Tritech International Limited

ZipJet-ULTRA

Operators Manual

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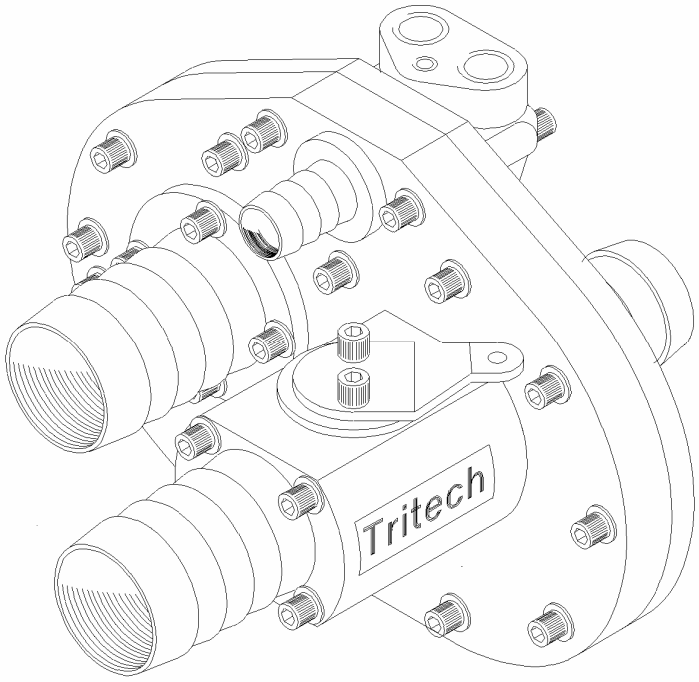

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CONTENTS

WARRANTY POLICY

Tritech International Limited herein after referred to as **TIL**

TIL warrants that at the time of shipment all products shall be free from defects in material and workmanship and suitable for the purpose specified in the product literature.

The unit/system warranty commences immediately from the date of customer acceptance and runs for a period of 365 days. Customer acceptance will always be deemed to have occurred within 72 hours of delivery.

Note: Any customer acceptance testing (if applicable) must be performed at either TIL premises or at one of their approved distributors unless mutually agreed in writing prior to despatch.

Conditions:

These include, but are not limited to, the following:

1 The warranty is only deemed to be valid if the equipment was sold through TIL or one of its approved distributors.

2 The equipment must have been installed and commissioned in strict accordance with approved technical standards and specifications and for the purpose that the system was designed.

3 The warranty is not transferable, except or as applies to Purchaser first then to client.

4 TIL must be notified immediately (in writing) of any suspected defect and if advised by TIL, the equipment subject to the defect shall be returned by the customer to TIL, via a suitable mode of transportation and shall be freight paid.

5 The warranty does not apply to defects that have been caused by failure to follow the recommended installation or maintenance procedures. Or defects resulting from normal wear & tear, incorrect operation, fire, water ingress, lightning damage or fluctuations in vehicles supply voltages, or from any other circumstances that may arise after delivery that is out with the control of TIL.
(**Note:** The warranty does not apply in the event where a defect has been caused by isolation incompatibilities.)

6 The warranty does not cover the transportation of personnel and per diem allowances relating to any repair or replacement.

7 The warranty does not cover any direct, indirect, punitive, special consequential damages or any damages whatsoever arising out of or connected with misuse of this product.

8 Any equipment or parts returned under warranty provisions will be returned to the customer freight prepaid by TIL

9 The warranty shall become invalid if the customer attempts to repair or modify the equipment without appropriate written authority being first received from TIL.

10 TIL retains the sole right to accept or reject any warranty claim.

11 Each product is carefully examined and checked before it is shipped. It should therefore be visually and operationally checked as soon as it is received. If it is damaged in anyway, a claim should be filed with the courier and TIL notified of the damage.

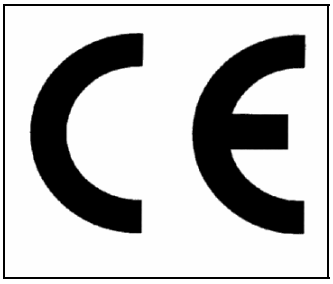
Note: TIL reserve the right to change specifications at any time without notice and without any obligation to incorporate new features in instruments previously sold.

Note: If the instrument is not covered by warranty, or if it is determined that the fault is caused by misuse, repair will be billed to the customer, and an estimate submitted for customer approval before the commencement of repairs.

F167.1

SAFETY STATEMENTS & CE MARKING

The installation of the pump is fully the responsibility of the user. It is powered by high pressure hydraulics and contains moving parts. Full consideration has been given to the requirements for CE marking and the relevant safety information is contained within this manual. Since the pump as supplied as a subsystem and its safe use is installation specific, actual compliance is the responsibility of the installer. It must be operated in accordance with the following instruction manual.. Failure to follow the recommendations of this manual may lead to safety hazards or equipment failure.



Danger!

Throughout the manual certain safety related comments and requirements that could lead to injury or loss of life will be highlighted to the operator by indications in the margin identified as opposite.

Caution!

Throughout the manual certain safety related comments and requirements that could result in damage to the product or other property will be highlighted to the operator by indications in the margin identified as opposite.

TECHNICAL SUPPORT

Contact your local agent or Tritech International Ltd

	**Mail**	***Tritech International Ltd.*** Peregrine Road, Westhill Business Park, Westhill, Aberdeen, AB32 6JL, UK
	**Telephone**	++44 (0)1224 744111
	Fax	++44 (0)1224 741771
	**Email**	support@tritech.co.uk
	Web	www.tritech.co.uk

An out-of-hours emergency number is available by calling the above telephone number

If you have cause to use our Technical Support service, please ensure that you have the following details at hand **prior** to calling:

- System Serial Number (if applicable)
- Fault Description
- Any remedial action implemented
- Software Revision (if applicable)

Due to the expansion of equipment capabilities and the fact that new sub-modules are continually being introduced, this manual cannot detail every aspect of the operation.

INTRODUCTION

The new ***ZipJet-ULTRA*** has been developed from the highly successful ***Zip Pump*** and ***ZipJet*** range of products.

The integrated eductor based excavation system is designed to pump mud,sand , gravel, drill cuttings, shale etc. without risk of blockage. A heavy duty cylinder reverses the flow at the nozzle to eject any object which may be causing an obstruction. A second cylinder operates a diverter valve to provide a powerful direct jet to break up heavy and cohesive seabed mud and sand prior to excavation.

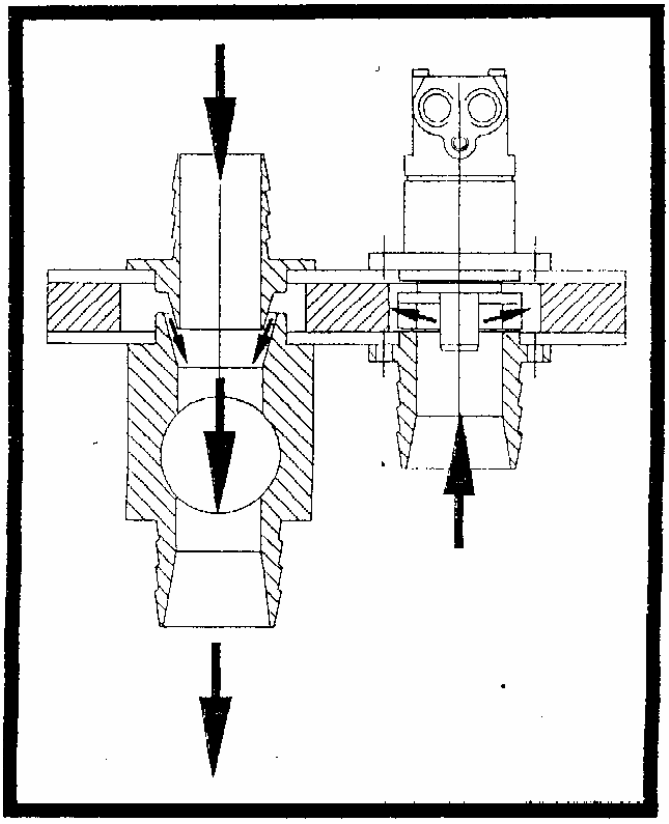
PRINCIPLES OF OPERATION

Suction Operation

The ZipJet Ultra pump is based on the principles of the annular eductor pump. It has a monoblock configuration in which the eductor pump and power pump are contained within a common body.

The power for the eductor section of the pump is provided by a stream of clean water driven by the centrifugal impeller section/

Clean water is drawn into the inlet, passes through the impeller of the power pump and is then injected into the main suction stream via the annular eductor nozzle.



The main suction stream can convey heavy contamination of sand, mud, gravel and drilling debris.

The pump has a retro flush valve just behind the eductor. When this is closed (operating cylinder extended) the power fluid is then directed to the suction nozzle. This feature can be used to clear blocked suction nozzle or to complete a deburial operation by blowing away the last sand and mud from around an object.

The optimum performance will be obtained with the nozzle pushed deep into the debris and agitated gently. Where a great deal of debris is encountered it will be necessary to keep withdrawing the nozzle.

Jetting Operation

The body of the pump contains a diverter vane. The purpose of the vane is to switch the flow of the power pump water between the suction eductor and the jetting outlet.

The diverter should be operated fully in one direction or the other: attempting to share the flow between the eductor and the jet nozzle by using a mid position will result in effectual performance from both. The diverter is set for suction when the cylinder is retracted and for jetting with the cylinder extended.

INSTALLATION.

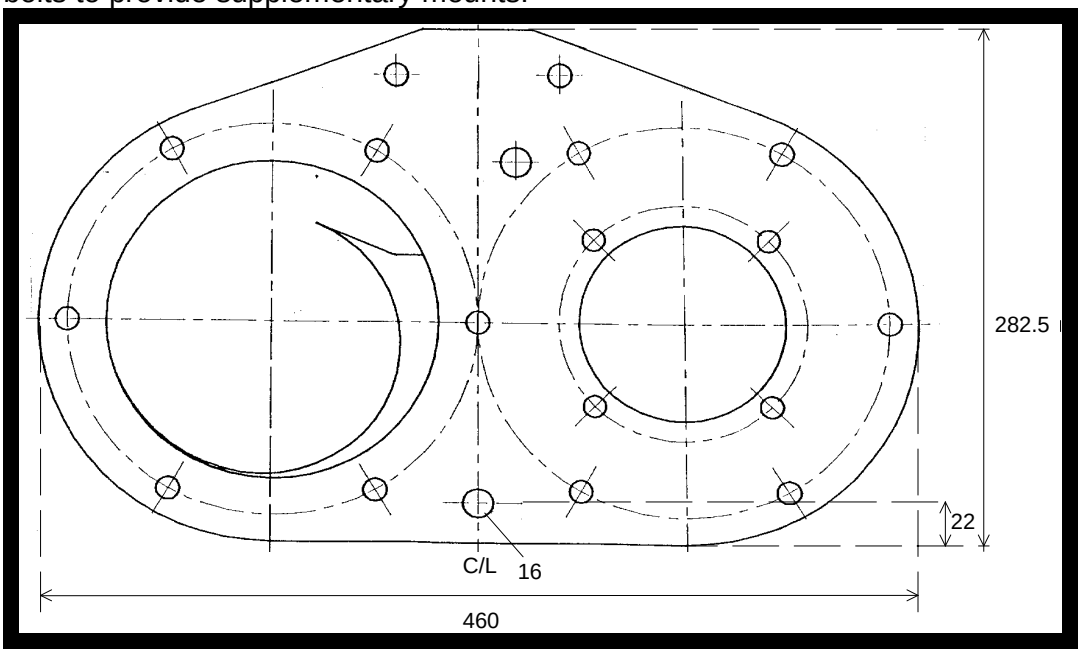
Do not power up the pump or hydraulic valve actuators until all hoses are properly connected to the pump.

There is a serious risk of injury to fingers if inserted into the water port.

If the user wishes to power up the motor or actuator before the installation is complete it is his responsibility to ensure that suitable safety measures are in place to prevent injury.

Mechanical Installation

The pump may be mounted in any orientation on the vehicle. There is one main mounting point, but any of the case bolts may be removed and replaced with longer bolts to provide supplementary mounts.



It is recommended that the pump be supported along its lower edge and a bracket used to secure it to the main 16mm diameter mounting point.

The pump should not be mounted using the motor or hose nozzles as attachment points.

Water Hose Installation.

Hoses

Clean water inlet hose	100mm ID
Dredge suction hose	75mm ID
Discharge hose	100mm ID
Recommended hose type	Kanaline AW Hydrasun Arizona

Kanaline AW has plastic reinforcement and a semi-transparent wall which assists visual inspection for damage and blockages. Being all plastic it is light in water. Alternative makes of suction and discharge hose may be used provided that they have a smooth internal bore.

If the above hose types are unavailable then the hose can be any crush resistant PVC coil strengthened hose.

Layflat style hoses are not recommended for discharge.

Fittings

Use standard Kanaline fittings or heavy duty worm drive clips. Use of heavy duty two bolt clamps will result in damage to the hose connections on the pump unit.

Jet hose	25mm ID
Recommended hose type	Kanaline AW Hydrasun Arizona

Clean Suction intake screen

It is recommended that a Tritech supplied suction strainer be used with the pump. If the user supplies his own strainer, then it must meet the following specifications.

Mesh types

Both rectangular and circular aperture suction screens may be used.

Square mesh	max.	4mm aperture
Circular perforations	max.	6mm dia
Total free flow area	min	0.016m^2

The pump should not be operated in any circumstances without a suction screen meeting the above specification.

Dredge Suction Nozzle

If the user wishes to make up special nozzles the following specification should be met to optimise performance.

Suction nozzles should be designed with a nozzle cross-section area of 3800mm^2.

Smaller nozzles may be used for special tasks but material removal rates will be reduced. Larger nozzles are of no benefit and will reduce performance.

A nozzle guard should be fitted that will pass a maximum of a 40mm dia sphere or 35mm sided cube. The pump can pass single objects of a larger size, but if the pump takes in a stream of objects of larger size than blockages can occur by bridging.

Jet Nozzle.

The user may make up jet nozzles as required.

The recommended size are 14 - 19 mm diameter or an equivalent area.
The optimum size will need to be determined by trial because the water output from the power pump will vary depending on the oil pressure and flow available from the ROV's hydraulic system.

Hydraulic Installation.

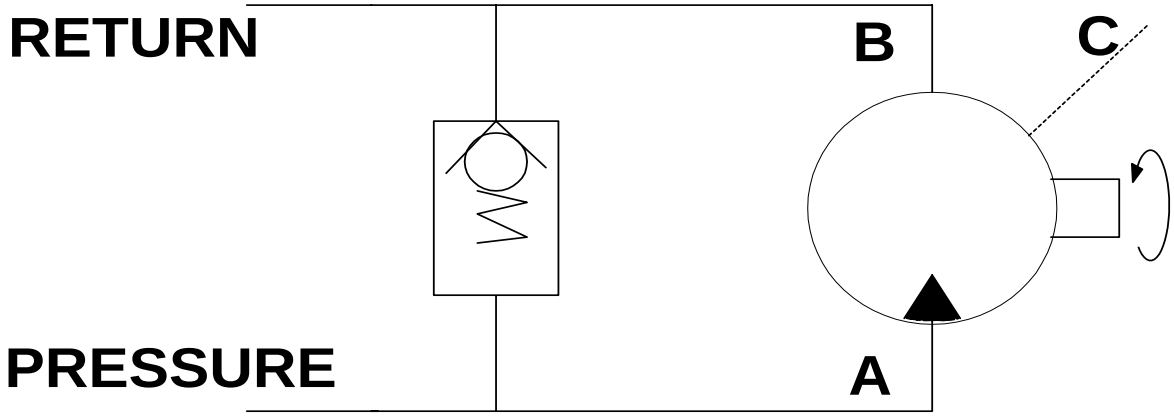
Hydraulic oil

The pump should be operated using a premium grade mineral based hydraulic oil of ISO VG 22 to 32.

Filtration

The hydraulic system filtration must be to a minimum of 10um absolute standard. A 10um nominal standard is regarded as inadequate.
The recommended filtration is UN elements produced by Pall Industrial Hydraulics Ltd. or equivalent products.

Hydraulic Hook-up.



The pump is configured for correct rotation when the hydraulic supply is connected to the "A" port of the Volvo motor and the return line to the "B" port.

It is mandatory that the drain connection from the motor back to tank is a minimum of 3/8" bore. The drain line should return straight to tank without restriction. It is permissible to connect the drain line back into a larger bore drain manifold which has been correctly sized to accommodate all drains attached to it.

Danger!

It is not permissible to common up the drain line with return flow lines.

It is strongly recommended that self sealing quick disconnects are not used on the drain line. Use of such fittings is at the users risk. If such a connection is used then it is mandatory to ensure that it has been fully and correctly fitted prior to starting the motor. Failure to do so may result in pressurisation of the motor casing which could explosively burst under system hydraulic pressure with considerable risk of personal injury.

To avoid shock loading the motor when the supply is stopped it is essential to provide the check valve shown. This will allow the motor to run down steadily rather than coming to an abrupt stop.

Specification for check valve.

1/2" check valve, cracking pressure 0.5 bar.

Recommended valve

Integrated Hydraulics FPR-1/22-0.5

Hydraulic fittings.

The following fittings are supplied as standard:-

Motor A&B ports	No 12 JIC male
Motor case drain	No 6 JIC male

If it is desired to change these for any reason then the motor port threads are

Motor A&B ports	3/4" BSP parallel
Motor case drain	3/8" BSP parallel

Tritech Volvo Protector.

The Zip Jet Ultra pumps serial numbered ZJU89025 onwards are factory fitted with the Tritech Volvo Protector. This removes the necessity to fit an external check valve as described above.
To establish whether a Volvo Protector is fitted to the pump examine the Volvo motor hydraulic ports and compare with picture 3. The Volvo Protector is clearly identifiable and will be stamped with the serial number AMI – VP .XXX.

Note: The BSP Volvo ports are no longer available with the Tritech Volvo Protector fitted.

Retro-fitting the Volvo Protector.

A Volvo Protector kit comprises :

1 x VVF 001 – Check valve body
2 x VVF 002 – JIC 12 fittings
1 x VVF 003 – JIC 6 fitting
2 x ‘O’-ring No. 024
1 x ‘O’-ring No. 017
2 x Dowty washer 3/4 BSP
1 x Dowty washer 3/8 BSP

The procedure to fit a Tritech AMI – Volvo Protector is as follows:

Remove any existing port fittings from the F11 – 10 Volvo motor. Ensure that the top face of the F11 – 10 Volvo motor is free from any debris i.e. paint, dirt and grit etc. Clean and degrease surface. Insert the three protector 'O'-rings into the grooves of the protector as shown in Picture 1.

Picture 1.

Place the protector onto the motor with the grooved face facing down. Ensure the 'O'-rings remain in their groove during this process. Place the dowty washers over the protector and screw in the fittings as shown in Picture 2.

Picture 2.

Once the fittings have been inserted and tightened, blanking caps should then be fitted. The motor assembly is fitted to the Zip Jet Ultra as shown in Picture 3.

Picture 3.

Safety Note

Danger!

Never use the same size fitting for pressure hoses and the case drain. If this is done there is a significant risk of incorrect hook-up causing pressure to be applied to the motor case which could cause the case to burst explosively with high risk of personal injury.

Required hydraulic flow

For the Volvo F11-10 motor

The vehicle hydraulic system should be capable of supplying a minimum 50l/min at 195 bar to the motor ports. Less than this will adversely affect performance.

The maximum permissible flow is 65l/min at 240bar.

Achieving these flows in an unloaded condition is no guarantee that the supply can actually be met in the working condition.

It is recommended that the installation be checked using a hydraulic flowmeter equipped with a loading valve which can simulate the motor running under load.

In order to avoid pressure losses it is mandatory that a minimum of 1/2" bore pipework or hoses is used on the flow and return lines to the motor. 3/4" or larger is recommended.

Testing In Air

Under no circumstances must the flow be allowed to exceed 70l/mi when testing in air. There is no back pressure on the impeller to control its speed and many vehicle hydraulic systems are capable of higher deliveries when there are no thrusters running. Over speeding the motor can cause catastrophic failure.
To avoid excessive wear and the possibility of ceasing the impeller and body, the unit should not be run for extended periods out of the water (More than 30 seconds). This is especially true when the unit is new. Absence of water around the plastic removes the natural cooling mechanism and may result in the moving parts becoming misshapen due to heat.

Retro-flush valve and diverter actuators

Two independent controls are required, one for each actuator.

The actuators can be connected to any standard three position 4 way solenoid valve. Pilot operated check valves can be advantageous, but a closed centre spool valve is adequate. If either actuator is not used then they must be filled with oil and securely capped. This is particularly important for the diverter which could easily be pilled open severely reducing efficiency.

The minimum supply pressure for reliable operation is 110bar.

The actuators are rated for working pressures of up to 240bar.

Actuator connection fittings

The actuators are supplied with No 4 JIC male fittings.

Hydraulic motor shaft seals

Volvo produce two seals.

"N" type coloured blue and

"H" type coloured red.

The "H" type is a high pressure seal and fitted as standard on the ZIPJet Ultra.

Replacement of seals with anything other than a genuine Volvo seal (or Tritech supplied seal) will invalidate warranty.

MAINTENANCE

Danger!

Do not power up the pump or hydraulic valve actuators until all hoses are properly connected to the pump.

There is a serious risk of injury to fingers if inserted in either the power water intake or the pump delivery port.

If the user wishes to power up the motor or actuator before the installation is complete it is his responsibility to ensure that suitable guards or other safety measures are in place to prevent injury.

The pump is designed for low maintenance operation.
The main materials are stainless steel and wear resistant polymer plastics.

The only internal moving parts that may need maintenance are

The power pump impeller

The hydraulic motor

The retro-flush valve spool

The divertor valve vane

The eductor set may need replacement after prolonged use with extremely abrasive materials or if aggressive chemicals have been encountered.

Basic maintenance procedures

Pre- Dive

Visual check for external damage

Check hoses are secure

Check mountings are secure

Check clean water suction strainer is in place and clear

In active time
If the vehicle will be in active for more than 48 hours or at demob

Run a fresh water hose into the clean water suction strainer for a few minutes, then spin the hydraulic motor for about 15 seconds (taking care not to allow it to over speed).

Storage

If the pump is removed from the vehicle, then the hydraulic ports should be blanked off with metal caps and the unit washed out with fresh water.

Leave the actuator valves in their retracted position.

Visually inspect the leading edges of the power pump impeller for damage and erosion.

Up to four blades may have leading edge damage of 5mm width and 4 mm depth before replacement becomes essential.

If the majority of leading edges are eroded more than 3.5mm back from the bore of the inlet nozzle then consideration should be given to replacing the impeller.

Basic fault finding

Poor performance

Check that the clean water suction strainer is clear and that there are no blockages in the hose.

Check that the retro-flush valve is opening fully.

Check that the suction hose reinforcement is intact and that there is no sign of the hose collapsing under suction.

Check that the discharge hose is not damaged or kinked.

Remove the clean water suction hose from the pump and check that the face of the impeller is not obstructed by material like rope fibre or shreds of plastic bags.

Check that the hydraulic motor runs freely without excessive noise or vibration.

Check that the hydraulic flow meets the specification.

Dismantling

Tools and materials

The following tools are required to work on the pump.

19mm open ended spanner

19mm socket, short extension bar and ratchet

10mm open ended spanner

10mm Allen key

4mm Allen key

Dead blow hammer

3 jaw puller

Loctite - "Studlock" for reassembly

Removal of hydraulic motor and power pump impeller

Disconnect all hydraulic hoses from the motor and fit caps to the ports

Remove the 6 bolts holding the motor mounting plate to the pump (this will include removing an actuator mounting post.)

Remove the mounting plate/motor/impeller assembly

Remove the four countersunk setscrews securing the impeller to the boss. (these will be tight since they are retained by Loctite) Remove the impeller.

Remove the retaining setscrew and endcap from the end of the motor shaft

Using a suitable 3 jaw puller remove the impeller boss from the motor shaft

Removal of the retro-flush valve

This requires splitting the pump casing.

Disconnect all hoses and remove the pump from the vehicle.

Remove the motor as above

Remove the 7 remaining case bolts and separate the casing.

Remove the actuator from the valve core arm

Unscrew the four long countersunk screws securing the valve body to the pump and then pull off the valve body.

The valve core is located by the four long screws so it is now free to be withdrawn from the valve body.

Removal of the diverter valve vane

This also requires splitting the pump case.

Proceed as above as far as separating the case sections

Access is now available to remove the two setscrews retaining the vane onto its operating shaft. Remove these two screws and lift out the vane blade.

Reassembly

Reassembly is the reverse of the procedures above, but with particular attention to the following.

Hydraulic Motor and Impeller

Apply some anti-seize grease to the motor shaft before fitting the impeller. Press the impeller boss onto the shaft right up to the shoulder

Assemble the retainer onto the shaft end and secure the setscrew using a small quantity of Loctite.

Replace the impeller on the boss and secure the four countersunk screws with Loctite.

Retro-flush core

Check that the core is a loose fit in the valve body, and that the dirt relief grooves are clear.

Push the core into the body and refit to the case using the 4 long countersunk screws to locate the valve core in the body.

Tighten the four screws carefully to about 10 ft lbs torque in a diagonal pattern. Check that the valve core continues to turn freely. If the bolts are over tightened, the valve core will start to bind.

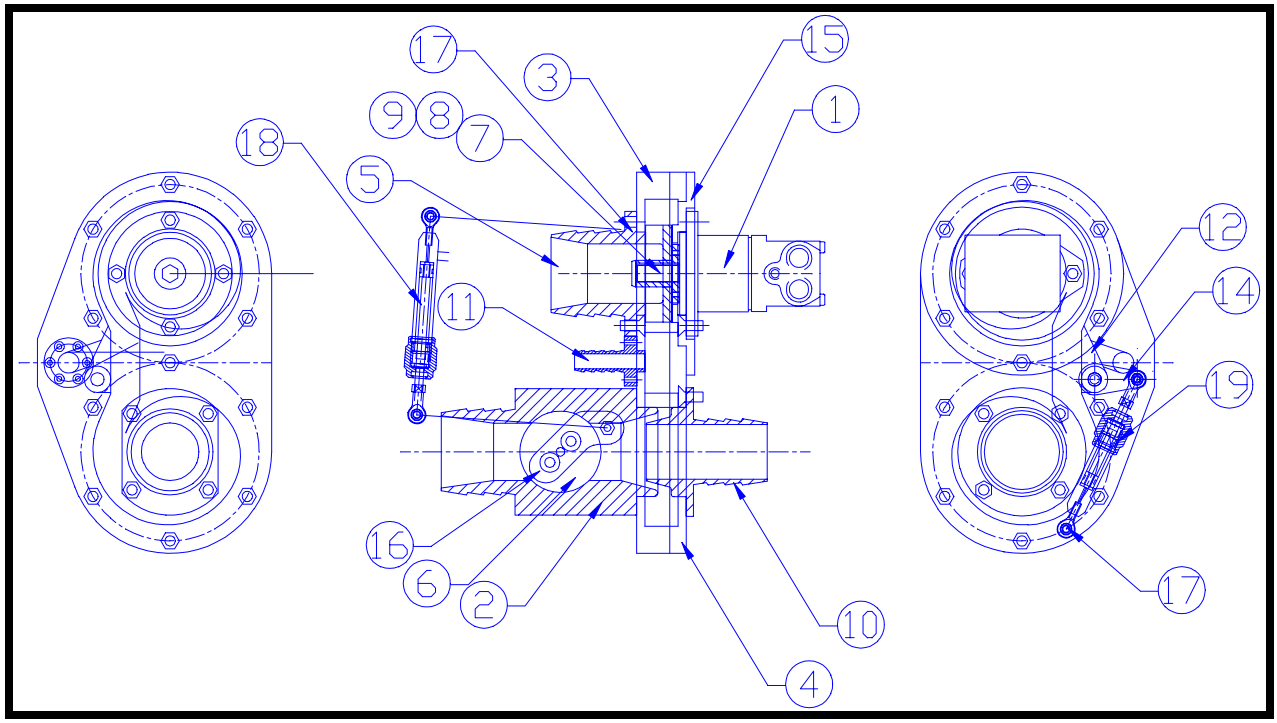
Divertor valve Vane

Line up the vane with the operating shaft and replace the two setcrews using a small amount of Loctite.

Divertor vane adjustment

The divertor valve actuator arm will require adjustment to ensure the vane lies correctly when set in either mode of operation.

Fit the rod end of the actuator to the operating shaft and leave the cylinder end free from the mounting nut.
Close the actuator fully and place the vane in the suction direction - (Fully clockwise when viewed from the motor side)
Adjust the cylinder end bearing to align with the actuator mounting nut.
Lock the setting using the locknut, and a small amount of Loctite.



Parts List

1	DEL-TRI-ZJU-89-01	Motor (Volvo F11-010-MB-CHK-000) c/w Speedi Sleeve DEF11-10MBCHK-99098
2	DEL-TRI-ZJU-89-02	Retro valve body
3	DEL-TRI-ZJU-89-03	Pump case (retro-valve side)
4	DEL-TRI-ZJU-89-04	Pump case (motor side)
5	DEL-TRI-ZJU-89-05	Clean water inlet body
6	DEL-TRI-ZJU-89-06	Retro-valve core
7	DEL-TRI-ZJU-89-07	Impeller
8	DEL-TRI-ZJU-89-08	Impeller boss
9	DEL-TRI-ZJU-89-09	Impeller retainer
10	DEL-TRI-ZJU-89-10	Suction inlet body
11	DEL-TRI-ZJU-89-11	Pressure jet outlet
12	DEL-TRI-ZJU-89-12	Diverter blade
14	DEL-TRI-ZJU-89-14	Diverter valve actuator arm
15	DEL-TRI-ZJU-89-15	Motor mounting disc
16	DEL-TRI-ZJU-89-16	Retro-valve actuator arm
17	DEL-TRI-ZJU-89-17	Actuator mounting nut
18	TI-SZJU-10/90-0-RSE or D16-90	Retro valve actuator cylinder
19	TI-SZJU-10/27-0-RSE or D16-27	Diverter valve actuator cylinder