

SELWOOD S100/ PERKINS 404D-22

The products of Selwood Limited, are designed, developed and produced in the company's Chandler's Ford factory. Many features are covered by world-wide patents. Product names such as Spate, Simplite and Seltorque, are registered trade marks.

As all products are subject to continuous development, the company reserves the right to alter the specifications and information given in this manual without prior notice.

Whilst every care has been taken in the preparation of this publication the information it contains must not be regarded as binding.

Amendments to this publication will only be issued to cover those design changes which fundamentally alter the build or operation and servicing procedures. They will be distributed through the company's dealers and agencies.

Your attention is drawn to the following symbols used throughout this manual:-



CAUTION

This caution symbol draws attention to special instructions or procedures that, if not correctly followed, may result in damage to, or destruction of equipment.



WARNING

This warning symbol draws attention to special instructions or procedures that, if not strictly observed, may result in personal injury.



WARNING

A WARNING SYMBOL WITH THIS TYPE OF TEXT DRAWS ATTENTION TO SPECIAL INSTRUCTIONS OR PROCEDURES WHICH, IF NOT STRICTLY OBSERVED MAY RESULT IN SEVERE PERSONAL INJURY, OR LOSS OF LIFE.

Additional copies of this manual are available from Selwood Pt No 1011027000

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Instructions for Ordering Replacement Parts

1. Always quote the pump serial number located on the plate fastened to the bearing and air pump mechanism housing.
2. Always quote the part number(s) (ten digit) of the component(s), NOT the item number(s).
3. Always quote the description of the component(s).

Items usually supplied together as sub-assemblies will have the sub-assembly part number printed at the bottom of the relevant page.

HEALTH AND SAFETY AT WORK 1974

As manufacturers of pumps and associated equipment we wish to inform you that, in compliance with Section 6 of the Act, safety precautions should be taken with our products.

We take every care to ensure as is reasonably practicable that our products are safe and without risk to health when properly used. Nevertheless, appropriate health and safety precautions must be taken, and in particular you are requested to have special regard to the operational and safety requirements leaflet P769 which accompanies each pump on despatch from our premises.



Our products also conform to the E.E.C. Machinery Safety Directive and carry the C.E. mark.

CALIFORNIA USA PROPOSITION 65 WARNING



Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

WARNING



Pumps and engines may be fitted with seals or 'O' rings manufactured from **VITON** or similar material.

When temperatures reach 400°C (720°F) a corrosive acid is produced, which cannot be removed from the skin.

If signs of material decomposition are evident, or if in doubt, **always wear disposable heavy-duty gloves.**

SAFETY PRECAUTIONS



WARNING

ALL ITEMS IN THIS SECTION, IF NOT STRICTLY OBSERVED, COULD RESULT IN SEVERE PERSONAL INJURY OR LOSS OF LIFE.

1. Use only lifting equipment of suitable capacity for the size and weight of the equipment being lifted
2. The equipment must always be lifted using safe working practices and in accordance with any local and national guidelines or statutes. It is intended for guidance only. If in doubt, consult Selwood Pumps or a local lifting expert.
3. Whilst lifting the unit keep personnel well away and **never** allow people underneath.
4. Personnel working on the pump must always wear clean, correctly fitting clothing and safety footwear. Clothing impregnated with oil or fuel can constitute a health hazard through prolonged contact with the skin and may also constitute a fire hazard.
5. Check the type of liquid that the pump has been employed on before working on them. Residues could be hazardous to your health. If in doubt, flush thoroughly with clean water before commencing work.
6. Rotating equipment presents a hazard in itself. Alert surrounding personnel before starting and post notifications whilst in operation.
7. Moving parts are guarded to protect you. Guards removed for maintenance must be replaced before starting the pump.
8. Never insert anything into the pump body whilst the pump is running and the suction or delivery hoses are disconnected.
9. Use all flange bolt holes and ensure the correct bolt size and quality is utilised when connecting suction and delivery hoses.
10. Collapsible hoses must never be used on the suction side of the pump.
11. Keep the hose end suction area free from debris. Although the pump can handle solids up to the size indicated in the Technical Data section of this manual, larger or irregular solids may cause blockage with damage to pump components.
12. Always allow adequate ventilation for the pump driver. Diesel engines require air for both combustion and cooling. This air must never be allowed to re-circulate.
13. Be aware of burn and fire risks from items such as exhaust pipes and silencers. Never place flammable items around the unit.
14. Liquid pressure may still be present even after shutdown of the pump. Particular attention should be paid to delivery lines that are long, or rise through any height, as these can contain large volumes of liquid. These lines must be isolated and drained down before commencing work.

Sudden release of this liquid can cause serious injury to an operator either directly or indirectly through the rotational motion it can induce.



WARNING! Delivery hose and any associated pipe work should be capable of withstanding the maximum system operating pressure. Selwood recommend the minimum pressure rating of 6 Bar hose. Suction hose should be of the non-collapsible variety.



WARNING! The pump should only be operated within the speed and pressure limits detailed in Section 1.6 of this manual.

1. If there is a danger of freezing, the fluid, normally retained within the pump between operating cycles, should be drained off through the drain tap provided.



2. **WARNING!** Never start or run the pump against a closed delivery valve (except the pump non return valve). Failure to comply may result in damage to the unit or personal injury.



3. **WARNING!** Noise level at operator position (Start Panel) is **over** 80dB(A). Hearing protection must be worn at all times within the canopy when the unit is running. Failure to comply may result in hearing damage or loss.

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1 GENERAL INFORMATION

1.1 Installation

1. The pump unit and its associated baseplate or trolley mounting should be positioned on a firm horizontal platform, and in the case of portable units restrained from accidental movement.
2. If the pump is fitted with push-on type suction and delivery spigots the hoses must be firmly secured on these spigots with heavy duty clamps or clips capable of withstanding the system operating pressure.
3. The integrity of the hose clamping arrangements should be checked at regular daily intervals in the case of static installations or whenever the pump is repositioned in the case of portable units.
4. Similar precautions should be taken with clamps securing multiple lengths of hose on installation where long delivery and suction lines are involved.
5. Delivery hose and any associated pipework should be capable of withstanding the maximum system operating pressure. Suction hose should be of the non-collapsible variety.

1.2 Operation

4. The pump should only be operated within the speed and pressure limits detailed in the operating handbook for the model in question.
5. If there is a danger of freezing, the fluid normally retained within the pump between operating cycles should be drained off through the drain taps provided.
6. Where protective caps are used to prevent damage to the suction and delivery spigots during storage or in transit they must be removed before the pump is started up.

1.3 Maintenance

1. Inspection and maintenance procedures are detailed in the operating and servicing manual for the model in question.
2. Replacement parts. Only the manufacturers or factory approved components should be used as replacement parts and where necessary they should be fitted with the assistance of the special purpose tools indicated in the operating and servicing manual.
3. All maintenance work must be carried out with the pump and engine/motor stationary.

1.4 I.C. Engines

1. Where I.C. engines are used to power the pump they have been mounted in accordance with the engine manufacturers recommendations and adequate guarding provided between the pump and engine.
2. **Exhaust and Exhaust Pipes.** If there is a risk of accidental contact by operators. The exhaust system should be lagged or screened and the outlet directed away from operators or other persons likely to be nearby. Direct contact with flammable materials of all types must be avoided. The importance of adequate ventilation to ensure removal of exhaust fumes when engines are operated in enclosed or covered accommodation cannot be over-stressed. Engines should not be run in hazardous explosive atmospheres.
3. **Access and Operation.** Ensure that the operator can start, control and stop the engine easily by making all controls readily accessible. Fit remote controls if access is difficult. Follow the instructions laid down in the engine manufacturer's Operators Handbook for starting, operating and stopping procedures.
4. **Fuel.** In addition to the fire hazard associated with fuel and lubricating oils, preventative action is necessary with respect to leakage, contamination and bodily contact.
5. **Electrical Connections.** It is essential that earth terminals are connected with an absolutely sound earth point and care should be taken to ensure that the correct sized conductors are selected to suit the current and distance to be carried.

1.5 Fitting Instructions for Bowex Couplings (Diesel Engines)

IMPORTANT NOTES – OBSERVE STRICTLY:

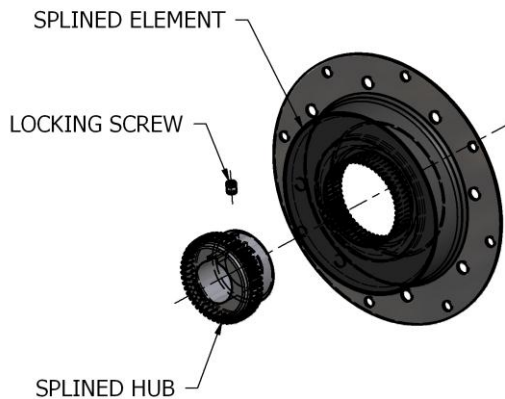
The Bowex Elastic Coupling Assembly is supplied in two halves and must be fitted to the pump drive shaft and engine flywheel individually. Typically, the most likely component to require replacement will be the rubber flywheel element.

The coupling assembly consists of a central steel splined hub fastened to the pump drive shaft using a grub screw onto the drive key and a splined rubber element fastened to the engine flywheel.

1.5.1 Replacement of the Steel Splined Hub and Splined Rubber Element

NOTE: Before separating the pump from the engine, the rear of the engine **must** be suitably supported using wooden blocks or similar as this end will become un-supported when unbolted from the pump bell housing.

1. To separate the pump from the engine you must first un bolt the bell housing from the engine. Slide the pump back away from the engine to reveal the coupling.



2. To remove the coupling hub from the pump shaft, loosen the grub screw which is fastened to the pump drive key. Note the position of the hub on the pump shaft to aid re-fitting.
1. Inspect and re-fit or re-furbish as necessary. Secure Grub screw to Drive key and lock with suitable thread locking adhesive.
2. To remove coupling element from the engine flywheel, remove the 8 fastening bolts from the element backplate.
3. Inspect and re-fit or re-furbish as necessary. Check for damage or wear to the splined teeth and/or rubber element..
4. First fasten Coupling element to Flywheel hand tight using 8 off screws grade 8.8 or more.

5. Tighten the screws to a torque of 24Nm using a suitable Torque wrench.
6. Slide the pump back towards the engine ensuring the splined hub and element are in line.
7. The bell housing location to the engine flywheel register will ensure coupling alignment is maintained
8. Fasten bell housing to engine flywheel housing.

1.6 Seltorque S100 Standard Data

Capacity	160M ³ /h 35200UK gal/h
Delivery Head	21.3m 70ft
Self Priming Lift	8.8m H ₂ O 29ft H ₂ O
Solids Size	75mm 3in
Air Handling Capacity	24l/s 50ft ³ /min
Pump Speed Max	1600rpm
Port Size BS EN 1092-2:2007	100mm 4in

2 ROUTINE MAINTENANCE

Lack of routine maintenance is the most frequent reason for the break-down of pumps. We earnestly advise users to ensure that at least the following actions are taken.

1. Check these three oil levels daily:
 - a) Engine oil.
 - b) Bearing housing oil.
 - c) Flushing chamber oil.
2. Always drain water from the pump in cold weather when it is not running. Drain:
 - a) Pump body.
 - b) Delivery valve chamber.
 - c) Both sides of air pump (4 drain taps if twin prime).
3. Do NOT run the pump if significant quantities of water escape through the exhaust valve of the air pump. This pump is designed to handle moisture-laden air, but not to pump a high percentage of water. Refer to servicing instructions for further advice.
4. Do NOT run the pump if malfunction is suspected in any of its parts. In particular, it must immediately be serviced if the level of oil in the flushing chamber varies daily, or if the oil becomes contaminated with the pumped fluid.
5. A hose strainer should always be fitted to the free end of the suction line if there is a possibility of over-sized solids entering the pump. The dimensions of rocks, pebbles, etc., must not exceed 75mm (3"). Larger soft solids, however, of the type found in abattoir duties, for example, will pass freely through the pump. Refer to Selwood Pumps if in need of advice in this connection.
6. As loss of prime and indeed loss of on-stream performance can easily arise as the result of leaking pipe-work joints, we recommend that all line fittings associated with the pump should be checked periodically for air-tightness.
7. It is most important to use the correct fuel oil in the engine. Make sure that it is appropriate for the weather conditions (summer or winter) and that it is clean and free from water and foreign matter. Unsatisfactory running performance, excessive wear and damage can all result from the use of an incorrect or contaminated fuel.
8. Periodically check the tension of all nuts and bolts, especially those securing the engine and pump to the chassis.
9. Pump servicing must always be carried-out in accordance with the instructions given in this manual. Only components supplied and approved by Selwood Pumps should be used. It is advisable to hold a small stock of spare parts to cover break-down circumstances. The Company will be pleased to give advice in this connection.

10. Engine servicing must always be carried-out in accordance with the instructions given in the manufacturer's manual. Do not hesitate to contact Selwood Pumps if the need for further advice arises.
11. Please contact Selwood Pumps in the event of experiencing difficulty when servicing. The company will also be very pleased to give advice in connection with the machine's installation, operation and maintenance.
12. All practical work must be carried-out in compliance with the Health and Safety at Work Act, 1975. Always start the engine in accordance with the manufacturer's instructions.

NOTE: If the above advice is followed, the likelihood of an expensive break-down will be greatly diminished. The pump should give a long and trouble-free life if these measures are put into effect.

3 LUBRICATION AND FASTENING TORQUES

3.1 Pump Lubrication

It is most important to maintain the correct levels of oil in the flushing chamber and bearing housing, and to ensure that the oil is of the recommended quality and is free from contamination. Selwood recommend the use of the following Q8 products, which should be applied as per the following table. In some territories, the following grades may be known under differing trade names, please contact Selwood if problems occur in identifying the correct product.

COMPONENT	Q8 GRADE
ENGINES	T750 - 15W/40
Bearing Housing	T750 - 15W/40
Flushing Chamber	T750 - 15W/40
Actuator Bore	Rubens
Impeller Bore	Rubens
Paper Gaskets	Rembrandt
Axle Shafts	Rembrandt
Axle Pivot Assembly	Rembrandt
M10 Screws - Port Plate to Diffuser	Castrol Optimoly Paste HT

COMPARTMENT	SERVICE/DRAIN	
	CHANGE OIL & FILTERS	CHECK & TOP UP
PERKINS 404D-22	500 Hours	Daily
Bearing Housing Flushing Chamber	250 – 500 Hours	Daily
Actuator Bore Impeller Bore Shaft Sleeve Bore	ON ASSEMBLY	-
Paper Gaskets	ON ASSEMBLY	-
Axle Shafts Axle Pivot Assembly	6-12 Months	-
M10 Screws - Port Plate To Diffuser	ON ASSEMBLY	-

3.1.1 Commissioning Period

Drain both pump chambers and engine within 100-150 running-hours of commissioning either a new, or rebuilt pump, and refill with new oil to level plugs.

Flushing chamber capacity about 1.5 litres (2.5 pints).

Bearing housing capacity about 1.8 litres (3 pints).

Engine sump – Refer to Engine Instruction book.

3.1.2 After Commissioning Period

If the pump is driven by a diesel engine, the oil in both pump chambers should be drained and renewed simultaneously with the time schedule laid down by the engine manufacturer. This will usually require the pump oils to be drained and replaced every 250 running hours. Under no circumstances should the period for the pump exceed 500 running hours.

3.2 Fastening Torques

Failure to tighten threaded fasteners correctly can easily lead to assembly breakdown. It is very important, therefore, when carrying-out the instructions in this manual, to achieve the appropriate tensioning torques. In some cases, specific requirements are described in the instructions which must always be implemented. The following torques, in particular, must be applied.

tem	Tightening Torques	
	lb ft	Nm
M16 Pump/Engine/Fuel Tank to Chassis Fixings	180	245
Actuator Cap Screw 0015975000	60	81
Cap Screw M12 9005120552	60	81
Impeller Screw 9000120302	60	81
Air Pump Drive rod to Small end of Connecting Rod - M8 Fixing	21	28
Bowex Coupling Element to Engine Flywheel – 5/16-18 UNF	18	24

4 CONDITIONS OF WARRANTY

For a period of twelve months from delivery of any Selwood pump to the first user thereof, or eighteen months from the despatch of any such pump by Selwood, whichever period is the shorter, Selwood will repair or, at its option, replace any component which in the opinion of Selwood has failed due to defective workmanship or materials.

This warranty does not apply to:

- a) the driver or any accessories or proprietary fittings whatsoever;

- b) any pump which, in the opinion of Selwood, has been altered, used, maintained, serviced or stored otherwise than in accordance with Selwoods instructions and professional practice;
- c) any pump wherefrom the serial numbers have been removed or altered;
- d) fair wear and tear;
- e) consequential loss or damage.

5 MAJOR SERVICING

5.1 Air Pump Maintenance

5.1.1 Delivery and Suction Valves

Failure of the pump set to prime quickly or to discharge the expected volume of air, may simply be due to faulty valve operation.

To inspect and service, proceed as follows:

1. Remove air hose item from suction valve box, after loosening relevant hose clips.
2. Note the orientation of the suction valve box and exhaust cover before commencing. Remove exhaust cover and suction valve box by releasing nuts and spring washers.

NOTE: The above actions allow the condition of the two valve rubbers to be checked. Do NOT attempt to remove valve studs. If valve rubbers are damaged, replace with new components. Pull old valves off stud heads, and discard.

3. Check and, if necessary, clean valve seats in outer pump body and valve box. Smear heads and grooves of studs with soft soap and push on new valves ensuring that they seat correctly.
4. The valve assemblies can now be replaced by reversing Instruction 1 and 2 of this procedure. It is advisable to fit new gaskets.

5.1.2 Actuator Valve

Another reason for the pump set failing to prime efficiently or to handle the expected volume of air, could be malfunction of the actuator valve.

To inspect and service, proceed as follows:

1. Remove nuts, spring washers, washers and screws, allowing outer pump body to be removed complete with attached delivery valve assembly. The actuator valve may now be examined. If it fails to seat efficiently on actuator or is in any way damaged, it should be pulled off the actuator nut and discarded.
2. Whilst the actuator valve is removed, it is advisable to examine the condition of the valve seat in the actuator, and also to check the security of the actuator screw. This should be checked and tightened to 60lbf ft (8.3kgf m) torque.

3. To replace actuator valve smear soft soap on the conical end and groove of actuator screw and ease new valve rubber into position ensuring that it seats correctly.

NOTE: It is advisable to examine the condition of actuator seal whilst it is exposed. Servicing instructions start at Section 5.1.3 Actuator Seal Instruction 1.

4. To replace outer pump body assembly, fit and evenly tighten screws, washers, spring washers and nuts, by sequentially turning each screw a small amount until they are all fully tensioned. It is important that the outer diameter of the actuator seal should be evenly clamped.

5.1.3 Actuator Seal

A further reason for the pump set failing to prime efficiently or to handle the expected volume of air, could be a faulty actuator seal.

To inspect and service, proceed as follows:

1. Remove outer pump body complete with delivery valve assembly. Remove actuator screw.
2. Set actuator to top dead centre (maximum distance from inner pump body), by rotating engine shaft with starting handle. Using a tool that will not cut the rubber (such as a blunt screwdriver) and a lubricant (soap solution), remove actuator seal by prising it from the inner pump body. Remove actuator complete with seal from drive rod.
3. To renew actuator seal remove failed component from actuator, insert firstly one side and then the other into the actuator groove, using a blunt tool that will not cut the rubber.

NOTE: The seal is handed and will not enter the inner pump body if fitted the wrong way round.

4. The correct assembly position for actuator seal is with the smaller diameter of its conical outer surface towards the inner pump body. It will be seen that the housing in the body is tapered in the same direction as the external surface of the seal.
5. At this stage it is advisable to examine the condition of actuator neck seal. This component should be replaced if any splits are evident on its visible surface. Refer to Section 5.1.4 Actuator Neck Seal.
6. Smear soft soap on the outside section of new actuator seal. Lightly grease actuator bore. Position actuator/seal assembly on drive rod, locate actuator screw and tighten to 60lb ft (8.3kgf m) torque.
7. Replace actuator valve if removed first smearing soft soap on the conical end and groove of actuator screw. The new valve should be eased into position by hand.
8. Before fitting outer pump body reciprocate the actuator by fitting and rotating the engine's starting handle about ten times to encourage centralisation of the connecting rod bearings. During this procedure, the actuator seal is likely to rotate slightly in the inner pump body. Stop shaft

rotation when actuator is at bottom dead centre (minimum distance from inner pump body).

9. Seat outside section of actuator seal in inner pump body recess by gently tapping with a non-metallic mallet.
10. Replace outer pump body assembly, and fit and evenly tighten screws washers spring washers and nuts, by sequentially turning each screw a small amount until they are all fully tightened. It is important that the outside diameter of the actuator seal should be clamped evenly.

5.1.4 Actuator Neck Seal

Another reason for the pump set failing to prime efficiently or to handle the expected volume of air, could be failure of the actuator neck seal.

To investigate and service, proceed as follows:

1. Remove outer pump body complete with delivery valve assembly, and actuator with actuator seal as directed in Section 5.1.3 Actuator Seal Instructions 1 and 2.
2. Release hose clip allowing air hose to be disconnected from suction valve box. Screws should then be removed, leaving washers in inner pump body.
3. The inner pump body can now be pulled by hand from the bearing housing, if necessary twisting to overcome any tendency of the seal to stick to drive rod. Remove and discard failed seal.
4. Smear new actuator neck seal with soft soap to assist fitting, position in inner pump body and push both components over drive rod using assembly tool (Part No. 0015102000) smeared with soft soap. Check that washers are in place, and fit and fully tighten screws. The heads of these screws should be fully contained within the recesses in the inner pump body.
5. Reassemble remaining components in accordance with Section 5.1.3 Actuator Seal Instructions 6 to 10, inclusively.

5.1.5 Drive Rod Seal Assembly and Bearing

If oil leaks from ports in housing it is probable that seal assembly is excessively worn. Such a condition may also indicate that drive rod bush should be replaced.

To inspect and service, proceed as follows:

1. Drain oil from bearing housing by removing filler cap and drain plug.
2. Remove air pump components in accordance with Section 5.1.3 Actuator Seal Instructions 1 and 2, and Section 5.1.4 Actuator Neck Seal Instructions 2 and 3.
3. Being careful not to damage the flat sealing faces of housing, carefully withdraw housing complete with its bearing and sealing components from bearing housing and drive rod.
4. Examine condition of lip and distributor seals together with bearing. If either are worn or damaged, we recommend that a new housing (Part No. 0010905000) complete with seal

assembly and bearing should be ordered and fitted. However, individual components can be renewed in accordance with the following instructions.

5. To replace drive rod bearing carefully remove circlip allowing seal components to be pushed from housing with blunt punch or drift from bearing end. The drive rod bearing can now be removed using bearing drift (Part No. 0015168000) and the new component pressed into position so that one face is flush with the end of the housing.
6. Ensure that seal components are assembled in accordance with the following instructions.
 - a) The wiper seal is first assembled to the drive rod seal carrier using wiper seal insertion tool (Part No. 0010103000) ensuring the correct orientation.
 - b) Then the internal distributor seal is offered up to the bearing and seal housing ensuring again the correct orientation and pushed into place with the drive rod seal carrier (Part No 0015195000) (together with wiper seal) and the whole pressed into place with the wiper seal insertion tool (Part No. 0010103000). Care must be exercised when replacing circlip to ensure that the lip of the wiper seal is not damaged by the hand tools used. See Section 6.4.
7. Before replacing bearing/seal housing assembly, check condition of drive rod, particularly if new bush has been fitted. If surface is significantly worn, the drive rod should be replaced in accordance with instructions given in Section 5.4.2.
8. Assembly tool (Part No. 0015101000) must be used when replacing bearing/ seal housing assembly to ensure that the wiping edges of the seal assembly are not damaged. The drive rod must be smeared with clean oil to assist this procedure. See Section 6.5. Gasket must be renewed, always use a component supplied by Selwood Pumps. Ensure that ports in housing are in the 3 and 9 o'clock positions.
9. Reassemble remaining pump components in accordance with Section 5.1.4 Actuator Neck Seal Instruction 4 and Section 5.1.3 Actuator Seal Instructions 6 to 10, inclusively.
10. Replace drain plug together with sealing washer and refill bearing housing with clean oil to level of plug and replace plug together with 'O' ring. Refer to Section 3.1 Pump Lubrication for details of the oil required for the Bearing Housing.

5.2 Separator Maintenance

5.2.1 Float

If water in significant quantities continuously passes through the exhaust valve of the air pump, it is probable that the float is in need of replacement.

To inspect and service, proceed as follows:

1. Disconnect air hose by loosening hose clip
2. Remove nuts and washers and lift off separator cap complete with peel valve/upper diffuser assembly inclusively. Examine condition of float and replace with new component if punctured or significantly worn.
3. Check condition of peel valve rubber and bush replacing them, if necessary, in accordance with advice commencing at Section 5.2.2 Peel Valve.
4. Also check for deposits of solids likely to interfere with the smooth working of the float system.
5. When fitting a new float, ensure that it is securely tightened against nut. During this procedure, the float should be positioned on the rod so that the operating plate with its associated peel valve fasteners is just clear of the central clamp-bar screws, when the float is located in the upper-diffuser cone.
6. If all components are seen to be in satisfactory condition, replace separator cap assembly, washers and nuts. Alternately tighten each nut a small amount to ensure that the cap is pulled down evenly. Do NOT over tighten. Replace air hose and re-tension hose clip.

5.2.2 Peel Valve

If significant quantities of water are discharged from the exhaust valve of the air pump, and the float is in satisfactory condition, it is probable that a fault exists in the peel valve assembly.

To inspect and service, proceed as follows:

1. Remove separator cap sub-assembly and unscrew float and nut.
2. Release screws and spring washers to allow upper-diffuser/valve assembly to be withdrawn.
3. Remove screws and sealing washers to allow upper diffuser to be removed from the port plate sub-assembly.
4. Examine condition of peel valve rubber and air ports in plate which it should completely cover when the float is fully raised. If the rubber does not seat correctly, is distorted, or in any way damaged, it must be removed and discarded by releasing screws.

5. To fit new peel valve rubber, carefully clean existing parts thoroughly, especially surfaces of port plate, and clamp bars, and position new rubber on plate. Assemble screws, clamp bar, clamp bar seal, washer and nuts in sequence shown on drawing. Alternately tighten each nut a small amount to ensure that even clamping pressure is produced. Correctly tightened nuts will not cause the clamp bar to distort the rubber.
6. Carefully attach the ends of the valve rubber to the operating plate, noting that the components and method of assembly are identical to those described in Section 5.2.2 Peel Valve Instruction 5, except that clamp bar seal is omitted. Again, ensure that the nuts are not over-tightened.
7. After completing Section 5.2.2 Peel Valve Instructions 5 and 6, check that the peel valve rubber is capable of closing all of the air holes in port plate when operating rod is square to the plate and fully lifted.
8. Check condition of bush in upper diffuser and replace, together with clip and Nitrile washer if significantly worn.

NOTE: The operating rod is normally a slack fit in the bush.

9. Position port plate sub-assembly on upper diffuser, fit washers after checking that they will seal efficiently and fully tighten screws. Reassemble nut and screw float on to operating rod and tighten securely in accordance with Section 5.2.1 Float Instruction 5.
10. Recheck operation of peel valve rubber to ensure that it fully covers air ports in plate when the float is located in the upper-diffuser cone. In this position there should be a gap of 3-5 mm between the heads of the centre clamp bar screws and the operating plate. Adjust the position of the float on the operating rod to obtain the correct dimension.
11. Examine condition of gasket and renew, if necessary, before installing between port plate and separator cap. Fit spring washers and screws each of which should be sequentially turned a small amount until fully tightened. Gasket must be evenly compressed.
12. Replace separator cap sub-assembly in accordance with Section 5.2.1 Float Instruction 6.

5.2.3 Deposits of Solids^{†‡}

When handling liquids containing solids capable of adhering to product wetted surfaces, it is advisable periodically to check the valve system in the separator.

To inspect and service, proceed as follows:

1. Remove separator cap sub-assembly in accordance with Section 5.2.1 Float Instructions 1, 2 and 3, allowing separator body together with lower diffuser, to be lifted off the suction tube.
2. Remove any deposits of scale from lower diffuser and check condition of welds securing its circular bottom to the perforated cylinder. Remove any solids that may have accumulated in the suction tube, renew gasket and reposition separator-body/lower-diffuser assembly on suction tube.
3. Remove deposited materials from surfaces of upper diffuser and note, in particular, the condition of welds securing cone and disc to perforated diffuser body. Also examine diffuser bush and operating rod, and replace if significantly worn in accordance with Section 5.2.2 Peel Valve Instructions 3 to 11. Remove all deposited solids that would interfere with the free movement of the mechanism, obstruct the passage of air across the port plate holes, or inhibit the flow of water (through the holes in the upper diffuser, for example).
4. Once it is established that all components are in a satisfactory condition and are free from scale, replace separator cap sub-assembly in accordance with Section 5.2.1 Float Instruction 6. Any re-assembly work carried out on the peel valve assembly should be in accordance with Section 5.2.2 Peel Valve commencing at Instruction 1.

[†] Use lower Diffuser (Part No. 1594161000) for sludge handling duties. This is recognised by holes in the base as well as around the side.

[‡] Use lower Diffuser (Part No. 0015038000) for other applications where no solids are present which can adhere to the internal surfaces.

5.3 Impeller, Mechanical Seal and Delivery Valve Maintenance

5.3.1 Impeller

Generally speaking, it is only necessary to remove the impeller if the existing component has become severely abraded, or if access to other rotating parts is required.

To remove and replace, proceed as follows:

1. Remove air hose item from separator cap after loosening hose clip.
2. Remove nuts and washers, and lift off separator cap complete with peel valve/upper diffuser assembly, inclusively.
3. Lift separator body complete with lower diffuser off suction tube allowing (dome) nuts and spring washers to be released.
4. Withdraw suction tube and gasket after removing nuts and associated spring washers.
5. Drain oil from flushing chamber by removing filler cap assembly and drain plug. The condition of the oil will indicate whether or not the mechanical seal has been functioning correctly. If contamination is evident, the mechanical seal must be replaced in accordance with Section 5.3.2 Mechanical Seal commencing at Instruction 1.
6. Remove impeller screw and washers, and withdraw impeller from drive shaft. To remove the screw, it will be necessary to lock the impeller by means of a wooden block wedged between the impeller blades and pump body.

NOTE: An impeller removal tool (Part No. 0015WRS781) is available to facilitate removal of the impeller - see Section 6.10.

7. Removal of the impeller will allow the mechanical seal spring to expand. Do NOT touch the shaft sleeve or spring if the mechanical seal has been functioning correctly and only the impeller is to be replaced. Premature failure of the mechanical seal assembly could result if the seal's faces are disturbed by moving the shaft sleeve.
8. When fitting a new impeller, ensure that key is not a tight fit in the impeller keyway. If necessary, remove very small amounts of metal from the sides of the key to achieve a close sliding fit that will not allow any perceptible rotation of the impeller on the shaft, and yet allow the impeller to slide into place by hand. Apply Rustilo 431 grease (or approved equivalent) to all impeller mounting surfaces.
9. Check condition of nylon patch on impeller screw. It is essential that this screw should be stiff to turn in the thread of the shaft. On no account use a screw that moves freely. Use a new screw if the head of the original component is abraded or if the screw is not a friction fit in the shaft thread. Do NOT lubricate these threads.

10. Ensuring that the mechanical seal spring is in position, replace impeller, washer, two washers with concave faces towards impeller and impeller screw, and tension screw to 60lb ft (8.3kgf m) torque. It is essential that this screw is correctly tensioned. During this operation, it will be necessary to lock the impeller by means of a wooden block wedged between the impeller blades and pump body. Remove block after use.
11. Use Rustilo 431 on the inside of the pump register. Fit new gasket, position suction tube on studs, fit washers and fully tighten nuts.
12. Renew gasket, reposition separator body sub-assembly on suction tube, and fit separator cap assembly. Assemble washers and nuts and alternatively tighten each nut a small amount to ensure that the cap is pulled down evenly. Do NOT over-tighten.
13. Reposition air hose on spigot of separator cap and tighten hose clip.
14. Replace drain plug using PTFE tape as a sealant, and fill flushing chamber with new oil to level of plug. Replace plug and 'O' ring. Refer to Section 3.1 Pump Lubrication for details of the oil required for the flushing chamber.

5.3.2 Mechanical Seal

The mechanical seal should be replaced if the flushing chamber oil continuously leaks into the pumped fluid, or if the oil becomes contaminated with the product. This latter condition is sometimes indicated by leakage of fluid out of a breather cap. Under extreme conditions, pumped fluid may be seen escaping out of the vent at the bottom of flushing chamber.

In the event of abrasive materials being detected in the oil, it is likely that lip seal will have become worn and necessitate replacement in accordance with Section 5.4.3 Bearings and Lip Seal .

Daily checks on oil condition should ensure that seal failure is detected before damage occurs to related components. If the mechanical seal leaks, proceed as follows:

1. Drain oil from flushing chamber by removing its filler cap and drain plug.
2. Remove impeller in accordance with Section 5.3.1 Impeller Instructions 1 to 7 inclusively, and remove impeller key.
3. Withdraw shaft sleeve together with rotating mechanical seal parts and spring. It is likely that O ring will be withdrawn with the sleeve remove it and check condition. Replace 'O' ring if unsuitable for further service.
4. Using seat removal tool (Part No. 0015166000), withdraw mechanical seal stationary seat from its housing in pump body. Also remove the seat's rubber joint ring. (See Section 6.3).
5. The rotating parts of mechanical seal should now be removed from the shaft sleeve and discarded, taking care not to damage the sleeve's surfaces. This operation should be carried-out by hand using a tool that will not scratch the sleeve.

6. Once removed, examine condition of sleeve and replace with new component if unacceptably corroded or worn.

IMPORTANT ADVICE



New mechanical seal components must be handled with great care. In particular, the seal faces must not be touched by hand and must only come into contact with clean soft paper that is free from abrasive materials. Premature seal failure is likely to occur if this advice is not heeded.

7. Thoroughly clean recess in pump body and also the surrounding surfaces. Smear lubricant (soft soap or washing-up liquid, but not grease) in recess and also on outside diameter of rubber joint ring. Using several layers of clean soft paper to protect the seating face, press seat into recess by applying even finger-pressure. Make sure that the highly-polished sealing face is on the impeller side of the recess, that the new joint ring has been used, and that the seat is positioned directly against the shoulder at the bottom of the recess.
8. Smear lubricant on drive shaft diameters and 'O' ring. Position 'O' ring on shaft taking care to prevent it contacting the shaft's keyway. If a new shaft sleeve is being used, ensure that it is capable of sliding freely along the shaft and correctly trapping the 'O' ring in the recess provided.
9. Smear lubricant (soft soap) on outside diameter of shaft sleeve and inside diameter of rubber drive band. Protect the highly polished face of the seal with several layers of clean soft paper, and slide seal assembly onto sleeve using finger pressure only - USE NO TOOLS. The seal must be positioned so that the carbon face is about 3mm past the non-flanged end of the sleeve.
10. Within a few minutes, to ensure that the lubricant has not set, slide sleeve seal assembly onto shaft (seal face towards stationary seat) and press into working position using only the sleeve's flange. This procedure automatically causes the seal head to slide along the sleeve into its correct working position. Ensure that 'O' ring is correctly trapped in sleeve recess and that sleeve abuts against shoulder on shaft.
11. Push mechanical seal spring onto location diameter provided on seal head. Ensure that the spring's coils are correctly supported by the flange of sleeve and will not become trapped between the flange and the impeller Refit key and impeller in accordance with Section 5.3.1 Impeller Instructions 8 to 10.
12. Replace remaining components in accordance with Section 5.3.1 Impeller Instructions 11 to 14, inclusively.

5.3.3 Delivery Valve,

Failure of the pump set to pump under suction lift conditions could be due to a fault in the delivery valve assembly.

To inspect and service, proceed as follows:

1. Ensure that pump has been shutdown and the delivery line has been drained.
2. Release T-bolt, swing locking bar clear, and remove inspection panel and gasket. It now becomes possible to lift the valve by hand to expose the valve seat so allowing foreign matter to be removed. Also undertake a preliminary check of the condition of the valve rubber.
3. If further disassembly is required, remove screws and washers, allowing clamping bar and delivery valve complete with valve plates and to be removed.
4. Separate upper and lower valve plates and (C30) by removing nut, and examine condition of rubber, especially along the hinge line and seating surface. Discard if damaged or mis-shapen.
5. To replace valve seat, remove valve chamber after releasing nuts and spring washers.
6. Reassemble components in reverse order, renewing gaskets if necessary. Ensure that the radiused edge of clamping bar is adjacent to hinge line of valve rubber and that each screw is tightened a small amount so as to produce an even clamping pressure. Correctly tightened screws will not cause the clamp bar to distort the rubber. Seal screws with Loctite 572.

5.4 Maintenance of Flushing Chamber, Air Pump Mechanism, Drive Coupling, Drive Shaft Bearings and Lip Seal

5.4.1 Flushing Chamber

Leakage of oil through the vent at the bottom of flushing chamber could be due to failure of either of the lip seals. If the pumped liquid also leaks through the vent, the mechanical seal will require to be replaced in addition to its adjacent lip seal.

In any of these events, proceed as follows:

1. Drain oil from flushing chamber and bearing housing by removing filler caps and drain plugs.
2. Remove separator assembly and suction tube in accordance with Section 5.3.1 Impeller Instructions 1 to 4, inclusively.
3. Remove impeller screws and washers and withdraw impeller mechanical seal spring, and shaft sleeve complete with mechanical seal parts. Handle the sleeve and mechanical seal with great care and store in a safe place, particularly if these parts are to be reused.
4. Remove split guard fitted around flexible coupling, and release all of the coupling's fasteners allowing the rubber tyre to be removed.
5. Attach lifting equipment to bearing housing and pump body in compliance with requirements of Health and Safety at Work Act, 1975.
6. Remove nuts, bolts and washers securing pump to chassis and hoist clear, carefully noting the positions of any shims between pump feet and chassis.
7. Lower unit onto working surface and, in compliance with Health and Safety at Work Act, 1975, tip pump onto ends of studs ensuring that they are suitably protected from damage.
8. Remove nuts and spring washers and carefully separate bearing housing and flushing chamber assembly from pump body. During this operation, be very careful not to damage the mechanical seal stationary seat by allowing it to contact the shaft.
9. It now becomes possible to remove flushing chamber from bearing housing, after releasing screws and spring washers.
10. To replace lip seals,
 - a) Press failed components out of housings and discard.
 - b) Thoroughly clean all surfaces of flushing chamber and press new seals into position, ensuring that they face in the correct directions: The garter spring fitted to the lip of the seal nearest the bearing housing, should be visible from the bearing housing side of the flushing chamber. The garter spring fitted to the lip of the seal nearest the impeller, should be visible from the impeller side of the flushing chamber. Refer to Section 6.8 for disposition of seals.
11. Replacement of the flushing chamber sub-assembly in the bearing housing must be undertaken very carefully to ensure that the lips of seals are not damaged by the shoulders on the drive shaft. Use assembly tool (Part No. 0010165100) for this purpose. A generous quantity of oil should be applied to the shaft to assist this operation, and a new gasket should be fitted. Replace and tighten screws and spring washers.
12. Position new gasket on studs and fit bearing housing assembly to pump body, taking great care to ensure that the shaft does not touch the mechanical seal stationary seat. Replace and tighten nuts and spring washers.
13. Using lifting equipment in compliance with the Health and Safety at Work Act, 1975, position pump unit on chassis.
14. Refer to Section 1.5 when refitting the pump to a diesel engine. Refer to Section 1.7 when refitting the pump to an electric motor.
15. Replace split guards around flexible coupling and ensure that it is securely fastened, with nuts bolts and washers. Also fasten to flywheel guard where applicable with bolts and washers.
16. Read Section 5.3.2 Mechanical Seal Instructions 7 to 12, and carefully remove any foreign matter from the sleeve and mechanical seal components. Smear clean oil on both the 'O' ring and the drive shaft diameters. Position the 'O' ring on the shaft taking care to prevent it contacting the drive shaft's keyway, and slide the sleeve/seal assembly onto shaft (carbon face towards stationary seat) and press into working position using only the sleeve's flange. Ensure that 'O' ring is correctly trapped in sleeve recess.
17. Replace impeller, suction tube and separator components in accordance with Section 5.3.1 Impeller Instructions 8 to 13, inclusively.
18. Replace bearing/seal housing assembly and actuator neck seal in accordance with Section 5.1.5 Drive Rod Seal Assembly and Bearing Instruction 8 and Section 5.1.4 Actuator Neck Seal Instruction 4.
19. Replace remaining air pump components in accordance with Section 5.1.3 Actuator Seal Instructions 6 and 10, inclusively.
20. Replace drain plug using PTFE tape as sealant and fill flushing chamber with new oil to level of plug hole. Replace plug with 'O' ring. Refer to Section 3.1 Pump Lubrication for details of the oil required for the flushing chamber.
21. Repeat this procedure for bearing housing ensuring that level plug with 'O' ring are replaced after the correct oil level is attained.

5.4.2 Air Pump Mechanism

Should actuator fail to reciprocate when the pump is running, or if other abnormal conditions are suspected,

the air pump mechanism should be immediately inspected to minimise the risk of consequential damage.

Proceed as follows:

1. Drain oil from bearing housing and flushing chamber by removing filler caps with 'O' ring and drain plugs with sealing washer.
2. Remove air pump components in accordance with Section 5.1.3 Actuator Seal Instructions 1 and 2, and Section 5.1.4 Actuator Neck Seal Instructions 2 and 3 (discard actuator neck seal if it has failed).
3. Being careful not to damage the flat sealing faces of housing carefully withdraw housing complete with bearing and sealing components from bearing housing and drive rod.
4. Carry out Section 5.3.1 Impeller Instructions 2 to 4, inclusively.
5. Carry out Section 5.4.1 Flushing Chamber Instructions 3 to 9, inclusively.
6. Release nut and withdraw screw, allowing fulcrum pin to be removed. Drive rod and connecting rod may then be withdrawn.
7. Remove circlip. Eccentric can now be removed by inserting M10 bolt in tapped hole provided and tapping to loosen in an anti-clockwise direction (eccentric has a right hand thread). See Section 6.9. Next, spacer can be slipped off drive shaft and inspected.
8. Examine condition of all components and renew failed or significantly worn items. A replacement connecting rod, complete with bushes, should be ordered against sub-assembly (Part No. 0015908000).
9. To rebuild mechanism, ensure thread and abutting spacer is thoroughly clean and simply screw on the eccentric, making sure it abuts against the spacer (D19) which in turn abuts shaft shoulder.
10. Position connecting rod on eccentric, thoroughly de-grease tapping in drive rod and assemble drive rod and fulcrum pin in connecting rod.
11. Assemble lock nut to new screw locating groove in fulcrum pin. Do NOT re-use old component. Fully tighten unit against recess in drive rod(s) to 2.9kgf m (21lb ft) torque.
12. Replace flushing chamber and pump on chassis in accordance with Section 5.4.1 Flushing Chamber Instructions 11 to 17 inclusive.

NOTE: It will be necessary to start at 5.4.1 Flushing Chamber Instruction 10, if lip seals have to be replaced.

13. Read Section 5.3.2 Mechanical Seal Instruction 7 and carefully remove any foreign matter from the sleeve and mechanical seal components. Smear clean oil on both the 'O' ring and the drive shaft diameters. Position the 'O' ring on the shaft taking care to prevent it contacting the drive shaft's keyway, and slide the sleeve/seal assembly onto shaft (carbon face towards stationary seat) and press into working position using only the sleeve's

flange. Ensure that 'O' ring is correctly trapped in sleeve recess.

14. Replace impeller, suction tube and separator components in accordance with Section 5.3.1 Impeller Instructions 8 to 13, inclusively.
15. Replace bearing/seal housing assembly and actuator neck seal in accordance with Section 5.1.5 Drive Rod Seal Assembly and Bearing Instruction 8 and Section 5.1.4 Actuator Neck Seal Instruction 4.
16. Replace remaining air pump components in accordance with Section 5.1.3 Actuator Seal Instructions 6 to 10, inclusively.
17. Replace drain plug using PTFE tape as sealant and fill flushing chamber with new oil to level of plug. Replace plug and 'O' ring. Refer to Section 3.1 Pump Lubrication for details of the oil required for the flushing chamber.
18. Repeat this procedure for bearing housing ensuring that level plug and 'O' ring are replaced after the correct oil level is attained.

5.4.3 Bearings and Lip Seal

In the unlikely event of a bearing failure, or if the bearing housing oil escapes from the engine end of the bearing housing by passing across lip seal, it becomes necessary to undertake work on the drive shaft assembly.

1. To replace lip seal only proceed as follows:
 - a) Remove oil from bearing housing by removing the filler cap and drain plug.
 - b) Remove lip seal carrier lip seal and 'O' ring by removing cap screws and washers.
 - c) Prise out the old lip seal and press in a new seal. When fitting lightly lubricate the lips of the seal and if damaged replace 'O' ring.
 - d) Refit the components taking care not to damage the lip seal on the sharp edges of the keyway.
 - e) Replace drain plug and sealing washer in bearing housing. Fill with oil to correct level and replace level plug and O-ring.
2. For bearing replacement proceed as follows:
 - a) Carry out Section 5.4.2 Air Pump Mechanism Instructions 1 to 8, inclusively.
 - b) Remove lipseal carrier lipseal and 'O' ring by removing capscrews and washers. If lipseal is to be utilised again ensure seal is not dragged over sharp edge of keyway.
 - c) Moving to the impeller end of the bearing housing remove bearing carrier by removing setscrews and washers. The bearing carrier can be jacked free by the two screwed holes adjacent to the fixings.
 - d) Remove drive shaft complete with bearings from bearing housing by applying pressure (preferably with a fly-press) to the protected coupling end of the drive shaft.

- e) Press bearings from shaft and discard. Thoroughly clean all bearing housing surfaces and inspect shaft for damage.
- f) To fit new bearings, thoroughly clean all drive shaft surfaces and smear oil on bearing mounting diameters. Press new bearings onto shaft using workshop tools and method described Sections 6.11 and 6.12, taking care to ensure that:
 - i) The bearings are kept in their as-received condition and do NOT come into contact with foreign matter.
 - ii) Pressure during fitting is applied directly to the inner rings of the bearings and not to the outer rings.
 - iii) The bearings are square to the shaft throughout the fitting procedure.
 - iv) When fitted, the bearings register against the shaft shoulders.

NOTE: Use of the workshop tools will ensure the above criteria is fulfilled.

- g) Before replacing the drive shaft sub-assembly into the bearing housing, make sure that the bores that receive the bearings are clean and smeared with clean engine oil. Care must be exercised when passing the drive shaft with bearings into the bearing housing to ensure it is concentric and parallel to the mating surfaces. This is described in Section 6.13.
- h) The sub-assembly should be pressed into position by 'jacking' home the bearing carrier by means of the setscrews - do not apply shock loads such as hammer blows.

NOTE: 'Jack' home evenly - protect surface of bearing carrier with plain washers under setscrews finally remove setscrews and fit new washers.

- i) The remaining components may now be reassembled in accordance with Section 5.4.2 Air Pump Mechanism Instructions 9 and 18, inclusively.

5.5 Chassis Maintenance

It is possible to work on individual components of the chassis without removing either the engine or the pump unit. In all cases work should be undertaken on level ground and care should be exercised to ensure that the pump set is fully immobilised. If the chassis is to be completely dismantled, both the engine and pump unit should be removed in compliance with the requirements of Health and Safety at Work Act, 1975.

1. To remove the fuel tank:
 - a) Drain the fuel by removing the drain plug and washer.
 - b) Disconnect the fuel feed and return lines.
 - c) Place suitable supports beneath the tank and remove the four nuts bolts and washers, access to the nuts and washers being inside the main chassis members.
 - d) The tank can then be slid from beneath the chassis, taking care not to lose the steel spacers if fitted.
2. To clean the fuel feed filter:
 - a) Remove the three set bolts and washers.
 - b) Lift the filter from the tank, taking care not to lose the gasket.

NOTE: The filter can be removed for cleaning without removing the tank from the chassis.

3. To remove the front axle:
 - a) Support the chassis beneath either the fuel tank ensuring that the weight is taken on a suitable piece of wood extending the full width of the tank, or underneath the main chassis members.
 - b) Remove the split pins and washers retaining the wheels and slide the wheels from the axle.
 - c) Remove the split pin and washer from one side only of the draw bar pivot pin and slide the pin free of the pivot and draw bar thus allowing the draw bar to come away from the assembly.
 - d) Remove the split pin and washer from one end of the axle pivot pin and slide the pin clear of the pivot and axle. The axle will now be free.
4. The front axle pivot locking system is designed as a backup to the single bolt fixing. To remove pivot:
 - a) Bend back lock washer and release the set bolt, lock washer and pivot topcap.
 - b) Drop the pivot clear of the chassis member. Note that if the engine is in place on the chassis the access to the set bolt is from beneath the engine between the chassis members.
 - c) Extract and replace the spring roll pin if damaged, from top of pivot.

5. To remove the rear axle:
 - a) Support the chassis and remove the wheels as described in paragraph 5.3.
 - b) Release the four horizontally disposed nuts, bolts, and spring washers, and the two vertical nuts, bolts, spring and taper washers.
6. To remove the lifting eye remove the four set bolts and spring washers.
7. Reassembly is a reverse of the above, ensuring that the wheel hubs, axles, pivot, pivot turntable, axle pivot pin and drawbar pin are thoroughly cleaned and liberally greased. Renew the fuel feed filter gasket if necessary.

NOTE: When placing pivot top cap on top of pivot ensure the top cap locates correctly over the spring roll pin in top of pivot shaft. Also when placing the lock washer with fixing bolt in place over the pivot top cap, ensure small tab locates in second hole of the pivot top cap - the first hole locating the spring roll pin. Always use a new lock washer. Finally bending up in one place to lock against the flat of the setbolt hexagon.

5.6 Supersilent Canopy – Canopy Removal

To remove the canopy, proceed as follows:

1. Disconnect the battery.
2. Unbolt and joggle plate at the outlet end and remove.
3. Using the key provided, remove panel of the canopy where joggle plates were.
4. Unbolt discharge bauer connection from the pump and remove.
5. Repeat for the inlet joggle plate, panel and suction bauer connection.
6. Remove the insulating cover surrounding the exhaust and then disconnect the exhaust pipe from the manifold flange.
7. Disconnect emergency stop switch loom, preferably from the plug connector but it can also be disconnected from the switch. Tie onto engine to prevent any damage to the wiring.
8. If applicable, disconnect the bulk fuel connection.
9. If the canopy has an auto stop/start or telemetry panel, unbolt the panel and push inside of the canopy. This can remain wired up.
10. If there is a telemetry aerial, this needs to be removed from inside the control box.
11. Remove the air hose between the separator and air primer if it is deemed to impede the removal of the canopy.
12. Remove the bolts between the canopy and the skid.
13. Using appropriate lifting equipment and the lifting eye on the canopy, lift the canopy clear of the skid. If required, there are extra holes in the top of the canopy where shackles can be applied to give extra support and stability.

5.7 Supersilent Canopy – Fuel Tank Removal

To remove the fuel tank, proceed as follows:

1. Suitably support the rear of the engine prior to removing the M10 bolts between the engine and the bell housing of the pump, as it will become unstable when the pump is removed.
2. Remove the M16 bolts mounting the pump from its mounting points. Using the appropriate lifting equipment draw the pump away from the coupling. When the pump is clear of the coupling, lift the pump clear of the skid chassis.
3. Disconnect and drain the fuel lines, and tie them to the engine to prevent any damage. Slacken the bulkhead fitting lock nut on the oil drain hose and remove the hose end from the skid base. Tie the hose back to a suitable location on the engine. If required, undo and remove the control panel and bracket from the engine.
4. Remove any other additional parts that will impede the removal of the fuel tank. This may include the battery assembly or the air pump silencer.
5. Attach the appropriate lifting equipment to the lifting eye of the engine so that it takes the weight. Remove the fixings between the engine mounts and A/V mounts. Lift the engine vertically up and away and place in a suitable frame to prevent any damage to the oil drain or the sump.
6. Remove the bolts holding the fuel tank to the A/V mounts on the skid.
7. Using the appropriate lifting equipment remove the fuel tank.

5.8 Supersilent Canopy – Fuel Tank Refitting

To refit the fuel tank, proceed as follows:

1. Refit the tank as per removal taking note of the fuel drain plug position and its relationship to the access plug in the skid base. Orientate the tank so that the drain is behind the larger plug.
2. Insert the four screws to secure the tank to the AV mounts and check the alignment of the tank in the skid base before tightening these screws. During the tightening procedure a twisting moment can be applied to the rubber element of the mount which is undesirable. If this occurs, use or make a suitable tool to counteract this twist and tighten to 150 Nm. Recheck alignment and ensure no mounts are twisted. Correct if required.
3. Refit engine but do not fully tighten the mounting to the AV mount screws at this stage, finger tighten only. Ensure it is suitably supported before removing the lifting equipment from the engine. Reconnect all fuel lines, oil drain and refit the control panel.
4. Before refitting the pump unit slacken the grub screw (hex socket set screw) in the pump half coupling boss. Ensure that the hub and rubber element are free to slide on the pump shaft. This

will be used as a guide for checking the alignment of the coupling at a later stage. Leave the coupling hub loose on the shaft.

5. Lift the pump end onto the chassis and push the unit onto the engine side coupling drive pins. With the coupling halves engaged drop in the four pump mounting fasteners and tighten nuts, finger tighten only.
6. The pump should now be visually aligned and can be tightened down to 150 Nm torque. Check that the coupling element and hub is free to move on the shaft to confirm correct alignment. A pry bar can be used, but it should not require any effort to move the assembly.
7. Move the engine on its mountings to make alignment adjustments. Any shimming to adjust vertical height should be added under the engine AV mounts.
8. When alignment is satisfactory gradually tighten the four AV mount screws to 70 Nm, checking element/hub movement on the shaft each time. During this procedure it is possible for the AV mount rubber to twist. To prevent this use a suitable tool to counteract the applied torque on the mount. This will maintain the mount in a neutral condition.
9. When complete, tighten the grubscrew in the coupling hub into position on the pump shaft. The element should not be fitted against the flywheel adaptor plate but clearance should be present to prevent end thrust transmission through the coupling element.

5.9 Supersilent Canopy – Canopy Refitting

To refit the canopy, proceed as follows:

1. Lift the canopy as for removal and lift into position. Take care not to damage the radiator when positioning. Lower onto skid base checking for alignment. Dummy studs can be used to aid alignment.
2. When down and before fitting any fixings check that the radiator overflow pipe is not trapped by the canopy bulkhead. Release if trapped.
3. Refit the bolts between the canopy and the skid, checking the alignment before tightening down.
4. If used, Remove eye bolts from canopy roof and replace with fasteners to prevent water ingress.
5. Refit the side panels of the canopy, joggle plates and bauer connections as the reverse of removal.
6. Reconnect the exhaust pipe to manifold flange and refit insulating cover.
7. Refit the fuel lines, control panel and bulk fuel kit.
8. Refit the air hose between the separator and air primer.
9. Refit the air pump exhaust silencer assembly.
10. Refit the telemetry aerial inside the control box.
11. Reconnect the emergency stop wiring and battery.

12. Refit coupling guards.
13. Fill with fuel and bleed the system as required. Test run. Inspect all fasteners after 50 hours of running.

6 WORKSHOP TOOLS

Major Servicing will always be carried-out more quickly by the use of the following special tools and procedure. More importantly, their use will help to ensure that new components are not damaged whilst being fitted.

The tools are simple to employ and have been designed for use in combination with standard fitter's tools. For some operations, a simple press, and a bench complete with a vice will be desirable.

We earnestly advise all pump users to purchase a complete set of tools.

6.1 Care of Servicing Tools

Always clean, oil and safely store tools after use.

Complete sets of tools are available by quoting:

Part No. 0010948200 - Seltorque S100 Excluding Impeller Removal Tool Part No. 0015WRS781

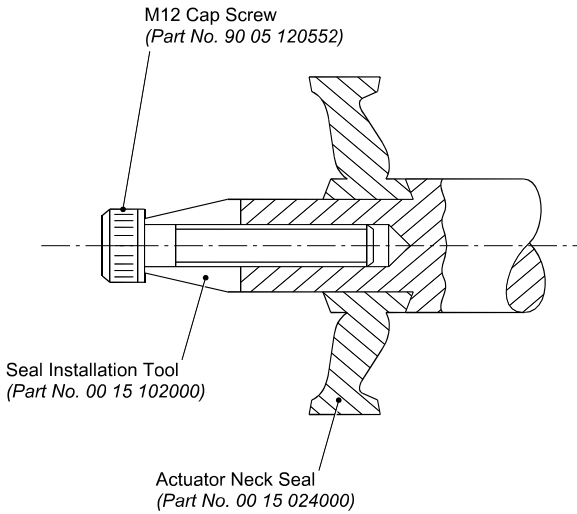
Comprising:

Drive End Bearing Assembly Tool	0015181100	1
Bearing Assembly Stud	0015172100	1
Eccentric Puller Block	0015170000	1
Impeller End Bearing Assy Tube	0015169200	1
Drive Rod Bearing Drift	0015168000	1
Mechanical Seal Removal Tool	0015166000	1
Flushing Chamber Lip Seal Fitting Tool	0015165100	1
Drive Rod Seal Tool	0010103000	1
Actuator Neck Seal Cone	0015102000	1
Drive Rod Installation Tool	0015101000	1

6.2 Fitting of Actuator Neck Seal

1. Lightly clamp seal installation tool against end of drive rod by means of capscrew, as shown.
2. Push seal into rear of inner pump body recess Part No. 0015014000.

- Clean exposed shaft and tool surfaces, and smear with soft soap. Carefully slide the actuator neck seal onto shaft until it abuts against the conical shoulder.



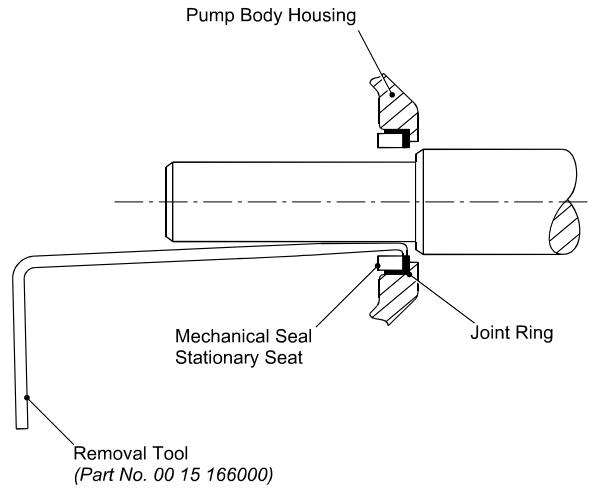
6.3 Removal of Mechanical Seal Stationary Seat and Joint Ring

- Ensure oil is drained from flushing chamber. Remove impeller and shaft sleeve, complete with rotating mechanical seal components.
- Engage tip of removal tool on inside face of seat. Remove seat by pulling evenly at several peripheral points.
- Joint ring can then be collapsed and discarded.
- To replace, the mechanical seal stationary seat and joint ring must be assembled together with the outer face of the joint ring smeared with soft soap, offered up to the flushing chamber housing and gently pressed home using a piece of wood.

IMPORTANT ADVICE



New Mechanical Seal Components must be handled with great care. In particular, the seal faces must not be touched by hand and must only come into contact with clean soft paper that is free from abrasive materials. Premature seal failure is likely to occur if this advice is not heeded.



6.4 Removal of Drive Rod Seal Assembly

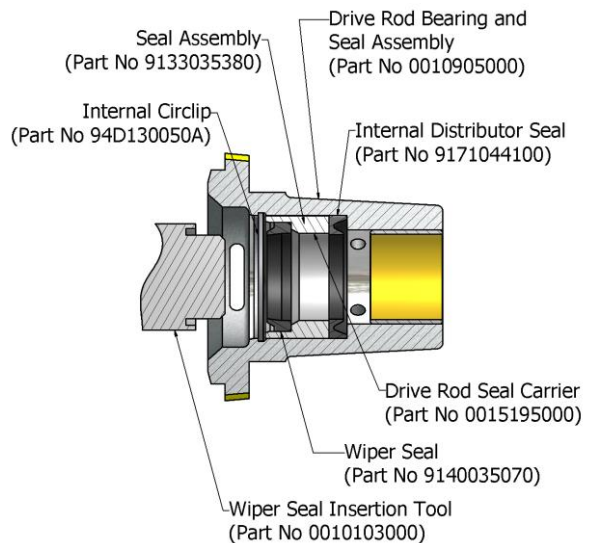
- Remove internal circlip with suitable pliers and remove seal assembly by carefully tapping with blunt punch or drift from bush end.
- Replacement of all components may be aided by smearing adjacent surfaces with soft soap.
- Prior to sliding home the drive rod seal carrier Part No. 0015195000, wiper seal Part No. 9140035070 **must first** be assembled together, using insertion tool Part No. 0010103000. Carefully applied pressure from a hand press or vice jaws may be employed for this operation.

IMPORTANT ADVICE



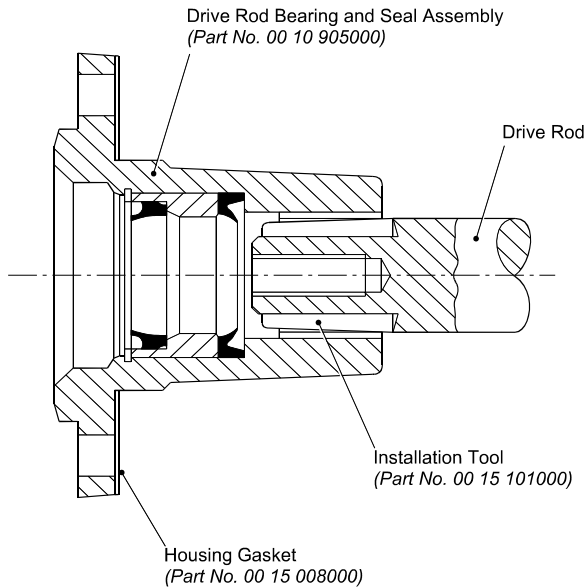
Parts must be assembled in correct order and orientation.

- Great care must be exercised when replacing the circlip to ensure that the lip of the wiper seal is not damaged by the hand tools used.



6.5 Fit Seal Housing Sub-Assembly to Pump

1. Thoroughly clean exposed drive rod surfaces and position installation tool as shown. Smear tool and drive rod surfaces with oil.
2. Thoroughly lubricate drive rod bearing and drive rod seal with oil and fit new gasket before pushing seal housing assembly along drive rod until it registers in bearing housing.

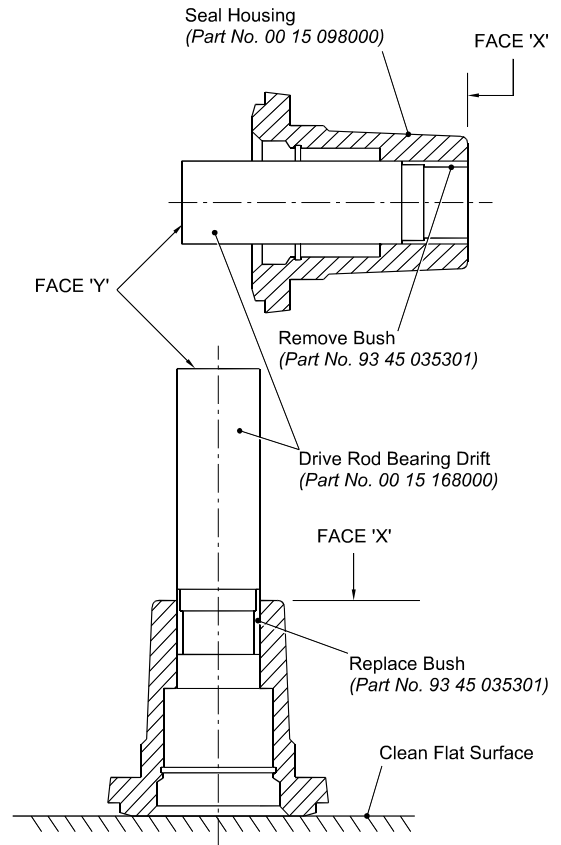


6.6 Remove Drive Rod Bearing Bush

1. Insert shouldered end of drift into bush as shown in upper sketch.
2. Support air pump pedestal evenly on face 'X' leaving sufficient clearance for bush to emerge freely.
3. Push out bearing bush by pressing or striking on tool face 'Y'.

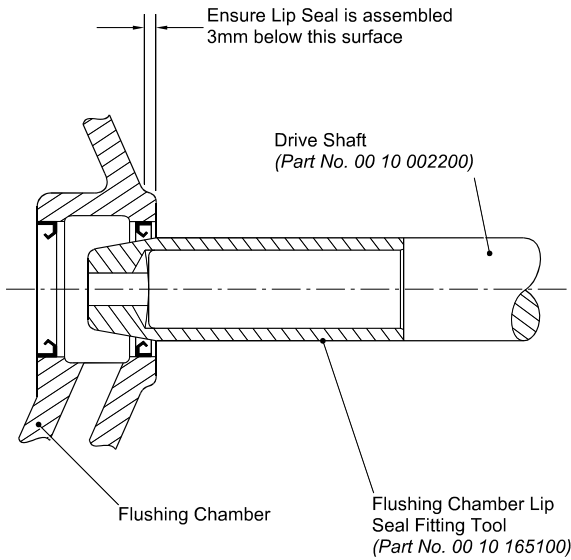
6.7 Fit New Bearing Bush

1. Position seal housing on clean flat surface and register new bush in bore as shown in lower drawing.
2. Lightly oil bore and bush to prevent pick up.
3. Insert shouldered end of drift into bush as shown in lower sketch.
4. Insert bush by pressing or striking on tool face 'Y' until end of bearing is flush with face 'X'.



6.8 Assemble Flushing Chamber

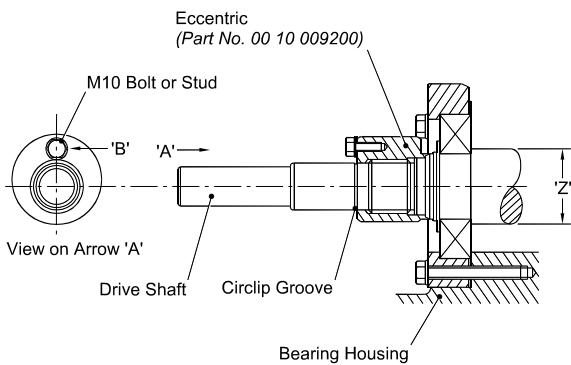
1. Check that circlip has been fitted to eccentric, and thoroughly clean exposed shaft surfaces and smear with oil. Check that lip seal fitting tool is internally and externally clean, smear with oil and slide over end of drive shaft as shown.
2. Check that flushing chamber lip seals are correctly orientated and generously lubricate their lips with oil. Slide chamber along fitting tool and onto drive shaft, taking great care to ensure that it remains concentric to the shafts axis. LIP SEALS MUST NOT BE USED TO SUPPORT THE FLUSHING CHAMBER. Ensure that the lip of the leading seal does not become deformed.



6.9 Remove Eccentric

1. Check that circlip adjacent to eccentric is removed.
2. Insert M10 bolt plus washer into eccentric as shown.
3. To release tap using drift in anticlockwise direction i.e. in direction of arrow 'B'.

NOTE: If removing eccentric when shaft is disassembled from pump, clamp with soft jaws on diameter 'Z'.



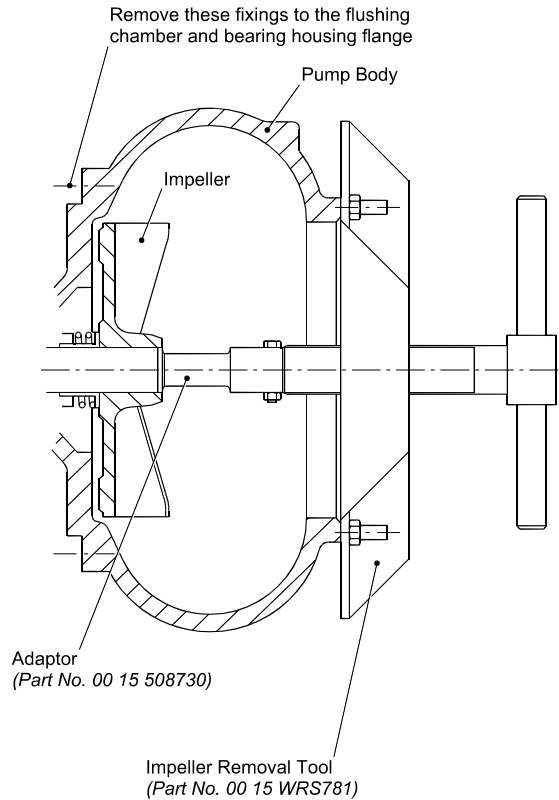
6.10 Remove Impeller

1. Pump should be removed from the chassis or the engine decoupled and the bearing housing supported.
2. Remove suction tube together with separator components ensuring that the gasket between pump body and suction tube is also removed.
3. Remove impeller screw and washers.
4. Remove nuts and washer (8off each) from the studs protruding from the pump body through the flushing chamber and bearing housing flange joint.
5. Offer up impeller removal tool across front face of pump body as shown ensuring the correct nose

adaptor is fitted. Affix by using existing nuts and washers.

6. Turn screw handle so that the drive shaft connected to the bearing housing is pushed through and out of the pump body leaving the impeller free.

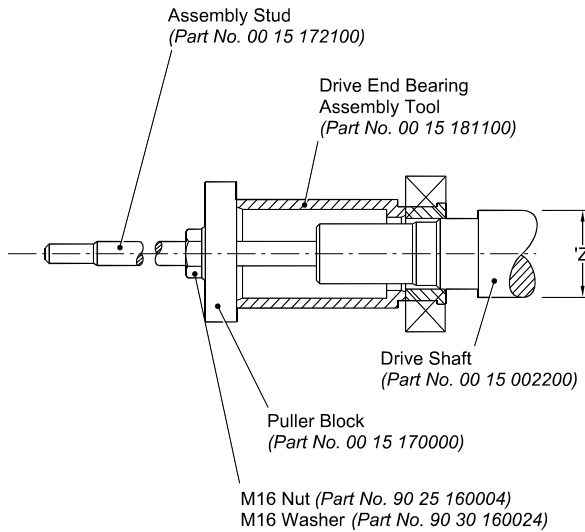
NOTE: When re-assembling impeller ensure end of shaft is coated with Shell ENSIS grease or approved equivalent.



6.11 Fit Replacement Drive End Bearing

1. Remove old bearing taking care not to damage the shaft in any way. Fit soft jaws to vice and clamp shaft horizontally on diameter 'Z' leaving the abutment shoulder overhanging.
2. Screw assembly stud Part No. 0015172100 into shaft end until it bottoms. Thoroughly clean bearing -mounting surfaces of shaft and smear with oil.
3. Carefully register bearing on shaft, ensuring that it is not contaminated by foreign matter, and position assembly tool Part No. 00151811000 and puller block Part No. 0015170000 as shown.
4. Ensuring that the bearing is square to the shaft and that assembly tool is concentric to the shaft's centre line, push bearing onto shaft by applying steady and continuous screwing torque to the M16 nut and washer.
5. Check that inner ring of bearing is touching abutment shoulder of drive shaft:

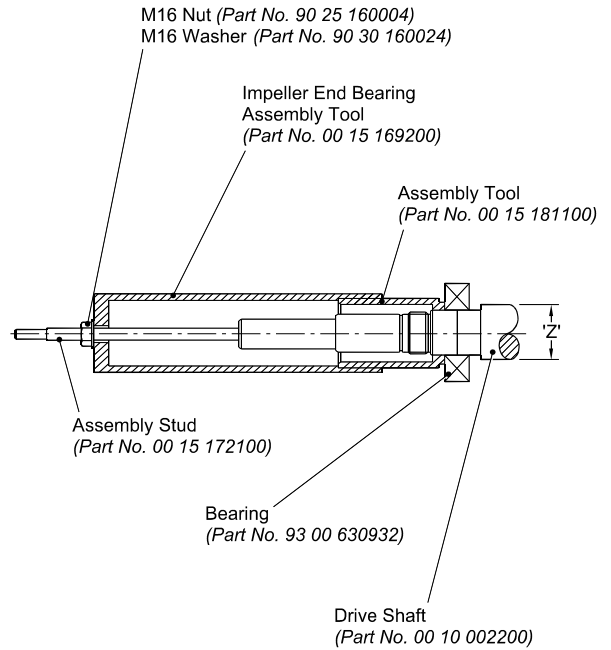
NOTE: Bearings may be replaced by using the assembly tool in conjunction with a press only, thus eliminating stud and puller block.



6.12 Fit Replacement Impeller End Bearing

1. Remove old bearing taking care not to damage the shaft in any way. Fit soft jaws to vice and clamp shaft horizontally on diameter 'Z' leaving the abutment shoulder overhanging.
2. Screw assembly stud Part No. 0015172100 into shaft end until it bottoms. Thoroughly clean bearing mounting surfaces of shaft and smear with oil.
3. Carefully register bearing on shaft ensuring that it is **not contaminated by foreign matter** and position assembly tool Part No. 0015169200 and Part No. 0015181100 as shown.
4. Ensuring that the bearing is square to the shaft and that assembly tool is concentric to the shaft centre line, push bearing onto shaft by applying steady and continuous screwing torque to the M16 nut and washer.
5. Check that inner ring of bearing is touching abutment shoulder of drive shaft.
6. Replace the bearing spacer and circlip.

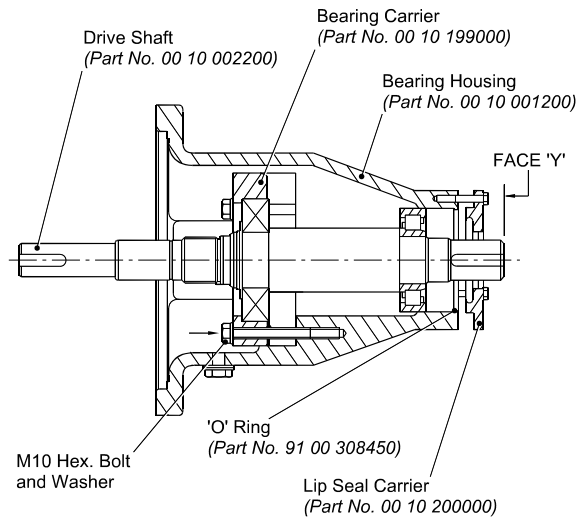
NOTE: Bearings may be replaced by using the assembly tools in conjunction with a press only, thus eliminating stud and puller block.



6.13 Assembly of Drive Shaft with Bearings into Housing

1. Remove assembly by releasing the 4 x M10 fixings. The bearing carrier can be jacked free by the two screwed holes adjacent to the fixings.
2. Remove the lip seal carrier, ensuring seal is not dragged over sharp edge of keyway, together with 'O' ring and press or strike (with soft faced mallet) shaft end 'Y', to withdraw bearings and bearing carrier.
3. When assembling, all parts should be scrupulously clean and bearing mounting surfaces smeared with oil.

4. The outer race of the drive end bearing is inserted by carefully drifting or pressing the race into the housing. Alternatively, the Lip Seal Carrier Part No. 0010200000 may be utilised, pressing the race into the housing by making use of longer bolts and jacking home evenly. If this latter method is employed be sure to use large washers beneath the bolt head to distribute pressure over a larger area as the lipseal carrier may be manufactured in light alloy.
5. Position bearing housing in vertical attitude with bell end upwards mounted on suitable supports so that end of shaft can emerge through bottom.
6. Ensure shaft with bearings is inserted into the bearing housing so that it is concentric and parallel to the mating surfaces. Assembly is 'jacked' home by tightening the M10 fixings assembled together with the bearing carrier.
7. Finally ensure lip seal is in good condition together with 'O' ring before finally bolting up the carrier.



7 FAULT FINDING GUIDE

This table gives the most common symptoms arising in connection with water-handling duties. Please consult Selwood Pumps for further advice if the service fault is not described, and particularly if the duty has uncommon characteristics.

At no time should the pump be run if its bearing housing or flushing chamber contains contaminated oil. Very small volumes of oil may be lost from these chambers during a day's normal running, but remedial action should immediately be taken if the loss becomes excessive.

The most likely causes of failure are given in the sequence in which they should be investigated. For example, if the pump will not prime, carry-out the first service instruction that is listed and proceed to the second only if the first proves to be inappropriate.

PUMP WILL NOT PRIME, OR LOSES PRIME HAVING PUMPED PRODUCT FOR A BRIEF PERIOD OF TIME

ACTION	COMMENT
1 Check that drain taps fitted to volute and air pumps are closed.	Drain taps are sometimes left open overnight. If okay, try Action 2.
2 Remove inspection cover and check that delivery valve is seating efficiently.	The delivery line MUST BE DRAINED before the cover is removed. If okay, try Action 3.
3 Disconnect hose from air pump spigot and attach vacuum gauge to pump - should read 29" H ₂ O (25.6" Hg) or more, after the pump is stopped.	If vacuum is okay, check Action 4. If vacuum is low or fails quickly, check Action 8.
4 Reconnect air pump hose, and check vacuum at suction spigot of main pump. Correct reading is given above.	If vacuum is okay, check Actions 5 (a) and (b). If vacuum is slow to rise or low at terminal condition, check Actions 6 and 7.
5 (a) Check all suction-side hoses, fittings and joints for air leaks.	Priming problems are VERY often caused by faults in supply pipework. Air must not be allowed to pass into the system across couplings, etc.
(b) Check strainer and suction hose for blockages.	Do not use non-reinforced hose. Always fit a strainer of correct size and type.
6 Examine separator assembly for air leaks or trapped solids. Check peel valve seat for ice in cold conditions.	Refer to Major Servicing: Section 5.2 for advice. The float must be able to rise and fall freely. The peel valve must completely shut-off the air pump when the float rises to its maximum position.
7 Check level of oil in flushing chamber.	If level is very low, mechanical seal may be admitting air. Top up, and re-check vacuum. Substantial oil loss indicates seal failure - refer to Major Servicing: Section 5.3.2 for advice.
8 Examine valves and flexing seals in air pump assembly and check that castings are not cracked.	Refer to Major Servicing: Section 5.1 for advice.

OUTPUT AND HEAD ARE LESS THAN PUBLISHED FIGURES

ACTION	COMMENT
1 Check strainer and suction pipework for blockages. Also check that air is not being pulled through a vortex created in the supply reservoir.	Choking of the supply system by solids will increase the flow resistance, thus increasing the head against which the pump has to operate, and so reducing output. The entry of air through faulty pipe joints will have a similar effect. Reduction also occurs if air is entrained through a vortex to eliminate, increase strainer's submergence.
2 Check pump speed with tachometer.	Speed, off-load must not exceed: 1600rpm.
3 Check that delivery valve, discharge branch of casing, and pipework are free from blockages.	Obstructions down-stream of the pump will increase the flow resistance and thus reduce output.
4 Check condition of impeller.	Excessively worn vanes will reduce output. Also check outside diameter of vanes: Standard Seltorque S100 - 215mm

LIQUID IS BEING PUMPED OUT OF AIR PUMP, I.E. WATER CARRY-OVER IS OCCURRING

ACTION	COMMENT
1 Check condition of separator assembly.	No significant amounts of water should normally pass across the air pump. The rubber peel valve may not be seating correctly, the float may be punctured, or not be able to rise and fall freely, etc. Also, check that bush is correctly positioned. Refer to Major Servicing: Section 5.2 for instructions.
2 Check condition of valves and flexing seals in air pump.	On rare occasions, malfunction of the air pump seals in air pump can cause the separator float to move erratically. Refer to major Servicing: Section 5.1 for instructions.

WATER LEAKING OUT OF FLUSHING CHAMBER VENT BEHIND VOLUTE, OR FROM BREATHER VALVE FITTED TO CHAMBER

ACTION	COMMENT
1 Drain flushing chamber to check contents.	The chamber should only contain oil. If the mechanical seal has failed, water may be present in the chamber. If so, replace seal in accordance with instructions given in Major Servicing: Section 5.3.2.

OIL LEAKING OUT OF FLUSHING CHAMBER VENT BEHIND VOLUTE

ACTION	COMMENT
1 Top up both oil reservoirs, and run pump under supervision for say 30 min to determine from which reservoir leakage is occurring.	Replace faulty lip seal in accordance with instructions given in Major Servicing: Section 5.4.

OIL LEAKING FROM VENTS BEHIND AIR PUMP

ACTION	COMMENT
1 Check that mechanism reservoir has not been overfilled with oil.	It is extremely difficult to overfill pumps built to latest specifications. However, earlier machines were fitted with oil level plugs which did not automatically limit the oil volumes.
2 Check conditions of air pump drive rod and associated seal.	Refer to Major Servicing: Section 5.4 for instructions.

OIL LEAKING FROM ENGINE-END OF PUMP ASSEMBLY

ACTION	COMMENT
1 Check that mechanism reservoir has not been overfilled with oil.	Although unlikely, incorrect filling may be responsible for the problem.
2 Replace lip seal between air pump mechanism and drive shaft bearings.	Refer to Major Servicing: Section 5.4 for instructions.

PUMP CANNOT BE ROTATED BY HAND BY MEANS OF STARTING HANDLE, FOR EXAMPLE

ACTION	COMMENT
1 Check for ice in air pump or volute.	In cold weather, ice can form in these chambers if they have not been drained. Eliminate by means of hot water.
2 Check that air pump assembly is not faulty.	The actuator must be securely fastened to its drive rod, and must be able to reciprocate freely without touching any stationary surface. Refer to Major Servicing: Section 5.1 for instructions.
3 Check that impeller and drive shaft are free to rotate.	Although unlikely, it is possible for fibrous solids to restrict the impeller's movement. Also, failure of the drive shaft bearings may have resulted in the impeller striking the casing. Seizure of the bearings could also produce the problem. Refer to Major Servicing: Section 5.3 for instructions.

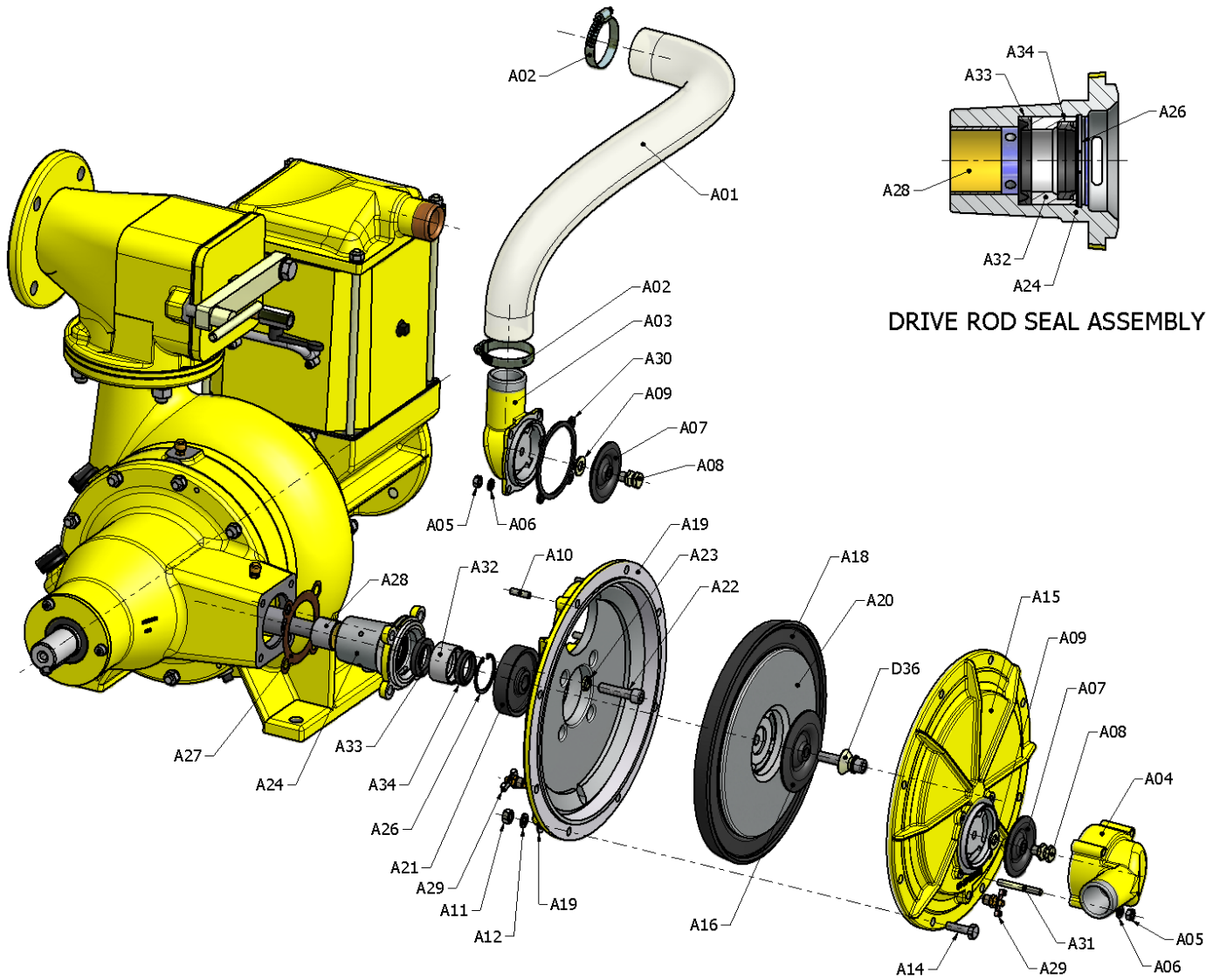
PUMP PRODUCES UNEXPECTED NOISES WHEN RUNNING

ACTION

COMMENT

- | | | |
|---|--|--|
| 1 | Check quality and quantity of oil in mechanism chamber and flushing chamber. | Incorrect volume and quality may result in overheating as well as abnormal noise. Note that extensive running under such circumstances can significantly damage pump components. |
| 2 | Check that air pump assembly is not faulty. | The actuator must be securely fastened to its drive rod, and must be able to reciprocate freely without touching any stationary surface. Refer to Major Servicing: 5.1 for instructions. |
| 3 | Check that air pump mechanism is not faulty. | Excessively worn connecting rod bearings, or an under-sized eccentric or fulcrum pin, could cause this problem. Refer to Major Servicing: 5.4 |

Refer to Selwood Pumps if the above advice does not solve your problem.



NOTES:

1. Drive Rod Seal assembly available as Part No. 0010905000 Linear Bearing and Seal Assembly.
2. Part Nos. 0015195000, 9140035070 and 9171044100 available as sub-assembly Part No. 9133035380.
3. Ensure that seal components are positioned as shown above, and are retained by the internal circlip. Great care must be exercised when fitting the circlip to ensure that the lip of the wiper seal is not damaged by the hand tools used. See Workshop Tools Section 6.4.
4. To safeguard the sealing lips, lubricate the bearing and seals with light oil and use seal installation tool when fitting assembled housing unit to pump assembly. See Workshop Tools Section 6.5.

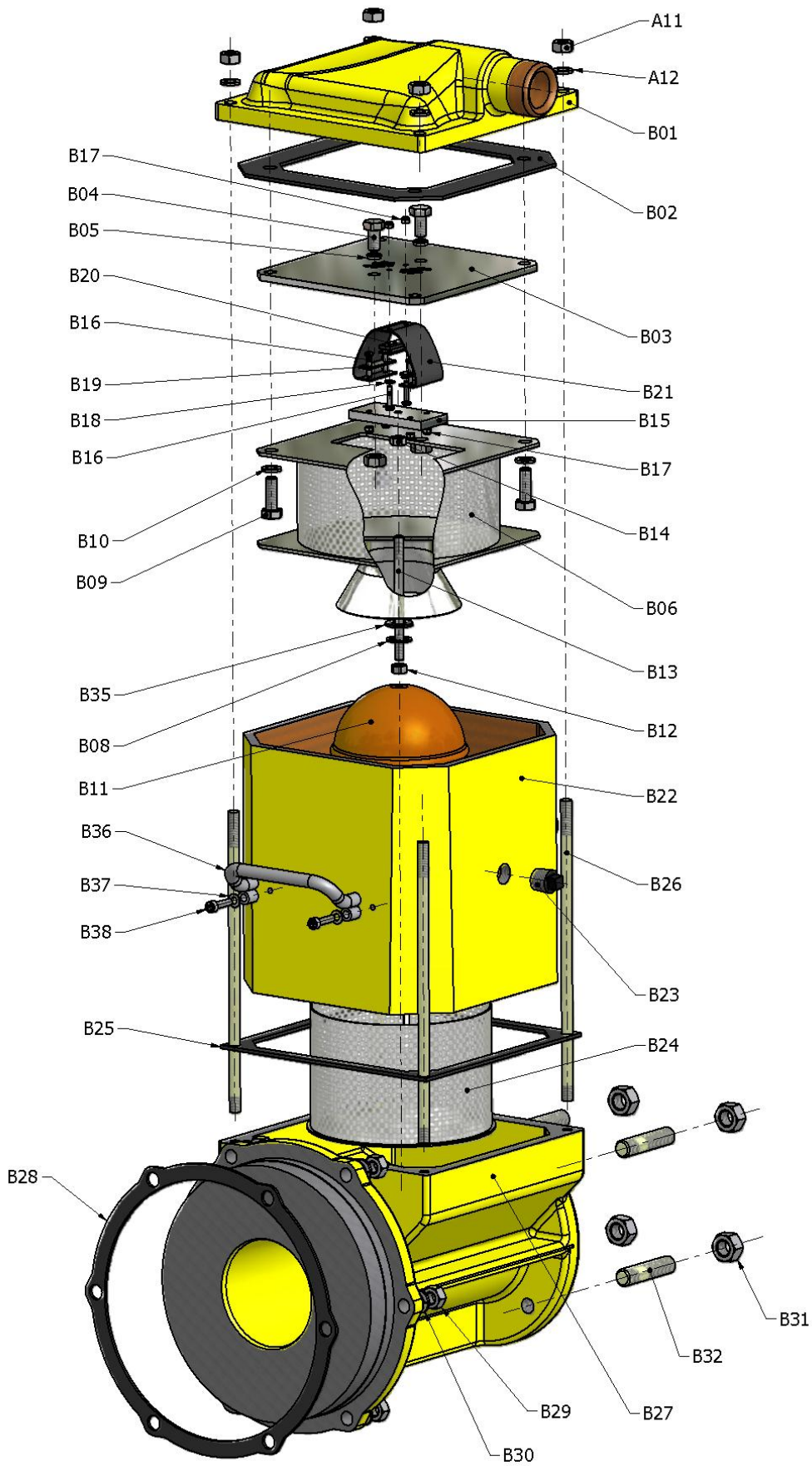
8 PARTS LIST

8.1 Air Pump Parts

ITEM	DESCRIPTION	PART NUMBER	QTY
A01	Hose 50mm Nom Bore	9542000000	1
A02	Size 3 Clip	9505007004	2
A03	Suction Valve Box	0015017000	1
A04	Exh Cover Air Pump	1592306000	1
A05	M8 Hex Full Nut	9025080004	8
A06	M8 Spring Washer Rect Sect	9030080229	8
A07	Suc/Delivery Valve	0015021000	2
A08	Actuator Stud – Suction Del	0015019000	2
A09	½ x 1 x 13 SWG Plain Washer	0002068000	2
A10	Stud	9035080204	4
A11	M10 Hex Full Nut	9025100004	8
A12	M10 Spring Washer Rect Sect	9030100229	8
A13	M10 x 21 x 1.2 Plain Washer	9030100024	8
A14	M10 x 35 Hex. Head Bolt	9001100351	8
A15	Outer Pump Body	0015015000	1
A16	Actuator Valve Syn	0003221200	1
D36	Actuator Ret Assy	0015975000	1
A18	Actuator Seal	0015023000	1
A19	Inner Pump Body	0015014000	1
A20	Air Pump Piston	0015016000	1
A21	Connecting Rod Seal	0015024000	1
A22	M12 x 1.75 x 50 Wdlk Hex Skt Cap	9001240-02	4
A23	Cap Screw Bearing Washer	0015100000	4
A24	Lin Brng Hsing Mchnd	0015098000	1
A25	Wiper Seal Assembly	9133035380	1
A26	Circlip Internal 50 Dia	94D130050A	1
A27	Gasket Air Pump Mounting	0015008000	1
A28	Glacier Bearing	9345035301	1
A29	¼" BSP Drain Tap	9520103000	2
A30	Suction Valve Box Gasket	0015022000	1
A31	Stud	9035080554	4
†A25	Comprises:		
A32	Drive Rod Seal Carrier	0015195000	1
A33	Int Dist Seal	9171044100	1
A34	Wiper Seal	9140035070	1
††D36	Comprises:		
	Act Valve Ret Boss	0015187000	1
	M12 x 55 Hex Hd Capscrew Wdlk	9005120552	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



8.2 Separator Parts

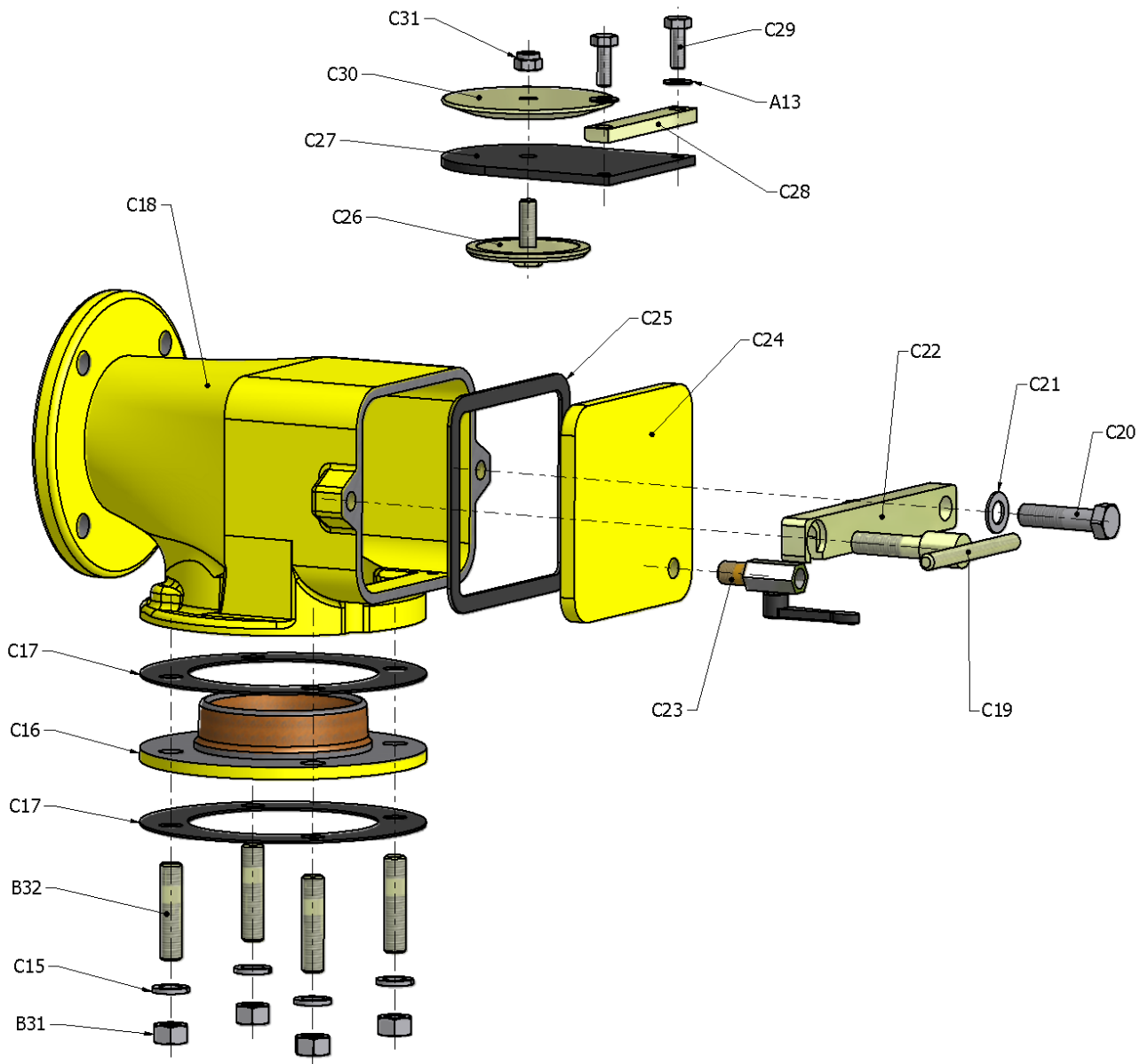
ITEM	DESCRIPTION	PART NUMBER	QTY
A11	M10 Hex Full Nut	9025100004	4
A12	M10 Spring Washer Rect Sect	9030100229	4
B01	Sep Top Cap	0015034000	1
B02	Top Cap Gasket	0015043000	1
B03	Port Plate Drilled S/S	0015036000	1
B04	M10 x 20 Hex Head Sets S/S	9000100207	2
B05	M10 x 12.5 Sealing Washer	9030100289	2
*B06	Upper Diffuser	0015037001	1
B07	Diffuser Bush	0015160000	1
B08	½" x 1.0" Starlock Washer SS	9030130407	1
B09	M10 x 30 LG Hex Head Sets S/S	9000100307	4
B10	M10 Spring Washer Sq Sect SS	9030100207	4
B11	Float Assembly	9565001000	1
B12	5/16" B.S.W. SS Full Nut	0006741030	1
B13	Peel Valve Rod	0015090000	1
B14	M8 Hex Full Nut S.S.	9025080007	1
B15	Operating Plate SS	0015085000	1
B16	M4 x 20 Pan Hd Mach Screw S/S	9018040207	6
B17	M4 Hex Self Lock Nut SS	9025040307	6
B18	M4 x 9.0 x 0.8 Plain Washer SS	9030040027	6
B19	Peel Valve Clamp Bar	0015084000	3
B20	Clamp Bar Seal	0015183000	1
B21	Peel Valve Rubber	0015039000	1
B22	Separator Body	0015033000	1
B23	½" BSP Plug	9522004000	1
B24	Lower Diffuser Plain Base	0015038000	1
	Lower Diffuser Sludge Version (Perforated)	1594161000	1
B25	Separator Body Gasket	0015044000	1
B26	Tie Rod Plated	0015045000	4
B27	Flgd Suct Tube	0010035001	1
B28	Suction Tube Gasket	0010048000	1
B29	M12 Hex Full Nut	9025120004	6
B30	M12 Spring Washer Rect Sect	9030120229	6
B31	M16 Hex Full Nut	9025160004	8
B32	Stud	9035160551	8
B35	Washer - Nitrile	1590049000	1
B36	Separator Handle	1507264000	2
B37	M6 x 12.5 x 0.8 Plain Washer	9030060024	4
B38	M6 x 25 Hex Socket Hd Capscrew SS	9005060250	4

Sub-Assembly B06 includes B07, B08 and B35.

Items B05, B07, B08, B16, B17, B18, B20 and B21 are available as spares kit 0015996000

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

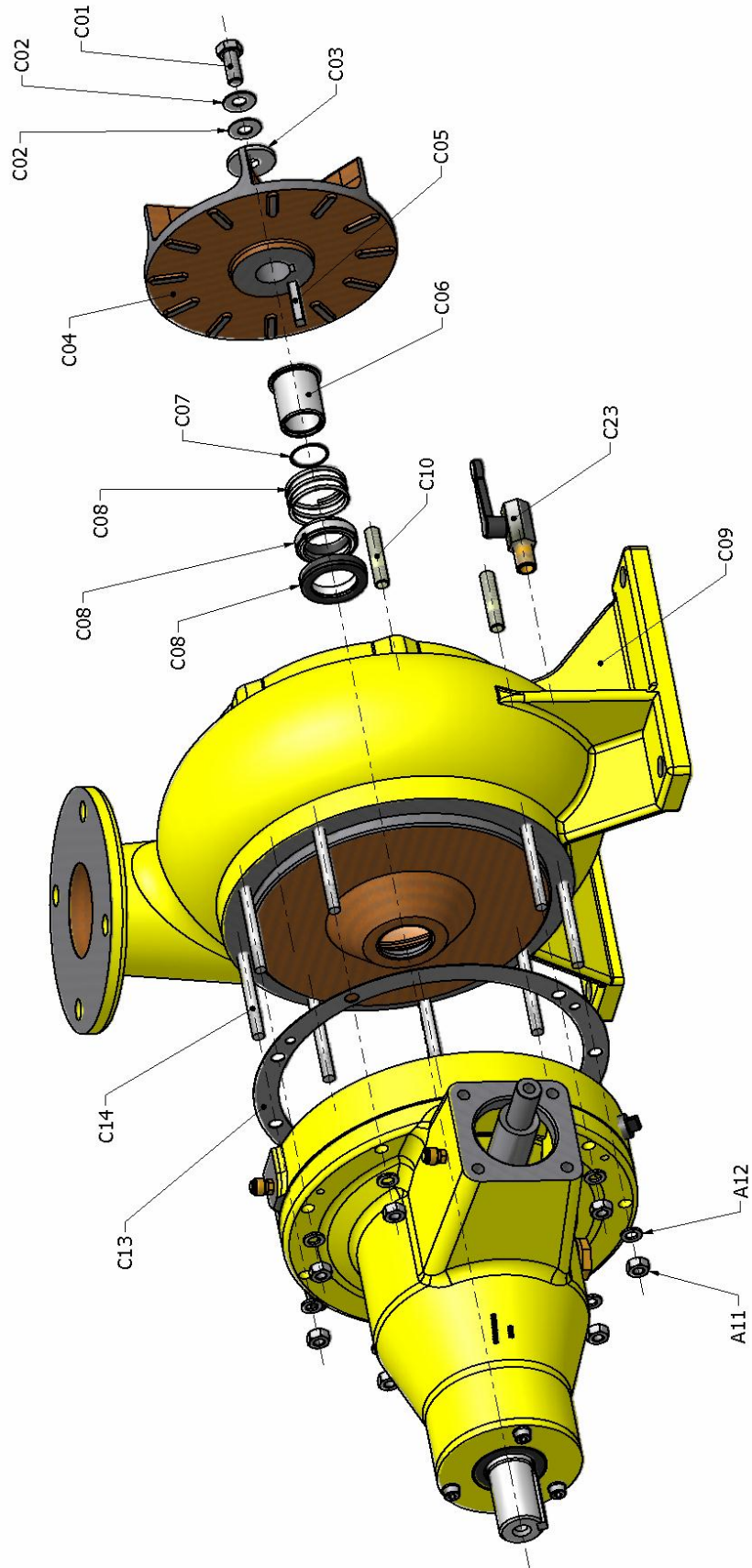


8.3 Delivery Valve Parts

ITEM	DESCRIPTION	PART NUMBER	QTY
B31	M16 Hex Full Nut	9025160004	4
C15	M16 Spring Washer Rect Sect	9030160229	4
C16	Rep Valve Seat	0015046000	1
C17	Delivery Valve Box Gasket	0015047000	2
B32	Stud	9035160551	4
C18	Del Valve Chamb	0010026001	1
C19	T – Handle Lckg Bolt	0015031000	1
C20	M16 x 65 Hex Head Bolt	9001160651	1
C21	M16 x 30 x 2.0 Plain Washer	9030160024	1
C22	Inspection Panel Lckg Bar	0015030000	1
C23	Drain Tap 450	9520003000	1
C24	Inspection Panel	0015029000	1
C25	Inspection Panel Gasket	0015028000	1
C26	Valve Plate lower	0015032000	1
C27	Discharge Valve Rubber	0006604000	1
C28	Valve Clamping Bar	0015027000	1
C29	M10 x 30 LG Hex Head Setscrew	9000100301	2
A13	M10 x 21 x 1.2 Plain Washer	9030100024	2
C30	Del Vlv Plate 100/150	0006698000	1
C31	M12 Hex Self Lock Nut	9025120344	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

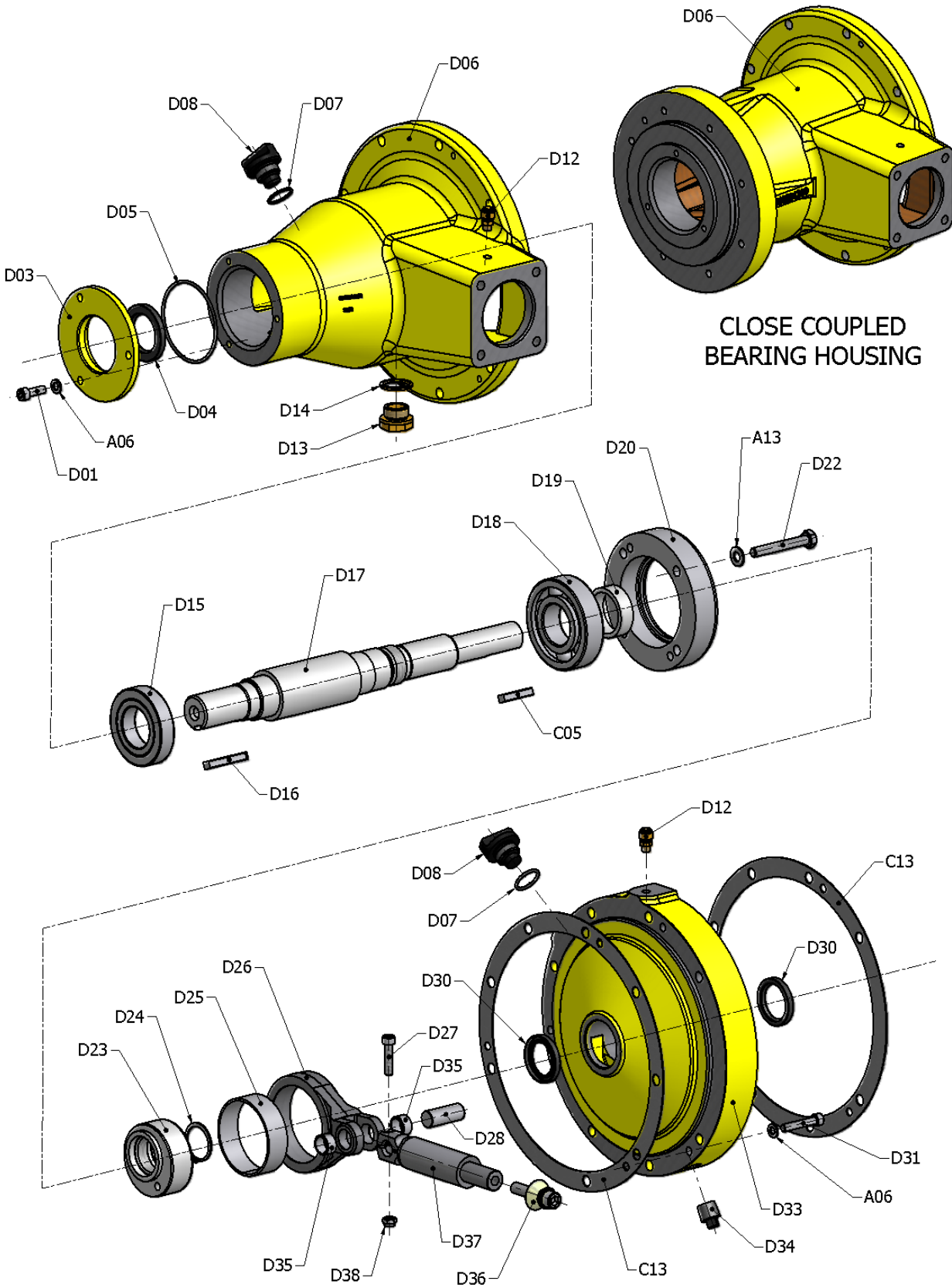


8.4 Pump Body Parts

ITEM	DESCRIPTION	PART NUMBER	QTY
C01	M12 x 30 Wdlk Hex Head Setscrew	9000120302	1
C02	½" x 1.³⁄₈" Belleville Washer	9030510359	2
C03	Impeller Retaining Washer	0010013000	1
C04	Impeller	0010012000	1
C05	Key 10 x 8 x 40	9041104013	1
C06	Shaft Sleeve	0010161000	1
C07	'O' Ring	9150001050	1
C08	Mech Seal (S100)	9110038000	1
C09	S100 Body Mach'd	0010010001	1
C10	Stud	9036120401	6
A11	M10 Hex Full Nut	9025100004	8
A12	M10 Spring Washer Rect Sect	9030100229	8
C13	Body Gasket	0010011000	2
C14	Stud	9036100854	8
C23	Drain Tap 450	9520003000	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



CLOSE COUPLED BEARING HOUSING

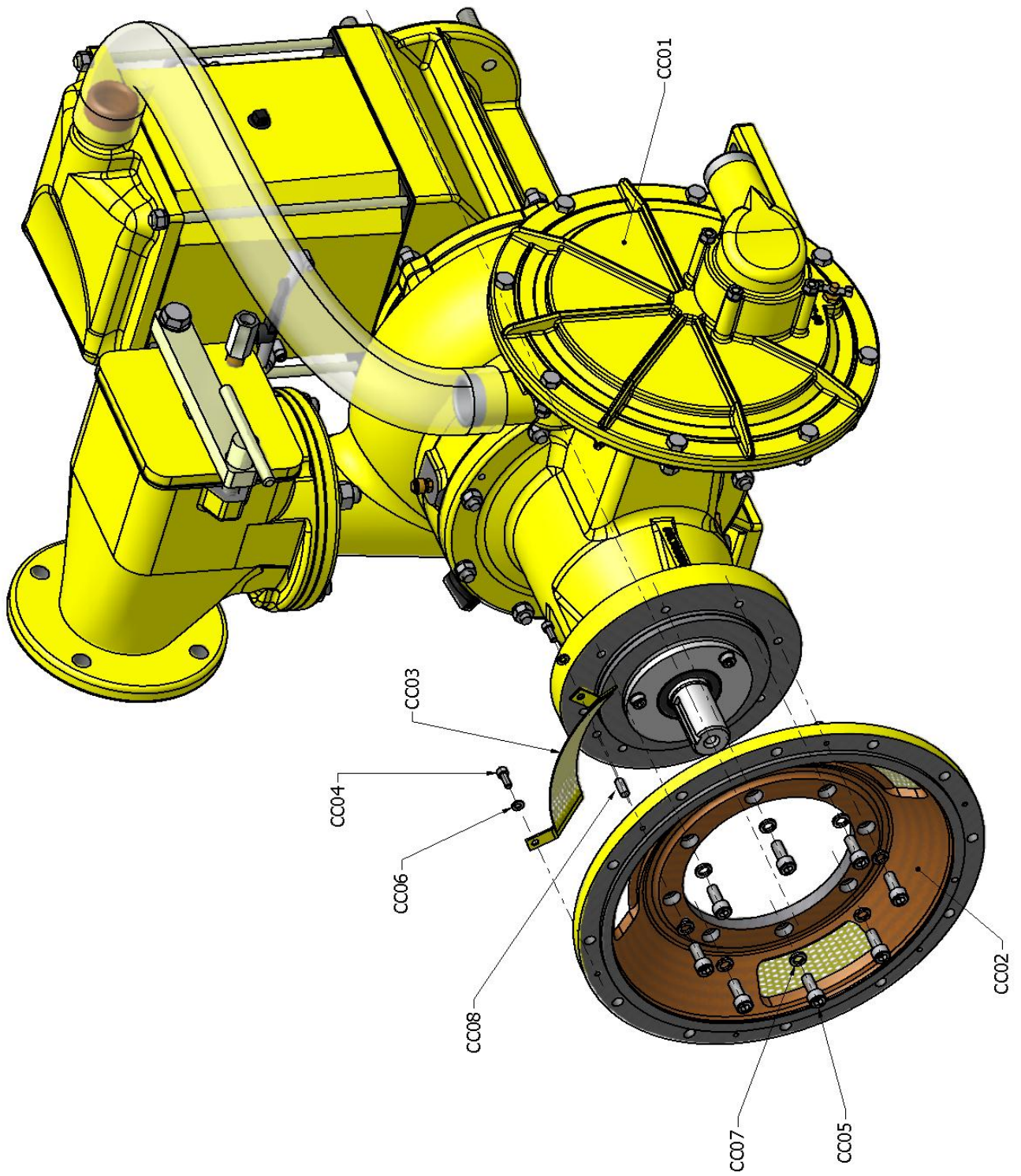
8.5 Bearing Housing and Air Pump Drive Assembly Parts

ITEM	DESCRIPTION	PART NUMBER	QTY
D01	M8 x 25 Hex Hd Socket Capscrew	9005080250	3
A06	M8 Spring Washer Rect Sect	9030080229	3
D03	Lip Seal Carrier	0010200000	1
D04	Lip Seal	9127040070	1
D05	Oil Seal 62 x 40 x 7	9100308450	1
D06	Brg Hsg Mchd	0010001201	1
	S100 Brg Hsg Close Coup	0010001300	1
D07	'O' Ring 24.5 I/D x 3.0 Section	9100300250	2
D08	Oil Filler Plug	0015186000	2
D09	Label Direction Arrow	0015078000	1
D10	2 x ¼ Hammer Drive Screw Round	9045002259	2
D11	Label Manufacturer Ce	0015071000	1
D12	Breather Valve	9528001000	2
D13	Tank Drain Plug	9521005000	1
D14	Bonded Washer for 471	9030710272	1
D15	Bearing NF 209	9309F20930	1
D16	Key 10 x 8 x 60	9000099-16	1
D17	Drive Shaft S100	0010002200	1
D18	Bearing (6309 2Z-C3)	9300630932	1
D19	Spacer	0010201000	1
D20	Bearing Carrier	0010199000	1
A13	M10 x 21 x 1.2 Plain Washer	9030100024	4
D22	M10 x 75 LG Hex. Head Setscrew	9000100751	4
D23	Air Pump Eccentric	0010009200	1
D24	Circlip 38 Dia	9401000381	1
D25	Connecting Rod Bush	0015066000	1
D26	Con Rod Assembly	0015908000	1
D27	Skt. Cap Screw M8 X 35	9005080350	1
D28	Drive Rod Fulcrum Pin	0015007000	1
C13	Body Gasket	0010011000	2
D30	Lip Seal	9127038070	2
D31	M8 x 45 Hex Hd Socket Capscrew M8 x 45	9005080450	3
A06	M8 Spring Washer Rect Sect	9030080229	3
D33	Flush Seal Chamb	0010157001	1
D34	½ - B.S.P Plug	9522004000	1
D35	Small End Bearing	0015065100	2
D36	Actuator Ret Assy	0015975000	1
D37	Drive Rod	0015018200	1
D38	M8 Hex Self Lock Nut	9025080344	1
C05	10 x 8 x 40 Key	9041104013	1
†D36	Comprises		
	Act Valve Ret Boss	0015187000	1
	M12 x 55 Hex Hd Capscrew Wdlk	9005120552	1

Items D27, D36, D37 and D38 can be supplied as Sub-Assembly 0015976000.

Items D25, D26 and D35 are supplied as Sub-Assembly 0015908000. These items are also available as a service exchange unit reference Part No. 0015998000, i.e. connecting rod with worn bushes may be exchanged for a service repaired unit.

When ordering spares, please state: PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

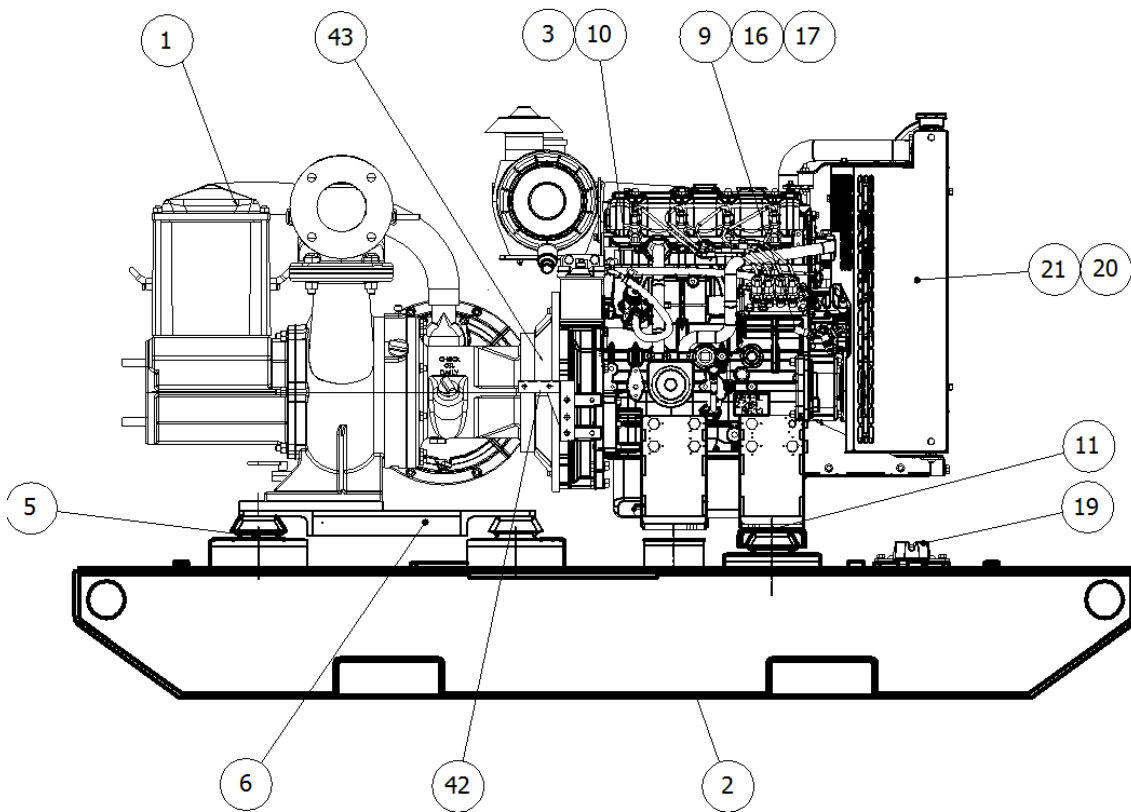
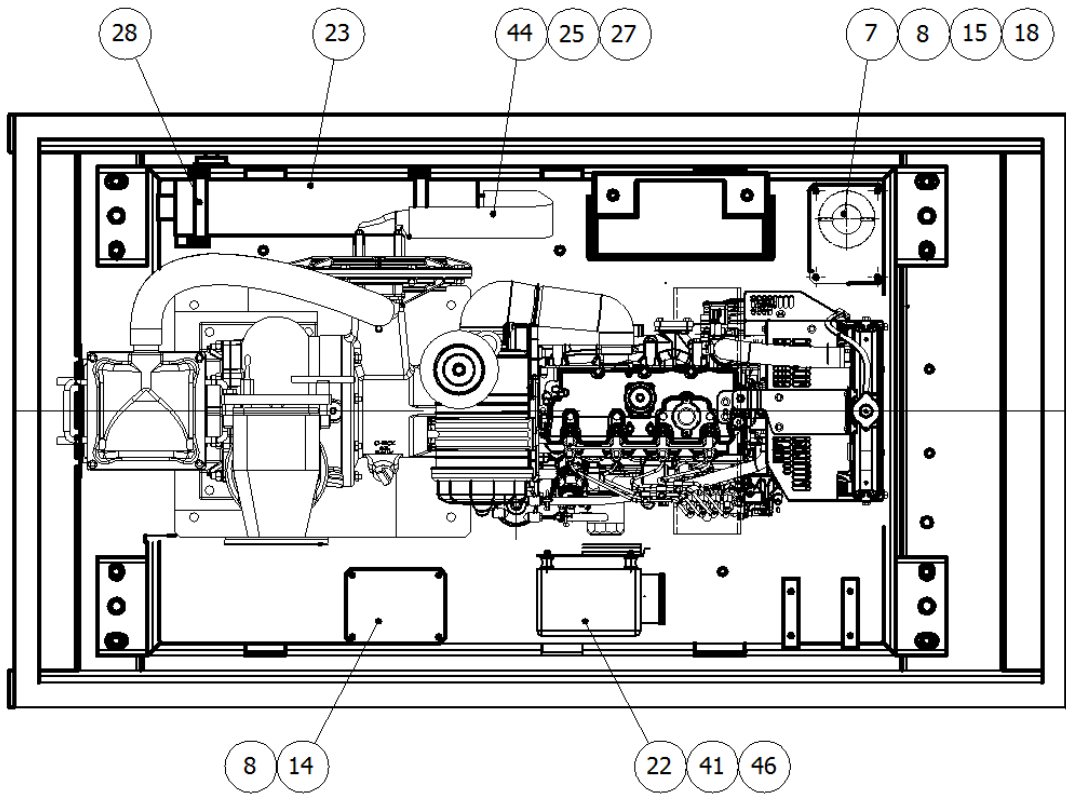


8.6 S100 Body Unit – Close Coupled 1006120000

ITEM	DESCRIPTION	PART NUMBER	QTY
CC01	S100 C/C Pump Unit Core	1008213000	1
CC02	S100 Bell Hsg Mach	1006062000	1
CC03	S100 Vent Cover	1008124000	3
CC04	M6 x 16 Hex Socket Capscrew	9000641-01	6
CC05	M10 x 25 Skt Capscrew	9005100250	8
CC06	M6 Spring Washer Rect Sect	9030060229	6
CC07	M10 Spring Washer Sq Sect	9001079-01	8
CC08	8 x 20 Dowel Pin	9000869-01	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

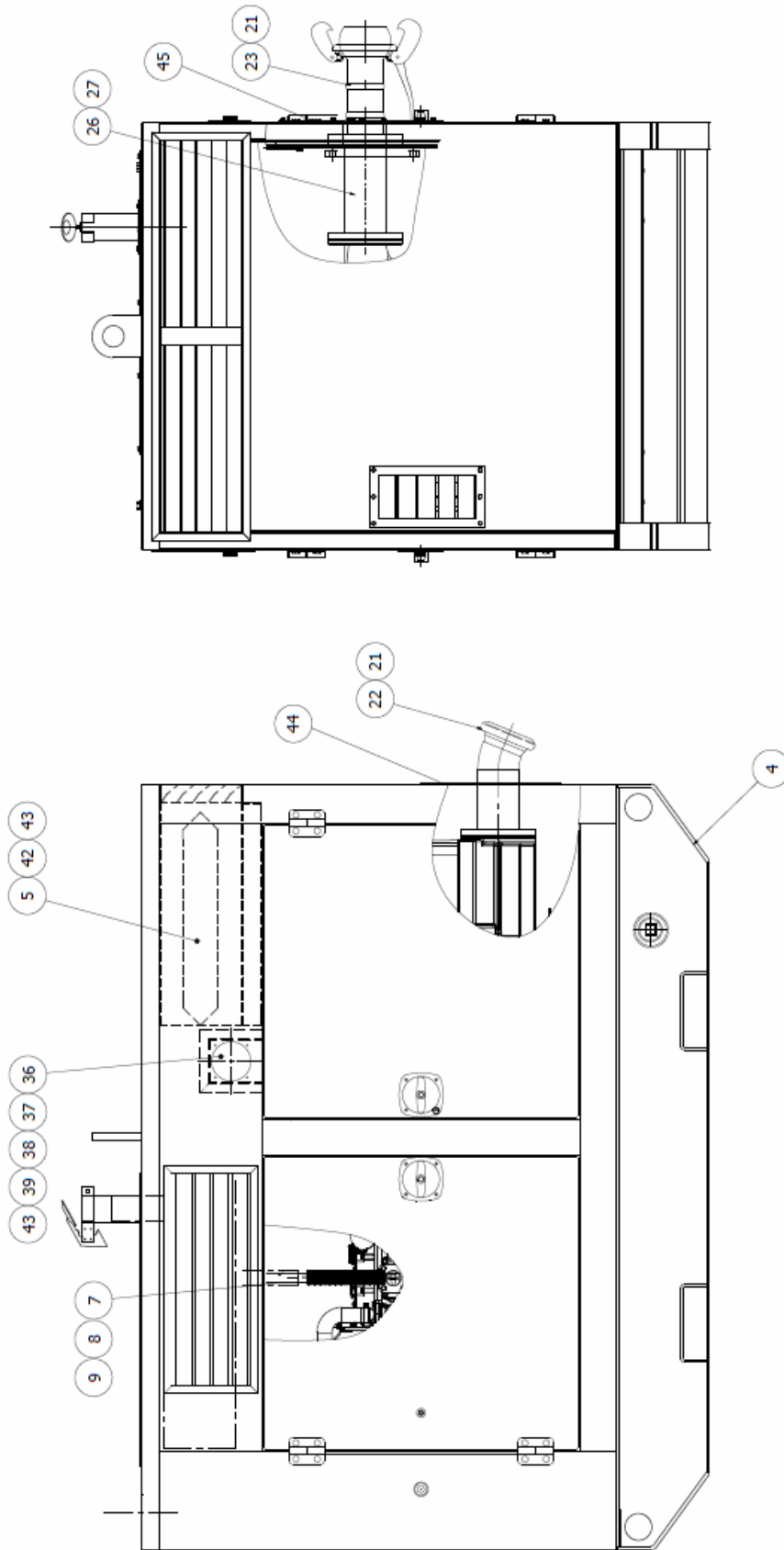


8.7 Perkins 404D-22 Close Coupled Core Build 1010413C00

ITEM	DESCRIPTION	PART NUMBER	QTY
1	S100 Body Unit C/C	1006120000	1
2	S100CC Skid/Tank	1510405000	1
3	Hose Adaptor Assy	2009033000	1
5	A/V Mount SM1609/45	9680M00048	6
6	Pump Mtg Bracket (S100 CC)	1010412000	1
7	Filler / Insp Plate	1506251000	1
8	Fuel Filler Plate Gasket	1501280000	2
9	Fuel Line Assy Watertrap	1002218000	1
10	Fuel Return Line Kit	1510407000	1
11	Front Eng Mtg – Perk 404D	1010300000	1
14	Blanking Plate	1506318000	1
15	Filler Filter (For 82 ID Neck)	7501252000	1
16	Gasket	0015063000	1
17	F/Tank Feed Filter	1500277000	1
18	Filler Cap	9550M11501	1
19	Fuel Gauge	9590K04801	1
20	Engine Side Wiring Loom Perk	92700-0353	1
21	Perkins 404D-22 IOPU Engine	92037-0001	1
22	C/Panel Perk 404D-22	92700-0342	1
23	Silencer Ads 1 – ½"	9510P01201	1
25	Socket 1.1/2"	9517P01201	1
27	Size 3 Clip	9505007004	2
28	Clamp (White)	0015509940	2
41	Control Panel Bracket	1010364000	1
42	Water Trap Bracket	1310062000	1
43	KTR Bowex Coupling 38 bore	9600M00047	1
44	Air Exhaust Conn Hose	1007411000	1
54	Oil Drain Hose Assy	1510334000	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



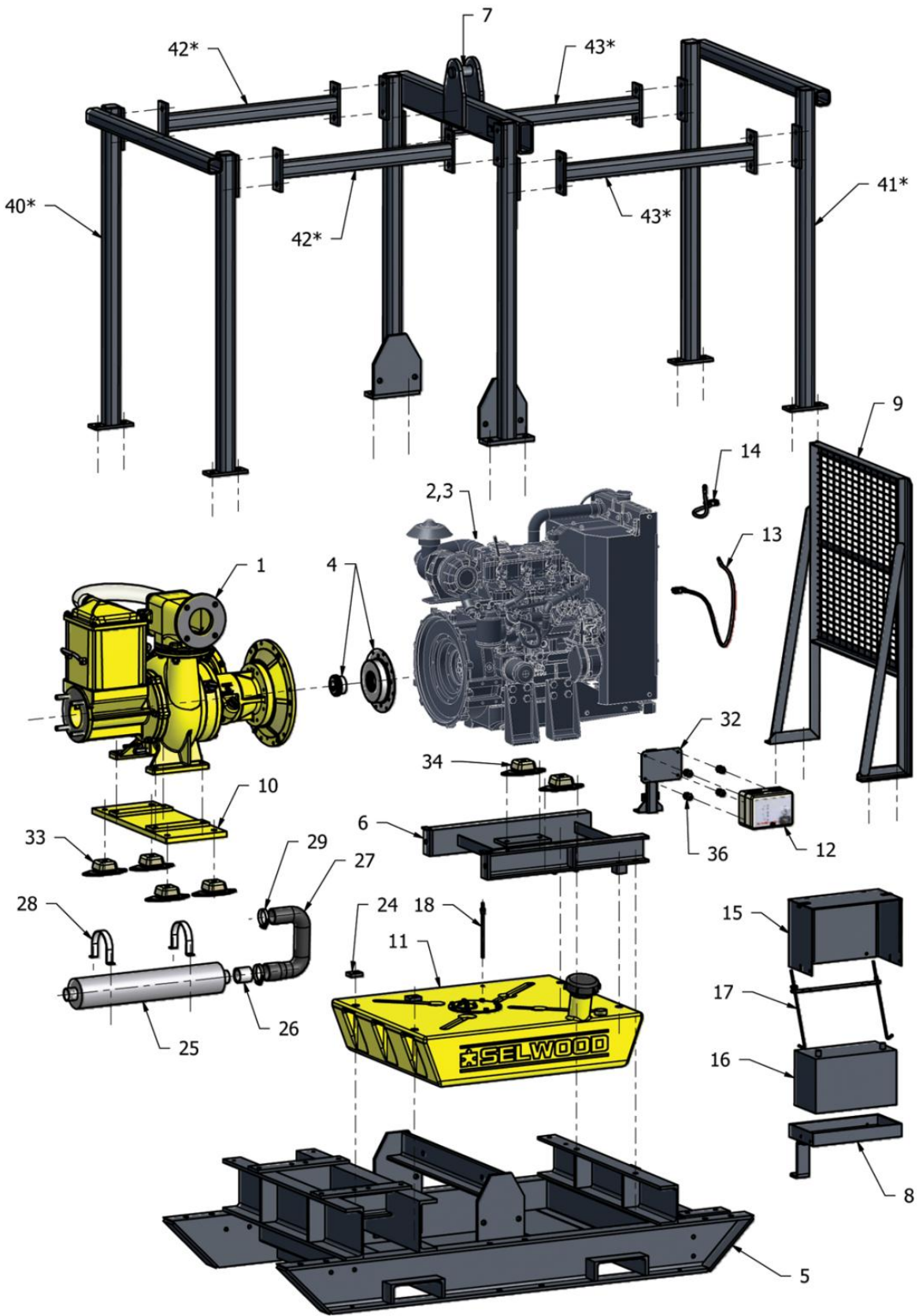
8.8 Perkins 404D-22 Close Coupled Supersilent Canopy Build 1010413S40

ITEM	DESCRIPTION	PART NUMBER	QTY
4	S100 CC Perk C/Build	1010413C00	1
5	S100 CC Can Assy	1510406000	1
7	Heat Resistant Exhaust Pipe Cover	1011195000	1
8	Exhaust Silencer Clamp	1011196000	1
9	Flexible Exhaust Pipe	1011197000	1
15	Battery Lead - Negative	0897118000	1
16	Battery Lead Pos	1589213000	1
17	Battery 656	92800-0003	1
18	Battery Clamp Set	9297500000	1
19	Cover Terminal	0006712000	2
21	Bauer Surround Gasket for 100C	1003165000	2
22	100 mm Flanged Bauer Kit	1002366000	1
23	Bauer Delivery Kit (M)	0010955000	1
24	Bauer Strainer 4"	0010156000	1
26	100mm Flanged Connector 280mm LG	1002335000	1
27	100 mm Flange Gasket	0010079000	1
36	Black Coated Dish Pan	9728-00045	2
37	Gasket	9728-00046	2
38	Mushroom Pushbutton	92800-0054	2
39	Contact Block	92800-0055	2
43	Emergency Stop Button Loom	1503238000	1
44	S100 Joggle Plate Set – Suction	1010307000	1
45	S100 Joggle Plate Set – Delivery	1010308000	1

*Items 7, 8 & 9 are supplied with Item 5

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



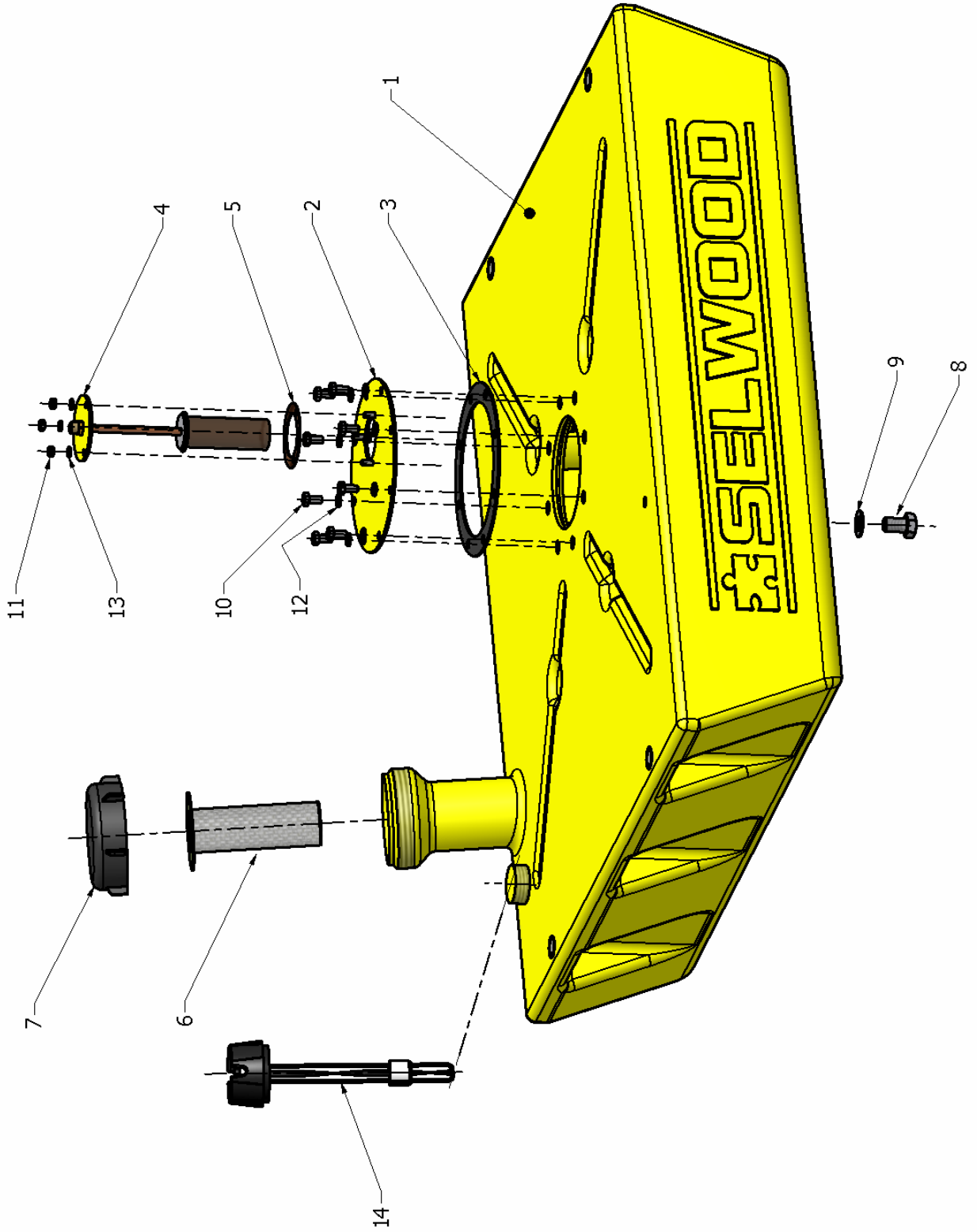
8.9 Perkins/404D-22 Close Coupled Pump Unit on Skid 1010358000

ITEM	DESCRIPTION	PART NUMBER	QTY
1	S100 Pump Unit CC	1006120000	1
2	Perkins 404D-22 IOPU Engine	92037-0001	1
3	Perkins 404D Side Entry Exh	92700-0354	1
4	KTR Bowex Coupling 38 bore	9600M00047	1
5	Skid-Chassis (Perkins)	1509089000	1
6	Sub-Chassis - Engine	1010359000	1
7	Lifting Frame	1509129000	1
8	Battery Tray Assembly	1509116000	1
9	Radiator Guard	1509128000	1
10	Pump Mounting Saddle	2008147000	1
11	Plastic F/Tank Assy (105 lt)	1502478000	1
12	C/Panel/Perk 404D-22	92700-0342	1
13	Battery Lead - Positive	0295310000	1
14	Battery Lead - Negative	0897118000	1
15	Battery Box Assy	1502163000	1
16	12V Battery 664	92800-0049	1
17	Battery Clamp Set	9297500000	1
18	Hose Adaptor Assy	2009033000	1
19	Fuel Line – Tank to Pump (not illustrated)	1510147000	1
20	Fuel Return Line Kit (not illustrated)	1510407000	1
23	Engine Side Wiring Loom Perk (not illustrated)	92700-0353	1
24	Fuel Tank Spacer	0015057000	2
25	Silencer Ads 1-½"	9510P01201	1
26	Socket 1.½"	9517P01201	1
27	Air Exhaust Conn Hose	1007411000	1
28	Clamp (White)	0015509940	2
29	Size 3 Worm Drive Hose Clip	9505007004	4
30	Batt Term Clamp Cover - Red (not illustrated)	92800-0158	1
31	Battery Clamp Boot (not illustrated)	92800-0005	1
32	Control Panel Bracket	1010360000	1
33	Anti-Vibration Mount	9680M00038	4
34	Anti-Vibration Mount	9680M00042	2
36	Anti-Vibration Mount	9680M00006	4
40 *	Roll Cage End Bar - Pump	1510418000	1
41 *	Roll Cage End Bar - Engine	1510419000	1
42 *	Roll Cage Tie Bar – 745lg	1510420000	2
43 *	Roll Cage Tie Bar – 825lg	1510421000	2

* Denotes part of optional kit

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

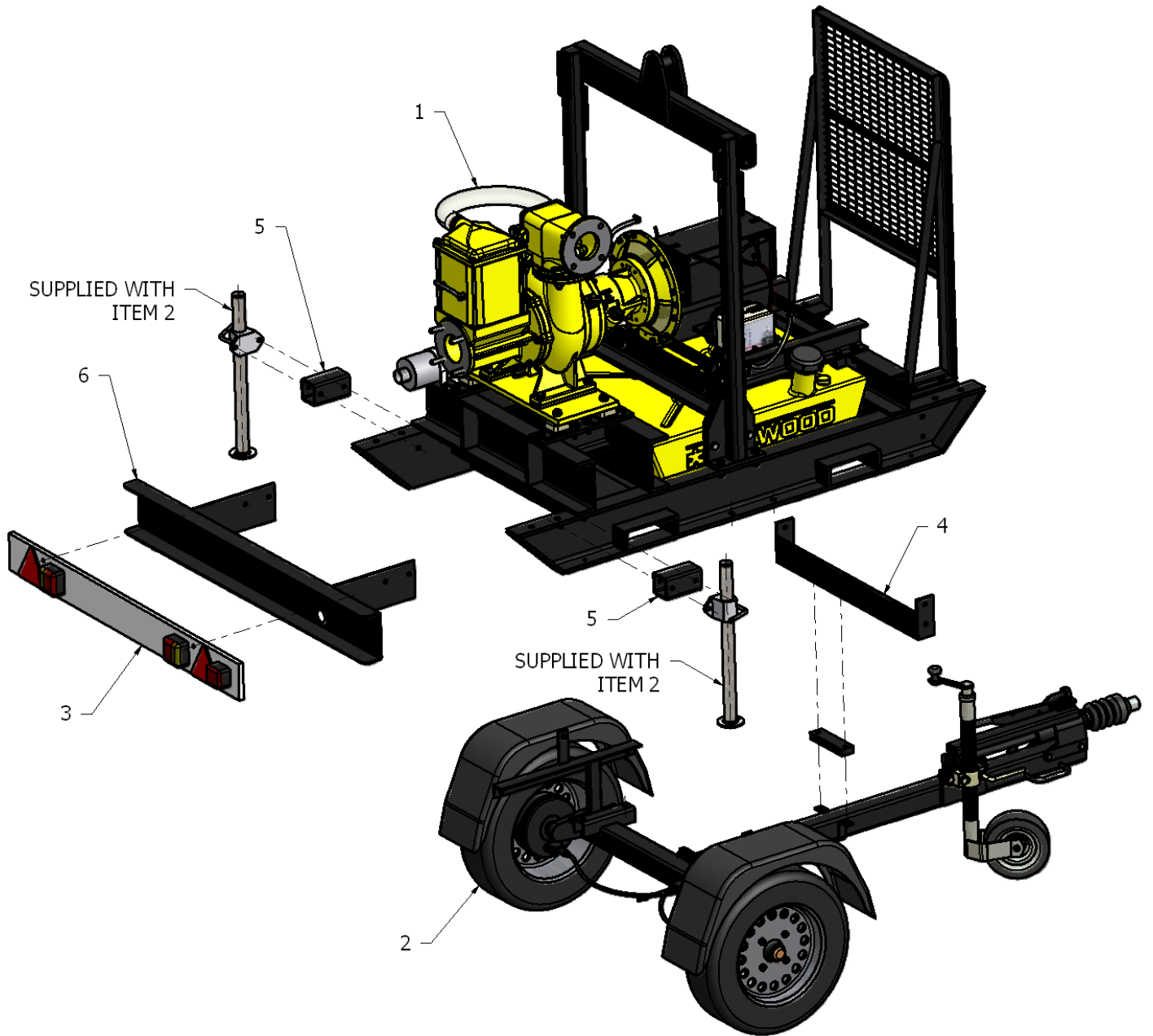


8.10 Plastic Fuel Tank Assembly (105lt) 1502478000

ITEM	DESCRIPTION	PART NUMBER	QTY
1	Plastic Fuel Tank (105 Ltrs)	1502503000	1
2	Fuel Tank Inspection Cover	1503405000	1
3	Fuel Tank Inspection Cover Gasket	1503406000	1
4	Fuel Tank Filter Assy	0006671000	1
5	Gasket	0015063000	1
6	Filler Neck Filter St/St	1503376000	1
7	Plastic Filler Cap (4")	9550M11503	1
8	Drain Plug, M16 x 2.00 x 25mm Long	9521M01601	1
9	Sealing Washer	9534M00301	1
10	M8 x 16 LG Hex Head Setscrew	9000080161	8
11	Hex Full Nut M6	9025060004	3
12	M8 Spring Washer Rect Sect	9030080229	8
13	M6 Spring Washer Rect Sect	9030060229	3
14	Fuel tank contents gauge (optional)	9590K06402	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

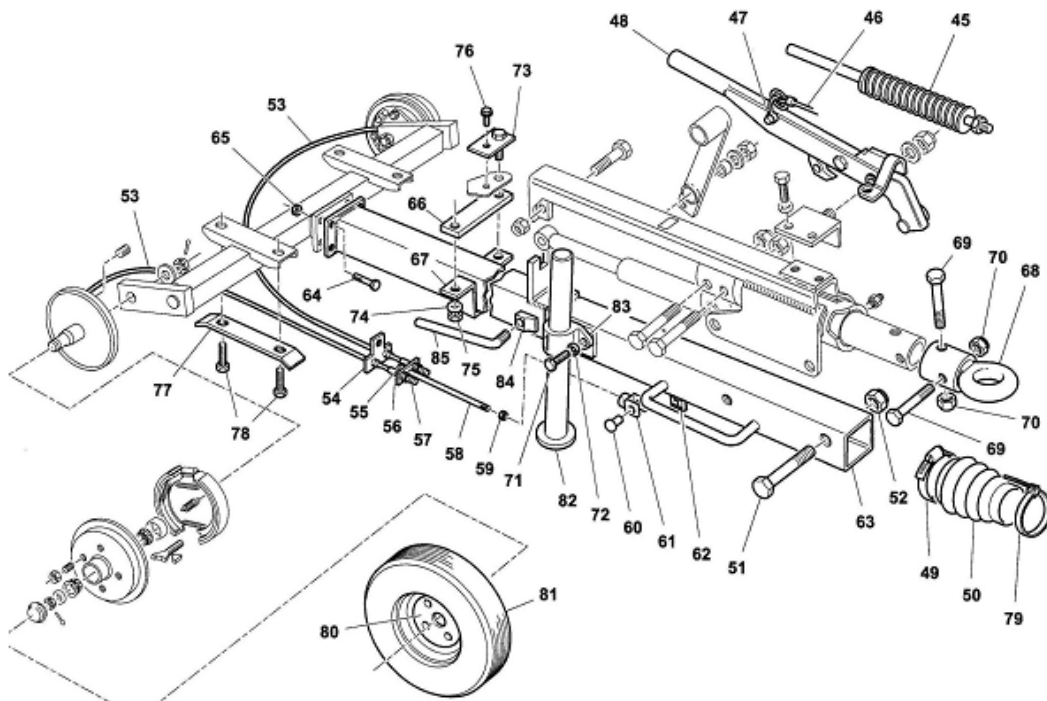
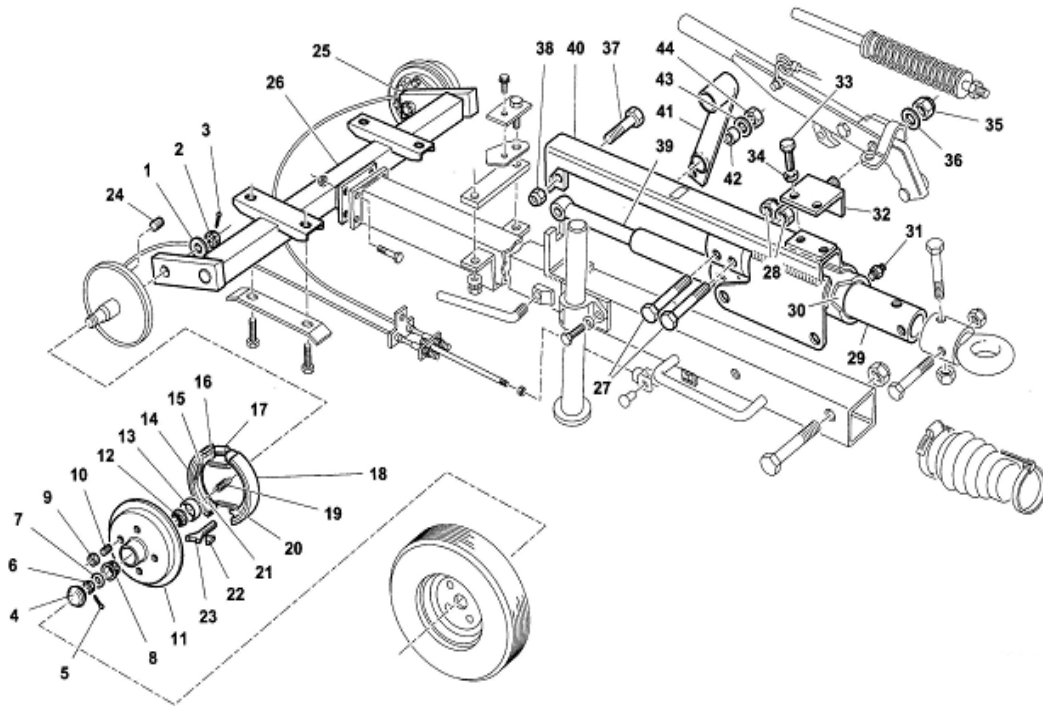


8.11 Open Fast Tow Kit S100 - 1511025000

ITEM	DESCRIPTION	PART NUMBER	QTY
1	S100/Perk 404D-22 Skid	1010358000	1
2	Fast Tow Trailer – T chassis 2” Ring 1500 kg	9729-00034	1
3	1.4 Mt LG Lighting Board	9730001000	1
4	Front Cross Member	1503060000	1
5	Prop Stand Bracket	1503061000	2
6	Lighting Board Bracket	1503059000	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

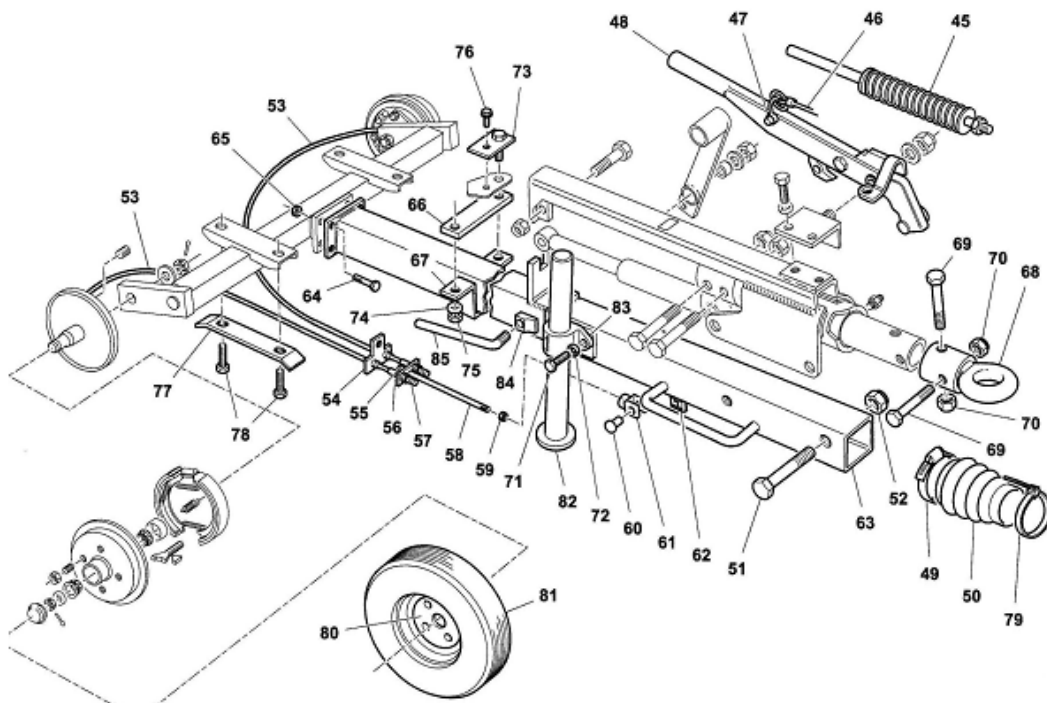
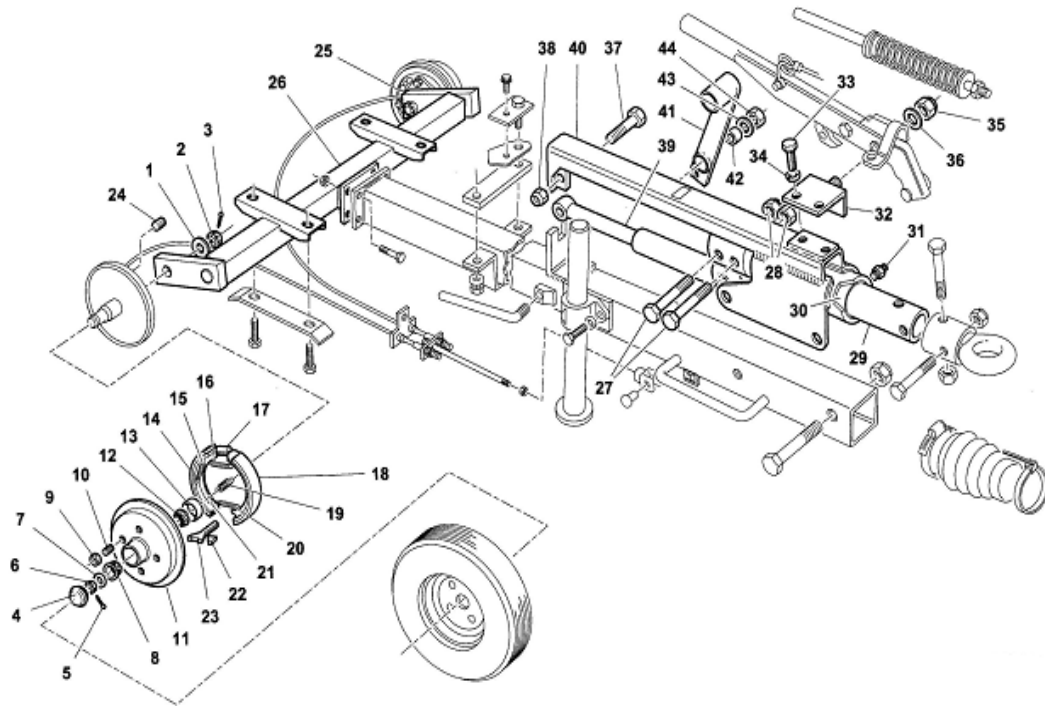


8.11.1 2 - Wheel Trailer 9729-00034

ITEM	DESCRIPTION	PART NUMBER.	QTY
4	Hub Cap	1061 02	1
5	Split Pin	1/8" X 1.1/4"	1
6	Slotted Nut	3/4 UNF	1
7	Washer	1053 05	1
8	Bearing (outer)	L44649/44610	1
9	Wheel Nut	1027 07	4
10	Stud	1026 15	4
11	Hub	1160	1
12	Bearing (inner)	LM48548/48510	1
13	Seal	162262	1
14	Shoe (reversing)	34905.06	1
15	Spring (carrier spring)	42904	2
16	Spring (top tension spring)	42903	1
17	Expander	45309	1
18	Shoe (fixed)	33802.06	1
19	Spring (shoe steady spring)	42861.02	1
20	Spring (bottom tension spring)	42126	1
21	Carrier	34648	1
22	Adjuster Wedges	45200	2
23	Bolt & Nut assembly	44826/45229	1
24	Plug	V10.1	1
25	Holder, cable	36341	1
27	Bolt M12 x 75	M12 x 75	2
28	Self Locking Nut	M12	2
29	Shaft	1119 00	1
30	Bush	1191 00	2
31	Grease Nipple	5/16" UNF	2
32	Bracket	1195 14	1
33	Setscrew	M10 x 30	2
34	Spring Washer Square Section	M10	2
35	Self Locking Nut	M16	1
36	Washer	M16	1
37	Bolt	M10x50	1
38	Self Locking Nut	M10	1
39	Damper	043591	1
40	Frame	1124 00	1
41	Lever	1127 01	1
42	Bush	CT529	1
43	Washer	M12	1
44	Self Locking Nut	M12	1
45	Spring Store	1117 00	1
46	Cable	1050 00	1
47	D Shackle (1/4" Pin)	1/4"	1
48	Lever, handbrake (complete)	1195 00	1
49	Clip, retaining (rear)	60/80	1
50	Cover	1075 04	1

When ordering spares, please state:

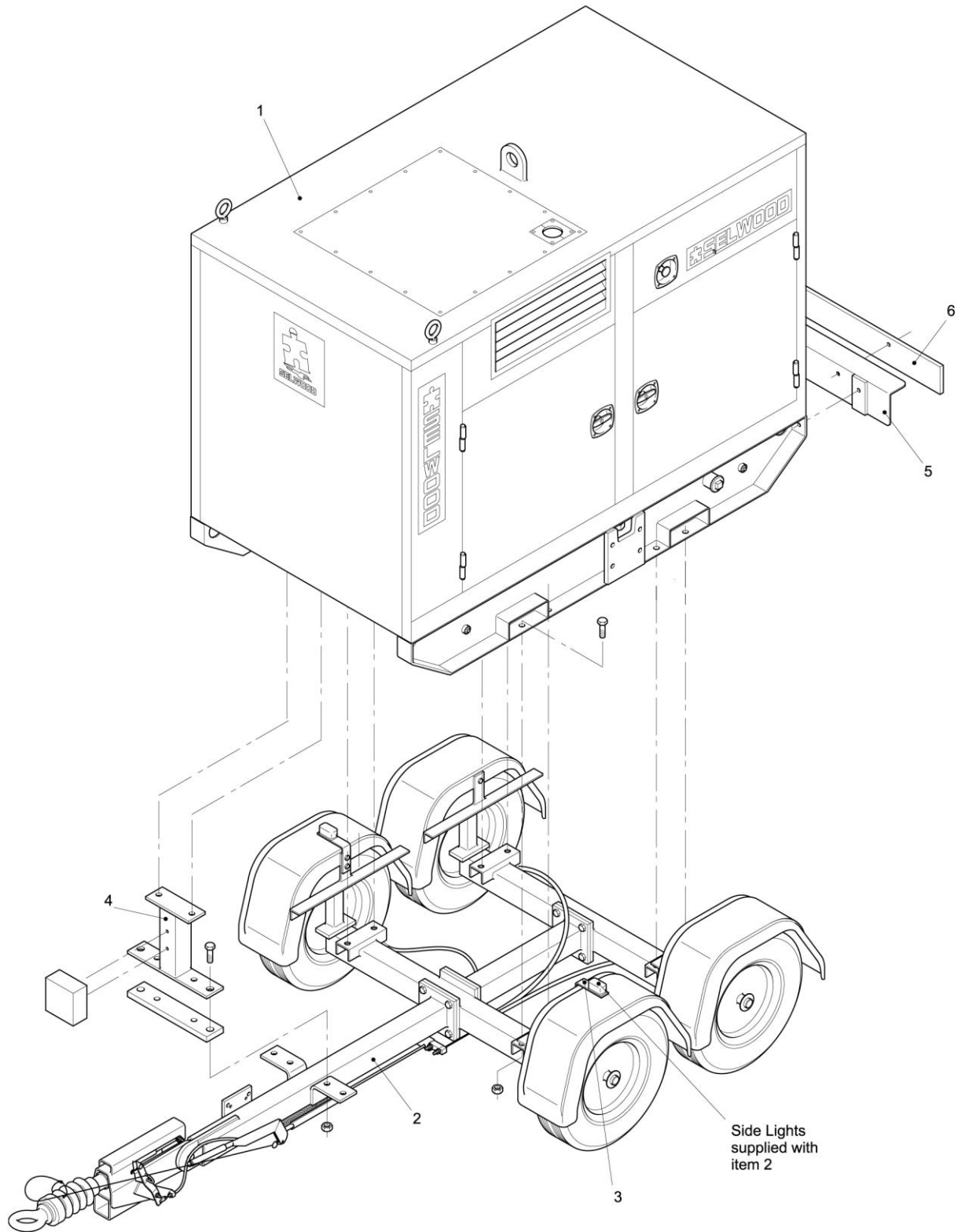
PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



ITEM	DESCRIPTION	M&E PART NUMBER	QTY
51	Bolt	1/2" UNF x 4 3/4"	2
52	Self Locking Nut	1/2" UNF	2
53	Cable	1165 04	2
54	Plate (cable anchor)	1192 01	1
55	Nut	5/16" UNF	2
56	Plate (compensator)	1017 03	1
57	Self Locking Nut	M12	1
58	48 1/2" Rod	1080 61	1
59	Nut	5/16" UNF	1
60	Pin	NBI312	1
61	Fork (clevis)	GK1312	1
62	Clip, retaining	SLM8F2	1
63	Tube Towbar	1137 152	1
64	Setscrew	M10 x 35	4
65	Self Locking Nut	M10	4
66	Pad	1044 16	1
67	Clamp	1041 10	1
68	Towing Eye 2" BSAU	1102 02	1
68	Towing Hitch 50mm Ball	1187 00	1
69	Bolt	M10 x 75	2
70	Self Locking Nut	M10	2
71 – 78	Chassis to Body Fixings		
79	Tie Wrap 350mm	REL250	1
80	Wheel	WR131	1
81	Tyre	175 R 13 C8	1
83 – 85	Cast Bracket Assembly	B42C3	1
OR			
82	Jockey Wheel	J48HL or J348S	1
83 – 85	Cast Bracket Assembly	B48C6	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

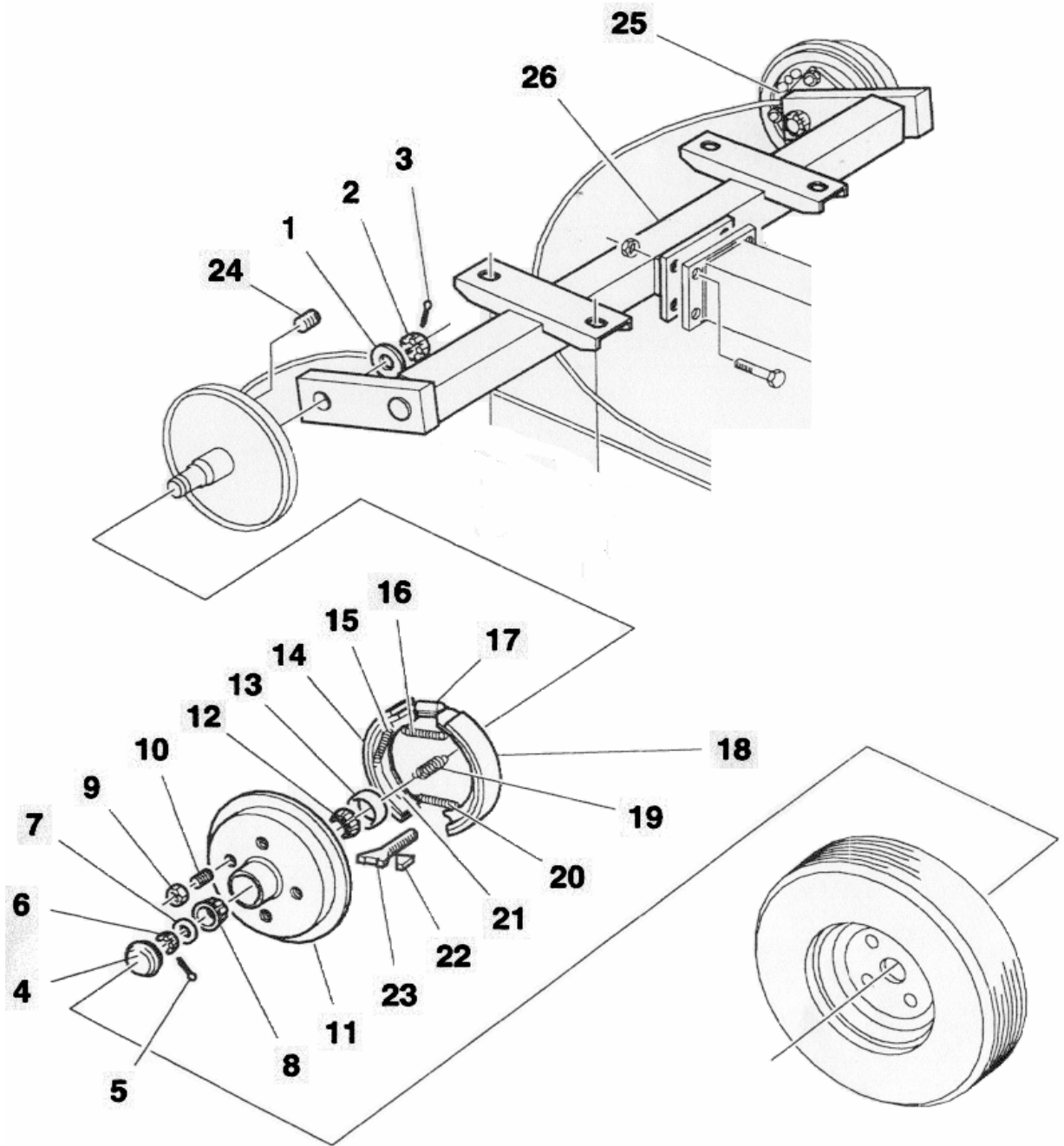


8.12 Super Silent Fast Tow Kit 1503121000

ITEM	DESCRIPTION	PART NUMBER	QTY
1	S100/Perk 404D-22 Supersilent	1010413S40	1
2	Trailer 4 Wheel 2400kg	9729-00013	1
3	Side Light Mounting Bracket	1503118000	2
4	Front Mounting Post	1503114000	1
5	Lighting Board Bracket	1503120000	1
6	1.4 Mt Lg Lighting Board	9730001000	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

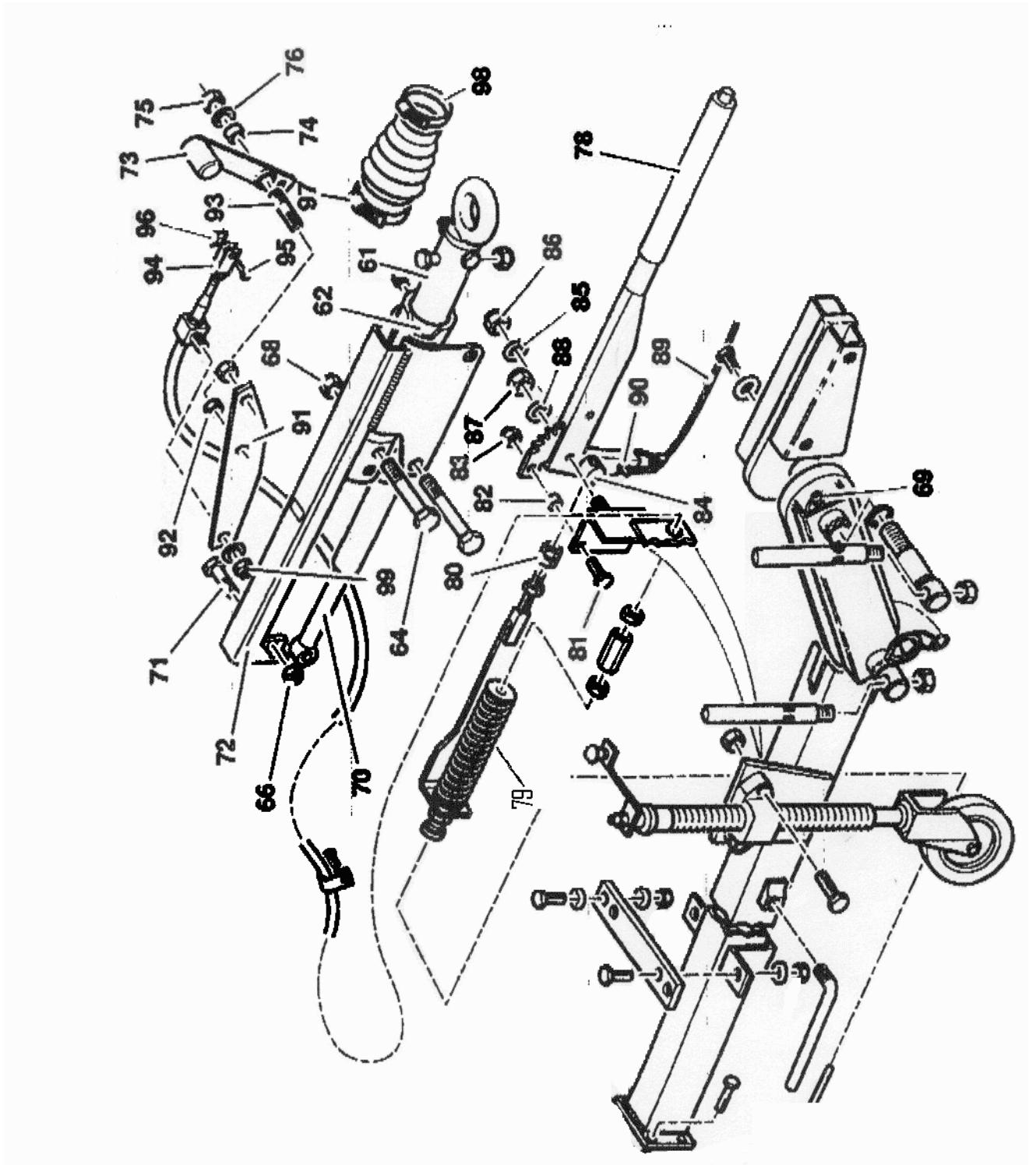


8.12.1 4 Wheel Trailer 9729-00013

ITEM	DESCRIPTION	M&E PART NUMBER	QTY
1-26	Front axle tube assembly	1290 62	1
1-26	Rear axle tube assembly	1290 63	1
1R-25	Hub & stub axle assembly RH	1288 02	1
1L-25	Hub & stub axle assembly LH	1288 01	1
1	Washer	1 1/4" table 3 LP	1
2	Slotted nut	1053 16	1
3	Split pin	3/16"x 2"	1
4	Hub cap	1061 02	1
5	Split pin	1/8" x 1.1/4"	1
6	Slotted nut	3/4 UNF	1
7	Washer	1053 05	1
8	Bearing (outer)	L44649/44610	1
9	Wheel nut	1027 07	4
10	Stud	1026 15	4
11	Hub	1203 03	1
12	Bearing (inner)	LM48548/48510	1
13	Seal	162262	1
14R-25	Stub axle & backplate assy RH	1281 31	1
14L-25	Stub axle & backplate assy LH	1281 30	1
14	Shoe (Reversing)	35259-21.02	1
15	Spring (Carrier spring)	42904	2
16	Spring (Top tension spring)	42903	
17	Expander	45309	
18	Shoe (Fixed)	35261-21.02	1
19	Spring (Shoe steady spring)	42861.01	1
20	Spring (Bottom tension spring)	42126	1
21	Carrier	34648	1
22	Adjuster wedges	45200	2
23	Bolt & Nut assembly	44826	1
24	Plug	V10.1	1
25	Holder, cable	45146	1
26	Front axle beam assy	1290 62	1
26	Rear axle beam assy	1290 63	1
Not shown	Rear axle cables	33921.1.14	2
Not shown	Front axle cables	33921.1.07	2
Not shown	Brake rod	M10 x 32 1/2"	1
Not shown	Four way compensator		1

When ordering spares, please state:

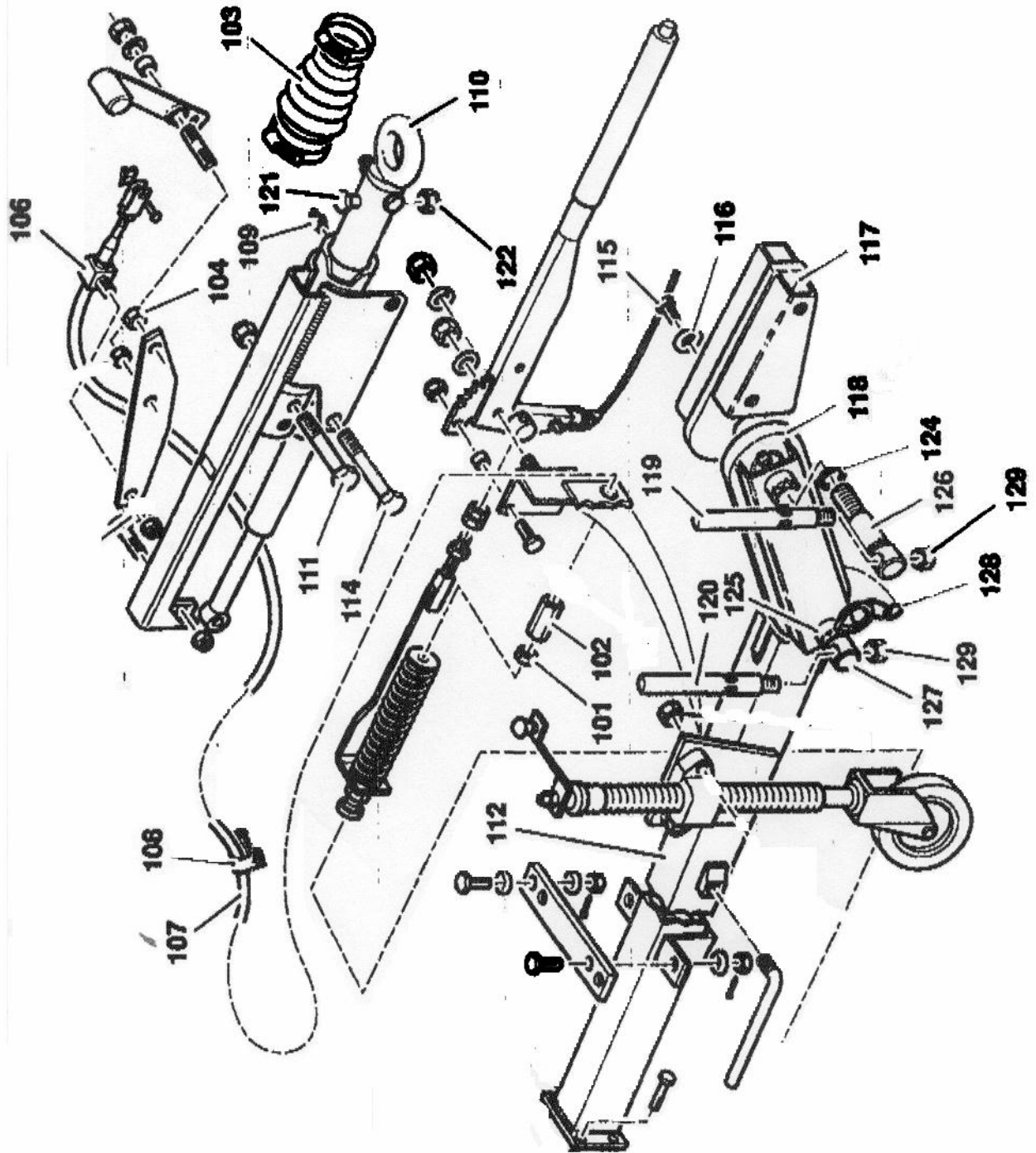
PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



ITEM	DESCRIPTION	M&E PART NUMBER	QTY
61	Shaft	1119 00	1
62	Bush	1191 00	2
63			
64	Bolt M12 x 90		2
65			
66	M10 self lock nut		1
67			
68	M12 Self lock nut		2
69	1/4" UNF grease nipple		2
70	Damper	485039	1
71	Bolt M10 x 50		1
72	Coupling body	1124 04	1
73	Overrun lever	1220 02	1
74	Overrun lever bush	CT 529	1
75	M12 self lock nut		1
76	Washer 1/2" table 3 LP		1
77			
78	Handbrake	1266 00	1
79	Spring store assy	1230 00	1
80	M12 full nut		3
81	Screw M8 x 35		1
82	Spacer	1266 07	1
83	M8 self lock nut		1
84	Peg	1255 05	1
85	Washer 1/2" table 3		1
86	M12 Self lock nut		1
87	M16 Self lock nut		1
88	Washer M16		1
89	Breakaway cable	1050 03	1
90	'D' shackle Ø 1/4" pin		1
91	Cable bracket	1232 01	1
92	M16 Self lock nut		1
93	Lever pin	1232 08	1
94	Clevis	GKLM8	1
95	Clevis pin	NBI312	1
96	Clevis clip	SLM8F2	1
97	Rear clip 60/80		1
98	Tie wrap	REL250	1
99	1/2 UNF full nut		1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



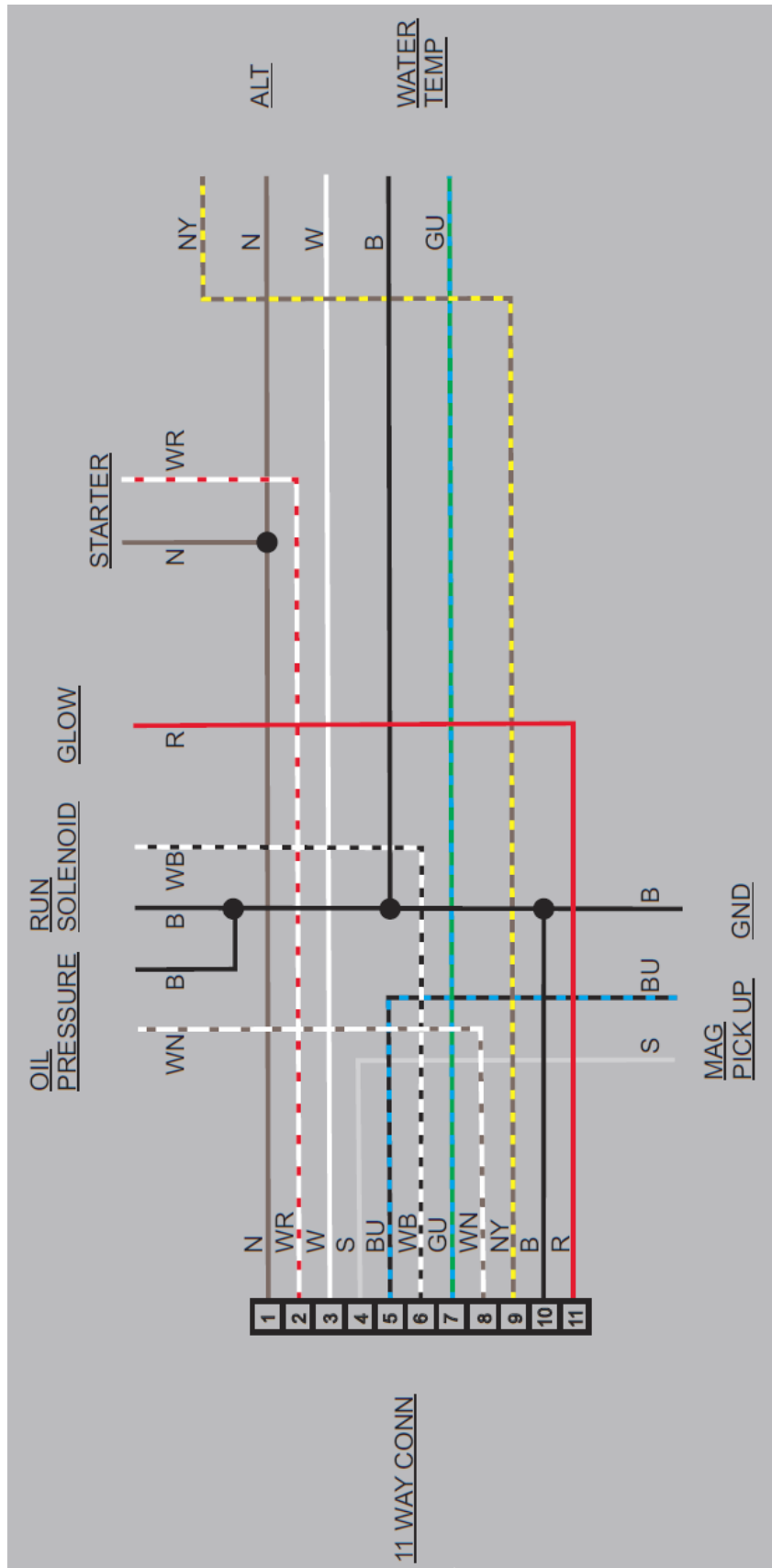
ITEM	DESCRIPTION	M&E PART NUMBER	QTY
100			
101	5/16 UNF full nut		1
102	ADAPTOR	1220 18	1
103	BELLOWS	1075 05	1
104	M16 Self lock nut		1
105			
106	Cable stop	1232 15	1
107	Cable	1232 12	1
108	Clip 3/4"		1
109	5/16" UNF grease nipple		2
110	2" BSAU eye	1102 02	1
110	DIN 40 eye	1186 00	1
110	76mm NATO	1106 02	1
110	50mm Ball hitch	1187 04	1
111			
112	Drawbar beam	1138 63	1
113			
114	Bolt M16 x 130		2
115	Screw 3/8 UNF x 1/2"		2
116	Washer 3/8" T6		2
117	Coupling mount	1210 02	1
118	Peg plate	1210 01	1
119	Handle	1180 07	1
120	Handle	1180 08	1
121	Bolt M12 x 75		2
122	M12 self lock nut		2
123			
124	Collar	1180 03	1
125	Collar	1214 00	1
126	Joint pin 1" UNF	1212 01	1
127	Joint pin 1 1/4" UNF	1212 02	1
128	Pin & chain assy	1177 19	1
129	M16 Self lock nut		

When ordering spares, please state:

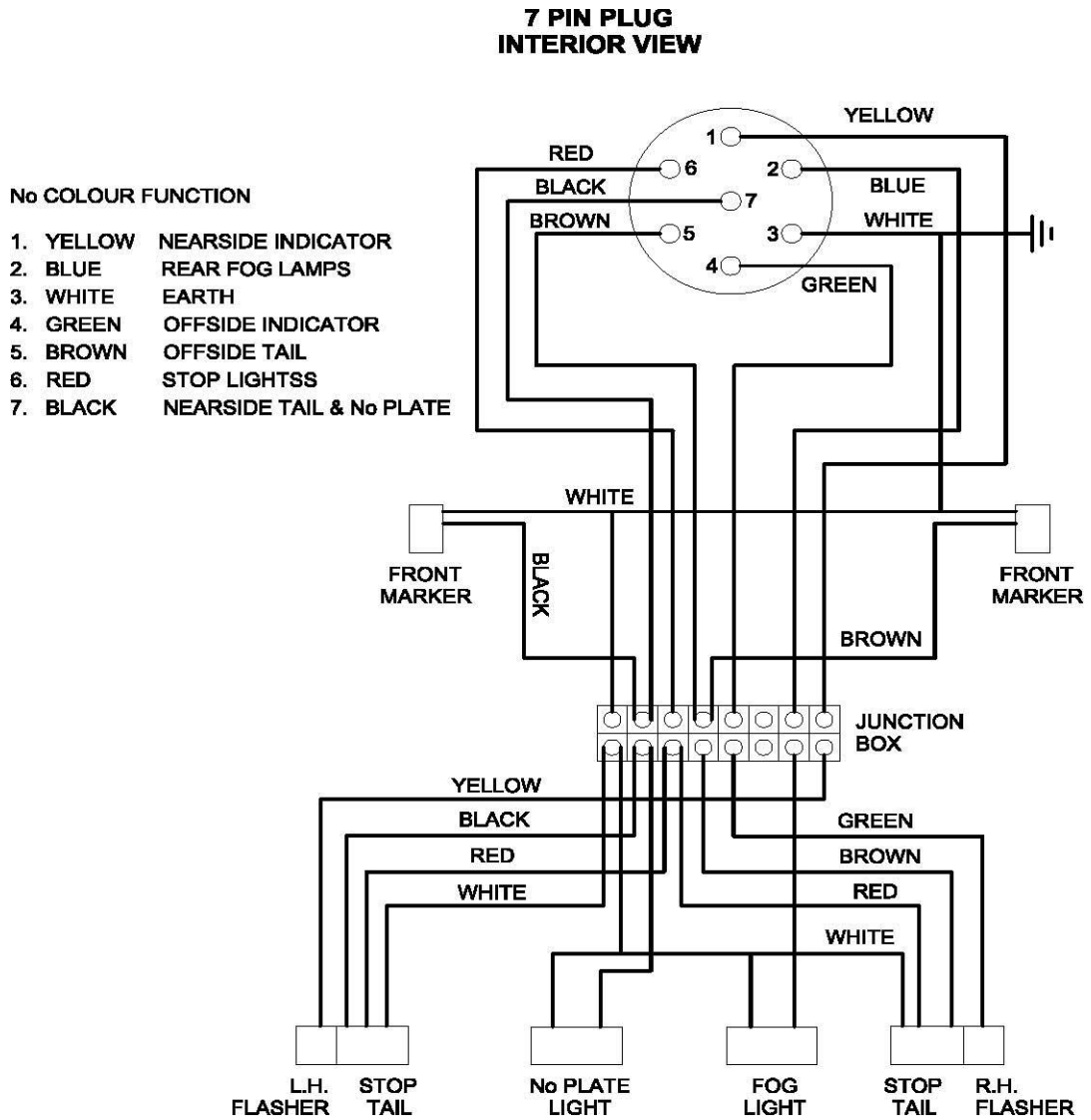
PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

9 WIRING DIAGRAMS

9.1 Perkins 404D-22T



9.2 Fast Tow trailer Lighting Circuit



NOTE:

Front marker lights are for twin axle assemblies only.

10 TECHNICAL DATA – AUTOSTOP START & TELEMETRY

Driver type to be fitted to:	All 12v power units
Available Voltages	12v DC ONLY
Engine control	ECM
Telemetry control	METRON
Sim Card	Data enabled / Pin disabled
Service Provider:	Not specific
Alarm Message Delivery	SMS only

11 GENERAL INFORMATION

The Selwood auto stop / start unit has 3 modes: Manual start, Auto start and Off. Each of the 3 modes is selected with the 3 position keyswitch. The panel has a replaceable electronic control module which is intended to be field replaceable in the event of damage or failure. Inbuilt are emergency stop and magnetic pickup diagnostic LED's to assist in field diagnosis of faults.

When the keyswitch is in the central "off" position, the electronics are in a low power shutdown mode but are still drawing a very small current. If the pump is not to be used for a long period of time, it is good practise to isolate the battery to stop this small current drain and preserve the charge of the battery.

Starting modes, "manual start" the engine will begin its start sequence immediately and begin cranking within a few seconds. In "auto start" the engine start sequence will not begin until the "high" float switch closes to show that there is sufficient fluid to pump.

When going from "off" to either manual or auto mode, all the LED's on the front face briefly flash red then green. This is to indicate that the electronics is primed and will now either start the engine, or will start when required, depending on mode selected.

The auto stop start panel is designed to operate in conjunction with a Metron telemetry device from Powelectrics. This is a separate plug in system which is self powered and takes signals from the auto stop start panel and sends SMS alarms in the event of high water temp/ low oil pressure/ fail to start or high float level.

11.1 Installation when used with Telemetry

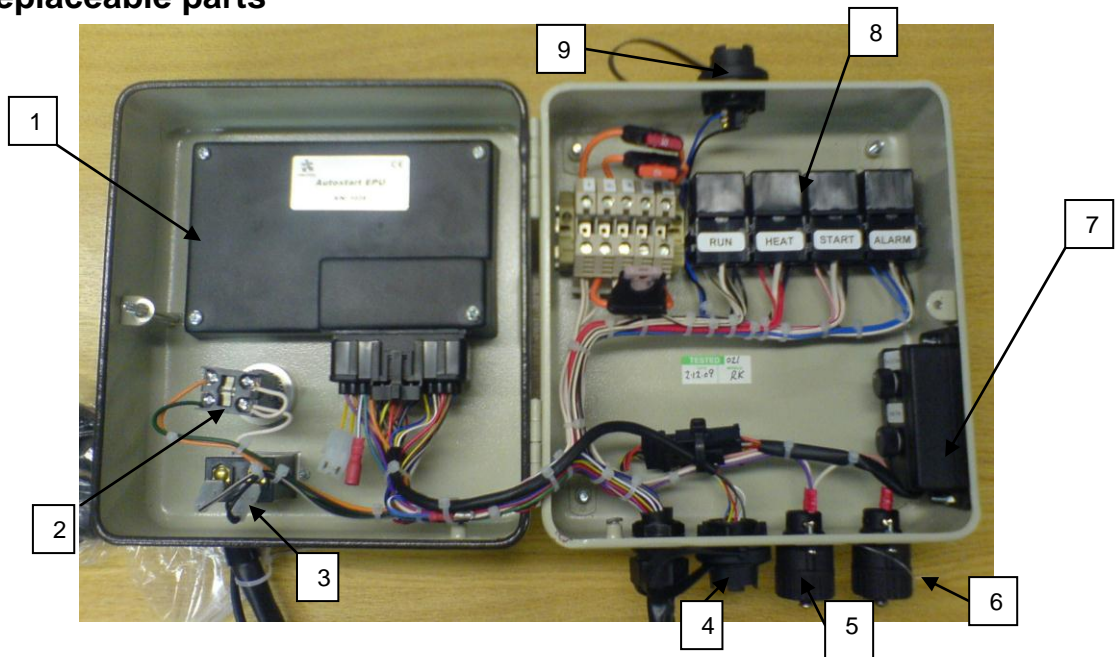
1. **Attention!** The pump should be placed on a level area of ground and installed in accordance with company recommendations and best practice.
2. The Telemetry system can accept four mobile phone numbers which it will dial in the event of an alarm being triggered. Setting up of these is covered in a later section. For hire fleet use it is recommended that the depot on call phone is entered into memory location 4, reserve 1,2 & 3 for customers requirements.
3. The positioning of the unit can and will affect the degree of signal strength and it is advised that the unit be operated and tested on site in situ to confirm that the unit operates and dials out successfully. A test can be performed with the Metron to obtain the degree of signal strength available at the location. Heavily built up areas, operation within steel framed buildings/ structures and rural area operation in hilly country (or deep quarries) can affect signal strength and operation. **If in doubt Always test before handover.**
4. When operating in auto mode with floats there is a pre set timer which will allow the unit to run on, after the low float has signalled a stop command to the unit. This period is set at 30 min and is variable down to a min 10 minutes. This range was determined at the design stage as the optimum when operating on small sumps to prevent repeated starts flattening batteries or damaging starter motors.
5. The High / High float position may be used in either auto or manual and connects directly with the Metron device and is independent of the auto stop start system.

- The pump assembly is always supplied with a strainer that should be fitted to the end of the suction pipe work. Failure to fit the strainer may result in severe damage to the pump and could ultimately invalidate the warranty.

11.2 Maintenance

- There are no maintenance procedures that can be applied to the system other than checking the integrity of the floats and ensuring that they are wired correctly. The floats and their corresponding plugs on the pump unit are fitted with waterproof covers. It is advised that these are used to prevent water/ dirt ingress when not in use.
- Where problems occur with the auto stop start unit it is possible to replace the main black box as an assembly on site. This negates the need to return the pump to a repair centre for repair or replacement.
- Ad hoc wiring repairs or alterations can and have caused damage to the operation of panels and boxes. Major problems have caused panels to be scrapped as not economic to repair.
- Replacement parts; Only the manufacturers or factory-approved components should be used as replacement parts.
- All maintenance work must be carried out with the pump and engine/motor stationary.

11.3 Replaceable parts




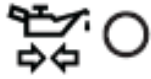
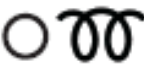





ITEM	DESCRIPTION	PART NUMBER	QTY
1	Autostart unit	92700-0326	1
2	Keyswitch Assembly	92700-0327	1
3	Hourmeter	92700-0289	1
4	Telemetry input plug.	92700-0328	1
5	Chassis Socket – 3 Way - Low	92800-0081	1
	Socket Dust Cover	92800-0082	
6	Chassis Socket – 3 Way - High	92800-0081	1
	Socket Dust Cover	92800-0082	
7	Heater Plug and run on timer module	92700-0329	1
8	Relays	92700-0288	4
9	Plug for Optional Audible alarm	92700-0330	1
10	Spare Key (Not pictured)		1

12 INSTRUCTIONS FOR OPERATION – AUTO STOP / START

On the front of the panel there is a 3 position key switch. These are clearly labelled:

OFF
MANUAL
AUTO

There is also a series of LED's to indicate the status of the engine and various alarms. These are as follows;

Engine running			Oil Pressure
Engine Preheat			Coolant temperature
Engine start failure			Battery charge warning
RPM (Magnetic pickup sensor)			Emergency stop

The above are dual colour LED's and will appear red or green depending on current panel status.

12.1 Basic Panel starting sequence

The starting sequence for the pump is as follows (same procedure regardless of mode selected):

- 1) **Preheat / warning.** During this stage the red start fail LED will flash to show the control unit is attempting to start the engine. The red Heater LED will also be lit to show that the engine glow plugs are being used. The audible sounder if connected will sound to provide a pre-start warning. This stage is adjustable in length from 5 to 10 seconds using the pot inside the control cabinet.
- 2) **Cranking.** During this stage the control unit is trying to start the engine. The red start LED will still be flashing to show the engine is trying to start. The control unit will be looking at the rpm sensor (magnetic pickup) to see if the engine is turning fast enough. As this sensor picks up pulses it flashes the RPM LED. The RPM LED is either red if the pulses are too slow, i.e. the engine is not yet running, or green if the sensor is seeing enough fast pulses to determine the engine is running. The crank stage is exited in one of 2 ways, either the RPM sensor picks up fast enough pulses to decide the engine is now running, OR, 5 seconds has elapsed since the unit started cranking. If the engine is now running then the control unit goes to stage 4) if the engine is not running then the unit goes to stage 3
- 3) **Resting.** During this stage the control unit is allowing the engine to rest before attempting to crank again. The red start fail LED will still be flashing to show that the unit is trying to start the engine. The unit will allow the engine to rest for 10 seconds in this stage and will then attempt to crank the engine again. Note the control unit will allow the engine 3 crank / rest cycles before deciding the engine is not going to start and will cease all attempts. At this point the control unit will go to the fault stage 5)

- 4) **Running.** To get to this stage the control unit will have cranked the engine and seen sufficient fast pulses from the magnetic pickup RPM sensor to decide the engine is now running. The green engine running LED will be lit, as will the green RPM led. During the first 16 seconds of this stage if there are any problems with the engine, e.g. low oil pressure, coolant temperature or charge warning, then the relevant LED will light red on the control unit as a warning. Once this 16 second “settling” stage has elapsed, if there is still a problem with the engine then the engine will be stopped to protect it, the control unit will enter the fault stage 5). Otherwise the engine will continue to run until it is either switched off (manual or auto mode), or the low float switch opens (auto mode only). Note in auto mode there is also a user adjustable run-on time that the pump will continue to run for after the low float has opened. This time is set from 10->27 minutes by adjusting the control pot inside the control cabinet.
- 5) **Fault.** This stage is when the engine will either not start or has been stopped by the control unit due to a problem. The red start fail LED will be flashing and other LED’s will also be lit red to show the cause of the problem, e.g. RPM LED is red showing that insufficient pulses were detected during cranking for the control unit to decide whether the engine was running or not. If the control unit is in this stage because an ESTOP button has been pressed then the red ESTOP LED will be lit red.

12.2 Key Switch in Off

In OFF the engine will not run.

12.3 Key Switch in Manual

When turned to MANUAL the engine will pre heat and start. The start sequence is automated with the glow plugs being switched on and off by the panel.

Once the engine is running the green Engine Running LED will be permanently on.

The unit will continue to run until the switch is returned to the OFF position or an alarm occurs.

If the unit fails to start then it will have 2 more attempts automatically. If the engine still fails to start then the start failure LED will illuminate. Switch from MANUAL to OFF to clear this alarm. An SMS text will also be sent if the optional Metron unit is fitted.

12.4 Key Switch in Auto

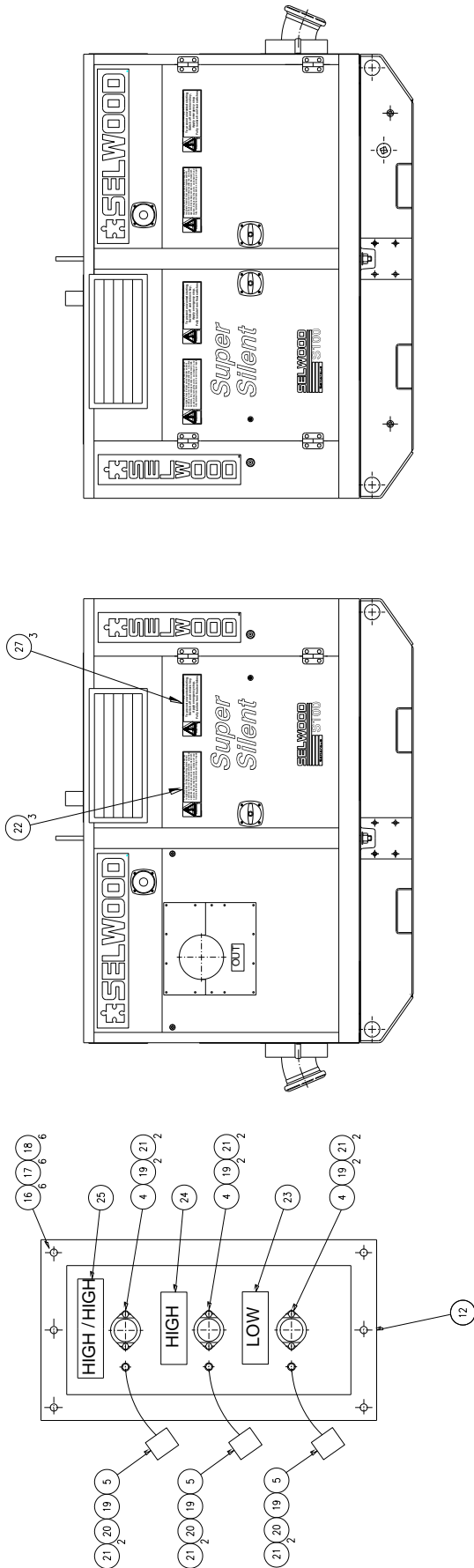
When turned to AUTO the unit is controlled by 2 float switches (plugged into the connection manifold on the side or end of the Selwood unit).

The engine will start automatically when the HIGH level is reached and continue to run until the LOW level is reached. In order to prevent the battery running low over repeated starts the unit has a variable run on timer from a minimum of 10 > 30 minutes after activation of the stop float, unless the switch is moved from AUTO to OFF or an alarm occurs.

The float switches must be wired normally open.

If the unit fails to start then it will have 2 more attempts automatically. If the engine still fails to start then the start failure LED will illuminate and if fitted with the optional Metron unit it will send an SMS text indicating failure to start, you will need to switch from AUTO to OFF to clear this alarm.

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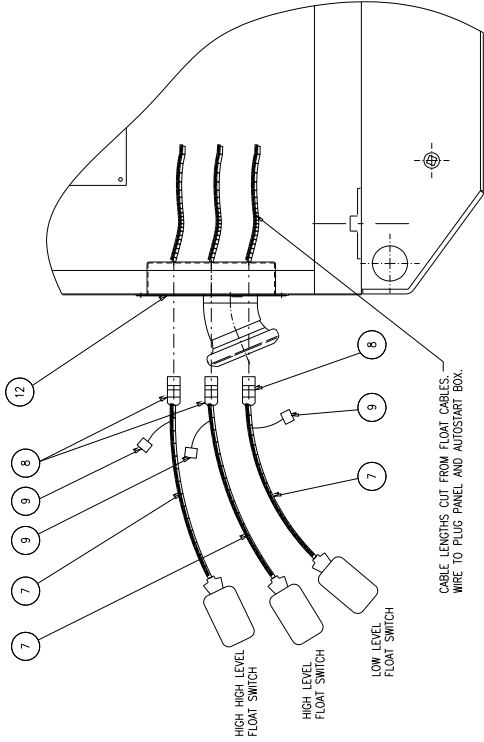


Warning

This pump unit can start at any time in response to signals from its float control system and will continue to run for 30 minutes after the stop float operates. Any canopy access must be made with caution. Ensure that the unit is switched off and fully isolated from floats before servicing or repair.

Warning

Access canopy with caution.
To prevent unwanted starting,
Switch off and remove key,
Apply emergency stop.
Fully isolate from float switches.



14 AUTO STOP/START KIT FOR S100 1011032000

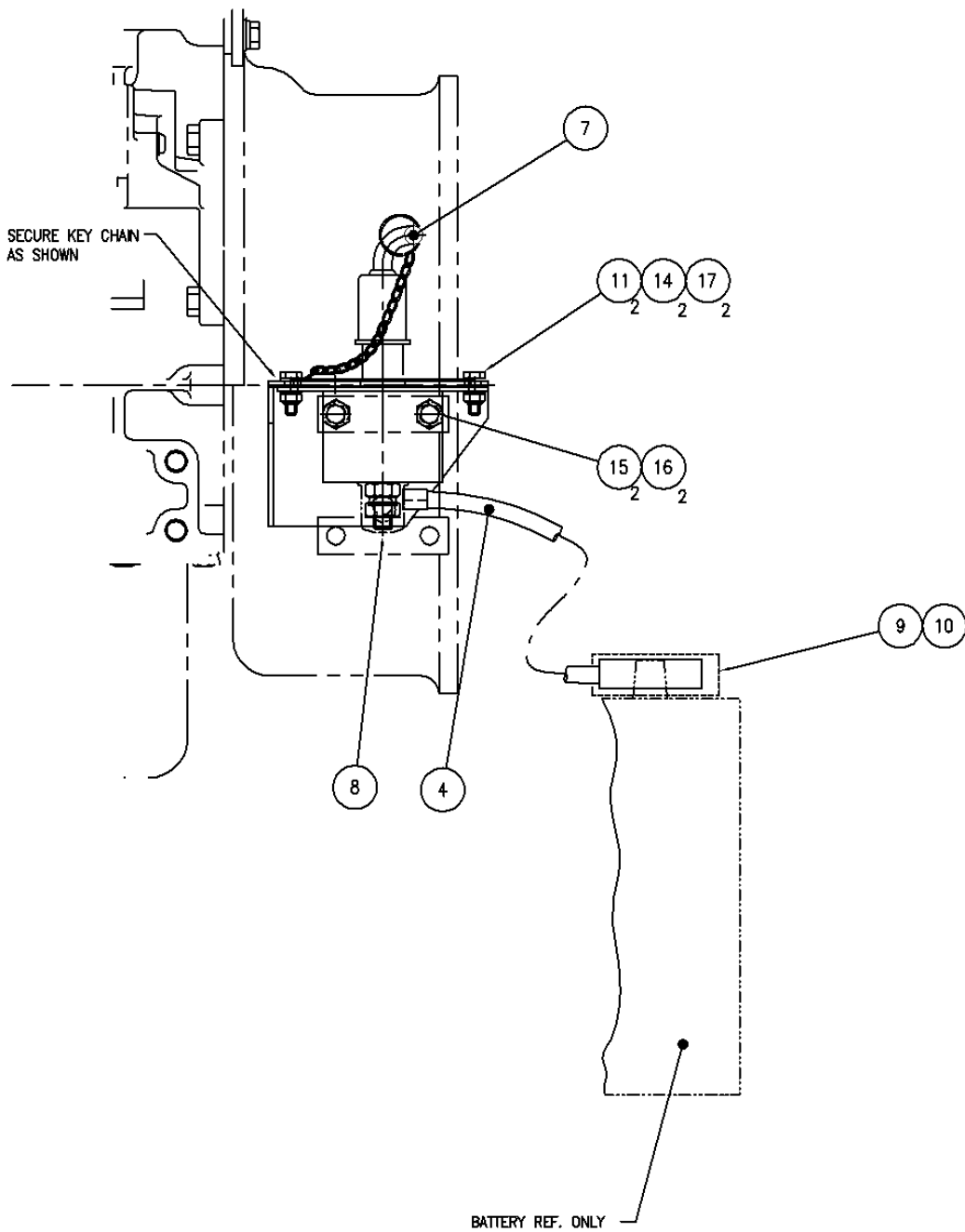
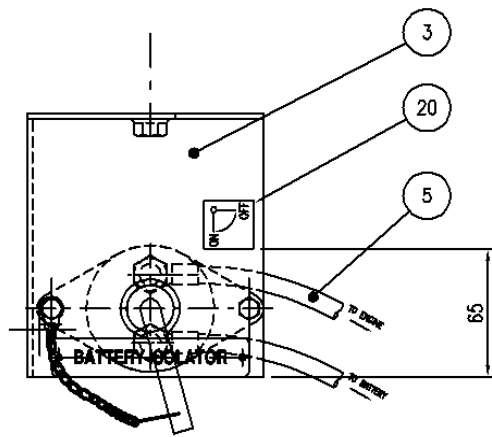
Comprising the following :- Telemetry kit complete with Mag Pickup Part Number 1011031000
Battery Isolator Kit Part Number 1011030000

14.1 Telemetry Kit 1011031000

ITEM	DESCRIPTION	PART NUMBER	QTY
2	Magnetic Pick-up Perk 404D-22 (Not shown)	92800-0201	1
3	Auto Stop/Start Telem Panel	92800-0182	1
4	Chassis socket 3 way	92800-0081	3
5	Socket Dust cap	92800-0082	3
6	Float Level Switch (20M cable)	92900-0033	3
7	Cable Plug – 3 way	92800-0083	3
8	Plug Dust cap	92800-0084	3
11	Float Plug Panel	1004100000	1
14	2BA x ½ x 18 x SWG Plain Washer	0002061A00	3
15	Domed C/Cable Gland M16/4	92800-0086	3
16	M6 x 12 LGHex Head Setscrew	9000060121	6
17	M6 x 12.5 Plain Washer S/S	9030060027	6
18	M6 SS Spring Washer Rect Sect	9000677-01	6
19	M3 x 12 LG Hex Head Setscrew	9000330-01	9
20	M3 Plain Washer Form A	9000374-01	3
21	M3 Hex Self Locking Nut	9000310-01	9
22	Label - Warning	1505173000	3
23	Label Float Conn (Low)	1505176000	1
24	Label Float Conn (High)	1505175000	1
25	Label Float Conn (High/High)	1505174000	1
27	Isolation Warning Label (Self Adhesive)	1506020000	4
28	Isolation Warning Label (Cable Tie)	1506025000	2

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

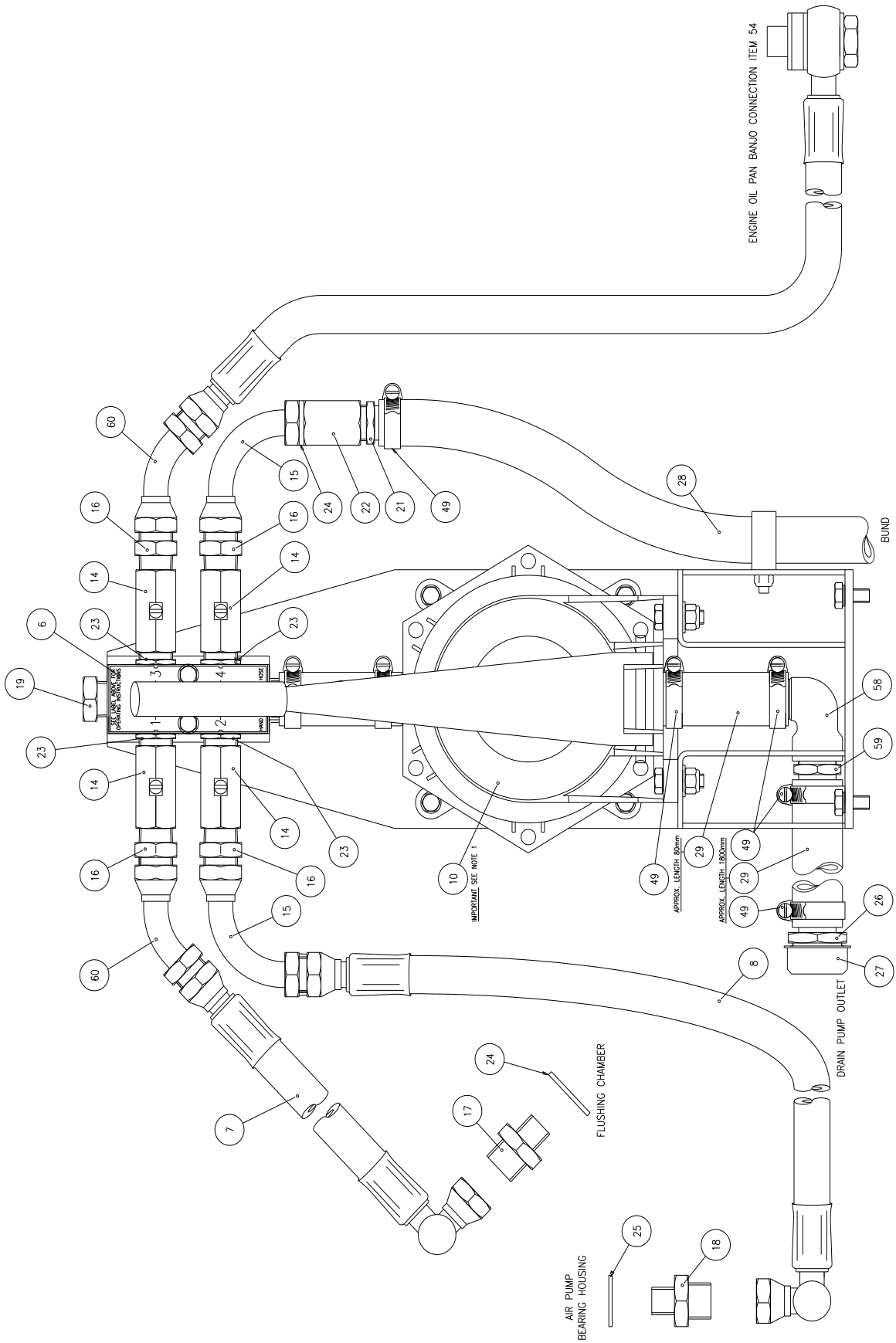


14.2 Battery Isolator Kit - 1011030000

ITEM	DESCRIPTION	PART NUMBER	QTY
3	Battery Isolator Bracket	2007083000	1
4	Battery Lead Positive	2007084000	1
5	Link Lead Postiive	2007085000	1
6	Label – Battery Isolator	1306091000	1
7	Battery Isolator Switch	92800-0154	1
8	Terminal Boot	92800-0008	2
9	Batt Term Clamp Cover - Red	92800-0158	1
10	Battery Clamp Boot	92800-0005	1
11	M6 x 20 LG Hex Hd Setscrew	9000060201	2
14	M6 Hex Self Lock Nut	9025060344	2
15	M10 x 25 LG Hex Head Setscrew	9000100251	2
16	M10 Spring Washer Rect Sect	9030100229	2
17	M6 x 12.5 x 0.8 Plain Washer	9030060024	2
20	Isol Switch Label – On/Off	1507105000	1

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

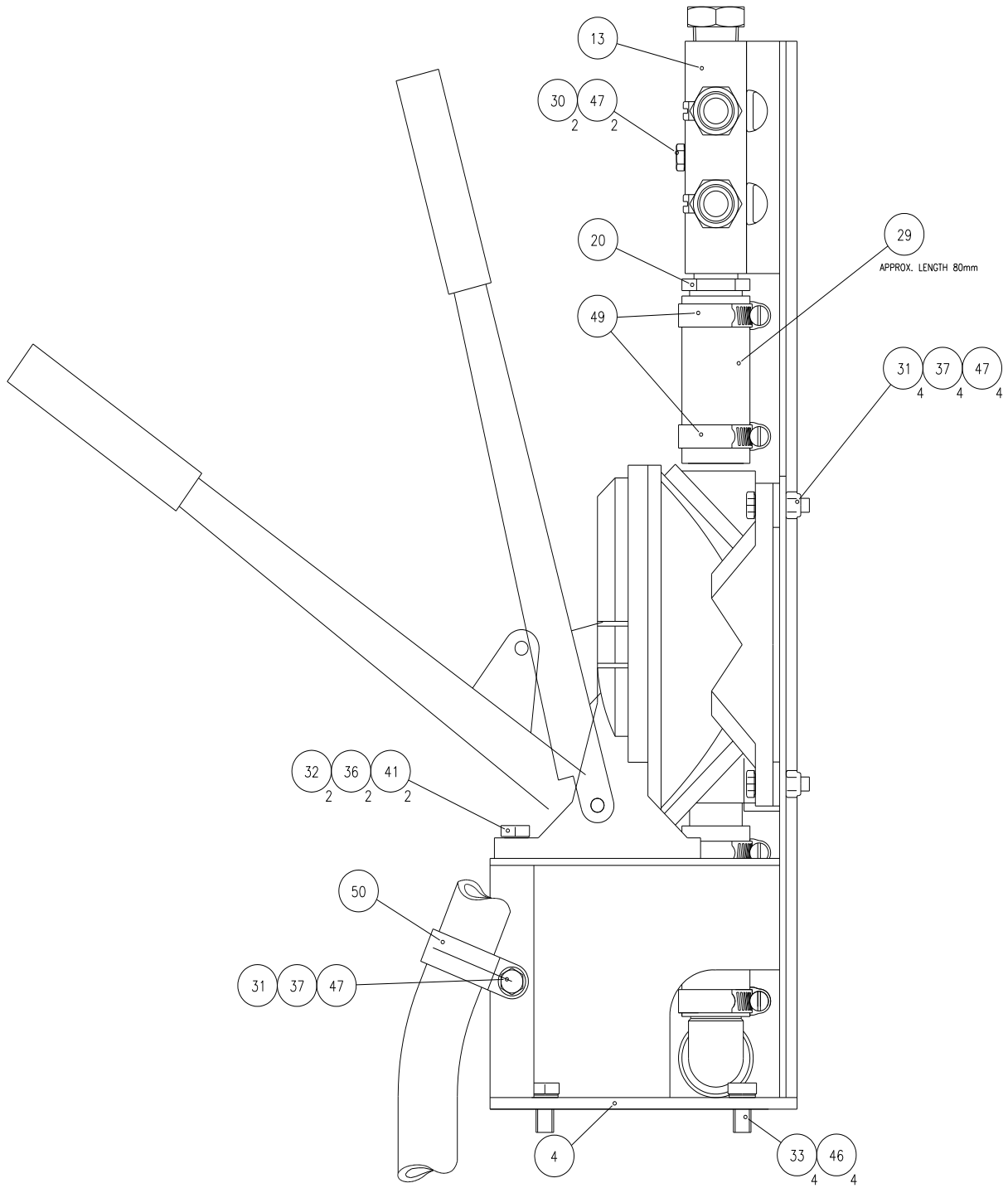


15 OIL DRAIN KIT PERKINS - 1011029000

ITEM	DESCRIPTION	PART NUMBER	QTY
4	Oil Drain Pump Bracket	1505208000	1
5	Label – Oil Drain Kit Inst	1510146000	1
6	Manifold Label	1505284000	1
7	Flushing Chamber Drain Hose	1505285000	1
8	Bearing Housing Drain Hose	1505286000	1
10	25mm Suct/Delv Diaphragm Pump	980257-001	1
13	½" BSPP - Manifold - 6 Port	9532P00401	1
14	½" BSPP Male/Female Ball Valve	9530P00404	4
15	½" BSPP Swivel 90 Deg. S/Elbow	9532P00402	2
16	Adaptor ½" BSPP Male 60 deg	9532P00403	4
17	Adaptor ½" BSPP Male 60 deg	9532P00404	1
18	Adaptor ½" BSPP Male 60 deg	9532P00405	1
19	½" BSPT Solid Plug	9532P00406	1
20	½" BSPT Deg 1" Hose Tail	9532P00407	1
21	½" BSPT Dia. ¾" Hose Tail	9532P00408	1
22	½" BSPP Fixed Fem/½"	9532P00409	1
23	½" BSPP Locknut	9532P00410	4
24	½" BSP Bonded Seal	9532P00411	2
25	¾" BSP Bonded Seal	9532P00603	1
26	1" BSPP / Dia. 1" Hose Tail	9532P00801	1
27	Plastic Cap 1" BSPP	9539P00801	1
28	¾" Oil Res Suction Hose	9500K00601	0.5m
29	Rubber Tube Oil Resistant 25mm	9507K00801	2.0m
30	M6 x 40 LG Hex Head Setscrew	9000060401	2
31	M6 x 25 LG Hex Head Setscrew	9000060250	5
32	M8 x 25 LG Hex Head Setscrew	9000080251	2
33	M8 x 16 LG Hex Head Setscrew	9000080161	4
36	M8 Hex Self Lock Nut	9025080344	2
37	M6 Hex Self Lock Nut	9025060344	5
41	M8 x 17 x 1.0 Plain Washer	9030080024	2
42	M6 x 12.5 x 0.8 Plain Washer	9030060024	5
46	M8 Spring Washer Rect Sect	9030080229	4
47	M6 Spring Washer Rect Sect	9030060229	2
49	Hose Clip No. 1	9505030004	7
50	Pipe Clip 'P' Type 28mm	9539M02801	4
54	Oil Drain Hose Assy	1510334000	1
58	90 Deg Hose Elbow Female	9516P00605	1
59	Hose Connector	9516P00606	1
60	Swept Elbow 135 deg ½" BSP	9532P00419	2

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



ITEM	DESCRIPTION	PART NUMBER	QTY
4	Oil Drain Pump Bracket	1505208000	1
5	Label – Oil Drain Kit Inst	1510146000	1
6	Manifold Label	1505284000	1
7	Flushing Chamber Drain Hose	1505285000	1
8	Bearing Housing Drain Hose	1505286000	1
10	25mm Suct/Delv Diaphragm Pump	980257-001	1
13	½" BSPP - Manifold - 6 Port	9532P00401	1
14	½" BSPP Male/Female Ball Valve	9530P00404	4
15	½" BSPP Swivel 90 Deg. S/Elbow	9532P00402	2
16	Adaptor ½" BSPP Male 60 deg	9532P00403	4
17	Adaptor ½" BSPP Male 60 deg	9532P00404	1
18	Adaptor ½" BSPP Male 60 deg	9532P00405	1
19	½" BSPT Solid Plug	9532P00406	1
20	½" BSPT Deg 1" Hose Tail	9532P00407	1
21	½" BSPT Dia. ¾" Hose Tail	9532P00408	1
22	½" BSPP Fixed Fem/½".	9532P00409	1
23	½" BSPP Locknut	9532P00410	4
24	½" BSP Bonded Seal	9532P00411	2
25	¾" BSP Bonded Seal	9532P00603	1
26	1" BSPP / Dia. 1" Hose Tail	9532P00801	1
27	Plastic Cap 1" BSPP	9539P00801	1
28	¾" Oil Res Suction Hose	9500K00601	0.5m
29	Rubber Tube Oil Resistant 25mm	9507K00801	2.0m
30	M6 x 40 LG Hex Head Setscrew	9000060401	2
31	M6 x 25 LG Hex Head Setscrew	9000060250	5
32	M8 x 25 LG Hex Head Setscrew	9000080251	2
33	M8 x 16 LG Hex Head Setscrew	9000080161	4
36	M8 Hex Self Lock Nut	9025080344	2
37	M6 Hex Self Lock Nut	9025060344	5
41	M8 x 17 x 1.0 Plain Washer	9030080024	2
42	M6 x 12.5 x 0.8 Plain Washer	9030060024	5
46	M8 Spring Washer Rect Sect	9030080229	4
47	M6 Spring Washer Rect Sect	9030060229	2
49	Hose Clip No. 1	9505030004	7
50	Pipe Clip 'P' Type 28mm	9539M02801	4
54	Oil Drain Hose Assy	1510334000	1
58	90 Deg Hose Elbow Female	9516P00605	1
59	Hose Connector	9516P00606	1
60	Swept Elbow 135 deg ½" BSP	9532P00419	2

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

16 BULK FUEL KIT - 1507288000

ITEM	DESCRIPTION	PART NUMBER	QTY
3	Instructions Label	1507255000	1
4	$\frac{3}{8}$ " Valve Bracket	1507287000	1
6	Diverter Valve $\frac{3}{8}$ " BSP	9530K00301	1
8	Griflex Hose	9508001000	3m
9	Oil Resistant Hose $\frac{3}{8}$ " Bore	9508K00301	4m
11	Cable Tie Nylon	9705002000	2
14	$\frac{3}{8}$ " Bonded Seal Washer	9532P00307	4
15	$\frac{3}{8}$ " BSPP Ext. Bulk Hd Fit	9532P00303	2
16	$\frac{3}{8}$ " BSPP Bulk Head	9532P00313	2
17	Hydraulic Coupling Connector	9532P00301	1
18	Hydraulic Plug Connector	9532P00302	1
22	Hose Clip	9505M02001	8
26	Swivel Nut/Hose Tail, $\frac{3}{8}$ " BSPP x $\frac{3}{8}$ "	9532P00311	2
27	Adaptor $\frac{3}{8}$ " BSPT	9534P00310	2
28	Straight Adaptor $\frac{3}{8}$ " BSPT x $\frac{5}{16}$ "	9534P00315	2
29	$\frac{5}{16}$ " Universal Stem Elbow	9534029205	2
30	Tube Sleeve $\frac{5}{16}$ "	9534027805	2
31	Enot Tube Nut	9534027905	2
32	Swivel Nut / Hose Tail, $\frac{3}{8}$ " BSPP x $\frac{5}{16}$ "	9532P00312	2
33	Universal Stem Elbow $\frac{3}{8}$ "	9534P00311	2
34	Universal Tubing Sleeve	9534P00312	2
35	Tubing Nut $\frac{3}{8}$ " O/D Tube	9534P00313	2
39	M16 x 40 LG Hex Head Setscrew	9000160401	2
41	M16 Hex Self Lock Nut	9025160344	2
44	M16 x 30 x 2.0 Plain Washer	9030160024	2

When ordering spares, please state:

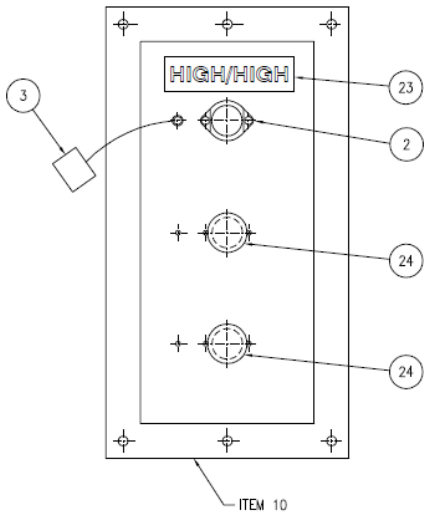
PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART

BULK FUEL KIT - 1507288000

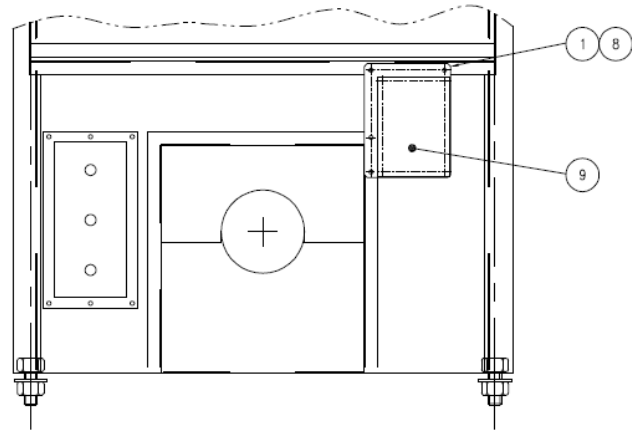
ITEM	DESCRIPTION	PART NUMBER	QTY
3	Instructions Label	1507255000	1
4	$\frac{3}{8}$ " Valve Bracket	1507287000	1
6	Diverter Valve $\frac{3}{8}$ " BSP	9530K00301	1
8	Griflex Hose	9508001000	3m
9	Oil Resistant Hose $\frac{3}{8}$ " Bore	9508K00301	4m
11	Cable Tie Nylon	9705002000	2
14	$\frac{3}{8}$ " Bonded Seal Washer	9532P00307	4
15	$\frac{3}{8}$ " BSPP Ext. Bulk Hd Fit	9532P00303	2
16	$\frac{3}{8}$ " BSPP Bulk Head	9532P00313	2
17	Hydraulic Coupling Connector	9532P00301	1
18	Hydraulic Plug Connector	9532P00302	1
22	Hose Clip	9505M02001	8
26	Swivel Nut/Hose Tail, $\frac{3}{8}$ " BSPP x $\frac{3}{8}$ "	9532P00311	2
27	Adaptor $\frac{3}{8}$ " BSPT	9534P00310	2
28	Straight Adaptor $\frac{3}{8}$ " BSPT x $\frac{5}{16}$ "	9534P00315	2
29	$\frac{5}{16}$ " Universal Stem Elbow	9534029205	2
30	Tube Sleeve $\frac{5}{16}$ "	9534027805	2
31	Enot Tube Nut	9534027905	2
32	Swivel Nut / Hose Tail, $\frac{3}{8}$ " BSPP x $\frac{5}{16}$ "	9532P00312	2
33	Universal Stem Elbow $\frac{3}{8}$ "	9534P00311	2
34	Universal Tubing Sleeve	9534P00312	2
35	Tubing Nut $\frac{3}{8}$ " O/D Tube	9534P00313	2
39	M16 x 40 LG Hex Head Setscrew	9000160401	2
41	M16 Hex Self Lock Nut	9025160344	2
44	M16 x 30 x 2.0 Plain Washer	9030160024	2

When ordering spares, please state:

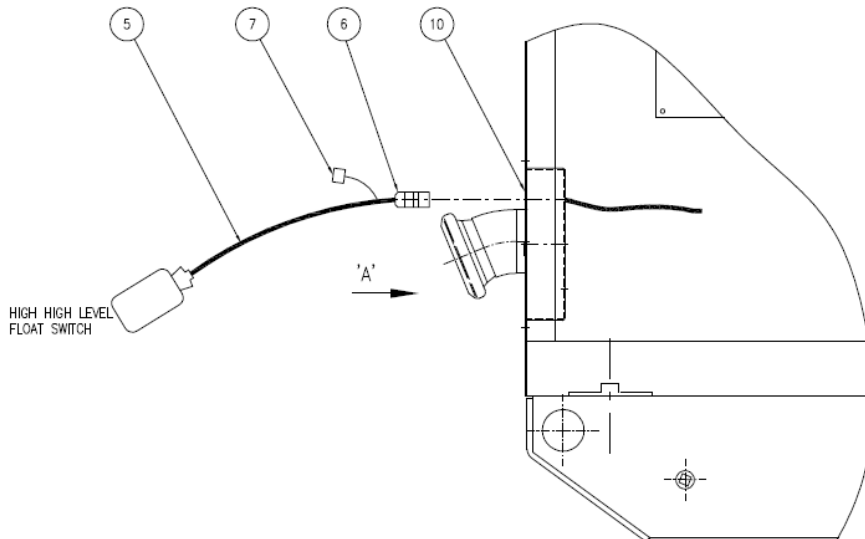
PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART



FLOAT PLUG PANEL
SCALE 1:2



VIEW FROM INSIDE OF CANOPY



17 METRON KIT - 0908241000

ITEM	DESCRIPTION	PART NUMBER	QTY
1	Mounting Plate – Metron Unit	0908207000	1
2	Chassis Socket – 3 Way	92800-0081	1
3	Socket Dust Cap	92800-0082	1
5	Float Switch + 20m Cable	92900-0033	1
6	Cable Plug – 3 Way	92800-0083	1
7	Plug Dust Cap	92800-0084	1
8	Aerial	92800-0176	1
9	Metron Unit	92800-0178	1
10	Float Plug Panel	1004100000	1
21	Cable Assembly (Between Metron & Stop/Start)	92800-0183	1
22	A/V Mounts	9680M00006	3
23	High/High Label	1505174000	1
24	Blanking Plug	92800-0085	2

When ordering spares, please state:

PUMP NUMBER - PART NUMBER - DESCRIPTION OF PART