



2 Axis Tilt-Switch

User Configurable 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.

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 single-axis, dual-axis, unipolar or rollover mode. Once mounted, the tilt-switch can be opened and zeroed by pressing a push-button switch internal to the device. This will compensate for small angle offsets due to mounting and will orientate the sensor. The unit should be calibrated at least once if it is to be used in any orientation other than with the mounting flange horizontal.

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 0 and 63 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.

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.

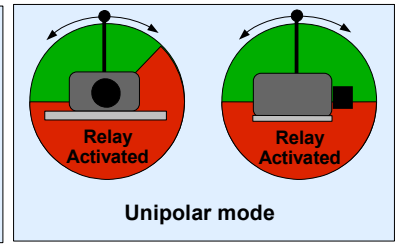
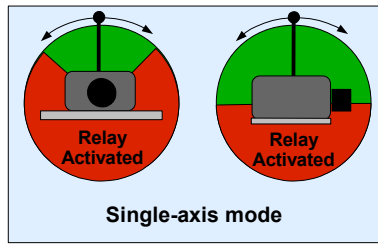
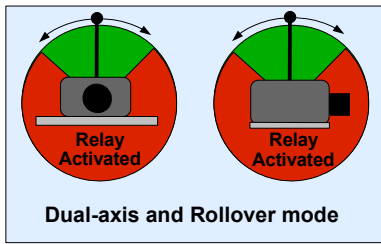
SW 9 sets hysteresis 0.5 or 1 degree; off 0.5 degree, on 1 deg.

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

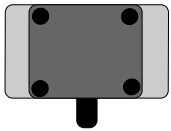
Orientation A – mounting plate horizontal, switch angle set to 45 degrees



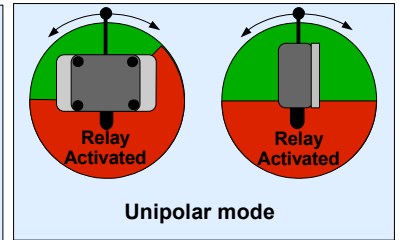
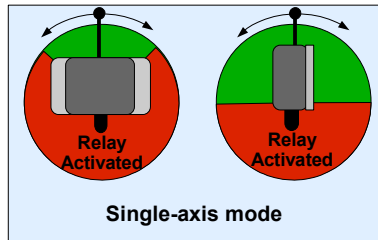
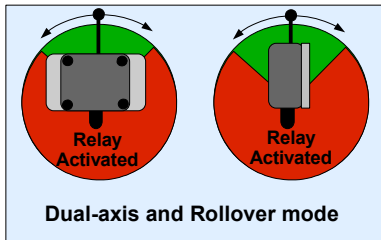
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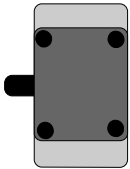
Orientation B – mounting plate vertical, cable down, switch angle set to 45 degrees



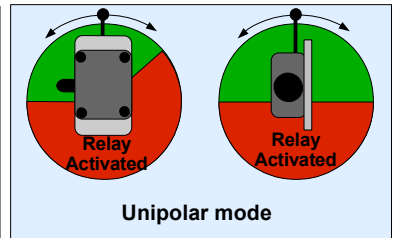
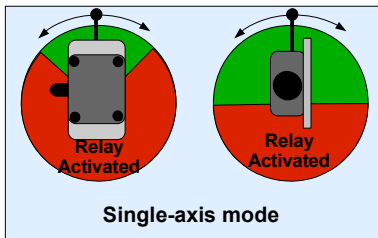
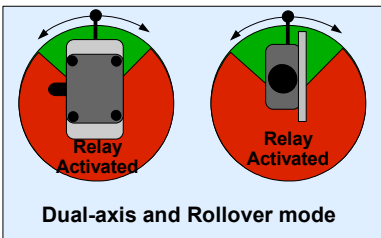
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Orientation C – mounting plate vertical, cable to the left, switch angle set to 45 degrees



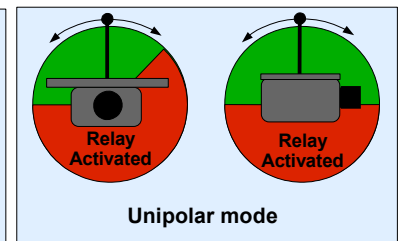
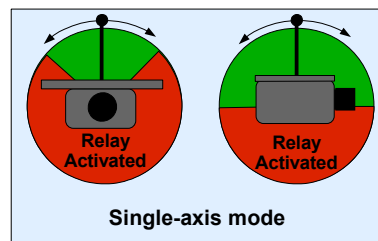
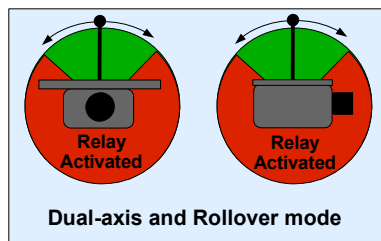
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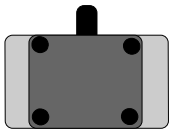
Orientation D – mounting plate horizontal, upside down, switch angle set to 45 degrees



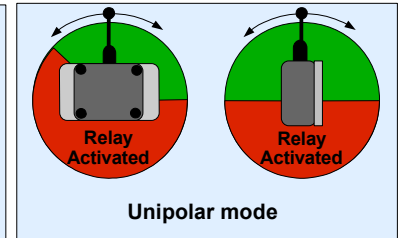
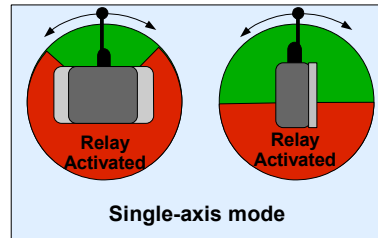
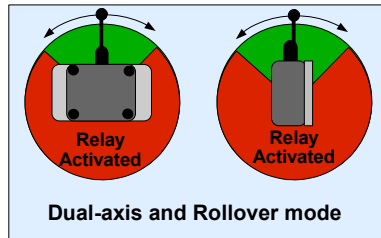
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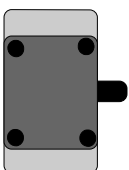
Orientation E – mounting plate vertical, cable up, switch angle set to 45 degrees



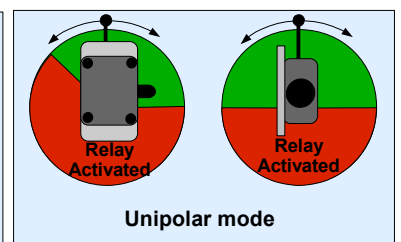
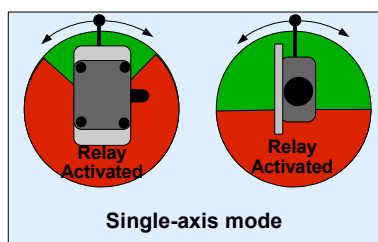
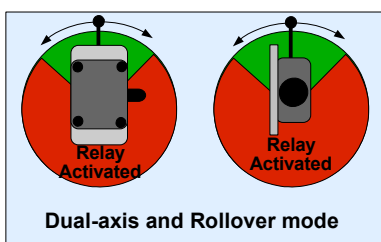
Calibrate like this



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



Calibrate like this



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 (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.

Technical Specifications and Ordering Information		
Part number	HMTS2CFG10B	
Device type	User Configurable Tilt Switch	
Number of axis	Dual Axis or Single Axis (switch selectable), Horizontal or Vertical operation	
Switch angle	0 to 70 degrees	
Relay Output	Voltage free <i>normally open</i> , <i>normally closed</i> and <i>common</i> contacts provided	
Output Specification	Maximum Relay Voltage: 36V DC, Maximum Relay Current:5A – not fused	
Input voltage	Minimum: 9V, Maximum: 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) at 24V in	
Accuracy	-15 to 15 degrees	±0.5 degrees at 25 °C with maximum filter applied
	-30 to 30 degrees	±1.0 degrees at 25 °C with maximum filter applied
	-60 to 60 degrees	±2.0 degrees at 25 °C with maximum filter applied
Frequency characteristics	Internal sampling frequency 10Hz (100msec)	
Dimensions	50mm (width) x 50mm (length) x 32mm (height) – baseplate 77mm wide	

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
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

SW1	SW2	SW3	SW4	SW5	SW6	Angle
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
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