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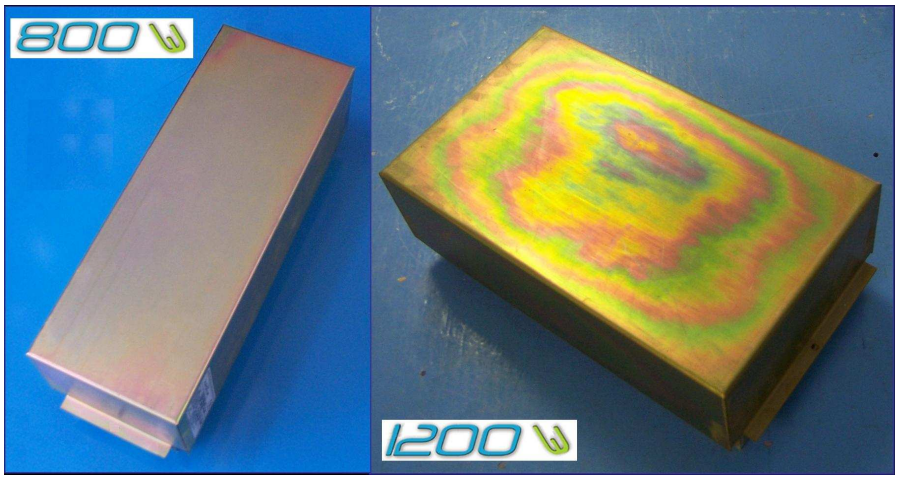
Kestrel Diversion Resistors

Type 0601



User Manual ***Revision 1.0 (03-08)***

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WARNING: Kestrel Charge Controllers Type 0401, 0801 and 0102 must have a Kestrel Diversion Resistor fitted before operation. ***The Diversion Resistor fitted must be of the correct type and value for the turbine and controller voltage.***

Disclaimer

Kestrel Wind Turbines makes every effort to give accurate information in this manual and is in no way liable for any error or omission. The user of this manual assumes full responsibility and risk. We appeal to your common sense to read and apply the safety notes. Consult professional engineers and take advice if you are unsure.

1 Safety Considerations
1.1 Mechanical Safety
1.2 Electrical Safety
1.3 Installation Hazards
1.4 Operational Safety

1 SAFETY FIRST

Although Kestrel's diversion resistors are designed with your safety in mind, accidents can easily occur and there are always inherent dangers associated with any type of machine. ***Consult installation professionals if you lack experience or confidence.***

1.1 Mechanical Safety

Use good handling methods and take precautions to avoid physical injury during installation and maintenance/repair procedures. Be responsible when using all tools whether manual or powered.

1.2 Electrical Safety

Read and adhere to the installation instructions for this product. Do not work on the system when the wind turbine is running or when lightning is possible.

Disconnecting and re-connecting wires may cause a spark and the presence of explosive hydrogen from battery charging is always a possibility. ***Adequate ventilation must be provided for battery installations.*** The wire size used for connections must be correct for the powers supplied. The smaller the wire diameter, the higher the wire losses and therefore the heat generated in the wire. ***Use correct wire sizes throughout the installation.*** The amount of energy stored in a battery is considerable and fire can result from shorts. ***Fit a suitable fuse or circuit breaker in the battery cable.*** ***In general, respect the system and use common sense. Consult a qualified electrician if you are unsure.***

1.3 Installation Hazards

Be sure to read and adhere to the installation instructions for this product. Always work carefully and have an assistant wherever possible. Always re-check the work as you progress. Slack bolts, poor workmanship and loose electrical connections must be avoided.

1.4 Operational Safety

Be aware that the Standard Controller will become hot during certain operation modes. This is quite normal but be aware of high temperatures within the case. System checks are best carried out in calm weather conditions. Avoid any maintenance or inspection during windy weather.

2 DIVERSION RESISTOR OVERVIEW

2 Diversion Resistor Overview
2.1 Diversion Resistor Description
2.2 Identification and Markings
2.3 Application and Uses

2.1 Diversion Resistor Description

IMPORTANT: This product is designed for use with Kestrel Charge Controllers that are installed to charge batteries known as Battery-Charging systems. Failure to fit a divert resistor to Kestrel Charge Controllers Type 0102, 0801 and 0401 will cause malfunctions and damage to the controller.

Sustainable/renewable energy sources such as wind turbines, hydro-generators and solar panels when used to charge batteries, are often connected to a charge controller. Such components can exhibit operational modes where excess electrical energy must be dissipated. The controller then diverts any unwanted energy to a power resistor. The power resistor converts the electrical energy into heat energy.

The Kestrel Type 0601 range of diversion resistors consist of wall mounted enclosures that contain electrical resistors which dissipates the energy in the atmosphere. Each version is designed to have a specific electrical resistance and power capability. The product is housed in a steel enclosure for wall mounting. Unit cooling is achieved by natural convection.

2.2 Identification and Markings

On the Diversion Resistor enclosure is a product rating plate and serial number, if the controller does not carry this stamp it does not carry a Kestrel warranty and may not be authentic.

kestrel wind turbines

PRODUCT RATING LABEL			
TYPE	DIVERT RESISTOR TYPE 0601		
IDENTIFICATION	0601 2R24 1200W		
RATED CURRENT	20 Adc	RATED VOLTAGE	50 Vdc
RATED POWER	1200 Wdc	MANUFACTURED	Jan 08
SERIAL NUMBER 00000000			
MADE IN SOUTH AFRICA BY	Eveready Diversified Products (Pty) Ltd T/A Kestrel Wind Turbines P.O. Box 3191, Strundale, North End Port Elizabeth, 6056 RSA		CE

**NOTE: Product Rating label example (above) is for format only, details may vary*

CHECK THE IDENTIFICATION NUMBER TO BE CORRECT FOR THE APPLICATION. REFER TO THE APPLICATION LIST IN SECTION 2.4 (Page 5)

2.3 Applications and Uses

Kestrel Diversion Resistors Type 0601are primarily intended for use with Kestrel Charge Controllers connected to Kestrel wind turbines that have been installed to charge batteries. Each application may require specific additional electrical equipment. Consult the manuals supplied with this equipment.

2.4 Application List

The following table shows the appropriate diversion resistor that must be used with each Kestrel turbine and charge controller. The electrical current rating gives a guide to the wire size requirements given in Section 4 of this manual.

TURBINE MODEL	TURBINE VOLTAGE	CHARGE CONTROLLER	DIVERSION RESISTOR	CURRENT Amps dc
e150 / e220i	12Vdc	0102 or 0401 12Vdc	**0601 0R23 800W**	62
e150 / e220i	24Vdc	0102 or 0401 24Vdc	**0601 0R94 800W**	32
e150 / e220i	36Vdc	0102 or 0401 36Vdc	**0601 3R00 800W**	19
e150 / e220i	48Vdc	0102 or 0401 48Vdc	**0601 3R00 800W**	19
e150 / e220i	110Vdc	0102 or 0401 110Vdc	**CONSULT FACTORY**	8
e300i	12Vdc	0102 or 0401 12Vdc	**0601 0R23 1200W**	65
e300i	24Vdc	0102 or 0401 24Vdc	**0601 0R75 1200W**	38
e300i	36Vdc	0102 or 0401 36Vdc	**0601 2R50 1200W**	23
e300i	48Vdc	0102 or 0401 48Vdc	**0601 2R50 1200W**	23
e300i	110Vdc	0102 or 0401 110Vdc	**0601 11R00 1200W**	11

3 DIVERSION RESISTOR ASSEMBLY

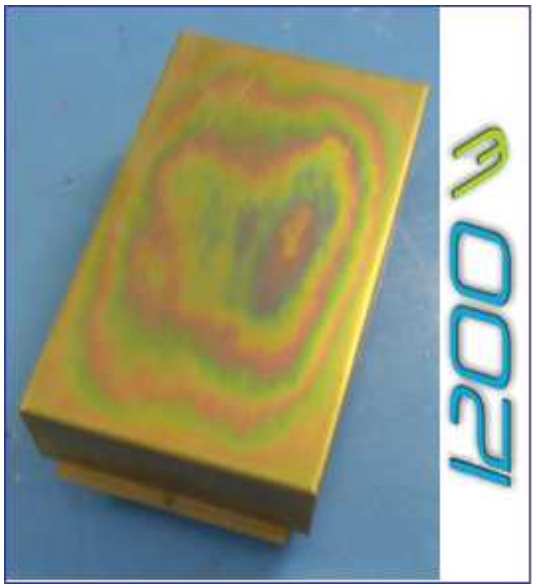
3 Diversion Resistor Assembly
3.1 Components Supplied
3.2 Components Not Supplied
3.3 Tools Required
3.4 Unpacking

3.1 Components Supplied

The following components are supplied:

- ☐ Diversion Resistor assembly (800 or 1200W)
- ☐ User Manual

3.2 Components Not Supplied



The following components are necessary to complete an installation:

- ☐ Electrical crimp terminals
- ☐ Wall fixing screws
- ☐ 20mm cable glands

3.3 Tools Required

The following hand tools are required for Diversion Resistor installation:

- ☐ Small size electrical screwdriver
- ☐ Medium size electrical screwdriver
- ☐ Wire strippers for electrical connections
- ☐ Electrical crimping pliers
- ☐ Tape measure for positioning

3.4 Unpacking

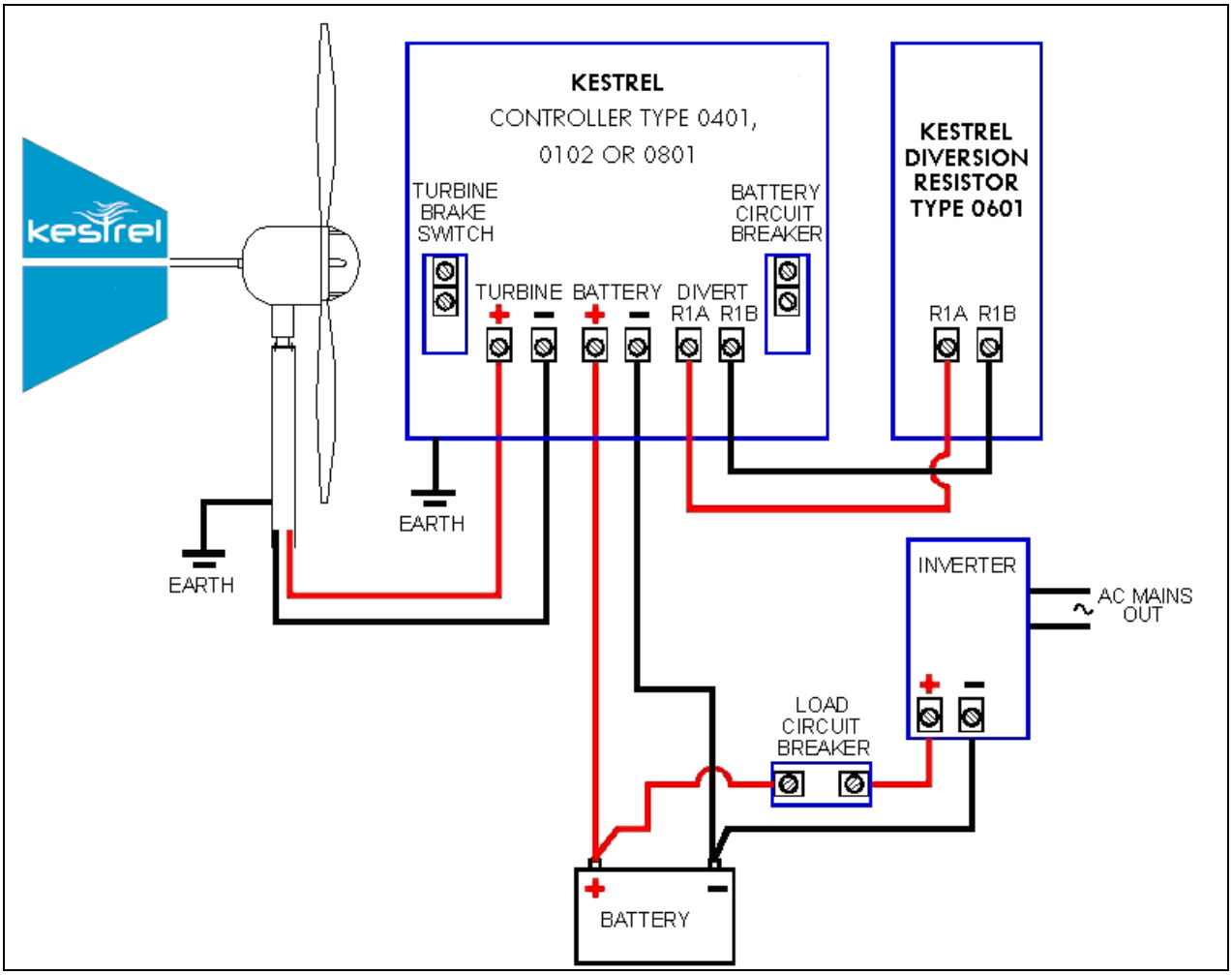
Open the packaging container and check for any transit damage. The parts contained are listed in section 3.1 and on the included packing slip. Lay out and identify the parts.

4 Installation Instructions
4.1 Typical Installation Example
4.2 Mounting the Diversion Resistor
4.3 Electrical Wiring
4.4 Securing the Diversion Resistor

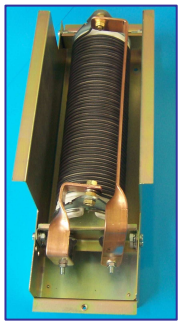
4 INSTALLATION INSTRUCTIONS

4.1 Typical Installation Example

A typical battery charging installation is shown below. The system comprises of a Kestrel wind turbine, Kestrel charge controller, Kestrel diversion resistor and storage battery. Note that other electrical equipment will be required to comply with local installation requirements, such as an additional inverter which converts the battery dc power into standard ac power such that common mains powered appliances can be supplied. Consult the relevant charge controller manual and inverter manuals for full installation procedures.

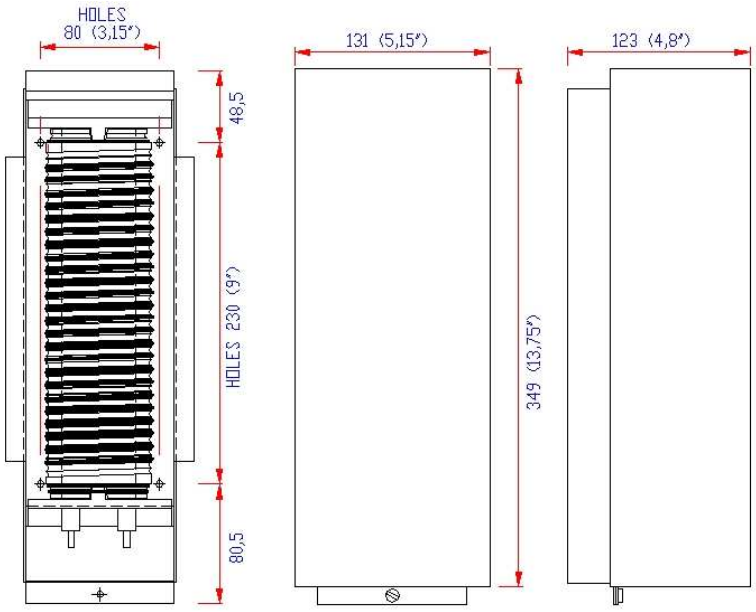


4.2 Mounting the Diversion Resistor



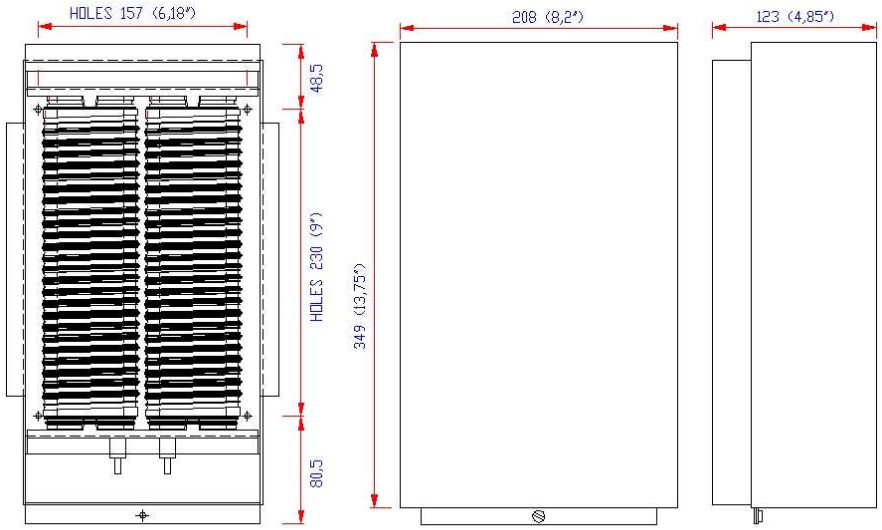
The Kestrel Diversion Resistor Type 0601 is only suitable for indoor installation. The unit must be vertically mounted using the four internal fixing holes provided. Use secure fastening with suitable wall plugs or bolts. Allow a minimum of 200mm (8") space all around the unit for cooling. It is normal for the voltage limiter to become quite hot at times as it dissipates unwanted energy.

Do not place any objects on the top of the enclosure. Make sure that air can freely enter at the bottom of the enclosure. The unit relies on the free passage of air through the enclosure for adequate cooling.



ONE RESISTOR ENCLOSURE

Do not make any electrical connections prior to mounting. It is beneficial to place four spacers (not supplied) on the mounting screws such that an air space exists between the wall and the diversion resistor.



DUAL RESISTOR ENCLOSURE

4.3 Electrical Wiring

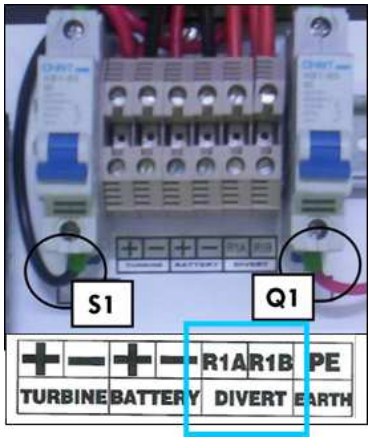
The diversion resistor is not polarity sensitive and can be connected either way round. It is usual to connect the positive terminal on the left.

CHECK THAT THE DIVERSION RESISTOR IS THE CORRECT TYPE FOR THE TURBINE AND CHARGE CONTROLLER.

PLEASE FOLLOW THE INSTRUCTIONS BELOW !

CONSULT SECTION 5 FOR WIRE SIZE RECOMMENDATIONS

The Kestrel charge regulator is provided with one pair of clearly marked terminals for "RESISTOR" at the bottom of the regulator marked R1A and R1B. The diversion resistor connections are also marked R1A and R2A. Cut suitable lengths of cable and make the connections between the two R1A terminals and the R1B terminals.



The wind turbine should not be rotating during this installation. If turbine access is not possible, either operate the Turbine Brake Switch (S1) or short the two turbine power wires together. Observe the Polarity at all times.

The following procedure applies to Kestrel charge controllers. If you lack confidence or experience, consult a professional or your dealer/re-seller.

a) Arrange that the turbine is shorted out or the turbine brake switch (S1) is **ON**.

b) Isolate or switch **OFF** any battery feeds to the charge controller.

c) Check that the charge controller OUTPUT CIRCUIT BREAKER (Q1) is switched **OFF** and that the TURBINE BRAKE SWITCH (S1) is switched **ON**.

d) Connect the two wires from the charge controller to the divert resistor.

e) Connect an electrical earth wire to the marked earth screw terminal provided.

f) Check that all connections to the divert resistor are good and tight

g) After all wiring is complete and secure, the charge controller battery circuit breaker may be switched on and the turbine brake switch switched off.

The instructions are reversed for de-commissioning. First isolate the additional equipment, by operating the turbine brake switch and switching the battery circuit breaker off
A disconnected turbine should always be shorted.

4.4 Securing the Diversion Resistor

Always switch the turbine brake on (S1 ON) and the output circuit breaker off (Q1 OFF) before any maintenance or service

The Kestrel Diversion Resistor Type 0601 has a single bottom screw for removal of the front cover.

NOTE: The diversion resistor controls high voltages and the internal components can cause a shock hazard. Be aware and consult a professional if you are in any way unsure.

IMPORTANT: It is quite normal for the casing to become hot during extended operation.

5 WIRING AND CABLE SIZES

5 Wiring and Cable Sizes
5.1 Diversion Resistor Wiring
5.2 Lightning Protection

5.1 Diversion Resistor Wiring

The following suggestions are made as a guideline. If you are in doubt, consult an electrician.

The output wires must be extended as required for the installation. Choose the wire size that is suggested for the size of turbine, electrical current and the distance from the turbine to the charge controller. Good wire connections between the charge controller and the diversion resistor are absolutely essential to maintain good charge controller operation and to avoid high temperatures at the connection.

All electrical systems lose energy because cables have a resistance. The cable connections between the charge controller and the diversion resistor will increase the overall resistance presented to the charge controller. Poor connections may cause battery overcharging.

Surplus correctly sized wire that has been fitted to the wind turbine output may be used to wire the diversion resistor.

Refer to section 1 for the electrical current value of the Kestrel turbine being installed.

Wire Size for Electrical Current [Maximum distance 2m (6')]

10Adc	20Adc	30Adc	40Adc	50Adc	60Adc	70Adc
2sq mm (15)	3sq mm (12)	5sq mm (10)	6sq mm (9)	8sq mm (8)	10sq mm (7)	10sqmm(7)

5.2 Lightning protection

Proper grounding is essential to protect the system from induced voltages and static. The installation must comply with local requirements for electrical installations. Ensure that the casing of the Diversion Resistor is electrically connected to the system earth.

6.1 TECHNICAL SPECIFICATIONS

General: High power resistor enclosure for the diversion and conversion of excess electrical energy into heat. Available in different ratings for suitable applications.

RESISTOR ELEMENTS

Winding former	High temperature moulded ceramic
Type of resistance wire	Copper Nickel Cupro 49 Oxidised

RESISTOR ELEMENT VARIATIONS

Wound elements wired in series / parallel

IDENTIFICATION	DESIGN VOLTAGE	DESIGN CURRENT	POWER RATING FOR BLACK OPERATION	MAJOR DIMENSIONS
0R94	14.5	15.5	828	DIA 63 x 250mm
2R26	43	19	664	DIA 63 x 250mm
3R00	57	19	881	DIA 63 x 250mm
0R45	14.5	32.5	770	DIA 63 x 250mm
0R37	14	38	636	DIA 63 x 250mm
5R00	57	11.4	692	DIA 63 x 250mm
5.50	64	11.6	763	DIA 63 x 250mm

DIVERSION ENCLOSURE VARIATIONS

TURBINE MODEL	TURBINE VOLTAGE	CHARGE CONTROLLER	DIVERSION RESISTOR	CURRENT Amps dc
e150 / e220i	12Vdc	0102 or 0401 12Vdc	0601 0R23 800W	62
e150 / e220i	24Vdc	0102 or 0401 24Vdc	0601 0R94 800W	32
e150 / e220i	36Vdc	0102 or 0401 36Vdc	0601 3R00 800W	19
e150 / e220i	48Vdc	0102 or 0401 48Vdc	0601 3R00 800W	19
e150 / e220i	110Vdc	0102 or 0401 110Vdc	CONSULT FACTORY	8
e300i	12Vdc	0801 or 0401 12Vdc	0601 0R23 1200W	65
e300i	24Vdc	0801 or 0401 24Vdc	0601 0R75 1200W	38
e300i	36Vdc	0801 or 0401 36Vdc	0601 2R50 1200W	23
e300i	48Vdc	0801 or 0401 48Vdc	0601 2R50 1200W	23
e300i	110Vdc	0801 or 0401 110Vdc	0601 11R00 1200W	11

Cooling		**Natural Convection**
Maximum Ambient		**40° C**
IP Rating		**IP23**
Cabinet Dimensions (wall mounting)	***800W -***	**130Wx120Hx350D**
	1200W -	**260Wx120Hx350D**
Mass	***800W -***	**3,4kg**
	1200W -	**7,1kg**
Certification	**Complies with EMC requirements CIS22 Class B**	

6.2 DECLARATION OF CONFORMITY

Eveready Diversified Products (Pty) Ltd
T/A Kestrel Wind Turbines

in South Africa

declare under our sole responsibility that the product

Diversion Resistor Type 0601

To which this declaration relates is in conformity with the following standards

IEC 60204-1	Safety of Machinery
IEC 60038	IEC Standard Voltages
IEC 60529	Degrees of Protection of Enclosures
IEC 61000	Electromagnetic Compatibility

Date: 25th December 2007 Place: Port Elizabeth South Africa

Authorising Signature:

James Carpy
Technical Director

Eveready Diversified Products (Pty) Ltd
Eveready Road, Struandale, Port Elizabeth
PO Box 3191, North End, Port Elizabeth, 6056
South Africa

7 TROUBLE SHOOTING

THE KESTREL TYPE 0601 DIVERSION RESISTOR MAY BE SERIOUSLY DAMAGED BY THE INGRESS OF WATER. DEGRADATION CAN OCCUR FROM IMPROPER INSTALLATION THAT CAUSES OVERHEATING.

SHORT OR BRAKE THE WIND TURBINE AND ISOLATE ALL BATTERIES BEFORE ANY MAINTENANCE PROCEDURE.

Q **The system voltage is high**

A The diversion resistor connections are poor

A The resistors are broken or open circuit

A The connection wire is undersize

Q **Does it matter what divert resistor I wire up to the controller**

A Yes. The divert resistor must be matched to the turbine and controller voltage and current. Fitting the wrong diversion resistor will cause malfunctions and damage

Q **The diversion resistor is always working at a high temperature.**

A The batteries are fully charged and full energy diversion is occurring. Consider using more electrical energy and fitting additional battery storage

A The battery circuit breaker has tripped

A The battery is defective and cannot receive charge

Q **Will I damage the charge controller if I disconnect the diversion resistor?**

A Yes, the charge controller is now unable to divert any energy and cannot control the system voltage. This will almost certainly damage the controller and overcharge the battery. Always disable the turbine and disconnect any battery before disconnecting the diversion resistor

Q **Can I remove the diversion resistor and short the resistor output terminals on the controller?**

A No. This will result in controller failure due to overheating

8 MAINTENANCE

Check that all connections are in good condition and tight on the Diversion Resistor during routine system checks.

The Kestrel Type 0601 Diversion Resistor is designed for continuous operation on 100% duty cycle and requires no regular part replacement. Keep the unit clean and ensure that no foreign objects reduce the airflow through the case. Clean the case only with a soft damp cloth. Do not use any form of solvent.

This product controls and limits voltages that can cause a shock. Always take extreme care when the cover is removed. In the unlikely event of failure, the unit should be returned to the dealer or direct to the factory for repairs.

9 WARRANTY CONDITIONS

Kestrel's wind turbines, controllers and diversion resistors are manufactured to the highest standards, in accordance with Kestrel Wind Turbines' standard and quality specifications, and warrants that the diversion resistor is in good working order upon delivery and for a period of 24 months. Warranty terms and conditions are outlined below.

1. Eveready warrants that Resistors will, on delivery, be free of defects in design, material and workmanship and will be fit for their intended purpose for a period of two years calculated from the date of installation, subject to proper installation, maintenance and use in accordance with the User Manual.

2. This warranty is further subject to the Customer returning the defective Resistors at its cost to the premises of Eveready within the warranty period and furnishing full details in writing of the alleged defect.

3. Eveready's obligations under this warranty shall be limited to the repair or replacement of defective Resistors at its cost or to a refund to the Customer of the original cost thereof, as Eveready may determine in its discretion. Eveready shall not be responsible for any damages suffered by the Customer pursuant to any defects covered by this warranty.

4. This warranty shall not apply to any damage to Resistors caused by winds exceeding 160 kilometres per hour or any other factors beyond the control of Eveready.

5. The Customer may purchase an extended warranty from Eveready in respect of Resistors, subject to Eveready's standard conditions.

CONTACT KESTREL WIND TURBINES

Kestrel Wind Turbines

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Registration Number 2006/005438/07

VAT Registration Number 4870231406

Web: www.kestrelwind.co.za

NOTES

10 CUSTOMER FEEDBACK

Customer enquiry and feedback sheet

Customer Information

Customer Name: _____

Postal Address: _____ Serial Number: _____

_____ Phone Number: _____

E-Mail Address: _____ Fax Number: _____

Enquiry Details

Complete the form and submit to Kestrel Wind Turbines. Your feedback and queries are valuable to us.

Indicate your enquiry or feedback in the space provided below

For OFFICIAL Use Only

Date Replied: _____

Signature: _____

Comments: