

emDrive H10

HIGH VOLTAGE MOTOR CONTROLLER

TRACTION, PROPULSION & WORK FUNCTION ELECTRIFICATION



PRODUCT DATASHEET

emDRIVE

PRODUCT OVERVIEW

emDrive electric Motor Controllers are designed for traction, propulsion, work functions, and electro-hydraulic systems.

Suitable for heavy duty off-highway machinery for construction, agriculture, mining, material handling, airport ground support as for electric boats and power-sports vehicles, it ensures reliable and efficient performance across various mobile applications.



emDrive shares common unique value propositions

- **Compactness** Unmatched continuous power density
- **Efficiency** Smart motor control unlocking full system performance and energy savings
- **Safety** Compliance with the latest electrical safety, environmental, EMC and functional safety
- **Modularity** One platform, multiple voltage options – Switch without system redesign

EMDRIVE MAIN FEATURES

emDrive are rugged motor controllers for mobile applications. Main features are:

- Advanced motor control algorithm for precise control of **AC, PM, and SyRM motors**
 - Torque and Velocity control for precise, smooth and responsive regulation
 - Generator mode to supply stable DC voltage - with PMSM motors
 - Overmodulation for full battery voltage utilization, enabling higher motor performances
 - Dynamic calculation of power stage and motor temperature for maximum performance
 - Dynamic switching frequency for optimal efficiency
 - Reliable system operation with linear derating and protection functions
 - Sensor or sensorless operation for reduced hardware
- Universal motor position sensor interface - supports digital and analogue sensors
- Configurable safe state behavior: Active Short Circuit (ASC) or open terminals
- Supports CAN communication protocols, including J1939 and UDS
- Advanced diagnostics and fast data acquisition
- HV voltage safety
 - Active and passive discharge
 - Isolated HVIL input (High voltage interlock loop. 20 mA nominal DC current loop)

Motor controllers can be supplied with emDrive Configurator PC software allowing real-time data acquisition, parameterization, diagnostics, firmware upgrading and application programming.

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SPECIFICATIONS

Key performances

emDrive	H10B-400-SD	H10B-800-SD	unit
DC link voltage	400	800	V
Continuous current S1			
Liquid cooled (power loss)	100 (600)	60 (800)	A _{RMS} (W)
Air cooled	100	50	A _{RMS}
Chassis mount	40	17	A _{RMS}
Peak current S2 -60sec			
Liquid cooled (power loss)	150 (950)	75 (1000)	A _{RMS} (W)
Air cooled	140	70	A _{RMS}
Chassis mount	140	70	A _{RMS}

Operating conditions: Space vector modulation (SVM) at 80%, Load cos phi >0.98, Switching frequency 8 kHz

- **Liquid cooled:** Coolant temperature 60 °C, Ambient temperature 60 °C, Nominal flow, 50:50 water/glycol
- **Air cooled:** Ambient temperature 30 °C, reference fined heatsink LA 35 300 12 FISCHER ELEKTRONIK
- **Chassis mount:** Ambient temperature 30 °C, Free hanging Steel plate 800 x 800 x 6 mm, Air flow 3 m/s

Electrical characteristics

emDrive	H10B-400-SD	H10B-800-SD	unit
DC link operating voltage	12* to 470	12* to 800**	V
DC link capacitance	650 ±10%	200 ±10%	µF
Insulation to heatsink (basic)	1100	2000	V
Supply voltage (KL15/KL30 voltage)	9 to 36	9 to 36	V
Supply current (max. Ignition current)	1,0	1,0	A
Switching frequency (adjustable)	8-16	8-16	kHz

* In case of ASC functionality minimum voltage is 200V.

** higher operating voltage up to 870V on request.

Environmental characteristics

emDrive	H10B-400-SD	H10B-800-SD	unit
Operating ambient temperature	-40 to 85		°C
Max. ambient temperature (no derating)	60		°C
Operating coolant temperature *	-40 to 85		°C
Max coolant temperature (no derating) *	60		°C
Nominal coolant flow *	5		l/min
Max. operating pressure *	2		bar
Pressure drop @ nominal flow & 25 °C *	0,03		bar

* LC variant. Note: 50/50 mixture of distilled water and glycol with glycol-tolerant hoses.

Mechanical characteristics

emDrive	H10B-400-SD		H10B-800-SD		unit
Cooling	LC	AC	LC	AC	/
Mass (+/-5%)	4510	5570	4510	5570	g
Dimensions (Height x Width x Length)	96 x 272 x 184	96 x 272 x 184*	96 x 272 x 184	96 x 272 x 184*	mm
Material (housing)	Aluminum				/

* Dimensions without reference heatsink

Communication and sensor connections

Communication	Motor feedback
• J1939, UDS, CANopen (DSP402 compatible) • Proprietary CAN messaging based on DBC • Optional ○ XCP ○ Secondary CAN interface ○ CAN FD • Cybersecurity related features ○ Secure FW upgrade ○ Authorization algorithms for secure access to parameters and features ○ Use of CPU security features to prevent reading memory and changing content	• Supports multiple position sensor types: ○ Sin/Cos differential & single-ended ○ Resolver ○ SSI (Synchronous Serial Interface) ○ Hall sensors ○ AB encoders • One or two connections for temperature sensing ○ Supported sensors PT100, PT1000, NTC and KTY

SAFETY AND COMPLIANCE

Functional safety

Development and design according to ISO25119, considered ISO19014 on system level and safety function aligned with EN1175 & IEC 61800. SAE J1939-76 Functional safety communication protocol. PL levels of machinery under ISO 13849 can be met following equivalence with ISO25119. Three core CPU compliant with ISO 26262 ASIL D.

The product design is ready for implementation of the following stopping and monitoring safety functions. The hardware and diagnostic provide all necessary inputs, safe outputs, and control interfaces to enable these functions in the overall system design. Please contact Emsiso to receive latest Safety manual.

By default, the inverter does not include safety functions or safety functions suitable for all customer applications, and it is essential to evaluate them in the context of the specific system requirements. It is the responsibility of the OEM integrator and EMSISO to discuss the required safety functions, after which the appropriate firmware will be provided to support them.

The safety manual includes details of the default safety software, which, while available, is not included by default. The default safety manual is always available.

For application-specific safety cases, a different safety manual can be provided in consultation with EMSISO.

Supported safety functions – AgPL-C performance level	
Stopping	Monitoring
Safe Torque Off (STO)	Safe Operating Stop (SOS)
Safe Stop 1 (SS1)	Safely Limited Speed (SLS)
Safe Stop 2 (SS2)	Safely Limited Acceleration (SLA)
	Safe Speed Range (SSR)
	Safe Limited Torque (SLT)
	Safe Torque Range (STR)
	Safe Direction (SDI)

Compliance

Compliance	Standard
Electrical safety	EN 61800-5-1 ¹
Environment	IP rating IP66 & IP67 (with mated connectors). Other IP ratings on request Random vibration ISO 16750-3:2023, Test XVI, 10 Hz – 2000 Hz, 31.9 m/s ² , 8h/axis Shock ISO 16750-3:2023, Shock II, 500 m/s ² , 6 ms, half-sine Free fall ISO 16750-3:2023, 0.25 m
EMC	UN ECE R10 Rev.6 EN ISO 13766-1, EN ISO 13766-2 EN ISO 14982
Compliance	CE

¹ Maximum altitude above sea level 4000 m, Humidity 10% - 95% RH, Pollution degree 2 (enclosure IP66/IP67)

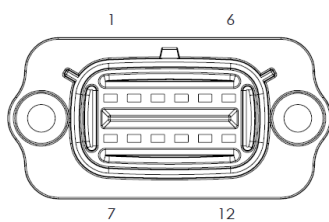
H10 Liquid Cooled – Slim system connector (EMDI-2-H10B-xxx-xx-L0-x-x-S2-1)



WIRING

Feedback connector details

Molex MX 150, Keying option A, 12 pin (Mating part²: 12 pin Molex PN 334721206 or equivalent PN from 160074, 300361)

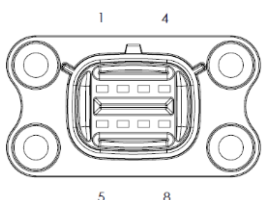


	1	2	3	4	5	6
Resolver	EXC +	EXC -	SIN +	SIN -	COS +	COS -
SIN/COS	5V supply	GND	SIN +	SIN -	COS +	COS -
SIN/COS single	5V supply	GND	SIN +	/	COS +	/
SSI	5V supply	GND	Data + (Rx)	Data - (Rx)	Clock + (Tx)	Clock - (Tx)
Hall	5V supply	GND	Hall U	Hall V	Hall W	Index
AB encoder	5V supply	GND	Enc A	Enc B	/	Enc Z
	TEMP 1 GND	TEMP 1	TEMP 2 GND (CAN2 L)*	TEMP 2 (CAN2 H)*	SHIELD (CAN2 GND)*	SHIELD
	7	8	9	10	11	12

* CAN 2 is optional HW configuration (see ordering information).

System connector details

Molex MX 150, Keying option A, 8 pin (Mating part²: 8 pin Molex PN 334724806 or equivalent PN from 160074, 300361)



1	2	3	4
GND (KL31)	CAN1 L	CAN1 GND	HVIL -
KL30	CAN1 H	KL15	HVIL +
5	6	7	8

KL30=Logic supply, KL15= Logic supply - Ignition, HVIL= High Voltage interlock

Power connection description

Connector	Description	Mating connector*
Connector DC	ELRA2A03 - ePower lite from Amphenol 5.7 mm 2-pole contact	ELPA2Axx
Connector AC	ELRA3A03 - ePower lite from Amphenol 5.7 mm 3-pole contact	ELPA3Axx

* follow manufacturer assembly recommendations (wire diameter, ...)

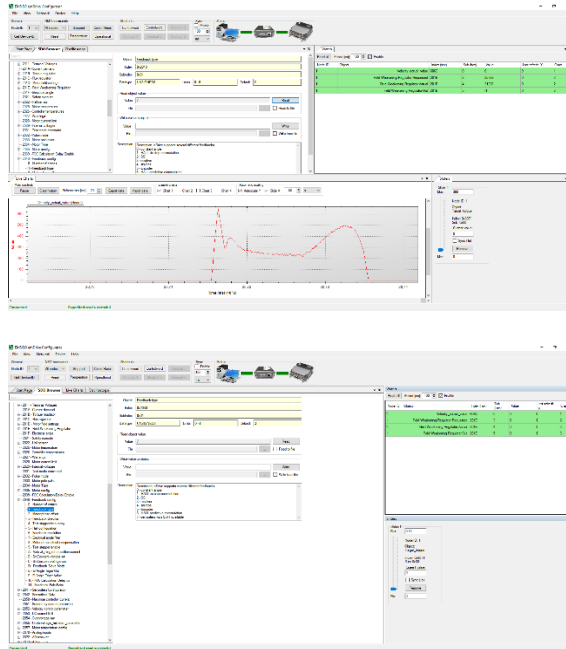
² For reliable vibration and galvanic corrosion protection mating contacts must be gold plated.

ECOSYSTEM AND TOOLS

emDrive Configurator

emDrive Configuration Tool is a powerful software application designed for the efficient setup, monitoring, and management of emDrive motor controllers. Key Features:

- **Comprehensive Parameter Configuration** to Easily adjust and fine-tune controller settings to match specific application requirements
- **Real-Time Data Acquisition** facilitating immediate analysis and informed decision-making.
- **Integrated Diagnostics**
- **Firmware Management:** Streamline firmware updates directly through the tool



Application Programming

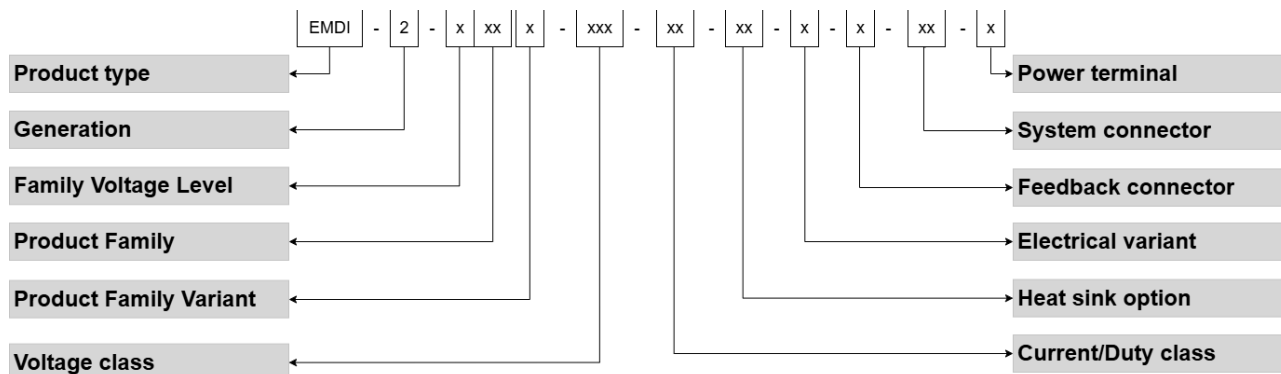
emDrive features **LUA high-level scripting language** used for **custom application programming** within the motor controller. It enables users to **tailor control logic**, implement **custom functionalities**, and optimize performance without modifying core firmware. Key Benefits:

- **Flexible control logic** for specific application needs
- **Real-time execution** for dynamic system adjustments
- **Seamless integration** with motor controller functions and CAN communication

MODEL CODE

Product code = Product base code + options/variants code

Example of product code: EMDI-2-H10B-400-SD-L0-0-0-S2-1 -> **EMDI2H10B400SDL000S21**



Product base code

Type	Gen	Level	Product Family	Family Variant	Voltage class	Current class	Heat sink
EMDI	2	H	10	B	400	SD	L0=Liquid A0=Air*
EMDI	2	H	10	B	800	SD	L0=Liquid A0=Air*

* Without reference heatsink

Options/variants codes

Electrical variant	Feedback connector	System connector	Power terminal/connector
0= SW conf. ASC, Active HVIL 1*= SW conf. ASC, Passive HVIL	0=2x Motor temp. 1*=1x Motor temp., 1x CAN2	S2=CAN1 + HVIL	1=Plug-in

* For further information please contact info@emsiso.com

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