MC01

Embention

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CONTENTS

INTRODUCTION

1.1 General Description

Veronte MC01 is a PWM, CAN or I2C-controlled ESC for critical actuator control. With built-in control mechanisms it tracks motor position by reading encoders. The MC01 can control non-critical motors with instruction received from a Veronte Autopilot.

It can be configured for receiving position or speed commands. Embedded PID control algorithms manages motor position as an absolute value or relative to a gyroscope.
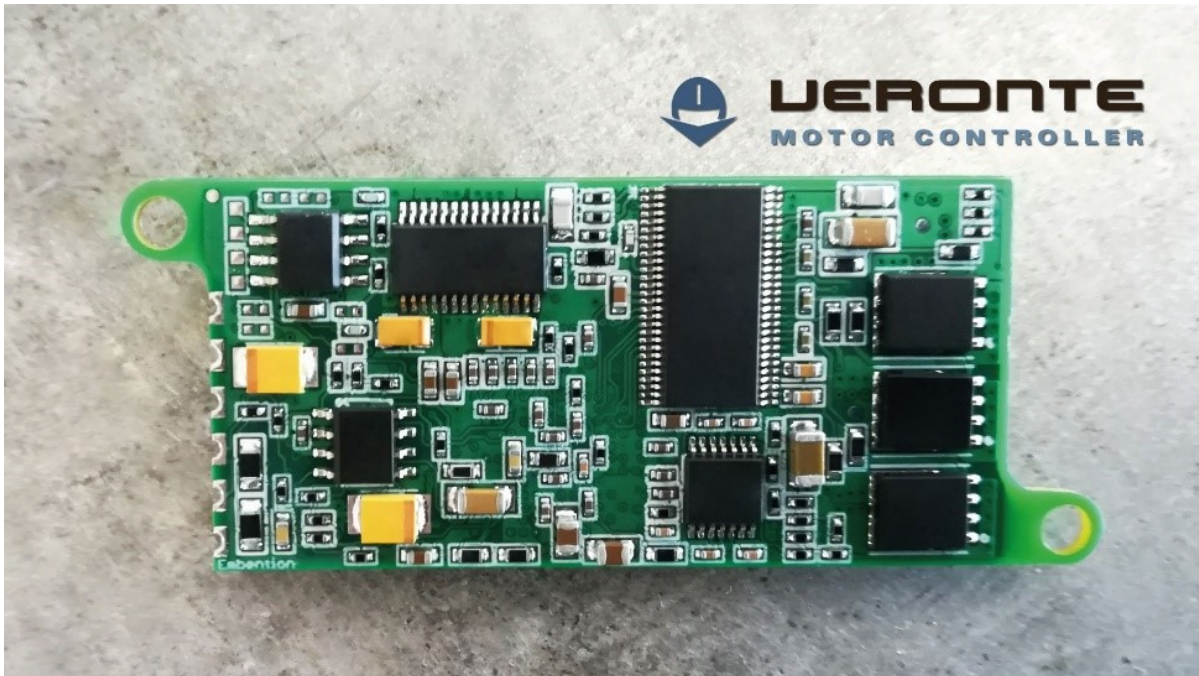
Veronte MC1

Veronte MC01 size comparison

1.2 Applications

- Precise steering
- Payload control
- Wiring optimization
- Gimbal control

1.3 Vehicles

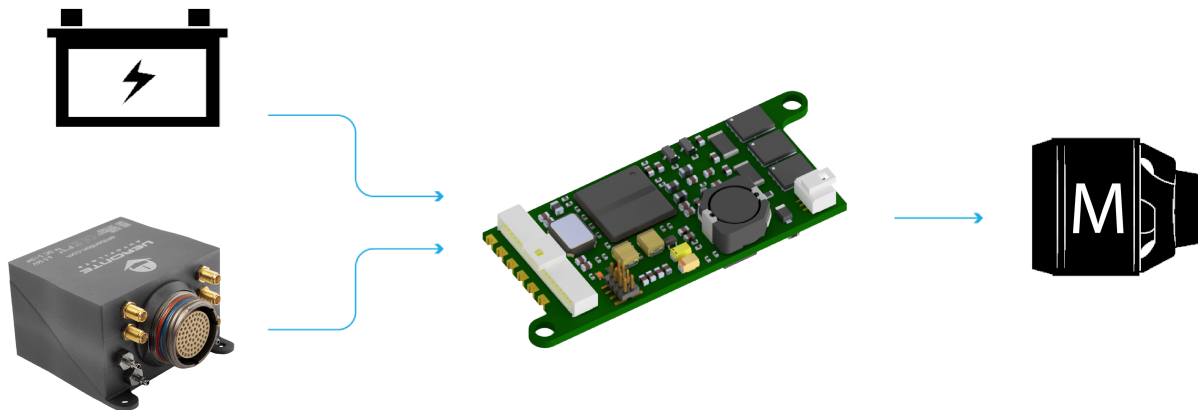- Large aircrafts
- High speed UAVs

QUICK START

2.1 First steps

The MC01 is connected to Veronte Autopilot, a battery and a motor according to the following diagram:

General diagram

To obtain more details about electrical connections, read the *Pinout/Connections* section.

Software installation and configuration is explained in the *Software Installation* section.

2.2 Warnings

The MC01 brushless variant has stablished a maximum intensity, which can be configured in the Heartbeat and intensity limit section in the VMC PDI Builder user manual. In case of overpassing the Maximum intensity during the stablished period, the MC01 will whut down. **Do not** use the MC01 to control critical motors, for example to produce propulsion or lift forces.

2.3 Requirements

To use the Veronte MC01, the following items are required at least:

- SPI enconder in the motor (from -12 to 12V).
- Power supply (up to 24 V DC and 3 A).
- **One of the following interfaces to control the motor speed:**
    - PWM
    - CAN
    - I2C
- A 120 Ohm resistor.
- A Veronte Autopilot.

TECHNICAL

3.1 Variants

Veronte MC01 has to variants or versions. Both have the same hardware, nonetheless the software is different.

- **MC01B - Brushless variant:** for brushless motors.
- **MC01S - Stepper variant:** for stepper motors.

3.2 General features

- **Compact design**
- **Lightweight**
- **Low energy consumption**
- **Very quick reaction**
- **Support for encoders**
- **Gyro-stabilisation**
- **Control algorithm:** Proportional Integral Derivative (configurable gains)
- **Dimensions:** 60x25x15mm
- **Weight**: 10g
- **Redundant Isolated CAN Expansion**
    - 2x CAN for critical actuators - two wires each one
    - No power wires required (optional)
- **Auxiliary Power Outputs**
    - 1x 5V DC
    - 1x 3.3V DC
- **Embedded Sensors**
    - Input voltage
    - Board temperature
    - Communication buses
    - 1x CAN

      – 1x I2C

- **Input / Output**

      – 4x GPIO (on/off)

      – 2x PWM / ECAP

- **Supported encoders**

      – SPI Differential

      – SPI

      – Digital (ECAP and EQEP)

3.3 Part List
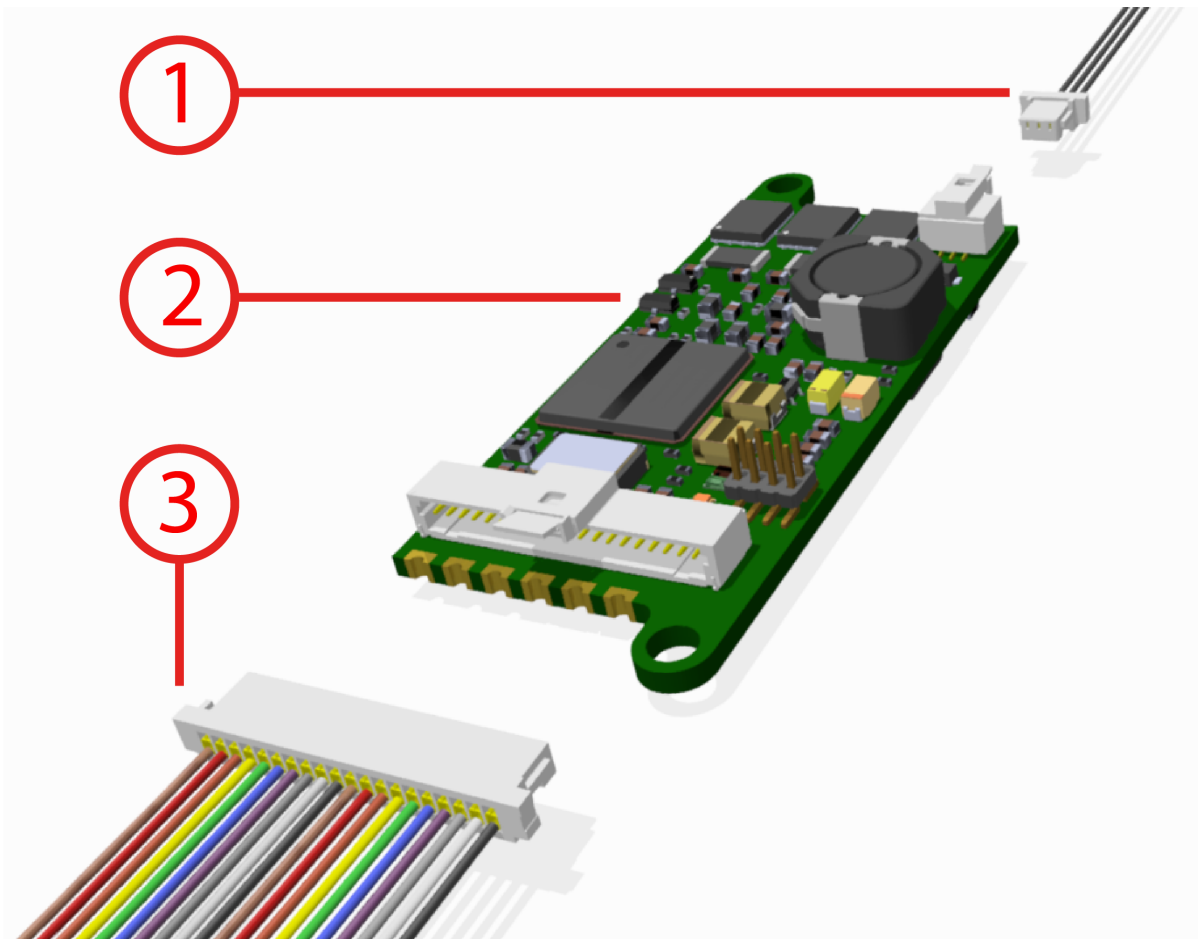
Number	Description	Commercial reference
1	Connector with 3 pins	S1SS-03-28-GF-07_00-L
2	Veronte MC01 controller	
3	Connector with 20 pins	S1SS-20-28C-GF-11_00-L

3.4 Dimensions
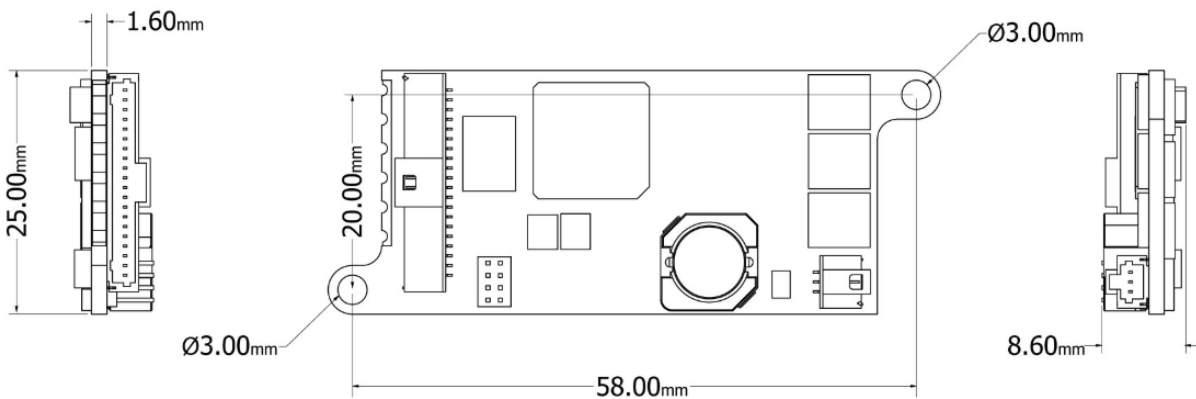
Veronte MC01 board dimensions

3.5 Electrical specifications

- **Motor**

    - Voltage: same as input. 3-phase brushless interface.

- **EQEP encoder**

    - 32-bit QEP channels.

- **PWM/ECAP**

    - Maximum voltage: 3.3V.

    - Maximum input current: 2.5 mA.

    - Sampling rate: up to 1 micro s.

- **Auxiliary 3.3V output**

    - Non-protected output – Light loads.

- **Auxiliary 5V output**

    - Non-protected output – Light loads.

- **CAN**

    - Complies with standards.

    - Non-Isolated.

    - Speed up to 1 Mbps.

- **I2C**

    - 3.3V Signals up to 400 KHz.

- **Power Input**

    - Vmax = 24V DC.

- IMax: 3A. Depends on the motor.

- Inom: 0.3A (motor not working).

- Typical Input Current: 1.5A.

- **SPI encoder**

- Maximum and minimum voltage: +12 to -12V.

- **Addon for isolated CAN transceivers – New board soldered**.

3.6 Interfaces

The only connections required are the connectors shown in the *Part List section*.
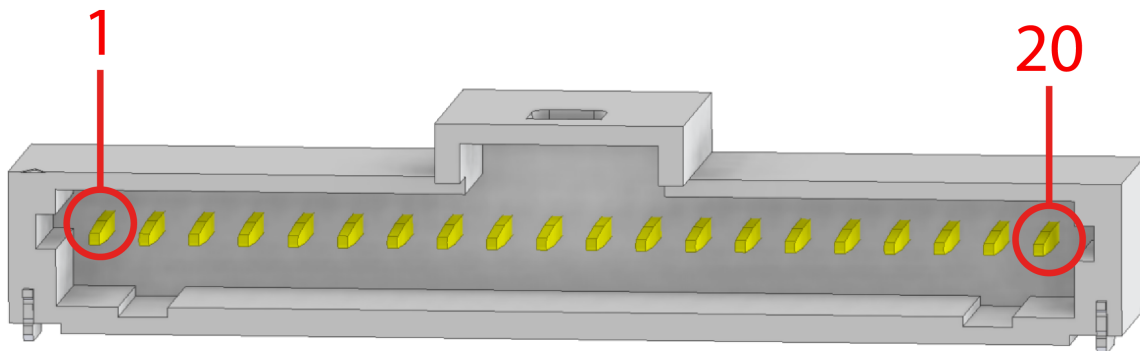
HARDWARE INSTALLATION

4.1 Assembly

Two M3 screws are recommended to assemble mechanically the MC01 to a frame. Its fixation holes do not have thread, then it is necessary to use more than 2mm as thread depth.

## 4.2 Pinout/Connections

4.2.1 20 Pin Connector

Allocation pin numbers

Number	Colour	Inputs	Use
1	Brown	EQEP1L	EQEP Encoder
2	Red	EQEP1S	EQEP Encoder
3	Orange	EQEP1B	EQEP Encoder
4	Yellow	PWM1/ECAP	PWM/ECAP
5	Green	EQEP1A	EQEP Encoder
6	Blue	3.3V	Output Power
7	Purple	PWM2/ECAP	PWM/ECAP
8	Gray	CAN (N)	CAN negative
9	White	CAN (P)	CAN positive
10	Black	GND	Ground
11	Brown	SDA	I2C
12	Red	SCL	I2C
13	Orange	INPUT POWER	Voltage supply
14	Yellow	5V	Output Power
15	Green	MISO+	SPI Encoder
16	Blue	MISO-	SPI Encoder
17	Purple	CLK-	SPI Encoder
18	Gray	CLK+	SPI Encoder

The encoder information is received as a differential signal between MISO+ and MISO-, with a differential clock signal between CLK+ and CLK-.

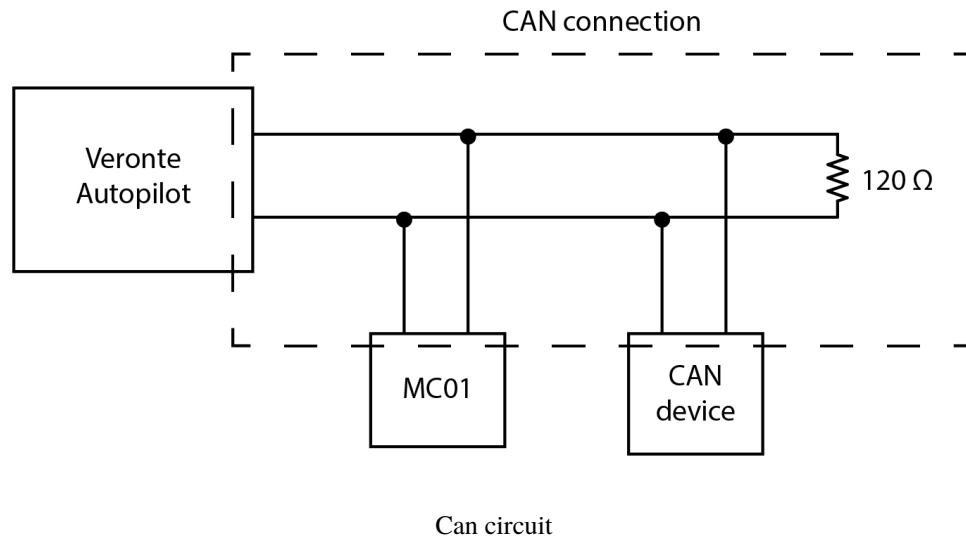## 4.2.2 3 Pin Output Connector

The 3 pin connector has the power outputs for motor power supply, each pin corresponds to a phase (A, B and C).
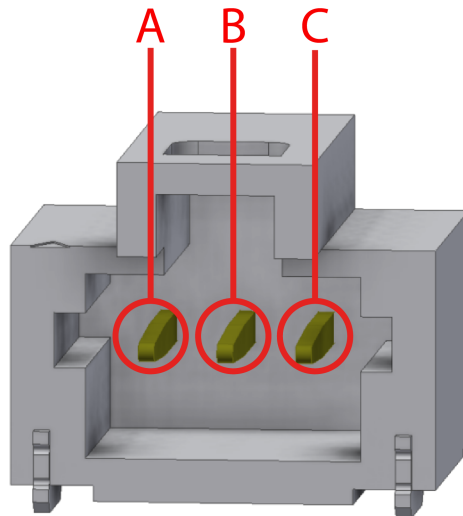
Allocation pin phases

4.3 CAN Assembly

A 120 Ohm resistor is required to connect via CAN a MC01 With a Veronte Autopilot. The following figure describes how to assembe the CAN connection with more devices.

Can circuit

SOFTWARE INSTALLATION

To configure the software, first of all a Veronte Autopilot must be connected to a PC with Veronte Link. Then the Veronte Autopilot has to be configured with 1x PDI Builder according to MC01. Finally the MC01 can be adjusted with the corresponding PDI builder according to the variant (MC01S or MC01B). These three tasks are referenced in this section.

5.1 How to stablish communication between PC and Veronte Autopilot

Follow the instructions from Veronte Link user manual to connect a Veronte device to a PC.

5.2 How to configure Veronte Autopilot

After connecting a PC to Veronte Autopilot, communications between Veronte Autopilot and MC01 have to be configured according to the 1x PDI Builder user manual.

5.3 How to configure MC01S

In case of using the stepper variant (MC01S) follow the instructions from the VMC Stepper PDI Builder user manual to configure a MC01S.

5.4 How to configure MC01B

In case of using the brushless variant (MC01B) follow the instructions from the VMC PDI Builder user manual to configure a MC01B.

MAINTENANCE

Apart from cleaning, no extra maintenance is required to guarantee the correct operation of the MC01.

In order to clean MC01 properly follow the next recommendations:

- Turn off the device before cleaning.

- Use a clean, soft and dry cloth to clean carefully the unit.

- Do not immerse the unit in water to clean it.

6.1 Software update

To update any software application, an additional application is required: **Veronte Updater**.

Note: The file with the new software version will be uploaded to the FTP folder when requested by the customer.

ACRONYMS AND DEFINITIONS

CAN	Controller Area Network
CLK	Clock
DC	Direct Current
ECAP	Enhaced CAPture
EQEP	Enhanced Quadrature Encoder Pulse sensor
ESC	Electronic Speed Control
GND	Electrical Ground
GPIO	General Purpose Input Output
M	Metric (threads)
MC	Motor Controller
MC01B	Motor Controller: brushless variant
MC01S	Motor Controller: stepper variant
MISO	Master Input Slave output
PWM	Pulse Width Modulation signal
SDA	Serial DAta line
SPI	Serial Peripheral Interface
UAV	Unmanned Aerial Vehicle

CONTACT DATA

You can contact Embention in any moment if you need further help and support.

Embention contact data is as follows:

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