Emerge 6000 Brushless Motor Controller

FRIWO®

Motor control solution for PMSM and BLDC drives

*Available in different colours

- ☐ Applications
  - ☐ E-mobility: electric scooters, eScooters, Kickboards, Logistic vehicles, LEV, micromobility, forc lifts
  - ☐ Industrial: Servo drives, pumps, fans
  - ☐ Powertools
- ☐ Interfaces[1]
  - ☐ CAN-bus
  - ☐ USB: Setup of the controller
  - ☐ 2x analogue input
  - ☐ 2x digital input
- ☐ Features
  - ☐ Automatic motor teach-in
  - ☐ Seamless regenerative braking (recuperation / regeneration)
  - ☐ Automatic Flux weakening to extend usable speed range
  - ☐ Bluetooth-LE (4.0) connection to smartphone
  - ☐ USB-based configuration and maintenance toolset for development, production and after-sales-support

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[1] Features depending on specific order

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Main Parameters Power-Electronic Emerge 6000		
Nominal power S1 @48V	W	6240
Repetitive peak power S2[2] @48V	W	10800
DC voltage min	V	12
DC voltage max	V	65
Max. current (AC)	A	300
Max. current (DC)	A	210
Remote Control Interfaces		
CAN (low speed & high speed)	kBit/s	125..1000
USB (Virtual Com Port)	kBit/s	256
2 x Analogue	V	5
Motor Types (PMSM / BLDC)		
Rotor speed max.	1/min (el)	96000
	1/sec. (el)	1600
Position feedback	Sensor-type	3x hall sensor
Mech. Parameters		
Diameter	mm	155
Height	mm	52
Weight	Gramm	930
Thermal interface		Convection-cooling or direct cooling on bottom side

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[2] Depending on MOSFET temperature

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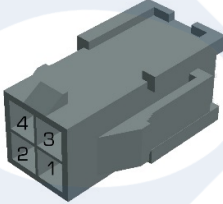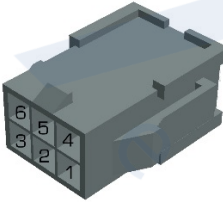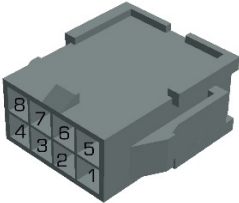| Smartphone App Interface (Bluetooth Low Energy)	

Intended Use-case	End-user interface to visualize drive data Cost-effective data-logging device
Supported OS	Android (any) iOS (any) Windows Phone (none)
Parameters to be displayed	Vehicle Speed Average Speed Trip Distance (ODO with Reset) Total Distance (ODO) Battery voltage Battery current (charge/discharge) Actual electrical power Diagnostic trouble codes (DTC, error codes)
Additional displayed information if connected to Emerge BMS (Battery Management System)	State of Charge Remaining Distance
Parameters to be setup (depending on configuration	Ride-Mode (four different modes of torque and speed stetting)

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Installation Signal Connector Cable (grey) [3] with standard hall-sensor setup

Connector (Controller Side)	Pin / Color	Function	Additional Info
Throttle Connector MPC4 Würth 64900421822 4 pole male	1	NC	Not used
	2 / Pink	5V	Throttle supply
	3 / Purple	AIN1	Analog input 1, 0 to 5V, (e.g. Throttle)
	4 / Brown	GND	Throttle ground
Motor Connector MPC4 Würth 64900621822 6 pole male	1 / Green	Hall L3	Hall sensor Phase L3
	2	NC	Not used
	3 / Red	5V	Hall sensor supply
	4 / Blue	Hall L2	Hall sensor Phase L2
	5 / Yellow	Hall L1	Hall sensor Phase L1
	6 / Black	GND	Hall sensor GND
Aux Connector MPC4 Würth 64900821822 8 pole male	1 / Yellow-Brown	DIN2	Diginal input 2, active low
	2 / White-Green	DIN1	Diginal input 1, active low
	3 / Red-Blue	5V	Additional sensor supply
	4 / Grey	CAN Low	125,250,500,1000kb/s
	5	NC	
	6 / White-Yellow	AIN2	Analog input 2, 0 to 12V, (e.g. Brake)
	7 / Brown-Green	GND	Additional sensor ground
	8 / White	CAN-High	125,250,500,1000kb/s

Order numbers of matching connectors for your vehicle wiring harness:
- crimp connectors (female): Würth 64900713722DEC
- housing 4 pole (female): Würth 649004113322
- housing 6 pole (female): Würth 649006113322
- housing 8 pole (female): Würth 649008113322

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[3] (Warning: If not declared separately, all I/O will not survive short against any voltage greater than +5V or reverse voltage).

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High-Current Screw Terminals [4]		
L1	Motor L1	
L2	Motor L2	
(-)	Battery -	Battery GND
L3	Motor L3	
(+)	Battery +	65V Nominal, (72V abs. max)

⌀ 155

hole pattern square 102.5 mm
@ front mount drill M4 thread
@ back mount drill hole Ø5,5

L1
-V
L2

L3
+V

102,5 ±0,1

102,5 ±0,1

Max Torque: 2Nm on all M5 bolts

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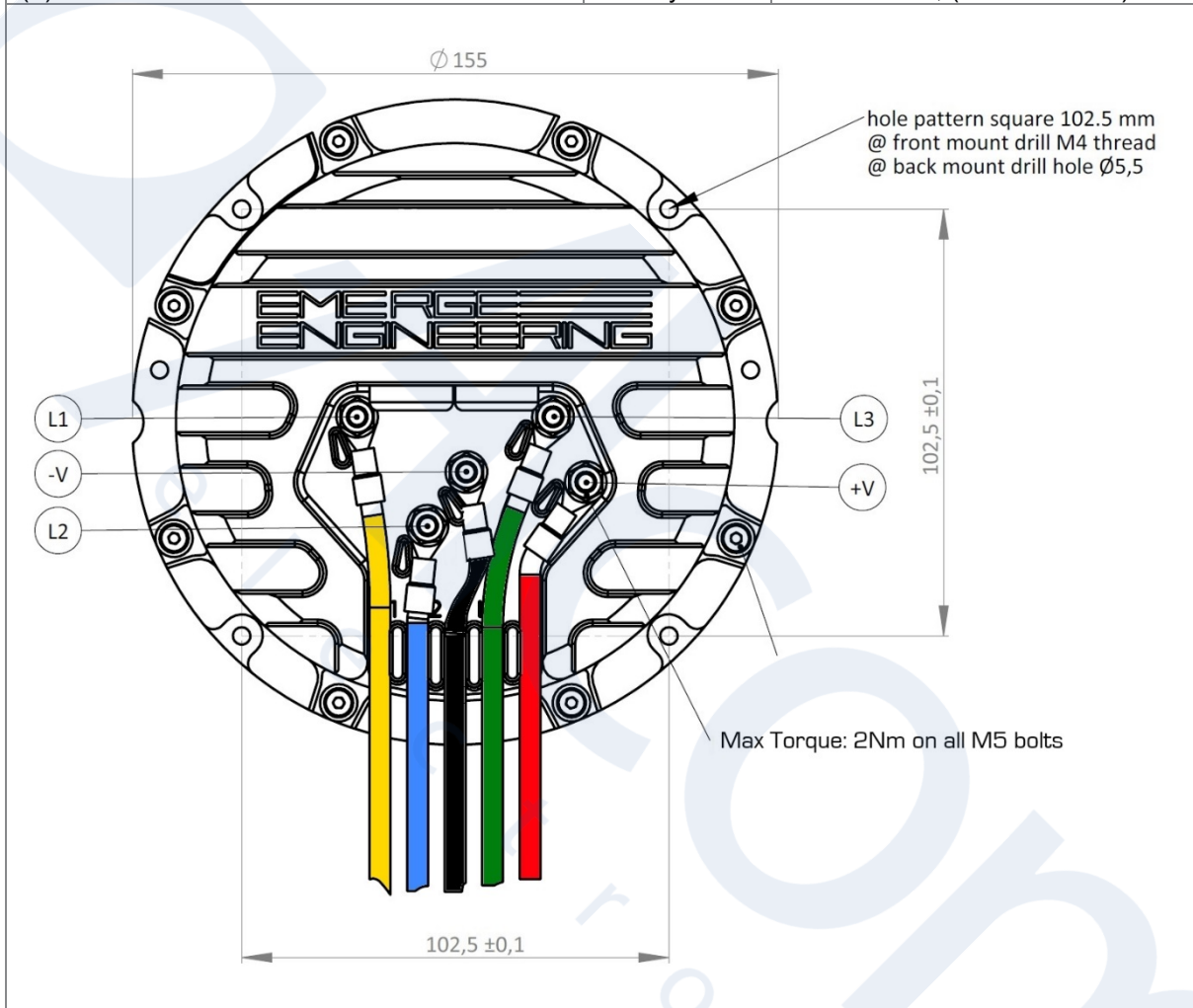
[4] **Terminal names are embosed on housing**

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USB-Interface[5] Overview

Enable Tool NG V21.9		

EMERGE ENGINEERING enable tool

Write _XC_ with Snapshot

Log filename (*.csv) LogFile   Start Logging
Log interval [ms] 100   Stop Logging

Tabs: APP_SmartphoneInterface | ARP_Resolver | ATI_ThrottleInput | ATSI_BrakeInput | BBTS_TorqueSensorInterface | BCF_CurrentAndVoltageMeasurement | BCM_BodyControllerModuleConfig
BLE_Bluetooth | Block_Commutation | BSW_Firmware | CANIN_CANbusInterface | CPU_LoadMonitor | ERR_Errorcodes | ERR_Memory | Err_Settings | FWD_PhaseCurrentMeasurement
Id_FOC_CurrentController | IHS_HallSensorInterface | IMU_BalancingModul | INV_InverseClarkPark | MEDKit_IoInterface | MO_MotorInfo | OTP_OneTimeProgrammable | PROD_Info
SYS_Info | TEMP_Temperatures | TRQ_DES_DesiredTorque | TRQ_LIM_TorqueLimiter | TRQ_STR_TorqueStrategy | WiFly_WifiSetup | LOGTAB | Service
PWMI_PWM_Input | ROC_Motor_TeachIn | RPM_SpeedController | SET_SystemSetup | SM_StateManager | SOC_StateOfChargeEstimator | SYS_RemainingDistance

Parameters & Measurements	Values	Description
SET_C_PE_Curr_Max	200	Motor phase-current maximum setting [A] ...
SET_C_PE_FW_Curr_Max	-75	Flux-weakening current [A] ...
SET_C_PE_Volt_Max	0,9980000257	Maximum relative phase-voltage [%/100] ...
SET_C_PE_Volt_Max_TeachIn	0,8999999762	Maximum relative phase-voltage during teach-in [%/100] ...
SET_C_MO_Hall_Sensor_Mapping	3	Preselect hall-sensor mapping ...
SET_C_MO_Hall_Sensor_Invert_Direction	0	Invert the rotor-speed direction with hall-sensors ...
SET_C_MO_Reverse_Direction	0	Teach-in with reverse motor-direction ...
SET_C_Curr_Lim_DC_Neg	-35	Recuperation DC current limit [A] ...
SET_C_Curr_Lim_DC_Pos	140	Max. DC current limit [A] ...
SET_C_Volt_Lim_DC_Lower	41	Lower limit of discharge voltage [V] ...
SET_C_Volt_Lim_DC_Upper	60	Upper limit of charge voltage [V] ...
SET_C_Tire_Outline	2,3659999371	Tire outline [m] ...
SET_C_MO_Polepairs	23	Number of pole-pairs ...

03.10.2016 15:26:28: License-refresh done
03.10.2016 15:26:28: Refreshing license started
03.10.2016 15:26:27: Starting connection...
03.10.2016 15:26:27: Connected to ECU with SW-Version 1000541
03.10.2016 15:26:27: Scanning for Power Electronic (PE) on all USB ports
03.10.2016 15:26:26: Version check done. Enable-Tool is up to date.

Create Snapshot | Write Snapshot
Store Parameters (ALT+S) | Restart ECU (ALT+R)
Update ECU Firmware

Reading takes 40 ms   Connected in App-Mode. Licensed session with 45 days offline-support | 177 days left

Intended Use-case	The enable-tool USB-interface is made to support the different stages of a product development
	a) Development: Allowing the motor-controller to be analyzed, measured and calibrated in real-time.
	b) Production: with reduced complexity, just allowing to write the production dataset and calibrate the system
	c) Aftersales: The look and feel of Enable-Tool can be customized and reduced to a "minimum level of complexity" to allow a quick and easy support.
	d) Dealer and Retailers: Setup your dealers and retailers to service your vehicles.
	Enable-Tool provides functions that you would expect from professional automotive measurement and calibration tools, like encryption of datasets to share with the production and dealships, or encrypted and signed flash-datasets and encrypted-hex-files.
Supported OS	Windows 7 / Windows 8

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[5] Parameter lists are customer specific and depend on your purchased package (you might see more or less parameters and/or are not allow to access some of them)

Alcom electronics

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