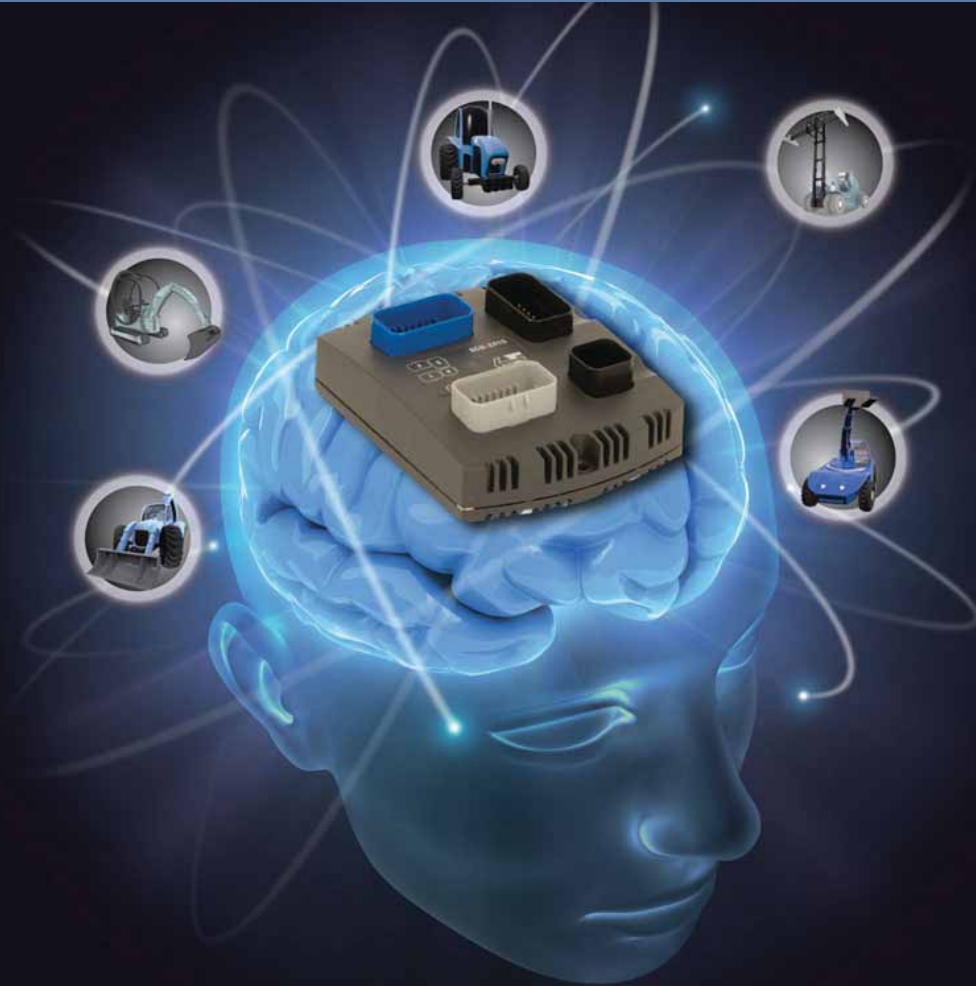




# HYDRAFORCE

High Performance Hydraulic Cartridge Valves  
and Electro-Hydraulic Control Systems



## CORETEK

C O N T R O L L E R S

NEW

CoreTek™ *Controllers Product Guide*

[www.hydraforce.com](http://www.hydraforce.com)

# Smart Design Starts with CoreTek™ Controllers

HydraForce has introduced a new line of general-purpose programmable controllers that can be used as stand-alone controllers or integrated with other CAN networked devices. These controllers are designed to withstand the environmental demands of mobile off-highway equipment applications. They feature flexible input and output configuration and are capable of driving up to 3.0 amps per output pin.

All of the controllers are fully sealed within a compact cast aluminum housing. Operating temperature range is -40° to +70°C (-40° to 158°F) and no external cooling or heat dissipation is required.

These controllers are programmed using the powerful CoDeSys™ Programming Tool. This open software environment offers maximum flexibility and painless servicing of a machine.



## CoreTek™ Benefits

- Controllers are optimized for Electro-Hydraulic System Integration
- Programmed with the powerful CoDeSys™ software tool, Backbone Configuration Tool and Impulse Service Tool.
- Fully-sealed, compact cast-aluminum housing is rated to IP67
- Advanced electronic design for reliability and accuracy.
- Reliable operation in real-world temperature conditions from -40° to +70°C (-40° to 158° F).
- Inputs and Outputs are protected against shorts.
- Outputs have diagnostic capability.
- No external cooling or heat dissipation required.

## CoreTek™ Controllers Ratings and Specifications

### POWER REQUIREMENTS:

**Operating Voltage:** 9 to 30 VDC (1 Watt idle power)  
**Operating Current:** 13 Amp max. continuous current  
**Over-Voltage:** 34 VDC maximum

### PROCESSING and MEMORY:

**Microprocessor:** 16-bit at 40 MHz; Flash ROM: 254 Kbyte  
**SRAM:** 256 Kbyte; EEPROM: 6200 bytes

### COMMUNICATION:

**(2) ISO CAN 2.0B Interfaces:** CANopen, J1939, or user-programmed

### ENVIRONMENTAL RATINGS:

**Operating Temperature:** -40°C to +70°C (-40 to 158°F)  
**Storage Temperature:** -50°C to +85°C (-58°C to 185°F)  
**Water Resistance:** meets IP67 standards  
**Radiated Immunity:** 20 to 2000 MHz at 30 V/m  
**Vibration:** 3.5Grms random from 10 to 500 Hz  
**Shock:** 50g peak

### SYSTEM REQUIREMENTS:

Operating system: Windows 2000, XP, or Vista  
Processor: 1 GHz Pentium level processor recommended  
Memory: 2 GB hard disk space, 1 GB RAM  
Screen resolution: 1024 x 768  
Hardware: USB to CAN adaptor (Kvaser, Vector, or IXXAT)

## CoDeSys™

CoDeSys or Controlled Development System is a complete development environment for PLCs. CoDeSys puts the powerful IEC language into the hands of the PLC programmer enabling a simple approach to application development.

The editors and debugging functions are based on the proven development program environments of advanced programming languages (such as Visual C++).

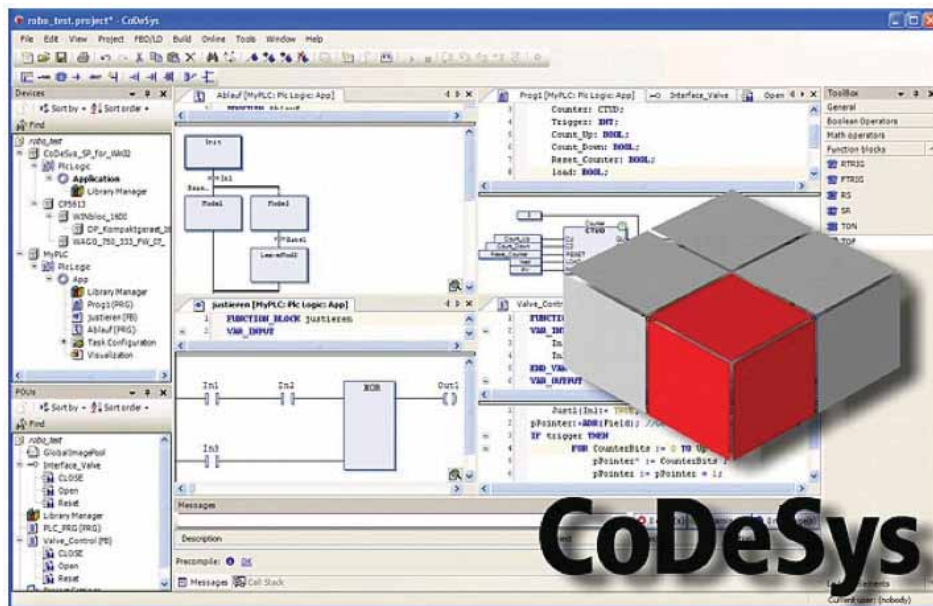
CoDeSys software is available as a free download from 3S Software: [www.3s-software.com](http://www.3s-software.com)

For a detailed overview of the functionality of CoDeSys visit: [www.3s-software.com/index.shtml?en\\_ProductTour](http://www.3s-software.com/index.shtml?en_ProductTour)

Valve function libraries, software tools, programming manuals and service guides can be downloaded from: [www.hydraforce.com/electronics](http://www.hydraforce.com/electronics)

### CoDeSys™ Features

- The 'Engineering Interface' can be used to access any desired source code management program via the ENI Server, which is running as an independent process. CoDeSys POU's and compile files can be filed in that database and are accessible by other clients of the ENI Server. This allows multi-user operation during the work on a CoDeSys project, provides a common data pool for different tools besides CoDeSys, and enables version management.
- A CoDeSys visualization can be processed as Web-Visualization and/or Target-Visualization. This allows visualizations to be programmed with relative ease while allowing you to run and view the visualization via internet or on a PLC monitor.
- Project can be exported to a text file at any time.
- Target settings allow you to load the same CoDeSys project to various target systems.



## Backbone Configuration Tool and Impulse Service Tool

**Backbone** is an all-in one I/O pin and CAN communication configuration tool. Backbone was designed for generating CoDeSys related import files. It allows the user to make configurations to modules, such as I/O pin assignment and CAN definitions prior to programming the device in the CoDeSys editor. This tool also helps the user to map PDOs and to define RPOs for modules automatically.

**Backbone** is divided into two sections: the first section is for adding the modules and configuring the network and the second section is for configuring the separate modules in detail.

**Impulse** is a simple diagnostic software for HydraForce Controllers and CAN Bus networks. Impulse can be used with and CANopen or J1939 based systems.

# CoreTek™ Controllers Product Line



## Model ECU-0710; Part No. 4000351

The ECU-0710 control can be set for up to 20 inputs, consisting of digital, pulse, current measuring feedback and analog. A total of seven outputs configurations can be set, including six PWM or digital high-side drivers and a single low-side driver.

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
6		X				X	X	
2	X		X					
2		X	X					
3					X			
6		X		X				
1		X						X
20	2	15	4	6	3	6	6	1



## Model ECU-2415; Part No. 4000352

The ECU-2415 control can be set for as many as 39 digital, pulse, current measuring feedback and analog inputs along with 24 outputs consisting of up to 24 PWM or digital high-side drivers.

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
1	X							
10					X			
6		X		X				
8	X		X					
8		X				X	X	
16	X					X	X	
49	25	14	8	6	10	24	24	0



## Model ECU-2032; Part No. 4000355

The ECU-2032 offers as many as 52 inputs and 20 outputs consisting of up to eight PWM or 20 digital high-side drivers.

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
1	X			X				
15		X		X				
16		X	X					
8		X				X		
8		X					X	X
4		X						X
52	1	51	16	16	0	8	8	12



## Model ECU-2820; Part No. 4000356

The ECU-2820 control offers as many as 52 inputs and 28 outputs consisting of up to 24 PWM or digital high-side drivers and up to four digital low-side drivers.

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
4		X						
4					X			
24		X				X	X	
8		X		X				
4		X						X
8		X	X					
52	0	48	8	8	4	24	24	4

# CoreTek™ Controllers Accessories

## Shock Cover Kit

CoreTek™ control units are designed to endure harsh environmental conditions. However, when the control unit is mounted in a place where it might receive impact from falling items, someone stepping on it, or where it is exposed to possible water spray, a special shock cover can be used to protect connectors and wire attachment points. While the cover does not increase control unit's IP classification, it will prevent any direct hits to the connectors. The shock cover is mounted on the control unit by using two special M6 bolts (included) that are screwed into a special wire bracket that is mounted under the control unit.

**Shock Cover Kit Part no. 4206820**



## Diagnostic Kit

The Diagnostic Kit can be used for troubleshooting and system testing by measuring the signals between the control unit and the machine. By simply connecting the measuring adapter to the connector cable of the control unit, you can measure the line with a multimeter or an oscilloscope, or connect a ground or voltage input to a controller's input pin.

The kit contains everything you need to measure the electrical signals using a multimeter or oscilloscope, including; banana connectors, an AmpSeal cable assembly, test point pliers, and a measuring adaptor.

**Diagnostic Kit Part no. 4000372**



## AmpSeal Connectors

AmpSeal connectors are known for their rugged reliability even under high-temperature automotive and industrial applications. These connectors offer IP67 weather protection, and feature a new snap-together design for easy assembly.

AmpSeal connectors are available as 100-piece kits from HydraForce. They are also available for purchase worldwide through Tyco's distribution network.



Part no. 4000360



Part no. 4000361



Part no. 4000362



Part no. 4000363



Part no. 4000364

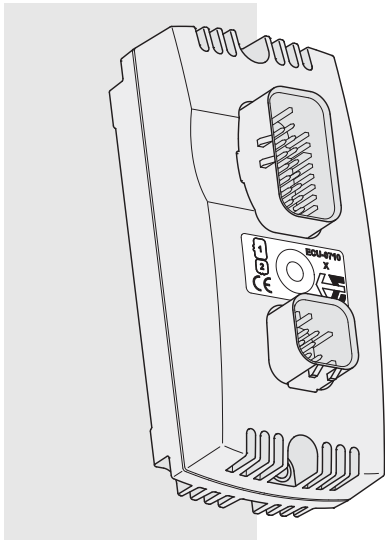


Part no. 4000365

# ELECTRONIC CONTROLS

EC

Machine Controller



## FEATURES

- Advanced electronic design for reliability and accuracy.
- Reliable operation in real-world temperature conditions from -40° to +70°C.
- Fully-sealed, compact cast-aluminum housing.
- Inputs and Outputs are protected against shorts.
- Outputs have diagnostic capability.
- No external cooling or heat dissipation required.
- Software developed with CoDeSys. 2.3 Programming Tool.

## DESCRIPTION

The ECU-0710 Machine Control is a general-purpose programmable controller designed to withstand the real-world environmental demands of the off-highway mobile market. The ECU-0710 can be used as a stand-alone controller, or for integrating into a CAN network with other devices.

Input configuration can be set for up to 20 inputs consisting of Digital, Pulse, Current Measuring Feedback and Analog inputs. Output configuration can be set for a total of 7 outputs consisting of up to 6 PWM or digital high-side drivers, and a single low-side driver. All outputs are capable of driving up to 3.0 Amps.

**Note:** Refer to Input/Output table below for pin configuration capability. Refer to ECU-0710 Technical Reference Manual for specific data and ratings of individual inputs and outputs.

## RATINGS

### POWER REQUIREMENTS:

**Operating Voltage:** 9 to 30 VDC

**Idle Power Consumption:** approximately 1 Watt

**Operating Current:** 10 Amp Max. continuous current, with full external load.

**Over-Voltage:** 34 VDC maximum

### REFERENCE VOLTAGES:

(1) **5 VDC Potentiometer Reference:** 5 mA DC

### COMMUNICATION:

(2) **ISO CAN 2.0B Interfaces:** CANopen, J1939, or user-programmable.

### PROCESSING and MEMORY:

**Microprocessor:** 16-bit at 40 MHz

**Flash ROM:** 254 Kbyte

**SRAM:** 256 Kbyte

**EEPROM:** 6200 bytes

### ENVIRONMENTAL RATINGS:

**Operating Temperature:** -40°C to +70°C

**Storage Temperature:** -50°C to +85°C

**Water Resistance:** meets IP67 standards (per IEC 660529)

**Humidity Tolerance:** Rel. Humidity > 90% from +25°C to +55°C (per IEC 60068-2-30 Test Db)

**Radiated Immunity:** 20 to 2000 MHz at 30 V/m (per 2005/83/EC Annex IX)

**Vibration:** 3.5Grms random from 10 to 500 Hz (per IEC 60068-2-64 Test Fh)

**Shock:** 50g peak (per IEC 60068-2-27 and -29 Tests Ea and Eb)

**Corrosion:** 50 g/l, NaCl for 24 hours at +35°C (per ISO 9227)

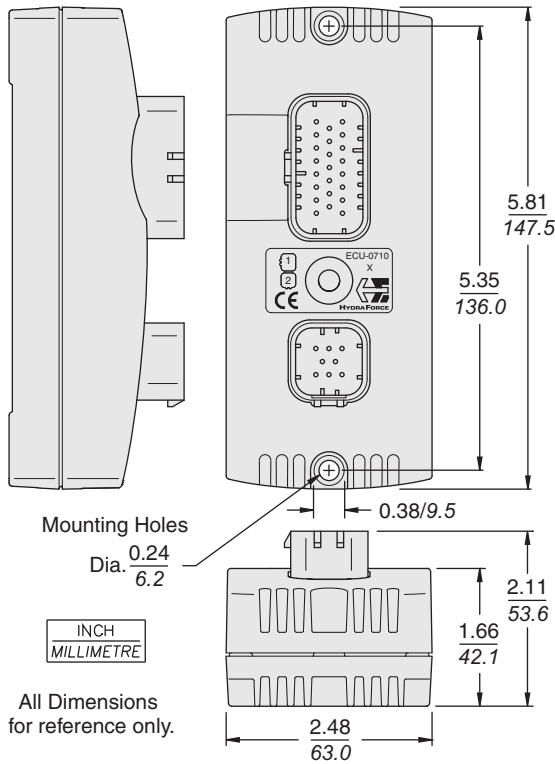
## INPUTS / OUTPUTS — 20 Total

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
6		X				X	X	
2	X		X					
2		X	X					
3					X			
6		X		X				
1		X						X
20	2	15	4	6	3	6	6	1

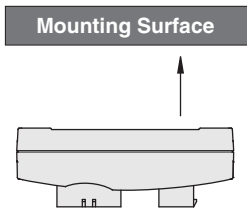
**Note:** The ECU-0710 has inputs and outputs that can be configured in multiple ways. For more information, consult the ECU-0710 Technical Reference Manual.

# EC Machine Controller

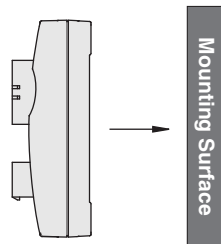
## DIMENSIONS and MOUNTING



### Mounting on Horizontal Surface:



### Mounting on Vertical Surface:



The mounting positions shown here will allow water or other potential contaminants to fall away from connectors.

Allow 5 in./125 mm clearance from mounting surface for connector installation.

For additional mounting information, consult the ECU-0710 Technical Ref. Manual.

## TO ORDER

**Controller:** Model **ECU-0710** Part No. 4000351

**AmpSeal Connectors:** 23-Pin Grey Part No. 4000361; 8-Pin Black Part No. 4000363

**AmpSeal Socket/Plug:** Sockets Gold (100 pc.) Part No. 4000369; Sealing Plugs (100 pc.) Part No. 4000370

**Shock Cover Kit (optional):** Part No. 4206820

**CoDeSys Programming Software:** available from 3S Software GmbH

**USB-CAN Adaptor:** Part No. 4000371, also available from [www.kvaser.com/prod/hardware/leaf\\_light.htm](http://www.kvaser.com/prod/hardware/leaf_light.htm)

**Diagnostic Kit:** Part No. 4000372

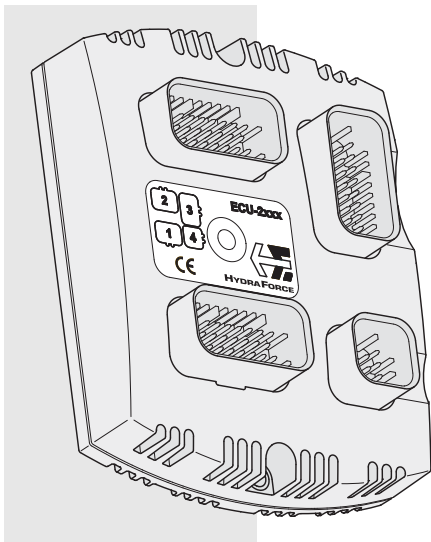
## PIN ASSIGNMENTS

Pin	Connector 1 Pin Function	Type
1	Digital Input/PWM Output/Digital Output	I/O
2	Current Measuring Feedback	FB
3	Digital Input/PWM Output/Digital Output	I/O
4	Digital Input/PWM Output/Digital Output	I/O
5	Current Measuring Feedback	FB
6	Current Measuring Feedback	FB
7	Digital Input/PWM Output/Digital Output	I/O
8	Digital Input/PWM Output/Digital Output	I/O
9	Digital Input/PWM Output/Digital Output	I/O
10	Digital Input/Analog Input	Input
11	Digital Input/Pulse Input, 2.2KΩ to +5VDC	Input
12	Digital Input/Pulse Input, 2.2KΩ to +5VDC	Input
13	Digital Input/Pulse Input, 10KΩ to GND	Input
14	Digital Input/Pulse Input, 10KΩ to GND	Input
15	Must be left open	N/A
16	+5 VDC Reference (Ref 47Ω)	—
17	Digital Input/Analog Input	Input
18	Digital Input/Digital Output	I/O
19	Ground (Ref 47Ω)	—
20	Digital Input/Analog Input	Input
21	Digital Input/Analog Input	Input
22	Digital Input/Analog Input	Input
23	Digital Input/Analog Input	Input

Pin	Connector 2 Pin Function	Type
1	Power Ground	—
2	CAN 1 HIGH	I/O
3	Power Ground	—
4	V <sub>SUPPLY</sub> (+9 to 30 VDC)	—
5	V <sub>SUPPLY</sub> (+9 to 30 VDC)	—
6	CAN 1 LOW	I/O
7	CAN 2 HIGH	I/O
8	CAN 2 LOW	I/O

# ELECTRONIC CONTROLS

## C a e Co ntro ller



### FEATURES

- Advanced electronic design for reliability and accuracy.
- Reliable operation in real-world temperature conditions from -40° to +70°C.
- Fully-sealed, compact cast-aluminum housing.
- Inputs and Outputs are protected against shorts.
- Outputs have diagnostic capability.
- No external cooling or heat dissipation required.
- Software developed with CoDeSys. 2.3 Programming Tool.

### DESCRIPTION

The ECU-2415 Machine Control is a general-purpose programmable controller designed to withstand the real-world environmental demands of the off-highway mobile market. The ECU-2415 can be used as a stand-alone controller, or for integrating into a CAN network with other devices.

Input configuration can be set for up to 39 inputs consisting of Digital, Pulse, Current Measuring Feedback and Analog inputs. Output configuration can be set for a total of 24 outputs consisting of up to 24 PWM or digital high-side drivers. All outputs are capable of driving up to 3.0 Amps.

**Note:** Refer to Input/Output table below for pin configuration capability. Refer to ECU-2415 Technical Reference Manual for specific data and ratings of individual inputs and outputs.

### RATINGS

#### POWER REQUIREMENTS:

**Operating Voltage:** 9 to 30 VDC

**Idle Power Consumption:** approximately 1 Watt

**Operating Current:** 10 Amp Max. continuous current, with full external load.

**Over-Voltage:** 34 VDC maximum

#### REFERENCE VOLTAGES:

(1) 5 VDC Potentiometer Reference: 5 mA DC

#### COMMUNICATION:

(2) ISO CAN 2.0B Interfaces: CANopen, J1939, or user-programmable.

#### PROCESSING and MEMORY:

**Microprocessor:** 16-bit at 40 MHz; **Flash ROM:** 254 Kbyte

**SRAM:** 256 Kbyte; **EEPROM:** 6200 bytes

#### ENVIRONMENTAL RATINGS:

**Operating Temperature:** -40°C to +70°C; **Storage Temperature:** -50°C to +85°C

**Water Resistance:** meets IP67 standards (per IEC 660529)

**Humidity Tolerance:** Rel. Humidity > 90% from +25°C to +55°C (per IEC 60068-2-30 Test Db)

**Radiated Immunity:** 20 to 2000 MHz at 30 V/m (per 2005/83/EC Annex IX)

**Vibration:** 3.5Grms random from 10 to 500 Hz (per IEC 60068-2-64 Test Fh)

**Shock:** 50g peak (per IEC 60068-2-27 and -29 Tests Ea and Eb)

**Corrosion:** 50 g/l, NaCl for 24 hours at +35°C (per ISO 9227)

### INPUTS / OUTPUTS — 49 Total

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
1	X							
10					X			
6		X		X				
8	X		X					
8		X				X	X	
16	X					X	X	
49	25	14	8	6	10	24	24	0

**Note:** The ECU-2415 has inputs and outputs that can be configured in multiple ways. For more information, consult the ECU-2415 Technical Reference Manual.

# C a e Co ntro ler

**PIN ASSIGNMENTS**

Pin	Connector 1 Pin Function	Type
1	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
2	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
3	Current Measuring Feedback	FB
4	Current Measuring Feedback	FB
5	Current Measuring Feedback	FB
6	Current Measuring Feedback	FB
7	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
8	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
9	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
10	Current Measuring Feedback	FB
11	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
12	Ground	—
13	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
14	Current Measuring Feedback	FB
15	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
16	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
17	Current Measuring Feedback	FB
18	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
19	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
20	Current Measuring Feedback	FB
21	Current Measuring Feedback	FB
22	Current Measuring Feedback	FB
23	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O

Pin	Connector 2 Pin Function	Type
1	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
2	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
3	Current Measuring Feedback	FB
4	Current Measuring Feedback	FB
5	Current Measuring Feedback	FB
6	Current Measuring Feedback	FB
7	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
8	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
9	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
10	Current Measuring Feedback	FB
11	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
12	Ground	—
13	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
14	Current Measuring Feedback	FB
15	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
16	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
17	Current Measuring Feedback	FB
18	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
19	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
20	Current Measuring Feedback	FB
21	Current Measuring Feedback	FB
22	Current Measuring Feedback	FB
23	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O

**PIN ASSIGNMENTS**

Pin	Connector 3 Pin Function	Type
1	+24 VDC Reference (Ref 300 mA)	—
2	+5 VDC Reference (Ref 47Ω)	—
3	Digital Input/ Analog Input, 2.2KΩ to +5VDC	Input
4	Digital I/P/ Analog I/P, 82kΩ to GND/ V, 220Ω GND/A	Input
5	Digital I/P/ Analog I/P, 82kΩ to GND/ V, 220Ω GND/A	Input
6	Digital I/P/ Analog I/P, 82kΩ to GND/ V, 220Ω GND/A	Input
7	Digital I/P/ Analog I/P, 82kΩ to GND/ V, 220Ω GND/A	Input
8	Digital Input/ Analog Input, 19.5kΩ to GND and +5VDC	Input
9	+24 VDC Reference (Ref 300 mA)	—
10	Ground	—
11	Ground	—
12	Ground	—
13	Ground	—
14	Digital Input, 2.2KΩ to +5VDC	Input
15	Must be left open	N/A
16	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input
17	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input
18	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input
19	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input
20	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input
21	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input
22	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input
23	Digital Input/ Pulse Input, 2.2KΩ to +5VDC	Input

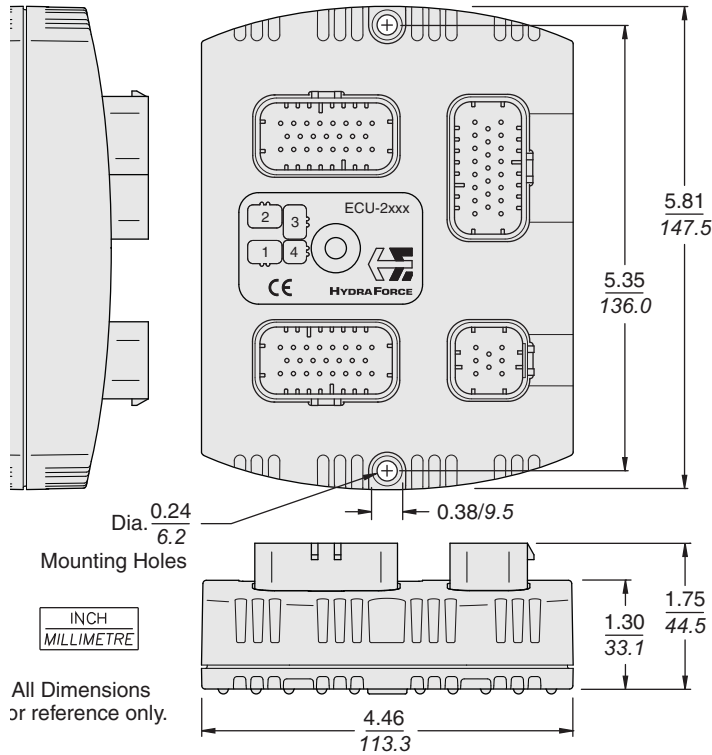
Pin	Connector 4 Pin Function	Type
1	Power Ground	—
2	CAN 1 HIGH	I/O
3	Power Ground	—
4	VSUPPLY (+9 to 30 VDC)	—
5	VSUPPLY (+9 to 30 VDC)	—
6	CAN 1 LOW	I/O
7	CAN 2 HIGH	I/O
8	CAN 2 LOW	I/O

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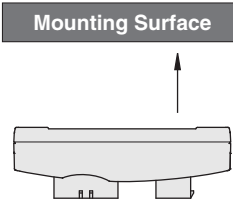
# ELECTRONIC CONTROLS

C a e Co ntro ler

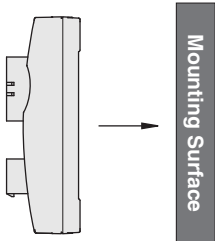
## DIMENSIONS and MOUNTING



### Mounting on Horizontal Surface:



### Mounting on Vertical Surface:



The mounting positions shown here will allow water or other potential contaminants to fall away from connectors.

Allow 5 in./125 mm clearance from mounting surface for connector installation.

For additional mounting information, consult the ECU-2415 Technical Ref. Manual.

## TO ORDER

**Controller:** Model **ECU-2415** Part No. **4000352**

**AmpSeal Connectors:** 23-Pin Grey Part No. 4000361; 23-Pin Blue Part No. 4000362  
23-Pin Black Part No. 4000360; 8-Pin Black Part No. 4000363

**AmpSeal Socket/Plug:** Sockets Gold (100 pc.) Part No. 4000369; Sealing Plugs (100 pc.) Part No. 4000370

**Shock Cover Kit (optional):** Part No. 4206820

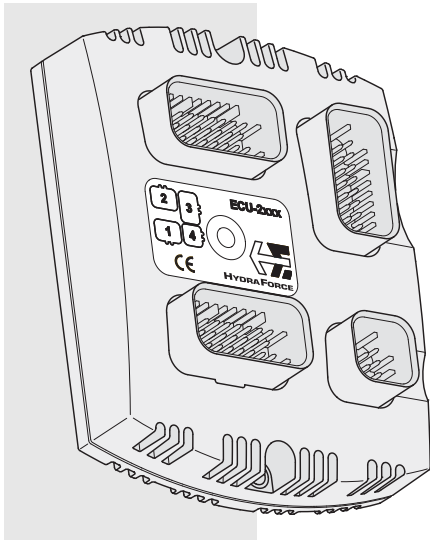
**CoDeSys Programming Software:** available from **3S Software GmbH**

**USB-CAN Adaptor:** Part No. 4000371, also available from [www.kvaser.com/prod/hardware/leaf\\_light.htm](http://www.kvaser.com/prod/hardware/leaf_light.htm)

**Diagnostic Kit:** Part No. 4000372

# ELECTRONIC CONTROLS

## C a e Co ntro ller



### FEATURES

- Advanced electronic design for reliability and accuracy.
- Reliable operation in real-world temperature conditions from  $-40^{\circ}$  to  $+70^{\circ}\text{C}$ .
- Fully-sealed, compact cast-aluminum housing.
- Inputs and Outputs are protected against shorts.
- Outputs have diagnostic capability.
- No external cooling or heat dissipation required.
- Software developed with CoDeSys. 2.3 Programming Tool.

### DESCRIPTION

The ECU-2032 Machine Control is a general-purpose programmable controller designed to withstand the real-world environmental demands of the off-highway mobile market. The ECU-2032 can be used as a stand-alone controller, or for integrating into a CAN network with other devices.

Input configuration can be set for up to 52 inputs consisting of Digital, Pulse, Current Measuring Feedback and Analog inputs. Output configuration can be set for a total of 20 outputs consisting of up to 8 PWM or 20 digital high-side drivers. All outputs are capable of driving up to 3.0 Amps.

**Note:** Refer to Input/Output table below for pin configuration capability. Refer to ECU-2032 Technical Reference Manual for specific data and ratings of individual inputs and outputs.

### RATINGS

#### POWER REQUIREMENTS:

**Operating Voltage:** 9 to 30 VDC

**Idle Power Consumption:** approximately 1 Watt

**Operating Current:** 10 Amp Max. continuous current, with full external load.

**Over-Voltage:** 34 VDC maximum

#### REFERENCE VOLTAGES:

**(3) 5 VDC Potentiometer Reference:** 10 mA DC

**(3) 12 VDC Potentiometer Reference:** 200 mA DC

#### COMMUNICATION:

**(2) ISO CAN 2.0B Interfaces:** CANopen, J1939, or user-programmable.

#### INTERNALLY REGULATED POWER SUPPLY:

**(1) 5 VDC:** 250 mA maximum

#### PROCESSING and MEMORY:

**Microprocessor:** 16-bit at 40 MHz; **Flash ROM:** 254 Kbyte

**SRAM:** 256 Kbyte; **EEPROM:** 6200 bytes

#### ENVIRONMENTAL RATINGS:

**Operating Temperature:**  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ ; **Storage Temperature:**  $-50^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

**Water Resistance:** meets IP67 standards (per IEC 660529)

**Humidity Tolerance:** Rel. Humidity > 90% from  $+25^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  (per IEC 60068-2-30 Test Db)

**Radiated Immunity:** 20 to 2000 MHz at 30 V/m (per 2005/83/EC Annex IX)

**Vibration:** 3.5Grms random from 10 to 500 Hz (per IEC 60068-2-64 Test Fh)

**Shock:** 50g peak (per IEC 60068-2-27 and -29 Tests Ea and Eb)

**Corrosion:** 50 g/l, NaCl for 24 hours at  $+35^{\circ}\text{C}$  (per ISO 9227)

### INPUTS / OUTPUTS — 52 Total

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
1	X			X				
15		X		X				
16		X	X					
8		X				X		
8		X					X	X
4		X						X
52	1	51	16	16	0	8	8	12

**Note:** The ECU-2032 has inputs and outputs that can be configured in multiple ways. For more information, consult the ECU-2032 Technical Reference Manual.

# C a e Co ntro ler

## PIN ASSIGNMENTS

Pin	Connector 1 Pin Function	Type
1	Analog Input, 10KΩ to +5VDC	Input
2	Analog Input, 10KΩ to +5VDC	Input
3	Analog Input, 10KΩ to +5VDC	Input
4	Analog Input, 10KΩ to +5VDC	Input
5	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
6	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
7	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
8	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
9	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
10	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
11	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
12	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
13	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
14	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
15	Ground	—
16	+12VDC Reference (ref 200mA)	—
17	Ground	—
18	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
19	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
20	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
21	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
22	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
23	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O

Pin	Connector 2 Pin Function	Type
1	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
2	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
3	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
4	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
5	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
6	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
7	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
8	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
9	Ground	—
10	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
11	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
12	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
13	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
14	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
15	Digital I/P/ Pulse I/P, 10KΩ or 5kHz to Ground	Input
16	Digital I/P / Digital O/P (open detect.)	I/O
17	Digital I/P / Digital O/P (open detect.)	I/O
18	Digital I/P / Digital O/P (open detect.)	I/O
19	Digital I/P / Digital O/P (open detect.)	I/O
20	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
21	Digital I/P/ PWM O/P/ Digital O/P (open detect.)	I/O
22	Ground	—
23	+12VDC Reference (ref 200mA)	—

## PIN ASSIGNMENTS

Pin	Connector 3 Pin Function	Type
1	Analog I/P, 0-5VDC, 41kΩ to +2.5VDC	Input
2	+5 VDC Regulated Power Supply (Ref 250mA)	—
3	Digital I/P/ Analog I/P, 0-5VDC or 0-22.7mA to +2.5VDC	Input
4	+5 VDC Reference (Ref +47Ω)	—
5	Digital I/P/ Analog I/P, 0-5VDC or 0-22.7mA to +2.5VDC	Input
6	+5 VDC Reference (Ref +47Ω)	—
7	Digital I/P/ Analog I/P, 0-5VDC or 0-22.7mA to +2.5VDC	Input
8	+5 VDC Reference (Ref +47Ω)	—
9	Ground	—
10	Digital I/P/ Analog I/P, 0-5VDC or 0-22.7mA to +2.5VDC	Input
11	Analog I/P, 0-5VDC, 41kΩ to +2.5VDC	Input
12	Analog I/P, 0-5VDC or 0-22.7mA, to +5VDC	Input
13	Analog I/P, 0-5VDC or 0-22.7mA, to +5VDC	Input
14	Analog I/P, 0-5VDC or 0-22.7mA, to +5VDC	Input
15	Must be left open	—
16	+12VDC Reference (ref 200mA)	—
17	Ground (Ref -47Ω)	—
18	Analog Input, 2.2KΩ to +5VDC	Input
19	Ground (Ref -47Ω)	—
20	Analog Input, 92KΩ to +46VDC	Input
21	Ground (Ref -47Ω)	—
22	Analog Input, 2.2KΩ to +5VDC	Input
23	Ground (Ref -47Ω)	—

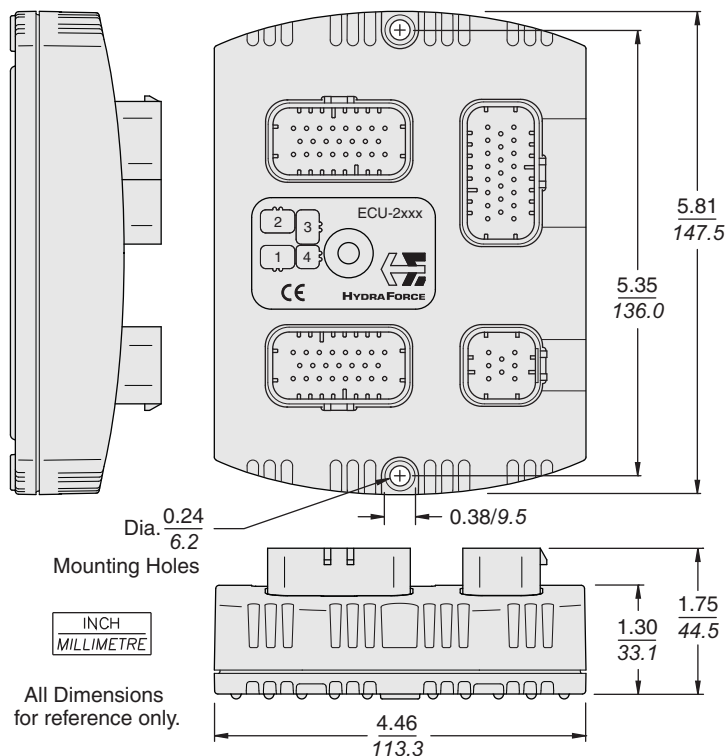
Pin	Connector 4 Pin Function	Type
1	Power Ground	—
2	CAN 1 HIGH	I/O
3	Power Ground	—
4	VSUPPLY (+9 to 30 VDC)	—
5	VSUPPLY (+9 to 30 VDC)	—
6	CAN 1 LOW	I/O
7	CAN 2 HIGH	I/O
8	CAN 2 LOW	I/O

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# ELECTRONIC CONTROLS

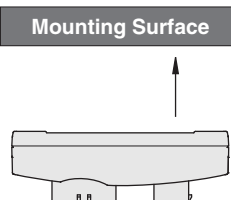
## C a e Co ntro ler

### DIMENSIONS and MOUNTING

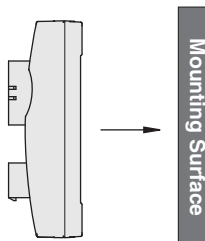


Weight: 1.55 lbs./0.7 kg

#### Mounting on Horizontal Surface:



#### Mounting on Vertical Surface:



The mounting positions shown here will allow water or other potential contaminants to fall away from connectors.

Allow 5 in./125 mm clearance from mounting surface for connector installation.

For additional mounting information, consult the ECU-2032 Technical Ref. Manual.

### TO ORDER

**Controller:** Model **ECU-2032** Part No. **4000355**

**AmpSeal Connectors:** 23-Pin Grey Part No. 4000361; 23-Pin Blue Part No. 4000362  
23-Pin Black Part No. 4000360; 8-Pin Black Part No. 4000363

**AmpSeal Socket/Plug:** Sockets Gold (100 pc.) Part No. 4000369; Sealing Plugs (100 pc.) Part No. 4000370

**Shock Cover Kit (optional):** Part No. 4206820

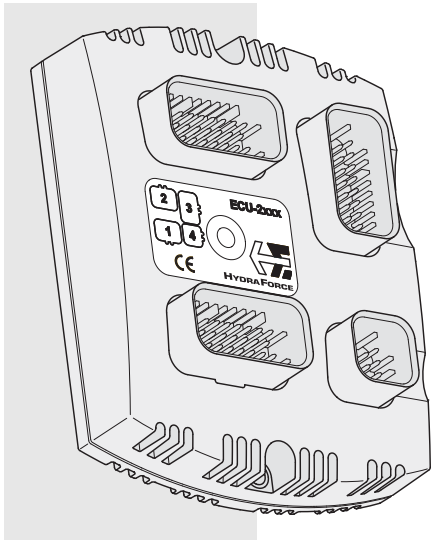
**CoDeSys Programming Software:** available from **3S Software GmbH**

**USB-CAN Adaptor:** Part No. 4000371, also available from [www.kvaser.com/prod/hardware/leaf\\_light.htm](http://www.kvaser.com/prod/hardware/leaf_light.htm)

**Diagnostic Kit:** Part No. 4000372

# ELECTRONIC CONTROLS

## C a e Co ntro ller



### FEATURES

- Advanced electronic design for reliability and accuracy.
- Reliable operation in real-world temperature conditions from  $-40^{\circ}$  to  $+70^{\circ}\text{C}$ .
- Fully-sealed, compact cast-aluminum housing.
- Inputs and Outputs are protected against shorts.
- Outputs have diagnostic capability.
- No external cooling or heat dissipation required.
- Software developed with CoDeSys. 2.3 Programming Tool.

### DESCRIPTION

The ECU-2820 Machine Control is a general-purpose programmable controller designed to withstand the real-world environmental demands of the off-highway mobile market. The ECU-2820 can be used as a stand-alone controller, or for integrating into a CAN network with other devices.

Input configuration can be set for up to 52 inputs consisting of Digital, Pulse, Current Measuring Feedback and Analog inputs. Output configuration can be set for a total of 28 outputs consisting of up to 24 PWM or digital high-side drivers and up to 4 digital low-side drivers. All outputs are capable of driving up to 3.0 Amps.

**Note:** Refer to Input/Output table below for pin configuration capability. Refer to ECU-2820 Technical Reference Manual for specific data and ratings of individual inputs and outputs.

### RATINGS

#### POWER REQUIREMENTS:

**Operating Voltage:** 9 to 30 VDC

**Idle Power Consumption:** approximately 1 Watt

**Operating Current:** 10 Amp Max. continuous current, with full external load.

**Over-Voltage:** 34 VDC maximum

#### INTERNALLY REGULATED POWER SUPPLY:

(1) **5 VDC:** 250 mA maximum across both pins

(1) **12 VDC:** 200 mA maximum across both pins

#### COMMUNICATION:

(2) **ISO CAN 2.0B Interfaces:** CANopen, J1939, or user-programmable.

#### PROCESSING and MEMORY:

**Microprocessor:** 16-bit at 40 MHz; **Flash ROM:** 254 Kbyte

**SRAM:** 256 Kbyte; **EEPROM:** 6200 bytes

#### ENVIRONMENTAL RATINGS:

**Operating Temperature:**  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ ; **Storage Temperature:**  $-50^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

**Water Resistance:** meets IP67 standards (per IEC 660529)

**Humidity Tolerance:** Rel. Humidity > 90% from  $+25^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  (per IEC 60068-2-30 Test Db)

**Radiated Immunity:** 20 to 2000 MHz at 30 V/m (per 2005/83/EC Annex IX)

**Vibration:** 3.5Grms random from 10 to 500 Hz (per IEC 60068-2-64 Test Fh)

**Shock:** 50g peak (per IEC 60068-2-27 and -29 Tests Ea and Eb)

**Corrosion:** 50 g/l, NaCl for 24 hours at  $+35^{\circ}\text{C}$  (per ISO 9227)

### INPUTS / OUTPUTS — 49 Total

Max. I/O Count	Digital In (SWG)	Digital In (SWB)	Pulse Input	Analog Input	Current Feedback	PWM (Source)	Digital Out (Source)	Digital Out (Sink)
4		X						
4					X			
24		X				X	X	
8		X		X				
4		X						X
8		X	X					
52	0	48	8	8	4	24	24	4

**Note:** The ECU-2820 has inputs and outputs that can be configured in multiple ways.

For more information, consult the ECU-2820 Technical Reference Manual.

# C a e Co ntro ler

## PIN ASSIGNMENTS

Pin	Connector 1 Pin Function	Type
1	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
2	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
3	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
4	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
5	Current Measuring Feedback	FB
6	Current Measuring Feedback	FB
7	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
8	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
9	Ground	—
10	Ground	—
11	Ground	—
12	Analog Input, 2.2KΩ to +5VDC or 220Ω to 22.7mA	Input
13	Auxiliary VSUPPLY (3A max) for External Devices	—
14	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
15	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
16	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
17	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
18	Digital Input/ Digital Output (open detect.)	I/O
19	Digital Input, 10KΩ to Ground	Input
20	Digital Input, 10KΩ to Ground	Input
21	Digital Input/ Digital Output (open detect.)	I/O
22	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
23	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O

Pin	Connector 2 Pin Function	Type
1	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
2	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
3	Current Measuring Feedback	FB
4	Current Measuring Feedback	FB
5	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
6	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
7	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
8	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
9	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
10	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
11	Back-up VSUPPLY (+9 to 30 VDC) for CPU	—
12	Analog Input, 2.2KΩ to +5VDC or 220Ω to 22.7mA	Input
13	Ground	—
14	Ground	—
15	Ground	—
16	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
17	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
18	Digital Input/ Digital Output (open detect.)	I/O
19	Digital Input, 10KΩ to Ground	Input
20	Digital Input, 10KΩ to Ground	Input
21	Digital Input/ Digital Output (open detect.)	I/O
22	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O
23	Digital I/P/ PWM O/P/ Digital O/P (no open detect.)	I/O

## PIN ASSIGNMENTS

Pin	Connector 3 Pin Function	Type
1	+12 VDC Regulated Power Supply (max 200mA)	—
2	+5 VDC Regulated Power Supply (max 250mA)	—
3	Ground	—
4	Ground	—
5	Digital I/P/ Analog I/P, 82KΩ to GND/V, 220Ω to GND/A	Input
6	Digital I/P/ Analog I/P, 82KΩ to GND/V, 220Ω to GND/A	Input
7	Digital I/P/ Analog I/P, 82KΩ to GND/V, 220Ω to GND/A	Input
8	Digital I/P/ Analog I/P, 82KΩ to GND/V, 220Ω to GND/A	Input
9	+12 VDC Regulated Power Supply (max 200mA)	—
10	+12 VDC Regulated Power Supply (max 200mA)	—
11	Ground	—
12	Ground	—
13	Digital I/P/ Analog I/P, 82KΩ to GND/V, 220Ω to GND/A	Input
14	Digital I/P/ Analog I/P, 82KΩ to GND/V, 220Ω to GND/A	Input
15	Must be left open	—
16	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input
17	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input
18	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input
19	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input
20	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input
21	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input
22	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input
23	Digital Input/ Pulse Input, 10KΩ or 5kHz to Ground	Input

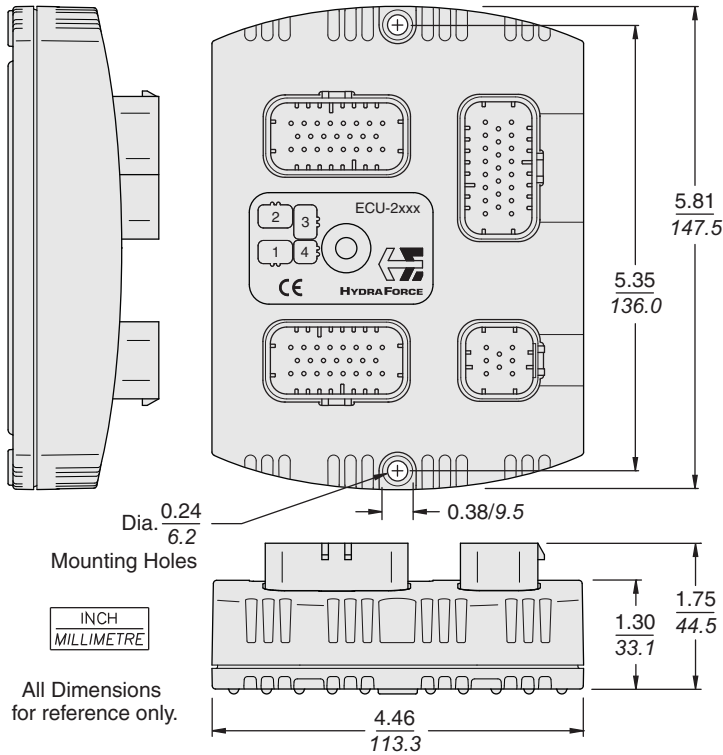
Pin	Connector 4 Pin Function	Type
1	Power Ground	—
2	CAN 1 HIGH	I/O
3	Power Ground	—
4	VSUPPLY (+9 to 30 VDC)	—
5	VSUPPLY (+9 to 30 VDC)	—
6	CAN 1 LOW	I/O
7	CAN 2 HIGH	I/O
8	CAN 2 LOW	I/O

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# ELECTRONIC CONTROLS

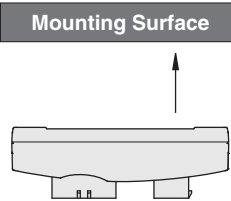
C a e Co ntro ler

## DIMENSIONS and MOUNTING

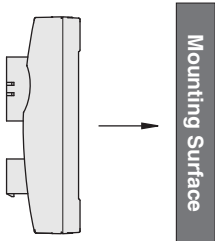


Weight: 1.55 lbs./0.7 kg

### Mounting on Horizontal Surface:



### Mounting on Vertical Surface:



The mounting positions shown here will allow water or other potential contaminants to fall away from connectors.

Allow 5 in./125 mm clearance from mounting surface for connector installation.

For additional mounting information, consult the ECU-2820 Technical Ref. Manual.

## TO ORDER

**Controller:** Model **ECU-2820** Part No. **4000356**

**AmpSeal Connectors:** 23-Pin Grey Part No. 4000361; 23-Pin Blue Part No. 4000362  
23-Pin Black Part No. 4000360; 8-Pin Black Part No. 4000363

**AmpSeal Socket/Plug:** Sockets Gold (100 pc.) Part No. 4000369; Sealing Plugs (100 pc.) Part No. 4000370

**Shock Cover Kit (optional):** Part No. 4206820

**CoDeSys Programming Software:** available from **3S Software GmbH**

**USB-CAN Adaptor:** Part No. 4000371, also available from [www.kvaser.com/prod/hardware/leaf\\_light.htm](http://www.kvaser.com/prod/hardware/leaf_light.htm)

**Diagnostic Kit:** Part No. 4000372





Main headquarters, engineering and manufacturing facility in Lincolnshire Illinois, just north of Chicago.



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European headquarters, engineering and manufacturing facility in Birmingham, England.

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**HYDRAFORCE INC**

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Member: National Fluid Power Assoc.  
ISO 9001

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ISO 9001 & ISO 14001

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Email: [bharatb@hydraforce.com](mailto:bharatb@hydraforce.com)



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