

emDriveH100

motor controller

Datasheet V1.8



Important Notice

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- This guide contains proprietary information belonging to Emsiso d.o.o.
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General

- Advanced BLDC / IPM / PMSM / induction motor controller for e-drive systems
- Optimized for up to 30 kW continuous / 50 kW peak at 350 V_{DC} and cos φ 0,9
- CANOpen fully compatible (profile DSP402)
- *Sensor less operation with start / restart with rotating motor (optional)*

Options

- *Two controllers in sensor less mode per one motor. Enables redundant operation (optional)*
- *UAVCAN with double redundant CAN interface (optional)*
- Air and liquid cooled versions available

Motor control features

- Vector current control minimizes torque ripple and vibrations of motor – No motor audible noise
- Four quadrant operations (forward / backward with regeneration)

Position sensors – as an option for traction applications

- Possible position sensors
 - Absolute digital SSI encoder with RS422 interface
 - Resolver with excitation signals
- Optional throttle input or servo PWM controls motor torque, motor speed or combination of both

Protection functions

- Maximum motor current protection
- Thermal protection for motor (input for temperature sensor in the motor) – Gradual decrease of maximum motor current when motor temperature reaches programmable limit
- Controller thermal protection – Gradual decrease of maximum motor current
- Low battery protection with battery voltage measurement – Gradual decrease of maximum current when battery voltage indicates empty battery
- High voltage battery protection – Prevents over voltage situations when regenerating with full or damaged battery
- Motor stall protection – Limits motor current if motor is blocked
- *Throttle out of range detection for detecting of damaged throttle or broken wire (optional)*

Logging functionality diagnostic

- System for internal data acquisition and storage
- All internal variables can be sent over CANOpen for data acquisition

Set up and customization

- All settings are stored as parameters and can be changed – No »hard-wired« limits and settings
- CAN connection with running CANOpen for parameter programming and data acquisition
- Support any number of motor poles

Electronic design

- All high voltage connections have automotive EMC protection
- All control connections are protected against short circuit to ground
- Low EMC design, with proper cable wiring reaches class B EMC emission regulations

Communication interfaces

- 1 x CAN interface (*optional two for redundant UAVCAN*)
- CAN 2.0B interface with galvanic isolation
- CANOpen protocol (fully compatible to DSP402)

Housing

- Aluminum base plate heat sink, plastic molded top cover
- Shielded cable glands for high voltage cables – Max shielded cable cross section 10 mm²
- Dimensions Air (Height x Width x Length) 143 x 200 x 201 mm, weight 3,9 kg
- Dimensions Liquid (Height x Width x Length) 70 x 200 x 204 mm, weight 2,2 kg
- IP65 protection

Isolation

- 2,5 kV (1 min DC) between control terminals and power terminals
- 2,5 kV (1 min DC) between power terminals and case
- 100 V (1 min DC) between control terminals and case

Specifications 450 V version

- Maximum battery voltage 450 V
- Permanent motor phase current 100 A, 1 minute up to 150 A (depends on cooling)
- Inverter losses at motor current 150 A and 350 V DC are 1,6 kW
- Switching frequency 16 kHz
- Liquid cooling temperature max 55°C without derating

Specifications

emDriveH100	H100_150/450	unit
Electrical data		
Output continuous current	100	A _{RMS}
Output maximum peak current (one minute)	150	A _{RMS}
Input DC link voltage range	100 to 450	V
Supply voltage range (Ignition voltage)	12 to 30	V
Supply current max. (Ignition current)	1,8	A
Output continuous power*	52	kVA
Output maximum peak power (one minute)*	78	kVA
Switching frequency	16	kHz
Operating ambient temperature**	-40 to 70	°C
Coolant temperature (derating point)	60	°C
Operating pressure	1.5	bar

* depends on load and cooling

** coolant temperature <60 °C

Connectors

System connector AmpSeal 8 pin

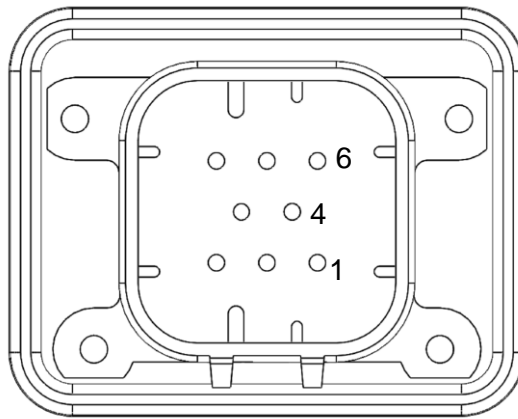


Fig. 1: emDrive system connector pinout numbers

Mating system connector is 8 pin female AMPSEAL with ordering code:

- connector housing (Manufacturer Part No: 776286-1)
- female crimp pins (Manufacturer Part No: 770854-3 (gold) or 770854-1 (tin))



Fig. 2: Mating system connector and crimp pin

More information about connector assembly, crimp pins, crimping tool and distributors are available at www.te.com

Table 1: System connector AmpSeal 8 (pin description)

Pin	Name	Description/comment
1	Ignition GND	Ground. Used for ignition. Internally connected with pin 3
2	Ignition VCC	Power supply for controller logic (10 -30 V _{DC})
3	CAN GND	CAN ground.
4	CANH	CAN 1 bus High signal
5	CANL	CAN 1 bus Low signal
6	Enable	Optional digital input
7	Analog input 1	Optional PWM input or CAN 2 bus High signal
8	Analog input 2	Optional CAN 2 bus Low signal

Position sensor feedback connector AmpSeal 14 pin

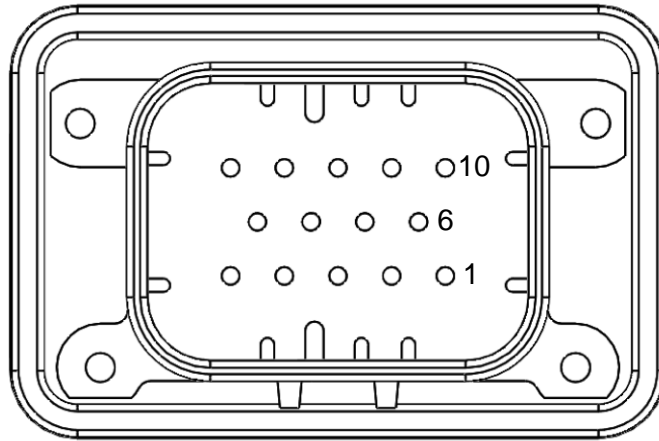


Fig. 3: Position sensor feedback connector pinout numbers

Position sensor feedback mating connector is 14 pin female AMPSEAL with ordering code:

- connector housing (Manufacturer Part No: 776273-1)
- female crimp pins (Manufacturer Part No: 770854-3 (gold) or 770854-1 (tin))



Fig. 4: Position sensor feedback mating connector and crimp pin

More information about connector assembly, crimp pins, crimping tool and distributors are available at www.te.com

Table 2: Position sensor feedback connector AmpSeal 14 (pin description)

Pin	Name	Description/comment
1	Feedback VCC	5 V used for powering position sensors (Max. current 200 mA)
2	SSI Data +	Absolute digital SSI encoder with RS422 interface (input)
3	SSI Data -	Absolute digital SSI encoder with RS422 interface (input)
4	SSI Clock +	Absolute digital SSI encoder with RS422 interface (output)
5	SSI Clock -	Absolute digital SSI encoder with RS422 interface (output)
6	Resolver exc +	Resolver power supply (output). 15 Vpp (10 kHz)
7	Resolver exc -	Resolver power supply (output). 15 Vpp (10 kHz)
8	Resolver SIN +	Resolver sensor. Analog input (0-5 V)
9	Resolver SIN -	Resolver sensor. Analog input (0-5 V)
10	/	/
11	Resolver COS -	Resolver sensor. Analog input (0-5 V)
12	Resolver COS +	Resolver sensor. Analog input (0-5 V)
13	Motor temperature	Temperature sensor input (KTY). For GND use pin 14
14	GND	Ground

Status LEDs

Table 3: emDrive controller LED status

LED \ status	OFF	Flashing	ON
CAN Run (green)	NMT state stopped	NMT state pre-operational	NMT state operational
CAN Error (red)	No CAN error	Single flash - CAN state passive	CAN bus OFF
		Double flash - Heartbeat lost	
Drive (green)	Controller in - Preoperational mode, - PWM disabled, - Safety procedure not started, - Brake enabled	Controller in - Operational mode, - Safety ok, - PWM disabled, - Brake disabled	Controller in - Drive mode PWM enabled, - Brake disabled
Warning (yellow)	All protections are inactive	/	One or more of protections active (object 0x2027)
Error (red)	No drive error	/	Drive error (object 0x603F)

Dimension and connection

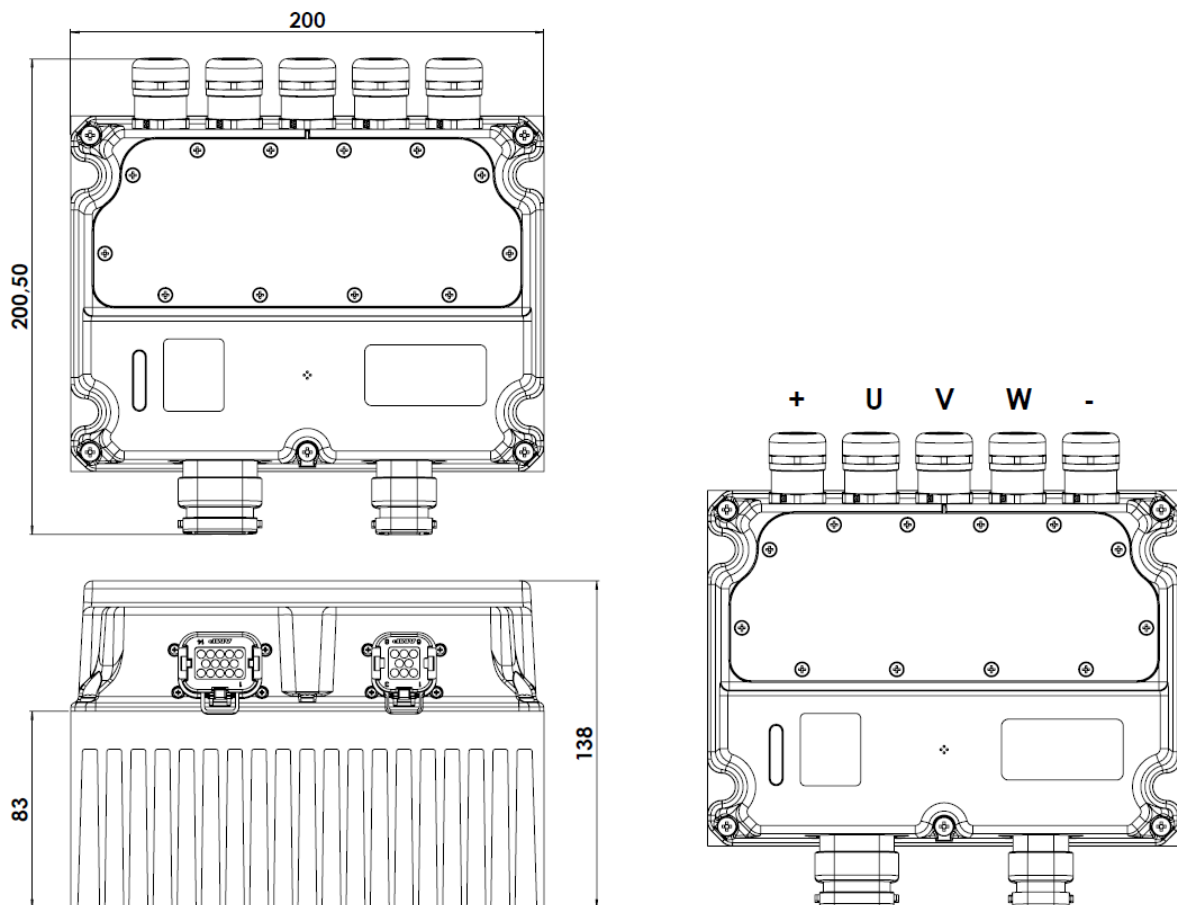


Fig. 5: emDrive H100 Air cooled version dimensions and connection order

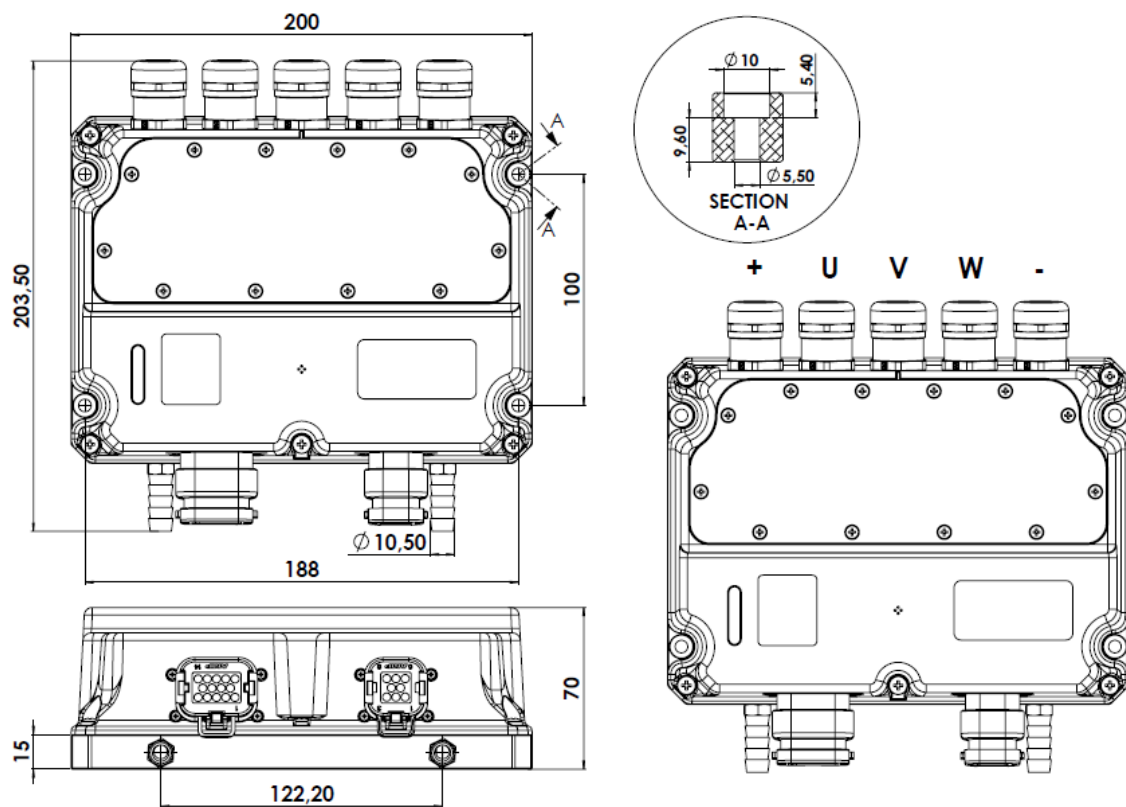


Fig. 6: emDrive H100 Liquid cooled version dimensions and connection order