PumpEng INNOVATIVE PUMP SOLUTIONS

Installation, care & maintenance manual

of the

Raptor 5kw

high head submersible pump

Manual Contents

Warranty

PumpEng will repair faults in the products we manufacture within the following constraints:

- The fault has been caused by defects in materials or workmanship.
- The fault has occurred when the product is used in circumstances to which the product was intended to be operated in and in accordance with installation and operating recommendations.
- All repairs and regular maintenance is performed by an authorized PumpEng repair dealership.
- All components used in servicing and repairs must be genuine PumpEng components
- The fault is not caused by inadequate maintenance.
- The fault occurs and is reported to PumpEng or an authorized PumpEng dealership within twelve (12) months of purchase.
- The product is returned to PumpEng or an authorized dealer at nil expense to the receiver.
- PumpEng accepts nil liability for consequential damage or losses
- PumpEng reserves the right to alter information and specifications without notice.

Pump Description

The PumpEng manufactured "Raptor" series of pumps are electro submersible de-watering pumps.

By incorporating a water cooled, jacketed motor these pumps can run both fully and partly submerged.

This feature allows de-watering to be achieved to a lower level than that which can be achieved with non jacketed submersible pump designs.

To further enhance this feature the "Raptor" pump series are supplied with class H (180 C) insulated motors thereby increasing the allowable temperature rise which would be applicable if a standard class F(150 C) motor was used.

This feature increases the life expectancy of the motor when dry run or snore operation is encountered.

Another design feature which helps to extend pump life during dry run or snore operation is the incorporation of dual mechanical seals running in an oil bath.

The standard motor configuration is 3 phase, 50 cycle. Motor speed is 2 pole and motors are available in both 415v and 1000v.

Variations on these standard motor specifications are available to suit specific requirements. **Note that the "Raptor" series of pump are not Ex-approved and as such cannot be used in explosive or flammable environments.**

The design speed of these pumps is set at 2 pole so as to allow high head pumping to be achieved. All pump Impellers are of a semi open design with full rear shrouds to help maintain constant discharge head over the wear life of the Impeller.

The pumps are designed as a wear resistant de-watering pump, incorporating unique features to minimize both the effects of wear and the costs associated with damage that occurs through wear. Due to the high speed and high head design of these pumps they are not intended for use as a slurry pump.

5kw Raptor Technical Specifications

Motor Details	415v	1000v
Phase	3	3
Full load amps	9.3 amps	3.9 amps
Speed	2865 RPM	2865 RPM
Full load torque	16.75Nm	16.75Nm
Locked torque	2.1	2.1
Hz	50	50
Winding Insulation	Class H	Class H
Pump Details		
Maximum discharge head	41 metres	
Maximum flow	16 litres/second	
Maximum water temperature	40 C	
Maximum pump submergence	22m	
Maximum SG of pumped water	1.1	
Bearing housing oil type	Hydraulic 68 ISO68 or equiv	
Bearing housing oil quantity	1.4 litres	
Outlet discharge	50mm BSP female	
Maximum diameter of solids	8.0mm	
Gross packed weight (nil accessories)	87kg	
Net weight	57kg	

Transportation, Storage & Installation

- Always lift the pump via the lifting handle. Never lift or drag the pump via the electrical power cable.
- Always ensure the pump is secured and packaged to prevent damage during transportation. When transporting along unsealed roads, pack the pump so as to prevent damage which can be caused to the bearings and seals by excessive vibration
- Do not drop the pump as not only can this cause physical damage to the exterior of the pump it can also cause damage to bearings and mechanical seals.
- Where pumps are stored for extended periods ensure that the cable, seal sleeve and mechanical seals, are intact before putting the pump into operation, also ensure that the impeller can rotate freely and that oil/grease levels are correct.
- Installation must be undertaken by suitably qualified persons. Ensure all relevant safety standards are adhered to and be aware of hazards which exist in the area in question.
- When positioning the pump in an operating environment take measures to reduce the amount of solids and fines which can enter the pump. Wear and associated repair costs are directly related to the amount of solids being pumped.
- Ensure that all electrical connections are correct and that suitable overload/motor protection devices are used and that the pump is operating within its designed current range.
- Ensure the direction of rotation is correct.
- Ensure discharge lines and fittings are properly secured and rated for the installation's design pressure. All discharge lines must be free of kinks and blockages.

Maintenance

The Raptor series of pumps are designed for long periods of trouble free operation.

The frequency of service inspections is determined by the operating conditions which the pump is operating in.

As a minimum the following inspections should be made every six (6) months, however site maintenance staff should set inspection intervals based on the operating conditions which the pumps are operating in.

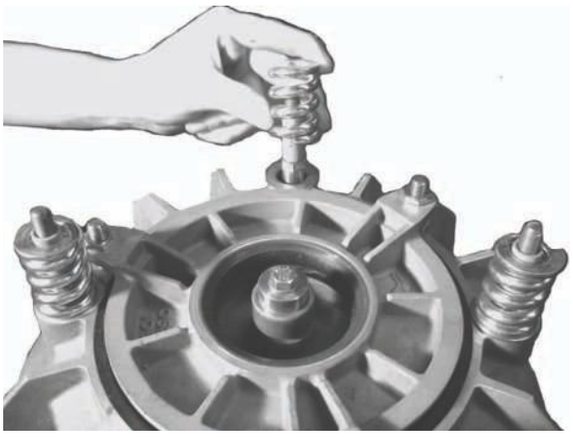
Note that a drop in output capacity or changes in operating current are an indication that the pump is in need of inspection.

- Ensure all inspection work is performed by suitably qualified and trained persons.
- Inspect the electrical power cable for damage and replace as necessary.
- Measure the insulation resistance of the power cable and motor windings. If the winding resistance is not correct then remove the cable and measure the resistance of the windings only. If this reading returns to normal replace the cable. If the reading does not return to normal the pump should be sent to a PumpEng dealership for repairs.
- Visually inspect all external components of the pump and replace any damaged components.
- Ensure that the cooling jacket internal waterways are free of obstruction, flush/clear as required.
- Check that all nuts, bolts and screws are secure. Remove the oil inspection screws. **(Danger this area may be under pressure, take appropriate precautions)** Lay the pump on its side and pour the oil into a suitable container, check the condition of the lower bearing housing oil. If there is any indication of contaminates in the oil then it is probable that the mechanical seals or bearing housing o-rings have failed and as such the pump should be sent to a PumpEng dealership for repairs. If the oil is not contaminated replace with new oil (quantity required is 1.4 Litres) ensuring that the inspection screw o-rings are replaced and the inspection screws are tightened to 15 Nm.
- Remove the stator inspection screw.**(Danger this area may be under pressure, take appropriate precautions)** lay the pump on its side and check if there is any water or oil in the stator casing. If evidence of oil or water are present it is indicative of a mechanical seal or o-ring failure and as such it is recommended that the pump be repaired by a PumpEng dealership. If nil water or oil is evident replace the stator inspection screw 0-ring and ensure that the inspection screw is tightened to 15 Nm.
- Remove the junction box cover and inspect for signs of water.**(Danger this area may be under pressure, take appropriate precautions)** If evidence of water exists determine where the water has entered. If the water has entered from the stator casing the pump should be returned to a PumpEng dealership for repairs. If on the other hand the water has entered via the lid or power cable then replace the cable, o-rings and seal sleeve as necessary. When re-fitting the seal sleeve ensure that the seal sleeve seals on a new area of the electric power cable, also ensure that the cable entry clamps are tightened securely on the electric power cable.
- Inspect all wet end components & replace as necessary.

Wet End Dismantling Part 1

Remove the suction strainer nuts and washers

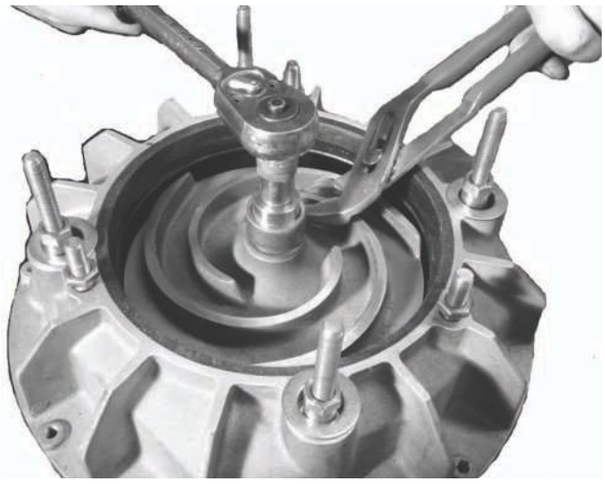
Remove the springs, pipe sleeves and washers

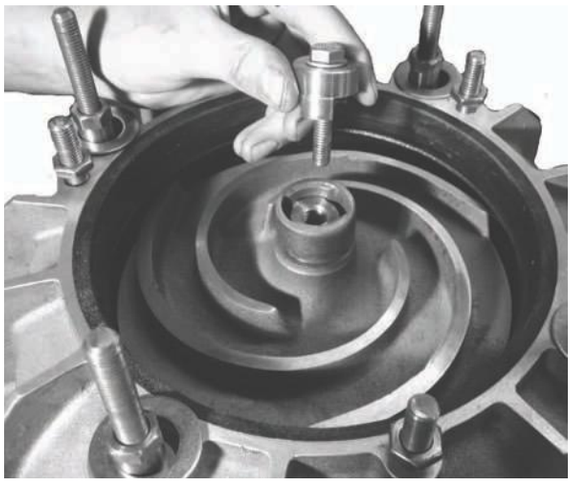


Remove the suction cover

Part 2 Wet End Dismantling

Secure the impeller –care must be taken not too damage or break the impeller.
Caution- Impeller edges are sharp
Remove the impeller bolt and top half of the combination lock washer.





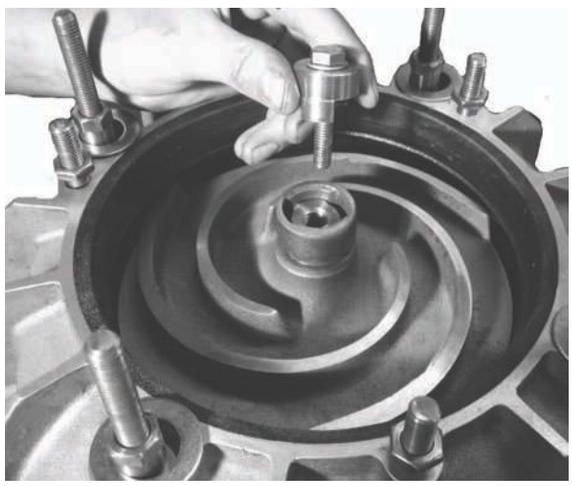
Remove the impeller by threading into the combination lock washer lower half an M12 bolt. This will release the impeller from the shaft,do not force or pry the impeller.

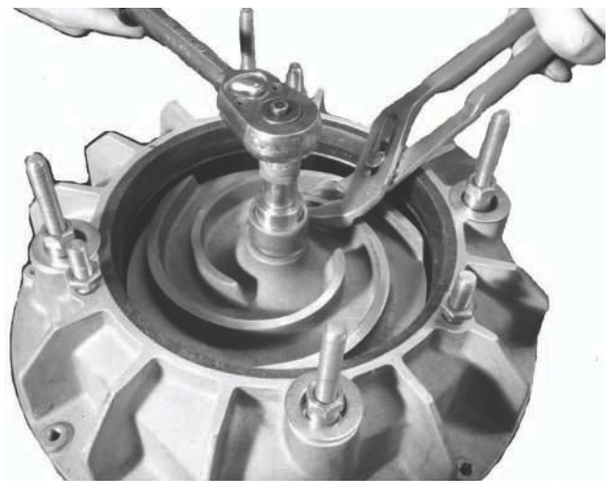
Wet End Assembly Part 1

Before fitting a new impeller check the shaft and key way are free of burrs.
Fit the impeller key to the shaft then align and fit the impeller. A quantity of adjusting shimming spacers (see Note 1) followed by the lower half of the combination lock washer.

Note 1 – A minimum amount of adjusting shim spacers should be used so that the clearance between the under side of the impeller and the oil housing is minimal.
Recommended clearance 0.2mm-0.3mm.

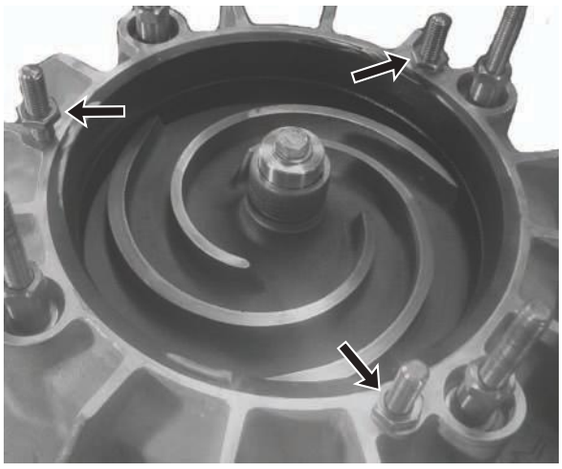
Fit the impeller bolt and upper combination lock washer and tighten down the impeller to a recommended torque setting of 40Nm.
Ensure the impeller turns freely by hand, adjust with shimming spacers as required.



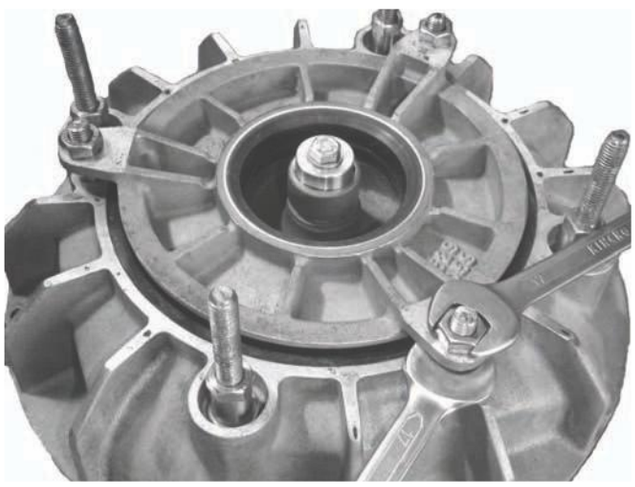


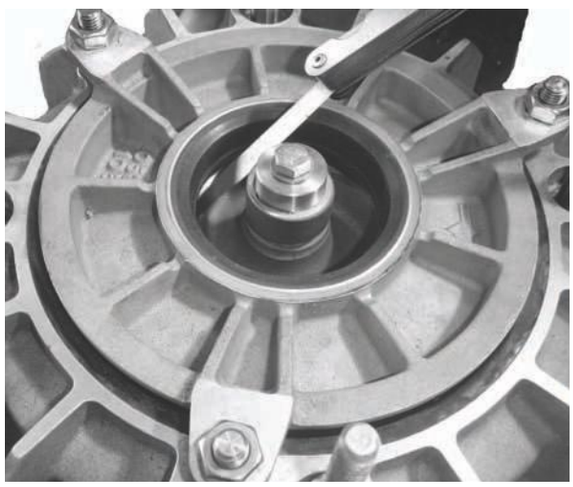
Part 2 Wet End Assembly

Fit one half size adjusting lock nut to each of the three studs that adjust the height of the suction cover, thread them down to they bottom out. Fit the suction cover



Adjust the suction cover clearance by adjusting the half lock nut and locking the top nut in place once an even minimal clearance has been achieved using a feeler gauge. Recommended clearance 0.2mm – 0.3mm.





Check that the impeller spins freely by hand once the suction cover lock nuts are set.

Wet End Assembly Part 3

Fit the spring assembly (washers,pipe sleeves and springs) then the suction strainer tighten down with nuts and washers.

5kw Torque List

5KW Raptor Torque List

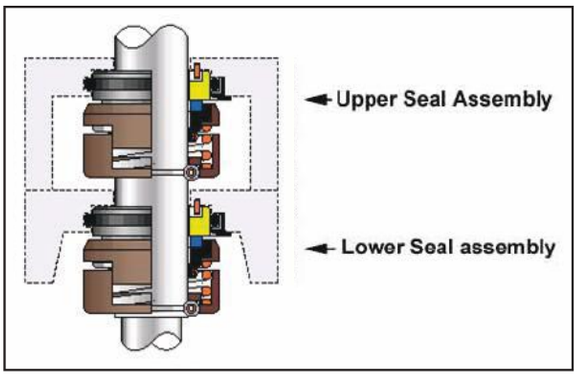
Item #	Part #	Item	Description	Recmd Torque
				Nm
3	05120003	Bearing Cover Bolt	M6 x 50mm	10 Nm
4	05120004	Junction Box Bolt	M8 x 20mm	10 Nm
5	05120005	Cable Entry Bolt	M8 x 25mm	8 Nm
6	05120006	Outer Casing Bolt	M8 x 35mm	30 Nm
7	05120007	Handle Bolt	M12 x 20mm	30 Nm
8	05120008	Impeller Bolt	M8 x 40mm	40 Nm
9	05130009	Oil Housing Inspection Screw	M10 Special	15 Nm
10	05130010	Oil Housing Screw	M6 x 16mm	10 Nm
14	05130014	Stator Housing Nut	M10 Nut	30 Nm
15	05130015	Suction Cover 1/2 Nut	M10	30 Nm
46B	05190046B	Stator Housing to Junction Box Bolt	M10 x 30mm	30 Nm
55	05120055	Spacer Nut	M10 Special	30 Nm

Installation instructions for Raptor 5kw H seals

General: The seals fitted to this pump have tungsten carbide rotary and stationary faces. The upper and lower seals are identical, and made to fit directly into the pump assembly.

Caution: Mechanical Seals are precision components and should be stored in the protective packaging supplied, until they are required for use. Handle the seal carefully, as some parts can be easily damaged through heavy handling or knocks. Do not use a hammer to install under any circumstances.

Exploded view of Seal components.



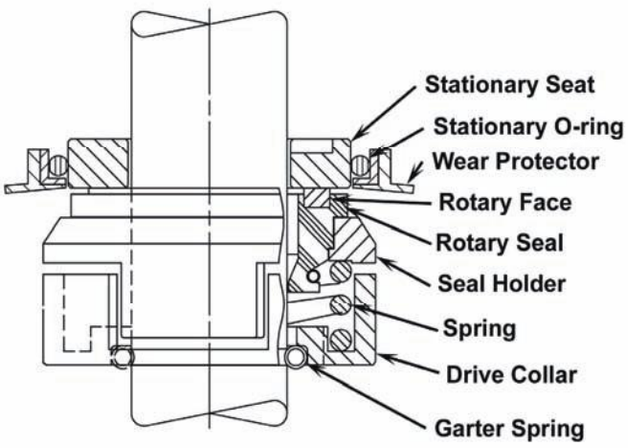
Seal assemblies Installed.

Old Seal Removal: Drain oil from pump, dismantle pump housing, impeller and key as previously described.
Lower Seal: Push the Drive collar forward to remove the garter spring, followed by the drive collar, compression spring, seal holder and seal assembly.
Upper Seal: Remove the oil housing and dismantle the upper seal in the same manner as the lower seal.

Preparation: Ensure that all seal and pump parts are present, and that the pump shaft and housing are clean and free from any burrs or sharp corners. Check that the anti-rotation pins are in place for the stationary seats and do not stand out more than the hole in the seat. The pump shaft should have a chamfer to assist entering seal onto the shaft and the same chamfer is required in the housing for the seat. Assemble pump as previously outlined ready for the seal assembly. Clean hands before installing seal.

Installation: (Upper Seal) Check the O-ring is installed on a stationary seat. Lubricate the outside of the O-ring and the motor housing with lube oil or liquid soap. Carefully slide the stationary seat into the motor housing, making sure the drive pin is in line with the hole in the seat. Push the stationary firmly into place with finger pressure, until it is securely mounted in the cavity. Install wear protector. Wipe the face with a clean lint free cloth. Clean the face of the rotary seal, lubricate the rubber inside of the seal and shaft, then slide seal and seal holder along the shaft until the seal faces are in contact. Install the compression spring and drive collar, making sure to engage the tangs between the seal holder and drive collar. Push the drive collar forward until it is possible to fit the garter spring into the groove on the shaft. Ensure the ball is correctly engaged in hole provided. Release the pressure on the drive collar and make sure the ball also engages in slot provided.

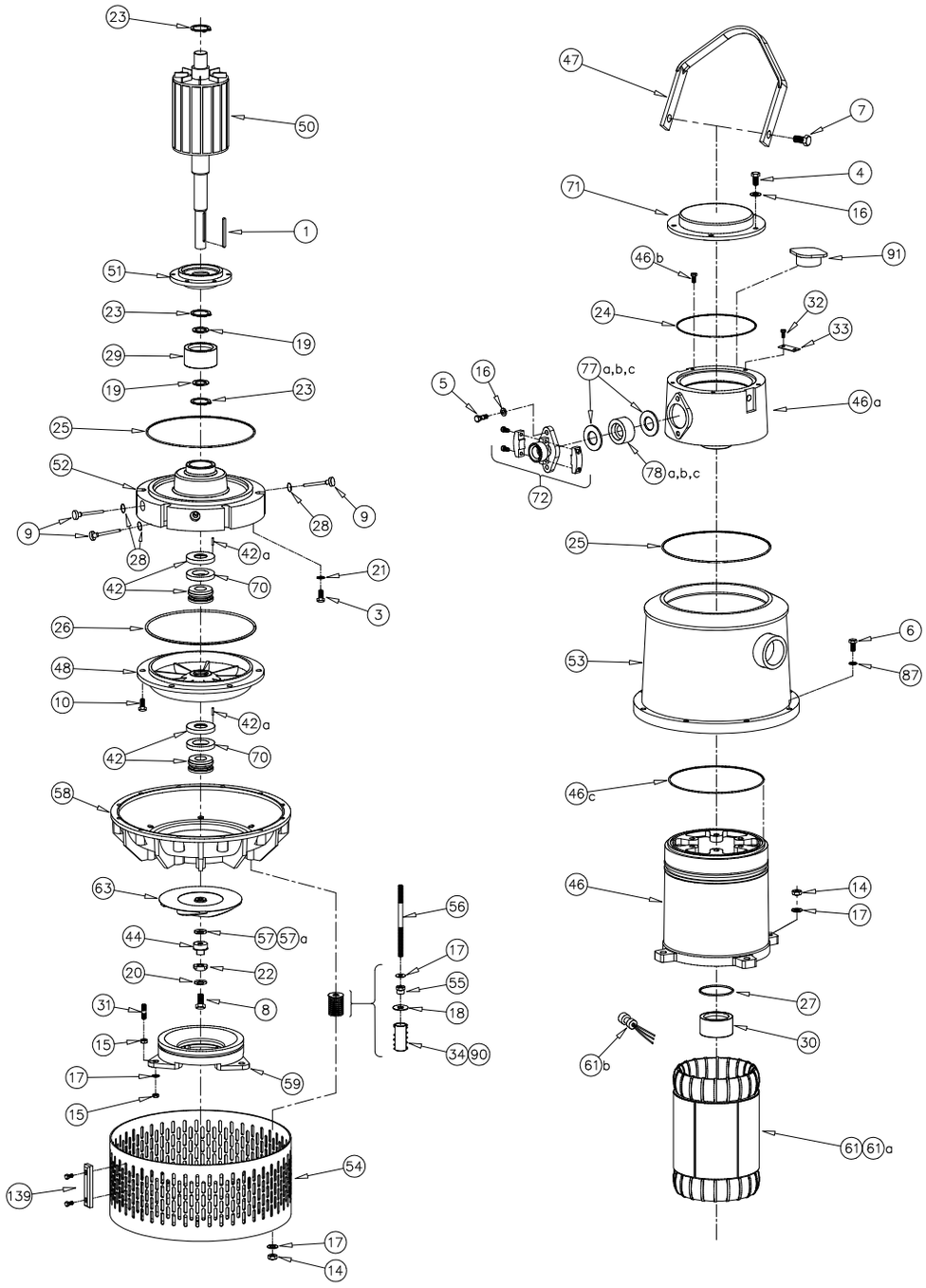
Installation: (Lower Seal) Install the oil housing in place and follow the same process as for the installation of the Upper Seal. Re-install the key, impeller and pump housing as previously instructed.



Component Parts of Seal Assembly.

Assembly A

DO NOT SCALE



Title PUMPENG 5kW 'Raptor' HIGH HEAD SUBMERSIBLE DEWATERING PUMP

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SUPPLIED BY:

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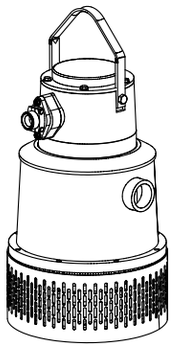
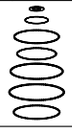
5kw Assembly
“Enhanced performance part numbers”

DO NOT SCALE

ACCESSORIES		
PART No.	DESCRIPTION	CONSISTS OF:
05-RK	5kW Repair Kit	Item #23 – Circlip
		Item #29 – Bearing Lower
		Item #30 – Bearing Upper
		Item #42 – Mech. Seal
		– Upper & Lower
		Item #70 – Wear Protection
		+
		1x O-Ring Kit #05 OK



ACCESSORIES		
PART No.	DESCRIPTION	CONSISTS OF:
05-OK	5kW O-Ring Kit	:-
		Item #21 – Nylon Washer
		Item #24 – O-Ring
		Item #25 – O-Ring
		Item #26 – O-Ring
		Item #27 – O-Ring
		Item #28 – O-Ring
		Item #46C – O-Ring

ENHANCED PERFORMANCE PARTS

ITEM No.	PART No.	DESCRIPTION	MATERIAL	QTY.	ITEM No.	PART No.	DESCRIPTION	MATERIAL	QTY.
1	05130001	5kW Impeller Key	S/Steel	1	50	05100050	Rotor Assembly – Complete	SS/Alum.	1
3	05120003	Bearing Cover Bolt	S/Steel	3	50A	05100050A	Replaceable Rotor Shaft	S/Steel	1
4	05120004	Junction Cover Bolt	S/Steel	5	51	05190051	5kW Bearing Cover	Aluminium	1
5	05120005	Cable Entry Bolt	S/Steel	2	52	05190052	Bearing Housing Lower	Aluminium	1
6	05120006	Outer Casing Bolt	S/Steel	8	53	05630053	5kW Outer Casing	S/Steel	1
7	05120007	Screw-Handle	S/Steel	2	54	05100054	5kW Strainer – Galvanised	Galv. Steel	1
8	05120008	Impeller Bolt	S/Steel	1	55	05120055	Spacer Nut	S/Steel	4
9	05130009	Oil Housing Inspection Screw	S/Steel	3	56	05120056	Diffuser Stud	S/Steel	4
10	05120010	Oil Housing Screw	S/Steel	4	57	05120057	5kW Impeller Shim 0.3mm	S/Steel	3
14	05120014	M10 Nut	S/Steel	8	57A	05120057A	5kW Impeller Shim 1.5mm	S/Steel	2
15	05120015	Suction Cover Half Nut	S/Steel	6	58	05291058	Diffuser	Alum/Poly	1
16	05120016	M8 Washer	S/Steel	7	59	05291059	Suction Cover – High Head	Alum/Poly	1
17	05120017	M10 Washer	S/Steel	20	61	05200061	5kW Stator 415v	–	1
18	05120018	M20 Washer	S/Steel	4	61A	05200061A	5kW Stator 1000v	–	1
19	05120019	Bearing Spacer	S/Steel	2	61B	05200061B	Protective Motor Cable Sheath	Composite	1
20	05120020	Combination Lock Washer (incl. item 22)	S/Steel	1	63	05710063	Impeller – High Head	Cr27	1
21	05120021	Nylon Washer	Nylon	3	70	05105070	Wear Protection	NBR/SS	2
22	Ref. Item 20	Included with Item 20	–	1	71	05190071	Junction Box Cover/Lid	Aluminium	1
23	05120023	Circlip	HTS	3	72	05190072	5kW Cable Entry 16–22mm	Aluminium	1
24	05100024	O-Ring – Junction Box Lid	NBR	1	77	08120027	Seal Sleeve Washer 14–16mm	S/Steel	2
25	05100025	O-Ring – Bearing Housing/Stator Casing	NBR	2	77A	08120027A	Seal Sleeve Washer 16–18mm	S/Steel	2
26	05100026	O-Ring – Oil Housing	NBR	1	77B	08120027B	Seal Sleeve Washer 18–20mm	S/Steel	2
27	05100027	O-Ring – Upper Bearing	NBR	1	77C	08120027C	Seal Sleeve Washer 20–22mm	S/Steel	2
28	05100028	O-Ring – Inspection Screw	NBR	3	78	08102031	Seal Sleeve 14–16mm	Rubber	1
29	05100029	Bearing Lower	–	1	78A	08102031A	Seal Sleeve 16–18mm	Rubber	1
30	08100122	Bearing Upper	–	1	78B	08102031B	Seal Sleeve 18–20mm	Rubber	1
31	05120031	Suction Cover Stud	S/Steel	3	78C	08102031C	Seal Sleeve 20–22mm	Rubber	2
32	05120032	Earth Plate Screw	S/Steel	2	87	05120087	Spring Washer	S/Steel	8
33	05100033	5kW Earth Plate	S/Steel	1	90	05120090	Spacer Tube	S/Steel	4
34	05100034	Spacer Pipe Spring	Galv. Steel	4	91	08102063	Lead Through Complete	Rubber	1
42	05128042	Mechanical Seal – Upper & Lower	TC	2	–	–	–	–	–
42A	05128042A	Mechanical Seal Drive Pin	S/Steel	2	–	–	–	–	–
44	05120044	Impeller Nut	S/Steel	1	–	–	–	–	–
46	05190046	5kW Stator Casing	Aluminium	1	–	–	–	–	–
46A	05190046A	Junction Box	Aluminium	1	–	–	–	–	–
46B	05190046B	M10 Bolt – Junction Box/Stator Casing	S/Steel	5	–	–	–	–	–
46C	05190046C	O-Ring – Junction Box/Stator Casing	NBR	1	139	GP2400139	Anode	Zinc	3
47	05190047	5kW Pump Carry Handle – Galvanised	Galv. Steel	1	–	–	–	–	–
48	05191048	Oil Housing	Alum/Poly	1	–	–	–	–	–

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INSTALLATION INSTRUCTIONS FOR 3 PHASE SUBMERSIBLE MOTORS.

WARNING

CATASTROPHIC OR FATAL ELECTRIC SHOCK MAY RESULT FROM FAILURE TO CONNECT THE MOTOR CONTROL ENCLOSURE, METAL PLUMBING, AND ALL OTHER METAL NEAR THE MOTOR OR CABLE, TO THE POWER SUPPLY GROUND TERMINAL. TO REDUCE THE RISK OF ELECTRICAL SHOCK, DISCONNECT POWER BEFORE WORKING ON OR AROUND THE WATER SYSTEM.

THIS EQUIPMENT IS INTENDED FOR INSTALLATION BY TECHNICALLY QUALIFIED PERSONNEL. FAILURE TO INSTALL IN COMPLIANCE WITH NATIONAL AND LOCAL REGULATIONS, MAY RESULT IN ELECTRIC SHOCK OR FIRE HAZARD, UNSATISFACTORY PERFORMANCE, AND EQUIPMENT FAILURE. SUBMERSIBLE MOTOR INSTALLATION INFORMATION IS AVAILABLE FROM PUMP MANUFACTURERS AND DISTRIBUTORS.

HANDLING AND INITIAL CHECKS

1. **Inspect the motor and cable for transport damage. Report any visible damage to the transport company and to your supplier immediately.**
2. **Do not lift the motor using the supply cable. Do not pull the supply cable. The supply cable needs to be protected at all times as a damaged cable may allow water into the individual conductors causing an Earth fault.**
3. **Check the motor nameplate data and ensure that it matches your purchase order and meets your requirements.**
4. **Motors are usually supplied with factory-installed oil in the Mechanical Seal chamber. Please check for any signs of oil leakage, and advise the supplier immediately if there appears to be any oil leakage.**
5. **On new installations and if the motor has not been used for a long period it must be "Meggered" at 1000V prior to operation. The Megger reading / Insulation Resistance should be at least 100 Mohms before operation and at least 50 Mohm when hot after running.**
6. **Verify that the motor Mechanical Seal chamber is full of oil to the fill plug level prior to Installation. (*FAILURE TO ENSURE THAT THE SEAL CHAMBER IS FULL OF OIL PRIOR TO OPERATION WILL VOID ANY WARRANTY CLAIMS.*)**

The oil chamber should only be filled to the level, as indicated in the specific pump model technical specs.) **Ensure all filling plugs, drain plugs, cable connections, and mounting bolts are tight.**

IF THERE IS A WARRANTY INSPECTION THE MOTOR MUST BE RETURNED TO THE ORIGINAL SUPPLIER, OR PUMPENG, WITH CABLES INTACT.

CHECK LIST PRIOR TO INSTALLATION

Please check the following:

1. **Ambient Temperature of the water to be pumped and ensure that it is less than the temperature rating of the motor.**
2. **The PH of the water is between 6.5 and 8.**
3. **Maximum Chlorine content in water is less than 500 PPM.**
4. **Maximum Sulphuric Acid Iron content in the water is less than 15 PPM.**
5. **Maximum Fluorine content in the water is less than 0.8 PPM.**
6. **Maximum Sand content is less than 50 PPM.**
7. **The electrical control equipment includes suitable fast acting current overload protection, which is set to shut the motor down within 3 seconds under locked rotor current or starting current conditions.**
8. **The electrical control equipment includes suitable fuses or circuit breakers to disconnect the system if there is a fault.**
9. **Variation of the supply voltage and frequency combination is within 5% of the motor nameplate voltage and frequency.**
10. **Maximum voltage unbalance is less than 5%.**
11. **The cable sizes are calculated to ensure that the voltage at the motor is still within 2% of the motor nameplate voltage after allowing for volt drop at full load current.**
12. **Waterproof submersible type cables must be used with these motors.**
13. **The motor has been correctly selected to suit the pump, thrust load from the pump, electrical supply capacity, and water availability. The motor should be installed to be submerged at all times as this will ensure a long service life.**
14. **These motors may overheat if they are run continuously on full load while not submerged or whilst running on the snore.**
15. **Connection of the motor to an incorrect supply will void any warranty.**
16. **Protection against single phasing is strongly recommended. If the motor fails due to single phasing the warranty will be void.**
17. **Installation of Lighting Arrestors is also recommended to protect the control panel, motor cables, and the motor. Any failure due to lightening will not be covered by warranty.**
18. **Any cable joints must be done properly by technically competent technicians. They must be waterproof and give a good electrical connection with no significant volt drop.**
19. **Reduced voltage starting using Soft Starters, VVVF drives, Autotransformers, (or Star-Delta starters if the motor has been supplied with 6 leads out), can create additional problems for submersible motors. Please ensure compliance with the following points.**

    A. **Correctly selected Overloads or Circuit Breakers are correctly installed and correctly set to protect the motor.**

    B. **Suitable Short Circuit Protection is installed.**

C. The starter will allow the motor to generate sufficient torque to start the pump and run it up to speed. (In general the torque is reduced by the square of the voltage a small reduction in voltage will lead to a large reduction in starting torque).

D. Timers are set to ensure that the motor has enough voltage for enough time to run the motor up to speed as quickly as possible, and also switch the motor over to full voltage as quickly as possible and prolonged running at reduced voltage will stress the motor windings.

COMMISSIONING and OPERATION

1. After energising the motor for the first time, ensure that the starting current drops to below the nameplate current within 5 seconds, which means that the motor has run up to full speed.

2. Check the starting reaction, flow rate and pressure from the pump to make sure the motor is running in the correct direction of rotation. Swapping any 2 of the 3 phase supply leads will change the direction of rotation.

3. While the motor is running for the first time check the water for sand. If sand appears continue to pump until the water clears. If the motor is switched off while the pump is still pumping sand this could accumulate in the pump and cause it to seize up.

4. During testing or checking rotation the number of starts and the time between starts needs to be controlled. As a general rule the motor should be allowed 5 minutes to cool down between each start.

5. It is strongly recommended that the "Over Current" protection is set to trip at about 5% higher than the steady state current recorded when the motor/pump is commissioned. It is not recommended that the "Over Current" protection is set at just above Full Load Nameplate Current, as, in a lot of cases, this will not protect the motor if the current increases, especially if the motor is not fully loaded. We believe that the operator needs to know if the current starts to increase, so they can determine why.

6. All temperatures and all 3 phases of voltage and current and insulation levels should be recorded throughout the life of the installation and monitored and reviewed as a form of preventative maintenance.

MAINTENANCE

The ball bearings have been greased for life during assembly - there is no need for additional oil or greasing during the operating life of the motor and bearings. The motor cannot be accessed unless it is removed from the sump, so everything that can be monitored needs to be monitored on a regular basis, and any unexplained changes investigated.

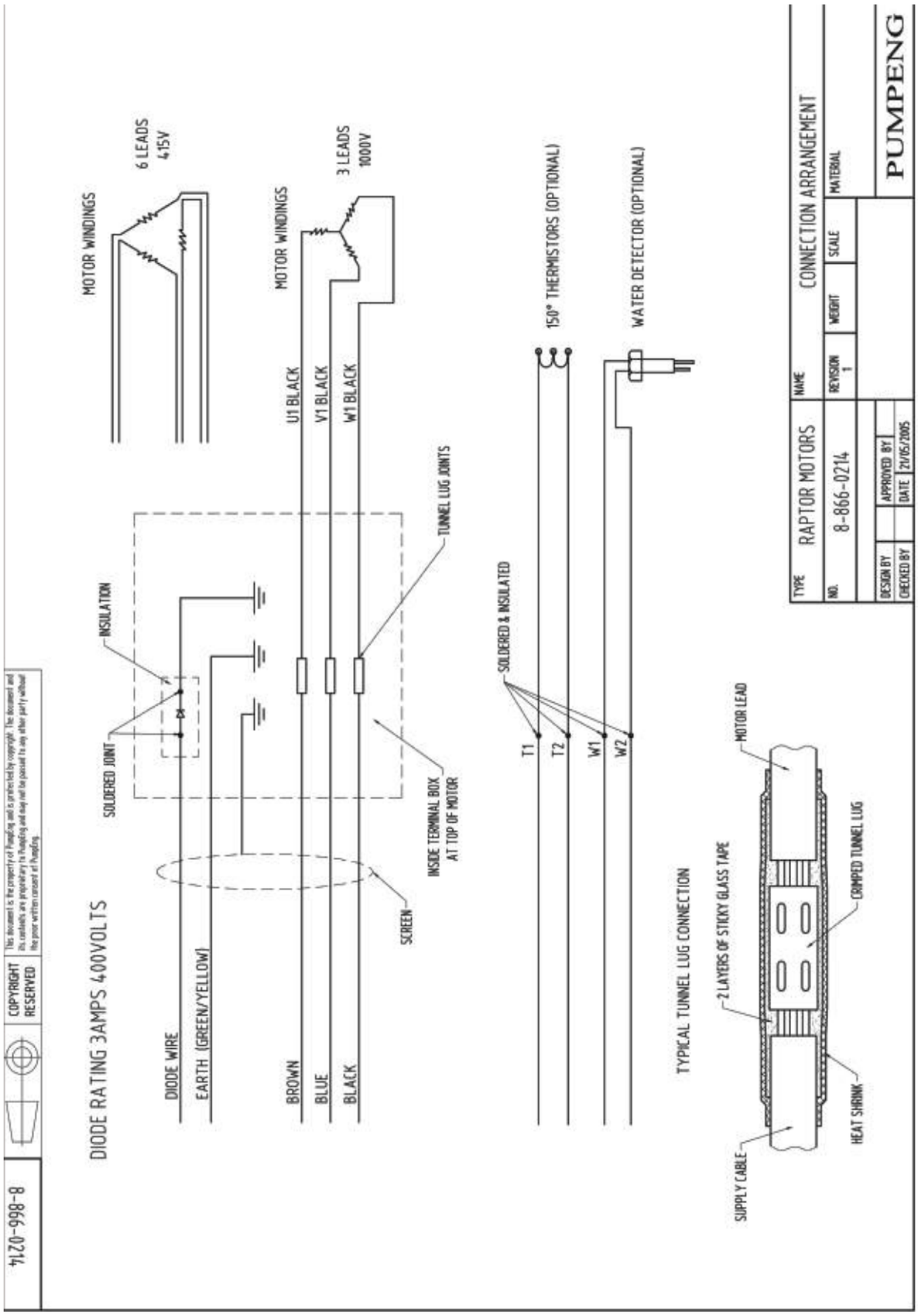
1. The normal running current, and voltage on all 3 phases need to be recorded on a regular basis.

2. The motor winding and the cable insulation needs to recorded on a regular basis. If the cold insulation drops below 2 Megohms the installation needs to be carefully checked out so as to determine the cause of the low Megohm reading.

3. The output pressure and flow from the pump should also be monitored on a regular basis.

The overall performance of the pump and motor can be reviewed based on the information being recorded and this can be used to determine any need for maintenance or overhauling, which might be required

Raptor Motors - Connection Arrangement



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