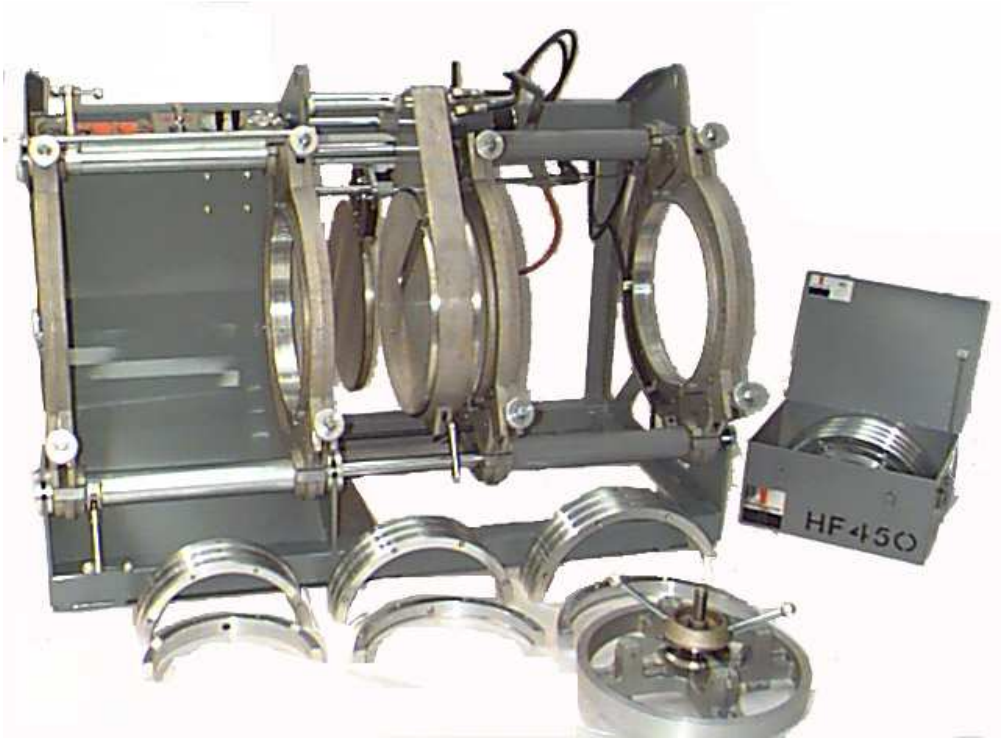
FUSIONMASTER®

HF450

OPERATOR'S MANUAL



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1. Safety considerations

Know the machine

This machine should only be used by an operator fully trained in its use.

Read these operating instructions carefully. Learn the operation, limitations and potential hazards of using your butt fusion machine.

Electrical safety

Use only a qualified electrician to carry out electrical maintenance work.

Connect electrical components only to a voltage source that corresponds to that marked on the components.

Do not operate the electrical equipment in damp or wet locations.

Prevent electric shock by correctly grounding electrical components. The green (or green/yellow) conductor in the electric cable is the grounding wire and should never be connected to a live terminal. An earth leakage protection device is located in the control cabinet.

The equipment is not explosion proof. Never butt weld in a gaseous or combustible atmosphere.

Pinch points

This machine has many slow moving parts that are designed to apply a great deal of force when carrying out its designed function. This especially refers to the clamps, heater and facer which cannot be guarded without preventing the machine function.

Any bodily parts caught in the machine when the hydraulics are operated could be crushed. Operators must ensure that all persons in the vicinity of the machine keep fingers and limbs well clear of moving clamps, facer or heater to avoid crush injuries during all phases of the welding process.

Facer

The facing machine is powerful and the cutting blades are sharp. To prevent injury the facer should only be operated when it is securely located in the pipe cutting position.

The nature of the machine and welding process makes it impractical to guard the operational area. Do not attempt to remove shavings from the cutting area while the facer is running. Remove loose clothing or jewellery to prevent these items being dragged into moving parts.

Wear appropriate apparel

The heater operates at over 200°C and contact can cause serious burns. Always wear gloves when handling the hot plate.

Hydraulic pressure

A sudden hydraulic oil leak can cause serious injury or even death if the pressure is high enough. Do not search for oil leaks with the fingers because a fine jet of pressurised oil could penetrate the skin causing serious injury. Use a piece of cardboard to test for leaks under pressure.

Avoid spraying oil into eyes when bleeding air from the system by wearing safety glasses and keeping the face clear of the area.

Maintain equipment carefully

The machine has moving parts and/or parts that may deteriorate with age and require maintenance. Regular inspection is recommended. For best results keep all machine components clean and properly maintained. Always disconnect the power when adjusting, servicing or changing accessories. Repair or replace damaged electric cables.

Transporting the machine

Dixon equipment mounted on wheels is not designed for on-road towing. Any attempt to do so could result in machine damage and/or personal injury. Transportation should be by truck or similar, with the machine well secured.

During transportation always ensure the heater surface is protected from coming in contact with the cutter blades to prevent serious damage occurring.

2. HF450 Machine Description

The **FUSIONMASTER®** HF450 is designed for "single pressure – low pressure" butt welding of pipe in the range 450-200mm. It is a robust machine built around a steel main frame supporting hard chromed, high strength steel guide shafts, and high strength cast alloy pipe clamps and pipe alignment assembly. It is ideally suited to joining pipe to pipe in the field.

The main clamps are 450mm inside diameter, with the top half clamp being manually lifted on and off and held in place with toggle bolts. The hydraulic power pack, heater and facer are permanently attached to the machine frame. The machine is fitted with two lift points for overhead lifting.

An optional wheel base can be quickly attached to the main frame.

2.1. General Specification

Machine dimensions (without wheelbase)	
Main clamp bore	450 mm
Length overall	1,660 mm
Width (heater extended behind machine)	1,100 mm
Height (facer in raised position)	1,100 mm
Component Weights	
Machine	approx. 580kg
Fittings attachment	15kg
Heater (element pad only)	22kg
Shipping crated with machine & fittings holder	approx. 850kg
Shipping crate with wheel base	approx. 150kg
Hydraulic Specifications	
Electric motor	415v, 2.2kw, 3 phase
Carriage cylinder maximum pressure	9,500kPa
cylinder area (for weld calculations)	2,027mm^2
System oil capacity	25 litres
Recommended hydraulic oil	Any brand with viscosity ISO 46
Heater plate	3.6kW, 415V, 3phase
Recommended genset for field operation.	13kva, 415V, 3 phase
Recommended grease for facer drive	Shell Alvania EP/LF2

2.2. Heating Plate

The cast aluminium heater plate has three circular elements to ensure uniform heat distribution across the effective heating diameter. The 3,600W, 415V, 3 phase heater plate reaches the operating temperature of 220°C from 20°C in under 20 minutes. Temperature is controlled by an electronic temperature controller located at the main electrical panel.

The heater plate is hinged to the machine frame and is manually moved in and out of position with spring loaded assistance.

Replaceable non-stick cloths are used to cover the heater faces to eliminate hot plastic adhesion. The cloths are secured by snap rings that enable quick and easy field repair if the surface is damaged.

2.3. Facer

The facing tool is hinged to the machine frame and is moved in or out of position with spring loaded lever. A single blade cutting arrangement, driven by a powerful hydraulic motor at 10 rpm, provides efficient, fast joint preparation.

2.4. Pipe Alignment

An eccentric mechanism built into the fixed clamp end of the machine allows approximately 6mm of pipe movement in two directions in the plane of the pipe joint. This feature helps to overcome misalignment problems caused by pipe dimensional variations, and increases productivity by reducing pipe alignment times.

2.5. Hydraulics

Hydraulic pressure is provided by a 415V, 2.2kw, 3 phase motor driving a single pump.

2.6. Reducing Liners

Clamp liners for the HF450 can be supplied in either metric or imperial dimensions to suit any pipe size down to 200mm. The metric insert configuration consists of

Diameter	Wide rings	Narrow rings	Comment	Weight per set
450-400	4	1		14kg
400-355	4	1		12kg
355-315	2	2	interchangeable with the HF350	9kg
355-280	2	2	interchangeable with the HF350	10kg
355-250	2	2	interchangeable with the HF350	12kg
355-225	2	2	interchangeable with the HF350	11kg
355-200	2	2	interchangeable with the HF350	13kg

The liners for 315mm to 200mm all nest inside the 355mm liners.

The 400 and 355 narrow liners attach to the side of the 450 clamp.

Narrow liners must be fitted into the inner clamps when required for welding short leg length radius elbows.

Note: The HF450 is not able to hold 450 short leg moulded elbows, or most short leg moulded Tees. Such fittings should be purchased with long leg lengths to enable the Tee or elbow section to protrude beyond the end clamp.

2.7. Accessory Cases

A steel accessory case stores both the 355mm and 400mm liners.

Each HF350 accessory case holds 3 liner sizes.

2.8. Fittings Attachment

The self-centring fittings attachment securely holds stub flanges or shouldered end fittings, either by the outside or inside diameter. This tool centrally locates stub flanges quickly and accurately, and when used in conjunction with the eccentric pipe alignment mechanism, greatly reduces set up time.

2.9. Power Requirement

The HF450 operates on three phase, 415V power. The recommended minimum portable generator capacity for field use at sea level is 13kva. The machine is connected via a 20A, 5 pin Australian Standard electrical plug.

2.10. Optional Wheel-Base

The optional wheel-base comprises two wheels on a fixed axle and two wheels on a steering axle. Each axle is mounted on a frame which slides inside the machine base frame and is pinned into position by M12 bolts. The wheel-base is designed to be retro-fitted to older machines if required. It is suitable for towing slowly between welds at less than 10kph only: it is not suitable for on road towing at speed.

2.11. High pressure welding

The HF40 is not designed for high pressure welding. However the high pressure method may be used providing the combined welding + drag pressure for a particular job is less than 9,500kPa.

3. The HF450 Controls

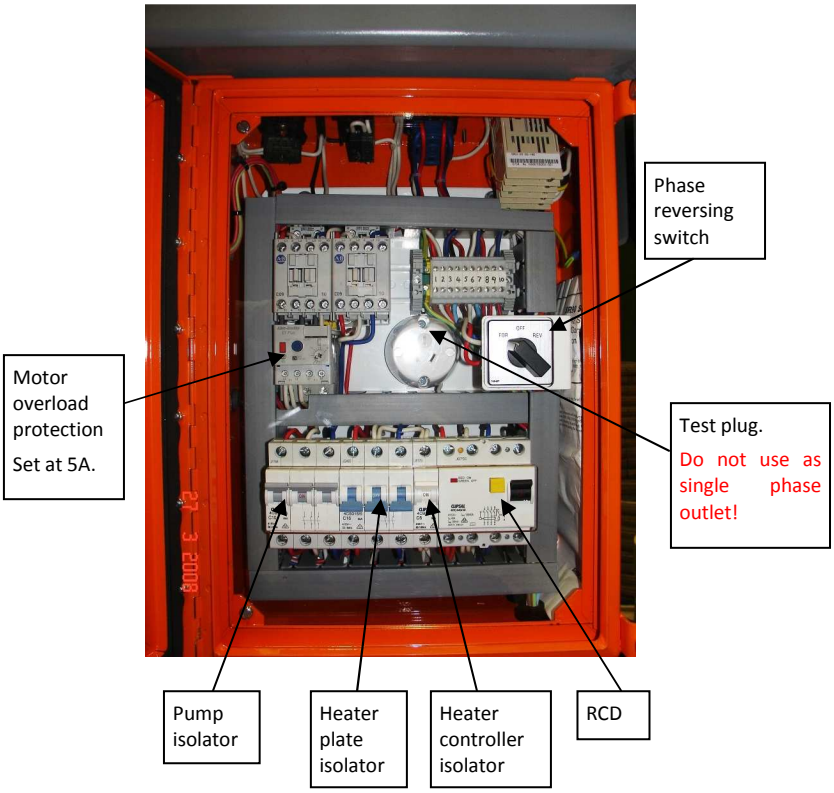
Operators should be thoroughly familiar with the machine before turning on power.

3.1. Electrical

The HF450 requires a 415 volt, 3 phase power supply. Connection to the power source is through a 20 amp, 5 pin plug (i.e. 3 active, 1 neutral, 1 earth).

After connecting to external power ensure none of the circuit breakers in the control box are isolated.

Control Box



The hydraulic pump and heater plate electrics are operated by main switches on the control panel, and isolated by circuit breakers in the electrical control box at the rear of the machine.

Before starting the pump, check the hydraulic oil level and top up if necessary.

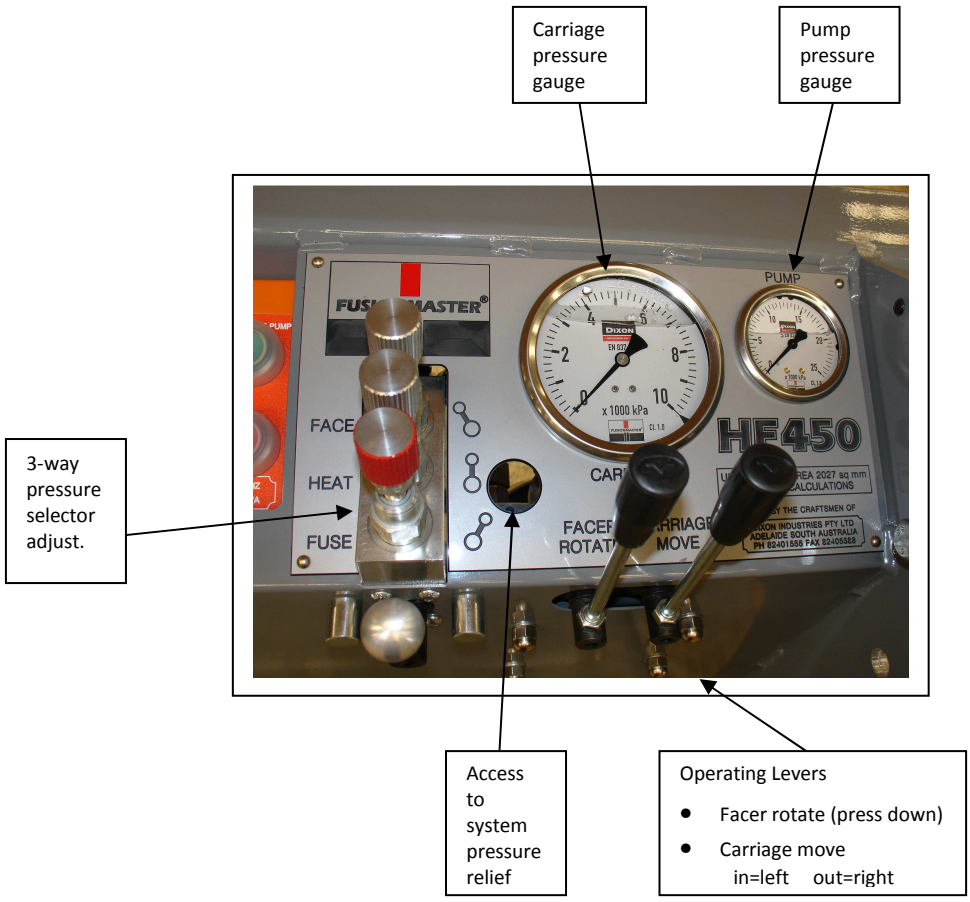
Start the hydraulic pump by pressing the green button on the control panel. Stop the pump by pressing the red stop button.

Switch on the heater at the control panel to power up the heater plate. Check that the temperature controller indicates rising temperature.

3.2. Phase Reversal

If the pump runs but no pressure is generated, check the pump motor fan is spinning clockwise when viewed from above. If not, open the orange control box and turn the phase reversing switch to the off position. Wait until the motor stops spinning then move the switch to the opposite position.

3.3. Hydraulic Controls



Pump Pressure Gauge: Indicates maximum pressure available to drive carriage and facer.

Carriage Pressure Gauge: Indicates the carriage cylinders welding pressure.

Pressure Selector: The 3-position pressure selector allows the operator to select one of the three pre-set carriage pressure regulators used during the welding process.

Pressure regulators: Three regulators allow independent pre-setting of three different pressures for the carriage cylinders. The front regulator with the red knob has the lowest pressure rating.

Regulator Face: usually set at the carriage pressure for facing.

Regulator Heat: usually set at the carriage pressure for the heat soak process, which usually equates to the "drag" pressure.

Regulator Fuse: usually set at the carriage pressure for bead up and fusion.

NB. The regulators only control pressure as the carriage moves toward the centre of the machine.

Main Control Levers

Carriage Move: Push the lever in towards the control panel to move the carriage from right to left. Pull the lever outwards to move the carriage from left to right.

Carriage speed increases with increasing pressure. Speed of travel can also be manipulated by partially opening the **Carriage Move** lever.

The carriage cylinders are series-connected to ensure they carry equal loading. This prevents the possibility of distortion of the machine under load and ensures optimum pipe alignment. Refer to the maintenance section for bleeding instructions.

Facer Rotate: Push the lever down to start facer rotation. Ensure the facer is lowered into the cutting position before commencing rotation.

Release the lever to stop the facer rotating. The facer rotational speed cannot be varied.

4. Using the HF450 single pressure low pressure method

4.1. Preparation

1. Connect only to a 415v, 50Hz power source. Ensure the output of any portable generator used is 415v ± 20v. Ensure any connecting plug has a neutral wire.
2. Power up and check all indicator lights and the hydraulic pressures.
3. Check for air in the hydraulic system and bleed if necessary (see maintenance section).
4. Clean and/or replace the non-stick cloths. Clean the heater plate before every weld with clean dry paper or cotton cloth - never use synthetic materials that may melt.
5. Check, and if necessary adjust the heater surface temperature.
6. Install the correct reducing liners for the pipe to be welded.
7. Check the facer cutting action (the shaving thickness should be 0.30-0.40mm).
8. Before facing, clean inside and outside of each pipe end, and the cutter blades.
9. Record the drag pressure from the pressure gauge before every weld.
10. Add the drag pressure to the calculated pressure to determine the appropriate bead up and fusion gauge pressures.

TIP

Put the top clamp over the pipe, then engage the bottom toggle bolt and hold it in place, then engage the upper toggle bolt, then tighten the toggle nuts.

4.2. Pipe Alignment

Place the pipes in the clamp jaws with about 50m of pipe extending past the clamps into the weld zone. Tighten the clamp toggle bolts securely using a shifter to prevent the pipe from moving when under hydraulic pressure. The outer ends of the pipe should be supported such that any external bending loads on the machine are eliminated and drag pressure is minimised

Move the pipe ends together until they are almost touching, then check for misalignment (maximum allowable misalignment is 10% of wall thickness). Reduce any misalignment to an acceptable amount by adjusting the top and bottom fixed clamp eccentric adjusters.

(Adjustment will not be possible if the pipe ends are in contact and under pressure.)

Move the pipe end clear of the weld zone and record the drag pressure. Add this value to the fusion pressure required to join the pipe (refer welding table).

4.3. Drag Pressure

"DRAG" is the amount of pressure required to overcome carriage friction plus the effort required to move the pipe. As drag pressure is a variable, it must be measured before every weld.

To determine the drag pressure, operate the **Carriage Move** lever and adjust a pressure regulator until the carriage is just moving. This is the drag pressure. The HF450 drag pressure without pipe loaded should be in the range 200-900kPa.

If drag pressure is excessive it may adversely affect the weld. Drag may be reduced by one or more of the following actions:

1. Use a low friction pipe support/roller system.
2. Ensure the pipe support/roller system maintains the whole length of the pipe level with the machine base to prevent bending forces acting on the machine frame.
3. Minimise the amount of pipe being pulled. Welding machines are not designed to pull multiple lengths of pipe.
4. Ensure neither the heater/facer rest bar nor the pipe lifter is obstructing carriage movement

All of these techniques are always important, but become critical when working near the limits of machine capacity.

4.4. Facing

Move the pipe ends apart and slide the facer along its guide shafts until it cannot hit the clamps or pipe ends then lower it into position between the pipe ends.

The facer lifting handle must always lock over the rest bar during facing.

Operate the **Facer Rotate** lever to start the facer rotating. Move the pipe ends into contact with the facer and apply the minimum pressure necessary to achieve cutting until a continuous shaving of plastic is simultaneously produced from both sides of the facer.

Caution: Take care not to overload the facer by applying excessive carriage pressure. Never exceed 1,500kPa more than drag.

On completion of facing, reverse the pipe carriage away from the facer then stop facer rotation. This prevents a step being produced in the faced ends. Raise the facer up and fully out of the machine.

4.5. Re-Check Pipe Alignment

Clear away all plastic cuttings without contaminating the pipe ends. **Do not touch the cut surface or re-clean it**. Move the pipe ends together and re-check pipe alignment (maximum allowable misalignment is 10% of wall thickness).

Always re-face the pipe ends if it becomes necessary to rotate the pipe in the clamps after initial facing.

4.6. Bead Up

Check the heater plate temperature before commencing each joint in case there has been any failure of the power supply or temperature controller.

The heater plate will reach 220°C from ambient in about 20 minutes and will take a further 10 minutes to stabilise. It is recommended that the heater not be switched off between welds to ensure temperature uniformity is maintained, and that the plate surface temperature is checked before commencing each joint.

Place the heater plate between the pipe faces.

Move the carriage to bring the pipe faces into contact with the heater plate. Increase pressure to the predetermined “bead-up” pressure.

Maintain pressure until an initial bead has formed completely around the pipe circumference on both sides of the heater plate. The bead up time is variable, and is influenced by weather conditions and pipe dimensions.

4.7. Heat Soak

After bead up, reduce the pressure down to the drag pressure to maintain a slight positive pressure between the pipe and the heater for the heat soak period. Failing to reduce pressure forces hot plastic out of the joint zone and could lead to a weld failure.

On completion of heat soak time, reverse the carriage direction to “crack” the heater plate away from the melted pipe, then move the heater plate out of the weld zone as quickly as possible. (Refer to parameters table for allowable changeover time).

The unique non-stick cloths allow a "peeling off" action as the pipe is cracked away, minimising adhesion of the melted pipe to the heater.

Caution: Do not allow the heater plate to slide across the pipe ends and distort the melted surface. Do not contaminate the melted surface in any way.

4.8. Fusion Cycle

Bring the melted pipe faces into contact with each other immediately to minimise heat loss from the weld zone. Smoothly build up to the required fusion pressure to avoid squeezing out too much hot plastic.

Unless hydraulic pressure is maintained while the weld is cooling, shrinkage will occur and voids may form in the weld zone. It is essential to run the pump and maintain the pipe in the clamps and under pressure until the weld/cooling time is complete.

4.9. Weld Quality Check

Inspect the uniformity of the bead size inside and out, top and bottom of the pipe. It is advisable to monitor and record times, temperatures and pressures at each phase of every joint for future reference. (See section on troubleshooting weld failures.)

5. Maintenance – Daily Check List

1. Keep the machine and accessories clean and free of dust and grease. *Do not lubricate any HF450 components except for the facer drive (see later) and steering axle.*
2. Inspect hydraulic components for leaks from connections and seals. Overhaul seals and fittings as necessary.
3. Check for air in the carriage cylinders (as evidenced by shuddering, and/or "springing back" of the cylinders). Air in the hydraulics will adversely affect weld quality and must be removed by bleeding (see later).
4. Check the pressure gauge needle returns to zero and does not stick.
5. Check the temperature of a number of points on the surface of both sides of the heater plate. The reading at any point on either side of the heater plate surface should not be more than ±10°C from the desired welding temperature. (Refer later section on heater plates.)
6. Do electrical safety checks.
7. Replace non-stick cloths if damaged in way of the weld area.
8. Facing blades should be sharp and have defect free cutting edges to provide continuous shaving thickness of 0.30-0.40mm. Shim worn blades if necessary; sharpen cutter blades if blunt; replace cutter blades if chipped.
9. Feel for "sloppy" movement of the cutter plates. This indicates the need to adjust the facer drive internally.
10. If using a portable generator, ensure its output is 3phase, 415 ± 20v and 50hz, to protect electrical components from permanent damage.

6. Maintenance - Periodic

In addition to the daily checks, more detailed inspections of the key machine components should be carried out before commencing each new project, or after 250 operating hours. Any faults found should be corrected as described in this section.

6.1. General

Check the hydraulic cylinder shafts for cuts or dents likely to damage the hydraulic seals.

Check the machine frame, main carriage guide shafts, hydraulic shafts and heater rest bars are not damaged or bent such that excessive drag pressure results. Without pipe in the machine, drag pressure should not exceed 900kPa.

6.2. Heater Plate

Heater surfaces should be flat, smooth and free of dents or gouges. Dress as necessary.

FUSIONMASTER® heater plates have a vent machined in the edge of the casting to allow entrapped air to escape from under the non-stick cloth. Clean out any build up of foreign material from the air vent to prevent any adverse temperature effect.

Putting a pin-hole in the dead centre of the cloth will also assist with air release.

Caution: Ensure heater plate non-stick surfaces are protected from damage during transport.

6.3. Heater Faults

If the heater does not power up it could be due to failure of the element pad, temperature controller or other electrical components. Always use an electrician to check electrical components, and always first test the power supply, electric cords and plugs before condemning the heater plate.

1. The RCD may trip out on first starting the machine due to moisture presence in the heater after it has been used in a damp environment and then allowed to cool down. This may be overcome by using a hot air gun to heat the element end

connections to drive out residual moisture. In extreme situations it may be necessary to remove the heater plate from the machine, place it in an oven, and bring its temperature up to 150°C for an hour or so.

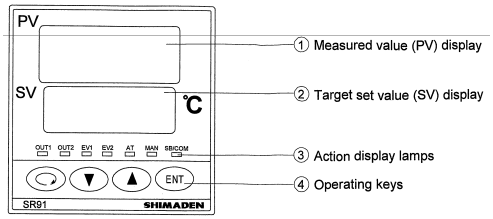
2. Surface temperature readings that are much lower than the set temperature in a ring around the plate could indicate:
   - Either, one of the 3 phases is not carrying power. First check that the heater circuit breaker has not tripped. Then call an electrician to check the existence of a faulty generator, electric cable, or other electrical component failure.
   - Or, the failure of an electric element. This may be confirmed by an electrician checking each element resistance, which should be 33ohms ± 10%. In the unlikely event of an element failing, the element pad must be replaced.
3. Surface temperature readings that vary by more than ±20° at random points or from side to side in the same location would indicate the method being used to measure the surface temperature is faulty. (See later section for more detailed discussion on heaters and temperature measurement.)

6.4. Heater Plate Mounting

Take careful note of the location and orientation of the heater bracket mounting bushes before removing the heater plate from the machine for any reason and always refit in the same orientation.

6.5. Heater Temperature Adjustment

The HF450 heater temperature is controlled by an electronic controller located at the top of the main control panel. It has been factory set to a target value of 220°C. Use the UP or DOWN keys to alter the target value then press ENT to store the new value. After adjusting the target temperature, always allow several minutes for the controller to stabilize plate temperature before welding.



Guidelines for changing other controller parameter settings are given in drawing TEMPCONTROL which may be found at the back of this manual. However it will not normally be necessary to change any controller parameters. The manufacturer's instructions for the controller are located in the orange control box.

6.6. Temperature Controller Failure

In the event of controller failure, remove the protective waterproof cover over the controller, extract the existing controller from its location, and plug an identical replacement into the vacant slot. (Some re-wiring may be required for very old machines.)

6.7. Temperature Sensor Failure

An error message HHHH displayed at the temperature controller indicates failure of one or both part of the temperature sensing circuit, which consists of:

1. a 300mm probe with K-type thermocouple that runs from the heater mounting bracket into the heater plate. (The probe is the most likely source of failure and should generally be replaced if the error HHHH occurs.)
2. a 2m cable that runs through the conduit from the heater mounting bracket to the temperature controller inside the control box. (Check the conduit for damage as this may indicate damage to the long thermocouple cable.)

1.2. Temperature Calibration

The temperature controller indicates the internal plate temperature only. As such it thermometer is only a guide to the welding temperature.

It is essential to check and record the **surface** temperature of the heater plate before every weld. This is best measured with either a contact pyrometer or a non-contact infrared pyrometer. The outer circumference of the heater should not be measured as this is too far from the weld area.

The pyrometer used to measure surface temperature will itself require calibration to a procedure as recommended by the pyrometer manufacturer.

Caution: Be aware that an insulating air gap can form between the Teflon cloth and the hot plate. Always ensure the cloth is forced into contact with the hot metal surface when using an infrared or non-contact pyrometer or a false reading is likely to occur. Never use an infrared pyrometer on a shiny surface as a false reading will occur.

6.8. Heater Non-Stick Cloth Replacement

The non-stick cloths should be replaced if they are torn, contaminated, or badly discoloured (due to overheating) or lose their non-stick ability. This operation will require two people. Use the following procedure.

TIP

Use several spring loaded plastic clamps to help hold the ring in place.

1. Use a screw driver to lever the snap rings out of their securing grooves. This takes very little force. Do not attempt to remove the snap rings if the plate temperature is more than 40°C because they will not release.
2. Place a new cloth into position and reposition the snap ring over the cloth.
3. With one person holding the snap ring in the groove around one half of the plate circumference, the second person uses a piece of wood or plastic to force the snap ring completely into its groove around the rest of the circumference. (This may take several attempts until some experience is developed.) Never use metallic objects to force the snap rings back into position as this may result in accidental damage to the cloth.

6.9. Facer Drive Chain Tension

Refer to Facer drawing.

1. Access the facer drive assembly by removing the securing screws from the idler cutter plate and removing the plate.
2. Clean out any dirt or plastic cuttings that could either damage the drive components, and/or significantly reduce facing efficiency.
3. Check that the main drive sprocket is in contact with all six bronze rollers. Three rollers are concentrically bushed and three are eccentrically bushed to enable bronze roller or sprocket wear to be taken up by adjusting the eccentric guide rollers. These are adjusted by loosening the holding bolts and rotating the bush in the direction of chain rotation, until the sprocket is supported by all rollers. Once the rollers wear beyond the point of any further adjustment, the guide roller & bearing assemblies must be replaced.
4. Tension the chain by adjusting the eccentrically bushed idler sprocket as described above.
5. Replace the chain if it cannot be tensioned because it is stretched.

6.10. Facer Bronze Roller Replacement

Refer to Facer drawing.

1. Remove the screws holding the idler cutter plate and remove the cutter plate.
2. Detach the driven cutter plate from the main sprocket by removing the 12 sprocket screws and carefully knocking the plate away from the sprocket. (The cutter plate locates in a groove machined into the sprocket face.)
3. Carefully note the location of the eccentric and concentric bronze roller assemblies and remove them.
4. Refit new concentric roller assemblies.
5. Hang main sprocket.

6. Refit new eccentric roller assemblies.
7. Adjust the eccentric rollers in the direction of chain rotation, so that all four bronze rollers support the main sprocket and the sprocket and rollers all turn freely.
8. Fit the chain and idler sprocket. Tension the chain by adjusting the eccentric bush in the idler sprocket.
9. Lubricate sparingly, and only with a high pressure grease e.g. Shell Alvania EP2.

   Do not use *graphite grease, molybdenumdisulphide or similar, as they may run and leak out of the facer, providing a potential weld contamination problem.*
10. Refit the driven cutter plate to the main sprocket, and test rotation before replacing the idler cutter plate.

6.11. Cutter Blade Sharpening

If chipped or damaged, the blades should be replaced.

If blunt, the high grade tool steel blades may be sharpened with a tool&cutter grinder. Shim the cutter blades if they are sharp, but shavings are too thin.

6.12. Hydraulic Operating Pressure

The maximum line pressure of the HF450 is limited by a relief valve in the control valve block. Increasing this pressure should not be necessary, and any adjustment should be done in consultation with Dixon Industries.

6.13. Pressure Gauge Calibration

Pressure gauges are easily damaged and may lose their accuracy. The carriage pressure gauge should be checked (calibrated) periodically. The HF450 hydraulic circuit has a plugged T provided at the rear of the 3-way valve block for this purpose.

Calibration options:

1. Check the carriage pressure gauge against a known standard test gauge fitted into the plugged T at the rear of the 3-way valve block.
2. Remove the carriage pressure gauge and have it checked by a NATA accredited test centre.
3. Replace the pressure gauge with a new certified gauge from time to time.

6.14. Synchronising The Carriage Cylinders

If air enters the cylinders, the carriage motion will eventually become out of phase or jerky. This will adversely affect the welding operation and air should be bled from the cylinders (see below).

The presence of air in the system could result from loose hydraulic fittings, damaged hydraulic cylinder seals or shafts. These should all be inspected and repaired if necessary before bleeding the system.

Caution: *The clamp cylinders are series connected to ensure both cylinders apply equal pressure. Do not change this configuration without consulting the manufacturer.*

The cylinder balance valve in the line between the clamp cylinders must remain closed during normal operation. This valve is only used when bleeding air from the system.

6.15. Hydraulic Bleeding Method

The presence of air in the hydraulic cylinder(s) can result from loose fittings, leaking cylinder seals, or damage to the cylinder shaft or bore. These possible problems should be inspected and repaired as necessary before attempting to remove air.

To bleed carriage cylinders:

1. Unbolt the clamp caps from the moving clamps to allow the cylinders freedom of movement, then rotate both cylinders until their inlet ports are pointing vertically upward. This allows trapped air to rise to the top of the cylinders and escape from the ports.

   Do not omit step#1 or air will remain in the system.
2. Open the cylinder balance valve in the line between the 2 cylinders, then drive the cylinders to the right hand frame plate.
3. Close the cylinder balance valve then reverse the direction and drive the cylinders fully in the opposite direction. Open the balance valve.
4. Repeat this cycle in each direction as many times as it takes to remove all air. This will be evidenced by there being no “spring back” when the pressure is released at the end of the cylinder travel in either direction.
5. Top up the oil tank if necessary, using any brand of oil with viscosity ISO 46.
6. Rotate the cylinders back to their original orientation and re-secure the clamps.
7. *At the end of this process ensure the cylinder balance valve is closed to lock the cylinders in phase.*

6.16. Adjusting eccentric cam mechanism

1. If a gap appears between the eccentric tube and the centre frame plate when the machine is under pressure, the eccentric clearance can be adjusted as follows (see drawing section of this manual for exploded view):

1. Remove the three M8 socket head cap screws in the shoulder nut at the left hand end of the machine.
2. Use a pin spanner to rotate the shoulder nut one position (60°) clockwise and refit the M8 screws.
3. Re-check clearance with the carriage under pressure and adjust again if necessary.
4. Do not over-tighten the shoulder nut. One position (60°) rotation of the shoulder nut will close gap approximately 0.35mm.

6.17. Replacing Defective Carriage Cylinder Parts

1. Before removing a cylinder for repairs, tag the hydraulic lines to ensure their reconnection to the correct ports. Then disconnect the hydraulic lines.
2. Refer to the drawing section of this manual for further description about servicing or replacing carriage cylinders.

Contact the manufacturer for information about any maintenance aspect not described in this section.

7. Notes About Heater Plates And Temperature

7.1. PE Welding Temperatures

Polyethylene pipe is weldable at temperatures ranging from 180°C to 260°C. However butt fusion parameters typically specify 220 ±15°C which is the required surface temperature of the heater plate.

Temperatures greater than 240°C when coupled with long heat soak times may result in diminution of the anti-oxidants in the pipe.

Cold joints will result if the weld temperature is too low, or the heat soak time is too short, or the time between removal of the heater and butting the pipes together is too long.

Caution: Either situation may lead to premature joint failure.

7.2. Heater Plate Temperature

Heater plate temperature displays generally indicate the internal heater temperature. Actual surface temperature may vary from the display, and will also fluctuate, for the following reasons.

1. The rate of heat loss from the heater surface depends on the design of the heater plate and temperature controller. The surface temperature could be significantly different to the thermometer indication. This variation will be greatest on cold, windy days. Always use a shelter when welding in these conditions.
2. As power input cycles on and off the temperature will be highest just after the power cycles off and lowest just as it cycles back on.
3. The temperature is unlikely to be exactly the same at every point on the heater surface due to manufacturing tolerances.
4. As heat is transferred into the pipe during heat soak, the heater temperature initially falls but eventually returns to the set point.

7.3. Measuring Surface Temperature

Note:

It is not physically possible for heater surface temperatures to vary significantly from one point to another. If such a variation is observed, it is most likely to result from using an incorrect temperature measuring technique.

1. Always wait 5 minutes after the heater has first reached set temperature for the temperature to stabilize before recording measurements.
2. Take readings at several points (at 3, 6, 9, 12 o'clock) on both sides of the heater, at the diameter of the pipe being welded.
3. **FUSIONMASTER®** heater plates are fitted with non-stick replaceable cloth. It is essential to use a contact probe to force the cloth into intimate contact with the plate. (Incorrect readings will result when the cloth system traps an insulating air layer between the cloth and the heater surface.)
4. If a contact probe is used it should be held in position for several seconds before the reading is taken.
5. If an infra red pyrometer is used incorrect reading are likely to result unless:
   - the emissivity is set at 0.95 for use on the non-stick cloth;
   - the device is held square to the surface being measured;
   - the non-stick cloth is forced into intimate contact with the heater plate (see suggestion below).
6. Never use an infra-red pyrometer to take a reading from a shiny aluminium surface (such as a **FUSIONMASTER®** heater without cloths, or the outer rim of a heater plate) or an error will result.

7.4. Suggestion

Use a "spot control adapter" fitted to an Infra-red pyrometer for consistently accurate measurements. When pressed squarely against the heater surface the infra-red beam is correctly focused every time, and intimate contact between the heater plate and non-stick cloth is assured.

8. Butt Welding Guidelines

It is recommended that the following guidelines be downloaded from Plastics Industry Pipe Association of Australia Ltd web site (www.pipa.com.au)

1. *POP003 Butt Fusion Jointing of PE Pipes and Fittings - Recommended Parameters.*
2. *TP003 Specifying Butt Welding of Polyethylene Pipe Systems.*

FUSIONMASTER® welders are designed for the "single pressure – low pressure" fusion method described in POP003.

The welding tables appended to the HF450 operating manual are based on POP003-SP-LP.

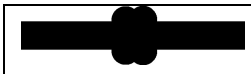
Operators should take care to determine the compatibility of materials for butt welding and only attempt to weld pipes and fittings made of the same polymer, eg PE to PE, PP to PP, PVDF to PVDF, etc.

The joint area must always be protected from adverse weather conditions, eg strong winds, excessive cold or heat, or rain, which could lead to the pipe wall developing non-uniformly heated zones and consequent failure issues.

The weld zone should be free of bending stress, free of notches or similar damage, and be free of contamination.

9. Weld Failure Trouble Shooting

(Bead shapes are exaggerated for effect.)

	Uniform bead correct welding. NB the external bead is always more uniform than the internal bead.
	Crack down centre of bead. "Cold weld" signified by clean break through the middle of the weld with a smooth appearance. Could be due to insufficient heat soak time or temperature, or changeover time too long, or excessive soak pressure, or insufficient fusion pressure, or no allowance for drag pressure, or drag pressure too great eg due to pulling pipe up a gradient.
	Misalignment - maximum allowable 10% of wall thickness. Care should also be taken to ensure pipes or fittings being joined have the same diameter and wall thickness or the probability of weld failure is significantly increased.
	Insufficient bead roll over. Could be due to insufficient heat soak time or temperature, or changeover time too long, or insufficient fusion pressure, or no allowance for drag pressure,
	Unequal bead size. Look for temperature gradients e.g. pipe surface in the hot sun vs pipe in the shade, or heater plate hot spots. Look for unequal application of pressure. If unequal uniformly around the whole circumference, look for physical difference in materials being joined eg melt flow index.

10.Warranty Policy

FUSIONMASTER® Butt Fusion Equipment

1. Subject to the terms below, Dixon Industries Pty Ltd "**The Company**") warrants to repair or replace at its option ex-works Adelaide any product manufactured or repaired by it within 2 years from the date of shipment which are found to be defective due to either faulty workmanship or use of faulty materials, provided that such defective product is returned to the Company's works at the customer's expense, unless otherwise agreed.
2. This warranty is limited solely to products manufactured or repaired by the Company. Products not manufactured by the Company (such as pumps, gauges, motors, switches, etc.) are not covered by this warranty. In relation to a repair, this warranty is limited to the Company's cost of parts and labour to remedy a defective repair.
3. This warranty does not apply to any product that has been damaged by accident, misuse, neglect, use of an electrical power supply that is incompatible with the design specifications of the product or repair or alteration of the product by anyone other than the Company.
4. A warranty claim must be made to the Company in writing within 14 days of the first occurrence of the event or condition on which the claim is based. The claim must include proof of purchase and a detailed statement of the manner in which the product has been used and the event or condition occurred. The Company's decision to admit or refuse any warranty claim shall be binding.
5. Replacement parts provided to the customer before the right to a warranty claim is accepted by the Company will be invoiced at the full cost of the parts, including applicable taxes and freight charges. If a warranty claim is accepted, the cost of any replacement parts covered by the warranty claim which have been so invoiced will be credited to the customer.
6. All costs of returning product to the customer shall be paid by the customer.
7. Other than provided in this warranty, the Company excludes any other responsibility or liability whatever to the maximum extent permitted by law including liability for breach of contract, negligence or incidental, consequential, indirect or special damages including without limitation, interruption to use of the product or any other plant or equipment.

Disclaimer

As the conditions of use of welding equipment are outside the control of Dixon Industries, no warranties are expressed or implied and no liability is assumed in connection with the use of butt welding equipment or the butt welding guidelines or parameters.

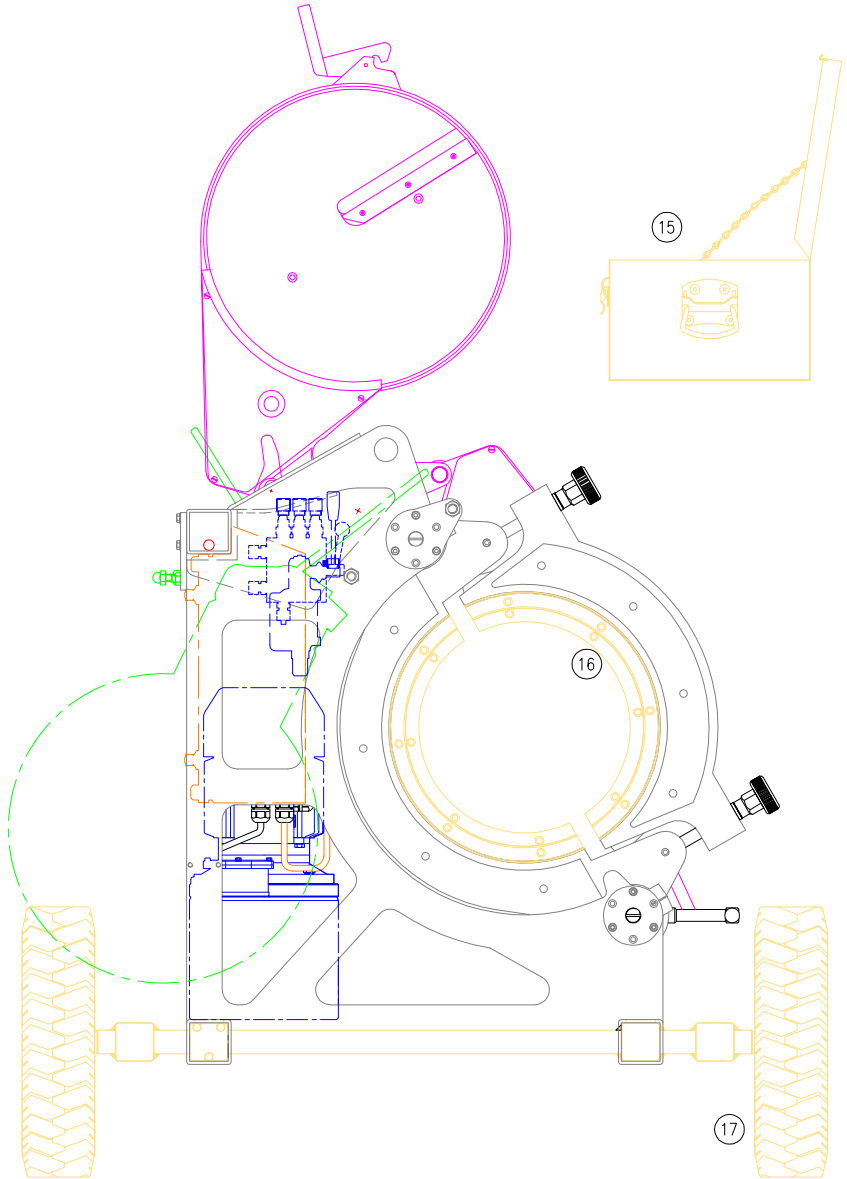
The manufacturer reserves the right to vary specifications without notice.

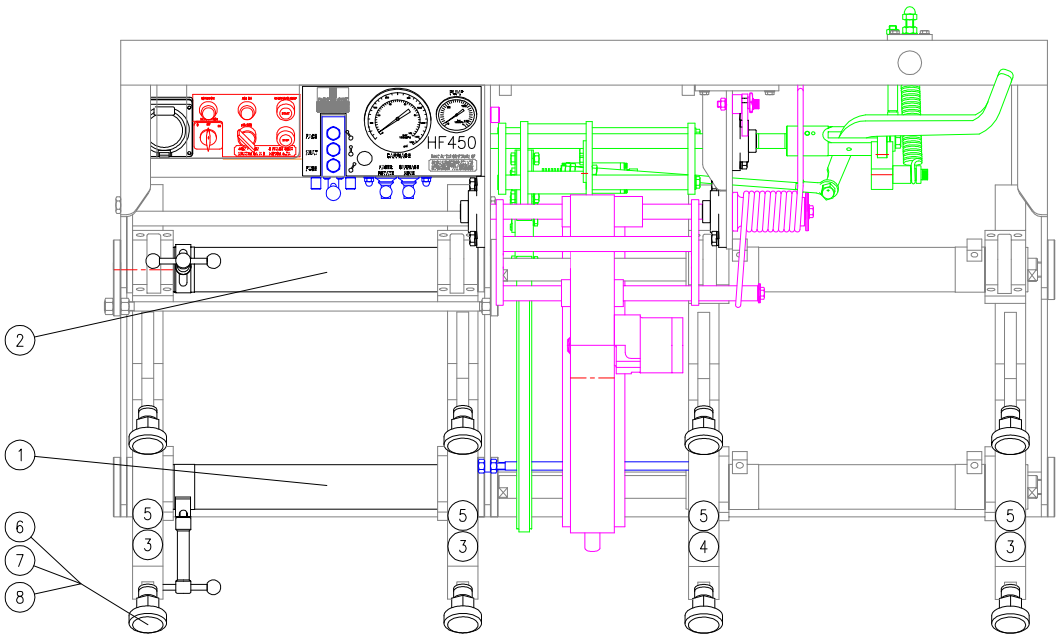
ITEM	PART No.	PART NAME	QTY /KIT
1	BF450061	Front Eccentric Alignment	1
2	BF450062	Rear Eccentric Alignment	1
3	BF450007A	Clamp Assy, Lower Half	3
4	BF450007A1	Clamp A., Lower Half, Rest Bar	1
5	BF450013	Clamp Assy, Upper Half	4
6	BF450008	Clamp Toggle Bolt	8
7	BF350009	Clamp Toggle Nut	8
8	BF350052	Clamp Toggle Nut Washer	8
9	BF450200	Facer Assembly	1
10	BF450052	Facer Rest Bar	1

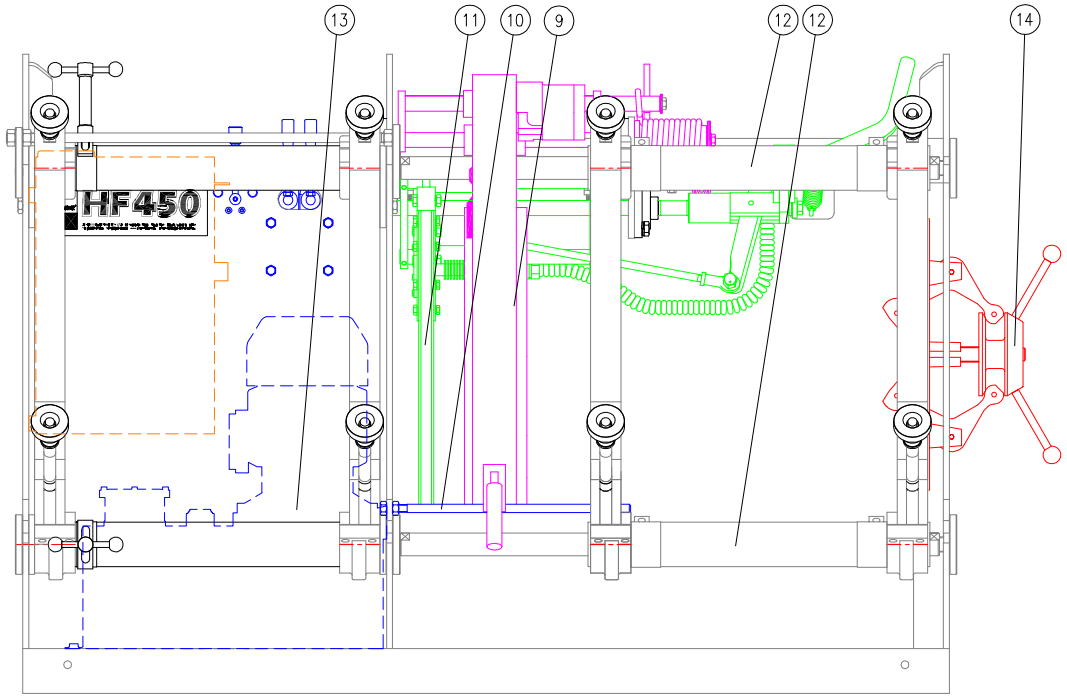
ITEM	PART No.	PART NAME	QTY /KIT
11	BF450100	Heater Plate & Brkt Assy	1
12	BF450600	Hydraulic Carriage Cylinder	2
13	BF450636	Hydraulic Tank Assy	1
14	BF450300	Fittings Attachment	1

15	BF450800	HF450 Liner Box	
16	BF4509Liner	Reducing Liner Set	
17	BF450400	Axle & Steering Assy	

NOTE: For more Details refer to individual Assembly Dwgs.







UNCONTROLLED DOCUMENT

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		Drawn:	SR
		Date:	12/06/09
CAD File:	U:\DWG_Manual Dwg\HF450-MAN\BF4500A0-MAN		

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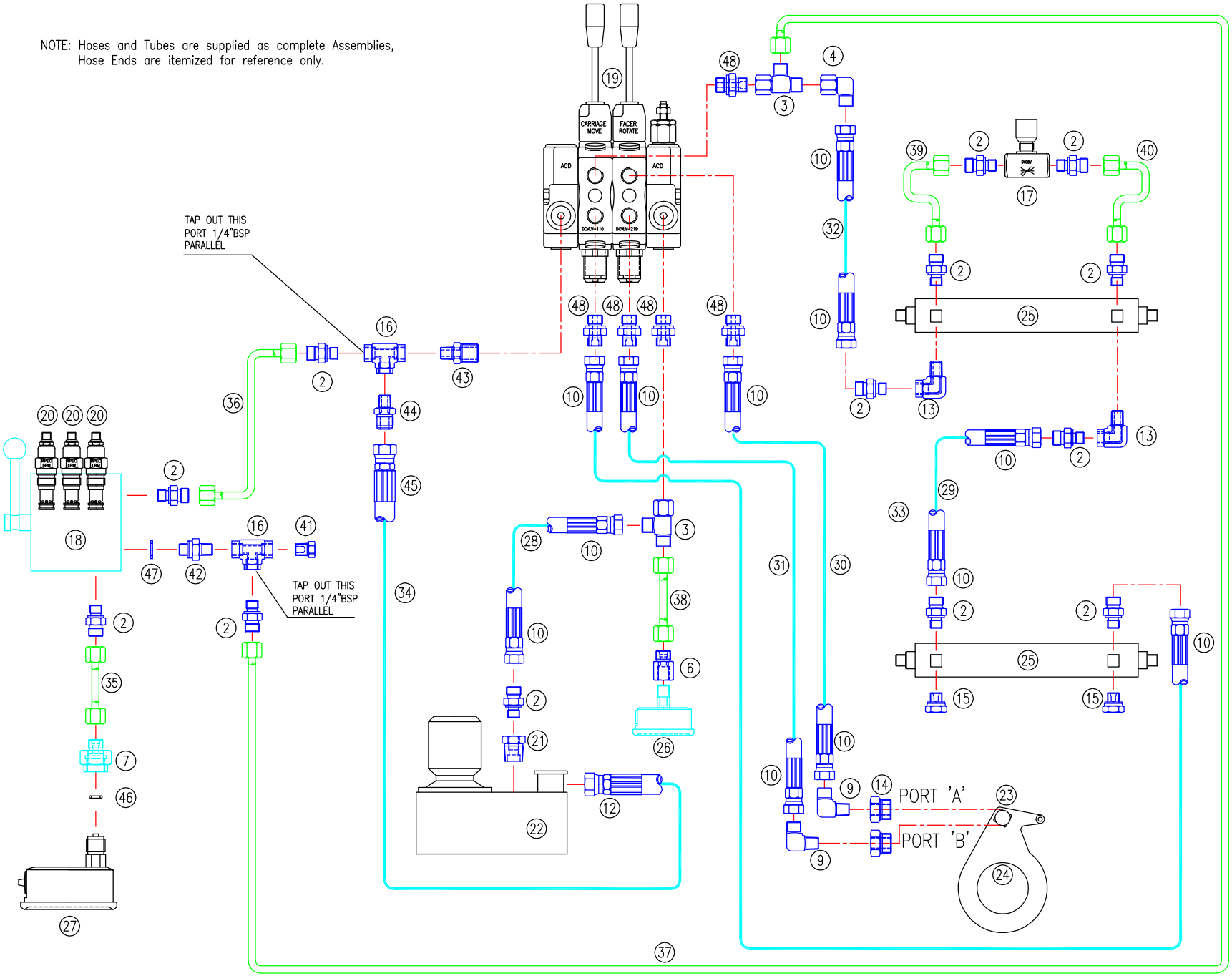
NOTE: Hoses and Tubes are supplied as complete Assemblies,
Hose Ends are itemized for reference only.



ITEM	PART No.	PART NAME	QTY /KIT
48	BF000311	Stud Reducer	5
47	BF000400	Seal	1
46	BF000727	O Ring	1
45		Fem. Hose End	1
44	BF000391	Nipple	1
43	BF000048	Nipple	1
42	BF000601	Nipple	1
41	BF000054	Plug	1
40	BF450628	Tube Assembly	1
39	BF450627	Tube Assembly	1
38	BF450626	Tube Assembly	1
37	BF450625	Tube Assembly	1
36	BF450624	Tube Assembly	1
35	BF450629	Tube Assembly	1
34	BF450648	Hose Assembly	1
33	BF450647	Hose Assembly	1
32	BF450646	Hose Assembly	1
31	BF450645	Hose Assembly	1
30	BF450644	Hose Assembly	1
29	BF450643	Hose Assembly	1
28	BF450642	Hose Assembly	1
27	BF000306	Press. Gauge ø100–10000kPa	1
26	BF000673	Press. Gauge ø63–25000kPa	1
25	BF450600	Carriage Assembly	1
ref. 24	BF450200	Facer Assembly	1
23	BF630223	Hydr.Facer Motor	1
22	BF450635	Hydr.Tank Assy	1
21	BF000056	Reducer	1
ref. 20	BF000187	Flow Control Cartridge	3
19	BF450684	Main Valve Assy	1
18	BF630639	3 Way Valve	1
17	BF000066	Flow Control Valve	1
16	BF000460	Tee	2
15	BF000404	End Plug	2
14	BF630699	Plug modified	2
13	BF000584	Elbow	2
12		Male Hose End	1
11			
10		Fem. Swivel Hose End	12
9	BF000291	Elbow	2
8			
7	BF630697	Gauge Adaptor	1
6	BF630698	Gauge Adaptor	1
5			
4	BF000068	Elbow	1
3	BF000067	Run Tee	2
2	BF000072	Stud Reducer	13
1			

(SEE NOTE)

Drawing Name:	HF450 HYDRAULIC SCHEMATIC OPERATORS MANUAL ONLY
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Drawn:	SR
Date:	29/03/11
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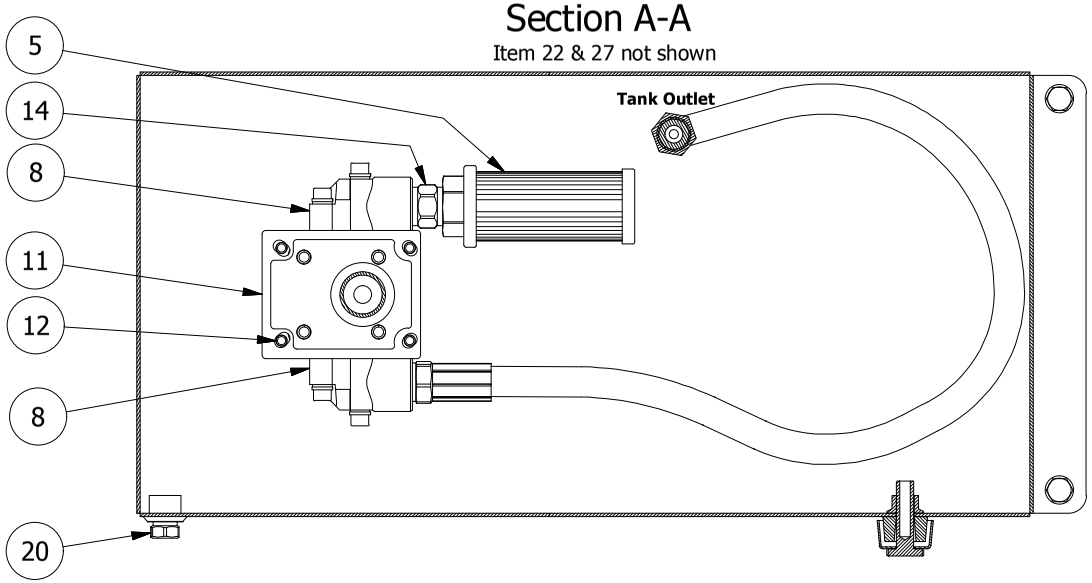
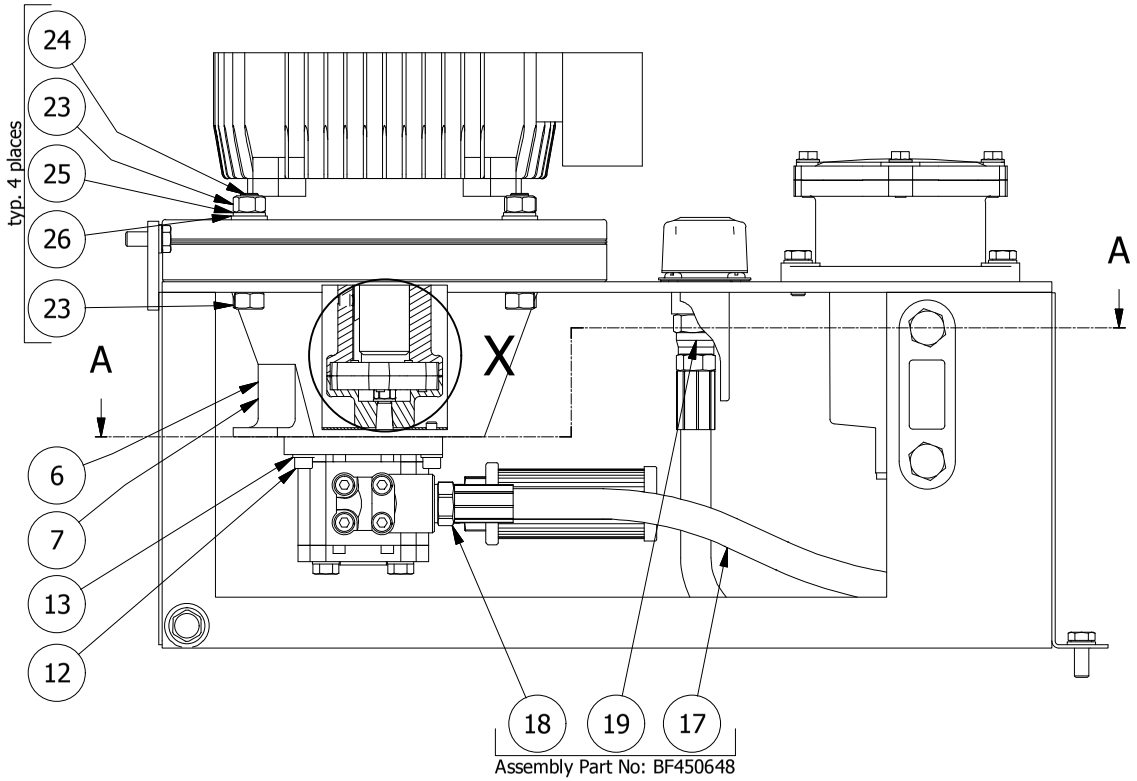
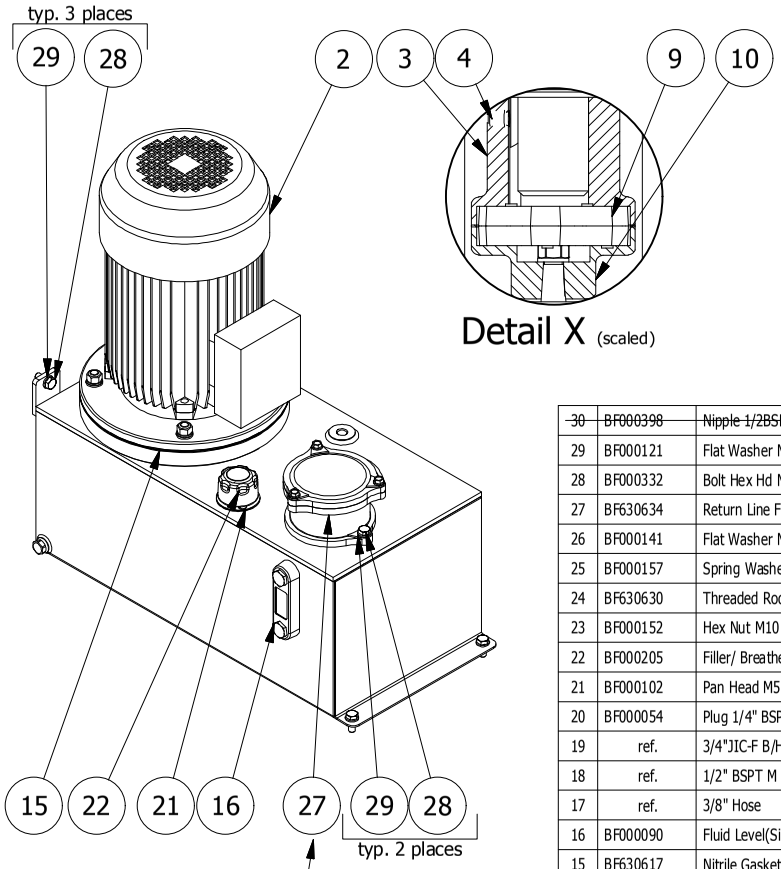
Section A-A

Item 22 & 27 not shown







Pump/ Filter Assy, Part No: BF630632

	Item	Part No.	Part Name	QTY
	~~30~~	~~BF000398~~	~~Nipple 1/2BSP x 3/4JIC~~	~~1~~
	29	BF000121	Flat Washer M8	5
	28	BF000332	Bolt Hex Hd M8x20	5
	27	BF630634	Return Line Filter 450/ 630	1
	26	BF000141	Flat Washer M10	4
	25	BF000157	Spring Washer M10	4
	24	BF630630	Threaded Rod M10	4
	23	BF000152	Hex Nut M10	8
	22	BF000205	Filler/ Breather 450/630	1
	21	BF000102	Pan Head M5 x 8	3
	20	BF000054	Plug 1/4" BSPT	1
	19	ref.	3/4"JIC-F B/HEX EZICRIMP	1
	18	ref.	1/2" BSPT M x 3/8" EZICRIMP	1
	17	ref.	3/8" Hose	1
	16	BF000090	Fluid Level(Sight) Gauge	1
	15	BF630617	Nitrile Gasket	1
	14	BF000052	Nipple 1/2"BSPT x 1/2"BSPT	1
	13	BF000108	Flat Washer M6	4
	12	BF000326	SHCS M6 x 20	4
	11	BF000038	Pump Gear (450)	1
	10	BF000200	Coupling Pump Half	1
	9	BF000309	Spider Elastic for SND65	1
	8	BF000002	Port Adaptor 1/2BSP	2
	7	ref.	Centre Ring (BF000185)	1
	6	BF630619	Bell Housing (modified)	1
	5	BF000193	Suction Element EH/450/630	1
ref.	4	BF000122	Set Screw M8 x 8	1
ref.	3	BF630618	Coupling Motor Half (mod.)	1
ref.	2	BF000203	Motor 2.2KW 415V 4POLE FL	1
	1	BF450636	Tank Weldment	1

Drawing Name: HF450 Hydraulic Tank Assembly
OPERATORS MANUAL ONLY

Scale: not to scale
Drawn: SR
Update: 29/05/2014

CAD File: U:\Inventor\HF450\450600\BF450635.idw

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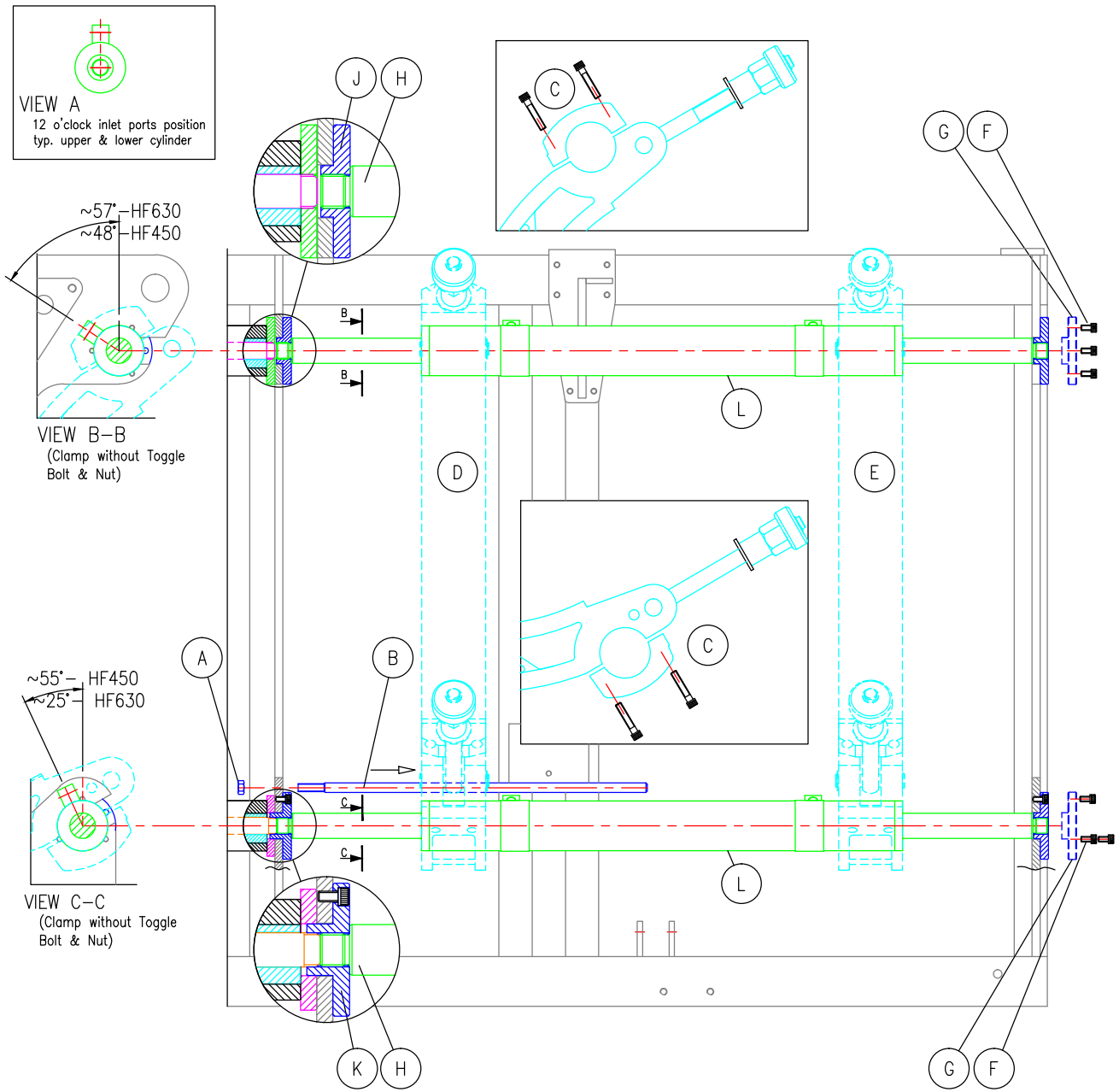

1. Preliminary
   a. Support the weight of the cylinder.
   b. Remove nut (A) and slide facer rest bar (B) out of clamp (D).
   c. Disconnect hydraulic hoses from hydraulic cylinder and clamps (D & E).
   d. Remove top and bottom clamp cap (C) 4 places and remove 2 clamps (D & E) to enable cylinder to be lifted out of the machine.
2. Remove the M8 socket screws (F) from the shaft nut (G).
3. Unscrew shaft nut (G).
4. Unscrew shaft of carriage cylinder (H) from shaft nut (J) upper or (K) lower.
5. Lift cylinder assembly out.
6. Service carriage cylinder as required.
7. Refit carriage cylinder
   e. Screw shaft (H) into shaft nut (J) upper or (K) lower until shaft shoulder is hard up against shaft nut.
   f. Screw shaft nut (G) onto other end of shaft until tight then back off enough to align nut with bolt holes then secure with M8 fasteners.
8. Refit clamps
   g. Rotate both carriage cylinders so the inlet ports are at the 12 o'clock position as in view A.
   h. Fit left clamp to top cylinder: align the left hand side of clamp with the left hand end of the top carriage cylinder then secure the top clamp cap.
   i. Fit left clamp to bottom cylinder: Move the bottom carriage cylinder so the left hand end of the cylinder aligns with the left side of the clamp then secure the clamp cap.
   j. Refit the right hand clamp. Align the right hand side of the clamp with the right hand end of the carriage cylinder.
9. Recharge oil and bleed air from system
   k. Re–connect hoses to the bottom carriage cylinder.
   l. Start pump and ensure there are no leaks.
   m. Apply pressure to the carriage and force it to move as far as possible in one direction. Then open the balance valve in the line between the top and bottom cylinders and apply pressure to move the carriage as far as possible in the opposite direction.
   n. Repeat this sequence until the carriage travels all the way in either direction without shuddering and there is no observable movement of either cylinder when the pressure is released at the either end of maximum travel.
10. Reposition cylinders and finish off
   o. Loosen the clamp caps to enable the carriage cylinder ports to be re–oriented. Movement of either cylinder barrel (L) along the shaft (H) indicates incomplete removal of air and the bleeding process should be continued.
   p. Rotate top cylinder as in view B–B and bottom cylinder as in view C–C and resecure the clamp caps.
   q. Secure the hoses to the clamps.
   r. Refit the facer rest bar.

Drawing Name: SERVICE OR REPLACE CARRIAGE CYLINDERS BF630600 (HF630) or BF450600 (HF450)	Scale:	Not To Scale	DIXON INDUSTRIES PTY LTD A.B.N. 89 008 171 855
	Drawn:	SR	
	Date:	15/8/2013	
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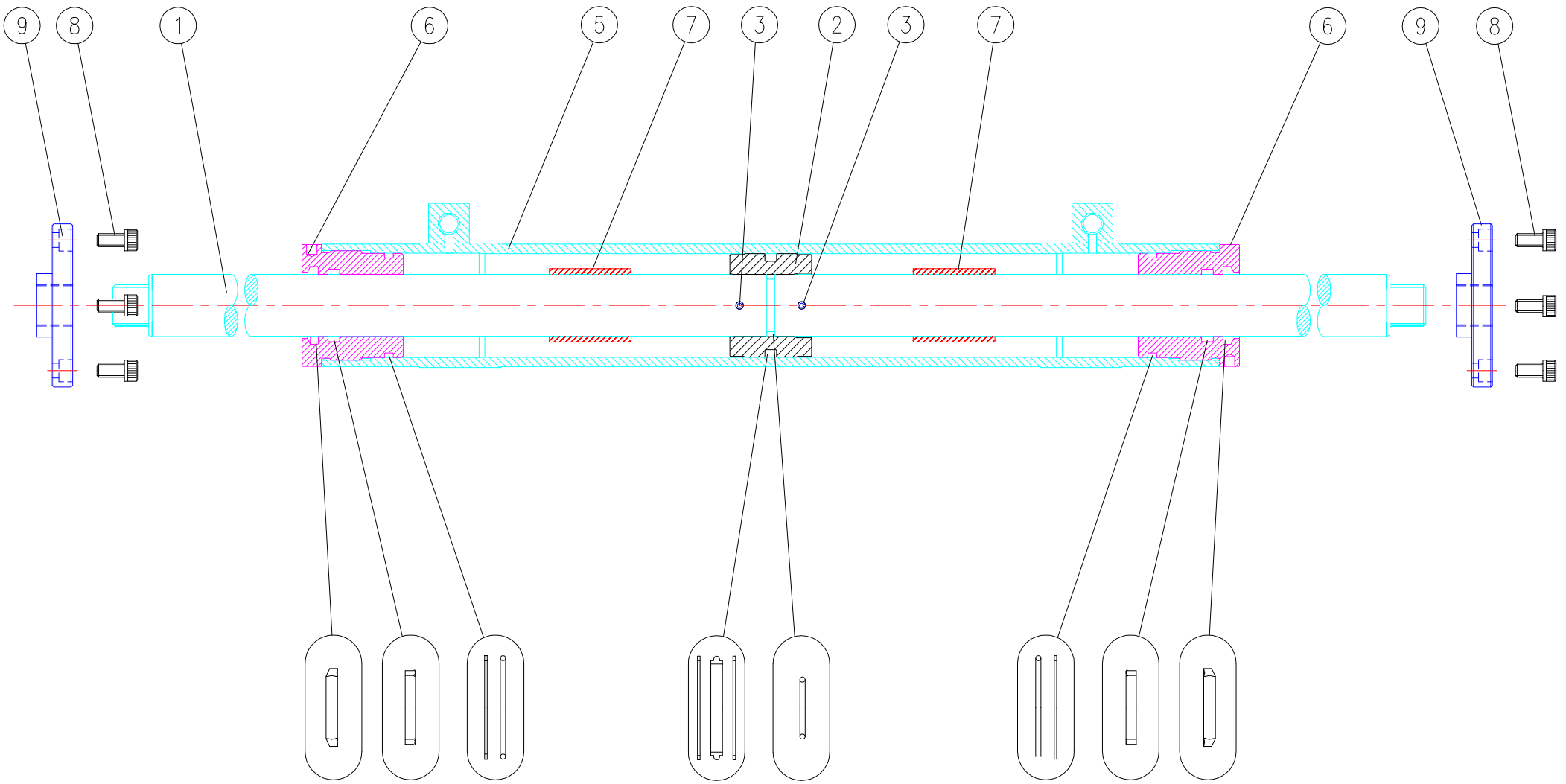

NOTE ORIENTATION OF SEALS (4)

NOTE; 2 off Shaft Nuts required for Rear Cylinder
and 1 off Shaft Nut required for Rear Cylinder.
3 off Shaft Nut Mtg. Screws per Shaft Nut.

BF450608
CARRIAGE SHAFT &
PISTON ASSY

ITEM	PART No.	PART NAME	QTY /KIT
SEE NOTE 1	9	BF630610	SHAFT NUT – SHORT	3
SEE NOTE 1	8	BF000134	SHAFT NUT MTG. SCREW	9
	7	BF450605	SPACER	2
	6	BF630604	GLAND	2
	5	BF450602	BARREL	1
	4	BF630664	SEAL KIT	1
	3	BF000251	ROLL PIN	2
	2	BF630603	PISTON	1
	1	BF450601	SHAFT	1

Drawing Name:	HF450 HYDRAULIC CARRIAGE CYLINDER OPERATORS MANUAL ONLY
Scale:	Not To Scale
Drawn:	SR
Date:	5/06/09
CAD File:	U:\DWG_Manual Dwg\HF450-MAN\BF4506A0-MAN

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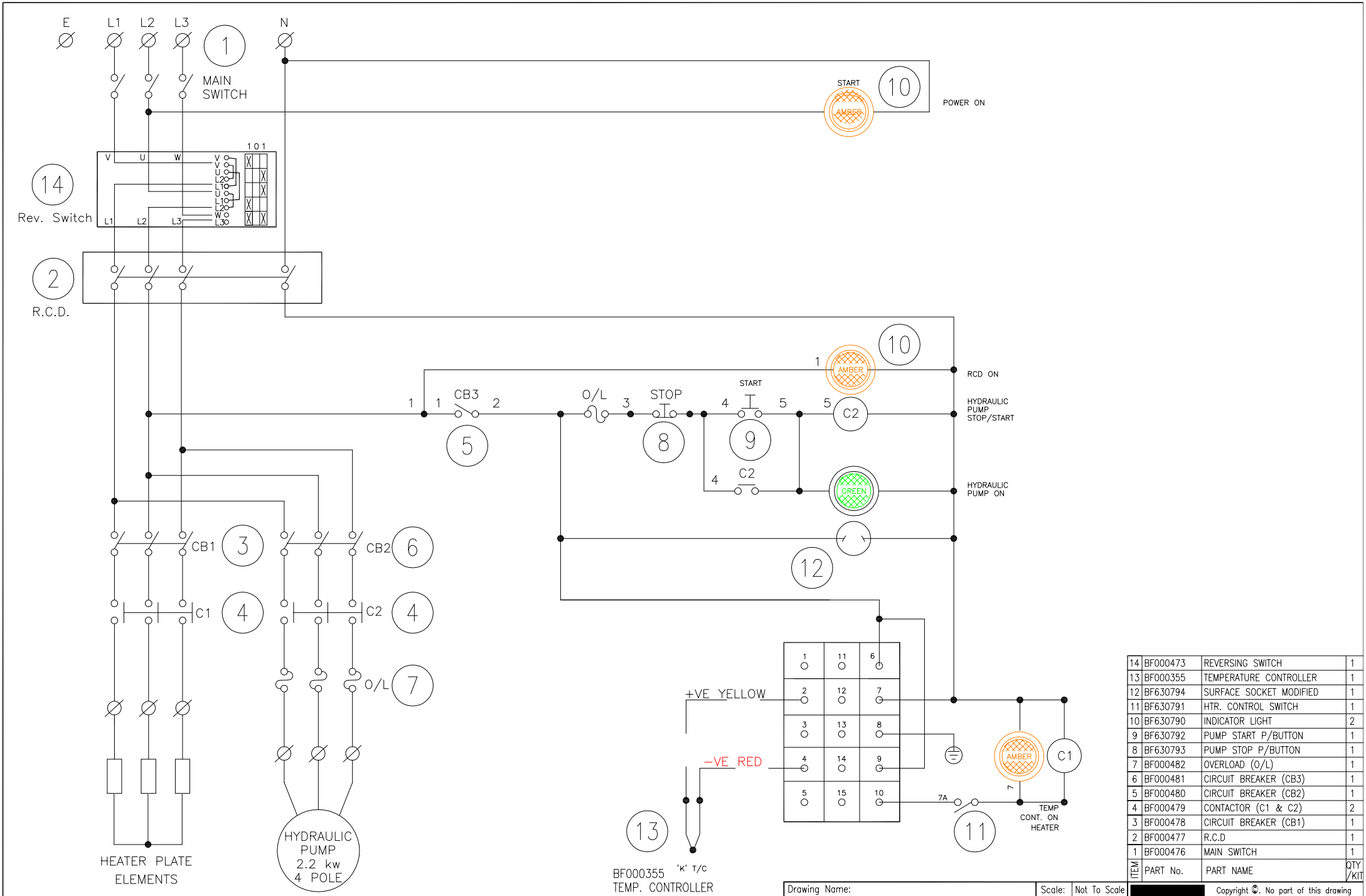

ITEM	PART No.	PART NAME	QTY /KIT
14	BF000473	REVERSING SWITCH	1
13	BF000355	TEMPERATURE CONTROLLER	1
12	BF630794	SURFACE SOCKET MODIFIED	1
11	BF630791	HTR. CONTROL SWITCH	1
10	BF630790	INDICATOR LIGHT	2
9	BF630792	PUMP START P/BUTTON	1
8	BF630793	PUMP STOP P/BUTTON	1
7	BF000482	OVERLOAD (O/L)	1
6	BF000481	CIRCUIT BREAKER (CB3)	1
5	BF000480	CIRCUIT BREAKER (CB2)	1
4	BF000479	CONTACTOR (C1 & C2)	2
3	BF000478	CIRCUIT BREAKER (CB1)	1
2	BF000477	R.C.D	1
1	BF000476	MAIN SWITCH	1

Drawing Name:	ELECTRICAL SCHEMATIC (3 PHASE) to suit HF450 & HF630 OPERATORS MANUAL ONLY
Scale:	Not To Scale
Drawn:	SR
Date:	9/06/09
CAD File:	U:\DWG_Manual Dwg\HF630-MAN\BF6307A0-MAN

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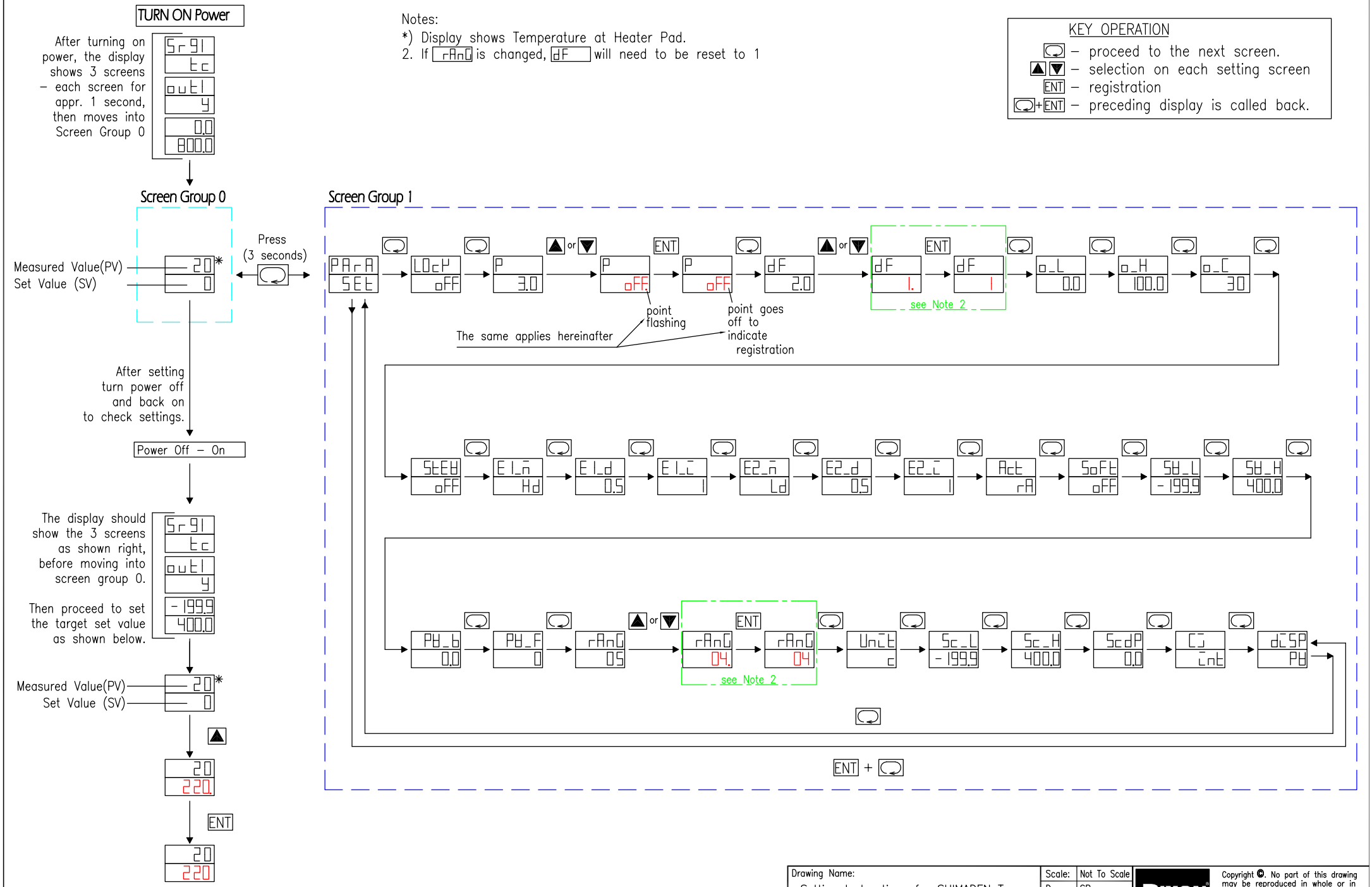

Drawing Name: Setting Instructions for SHIMADEN Temp.. Controller(SR91–Y8–90–1NO) / Thermocouple		Scale:	Not To Scale
		Drawn:	SR
		Date:	10/06/10
CAD File: U:\DWG\AF000\Temperature Controller			

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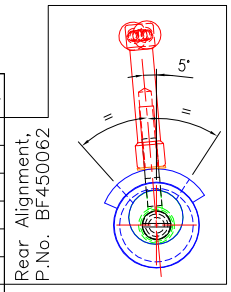
ITEM	PART No.	PART NAME	QTY /KIT
11	BF450030	Ecc. Tie Shaft	1
12	BF450032	Ecc. Tube, bushed	1
13	BF450019	Ecc. Connector Tube	1
14	BF350055	Ecc. Stud	1
15	BF000272	Flat Washer	1
16	BF200034	Toggle Nut Assembly	1
17	BF450068	Clamp Pivot Assembly	1
18	BF450075	Shoulder Bolt	2
19	BF450078	Lock Nut	2
20	BF450072	Lug Weldment LHS	1
21	BF450073	Lug Weldment RHS	1
22	BF000134	Lug Mounting Bolt	6
23	BF450076	Tie Rod	1
24	BF000166	Hex Nut	3



ITEM	PART No.	PART NAME	QTY /KIT
1	BF450031	Ecc. Tie Shaft	1
2	BF450032	Ecc. Tube, bushed	1
3	BF450019	Ecc. Connector Tube	1
4	BF350055	Ecc. Stud	1
5	BF000272	Flat Washer	1
6	BF200034	Toggle Nut Assembly	1
7	BF450077	Ecc.Spacer	2
8	BF630609	Shaft Nut, long	2
9	BF000134	Shaft Nut Mtg. Screw	6

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Drawing Name: HF450 ECCENTRIC AIIGNMENT OPERATORS MANUAL ONLY	Scale:	Not To Scale
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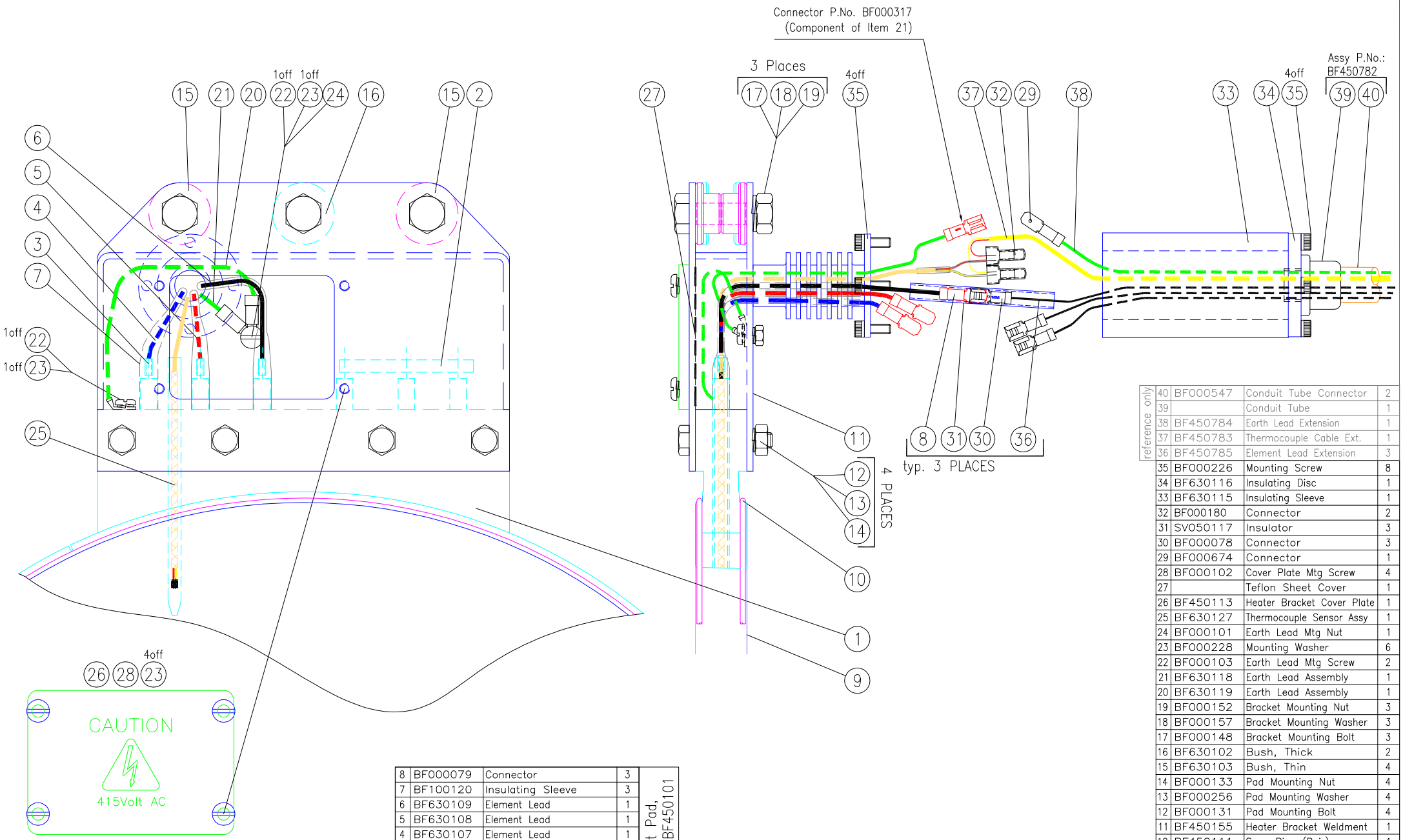

ITEM	PART No.	PART NAME	QTY /KIT
8	BF000079	Connector	3
7	BF100120	Insulating Sleeve	3
6	BF630109	Element Lead	1
5	BF630108	Element Lead	1
4	BF630107	Element Lead	1
3	BF1000116	Crimp	3
2	BF630149	Strip	1
1		Element Pad Casting	1

Element Pad, P.No.: BF450101

ITEM	PART No.	PART NAME	QTY /KIT
reference only	40	BF000547	Conduit Tube Connector	2
	39		Conduit Tube	1
	38	BF450784	Earth Lead Extension	1
	37	BF450783	Thermocouple Cable Ext.	1
	36	BF450785	Element Lead Extension	3
	35	BF000226	Mounting Screw	8
	34	BF630116	Insulating Disc	1
	33	BF630115	Insulating Sleeve	1
	32	BF000180	Connector	2
	31	SV050117	Insulator	3
	30	BF000078	Connector	3
	29	BF000674	Connector	1
	28	BF000102	Cover Plate Mtg Screw	4
	27		Teflon Sheet Cover	1
	26	BF450113	Heater Bracket Cover Plate	1
	25	BF630127	Thermocouple Sensor Assy	1
	24	BF000101	Earth Lead Mtg Nut	1
	23	BF000228	Mounting Washer	6
	22	BF000103	Earth Lead Mtg Screw	2
	21	BF630118	Earth Lead Assembly	1
	20	BF630119	Earth Lead Assembly	1
	19	BF000152	Bracket Mounting Nut	3
	18	BF000157	Bracket Mounting Washer	3
	17	BF000148	Bracket Mounting Bolt	3
	16	BF630102	Bush, Thick	2
	15	BF630103	Bush, Thin	4
	14	BF000133	Pad Mounting Nut	4
	13	BF000256	Pad Mounting Washer	4
	12	BF000131	Pad Mounting Bolt	4
	11	BF450155	Heater Bracket Weldment	1
	10	BF450111	Snap Ring (Pair)	1
	9	BF450110	Heater PFTE Cloth (Pair)	1

Drawing Name:	HF450 HEATER PLATE ASSEMBLY OPERATORS MANUAL ONLY
Scale:	Not To Scale
Drawn:	SR
Date:	10/06/09
CAD File:	U:\DWG_Manual Dwg\HF450-MAN\BF4501A0-MAN

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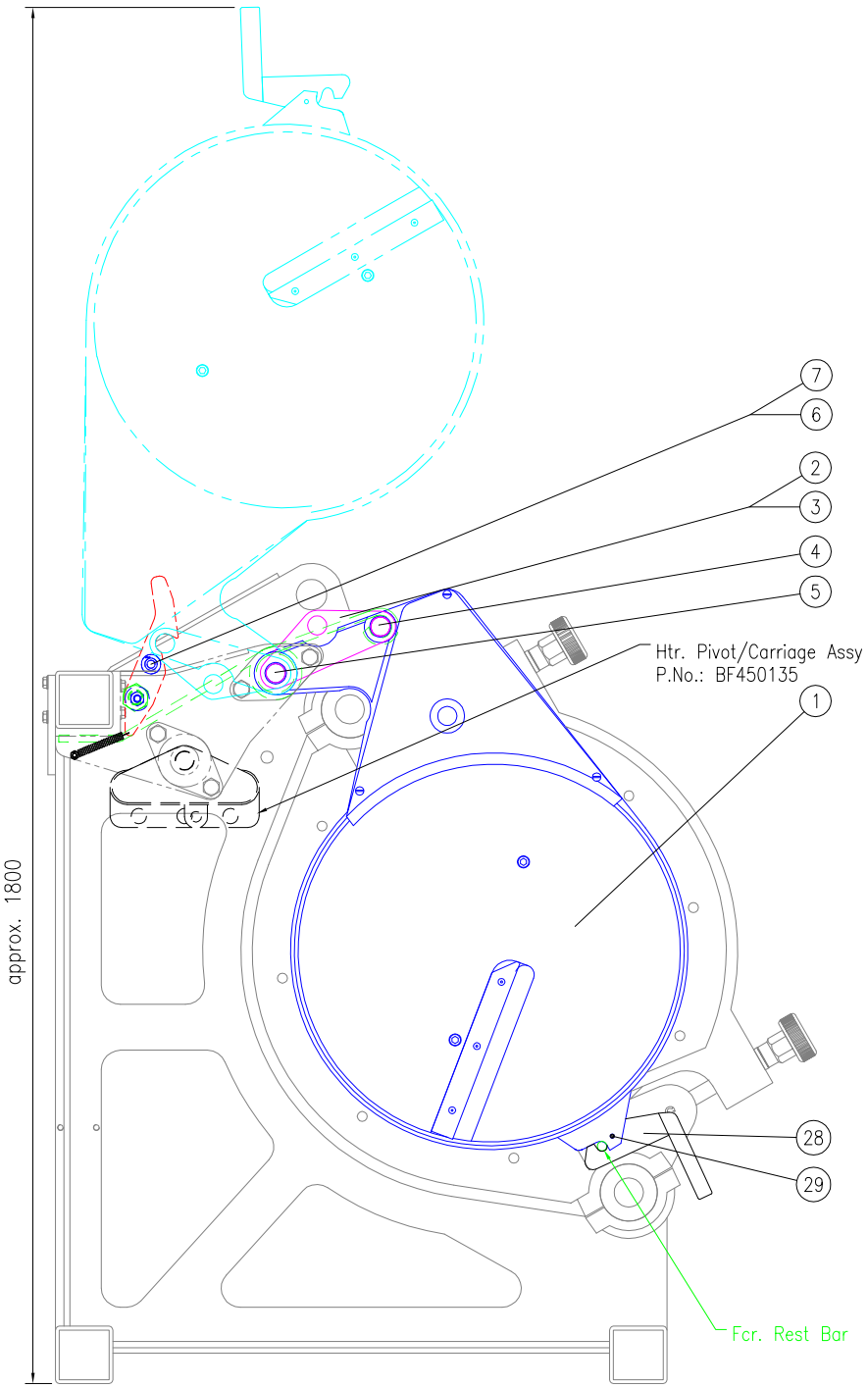

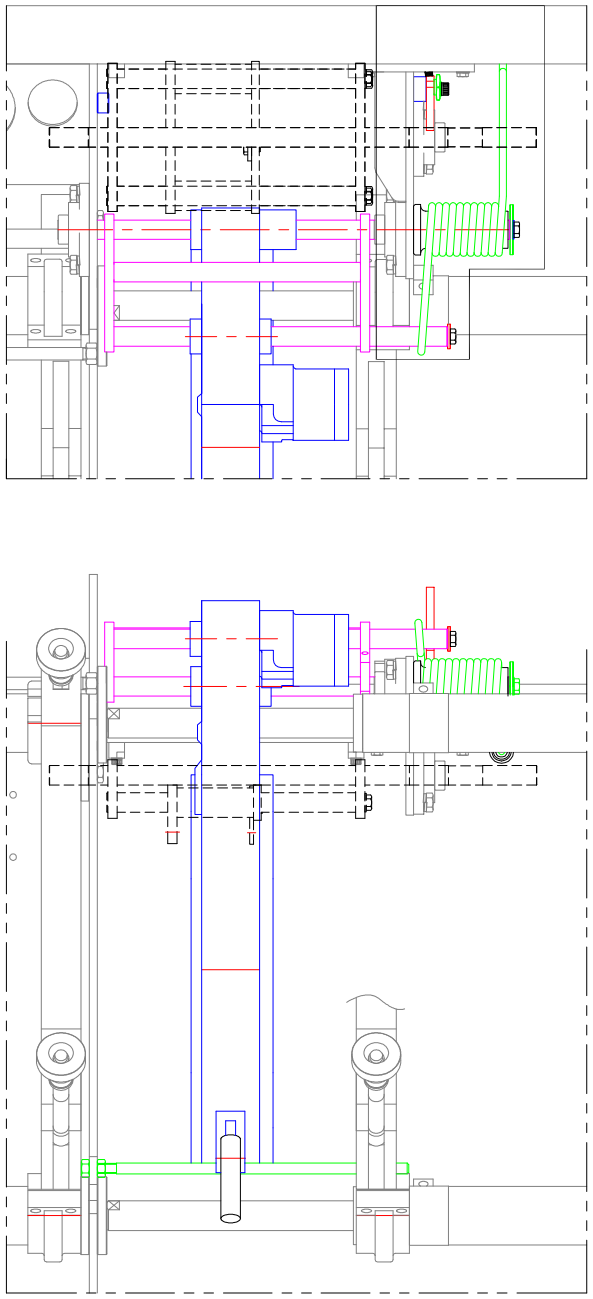

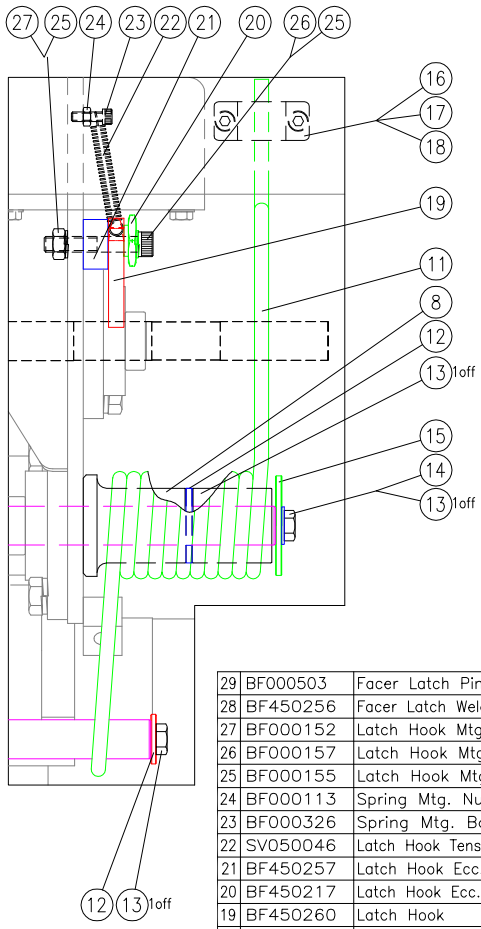

ITEM	PART No.	PART NAME	QTY /KIT
29	BF000503	Facer Latch Pin	1
28	BF450256	Facer Latch Weldment	1
27	BF000152	Latch Hook Mtg. Nut	1
26	BF000157	Latch Hook Mtg. Washer	2
25	BF000155	Latch Hook Mtg. Bolt	1
24	BF000113	Spring Mtg. Nut	1
23	BF000326	Spring Mtg. Bolt	1
22	SV050046	Latch Hook Tension Spring	1
21	BF450257	Latch Hook Ecc. Spacer	1
20	BF450217	Latch Hook Ecc. Bush	1
19	BF450260	Latch Hook	1
18	BF000134	Saddle Mtg. Bolt	2
17		Saddle Rubber	1
16	BF630771	Saddle	1
15	BF630415	Aluminium Washer	1
14	BF000158	Flat Washer	1
13	BF000161	Mounting Bolt	2
12	BF110013	Flat Washer	1
11	BF450265	Facer Return Spring	1
10	BF450250	Spring Bushing Type 2	1
9	BF450252	Washer	1
8	BF450251	Spring Bushing Type 1	1
7	BF000348	Facer Stop Mtg Bolt	1
6	BF450264	Facer Stop	1
5	BF450249	Slide Shaft	1
4	BF450248	Pivot Shaft	1
3	BF000122	Shaft Mounting Screw	4
2	BF450241	Facer Pivot Weldment	1
1	BF450200	Facer Assembly	1

Facer Pivot Assembly P.No.:BF450240

NOTE: Not all lines shown for clarity

UNCONTROLLED DOCUMENT

Drawing Name: HF450 FACER MOUNTING ASSEMBLY OPERATORS MANUAL ONLY	Scale: Not To Scale
	Drawn: SR
	Date: 11/06/09
CAD File: U:\DWG\Manual Dwg\HF450-MAN\BF4502A0-MAN	

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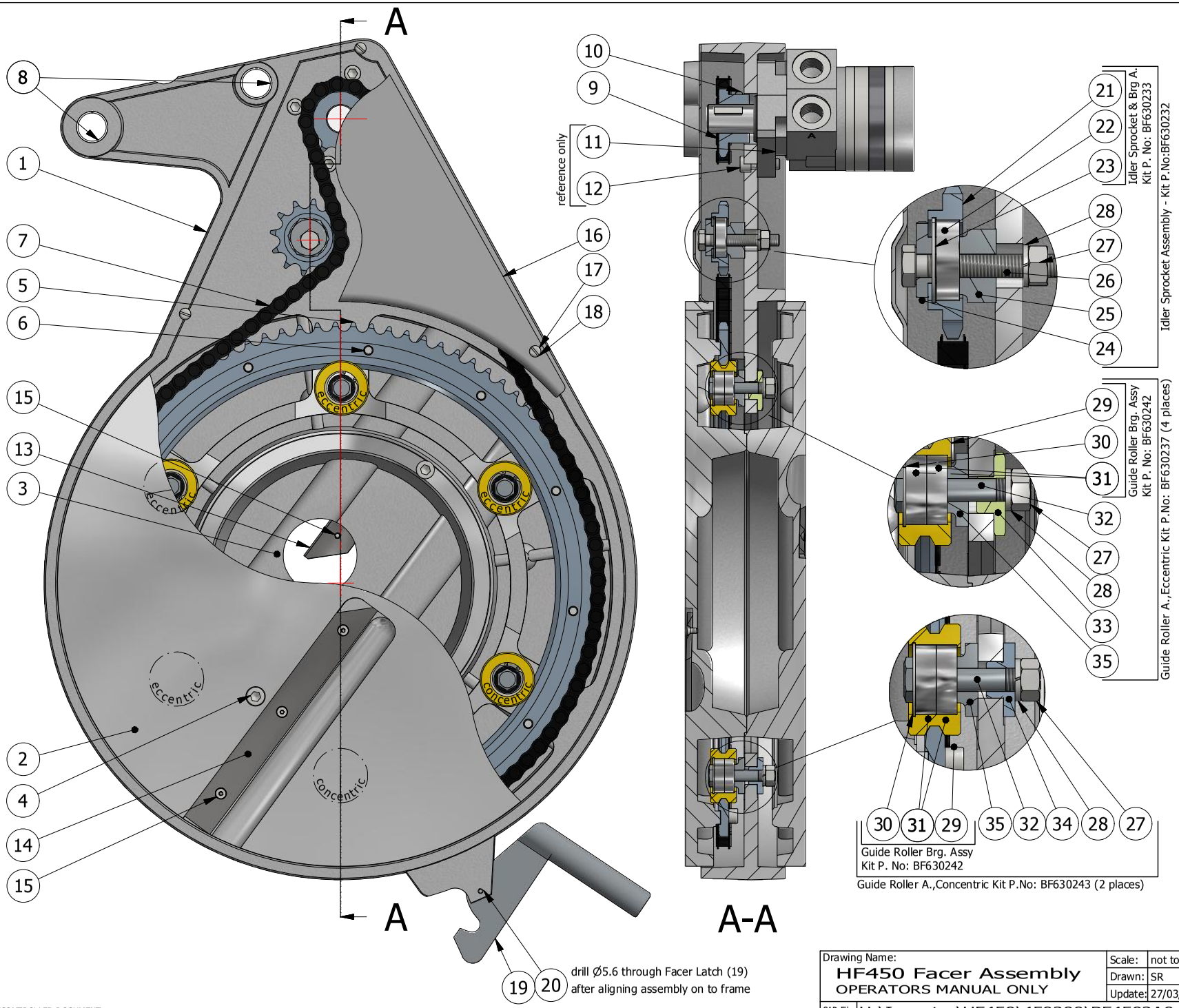

	Item	Part No.	Part Name	QTY
	35	BF630213	Guide Roller Bearing Spacer	6
	34	BF630210	Concentric Bush	2
	33	BF630209	Eccentric Bush	4
	32	BF630234	Mtg. Bolt, Guide Roller Assy	6
BF630242	31	BF000023	Brg. Ball 30x10x9, 2 Seals	12
	30	BF000083	Circlip 30 x 1.2	6
	29	BF630206	Guide Roller	6
	28	BF000157	Spring Washer M10	7
	27	BF000152	Hex Nut M10	7
	26	BF000150	Bolt Hex Hd M10 x 65	1
	25	BF630238	Idler Spacer	1
	24	BF630217	Idler Eccentric Bush	1
BF630233	23	BF000084	Circlip 35 x 1.5	1
	22	BF000021	Brg. Ball 35x17x10, 2 Seals	1
	21	BF630205	Idler Sprocket	1
	20	BF000288	Spring Pin 7/32 x 1 1/2	1
	19	BF450256	Facer Latch	1
	18	BF000097	Flat Washer M5	3
	17	BF000103	MTPan Head M5 x 10	3
	16	BF450239	Cover Plate	1
Kit P.No.: BF450212	15	BF000217	SFHS 3/16 x 3/8	6
	14	BF450212B	Driver Cutter Blade	1
	13	BF450212A	Idler Cutter Blade	1
	12	BF000464	SHCS 3/8 UNC x 1	4
	11	BF630223	Facer Motor	1
	10	BF000109	Set Screw M6 x 6	2
	9	BF630204	Drive Sprocket	1
	8	BF000074	Glycodur Bush 25mmm	4
	7	BF450226	Chain & Link	1
	6	BF000136	SHCS M8 x 20	12
	5	BF450203	Main Sprocket	1
	4	BF000155	SHCS M10 x 60	2
	3	BF450215	Idler Cutter Plate	1
	2	BF450202	Driver Cutter Plate	1
	1	BF450201	Facer Body	1

Drawing Name: HF450 Facer Assembly
OPERATORS MANUAL ONLY

Scale: not to scale
Drawn: SR
Update: 27/03/13

CAD File: U:\Inventor\HF450\450200\BF4502A0.idw

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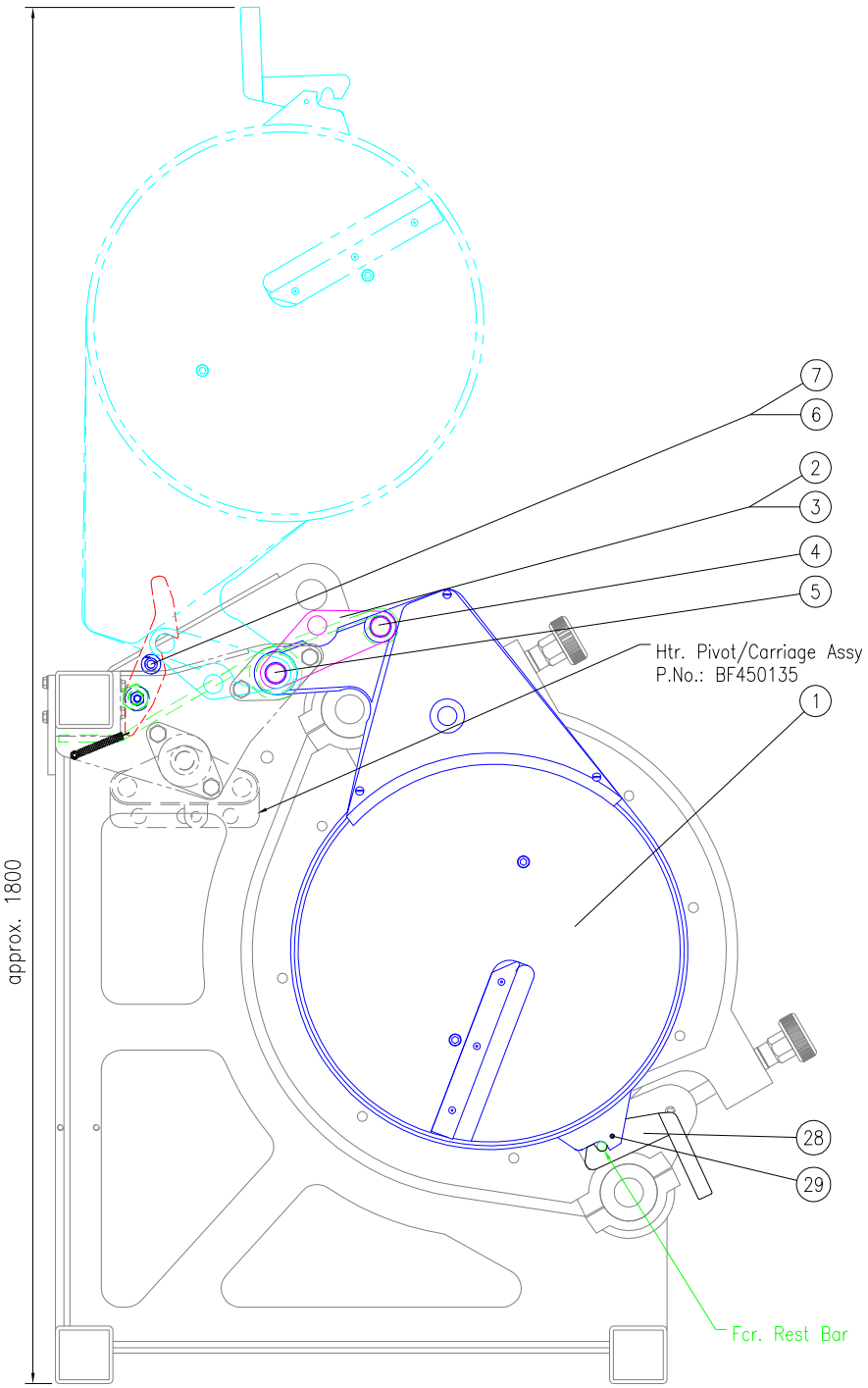

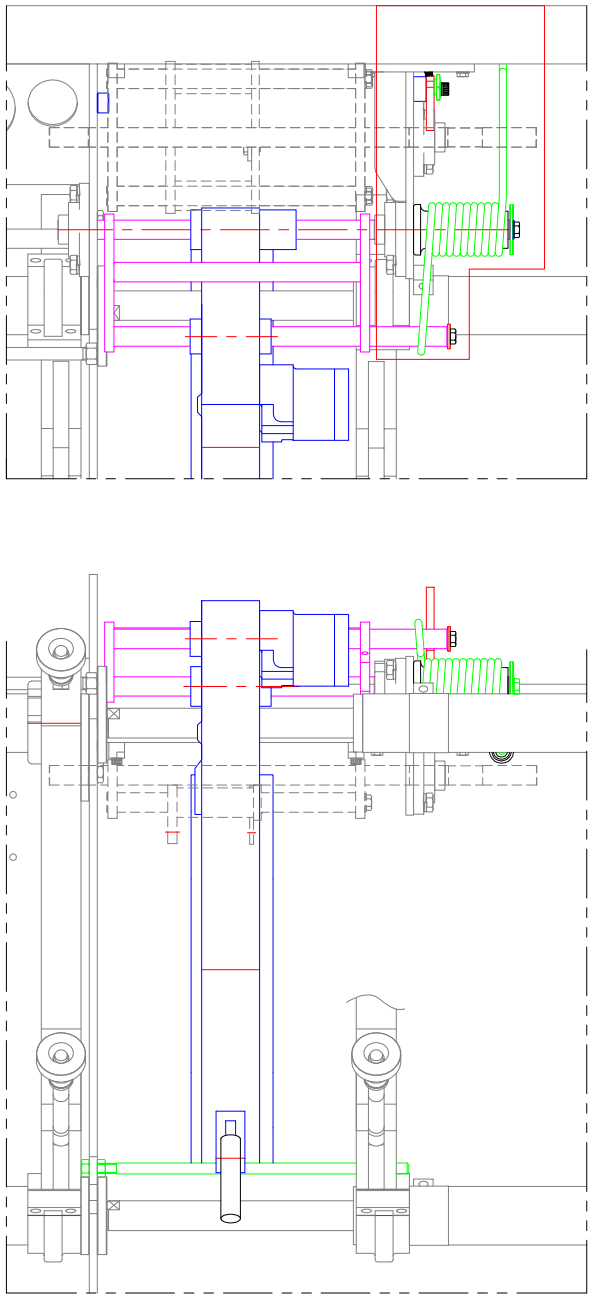

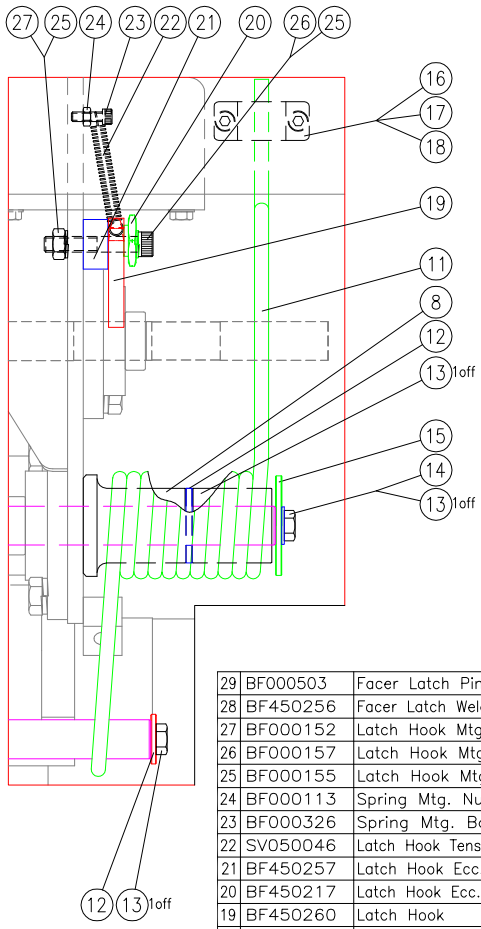

Facer Pivot Assembly P.No.:BF450240

ITEM	PART No.	PART NAME	QTY /KIT
29	BF000503	Facer Latch Pin	1
28	BF450256	Facer Latch Weldment	1
27	BF000152	Latch Hook Mtg. Nut	1
26	BF000157	Latch Hook Mtg. Washer	2
25	BF000155	Latch Hook Mtg. Bolt	1
24	BF000113	Spring Mtg. Nut	1
23	BF000326	Spring Mtg. Bolt	1
22	SV050046	Latch Hook Tension Spring	1
21	BF450257	Latch Hook Ecc. Spacer	1
20	BF450217	Latch Hook Ecc. Bush	1
19	BF450260	Latch Hook	1
18	BF000134	Saddle Mtg. Bolt	2
17		Saddle Rubber	1
16	BF630771	Saddle	1
15	BF630415	Aluminium Washer	1
14	BF000158	Flat Washer	1
13	BF000161	Mounting Bolt	2
12	BF110013	Flat Washer	1
11	BF450265	Facer Return Spring	1
10	BF450250	Spring Bushing Type 2	1
9	BF450252	Washer	1
8	BF450251	Spring Bushing Type 1	1
7	BF000348	Facer Stop Mtg Bolt	1
6	BF450264	Facer Stop	1
5	BF450249	Slide Shaft	1
4	BF450248	Pivot Shaft	1
3	BF000122	Shaft Mounting Screw	4
2	BF450241	Facer Pivot Weldment	1
1	BF450200	Facer Assembly	1

NOTE: Not all lines shown for clarity

Drawing Name:	HF450 FACER MOUNTING ASSEMBLY OPERATORS MANUAL ONLY
Scale:	Not To Scale
Drawn:	SR
Date:	11/06/09
CAD File:	U:\DWG\Manual Dwg\HF450-MAN\BF4502A0-MAN

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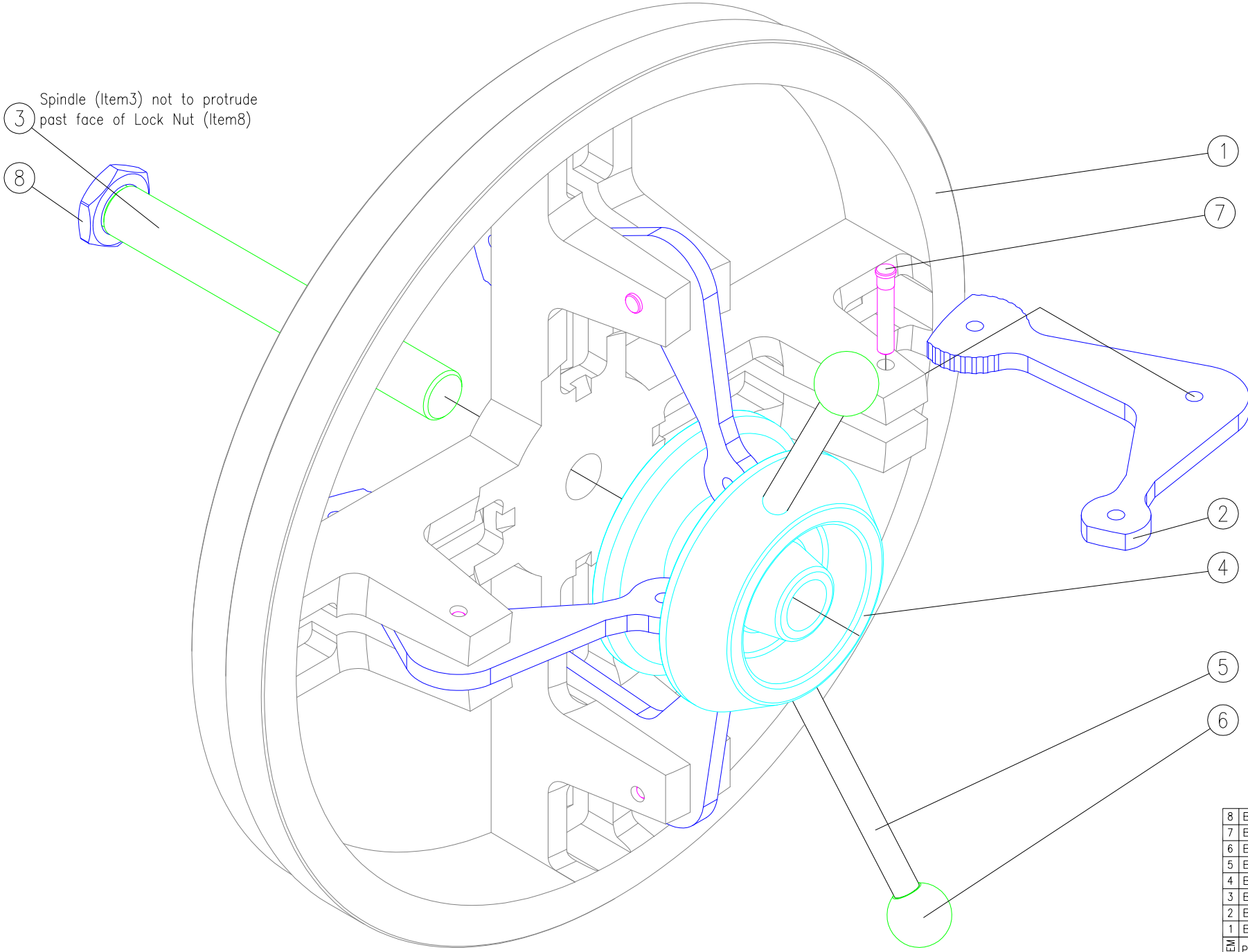

ITEM	PART No.	PART NAME	QTY /KIT
8	BF200305	Lock Nut	1
7	BF450309	Pivot Pin	4
6	BF350308	Handle Knob	2
5	BF450306	Tee Bar	2
4	BF450302	Adjuster Nut	1
3	BF450304	Spindle	1
2	BF450303	Finger Lever	4
1	BF450301	Body	1

Drawing Name: HF450 FITTINGS ATTACHMENT ASSEMBLY OPERATORS MANUAL ONLY	
Scale:	Not To Scale
Drawn:	SR
Date:	5/06/09
CAD File:	U:\Dwg\Mech Desktop\HF450\BF450300\450fitt.dwg

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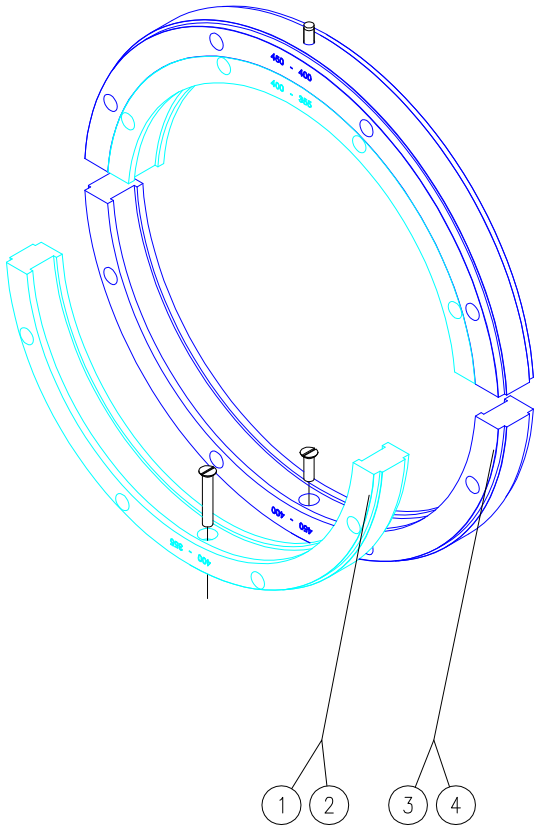
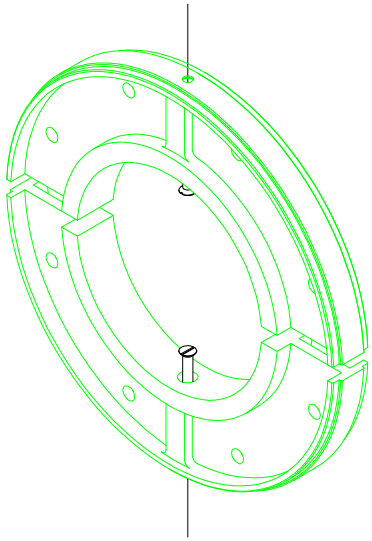


ITEM	PART No.	PART NAME	QTY /KIT
1	BF450935P	Plain Liner Ring 400–355	4
2	BF000118	Mounting Screw (400–355)	8
3	BF450940P	Plain Liner Ring 450–400	4
4	BF000119	Mounting Screw 450–400)	8

PLAIN LINERS FIT INTO CLAMPS

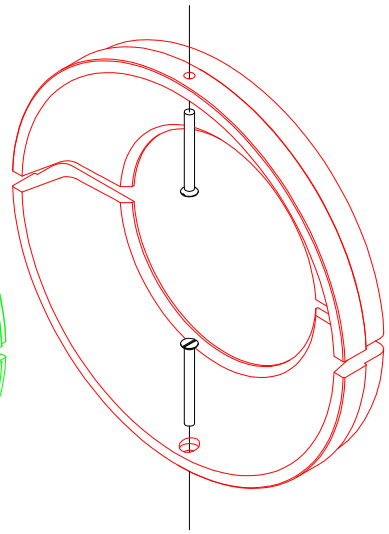


USE MOUNTING SCREW
P.No. BF000119

PART NO.	SIZE
BF350920P	355–200
BF3509213P	355–213
BF3509219P	355–219
BF3509225P	355–225
BF350925P	355–250
BF3509273P	355–273
BF350928P	355–280
BF3509315P	355–315
BF3509323P	355–323

355–200 SHOWN

PLAIN LINER FIT INTO
'400-355' LINER

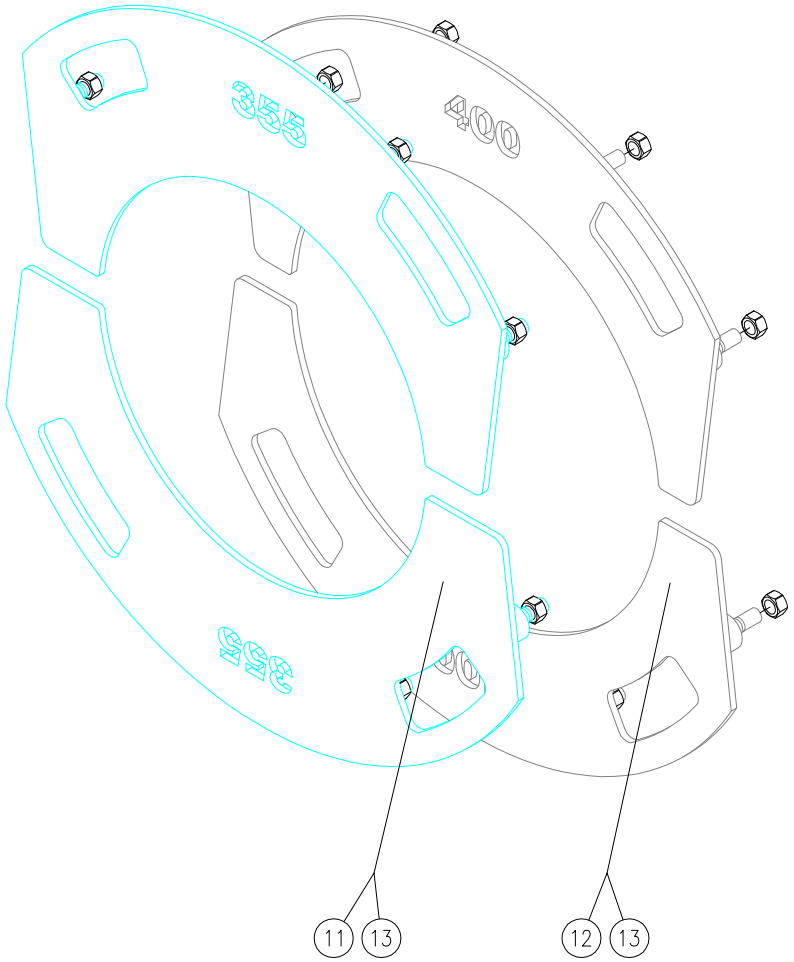


USE MOUNTING SCREW
P.No. BF000119

PART NO.	SIZE
BF350920N	355–200
BF3509213N	355–213
BF3509219N	355–219
BF3509225N	355–225
BF350925N	355–250
BF350928N	355–280
BF3509315N	355–315

355–200N SHOWN

NARROW LINERS FIT INTO
'400-355' LINER



ITEM	PART No.	PART NAME	QTY /KIT
11	BF450935N	Narrow Liner Ring 400–355	4
12	BF450940N	Narrow Liner Ring 450–400	4
13	BF000162	Mounting Nut (per Ring)	8

NARROW LINERS FIT ONTO CLAMPS

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Drawing Name: HF450 PLAIN & NARROW LINERS OPERATORS MANUAL ONLY	Scale:	Not To Scale	DIXON INDUSTRIES PTY LTD A.B.N. 89 008 171 855
	Drawn:	SR	
	Date:	3/06/09	
CAD File: U:\Dwg\Mech Desktop\HF450\BF450900\450liners			

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EXCHANGE
TANK MTG. BOLT
WITH SUPPLIED ITEM 5
OR SHORTEN
EXISTING BOLT TO
APPR. LENGTH 7mm

APPR. 6mm INTERFERENCE
BETWEEN TYRE
AND BRAKE ADJUSTING BOLT

ADJUSTABLE

ADJUSTABLE

1230

Ø13

27

40

75

1. REMOVE ALL EXISTING WELDS
AT TOP END OF RHS TUBES

2. MARK HOLE CENTRE TO DIMENSIONS
AND DRILL Ø13mm THROUGH TUBE
TYPICAL 4 PLACES

3. BOLT WHEEL ASSEMBLIES
TO HF 450 FRAME WITH
M12 FASTENERS SUPPLIED (ITEMS 3 &4)

1919

ITEM	PART No.	PART NAME	QTY /KIT
5	BF450690	Modified Mtg Bolt	1
4	BF000144	Nylock Nut	4
3	BF000561	Mounting Bolt	4
2	BF450639	Front Axle Assembly	1
1	BF450631	Rear Axle Assembly	1

Drawing Name:	HF450 AXLE & BRAKE ASSEMBLY OPERATORS MANUAL ONLY
Scale:	Not To Scale
Drawn:	SR
Date:	23/06/10
CAD File:	U:\DWG\Manual Dwg\HF450-MAN\BF4504A0-MAN

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Parameters based on PIPA Guideline POP003: 6.1 Sept 2011, Single Pressure - Low Pressure. **HF450 hydraulic cylinder area 2027mm²**

nominal pipe od		D	mm	450	450	450	450	450	450	450	450	450	400	400	400	400	400	400	400	400	400
SDR				41	33	26	21	17	13.6	11	9	7.4	41	33	26	21	17	13.6	11	9	7.4
PE80				PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20
PE100				PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25
mean wall thickness		t	mm	11.6	14.6	18.2	22.7	28.1	34.9	43.0	52.9	64.7	10.4	13.0	16.2	20.2	25.0	31.0	38.2	47.0	57.5
		Parameter																			
mean heater surface temp		220+/-15	°C	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220
allowable axial misalignment		0.1t	mm	1.2	1.5	1.8	2.3	2.8	3.5	4.3	5.3	6.5	1.0	1.3	1.6	2.0	2.5	3.1	3.8	4.7	5.8
bead up pressure	P1	170+/-20	kPa	1340	1670	2066	2551	3124	3812	4612	5535	6565	1063	1326	1634	2017	2466	3010	3642	4372	5189
+ measured drag	P3	+drag	kPa																		
total bead up pressure	P3		kPa																		
soak pressure	P2	drag	kPa	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag
soak time	T2	(11±1)t	second	128	160	200	249	309	383	473	582	711	114	143	178	222	274	340	420	517	633
heater out	T3	0.1t + 4	second	5	5	6	6	7	7	8	9	10	5	5	6	6	6	7	8	9	10
pressure up	T4	0.4t + 2	second	7	8	9	11	13	16	19	23	28	6	7	8	10	12	14	17	21	25
welding & cooling pressure	P3	170+/-20	kPa	1340	1670	2066	2551	3124	3812	4612	5535	6565	1063	1326	1634	2017	2466	3010	3642	4372	5189
+ measured drag	P3	+drag	kPa																		
total welding & cooling pressure	P3		kPa																		
minimum welding & cooling time in the clamps	T5	t + 3	minute	15	18	21	26	31	38	46	56	68	13	16	19	23	28	34	41	50	61
cooling time out of clamps before rough handling	T6	t + 3	minute	15	18	21	26	31	38	46	56	68	13	16	19	23	28	34	41	50	61

NB the drag pressure must be re-measured and added to the calculated weld pressure for each new joint .

Parameters based on PIPA Guideline POP003: 6.1 Sept 2011, Single Pressure - Low Pressure. **HF450 hydraulic cylinder area 2027mm²**

nominal pipe od		D	mm	355	355	355	355	355	355	355	355	355	315	315	315	315	315	315	315	315	315
SDR				41	33	26	21	17	13.6	11	9	7.4	41	33	26	21	17	13.6	11	9	7.4
PE80				PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20
PE100				PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25
mean wall thickness		t	mm	9.2	11.5	14.4	17.8	22.3	27.5	33.9	41.7	45.2	8.2	10.3	12.8	15.8	19.7	24.5	30.1	37.1	45.2
		Parameter																			
mean heater surface temp		220+/-15	°C	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220
allowable axial misalignment		0.1t	mm	0.9	1.2	1.4	1.8	2.2	2.8	3.4	4.2	4.5	0.8	1.0	1.3	1.6	2.0	2.4	3.0	3.7	4.5
bead up pressure	P1	170+/-20	kPa	839	1041	1293	1582	1951	2373	2869	3439	3690	659	824	1020	1246	1533	1872	2260	2714	3214
+ measured drag	P3	+drag	kPa																		
total bead up pressure	P3		kPa																		
soak pressure	P2	drag	kPa	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag
soak time	T2	(11±1)t	second	101	127	158	196	245	303	373	458	497	90	113	141	174	217	269	331	408	497
heater out	T3	0.1t + 4	second	5	5	5	6	6	7	7	8	9	5	5	5	6	6	6	7	8	9
pressure up	T4	0.4t + 2	second	6	7	8	9	11	13	16	19	20	5	6	7	8	10	12	14	17	20
welding & cooling pressure	P3	170+/-20	kPa	839	1041	1293	1582	1951	2373	2869	3439	3690	659	824	1020	1246	1533	1872	2260	2714	3214
+ measured drag	P3	+drag	kPa																		
total welding & cooling pressure	P3		kPa																		
minimum welding & cooling time in the clamps	T5	t + 3	minute	12	15	17	21	25	31	37	45	48	11	13	16	19	23	27	33	40	48
cooling time out of clamps before rough handling	T6	t + 3	minute	12	15	17	21	25	31	37	45	48	11	13	16	19	23	27	33	40	48

NB the drag pressure must be re-measured and added to the calculated weld pressure for each new joint .

Parameters based on PIPA Guideline POP003: 6.1 Sept 2011, Single Pressure - Low Pressure. **HF450 hydraulic cylinder area 2027mm²**

nominal pipe od		D	mm	280	280	280	280	280	280	280	280	280	250	250	250	250	250	250	250	250	250
SDR				41	33	26	21	17	13.6	11	9	7.4	41	33	26	21	17	13.6	11	9	7.4
PE80				PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20
PE100				PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25
mean wall thickness		t	mm	7.3	9.1	11.3	14.2	17.5	21.7	26.8	33.0	40.3	6.6	8.2	10.2	12.6	15.6	19.4	23.9	29.4	36.0
		Parameter																			
mean heater surface temp		220+/-15	°C	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220
allowable axial misalignment		0.1t	mm	0.7	0.9	1.1	1.4	1.8	2.2	2.7	3.3	4.0	0.7	0.8	1.0	1.3	1.6	1.9	2.4	2.9	3.6
bead up pressure	P1	170+/-20	kPa	525	650	801	992	1211	1477	1785	2145	2546	424	520	642	786	964	1179	1424	1707	2030
+ measured drag	P3	+drag	kPa																		
total bead up pressure	P3		kPa																		
soak pressure	P2	drag	kPa	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag
soak time	T2	(11±1)t	second	80	100	124	156	193	239	294	362	443	73	90	112	138	172	213	263	323	396
heater out	T3	0.1t + 4	second	5	5	5	5	6	6	7	7	8	5	5	5	5	6	6	6	7	8
pressure up	T4	0.4t + 2	second	5	6	7	8	9	11	13	15	18	5	5	6	7	8	10	12	14	16
welding & cooling pressure	P3	170+/-20	kPa	525	650	801	992	1211	1477	1785	2145	2546	424	520	642	786	964	1179	1424	1707	2030
+ measured drag	P3	+drag	kPa																		
total welding & cooling pressure	P3		kPa																		
minimum welding & cooling time in the clamps	T5	t + 3	minute	10	12	14	17	21	25	30	36	43	10	11	13	16	19	22	27	32	39
cooling time out of clamps before rough handling	T6	t + 3	minute	10	12	14	17	21	25	30	36	43	10	11	13	16	19	22	27	32	39

NB the drag pressure must be re-measured and added to the calculated weld pressure for each new joint .

Parameters based on PIPA Guideline POP003: 6.1 Sept 2011, Single Pressure - Low Pressure. **HF450 hydraulic cylinder area 2027mm²**

nominal pipe od		D	mm	225	225	225	225	225	225	225	225	225	200	200	200	200	200	200	200	200	200
SDR				41	33	26	21	17	13.6	11	9	7.4	41	33	26	21	17	13.6	11	9	7.4
PE80				PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN3.2	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20
PE100				PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25	PN4		PN6.3	PN8	PN10	PN12.5	PN16	PN20	PN25
mean wall thickness		t	mm	5.9	7.3	9.1	11.4	14.2	17.5	21.6	26.5	32.4	5.2	6.6	8.2	10.2	12.6	15.5	19.2	23.6	28.8
		Parameter																			
mean heater surface temp		220+/-15	°C	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220
allowable axial misalignment		0.1t	mm	0.6	0.7	0.9	1.1	1.4	1.8	2.2	2.6	3.2	0.5	0.7	0.8	1.0	1.3	1.6	1.9	2.4	2.9
bead up pressure	P1	170+/-20	kPa	338	419	518	642	787	957	1158	1384	1645	267	337	412	508	620	754	915	1097	1298
+ measured drag	P3	+drag	kPa																		
total bead up pressure	P3		kPa																		
soak pressure	P2	drag	kPa	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag	drag
soak time	T2	(11±1)t	second	64	80	100	125	156	193	238	291	356	57	73	90	112	138	171	211	260	316
heater out	T3	0.1t + 4	second	5	5	5	5	5	6	6	7	7	5	5	5	5	5	6	6	6	7
pressure up	T4	0.4t + 2	second	4	5	6	7	8	9	11	13	15	4	5	5	6	7	8	10	11	14
welding & cooling pressure	P3	170+/-20	kPa	338	419	518	642	787	957	1158	1384	1645	267	337	412	508	620	754	915	1097	1298
+ measured drag	P3	+drag	kPa																		
total welding & cooling pressure	P3		kPa																		
minimum welding & cooling time in the clamps	T5	t + 3	minute	9	10	12	14	17	21	25	29	35	8	10	11	13	16	19	22	27	32
cooling time out of clamps before rough handling	T6	t + 3	minute	9	10	12	14	17	21	25	29	35	8	10	11	13	16	19	22	27	32

NB the drag pressure must be re-measured and added to the calculated weld pressure for each new joint .

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