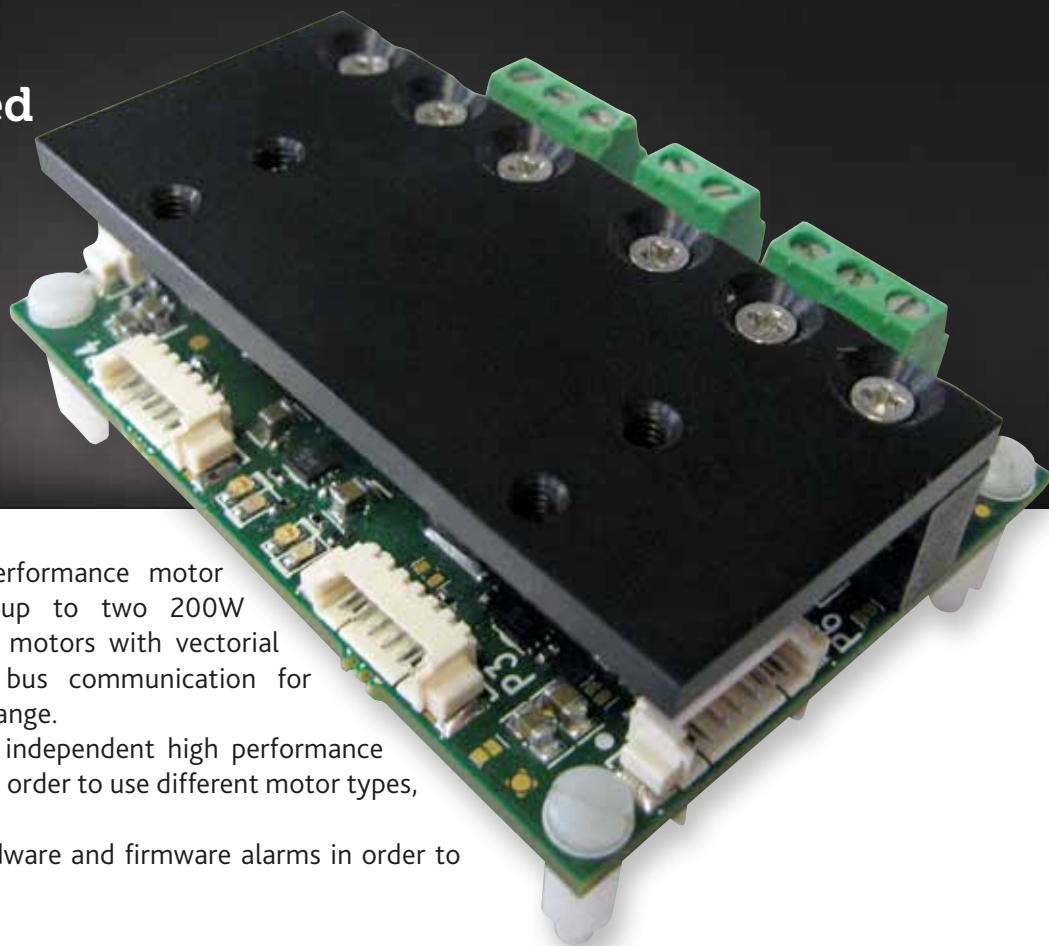


# 2FOC

## Dual Field Oriented Controller for brushless motors



The **2FOC** board is a high performance motor controller capable of driving up to two 200W permanent magnet synchronous motors with vectorial algorithms (FOC), using CAN bus communication for commands and control data exchange.

The board is provided with two independent high performance DSPs and is highly configurable in order to use different motor types, sensors or control loops.

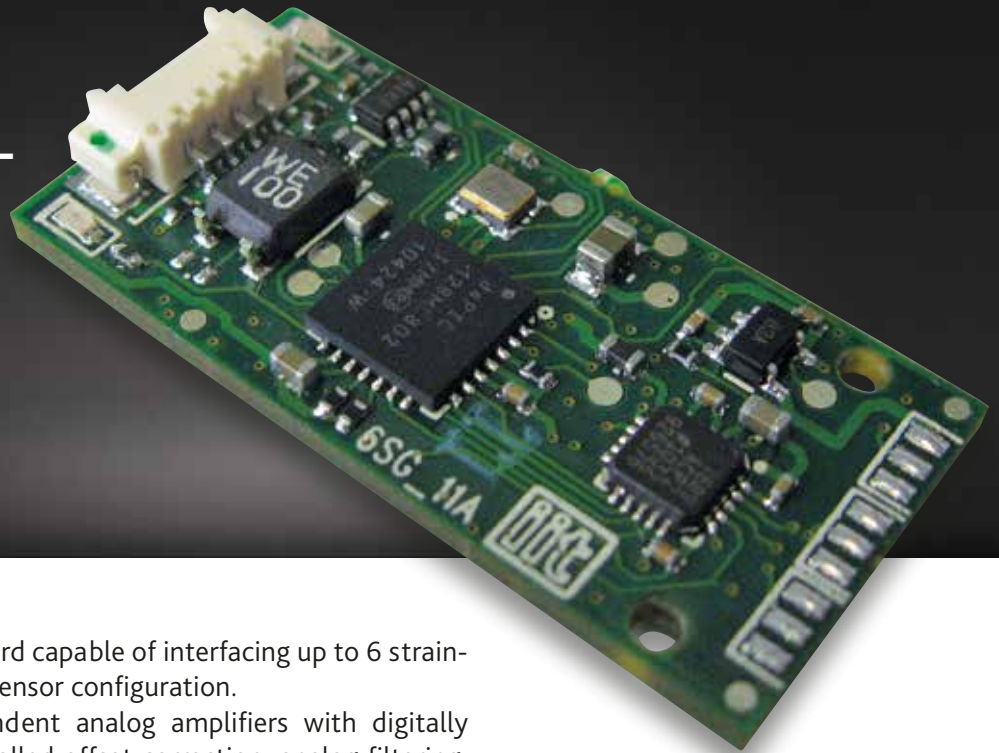
The board uses a mixture of hardware and firmware alarms in order to safely detect fault conditions.

### Specifications

Power supply	18V to 48V (max 75V peak)
Communication	CAN Bus 2.0B, 1Mbps
Motor number, type	Two, three phase Permanent Magnet Synchronous Motor (PMSM) or Brushless DC
Output current	5A continuous, up to 20A I2T limited
Microcontrollers	dsPIC33F802 16bit, 40MIPS, 128K Flash, 16K RAM, CAN, SPI
Incremental encoders	Magnetic and optical, w or w/o index up to 16.000 CPR (see <b>LCORE</b> , <b>ROIE</b> , <b>ROIEL</b> info sheet)
Absolute encoders	Magnetic, SPI communication (see <b>AEA</b> and <b>AEA2</b> info sheet), Hall effect sensors
Brake energy recovery	With (required) external capacitor
Alarms	Overcurrent, overvoltage, undervoltage, I <sup>2</sup> T, emergency button, sensor feedback, CAN communication, memory, current sensors
Current loop speed	20 to 40KHz depending on encoder choice
Velocity loop speed	Up to 2KHz
Position loop speed	Up to 1KHz
Torque sensing	Via CAN bus when used with <b>6SG</b> board or <b>FTSensor</b>
Utilities	In field reprogramming, drive configuration, graphical data analysis
Operating conditions	0 to 50°C, humidity <85% without condensation
Dimensions [LWH]	58x42x17 mm
Weight	44g

# 6SG

## 6 channels strain-gauge interface with CAN Bus communication



The 6SG board is a miniature board capable of interfacing up to 6 strain-gauge technology in half bridge sensor configuration. The board includes six independent analog amplifiers with digitally configurable gain, digitally controlled offset correction, analog filtering, A/D conversion. The board uses a high performance DSP for digital filtering, calibration matrix calculation and CAN communication.

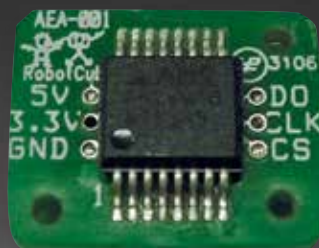
### Specifications

Power supply	5V±10%, current consumption max 100mA, provided from CAN Bus connector
Communication	CAN Bus 2.0B, 1Mbps
Analog channels	6, in half bridge configuration
Output data	16 bit, 6 channels, up to 1K messages/sec
Microcontroller	dsPIC33F802 16bit, 40MIPS, 128K Flash, 16K RAM, CAN, SPI
Alarms	CAN communication, memory, ADC and PGA
Digital filter	6 independent 5th order IIR
A/D Converter	16 bit, 200ksps
Gain settings	<ul style="list-style-type: none"><li>▪ First stage from 4 to 6.4 in 128 steps</li><li>▪ Second stage from 17.5 to 200 in 8 steps</li><li>▪ Combined gain from 70 to 1280</li></ul>
Offset correction	256 Analog steps plus digital offset correction
Utilities	In field reprogramming, device configuration, graphical data analysis
Operating conditions	0 to 50°C, humidity <85 without condensation
Dimensions [LWH]	34x16x6.5mm
Weight	10g

# AEA-001

# AEA-002

## Absolute Magnetic Encoders



Contactless magnetic rotary encoder in two different sizes for accurate angular measurement over a full turn of 360°.

### Specifications

Power supply	5V±10%, current consumption max 30mA
Communication	up to 1Mbps SSI serial communication
Resolution	12 bit [0.0875°]
Operating conditions	0 to 70°C, humidity <85% without condensation
Magnet	Diametric Magnet NdFeB, Grade N35, D6x2.5mm
Dimensions [LWH]	AEA-001: 14x11x5mm AEA-002: 16x7x4mm
Weight	5g



# FTSens

## 6 axis torque and force sensor with CAN Bus communication



The FTSENS is capable of measuring 3 forces and 3 torques (in a Cartesian reference system) using a CAN bus line to transmit data in digital form. The sensor is based on semiconductor strain-gauge technology; the mechanical assembly contains all the signal conditioning electronics and a microcontroller for communication.

### Specifications

Power supply	5V±10%, current consumption max 100mA, provided from CAN Bus connector
Communication	CAN Bus 2.0B, 1Mbps
Channels	Six, 3 torques (Tx, Ty, Tz) and 3 forces (Fx, Fy, Fz)
Measure range	2000 N (Fx, Fy, Fz) 40 Nm (Tx, Ty) 30 Nm (Tz)
Resolution	0.25 N (Fx, Fy, Fz) 0.049 Nm (Tx, Ty) 0.037 Nm (Tz)
Output data	16 bit, 6 channels, up to 1K messages/sec
Microcontroller	dsPIC30F4013 16bit, 30MIPS, 48K Flash, 2K RAM, CAN, SPI
Alarms	CAN communication, memory, ADC and PGA
Digital filter	6 independent 5th order IIR
A/D Converter	16 bit, 250ksps
Gain settings	Fixed analog gain
Offset correction	digital offset correction
Utilities	In field reprogramming, device configuration, graphical data analysis
Operating conditions	0 to 50°C, humidity <85% without condensation
Dimensions [Φ,H]	45x18mm
Weight	122g

# MAIS

## 15 channels analog hall effect sensor interface with CAN Bus communication



The **MAIS** is a miniature board for the acquisition of 15 analog signals that can be used to interface absolute position sensors in hall effect or resistive technology. The board includes analog filtering, multiplexing, A/D conversion and a microcontroller that manages the acquisition sequence and CAN communication.

### Specifications

Power supply	5V±10%, current consumption max 100mA, provided from CAN Bus connector
Communication	CAN Bus 2.0B, 1Mbps
Analog channels	15 analog channels, 0..5V
Microcontroller	dsPIC30F4013 16bit, 30MIPS, 48K Flash, 2K RAM, CAN, SPI
A/D Converter	12 bit, 200ksps
Utilities	In field reprogramming, device configuration, graphical data analysis
Operating conditions	0 to 50°C, humidity <85% without condensation
Dimensions [LWH]	60x17x6mm
Weight	10g



# MC4-001

# MCP-001

## Quad DC Motor Driver



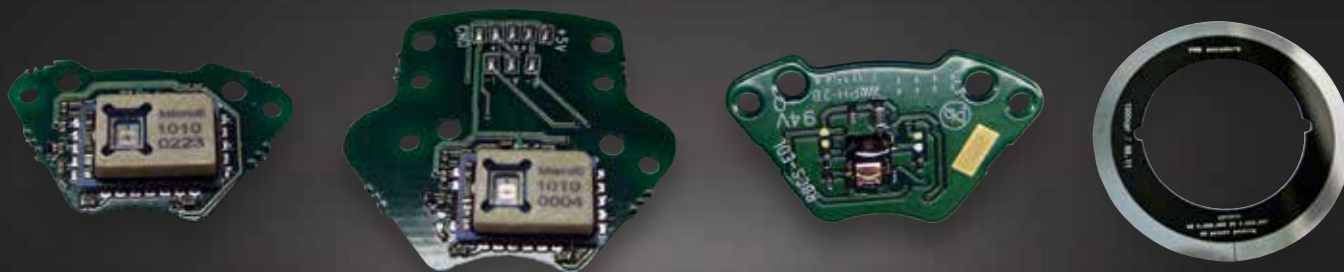
The **MC4** board is a small motor controller capable of driving up to four brushed DC motors, using CAN bus communication for commands and control data exchange. This is complemented by a small power supply board (MCP).

### Specifications

Power supply	12 to 24V
Communication	CAN Bus 2.0B 1Mbps
Motor number, type	4 Brushed DC motors
Output current	1A continuous, 2A overcurrent protection
Microcontrollers	Freescale DSP56F807, 80MHz, 144KB Flash, 8KB SRAM, 2KB EEPROM
Incremental encoders	Magnetic and optical, with an index up to 16.000cpr (see <b>LCORE</b> , <b>ROIE</b> , <b>ROIEL</b> info sheet)
Absolute encoders	Magnetic, SPI communication (see <b>AEA</b> and <b>AEA2</b> info sheet), Analog Hall effect sensors
Alarms	Overcurrent, I <sup>2</sup> T, emergency button, sensor feedback, CAN communication, current sensors
Velocity loop speed	Up to 1KHz
Position loop speed	Up to 1KHz
Utilities	In field reprogramming, the board can be either stacked or connected trough a cable
Operating conditions	0 to 50°C, humidity <85% without condensation
Dimensions [LWH]	MC4 80x30x9mm / MCP 80x30x11mm
Weight	MC4 20g / MCP 20g

# ROIE, ROIEL, LCORE

high resolution incremental encoders  
in optical reflective technology



The Reflective Optical Encoder in two different sizes (**ROIE, ROIEL**) and **LCORE** (Low Cost Reflective Encoder) boards are a series of incremental encoders with resolution from 1000 to 4000ppr (4000 to 16000cpr). The encoders use low cost reflective disks or linear scales.

## ROIE, ROIEL Specifications

Power supply	5V±10%, current consumption max 30mA
Output channels	Quadrature differential or single ended A and B, 5V CMOS/TTL
Resolution	2048ppr (8196cpr)
Operating conditions	0 to 70°C, humidity <85% without condensation
Dimensions [LWH]	ROIE 14x24x4.3mm / ROIEL 28x25x4.3mm
Weight	10g

## LCORE Specifications

Power supply	5V±10%, current consumption max 10mA
Output channels	Quadrature single ended A, B and Index, 5V or 3.3V configurable
Resolution	1000ppr (4000cpr) with 1x interpolation 2000ppr (8000cpr) with 2x interpolation 4000ppr (16000cpr) with 4x interpolation
Operating conditions	-20 to 85°C, humidity <85% without condensation
Dimensions [LWH]	14x24x2.6mm
Weight	5g

# Artificial Skin

with MTB interface boards



Large Area tactile sensor based on capacitive technology. Up to 16 triangles with 12 sensors each (192 taxels) interconnected on a flexible-pcb driven by a microcontroller board (MTB). The skin can be cut from the triangular panel and applied to any 3D surface.



## Specifications

Power supply	5V±10%, current consumption max 70mA
Communication	CAN Bus 2.0B 1Mbps
Microcontroller	dsPIC30F4011 16bit, 40MIPS, 48K Flash, 2K RAM, CAN, SPI
Resolution	8 bit
Bandwidth	From 25Hz up to 250Hz
Utilities	In field reprogramming, drive configuration, graphical data analysis
Operating conditions	0 to 50°C, humidity <85% without condensation
Dimensions [LWH]	MTB 25.5x17.4x7mm / Triangle side of 30mm, etched on a 0.22 mm flexible PCB
Weight	MTB 2g / Triangle 0.3g



# EMS4

## Ethernet Motor Supervisor



The EMS4 card is a 32-bit Arm Cortex-M4 embedded microcontroller based device designed for managing several communication channels in robotic applications. Its main function is to provide the bridges among two Ethernet 10/100 base-T high-speed link, two CAN-2.0B buses and six SPI-master buses. When connected to external motor-driver cards (i.e. 2FOC, BLL/BLP or MCP/MC4), the EMS4 embedded microcontroller provides enough computational power to directly manage up to four motor control-loops.

### Specifications

Power supply	Operating: 9.5Vcc to 58Vcc
Microcontroller	STM32F407VGT6, ARM Cortex M4 168MHz clock
Memory	256KB Flash ROM, 64KB SRAM and 64KB non-volatile EEPROM
Communications	Ethernet 10/100Mbps MAC with IEEE1588 capability. On board managed switch with dual 10T/100TX PHY ports, with auto-MDI/ MDI-X protocol
Expansion buses	2 independent CAN 2.0B buses / 6 (3x2 multiplexed) SPI Master buses
Special functions	3 axes accelerometer: 16bit output, full scale 2g, 4g or 8g 3 axes gyroscope: 16bit output, full scales 250dps, 500dps or 2000dps
Expansion I/O	7 general purpose terminals configurable as digital I/O, incremental encoder inputs, PWM outputs, analog inputs (6 channels), and analog outputs (2 channel)
Generated power supply	5Vcc $\pm$ 3%, max. 450mA (CAN and SPI buses) / 3.3Vcc $\pm$ 3%, max 200mA (CAN and SPI buses)
Tools	Programming and debugging tools from ST, Kail, GNU, Raisonance, IAR and others. JTAG or USART download
Operating Conditions	0°C to 50°C, relative humidity <85% (operating)
Dimensions [LxWxH]	58x42x11 mm (2.28x1.65x0.43 in)
Weight	17g

# CFW-002

PC104+ expansion card with 10-CAN, 2-firewire and audio I/O



The CFW-002 board is PC104+ standard expansion card directly connected to the PC104+ bus. The board has 10 CAN Bus 2.0B links, 2 IEEE 1394 (Firewire) high speed ports, one stereo microphone preamplifier and a single D-Class speaker output.

The CFW-002 is designed to operate with the PC104+ CPU (Linux based). The device drivers are available for Linux (2.6.x kernel) which enable high bandwidth, low latency data stream towards and from the PC104+ card.

## Specifications

Power supply	3.3V,5V and 12V
Communication	10x ESD-protected CAN Bus ports, 1Mbps. 2x Firewire 400mbps IEEE-1394 compliant ports 33MHz PCI
Audio PA maximum power	920 mWatt over 8 ohm
Audio LNA SNR	74dB
Audio PGA regulation	7-step software controlled
Onboard RAM for CAN packets FIFOs	128Kbits
Microcontrollers	2X Infineon XC2287/XC2287M, up to 80 Mhz clock
OS support	Linux 2.6.X custom device driver
PC side connection	Standard PC104+ 33Mhz PCI connector
Operating conditions	0 to 50°C, humidity <85% without condensation
Dimensions [LxWxH]	96x116x13
Weight	72 g

# BLL-001

# BLP-001

## Dual Brushless Motor Driver



This motor controller is made of two separate boards. The BLL contains the logic circuits, while the BLP includes the power drivers. The controller is capable of driving up to two 250W Brushless DC motors using CAN bus communication for command and control data exchange.

### Specifications

Power supply	18V to 48V
Communication	CAN Bus 2.0B 1Mbps
Motor number, type	Two Brushless DC
Output current	7A continuous, up to 25A I <sup>2</sup> T limited
Microcontrollers	Freescale DSP56F807, 80MHz, 144KB Flash , 8KB SRAM, 2KB EEPROM
Incremental encoders	Magnetic and optical, with index up to 16.000cpr (see <b>LCORE</b> , <b>ROIE</b> , <b>ROIEL</b> info sheet)
Absolute encoders	Magnetic, SPI communication compatible with <b>AEA-001</b> and <b>AEA-002</b> (see info sheet), Hall effect sensors
Alarms	Overcurrent, overvoltage, undervoltage, I <sup>2</sup> T, emergency button, sensor feedback, CAN communication, current sensors
Velocity loop speed	Up to 1KHz
Position loop speed	Up to 1KHz
Utilities	In field reprogramming, the board can be either stacked or connected trough a flat cable
Operating conditions	0 to 50°C, humidity <85% without condensation
Dimensions [LxWxH]	BLL 58x42x10mm / BLP 58x42x18mm
Weight	BLL 16g / BLP 47g