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

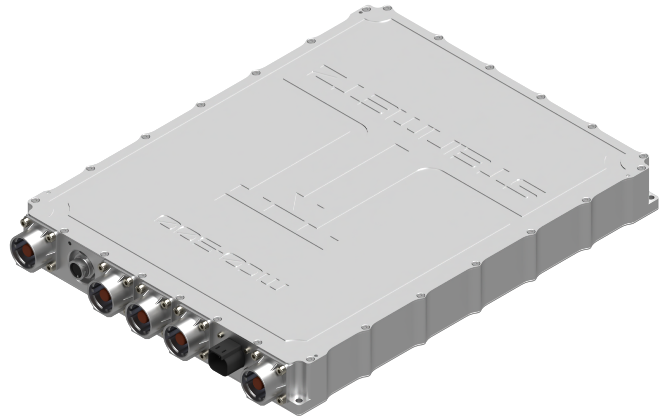

Figure 1: Steinmetz MC0-500

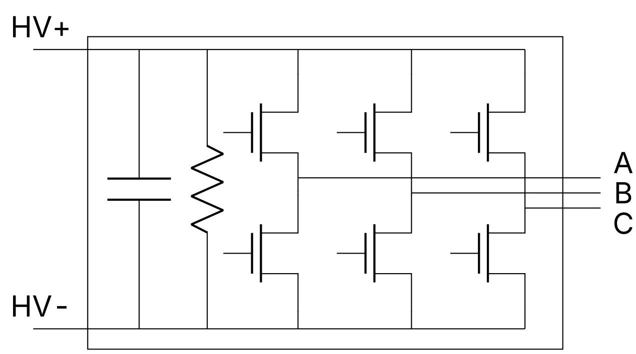

Figure 2: Pinout and Principle of Operation

Specifications

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

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.

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[a]	
Mass	m		7.4	kg
Volume	V		4.8	L
Dimensions			43mm x 298mm x 381mm	

[a] Full IP67-rated enclosures will ship in Q2 2026. Early development units do not have this guarantee.

Cooling

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Temperature (coolant)	T_{OP}	-40	25	80	°C	Power Derates
Pump Flow Rate	$\dot{V}$		24	40	L/min	Lower flow rate derates power
Inlet Pressure	P_{in}			300	kPa	

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	12	13	V	24-48V operation supported in upcoming revision
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 10V up to 60V allowing use of standard 12V lead acid batteries in addition to 24 and 48V architectures. The LV system has a high-impedance connection from LV ground to the chassis [1].

Communication
Communication to the device occurs through CAN and Automotive Ethernet (100BASE-T1)[2]. 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[3]
- Sensorless (not fully implemented, supported in future firmware releases)

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.

[1]Units shipped in 2025 support 12V operation. 24-48V architectures will be enabled for units shipping in early 2026.
[2]100BASE-T1 support will be enabled for units shipping in early 2026
[3]Units shipped in 2025 only support using a resolver, support for other position sensing will be enabled in mid-2026

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 2 1/8"-27 threads on the rear of the unit which act as the coolant ports. A 50/50 water glycol mix is recommended as coolant.

Mounting

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