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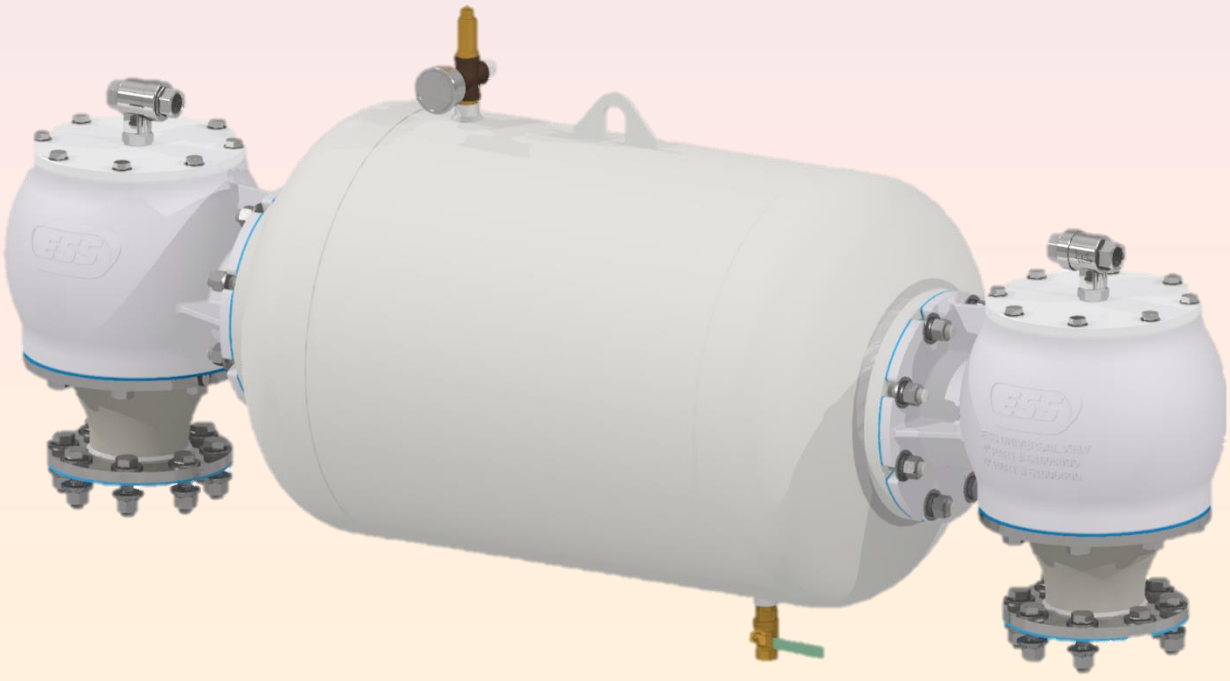
Universal XHV Air Cannon (UXHV)

Installation, Operation & Maintenance Manual



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WARRANTY

ESS warrants the **ESS Air Cannon** to be free of defects both in materials and workmanship for a period of 12 months from the date of despatch of the product from the *ESS* factory. The warranty given by *ESS* in this regard will extend only to replacing or repairing product shown to be defective.

The warranty is also subject to the following restrictions:

a) Installation of the product contrary to the instructions contained in the supplied manual will void such warranty absolutely;
b) The warranty will not extend to any liability for injuries incurred and which result from the use of the product contrary to the instructions in the manual;
c) Save as prescribed by law, *ESS* will not be liable for any damage sustained by a purchaser or a third party by way of consequential loss arising out of defects in the product.

You are asked to note that *ESS* offers purchasers a service whereby either:

It will install the product and certify the correctness of such installation, or

Certify the correctness or otherwise of the installation of the product by third parties.

This certification service is designed to ensure that you obtain the full benefit of the *ESS* warranty hereby provided. If you would like to take advantage of the installation certification service provided, please contact *ESS* regarding the service.

Refer to the Final Checklist at the back of this manual.

Visit the *ESS* website www.esseng.com.au to register your product warranty.

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1. INTRODUCTION

This manual will assist in the installation and operation of ESS' XHV External Valve Air Cannons. Please read the entire manual to assure proper installation, operation, and maintenance of this equipment. These instructions apply to the following models, from left to right:

1.1.SAFETY LABELS

Pictograph labels are used to show graphically where potential safety hazards exist around this product. These labels do not represent every possible hazard. They are not intended to be a substitute for safe work practices and good judgment. These labels and *ESS* technical manuals use specific words to identify the severity of the hazard. They are described below. Take time to read and understand the meaning of these words and symbols.

Danger labels call attention to imminently hazardous situations that will result in serious personal injury or death if not avoided. Injury from these hazards is immediate in nature and has a high probability of resulting in a serious or fatal accident if proper precautions are not followed.

Warning labels call attention to potentially hazardous situations that could result in serious personal injury or death if not avoided. Injury from these hazards is usually serious in nature, and a severe or fatal accident can occur if proper precautions are not followed.

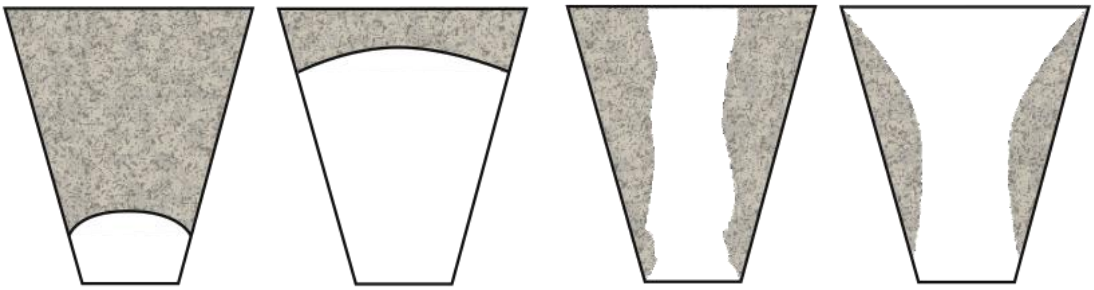
Caution labels call attention to potentially hazardous situations that may result in minor or moderate personal injury if not avoided. Injury from these hazards is normally less serious than those from Danger or Warning hazards. However, there is still the potential for an accident resulting in serious injury if proper precautions are not followed.

1.2.GENERAL

ESS Air Cannons are pressure vessels with an attached valve mechanism that is designed to discharge stored air at a very high velocity. The resultant air blast is used to dislodge adhering, bridging, or built-up bulk materials in bins, silos, and stockpiles. The air blast is directed to the required location via fully welded and secured blast pipework. On most applications, a number of Air Cannons will be utilised as a system approach to solving a material flow problem, with cannons firing in a determined sequence.

1.3.WHAT IS AN AIR CANNON?

ESS Air Cannons are direct blast aerators consisting of a compressed air reservoir with a quick opening valve that releases the stored air in a sudden, high energy blast. This blast is directed through a discharge pipe to restore material flow by aerating and dislodging material that is bridging, arching, rat holing, or clinging.



Bridging Arching Rat holing Clinging

The direct blast design of the valve allows the stored air in the reservoir to escape directly through the valve into the discharge pipe without bends or obstructions that could impede the flow of air. This is important because the quicker the air discharges, the greater the velocity, impulse, and force of the blast and, therefore, the greater the amount of material affected. Air Cannons are activated remotely via a Sequence Controller which controls the firing time interval and sequence of one or more Air Cannons. ESS Engineering offers three valve sizes in their Air Cannons; 2.5” (2”), 4”, and 6”. These Air Cannons are rated for high temperature applications (ambient temperatures up to 119°C) such as cement kilns and steel mills where internal kiln temperatures can be as high as 1,100°C.

1.4.APPLICATIONS

Air Cannons easily solve bulk flow problems in silos, hoppers, chutes, and storage piles. They are used where vibration is not practical, or when other methods are too expensive, dangerous, or destructive. Air Cannons are recommended for a wide range of material clogs and jams and are well suited for large structures of any type. They are commonly used when it is impractical to physically shake stuck material loose, and are effective for very cohesive, difficult materials. For instance, large concrete bunkers and storage piles on the ground are impossible to vibrate but are common locations of flow problems. Wood chips are very difficult to dislodge by other means but respond very well to the quick-release air impulse. Air Cannons are also used to periodically aerate material sitting in bins, hoppers, and silos since their blast will lift and separate the material rather than compact it.

1.5.SAFETY PRECAUTIONS

The air blast can ***exceed 300 m/sec and 680 kg of force***. Be sure to read and follow all safety precautions.

- Do not stand in front of any Air Cannon during discharge. The air blast can cause serious injury or death.
- Use of an Air Cannon to shoot a projectile may cause serious injury or death.

- ESS Air Cannon pressure vessels are AS 1210 designed, welded, and certified. Do not weld onto the pressure vessel (tank). Welding to the tank will void AS 1210 certification and may cause vessel malfunction.
- All WH&S, MDG and owner's safety procedures and regulations must be followed during installation, operation, and maintenance of Air Cannons.
- Do not discharge the Air Cannon into open air without clear warnings to all persons in the area.
- The Air Cannons are LOUD. Do not discharge with nearby personnel without hearing protection. Doing so may cause permanent hearing damage.
- All Air Cannons must be empty of air when being transported, mounted, or inspected.
- Due to recoil, do not discharge an Air Cannon that is not securely mounted to a structure.
- Mount the Air Cannon securely on Schedule 40 pipe or equivalent. If structure is not sufficiently rigid to support the Air Cannon, contact your ESS Representative to obtain special mount hardware.
- Attach the lifting lug on the end of the Air Cannon tank to a structural support with a suspension kit to prevent the Air Cannon from falling if its supports were to give way.
- Do not enter application structure (i.e. bin or hopper) if Air Cannons are pressurized and ready to be discharged.

⚠ CAUTION

- Do not allow the internal pressure in a closed storage vessel to exceed its limitations when the Air Cannons are fired. This may cause damage to the storage vessel. Install exhaust vents if pressures exceed 0.03 bar. Generally, ESS will design so this will not be an issue. The momentary vessel pressure following the firing of an Air Cannon can be estimated as follows:

$$P_m = \frac{\text{Air Cannon tank pressure (atm) x Air Cannon tank volume (litres)}}{\text{Air Cannon tank volume (litres) + Structure volume (litres)}}$$

- ESS 4" and 6" series Air Cannons can withstand ambient temperatuers between -10°C and 119°C. Exposure to temperatures outside of this range this will cause the piston to seize. Damage caused by operating ESS 4" and 6" series Air Cannons at temperatures outside of this range are not covered by the product warranty. Do not expose the 2" to high temperatures .

- For continued operation, operators must comply with the relevant Mines Safety Regulation, AS 3788 – Pressure Vessels - In-Service Inspection, or their own Risk Based Inspection (RBI) procedures.

DANGER

Do not remove air lines when tank is pressurised. Doing so may cause tank to fire. Always drain tank pressure from the tank itself via the pressure relief valve or ball valve.

1.6.AIR CANNON OPERATION

1.6.1. GENERAL OVERVIEW - HOW THE AIR CANNON WORKS

Two options of firing arrangements are available to choose from. These options are explained below.

1.6.1.1. FILL ON DEMAND (NORMALLY CLOSED)

When the actuation signal is sent it causes the tank to begin filling, and when the actuation signal is removed the tank automatically fires. A remotely actuated normally closed 3-way pilot solenoid controls another 3-way normally-closed solenoid. In this arrangement, the tank will only fill when the actuation signal causes the pilot solenoid to open another 3-way normally closed solenoid.

Referencing the figure below, without the actuation signal the air supply is unable to fill the tank. When the actuation signal is sent, the first normally closed pilot solenoid is switched open to supply a pilot line that causes a tank-mounted solenoid to open, allowing the tank to fill. The colours are for indicative purposes only.

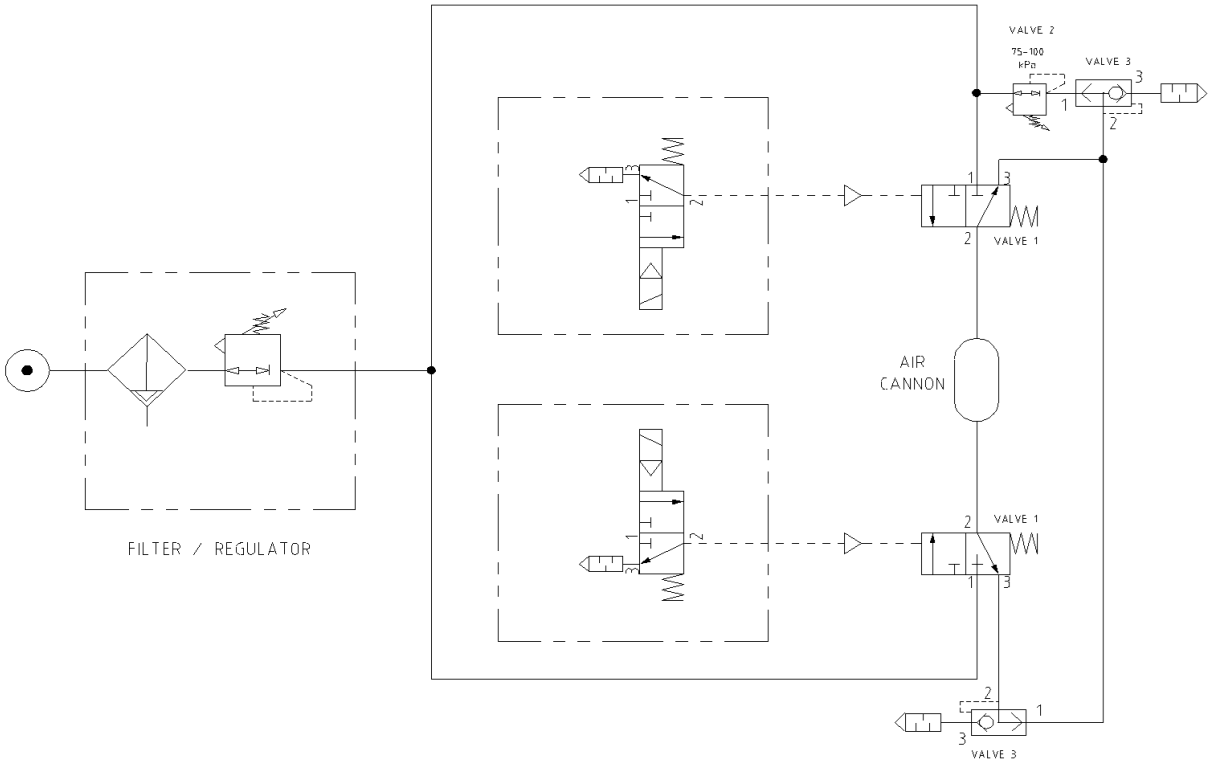


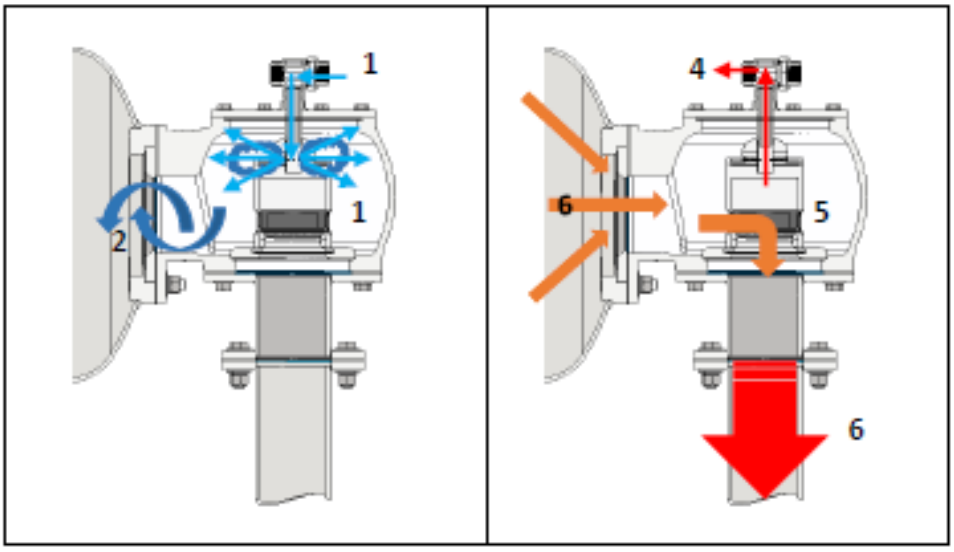
Figure 1 - Normally Closed Pneumatic Schematic

After the actuation signal sent from an automated PLC is removed, the pilot valve will close again, which in turn causes the tank-mounted valve to close/switch, causing the fill tube air to exhaust, and the cannon fires. This firing arrangement of Option 1 ensures that the tank fills when required, and the tank is not kept pressurised reducing the chance of a misfire if line pressure is lost. This also has the added benefit of reducing air consumption, as any air that could be lost due to leaks will no longer occur, and air will be consumed by the tank

only when needed which frees up available compressed air for other uses. This is ESS' recommended option for air cannon control.

A step-by-step outline of the filling and discharging process follows:

1. A patented circuit, consisting of a low-pressure regulator, in conjunction with a quick-exhaust valve maintains a pressure slightly more than atmosphere to positively close the Air Cannon valves. This ensures that the tank is not charged to high pressure whilst ensuring no material ingress via open valves.
   An actuation signal is sent to the master pilot solenoid, which switches to open a pilot line to a second 3-way slaved solenoid, which allows plant air to enter the Air Cannon.
2. Plant air is forced out through the check valve in the quick exhaust valve cap to fill the pressure vessel with air. The pressure of the plant air ensures an airtight seal between the piston and seat, preventing any air loss while Air Cannon is waiting to be fired.
3. Due to the pressure differential created, the tank pressure forces the piston back into the open position.
4. The compressed air in the pressure vessel escapes through the discharge in an explosive blast that lifts and separates material particles, restoring material flow.
5. The actuation signal will automatically cease after a pre-set duration.
   When the signal is removed, the pilot solenoid closes and exhausts the pilot line, which in turn closes the tank 3-way valve, so air in the tank's internal fill tube is exhausted, causing the air pressure at the back of the piston to drop.



1.6.1.2. READY-FILLED (NORMALLY OPEN)

Each Blaster is by default filling with compressed air through an air inlet controlled by a single 3-way normally open solenoid valve. Once filled, the Air Cannon remains charged as long as pressure to the tank is maintained by pressure in the fill line. To fire the Air Cannon, an actuation signal is sent to the solenoid causing it to switch, and pressure in the fill line is suddenly exhausted, evacuating the air to the atmosphere. After firing, the 3-way valve will automatically switch closed, restoring plant air allowing the Air Cannon to refill.

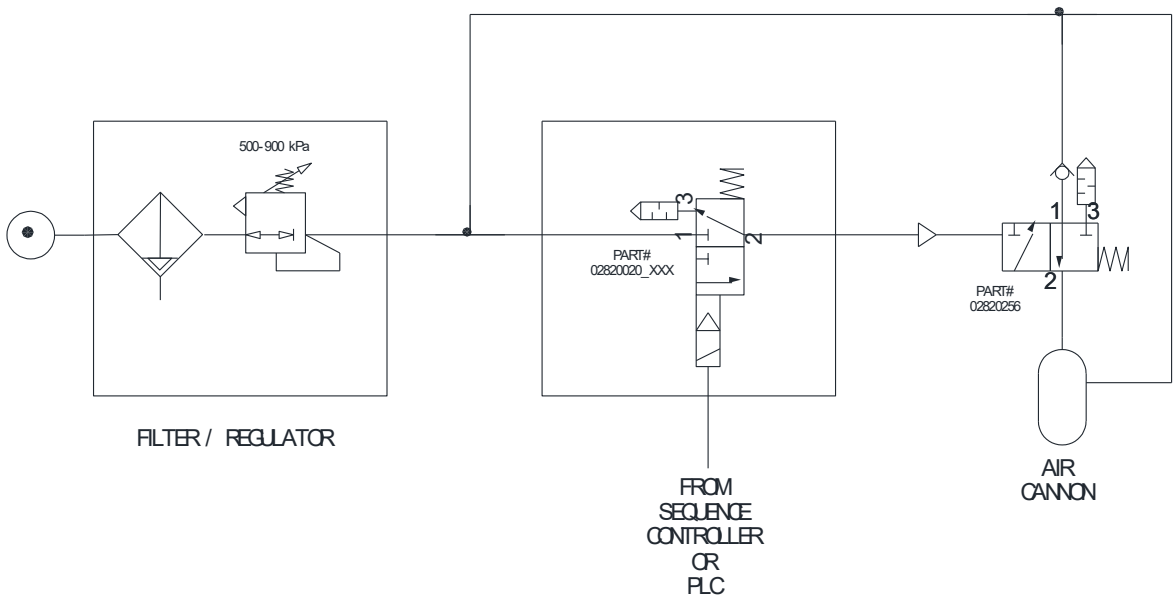
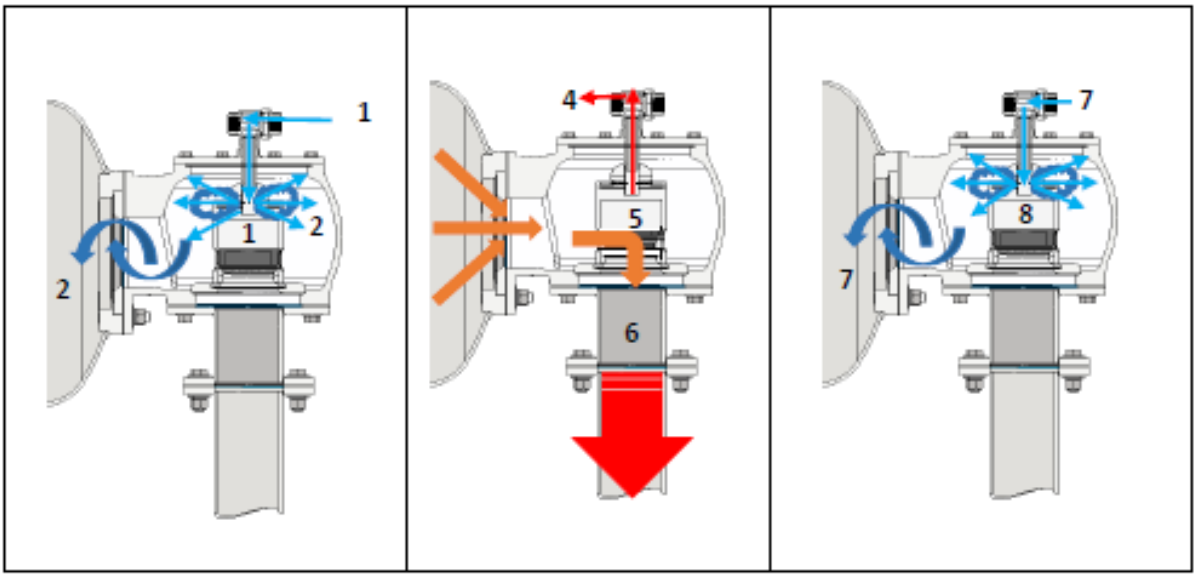


Figure 2 - Normally Open (NO) Single ended Air Cannon Pneumatic Schematic

A step-by-step outline of the filling and discharging process follows:

1. A 3-way valve in the open position allows plant air to enter the Air Cannon. The pressure of the plant air ensures an airtight seal between the piston and seat, preventing any air loss while the Air Cannon is waiting to be fired.
2. Plant air is forced out through the check valve in the quick exhaust valve to fill the pressure vessel with air.
3. Once filled, the Air Cannon remains on standby waiting to be fired.
4. When the actuation signal is sent, the 3-way valve is switched, and air in the fill line is exhausted, causing the air pressure at the back of the piston to drop.
5. Due to the pressure differential created, the tank pressure forces the piston back into the open position.
6. The compressed air in the pressure vessel escapes through the discharge in an explosive blast that lifts and separates material particles, restoring material flow.
7. The 3-way valve is automatically re-switched allowing the plant air to recharge the Air Cannon.
8. The pressure of the plant air forces the piston to close against the valve seat preventing contaminants from entering the Air Cannon.



NOTE

The MAC 55 series slave valve attached to the cannon has 3/8" ports and is pneumatically pilot operated (does not require electrical power). The electrical control solenoids (MAC 100 series) which supply this pneumatic pilot signal are housed in a sperate control box enclosure. Refer to the assembly drawings in the appendix for specific part numbers for voltage/type options.

1.6.2. INSTALLATION OF SUPPLIED AIR CANNON

1.6.2.1. AIR REQUIREMENTS

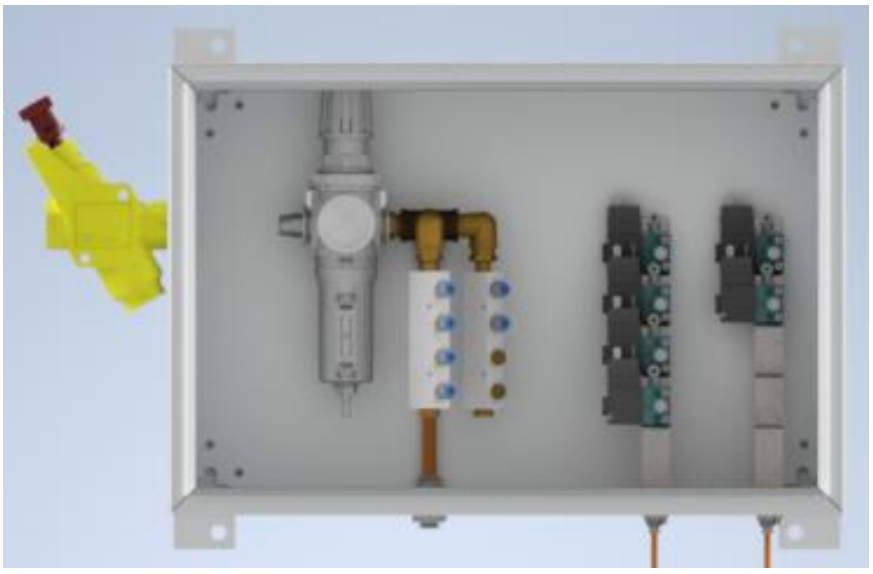
For optimum performance, operate the Air Cannon on filtered, regulated air between 3-8.5bar. The pressure may be adjusted to obtain the desired amount of blast force (generally 6 to 7 bar). Refer to ESS for recommendations on air pressure. A standard air compressor can be used, however; nitrogen, carbon dioxide, or another inert gas can be used in place of the normal air supply. The Air Cannon pressure vessel has a 9.65 bar pressure relief valve (safety valve) which can be used to completely exhaust the compressed air inside the tank without firing the Air Cannon. The ball valve is used for draining excess moisture that accumulates in the tank.

1.6.2.2. AIR FILTRATION

Use filtered (40 Micron) compressed air to fill and operate the Air Cannon.

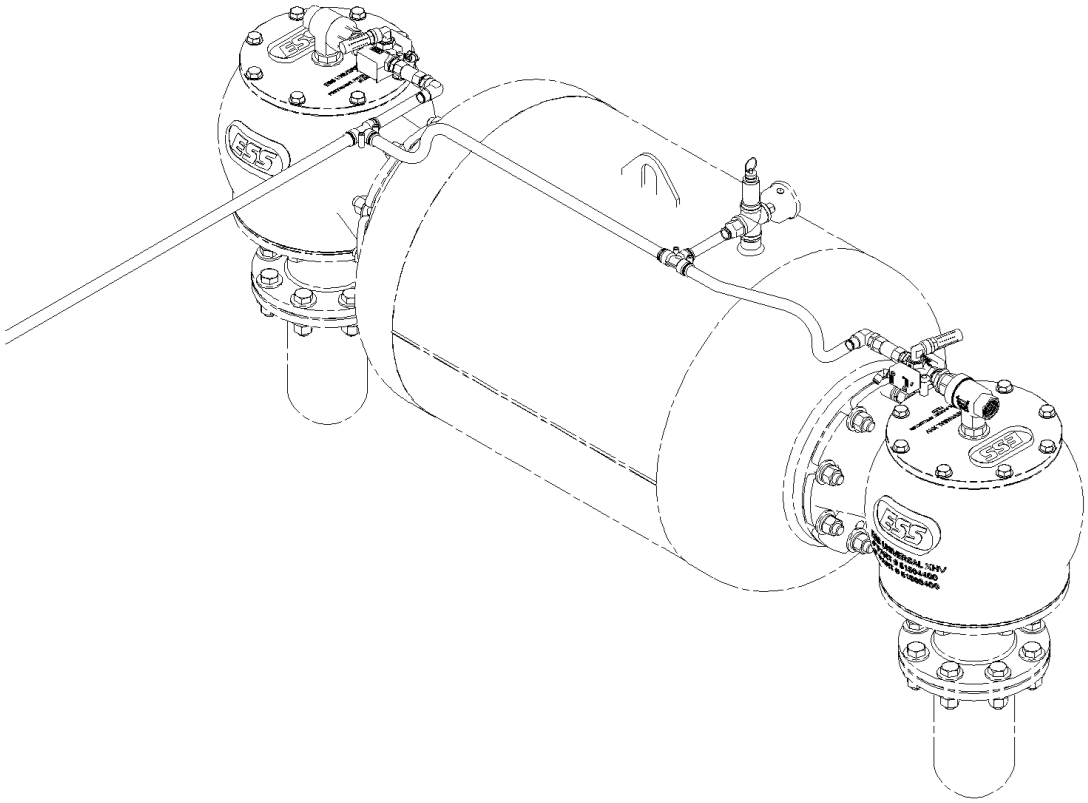
1.6.2.3. ESS FIRING KIT CONTROL BOX

ESS recommends purchasing a Firing Kit Control Box with your Air Cannons for installation remotely from where the air cannons are located. This control box is a 'plug-and-play' solution such that you can simply connect air and power to the box and have the air cannons able to be used without the need to have any cables mounted to the air cannons. There are simply a supply (12mm) and control (6mm) air line required to be connected to the air cannon.



1.6.2.4. QUICK-FILL ASSEMBLY

The Air Cannon should be hosed to enable the fastest fill time available to have quickest uptime for repeated firing, especially in the instances of a double-ended operation. Ample tubing and fittings are supplied with all ESS Firing kits and should be plumbed up with the 12mm tubing as shown.



1.7.WHEN TO "FIRE" THE AIR CANNON

It is best to discharge the Air Cannon only when a material flow problem occurs. Firing too often when the storage vessel discharge is closed is not recommended. A group of Air Cannons may be fired sequentially using an ***ESS Air Cannon Sequence Controller*** PLC based sequencing timer or integrated into an existing control system.

1.7.1. REQUIRED ACCESSORIES:

This manual includes instructions for installing a complete Air Cannon system. The following external air control components are necessary for ESS Air Cannons to be fully operational.

1.7.1.1. QUICK EXHAUST VALVE:

The Air Cannon is discharged by reducing the pressure in the air supply. First, the solenoid releases pressure in the fill line, which causes the Quick Exhaust Valve to open. The QEV then quickly discharges the air from the internal fill pipe, causing the valve piston to retract due to the pressure differential.

1.7.1.2. 3/2 DUMP VALVE

A 3-Way spool lockout valve in Safety Red and Yellow, mounted on the inlet of the control box to enable full air discharge of the air cannon system and a lockable handle for isolation procedural compliance. (Comes standard with Firing Kit control boxes)

1.7.1.3. SHUT OFF BALL VALVE

A 2-way shut-off ball valve is used to verify that the pressure vessel is discharged, and can be used to drain accumulated moisture in the vessel. **Clearly label and locate the shut-off valve where it can be quickly and easily reached in an emergency or for routine maintenance.** A 1/2" or larger valve is recommended for all ESS Air Cannon models. See Air Cannon Orientation on page **Error! Bookmark not defined.**21.

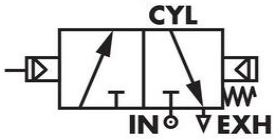
1.7.1.4. FILTER REGULATOR GAUGE:

The filter-regulator-gauge (FRG) protects the Air Cannon and airline components by filtering water and particulate contaminants from the air supply. It also is used to control the force output of the Air Cannon by regulating the air pressure (determines the volume of air stored in the Air Cannon pressure vessel). For optimum performance drain the filter reservoir of the FRG daily. For this reason, an FRG that drains automatically may be desired. We recommend using one (1) FRG for every four (4) Air Cannons. A 1/2" or larger FRG is recommended for all Air Cannon models.

1.7.1.5. AIRLINE CHECK VALVE

The airline check valve prevents accidental firing of the Air Cannon due to pressure loss in the main supply line. If the main airline loses pressure, the check valve maintains pressure to the Air Cannon by preventing backward air flow out of Port 1. Use one check valve for every Air Cannon, and install it between the FRG and the 3-way control valve. A 1/2" or larger check valve is recommended for all Air Cannon models, when using firing arrangement Option 2 – Normally Open firing circuit.

1.7.1.6. 3-WAY CONTROL VALVE



ESS has available for purchase two options of firing arrangements using MAC solenoid valves, as mentioned previously in GENERAL OVERVIEW - HOW THE AIR CANNON WORKS on Page 11.

1.7.1.7. PRESSURE RELIEF VALVE

This safety device will relieve tank pressure if pressure exceeds 9.65 bar. It can also be used to manually drain the tank for maintenance.

2. INSTALLATION

2.1.AIR CANNON ORIENTATION

In general, it is best to have transition pipes that the Air Cannons are mounted to be as straight and short as possible. This allows the maximum blast force to be applied to the material in the storage vessel. A downward slant to the discharge pipe helps prevent the stored material from entering the transition pipe and contaminating the Air Cannon. However, due to space limitations, these guidelines cannot always be followed.

Sometimes, the discharge pipe will have to have a bend or be longer in length, and the Air Cannon may need to be oriented at different angles. If the air source is of poor quality, containing much water, or if condensation is a problem, the Air Cannon pressure vessel will need to be drained occasionally. To assist in draining the tank, two accessory ports are provided. When mounting, place a two-way ball valve in the lower of the two ports. On the other, place the provided T-connector, with pressure gauge and pressure relief valve at an orientation best suited to read the gauge.

Each air cannon requires an adjustable suspension kit (part number 51072107) to be attached to a structure strong enough to support the cannon. The suspension kit should always be orientated vertically and adjusted such that the chain is supporting the cannon but not so tight that it pulls against the transition pipes. Care must be taken when field welding the transition pipes that residual forces are not introduced into the cannon via welding distortion.

2.2.REQUIRED STORAGE STRUCTURE WALL THICKNESS

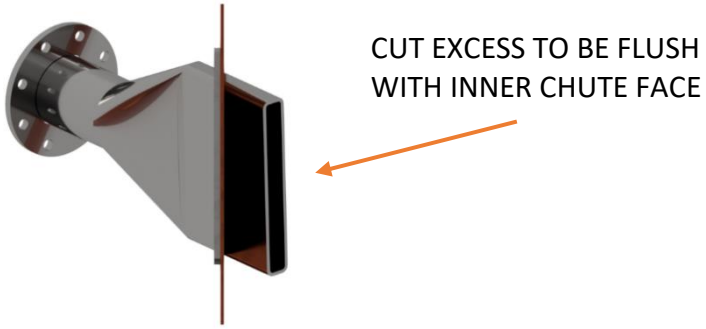
The storage structure wall must be rigid enough to support the weight of the Air Cannon and withstand the forces that occur during discharge. ESS will provide compensation plates to reinforce structure walls less than 6 mm thick. Lifting and suspension kits will be supplied from ESS Engineering to help support the weight of the Air Cannon and withstand the firing forces.

2.3. HIGH TEMPERATURE APPLICATIONS

In case of firing an air cannon into areas of ambient temperatures in excess of 1100°C, a drop-in Thermo Safety Shield (P/N: 51101204) needs to be affixed between the air cannon and the nozzle. This helps protect hot air and particles from coming in contact with the valve body. It is also a requirement to have at least 1.5 metres of transition pipe between the hot environment and the tank. These requirements will be handled by ESS.

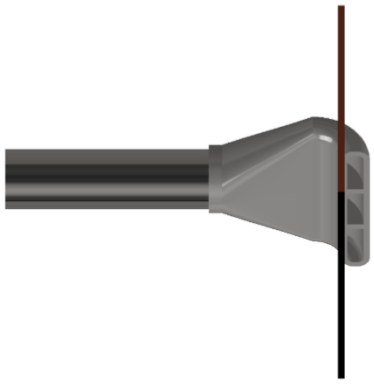
2.4.MOUNTING A FANJET NOZZLE

Fanjet nozzles are designed to have excess material. Trim the excess material to be flush with the inside of the chute as necessary, and securely weld. Compensation plates will be provided if the chute wall is deemed too thin to support the weight of the air cannon system.



2.5.MOUNTING A 90 DEGREE FANJET

The 90 degree fanjet nozzle is designed to blast air parallel to the chute wall in order to shear material away, while the transition pipe remains perpendicular to the wall. Ensure the chute wall cutout is large enough to allow the 90 degree bend to pass through, but not too large so as to be unable to weld securely, and that the discharge area of the nozzle is inside the chute.



2.6.SOLENOID OPTION 1 - ARRANGEMENT

Install the firing arrangement as shown below. It is recommended to use 12mm hose from the air supply to port 1 on the firing solenoid, but this is only necessary for filling times. Use 6mm hose between the 6mm push fit on the tee connector and port 1 on the control (smaller) solenoid, and also between port 2 of the control solenoid to the pilot port on the firing solenoid. Mount the firing solenoid directly to the Quick Exhaust valve shown via the fitting in Port 2. The firing arrangement can be test “fired” by depressing the white button on the smaller solenoid. Holding this down will cause the air to begin flowing as if the tank was filling, and releasing the button will cause the air to exhaust/”fire”. **Without the control solenoid energised air should not be flowing.**

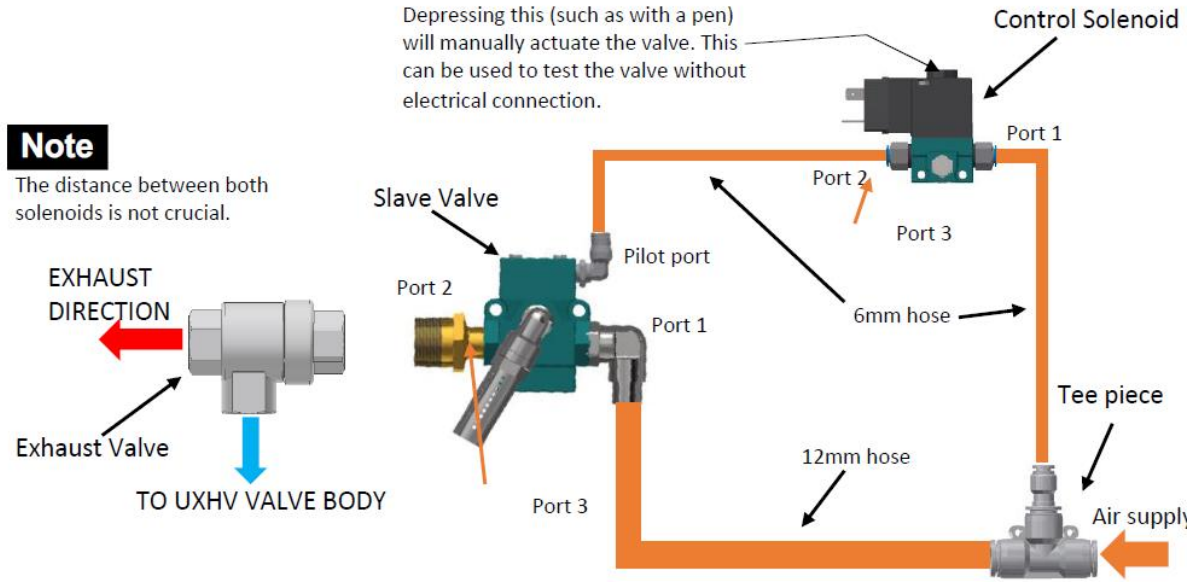


Figure 4 - Control Solenoid & Slave Valve

	Part Number	Description	Placement
Slave valve	02370265B	Elbow, 3/8”M-12mm, Tube, P/fit, Brass	Port 1 (slave valve)
	02404540B	Nipple, ¾” x 3/8” Reducer, Brass	Port 2 (slave valve)
	02400250B	Elbow, 3/8” M/F, Screwed, Brass	Port 3 (slave valve)
	02370007B	Elbow, 1/8M-6mm P/fit, Brass	Pilot port (slave valve)
	02650315	Silencer, 3/8”, Bantam	To the elbow on port 3 (slave valve)
Control solenoid	02366010	Connector, 1/8”M-6mm P/fit (2 off), Plastic	Port 1 & 2 (control solenoid)
	02650305	Silencer, 1/8”, Bantam	Port 3 (control solenoid)
Tee piece	02378120P	Tee, 12mm P/fit, Plastic	Connected: air supply, port 1 of both solenoids. Using 12mm and 6mm hose.
	02392300P	Reducer, 12mm-6mm P/fit, Plastic	On one port on tee piece

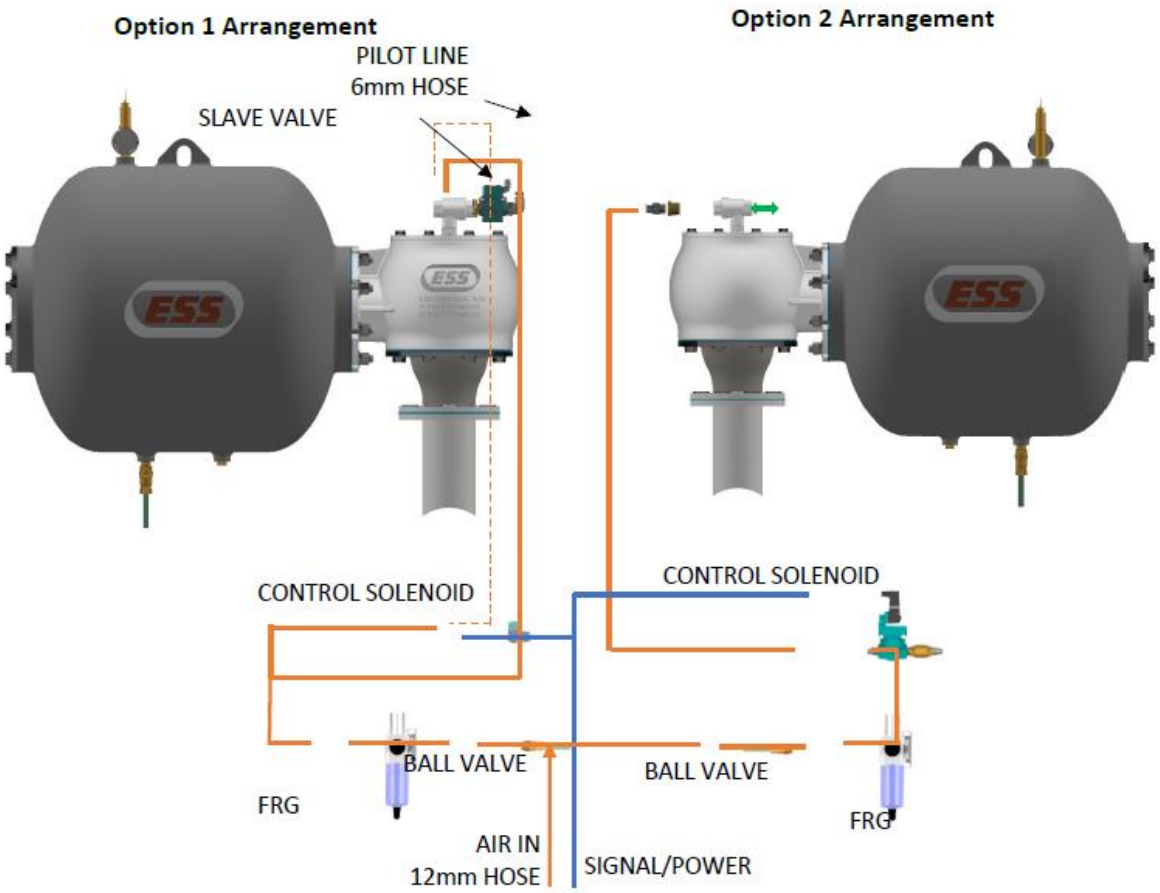


Figure 5 - Showing the air supply arrangement for both Option 1 and Option 2

2.7.IF REPLACING AN EXISTING XHV

If an ESS UXHV is being used to replace an existing Martin XHV, simply remove the old valve and QEV, and replace it with the UXHV. As the UXHV comes with a QEV already mounted, discard the QEV that the XHV used. The UXHV uses the same flange PCD, as well as all air fittings and solenoid/s, as the UXHV functions the same way as the XHV.

Connect the air supply hose to the top of the new QEV, and the air cannon is ready to use.

Regarding the slotted to-tank mount holes on the valve body transition piece; these are capable of adapting the valve to a larger PCD found on some ESS tanks.

2.8.AIR CANNON START-UP PROCEDURE

1. Make sure ***all connections*** for Air Cannons, discharge assemblies, and air & electrical components are secure.
2. Check all 3-Way Control Valves to ensure they are correctly set up (see page 17)
3. Set Filter-Regulator-Gauge (FRG) to minimum pressure position.
4. Open the inlet valve to allow plant air to enter the system.
5. Set the FRG to the pressure desired for charging the Air Cannons:
   Minimum pressure = 280 kPa (40 psi).
   Solenoid valves and air cannon valve might not operate consistently at lower pressures.
   Maximum pressure = 860 kPa (125 psi).
   The Air Cannon tank is rated for 1034 kPa (150 psi). Its safety relief valve will relieve excess pressure in the tank if the pressure exceeds 965 kPa (140 psi). Pressure between 550 and 860 kPa (80 and 125 psi) will give excellent performance for most applications.

⚠ WARNING

Wear hearing protection. If there are sufficiently large leaks it may cause the air cannon to unexpectedly discharge.

6. Check all airline pipe connections for leaks. Mark all leaks found and de-pressurize the system by closing the Shut-off Ball Valve.
7. Repair any leaks found in Step 6 and return to Step 3. If no leaks were found, continue with Step 8.
8. Test each Air Cannon separately via the firing arrangements. MAC valves can be manually fired by depressing a plastic piece on the solenoid body (see the Figures on Page 2121)
9. If the Air Cannon System is to be controlled by a micro-controller-based sequencing timer, such ESS' 8 Blaster Sequence Controller, ensure it is connected as per the instructions. Firing times will be specified by ESS based on a case by case basis.
10. After completion of the above Steps, your ESS Engineering Air Cannon system is ready for use.

Contact ESS with any questions or concerns about the installed equipment.
Refer to Section 4-TROUBLESHOOTING if any problems arise.

3. MAINTENANCE

Preventive maintenance is important to ensure effective and safe performance of the Air Cannon system.

3.1. LUBRICATION

ESS Air Cannons require no airline lubrication.

3.2. AIR CONTROL ACCESSORIES

Check periodically to make sure all valves are clean and functional. The reservoir on the Filter-Regulator-Gauge should be drained daily. Clean unit and filter with warm water and mild soap as needed. Blow with compressed air to dry. Use a 40 micron filter when the filter element needs replacing.

3.3. AIR CANNON MOUNTING

All mounts must remain rigid. Check periodically and retighten as necessary. Any damaged or rusted parts should be repaired or replaced.

3.4. AIR CANNON INTERNAL VALVE:

The Air Cannon valve is designed to provide many years of maintenance free operation. Should the Air Cannon malfunction or performance appear to decrease, the internal valve should be inspected for wear or contamination. If the Air Cannon is used in a harsh environment, several Air Cannons in the system should be inspected periodically - semi-annually or annually - during routine plant maintenance periods. This rotating inspection schedule should indicate if the Air Cannons are showing any signs of wear or contamination that will need attention. If the Air Cannon is not used in a harsh environment, an inventory of spare parts may not be needed.

3.5. PRESSURE VESSEL INSPECTION:

Operators must comply with the relevant Mines Safety Regulation, AS 3788 – Pressure Vessels - In-Service Inspection, or their own Risk Based Inspection (RBI) procedures. If the Air Cannon tank has reached its cyclic design life (see table below) or is found to be damaged in any way, it should be replaced immediately.

Tank Size (L)	Design Life (cycles)
40	3,500,000
70	3,500,000
150	3,200,000
Epsilon 150	15,000,000
250	3,200,000
375	4,000,000

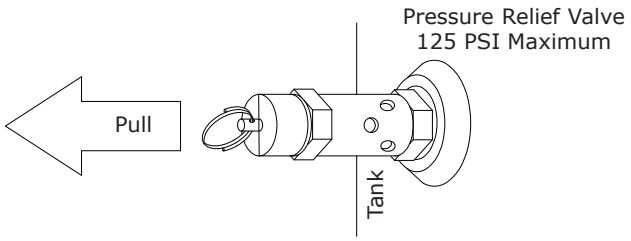
3.6. DIS/ ASSEMBLY OF THE EXTERNAL VALVE

Disassembling the Air Cannon only (separating it from the valve)

Tools Required:
2 x 24mm spanners/shifters
Sufficient capacity hoist (refer to supplied drawings for tank masses)

⚠ WARNING

- **The Air Cannon is fired by a sudden pressure drop in the air inlet line, therefore, all pressure within the tank must be relieved before the tank can be dismounted. Failure to relieve air pressure may result in unexpected Air Cannon discharge, causing serious injury or death to nearby persons.**



1. Turn off the air supply to the Air Cannon using the shut off ball valve.
2. Fire the Air Cannon to relieve all the pressure within the tank. If it is not possible to fire the Air Cannon, pull the ring on the pressure relief valve mounted on the Air Cannon tank.
3. Remove the pressure relief valve and ball valve from the Air Cannon. This is to ensure they do not get crushed and damage the tank if the tank is lowered onto them.
4. Using the hoist, support the Air Cannon by the lifting lug. Remove the safety support chain.
5. Loosen the mounting bolts connecting the tank to the valve body.
6. Take up the slack in the lifting chain.
7. Remove the mounting bolts previously loosened and lift the Air Cannon clear of the valve body. If the gasket is damaged, discard it and use a new gasket of the same type when remounting the Air Cannon. If the gasket is in good condition, it can be reused when remounting the Air Cannon.
8. Lower the Air Cannon to the ground and transport it to an appropriate working area.
9. The valve body is safe to leave mounted.

3.7.REMOVING THE INTERNAL VALVE (FROM THE VALVE BODY)

Refer to APPENDIX B SECTION 8 ASSEMBLY DRAWINGS for the full parts list and relevant assembly views.

Tools Required:
2 x 24mm spanners/shifters/24mm Sockets
Large Shifter (>24mm)

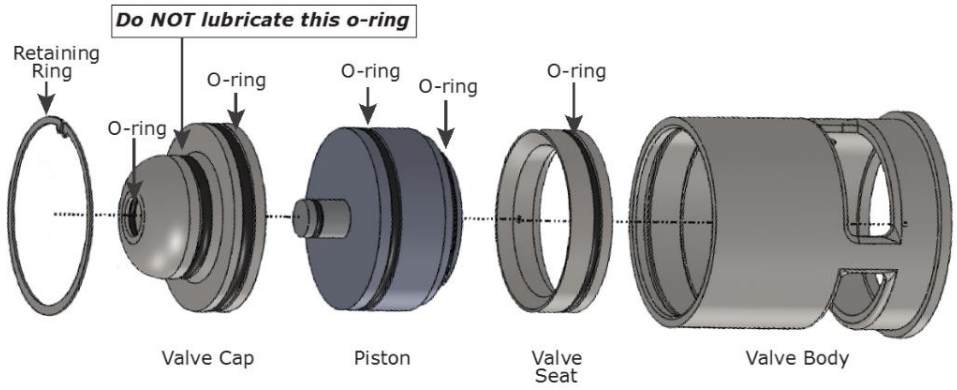
⚠ WARNING

ENSURE TANK IS EMPTY – DRAIN TANK USING PRESSURE RELIEF VALVE, AND THEN OPEN BALL VALVE

1. Remove the top flange from the valve body.
2. Remove the internal valve, being mindful of the two O-ring and seat underneath the internal valve (4" only), or the single O-ring (6" valve) once the valve is lifted out.
3. Inspect the inside of the Air Cannon tank for corrosion and contamination. Clean the inside of the tank with compressed air prior to reassembly.

3.8.VALVE DISASSEMBLY

Tools Required:
Brake Press (a soft wooden block and hammer may be used in place of the Brake press)
Large Internal Circlip Pliers (For the 6" valve: circlip pliers >65mm. For the 4" valve: circlip pliers >45mm)
Small Flat Blade Screw Driver



1. Use the large retaining ring pliers to remove the retaining ring at the base of the valve cap.

⚠ WARNING

The retaining ring is under high stress. Use care to ensure the ring does not fly off the pliers or out of the valve body and injure nearby persons.

2. Inspect the retaining ring and retaining ring groove for wear or damage. Replace the retaining ring or valve body if damage is evident.
3. Carefully remove the piston, and valve cap from the valve body. Light pressure on the face of the piston may be necessary.
4. After the piston and valve cap are removed, press the valve seat from the valve body.
5. Use the flat blade screw driver to carefully pry the O-rings from the valve seat, piston and valve cap.

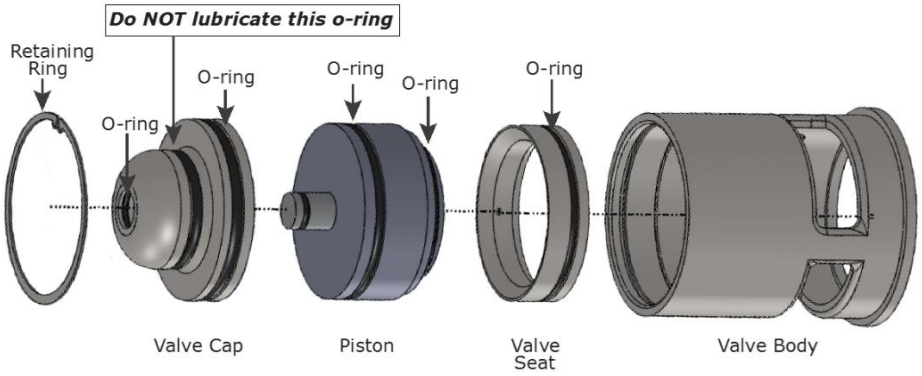
3.9.VALVE INSPECTION

1. Clean all valve parts thoroughly in a non-solvent based cleaner.
2. Inspect the valve body bore for deep scratches, pits, grooves, or corrosion. The valve body bore must be in good condition to function properly.
3. Inspect the sealing face of the valve seat for smoothness. The valve seat must be smooth to properly seat the piston.
   Check the piston face, sealing bevel, and O-rings for heat damage, chemical erosion, or signs of wear. The piston must be in good condition with smooth sealing and wear surfaces. Minor pitting in the nose of the piston is acceptable
   if the pits are less than 1/16" (2 mm) deep and the sealing bevel is not pitted. Any distortion of the piston, which hampers smooth sliding or exhibits excessive clearance in the valve body, is unacceptable.

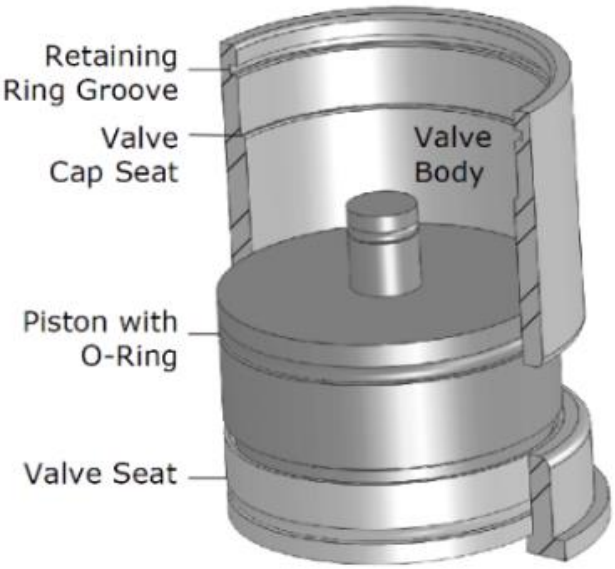
It is recommended that, once removed, all O-rings on the piston, valve seat, and valve cap be replaced. Contact ESS for a replacement kit if necessary.

3.10. ASSEMBLING THE VALVE

1. Replace the O-ring on the valve seat, valve cap, and piston. The piston uses a "floating" type O-ring fit; therefore, the piston O-ring will not fit tightly in its groove. Sparingly coat all O-rings, **except the O-ring on the cap that serves as the check valve,** with silicone lubricant/grease. Be careful not to damage the O-rings**.**



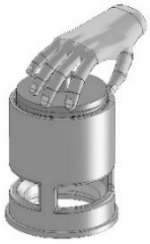
2. Assembly of the Air Cannon valve proceeds in the reverse order of disassembly except **all parts are individually pressed** into the valve body. **Do not press all parts in at the same time.** Using the press, position the valve seat (bevel side up) completely down into the valve body. The bevelled side of the seat should match the bevelled face of the piston. Take care that the O-ring is not cut as it passes over the window openings in the valve body.



3. Lightly oil the sides of the piston and the bore (internal surface of the valve body). Align the O-ring in the groove on the side of the piston.
4. Making sure the piston remains straight, push the piston (bevel face down) and O-ring

into the valve body until the O-ring approaches the valve cap seat (shoulder machined inside valve body at top of piston bore).
5. Due to the floating O-ring fit, the O-ring may bind as it tries to pass over the valve cap seat, preventing the piston from sliding smoothly into the bore. While using only hand pressure on the piston, use a thin piece of metal or screwdriver to work the O-ring into the piston groove, allowing the piston to slide completely into the bore.
6. Press the valve cap into the valve body until it reaches the valve cap seat. The retaining ring groove will be visible above the cap.
7. Install the retaining ring using the retaining ring pliers. The retaining ring will have a sharp edge and a rounded edge. Check the sharp edge of the retaining ring for burrs or rounded areas. Install the retaining ring with the sharp edge away from the valve cap. Check that

the retaining ring is properly seated in the valve body groove.
8. Check the piston to make sure it slides easily within the valve body.
9. Check the O-ring check valve on the valve cap to see that it is properly seated in its groove.



3.11. ASSEMBLING THE EXTERNAL VALVE:

3.11.1. 4” VALVE

1. Place the lower O-ring (item 7) in the grove in the valve body.
2. Place the adaptor seat (item 15) over the O-ring placed in step 1
3. Place the O-ring (item 6) in the groove in the adaptor seat.
4. Reseat the 4” valve (item 17) in the valve seat.
5. Insert the inlet plate O-ring (item 8) into the groove in the valve body.
6. Screw the pipe adaptor (item 16) into the inlet plate (check orientation), threading it in more than 30mm: making sure the non-threaded end is on the “inner” face of the flange.
7. Place the inlet plate (item 12) on the top of the cast housing (item 11), and screw / unscrew the pipe adaptor until the inlet plate sits comfortably on the cast housing, and then a half turn more.
8. Screw and torque the inlet plate to the UXHV valve body.
9. Screw in the pipe adaptor, until resistance is felt to securely contact the top face of the valve.
10. Screw the flanged nut (item 1) onto the pipe adaptor.
11. Refit the quick exhaust valve (item 9)

3.11.2. 6” VALVE

Place the lower O-ring (item 6) in the groove at the bottom of the inside of the cast housing (item 11)

1. Reseat the 6” valve (item 16)
2. Place the O-ring (item 8) in the groove on the upper face of the cast housing.
3. Place the O-ring (item 7) in the groove of the inlet plate (item 12)
4. Screw and torque the inlet plate to the UXHV valve body.
5. Screw the brass nipple (item 5) through the inlet plate.
6. Refit the quick exhaust valve (item 9)

4. TROUBLESHOOTING

Prior to shipment, all ESS Air Cannons are tested for pressure and function according to corresponding pressure vessel regulations and quality manufacturing specifications. Despite the simple and sturdy construction, malfunctions can occur due to the kind of application, installation, and/or operation. The following list should help identify the causes of some problems that occur and gives possible solutions to eliminate those problems. Control Valve = 3-Way Solenoid Valve Arrangement (Option 1 and 2) (solenoid with electrical connection). Operating Valve = Quick Exhaust Valve.

ISSUE - Air cannon won't fire, or the blast is weak.

- No air to/in tank
    - Check all airline components.
        - Ball valves in the supply line are open.
        - Non-return valve is orientated correctly.
    - Check solenoids are correctly configured.
        - Option 1 – both solenoids are set as "normally closed". Energising the control solenoid causes air to flow via the pilot line to the firing solenoid, which opens the pathway to the tank.
        - Option 2 – check that the control solenoid is set to "normally open" on the indicator tab. Energising the solenoid causes air to stop flowing through from ports 1-2, and instead opens 2-3.
    - Check airline fill pipe is not covering the internal valve's fill ports due to incorrect length or tightened wrongly.
- Low air pressure. If after firing the tank makes a low humming/vibrating noise it is indicative of low air pressure.
    - Check tank pressure before firing.
    - Check that the regulator is set at the correct pressure.
    - Check for leaks.
    - Option 1 – check the actuating signal to the control solenoid is long enough to fill the tank to the desired pressure.
- Control solenoid not energising.
    - Check plug wiring is correct.
    - Check voltage and type requirements.
- Control solenoid is energising but not firing the tank.
    - Option 1 – ensure the actuating signal is allowing air to sufficiently fill the tank. With sufficient air, and when the signal stops, the tank will fire.
    - Option 2 - Check the indicator tab is set on "3-NO" (if using MAC56 valve).
    - Option 2 – the firing solenoid is too far away from the tank.
- Piston is not reseating.
    - Clean or replace piston and/or O-rings.
    - Check the valve seat and valve walls for damage.

5. INSTALLATION DRAWINGS

Figure 6 - F0680 AIR CANNON- 40L- e6- S/E

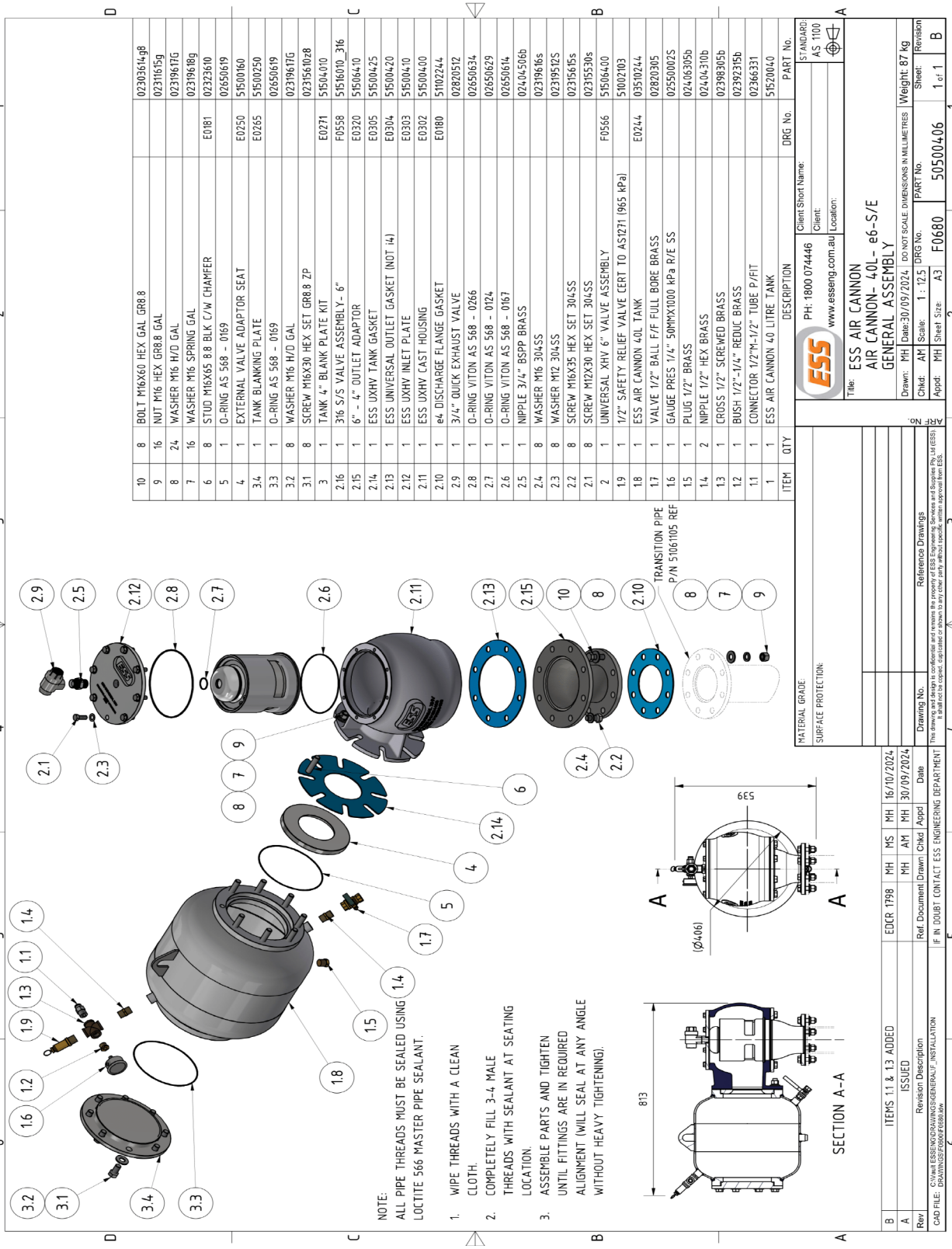


Figure 7 - F0681 AIR CANNON 50L- e6- S/E

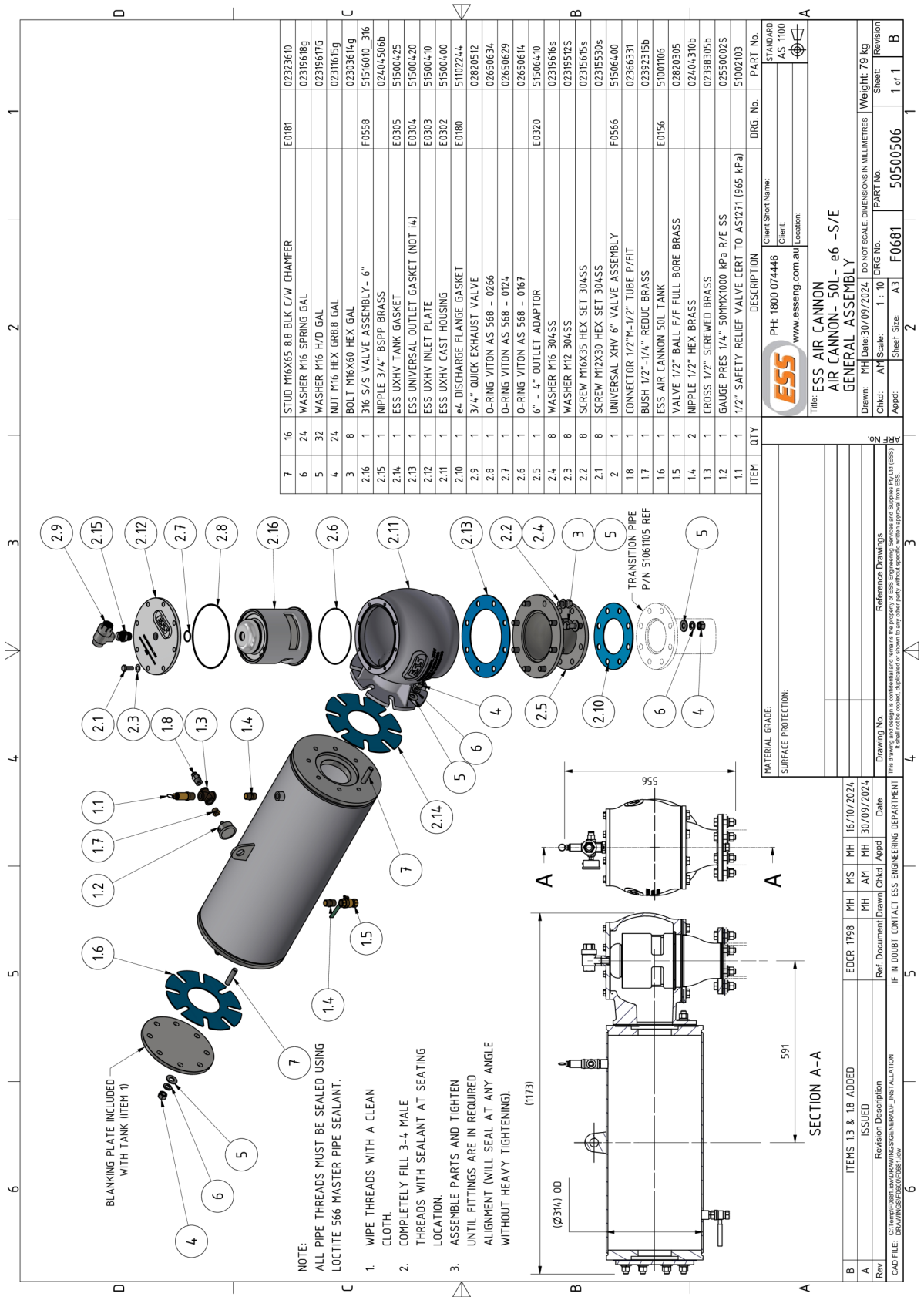


Figure 8 - F0682 AIR CANNON- 50L- e6- D/E

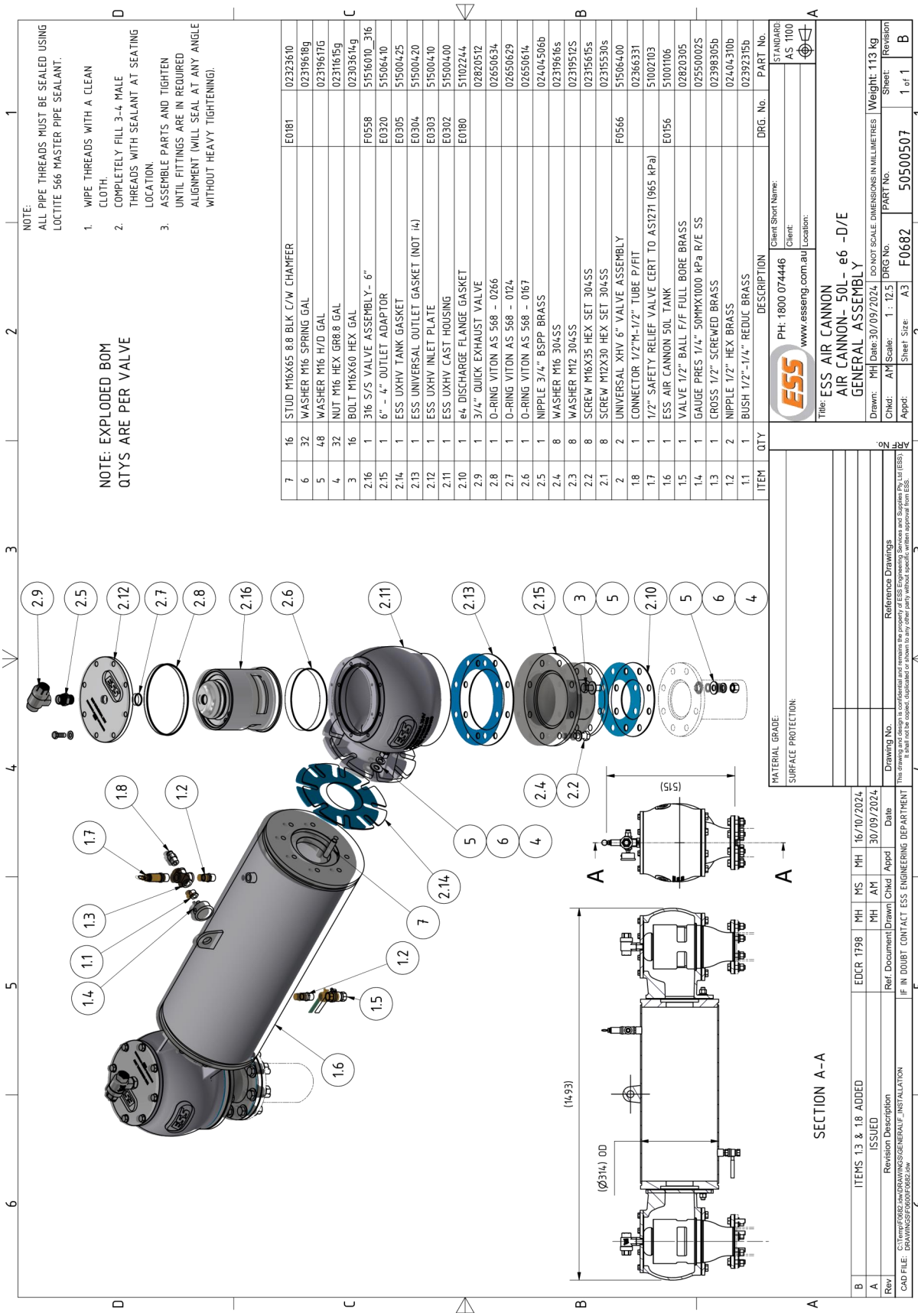


Figure 9 - F0574 AIR CANNON- 70L- e6-S/E

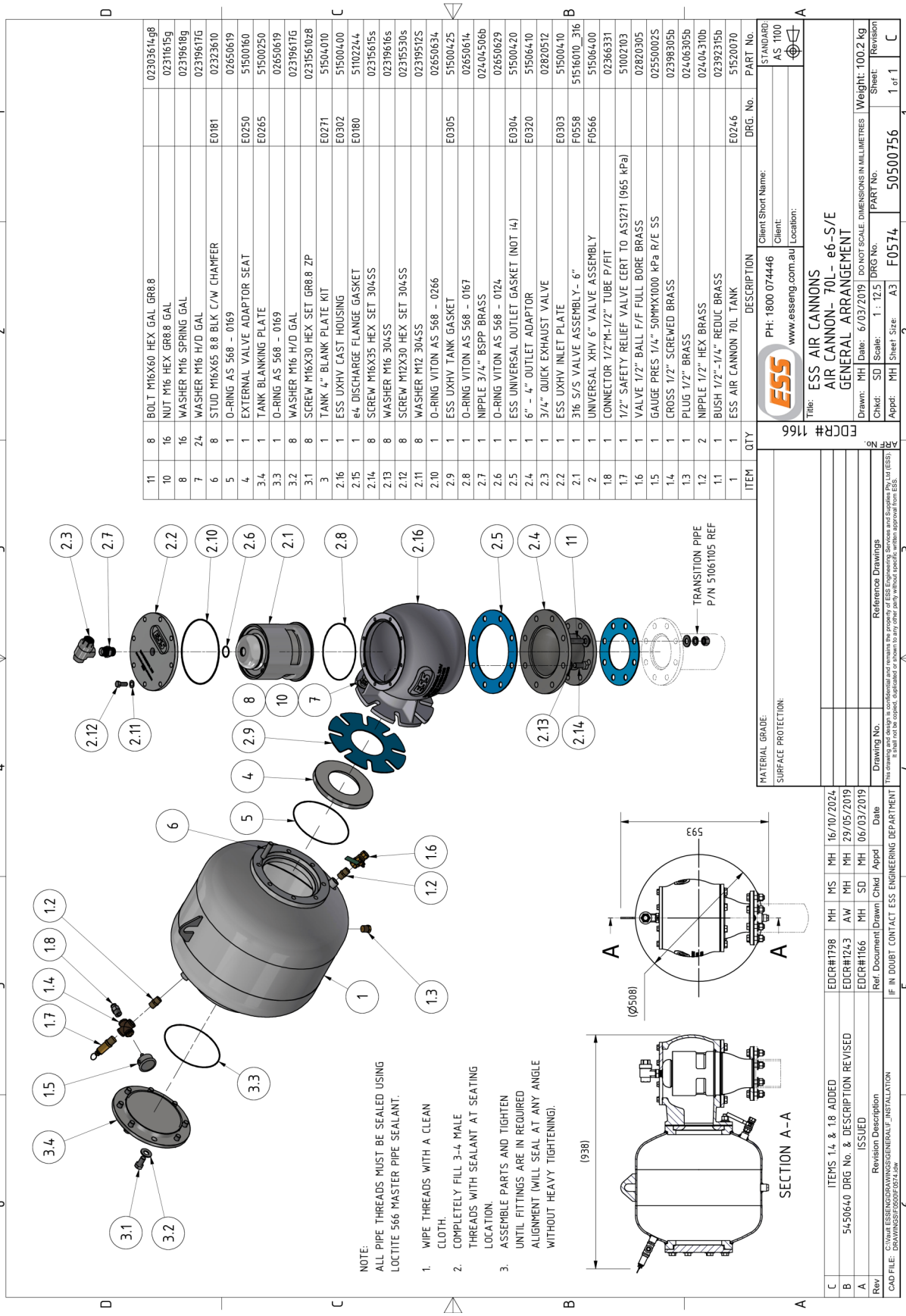
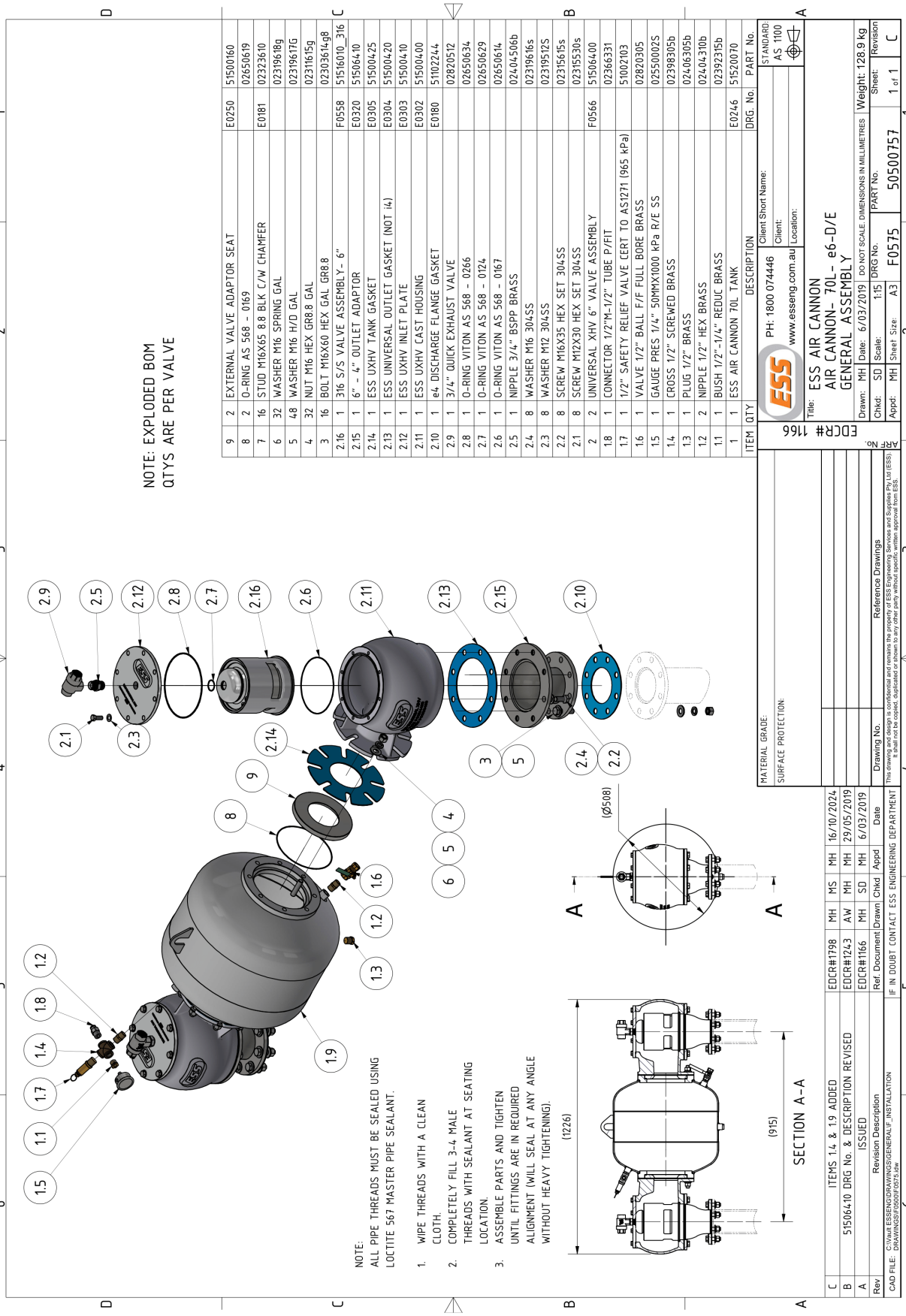


Figure 10 - F0575 AIR CANNON- 70L- e6- D/E



ITEM	QTY	DESCRIPTION	DRG. No.	PART No.
9	2	EXTERNAL VALVE ADAPTOR SEAT	E0250	51500160
8	2	O-RING AS 568 - 0169		02650619
7	16	STUD M16X65 8.8 BLK C/W CHAMFER	E0181	02323610
6	32	WASHER M16 SPRING GAL		02319618g
5	48	WASHER M16 H/D GAL		02319617G
4	32	NUT M16 HEX GR8.8 GAL		02311615g
3	16	BOLT M16X60 HEX GAL GR8.8		02303614g8
2.16	1	316 S/S VALVE ASSEMBLY- 6"	F0558	51516010_316
2.15	1	6" - 4" OUTLET ADAPTOR	E0320	515064.10
2.14	1	ESS UXHV TANK GASKET	E0305	515004.25
2.13	1	ESS UNIVERSAL OUTLET GASKET (NOT i4)	E0304	515004.20
2.12	1	ESS UXHV INLET PLATE	E0303	515004.10
2.11	1	ESS UXHV CAST HOUSING	E0302	515004.00
2.10	1	e4 DISCHARGE FLANGE GASKET	E0180	51102244
2.9	1	3/4" QUICK EXHAUST VALVE		02820512
2.8	1	O-RING VITON AS 568 - 0266		02650634
2.7	1	O-RING VITON AS 568 - 0124		02650629
2.6	1	O-RING VITON AS 568 - 0167		02650614
2.5	1	NIPPLE 3/4" BSPP BRASS		02404506b
2.4	8	WASHER M16 304SS		02319616s
2.3	8	WASHER M12 304SS		02319512S
2.2	8	SCREW M16X35 HEX SET 304SS		02315615s
2.1	8	SCREW M12X30 HEX SET 304SS		02315530s
2	2	UNIVERSAL XHV 6" VALVE ASSEMBLY	F0566	515064.00
1.8	1	CONNECTOR 1/2"M-1/2" TUBE P/FIT		02366331
1.7	1	1/2" SAFETY RELIEF VALVE CERT TO AS1271 (965 kPa)		51002103
1.6	1	VALVE 1/2" BALL F/F FULL BORE BRASS		02820305
1.5	1	GAUGE PRES 1/4" 50MMX1000 kPa R/E SS		02550002S
1.4	1	CROSS 1/2" SCREWED BRASS		02398305b
1.3	1	PLUG 1/2" BRASS		02406305b
1.2	2	NIPPLE 1/2" HEX BRASS		02404310b
1.1	1	BUSH 1/2"-1/4" REDUC BRASS		02392315b
1	1	ESS AIR CANNON 70L TANK	E0246	51520070

Figure 11 - F0576 AIR CANNON- 150L- e6-S/E

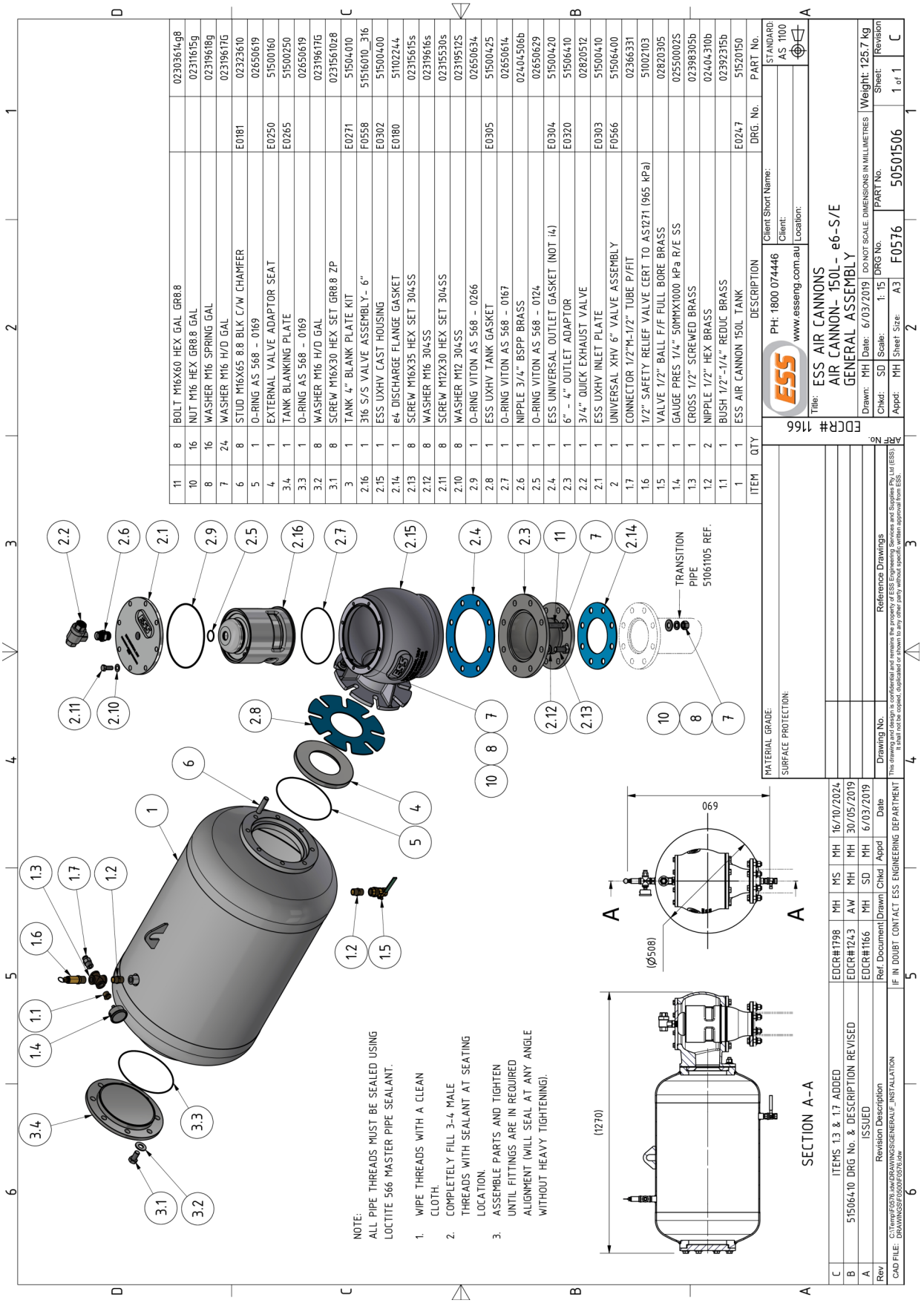


Figure 12 - F0578 AIR CANNON- 150L EPSILON- e6-S/E

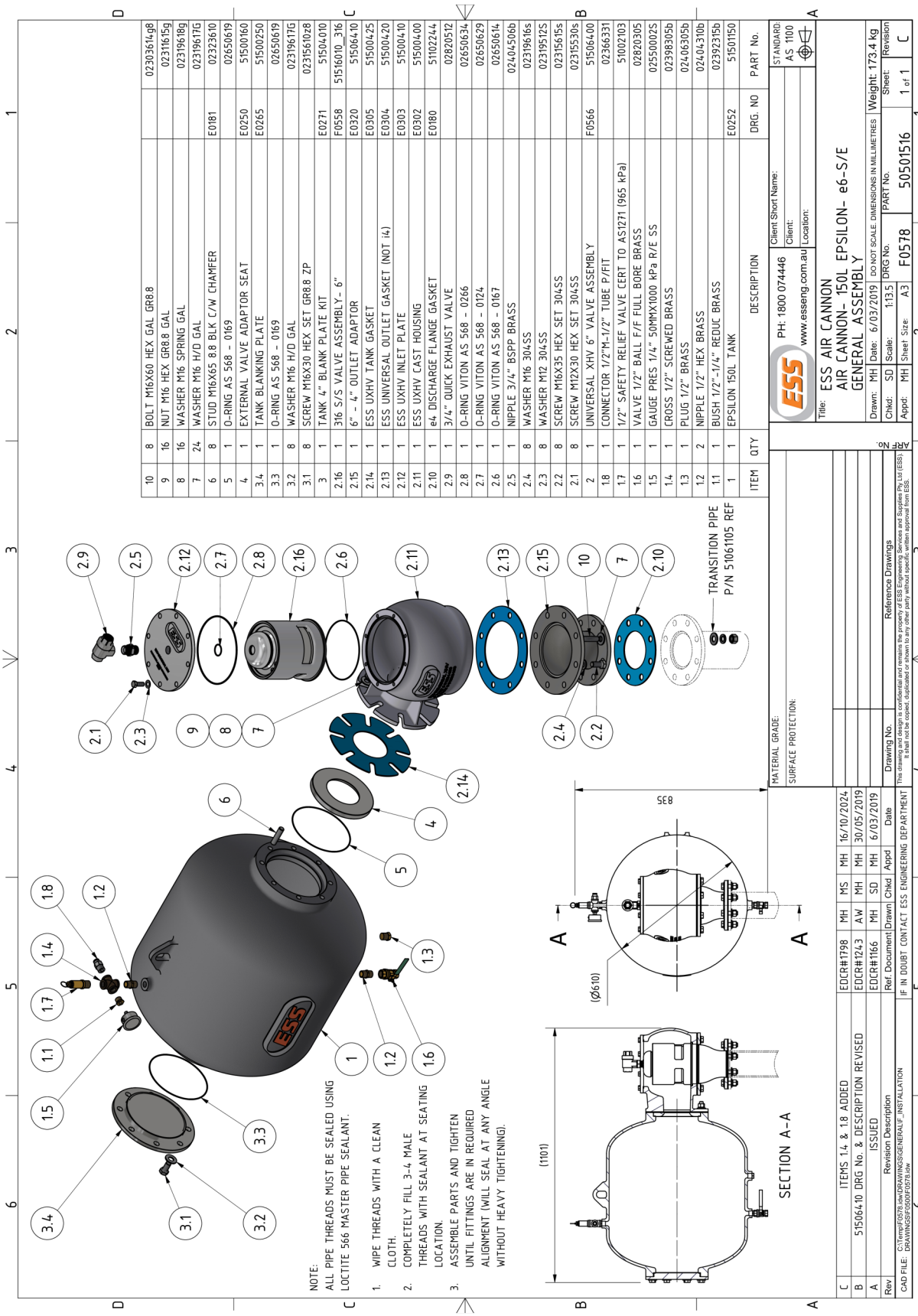


Figure 13 - F0577 AIR CANNON- 150L- e6- D/E

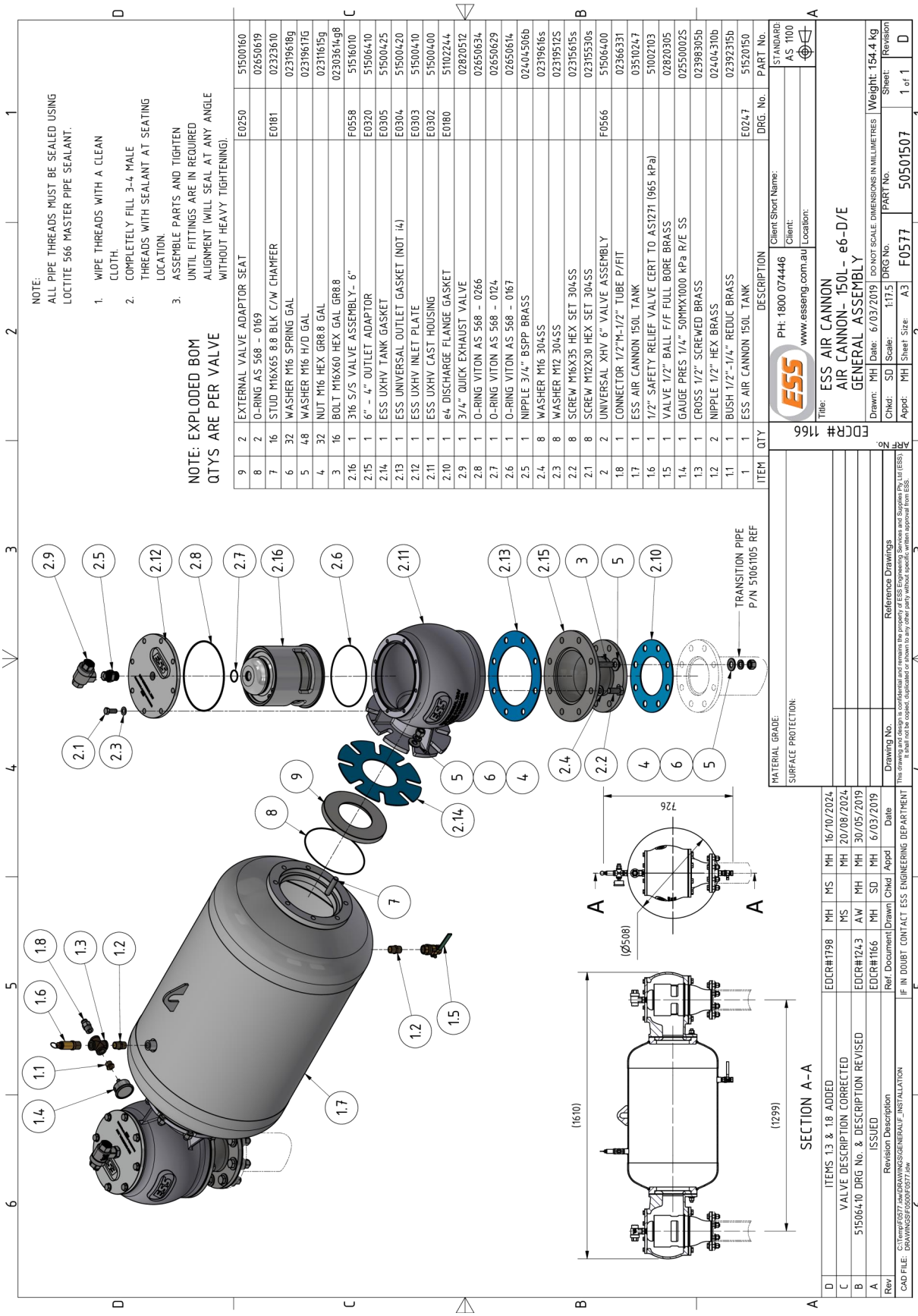


Figure 14 - F0579 AIR CANNON 150L EPSILON- e6- D/E

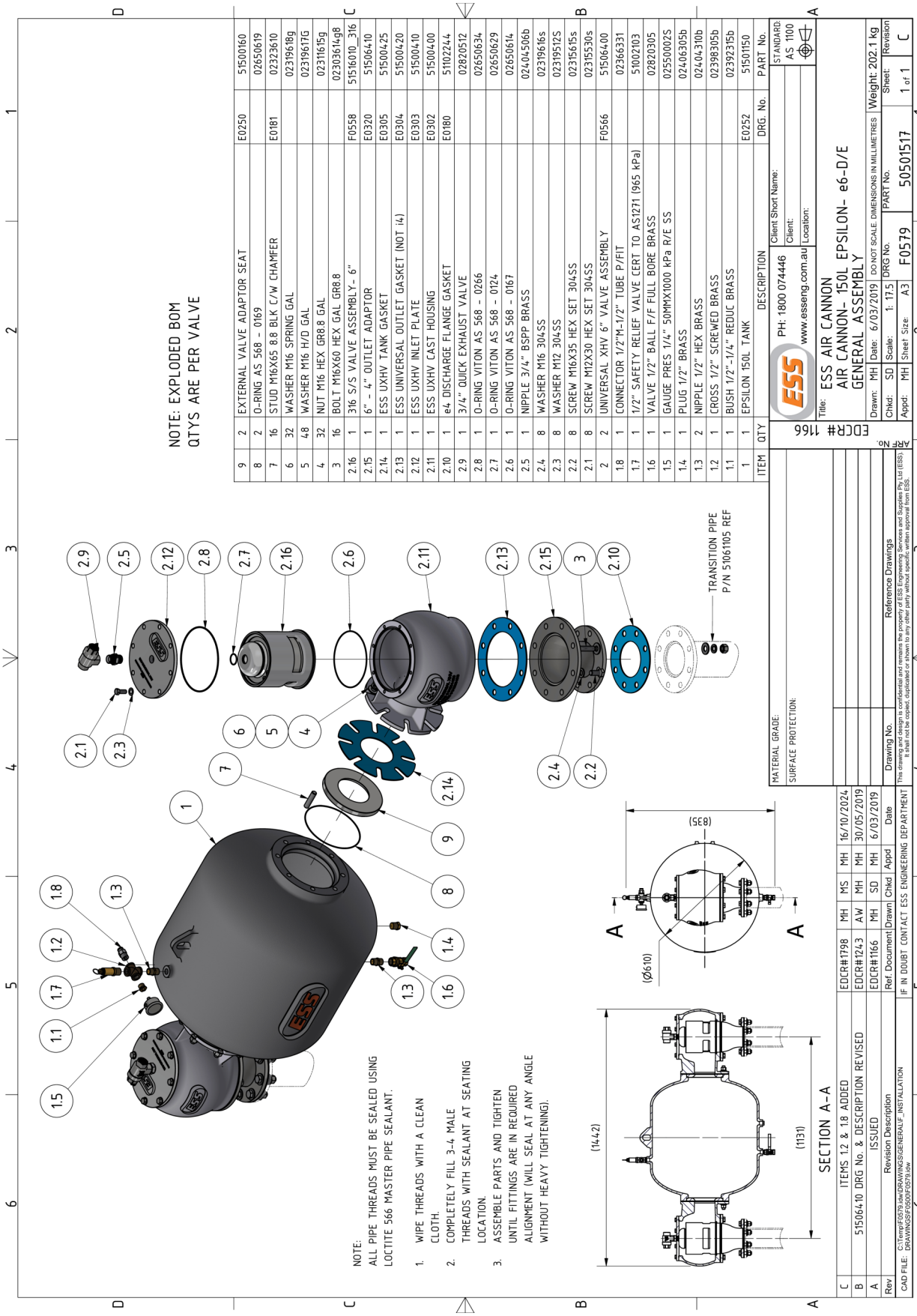


Figure 15 - F0580 AIR CANNON- 250L- e6- S/E

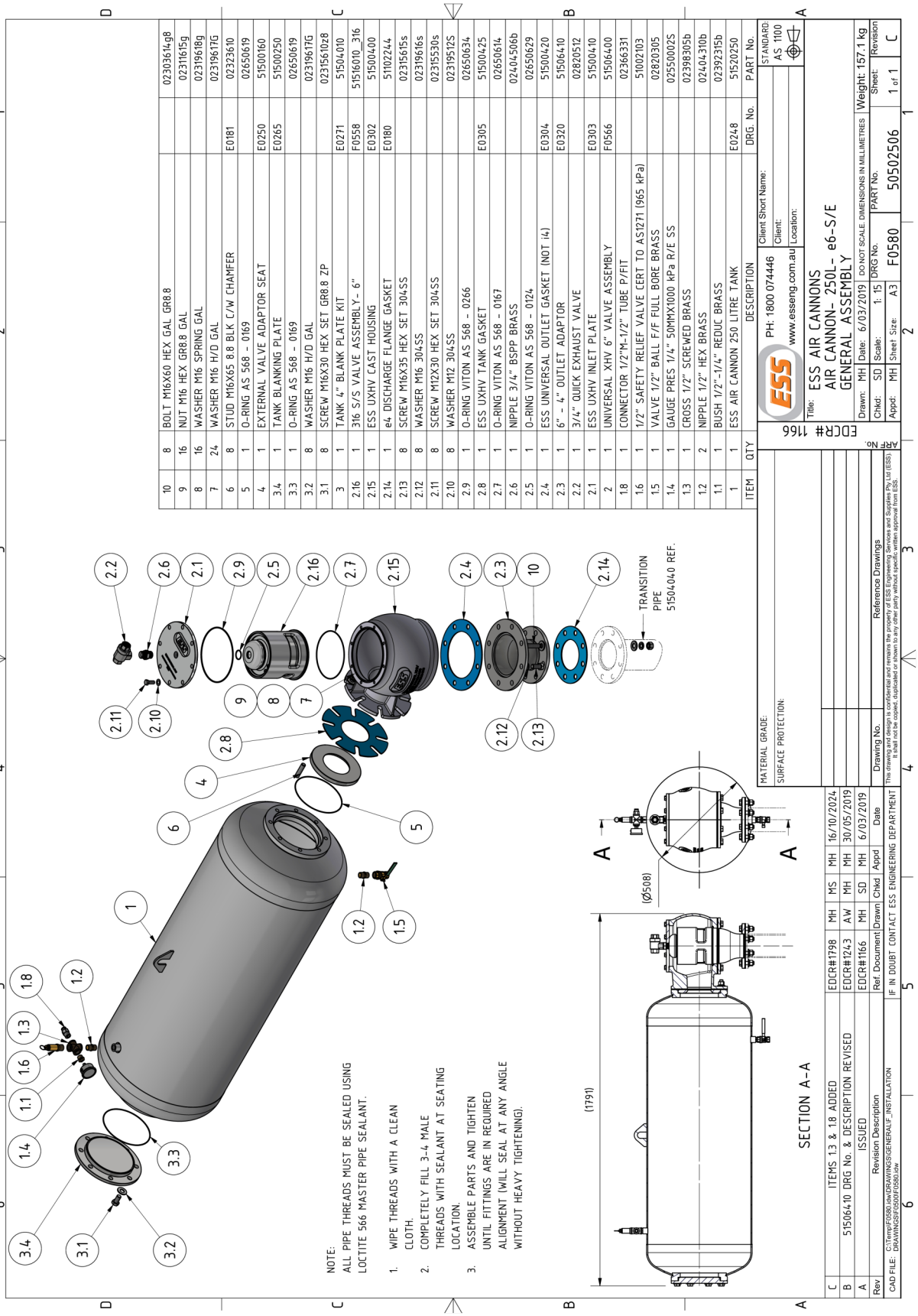
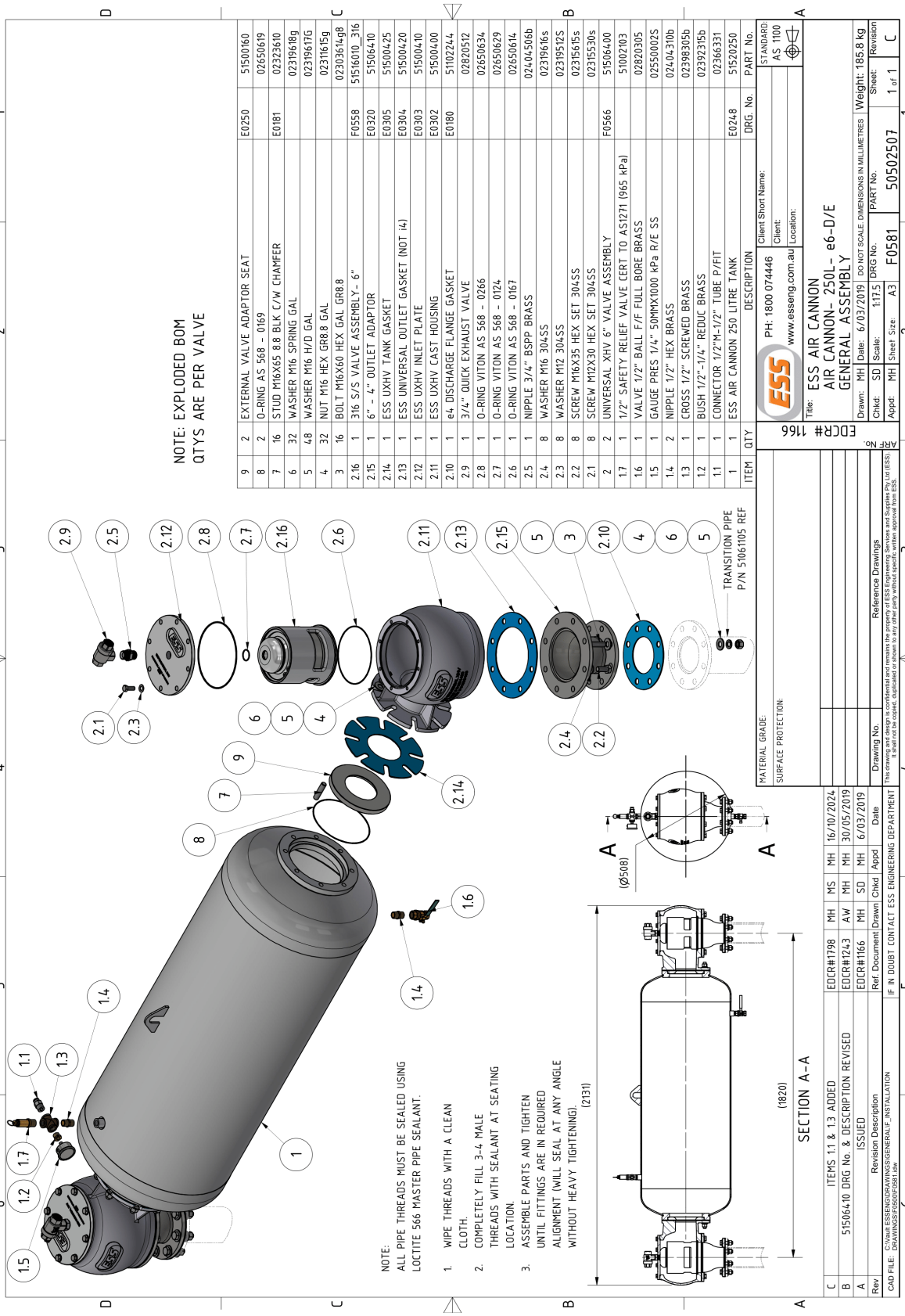


Figure 16 - F0581 AIR CANNON- 250L- e6- D/E



ITEM	QTY	DESCRIPTION	DRG. No.	PART No.
9	2	EXTERNAL VALVE ADAPTOR SEAT	E0250	51500160
8	2	O-RING AS 568 - 0169		02650619
7	16	STUD M16X65 8.8 BLK C/W CHAMFER	E0181	02323610
6	32	WASHER M16 SPRING GAL		02319618g
5	48	WASHER M16 H/D GAL		02319617G
4	32	NUT M16 HEX GR8.8 GAL		02311615g
3	16	BOLT M16X60 HEX GAL GR8.8		02303614g8
2.16	1	316 S/S VALVE ASSEMBLY- 6"	F0558	51516010_316
2.15	1	6" - 4" OUTLET ADAPTOR	E0320	51506410
2.14	1	ESS UXHV TANK GASKET	E0305	51500425
2.13	1	ESS UNIVERSAL OUTLET GASKET (NOT i4)	E0304	51500420
2.12	1	ESS UXHV INLET PLATE	E0303	51500410
2.11	1	ESS UXHV CAST HOUSING	E0302	51500400
2.10	1	ø4 DISCHARGE FLANGE GASKET	E0180	51102244
2.9	1	3/4" QUICK EXHAUST VALVE		02820512
2.8	1	O-RING VITON AS 568 - 0266		02650634
2.7	1	O-RING VITON AS 568 - 0124		02650629
2.6	1	O-RING VITON AS 568 - 0167		02650614
2.5	1	NIPPLE 3/4" BSPP BRASS		02404506b
2.4	8	WASHER M16 304SS		02319616s
2.3	8	WASHER M12 304SS		02319512S
2.2	8	SCREW M16X35 HEX SET 304SS		02315615s
2.1	8	SCREW M12X30 HEX SET 304SS		02315530s
2	2	UNIVERSAL XHV 6" VALVE ASSEMBLY	F0566	51506400
1.7	1	1/2" SAFETY RELIEF VALVE CERT TO AS1271 (965 kPa)		51002103
1.6	1	VALVE 1/2" BALL F/F FULL BORE BRASS		02820305
1.5	1	GAUGE PRES 1/4" 50MMX1000 kPa R/E SS		02550002S
1.4	2	NIPPLE 1/2" HEX BRASS		02404310b
1.3	1	CROSS 1/2" SCREWED BRASS		02398305b
1.2	1	BUSH 1/2"-1/4" REDUC BRASS		02392315b
1.1	1	CONNECTOR 1/2"M-1/2" TUBE P/FIT		02366331
1	1	ESS AIR CANNON 250 LITRE TANK	E0248	51520250

Rev	Revision Description	Ref. Document	Drawn	Chkd	Appd	Date
C	ITEMS 1.1 & 1.3 ADDED	EDCR#1798	MH	MS	MH	16/10/2024
B	5150610 DRG No. & DESCRIPTION REVISED	EDCR#1243	AW	MH	MH	30/05/2019
A	ISSUED	EDCR#1166	MH	SD	MH	6/03/2019

Drawing No. | Reference Drawings

IF IN DOUBT CONTACT ESS ENGINEERING DEPARTMENT

CAD FILE: C:\Vault ESSENG\DRAWINGS\GENERAL\F_INSTALLATION DRAWINGS\F0500\F0581.idw

MATERIAL GRADE:
SURFACE PROTECTION:

ESS PH: 1800 074446
www.esseng.com.au

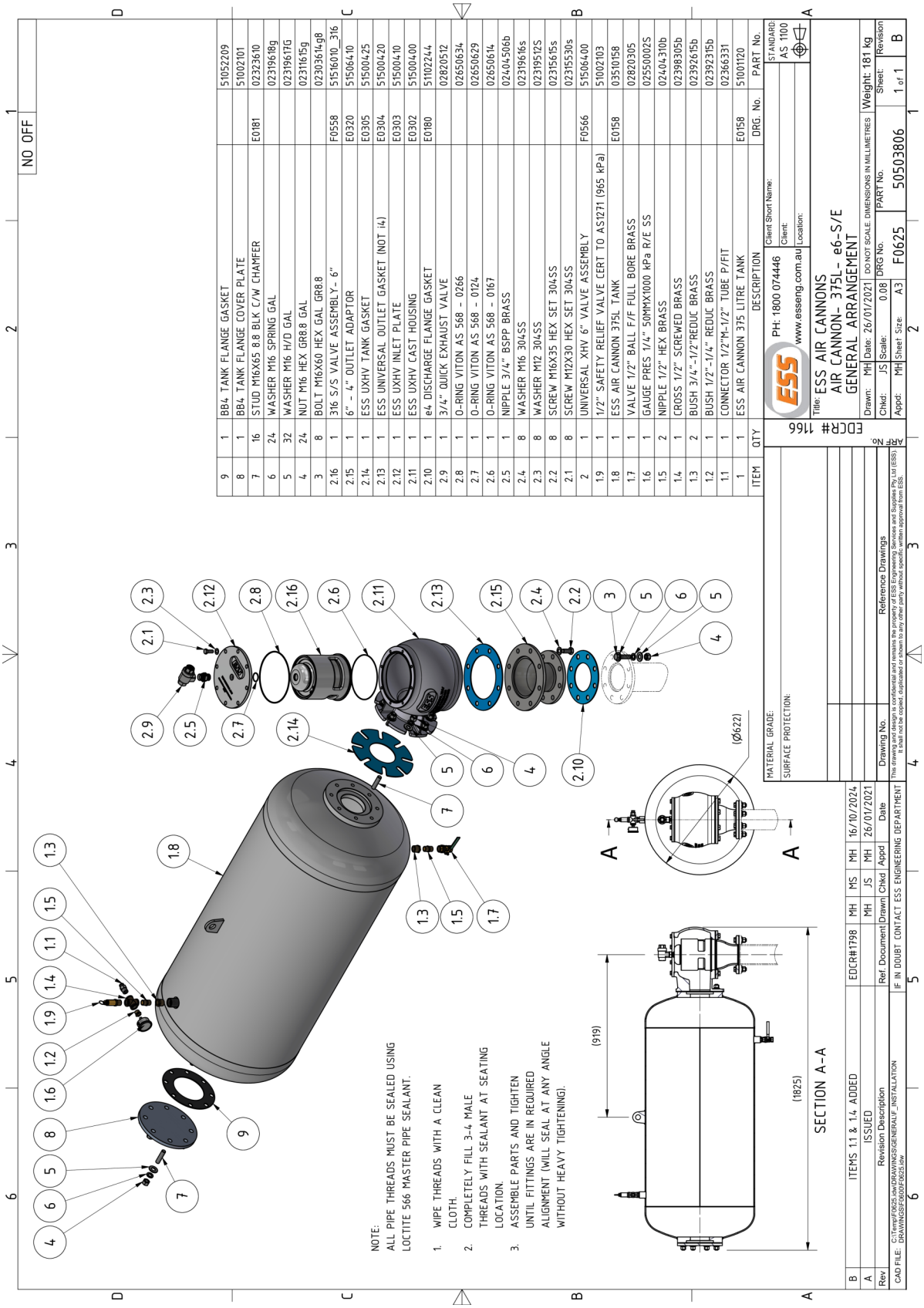
Client Short Name:
Client:
Location:

STANDARD: AS 1100

DO NOT SCALE: DIMENSIONS IN MILLIMETRES | Weight: 185.8 kg

Drawn: MH | Date: 6/03/2019 | DRG No. | PART No. | Sheet: | Revision
Chkd: SD | Scale: 1:17.5 | Sheet: A3 | 1 of 1 | C
Appd: MH

Figure 17 - F0625 AIR CANNON- 375L- e6- S/E



ITEM	QTY	DESCRIPTION	DRG. No.	PART No.
9	1	BB4 TANK FLANGE GASKET		51052209
8	1	BB4 TANK FLANGE COVER PLATE		51002101
7	16	STUD M16X65 8.8 BLK C/W CHAMFER	E0181	02323610
6	24	WASHER M16 SPRING GAL		02319618g
5	32	WASHER M16 H/D GAL		02319617G
4	24	NUT M16 HEX GR8.8 GAL		02311615g
3	8	BOLT M16X60 HEX GAL GR8.8		02303614g8
2.16	1	316 S/S VALVE ASSEMBLY- 6"	F0558	51516010_316
2.15	1	6" - 4" OUTLET ADAPTOR	E0320	51506410
2.14	1	ESS UXHV TANK GASKET	E0305	51500425
2.13	1	ESS UNIVERSAL OUTLET GASKET (NOT i4)	E0304	51500420
2.12	1	ESS UXHV INLET PLATE	E0303	51500410
2.11	1	ESS UXHV CAST HOUSING	E0302	51500400
2.10	1	e4 DISCHARGE FLANGE GASKET	E0180	51102244
2.9	1	3/4" QUICK EXHAUST VALVE		02820512
2.8	1	O-RING VITON AS 568 - 0266		02650634
2.7	1	O-RING VITON AS 568 - 0124		02650629
2.6	1	O-RING VITON AS 568 - 0167		02650614
2.5	1	NIPPLE 3/4" BSPP BRASS		02404506b
2.4	8	WASHER M16 304SS		02319616s
2.3	8	WASHER M12 304SS		02319512S
2.2	8	SCREW M16X35 HEX SET 304SS		02315615s
2.1	8	SCREW M12X30 HEX SET 304SS		02315530s
2	1	UNIVERSAL XHV 6" VALVE ASSEMBLY	F0566	51506400
1.9	1	1/2" SAFETY RELIEF VALVE CERT TO AS1271 (965 kPa)		51002103
1.8	1	ESS AIR CANNON 375L TANK	E0158	03510158
1.7	1	VALVE 1/2" BALL F/F FULL BORE BRASS		02820305
1.6	1	GAUGE PRES 1/4" 50MMX1000 kPa R/E SS		02550002S
1.5	2	NIPPLE 1/2" HEX BRASS		02404310b
1.4	1	CROSS 1/2" SCREWED BRASS		02398305b
1.3	2	BUSH 3/4"-1/2"REDUC BRASS		02392615b
1.2	1	BUSH 1/2"-1/4" REDUC BRASS		02392315b
1.1	1	CONNECTOR 1/2"M-1/2" TUBE P/FIT		02366331
1	1	ESS AIR CANNON 375 LITRE TANK	E0158	51001120

Figure 18 - F0624 AIR CANNON- 375L- e6- D/E

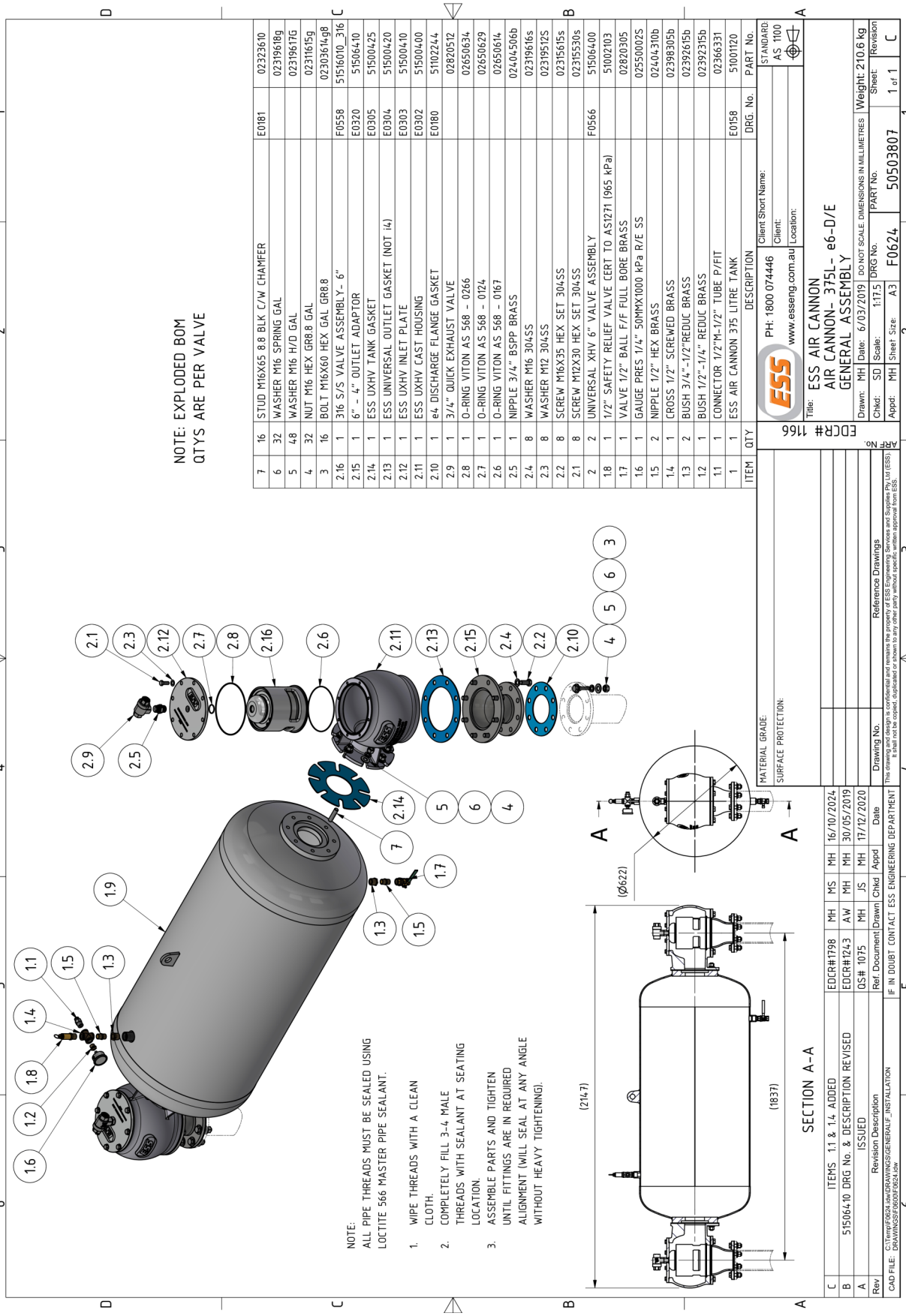
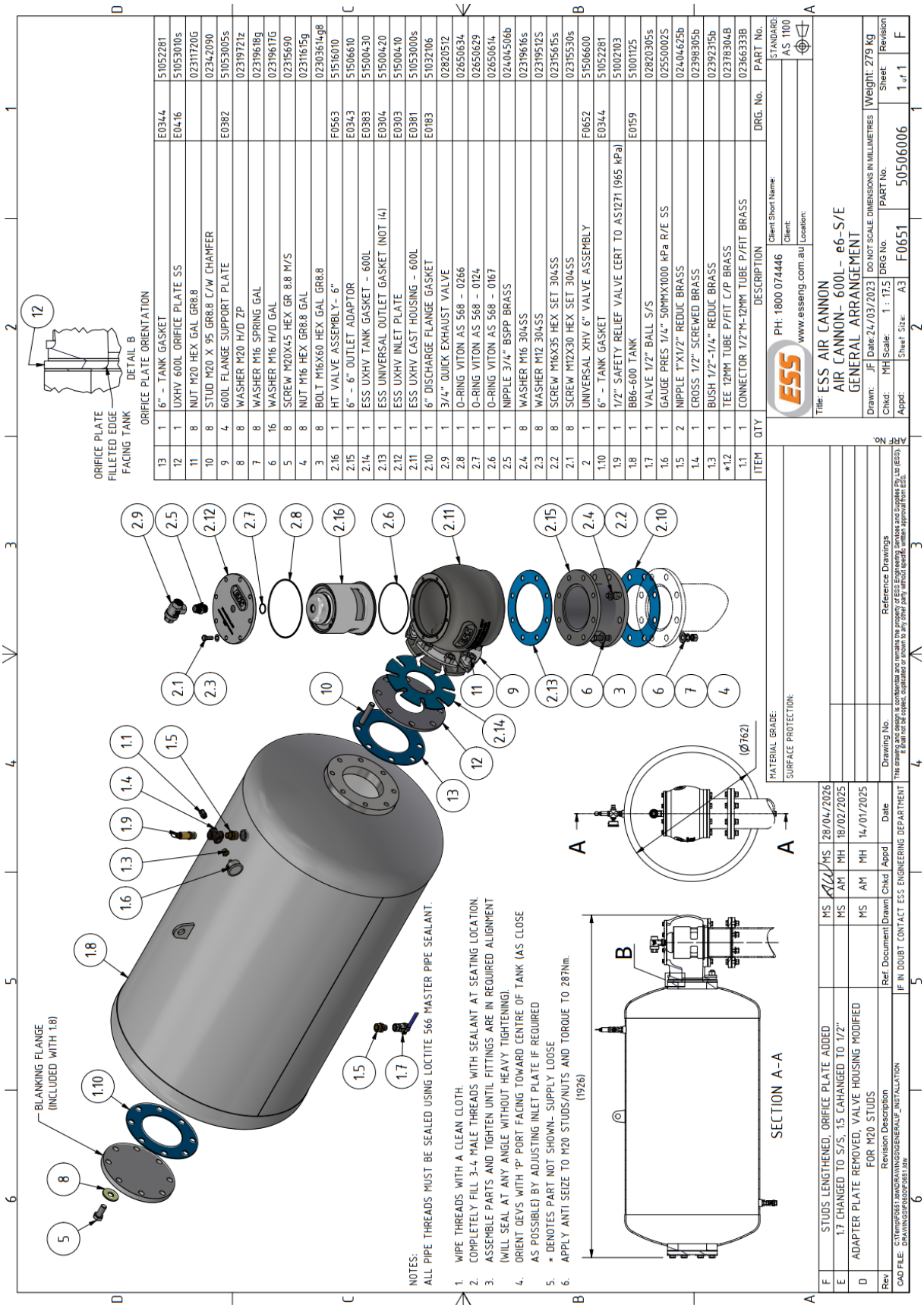


Figure 19 - F0651 AIR CANNON- 600L- e6- S/E



ITEM	QTY	DESCRIPTION	DRG. No.	PART No.
13	1	6" - TANK GASKET	E0344	51052281
12	1	UXHV 600L ORIFICE PLATE SS	E0416	51053010s
11	8	NUT M20 HEX GAL GR8.8		02311720G
10	8	STUD M20 X 95 GR8.8 C/W CHAMFER		02342090
9	4	600L FLANGE SUPPORT PLATE	E0382	51053005s
8	8	WASHER M20 H/D ZP		02319721z
7	8	WASHER M16 SPRING GAL		02319618g
6	16	WASHER M16 H/D GAL		02319617G
5	8	SCREW M20X45 HEX GR 8.8 M/S		02315690
4	8	NUT M16 HEX GR8.8 GAL		02311615g
3	8	BOLT M16X60 HEX GAL GR8.8		02303614g8
2.16	1	HT VALVE ASSEMBLY- 6"	F0563	51516010
2.15	1	6" - 6" OUTLET ADAPTOR	E0343	51506610
2.14	1	ESS UXHV TANK GASKET - 600L	E0383	51500430
2.13	1	ESS UNIVERSAL OUTLET GASKET (NOT i4)	E0304	51500420
2.12	1	ESS UXHV INLET PLATE	E0303	51500410
2.11	1	ESS UXHV CAST HOUSING - 600L	E0381	51053000s
2.10	1	6" DISCHARGE FLANGE GASKET	E0183	51032106
2.9	1	3/4" QUICK EXHAUST VALVE		02820512
2.8	1	O-RING VITON AS 568 - 0266		02650634
2.7	1	O-RING VITON AS 568 - 0124		02650629
2.6	1	O-RING VITON AS 568 - 0167		02650614
2.5	1	NIPPLE 3/4" BSPP BRASS		02404506b
2.4	8	WASHER M16 304SS		02319616s
2.3	8	WASHER M12 304SS		02319512S
2.2	8	SCREW M16X35 HEX SET 304SS		02315615s
2.1	8	SCREW M12X30 HEX SET 304SS		02315530s
2	1	UNIVERSAL XHV 6" VALVE ASSEMBLY	F0652	51506600
1.10	1	6" - TANK GASKET	E0344	51052281
1.9	1	1/2" SAFETY RELIEF VALVE CERT TO AS1271 (965 kPa)		51002103
1.8	1	BB6-600 TANK	E0159	51001125
1.7	1	VALVE 1/2" BALL S/S		02820305s
1.6	1	GAUGE PRES 1/4" 50MMX1000 kPa R/E SS		02550002S
1.5	2	NIPPLE 1"X1/2" REDUC BRASS		02404625b
1.4	1	CROSS 1/2" SCREWED BRASS		02398305b
1.3	1	BUSH 1/2"-1/4" REDUC BRASS		02392315b
*1.2	1	TEE 12MM TUBE P/FIT C/P BRASS		02378304B
1.1	1	CONNECTOR 1/2"M-12MM TUBE P/FIT BRASS		02366333B

Rev	Revision Description	Ref. Document	Drawn	Chkd	Appd	Date
F	STUDS LENGTHENED, ORIFICE PLATE ADDED		MS		MS	28/04/2026
E	1.7 CHANGED TO S/S, 1.5 CAHANGED TO 1/2"		MS	AM	MH	18/02/2025
D	ADAPTER PLATE REMOVED, VALVE HOUSING MODIFIED FOR M20 STUDS		MS	AM	MH	14/01/2025

CAD FILE: C:\Temp\F0651 AIR\DRAWING\GS\GENERAL\F_INSTALLATION DRAWING\GS\F0600\F0651.idw
IF IN DOUBT CONTACT ESS ENGINEERING DEPARTMENT

Drawing No. | Reference Drawings

MATERIAL GRADE:
SURFACE PROTECTION:

PH: 1800 074446
www.esseng.com.au

Client Short Name:
Client:
Location:
STANDARD: AS 1100

Drawn: JF | Date: 24/03/2023 | DO NOT SCALE. DIMENSIONS IN MILLIMETRES | Weight: 279 kg
Chkd: MH | Scale: 1 : 17.5 | DRG No. F0651 | PART No. 50506006 | Sheet: 1 of 1 | Revision F
Appd: | Sheet Size: A3

Figure 20 - F0671 AIR CANNON- 600L- e6 D/E

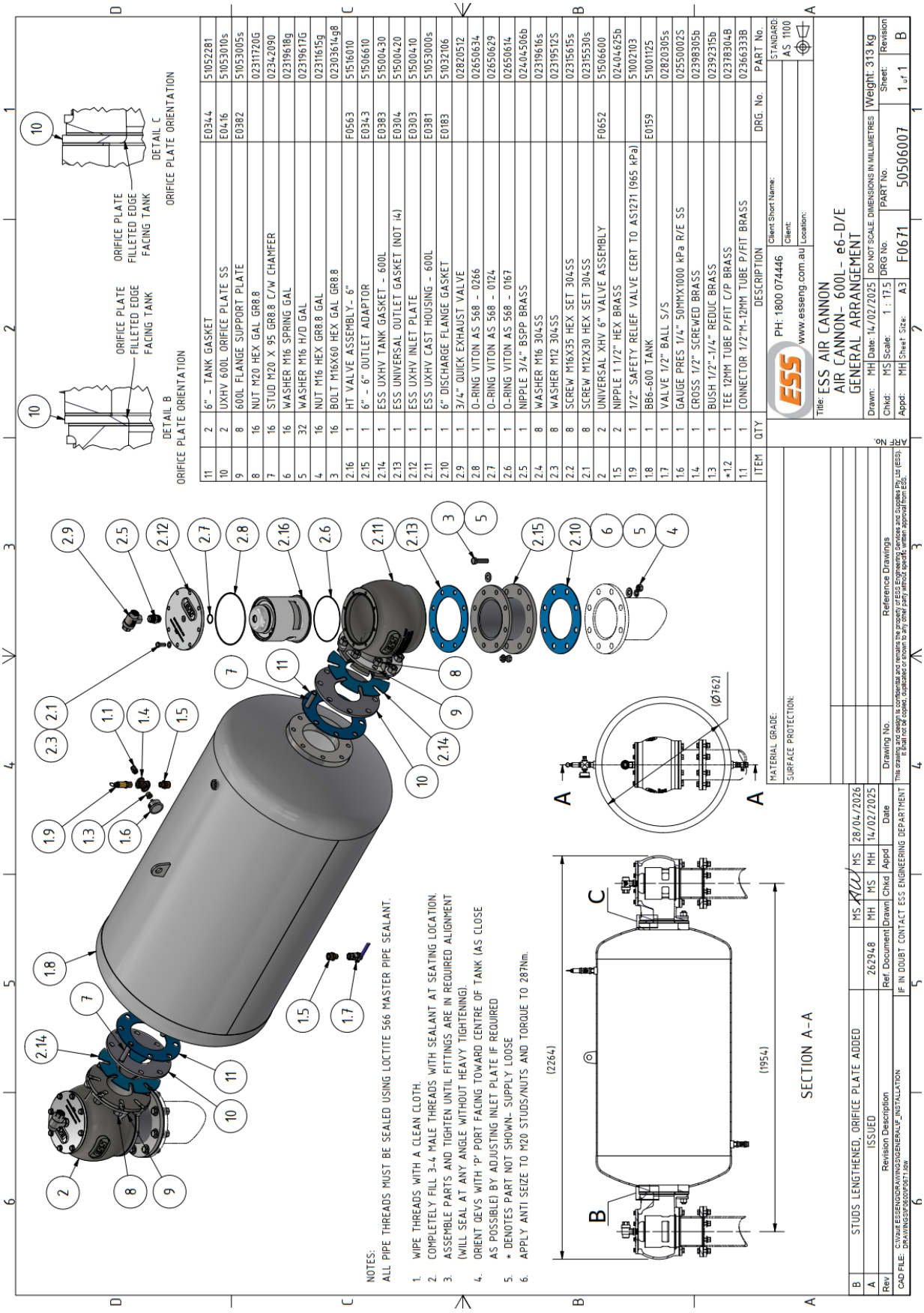


Figure 21 - F0568 2.5" VALVE ASSY - LOW TEMP ONLY DETAIL

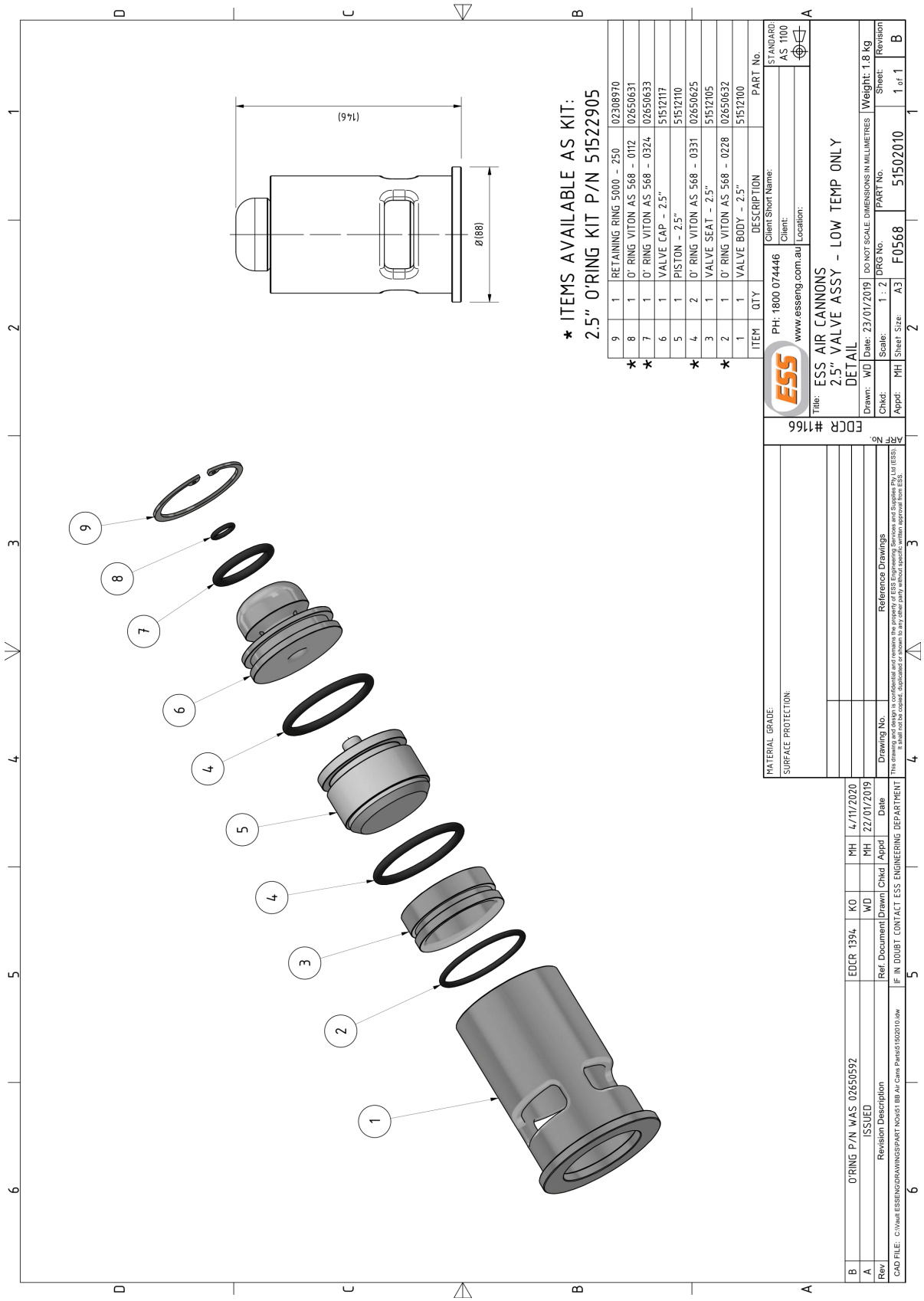


Figure 22 – F0562 AIR CANNON HT 4" VALVE ASSEMBLY DETAIL

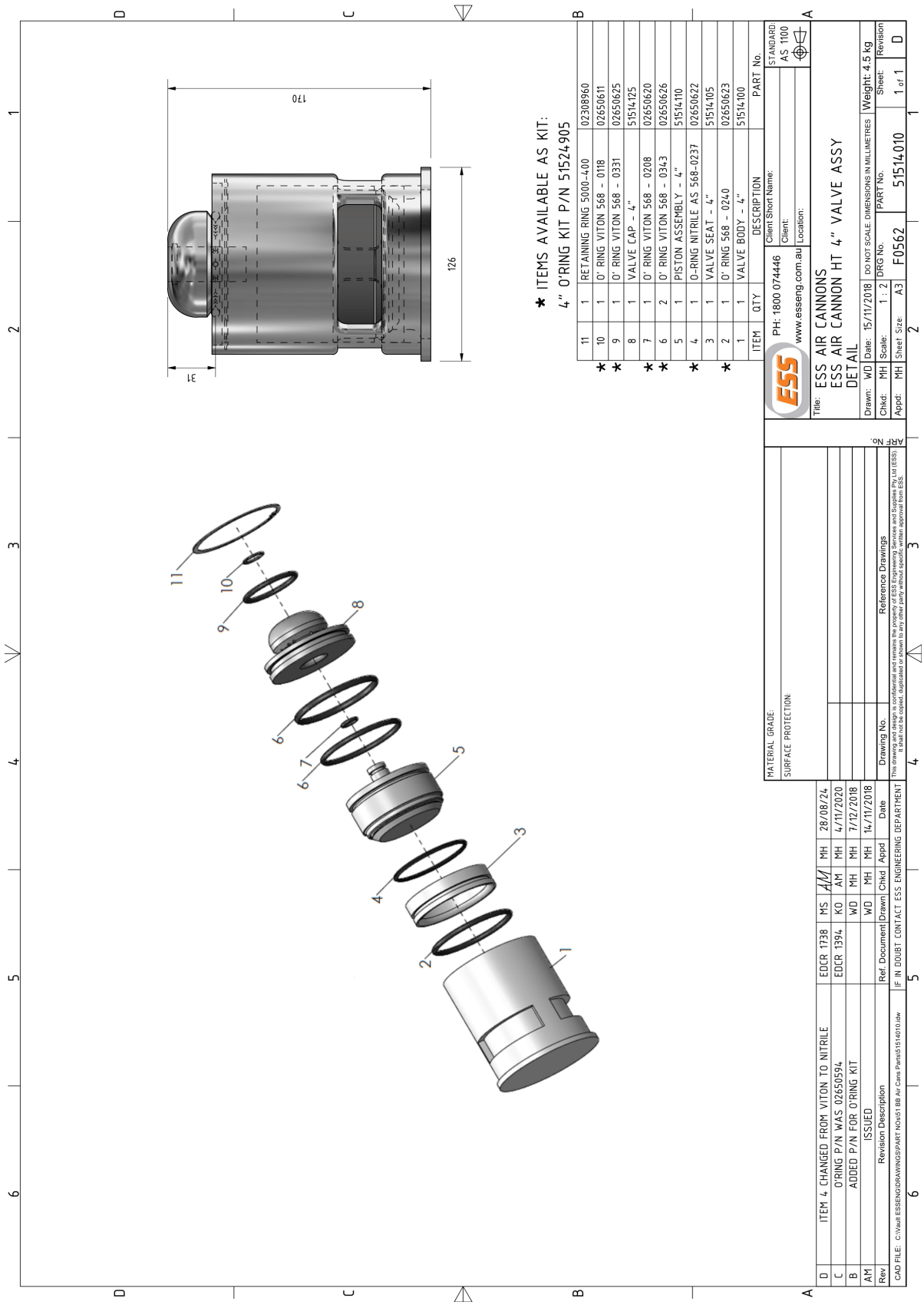


Figure 23 - F0558 316S/S VALVE ASSEMBLY- 6" GENERAL ASSEMBLY

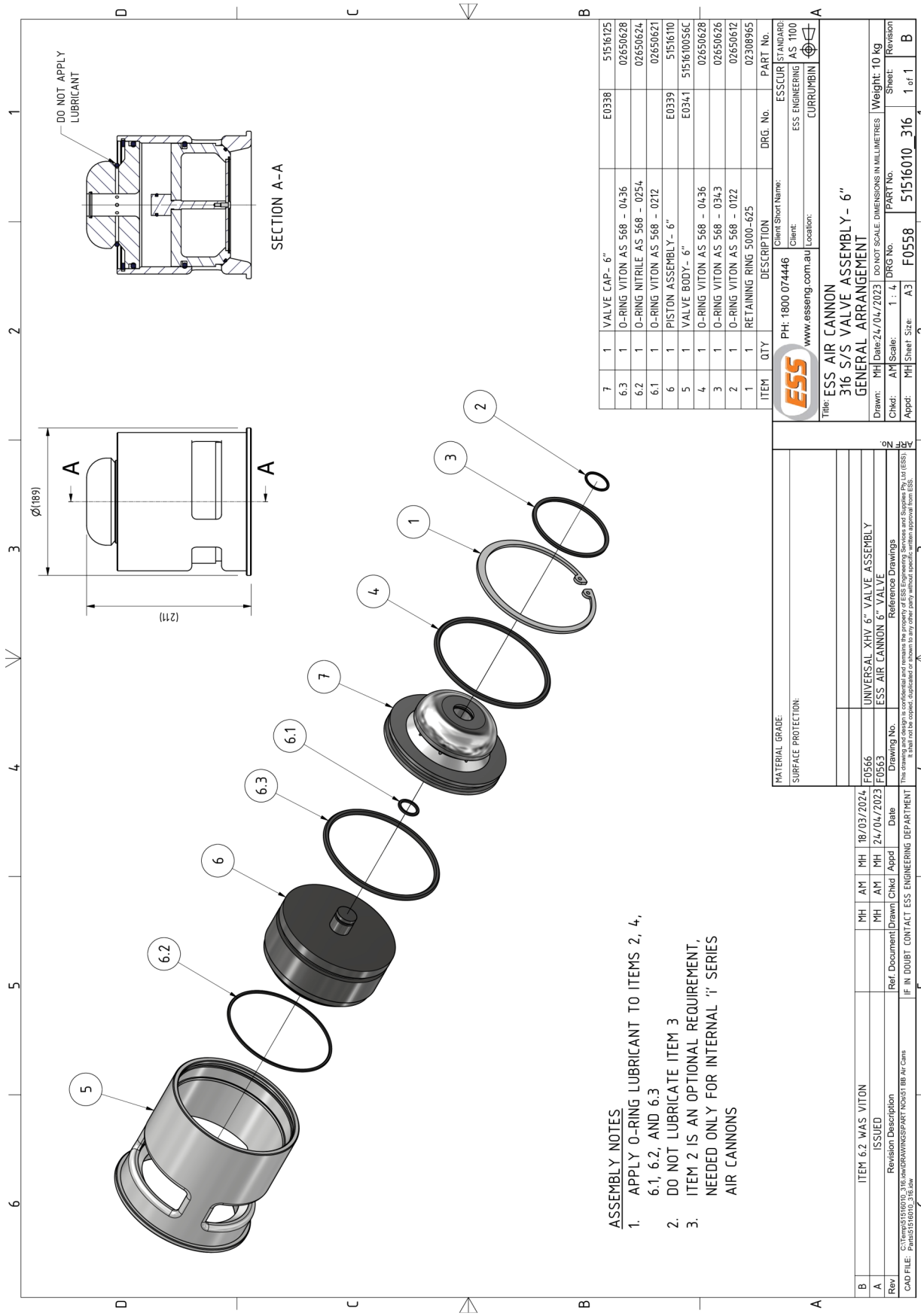


Figure 24 – F0563 AIR CANNON HT 6" VALVE ASSEMBLY DETAIL

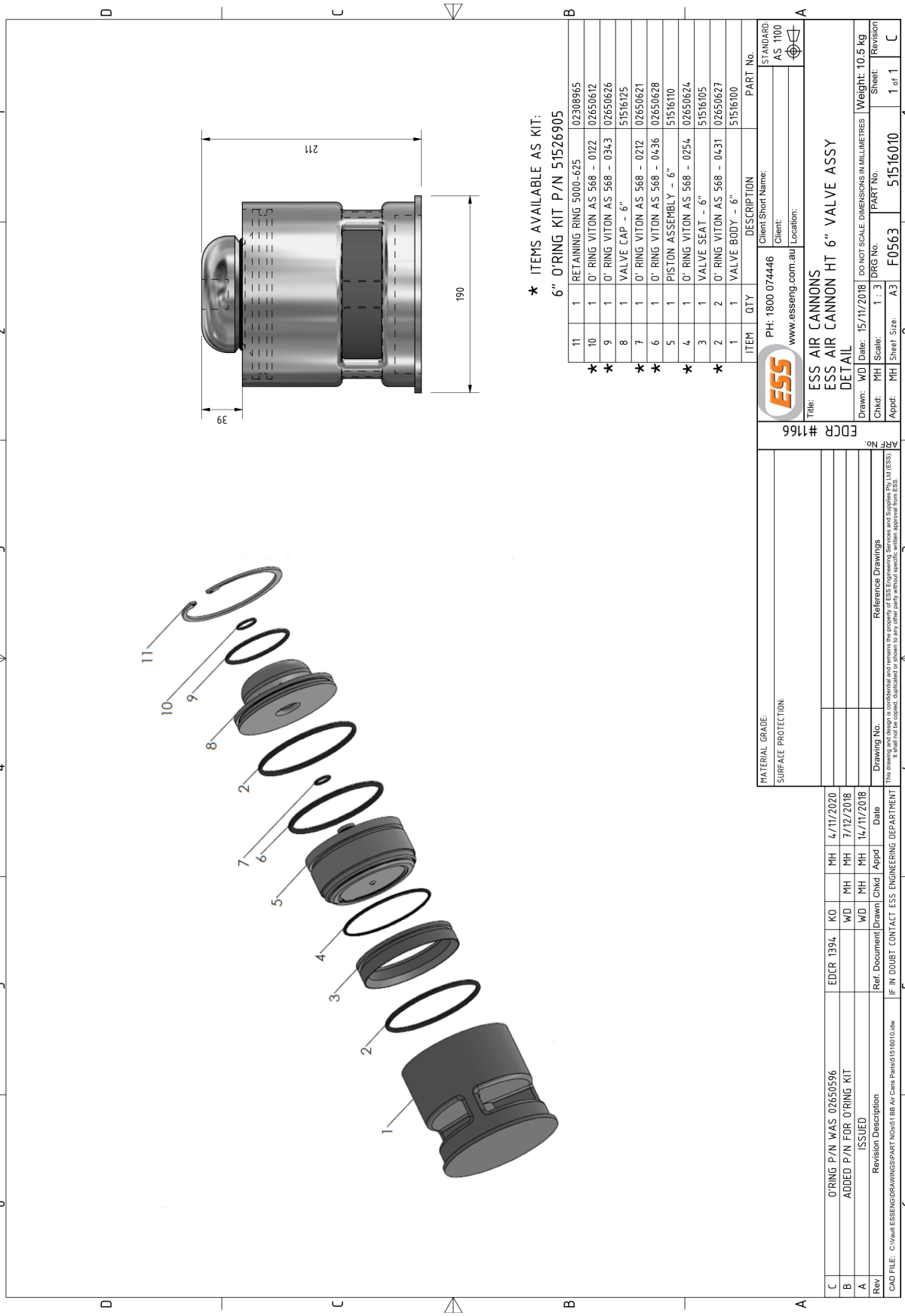


Figure 25 - F0567 e2 VALVE ASSEMBLY COMPLETE

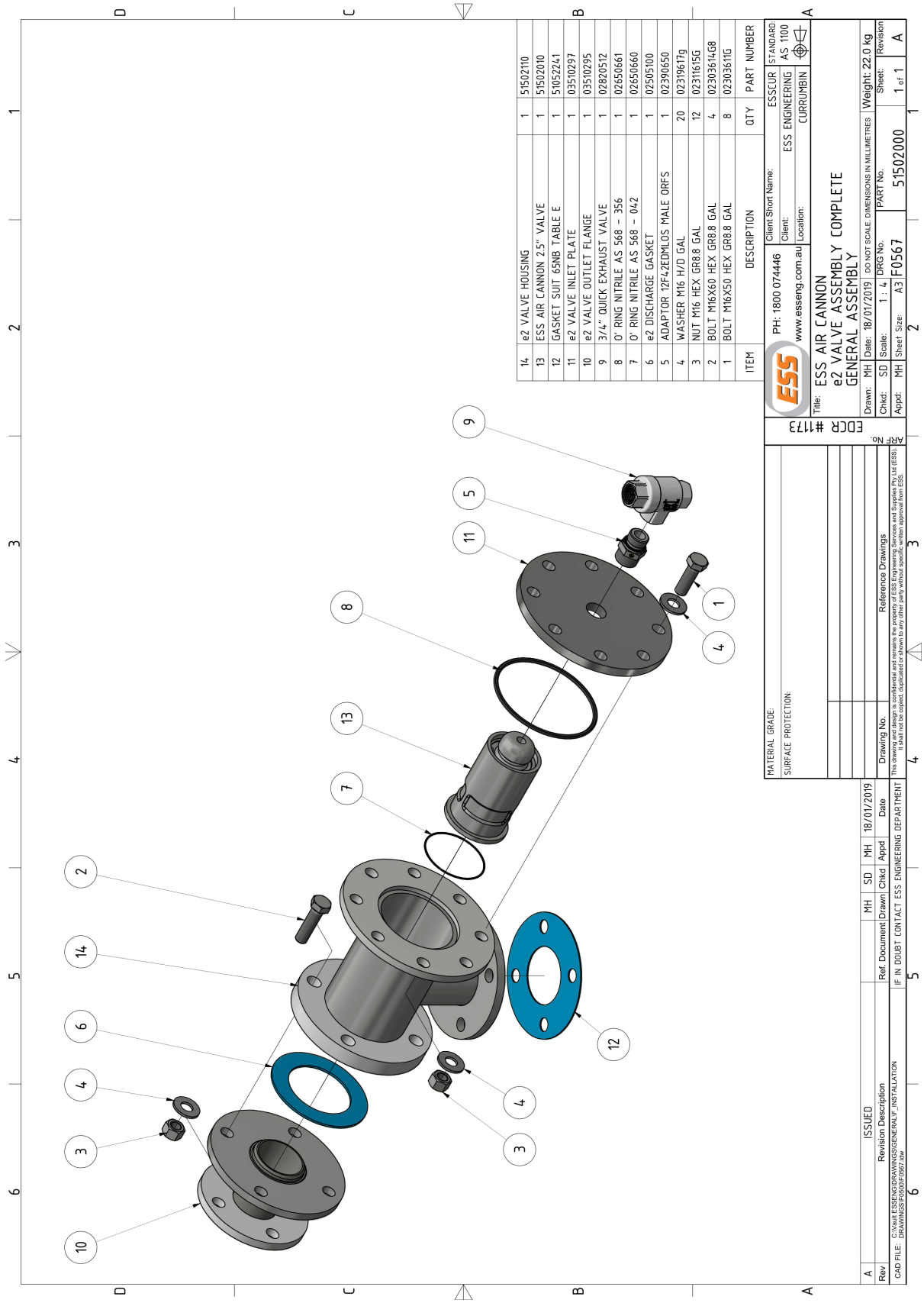


Figure 26 - F0565 UNIVERSAL XHV 4" VALVE ASSEMBLY

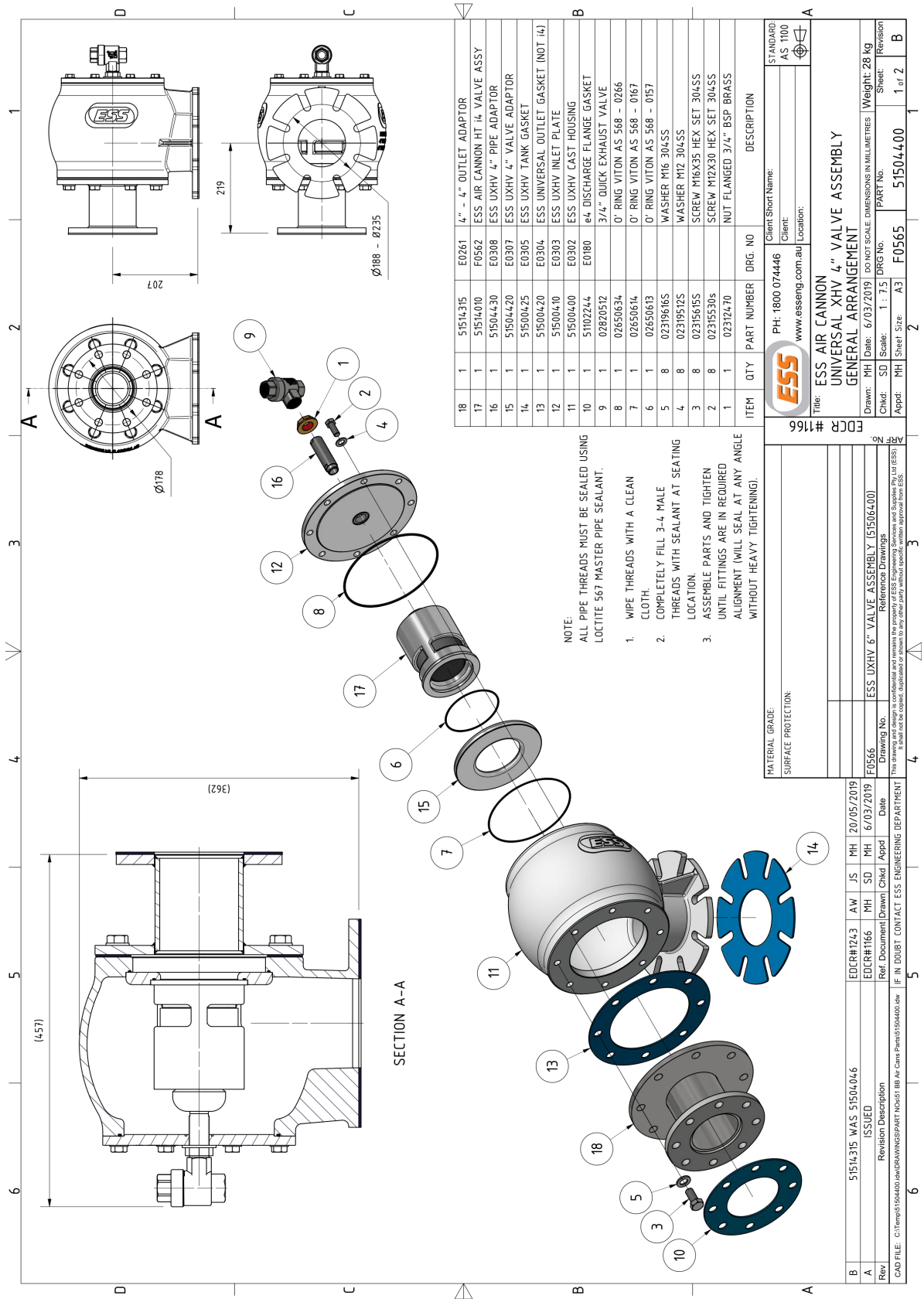


Figure 27 - F0566 UNIVERSAL XHV 6" VALVE ASSEMBLY

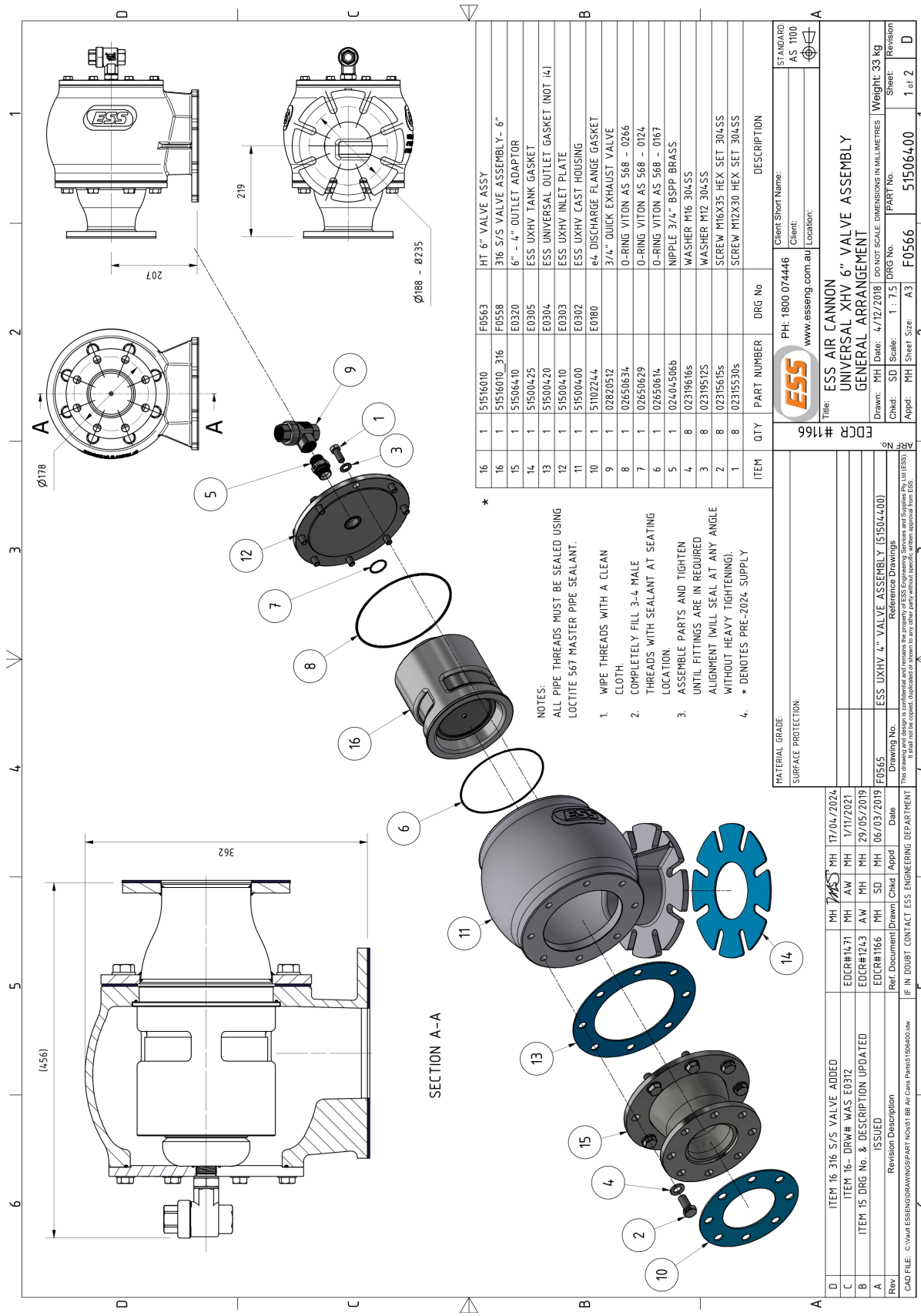


Figure 28 - F0587 FIRING KIT ENCLOSURE 1-4 OUTLETS

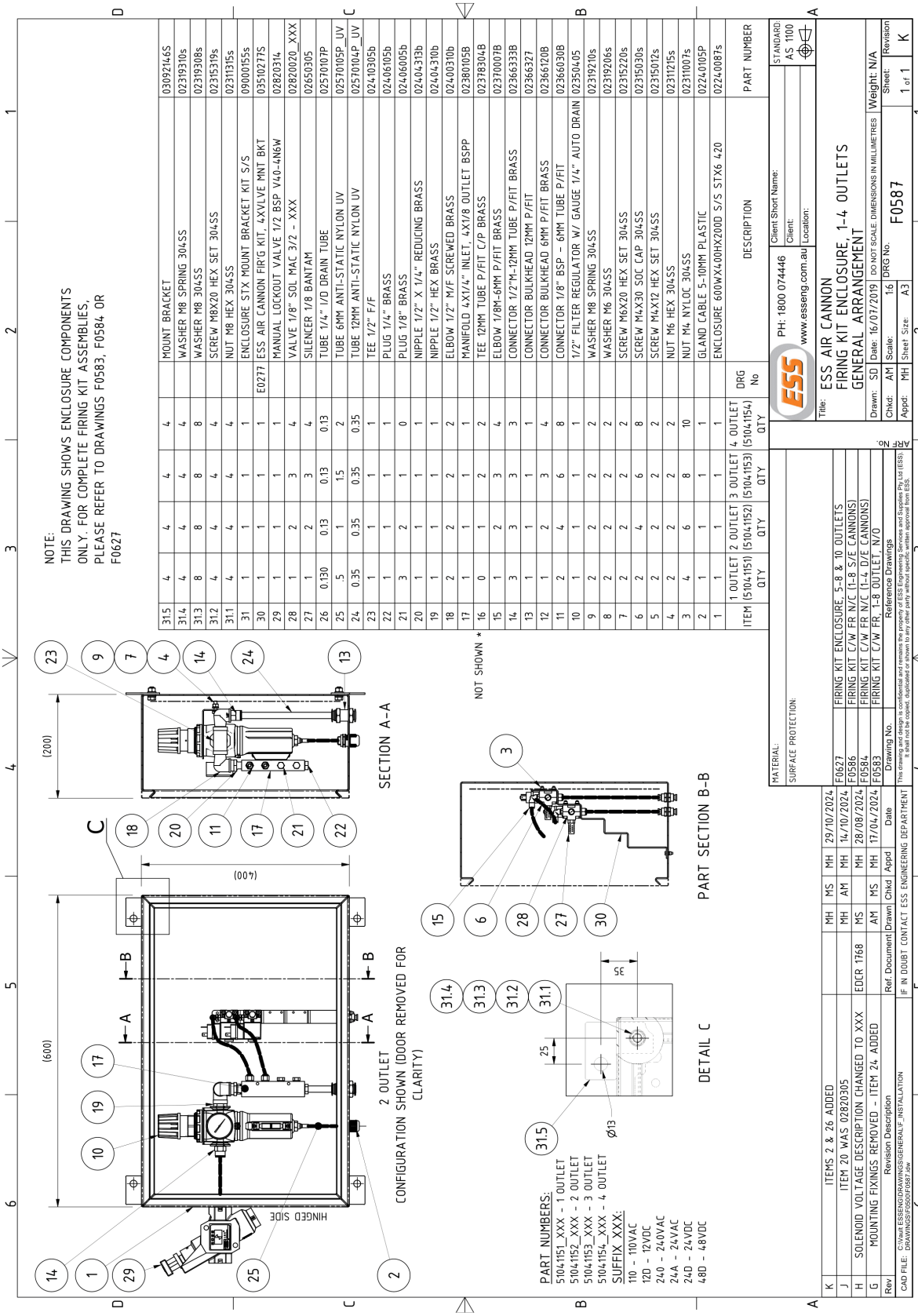


Figure 29 - F0627 FIRING KIT ENCLOSURE- 5-8 & 10 OUTLET

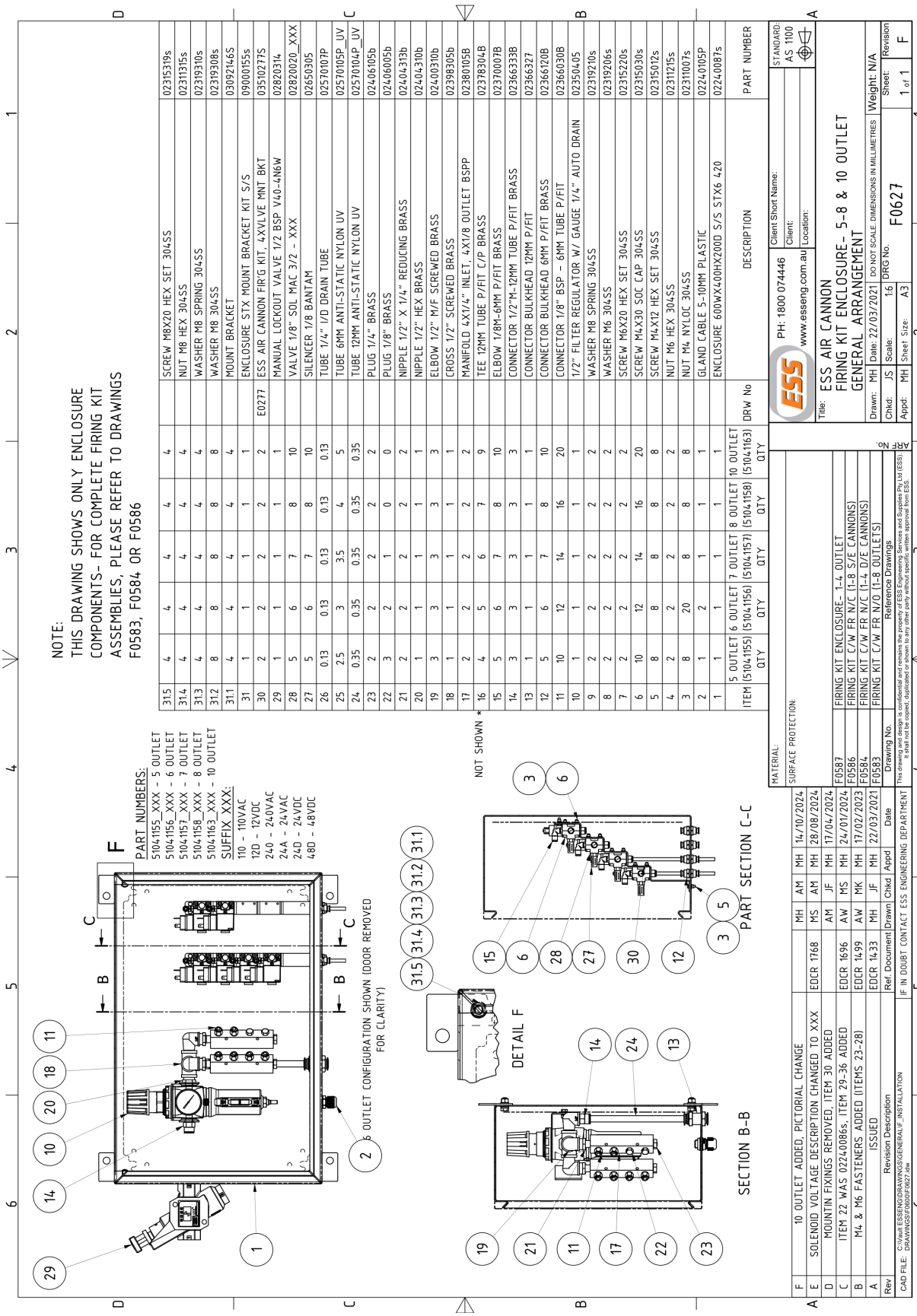


Figure 30 - F0583 FIRING KIT C/W FR. 1-8 OUTLET N/O

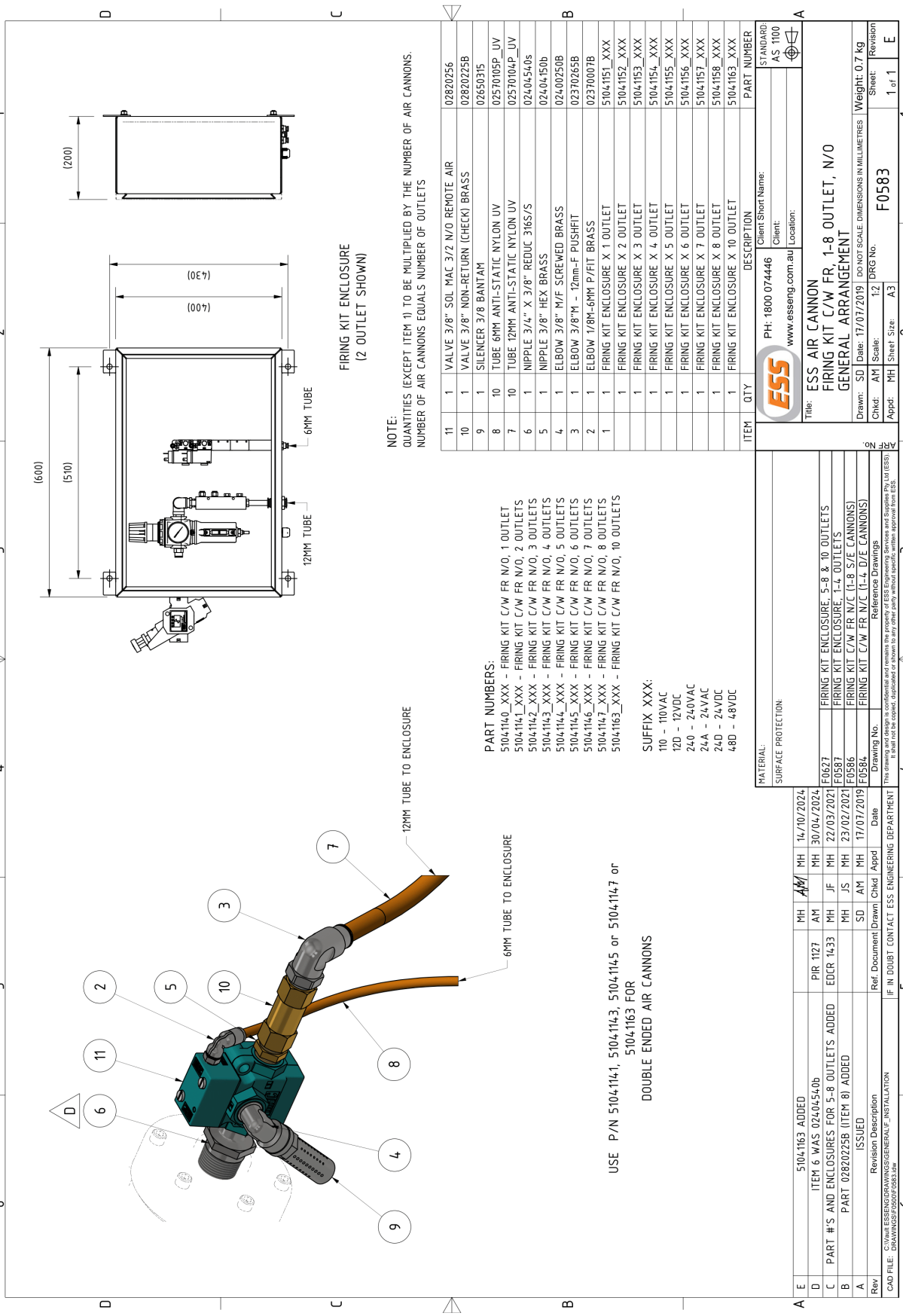


Figure 31 - F0584 FIRING KIT C/W FR N/C (1-4 D/E CANNONS)

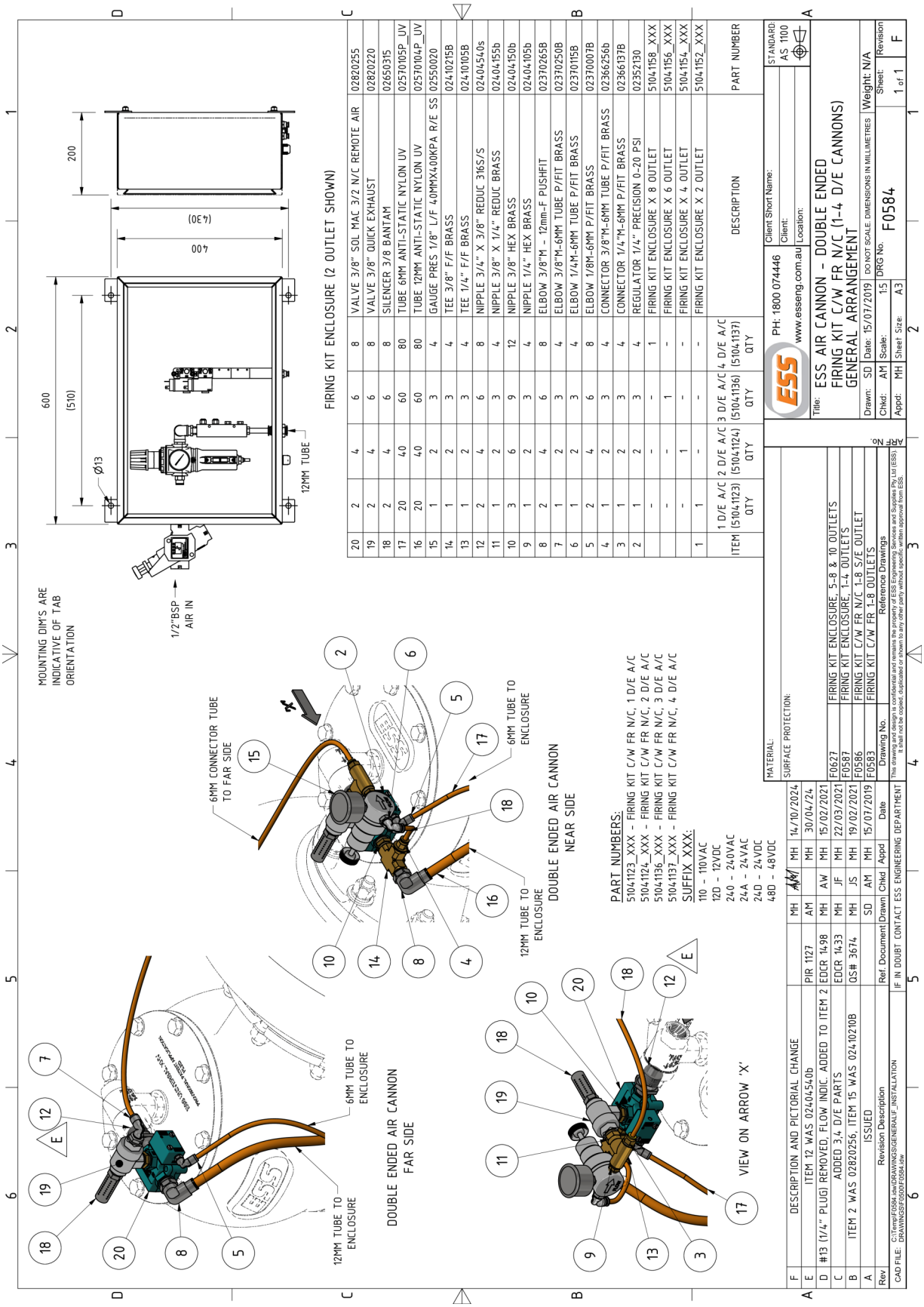


Figure 32 - F0586 FIRING KIT C/W FR N/C (1-8 S/E CANNONS)

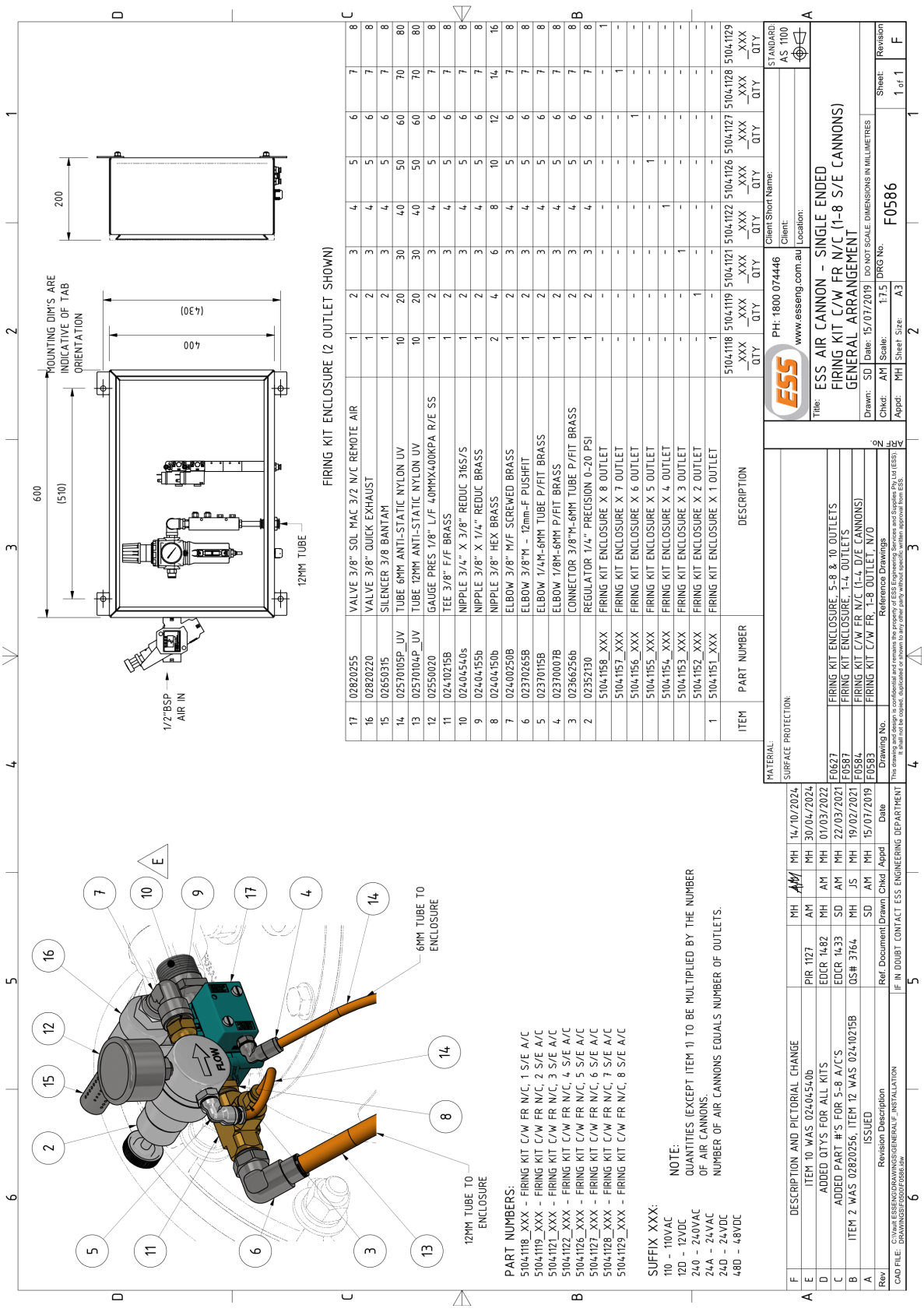


Figure 33 - F0540 SAFETY FIRING KIT - POSITIVE PRESSURE (N/C)

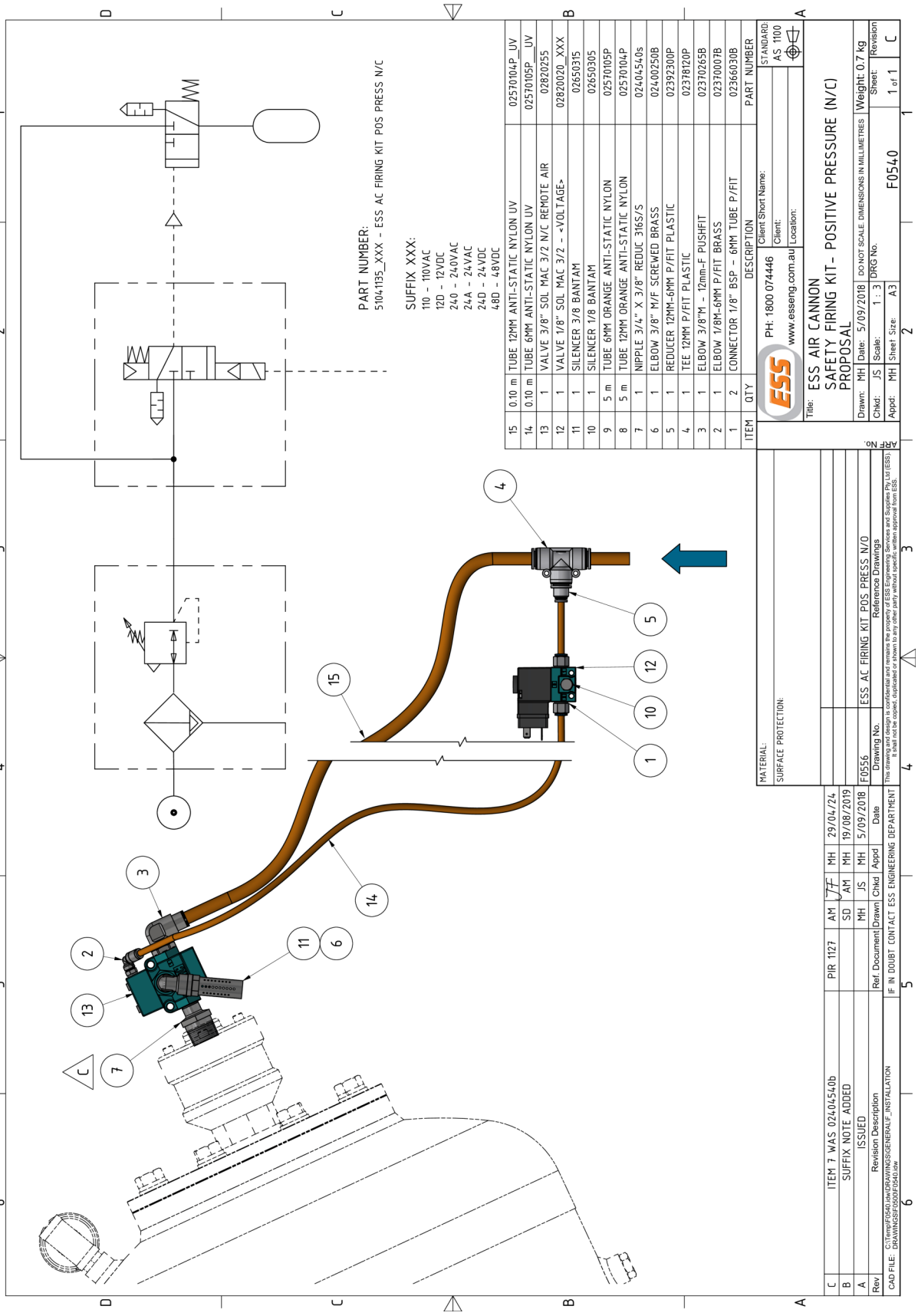
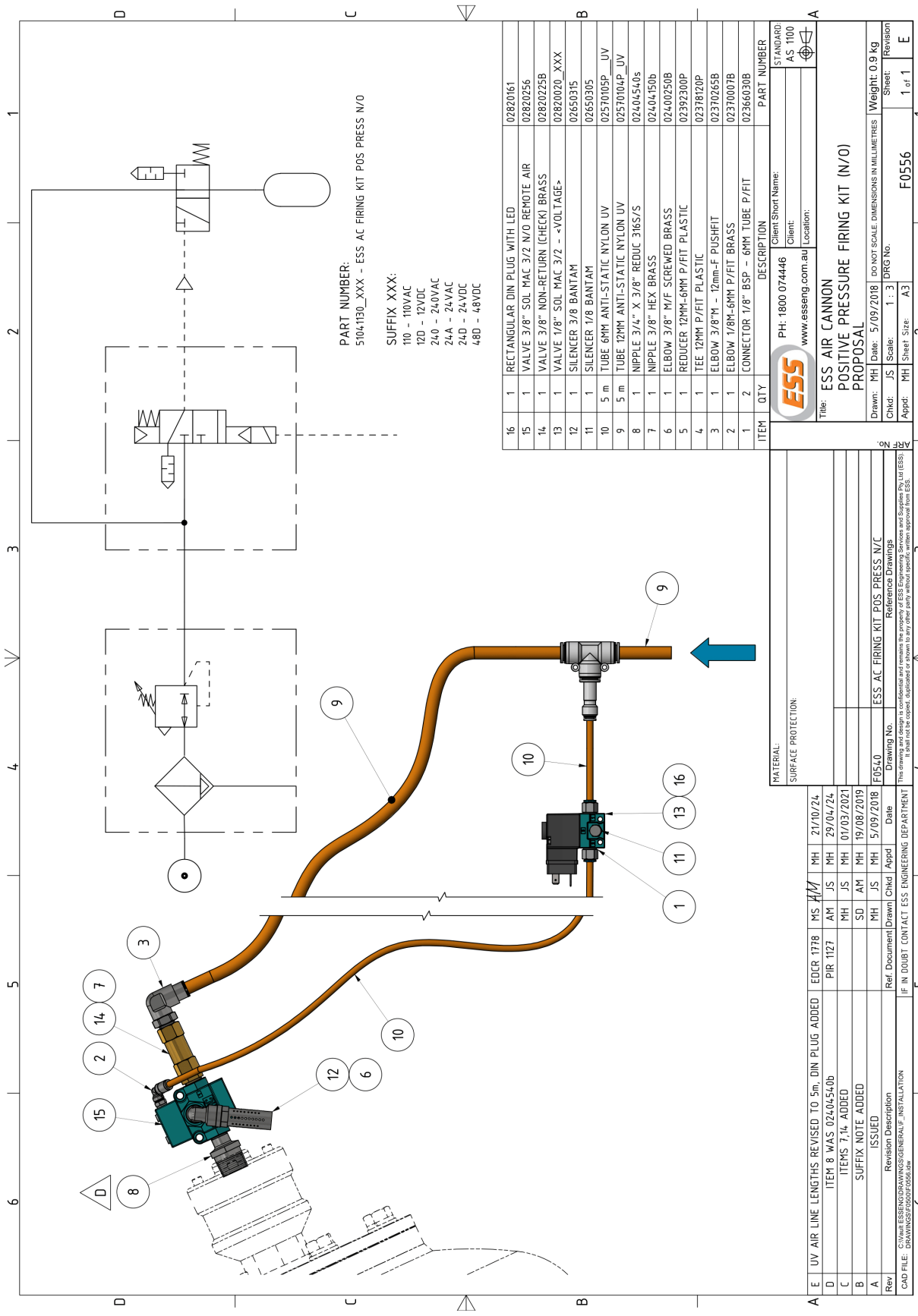


Figure 34 - F0556 POSITIVE PRESSURE FIRING KIT (N/O)



5.1. RECOMMENDED SPARES

EXTERNAL VALVES (E SERIES)

UXHV 2" SERVICE KIT

Refer to Drawing F0567

Item Number	Description	Part Number	Quantity
	2" VALVE O-RING KIT	51522905	1
6	e2 DISCHARGE GASKET	02505100	1
7	O-RING NITRILE AS 568 – 042	02650660	1
8	O-RING NITRILE AS 568 – 356	02650661	1
12	GASKET SUIT 65NB TABLE E	51052241	1
13	ESS AIR CANNON 2.5" VALVE	51502010	1

UXHV 4" SERVICE KIT

Refer to Drawing F0565

Item Number	Description	Part Number	Quantity
	4" VALVE O-RING KIT	51524905	1
6	O-RING VITON AS 568 – 157	02650613	1
7	O-RING VITON AS 568 – 0167	02650614	1
8	O-RING VITON AS 568 - 0266	02650634	1
10	e4 DISCHARGE FLANGE GASKET	51102244	1
14	O-RING VITON AS 568 – 0266	02650634	1
13	ESS UXHV OUTLET GASKET	51500420	1
14	ESS UXHV TANK GASKET	51500425	1
17	ESS AIR CANNON HT i4 VALVE ASSY	51514010	1

UXHV 6" SERVICE KIT

Refer to Drawing F0566

Item Number	Description	Part Number	Quantity
	6" VALVE O-RING KIT	51526905	1
6	O-RING VITON AS 568 – 0167	02650614	1
7	O-RING VITON AS 568 – 0124	02650629	1
8	O-RING VITON AS 568 – 0266	02650634	1
10	E4 DISCHARGE FLANGE GASKET	51102244	1
13	ESS UXHV OUTLET GASKET	51500420	1
14	ESS UXHV TANK GASKET	51500425	1
16	ESS AIR CANNON HT 6" VALVE ASSEMBLY	51516010	1

6. FINAL CHECKLIST

Site: _____ Number: _____ Date: _____

Site Equipment No./Location: _____ Site Contact: _____

Completed By: _____ **(Circle Yes or No Below)**

1. Was equipment to *ESS* Specification? _____ Yes/No

   Drawing No. Ref: _____ Attached? Yes/No

   If No, WHY _____

   _____

   Will this affect performance? Yes/No

   If Yes, WHY _____

   _____

2. Was this a standard ☐ service ☐ inspection ☐ installation? Yes/No

   If No, WHY _____

   _____

3. Was work carried out as per procedure and JSA? Yes/No

   If No, WHY _____

   _____

4. Is equipment fit for commissioning? Yes/No

   If No, WHY _____

   _____

5. Was a final inspection carried out while plant was running? Yes/No

   If No, WHY _____

   _____

6. Has anything changed from previous service / inspection / installation? Yes/No

   If Yes, WHAT _____

   _____

7. Is equipment performance to Client expectations? Yes/No

   If No, WHY _____

   _____

   ESS Signature: _____ Client Signature: _____

7. NOTES