



## Rhino Industrial 400W Brushless DC Motor Drive with RTU Modbus (Model No: RMCS – 3303)



## Operating Manual v1.0

# Rhino Motion Controls

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## Introduction – Salient Features

Rhino Motion Controls RMCS-3303 is 400W RTU MODBUS high performance brush-less dc drive. It supports (12–48V DC) and it is designed for optimized operation of Rhino brush-less DC motors with Hall sensor. This is an amazing cost effective solution to provide closed loop / open loop control for various applications. The salient features of this drive:

- This drive provides a closed loop / open loop speed control for the brush-less dc system.
- This drive has speed feedback (Hz) and current feedback (A).
- The drive will provide full torque at all speeds within the range.
- This drive is designed for smooth and quiet operation without compromising on torque and control at higher speeds.
- There is LED indication for power and error state in this drive.
- Open Collector Error Output is available in this drive.
- It is possible to run the motor in three different modes.
- It has short-circuit protection for the motor outputs, over-voltage and under-voltage protection and will survive accidental motor disconnects while powered-up.
- This drive is configured using MODBUS RTU protocol through RS485 Communication.
- There is a function in the drive for setting the MODBUS Slave Address from 1 to 247 using MODBUS Tool Device (Software Setting).
- There is a Potentio-meter to control speed of motor in Analog control mode.
- There are three user speed control modes in the drive :
  - Mode 0: Analog Open Loop Mode.
  - Mode 3: Analog Closed Loop Mode.
  - Mode 5: Wobble Mode.

## Technical specifications

### Supply Voltage:

Specification	Min	Max	Units	Comments
Supply Voltage	12	48	Volts DC	Between V+ and V-

### Switch Selection for Current (24VDC):

Max current motor	Switch S1	
	1	2
12A	OFF	OFF
9A	OFF	ON
6A	ON	OFF
3A	ON	ON

**Default: 12A.**

## Modbus Registers

Register	Data Address (Decimal)	Access	Size (bit)	Function	Range/ Command And Default value in HEX (Decimal)	Specification	Description		
40001	0	Read / Write	16 bit	Write Parameters to EEPROM	FF (255)	-	To save parameters in Drive (EEPROM) send Hex value XXFF to Address 0. Where XX is <b>slave ID</b> ranging from 1 to F7(1 - 247) For example: If slave id is 7 then write 07FF.		
				Modbus Slave Address	Range:1-F7 (1-247) Default: 1 (1)	-	Slave ID can be changed using Modbus tool software		
40002	1	Read / Write	16 bit	<b>Modes (Default value: 0)</b>					
				Analog Open Loop Mode <b>(Mode 0)</b>	0000 (0)	Mode byte:00 Control byte:00	-		
				Analog Closed Loop Mode <b>(Mode 3)</b>	0300 (768)	Mode byte:03 Control byte:00	-		
				Wobble Mode <b>(Mode 5)</b>	0500 (1280)	Mode byte:05 Control byte:00	-		
40005	4	Read	16 bit	Speed Feedback	Range:0000-FFFF (0-65535)	-	Current Speed of motor (Hz) / Unfiltered.		
40006	5	Read	16 bit	Current Feedback	Range:0000-FFFF (0-65535)	-	Current Feedback (A)		
40008	7	Read / Write	16 bit	Wobble Up Time	Range: (0 to 60) Default: 000A (10)	-	Rise Time (sec)		
40009	8	Read / Write	16 bit	Wobble Down Time	Range: (0 to 60) Default: 0007 (7)	-	Fall Time (sec)		
40010	9	Read / Write	16 bit	Wobble RPM	Range: (0 to 250) Default: 0064 (100)	-	-		
40011	10	Read / Write	16 bit	Wobble Ramp Time	Range: (0 to 200) Default: 0005 (5)	-	Ramp Time (sec)		
40012	11	Read / Write	16 bit	Wobble Hold Time	Range: (0 to 5) Default: 0003 (3)	-	Hold Time (sec)		

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40013	12	Read / Write	16 bit	Wobble Centre RPM	Default: 0640 (1600)	-	rpm
40014	13	Read	16 bit	Wobble Speed Feedback	Range: (0-65535) Default: 0000 (0)	-	Current Speed of motor (Hz) / Filtered.
40015	14	Read	16 bit	Wobble Braking Strength	Default: 0050 (80)	-	-
40016	15	Read	16 bit	Number of Poles	-	-	-



## Pin Description:

Sr No.	Drive PIN OUT	Power Supply PIN OUT
1	V-	GND
2	V+	+VCC (12-48VDC)
<b>MOTOR PIN OUT</b>		
1	W	W (Thick Blue)
2	V	V (Thick Green)
3	U	U (Think Yellow)
<b>HALL ENCODER</b>		
1	GND	GND (Black)
2	+5V	+5V (Red)
3	HW	HW (Blue)
4	HV	HV (Green)
5	HU	HU (Yellow)
<b>INPUT</b>		
1	SPEED_POT	Potentiometer
2	BREAK	Connect +5V to 48V for Motor Break
3	DIR	Connect +5V to 48V for Motor direction change in cw/ccw
4	ENBL	Connect +5V to 48V for Enable Motor
5	ERR	Open Collector Error Output reference to AGND
6	AGND	Common GND for Input
7	AA	D+
8	BB	D-



## Control Modes

Motor can be run in 3 different modes (refer Modbus Registers Table):

### Mode 0 Analog Open Loop Mode:

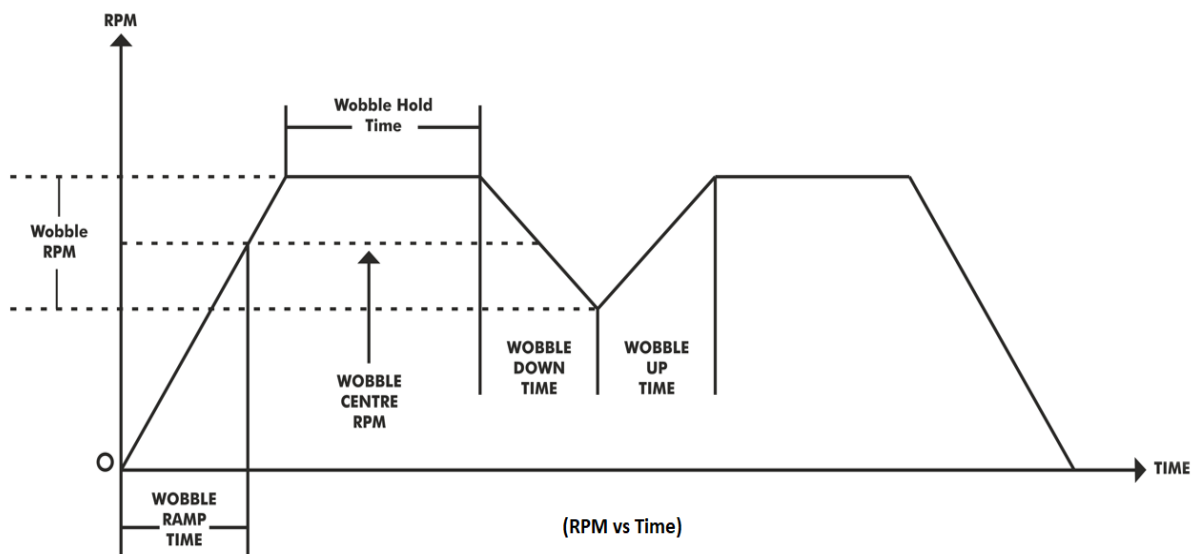
- In this mode the PWM / Voltage of the Rhino BLDC motor can be controlled by using Potentiometer.
- The ENABLE, BRAKE and DIRECTION inputs are available in this mode.
- Need to connect the ENABLE, BRAKE and DIRECTION pin to 5V and the AGND pin to GND.
- Also the Open Collector Error Output is available in this mode.

### Mode 3: Analog Closed Loop Mode:

- In this mode the speed [RPM] of the Rhino BLDC motor can be controlled by using Potentiometer.
- The ENABLE, BRAKE and DIRECTION inputs are available in this mode.
- Need to connect the ENABLE, BRAKE and DIRECTION pin to 5V and the AGND pin to GND.
- Also the Open Collector Error Output is available in this mode.
- The drive will provide full torque at all speeds within the range.

### Mode 5: Wobble Mode:

- The speed of the BLDC motor can be control as per the below wobble waveform used in textile machines for winding applications.
- The settings for the RPM, acceleration and timings are set via the MODBUS [RS-485] interface. The start and stop are managed by the ENABLE pin.



## **Troubleshooting**

- a. If timeout error check hardware connections of motor, power supply, RS485 module connections. Also check slave id is correct or not.
- b. If motor is not running in analog mode check potentiometer position and check enable connection as it must be connected with 5V. AGND is connected with GND.
- c. If error light is ON reset power.
- d. And if any parameters are saved in drive then write reset command in drive.

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