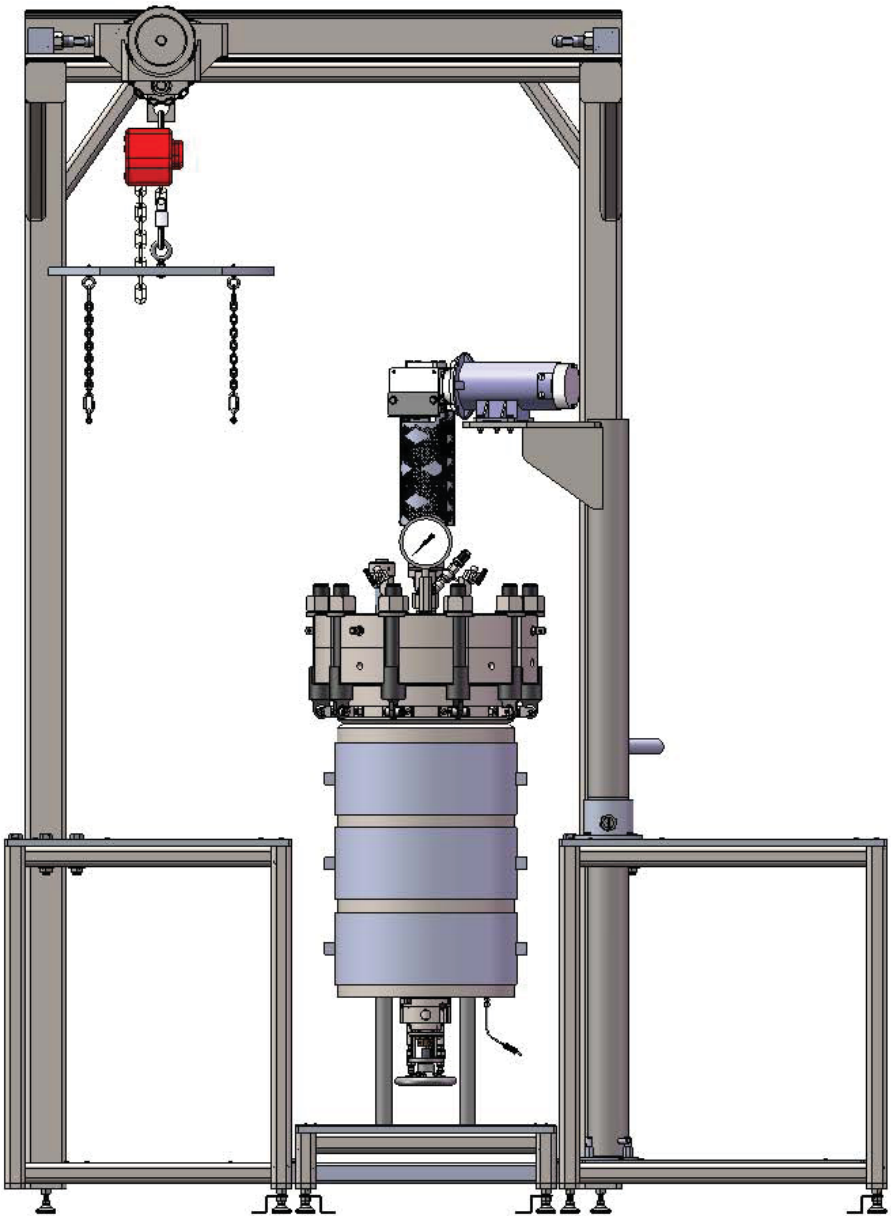


8500 Floor Stand Reactor System

Operating Instruction Manual

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PREFACE

Scope

These instructions include information for the installation and operation of Floor Stand Reactor System with 50 L, 100 L, or other large volumes.

These instructions cover the basic steps to be followed in installing this reactor and describe the function of all principal components. They are intended to be used in conjunction with several related instruction sheets listed below which provide information describing several components which are common to most pressure reaction apparatus. These instructions also include safety precautions and other information applicable to all pressure equipment.

The user should study all of these instructions carefully before starting to use these reactors to fully understand the capabilities and limitations of the equipment, and to be well aware of the precautions to be observed in the operation.

Related Instructions

The following publications are also available to further your understanding of this instrument and its component parts:

No.	Description of Instructions
201M	*Limited Warranty*
230M	*Safety Precautions to be observed when operating Pressure Reaction Equipment*
234M	*Magnetic Drives*
548M	*4848 Reactor Controllers*
723M	*A1906E Series Pressure Transducer*
733M	*A4190HC Bottom Drain Valve*
734M	*A4370HC Series Magnetic Drives*
736M	*A4366HC Safety Rupture Discs*
FX004	*Health & Safety Assurance Certification*

Intended Usage

This system has been designed for use as a stirred reactor system. It has been designed, built, and tested to strict physical and electrical standards. However, it is the user's responsibility to install and operate it in conformance with local pressure and electrical codes. If the instrument is used in a manner not specified by Company, the protection provided by the equipment may be impaired.

Safety Information

To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capability.
2. Ensure that the equipment is connected to electrical service according to local national electrical codes. Failure to properly connect may create a fire or shock hazard.
3. For continued protection against possible hazard, replace fuses with same type and rating of fuse.
4. Disconnect from the power supply before maintenance or servicing.

To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials; fire or explosion may result. This device contains components which may ignite such material.
2. Refer servicing to qualified personnel.

General Specifications

Electrical Ratings

Controller ratings are found on the controller data plate.

Before connecting a controller to an electrical outlet, the user must be certain that the electrical outlet has an earth ground connection and that the line, load and other characteristics of the installation do not exceed the following limits:

Voltage: Fluctuations in the line voltage should not exceed 10% of the rated nominal voltage shown on the data plate.

Frequency: Controllers can be operated from either a 50 or 60 Hertz power supply without affecting their operation or calibration.

Slave Boxes:

Part No.	Volts	Hertz	Amps
A1761HCEE	230 VAC	50/60	40.0

Current: The total current drawn should not exceed the rating shown on the data plate on the controller by more than 10 percent.

Thermocouple: Unless otherwise specified, all Series 4848 Controllers operate with a Type J (iron-constantan) thermocouple. The total resistance of the thermocouple and the lead wires should not exceed 100 ohms. If the resistance of the thermocouple circuit is higher, it will reduce the sensitivity of the control system.

Explanation of Symbols

I	On position
O	Off Position
~	Alternating Current (AC) Single Phase
3~	Alternating Current (AC) 3-Phase
	This **CAUTION** symbol may be present on the Product Instrumentation and literature. If present on the product, the user must consult the appropriate part of the accompanying product literature for more information.
	This **CAUTION** symbol indicates that the surface may be hot.
	This **CAUTION** symbol indicated that there is a pinch point hazard.
	**Protective Earth (PE) terminal**. Provided for connection of the Protective Earth (green or green/yellow) supply system conductor.

Environmental Conditions

This instrument is intended to be used indoors.



CAUTION! Do not use in hazardous atmospheres.

Operating: 15 °C to 35 °C; maximum relative humidity of 80% non-condensing.

Installation Category II (over voltage) in accordance with IEC 664.

Pollution degree 2 in accordance with IEC 664.

Altitude Limit: 2,000 meters.

Storage: -25 to 65 °C; 10 to 85% relative humidity.

Unpack Carefully

Unpack the equipment carefully and check all the parts against the packing list. If shipping damage is discovered, report it immediately to the delivering carriers.

Examine the components closely for any loose parts or shipping damage and be sure to check all layers of packing materials thoroughly so as not to overlook any parts which might otherwise be discarded.



CAUTION! The vessel cart and stand components are top heavy. Handle with care and secure all loads appropriately while moving.

Provisions for Lifting and Transporting

The 8500 Floor Stand Reactor System and its components are extremely heavy. Use proper and safe lifting techniques and equipment when installing or moving this system and/ or its components. Before moving ensure all cables and tubings are disconnected.

The reactor unit is installed on a standalone integral frame with provisions for lifting/moving using a forklift if necessary. Tare weights of the 50L and 100L vessels are approximately 600 lbs and 1200 lbs respectively. The Vessel Cart the reactor vessel is mounted on weighs approximately 550 lbs. Exercise due caution when moving the reactor unit away from the stand assembly. There are no direct attachments between the reactor module support structure (center console) and stand assembly. The reactor module is intended to be pushed into the stand assembly until both units are approximately flush at the front of the units.



CAUTION! Do not move the overall stand assembly as a single unit!

The stand assembly comprises of the Left Console, Vessel Cart, Right (Controller) Console, Upper Frame Work and the Motor Support Console. **Do not move the overall stand assembly as a single unit.** Disassemble and move each unit separately when necessary to do so. It is recommended that the trolley and hoist assembly be removed before attempting to move the upper frame work. Lift strap aligners are provided at the approximate location of a vertical plane containing center of gravity of the upper frame work and can be used to aid lifting/handling of this unit.

Four lift lugs have been provided on the cylinder flange as well as on the head flange.

PREFACE *(Continued)*

CAUTION! DO NOT lift the entire unit using the lift lugs on the head. Use extreme caution to protect against personnel or equipment damage when lifting or handling heavy equipment.

CAUTION! Do not attempt to move the vessel on an unlevel surface. Bodily injury or property damage will result.

Cleaning & Maintenance

Periodic cleaning may be performed on the exterior surfaces of the controller with a lightly dampened cloth containing mild soap solution. All power should be disconnected and the power cord should be unplugged when cleaning the instrument.

There are no user serviceable parts inside the product other than what is specifically called out and discussed in this manual. Advanced troubleshooting instructions beyond the scope of this manual can be obtained by calling Company in order to determine which part(s) may need to be replaced or serviced.

WARNING! HOT SURFACE
Ensure that any hot surfaces have had adequate time to cool before cleaning or maintaining the reactor and/or its components.

Users Responsibility

All reactors and pressure vessels are designed and manufactured with great care to assure safe operation when used within their prescribed temperature and pressure limits.

But... the basic responsibility for safety when using this equipment rests entirely with the user; who must:

1. **Select a reactor or pressure vessel** that has the capability, pressure rating, corrosion resistance, and design features that are suitable for its intended use. Company engineers will be glad to discuss available equipment and material options with prospective users, but the final responsibility for selecting a reactor or pressure vessel that will perform to the user's satisfaction in any particular reaction or test must rest with the user.

   In exercising the responsibility for the selection of pressure equipment, the prospective user is often faced with the choice between over- or under-designed equipment. The hazards introduced by under-designed pressure vessels are readily apparent, but the penalties that must be paid for over-designed apparatus are often overlooked. Recognizing these criteria, reactors and pressure vessels are offered in several different styles, each designed for convenient use in daily operation within certain temperature and pressure limits, using gaskets, closures, and other elements carefully selected for safe operation within the limits specified for that design. But in order to preserve the validity of these designs, all temperature and pressure limits must be observed, and no attempt should be made to increase these limits by making alterations or by substituting components which are not recommended by Company.

2. **Install and operate** the equipment within a suitable barricade, if required, with appropriate safety accessories and in full compliance with local safety codes and rules.

   All standard pressure vessels are provided with either a suitable relief device or a means to attach one (typically in the form of a plugged opening). When a pressure vessel is delivered without a pressure venting device, it is the customer's responsibility to provide pressure relief in order to protect the operator and the equipment from destructive high pressures. If you need more information or need help in selecting a proper relief device, please contact Company.

3. **Establish training procedures** to ensure that any person handling the equipment knows how to use it properly.

4. **Maintain the equipment** in good condition and establish procedures for periodic testing to be sure the vessel remains structurally sound.

INSTALLATION

Pressure and Temperature Limits

The working pressure and temperature at which any reactor or pressure vessel can be used will depend upon the design of the vessel and the materials used in its construction. Since all materials lose strength at elevated temperatures, any pressure rating must be stated in terms of the temperature at which it applies. The standard material of construction for Company is Type 316 Stainless Steel.

Limits for vessels made of other materials and for other operating temperatures can be obtained from Customer Service. No attempt should be made to increase these limits by making alterations or by substituting components which are not recommended by the Company. It must also be understood that lower pressure and temperature limits may be required for modified reactors and for vessels made of special alloys.

Limits for vessels will be determined by the physical characteristics of the vessel material and will be prescribed on an individual basis.

Temperature and pressure limits are also affected by the physical properties and temperature limits of the gaskets and seals used in the vessel, and by any valves, gages or other fittings attached to the vessel. Obviously, the safe operating pressure of any system can be no higher than that of its lowest rated component.

All reactors show the maximum safe operating pressure and temperature imprinted on the cylinder.

The working pressure and temperature on 8500 Floor Stand Reactor Systems must not exceed the limits imprinted on the reactor head.

Assemble the Reactor

These reactors should be operated in a well ventilated area with convenient access to an electric outlet, running water and a drain. This assembled unit needs to be placed at least 10 inches away from walls or flammable materials. It is recommended that the unit be installed with a clearance of 3-4 feet all around for easy access to all bolts and head fittings. Use the associated assembly reference drawings included in this manual to help identify parts to assemble the reactor.

1. Assembly of the stand must be done prior to use.
2. Position the left and right hand consoles at the desired location. Maintain a distance of approximately 26 inches between the inside edges (reference assembly layout). Ensure the two side consoles are well aligned. The rear tie bar may be utilized to confirm this. Loosely tighten the two 1/2-13 bolts on the rear tie bar to maintain relative distance between the left and right hand consoles.
3. Measure center-to-center distances between corresponding mounting bolt holes on the left and right hand uprights on the overhead console. Confirm that corresponding distances match on the bolt holes on the mounting pads. Adjust relative position of the left and right hand consoles accordingly; then tighten the two 1/2-13 bolts to secure the rear tie bar.
4. Use levelling feet to ensure all surfaces are level relative to each other using a bubble level (or equivalent). The left and right hand consoles have two sets of anchoring locations (2 anchor brackets per side). Loosely anchor the two consoles in place using appropriate hardware mounted through the 0.50" diameter holes provided on the (4) anchor brackets.
5. If the unit is furnished with a Motor Support Console, lift the motor support tube assembly with the top bushings/housings already installed and lower the tube through the work surface on the Right Console. Place the end of the tube over the bottom bushing. Secure the console using the hardware furnished. Ensure the nuts and stop rod are installed as shown in assembly layout.



WARNING! In order to ensure adequate protection against tipping hazards, do not swivel the motor to the front of the unit beyond the allowance provided by the motor console stop rod.

6. Using appropriate gear, lift the Upper Frame Work. Lift strap aligners (reference assembly layout) are provided on the Upper Frame Work at the approximate location of a vertical plane containing center of gravity of the unit. Use these aligners to maintain the Upper Frame Work in a vertical position when lifting it into place.



CAUTION! The lift strap aligners are not designed to withstand any structural load!



CAUTION! Check to ensure lifting gear is adequately rated to lift at least 500 lbs of load.

INSTALLATION *(Continued)*

WARNING! Do not lift the Upper Frame Work over people.

7. Once the Upper Frame Work is placed atop mounting pads on the left and right consoles and all bolt clearance holes are properly aligned, commence installation of the 12 structural bolts to secure the overhead unit.

   Note! Tighten all 12 bolts to 100 ft-lbs

WARNING! The Upper Frame Work shall be adequately secured and supported (using lift straps as described above or by other means necessary) until all 12 bolts have been tightened to specified torque rating.

8. If applicable, mount motor on the motor support console.
9. Mount the trolley, hoist and lift support plate on the overhead console
10. The cables for the motor and tachometer are to be routed through the motor support tube and out the bottom bearing support. Route these cables through the conduit provided on the underside of the Right (controller) Console. Connect the cables to the appropriate connectors.
11. If applicable, install the Bottom Drain Valve into bottom of cylinder using the three bolts provided. Ensure PTFE flat gasket is installed on Bottom Drain valve prior to mounting it on to the cylinder.

    Apply 30 ft-lbs to these bolts

WARNING! The Vessel Cart is top heavy. Ensure the Vessel Cart is properly secured (e.g. using appropriately rated straps) to the forks of a pallet jack before moving.

12. Before lifting vessel cart, ensure all (4) anchor brackets are off of the ground and retained higher than the base of the levelling feet using the retaining nut provided under each the anchor bracket. Also ensure the two sets of Vessel Cart locking tabs provided on left and right consoles do not obstruct placement of the Vessel Cart between the left and right consoles.
13. Bring the Vessel Cart into position between the left and right consoles. Ensure the Vessel Cart fits snugly within the outer support structure and that the front of the three consoles are flush. Use levelling feet, as necessary, to ensure all surfaces are level relative to left and right consoles using a bubble level (or equivalent). Loosen the anchor bracket retaining nuts to allow anchor brackets come in contact with the floor. Loosely anchor brackets in place using appropriate hardware mounted through the 0.50" diameter holes provided.

CAUTION! Always use anchor brackets retaining nut to ensure anchor brackets do not touch the ground before the levelling feet.

14. Tighten all (8) anchoring locations on vessel cart and left/right consoles.
15. Engage motor with magnetic drive via coupling furnished. If the drive coupler needs to be adjusted to center the coupler halves, loosen the mounting bolts of the motor and move the motor assembly as required to center the drive couplers. Tighten the bolts while holding the motor assembly in position.
16. If the unit is furnished with band heaters, ensure the heaters are not installed over a welded area.
17. As an alternative to using the (4) anchor brackets on the Vessel Cart, two sets of Vessel Cart locking tabs provided on left and right consoles may be used to prevent the Vessel Cart from tipping. However, we strongly recommend use of anchoring bolts wherever possible to guarantee the most secure installation of the Vessel Cart.

A1761HCEE Single Phase Slave Box Control

Installation of the A1761HCEE Single Phase Slave Box, 230V 40 AMP, requires a switch or circuit breaker installed in the building.

1. It shall be in close proximity to equipment and within easy reach of the operator.
2. It shall be marked as disconnecting device for the equipment.
3. It shall meet national and local electrical rules and regulations.

HEAD FITTINGS

Pressure Gage

A 5-1/2" diameter pressure gage, with a T316 Stainless Steel Bourdon tube, is mounted on the head using attachment fittings.

Safety Rupture Disc

There is a 1-1/2" diameter safety rupture disc attached to the head which is intended to rupture and release the pressure before it reaches a dangerous level. A metal tag wired to the safety head identifies the burst pressure at room temperature for that particular disc. A similar tag is furnished with each replacement disc. This tag must remain with the apparatus at all times so that both present and future operators will be aware of the disc rating. Users should read the discussion of rupture discs given in Instruction Manual No. 736M for a complete description of the characteristics of rupture discs and the precautions to be observed when operating pressure equipment protected by this type of safety device.

Inlet Valve

Typically, this is provided as a 3/8" NPT angle valve. The inlet valve is furnished with an attached fitting which provides a socket for attaching the A495HC pressure hose furnished with the reactor.

Outlet Valve

Typically, this is provided as a 3/8" NPT angle valve. The gas release valve is connected to a plain opening on the underside of the head. Gas released from this valve will be drawn from the top of the reactor.

Solids Charging Device

A 1" NPT solids charging device is provided as a convenient access port for use at atmospheric pressure. The body of this device is machined with an internal taper to aid in the delivery of the solids into the vessel. It has a convenient screw cap closure, typically furnished with an FKM O-ring seal.

Alternately, based on customer specifications, a ball valve may be provided as the solids charge port.

Magnetic Drive

Reference the 234M for information on Magnetic Drives with 120 in-lbs of coupling torque and the 734M for mag drives with 300 or 600 in-lbs of coupling torque.

CYLINDER BOTTOM FITTINGS

Drain Valve/Stirrer Support

The bottom drain valve/stirrer support is centrally located on cylinder bottom. It forms a seal with the cylinder using a PTFE flat gasket. Use the three threaded bolts to mount the unit to the cylinder.

The Bottom Drain Valve has a 3/4" NPT outlet connection. Reference the 733M for further information.

Apply 30 ft-lbs to these bolts.

Type J Thermocouple

A Type J thermocouple in a 1/8" dia. stainless steel sheath is furnished with the reactor. Insertion depth of the thermocouple is not adjustable.

Internal Cooling Coil

The Spiral Cooling Coil is installed on the bottom of these reactors. A spiral coil does not interfere with the use of an anchor style stirrer. Plugs are available to seal the cooling coil opening when the coil is not used.

Cooling media may be introduced via a quick connect coupling with 3/8" Tube connection provided at the inlet/outlet of the coil. In order to remove the coil, remove quick disconnect couplings and retaining clips from both ends.* Loosen the retaining nuts. Then carefully pull the entire coil including the cooling adapter from inside the vessel.

Before reinstalling the coil, check to ensure all connections including nuts on the two male connectors used to mount the cooling coil onto the cooling adapters are securely tightened. Proceed to lower it into the cylinder until both cooling adapters hit the inside bottom of cooling ports. Then proceed to install the O-ring seal, washer and retaining nut to seal the cooling coil. The gland nut need only be wrench tight. Install the retaining ring and quick connect couplings.

**Some cooling fluid may drain out of the coil when you remove the quick connect fittings.*

Removable Baffle

A Baffle assembly, when furnished, may be installed by inserting lock pins on the baffle inside locating pins mounted on to the cooling adapter referenced above. Ensure the cooling is properly seated before installing the baffle. Also ensure that all support legs on the baffle are in contact with the base of the cylinder.

DRIVE SYSTEM

Variable Speed Electric Motor

Reactors are normally equipped with a DC variable speed motor supplied and controlled through the 4848M Master Controller. Instructions for connecting and operating these motors are included in the controller Instruction Manual No. 548M. This motor is usually installed in a drive system designed to produce stirring speeds up to 200 rpm via a 5:1 gear drive.

Universal Drive Coupler and Guard

The universal drive coupler is keyed to the drive shaft. The lower end of the coupling has a male hex end that slips into a corresponding female hex on the magnetic drive. Disengage the drive by decoupling the hex end from the magnetic drive unit. Re-engage by inserting the hex end of the coupling into the magnetic drive unit – you may need to turn the magnetic drive by hand to ensure the hex flats line up. So long as the vessel sits between the right and left side console and the front of all sections are approximately flush and in line, the universal coupling will accommodate any angular or axial misalignment between the motor and magnetic drive units.

A guard is installed to protect the user against hazards associated with rotating parts inclusive of the magnetic drive and universal coupling. This guard SHOULD NOT be removed during operation of the equipment. Portions of the rotating magnetic drive close to the reactor head may not be completely covered by the magnetic drive guard. The user is hereby warned against this residual hazards. Company believes an attempt to completely eliminate this hazards would result in loss of functionality of the equipment.



CAUTION! Do not remove the magnetic drive guard during operation of the equipment. When disengaging the motor, unscrew the four thumb screws to remove the front part of the guard.

Drive Shaft

A portion of the drive shaft is mounted directly on the inner rotor of the magnetic drive. This end remains with the head at all times. A solid shaft coupling joins the stub shaft coming out of the magnetic drive with an intermediate coupling shaft. The intermediate coupling shaft engages the self-lifting coupler and also allows the coupler to slide up along its outer surface in case of misalignment. As the head is lowered into position on the cylinder, the self-lifting feature of the coupler enables the magnetic drive to couple with the drive shaft without the need for adjustments under the head. If the hexagonal pattern on the lower drive shaft assembly does not line up with corresponding pattern on the self-lifting coupler assembly, the coupler will lift up to prevent damage to drive train components. In this case, manually spin the magnetic drive a quarter of a turn to allow the coupler to engage completely. The drive shaft rests on a lower shaft hub, which, in turn, rests on a bearing mounted to the drain valve/stirrer support.

HOW TO USE THE VESSEL

Open the Vessel

Open the gas release valve to discharge any internal pressure. Remove any rigid tubing connections.

Loosen the Qik-Latch self-contained bolting units by turning the hex nuts counterclockwise. Back off the nuts just enough to swing the Qik-Latches away from the head. The nuts are retained in place with a retaining ring and will not come off. Qik-Latch self-contained bolting units are intended to always remain attached to the cylinder even when the vessel is not in use.

Remove and disconnect all tubing and hard plumbing. A quick disconnect adapter is provided at the outlet of the burst disc unit. A cooling hose holder is provided to attach any loose hose connections that need to be temporarily disconnected from the vessel unit.

Once the area around the head is cleared of all attachments and connections, disconnect the drive by opening the magnetic guard and lifting the coupler out of the magnetic drive. Disengage the spring loaded locking pin on the motor support assembly. Then, use the integral handle provided to slowly rotate the motor support assembly towards the rear of the unit until the spring loaded pin again locks it into place. Further movement will be prevented by stops at the base of the unit.

Use the trolley chain to position the lift plate/lift chains over the head and attach the chains to the lift eyes in the head. Use hoist to raise the head until all internal appendages clear the cylinder lip.

CAUTION! Check to ensure all head attachments clear the cylinder completely before attempting to move the head.

Note: The self-lifting coupler, the O-ring and O-ring retaining ring will remain with the head as it is lifted away from the cylinder.

Move the head assembly to the left of the unit using trolley chain and lower it into the service position of the left hand console. Handle the head carefully so as not to damage the stub shaft and other appendages when they are outside of the cylinder. You will now have complete and unrestricted access to the full bore of the cylinder.



WARNING! PINCH POINT HAZARD
DO NOT place hands under head when lowering it into position. Weight of the head can cut or crush. The user is hereby warned against this residual hazard. Company believes an attempt to eliminate this hazard would result in loss of functionality of the equipment.

Close the Vessel

Check integrity of the O-ring. It should fit loosely on the retaining ring under the head.

Lift the head carefully from its service position and lower onto the cylinder. The O-ring retaining ring should make the first contact with the cylinder. This will help prevent damage to the O-ring sealing surface on the cylinder. The cylinder has two alignment pins (typically brass bolts) on the top surface while the head has two corresponding alignment notches towards the front of the unit. As the head is lowered onto the cylinder, ensure the alignment notches on the head line up closely with the corresponding alignment pins. So long as the alignment pin and notches are lined up, the PTFE alignment ring under the head will help engage the head until it sits flush with the top of the cylinder.

CAUTION! The head and the cylinder will only mate in one position due to presence of the aforementioned alignment feature. Do not exert undue force to assemble the unit if the head/cylinder are not in the proper position.

HOW TO USE THE VESSEL *(Continued)*

Swing the Qik-Latch self-contained bolting units into place ensuring the washer and nut fit snugly on corresponding cutouts on the head.

Tighten each of the nuts with the torque adapter furnished with the apparatus or with a torque wrench. Tightening should proceed in a crisscross pattern rather than progressively around the circle.

Recommended bolt torque is as noted below.

Recommended Torque Rating		
Pressure (psi)	**100 L**	**50 L**
725	270 ft-lb	110 ft-lb
500	190 ft-lb	
300	120 ft-lb	

Rotate the motor support into position above the magnetic drive. Connect the drive by engaging the universal coupling with corresponding female hex on magnetic drive. Move the magnetic drive by hand to ensure the hex flats line up. Install the magnetic guard.

Gas Connections

Gas connections are dependent on applications. For general usage, use the pressure hose furnished with the reactor. Screw the Type "A" coned pressure fitting into the adapter attached to the gas inlet valve and tighten the compression nut firmly. Do not use any thread dope on the coned fitting. The A495HC pressure hose is made of reinforced Nylon which can be used for all non-corrosive gases at pressures up to 2500 psig. For operations involving corrosive gases, this hose should be replaced with an A490HC hose which has a PTFE lining and a braided stainless steel outer covering. An A506HC all metal hose is also available in stainless steel and other corrosion resistant materials. All of these hoses have the same fittings.

Pressurizing the Vessel

Check all valves carefully before admitting gas into the system. The gas release valve must also be closed unless the vessel is to be purged, or unless there is to be a continuous flow through the reactor during a run. Always make certain that the pressure in the gas tank is greater than the pressure in the vessel. If there is any possibility that the tank pressure might not be high enough to force gas into the reactor, install a one way check valve (optional) in the gas line to prevent any reverse flow. With the inlet valve open and the flow control valve on the gas tank closed, open the main valve on the gas tank only about one-quarter turn; then use the flow control valve or the valve on a pressure regulator to control the flow of gas into the vessel. After the desired pressure has been reached, close the tank valves and the vessel inlet valve and disconnect the hose at the vessel end.

Do Not Overfill the Vessel

Always watch the pressure gage closely when admitting gas so as not to exceed the maximum working limit. Remember that any subsequent increase in temperature will raise the pressure. Also, be sure that the amount of liquid placed in the vessel is carefully controlled. As a general rule, the liquid charge should not exceed two-thirds of the capacity of the cylinder. Too much liquid in the vessel can lead to development of dangerous pressures if sufficient space is not provided for expansion when the liquid is heated. This hazard is explained in greater detail in a warning statement included in the Safety Instruction Manual No. 230M.

Releasing Pressure

Use the gas release valve to reduce the pressure in the vessel if the reactor is accidentally overcharged when filling. Use this valve also to release any excess pressure during a run and to exhaust the vessel at the end of a run. If the discharge gases are flammable or toxic, discharge to an exhaust hood or to any other safe release point.

Reactors With Slave Box Controls

For the high powered 3-zone type heaters, Company offers a series of slave box controls. Having zone control allows a wide range of heating power to be selectable by the operator. These slave controls are used in conjunction with the 4848M Master Controllers.

Note: 3-Zone Heater locations are traditionally:

Zone 1 = Bottom Heater
Zone 2 = Middle Heater
Zone 3 = Top Heater

A1761HCEE 3-Zone Slave Control Box

The A1761HCEE slave control box is supplied with a 250 volt, 50 amp (NEMA 6-50P) power plug. A 230 volt, 50 or 60 Hz, single phase power supply capable of a maximum current draw of 40 amperes is required.

The A1761HCEE slave control box has 3 heater outputs each corresponding with a respective heated zone. There is a 4 position selectable switch, on the front panel, which can switch the heaters off or turn on zone 1, zones 1 and 2, or zones 1, 2 and 3.

Also located on the front panel are 3 manual reset, high limit switches. These switches will trip if an alarm condition is present on the master controller. Once the alarm condition has been resolved, ensure the selector switch is in the "off" position, and reset each switch by pushing in each button until it latches. These switches may have to be set when the unit is first powered on.

Band Heater

CAUTION! Insufficient contact between the heater and the reactor may result in premature heater failure. Failure from improper usage is not covered by the Limited Warranty.

Band heaters rely on good thermal contact. Without proper heat transfer the elements can overheat and fail. Larger diameter band heaters require additional steps to ensure that the contact is sufficient. Two-person installation may be necessary on large diameter band heaters.

1. When installing the band heaters, ensure that the band is square with the vessel.
2. Tighten the band just enough so that it's making contact but can still be aligned.
3. Adjusting the band vertically on the cylinder can indicate whether the band is evenly clamped (square) to the reactor.
4. Once the band heater is aligned, tighten the band heater clamp fasteners a little at a time.
5. Gradually heat the band heater to the desired temperature and once at temperature recheck the clamping bolts.
6. If there's reason to believe that thermal cycling is a concern, then lower the temperature by 20 °C to 30 °C and recheck the clamping bolts.

CAUTION! Band heaters must be uniformly clamped to the reactor before use to avoid damage to the heater.

Initial Operating Test

Read all operating instructions carefully so as to be well acquainted with the correct procedures for handling the vessel and for operating the controller and other accessories. An initial operating test should be made, with only water, to check the apparatus before starting the first experimental runs. For this initial test, fill the cylinder not more than half-full of water and run the temperature up to 150 °C while checking the apparatus for leaks and observing the performance of the temperature controller.

MAINTENANCE

General Maintenance Notes

1. Periodically inspect all electrical wiring and pressure connections for excessive corrosion or wear. Suspect parts should be replaced by components only supplied by Company.
2. Always use appropriate wrenches on all fittings and valves. Never use pliers or pipe wrenches.
3. NPT (National Pipe Taper) threads should not be disassembled any more than necessary. It will become increasingly difficult to maintain a tight seal with these tapered threads if the joint is made and broken repeatedly.
4. Do not use oil or anti-seize lubricant on threads or fittings if the vessel is to be used with oxygen.
5. Periodically check integrity of head O-ring and alignment ring on the head. Minor deformation of alignment ring is tolerable, but it will need to be replaced periodically, especially if it hinders assembly of the head and cylinder
6. Periodically check and replace all O-rings on cooling coil assembly and bottom drain valve/stirrer support assembly
7. Periodically check stirrer support hub and bushing for excessive wear. Replace with a new bushing if it shows signs of physical wear. Excessive lateral play in the stirrer shaft is an indication of worn bearings. Labored rotation or excessive debris inside the reactor cylinder also indicates a need for maintenance. It's difficult to recommend a time-based preventative maintenance interval for the drive due to the wide spectrum of operating conditions encountered. The experience of the laboratory should be used to guide the need for preventative maintenance.
8. Clean all threads and gas passages thoroughly and remove all tape fragments when overhauling a vessel. An ultrasonic bath is excellent for cleaning metal parts, but do not place a thermocouple probe, pressure gage, face seals or ball bearings in an ultrasonic bath. Periodic cleaning may be performed on the exterior surfaces of the reactor stand with lightly dampened cloth containing mild soap solution. All power should be disconnected when cleaning.
9. Routinely inspect Qik-Latch bolting units for lubrication and cleanliness. It is important to clean and lubricate periodically with High Temperature Anti-Seize Lubricant so that the required torque is accurately applied.
10. If servicing assistance is needed, contact Company directly. Contact information can be found on the next page and on the back cover of these instructions.

Slave Box Fuses

The replacement of protective fuses in the A1761HCEE Slave Box should be performed by qualified personnel.

Note: *Check the labels on the instrument for correct fuse rating.*

Part No.	Description
2094E	Heater Fuse (Fast-Acting, 25 Amps, 250VAC)
2093E	Main Fuse (Fast-Acting, 50 Amps, 250VAC)

Periodic Pressure Tests

Each cylinder used in a stirred reactor is tested under hydrostatic pressure to the higher of 1.43 times the rated working pressure at room temperature or 1.30 times the rated working pressure corrected for temperature before it is released from the factory. Inability to hold pressure or excessive/visible deformation indicates that a cylinder is potentially unsafe and it will be rejected. Similar tests should be made at regular intervals during the life of each cylinder, and particularly whenever the user suspects that the equipment has been over-stressed or damaged.

Some laboratories maintain hydraulic test facilities and make it a rule that all pressure vessels must be tested at regular intervals. Any cylinder that shows signs of excessive deformation after application of the prescribed hydrostatic test should be discarded as unsafe for further use.

Users who do not have pressure test facilities can return any pressure vessel to the factory for hydrostatic testing and overhaul. This should be done whenever the metal shows excessive damage from corrosion or whenever an over-pressure or other unusual occurrence raises any safety questions.

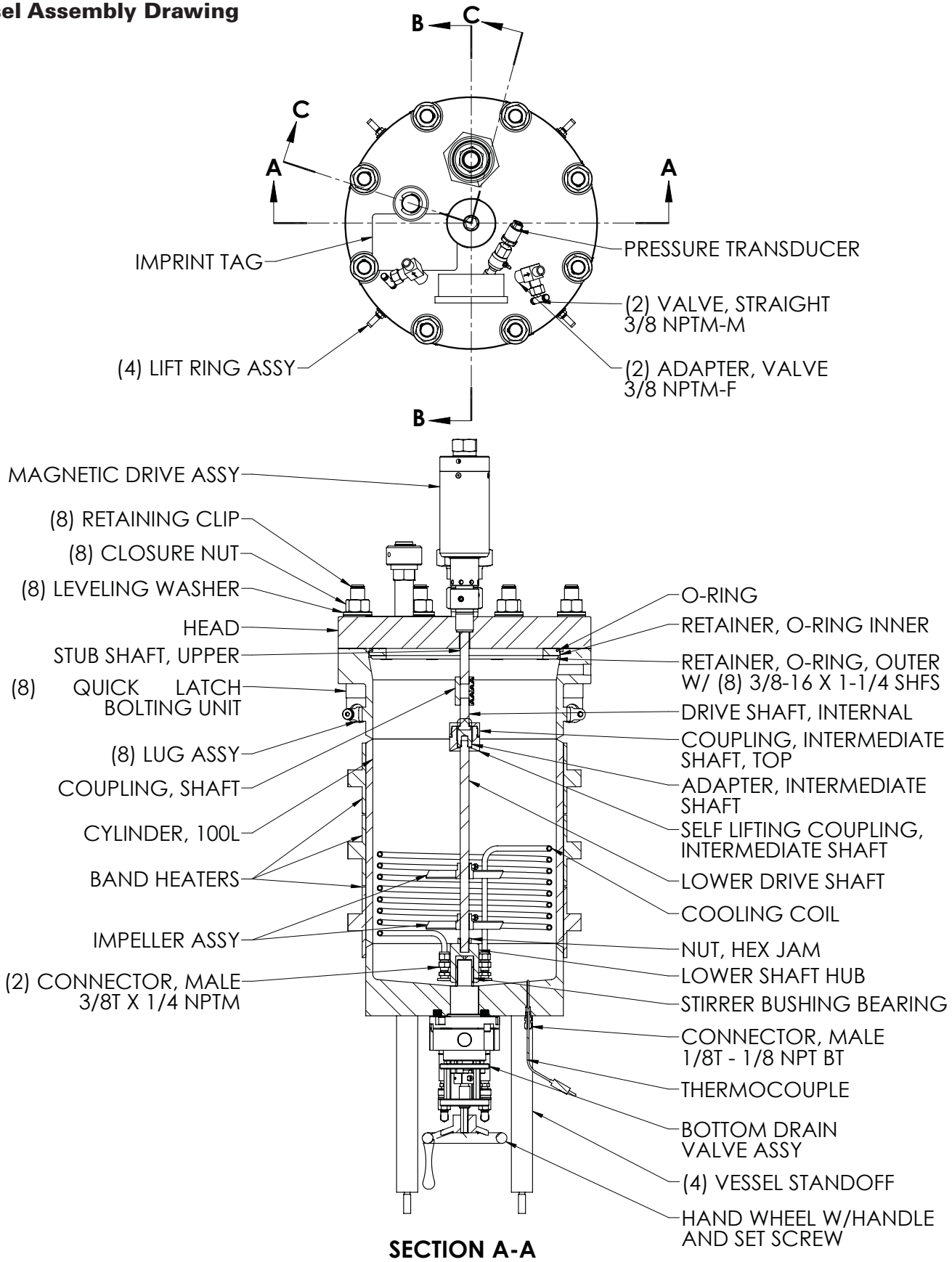
To return a vessel for repair, contact Instrument Company for a return authorization number (RMA).

Technical Support

Company strives to provide our customers with world class support. When contacting Company for technical support, please provide the complete serial number etched on the head. Serial numbers are a long string of letters and numbers. See highlighted text in figure below for an example of a complete serial number.

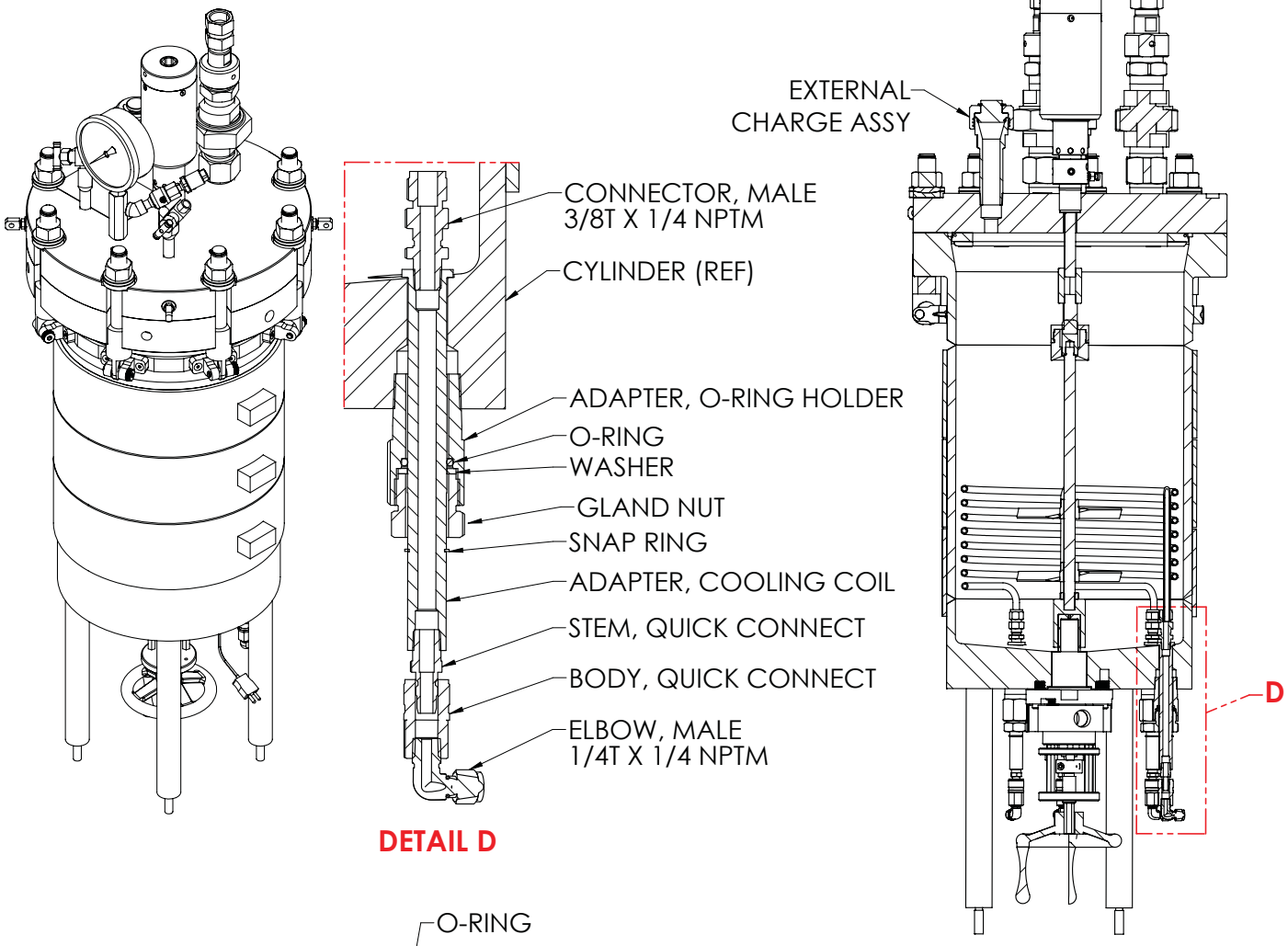
DRAWINGS

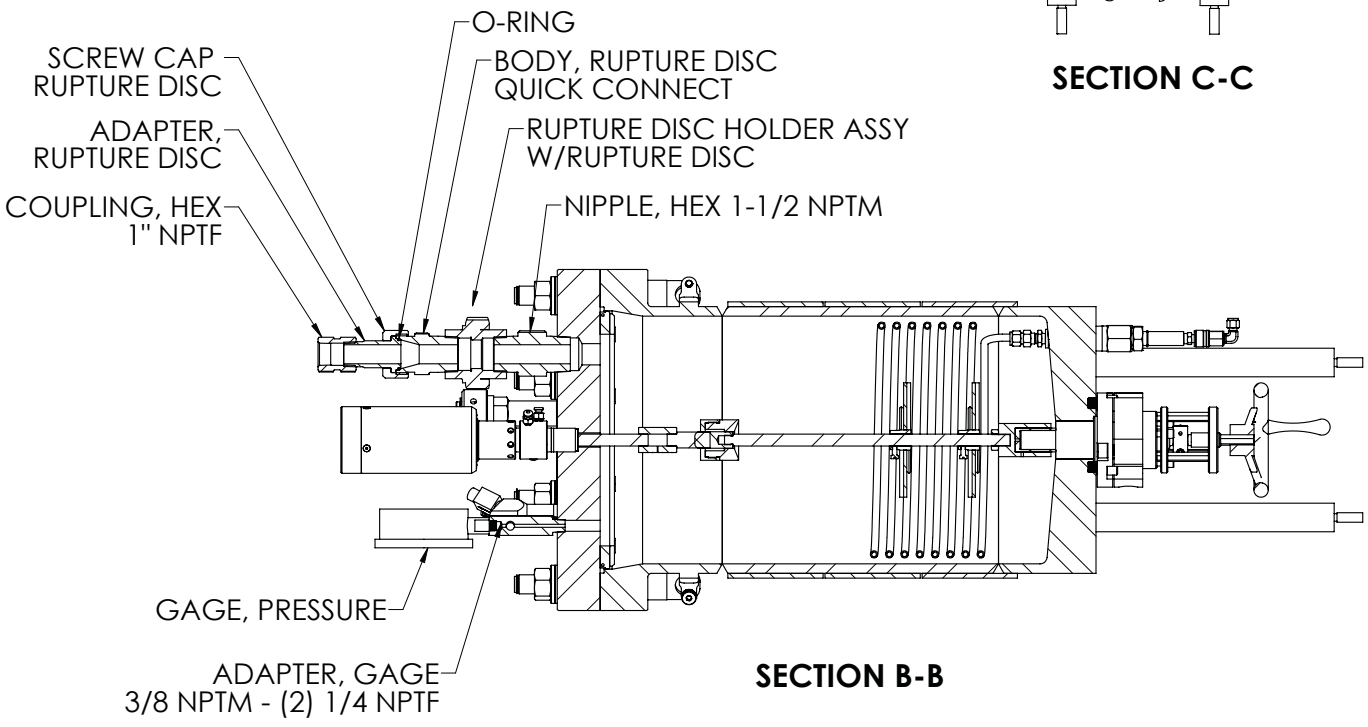
Vessel Assembly Drawing



SECTION A-A

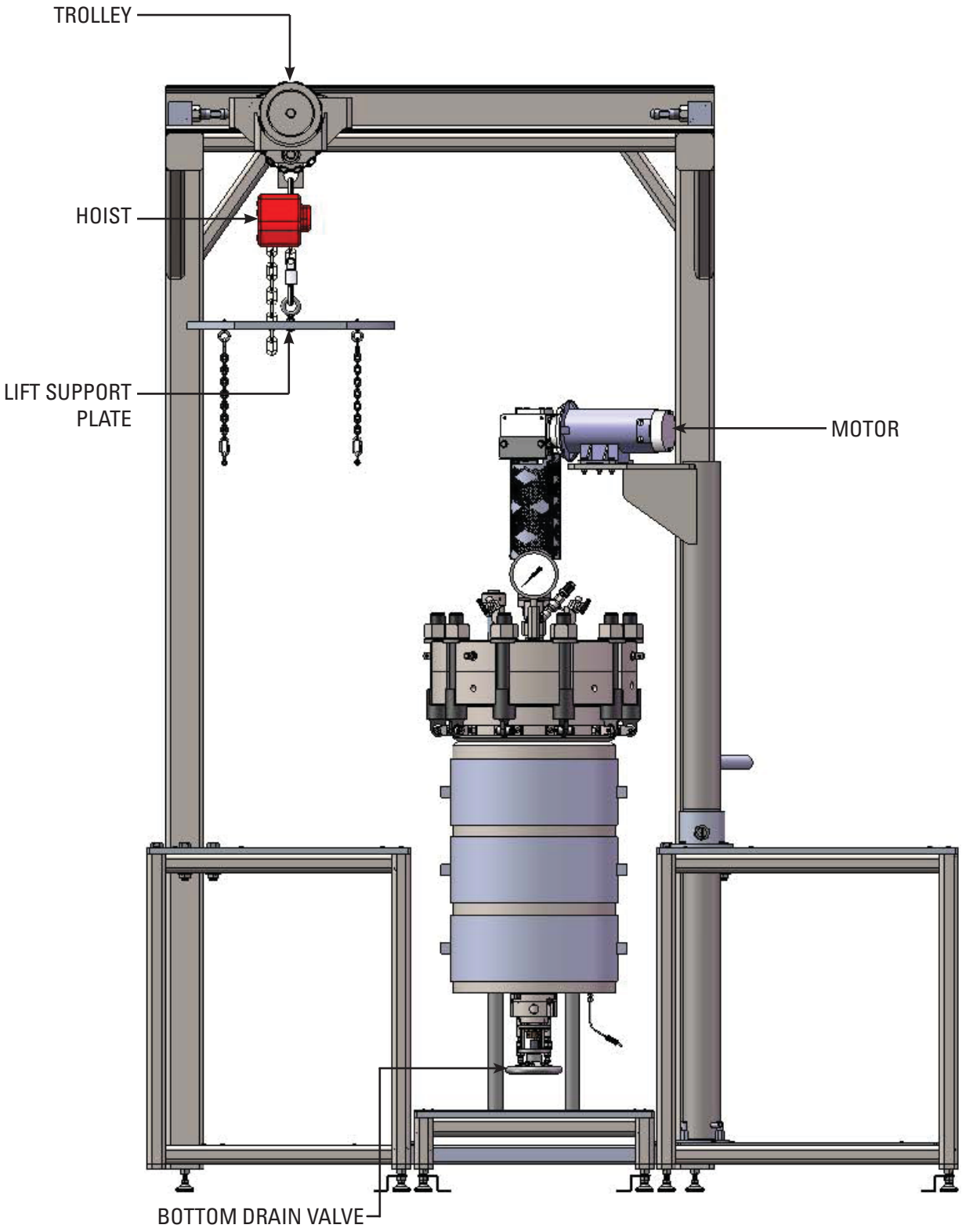
Vessel Assembly Drawing *(Continued)*



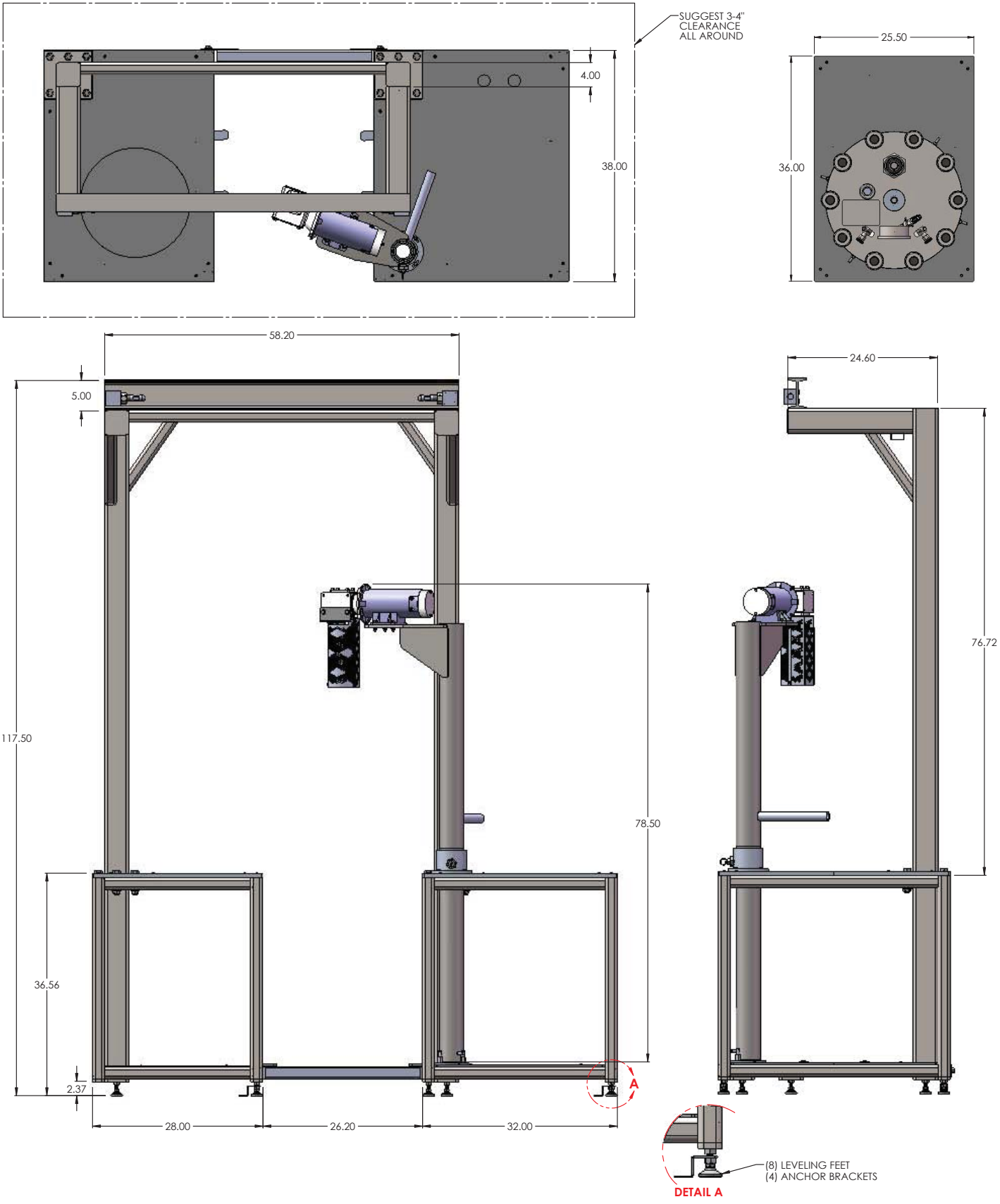


DRAWINGS *(Continued)*

Stand Assembly



Stand Dimensions



DRAWINGS *(Continued)*

Stand Components

