

C/CL700-C/CL1000 Series

CONTROLLER USER MANUAL

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General Overview

- **CL700/CL1000** is a state of art motor controller designed for all kind of EV application like 4W, 2W, Car, motorcycles, go-karts, performance vehicle project etc.
- Performance is far better than any other controller series available in the global market
- **CL700/CL1000** is the first of its kind motor controller which runs on open source VESC software and totally customizable for every kind of application which have an electric motor
- The development team behind it has been working in this field from last 6 years and is very skilled and have experience in developing electric motor sports vehicles
- **CL700/CL1000** comes with no warranty on the product, replacement only on manufacturing defect. (Term & Conditions apply – <https://3shulmotors.com>)
- One-time remote setup and troubleshooting service will be provided free of cost
- Further it will be charged hourly for any consultation for upgrade and modifications

Controller Specifications

Voltage	36 - 126V (8-30s safe)
Current	500A continuous max, 1000A phase (values depend on mounting and ambient temperature around the device)
Motor Control Modes	BLDC square wave and FOC sine wave
Firmware	Latest (firmware update supported)
ERPM	150,000
Control Interface Ports	USB, CAN, UART, Bluetooth
Supported Sensors	ABI, HALL, AS5047, AS5048A, Sensor-less
Input Set Support	PPM, ADC, NRF, UART
Bus Bar Diameter	14mm
Programmable	Yes
Max Power Output	60 KW

Hardware Setup

In the box:

- The CL700/CL1000 controller unit
- A pack of terminal bolts for connections and mounting
- Bunch of extra connectors and pins
- Wiring Harness with complete connectors

Mounting and Connection Instructions:

1. Unbox the package
2. Take the controller unit out
3. Check the fitting screws pack
4. Check for any damage, if found let us know through our website forum at 3shulmotors.com or e-mail support@3shulmotors.com
5. Crimp lugs for U, V, W and Battery +, - terminals
6. Please read all the terms & conditions before purchasing the product from 3 Shul Motors for claiming warranties or making returns.
7. Start the assembly fixing the controller on the table setup or in the vehicle test unit with the provided fitting accessories.
8. Tighten the lug bolts of M6 x 1.0 with spring washer up to 3Nm to ensure good connection or fitting.
9. Wiring harness is included in the box you can refer to the pin out section in the manual for connections.
10. A free setup call will be arranged for the first-time setup of controller for software configuration according to the application.
11. After setup enjoy the beast power output of CL700/CL1000 on your projects or vehicles.
12. For any other problem faced during installation you can email it at support@3shulmotors.com , our team will respond your query as soon as possible.

Software Setup

Please follow the step-by-step guide for the software setup of the controller

The link is given below:

<https://vesc-project.com/node/178>

If you have any other problem in setting up the controller you can contact us at

support@3shulmotors.com

Features

- Field Weakening and MTPA (Maximum Torque Per Amp) is supported
- IMU (Gyroscope and Accelerometer) Onboard (BMI160).
- 12v 5Amp dc-dc converter for powering accessories.
- 120mm fan mount for forced cooling
- Plenty of CPU resources left so you can run apps on the controller
- Powered by STM32F4 microcontroller running at 168MHz
- Sensored and sensor-less FOC with auto-detection of all motor parameters
- Current and voltage measurement on all phases
- Variable regenerative braking
- Brushless, brushed DC motors, IPM motors are supported
- A GUI that is easy on the eyes
- Adaptive PWM frequency to get as good ADC measurements as possible
- Good start-up torque in the sensor-less mode and sensored mode
- The motor is used as a tachometer, which is good for odometry
- Duty-cycle Control, Speed Control, Current Control and Position Control
- Seamless 4-quadrant operation
- Interface to control the motor: PPM signal (RC servo), analog, UART, I2C, USB or CAN-bus
- Consumed and regenerated amp-hour and watt-hour counting
- Optional PPM signal output
- The USB port uses the modem profile, so an Android device can be connected to the motor controller without rooting
- Adjustable protection against:
 - Low input voltage limit
 - High input voltage limit
 - High motor current limit
 - High input current limit
 - High regenerative braking current limit (separate limits for motor and input)
 - Rapid duty cycle changes (ramping)
 - High RPM limit (separate limits for each direction)

- When the current limits are hit, a soft back-off strategy is used while the motor keeps running. If the current becomes way too high, the motor is switched off completely
- The RPM limit also has a soft back-off strategy
- Realtime data logging and monitoring

Position Sensors

Multiple position sensor types are supported with this controller:

- Hall sensor
- Encoder
 - SPI/Serial: AS5047P, AS5048D, TS5700N8501/Multiturn, MT6816
 - ABI
 - Analogue: SIN-COS encoder
- Sensorless

Hardware Protection

- Over current protection
- PWM overlap protection
- Short-circuit protection for power rails
- ESD protected inputs

Design and Casing

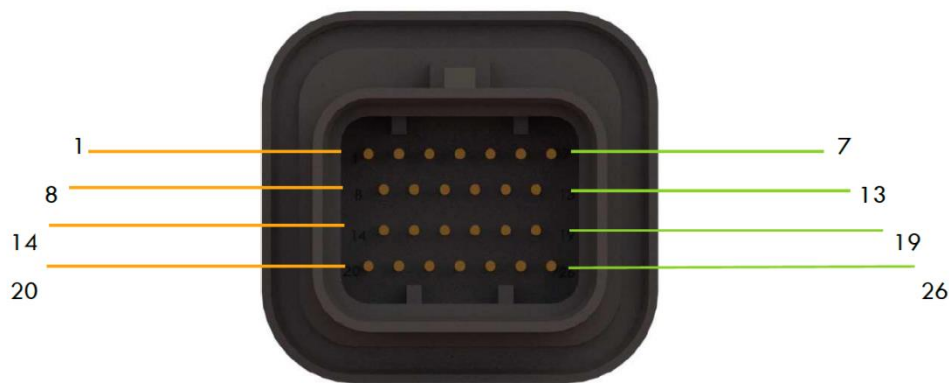
- Enclosed in an aluminium and Resin Printed enclosure
- Aluminium part is at bottom acting as a heat sink
- The Resin Printed enclosure is designed specifically to cover the whole component aesthetically
- The Terminals are appropriately visible and easy to perform operation on it
- The overall structure is rigid and easy to work with in any application
- The size is also compact and easy to fit in any space
- The bottom of the aluminium heatsink is fins surface and 120mm mount for fan.

Connector

CL1000 CONNECTOR PIN OUT

Control interface mating connector is 26 pin AMPSEAL with ordering code:

- Connector (Manufacturer Part no.: 6437288-6)
- Mating Housing (Manufacturer Part no.: 3-1437290-7)
- Female crimp pins (Manufacture Part no.: 3-1447221-3)

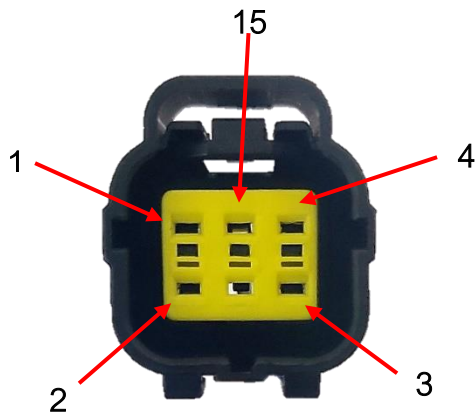


Pin	Name	Description/Comment
1	+5v	5V for sin cos encoder
2	sin	Sin signal from encoder
3	cos	Cos signal from encoder
4	Gndd	Gndd
5	tx	Tx or Cruise Control Pin (TX to GND will activate cruise)
6	rx	Rx or Reverse Control Pin (RX to GND will activate Reverse)
7	+5v	5 Volt supply (MAX: 650mA)
8	GNDD	Gnd return For Uart and USB internally Connected to Pin12
9	Usb_d-	USB D- Pin
10	Usb_d+	USB D+ Pin
11	+3.3 V	3.3Volt supply (MAX: 650mA)
12	GNDD	Gnd return For Canbus, Hallsensor, Throttles MotorTemp
13	Can_l	CANBUS Low
14	Can_h	CANBUS High
15	Motor_temp	Motor Temperature sensor input 16
16	Hall_u	Hallsensor U_Phase / CLK(Encoder)

17	Hall_v	Hallsensor V_Phase / MISO(Encoder)
18	Hall_w	Hallsensor W_Phase / CS(Encoder)
19	+5 V	5 Volt supply for Throttle
20	Adc1	Acclerator Throttle input
21	Adc 2	Regen Throttle Input
22	RC_PWM	PPM Input
23	Auxout 1	Aux1 Open drain Output For driving relay or fans (12v/500mA MAX) Use Flywheel Diode for Inductive Loads
24	+12 V	12V output for driving fans and relay.
25	Auxout 2	Aux2 Open drain Output For driving relay or fans (12v/500mA MAX) Use Flywheel Diode for Inductive Loads
26	vin	Ignition Input. Series Diode is required externally connected to battery positive.

- Wiring harness with connectors & pin out description

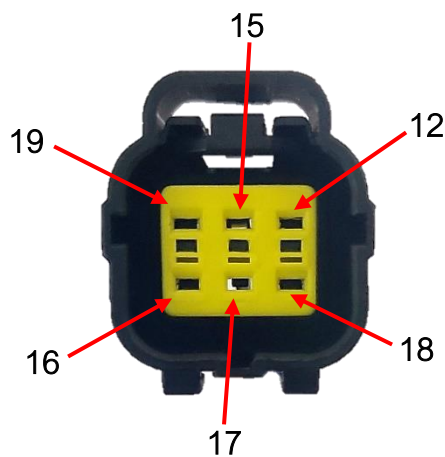
Sine Cos Encoder Coupler



Pin Description:

1- +5V
15- Motor_temp
4- Ground (-)
2-Sine
3-Cos

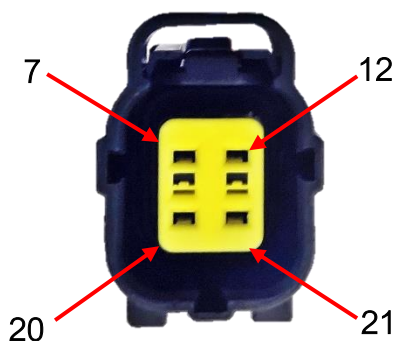
Hall Sensor Coupler



Pin Description:

19- +5V
15- Motor temp
12- Ground (-)
16-Hall_u
17-Hall_v
18-Hall_w

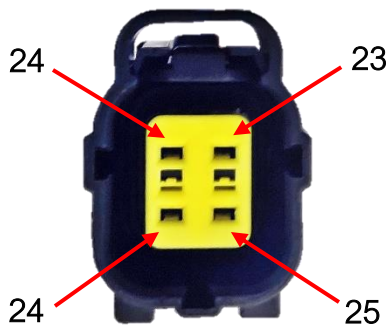
Throttle And Regen Coupler



Pin Description:

7 - +5V
12- Ground (-)
20- Adc1(Throttle Input)
21- Adc2(Regen Throttle Input)

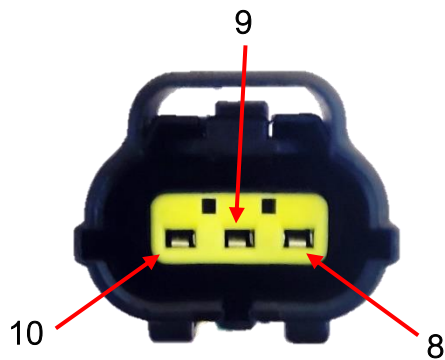
Auxiliary 12V Supply Coupler



Pin Description:

24- +12V
23- Aux1(switchable GND)
24- +12V
25- Aux2(switchable GND)

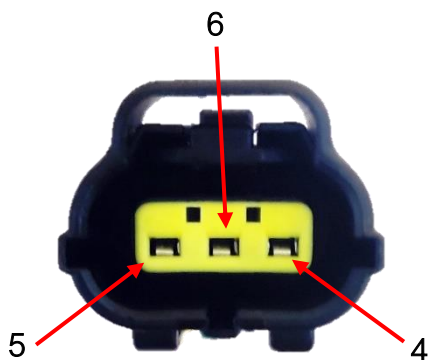
USB Coupler



Pin Description:

10- Usb_d (+)
9- Usb_d (-)
8- Ground (-)

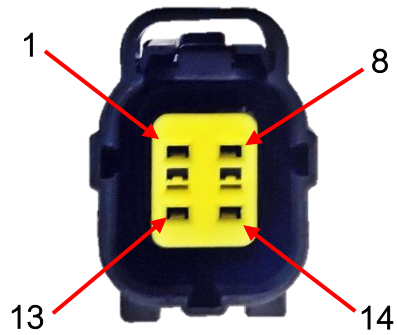
Cruise And Reverse Coupler



Pin Description:

5-TX (Cruise)
6-RX (Reverse)
4-Ground (-)

CAN Coupler



Pin Description:

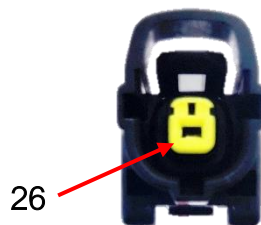
1- +5V

8- Ground (-)

13-Can_low

14-Can_high

Ignition Input Coupler

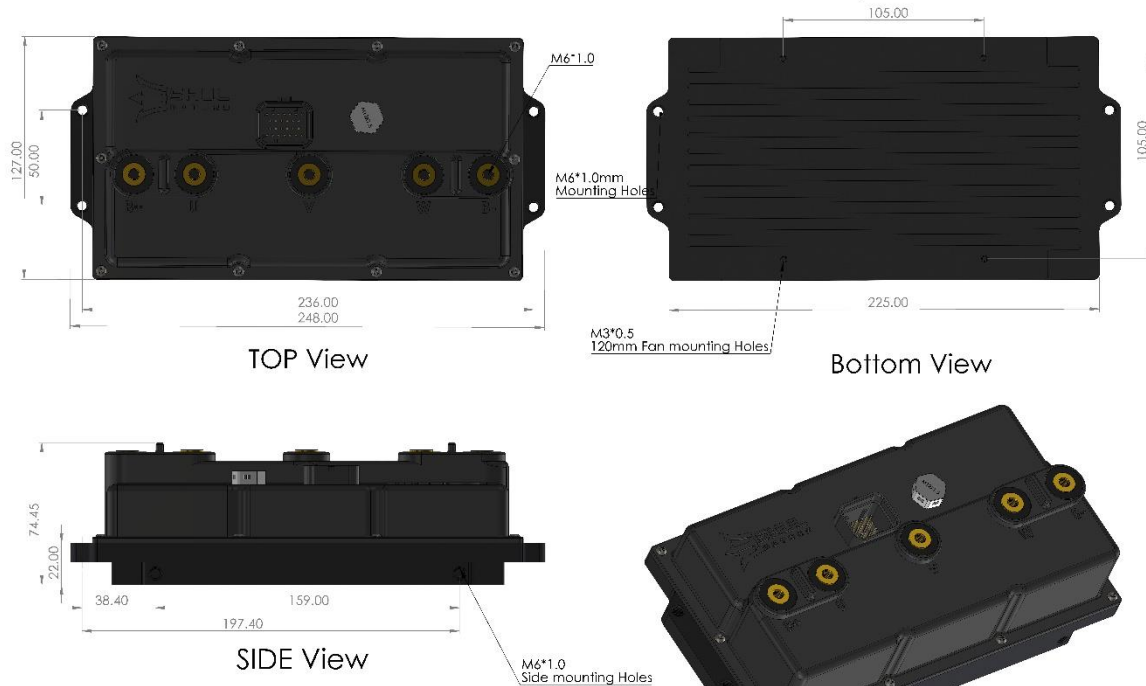


Pin Description:

26- Ignition input (high volt)

Dimensions

C700/CL700/C1000/CL1000 Reference Diagram



Note:

1. Actual Product may differ in color appearance.
2. Mountings can fit Surron and Talaria Ebikes with little bit tweaking in frame.
3. Fin Side should be exposed to flowing air for optimum performance.
4. Please refer to user manual for correct information of operation.

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