Operating Procedure

Flange Pulling System

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Introduction

The TITON Flange Pulling system has been developed for use on subsea flanged connections where speed reliability and simple operation are essential. They are hydraulically operated tools being connected to a pump unit via a hydraulic harness assembly and downline.

The system comprises of a hydraulic pulling unit, hydraulic reaction clamp and length of wire rope. The wire rope is placed through corresponding bolt holes on each of the flanges. The reaction clamp is then located on the rope at the back of one of the flanges and acts as reaction point for the system. The clamp 'grips' the rope via an integral hydraulically activated and de-activated collect system. The pulling unit is located at the opposite end of the wire rope (at the rear of the opposite flange). Collets located at the front and rear of the flange-pulling unit alternatively 'grip' the wire as the piston in the puller extends and retracts. As the piston extends the rear collect grips the rope and the puller moves forward bringing the flanges together. The piston is then retracted and rear collets grip the rope holding the puller in position. This operation is repeated until the flanges are brought together. To bring the flanges together evenly and in alignment 2 pullers and clamps are normally used. Valves on the pullers allows each of them to be operated either in tandem or individually for accurate alignment. Once the flanges are brought together the clamps can be hydraulically de-activated and removed from the wire this then allows the puller units and the wires to be removed and recovered to the surface.

Safety Notes

The TITON Flange Pulling System must only be used for the purpose for which it is intended. That is the drawing together of flanged connections. The tools should not be used for any other purpose or modified or adapted to other application without prior consultation with B & A Hydraulics. The following safety notes are not an exhaustive list but serve to provide a framework for considerations to be observed whilst using the equipment.

1. Read the operating instruction manual
2. Always wear personal protective equipment - eye protection is essential
3. Never exceed the equipment's stated maximum working pressure
4. Do pressurise UN-COUPLED male 'Quick Disconnect Couplings'.
5. Never attempt to tighten or loosen any part of the hydraulic system while it is still under pressure.
6. Always ensure that the wire rope protrudes through the ends of both the puller unit and the reaction clamp.
7. If in doubt - ASK.

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Preliminary System Checks

Prior to using any B & A Hydraulics Flange Pulling Equipment ensure the following requirements have been met:

Flange Puller Collet Housings - See Appendix 1

There is one Front and Rear Collet Housing available per Puller.

Each Collect Housing contains one set of collets and one spring.

Both the internals of the collect housing and collets are well lubricated with coppaslip and are free form dirt.

Flange Puller Body - See Appendix 1

Ensure the Pullers are in good condition. Look for damage to the piston, valve and fittings.

Each Puller Body has a Front and Rear Collect Housings fitted.

The piston is stroked back.

Flange Puller Clamps - See Appendix 1

Ensure each Clamp has a heavy duty spring and collet set and the collets are well lubricated with coppaslip and are free form dirt.

Hosereel - See Appendix 4

The Hosereel is complete with Twin Downline

The Hosereel has sufficient hose length for your application.

The Hosereel is in good condition and has not incurred any damage.

Air Driven Pump - See Appendix 5

The pump unit reservoir is filled with hydraulic oil.

There is an air supply capable of delivering 100 – 120 PSI @ 56 C.F.M available.

The pump unit is in good condition and has not incurred any damage.

Interconnecting Hoses - See Appendix 2 & 3

Ensure there is a twin pump to Hosereel hose and that it is in good condition and has not incurred any damage.

Ensure that there are 2 'T' piece hoses and that they are in good condition and have not incurred any damage.

Note: In addition to the above ensure that the appropriate flange adapters and lengths of wire are available and in good condition

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Flange Checks

Prior to Bolt Tensioning ensure the following Flange Checks have been made.

Flanges

The Flanges to be tensioned are the correct mating flanges

Both Flanges are free from damage

Both Flange faces are clean and free from debris

Gaskets

The correct Gasket has been selected

The Gasket is free form damage

Stud Bolts

The correct number and size of Stud Bolts for the flange have been selected

Each Stud Bolt has one drilled and one plain nut.

Both the Stud Bolts and nuts are free from damage.

On completion of the above checks the flanges are ready for pulling and assembly.

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Set Up - Topside

Pump Unit - Setting the Stall Pressure:

Connect air supply line to the air line connection.

Ensure the pump unit is unconnected or connect a Hose Whip to the Female Coupling on the pump outlet, ensure hose whip has either a Female High Pressure Coupling or Blanking Plug fitted.

Ensure the Air On /Off valve is in the closed position and that the Hydraulic Pressure Release valve is fully open (turn anti-clockwise).

Lift the knob on the air pressure regulator and reduce air pressure to zero (turn adjusting knob anti-clockwise.)

Fully open the Air On / Off valve and slowly turn the air pressure regulator knob clockwise the air pressure is indicated on the air pressure gauge.

Close the Pressure Release Valve and pressure will build up. This will be indicated on the Pressure Gauge, continue to increase the air pressure until 7,500 PSI is shown on the Pressure Gauge.

Close the Air On /Off valve. Pressure will at this point be held constant at the 'Stall Pressure'.

Release the pressure from the pump by slowly opening the pressure release valve, this will allow the hydraulic oil to return to tank.

The pump unit is now ready for use.

To operate the pump, close the Hydraulic Release valve, and open the Air On / Off valve the pressure will begin to rise.

When the required pressure is reached shut the Air On / Off valve and the pressure will be held.

Release the pressure by opening the Hydraulic Release valve.

NOTE:

The Air On / Off Valve has two operational positions:

- A jog position which springs to the close position when it is released
- The run position which locks open for continuous running

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Flange Pullers -Assembling The Pullers:

Ensure the Front & Rear Collect Housings have collets fitted and are attached to the Puller Bodies.

Locate a flange adapter at the front of each Puller nose and Clamp unit

Connect the Male-Male and Female-Female adapters to one end of the Pump to Hosereel hoses. Then connect this end to the Clamp Unit

Connect the opposite end (without the adapters) to the Pump Unit

Operate the Pump Unit to 3,500 PSI. This activates the collets in the clamp and places it in the 'Grip' mode.

Release the pressure and disconnect the hoses and adapters. - **Failure to remove the adapters will result in damage to the Flange Puller Valves.**

Slide the Reaction Clamp over a length of wire feeding the wire in from the front end (where the Flange Adapter is located). Once the Clamp is on the wire it should only move in one direction on the rope. If this is the case, the clamp is activated and is ready for use. If this is not the case the clamp needs to be activated as per the steps in this procedure.

Repeat this procedure for each clamp being used in the system.

Deploy the Downline

Connect the Pump to Hosereel hoses to the Pump Unit and the Downline - **ensure the Male-Male & Female-Female Adapters have been removed.**

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Set up Subsea

Place the wire rope through the bolt holes of the flange usually at the 3 & 9 O'clock positions - ensure sufficient wire protrudes from each side of the flange to allow location of the Puller and Clamp

Place a Clamp Unit on one end of one of the wire ropes and the other Clamp Unit on the same end of the other wire rope. Once the Clamp is engaged on the rope slide it along toward the flange until the flange adapter is located in the bolt hole

Place a Puller Unit on the opposite end of the wire rope from the first clamp and the other Puller unit on the opposite end of the wire rope from the other clamp. Once the Puller is engaged on the rope slide it along toward the flange until the flange adapter is located in the bolt hole

Connect the return 'T' hoses with the female inlet connection to the return hose on the Downline (Hose has a Male Fitting)

Connect the pressure 'T' hoses with the male inlet connection to the feed hose on the Downline (Hose has a Female Fitting)

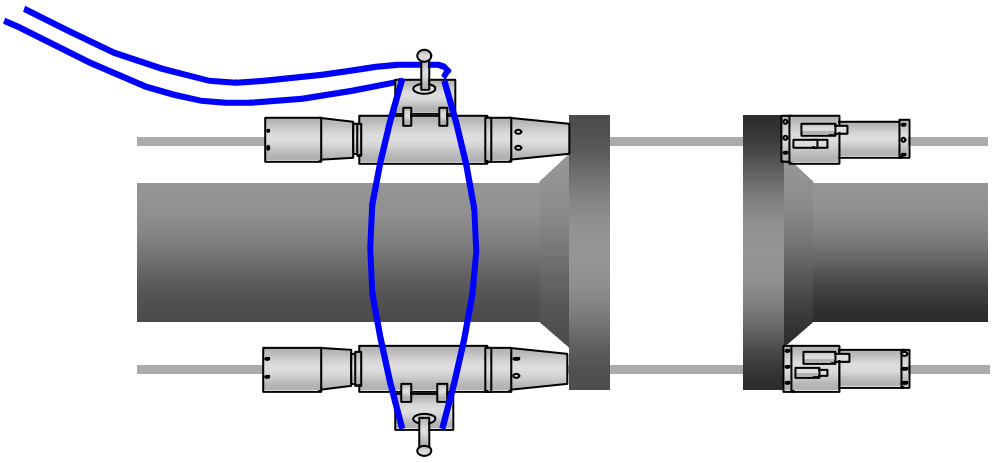
Connect one female end of the pressure hoses to the male connection on one Puller and the other female end to male connection on the other Puller

Connect one male end of the return hoses to the female connection on one Puller and the other male end to the female connection on the other Puller

Ensure the Valve handle on each of the Pullers are in the centre (Stop) position

The system should now be set-up as per the diagram below

The Flange Pulling Operation is ready to commence.



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Flange Pulling:

Ensure the Pump Unit, Hosereel, Hoses, Pullers & Clamp Units are set-up correctly and that the valve handles are in the centre (Stop) position

Operate the Pump Unit, pressure will start to build up on the gauge, stop at 1,000 Psi and check for leaks.

If there are no leaks continue pumping.

Place the Valve handles in the Advance position (towards the flange). The Pullers will begin to stroke out and the flanges will begin to be pulled together.

When full stroke (3") has been reached on each Puller place the valve handle in the opposite position, Retract. The Pullers will begin to re-stroke.

Continue the above two steps until flanges are a few inches apart.

NOTE: If at any time one side of the flange become mis-aligned place the opposite Puller's valve in the centre (Stop) position and operate only the other Puller

If at any time there is a leak immediately release the pressure by opening the Hydraulic Valve and closing the Air On / Off Valve on the pump unit. Replace the leaking component.

Should it be necessary to leave the joint prior to the pull being completed, place both valve handles in the centre (Stop) position and release the pressure on the Pump Unit. This places a hydraulic lock on the Pullers restricting any relaxation of the flanges

Disconnect both 'T' piece Hoses from the valves and recover the Downline.

The Pullers will remain in position stopping the flanges from separating.

Once the flanges are a few inches apart place the Puller's valves in the centre position.

Check flange alignment then insert the gasket and 4 holding bolts.

Once the 4 holding bolts are in position the flanges can be brought completely together using the above steps.

Once the flanges are together, place the valve handles in the centre (Stop) position and hand tighten the 4 holding bolts inserted in the flange

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De-Commissioning Procedure

Once the bolts are tightened place the valve handles in the retract position and fully retract both Pullers.

Once both Pullers are retracted move the valve handle to centre (Stop) position and release the pressure in the Pump Unit

Allow time for the Downline to fully de-pressurise, then move the valve handle to the advance and retract positions several times. This releases any pressure in the Puller and is necessary to remove the Clamps.

Disconnect both 'T' piece Hoses from the valves and connect them to the Clamps. Connect one pressure and one return 'T' hose to each clamp.

Operate the Pump to approx. 5,000 PSI, this will release the clamps (pull them away from the flange in order to check they have released, if not increase the pressure slowly to 10,000 PSI.)

Once both clamps are released, release the pressure in the pump unit, disconnect the hoses and remove the clamps from the wire rope.

The Pullers & wire rope, Clamp Units & hoses and the Downline can now be recovered to surface.

NOTE: When recovering the Pullers it may be possible for the Pullers to slip off the rope. Ensure the flange adapters are facing upwards to prevent this happening.

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Subsea Re-Commissioning Procedure

Ensure the Clamp unit is removed from the wire rope.

Disconnect the 'T' hoses from the Downline and connect the Downline directly to one of the Pullers

Operate the pump unit and place the control valve handle in the advance position and stroke the piston out approx. 1", this will ensure the front collets are free. Place the control valve handle in the retract position and fully retract the piston this will ensure the rear collets are free. Place the valve handle in the Centre (Stop) position, stop the pump unit and release the pressure.

Disconnect the hoses and remove the Puller from the wire rope (Pull the rope through from the rear of the Puller). Repeat on the remaining Pullers.

Reconnect the 'T' Piece hoses to the Downline and connect one pressure and one return hose end to each of the clamps.

Pump Operator to insert Male-Male & Female-Female adapters to the Hosereel end of the Pump To Hosereel Hoses.

Operate the pump unit to 2,500 PSI, stop the pump and release the pressure.

Ensure the Male-Male & Female-Female adapters are removed. If these are not removed the return side of the Puller's valve will be pressurised causing it to damage the seals and fail

On completion of the Re-commissioning procedures the system is ready for the next application.

Regular maintenance is required in order to keep the system operating efficiently it is advisable to perform all maintenance procedures after each use.

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Maintenance

After each operation of the system it is recommended that the following post-use maintenance procedures be carried out.

In general clean all equipment parts with WD40 or similar to remove any dirt or grease. If corrosion is evident clean the effected areas using a wire brush or wire wool and WD40 or similar.

Clamp Units

Remove the end cap from the clamp, then remove the spring guide, spring (heavy duty type)and collets.

Ensure that interior of the Clamp's collet housing is clean and free from scale, dirt, grit etc. by spraying with WD 40 or equivalent and wiping out thoroughly.

Ensure that the collets (3 segments) are clean and free from scale, dirt, grit etc on both the back and on the teeth. To clean spray with WD 40 or equivalent and thoroughly wire brush both the back and the teeth and wipe clean.

Clean the spring with WD 40 or equivalent

Place a liberal coating of coppaslip on the inside of the Clamp's collet housing, and on the outside of the collets. Do Not coppaslip the collet's teeth.

Replace the collets, spring and spring guide then screw the clamp's cap back on.

Puller Units

Repeat the above procedure on each of the Collect Housings on the Pullers. (Note: a smaller spring is used on the Pullers) .

Hosereel

Spray the Quick Disconnect couplers with a water repellent such as WD40 or similar. Particular attention should be given to the ball bearings in the female coupler. If corrosion is evident spray with WD40 or similar and wire brush the effected areas

Apply grease to the reel spindles where they rest on the stand.

Air Driven Pump

Spray the Quick Disconnect couplers with a water repellent such as WD40 or similar. Particular attention should be given to the ball bearings in the female coupler. If corrosion is evident spray with WD40 or similar and wire brush the effected areas

Refill the pump unit reservoir if necessary.

Ensure the air lubricator oil reservoir has sufficient oil

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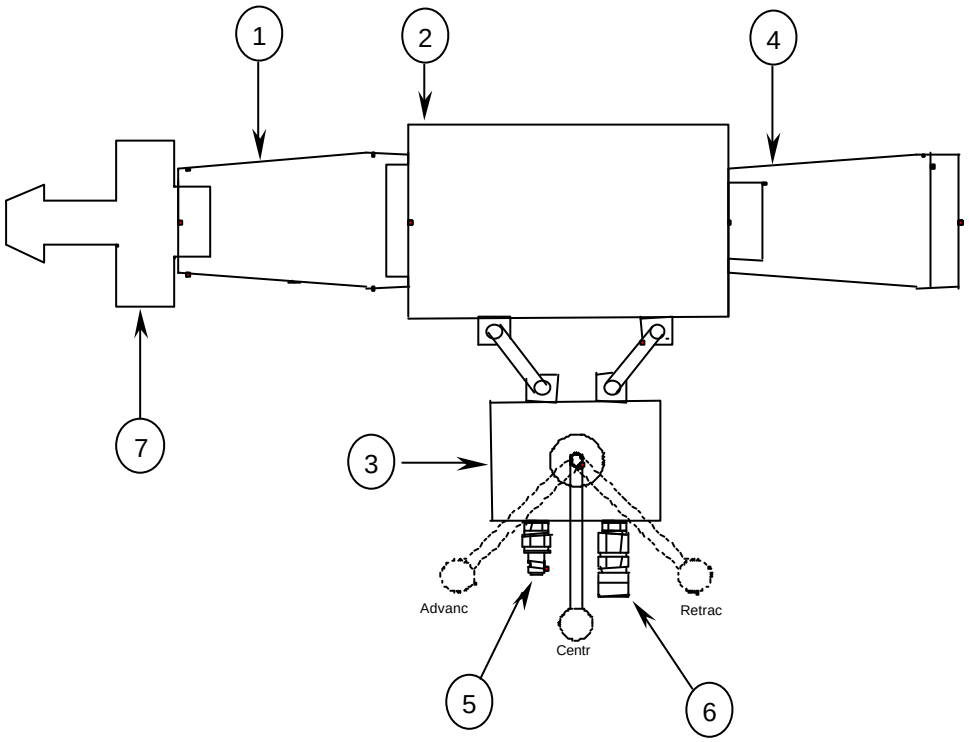
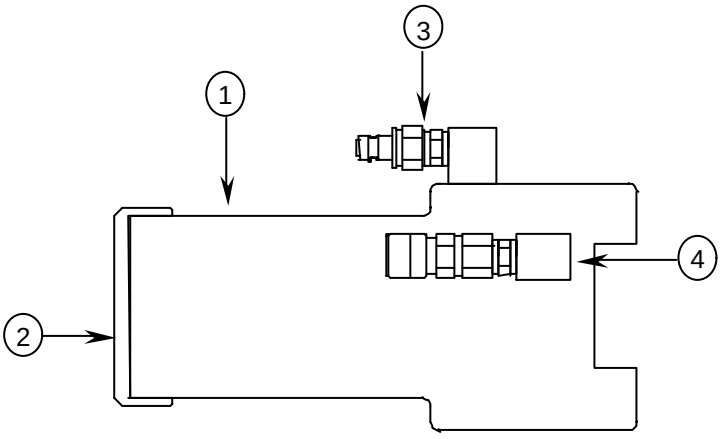
Appendix 1 - Flange Puller / Reaction Clamp

Item No	Description	Qty
Flange Puller		
1	Front Collect Housing (c/w 1 x Spring, 1 x Collet set)	1
2	Puller Body	1
3	Puller Control Valve	1
4	Rear Collect Housing (c/w 1 of set of Collets & Spring)	1
5	Cejin 116 Series Nipple – Advance Port	1
6	Cejin 116 Series Coupling Assembly - Retract Port	1
7	Flange Adapter	4
Reaction Clamp		
1	Clamp Body containing 1 x Spring Guide, 1 x Heavy Duty Spring 1 x Collets set)	1
2	Clamp Body End Cap	1
3	Male Coupling	1
4	Female Coupling	1





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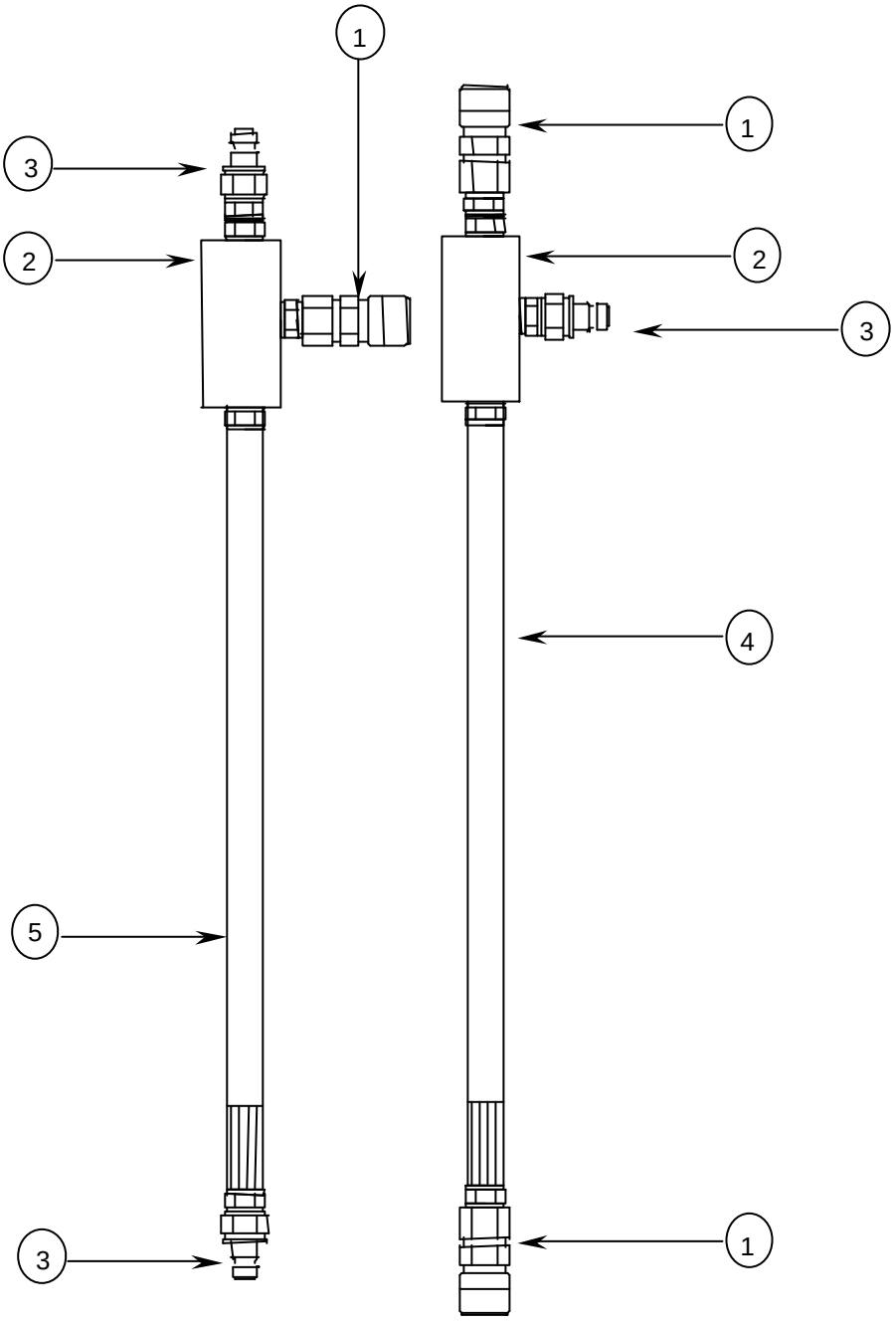
Appendix 2 - 'T' Interconnecting Hose Assembly

Item No	Description	Qty
1	Cejin 116 Series Coupling Assembly	3
2	Tee Block Assembly	2
3	Cejin 116 Series Nipple Assembly	3
4	Pressure Line 'T' Hose	1
5	Return Line 'T' Hose	1



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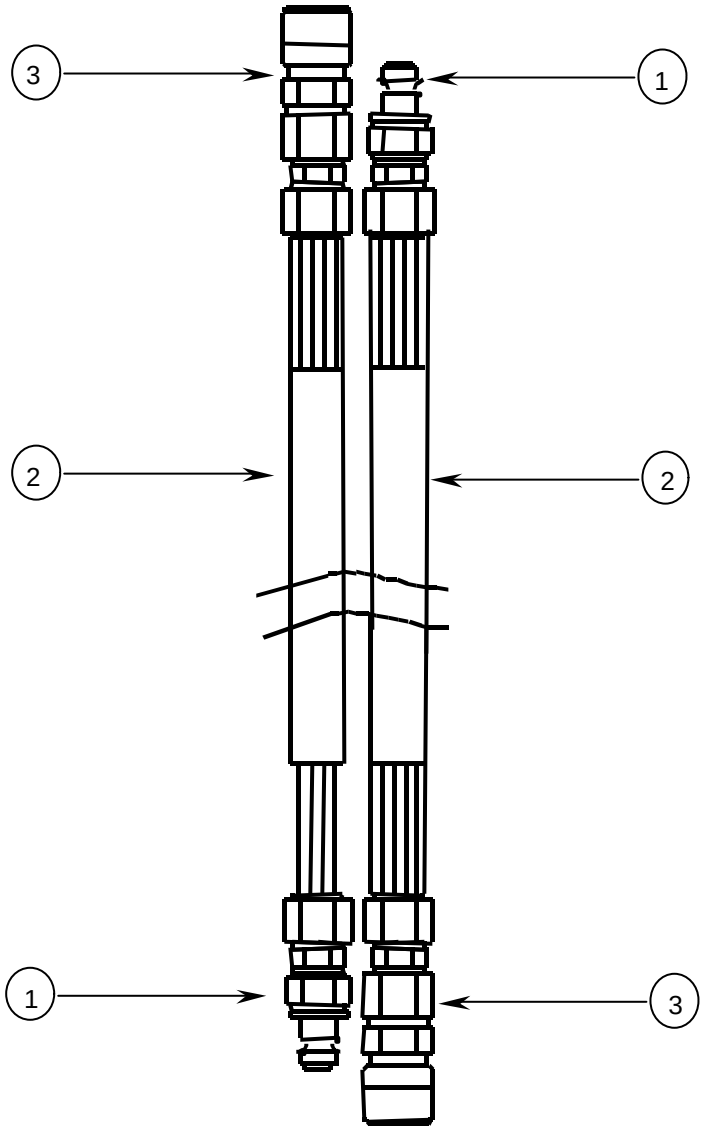
Appendix 3 - Twin Hose to Hosereel Hoses

Item No	Description	Qty
1	Cejin 116 Series Nipple Assembly	2
2	Pressure & return Twin Hose Assy 10,000 Psi MWP Hose	1
3	Cejin 116 Series Coupling Assembly	2



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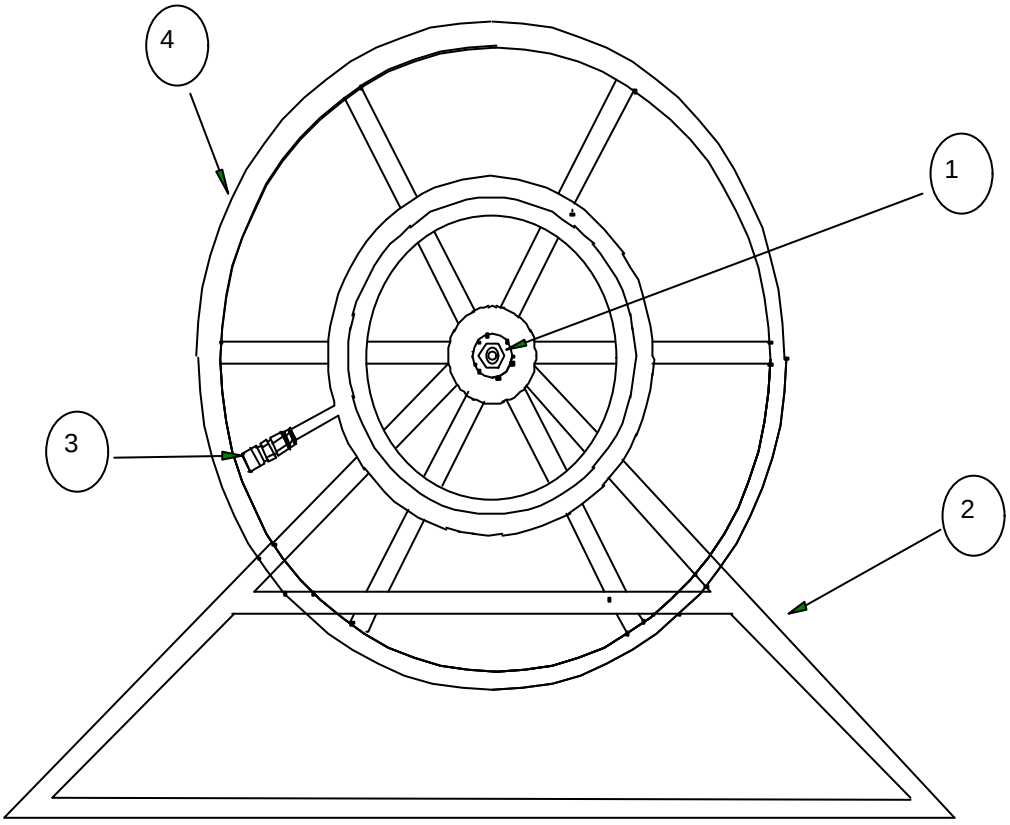
Appendix 4 - Twin Hosereel

Item No.	Description	Qty
01	Inlet Manifold Block comprising 1 x Cejin 116 Series Nipple Assembly 1 x Cejin 116 Series Coupler Assembly	1
02	Reel Stand	1
03a	Cejin 116 Series Coupler Assembly	1
03b	Cejin 116 Series Nipple Assembly	1
04	Reel c/w 210m Twin D/Line -7 x 30m hose lengths as standard	1



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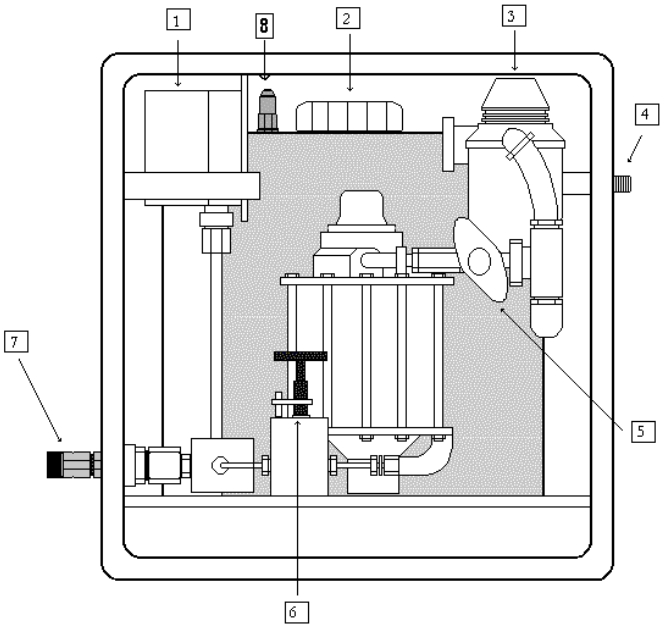
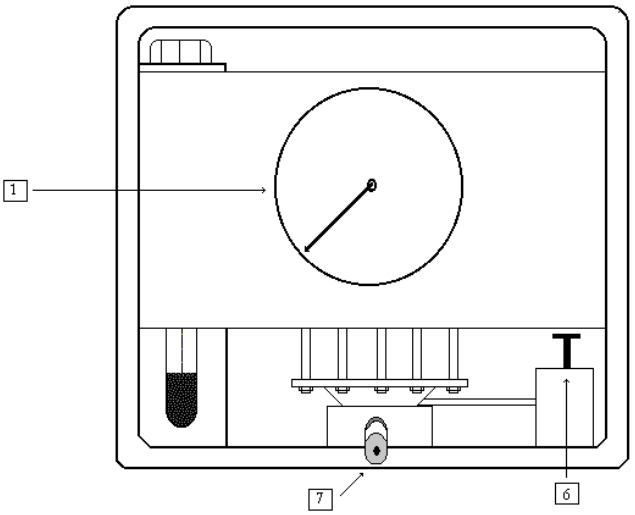
Appendix 5 - Air Driven Pump Unit

Item No	Description	Qty
1	Pressure Gauge	1
2	Pump Unit Reservoir	1
3	Air Pressure Regulator	1
4	Air Line Connection (1/2" NPT female)	1
5	Air On / Off Valve	1
6	Hydraulic Release Valve	1
7	Female High Pressure Coupling	1
8	Male Coupling	1





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