MC0-500

Features

- Industry Leader for Medium to High Power device at 100kW/L
- Engineered for Whole Vehicle Cost-Efficiency
- Very High Efficiency (nom. >99%)
- IP67 Rated with Shock Tolerance
- Simple Software Integration with 1-click Motor Tuning
- Motoring and Generation Capabilities

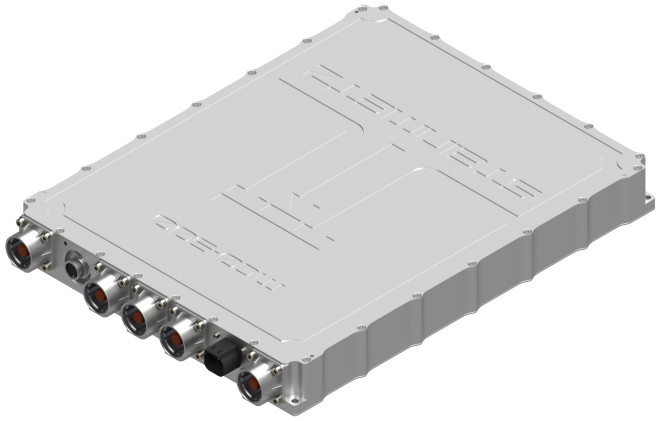


Figure 1: Steinmetz MC0-500

Specifications

- 1000 V_{DC}
- 500 A_{RMS} cont.
- 500 kW cont.
- $0\ \text{Hz} < f_{sw} < 100\ \text{kHz}$
- 4.8 L (292 in^3)
- 7.4 kg (16.3 lbs)

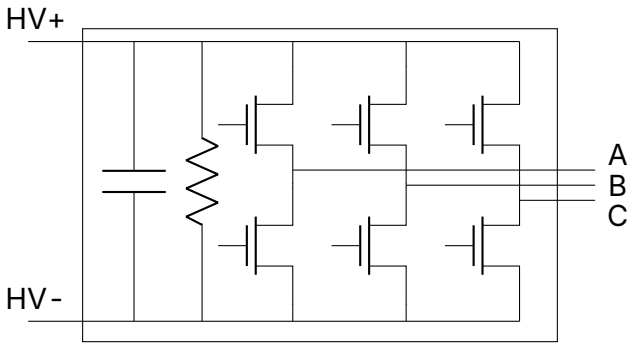


Figure 2: Pinout and Principle of Operation

Applications

- Traction Drive for large EVs (Trucks, Boats, Planes)
- Traction Drive for performance sports cars
- Very Heavy Industrial Machinery

General Description

The **Steinmetz MC0-500** is a high power density and cost-efficient 3-phase inverter. The MC0-500 delivers industry leading power densities, with 500kW packed into a single, compact motor controller.

Contact sales@steinmetzmotors.com with any inquiries.

High-Voltage Electrical Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Maximum Input Voltage	V_{DC}	60		1000	V	
Continuous Phase Current	I_{cont}			500	A (RMS)	
Continuous Power	P_{cont}			500	kVA	Derates based on temperature and voltage.
Switching Frequency	f_{sw}	0	20	100	kHz	
Electrical Frequency	f_e	0		2	kHz	
DC Bus Capacitance	C_{BUS}		50		μF	Changes based on DC Bus Voltage.
Discharge Resistance	R_{DIS}	660	666	673	kΩ	
Passive Discharge Time (<60V)	t_{DIS}		100		s	
Active Discharge Time (<60V)	t_{DIS}			0.5	s	

Mechanical Specifications

Structural

Parameter	Symbol		Val.	Unit
Ingress Rating	IP		IP67	
Mass	m		7.4	kg
Volume	V		4.8	L
Dimensions			43mm x 298mm x 381mm	

Cooling

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Coolant Inlet Temperature (full load)	T_{in}	-40	25	60	°C	Higher inlet temperature may derate output power.
Coolant Flow Rate	$\dot{V}$		25		L/min	Recommended for full performance; about 1 bar pressure drop.
Maximum Inlet Pressure	P_{in}			3.1	bar	45 psi relative to ambient.
Coolant Mixture			50/50			Water-glycol.
Stock Coolant Fittings			1/2 in barb			McMaster-Carr 5357K39.
Coolant Port Thread			1/4-18 NPT			User-replaceable fittings.

Connectors

Parameter	Value
Supported Conductor Size	35mm^2, 50mm^2, 70mm^2, 95mm^2. Larger cables will allow higher continuous powers.
High Voltage Connectors	Amphenol PL00X-301-10M10
Low Voltage I/O Connector	Hirose F13WBRB-20SD
Automotive Ethernet	TE 9-2367359-1

Low Voltage Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Input Voltage	V_{LV}	11		52	V	Full 11-52V operation supported
Nominal Current Draw	I_{LV}	0.5		1.5	A	

0-Series Motor Controllers

The 0-Series of motor controllers is Steinmetz's first production line of motor controllers engineered for extreme performance enabling the next-generation of EVs. Lightweight, efficient, powerful and uncompromising.

Built to eliminate integration pain points, the 0-Series brings true plug-and-play capability to high-voltage, high-performance electric drives. A streamlined setup empowers small teams to get running in minutes, with a scalable architecture designed to take you from 0 to 1, to 100, to 1,000,000 units with ease.

Application Information

Low-Voltage Electronics

LV Power

The LV system has support for input voltages from 11V up to 52V allowing use of standard 12V lead acid batteries in addition to 24 and 48V architectures. The LV system has a weak parallel RC connection from LV ground to the chassis.

Communication

Communication to the device occurs through CAN and Automotive Ethernet (100BASE-T1). Configuration and operation can occur through either of these interfaces.

Control

The system uses a modified SVPWM algorithm. The following interfaces are available for rotational feedback from the motor:

- Resolver (recommended)
- Digital Encoder
- Sensorless

Connectors

The LV I/O connector is the Hirose LF13WBRB-20SD. CAN, GPIO, LV power and position sensing goes through this connector. The mating connector for this part are the: LF13WBP-20P or LF13WBLP-20P.

The other LV connector is the TE 9-2367359-1 which carries 100BASE-T1, the recommended mating connector is the TE 9-2367337.

High-Voltage Electronics

Connectors

The HV connectors on the MC0-500 are all Amphenol Industrial PL00X-301. The supported mating connectors are: PL18X-301, PL28X-301, PL10X-301, and PL20X-301.

Each connector has a daisy chained interlock loop which detects if any connector is improperly seated.

Power Derating
The specifications listed in the datasheet are subject to derating depending on ambient temperature, DC bus voltage, coolant flow rate, cable size and switching frequency. More information can be found in the detailed documentation Steinmetz Documentation.

Mechanical

Grounding
There is a threaded M4x0.70 hole on the I/O side of the unit to provide a solid grounding connection to the motor. There should be a strong, low-impedance connection from this point to the motor to mitigate EMI and prevent hazardous build-up of high-voltage ground shifts.

Cooling
There are two 1/4"-18 NPT coolant ports on the rear of the unit. As shipped, MC0-500 uses straight 1/2 in barbed tube fittings (McMaster-Carr 5357K39) for 1/2 in ID flexible hose. The fittings can be replaced with any 1/4"-18 NPT threaded fitting. A 50/50 water glycol mix is required as coolant. For full performance, provide 25L/min of coolant flow and limit inlet temperature to 60°C. At the recommended flow rate, pressure drop is about 1 bar (15 psi); maximum inlet pressure is 3.1 bar (45 psi) relative to ambient.

Mounting
The MC0-500 provides mounting via either four M5x0.8x5 blind threaded holes, or four M5 clearance holes