



# EHF225

## OPERATORS MANUAL

### Contents

<b>Safety precautions</b> .....	<b>2</b>
<b>Limited Warranty</b> .....	<b>3</b>
<b>Machine Description</b> .....	<b>4</b>
Hydraulics .....	4
Hydraulic Specification .....	4
Heater Plate .....	4
Facer .....	5
Reducing Liners .....	5
Fittings Attachment .....	5
Accessory Case .....	5
Shipping Container .....	5
Component Weights .....	5
Electrical Power Requirement .....	5
<b>Using the EHF225</b> .....	<b>6</b>
Hydraulic Controls .....	6
Preparation .....	6
Drag Pressure .....	6
Pipe Alignment .....	6
Facing .....	6
Check Alignment .....	7
Heating Cycle .....	7
Fusion Cycle .....	8
Weld Quality Check .....	8
<b>Maintenance - daily checks</b> .....	<b>8</b>
<b>Maintenance - Periodic</b> .....	<b>8</b>
General .....	8
Heater .....	9
Facer drive .....	9
Blade sharpening .....	9
Heater Temperature adjustment .....	9
Heater failure .....	9
Non-stick cloth replacement .....	9
Hydraulic Operating Pressure .....	10
Hydraulic Bleeding Method .....	10
<b>Notes about heater plates and temperature</b> .....	<b>11</b>
<b>Butt welding - general procedure</b> .....	<b>12</b>
<b>PIPA POP003 butt weld guideline</b> .....	<b>13</b>
<b>Assembly drawings</b> .....	<b>14..</b>
<b>225 butt welding tables (single pressure, low pressure)</b> .....	<b>appendix 1-5</b>



### DIXON INDUSTRIES PTY. LTD.

ABN 89 008 171 855

17 Frederick Road, Royal Park, South Australia, 5014.

Tel. 61 8 8240 1555

Fax. 61 8 8240 5588

Email: [sales@dixonind.com.au](mailto:sales@dixonind.com.au) Web site: [www.fusionmaster.com.au](http://www.fusionmaster.com.au)

FUSIONMASTER® and Dixon® are registered trademarks of Dixon Industries Pty. Ltd. © Dixon Industries Pty. Ltd. 2000. Revised Sep. 2011.



# Safety precautions

---

## 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.

Report anything that doesn't look right, sound right, smell right, feel right, or is in any way different from what you expect, or that you think may be unsafe.

## Avoid dangerous environments

The equipment is not explosion proof. Never carry out butt fusion in a gaseous or combustible atmosphere.

## 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. The use of earth leakage protection with portable electric tools is essential and must be provided by the user.

## Heater

The heater is supplied with a short extension cord that will melt through if allowed to contact the hot plate. The factory supplied cord has a high melting point outer sheath that will delay, but will not prevent, the inevitable life threatening situation that could occur.

Always use an earth leakage safety device in any circuit connected to the heater.

Never use a standard appliance cord with low melting point PVC sheath.

Never stand the heater plate such that the temperature controller handle is vertically above the hot plate.

## Facer

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

Because of the nature of the machine it is not practical to guard the operational area. Do not attempt to remove shavings from the cutting area while the facer is running.

## Wear appropriate apparel

The heater is very hot and should be handled carefully. Wear gloves to prevent burns.

Remove loose clothing or jewellery to prevent injury from these items being dragged into moving parts.

## Hydraulic pressure

Remember that 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.

Any body parts caught in the machine when the hydraulics are operated will be crushed. Keep fingers, arms, etc, well clear of the clamp 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 cords.

## Transporting the machine

Dixon equipment supplied with 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 unit well secured.

It is particularly important to ensure that heater plate non-stick surfaces are protected from damage during transportation.

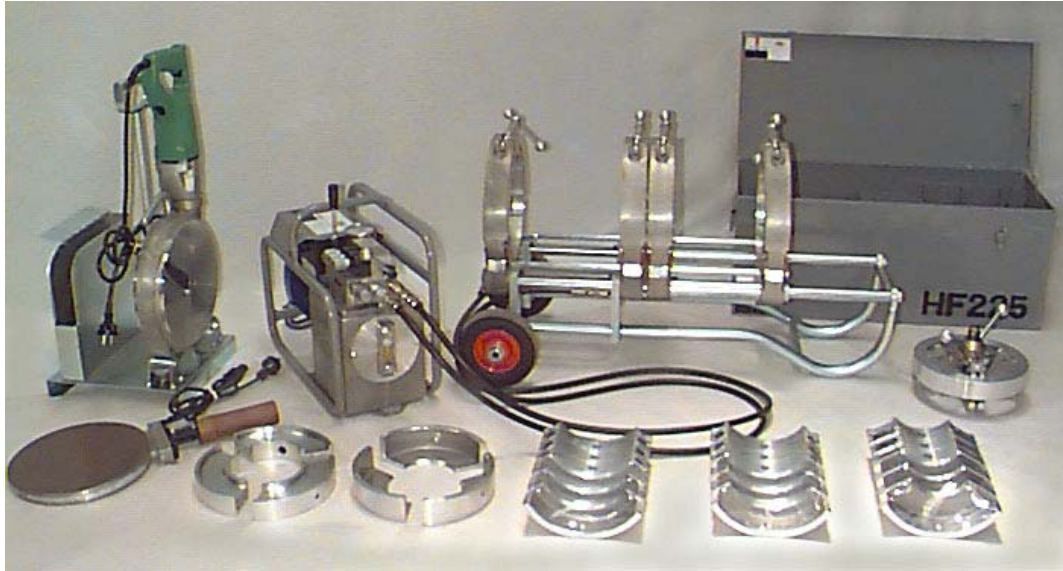


# Butt Welding Equipment Limited Warranty

---

- 1) Subject to the terms below, Dixon Industries Pty Ltd (“**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.

# EHF225 electric hydraulic butt welder.



## Machine Description

The **FUSIONMASTER**® EHF225 is a lightweight, compact butt fusion machine for fast accurate joining of 225-63mm polyethylene pipe and fittings using the "single pressure and low fusion pressure" butt weld procedure. Its robustness is derived from the hard chromed, high strength steel guide shafts, rigid subframe and high strength cast aluminium alloy clamps. All mild steel machine components are zinc plated for maximum corrosion protection.

Two solid rubber wheels and a basic machine weight of only 40kg allows easy mobility. The two fixed and two moving clamps have three segments to help reduce ovality when joining wide tolerance pipes.

### Machine Specification

Main clamp bore	225 mm
Length overall	860 mm
Width overall	410 mm
Height overall	460 mm

(See machine assembly drawing BF2250AO-MAN.)

### Hydraulics

The EHF225 has a stand alone electric-hydraulic pump that applies pressure to the hydraulic cylinder that transports the moving clamps.

Maximum welding pressure is limited to 7,500 kPa by a relief valve in the oil tank. This is accessible only by removing the main valve block from the top of the tank.

### Hydraulic Specification

Electric pump	.37kW, 240V, single phase
Pressure gauge	0-8,000kPa
Relief valve pressure setting	7,500kPa
Cylinder effective cylinder area	753 mm <sup>2</sup>
System oil capacity	3 litres
Recommended oil:	viscosity rating ISO 46

### Heater Plate

The 1400W, 240V aluminium heater plate has a cast in circular element to ensure uniform heat distribution across the 240mm effective heating diameter.

Plate temperature is controlled with an adjustable solid state controller. A neon lamp indicates when power is on, and a dial thermometer indicates internal plate temperature. (Refer section on heater technology.) It takes less than 15 minutes to heat up to working temperature.

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.

The detachable 1.2m, 7.5 amp electric cord has a melt resisting outer sheath for protection against short periods of accidental contact with the heater.

(See heater assembly drawing BF2001AO-MAN.)



Simply Better

# EHF225 electric hydraulic butt welder.

## Facer

Joint preparation time is reduced to a minimum using the lightweight electric powered facing head. The facer is self aligning and will produce parallel pipe joint faces. The dual speed motor provides adequate torque and speed to process small or large diameter pipes quickly. When not in use, both the facer and heater plate are stored in a protective floor stand.

The facer is driven by an electric drill (900W, 240V). It has one blade on each cutting face and can cut pipe from 225mm outside dia. to 45mm inside dia.

(See facer assembly drawing BF2002AO-MAN.)

## Reducing Liners

Clamp liners for the EHF225 can be supplied to suit any pipe size from 200mm to 63mm, in either metric or imperial dimensions. There are four rings to each liner size comprising 2 wide rings (for pipe to pipe) and 2 narrow rings (for holding short leg moulded fittings). The wide 63mm, 75mm and 90mm liners nest inside 110mm liners, while all the narrow liners fit directly into the main 225mm clamp.

When welding pipe to pipe the wide rings are placed in the inner two clamps, with the narrow rings in the two outer clamps. (See drawing HF225900-MAN.)

## Fittings Attachment

The self centring fittings attachment securely holds flanged or shouldered end fittings, etc, either by the outside or inside diameter. This time saving tool mounts into one of the main clamps enabling fast, accurate alignment of fittings with very little effort.

(See fittings attachment assembly drawing BF2253AO-MAN.)

## Accessory Case

The EHF225 kit is supplied with a steel accessory case that holds the heater, facer, heater stand and three sets of reducing liners. The case is 720 x 330 x 290mm. A separate case to hold all other liner sizes is also available.

## Shipping Container

The EHF225 ships in a plywood-timber crate.

## Component Weights

Butt machine	40 kg
Electric hydraulic power unit	28 kg

Heater plate	3.5 kg
Facer	11 kg
Fittings chuck	8 kg
Liners 160mm 2p&2n	5.2 kg/set
Liners 110mm 2p&2n	6.4 kg/set
Liners 90mm 2p&2n	3.5 kg/set
Heater stand	5 kg
Accessory case (loaded)	44 kg
Shipping crate (loaded)	160 kg

## Electrical Power Requirement.

A portable power supply of 3.5kW, 240V, single phase is recommended for field operation.

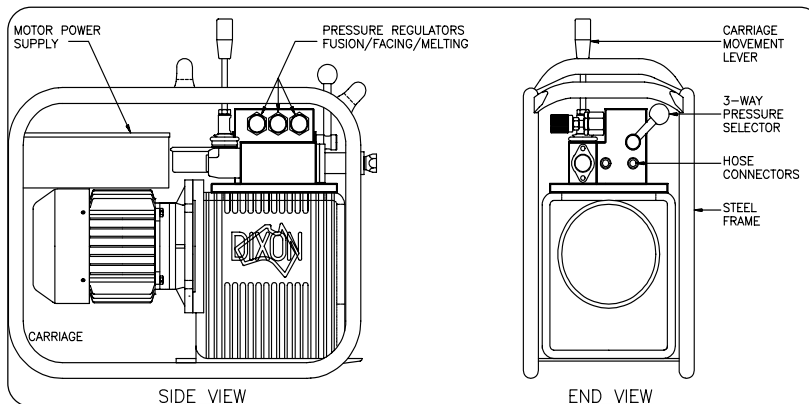
## Using the EHF225

### Hydraulic Controls

Operators should be thoroughly familiar with the hydraulic controls before start up.

#### Pressure regulators

Three pressure regulators allow the operator to preset pressures independently. These may be used to pre-set *facing, heat soak, welding-cooling or drag* pressures, depending on how the operator prefers to work.



The pressure regulators control the *Carriage Cylinder Pressure* during the fusion process, ie when the pipe ends are being brought together. During travel in the reverse direction the regulators do not control pressure, nor does the gauge register pressure.

*Carriage pressure* of about 1,000 kPa (plus drag) should normally be sufficient during facing. Greater pressure could damage the facer.

#### Pressure selector

A 3-way selector allows the operator to easily choose one of the pre-set pressures during the weld process.

#### Carriage Movement Lever

This is operated to open or close the carriage.

### Preparation

- Connect only to a 240v power source. Ensure the output of any portable generator used is 240v +/- 20v and 50hz to protect the electronic temperature controller from electric damage.
- Test for air in the hydraulic system. Bleed as necessary.
- Clean and/or replace the non-stick cloths. Clean the plate before every weld with clean dry paper or cotton cloth - never use synthetic materials that may melt.

- Check, and if necessary adjust the heater surface temperature.
- Check the facer cutting action (the shaving thickness should be 0.3-0.4mm).
- Install the correct reducing liners for the pipe to be welded.
- Clean each pipe end and the cutter blades before facing.
- Read the drag pressure from the pressure gauge before every weld.
- Add the drag pressure to the calculated pressure to determine the appropriate heat soak and welding gauge pressure

### Drag Pressure

The “drag” pressure is that required to just maintain motion of the carriage. The size of the drag will depend both on the friction acting inside the cylinders and on the effort required to move the pipe. It must therefore be measured before every weld and added to the calculated welding pressure for the pipe.

To determine the drag pressure: Switch on the pump, select one of the *Pressure Regulators*, apply the *Directional Control* lever, adjust the *Pressure* regulator, and observe the gauge pressure at which the carriage just begins to move. This is the drag pressure.

### Pipe Alignment

Place the pipes in the clamp jaws with about 30mm of pipe extending past the clamps into the operating zone, and tighten the clamps. Using the hydraulics, move the pipe ends together and check for alignment. The other ends of the pipe should be supported in a way that eliminates any external bending loads on the machine and minimises drag on the pipe.

Tolerances on small bore pipes should be sufficient to permit pipe alignment in the EHF225 without much adjustment of the three segment clamps. However, in severe out of round situations, adjust out any misalignment by loosening the clamps and rotating the pipes, and/or using packers as necessary.

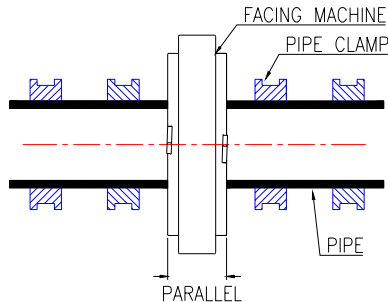
Tighten the clamp toggle bolts securely to prevent pipe movement under hydraulic pressure.

### Facing

Move the pipe ends apart and place the facing machine between the pipe faces. Ensure the facer body is hooked on to the guide shafts. (The heater plate rest

# EHF225 electric hydraulic butt welder.

bars must be retracted during the facing operation.) Reverse the directional valve lever on the hydraulic pump to permit the pipe to be moved toward the facer.



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.

Move the pipe away from the facer before stopping facer rotation to prevent any step forming.

**Caution:**

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

**Check Alignment**

Remove the facer and clear away all plastic cuttings without contaminating the pipe ends. Do not touch the cut surface or reclean it.

Re-check pipe alignment (maximum misalignment 10% of wall thickness) as this is extremely important in obtaining uniform heating and minimising stresses at the finished joint.

If the alignment is unacceptable repeat the facing operation. Always reface if it becomes necessary to rotate the pipe in the clamps after initial facing.

**Heating Cycle**

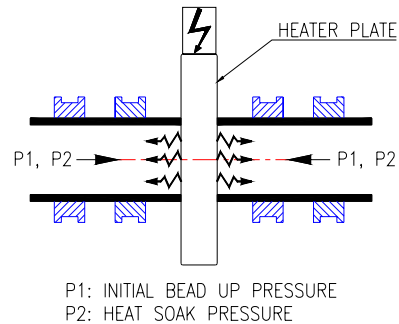
Extend the heater rest bars ready to support the heater plate and prevent damaging the hydraulic cylinder shafts.

Always check the heater plate temperature before commencing each joint.

Place the heater plate between the pipe faces.

**Caution:**

**Ensure the heater handle is NOT standing vertically above the plate or dangerous overheating may occur.**



Move the carriage to bring the pipe faces into contact with the heater plate, and increase pressure to the predetermined heating pressure.

Maintain pressure until an initial bead has formed uniformly around both sides of the heater plate. This commences the heat soak period.

Then, while maintaining the heater/pipe face contact, reduce the pressure down to the drag pressure for the remainder of the heat soak time period. Failing to reduce pressure forces hot plastic out of the joint zone and can lead to a "cold joint".

On completion of heat soak time, reverse the carriage direction to “crack” the heater plate away from the melted pipe and 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.

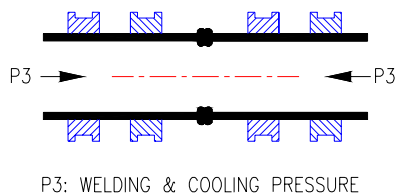
Remove the heater plate and replace it in the floor stand.

**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.**

**Fusion Cycle**

Bring the melted pipe faces into contact with each other gently without delay to minimise heat loss from the weld zone. Build up to the required fusion pressure gradually to avoid squeezing out too much hot plastic.



Shrinkage will occur as the weld cools allowing the pressure to fall. It is essential to run the pump and maintain pressure until shrinkage ceases.

It is recommended that the pump not be switched off until the end of the cooling period. Maintain the pipe in the clamps and under pressure until the weld/cooling time is complete.

**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 weld failure trouble-shooting.)

## Maintenance - daily checks

1. Keep the machine and accessories clean and free of dust and grease. Do not lubricate any part of the machine.
2. Inspect hydraulic components for leaks from connections and seals. Overhaul seals and fittings as necessary.
3. Check for air in the carriage cylinder (as evidenced by shuddering, and/or “springing back” of the rams). This must be removed by bleeding.
4. Check the pressure gauge operates and returns to zero.
5. Check the temperature of a number of points on the surface of both sides of the heater plate. Readings should be within a 20°C range, (say 210-230°C).
6. Check for bare electric wires.
7. Replace non-stick cloths if damaged in the weld zone.
8. Facing blades should be sharp and have defect free cutting edges to provide continuous swarf of uniform thickness. Sharpen or replace cutter blades if blunt or chipped.
9. If using a portable generator, ensure its output is 240v +/- 20v and 50hz, to protect the electronic temperature controller from permanent damage.

## Maintenance - Periodic

In addition to the daily checks, the following should be carried out before commencing each new project, or after 250 operating hours.

**General**

1. Check the hydraulic cylinder shaft for cuts or dents likely to damage the hydraulic seals.
2. Check the frame, chrome guide shafts and heater rest bars are not bent such that excessive drag pressure results. Without pipe in the machine, drag pressure should be in the range 200-500kPa.

## Heater

1. Heater surfaces should be flat, smooth and free of dents or gouges. Dress as necessary.
2. Heaters with non-stick cloths have a vent machined in the edge of the casting to prevent air being trapped under the cloth. This vent should always be kept clear.

## Facer drive

1. Access the facer drive assembly by removing the securing screw from the facer plate and removing the plate.
2. Inspect the worm and worm wheel assembly for wear. If replacement is deemed necessary, replace as a complete assembly.
3. Inspect the worm shaft needle thrust bearing for damage and replace if necessary.
4. Clean out and regrease sparingly with a high pressure grease eg Shell EP2. Do not use molybdenum disulphide, graphite grease or similar as these may run and cause joint contamination.
5. Replace felt dust seals as required.

## Blade sharpening

If chipped or damaged, the blades should be replaced.

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

## Heater Temperature adjustment

The temperature setting of the heater is adjusted by turning the screw in the end of the heater handle, clockwise for higher temperature, and anticlockwise for lower temperature. About one degree of turn equals one degree of temperature. Always allow several minutes for the plate temperature to stabilise after making any adjustment.

The controller is factory set to operate in the range 180°C to 260°C.

## Heater failure

1. If the heater does not power up it could be due either to failure of the element pad or failure of the temperature controller.

2. However always first test the power supply and the power cord on some other appliance to ensure those items are not at fault.

3. To test for element pad failure:

**Caution: This job must be performed by a qualified electrician.**

- Disconnect the power supply.
- Remove the three screws securing the handle to the heater bracket.
- Remove the bracket and gasket from the heater plate to expose the temperature sensor probe. Withdraw the probe with long nose pliers, pulling on the metal case, not the fine lead wires. Disconnect the quick connect leads from the element ends and remove the earth connector.
- Remove the heater plate handle bracket to gain access to the element end connections. Disconnect the leads from the element and measure the resistance across the two ends of the element (should be 40 ohms +/-10%). If there is a short circuit, the element pad must be replaced. If the element, leads and connectors are OK, the controller will be faulty and must be replaced.

4. Before fitting the controller handle, coat the probe with a heat sink compound to increase thermal sensitivity then refit it into the element body. Reconnect the leads of the replacement handle to the element and test the unit for short circuit and earthing before reconnection to the power supply.

5. Replace the screws connecting the handle to the bracket and tighten securely.

6. Plug the power cord into the handle and switch on. The neon should light immediately, indicating power on. The new handle has been factory set to run at 230°C. When first fitted, allow 20 minutes for the heater to reach temperature and to stabilise before making any adjustments. Always allow several minutes for the plate temperature to stabilise after making any adjustment.

## Non-stick cloth replacement

The non-stick cloths should be replaced if they become torn, contaminated or overheated.



Simply Better

# EHF225 electric hydraulic butt welder.

Do not attempt to remove the cloths unless the plate temperature is less than 40°C because the snap rings will not release above this temperature. Use the following procedure.

1. Use a screw driver to lever the snap rings out of their securing grooves. This takes very little force.
2. With the plate flat, place a new cloth into position and reposition the snap ring over the cloth.
3. Push the snap ring into the groove around an arc of the plate. Hold in position with one hand. With the free hand, use a piece of wood or plastic to force the snap ring completely into its groove. (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.
4. Trim the excess cloth away with a sharp knife before putting the heater plate back into service.

## Hydraulic Operating Pressure

Start the hydraulic pump and note the gauge readings for each pressure regulator. The operating pressure of the EHF225 is factory set to 7,500kPa when using an 8,000kPa gauge. Increasing pressure above this setting will damage the pressure gauge. The relief valve is located on the pump. Should it be necessary to adjust the relief pressure contact the manufacturer for advice.

(Older equipment was fitted with a 6,000kPa gauge relieved to 5,500kPa.)

During normal operation the hydraulic oil temperature will reach up to 80°C, and the electric motor up to 70°C.

## Hydraulic Bleeding Method

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

Should the hydraulic cylinder need to be drained for any reason, the following method is recommended for recharging with oil.

1. Check that all fittings are tight. Remove the filler nut from the top of the oil tank and insert a filling funnel.
2. Fill the tank to the top of the level gauge. Start the pump and operate the directional control lever alternately about 50mm in each direction such that the cylinder begins to fill. Check the oil reservoir level and top up as required. Repeat until the cylinder starts to move. Recommend use of any ISO 46 viscosity oil.
3. Repeat this movement several times, increasing the distance moved by the cylinder a few millimetres each time as more oil is transferred into the cylinder. As the amount of air being forced from the system reduces, rotate the machine by 45° along its longitudinal axis so that the cylinder piping entry points are in the vertical position allowing trapped air to rise to the top and escape.
4. With the cylinder entry points still in the vertical position, lift the wheeled end of the machine about 500mm from ground level and pump until the cylinder is fully closed. Then reverse the directional valve.
5. Raise the opposite end of the machine about 500mm from the ground (still keeping the cylinder entry points in the vertical position) and pump until the cylinder is fully open.
6. Repeat this cycle in each direction until any change of the directional control lever, and the resultant motion of the carriage, is immediate and exactly in sequence. There should also be no clamp spring back at the end of the cylinder stroke (either end) on changing the directional control valve. At this point all air should be fully expelled from the system. Top up the tank as necessary to the top of the level gauge.

**The manufacturer reserves the right to vary this specification without notice.**

## PE welding temperatures

The temperature range at which polyethylene pipe should be welded is  $220^{\circ} \pm 15^{\circ}\text{C}$ . This should be the temperature between the interface of the heater surface and the pipe material.

Temperatures greater than  $240^{\circ}\text{C}$  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.

*Either situation will eventually lead to joint failure*

## Heater plate temperature

Heater plate temperature displays usually indicate the internal temperature of the plate. However the actual surface temperature may vary from that displayed for a number of reasons.

- 1) The rate of heat lost from the heater surface will depend on the design of the heater plate and the type of temperature controller used. The surface temperature could be up to  $25^{\circ}\text{C}$  cooler than the thermometer indication. This variation will be greatest on cold, windy days - which is one reason for using a shelter when welding.
- 2) The temperature will change as power is being pumped into the heater. 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 surface, and there may also be small variations from side to side, 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. As it is the welding temperature that is important, it is recommended to check the heater surface temperature during the heat soak phase.

## Measuring surface temperature

- To ensure the temperature of the heater plate has stabilised, wait 5 minutes after the heater has reached set temperature before recording measurements.
- Take readings at several points (North, South, East, West) on both sides of the heater, at the diameter of the pipe being welded .
- If a contact probe is used it should be held in position for 3-5 seconds before the reading is taken.
- With **FUSIONMASTER**<sup>®</sup> heater plates using non-stick cloth, it is essential to use a contact probe which forces the cloth into contact with the plate. (Incorrect readings may result if the cloth system traps an insulating air layer between the cloth and the heater surface.)
- If an infra red pyrometer is used, care must be taken to ensure its emissivity is correctly calibrated for use on the non-stick cloth, AND care must be taken to ensure no air is trapped between the plate and the cloth or an incorrect reading is likely to result (see suggestion below).
- Never use an infra-red pyrometer to take a reading from a shiny aluminium surface (such as a **FUSIONMASTER**<sup>®</sup> heater without cloths, or the outer edge of a heater plate) or a gross error will result.

## Suggestion

Infra-red pyrometers are good tools for reading heater plate temperatures, but should always be used with a "spot control adapter" (Dixon part number AF000104).

The "spot control adapter" clips to the end of a Thermotwin pyrometer. When pressed square against the heater surface this correctly focuses the infra-red beam every time, and when used on **FUSIONMASTER**<sup>®</sup> heaters, it expels trapped air from beneath the non-stick cloth, ensuring consistently accurate measurements.

The butt welding method of joining polyolefin pipe requires application of a combination of appropriate temperature, time and pressure to ensure a sound weld.

Operators should take care to determine the suitability of materials for butt welding. Join only pipes and fittings made from the same raw materials, eg PE to PE, PP to PP, PVDF to PVDF, etc.

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

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

In the absence of an Australian Standard on butt welding, a table of welding parameters is given on the next page.

## The basic welding process

- Prepare the ends of the pipe or fittings to be joined so they are clean and parallel to each other.
- Heat the ends at pressure  $P_1$  and for time  $T_1$  to melt the plastic until a bead just forms completely around both ends.
- Heat soak the ends at pressure  $P_2$  and for time  $T_2$ . (Time  $T_1 + T_2$  is critical to achieving good weld quality and should never be shortened.)
- Remove the heater plate and bring the pipe ends gently into contact with each other within time  $T_3$ . (If  $T_3$  is too long, too much heat is lost from the weld area allowing PE recrystallization to commence prematurely.)
- Raise the pressure gradually to pressure  $P_3$  within time  $T_4$ . (If pressure is applied too fast it can cause too much melt to be forced out of the weld area with adverse results.)
- Maintain pressure at  $P_3$  for time  $T_5$  before unclamping and removing pipe from the machine. Never artificially accelerate the cooling process.

## Weld test - destructive

Cutting out and testing of trial welds is frequently required to qualify the welding machine, operator, welding parameters, pipe material, or when the consequences of failure are significant.

Tensile testing is widely used. The ratio of ductile:brittle appearance is usually indicative of weld acceptability.

## Weld failure trouble shooting



Uniform bead - correct welding.



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.*

Butt welding equipment is designed to apply the temperatures and pressures specified by the parameters. 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.

PIPA recommends using the butt fusion procedures and parameters as specified in ISO 21307. Please refer to PIPA Guideline POP003, issue 6.0, 2009 for detailed information. The section of Guideline POP003 which is relevant to this machine is reproduced below for reference.

## Disclaimer (see [www.pipa.com.au](http://www.pipa.com.au))

PIPA makes no warranty or representation regarding the information, opinions and recommendations contained in the Guidelines. Users of the Guidelines are advised to seek and rely upon their own professional advice and assessment of the matters contained in the Guidelines and not rely solely on the Guidelines in relation to any issue that may or might risk any loss.

In addition, PIPA excludes:

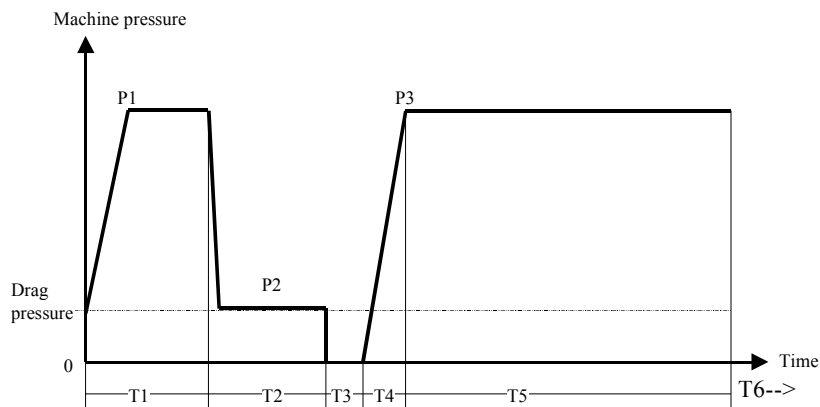
- (a) all conditions warranties and terms implied by statute general law or custom except where exclusion would contravene any statute; and
- (b) all liability to any user of the Guidelines for consequential or indirect damages or any other form of compensation or relief whatsoever for any acts or omissions of PIPA arising out of or in connection with the use of the Guidelines irrespective of whether the same arises at law in equity or otherwise.

PIPA's liability to any user of the Guidelines for any breach of a non-excludable condition or warranty is limited at PIPA's option to any one of resupplying replacing or amending that part of the Guidelines in respect of which the breach occurred.

### single pressure and low fusion

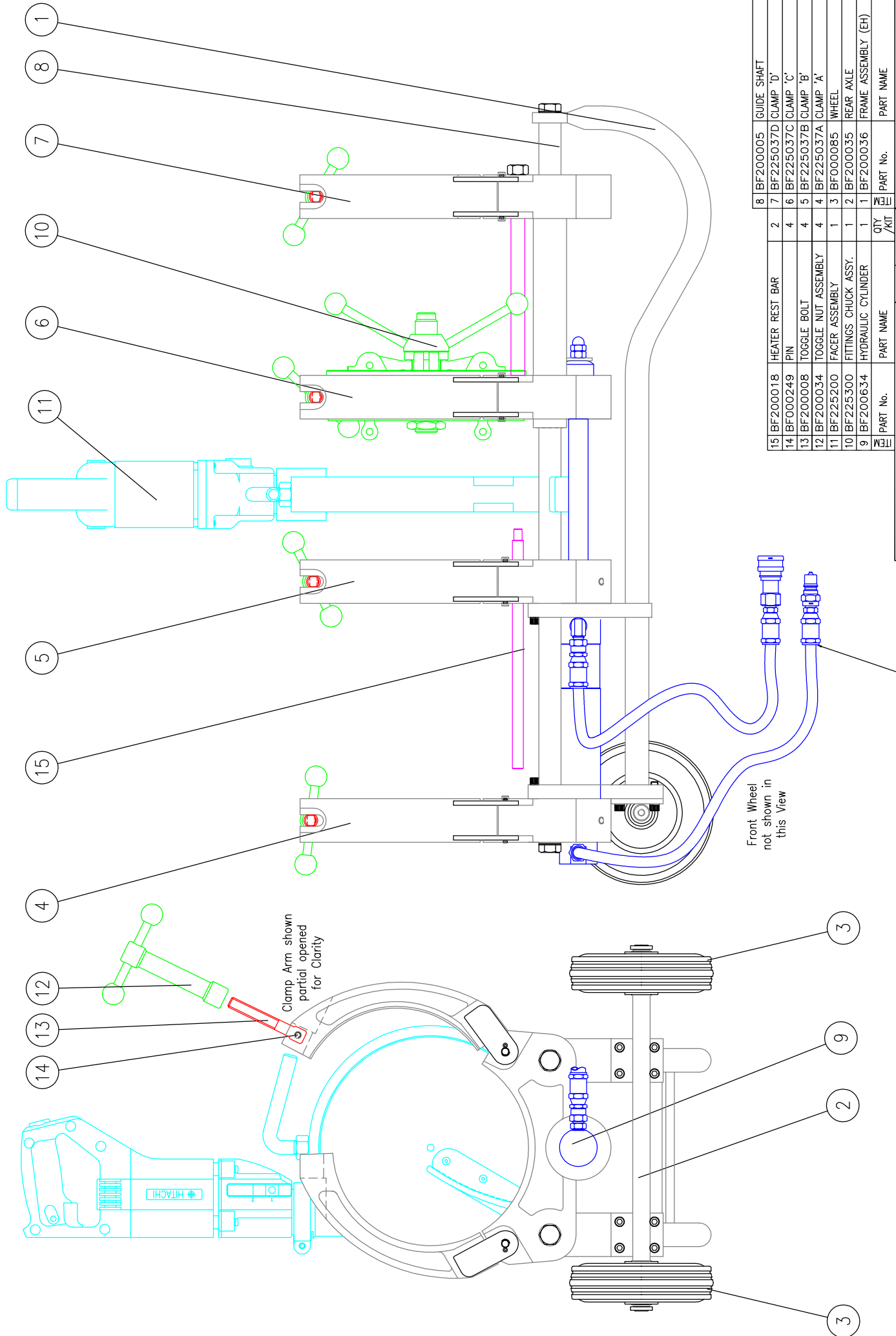
#### jointing pressure procedure

		Units	Value	Comments
Heater plate temperature		°C	200-245	
Pressure value: Bead up	P1	kPa	$170 \pm 20$	Calculate (see note 5). Always add drag pressure to calculated pressure.
Approx. bead width after bead up		mm	$0.5 + 0.1e_n$	max. 6mm.
Bead up time	T1	second		Varies with ambient conditions and pipe size.
Heat soak pressure	P2	kPa	Drag only	
Minimum heat soak time	T2	second	$(11 \pm 1) e_n$	
Maximum heater plate removal time	T3	second	$0.1e_n + 4$	
Max. time to achieve welding pressure	T4	second	$0.4e_n + 2$	
Fusion jointing pressure	P3	kPa	$170 \pm 20$	Calculate (see note 5). Always add drag pressure to calculated pressure.
Minimum cooling time in machine under pressure	T5	minute	$e_n + 3$	Time in clamps
Minimum cooling time out of machine	T6	minute	$e_n + 3$	Before "rough" handling is allowed.



#### Notes:

1. These parameters apply to the butt fusion of PE80 or PE100 polyethylene materials as specified in AS/NZS4131.
2. These parameters may also apply to the butt welding of PE80 to PE100. This may result in slightly different bead formation without reducing weld quality. If in doubt refer to the pipemaker.
3. Only pipes and fittings of the same diameter and wall thickness should be butt fused together.
4.  $e_n$  = mean pipe wall thickness calculated from AS4130 min/max values, rounded to the nearest mm.
5. Pressure calculation formula:  $\{\text{pipe annulus area, mm}^2\} \div \{\text{hydraulic cylinder area, mm}^2\} \times \{\text{pressure value, kPa}\}$ .  
where pipe annulus area =  $\pi (D_n - e_n) e_n$  and  $D_n$  means nominal pipe diameter.
6. Cooling times may require lengthening or shortening depending on ambient temperature.



Front Wheel  
not shown in  
this View

Clamp Arm shown  
partial opened  
for clarity

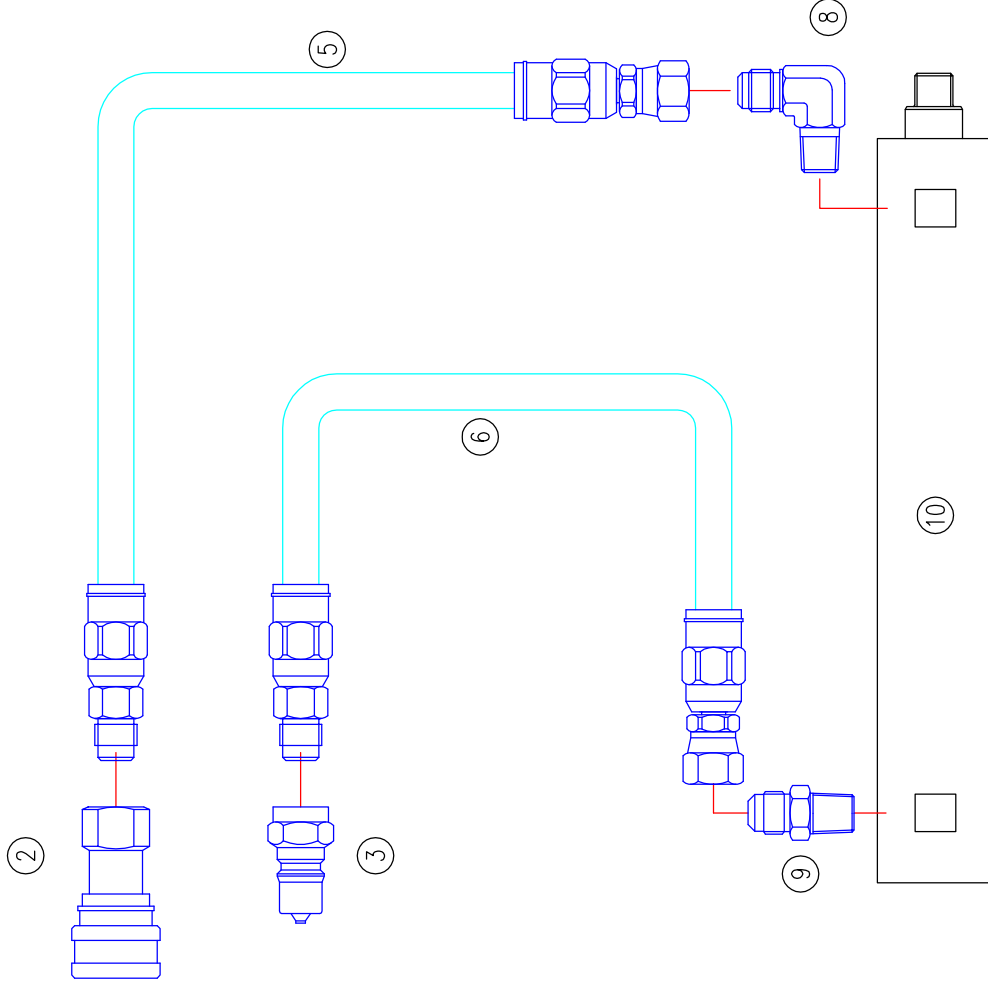
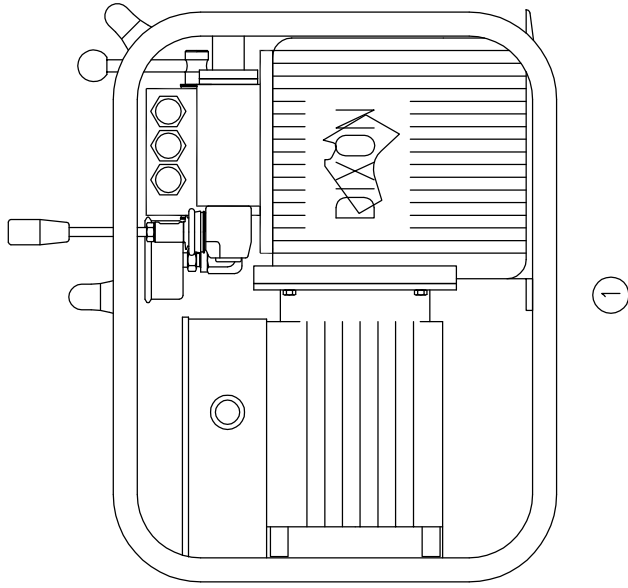
8	BF200005	GUIDE SHAFT	2
7	BF225037D	CLAMP 'D'	1
6	BF225037C	CLAMP 'C'	1
5	BF225037B	CLAMP 'B'	1
4	BF225037A	CLAMP 'A'	1
3	BF000085	WHEEL	2
2	BF200035	REAR AXLE	1
1	BF200036	FRAME ASSEMBLY (EH)	1
PART No.			QTY
PART NAME			/KIT

15	BF200018	HEATER REST BAR	2
14	BF000249	PIN	4
13	BF200008	TOGGLE BOLT	4
12	BF200034	TOGGLE NUT ASSEMBLY	4
11	BF225200	FACER ASSEMBLY	1
10	BF225300	FITTINGS CHUCK ASSY.	1
9	BF200634	HYDRAULIC CYLINDER	1
PART No.			QTY
PART NAME			/KIT

Drawing Name: Hf225 MACHINE ASSEMBLY (ELEC./HYD.)  
 OPERATORS MANUAL ONLY  
 Scale: Not To Scale  
 Drawn: SR  
 Date: 17/4/10  
 CAD File: U:\DWG\Manual Dwg\Hf225-MAN\BF2250AO-MAN.dwg  
 Copyright © No part of this drawing may be reproduced in whole or in part without the written permission of Dixon Industries Pty. Ltd.  
 ABN: 89 008 171 855  
 www.dixonind.com.au

TO ELECTRIC HYDRAULIC UNIT  
(REFER SEPERATE DRAWING)



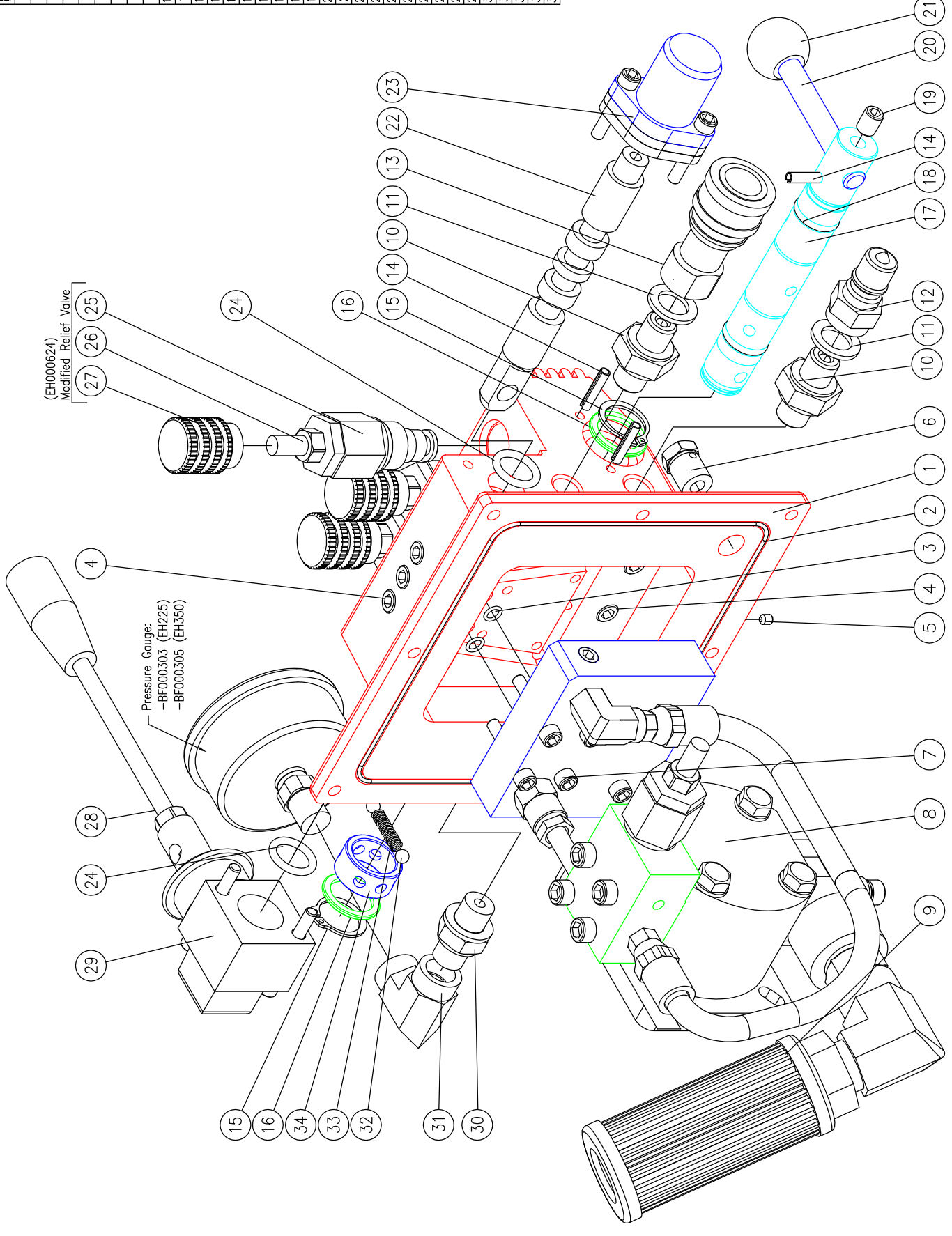
10	BF200634	Hydraulic Cylinder	1
9	BF000289	Nipple	1
8	BF000059	Elbow	1
7			
6	BF200667	Hose Assembly, EHU-1830mm	1
5	BF200666	Hose Assembly, EHU-2000mm	1
4			
3	BF000297	Quick Connect Male	1
2	BF000003	Quick Connect Female	1
1	EH225600	Electric Hydraulic Unit	1
ITEM	PART No.	PART NAME	QTY /KIT

ref. 3  
ref. 2

Drawing Name: HF225 ELECTRIC HYDRAULIC SCHEMATIC OPERATORS MANUAL ONLY  
 Scale: Not To Scale  
 Drawn: SR  
 Date: 7/4/10  
 CAD File: U:\DWG\Manual Dwg\HF225-MAN\BF2256A0-MAN

**DIXON**  
 INDUSTRIES PTY LTD  
 A.B.N. 89 008 171 855  
 www.dixonind.com.au

PART No.	PART NAME	QTY /KIT
1	EH000602 Valve Body	1
2	BF000033 O-Ring (Tank Lid)	1
3	BF000029 O-Ring	2
4	BF000065 Dry Seal Plug	6
5	BF000105 Set Screw	1
6	EH000626 Modified Plug	1
7	BF000106 Pump Assy Mtg Screw	6
8	BF000036 Pump	1
9	BF000193 Suction Element	1
10	BF000600 Nipple	2
11	BF000400 Metal Back Seal	2
12	BF000297 Quick Connect Male	1
13	BF000003 Quick Connect Female	1
14	BF000094 Roll Pin	3
15	BF000026 Circlip	2
16	BF630671 Spacer Washer	2
17	BF630680 Spool	2
18	BF000031 O-Ring (Spool)	2
19	BF000122 Set Screw	1
20	EH000608 Lever	1
21	BF200011 Knob	1
22	BF000005 Spool Type SD4	1
23	BF000020 Spool Detent Version 9	1
24	BF000032 O-Ring (Spool)	2
25	BF0000212 Relief Valve Cartridge	3
26	EH000611 Piston	3
27	EH000609 Aluminium Knob	3
28	BF000028 LEVER FOR D/C	1
29	BF000019 LEVER ASSY STANDARD D/C	1
30	BF000601 Nipple	1
31	BF000050 Elbow	1
32	BF000470 S/S Brg. Ball	2
33	BF630674 Detent Spring	1
34	BF630673 Detent Ring	1



**DIXON**  
INDUSTRIES PTY LTD

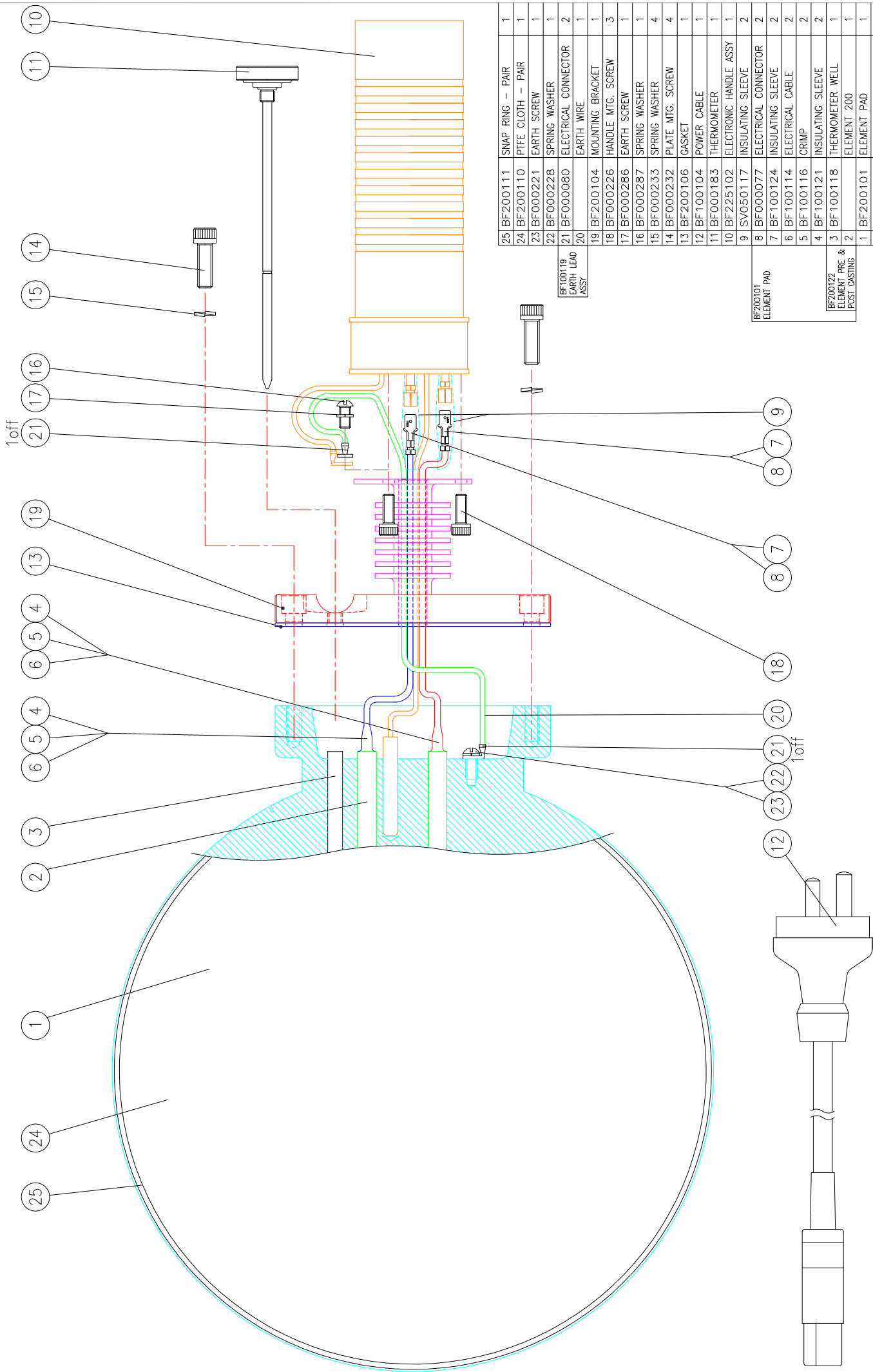
Scale: Not To Scale  
Drawn: SR  
Date: 22/12/10

Drawing Name:  
ELECTRIC HYDRAULIC UNIT  
OPERATORS MANUAL ONLY

CAD File: U:\DWG\Mech Desktop\EH000\000636.dwg  
Asn: 88 008 171 855  
www.dixonind.com.au

Copyright ©. No part of this drawing may be reproduced in whole or in part without the written permission of Dixon Industries Pty. Ltd.





25	BF200111	SNAP RING - PAIR	1
24	BF200110	PIPE CLOTH - PAIR	1
23	BF000221	EARTH SCREW	1
22	BF000228	SPRING WASHER	1
21	BF000080	ELECTRICAL CONNECTOR	2
20		EARTH WIRE	1
19	BF200104	MOUNTING BRACKET	1
18	BF000226	HANDLE MTG. SCREW	3
17	BF000286	EARTH SCREW	1
16	BF000287	SPRING WASHER	1
15	BF000233	SPRING WASHER	4
14	BF000232	PLATE MTG. SCREW	4
13	BF200106	GASKET	1
12	BF100104	POWER CABLE	1
11	BF000183	THERMOMETER	1
10	BF225102	ELECTRONIC HANDLE ASSY	1
9	SV050117	INSULATING SLEEVE	2
8	BF000077	ELECTRICAL CONNECTOR	2
7	BF100124	INSULATING SLEEVE	2
6	BF100114	ELECTRICAL CABLE	2
5	BF100116	CRIMP	2
4	BF100121	INSULATING SLEEVE	2
3	BF100118	THERMOMETER WELL	1
2		ELEMENT PAD	1
1	BF200101	ELEMENT PAD	1
PART No.			QTY /KIT
PART NAME			

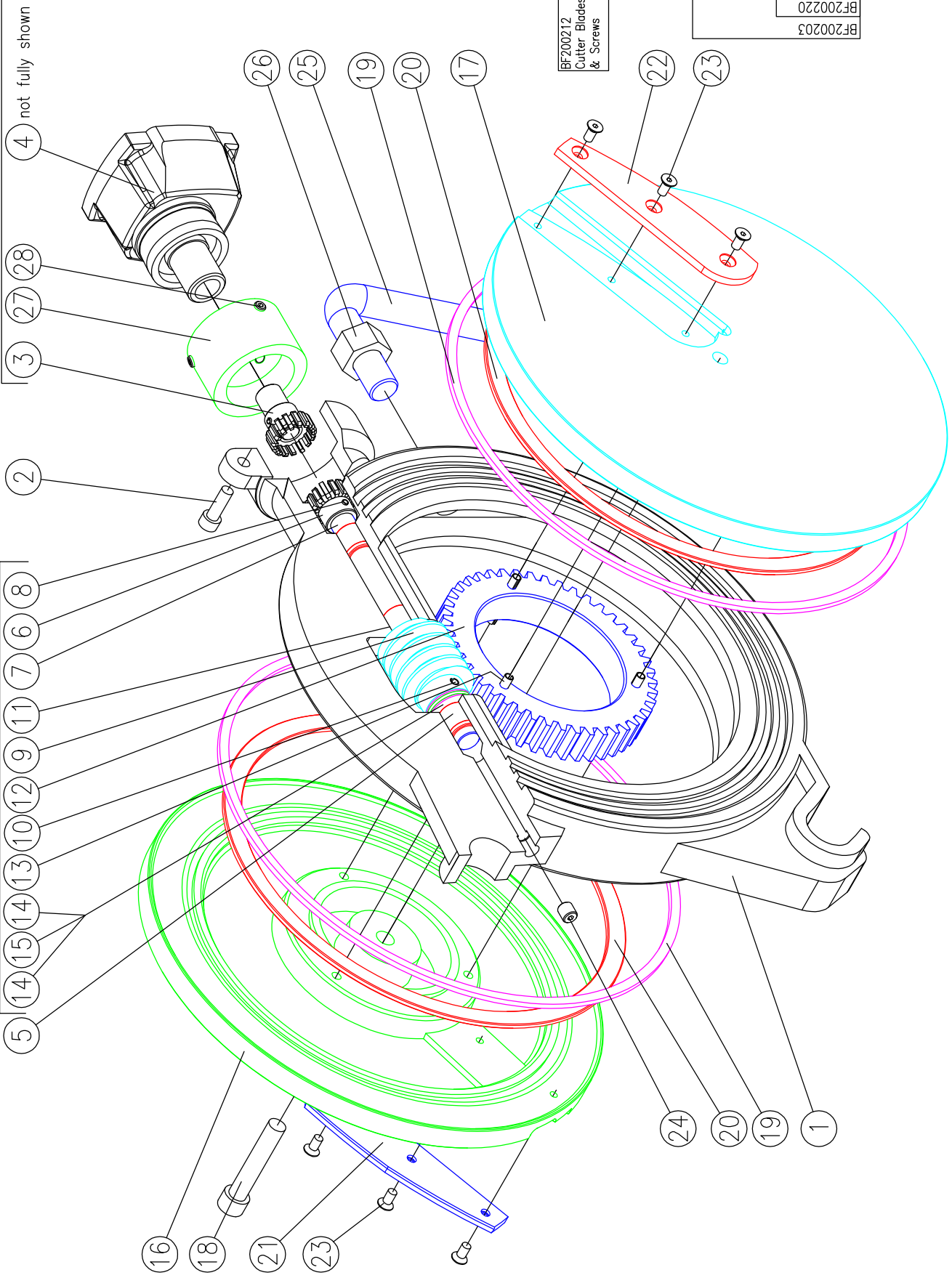
Copyright © No part of this drawing may be reproduced in whole or in part without the written permission of Dixon Industries Pty. Ltd.  
 A.B.N. 89 008 171 855 www.dixonind.com.au

Drawing Name: HF225 HEATER PLATE ASSEMBLY OPERATORS MANUAL ONLY  
 Scale: Not To Scale  
 Drawn: SR  
 Date: 28/05/09  
 CAD File: U:\DWG\Manual Dwg\HF225-MAN\BF2001A0-MAN

NOTE: ASSEMBLY SHOWN EXPLODED FOR CLARITY, ELECTRICAL CABLE LENGTHS SHOWN MAY NOT BE TO SCALE.  
 UNCONTROLLED DOCUMENT

FACER WORM DRIVE ASSEMBLY – P.No.BF200203

DRILL CHANGEOVER – P.No.BF225250



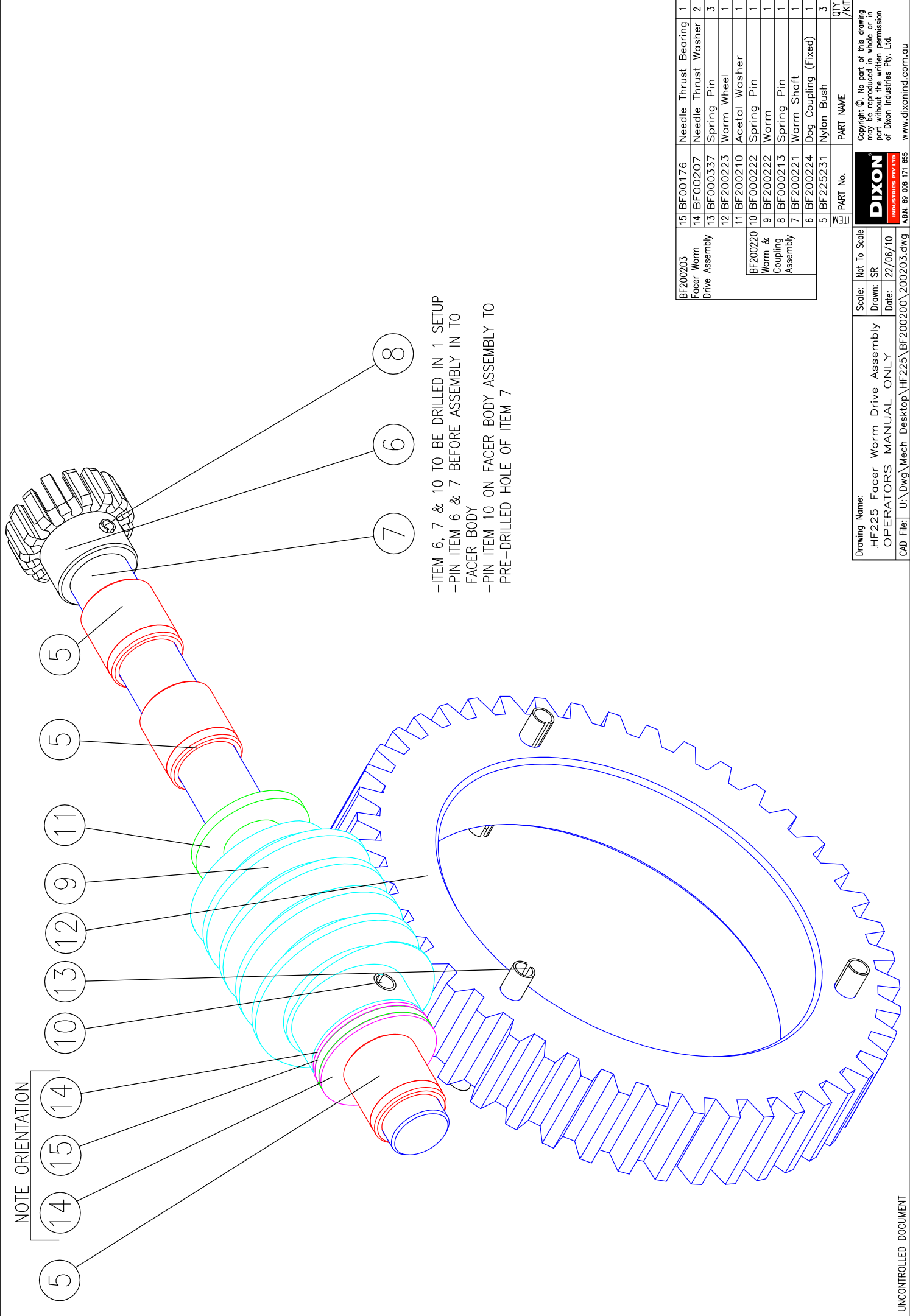
3 27 28 4 not fully shown

5 14 15 16 17 18 19 20 21 22 23

28	BF000109	Set Screw	3
27	BF225247	Drill Adaptor	1
26	BF000166	Hex Nut	1
25	BF200218	Facer Handle	1
24	BF000239	Set Screw	1
23	BF000217	Blade Screw	6
22	BF200212T	Cutter Plate (Tapped)	1
21	BF200212B	Cutter Blade (Bored)	1
20	BF200207	Rally Thrust Ring (Pair)	1
19	BF200205	Felt Seal (Pair)	1
18	BF000267	Cutter Plate Screw	1
17	BF200208	Cutter Plate (Tapped)	1
16	BF200202	Cutter Plate (Bored)	1
15	BF000176	Needle Thrust Bearing	1
14	BF00207	Needle Thrust Washer	2
13	BF000337	Spring Pin	3
12	BF200223	Worm Wheel	1
11	BF200210	Acetal Washer	1
10	BF000222	Spring Pin	1
9	BF200222	Worm	1
8	BF000213	Spring Pin	1
7	BF200221	Worm Shaft	1
6	BF200224	Dog Coupling (Fixed)	1
5	BF225231	Nylon Bush	3
4	BF000722	Drill (PROT00L MXP800E)	1
3	BF225246	Dog Coupling	1
2	BF000232	Clamp Screw	1
1	BF225201	Body – suit DMT16	1
	PART No.	PART NAME	QTY /KIT

Drawing Name: HF225 FACER ASSEMBLY OPERATORS MANUAL ONLY  
 Scale: Not To Scale  
 Drawn: SR  
 Date: 19/12/09  
 CAD File: U:\Dwg\Mech. Desktop\HF225\BF200200\BF225200PROT00L.dwg

**DIXON**  
 INDUSTRIES PVT LTD  
 A.S.N. 88 008 171 855  
 Copyright ©. No part of this drawing may be reproduced in whole or in part without the written permission of Dixon Industries Pty. Ltd.  
 www.dixonind.com.au



NOTE ORIENTATION

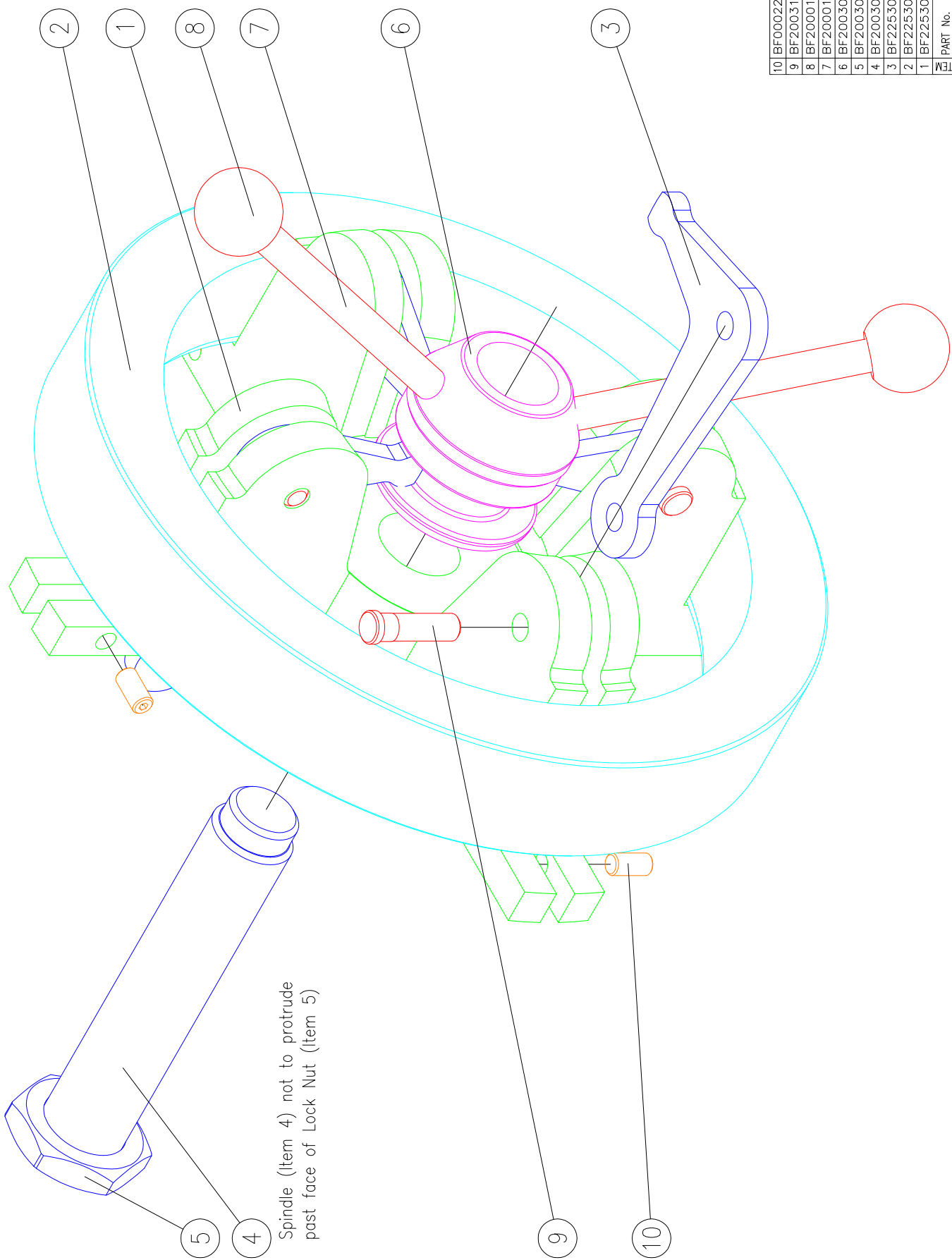
-ITEM 6, 7 & 10 TO BE DRILLED IN 1 SETUP  
 -PIN ITEM 6 & 7 BEFORE ASSEMBLY IN TO  
 FACER BODY  
 -PIN ITEM 10 ON FACER BODY ASSEMBLY TO  
 PRE-DRILLED HOLE OF ITEM 7

BF200203	15	BF00176	Needle Thrust Bearing	1
Face Worm Drive Assembly	14	BF00207	Needle Thrust Washer	2
	13	BF000337	Spring Pin	3
	12	BF200223	Worm Wheel	1
	11	BF200210	Acetal Washer	1
BF200220	10	BF000222	Spring Pin	1
Worm & Coupling Assembly	9	BF200222	Worm	1
	8	BF000213	Spring Pin	1
	7	BF200221	Worm Shaft	1
	6	BF200224	Dog Coupling (Fixed)	1
	5	BF225231	Nylon Bush	3
		PART No.	PART NAME	QTY /KIT

Drawing Name: HF225 Face Worm Drive Assembly  
 OPERATORS MANUAL ONLY  
 CAD File: U:\Dwg\Mech\Desktop\HF225\BF200200\200203.dwg

Scale: Not To Scale  
 Drawn: SR  
 Date: 22/06/10

**DIXON**  
 INDUSTRIES PTY LTD  
 A.B.N. 89 008 171 855 www.dixonind.com.au



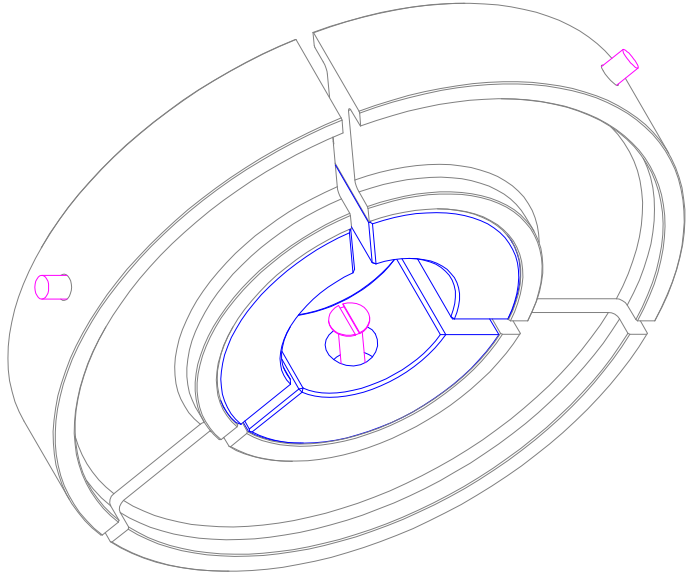
Spindle (Item 4) not to protrude past face of Lock Nut (Item 5)

Item No.	Part Name	Qty
10	BF000229 Set Screw	4
9	BF200310 Stepped Pin	4
8	BF200011 Aluminium Knob	2
7	BF200010 Tee Bar	2
6	BF200306 Adjusting Nut	1
5	BF200305 Lock Nut	1
4	BF200304 Spindle	1
3	BF225303 Finger Lever	4
2	BF225302 Rim	1
1	BF225301 Body	1
	PART No.	
	PART NAME	
	QTY	
	/KIT	

Drawing Name: HF225 FITTINGS ATTACHMENT OPERATORS MANUAL ONLY  
 Scale: Not To Scale  
 Drawn: SR  
 Date: 26/05/09  
 CAD File: U:\Dwg\Mech Desktop\HF225\BF200300\2253a0.dwg

**DIXON**  
 INDUSTRIES PTY LTD  
 A.B.N. 89 008 171 855 www.dixonind.com.au

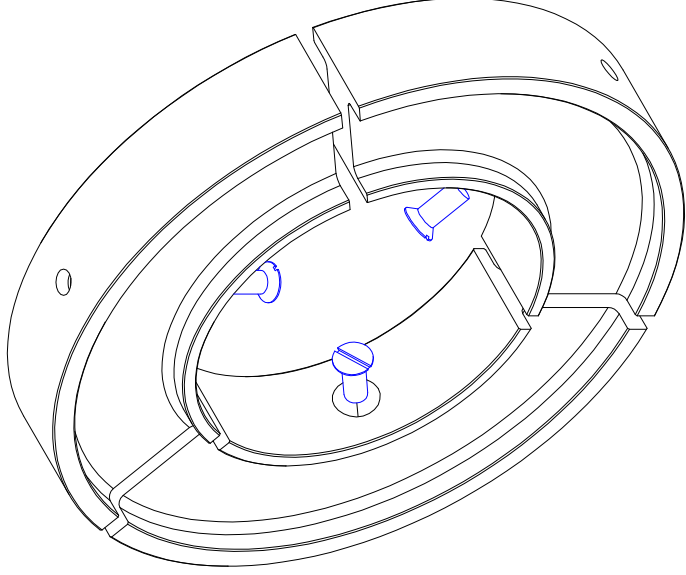
Copyright © No part of this drawing may be reproduced in whole or in part without the written permission of Dixon Industries Pty. Ltd.



USE MOUNTING SCREW  
PART No. BF000354

PART No.	SIZE
BF110963P	110-63
BF110969P	110-69
BF110975P	110-75
BF110990P	110-90

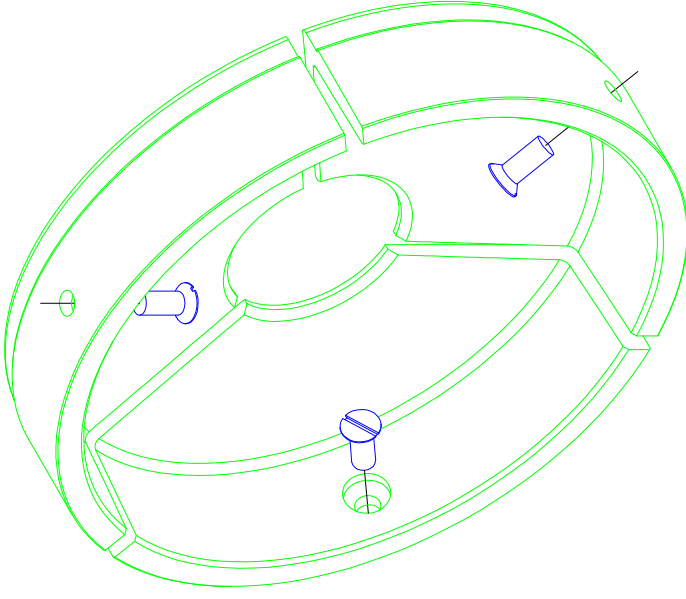
110-63 SHOWN  
LINERS FIT INTO 225-110 LINERS



USE MOUNTING SCREW  
PART No. BF000236

PART No.	SIZE
BF225911P	225-110
BF225912P	225-125
BF225914P	225-140
BF225916P	225-160
BF350925P	355-250
BF225918P	225-180
BF225920P	225-200

225-125 SHOWN  
LINERS FIT INTO MACHINE CLAMPS



USE MOUNTING SCREW  
PART No. BF000236

PART No.	SIZE
BF225906N	225-63
BF225907N	255-75
BF225909N	225-90
BF225911N	225-110
BF225912N	225-125
BF225914N	225-140
BF225916N	225-160
BF225918N	225-180
BF225920N	225-200

225-63N SHOWN  
LINERS FIT INTO MACHINE CLAMPS

Drawing Name: HF225 CLAMP LINERS OPERATORS MANUAL ONLY  
CAD File: U:\DWG\Mech Desktop\HF225\BF200900\225 Clamp Liners

Scale: Not To Scale  
Drawn: SR  
Date: 28/05/09  
A.B.N. 89 008 171 855  
www.dixonind.com.au



Copyright ©. No part of this drawing may be reproduced in whole or in part without the written permission of Dixon Industries Pty. Ltd.









