Rutland FM910-4 Windcharger

(12 or 24 V)

Owners Manual

Installation and Operation

Doc No: SM-138 Iss. F 01.10.19

Blank Page

Contents

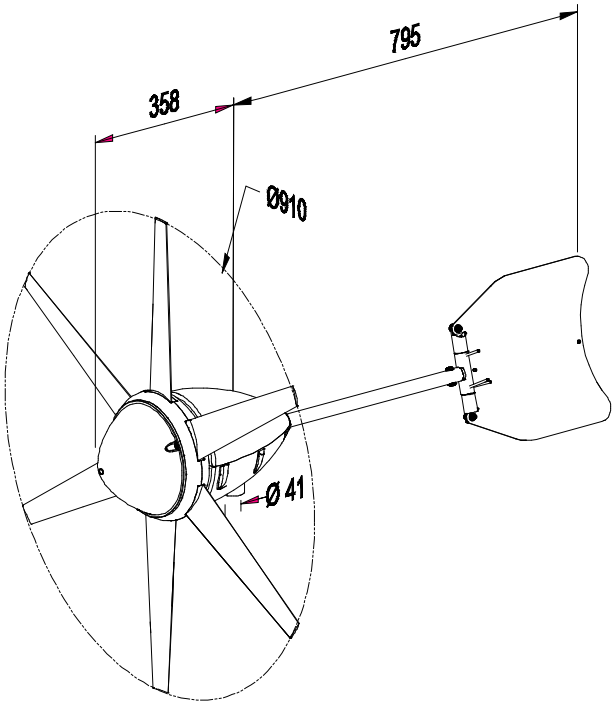
Introduction

Congratulations and thank you for purchasing your Rutland FM-910-4 Windcharger. The utmost of care goes into the manufacture of all our products in our ISO9001 approved factory. To ensure you get the very best out of the Rutland FM910-4 we recommend that you read this manual and familiarise yourself with its contents before installing and operating the Windcharger system.

Summary of Features and Uses

- Automatic “furling” tail fin directs the turbine out wind above 15m/s for gale protection.
- Low wind speed start up maximises power generation in low winds.
- High grade construction materials for durability in the harshest environments.
- Provides a D.C. power supply to charge 12 or 24 V battery banks.
- Designed for use on permanent land based applications where low power is needed for professional and domestic devices.
- Ideally mounted on the Rutland Land Tower and Rigging Kit – see product catalogue.

Profile and Dimensions



General Guidelines and Warnings

Mounting pole outside diameter MUST NOT exceed 50mm for at least the top 0.5m to ensure secure fitting onto the pole. Below that larger section poles may be used to achieve a suitable tower. It is essential for the effective operation of the furling tail system that the mounting pole is vertical. Note that an unsupported tower will experience lateral movement particularly in high winds and furling could be adversely affected with potential damage to the Windcharger.

When turning, the Windcharger is capable of generating voltages in excess of the nominal voltage. The turbine must never be allowed to rotate unless it is electrically connected to a regulator or batteries. Connecting an open circuit running turbine to the electrical system can cause serious damage to system components owing to excessive voltage. Caution must be exercised at all times to avoid electric shock.

Stopping the turbine – this may be necessary to undertake battery maintenance. If possible stopping the turbine should be done in low wind speed conditions. The turbine can be slowed by rotating or orienting the tail fin upwind, this will slow the turbine sufficiently for it to be safely secured to the pole with rope. Avoid leaving the turbine tied up for any period of time, we recommend that the turbine either be covered to give protection from the weather or removed and stored in a dry location. We recommend the use of Marlec charge regulator that includes a shutdown switch.

Choose a calm day to install the equipment and consider other safety aspects. No attempt to repair the system should be made until the wind generator is restrained from turning.

The Windcharger is fitted with ceramic magnets, which can be damaged by heavy handling. The main generator assembly should be treated with care during transit and assembly.

It is essential to observe the correct polarity when connecting the Windcharger and all other components into an electrical circuit. Reverse connection will damage the Windcharger and incorrect installation will invalidate the warranty.

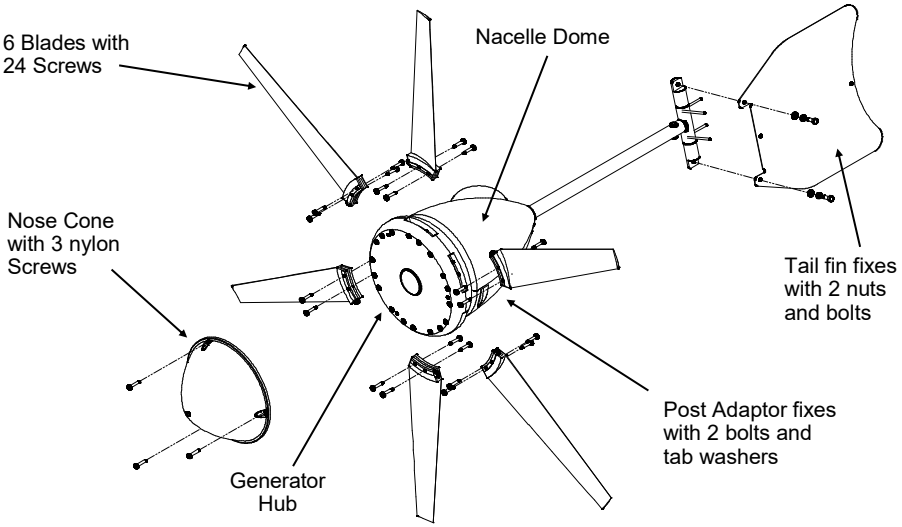
High winds – The furling tail mechanism of the Furlmatic model will operate in high winds orienting the turbine out of the prevailing wind direction to slow the turbine down. It will return to face the wind as windspeeds fall and will be seen to cycle during high wind speeds. As a secondary safety feature the Windcharger has a built-in thermostat which may operate in extreme conditions to prevent the generator overheating. In this mode the output will cease and the turbine will temporarily slow down until such time as a lower temperature is reached and the generator is once again connected and charging. This may be seen to cycle in prolonged high winds particularly in high ambient temperatures.

If in doubt refer to your dealer, a competent electrical engineer or the manufacturer.

Check You Have Received - See FM910-4 Exploded View
In the event of loss or damage, consult your dealer or the manufacturer.

1 x Main generator assembly
1 x Tail Fin
6 x aerofoil blades
24 x No. 0x25mm special self-tapping screws
2 x M10 hex head screws
2 x Tab washers
1 x 2-way terminal block

Exploded View of Rutland FM910-4



Tools That You Will Need:

- Suitable wire stripper
- Small terminal screwdriver
- Large flat blade screwdriver
- Crosshead screwdriver
- 10mm and 17mm Spanner

Other Items You Will Need:

- Tower/Mounting pole
- Batteries
- Battery terminals
- Cable
- Connector blocks (as determined by your total system)

Other Items You May Have Selected from Marlec:

- A Rutland Charge Regulator - visit www.marlec.co.uk for current models
- Land Tower and Rigging Kit (Part Nos. CA-12/08 & CA-12/07)
- Cable

Assembly & Installation

Eleven Step Quick Start Guide

1. Choose an open site that exposes the Windcharger to a clear flow of wind and avoids obstructions, this is essential for effective operation of the furling tail system. *Read the section on* ***Siting.***

2. Choose a mounting pole with an internal diameter of 41mm and external diameter of no greater than 50mm for the top 0.5 m minimum to ensure secure fixing to the tower. Any play between the tower and the post adaptor must be taken up with a “shim.”

3. Drill the mounting pole, if required, in preparation to accept and secure the Windcharger. *See* ***Assembly and Installation*** *section.*

4. Choose suitable two core cable to connect from the Windcharger to the regulator. Up to 20m this should be of at least 2.5mm² cross sectional area. *For other distances see the table in* ***Cable Specifications.*** A short section of 4mm² cross sectional area is required to link the regulator to the battery.

5. Position the mounting pole (*this may be done on the ground before raising the pole*) so that the selected cable can be threaded along it.

6. Fit the blades, tail and nose to the Windcharger using fasteners provided. ***It is essential that 4 screws are fitted per blade.***

7. Join the cable threaded through the pole to the Windcharger output cable using the connector block provided. Wrap with insulating tape. Alternatively use a latching plug and socket. *We recommend looping back the cable and securing with a cable tie to provide strain relief to the joint.*

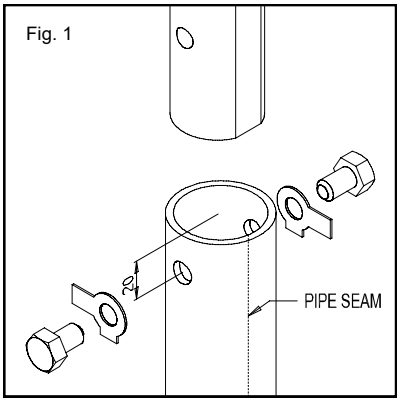
8. Carefully push the cables down the pole whilst sliding the post adaptor down the pole. Line up the holes and secure in place with the screws and tab washers provided. ***Do not allow the turbine to spin freely.***

9. Locate the Marlec charge regulator close to the battery and carefully follow ALL the regulator guidelines and installation sequences for connecting the Windcharger through to the battery.

10.Ensure that the battery connections are permanent as the Windcharger should NEVER be operated without a connection to the battery.

11.Raise and secure the Windcharger. It can now be allowed to rotate. Follow the **Up and Running- Five Points Final Checklist** featured later. Also the **General Guidelines and Warnings** section expands on the above points.

Assembly and Installation Detailed Instructions



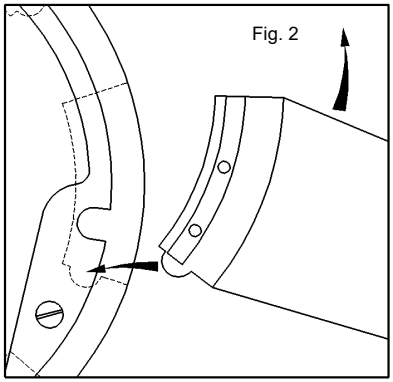
Tower Preparation (Fig.1)
1. Select a suitable pole from the suggested guidelines in Tower Construction.
Note: the post adapter fitted to the FM910-4 is designed to fit inside a standard 41mm (1⅝") internal diameter tube.

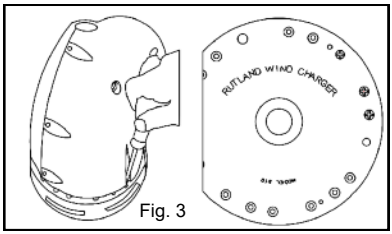
The adaptor is provided with a flat on one side to clear any tube weld seam.

Items 2 and 3 can be ignored when using a pre-drilled Marlec pole.

2. Mark and centre-punch two positions diametrically opposite 20mm from top of the tube at 90° to any tube seam if necessary.
Note: Use metric measurements for this operation

3. Drill two holes 10.5mm in diameter on centre-punch positions.
Note :Use metric measurements for this operation





Caution- It is essential that all 4 screws are fitted!

Blade & Nose Assembly
1. Place the generator assembly on a flat surface hub-side down. Position blade as shown. **The blades will only fit one way around.** (Fig. 2)

2. Insert the protrusion at the trailing edge of the blade root fixing first into the socket to align with the corresponding recess in the blade socket. The blade can be inserted with a lever action and a soft faced mallet may be used to tap the end of the blade to fully locate it.

3. First fit each blade with two special self-tapping screws provided to the rear of each blade by inserting each in turn through the cut out in the nacelle, rotating the generator each time until the holes align. (Fig. 3)

4. Fit the remaining 2 screws per blade from the front of the generator hub. Check tightness of all screws but do not overtighten.

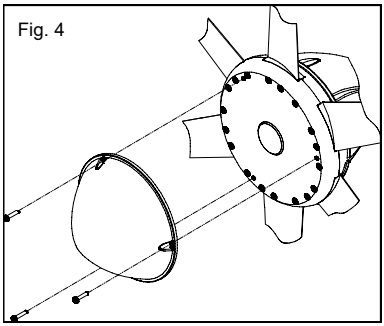


Fig. 4

5. Fit the plastic nose dome in position on the front of the generator hub and secure in place with the three nylon screws provided. (Fig.4)

Recheck the tightness of all screws in a few weeks time as loosening is possible.

Alternatively the blades, tail and nose dome can be fitted after mounting the generator assembly to the tower.

Tail Assembly

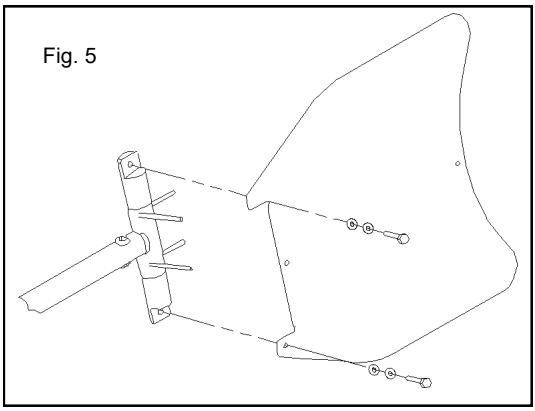


Fig. 5

Fit the tail fin on to the hinge assembly using the screws and washers already present (Fig 5)

Do not remove the silicone protectors from the tail stops!

NB. The tail fin is set at an angle of 15° from vertical. This is vital to the furling mechanism and should not be altered.
For the effective operation of the furling system the wind turbine must be sited to ensure it is as free as possible from turbulence and the tower is in a stable, upright position.

Electrical Connection and Fitting to The Tower

1. Run the cable selected, see **Cable Specification**, down the inside of the pole.

2. Select one of the 2 basic wiring systems, **Typical Wiring Diagrams** and follow the manual provided with the voltage controller.

3. Connect the wind generator flying leads to the cable protruding from the tower using the connector block supplied, taking care to observe polarity. Connect the windcharger + to cable + and windcharger – to cable –

Red is + Positive
Black is - Negative

4. Wrap the connection with insulation tape to secure/protect from environment. Alternatively join the cables using a latching-type plug and socket.

5. Locate the wind generator into the tower whilst gently easing the cable from the tower base to ensure the cable is not trapped.

6. Secure the wind generator to the tower using the hex head bolts and tab washers provided. Use a flat blade screwdriver to fold the tabs around the hex head bolt, this helps to prevent the bolts from loosening.

Up and Running

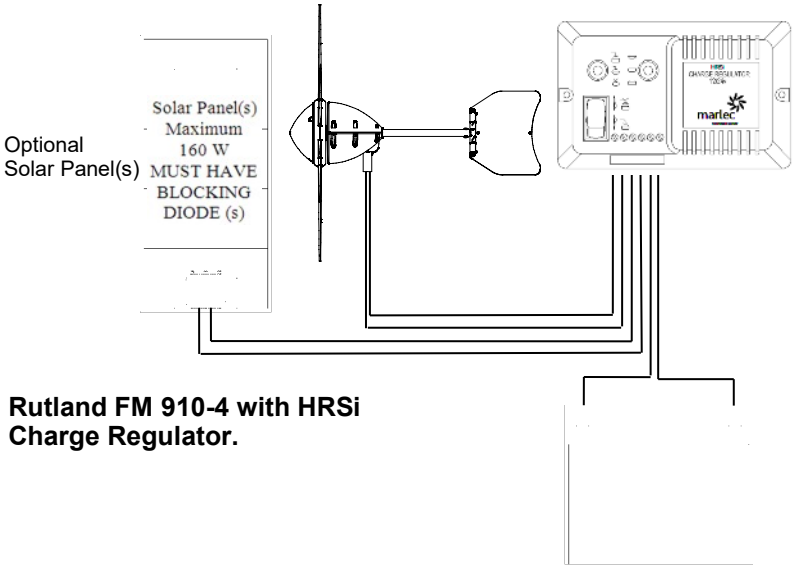
Five Point Final Checklist

Before raising and securing the wind generator:
1. Check the tightness of the blade & tail fixing screws and generator mounting screws.
2. Check free rotation of the hub and yaw axis.
3. Check the tail fin is free and sitting at a 15° angle off vertical
4. Check that the cable is not trapped.
5. Check that all electrical connections are secure and safe.

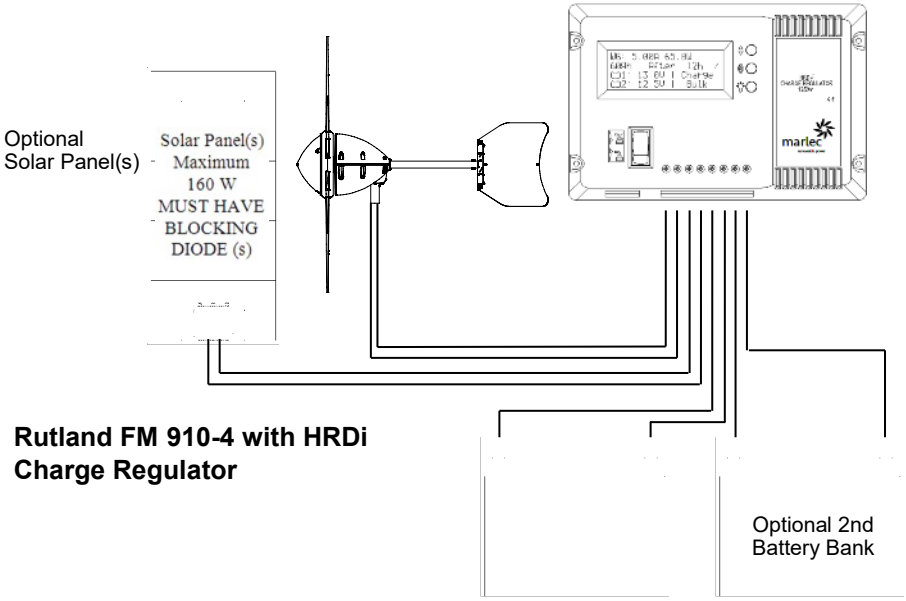
The wind generator can now be raised into position.
Take care to avoid all moving parts when raising and lowering the wind generator.

When raised, secure the structure firmly in an upright position.
Caution-The performance of your Windcharger will be impaired if the pole is not vertical.

Typical Wiring Diagrams For Rutland FM910-4 Windcharger



Rutland FM 910-4 with HRSi Charge Regulator.



Rutland FM 910-4 with HRDi Charge Regulator

NB: Follow the installation instructions provided with the selected Marlec regulator.

Siting The Windcharger

General Considerations

The location and height of the mounting pole or tower for your wind turbine will be the major factor in the overall performance of your system. The smooth flow of wind over land and water is often interrupted by a multitude of obstructions causing wind sheer and turbulence.

Wind sheer describes the interference between the fast moving upper air and the slow moving air close to the ground and the resulting decrease in average wind speed as one gets closer to the ground.

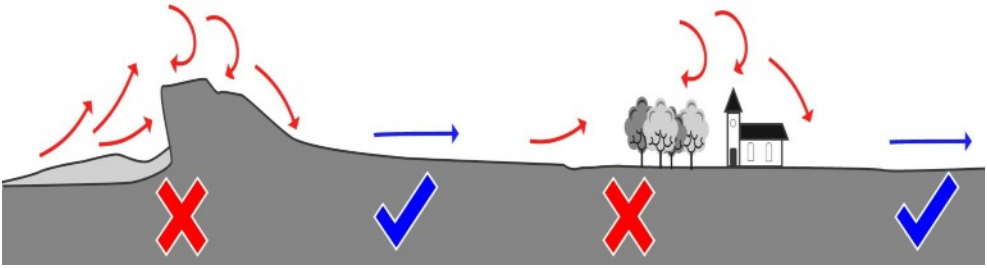
Turbulence is caused by the wind passing over obstructions such as trees and buildings.

Both wind sheer and turbulence diminish with height and can be overcome simply by putting the machine sufficiently high above them as shown.

Wind speed decreases and turbulence increases where obstructions exist.

Consider also that downwind obstructions can be as detrimental to performance as upwind obstructions.

Fig. 7



Tower Construction

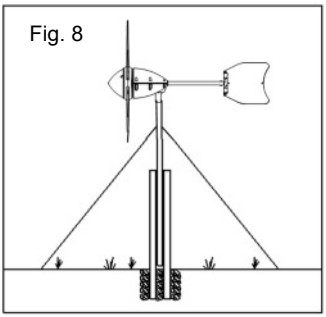
The Furlmatic 910-4 is designed to fit inside an aluminium, stainless or steel tube with an internal diameter of 41mm with a minimum wall thickness of 3mm. Maximum outside diameter of 50mm.
A suitable mounting pole can be erected using a 6.5 metre (21 feet) galvanised (medium) tube. The tube must be supported by a minimum of four guy lines.

The attachment points for the guy lines to the tower should be securely fixed to the tower.

- The guy wires should be a minimum of 4mm in diameter.
- The shackles should be a minimum of 5mm in diameter.
- Rigging screws should be a minimum of 5mm in diameter.
- All items should be galvanised or stainless steel for protection against corrosion.
- Where guy lines are looped, the loop must incorporate a thimble and be fitted with a minimum of three rope grips.
- All ground fixings must be made suitable according to the terrain.

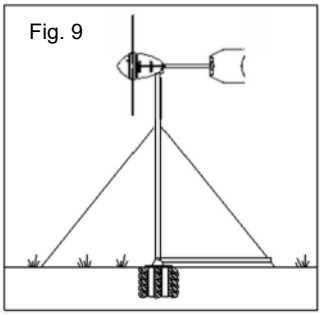
Pivot type towers are recommended as these allow for easier installation and lowering for access to the wind generator. Two forms of pivot tower are suggested in Figs 8 & 9. Non-guyed pivoting towers are available, for further details contact the dealer or manufacturer.

Fig. 8



Centre pivoted pole

Fig. 9



Base pivoted with gin pole

NB: See the warnings section regarding the tower. It is essential that the tower is maintained vertically to minimise lateral movement which interferes with the effective operation of the furling tail.

Further System Requirements

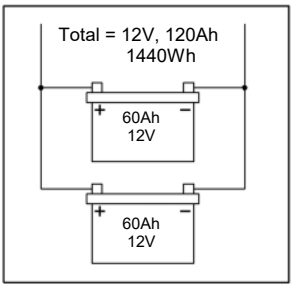


Fig 10. In parallel to increase amp hours

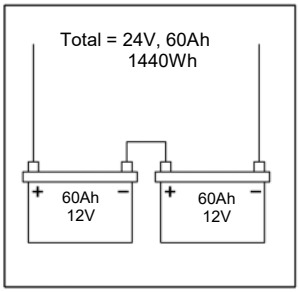


Fig 11. In series to increase voltage

Batteries

Leisure / Deep Cycle batteries are specifically designed for good performance in terms of charge / discharge cycles. Batteries are the most important part of the renewable energy battery charging system and should be sized according to the load requirements and provide at least 3 days reserve capacity. This will reduce cycling, prolong the life of the battery and ensure system reliability during periods of low wind.

- Permanent connections should always be made to the battery terminals. Never use crocodile clips or similar devices.

- We strongly recommend that one of the voltage regulators available from Marlec is fitted to prevent batteries becoming overcharged in strong winds and during low energy consumption periods. A regulator is essential with gel and sealed batteries.

- Batteries may be linked as shown in the figures 10 and 11. It is essential to observe polarity as follows:

Red is + Positive Black is - Negative

Cable Run (m)	Cable Size 12V mm²	12V AWG	24V mm²	24V AWG
0-20	2.5	14	1.5	16
21-30	4	12	2.5	14
31-45	6	10	4	12
46-80	10	8	6	10

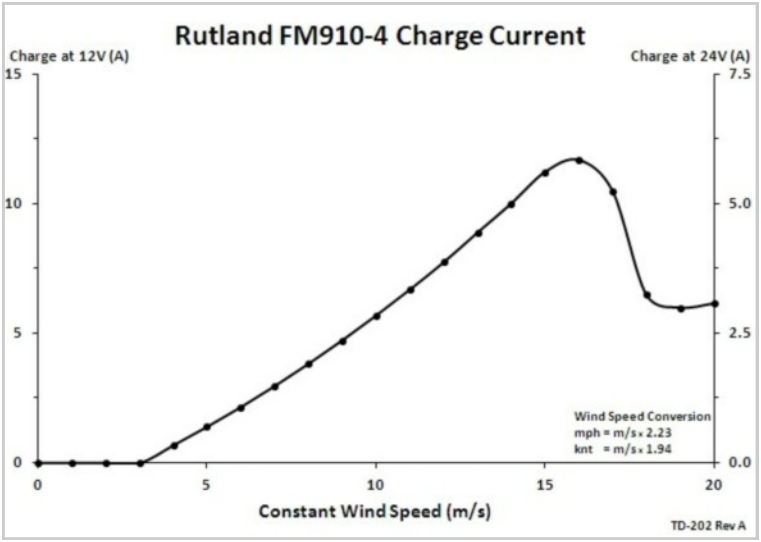
Cable Specification

The cable used for connection of the Windcharger to the regulator should be in accordance with this table. The use of smaller cable will reduce performance and will cause damage to the turbine, regulator or wiring.
Cable and connectors are available from your dealer or the manufacturer.

Specification and Performance

Guideline Performance Curve

Note : The curve shown below is for clear, non-turbulent wind conditions; this may not be achieved in some installations. Refer to the section on Siting to optimise performance at your site. Wind speeds are those flowing across the turbine of the Windcharger and may not reflect those measured at mast top or those reported by the Met. Office.



Maintenance and Troubleshooting

Inspection and Maintenance

The Rutland Windcharger requires no scheduled maintenance but an annual inspection should be carried out to monitor the general condition of the system to ensure the electrical and mechanical integrity and safety of the system.

WARNING! Before inspection, the turbine should either be lowered to the ground or tied to prevent the generator from turning. To stop the generator from turning proceed as follows:

1.Turn the wind generator out of the wind (180°) using the tail, apply the switch to stall mode on the charge regulator if used. The generator will gradually slow down.

2. Tie a blade to the mounting pole to prevent it from rotating.

Whilst the generator is stationary, the following routine checks should be performed:

1. Check the blades for damage, eg chips or nicks. Replace any damaged blades. The turbine should not be operated with damaged blades as this may cause imbalance resulting in premature wear and possible failure. Check the blade screws for tightness.
2. Check all other nuts, bolts and screws for tightness.
3. Check the yaw axis for free rotation.
4. Check the tail fin moves freely.
5. Check tower assembly for condition.
6. Check the tension of any guy wires if applicable. The tension of guy wires should be checked frequently during the first year.
7. The unit can be wiped with a mild detergent and rinsed with water to remove dirt and debris.

Note: The Windcharger is designed for continuous running to achieve maximum resistance to water ingress. Should you wish to take the unit out of service for an extended period it is recommend that the unit be removed from the mounting and stored in a dry location or covered.

Troubleshooting

In the unlikely event that your Rutland Windcharger should develop a defect, the turbine should first be tied to prevent the blades from turning to perform the static tests below. (Follow the procedure described in the Inspection and Maintenance section). It will be necessary to let it run for the tests to check for power production.

1. **Read the Electrical Connection** and **Up & Running** sections and be satisfied that your system complies.

2. **Is there sufficient wind?** The windcharger needs approximately 4-5 knots wind speed to start charging. The wind speed across the turbine blades may be greatly reduced in built-up area s compared with weather reports.

3. **Static Tests: Is the battery in good condition?** Check the voltage and electrolyte level of each battery. **Check electrical continuity** throughout the system, especially corrosion and poor connections in cable joins and connector blocks.

4. **Running Tests: Check for power output from the Windcharger, following this procedure:**

Set a digital multimeter to DC Amps, scale of between 5 and 10 if possible. Connect the meter positive (+) probe to the wind generator output positive cable and the meter negative (-) to the regulator input positive. Provided there is sufficient wind there should be a current reading. This establishes that power is being delivered.

Using the same multimeter setting as above measure between the regulator to battery + and the battery +. Provided there is sufficient wind there should be a current reading. This establishes if power is passing through the regulator.

If both above are unsuccessful set the multimeter to DC Volts. Disconnect the wind generator from the regulator and connect the meter + to the wind gen + and the meter – to the wind gen -. Provided there is sufficient wind there should be a variable voltage reading according to the speed of the wind seen at the wind turbine. This will establish if the wind generator is able to deliver power or not.

If tests A and C are successful but test B fails to produce results connect the wind gen directly to the battery. Set the digital multimeter to DC Amps and measure power between the wind gen + and the battery +. If a reading is measured, providing there is sufficient wind, then the regulator is faulty.
If the wind turbine fails to deliver any current or open circuit V reading undertake the further tests below.

5. **Mechanical inspection.** It will be necessary to remove the Windcharger from its pole for the following tests.

6.**Check the brushes and slipring for wear or damage.** To inspect the brushes, remove the 6 screws joining the nacelle halves together and remove top half of nacelle. Remove the 4 screws connecting the bottom half of nacelle to the post adaptor and remove bottom half of nacelle. This now gives access to the 2 sets of brush holders (2 brushes in each). The brushes and slipring can then be inspected by removing the four self-tapping screws holding the brush holder assemblies in place. Remove any black deposits from the slipring with fine emery paper. Heavy deposits and reduced power indicate a possible reverse connection to the battery. Check brushes for undue wear and replace if necessary.

7. **Check hub for free rotation with generator disconnected from battery.** the hub does not rotate freely, check for a possible short circuit in the wiring. If no wiring fault is found refer to your dealer or manufacturer.

If the above checks have identified a need for spare parts or failed to identify the problem you should contact Marlec who can advise you of your nearest distributor in their world wide network. In the first instance we recommend that you contact the company from whom the product was originally purchased.

If in doubt, refer to your dealer or manufacturer.

LIMITED WARRANTY

The Marlec Engineering Company Limited Warranty provides free replacement cover for all defects in parts and workmanship for 24 months from the date of purchase. Marlec's obligation in this respect is limited to replacing parts which have been promptly reported to the seller and are in the seller's opinion defective and are so found by Marlec upon inspection. A valid proof of purchase will be required if making a warranty claim.

Defective parts must be returned by prepaid post to the manufacturer Marlec Engineering Company Limited, Rutland House, Trevithick Road, Corby, Northamptonshire, NN17 5XY, England, or to an authorised Marlec agent.

This Warranty is void in the event of improper installation, owner neglect, misuse, damage caused by flying debris or natural disasters including lightning and hurricane force winds. This warranty does not extend to support posts, inverters, batteries or ancillary equipment not supplied by the manufacturer.

No responsibility is assumed for incidental damage. No responsibility is assumed for consequential damage. No responsibility is assumed for damage caused by the use of any unauthorised components.
No responsibility is assumed for use of a non "furling" versions of the Rutland Windcharger where Marlec or one of its authorised agents finds that a generator incorporating a furling device should have been used.

Sunshine™ SOLAR
the sun belongs to everyone

Manufactured in the UK by
Marlec Engineering Co Ltd

Distributed in the UK by
Sunshine Solar Ltd
www.sunshinesolar.co.uk

Sunshine™ SOLAR
the sun belongs to everyone

Solar Energy Systems!

Solar power that works with your Rutland Windcharger

Solar power to keep batteries topped up on-board

Sunshine Solar Panels working in harmony with Marlec Windchargers

www.sunshinesolar.co.uk

Sunshine Solar Limited
Unit 30, Ashwellthorpe Industrial Estate
Ashwellthorpe
Norwich
Norfolk
NR16 1ER

www.sunshinesolar.co.uk

Company Registration: 5105890 - registered in England & Wales
VAT Registration: GB868 839 842