emDrive L30

LOW VOLTAGE MOTOR CONTROLER
TRACTION, PROPULSION & WORK FUNCTION ELECTRIFICATION

PRODUCT DATASHEET

POCLAIN

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 powersports 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 to latest electrical safety, environnemental, 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 behaviour: Active Short Circuit (ASC) or open terminals
- Supports CAN communication protocols, including J1939 and UDS
- Advanced diagnostics and fast data acquisition
- Active discharge and pre-charge functionality
- Galvanic isolation between control / I/O section and power stage

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	L30B-048-SD	L30B-096-SD	unit
Continuous current S1			
Liquid cooled (power loss)	450 (700)	300 (1200)	A_{RMS} (W)
Air cooled	390	/	A_{RMS}
Chassis mount	310	/	A_{RMS}
Peak current S2 -60sec			
Liquid cooled (power loss)	650 (1100)	450 (2400)	A_{RMS} (W)
Air cooled	650	/	A_{RMS}
Chassis mount	650	/	A_{RMS}

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

- **Liquid cooled:** Coolant temp. 60 °C, Ambient temperature 60 °C, Coolant flow 7 l/min, 50:50 water/glycol
- **Air cooled:** Ambient temp. 30 °C, re. finned heatsink OMAR-alluminio932 length 265mm 2xfan MS1238E.H
- **Chassis mount:** Ambient temperature 30 °C, Free hanging Steel plate 800 x 800 x 6 mm, Air flow 3 m/s

Electrical characteristics

emDrive	L30B-048-SD	L30B-096-SD	unit
DC link operating voltage	12* to 60	12* to 120	V
DC link capacitance	19680 ±20%	3600 ±20%	µF
Insulation to heatsink (basic)	160	240	V
Supply voltage (KL15 voltage)	9 to 60	9 to 60	V
Supply current (max. Ignition current)	1,2	1,2	A
Switching frequency (adjustable)	4-16	4-16	kHz

* in case of ASC functionality minimum voltage is 30V.

Environmental characteristics

emDrive	L30B-048-SD	L30B-096-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 *	7		l/min
Max. operating pressure *	2		bar
Pressure drop @ 7 l/min & 25 °C *	0,19		bar

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

Mechanical characteristics

emDrive	L30B-048-SD		L30B-096-SD		unit
Cooling	LC	AC	LC	AC	/
Mass	2600	2600	2600	2600	g
Dimensions (Height x Width x Length)	105 x 165 x 201	105 x 165 x 193*	105 x 165 x 201	105 x 165 x 193*	mm
Material (housing | base plate)	PC30%GF | 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.

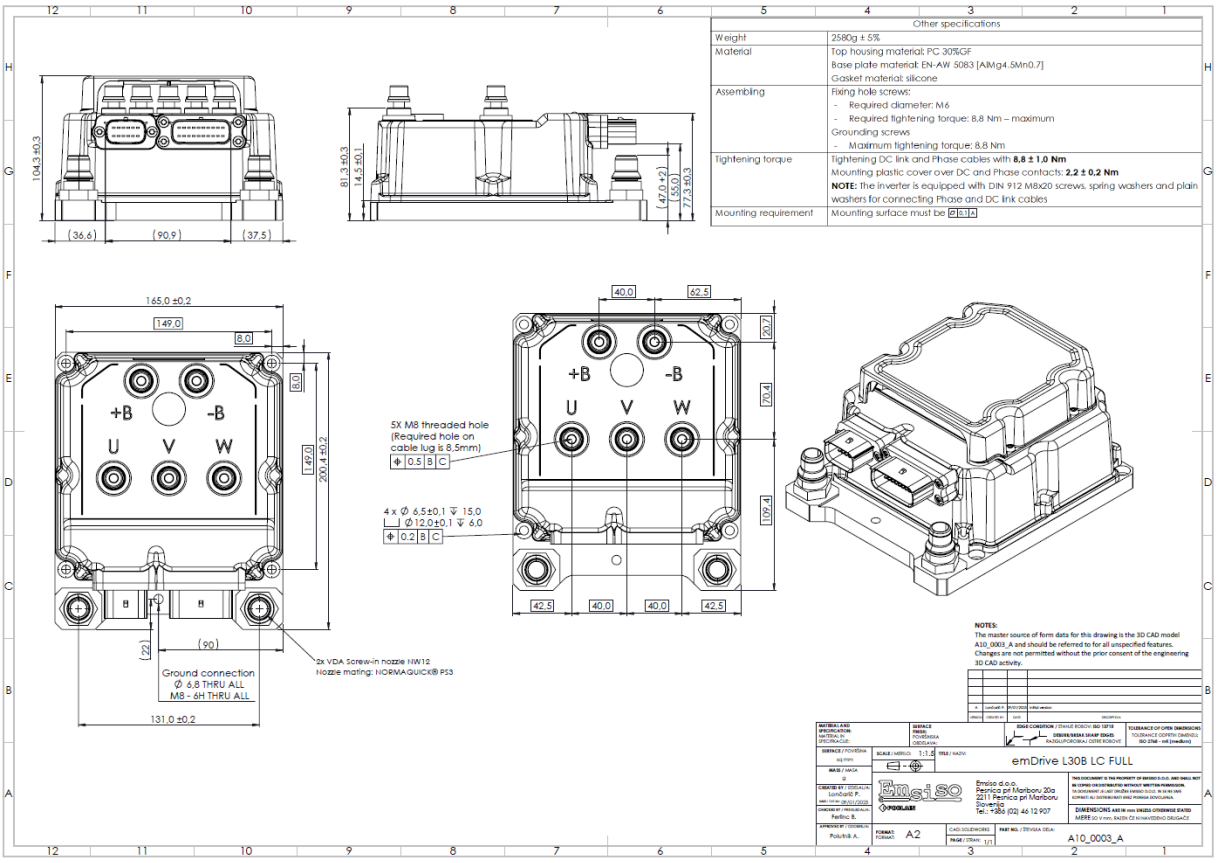
Supported safety functions – **AgPL-C performance level**		
Stopping	**Monitoring**	**Output**
Safe Torque Off (STO)	Safe Operating Stop (SOS)	Safe Brake Control (SBC)
Safe Stop 1 (SS1)	Safely Limited Speed (SLS)	Main contactor control
Safe Stop 2 (SS2)	Safely Limited Acceleration (SLA)	Safe outputs reserved for specific apps
	Safe Speed Range (SSR)	
	Safe Limited Torque (SLT)	
	Safe Torque Range (STR)	
	Safe Direction (SDI)	
	Driver presence detection - CAN or general input	
	Emergency stop detection - CAN or general input	
	Safe inputs reserved for specific apps	

Compliance

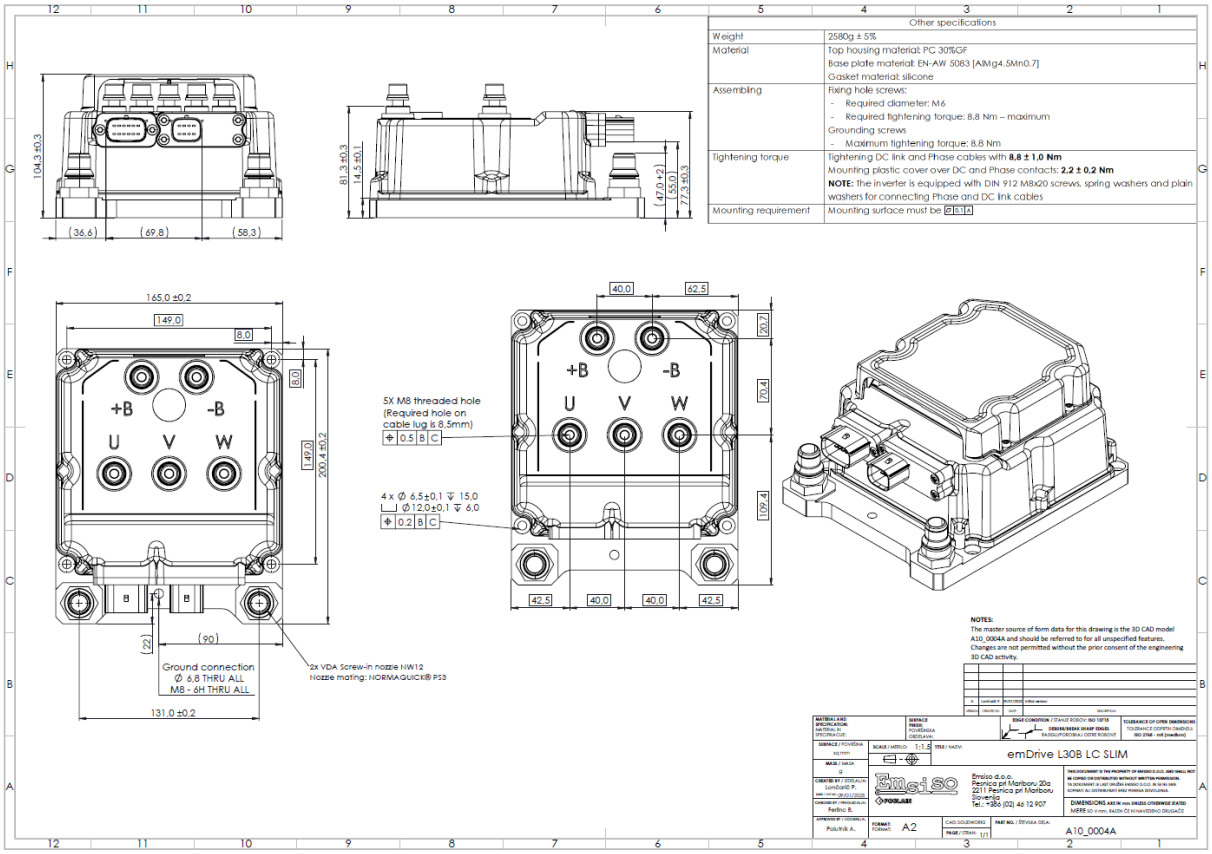
Compliance	Standard
Electrical safety	EN 61800-5-1
Functional safety	ISO 25119 EN ISO 13849 EN ISO 19014 (considered for system level HARA) EN 61800-5-2 (safety functions) EN 1175 (safety functions)
Environment	IP rating IP66 & IP69K (with mated connectors) Random vibration ISO 16750-3:2023, Test XVI, 10 Hz – 2000 Hz, 31.9 m/s2 Shock ISO 16750-3:2023, Shock II, 500 m/s2, 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 EN 12895
Compliance	CE

MECHANICS

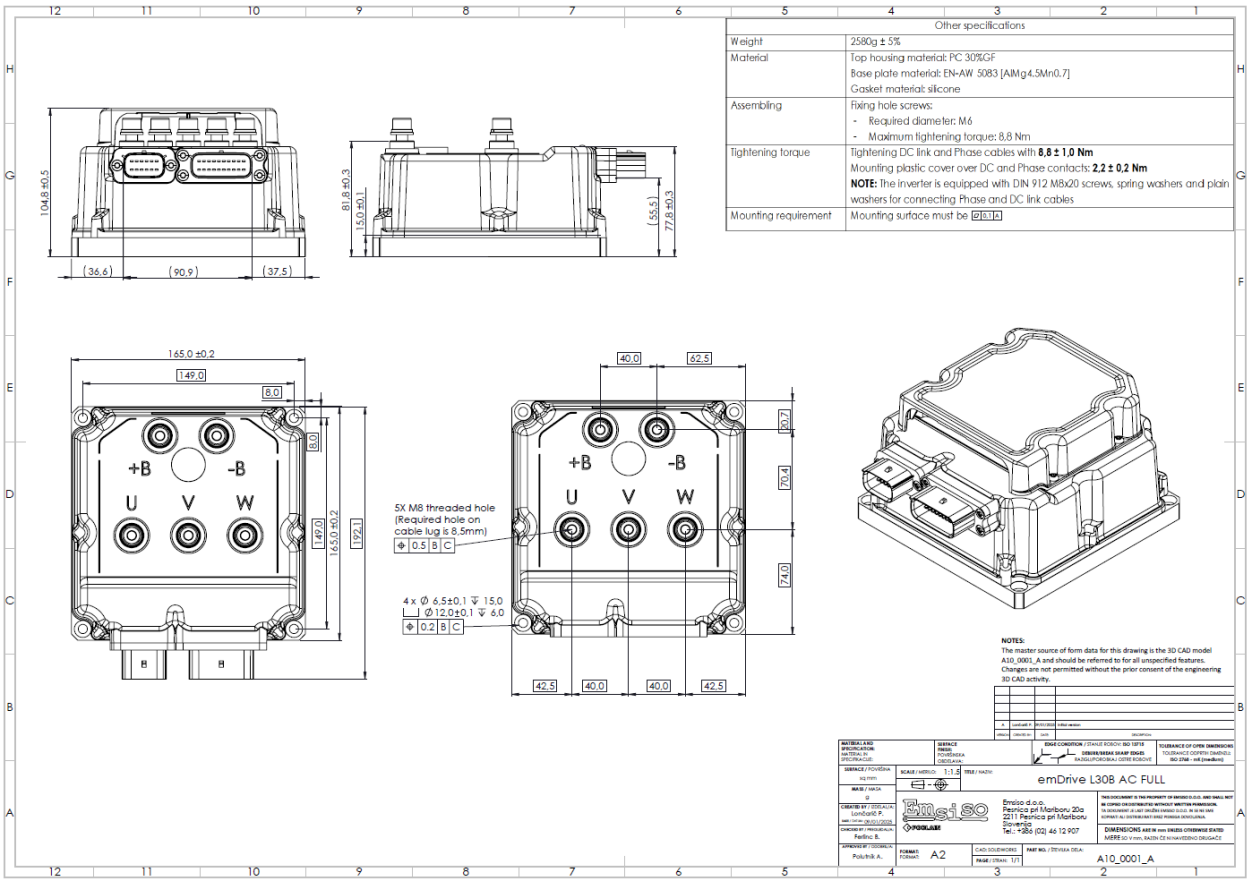
L30 Liquid Cooled – Full system connector (EMDI-2-L30B-xxx-xx-L0-x-x-F0-0)



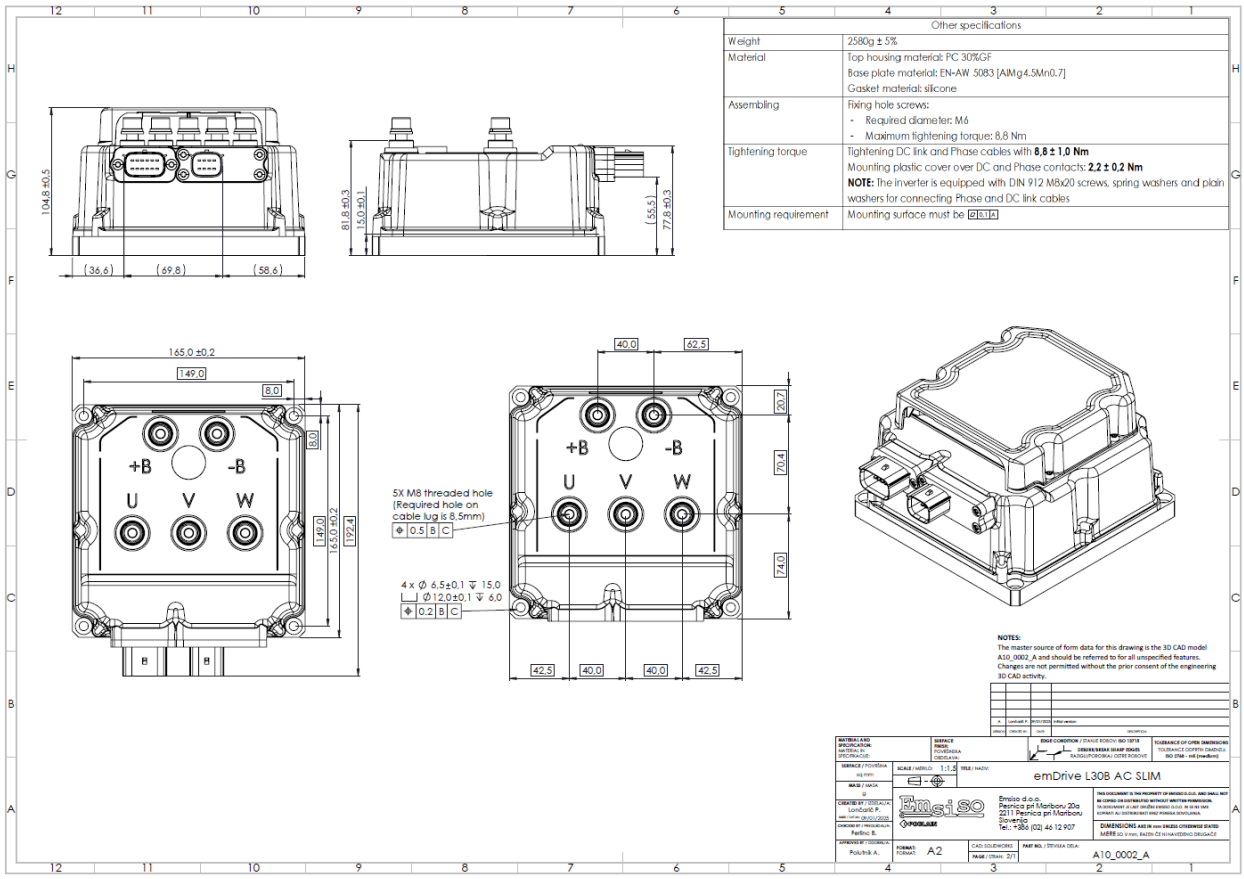
L30 Liquid cooled – Slim system connector (EMDI-2-L30B-xxx-xx-L0-x-x-Sx-0)



L30 Air cooled – Full system connector (EMDI-2-L30B-xxx-xx-A0-x-x-F0-0)



L30 Air cooled – Slim system connector (EMDI-2-L30B-xxx-xx-A0-x-x-Sx-0)

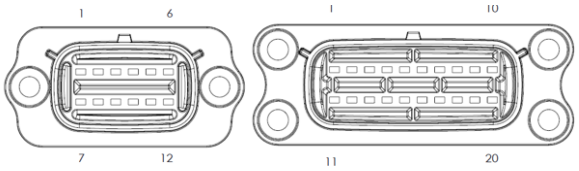


WIRING

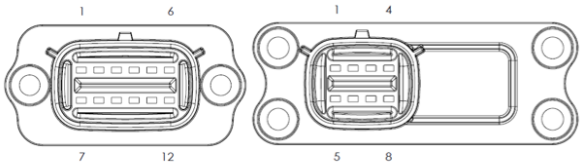
I/O Connector versions

Controller offers **two connector variants** to match different application needs:

- **Full Version:** Includes **extended I/O functionality**, enabling additional inputs and outputs for advanced system control and monitoring.
- **Slim Version:** Optimized for **basic functionality**, providing essential connections in a compact layout for space-constrained installations.



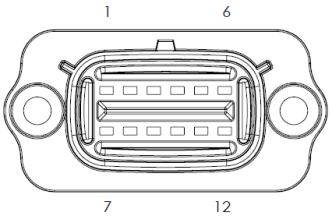
Feedback connector — System connector (**Full** version)



Feedback connector — System connector (**Slim** version)

Feed-back connector details

Molex MX 150, Keying option A, 12 pin (Mating part[1]: 12 pin Molex PN 334721206)

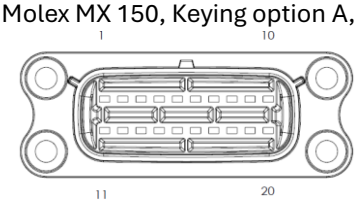


	1	2	3	4	5	6
Resolver	EXC +	EXC -	SIN +	SIN -	COS +	COS -
SIN/COS	5V supply	GND	SIN +	SIN -	COS +	COS -
SIN/COS single	5V supply	GND	SIN +	/	COS +	/
SSI	5V supply	GND	Data + (Rx)	Data - (Rx)	Clock + (Tx)	Clock - (Tx)
Hall	5V supply	GND	Hall U	Hall V	Hall W	Index
AB encoder	5V supply	GND	Enc A	Enc B	/	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 - full version F0

Molex MX 150, Keying option A, 20 pin (Mating part[1]: 20 pin Molex PN 334722506)

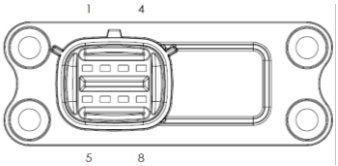


1	2	3	4	5	6	7	8	9	10
GND (KL31)	CAN1 L	CAN1 GND	LS6	POT supply	LS5	Sig. GND	LS4	INP4	Coil Supply
KL15	CAN1 H	LS7	INP1	LS1	INP2	LS2	INP3	LS3	HS
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

INP=Configurable input (analog, digital), LS=Low side switch, HS=high side switch, KL15=Logic supply – Ignition

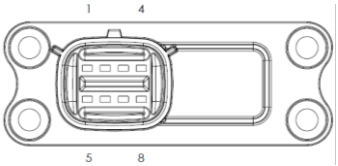
System connector details - slim version S0 with KL15, 2x isolated CAN

Molex MX 150 A, Keying option A, 8 pin (Mating part[1]: 8 pin Molex PN 334724806)



1	2	3	4
GND (KL31)	CAN1 L	CAN1 GND	CAN2 L
KL15	CAN1 H	CAN2 GND	CAN2 H
5	**6**	**7**	**8**

System connector details - slim version S1 with KL15, CAN1, 3x IO



1	2	3	4
GND (KL31)	CAN1 L	CAN1 GND	LS6
KL15	CAN1 H	LS7	INP1
5	**6**	**7**	**8**

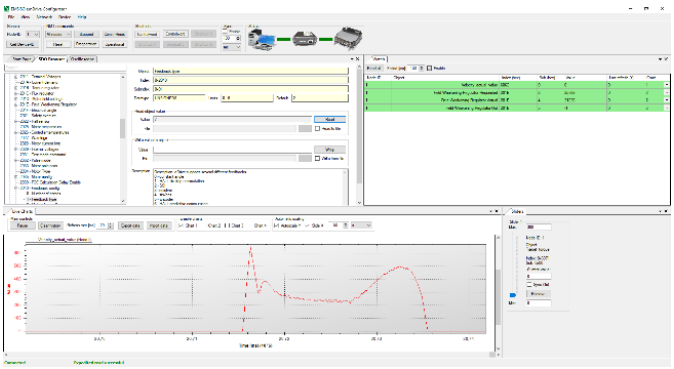
[1] For reliable vibration and galvanic corrosion protection recommended mating contacts shall be gold plated.

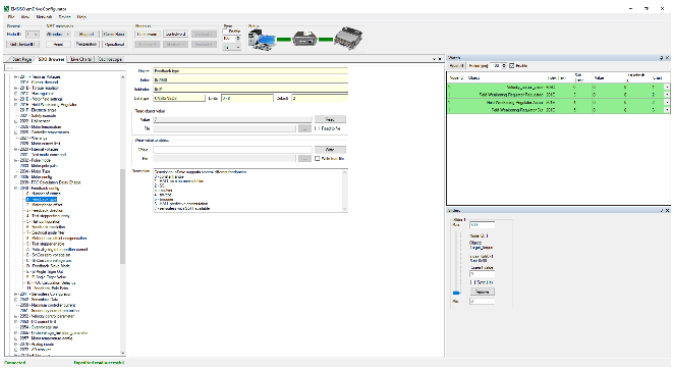
ECOSYSTEM AND TOOLS

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

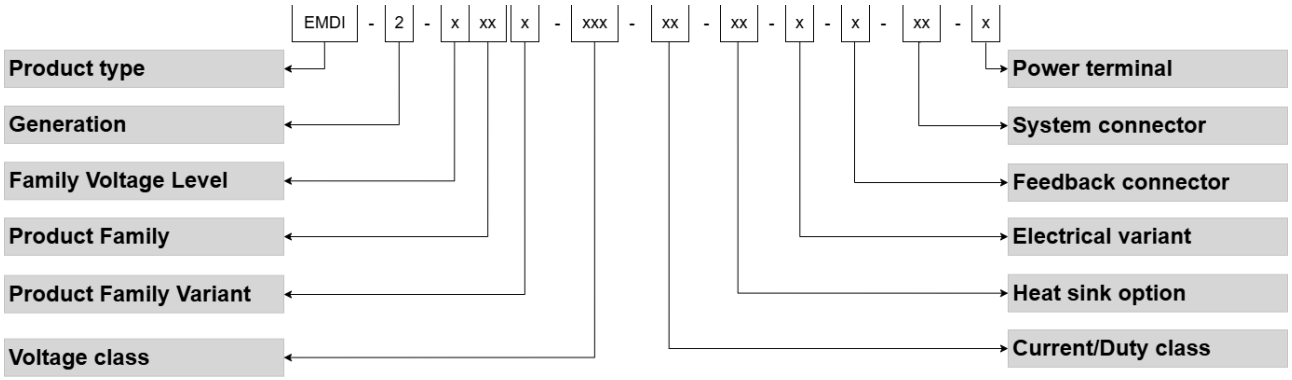
Throttle Application

The Throttle application allows the user to implement a simple throttle control directly on the emDrive. Input devices can be connected directly to the emDrive and mapped to the throttle application. The application calculates the desired output based on these inputs and passes it to motor control. The output can be used as either a torque input or a speed input in the motor controller, depending on which CANOpen object the output is mapped to.
The Throttle application supports the following features:

- Throttle Module
- Brake Module
- Pump Control Module
- Precharge Module
- DC-DC Turn on Delay Module
- SOC Monitoring Module
- Charging Detection Module
- Input Mapping

MODEL CODE

Product code = Product base code + options/variants code
Example of product code: EMDI-2-L30B-048-SD-L0-1-0-F0-0 -> **EMDI2L30B048SDL010F01**



Product base code

Type	Gen	Level	Product Family	Family Variant	Voltage class	Current class	Heat sink
EMDI	2	L	30	B	048	SD	L0=liquid A0=Air
EMDI	2	L	30	B	096	SD	**L0=liquid** A0*=Air

Options/variants codes for voltage class 048

Electrical variant	Feedback connector	System connector	Power terminal/connector
0*=nonASC **1= default (SW conf. ASC)** 2*=Active pre-charge terminal, ASC 3*=Active pre-charge terminal, nonASC	**0=2x Motor temp.** 1*=1x Motor temp., 1x CAN2	**F0=Full version (20 pin)** S0*=KL15, 2x isolated CAN S1*= KL15, CAN1, 3x IO	**0=Screw terminal**

Options/variants codes for voltage class 096

Electrical variant	Feedback connector	System connector	Power terminal/connector
0*=nonASC **1= default (SW conf. ASC)** 2*=Active pre-charge terminal, nonASC 3*=Active pre-charge terminal, ASC	**0=2x Motor temp.** 1*=1x Motor temp., 1x CAN2	**F0=Full version (20 pin)** S0*=KL15, 2x isolated CAN S1*= KL15, CAN1, 3x IO	**0=Screw terminal**

* For further information please contact https://poclain.com/contact-us

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