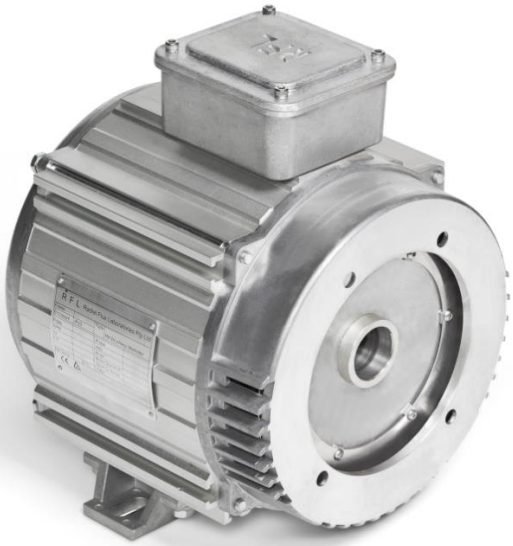
RF2 – Series

2 Pole Permanent Magnet Alternators



Installation and Maintenance Manual

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Contents

Introduction 3

Inspection 4

Identification 4

Pre-installation 5

Installation 6

Electrical Connections 9

Mechanical Characteristics 11

Dismounting the Alternator 12

Introduction

The RFL RF2 SERIES of alternators is a breakthrough in 2 pole synchronous alternator design. The patented rotor design combines permanent magnets with reluctance to overcome the limitations of other permanent magnet synchronous alternator designs.

Characteristics

- **Full Permanent Magnet Rotor, no windings on rotor, no rotor losses.**
- **IP 23 Mechanical Protection.**
- **Temperature specifications: tested in ambient temperature range of -10°C to 40°C**
- **Very high efficiency >92%.**
- **Excellent THD, <3%, no transients, no voltage spike on load rejection.**
- **Small footprint and lightweight.**
- **Reduced size.**
- **No electronics, increased reliability and robustness. Easy to fit and maintain.**
- **Bearing is the only wearing component**
- **PTO V-type shaft mounting**

Advantages

Unbalanced 3 Phase loads – The RF2 series alternator can supply 3 x 1 Phase circuits with varying loads, as well as a 3 phase load at the same time.

Motor Start capability – The Tri-Gen Generator can start single phase motors as well as 3 phase motors.

Paralleling generators – The Tri-Gen patented rotor allows a much wider out of phase angle over which they will lock together without high surge currents and shaft shock. This feature allows a number of smaller generators to be used to supply large loads with no special switching equipment.

Adjustable location of feet, bottom and side mounting options – The mounting legs can be relocated linearly to a desired position by loosening the bolts and sliding the mounting leg along the casing body as shown below. Refasten the leg bolts before mounting the alternator.

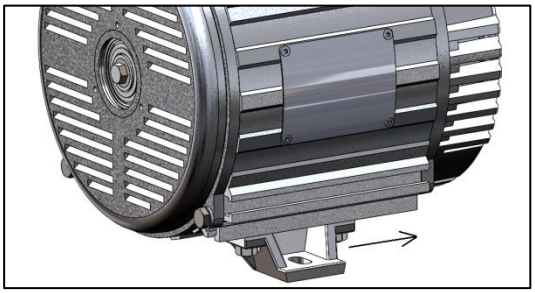


Figure 1 - Feet mounting can be adjusted along the length of the unit

Before performing any operations with this alternator, it is highly recommended to read this manual for handling, installation and maintenance in its entirety. Maintenance and repairs should be performed by a qualified technician.

Technical support can be provided by contacting Radial Flux Laboratories at sales@rflalternators.com

Inspection

Upon receiving of the alternator, check that no damage has occurred during transit. Ensure that there are no loose items inside the fan cover and all fasteners are tightly secured. Do not use the fan to turn the rotor before the alternator is mounted onto the engine. Doing so will cause rubbing and possible damage. If any damage is clearly visible, please consult RFL before installing this machine.

The RF2 alternator series should be stored at standard room temperature conditions free from dust and sediments. Keep away from vibration where possible. The IP casing design of the alternator resists moisture, however, permanent exposure to a moist environment during storage is not recommended.

The RFL alternator series is designed to generate single phase and 3 phase electricity. Voltages can be customised before manufacturing and is fixed at the factory during winding to suit applications.

Identification

All RFL alternators can be identified by the name plate fixed to the body of the machine. Check that the name plate information conforms to the ordered model. Before installing the alternator, check that the rated voltage, frequency and power are correct.

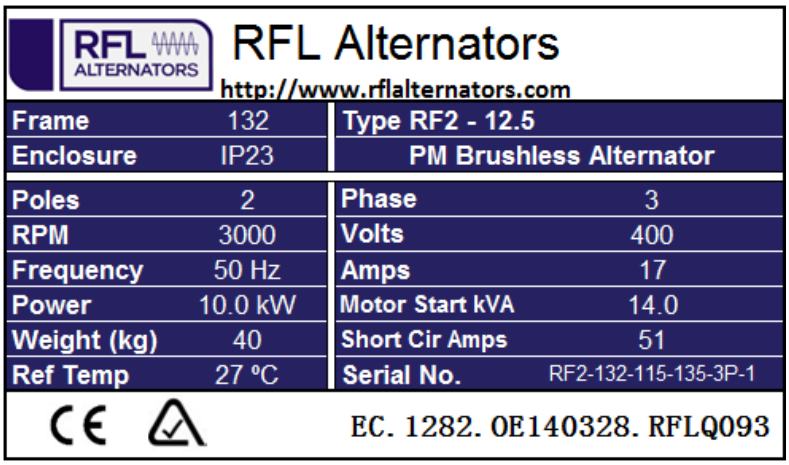
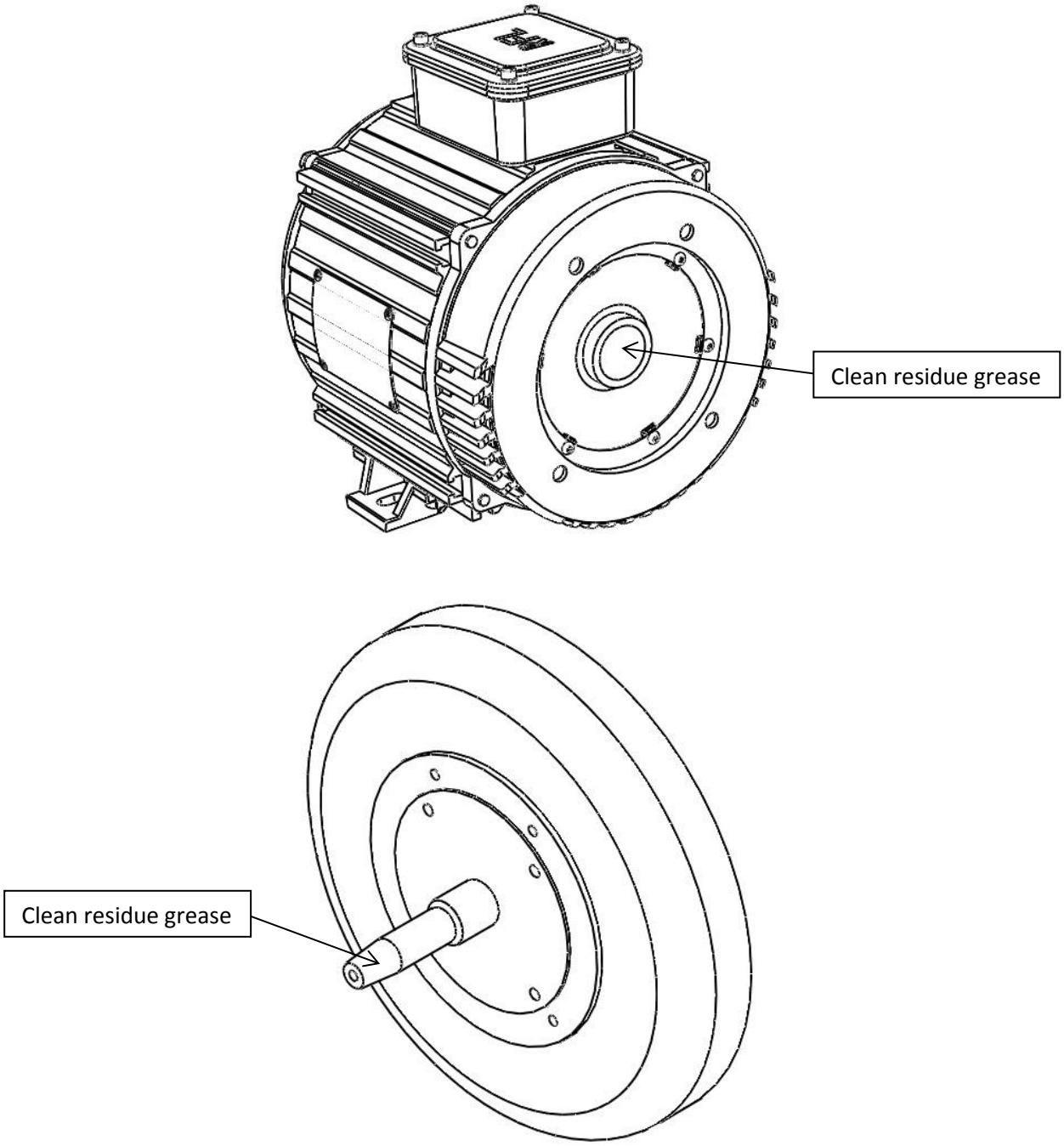


Figure 2 – Example name plate information for 2 Pole units

Pre-installation

Before installing the alternator, it is important to remove the grease on the taper surface inside the rotor shaft, and any existing grease on the engine V-type taper shaft. The protective anti-rust grease is applied during manufacturing to protect the alternator during storage and transit and must be removed to ensure a solid lock on the V-type taper shaft.



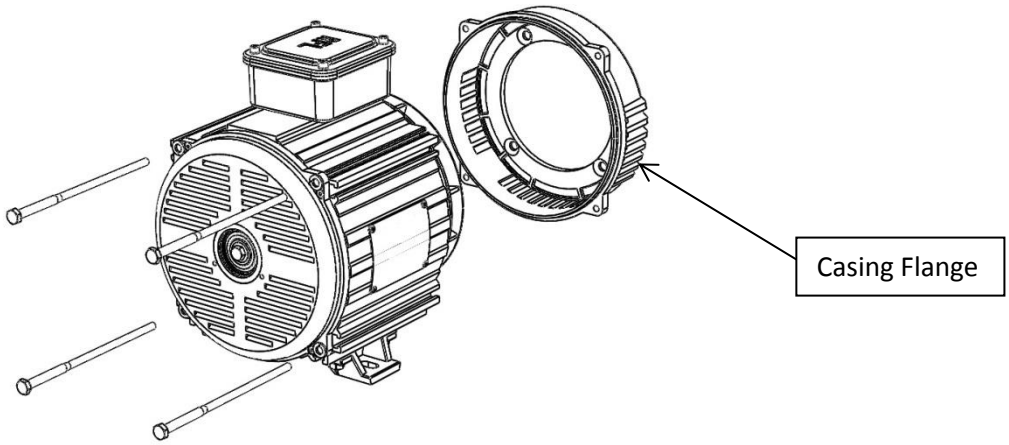
Installation

Before mounting this machine to the engine, care must be taken to ensure that the cooling air intake through the grill of the alternator is clear and unhindered. It is highly recommended to divert both hot air and exhaust air from the engine away from the air intake of the alternator to maximise cooling.
Whilst the mounting legs can be taken off and relocated in various configurations on the casing body, ensure care is taken to locate any drain plugs/holes on the lowest point of the alternator.

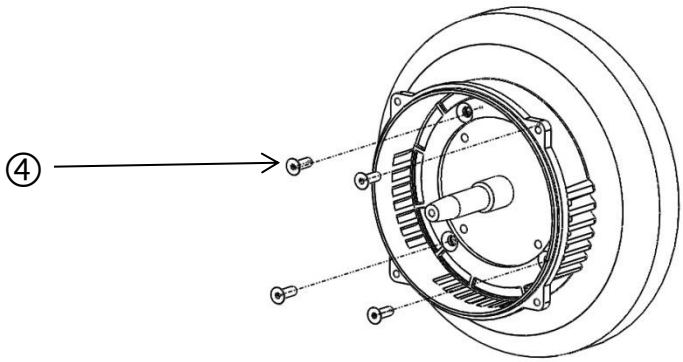
Part Name	Number
5/16 UNF Engine Bolt	①
5/16 Washer	②
5/16 Spring Washer	③
4 x 5/16 x 24 UNF Socket Flat head Bolt	④

The above parts are required to perform steps to a correct alternator attachment to the engine mount. Please identify all parts before proceeding.

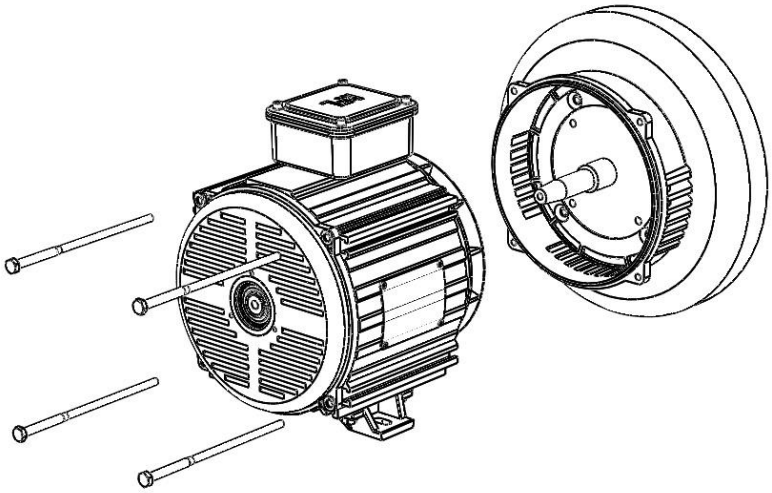
1) Unbolt the 4 casing bolts and remove the Casing Flange from the casing body as shown. Gentle taps with a soft hammer will loosen the fit between the two parts.



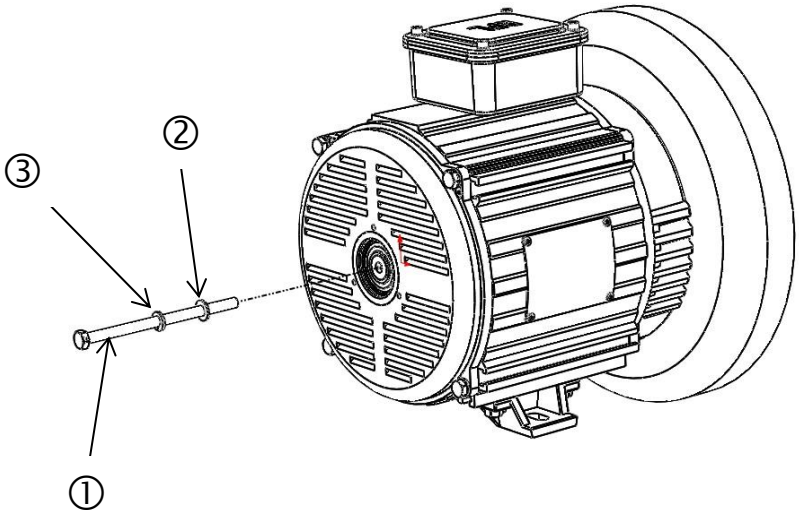
2) Fit the Casing Flange over the engine and align the holes. Use socket flat head bolts to fasten ④



3) **Bolt the alternator unit back onto the Casing Flange using the four casing bolts and tighten. Ensure the holes on the feet mount align with the vibration dampeners.**

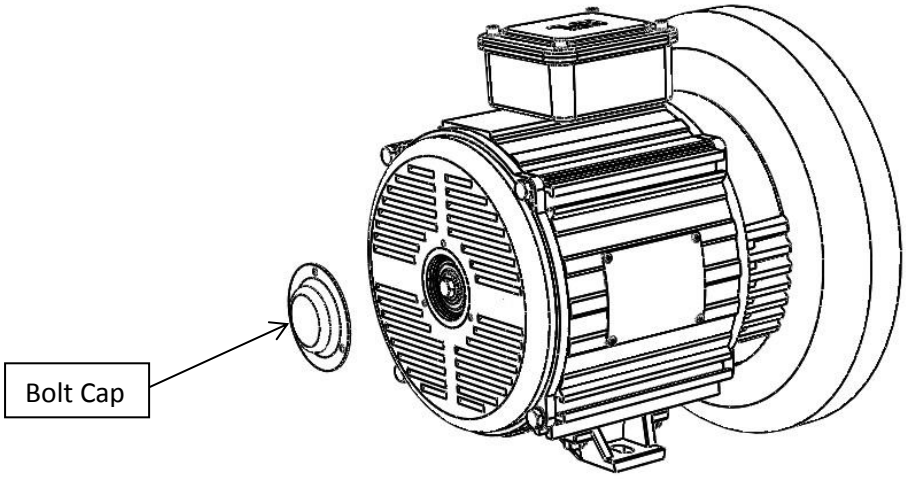


4) **The alternator is now ready to be taper-locked onto the engine shaft. Remove the bolt cap covering the rotor shaft and add the 5/16 washer ② and 5/16 spring washer ③ onto the 5/16 UNF bolt ①. Insert the bolt into the central rotor shaft of the alternator and tighten firmly with a torque wrench. Hold the engine in place as the engine may begin to rotate as the bolt tightens by holding the manual pull start rope. If the engine has an electric start, then the rotor of the alternator can be fixed by wedging a screwdriver into the side grill of the alternator and stopping the fan from turning. This will allow further tightening of the bolt up to the required tension as listed on the following page.**



Alternator Model	Bolt Tension
RF2-7.5	N.m.
RF2-12.5	N.m.
RF2-17.5	N.m.

5) Bolt the Bolt Cap back onto the end of the alternator to cover the spinning bolt head for safety purposes.

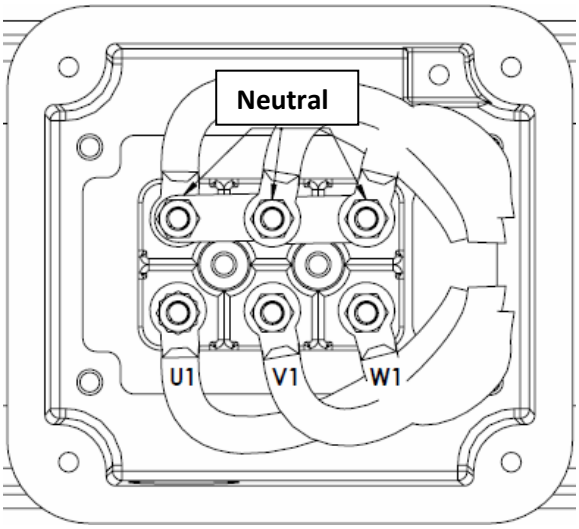


6) Bolt down the feet mounts and complete electrical connections (see next page).

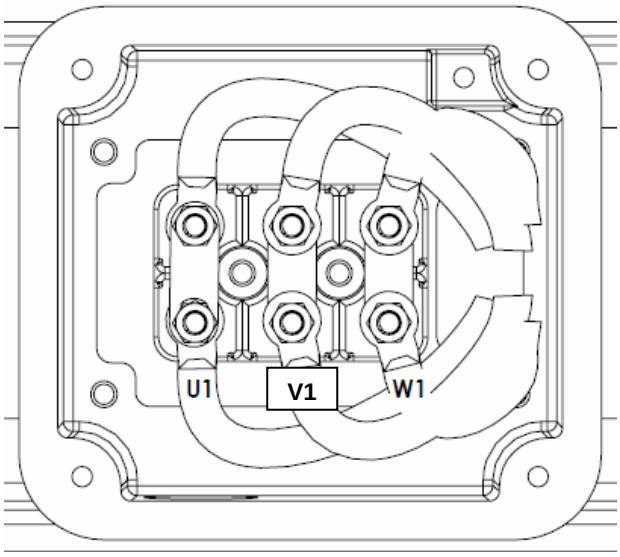
Electrical Connections

The RFL alternators can be connected in Y-Connection to produce 3-Phase output or in Δ-Connection to produce Single-Phase output. Adjust the position of the brass bridge connector to one of two configurations shown below to suit the required electrical output.

Y-Connection for 3-Phase output



Δ-Connection for Single-Phase output

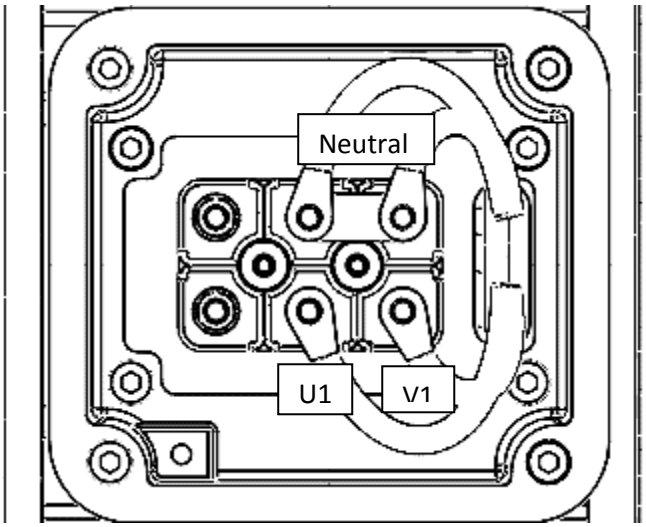


The RFL Alternator can also be manufactured in the 2-Phase configuration which provides two independent single-phase outputs. Since the RFL Alternators do not require any external voltage regulation, the voltages on the each phase of the alternator have individual voltage control.

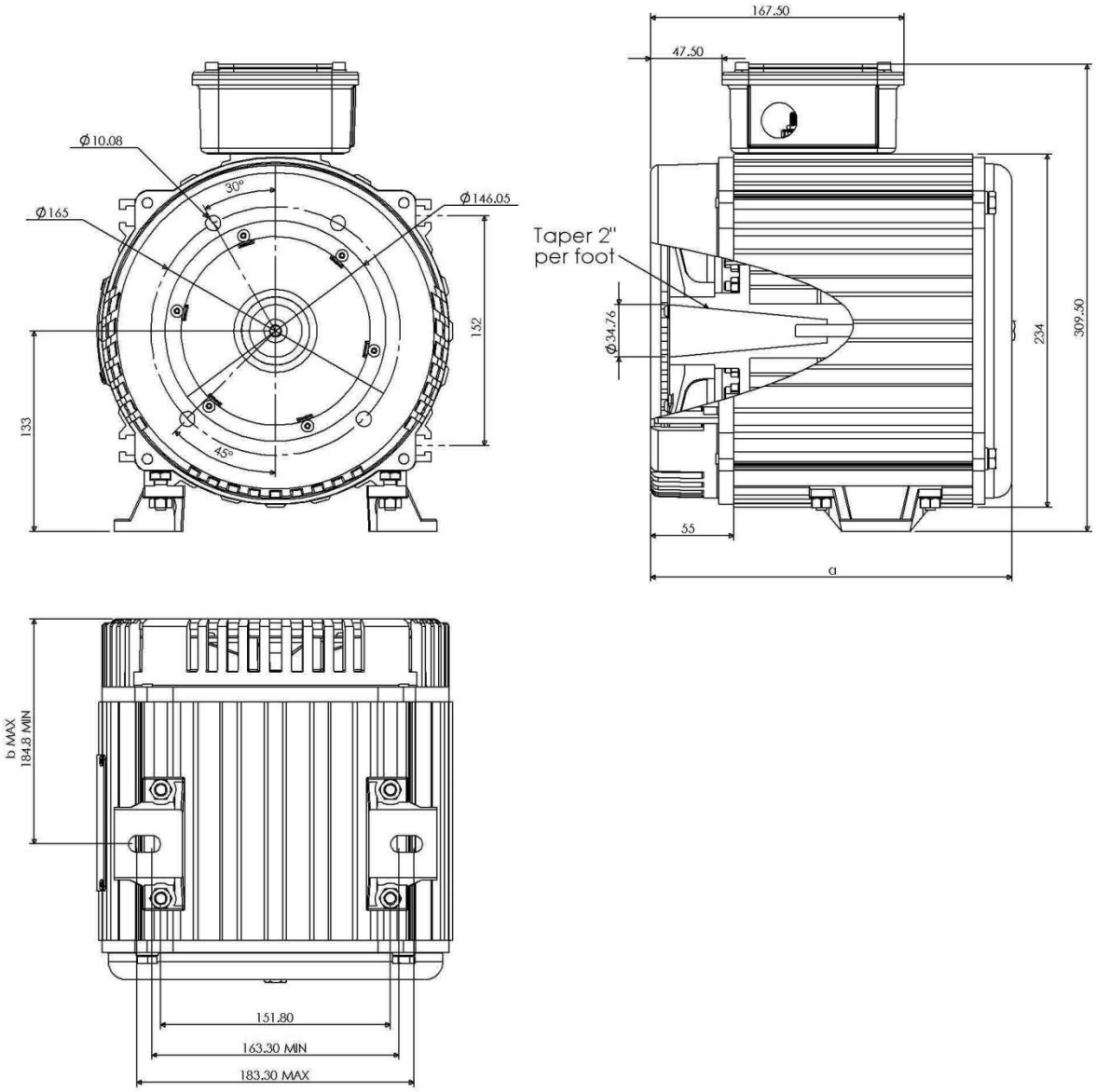
In a RFL Alternator with two Phases, the voltages are 90° out of phase. The peak current and voltages on each phase occurs when the other phase is at its neutral point, therefore the voltages and voltage regulation are independent of each other. A heavy load (motor start) on one phase will have minimal effect on the voltage of the other phase.

Connection of the 2-Phase output is shown below:

Connection for 2-Phase output



Mechanical Characteristics

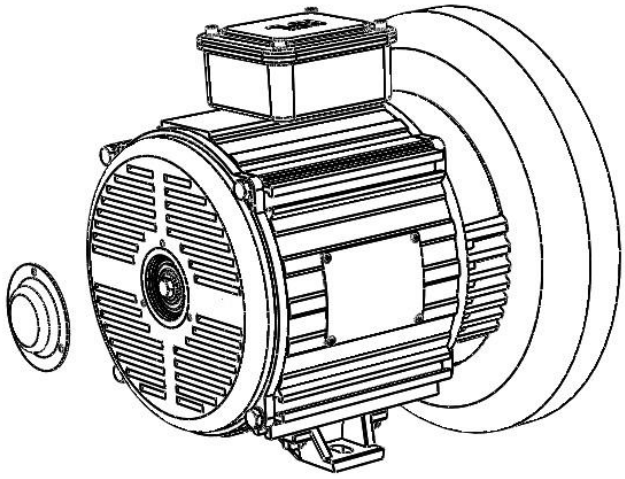


Model	a	b	Weight
	mm	mm	kg
RF2-7.5	192	189	28
RF4-20	237	169	40
RF4-30	286	219	51

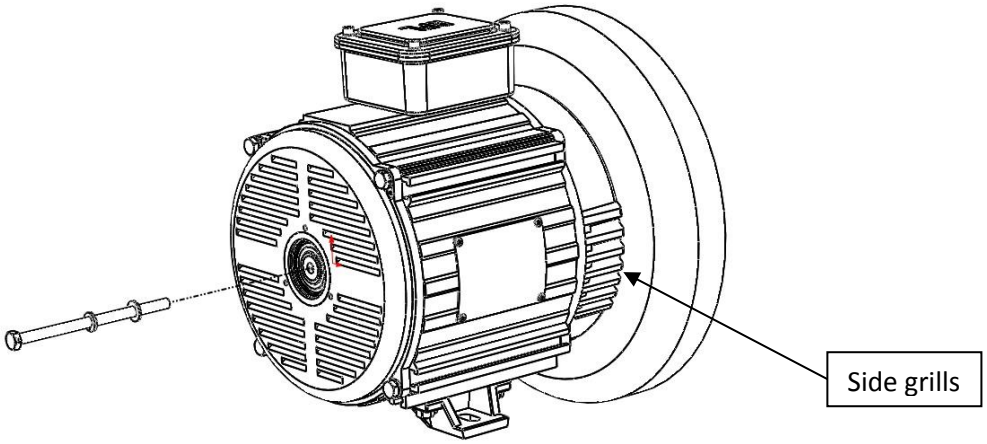
Dismounting the Alternator

RFL Alternators are designed to maximise service life by minimising wearing parts. In extreme cases requiring alternator removal, the following method can be used to detach the taper connection.

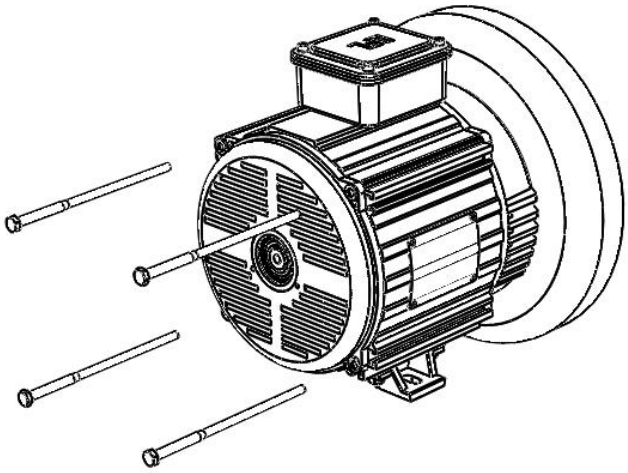
1) **Remove the Bolt Cap from the back of the alternator.**



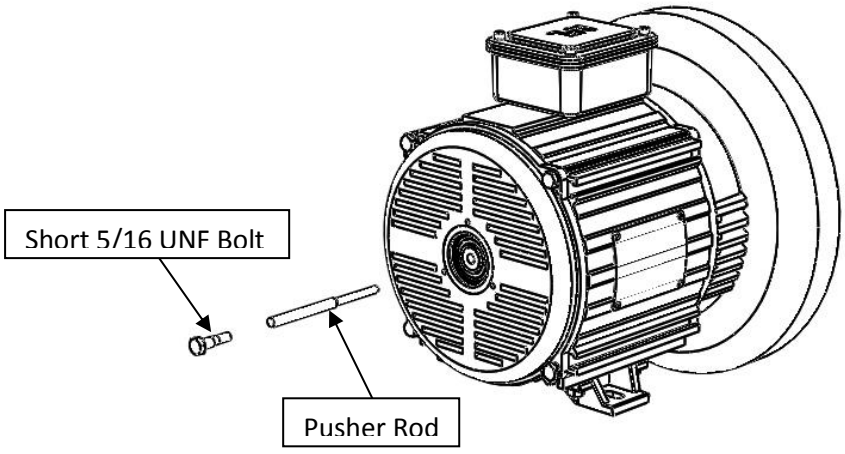
2) **Unbolt the 5/16 UNF Bolt from the centre rotor shaft. The rotor and engine may begin to turn as the bolt is being unwound. When this happens, either lock the engine by holding onto the manual pull start rope or lock the alternator rotor by wedging a screwdriver into the side grills to stop the fan from turning.**



3) **Unbolt and remove the four casing bolts from the casing body. Remove any bolts from the feet mounts of the alternator.**

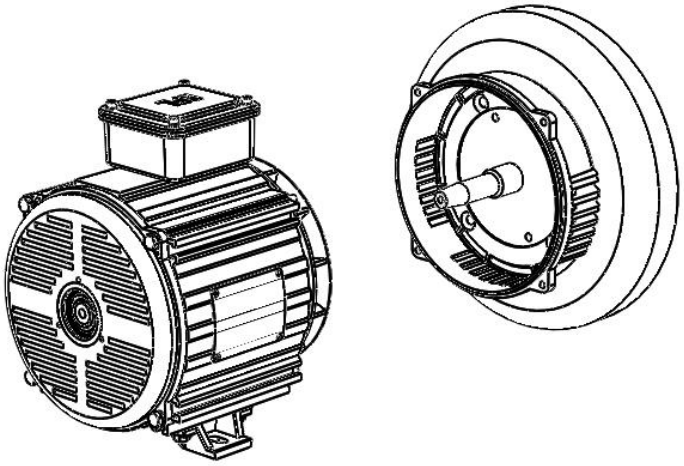


4) **The final connection to remove is the taper connection between the rotor and the engine shaft. Breaking this connection can be achieved by inserting the appropriate pusher rod into the central rotor shaft and bolting a short UNF 5/16 bolt into the central shaft until the taper connection is broken. Continue to torque the UNF bolt into the rotor shaft until a pop is heard, or the alternator moves slightly. This is a sign that the taper connection was broken and the magnets closed the air gap between the rotor and the stator. This is generally easier to achieve when the alternator has been running and is warm.**



Note that the length of the pusher rod varies depends on the alternator model. The complete dimensions of the pusher rod for various 2 pole alternator models can be found at the back of this manual.

5) **Gently tap the aluminium casing extrusion with a rubber hammer until the casing flange beings to slide out. Alternatively, use a screwdriver to wedge in between the casing and the casing flange to separate the two. Pull the alternator off by hand or using a crane.**



6) **Remove and unbolt the 4 bolts of the casing flange from the engine, and reattach back onto the alternator using the four long casing bolts.**