



**TRI NUCLEAR CORP.**

THE INDUSTRY STANDARD IN UNDERWATER FILTRATION

WWW.TRINUCLEAR.COM -- P.O. BOX 1130 BALLSTON LAKE, NY 12019 -- TEL: 518-399-1389 -- FAX: 518-399-9586

# **Underwater Filter/Vacuum (UFV-xxx) and Underwater Filter (UF-xxx)**

## **Operating and Maintenance Manual**

For Models:

UFV-xxx-CE


UF-xxx-CE



Operating and Maintenance Manual Underwater Filter / Vacuum Series	Doc. No.	Rev.	Effective Date	Page 1 of 85
	OM-001	2	20 Sept 2017	

ORIGINAL DOCUMENT (ENGLISH VERSION ONLY)

## 0.1 Front Matter – Approval and Record of Revision

Operating and Maintenance Manual	
Approval: Operations Manager John J. Flynn 	Date 20 Sept 2017

### Tri Nuclear Record of Revision

Revision or Change Number	Effective Date of Revision or Change	Affected Page and / or Paragraph number	Person Entering Revision	Revision or change Cancelled By
Rev. 0	2 Dec 2016	Original Issue	J. Flynn	Rev. 0
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Rev. 2	20 Sept 2017	0.2, 0.6, 0.7, 1.4, 1.5, 4.1.3, 4.1.5.1, 5.4.6, 5.4.8.2, 8.2, 9.0 Figures: 2.3.1 2.8.11 2.8.10 4.1.2.2 5.4.8.2	J. Flynn	

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](mailto:info@trinuclear.com)

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ORIGINAL INSTRUCTIONS (ENGLISH VERSION ONLY)

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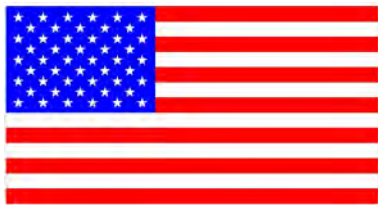

### Attachments:

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### 0.3 Front Matter – Information on Noise Emission

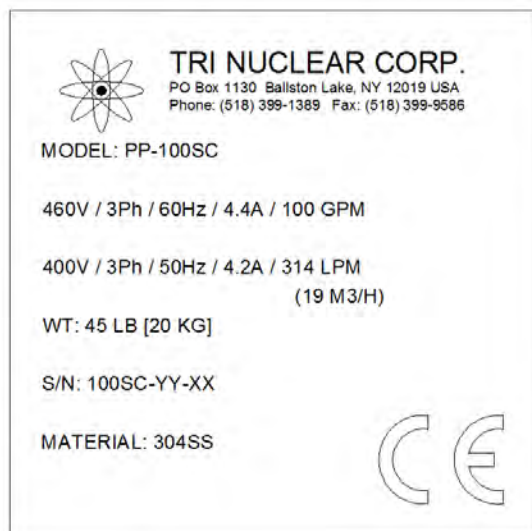
#### Information on Noise Emission

Tri Nuclear Corp. Underwater Filtration Systems / Model UF/UFV-xxx / Sound Pressure and Sound Power Levels per EN ISO 20361 are as follows:

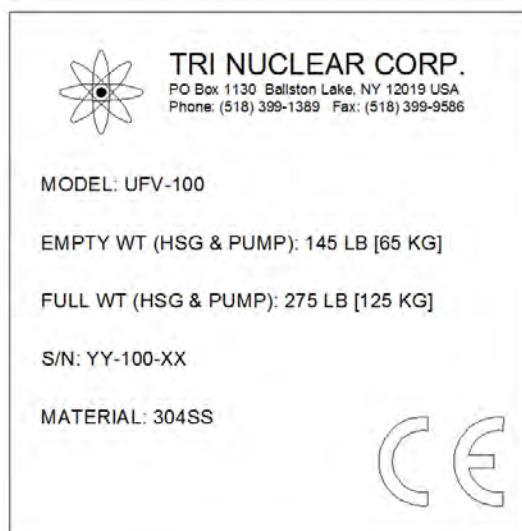
Model No: UFV-260-CE	Serial No: 260-16-02	Year of Construction: 2016	
		<b>Operating</b>	<b>Idle</b>
$L_{pA}$ (Operator Position)		58 dB (A)	56 dB (A)
$L_{pA}$ (Bystander Position)		58 dB (A)	56 dB (A)
Peak C-weighted instantaneous SPL in the Operator’s position		60 dB (C)	---
Sound power emitted where the equivalent continuous A-weighted SPL exceeds 80 dB (A).		N/A	---
The average difference between the extraneous noise level and the sound power level at each measuring point:		$L_{pA} \Delta = 2 \text{ dB (A)}$	
Ambient Correction Factor K3A calculated according to EN ISO 11204 Appendix A.		4 dB (A)	
Measurements were made at a height of 1.5 m and 1 m from the Operator Position and all four sides of the equipment.			
The figures quoted are emission levels and are not necessarily safe working levels. While there is a correlation between the emission and exposure levels this cannot be used reliably to determine whether or not further precautions are required.			
Factors that influence the actual level of exposure of the workforce include characteristics of the work room, the other sources of noise, etc. such as the number of machines and other adjacent processes. Also, the permissible level of exposure can vary from country to country.			
This information, however, will enable the user of the machine to make a better evaluation of the hazard and risk.			
		Tri Nuclear Corp. Ballston Lake, NY USA	
			

## 0.4 Front Matter – Name Plate Data

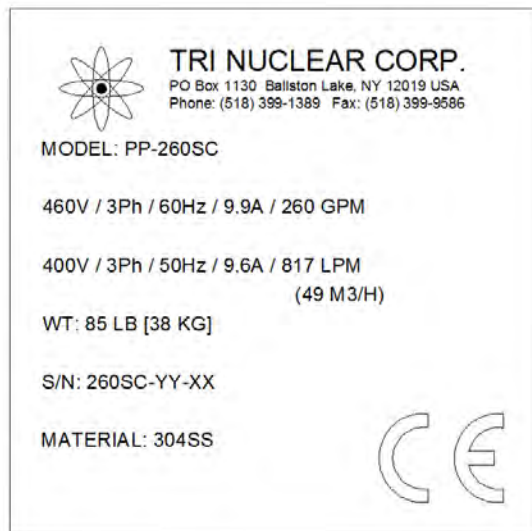
### UFV-100-CE System Name Plate Data Pump Name Plate



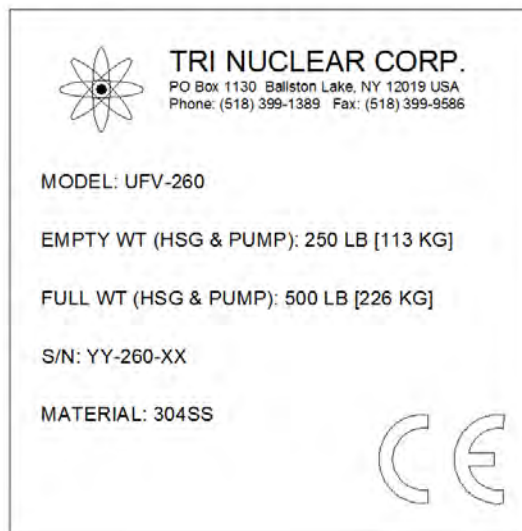
### Housing Name Plate



### UFV-260-CE System Name Plate Data Pump Name Plate





### Housing Name Plate





## 0.4 Front Matter – Name Plate Data (Continued)

### UF-600-CE System Name Plate Data

#### Pump Name Plate



	<b>TRI NUCLEAR CORP.</b> PO Box 1130 Ballston Lake, NY 12019 USA Phone: (518) 399-1389 Fax: (518) 399-9586
MODEL: PP-600SC	
460V / 3Ph / 60Hz / 24.5A / 600 GPM	
400V / 3Ph / 50Hz / 24.0A / 1,892 LPM (113 M3/H)	
WT: 210 LB [95 KG]	
S/N: 600SC-YY-XX	
MATERIAL: 304SS	
	

#### Housing Name Plate



	<b>TRI NUCLEAR CORP.</b> PO Box 1130 Ballston Lake, NY 12019 USA Phone: (518) 399-1389 Fax: (518) 399-9586
MODEL: UF-600	
EMPTY WT (HSG & PUMP): 520 LB [235 KG]	
FULL WT (HSG & PUMP): 1,020 LB [462 KG]	
S/N: YY-600-XX	
MATERIAL: 304SS	
	

### UFV-600-CE System Name Plate Data

#### Pump Name Plate

	<b>TRI NUCLEAR CORP.</b> PO Box 1130 Ballston Lake, NY 12019 USA Phone: (518) 399-1389 Fax: (518) 399-9586
MODEL: PP-600SC	
460V / 3Ph / 60Hz / 24.5A / 600 GPM	
400V / 3Ph / 50Hz / 24.0A / 1,892 LPM (113 M3/H)	
WT: 210 LB [95 KG]	
S/N: 600SC-YY-XX	
MATERIAL: 304SS	
	

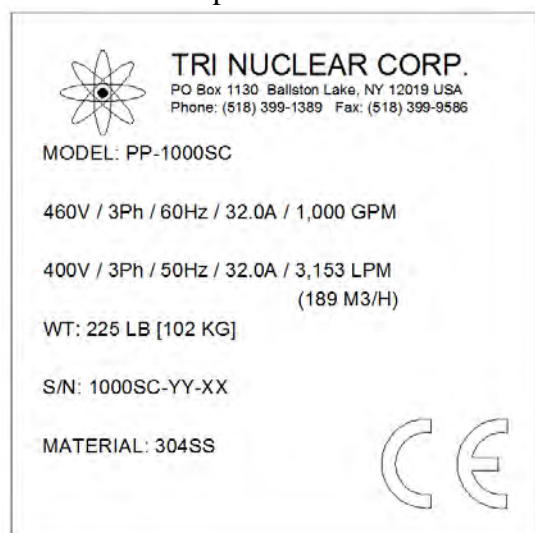
#### Housing Name Plate

	<b>TRI NUCLEAR CORP.</b> PO Box 1130 Ballston Lake, NY 12019 USA Phone: (518) 399-1389 Fax: (518) 399-9586
MODEL: UFV-600	
EMPTY WT (HSG & PUMP): 550 LB [249 KG]	
FULL WT (HSG & PUMP): 1,055 LB [478 KG]	
S/N: YY-600V-XX	
MATERIAL: 304SS	
	

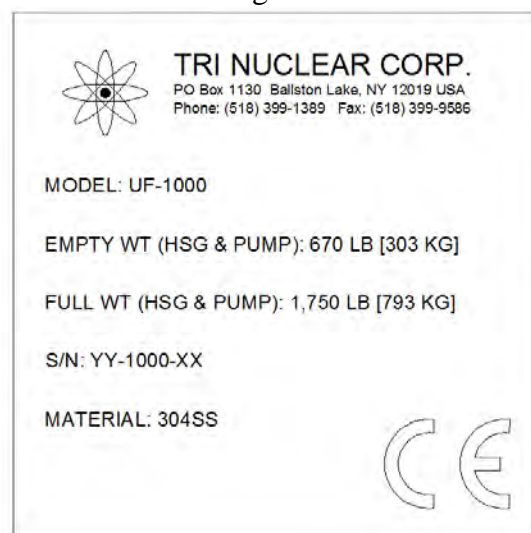
## 0.4 Front Matter – Name Plate Data (Continued)

### UF-1000-CE System Name Plate Data

#### Pump Name Plate










#### Housing Name Plate








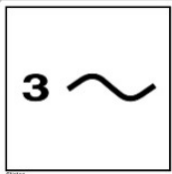
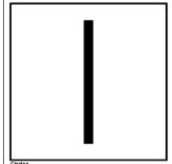
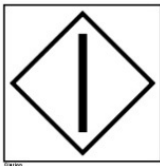
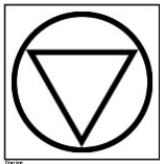
## 0.5 Front Matter – ISO Safety Symbols - Defined

ISO Symbols	Meaning
	Yellow warning triangle/black graphical symbol, indicates what the hazard is. (Hazard Identification)
	Red circle-with-slash/black graphical symbol indicates a prohibited action to avoid the hazard. (Prohibited Action)
	Blue mandatory action circles/white graphical symbol - indicates an action to take to avoid the hazard. (Mandatory Action)
	<b>DANGER</b> - Indicates an imminently hazardous situation, which if not avoided, <b>will result in death or serious injury</b> .
	<b>WARNING</b> - Indicates a potentially hazardous situation, which if not avoided <b>could result in death or serious injury</b> .
	<b>CAUTION</b> - Indicates a potentially hazardous situation which, if not avoided, <b>may result in minor or moderate injury</b> .
	“CAUTION” without the safety alert symbol should be used for safety labels that indicate only equipment damage.
	<b>NOTICE</b> indicates information that relates directly or indirectly to the safety of personnel or protection of property.



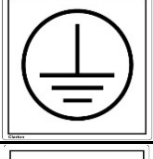
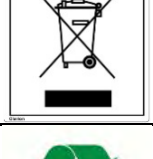

## 0.5 Front Matter – ISO Safety Symbols – Defined (Continued)

Symbol	Meaning
	<b>General Caution:</b> <ul style="list-style-type: none"> <li>Do not use this Equipment for any purpose not described in this Manual.</li> </ul>
	<b>Danger:</b> <ul style="list-style-type: none"> <li>High Voltage</li> <li>Do not operate this equipment from any power source that does not match the voltage rating stamped on the equipment. Refer to the Manufacturer's Identification Label for operational requirements.</li> </ul>
	<b>Caution:</b> <ul style="list-style-type: none"> <li>Replace Fuse with Same Type and Rating Only!</li> </ul>
	<b>Caution:</b> <ul style="list-style-type: none"> <li>Emergency Stop Button.</li> </ul>
	<b>Caution:</b> <ul style="list-style-type: none"> <li>Normal operation of this equipment will likely result in radioactive contamination. Decontamination must be performed in accordance with approved procedures.</li> </ul>
	<b>Prohibited:</b> <ul style="list-style-type: none"> <li>Do NOT use tools. Hand tighten only.</li> </ul>
	<b>Mandatory:</b> <ul style="list-style-type: none"> <li>This device exceeds the 40lb (18kg) threshold. A minimum of two people are required to lift.</li> </ul>

## 0.5 Front Matter – ISO Safety Symbols – Defined (Continued)

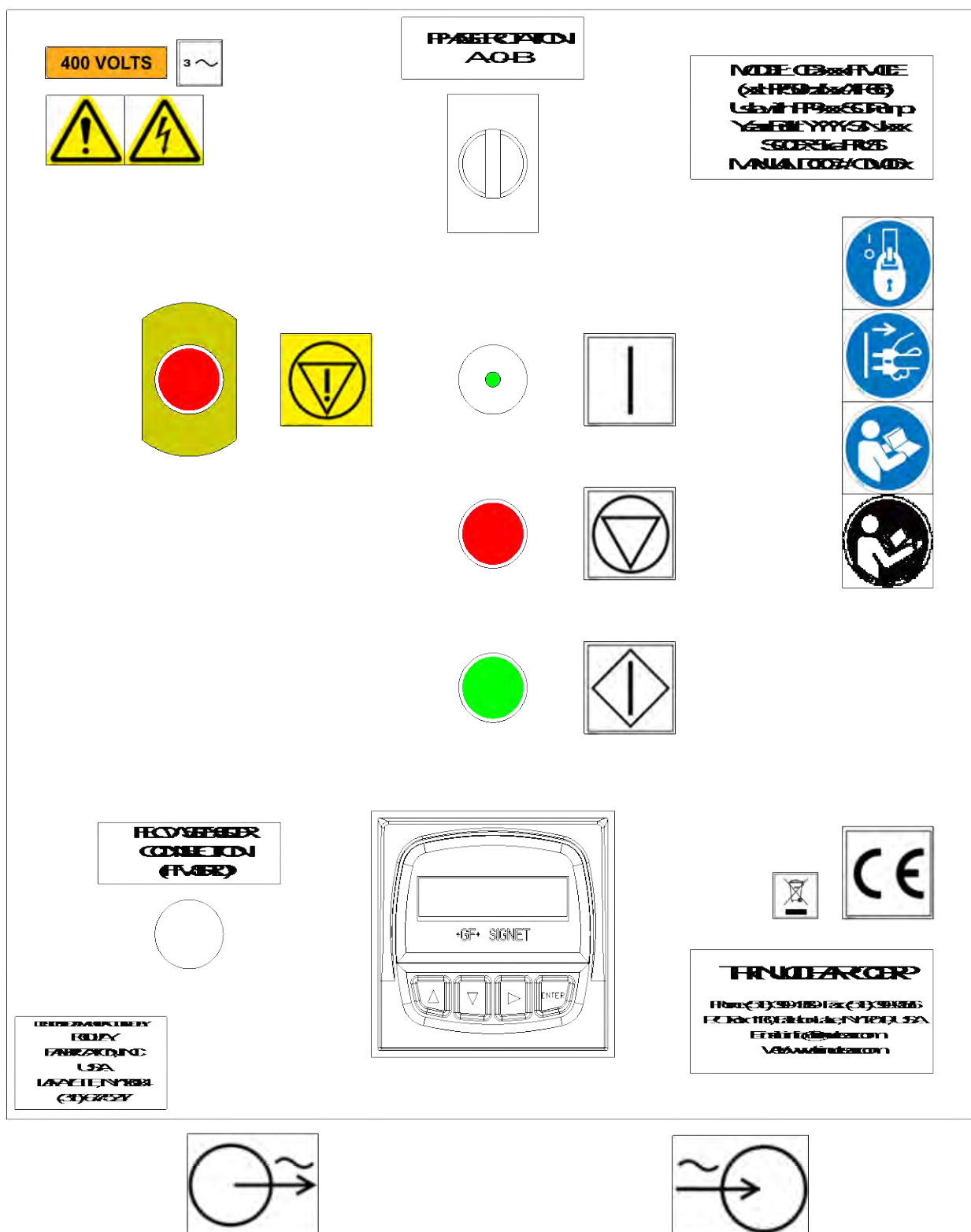
Symbol	Meaning
	<b>Mandatory:</b> <ul style="list-style-type: none"> <li>CIRCUITS ARE LIVE –LOCKOUT / TAGOUT the upstream disconnecting means prior to opening for service.</li> </ul>
 	<b>Mandatory:</b> <ul style="list-style-type: none"> <li>Refer to the Operating and Maintenance Manual prior to proceeding.</li> </ul>
	<b>Mandatory:</b> <ul style="list-style-type: none"> <li>Use only lift points indicated in the Manual.</li> </ul>
	<b>Mandatory:</b> <ul style="list-style-type: none"> <li>Unplug equipment prior to servicing</li> </ul>
	<b>Information:</b> <ul style="list-style-type: none"> <li>Three Phase AC Power</li> </ul>
	<b>Information:</b> <ul style="list-style-type: none"> <li>Power On / Run Light</li> </ul>
	<b>Information:</b> <ul style="list-style-type: none"> <li>Start</li> </ul>
	<b>Information:</b> <ul style="list-style-type: none"> <li>Stop</li> </ul>

## 0.5 Front Matter – ISO Safety Symbols – Defined (Continued)

<u>Symbol</u>	<u>Meaning</u>
	<b><u>Information:</u></b> <ul style="list-style-type: none"> <li>CE Compliant</li> </ul>
	<b><u>Information:</u></b> <ul style="list-style-type: none"> <li>Physical Earth</li> </ul>
	<b><u>Information:</u></b> <ul style="list-style-type: none"> <li>Protective Earth Ground</li> </ul>
	<b><u>Prohibited:</u></b> <ul style="list-style-type: none"> <li>Electronics - Must be recycled as required by local environmental law. Do not dispose of by adding to the Municipal waste stream.</li> </ul>
	<b><u>Recycle:</u></b> <ul style="list-style-type: none"> <li>Metal/Other Parts of the System - Must be recycled as required by local environmental law.</li> </ul>






## 0.6 Front Matter – ISO Safety Symbols – Locations



**NOTE: Exact placement of labels may vary.**

## 0.7 Front Matter – Precautions and Warnings

Type	Description
	Do not submerge the control box for any reason.
	Ensure proper electrical safety precautions are taken if the cover of the control box is open and there is power to the control box.
	Do NOT attempt to perform maintenance on the control box while it is energized.
	It is expected that trained and qualified personnel will operate the unit. Radiological considerations and requirements are not included in this document and should be specifically addressed by the end user organization.
	Do NOT use the electrical cables to lift the pump out of the water.
	Tri Nuclear's ergonomic testing has concluded that the control box be mounted between 2ft. - 6.5 ft. (0.6M and 1.99M) from the platform it will be used on.
<b>CAUTION</b>	Caution should be taken to <b><i>NOT</i></b> 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 10E6 Rad [10,000 Sieverts]. 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.
	Use of any components other than genuine Tri Nuclear replacement parts will void the warranty.
	Slowly lower the housing into the water. This allows water to fill the housing from the drain hole(s) in the base plate. Lowering the unit too fast may cause it to become unstable until it fills with water.
	Fully submerge pump prior to starting the system. Running or "bumping" the pump dry (out of water) will result in damage to the pump.
	Pumps must be installed at least 10 ft. [3.05m] below the water level of the pool to ensure enough NPSH (Net Positive Suction Head) for proper operation of the pump.
	Check for proper phase rotation before running the system. Running the pump in reverse will result in damage over time.

## 0.7 Front Matter – Precautions and Warnings (continued)

Type	Description
<b>CAUTION</b>	<ul style="list-style-type: none"> <li>• When installing the power cord to the pump, ensure the keyway male end on the PSC-100P cable is aligned with the female keyway on the SC connector on the pump.</li> <li>• Ensure the PSC-100P plug is sufficiently lubricated with a non-conductive electrical lubricant (Dow Corning #4).</li> <li>• Do not use excessive downforce or side-to-side action to try and “make it fit” as you may damage the plug.</li> <li>• Install the power cord to pump pigtail HAND TIGHT ONLY. Do NOT use any tools (pliers, channel locks etc.) to tighten the connection.</li> </ul>
	<ul style="list-style-type: none"> <li>• When removing the power cord, be sure that the plug is fully unthreaded and pull in a vertical direction only.</li> <li>• Do not use side-to-side action to try and “loosen it up” as you may damage the plug.</li> </ul>
	Do not start the pump more than once every 2 minutes or 300 starts/day. Damage to the motor winding insulation may occur.
<b>NOTICE</b>	Do not install more than 50ft [50mm x 12.24m] of suction hose to a single suction port on a UFV filter system. This will ensure there is adequate flow velocity at the vacuum nozzle for vacuuming operations.
	One Strainer Basket (SB-.125) per filter housing must be used to ensure effective straining operations.
	One Underwater Catch Basket (UCB-1) per filter must be used to ensure effective straining operations.
	Dense granular material (less than .125”) may pass through the SB-.125 strainer basket and could collect in the bottom of the filter housing.
	Perform a flow meter check: <ul style="list-style-type: none"> <li>• Prior to initial installation</li> <li>• When a sensor is replaced</li> <li>• Sensor is suspected to be damaged</li> </ul>
	The preferred method of storing the submersible pump assembly when not in use is underwater.
	Running the unit without hoses will not produce desired results in pool filtration or water clarity.
	The UFV-600 must be run with either suction OR discharge hoses installed. It is NOT desired OR required to run the unit with BOTH suction and discharge hoses installed.
	The PP-1000SC-CE pump discharge “T” must be in parallel with the lifting plates on the UF-1000-CE housing. The pump housing has internal guide bars to correctly position the pump cover and prevent the cover from rotating during operation. If the pump is installed in any other configuration, it will prevent the installation and/or removal of filter cartridges.
	Filter cartridges can take several minutes to flood while trying to submerge them in the pool. The flooding time can be minimized by pre-soaking the filters

## 1.0 Introduction

Tri Nuclear's Underwater Filter / Vacuum systems are portable underwater filter systems that:

- Will aid in the retrieval of foreign material from the water (vacuum units only).
- Provides supplemental filtration to improve water clarity.
- Provides supplemental filtration to reduce the activity in the water of spent fuel pool, reactor cavity and other areas of the plant.
- Can be used in the reactor vessel, reactor cavity, and spent fuel pool storage areas in any nuclear power plant.

They are designed to operate at flow rates between 83-833 GPM [314 - 3,153 LPM] [18 – 208 m<sup>3</sup>/hr] (depending on the model) and they have the ability to filter sub-micron to 20 micron size particles using disposable filter cartridges. The vacuum units also have the ability to filter/strain larger size material with stainless steel strainer baskets in place of filter cartridges.

The Underwater Filter / Vacuum systems include a connection point on the housing for attachment of rigging to remove the unit from the pool. Rigging is **NOT** included with the systems.

All Tri Nuclear Underwater Filter Vacuum systems operate under negative pressure.

This design feature eliminates the need for special bolted pressure closures on the filter and pump housings requiring tooling for operation. Each filter and pump housing seals with a simple flat cover plate held in place by negative pressure during operation.

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 in place during normal operation.

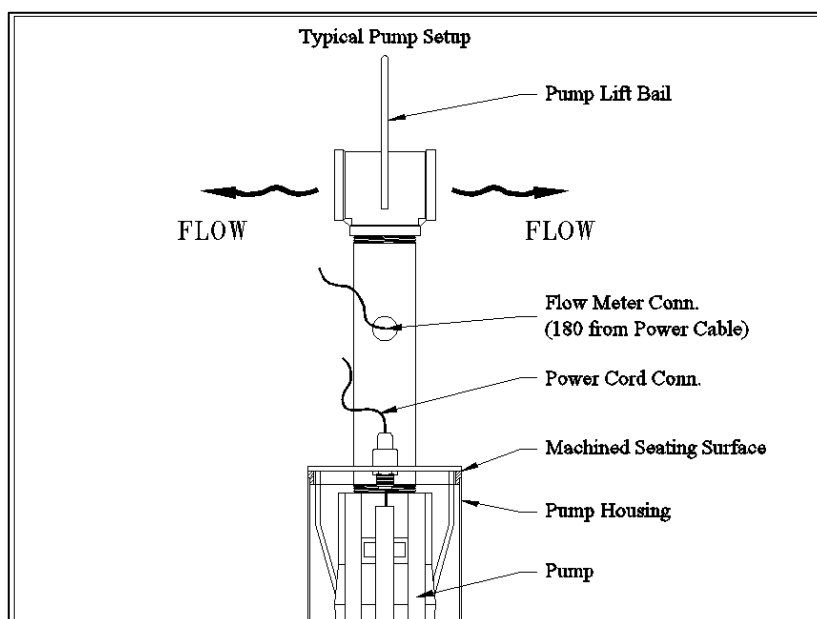


Figure 1.1 – Typical Pump Setup

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### **Underwater Filter Vacuum (UFV) Systems:**

Tri Nuclear has developed a wide range of stand-alone Underwater Filter Vacuums which are ideal for use in various pool cavity applications.

- The UFV-100 is a compact stand-alone Underwater Filter Vacuums which is ideal for use on special projects or in confined areas where space is at a premium.
- The UFV-260 is a versatile stand-alone Underwater Filter Vacuums which is ideal for use in the Spent Fuel Pool or Reactor Cavity and is the most widely used underwater filter vacuum on the market.
- The UFV-600 is a large stand-alone Underwater Filter Vacuums which can process large amounts of water rapidly for water clarity and still retains the ability for minor vacuuming campaigns.

### **Underwater Filter (UF) Systems:**

Tri Nuclear also has stand-alone Underwater Filters that are used to establish or maintain water clarity but do not have the capability to vacuum.

- The UF-600 is a large stand-alone Underwater Filter which is ideal for processing large amounts of water rapidly to establish or maintain water clarity.
- The UF-1000 is the largest stand-alone Underwater Filter made by Tri Nuclear Corp. This system is specifically designed for processing significant amounts of water rapidly to establish or maintain water clarity. No system on the market can outperform the UF-1000 when pool water clarity becomes an issue impacting critical path time.

<b>Underwater Filter/Vacuum Systems</b>					
	<b>UFV-100</b>	<b>UFV-260</b>	<b>UF-600</b>	<b>UFV-600</b>	<b>UF-1000</b>
<i>Flow Rate</i>	83 GPM [314 LPM] [18m <sup>3</sup> /hr]	216 GPM [817 LPM] [49m <sup>3</sup> /hr]	500 GPM [1,892LPM] [151m <sup>3</sup> /hr]	500 GPM [1,892LPM] [151m <sup>3</sup> /hr]	833 GPM [3,153 LPM] [208m <sup>3</sup> /hr]
<i>Type</i>	Filter / Vacuum	Filter / Vacuum	Filter Only	Filter / Vacuum	Filter Only
<i>Filter Capacity</i>	1 Cartridge	2 Cartridges	4 Cartridges	4 Cartridges	8 Cartridges
<i>Hoses</i>	1 Suction	2 Suction	2 Discharge	2 Suction or 2 Discharge	2 Discharge
<i>Footprint</i>	14 x 24 in 356 x 610 cm	24 x 24 in 610 x 610 cm	24 x 30 in 610 x 762 cm	38 x 30 in 965 x 762 cm	34 x 34 in 834 x 834 cm
<i>Height</i>	55 in [140 cm]	70 in [178 cm]	99 in [251 cm]	99 in [251 cm]	86 in [215 cm]
<i>Pump Weight</i>	45 lb. [20 kg]	90 lb. [42 kg]	210 lb. [95 kg]	210 lb. [95 kg]	235 lb. [107 kg]
<i>Housing &amp; Pump Empty Weight</i>	140 lb. [64 kg]	255 lb. [116 kg]	515 lb. [234 kg]	550 lb. [249 kg]	650 lb. [295 kg].
<i>Housing &amp; Pump Filled with Water Weight</i>	280 lb. [127 kg]	485 lb. [220 kg]	1,020 lb. [463 kg]	1,055 lb. [479 kg].	1,725 lb. [782 kg]

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## 1.1 Typical Operation

Unfiltered water from the cavity pool enters from the two attached suction hoses (if equipped or installed) and into the filter tubes with installed filter cartridges. Filtered water from the filter housings passes through a common bottom tunnel connected to the pump housing.

The submersible pump draws water from the pump housing and discharges filtered water back to the cavity pool.

Filters placed into the filter housings are sealed by an O-ring mounted in the filter tube sheet. Negative pressure developed in the filter cartridges provide a positive seal between the filter cartridge and the mounted o-ring.

## 1.2 Environmental Conditions

With the exception of the electrical disconnect box, electrical controls, and the flow meter display, the Underwater Filter Vacuum Systems are designed to be submerged in the spent fuel pool and / or refueling pool water.

- 1.2.1 The Underwater Filter Vacuum Systems are designed to operate in continuous use in pure and / and borated water from 40F to 140F [4C to 60C, PH ranges from 4.0 to 11.0 and up to 100 ft. [30.5m] water depth.
- 1.2.2 The Underwater Filter Vacuum System components are designed for storage out of water in an ambient temperature range in air from 40F to +140F [4C to 60C] with 100% humidity.
- 1.2.3 The Underwater Filter Vacuum Systems will operate correctly up to 5,000ft [1,524m] above mean seal level. For operating in elevations greater than 5,000 ft [1,524m], contact Tri Nuclear for any special precautions.

## 1.3 Transportation and Storage

The Underwater Filter Vacuum System components will withstand, or has been protected against, transportation and storage temperatures of 40F to +140F [4C to 60C].

The systems have been packaged to prevent damage from the effects of normal humidity, vibration and shock.

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## 1.4 Equipment Guide List

TNC Part Number	Description	UFV-100-CE Qty	UFV-260-CE Qty	UF-600-CE Qty	UFV-600-CE Qty	UF-1000-CE Qty
UFV-100H	Basic Housing for UFV-100 system	1				
UFV-260H	Basic Housing for UFV-260 system		1			
UF-600H	Basic Housing for UF-600 system			1		
UFV-600H	Basic Housing for UFV-600 system				1	
UF-1000H	Basic Housing for UF-1000 system					1
PP-100SC-CE	Grundfos pump, 2HP/400V/3Ph/50Hz, w/cover & SC connector	1				
CB-100-FM-CE	2 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-600 LPM digital flow meter.	1				
PP-260SC-CE	Grundfos pump, 5HP/400V/3Ph/50Hz, w/cover & SC connector		1			
CB-260-FM-CE	5 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-2,000 LPM digital flow meter.		1			
PP-600SC-CE	Grundfos pump, 15HP/400V/3Ph/50Hz, w/cover & SC connector			1	1	
CB-600-FM-CE	15 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-4,000 LPM digital flow meter.			1	1	
PP-1000SC-CE	Grundfos pump, 20HP/400V/3Ph/50Hz, w/cover & SC connector					1
CB-1000-FM-CE	20 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-6,000 LPM digital flow meter.					1
PSC-100P	PSC-100P Power Cable with twist lock plug (100ft [30.5m] 10/4 SO Cable w/ male twistlock plug)	1	1	1	1	1
PC-50-CE	PC-50-CE drop cable with female plug (50ft [12.4m] Cable w/ female connector)	1	1	1	1	1
FM-SRD	Flow sensor with reinforced paddlewheel and 100ft [30.5m] cable with Amphenol connector.	1	1	1	1	1
PH-2x50-EP	2in x 50ft [50mm x 12.24m] EPDM suction hose with MxF camlock couplers	1	2			
PH-2.5x50-EP	2.5in x 50ft [64mm x 12.24m] EPDM suction hose with MxF camlock couplers				2	
PH-3x25-EP	3in x 25ft [76mm x 7.62m] EPDM discharge hose with MxF camlock couplers			2	2	
PH-4x25-EP	4in x 25ft [101mm x 7.62m] EPDM discharge hose with MxF camlock couplers					2

## 1.4 Equipment Guide List (continued)

TNC Part Number	Description	UFV-100-CE Qty	UFV-260-CE Qty	UF-600-CE Qty	UFV-600-CE Qty	UF-1000-CE Qty
SP-1	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 10ft [3.05m] lg, with pinned coupler.	4	4		4	
SP-1x5	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 5ft [1.52m] lg, with pinned coupler.	1	1		1	
SP-1x3	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 3ft [0.91m] lg, with pinned coupler.	1	1		1	
SP-1x2	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 2ft [0.61m] lg, with pinned coupler.	1	1		1	
BC-1	Buoyancy Float	5	5		5	
UT-1SPT	Stainless Steel Pool Pole "T" Handle	1	1		1	
UT-3/6	Floor Storage Rack for (6) Tri Nuclear Filter Cartridges	1	1	1	1	2
UT-3H	Hanging Filter Storage Rack for (6) Tri Nuclear Filters	1	1	1	1	1
UT-5SP	Floor Vacuum Cleaner Head	1	1			
UT-5SP-2.5	Floor Vacuum Cleaner Head for use with 2-1/2in [64mm] hose				1	
UT-6SP	Hose to Pole Clamp	1	1		1	
UT-7	Stainless Steel Vacuum Nozzle	1	1			
UT-7-2.5	SS Vacuum nozzle for 2-1/2in [64mm] suction hose				1	
UT-8	Diffuser Pipe for 3in [76mm] discharge hose			2	2	
UT-9	Rope Filter Lift Tool	2	2	2	2	2
UT-10D	Free standing Mounting Panel for mounting Phase Reversing Control Box	1	1	1	1	1
UT-11	Suction Hose Standoff	1	2			
UT-11B	Suction Hose standoff for 2-1/2in [64mm] hose				2	
UT-12	1in [25.4mm] Orifice Cap	1	1			
UT-13	Diffuser Pipe for 4in [101mm] discharge hose					2



## 1.5 Materials of Construction

TNC Part Number	Description	Materials of Construction
UFV-100H	Basic Housing for UFV-100 system	304SS, 316SS, Buna N O-rings
UFV-260H	Basic Housing for UFV-260 system	304SS, 316SS, Buna N O-rings
UF-600H	Basic Housing for UF-600 system	304SS, 316SS, Buna N O-rings
UFV-600H	Basic Housing for UFV-600 system	304SS, 316SS, Buna N O-rings
UF-1000H	Basic Housing for UF-1000 system	304SS, 316SS, Buna N O-rings
PP-100SC	Grundfos pump, 2HP/400V/3Ph/50Hz, w/cover & SC connector	304SS
CB-100-FM-CE	CB-100-FM-CE PHASE REVERSING control box with twist lock plugs and integral digital flow meter.	Fiberglass Enclosure
PP-260SC	Grundfos pump, 5HP/400V/3Ph/50Hz, w/cover & SC connector	304SS
CB-260-FM-CE	CB-260-FM-CE PHASE REVERSING control box with twist lock plugs and integral digital flow meter.	Fiberglass Enclosure
PP-600SC	Grundfos pump, 15HP/400V/3Ph/50Hz, w/cover & SC connector	304SS
CB-600-FM-CE	CB-600-FM-CE PHASE REVERSING control box with twist lock plugs and integral digital flow meter.	Fiberglass Enclosure
PP-1000SC	Grundfos pump, 20HP/400V/3Ph/50Hz, w/cover & SC connector	304SS
CB-1000-FM-CE	CB-1000-FM-CE PHASE REVERSING control box with twist lock plugs and integral digital flow meter.	Fiberglass Enclosure
PSC-100P	PSC-100P Power Cable with twist lock plug (100ft [30.5m] 10/4 SO Cable w/ male twistlock plug)	10/4 SOOW Cable
PC-50-CE	PC-50-CE drop cable with female plug (50ft [12.4m] Cable w/ female connector)	10/4 <HAR> Cable
FM-SRD	Flow sensor with reinforced paddlewheel and 100ft [30.5m] cable with Amphenol connector.	Polypropylene
PH-2x50-EP	2in x 50ft [50mm x 12.24m] EPDM suction hose with MxF camlock couplers	EPDM hose with Polypropylene camlock couplers & 304SS crimped sleeves
PH-2.5x50-EP	2.5in x 50ft [64mm x 12.24m] EPDM suction hose with MxF camlock couplers	EPDM hose with Aluminum camlock couplers & 304SS crimped sleeves
PH-3x25-EP	3in x 25ft [76mm x 7.62m] EPDM discharge hose with MxF camlock couplers	EPDM hose with Polypropylene camlock couplers & 304SS crimped sleeves

## 1.5 Materials of Construction (continued)

TNC Part Number	Description	Materials of Construction
PH-4x25-EP	4in x 25ft [101mm x 7.62m] EPDM discharge hose with MxF camlock couplers	EPDM hose with Polypropylene camlock couplers & 304SS crimped sleeves
SP-1	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 10ft [3.05m] lg, with pinned coupler.	304 SS
SP-1x5	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 5ft [1.52m] lg, with pinned coupler.	304 SS
SP-1x3	Stainless Steel Pool Pole, , 1in [25.4mm] Dia x 3ft [0.91m] lg, with pinned coupler.	304 SS
SP-1x2	Stainless Steel Pool Pole, , 1in [25.4mm] Dia x 2ft [0.61m] lg, with pinned coupler.	304 SS
BC-1	Buoyancy Float	304 SS
UT-1SPT	Stainless Steel Pool Pole "T" Handle	304 SS
UT-3/6	Floor Storage Rack for (6) Tri Nuclear Filter Cartridges	304 SS
UT-3H	Hanging Filter Storage Rack for (6) Tri Nuclear Filters	304 SS
UT-5SP	Floor Vacuum Cleaner Head	304 SS, / 316 SS, Polypropylene
UT-5SP-2.5	Floor Vacuum Cleaner Head for use with 2-1/2in [64mm] hose	304 SS, / 316 SS, Polypropylene
UT-6SP	Hose to Pole Clamp	304 SS
UT-7	Stainless Steel Vacuum Nozzle	304 SS, / 316 SS
UT-7-2.5	SS Vacuum nozzle for 2-1/2in [64mm] suction hose	304 SS, / 316 SS
UT-8	Diffuser Pipe for UF-600 discharge hose	304 SS, / 316 SS
UT-9	Rope Filter Lift Tool	304 SS, / 316 SS
UT-10A	Mounting Panel for mounting Flow Meter and Phase Reversing Control Box	304 SS
UT-11	Suction Hose Standoff	304 SS, / 316 SS
UT-11B	Suction Hose standoff for 2-1/2in [64mm] hose	304 SS, / 316 SS
UT-12	1in [25.4mm] Orifice Cap	Polypropylene
UT-13	Diffuser Pipe for 4in [101mm] discharge hose	304 SS, / 316 SS

## 2.0 Description of Equipment

### 2.1 Pump and filter housing:

The pump and filter housings of all Tri Nuclear UF/UFV equipment provide the means of connecting the filters to the suction of the pump. All units have at least one 1/2in [13mm] drain hole in the base plate to allow for filling & draining the housing. All units operate under negative pressure. Their differences are described below.



**Figure 2.1.1 - UFV-100 Housing**



**Figure 2.1.2 - UFV-260 Housing**



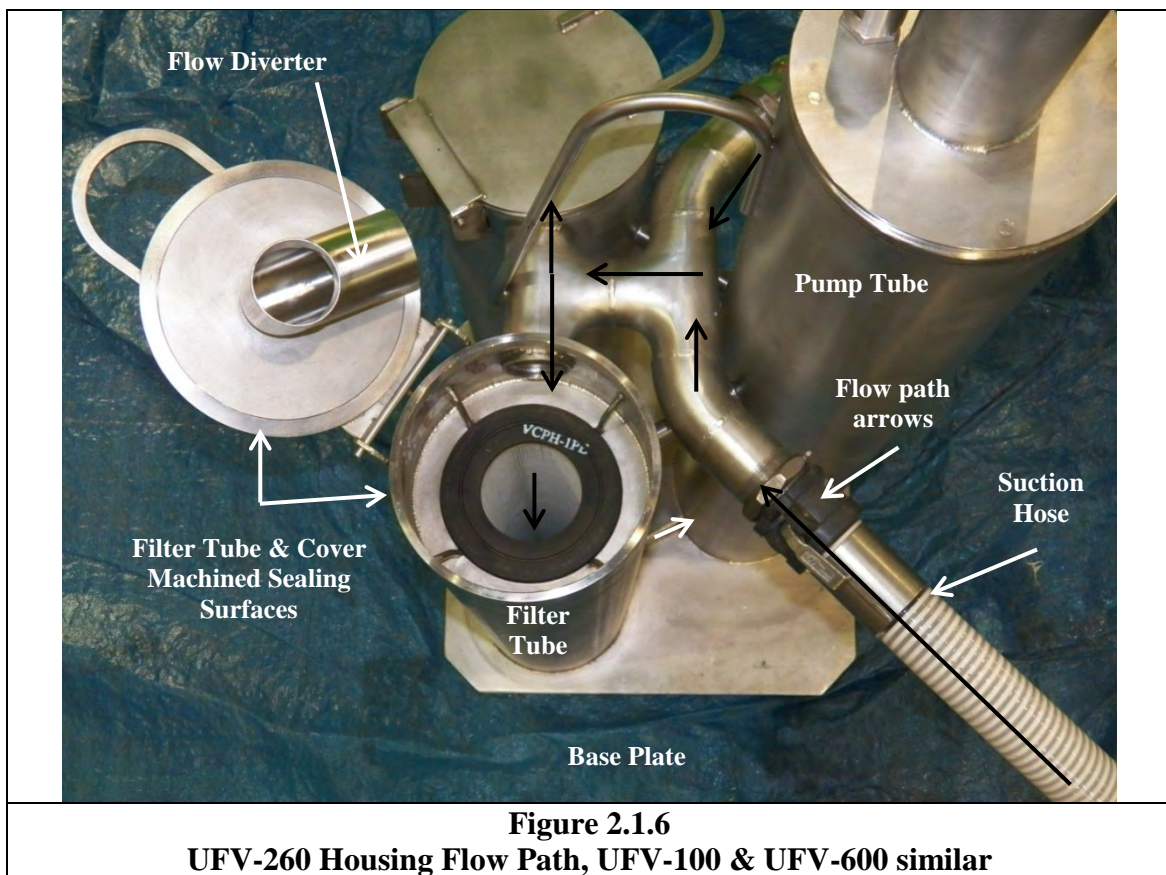
**Figure 2.1.3 - UFV-600 Housing**



**Figure 2.1.4 - UF-600 Housing**



**Figure 2.1.5 - UF-1000 Housing**



**Figure 2.1.6  
UFV-260 Housing Flow Path, UFV-100 & UFV-600 similar**

#### 2.1.1 UFV-100 Housing (See TNC-001-12 for details)

The housing for the UFV-100 contains one filter tube with a swing cover and one pump tube. A lifting attachment is centered between the filter tube and the pump tube for lifting the UFV-100.

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### 2.1.2 UFV-260 Housing (See TNC-002-12 for details)

The housing for the UFV-260 contains two filter tubes with swing covers and one pump tube. A lifting attachment is centered between the filter tubes and the pump tube for lifting the UFV-260.

### 2.1.3 UF-600 Housing (See TNC-003-12 for details)

The housing for the UF-600 contains four open top filter tubes and one pump tube. A centered swing lift bale over the pump housing is provided for lifting the UF-600.

### 2.1.4 UFV-600 Housing (See TNC-004-12 for details)

The housing for the UFV-600 contains four filter tubes with swing covers and one pump tube. A centered swing lift bale over the pump housing is provided for lifting the UFV-600.

### 2.1.5 UF-1000 Housing (See TNC-005-12 for details)

The housing for the UF-1000 contains a plenum for eight filters and one pump tube. Lifting attachments are located on either side of the pump tube for lifting the UF-1000.

## 2.2 Submersible Pump Assembly:

Tri Nuclear uses a variety of a submersible pumps and motors to provide flow for the Underwater Filter / Vacuum units. All Tri Nuclear pumps are constructed out of stainless steel and have the following common features:

The assemblies include a pump cover, discharge piping, flow sensor tap, and top lifting bail. The pump has its internal check valve welded in the open position to allow for water to drain out of the pump and pump cover when lifting and removing it from the pool.

There is a stainless steel electrical disconnect mounted on the pump cover for the 100ft 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.



	PP-100SC-CE	PP-260SC-CE	PP-600SC-CE	PP-1000SC-CE
For System	UFV-100	UFV-260	UF & UFV-600	UF-1000
Flow Rate	83 GPM [314 LPM] [18m³/hr]	216 GPM [817 LPM] [49m³/hr]	500 GPM [1,892LPM] [151m³/hr]	833 GPM [3,153 LPM] [208m³/hr]
Pump Weight	45 lb. [20 kg]	90 lb. [42 kg]	210 lb. [95 kg]	235 lb. [107 kg]
Horse Power HP	2 HP	5 HP	15 HP	20 HP
Voltage / Freq	400V** / 50Hz / 3Ph			
Overcurrent Trip Set point	4..2 Amps	9.6 Amps	24 Amps	32 Amps
Control Box P/N	CB-100-FM-CE	CB-260-FM-CE	CB-600-FM-CE	CB-1000-FM-CE
Discharge Size	2in [50mm] FNPT	3in [76mm] FNPT	3in [76mm] male camlock	4in [102mm] male camlock
Flow Sensor	FM-SRD			
Power Cords	PSC-100P & PC-50-CE			
Additional Pump/Motor Information				
Reference Drawing	TNC-007-12	TNC-008-12	TNC-009-12	TNC-010-12
Horse Power HP	2 HP	5 HP	15 HP	20 HP
Voltage / Freq	400V** / 50Hz / 3Ph			
Starting Amps	24 Amps	54 Amps	115 Amps	172 Amps
Overcurrent Trip Set point	4..2 Amps	9.6 Amps	24 Amps	32 Amps
Service Factor	1.25	1.15	1.15	1.15
Circuit Breaker Size	10 Amp	20 Amp	60 Amp	80 Amp
Nominal line to line resistance (ohms)	12.1	5.0	1.6	.78

\*\* voltage listed has an acceptable range of +/- 10% (360V – 440V)



NOTE: Standard Tri Nuclear pumps, control boxes and power cables shown, CB-xxx-FM-CE control box versions similar.

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## 2.3 Electrical Control Box (CB-xxx-FM-CE)

All Tri Nuclear CB-xxx-FM-CE control boxes are CE certified.

The CB-xxx-FM-CE is an IP66 / NEMA 4X type fiberglass enclosure (14x16) that has two 400V/3Ph/50Hz motor contactors/starters and a manual motor controller with short circuit protection and an 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. A red “Emergency Stop” button is also included on the front of the box. The control box includes an integral digital flow meter and Amphenol connection for the flow sensor connection on the front cover.

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 contactors/starters inside the control box. These two motor contactors/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 “O” position, neither motor starter will be energized and the pump will not start.

There is a flanged inlet to connect line in power through the PC-50-CE drop cable to the control box. There is a Twist Lock plug to connect the PSC-100P pump power cable to the control box. These allow the operator to easily install and remove the cables without the need for special tools.

The primary (400V) side of the transformer is protected by two 1/2 amp fuses and the secondary (120V) side of the transformer is protected by a 1 amp fuse. Fuse details are listed below in the table below.

The control box also comes with two Master™ locks to lock its closure hasps. These Master™ locks have key #48.

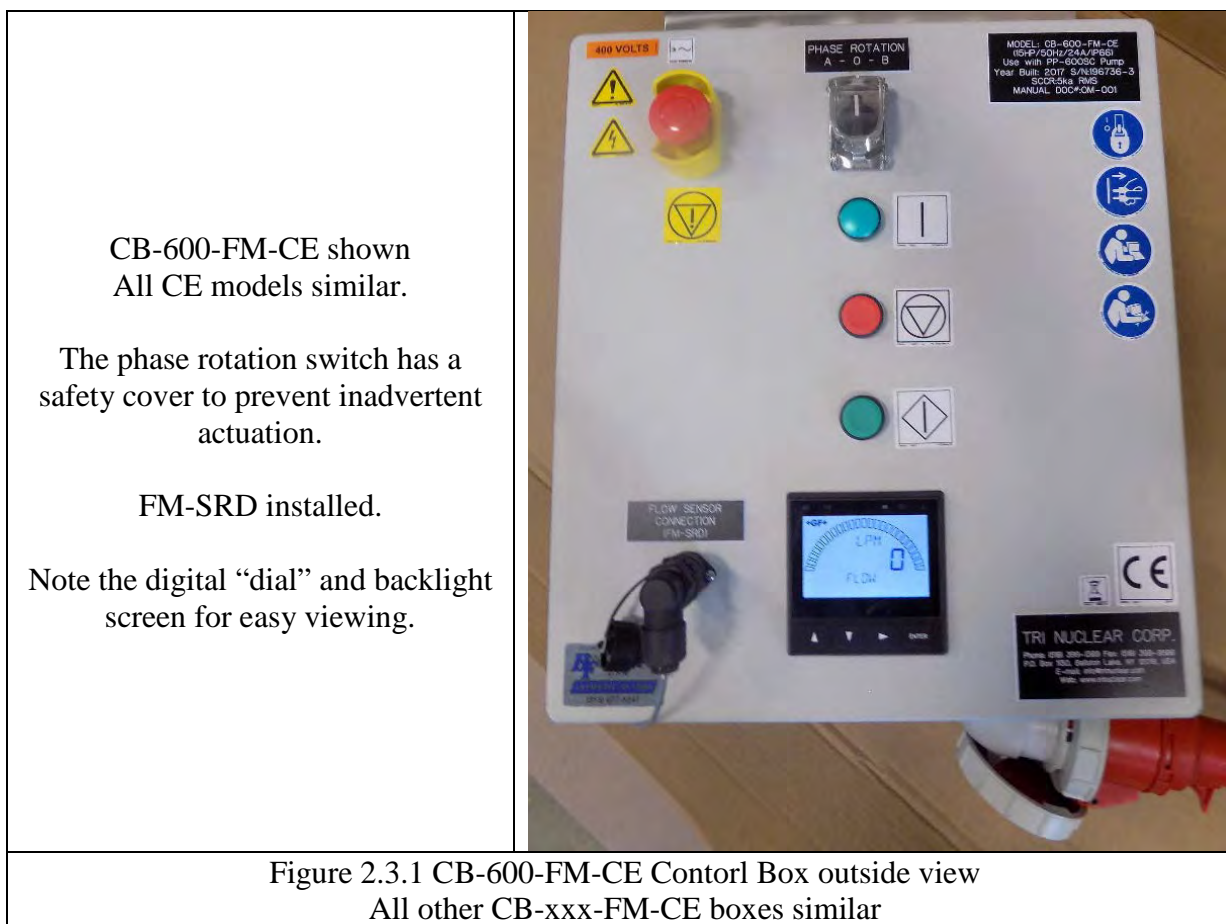
The digital flow meter is installed to provide a gross indication of system flow. System flow rate is a gauge for determining change in pressure drop through the filters. Under normal operations a filter would be changed out when system flow rate drops to ~50% of clean filter value.

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Control Box Ratings / Data				
	CB-100-FM-CE	CB-260-FM-CE	CB-600-FM-CE	CB-1000-FM-CE
For System	UFV-100	UFV-260	UF & UFV-600	UF-1000
Horse Power HP	2 HP	5 HP	15 HP	20 HP
Voltage / Freq	400V** / 50Hz / 3Ph			
Overcurrent Trip Set point	4.2 Amps	9.6 Amps	24 Amps	32 Amps
Flow Meter Range	0-600 LPM	0-2,000 LPM	0-4,000 LPM	0-6,000 LPM
Primary Fuse Type / rating / P/N & QTY	Ferraz Shawmut, Amp-trap 2000® ATDR Class CC Fuse, 1/2 Amp Replacement P/N: ATDR1/2 QTY: 2ea installed , 1 ea spare			
Secondary Fuse Type / rating / P/N & QTY	Littelfuse 3AG Fast-Acting Fuse, 1 Amp Replacement P/N: 312001P QTY: 1ea installed , 1 ea spare			

\*\* voltage listed has an acceptable range of +/- 10% (360V – 440V)





Inside view of a typical CB-xxx-FM-CE control box showing the two motor starters, short circuit / over current trip, 400/120V transformer, 120V/24VDC transformer, fuse blocks and the line in/out twist lock plug terminals.



Figure 2.3.2 CB-xxx-FM-CE Inside View of Control Box

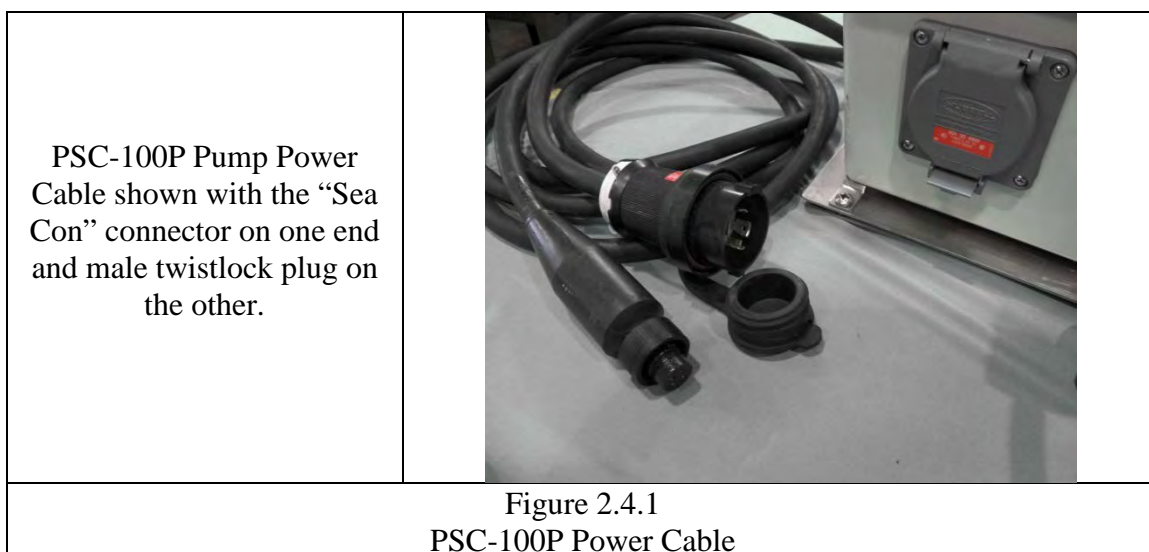
Twist Lock plugs are located on the bottom of the control box.  
The plug to the right (Red with the male connections) is the line in / power in plug.  
The plug to the left (with the female Twist Lock connections) is the power out to the pump.



Figure 2.3.3 CB-xxx-FM-CE Twist Lock Plugs

## 2.4 Pump Power Cable (P/N: PSC-100P):

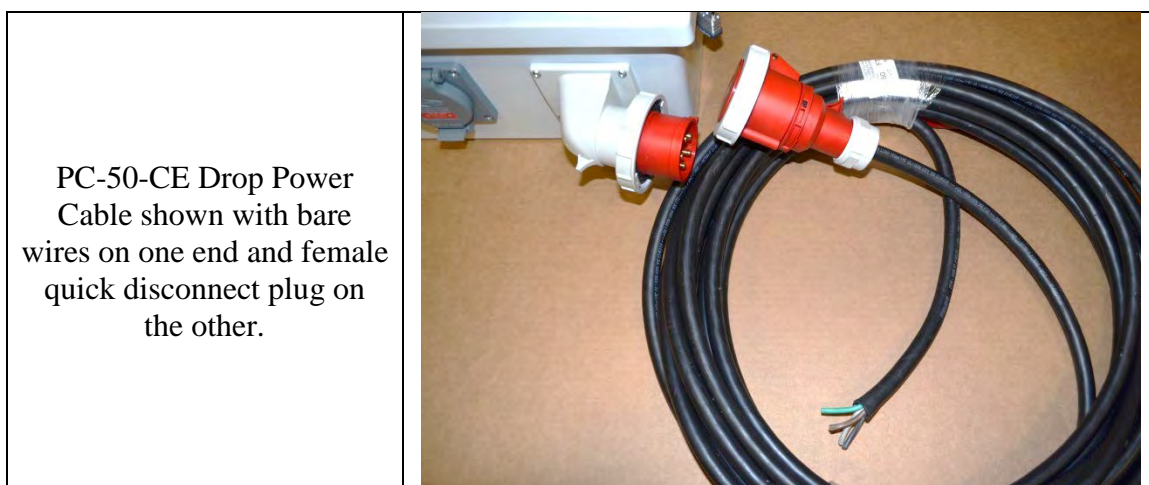
The PSC-100P Pump Power cable is a 100ft [30.5m] 10/4 SO cable with a male Nema 4x Twist Lock plug x Sea Con Connector. This Pump Power cable is to supply power to the pump from the Phase Reversing Control Box.



## 2.5 Drop Cable (P/N: PC-50-CE):

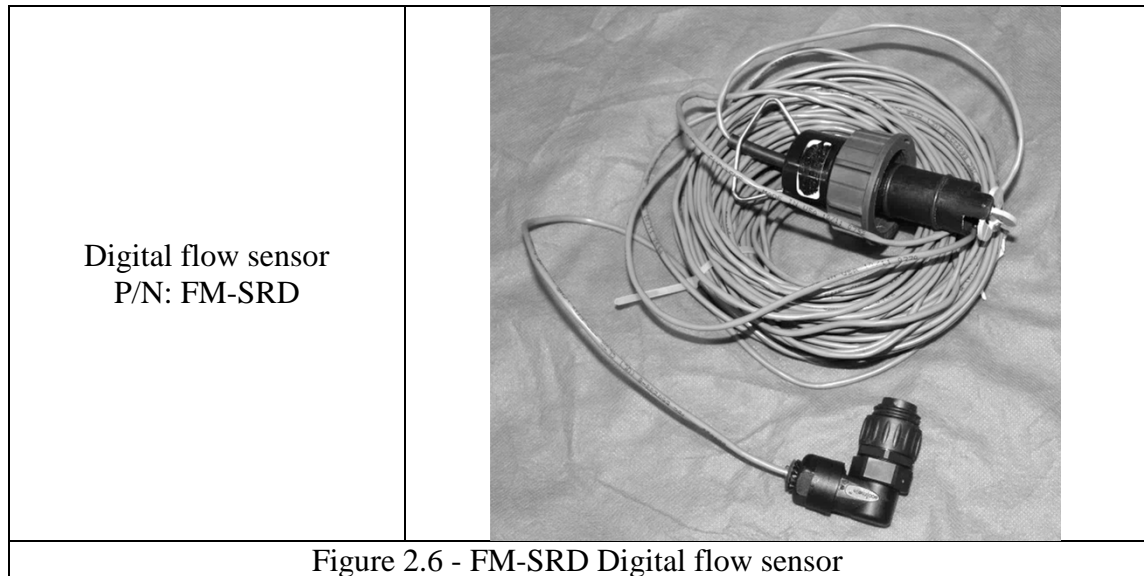
The PC-50-CE Control Box Drop Cable is a 50ft [12.4m] <HAR> H07RN-F 10 4 (10/4 SO equivalent) cable with a female twist lock plug x bare wire. This drop cable is to supply the control box from the in plant power source / motor control center / welding outlets etc.

PC-50-CE drop cable with female plug (50ft [12.4m] Cable w/ female connector)



## 2.6 Digital Flow Sensor (P/N: FM-SRD):

The digital flow sensor is a paddlewheel type flow sensor. The paddlewheel has a reinforced 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 [30.5m] of instrument cable with a 90 deg. Amphenol connector to connect to the CB-xxx-FM-CE control box front.



## 2.7 Hoses:

- 2.7.1 The UFV-100 system comes equipped with one 2in x 50ft [50mm x 12.24m] EPDM suction hose with male x female cam lock couplers for vacuuming operations and water clarity operations.
- 2.7.2 The UFV-260 comes equipped with two 2in x 50ft [50mm x 12.24m] EPDM suction hoses with male x female cam lock couplers for vacuuming operations and water clarity operations.
- 2.7.3 The UF-600 comes equipped with two 3in x 25ft [76mm x 7.62m] EPDM discharge hoses with male x female cam lock couplers that connect to the discharge of the PP-600SC pump for water clarity operations.
- 2.7.4 The UFV-600 comes equipped with two sets of hoses. The mode of operation used for the UFV-600 determines which set of hoses will be installed.
  - 2.7.4.1 Vacuuming with the UFV-600: When vacuuming with the UFV-600, two 2.5in x 50ft [64mm x 12.24m] EPDM suction hoses with male x female cam lock couplers are installed.
  - 2.7.4.2 Water Clarity operations with UFV-600: When using the UFV-600 for water clarity install the two 3in x 25ft [76mm x 7.62m] EPDM discharge hoses with male x female cam lock couplers to the discharge of the PP-600SC pump
- 2.7.5 The UF-1000 comes equipped with two 4in x 25ft [101mm x 7.62m] EPDM discharge hoses with male x female cam lock couplers that connect to the discharge of the PP-1000SC pump for water clarity operations.

## 2.8 Tooling

The following is a list of Tooling and Accessories. See the EGL in Section 1.1 for a listing of tools that are supplied with your specific system.

### 2.8.1 Stainless Steel Pool Poles (P/N: SP-1)

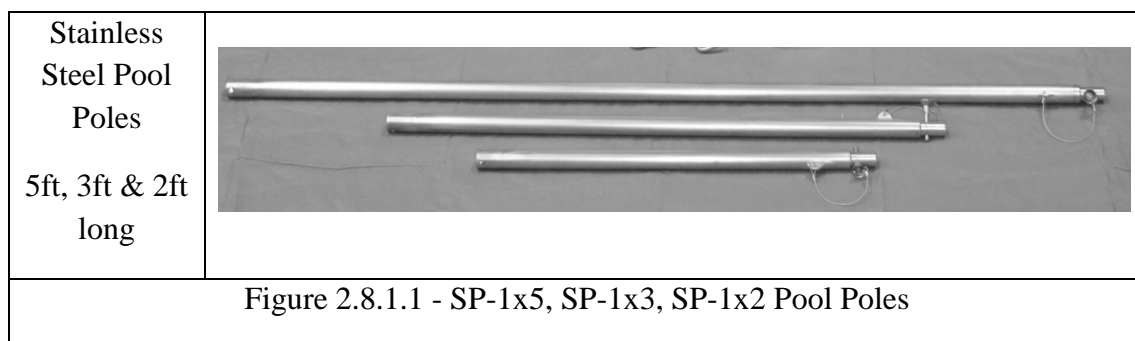
Tri Nuclear Corp. has designed special 10ft [3.05m] stainless steel pole sections for deep submergence pool work at nuclear power stations. The required total length of pole is obtained by coupling together (without tools) multiple 10ft [3.05m] sections using a quick release, "recessed button type", positive locking pull pin. This provides for a strong rigid connection for transmission of high torque and loading. The same connection is used to attach special tooling fixtures to the bottom end of the assembled pole sections for performing various types of underwater remote hand operations.

- Material: all Stainless Steel
- Weight: 10 lbs [4.5kg] per 10ft [3.05m] Section
- Pool Poles are floodable
- Poles connected together with a quick release, "recessed button type", Stainless Steel, positive locking pull pin
- Pull pins are lanyarded to pool poles with stainless steel wire rope
- T-handle has a top lift bail for crane lifting operations or tying off to cavity wall

#### 2.8.1.1 Short Stainless Steel Pool Poles (P/N's: SP-1x5, SP-1x3, SP-1x2)

The SP-1x5, SP-1x3, SP-1x2 Poles are identical to the SP-1 pool pole with the exception that their lengths are 5ft [1.52m], 3ft [0.91m] or 2ft [0.61m] long instead of 10 ft [3.05m] long.

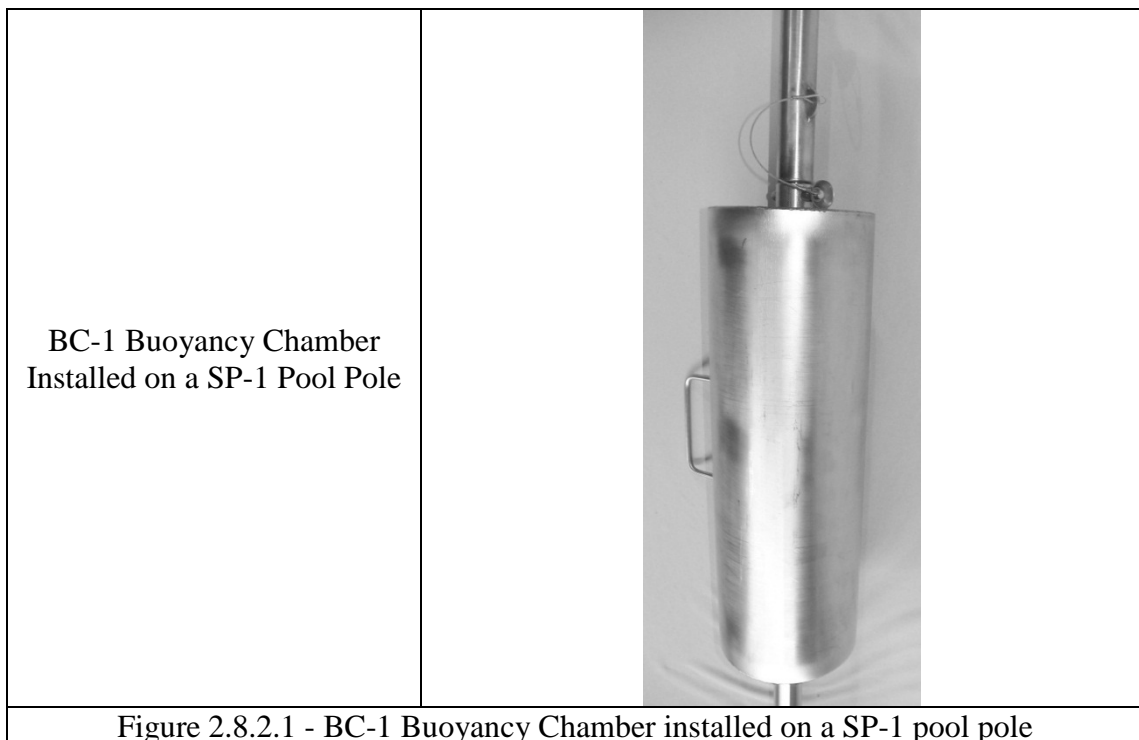
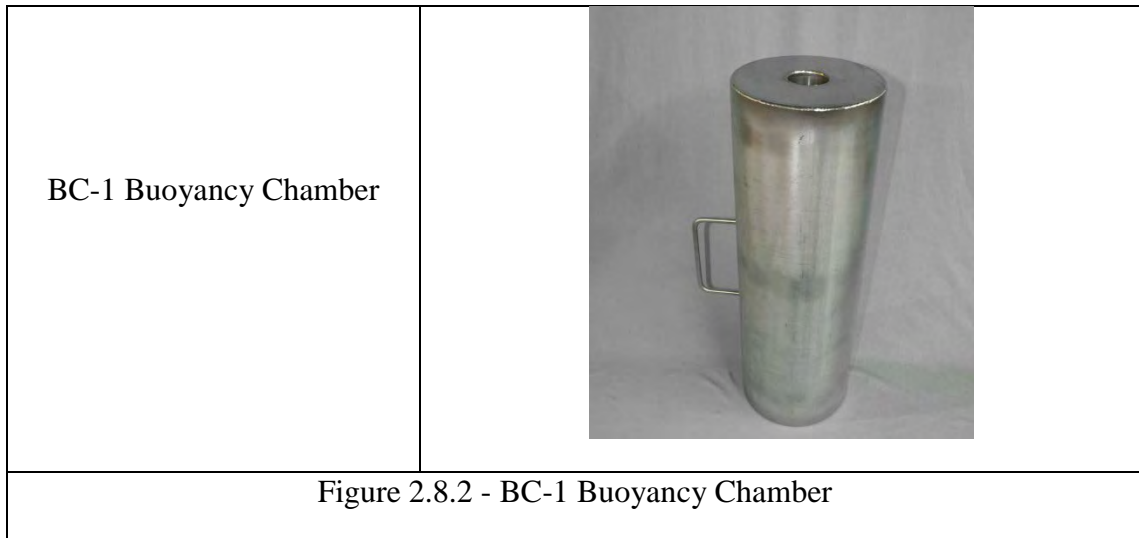
Their purpose is to provide an overall adjustment in height for the operator on a bridge or wall.



## 2.8.2 Buoyancy Chamber (P/N: BC-1)

Tri Nuclear has developed a Buoyancy Chamber that slides over the pool pole. It is a 6in x 18in [15.2 cm x 45.7cm] long stainless steel chamber that provides positive buoyancy for the pool poles. The effect of this positive buoyancy is to reduce the overall weight of the assembled pool poles for the operator.

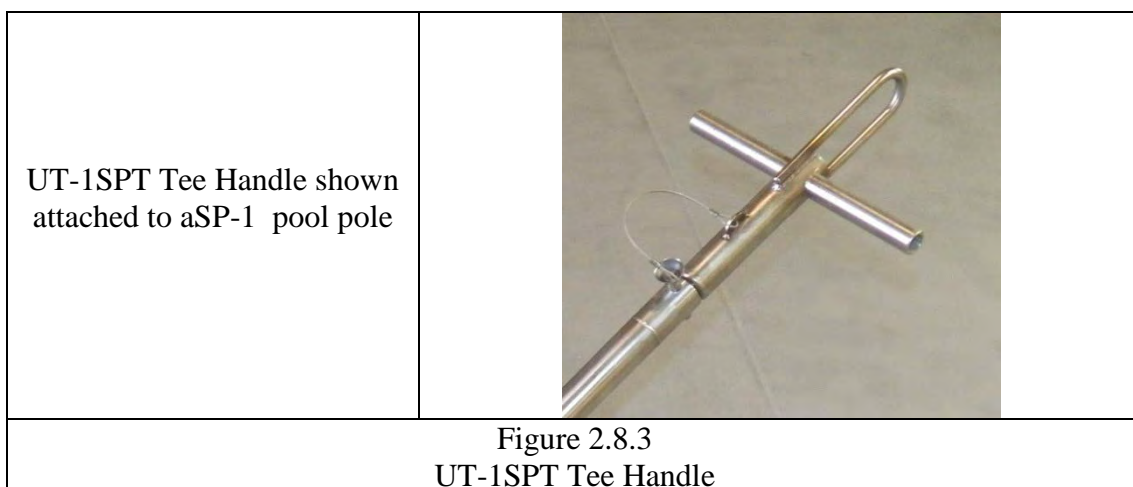
Each Buoyancy Chamber reduces the weight of the pool by approximately half. The BC-1 Buoyancy Chamber has a handle for ease of moving and installing on the pool pole.





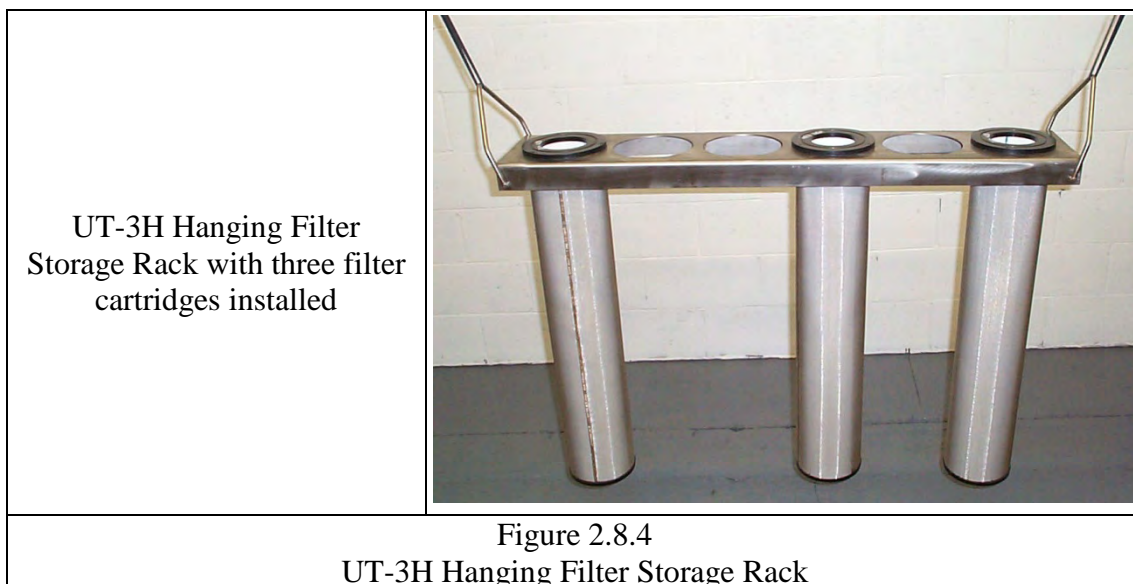
### 2.8.3 Tee Handle for Stainless Steel Pool Poles (P/N: UT-1SPT)

The Tee Handle connects to the top of the pool poles and provides the operator with the ability to lift the assembled pool poles and manipulate the tooling attached to the end of the poles.



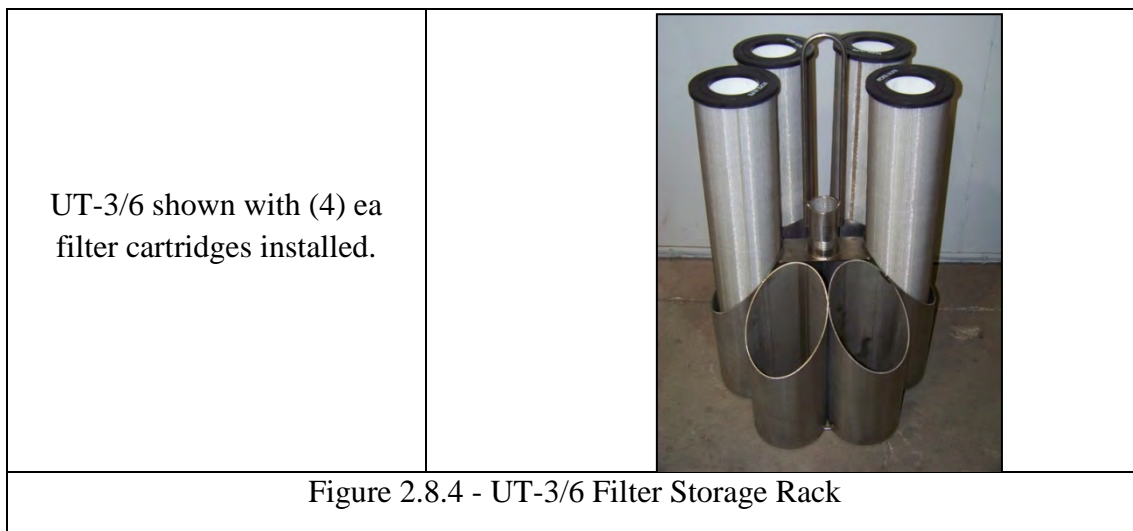
### 2.8.4 Hanging Filter Storage Rack (P/N: UT-3H)

A 42in x 8in x 4in [106.7cm x 20.3 x 10.2] (LWH) hanging rack for holding six (6) spare or spent filter cartridges. This rack can be hung from the railing around the pool or the fuel bridge and allows for more efficient filter change out.



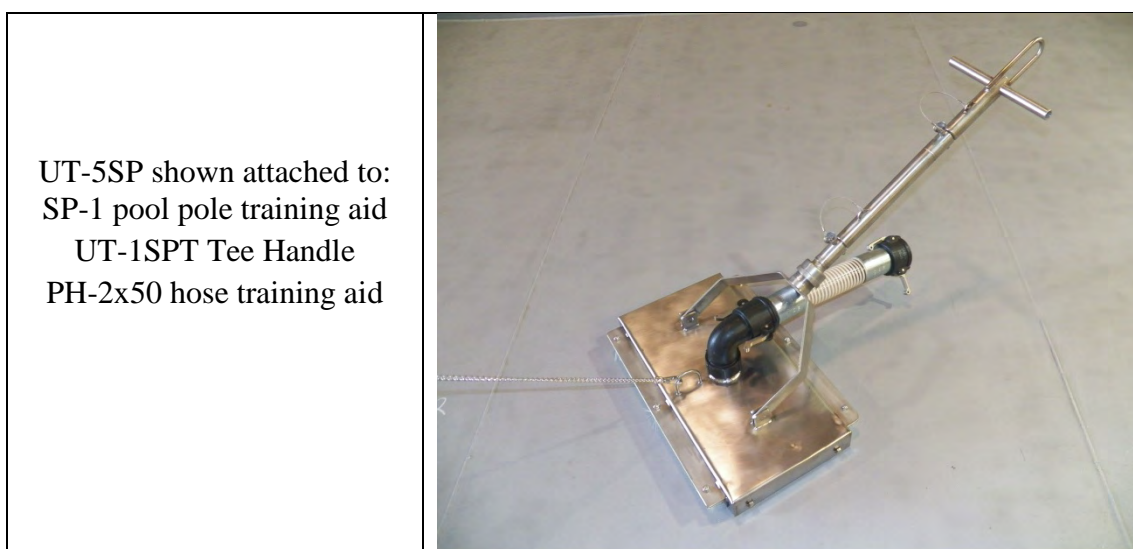
### 2.8.5 Filter Storage Rack (P/N: UT-3/6)

A six (6) tube 20in [25.4 cm] dia. x 33in [83.8cm] high rack for holding filter cartridges underwater adjacent to the Underwater Filter Unit to facilitate the speedy underwater change-out and replacement of filter cartridges. This rack has a removable center lift bail that terminates above the filter cartridges for easy lifting. The UT-3/6 is designed to be easily stored in a standard 55 gal. waste drum.

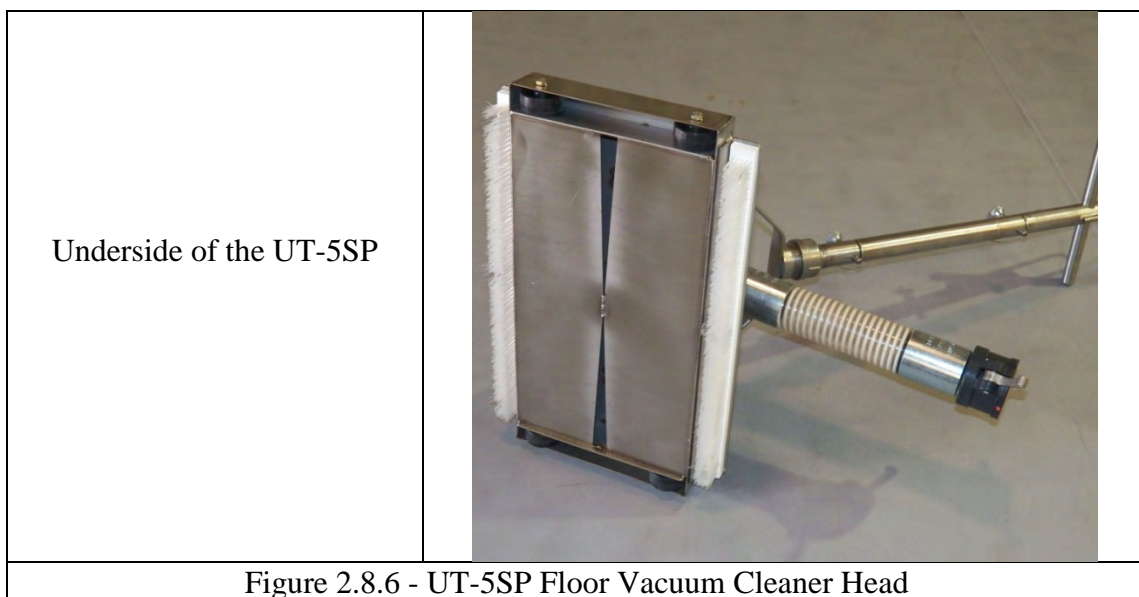


### 2.8.6 Floor Vacuum Cleaner Head (P/N: UT-5SP)

A 10in x 20in [25.4cm x 50.8cm] four wheel stainless steel vacuum cleaner head is equipped with two brushes, which attaches to the bottom pool pole and to the suction end of a 2in [50mm] vacuum hose leading to the UFV-260 Unit. The 2in [50mm] female hose connection is polypropylene.

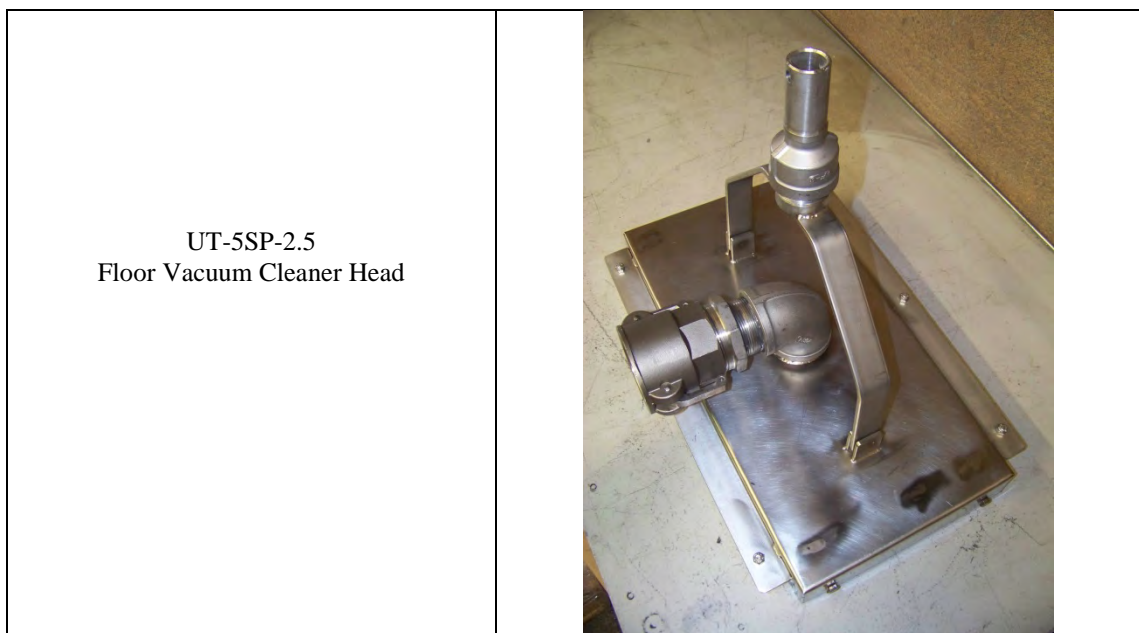






#### 2.8.6.1 Floor Vacuum Cleaner Head (P/N: UT-5SP-2.5)

A 10in x 20in [25.4cm x 50.8cm] four wheel stainless steel vacuum cleaner head is equipped with two brushes, which attaches to the bottom pool pole and to the suction end of a 2-1/2in [64mm] vacuum hose leading to the UFV-600 Unit. The 2-1/2in [64mm] female hose connection is stainless steel.

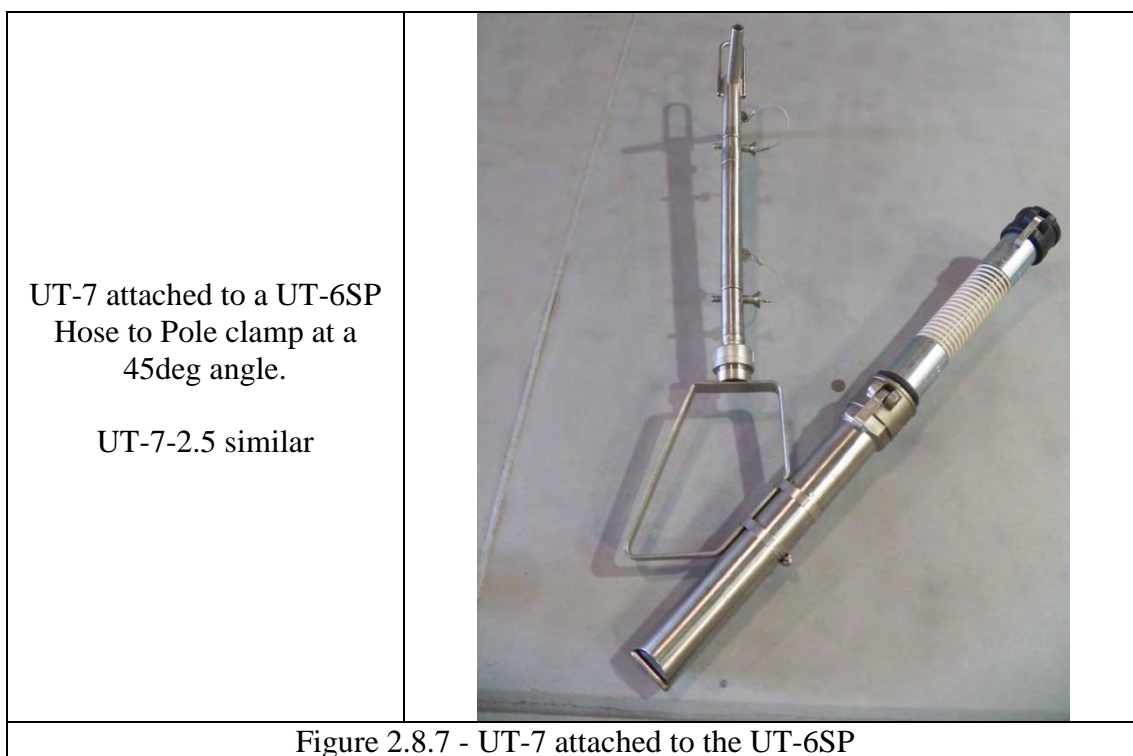


#### 2.8.7 Vacuum Nozzle (P/N: UT-7)

A 2in [50mm] dia.x 18in [45.7cm] vacuum nozzle is connected to the end of a vacuum hose. The vacuum nozzle is used for vacuuming small areas requiring high water velocity for lifting. This is used with the UT-6SP Hose to Pole Clamp.

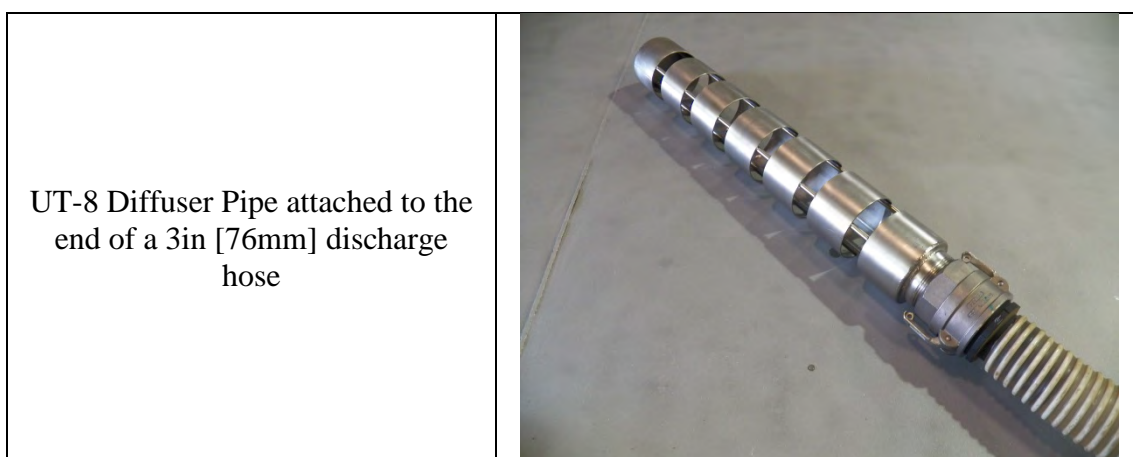
### 2.8.7.1 Vacuum Nozzle (P/N: UT-7-2.5)

A 2-1/2in [64mm] dia.x 18in [45.7cm] vacuum nozzle is connected to the end of a vacuum hose. The vacuum nozzle is used for vacuuming small areas requiring high water velocity for lifting. This is used with the UT-6SP Hose to Pole Clamp.



### 2.8.8 Diffuser Pipe (P/N: UT-8)

The Diffuser Pipe is 4.5in [114mm] dia x 32in [81cm] long and connects to the 3in [76mm] discharge hose from the PP-600SC pump. They are used to minimize the high discharge water velocity preventing hose-end whipping and surface water agitation.



### 2.8.9 Rope Filter Lift Tool (P/N: UT-9)

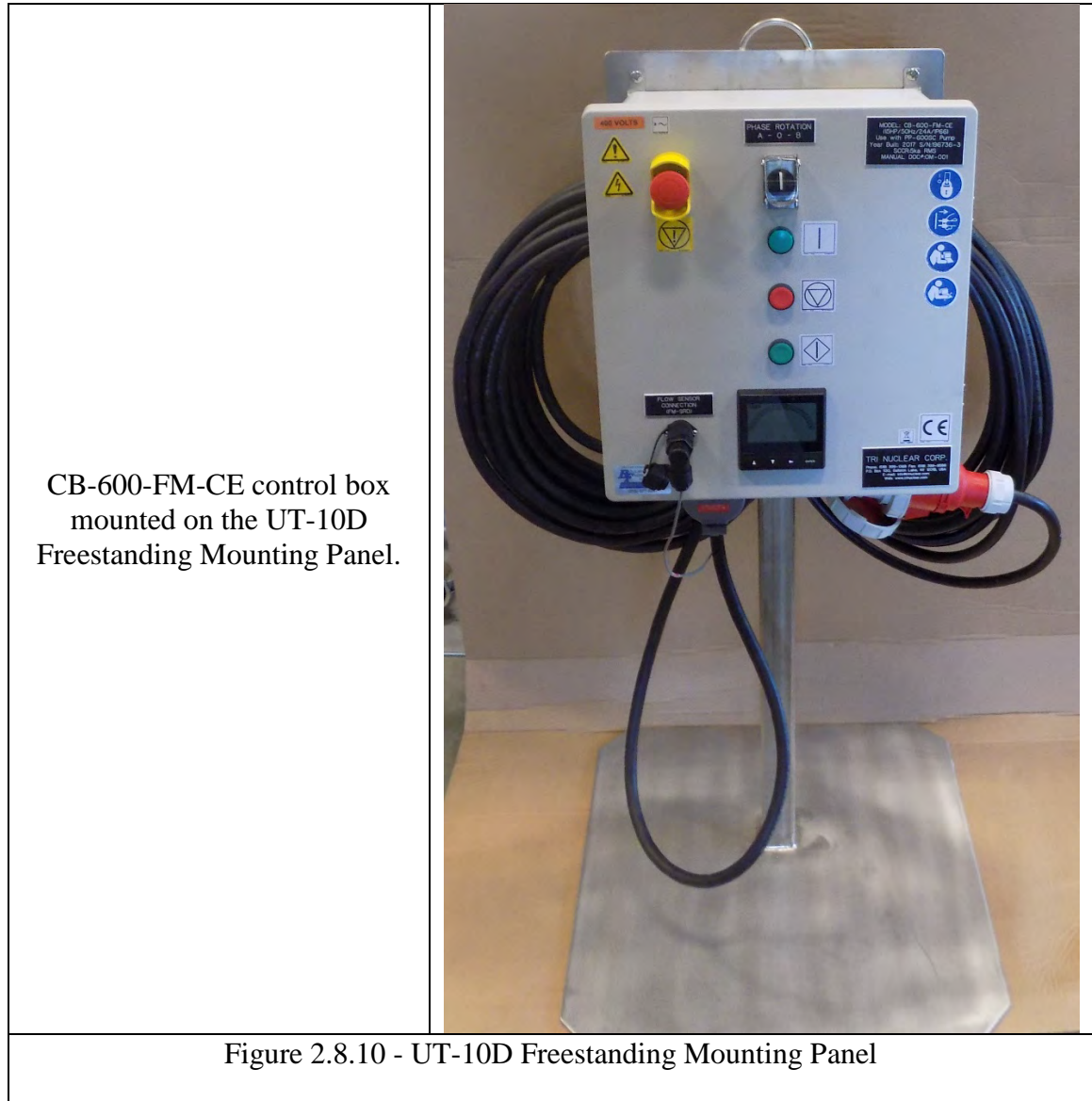
A special 18in [45.7cm] high tool is used for changing out filter cartridges remotely underwater using a customer supplied rope or chain. This tool uses a "positive latch" mechanism allowing for a very simple, effective, and quick method for filter change-out.

UT-9 Rope Filter Lift Tool	
UT-9 Rope Filter Lift Tool installed in a Tri Nuclear filter cartridge	
Figure 2.8.9 UT-9 Rope Filter Lift Tool	

### 2.8.10 Free Standing Mounting Panel (P/N: UT-10D)

The UT-10D free standing panel mounts the control box in one location and can be placed on any level floor.

The UT-10D includes hooks for hanging any excess cable lengths from the PC-50-CE drop cable, PSC-100P pump power cable, and the FM-SRD flow sensor cable. It can be easily moved around via hand cart or by crane via a top located lifting hoop.



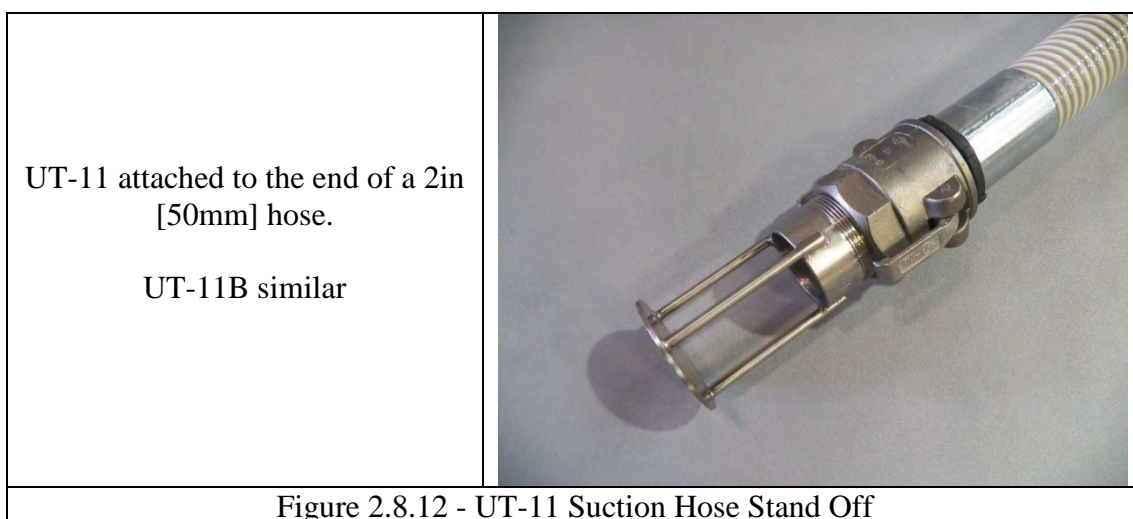


### 2.8.11 Suction Hose Stand-Off (P/N: UT-11)

The suction hose stand-off is a stainless steel, 2in [50mm] camlock adapter that is attached to the end of a 2in [50mm] suction hose. The suction hose stand-off prevents the hose from “dead heading” on the wall or floor.

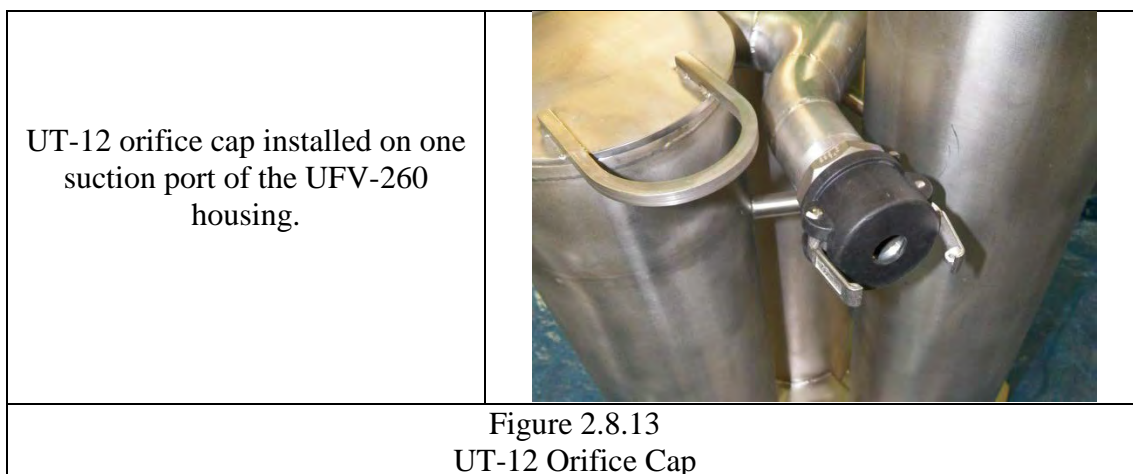
#### 2.8.11.1 Suction Hose Stand (P/N: UT-11B)

The suction hose stand-off is a stainless steel, 2-1/2in [64mm] camlock adapter that is attached to the end of a 2-1/2in [64mm] suction hose. The suction hose stand-off prevents the hose from “dead heading” on the wall or floor.



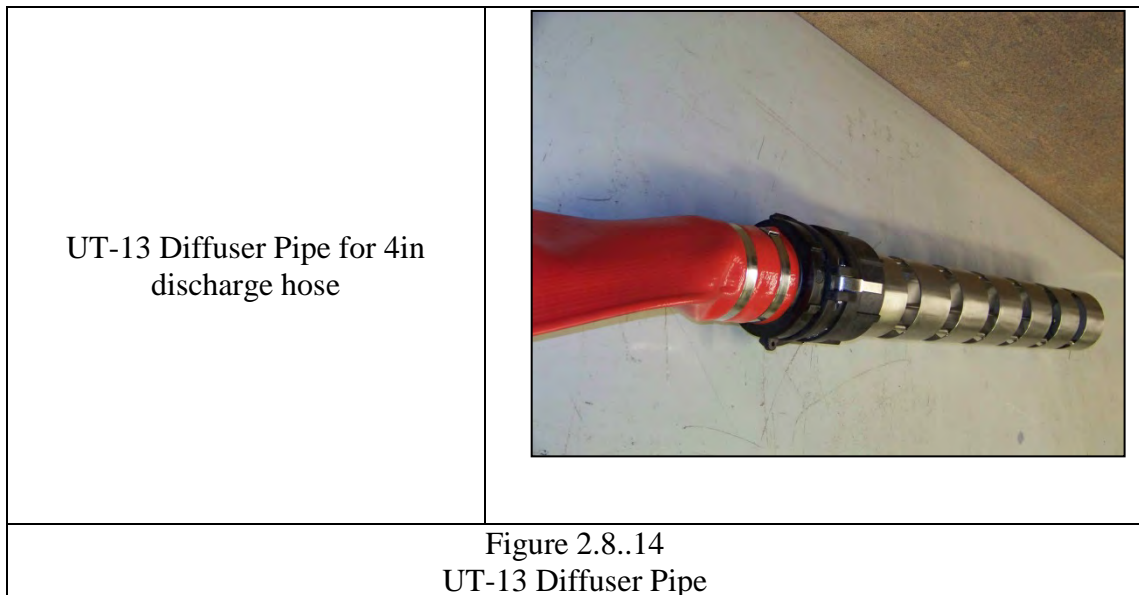
### 2.8.12 Orifice Cap (P/N: UT-12)

A 1in [24.5mm] orifice suction cap is shipped with each UFV-260 unit. This cap is to be installed on a suction port during single hose operations. The orifice provides sufficient flow to the pump to prevent cavitation



### 2.8.13 Diffuser Pipe (P/N: UT-13)

The Diffuser Pipe is 4.5in [114mm] dia x 32in [81cm] long and connects to the 4in [101mm] discharge hose from the PP-1000SC pump. They are used to minimize the high discharge water velocity preventing hose-end whipping and surface water agitation.



## 2.9 Tri Nuclear Filter Cartridges

Tri Nuclear Filter Cartridges are designed for inside to outside flow. This keeps major contamination on the inside of the filter cartridge and reduces contamination exposure to workers during filter change out and transfer.

The Polyester filter media has a higher dirt loading capacity than other similar media and results in longer filter runs. It also has a higher resistance to gamma radiation than conventional polypropylene media.

<b>CAUTION</b>	<b>At 10E6 RADs [10,000 Sieverts] accumulated dose, filter cartridges can start to break down.</b>
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Design Data:

Size: 6in [152mm] dia x 30in [762mm] long  
 Flow: Inside to outside, open top, solid bottom  
 Media: Pleated Polyester  
 Shroud: 18x18 Stainless Steel Mesh  
 Storage: Designed for long term underwater storage  
 Max D/P: 25PSID [172kPa]  
 Max Flow: 150 GPM per filter [568 LPM]  
 Max Temp: 140F [60C]

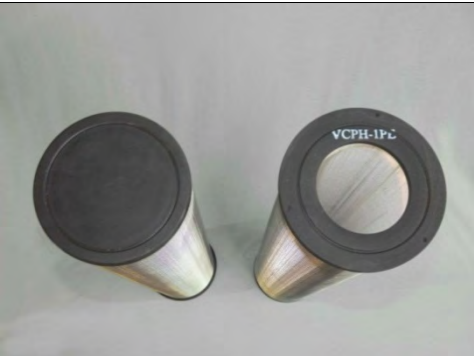
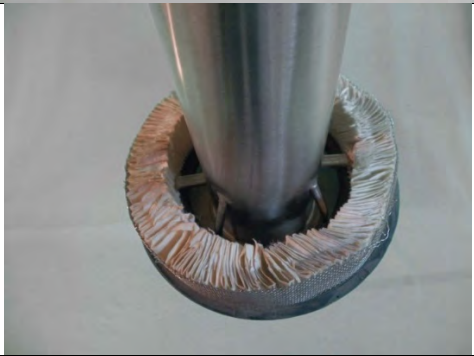

Filter Cartridge Data					
TNC Part No.	Cartridge Size	Size Rating	Media Area	Media Type	Weight Each
VCPH-0.1G	0.1 µ (micron)	Nominal	52 Sq. Ft. [4.8 m <sup>2</sup> ]	Micro Glass	6 Lbs. [2.72kg]
VCPH-0.3PE	0.3 µ (micron)	Nominal	60 Sq. Ft. [5.6 m <sup>2</sup> ]	Polyester	6 Lbs. [2.72kg]
VCPH-1PE	1.0 µ (micron)	Nominal	62 Sq. Ft. [5.8 m <sup>2</sup> ]	Polyester	4.21 Lbs. [1.91kg]
VCPH-5PE	5.0 µ (micron)	Nominal	85 Sq. Ft. [7.9 m <sup>2</sup> ]	Polyester	3.83 Lbs. [1.74]
VCPH-10PE	10.0 µ (micron)	Nominal	64 Sq. Ft. [5.9 m <sup>2</sup> ]	Polyester	4.21 Lbs. [1.91kg]
VCPH-20PE	20.0 µ (micron)	Nominal	64 Sq. Ft. [5.9 m <sup>2</sup> ]	Polyester	4 Lbs. [1.81kg]

Guidelines for filter selection:

- The 10 micron filter VCPH-10PE is normally chosen for high dirt loading when vacuuming settled particulate.
- The 5 micron filter VCPH-5PE will capture material that might bypass the 10 micron during vacuuming.
- The 1 micron filter VCPH-1PE is excellent for water clarity issues.
- The 0.3 micron VCPH-0.3PE filter is used for “polishing” when water clarity is “a must”.
- The 0.1 micron VCPH-0.1G filter is used when particles bypass the 0.3 micron filter and re-establishing water clarity is needed.

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Typical Tri Nuclear Filter Cartridge showing the open top and solid bottom.			
Cut away view of a typical Tri Nuclear Filter Cartridge with the UT-9 Rope Filter Lift Tool engaged.			
Looking into a standard Tri Nuclear Filter Cartridge			
<p>Figure 2.9 Typical Tri Nuclear Filter Cartridge</p>			



## 2.10 Strainer Basket (SB-.125)

(OPTIONAL EQUIPMENT)

The Tri Nuclear Strainer Basket is designed for large particle (>1/8in [3.18mm] dia) collection / separation. The SB-.125 is used in place of a standard filter cartridge and can be installed and removed with the UT-9 Rope Filter Lift Tool.

The SB-.125 strainer basket is designed to be dumped out by upending the basket when the open cutout at the bottom of the basket is grappled. This allows for inspection of collected particles.

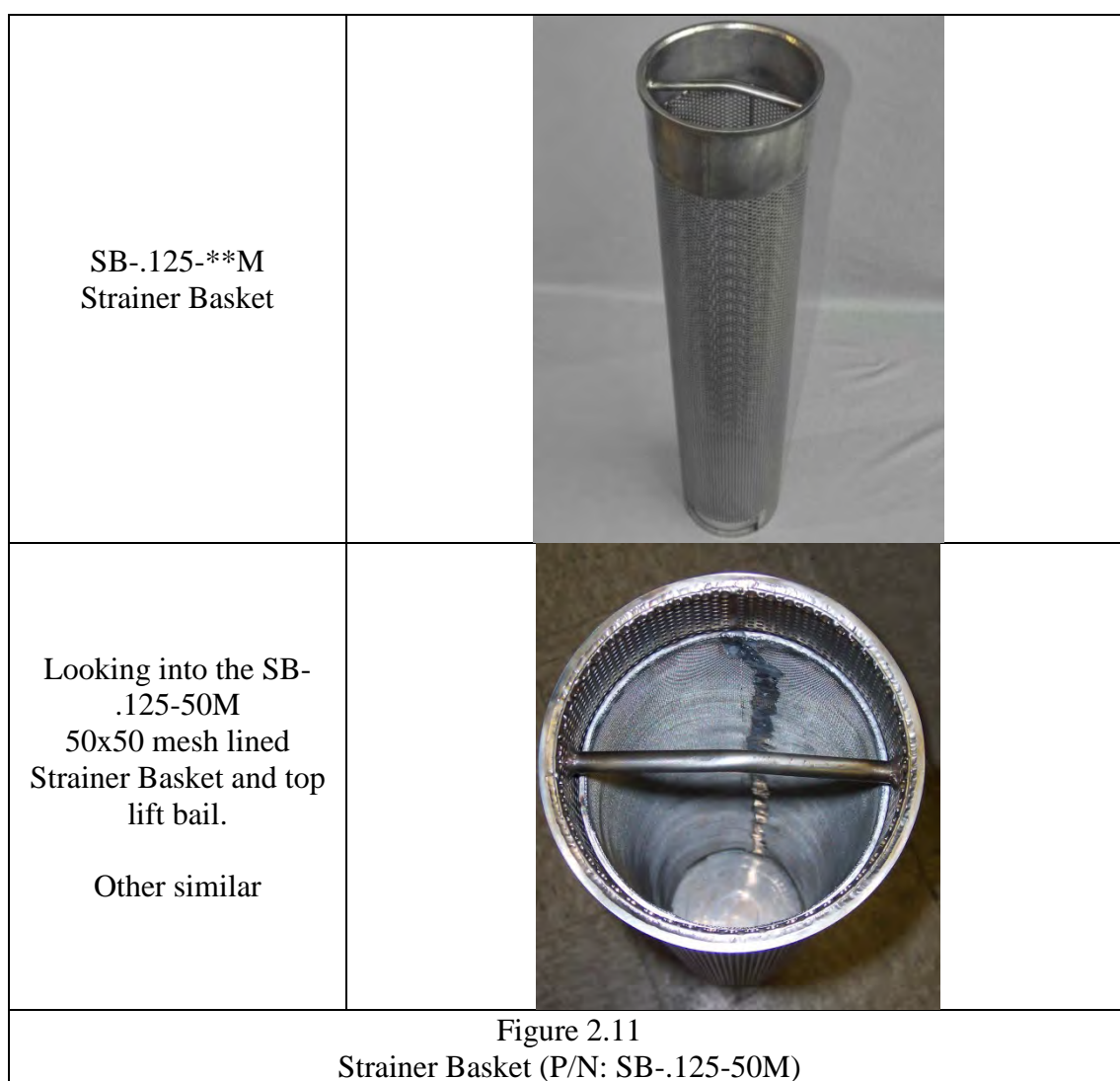


## 2.11 Mesh Lined Strainer Basket (P/N: SB-.125-\*\*-M) (OPTIONAL EQUIPMENT)

The Tri Nuclear Mesh Lined Strainer Basket is designed for fine particle collection / separation using a stainless steel mesh liner. The SB-.125-\*\*-M (where \*\* is the mesh screen size) is used in place of a standard filter cartridge and can be installed and removed with the UT-9 Rope Filter Lift Tool.

TNC Mesh Lined Strainer Basket Data		
Part Number	Mesh Size	Open Square Size
SB-.125-50M	50x50 mesh	0.012in [0.3mm] Opening
SB-.125-100M	100x100 mesh	0.006in [0.15mm] Opening
SB-.125-200M	200x200 mesh	0.003in [0.76mm] Opening
SB-.125-400M	400x400 mesh	0.0015in [0.038mm] Opening

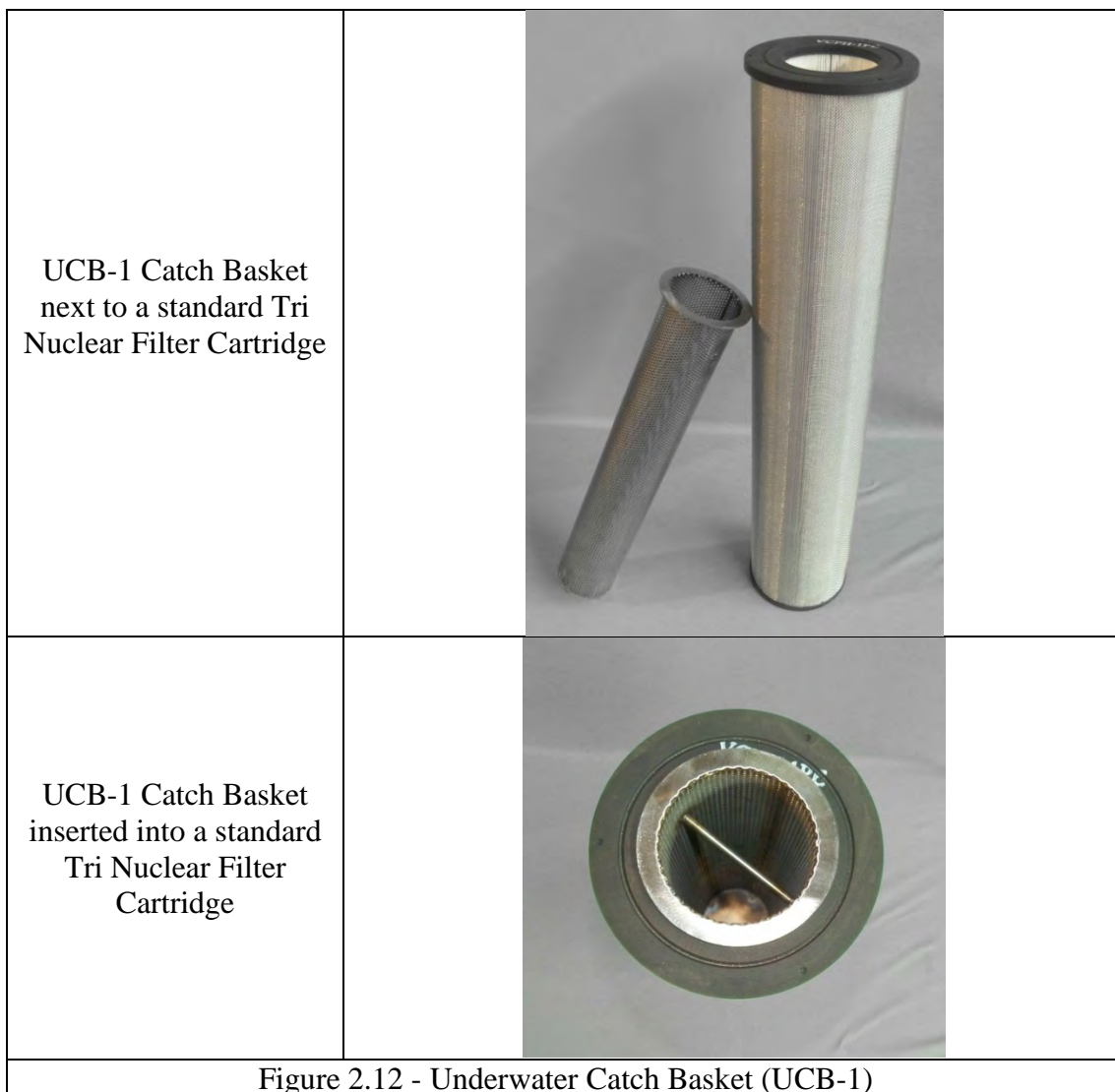
The SB-.125-\*\*-M strainer basket is designed to be dumped out by upending the basket when the open cutout at the bottom of the basket is grappled. This allows for inspection of collected particles.



## 2.12 Underwater Catch Basket (UCB-1) (OPTIONAL EQUIPMENT)

The UCB-1 Underwater Catch Basket is 20in [508mm] long designed to be inserted into the open end of a standard Tri Nuclear Filter Cartridge. Its purpose is to collect large particles  $>3/32$ in [2.38mm] and prevent them from becoming embedded in a Filter Cartridge. This helps minimize the chance a filter cartridge being classified as Intermediate level waste during actions where highly radioactive particles could be vacuumed up.

The UCB-1 is installed and removed using the UT-9 Rope Filter Lift Tool. Like the SB-.125, the UCB-1 is designed to be dumped out by upending the catch basket when one of the open loops at the bottom of the catch basket is grappled. This allows for inspection of collected particles.



### 3.0 Equipment as Shipped

This is a general description of how the equipment is normally shipped. Actual shipments may differ depending on customer shipping requirements.

TNC Part Number	Description	Materials of Construction
UFV-100H	Basic Housing for UFV-100 system	Shipped in Crate #1
UFV-260H	Basic Housing for UFV-260 system	Shipped in Crate #1
UF-600H	Basic Housing for UF-600 system	Shipped in Crate #1
UFV-600H	Basic Housing for UFV-600 system	Shipped in Crate #1
UF-1000H	Basic Housing for UF-1000 system	Shipped in Crate #1
PP-100SC-CE	Grundfos pump, 2HP/400V/3Ph/50Hz, w/cover & SC connector	Shipped in Crate #1
CB-100-FM-CE	2 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-600 LPM digital flow meter.	Shipped in Crate #1
PP-260SC-CE	Grundfos pump, 5HP/400V/3Ph/50Hz, w/cover & SC connector	Shipped in Crate #1
CB-260-FM-CE	5 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-2,000 LPM digital flow meter.	Shipped in Crate #1
PP-600SC-CE	Grundfos pump, 15HP/400V/3Ph/50Hz, w/cover & SC connector	Shipped in Separate Pump Crate
CB-600-FM-CE	15 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-4,000 LPM digital flow meter.	Shipped in Separate Pump Crate
PP-1000SC-CE	Grundfos pump, 20HP/400V/3Ph/50Hz, w/cover & SC connector	Shipped in Separate Pump Crate
CB-1000-FM-CE	20 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-6,000 LPM digital flow meter.	Shipped in Separate Pump Crate
PSC-100P	PSC-100P Power Cable with twist lock plug (100ft [30.5m] 10/4 SO Cable w/ male twistlock plug)	Shipped in Crate #1 or Shipped in Separate Pump Crate depending on the system.
PC-50-CE	PC-50-CE drop cable with female plug (50ft [12.4m] Cable w/ female connector)	Shipped in Crate #1 or Shipped in Separate Pump Crate depending on the system.
FM-SRD	Flow sensor with reinforced paddlewheel and 100ft [30.5m] cable with Amphenol connector.	Shipped in Crate #1 or Shipped in Separate Pump Crate depending on the system.
PH-2x50-EP	2in x 50ft [50mm x 12.24m] EPDM suction hose with MxF camlock couplers	Shipped in Crate #1
PH-2.5x50-EP	2.5in x 50ft [64mm x 12.24m] EPDM suction hose with MxF camlock couplers	Shipped in Crate #1
PH-3x25-EP	3in x 25ft [76mm x 7.62m] EPDM discharge hose with MxF camlock couplers	Shipped in Crate #1

### 3.0 Equipment as Shipped (continued)

TNC Part Number	Description	Materials of Construction
PH-4x25-EP	4in x 25ft [101mm x 7.62m] EPDM discharge hose with MxF camlock couplers	Shipped in Crate #1
SP-1	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 10ft [3.05m] lg, with pinned coupler.	Shipped in Separate Pool Pole Pump Crate
SP-1x5	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 5ft [1.52m] lg, with pinned coupler.	Shipped in Separate Pool Pole Pump Crate
SP-1x3	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 3ft [0.91m] lg, with pinned coupler.	Shipped in Separate Pool Pole Pump Crate
SP-1x2	Stainless Steel Pool Pole, 1in [25.4mm] Dia x 2ft [0.61m] lg, with pinned coupler.	Shipped in Separate Pool Pole Pump Crate
BC-1	Buoyancy Float	Shipped in Crate #1
UT-1SPT	Stainless Steel Pool Pole "T" Handle	Shipped in Crate #1
UT-3/6	Floor Storage Rack for (6) Tri Nuclear Filter Cartridges	Shipped in Crate #1
UT-3H	Hanging Filter Storage Rack for (6) Tri Nuclear Filters	Shipped in Crate #1
UT-5SP	Floor Vacuum Cleaner Head	Shipped in Crate #1
UT-5SP-2.5	Floor Vacuum Cleaner Head for use with 2-1/2in [64mm] hose	Shipped in Crate #1
UT-6SP	Hose to Pole Clamp	Shipped in Crate #1
UT-7	Stainless Steel Vacuum Nozzle	Shipped in Crate #1
UT-7-2.5	SS Vacuum nozzle for 2-1/2in [64mm] suction hose	Shipped in Crate #1
UT-8	Diffuser Pipe for UF-600 discharge hose	Shipped in Crate #1
UT-9	Rope Filter Lift Tool	Shipped in Crate #1
UT-10A	Mounting Panel for mounting Flow Meter and Phase Reversing Control Box	Shipped in Crate #1
UT-11	Suction Hose Standoff	Shipped in Crate #1
UT-11B	Suction Hose standoff for 2-1/2in [64mm] hose	Shipped in Crate #1
UT-12	1in [25.4mm] Orifice Cap	Shipped in Crate #1
UT-13	Diffuser Pipe for 4in [101mm] discharge hose	Shipped in Crate #1

RECEIPT INSPECTION - Carefully inspect the main unit and pump for any shipping damage. Using the EGL (Equipment Guide List), verify all material ordered has been received.

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## 4.0 Assembly and Installation in Pool

### 4.1 Pre Start Up

#### 4.1.1 Mount the CB-xxx-FM-CE control box to the UT-10D mounting panel

- 4.1.1.1 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 box with a flat head screwdriver.

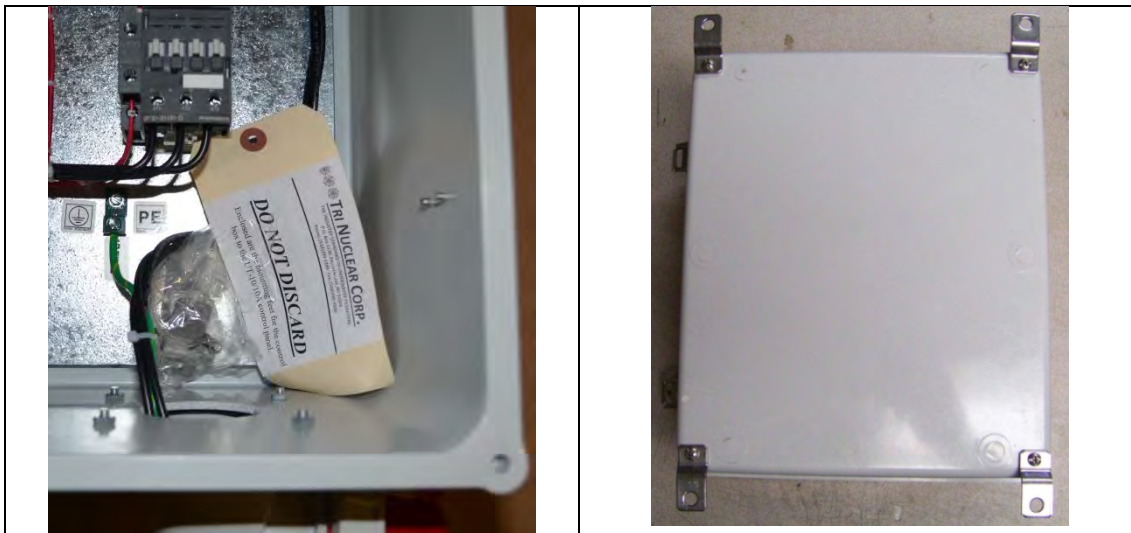
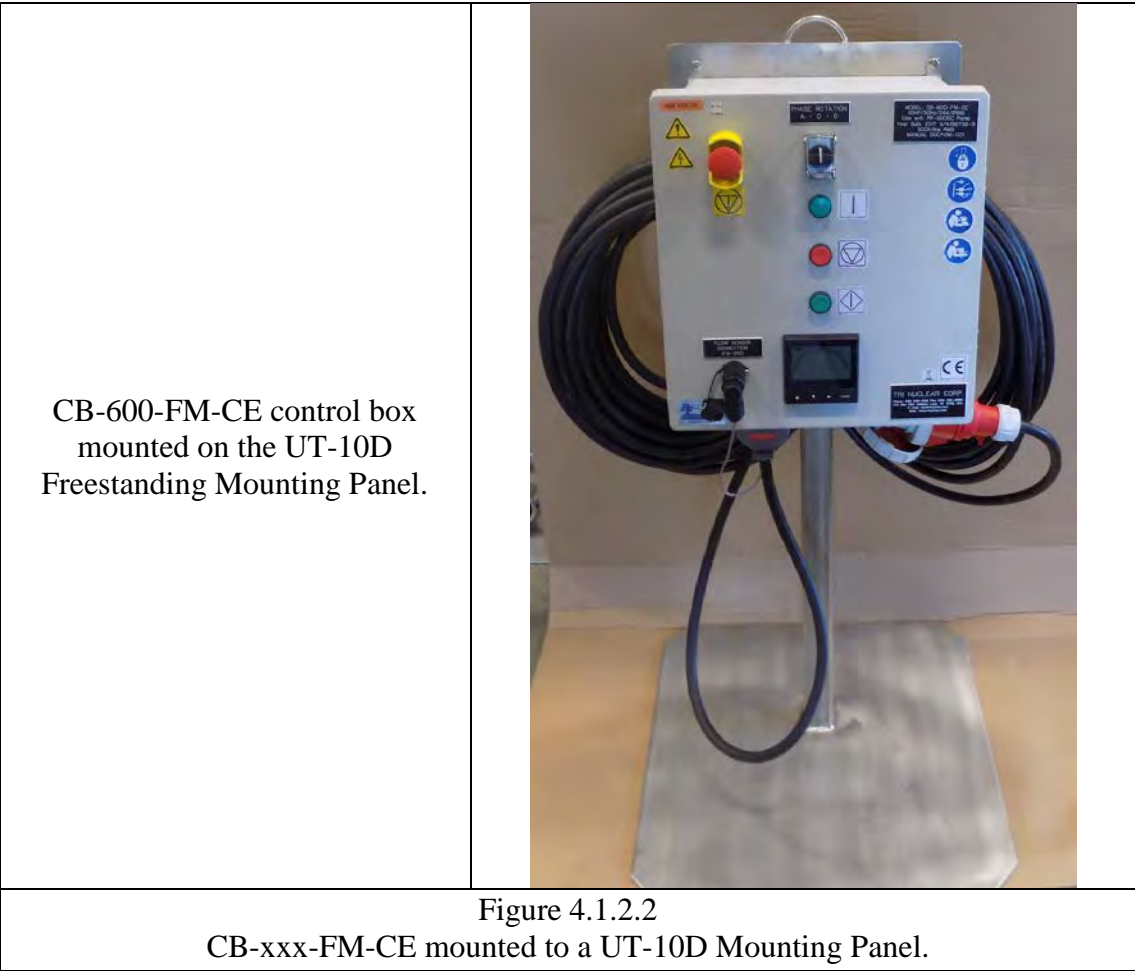


Figure 4.1.1.1

Mounting feet installed on the back of the CB-600-FM-CE control box  
All other CB-xxx-FM-CE control boxes similar.

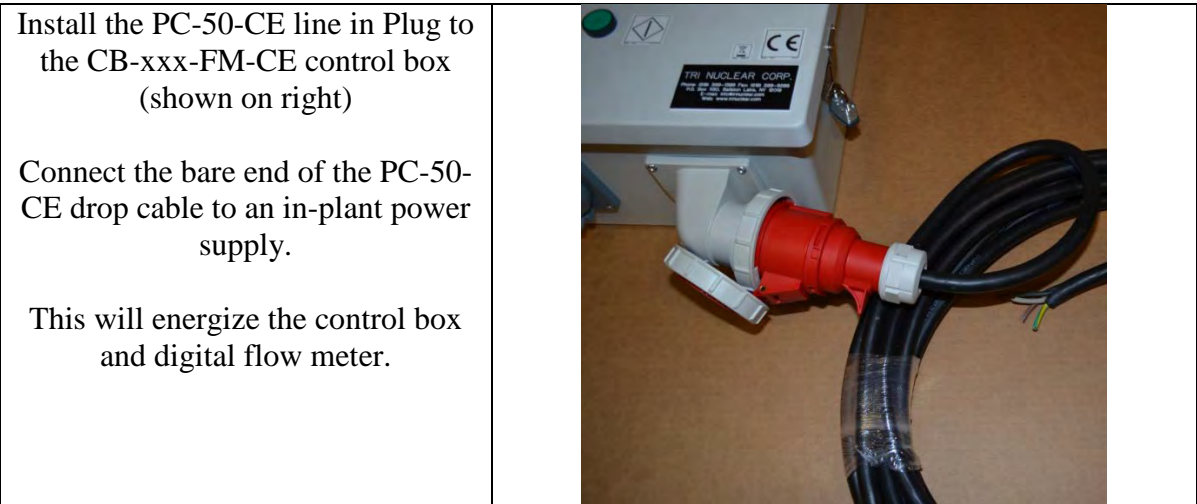
- 4.1.2.2 Using a #3 Phillips Screwdriver and a 1/2in [13mm] open or box end wrench, mount the CB-xxx-FM-CE control box using the four (4) mounting screws, lock washers & nuts (located on the UT-10D mounting panel) assembly on the UT-10D Mounting panel.





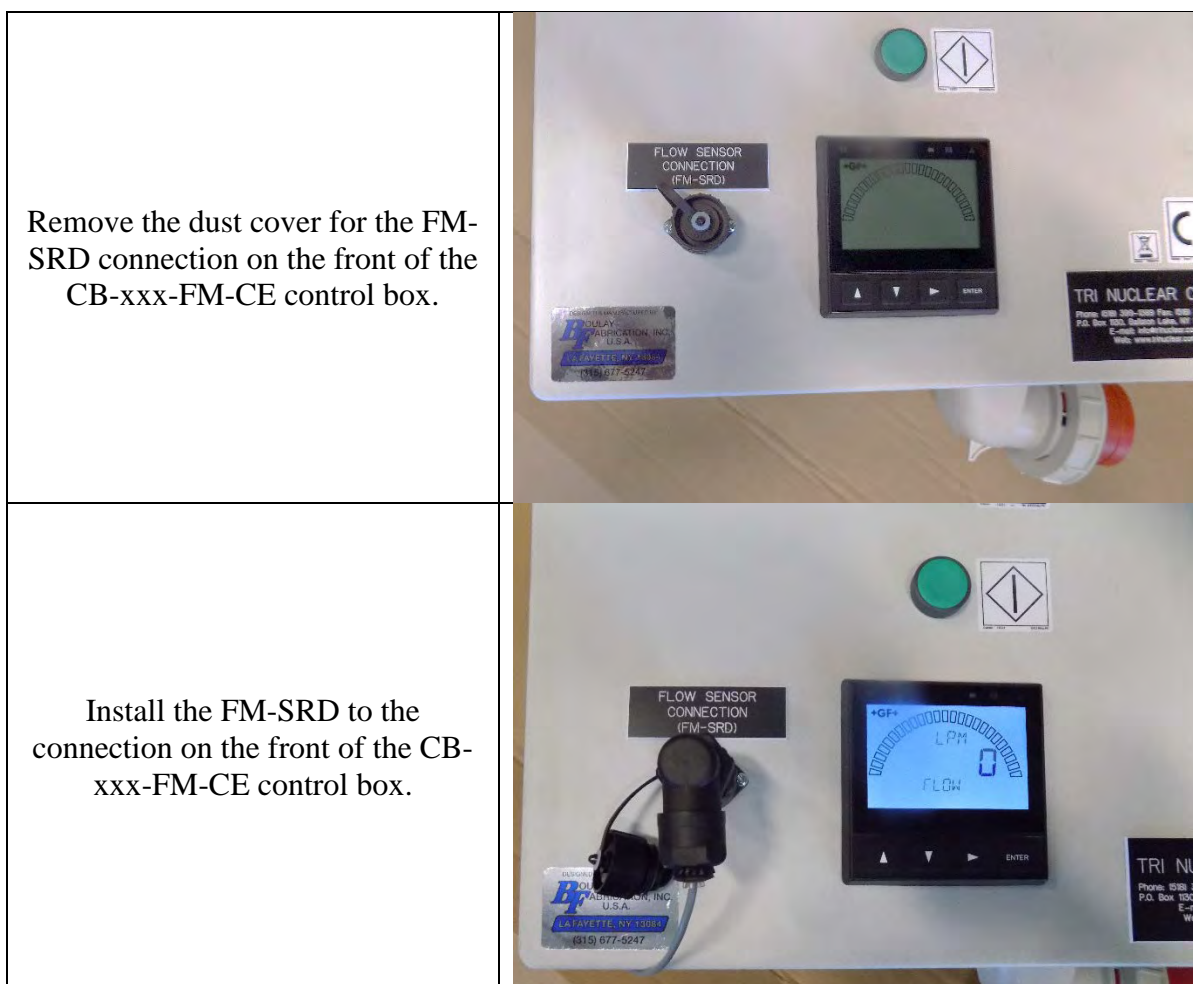
4.1.2 Install line in power to the Control Box

After the CB-xxx-FM-CE control box has been mounted to the UT-10D Mounting Panel, attach the PC-50-CE Drop Cable as shown below:



#### 4.1.3 Install the Digital Flow Sensor cable to the control box

After the CB-xxx-FM-CE control box has been mounted to the UT-10D mounting panel, attach the FM-SRD cable to the control box:





#### 4.1.4 Energize the control box



##### 4.1.4.1 Energize the control box by supplying power to the PC-50 power cable.

#### 4.1.5 Digital Flow Sensor installation in the pump.

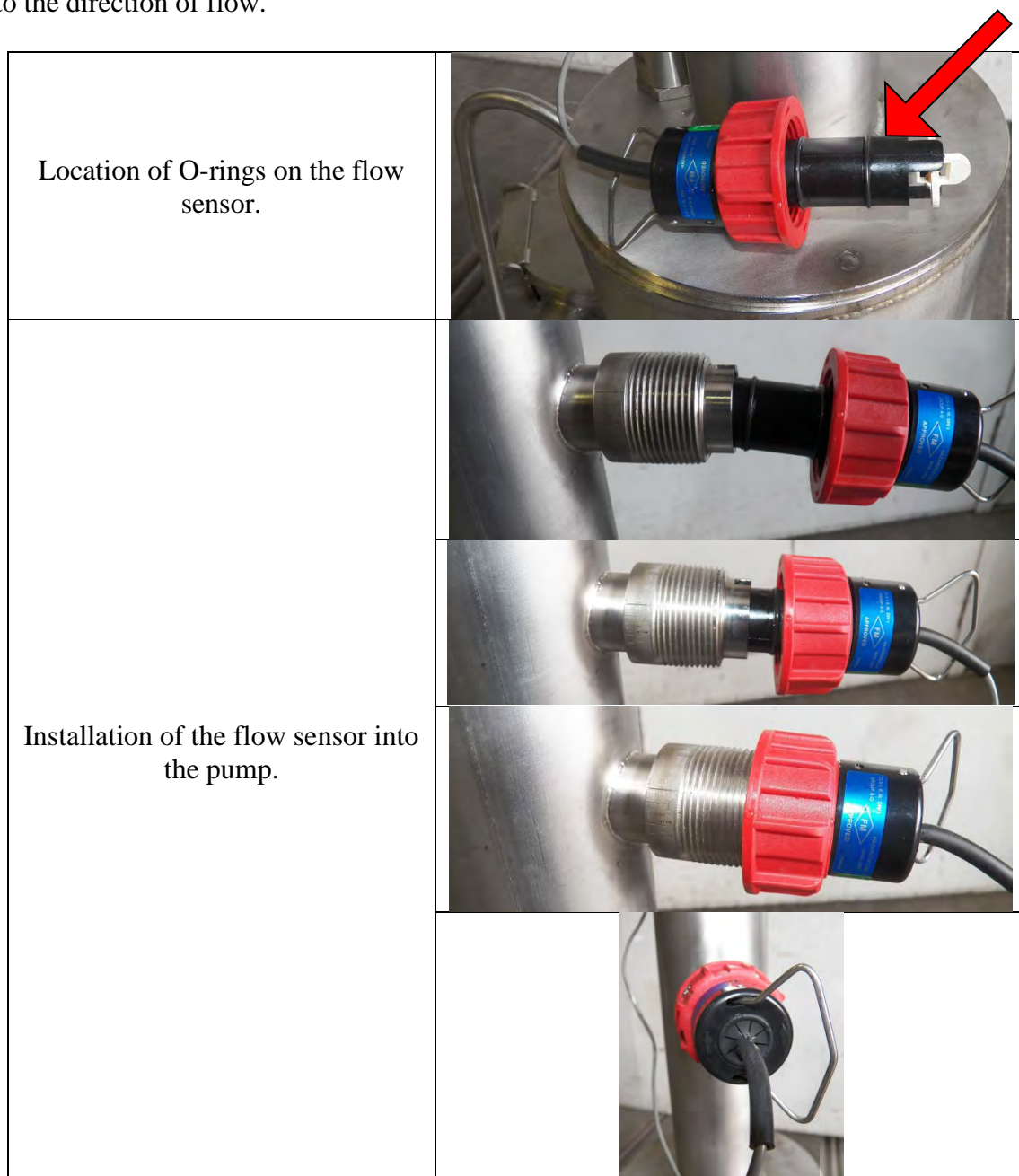
<b>NOTICE</b>	<b>Perform a flow meter check:</b> <ul style="list-style-type: none"><li>- Prior to initial installation</li><li>- When sensor is replaced</li><li>- Sensor is suspected to be damaged</li></ul>
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##### 4.1.5.1 Prior to installing the flow sensor in the pump, perform a flow meter check by flipping the paddle wheel with a finger to check for dial read-out response. You should be able to achieve 1/2 to full scale deflection by spinning the paddlewheel in either direction.

This is to ensure the flow sensor and digital meter work prior to installing the pump in the water.

FM-SRD prior to installation to a Tri Nuclear pump	
Meter readout showing 2440 LPM on the CB-600-FM -CE during the flow sensor check.  All other CB-xxx-FM-CE control boxes similar.	

- 4.1.5.2 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.
- 4.1.5.3 Prior to installing the flow sensor in the pump, lubricate the O-rings with DI water or other approved lubricant
- 4.1.5.4 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.




#### 4.1.6 Pump Power Cable

<b>CAUTION</b>	<ul style="list-style-type: none"> <li>• When installing the power cord to the pump, ensure the keyway male end on the PSC-100P cable is aligned with the female keyway on the SC connector on the pump.</li> <li>• Ensure the PSC-100P plug is sufficiently lubricated with a non-conductive electrical lubricant (Dow Corning #4).</li> <li>• Do no excessive downforce or side-to-side action to try and “make it fit” as you may damage the plug.</li> <li>• Install the power cord to pump pigtail HAND TIGHT ONLY. Do NOT use any tools (pliers, channel locks etc.) to tighten the connection.</li> </ul>
<b>CAUTION</b>	<ul style="list-style-type: none"> <li>• When removing the power cord, be sure that the plug is fully unthreaded and pull in a vertical direction only.</li> <li>• Do not use side-to-side action to try and “loosen it up” as you may damage the plug.</li> </ul>

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.

<p>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</p> <p>The plug provides a waterproof seal; therefore, the pump assembly can be stored underwater with the seal plug installed.</p>	
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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 PSC-100P cable.



PSC-100P shown being installed on a PP-260SC-CE pump. All other pump similar

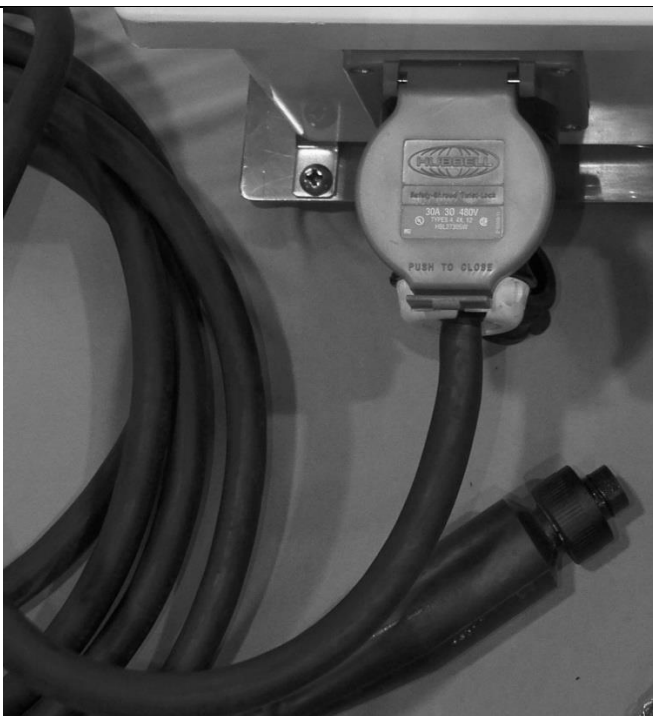


#### 4.1.7 Install Pump Power Cables to the Control Box

Attach the PSC-100P power cord to the CB-xxx-FM-CE control box as shown below:

Install the PSC-100P Pump Power  
Cable Twist Lock Plug to the  
CB-xxx-FM-CE control box  
(shown on left)

All other control boxes similar.






#### 4.1.8 Zip-Tie Cables Together


Lay-out the 100 ft. of pump power cable and flow meter cable in a straight line. Tie the two 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.




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## 4.2 Installing the unit in the water.

	Do not submerge the control box for any reason.
---	---

	Do NOT use the electrical cables to lift the pump out of the water.
---	---

<b>CAUTION</b>	Slowly lower the housing into the water. This allows water to fill the housing from the drain hole(s) in the base plate. Lowering the unit too fast may cause it to become unstable until it fills with water.
----------------	--

	Running the unit without hoses will not produce desired results in pool filtration or water clarity.
---	--

			
PP-260SC-CE pump being installed in a UFV-260 housing All PP-100SC-CE & PP-600SC-CE similar		The pump will ‘self-center’ as it is lowered into the housing.	
Figure 4.2 - Pump Installation			

### 4.2.1 Install the UFV-100-CE in the water.

4.2.1.1 Install the PH-2x50-EP suction hose to the suction of the UFV-100-CE Housing. Ensure a suction hose stand-off (UT-11), vacuum nozzle (UT-7) or a vacuum cleaner head is installed on the end of the hose. This prevents the hose from “deadheading” on the pool floor or wall.

4.2.1.2 Install the PP-100SC-CE pump in the housing. This step can be performed after the housing has been placed in the pool.

4.2.1.3 Attach customer supplied rigging to the UFV-100-CE housing center lift point. Lower the unit to the bottom of the pool and tie-off the lifting line to the side of the pool.

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#### 4.2.2 Install the UFV-260-CE in the water.

- 4.2.2.1 Install the two PH-2x50-EP suction hoses to the suction ports of the UFV-260-CE Housing. Ensure a suction hose stand-off (UT-11), vacuum nozzle (UT-7) or a vacuum cleaner head is installed on the end of each hose. This prevents the hose from “deadheading” on the pool floor or wall.



Figure 4.2.2.1 - PH-2x50-EP installed on the UFV-260-CE Housing

- 4.2.2.2 If only one hose is required for operation, the 1in orifice cap (P/N UT-12) MUST be installed on the other suction port. See section 5.2.4 for details of single hose operations.



Figure 4.2.1.2 – UT-12 Orifice Cap installed on the UFV-260-CE Housing

- 4.2.2.2 Install the PP-260SC-CE pump in the housing. This step can be performed after the housing has been placed in the pool.
- 4.2.2.3 Attach customer supplied rigging to the UFV-260-CE housing center lift point. Lower the unit to the bottom of the pool and tie-off the lifting line to the side of the pool.

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#### 4.2.3 Install the UF-600-CE in the water.

Prior to proceeding with the UF-600 system installation in the pool, a decision must be made as to HOW the equipment will be installed, meaning will it be installed in one lift (pump installed in the housing) or two lifts (pump installed AFTER the housing is in place).

The reason why a decision must be made is the UF-600 has a swing lift bale and the discharge hoses on the PP-600SC-CE pump have a very specific orientation depending on if one lift or two is chosen.

Advantages of single lift: One lift and the pump and housing are installed in the pool.

Disadvantages of a single lift: If there are problems with the pump, any troubleshooting of the pump & flow sensor require the entire UF-600 system to be removed from the pool.

Advantages of two lifts: It allows for the pump to be removed from the housing for troubleshooting the flow sensor or replacement if necessary without having to lift the housing out of the pool.

Disadvantages of two lifts: You have to perform two lift to install the UF-600 in the pool. This could impact critical path time.

- 4.2.3.1 Install the two PH-3x25-EP discharge hoses to the discharge of the PP-600SC-CE pump. Install the two UT-8 diffuser pipes to the end of the hoses. It is recommended handling lines be tied to the diffuser ends for moving the hoses underwater to desired locations. The diffuser pipes are used to dampen a hose “whip” reaction which would occur on the end of a discharge hose.

NOTE: If performing a single lift, the hoses must be installed after the PP-600SC-CE pump is installed in the housing and oriented such that the hoses do not interfere with the lift bale swing.

- 4.2.3.2 Install the PP-600SC-CE pump in the housing.

- 4.2.3.3 Attach customer supplied rigging to the UF-600-CE housing center lift point. Lower the unit to the bottom of the pool and tie-off the lifting line to the side of the pool.

#### 4.2.4 Install the UFV-600-CE in the water.

### NOTICE

The UFV-600 must be run with either suction OR discharge hoses installed. It is NOT desired OR required to run the unit with BOTH suction and discharge hoses installed.

Prior to proceeding with the UFV-600 system installation in the pool, a decision must be made as to HOW the equipment will be installed, meaning will it be installed in one lift (pump installed in the housing) or two lifts (pump installed AFTER the housing is in place).

The reason why a decision must be made is the UFV-600 has a swing lift bale and the discharge hoses on the PP-600SC-CE pump have a very specific orientation depending on if one lift or two is chosen.

Advantages of single lift: One lift and the pump and housing are installed in the pool.

Disadvantages of a single lift: If there are problems with the pump, any troubleshooting of the pump & flow sensor require the entire UFV-600 system to be removed from the pool.

Advantages of two lifts: It allows for the pump to be removed from the housing for troubleshooting the flow sensor or replacement if necessary without having to lift the housing out of the pool.

Disadvantages of two lifts: You have to perform two lift to install the UFV-600 in the pool. This could impact critical path time.

4.2.3.1 Install the two PH-3x25-EP discharge hoses to the discharge of the PP-600SC-CE pump. Install the two UT-8 diffuser pipes to the end of the hoses. It is recommended handling lines be tied to the diffuser ends for moving the hoses underwater to desired locations. The diffuser pipes are used to dampen a hose “whip” reaction which would occur on the end of a discharge hose.

NOTE: If performing a single lift, the hoses must be installed after the PP-600SC-CE pump is installed in the housing and oriented such that the hoses do not interfere with the lift bale swing.

4.2.3.2 Install the PH-2.5x50-EP suction hose to the suction of the UFV-100-CE Housing. Ensure a suction hose stand-off (UT-11B), vacuum nozzle (UT-7-2.5) or a vacuum cleaner head is installed on the end of the hose. This prevents the hose from “deadheading” on the pool floor or wall.

4.2.3.3 Install the PP-600SC-CE pump in the housing.

4.2.3.3 Attach customer supplied rigging to the UF-600-CE housing center lift point. Lower the unit to the bottom of the pool and tie-off the lifting line to the side of the pool.

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#### 4.2.4 Install the UF-1000-CE in the water.

4.2.4.1 Install the two PH-4x25-EP discharge hoses to the discharge of the PP-1000SC-CE pump. Install the two UT-13 diffuser pipes to the end of the hoses. It is recommended handling lines be tied to the diffuser ends for moving the hoses underwater to desired locations. The diffuser pipes are used to dampen a hose “whip” reaction which would occur on the end of a discharge hose.

4.2.4.2 Install the PP-1000SC-CE pump in the housing. This step can be performed after the housing has been placed in the pool.

<b>NOTICE</b>	The PP-1000SC-CE pump discharge “T” must be in parallel with the lifting plates on the UF-1000-CE housing. The pump housing has internal guide bars to correctly position the pump cover and prevent the cover from rotating during operation. If the pump is installed in any other configuration, it will prevent the installation and/or removal of filter cartridges.
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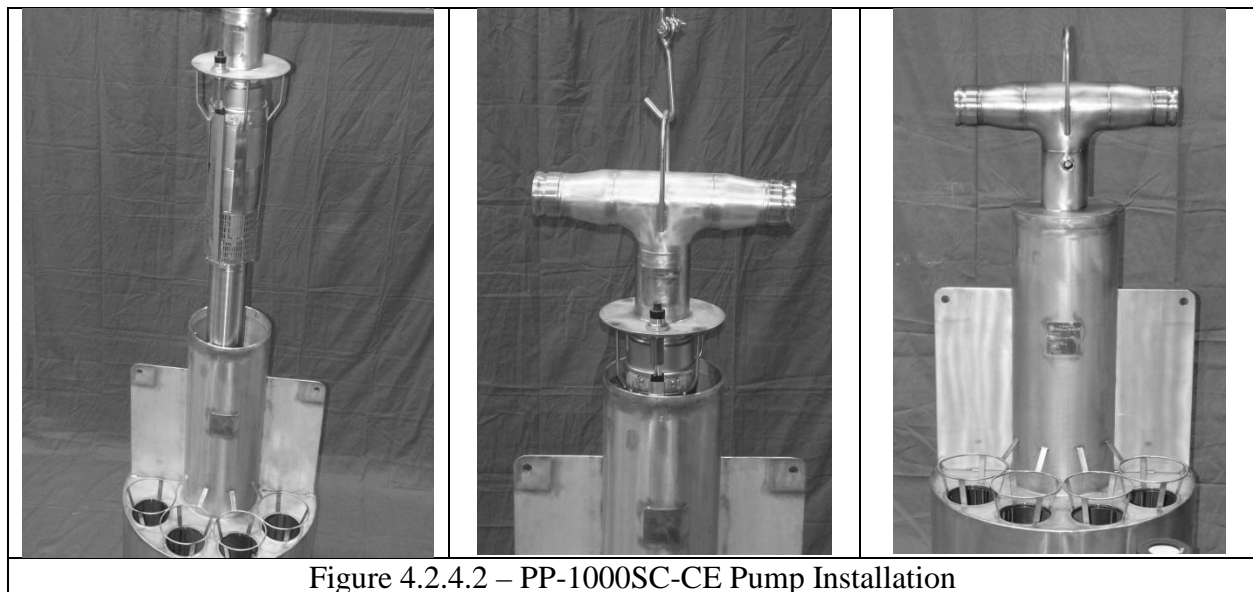


Figure 4.2.4.2 – PP-1000SC-CE Pump Installation

4.2.4.3 Attach customer supplied rigging to the UF-1000-CE housing lifting points. Lower the unit to the bottom of the pool and tie-off the lifting line to the side of the pool.

### 4.3 Install Filter Cartridges

Proper Filter Selection is “a must” in order to achieve desired results. See Tri Nuclear Drawing TNC-019-12 for information on Tri Nuclear Filter Cartridges. Filter Cartridges may be installed AFTER the housing has been lowered into the pool.

Guidelines for filter selection are show below:

- The 10 micron filter VCPH-10PE is normally chosen for high dirt loading when vacuuming settled particulate.
- The 5 micron filter VCPH-5PE will capture material that might bypass the 10 micron during vacuuming.
- The 1 micron filter VCPH-1PE is excellent for water clarity issues.
- The 0.3 micron VCPH-0.3PE filter is used for “polishing” when water clarity is “a must”.
- The 0.1 micron VCPH-0.1G filter is used when particles bypass the 0.3 micron filter and re-establishing water clarity is needed.

### 4.4 Install Other Equipment

#### 4.4.1 UT-3/H Hanging Filter Storage Rack

If desired the UT-3H Hanging Filter Storage Rack can be attached to the pool bridge or side wall for additional filter storage space (for either clean or dirty filters).

#### 4.4.2 UT-3/6 Floor Storage Rack

If desired the UT-3/6 can be lowered and placed on the pool floor in the vicinity near the UFV-260 housing. The UT-3/6 can be used to hold six (6) clean or dirty filter cartridges and the SB-.125 Strainer Baskets.

### 4.5 Phase Rotation Check.

A Phase Rotation Check is necessary because a 3 phase AC motor can run both backwards & forwards, but the centrifugal pump end is designed to pump efficiently in one direction only.

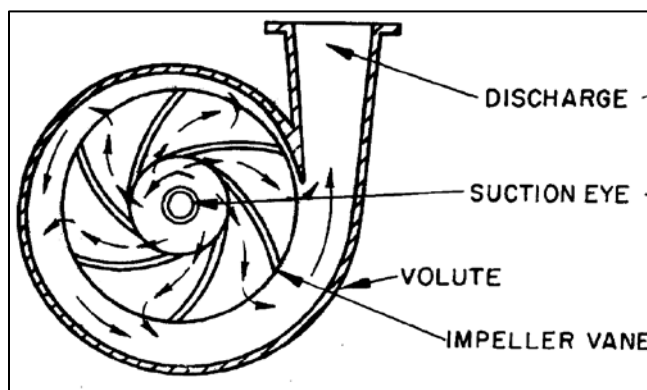
Perform a Phase Rotation Check whenever a pump is disconnected from its electrical power source!

System	Typical flow Rate phased <b>CORRECTLY</b> (Liters per minute)	Typical flow Rate phased <b>BACKWARDS</b> (Liters per minute)
UFV-100-CE	315 l/min	100 l/min
UFV-260-CE	820 l/min	250 l/min
UF-600-CE UFV-600-CE	2525 l/min	250-300 l/min
UF-1000-CE	3470 l/min	250-300 l/min

Note: All Tri Nuclear Pumps are centrifugal pumps.

If they are phased backwards the impeller is rotating opposite of what it should.

***IT DOES NOT MEAN THE PUMP  
WILL PUMP WATER  
BACKWARDS!***



Typical centrifugal pump

<b>CAUTION</b>	Do not start the pump more than once every 2 minutes or 300 starts/day. Damage to the motor winding insulation may occur.
	Fully submerge pump prior to starting the system. Running or "bumping" the pump dry (out of water) will result in damage to the pump.
	Pumps must be installed at least 10 ft. [3.05m] below the water level of the pool to ensure enough NPSH (Net Positive Suction Head) for proper operation of the pump.

- 4.5.1 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.

- 4.6 When all the steps of section 4.0 are completed, the unit is ready for operation in the spent fuel pool or reactor cavity.

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## 5.0 Operations

### 5.1 Modes of Operation:

There are two basic modes of operation for Tri Nuclear Underwater Filter / Vacuum units: Vacuuming Operations and Water Clarity Operations.

### 5.2 Vacuuming Operations

#### 5.2.1 Vacuuming with the Vacuum Cleaner Head (UT-5SP) – UFV-100 & UFV-260 units only.

For vacuum cleaning the bottom of a pool, use the four wheel vacuum cleaner head (UT-5SP) attached to the bottom end of the pool poles. The suction end of the PH-2x50 hose is attached to the hose coupler on the vacuum cleaner head. Dose rates on the filter should be closely monitored since high dose rates may be reached before the filter shows much loss of flow.

The optional UT-15 Utility Chain (or any other suitable rope) may be attached to the loop on the Vacuum Cleaner Head to assist in moving it around the bottom of the pool.

##### 5.2.1.1 Vacuuming with the Vacuum Cleaner Head (UT-5SP-2.5) – UFV-600 units only.

For vacuum cleaning the bottom of a pool, use the four wheel vacuum cleaner head (UT-5SP-2.5) attached to the bottom end of the pool poles. The suction end of the PH-2.5x50 hose is attached to the hose coupler on the vacuum cleaner head. Dose rates on the filter should be closely monitored since high dose rates may be reached before the filter shows much loss of flow.

The optional UT-15 Utility Chain (or any other suitable rope) may be attached to the loop on the Vacuum Cleaner Head to assist in moving it around the bottom of the pool.

#### 5.2.2 Vacuuming with the Vacuum Nozzle (UT-7) – UFV-100 & UFV-260 units only.

Vacuum cleaning around fuel rack ledges or the rim of an open reactor vessel may be accomplished using the vacuum cleaner nozzle (UT-7) attached to the end of a suction hose and to the bottom end of the pool poles (SP-1) using the hose-to-pole clamp (UT-6SP). This fixture will permit the vacuum nozzle to be used in either a vertical, 45deg., or horizontal position.

##### 5.2.2.1 Vacuuming with the Vacuum Nozzle (UT-7-2.5) – UFV-600 units only.

Vacuum cleaning around fuel rack ledges or the rim of an open reactor vessel may be accomplished using the vacuum cleaner nozzle (UT-7-2.5) attached to the end of a suction hose and to the bottom end of the pool poles (SP-1) using the hose-to-pole clamp (UT-6SP). This fixture will permit the vacuum nozzle to be used in either a vertical, 45deg., or horizontal position.

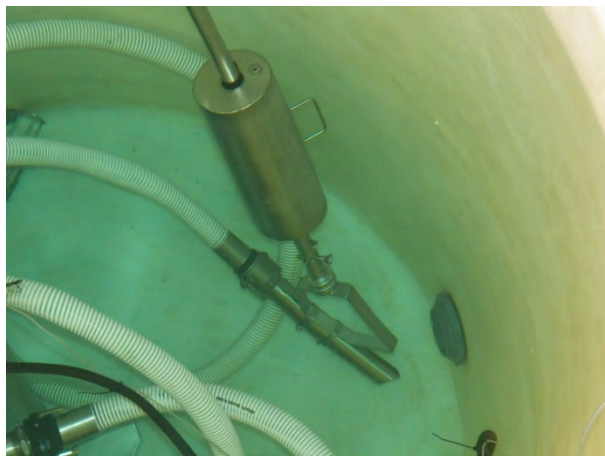
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### 5.2.3 Pool Poles (SP-1, SP-1x5, SP-1x3 & SP-1x2)

The pool poles come in 4 different lengths – 10ft, 5ft, 3ft & 2ft long. Determine the depth the vacuuming will take place and assemble the appropriate number of pool poles for optimal operation interaction with the pool poles and tee handle.

#### 5.2.3.1 Buoyancy Chambers (BC-1)

The Buoyancy Chamber (BC-1) is designed to reduce the weight of the pool pole by about half. After determining the number of pool poles to be used, install the same number of Buoyancy Chambers on the uppermost, fully submerged pool pole. The placement of the Buoyancy Chambers at the top end of the of the Pool Pole sections helps the operator manipulate the tooling, especially the UT-5SP Vacuum Cleaner Head.



BC-1 installed on a SP-1 pool pole  
in TNC's test tank

### 5.2.4 Single Hose Operations

There are times with it is useful to operate the UFV-260 with a single hose. In order to provide adequate flow through the unit during Single Hose Operations, install the UT-12 Orifice Cap on one of the suction ports of the UFV-260.

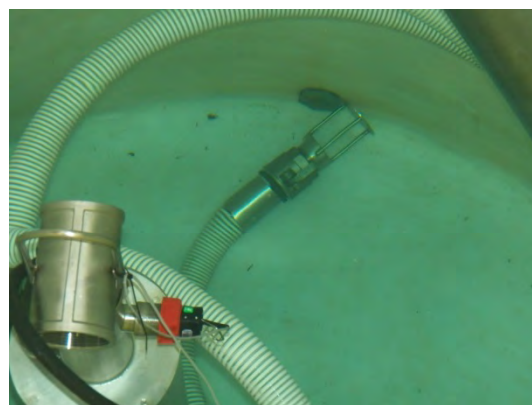
<b>NOTICE</b>	<b>Do not install more than 50ft [50mm x 12.24m] of suction hose to a single suction port on a UFV filter system. This will ensure there is adequate flow velocity at the vacuum nozzle for vacuuming operations.</b>
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### 5.3 Water Clarity Operations (all units)

Successful water clarity operations depend on effective cross circulation. Hoses are used to either draw water to the units or direct water away from the units.

All suction hoses should have a suction hose standoff (or vacuuming attachment) installed to prevent dead heading of the hose against the pool floor.

All discharge hoses should have a diffuser installed to prevent hose whipping.



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## 5.4 Filter Change Out

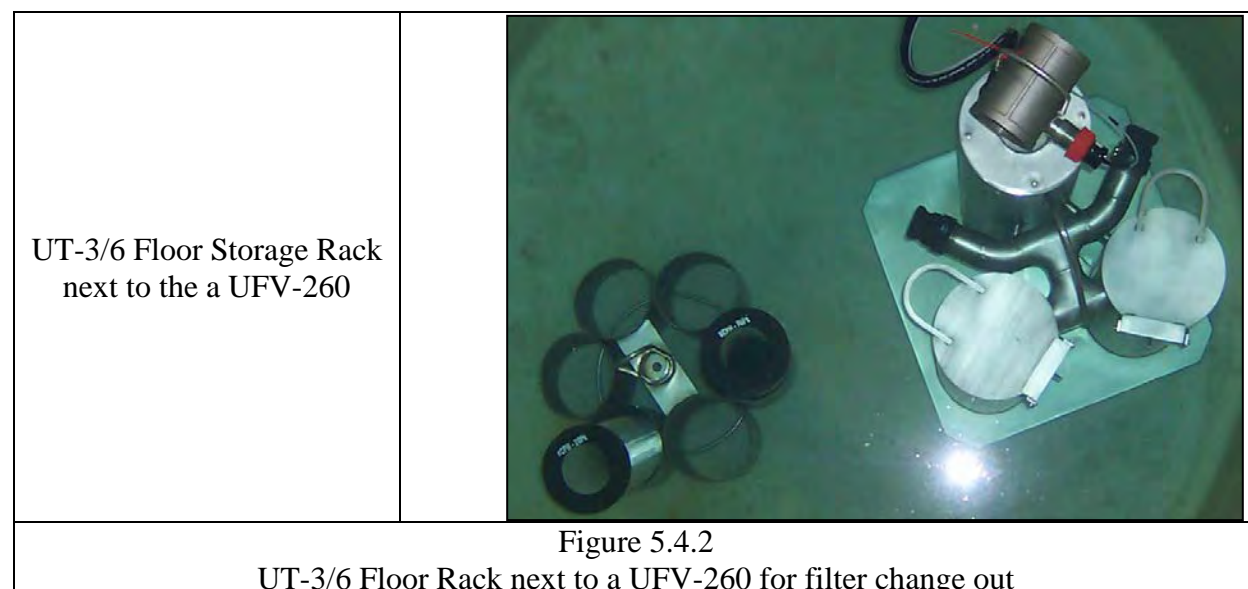
Continue operation of filters until they are considered depleted. Filters should be changed out on one of two conditions:

- 50% clean filter flow
  - If initial flow was 800 l/min then filters should be changed out at ~400 l/min
  - The filter cartridge is 'expended' at this point and running it further does not increase dirt loading/holding of the filter by very much at all.
- Pre-determined radiation levels
  - Each plant determines this level

<b>NOTICE</b>	<b>Filter cartridges can take several minutes to flood while trying to submerge them in the pool. The flooding time can be minimized by pre-soaking the filters</b>
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### 5.4.1 Turn off the pump.


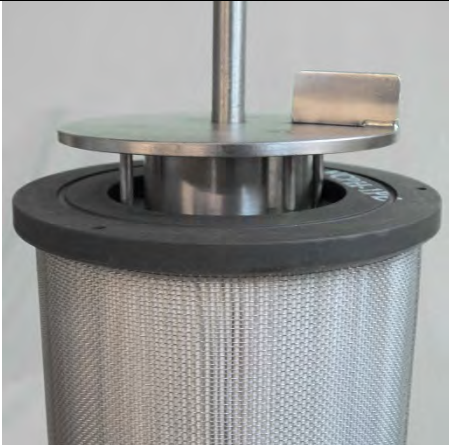
5.4.2 To change-out an expended filter cartridge from an Underwater Filter/Vacuum Unit, first lower the Underwater Filter Storage Rack with new filter cartridges down to the bottom of the pool adjacent to the Underwater Filter/Vacuum Unit. Allow the filters to fill with water before lowering quickly into the pool.

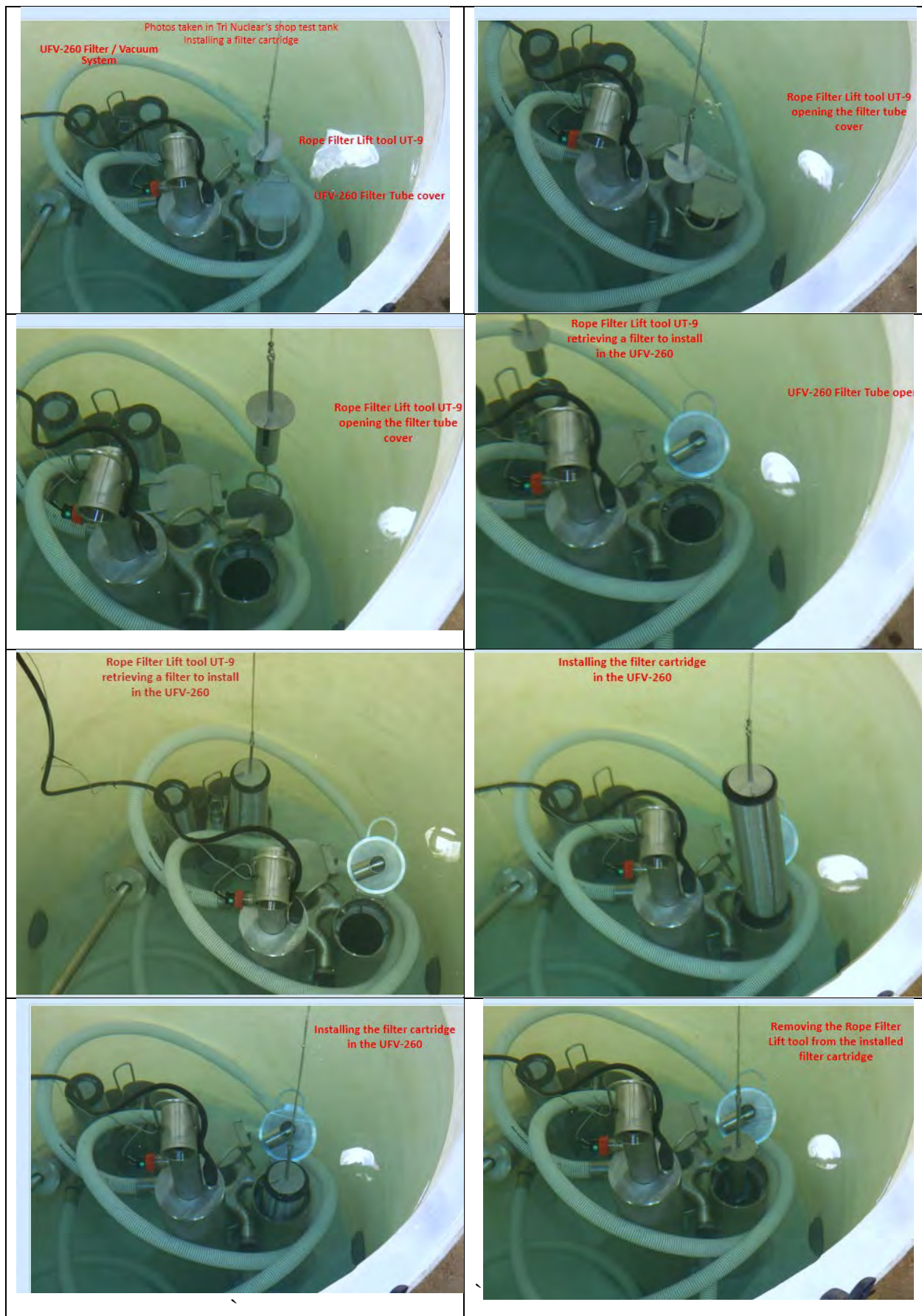


5.4.3 Attach an approved rope or optional UT-15, Stainless Steel Utility Chain to the top lifting eye of the Rope Filter Lift Tool, and lower it down until the bottom hook lands on the top cover of the filter housing.

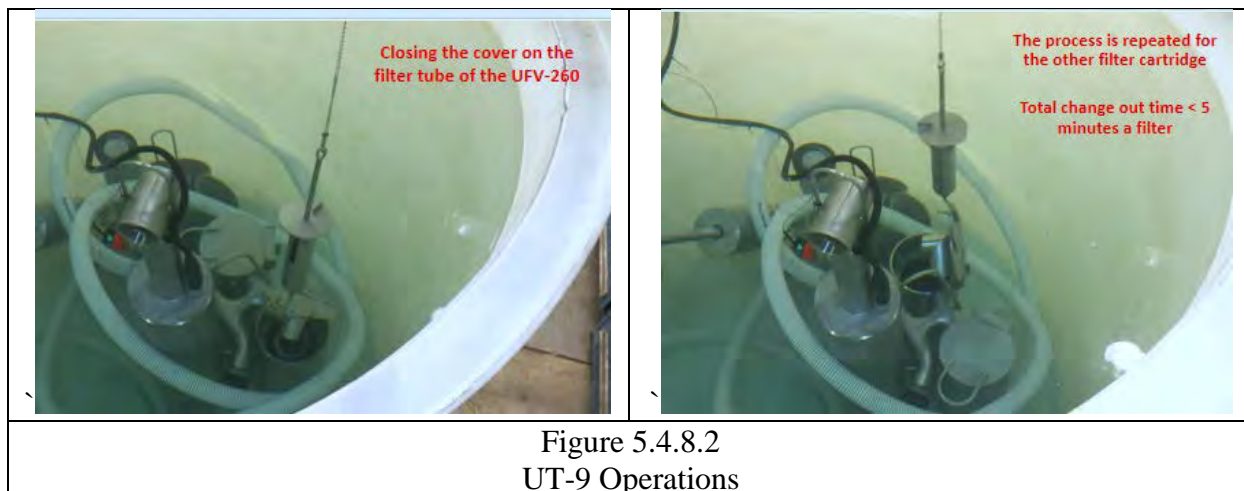


- 5.4.4 Rotate and move the tool until the bottom J-hook engages the lift handle on the filter housing top cover. Note that the hook locator tab welded on the top of the tool indicates from a top view the orientation of the open side of the hook
- 5.4.5 Raise the UT-9 Rope Filter Lift Tool to open and lay back the top cover and disengage the tool from the cover.
- 5.4.6 With the filter cover open use the UT-9 rope filter lift tool to remove the expended filter cartridge and install a new filter cartridge as follows:
  - 5.4.6.1 Next, lower the tool down into the open top of the expended filter cartridge until the top plate of the Rope Filter Lift Tool seats on the top of the filter cartridge. This is determined by a sudden decrease in the weight of the tool on the rope or UT-15, Stainless Steel Utility Chain.
  - 5.4.6.2 Continue to partially lower the rope or UT-15, Stainless Steel Utility Chain ONLY another 4 or 5 inches [10-12 cm]. This will allow the side arms of the tool to extend out through the open slots on the side of the tool housing and engage the underside of the filter top cap.
  - 5.4.6.3 Pull up on the tool to raise the filter out of the filter housing, and lower it into one of the open tubes in the Underwater Filter Storage Rack
  - 5.4.6.4 Slack-off the rope or UT-15, Stainless Steel Utility Chain until the rope tool slide rod hits the bottom and all of the weight of the rope tool is transferred to the filter cartridge. This will rotate the internal cam fitting so the hinged arms will no longer extend out through the side slots in the tool housing.
  - 5.4.6.5 Next, raise the UT-15, Stainless Steel Utility Chain or nylon line, to lift the rope tool out of the filter cartridge.
  - 5.4.6.6 Lower the rope tool down into a new filter cartridge, and repeat the steps to install a new filter into the housing.
  - 5.4.6.7 Finally, re-engage the bottom J-hook of the rope tool onto the lift handle on the filter housing top cover, lift up to close the filter housing cover, and then disengage the hook.
- 5.4.7 Repeat steps 5.4.2 -5.4.7 for the other filter cartridge to be changed out.
- 5.4.8 Start the pump. Read and record initial clean filter flow rate for future filter cartridge change out.

		
UT-9 being lowered into a filter cartridge	UT-9 partially installed in a filter cartridge	Filter cartridge attached to the UT-9 Rope Filter Lift Tool. Note UT-15 Utility Chain attached to top loop of UT-9
		
Cutaway view of a filter cartridge showing the extended arms of the UT-9 catching the underside of the top cap of a typical Tri Nuclear Filter Cartridge	UT-9 Rope Filter Lift Tool with a Tri Nuclear Filter installed.	
Figure 5.4.6 UT-9 Operations		







## 5.5 Pump Change Out

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

5.5.1 Turn off the pump.

5.5.2 Using any approved lifting hook or rigging, lift and remove the pump using the overhead crane.

5.5.3 Install the pump per section 4.2.1

5.5.6 If the pump was disconnected from the electrical power source or it was replaced, perform the phase rotation check in section 4.3 prior to operations.

## 5.6 Use of the SB-.125 or SB-.125-\*\*M Strainer Basket

The SB-.125 is used for large particle collection. It provides NO filtering capability and particles less than < .125in [3.18mm] can pass through the perforated screen. To use the SB-.125, install the strainer baskets in place of the filter cartridges per section 5.4.1

<b>NOTICE</b>	One Strainer Basket (SB-.125) per filter housing must be used to ensure effective straining operations.
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## 5.7 Use of the UCB-1 Underwater Catch Basket

The UCB-1 is used in conjunction with any Tri Nuclear Filter Cartridge to prevent large, potentially high dose, particles greater than 3/32in [2.38mm] from becoming embedded in the filter cartridges.

The UCB-1 is installed using the UT-9 Rope Filter Lift Tool into the open top of any Tri Nuclear filter cartridge. See Drawing TNC-086-12 for details.

<b>NOTICE</b>	One Underwater Catch Basket (UCB-1) per filter must be used to ensure effective straining operations.
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## 6.0 Storage Requirements

<b>CAUTION</b>	<p>Caution should be taken to <u>NOT</u> store any plastic components (eg. filters or hoses) near high radiation fields associated with equipment such as fuel bundles, LPRM's or control blades.</p> <p>Breakdown of such components can occur with accumulated exposures of 10E6 Rad [10,000 Sieverts]. 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.</p> <p>All components are chemically suitable for long term storage in the fuel pool cavity environment.</p>
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- 6.1 The preferred method of storing the submersible pump assembly when not in use is underwater. The flow sensor can be removed for storage. The PSC-100P power cable can also be removed for storage, however, the SC-P plug must be installed on the pump cover to protect the electrical connection on the pump.



- 6.2 The housing for all UF / UFV systems can be stored in the reactor cavity during power operations. Many plants have found this beneficial and reduces exposure related to installing and removing equipment every outage.

The following components must be removed prior to commencement of power operations if the housing will be left in the reactor cavity:

- Filter Cartridges
- Suction Hoses
- Pump, power cable and flow sensor cable
- Discharge hoses

## 7.0 Maintenance

There is no required periodic maintenance required for Tri Nuclear UF / UFV equipment.

### 7.1 Tube Sheet O-Ring replacement

If the Tube Sheet o-ring becomes damaged, it can be replaced.

7.1.1 Remove the old O-ring and ensure the O-ring groove is clean and free of any material that may have been left behind from the old O-ring.

7.1.2 Obtain a tube sheet O-ring, and inspect for cuts and nicks. Clean the O-ring prior to installation.

7.1.3 Run a bead of glue around the tube sheet seating surface after cleaning surfaces thoroughly.

7.1.4 Install O-ring and maintain a constant pressure for approximately 20 seconds.

7.1.5 Verify O-ring is properly mounted by attempting to remove it using a reasonable force.

7.1.6 Install a standard Tri Nuclear filter cartridge and check for proper seating on the O-ring.



## 8.0 Troubleshooting

Effective troubleshooting requires that problem locations be systematically eliminated until the problem is found.

When Tri Nuclear equipment does not work or work as expected, there could be multiple reasons for it. This troubleshooting guide will help the operator determine the cause of the problems from observing specific symptoms.

### 8.1 Faulty Flow Sensor

A faulty flow sensor can indicate both high or low flow readings. The following sections will help determine the cause of the high or low readings.

#### 8.1.1 High Flow Rate

A high system flow rate can be experienced with new filters, and should not be considered a problem. For example operating experience has shown that with clean filters and a new pump the PP-260SC can have an initial flow rate of 260-300 gpm [946-1,136LPM] at 60hz. Flow rate should decrease as the filters load with particulate material from the water.

#### 8.1.2 Low Flow Rate

A low system flow rate can be caused by several factors. They include, but are not limited to:

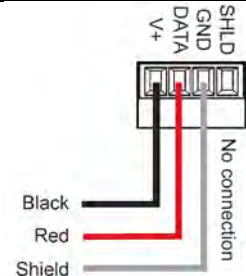
- Missing o-ring on flow sensor (causing it to not be installed correctly)
- Faulty flow meter/sensor
- Flow Sensor installed incorrectly
- Flow Sensor to Meter installed incorrectly
- Plugged filters / collapsed, damaged or plugged hoses
- Running with only one suction hose and the other suction port capped
- Suction hose length too long (greater than 50 feet [15.25M] long)
- Suction hoses dead ended or not vented and filled with air
- Pump phased incorrectly and pump running in reverse (approximately 1/3 full flow)
- Running 50 Hz. Running pumps at 50 Hz will produce a flow of approximately 83% of rated 60 Hz flow. Thus a UFV-260 flow of 260 GPM at 60 Hz would be approximately 215 GPM at 50 Hz.
- Incorrect power frequency (eg. Less than 50hz for 400V/50Hz applications )
- Pump mechanical internal wear or strainer plugged

These items will be covered in the troubleshooting chart in section 8.2

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## 8.2 Troubleshooting Chart

The following troubleshooting chart was developed to help in the identification and correction of most of the pump problems you may encounter:

Problem	Possible Causes	How To Check	How To Correct
<b>A. Flow meter does not respond</b>	1. Pump is off	Check for voltage at control box	<ul style="list-style-type: none"> <li>• Verify control box has not tripped</li> <li>• Verify the “Phase Rotation Switch is in the “A” or “B” position.</li> <li>• Verify supply breaker is on.</li> <li>• Verify 1amp fuse on the secondary side of the transformer is not blown</li> <li>• Verify 1/2amp primary fuses to the transformer are not blown</li> <li>• Verify the on/off switch on the Short Circuit motor protector is ON.</li> <li>• Verify the E-Stop is not engaged.</li> <li>• Start pump</li> </ul>
	2. Amphenol connector on control box is not properly connected to the digital flow meter.	Verify pump is running by using a clamp-on ammeter on one lead of the pump power cable.	<p>Connect digital flow sensor to a spare control box to verify it is operating correctly.</p> <p>Verify Amphenol connector is wired with the following sequence:</p> <p>Pin #1 – Black Wire Pin #2 – Red Wire Pin #3 – Shield Wire</p> <p>Verify Amphenol connector is wired to the flow meter as follows:</p> 

Problem	Possible Causes	How To Check	How To Correct
<b>A. Flow meter does not indicate (Cont.)</b>	3. Flow sensor is faulty	Verify pump is running by using a clamp-on ammeter on one lead of the pump power cable.	After performing step A.2 and there is still no indication, the pump must be removed and the flow sensor replaced.  Perform flow sensor checks per 4.1 prior to installing it in the pump
	4. Motor and/or cable are damaged	Turn off power. Disconnect motor leads from control box. Measure the lead-to-lead resistances with the ohmmeter (Rx1) Measure lead to ground values with the ohmmeter (Rx100K)	If open motor winding or ground is found, remove pump from pool/cavity and recheck resistance values.
	5. Motor starter overloads have tripped	Check for voltage on the line side of starter	Verify 400VAC +/- 10% (360V – 440V)
	See step E if this is reoccurring	Check Solid State Trip set point.	See section 2.3 for set points
<b>B. Flow meter indicates higher than normal flow</b>	1. New pump and/or filters installed	Check when pump was placed in service. Pumps shipped after 1998 are more efficient.	No corrective action needed.
	2. Flow meter is off scale high	If the flow sensor is on greater than the indicated flow, but not hard pegged, the flow meter can be recalibrated.  If the flow sensor is hard pegged, it may be damaged not able to be recalibrated.	See section 8.5 for the recalibration procedure.  If the flow meter is hard pegged, and recalibration does not correct the problem, replace the flow meter
	3. Flow meter is faulty.	Verify pump is running by using a clamp on ammeter on one lead of the pump power cable.	Install a spare flow meter

Problem	Possible Causes	How To Check	How To Correct
<b>B. Flow meter indicates higher than normal flow (cont.)</b>	4. Pump cover not seated on pump tube	Lift pump ~6in [15cm] from the pump tube while running. This bypasses the UF/UFV system. There should be an increase in flow when the pump is lifted.	Reseat the pump and verify that it is not “cocked” or that there is nothing interfering with the seating surface on the pump tube.
	5. Filters not installed	Verify filters installed in the unit. On the UFV units the filter tube cover must be opened to verify	Install filters (drop in flow rate should not be greater than 15% with new filters)
<b>C. Flow meter indicates lower than expected flow</b>	1. Pump phased incorrectly	With pump running, record flow.  With a Phase Reversing Control Box – stop the pump and change the phase rotation switch to either “A” or “B”	The proper phasing will give the higher flow rate.  If pump is phased incorrectly, system will run at approximately 1/3 flow
	2. Deleted		
	3. Flow sensor is faulty	Verify pump is running by using a clamp-on ammeter on one lead of the pump power cable.  Install spare flow meter	After performing steps C.2 & C.3 and if there is still no indication, the pump must be removed and the flow sensor replaced.  Perform flow sensor checks per 4.1.1 & 4.1.3 prior to installing it in the pump
	4. Filters are expended	Filters should be changed out at 50% clean flow rate	If filter change out is occurring too rapidly see section E.
<b>D. Low flow /velocity at suction nozzle</b>	1. Filters are expended	Filters should be changed out at 50% clean flow rate	If filter change out is occurring too rapidly see section E.
	2. Collapsed hose	Visually check hose for collapsed section	Change out damaged hose, keep hose away from high rad fields and high temperatures greater than 140F [60C].

Problem	Possible Causes	How To Check	How To Correct
<b>D. Low flow /velocity at suction nozzle (Cont.)</b>	3. Suction hose clogged	Change out filters  Lift pump ~6in [15cm] from the pump tube while running. This bypasses the UF/UFV system. There should be an increase in flow when the pump is lifted.	Ensures filters are not expended.  If flow increases on flow meter and clean filters, this indicates a plugged hose.  Remove & replace hose on housing.
	4. Hose too long	More than one 50ft [15.25M] section of hose on the suction of the pump will decrease the flow thru that hose and cause low velocity at the nozzle	Only use one 50ft [15.25] hose on suction of the pump.
<b>E. Filters load up too quickly</b>	1. Incorrect filter selection for application	Verify proper filters were chosen based on the criteria of section 2.9 & 4.3	Install proper size micron, based on application
<b>F. Circuit breakers/overloads trip</b>	1. High or low voltage	Check voltage at control box. If not within $\pm 10\%$ check equipment loads at power source.	If not in specification, correct power supply or choose an alternate power supply.
	2. Three-phase current unbalance	Check current draw on each lead. Unbalance must be within $\pm 5\%$ . Follow the steps in Table F below to perform current unbalance check.	If current unbalance is not within $\pm 5\%$ , contact the electrical supervisor.
	3. Incorrect Overload trip setting	Check the adjustable trip set point. They should be set to per section 2.3.	If incorrectly set, Adjust set point per paragraph 8.5

Table F		Checking and Correcting Three Phase Power Unbalance	
1	Verify the pump is phased correctly per section 4.5.		
2	After correct rotation has been established, check the current in each of the three motor leads and calculate the current unbalance as explained in 3 below.		
	If the current unbalance is 2% or less, leave the leads as connected.  If the current unbalance is more than 2%, current readings should be checked on each leg using each of three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.		
3	To calculate percent of current unbalance:		
	A. Add the three line amps values together.		
	B. Divide the sum by three, yielding average current.		
	C. Pick the amp value which is furthest from the average current (either high or low).		
	D. Determine the difference between this amp value (furthest from average) and the average.		
4	E. Divide the difference by the average. Multiply the result by 100 to determine percent of unbalance.		
	Current unbalance should not exceed 5% at max amp load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected.		
	If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the "power side" of the system.  If the reading farthest from average moves with the same motor lead, the primary source of unbalance is on the "motor side" of the starter. In this instance, consider a damaged cable, leaking splice, poor connection, or faulty motor winding.		
<div><div><div><div>1st Hook Up</div><div><div>L1</div><div>L2</div><div>L3</div></div><div><div><div></div><div></div><div></div></div></div><div><div>T2</div><div>T1</div><div>T3</div></div></div></div><div><div>2nd Hook Up</div><div><div>L1</div><div>L2</div><div>L3</div></div><div><div><div></div><div></div><div></div></div></div><div><div>T3</div><div>T1</div><div>T2</div></div></div></div> <div><div>3rd Hook Up</div><div><div>L1</div><div>L2</div><div>L3</div></div><div><div><div></div><div></div><div></div></div></div><div><div>T3</div><div>T2</div><div>T1</div></div></div> <div><div>supply</div><div>starter</div><div>motor</div></div> <div><div>EXAMPLE:</div><div><div>T1 = 51 amps T2 = 46 amps + T3 = 53 amps Total = 150 amps <div><div>150</div><div>3</div></div> = 50 amps 50 - 46 = 4 amps <div><div>4</div><div>50</div></div> = 0.08 or 8%</div><div><div>T3 = 50 amps T1 = 49 amps + T2 = 51 amps Total = 150 amps <div><div>150</div><div>3</div></div> = 50 amps 50 - 49 = 1 amp <div><div>1</div><div>50</div></div> = 0.02 or 2%</div><div><div>T2 = 50 amps T3 = 48 amps + T1 = 52 amps Total = 150 amps <div><div>150</div><div>3</div></div> = 50 amps 50 - 48 = 2 amps <div><div>2</div><div>50</div></div> = 0.04 or 4%</div></div></div></div></div>			

### 8.3 Motor Data

OHM VALUE	MEGAHOM VALUE	CONDITION OF MOTOR AND LEADS
<b>Motor not yet installed</b>		
2,000,000	2.0	New motor
1,000,000	1.0	Used motor
<b>Motor in use (ohm values are for motor plus power cable)</b>		
500,000-1,000,000	0.5-1.0	A motor in reasonably good condition
20,000-500,000	0.02-0.5	A motor which may have been damaged or has a damaged power cable or pigtail
10,000-20,000	0.01-0.02	A motor which has definitely has been damaged or has a damaged power cable or pigtail. The pump & power cord should be removed from the unit and inspected
< 10,000	0-0.01	A motor which has failed or with completely destroyed cable insulation.

### 8.4 Flow Meter Calibration

Contact Tri Nuclear Corp. for information on how to verify and perform field calibration of the digital flow meter.

### 8.5 Adjustment of overcurrent set point

<b>CAUTION</b>	Improper setting of the over current trip set point can cause severe damage to the pump/motor assembly
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#### 8.5.1 If required, adjust the set point of the over current trip to the values in section 2.3.

(A #2 Philips or flat head screw driver is required to adjust the set point)





Figure 8.5.1  
CB-600-FM-CE Overcurrent Adjustment  
Others similar

## 9.0 Replacement Parts

Below is a listing of **Recommended Spare Parts** for each system:

TNC Part Number	Description	UFV-100-CE Qty	UFV-260-CE Qty	UF-600-CE Qty	UFV-600-CE Qty	UF-1000-CE Qty
PP-100SC-CE	Grundfos pump, 2HP/400V/3Ph/50Hz, w/cover & SC connector	1				
CB-100-FM-CE	2 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-600 LPM digital flow meter.	1				
PP-260SC-CE	Grundfos pump, 5HP/400V/3Ph/50Hz, w/cover & SC connector		1			
CB-260-FM-CE	5 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-2,000 LPM digital flow meter.		1			
PP-600SC-CE	Grundfos pump, 15HP/400V/3Ph/50Hz, w/cover & SC connector			1	1	
CB-600-FM-CE	15 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-4,000 LPM digital flow meter.			1	1	
PP-1000SC-CE	Grundfos pump, 20HP/400V/3Ph/50Hz, w/cover & SC connector					1
CB-1000-FM-CE	20 HP/400V/3Ph/50 Hz phase reversing control box with twist lock plugs and integral 0-6,000 LPM digital flow meter.					1
PSC-100P	PSC-100P Power Cable with twist lock plug (100ft [30.5m] 10/4 SO Cable w/ male twistlock plug)	1	1	1	1	1
PC-50-CE	PC-50-CE drop cable with female plug (50ft [12.4m] Cable w/ female connector)	1	1	1	1	1
FM-SRD	Flow sensor with reinforced paddlewheel and 100ft [30.5m] cable with Amphenol connector.					
PH-2x50-EP	2in x 50ft [50mm x 12.24m] EPDM suction hose with MxF camlock couplers	1	2			
PH-2.5x50-EP	2.5in x 50ft [64mm x 12.24m] EPDM suction hose with MxF camlock couplers				2	
PH-3x25-EP	3in x 25ft [76mm x 7.62m] EPDM discharge hose with MxF camlock couplers			2	2	
PH-4x25-EP	4in x 25ft [101mm x 7.62m] EPDM discharge hose with MxF camlock couplers					2
O-Ring	O-ring for tube sheet	1	2	4	4	8
SC-P	Seal Plug for electrical connector on Tri Nuclear pumps	1	1	1	1	1

## 9.0 Replacement Parts (continued)

Strainer Baskets & Filter Cartridges		
Qty	Part No.	Description
AR	VCPH-0.1G	Filter Cartridge, 0.1 micron, 52ft <sup>2</sup> [4.8 m <sup>2</sup> ] microglass, media, 6in x 30in [15.2 cm x 76.2 cm] lg, 6ea/cs
AR	VCPH-0.3PE	Filter cartridge, 0.3 micron, 60 ft <sup>2</sup> [5.6 m <sup>2</sup> ] polyester media, 6in x 30in [15.2 cm x 76.2 cm] lg, 6ea/cs
AR	VCPH-1PE	Filter cartridge, 1 micron, 62 ft <sup>2</sup> [5.8 m <sup>2</sup> ] polyester media, 6in x 30in [15.2 cm x 76.2 cm] lg, 6ea/cs
AR	VCPH-5PE	Filter cartridge, 5 micron, 85 ft <sup>2</sup> [7.9 m <sup>2</sup> ] polyester media, 6in x 30in [15.2 cm x 76.2 cm] lg, 6ea/cs
AR	VCPH-10PE	Filter cartridge, 10 micron, 64 ft <sup>2</sup> [5.9 m <sup>2</sup> ] polyester media, 6in x 30in [15.2 cm x 76.2 cm] lg, 6ea/cs
AR	SB-.125	Strainer Basket, Perforated Stainless Steel, .125in [3mm] dia holes, 6inx30in lg [15.2 cm x 76.2 cm]
AR	SB-.125-50M	Strainer Basket, Mesh Lined Perforated Stainless Steel, .125in [3mm] dia holes with a 50x50 (.012in [0.30mm] opening) Stainless steel mesh insert, 6inx30in lg [15.2 cm x 76.2 cm]
AR	SB-.125-100M	Strainer Basket, Mesh Lined Perforated Stainless Steel, .125in [3mm] dia holes with a 100x100 (.006in [0.15mm] opening ) Stainless steel mesh insert, 6inx30in lg [15.2 cm x 76.2 cm]
AR	SB-.125-200M	Strainer Basket, Mesh Lined Perforated Stainless Steel, .125in [3mm] dia holes with a 200x200 (.003in [0.07mm] opening ) Stainless steel mesh insert, 6inx30in lg [15.2 cm x 76.2 cm]
AR	SB-.125-400M	Strainer Basket, Mesh Lined Perforated Stainless Steel, .125in [3mm] dia holes with a 400x400 (.0015in [0.03mm] opening ) Stainless steel mesh insert, 6inx30in lg [15.2 cm x 76.2 cm]
AR	UCB-1	Underwater Catch Basket insert for Tri Nuclear VCPH Filters, SS, perforated holes 3/32in [2.3mm]

## 10.0 ADDITIONAL INFORMATION

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

John J. Flynn  
 Quality Manager  
 Tri Nuclear Corp.  
 Ph. 518-399-1389  
 Fx. 518-399-9586  
 Cell. 518-312-6316  
[www.trinuclear.com](http://www.trinuclear.com)  
 e-mail: [john@trinuclear.com](mailto:john@trinuclear.com)

Rick Russell  
 Engineering Manager  
 Tri Nuclear Corp.  
 Ph. 518-399-1389  
 Fx. 518-399-9586  
 Cell. 518-728-3635  
[www.trinuclear.com](http://www.trinuclear.com)  
 e-mail: [rick@trinuclear.com](mailto:rick@trinuclear.com)

Operating and Maintenance Manual Underwater Filter / Vacuum Series	Doc. No.	Rev.	Effective Date	Page 85 of 85
	OM-001	2	20 Sept 2017	

ORIGINAL INSTRUCTIONS (ENGLISH VERSION ONLY)





# TRI NUCLEAR CORP.

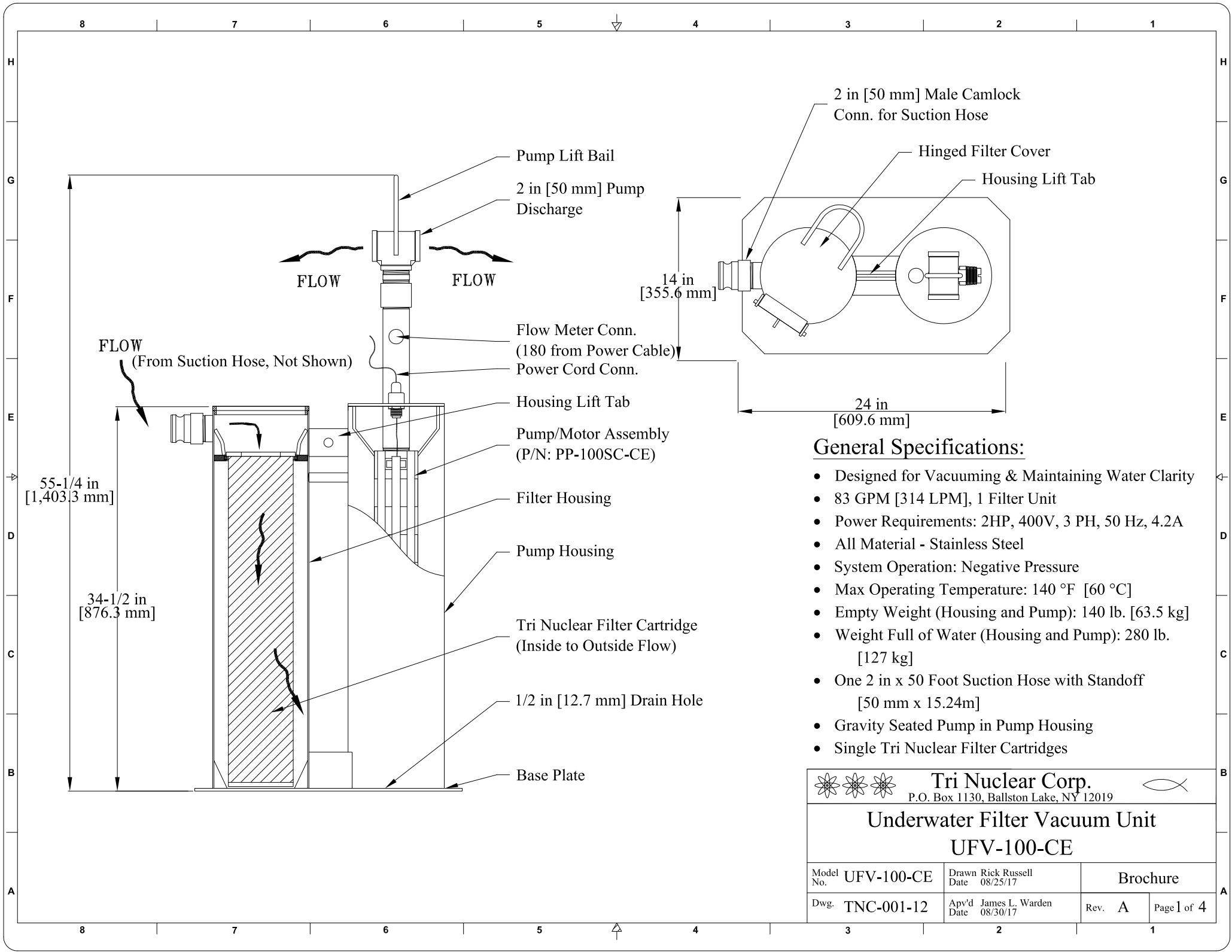
THE INDUSTRY STANDARD IN UNDERWATER FILTRATION  
ISO 9001:2008 CERTIFIED

WWW.TRINUCLEAR.COM -- P.O. BOX 1130 BALLSTON LAKE, NY 12019 -- TEL: 518-399-1389 -- FAX: 518-399-9586

## Declaration of Conformity to European Union Directives

In accordance with EN ISO 17050-1:2010

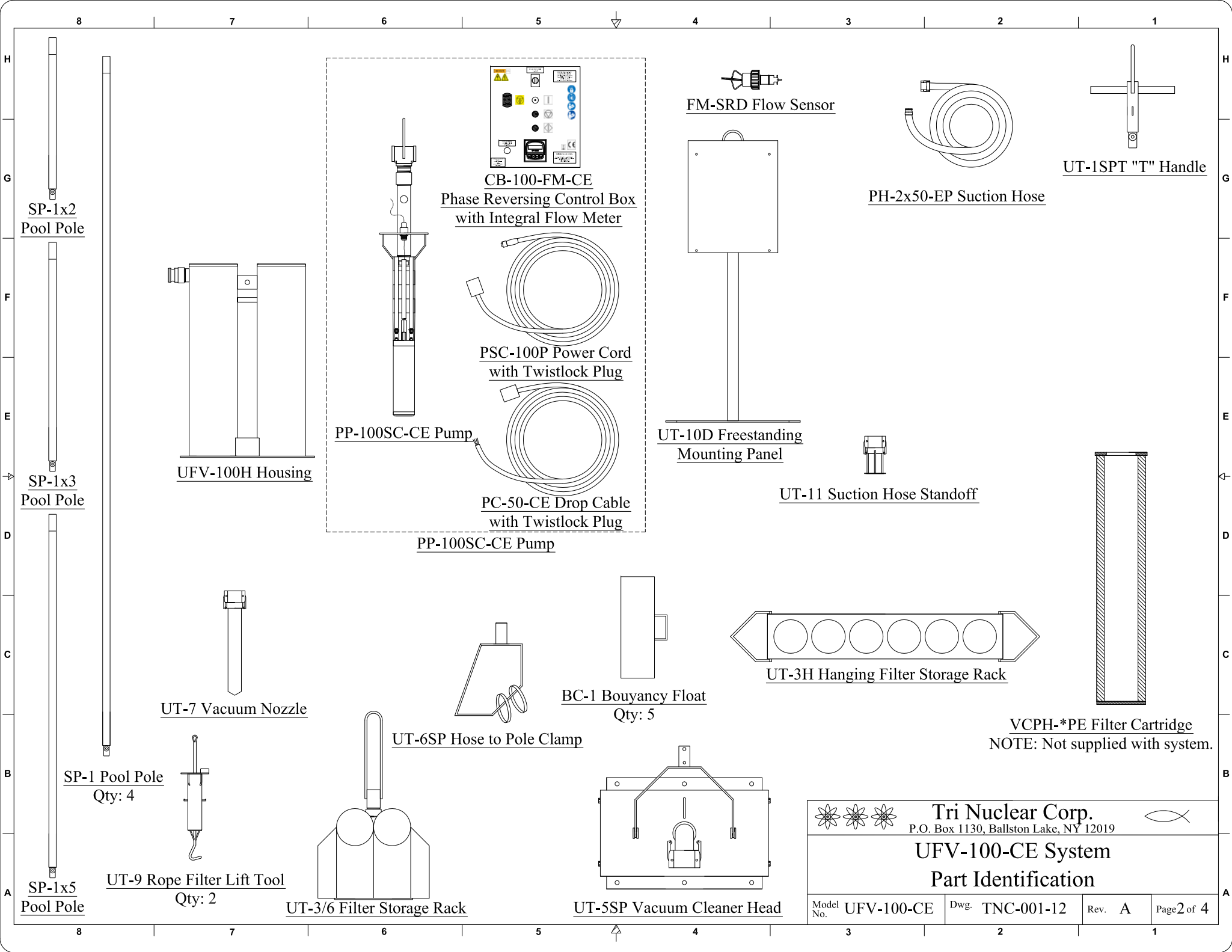
We	Tri Nuclear Corp.
of	40 Lake Rd, Ballston Lake, NY 12019 USA
<i>in accordance with the following Directive(s):</i>	
	2006/42/EC The Machinery Directive
<i>hereby declare that:</i>	
Equipment	Underwater Filter / Vacuum Systems Underwater Filter Systems
Model number	UFV-xxx-CE UF-xxx-CE
<i>is in conformity with the applicable requirements of the following documents</i>	
EN 60204-1:2006+A1:2009/AC 2010 Safety of machinery. Electrical equipment of machines. General requirements.	
EN ISO 12100:2010 Safety of Machinery – General Principles for design – Risk Assessment and risk reduction	
EN 809:1998+A1:2009 Pumps and pump units for liquids Common safety requirements	
Person Authorized to Compile the Technical File Residing in the EU	Name: Mr. Per H. Segerud Title: Project Manager Company Name: Westinghouse Electric Sweden AB Street Address: Fredholmsgatan 22 County and Postal Code: SE-721 63 Västerås Country: Sweden
We hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The apparatus complies with all applicable Essential Requirements of the Directives.	
Signed by:	
Name:	John J. Flynn
Position:	Quality Assurance Manager
Done at	40 Lake Rd, Ballston Lake, NY 12019 USA
On	23 November 2016
	



**General Specifications:**

- Designed for Vacuuming & Maintaining Water Clarity
- 83 GPM [314 LPM], 1 Filter Unit
- Power Requirements: 2HP, 400V, 3 PH, 50 Hz, 4.2A
- All Material - Stainless Steel
- System Operation: Negative Pressure
- Max Operating Temperature: 140 °F [60 °C]
- Empty Weight (Housing and Pump): 140 lb. [63.5 kg]
- Weight Full of Water (Housing and Pump): 280 lb. [127 kg]
- One 2 in x 50 Foot Suction Hose with Standoff [50 mm x 15.24m]
- Gravity Seated Pump in Pump Housing
- Single Tri Nuclear Filter Cartridges

<div>Tri Nuclear Corp.</div> <div>P.O. Box 1130, Ballston Lake, NY 12019</div>			<div>Underwater Filter Vacuum Unit</div> <div>UFV-100-CE</div>	
Model No.	UFV-100-CE	Drawn Rick Russell	Brochure	
		Date 08/25/17		
Dwg.	TNC-001-12	Apv'd James L. Warden	Rev. A	Page 1 of 4
		Date 08/30/17		



SP-1x2  
Pool Pole

SP-1x3  
Pool Pole

SP-1x5  
Pool Pole

SP-1 Pool Pole  
Qty: 4

UFV-100H Housing

UT-7 Vacuum Nozzle

UT-9 Rope Filter Lift Tool  
Qty: 2

UT-3/6 Filter Storage Rack

UT-6SP Hose to Pole Clamp

PP-100SC-CE Pump

PSC-100P Power Cord  
with Twistlock Plug

PC-50-CE Drop Cable  
with Twistlock Plug

CB-100-FM-CE  
Phase Reversing Control Box  
with Integral Flow Meter

BC-1 Bouyancy Float  
Qty: 5

UT-5SP Vacuum Cleaner Head

FM-SRD Flow Sensor

UT-10D Freestanding  
Mounting Panel



UT-11 Suction Hose Standoff

PH-2x50-EP Suction Hose

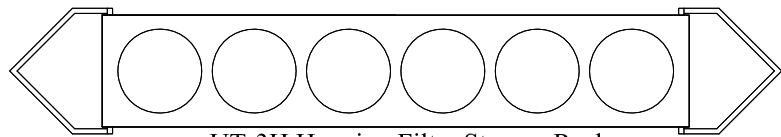
UT-1SPT "T" Handle

UT-3H Hanging Filter Storage Rack

VCPH-\*PE Filter Cartridge  
NOTE: Not supplied with system.

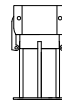
 <b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019 			
<b>UFV-100-CE System</b> <b>Part Identification</b>			
Model No.	UFV-100-CE	Dwg.	TNC-001-12
Rev.	A	Page	2 of 4

8 7 6 5 4 3 2 1

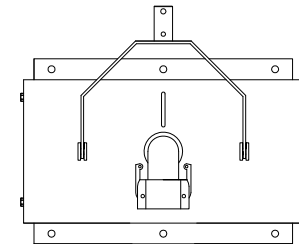


**UT-3H Hanging Filter Storage Rack**  
Holds (6) Tri Nuclear Filter Cartridges  
Dimensions: 42 in x 8 in x 4 in (LWH)  
[1067 mm x 203 mm x 102 mm]  
Weight: 13.5 lb. [6.1 kg]

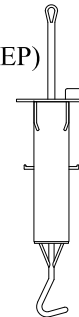
**Swing Lift Bail**



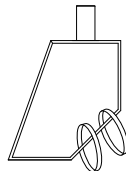
**UT-11 Suction Hose Standoff**  
Attaches to 2 in Suction Hose (Typically PH-2x50-EP)  
Dimensions: 3 in Dia x 8 in Lg.  
[76 mm x 203 mm]  
Weight: 2 lb. [0.9 kg]



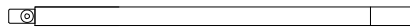
**UT-5SP Vacuum Cleaner Head**  
Attaches to 2 in Suction Hose  
(Typically PH-2x50-EP)  
Dimensions: 20 in x 10 in x 8 in  
[508 mm x 254 mm x 203 mm]  
Weight: 18.5 lb. [8.39 kg]  
Polypro Camlock Fitting



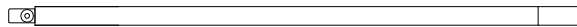
**UT-9 Rope Filter Lift Tool**  
Dimensions: 5 in Dia x 24-3/4 in Lg.  
[127 mm x 628 mm]  
Weight: 4.5 lb. [2 kg]



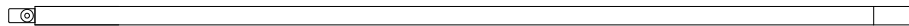
**UT-6SP Hose to Pole Clamp**  
Dimensions: 13-3/4 in x 8 in x 2 in  
[349 mm x 203 mm x 50 mm]  
Weight: 2 lb. [0.9 kg]



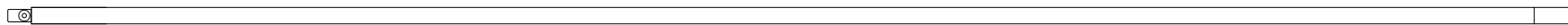
**SP-1x2 Pool Pole**  
Dimensions: 1 in Dia x 2 ft Lg.  
[25 mm x 0.6 m]  
Weight: 2.5 lb. [1.1 kg]



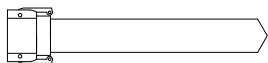
**SP-1x3 Pool Pole**  
Dimensions: 1 in Dia x 3 ft Lg.  
[25 mm x 0.91 m]  
Weight: 3 lb. [1.3 kg]



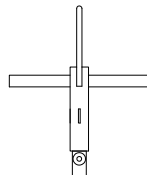
**SP-1x5 Pool Pole**  
Dimensions: 1 in Dia x 5 ft Lg.  
[25 mm x 1.5 m]  
Weight: 5 lb. [2.2 kg]



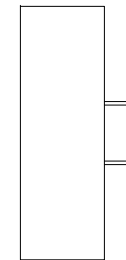
**SP-1 Pool Pole**  
Dimensions: 1 in Dia x 10 ft Lg.  
[25 mm x 3 m]  
Weight: 9 lb. [4 kg]



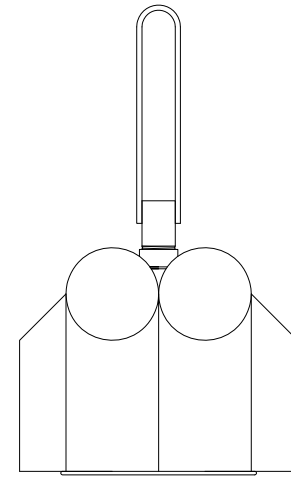
**UT-7 Vacuum Nozzle**  
Attaches to 2 in Suction Hose  
(Typically PH-2x50-EP)  
Dimensions: 2 in Dia x 18 in Lg.  
[50 mm x 457 mm]  
Weight: 4 lb. [1.8 kg]



**UT-1SPT "T" Handle**  
Dimensions: 10 in x 10 in x 1 in  
[254 mm x 254 mm x 25 mm]  
Weight: 2 lb. [0.9 kg]

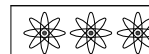


**BC-1 Bouyancy Float**  
Dimensions: 6 in Dia x 18 in Lg.  
[152 mm x 457 mm]  
Weight: 8.5 lb. [3.8 kg]



**UT-3/6 Filter Storage Rack**  
Holds (6) Tri Nuclear Filter Cartridges  
Dimensions: 20 in Dia x 33 in High  
[508 mm x 838 mm]  
Weight: 50 lb. [22.6 kg]

• All Material - Stainless Steel



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



**UFV-100-CE**  
**Accessory Tooling**

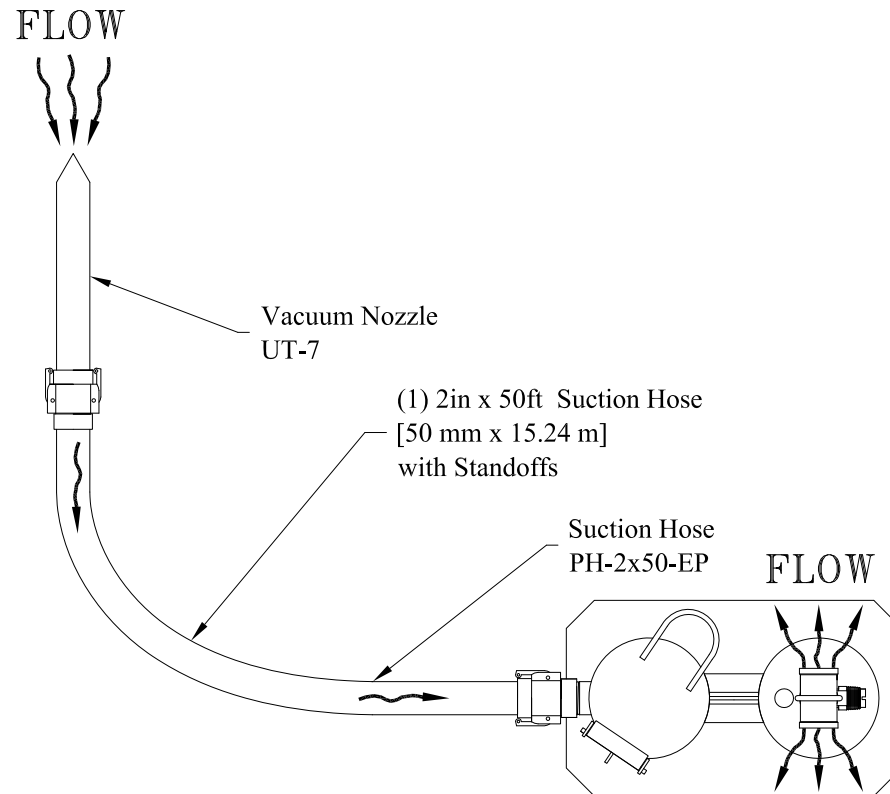
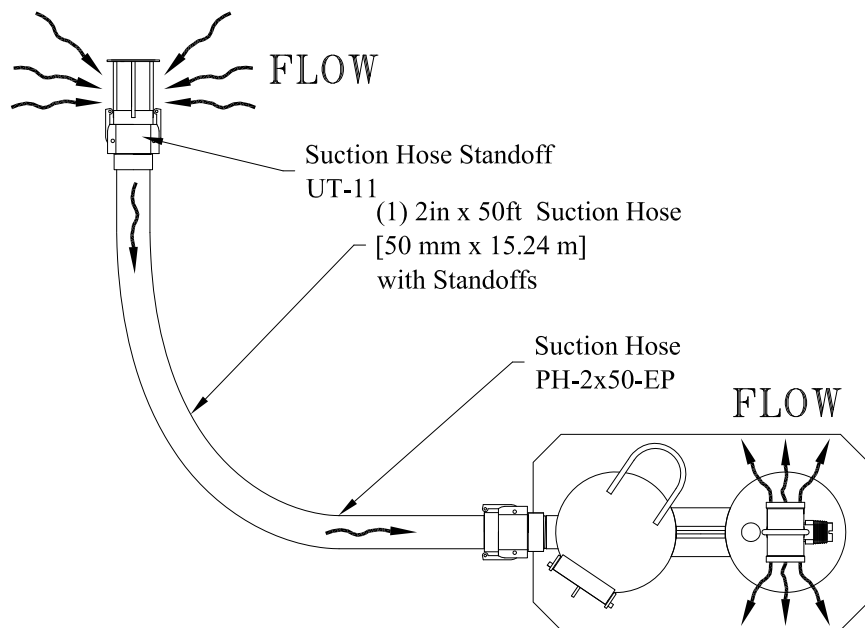
Model No.	UFV-100-CE	Dwg.	TNC-001-12	Rev.	A	Page 3 of 4
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8 7 6 5 4 3 2 1



## WATER CLARITY OPERATIONS

## VACUUMING OPERATIONS



\* NOTE: UFV-100-CE Must be run with Suction Hose attached.

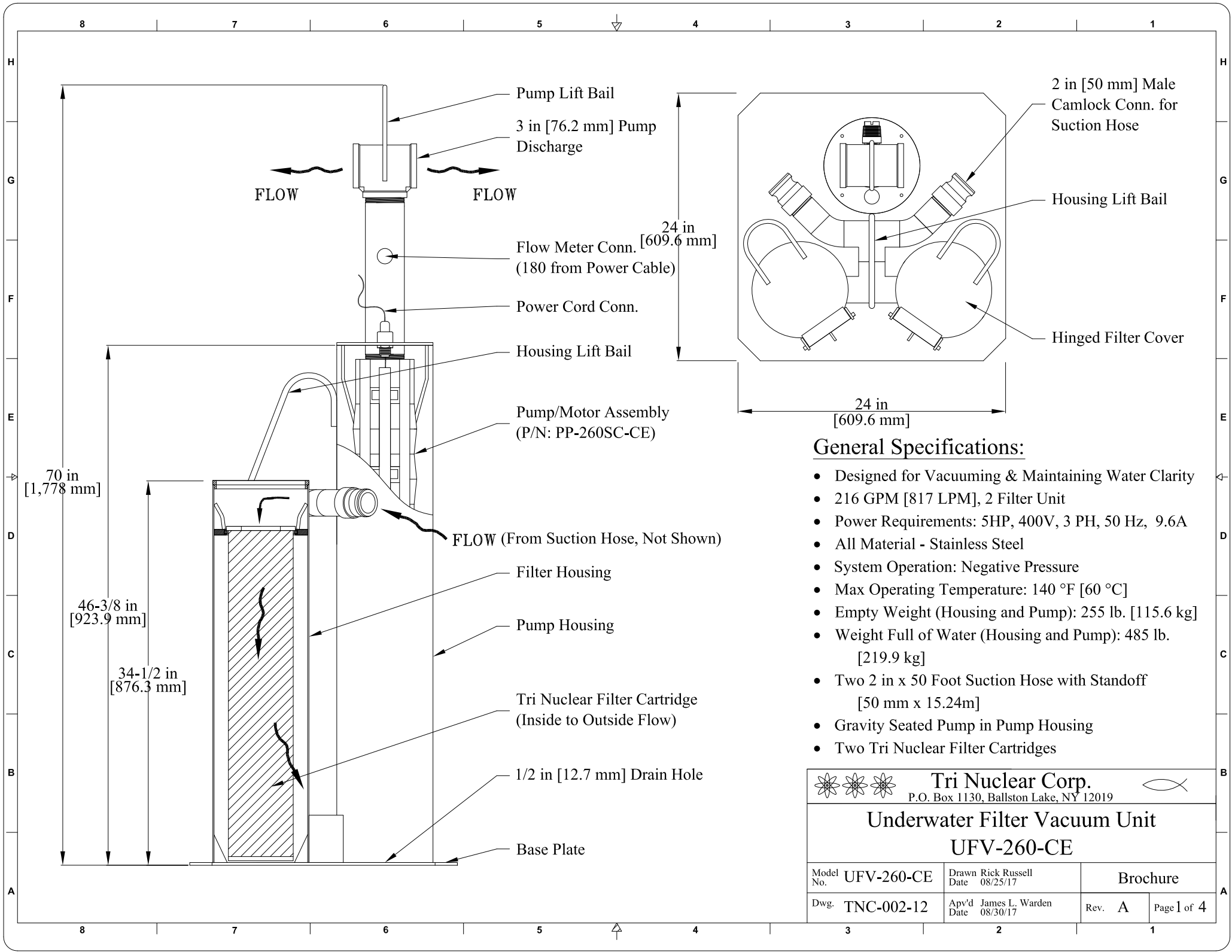


**Tri Nuclear Corp.**  
P.O. Box 1130, Ballston Lake, NY 12019





**UFV-100-CE System**  
**Modes of Operation**

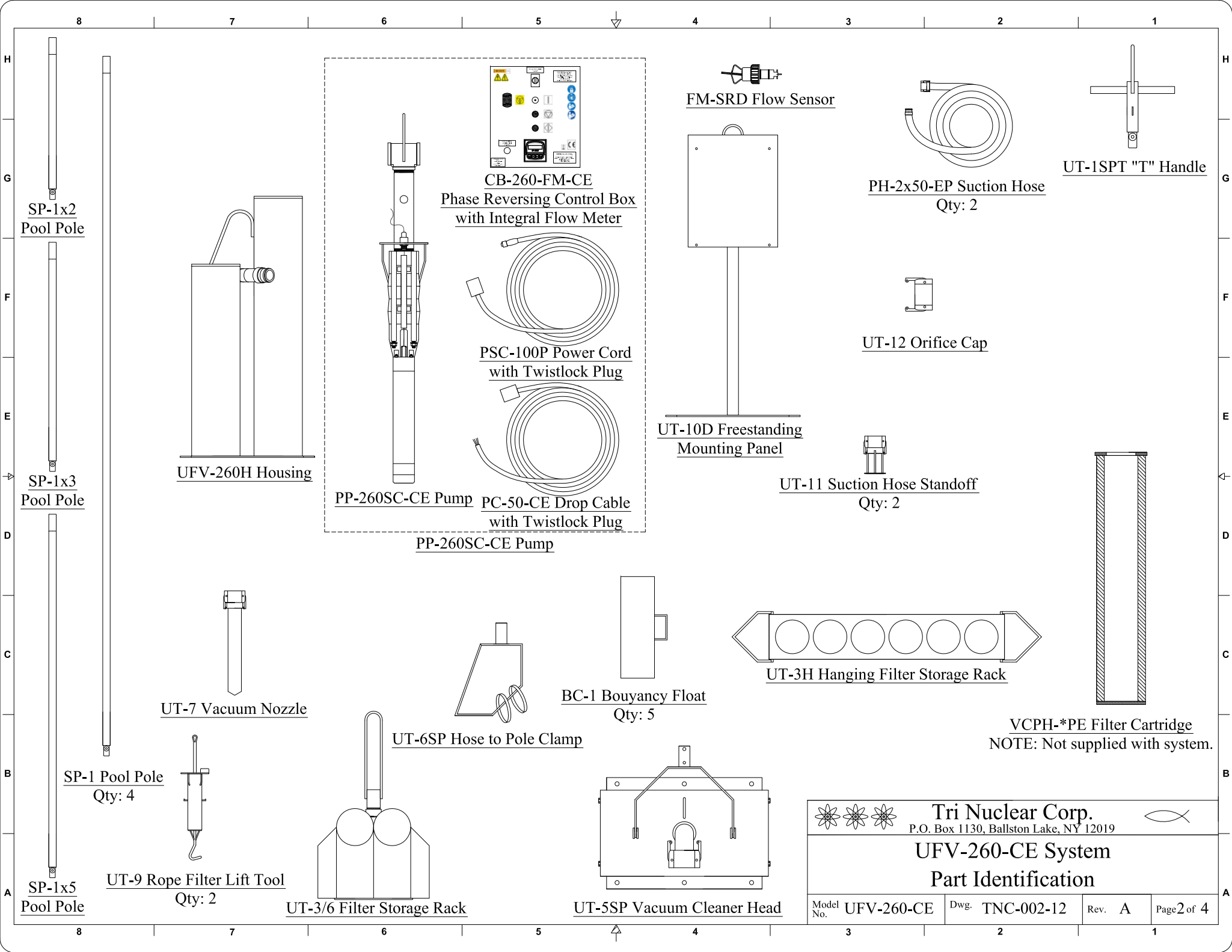
Model No.	UFV-100-CE	Dwg.	TNC-001-12	Rev.	A	Page 4 of 4
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**General Specifications:**

- Designed for Vacuuming & Maintaining Water Clarity
- 216 GPM [817 LPM], 2 Filter Unit
- Power Requirements: 5HP, 400V, 3 PH, 50 Hz, 9.6A
- All Material - Stainless Steel
- System Operation: Negative Pressure
- Max Operating Temperature: 140 °F [60 °C]
- Empty Weight (Housing and Pump): 255 lb. [115.6 kg]
- Weight Full of Water (Housing and Pump): 485 lb. [219.9 kg]
- Two 2 in x 50 Foot Suction Hose with Standoff [50 mm x 15.24m]
- Gravity Seated Pump in Pump Housing
- Two Tri Nuclear Filter Cartridges

		<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>Underwater Filter Vacuum Unit</b> <b>UFV-260-CE</b>					
Model No. <b>UFV-260-CE</b>		Drawn Rick Russell Date 08/25/17		Brochure	
Dwg. <b>TNC-002-12</b>		Apv'd James L. Warden Date 08/30/17		Rev. <b>A</b>	Page 1 of 4



SP-1x2  
Pool Pole

SP-1x3  
Pool Pole

SP-1 Pool Pole  
Qty: 4

SP-1x5  
Pool Pole

UFV-260H Housing

UT-7 Vacuum Nozzle

UT-9 Rope Filter Lift Tool  
Qty: 2

UT-3/6 Filter Storage Rack

CB-260-FM-CE  
Phase Reversing Control Box  
with Integral Flow Meter

PSC-100P Power Cord  
with Twistlock Plug

PC-50-CE Drop Cable  
with Twistlock Plug

PP-260SC-CE Pump

PP-260SC-CE Pump

FM-SRD Flow Sensor

UT-10D Freestanding  
Mounting Panel

UT-11 Suction Hose Standoff  
Qty: 2

UT-12 Orifice Cap

UT-1SPT "T" Handle

PH-2x50-EP Suction Hose  
Qty: 2

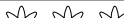

BC-1 Bouyancy Float  
Qty: 5

UT-6SP Hose to Pole Clamp

UT-3H Hanging Filter Storage Rack

VCPH-\*PE Filter Cartridge  
NOTE: Not supplied with system.

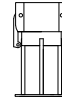
UT-5SP Vacuum Cleaner Head

			<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019								
<b>UFV-260-CE System</b> <b>Part Identification</b>											
Model No.		UFV-260-CE		Dwg.		TNC-002-12		Rev. A		Page 2 of 4	

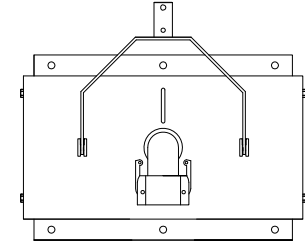


**UT-3H Hanging Filter Storage Rack**  
Holds (6) Tri Nuclear Filter Cartridges  
Dimensions: 42 in x 8 in x 4 in (LWH)  
[1067 mm x 203 mm x 102 mm]  
Weight: 13.5 lb. [6.1 kg]

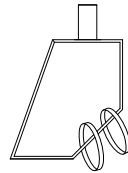
**Swing Lift Bail**



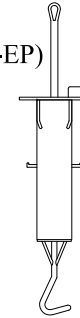
**UT-11 Suction Hose Standoff**  
Attaches to 2 in Suction Hose (Typically PH-2x50-EP)  
Dimensions: 3 in Dia x 8 in Lg.  
[76 mm x 203 mm]  
Weight: 2 lb. [0.9 kg]



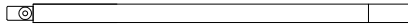
**UT-5SP Vacuum Cleaner Head**  
Attaches to 2 in Suction Hose  
(Typically PH-2x50-EP)  
Dimensions: 20 in x 10 in x 8 in  
[508 mm x 254 mm x 203 mm]  
Weight: 18.5 lb. [8.39 kg]  
Polypro Camlock Fitting



**UT-6SP Hose to Pole Clamp**  
Dimensions: 13-3/4 in x 8 in x 2 in  
[349 mm x 203 mm x 50 mm]  
Weight: 2 lb. [0.9 kg]



**UT-9 Rope Filter Lift Tool**  
Dimensions: 5 in Dia x 24-3/4 in Lg.  
[127 mm x 628 mm]  
Weight: 4.5 lb. [2 kg]



**SP-1x2 Pool Pole**  
Dimensions: 1 in Dia x 2 ft Lg.  
[25 mm x 0.6 m]  
Weight: 2.5 lb. [1.1 kg]



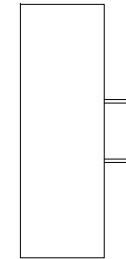
**SP-1x3 Pool Pole**  
Dimensions: 1 in Dia x 3 ft Lg.  
[25 mm x 0.91 m]  
Weight: 3 lb. [1.3 kg]



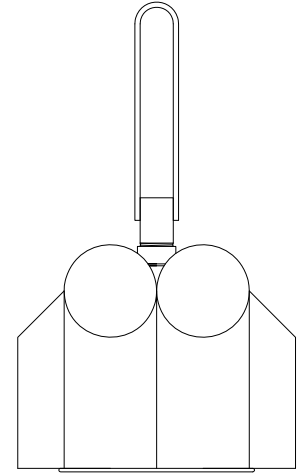
**SP-1x5 Pool Pole**  
Dimensions: 1 in Dia x 5 ft Lg.  
[25 mm x 1.5 m]  
Weight: 5 lb. [2.2 kg]



**UT-12 Orifice Cap**  
Dimensions: 3 in x 3 in x 4 in  
[76 mm x 76 mm x 101 mm]  
Weight: 0.5 lb. [0.2 kg]  
Polypro Camlock Fitting



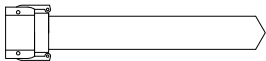
**BC-1 Bouyancy Float**  
Dimensions: 6 in Dia x 18 in Lg.  
[152 mm x 457 mm]  
Weight: 8.5 lb. [3.8 kg]



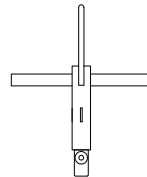
**UT-3/6 Filter Storage Rack**  
Holds (6) Tri Nuclear Filter Cartridges  
Dimensions: 20 in Dia x 33 in High  
[508 mm x 838 mm]  
Weight: 50 lb. [22.6 kg]



**SP-1 Pool Pole**  
Dimensions: 1 in Dia x 10 ft Lg.  
[25 mm x 3 m]  
Weight: 9 lb. [4 kg]

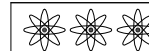


**UT-7 Vacuum Nozzle**  
Attaches to 2 in Suction Hose  
(Typically PH-2x50-EP)  
Dimensions: 2 in Dia x 18 in Lg.  
[50 mm x 457 mm]  
Weight: 4 lb. [1.8 kg]



**UT-1SPT "T" Handle**  
Dimensions: 10 in x 10 in x 1 in  
[254 mm x 254 mm x 25 mm]  
Weight: 2 lb. [0.9 kg]

• All Material - Stainless Steel except as noted.



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

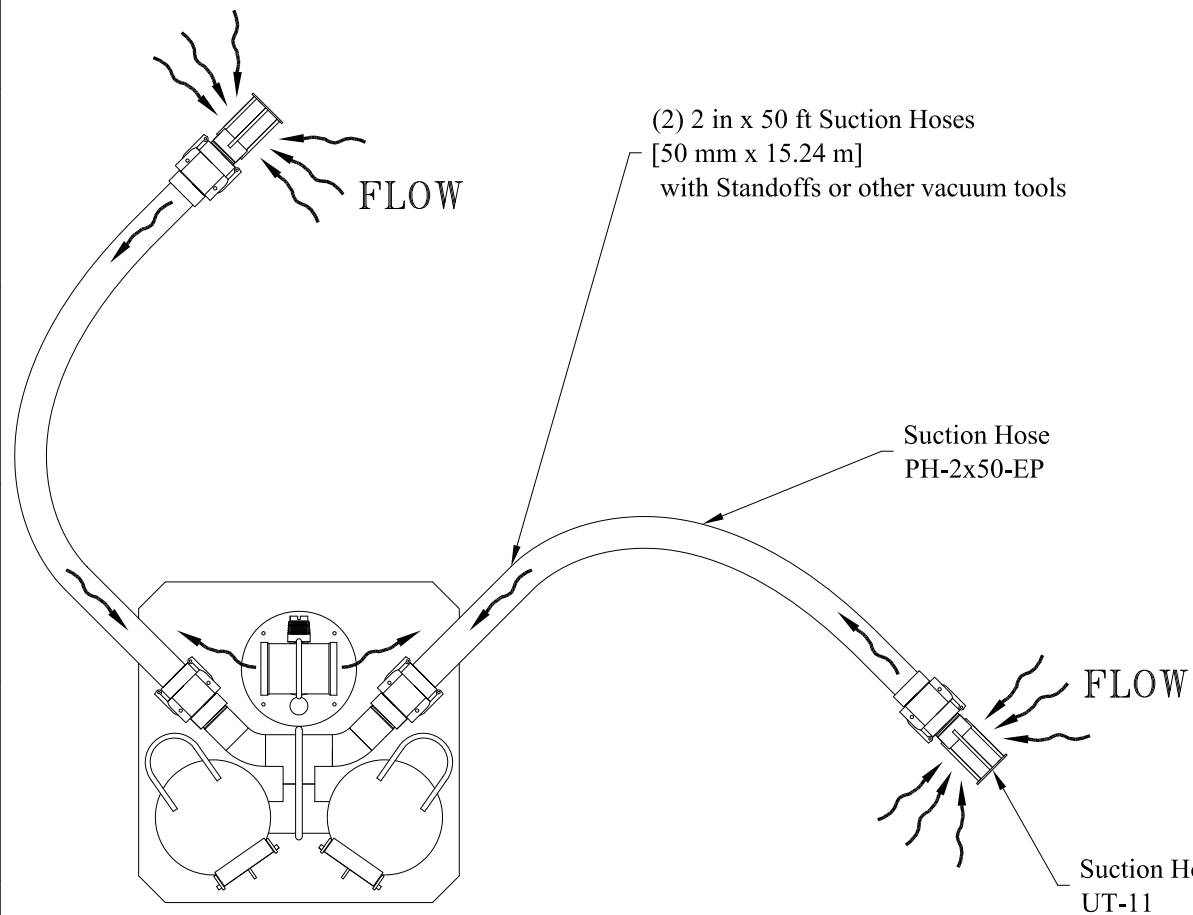


**UFV-260-CE**  
**Accessory Tooling**

Model No.	UFV-260-CE	Dwg.	TNC-002-12	Rev.	A	Page 3 of 4
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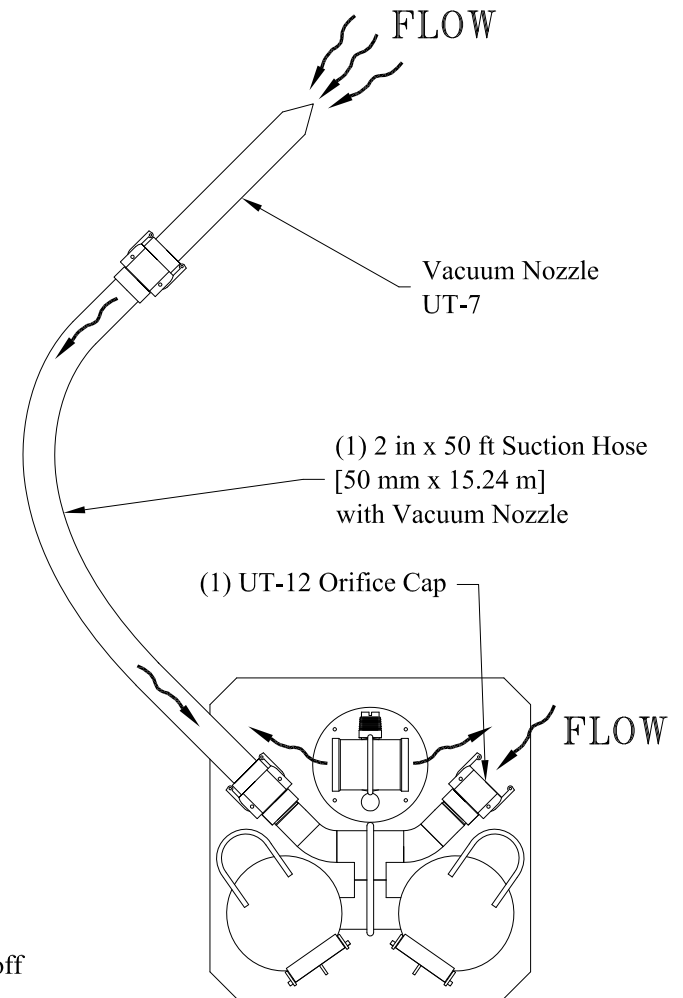
## WATER CLARITY OPERATIONS

(Dual Hose Operation)

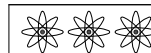


## VACUUMING OPERATIONS

(Single Hose Operation)



\* NOTE: UFV-260-CE Must be run with at least one Suction Hose attached.

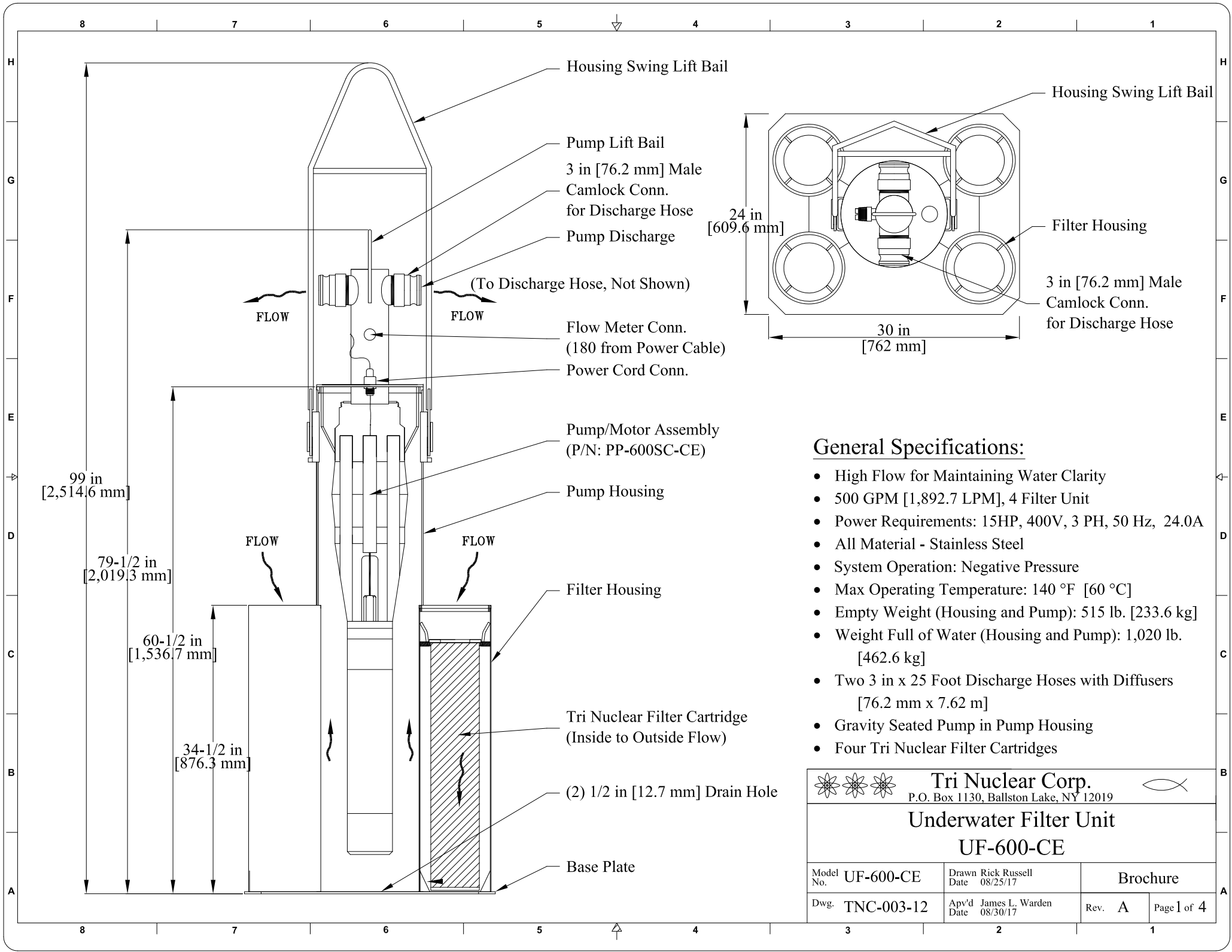


**Tri Nuclear Corp.**  
P.O. Box 1130, Ballston Lake, NY 12019





**UFV-260-CE System**  
**Modes of Operation**

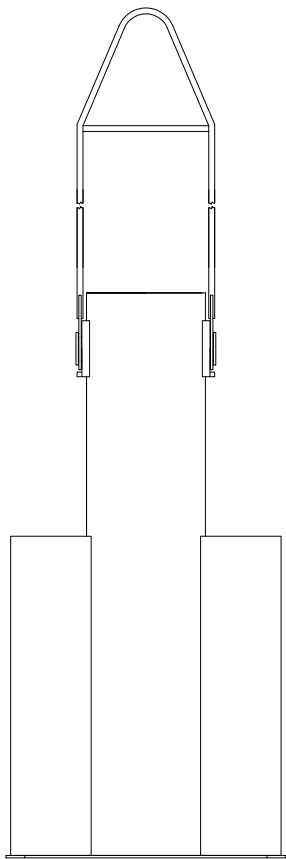
Model No.	UFV-260-CE	Dwg.	TNC-002-12	Rev.	A	Page 4 of 4
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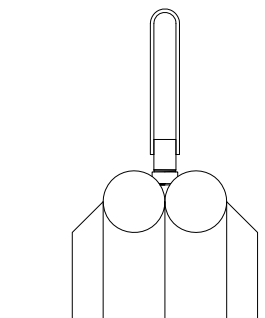
**General Specifications:**

- High Flow for Maintaining Water Clarity
- 500 GPM [1,892.7 LPM], 4 Filter Unit
- Power Requirements: 15HP, 400V, 3 PH, 50 Hz, 24.0A
- All Material - Stainless Steel
- System Operation: Negative Pressure
- Max Operating Temperature: 140 °F [60 °C]
- Empty Weight (Housing and Pump): 515 lb. [233.6 kg]
- Weight Full of Water (Housing and Pump): 1,020 lb. [462.6 kg]
- Two 3 in x 25 Foot Discharge Hoses with Diffusers [76.2 mm x 7.62 m]
- Gravity Seated Pump in Pump Housing
- Four Tri Nuclear Filter Cartridges

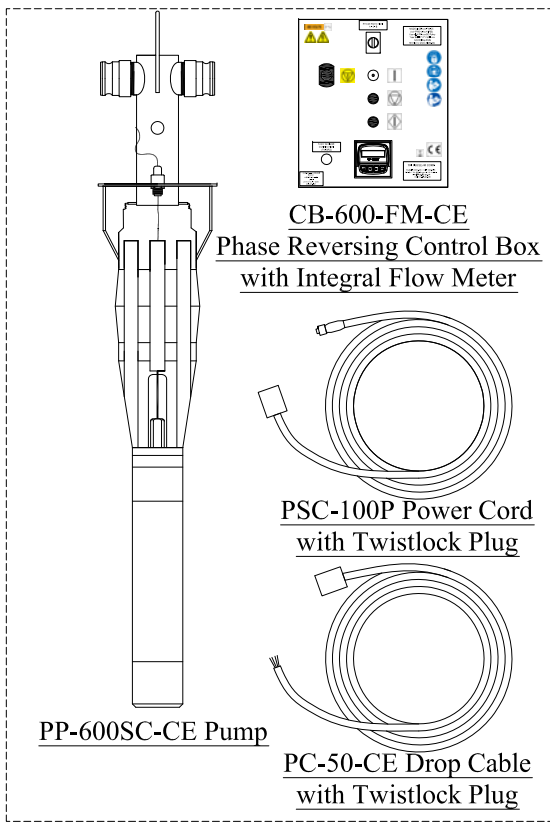
		<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>Underwater Filter Unit</b> <b>UF-600-CE</b>					
Model No. <b>UF-600-CE</b>		Drawn Rick Russell Date 08/25/17		Brochure	
Dwg. <b>TNC-003-12</b>		Apv'd James L. Warden Date 08/30/17		Rev. <b>A</b>	Page 1 of 4



UF-600H Housing



UT-3/6 Filter Storage Rack



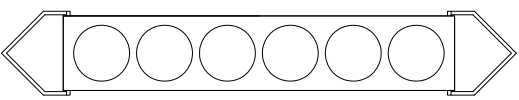
PP-600SC-CE Pump

PP-600SC-CE Pump

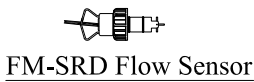
CB-600-FM-CE  
Phase Reversing Control Box  
with Integral Flow Meter

PSC-100P Power Cord  
with Twistlock Plug

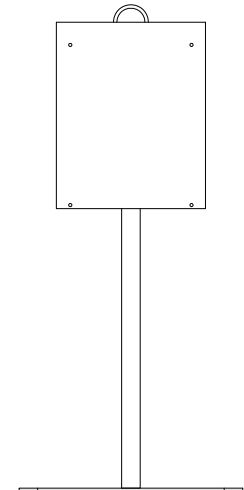
PC-50-CE Drop Cable  
with Twistlock Plug



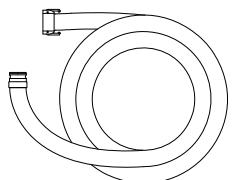
UT-3H Hanging Filter Storage Rack



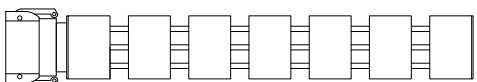
FM-SRD Flow Sensor



UT-10D Freestanding  
Mounting Panel



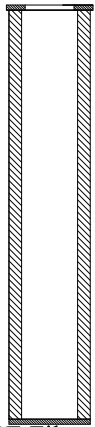
PH-3x25-EP Discharge Hose  
Qty: 2





UT-8 Diffuser Pipe  
Qty: 2



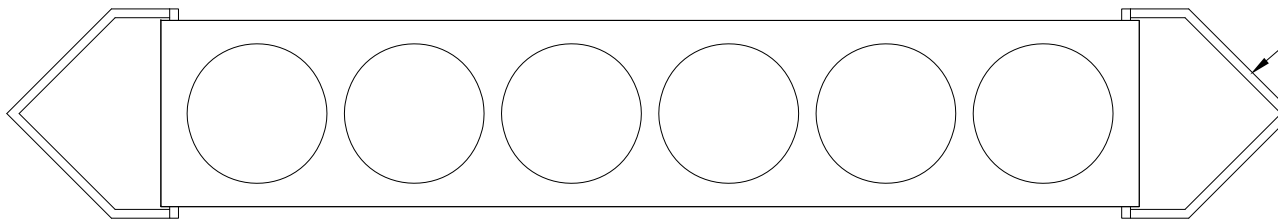
UT-9 Rope Filter Lift Tool  
Qty: 2



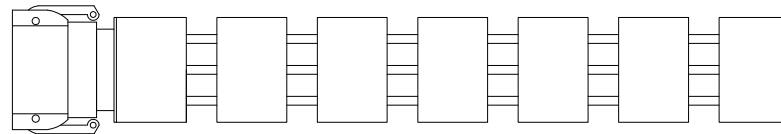
VCPH-\*PE Filter Cartridge  
NOTE: Not supplied with system.

				<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019					
<b>UF-600-CE System</b> <b>Part Identification</b>									
Model No. <b>UF-600-CE</b>			Dwg. <b>TNC-003-12</b>			Rev. <b>A</b>		Page <b>2</b> of <b>4</b>	

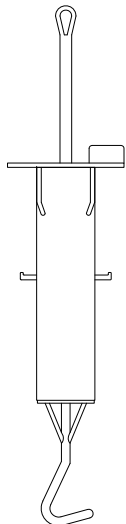




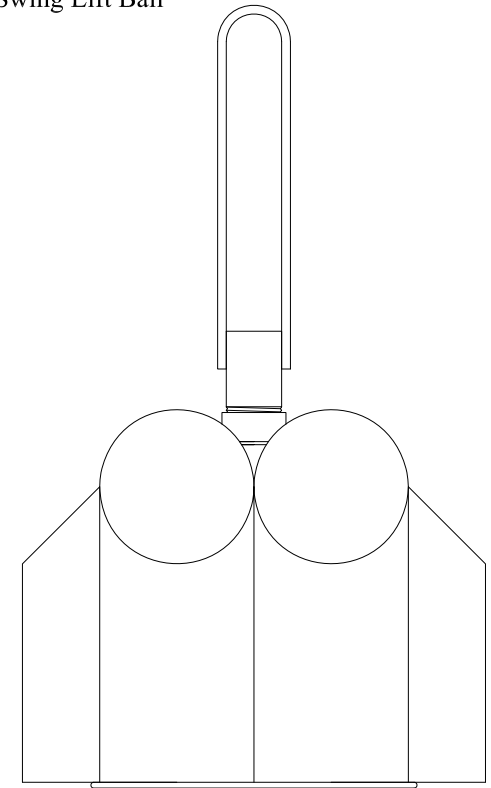
**UT-3H Hanging Filter Storage Rack**  
 Holds (6) Tri Nuclear Filter Cartridges  
 Dimensions: 42 in x 8 in x 4 in (LWH)  
 [1067 mm x 203 mm x 102 mm]  
 Weight: 13.5 lb. [6.1 kg]



**UT-8 Diffuser Pipe**  
 Attaches to 3 in [76 mm] Discharge Hose (Typically PH-3x25-EP)  
 Dimensions: 3-1/2 in Dia x 33-1/2 in Lg.  
 [88.9 mm x 850.9 mm]  
 Weight: 15 lb. [6.8 kg]



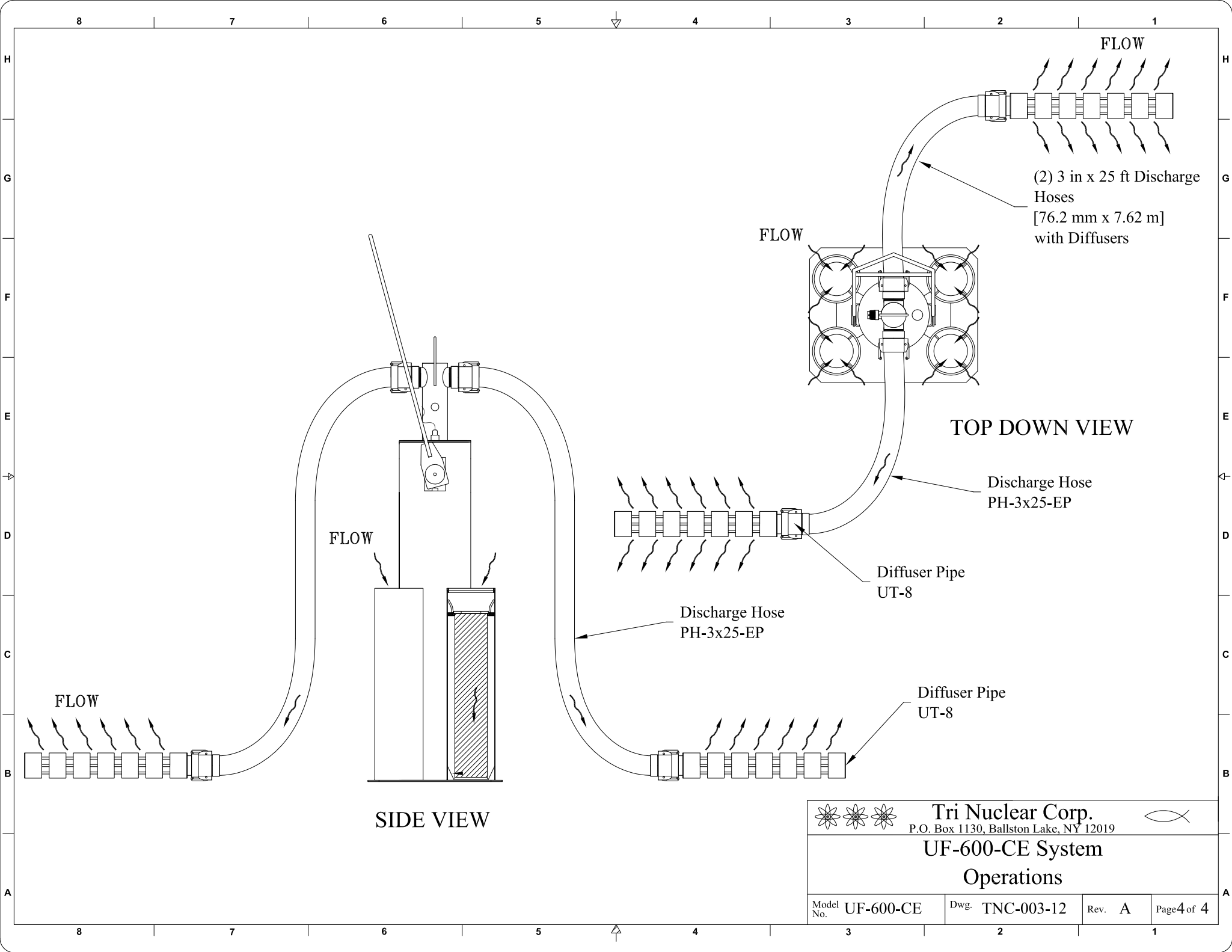
**UT-9 Rope Filter Lift Tool**  
 Dimensions: 5 in Dia x 24-3/4 in Lg.  
 [127 mm x 628 mm]  
 Weight: 4.5 lb. [2 kg]



**UT-3/6 Filter Storage Rack**  
 Holds (6) Tri Nuclear Filter Cartridges  
 Dimensions: 20 in Dia x 33 in High  
 [508 mm x 838 mm]  
 Weight: 50 lb. [22.6 kg]

● All Material - Stainless Steel

 <b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>UF-600-CE</b> <b>Accessory Tooling</b>			
Model No.	UF-600-CE	Dwg.	TNC-003-12
Rev.	A	Page	3 of 4



FLOW

FLOW

FLOW

FLOW

SIDE VIEW

TOP DOWN VIEW


(2) 3 in x 25 ft Discharge  
Hoses  
[76.2 mm x 7.62 m]  
with Diffusers

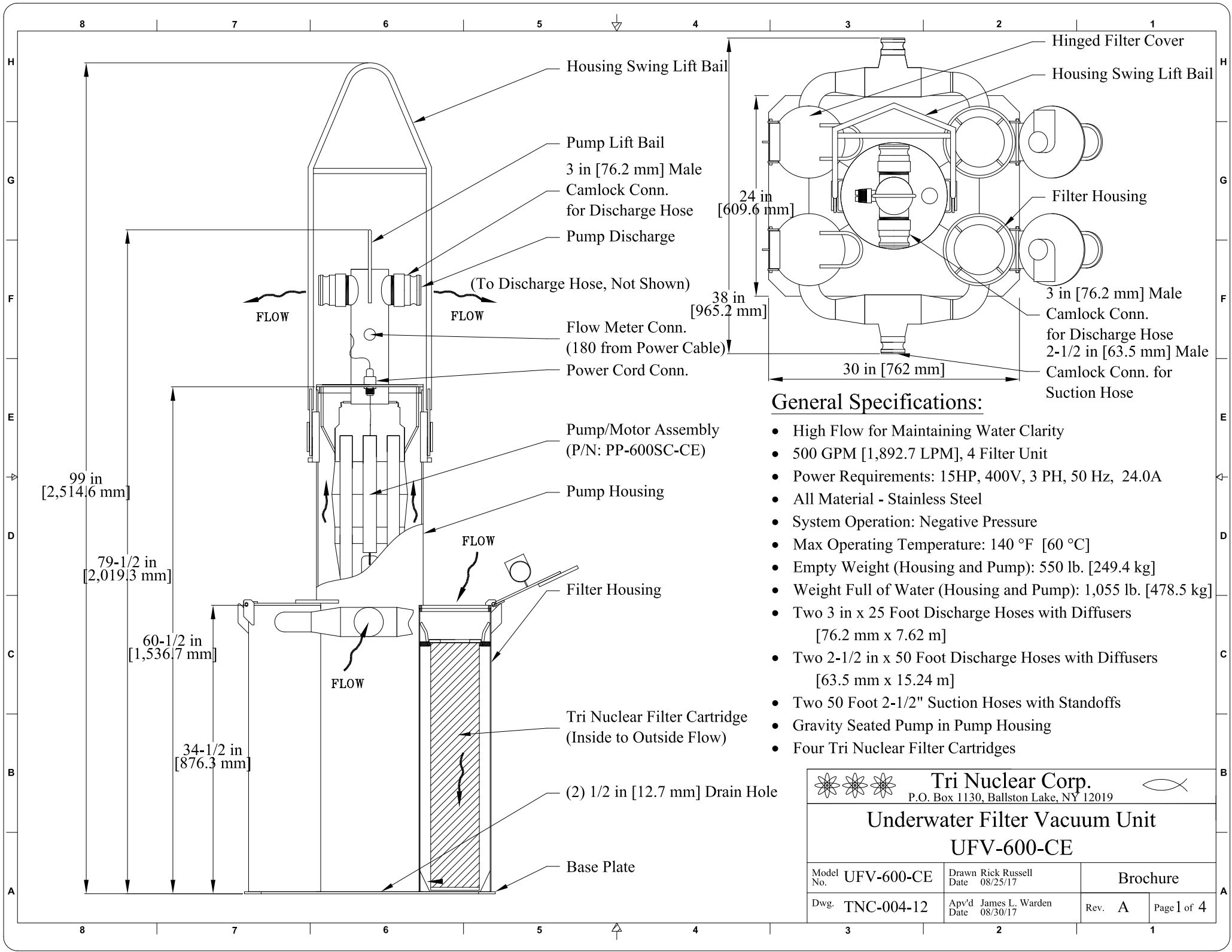
Discharge Hose  
PH-3x25-EP

Diffuser Pipe  
UT-8

Discharge Hose  
PH-3x25-EP


Diffuser Pipe  
UT-8

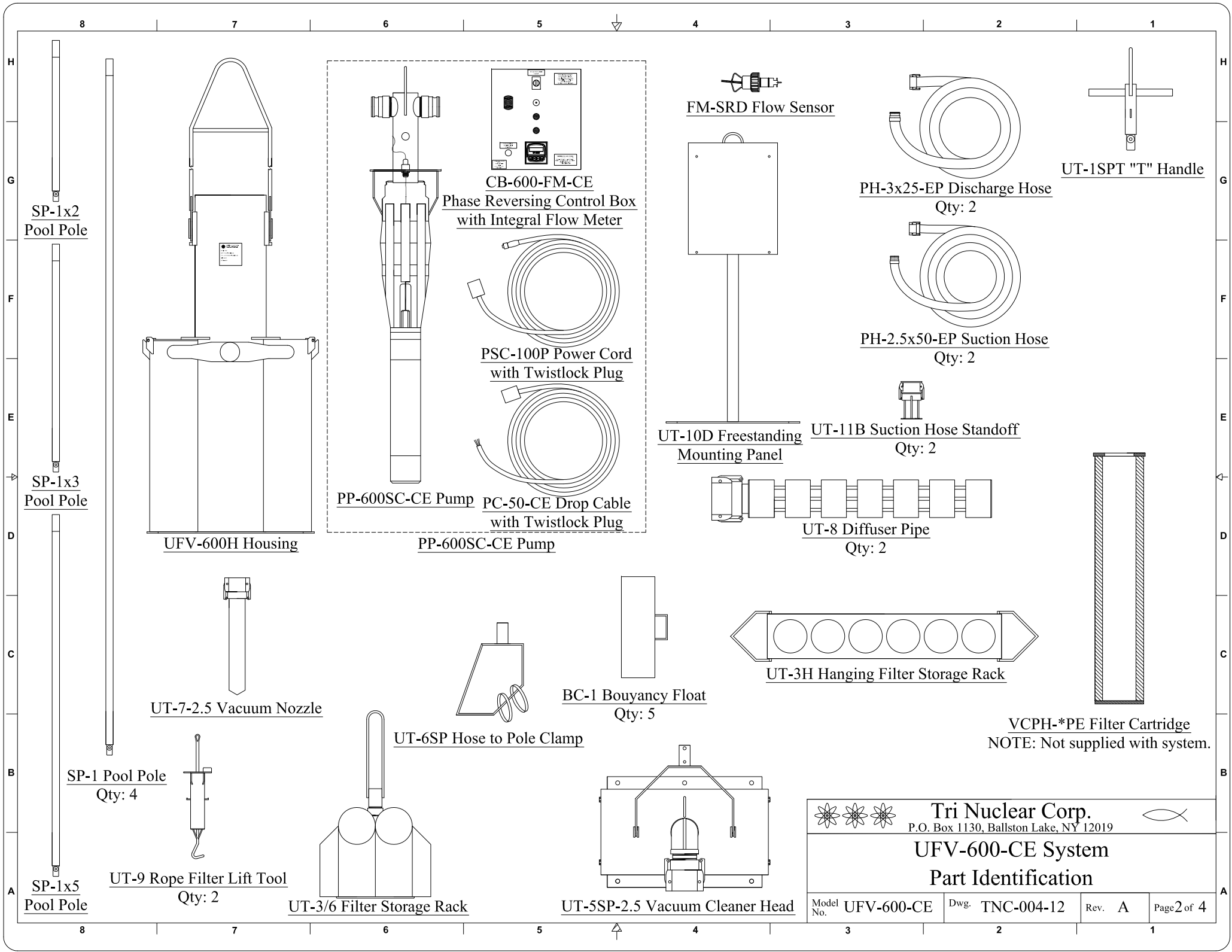
				<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>UF-600-CE System</b>							
<b>Operations</b>							
Model No. <b>UF-600-CE</b>		Dwg. <b>TNC-003-12</b>		Rev. <b>A</b>		Page <b>4</b> of <b>4</b>	

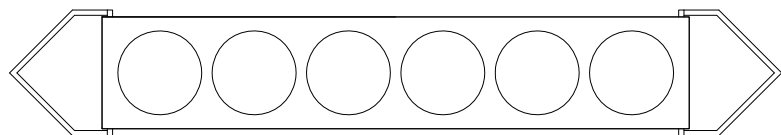


### General Specifications:

- High Flow for Maintaining Water Clarity
- 500 GPM [1,892.7 LPM], 4 Filter Unit
- Power Requirements: 15HP, 400V, 3 PH, 50 Hz, 24.0A
- All Material - Stainless Steel
- System Operation: Negative Pressure
- Max Operating Temperature: 140 °F [60 °C]
- Empty Weight (Housing and Pump): 550 lb. [249.4 kg]
- Weight Full of Water (Housing and Pump): 1,055 lb. [478.5 kg]
- Two 3 in x 25 Foot Discharge Hoses with Diffusers [76.2 mm x 7.62 m]
- Two 2-1/2 in x 50 Foot Discharge Hoses with Diffusers [63.5 mm x 15.24 m]
- Two 50 Foot 2-1/2" Suction Hoses with Standoffs
- Gravity Seated Pump in Pump Housing
- Four Tri Nuclear Filter Cartridges

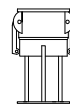
 <b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>Underwater Filter Vacuum Unit</b> <b>UFV-600-CE</b>			
Model No. <b>UFV-600-CE</b>	Drawn Rick Russell Date 08/25/17	Brochure	
Dwg. <b>TNC-004-12</b>	Apv'd James L. Warden Date 08/30/17	Rev. <b>A</b>	Page 1 of 4



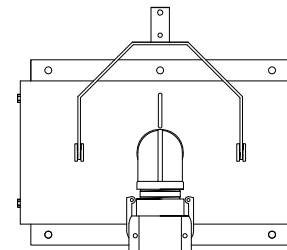


**UT-3H Hanging Filter Storage Rack**  
Holds (6) Tri Nuclear Filter Cartridges  
Dimensions: 42 in x 8 in x 4 in (LWH)  
[1067 mm x 203 mm x 102 mm]  
Weight: 13.5 lb. [6.1 kg]

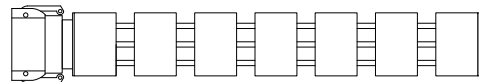
Swing Lift Bail



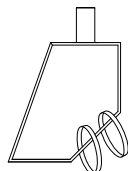
**UT-11B Suction Hose Standoff**  
Attaches to 2-1/2 in Suction Hose  
(Typically PH-2.5x50-EP)  
Dimensions: 3 in Dia x 8 in Lg.  
[76 mm x 203 mm]  
Weight: 3.5 lb. [1.5 kg]



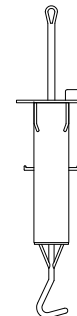
**UT-5SP-2.5 Vacuum Cleaner Head**  
Attaches to 2-1/2 in Suction Hose  
(Typically PH-2.5x50-EP)  
Dimensions: 20 in x 10 in x 8 in  
[508 mm x 254 mm x 203 mm]  
Weight: 23.5 lb. [10.6 kg]



**UT-8 Diffuser Pipe**  
Attaches to 3 in [76 mm] Discharge Hose  
(Typically PH-3x25-EP)  
Dimensions: 3-1/2 in Dia x 33-1/2 in Lg.  
[88.9 mm x 850.9 mm]  
Weight: 15 lb. [6.8 kg]



**UT-6SP Hose to Pole Clamp**  
Dimensions: 13-3/4 in x 8 in x 2 in  
[349 mm x 203 mm x 50 mm]  
Weight: 2 lb. [0.9 kg]



**UT-9 Rope Filter Lift Tool**  
Dimensions: 5 in Dia x 24-3/4 in Lg.  
[127 mm x 628 mm]  
Weight: 4.5 lb. [2 kg]



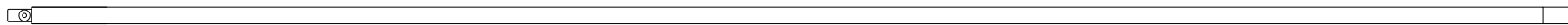
**SP-1x2 Pool Pole**  
Dimensions: 1 in Dia x 2 ft Lg.  
[25 mm x 0.6 m]  
Weight: 2.5 lb. [1.1 kg]



**SP-1x3 Pool Pole**  
Dimensions: 1 in Dia x 3 ft Lg.  
[25 mm x 0.91 m]  
Weight: 3 lb. [1.3 kg]



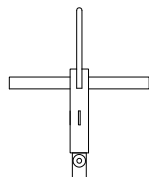
**SP-1x5 Pool Pole**  
Dimensions: 1 in Dia x 5 ft Lg.  
[25 mm x 1.5 m]  
Weight: 5 lb. [2.2 kg]



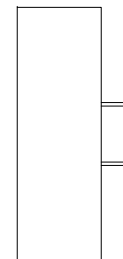
**SP-1 Pool Pole**  
Dimensions: 1 in Dia x 10 ft Lg.  
[25 mm x 3 m]  
Weight: 9 lb. [4 kg]



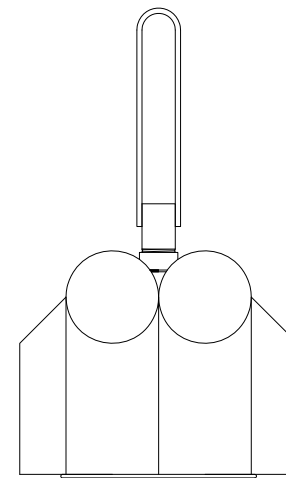
**UT-7 Vacuum Nozzle**  
Attaches to 2-1/2 in Suction Hose  
(Typically PH-2.5x50-EP)  
Dimensions: 3 in Dia x 18 in Lg.  
[76 mm x 457 mm]  
Weight: 4 lb. [1.8 kg]



**UT-1SPT "T" Handle**  
Dimensions: 10 in x 10 in x 1 in  
[254 mm x 254 mm x 25 mm]  
Weight: 2 lb. [0.9 kg]

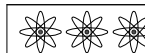


**BC-1 Bouyancy Float**  
Dimensions: 6 in Dia x 18 in Lg.  
[152 mm x 457 mm]  
Weight: 8.5 lb. [3.8 kg]



**UT-3/6 Filter Storage Rack**  
Holds (6) Tri Nuclear Filter Cartridges  
Dimensions: 20 in Dia x 33 in High  
[508 mm x 838 mm]  
Weight: 50 lb. [22.6 kg]

• All Material - Stainless Steel



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

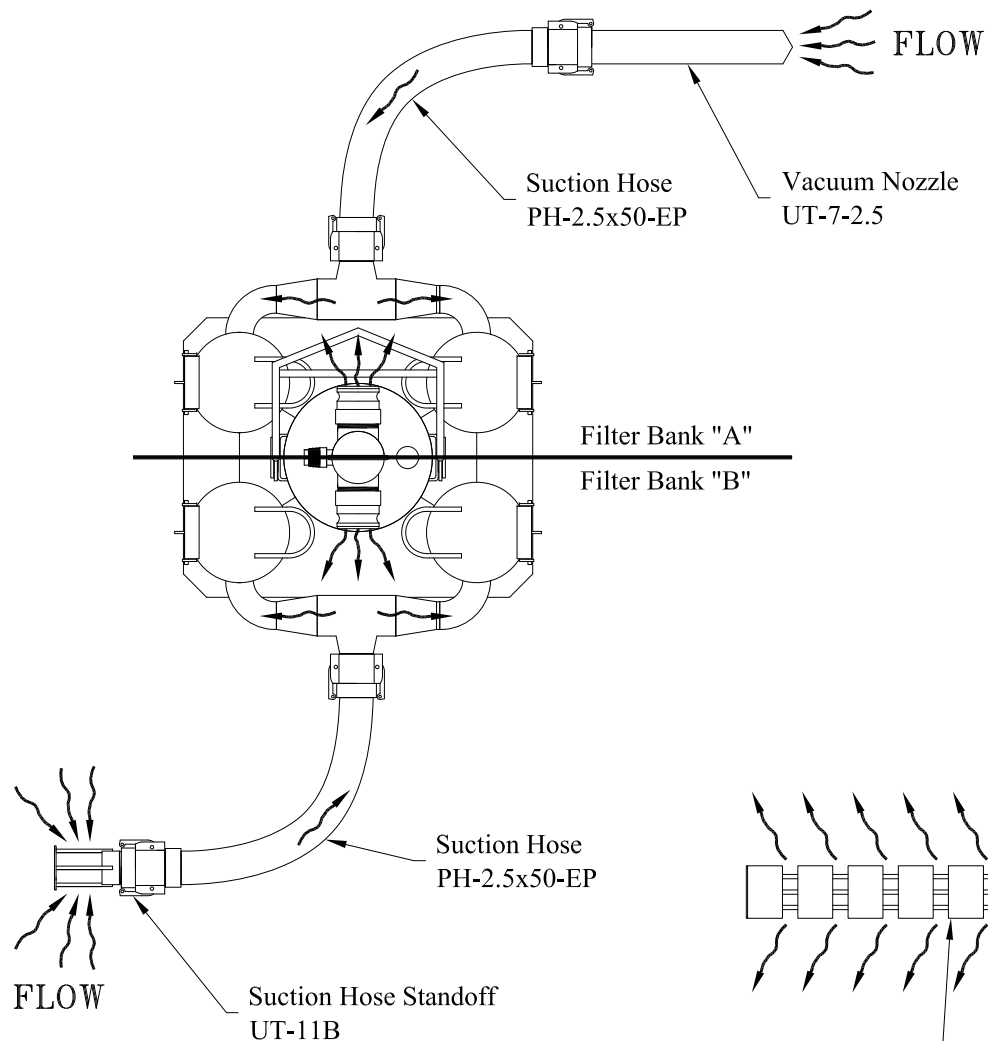


**UFV-600-CE**  
**Accessory Tooling**

Model No.	UFV-600-CE	Dwg.	TNC-004-12	Rev.	A	Page 3 of 4
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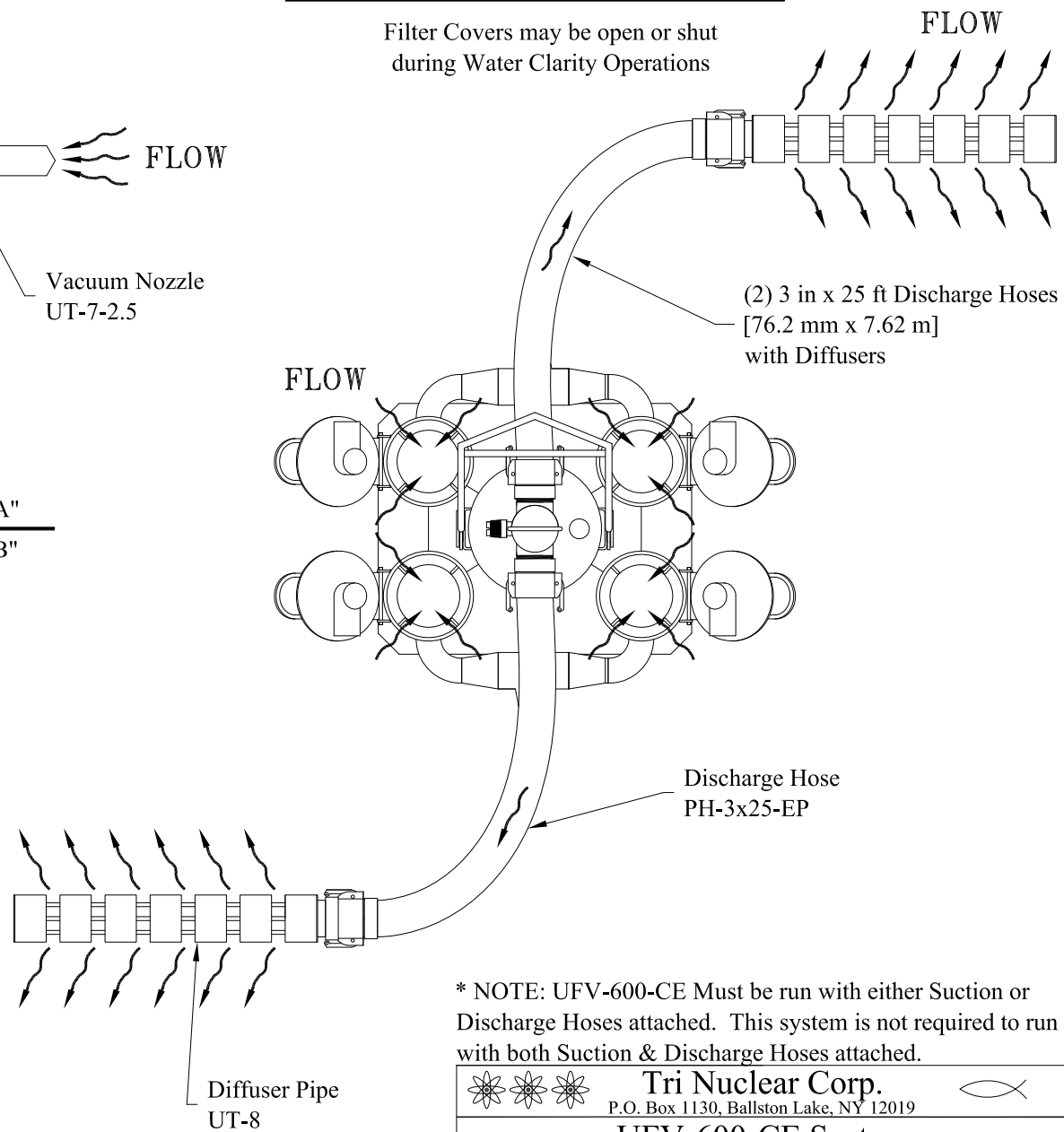
## VACUUMING OPERATIONS

NOTE: Each Suction Hose is tied to a single bank of 2 filters.  
Vacuuming with one Suction Hose can cause an imbalance in filter loading between the two banks of filters.

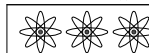


## WATER CLARITY OPERATIONS

Filter Covers may be open or shut during Water Clarity Operations



\* NOTE: UFV-600-CE Must be run with either Suction or Discharge Hoses attached. This system is not required to run with both Suction & Discharge Hoses attached.

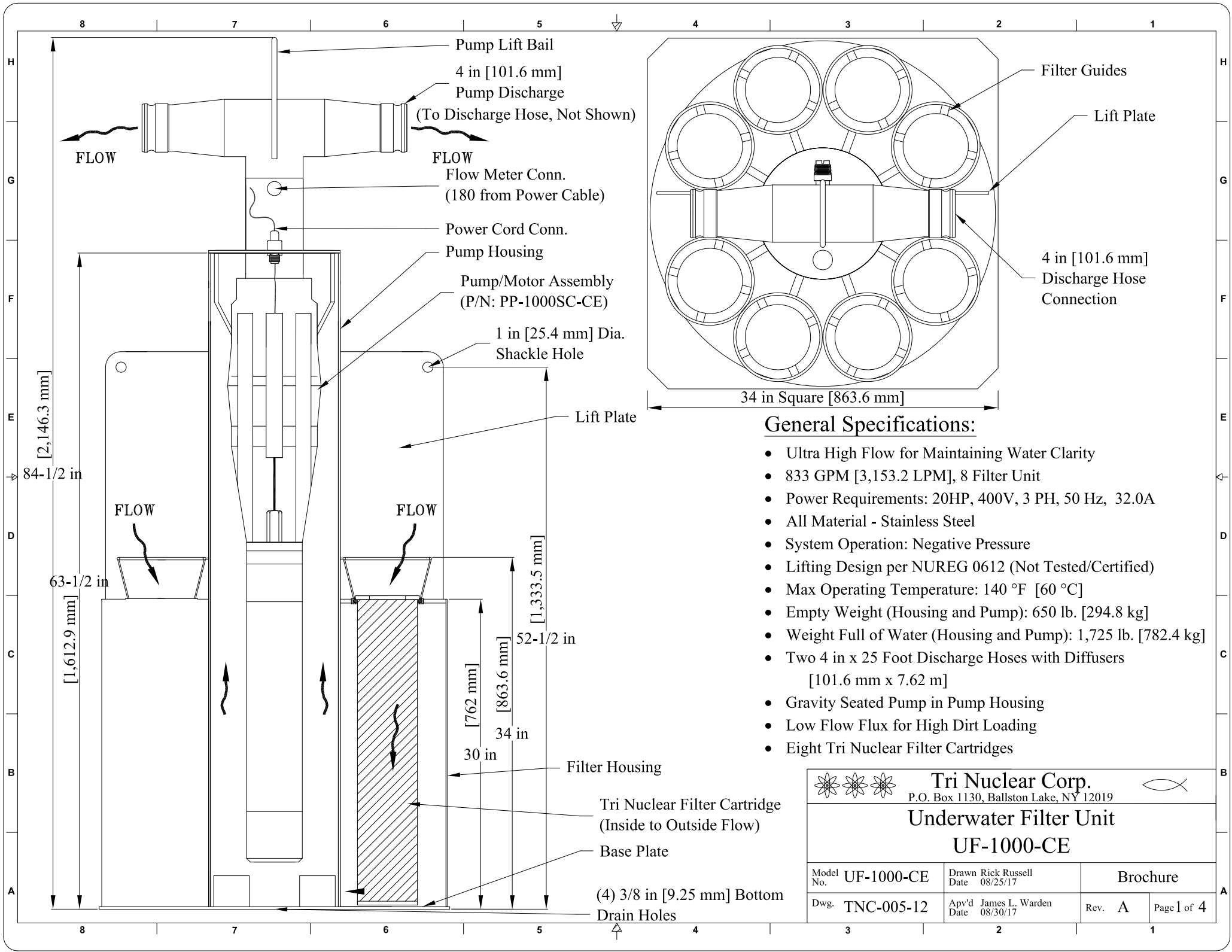


**Tri Nuclear Corp.**  
P.O. Box 1130, Ballston Lake, NY 12019

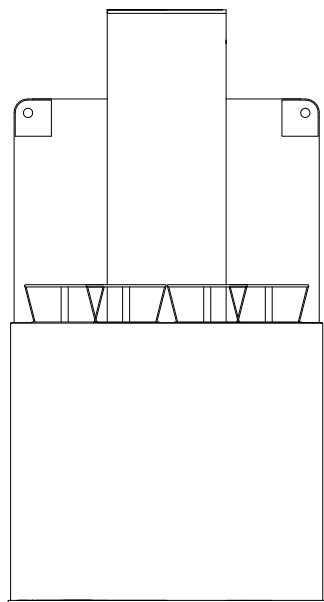


**UFV-600-CE System**  
**Modes of Operation**

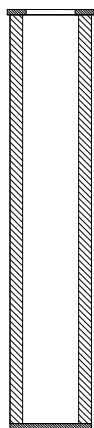
Model No.	UFV-600-CE	Dwg.	TNC-004-12	Rev.	A	Page 4 of 4
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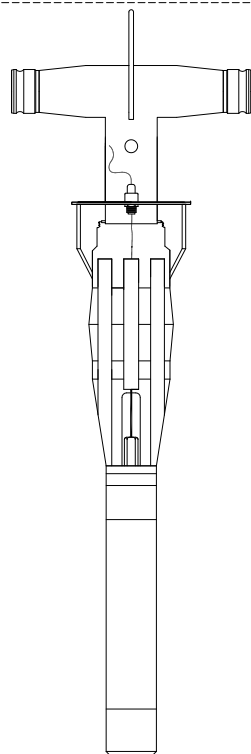




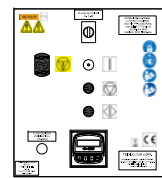
UF-1000H Housing



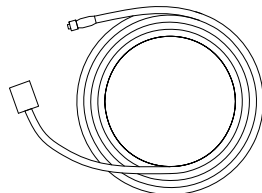
VCPH-\*PE Filter Cartridge  
NOTE: Not supplied with system.



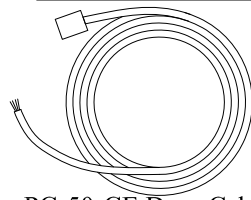
PP-1000SC-CE Pump



CB-1000-FM-CE  
Phase Reversing Control Box  
with Integral Flow Meter



PSC-100P Power Cord  
with Twistlock Plug

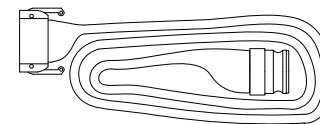


PC-50-CE Drop Cable  
with Twistlock Plug

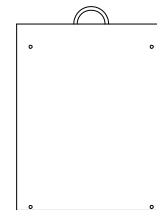
PP-1000SC-CE Pump



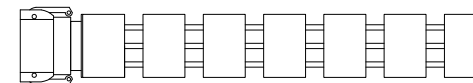
FM-SRD Flow Sensor



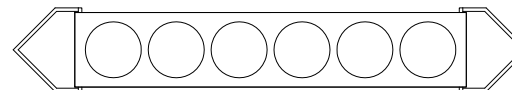
PH-4x25-EP Discharge Hose  
Qty: 2



UT-10D Freestanding  
Mounting Panel



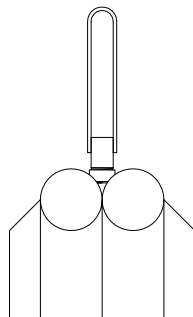
UT-13 Diffuser Pipe  
Qty: 2





UT-3H Hanging Filter Storage Rack

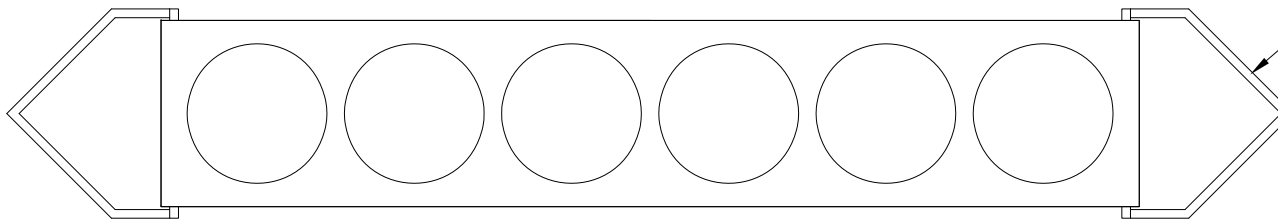


UT-9 Rope Filter Lift Tool  
Qty: 2

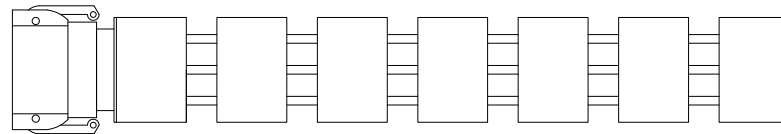


UT-3/6 Filter Storage Rack  
Qty: 2

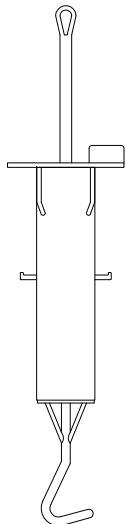
		<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019		
<b>UF-1000-CE System</b>				
<b>Part Identification</b>				
Model No.	UF-1000-CE	Dwg.	TNC-005-12	Rev. A
				Page 2 of 4



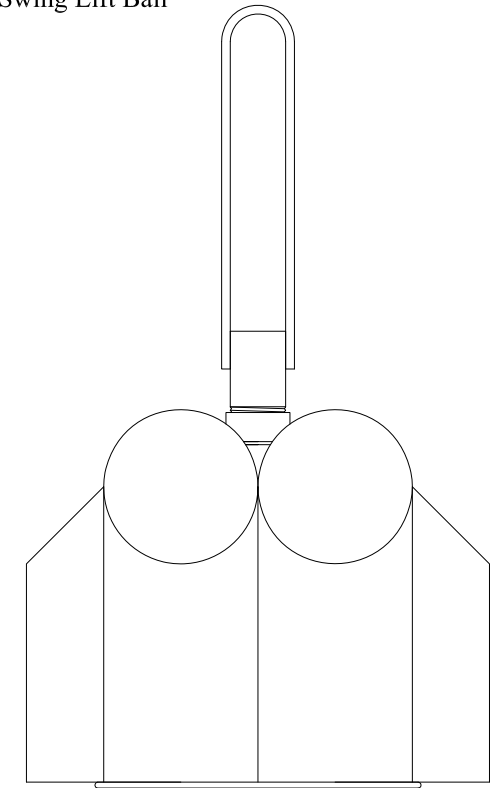
**UT-3H Hanging Filter Storage Rack**  
 Holds (6) Tri Nuclear Filter Cartridges  
 Dimensions: 42 in x 8 in x 4 in (LWH)  
 [1067 mm x 203 mm x 102 mm]  
 Weight: 13.5 lb. [6.1 kg]



**UT-13 Diffuser Pipe**  
 Attaches to 4 in [101.6 mm] Discharge Hose (Typically PH-4x25-EP)  
 Dimensions: 3-1/2 in Dia x 33-1/2 in Lg.  
 [88.9 mm x 850.9 mm]  
 Weight: 15 lb. [6.8 kg]



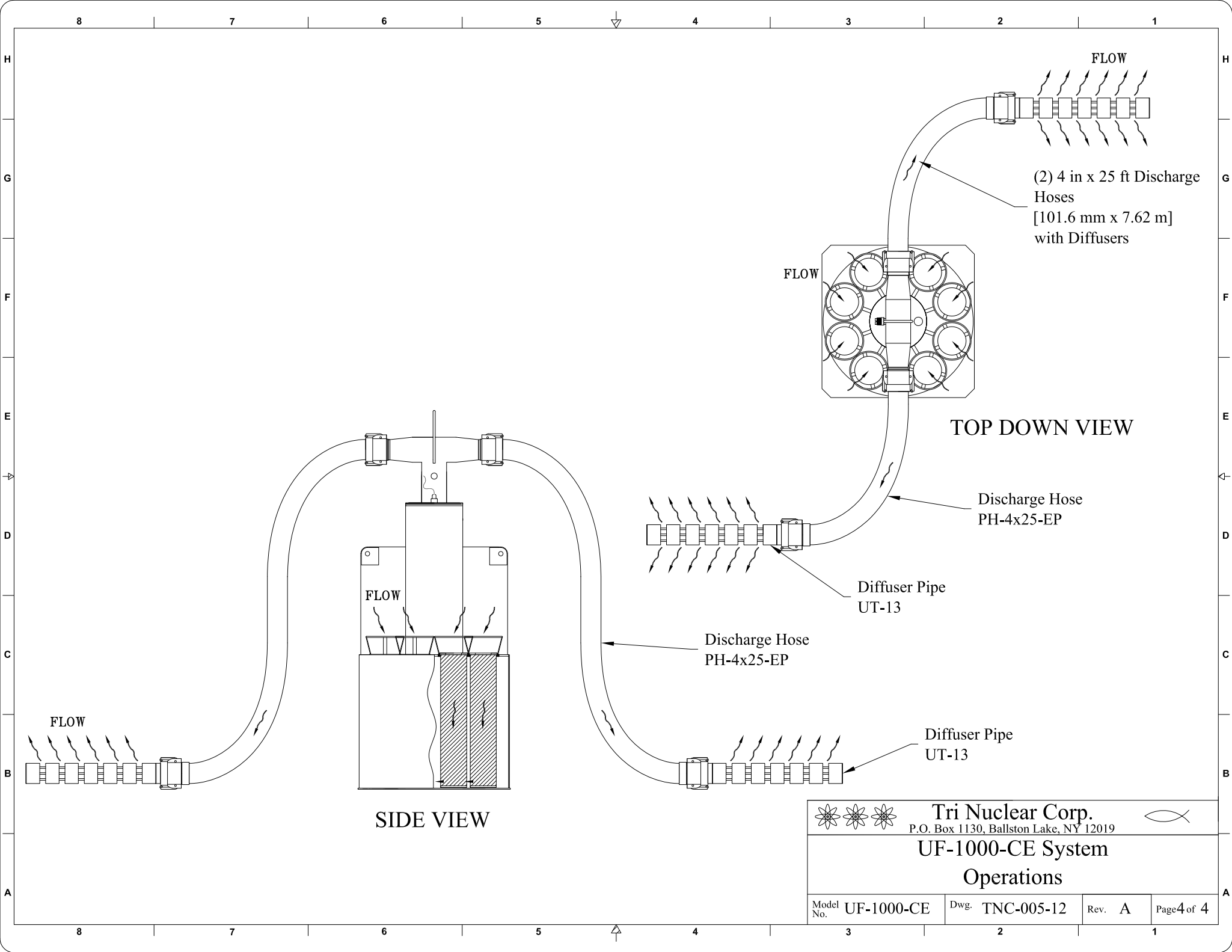
**UT-9 Rope Filter Lift Tool**  
 Dimensions: 5 in Dia x 24-3/4 in Lg.  
 [127 mm x 628 mm]  
 Weight: 4.5 lb. [2 kg]



**UT-3/6 Filter Storage Rack**  
 Holds (6) Tri Nuclear Filter Cartridges  
 Dimensions: 20 in Dia x 33 in High  
 [508 mm x 838 mm]  
 Weight: 50 lb. [22.6 kg]

● All Material - Stainless Steel

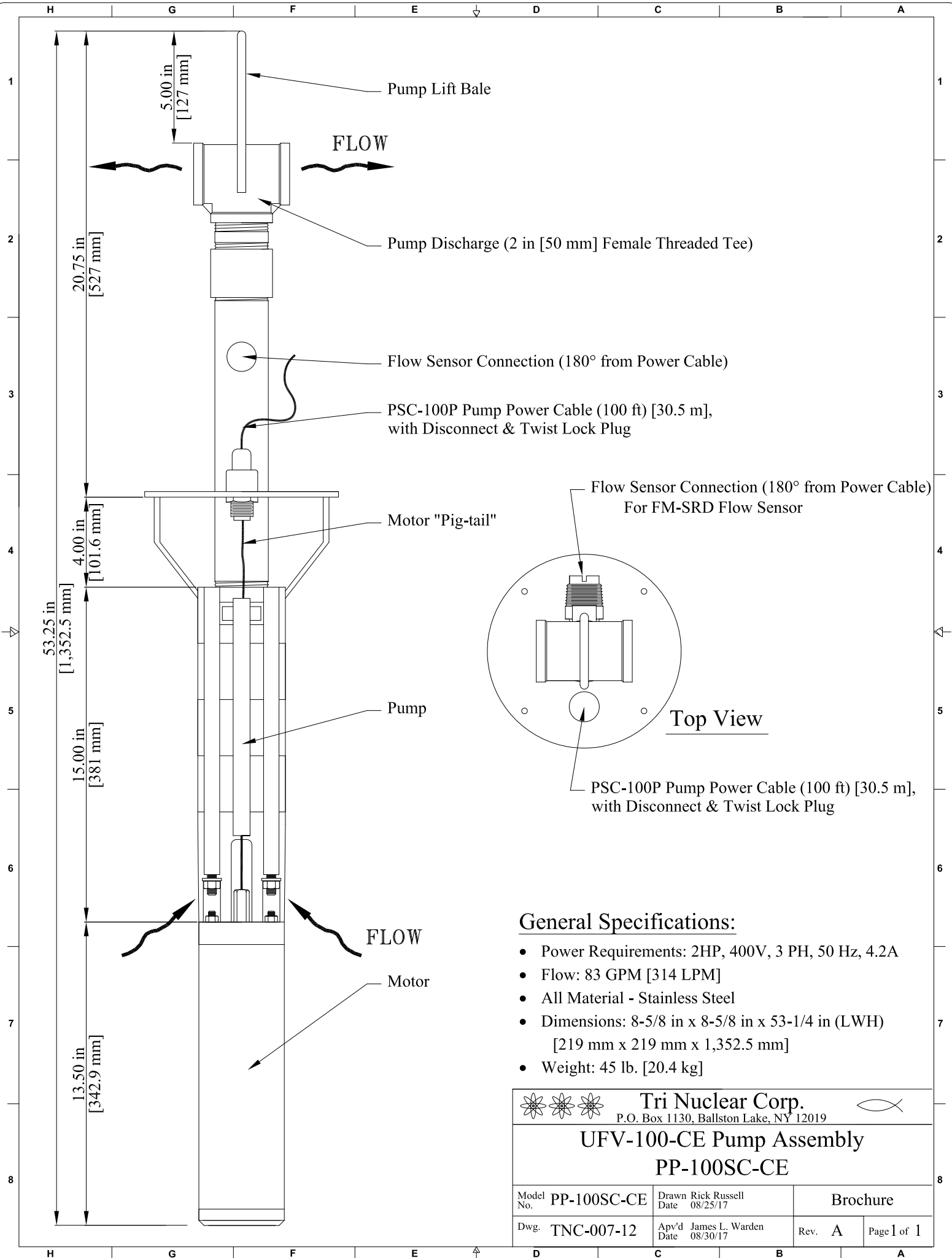
			<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019										
<b>UF-1000-CE System</b> <b>Accessory Tooling</b>													
Model No.		UF-1000-CE		Dwg.		TNC-005-12		Rev.		A		Page 3 of 4	



SIDE VIEW



TOP DOWN VIEW

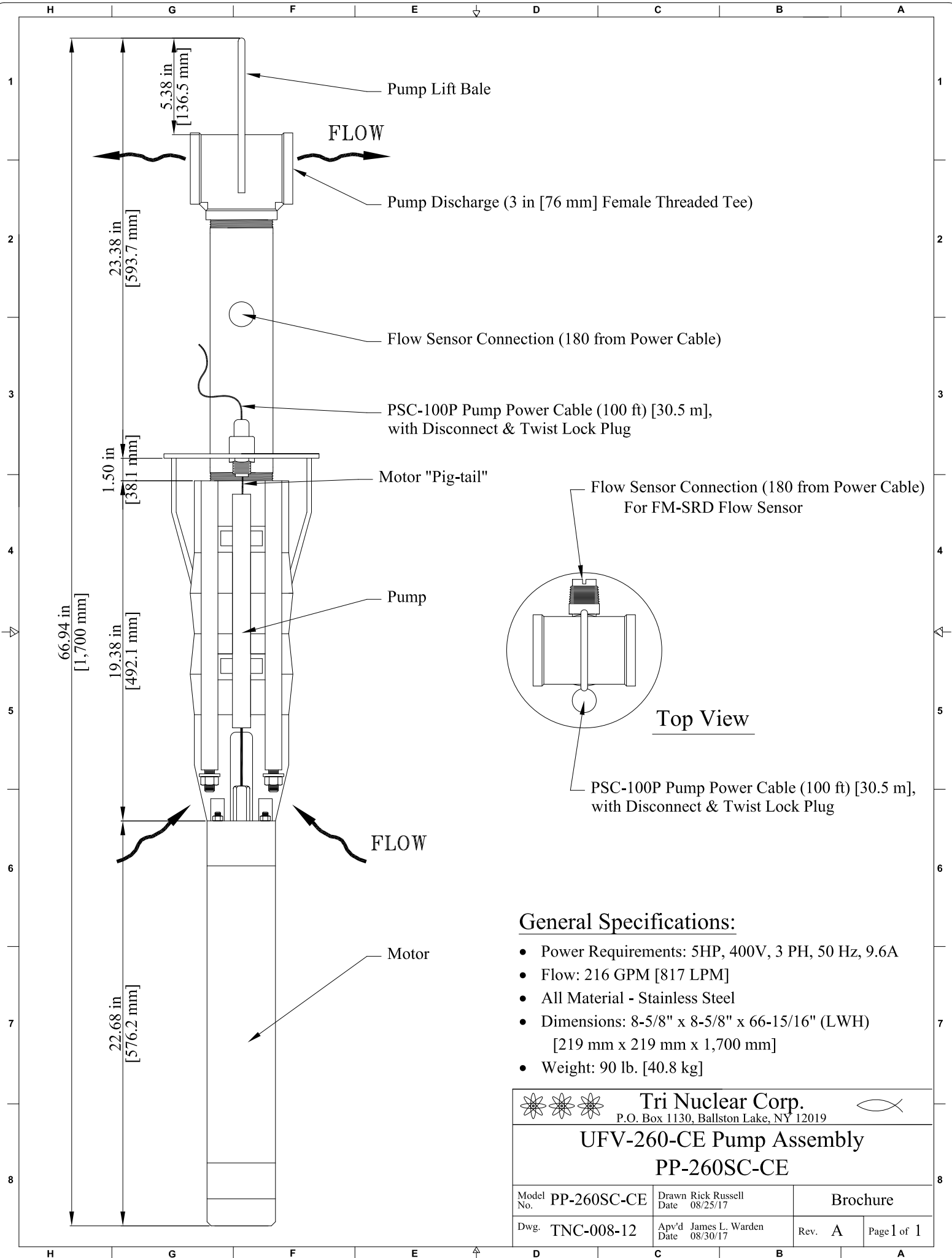
<div><div>Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019</div></div>					
UF-1000-CE System					
Operations					
Model No. UF-1000-CE		Dwg. TNC-005-12	Rev. A	Page4 of 4	



**General Specifications:**



- Power Requirements: 2HP, 400V, 3 PH, 50 Hz, 4.2A
- Flow: 83 GPM [314 LPM]
- All Material - Stainless Steel
- Dimensions: 8-5/8 in x 8-5/8 in x 53-1/4 in (LWH)  
[219 mm x 219 mm x 1,352.5 mm]
- Weight: 45 lb. [20.4 kg]

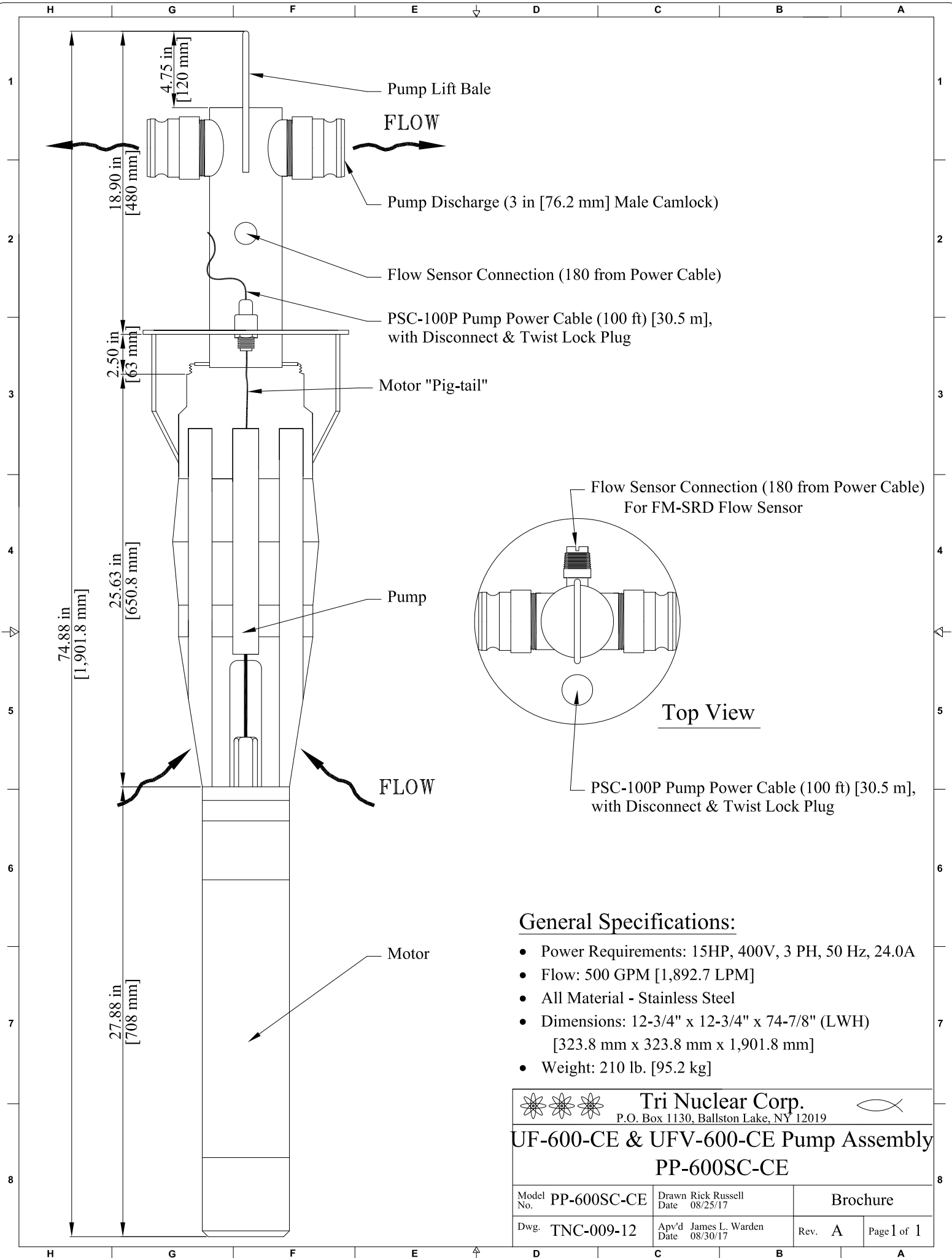
<div> <b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019</div> <div></div>		
<b>UFV-100-CE Pump Assembly</b> <b>PP-100SC-CE</b>		
Model No. <b>PP-100SC-CE</b>	Drawn Rick Russell Date 08/25/17	Brochure
Dwg. <b>TNC-007-12</b>	Apv'd James L. Warden Date 08/30/17	Rev. <b>A</b> Page 1 of 1



### General Specifications:



- Power Requirements: 5HP, 400V, 3 PH, 50 Hz, 9.6A
- Flow: 216 GPM [817 LPM]
- All Material - Stainless Steel
- Dimensions: 8-5/8" x 8-5/8" x 66-15/16" (LWH)  
[219 mm x 219 mm x 1,700 mm]
- Weight: 90 lb. [40.8 kg]

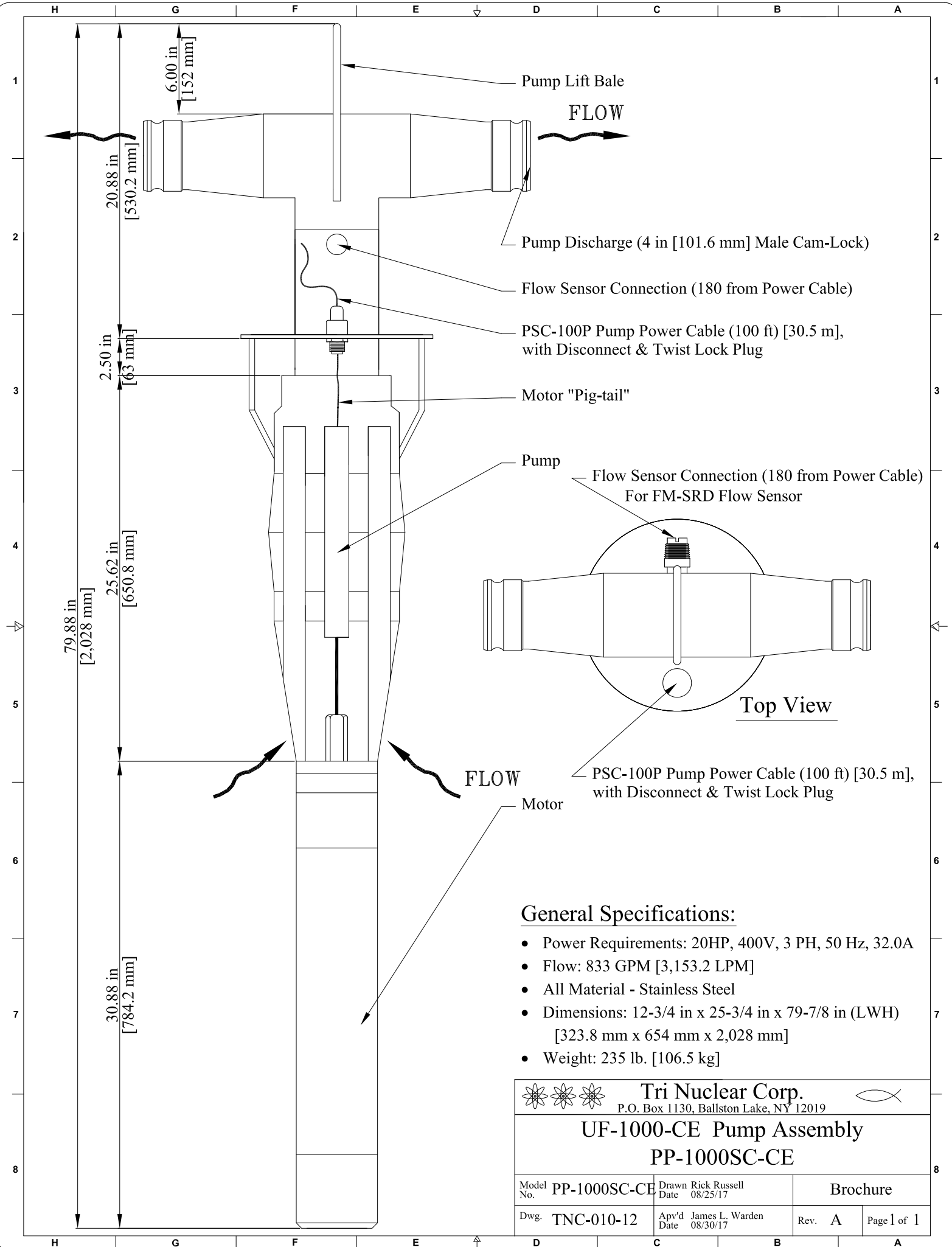
		<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>UFV-260-CE Pump Assembly</b> <b>PP-260SC-CE</b>					
Model No. <b>PP-260SC-CE</b>		Drawn Rick Russell Date 08/25/17		Brochure	
Dwg. <b>TNC-008-12</b>		App'd James L. Warden Date 08/30/17		Rev. <b>A</b>	Page <b>1</b> of <b>1</b>



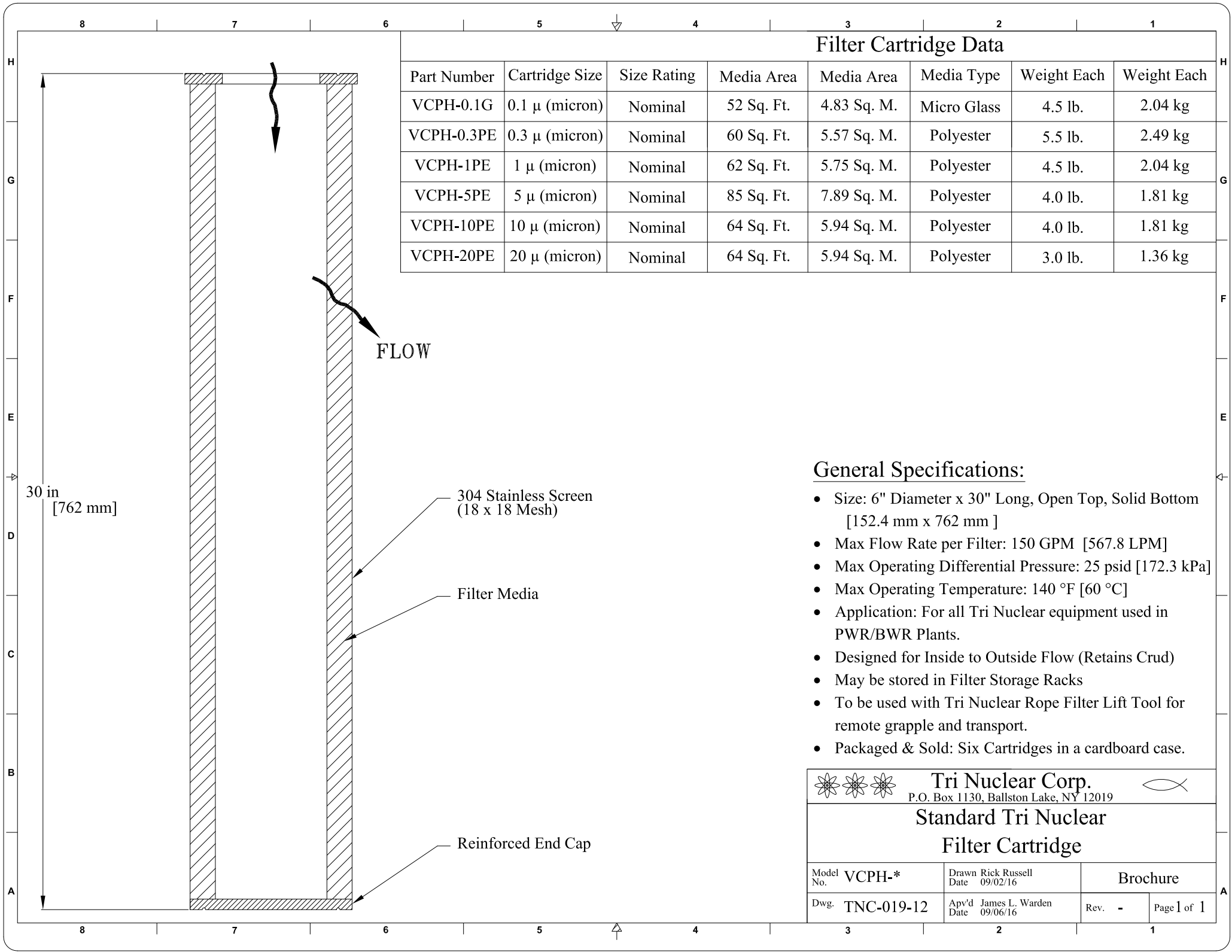
### General Specifications:

- Power Requirements: 15HP, 400V, 3 PH, 50 Hz, 24.0A
- Flow: 500 GPM [1,892.7 LPM]
- All Material - Stainless Steel
- Dimensions: 12-3/4" x 12-3/4" x 74-7/8" (LWH)  
[323.8 mm x 323.8 mm x 1,901.8 mm]
- Weight: 210 lb. [95.2 kg]

		<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>UF-600-CE &amp; UFV-600-CE Pump Assembly</b>					
<b>PP-600SC-CE</b>					
Model No. PP-600SC-CE		Drawn Rick Russell Date 08/25/17		Brochure	
Dwg. TNC-009-12		App'd James L. Warden Date 08/30/17		Rev. A	Page 1 of 1









Filter Cartridge Data							
Part Number	Cartridge Size	Size Rating	Media Area	Media Area	Media Type	Weight Each	Weight Each
VCPH-0.1G	0.1 μ (micron)	Nominal	52 Sq. Ft.	4.83 Sq. M.	Micro Glass	4.5 lb.	2.04 kg
VCPH-0.3PE	0.3 μ (micron)	Nominal	60 Sq. Ft.	5.57 Sq. M.	Polyester	5.5 lb.	2.49 kg
VCPH-1PE	1 μ (micron)	Nominal	62 Sq. Ft.	5.75 Sq. M.	Polyester	4.5 lb.	2.04 kg
VCPH-5PE	5 μ (micron)	Nominal	85 Sq. Ft.	7.89 Sq. M.	Polyester	4.0 lb.	1.81 kg
VCPH-10PE	10 μ (micron)	Nominal	64 Sq. Ft.	5.94 Sq. M.	Polyester	4.0 lb.	1.81 kg
VCPH-20PE	20 μ (micron)	Nominal	64 Sq. Ft.	5.94 Sq. M.	Polyester	3.0 lb.	1.36 kg

General Specifications:

- Size: 6" Diameter x 30" Long, Open Top, Solid Bottom [152.4 mm x 762 mm ]
- Max Flow Rate per Filter: 150 GPM [567.8 LPM]
- Max Operating Differential Pressure: 25 psid [172.3 kPa]
- Max Operating Temperature: 140 °F [60 °C]
- Application: For all Tri Nuclear equipment used in PWR/BWR Plants.
- Designed for Inside to Outside Flow (Retains Crud)
- May be stored in Filter Storage Racks
- To be used with Tri Nuclear Rope Filter Lift Tool for remote grapple and transport.
- Packaged & Sold: Six Cartridges in a cardboard case.

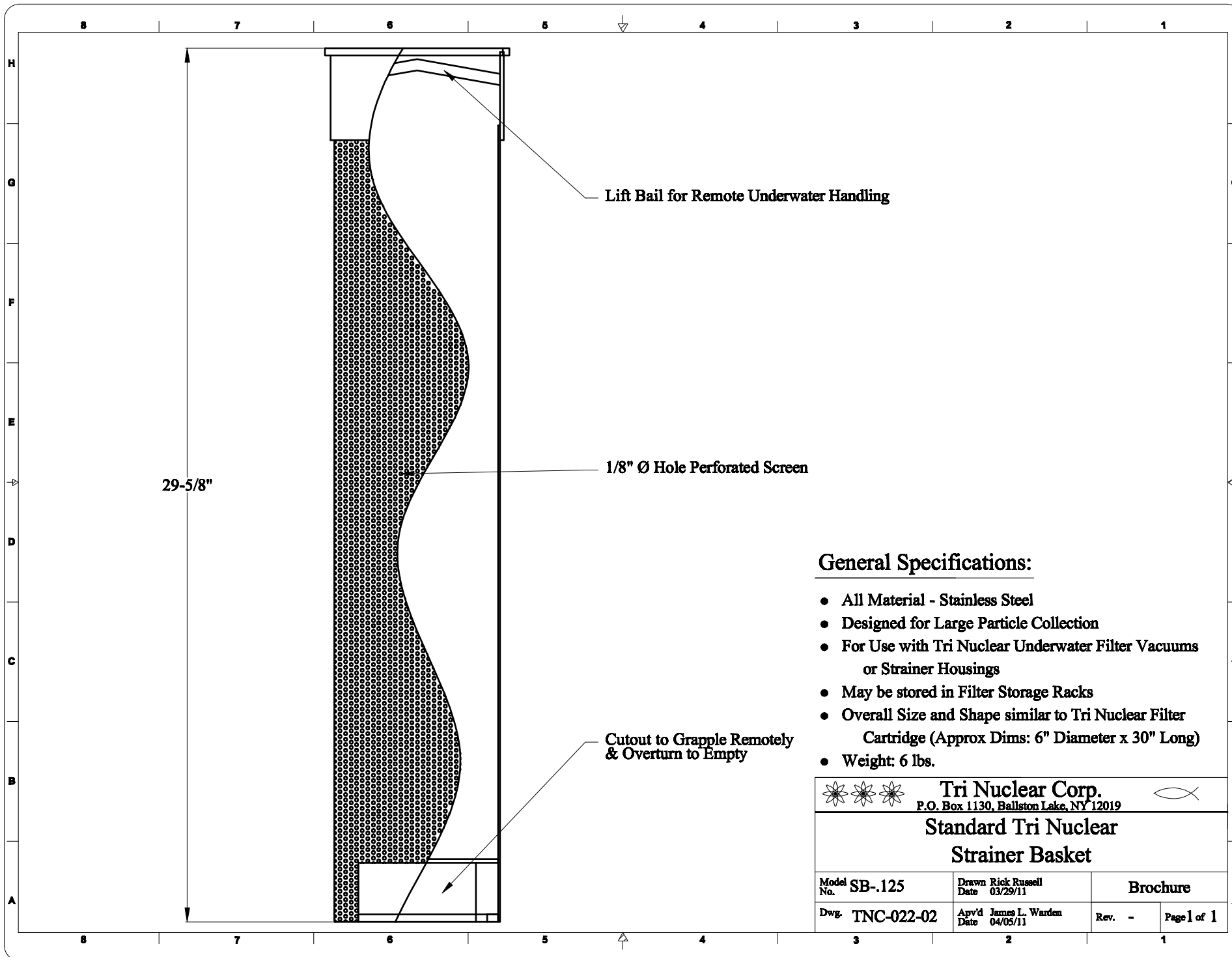


**Tri Nuclear Corp.**  
P.O. Box 1130, Ballston Lake, NY 12019





**Standard Tri Nuclear**  
**Filter Cartridge**

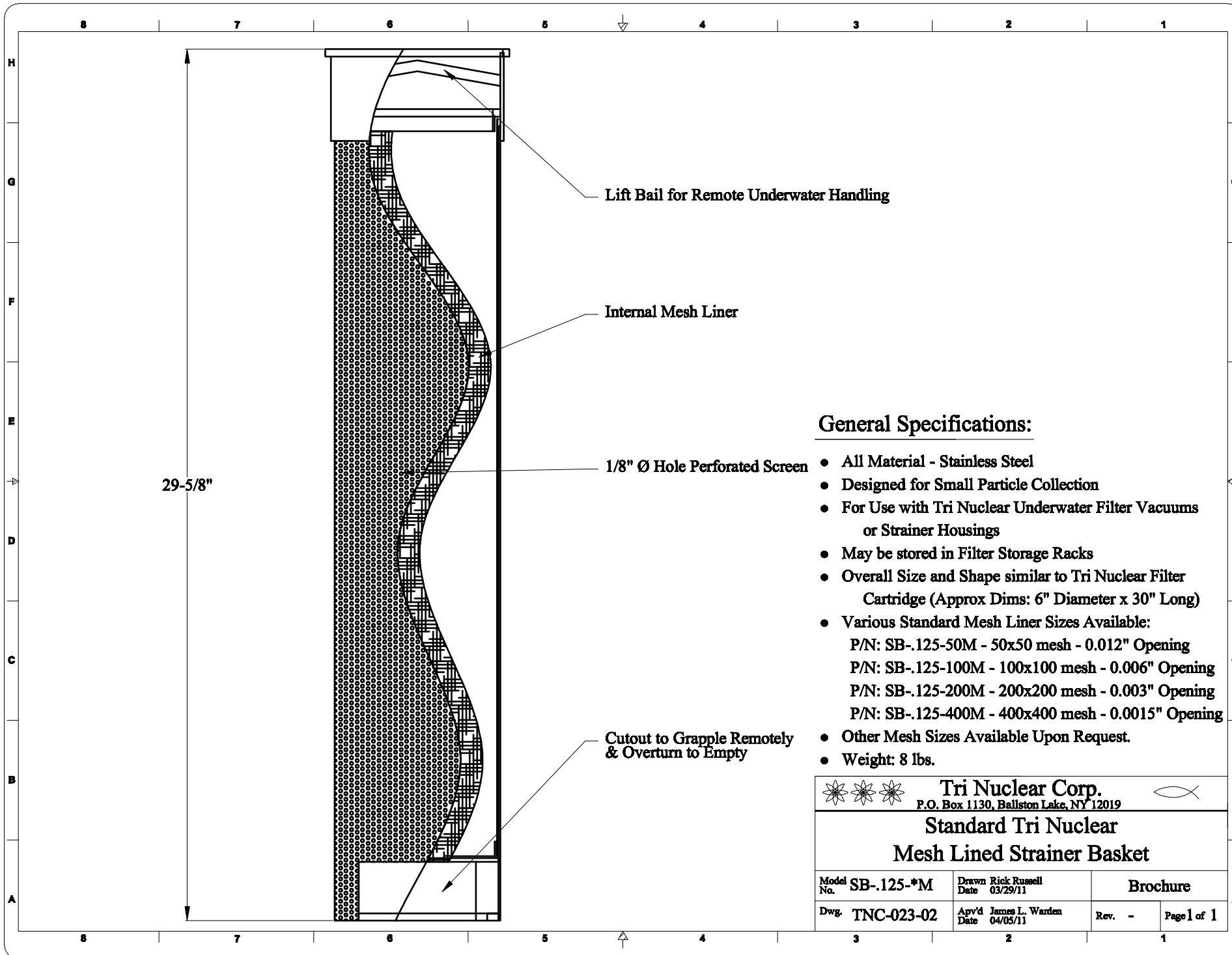
Model No. <b>VCPH-*</b>	Drawn Rick Russell Date 09/02/16	Brochure	
Dwg. <b>TNC-019-12</b>	Apv'd James L. Warden Date 09/06/16	Rev. -	Page 1 of 1



### General Specifications:

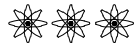

- All Material - Stainless Steel
- Designed for Large Particle Collection
- For Use with Tri Nuclear Underwater Filter Vacuums or Strainer Housings
- May be stored in Filter Storage Racks
- Overall Size and Shape similar to Tri Nuclear Filter Cartridge (Approx Dims: 6" Diameter x 30" Long)
- Weight: 6 lbs.

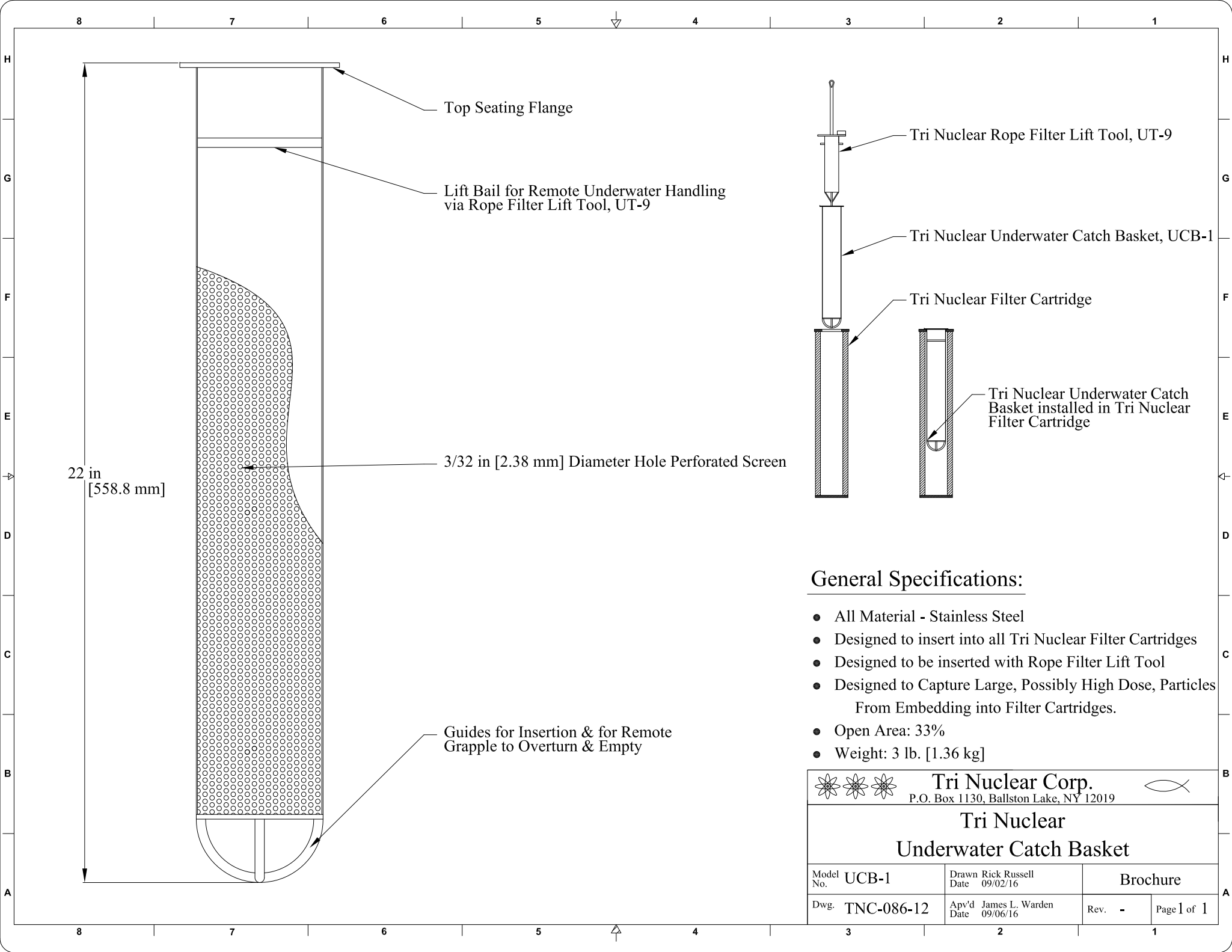
 <b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019				
<b>Standard Tri Nuclear Strainer Basket</b>				
Model No.	SB-.125	Drawn Rick Russell Date 03/29/11	Brochure	
Dwg.	TNC-022-02	App'd James L. Warden Date 04/05/11	Rev. -	Page 1 of 1



### General Specifications:

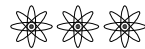

- All Material - Stainless Steel
- Designed for Small Particle Collection
- For Use with Tri Nuclear Underwater Filter Vacuums or Strainer Housings
- May be stored in Filter Storage Racks
- Overall Size and Shape similar to Tri Nuclear Filter Cartridge (Approx Dims: 6" Diameter x 30" Long)
- Various Standard Mesh Liner Sizes Available:
  - P/N: SB-.125-50M - 50x50 mesh - 0.012" Opening
  - P/N: SB-.125-100M - 100x100 mesh - 0.006" Opening
  - P/N: SB-.125-200M - 200x200 mesh - 0.003" Opening
  - P/N: SB-.125-400M - 400x400 mesh - 0.0015" Opening
- Other Mesh Sizes Available Upon Request.
- Weight: 8 lbs.

 <b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019 			
<b>Standard Tri Nuclear Mesh Lined Strainer Basket</b>			
Model No. <b>SB-.125-*M</b>	Drawn <b>Rick Russell</b> Date <b>03/29/11</b>	<b>Brochure</b>	
Dwg. <b>TNC-023-02</b>	App'd <b>James L. Warden</b> Date <b>04/05/11</b>	Rev. <b>-</b>	Page <b>1 of 1</b>



General Specifications:

- All Material - Stainless Steel
- Designed to insert into all Tri Nuclear Filter Cartridges
- Designed to be inserted with Rope Filter Lift Tool
- Designed to Capture Large, Possibly High Dose, Particles From Embedding into Filter Cartridges.
- Open Area: 33%
- Weight: 3 lb. [1.36 kg]

		<b>Tri Nuclear Corp.</b> P.O. Box 1130, Ballston Lake, NY 12019			
<b>Tri Nuclear Underwater Catch Basket</b>					
Model No.	UCB-1	Drawn	Rick Russell	Brochure	
		Date	09/02/16		
Dwg.	TNC-086-12	Apv'd	James L. Warden	Rev.	-
		Date	09/06/16		Page 1 of 1

10/05/16

Tri Nuclear Corp. filter distance information for the  
following units:

UFV-100

UFV-260

UF-600

UFV-600

Distance from edge of filter to ID of filter tube: 1.3 in [3.3cm]

Filter tube 0.109in [2.76mm] tk 304 Stainless Steel.

Questions? Please contact:

John J. Flynn

Operations Manager

Tri Nuclear Corp.

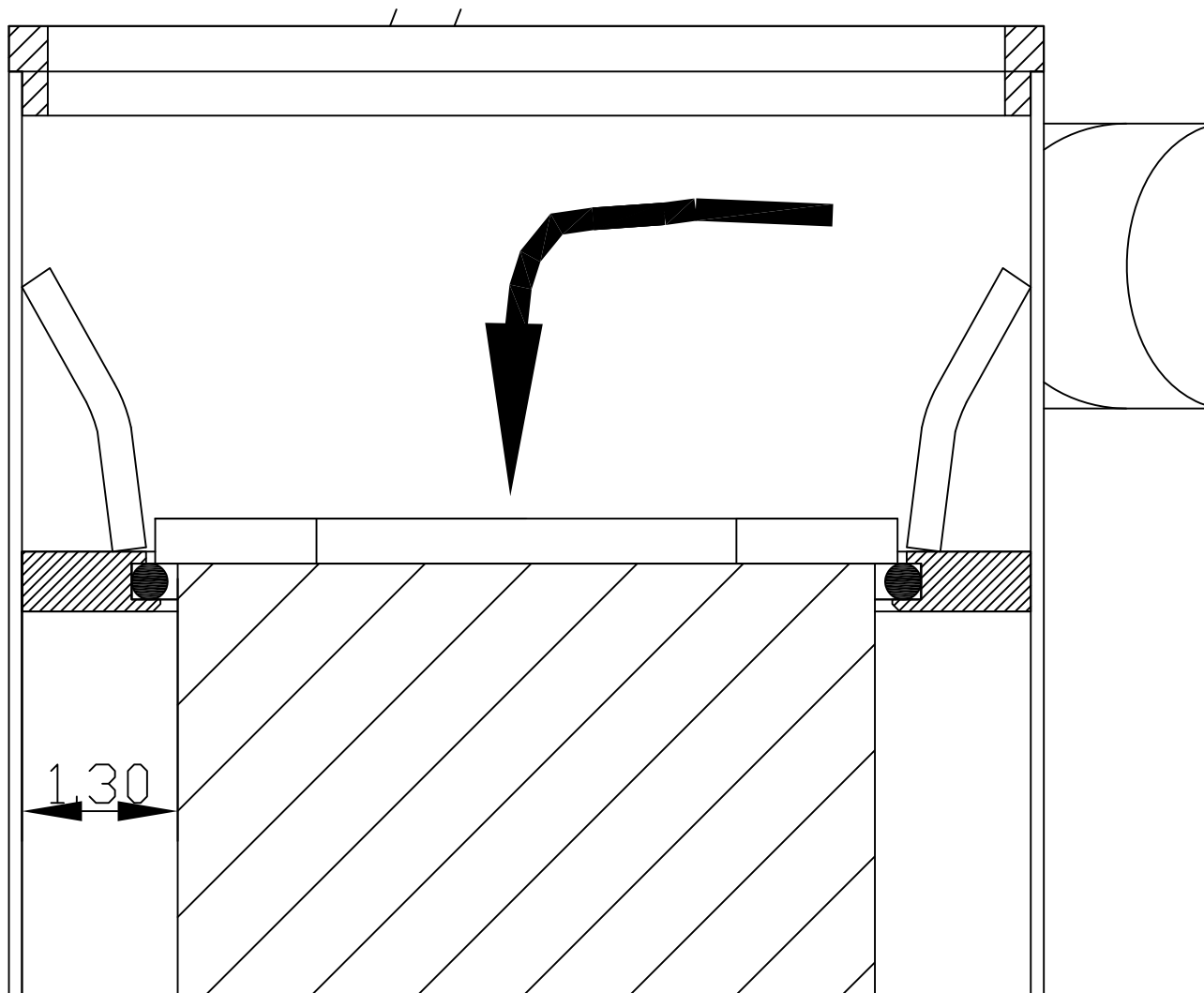
Ph. 518-399-1389

Fx. 518-399-9586

Cell. 518-312-6316

[www.trinuclear.com](http://www.trinuclear.com)

e-mail: [jfflynn@trinuclear.com](mailto:jfflynn@trinuclear.com)



10/05/16

Tri Nuclear Corp. filter distance information for the  
following units:

UF-1000

Distance from edge of filter to ID of filter tube: 2.77in [7.04 cm]

Housing shell is 0.120 in [3.03 mm] tk 304 Stainless Steel.

Questions? Please contact:

John J. Flynn

Operations Manager

Tri Nuclear Corp.

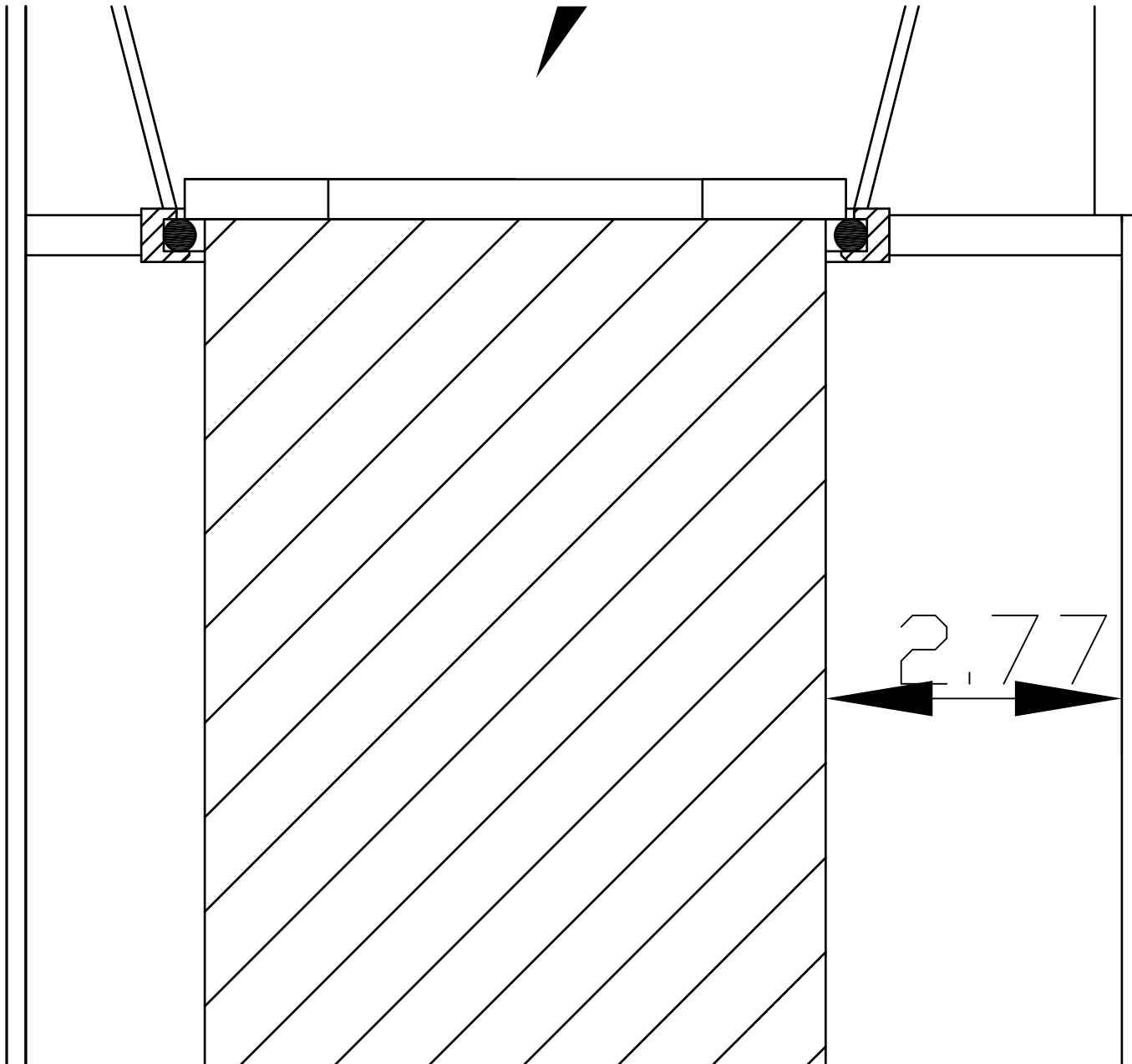
Ph. 518-399-1389

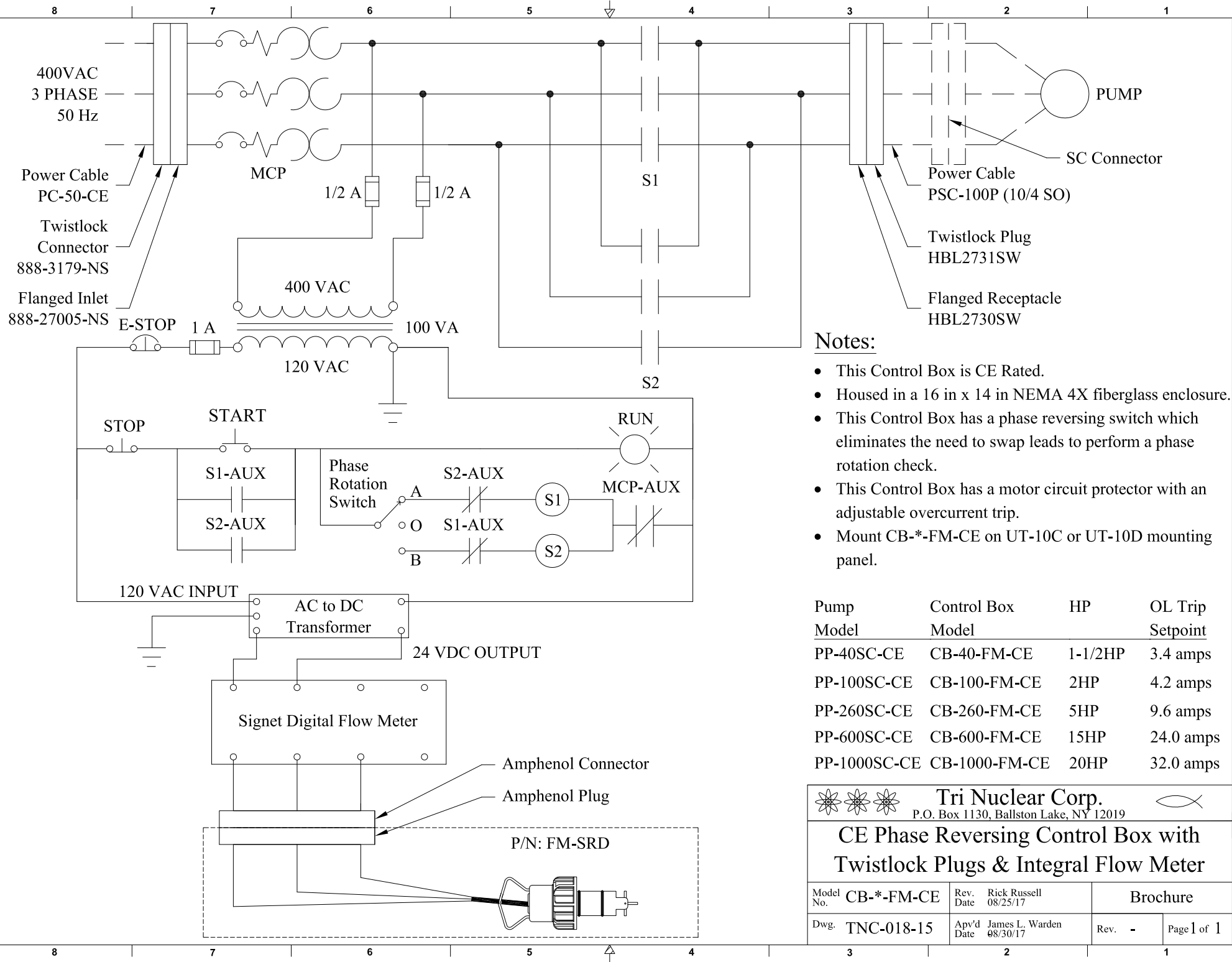
Fx. 518-399-9586

Cell. 518-312-6316

[www.trinuclear.com](http://www.trinuclear.com)

e-mail: [jflynn@trinuclear.com](mailto:jflynn@trinuclear.com)

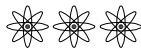





**Notes:**

- This Control Box is CE Rated.
- Housed in a 16 in x 14 in NEMA 4X fiberglass enclosure.
- This Control Box has a phase reversing switch which eliminates the need to swap leads to perform a phase rotation check.
- This Control Box has a motor circuit protector with an adjustable overcurrent trip.
- Mount CB-\*-FM-CE on UT-10C or UT-10D mounting panel.

Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC-CE	CB-40-FM-CE	1-1/2HP	3.4 amps
PP-100SC-CE	CB-100-FM-CE	2HP	4.2 amps
PP-260SC-CE	CB-260-FM-CE	5HP	9.6 amps
PP-600SC-CE	CB-600-FM-CE	15HP	24.0 amps
PP-1000SC-CE	CB-1000-FM-CE	20HP	32.0 amps

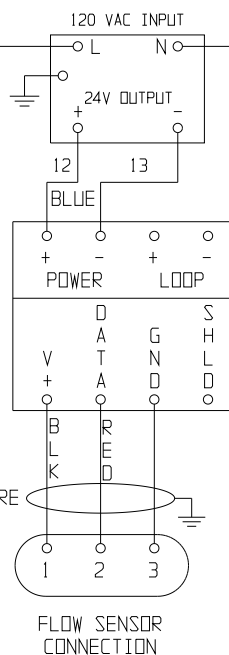
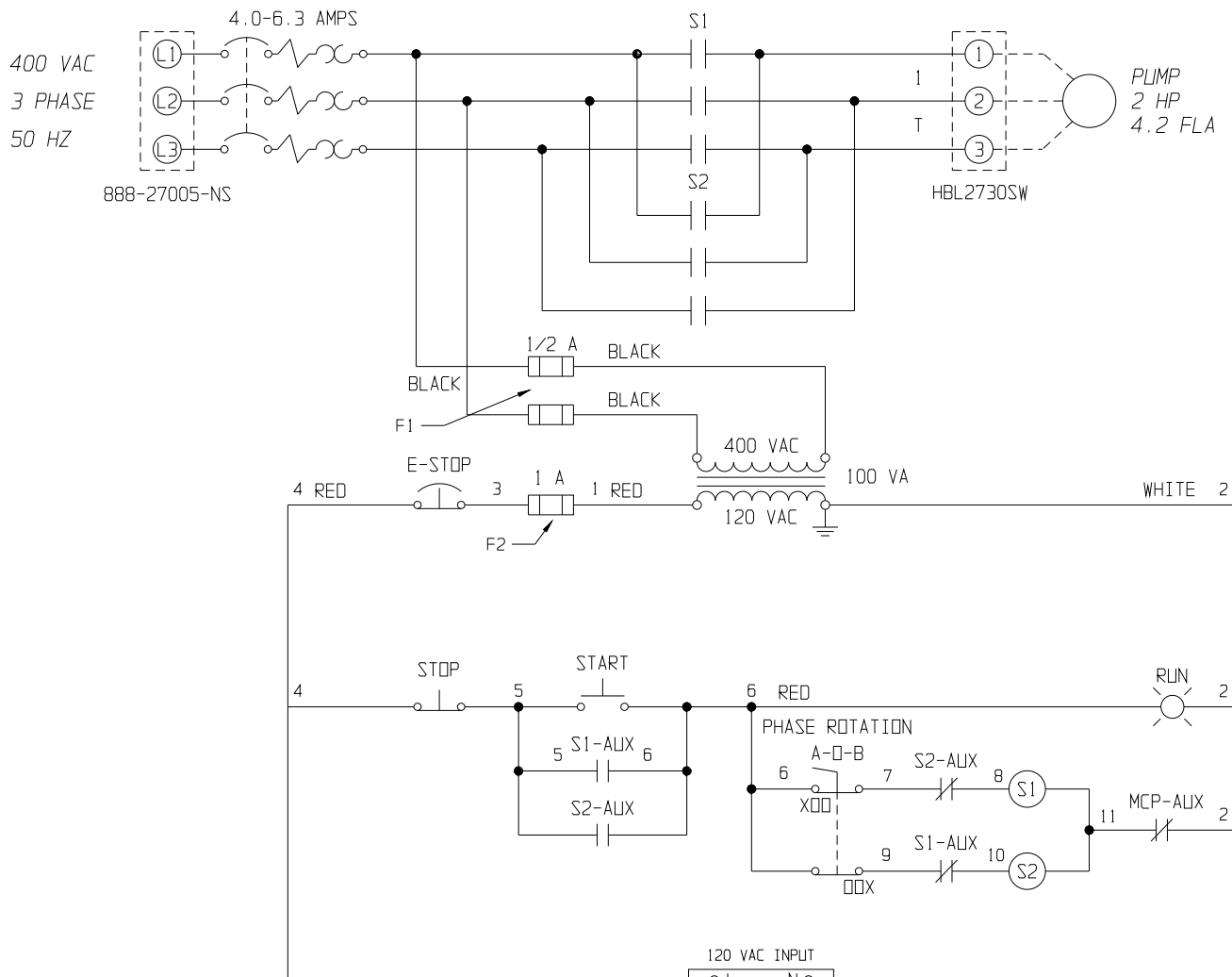
**Tri Nuclear Corp.**  
P.O. Box 1130, Ballston Lake, NY 12019

**CE Phase Reversing Control Box with  
Twistlock Plugs & Integral Flow Meter**

Model No. <b>CB-*-FM-CE</b>	Rev. Date <b>Rick Russell 08/25/17</b>	<b>Brochure</b>	
Dwg. <b>TNC-018-15</b>	Apv'd Date <b>James L. Warden 08/30/17</b>	Rev. <b>-</b>	Page <b>1</b> of <b>1</b>



A FUSED DISCONNECT OR CIRCUIT BREAKER  
MUST BE PROVIDED BY INSTALLER. PROVIDE  
DISCONNECT SIZING PER NEC 430-53(C)



SIGNET TRANSMITTER

SHIELDED WIRE

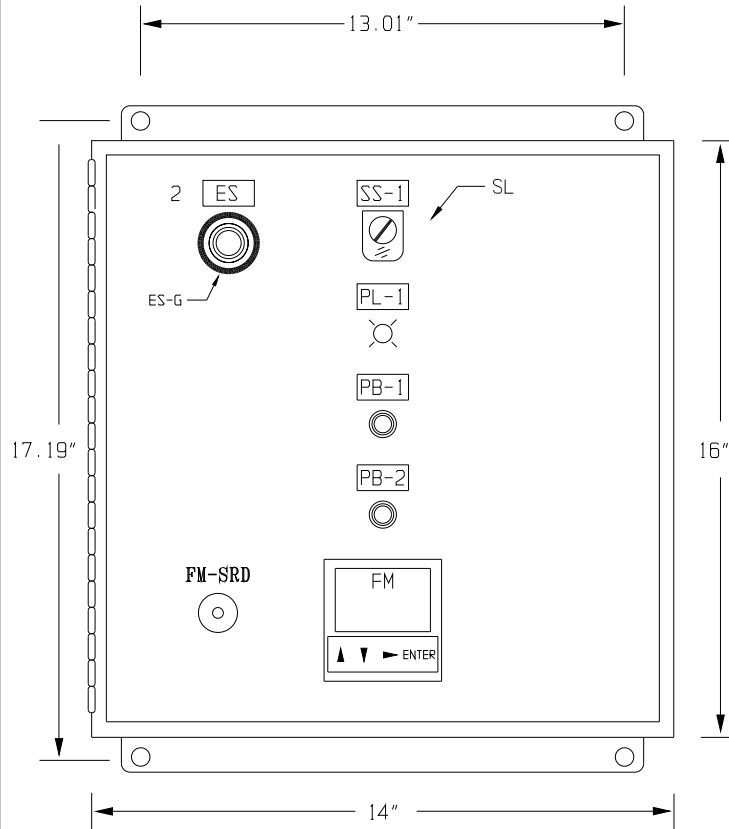
FLOW SENSOR  
CONNECTION

NOTES:  
ONE EACH SPARE FUSE PROVIDED. TAPED INSIDE THE PANEL  
ALL POWER WIRES BLACK - 14 GA.  
ALL CONTROL WIRES RED - 18 GA.  
ALL NEUTRAL WIRES WHITE - 18 GA.  
ALL GROUND WIRES 70% GREEN/30% YELLOW 10 GA.

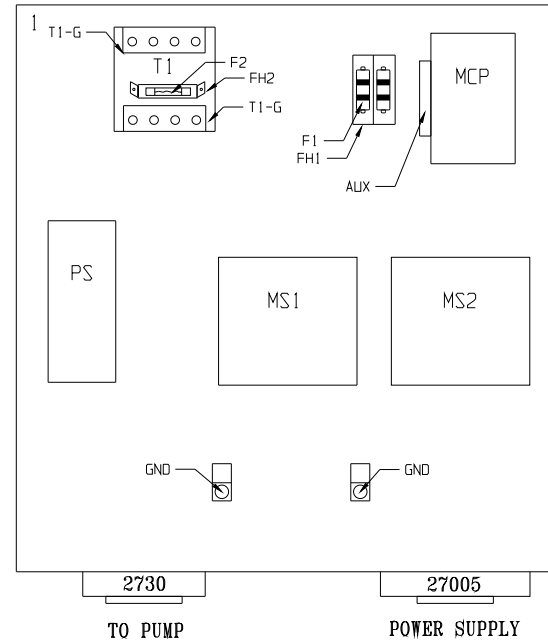
THIS DRAWING IS THE PROPERTY OF BOLLAY FABRICATION, INC. DRAWING TO BE RETURNED UPON REQUEST.		CB-100-FM-CE		ORDER
DRAWING	DATE	BOLLAY FABRICATION, INC. P.O. Box 508 LaFayette N. Y. 13084 Phone 315-677-5247 UL/CSA Approved Electrical Control Panels Fax 315-677-5325		
JLH	7-11-17			
CAD FILE		PREPARED FOR: GARTNER EQUIPMENT COMPANY		
CB-100FM-CE				
REVISED	DATE	SIMPLEX CONTROL 400/3/50 2 HP		

# BILL OF MATERIALS

## ENCLOSURE LAYOUT



## PANEL LAYOUT



ITEM	QTY.	MFR.	CAT. NUMBER	DESCRIPTION
MCP	1	EATON	XTPR6P3BC1	MOTOR CIRCUIT PROTECTOR
AUX	1	EATON	XTPAXSATR02	MOTOR CIRCUIT PROTECTOR AUXILIARY
MS1,2	2	ABB	AF30-30-00-13	MOTOR CONTACTORS
T1	1	HAMMOND	SP100KHP	TRANSFORMER
T1-G	2	HAMMOND	SPFG1	TRANSFORMER FINGER GUARD
PS	1	MEAN WELL	MDR-10-24	POWER SUPPLY
F1	2	MERSEN/FERRAZ SHAWMUT	ATOR1/2	FUSE 1
FH1	1	MERSEN/FERRAZ SHAWMUT	30322R	FUSE HOLDER 1
F2	1	LITTELFUSE	312001P	FUSE 2
FH2	1	OPTIFUSE	BLC-16-B	FUSE HOLDER 2
SS1	1	SCHNEIDER ELECTRIC	ZB5AD3	SELECTOR SWITCH: A-D-B
PL1	1	SCHNEIDER ELECTRIC	ZB5AV033	GREEN PILOT LIGHTS: RUN
PB1	1	SCHNEIDER ELECTRIC	ZB5AA4	RED PUSH BUTTON: STOP
PB2	1	SCHNEIDER ELECTRIC	ZB5AA3	GREEN PUSH BUTTON: START
ES	1	SCHNEIDER ELECTRIC	ZB5AT84	RED PUSH BUTTON: 40MM E-STOP
SL	1	ALLEN BRADLEY	800F-AL01	SWITCH COVER/ LOCK ATTACHMENT
ESG	1	ALLEN BRADLEY	800F-AMEGY	PUSH BUTTON GUARD
SS1-CB	2	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: SWITCH
PL1-CB	1	SCHNEIDER ELECTRIC	ZBVG3	CONTACT BLOCK: RUN
PB1-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: STOP
PB2-CB	1	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: START
ES-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: E-STOP
GND	2	BURNDY	KA6U	GROUND LUG
FM	1	GFSIGNET	9900	TRANSMITTER
FMSRD	1			FLOW SENSOR CONNECTOR
2730	1	HUBBELL	HBL2730SW	TWISTLOCK RECEPTACLE
27005	1	INT'L CONFIGURATION	888-27005-NS	FLANGED INLET
1	1	BF1	BP-1614	14 GA. GALVANIZED PANEL
2	1	ALLIED MOULDED	AM1648L	NEMA 4X FIBERGLASS ENCLOSURE

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DRAWING DATE  
JLH 7-11-17

CAD FILE  
CB-100FM-CE

REVISED DATE

CB-100-FM-CE

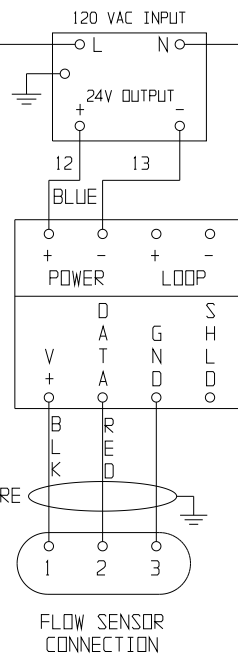
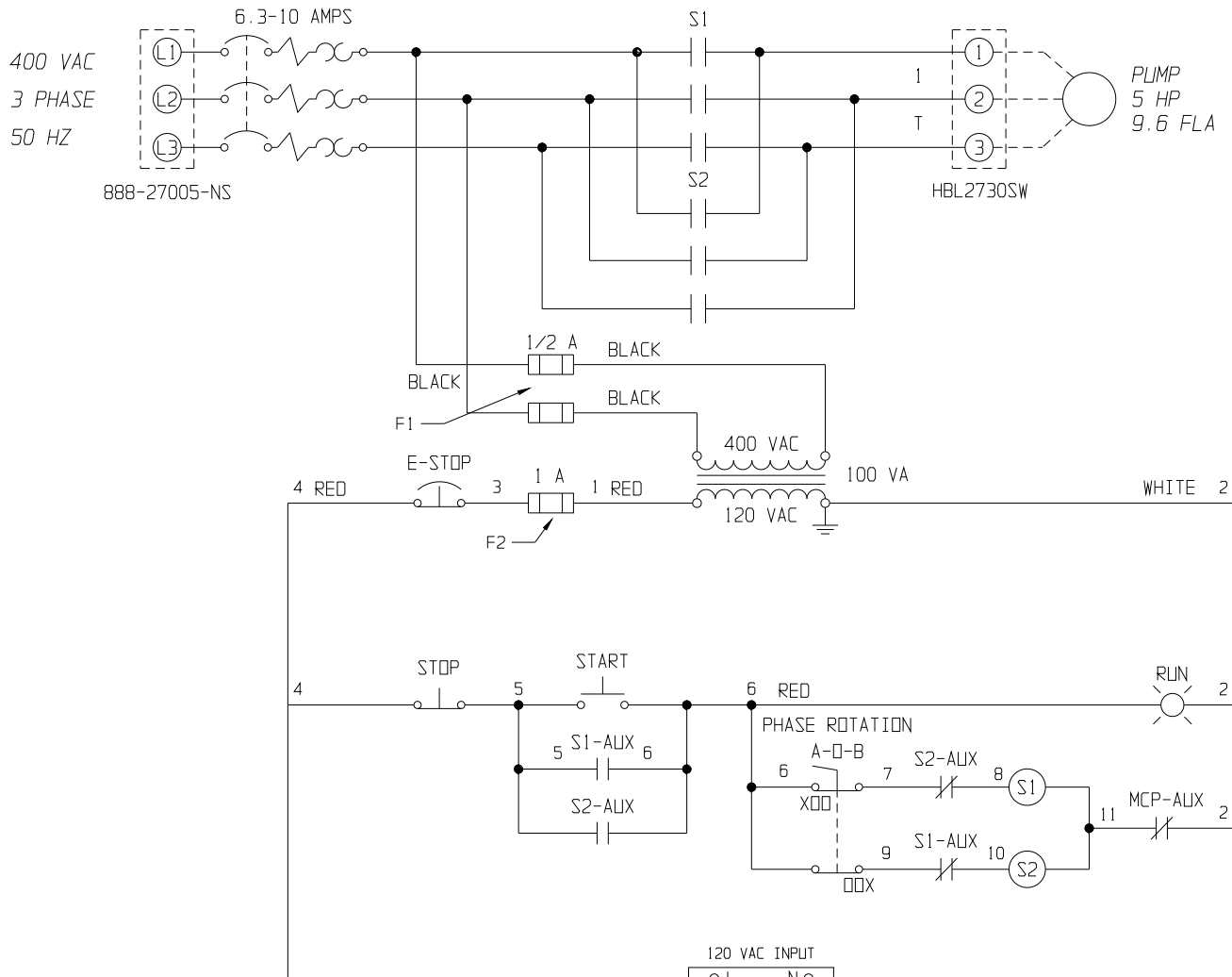
BOULAY FABRICATION, INC.

PO. Box 508 LaFayette N.Y. 13084 Phone 315-677-5247  
UL/CSA Approved Electrical Control Panels Fax 315-677-5325

PREPARED FOR: GARTNER EQUIPMENT COMPANY

SIMPLEX CONTROL 400/3/50 2 HP

A FUSED DISCONNECT OR CIRCUIT BREAKER  
MUST BE PROVIDED BY INSTALLER. PROVIDE  
DISCONNECT SIZING PER NEC 430-53(C)



SIGNET TRANSMITTER

SHIELDED WIRE

FLOW SENSOR  
CONNECTION

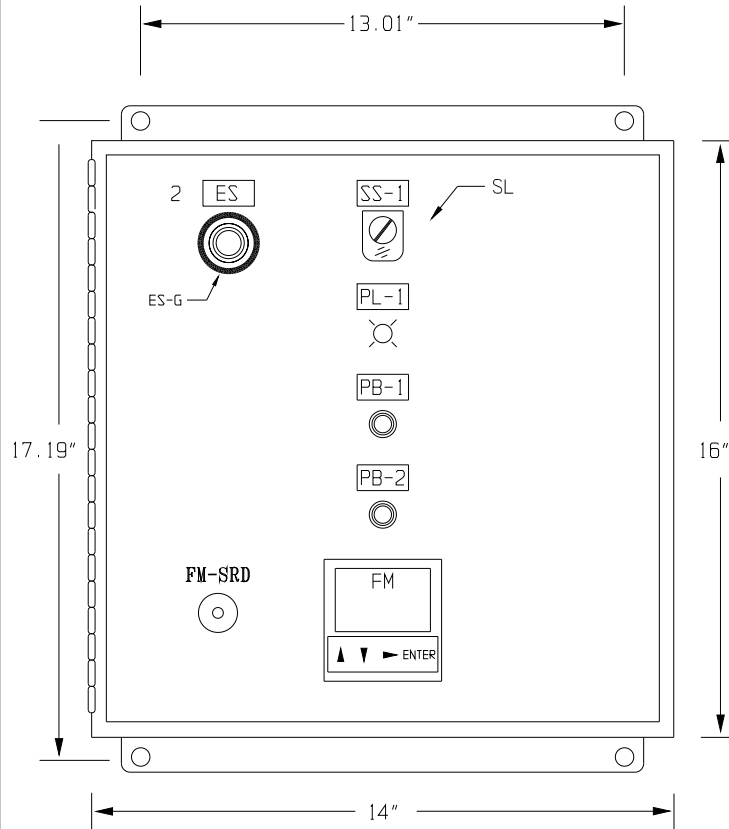
NOTES:  
ONE EACH SPARE FUSE PROVIDED. TAPED INSIDE THE PANEL  
ALL POWER WIRES BLACK - 14 GA.  
ALL CONTROL WIRES RED - 18 GA.  
ALL NEUTRAL WIRES WHITE - 18 GA.  
ALL GROUND WIRES 70% GREEN/30% YELLOW 10 GA.

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DRAWING  
JLH  
DATE  
7-11-17

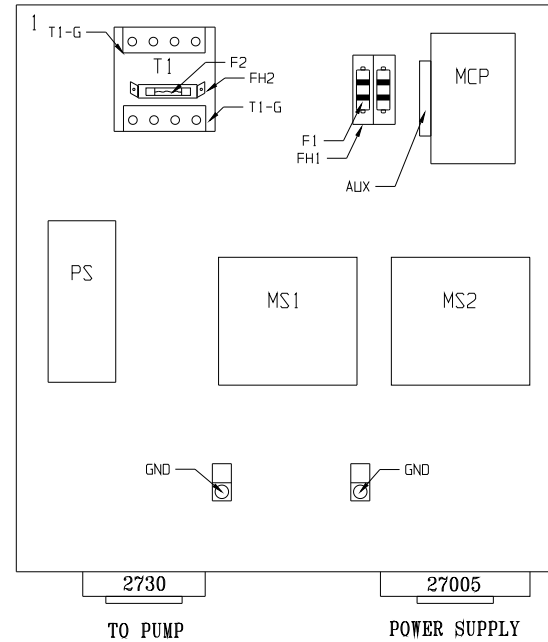
CB-260-FM-CE  
ORDER  
BOLLAY FABRICATION, INC.  
P.O. Box 508 Lefayette N.Y. 13084  
Phone 315-677-5247  
UL/CSA Approved Electrical Control Panels Fax 315-677-5325  
PREPARED FOR: GARTNER EQUIPMENT COMPANY  
DATE  
CB-260-FM-CE  
REVISED  
SIMPLEX CONTROL 400/3/50 5 HP

# BILL OF MATERIALS

## ENCLOSURE LAYOUT



## PANEL LAYOUT



ITEM	QTY.	MFR.	CAT. NUMBER	DESCRIPTION
MCP	1	EATON	XTPR010BC1	MOTOR CIRCUIT PROTECTOR
AUX	1	EATON	XTPAXSATR02	MOTOR CIRCUIT PROTECTOR AUXILIARY
MS1,2	2	ABB	AF30-30-00-13	MOTOR CONTACTORS
T1	1	HAMMOND	SP100KHP	TRANSFORMER
T1-G	2	HAMMOND	SPFG1	TRANSFORMER FINGER GUARD
PS	1	MEAN WELL	MDR-10-24	POWER SUPPLY
F1	2	MERSEN/FERRAZ SHAWMUT	ATOR1/2	FUSE 1
FH1	1	MERSEN/FERRAZ SHAWMUT	30322R	FUSE HOLDER 1
F2	1	LITTELFUSE	312001P	FUSE 2
FH2	1	OPTIFUSE	BLC-16-B	FUSE HOLDER 2
SS1	1	SCHNEIDER ELECTRIC	ZB5AD3	SELECTOR SWITCH: A-D-B
PL1	1	SCHNEIDER ELECTRIC	ZB5AV033	GREEN PILOT LIGHTS: RUN
PB1	1	SCHNEIDER ELECTRIC	ZB5AA4	RED PUSH BUTTON: STOP
PB2	1	SCHNEIDER ELECTRIC	ZB5AA3	GREEN PUSH BUTTON: START
ES	1	SCHNEIDER ELECTRIC	ZB5AT84	RED PUSH BUTTON: 40MM E-STOP
SL	1	ALLEN BRADLEY	800F-AL01	SWITCH COVER/ LOCK ATTACHMENT
ESG	1	ALLEN BRADLEY	800F-AMEGY	PUSH BUTTON GUARD
SS1-CB	2	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: SWITCH
PL1-CB	1	SCHNEIDER ELECTRIC	ZBVG3	CONTACT BLOCK: RUN
PB1-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: STOP
PB2-CB	1	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: START
ES-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: E-STOP
GND	2	BURNDY	KA6U	GROUND LUG
FM	1	GFSIGNET	9900	TRANSMITTER
FMSRD	1			FLOW SENSOR CONNECTOR
2730	1	HUBBELL	HBL2730SW	TWISTLOCK RECEPTACLE
27005	1	INT'L CONFIGURATION	888-27005-NS	FLANGED INLET
1	1	BF1	BP-1614	14 GA. GALVANIZED PANEL
2	1	ALLIED MOULDED	AM1648L	NEMA 4X FIBERGLASS ENCLOSURE

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DRAWING DATE  
JLH 7-11-17

CAD FILE  
CB-260-FM-CE

REVISED DATE

CB-260-FM-CE

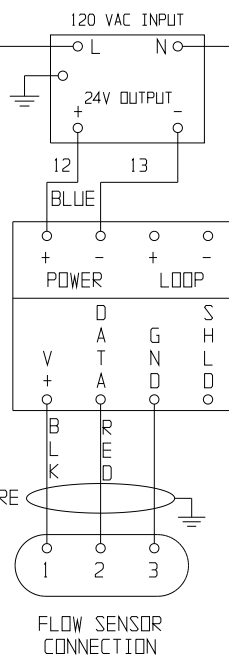
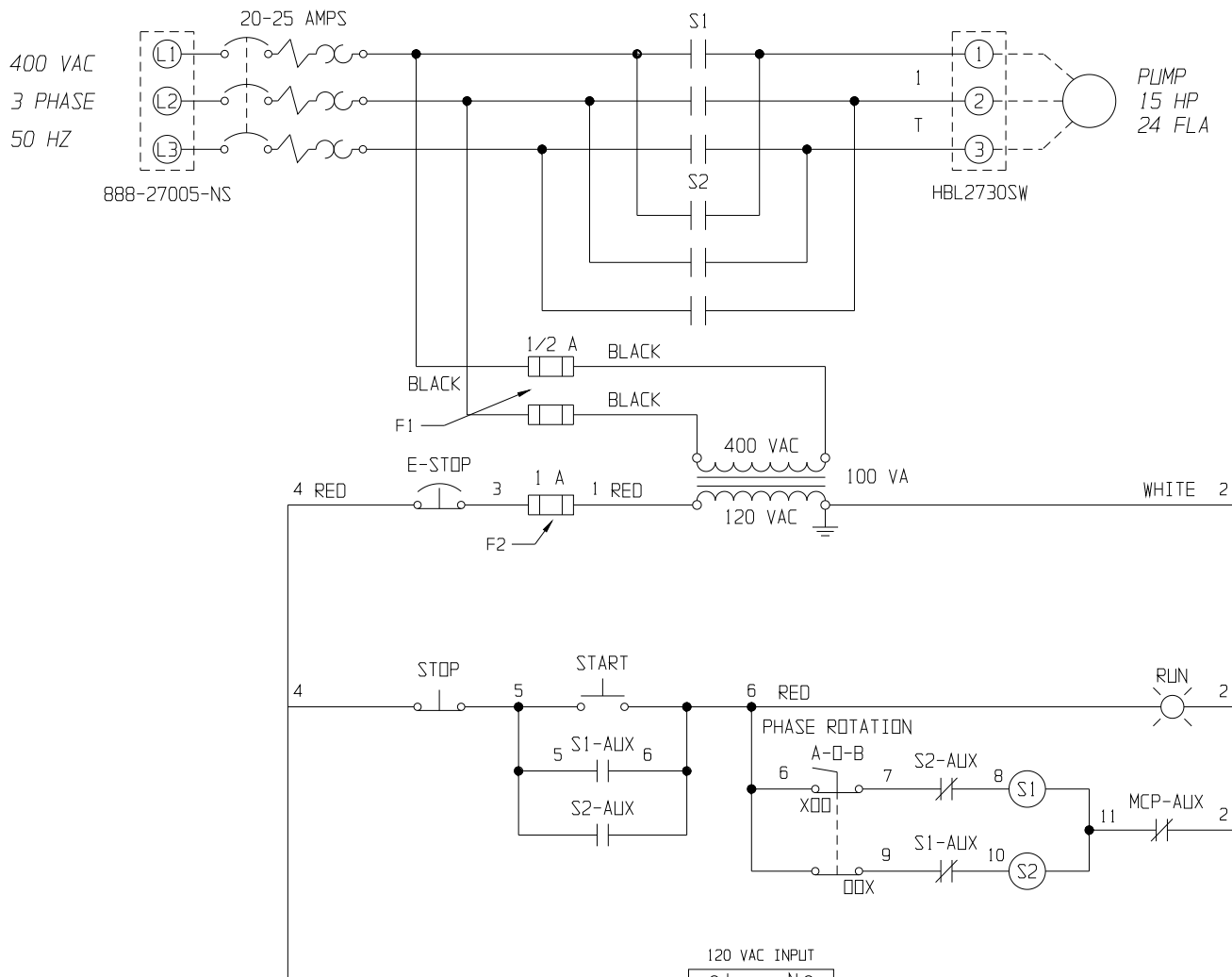
BOULAY FABRICATION, INC.

PO. Box 508 LaFayette N.Y. 13084 Phone 315-677-5247  
UL/CSA Approved Electrical Control Panels Fax 315-677-5325

PREPARED FOR: GARTNER EQUIPMENT COMPANY

SIMPLEX CONTROL 400/3/50 5 HP

A FUSED DISCONNECT OR CIRCUIT BREAKER  
MUST BE PROVIDED BY INSTALLER. PROVIDE  
DISCONNECT SIZING PER NEC 430-53(C)



SIGNET TRANSMITTER

SHIELDED WIRE

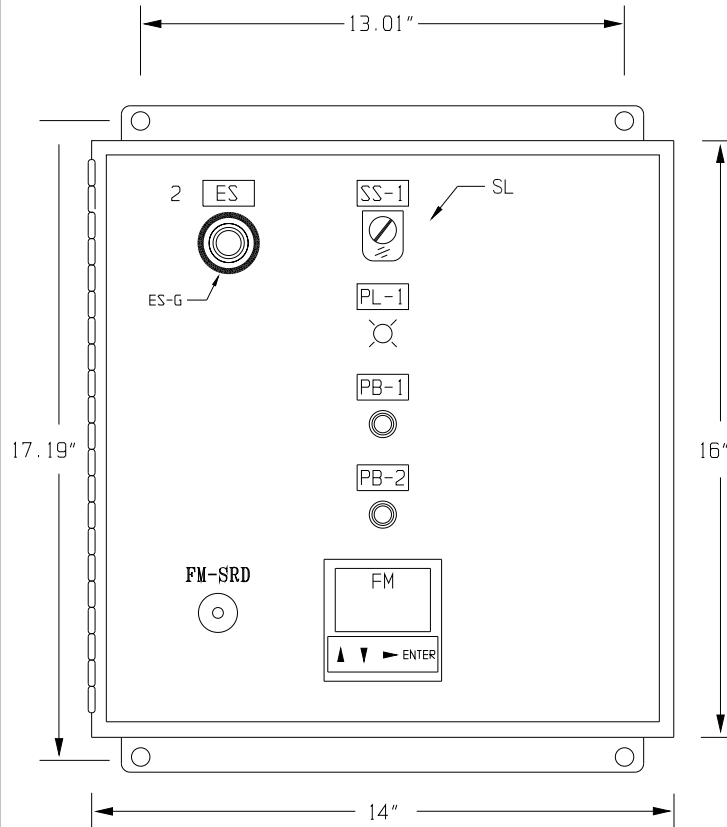
FLOW SENSOR  
CONNECTION

NOTES:  
ONE EACH SPARE FUSE PROVIDED. TAPED INSIDE THE PANEL  
ALL POWER WIRES BLACK - 10 GA.  
ALL CONTROL WIRES RED - 18 GA.  
ALL NEUTRAL WIRES WHITE - 18 GA.  
ALL GROUND WIRES 70% GREEN/30% YELLOW 10 GA.

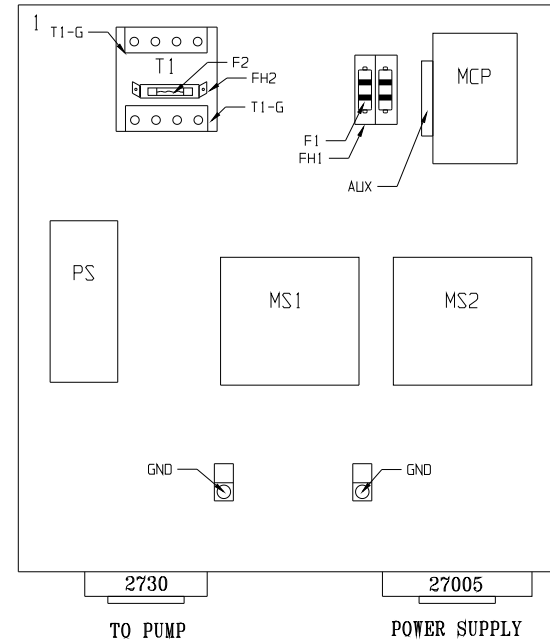
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DRAWING	DATE	BOLLAY FABRICATION, INC. P.O. Box 508 LaFayette N.Y. 13084 Phone 315-677-5247 UL/CSA Approved Electrical Control Panels Fax 315-677-5325		
JLH	7-11-17			
CAD FILE		PREPARED FOR: GARTNER EQUIPMENT COMPANY		
CB-600-FM-CE				
REVISED	DATE	SIMPLEX CONTROL 400/3/50 15 HP		

# BILL OF MATERIALS

## ENCLOSURE LAYOUT



## PANEL LAYOUT



ITEM	QTY.	MFG.	CAT. NUMBER	DESCRIPTION
MCP	1	EATON	XTPR025BC1	MOTOR CIRCUIT PROTECTOR
AUX	1	EATON	XPAXSATR02	MOTOR CIRCUIT PROTECTOR AUXILIARY
MS1,2	2	ABB	AF30-30-00-13	MOTOR CONTACTORS
T1	1	HAMMOND	SP100KHP	TRANSFORMER
T1-G	2	HAMMOND	SPFG1	TRANSFORMER FINGER GUARD
PS	1	MEAN WELL	MDR-10-24	POWER SUPPLY
F1	2	MERSEN/FERRAZ SHAWMUT	ATOR1/2	FUSE 1
FH1	1	MERSEN/FERRAZ SHAWMUT	30322R	FUSE HOLDER 1
F2	1	LITTELFUSE	312001P	FUSE 2
FH2	1	OPTIFUSE	BLC-16-B	FUSE HOLDER 2
SS1	1	SCHNEIDER ELECTRIC	ZB5AD3	SELECTOR SWITCH: A-D-B
PL1	1	SCHNEIDER ELECTRIC	ZB5AV033	GREEN PILOT LIGHTS: RUN
PB1	1	SCHNEIDER ELECTRIC	ZB5AA4	RED PUSH BUTTON: STOP
PB2	1	SCHNEIDER ELECTRIC	ZB5AA3	GREEN PUSH BUTTON: START
ES	1	SCHNEIDER ELECTRIC	ZB5AT84	RED PUSH BUTTON: 40MM E-STOP
SL	1	ALLEN BRADLEY	800F-AL01	SWITCH COVER/ LOCK ATTACHMENT
ESG	1	ALLEN BRADLEY	800F-AMEGY	PUSH BUTTON GUARD
SS1-CB	2	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: SWITCH
PL1-CB	1	SCHNEIDER ELECTRIC	ZBVG3	CONTACT BLOCK: RUN
PB1-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: STOP
PB2-CB	1	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: START
ES-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: E-STOP
GND	2	BURNDY	KA6U	GROUND LUG
FM	1	GFSIGNET	9900	TRANSMITTER
FMSRD	1			FLOW SENSOR CONNECTOR
2730	1	HUBBELL	HBL2730SW	TWISTLOCK RECEPTACLE
27005	1	INT'L CONFIGURATION	888-27005-NS	FLANGED INLET
1	1	BF1	BP-1614	14 GA. GALVANIZED PANEL
2	1	ALLIED MOULDED	AM1648L	NEMA 4X FIBERGLASS ENCLOSURE

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DRAWING DATE  
JLH 7-11-17

CAD FILE  
CB-600-FM-CE

REVISED DATE

CB-600-FM-CE

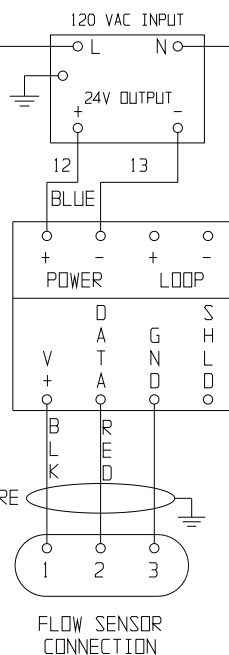
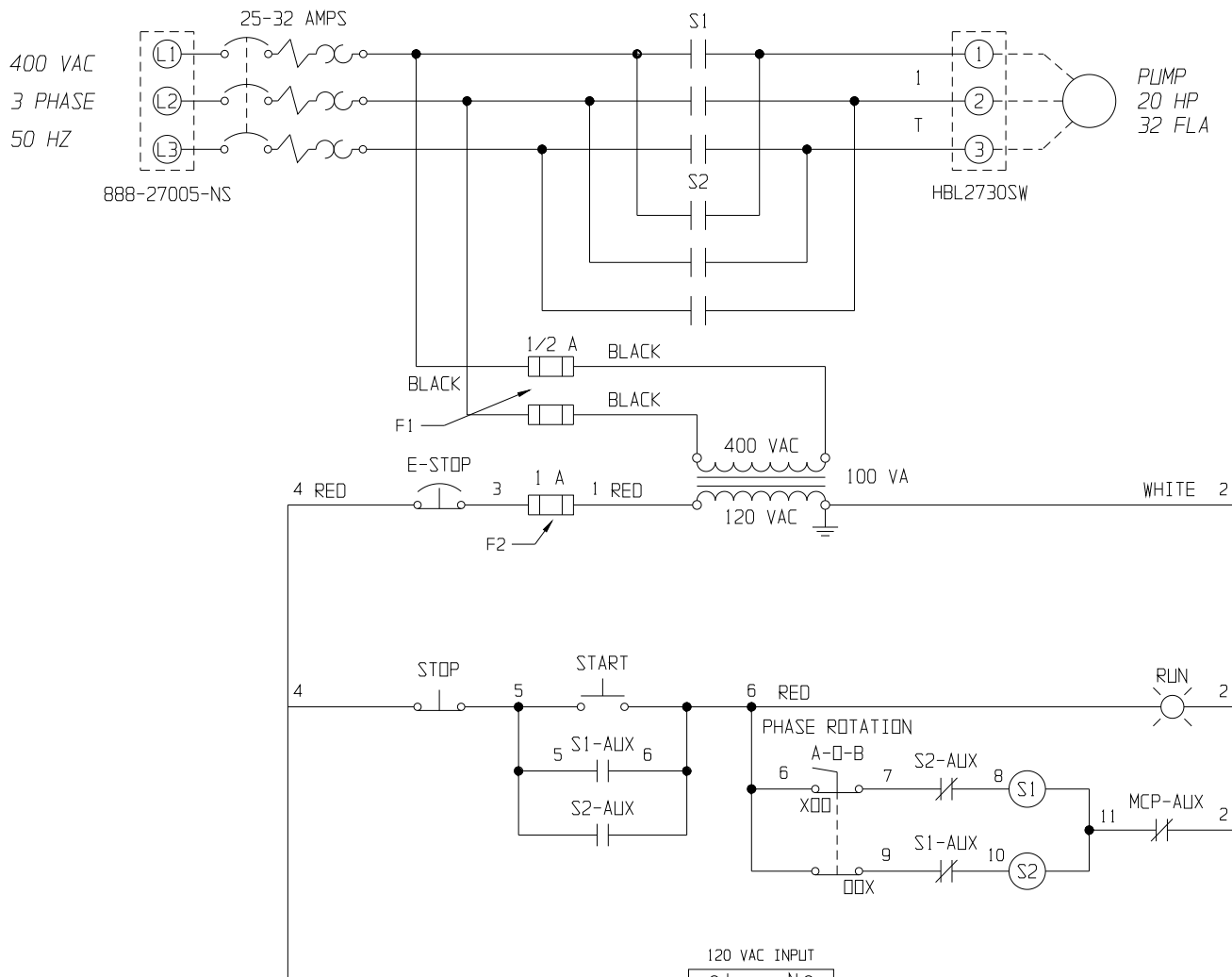
BOULAY FABRICATION, INC.

PO. Box 508 LaFayette N.Y. 13084 Phone 315-677-5247  
UL/CSA Approved Electrical Control Panels Fax 315-677-5325

PREPARED FOR: GARTNER EQUIPMENT COMPANY

SIMPLEX CONTROL 400/3/50 15 HP

A FUSED DISCONNECT OR CIRCUIT BREAKER  
MUST BE PROVIDED BY INSTALLER. PROVIDE  
DISCONNECT SIZING PER NEC 430-53(C)



SIGNET TRANSMITTER

SHIELDED WIRE

FLOW SENSOR  
CONNECTION

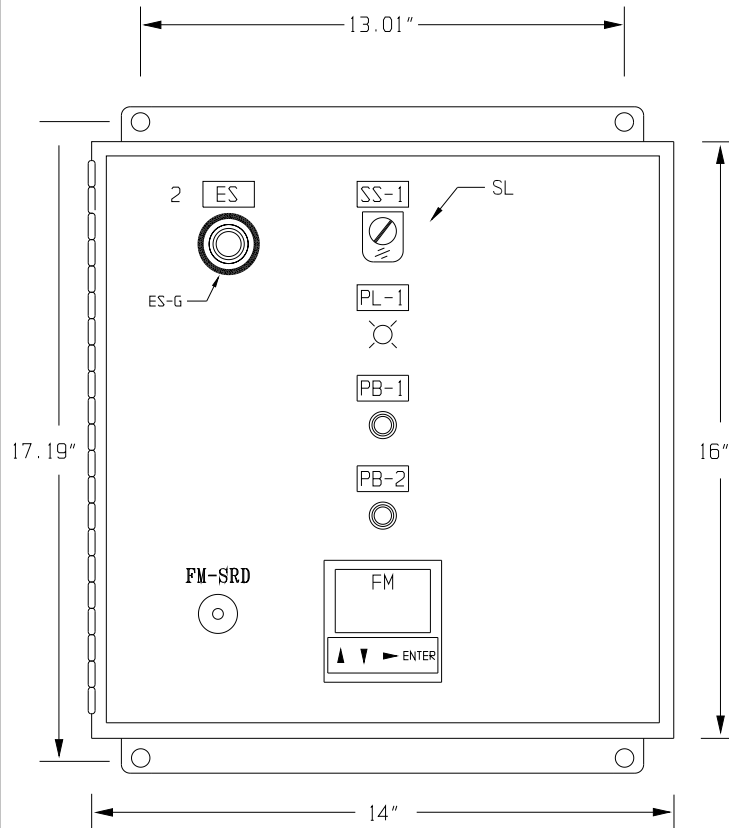
NOTES:  
ONE EACH SPARE FUSE PROVIDED. TAPED INSIDE THE PANEL  
ALL POWER WIRES BLACK - 10 GA.  
ALL CONTROL WIRES RED - 18 GA.  
ALL NEUTRAL WIRES WHITE - 18 GA.  
ALL GROUND WIRES 70% GREEN/30% YELLOW 10 GA.

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DRAWING	DATE	BOLLAY FABRICATION, INC.		
JLH	7-11-17	P.O. Box 508 LaFayette N. Y. 13084 Phone 315-677-5247 UL/CSA Approved Electrical Control Panels Fox 315-677-5325		
CAD FILE		PREPARED FOR: GARTNER EQUIPMENT COMPANY		
CB-1000-FM-CE				
REVISED	DATE	SIMPLEX CONTROL 400/3/50 20 HP		

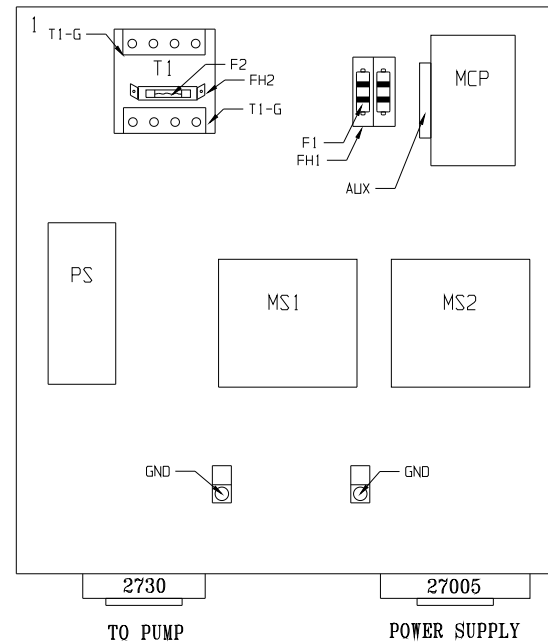


# BILL OF MATERIALS

## ENCLOSURE LAYOUT



## PANEL LAYOUT



ITEM	QTY.	MFG.	CAT. NUMBER	DESCRIPTION
MCP	1	EATON	XTPR032BC1	MOTOR CIRCUIT PROTECTOR
AUX	1	EATON	XPAXSATR02	MOTOR CIRCUIT PROTECTOR AUXILIARY
MS1,2	2	ABB	AF30-30-00-13	MOTOR CONTACTORS
T1	1	HAMMOND	SP100KHP	TRANSFORMER
T1-G	2	HAMMOND	SPFG1	TRANSFORMER FINGER GUARD
PS	1	MEAN WELL	MDR-10-24	POWER SUPPLY
F1	2	MERSEN/FERRAZ SHAWMUT	ATOR1/2	FUSE 1
FH1	1	MERSEN/FERRAZ SHAWMUT	30322R	FUSE HOLDER 1
F2	1	LITTELFUSE	312001P	FUSE 2
FH2	1	OPTIFUSE	BLC-16-B	FUSE HOLDER 2
SS1	1	SCHNEIDER ELECTRIC	ZB5AD3	SELECTOR SWITCH: A-D-B
PL1	1	SCHNEIDER ELECTRIC	ZB5AV033	GREEN PILOT LIGHTS: RUN
PB1	1	SCHNEIDER ELECTRIC	ZB5AA4	RED PUSH BUTTON: STOP
PB2	1	SCHNEIDER ELECTRIC	ZB5AA3	GREEN PUSH BUTTON: START
ES	1	SCHNEIDER ELECTRIC	ZB5AT84	RED PUSH BUTTON: 40MM E-STOP
SL	1	ALLEN BRADLEY	800F-AL01	SWITCH COVER/ LOCK ATTACHMENT
ESG	1	ALLEN BRADLEY	800F-AMEGY	PUSH BUTTON GUARD
SS1-CB	2	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: SWITCH
PL1-CB	1	SCHNEIDER ELECTRIC	ZBVG3	CONTACT BLOCK: RUN
PB1-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: STOP
PB2-CB	1	SCHNEIDER ELECTRIC	ZBE101	CONTACT BLOCK: START
ES-CB	1	SCHNEIDER ELECTRIC	ZBE102	CONTACT BLOCK: E-STOP
GND	2	BURNDY	KA6U	GROUND LUG
FM	1	GFSIGNET	9900	TRANSMITTER
FMSRD	1			FLOW SENSOR CONNECTOR
2730	1	HUBBELL	HBL2730SW	TWISTLOCK RECEPTACLE
27005	1	INT'L CONFIGURATION	888-27005-NS	FLANGED INLET
1	1	BF1	BP-1614	14 GA. GALVANIZED PANEL
2	1	ALLIED MOULDED	AM1648L	NEMA 4X FIBERGLASS ENCLOSURE

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DRAWING DATE  
JLH 7-11-17

CAD FILE  
CB-1000-FM-CE

REVISED DATE

CB-1000-FM-CE

BOULAY FABRICATION, INC.

PO. Box 508 LaFayette N.Y. 13084 Phone 315-677-5247  
UL/CSA Approved Electrical Control Panels Fax 315-677-5325

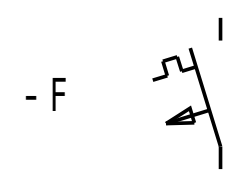
PREPARED FOR: GARTNER EQUIPMENT COMPANY

SIMPLEX CONTROL 400/3/50 20 HP

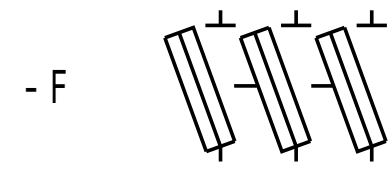
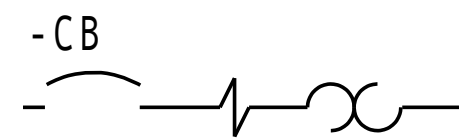
Symbols

IEC 1346-1

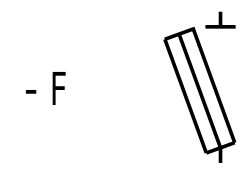
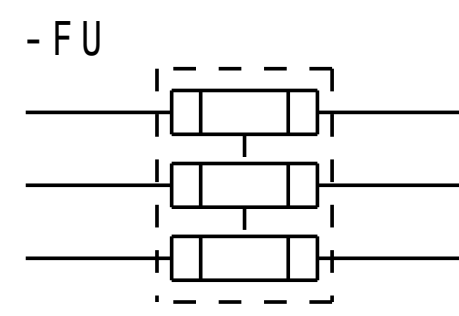
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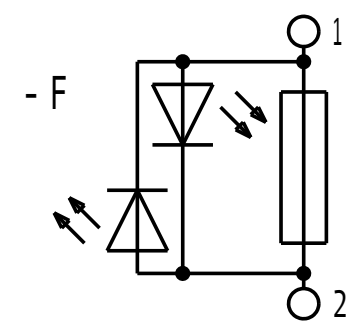
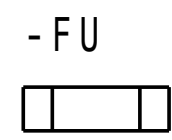
circuit breaker



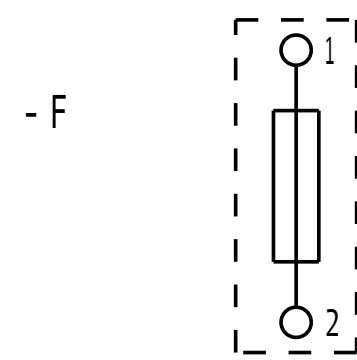
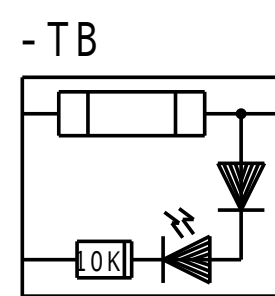
fuseholder/fuse



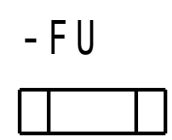
fuseholder/fuse



fuse holder  
terminal+LED



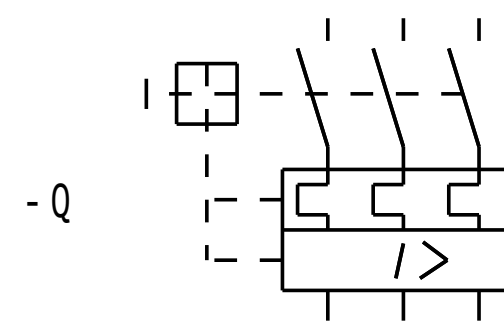
terminal with fuse



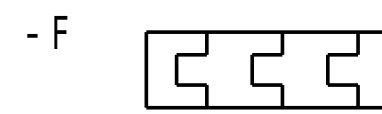
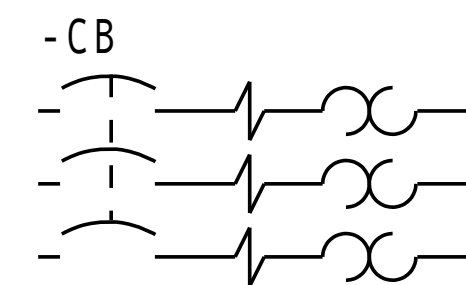
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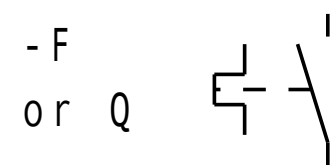
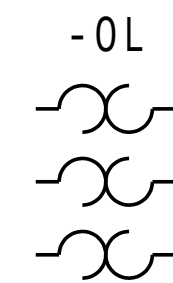
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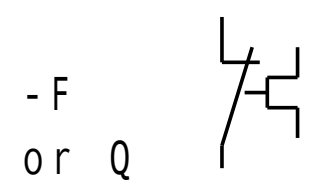
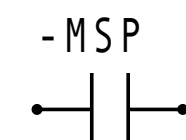
Motor  
circuit breaker



bimetal motor



bimetal contact  
normaly opened



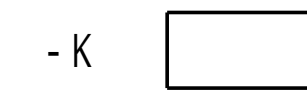
bimetal contact  
normaly closed



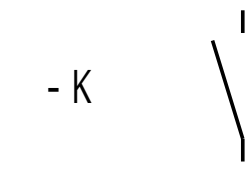
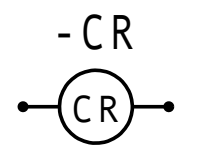
Symbols

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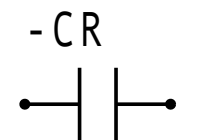
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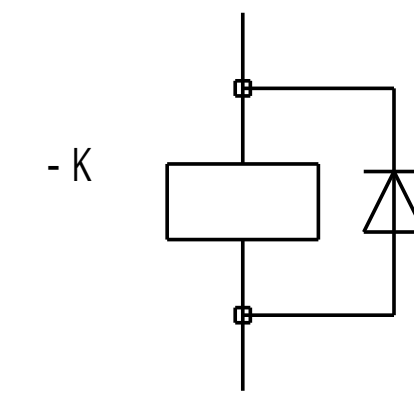
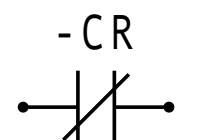
contactor



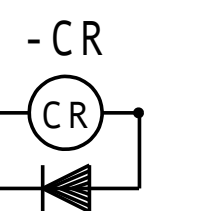
normaly opened  
contact



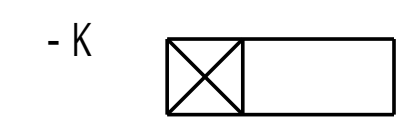
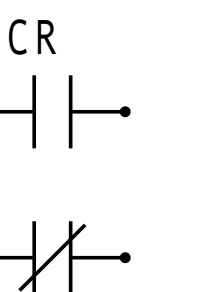
normaly closed  
contact



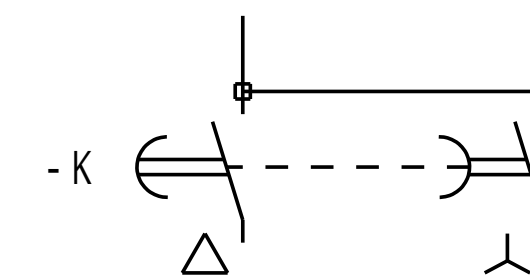
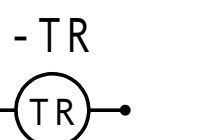
relay



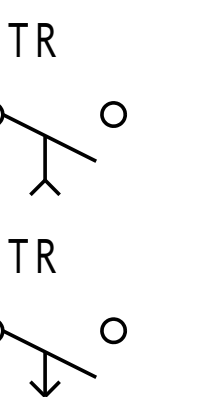
relay contact



time relay



time relay  
contact



El. diagram

Date

Name

Designation Explanation sheet

Ser.No. 074218.200605

=01 +A1



dr'n.

29.11.06

Wahl A.

Benennung Erklärungsblatt

Order No.

Bl. 05

Total  
100

chkd.

Customer CANADA - UL-CC200 - HV1

Type VC 1350/220 TECH

Origin.

D.No. 0742-765-27-18-006

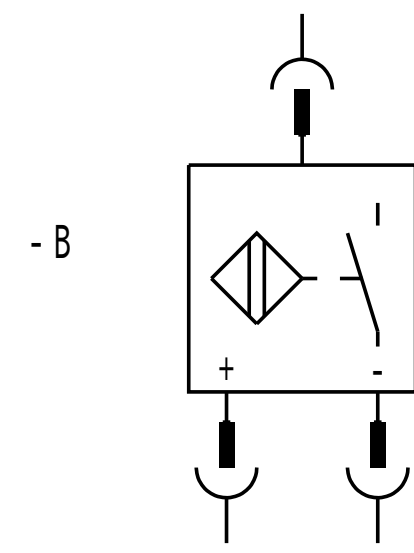
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This document remains our property.  
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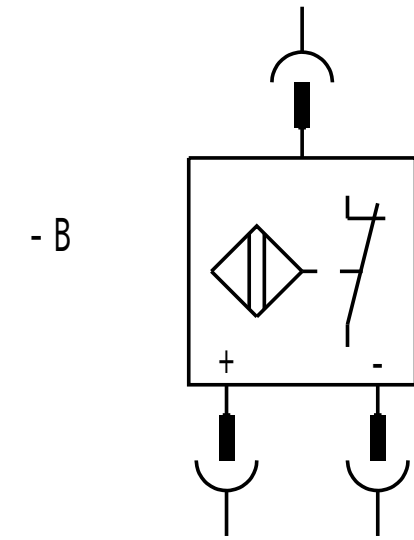
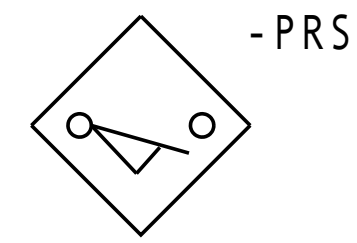
## Symbols

IEC 1346-1

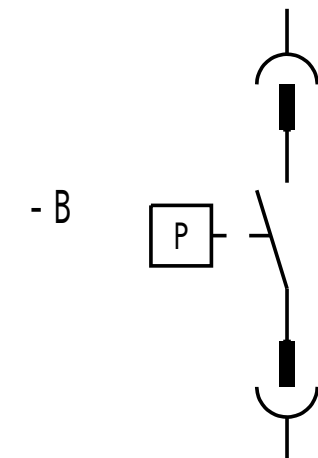
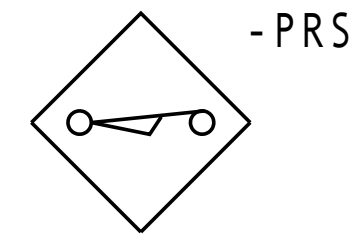
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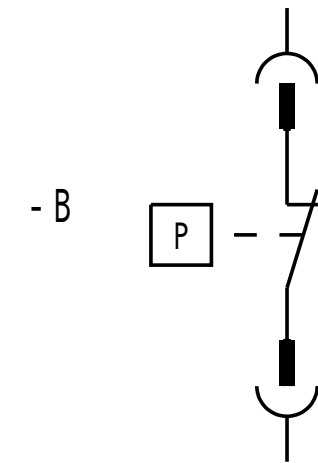
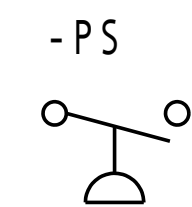
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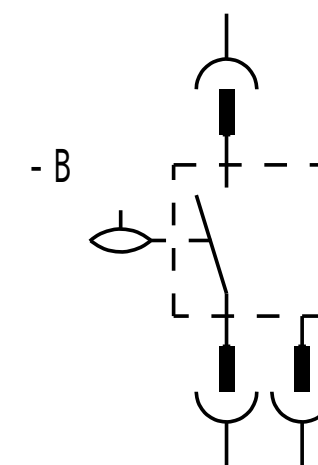
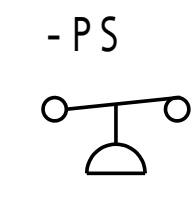
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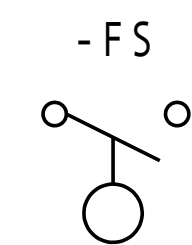
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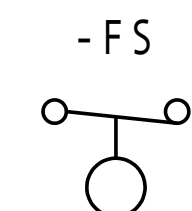
pressure switch  
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oil level  
normally opened



oil level  
normally closed



## Symbols

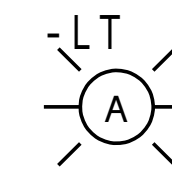
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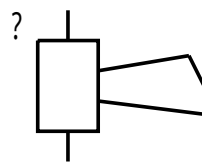
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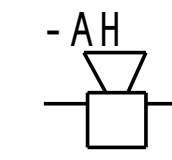
lamp



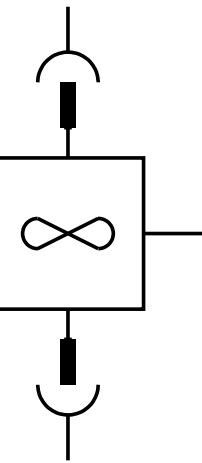
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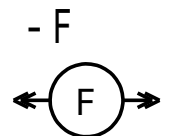
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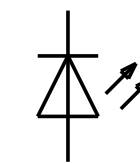
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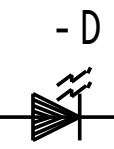
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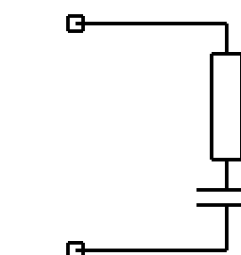
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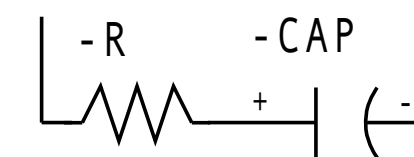
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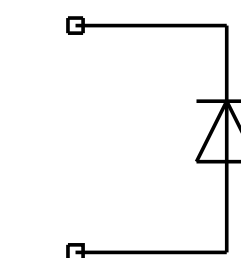
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RC-section



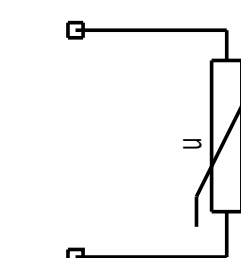
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free-wheel diode



-Z



suppression filter  
Varistor

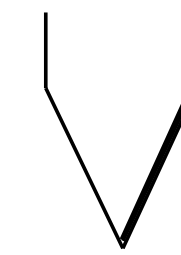


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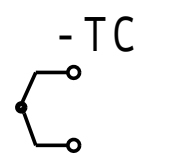
IEC 1346-1

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-B



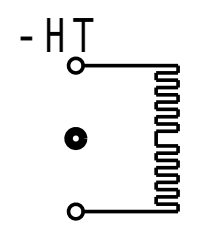
temperature tracer



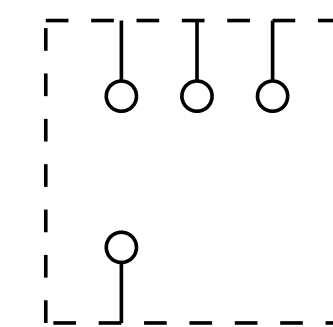
-E



heater band



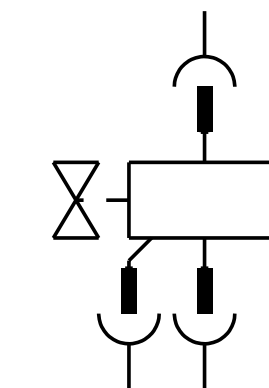
-V



solid state relays



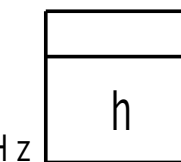
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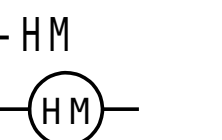
solenoid



-P



working hours  
counter



El. diagram

**ENGEL**  
AUSTRIA

dr'n.  
chkd.

29.11.06

Wahl A.

Designation Explanation sheet  
Benennung Erklärungsblatt

Customer CANADA - UL-CC200 - HV1

Type VC 1350/220 TECH

Ser.No. 074218.200605

Order No.

Origin.

D.No. 0742-765-27-18-006

=01 +A1

B1.06

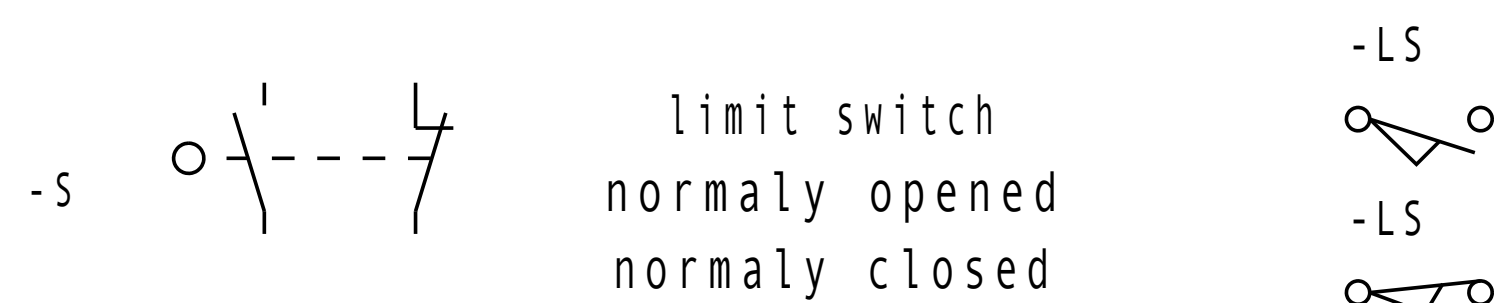
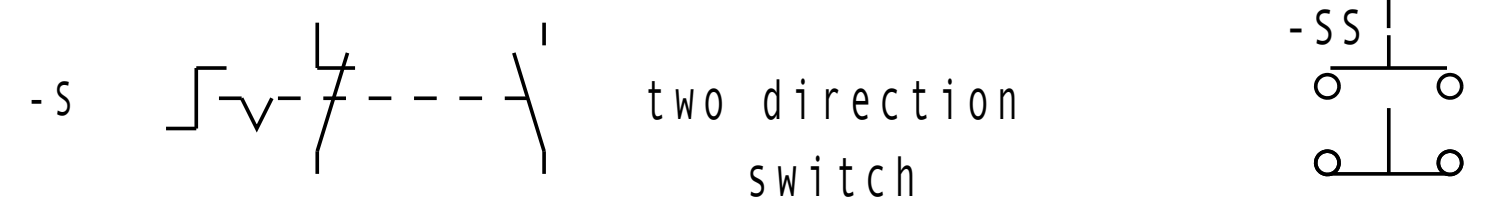
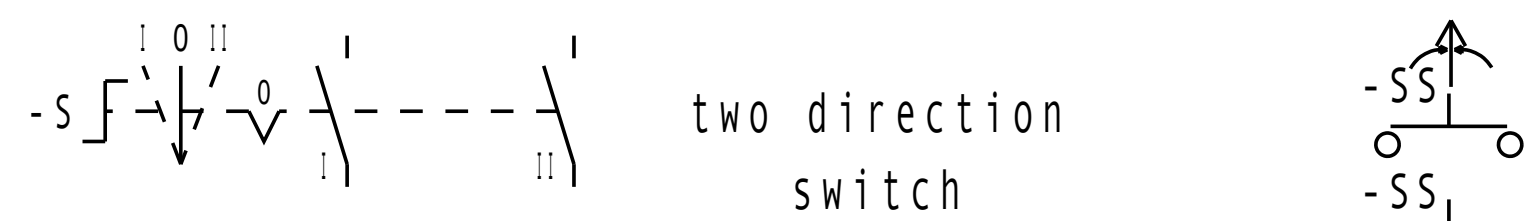
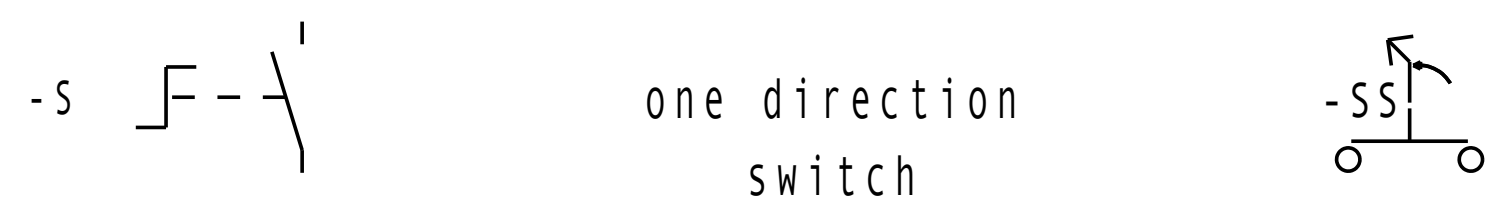
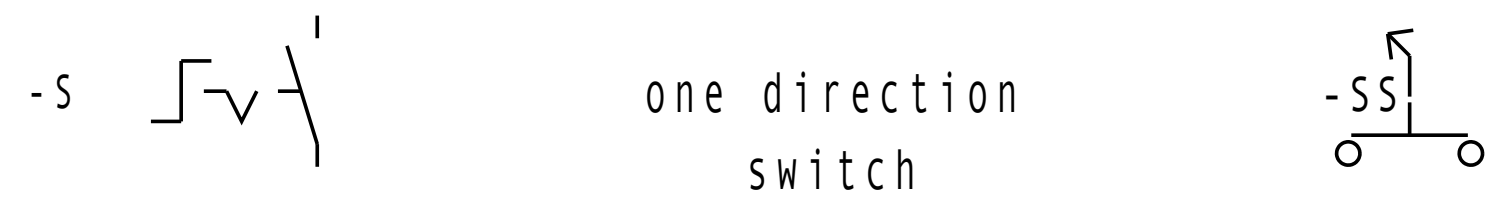
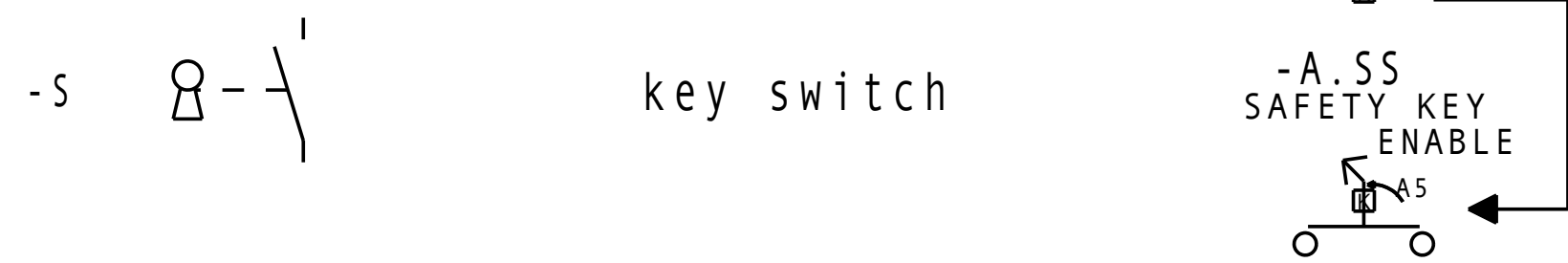
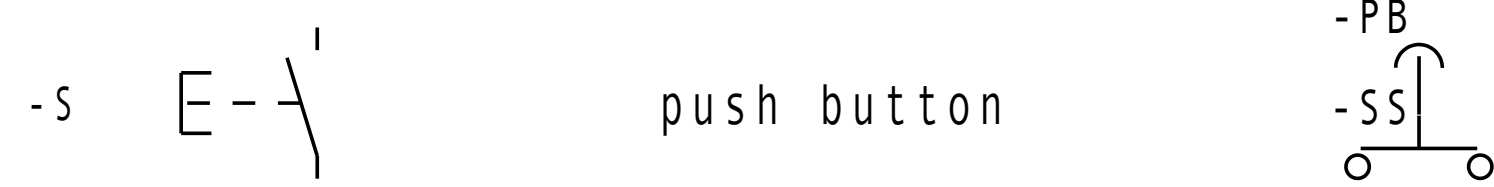
Total  
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Version

## Symbols

IEC 1346-1

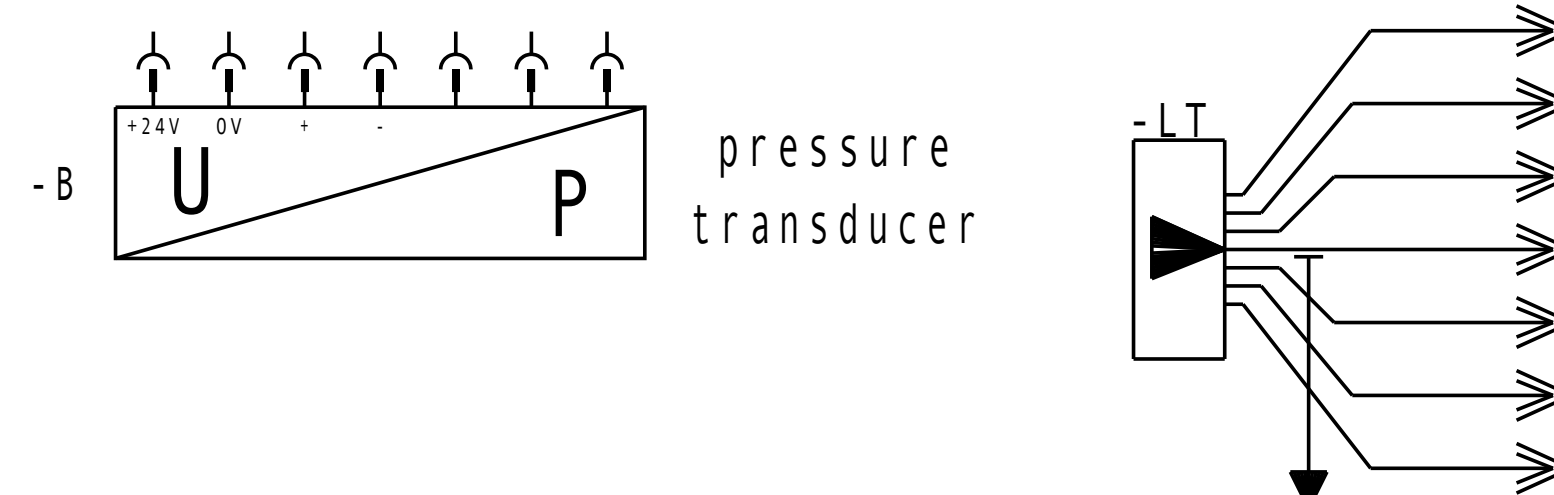
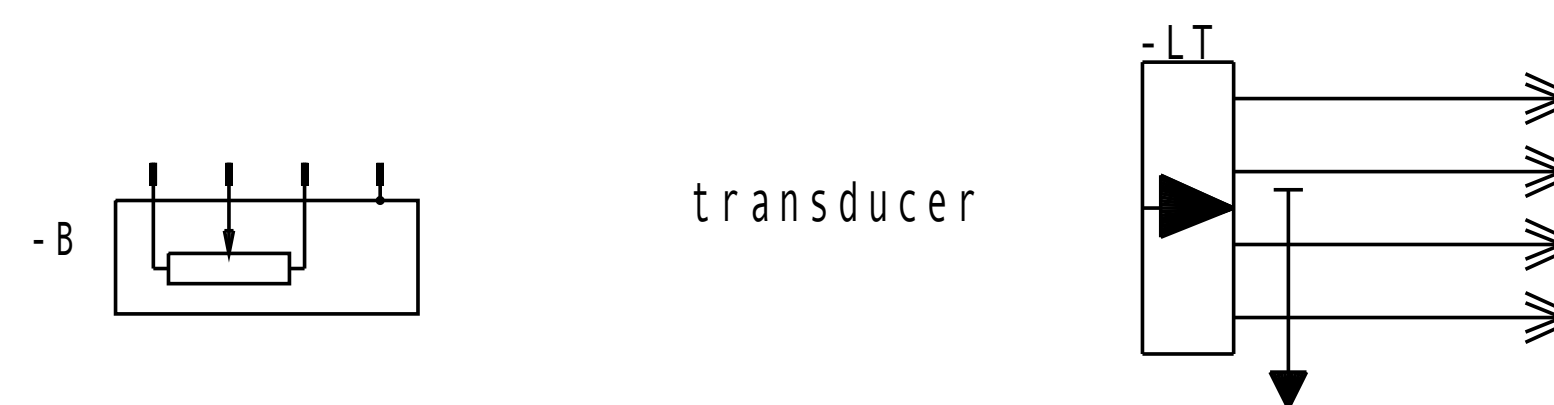
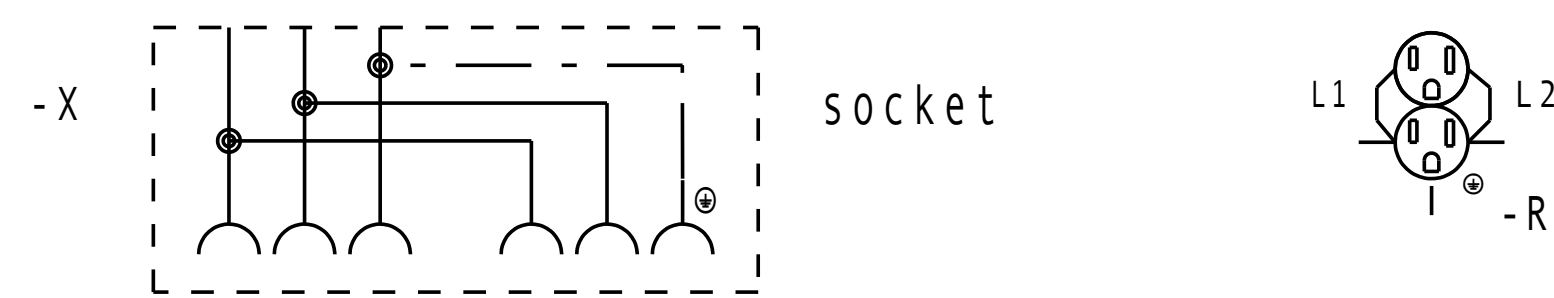
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## Symbols

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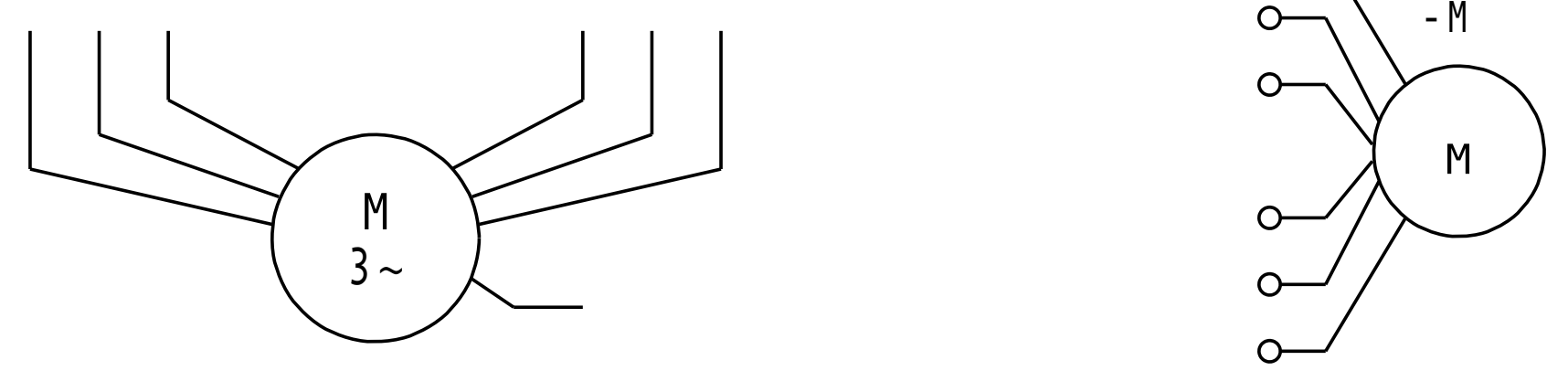
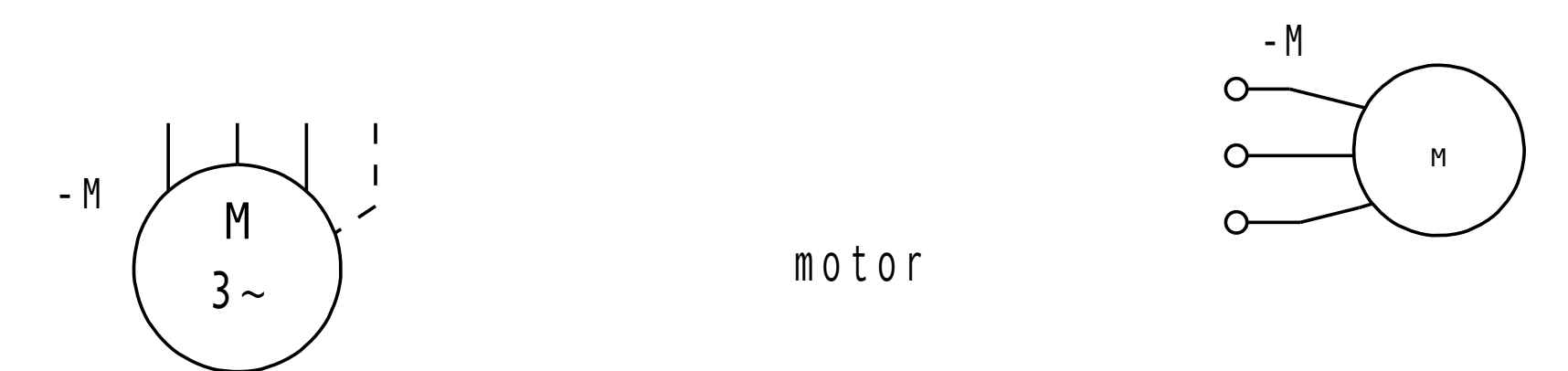
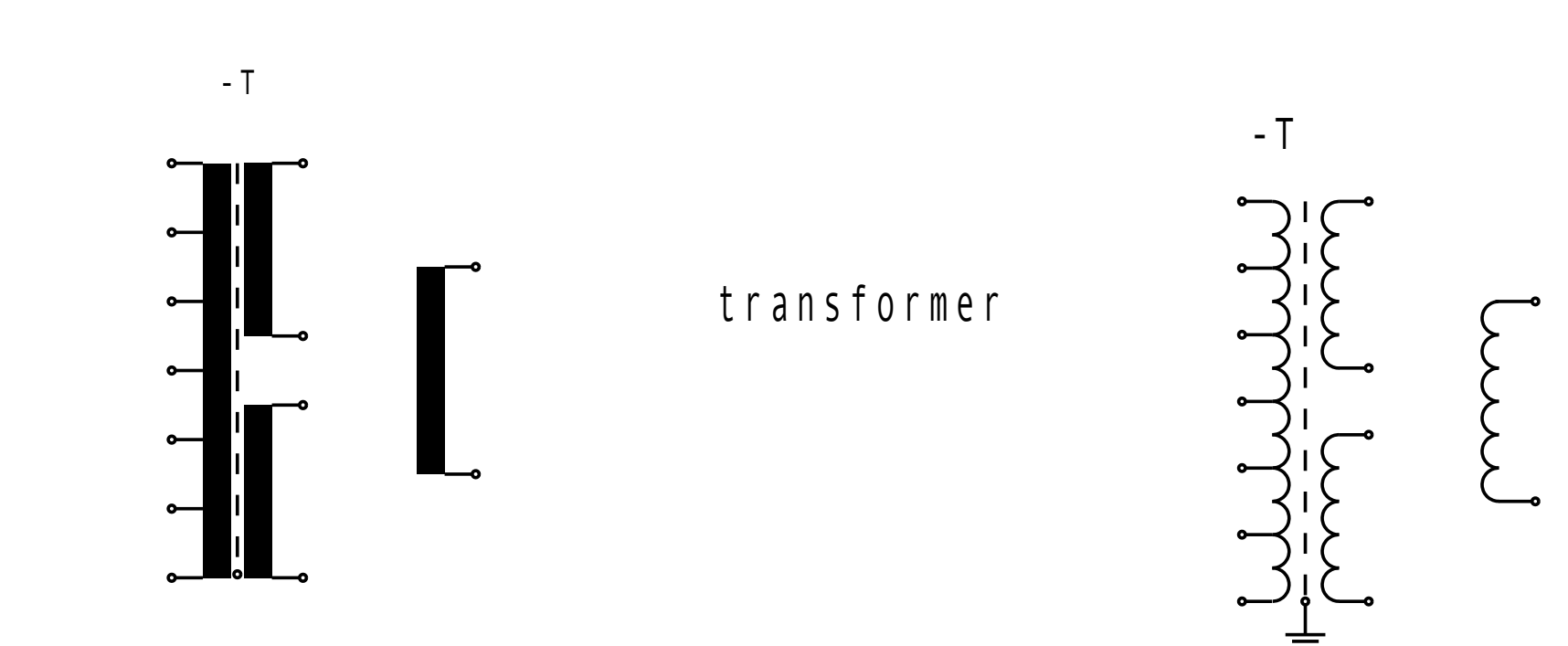
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## Symbols

IEC 1346-1

ANSI



El. diagram		Date	Name	Designation Explanation sheet		Ser.No.	074218.200605	=01 +A1	
	dr'n.	29.11.06	Wahl A.	Benennung Erklärungsblatt		Order No.		Bl. 07	Total 100
	chkd.			Customer CANADA - UL-CC200 - HV1	Type VC 1350/220 TECH	Origin.		Version	
						D.No.	0742-765-27-18-006		