



AIR DRIVEN PUMP OPERATING MANUAL TT-1506

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AIR DRIVEN PUMP

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Introduction

The TITAN air driven pump is mounted in a compact tubular steel carrying frame complete with air filter, air pressure gauge, air pressure regulator, air lubricator, air on/off valve, air pressure limit valve, 8.5 litre oil reservoir, oil pressure release valve, 150 mm dual scale oil pressure gauge with damping, pressure gauge guard and oil pressure outlet via a self sealing quick connect coupling.



RED 2500 bar

BLUE 1500 bar

GREEN 1000 bar

The frame is painted to correspond with the hydraulic hoses and the maximum operating pressure rating. GREEN for 1000 bar operating pressure, BLUE for 1500 bar operating pressure and RED for 2500 bar operating pressure. TITAN has a range of standard pumps, two for 1000 bar systems, two for 1500 bar systems and two for 2500 bar systems. Others designed to meet specific customer requirements are also available. The main components of the pump unit are shown in the following diagrams. The method of operation is the same for all the air driven pumps. The pictures in this manual show a green 1000 bar pump but the instructions apply to all of the models.



1000 bar pump hoses and bolt tensioning tools



1500 bar pump hoses and fittings



2500 bar pump and hoses



HEALTH & SAFETY INSTRUCTIONS

THINK SAFETY

The air driven pump supplied by TITAN has been designed to give a long and safe working environment for developing high hydraulic pressures for operating TITAN hydraulic bolt tensioning tools and equipment when used as instructed in this manual.

The main Health & Safety considerations when using this air driven pump relate to :-

- A) The connection disconnection and use of the compressed air supply to the pump.
- B) The setting of the air pressure limit valve.
- C) The correct setting of the stall pressure
- D) The correct connection of the hoses and other equipment to be pressurised by the pump.

A) AIR SUPPLY

Precautions should be taken when connecting and disconnecting the compressed air supply to and from the pump.

Before connecting the compressed air make sure the pump ON/OFF control valve is turned off and the return to tank valve is fully open. Check the compressed air supply pressure does not exceed 7 bar.

When disconnecting the compressed air supply, first open the return to tank valve, and close the pump ON/OFF control valve. Turn off the compressed air at the point of supply. Open the pump ON/OFF valve to release the air pressure in the pump and the pipe-work connecting the pump to the supply point. The air pipeline connection at the pump can then be safely disconnected.

Observe all the normal Health & Safety rules associated with the use of compressed air.

B) SETTING THE AIR PRESSURE LIMIT VALVE.

The air pressure limit valve is factory pre-set. TITAN does not recommend users to change the setting. Instead the user should learn to correctly set the pump stall pressure, as described later in this instruction manual. Setting the pump stall pressure will prevent the pump from operating at a pressure in excess of the recommended pressure for the equipment attached to the pump.

The air pressure limit valve prevents the pump from developing pressures above the safe limits for other components within the pump unit.



DO NOT CHANGE THE SETTING OF THE AIR PRESSURE LIMIT VALVE TO INCREASE THE PRESSURE DEVELOPED BY THE PUMP.

C) SETTING THE PUMP STALL PRESSURE

The procedure for setting the pump stall pressure is described later in this manual.

Always follow the procedure to set the pump to stall either at the maximum working pressure marked on the side of the equipment to be connected to the pump or the lower pressure at which you want the equipment to operate. Following the procedure will ensure the equipment connected to the pump is never accidentally over-pressurised.



DO NOT PRESSURISE TITAN HYDRAULIC TOOLS ABOVE THE MAXIMUM WORKING PRESSURE MARKED ON THE SIDE OF THE CYLINDER OR ON THE TOP OF THE PULLER

HEALTH & SAFETY INSTRUCTIONS

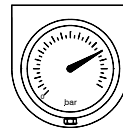
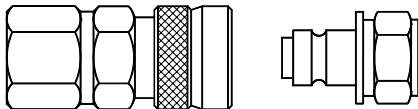
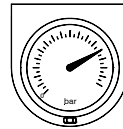
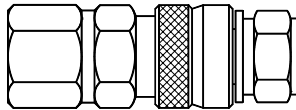
Quick Connectors



DO NOT pressurise the connectors when they are disconnected



Check there is no pressure in the system before attempting to connect or disconnect the couplings.



Hoses

The flexible hydraulic hoses supplied by **TITAN** have a small plastic core tube surrounded by multiple high tensile steel spiral windings. The outside of the hose is moulded with a coloured plastic coating. Most hoses are also given a clear plastic cover to provide additional protection against damage when in use. Each hose is identified with a serial number. All hoses are pressure tested when manufactured and test certificates can be issued.

TITAN supplies three types of high pressure flexible hydraulic hose and they are easily identified by the colour of the moulded plastic coating beneath the clear plastic cover. The maximum working pressure for the hose is sometimes marked on the outside of the coloured plastic coating, however this is the working pressure of the hose **ONLY** and not the hose **ASSEMBLY**. The maximum working pressure of a hose assembly is often limited by the pressure rating of the quick connect couplings and/or the fittings on the end of the hose. Although the hose may be capable of operating at higher pressures the limit you must observe is shown below along with the minimum bend radius.

Colour	Max Working Pressure	Min Bend Radius
GREEN	1000 bar	95 mm
BLUE	1500 bar	130 mm
RED	2500 bar	200 mm

Each type of hose is fitted with self sealing quick connect couplings at one or both ends.

HEALTH & SAFETY INSTRUCTIONS

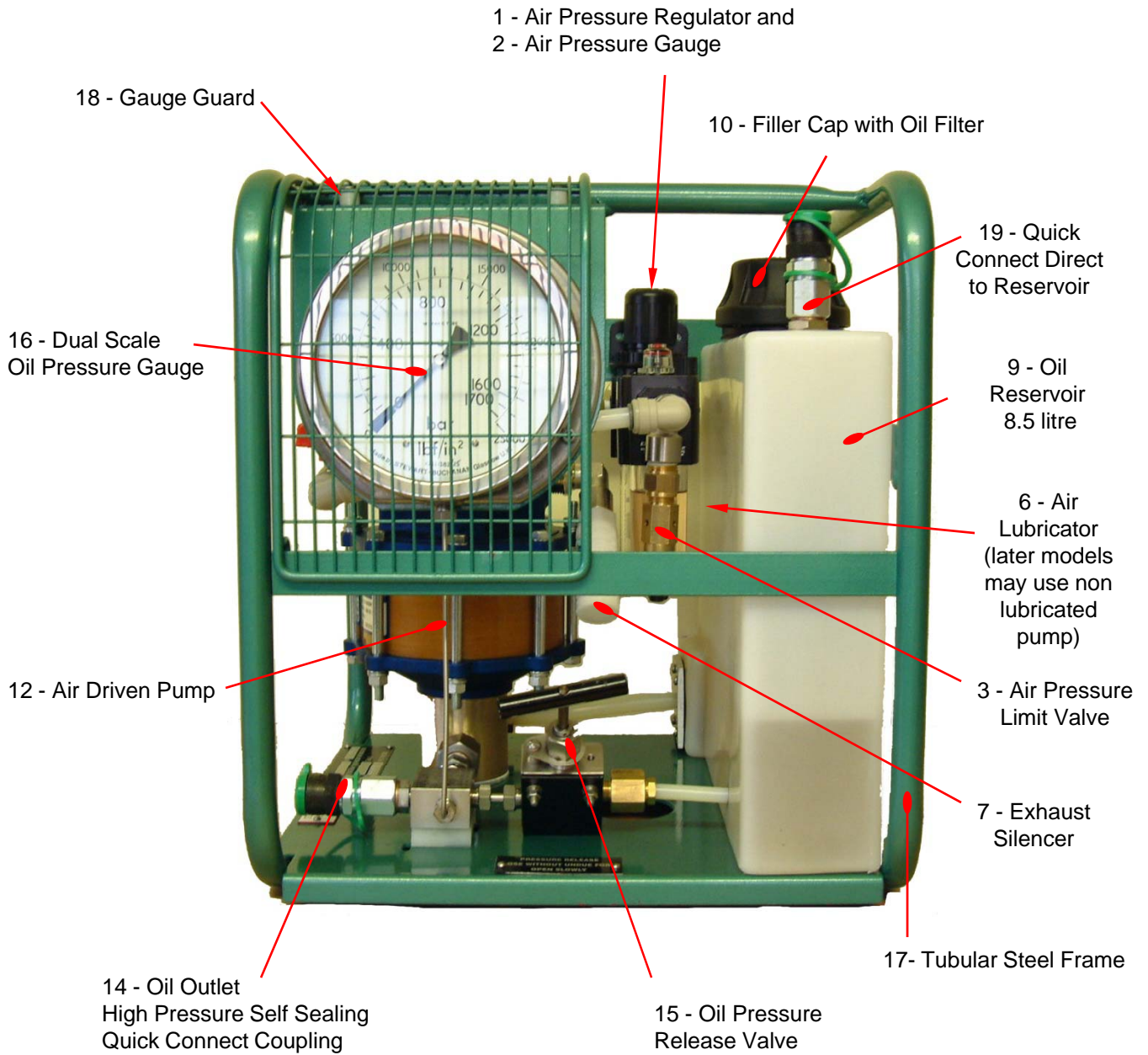


You must observe the following Health & Safety instructions when using hydraulic hoses.

- Discard and do not use any hose that does not have an identifying serial number
- Discard and do not use any hose that shows any sign of damage either :-
 - a) to the coloured moulded plastic coating
 - b) where the spiral windings are exposed
 - c) where the spiral windings are damaged or broken
 - d) where there is damage to the swaged metal ends
- Do not allow any hose to be kinked or knotted. Hoses which have been kinked or knotted will have suffered damage to the windings and must be discarded.
- Do not allow heavy objects to fall on, rest on, or roll over the hoses.
- Do not allow hoses to be subjected to temperatures higher than 60 deg C.
- Discard and do not use any hose which has been subjected to heat or fire.
- Do not bend the hose tighter than the minimum bend radius of the hose or it will be kinked.
- Do not exceed the maximum working pressure of 1000 bar for the GREEN colour hose, 1500 bar for BLUE colour hose, and 2500 bar for RED colour hose.
- Only use the hoses for their intended purpose – for use with **TITAN** hydraulic equipment.
- After use check the hoses for damage, wipe to remove dirt and oil, refit dust caps and prepare for storage.

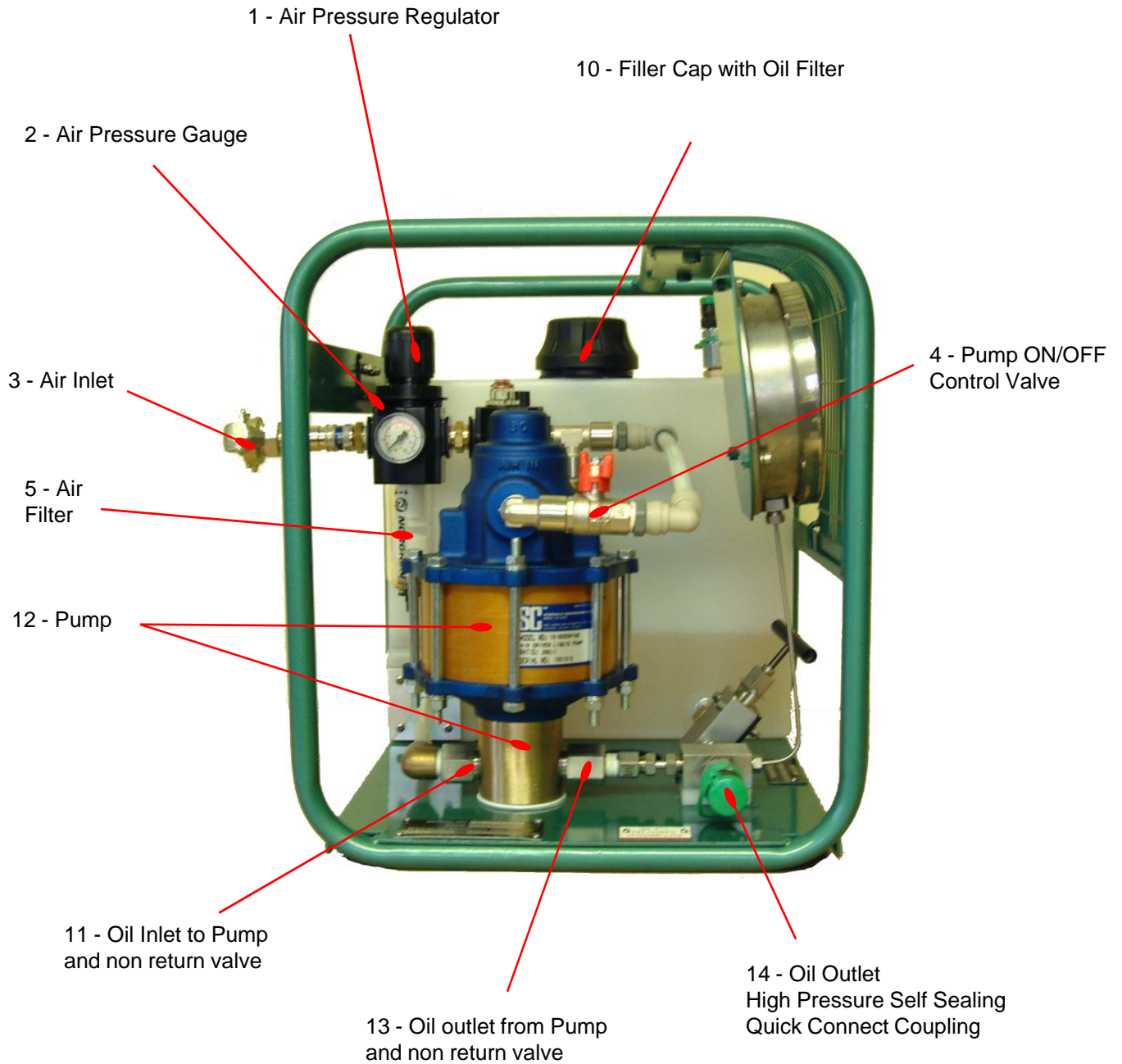
- When not in use store the hoses in a safe place where they cannot easily be damaged.
- Do not mix the GREEN, BLUE , RED colour coded hoses. The end fittings and quick disconnect couplings on these hoses have different pressure ratings.
- Never move hose end connectors or quick disconnects from BLUE hoses to any other colour hose.
- Never move hose end connectors or quick disconnects from RED hoses to any other colour hose.
- Never move hose end connectors or quick disconnects from GREEN hoses to any other colour hose.
- Use GREEN colour coded hoses for 1000 bar System Tools and Equipment.
- Use BLUE colour coded hoses for 1500 bar System Tools and Equipment.
- Use RED colour coded hoses for 2500 bar System Tools and Equipment.
- Check the bolt tensioning tools you are using are compatible with the hoses you are using. All **TITAN** tools are marked with the maximum operating pressure.
- Never pressurise a quick disconnect coupling or nipple when disconnected.
- Do not take apart any ring main harness component or hose assembly. These are filled with oil and pressure tested after assembly. When taken apart the integrity of the assembly is lost and the pressure test invalidated. Return any parts that need attention to TITAN where the correct specification parts will be used to effect repairs, followed by pressure testing and certification before return.

Main Components



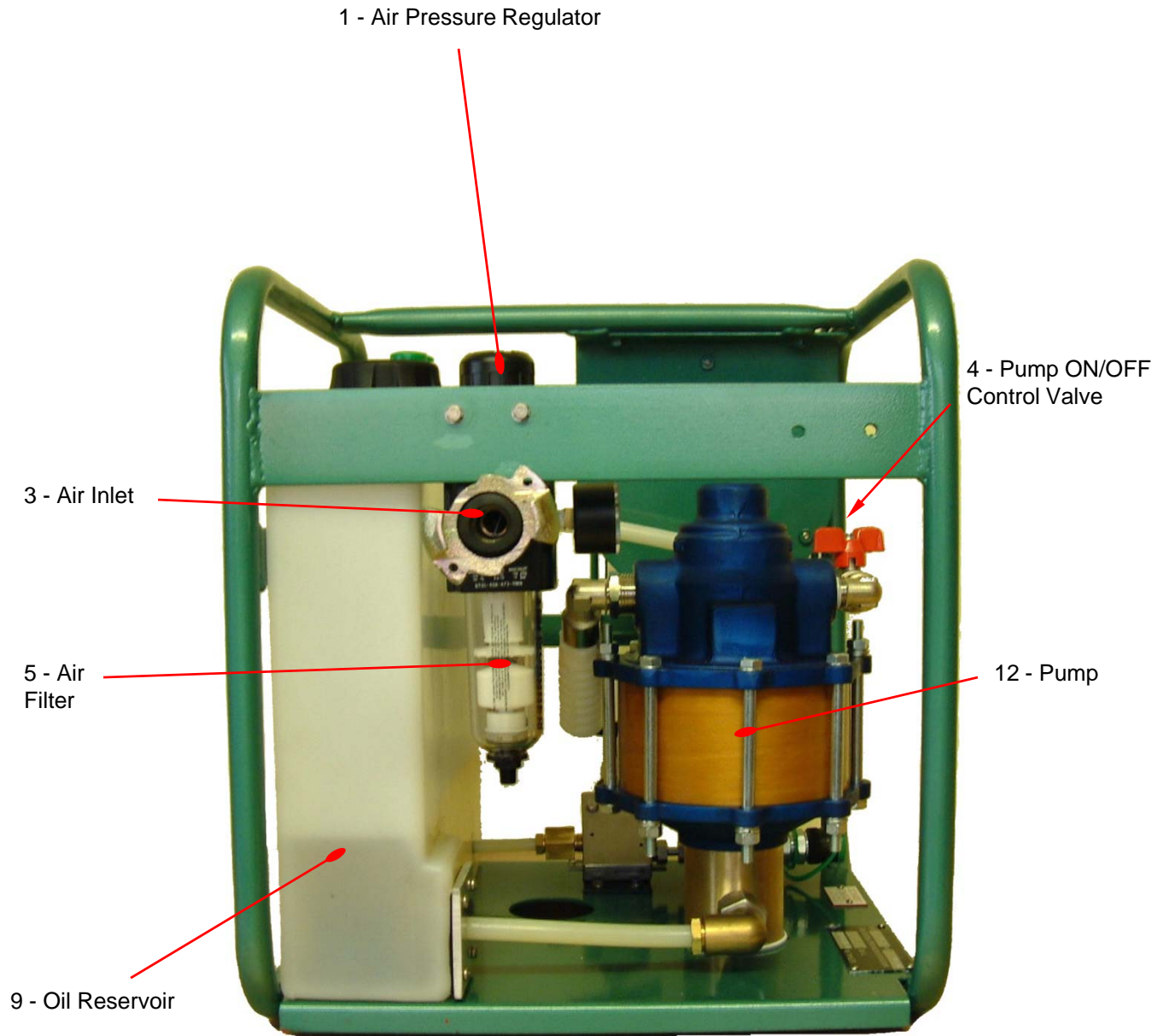
Front View

Main Components



Side View

Main Components



Rear View

Main Components

The numbers in brackets refer to the Front, Side and Rear Views.

1 - Air Pressure Regulator

The air pressure regulator controls the air pressure applied to the pump. To avoid accidental adjustment the cap has a locking mechanism. To unlock pull the cap upwards. To lock, push the cap down. When pulled up, rotate the plastic cap anti-clockwise to reduce pressure, and clockwise to increase air pressure. The controlled air pressure is displayed on the air pressure gauge (2). The controlled air pressure is limited by an air pressure limit valve (3).



2 - Air Pressure Gauge

Displays the controlled air pressure applied to the pump.



3 - Air Pressure Limit Valve

Limits the maximum air pressure applied to the pump and therefore limits the maximum oil pressure the pump can develop.



4 - Pump ON / OFF Valve

Starts and stops the pump by turning the controlled air ON or OFF. The picture on the right shows the valve in the OFF position. Turn through 90 degrees to turn fully ON and run the pump at maximum speed. The pump can be run slowly by partially opening this valve.



5 - Air Filter

The air filter is combined with the air pressure regulator (1). The filter bowl is beneath the air pressure regulator control cap. The filter removes dirt and water from the air supply. A drain valve at the base of the filter bowl can be opened to allow water to escape. When used with a wet air supply, the drain valve should be left open, just enough, to ensure the continual removal of all water entering the filter. The drain valve can remain closed when the air supply is always dry.



Main Components

6 - Air Lubricator

Provides oil mist lubrication for the pump. This is factory pre-set and should not need attention. The lubricator bowl is pre-filled with oil and should last a very long time. Later models use a new lubrication free air motor.



7 - Exhaust Silencer

When air has passed through the pump it exits the exhaust port of the pump through a plastic silencer. The silencer should require no maintenance.



8 - Air Inlet

The air inlet is through an industry standard bayonet connector. The connector can be easily unscrewed and changed if it does not match the fittings in use at the customers premises.



9 - Oil Reservoir

A large 8.5 litre plastic oil reservoir is provided. Oil is gravity fed to the pump from the base of the reservoir through a fine filter which should not require maintenance. Oil returns to the reservoir from the Oil Pressure Release Valve (15). A quick disconnect nipple is provided on the top of the reservoir. This is used if it becomes necessary to fill or bleed any of the hydraulic hoses.



10 - Filler Cap with Oil Filter

A large black plastic filler cap is removed by turning anti-clockwise and replaced by turning clockwise. Immediately beneath the filler cap, in the mouth of the reservoir, is a coarse oil filter. This can be easily lifted out for cleaning. The oil filter must be in place when filling the reservoir.



Main Components

11 - Oil Inlet to Pump and Non Return Valve

Oil enters the pump from the reservoir through a spring loaded Non Return Valve. This valve should not require attention. If problems arise with any of the non return valves it is best to return the pump to TITAN for service. Overseas customers may have a local SC pump distributor who can carry out maintenance on these parts.



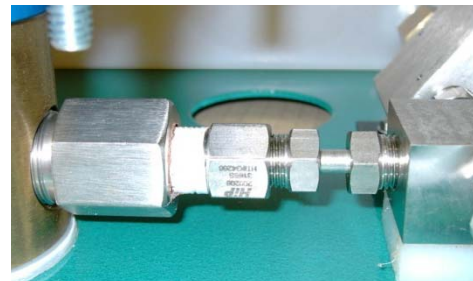
12 - Pump

The pump is manufactured by SC Hydraulic Engineering Corporation and is very robust and reliable. If used as directed the pump should not require maintenance for many years. If problems arise with the pump itself it is best to return the complete package to TITAN for service. Overseas customers may have a local SC pump distributor who can carry out maintenance on the pump.



13 - Oil Outlet and Non Return Valve

Oil leaves the pump under pressure through a spring loaded non return valve. This valve should not require attention. If problems arise with any of the non return valves it is best to return the pump to TITAN for service. Overseas customers may have a local SC pump distributor who can carry out maintenance on these parts.



14 - Oil Outlet - High Pressure Self Sealing Quick Connect Coupling

From the pump and non return valve, high pressure oil enters a 4 way distribution block. (one inlet and three outlets). One outlet feeds the oil pressure gauge(2). Another outlet goes directly to the Oil Pressure Release Valve (15). The final outlet is fitted with a self sealing quick connect coupling to which the hydraulic hose feeding the bolt tensioning tools must be connected. The coupling has a plastic dust cover which should be replaced when the pump is not in use. The pump should not be pressurised when the coupling is disconnected. A blank Quick Connect Nipple must be fitted to the coupling if the pump is to be pressurised.



Main Components

15 - Oil Pressure Release Valve

This high pressure valve should be treated with care. It is opened by turning the T shaped handle anti-clockwise. It is closed by turning the handle clockwise. The pump cannot generate any pressure when the valve is open as oil is free to circulate to the Oil Reservoir (9). When closing the valve care must be taken. Excess tightening will damage the high pressure valve seat. Care is also needed when opening the valve under pressure. Open slowly allowing the pressure to fall gently.



16 - Oil Pressure Gauge

All pump units are fitted with dual scale damped pressure gauges. The 1000 bar and 1500 bar systems use the same gauge calibrated to 1700 bar and 25,000 psi. The 2500 bar unit uses a similar gauge but calibrated to 3500 bar and 50,000 psi. The reciprocating pump causes pressure pulses which are damped by the gauge to display a steadily rising or falling indication during pump operation.



17 - Tubular Steel Frame

All of the pump components are mounted in an easily transported, fabricated steel tube, carrying frame. The frame is painted GREEN for 1000 bar systems, BLUE for 1500 bar systems and RED for 2500 bar systems. The colours match the colour of the flexible hoses for these systems. Only use GREEN hoses with a pump painted GREEN, BLUE hoses with a pump painted BLUE and RED hoses with a pump painted RED. Do not mix the hoses and pumps.



18 - Gauge Guard

A metal grille is provided to protect the glass face of the pressure gauge.

19 - Quick Connect Direct to Reservoir

A quick connect coupling is provided directly onto the top of the Oil Reservoir. This can be used to bleed air from hoses and Ring Mains by connecting one end to the pump outlet and the other to this coupling. The connector can also be used to by-pass the Oil Pressure Release Valve during the bolt tensioner piston return operation. The hose is simply removed from the outlet and connected directly onto the tank. The bolt tensioner pistons will then be much easier to return.



How the Pump Works.

The air driven pump unit is a reciprocating pump / intensifier. A large diameter piston reciprocates under air pressure of 4 bar to 6 bar and is attached to a much smaller diameter piston which generates oil pressures between 1000 bar, 1500 bar and 2500 bar depending on the model of pump.

An air flow and oil flow chart on the next page shows the movement of both air and oil through the air driven pump unit.

Air Side

Air enters the pump through the bayonet air inlet (8), and passes immediately to the air filter (5) and air pressure regulator (1). The air pressure regulator controls the pressure from the air inlet which is allowed to act on the air piston of the pump. Increasing the air pressure on the air piston will increase the oil pressure generated at the oil piston. The air pressure at the air piston is indicated on the air pressure gauge (2). From the air pressure gauge the air passes through an oil mist air lubricator (6) which provides a small amount of lubrication for the air piston seals. Later models may use a lubrication free air motor. Air then passes an air pressure limit valve (3). This valve is spring loaded and has been factory set to limit the air pressure which can be applied to the piston. From the air pressure limit valve the air passes to the air piston via the pump ON / OFF Control Valve (4). Fully opening this valve allows the pump to run at full speed. This valve can be used to throttle the air passing to the air piston causing the pump to run more slowly. The air arriving at the air piston forces it down generating oil pressure on the oil side of the pump. At the end of its downward power stroke a series of valves and springs causes the piston to return to the top of its cylinder ready for the next power stroke. During the return stroke the used air is released to the atmosphere through an exhaust silencer.

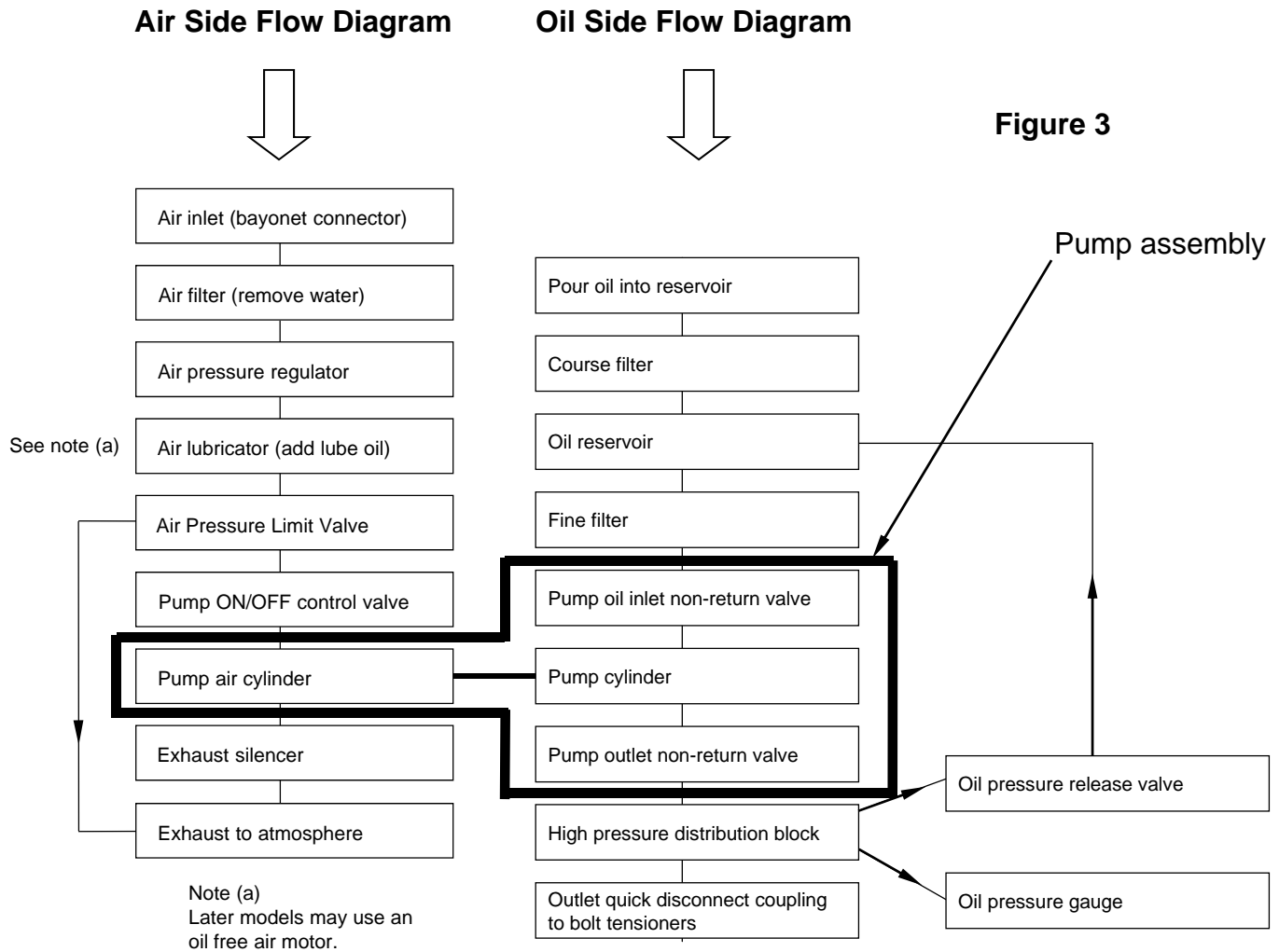
Oil Side

Oil enters the oil reservoir through the filler cap (10), passing immediately through a coarse oil filter. Oil is retained in the oil reservoir (9). Gravity causes the oil to pass through a fine filter at the base of the reservoir before arriving at the oil pump inlet. As the air and oil piston assembly rises, oil is drawn into the oil cylinder through an oil inlet non return valve (11). When the piston falls under the power stroke the oil is compressed and forced out of the oil cylinder through the oil outlet non return valve (14). The oil enters a high pressure distribution block where its return to the reservoir is blocked by the oil pressure release valve (15), when closed. If the oil pressure release valve (15) is open, oil is simply recycled to the reservoir (9). As long as the pump ON/OFF Control valve (4) remains open the pump will run sending oil around the oil circuit and back to the reservoir (9) but never achieving any increase in oil pressure. As soon as the oil pressure release valve (15) is closed the oil cannot return to the reservoir and oil pressure will be developed in the high pressure distribution block. The high pressure distribution block feeds oil pressure to the oil pressure gauge (16) which indicates the pressure generated. The oil pressure gauge (16) is damped to ensure a steady reading during the pressure pulses generated by the reciprocation of the pump(12). Oil passes from the pump unit through the oil outlet high pressure self sealing quick disconnect coupling (14). The bolt tensioning equipment is connected to this coupling. Oil passes to the bolt tensioning tools and the pressure generated by the pump acts on all of the tools simultaneously. The pressure generated is indicated on the oil pressure gauge (16) at all times.

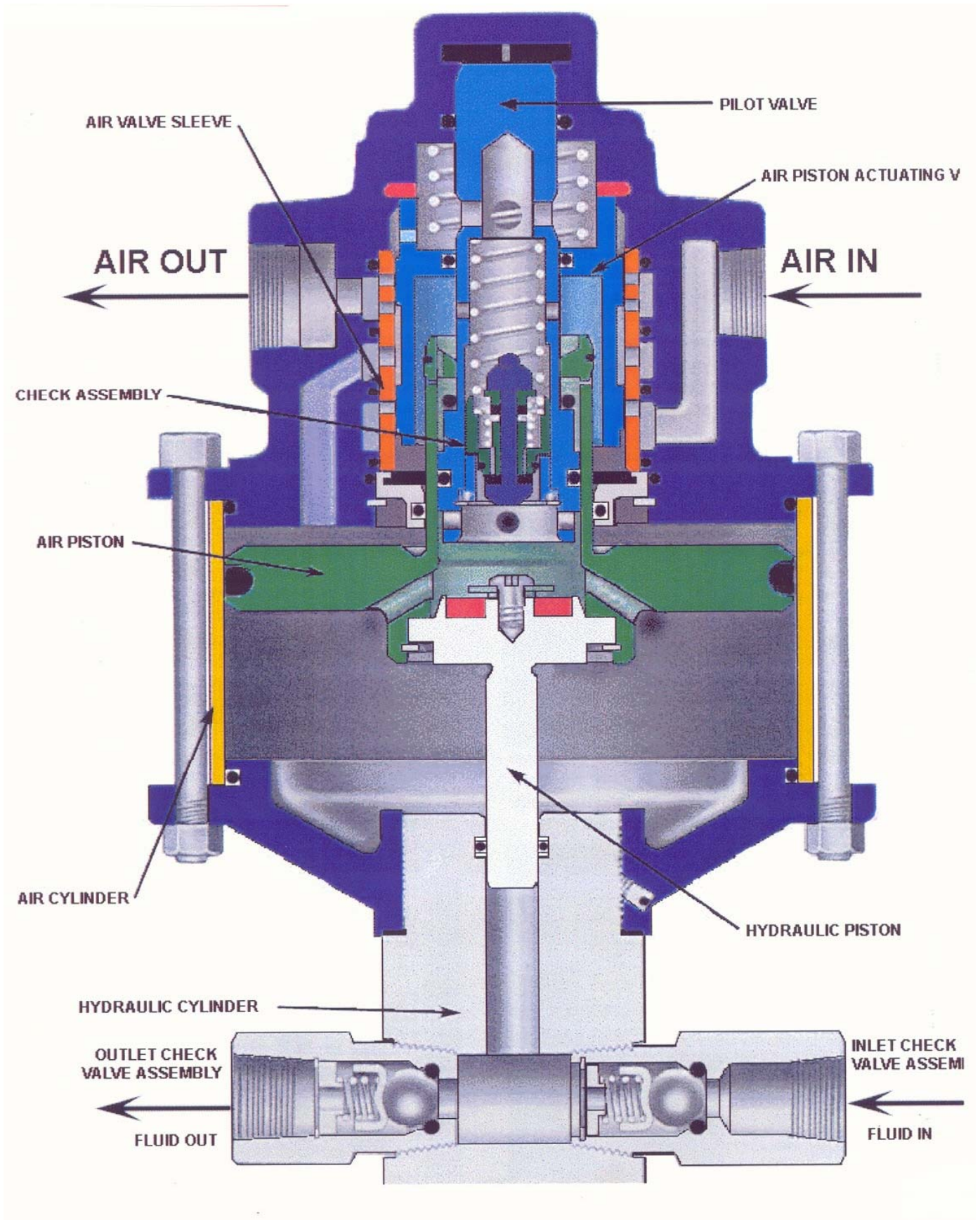
Pump Stall

When the pump is working and generating an increasing oil pressure the pump will eventually begin to slow down until a stall situation arises. At this point the pump will stop and the oil pressure will be maintained. If the oil pressure starts to fall, for any reason, the pump will restart until the stall pressure has been achieved again. This stall will happen when the force on the air piston equals the force on the oil side of the piston. The stall oil pressure is effectively set by the air pressure regulator (1). A higher air pressure will result in a higher oil pressure stall and a lower air pressure will result in a lower oil pressure stall. This phenomenon of stall allows the operator to pre-set the pump to achieve a desired oil outlet pressure which cannot be exceeded. The air pressure limit valve (3) has been factory set to limit the maximum air pressure which can be applied to the pump and hence the maximum oil pressure the pump can generate.

How the Pump Works.



Sectional drawing of the Pump Assembly



SETTING UP THE PUMP

Step 1

If a packing case was ordered with the pump, carefully open the case and retain it for storing the pump when not in use. Remove the pump from the plastic bag.

Step 2

Check the air pressure inlet connection is compatible with the mains air supply you intend to use with the pump. If not fit the correct type of connector to the air inlet on the pump unit.



Step 3

Remove the oil filler cap from the oil reservoir. Do not remove the coarse filter fitted beneath the filler cap. Pour ISO10 hydraulic fluid into the reservoir, through the coarse filter until it is about three quarters full. The reservoir takes about 8.5 litres of oil when full. Refit the oil filler cap.



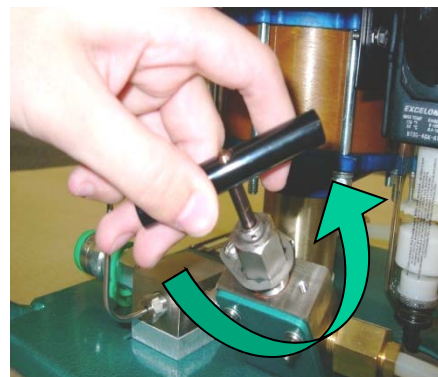
Step 4

Check the air lubricator to see if it is filled with lubricating oil. If not locate the lubricating oil supplied with the pump and fill the lubricator to the maximum level marked on the bowl. Do not attach the mains air before the lubricator is filled. If the mains air supply has been attached you must remove it before attempting to fill the oil lubricator.



Step 5

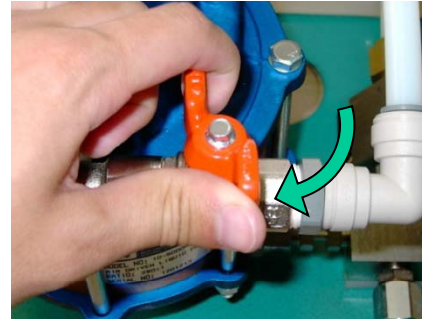
Fully open the Oil Pressure Release Valve. Turn the handle ant-clockwise to open the valve.



SETTING UP THE PUMP

Step 6

Close the pump ON/OFF control valve. Turn the handle a quarter turn clockwise to close the valve.



Step 7

Connect the mains air supply (70 -100 psi 5 - 7 bar).

Step 8

Check the regulated air pressure gauge.

Regulated Air
Pressure
Gauge



If it is not zero, Lift the black cap to unlock it and turn the air pressure regulator anti clockwise until the regulated air pressure falls to zero.



Step 9

Open the pump ON/OFF valve. Turn the handle a quarter turn anti-clockwise to open the valve.



SETTING UP THE PUMP

Step 10

Slowly turn the air pressure regulator clockwise until the pump runs at a speed between 30 and 60 strokes per minute.

Leave the pump to reciprocate for two minutes to bleed all of the air from the pump and pipe-work.



Step 11

Observe the air lubricator (if fitted). This has been factory set to lubricate the air supply at the rate of one drop of oil for every fifty strokes of the pump.

A red plastic knob is provided for adjustment if and when necessary.



Step 12

Stop the pump by closing the pump ON/OFF control valve.

The pump is now ready for use. Proceed by first setting the pump stall pressure as described in of this manual.



SETTING THE PUMP STALL PRESSURE

The air driven pump can be set to stall at any pre-determined pressure. This is a safety feature which, prevents the operator from inadvertently exceeding the maximum working pressure for the bolt tensioning equipment.

Setting the stall pressure is achieved by adjusting the regulated air pressure which is allowed to drive the pump. To set the pump stall pressure first set up the pump as described earlier in this manual, ensure the oil reservoir has a good supply of oil and connect the pump to a suitable air supply.

With the pump ready for operation proceed as followings:-

Step 1 Attach a blank quick connect nipple to the oil pressure outlet coupling.

The oil outlet quick connector must not be pressurised whilst it is disconnected.

To set the stall pressure the oil pressure must be increased so a quick connect nipple with a blank end must first be fitted to the outlet connector.

The Health and Safety Section 2, gives instructions for the connecting and disconnecting of these fittings.

To fit the blank quick connect nipple, pull back the spring loaded collar on the oil outlet coupling, push the nipple into the coupling and release the collar.

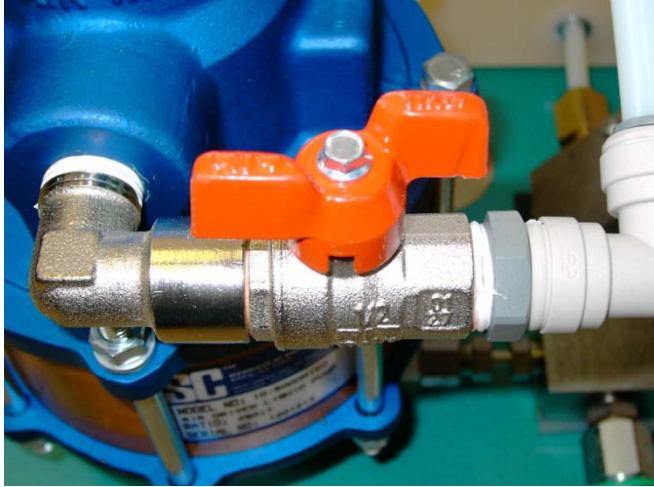
Check the nipple is properly connected before proceeding.



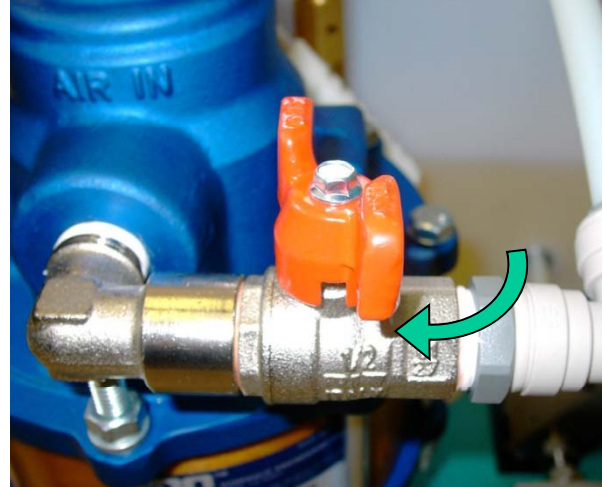
SETTING THE PUMP STALL PRESSURE

Step 2 Close the Pump ON/OFF control valve.

Turn the valve clockwise to close the valve



Open



Closed

Step 3 Unlock the air pressure regulator cap.



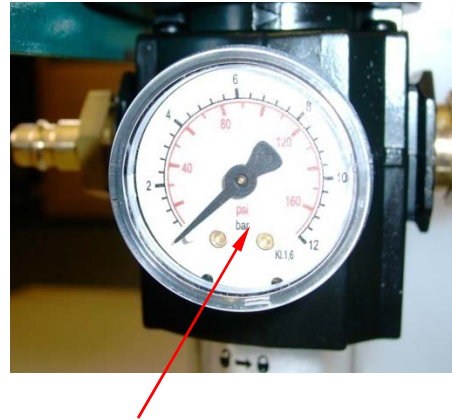
The air pressure regulator has a black cap. The cap is locked by pushing it down and unlocked by lifting it up.

Unlock the cap by lifting it.

SETTING THE PUMP STALL PRESSURE

Step 4 Reduce the regulated air pressure to zero.

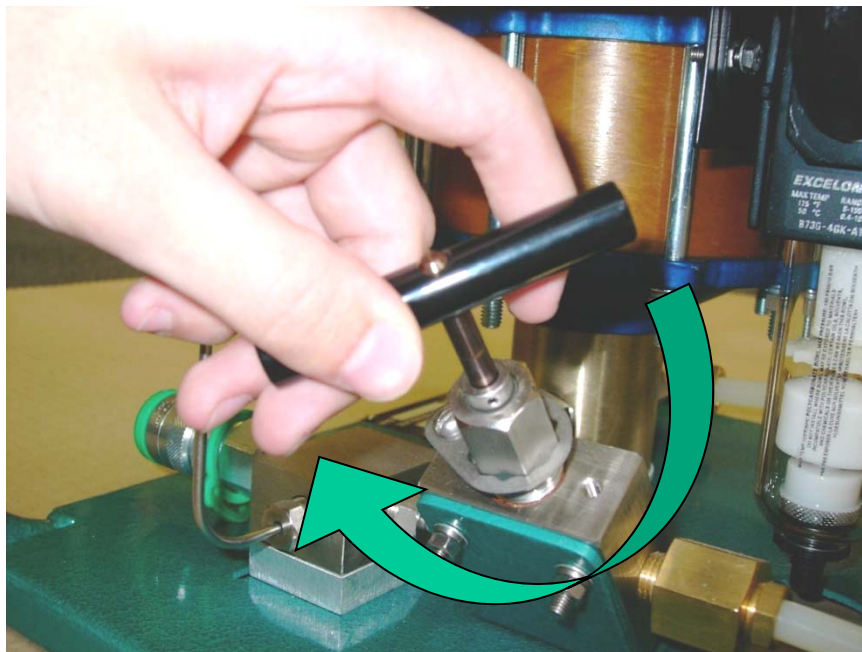
Turn the air pressure regulating cap anti-clockwise to reduce the regulated air pressure. Observe the regulated air pressure gauge. Stop turning the air pressure regulator when the regulated air pressure gauge is reading zero bar.



Regulated Air
Pressure Gauge

Step 5 Close the oil pressure release valve.

Turn the handle on the oil pressure release valve (15) clockwise until the valve is closed. Do not over tighten this valve otherwise the seat can be damaged.



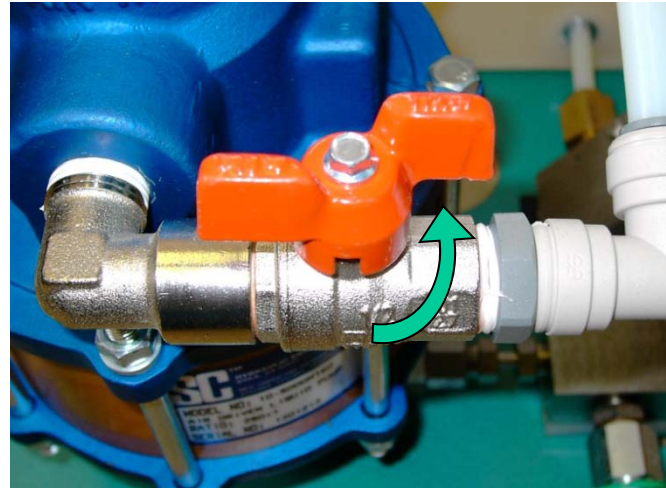
SETTING THE PUMP STALL PRESSURE

Step 6 Open the pump ON/OFF control valve.

Turn the pump control valve anti-clockwise to open it. The pump will not start at this point because the regulated air pressure has been reduced to zero bar.



Closed



Open

Step 7 Slowly increase the regulated air pressure

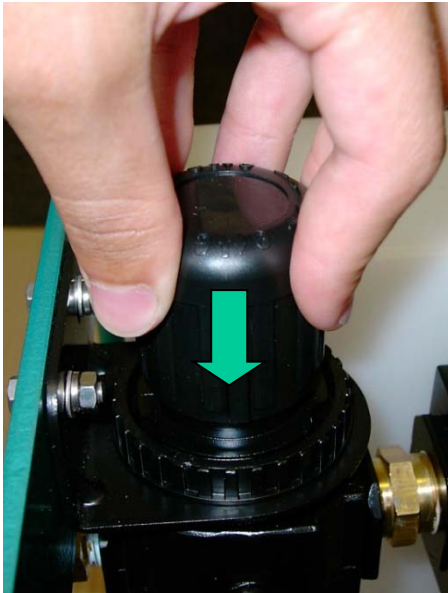
Turn the air pressure regulator clockwise to increase the regulated air pressure. Turn the regulator slowly. As soon as the air pressure starts to increase the pump will run. Because of the small volume of oil under pressure, the pump will quickly stall. The stall pressure will now be seen on the oil pressure gauge.

Continue to turn the air pressure regulator until the desired stall pressure is indicated on the oil pressure gauge.



SETTING THE PUMP STALL PRESSURE

Step 8 Lock the the air pressure regulator.



Lock the air pressure regulator cap . Push the cap down to lock it.

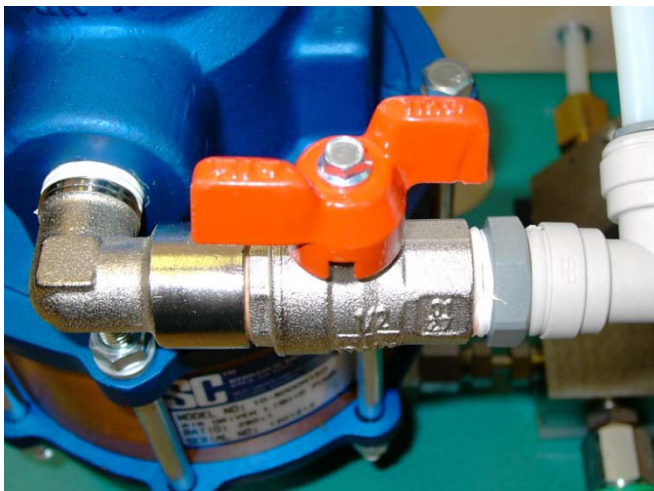
The oil pressure gauge continues to indicate the stall pressure.



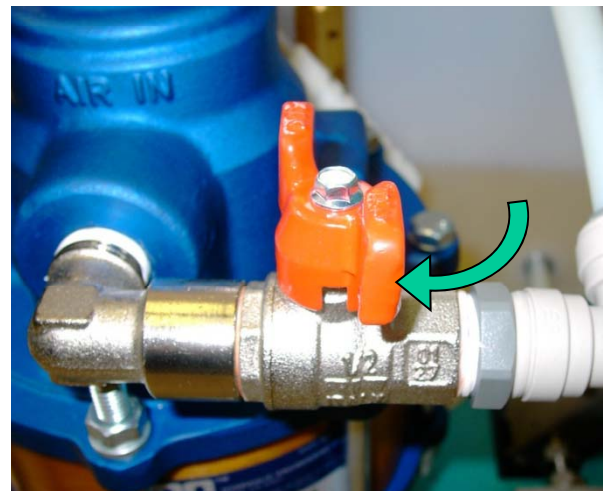
Step 9 Close the pump ON/OFF control valve.

Turn the pump control valve anti-clockwise to close it.

The pump has already stalled so there will be no immediate or noticeable reaction to the closing of the ON/OFF control valve.



Open



Closed

SETTING THE PUMP STALL PRESSURE

Step 10 Slowly open the oil pressure release valve.

Slowly turn the handle on the oil pressure release valve anti-clockwise until the valve is fully open.

The oil pressure will quickly fall to zero bar.

The pump has now been set to stall at the pre-determined oil pressure. When in use the pump will not increase the pressure above the stall pressure now set.



This assumes a constant air pressure supply to the pump. If there are large variations in the supply air pressure, the pump may stall at a lower or higher pressure than the stall pressure setting.



OPERATING THE PUMP

Step 1 - Follow the instruction under SETTING UP THE PUMP as described from page 18 of this section of the manual.

Step 2 - Follow the instructions under SETTING THE PUMP STALL PRESSURE from page 21 of this section of the manual. Set the stall pressure of the pump to match the operating pressure of the equipment to be used.

Step 3 - Connect the equipment to be pressurised to the quick connect coupling on the outlet of the pump unit. Follow the instructions for using the quick connect couplings as described on page 6 of this section of the manual.

Step - 4 Close the Oil Pressure Release Valve.

Step - 5 Check all of the quick connect couplings on the hydraulic hoses and tools are correctly connected and ready to be pressurised.

Step - 6 Start the pump by opening the Pump ON/OFF control valve.

Step - 7 The pump will run and pressure will build up. The speed of the pump can be regulated by how much the pump ON/OFF valve is opened.

The oil pressure will be indicated on the oil pressure gauge. The pump will run until the pressure reaches the stall pressure setting. To stop the pump before reaching the stall pressure, close the pump ON/OFF control valve.

Step - 8 Stop the pump by closing the Pump ON/OFF control valve.

Step - 9 To release the oil pressure, with the pump ON/OFF valve closed, slowly crack open the Oil Pressure Release Valve. Allow the oil pressure to fall slowly to zero. When at zero pressure, fully open the valve.



IF ANY UNSAFE WORKING SITUATION SHOULD ARISE DURING THE OPERATION OF THE PUMP IMMEDIATELY FULLY OPEN THE OIL PRESSURE RELEASE VALVE AND THEN CLOSE THE PUMP ON/OFF CONTROL VALVE.

This will dump the oil pressure and stop the pump.