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Underwater Demineralizer System Assembly & Operating Instructions

Model UD-48A



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Approved By: _____

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12/21/12

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If you have any questions concerning changes in this document, please call the main Tri Nuclear office at 518-399-1389 or e-mail at info@trinuclear.com

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UNDERWATER DEMINERALIZER UNIT

(Model UD-48A)

Assembly and Operating Instructions

1.0 INTRODUCTION

The Underwater Demineralizer Model UD-48A is a self-contained, portable Underwater Demineralizer System, 48in dia with a resin capacity of 50ft³, and is designed to operate in the spent fuel pool or reactor cavity. The UD-48A's unique design allows for the demineralizer to be operated underwater and under negative pressure. The pump seals with a simple flat cover plate held in place by negative pressure during operation.

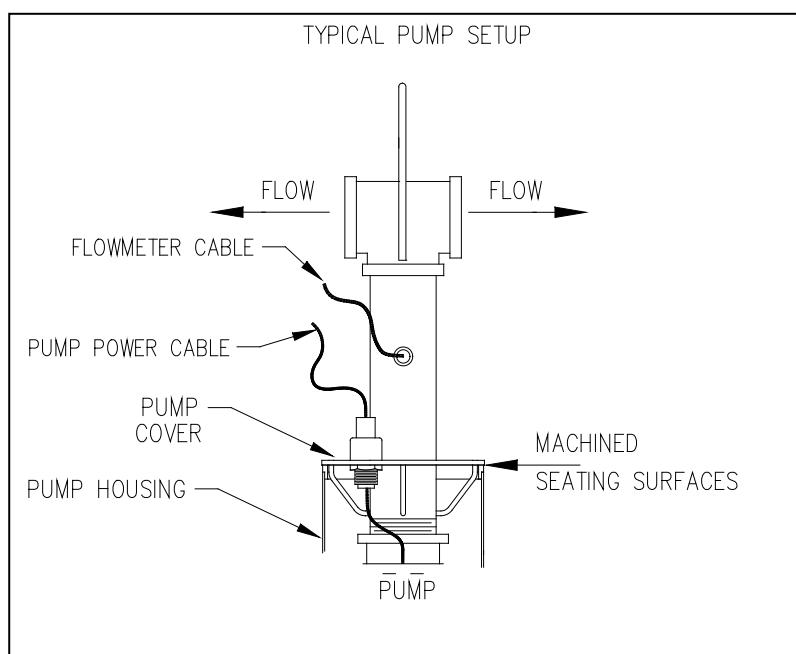


Figure 1.1

One of the many benefits of this design is that it requires no special tooling to install or remove a pump underwater. With the pump installed correctly in the pump tube, the weight of the pump keeps it secure during normal operation.

This procedure covers the initial installation and start-up of the unit and normal underwater operations. A separate procedure, OI-36 - General Underwater Sluicing Procedure, covers the initial loading of resin and subsequent sluicing operations. It is expected that trained and qualified personnel will operate the unit. Radiological considerations and requirements are not included in this document, which may vary between stations, and should be specifically addressed by the end user organization.

1.1 Equipment Guide List

The following is the Equipment Guide List for the Underwater Demineralizer System Model UD-48A:

STANDARD Equipment Shipped with the UD-48A

| TNC Part Number | Description | Qty |
|-----------------|--|-----|
| UD-48A-V | Basic Demineralizer vessel for the UD-48A system, 48" dia, 50ft ³ resin capacity, Certified to NUREG-0612 & ANSI N14.6 | 1 |
| PP-260SC | Grundfos pump, 5HP/460V/3Ph/60Hz, w/cover, SC connector, CB PR-260-4XP PHASE REVERSING control box with twist lock plugs, PSC-100P Power Cable with twist lock plug and PC-50 drop cable with twist lock plug | 1 |
| FM-260 | Flow Meter Kit, includes 0-400 GPM analog meter and paddlewheel flow sensor w/100 ft cable | 1 |
| PH-3x25 | 3" x 25' hose with Polypro MxF camlock couplers | 1 |
| UT-8 | Diffuser Pipe for 3" discharge hose | 1 |
| UT-10A | Mounting Panel for Flow Meter and Control Box | 1 |
| SHCK-UD-48A | Suction Hose Conversion Kit for the UD-48A system. Includes the following: (2) Safety Screen Vent Assemblies (P/N: SSVA-48A) (2) Suction hoses (P/N: PH-3x50) (2) Johnson Screen strainer (P/N: SHKC-JS-4x12) | 1 |
| BV-1.5SS-MxF | 1-1/2" SS FP Ball Valve with Male by Locking Female camlock couplers. Includes remote grapple lanyard. | 2 |
| FPS-1.5x50 | Suction/Discharge hose, 1.5" x 50' lg with SS MxF camlock couplers, 150 PSI | 2 |
| SH-.5x100 | Sample hose, 1/2" x 100' lg with a 1/2" SS female camlock coupler x 1/2" SS ball valve | 1 |

OPTIONAL Equipment Recommended for use with the UD-48A

| TNC Part Number | Description | Qty |
|-----------------|---|-----|
| AP-65 | Resin sluice pump, dolly mounted. Includes 2in AL Sandpiper™ flap valve pump with 1-1/2in SS ball valves, inlet/outlet female camlock couplers, 3/4in water flush valve, & 1/4in drain valve. | 1 |
| FPS-1.5x25 | Suction/Discharge hose, 1.5" x 25' lg with SS MxF camlock couplers, 150 PSI | 1 |

1.2 Materials of Construction

The following is a list of the materials of construction for the Underwater Demineralizer System Model UD-48A:

| Tri Nuclear Part No. | Description | Materials of Construction |
|----------------------|--|--|
| UD-48A-V | UD-48A Vessel | 304SS, 316SS |
| PP-260SC | 5HP Grundfos Pump & Motor Assembly | 304SS |
| | CB-PR-260-4XP Phase Reversing Control Box | Fiberglass Enclosure |
| | PSC-100P Power Cable with twist lock plug (100ft 10/4 SO Cable w/ male twistlock plug) | 10/4 SO Cable |
| | PC-50 drop cable with twist lock plug (50ft 10/4 SO Cable w/ female twistlock connector) | 10/4 SO Cable |
| FM-260 | Flow Meter Kit and Paddlewheel Sensor | Polypropylene |
| PH-3x50 PH-3x25 | Suction Hose with MxF camlock couplers | PVC hose with Polypropylene camlock couplers & 304SS crimped sleeves |
| UT-8 | Diffuser Pipe for 3" discharge hose | 304 SS, 316SS female camlock coupler |
| UT-10A | Mounting Panel for Mounting Panel for Control box and Flow Meter | 304 SS |
| SSVA-48A | Safety Screen Vent Assembly | 304SS, 316SS |
| SHKC-JS-4x12 | Johnson Screen strainer | 304SS, 316SS |
| BV-1.5SS-MxF | Ball Valve assembly | 304SS, 316SS |
| FPS-1.5x50 | Suction/Discharge hose, 1.5" x 50' lg with SS MxF camlock couplers, | EPDM hose with 316SS camlock couplers & 304SS crimped sleeves |
| SH-.5x100 | Sample hose, 1/2" x 100' lg with a 1/2" SS female camlock coupler x 1/2" SS ball valve | PVC reinforced hose with 316SS camlock coupler & 316SS ball valve |

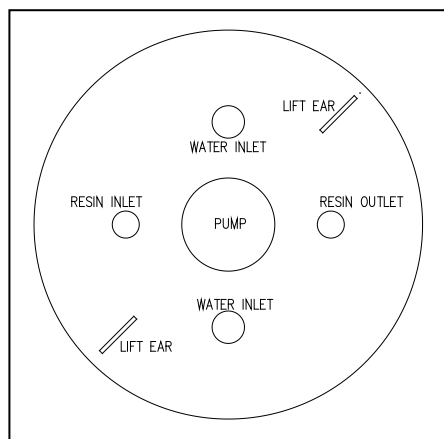
2.0 EQUIPMENT DESCRIPTION

2.1 DEMINERALIZER VESSEL:

The UD-48A vessel has been designed and built to the ASME Boiler and Pressure Code Section VIII, Div. 1 (but not code stamped). The system outline is shown on brochure drawing TNC-013-02. The vessel has an outside diameter of 48", an overall height of 96" (to the top of the pump lift bail) and an approximate resin capacity of 50 ft³.

The UD-48A demineralizer top connections include two 4" threaded couplings for installing two safety Johnson screens for water inlet flow (or the suction hose conversion kits), two 1-1/2" male cam-lock couplings (one for resin slurry inlet and one for resin slurry outlet), and a center 8" pipe opening for installing the submersible pump assembly.

The vessel has two lift ears with 1-1/8" dia holes. UD-48A vessels fabricated since July 2011 are load tested and certified to NUREG 0612.



Top view of UD-48A

Standard Operation of the UD-48A (operations without suction hose conversion kits installed) See Drawing TNC-013-02:

Unfiltered water from the pool enters thru (2) two water inlet safety screens (.015"). These safety screens prevent any resin/media from escaping the vessel through the inlet piping.

The water is then distributed across the media bed via the inlet diverter plates. The water travels thru the media bed, and into one of the (20) outlet retention elements (.007") and to a common outlet plenum. There is an additional outlet safety screen (.015") in the pump tube which prevents any resin from escaping in the very unlikely event that a .007" retention element fails.

Water then travels thru the PP-260SC pump and back to the pool thru a 3" x 25ft long hose.

Operation of the UD-48A with suction hoses (operations with suction hose conversion kits installed) See Drawing TNC-013-02:

NOTE: This setup is normally used when the plant wants to go after the ‘source’ of activity in the pool. This typically is the reactor vessel itself.

Unfiltered water from the pool enters thru (2) two water inlet safety screens (.015”) attached to the end (2) two 3” x 50ft hoses. Water travels through the suction hoses and into the Safety Screen Vent Assemblies. The Safety Screen Vent Assemblies prevent any resin/media from escaping the vessel through the inlet piping.

The water is then distributed across the media bed via the inlet diverter plates. The water travels thru the media bed, and into one of the (20) outlet retention elements (.007”) and to a common outlet plenum. There is an additional outlet safety screen (.015”) in the pump tube which prevents any resin from escaping in the very unlikely event that a .007” retention element fails.

Water then travels thru the PP-260SC pump and back to the pool through the top of the pump.

Johnson Screen® Retention Elements:

The UD-48A uses Johnson Screens® as the primary and safety screens in the UD-48A. They are spiral wound (Tri Nuclear does not use staked disk or mesh) and are made out of 316L SS “Vee” wire.

The primary retention element screens are 1-1/2” (NPS) with .007” slot openings and are of a “standard construction” (see Fig 2.1). They are designed for a uniform distribution flow through the demineralizer bed without any “dead zones” in the bed. These primary retention elements also prevent the escape of resin from the demineralizer bed.

The UD-48A has two different sets of safety screens. The vessel outlet safety screen and the vessel inlet safety screens.

There is a single vessel outlet safety screen located internally in the water outlet plenum. It is a 2in “standard construction” Johnson Screen® with .015” openings and is designed to prevent resin migration from the vessel in the highly unlikely change that a primary retention element fails.

The vessel inlet safety screens (for the standard setup and in the safety screen vent assembly) are a 2in “standard construction” Johnson Screen® with .015” openings and is designed to prevent resin migration out of the vessel from the top of the resin bed (a highly unlikely event).

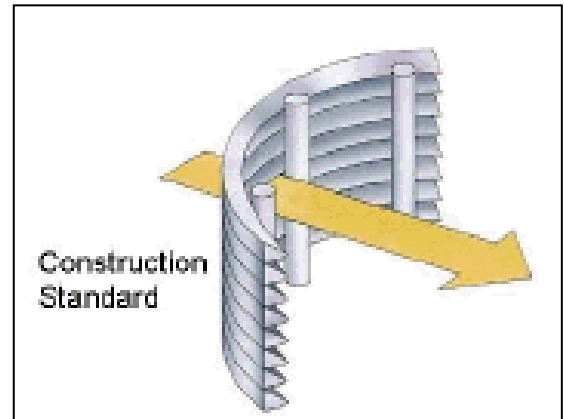


Fig. 2.1 Standard Johnson Screen® construction

| | |
|--|---|
| | |
| <p>Standard .007” Johnson screen assemblies (welded to the inner head)</p> | <p>Standard .015” Johnson screen assembly (safety screen for the pump tube)</p> |

2.2 SUBMERSIBLE PUMP ASSEMBLY (P/N: PP-260SC) -See TNC-008-02 for details-

The PP-260SC is a single stage, 5HP/460V/3Ph/60Hz pump and motor comes assembled and ready for operation. Nominal rated flow through the PP-260SC pump is 200-260GPM.

The assembly includes the pump cover, discharge piping, the flow sensor tap, and top lifting bail and a capped 1/2" sample port. The pump 3in discharge piping has a flow sensor tap for mounting the flow sensor. A top 3in NPT threaded tee is mounted to the discharge pipe for horizontally directing filtered water back to the cavity pool.

The pump has a 1in hole drilled through its internal check valve to allow for pump drainage when lifting and removing the pump from the pool.

There is a stainless steel electrical disconnect mounted on the pump cover for the 100 ft PSC-100P power cable. This allows for the removal of the power cable for ease of handling and equipment storage. The electrical disconnect on the pump cover is a "Sea Con" type underwater connector.

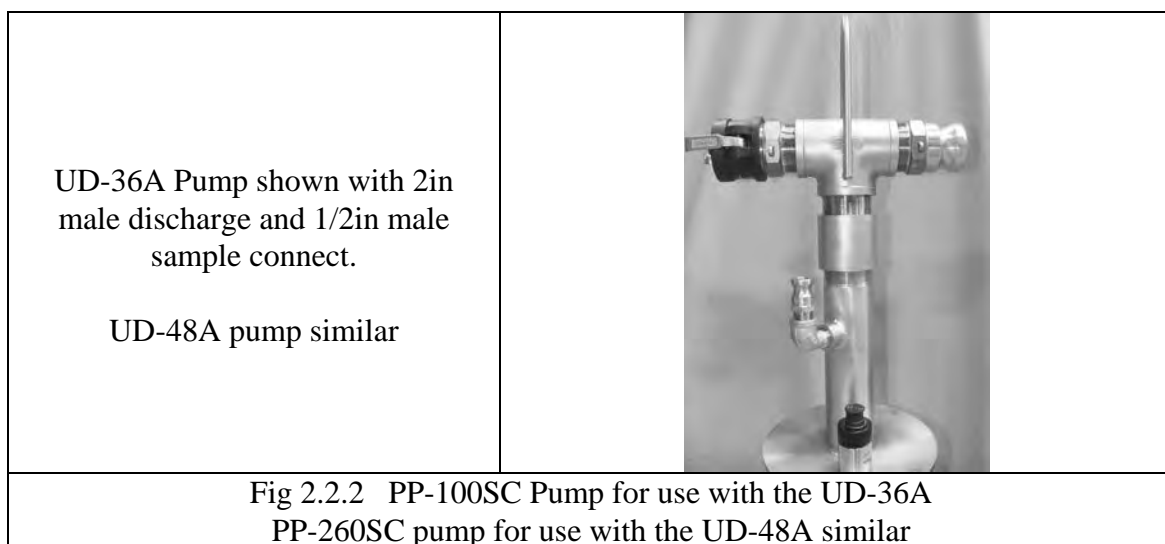
There is a seal plug (P/N: SC-P) that should be installed on the pump Sea Con connector whenever the power cord is not installed. The seal plug provides sealing of the connector for underwater storage of the pump (without the power cable) and protects the threads of the Sea Con connector when the power cord is not installed.



Figure 2.2
PP-260SC pump cover installed
in a UFV-260 Housing
UD-48A similar



Figure 2.2.1
SC-P Seal Plug



2.2.1 Additional Pump/Motor Information:

| Pump Type | HP | Volt | Hz | Furnas Heater Size | S.F. | Circuit Breaker | Amperage | |
|-----------|----|------|----|--------------------|------|-----------------|----------|-----|
| | | | | | | | Start | Max |
| PP-260 | 5 | 380 | 50 | K-50 | 1 | 20amp | 54 | 9.6 |
| PP-260 | 5 | 460 | 60 | K-50 | 1.15 | 20amp | 54 | 9.9 |
| PP-260 | 5 | 575 | 60 | K-43 | 1.15 | 15amp | 54 | 7.9 |

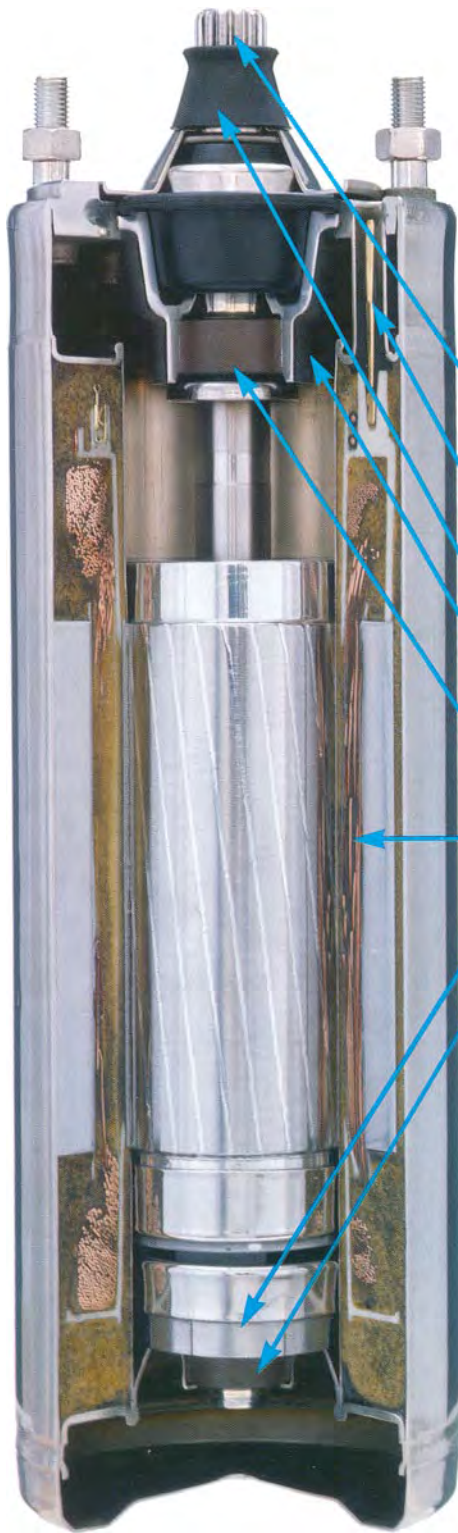
Table 2-1: Tri Nuclear Motor Data

| | |
|-----------------|--|
| Motor Mfgr: | Grundfos |
| Frame No: | 4 |
| Ratings: | 5Hp, 460V, 3Ph AC |
| Voltage: | 460 \pm 10% VAC (bus voltage: 480 \pm 10%) 380 \pm 10% VAC (bus voltage: 400 \pm 10%) |
| Service Factor: | 1.15 |
| RPM: | 3450 |
| Efficiency: | Full Load (%) 80 |
| Power Factor: | Full Load (%) 82 |
| Max Thrust: | 1000lbs |
| NEMA design: | B |
| Enclosure: | hermetically sealed (submersible type) |
| Lubrication: | Water |

2.2.2 Flow rates at 50Hz:

All flow rates listed in this Operating Instruction are based on a 60Hz pump. Performance operating at 50Hz may be calculated by using the pump affinity laws. For 50Hz operation, the flow rate is .833 x the listed 60Hz flow.

PP-260SC
5HP Grundfos Motor Cut Away View



ONE-PIECE SPLINE SHAFT - Wear resistant, hardened stainless steel ensures maximum resistance to corrosion.

LEADCONNECTOR- 3-wire with ground conforms to National Electrical Code.

SAND SLINGER - Protects against penetration of sand into the motor.

INTERNAL COOLING CHAMBER- Eliminates the need for a flow inducer sleeve.

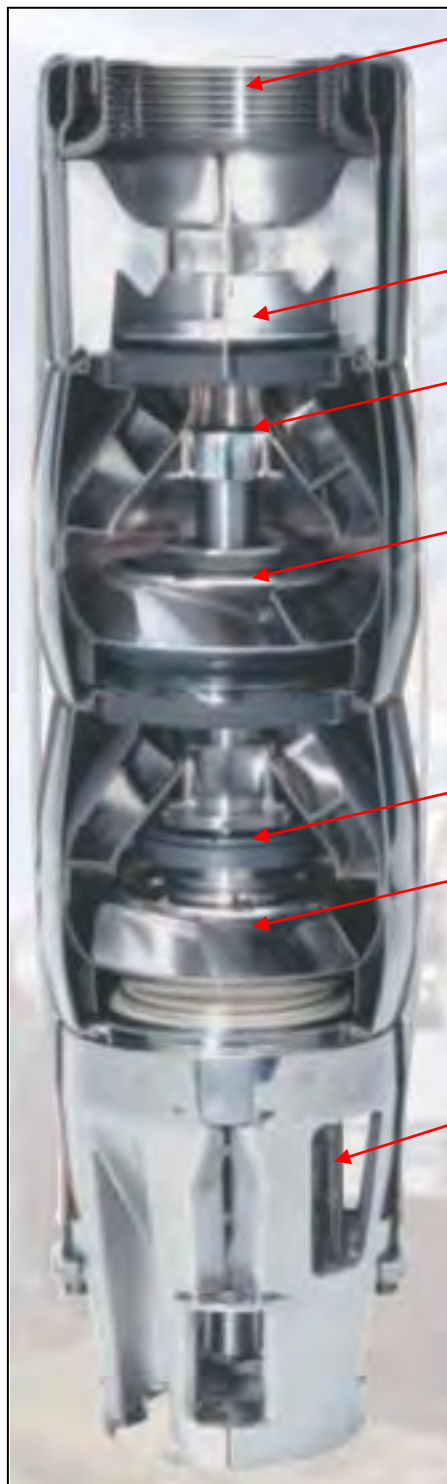
UPPER RADIAL BEARING - Water lubricated ceramic bearing runs against a tungsten carbide shaft journal providing extra long bearing life.

BUILT-IN LIGHTNING PROTECTION - Highly insulated stator is hermetically sealed in stainless steel and encapsulated in polyurethane foam.

THRUST BEARING - Ceramic on carbon design provides longer thrust bearing life.

LOWER RADIAL BEARING - (same as upper radial bearing)

PP-260SC
5HP Grundfos Pump Cut Away View



3" NPT discharge to pump cover

Check valve w/ 1" hole drilled in it

Upper radial & thrust bearings

NOTE: The 2nd stage impellor is NOT installed on the PP-260SCpumps (but the 2nd stage volute is in place)

Up-thrust bearing

1st stage impellor

Suction screen

2.3 CONTROL BOX

Tri Nuclear has used four different control boxes for our underwater pumps over the years. They are the CB-260, CB-260-4X, the CB-PR-260-4X and the most recent is the CB-PR-260-4XP.

The CB-260 (see section 2.3.1) is no longer produced and is referenced here for legacy purposes only. The CB-260-4X (see section 2.3.2) and CB-PR-260-4X (see section 2.3.3) have been replaced by the upgraded CB-PR-260-4XP (see section 2.3.4).

2.3.1 CB-260 USED Prior to May 2005 See Drawing MS-109

On control boxes purchased prior to May 2005, the control box for the PP-260 pump was housed in a NEMA 1 type enclosure and is a 460V/3Ph/60Hz “Definite Purpose Starter” that protects the pump from over current. The control box has two pushbuttons, start and stop, three K-50 Furnas overload heaters and a three phase magnetic starter. NOTE: This control box is dual rated for 460V/60Hz & 380V/50hz.

This item is discontinued and his described here for legacy purposes only.

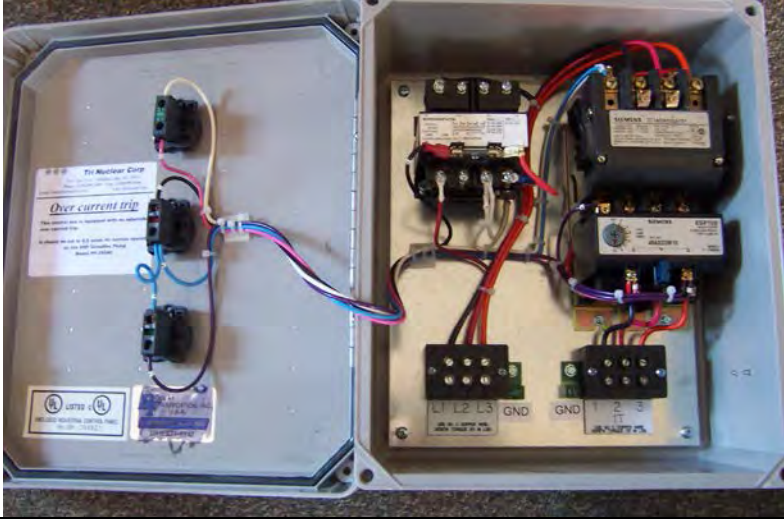

CB-260 Control Box
showing
(3) bi-metallic overload heaters



Figure 2.3.1 CB-260 Control Box inside view

2.3.2 CB-260-4X USED from May 2005 to August 2009 See Drawing TNC-018-01

The CB-260-4X control box is mounted in a NEMA 4X type enclosure and has a 460V/3Ph/60Hz solid state controller with an adjustable over current trip. The control box has start/stop pushbuttons and a green “run” indicating light on the front of the panel. *This item is discontinued and his described here for legacy purposes only.*

| | |
|---|---|
| <p>Inside view of control box showing solid state starter, transformer, and line in and load terminal blocks.</p> |  |
| <p>CB-260-4X shown mounted on the UT-10 control panel with associated flow meter</p> |  |
| <p>Figure 2.3.2 CB-260-4X Nema 4X Contorl Box</p> | |

NOTE: This control box is ONLY rated for 460V/3Ph/60Hz. A 380V/50Hz control box version of this was also supplied. See Drawing TNC-018-04 for details.

2.3.3 CB-PR-260-4X (Phase Reversing Control Box)

USED from August 2009 to November 2012

See Drawing TNC-018-02

In August of 2009 Tri Nuclear introduced an upgraded version of our standard control box that allows the operator to change the phase rotation of the pump WITHOUT having to open the control box and swap two of the three motor leads.

This is accomplished by a switch on the front of the control box and two motor starters inside the control box. These two motor starters are wired such that when the “Phase Rotation Switch” is in the “A” position the pump motor rotates one direction, and when the “Phase Rotation Switch” is in the “B” position the pump motor rotates in the opposite direction. If the “Phase Rotation Switch” is in the center position, neither motor starter will be energized and the pump will not start.

The CB-PR-260-4X is a NEMA 4X type enclosure (14x16) and has two 460V/3Ph/60Hz solid state controllers with an single adjustable over current trip. The control box has a “Phase Rotation Switch” with safety cover, start/stop pushbuttons and a green “run” indicating light on the front of the panel.



| | |
|---|--|
| <p>CB-PR-260-4X shown</p> <p>The Phase Rotation Switch has a safety cover to prevent inadvertent actuation.</p> |  |
| <p>Inside view of a CB-PR-260-4X control box showing the two solid state motor starters, over current trip, transformer, and line in and load terminal blocks</p> |  |

Figure 2.3.3 CB-PR-260-4X PHASE REVERSING Control Box

NOTE: This control box is ONLY rated for 460V/3Ph/60Hz.

A 380V/50Hz control box can be supplied upon request. See Drawing TNC-018-05 for details.

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2.3.4 CB-PR-260-4XP PHASE REVERSING CONTROL BOX WITH TWISTLOCK PLUGS

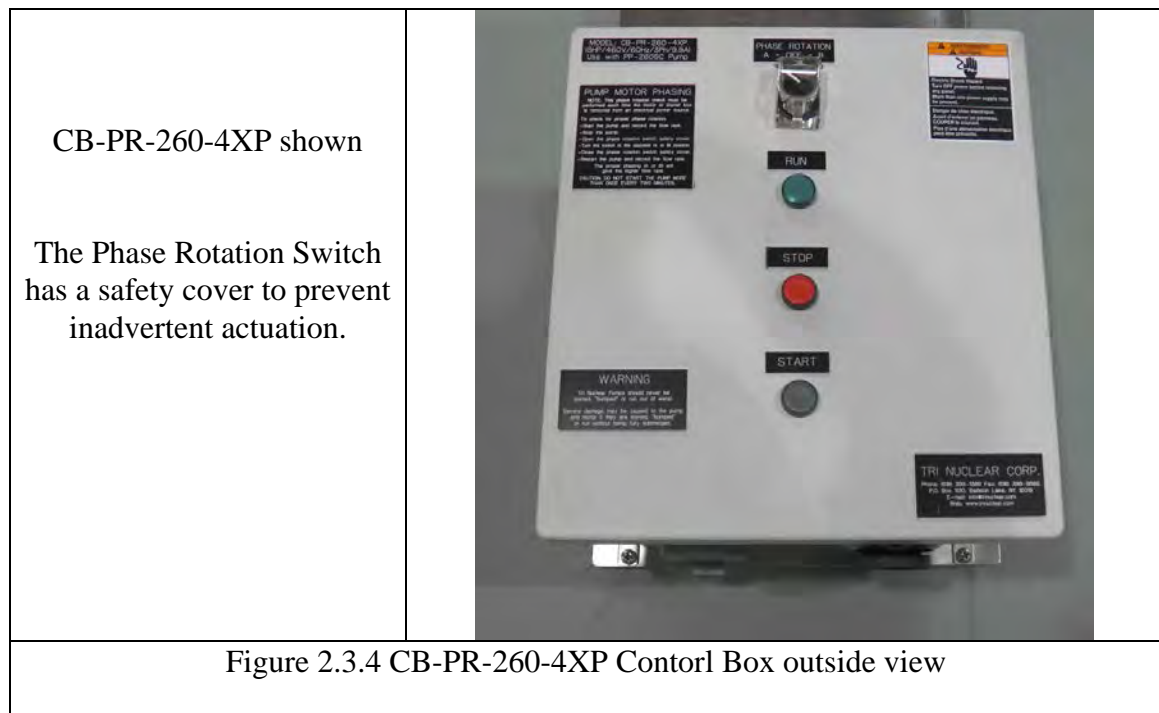
The CB-PR-260-4XP is a NEMA 4X type fiberglass (14x16) that has two 460V/3Ph/60Hz solid state controllers with an single adjustable over current trip. The control box has a “Phase Rotation Switch” with safety cover, start/stop pushbuttons and a green “run” indicating light on the front of the panel.

The Phase Reversing feature in this control box allows the operator to change the phase rotation of the pump WITHOUT having to open the control box and swap two of the three motor leads.

This is accomplished by a switch on the front of the control box and two motor starters inside the control box. These two motor starters are wired such that when the “Phase Rotation Switch” is in the “A” position the pump motor rotates one direction, and when the “Phase Rotation Switch” is in the “B” position the pump motor rotates in the opposite direction. If the “Phase Rotation Switch” is in the center position, neither motor starter will be energized and the pump will not start.

The 460V / 3ph / AC 30amp Nema 4X Twist Lock plugs allow the operator to quickly and easily install the PC-50 drop cable and PSC-100P pump power cable to the control box without drilling and connecting bare cables to internal terminal blocks in the control box.

See Drawing TNC-018-07 for Phase Reversing Control Box details.



2.3.4 CB-PR-260-4XP (Cont.)

Inside view of a typical CB-PR-260-4XP control box showing the two solid state motor starters, over current trip, transformer, and the Twist Lock plug terminals

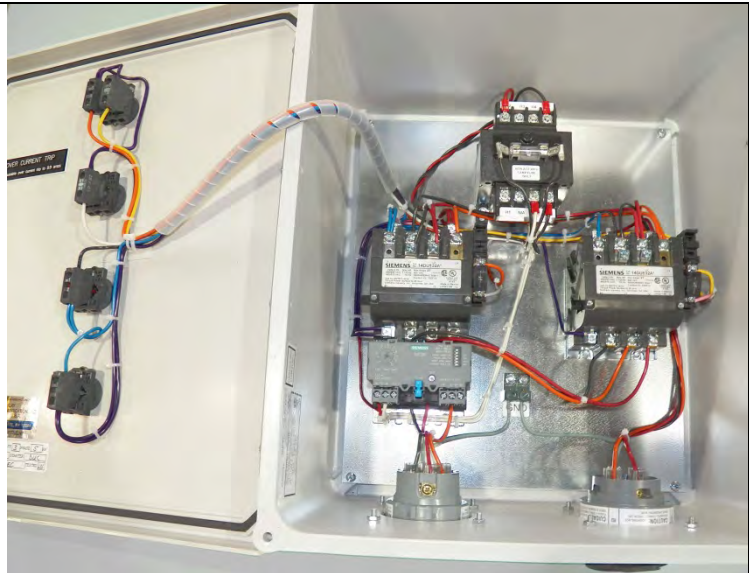


Figure 2.3.4.1 CB-PR-260-4XP Inside View of Control Box

Twist Lock plugs are located on the bottom of the control box.
The plug to the right (with the male Twist Lock connections) is the line in / power in plug.

The plug to the left (with the female Twist Lock connections) is the power out to the pump.

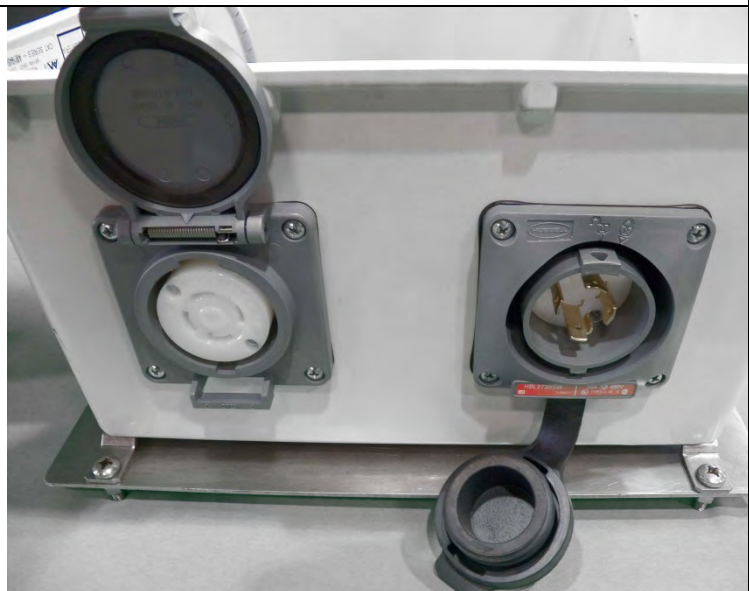
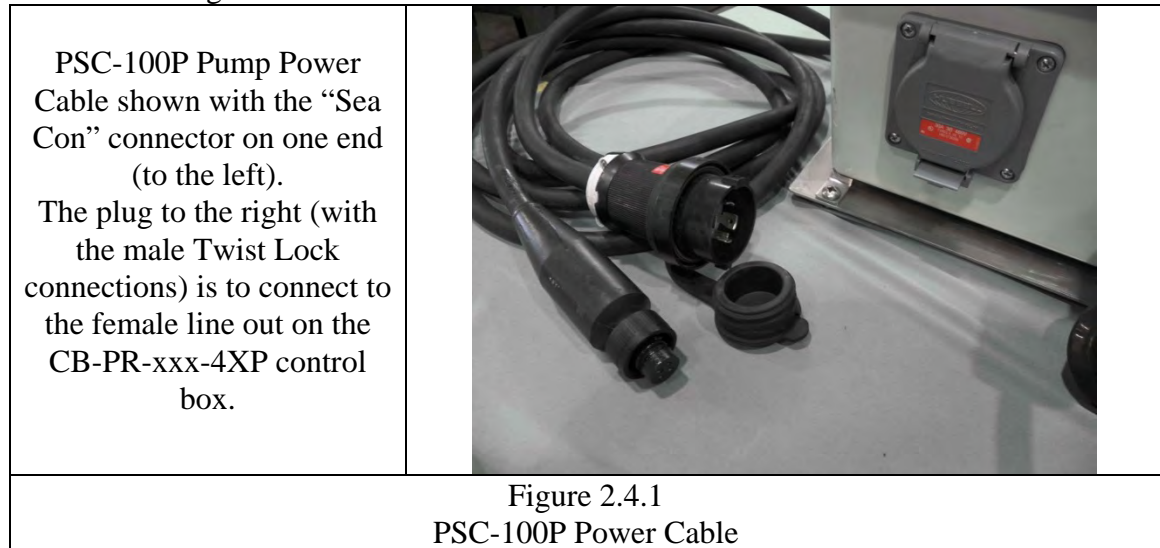


Figure 2.3.4.2 CB-PR-260-4XP Twist Lock Plugs

2.4 PUMP POWER CABLE

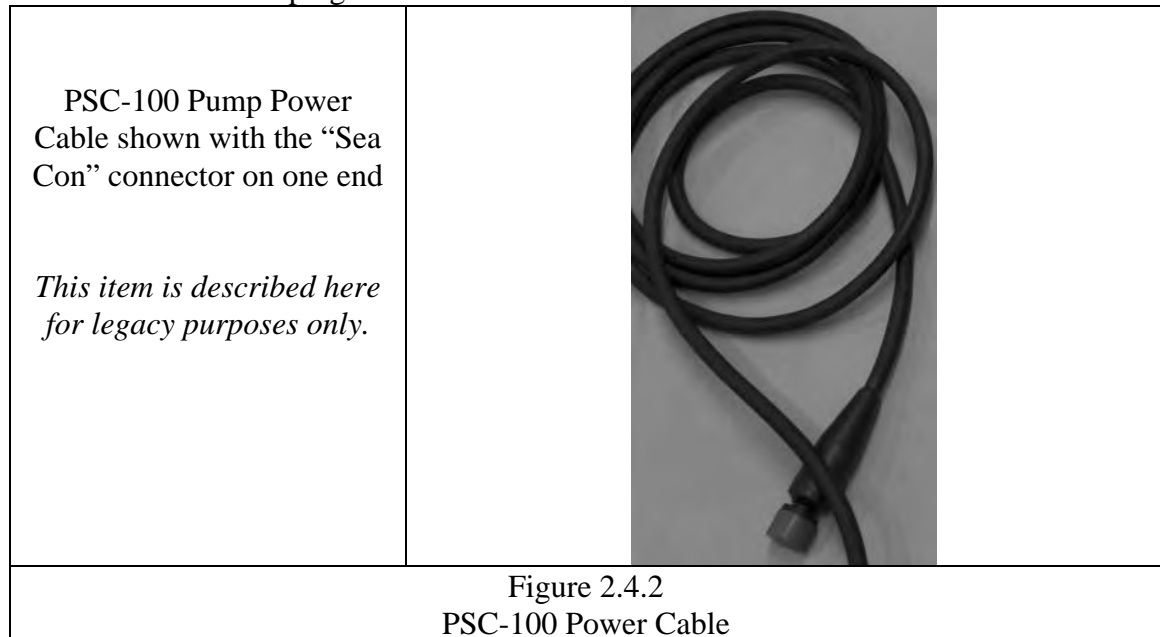
2.4.1 POWER CABLE WITH TWISTLOCK PLUGS (P/N:PSC-100P):

The PSC-100P Pump Power cable is a 100ft 10/4 SO cable with a male Nema 4x Twist Lock plug x Sea Con Connector. This Pump Power cable is to supply power to the pump from the Phase Reversing Control Box.



2.4.2 POWER CABLE (P/N:PSC-100):

The PSC-100 Pump Power cable is a 100ft 10/4 SO cable with a Sea Con Connector x bare wire end. This Pump Power cable is to supply power to the pump from any Control Box without the twistlock plug connections.



2.5 DROP CABLE (P/N: PC-50):

The PC-50 Control Box Drop Cable is a 50' 10/4 SO cable with a female Nema 4X twist lock plug x bare wire. This drop cable is to supply the control box from the in plant power source / motor control center / welding outlets etc.

PC-50 Pump Power Cable shown with bare wires on one end (to connect to the in plant power connection/supply (to the right).

The plug to the left (with the female Twist Lock connections) is to connect to the male line in on the CB-PR-xxx-4XP control box.



2.6 FLOW METER AND SENSOR (P/N: FM-260):

The UD-48A flow meter is installed to provide a gross indication of system flow. System flow rate is a gauge for determining change in pressure drop through the ion exchange bed.

The flow meter used for the UD-48A is a self-powered analog meter that provides flow indication from 0-400GPM. The flow meter uses the amplitude of the flow sensor signal to drive the 100-microamp meter movement.



The flow sensor for the UD-48A is a paddlewheel type flow sensor. The paddlewheel has a re-enforced sleeve that covers the titanium shaft and is designed to minimize wear of the rotor. When water flows past the paddlewheel and it rotates, the flow sensor produces a sinusoidal waveform with frequency and amplitude directly proportional to the flow rate. The sensor comes equipped with 100ft of instrument cable.

Flow Sensor Specifications:

Output frequency: 5-6 Hz/fps nominal
Flow Range: 1-50 fps
Linearity: $\pm 1\%$ full range

Flow Meter Specifications:

Input signal amplitude: 0.4 V peak to peak minimum
Input Frequency range: 0-200 Hz
Meter Range: 100 micro amps $\pm 2\%$ at full deflection

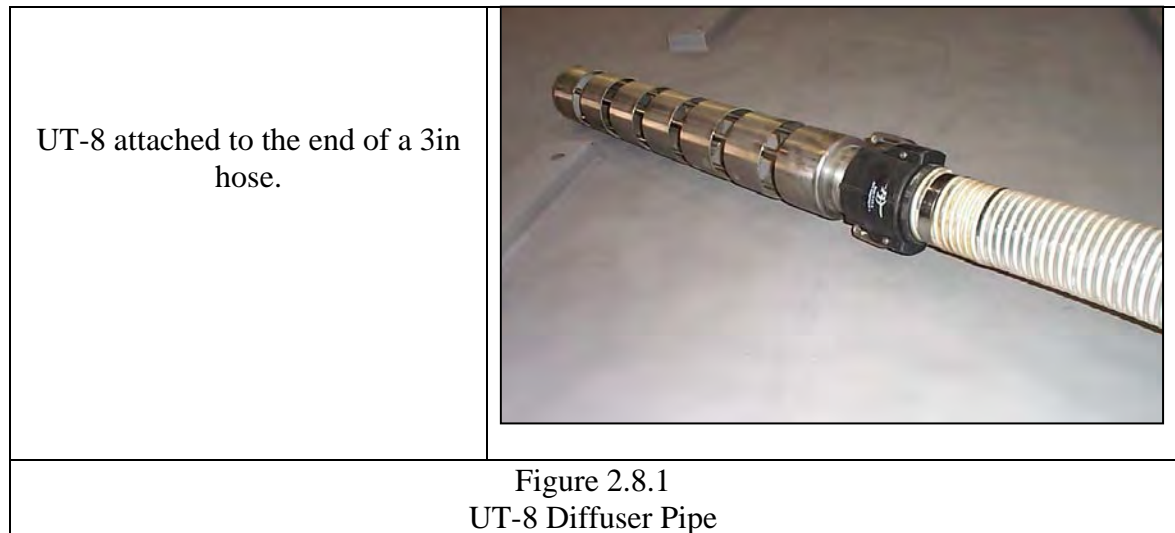
| | |
|-----------------------------------|--|
| FM-260 Analog Flow Meter shown |  |
| FM-260 Paddlewheel Flow Sensor |  |
| Figure 2.6 FM-260 Flow Meter | |

2.7 DISCHARGE HOSE

The UD-48A comes equipped with one 3" x 25' discharge hose with male x female camlock couplers. This hose connects to the pump discharge and provides good cross circulation of cavity pool water by directing clean processed water away from the demineralizer.

2.8 DIFFUSER PIPE (UT-8)

The diffuser pipe assembly (4.5" diameter x 32"lg.) is connected to the 3" ***discharge*** hose connected to the PP-260SC pump. It is used to minimize the high discharge water velocity preventing hose-end whipping and surface water agitation.

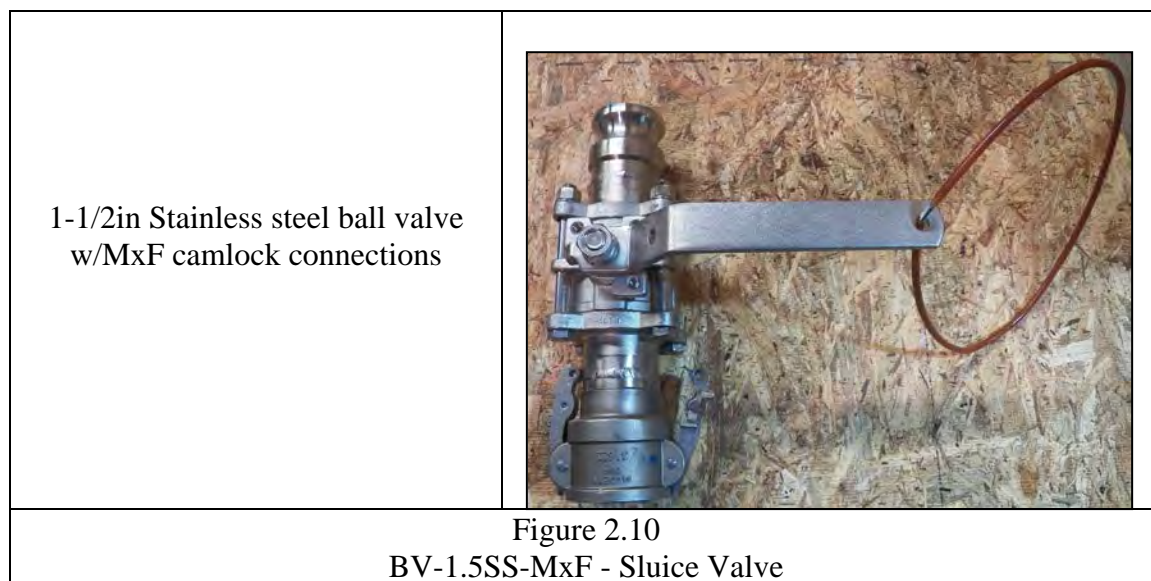


2.9 SLUICE HOSES P/N: (FPS-1.5x50)

The UD-48A comes equipped with two 1-1/2" x 50' sluice hoses with stainless steel male x female camlock couplers. These hoses are rated for 150 PSI and are hydro tested prior to shipment from the factory.

2.10 SLUICE VALVES (P/N: BV-1.5SS-MxF)

Each UD-48A comes with (2) removable 1-1/2 Male by locking female camlock, full port stainless steel ball valves. The handle on the ball valve has a lanyard loop attached for opening the valve with a grapple tool. The purpose of the ball valves is to provide positive isolation to the UD-48A vessel when the sluice hoses are attached. This positive isolation prevents a resin excursion from the vessel in the event a hose is damaged during operations.



2.11 SUCTION HOSE CONVERSION KIT (SHCK-UD-48A) See Drawing TNC-013-02

Each UD-48A come equipped with a suction hose conversion kit. The purpose of the SHCK-UD-48A is to allow the attachment of (2) 3in x 50ft long suction hoses to the inlet of the demineralizer. This allows the demineralizer to take a suction away from the vessel itself. This is typically done for source reduction purposes. The UD-48A vessel is placed near the Rx vessel flange and the suction hoses are lowered into the vessel itself to go after the source of the activity.

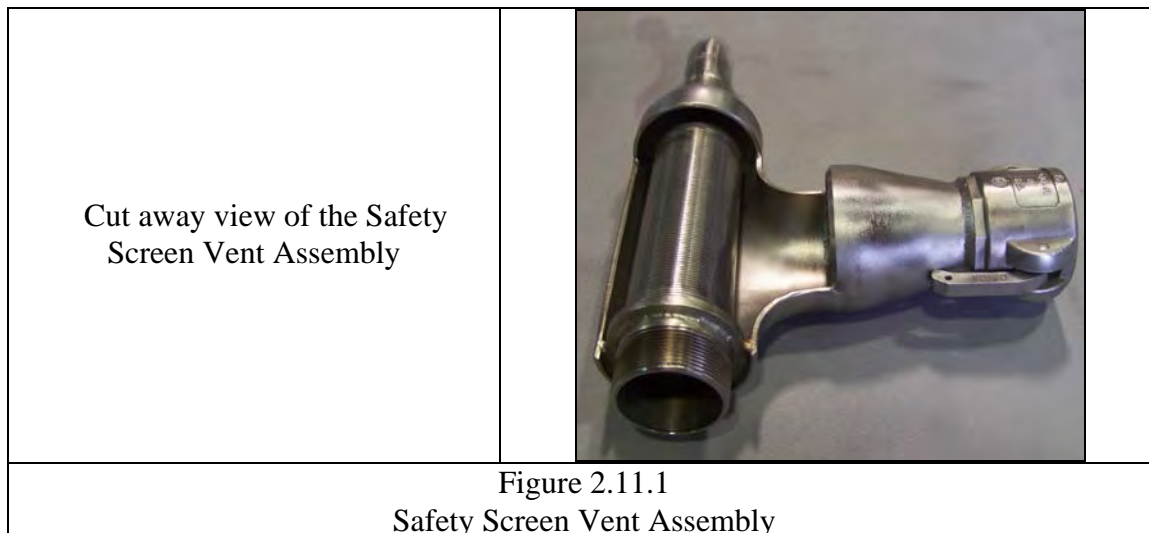
The SHCK-UD-48A comes with the following components:

- (2ea) Safety Screen Vent Assembly, P/N: SSVA-48A
- (2ea) Johnson Screen Strainer Assembly, P/N: SHKC-JS-4x12
- (2ea) Suction Hose, P/N: PH-3x50

2.11.1 SAFETY SCREEN VENT ASSEMBLY (P/N: SSVA-48A)

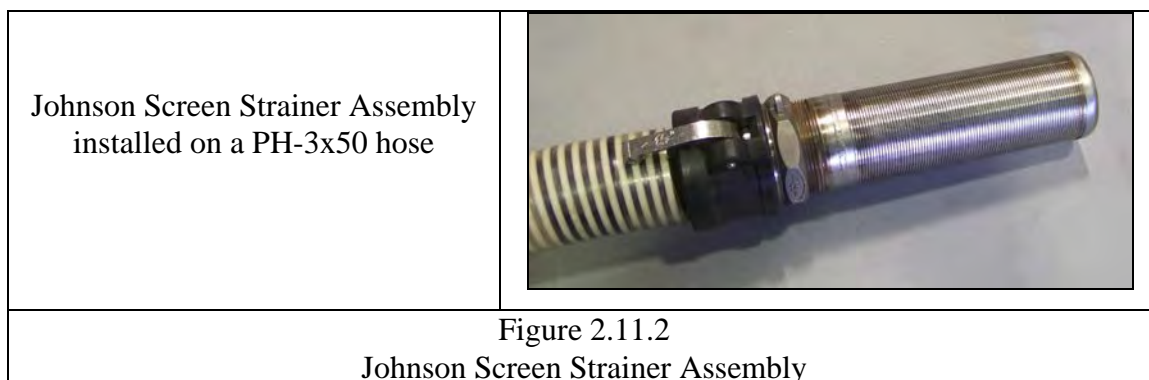
The Safety Screen Vent Assembly threads into the inlet coupling on the top of the UD-48A in place of the standard inlet safety screen. The SSVA-48A has a 3in female camlock hose connection and a vent that will allow any gases that come out of solution in the UD-48A vessel to be vented to the pool.

The SSVA-48A has an integral 2in .015" Johnson Screen safety screen to prevent resin migration to the pool/cavity from the top of the resin bed.



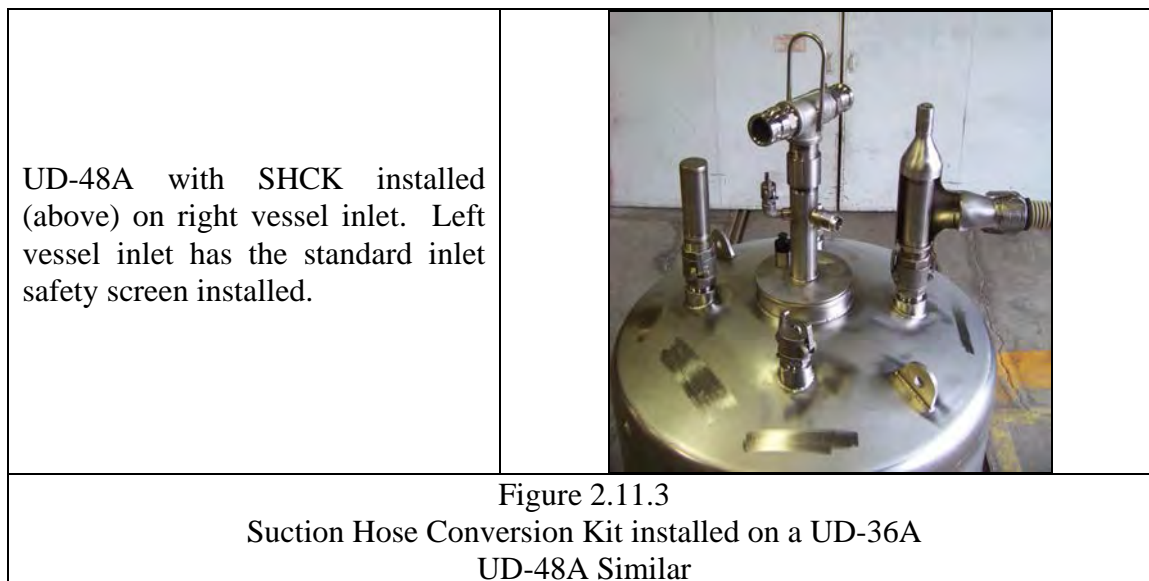
2.11.2 JOHNSON SCREEN STRAINER ASSEMBLY (P/N: SHKC-JS-4x12)

The Johnson Screen Strainer Assembly is a 4in .015" Johnson with a 3in male camlock connection. It is designed for two purposes. The first is to prevent the suction hose from dead heading on the pool/cavity floor or wall. The second is to prevent any large particles (>.015") items from entering the hose and fouling the Safety Screen Vent Assembly.



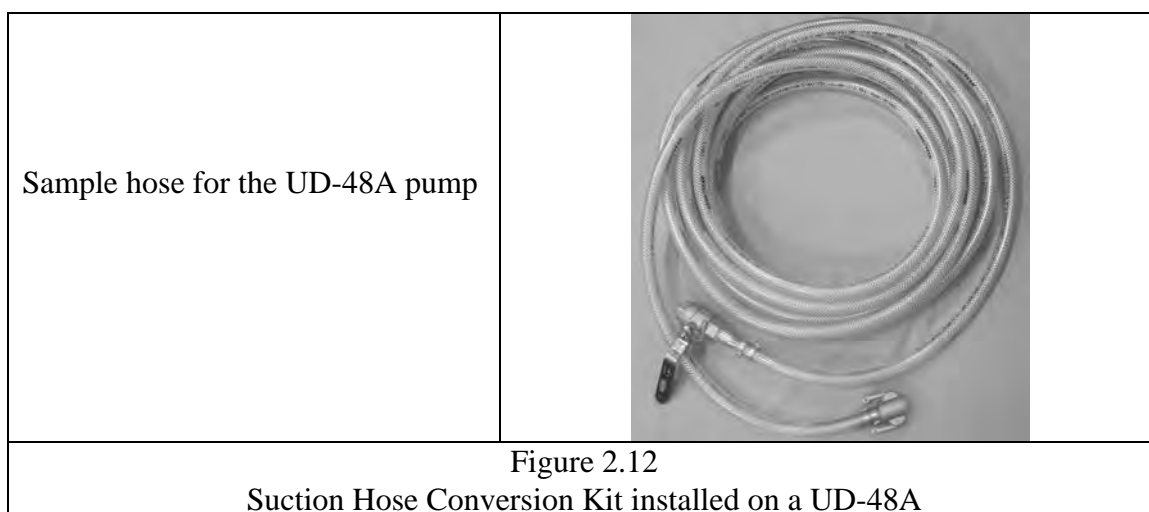
2.11.3 SUCTION HOSE (PH-3x50)

The SHCK comes equipped with a 3" x 50' suction hose with male x female cam lock couplers. The male end of the hose attaches to the Safety Screen Vent Assembly and the female end of the hose is attached to the Safety Screen Strainer Assembly.



2.12 SAMPLE HOSE (P/N: SH-.5x100)

The sample hose is a 1/2in x 100ft long hose (P/N: SH-.5x100) with a stainless steel female camlock coupler and a 1/2in SS ball valve. The hose is connected to the male camlock sample port on the PP-100SC pump. When it is desired to take an effluent sample, the valve is opened and a sample can be drawn.

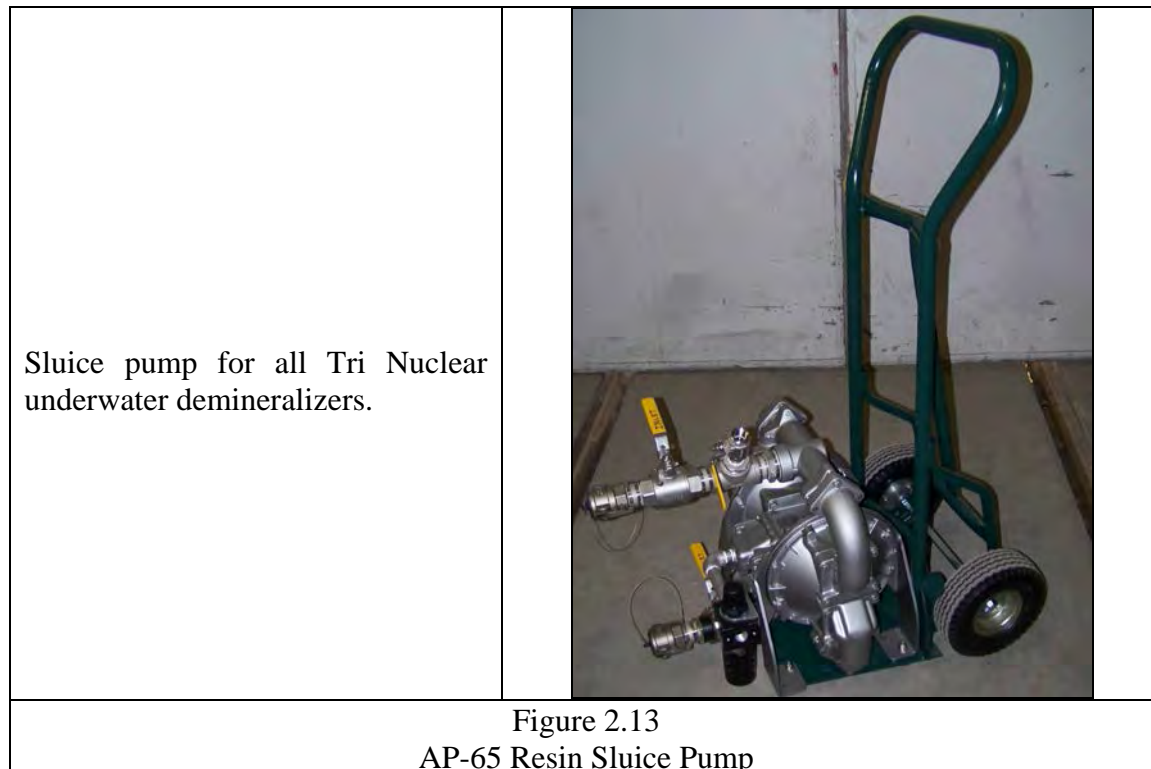


OPTIONAL SLUICING EQUIPMENT FOR THE UD-48A

(these items are optional and must be purchased separately)

2.13 RESIN SLUICE PUMP (P/N: AP-65) - (OPTIONAL)

The Resin sluice pump is a 2in AL Sandpiper™ flap valve pump with 1-1/2in SS ball valves, inlet/outlet female camlock couplers & 3/4in water flush valve mounted on a dolly with pneumatic tires. (P/N: AP-65). See drawing TNC-087-02 and OI-36, General Resin Sluicing Procedure for information on its use.



2.12 RESIN TRANSFER HOSE (P/N: FPS-1.5x25) (OPTIONAL)

The resin transfer hose is a 1-1/2" x 25' hose attached to the AP-65 Resin Sluice Pump discharge and is used for sluicing clean resin from a new resin drum to the demineralizer. This same hose may be used for discharging depleted resin from the demineralizer to a radwaste disposal liner.

3.0 EQUIPMENT AS SHIPPED

(This is a general description of how the equipment is shipped. The actual equipment shipping requirements may differ depending on customer requirements)

- 3.1 MAIN UNIT ON FIRST PALLET - The UD-48A demineralizer is banded to a standard sized wooden pallet.
- 3.2 The pump assembly is installed and shipped in a wooden crate with the power cable, control box. The following additional items are shipped in the pump crate:
- FM-260
 - UT-8
 - SSVA-48A (part of the Suction Hose Conversion Kit)
 - SHKC-JS-4x12 (part of the Suction Hose Conversion Kit)
 - BV-1.5SS-MxF
 - SH-.5x100
 - UT-10A
- 3.3 The PH-3x25 discharge hose, the (2) PH-3x50 suction hoses, the (2) FPS-1.5x50 sluice hoses, mounting panel, flow meter and diffuser are all strapped down and shrunk wrapped to a 2nd pallet.
- 3.4 ACCESSORY EQUIPMENT ON SECOND PALLET - The second wooden pallet contains the following optional items (if ordered) for the UD-36A:
- AP-65
 - FPS-1.5x25
 - Any additional hoses
- 3.5 RECEIPT INSPECTION – Using the EGL in this procedure carefully inspect and ensure all items are accounted for. Any missing or damaged items must be reported to Tri Nuclear ASAP.

4.0 ASSEMBLY AND INSTALLATION IN POOL

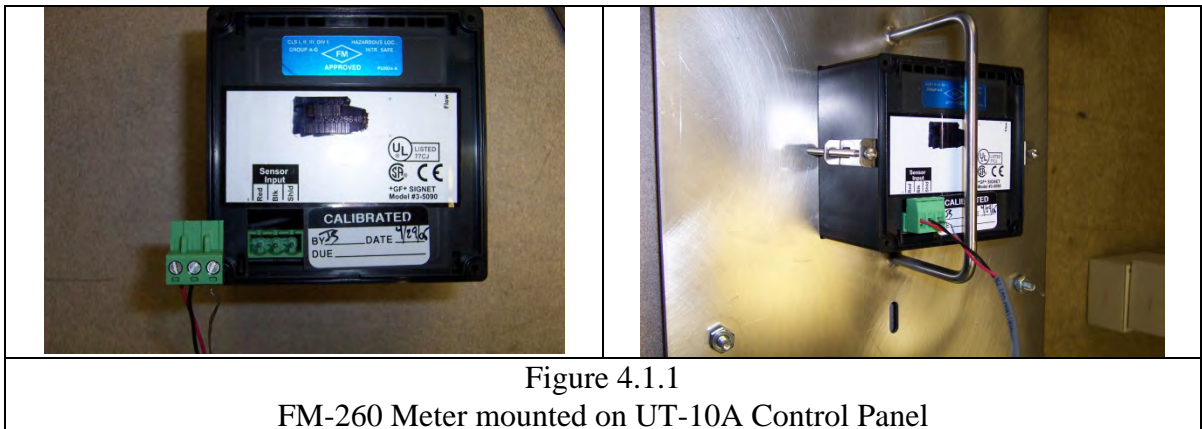
4.1 Pre Start Up

4.1.1 Flow Meter & Sensor Installation

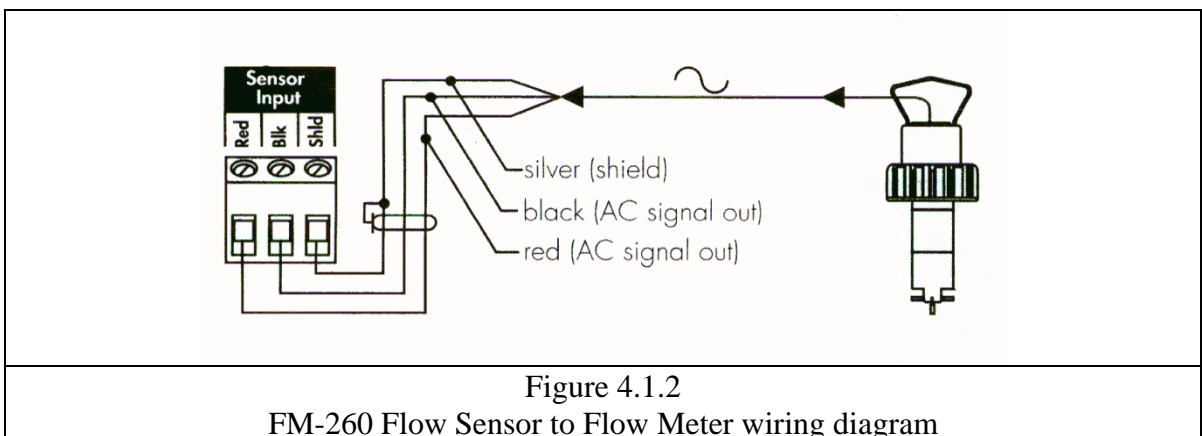
CAUTION:

The flow meter dial read-out gauge is a delicate instrument (milliammeter) and should be protected from rough handling. It could be broken if dropped on the floor. Mount it to the UT-10A control panel and hung on a suitable railing for protection.

Remove the FM-260 flow meter from its box. Verify the analog flow meter has a 0-400 GPM scale and mount the flow meter to the control panel UT-10A using the two bracket mounting screws located in the FM-260 flow meter's box.



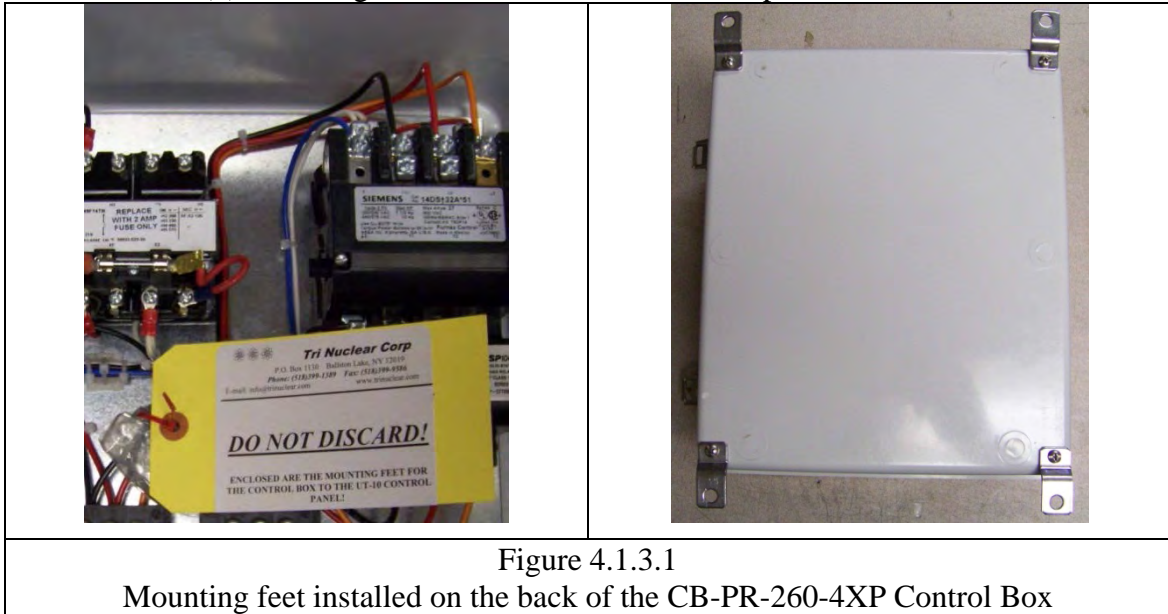
- 4.1.2 Remove the paddlewheel flow sensor from its box. Connect the flow sensor cable to the back of the FM-260 meter's green electrical plug using figure 4.1.2 as a guide.



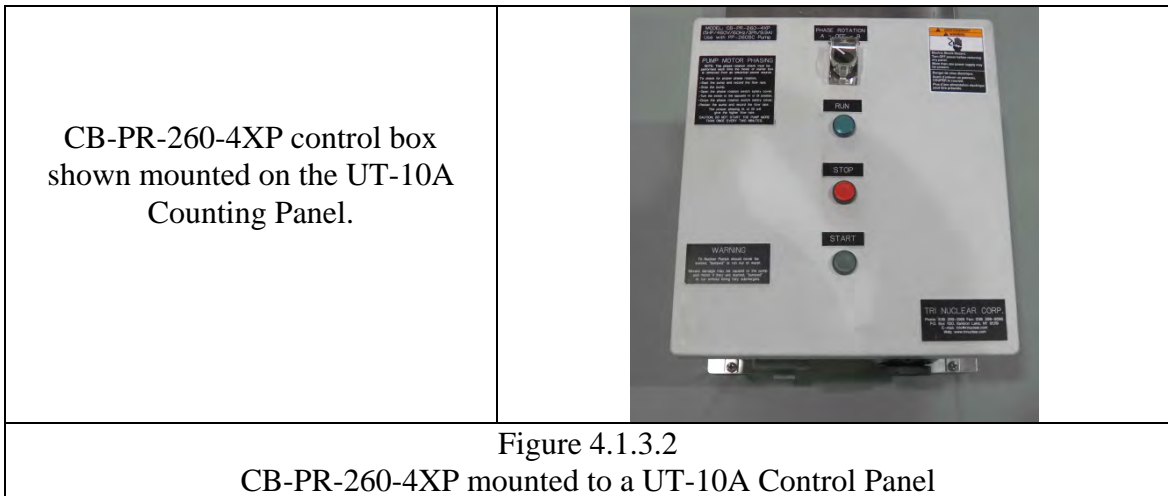
4.1.3 Mount the CB-PR-260-4XP Control Box to the UT-10A Control Panel

- 4.1.3.1 Remove the control box from its cardboard box. Locate the mounting feet in a bag inside the control box. The bag is taped to the bottom and/or side of the control box with a tag marked “Do Not Discard”.

Install the four (4) mounting feet to the back of the control panel.



- 4.1.3.2 Using a #3 Phillips Screwdriver and a 1/2in open or box end wrench, mount the CB-PR-260-4XP control box using the four (4) mounting screws, lock washers & nuts located on the UT-10A control panel) assembly on the UT-10A Control Panel.



4.1.3 Flow Sensor

Before installing the flow sensor to the flow tap mounted on the pump discharge pipe, flip the paddle wheel with a finger to check for dial read-out response.

Verify the two o-rings are installed on shaft of the Flow Sensor. The flow sensor may not operate properly without the o-rings installed.



Prior to installing the flow sensor in the pump, lubricate the o-rings with DI water or other approved lubricant



Install the probe into the flow sensor tap making sure the slots in the fitting mate properly with the flow meter sensor orientation pins. The paddle wheel will then be perpendicular to the direction of flow.



4.1.4 Pump Power Cable

Remove the Sea Con seal plug (P/N: SC-P) from the pump power connector. This plug should be installed whenever the power cable is removed for proper protection

The plug provides a waterproof seal; therefore, the pump assembly can be stored underwater with the seal plug installed.



Remove the PSC-100P power cable from the pump box. Place a thin coat of non-conductive lubricant (Dow Corning #4) on the outside surface of the female SeaCon connector found at one end of the 100' cable.

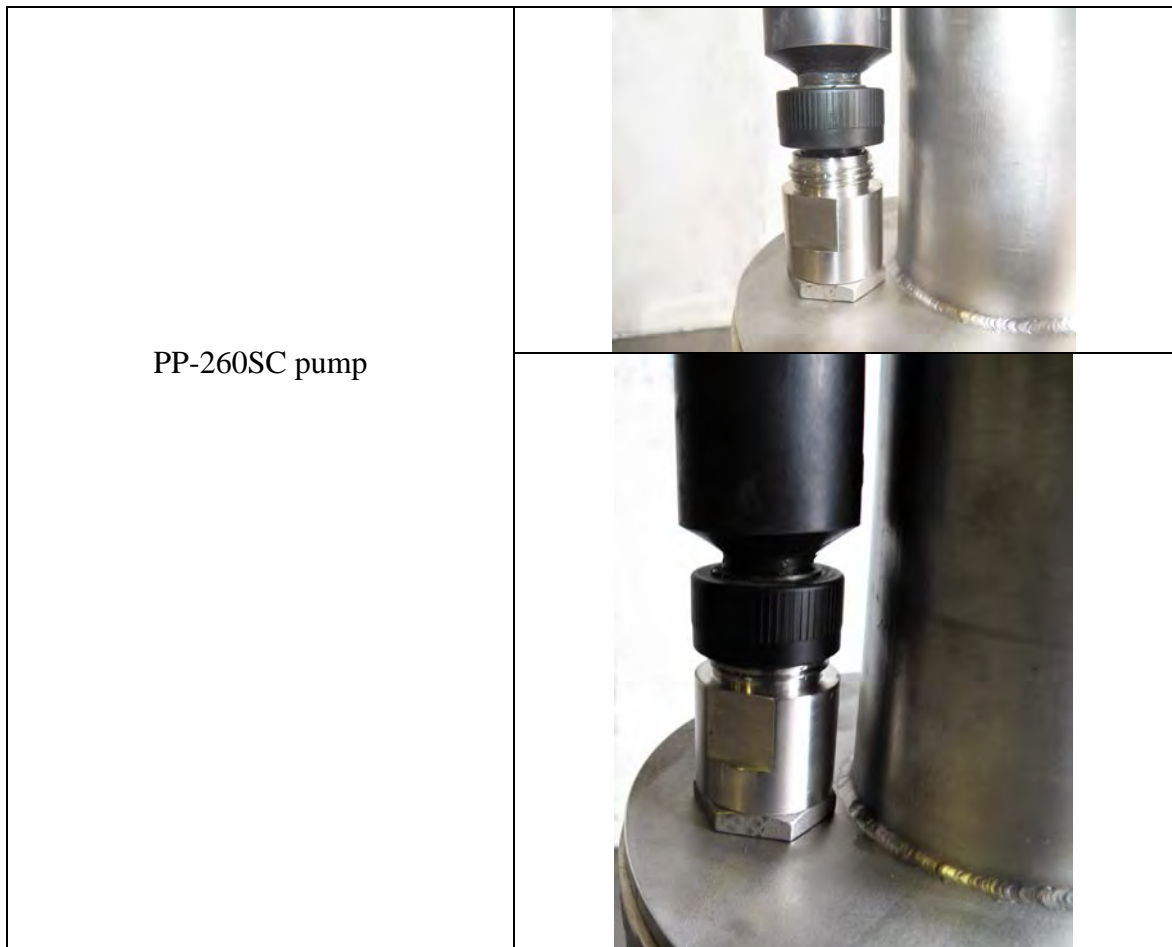
The mating SeaCon female connector is mounted to the pump cover. Place a thin coat of lubricant on the inside of the connector



When installing and removing the power cord, do not move the power cable connector with side to side motion in an attempt to install or remove it.

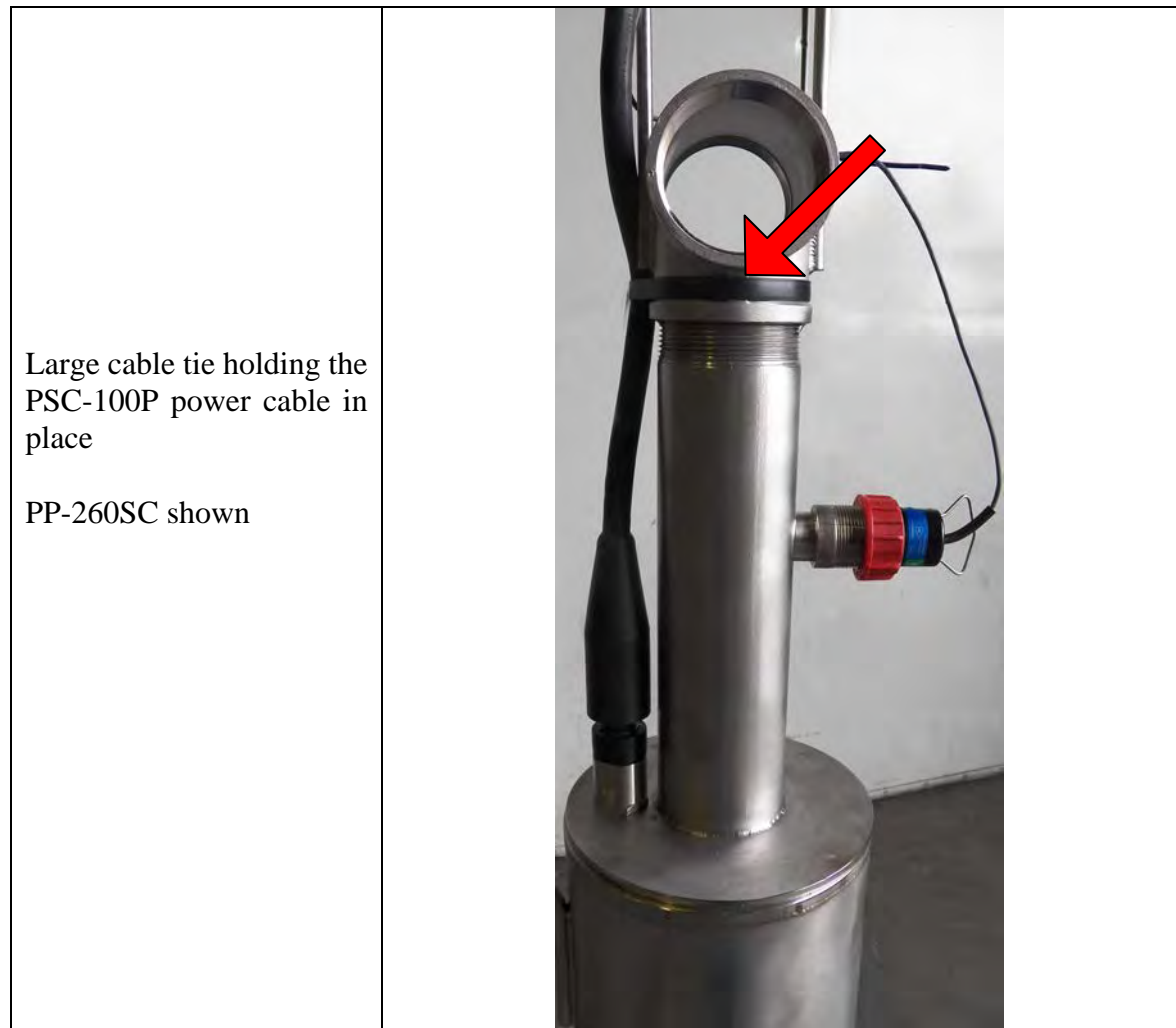
- If difficulty is encountered during installation ensure the keyway is oriented properly and that the male end of the PSC-100P power cord is properly lubricated with a non-conductive electrical lubricant (Dow Corning #4).
- If difficulty is encountered during removal ensure the power cable has been unthreaded fully and pull in the vertical direction ONLY to remove the power cable from the pump.

Install the power cord to pump pigtail HAND TIGHT ONLY. **DO NOT** use any tools (pliers, channel locks etc.) to tighten the connection.



Eliminate the possibility of a bending force on the connector by using the cable ties provided to fasten the pump power cable to the vertical discharge pipe of the pump. (see photograph below)

Connect the other end of the power cable to the pump control box.



4.1.5 Sample Hose

The PP-260SC pump has a vertical 1/2in male camlock connection as its sample port. The pump is shipped with this port capped with a 1/2in SS camlock cap. If sampling of the demineralizer effluent is desired, remove this cap and install the sample hose PRIOR to the pump being installed in the pool.

Remove the cap from the 1/2in male camlock on the PP-260SC pump and couple the female camlock on the sample hose to it.



Figure 4.1.5
SH-.5x100 Sample Hose attached to the PP-100SC pump.
PP-260SC pump similar

4.1.6 Zip-Tie Cables Together

Lay-out the 100 ft. of pump power cable, flow meter cable and sample hose in a straight line. Tie the three cables together with "zip-ties" every 2 feet starting at the pump end. Approx. 50 zip-ties are in a small plastic bag in the flow meter box. These "zip-ties" are black in color and are made out of polypropylene. They will float if accidentally dropped in the water.

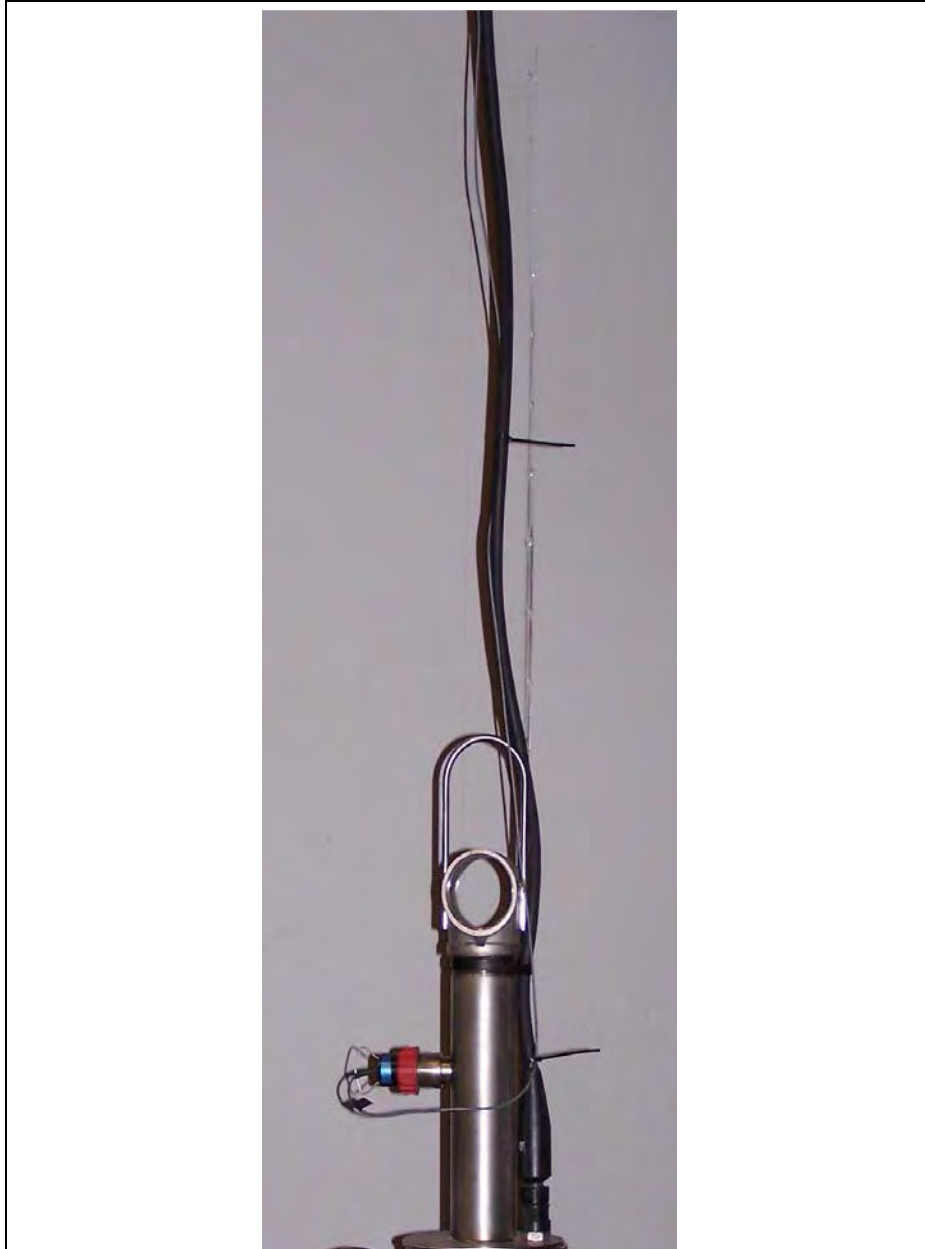


Figure 4.1.6
PSC-100P Power Cable zip tied to the FM-260 flow sensor cable
PP-260SC shown

4.1.7 Install Cables to the Control Box

After the CB-PR-260-4XP control box has been mounted to the UT-10A Mounting Panel, attach the PSC-100P power cord and PC-50 Drop Cable as shown below:

| | |
|---|--|
| <p>CB-PR-260-4XP control box shown mounted on the UT-10A Mounting Panel.</p> |  |
| <p>Install the PC-50 line in Twist Lock Plug to the CB-PR-260-4XP control box (shown on right)</p> <p>Connect the bare end of the PC-50 drop cable to an in plant power supply.</p> <p>Install the PSC-100P Pump Power Cable Twist Lock Plug to the CB-PR-260-4XP control box (shown on left)</p> |  |

4.2 UD-48A VESSEL

Prior to proceeding any further, ensure the vessel has been filled with resin per OI-36, General Resin Sluicing Procedure for Tri Nuclear Underwater Demineralizers. The rest of this procedure assumes the vessel is already filled with resin.

Tri Nuclear dwg. TNC-013-02 shows a schematic view of the UD-48A system, including the difference between “TYPICAL” operations (suction via the inlet screens on the top of the vessel) and the “OPTIONAL” setup using suction hoses (suction via the 2” x 50ft suction hoses).

Regardless of the mode of operation, the sluice valves and sluice hoses are installed. This allows the operators to sluice resin out of the vessel without having to raise the vessel to the surface to install hoses.

Determine which “MODE” of operation will be used, “TYPICAL” or “OPTIONAL”

4.2.1 TYPICAL operations:

Verify that the two Johnson screen assemblies on the two 4” water inlet connections are installed. These assemblies act as safety screens preventing resin from migrating from the vessel during resin fill operations.

4.2.2 OPTIONAL operations:

If installed, remove the standard inlet Johnson Screen assemblies and thread in the SSVA-48A.

Install the PH-3x50 suction hose to the female camlock coupler on the SSVA-48A and the Johnson Screen Strainer Assembly (SHKC-JS-4x12) to the male end of the hose.



UD-36A with SHCK installed (above) on right vessel inlet. Left vessel inlet has the standard inlet safety screen installed. UD-48 Similar.

4.2.3 SLUICE VALVES

Remove the stainless steel camlock caps from the 1-1/2in resin inlet & outlet male camlock connections and install the 1-1/2in SS ball valve assembly (BV-1.5SS-MxF) to each connection. Verify the valves are shut. Install the Resin Sluice hose (FPS-1.5x50) to the valve and place the SS camlock cap on the end of the hose.



It is highly recommended that the end of the hoses are labeled "Resin in" / "Resin out" for future sluicing operations.

The vessel connections are etched (Resin Outlet shown) to aid the operator in connecting hoses.



4.2.4 DISCHARGE HOSE

If the UD-48A is being set up for “TYPICAL” Operations, couple the female camlock of the 2in x 25 ft. long discharge hose (P/N: PH 3x25) to the 3in male camlock connection on the PP-260SC pump tee.

Connect the diffuser pipe (P/N: UT-8) to the male camlock on the end of the discharge hose.

A handling line (NOT SUPPLIED) may be tied to the UT-8 diffuser for moving the hose underwater to a desired locations.

The diffuser pipes are used to dampen a hose “whip” reaction which occurs at the end of a discharge hose.



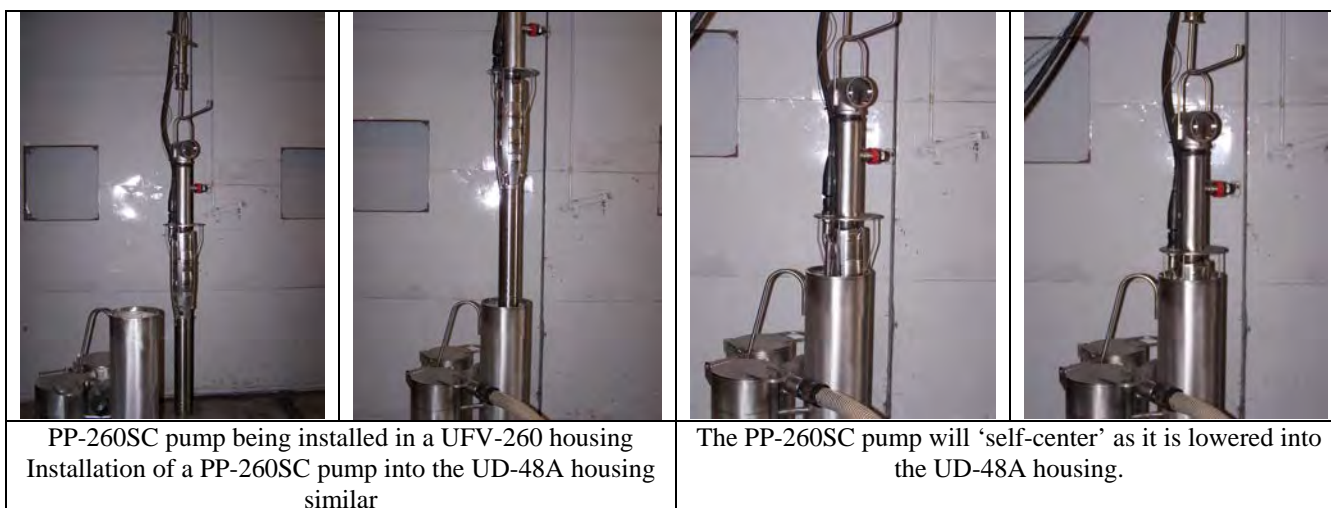
NOTE:

Running the UD-48A without suction or discharge hoses will not produce desired results in pool demineralization due to "short circuiting" the water flow (the pump will discharge directly above the vessel inlet connections).

It is also not required or desired to install BOTH suction and Discharge hoses to the UD-48A

4.3 Install Pump in Vessel

Lower the PP-260SC pump into the UD-48A vessel.



(Note: The pump may be installed in the housing AFTER the demineralizer vessel has been lowered into the pool)

4.4 SUBMERGE VESSEL IN POOL

- 4.4.1 Before installing the vessel into the pool, fill it from an approved water source through the resin inlet hose. The vessel will be full when water starts to overflow the 2in Johnson screens installed in the vessel top water inlet.
- 4.4.2 Lift the vessel with a crane, using caution to guide the vessel hoses to prevent them from fouling the rigging equipment or be trapped underneath the vessel. If the PP-100SC pump is installed and lowered with the vessel, ensure the power cable, flow sensor cable and pump discharge hose do not foul the rigging lines or become trapped underneath the vessel.

After the vessel is in place remove caps from the FPS-1.5x50 hoses and submerge the open end momentarily to fill them with water and reinstall the caps.

4.5 Phase Rotation Check with CB-PR-260-4XP Phase Reversing Control Box

IMPORTANT - READ THIS STEP CAREFULLY!

!!!WARNING!!!

Do not run the pump until a proper phase rotation check is made! Running the pump in reverse for any long duration WILL damage the pump!

!!!WARNING!!!

**DO NOT RUN/BUMP THE PUMP DRY OR OUT OF THE WATER!
SEVERE DAMAGE TO THE PUMP MAY OCCUR!**

To check for proper phase rotation of the pump motor, turn on the unit and record the flow rate. Switch the phase of the pump using the phase rotation switch, start the pump and again record the flow rate. The proper phasing will give the higher flow rate.

To change the phase of the pump, stop the pump (if running), open the safety cover, Turn the switch to the Phase A or B position, Close the safety cover, and restart the pump.

!!!WARNING!!!

DO NOT START THE PUMP MORE THAN ONCE EVERY TWO MINUTES

This phase rotation check must be performed each time the motor or starter box is disconnected from the electrical power source.

5.0 OPERATIONS

5.1 NORMAL OPERATIONS

Note:

During normal operations, the two FPS-1.5x50 hoses (resin inlet & outlet) may be removed from the vessel. The 1-1/2in camlock caps installed on the hoses must be installed on the 1-1/2in male camlock fittings on the valve spool pieces (resin inlet & outlet) on the UD-48A vessel. These connections must be capped during operation.

If the FPS-1.5x50 hoses were removed, they must be reinstalled prior to resin sluice out operations when the vessel is full of potentially 'hot' resin. Plant HP and operators need to discuss the issue of these sluice hoses before they are removed for normal operations.

5.1.1 Start the PP-260SC pump, and observe and record the flow on the flow meter for future reference. The normal flow rate for the UD-48A should be between 200-260 GPM. Higher flow rates (between 260gpm & 300gpm) are also acceptable for recirc demineralizers. If flow is observed to be >300GPM it is out of spec high. If this occurs please contact Tri Nuclear with the details of the operations leading up to this high flow rate so we can help troubleshoot the problem.

5.1.2 Occasionally (once every 12-24 hrs), shut-off the pump and observe if much air vents from the top water inlet Johnson screen. While the system is normally operating, the inlet Johnson screen has been sized to allow water to enter through the screen and any residual collected air to be vented from the screen. Very small air bubbles might be observed exiting the pump discharge. This occurs due to the negative pressure in the vessel as air is stripped from the pool water. This observation is normal and should not be of any concern.

5.2 EFFLUENT SAMPLE

If desired, an effluent sample may be obtained from the sample hose SH-.5x100.





With the pump running, open the sample valve on the end of the 100ft sample hose to flush the hose. After the hose has been flushed, a sample may be obtained.

5.3 PUMP CHANGE OUT

When it becomes necessary to remove the pump perform the following:

- Turn off the pump.
- Using a pump lift hook lift and remove the pump.
- Install the pump per section 4

If the pump is to be replaced perform the applicable pre-start up checks of section 4 prior to installing the new pump.

| | | | |
|---|---|--|---|
|  |  |  |  |
| PP-260SC pump being installed in a UFV-260 housing Installation of a PP-260SC pump into the UD-48A housing similar | | The PP-260SC pump will 'self-center' as it is lowered into the UD-48A housing. | |

5.4 TROUBLESHOOTING

See OI-5, Tri Nuclear Pump Trouble Shooting Guide, for trouble shooting guidelines with the UD-48A.

5.5 SLUICING OPERATIONS

See OI-36, General Resin Sluicing Procedure for Tri Nuclear Underwater Demineralizers, for the procedure for sluicing resin into and out of Tri Nuclear Underwater Demineralizers.

6.0 STORAGE REQUIREMENTS

- 6.1 Caution should be taken to **NOT** store any plastic components (eg. filters or hoses) near high radiation fields associated with equipment such as fuel bundles, LPRM's or control blades. Breakdown of such components can occur with accumulated exposures of 10^6 R. For this reason, precautions should be taken to minimize accumulative dose for the following components: suction hose, filter cartridges, power and instrument cable, flow sensor, and electric motor. All components are chemically suitable for long term storage in the fuel pool cavity environment.
- 6.2 The preferred method of storing the submersible pump assembly when not in use is underwater. Periodically, running the pump (at least once a month) is also desirable to prevent seals from remaining in a stagnant condition.

7.0 Precautions and Warnings

WARNING:

Do not run/bump the pump dry or out of the water! Severe damage to the pump may occur!

WARNING:

Install the power cord to pump pigtail HAND TIGHT ONLY. Do NOT use any tools (pliers, channel locks etc.) to tighten the connection.

CAUTION:

Do not start the pump more than once every 2 minutes or 300 starts/day. Damage to the motor winding insulation may occur.

CAUTION:

Do not run the pump until a proper phase rotation check is made! Running the pump in reverse for any long duration will damage the pump!

CAUTION:

When installing and removing the power cord, do not move the power cable connector with side to side motion in an attempt to install or remove it.

- If difficulty is encountered during installation ensure that the keyway is lined up and that the male end of the PSC-100P power cord is properly lubricated with a non conductive electrical lubricant (Dow Corning #4).
- If difficulty is encountered during removal ensure the power cable has been unthreaded fully and pull in the vertical direction ONLY to remove the power cable from the pump.

CAUTION:

The CB-PR-260-4XP is rated for 460V/3ph/60Hz ONLY. Any other voltage/frequency supplied to this control box will prevent them from operating properly.

CAUTION:

The flow meter dial read-out gauge is a delicate instrument (milliammeter) and should be protected from rough handling. It could be broken if dropped on the floor. Mount it to the UT-10A control panel and hung on a suitable railing for protection.

NOTE:

Perform the flow meter check before installing the Underwater Filter units into the pool for the first time, whenever the flow meter or sensor is replaced, or anytime the flow sensor is suspected of being damaged.

NOTE:

It is not recommend to operate the UD-48A with a stratified media bed (resin & carbon media).

8.0 Troubleshooting

See OI-5, Tri Nuclear Pump Trouble Shooting Guide, for trouble shooting guidelines with the UD-48A.

9.0 Replacement Parts

Below is a listing of **Recommended Spare Parts**:

| Qty | Part No. | Description |
|------------------------------------|---------------|--|
| 1 | PP-260SC | Grundfos pump, 5HP/460V/3Ph/60Hz, w/cover, SC connector, CB PR-260-4XP PHASE REVERSING control box with twist lock plugs, PSC-100P Power Cable with twist lock plug and PC-50 drop cable with twist lock plug |
| 1 | FM-260 | Flow Meter Kit, includes 0-400 GPM analog meter and paddlewheel flow sensor w/100 ft cable |
| 1 | CB-PR-260-4XP | 5HP/460V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable |
| 1 | PSC-100P | Pump Power Cable, 100ft 10/4 SO with SC connector & twist lock plug (Note: For use with the CB-PR-xxx-4XP control box) |
| 1 | PC-50 | Control Box Drop Cable, 50ft 10/4 SO cable w/ twist lock plug x bare wire (Note: For use with the CB-PR-xxx-4XP control box) |
| 1 | SC-P | Seal Plug for electrical connector on Tri Nuclear pumps |
| 1 | PH-3x25 | 3" x 25' hose with Polypro MxF camlock couplers |
| 1 | UT-8 | Diffuser Pipe for 3in discharge hose. |
| 1 | SHCK-UD-48A | Suction Hose Conversion Kit for the UD-48A system. Includes (2) Safety Screen Vent Assemblies (P/N: SSVA-48A), (2) PH-3x50 suction hoses, & (2) Johnson Screen strainer (P/N: SHKC-JS-4x12) |
| 2 | FPS-1.5x50 | Suction/Discharge hose, 1.5" x 50' lg with SS MxF couplers, 150 PSI |
| 2 | BV-1.5SS-MxF | 1-1/2" SS FP Ball Valve with Male by Locking Female camlock couplers. Includes remote grapple lanyard. |
| 1 | SH-.5x100 | Sample hose, 1/2" x 100' lg with SS F camlock coupler x SS ball valve |
| Optional Sluicing Equipment | | |
| 1 | AP-65 | Resin sluice pump, dolly mounted. Includes 2in AL Sandpiper™ flap valve pump with 1-1/2in SS ball valves, inlet/outlet female camlock couplers, 3/4in water flush valve, & 1/4in drain valve. |
| 1 | FPS-1.5x25 | Suction/Discharge hose, 1.5" x 25' lg with SS MxF camlock couplers, 150 PSI |

10.0 ADDITIONAL INFORMATION

For additional information, or if special problems develop, please contact:

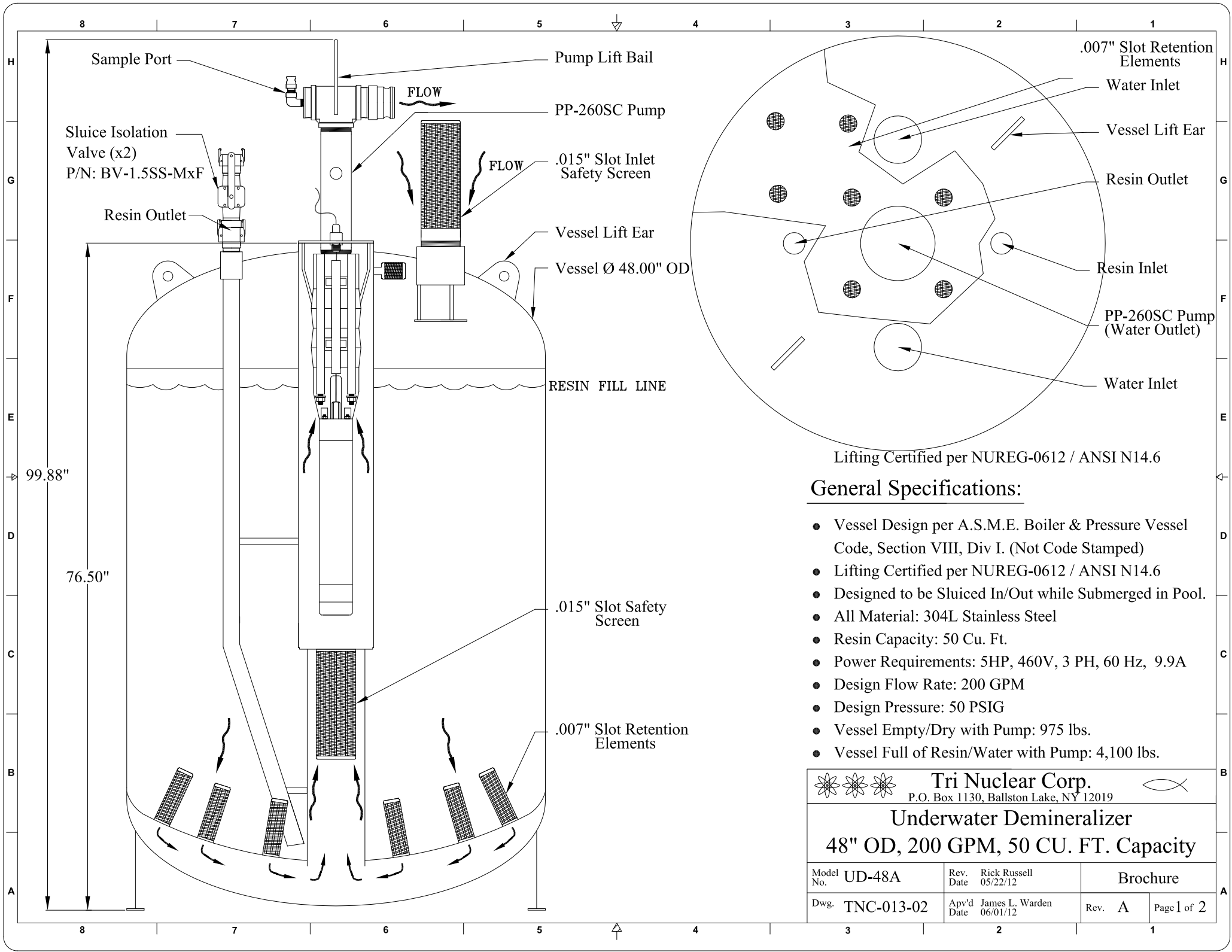
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e-mail: jwarden@trinuclear.com



We also have a CD-Rom that contains all the operating procedures/drawings/brochures for this system and all other Tri Nuclear equipment. Please call, fax, or e-mail us to request your copy.

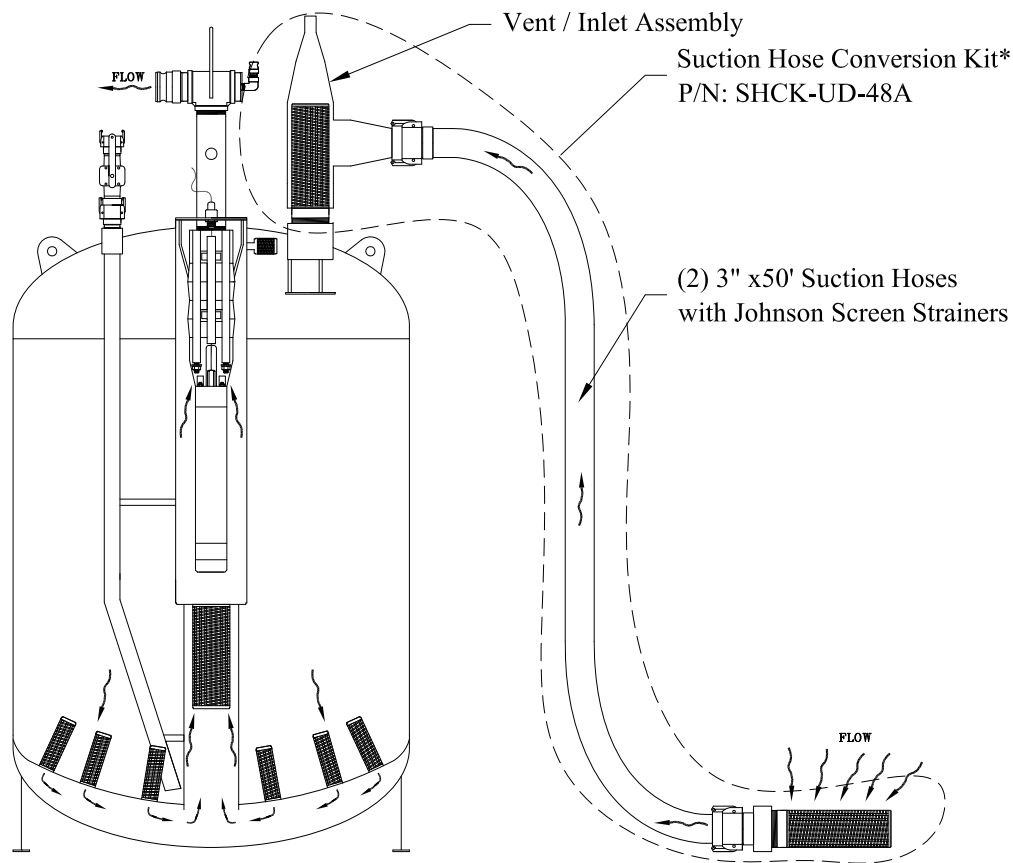


Lifting Certified per NUREG-0612 / ANSI N14.6

General Specifications:

- Vessel Design per A.S.M.E. Boiler & Pressure Vessel Code, Section VIII, Div I. (Not Code Stamped)
- Lifting Certified per NUREG-0612 / ANSI N14.6
- Designed to be Sluiced In/Out while Submerged in Pool.
- All Material: 304L Stainless Steel
- Resin Capacity: 50 Cu. Ft.
- Power Requirements: 5HP, 460V, 3 PH, 60 Hz, 9.9A
- Design Flow Rate: 200 GPM
- Design Pressure: 50 PSIG
- Vessel Empty/Dry with Pump: 975 lbs.
- Vessel Full of Resin/Water with Pump: 4,100 lbs.

| | | | | | |
|---|--|--|--|---|-------------|
|  | | Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | |  | |
| Underwater Demineralizer 48" OD, 200 GPM, 50 CU. FT. Capacity | | | | | |
| Model No. UD-48A | | Rev. Date Rick Russell 05/22/12 | | Brochure | |
| Dwg. TNC-013-02 | | Apv'd Date James L. Warden 06/01/12 | | Rev. A | Page 1 of 2 |

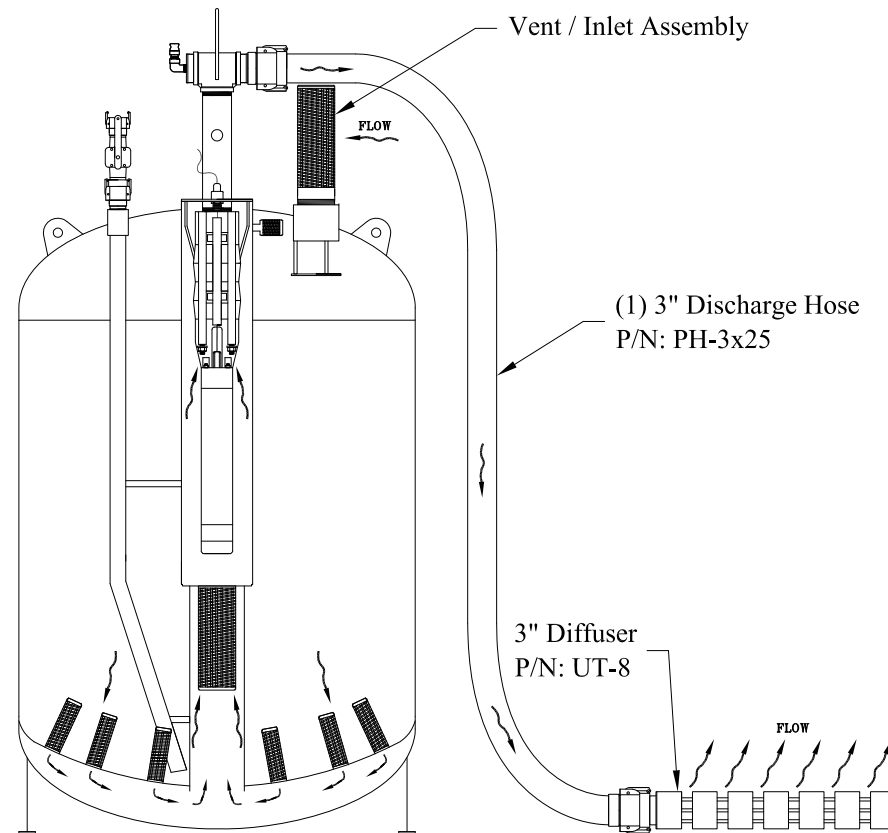


"OPTIONAL" SUCTION HOSE OPERATIONS

Dual Suction Hoses attached to
Vessel Inlet. No Hose attached to
discharge of pump.

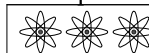
*SHCK-UD-48A Includes:

- (2) Safety Screen Vent Assembly, P/N: SHCK-SSVA-3x4
- (2) Suction Hose, P/N: PH-3x50
- (2) Johnson Screen Strainer, P/N: SHCK-JS-4x12



"TYPICAL" DISCHARGE HOSE OPERATIONS

NOTE: UD-48A to be run with either Suction or Discharge
Hoses attached for efficient cross-circulation. This system is
not required to run with both Suction & Discharge Hoses.

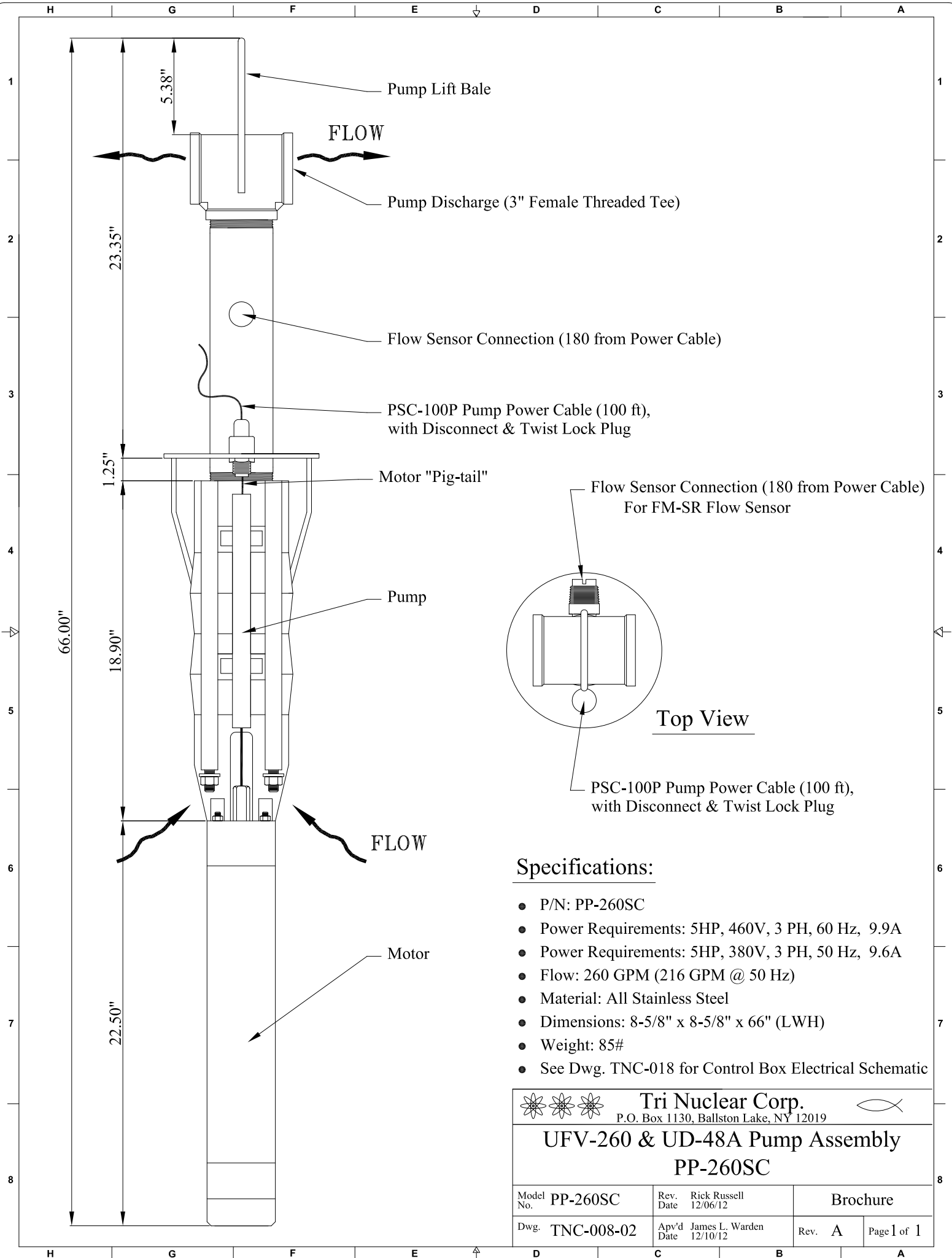


Tri Nuclear Corp.
P.O. Box 1130, Ballston Lake, NY 12019





UD-48A System Modes of Operation

| | | | | | | |
|--------------|--------|------|------------|------|---|-------------|
| Model No. | UD-48A | Dwg. | TNC-013-02 | Rev. | A | Page 2 of 2 |
|--------------|--------|------|------------|------|---|-------------|

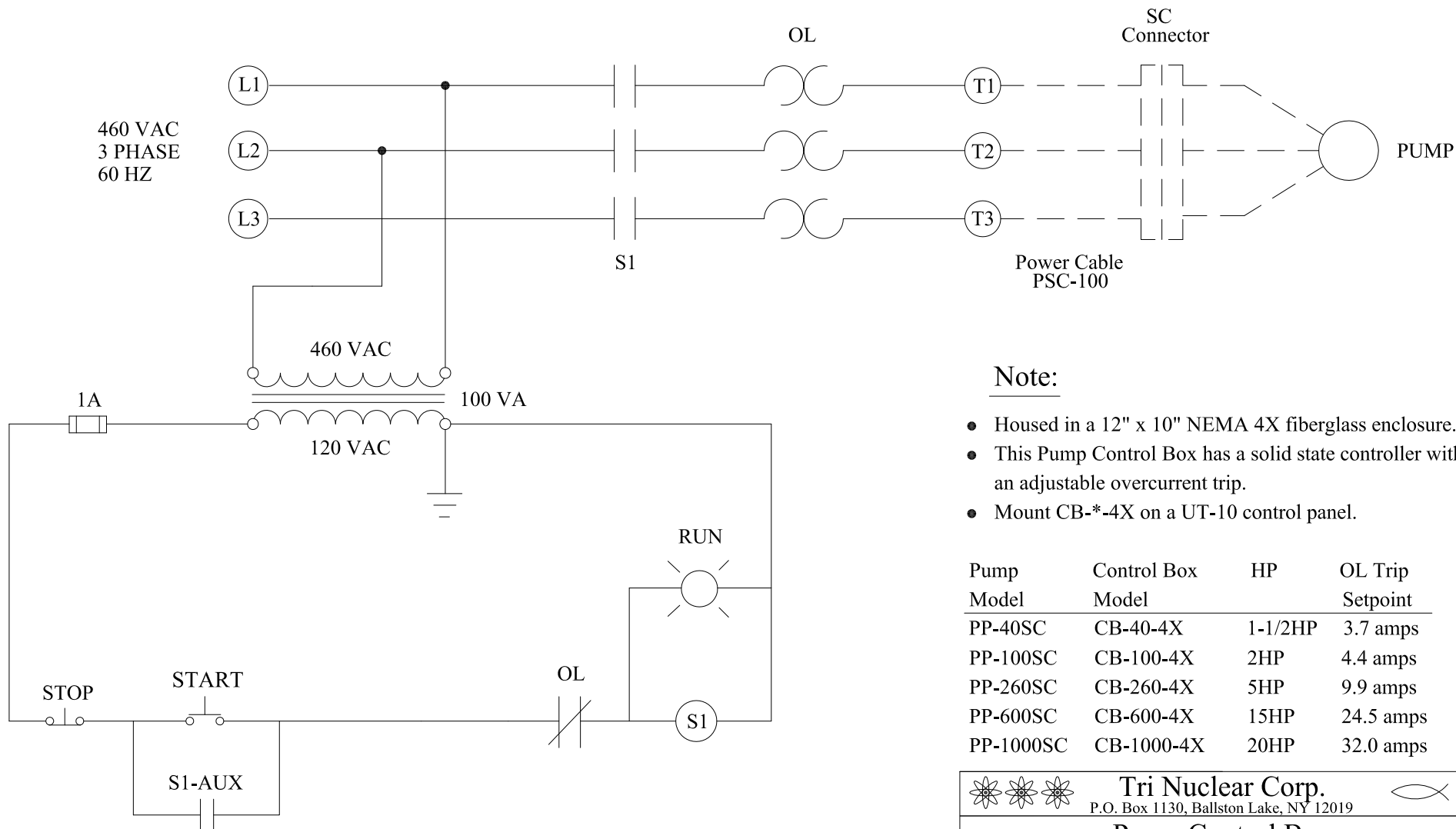


Specifications:

- P/N: PP-260SC
- Power Requirements: 5HP, 460V, 3 PH, 60 Hz, 9.9A
- Power Requirements: 5HP, 380V, 3 PH, 50 Hz, 9.6A
- Flow: 260 GPM (216 GPM @ 50 Hz)
- Material: All Stainless Steel
- Dimensions: 8-5/8" x 8-5/8" x 66" (LWH)
- Weight: 85#
- See Dwg. TNC-018 for Control Box Electrical Schematic

| | | | | | |
|--|--|--|--|---|-------------|
|  | | Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | |  | |
| UFV-260 & UD-48A Pump Assembly PP-260SC | | | | | |
| Model No. PP-260SC | | Rev. Date Rick Russell 12/06/12 | | Brochure | |
| Dwg. TNC-008-02 | | App'd Date James L. Warden 12/10/12 | | Rev. A | Page 1 of 1 |

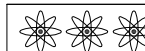
A fused disconnect or circuit breaker
must be provided by installer.
Provide disconnect sizing per
NEC-430-53 (c)



Note:

- Housed in a 12" x 10" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-*-4X on a UT-10 control panel.

| Pump Model | Control Box Model | HP | OL Trip Setpoint |
|------------|-------------------|---------|------------------|
| PP-40SC | CB-40-4X | 1-1/2HP | 3.7 amps |
| PP-100SC | CB-100-4X | 2HP | 4.4 amps |
| PP-260SC | CB-260-4X | 5HP | 9.9 amps |
| PP-600SC | CB-600-4X | 15HP | 24.5 amps |
| PP-1000SC | CB-1000-4X | 20HP | 32.0 amps |



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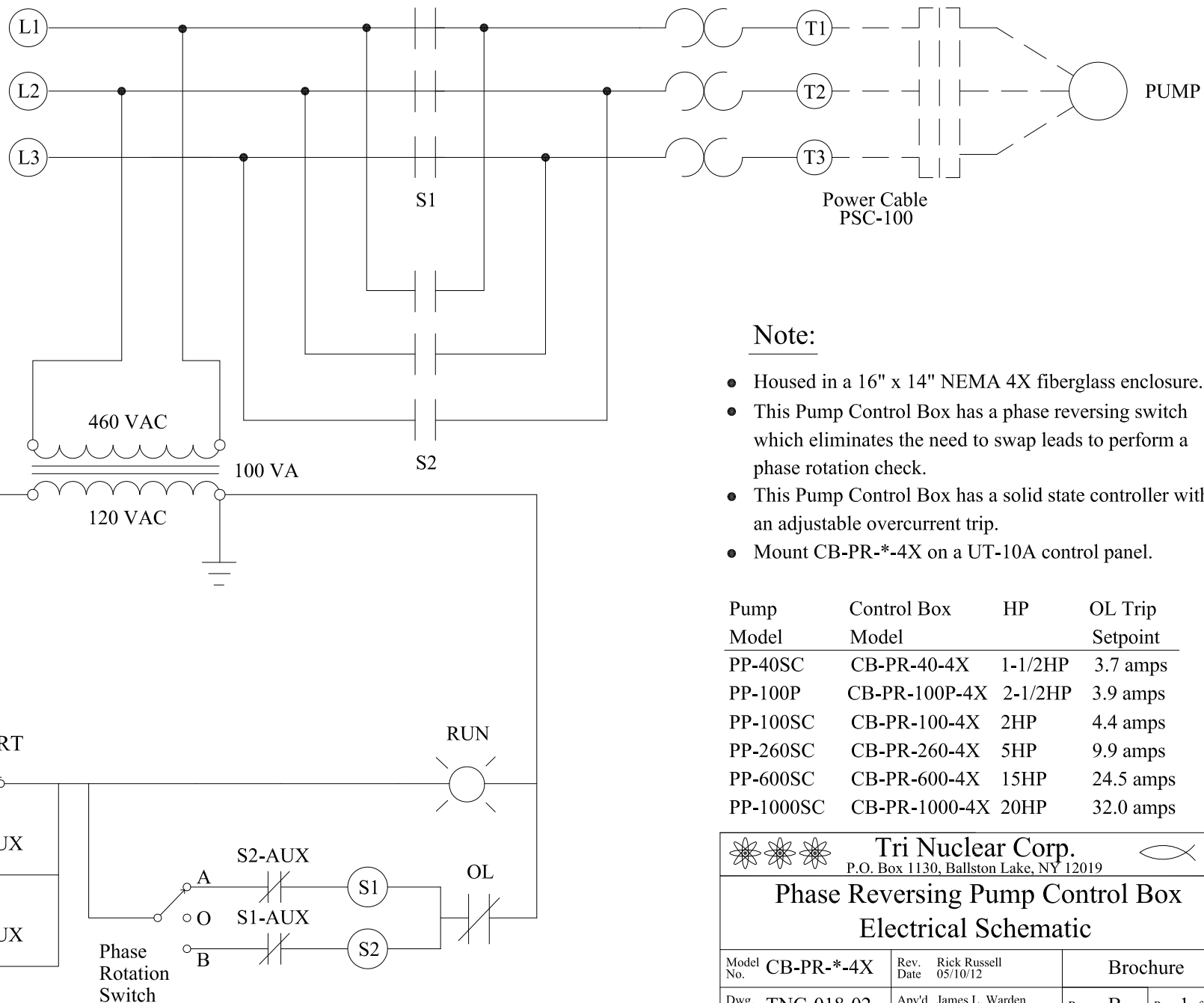


Pump Control Box Electrical Schematic

| | | | |
|--------------------------|--|---------------|---------------------------|
| Model No. CB-*-4X | Rev. Date Rick Russell 05/10/12 | Brochure | |
| Dwg. TNC-018-01 | Apv'd Date James L. Warden 05/10/12 | Rev. A | Page 1 of 1 |

A fused disconnect or circuit breaker
must be provided by installer.
Provide disconnect sizing per
NEC-430-53 (c)


460 VAC
3 PHASE
60 HZ



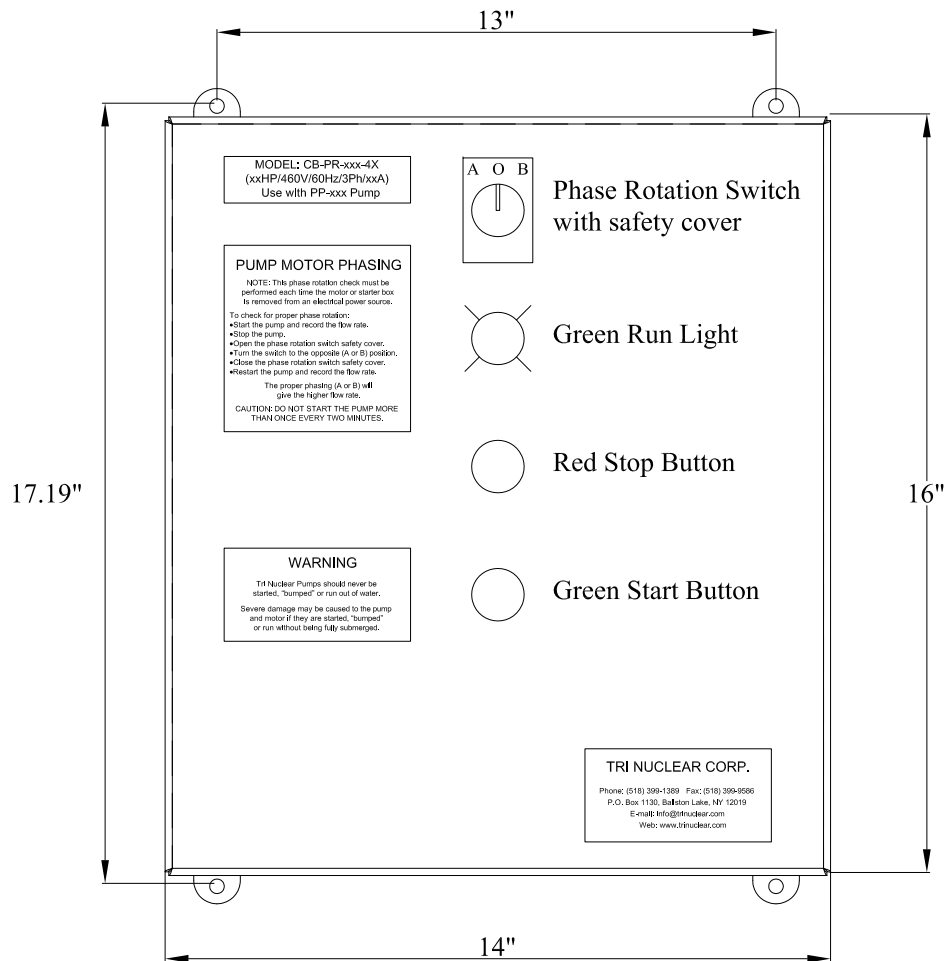
Note:

- Housed in a 16" x 14" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a phase reversing switch which eliminates the need to swap leads to perform a phase rotation check.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-PR-*-4X on a UT-10A control panel.

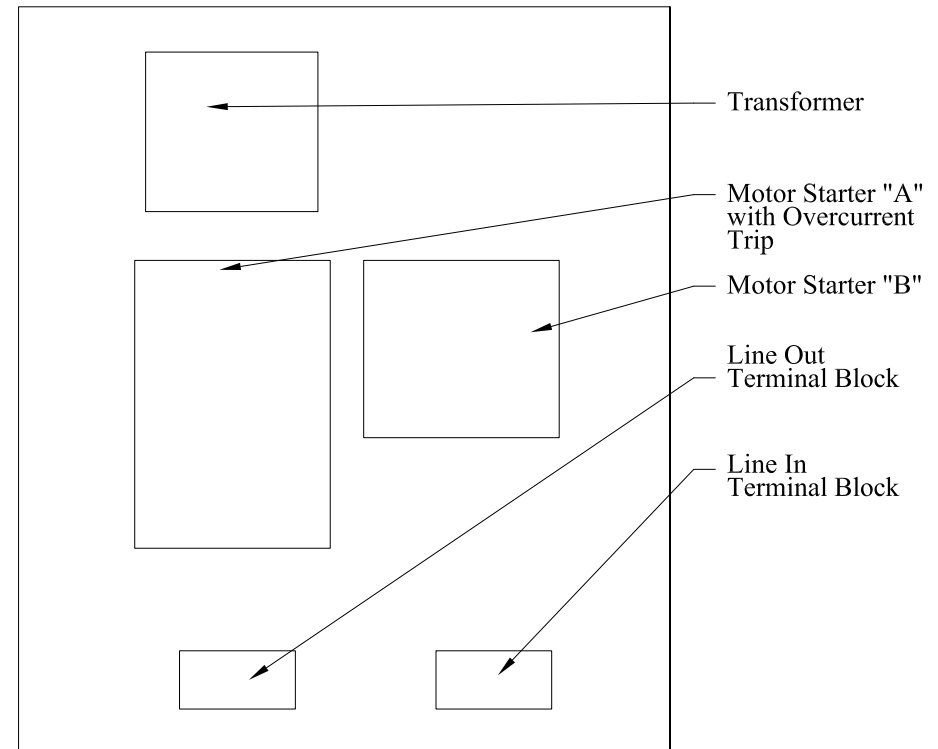
| Pump Model | Control Box Model | HP | OL Trip Setpoint |
|------------|-------------------|---------|------------------|
| PP-40SC | CB-PR-40-4X | 1-1/2HP | 3.7 amps |
| PP-100P | CB-PR-100P-4X | 2-1/2HP | 3.9 amps |
| PP-100SC | CB-PR-100-4X | 2HP | 4.4 amps |
| PP-260SC | CB-PR-260-4X | 5HP | 9.9 amps |
| PP-600SC | CB-PR-600-4X | 15HP | 24.5 amps |
| PP-1000SC | CB-PR-1000-4X | 20HP | 32.0 amps |

| | | | |
|--|--|-----------------|-------------|
|  Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | | | |
| Phase Reversing Pump Control Box Electrical Schematic | | | |
| Model No. CB-PR-*-4X | Rev. Date Rick Russell 05/10/12 | Brochure | |
| Dwg. TNC-018-02 | Apv'd Date James L. Warden 05/10/12 | Rev. B | Page 1 of 2 |

CONTROL BOX FRONT



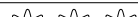

CONTROL BOX INSIDE



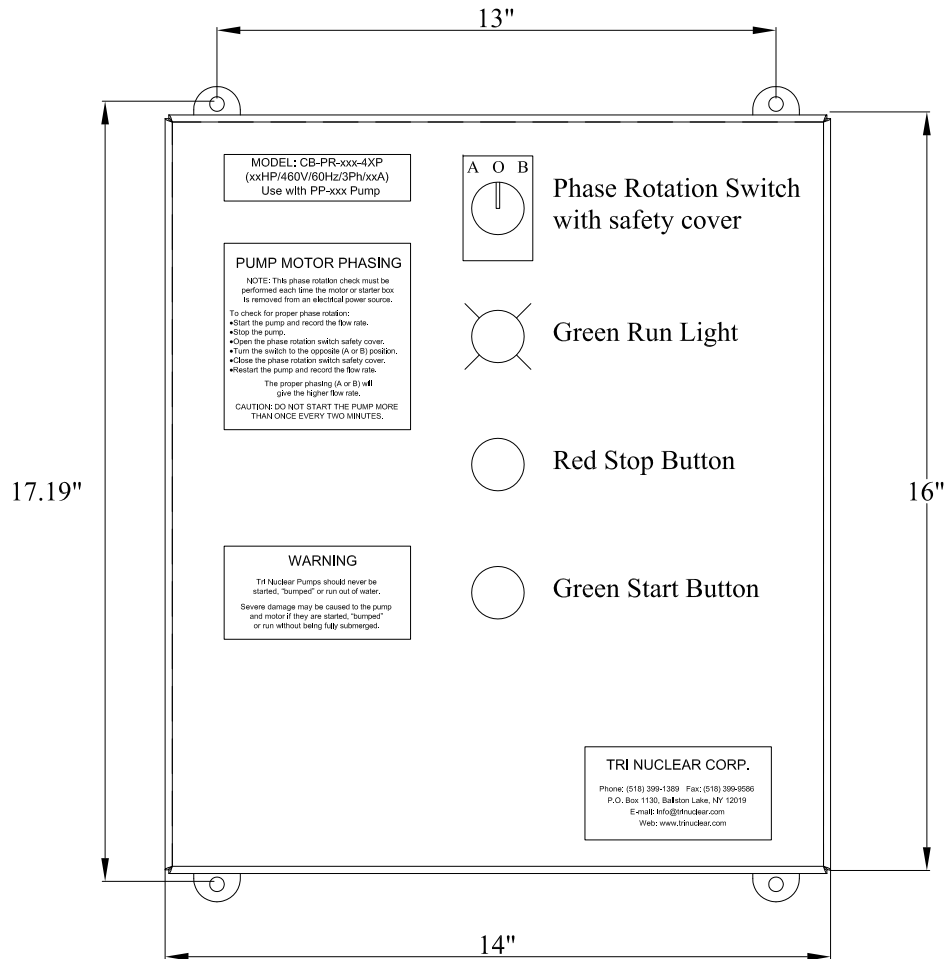
To check for proper phase rotation of the pump motor, turn on the unit and record the flow rate. Switch the phase of the pump using the phase rotation switch, start the pump and again record the flow rate. The proper phasing will give the higher flow rate.

To change the phase of the pump, stop the pump (if running), open the safety cover, rotate the switch to the Phase A or B position, close the safety cover, and restart the pump.

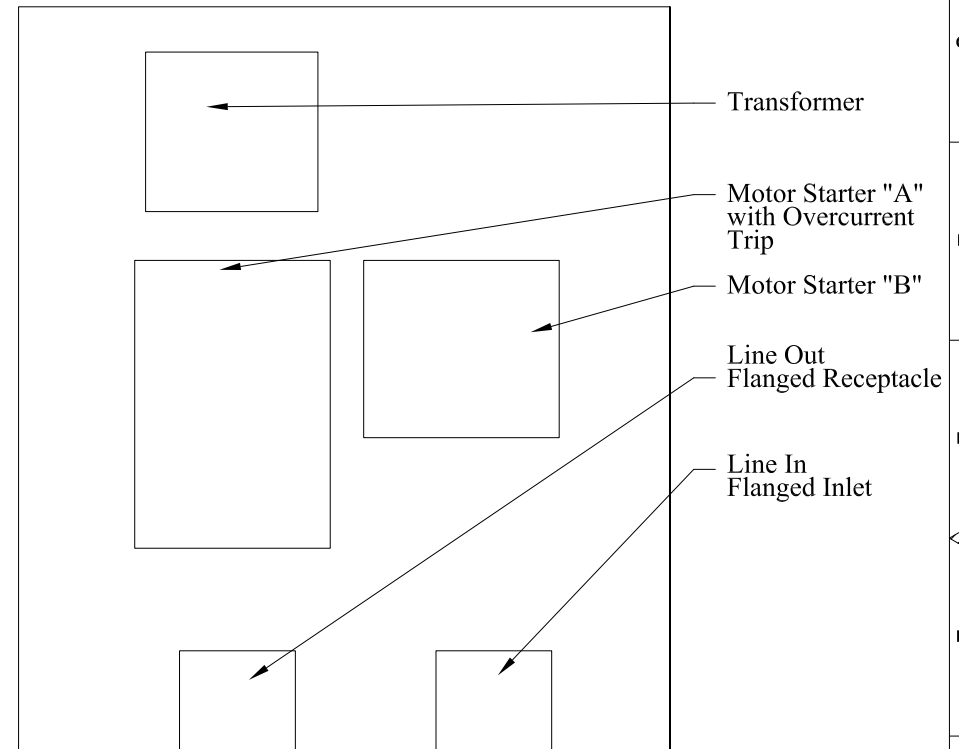
This phase rotation check must be performed each time the motor or starter box is disconnected from the electrical power source.

| | | | | | |
|---|-------------|--|------------|---|--------|
|  | | Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | |  | |
| Phase Reversing Pump Control Box Electrical Schematic | | | | | |
| Model No. | CB-PR-xx-4X | Dwg. | TNC-018-02 | Rev. | B |
| | | | | Page | 2 of 2 |

CONTROL BOX FRONT





CONTROL BOX INSIDE



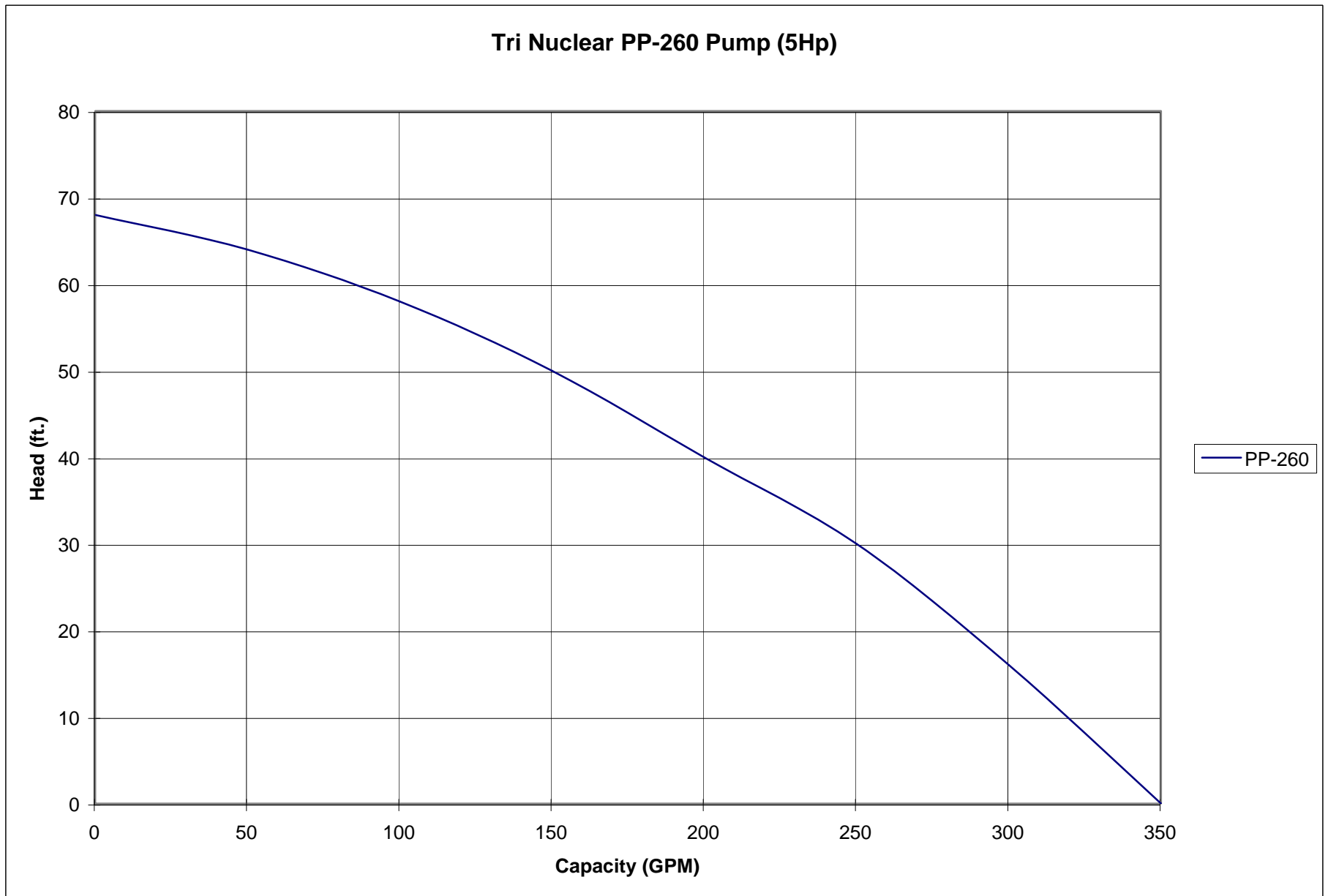
To check for proper phase rotation of the pump motor, turn on the unit and record the flow rate. Switch the phase of the pump using the phase rotation switch, start the pump and again record the flow rate. The proper phasing will give the higher flow rate.

To change the phase of the pump, stop the pump (if running), open the safety cover, rotate the switch to the Phase A or B position, close the safety cover, and restart the pump.

This phase rotation check must be performed each time the motor or starter box is disconnected from the electrical power source.

| | | | |
|--|--------------|---|------------|
|  Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | |  | |
| Phase Reversing Pump Control Box Electrical Schematic | | | |
| Model No. | CB-PR-xx-4XP | Dwg. | TNC-018-07 |
| Rev. | A | Page | 2 of 2 |

PP-260 Pump Curve Chart 1





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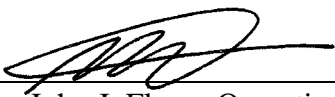
General Resin Sluicing Procedure for all Tri Nuclear Underwater Demineralizers

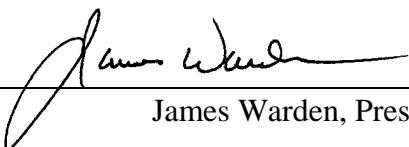
This OI covers the following Underwater Demineralizer Models:

UD-30A, UD-34A, UD-36A, UD-48A, UDFS-48, UD-48P



Document No: OI-36 Rev 0 01/20/12
Date

Prepared By:  01/20/12
John J. Flynn, Operations Manager Date

Approved By:  01/20/12
James Warden, President Date

Tri Nuclear Record of Revision

| Revision or Change Number | Effective Date of Revision or Change | Affected Page and/or Para # | Person Entering Revision | Revision or change Cancelled By |
|---------------------------|--------------------------------------|-----------------------------|--------------------------|---------------------------------|
| Rev. 0 | 01/20/12 | Original Issue | ----- | |
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If you have any questions concerning changes in this document, please call the main Tri Nuclear office at 518-399-1389 or e-mail at info@trinuclear.com

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Attachments:

- A. TNC-087-02, AP-65 Brochure Drawing
- B. TNC-088-02, General Sluice Brochure Drawing
- C. TNC-011-02, UD-30A Brochure Drawing
- D. TNC-054-02, UD-34A Brochure Drawing
- E. TNC-012-02, UD-36A Brochure Drawing
- F. TNC-013-02, UD-48A Brochure Drawing

General Resin Sluicing Procedure
for all Tri Nuclear Underwater Demineralizers
(Models UD-30A, UD-34A, UD-36A, UD-48A, UDFS-48, UD-48P)

Operating Instructions

1.0 INTRODUCTION

This Operating Instruction is a “generic” procedure designed to provide general guidance for sluicing operations (initial fill, & replacement of resin) of a typical Tri Nuclear Underwater Demineralizer.

All Tri Nuclear Underwater Demineralizers are designed to have the resin sluiced in and out while the vessel is submerged underwater.

CAUTION:

*Tri Nuclear Underwater Demineralizer's are NOT designed to have the resin sluiced
OUT of the vessel while the vessel is out of the water.*

It is expected that trained and qualified personnel will be performing the sluicing operations. Radiological considerations and requirements are not included in this document, which may vary between stations, and should be specifically addressed by the end user organization. However, the Underwater Demineralizer resin can become extremely “HOT” (>15R is normal and expected at the top of the demineralizer) and proper ALARA controls need to be addressed prior to beginning the slicing procedure.

Equipment Guide List

For

General Sluicing Operations for Tri Nuclear Underwater Demineralizer Systems

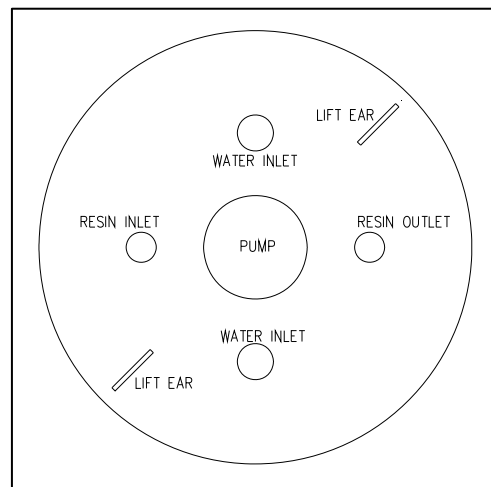
The following equipment is recommended for sluicing Tri Nuclear Underwater Demineralizer Systems:

| TNC Part Number | Description | Qty |
|------------------------|---|------------|
| AP-65 | Resin sluice pump, dolly mounted. Includes 2in AL Sandpiper™ flap valve pump with 1-1/2in SS ball valves, inlet/outlet female camlock couplers, 3/4in water flush valve, & 1/4in drain valve. | 1 |
| BV-1.5SS-MxF | 1-1/2" SS FP Ball Valve with Male by Locking Female camlock couplers. Includes remote grapple lanyard. | 2 |
| FPS-1.5x50 | Suction/Discharge hose, 1.5" x 50' lg with SS MxF camlock couplers, 150 PSI | 2 |
| FPS-1.5x25 | Suction/Discharge hose, 1.5" x 25' lg with SS MxF camlock couplers, 150 PSI | 1 |

2.0 EQUIPMENT DESCRIPTION

2.1 DEMINERALIZER VESSELS:

All Tri Nuclear Underwater Demineralizers are similar in their design and top connections (with the exception of the UD-48P & UDFS-48). Below is a typical top view of a Tri Nuclear underwater demineralizer:



**Top view of the UD-30A, UD-34A, UD-36A & UD-48A
(UD-48P & UDFS-48 resin inlet & outlet connections similar)**

Regardless of the Model of the Underwater Demineralizer, the Resin Inlet & Resin Outlet connections are either stamped or etched on the head near the connection itself.



All Tri Nuclear Underwater Demineralizer Resin Inlet & Outlet connections are 1-1/2in male camlock couplers with a stainless steel cap.

| Capacity of Tri Nuclear Demineralizers | | | |
|--|------------------------|---------------------------|---|
| Model Number | Typical Resin Capacity | Diameter of Demineralizer | Height of Demineralizer (to top of pump tube) |
| UD-30A | 15 ft ³ | 30in | 47-1/2" |
| UD-34A | 15 ft ³ | 34in | 48-7/8" |
| UD-36A | 28 ft ³ | 36in | 67-5/8" |
| UD-48A | 50 ft ³ | 48in | 76-1/2" |
| UD-48P | 30 ft ³ | 48in | n/a |
| UDFS-48 | 50 ft ³ | 48in | 76-1/2" |

2.2 SLUICE VALVES (BV-1.5SS-MxF)

Each Underwater Demineralizer vessel purchased after October 2011 comes with (2) removable 1-1/2 Male by locking Female camlock, full port stainless steel ball valves. The handle on the ball valve has a lanyard loop attached for opening the valve with a grapple tool.

The purpose of the ball valve is to provide positive isolation to the Underwater Demineralizer vessel when the sluice hoses are attached. This positive isolation prevents a resin excursion from the vessel in the event a hose is damaged during operations.



2.3 SLUICE HOSES (FPS-1.5x50)

Each Underwater Demineralizer vessel purchased after October 2011 comes equipped with two 1-1/2" x 50' sluice hoses with stainless steel male x female camlock couplers. These hoses are rated for 150 PSI and are hydro tested prior to shipment from the factory.

2.4 RESIN TRANSFER HOSE (OPTIONAL)

The resin transfer hose is a 1-1/2" x 25' hose (P/N: FPS-1.5x25) attached to the AP-65 Resin Sluice Pump and is used for sluicing clean resin from a new resin drum to the demineralizer. This same hose may be used for discharging deleted resin from the demineralizer to a radwaste disposal liner.

2.5 RESIN SLUICE PUMP (OPTIONAL)

Resin sluice pump. Includes 2in AL Sandpiper™ flap valve pump with 1-1/2in SS ball valves, inlet/outlet female camlock couplers & 3/4in water flush valve mounted on a dolly with pneumatic tires. (P/N: AP-65). See drawing TNC-087-02.



3.0 EQUIPMENT AS SHIPPED

(This is a general description of how the equipment is shipped. The actual equipment shipping requirements may differ depending on customer requirements)

- 3.1 The AP-65 is shipped on a single pallet. All accessory hoses, valve spool pieces etc. are shipped on a second pallet.

4.0 INITIAL RESIN FILL OF A NEW / CLEAN UNDERWATER DEMINERALIZER

CAUTION:

This initial fill procedure is designed to be used on a new / clean Underwater Demineralizer. Due to ALARA concerns & possible hot spots/rad levels after the Underwater Demineralizer has been operated, it is NOT recommended to perform resin fill via this method on a used / contaminated Underwater Demineralizer vessel.

CAUTION:

Do not operate ANY Tri Nuclear Underwater Demineralizer with a stratified media bed (carbon & resin) or a carbon only bed. Resin selection is the responsibility of the customer.

The initial resin fill of a new / clean Underwater Demineralizer can be done “dry” and with the demineralizer vessel out of water. This dry fill uses a “shop vac” to draw suction on the vessel and the resin is drawn into the vessel via the vacuum from the “shop vac”.

All subsequent resin discharge / fill operations require the demineralizer vessel to be submerged in the reactor cavity or spent fuel pool.

- 4.1 Procure the required / correct amount of resin for the Underwater Demineralizer. Refer to the chart below for the proper resin capacity:

| Capacity of Tri Nuclear Demineralizers | | | |
|--|------------------------|---------------------------|---|
| Model Number | Typical Resin Capacity | Diameter of Demineralizer | Height of Demineralizer (to top of pump tube) |
| UD-30A | 15 ft ³ | 30in | 47-1/2” |
| UD-34A | 15 ft ³ | 34in | 48-7/8” |
| UD-36A | 28 ft ³ | 36in | 67-5/8” |
| UD-48A | 50 ft ³ | 48in | 76-1/2” |
| UD-48P | 30 ft ³ | 48in | n/a |
| UDFS-48 | 50 ft ³ | 48in | 76-1/2” |

CAUTION:

*Do not overfill the Underwater Demineralizer with resin.
See the applicable drawing for the resin fill line.*

- 4.2 Prepare the Underwater Demineralizer for resin filling operations as follows:
- 4.2.1 Remove the submersible pump if installed & tape over the pump tube to seal it.
 - 4.2.2 Ensure the camlock cap & valve spool piece (BV-1.5SS-MxF) is installed on the resin outlet male camlock connection.
 - 4.2.3 Remove the inlet Johnson Screen assemblies (or Safety Screen Vent Assemblies (P/N: SSVA-36A). Tape over only ONE of the two inlet connections.
 - 4.2.4 Attach a “shop vac” vacuum hose to the other 2in female coupling inlet connection on the top of the Underwater Demineralizer and tape it in place to achieve a good seal.
 - 4.2.5 Attach the FPS-1.5x25 hose to the Resin inlet connection (either the male camlock on the vessel or the male camlock on the valve spool piece (BV-1.5SS-MxF)
 - 4.2.6 Turn on the “shop vac”, open the valve spool piece (BV-1.5SS-MxF) if installed.
 - 4.2.7 Using the end of the FPS-1.5x25 hose, suck the required amount of dry resin into the Underwater Demineralizer vessel.
 - 4.2.8 After the Underwater Demineralizer vessel is filled with resin, remove the tape and replace the components removed in steps 4.2.1 thru 4.2.5.
- 4.3 Ensure the vessel is full of water prior to submerging in the Spent Fuel Pool or Reactor Cavity.

Before installing the vessel into the pool, fill it with water from an approved water source through the resin inlet hose. The vessel will be full when water starts to overflow the 2in Johnson screens installed in the vessel top water inlet.

- 4.4 The vessel is now ready for operation. Refer to the vessel's applicable Operating Instruction for more information regarding the Underwater Demineralizer setup and instillation.

| Tri Nuclear Demineralizers | |
|-----------------------------------|--|
| Model Number | Operating Instruction (OI) Number |
| UD-30A | OI-24 |
| UD-34A | OI-33 |
| UD-36A | OI-10 |
| UD-48A | OI-21 |
| UD-48P | OI-27 |
| UDFS-48 | OI-28 |

5.0 DISCHARGE OF DEPLETED RESIN FROM AN UNDERWATER DEMINERALIZER VESSEL

When it is determined that the resin bed is expended, has reached pre-determined rad levels, or prior to movement, the resin in an underwater demineralizer may be sluiced out while the vessel is submerged. This is the recommended way to sluice out the resin from any Tri Nuclear an underwater demineralizer.

The resin is removed from an underwater demineralizer by using the suction of the AP-65 flap valve Sandpiper™ pump. As the resin is removed from the vessel, water will enter the vessel through its normal water inlets replacing the resin volume as the resin is sluiced out of the vessel.

5.1 Prepare System for Resin Discharge

- 5.1.1 Ensure the Underwater Demineralizer system is secured per the appropriate Operating Instruction.
- 5.1.2 If the FPS-1.5x50 hoses and valve spool pieces were removed for normal operations, or were not initially installed, attach them to the vessel as follows: (if the hoses are already installed, skip to step 5.1.3)
 - 5.1.2.1 Raise the underwater demineralizer vessel to the surface of the pool.
 - 5.1.2.2 Remove the cap from the 1-1/2in "resin inlet" camlock connection. Install (1) SLUICE VALVE SPOOL PIECE (BV-1.5SS-MxF) and (1) FPS-1.5x50 hose on this connection. Place the cap on the male 1-1/2in camlock fitting on the end of the hose. Label the hose as "resin inlet".
 - 5.1.2.3 Remove the cap from the 1-1/2in "resin outlet" camlock connection. Install (1) SLUICE VALVE SPOOL PIECE (BV-1.5SS-MxF) and (1) FPS-1.5x50 hose on this connection. Place the cap on the male 1-1/2in camlock fitting on the end of the hose. Label the hose as "resin outlet".
 - 5.1.2.4 Lower the underwater demineralizer vessel back to the pool floor. When the vessel is on the floor, remove the caps from the FPS - 1.5x50 hoses and briefly submerge them to fill them with water. Reinstall the caps when they are full of water. .
- 5.1.3 Verify which hose is connected to the "Resin inlet" connection and "Resin outlet" connection on the vessel. The vessel connections have been vibro-etched to identify the resin inlet/outlet connections.

5.2 AP-65 setup for resin discharge
(See Tri Nuclear Drawing TNC-088-02 for details)

- 5.2.1 Connect the AP-65 air regulator to a 100 psi air supply via a 1/2in air hose. Ensure the air regulator is backed all the way 'off'.
- 5.2.2 Connect a water supply to the 3/4in water inlet valve on the suction side of the AP-65 pump. Verify the water inlet valve is shut.
- 5.2.3 Remove the cap and attach the FPS-1.5x50 "RESIN OUTLET" hose to the suction of the AP-65 pump. Verify the AP-65 suction valve is shut. Do NOT discard the hose cap as it will be needed after resin sluicing operations are complete.
- 5.2.3 Attach the FPS-1.5x25 resin transfer hose to the discharge of the of the AP-65 pump. Verify the AP-65 suction valve is shut. Connect the other end of the hose to the waste shipping liner or shielded waste container for final resin disposal.

5.3 Discharge Depleted Resin from Demineralizer

- 5.3.1 Open the AP-65 suction and discharge valves.
- 5.3.2 Using a grapple tool, open the "Resin Outlet" valve (if installed) on the Underwater Demineralizer vessel. A lanyard loop has been installed on the valve handle to facilitate opening the valve underwater.
- 5.3.3 Start the AP-65 Sandpiper pump by turning on the air valve and adjusting the regulator air pressure for a medium flow rate of approximately 15 gpm, which is about 110 strokes per minute on the pump. This will provide a resin slurry velocity flow rate of approximately 4 ft./sec., which is desirable for slurry flow.

CAUTION:

Do not stop the pump during resin transfer operation since this could cause a hose to plug

- 5.3.4 The resin slurry discharge to the waste container should be monitored continuously in case a resin plug is encountered, and to determine when the resin transfer has been completed.
- 5.3.5 When the resin transfer has been completed and only water is observed discharging into the waste container, stop the AP-65 Sandpiper pump by securing air to the regulator. Shut the AP-65 suction valve.

5.3 Discharge Depleted Resin from Demineralizer (Continued)

- 5.3.6 Flush the AP-65 pump and discharge hose by opening the 3/4in water supply valve. Start the AP-65 pump to flush the pump and FPS-1.5x25 resin transfer hose. When flushing is completed, stop the AP-65 pump and shut the water supply valve.
- 5.3.7 Remove the water supply to the 3/4in water supply valve.
- 5.3.8 Start the AP-65 pump and open the 3/4in water inlet valve; --- this will allow air to be forced through the FPS-1.5x25 resin transfer hose and clear out the hose. When the FPS-1.5x25 hose is clear of water, stop the AP-65 pump and shut the 3/4in water inlet valve.
- 5.3.9 Shut the AP-65 discharge valve and remove the FPS-1.5x25 resin transfer hose.
- 5.3.10 Shut the "the "Resin Outlet" valve (if installed) on the Underwater Demineralizer vessel.
- 5.3.11 Remove the FPS-1.5x50 "RESIN OUTLET" hose from the suction of the AP-65 pump and install the 1-1/2in camlock cap on the male end of the resin outlet hose.

5.4 RECOVERY FROM RESIN PLUGGED IN THE DISCHARGE HOSE

In case of a resin blockage, the following steps can be taken to recover:

- 5.4.1 Stop the AP-65 Sandpiper pump & shut the 1-1/2in inlet suction valve.
- 5.4.2 Open the 3/4in water inlet valve and start the AP-65 pump. Check the discharge flow into waste container and continue pumping until water runs clear, then stop the pump.
- 5.4.3 Shut the AP-65 pump discharge valve and open the suction valve. This will back-flow pure water and blocked resin back into the demineralizer. This should clear the line. Shut the AP-65 suction valve and 3/4in water supply valve. Proceed with normal resin transfer (see Sect 5.3).

6.0 RESIN FILL OF A SUBMERGED UNDERWATER DEMINERALIZER

6.1 AP-65 setup for resin discharge

(See Tri Nuclear Drawing TNC-088-02 for details)

- 6.1.1 Connect the AP-65 air regulator to a 100 psi air supply via a 1/2in air hose. Ensure the air regulator is backed all the way 'off'.
- 6.1.2 Connect a water supply to the 3/4in water inlet valve on the suction side of the AP-65 pump. Verify the water inlet valve is shut.
- 6.1.3 Remove the cap and attach the FPS-1.5x50 "RESIN OUTLET" hose to the suction of the AP-65 pump. Verify the AP-65 suction valve is shut. Do NOT discard the hose cap as it will be needed after resin sluicing operations are complete.
- 6.1.3 Attach the FPS-1.5x25 resin transfer hose to the discharge of the of the AP-65 pump. Verify the AP-65 suction valve is shut. Connect the other end of the hose to the waste shipping liner or shielded waste container for final resin disposal.

6.2 New Resin Drum

- 6.2.1 Obtain the resin needed for the resin fill. The total volume should not exceed the total cubic feet of resin recommend per the chart below:

| Capacity of Tri Nuclear Demineralizers | | | |
|--|------------------------|---------------------------|---|
| Model Number | Typical Resin Capacity | Diameter of Demineralizer | Height of Demineralizer (to top of pump tube) |
| UD-30A | 15 ft ³ | 30in | 47-1/2" |
| UD-34A | 15 ft ³ | 34in | 48-7/8" |
| UD-36A | 28 ft ³ | 36in | 67-5/8" |
| UD-48A | 50 ft ³ | 48in | 76-1/2" |
| UD-48P | 30 ft ³ | 48in | n/a |
| UDFS-48 | 50 ft ³ | 48in | 76-1/2" |

- 6.2.2 Open a new drum of resin, and with a water hose fill and cover the resin with water.
- 6.2.3 To slurry the resin out of the drum, place the end of the FPS-1.5x25 Resin transfer hose in the resin drum.

6.3 Charge the Underwater Demineralizer Vessel with resin

- 6.3.1 Open the AP-65 suction and discharge valves.
- 6.3.2 Using a grapple tool, open the “Resin Intlet” valve (if installed) on the Underwater Demineralizer vessel. A lanyard loop has been installed on the valve handle to facilitate opening the valve underwater.
- 6.3.3 Start the AP-65 Sandpiper pump by turning on the air valve and adjusting the regulator air pressure for a medium flow rate of approximately 15 gpm, which is about 110 strokes per minute on the pump. This will provide a resin slurry velocity flow rate of approximately 4 ft./sec., which is desirable for slurry flow.
- 6.3.4 Ensure that the new resin in the drum is covered with pure water at all times during resin transfer. While the Sandpiper pump is running, ensure the suction hose remains underwater at all times. The pump is self-priming and can draw air through the hose to the UD-34A vessel.
- 6.3.5 When the first drum is empty of resin, shut off the pump and move the FPS-1.5x25 resin transfer hose to the second drum. Start the pump, and continue the operation until the vessel is fully charged with no more than the resin listed in 6.2.1
- 6.3.6 After the last drum of resin has been charged into the vessel, flush the FPS-1.5x25 resin transfer hose and FPS-1.5x50 resin inlet hose with water (to ensure all the resin is in the vessel) by pumping 1-2 cu ft of water through the system from empty resin drum. Secure the air to the AP-65 when complete.
- 6.3.7 Once resin charging operations are complete, shut the AP-65 suction and discharge valves. Disconnect the FPS-1.5x25 resin transfer hose and store for later use.
- 6.3.8 Shut the “Resin Outlet” valve (if installed) on the Underwater Demineralizer vessel.
- 6.3.9 Disconnect the FPS-1.5x50 resin inlet hose from the AP-65 pump and reinstall the hose cap.

7.0 Precautions and Warnings

CAUTION: Do not stop the pump during resin transfer operation since this could cause a hose to plug

NOTE: Perform the flow meter check before installing the Underwater Filter units into the pool for the first time, whenever the flow meter or sensor is replaced, or anytime the flow sensor is suspected of being damaged.

NOTE: It is not recommend to operate any Tri Nuclear Underwater demineralizer with a stratified media (resin / carbon) bed or a carbon only bed.

8.0 TROUBLESHOOTING

Call Tri Nuclear for troubleshooting sluicing operations

9.0 REPLACEMENT PARTS

Below is a listing of Recommended Spare Parts for the sluicing Tri Nuclear Underwater demineralizers:

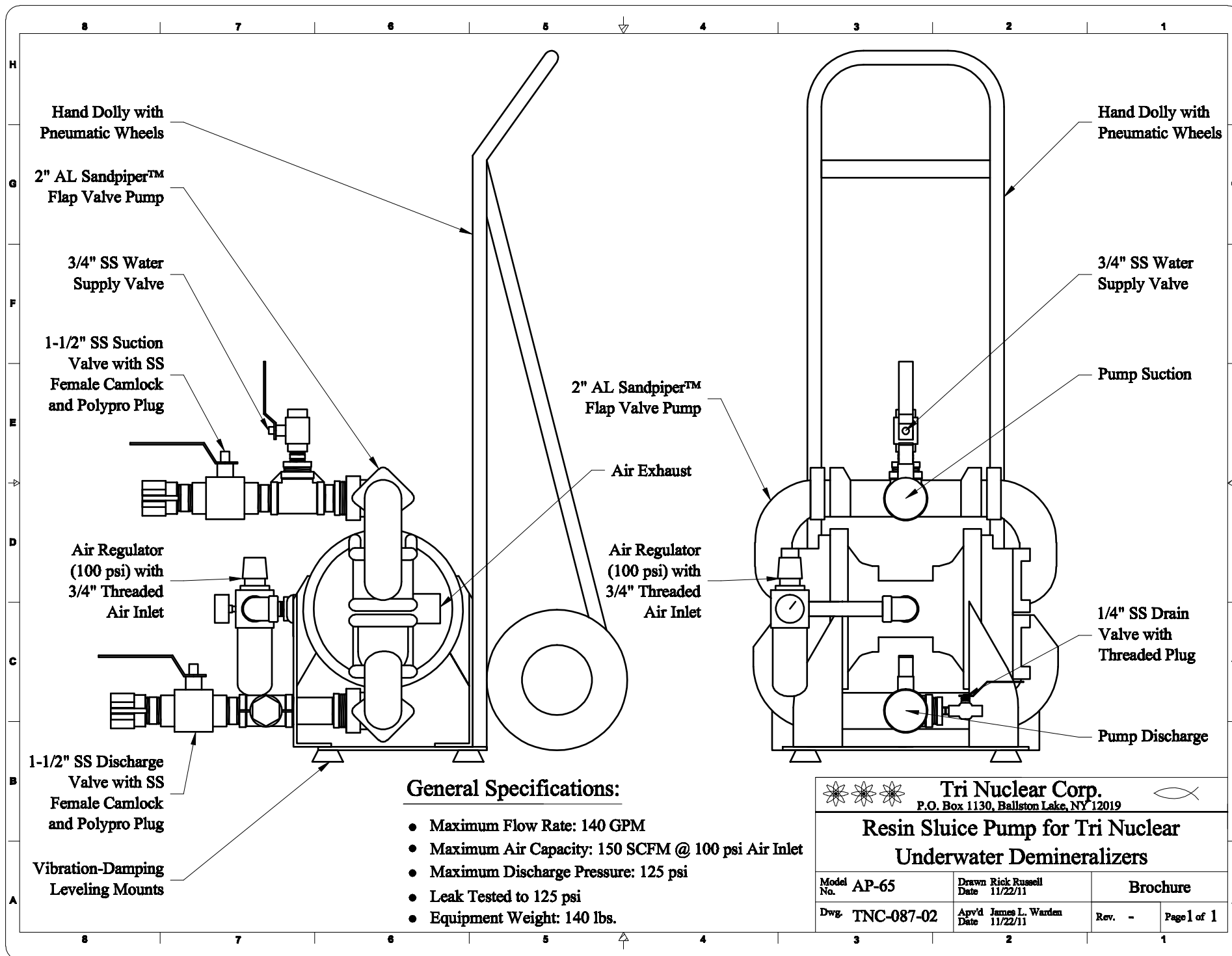
Recommended Spare Parts

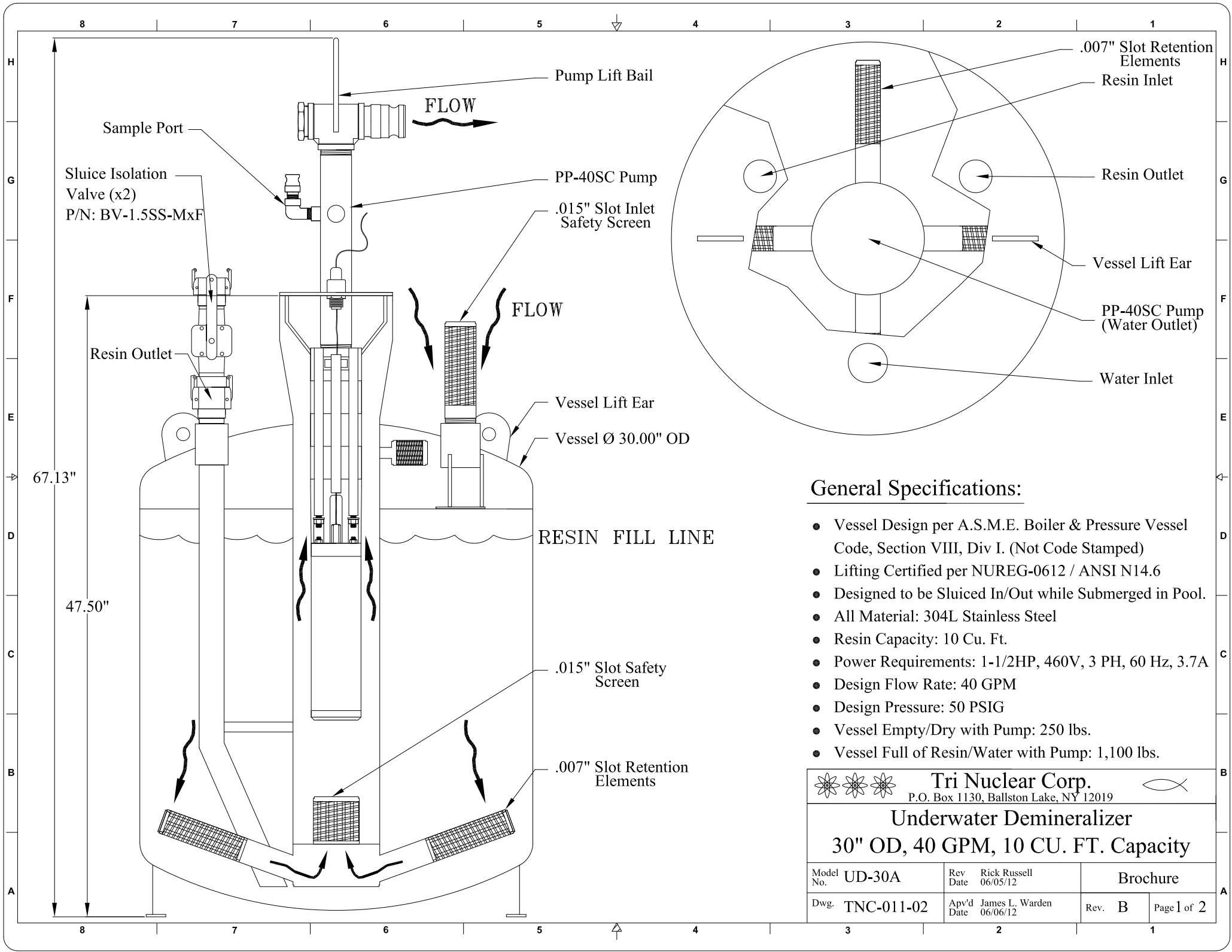
| Qty | Part No. | Description |
|-----|--------------|---|
| 1 | AP-65 | Resin sluice pump, dolly mounted. Includes 2in AL Sandpiper™ flap valve pump with 1-1/2in SS ball valves, inlet/outlet female camlock couplers, 3/4in water flush valve, & 1/4in drain valve. |
| 2 | FPS-1.5x50 | Suction/Discharge hose, 1.5" x 50' lg with SS MxF camlock couplers, 150 PSI |
| 2 | BV-1.5SS-MxF | 1-1/2" SS FP Ball Valve with Male by Locking Female camlock couplers. Includes remote grapple lanyard. |
| 1 | FPS-1.5x25 | Suction/Discharge hose, 1.5" x 25' lg with SS MxF camlock couplers, 150 PSI |

10.0 ADDITIONAL INFORMATION

For additional information, or if special problems develop, please call James Warden or John Flynn @ (518)-399-1389. (e-mail info@trinuclear.com)

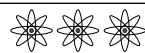

We also have a CD-Rom that contains all the operating procedures/drawings/brochures for this system and all other Tri Nuclear equipment. Please call, fax, or e-mail us to request your copy.

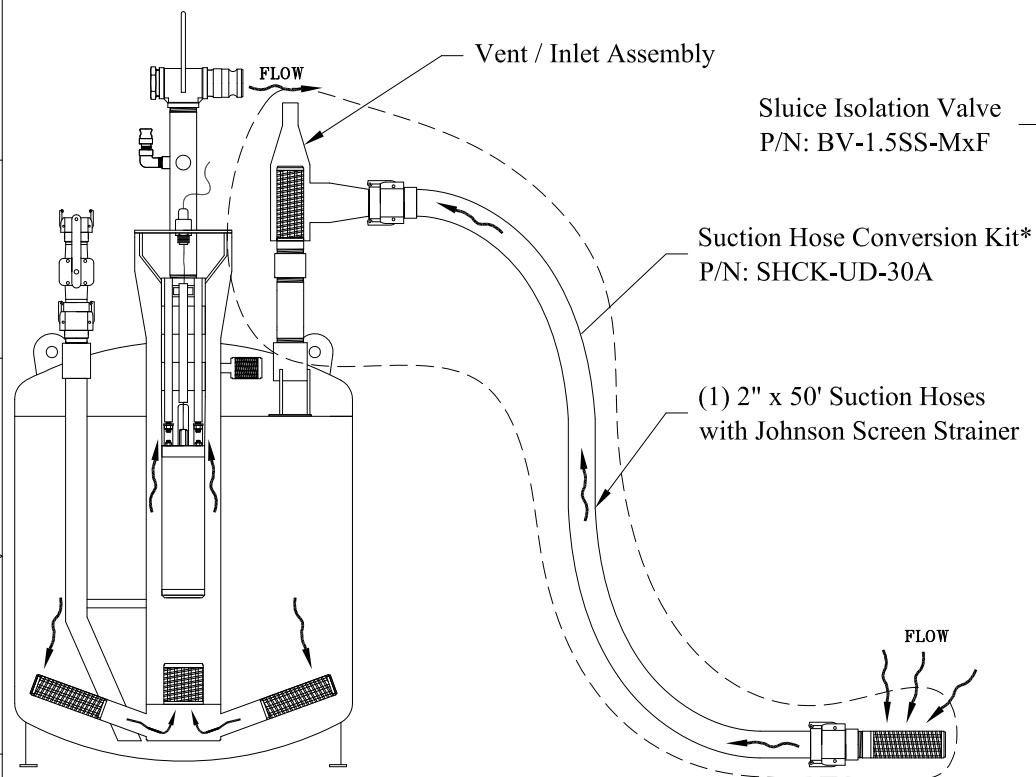




General Specifications:

- Vessel Design per A.S.M.E. Boiler & Pressure Vessel Code, Section VIII, Div I. (Not Code Stamped)
- Lifting Certified per NUREG-0612 / ANSI N14.6
- Designed to be Sluiced In/Out while Submerged in Pool.
- All Material: 304L Stainless Steel
- Resin Capacity: 10 Cu. Ft.
- Power Requirements: 1-1/2HP, 460V, 3 PH, 60 Hz, 3.7A
- Design Flow Rate: 40 GPM
- Design Pressure: 50 PSIG
- Vessel Empty/Dry with Pump: 250 lbs.
- Vessel Full of Resin/Water with Pump: 1,100 lbs.

| | | | | | |
|--|--|---|--|---|---------------------------|
|  Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | | | |  | |
| Underwater Demineralizer | | | | | |
| 30" OD, 40 GPM, 10 CU. FT. Capacity | | | | | |
| Model No. UD-30A | | Rev Date Rick Russell 06/05/12 | | Brochure | |
| Dwg. TNC-011-02 | | Apv'd Date James L. Warden 06/06/12 | | Rev. B | Page 1 of 2 |

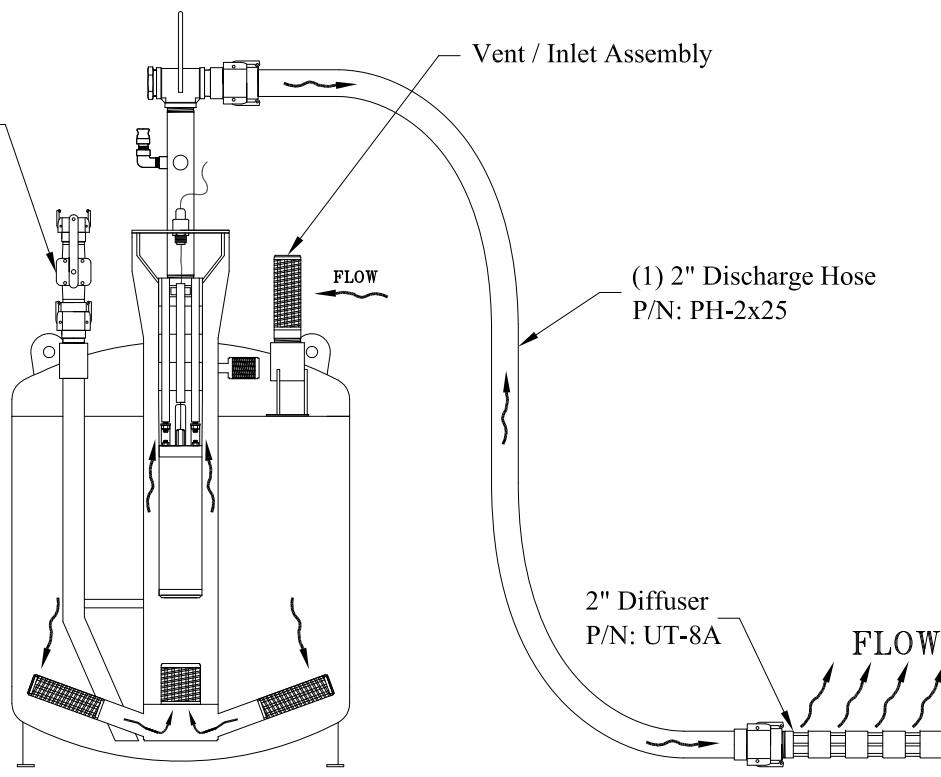


"OPTIONAL" SUCTION HOSE OPERATIONS

Single Suction Hose attached to
Vessel Inlet. No Hose attached to
discharge of pump.

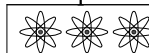
*SHCK-UD-30A Includes:

- (1) Safety Screen Vent Assembly, P/N: SHCK-SSVA-2x2
- (1) Suction Hose, P/N: PH-2x50
- (1) Johnson Screen Strainer, P/N: SHCK-JS-2x6



"TYPICAL" DISCHARGE HOSE OPERATIONS

NOTE: UD-30A to be run with either Suction or Discharge
Hoses attached for efficient cross-circulation. This system is
not required to run with both Suction & Discharge Hoses.



Tri Nuclear Corp.
P.O. Box 1130, Ballston Lake, NY 12019



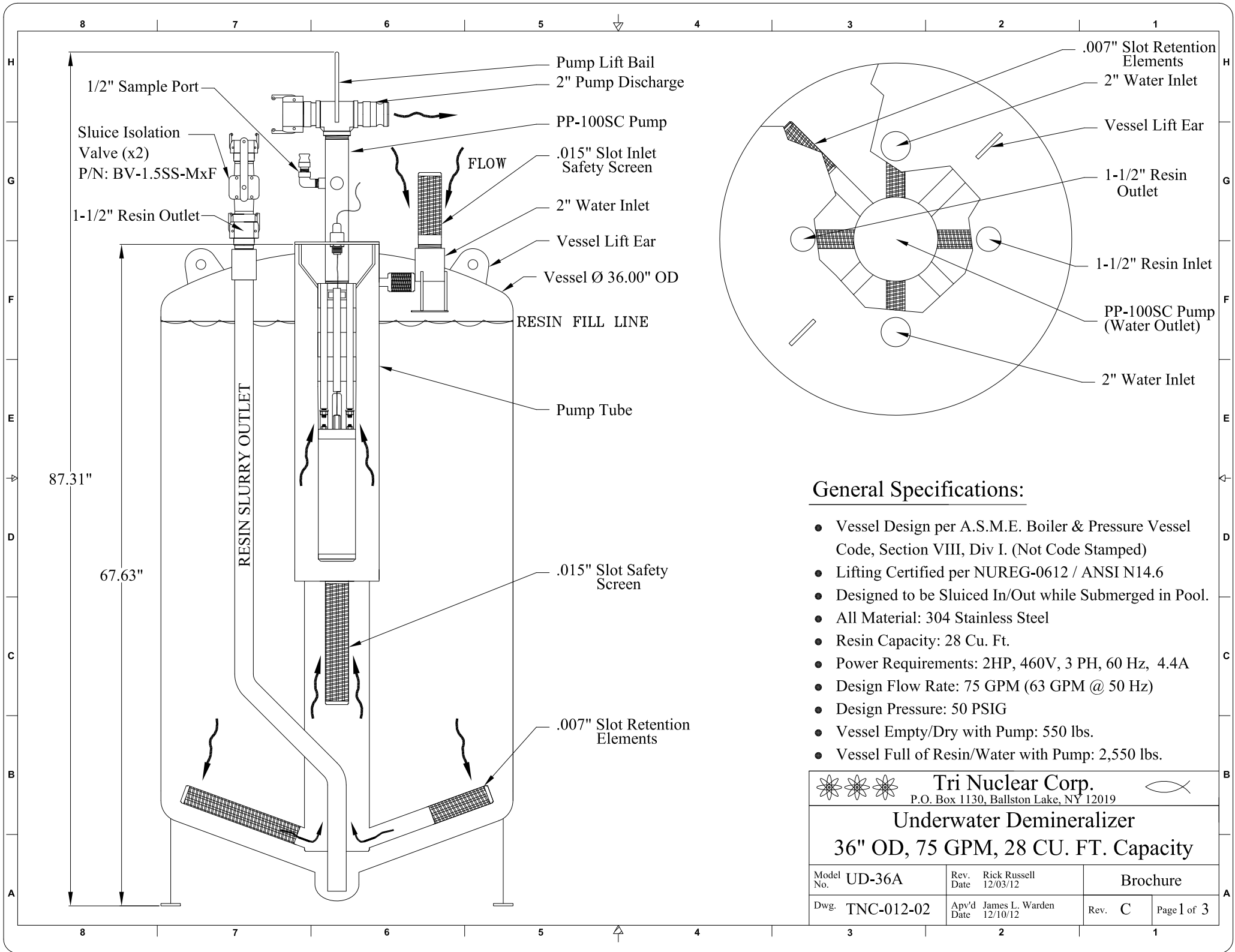
UD-30A System Modes of Operation

Model
No. UD-30A

Dwg. TNC-011-02

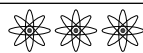

Rev. B

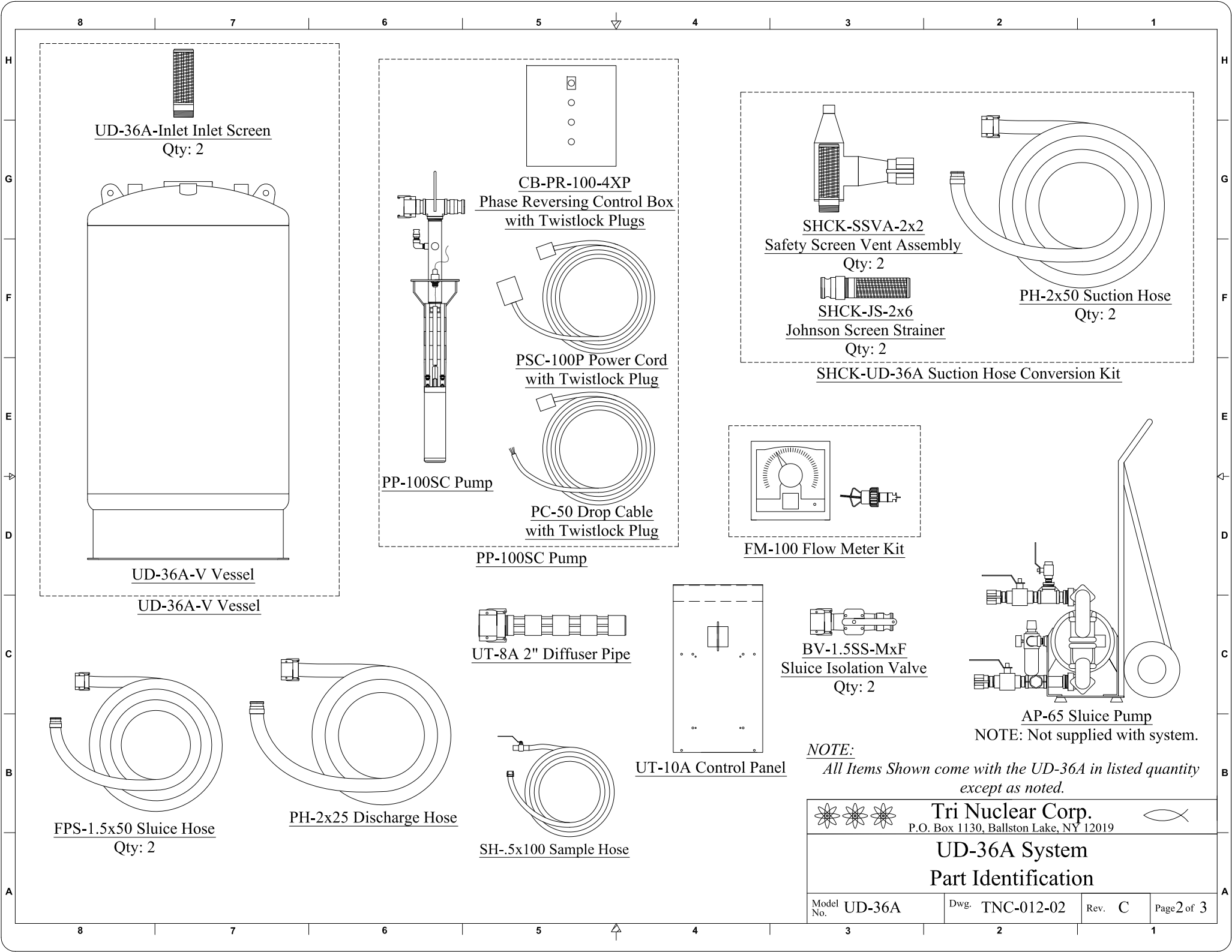
Page 2 of 2



General Specifications:

- Vessel Design per A.S.M.E. Boiler & Pressure Vessel Code, Section VIII, Div I. (Not Code Stamped)
- Lifting Certified per NUREG-0612 / ANSI N14.6
- Designed to be Sluiced In/Out while Submerged in Pool.
- All Material: 304 Stainless Steel
- Resin Capacity: 28 Cu. Ft.
- Power Requirements: 2HP, 460V, 3 PH, 60 Hz, 4.4A
- Design Flow Rate: 75 GPM (63 GPM @ 50 Hz)
- Design Pressure: 50 PSIG
- Vessel Empty/Dry with Pump: 550 lbs.
- Vessel Full of Resin/Water with Pump: 2,550 lbs.

| | | | |
|---|--|-----------------|---------------------------|
| <div>Tri Nuclear Corp.</div> <div>P.O. Box 1130, Ballston Lake, NY 12019</div> | | | |
| Underwater Demineralizer | | | |
| 36" OD, 75 GPM, 28 CU. FT. Capacity | | | |
| Model No. UD-36A | Rev. Date Rick Russell 12/03/12 | Brochure | |
| Dwg. TNC-012-02 | App'd Date James L. Warden 12/10/12 | Rev. C | Page 1 of 3 |



UD-36A-Inlet Inlet Screen
Qty: 2

CB-PR-100-4XP
Phase Reversing Control Box
with Twistlock Plugs

SHCK-SSVA-2x2
Safety Screen Vent Assembly
Qty: 2

SHCK-JS-2x6
Johnson Screen Strainer
Qty: 2

PH-2x50 Suction Hose
Qty: 2

SHCK-UD-36A Suction Hose Conversion Kit

PP-100SC Pump

PSC-100P Power Cord
with Twistlock Plug

PC-50 Drop Cable
with Twistlock Plug

PP-100SC Pump

FM-100 Flow Meter Kit

UD-36A-V Vessel

UD-36A-V Vessel

UT-8A 2" Diffuser Pipe

BV-1.5SS-MxF
Sluice Isolation Valve
Qty: 2

AP-65 Sluice Pump
NOTE: Not supplied with system.


UT-10A Control Panel

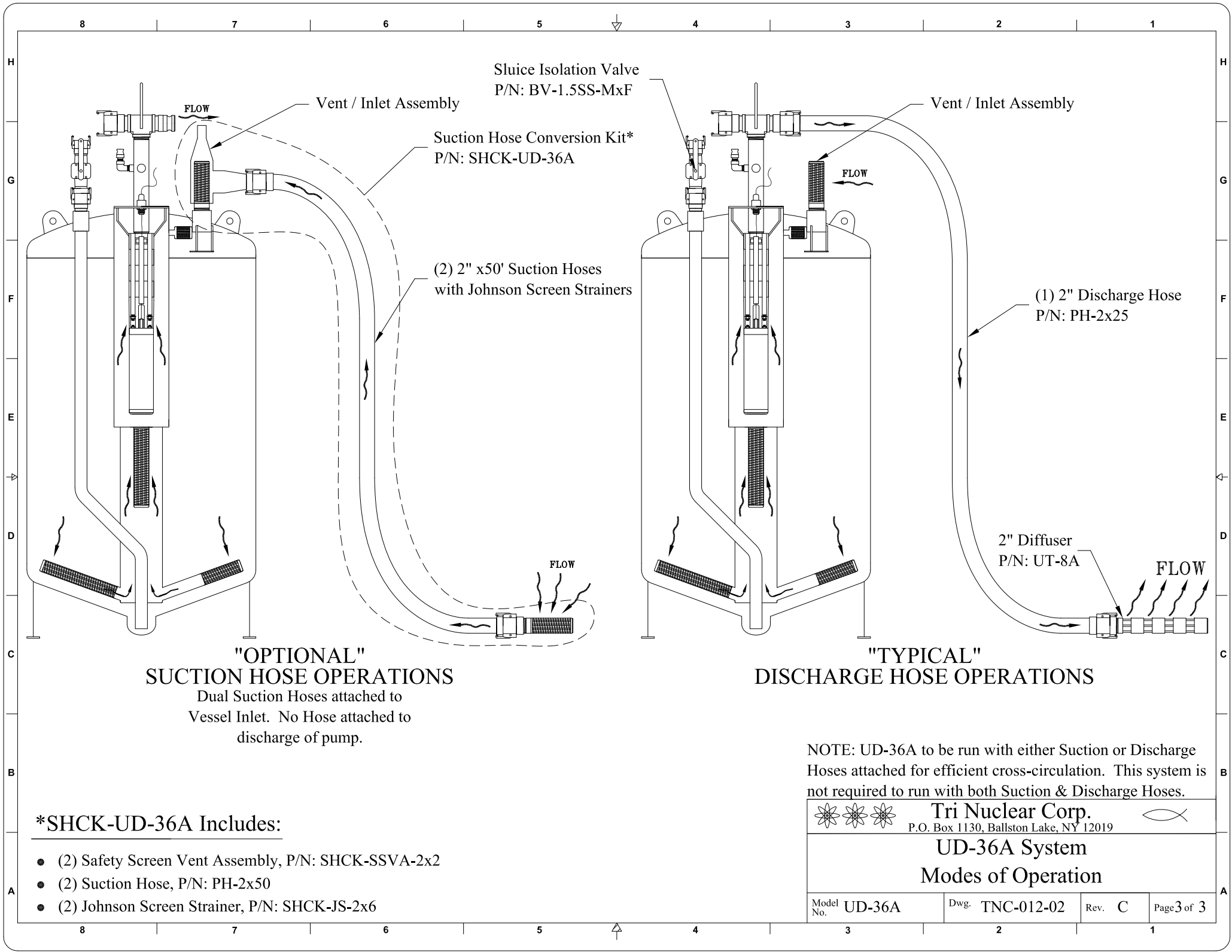
FPS-1.5x50 Sluice Hose
Qty: 2

PH-2x25 Discharge Hose

SH-.5x100 Sample Hose

NOTE:
All Items Shown come with the UD-36A in listed quantity
except as noted.

| | | | | | | |
|---|--|-----------------|--|--------|---|-------------|
|  | | | Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | |  | |
| UD-36A System Part Identification | | | | | | |
| Model No. UD-36A | | Dwg. TNC-012-02 | | Rev. C | | Page 2 of 3 |



"OPTIONAL" SUCTION HOSE OPERATIONS



Dual Suction Hoses attached to
Vessel Inlet. No Hose attached to
discharge of pump.

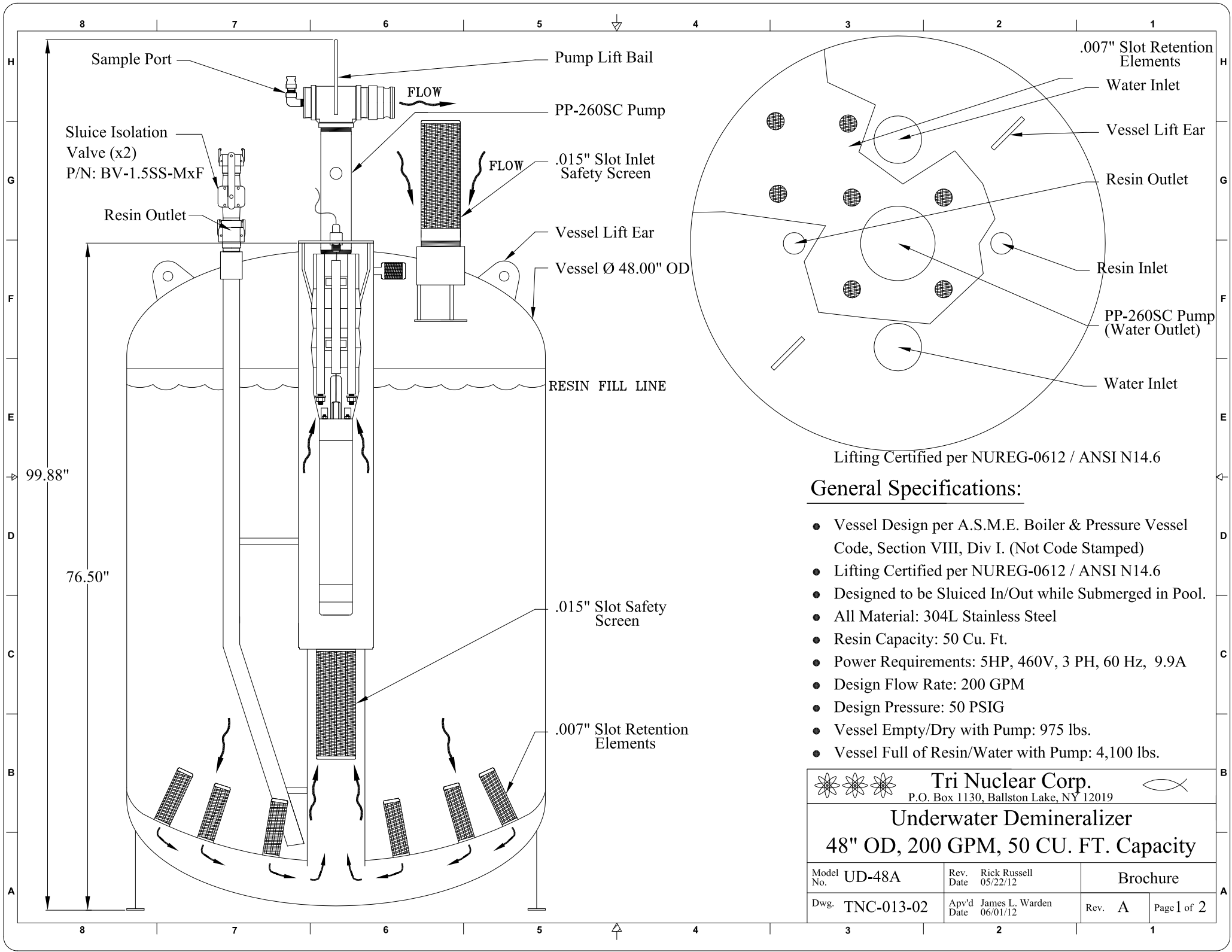
"TYPICAL" DISCHARGE HOSE OPERATIONS

*SHCK-UD-36A Includes:

- (2) Safety Screen Vent Assembly, P/N: SHCK-SSVA-2x2
- (2) Suction Hose, P/N: PH-2x50
- (2) Johnson Screen Strainer, P/N: SHCK-JS-2x6

NOTE: UD-36A to be run with either Suction or Discharge Hoses attached for efficient cross-circulation. This system is not required to run with both Suction & Discharge Hoses.



| | | | | | |
|--|--------|------|-------------|---|---|
|  Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | | | |  | |
| UD-36A System Modes of Operation | | | | | |
| Model No. | UD-36A | Dwg. | TNC-012-02 | Rev. | C |
| | | | Page 3 of 3 | | |

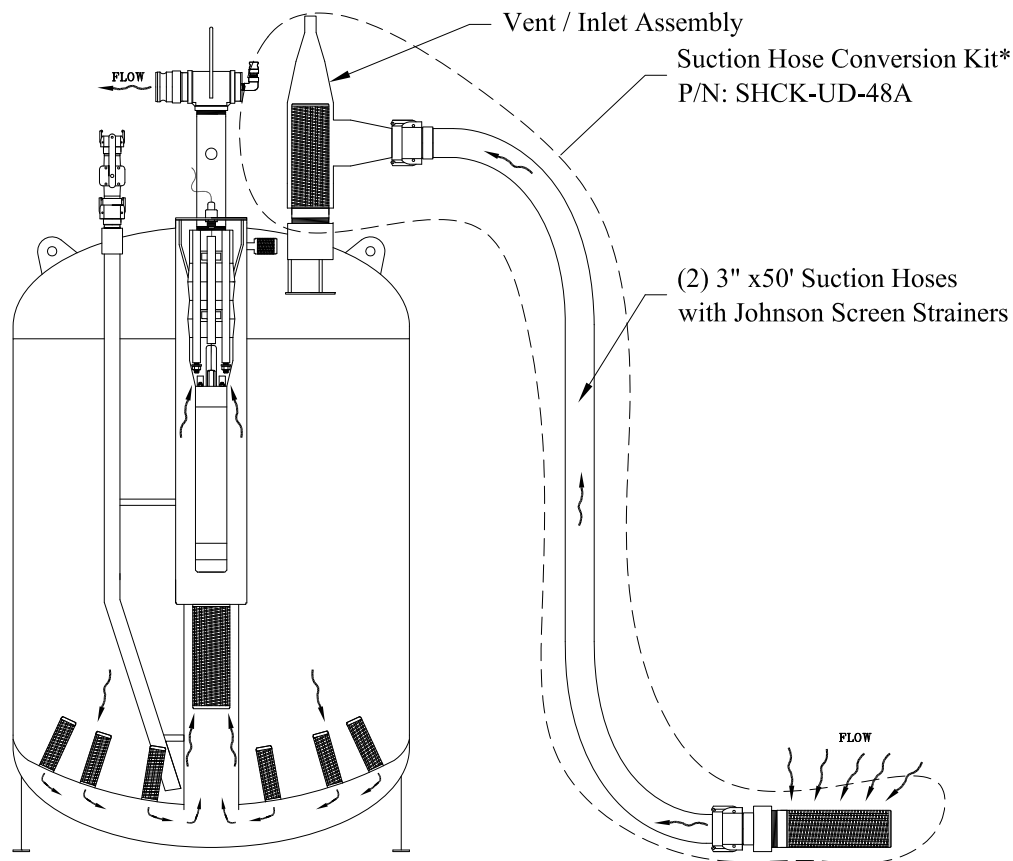


Lifting Certified per NUREG-0612 / ANSI N14.6

General Specifications:

- Vessel Design per A.S.M.E. Boiler & Pressure Vessel Code, Section VIII, Div I. (Not Code Stamped)
- Lifting Certified per NUREG-0612 / ANSI N14.6
- Designed to be Sluiced In/Out while Submerged in Pool.
- All Material: 304L Stainless Steel
- Resin Capacity: 50 Cu. Ft.
- Power Requirements: 5HP, 460V, 3 PH, 60 Hz, 9.9A
- Design Flow Rate: 200 GPM
- Design Pressure: 50 PSIG
- Vessel Empty/Dry with Pump: 975 lbs.
- Vessel Full of Resin/Water with Pump: 4,100 lbs.

| | | | | | |
|---|--|--|--|---|-------------|
|  | | Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 | |  | |
| Underwater Demineralizer 48" OD, 200 GPM, 50 CU. FT. Capacity | | | | | |
| Model No. UD-48A | | Rev. Date Rick Russell 05/22/12 | | Brochure | |
| Dwg. TNC-013-02 | | Apv'd Date James L. Warden 06/01/12 | | Rev. A | Page 1 of 2 |

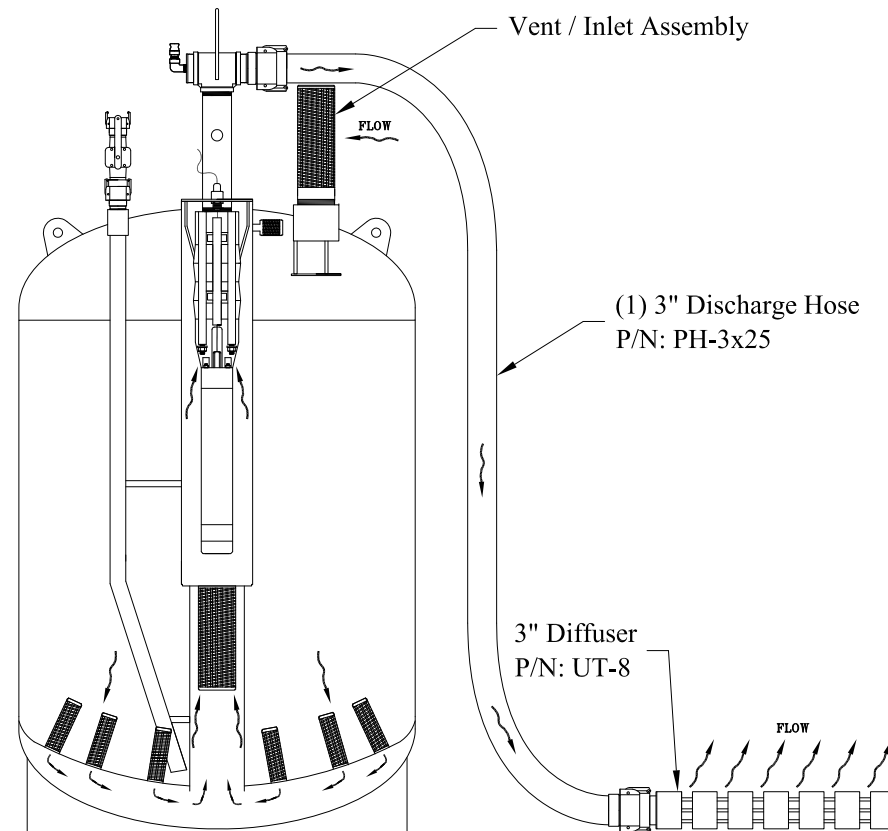


"OPTIONAL" SUCTION HOSE OPERATIONS

Dual Suction Hoses attached to
Vessel Inlet. No Hose attached to
discharge of pump.

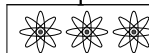
*SHCK-UD-48A Includes:

- (2) Safety Screen Vent Assembly, P/N: SHCK-SSVA-3x4
- (2) Suction Hose, P/N: PH-3x50
- (2) Johnson Screen Strainer, P/N: SHCK-JS-4x12



"TYPICAL" DISCHARGE HOSE OPERATIONS

NOTE: UD-48A to be run with either Suction or Discharge
Hoses attached for efficient cross-circulation. This system is
not required to run with both Suction & Discharge Hoses.



Tri Nuclear Corp.
P.O. Box 1130, Ballston Lake, NY 12019



UD-48A System Modes of Operation

| | | | | | | |
|-----------|--------|------|------------|------|---|-------------|
| Model No. | UD-48A | Dwg. | TNC-013-02 | Rev. | A | Page 2 of 2 |
|-----------|--------|------|------------|------|---|-------------|