



2 Axis Tilt Switch

HMTS2CFG10B



2 AXIS TILT SWITCH

HUMMINGBIRD ELECTRONICS' TWO-AXIS TILT SWITCH IS A SIMPLE TO CONFIGURE, FLEXIBLE TILT SWITCH WITH A WIDE RANGE OF APPLICATIONS.

THE TILT-SWITCH CAN BE OPERATED HORIZONTALLY, VERTICALLY OR UPSIDE DOWN AND CAN BE CONFIGURED FOR SINGLE OR DUAL AXIS OPERATION. THE SWITCH SET-POINT IS USER CONFIGURABLE.

WARNING & SAFETY INSTRUCTIONS

THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS FOR THE 2 AXIS TILT SWITCH.

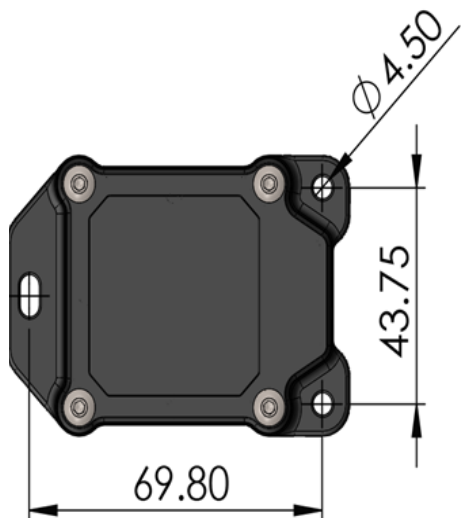
DO NOT OPERATE THE TILT SWITCH UNLESS YOU HAVE READ AND UNDERSTOOD THIS MANUAL AND THE DEVICE IS INSTALLED AS PER THE INSTALLATION INSTRUCTIONS.

2 SPECIFICATIONS

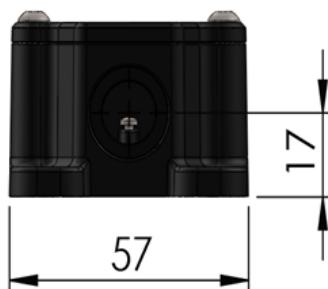
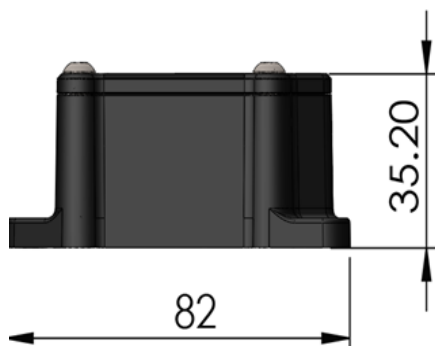
TECHNICAL SPECIFICATIONS & ORDERING INFORMATION

PART NUMBER	HMTS2CFG10B
NUMBER OF AXIS	DUAL AXIS OR SINGLE AXIS (SWITCH SELECTABLE), HORIZONTAL OR VERTICLE OPERATION
SWITCH ANGLE	0-64 DEGREES
RELAY OUTPUT	VOLTAGE FREE NORMALLY OPEN , NORMALLY CLOSED AND COMMON CONTACTS PROVIDED
OUTPUT SPECIFICATION	MAXIMUM RELAY VOLTAGE 36V DC, MINIMUM RELAY CURRENT: 5A - NOT FUSED
INPUT VOLTAGE	9V - 36V
CURRENT CONSUMPTION AT 12V	TYPICALLY 15mA(RELAYS OFF) AND 35mA(RELAY ON) AT 12V IN
CURRENT CONSUMPTION AT 24V	TYPICALLY 7mA(RELAYS OFF) AND 30mA(RELAY ON) AT24 IN
ACCURACY -15 TO 15 DEGREES -30 TO 30 DEGREES -60 TO 60 DEGREES	+/- 0.5 DEGREES AT 25°C WITH MAXIMUM FILTER APPLIED +/- 1.0 DEGREES AT 25°C WITH MAXIMUM FILTER APPLIED +/- 2.0 DEGREES AT 25°C WITH MAXIMUM FILTER APPLIED
DIMENSIONS	82MM (LENGTH) X 58MM (WIDTH) X 36MM (HEIGHT)

2 SPECIFICATIONS



Mounting holes
suit M4 screws.



SENSOR DIMENSIONS

3 OPERATION

POWERFUL PERFORMANCE

Hummingbird Electronics' tilt-switches measure pitch and roll angles with high accuracy by measuring the earth's gravitational field with a three axis accelerometer.

A dip-switch provided allows the user to select horizontal or vertical operation and allows single or dual axis operation. Once mounted, the tilt-switch can be opened and calibrated by pressing a push-button switch internal to the device. This will compensate for small angle offsets due to mounting. The unit should be calibrated at least once if it is to be used upside down.

The damping factor (how much averaging is performed) can be changed between two values for fast operation and noise immune operation.

A hysteresis value can be set to be either 0.5 degrees or 1 degree. With a set-point of 10 degrees and 1 degree hysteresis, the relay will switch on at 10 degrees and off at 9 degrees. Hysteresis prevents the internal relay from continuously switching on and off at the switch-point.

The activation angle can be set between 1 and 64 degrees using the internal dip-switch. A relay with contacts rated at 10A will switch on when the angle set-point is exceeded. Voltage free Normally-Open, Normally-Closed and Common contacts are provided.

An internal bi-colour LED is normally green and changes to red when the relay is activated.

Rugged Hardware

The configurable tilt-switches are supplied in a rugged aluminium enclosure that is splash-proof. Provision for screw mounting when required is provided.

Power to the unit and outputs are provided through colour coded wires.

Please note that the integrated relay outputs are not internally fused. Driving currents larger than those specified will result in damage to the tilt-switch.

3 OPERATION

Features:

- Relay output
- In system calibration Multi-voltage 12/24V
- Reverse polarity protected
- Rollover mode
- Configurable damping

Connection Specification

Red – Power (9-36V)

Black – Ground

White – Relay Common

Blue – Relay Normally Open

Brown – Relay Normally Closed

SW 1-6 set tilt angle 0-63 degrees; switch weighting is 1 degree for sw1, 2 for sw2, 4 for sw3, 8 for sw4, 16 for sw5 and 32 for sw6.

SW7 off, SW8 off; dual Axis operation. In this mode the device will trigger in either the pitch or roll axis.

SW7 off, SW8 on; single axis operation. The device only measures in a single axis.

SW7 on, SW8 off; unipolar operation. The device only measures in one axis and will only trigger for positive angles.

SW7 on, SW8 on; rollover mode. The device acts like a dual axis tilt switch but will react slower to improve operation on rough roads.

SW 9 sets hysteresis 0.5 or 1 degree; off 0.5 degree, on 1 degree.

SW 10 sets damping factor - off standard, on more damping

4 INSTALLATION

SETTING THE MOUNTING ORIENTATION AND CALIBRATING THE TILT SWITCH

The HMBS2CFG10B can be used in 6 different orientations. The device learns its orientation at calibration.

To calibrate the device or to change its orientation from mounting flange horizontal (Orientation A), press the push-button at power up.

Before calibrating, the unit must be mounted within 5 degrees of the orientation in which it is to work.

The internal LED will start to flash alternately red and green for approximately 10 seconds and then must go solid green. If the calibration was unsuccessful, the LED will flash red.

Make sure that the device is mounted within 5 degrees and re-calibrate.

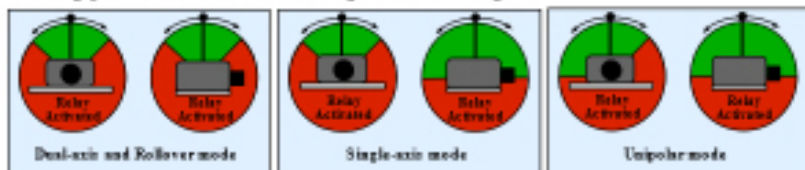
If the device is to be operated on a normally inclined surface at greater than 5 degrees then calibrate the device before attaching the device.

4 INSTALLATION

Orientation A – mounting plate horizontal, switch angle set to 45 degrees



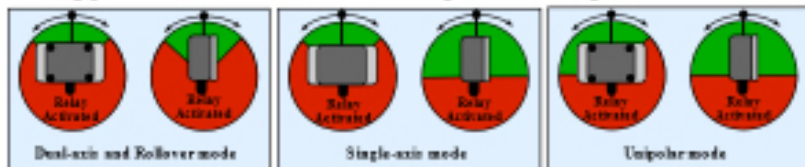
Calibrate like this



Orientation B – mounting plate vertical, cable down, switch angle set to 45 degrees



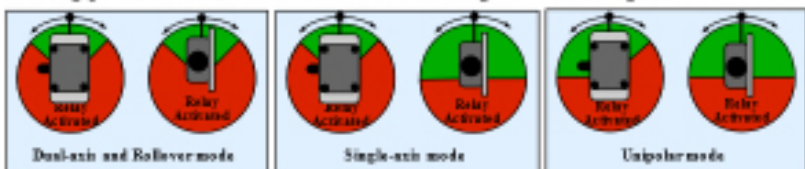
Calibrate like this



Orientation C – mounting plate vertical, cable to the left, switch angle set to 45 degrees



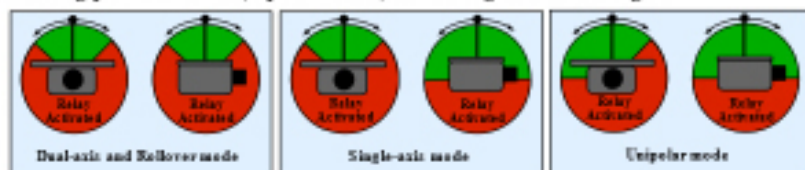
Calibrate like this



Orientation D – mounting plate horizontal, upside down, switch angle set to 45 degrees



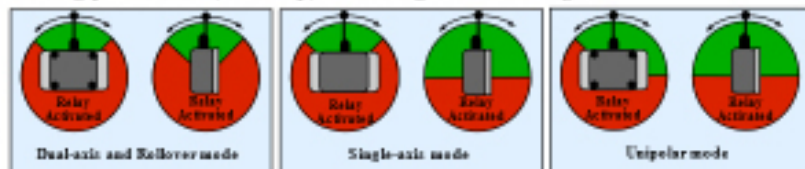
Calibrate like this



Orientation E – mounting plate vertical, cable up, switch angle set to 45 degrees



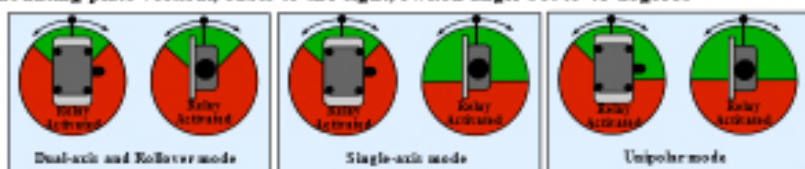
Calibrate like this



Orientation F – mounting plate vertical, cable to the right, switch angle set to 45 degrees



Calibrate like this



4 INSTALLATION

SW1	SW2	SW3	SW4	SW5	SW6	ANGLE
OFF	OFF	OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	3
OFF	OFF	ON	OFF	OFF	OFF	4
ON	OFF	ON	OFF	OFF	OFF	5
OFF	ON	ON	OFF	OFF	OFF	6
ON	ON	ON	OFF	OFF	OFF	7
OFF	OFF	OFF	ON	OFF	OFF	8
ON	OFF	OFF	ON	OFF	OFF	9
OFF	ON	OFF	ON	OFF	OFF	10
ON	ON	OFF	ON	OFF	OFF	11
OFF	OFF	ON	ON	OFF	OFF	12
ON	OFF	ON	ON	OFF	OFF	13
OFF	ON	ON	ON	OFF	OFF	14
ON	ON	ON	ON	OFF	OFF	15
OFF	OFF	OFF	OFF	ON	OFF	16
ON	OFF	OFF	OFF	ON	OFF	17
OFF	ON	OFF	OFF	ON	OFF	18
ON	ON	OFF	OFF	ON	OFF	19
OFF	OFF	ON	OFF	ON	OFF	20
ON	OFF	ON	OFF	ON	OFF	21
OFF	ON	ON	OFF	ON	OFF	22
ON	ON	ON	OFF	ON	OFF	23
OFF	OFF	OFF	ON	ON	OFF	24
ON	OFF	OFF	ON	ON	OFF	25
OFF	ON	OFF	ON	ON	OFF	26
ON	ON	OFF	ON	ON	OFF	27

4 INSTALLATION

SW1	SW2	SW3	SW4	SW5	SW6	ANGLE
OFF	OFF	ON	ON	ON	OFF	28
ON	OFF	ON	ON	ON	OFF	29
OFF	ON	ON	ON	ON	OFF	30
ON	ON	ON	ON	ON	OFF	31
OFF	OFF	OFF	OFF	OFF	ON	32
ON	OFF	OFF	OFF	OFF	ON	33
OFF	ON	OFF	OFF	OFF	ON	34
ON	ON	OFF	OFF	OFF	ON	35
OFF	OFF	ON	OFF	OFF	ON	36
ON	OFF	ON	OFF	OFF	ON	37
OFF	ON	ON	OFF	OFF	ON	38
ON	ON	ON	OFF	OFF	ON	39
OFF	OFF	OFF	ON	OFF	ON	40
ON	OFF	OFF	ON	OFF	ON	41
OFF	ON	OFF	ON	OFF	ON	42
ON	ON	OFF	ON	OFF	ON	43
OFF	OFF	ON	ON	OFF	ON	44
ON	OFF	ON	ON	OFF	ON	45
OFF	ON	ON	ON	OFF	ON	46
ON	ON	ON	ON	OFF	ON	47
OFF	OFF	OFF	OFF	ON	ON	48
ON	OFF	OFF	OFF	ON	ON	49
OFF	ON	OFF	OFF	ON	ON	50
ON	ON	OFF	OFF	ON	ON	51
OFF	OFF	ON	OFF	ON	ON	52
ON	OFF	ON	OFF	ON	ON	53
OFF	ON	ON	OFF	ON	ON	54
ON	ON	ON	OFF	ON	ON	55
OFF	OFF	OFF	ON	ON	ON	56

4 INSTALLATION

SW1	SW2	SW3	SW4	SW5	SW6	ANGLE
ON	OFF	OFF	ON	ON	ON	57
OFF	ON	OFF	ON	ON	ON	58
ON	ON	OFF	ON	ON	ON	59
OFF	OFF	ON	ON	ON	ON	60
ON	OFF	ON	ON	ON	ON	61
OFF	ON	ON	ON	ON	ON	62
ON	ON	ON	ON	ON	ON	63

5 DISCLAIMER

USE OF PRODUCTS

1. You, (the "Purchaser"), acknowledge that you have the sole responsibility of satisfying yourself that the goods supplied by Redarc Electronics Pty Ltd (ACN 009 971 794) atf the Redarc Trust trading as Hummingbird Electronics ("Hummingbird Electronics") are suitable for the use of the Purchaser or any contemplated use of the Purchaser and that the Purchaser has conducted its own investigations and has not relied upon any information, statement, advice or representation by Hummingbird Electronics of or in relation to:

1.1 the operating and/or performance parameters of the goods;

1.2 the outcomes that the goods may achieve;

1.3 the suitability of the goods to any particular application, installation or physical environment; and

1.4 the appropriateness of the use of the goods outside Australia.

2 The Purchaser acknowledges and agrees that:

2.1 any representation as to the operating parameters of the goods provided by Hummingbird Electronics are representative of laboratory conditions;

2.2 the actual performance of the goods in situ might be affected by external factors (including without limitation environmental conditions) beyond Hummingbird Electronics' control;

2.3 incorrect and/or negligent installation, application or use of the goods may cause loss of life, injury and/or damage to property;

2.4 Hummingbird Electronics makes no representation, warranty or assurance as to any of the matters listed in clause 1 and that Hummingbird Electronics shall not be liable for any loss or cost arising from those matters to the maximum extent permitted by law.

3. Hummingbird Electronics gives the warranties specified in the Warranty as being given by Hummingbird Electronics, and subject to and to the maximum extent permitted by law, excludes all other warranties in relation to the goods, whether express or implied, including without limitation any warranty regarding merchantability or fitness for a particular purpose.

4. To the maximum extent permitted by law, Hummingbird Electronics excludes all liability in respect of the goods. To the extent that Hummingbird Electronics is not able to exclude liability under law, then to the maximum extent permitted by law Hummingbird Electronics' liability under the Warranty or otherwise in respect of the goods is limited as in accordance with the Warranty.

5 DISCLAIMER

5. Other than specifically stated in this document and to the maximum extent permitted by law, Hummingbird Electronics is not liable for and the Purchaser hereby releases Hummingbird Electronics from any consequential loss or damages of any type including without limitation incidental, special, indirect, punitive or otherwise, including loss of profit, whatever the claim (tort, breach of contract or warranty or otherwise) and whatever the forum, whether arising out of or in connection with the goods or any other cause whatsoever.

6. The Purchaser releases Hummingbird Electronics from all liability, in respect of personal injury or death or damage or loss of property of any person including the Purchaser or the Purchaser's employees agents or contractors, arising wholly or in part from the Purchaser's acts, omissions, negligence, breach of duty or breach of contract.

7. In any event and without limiting the generality of the foregoing, Hummingbird Electronics' liability for any breach of a term, condition or warranty not excluded in this document will be limited to the replacement of goods delivered or the payment of the cost of replacing the goods or acquiring equivalent goods from an alternate supplier and/or the resupply of any services rendered or the cost of having those services resupplied.

8. The Purchaser shall be responsible for and indemnify and hold harmless Hummingbird Electronics from and against all claims, damages, costs (including without limitation legal costs on a full indemnity basis), losses, liabilities and expenses caused by the Purchaser's acts, omissions, negligence, breach of duty or breach of contract.

6 WARRANTY

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Hummingbird Electronics offers a warranty in respect of its Products where the Products are purchased from an authorised distributor or reseller of Hummingbird Electronics by the Purchaser, on the terms and conditions, and for the duration, outlined below in this document ("Warranty"). The benefits of this Warranty are in addition to other rights and remedies available at law in respect of the Products and shall not derogate from any applicable mandatory statutory provisions or rights under the Australian Consumer Law.

9. In this Warranty, the term Products means:

9.1 all products manufactured or supplied by Hummingbird Electronics; and

9.2 any component of or accessory for any product in clause 9.2 manufactured or supplied by Hummingbird Electronics.

Offer and duration of product warranties

10. Hummingbird Electronics warrants that its Products will be free, under normal application, installation, use and service conditions, from defects in materials and workmanship affecting normal use, for 12 months from the date of purchase ("Warranty Period").

11. Where a Product malfunctions or becomes inoperative during the Warranty Period, due to a defect in materials or workmanship, as determined by Hummingbird Electronics, then subject to further rights conferred by the Australian Consumer Law on the Purchaser, Hummingbird Electronics will, in exercise of its sole discretion, either:

11.1 repair the defective Product;

11.2 replace the defective Product; or

11.3 provide a refund to the Purchaser for the purchase price paid for the defective Product, without charge to the Purchaser.

12. The warranty given by Hummingbird Electronics in clause 11 covers the reasonable costs of delivery and installation of any repaired or replaced Products or components of Products to the Purchaser's usual residential address notified to Hummingbird Electronics, together with the reasonable costs of removal and return of any Products determined by Hummingbird Electronics to be defective.

6 WARRANTY

13. If the Purchaser incurs expenses of the nature referred to in clause 12 in the context of making a claim pursuant to this Warranty that is accepted by Hummingbird Electronics, the Purchaser will be entitled to claim for reimbursement of those expenses which Hummingbird Electronics determines, in exercise of its sole discretion, to be reasonably incurred, provided that the claim is notified to Hummingbird Electronics in writing at the postal address or email address specified in clause 29 and includes:

13.1 details of the relevant expenses incurred by the Purchaser; and

13.2 proof of the relevant expenses having been incurred by the Purchaser.

Exclusions and limitations

14. This Warranty will not apply to, or include any defect, damage, fault, failure or malfunction of a Product, which Hummingbird Electronics determines, in exercise of its sole discretion, to be due to:

14.1 normal wear and tear or exposure to weather conditions over time;

14.2 accident, misuse, abuse, negligence, vandalism, alteration or modification;

14.3 non-observance of any of the instructions supplied by Hummingbird Electronics, including instructions concerning installation, configuring, connecting, commissioning, use or application of the Product, including without limitation choice of location;

14.4 failure to ensure proper maintenance of the Product strictly in accordance with Hummingbird Electronics' instructions or failure to ensure proper maintenance of any associated equipment or machinery;

14.5 repairs to the Product that are not strictly in accordance with Hummingbird Electronics' instructions;

14.6 installation, repairs or maintenance of the Product by, or under the supervision of, a person who is not a qualified auto electrician or technician, or if non-genuine or non-approved parts have been fitted;

14.7 faulty power supply, power failure, electrical spikes or surges, lightning, flood, storm, hail, extreme heat, fire or other occurrence outside the control of Hummingbird Electronics;

14.8 use other than for any reasonable purpose for which the Product was manufactured;

14.9 any indirect or incidental damage of whatever nature outside the control of Hummingbird Electronics.

6 WARRANTY

15. Warranty claims in respect of a Product must be made in writing to Hummingbird Electronics at the postal address or email address specified in clause 29 within the Warranty Period. Such claims must include the following:

- 15.1 details of the alleged defect or fault and the circumstances surrounding the defect or fault;
- 15.2 evidence of the claim, including photographs of the Product (where the subject of the claim is capable of being photographed);
- 15.3 the serial number of the Product, specified on the label affixed to the Product; and
- 15.4 proof of purchase documentation for the Product from an authorised distributor or reseller of Hummingbird Electronics, which clearly shows the date and place of purchase.

The return of any Products without the prior written instructions of Hummingbird Electronics will not be accepted by Hummingbird Electronics.

16. Without limiting any other clause in this Warranty, Hummingbird Electronics has the right to reject any Warranty claim made by a Purchaser pursuant to this Warranty where:

- 16.1 the Purchaser does not notify Hummingbird Electronics in writing of a Warranty claim within the Warranty Period;
- 16.2 the Purchaser does not notify Hummingbird Electronics in writing of a Warranty claim within 1 month of becoming aware of the relevant circumstances giving rise to the claim, so that any further problems with the Product are minimised;
- 16.3 the serial number of the Product has been altered, removed or made illegible without the written authority of Hummingbird Electronics;
- 16.4 the Purchaser is unable to provide proof of purchase documentation in accordance with clause 15.4 or evidence that the Product was properly installed and removed (if relevant), and that proper maintenance has been performed on the Product, by, or under the supervision of, a qualified auto electrician or technician, in accordance with the instructions of Hummingbird Electronics.

17. If the Product is found to be working satisfactorily on return to Hummingbird Electronics or upon investigation by Hummingbird Electronics, the Purchaser must pay Hummingbird Electronics' reasonable costs of testing and investigating the Product in addition to shipping and transportation charges. Where Hummingbird Electronics is in possession of the Product, the Product will be returned to the Purchaser on receipt of the amount charged.

18. Any replaced Products or components of Products shall become the property of Hummingbird Electronics.

6 WARRANTY

19. Hummingbird Electronics may, in exercise of its sole discretion, deliver another type of Product or component of a Product (different in size, colour, shape, weight, brand and/or other specifications) in fulfilling its obligations under this Warranty, in the event that Hummingbird Electronics has discontinued manufacturing or supplying the relevant Product or component at the time of the Warranty claim, or where such Product or component is superior to that originally purchased by the Purchaser.

Other conditions of Warranty

20. If the Purchaser acquired a Product for the purpose of resupply, then this Warranty shall not apply to that Product.

21. In particular, the sale of a Product via an online auction, online store or other internet website by a party that is not an authorised distributor or reseller of the Product will be deemed to be a resupply within the meaning of the Australian Consumer Law and will render this Warranty void, as Hummingbird Electronics has no control over the storage, handling, quality or safety of Products sold by such persons.

22. A Purchaser shall only be entitled to the benefit of this Warranty after all amounts owing in respect of the Product have been paid.

23. While Hummingbird Electronics warrants that the Products will be free from defects in materials and workmanship in the circumstances set out in this Warranty, to the maximum extent permitted by law Hummingbird Electronics does not warrant that the operation of the Products will be uninterrupted or error-free.

24. To the maximum extent permitted by law, Hummingbird Electronics' determination of the existence of any defect and the cause of any defect will be conclusive.

25. Spare parts or materials for the Products are guaranteed to be available for a period of 12 months after purchase of the Products.

26. The agents, officers and employees of any distributor or reseller of the Products and of Hummingbird Electronics are not authorised to vary or extend the terms of this Warranty.

6 WARRANTY

27. Hummingbird Electronics shall not be responsible or liable to the Purchaser or any third party in connection with any non-performance or delay in performance of any terms and conditions of this Warranty, due to acts of God, war, riots, strikes, warlike conditions, plague or other epidemic, fire, flood, blizzard, hurricane, changes of public policies, terrorism and other events which are beyond the control of Hummingbird Electronics. In such circumstances, Hummingbird Electronics may suspend performance of this Warranty without liability for the period of the delay reasonably attributable to such causes.

28. If a clause or part of a clause in this Warranty can be read in a way that makes it illegal, unenforceable or invalid, but can also be read in a way that makes it legal, enforceable and valid, it must be read in the latter way. If any clause or part of a clause in this Warranty is illegal, unenforceable or invalid, that clause or part is to be treated as removed from this Warranty, but the rest of this Warranty is not affected.

Hummingbird Electronics' contact details

29. Hummingbird Electronics' contact details for the sending of Warranty claims under this Warranty are:

29.1 Redarc Electronics Pty Ltd

23 Brodie Road (North), Lonsdale SA 5160

Email: power@redarc.com.au Telephone: +61 8 8322 4848

Free technical assistance!

please contact

Hummingbird Electronics

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1 Technology Place

Williamtown NSW 2318

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Ph: +61 2 9043 0052(From overseas)

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