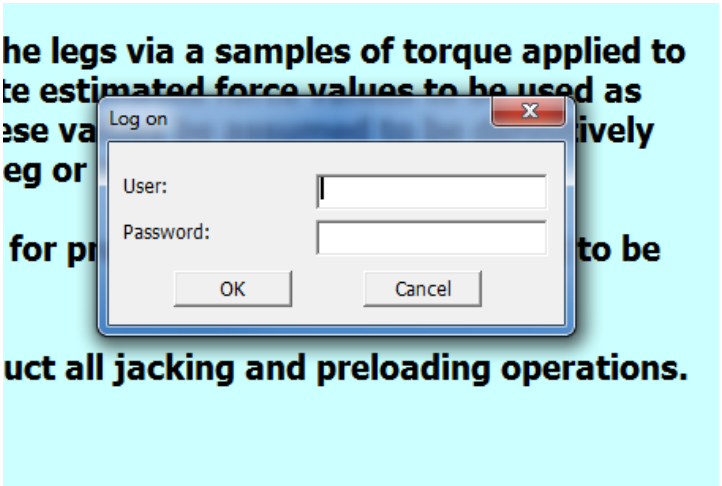
# Touch Screen HMI Operation

The opening page appears automatically following power up of the system.

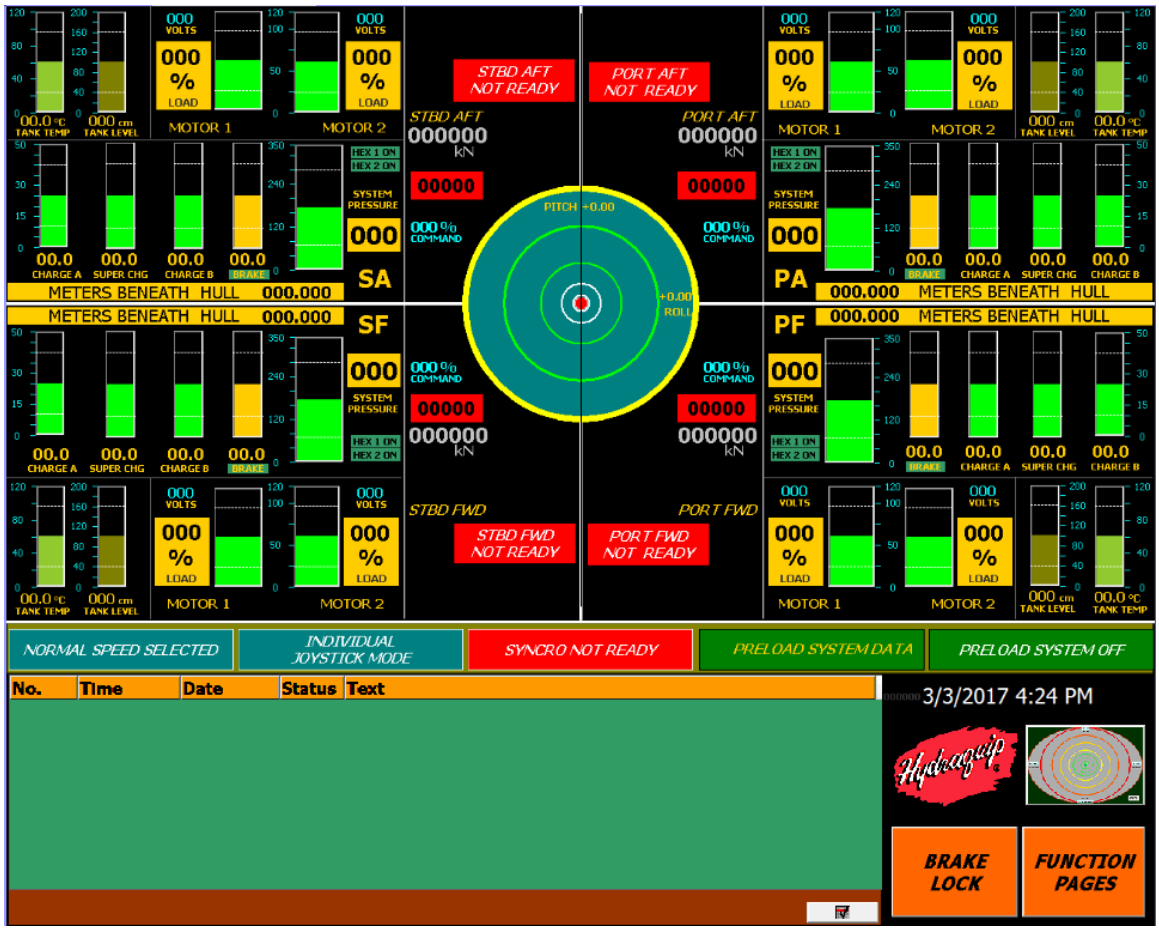
The Warning Page reminds untrained users to step away!!




Operator username and password is required to access system.



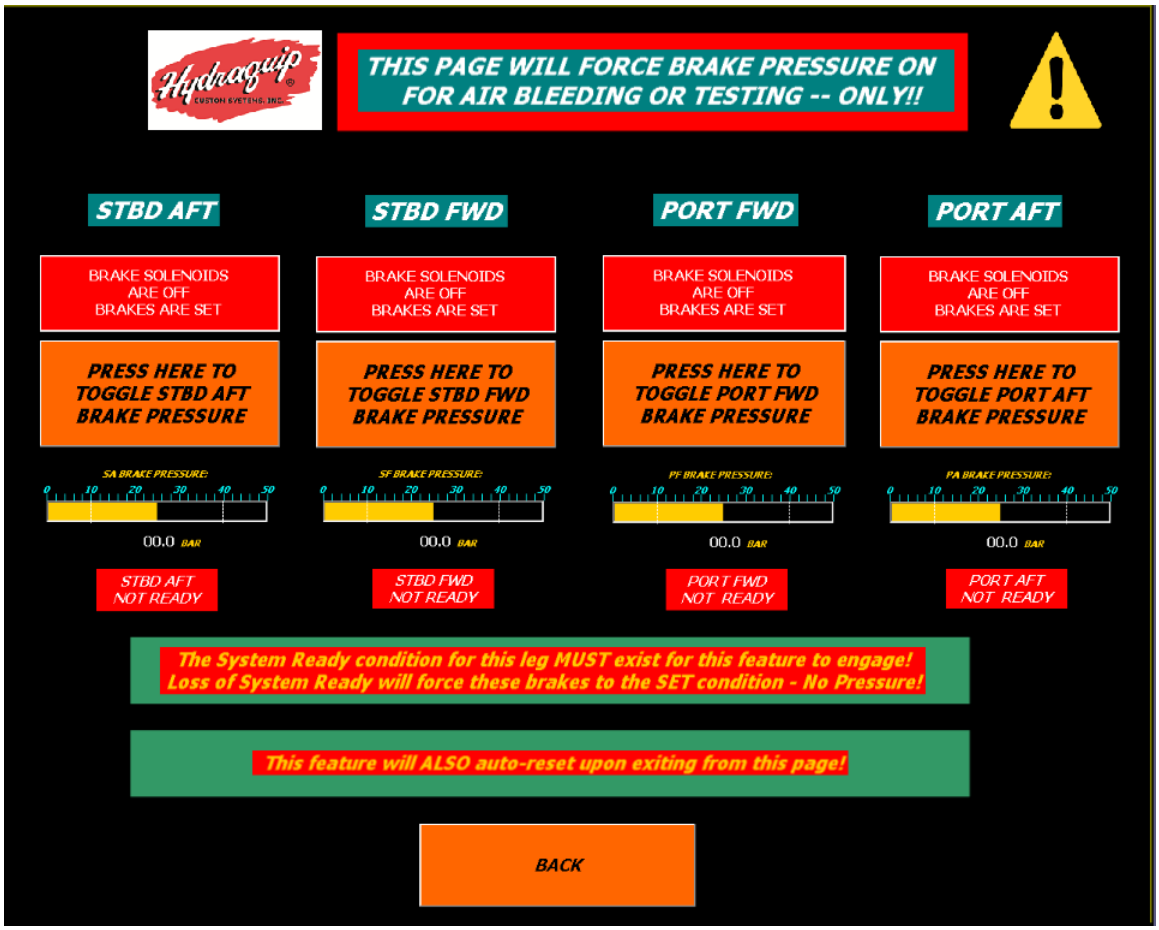
The Operation Page appears next as the primary interactive interface to jacking operations.




See *Operation Page* details in separate section below for more information.

The Brake Lock Page is accessed via the “Brake Lock” button on the Operation Page

The Special Brake Bleed Page is accessed via the “Special Brake Bleed Page” button on the Brake Lock Page

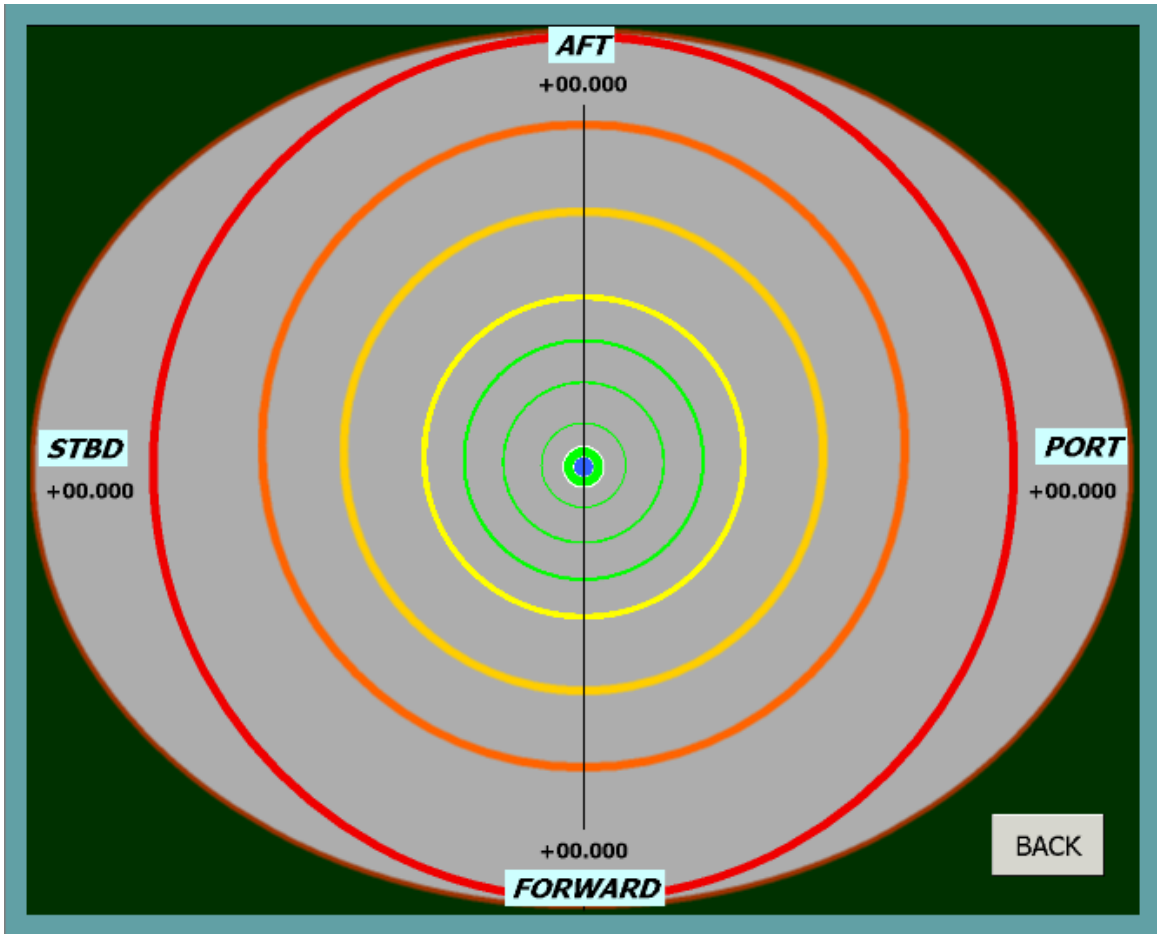


The Menu Page is accessed via the “Function Pages” button on the Operation Page


This Page allows access to the following Pages:

- Clock Page
- Operation Page
- Inclinometer page
- Exit Page
- Overrides Page
- Leg Counter Page

The Inclinometer Page is accessed via the image of the “Bubble Scale” button on the Menu Page or the Operation Page

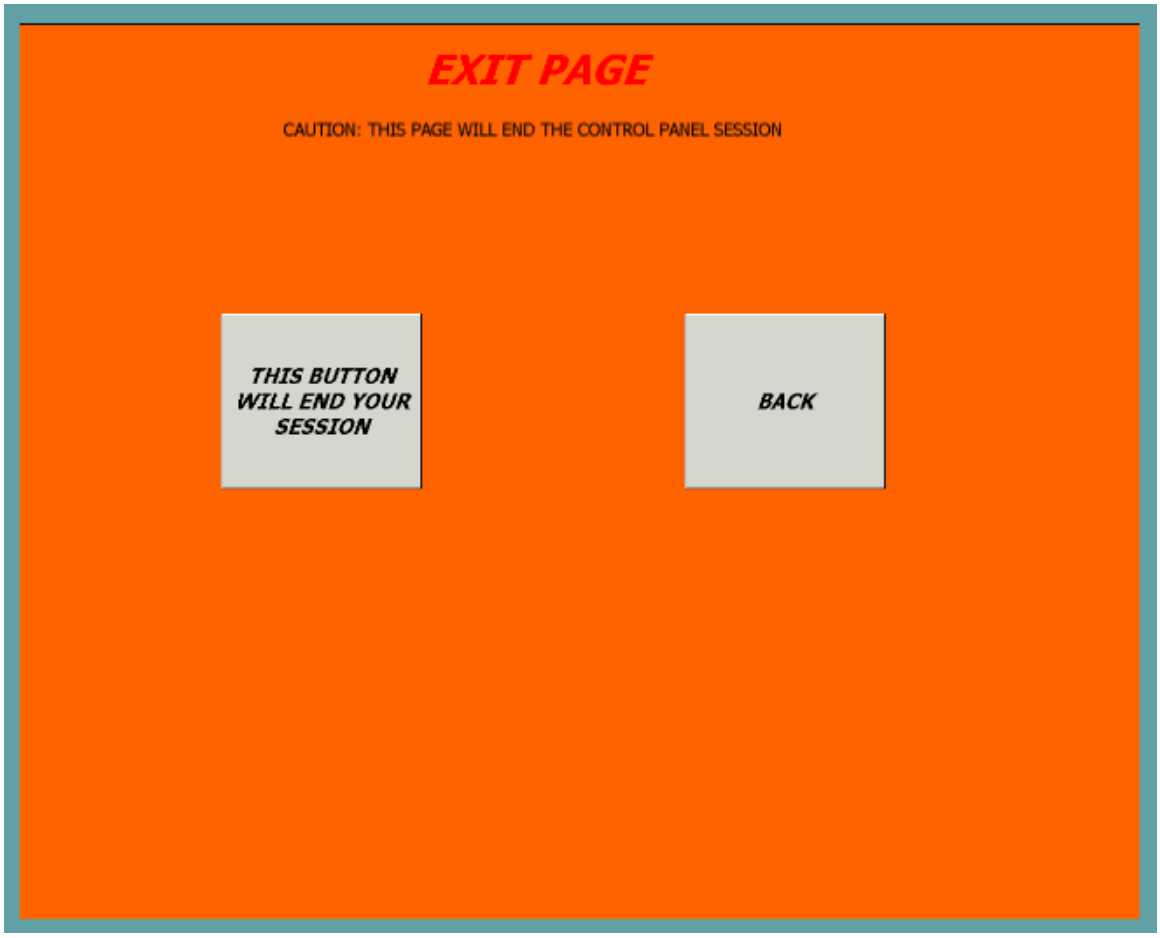



This page displays the angular trim of the vessel similar to a standard Level.

The “Bubble” moves towards the high point.

“Back” returns to the previous page.

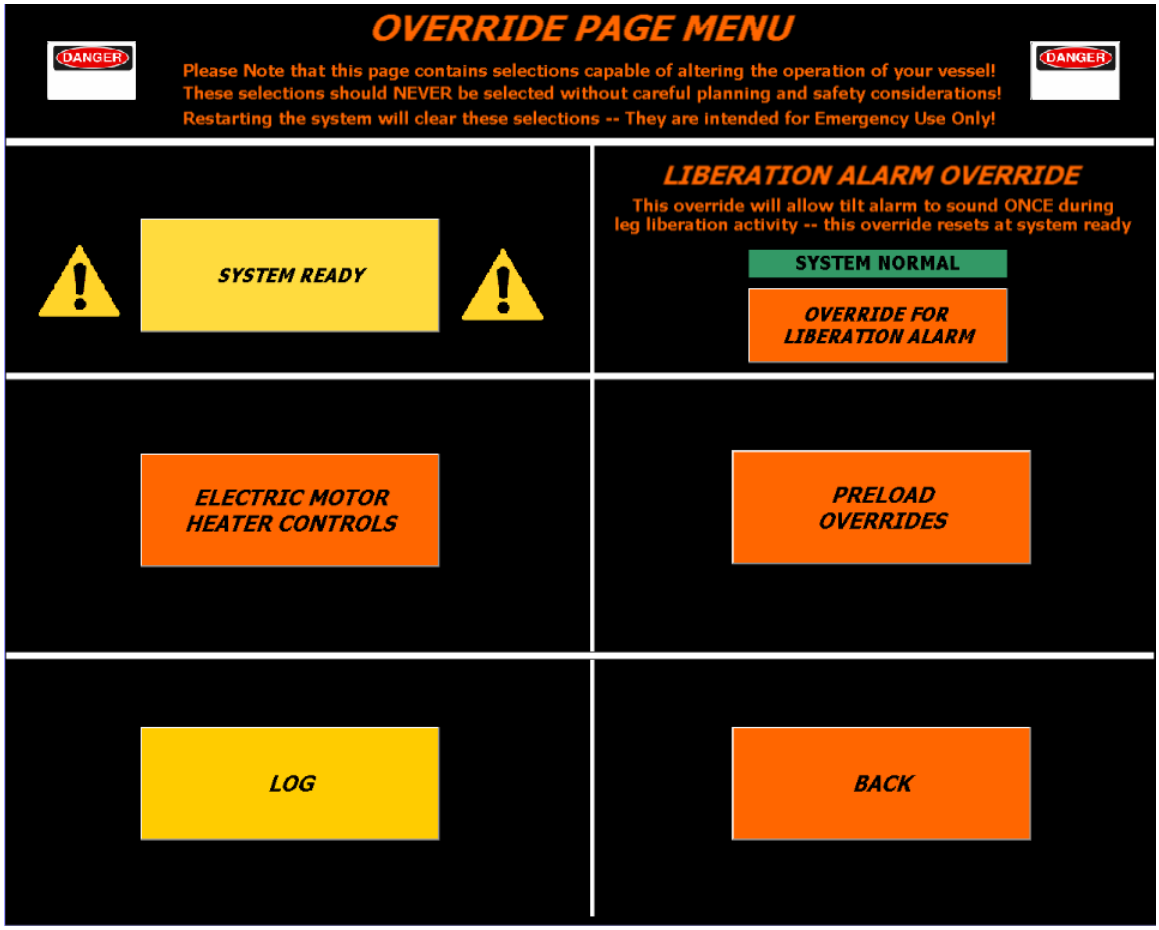
The Exit Page is accessed via the EXIT button on the Menu Page.




This page allows the operator to exit the Runtime Program for Screen adjustments or Shutdown.

"Back" returns to the previous page.

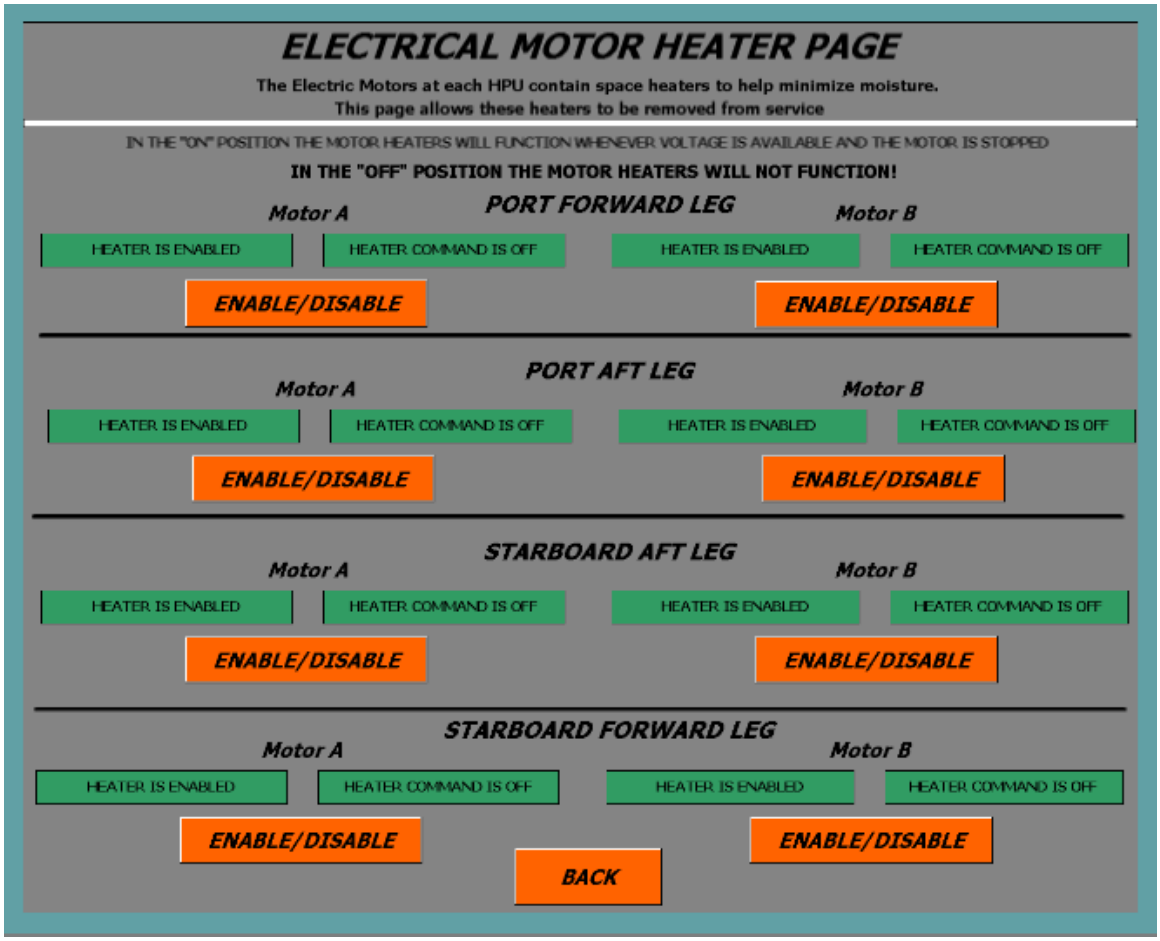
The Overrides Page is accessed via the overrides Pushbutton on the Menu Page.




This page allows the operator to:

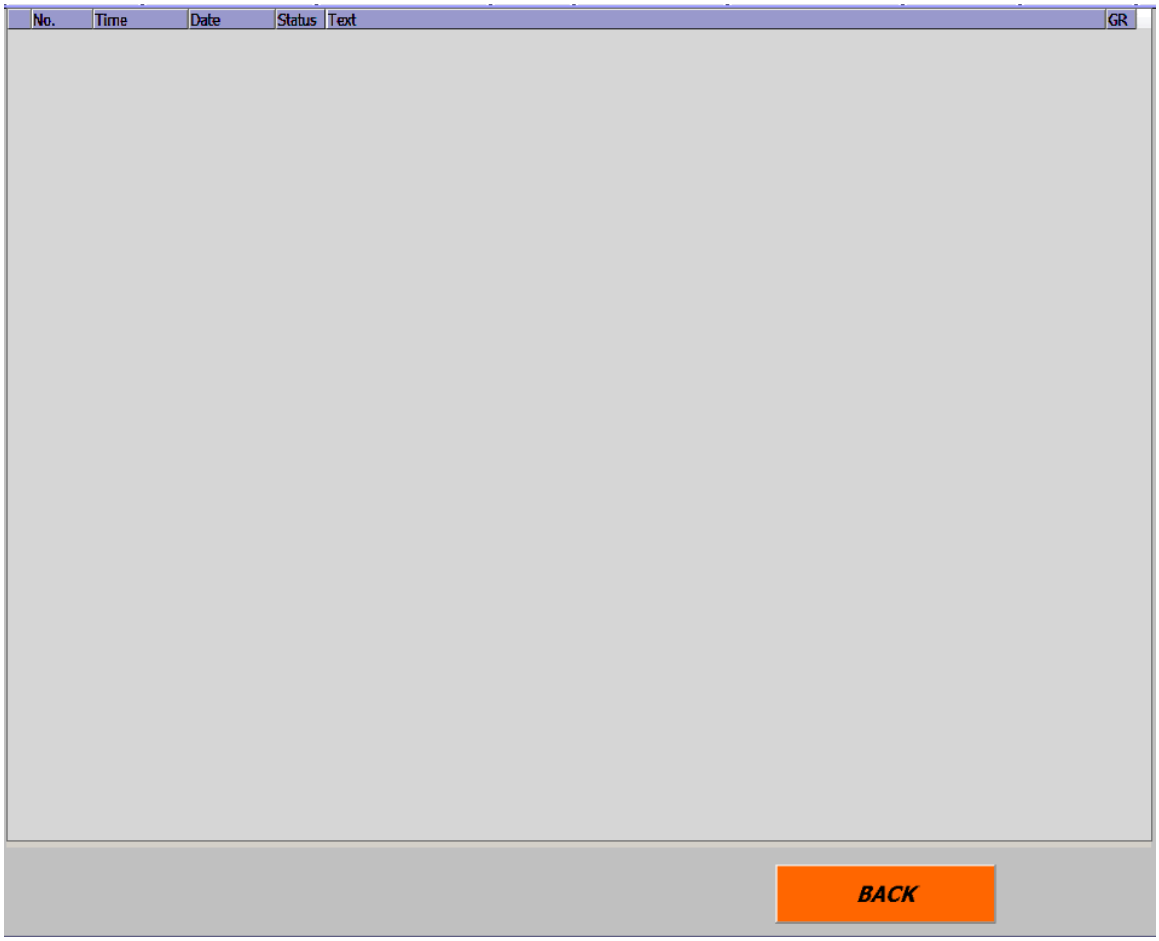
- Override the tilt alarm for the immediate session ONLY (used primarily while vessel floating in challenging sea conditions or intentional trim changes in excess of alarm conditions)
- Access the “Motor Heater” Page
- Access the “Alarm Log” Page
- Access the “System ready” Page (OEM use only)
- Access the “Preload Overrides” Page (See Preload Section for more information)
- “Back” returns to the previous page

Motor Heater Page is accessed via the “Electric Motor Heater Controls” button on the Overrides Page

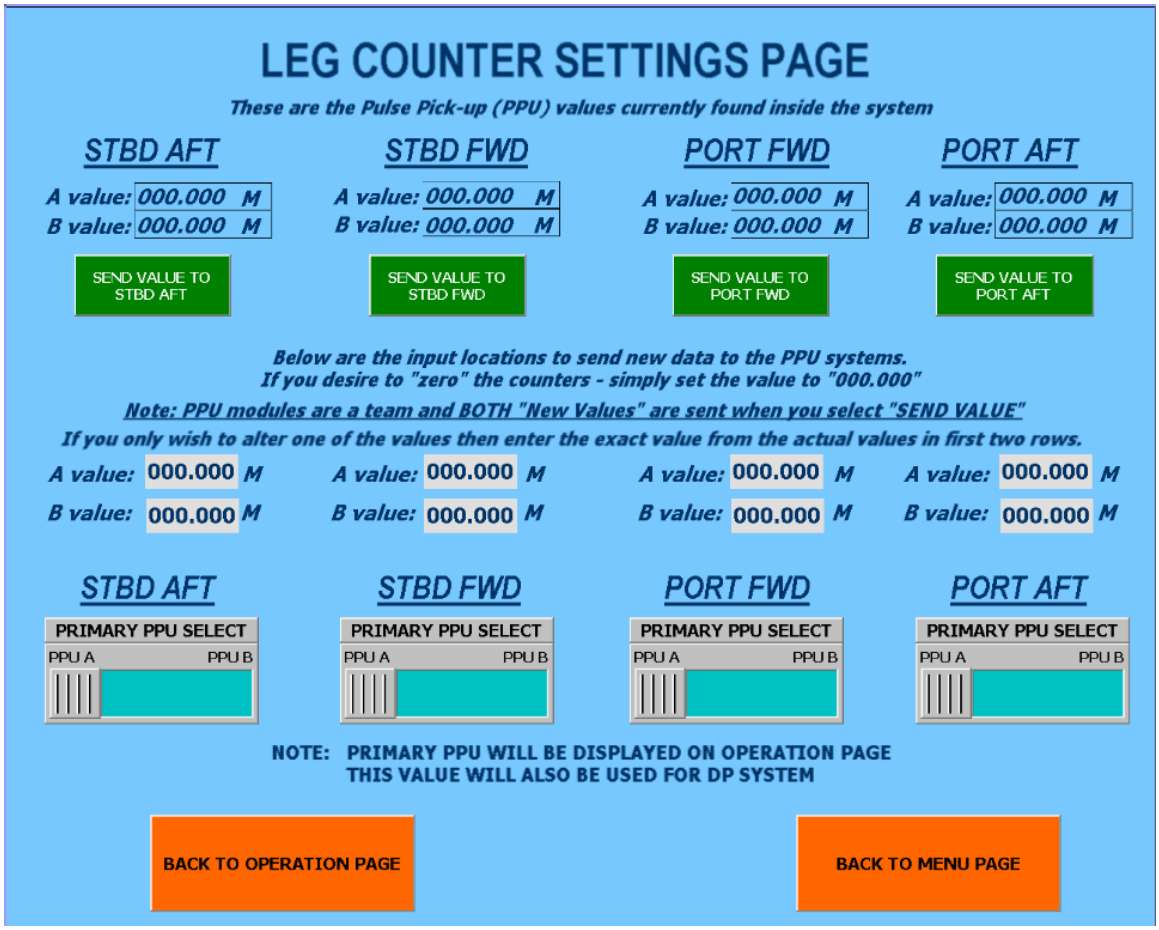



This page allows the operator to override individual Electrical Motor heaters as needed.

Alarm Log Page is accessed via the “Log” button on the Overrides Page. Alarms will be listed with timestamp, alarm status and description.



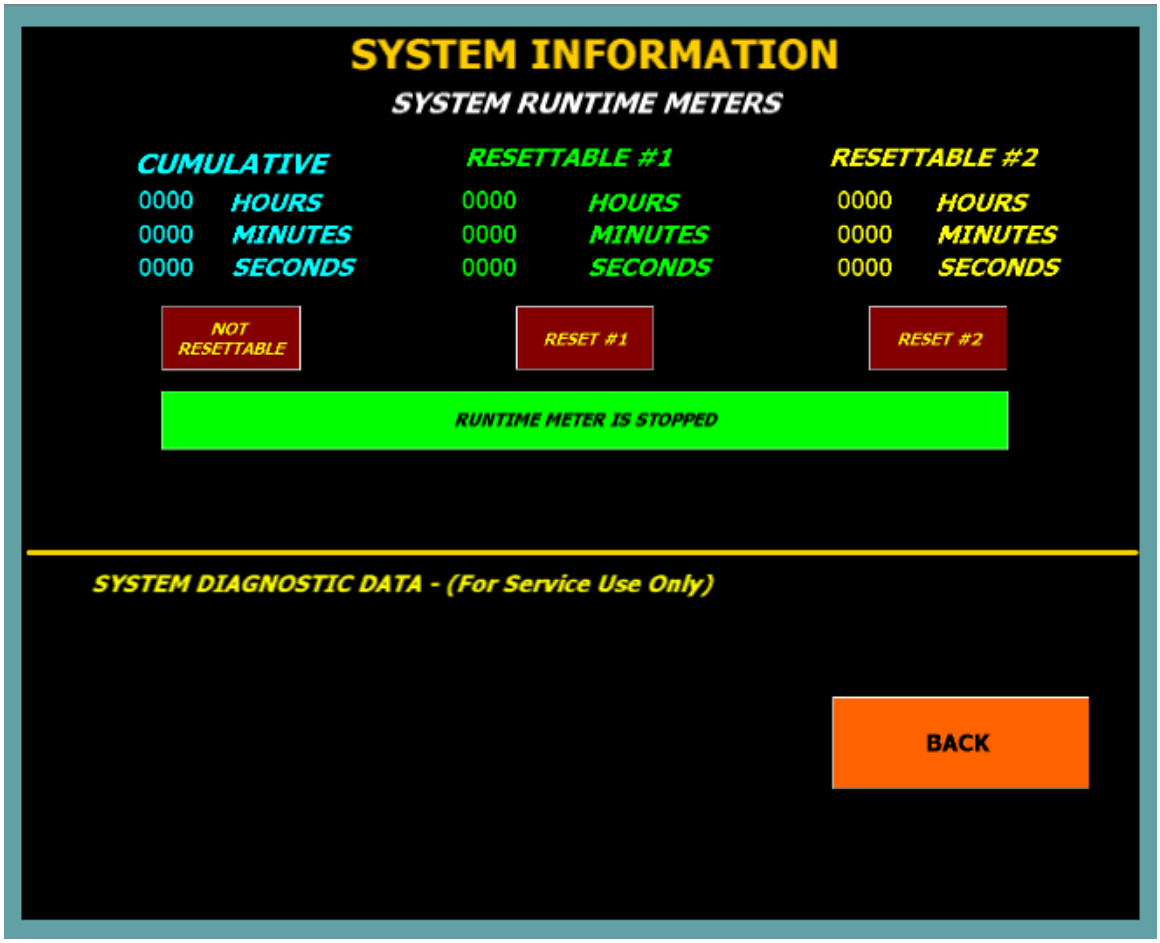
Leg Counter Page is accessed via the “Leg Counter Page” button on the Menu Page




This page allows the operator to:

- Enter NEW values into the measuring system for each leg individually.
  - The operator enters the desired value into EACH Pulse Pickup location as shown on the screen
  - Then selects the appropriate pushbutton to cause the value to be sent to the controller.
  - Further instructions are located ON the page.
- Select which leg counter to use for display on Operation Page
  - The device selected for display on Operation Page is also the value sent to Dynamic Positioning System for processing.

Runtime Information Page is accessed via the “Runtime Information” button on the Menu Page

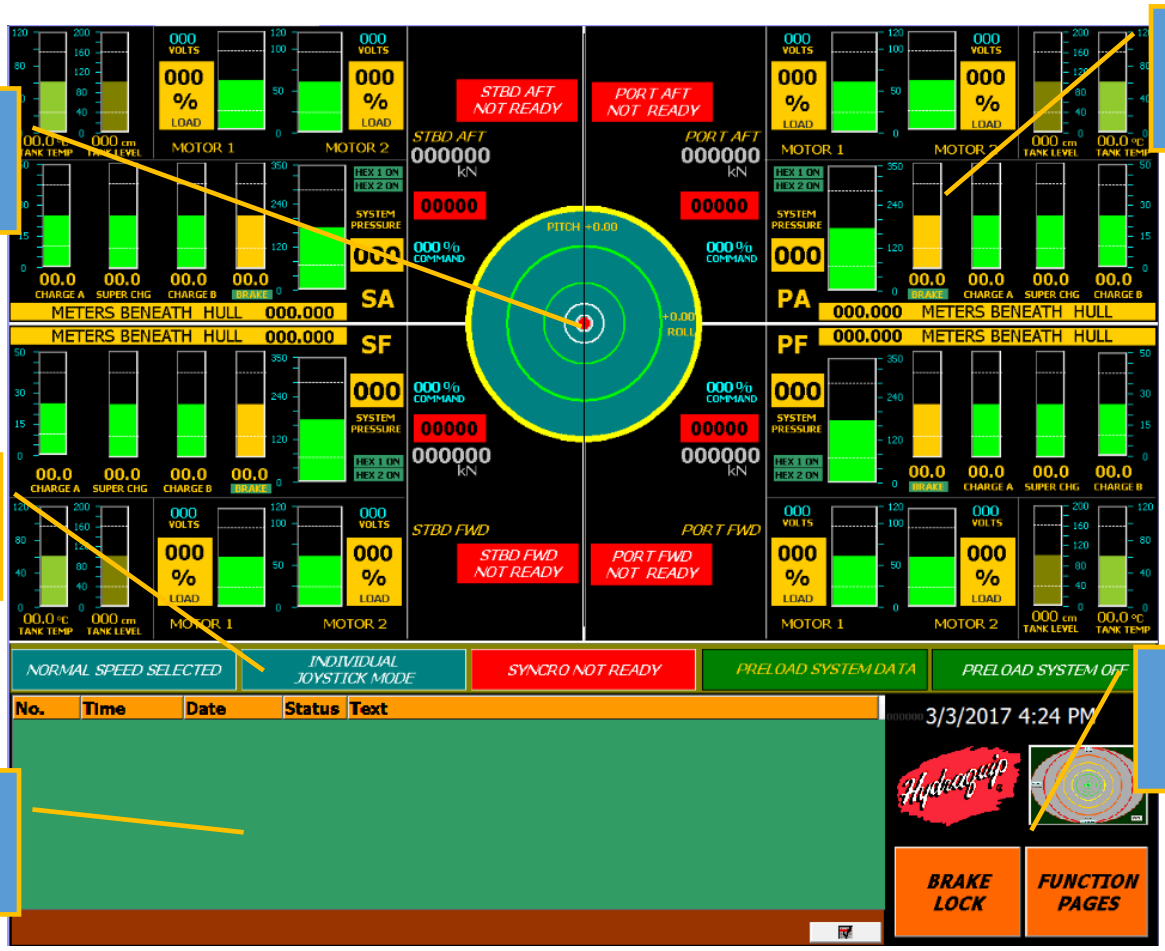



This page allows the operator to observe three separate Runtime Meters:

- A NON Resettable Cumulative Meter
- Resettable Meter #1
- Resettable Meter #2

These meters increment when the system is in System Ready Conditions and are convenient timers for filter and oil changes or other maintenance needs.

# Operation Page Details



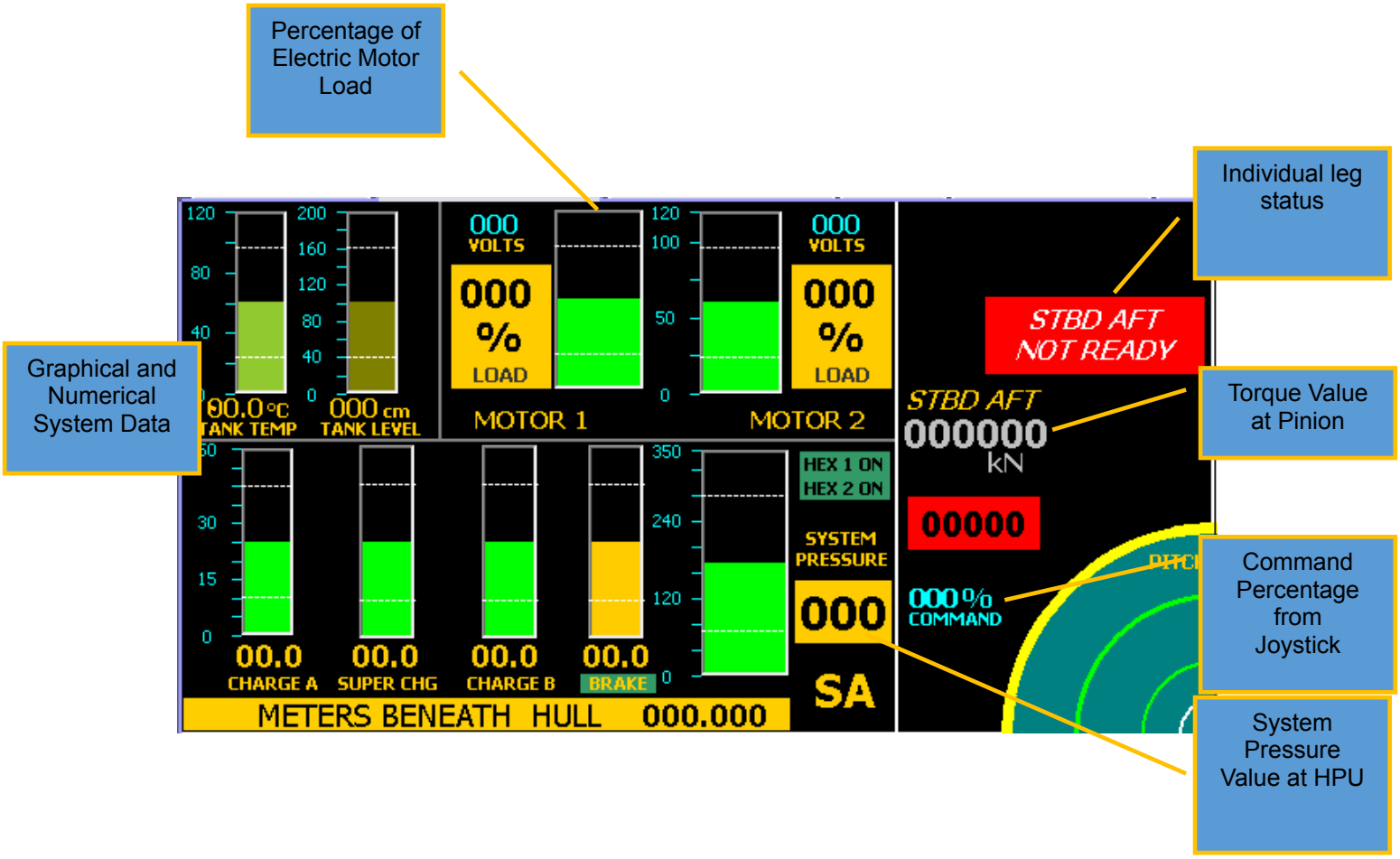

Inclinometer Information

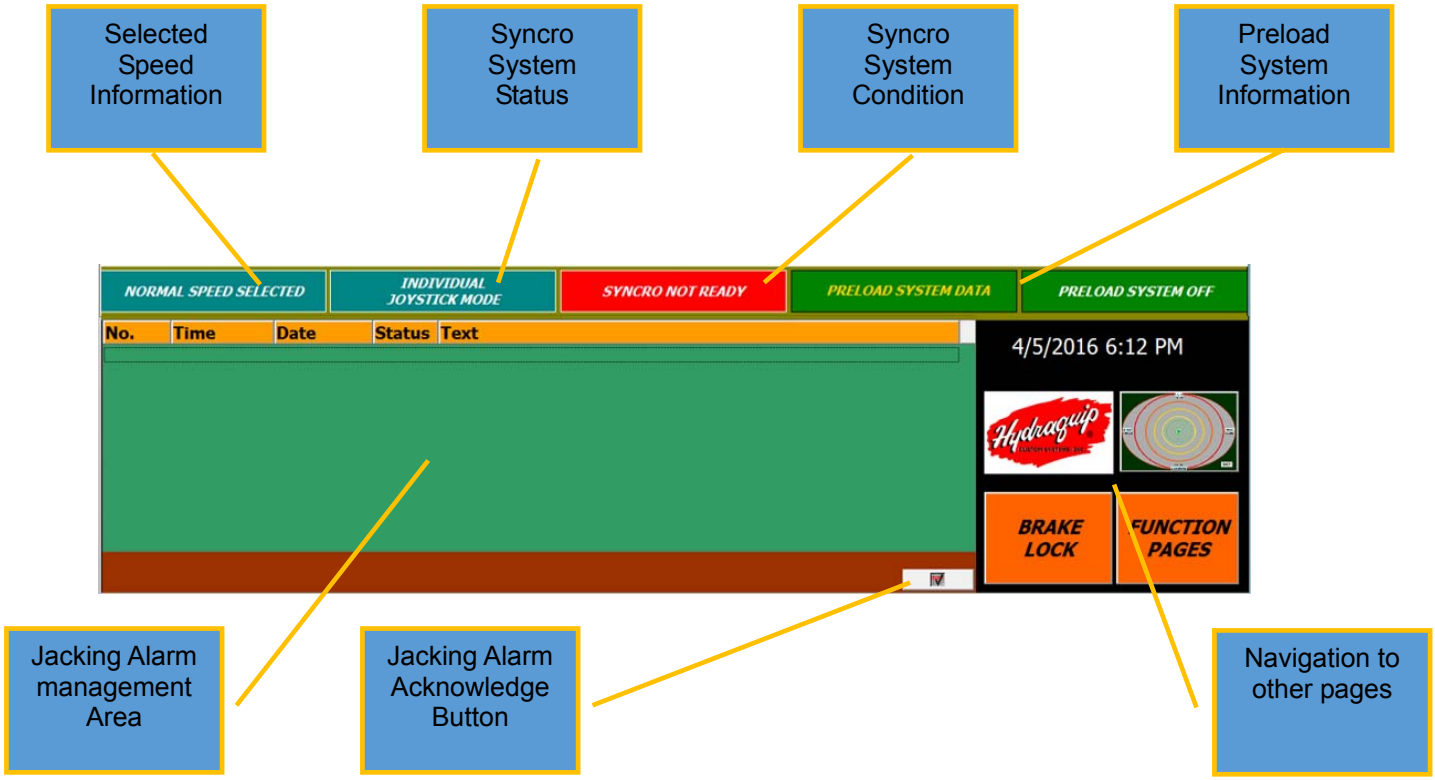
General information per leg

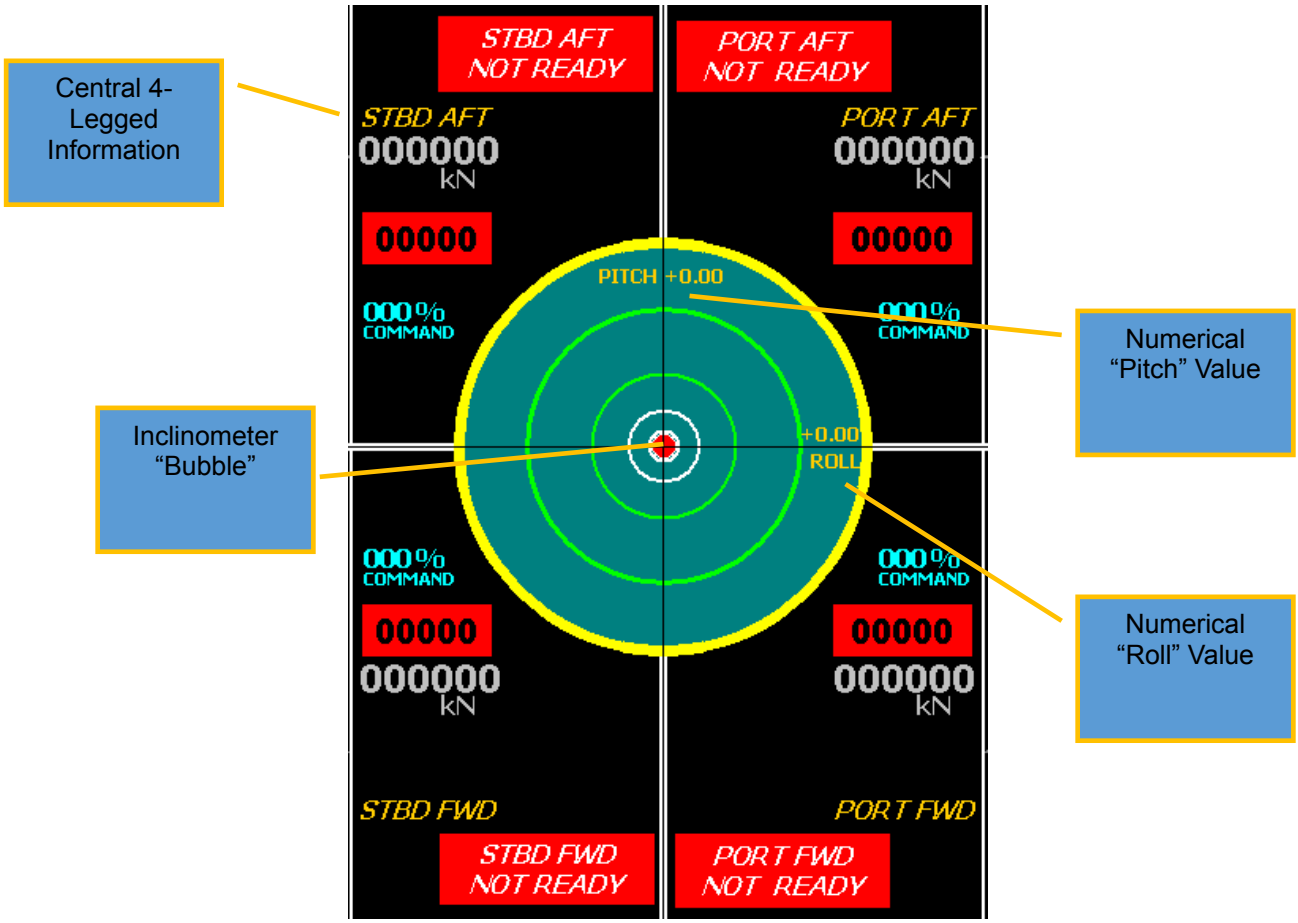
General Notifications

Navigation to other Pages

Jacking Alarm Data


Percentage of Electric Motor Load
Individual leg status
Graphical and Numerical System Data
Torque Value at Pinion
Command Percentage from Joystick
System Pressure Value at HPU
000 VOLTS
000 % LOAD
MOTOR 1
MOTOR 2
STBD AFT NOT READY
STBD AFT
000000 kN
00000
000 % COMMAND
HEX 1 ON
HEX 2 ON
SYSTEM PRESSURE
000
SA
00.0 °C TANK TEMP
000 cm TANK LEVEL
00.0 CHARGE A
00.0 SUPER CHG
00.0 CHARGE B
00.0 BRAKE
METERS BENEATH HULL 000.000


Selected Speed Information
Syncro System Status
Syncro System Condition
Preload System Information
NORMAL SPEED SELECTED
INDIVIDUAL JOYSTICK MODE
SYNCRO NOT READY
PRELOAD SYSTEM DATA
PRELOAD SYSTEM OFF
No.
Time
Date
Status
Text
4/5/2016 6:12 PM
Hydraquip
BRAKE LOCK
FUNCTION PAGES
Jacking Alarm management Area
Jacking Alarm Acknowledge Button
Navigation to other pages


Central 4-Legged Information
STBD AFT NOT READY
PORT AFT NOT READY
STBD AFT
000000
kN
PORT AFT
000000
kN
00000
00000
PITCH +0.00
000%
COMMAND
000%
COMMAND
+0.00
ROLL
Inclinometer "Bubble"
Numerical "Pitch" Value
Numerical "Roll" Value
000%
COMMAND
000%
COMMAND
00000
00000
000000
kN
000000
kN
STBD FWD
PORT FWD
STBD FWD NOT READY
PORT FWD NOT READY

# Section 5 – Troubleshooting

This section deals with troubleshooting the jacking system. The following is a guideline for troubleshooting:

| ***Problem*** | ***Possible Cause*** |
|---|---|
| Pump will not produce flow | Oil level in reservoir inadequate<br>Leak in plumbing<br>Clogged Suction Strainer<br>Suction valve closed<br>Pump damaged<br>EDC bad<br>NO SYSTEM READY |
| Noisy Operation | Oil level in reservoir inadequate<br>Air present in oil<br>Oil contaminated<br>Pump damaged |
| Oil temperature excessively high | Ambient temperature above max levels<br>Cross-port relief valves set too low<br>Clogged return filer<br>Restriction in pressure or return lines<br>Incorrect or damaged temperature gauge<br>HEAT EXCHANGERS NOT OPERATIONAL |
| Low Charge Pressure | Bad pump or motor<br>Charge pressure relief valve stuck or set low<br>Clogged suction filter<br>Suction valve closed<br>Leak in plumbing<br>OIL TEMPERATURE TOO LOW |
| Controls Not Functioning | Damaged joystick<br>Open Circuit Breaker(s)<br>Control Power failure<br>EDC bad<br>No System Ready<br>Communication system failure |

| | |
|---|---|
| Brakes not releasing | Air in brake lines<br>Bad coil on brake release valve<br>No charge pressure<br>Brake circuit Breakers open<br>HMI Brake “LOCK” selected |
| Legs move slowly | Bad motor or pump<br>Bad joystick or EDC control<br>Engine speed low<br>Load too high<br>Cross port relief valve stuck or set too low<br>Pump multi-function valve stuck or set too low |
| Motor Amperage too high | Bad motor or pump<br>Jacking speed too fast<br>Voltage drop<br>Oil too cold<br>Cross port relief valve set too high<br>Pump multi-function valve set too high |
| Leg counters inoperable | Wiring fault<br>Bad sensor<br>Loose plug on sensor<br>Gateway unplugged |

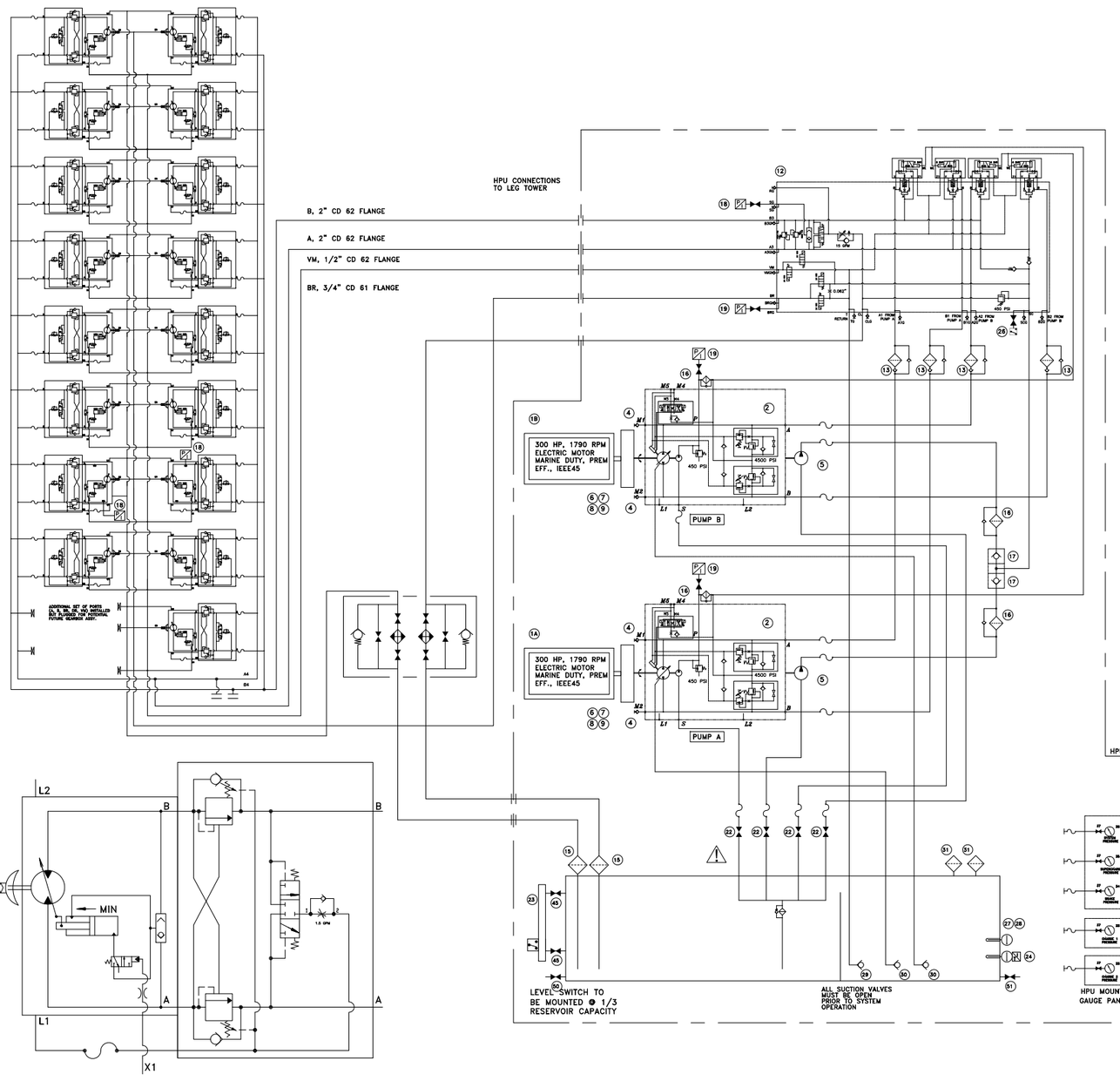
# Section 6 - Spare Parts

This portion of the section deals with recommended spare parts for the jacking system.

# Section 7 – Drawings

This section gives the number and the titles of all pertinent drawings for this system.

| | |
|---|---|
| 4680-1000 Sht 1 | Jacking System Hydraulic Schematic |
| 4680-1000 Sht 2 | Jacking System Hydraulic Schematic Bill of Materials |
| 4680-1100 | Jacking System Hydraulic Piping Diagram |
| 4680-2000 | Jacking System Hydraulic Power Unit General Arrangement |
| 4680-2006 | Remote Heat Exchanger Connections |
| 4680-2601 | Heat Exchanger Assembly |
| 4680-2700 | Leg Tree Hose Data |
| 4680-2701 | HPU Connection Hoses Data |
| 4680-HEADER | Leg Tree Piping Layout |
| 4680-7500 | Jacking System Motor, Brake, and Gearbox Assembly |
| 4680-7501 | Jacking System Motor, Torque Transducer Brake, Gearbox Assy |
| 4680-7502 | Gearbox, Brake, and Motor Assembly View |
| 4680-7510 | Static Brake Assembly |
| 4680-7511 | Torque Transducer Assembly |
| 4680-7520 | Planetary Gearbox Assembly |
| 4680-7530 | Planetary Gearbox Mounting Flange Details |
| 4680-7550 | Planetary Gearbox Outboard Bearing Endcap Assy |
| 4680-7560-1 | Rack Profile |
| 4680-7580 | Planetary Gearbox Typical Tower Installation Arrangement |
| 4680-7590 | Planetary Gearbox/Bearing Endcap Washer Plate |
| 4680-8100PCA | Bridge Jacking Control Panel |
| 4680-8200PC | Bridge Motor Start/Stop Panel |
| 4680-8250 | HPU Local Terminal Box Arrangement |
| 4680-8300TS | Bridge Touch Screen Panel |
| 4680-8400TP | Power Transfer Panel |
| 4680-8500PP | Jacking System CPU Panel |
| 4680-8600XLP | Jacking System Leg Control Panel |
| 4680-8700EJ | Emergency Jacking Panel |
| 4680-8800HS | Pwr Dist / Heat Exchanger Motor Starter Panel |
| 4680-8900MS | Jacking System Motor Starter Panel |
| 4680-8950MS | Jacking System Motor Starter Internal Layout |
| 4680-9000WP | Shipboard Cable Pull Diagram |
| 4680-9100PCA | Bridge Jacking Control Panel Wiring Schematic |
| 4680-9200PCB | Bridge Motor Start Stop Panel Wiring Schematic |
| 4680-9250HP | HPU Junction Box Wiring Schematic |
| 4680-9400TP | Power Transfer Panel Wiring Schematic |
| 4680-9500PP | Pilot House CPU Panel Wiring Schematic |
| 4680-9500XLP | Leg Control Panel Wiring Schematic |
| 4680-9700EJ | Emergency Jacking Panel Wiring Schematic |
| 4680-9800HS | Pwr Dist / Heat Exchanger Motor Starter Wiring Schematic |
| 4680-9900MS | Soft Motor Starter Wiring Schematic |




HYDRAULIC MOTOR SCHEMATIC

***MAXIMUM DESIGN TEMPERATURE FOR ALL COMPONENTS - 180 F

GENERAL NOTES:

1) MATERIALS USED IN PIPING SHALL BE SELECTED FROM THE SPECIFICATIONS WHICH APPEAR IN ABS MODU 2014 RULES.
2) RESERVED
3) FLEXIBLE HOSE ASSEMBLIES WHERE USED SHALL BE FURNISHED WITH FACTORY ASSEMBLED END FITTINGS REQUIRING NO FURTHER ADJUSTMENT IN ACCORDANCE WITH ABS MODU 2014 RULES. HOSES MUST BE LISTED IN SAE J1942 AND BE ABS TYPE APPROVED
4) IN GENERAL, ALL PIPING MATERIAL, DESIGN, FLUIDS, INSTALLATION AND TESTING ARE TO BE IN ACCORDANCE WITH ABS MODU 2014 RULES.
5) ALLOWABLE WORKING PRESSURE TO BE 4500 PSIG MAX. SET BY RELIEF VALVE.
6) PIPING TEST PRESSURE TO BE 1.5 TIMES MAX. ALLOWABLE WORKING PRESSURE.
7) ALL CONNECTIONS SHALL BE SAE 4-BOLT FLANGE, JIC OR SAE O-RING. NPT THREADED CONNECTIONS ARE TO BE USED ONLY WHEN APPROVAL IS FORTHCOMING FROM STATED REGULATORY AGENCIES AND/OR DESIGN AGENT.
8) NONDESTRUCTIVE TEST OF WELDS, WHERE REQUIRED, TO BE IN CONFORMANCE WITH ABS MODU 2014 RULES.
9) PIPING TO BE USCG CLASS 1.
10) ALL PIPING SHALL BE PICKLED AND FLUSHED BY SHIPYARD TO REMOVE ALL MILL SCALE, WELD SLAG AND ANY FOREIGN PARTICLES PRIOR TO FINAL CLEANING OF THE SYSTEM TO THE LEVEL SPECIFIED PER NAS 1638, CLASS 8.
11) ALL PIPING AND HOSES ARE TO BE CLEANED BY SHIPYARD AND MEET CLEANLINESS REQUIREMENT AS PER NAS 1638, CLASS 8.
12) LOW PRESSURE SUCTIONS AND RELIEF LINES AS NOTED TO BE CLASS II.
13) PIPE AND TUBING SHALL BE CLEANED BY SHIPYARD AND SUPPORTED WITH PIPE CLAMPS ON NOT MORE THAN SIX (6) FOOT CENTERS.
14) EACH RELIEF VALVE IS TO BE CAPABLE OF RELIEVING NOT LESS THAN FULL PUMP FLOW WITH A MAXIMUM PRESSURE RISE OF NOT MORE THAN 10% OF THE RELIEF VALVE SETTING IN ACCORDANCE WITH ABS STEEL VESSELS UNDER 90 METERS (UNDER 295 FT) 4-4-6/1.3.2.
15) FLEXIBLE HOSES ARE TO HAVE A MINIMUM FOUR (4) TO ONE (1) BURST TEST WORKING PRESSURE RATIO AS PER ABS MODU 2014 4/2.9.14, STEEL RULES 4/6.2.5.7.1.
16) THE HYDRAULIC FLUID SHALL BE IN ACCORDANCE WITH 46 CFR (SHELL AW 46 OR MOBIL DTE 25, OR EQUIVALENT).
17) RESERVED
18) RESERVED
19) RESERVED
20) RESERVED
21) THE HYDRAULIC PUMPS AND MOTOR SHAFTS SHALL BE COATED WITH 'NEVER SEIZE' PRIOR TO INSTALLATION.
22) ALL HYDRAULIC COMPONENTS SHALL BE STORED IN A COOL DRY WAREHOUSE PRIOR TO INSTALLATION.
23) ALL HYDRAULIC COMPONENTS SHALL HAVE ALL PORTS PLUGGED UNTIL PIPING IS INSTALLED.
24) RESERV ED
25) PIPING CALCULATIONS SHOWN ARE DEVELOPED FROM ANSI B31.1, IN ACCORDANCE WITH ABS MODU 2014 RULES.
26) ALL RETURN PENETRATIONS TO THE HYDRAULIC RESERVOIR SHALL BE SEPARATED FROM THE SUCTION LINES BY A BAFFLE.
27) THE HYDRAULIC RESERVOIR BAFFLE SHALL HAVE ADEQUATE CUT OUT AREA BETWEEN THE SUCTION AND THE RETURN.
28) ALL RESERVOIR PENETRATIONS SHALL BE 3000 LB. COUPLINGS.
29) RESERVED
30) RESERVOIR RETURN AND CASE DRAIN LINES SHALL BE EXTENDED TO WITHIN SIX (6) INCHES OF THE RESERVOIR BOTTOM.
31) RESERVED
32) RESERVED
33) RESERVED
34) PIPE FITTINGS FOR PRESSURE PIPING TO BE ASTM A105 MEETING ASME B16.11 SOCKET WELD.
35) ALL CLASS II PIPING (225 PSI DESIGN PRESSURE AND BELOW AND TEMPERATURE 400 DEG AND BELOW) SHALL BE CONNECTED USING ASTM 105 FITTINGS MEETING ASME B16.11 THREADED OR SOCKET.

HYDRAULIC SYMBOL LEGEND

| | |
|---|---|
| SIGHT LEVEL GAGE W/ INTEGRAL LEVEL SWITCH | VALVE, DIRECTIONAL CONTROL, 2-WAY, 2-POSITION, SPRING CLOSED SOLENOID OPERATED |
| VALVE, DIRECTIONAL CONTROL, 3-WAY, 2 POSITION SOLENOID OPERATED | PUMP, HYDROSTATIC W/ INTEGRAL CHARGE PUMP |
| VALVE, DIRECTIONAL CONTROL, 3-WAY, 3-POSITION, SPRING CLOSED HYDRAULIC OPERATED | MOTOR, HYDRAULIC, VARIABLE DISPLACEMENT |
| VALVE, DIRECTIONAL CONTROL, 4-WAY, 3-POSITION, SPRING CENTERED SOLENOID OPERATED | PRESSURE TRANSDUCER |
| NEEDLE VALVE | CHECK VALVE |
| MANIFOLD, DUAL COUNTERBALANCE | SUCTION STRAINER, INTEGRAL BYPASS |
| VALVE, CHECK, PILOT OPERATED, DUAL | PRESSURE GAGE |
| STRAINER | THERMOMETER IN THERMOWELL |
| RESERVOIR FILTER/ VENT WITH WATER REMOVAL ELEMENT | RELIEF VALVE |
| TEST POINT | TEMPERATURE TRANSMITER/ THERMOWELL |
| FLEXIBLE HOSE | SPRING CLOSED POPPET VALVE |
| | EQUIPMENT BOUNDARY |
| | VALVE, BALL |



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| D | UPDATED SCHEMATIC AND BILL OF MATERIAL TO ADD (1) GEARBOX DRIVE ASSEMBLY | 05/22/17 | MJP | TMW |
| C | UPDATED ELECTRIC MOTOR RPM IN BOM AND NOTES TO REFLECT ABS 2014 RULES | 04/13/16 | MJP | TMW |
| B | ADDED BILL OF MATERIALS | 08/27/15 | DSS | TMW |
| A | INITIAL RELEASE | 02/04/15 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING
DRAWN BY M.PALMER DATE 02/04/15
CHECKED T.WELSH DATE 02/04/15
APPROVED T.WELSH DATE 02/04/15
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

JACKING SYSTEM HYDRAULIC SCHEMATIC, TYPICAL PER LEG

DWG. NO. 4680-1000 SIZE D REVISION
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| ITEM# | QTY | DESCRIPTION | MANUF | PART NUMBER | MAWP | DES PRESS | MAX SPEED | INLET PORT | OUTLET PORT | CASE | GAUGE | PAD | SHAFT | VOLT | MAXTEMP(F) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | MOTOR, ELECTRIC, 300HP | MARATHON | 300HP ELEC MOTOR | N/A | NIA | 1790 RPM | N/A | N/A | N/A | N/A | N/A | N/A | 690 | 311 |
| 2 | 2 | PUMP, CLOSED LOOP, 90 SERIES, 250 cc | DANFOSS POWER SYSTEMS | 90L250KT5CD80T4C8K03NNN292924 | 6000 PSI | 4500 PSI | 2300RPM | 1-1/2" C.61 SPLIT FLANGE | 1-1/2" C.62 SPLIT FLANGE | #20 SAE O-RING | SAE #6 O-RING | SAEE | 13T 8/16DP | 85ma | 240 |
| 3 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 4 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 5 | 6 | TEST POINT (CHARGE PRESS, A/B PRESSURE) | SCHROEDER | SP1215UN916VM (VITON "V" OPTIONAL) | 10000 PSI | 4500 PSI | N/A | SAE#6 O-RING | N/A | N/A | N/A | N/A | NIA | 275 |
| 6 | 2 | PUMP, GEAR, SUPERCHARGE, 81.4CC/REV | GEARTEK | D35L-1C | 3000 PSI | 600 PSI | 2500RPM | 1-1/2" C61 SPLIT FLANGE | 1 1/4" C.61 SPLIT FLANGE | N/A | N/A | SAEC | 14T 12124DP | NIA | 220 |
| 7 | 2 | C-FACE ADAPTER | BSF | PD1-A240-A2-R01 | N/A | N/A | N/A | N/A | NIA | N/A | N/A | NIA | N/A | N/A | - |
| 8 | 2 | COUPLING HALF, 2 3/8" x 5/8", ELECTRIC MOTOR HALF | KTR ROTEC | RT7501ST 2-3/8 x 5/8 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NIA | N/A | 13T 8/16DP | N/A |
| 9 | 2 | COUPLING HALF, 27T 16/32 SPLINED, PUMP HALF | KTR ROTEC | RT75-01 ST 27T16/32 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NIA | N/A |
| 10 | 2 | COUPLING INSERT | KTR ROTEC | RT75/95 PURPLE INSERT | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NIA | N/A |
| 11 | 1 | HPU STEEL FRAME | HYDRAQUIP CSI | 4680-3000 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NIA | N/A |
| 12 | 1 | STEEL RESERVOIR ASSEMBLY | HYDRAQUIP CSI | 4680-3500 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 35ma | N/A |
| 13 | 1 | MAIN MANIFOLD ASSY, JACKING | HYDRAQUIP CSI | 4680-3100 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 14 | 4 | FILTER, HIGH PRESSURE, HYDROSTATIC, 1-1/2" CD62 | SCHROEDER | H560-13HZ5-F24-D13 | 6000 PSI | 4500 PSI | N/A | 1 1/2" C.62 SAE FLANGE PORT | N/A | N/A | N/A | N/A | N/A | 4-20mA | 190 |
| 15 | 1 | FILTER, SUCTION | HYDAC | SFW/HC1300FW25UE1.1/16B0.2 | 360PSI | 50 PSI | N/A | 4" C.61 SAE FLANGE PORT | 4" C.61 SAE FLANGE PORT | N/A | N/A | N/A | N/A | N/A | 190 |
| 16 | 1 | FILTER, MOTOR CASE DRAIN HEADER, 3" Cd 61 PORT, 149u ELEMENT | HYDAC | RFW/HC660DN149B1.1/16A1.5-B2 | 5000 PSI | 50 PSI | N/A | 3" C.61 FLANGE PORT | N/A | N/A | N/A | N/A | N/A | N/A | 350 |
| 16A | 1 | FILTER, COOLING LOOP HEADER, 3" Cd 61 PORTS | HYDAC | RFBN/HC660DN10B1.1/16B1 | 5000 PSI | 50 PSI | N/A | SAE#20 O-RING | N/A | N/A | N/A | N/A | N/A | N/A | 350 |
| 17 | 2 | SUPERCHARGE PRESSURE FILTER, HPK05 | DONALDSON | HPK04 | 6000 PSI | 4500 PSI | N/A | 2" C.61 SAE FLANGE | 2" C.61 SAE FLANGE | N/A | N/A | N/A | N/A | NIA | 250 |
| 18 | 2 | CHECK VALVE, SUPERCHARGE 3 psi | Inserta | ICFT-A-6120-N03-R | 3000 PSI | N/A | N/A | 1-1/4" C.62 FLANGE | N/A | N/A | N/A | N/A | N/A | NIA | 250 |
| 19 | 4 | PRESSSURE TRANSDUCER W/ INTEGRAL CABLE | GP-50 | 311-N-C-6-RM-LH-A33 | 1000 PSI | 4500 PSI | N/A | SAE #6 O-RING | NIA | N/A | N/A | N/A | N/A | 4-20mA | 190 |
| 20 | 1 | PRESSSURE TRANSDUCER W/ INTEGRAL CABLE | GP-50 | 311-N-C-6-RV-LH-A33 | 5000 PSI | 4500 PSI | N/A | SAE #6 O-RING | NIA | N/A | N/A | N/A | N/A | 4-20mA | 190 |
| 21 | 4 | HEAT EXCHANGER, TT418, SINGLE PASS, COPPER TUBES & HEADERS | HAYDEN | HAY048966-XA | 99PSI | 50 PSI | N/A | 11/4" NPTF | N/A | N/A | N/A | N/A | N/A | 460/6013 | N/A |
| 22 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 23 | 2 | VALVE, SUCTION, 90 SERIES PUMP | ANCHOR FLANGE | LV2BS#24-2T (-MH ALTERNATE) | 999 PSI | 5PSI | N/A | SAE #20 O-RING | SAE #24 O-RING BOSS | N/A | N/A | N/A | N/A | NIA | 349 |
| 23A | 2 | VALVE, SUCTION, SUPERCHARGE PUMPS | ANCHOR FLANGE | LV2BS#24-2T (-MH ALTERNATE) | 1000 PSI | 5PSI | N/A | SAE #20 O-RING | SAE #24 O-RING BOSS | N/A | N/A | N/A | N/A | NIA | 350 |
| 24 | 1 | LEVEL GAGE, MINI SURE-SITE. 32" C-C LENGTH | GEMS | W135644 | 400 PSI | 2 PSI | N/A | 3/4"NPTM | 3/4"NPTM | NIA | N/A | N/A | N/A | NIA | 400 |
| 25 | 1 | RESERVOIR TEMPERATURE TRANSDUCER 4 - 20mA, 0 - 300degF | JMS | 3ESBNK12CSPZYZYSI8H | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 26 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 27 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 28 | 1 | TEMPERATURE GAUGE, DUAL SCALE | ASHCROFT | 30EI60R040XCS 0/250 FC | NIA | N/A | N/A | 1/2" NPTM | N/A | N/A | N/A | N/A | NIA | NIA | 250 |
| 29 | 1 | THERMOWELL, TEMPERATURE GAUGE | ASHCROFT | 75W0250-ST-260C | N/A | N/A | N/A | 1/2" NPTM | 3/4" NPTM | N/A | N/A | N/A | N/A | NIA | 406 |
| 30 | 2 | SWING CHECK, 1 1/4" NPT, PUMP CASE DRAIN | KITZ | 04-114 | 125 PSI | 5PSI | N/A | 1 1/4" NPTF | 1 1/4" NPTF | NIA | N/A | N/A | N/A | NIA | 406 |
| 31 | 1 | SWING CHECK, 3/4" NPT, MANIFOLD DRAIN | KITZ | 04-034 | 125 PSI | 5PSI | N/A | 3/4" NPTF | 3/4"NPTF | NIA | N/A | N/A | N/A | NIA | 406 |
| 32 | 2 | WATER GATE ELEMENT | EATON VICKERS | BR110 | NIA | N/A | N/A | 3/4"NPTF | N/A | NIA | N/A | N/A | N/A | NIA | 250 |
| 33 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 34 | 2 | GAUGE, CHARGE PRESSURE | NOSHOK | 25-510-1000-PSI/BAR-1/4-SSFF | 9000 PSI | 450 PSI | N/A | 114" NPTM | N/A | NIA | N/A | N/A | N/A | NIA | 212 |
| 35 | 1 | GAUGE, BRAKE PRESSURE | NOSHOK | 25-510-1000-PSI/BAR-1/4-SSFF | 9000 PSI | 450 PSI | N/A | 114" NPTM | N/A | NIA | N/A | N/A | N/A | NIA | 212 |
| 36 | 1 | GAUGE, SUPERCHARGE PRESSURE | NOSHOK | 25-510-1000-PSI/BAR-1/4-SSFF | 9000 PSI | 450 PSI | N/A | 114" NPTM | N/A | NIA | N/A | N/A | N/A | NIA | 212 |
| 37 | 1 | GAUGE, SYSTEM PRESSURE | NOSHOK | 25-510-6000-PSI/BAR-1/4-SSFF | 9000 PSI | 4500 PSI | N/A | 114" NPTM | N/A | NIA | N/A | N/A | N/A | NIA | 212 |
| 38 | 5 | VALVE, GAUGE SHUTOFF | HYLOK | NV2-H4TS316 | 5000 PSI | 4500 PSI | N/A | 114" TUBE FITTING | 1/4" TUBE FITTING | NIA | N/A | N/A | N/A | NIA | 450 |
| 39 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 40 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 41 | 17 | MOTOR, HYDRAULIC, VARIABLE DISPLACEMENT | DANFOSS POWER | H1B080AHEHENBTAVNANNNNNNN041200NNN | 6960PSI | 4500PSI | 3600/5900RPM | 3/4" C. 62 FLANGE PORT | 3/4" C. 62 FLANGE PORT | SAE #12 ORING | SAE #6 ORING | SAE C | 14T 12124DP | N/A | N/A |
| 42 | 17 | MANIFOLD COUNTERBALANCE/ASSEMBLY | SELLING PRECISION | QUOTE SQ68837, P/N D12009 | 5000PSI | 4500PSI | N/A | 1" C.62 FLANGE PORT | 3/4" C. 62 FLANGE PORT | SAE #8 ORING | NIA | NIA | NIA | NIA | NIA |
| 43 | 17 | COUNTERBALANCE VALVE | SUN | CWEL-LGN-4750PSI | 2000 PSI | 5PSI | N/A | 1/2"NPTF | 1/2" NPTF | - | - | - | - | - | 400 |
| 43A | 17 | COUNTERBALANCE VALVE | SUN | CWEL-LGN-2425PSI | 2000 PSI | 2 PSI | N/A | 3/4" NPTF | 3/4" NTPF | NIA | NIA | NIA | NIA | NIA | 400 |
| 44 | 17 | BRAKE | MICO | 1354750B-ABS | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 45 | 17 | PLANETARY GEARBOX | FAIRFIELD | S60A2444374-01 | N/A | N/A | 3RPM @ MAXLOAD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 46 | 2 | SHUTOFF VALVE, SIGHT LEVEL GAGE | NIBCO | T560CSR66FSLL3/4" (API 607 FIRE SAFE) | 2000PSI | 2PSI | N/A | 3/4" NPTF | 3/4" NPTF | N/A | N/A | N/A | N/A | N/A | 400 |
| 47 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 48 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 49 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 50 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 51 | 2 | VALVE, RESERVOIR DRAIN/FLUSHING | NIBCO | T560S6R66FSLL11/2" (API 607 FIRESAFE) | 2000PSI | 5PSI | N/A | 2" NPTF | 2" NPTF | N/A | N/A | N/A | N/A | N/A | 400 |
| 52 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 53 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 54 | 1 | RESERVED | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 55 | 4 | 2" Cd 62 SPLIT FLANGE KIT | ANCHOR FLANGE | 32SFXO | 6000PSI | 4500PSI | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 56 | 10 | 2" Cd 62 SOCKET WELD COMPANION FLANGE FLAT FACE | ANCHOR FLANGE | W60-32-32 | 6000PSI | 4500PSI | N/A | 2" SOCKET WLED | 2" COMPANION FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 57 | 4 | 2" Cd 62 SOCKET WELD O-RING FLANGE | ANCHOR FLANGE | W59-32-32U | 6000PSI | 4500PSI | N/A | 2" SOCKET WLED | 2" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 58 | 36 | 2" SADDLE BY 3/4" Cd 62 COMPANION FLANGE | ANCHOR FLANGE | W107-32-32U | 6000PSI | 4500PSI | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 59 | 4 | 3/4" Cd 62 BLANK O-RING FLANGE | ANCHOR FLANGE | W38-12-12U | 6000PSI | 4500PSI | N/A | 3/4" SOCKET WLED | 3/4" COMPANION FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 60 | 64 | 3/4" Cd 62 SPLIT FLANGE KIT | ANCHOR FLANGE | 12SFXO | 6000PSI | 4500PSI | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 61 | 4 | 2" Cd 62 BLANK O-RING FLANGE | ANCHOR FLANGE | W38-32-32U | 6000PSI | 4500PSI | N/A | 3/4" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 62 | 2 | SPLIT FLANGE KIT, 2" Cd 61 | ANCHOR FLANGE | 32-SFO | 3000PSI | 90PSI | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 63 | 2 | 1 1/2" C61 SOCKET WELD COMPANION FLANGE | ANCHOR FLANGE | W61-32-32 | 3000PSI | 90PSI | N/A | 2" SOCKET WLED | 2" COMPANION FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 64 | 5 | 1 1/2" Cd 61 SOCKET WELD O-RING FLANGE | ANCHOR FLANGE | W4-32-32U | 3000PSI | 90PSI | N/A | 2" SOCKET WLED | 2" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 65 | 1 | SPLIT FLANGE KIT, 1 1/2" Cd 62 | ANCHOR FLANGE | 08-SFXO | 3000PSI | 90PSI | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 66 | 18 | ADAPTER, #12 SAEF 1/2 COUPLING | ANCHOR FLANGE | 835B-12 | 6000PSI | 4500PSI | N/A | #12 SAEF | #12 SAEF | N/A | N/A | N/A | N/A | N/A | N/A |
| 67 | 16 | ADAPTER, #12 MJIC x #12 SAEW, STR | AIRWAY | 6400-12-12-O | 6000PSI | 4500PSI | N/A | #12 MJIC | #12 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 68 | 16 | ADAPTER, #12 MJIC x #10 SAEW, 90 | AIRWAY | 6801-12-10-NWO | 6000PSI | 4500PSI | N/A | #12 MJIC | #10 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 69 | 2 | 1 1/2" C61 BLANKING O-RING FLANGE | ANCHOR FLANGE | W36-32-32U | 3000PSI | 90PSI | N/A | 2" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 70 | 1 | SPLIT FLANGE KIT, 2" Cd 61 | ANCHOR FLANGE | 08-SFO | 3000PSI | 90PSI | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 71 | 5 | 1/2" Cd 61 SOCKET WELD COMPANION FLANGE | ANCHOR FLANGE | W61-08-08U | 3000PSI | 90PSI | N/A | 1/2" SOCKET WLED | 1/2" COMPANION FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 72 | 2 | 1/2" Cd 61 SOCKET WELD O-RING FLANGE | ANCHOR FLANGE | W4-08-08U | 3000PSI | 90PSI | N/A | 1/2" SOCKET WLED | 1/2" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 73 | 18 | ADAPTER, #4 SAEF 1/2 Cplg | ANCHOR FLANGE | 835B-4 | 6000PSI | 4500PSI | N/A | #4 SAEF | #4 SAEF | N/A | N/A | N/A | N/A | N/A | N/A |
| 74 | 16 | ADAPTER, #4 MJIC X #4 SAEM, STR | AIRWAY | 6400-04-04-O | 6000PSI | 4500PSI | N/A | #4 MJIC | #4 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 75 | 16 | ADAPTER, #4 MJIC X #6 SAEM, 90 | AIRWAY | 6801-04-06-NWO | 6000PSI | 4500PSI | N/A | #4 MJIC | #6 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 76 | 2 | 1/2" Cd 61 BLANK O-RING FLANGE | ANCHOR FLANGE | W36-08-08U | 3000PSI | 90PSI | N/A | 1/2" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 77 | 2 | SPLIT FLANGE KIT, 3/4" Cd 61 | ANCHOR FLANGE | 12-SFO | 3000PSI | 90PSI | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 78 | 5 | 3/4" Cd 61 SOCKET WELD COMPANION FLANGE | ANCHOR FLANGE | W61-12-12 | 3000PSI | 90PSI | N/A | 3/4" SOCKET WLED | 3/4" COMPANION FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 79 | 2 | 3/4" Cd 61 SOCKET O-RING FLANGE | ANCHOR FLANGE | W4-12-12U | 3000PSI | 90PSI | N/A | 3/4" SOCKET WLED | 3/4" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A |
| 80 | 18 | ADAPTER, #6 SAEF 1/2 Cplg | ANCHOR FLANGE | 835B-6 | 6000PSI | 4500PSI | N/A | #6 SAEF | #6 SAEF | N/A | N/A | N/A | N/A | N/A | N/A |
| 81 | 16 | ADAPTER, #6 MJIC X #6 SAEM, STR | AIRWAY | 6400-06-06-O | 6000PSI | 4500PSI | N/A | #6 MJIC | #6 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 82 | 16 | ADAPTER, #6 MJIC X #4 SAEM, 90 | AIRWAY | 6801-06-04-NWO | 6000PSI | 4500PSI | N/A | #6 MJIC | #4 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 83 | 2 | 3/4" Cd 61 BLANK O-RING FLANGE | ANCHOR FLANGE | W36-12-12U | 3000PSI | 90PSI | N/A | 3/4" O-RING FLANGE | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 84 | 16 | ADAPTER, #8 MJIC X #8 SAEM 90 | AIRWAY | 6801-08-08-NWO | 6000PSI | 4500PSI | N/A | #8 MJIC | #8 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 85 | 16 | ADAPTER, #8 MJIC X #10 SAEM 90 | AIRWAY | 6801-08-10-NWO | 6000PSI | 4500PSI | N/A | #8 MJIC | #10 SAEM | N/A | N/A | N/A | N/A | N/A | N/A |
| 86 | 32 | 3/4" HOSE, #12 Cd 62 SF STR X Cd 62 #12 SF 45, 30" EXPOSED RUBBER | AEROQUIP | GH493RL-12-12FH-12FH45-36.75 | 5500PSI | 4500PSI | N/A | 1B12FHA12 | 1B12FHA13 | N/A | N/A | N/A | N/A | N/A | 250 |
| 87 | 16 | 3/4" HOSE, #12 FJIC STR X #12 FJIC STR, 30" EXPOSED RUBBER | AEROQUIP | GH781-12-12FJ-12FJ-0035.68 | 3125PSI | 90PSI | N/A | 1AA12FJ12 | 1AA12FJ13 | N/A | N/A | N/A | N/A | N/A | 212 |
| 88 | 16 | 1/4" HOSE, #4 FJIC STR X #4 FJIC STR, 30" EXPOSED RUBBER | AEROQUIP | GH781-4-4FJ-4FJ-0034.00 | 5800PSI | 4500PSI | N/A | 1AA12FJ4 | 1AA12FJ5 | N/A | N/A | N/A | N/A | N/A | 212 |
| 89 | 16 | 3/8" HOSE, #6 FJIC STR X #6 FJIC STR, 30" EXPOSED RUBBER | AEROQUIP | GH781-6-6FJ-6FJ-0034.56 | 5000PSI | 600PSI | N/A | 1AA12FJ6 | 1AA12FJ7 | N/A | N/A | N/A | N/A | N/A | 212 |
| 90 | 16 | 1/2" HOSE, #8 FJIC STR X #8 FJIC STR, XX" EXPOSED RUBBER, 21" OAL | AEROQUIP | GH781-8-8FJ-8FJ-0021.00 | 4250PSI | 90PSI | N/A | 1AA12FJ8 | 1AA12FJ9 | N/A | N/A | N/A | N/A | N/A | 212 |
| 91 | 2 | 2" HOSE, #32 Cd 62 SF STR X Cd #32 SF STR, 30" EXPOSED RUBBER | AEROQUIP | FC500-32-32FH-32FH | 5100PSI | 4500PSI | N/A | 1Z32FH32 | 1Z32FH32 | N/A | N/A | N/A | N/A | N/A | 212 |
| 92 | 1 | 3/4" HOSE, #12 Cd 61 SF STR X Cd #12 SF 90, 30" EXPOSED RUBBER | AEROQUIP | GH781-12-12FL-12FLB90 | 3125PSI | 90PSI | N/A | 1A32FL32 | 1A32FLB32 | N/A | N/A | N/A | N/A | N/A | 212 |
| 93 | 1 | 1/2" HOSE, #8 Cd 61 SF STR X #8 Cd 62 SF 45, 30" EXPOSED RUBBER | AEROQUIP | GH493-08-08FL-08FHA45 | 6000PSI | 4500PSI | N/A | 1A8FL8 | 1A8FLA8 | N/A | N/A | N/A | N/A | N/A | 212 |
| 94 | 1 | 1 1/2" HOSE, #24 CD 61 STR X #24 CD61 90, 30" EXPOSED RUBBER | AEROQUIP | GH781-24-24FL-24FLB90 | 2000PSI | 600PSI | N/A | 1A12FL12 | 1A12FLB12 | N/A | N/A | N/A | N/A | N/A | 212 |



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| D | UPDATED SCHEMATIC AND BILL OF MATERIAL TO ADD (1) GEARBOX DRIVE ASSEMBLY | 05/22/17 | MJP | TMW |
| C | UPDATED ELECTRIC MOTOR RPM IN BOM AND NOTES TO REFLECT ABS 2014 RULES | 04/13/16 | MJP | TMW |
| B | ADDED BILL OF MATERIALS | 08/27/15 | DSS | TMW |
| A | INITIAL RELEASE | 02/04/15 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY M.PALMER DATE 02/04/15
CHECKED T.WELSH DATE 02/04/15
APPROVED T.WELSH DATE 02/04/15
P.O. NO. N/A REQ. NO.

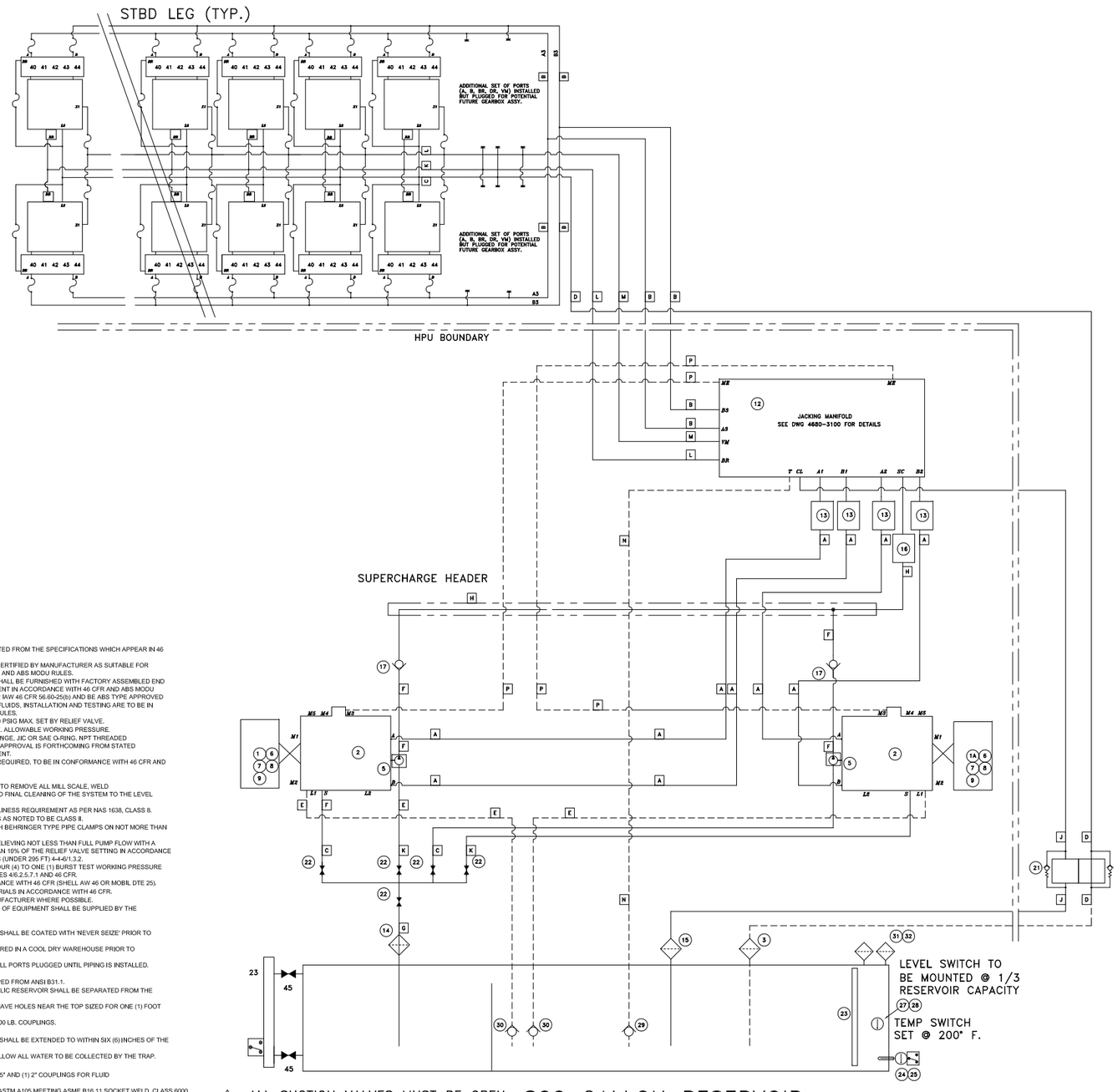
TRIYARDS H1028/H1029

JACKING SYSTEM HYDRAULIC SCHEMATIC, TYPICAL PER LEG

DWG. NO. 4680-1000 SIZE REVISION D
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

(10) MOTORS SHOWN FOR CLARITY
(17) MOTORS INSTALLED TOTAL PER LEG




GENERAL NOTES:

1) MATERIALS USED IN PIPING SHALL BE SELECTED FROM THE SPECIFICATIONS WHICH APPEAR IN 46 CFR AND ABS MODU RULES.
2) HYDRAULIC PUMPS AND MOTORS SHALL BE CERTIFIED BY MANUFACTURER AS SUITABLE FOR INTENDED USE IN ACCORDANCE WITH 46 CFR AND ABS MODU RULES.
3) FLEXIBLE HOSE ASSEMBLIES WHERE USED SHALL BE FURNISHED WITH FACTORY ASSEMBLED END FITTINGS REQUIRING NO FURTHER ADJUSTMENT IN ACCORDANCE WITH 46 CFR AND ABS MODU RULES. HOSES MUST BE LISTED IN SAE J1942 IAW 46 CFR 56.60-25(b) AND BE ABS TYPE APPROVED
4) IN GENERAL, ALL PIPING MATERIAL, DESIGN, FLUIDS, INSTALLATION AND TESTING ARE TO BE IN ACCORDANCE WITH 46 CFR AND ABS MODU RULES.
5) ALLOWABLE WORKING PRESSURE TO BE 4500 PSIG MAX, SET BY RELIEF VALVE.
6) PIPING TEST PRESSURE TO BE 1.5 TIMES MAX. ALLOWABLE WORKING PRESSURE.
7) ALL CONNECTIONS SHALL BE SAE 4-BOLT FLANGE, JIC OR SAE O-RING, NPT THREADED CONNECTIONS ARE TO BE USED ONLY WHEN APPROVAL IS FORTHCOMING FROM STATED REGULATORY AGENCIES AND/OR DESIGN AGENT.
8) NONDESTRUCTIVE TEST OF WELDS, WHERE REQUIRED, TO BE IN CONFORMANCE WITH 46 CFR AND ABS MODU RULES.
9) PIPING TO BE USCG CLASS 1.
10) ALL PIPING SHALL BE PICKLED AND FLUSHED TO REMOVE ALL MILL SCALE, WELD SLAG AND ANY FOREIGN PARTICLES PRIOR TO FINAL CLEANING OF THE SYSTEM TO THE LEVEL SPECIFIED PER NAS 1638, CLASS 8.
11) ALL PIPING AND HOSES ARE TO MEET CLEANLINESS REQUIREMENT AS PER NAS 1638, CLASS 8.
12) LOW PRESSURE SUCTIONS AND RELIEF LINES AS NOTED TO BE CLASS II.
13) PIPE AND TUBING SHALL BE SUPPORTED WITH BEHRINGER TYPE PIPE CLAMPS ON NOT MORE THAN SIX (6) FOOT CENTERS.
14) EACH RELIEF VALVE IS TO BE CAPABLE OF RELIEVING NOT LESS THAN FULL PUMP FLOW WITH A MAXIMUM PRESSURE RISE OF NOT MORE THAN 10% OF THE RELIEF VALVE SETTING IN ACCORDANCE WITH ABS STEEL VESSELS UNDER 90 METERS (UNDER 295 FT) 4-4-6/1.3.2.
15) FLEXIBLE HOSES ARE TO HAVE A MINIMUM FOUR (4) TO ONE (1) BURST TEST WORKING PRESSURE RATIO AS PER ABS MODU 4/2.9.14, STEEL RULES 4/6.2.5.7.1 AND 46 CFR.
16) THE HYDRAULIC FLUID SHALL BE IN ACCORDANCE WITH 46 CFR (SHELL AW 46 OR MOBIL DTE 25).
17) MILL CERTS ARE TO BE PROVIDED FOR MATERIALS IN ACCORDANCE WITH 46 CFR.
18) ALL VALVES SHALL BE FROM THE SAME MANUFACTURER WHERE POSSIBLE.
19) ALL PIPING, HOSES, FITTINGS AND MOUNTING OF EQUIPMENT SHALL BE SUPPLIED BY THE SHIPYARD.
20) RESERVED.
21) THE HYDRAULIC PUMPS AND MOTOR SHAFTS SHALL BE COATED WITH 'NEVER SEIZE' PRIOR TO INSTALLATION.
22) ALL HYDRAULIC COMPONENTS SHALL BE STORED IN A COOL DRY WAREHOUSE PRIOR TO INSTALLATION.
23) ALL HYDRAULIC COMPONENTS SHALL HAVE ALL PORTS PLUGGED UNTIL PIPING IS INSTALLED.
24) RESERVED
25) PIPING CALCULATIONS SHOWN ARE DEVELOPED FROM ANSI B31.1.
26) ALL RETURN PENETRATIONS TO THE HYDRAULIC RESERVOIR SHALL BE SEPARATED FROM THE SUCTION LINES BY A BAFFLE.
27) THE HYDRAULIC RESERVOIR BAFFLE SHALL HAVE HOLES NEAR THE TOP SIZED FOR ONE (1) FOOT PER SECOND VELOCITY.
28) ALL RESERVOIR PENETRATIONS SHALL BE 3000 LB. COUPLINGS.
29) RERSERVED
30) RESERVOIR RETURN AND CASE DRAIN LINES SHALL BE EXTENDED TO WITHIN SIX (6) INCHES OF THE RESERVOIR BOTTOM.
31) RESERVOIR BOTTOM SHALL BE SLOPED TO ALLOW ALL WATER TO BE COLLECTED BY THE TRAP.
32) RESERVED
33) RESERVOIR SHALL BE FITTED WITH ONE (1) 1.5" AND (1) 2" COUPLINGS FOR FLUID FILTERING WITH FLUSHING CART.
34) PIPE FITTINGS FOR PRESSURE PIPING TO BE ASTM A105 MEETING ASME B16.11 SOCKET WELD, CLASS 6000.
35) ALL CLASS II PIPING (225 PSI DESIGN PRESSURE AND BELOW AND TEMPERATURE 400 DEG AND BELOW) SHALL BE CONNECTED USING ASTM 105 FITTINGS MEETING ASME B16.11 THREADED OR SOCKET WELD.

RECOMMENDED PIPING

The following wall thickness calculations are based on ABS Rules for Steel Vessels Under 90 Meters, Part 4/6.13.6 and ANSI B31.1 Code for Pressure Piping
Where:

$$t = \frac{WD}{KS + MW} + C \qquad W = \frac{KS(t - c)}{D - M(t - c)}$$

K = 2
W = Maximum allowable working pressure in PSI
t = Minimum thickness of pipe in in.
D = Actual external diameter of pipe in in.
S = Maximum allowable fiber stress in PSI
M = 0.8 (Factor from ABS table 4/6.1)
C = 0.02 (Allowance for threading, grooving or mechanical strength)
0.0 Plain-end steel or wrought-iron pipe or tubing up to 4in N.P.S.
Used for hydraulic piping systems
A 12.5% reduction in wall thickness is used to allow for manufacturing tolerances for piping. Note: **A 10% reduction is used for stainless steel tubing.

| | | |
|---|---|---|
| S = | 14000 | (A106 Grade C, S=17,500; Use 80% for Coast Guard) |
| M = | 0.8 | |
| C = | 0.02 | ** C=.02" TOLERANCE ALLOWANCE FOR THREADED CONNECTIONS |
| M = | 0.8 | |
| C = | 0 | |

## PIPING INTERNAL TO HYDRAULIC POWER UNIT

| Symbol | Pipe Service | Actual Pipe Selected | S Value | Pipe size, in. | Pipe OD, in. | Actual Wall thickness, in. | Reduction for Mfg. Tol | Reduced Wall Thickness | Design Pressure, PSI | Minimum wall thickness required, in. | Allowable Working PSI, ANSI B31.1 | Internal Area, in^2 | Fluid Flow, GPM | Fluid Velocity, ft/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | PUMP PRESSURE TO MANIFOLD A/B LINES | 1 1/2" SCH 160, A106 GRC | 17500 | 2.0 | 2.375 | 0.343 | 12.5% | 0.300 | 4500 | 0.277 | 4920 | 2.241 | 94 | 13.5 |
| E | PUMP DRAIN CASE LINE | 1 1/4" SCH 40, A106 GRB | 15000 | 1.25 | 1.66 | 0.140 | 12.5% | 0.123 | 90 | 0.005 | 2353 | 1.496 | 30 | 6.4 |
| F | SUPERCHARGE PRESSURE LINES | 1 1/2" SCH 40, A106 GRB | 15000 | 1.5 | 1.9 | 0.145 | 12.5% | 0.127 | 600 | 0.037 | 2116 | 2.037 | 56 | 8.8 |
| G | SUCTION LINE HEADER | 3" SCH 40, A106 GRB | 15000 | 3.0 | 3.50 | 0.216 | 12.5% | 0.189 | 90 | 0.010 | 1693 | 7.396 | 166 | 7.2 |
| H | SUPERCHARGE PRESS HEADER | 1 1/2" SCH 40, A106 GRB | 15000 | 1.5 | 1.9 | 0.145 | 12.5% | 0.127 | 600 | 0.037 | 2116 | 2.037 | 60 | 9.5 |
| J | COOLER CL MANIFOLD PORT TO HEAT EXCHANGER | 1 1/2" SCH 40, A106 GRB | 15000 | 1.5 | 1.9 | 0.145 | 12.5% | 0.127 | 90 | 0.006 | 2116 | 2.037 | 46 | 7.2 |
| N | MANIFOLD DRAIN LINE | 3/4" SCH 40, A106 GR B | 15000 | 0.75 | 1.05 | 0.113 | 12.5% | 0.099 | 90 | 0.003 | 3055 | 0.533 | 5 | 3.0 |
| Q | MANIFOLD ENGAGE LINE | 3/8" X 0.035" A269/A312 SS ASTM TUBING | 15700 | 0.375 | 0.375 | 0.035 | 10.0% | 0.032 | 600 | 0.007 | 2828 | 0.073 | 3 | 13.2 |
| C | COMMON SUCTION LINE | 4" SCH 40, A106 GR B | 15000 | 4 | 4.50 | 0.237 | 12.5% | 0.207 | 90 | 0.013 | 1435 | 12.735 | 130 | 3.3 |

## FIELD PIPING BY SHIPYARD

| Symbol | Pipe Service | Actual Pipe Selected | S Value | Pipe size, in. | Pipe OD, in. | Actual Wall thickness, in. | Reduction for Mfg. Tol | Reduced Wall Thickness | Design Pressure, PSI | Minimum wall thickness required, in. | Allowable Working PSI, ANSI B31.1 | Internal Area, in^2 | Fluid Flow, GPM | Fluid Velocity, ft/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | A/B PRESSURE LINES FROM HPU TO LEG TOWERS | 2" SCH 160, A106 GRC | 17500 | 2.0 | 2.375 | 0.343 | 12.5% | 0.300 | 4500 | 0.277 | 4920 | 2.241 | 236 | 33.8 |
| D | MOTOR CASE DRAIN HEADER FROM LEG TREE TO COOLER/HPU | 2" SCH 80, A106 GRB | 15000 | 2.0 | 2.375 | 0.154 | 12.5% | 0.135 | 100 | 0.007 | 1783 | 3.357 | 64 | 6.1 |
| J | HPU CL MNFLD PORT TO HEAT EXCHANGER AND TO HPU | 2" SCH 80, A106 GRB | 15000 | 2.0 | 2.375 | 0.154 | 12.5% | 0.135 | 100 | 0.007 | 1783 | 3.357 | 106 | 16.7 |
| L | BRAKE RELEASE LINE FROM HPU TO LEG | 3/4" SCH 40, A106 GR B | 15000 | 0.75 | 1.05 | 0.113 | 12.5% | 0.099 | 600 | 0.021 | 3055 | 0.533 | 5 | 3.0 |
| M | VARIABLE SPEED PRESSURE LINE FROM HPU TO LEG | 1/2" SCH 40, A106 GR B | 15000 | 0.5 | 0.84 | 0.109 | 12.5% | 0.095 | 600 | 0.017 | 3747 | 0.304 | 3 | 3.2 |

RECOMMENDED HOSES PER LEG

| SERVICE | QTY | DESCRIPTION | MFG. | HOSE | HOSE FITTING #1 | HOSE FITTING #2 | WP* | MAWP** | BURST |
|---|---|---|---|---|---|---|---|---|---|
| LEG TOWERS | | | | | | | | | |
| PRESSURE LINES (A&B) | 32 | 3/4" HOSE, 3/4" C62 SF X 3/4" C62 SF 45 X 30" | AEROQUIP | FC273-12 | 1B12FH12 | 1B12FHA12 | 5000 | 4500 | 20000 |
| MOTOR CASE DRAIN | 16 | 3/4" HOSE, #12 FM JIC X #12 FM JIC X 30" | AEROQUIP | GH781-12 | 1AA12FJ12 | 1AA12FJ12 | 3125 | 100 | 12500 |
| VARIABLE LINES | 16 | 1/4" HOSE, #4 FM JIC F X #4 FM JIC X 30" | AEROQUIP | GH781-4 | 1AA4FJ4 | 1AA4FJ4 | 5800 | 600 | 23200 |
| BRAKE LINES | 16 | 3/8" HOSE, #6 FM JIC X #6 FM JIC X 30" | AEROQUIP | GH781-6 | 1AA6FJ6 | 1AA6FJ6 | 5000 | 600 | 23200 |
| COUNTERBALANCE DRAIN | 16 | 1/2" HOSE, #8 FM JIC X #8 FM JIC X 24" | AEROQUIP | GH781-8 | 1AA8FJ8 | 1AA8FJ8 | 5000 | 600 | 20000 |

HPU HOSES PER HPU

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PRESSURE LINES (A&B) | 2 | 2" HOSE, 2" C62 SF X 2" C62 SF X 30" | AEROQUIP | FC500-32 | 1Z32FH32 | 1Z32FH32 | 5000 | 5100 | 20400 |
| MOTOR CASE DRAIN | 1 | 2" HOSE, 2" C61 SF X 2" C61 SF 90 X 30" | AEROQUIP | GH781-32 | 1A32FL32 | 1A32FLB32 | 90 | 2000 | 8000 |
| VARIABLE LINES | 1 | 1/2" HOSE, 1/2" C61 SF X 1/2" C61 SF 90 X 30" | AEROQUIP | GH493-12 | 1B8FL8 | 1B8FLA8 | 3125 | 600 | 12500 |
| BRAKE LINES | 1 | 3/4" HOSE, 3/4" C61 SF X 3/4" C61 SF 45 X 30" | AEROQUIP | GH781-12 | 1A12FL12 | 1A12FLB12 | 3125 | 600 | 12500 |

"WP" - RATED WORKING PRESSURE OF HOSE
"MAWP" - MAXIMUM ALLOWABLE PRESSURE OF CIRCUIT IN WHICH HOSE IS INSTALLED



| REV | DESCRIPTION | DATE | CHC BY | APPVL |
|---|---|---|---|---|
| D | CHANGED QUANTITY OF GEARBOX/MOTOR DRIVE ASSEMBLIES FROM (16) TO (17) PER LEG | 05/22/17 | MJP | TMW |
| C | UPDATED HOSE AND PIPE CHARTS | 04/13/16 | MJP | TMW |
| B | ADDED BRAKE LINE PIPE SIZE TO PIPE CHART | 10/01/15 | MJP | TMW |
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

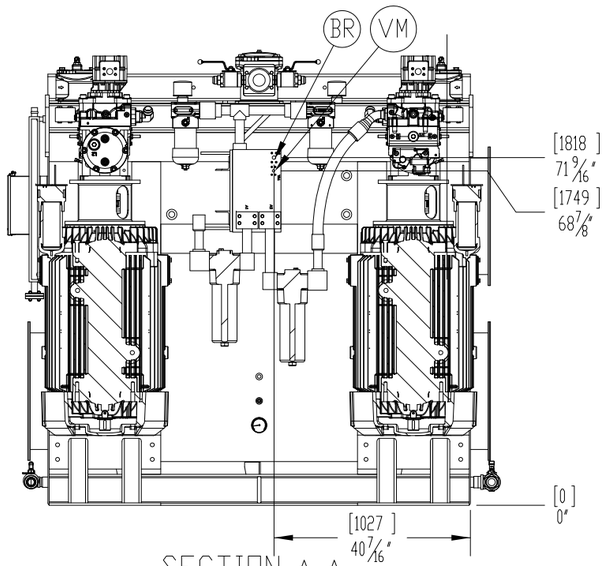
DO NOT SCALE DRAWING
DRAWN BY M.PALMER DATE 02/04/15
CHECKED T.WELSH DATE 02/04/15
APPROVED T.WELSH DATE 02/04/15
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

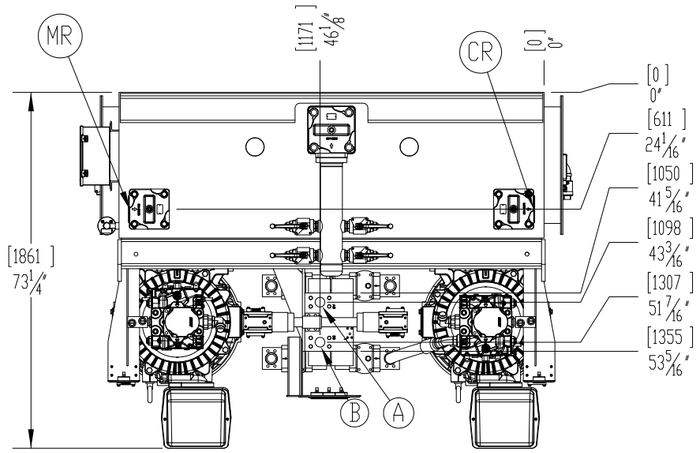
JACKING SYSTEM PIPING DIAGRAM, TYPICAL PER LEG

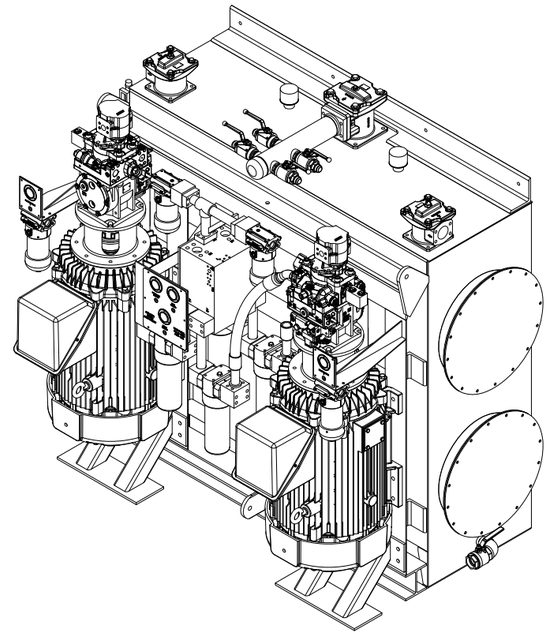
DWG. NO. 4680-1100 SIZE D REVISION
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

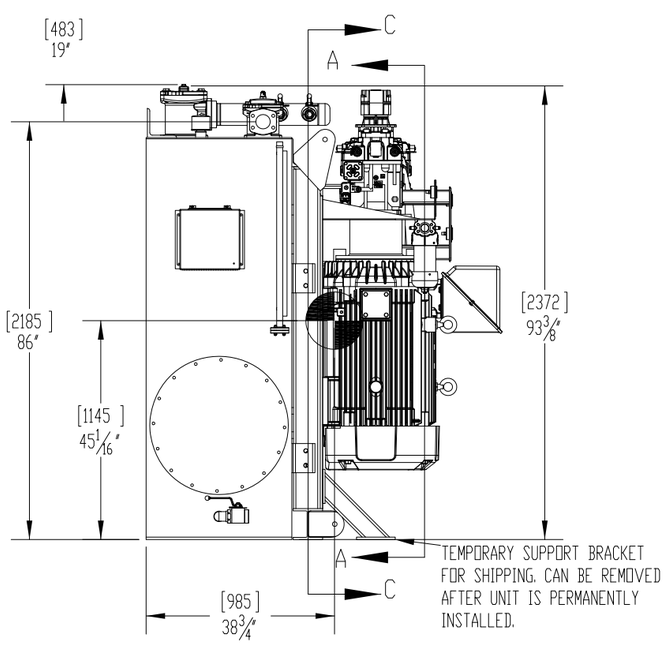


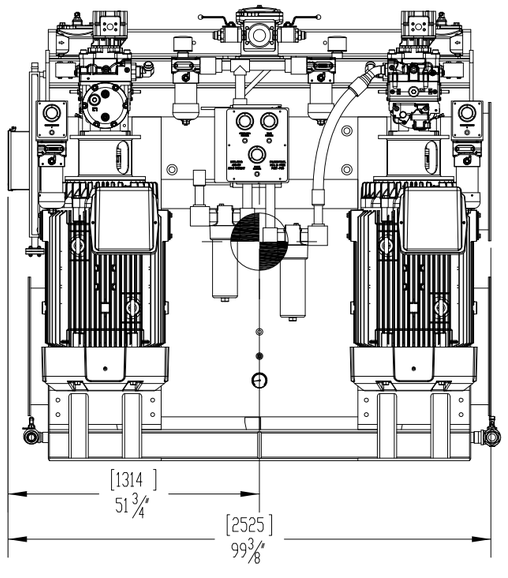

SECTION A-A

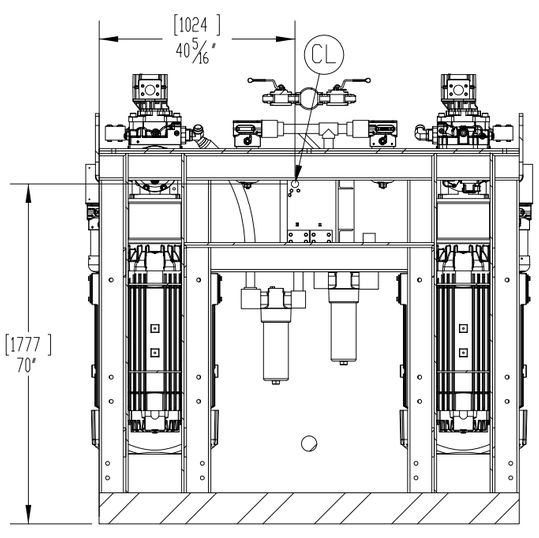


FILTER REMOVAL
REQUIRED CLEARENCE




SECTION C-C

* APPROX. DRY WEIGHT: 13,000 lbs.
5,897 kg.

* APPROX. WET WEIGHT: 19,120 lbs.
8,673 kg.

* RESERVOIR CAP: 765 gal.
2,896 L

| CUSTOMER CONNECTION | | |
|---|---|---|
| ID | CONNECTION | DESCRIPTION |
| A | 2″ Cd 62 | SYSTEM PRESSURE A |
| B | 2″ Cd 62 | SYSTEM PRESSURE B |
| VM | 1/2″ Cd 62 | VARIABLE MOTOR |
| BR | 3/4″ Cd 61 | BRAKE |
| CL | 1-1/2″ Cd 61 | CIRCULATION LOOP |
| CR | 2″ Cd 61 | CIRCULATION RETURN |
| MR | 2″ Cd 61 | MOTOR CASE RETURN |



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| F | UPDATED PROJECT NAME IN TITLE BLOCK | 04/13/16 | MJP | TMW |
| E | ADDED NOTE TO TEMPORARY SUPPORT BRACKET | 12/31/15 | WAB | TMW |
| D | ADDED SECTION VIEW 'C' TO SHOW CL PORT LOCATION | 10/2/15 | WAB | TMW |
| C | ADDED HPU WET WEIGHT; UPDATED RERTURN CONNECTION SIZE | 7/13/15 | WAB | TMW |
| B | CORRECTED VM PORT TYPE | 6/22/15 | WAB | TMW |
| A | NEW RELEASE | 5/1/15 | WAB | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125/V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | W.BACARISSE | DATE 5/1/15 |
| CHECKED | T.WELSH | DATE 5/1/15 |
| APPROVED | T.WELSH | DATE 5/1/15 |
| P.O. NO. | N/A | REQ. NO. |

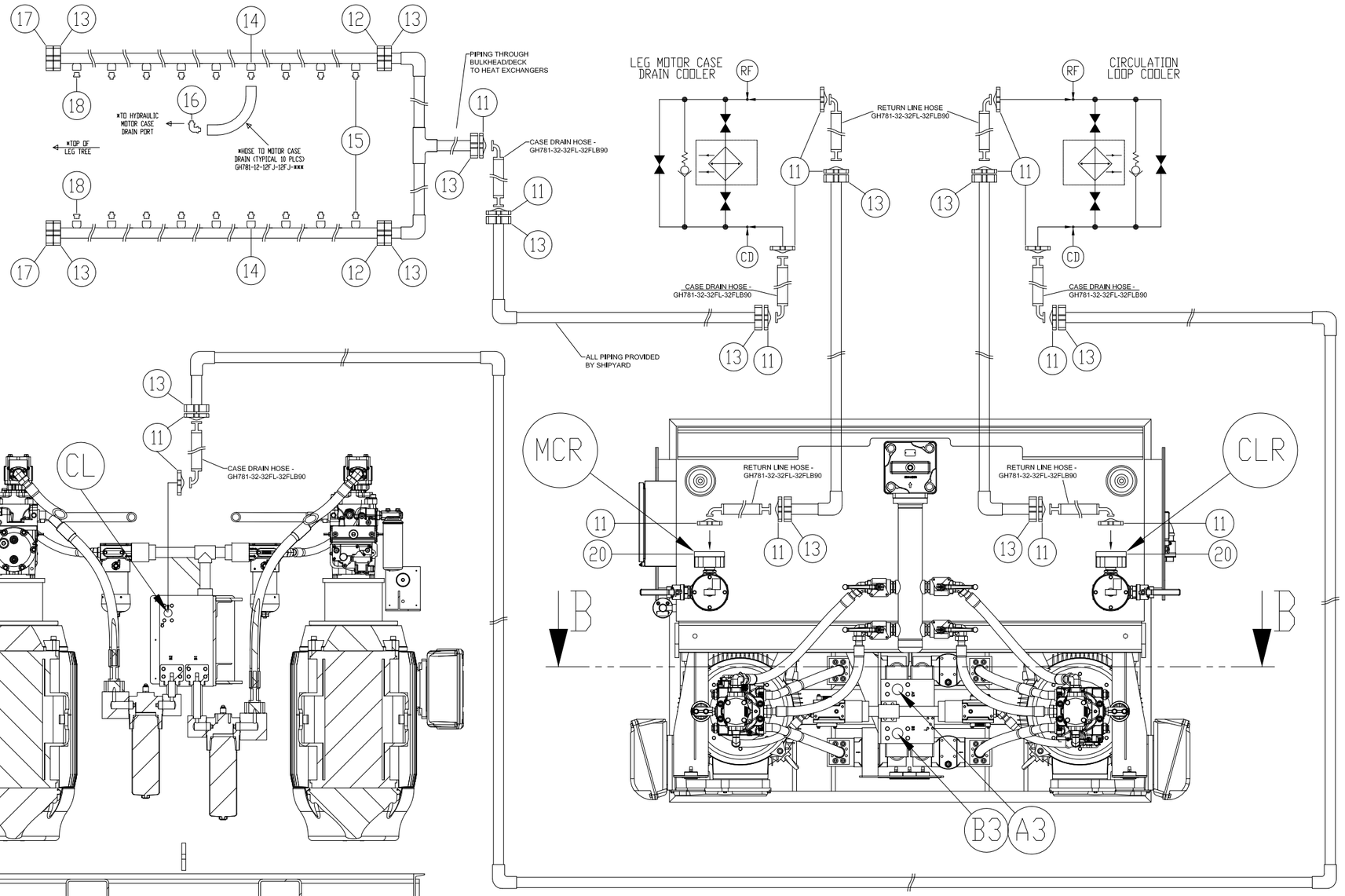
TRIYARDS H1028/H1029

HPU GENERAL ARRANGEMENT

DWG. NO. 4680-2000 SIZE F REVISION

SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020




SECTION B-B

| CASE DRAIN HEADER FITTINGS AND FLANGES | | |
|---|---|---|
| ITEM | DESCRIPTION | P/N |
| 11 | SPLIT FLANGE KIT, 2" Cd 61 | 32-SFD |
| 13 | 2" C61 SW COMPANION FLANGE | W61-32-32 |
| 20 | 3" CD61 X 2" CD 61 SPLIT FLANGE ADAPTER | IFRA-A-6148-N-6132 |

| LEG MOTOR CASE DRAIN COOLER CONNECTION SCHEDULE | | |
|---|---|---|
| ITEM | FUNCTION | SIZE, TYPE |
| RF | OIL OUTLET TO MCR PORT RETURN FILTER | #32 JIC |
| CD | OIL INLET FROM LEG MOTOR CASE DRAIN HEADER | 2" CD 61 |

| CIRCULATION LOOP COOLER CONNECTION SCHEDULE | | |
|---|---|---|
| ITEM | FUNCTION | SIZE, TYPE |
| RF | OIL OUTLET TO CLR PORT RETURN FILTER | #32 JIC |
| CD | OIL FROM INLET HPU CL PORT | 2" CD 61 |

| CONNECTION SCHEDULE | | |
|---|---|---|
| ITEM | FUNCTION | SIZE, TYPE |
| A3 | A PRESSURE PORT LEGS | 2" CD 62 |
| B3 | B PRESSURE PORT LEGS | 2" CD 62 |
| VM | VARIABLE MOTOR | 1/2" CD 62 |
| BR | BRAKE RELEASE | 3/4" CD 61 |
| CL | CIRCULATION LOOP | 2" CD 61 |
| MCR | LEG MOTOR CASE COOLER RETURN | 3" CD 61 |
| CLR | CIRCULATION LOOP COOLER RETURN | 3" CD 61 |
| FL | FILL PORT | #24 SAE |
| DR | DRAIN PORT | 2" NPT |

***NOTE: DRAWING NOT TO SCALE***



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | INITIAL RELEASE | 07/14/15 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | M.PALMER | DATE 07/14/15 |
| CHECKED | T.WELSH | DATE 07/14/15 |
| APPROVED | T.WELSH | DATE 07/14/15 |
| P.O. NO. | N/A | REQ. NO. |

TRIYARDS H1028/H1029

# LIFTBOAT REMOTE HEAT EXCHANGER CONNECTIONS

DWG. NO. 4680-2006 | SIZE - | REVISION A
SCALE NONE | SH. 1 OF 1

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12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
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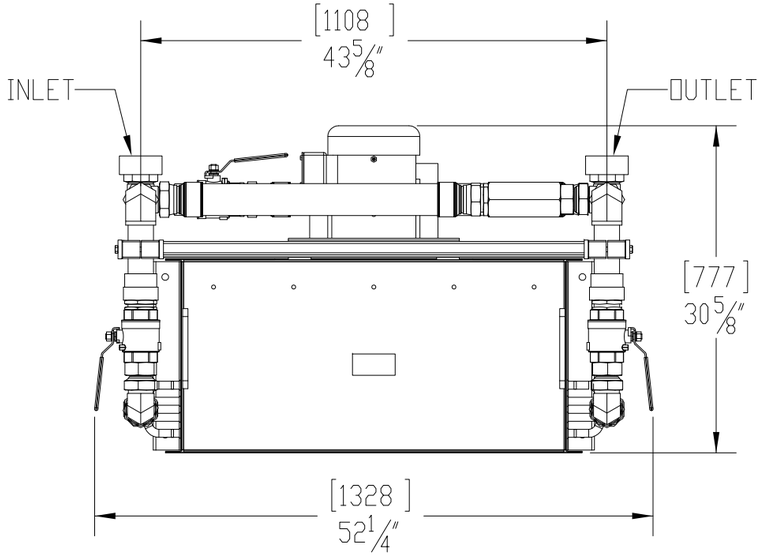
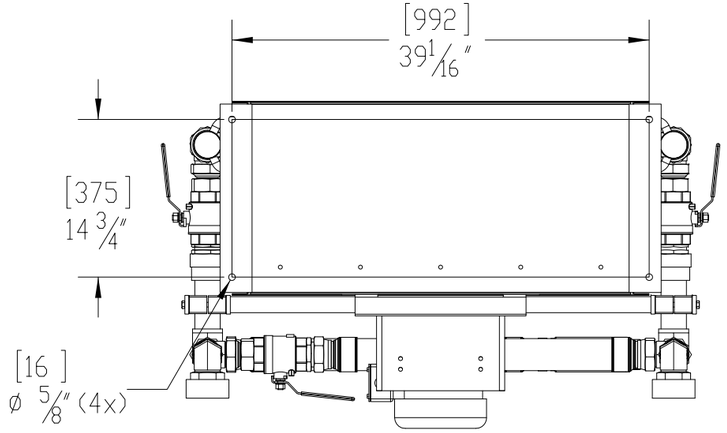
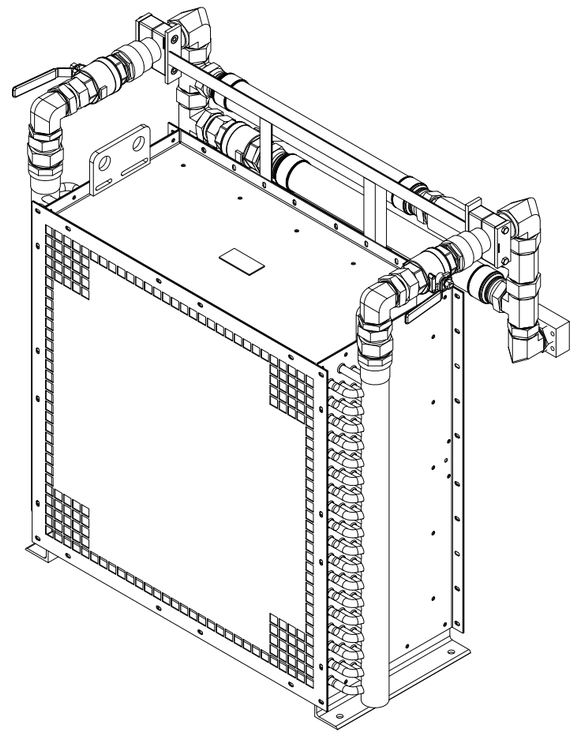
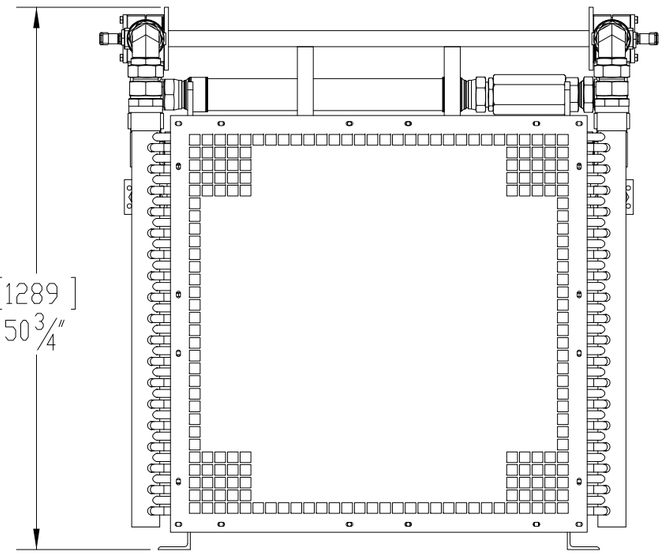
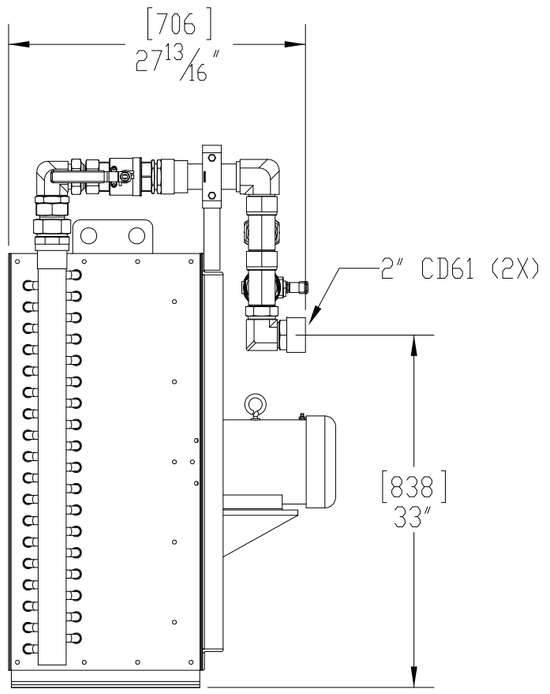



MOUNTING DIMENSIONS






*APPROX. DRY WEIGHT: 600 LBS.
272 kg

* APPROX. WET WEIGHT: 650 LBS.
295 kg



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | MODIFIED MOUNTING FEET | 1/4/15 | WAB | TMW |
| A | NEW RELEASE | 10/28/15 | WAB | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY W.BACARISSE DATE 10/28/15
CHECKED T.WELSH DATE 10/28/15
APPROVED T.WELSH DATE 10/28/15
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

COOLER ASSEMBLY DETAIL

DWG. NO. 4680-2601 SIZE B REVISION B
SCALE NONE SH. 1 OF 1

Hydraquip
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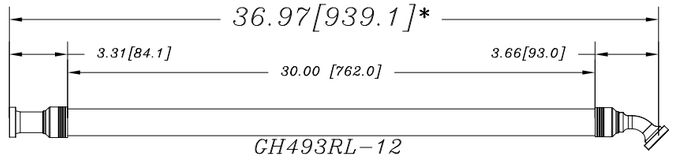
Fax: (281) 822-5020

## A/B PRESSURE LINES



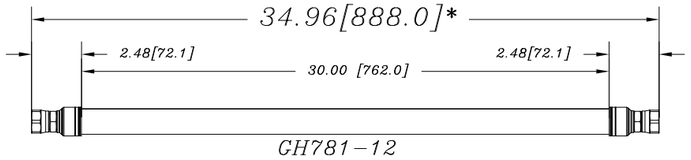

GH493RL-12

3/4" Cd 62 Split Flange
1B12FH12

3/4" Cd 62 Split Flange
1B12FHA12

(30" EXPOSED RUBBER)
(QUANTITY OF 130 REQUIRED, INCL 2 SPARES)
MINIMUM BEND RADIUS 4.75" (120.7MM)
FROM: "A/B" LEG TREE CONNECTIONS
TO: HYDRAULIC MOTOR MANIFOLD "A/B" PORTS
ASSEMBLY WEIGHT: 3.8LB (1.72KG)

## MOTOR CASE DRAIN LINES



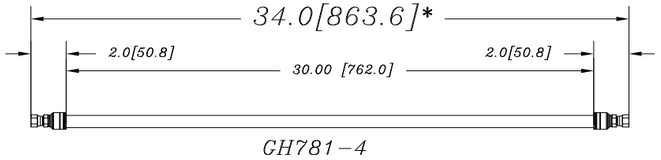

GH781-12

3/4" Female JIC
1AA12FJ12

3/4" Female JIC
1AA12FJ12

(30" EXPOSED RUBBER)
(QUANTITY OF 66 REQUIRED, INCL 2 SPARES)
MINIMUM BEND RADIUS 4.75" (120.7MM)
FROM: CASE DRAIN LEG TREE CONNECTION
TO: MOTOR CASE DRAIN "L2" PORT
ASSEMBLY WEIGHT: 2.4LB (1.09KG)

## VARIABLE MOTOR LINES



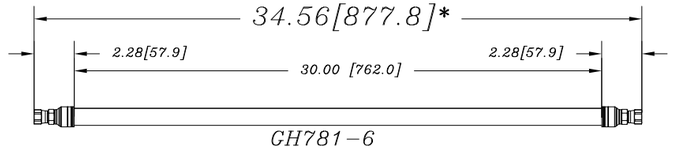

GH781-4

1/4" Female JIC
1AA4FJ4

1/4" Female JIC
1AA4FJ4

(30" EXPOSED RUBBER)
(QUANTITY OF 66 REQUIRED, INCL 2 SPARES)
MINIMUM BEND RADIUS 2" (50.8MM)
FROM: VARIABLE MOTOR LEG TREE CONNECTION
TO: HYDRAULIC MOTOR "X1" PORT
ASSEMBLY WEIGHT: 0.83LB (0.38KG)

## BRAKE LINES



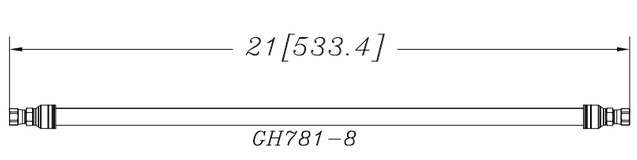

GH781-6

3/8" Female JIC
1AA6FJ6

3/8" Female JIC
1AA6FJ6

(30" EXPOSED RUBBER)
(QUANTITY OF 66 REQUIRED, INCL 2 SPARES)
MINIMUM BEND RADIUS 2.50" (63.5MM)
FROM: BRAKE LEG TREE CONNECTION
TO: HYDRAULIC BRAKE "BR" PORT
ASSEMBLY WEIGHT: 1.1LB (0.50KG)

## COUNTERBALANCE MANIFOLD DRAIN




GH781-8

1/2" Female JIC
1AA8FJ8

1/2" Female JIC
1AA8FJ8

(21" OVERALL LENGTH)
(QUANTITY OF 66 REQUIRED, INCL 2 SPARES)
MINIMUM BEND RADIUS 3.50" (88.9MM)
FROM: CBV MANIFOLD "DR" PORT
TO: MOTOR CASE DRAIN "L1" PORT
ASSEMBLY WEIGHT: 1.92LB (0.87KG)

HOSES FOR ASSEMBLIES WITHOUT TORQUE TRANSDUCERS

*ALL HOSE LENGTHS AND WEIGHTS ARE APPROXIMATE. ALL PIPING BY SHIPYARD TO BE FIELD FIT TO MEET HOSE. PREINSTALLING PIPING MAY CAUSE HOSE FIT ISSUES.



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | INITIAL RELEASE | 03/03/16 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5*
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES
DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | M.PALMER | DATE 03/03/16 |
| CHECKED | T.WELSH | DATE 08/14/15 |
| APPROVED | T.WELSH | DATE 08/14/15 |
| P.O. NO. | N/A | REQ. NO. |

TRIYARDS H1028/H1029

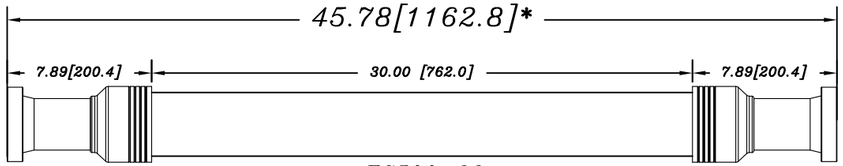
H1029 LIFTBOAT JACKING SYSTEM LEG TREE HOSE DATA

DWG. NO. 4680-2700 | SIZE | REVISION A

SCALE NONE SH. 1 OF 2

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

## A/B HPU LINES




FC500-32

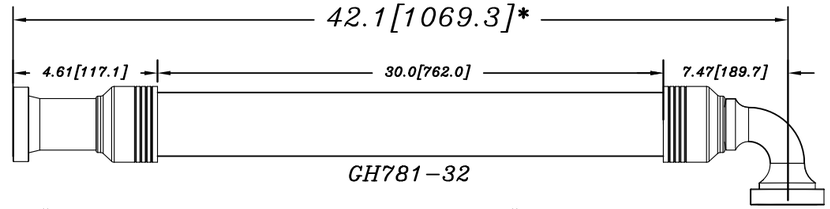
2"Cd 62 Split Flange
1Z32FH32

2"Cd 62 Split Flange
1Z32FH32

(30" EXPOSED RUBBER)

(QUANTITY OF 8 REQUIRED)
MINIMUM BEND RADIUS 18.75" (476MM)
FROM: A/B SHIPBOARD PIPING TO LEG TREES
TO: HPU "A/B" PRESSURE CONNECTION
ASSEMBLY WEIGHT: 24.1LB (10.93KG)

## MOTOR CASE DRAIN TO COOLER/HPU LINES




GH781-32

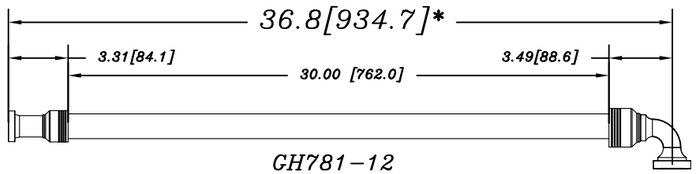
2"Cd 61 Split Flange
1A32FL32

2"Cd 61 Split Flange
1A32FLB32

(30" EXPOSED RUBBER)

(QUANTITY OF 4 REQUIRED)
MINIMUM BEND RADIUS 4.75" (120.7MM)
FROM: CASE DRAIN SHIPBOARD PIPING
TO: HPU "MR" CONNECTION
ASSEMBLY WEIGHT: 22.5LB (10.21KG)*

## BRAKE HPU LINES




GH781-12

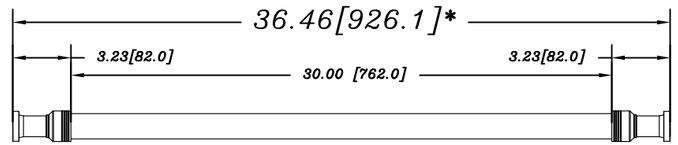
3/4"Cd 61 Split Flange
1A12FL12

3/4"Cd 61 Split Flange
1A12FLB12

(30" EXPOSED RUBBER)

(QUANTITY OF 4 REQUIRED)
MINIMUM BEND RADIUS 4.75" (120.7MM)
FROM: BRAKE SHIPBOARD PIPING
TO: HPU "BR" CONNECTION
ASSEMBLY WEIGHT: 1.7LB (0.77KG)

## VARIABLE MOTOR HPU LINES




GH493-08

1/2"Cd 61 Split Flange
1B8FL8

1/2"Cd 62 Split Flange
1B8FH8

(30" EXPOSED RUBBER)

(QUANTITY OF 4 REQUIRED)
MINIMUM BEND RADIUS 3.5" (90MM)
FROM: VARIABLE MOTOR SHIPBOARD PIPING
TO: HPU "VM" CONNECTION
ASSEMBLY WEIGHT: 1.93LB (0.88KG)

*ALL HOSE LENGTHS ARE APPROXIMATE. ALL PIPING BY SHIPYARD TO BE FIELD FIT TO MEET HOSE. PREINSTALLING PIPING MAY CAUSE HOSE FIT ISSUES.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| C | UPDATED VM HOSE END TO MATCH TO CD62 HPU CONNECTION | 05/17/16 | MJP | TMW |
| B | ADDED PIPING INSTALLATION NOTE – ADDED HOSE WEIGHTS AND DIMENSIONS | 03/03/16 | MJP | TMW |
| A | INITIAL RELEASE | 08/14/15 | DSS | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY D.SHERWOOD | DATE 08/14/15 |
| CHECKED T.WELSH | DATE 08/14/15 |
| APPROVED T.WELSH | DATE 08/14/15 |
| P.O. NO. N/A | REQ. NO. |

TRIYARDS H1028/H1029

H1029 LIFTBOAT JACKING SYSTEM HPU CONNECTION HOSES

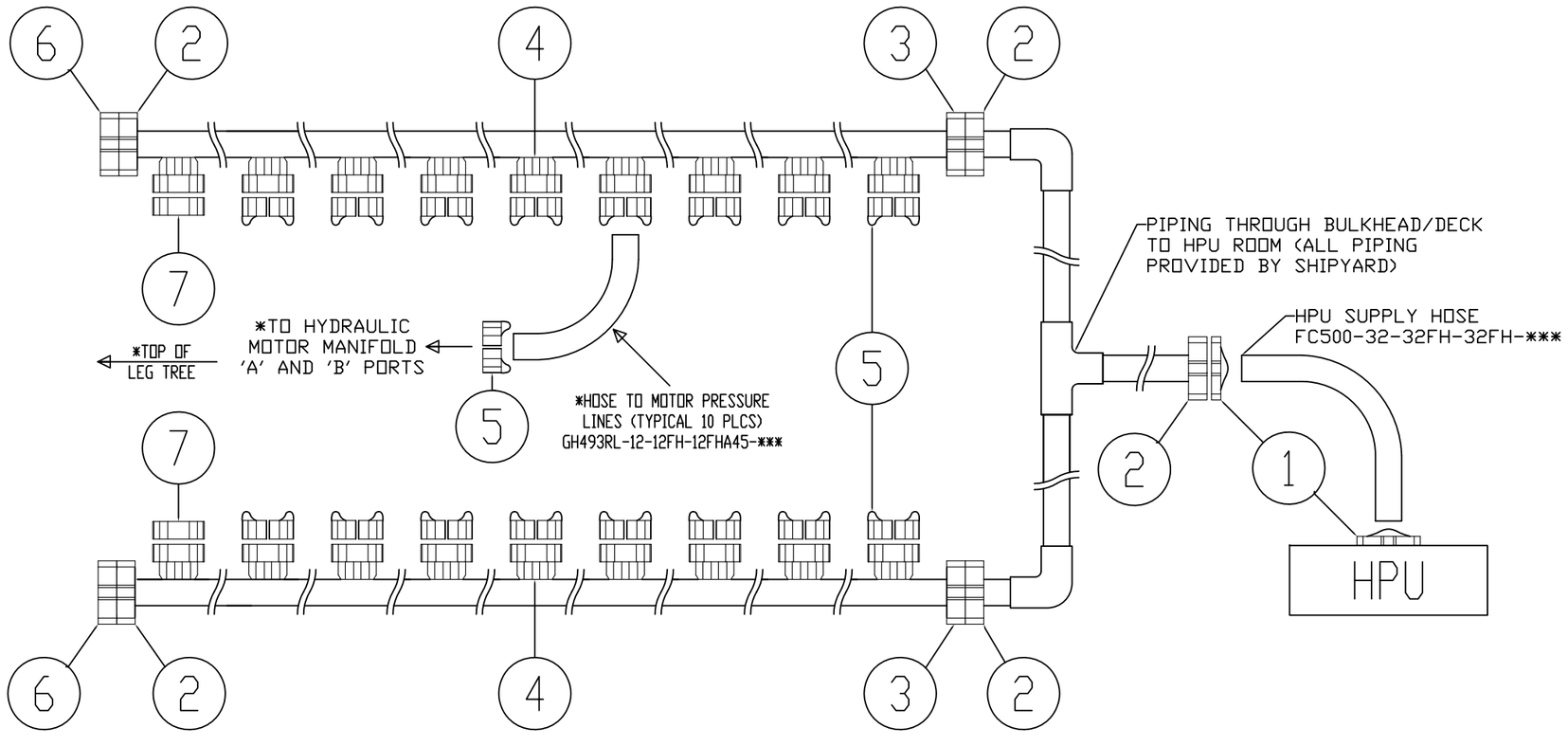
DWG. NO. 4680-2701 | SIZE | REVISION C

SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

# A/B PRESSURE HEADERS

| ITEM | QTY | P/N | DESCRIPTION |
|---|---|---|---|
| 1 | 2 | 32SFX□ | 2" Cd 62 SPLIT FLANGE KIT |
| 2 | 5 | W60-32-32 | 2" Cd 62 SOCKET WELD COMPANION FLANGE |
| 3 | 2 | W59-32-32U | 2" Cd 62 SOCKET WELD O-RING FLANGE |
| 4 | 18 | W107-32-12L | 2" SADDLE BY 3/4" Cd 62 COMPANION FLANGE |
| 5 | 32 | 12SFX□ | 3/4" Cd 62 SPLIT FLANGE KIT |
| 6 | 2 | W38-32-32U | 2" Cd 62 BLANK O-RING FLANGE |
| 7 | 2 | W38-12-12U | 3/4" Cd 62 BLANK O-RING FLANGE |
| P | N/A | 2" SCH 160 A106 GRC | 2" SCH 160 |




NOTES:

(1) 8 SETS REQUIRED PER BOAT (2 PER LEG)

(2) ALL PIPING SHALL BE PICKLED AND FLUSHED BY SHIPYARD TO REMOVE ALL MILL SCALE, WELD SLAG AND ANY FOREIGN PARTICLES PRIOR TO FINAL CLEANING OF THE SYSTEM TO THE LEVEL SPECIFIED PER NAS 1638, CLASS 8.

(3) PIPING MUST BE HYDROSTATICALLY PRESSURE TESTED TO 1.5X THE DESIGN PRESSURE OF THE SYSTEM PSI. TEST TO BE DOCUMENTED AND WITNESSED BY ABS.

(4) NOT TO SCALE.



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | INITIAL RELEASE | 07/07/15 | DSS | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED: X/Y ±1/16; .X ±.1; .XX ±.01; .XXX ±.005; ANGLES ±.5°; 125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY D.SHERWOOD DATE 06/19/15

CHECKED T.WELSH DATE 06/19/15

APPROVED T.WELSH DATE 06/19/15

P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

LIFTBOAT JACKING SYSTEM
LEG TREE PIPING LAYOUT, TYPICAL PER LEG

DWG. NO. 4680-HEADER SIZE REVISION A

SCALE NONE SH. 1 OF 4

Hydraquip
CUSTOM SYSTEMS, INC.
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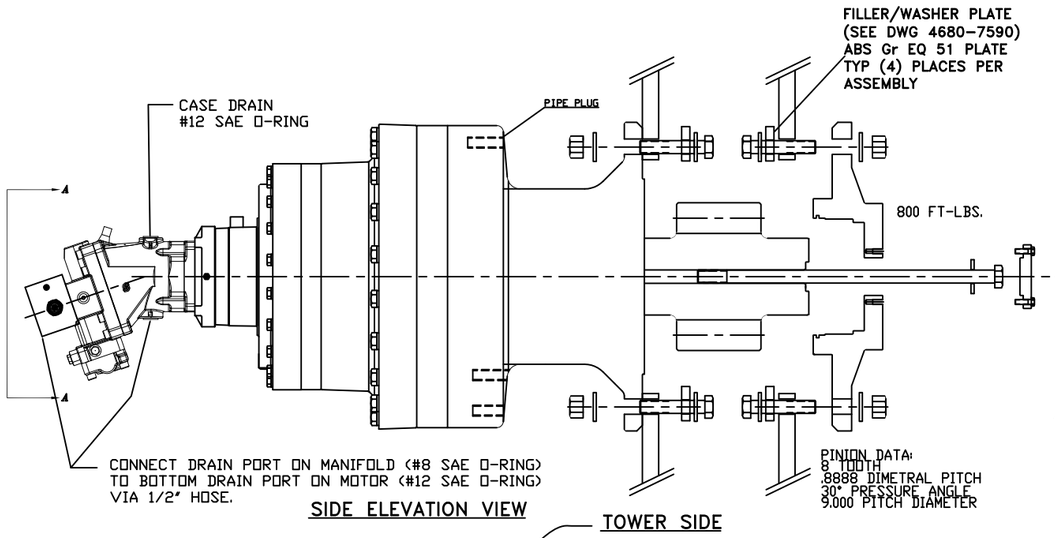
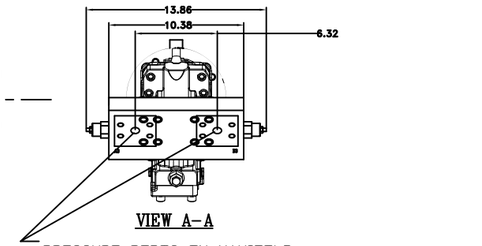
Telephone: (281) 822-5000
Fax: (281) 822-5020

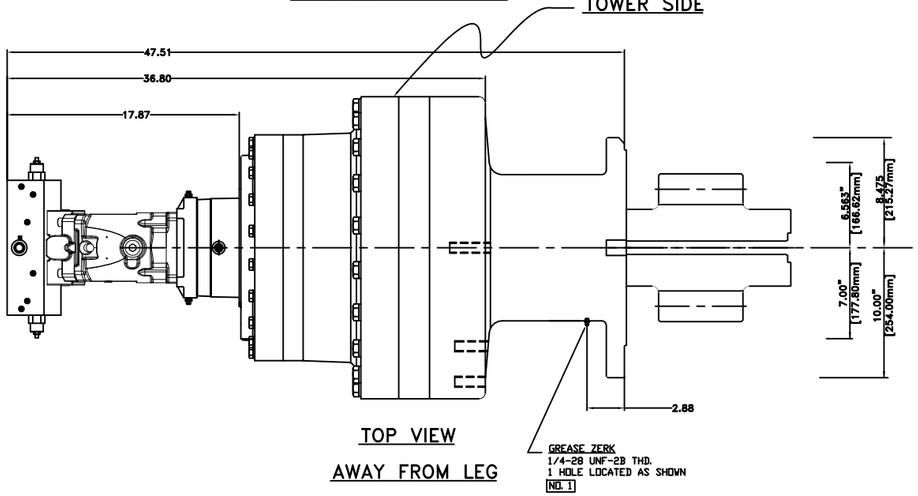



SIDE ELEVATION VIEW



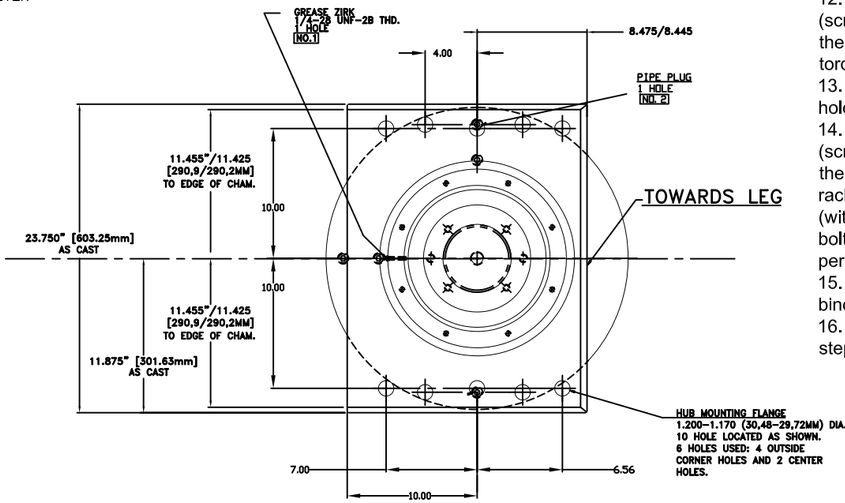

VIEW A-A

PRESSURE PORTS ON MANIFOLD
A & B, 3/4" CODE 62 FLANGE
(NOTE: SWITCH ON OPPOSITE SIDES OF LEG TOWERS)




TOP VIEW

AWAY FROM LEG




SECTION

1. Fill each planetary with gear oil (Shell Spirax HD 85W14 or equivalent) to level even with centerline of pump through fill plug.
2. Pump approximately 1 pint of grease (Shell Alvania EP1 or equivalent) into grease zerks on both the torque tube and the bearing endcap.
3. Install hydraulic motor/S60 gearbox/output pinion subassembly and opposite cover subassembly onto tower with bolts, washers and nuts as specified. Do not tighten bolts at this time.
4. With leg centered in tower, move hydraulic motor/S60 gearbox/output pinion subassembly and opposite cover subassembly into tight mesh (zero backlash) with the rack. Both gearbox and cover subassemblies must be moved together and at the same time, keeping alignment parallel between the pinion and rack. Use special tooling to do this.
5. Back out (withdraw) gearbox/cover subassemblies 0.150 inch from rack.
6. Tighten all mounting bolts to sequentially to 400 foot-pounds, then 600 foot-pounds, and then 800 foot-pounds torque.
7. Scribe or otherwise mark the position of the gearbox and cover housings relative to the tower so that any later movement can be detected. Scribe or mark around the outline of the housings on the surface of the tower.
8. Repeat the above procedure for all gearboxes on all towers.
9. Move the liftboat to a deep water area where the legs can be fully lowered without jacking the boat. This is important, because actually jacking the boat may produce enough torque on the gearboxes without the welded keystock to move them.
10. Engage the hydraulic system and move all legs up and down the full length of the leg and full range of rack/pinion engagement.
11. Check the relative position of the gearbox and cover to the tower. Do this by looking at the scribe/marked lines.
12. If the gearbox/cover subassemblies *have not* moved relative to the tower (scribe/marked lines are in the same position as when they were first marked), then re-check attachment bolt torque and make sure it is still 800 foot pounds torque.
13. Weld keystock to the perimeters of the gearbox and cover on three sides to hold them in place. As a minimum, use 1" A-36 square bar for the keystock.
14. If the gearbox/cover subassemblies *have* moved relative to the tower (scribe/marked lines are in a different position than when they were first marked), then measure the amount of movement of the gearbox/cover away from the rack/tower and record this number. Loosen the mounting bolts and back out (withdraw) the gearbox/cover subassemblies 0.150 inch from the rack. Tighten bolts/nuts to 800 foot-pounds tightening torque and weld keystock to the perimeters of the gearbox and cover.
15. Move leg up and down again and listen/observe operation of legs for signs of binding/tight backlash.
16. After successful movement of all legs without movement of gearboxes, repeat steps 10 and 11.



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | ADDED FILLER/WASHER PLATES FOR GEARBOX AND ENDCAP INSTALLATION. REM'D LOCKWASHERS | 10/24/16 | MJP | TMW |
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY M.PALMER | DATE 02/04/14 |
| CHECKED T.WELSH | DATE 02/04/14 |
| APPROVED T.WELSH | DATE 02/04/14 |
| P.O. NO. N/A | REQ. NO. |

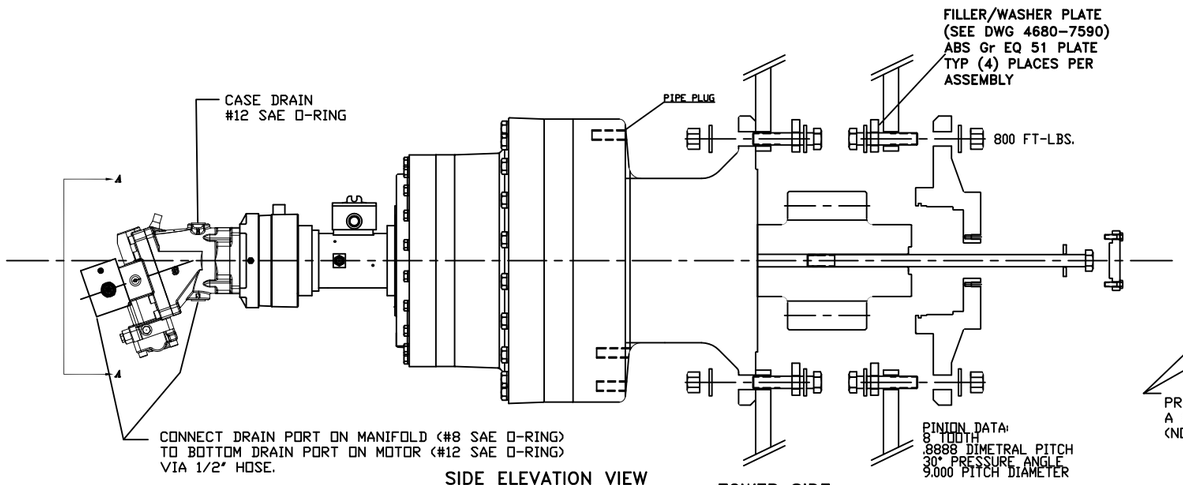
FALCON GLOBAL

PLANETARY GEARBOX, BRAKE, HYDRAULIC MOTOR ASSEMBLY GENERAL LAYOUT

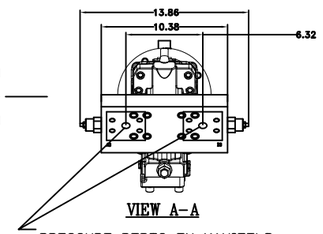
DWG. NO. 4680-7500 SIZE REVISION B

SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

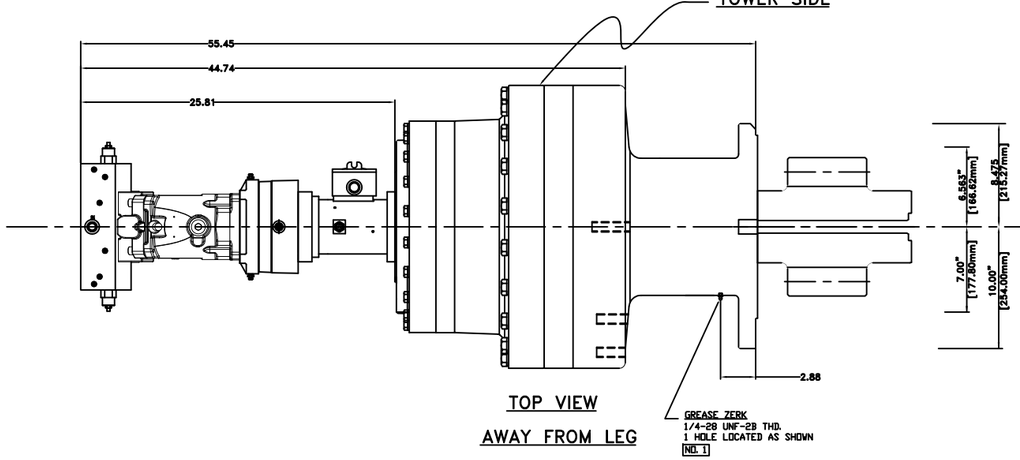



SIDE ELEVATION VIEW



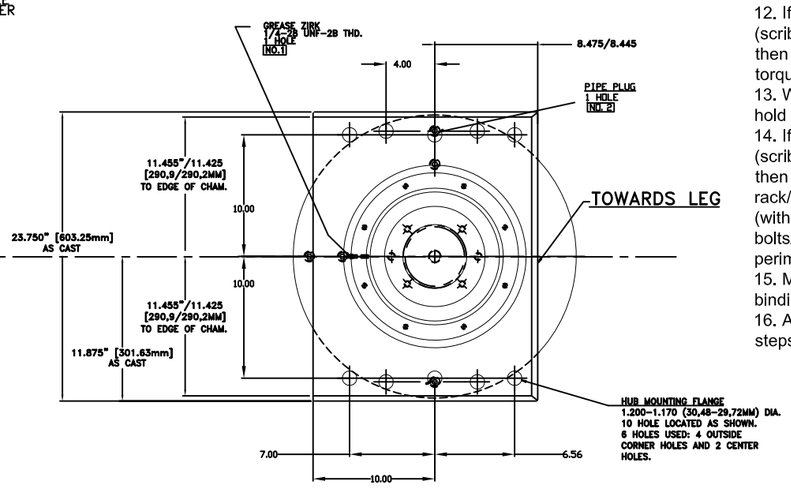

VIEW A-A

PRESSURE PORTS ON MANIFOLD
A & B, 3/4" CODE 62 FLANGE
(NOTE: SWITCH ON OPPOSITE SIDES OF LEG TOWERS)




TOP VIEW

AWAY FROM LEG




SECTION

1. Fill each planetary with gear oil (Shell Spirax HD 85W14 or equivalent) to level even with centerline of pump through fill plug.
2. Pump approximately 1 pint of grease (Shell Alvania EP1 or equivalent) into grease zerks on both the torque tube and the bearing endcap.
3. Install hydraulic motor/S60 gearbox/output pinion subassembly and opposite cover subassembly onto tower with bolts, washers and nuts as specified. Do not tighten bolts at this time.
4. With leg centered in tower, move hydraulic motor/S60 gearbox/output pinion subassembly and opposite cover subassembly into tight mesh (zero backlash) with the rack. Both gearbox and cover subassemblies must be moved together and at the same time, keeping alignment parallel between the pinion and rack. Use special tooling to do this.
5. Back out (withdraw) gearbox/cover subassemblies 0.150 inch from rack.
6. Tighten all mounting bolts to sequentially to 400 foot-pounds, then 600 foot-pounds, and then 800 foot-pounds torque.
7. Scribe or otherwise mark the position of the gearbox and cover housings relative to the tower so that any later movement can be detected. Scribe or mark around the outline of the housings on the surface of the tower.
8. Repeat the above procedure for all gearboxes on all towers.
9. Move the liftboat to a deep water area where the legs can be fully lowered without jacking the boat. This is important, because actually jacking the boat may produce enough torque on the gearboxes without the welded keystock to move them.
10. Engage the hydraulic system and move all legs up and down the full length of the leg and full range of rack/pinion engagement.
11. Check the relative position of the gearbox and cover to the tower. Do this by looking at the scribe/marked lines.
12. If the gearbox/cover subassemblies *have not* moved relative to the tower (scribe/marked lines are in the same position as when they were first marked), then re-check attachment bolt torque and make sure it is still 800 foot pounds torque.
13. Weld keystock to the perimeters of the gearbox and cover on three sides to hold them in place. As a minimum, use 1" A-36 square bar for the keystock.
14. If the gearbox/cover subassemblies *have* moved relative to the tower (scribe/marked lines are in a different position than when they were first marked), then measure the amount of movement of the gearbox/cover away from the rack/tower and record this number. Loosen the mounting bolts and back out (withdraw) the gearbox/cover subassemblies 0.150 inch from the rack. Tighten bolts/nuts to 800 foot-pounds tightening torque and weld keystock to the perimeters of the gearbox and cover.
15. Move leg up and down again and listen/observe operation of legs for signs of binding/tight backlash.
16. After successful movement of all legs without movement of gearboxes, repeat steps 10 and 11.

TWO TORQUE TRANSDUCERS WILL BE MOUNTED PER LEG. INSTALL UNITS ON SECOND GEARBOX UP FROM THE DECK, ONE ON EACH SIDE OF LEG.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| D | ADDED FILLER/WASHER PLATES FOR GEARBOX AND ENDCAP INSTALLATION. REM'D LOCKWASHERS | 10/24/16 | MJP | TMW |
| C | ADDED NOTE ABOUT LOCATION OF TORQUE TRANSDUCER INSTALLATION. | 03/18/16 | MJP | TMW |
| B | UPDATED ORDER OF BRAKE AND TORQUE TRANSDUCER | 01/19/16 | DSS | TMW |
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED: X/Y ±1/16; .X ±.1; .XX ±.01; .XXX ±.005; ANGLES ±.5°; 125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | M.PALMER | DATE 02/04/14 |
| CHECKED | T.WELSH | DATE 02/04/14 |
| APPROVED | T.WELSH | DATE 02/04/14 |
| P.O. NO. | N/A | REQ. NO. |

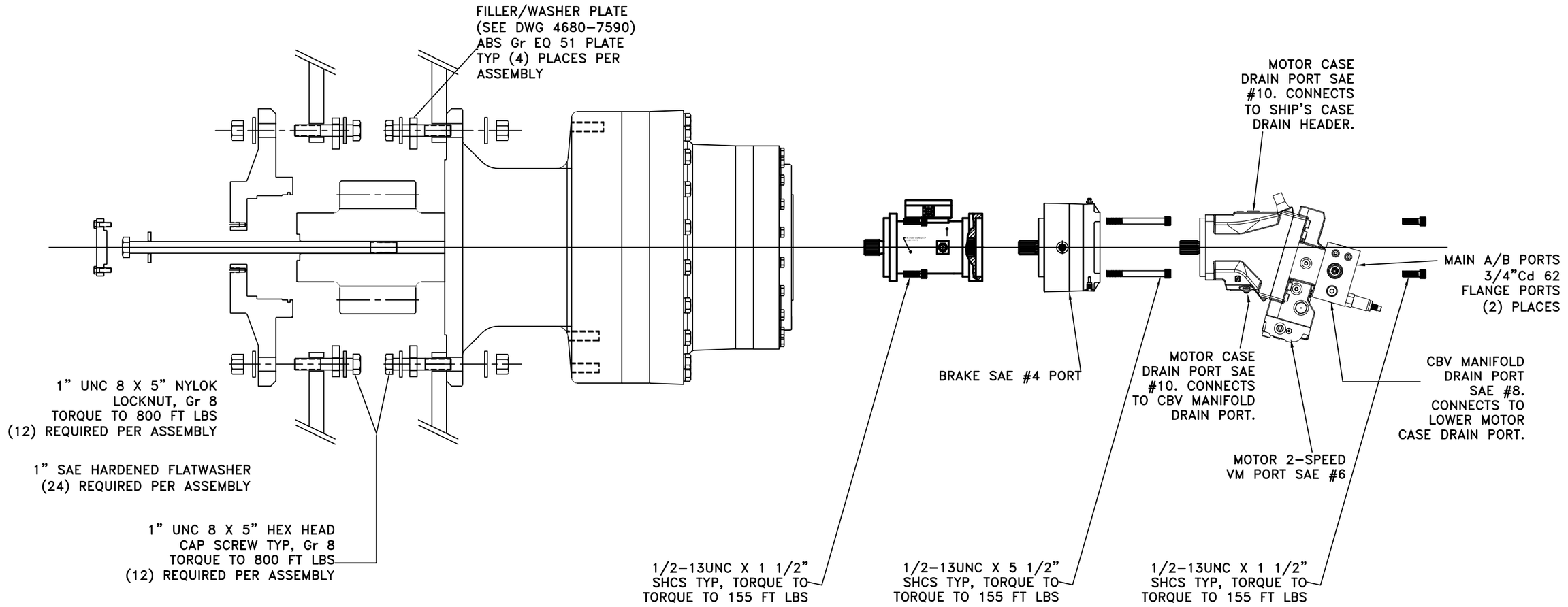
FALCON GLOBAL

PLANETARY GEARBOX, BRAKE, HYDRAULIC MOTOR ASSEMBLY GENERAL LAYOUT W/ TORQUE TRANSDUCER

DWG. NO. 4680-7501 | SIZE | REVISION D

SCALE NONE | SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020




TWO TORQUE TRANSDUCERS WILL BE MOUNTED PER LEG. INSTALL UNITS ON SECOND GEARBOX UP FROM THE DECK, ONE ON EACH SIDE OF LEG.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| E | ADDED FILLER/WASHER PLATES FOR GEARBOX AND ENDCAP INSTALLATION. REM'D LOCKWASHERS | 10/24/16 | MJP | TMW |
| D | ADDED NOTE ABOUT LOCATION OF TORQUE TRANSDUCER INSTALLATION. | 03/18/16 | MJP | TMW |
| C | REPLACED GEARBOX TO REFLECT EQUIPMENT PROVIDED | 01/19/16 | MJP | TMW |
| B | MODIFIED NOTES TO INCLUDE BOLTS PER ASSY AND BOLT TORQUE – ADDED FILLER PLATES | 05/01/15 | MJP | TMW |
| A | NEW RELEASE | 10/03/14 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY M.PALMER DATE 10/03/14
CHECKED T.WELSH DATE 10/03/14
APPROVED T.WELSH DATE 10/03/14
P.O. NO. N/A REQ. NO.

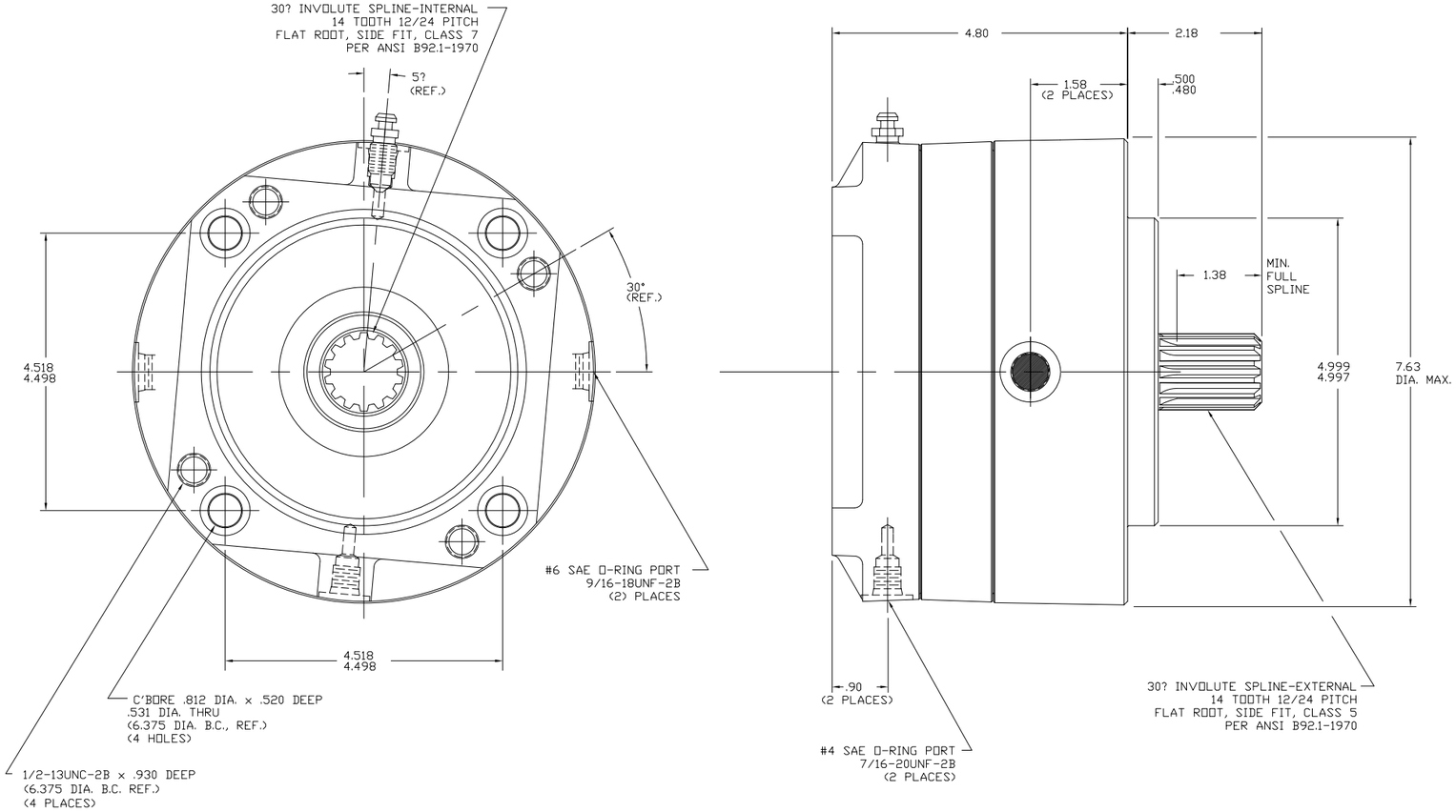
MONTCO OFFSHORE

LIFTBOAT PLANETARY GEARBOX, BRAKE, TORQUE TRANSDUCER, HYDRAULIC MOTOR ASSEMBLY VIEW

DWG. NO. 4680–7502 SIZE E REVISION
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822–5000
Fax: (281) 822–5020

| DRAWING NUMBER |
|---|
| 13-547-508 |
| NPI OR ECN NO |
| NPR 000010 |




## NOTES:

1.) LINING REPAIR KIT P/N 12-501-004

2.) BEARING REPAIR KIT P/N 12-501-006

3.) O-RING REPAIR KIT P/N 12-501-002

4.) SPRING REPAIR KIT P/N 12-501-008

## SPECIFICATIONS:

| | |
|---|---|
| TYPE: | WET MULTIPLE DISC BRAKE, SPRING APPLY, HYDRAULIC RELEASE |
| TORQUE RATING: | WET 4,600 LB-IN STATIC (BREAKAWAY) AT 0 PSI BACK PRESSURE<br>DRY 7,000 LB-IN DRY TORQUE FOR BRAKE RATING & SPECIFICATIONS ONLY |
| RELEASE PRESSURE: | 160 PSI INITIAL, 210 PSI FULL |
| MAXIMUM OPERATING PRESSURE: | 3,000 PSI |
| MAXIMUM SPEED: | 3,900 RPM |
| LINING MATERIAL: | SINTERED BRONZE |
| APPROXIMATE WEIGHT: | 40 LBS. |

### COOLING OIL RECOMMENDATIONS:

OIL TYPE: MINERAL BASE HYDRAULIC OIL SUCH AS MOBIL DTE 24, CITGO A/W 32 OR EQUIVALENT
FLOW THRU CAPACITY: 1.0 - 7.0 GPM
MAXIMUM CASE PRESSURE: 15 PSI
SUMP OIL VOLUME:
HORIZONTAL: 4 FL.OZ.
VERTICAL: CONTACT FACTORY

MICO®
North Mankato, Minnesota USA



| SCALE | TITLE | | | |
|---|---|---|---|---|
| 1:2 | MULTIPLE DISC BRAKE | | | |
| DWN GAA 9-8-03 | APVD PROD ENGRG | SIZE | DRAWING NUMBER | REV |
| | | B | 13-547-508 | A |



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED BRAKE SCALE | 01/19/16 | DSS | TMW |
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY M.PALMER DATE 02/04/14
CHECKED T.WELSH DATE 02/04/14
APPROVED T.WELSH DATE 02/04/14
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

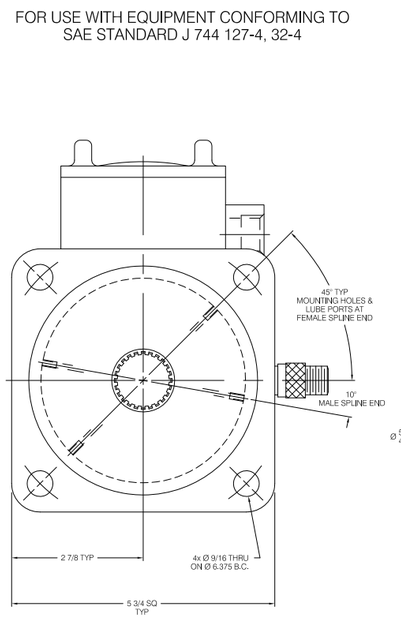
JACKING SYSTEM STATIC BRAKE

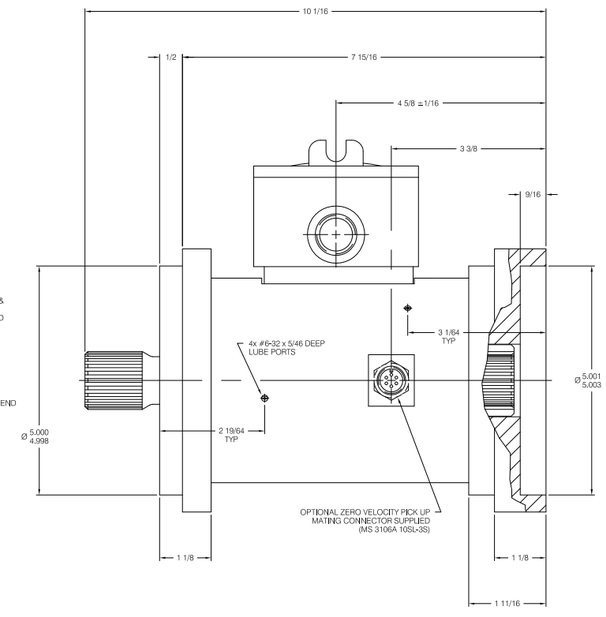
DWG. NO. 4680-7510 SIZE B REVISION B
SCALE NONE SH. 1 OF 1

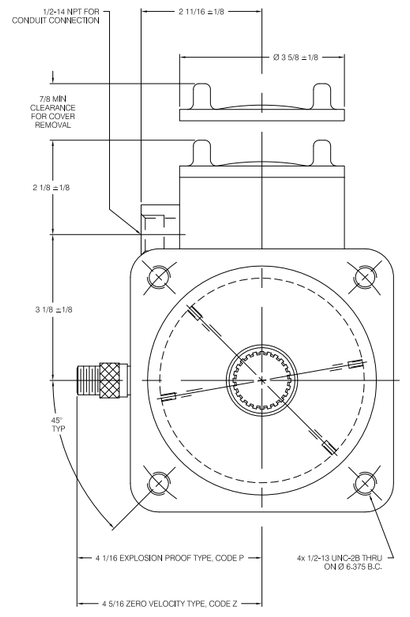
Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

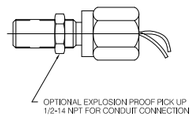
| REVISIONS | | | |
|---|---|---|---|
| SYM | DESCRIPTION | DATE | APPR |

FOR USE WITH EQUIPMENT CONFORMING TO
SAE STANDARD J 744 127-4, 32-4




EXTERNAL & INTERNAL SPLINE DATA
12/24 DIAMETRAL PITCH
14 TEETH
30° PRESSURE ANGLE

PLOTTED: 03/13/2015 @01:30, END REF ONLY: 48794.DWG,GBD525

| | | | |
|---|---|---|---|
| DEBURR & BREAK SHARP EDGES | ORIGINAL DATE OF DRAWING | S. HIMMELSTEIN & CO. | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES | DRAWN Gerald Bailey 03/13/2015 | OUTLINE 39569X | |
| TOLERANCES ON FRACTIONS / DECIMALS / ANGLES | CHECKED Allen J. Jacks 03/13/2015 | SIZE D | 224-8794 |
| SURFACE FINISH 7 | ENGINEER DATE | SCALE 1:1 | SHEET 1 OF 1 REV |
| MATERIAL: | | | |
| HEAT TREAT: | | | |
| FINISH: | | | |

TWO UNITS SUPPLIED PER LEG SHIPPED LOOSE FOR INSTALLATION BETWEEN PLANETARY GEARBOX AND STATIC BRAKE. INSTALL UNITS ON SECOND GEARBOX UP FROM THE DECK, ONE ON EACH SIDE OF LEG.



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | ADDED NOTE ABOUT LOCATION OF TORQUE TRANSDUCER INSTALLATION. | 03/18/16 | MJP | TMW |
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

REVISIONS

| TOLERANCE UNLESS OTHERWISE SPECIFIED | | SURFACE TREATMENT | DO NOT SCALE DRAWING | |
|---|---|---|---|---|
| X/Y ±1/16 | | | DRAWN BY M.PALMER | DATE 02/04/14 |
| .X ±.1 | ANGLES ±.5° | MATERIAL & HEAT TREAT | CHECKED T.WELSH | DATE 02/04/14 |
| .XX ±.01 | 125 √ ON ALL MACHINED SURFACES | | APPROVED T.WELSH | DATE 02/04/14 |
| .XXX ±.005 | | SUPERSEDES DATE | P.O. NO. N/A | REQ. NO. |

TRIYARDS H1028/H1029

TORQUE TRANSDUCER

DWG. NO. 4680-7511 | SIZE B | REVISION

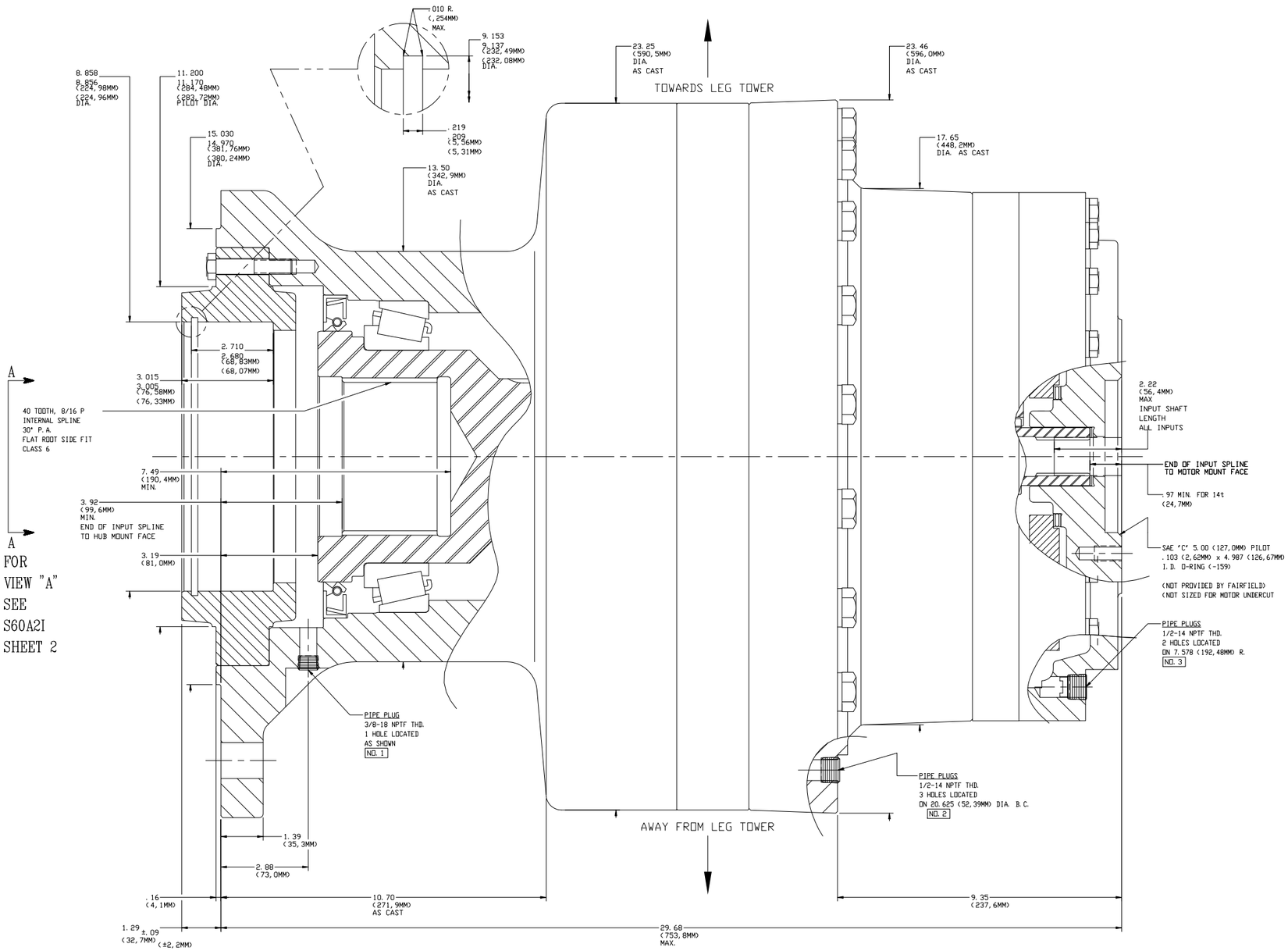
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| RATIO | INPUT SPLINES | LUBRICATION |
|---|---|---|
| 374 - 374.001<br>430 - 430.251 | 14 T 12/24 DP 30° PA<br>INVOLUTE SPLINE PER ANSI B92.1-1970 | ON MOST HORIZONTAL APPLICATIONS<br>(AS SHOWN) FILL HALF FULL WITH<br>90 WEIGHT GEAR OIL WITH EP ADDITIVES. |

NOTE:

1. SCALE: 1=1 UNLESS OTHERWISE SPECIFIED
2. SEE YOUR TORQUE-HUB REPRESENTATIVE FOR:
   A. HORSEPOWER AND SPEED CAPABILITIES.
   B. EXACT MODEL FORMULA
   C. LUBRICATION, OIL LEVEL AND TYPE MAY VARY WITH SPECIFIC APPLICATIONS.




| LTR | ZONE | REVISION | ECN | DATE |
|---|---|---|---|---|
| A | --- | SEE SHT 2 FOR CHGS. | 001211 | 09-19-02 |

DRAWN: GICK 01-28-98
CHECKED: DLB 03-11-98
DJ: ---
DB: S60A2I
LIB: INSTAL2

TORQUE-HUB ®

INSTALLATION

S60A2I SHEET 1



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | M.PALMER | DATE 02/04/14 |
| CHECKED | T.WELSH | DATE 02/04/14 |
| APPROVED | T.WELSH | DATE 02/04/14 |
| P.O. NO. | N/A | REQ. NO. |

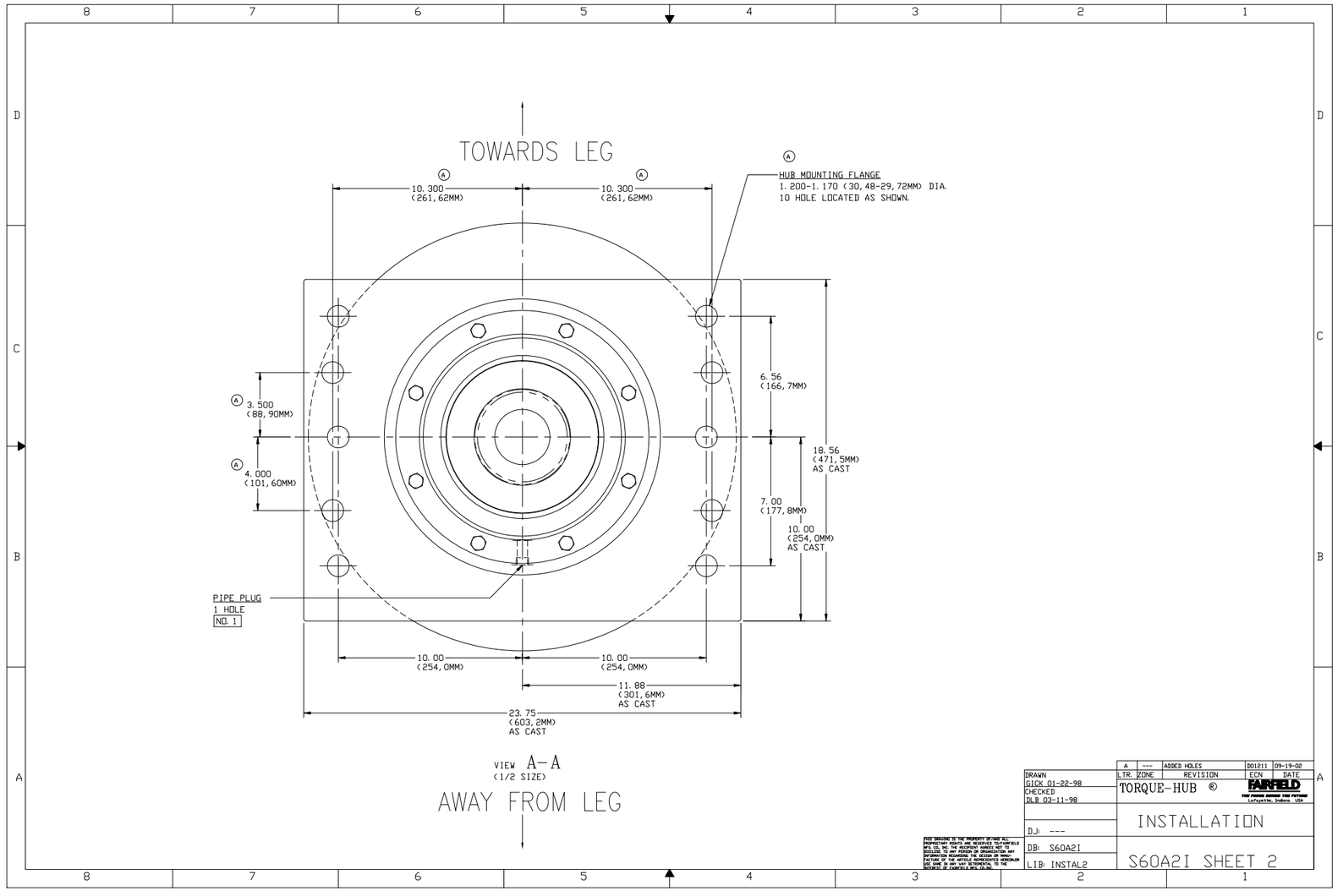
TRIYARDS H1028/H1029

PLANETARY GEARBOX INSTALLATION DIMENSIONS

DWG. NO. 4680-7520 SIZE A REVISION

SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020




| LTR | ZONE | REVISION | ECN | DATE |
|---|---|---|---|---|
| A | --- | ADDED HOLES | D01211 | 09-19-02 |

DRAWN GICK 01-22-98
CHECKED DLB 03-11-98
DJ: ---
DB: S60A2I
LIB: INSTAL2

TORQUE-HUB ®

INSTALLATION

S60A2I SHEET 2



THIS DRAWING IS THE PROPERTY OF HYDRAQUIP CUSTOM SYSTEMS, INC. AND IS CONSIDERED CONFIDENTIAL INFORMATION. THE DRAWING AND DESIGN ARE BASED ON SPECIFICATIONS AND OTHER DATA FURNISHED BY THE BUYER. SELLER SHALL NOT BE RESPONSIBLE FOR ANY DAMAGE CLAIMED BY BUYER AS A RESULT OF ALLEGED ERRORS OR OMISSIONS IN THE SPECIFICATIONS OR FURNISHED DATA. IT IS THE RESPONSIBILITY OF THE BUYER TO PROVIDE ALL SAFETY DEVICES AS DEEMED NECESSARY AND/OR REQUIRED BY LAW.

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY M.PALMER DATE 02/04/14
CHECKED T.WELSH DATE 02/04/14
APPROVED T.WELSH DATE 02/04/14
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

PLANETARY GEARBOX MOUNTING DIMENSIONS

DWG. NO. 4680-7530 SIZE REVISION A

SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
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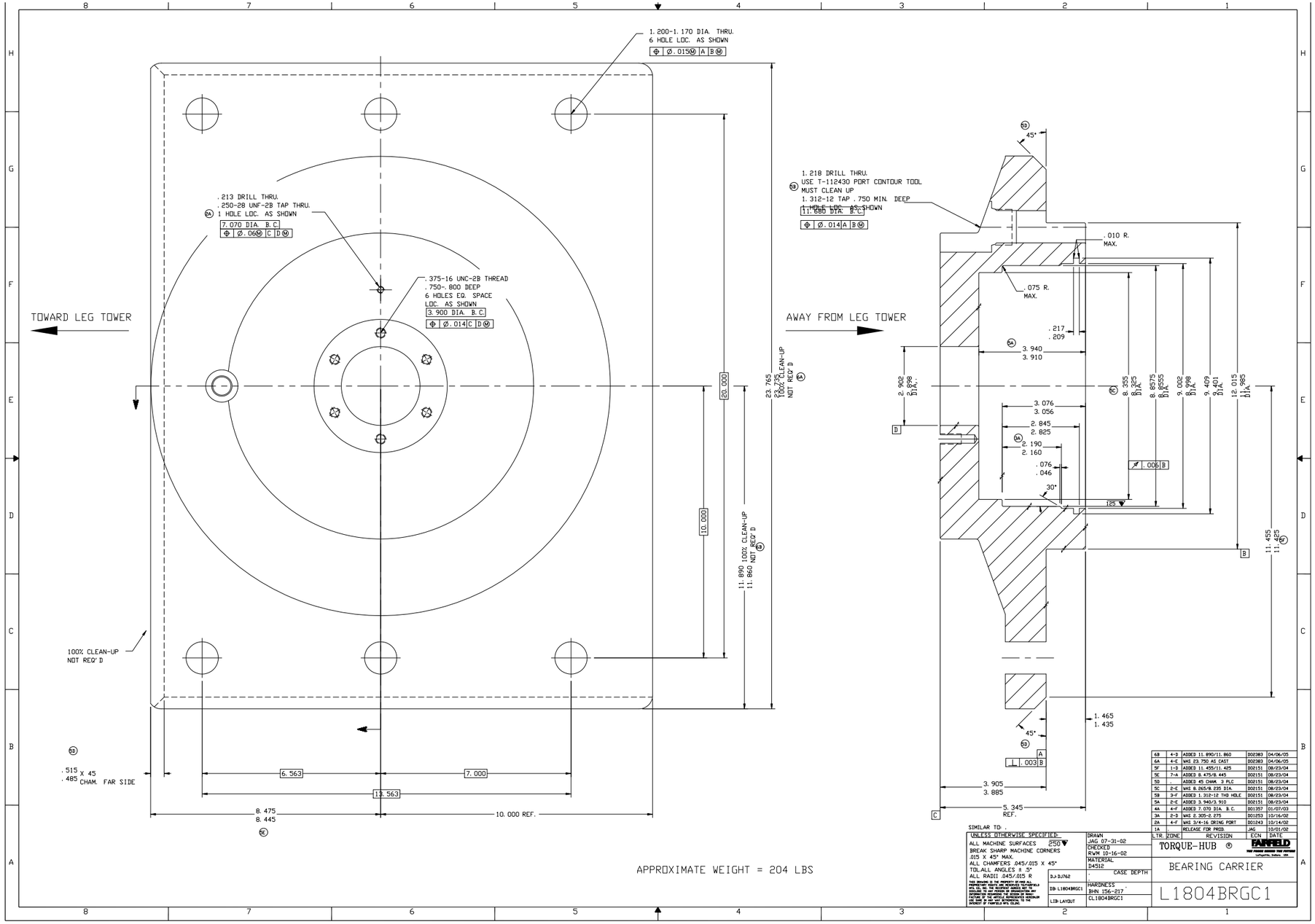



| LTR | ZONE | REVISION | ECN | DATE |
|---|---|---|---|---|
| 6B | 4-3 | ADDED 11.890/11.860 | D02383 | 04/06/05 |
| 6A | 4-E | WAS 23.750 AS CAST | D02383 | 04/06/05 |
| 5F | 1-3 | ADDED 11.455/11.425 | D02151 | 08/23/04 |
| 5E | 7-A | ADDED 8.475/8.445 | D02151 | 08/23/04 |
| 5D | - | ADDED 45 CHAM. 3 PLC | D02151 | 08/23/04 |
| 5C | 2-E | WAS 8.265/8.235 DIA. | D02151 | 08/23/04 |
| 5B | 3-F | ADDED 1.312-12 THD HOLE | D02151 | 08/23/04 |
| 5A | 2-E | ADDED 3.940/3.910 | D02151 | 08/23/04 |
| 4A | 4-F | ADDED 7.070 DIA. B.C. | D01357 | 01/07/03 |
| 3A | 2-3 | WAS 2.305-2.275 | D01253 | 10/16/02 |
| 2A | 4-F | WAS 3/4-16 ORING PORT | D01243 | 10/14/02 |
| 1A | - | RELEASE FOR PROD. | JAG | 10/01/02 |

UNLESS OTHERWISE SPECIFIED:
ALL MACHINE SURFACES 250
BREAK SHARP MACHINE CORNERS
.015 X 45° MAX.
ALL CHAMFERS .045/.015 X 45°
TOL:ALL ANGLES ± .5°
ALL RADII .045/.015 R



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY M.PALMER DATE 02/04/14
CHECKED T.WELSH DATE 02/04/14
APPROVED T.WELSH DATE 02/04/14
P.O. NO. N/A REQ. NO.

DRAWN JAG 07-31-02
CHECKED RWM 10-16-02
MATERIAL D4512
CASE DEPTH
DJ-DJ762
DB-L1804BRGC1
HARDNESS BHN 156-217
LIB LAYOUT CL1804BRGC1

TRIYARDS H1028/H1029

PLANETARY GEARBOX
BEARING CARRIER

TORQUE-HUB ®
BEARING CARRIER
L1804BRGC1

DWG. NO. 4680-7550 SIZE A REVISION A
SCALE NONE SH. 1 OF 1

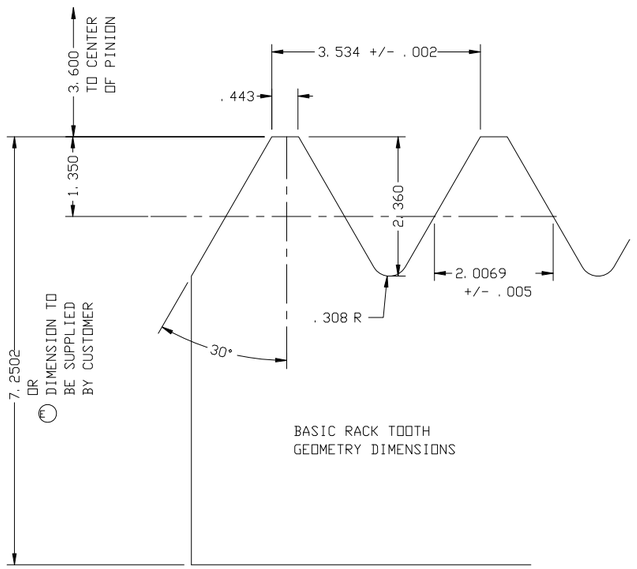
Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

(C) BASIC RACK TOOTH
GEOMETERY DIMENSIONS:

MAXIMUM OUT OF STRAIGHTNESS:
IN 120 IN 0.100
IN 240 IN 0.175
IN 360 IN 0.250

MAXIMUM PITCH ERROR
IN 120 IN 0.100
IN 240 IN 0.200
IN 360 IN 0.250

FACE WIDTH +0.125
-0.000




BASIC RACK TOOTH
GEOMETRY DIMENSIONS

(B) APPROVED FOR PRODUCTION

BY RICK MILLER

NOTE:

MATERIAL: ASTM A514 THROUGH HARDENED STEEL

YIELD STRENGTH = 90,000 PSI

(D)

SHEET 1 OF 2

SIMILAR TO: .

UNLESS SPECIFIED: ALL DIAMETERS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN INCHES
GD&T PER ANSI Y14.5.1M - 1994
ALL MACHINED SURFACES 250 RMS
ALL RADII .045/.015 R
TOL:ALL ANGLES ± .5°

ALL CHAMFERS .045/.015 X 45°
NO BURRS OR SHARP EDGES
BREAK .020 R OR .020 X 45° MAX

REFER TO PURCHASE ORDER FOR MATERIAL SPECIFICATIONS AND OPTIONAL MATERIAL GRADES. IF THE PURCHASE ORDER CONFLICTS WITH THE PART PRINT OR FAIRFIELD SPECIFICATIONS THEN THE PURCHASE ORDER PREVAILS.



DJ: 762
DB: L1804RACK
LIB: LAYOUT

DRAWN JAG 08/01/02
CHECKED .
MATERIAL SEE NOTE
. CASE DEPTH .
HARDNESS SEE NOTE .

| LTR. | ZONE | REVISION | ECN | DATE |
|---|---|---|---|---|
| E | | ADDED NOTES 4 PLACES | JAG | 01/24/08 |
| D | 4-A | REMOVED BHN = 255 | D02248 | 11/18/04 |
| C | | REVISED ADDED SHEET 2 | JAG | 01-06-03 |
| B | | REVISED ADDED APPROVAL | JAG | 01-02-03 |
| A | | REVISED | STD | 09-23-02 |

FAIRFIELD MFG. CO. INC.
U.S. 52 SOUTH
P.O. BOX 7940
LAFAYETTE, INDIANA 47903 USA
www.fairfieldmfg.com

FAIRFIELD DESIGN ENGINEERING

LIFT BOAT RACK

L1804RACK

THIS PRINT FOR DESIGN, TOOLING, ROUTING, AND VENDOR USE ONLY. DO NOT USE FOR IN-HOUSE MANUFACTURING.



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/14 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

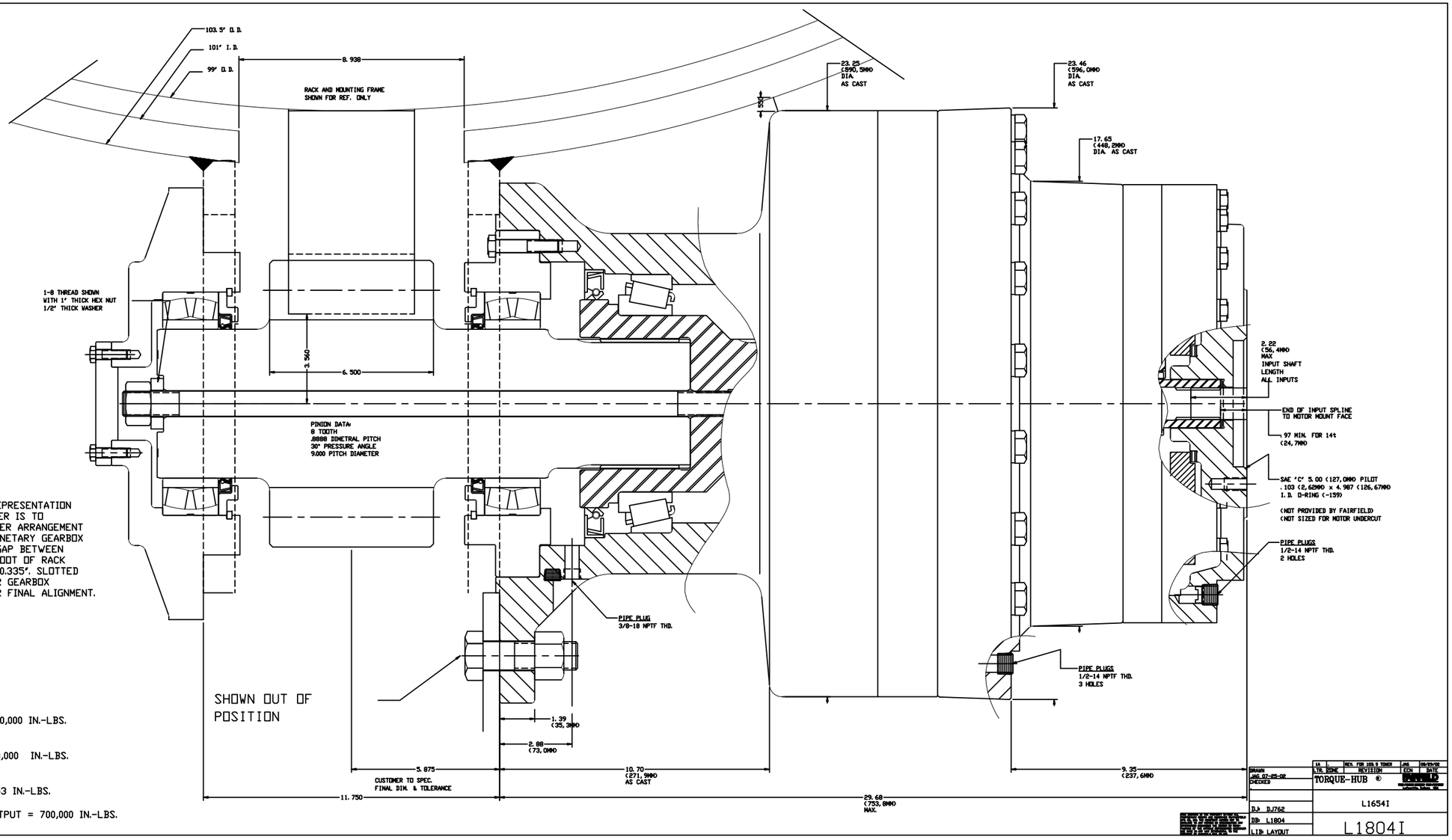
DRAWN BY M.PALMER DATE 02/04/14
CHECKED T.WELSH DATE 02/04/14
APPROVED T.WELSH DATE 02/04/14
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

LIFTBOAT JACKING SUGGESTED RACK PROFILE

DWG. NO. 4680-7560-1 SIZE REVISION A
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020




THIS DRAWING IS A GENERIC REPRESENTATION OF A "TYPICAL" TOWER. DESIGNER IS TO ADJUST FOR SPECIFIC LEG TOWER ARRANGEMENT AND LEG RACK DIMENSIONS. PLANETARY GEARBOX MUST BE LOCATED SUCH THAT GAP BETWEEN CROWN OF PINION TOOTH AND ROOT OF RACK TOOTH IS BETWEEN 0.290" AND 0.335". SLOTTED HOLES SHALL BE PROVIDED FOR GEARBOX MOUNTING BOLTS TO ALLOW FOR FINAL ALIGNMENT.

RATING FOR S60 GEAR BOX

1.) 80% OF YIELD RATING = 1,000,000 IN.-LBS.
(STORM HOLDING)

2.) 60% OF YIELD RATING = 800,000 IN.-LBS.
(MAX STATIC HOLDING)

3.) ENDURANCE RATING = 571,953 IN.-LBS.

4.) 200 HOUR RATING 3 RPM OUTPUT = 700,000 IN.-LBS.

| | | | | |
|---|---|---|---|---|
| 1A | REV. FOR LEG B TOWER | JNS | 09/29/05 | |
| LTR. ZONE | REVISION | ECN | DATE | |
| DRAWN: JNS 07-25-02 | TORQUE-HUB © | | | |
| CHECKED: | | | | |
| D.J: DJ762 | L1654I | | | |
| DB: L1804 | L1804I | | | |
| LIB LAYOUT | | | | |



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | ADDED LOCATION NOTES | 08/31/10 | TMW | TMW |
| A | INITIAL RELEASE | 06/14/10 | TMW | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED: .X ±.1; .XX ±.01; .XXX ±.001; ANGLES ±.5°

125 √ ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY: T.WELSH | DATE: 05/14/10 |
| CHECKED: T.WELSH | DATE: 05/14/10 |
| APPROVED: T.WELSH | DATE: 05/14/10 |
| P.O. NO.: N/A | |

TRIYARDS H1028/H1029

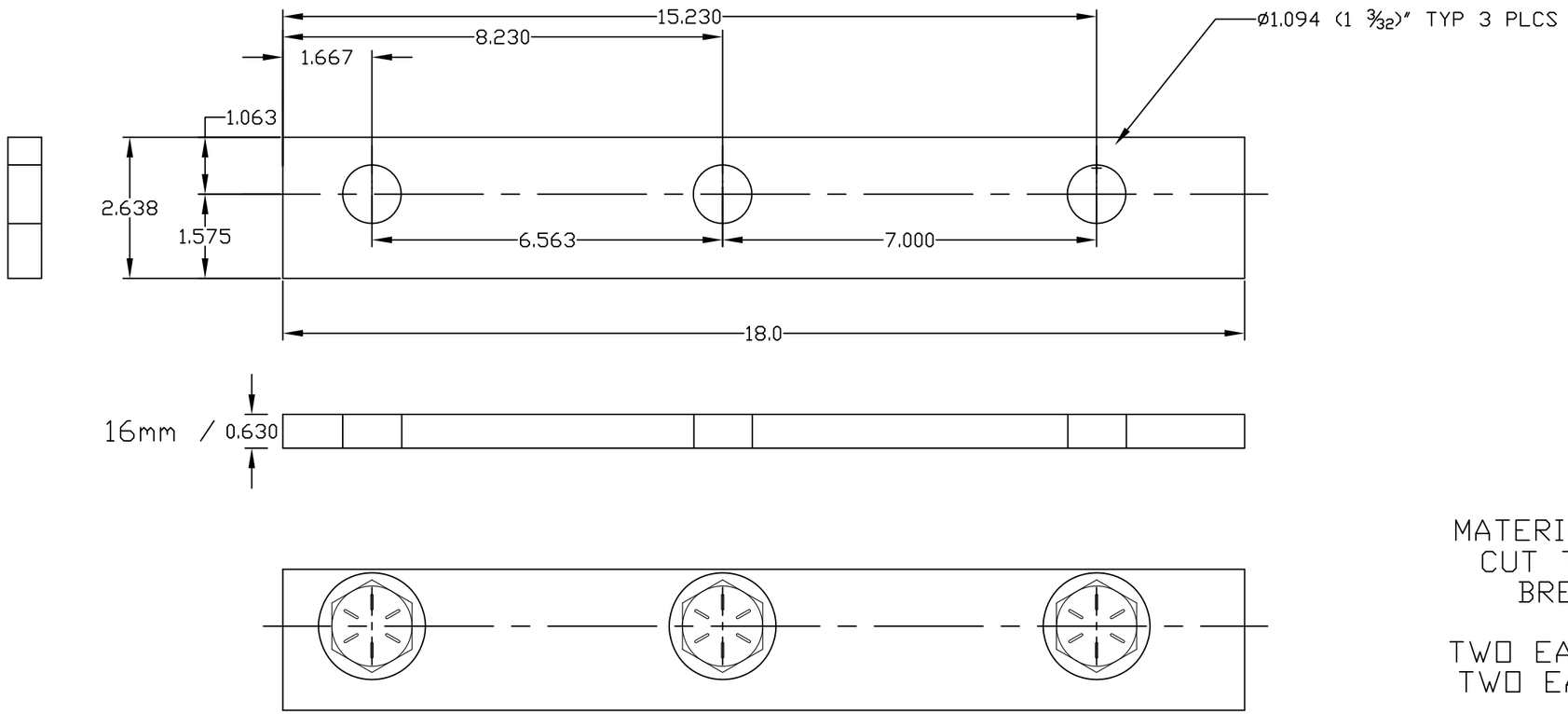
PLANETARY GEARBOX
TYPICAL TOWER
INSTALLATION

DWG. NO. 4680-7580 | SIZE B | REVISION

SCALE NONE | SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
—MARINE DIVISION—
190 JAMES DRIVE EAST, SUITE 120
ST. ROSE, LOUISIANA 70087
Telephone: (281) 822-5000
Fax: (504) 471-0369

## WASHER PLATE TYP




MATERIAL ABS EQ 51 FLATBAR
CUT TO DIMENSIONS SHOWN
BREAK ALL EDGES AND
SHARP CORNERS
TWO EACH REQ'D PER GEARBOX
TWO EACH REQ'D PER ENDCAP



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| F | CHANGED WASHER PLATE THICKNESS TO 16mm. REMOVED BEVEL. CHANGED OVERALL | 10/12/16 | TMW | TMW |
| | DIMENSIONS AS PER CUSTOMER REQUEST. | | | |
| C | CHANGED WASHER PLATE THICKNESS TO 10mm | 08/12/16 | TMW | TMW |
| B | TRIMMED BAR FOR WELD CLEARANCE, ADDED BEVEL. ADDED UPPER AND LOWER VERSIONS. | 08/10/16 | TMW | TMW |
| A | NEW RELEASE | 08/09/16 | TMW | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | T.WELSH | DATE 08/09/16 |
| CHECKED | T.WELSH | DATE 08/09/16 |
| APPROVED | T.WELSH | DATE 08/09/16 |
| P.O. NO. | N/A | REQ. NO. |

FALCON GLOBAL

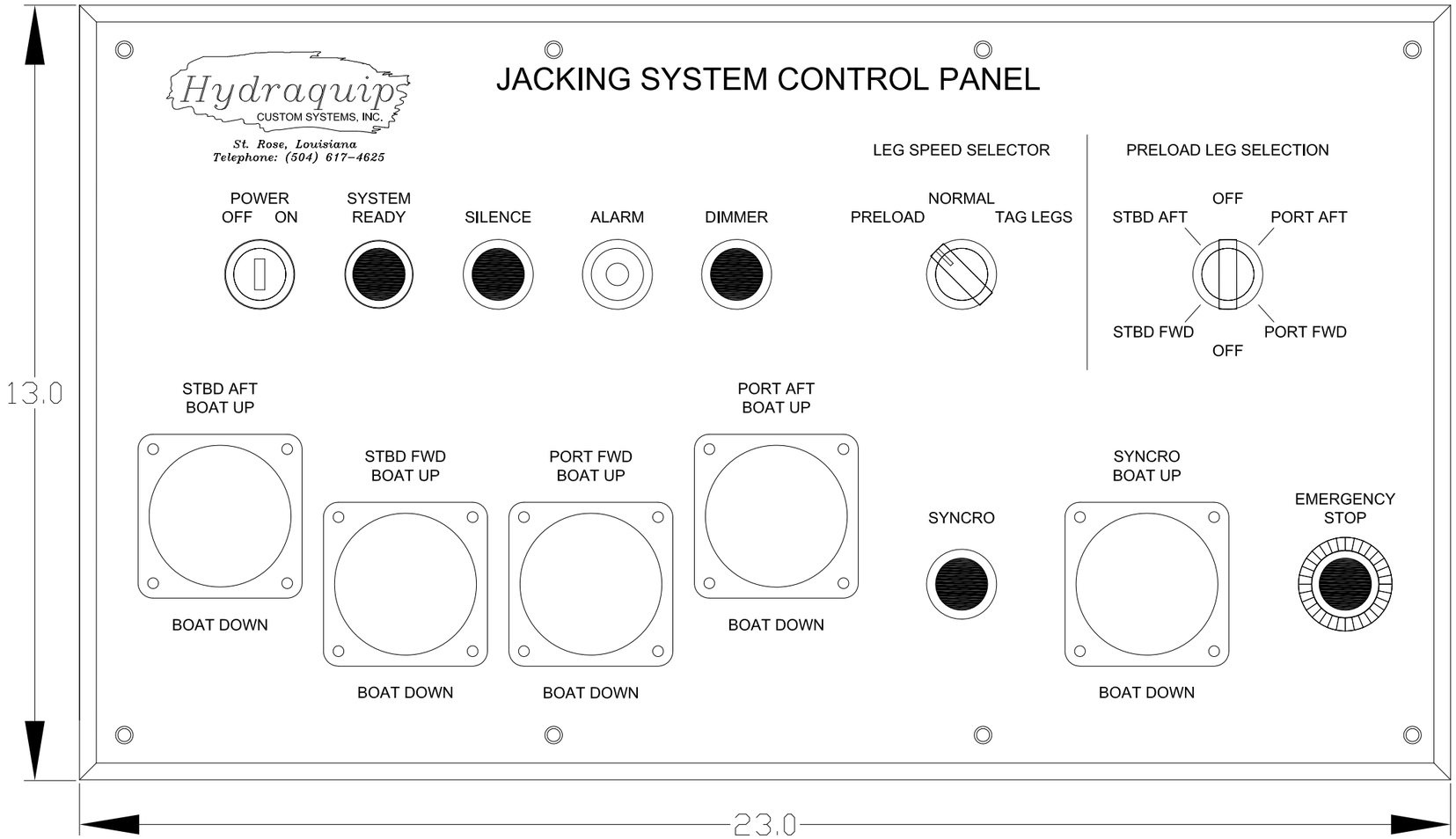
PLANETARY GEARBOX AND BEARING ENDCAP WASHER PLACTE

DWG. NO. 4680-7590 SIZE - REVISION F
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

# JACKING SYSTEM CONTROL PANEL

Hydraquip
CUSTOM SYSTEMS, INC.
St. Rose, Louisiana
Telephone: (504) 617-4625




SHIPPED LOOSE, MOUNTED
AND WIRED BY SHIPYARD.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | CHANGED SIZE, LAYOUT, AND LABELING TO MATCH ORIENTATION OF VESSEL | 06/23/15 | AN | TMW |
| A | NEW RELEASE | 04/30/15 | AN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | A.NADEAU | DATE 04/30/15 |
| CHECKED | T.WELSH | DATE 04/30/15 |
| APPROVED | T.WELSH | DATE 04/30/15 |
| P.O. NO. | N/A | REQ. NO. |

TRIYARDS H1028/H1029

BRIDGE JACKING CONTROL PANEL

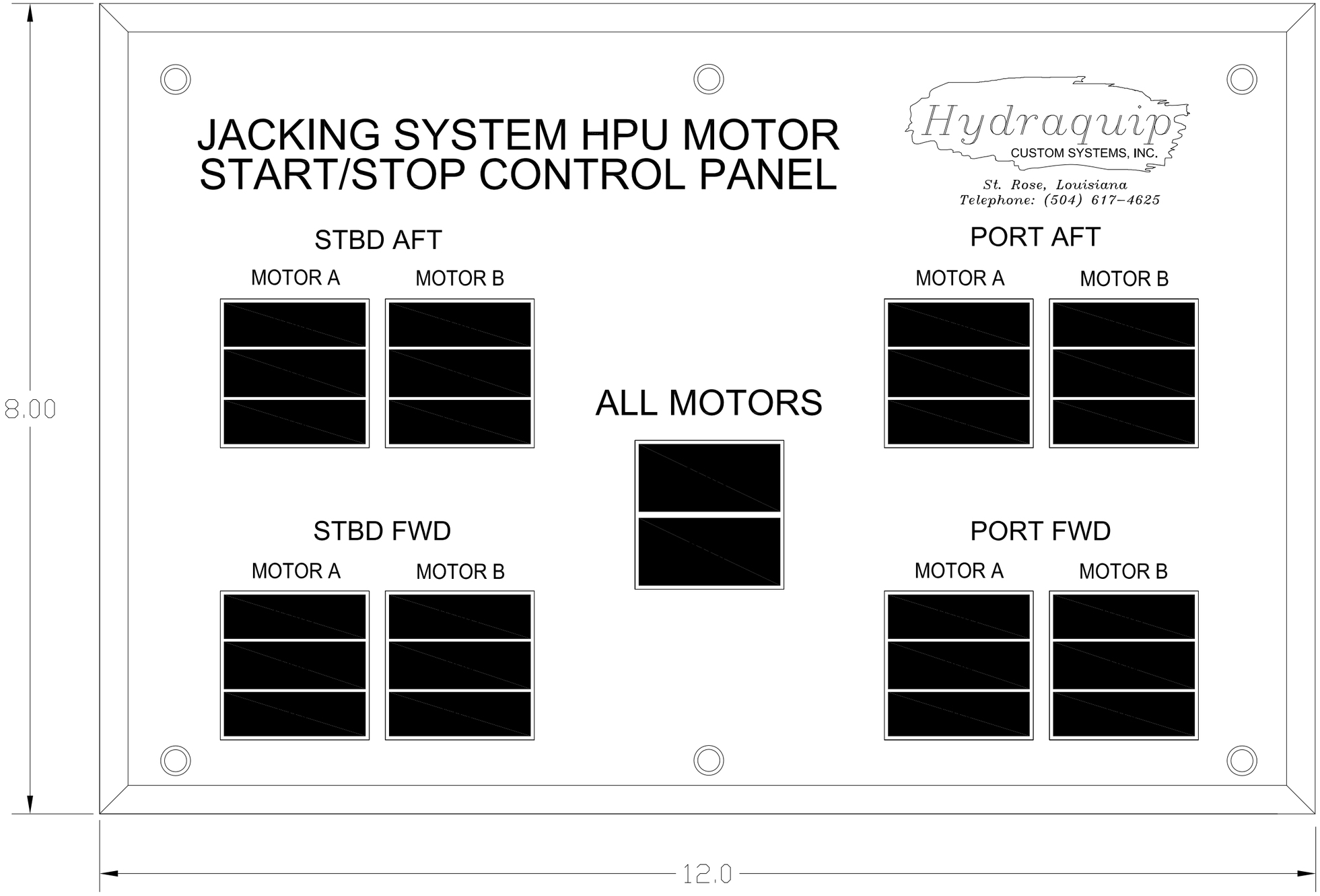
DWG. NO. 4680-8100PC | SIZE | REVISION B

SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

# JACKING SYSTEM HPU MOTOR START/STOP CONTROL PANEL

Hydraquip
CUSTOM SYSTEMS, INC.
St. Rose, Louisiana
Telephone: (504) 617-4625




SHIPPED LOOSE, MOUNTED AND WIRED BY SHIPYARD.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | CHANGED SIZE, LAYOUT, AND LABELING TO MATCH ORIENTATION OF VESSEL | 06/23/15 | AN | TMW |
| A | NEW RELEASE | 04/30/15 | AN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY A.NADEAU | DATE 04/30/15 |
| CHECKED T.WELSH | DATE 04/30/15 |
| APPROVED T.WELSH | DATE 04/30/15 |
| P.O. NO. N/A | REQ. NO. |

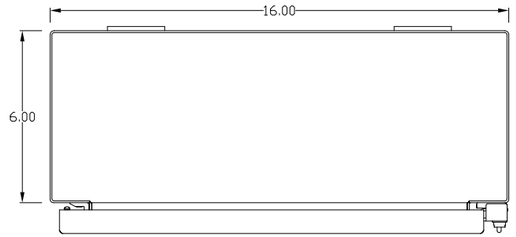
TRIYARDS H1028/H1029

BRIDGE JACKING MOTOR START/STOP PANEL

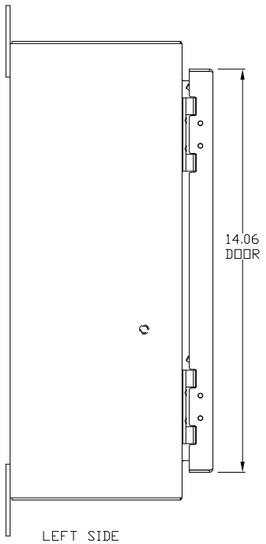
DWG. NO. 4680-8200 | SIZE | REVISION B
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

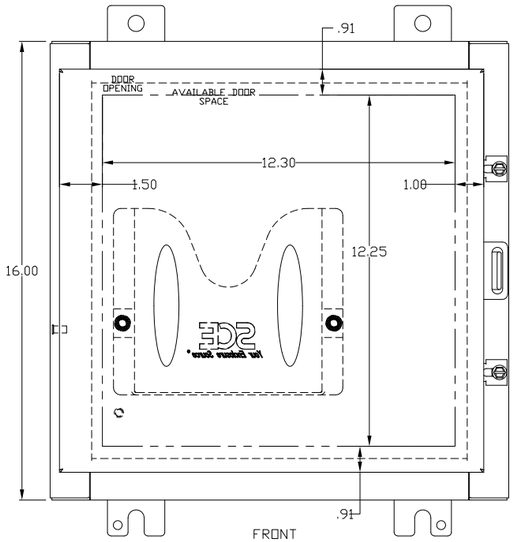
# SAGINAW CONTROL & ENGINEERING
# SCE-16H1606LP



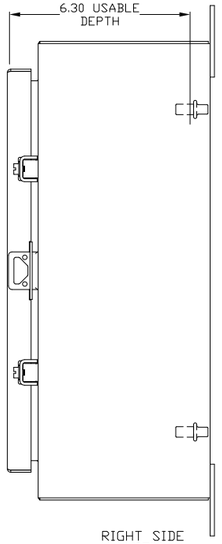

TOP VIEW



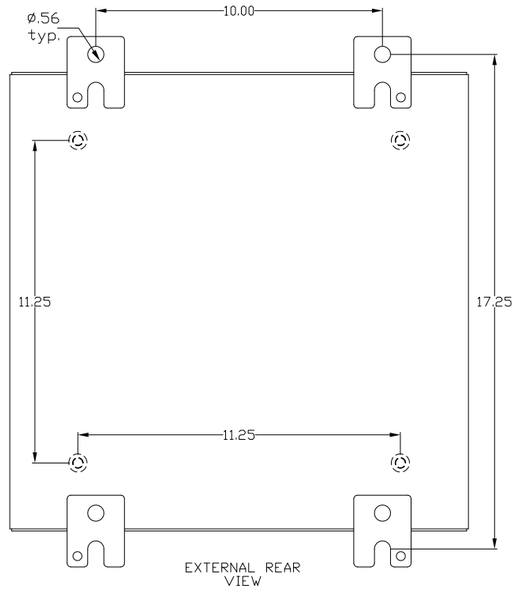

LEFT SIDE VIEW



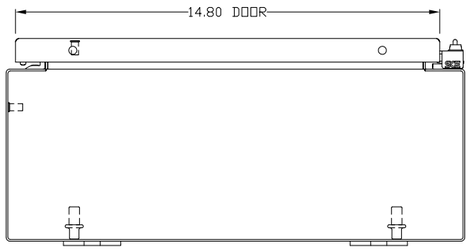

FRONT VIEW




RIGHT SIDE VIEW




EXTERNAL REAR VIEW




BOTTOM VIEW

DATA SUBJECT TO CHANGE WITHOUT NOTICE

MOUNTED AND WIRED BY HCSI ON HPU



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | CORRECTED SIZE OF ENCLOSURE | 10/23/15 | MJP | TMW |
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 √ ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | M.PALMER | DATE 02/04/15 |
| CHECKED | T.WELSH | DATE 02/04/15 |
| APPROVED | T.WELSH | DATE 02/04/15 |
| P.O. NO. | N/A | REQ. NO. |

TRIYARDS H1028/H1029

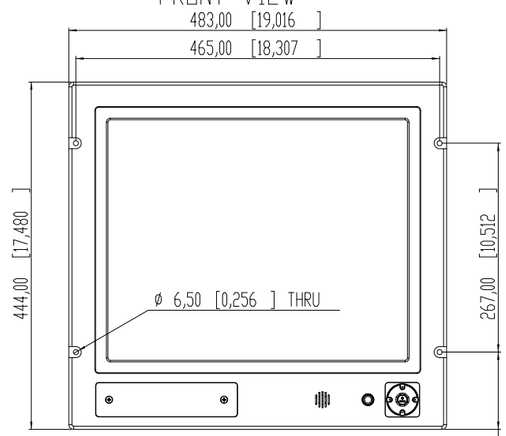
JACKING SYSTEM LOCAL HPU TERMINATION BOX

DWG. NO. 4680-8250 SIZE B REVISION

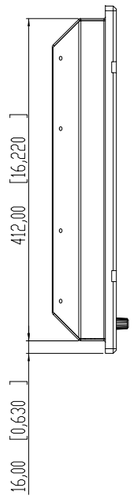
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

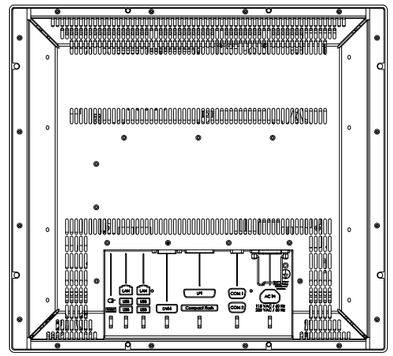
## FRONT VIEW



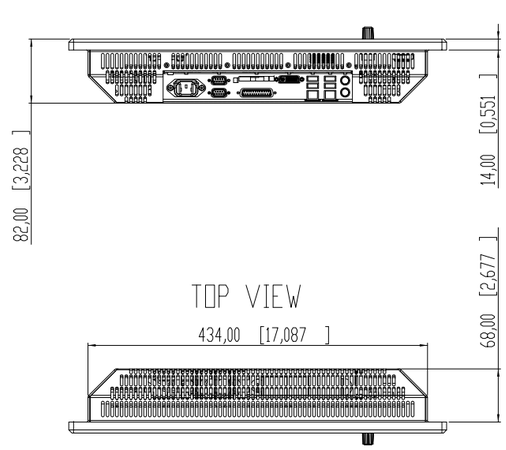

## SIDE VIEW




## BACK VIEW



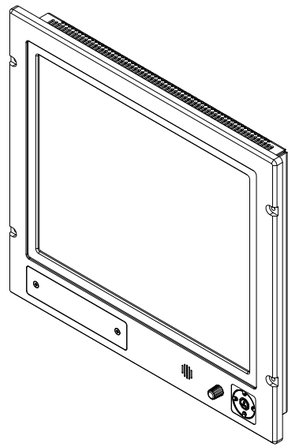
## BOTTOM VIEW



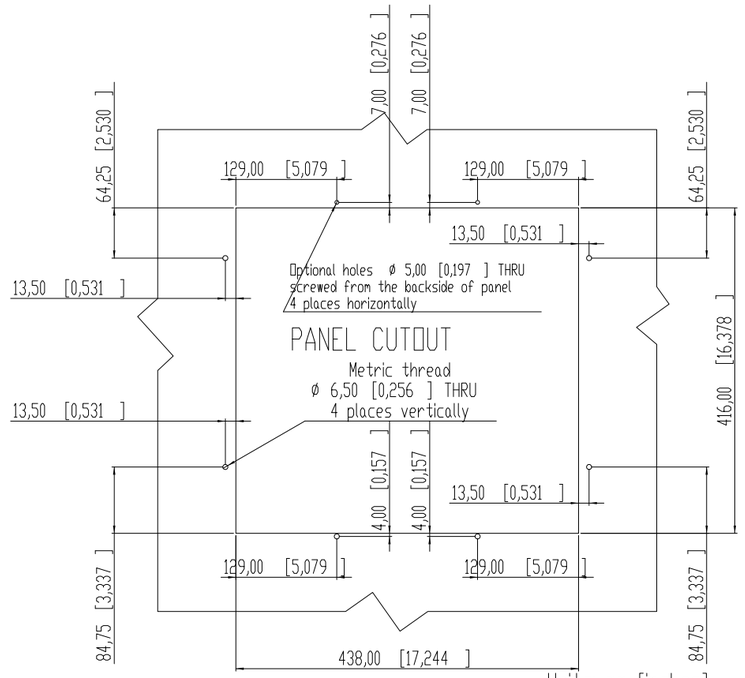

## TOP VIEW




## DIMETRIC VIEW



## PANEL CUTOUT




## SALES DRAWING JH 19T14 MMC

-AA1-AABA model is shown in this drawing, but measurements generally apply for all JH 19T14 MMC-AA1-xxxx models

| HATTELAND DISPLAY STANDARD | Drawn by: ek | Date: 01-09-08 | Verified by: | Date: | Version: 1 |
|---|---|---|---|---|---|
| Material type and Quality: | | | Surface treatment: | | |
| Aluminium 5052, standard EN 485-2 Cl 1, 2? Cl 3? Sur/Petic Standard EN 1057-2 | | | TO TERRATEN Chro/Mangan Phosphatering/ CQ Powder coating RAL 7035 LIGHT GRAUTOP | | |
| Stainless Steel AISI 316, L1 Standard EN 4404 | | | Bu Polish EP580-490007 | | |
| Welding specification: | | | Tolerance: | | |
| NS-EN-288-4 | | | ISO 2768-1 MIDDEL | | |
| Sheet metal fasteners: | | | | | |
| PEM International or equivalent (www.pemfasteners.com) | | | | | |

NOTES:
1. SCREEN MUST BE MOUNTED +/- 30 DEG FROM VERTICAL FOR PROPER VENTILATION. INSTALLATION SHOULD PROVIDE CLEARANCE AROUND SIDES AND REAR OF UNIT TO PROVIDE AMPLE NATURAL AIR FLOW FOR COOLING. IF ADEQUATE SPACE IS NOT POSSIBLE, VENTILATION FANS SHOULD BE INSTALLED TO INSURE ADEQUATE COOLING. LOCATION OF INSTALLATION MUST BE OUTSIDE OF THE MAXIMUM SAFE MAGNETIC DISTANCE FOR ALL NEIGHBORING ELECTRONIC COMPONENTS.
2. TWO SCREENS SUPPLIED FOR MOUNTING ON BRIDGE CONSOLE.
3. THESE SCREENS ARE COMPUTERS, AND SHOULD BE HANDLED AND STORED WITH APPROPRIATE CARE. STORAGE SHOULD BE A COOL, DRY ENVIRONMENT, AWAY FROM ANY MAGNETIC FIELDS.
4. PROVIDE SUFFICIENT ELECTRICAL CABLE TO ALLOW REMOVAL OF SCREEN FROM CONSOLE WITHOUT DISCONNECTING WIRES.
5. SCREEN SHALL ONLY BE CLEANED WITH WATER, OR ALCOHOL AND A SOFT CLOTH. NO ABRASIVE MATERIAL MAY BE USED.

PRELIMINARY SUBJECT TO CHANGE

| Date | Mechanical Designer | Projection | Size A1 Format |
|---|---|---|---|
| 17-12-2010 | 7251 | | Scale 1:3 |
| Hatteland Display AS<br>Amsosen<br>N-5578 Nedre Vats | | | Colour code<br>Surface treatment |

HATTELAND® DISPLAY

Approved by: -- Revision: 1
Drawing number: A001937-1



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 √ ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | M.PALMER | DATE 02/04/15 |
| CHECKED | T.WELSH | DATE 02/04/15 |
| APPROVED | T.WELSH | DATE 02/04/15 |
| P.O. NO. | | REQ. NO. |

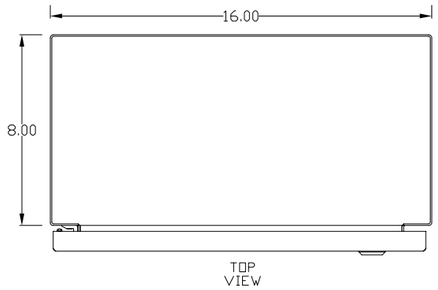
TRIYARDS H1028/H1029

JACKING SYSTEM TOUCH SCREEN

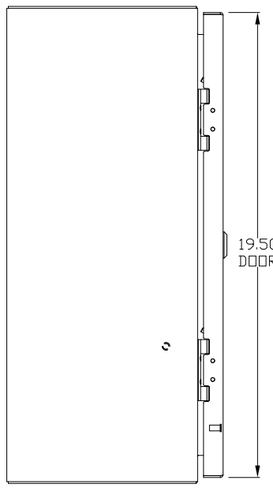
DWG. NO. 4680-8300TS | SIZE A | REVISION A
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

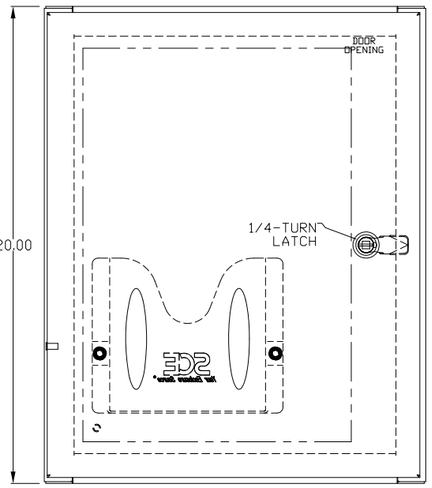
# SAGINAW CONTROL & ENGINEERING
# SCE-20EL1608LP



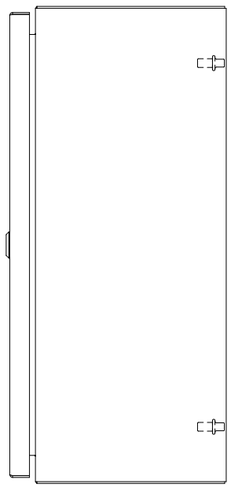
TOP VIEW

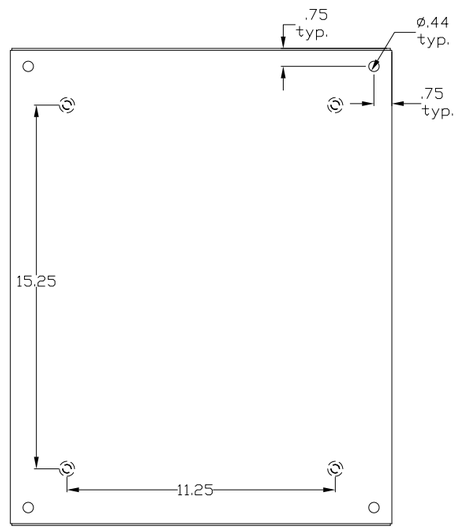


LEFT SIDE VIEW

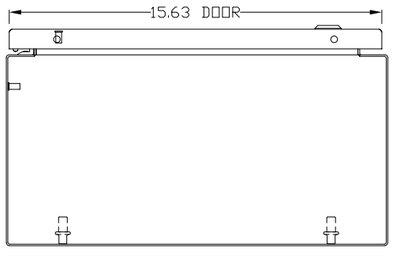


FRONT VIEW


RIGHT SIDE VIEW



EXTERNAL REAR VIEW



BOTTOM VIEW

DATA SUBJECT TO CHANGE WITHOUT NOTICE

SHIPPED LOOSE, MOUNTED AND WIRED BY SHIPYARD.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING
DRAWN BY M.PALMER DATE 02/04/15
CHECKED T.WELSH DATE 02/04/15
APPROVED T.WELSH DATE 02/04/15
P.O. NO. N/A REQ. NO.

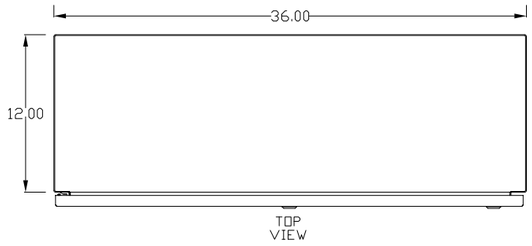
TRIYARDS H1028/H1029

JACKING SYSTEM POWER TRANSFER PANEL

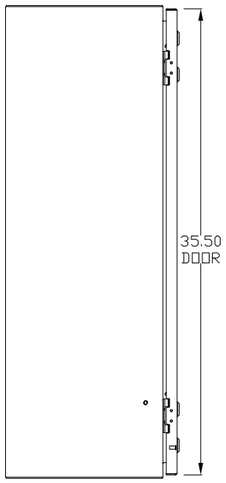
DWG. NO. 4680-8400TP SIZE REVISION A
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

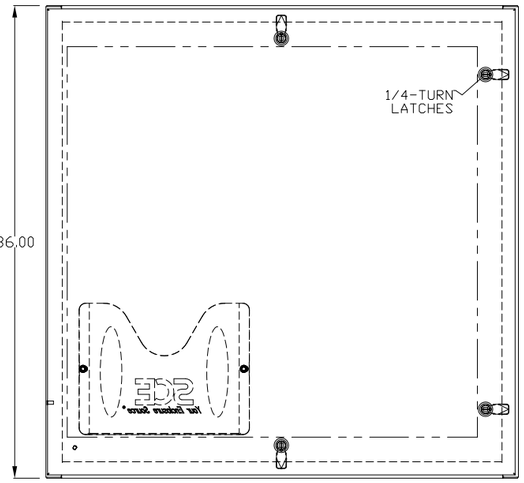
# SAGINAW CONTROL & ENGINEERING
# SCE-36EL3612LP



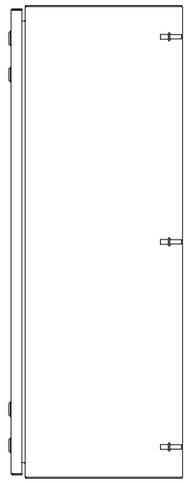
TOP VIEW

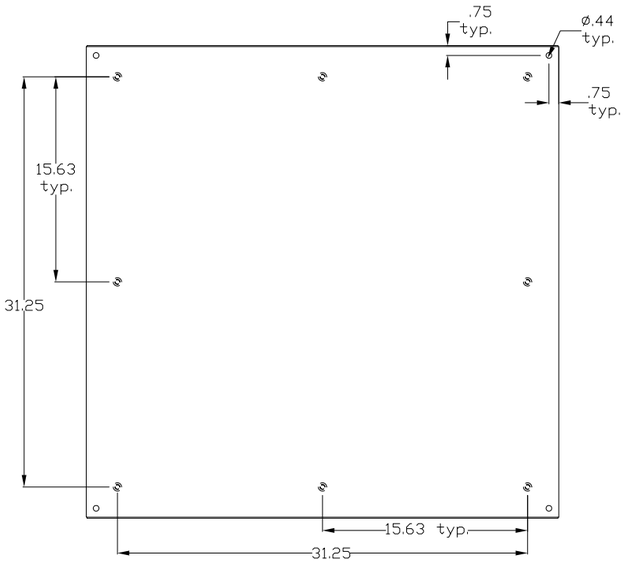


LEFT SIDE VIEW

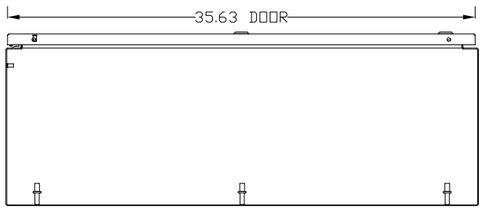


FRONT VIEW


RIGHT SIDE VIEW



EXTERNAL REAR VIEW



BOTTOM VIEW

DATA SUBJECT TO CHANGE WITHOUT NOTICE

SHIPPED LOOSE, MOUNTED AND WIRED BY SHIPYARD.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

| TOLERANCE UNLESS OTHERWISE SPECIFIED | | SURFACE TREATMENT |
|---|---|---|
| X/Y ±1/16 | | |
| .X ±.1 | ANGLES ±.5° | MATERIAL & HEAT TREAT |
| .XX ±.01 | 125 ON ALL MACHINED SURFACES | |
| .XXX ±.005 | | SUPERSEDES DATE |

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY M.PALMER | DATE 02/04/15 | |
| CHECKED T.WELSH | DATE 02/04/15 | |
| APPROVED T.WELSH | DATE 02/04/15 | |
| P.O. NO. N/A | REQ. NO. | |

TRIYARDS H1028/H1029

JACKING SYSTEM PILOT HOUSE CPU PANEL

DWG. NO. 4680-8500PP | SIZE | REVISION A

SCALE NONE | SH. 1 OF 1

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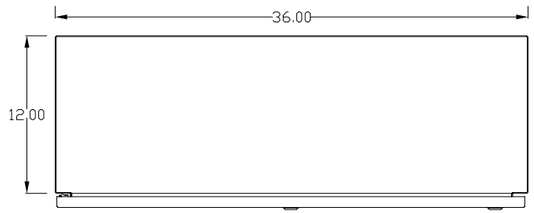
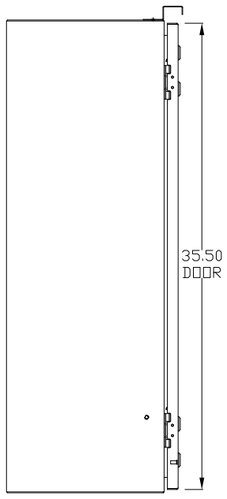
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

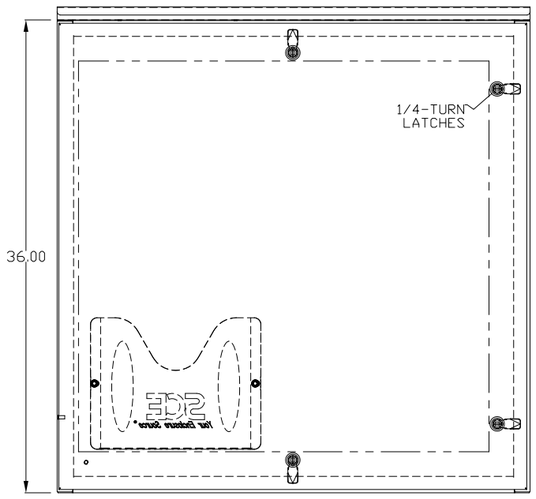
# SAGINAW CONTROL & ENGINEERING
# SCE-36EL3612LP



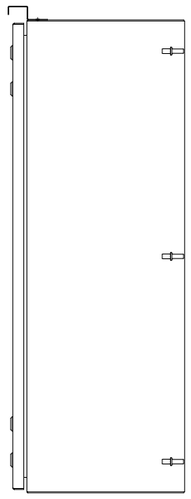

TOP VIEW



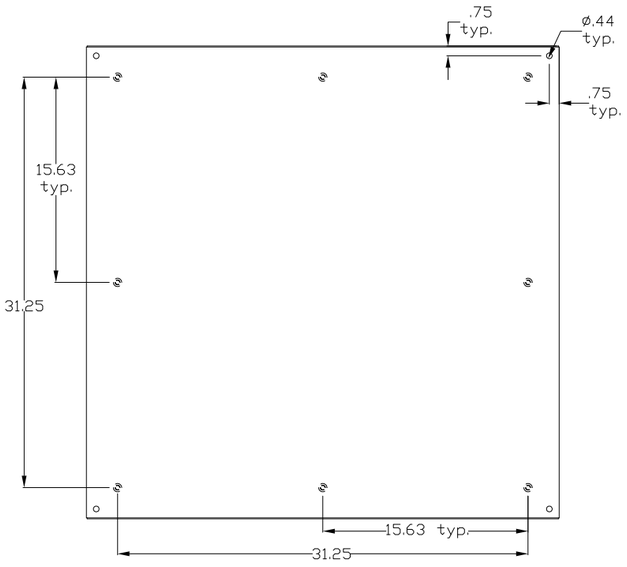

LEFT SIDE VIEW



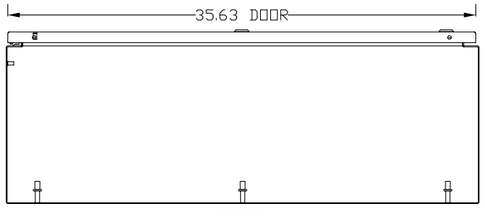

FRONT VIEW



RIGHT SIDE VIEW




EXTERNAL REAR VIEW




BOTTOM VIEW

DATA SUBJECT TO CHANGE WITHOUT NOTICE

SHIPPED LOOSE, MOUNTED AND WIRED BY SHIPYARD.



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

REVISIONS

| TOLERANCE UNLESS OTHERWISE SPECIFIED | | SURFACE TREATMENT |
|---|---|---|
| X/Y ±1/16 | | |
| .X ±.1 | ANGLES ±.5° | MATERIAL & HEAT TREAT |
| .XX ±.01 | 125 ON ALL MACHINED SURFACES | |
| .XXX ±.005 | | SUPERSEDES DATE |

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY M.PALMER | DATE 02/04/15 | |
| CHECKED T.WELSH | DATE 02/04/15 | |
| APPROVED T.WELSH | DATE 02/04/15 | |
| P.O. NO. N/A | REQ. NO. | |

TRIYARDS H1028/H1029

JACKING SYSTEM LEG CONTROL PANEL, TYP PER LEG/HPU

| DWG. NO. | SIZE | REVISION |
|---|---|---|
| 4680-8600XLP | | A |

SCALE NONE SH. 1 OF 1

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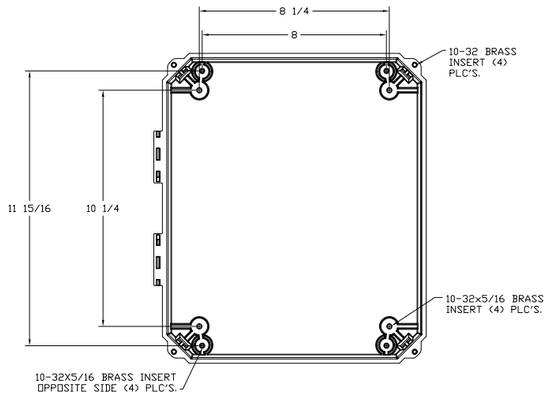
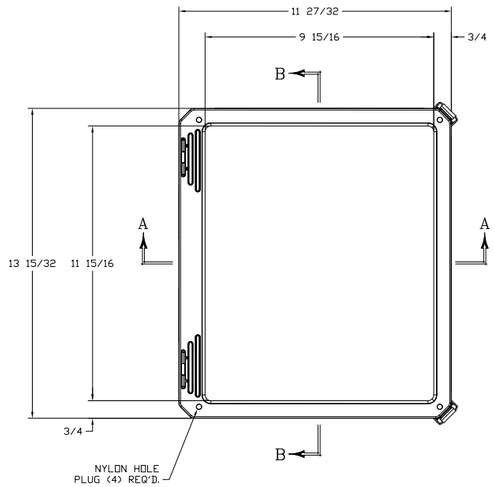
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

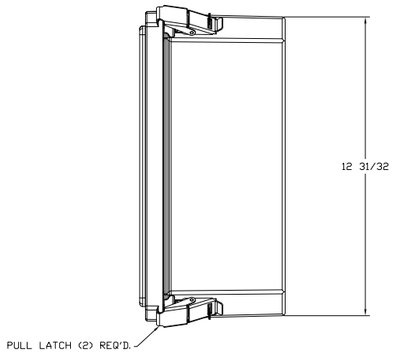
STAHLIN

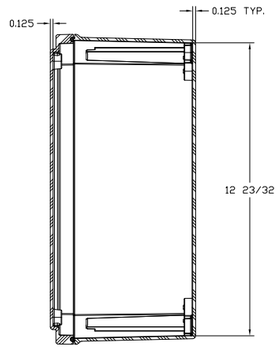
P/N DS121006HPL



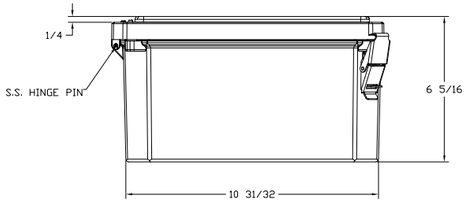

WITH COVER REMOVED

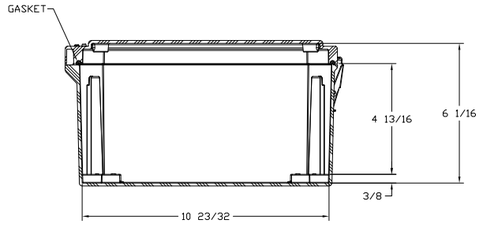



SECTION B–B




SECTION A–A

SHIPPED LOOSE, MOUNTED AND WIRED BY SHIPYARD.



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED: X/Y ±1/16; .X ±.1; .XX ±.01; .XXX ±.005; ANGLES ±.5°

125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY DATE

CHECKED DATE

APPROVED DATE

P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

JACKING SYSTEM
EMERGENCY JACKING
PANEL, TYP PER LEG

DWG. NO. 4680–8700EJ SIZE REVISION A

SCALE NONE SH. 1 OF 1

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CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
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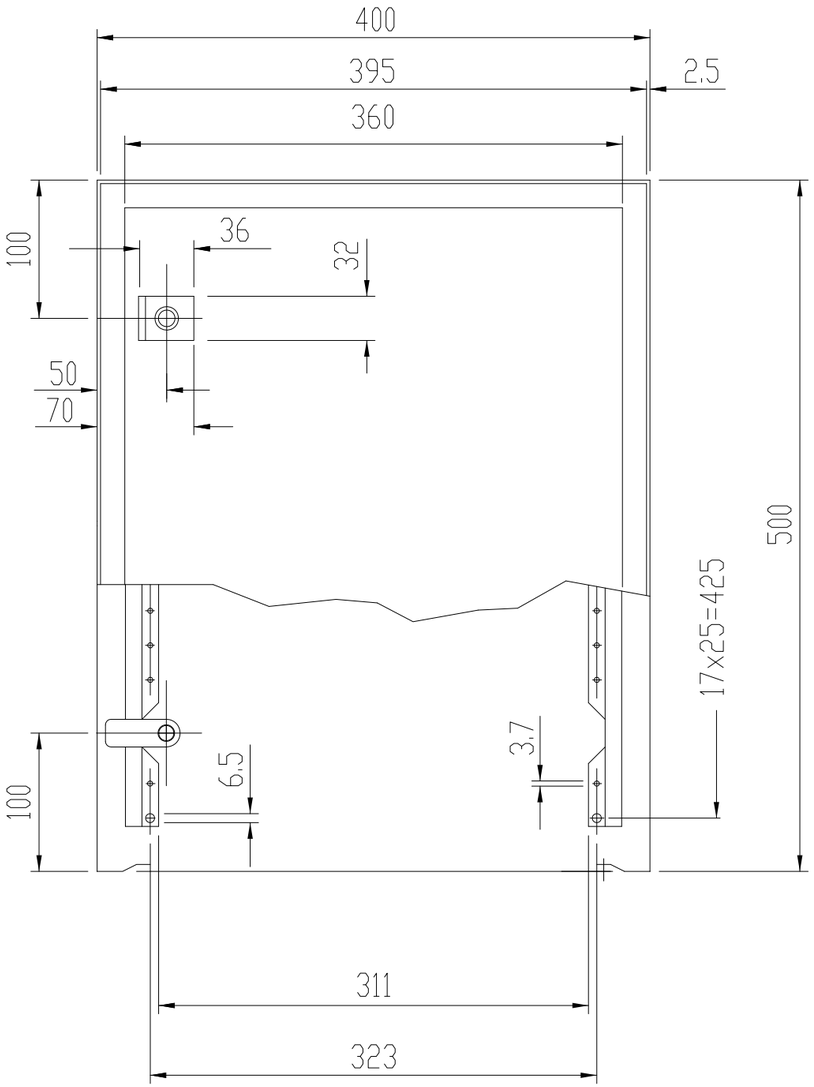
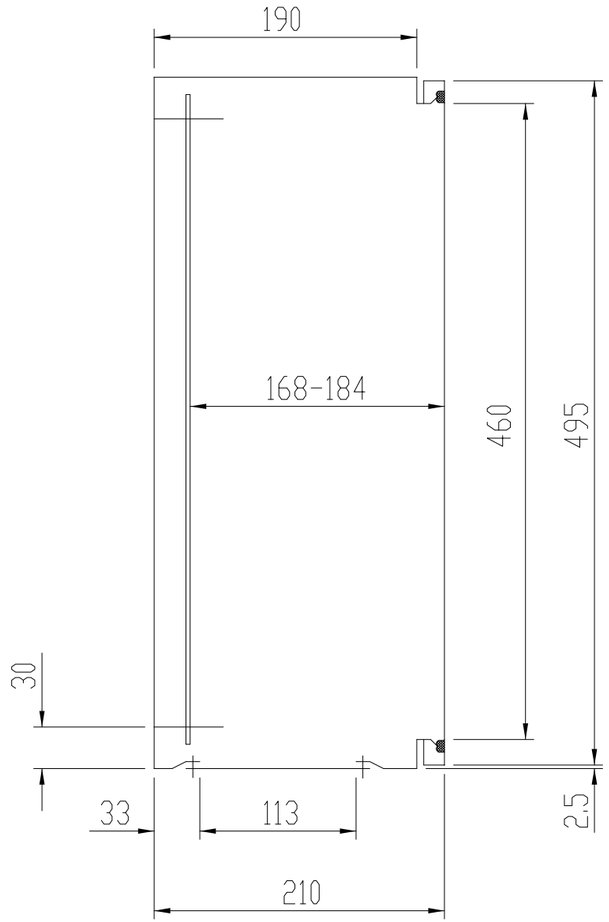
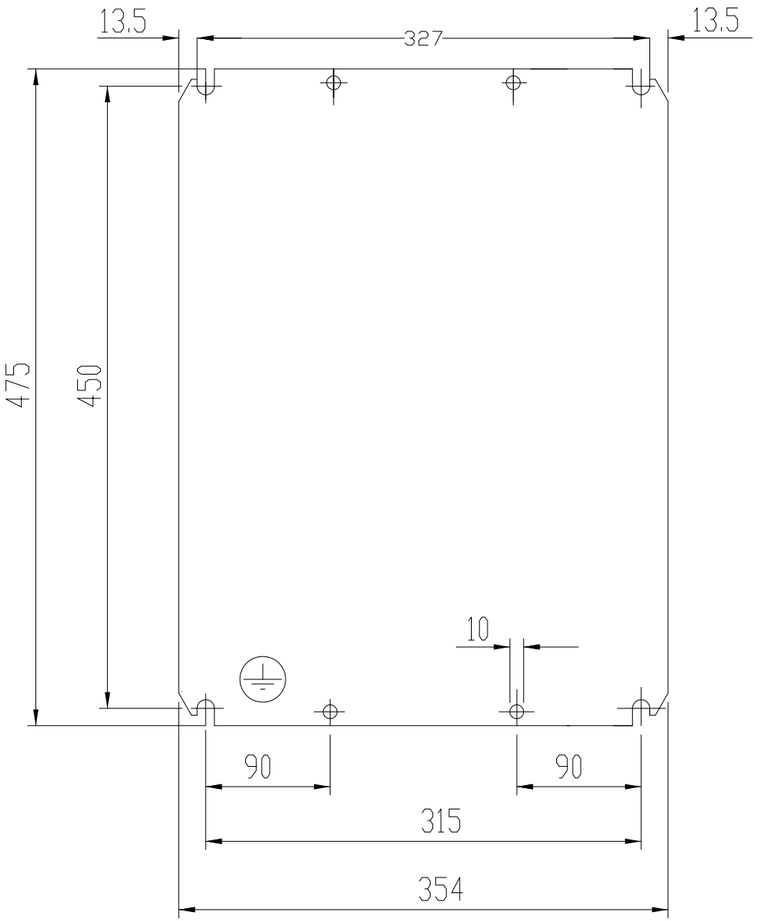
Fax: (281) 822–5020




AE1045.500




MOUNTING PANEL



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | M.PALMER | DATE 02/04/15 |
| CHECKED | T.WELSH | DATE 02/04/15 |
| APPROVED | T.WELSH | DATE 02/04/15 |
| P.O. NO. | N/A | REQ. NO. |

TRIYARDS H1028/H1029

JACKING SYSTEM HEAT EXCHANGER MOTOR STARTER PANEL, TYP PER LEG

DWG. NO. 4680-8800HS | SIZE | REVISION A

SCALE NONE SH. 1 OF 1

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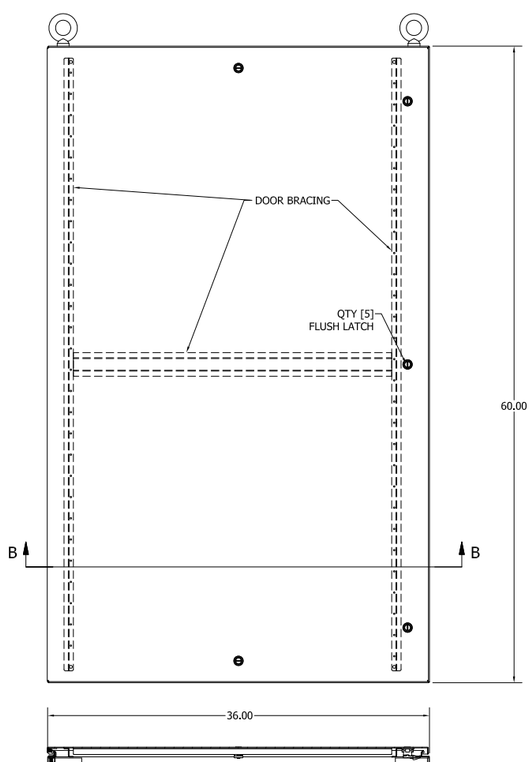
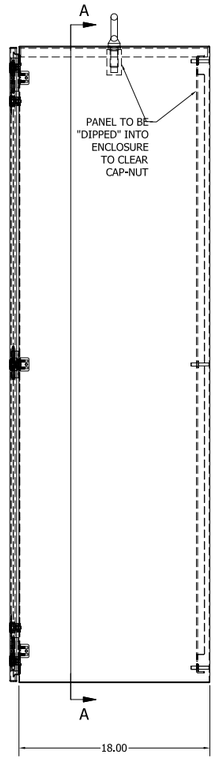
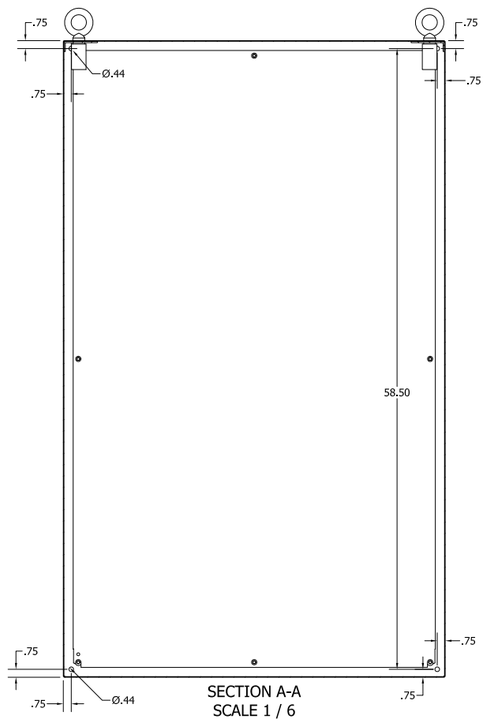
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020




SECTION B-B
SCALE 1 / 6




SECTION A-A
SCALE 1 / 6

| REV | DATE | REVISION NOTE | DRAWN | CHKD | APPR |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| A | 10/09/15 | REMOVED PDBs | EM | BH | |
| - | 10/07/15 | FIRST RELEASE | EM | BH | TW |

C:\Users\harmonb\Desktop\HMC_Logo.jpg

TITLE:

CUSTOM 300HP SS WITH BYPASS
3Ø/60Hz/690VAC

| ENGINEER: | SCALE: N/A | SHEET NO: M1 |
|---|---|---|
| PO#/CUSTOMER UNITS # 4680/4740 HYDRAQUIP | DRAWING NO: 30019SS71F04.M1 | REV: A |



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED ENCLOSURE DETAILS | 09/22/15 | MJP | TMW |
| A | NEW RELEASE | 02/04/15 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY M.PALMER | DATE 02/04/15 |
| CHECKED T.WELSH | DATE 02/04/15 |
| APPROVED T.WELSH | DATE 02/04/15 |
| P.O. NO. N/A | REQ. NO. |

TRIYARDS H1028/H1029

JACKING SYSTEM SOFT MOTOR STARTER ENCLOSURE, TYP (2) PER HPU

| DWG. NO. 4680-8900MS | SIZE | REVISION B |
|---|---|---|
| SCALE NONE | SH. 1 OF 1 | |

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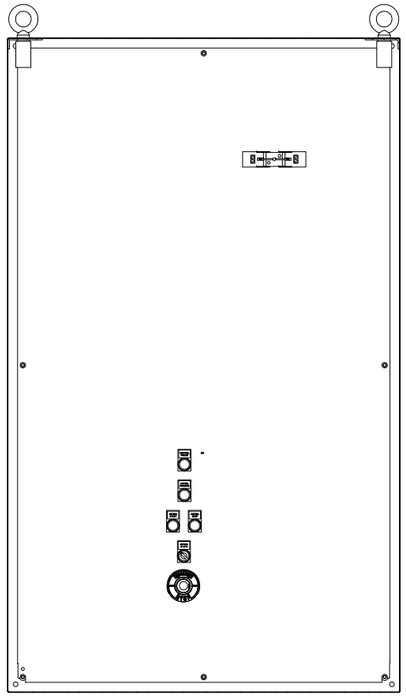
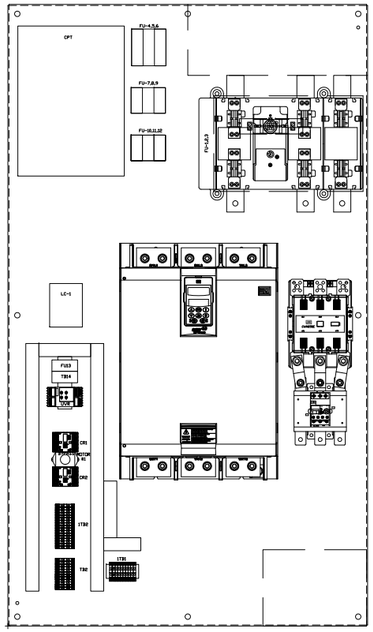
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020






| REV | DATE | REVISION NOTE | DRAWN | CHKD | APPR |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| A | 10/09/15 | REMOVED PDBs | EM | BH | |
| - | 10/07/15 | FIRST RELEASE | EM | BH | TW |

C:\Users\harmonb\Desktop\HMC_Logo.jpg

TITLE:

CUSTOM 300HP SS WITH BYPASS
3Ø/60Hz/690VAC

ENGINEER: | SCALE: N/A | SHEET NO: M1

PO#/CUSTOMER: UNITS # 4680/4740 HYDRAQUIP | DRAWING NO: 30019SS71F04.M1 | REV: A



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 09/22/15 | MJP | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY M.PALMER DATE 09/22/15
CHECKED T.WELSH DATE 09/22/15
APPROVED T.WELSH DATE 09/22/15
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

JACKING SYSTEM SOFT MOTOR STARTER CABINET LAYOUT, TYP (2) PER HPU

DWG. NO. 4680-8950MS SIZE REVISION A
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

CABLE SCHEDULE

| CABLE | TYPE | DESCRIPTION | SUPPLIED BY |
|---|---|---|---|
| K-J-PPUA-SA | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PPUB-SA | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PPUA-SF | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PPUB-SF | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PPUA-PF | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PPUB-PF | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PPUA-PA | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PPUB-PA | TPS16TIA-3 | 6 COND, 3 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-10-SA | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-10-SF | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-10-PF | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-10-PA | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-15-SA | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-15-SF | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-15-PF | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-15-PA | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-16-SA | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-16-SF | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-16-PF | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-16-PA | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-17-SA | TPS16TIA-5 | 20 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-17-SF | TPS16TIA-5 | 20 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-17-PF | TPS16TIA-5 | 20 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-17-PA | TPS16TIA-5 | 20 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-220-SA | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-220-SF | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-220-PF | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-220-PA | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-220TP | TXIA-6 | 3 COND, 12 AWG | SHIPYARD |
| K-J-AMS1 | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-AMS2 | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-PMS | TPS16TIA-25 | 50 COND, 25 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-DP | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDA-SA | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDB-SA | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDA-SF | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDB-SF | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDA-PF | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDB-PF | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDA-PA | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-LDB-PA | TPS16TIA-2 | 4 COND, 2 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-96-SA | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-96-SF | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-96-PF | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-96-PA | TPS16TIA-10 | 20 COND, 10 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-HPU-SA | TPS16TIA-15 | 30 COND, 15 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-HPU-SF | TPS16TIA-15 | 30 COND, 15 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-HPU-PF | TPS16TIA-15 | 30 COND, 15 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-HPU-PA | TPS16TIA-15 | 30 COND, 15 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-18-SA | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-18-SF | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-18-PF | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-18-PA | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-19-SA | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-19-SF | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-19-PF | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-19-PA | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |
| K-J-97-SA | TPS16TIA-3 | 6 COND, 3 TWSH PAIRS, 16AVG | SHIPYARD |
| K-J-97-SF | TPS16TIA-3 | 6 COND, 3 TWSH PAIRS, 16AWG | SHIPYARD |
| K-J-97-PF | TPS16TIA-3 | 6 COND, 3 TWSH PAIRS, 16AWG | SHIPYARD |
| K-J-97-PA | TPS16TIA-3 | 6 COND, 3 TWSH PAIRS, 16AWG | SHIPYARD |
| K-J-ES-SA-A | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-ES-SA-B | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-ES-SF-A | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-ES-SF-B | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-ES-PF-A | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-ES-PF-B | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-ES-PA-A | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-ES-PA-B | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-220-H1 | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-220-H2 | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-PCA | TPS16TIA-20 | 40 COND, 20 TWISTED SHIELDED PAIRS, 16AWG | SHIPYARD |
| K-J-PCB | TPS16TIA-20 | 40 COND, 20 TWISTED SHIELDED PAIRS, 16AWG | SHIPYARD |
| K-J-220-PP | TXIA-4 | 3 COND, 14 AWG | SHIPYARD |
| K-J-20 | TPS16TIA-5 | 10 COND, 5 TWISTED SHIELDED PAIRS, 16AVG | SHIPYARD |

NETWORK DATA CABLE SCHEDULE (A)

| | | | |
|---|---|---|---|
| K-J-ETH-PP2PA | 6XV1840-4AH10 | SIEMENS INDUSTRIAL MARINE ETHERNET CABLE | SHIPYARD |
| K-J-ETH-PA2PF | 6XV1840-4AH10 | SIEMENS INDUSTRIAL MARINE ETHERNET CABLE | SHIPYARD |
| K-J-ETH-PF2SF | 6XV1840-4AH10 | SIEMENS INDUSTRIAL MARINE ETHERNET CABLE | SHIPYARD |
| K-J-ETH-SF2SA | 6XV1840-4AH10 | SIEMENS INDUSTRIAL MARINE ETHERNET CABLE | SHIPYARD |
| K-J-ETH-SA2PP | 6XV1840-4AH10 | SIEMENS INDUSTRIAL MARINE ETHERNET CABLE | SHIPYARD |
| K-J-CAN-PP2PA | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-CAN-PA2PF | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-CAN-PF2SF | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-CAN-SF2SA | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-CAN-SA2PP | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-PRQ-SA-MSA | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-PRQ-SA-MSB | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-PRQ-SF-MSA | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-PRQ-SF-MSB | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-PRQ-PF-MSA | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-PRQ-PF-MSB | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-PRQ-PA-MSA | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-PRQ-PA-MSB | BELDEN 3079A | 2 COND, 1 TWISTED SHIELDED PAIRS, 22AVG | SHIPYARD |
| K-J-ECAN-SA | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-ECAN-SF | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-ECAN-PF | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-ECAN-PA | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-ETH-PC1 | 6XV1840-4AH10 | SIEMENS INDUSTRIAL MARINE ETHERNET CABLE | SHIPYARD |
| K-J-ETH-PC2 | 6XV1840-4AH10 | SIEMENS INDUSTRIAL MARINE ETHERNET CABLE | SHIPYARD |
| K-J-CAN-PCA1 | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |
| K-J-CAN-PCA2 | FPLTC154C-001 | NORTH WIRE DATA CELL CANBUS CABLE | SHIPYARD |

| CIRCUIT PROTECTION BY CUSTOMER | | |
|---|---|---|
| CABLE | TYPE | DESCRIPTION |
| K-J-220-TP | 220VAC, 60HZ, 30 AMP | MAIN CONTROL POWER, 3 COND |

NOTES:

(A) THIS SERVICE SUPPLIED BY OTHERS SHALL NOT BE INSTALLED NEAR CONTROL OR NETWORK CABLES OR CONDUCTORS. DO NOT ALLOW HIGH INDUCTION SUPPLY LINES NEAR CONTROL OR NETWORK CABLES OR CONDUCTORS. MOTOR CASE HEATER CABLE TO BE INSTALLED SEPARATE FROM SUPPLY CABLES.

(B) LOAD SENSOR CABLES MAY BE REPLACED WITH ONE 20 CONDUCTOR CABLE (TPS16TIA-10) WITH USE OF JUNCTION BOX LOCATED AT LEG TOWER

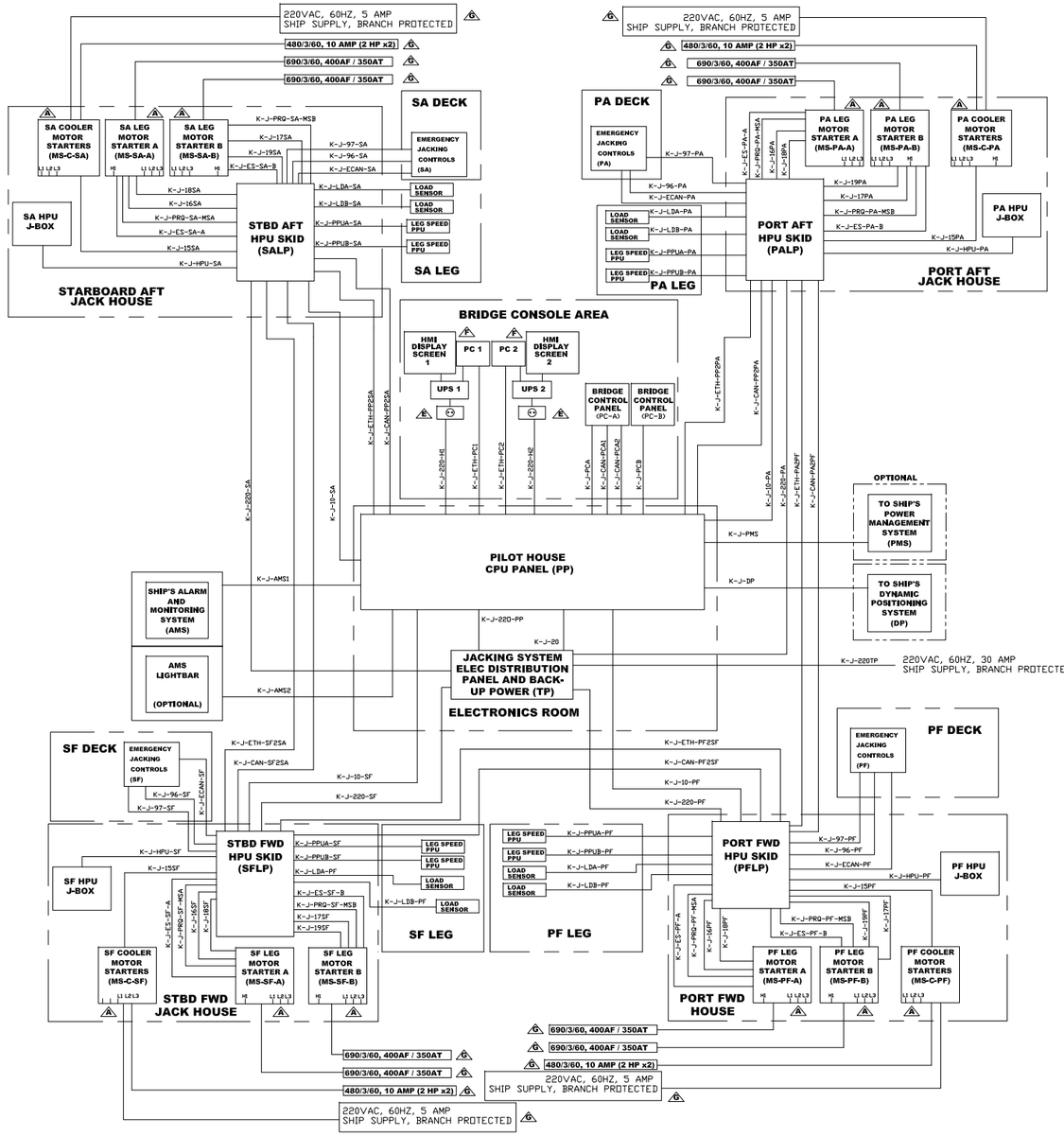
(C) PPU CABLES MAY BE REPLACED WITH TWO 20 CONDUCTOR CABLES (TPS16TIA-10) WITH USE OF JUNCTION BOX LOCATED AT LEG TOWER

(D) SIEMENS INDUSTRIAL MARINE ETHERNET CABLE (6XV1840-4AH10) MUST BE USED WHERE SPECIFIED

(E) SHIPYARD TO PROVIDE ELECTRICAL BOX WITH (1) CEE7 TYPE RECEPTACLE FOR UPS1 AND UPS2 (220VAC) WITHIN 1 METER OF HMI LOCATION

(F) HMI DISPLAY SCREEN (1&2), PC(1&2) AND UPS(1&2) USE FACTORY POWER CABLES PROVIDED BY HCSI.

(G) CABLE NUMBER AND CABLE TYPE PROVIDED BY OTHERS

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| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| C | CHANGED K-J-PMS TO 50 CONDUCTOR CABLE, CHANGED K-J-HPU-SA/PA/PF/SF | 3/22/16 | MDG | TMW |
| B | ADDED 220VAC (MTR HTRS), HPU BOX, KJ18X/19, INC COND KJ16X/17X, PC/SCRN, NOTES | 12/8/15 | MDG | TMW |
| A | NEW RELEASE | 06/21/15 | MDG | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y
.X ANGLES
.XX
.XXX
SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY MDG | DATE 06/20/15 |
| CHECKED BJC | DATE 06/23/15 |
| APPROVED T. WELSH | DATE 06/24/15 |
| P.O. NO. | REQ. NO. |

TRIYARDS H1028/H1029

JACKING SYSTEM ELECTRICAL CABLE DIARAM

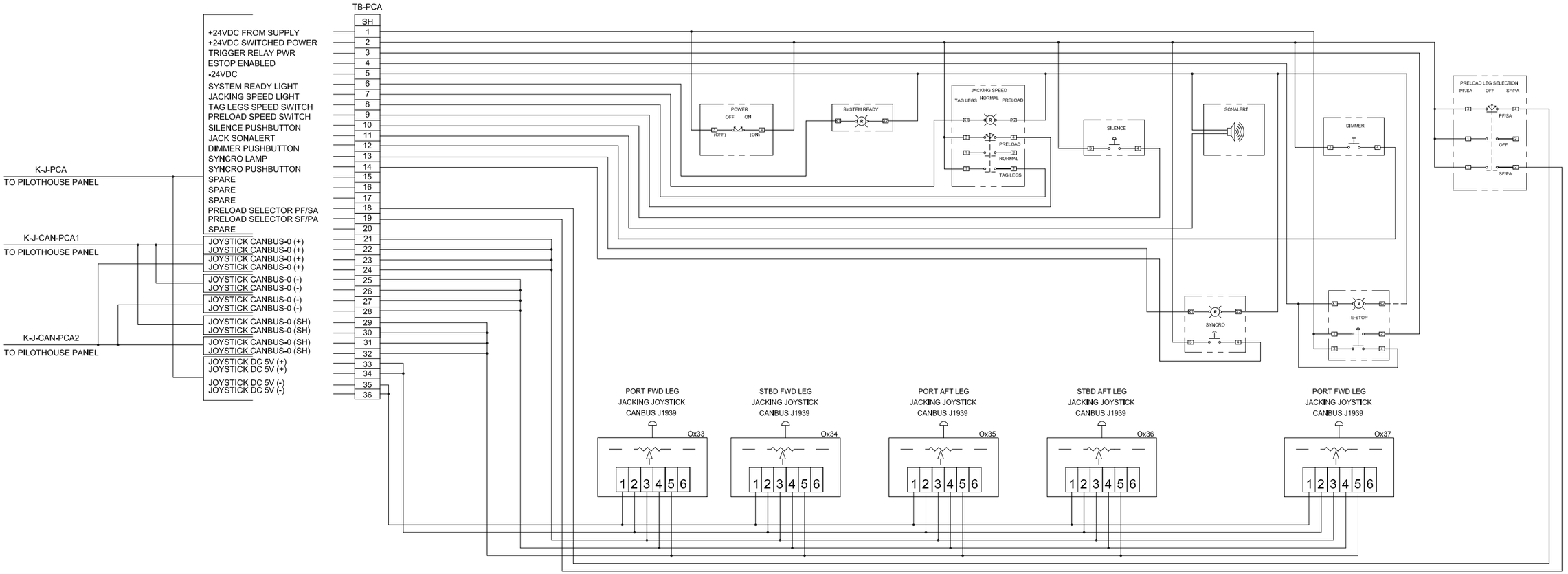
DWG. NO. 4680-9000WP | SIZE | REVISION C

SCALE NONE | SH. 1 OF 1


Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item | Qty | Description | Manufacturer | Part Number |
| 1 | 1 | POWER ON / OFF KEY SW ASSY | SIEMENS | 3SB3601-4AD11 |
| 2 | 1 | E-STOP SWITCH, ILLUMINATED | SIEMENS | 3SB3501-1EA21 |
| 3 | 1 | ILLUMINATED PUSHBUTTON | SIEMENS | 3SB3647-0AA21 |
| 4 | 2 | 3-POS - SELECTOR SWITCH - 3-POS | SIEMENS | 3SB3501-2SA21 |
| 5 | 1 | SONALERT | SIEMENS | 3SB3233-7BA10 |
| 6 | 5 | J1939 CANBUS 24VDC JOYSTICK | SAUER-DANFOSS | JS1000-10104237 |
| 7 | 5 | 6 PIN DEUTSCH CONNECTOR | SAUER-DANFOSS | 10101551 |

# JACKING SYSTEM BRIDGE CONTROL PANEL (PCA)






| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | CORRECTED JOYSTICK LABELS | 05/19/16 | MJP | TMW |
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY B.CHAUVIN DATE 09/22/15
CHECKED M.GRIMM DATE 12/09/15
APPROVED T.WELSH DATE 12/21/15
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

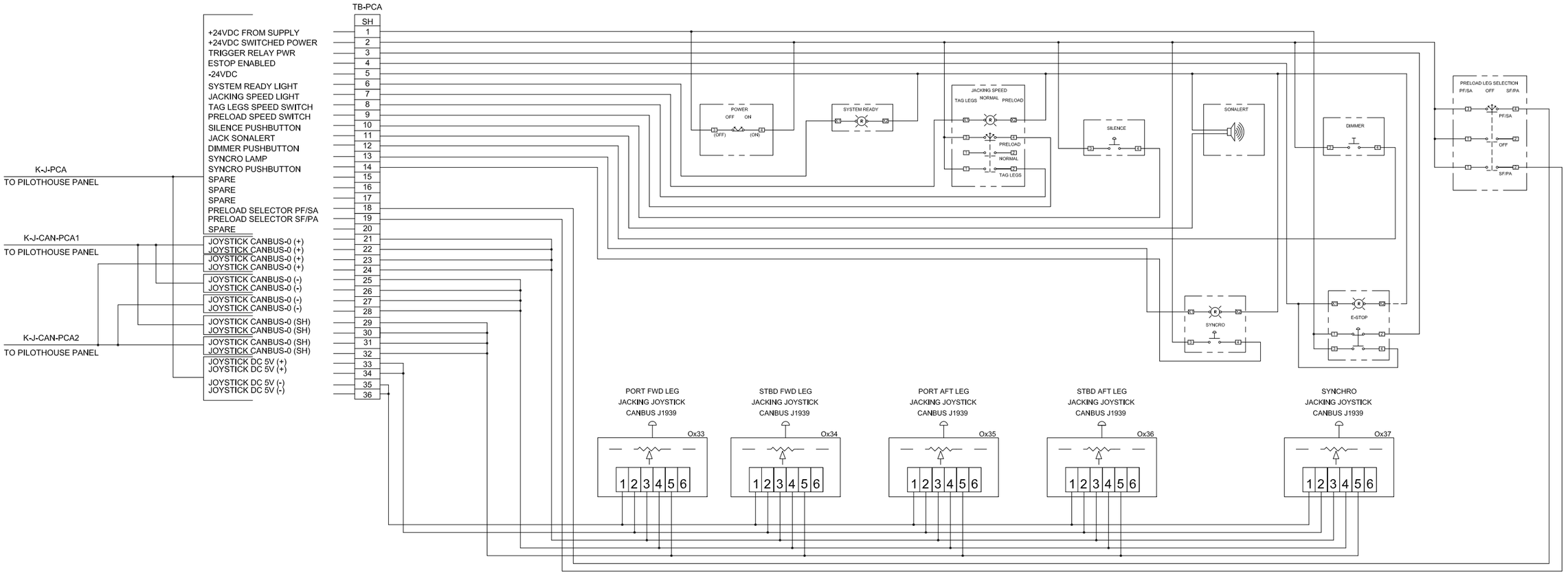
JACKING SYSTEM PILOT HOUSE JOYSTICK CONTROL PANEL WIRING DIAGRAM

DWG. NO. 4680-9100PCA SIZE B REVISION
SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item | Qty | Description | Manufacturer | Part Number |
| 1 | 1 | POWER ON / OFF KEY SW ASSY | SIEMENS | 3SB3601-4AD11 |
| 2 | 1 | E-STOP SWITCH, ILLUMINATED | SIEMENS | 3SB3501-1EA21 |
| 3 | 1 | ILLUMINATED PUSHBUTTON | SIEMENS | 3SB3647-0AA21 |
| 4 | 2 | 3-POS - SELECTOR SWITCH - 3-POS | SIEMENS | 3SB3501-2SA21 |
| 5 | 1 | SONALERT | SIEMENS | 3SB3233-7BA10 |
| 6 | 5 | J1939 CANBUS 24VDC JOYSTICK | SAUER-DANFOSS | JS1000-10104237 |
| 7 | 5 | 6 PIN DEUTSCH CONNECTOR | SAUER-DANFOSS | 10101551 |

# JACKING SYSTEM BRIDGE CONTROL PANEL (PCA)






| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| C | CORRECTED SYNCHRO JOYSTICK LABEL | 05/24/16 | MJP | TMW |
| B | CORRECTED JOYSTICK LABELS | 05/19/16 | MJP | TMW |
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY B.CHAUVIN DATE 09/22/15
CHECKED M.GRIMM DATE 12/09/15
APPROVED T.WELSH DATE 12/21/15
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

JACKING SYSTEM PILOT HOUSE JOYSTICK CONTROL PANEL WIRING DIAGRAM

DWG. NO. 4680-9100PCA SIZE C REVISION
SCALE NONE SH. 1 OF 1

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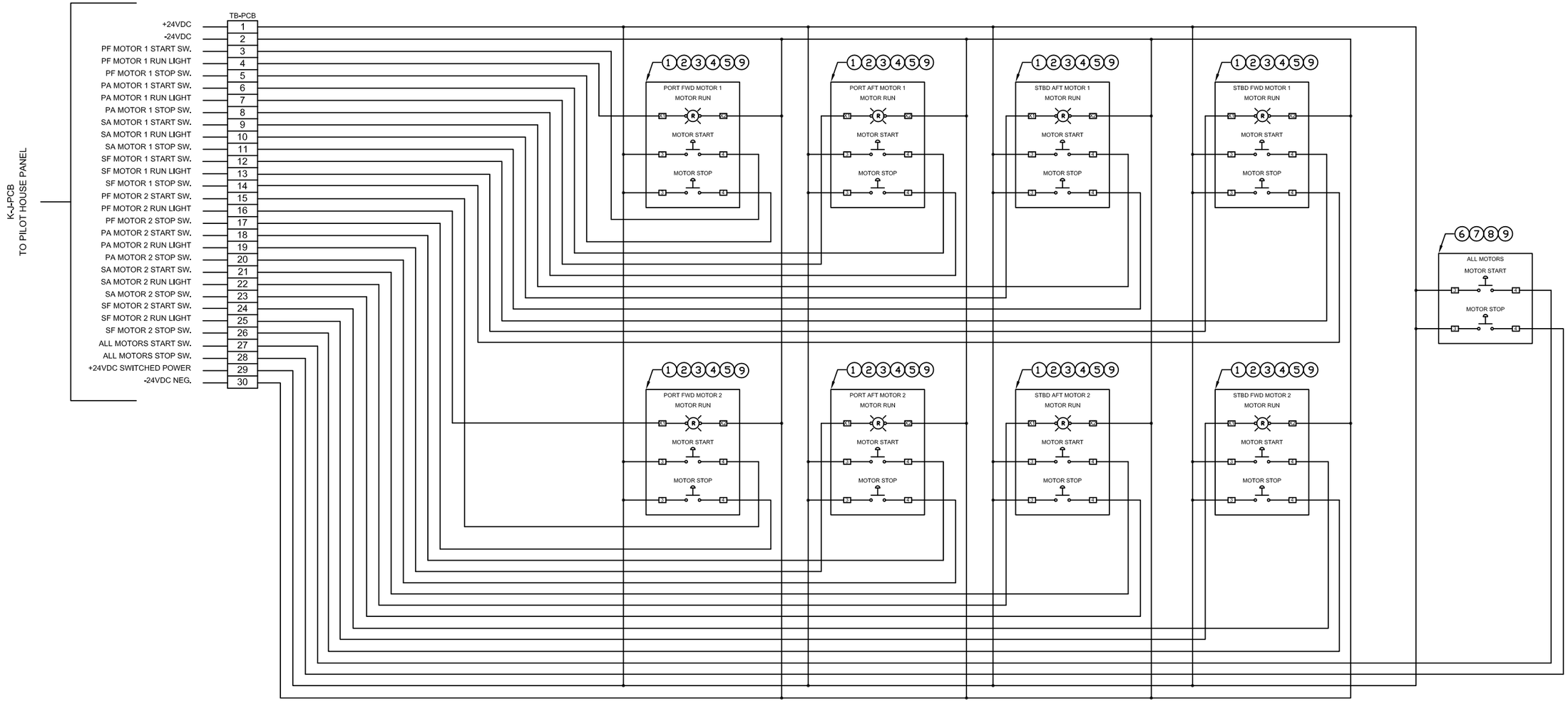
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item | Qty | Description | Manufacturer | Part Number |
| 1 | 8 | TWO BUTTON OPERATOR & INDICATOR | EATON | E30EX13 |
| 2 | 8 | GREEN START LENS | EATON | E30KE330 |
| 3 | 8 | RED STOP LENS | EATON | E30KE231 |
| 4 | 8 | GREEN MOTOR RUN LENS | EATON | E30KJ23 |
| 5 | 8 | 24VDC GREEN LED LAMP | LEDTRONICS | 5SBF-200-0AG-028B |
| 6 | 1 | TWO BUTTON OPERATOR | EATON | E30AC |
| 7 | 1 | GREEN START LEN | EATON | E30KB330 |
| 8 | 1 | RED STOP LEN | EATON | E30EB231 |
| 9 | 18 | NORMALLY OPEN CONTACT BLOCKS | EATON | E30KLAE1 |

# JACKING SYSTEM BRIDGE CONTROL START/STOP PANEL (PCB)






| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 09/23/15 |
| CHECKED M.GRIMM | DATE 12/08/15 |
| APPROVED T.WELSH | DATE 12/21/15 |
| P.O. NO. N/A | REQ. NO. |

TRIYARDS H1028/H1029

JACKING SYSTEM PILOT HOUSE MOTOR START/STOP CONTROL PANEL WIRING DIAGRAM

DWG. NO. 4680-9200PCB | SIZE | REVISION A

SCALE NONE | SH. 1 OF 1

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12311 CUTTEN RD.
HOUSTON, TEXAS 77066
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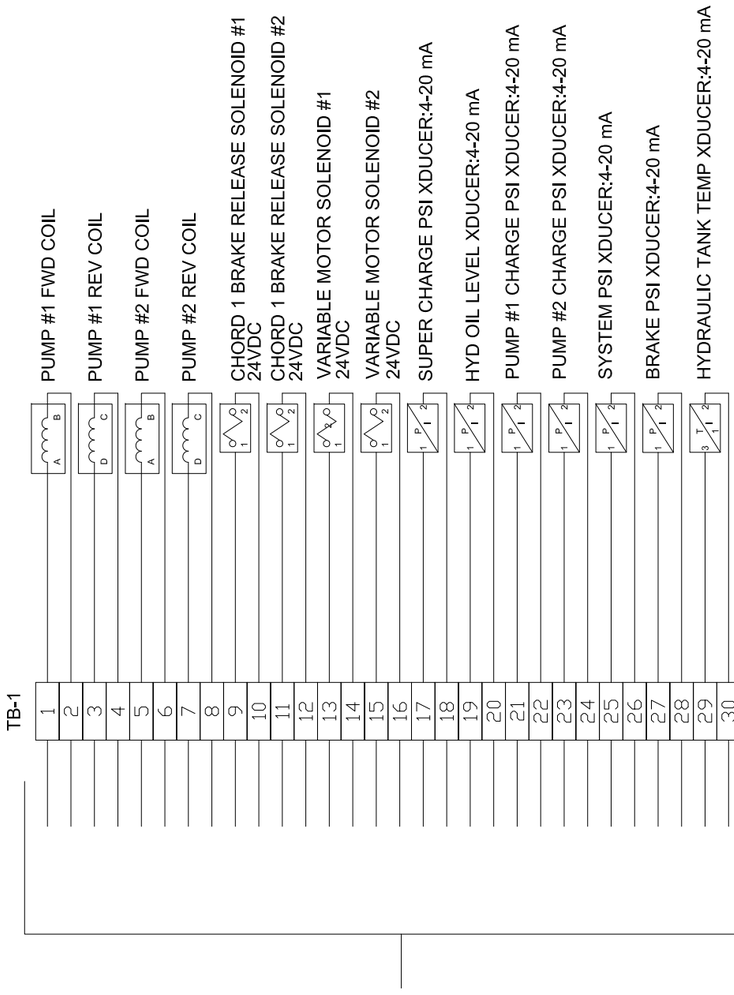
# HPU JUNCTION BOX




NOTE: COMMON FOR ALL LEGS (X)

TO (X) LEG CONTROL PANEL

K-J-HPU-(X)-A

K-J-HPU-(X)-B

TB-HPU



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 11/13/15 |
| CHECKED M.GRIMM | DATE 11/29/15 |
| APPROVED T.WELSH | DATE 12/21/15 |
| P.O. NO. N/A | REQ. NO. |

TRIYARDS H1028/H1029

JACKING SYSTEM FPU
JUNCTION BOX ELECTRICAL DIAGRAM

DWG. NO. 4680-9250HP | SIZE | REVISION A

SCALE NONE SH. 1 OF 1

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12311 CUTTEN RD.
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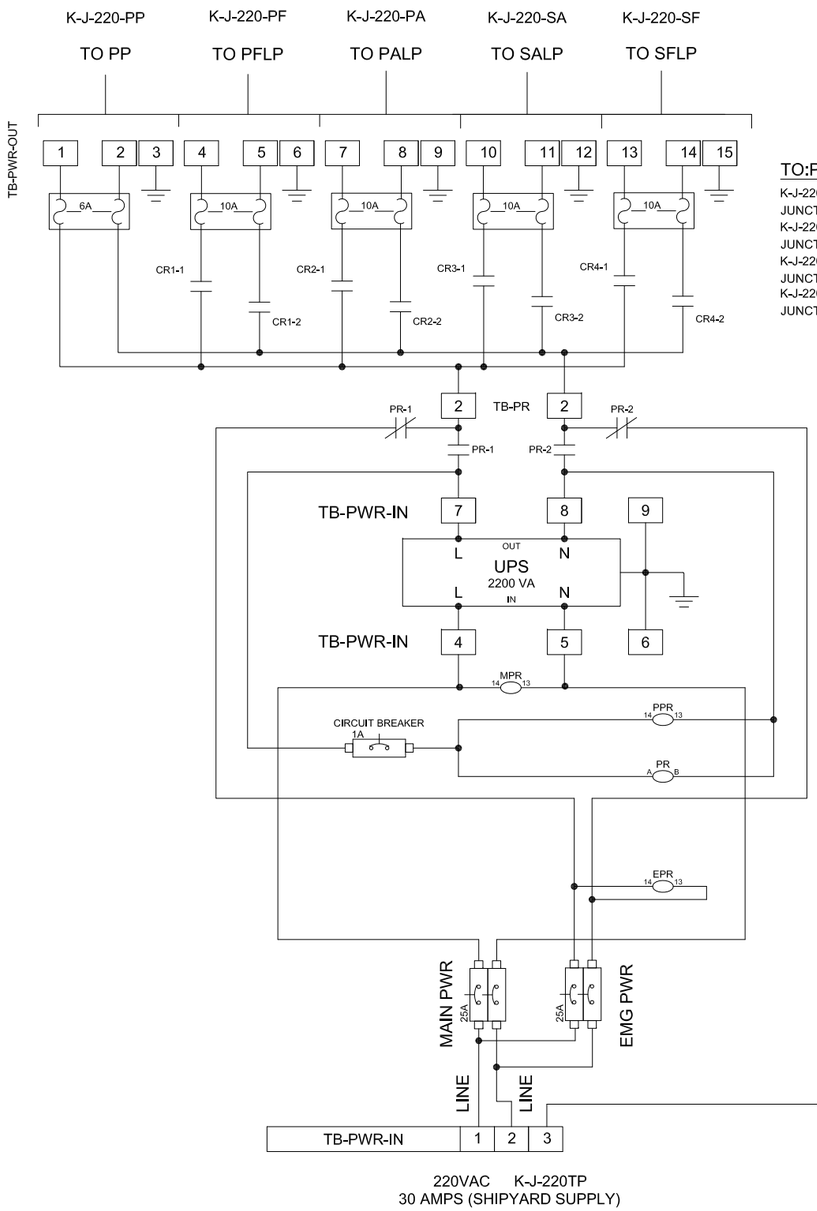
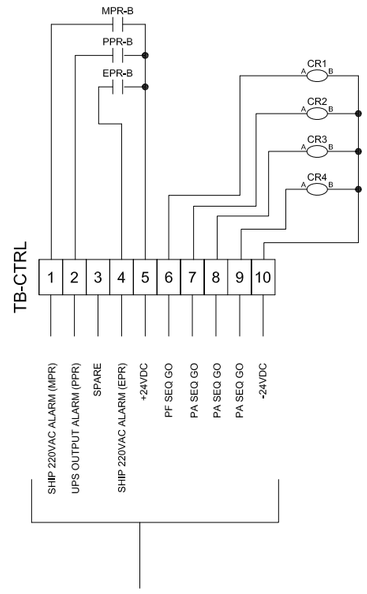
Telephone: (281) 822-5000
Fax: (281) 822-5020

# POWER TRANSFER PANEL




TO:PP,PFLP,PALP,SALP,SFLP

K-J-220-PF TO PORT FWD JACKING LP CONTROL JUNCTION PANEL (PFLP) TXIU-6
K-J-220-PA TO PORT AFT JACKING LP CONTROL JUNCTION PANEL (PALP) TXIU-6
K-J-220-SA TO STBD AFT JACKING LP CONTROL JUNCTION PANEL (SALP) TXIU-6
K-J-220-SA TO STBD FWD JACKING LP CONTROL JUNCTION PANEL (SFLP) TXIU-6




## BILL OF MATERIALS FOR JACKING SYSTEM POWER TRANSFER PANEL

| ITEM NO. | QTY | DESCRIPTION | MANUFACTURER | PART NO. |
|---|---|---|---|---|
| 1 | 1 | JUNCTION BOX, TRANSFER PANEL | SAGINAW | SCE-24EL2006LP |
| 2 | 1 | UNINTERRUPTIBLE POWER SUPPLY | UPS | UPS |
| 3 | 4 | CIRCUIT BREAKER, 220VAC, 10A, 2 POLE | ABB | S202-C10 |
| 4 | 4 | RELAY, DPDT, 10A, 24VDC | SIEMENS | 3TX71195LC03 |
| 5 | 1 | RELAY, DPDT, 10A, 24VDC (EPR) | SIEMENS | 3TX7114-5LC03 |
| 6 | 1 | RELAY, DPDT, 30A, 120VAC (PR) | SIEMENS | 3TX7130-0DF13 |
| 7 | 3 | RELAY, 4PDT, 5A, 220VAC (PPR/MPR/EPR) | IDEC | RY4S-ULAC220-240V |
| 8 | 1 | CIRCUIT BREAKER, 220VAC, 25A, 2 POLE | ABB | S202-K25 |
| 9 | 1 | CIRCUIT BREAKER, 24VDC, 1A, 1 POLE | ABB | S201-C1 |
| 10 | 1 | CIRCUIT BREAKER, 220VDC, 10A, 2 POLE | ABB | S202-C10 |

## ALARM RELAY STATES

MPR = OFF WITH LOSS OF SHIP'S 220VAC (MAIN PWR)

PPR/PR = OFF WITH LOSS OF UPS 220VAC OUT

ERP = OFF WITH LOSS OF SHIP'S 220VAC (EMG PWR)

(ALARMS INTERNAL TO JACKING SYSTEM)



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5*
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES
DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | B.CHAUVIN | DATE 10/15/15 |
| CHECKED | M.GRIMM | DATE 11/29/15 |
| APPROVED | T.WELSH | DATE 12/21/15 |
| P.O. NO. | N/A | REQ. NO. |

TRIYARDS H1028/H1029

JACKING SYSTEM POWER TRANSFER PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9400TP | SIZE A | REVISION
SCALE NONE | SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

# PILOT HOUSE CPU PANEL (PP)

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item No. | Quantity | Description | Manufacturer | Part Number |
| 1 | 1 | PLC, CPU-315-2PN-DP | SIEMENS | 6ES73152EH140AB0 |
| 2 | 3 | DIGITAL INPUT MODULE, 16 PT | SIEMENS | 6ES7321-1BH02-0AA0 |
| 3 | 1 | DIGITAL OUTPUT MODULE, 16PT | SIEMENS | 6ES7322-1BH01-0AA0 |
| 4 | 1 | PROFIBUS CONNECTOR (90 DEG) PASS THRU | SIEMENS | 6ES7 972-0BA12-0XA0 |
| 5 | 2 | SINGLE POLE CIRCUIT BREAKER, 24VDC, 13A | SIEMENS | 5SY6113-7 |
| 6 | 3 | DOUBLE POLE CIRCUIT BREAKER, 120VAC, 3A | SIEMENS | 5SY6203-7 |
| 7 | 1 | DOUBLE POLE CIRCUIT BREAKER, 120VAC, 5A | SIEMENS | 5SY6205-7 |
| 8 | 2 | 24VDC 10AMP QUINT POWER SUPPLY | PHOENIX | 28 66 76 3 |
| 9 | 1 | DIODE MODULE | PHOENIX | 29 38 96 3 |
| 10 | 1 | CANBUS (J1939) TO PROFIBUS GATEWAY | ANYBUS | AB7614 |
| 11 | 1 | PLUS1 CONTROLLER, MC050-118 | SAUER | 11130960 |
| 12 | 1 | PLUS 1 5 PIN CONNECTOR KIT | SAUER | 10100946 |
| 13 | 1 | IE FC RJ45 PLUG 180 | SIEMENS | 6GK1901-1BB10-2AB0 |
| 14 | 1 | DIGITAL OUTPUT MODULE, RELAY, 16PT | SIEMENS | 6ES7322-1HH01-0AA0 |
| 15 | 1 | DIGITAL OUTPUT MODULE, RELAY, 8PT | SIEMENS | 6ES7322-1HF10-0AA0 |
| 16 | 1 | ANALOG IN, 8PT | SIEMENS | 6ES7331-7KF02-0AB0 |
| 17 | 1 | SCALANCE X208 ETHERNET SWITCH | SIEMENS | 6GK5208-0BA10-2AA3 |
| 18 | 1 | SIMATIC S7, MEMORY CARD, 128 KBYTS, 3.3 V | SIEMENS | 6ES7953-8LG20-0AA0 |
| 19 | 1 | CG 150 CAN GATEWAY | SAUER | 10104136 |
| 20 | 2 | 19" COMFORT PANEL, TOUCH OPERATION | SIEMENS | 6AV21240UC020AX0 |



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | REMOVED CAN1 CABLES AND UPDATED ETHERNET AND CAN DESTINATIONS TO MATCH 9000WP | 3/18/16 | BC | TMW |
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 10/28/15 |
| CHECKED M.GRIMM | DATE 12/08/15 |
| APPROVED T.WELSH | DATE 12/21/15 |
| P.O. NO. N/A | REQ. NO. |

TRIYARDS H1028/H1029

JACKING SYSTEM PILOT HOUSE CPU PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500PP | SIZE | REVISION B

SCALE NONE SH. 1 OF 1

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

## NOTES

| (X) = | XLP = |
|---|---|
| PF | PFLP |
| PA | PALP |
| SA | SALP |
| SF | SFLP |



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

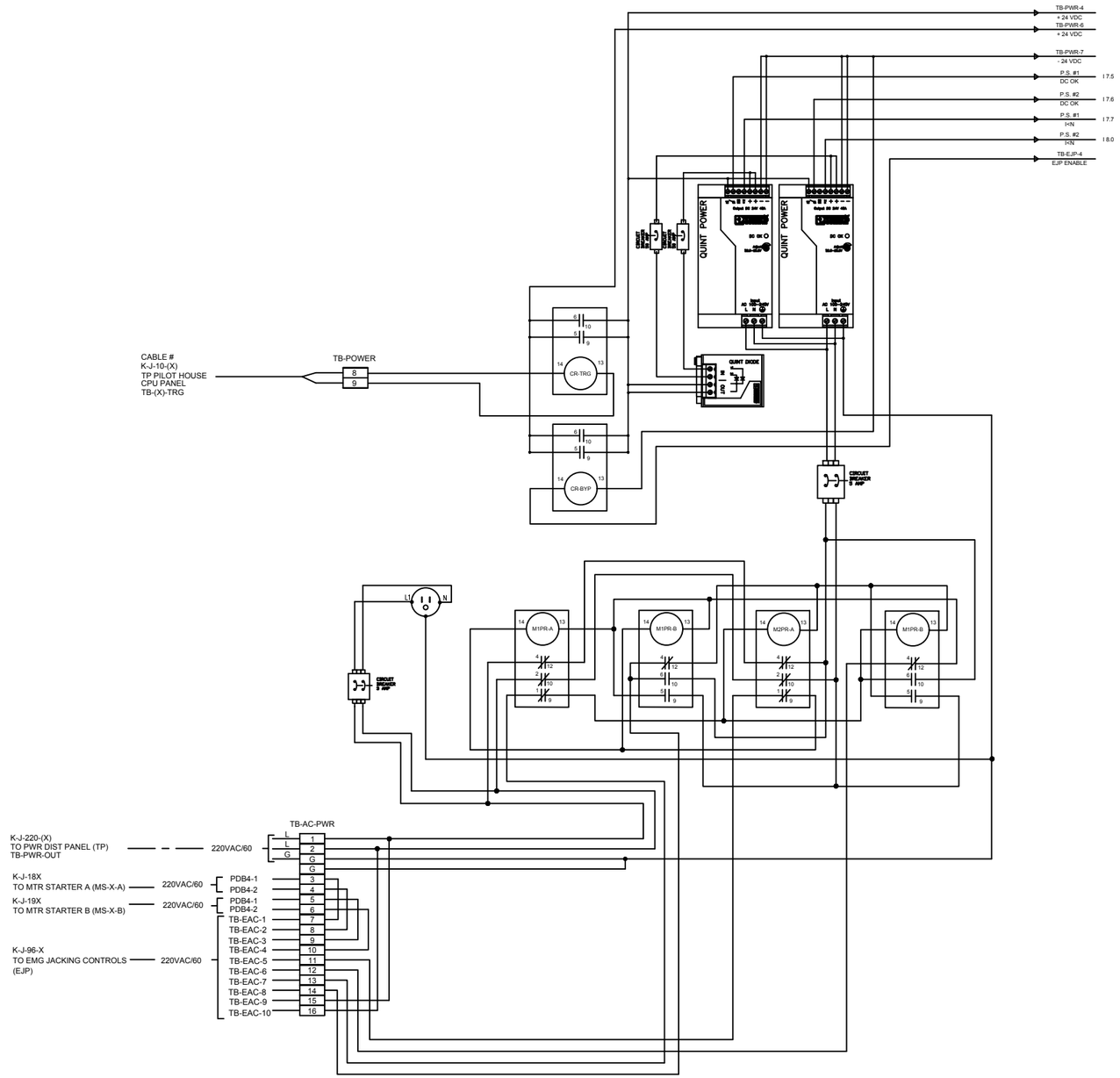
| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 09/14/15 |
| CHECKED T.WELSH | DATE 11/25/15 |
| APPROVED T.WELSH | DATE 12/22/15 |
| P.O. NO. N/A | REQ. NO. |

MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B
SCALE NONE | SH. 1 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020




| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item No. | Quantity | Description | Manufacturer | Part Number |
| 1 | 2 | POWER SUPPLY, 24VDC, QUINT PS/1AC/24DC/40 | PHOENIX | 2866789 |
| 2 | 1 | DIODE MODULE, 40 AMP | PHOENIX | 2938963 |
| 3 | 1 | CIRCUIT BREAKER, 10A, DUAL POLE | ABB | S202P-C10 |
| 4 | 2 | CIRCUIT BREAKER, 50A, SINGLE POLE | ABB | S201P-C50 |
| 5 | 1 | CIRCUIT BREAKER, 3A, DUAL POLE | ABB | S202P-C3 |
| 6 | 2 | POWER RELAY, 24VDC, 5A, DPDT | SIEMENS | 3TX71195LC03 |
| 7 | 2 | POWER RELAY BASE, 11 PIN | SIEMENS | 3TX7144-1E4 |
| 8 | 4 | Relay Plug-In3PDT 10A 120VAC | IDEC | RH3B-ULAC120V |
| 9 | 4 | Relay 3 pole Base | IDEC | SH3B-05 |
| 10 | 1 | 120 VAC RECEPTACLE | PHOENIX | 2963860 |



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 √ ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY B.CHAUVIN DATE 09/14/15
CHECKED T.WELSH DATE 11/25/15
APPROVED T.WELSH DATE 12/22/15
P.O. NO. N/A REQ. NO.

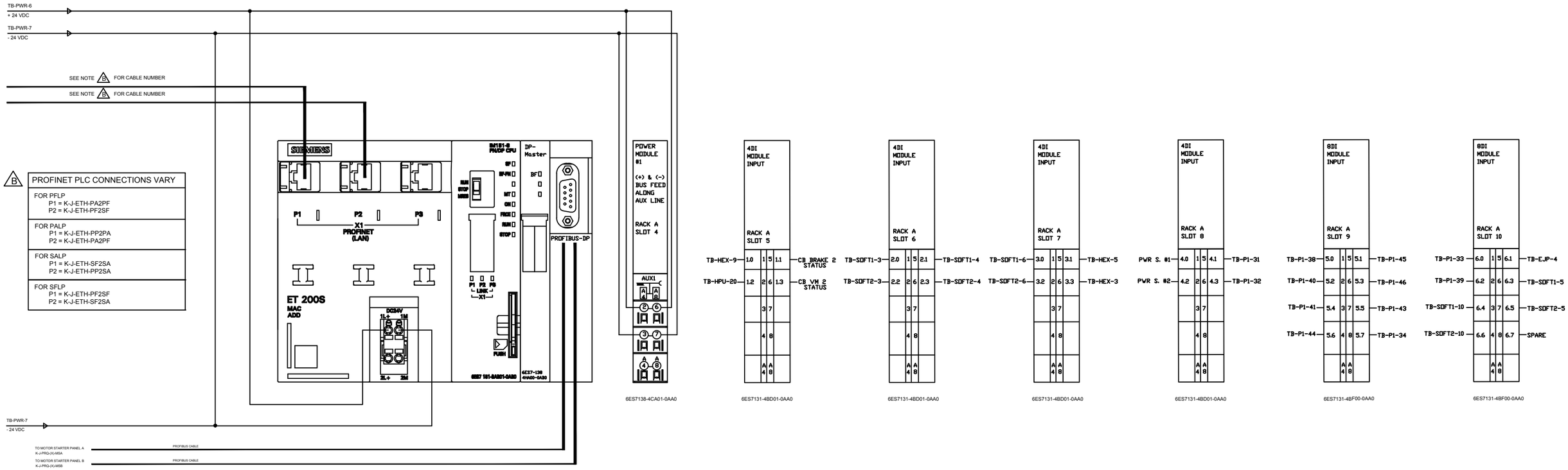
MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP SIZE REVISION B
SCALE NONE SH. 2 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item No. | Quantity | Description | Manufacturer | Part Number |
| 1 | 1 | SIMATIC DP, IM151-8 PN/DP CPU | SIEMENS | 6ES7151-8AB01-0AB0 |
| 2 | 1 | SIMATIC S7, MICRO MEMORY CARD | SIEMENS | 6ES7953-8LF20-0AA0 |
| 3 | 1 | SIMATIC DP, DP MASTER INTERFACE FOR CPU | SIEMENS | 6ES7138-4HA00-0AB0 |
| 4 | 1 | POWER MODULE PM-E | SIEMENS | 6ES7138-4CA01-0AA0 |
| 5 | 1 | TERMINAL MODULE FOR PM-E | SIEMENS | 6ES7193-4CD20-0AA0 |
| 6 | 4 | 4 DI STANDARD 24V DC, 15 MM WIDTH | SIEMENS | 6ES7131-4BD01-0AA0 |
| 7 | 2 | 8 DI DC 24V 15 MM WIDTH | SIEMENS | 6ES7131-4BF00-0AA0 |
| 8 | 6 | UNIVERSAL TERMINAL MODULES | SIEMENS | 6ES7193-4CA40-0AA0 |






| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY B.CHAUVIN DATE 09/14/15
CHECKED T.WELSH DATE 11/25/15
APPROVED T.WELSH DATE 12/22/15
P.O. NO. N/A REQ. NO.

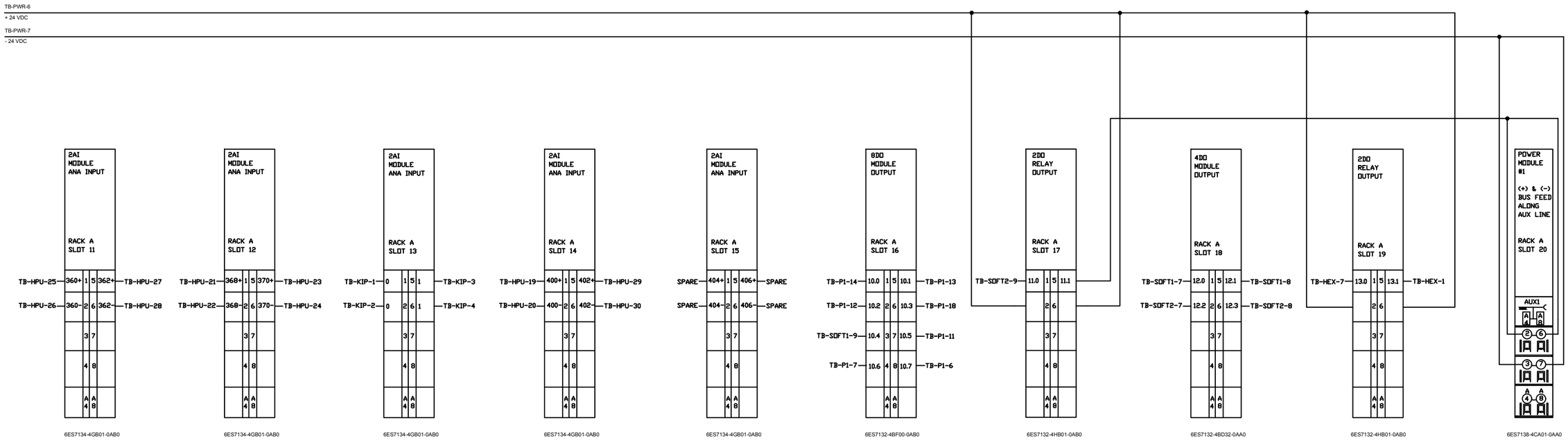
MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP SIZE REVISION B
SCALE NONE SH. 3 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item No. | Quantity | Description | Manufacturer | Part Number |
| 1 | 1 | 8DO MODULE | SIEMENS | 6ES7132-4BF00-0AB0 |
| 2 | 5 | 2 AI MODULE | SIEMENS | 6ES7134-4GB01-0AB0 |
| 3 | 9 | UNIVERSAL TERMINAL MODULES | SIEMENS | 6ES7193-4CA40-0AA0 |
| 4 | 2 | 2DO, RELAY | SIEMENS | 6ES7132-4HB01-0AB0 |
| 5 | 1 | 4DO STANDARD C 24V/2A | SIEMENS | 6ES7132-4BD32-0AA0 |
| 6 | 1 | POWER MODULE PM-E | SIEMENS | 6ES7138-4CA01-0AA0 |
| 7 | 1 | TERMINAL MODULE FOR PM-E | SIEMENS | 6ES7193-4CD20-0AA0 |






| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 09/14/15 |
| CHECKED T.WELSH | DATE 11/25/15 |
| APPROVED T.WELSH | DATE 12/22/15 |
| P.O. NO. N/A | REQ. NO. |

MONTCO OFFSHORE

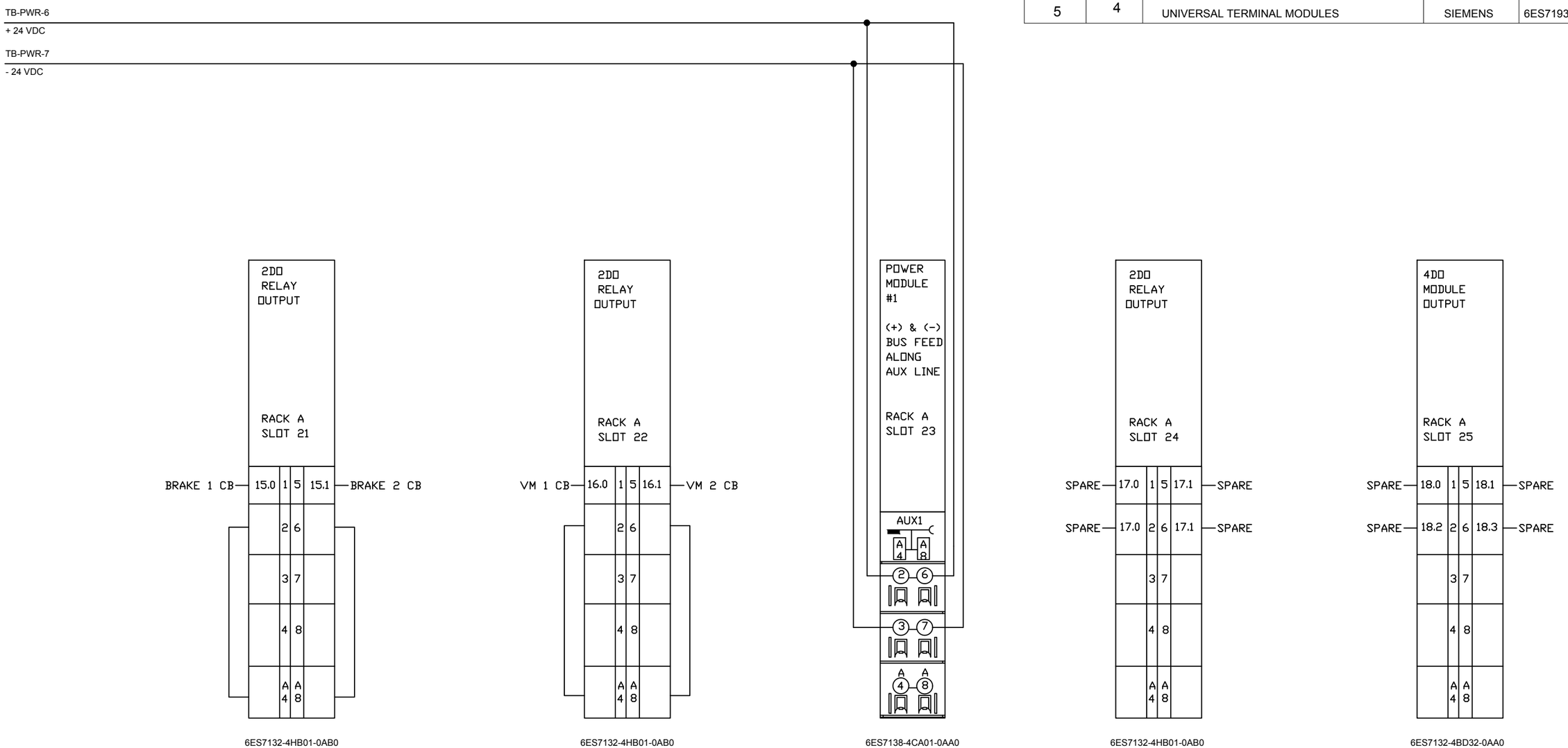
# JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B

SCALE NONE | SH. 4 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item No. | Quantity | Description | Manufacturer | Part Number |
| 1 | 3 | 2DO, RELAY | SIEMENS | 6ES7132-4HB01-0AB0 |
| 2 | 1 | 4DO STANDARD C 24V/2A | SIEMENS | 6ES7132-4BD32-0AA0 |
| 3 | 1 | POWER MODULE PM-E | SIEMENS | 6ES7138-4CA01-0AA0 |
| 4 | 1 | TERMINAL MODULE FOR PM-E | SIEMENS | 6ES7193-4CD20-0AA0 |
| 5 | 4 | UNIVERSAL TERMINAL MODULES | SIEMENS | 6ES7193-4CA40-0AA0 |




6ES7132-4HB01-0AB0 | 6ES7132-4HB01-0AB0 | 6ES7138-4CA01-0AA0 | 6ES7132-4HB01-0AB0 | 6ES7132-4BD32-0AA0



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 09/14/15 |
| CHECKED T.WELSH | DATE 11/25/15 |
| APPROVED T.WELSH | DATE 12/22/15 |
| P.O. NO. N/A | REQ. NO. |

MONTCO OFFSHORE

# JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B
SCALE NONE | SH. 5 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
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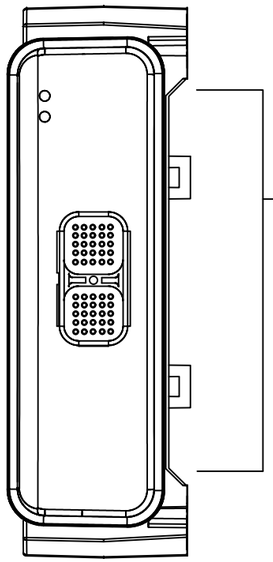


CONTROLLER 1
MODEL 50-118

| Pin | Signal | Destination |
|---|---|---|
| | TB-P1 | |
| 1 | -24VDC | TB-PWR-7 |
| 2 | +24VDC | TB-PWR-6 |
| 3 | CAN0 HI | TB-CAN0-3 |
| 4 | CAN0 LO | TB-CAN0-4 |
| 5 | CAN0 SHD | TB-CAN0-5 |
| 6 | SYNCRO | 8DO 10.7 |
| 7 | SYSTEM READY | 8DO 10.6 |
| 8 | +5VDC SENSOR PWR | TB-PPU-1A&1B (4) |
| 9 | -5VDC SENSOR GND | TB-PPU-1A&1B (5) |
| 10 | SPARE | SPARE |
| 11 | RESET PPU | 8DO 10.5 |
| 12 | BITPLACE 2 | 8DO 10.2 |
| 13 | LOCAL MODE DOWN | 8DO 10.1 |
| 14 | LOCAL MODE UP | 8DO 10.0 |
| 15 | EJP ENABLE | TB-EJP(4) |
| 16 | DIRECTION A | TB-PPU-1A (2) |
| 17 | DIRECTION B | TB-PPU-1B (2) |
| 18 | PRELOAD | 8DO 10.3 |
| 19 | SPARE | SPARE |
| 20 | CAN1 HI | TB-EJP(1) |
| 21 | CAN1 LO | TB-EJP(2) |
| 22 | CAN1 SHD | TB-EJP(3) |
| 23 | PPU A SPEED 2 | TB-PPU-1A (1) |
| 24 | PPU A SPEED 1 | TB-PPU-1A (3) |
| 25 | PPU B SPEED 2 | TB-PPU-1B (1) |
| 26 | PPU B SPEED 1 | TB-PPU-1B (3) |
| 27 | PPU A TEMP | TB-PPU-1A (6) |
| 28 | PPU B TEMP | TB-PPU-1B (6) |
| 29 | SPARE | SPARE |
| 30 | SPARE | SPARE |
| 31 | UP SIGNAL | 4DI 4.1 |
| 32 | DOWN SIGNAL | 4DI 4.3 |
| 33 | 50-118 HEARTBEAT | 8DI 6.0 |
| 34 | SYNC JSTK DTENT | 8DI 5.7 |
| 35 | BRAKE COIL 1 | CB BRAKE 1 |
| 36 | BRAKE COIL 2 | CB BRAKE 2 |
| 37 | EDC #1 FWD A-B | TB-HPU-1 |
| 38 | BITPLACE A | 8DI 5.0 |
| 39 | CAN DATA PROBLEM | 8DI 6.2 |
| 40 | BITPLACE 1 | 8DI 5.2 |
| 41 | BITPLACE 3 | 8DI 5.4 |
| 42 | EDC #1 REV D-C | TB-HPU-3 |
| 43 | BITPLACE 4 | 8DI 5.5 |
| 44 | JSTK DTENT | 8DI 5.6 |
| 45 | BITPLACE B | 8DI 5.1 |
| 46 | BITPLACE 2 | 8DI 5.3 |
| 47 | +24VDC | TB-PWR-6 |
| 48 | +24VDC | TB-PWR-6 |
| 49 | +24VDC | TB-PWR-6 |
| 50 | +24VDC | TB-PWR-6 |

BILL OF MATERIALS

| Item No. | Quantity | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 1 | 1 | PLUS1 CONTROLLER, MC050-118 | SAUER DANFOSS | 11130960 |
| 2 | 2 | PLUS 1 PROGRAMMING PLUG | HYDRAQUIP CSI | DINRAIL-DB9 |



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

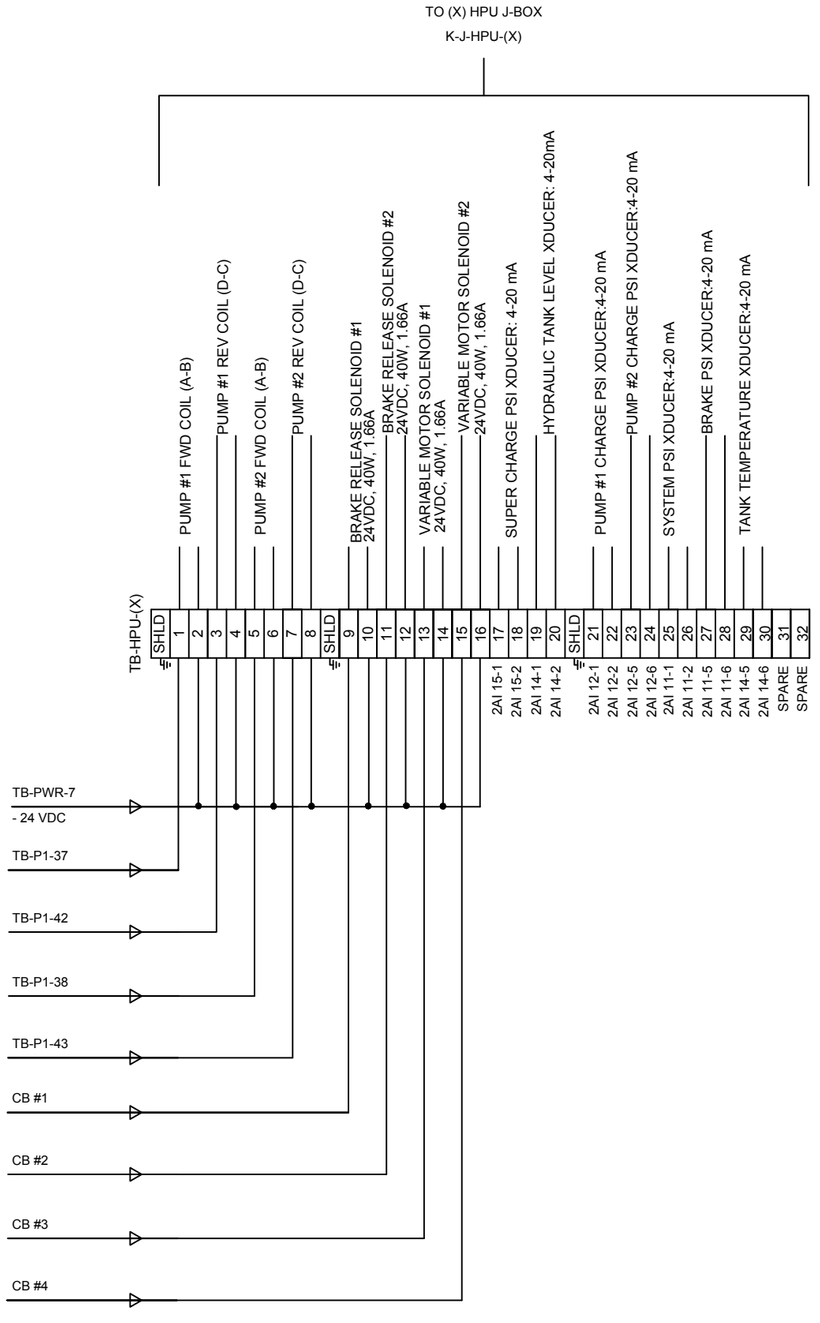
| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 09/14/15 |
| CHECKED T.WELSH | DATE 11/25/15 |
| APPROVED T.WELSH | DATE 12/22/15 |
| P.O. NO. N/A | REQ. NO. |

MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B
SCALE NONE SH. 6 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020






REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
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ANGLES ±.5°
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 09/14/15 |
| CHECKED T.WELSH | DATE 11/25/15 |
| APPROVED T.WELSH | DATE 12/22/15 |
| P.O. NO. N/A | REQ. NO. |

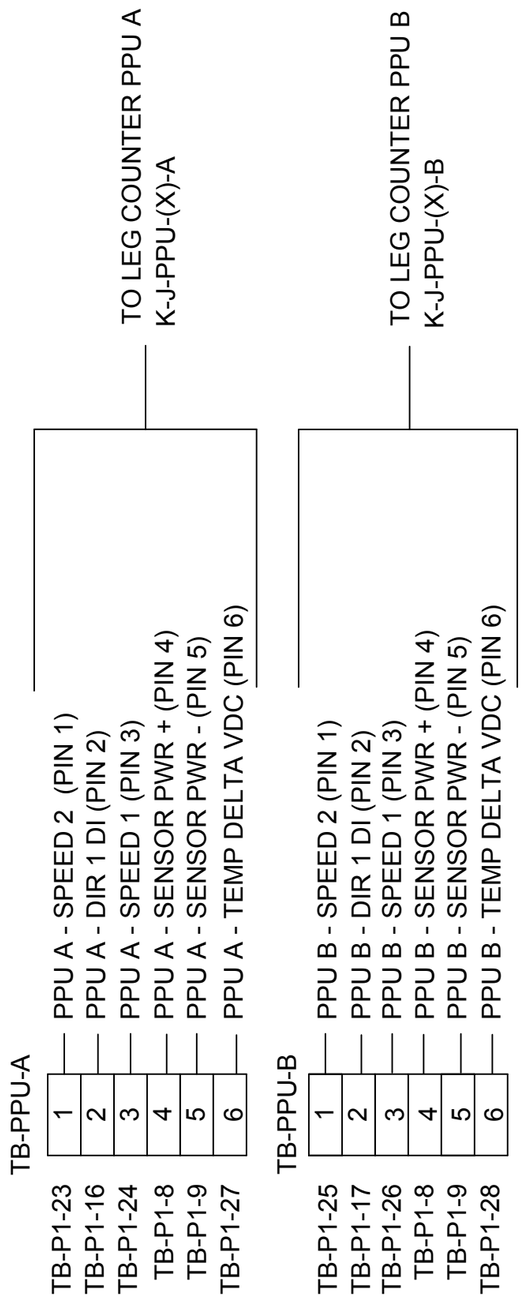
MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B

SCALE NONE | SH. 7 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020






| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY B.CHAUVIN DATE 09/14/15
CHECKED T.WELSH DATE 11/25/15
APPROVED T.WELSH DATE 12/22/15
P.O. NO. N/A REQ. NO.

MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP SIZE REVISION B
SCALE NONE SH. 8 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
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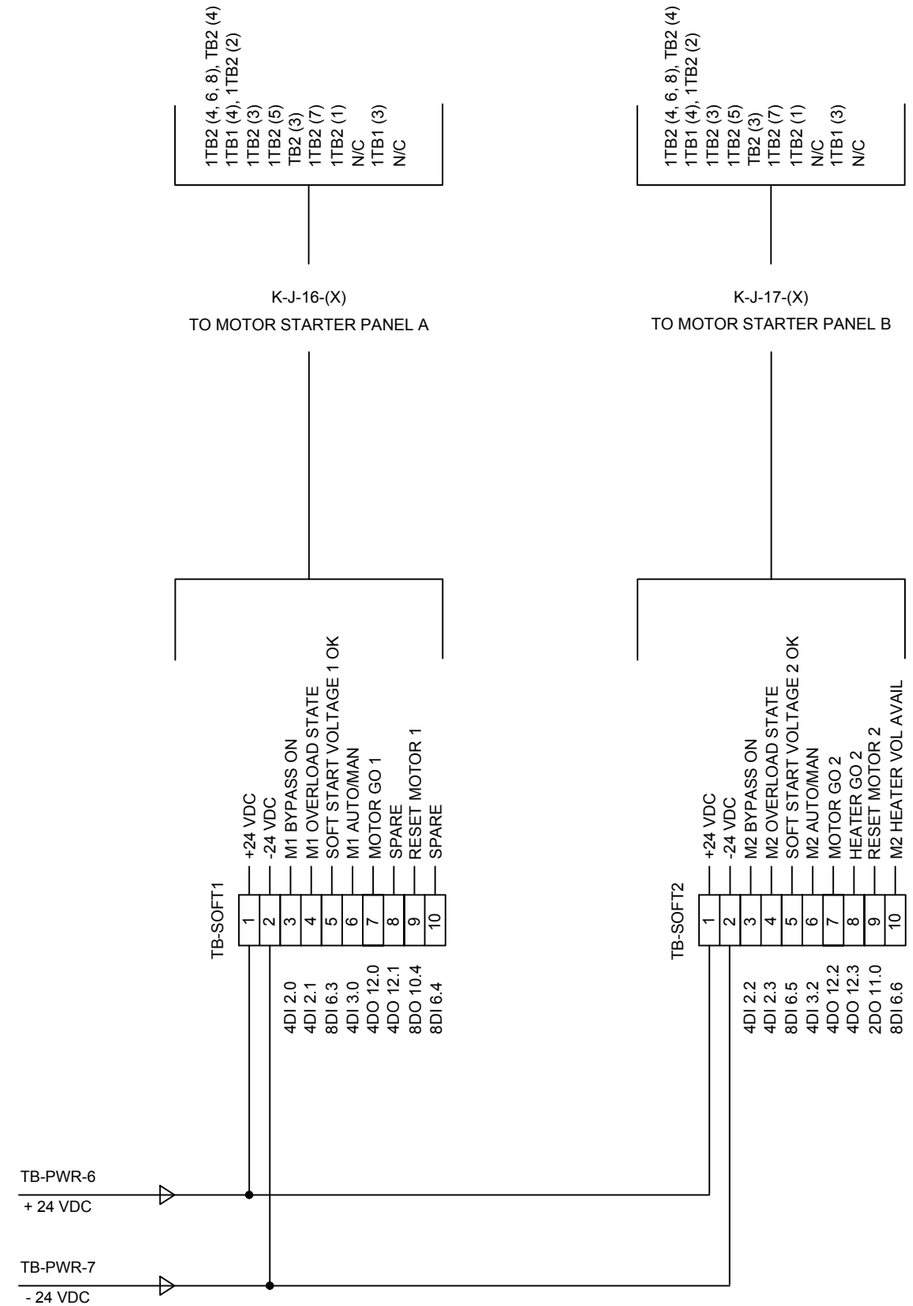




REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
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.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY B.CHAUVIN | DATE 09/14/15 |
| CHECKED T.WELSH | DATE 11/25/15 |
| APPROVED T.WELSH | DATE 12/22/15 |
| P.O. NO. N/A | REQ. NO. |

MONTCO OFFSHORE

# JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B

SCALE NONE SH. 9 OF 12

Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
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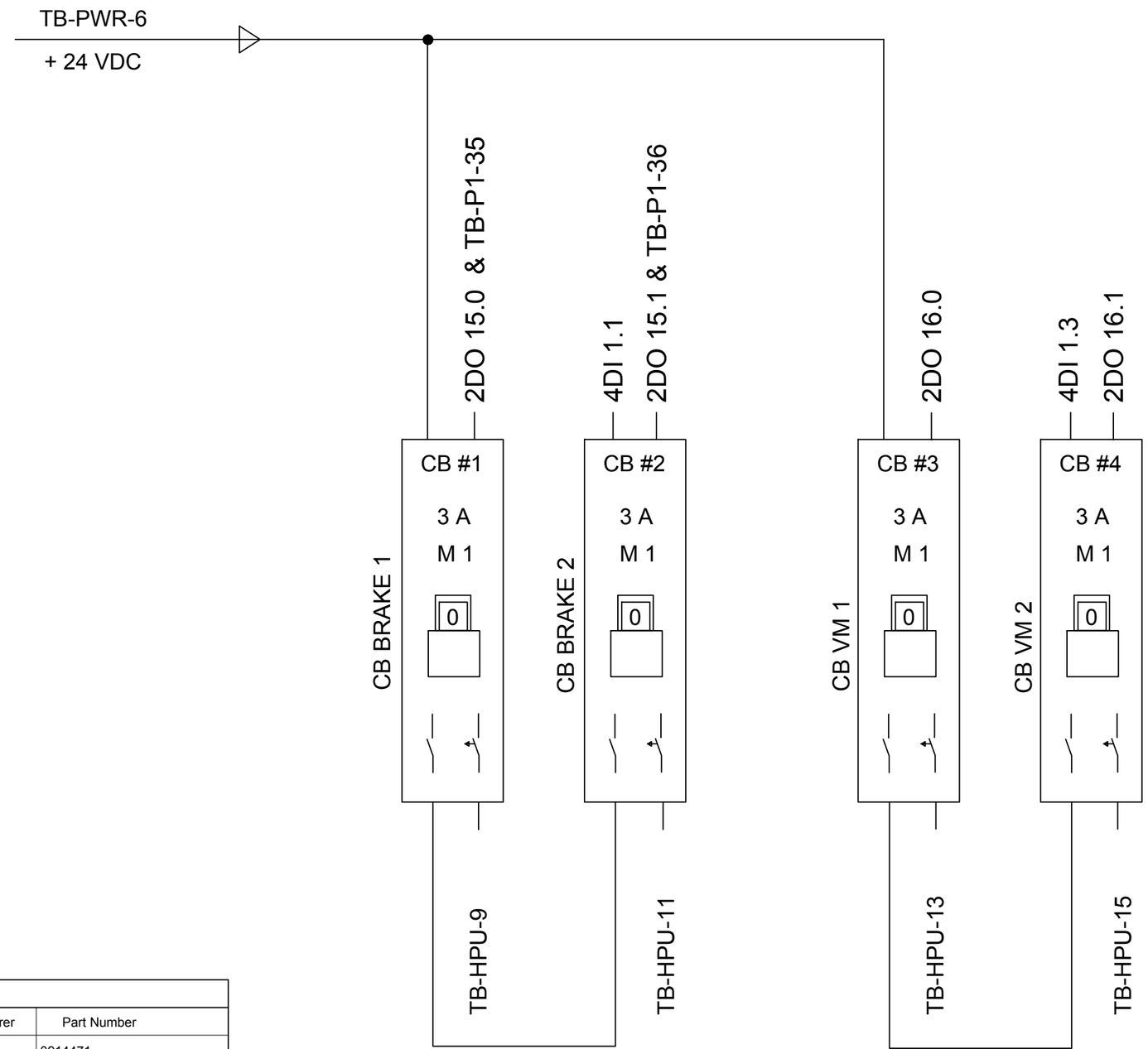


BILL OF MATERIALS

| Item No. | Quantity | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 1 | 4 | CIRCUIT BREAKER, 3A, DIN RAIL MOUNTED | PHOENIX | 0914471 |
| | | | | |
| | | | | |



REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
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TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
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125 √ ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

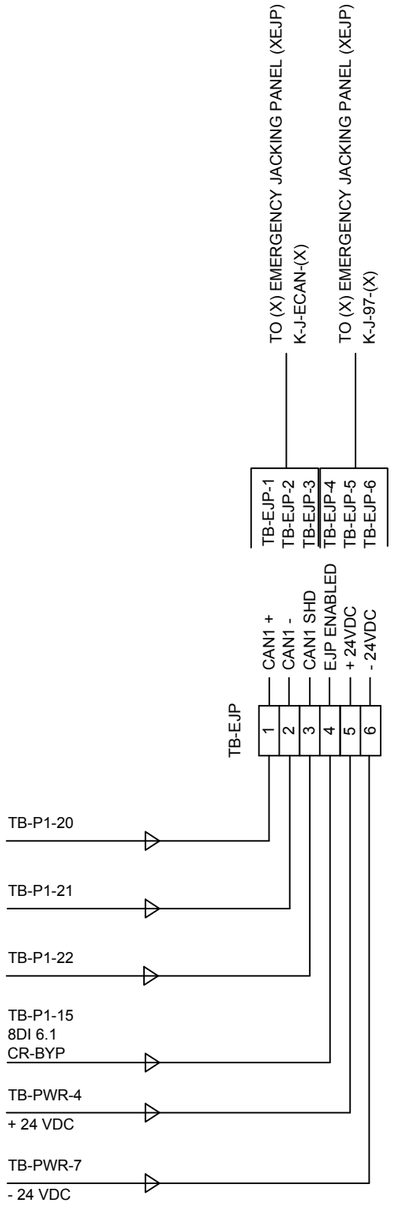
DRAWN BY B.CHAUVIN DATE 09/14/15
CHECKED T.WELSH DATE 11/25/15
APPROVED T.WELSH DATE 12/22/15
P.O. NO. N/A REQ. NO.

MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

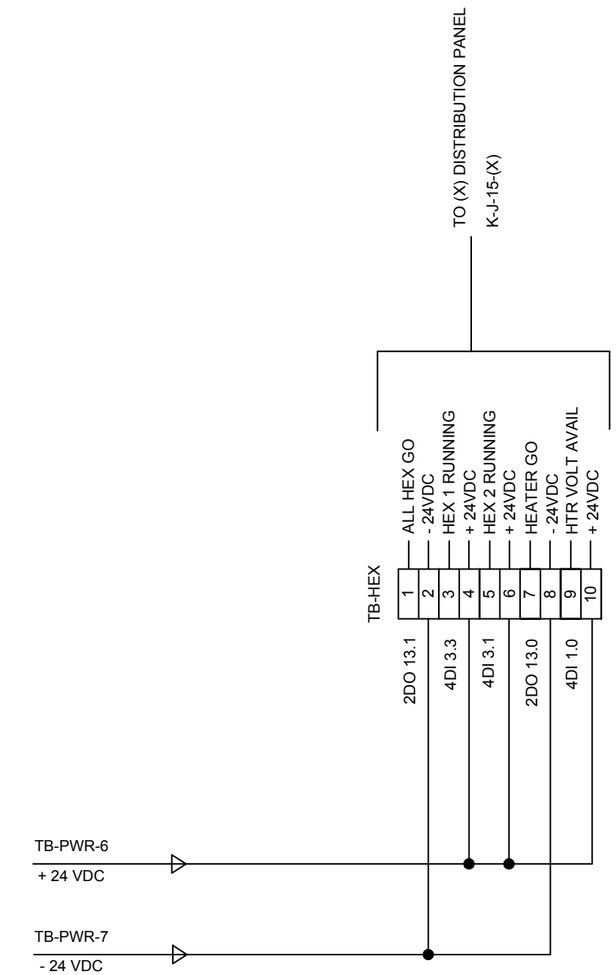
DWG. NO. 4680-9500XLP SIZE REVISION B
SCALE NONE SH. 10 OF 12

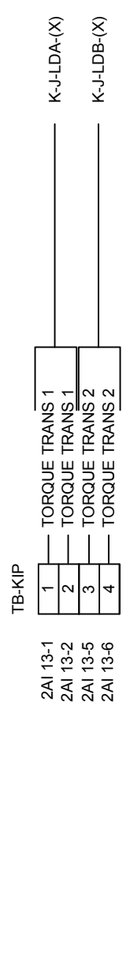
Hydraquip
CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

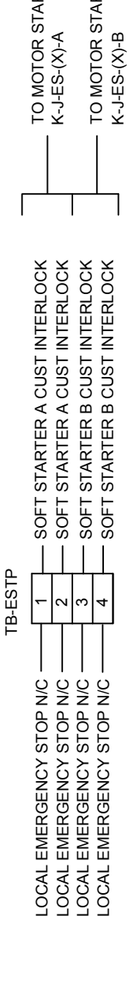











REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | B.CHAUVIN | DATE 09/14/15 |
| CHECKED | T.WELSH | DATE 11/25/15 |
| APPROVED | T.WELSH | DATE 12/22/15 |
| P.O. NO. | N/A | REQ. NO. |

MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B
SCALE NONE SH. 11 OF 12

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HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

B

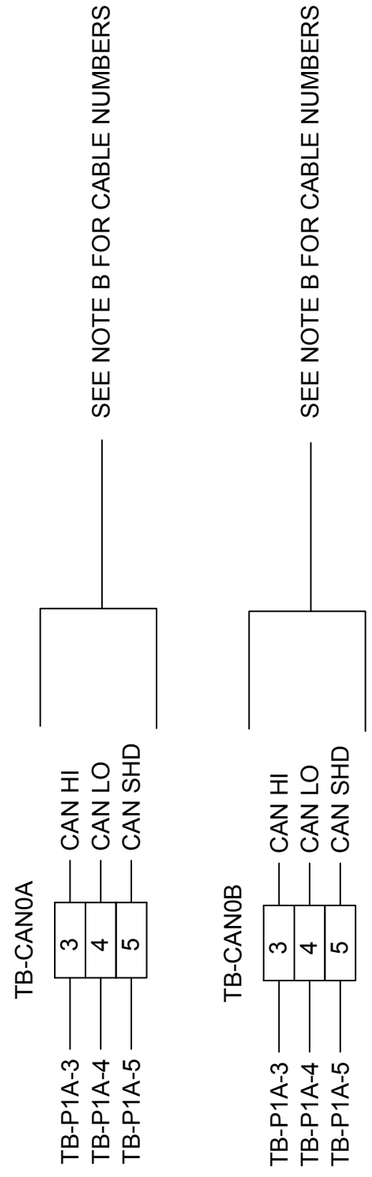
## CAN BUS CABLE NUMBERS

FOR PFLP
TB-CAN0A = K-J-CAN-PA2PF
TB-CAN0B = K-J-CAN-PF2SF

FOR PALP
TB-CAN0A = K-J-CAN-PP2PA
TB-CAN0B = K-J-CAN-PA2PF

FOR SALP
TB-CAN0A = K-J-CAN-SF2SA
TB-CAN0B = K-J-CAN-PP2SA

FOR SFLP
TB-CAN0A = K-J-CAN-PF2SF
TB-CAN0B = K-J-CAN-SF2SA






REVISIONS

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| B | UPDATED PROFIBUS CABLE NUMBERS | 3/22/16 | MDG | TMW |
| A | NEW RELEASE | 12/22/15 | AMN | TMW |

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
.XX ±.01
.XXX ±.005
ANGLES ±.5°
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT
SUPERSEDES DATE

DO NOT SCALE DRAWING

| | | |
|---|---|---|
| DRAWN BY | B.CHAUVIN | DATE 09/14/15 |
| CHECKED | T.WELSH | DATE 11/25/15 |
| APPROVED | T.WELSH | DATE 12/22/15 |
| P.O. NO. | N/A | REQ. NO. |

MONTCO OFFSHORE

JACKING SYSTEM LEG PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9500XLP | SIZE | REVISION B
SCALE NONE SH. 12 OF 12

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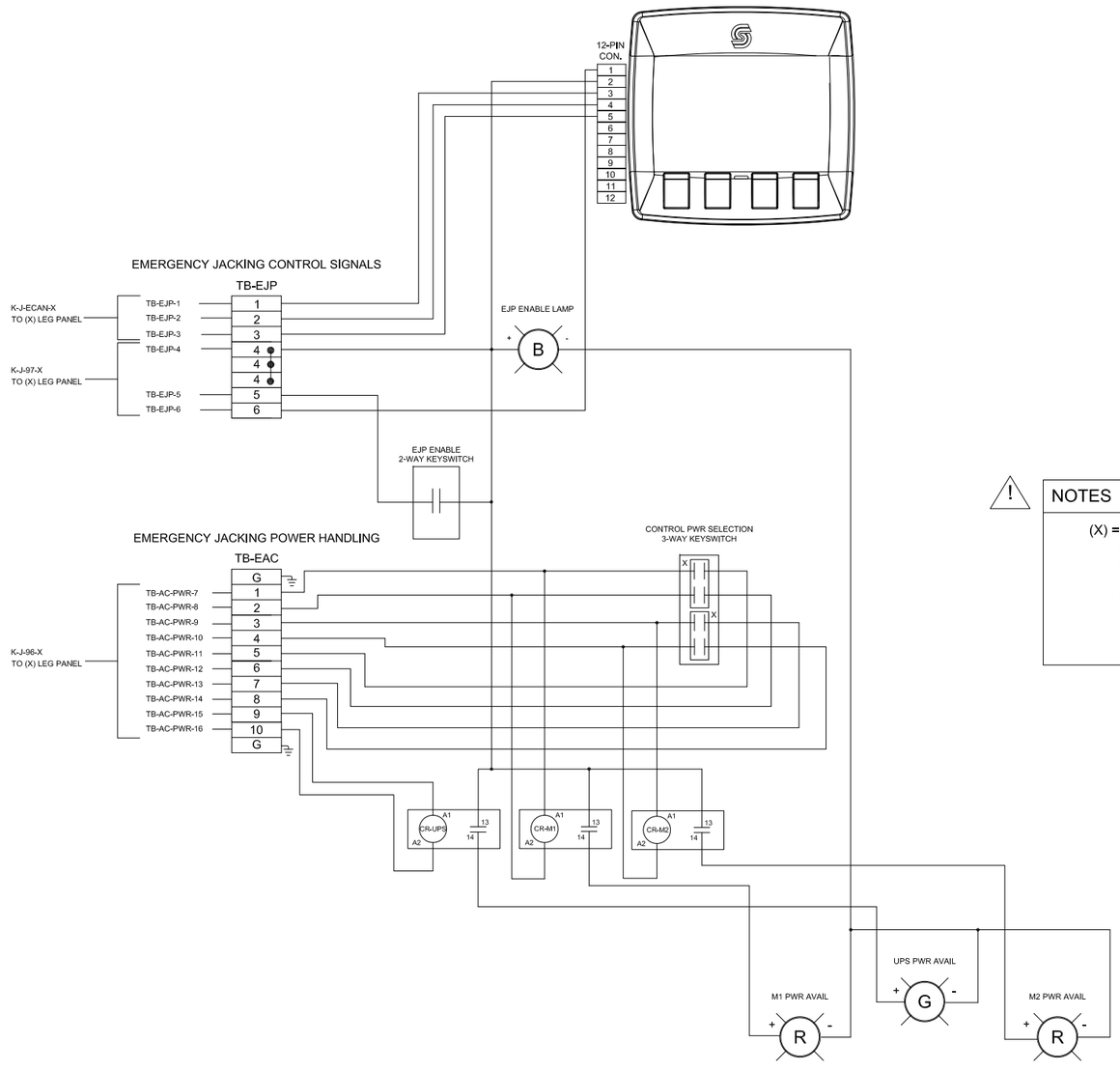
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

# EMERGENCY JACKING CONTROLS

| BILL OF MATERIALS | | | | |
|---|---|---|---|---|
| Item No. | Quantity | Description | Manufacturer | Part Number |
| 1 | 1 | EMG SCREEN, DP200 | DANFOSS | 10106883 |
| 2 | 1 | 3 WAY KEY SW, MAINTAINED | IDEC | ASW3K00-1 |
| 3 | 1 | 2POS KEY-RL SW, MAINTAINED | IDEC | HW1K-2BF20 |
| 4 | 5 | NO CONTACT BLOCK | IDEC | HW-C10 |
| 5 | 2 | INDICATOR, LED; RED; 11/16 IN.; 20 MA | DIALIGHT | 557-1505-203F |
| 6 | 1 | INDICATOR, LED; GREEN; 11/16 IN.; 20 MA | DIALIGHT | 557-1605-203F |
| 7 | 1 | INDICATOR, LED; BLUE; 11/16 IN.; 20 MA | DIALIGHT | 557-1805-203F |
| 8 | 3 | RELAY, NON LATCHING, SPDT, 240 V, 6 A | IDEC | RV8H-L-AD220 |




⚠

## NOTES

| (X) = | XLP = |
|---|---|
| PF | PFLP |
| PA | PALP |
| SA | SALP |
| SF | SFLP |

THIS DRAWING IS THE PROPERTY OF HYDRAQUIP CUSTOM SYSTEMS, INC. AND IS CONSIDERED CONFIDENTIAL INFORMATION. THE DRAWING AND DESIGN ARE BASED ON SPECIFICATIONS AND OTHER DATA FURNISHED BY THE BUYER. SELLER SHALL NOT BE RESPONSIBLE FOR ANY DAMAGE CLAIMED BY BUYER AS A RESULT OF ALLEGED ERRORS OR OMISSIONS IN THE SPECIFICATIONS OR FURNISHED DATA. IT IS THE RESPONSIBILITY OF THE BUYER TO PROVIDE ALL SAFETY DEVICES AS DEEMED NECESSARY AND/OR REQUIRED BY LAW.

| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY B.CHAUVIN — DATE 10/13/15
CHECKED M.GRIMM — DATE 11/18/15
APPROVED T.WELSH — DATE 12/21/15
P.O. NO. N/A — REQ. NO.

TRIYARDS H1028/H1029

JACKING SYSTEM EMERGENCY JACKING PANEL ELECTRICAL DIAGRAM

DWG. NO. 4680-9700EJP — SIZE — REVISION A

SCALE NONE — SH. 1 OF 1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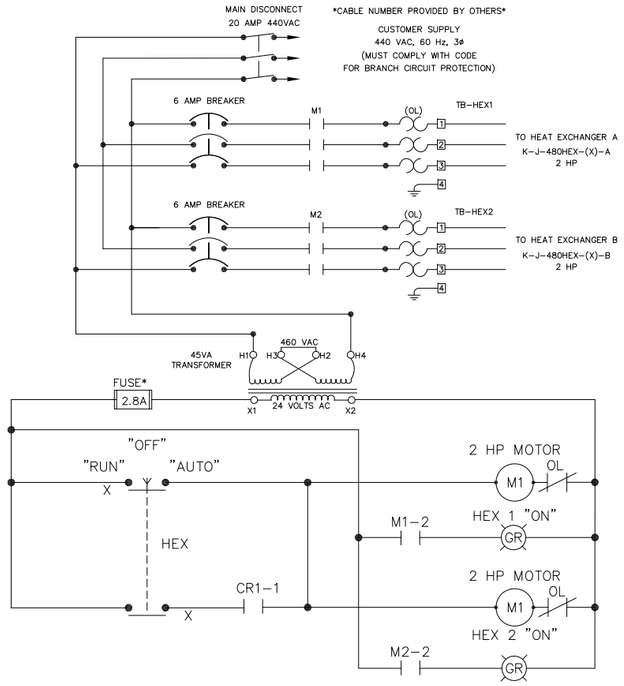
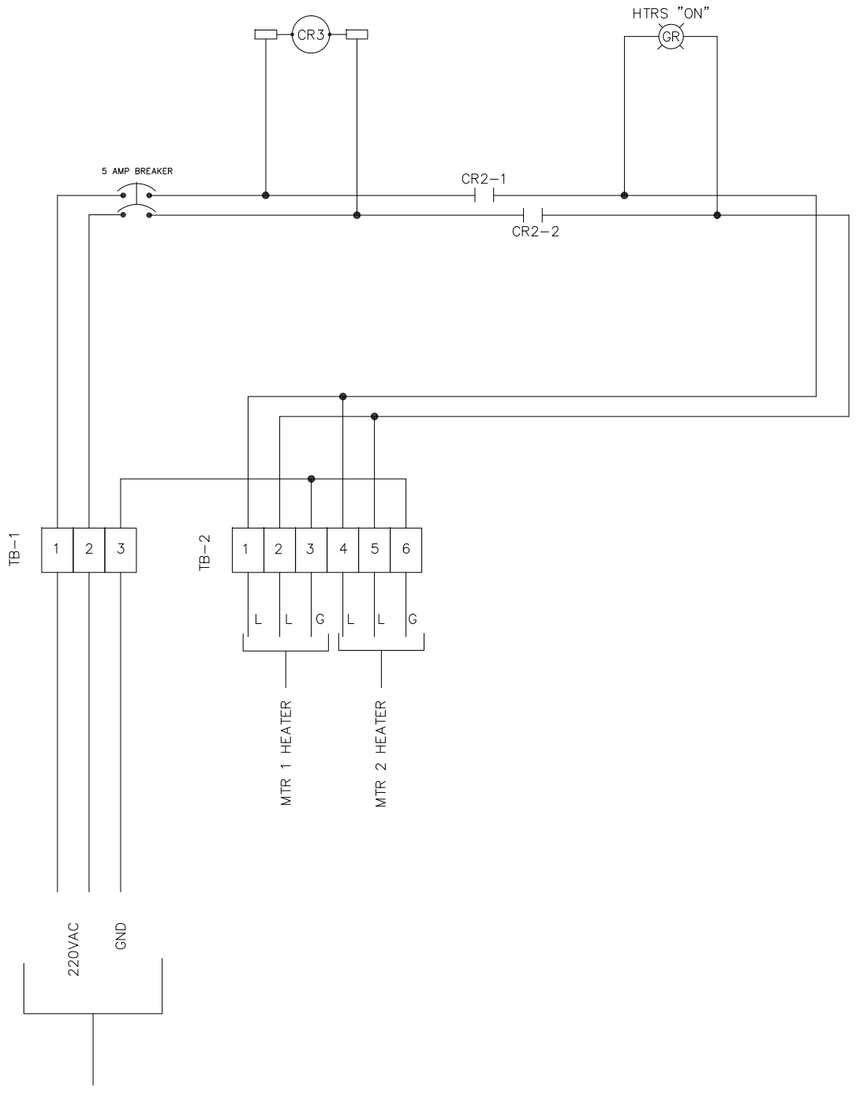
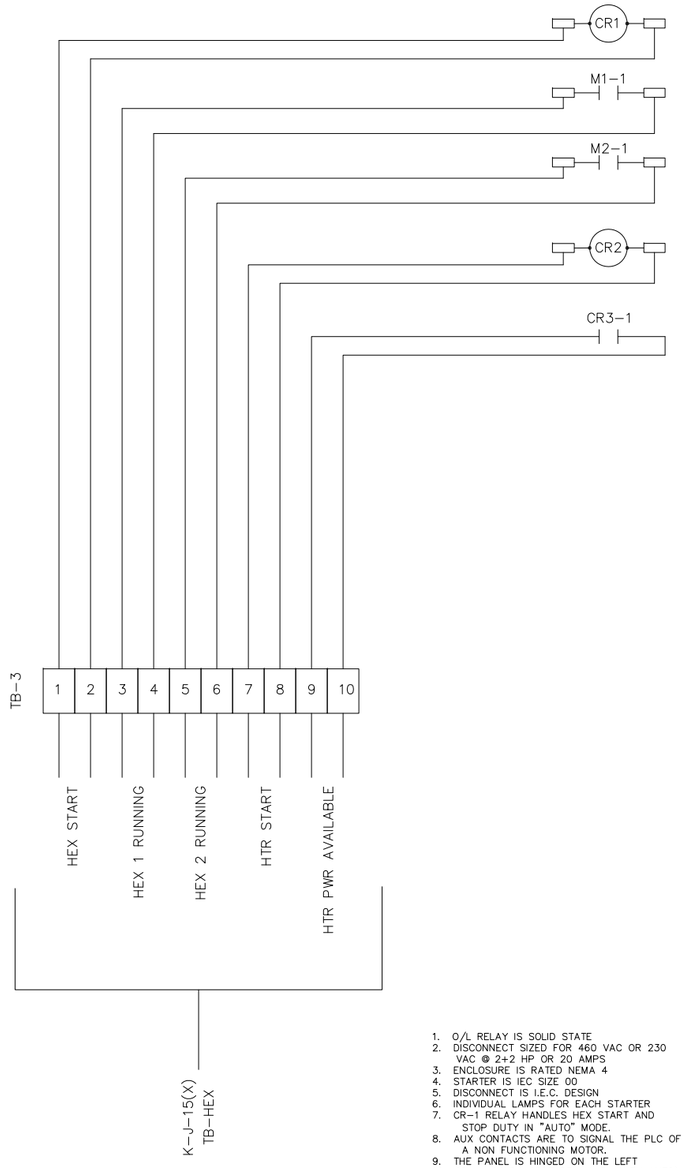



*CABLE NUMBER PROVIDED BY OTHERS*
CUSTOMER SUPPLY
220 VAC, 60 Hz, 1ø
(MUST COMPLY WITH CODE
FOR BRANCH CIRCUIT PROTECTION)




1. O/L RELAY IS SOLID STATE
2. DISCONNECT SIZED FOR 460 VAC OR 230 VAC @ 2+2 HP OR 20 AMPS
3. ENCLOSURE IS RATED NEMA 4
4. STARTER IS IEC SIZE 00
5. DISCONNECT IS I.E.C. DESIGN
6. INDIVIDUAL LAMPS FOR EACH STARTER
7. CR-1 RELAY HANDLES HEX START AND STOP DUTY IN "AUTO" MODE.
8. AUX CONTACTS ARE TO SIGNAL THE PLC OF A NON FUNCTIONING MOTOR.
9. THE PANEL IS HINGED ON THE LEFT
10. CR-1: 24VDC SPDT RELAY, 5A (HEX AUTO)
11. CR-2: 24VDC DPDT RELAY, 10A (HTR)
12. CR-3: 220VAC 4PDT, 5A (VOLT AVAIL)
13. (X) = PF,PA,SA,SF



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 12/21/15 | AMN | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED
X/Y ±1/16
.X ±.1
ANGLES ±.5°
.XX ±.01
.XXX ±.005
125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

DRAWN BY B.CHAUVIN DATE 08/03/15
CHECKED M.GRIMM DATE 11/25/15
APPROVED T.WELSH DATE 12/21/15
P.O. NO. N/A REQ. NO.

TRIYARDS H1028/H1029

JACKING SYSTEM
DISTRIBUTION PANEL
ELECTRICAL DIAGRAM

DWG. NO. 4680-9800HS SIZE A REVISION
SCALE NONE SH. 1 OF 1

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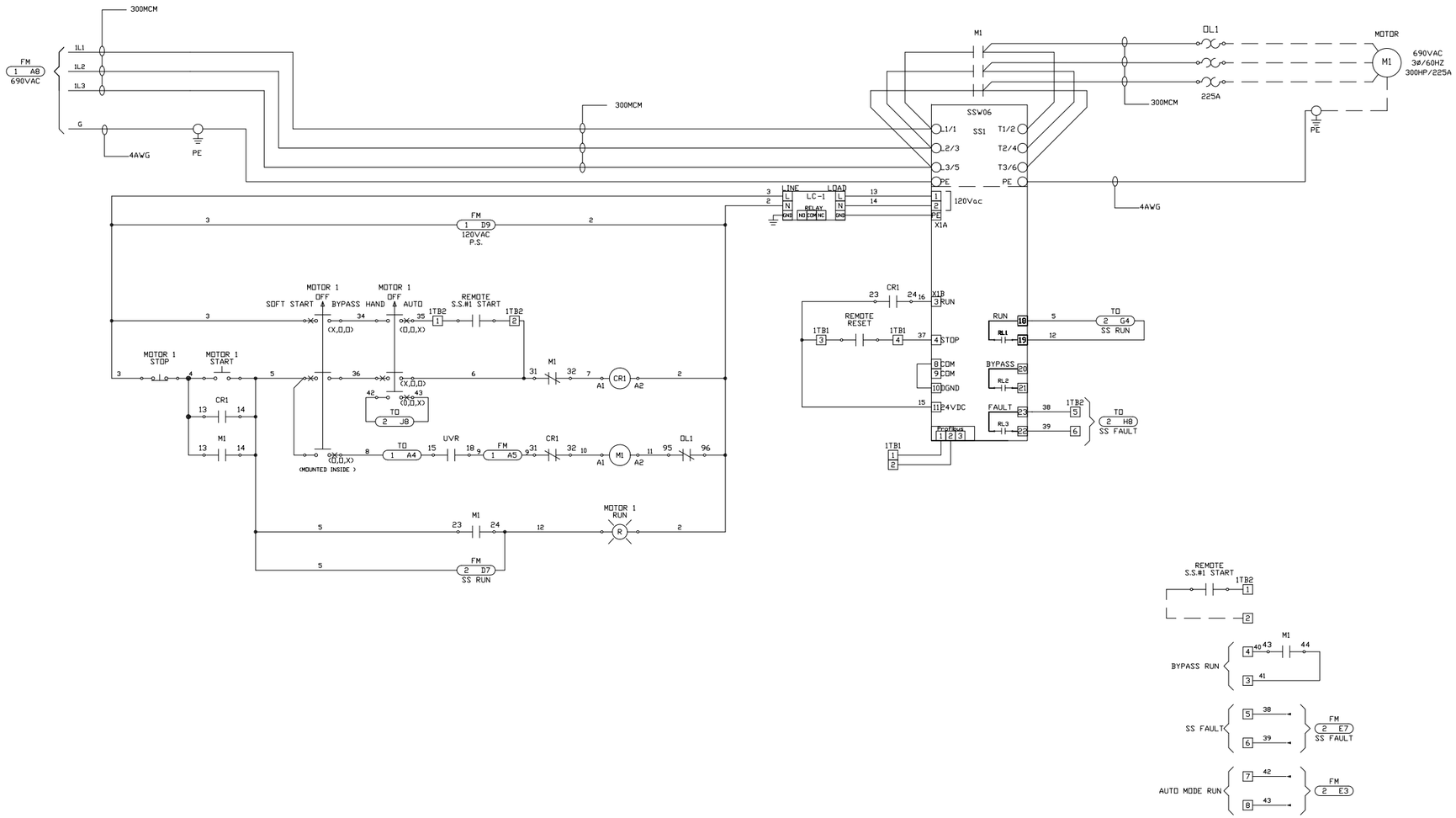
Telephone: (281) 822-5000
Fax: (281) 822-5020




WIRING NOTES:

1. SINGLE CONDUCTOR NON-SHIELDED CONTROL WIRE IS "16 AWG", EXCEPT AS NOTED.
2. SINGLE OR MULTI-COND SHIELDED CABLE IS BELDEN, EXCEPT AS NOTED.
3. DO NOT TRIM UNTERMINATED SHIELDS. FOLD BACK AND INSULATE.
4. "ISG" = INSTRUMENT GROUND. "PE" = PRIMARY EARTH GROUND.
5. RUN ALL "PE" IN #14 AWG GREEN.
6. STRANDED CONDUCTORS SHALL BE TERMINATED USING ABB INSULATED FERRULES OR EQUAL.

| REV | DATE | REVISION NOTE | DRAWN | CHKD | APPR |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| A | 10/09/15 | REMOVED PDBs | EM | BH | |
| – | 10/02/15 | FIRST RELEASE | EM | BH | |

C:\Users\harmonb\Desktop\HMC_Logo.jpg

TITLE: CUSTOM 300HP SS WITH BYPASS 3Ø/60Hz/690VAC

| ENGINEER: | SCALE: N/A | SHEET NO: E2 |
|---|---|---|
| PO#/CUSTOMER UNITS # 4680/4740 HYDRAQUIP | DRAWING NO: 30019SS71F04.E2 | REV: A |



| REV | DESCRIPTION | DATE | CHG BY | APPVL |
|---|---|---|---|---|
| A | NEW RELEASE | 09/22/15 | MJP | TMW |

REVISIONS

TOLERANCE UNLESS OTHERWISE SPECIFIED: X/Y ±1/16; .X ±.1; .XX ±.01; .XXX ±.005; ANGLES ±.5°; 125 V ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

SUPERSEDES DATE

DO NOT SCALE DRAWING

| | |
|---|---|
| DRAWN BY M.PALMER | DATE 09/22/15 |
| CHECKED T.WELSH | DATE 09/22/15 |
| APPROVED T.WELSH | DATE 09/22/15 |
| P.O. NO. N/A | REQ. NO. |

TRIYARDS H1028/H1029

SOFT MOTOR STARTER WIRING DIAGRAM, TYP PER ELECTRIC MOTOR PER HPU

DWG. NO. 4680-9900MS | SIZE | REVISION A

SCALE NONE SH. 2 OF 2

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CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.
HOUSTON, TEXAS 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

# Section 8 – Data Sheets

This section includes all pertinent cutsheet information for all major and minor mechanical and electrical components of the system.

# Section 9 – ABS Documentation

This section includes all pertinent ABS Documentation for this system.

| | |
|---|---|
| **ABSID:** | **YY262247**<br>**YY262248** |
| **SHIPYARD:** | **SAIGON SHIPYAR CO., LTD.,** |
| **FACILITY NAME:** | **FALCON PEARL**<br>**FALCON DIAMOND** |
| **FACILITY TYPE:** | **SELF ELEVATING UNIT** |
| **HULL NUMBER:** | **H1028**<br>**H1029** |
| **PROJECT NO:** | **3509218** |
| **TASK NO:** | **T1637954/T1628883/T1592039**<br>**/T1481689/T1448771** |
| **REFER TO:** | **HZ/ GK/ CH** |

**Date: 01 June, 2016 (Updated Hydraulic drawings)**

**Subject:** **Design Review of Mechanical/Hydraulic/Electrical aspects of Jacking Systems for Hull #: H1028 & H1029**
**Fairfield Jacking Gearbox – Model Number S60A**
**P/N: S60A24437401**
**Hydraquip Assembly DWG#: 4680-7501 Rev C & 4680-7502, Rev. E**

**Drawings/Documents as per attached list**

HYDRAQUIP CUSTOM SYSTEMS, INC.
12311 CUTTEN RD.,
HOUSTON, TX 77066
UNITED STATES

Attention: Mr. TODD WELSH/Mr. MAXWELL PALMER

We have your transmittals submitting copies of drawings & documentation as listed therein on the above subject and with regard thereto have to advise that insofar as our requirements for Classification are concerned, the arrangements and details as indicated appear satisfactory in association with the following design conditions and comments:

- The design review of the subject drawings was in accordance with ABS 2014 Rules for Building and Classing Mobile Offshore Drilling units.

  **Effective Ratings:**
  (Approx. 08% Friction loss at Rack & Pinion and Rack & Guide is considered for Jacking)

  Maximum Normal Jacking Load Pinion Capacity: **162, 660 lbf (73.78 MT) @ 0.85 rpm for 146 hours**

  Maximum Effective Normal Jacking Weight (based on 68 pinions): 5017.13 MT

  Pre- Load Jacking Load Pinion Capacity: N/A

  Total maximum preload Weight: 5897.4 MT

  Normal Holding Load Pinion Capacity: 191, 200 lbf (86.7 MT)

  Severe Storm Holding Load Pinion Capacity: **244, 400 lbf (110.8 MT)**

  Minimum Design Temperature: **-20°C**

| | |
|---|---|
| **ABSID:** | **YY262247**<br>**YY262248** |
| **SHIPYARD:** | **SAIGON SHIPYAR CO., LTD.,** |
| **FACILITY NAME:** | **FALCON PEARL**<br>**FALCON DIAMOND** |
| **FACILITY TYPE:** | **SELF ELEVATING UNIT** |
| **HULL NUMBER:** | **H1028**<br>**H1029** |
| **PROJECT NO:** | **3509218** |
| **TASK NO:** | **T1637954/T1628883/T1592039**<br>**/T1481689/T1448771** |
| **REFER TO:** | **HZ/ GK/ CH** |

**Date: 01 June, 2016 (Updated Hydraulic drawings)**

***NOTE:*** *Please be advised that the above rating should not be exceeded & should be reflected in the Operational Manual of the H1028 & H1029. The jacking system and holding mechanism on self-elevating units are to be designed and constructed with sufficient redundancy so that upon failure of any one component, the system will prevent an uncontrolled descent of the unit. This is to be accomplished by either continuing to jack to a safe position or holding in place. Approved procedures are to be provided to allow emergency raising or lowering of the unit after failure in the case the unit is holding in an unsafe position and should be reflected in the Operational Manual of the H1028/ H1029.*

- The design and the holding capacity of the brake are to meet ABS 2014 MODU rules. The brake holding capacity is to be at least equal to 120% of the maximum required brake torque associated with the maximum rated load applied to the climbing pinion from all loading conditions.

- Every torque carrying mechanical linkages from the brake or motor to the input shaft of the subject gearbox shall be rated at not less than the maximum torque specified by the motor and brake specification. The brake used in association with this gearbox in this application must be a spring loaded and power opened design where the power arrangement are made such that the power that holds the brakes open is the same as the power that runs the jacking motors. If power driving the motor that turns any given jacking pinion fails, power holding the brakes associated with that pinion open must also fail. The ABS Surveyor is to verify this to his satisfaction.

- Material Tests for all Torque-Transmitting and Load-Bearing Components of each Gear Unit, including Charpy Impact Testing, are to be carried out in accordance with MODU Rules Section 2.1 and 2.2 in the presence of an ABS Surveyor. Materials are to be traceable to the Material used in accordance with MODU Rules, Section 6-1-9.

- Non-Destructive Examination (NDE) is to be carried out to the satisfaction of the attending Surveyor.

- Please note that the Hydraulic Motors are also approved under this review, please view “Motor compliance letter for H1028 & H1029” for reference.

- All Material Test Data and Inspection Results shall be made available to the Surveyor to review at his discretion.

- The Rack is also in the scope of this review and is approved under this review.

| | |
|---|---|
| **ABSID:** | **YY262247**<br>**YY262248** |
| **SHIPYARD:** | **SAIGON SHIPYAR CO., LTD.,** |
| **FACILITY NAME:** | **FALCON PEARL**<br>**FALCON DIAMOND** |
| **FACILITY TYPE:** | **SELF ELEVATING UNIT** |
| **HULL NUMBER:** | **H1028**<br>**H1029** |
| **PROJECT NO:** | **3509218** |
| **TASK NO:** | **T1637954/T1628883/T1592039**<br>**/T1481689/T1448771** |
| **REFER TO:** | **HZ/ GK/ CH** |

**Date: 01 June, 2016 (Updated Hydraulic drawings)**

- ABS Surveyor is to verity that a prototype test of a unit has been conducted as per 2014 ABS MODU Rules Section 6-1-9/25.3. The prototype test is to be carried out at 150% of the maximum normal holding capacity rating of the unit. The design approval for the subject equipment only applies when it is used with the Pinion prototype tested together with the subject Gearbox. This has to be verified ABS Surveyor.

An invoice to cover the cost of our technical services on the above subject is under separate correspondence. Please forward your remittance as per instructions on the invoice.

If you have any question regarding this review, please contact Haroon Zuberi at (281) 877-6487 or at Hzuberi@eagle.org and Charles He at (281) 877-6866 or at CHe@eagle.org. You can also contact the undersigned at 281-877-6288 or at LZhao@eagle.org.

Very truly yours

Roy H. Bleiberg
Vice President of Engineering
ABS Americas

By: _____
Lin Zhao
Sr. Managing Principal Engineer
Offshore Equipment
Engineering Service Department (ESD)

| | |
|---|---|
| **ABSID:** | **YY262247**<br>**YY262248** |
| **SHIPYARD:** | **SAIGON SHIPYAR CO., LTD.,** |
| **FACILITY NAME:** | **FALCON PEARL**<br>**FALCON DIAMOND** |
| **FACILITY TYPE:** | **SELF ELEVATING UNIT** |
| **HULL NUMBER:** | **H1028**<br>**H1029** |
| **PROJECT NO:** | **3509218** |
| **TASK NO:** | **T1637954/T1628883/T1592039**<br>**/T1481689/T1448771** |
| **REFER TO:** | **HZ/ GK/ CH** |

**Date: 01 June, 2016 (Updated Hydraulic drawings)**

## Drawing & Documentation List

| **Engineering Office:** | Houston ESD – Offshore Equipment | |
|---|---|---|
| **Submitter:** | HYDRAQUIP CUSTOM SYSTEMS, INC. (405991) | |
| **Drawing No** | **Rev. No** | **Drawing Title** |
| 4680-1000 | D | JACKING SYSTEM PIPING DIAGRAM, TYPICAL PER LEG |
| 4680-1100 | D | JACKING SYSTEM PIPING DIAGRAM, TYPICAL PER LEG |

## Previously Approved Drawing & Documentation List

| **Engineering Office:** | Houston ESD – Offshore Equipment | |
|---|---|---|
| **Submitter:** | HYDRAQUIP CUSTOM SYSTEMS, INC. (405991) | |
| **Drawing No** | **Rev. No** | **Drawing Title** |
| 4680 Jacking Calculations | A | H1028/H1029 Calculations Gearbox Addition |
| 4680 Gearbox Add CBV Valve Calculations | 1 | 4680 Gearbox Add CBV Valve Calculations |
| 4680 Gearbox Add Supercharge Pump Calculations | 1 | 4680 Gearbox Add Supercharge Pump Calculations |
| 14-HS1028524-PDA | - | Fairfield S60 PDA |
| 4680-CALCS | B | 4680 JACKING CALCULATIONS |
| 4680-2000 | F | HPU GENERAL ARRANGEMENT |
| 4680-2006 | A | LIFTBOAT REMOTE HEAT EXCHANGER CONNECTIONS |
| 4680-2040 | A | LEVEL INDICATOR |
| 4680-7501 | C | 4680 GEARBOX STACK ASSEMBLY W TORQUE TRANSDUCER |
| 4680-7500 | A | 4680 GEARBOX STACK ASSEMBLY |
| 4680-7502 | E | 4680 GEARBOX STACK ASSEMBLY VIEW |
| 4680-7510 | B | 4680 HYDRAULIC BRAKE |
| 4680-7511 | B | 4680 TORQUE TRANSDUCER |

**ABSID:** YY262247
YY262248
**SHIPYARD:** SAIGON SHIPYAR CO., LTD.,
**FACILITY NAME:** FALCON PEARL
FALCON DIAMOND
**FACILITY TYPE:** SELF ELEVATING UNIT
**HULL NUMBER:** H1028
H1029
**PROJECT NO:** 3509218
**TASK NO:** T1637954/T1628883/T1592039
/T1481689/T1448771
**REFER TO:** HZ/ GK/ CH

**Date: 01 June, 2016 (Updated Hydraulic drawings)**

| | | |
|---|---|---|
| 4680-7520 | A | 4680 S60 GEARBOX INSTALLATION DIMENSIONS |
| 4680-7530 | A | 4680 S60 GEARBOX MOUNTING DIMENSIONS |
| 4680-7550 | A | 4680 S60 GEARBOX BEARING CARRIER |
| 4680-7560 | A | 4680 S60 SUGGESTED RACK PROFILE |
| 4680-7580 | A | 4680 S60 GEARBOX TYPICAL TOWER INSTALLATION |
| 4680-8250 | B | JACKING SYSTEM LOCAL HPU TERMINATION BOX |
| 4680-EMSURVEYREPORT | A | 4680 ELECTRIC MOTOR SURVEYOR REPORT |
| 4680-BRAKE1 | A | 4680 EXTENSION OF DESIGN APPROVAL FOR BRAKE H1028 |
| 4680-BRAKE2 | A | 4680 EXTENSION OF DESIGN APPROVAL FOR BRAKE H1029 |
| 4680-BRAKE1B | A | 4680 MICO BRAKE SURVEYOR REPORT H1028 |
| 4680-BRAKE2B | A | 4680 MICO BRAKE SURVEYOR REPORT H1029 |
| 4680-7565 | 2 | S60 Pinion/Rack Mating Details |
| S60-RACK-Calcs | A | S60 Rack Strength Calculations |
| 15-HS1340915-PDA | 1 | Electric Motor Type Approval PDA |
| HCSI-FMEA | A | HCSI Jacking System FMEA |
| 4680-HEX-COC | 1 | 4680 Heat Exchanger Certificate of Conformity |
| S60-RACKPINIONCALCS | 1 | S60 Rack and Pinion Documentation and Calculation Package |
| Fairfield Prototype Fixture | - | Fairfield Prototype Fixture |
| Fairfield S60 ABS Prototype Testing Documentation | - | Fairfield S60 ABS Prototype Testing Documentation |
| H1B 080 Shaft - Performance Data | - | H1B 080 Shaft - Performance Data |
| Fairfield S-60 Gearbox Vessel | - | Fairfield S-60 Gearbox Vessel pics |
| Material H1 | - | Material H1 |
| ABS Letter Task T1592039 | - | Danfoss H1B-080 Hydraulic Motor Certification HCSI Jacking Systems for H1028 & H1029 |

**ABSID:** YY262247
YY262248
**SHIPYARD:** SAIGON SHIPYAR CO., LTD.,
**FACILITY NAME:** FALCON PEARL
FALCON DIAMOND
**FACILITY TYPE:** SELF ELEVATING UNIT
**HULL NUMBER:** H1028
H1029
**PROJECT NO:** 3509218
**TASK NO:** T1637954/T1628883/T1592039
/T1481689/T1448771
**REFER TO:** HZ/ GK/ CH

**Date: 01 June, 2016 (Updated Hydraulic drawings)**

| | | |
|---|---|---|
| Sauer Danfoss H1B Motor Nomenclature Breakdown | - | Sauer Danfoss H1B Motor Nomenclature Breakdown |
| Sauer Danfoss H1B-080 Shaft Torque Application Calcs S-350 | - | Sauer Danfoss H1B-080 Shaft Torque Application Calcs S-350 |
| Sauer Danfoss H1B-080 Shaft Torque Application Calcs S-60 | - | Sauer Danfoss H1B-080 Shaft Torque Application Calcs S-60 |
| SIT S60 Pinion and Rack Documentation -FEA Package | - | SIT S60 Pinion and Rack Documentation -FEA Package for ABS Certification |
| SIT S60 Pinion and Rack Documentation, 12-30-2016 | - | SIT S60 Pinion and Rack Documentation for ABS Certification 12-30-2016 |
| SIT S60 Pinion and Rack Documentation,12-29-2016 | - | SIT S60 Pinion and Rack Documentation for ABS Certification 12-29-2016 |

Pertinent Correspondence:

- *ABS Ref: T1592039; OPN: 3509218; ABS letter dated: 30 DECEMBER, 2016 (Revised 8 March 2017)*

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Hydraquip Job # 4680-001
Falcon Global
Hull#: H1028
Vessel Name: Falcon Pearl
ABS#: YY262247
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: _____Port Fwd HPU ✓ Port Aft HPU _____Stbd Aft HPU _____Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

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4.6 Not used.

4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

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5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

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**6. Completion**

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

**7. Test Results**

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 116.8 gpm | 116.9 gpm |
| B Port Maximum Flow: | 119.2 gpm | 117.9 gpm |
| Electric Motor Maximum Current: | 196.9 amps | 191.8 amps |
| Electric Motor Current EDC Neutral | 60.3 amps | 77.7 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 601 psi | |

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NATIONAL FLUID POWER ASSOCIATION NFPA MEMBER

FLUID POWER DISTRIBUTORS ASSOCIATION FPDA

Sustaining Member: FLUID POWER SOCIETY

## Test Instrumentation Calibration Information

Main System Flow Meter: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

Main System Pressure Gage: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

VM Pressure Gage: Serial No.: SM01.5K-01 Cert. No:. HCS1-00020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No.: SM01.5K-01 Cert. No:. HCS1-00020 Expiration Date: 8/17/2016

Large Ammeter: Serial No.: 10370609 Cert. No:. 1069926 Expiration Date: 6/3/2016

**Tested by:** Steve Rotty

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** (If in attendance)

ABS HOUSTON

**Customer Witness:** (If in attendance)

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Hydraquip Job # 4680-001
Falcon Global
Hull#: H1028
Vessel Name: Falcon Pearl
ABS#: YY262247
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: ✓ Port Fwd HPU _____ Port Aft HPU _____ Stbd Aft HPU _____ Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

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4.6 Not used.

4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

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5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

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**6. Completion**

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

**7. Test Results**

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 116.1 gpm | 117.1 gpm |
| B Port Maximum Flow: | 118.1 gpm | 118.6 gpm |
| Electric Motor Maximum Current: | 163.7 amps | 215.3 amps |
| Electric Motor Current EDC Neutral | 77.8 amps | 76.9 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 433 psi | |

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MEMBER

FLUID POWER DISTRIBUTORS ASSOCIATION FPDA

Sustaining Member:

## Test Instrumentation Calibration Information

Main System Flow Meter: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

Main System Pressure Gage: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

VM Pressure Gage: Serial No. SM015K-01 Cert. No:. HES1-00020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No.: SM015K-01 Cert. No:. HES1-00020 Expiration Date: 8/17/2015

Large Ammeter: Serial No.: 10370609 Cert. No:. 1069926 Expiration Date: 6/3/2016

**Tested by:** Steve Roth

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** (If in attendance)

ABS HOUSTON

**Customer Witness:** (If in attendance)

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Hydraquip Job # 4680-001
Falcon Global
Hull#: H1028
Vessel Name: Falcon Pearl
ABS#: YY262247
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: _____Port Fwd HPU_____Port Aft HPU ✓ Stbd Aft HPU _____Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

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4.6 Not used.

4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

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5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

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**6. Completion**

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

**7. Test Results**

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 117.3 gpm | 113.1 gpm |
| B Port Maximum Flow: | 120.2 gpm | 117.9 gpm |
| Electric Motor Maximum Current: | 185.9 amps | 190.9 amps |
| Electric Motor Current EDC Neutral | 74.3 amps | 75.8 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 643 psi | |

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MEMBER

FLUID POWER DISTRIBUTORS ASSOCIATION FPDA

Sustaining Member:

## Test Instrumentation Calibration Information

Main System Flow Meter: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

Main System Pressure Gage: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

VM Pressure Gage: Serial No.: SM01.5K-01 Cert. No:. HCSI-00020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No.: SM01.5K-01 Cert. No:. HCSI-00020 Expiration Date: 8/17/2016

Large Ammeter: Serial No.: 1037060 9 Cert. No:. 106926 Expiration Date: 6/3/2016

**Tested by:** Steve Roth

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** (If in attendance)

**Customer Witness:** (If in attendance)

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Hydraquip Job # 4680-001
Falcon Global
Hull#: H1028
Vessel Name: Falcon Pearl
ABS#: YY262247
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: _____Port Fwd HPU_____Port Aft HPU _____Stbd Aft HPU ✓_____Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

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4.6 Not used.

4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

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5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

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**6. Completion**

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

**7. Test Results**

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 116.5 gpm | 116.4 gpm |
| B Port Maximum Flow: | 115.1 gpm | 116.9 gpm |
| Electric Motor Maximum Current: | 189.9 amps | 208.9 amps |
| Electric Motor Current EDC Neutral | 74.5 amps | 73.4 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 594 psi | |

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Sustaining Member:

## Test Instrumentation Calibration Information

Main System Flow Meter: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

Main System Pressure Gage: Serial No.: FM200-04 Cert. No:. N/A Expiration Date: 12/11/2015

VM Pressure Gage: Serial No.: SM015K-01 Cert. No: HCSI-00020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No.: SM015K-01 Cert. No:. HCSI-00020 Expiration Date: 8/17/2016

Large Ammeter: Serial No.: 10370609 Cert. No:. 069926 Expiration Date: 6/3/2015

**Tested by:** Steve Rotte

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** P. Gowace (If in attendance)

**Customer Witness:** (If in attendance)

ABS HOUSTON

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Hydraquip Job # 4680
Falcon Global H1028 / H1029
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: _____Port Fwd HPU ✓ Port Aft HPU _____Stbd Aft HPU _____Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

4.6 Not used.

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4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

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5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

**6. Completion**

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

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## 7. Test Results

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 116.6 gpm | 118.0 gpm |
| B Port Maximum Flow: | 118.2 gpm | 117.5 gpm |
| Electric Motor Maximum Current: | 184.9 amps | 171.0 amps |
| Electric Motor Current EDC Neutral | 72.1 amps | 70.5 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 580 psi | |

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FLUID POWER DISTRIBUTORS ASSOCIATION FPDA

Sustaining Member:

NFPA MEMBER

## Test Instrumentation Calibration Information

Main System Flow Meter: Serial No. FM200-01 Cert. No:. N/A Expiration Date: 6/23/2016

Main System Pressure Gage: Serial No. FM200-01 Cert. No:. N/A Expiration Date 6/23/2016

VM Pressure Gage: Serial No. SM01.5K-01 Cert. No: HCSI-00020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No. SM01.5K-01 Cert. No HCSI-00020 Expiration Date: 8/17/2016

Large Ammeter: Serial No.: 10370609 Cert. No: 1069926 Expiration Date: 6/3/2016

**Tested by:** Steve Roth

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** (If in attendance)

**Customer Witness:** (If in attendance)

ABS HOUSTON

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Hydraquip Job # 4680
Falcon Global H1028 / H1029
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: _____Port Fwd HPU_____Port Aft HPU ✓ Stbd Aft HPU _____Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

4.6 Not used.

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4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

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5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

## 6. Completion

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

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## 7. Test Results

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 118.1 gpm | 117.2 gpm |
| B Port Maximum Flow: | 119.1 gpm | 116.9 gpm |
| Electric Motor Maximum Current: | 213.5 amps | 226.1 amps |
| Electric Motor Current EDC Neutral | 74.5 amps | 72.8 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 590 psi | |

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Sustaining Member: FLUID POWER SOCIETY

**Test Instrumentation Calibration Information**

Main System Flow Meter: Serial No. FM200-01 Cert. No:. N/A Expiration Date 6/23/2016

Main System Pressure Gage: Serial No. FM200-01 Cert. No:. N/A Expiration Date: 6/23/2016

VM Pressure Gage: Serial No. Smo1.5k-01 Cert. No. HCSI-00020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No. Smo1.5k-01 Cert. No. HCSI-00020 Expiration Date: 8/17/2016

Large Ammeter: Serial No. 10370609 Cert. No:. 106926 Expiration Date: 6/3/2016

**Tested by:** Steve Roth

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** P. Gonzalez (If in attendance)

ABS HOUSTON

**Customer Witness:** (If in attendance)

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Hydraquip Job # 4680
Falcon Global H1028 / H1029
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: _____Port Fwd HPU_____Port Aft HPU _____Stbd Aft HPU ✓_____Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

4.6 Not used.

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4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

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5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

**6. Completion**

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

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## 7. Test Results

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 115.5 gpm | 117.0 gpm |
| B Port Maximum Flow: | 118.5 gpm | 117.6 gpm |
| Electric Motor Maximum Current: | 186.6 amps | 195.9 amps |
| Electric Motor Current EDC Neutral | 72.9 amps | 75.9 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 540 psi | |

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Sustaining Member: FLUID POWER SOCIETY

## Test Instrumentation Calibration Information

Main System Flow Meter: Serial No.: FM200-01 Cert. No:. N/A Expiration Date: 6/23/2016

Main System Pressure Gage: Serial No.: FM200-01 Cert. No:. N/A Expiration Date: 6/23/2016

VM Pressure Gage: Serial No.: SM01.5K-01 Cert. No: HCSI-00020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No.: SM01.5K-01 Cert. No: HCSI-00020 Expiration Date: 8/17/2016

Large Ammeter: Serial No.: 10370609 Cert. No:. 1069926 Expiration Date: 6/3/2016

**Tested by:** Stu Roth

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** T. Gourlay (If in attendance)

ABS HOUSTON

**Customer Witness:** _____ (If in attendance)

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Hydraquip Job # 4680
Falcon Global H1028 / H1029
Hydraulic Power Unit Test Procedure
Jacking Hydraulic System

**1.** The purpose of this test procedure is to verify compliance with appropriate performance of the unit in accordance with all technical requirements.

## 2. Reference

See current revision of Drawing 4680-1000

## 3. Requirements

The performance of the system is to meet the requirements of Drawing 4680-1000.

Test Equipment Required:

0 – 150gpm Calibrated Flow Meter with Load Valve and Calibrated Pressure Gage (System Flow and Pressure Measurement)
0 – 1000psi Calibrated Pressure Gages (VM, BR, and SCG test points)
Calibrated Ammeter (Motor Current)
(2) 15 – 85mA EDC Driver

Indicate Unit: ✓ Port Fwd HPU _____ Port Aft HPU _____ Stbd Aft HPU _____ Stbd Fwd HPU

## 4. Hydraulic Power Unit Test

4.1 Verify that unit is completely assembled and ready for testing.

4.2 Verify that reservoir and all tubing have been appropriately cleaned prior to testing.

4.3 Fill hydraulic reservoir with filtered premium petroleum hydraulic oil to normal operating level.

4.4 Not used.

4.5 Fill case drain of each 90 Series pump with hydraulic oil.

4.6 Not used.

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4.7 Connect circulation hoses complete with calibrated flow meter, pressure gage, and valve to simulate artificial load on system to "A" and "B" ports. Load valves should be open at beginning of test. Flow meter should be rated to measure a minimum of 150gpm.

4.8 Not used.

4.9 Gages shall be connected to test points on the manifold at ports VM, BR and SCG. These gages shall be rated for at least 1,000psi.

4.10 Connect electrical system to unit so that functional test can be performed.

- 690 VAC, 3 Phase, suitable to operate (1) 250 hp electric motors (225amps ea) and auxiliary electrical system equipment.
- 24 VDC supply for brake release (BR) valve and variable motor (VM) valve actuation. A total of up to (2) brake valves will be energized simultaneously. A total of (2) VM coils will be energized simultaneously.
- (1) 14-85 mA driver for series 90 pump coils

4.11 Open pressure gage shutoff valves at pressure gages.

4.12 Confirm that all Suction Ball Valves are open.

4.13 Back out Cross Port Relief Valves.

4.14 Back out Super Charge Pressure Relief Valve.

## 5. Pump Group Chord 1

5.1 Bump electric motor to verify proper rotation. Correct supply wiring as needed for proper rotation.

5.2 Start electric motor for Pump 1. Monitor pump charge pressure. Inspect system lines for any leaks. Adjust pump charge pressure to 450 psi. Record on Test Report.

5.3 Raise Supercharge Relief Valve setting to 450 psi. Record on Test Report.

5.4 Set Supercharge Relief Valve to 450psi. Record on Test Report.

5.5 Stroke the Danfoss Series 90 pump for "A" port flow, inspect lines for leaks.

5.6 Stroke the Sauer Series 90 pump for "B" port flow, inspect lines for leaks.

5.7 Increase the setting of the cross port relief valves to maximum and close the load valve.

**HYDRAQUIP CUSTOM SYSTEMS, INC**
12311 Cutten Rd. • Houston, TX 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020



5.8 Stroke the pump to "A" and increase the multifunction valve setting to 4700 psi.

5.9 Lower the "A" side cross port relief valve to 4500 psi, Record on Test Report.

5.10 Lower the "A" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.11 Stroke the pump to "B" and increase the multifunction valve setting to 4700 psi.

5.12 Lower the "B" side cross port relief valve to 4500 psi, Record on Test Report.

5.13 Lower the "B" multifunction valve to 4000 psi and lock in setting, Record on Test Report.

5.14 Open load valve and stroke the pump full flow to "A" and then "B" Record flows on Test report.

5.15 Energize Brake Coils for BR Port. Confirm that pressure at BR port rises to Super Charge Pressure Setting. De-energize and verify that pressure at BR port declines to 0.

5.16 Not used.

5.17 Energize Variable Motor Coils for VM Port. Confirm that pressure at VM1 port rises to Super Charge Pressure Setting. De-energize and verify that pressure at VM port declines to 0.

5.18 Place amp meter on 1 phase of electric motor. Stroke A port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.19 Stroke B port of pump to 115gpm and close load valve until pressure climbs to 4000 psi. Record max amperage on Test Report.

5.20 Open Load Valve and record amperage with pump EDC in neutral

5.21 Stroke pump to maximum displacement and record system pressure

5.22 Open load valve then turn off electric motor 1.

5.23 Not used

5.24 Connect second electric motor and repeat all steps in Section 5 and record on Test Report

**6. Completion**

6.1 Disconnect all test equipment. Plug all ports for shipping. Clean unit as needed. Drain reservoir.

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Fax: (281) 822-5020



## 7. Test Results

| | Pump 1 | Pump 2 |
|---|---|---|
| Charge Pump Setting: | 450 psi | 450 psi |
| A Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| B Port Pump Multifunction Valve Setting: | 4000 psi | 4000 psi |
| A Port Maximum Flow: | 117.2 gpm | 113.2 gpm |
| B Port Maximum Flow: | 119.0 gpm | 116.9 gpm |
| Electric Motor Maximum Current: | 202.9 amps | 189.6 amps |
| Electric Motor Current EDC Neutral | 75.7 amps | 75.1 amps |
| Supercharge Pressure Relief Setting: | 450 psi | |
| Crossport Pressure Relief Setting A Port: | 4500 psi | |
| Crossport Pressure Relief Setting B Port: | 4500 psi | |
| BR Port Pressure Energized: | 450 psi | |
| BR Port Pressure De-Energized: | 0 psi | |
| VM Port Pressure Energized: | 450 psi | |
| VM Port Pressure De-Energized: | 0 psi | |
| No Load Full Flow Pressure Drop: | 619 psi | |

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12311 Cutten Rd. • Houston, TX 77066
Telephone: (281) 822-5000
Fax: (281) 822-5020

NFPA MEMBER

FLUID POWER DISTRIBUTORS ASSOCIATION FPDA

Sustaining Member: FLUID POWER SOCIETY

## Test Instrumentation Calibration Information

Main System Flow Meter: Serial No.: Fm200-01 Cert. No.: N/A Expiration Date: 6/23/2016

Main System Pressure Gage: Serial No.: Fm200-01 Cert. No.: N/A Expiration Date: 6/23/2016

VM Pressure Gage: Serial No.: Sm01.5K-01 Cert. No.: HCSI-000020 Expiration Date: 8/17/2016

BR Pressure Gage: Serial No.: Sm01.5K-01 Cert. No.: HCSI-000020 Expiration Date: 8/17/2016

Large Ammeter: Serial No.: 10370609 Cert. No.: 1069926 Expiration Date: 6/3/2016

**Tested by:** Steve Roth

**Approved by:**

**Hydraquip CSI Witness:**

**ABS Witness:** (If in attendance)

ABS HOUSTON

**Customer Witness:** (If in attendance)

Certificate Number: 14-HS1028524-PDA
16/JUL/2014

# *Confirmation of Product Type Approval*

Please refer to the "Service Restrictions" shown below to determine if Unit Certification is required for this product.

This certificate reflects the information on the product in the ABS Records as of the date and time the certificate is printed.

Pursuant to the Rules of the American Bureau of Shipping (ABS), the manufacturer of the below listed product held a valid Manufacturing Assessment (MA) with expiration date of 24/MAR/2015. The continued validity of the Manufacturing Assessment is dependent on completion of satisfactory audits as required by the ABS Rules.

And; a Product Design Assessment (PDA) valid until 22/APR/2019 subject to continued compliance with the Rules or standards used in the evaluation of the product.

The above entitle the product to be called Product Type Approved.

The Product Design Assessment is valid for products intended for use on ABS classed vessels, MODUs or facilities which are in existence or under contract for construction on the date of the ABS Rules used to evaluate the Product.

ABS makes no representations regarding Type Approval of the Product for use on vessels, MODUs or facilities built after the date of the ABS Rules used for this evaluation.

Due to wide variety of specifications used in the products ABS has evaluated for Type Approval, it is part of our contract that; whether the standard is an ABS Rule or a non-ABS Rule, the Client has full responsibility for continued compliance with the standard.

## Product Name: Jacking System
## Model Name(s): S60A24437401 (Fairfield Jacking Gearbox S60A)

**Presented to:**
OERLIKON FAIRFIELD DRIVE SYSTEMS
2309 CONCORD ROAD
P.O. BOX 7940
LAFAYETTE
United States

| | |
|---|---|
| **Intended Service:** | Offshore Applications - Liftboat and Jack-up Workboat Jacking System. |
| **Description:** | Jacking Pinion & Planetary Gearbox that drives the Jacking Pinion which lifts the Boat on legs that have been fitted with Gear Racks that the Jacking Pinions mesh with. |
| **Tier:** | 5 |
| **Ratings:** | Maximum Leg Jacking (Raising) Load Pinion Capacity: 32,700 lbf and Output Torque 147,524 in-lbf @ 2.97 rpm for 377 hours; Maximum Leg Jacking (Lowering) Load Pinion Capacity: 32,700 lbf and Output Torque 147,524 in-lbf @ 2.97 rpm for 377 hours; Maximum Normal Jacking (Raising) Load Pinion Capacity: 124,540 lbf and Output Torque 560,498 in-lbf @ 1.70 rpm for 73 hours; Maximum Normal Jacking (Lowering) Load Pinion Capacity: 124,540 lbf and Output Torque 560,498 in-lbf @ 1.70 rpm for 73 hours; Maximum Pre-load Jacking (Raising/Lowering) Load Pinion Capacity: 161,320 lbf and Output Torque 726,062 in-lbf @ .85 rpm for 73 hours; Maximum Jacking (Raising/Lowering) Load Pinion Capacity: 162,600 lbf and Output Torque 732,000 in-lbf @ .85 rpm for 73 hours; Maximum Normal Holding Load Pinion Capacity: 191,200 lbf and Output Torque 860,000 in-lbf; Severe Storm Holding Load Pinion Capacity: 244,400 lbf and Output Torque 1,100,000 in-lbf; Maximum Ambient Temperature (Summer): +45°C @ 100% RH, or +54°C @ 45% RH; Minimum Ambient Temperature: minus 20 °C; |

| | |
|---|---|
| **Service Restrictions:** | Unit Certification is required for this product. Not for use in temperatures less than minus 20 °C. The motor, brake and all mechanical linkages between the motor and this gearbox system must be ABS design approved for the intended service and must fully comply with Fairfield specifications for those items. Every torque carrying mechanical linkages from the brake or motor to the input spline of the subject gearbox shall be rated at not less than the maximum torque specified by the Fairfield motor and brake specification. The brake used in association with this gearbox in this application must be a spring closed, power opened design where the power arrangements are made such that the power that holds the brakes open is the same as the power that runs the jacking motors. If power driving the motor that turns any given jacking pinion fails, power holding the brake(s) associated with that pinion open must also fail. The ABS Surveyor is to check this to his satisfaction. The approval for this jacking system planetary gearbox only applies when it is used with the pinion shown in drawing L1804PINION rev C and the associated frame and bearings shown in drawings listed in the ABS Type Approval letter associated with this product design assessment. Brake, Motor, Support Structure/Jack Case, Rack, and the Electric/Hydraulic Controls of the jacking system are not within the scope of this design assessment. Tests and inspections on materials associated with the jacking system are to be performed to the satisfaction of the Surveyor. All material test data and inspection results shall be made available to the Surveyor to review at his discretion. |
| **Comments:** | The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product. The design and the holding capacity of the brake are to meet ABS MODU rules. The electrical motor is to meet ABS MODU rules. Unit Certification is required for the motor. Failure Modes and Effects Analysis (FMEA) for the complete jacking system is to be carried out as per 6-1-9/7 of the ABS MODU Rules. |
| **Notes / Documentation:** | Supporting Data: Dwg. No. S60A244374RABS, Rev. L, S60 Planetary Assembly; Dwg. No. S60A24437401,Rev. B, Assembly, 2 shts; Dwg. No. L1804PINION, Rev. C, Pinion; Dwg. No. L1804BRGC1, Rev. 6B, Bearing Carrier; Dwg. No. L1804SEALCARIER, Rev. 1B, Seal Carrier; Dwg. No. L1804BRGC1CAP, Rev.-, Cap; Dwg. No. 13-547-508, Rev.A, Multiple Disc Brake; Dwg. No. 60500602, Rev.N, Housing, 2 shts; Dwg. No. 60501001, Rev.F, Hub; Dwg. No. 60501902, Rev.4A, Bearing Carrier; Dwg. No. 96T050701, Rev.C, Sun Gear; Dwg. No. 96T050702, Rev.D, Involute Gear, 2 shts; Dwg. No. 96T050703, Rev.M, Internal Spur Gear, 2 shts; Dwg. No. 96T050704, Rev.H, Internal Gear, shts 1 & 2 of 3; Dwg. No. 96T050705, Rev.F, Multiple Gear, 2 shts; Dwg. No. 96T050711, Rev.N, Internal Coupling, shts 1 & 2 of 3; Dwg. No. 96T050712, Rev.L, Internal Ring Gear; Dwg. No. 96T050718, Rev.F, Input Gear, 2 shts; Dwg. No. 96T050719, Rev.E, Output SDhft, 1, 2 & 3 of 4 Dwg. No. 96T050720, Rev.J, Carrier; Brochure 520L0440, Rev.AE, Dec.2010, Sauer Danfoss Series 51 & 51-1 Bent Axis Variable Displacement Motors Technical Information; Clculations - Bolt/Dowel Torque, S60 Bending, Spur Gear Specification & Stress Analysis,Shaft Shear Stress, Spline Stress, FMEA, DJ1051 S350 Bearing; S60A24437401 Overview, Safety Factors, Gearbox Design Rating, Gearing, Spline Connections & Calculations, Shaft Analysis, 240ft Lift Boat Output Pinion Shaft Bending Stress Calculations- Fatigue, Bearings; Material Specification Chart. |
| **Term of Validity:** | This Product Design Assessment (PDA) Certificate 14-HS1028524-PDA, dated 23/Apr/2014 remains valid until 22/Apr/2019 or until the Rules or specifications used in the assessment are revised (whichever occurs first). This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product. Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA. Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client. |
| **ABS Rules:** | 2014 Steel Vessels Rules 1-1-4/7.7, 1-1-A3; 2014 MODU Rules Chapter 6-1-9; 2014 Liftboat Guide Chapter 4-4 (Revised February 2014); |
| **National Standards:** | AGMA 2001-D04; |
| **International Standards:** | |
| **Government Authority:** | |

**EUMED:**
**Others:** Manufacturers Specification.

| Model Certificate | Model Certificate No | Issue Date | Expiry Date |
|---|---|---|---|
| PDA | 14-HS1028524-PDA | 23/APR/2014 | 22/APR/2019 |

ABS Programs

ABS has used due diligence in the preparation of this certificate and it represents the information on the product in the ABS Records as of the date and time the certificate was printed. Type Approval requires Drawing Assessment, Prototype Testing and assessment of the manufacturer's quality assurance and quality control arrangements. Limited circumstances may allow only Prototype Testing to satisfy Type Approval. The approvals of Drawings and Products remain valid as long as the ABS Rule, to which they were assessed, remains valid. ABS cautions manufacturers to review and maintain compliance with all other specifications to which the product may have been assessed. Further, unless it is specifically indicated in the description of the product; Type Approval does not necessarily waive witnessed inspection or survey procedures (where otherwise required) for products to be used in a vessel, MODU or facility intended to be ABS classed or that is presently in class with ABS. Questions regarding the validity of ABS Rules or the need for supplemental testing or inspection of such products should, in all cases, be addressed to ABS.

# AMERICAN BUREAU OF SHIPPING

| | | | |
|---|---|---|---|
| Customer Name | **OERLIKON FAIRFIELD DRIVE SYSTEMS** | Purchase Order No. | |
| Attending Office | **Chicago, IL** | Report Number | **CH2771727.R1** |
| First Visit Date | **24-Nov-2014** | Last Visit Date | **22-Jun-2015** |

**Certification Of:** One Hundred Twenty Eight (128) S60A Jacking Gearboxes and Pinions — Quantity: One(1)
Manufacturer: OERLIKON FAIRFIELD DRIVE SYSTEMS

**Survey Location:** Lafayette, IN

**Equipment Data**

| | |
|---|---|
| Manufacturer Number(S. No.) | See Report |
| Model Number | S60A24437401 |
| Designer Name | Oerlikon Fairfield Drive Systems |
| Purchaser Name | Hydraquip |

**Design Details**

| | |
|---|---|
| Design State | Type Approved |
| ABS Reviewing Organization | Houston SED - Ship Equipment |
| Drawing Number | S60A24437401 |

**Additional Data**

| | |
|---|---|
| ABS Stamping | CH2771727 |

**This is to Certify** that the undersigned surveyor(s) to this Bureau did, at the request of the customer, carry out the following survey and report as follows:

Traceability of materials used on this project has been verified.
The principal data has been verified in accordance with the applicable Rules/specifications and approved plans, and confirmed to be within acceptable tolerances.
Examination during manufacturer assembly has been carried out to verify all critical phases of welding, fitting, machining, and non-destructive examination as required by the applicable Rules and/or requirements.
All testing (pressure/load/operational/etc.) has been carried out as applicable and verified in accordance with the applicable Rules/specifications.
Testing machines are maintained in a satisfactory condition and records of their recheck or calibration dates confirmed.
All parts of the machinery/equipment satisfactorily complied with the approved drawings. Amendments, if any, verified to be rectified and considered satisfactory.
Subject to satisfactory installation, testing and trials after installation onboard the vessel.
Asbestos-free declaration verified and supporting documentation reviewed.

1. The undersigned Surveyors did attend Oerilkon Fairfield facility in Lafayette, Indiana to certify one hundred twenty eight (128) S60A Jacking Gearboxes and Pinions, Model S60A24437401. These gearboxes were manufactured in accordance with Certificate 14-HS1028524-PDA dated 23 April 2014. This facility holds a Manufacturer's Assessment Certificate (RQS) No. 10-CH1808359-X and a Product Quality Assurance Certificate (PQA) No. 10-QA 1836-X which are both valid until 24 March 2015.

2. The material was tested in the presence of the Surveyor and accepted by Oerlikon Fairfield in accordance with the approved PDA and

the ABS MODU Rule 6-9-1 (20014) . The material was manufactured by an ABS approved facility and the material test reports were reviewed, considered satisfactory and are maintained on file with this office.

3. The finish machined parts were subject to Magnetic Particle Inspection by the manufacturer with oversight by the undersigned. The assembled gearboxes were tested for tightness, roll tested in both directions and were considered satisfactory.

4. The One Hundred Twenty Eight (128) serial numbers for gearbox and pinion sets covered by this report are as follows:

**K14AN0001US / 14-09-37**
**K14AN0002US / 14-09-21**
**K14AN0003US / 14-09-14**
**K14AN0004US / 14-09-08**
**K14AN0005US / 14-09-13**
**K14AN0006US / 14-09-05**
**K14AN0007US / 14-09-25**
**K14AN0008US / 14-09-16**
**K14AN0009US / 14-09-03**
**K14AN0010US / 14-09-09**
**L14AN0001US / 14-09-20**
**L14AN0002US / 14-09-15**
**L14AN0003US / 14-09-18**
**L14AN0004US / 13-08-26**
**L14AN0005US / 14-09-19**
**L14AN0006US / 14-09-17**
**L14AN0023US / 14-09-01**
**L14AN0024US / 14-09-35**
**L14AN0025US / 14-09-32**
**L14AN0026US / 14-09-29**
**L14AN0027US / 14-09-34**
**L14AN0028US / 14-09-27**
**A15AN0001US / 14-09-22**
**A15AN0002US / 14-09-36**
**A15AN0003US / 14-09-07**
**A15AN0004US / 14-09-24**
**A15AN0009US / 14-10-23**
**A15AN0010US / 14-10-05**
**A15AN0011US / 14-10-30**
**A15AN0012US / 14-10-26**
**A15AN0017US / 14-10-37**
**A15AN0018US / 14-10-10**
**A15AN0019US / 14-10-36**
**A15AN0020US / 14-10-34**
**A15AN0025US / 14-10-21**
**A15AN0026US / 14-10-12**
**A15AN0027US / 14-10-22**
**A15AN0028US / 14-10-06**

**B15AN0010US / 14-10-20**
**B15AN0011US / 14-10-24**
**B15AN0012US / 14-10-27**
**B15AN0013US / 14-10-23**
**B15AN0018US / 14-10-17**
**B15AN0019US / 14-10-25**
**B15AN0020US / 14-10-03**
**B15AN0021US / 14-10-31**
**B15AN0030US / 14-10-13**
**B15AN0031US / 14-10-01**
**B15AN0032US / 14-10-28**
**B15AN0033US / 14-10-15**
**B15AN0038US / 14-10-08**
**B15AN0039US / 14-09-30**
**B15AN0040US / 14-10-07**
**B15AN0041US / 14-09-31**
**B15AN0042US / 14-10-16**
**B15AN0043US / 14-10-35**
**B15AN0044US / 14-10-09**
**B15AN0045US / 14-10-11**
**B15AN0050US / 14-09-11**
**B15AN0051US / 14-09-10**
**B15AN0052US / 14-09-06**
**B15AN0053US / 14-09-12**
**B15AN0060US / 14-10-19**
**B15AN0061US / 14-09-29**
**C15AN0001US / 14-09-26**
**C15AN0002US / 14010-04**
**C15AN0003US / 14-10-18**
**C15AN0004US / 14-10-32**
**C15AN0009US / 14-09-04**
**C15AN0010US / 14-09-33**
**C15AN0011US / 14-09-28**
**C14AN0012US / 14-09-02**
**C15AN0017US / 15-01-52**
**C15AN0018US / 15-01-15**
**C15AN0019US / 15-01-40**
**C15AN0020US / 15-01-04**
**C15AN0029US / 15-01-07**
**C15AN0030US / 15-01-08**
**C15AN0031US / 15-01-36**
**C15AN0032US / 15-01-31**
**D15AN0005US / 15-01-49**
**D15AN0006US / 15-01-14**
**D15AN0007US / 15-01-48**
**D15AN0008US / 15-01-38**

**D15AN0012US / 15-01-33**
**D15AN0013US / 15-01-34**
**D15AN0014US / 15-01-13**
**D15AN0019US / 15-01-24**
**D15AN0020US / 15-01-19**
**D15AN0021US / 15-01-20**
**D15AN0022US / 15-01-17**
**D15AN0027US / 15-01-51**
**D15AN0028US / 15-01-23**
**D15AN0029US / 15-01-32**
**D15AN0030US / 15-01-35**
**D15AN0031US / 15-01-22**
**D15AN0032US / 15-01-39**
**D15AN0033US / 15-01-06**
**D15AN0034US / 15-01-10**
**D15AN0039US / 15-01-45**
**D15AN0040US / 15-01-21**
**D15AN0041US / 15-01-26**
**D15AN0042US / 15-01-27**
**D15AN0051US / 15-01-43**
**D15AN0052US / 15-01-44**
**D15AN0053US / 15-01-42**
**D15AN0054US / 15-01-05**
**E15AN0001US / 15-01-54**
**E15AN0002US / 15-01-02**
**E15AN0003US / 15-01-18**
**E15AN0004US / 15-01-50**
**E15AN0005US / 15-01-37**
**E15AN0006US / 15-01-28**
**E15AN0007US / 15-01-25**
**E15AN0015US / 15-04-09**
**E15AN0016US / 15-04-06**
**E15AN0017US / 15-04-10**
**E15AN0022US / 15-02-01**
**E15AN0023US / 15-02-03**
**E15AN0024US / 15-02-02**
**E15AN0025US / 15-02-04**
**E15AN0026US / 15-04-05**
**E15AN0027US / 15-04-02**
**E15AN0028US / 15-01-55**
**E15AN0029US / 15-04-08**
**E15AN0034US / 15-04-07**
**E15AN0035US / 15-04-04**
**E15AN0036US / 15-04-01**

5. The approval of these jacking gearboxes only applies when it is used with the provided climbing pinion (drawing # L1804PINION rev C)

as listed in the approved PDA. The motor, brake and all mechanical linkages between the motor and this gearbox must be ABS approved. This report only covers the gearbox and pinion; the motor, brake, support structure and electric/hydraulic controls are not covered by this report.

6. Each assembly was stamped with its part number, serial number, this report number and the date assembled.

7. These one hundred twenty eight (128) jacking gearboxes and pinions are considered satisfactory subject to installation and testing on board, including testing of all safety devices listed in the approved PDA, to the satisfaction of the attending Surveyor.

**Surveyor(s) to The American Bureau of Shipping**
**Attending Surveyors**

Andersen Michael

Beattie Paul L.

**Reviewed By**

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-001

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0001US / 14-09-37 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 21 November 2014

No. K14AN0001US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

**P. Beattie, Chicago Port**

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-002

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0002US / 14-09-21 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 21 November 2014

No. K14AN0002US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-003

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0003US /14-09-14 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 21 November 2014

No. K14AN0003US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.: 925745-2771727-004

PORT OF Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0004US / 14-09-08 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 21 November 2014

No. K14AN0004US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-005

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0005US / 14-09-13 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 21 November 2014

No. K14AN0005US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-006

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0006US / 14-09-05 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 25 November 2014

No. K14AN0006US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-007

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0007US / 14-09-25 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 November 2014

No. K14AN0007US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-008

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0008US / 14-09-16 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 November 2014

No. K14AN0008US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-009

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0009US / 14-09-03 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 November 2014

No. K14AN0009US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-010

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. K14AN0010US / 14-09-09 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 November 2014

No. K14AN0010US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-011

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0001US / 14-09-20 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 05 December 2014

No. L14AN0001US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-012

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0002US / 14-09-15 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 05 December 2014

No. L14AN0002US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-013

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0003US / 14-09-18 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 05 December 2014

No. L14AN0003US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-014

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0004US / 13-08-26 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 December 2014

No. L14AN0004US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-015

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0005US / 14-09-19 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 December 2014

No. L14AN0005US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-016

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0006US / 14-09-17 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 December 2014

No. L14AN0006US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-017

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0023US / 14-09-01 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 December 2014

No. L14AN0023US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-018

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0024US / 14-09-35 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 December 2014

No. L14AN0024US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-019

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0025US / 14-09-32 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 10 December 2014

No. L14AN0025US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-020

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0026US / 14-09-29 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 10 December 2014

No. L14AN0026US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-021

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0027US / 14-09-34 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 10 December 2014

No. L14AN0027US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-022

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. L14AN0028US / 14-09-27 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 15 December 2014

No. L14AN0028US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

ABS CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-023

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0001US / 14-09-22 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 January 2015

No. A15AN0001US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-024

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0002US / 14-09-36 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 January 2015

No. A15AN0002US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

ABS CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-025

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0003US / 14-09-07 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 January 2015

No. A15AN0003US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Pdt

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-026

PORT OF
Chicago, Illinois

DATE 10 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0004US / 14-09-24 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 26 January 2015

No. A15AN0004US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-027

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0009US / 14-10-33 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 January 2015

No. A15AN0009US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port
SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-028

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0010US / 14-10-05 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 January 2015

No. A15AN0010US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-029

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0011US / 14-10-30 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 January 2015

No. A15AN0011US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-030

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0012US / 14-10-26 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 January 2015

No. A15AN0012US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-031

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0017US / 14-10-37 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 30 January 2015

No. A15AN0017US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-032

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0018US / 14-10-10 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 31 January 2015

No. A15AN0018US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-033

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0019US / 14-10-36 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 31 January 2015

No. A15AN0019US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-034

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0020US / 14-10-34 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 31 January 2015

No. A15AN0020US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-035

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0025US / 14-10-21 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 01 February 2015

No. A15AN0025US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-036

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0026US / 14-10-12 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 01 February 2015

No. A15AN0026US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-055

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0042US / 14-10-16 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 15 February 2015

No. B15AN0042US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-056

PORT OF
Chicago, Illinois

DATE 10 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0043US / 14-10-35 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 15 February 2015

No. B15AN0043US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-057

PORT OF
Chicago, Illinois

DATE 10 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0044US / 14-10-09 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 15 February 2015

No. B15AN0044US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-058

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0045US / 14-10-11 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 15 February 2015

No. B15AN0045US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-059

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0050US / 14-09-11 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 17 February 2015

No. B15AN0050US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-060

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0051US / 14-09-10 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 17 February 2015

No. B15AN0051US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-061

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0052US / 14-09-06 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 17 February 2015

No. B15AN0052US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-062

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0053US / 14-09-12 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 February 2015

No. B15AN0053US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-063

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0060US / 14-10-19 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 February 2015

No. B15AN0060US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-064

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0061US / 14-09-29 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 February 2015

No. B15AN0061US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-065

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0001US / 14-09-26 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 17 March 2015

No. C15AN0001US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Post

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-066

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0002US / 14-10-04 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 17 March 2015

No. C15AN0002US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-067

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0003US / 14-10-18 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 March 2015

No. C15AN0003US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-068

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0004US / 14-10-32 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 March 2015

No. C15AN0004US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-069

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0009US / 14-09-04 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 24 March 2015

No. C15AN0009US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-070

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0010US / 14-09-33 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 24 March 2015

No. C15AN0010US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-071

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0011US / 14-09-28 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 25 March 2015

No. C15AN0011US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-072

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0012US / 14-09-02 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 25 March 2015

No. C15AN0012US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-037

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0027US / 14-10-22 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 01 February 2015

No. A15AN0027US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Rep.

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-038

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. A15AN0028US / 14-10-06 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 02 February 2015

No. A15AN0028US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-039

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0010US / 14-10-20 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 03 February 2015

No. B15AN0010US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-040

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0011US / 14-10-24 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 03 February 2015

No. B15AN0011US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-041

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0012US / 14-10-27 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 03 February 2015

No. B15AN0012US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-042

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0013US / 14-10-23 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 03 February 2015

No. B15AN0013US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-043

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0018US / 14-10-17 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 05 February 2015

No. B15AN0018US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-044

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0019US / 14-10-25 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 05 February 2015

No. B15AN0019US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-045

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0020US / 14-10-03 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 05 February 2015

No. B15AN0020US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-046

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0021US / 14-10-31 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 05 February 2015

No. B15AN0021US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-047

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0030US / 14-10-13 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 07 February 2015

No. B15AN0030US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-048

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0031US / 14-10-01 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 07 February 2015

No. B15AN0031US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-049

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0032US / 14-10-28 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 February 2015

No. B15AN0032US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-050

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0033US / 14-10-15 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 February 2015

No. B15AN0033US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-051

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0038US / 14-10-08 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 11 February 2015

No. B15AN0038US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-052

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0039US / 14-09-30 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 11 February 2015

No. B15AN0039US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-053

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0040US / 14-10-07 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 11 February 2015

No. B15AN0040US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-054

PORT OF
Chicago, Illinois

DATE 10 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. B15AN0041US / 14-09-31 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 11 February 2015

No. B15AN0041US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-073

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0017US / 15-01-52 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 30 March 2015

No. C15AN0017US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-074

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0018US / 15-01-15 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 30 March 2015

No. C15AN0018US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-075

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0019US / 15-01-40 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 31 March 2015

No. C15AN0019US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Pdn

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-076

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0020US / 15-01-04 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 31 March 2015

No. C15AN0020US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-077

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0029US / 15-01-07 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 01 April 2015

No. C15AN0029US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port
SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-078

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0030US / 15-01-08 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 01 April 2015

No. C15AN0030US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-079

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0031US / 15-01-36 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 01 April 2015

No. C15AN0031US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-080

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. C15AN0032US / 15-01-31 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 01 April 2015

No. C15AN0032US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-081

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0005US / 15-01-49 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 02 April 2015

No. D15AN0005US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-082

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0006US / 15-01-14 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 02 April 2015

No. D15AN0006US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-083

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0007US / 15-01-48 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 03 April 2015

No. D15AN0007US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-084

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0008US / 15-01-38 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 03 April 2015

No. D15AN0008US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-085

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0012US / 15-01-33 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 April 2015

No. D15AN0012US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-086

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0013US / 15-01-34 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 April 2015

No. D15AN0013US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Ofc

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-087

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0014US / 15-01-13 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 April 2015

No. D15AN0014US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-088

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0019US / 15-01-24 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 April 2015

No. D15AN0019US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie

**P. Beattie, Chicago Port**
SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-089

PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0020US / 15-01-19 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 April 2015

No. D15AN0020US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-090

PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0021US / 15-01-20 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 April 2015

No. D15AN0021US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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CERTIFICATE NO.:
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PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0022US / 15-01-17 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 09 April 2015

No. D15AN0022US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-092

PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0027US / 15-01-51 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 10 April 2015

No. D15AN0027US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Dist.

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-093

PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0028US / 15-01-23 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 10 April 2015

No. D15AN0028US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-094

PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0029US / 15-01-32 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 13 April 2015

No. D15AN0029US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.: 925745-2771727-095

PORT OF Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0030US / 15-01-35 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 13 April 2015

No. D15AN0030US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-096

PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0031US / 15-01-22 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 15 April 2015

No. D15AN0031US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Part A

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-097

PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0032US / 15-01-39 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 16 April 2015

No. D15AN0032US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

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PORT OF
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DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0033US / 15-01-06 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 16 April 2015

No. D15AN0033US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

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CERTIFICATE NO.:
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PORT OF
Chicago, Illinois

DATE 22 June 2015

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Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0034US / 15-01-10 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 16 April 2015

No. D15AN0034US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-100

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0039US / 15-01-45 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 20 April 2015

No. D15AN0039US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-101

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0040US / 15-01-21 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 20 April 2015

No. D15AN0040US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-102

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0041US / 15-01-26 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 20 April 2015

No. D15AN0041US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-103

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0042US / 15-01-27 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 21 April 2015

No. D15AN0042US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port CHICAGO
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-104

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0051US / 15-01-43 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 April 2015

No. D15AN0051US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-105

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0052US / 15-01-44 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 April 2015

No. D15AN0052US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-106

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0053US / 15-01-42 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 April 2015

No. D15AN0053US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-107

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. D15AN0054US / 15-01-05 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 29 April 2015

No. D15AN0054US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-108

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0001US / 15-01-54 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 04 May 2015

No. E15AN0001US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-109

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0002US / 15-01-02 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 04 May 2015

No. E15AN0002US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-110

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0003US / 15-01-18 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 04 May 2015

No. E15AN0003US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-111

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0004US / 15-01-50 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 07 May 2015

No. E15AN0004US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-112

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0005US / 15-01-37 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 07 May 2015

No. E15AN0005US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-113

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0006US / 15-01-28 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 07 May 2015

No. E15AN0006US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Pool

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-114

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0007US / 15-01-25 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 07 May 2015

No. E15AN0007US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-115

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0015US / 15-04-09 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 May 2015

No. E15AN0015US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-116

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0016US / 15-04-06 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 May 2015

No. E15AN0016US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-117

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0017US / 15-04-10 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 08 May 2015

No. E15AN0017US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-118

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0022US / 15-02-01 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 12 May 2015

No. E15AN0022US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

ABS CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-119

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0023US / 15-02-03 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 13 May 2015

No. E15AN0023US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-120

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0024US / 15-02-02 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 13 May 2015

No. E15AN0024US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-121

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0025US / 15-02-04 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 13 May 2015

No. E15AN0025US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Pom

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-122

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0026US / 15-04-05 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 14 May 2015

No. E15AN0026US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-123

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0027US / 15-04-02 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 14 May 2015

No. E15AN0027US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-124

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0028US / 15-01-55 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 14 May 2015

No. E15AN0028US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port

SURVEYOR

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-125

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0029US / 15-04-08 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 15 May 2015

No. E15AN0029US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Post

ABS CHICAGO

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-126

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0034US / 15-04-07 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 May 2015

No. E15AN0034US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

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# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-127

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0035US / 15-04-04 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 May 2015

No. E15AN0035US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

P. Beattie, Chicago Port
SURVEYOR

ABS CHICAGO

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
925745-2771727-128

PORT OF
Chicago, Illinois

DATE 22 June 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Oerlikon Fairfield Drive Systems attend their plant at Lafayette, Indiana on the 24th day of November 2014 and subsequent dates in order to examine and report on One (1) S60A (Model: S60A24437401) Jacking Gearbox and One (1) L1084 Pinion intended for the HYDRAQUIP CORP.

Shipbuilder Not Stated Hull Nos. Not Stated

Serial Nos. E15AN0036US / 15-04-01 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the Jacking System of a classed vessel with the notation in the record book of ✠ Liftboat and Jack-up Workboat signifying the highest classification for Equipment and special survey during construction.

STAMPED:

A B

CH2771727

DATE 18 May 2015

No. E15AN0036US

HYDROSTATIC TESTS: Leak and spin test completed during final inspection.

Maximum Jacking Load: 162,600 lbf / Maximum Holding Load: 191,200 lbf / Severe Storm Load: 244,400 lbf. Minimum Ambient Temp: -20 degrees C.

The Service Restrictions are applied to this gearbox as noted in 14-HS1028524-PDA dated 23 April 2014.

ABS CHICAGO

P. Beattie, Chicago Port

SURVEYOR

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or authorized entities. This Certificate is a representation only that the vessel, structure, item of material, equipment, machinery or any other item covered by this Certificate has been examined for compliance with, or has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping which shall remain sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.

**PROJECT NO: 3509218**
**TASK NO: T1592039**

**Date: 30 December 2016**

| | |
|---|---|
| Subject: | Hydraulic Motor Certification, HCSI Jacking Systems |
| Model Number: | Danfoss H1B-080 Hydraulic Motor with 14T 12/24 Splined Shaft |
| Serial Numbers: | Please see Attachments A & B |

**Hydraquip Custom Systems, INC.**
**12311 Cutten Rd.,**
**Houston, Texas 77066**
**USA**

Attention: Mr. Todd Welsh/ Mr. Maxwell Palmer

We advise that ABS recently completed a review into the suitability of Danfoss H1B-080 hydraulic motor for the application on the Fairfield S-60 and S-350 Planetary gearbox for the below listed ABS Class MODUs. ABS has reviewed and evaluated the attached submitted product definition, material specifications, performance data, shaft torque calculations, service history and other supplemental justification to establish compliance with the intent of ABS MODU 6-1-9/15.3 and Table 2.

Accordingly, we advise that we have no objection to the application of these hydraulic motors specific for the below mentioned vessel information and serial numbers only:

| Facility Name | Facility Number | Danfoss Motor Serial Numbers |
|---|---|---|
| Falcon Pearl | H1028 | Attachment A |
| Falcon Diamond | H1029 | Attachment B |

If you have any question regarding this review, please contact Haroon Zuberi at (281) 877-6487 or at HZuberi@eagle.org and Satya Meruva at (281) 877-5705 or Demetri Stroubakis at DStroubakis@eagle.org (713)723-3260. You can also contact the undersigned at 281-877-6374 or at MChakala@eagle.org .

Very truly yours

Roy H. Bleiberg
Vice President of Engineering
ABS Americas

By: _____
Mathew Chakala
Manager | Americas
Engineering Service Department (ESD)

Date: 30 December 2016

## ATTACHMENT A:

**Falcon Pearl**
**H1028**
**ABS ID YY262247**
**Jacking System Hydraulic Motor Serial Numbers by Location**

| | Port Aft Leg | | Port Fwd Leg | | Stbd Fwd Leg | | Stbd Aft Leg | |
|---|---|---|---|---|---|---|---|---|
| Layer | Fwd | Aft | Fwd | Aft | Fwd | Aft | Fwd | Aft |
| 9 | N153300125 | N153300117 | N153300179 | N153300153 | N153300188 | N153300184 | N153300200 | N153300171 |
| 8 | N153200989 | N153200984 | N153200988 | N153200981 | N153200992 | N153200987 | N153200982 | N153300160 |
| 7 | N153300170 | N153300132 | N153300156 | N153300131 | N153300202 | N153300177 | N153300145 | N153300195 |
| 6 | N153300165 | N153300150 | N153300201 | N153300140 | N153300120 | N153300144 | N153300142 | N153300148 |
| 5 | OPEN | OPEN | OPEN | OPEN | OPEN | OPEN | OPEN | OPEN |
| 4 | N153300116 | N153300141 | N153300138 | N153300139 | N153300126 | N153300197 | N153300122 | N153300174 |
| 3 | N153300119 | N153300143 | N153300155 | N153300152 | N153300127 | N153300149 | N153300123 | N153300167 |
| 2 | N153300166 | N153300146 | N153300118 | N153300133 | N153300115 | N153300212 | N153200982 | N153200986 |
| 1 | N153300125 | N153300154 | N153300192 | N153300158 | N153300136 | N153300213 | N153300200 | N153300169 |

### Please Note:

The layer 5 is listed as “OPEN” as there is a spare location in the jacking tower for provision for a potential future gearbox/pinion assembly. Montco Offshore (part of Falcon Global joint venture) has historically done this for potential future increase in capability of jacking system. It is currently not used and mentioned as “open” position.

Date: 30 December 2016

## ATTACHMENT B:

**Falcon Diamond**
**H1029**
**ABS ID YY262248**
**Jacking System Hydraulic Motor Serial Numbers by Location**

| | Port Aft Leg | | Port Fwd Leg | | Stbd Fwd Leg | | Stbd Aft Leg | |
|---|---|---|---|---|---|---|---|---|
| Layer | Fwd | Aft | Fwd | Aft | Fwd | Aft | Fwd | Aft |
| 9 | N153300162 | N153300129 | N153300198 | N153300225 | N153300217 | N153300198 | N153300205 | N153300159 |
| 8 | N153300164 | N153200215 | N153300173 | N153300224 | N153300180 | N153300185 | N153300135 | N153300223 |
| 7 | N153300209 | N153300181 | N153300163 | N153300222 | N153300218 | N153300193 | N153300124 | N153300159 |
| 6 | N153300190 | N153300130 | N153300207 | N153300172 | N153300182 | N153300226 | N153300134 | N153300137 |
| 5 | OPEN | OPEN | OPEN | OPEN | OPEN | OPEN | OPEN | OPEN |
| 4 | N153300176 | N153300186 | N153300206 | N153300161 | N153300210 | N153300219 | N153300220 | N153300147 |
| 3 | N153300175 | N153300183 | N153300194 | N153300211 | N153300189 | N153300193 | N153300202 | N153300151 |
| 2 | N153200995 | N153200990 | N153200985 | N153200991 | N153200996 | N153200993 | N153200983 | N153200994 |
| 1 | N153300157 | N153300214 | N153300178 | N153300191 | N153300121 | N153300221 | N153300204 | N153300168 |

### Please Note:

The layer 5 is listed as “OPEN” as there is a spare location in the jacking tower for provision for a potential future gearbox/pinion assembly. Montco Offshore (part of Falcon Global joint venture) has historically done this for potential future increase in capability of jacking system. It is currently not used and mentioned as “open” position.

# AMERICAN BUREAU OF SHIPPING

CERTIFICATE NO.:
358102-2876983-001

PORT OF
Sturgeon Bay, Wisconsin

DATE 06 May 2015

**THIS IS TO CERTIFY** that the undersigned surveyor to this Bureau did, at the request of Marathon Electric MFG attend their plant at Wausau, Wisconsin on the 20th day of April 2015 and subsequent dates in order to examine and report on One (1) AC Electric Motor model no. 900129 intended for the UNKNOWN VESSEL Shipbuilder Saigon Offshore Fab & Eng LTD Hull Nos. UNKNOWN Serial Nos. WAA098510 and,

That I have transmitted to the Committee of the American Bureau of Shipping, a report stating that the aforementioned equipment has been manufactured and tested satisfactorily in accordance with the requirements of the rules of this Bureau; and

That I have recommended that this equipment is entitled to become part of the machinery of a classed vessel with the notation in the record book of ✠ AMS signifying the highest classification for machinery and special survey during construction.

STAMPED:

A B ✠

SB2876983

DATE 20 April 2015

No. WAA098510

HYDROSTATIC TESTS:

The unit was rated as follows:

300 Hp (224kW), 690 Volts, 225 Amps, IP56 Enclosure, 3 Phase, SF 1.0, 0.86 PF 1787 RPM, Class H Insulation 80C Rise/50C Amb

Coupling bolts are not provided with the unit. Customer to provide details / calculations to an ABS Technical Office for approval or provide certification to the satisfaction of the attending ABS Surveyor.

ABS STURGEON BAY

**Dion, Andrew D, Sturgeon Bay Port**

SURVEYOR

Certificate No.: 358102-2876983-002
Port of Sturgeon Bay, WI
Date: 06 May 2015

ABS

# INTERIM PRODUCT CERTIFICATE (PQA)

**THIS IS TO CERTIFY:**

That on **06 May 2015**
the **Marathon Electric MFG** plant
at **Wausau, Wisconsin**
completed the construction of
**Fifteen (15) AC Electric Motors model no. 900129**

rated at

| | | | |
|---|---|---|---|
| **300 Hp** | **690 Volts** | **225 Amps** | **3 Phase** |
| **SF 1.0** | **0.86 PF** | **1787 RPM** | **IP 56 Enclosure** |
| **Class H Insulation** | **80C Rise/50C Amb** | | |

intended for **Saigon Offshore Fab & Eng LTD**
Hull No. **UNKNOWN**

And:
The manufacturer has issued the attached "Declaration of Conformity" confirming that the product was manufactured under a Recognized Quality System in compliance with the ABS Rules for Product Quality Assurance (PQA); and confirms that the details of design, materials and workmanship of the product conforms to the applicable Rules of the American Bureau of Shipping as noted in Product Design Assessment Number: **TBD Ref. T1340915/T1361913**
dated **2 April 2015 / 30 April 2015**;

The product was identified as:

| Serial No. | Serial No. | Serial No. |
|---|---|---|
| WAA098511 | WAA098585 | WAA098625 |
| WAA098533 | WAA098586 | WAA098626 |
| WAA098534 | WAA098587 | WAA098661 |
| WAA098560 | WAA098611 | WAA098662 |
| WAA098561 | WAA098612 | WAA098663 |

The undersigned have confirmed the quality control surveillance audits as required by the Rules for Building and Classing Steel Vessels have been carried out at the above plant and:

Therefore, contingent upon the completion of satisfactory operational tests aboard the intended vessel, MODU or facility; this product is considered to be eligible to become part of the Machinery of a classed vessel, MODU or facility, with the notation of ✠ AMS signifying the highest classification of the Machinery.

Remarks:
Coupling bolts are not provided with the unit. Customer to provide details / calculations to an ABS Technical Office for approval or provide certification to the satisfaction of the attending ABS Surveyor.

ABS STURGEON BAY

**Dion, Andrew D., Sturgeon Bay, Port**

*Surveyor, American Bureau of Shipping*

*Surveyor, American Bureau of Shipping*

marathon™ Motors

## Declaration of Conformity with Type Approval

We hereby certify that the product described herein has been manufactured to the applicable ABS Rules for Building and Classing Steel Vessels 2015, IEEE45, IEC60092, USCG CFR 46, and the manufacturer's specifications. This Product has been tested in accordance with the requirements of the American Bureau of Shipping Rules.

Certificate Number: SB2876983

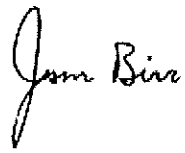
Serial Number(s): WAA098511, WAA098533, WAA098534, WAA098560, WAA098561, WAA098585, WAA098586, WAA098587, WAA098611, WAA098612, WAA098625, WAA098626, WAA098661, WAA098662, WAA098663

Marine Plan Number: 900129

Marine Plan Dash Number: 0001

Description: 300HP, 1800RPM, TEFC, IP56, 447/449TSCV
Customer: HYDRAQUIP CORPORATION
Shipyard: SAIGON OFFSHORE FAB & ENG LTD
Intended For: PUMP

**May 6, 2015**
**Signed:**



**Jason Birr**
**Marine Team Representative**

MARATHON ELECTRIC MFG. CORP.
100 E RANDOLPH ST WAUSAU, WI 54401, U.S.A. 715-675-3311 FAX 715-675-8030

**AH/RG**
**Project Number: 3492957**
**Task Number: T1335386A**
**Class Number: YY262247**

**DATE:** **8 APRIL 2015**

**SUBJECT:** ***EXTENSION OF APPROVAL:***
**MULTIPLE DISC BRAKE**
**P/N: 13-547-508-ABS**

SAIGON SHIPYARD CO., LTD– H1028
SELF ELEVATING UNIT

**(ORIGINALLY APPROVED DRAWINGS AS PER ATTACHED)**

**MICO WEST DIVISION**
**P.O. BOX 9058**
**ONTARIO, CA 91762**

**ATTENTION: RENE MORENO**

We have your email dated 24 March, 2015 requesting extension of approval for the subject Multiple Disc Brake originally approved by ABS Letter dated 24 September 2008, ABS Ref: 374929, OPN # 194395, and with regard thereto have to advise that we have no objection to the requested extension of our past approval for the above rig.

The design of the subject equipment has been reviewed and found to be in compliance with the ABS 2014 "Rules for Building and Classing Mobile Offshore Drilling Units" for the following design conditions:

| | | |
|---|---|---|
| ***Torque Rating:*** | ***4,600*** | ***Lb-in*** |
| ***Service Factor:*** | ***3,000*** | ***Psi*** |
| ***Minimum Operating Temperature:*** | ***-22°C*** | ***(-8°F)*** |
| ***Maximum Operating Temperature:*** | ***132°C*** | ***(270°F)*** |

- **The hydraulic/electric controls of the Disc Brake are not within our scope of this design review. Brakes are to be designed to engage automatically in the event of failure of power supply to the motor (fail-safe type).**
- **The brake holding capacity is to be at least equal to 120% of the maximum required brake torque associated with the maximum rated load applied to the climbing pinion from all loading conditions specified in section 6-1-9/11 of ABS 2014 MODU Rules. The brake holding capacity is to be tested in the presence of attending ABS Surveyor**
- **A subcomponent Failure Modes and Effects Analysis (FMEA) is to be carried out and submitted as part of a complete jacking system analysis as per 6-1-9/7 of the ABS 2014 MODU Rules, to the satisfaction of the attending Surveyor.**

Please be advised that our attending Surveyor is to conduct an in-shop survey/inspection.

The ABS Letter of Approval can be downloaded through ABS My Eagle Engineering Manager.

**AH/RG**
**Project Number: 3492957**
**Task Number: T1335386A**
**Class Number: YY262247**

**DATE: 8 APRIL 2015**

An invoice to cover the cost of our services will follow under separate correspondence.

If we may be of further assistance, please feel free to contact Andrew Harville at 281.877.6949 or the undersigned at 281.877.6374.

Very truly yours,

Daniel D. Cronin
Vice President of Engineering
ABS Americas

By: _____
Prudhviraju Gadapa
Managing Principal Engineer
ABS Offshore Engineering Department – Equipment

NOTE: DISC BRAKE PREVIOUSLY APPROVED PER ABS LETTER DATED 24 SEPTEMBER 2008, ABS REF 374929, OPN # 1949395

**AMERICAS DIVISION**
ABS PLAZA, 16855 NORTHCHASE DRIVE, HOUSTON, TX 77060 USA
TEL: 1-281-877-6000 FAX: 281-877-6001 EMAIL: abs-amer@eagle.org WEBSITE: www.eagle.org

**Project Number:** AH/RG 3492957
**Task Number:** T1335386A
**Class Number:** YY262247

**DATE:** 8 APRIL 2015

## DRAWINGS LIST

| | | |
|---|---|---|
| **Engineering Office:** | Houston OED - Equipment | |
| **Submitter:** | MICO WEST DIVISION | |
| **Drawing No** | **Rev No** | **Drawing Title** |
| 13-547-508 | A | MULTIPLE DISK BRAKE |
| 13-547-508 | B | MULTIPLE DISK BRAKE – CUSTOMER COPY |
| 42-230-012 | D | ROTOR |
| 40-230-141 | H | SPRING PLATE |
| 40-230-241 | B | PRESSURE PLATE |
| 40-030-128 | B | COVER PLATE |
| 40-180-276 | D | OUTER SPLINE SHAFT |
| 42-230-011 | G | STATOR |
| 42-660-023 | K | SPRING |
| 42-660-022 | H | SPRING |
| 42-470-043 | C | BEARING |
| 42-230-010 | H | PRIMARY |
| 40-010-042 | N | PISTON |
| 40-180-275_1 | C | SHAFT |

**NOTE: DRAWINGS PREVIOUSLY APPROVED PER ABS LETTER DATED 24 SEPTEMBER 2008, ABS REF 374929, OPN # 1949395, ABS LETTER DATED 24 JULY 2013, ABS REF T1039374, OPN #3033017.**

**AMERICAS DIVISION**
ABS PLAZA, 16855 NORTHCHASE DRIVE, HOUSTON, TX 77060 USA
TEL: 1-281-877-6000 FAX: 281-877-6001 EMAIL: abs-amer@eagle.org WEBSITE: www.eagle.org

# AMERICAN BUREAU OF SHIPPING

| | | | |
|---|---|---|---|
| Customer Name | **MICO WEST DIVISION** | Purchase Order No. | **110084** |
| Attending Office | **Los Angeles, CA** | Report Number | **LA2905560** |
| First Visit Date | **18-May-2015** | Last Visit Date | **18-May-2015** |

**Certification Of:** Elevator
Manufacturer: MICO WEST DIVISION

Quantity : One (1)

**Survey Location :** Ontario, CA

**Equipment Data**

| | |
|---|---|
| Item Name | Multiple Disc Brake |
| Manufacturer Number(S. No.) | 15-C-133 |
| Model Number | 13-547-508-ABS |
| Designer Name | Mico West Division |

**Design Details**

| | |
|---|---|
| Design State | Design Approved/Reviewed |
| ABS Reviewing Organization | Houston OED - Equipment |
| Drawing Number | T1335386A dated 08 April 2015 |

**This is to Certify** that the undersigned surveyor(s) to this Bureau did, at the request of the customer, carry out the following survey and report as follows:

The principal data has been verified in accordance with the applicable Rules/specifications and approved plans, and confirmed to be within acceptable tolerances.
All testing (pressure/load/operational/etc.) has been carried out as applicable and verified in accordance with the applicable Rules/specifications.
Testing machines are maintained in a satisfactory condition and records of their recheck or calibration dates confirmed.
All parts of the machinery/equipment satisfactorily complied with the approved drawings. Amendments, if any, verified to be rectified and considered satisfactory.
Subject to satisfactory installation, testing and trials after installation onboard the vessel.
Asbestos-free declaration verified and supporting documentation reviewed.

Sixty four (64) multiple disc brake, Date Code: 15-C-133, were examined and tested in accordance with MICO West Division Drawing No.13-547-508-ABS, Rev. A, ABS MODU Rules (2014), and ABS Design Approval Extension Letter dated 08 April 2015, Project No. 3492957 Task No. T1335386A. The brakes are reportedly destined for:

Builder: Saigon Shipyard Co Ltd
Facility Type: Self Elevating Unit
Facility Name: TBA
Hull No.: H1028
ABS ID No.: YY262247

Dry Torque Ratings for these units were tested and particulars verified:

- Torque Rating: Wet 4,600 LB-IN Static Dry 7,000 LB-IN
- Max. Operating Pressure: 3,000 PSI
- Operating Temperature Range: minus 22 C (minus 8 F) to 132 C (270 F)

| | | | |
|---|---|---|---|
| Customer Name | **MICO WEST DIVISION** | Purchase Order No. | **110084** |
| Attending Office | **Los Angeles, CA** | Report Number | **LA2905560** |
| First Visit Date | **18-May-2015** | Last Visit Date | **18-May-2015** |

- Release Pressure: 160 PSI initial, 210 PSI full

**AH/RG**
**Project Number: 3492957**
**Task Number: T1335386B**
**Class Number: YY262248**

**DATE:** **8 APRIL 2015**

**SUBJECT:** ***EXTENSION OF APPROVAL:***
**MULTIPLE DISC BRAKE**
**P/N: 13-547-508-ABS**

SAIGON SHIPYARD CO., LTD– H1029
SELF ELEVATING UNIT

**(ORIGINALLY APPROVED DRAWINGS AS PER ATTACHED)**

**MICO WEST DIVISION**
**P.O. BOX 9058**
**ONTARIO, CA 91762**

**ATTENTION: RENE MORENO**

We have your email dated 24 March, 2015 requesting extension of approval for the subject Multiple Disc Brake originally approved by ABS Letter dated 24 September 2008, ABS Ref: 374929, OPN # 194395, and with regard thereto have to advise that we have no objection to the requested extension of our past approval for the above rig.

The design of the subject equipment has been reviewed and found to be in compliance with the ABS 2014 "Rules for Building and Classing Mobile Offshore Drilling Units" for the following design conditions:

| | | |
|---|---|---|
| ***Torque Rating:*** | ***4,600*** | ***Lb-in*** |
| ***Service Factor:*** | ***3,000*** | ***Psi*** |
| ***Minimum Operating Temperature:*** | ***-22°C*** | ***(-8°F)*** |
| ***Maximum Operating Temperature:*** | ***132°C*** | ***(270°F)*** |

- **The hydraulic/electric controls of the Disc Brake are not within our scope of this design review. Brakes are to be designed to engage automatically in the event of failure of power supply to the motor (fail-safe type).**
- **The brake holding capacity is to be at least equal to 120% of the maximum required brake torque associated with the maximum rated load applied to the climbing pinion from all loading conditions specified in section 6-1-9/11 of ABS 2014 MODU Rules. The brake holding capacity is to be tested in the presence of attending ABS Surveyor**
- **A subcomponent Failure Modes and Effects Analysis (FMEA) is to be carried out and submitted as part of a complete jacking system analysis as per 6-1-9/7 of the ABS 2014 MODU Rules, to the satisfaction of the attending Surveyor.**

Please be advised that our attending Surveyor is to conduct an in-shop survey/inspection.

The ABS Letter of Approval can be downloaded through ABS My Eagle Engineering Manager.

**AH/RG**
**Project Number: 3492957**
**Task Number: T1335386B**
**Class Number: YY262248**

**DATE: 8 APRIL 2015**

An invoice to cover the cost of our services will follow under separate correspondence.

If we may be of further assistance, please feel free to contact Andrew Harville at 281.877.6949 or the undersigned at 281.877.6374.

Very truly yours,

Daniel D. Cronin
Vice President of Engineering
ABS Americas

By: _____
Prudhviraju Gadapa
Managing Principal Engineer
ABS Offshore Engineering Department – Equipment

NOTE: DISC BRAKE PREVIOUSLY APPROVED PER ABS LETTER DATED 24 SEPTEMBER 2008, ABS REF 374929, OPN # 1949395

**AMERICAS DIVISION**
ABS PLAZA, 16855 NORTHCHASE DRIVE, HOUSTON, TX 77060 USA
TEL: 1-281-877-6000 FAX: 281-877-6001 EMAIL: abs-amer@eagle.org WEBSITE: www.eagle.org

**AH/RG**
**Project Number: 3492957**
**Task Number: T1335386B**
**Class Number: YY262248**

**DATE: 8 APRIL 2015**

## DRAWINGS LIST

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| **Submitter:** | MICO WEST DIVISION | |
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| 42-660-022 | H | SPRING |
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| 42-230-010 | H | PRIMARY |
| 40-010-042 | N | PISTON |
| 40-180-275_1 | C | SHAFT |

**NOTE: DRAWINGS PREVIOUSLY APPROVED PER ABS LETTER DATED 24 SEPTEMBER 2008, ABS REF 374929, OPN # 1949395, ABS LETTER DATED 24 JULY 2013, ABS REF T1039374, OPN #3033017.**

**AMERICAS DIVISION**
ABS PLAZA, 16855 NORTHCHASE DRIVE, HOUSTON, TX 77060 USA
TEL: 1-281-877-6000 FAX: 281-877-6001 EMAIL: abs-amer@eagle.org WEBSITE: www.eagle.org

# AMERICAN BUREAU OF SHIPPING

| | | | |
|---|---|---|---|
| Customer Name | **MICO WEST DIVISION** | Purchase Order No. | **110084** |
| Attending Office | **Los Angeles, CA** | Report Number | **LA2905560** |
| First Visit Date | **18-May-2015** | Last Visit Date | **18-May-2015** |

**Certification Of:** Elevator
Manufacturer: MICO WEST DIVISION

Quantity : One (1)

**Survey Location :** Ontario, CA

**Equipment Data**

| | |
|---|---|
| Item Name | Multiple Disc Brake |
| Manufacturer Number(S. No.) | 15-C-134 |
| Model Number | 13-547-508-ABS |
| Designer Name | MICO WEST DIVISION |

**Design Details**

| | |
|---|---|
| Design State | Design Approved/Reviewed |
| ABS Reviewing Organization | Houston OED - Equipment |
| Drawing Number | T1335386B dated 08 April 2015 |

**This is to Certify** that the undersigned surveyor(s) to this Bureau did, at the request of the customer, carry out the following survey and report as follows:

The principal data has been verified in accordance with the applicable Rules/specifications and approved plans, and confirmed to be within acceptable tolerances.
All testing (pressure/load/operational/etc.) has been carried out as applicable and verified in accordance with the applicable Rules/specifications.
Testing machines are maintained in a satisfactory condition and records of their recheck or calibration dates confirmed.
All parts of the machinery/equipment satisfactorily complied with the approved drawings. Amendments, if any, verified to be rectified and considered satisfactory.
Subject to satisfactory installation, testing and trials after installation onboard the vessel.
Asbestos-free declaration verified and supporting documentation reviewed.

Sixty four (64) multiple disc brake, Date Code: 15-C-134, were examined and tested in accordance with MICO West Division Drawing No.13-547-508-ABS, Rev. A, ABS MODU Rules (2014), and ABS Design Approval Extension Letter dated 08 April 2015, Project No. 3492957 Task No. T1335386B. The brakes are reportedly destined for:

- Builder: Saigon Shipyard Co Ltd
- Facility Type: Self Elevating Unit
- Facility Name: TBA
- Hull No.: H1029
- ABS ID No.: YY262248

Dry Torque Ratings for these units were tested and particulars verified:

- Torque Rating: Wet 4,600 LB-IN Static Dry 7,000 LB-IN
- Max. Operating Pressure: 3,000 PSI
- Operating Temperature Range: minus 22 C (minus 8 F) to 132 C (270 F)
- Release Pressure: 160 PSI initial, 210 PSI full

| | | | |
|---|---|---|---|
| Customer Name | **MICO WEST DIVISION** | Purchase Order No. | **110084** |
| Attending Office | **Los Angeles, CA** | Report Number | **LA2905560** |
| First Visit Date | **18-May-2015** | Last Visit Date | **18-May-2015** |

**Surveyor(s) to The American Bureau of Shipping**
**Attending Surveyors**

Davis John Patrick — Electronically Signed on 22-May-2015

**Reviewed By**
Donahue III, Arthur — Electronically Signed on 22-May-2015, Los Angeles Port

RV/PG
**Reference:** **T1451681**
**Project Number:** **3639305**
**Class Number:** **N/A**

**S. HIMMELSTEIN AND COMPANY**
2490 PEMBROKE AVE,HOFFMAN ESTATES
IL, UNITED STATES - 60169

ATTN: Steve Tveter

**19 January 2016**

| | |
|---|---|
| **Review Activity:** | **Type Approval Design Assessment** |
| **Equipment:** | **Torque Transducer for Jacking System**<br>Model: **MCRT 38569XS(5-3)NNN** |
| **Documentation:** | **As per PDA** |

We have received your declaration stating that the materials in the requested assessment are free from Asbestos and your application for ABS Type Approval dated 02nd November 2015 together with the enclosures listed below and are pleased to advise that we have completed the Product Design Assessment (PDA) phase of the type approval process. Enclosed is your original copy of the PDA. Your details are published on our web site at www.typeapproval.org and can also be downloaded there.

The submitted drawings and documentation have been reviewed for compliance with the applicable requirements of ABS Rules for Building and Classing Mobile Offshore Drilling Units, 2015.

Please be sure that you understand the scope and conditions of the validity of the certificate. An assessment is not an approval. As applicable, the PDA is a generic assessment of materials, components, products or systems for a specific use in compliance with the Rules, Guides and recognized standards. In essence the final approval is given when an Engineer or Surveyor accepts it for a specific user and installation. Therefore, the PDAs are written assuming that the end user and installation of the product is unknown and that the manufacturer may or may not apply for Manufacturing Assessment.

In particular we draw your attention to the pages attached to the PDA and the restrictions that may affect its use.

Please be aware that this product does require Conformity Assessment, also known as Unit Certification, or Factory Acceptance Testing. If the product is to be used for an ABS Classed vessel, MODU or facility the Conformity Assessment must be done in the presence of a Surveyor or by your company's representative if you are in the Product Quality Assurance category.

This Product Design Assessment (PDA) is intended for products to be used on ABS classed vessels, MODUs or facilities which are in existence or under contract for construction on the date of the ABS Rules used to evaluate the Product. The use of the product in a non-ABS classed vessel, MODU or facility is to be mutually agreed between your company and your client

We recommend that you monitor the ABS Rules, Guides and other standards used in the approval. These Rules, Guides and standards often change on an annual basis, and you must comply with the new Rules, Guides and standards in order for the product to be used on an ABS classed vessel or facility contracted under the new Rules, Guides or specifications.

We do caution you that the use of the ABS logo is copyrighted. However, our "Design Assessed" logo may be used as long as your PDA remains valid.

| | |
|---|---|
| | **RV/PG** |
| **Reference:** | **T1451681** |
| **Project Number:** | **3639305** |
| **Class Number:** | **N/A** |

Our "Product Type Approval" Logo may be used as long as **you have an ISO9001 Certified Quality System (or equivalent) and** you are conducting regular **ABS Manufacturing Assessment** audits of your manufacturing process. Should you desire to continue with Product Type Approval, please contact the ABS Office at Houston, TX Tel: 1-281-877-6000, Fax: 1-281-877-6001. The office will arrange for the production testing as may be necessary and audit of your quality assurance and control arrangements. To find another office, please use the directory of ABS offices on the ABS Web Site at www.eagle.org. You may also ask the ABS Program staff at Tel. (281) 877-6107, Fax (281) 877-6591, or e-mail absta-programs@eagle.org.

**A copy of the artwork for the Design Assessed and Type Approved logos may be requested from our email address absta-progams@eagle.org. Please be aware that both logos are not to be used at the same time. For a copy of the art work and detailed guidance on their use, please contact absta-programs@eagle.org**

One (1) copy of the submitted plans, appropriately stamped to indicate our review, is being returned electronically through ABS Eagle Customer Interface.

An invoice to cover the cost of the design assessment phase of the type approval process will follow under a separate correspondence.

If you should have any comments relative to the scope and conditions of the assessment of your product, or if we can be of any further assistance, please do not hesitate to contact Ravi Vanjarapu at (281) 877-6965 or the undersigned at (281) 877-6866.

Daniel Cronin
Vice President of Engineering
ABS Americas

By: _____
Prudhviraju Gadapa
Managing Principal Engineer
ABS Offshore Engineering Department –Equipment

CERTIFICATE NUMBER
16-HS1451681-PDA

DATE
19 Jan 2016

ABS TECHNICAL OFFICE
Houston OED - Equipment

# CERTIFICATE OF
# DESIGN ASSESSMENT

This is to certify that a representative of this Bureau did, at the request of

**S. HIMMELSTEIN AND COMPANY**

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product: **Torque Transducer**

Model: **MCRT 38569XS(5-3)NNN**

This Product Design Assessment (PDA) Certificate 16-HS1451681-PDA, dated 19/Jan/2016 remains valid until 18/Jan/2021 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

AMERICAN BUREAU OF SHIPPING

Tim Kimble
Engineer/Consultant

**S. HIMMELSTEIN AND COMPANY**
2490 PEMBROKE AVE
HOFFMAN ESTATES IL
United States 60169
Telephone: 847-843-3300
Fax: 847-843-8488
Email: sales@himmelstein.com
Web: himmelstein.com

**Tier: 2 - PDA Issued**

**Product:** **Torque Transducer**
**Model:** **MCRT 38569XS(5-3)NNN**
**Intended Service:**
Marine and Offshore Application - Control Torque Transducer in Jacking System.

**Description:**
Torque Transmitter measures bidirectional static (stall) & dynamic shaft torque & speed (optional)

**Rating:**
Full Scale Torque Rating: 5000 lbf-in
Overload Rating : 10000 lbf-in
Maximum Overhung Moment : 5000 lbf-in
Torsional Stiffness : 520,000 lbf-in/rad
Temperature rating: -25 deg C to +85 deg C

Speed rating : 3800 rpm
Output: 4-20 mA (12±8 mA)
Supply Voltage: 10 to 28 volts dc
Environmental rating : IP66

**Service Restriction:**
If fully type approved, unit certification is not required.

**Comments:**
1) The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.

**Notes/Drawing/Documentation:**
Drawing No. ABS_Supporting_Reference_Material, ABS_Supporting_Reference_Material, Revision: -, Pages: -
Drawing No. B7640_ABS, B7640_ABS, Revision: -, Pages: -
Drawing No. Correspondence, Asbestos Free Declaration, Revision: -, Pages: -
Drawing No. Correspondence, Type Approval Application, Revision: -, Pages: -
Drawing No. Correspondence, PO_68216, Revision: -, Pages: -
Drawing No. Correspondence 1, Correspondence 1, Revision: -, Pages: -
Drawing No. Correspondence 2, Correspondence 2, Revision: -, Pages: -
Drawing No. Hydraquip_ABS_TransmitterShaft_Analysis_33816XV,
Hydraquip_ABS_TransmitterShaft_Analysis_33816XV, Revision: -, Pages: -
Drawing No. Hydraquip_MaterialProperties, Hydraquip_MaterialProperties, Revision: -, Pages: -
Drawing No. Hydraquip_MaterialTestReport, Hydraquip_MaterialTestReport, Revision: -, Pages: -
Drawing No. MCRT_38569X_CrossSection_48810, MCRT_38569X_CrossSection_48810, Revision: -, Pages: -
Drawing No. MCRT_38569X_Outline_48823, MCRT_38569X_Outline_48823, Revision: -, Pages: -
Drawing No. MCRT_38569X_Shaft_48825XX, MCRT_38569X_Shaft_48825XX, Revision: -, Pages: -
Drawing No. MCRT_38569X_Shaft_TorsionSection_48825s, MCRT_38569X_Shaft_TorsionSection_48825s,
Revision: -, Pages: -
Drawing No. SAE_J744_201302, SAE_J744_201302, Revision: -, Pages: -
Drawing No. Shaft_Stress_Calculations_MCRT_38569X, MCRT_38569X_Shaft_TorsionSection_48825s, Revision:
-, Pages: -
Drawing No. Torque_Transducer_Installation_Sketch, Torque_Transducer_Installation_Sketch, Revision: -, Pages: -
Drawing No. etr1504882-01, etr1504882-01, Revision: -, Pages: -

**Terms of Validity:**
This Product Design Assessment (PDA) Certificate 16-HS1451681-PDA, dated 19/Jan/2016 remains valid until 18/Jan/2021 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

**S. HIMMELSTEIN AND COMPANY**
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Web: himmelstein.com

**Tier: 2 - PDA Issued**

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

## STANDARDS

**ABS Rules:**
Rules for Conditions of Classification, Part 1 2016 Steel Vessels Rules 1-1-4/7.7, 1-1-A3, 1-1-A4;
2016 Offshore Units and Structures 1-1-4/9.7, 1-1-A2, 1-1-A3, which covers the following:
Mobile Offshore Drilling Units (2016): 4-1-3;

**National:**
NA

**International:**
NA

**Government:**
NA

**EUMED:**
NA

**OTHERS:**
NA

# S. HIMMELSTEIN AND COMPANY

*Designing and Making the World's Best Torque Instruments Since 1960*

*January 14, 2016*

## *Certificate of Compliance*

*We certify that the material described on the referenced sales order and the materials and processes used to produce them meet the requirements and approved deviations, if any, as called for by the specifications which our records indicate effective at the time of manufacture. This shipment is in compliance with your Purchase Order 41006587, line item 1 for the following products:*

***Quantity 12 MCRT 38569XS(5-3)NNN Torquemeters***

**Serial Numbers:**
**38569X36150102, 38569X36150103,**
**38569X36150104, 38569X36150105,**
**38569X36150106, 38569X36150107,**
**38569X36150108, 38569X36150109,**
**38569X36150110, 38569X36150111,**
**38569X36150112, 38569X36150113**

*Certified True and Correct*

***S. Himmelstein and Company***

*Testing Witnessed By,*

ABS CHICAGO

*Ben Mantey*
*ABS Surveyor*

*Respectfully Submitted,*
*S. Himmelstein and Company*

*Steven E. Tveter*
*Vice President*

***References***

- **Hydraquip Purchase Order Number: 4100657**
- **SHC Order Number: SO-42147**
- **SHC File Number: 33816-XV**



2490 Pembroke Avenue, Hoffman Estates, IL 60169 • Telephone: 847/843-3300 • FAX: 847/843-8488 • www.himmelstein.com

CERTIFICATE NUMBER
15-HS1451641-PDA

DATE
10 Dec 2015

ABS TECHNICAL OFFICE
Houston OED - Systems

# CERTIFICATE OF DESIGN ASSESSMENT

This is to certify that a representative of this Bureau did, at the request of

**HOUSTON MOTOR & CONTROL, INC. (HMC)**

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product: **Motor Start Control Unit**

Model: **Motor Control panel 4680, model No. 30019SS71F04**

This Product Design Assessment (PDA) Certificate 15-HS1451641-PDA, dated 10/Dec/2015 remains valid until 09/Dec/2020 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

AMERICAN BUREAU OF SHIPPING

Tim Kimble
Engineer/Consultant

**HOUSTON MOTOR & CONTROL**
14400 HOLLISTER, SUITE 100
HOUSTON TX
United States 77066
Telephone: 713-464-3910
Fax: 713-464-4568
Email: bharmon@motor-hmc.com
Web: WWW.MOTOR-HMC.COM

**Tier: 5 - Unit Certification Required**

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**Product:** **Motor Start Control Unit**
**Model:** **Motor Control panel 4680, model No. 30019SS71F04**
**Intended Service:**
Marine and Offshore application - Motor Starting and Protection

**Description:**
Soft-Starter Panel with external bypass consisting of: NEMA 4 Steel Enclosure, One (1) Soft Start Motor Starter with Profibus Module, One (1) Across the Line Motor Starter, Start/ Stop pushbuttons, 3-Pos HOA Switch with E-Stop and Indicating Lights.

**Rating:**
- Designed for 690VAC, 3 Phase, 60Hz, 300HP Induction Motor, 225 FLA, Short Circuit Rating 120kAic.

**Service Restriction:**
- Unit Certification is required for this product.
- Designed to be operated in non-hazardous location

**Comments:**
- The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.

Unit Certification Requirements:
- Insulation resistance measurements in accordance with ABS Mobile Offshore Drilling Unit Rules 6-1-7/9.3.
- Dielectric strength test in accordance with ABS Mobile Offshore Drilling Unit Rules 6-1-7/9.5.
- Protective device tripping test.
- Inspection of the assembly, including inspection of wiring.

**Notes/Drawing/Documentation:**
Drawing No. 30019SS71F04.E1, custom 300hp ss with bypass 3 dim 60hz 690vac, Revision: A
Drawing No. 30019SS71F04.E2, MK15092781 custom 300hp ss with bypass 3 dim 60hz 690vac, Revision: C
Drawing No. 30019SS71F04.M1, MK15092781 custom 300hp ss with bypass 3 dim 60hz 690vac, Revision: B
Drawing No. MK15092781 - 4680 - Hydraquip 300HP SS 690V_BOM, Bill of materials 4680, Revision: 2
Drawing No. WOHNER 03943_Data Sheet, Data Sheet
Drawing No. WOHNER Data Sheet_M21_Size 1 & 2, Data Sheet
Drawing No. Emerson AC Filter Islatrol, AC Filter

**Terms of Validity:**
This Product Design Assessment (PDA) Certificate 15-HS1451641-PDA, dated 10/Dec/2015 remains valid until 09/Dec/2020 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

**STANDARDS**

**HOUSTON MOTOR & CONTROL**
14400 HOLLISTER, SUITE 100
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Email: bharmon@motor-hmc.com
Web: WWW.MOTOR-HMC.COM

**Tier: 5 - Unit Certification Required**

**ABS Rules:**
Rules for Conditions of Classification, Part 1 2015 Steel Vessels Rules 1-1-4/7.7, 1-1-A3, 1-1-A4;
2015 ABS Rules for Conditions of Classification, Part 1 – 2015 Offshore Units and Structures 1-1-4/9.7, 1-1-A2, 1-1-A3, which covers the following:
2015 ABS Rules for Building and Classing Mobile Offshore Drilling Units 4-3-2/9.13, 4-3-3/13.3, 6-1-7/9.3, 6-1-7/9.5, 6-1-7/19.7, 6-1-9/15.1;

**National:**
NA

**International:**
NA

**Government:**
NA

**EUMED:**
NA

**OTHERS:**
NA