



CURTIS

Motor Controllers



# ACF4-A

## AC Motor Controller with VCL



CE 





## Superb Performance and Value

The Curtis Model AC F4-A Motor Controller provides accurate speed and torque control of 3-phase AC induction and PMAC motors.

The AC F4-A uses dual, high-performance ARM Cortex microprocessors to ensure the highest possible levels of functional safety, while providing highly efficient motor control and flexible system control capabilities. It is intended to control the Electric Traction (Propel), Hydraulic Pump and On-Engine Generator (OEG) Hybrid systems on mobile equipment applications such as Materials Handling Trucks, Aerial Work Platforms and Construction Equipment. In addition to the highly advanced motor control, the Model AC F4-A is also a powerful Vehicle Manager /System Controller, with significant CANbus system master capabilities.

## FEATURES

### Fit for Purpose

- ▶ High-efficiency, field-oriented motor control algorithms for 3-phase AC motors.
- ▶ Advanced motor control for maintaining optimal performance at all operating conditions.
- ▶ Provides real-time motor torque and power estimates for vehicle level power optimization.
- ▶ Compact, rugged housing with very small 'footprint' for its power rating.
- ▶ Heavy-duty M6 busbars for motor and battery connectors.
- ▶ Sealed, 35-pin AMPseal I/O connector.
- ▶ Impervious to most oils, solvents, degreasers and other chemicals often encountered by industrial vehicles.
- ▶ IP65 and IP67 environmental protection as per IEC 60529.
- ▶ Exceeds latest global conformance requirements for functional safety, electrical safety and EMC.
- ▶ CE marked as a programmable safety device.
- ▶ UL583 Pending.

### Motors

- ▶ Easily configured to work with any AC induction or PMAC motor.
- ▶ Improved motor auto-characterization setup allows simple on-truck pairing with different Induction motor types.
- ▶ Comprehensive library of induction and PMAC motor types stored in controller memory.

### You Feel It When You Drive It— Maximum Torque, Minimum Losses, Full control

- ▶ The latest implementation of Curtis' renowned field-oriented control algorithms, and our advanced PWM switching technology, assures maximum motor output torque and highest possible system efficiency across the entire torque/speed spectrum.
- ▶ Smooth and predictable drive control that only Curtis can deliver.





## FEATURES continued

### Get More Out of Your Battery—Regardless of the Technology

- ▶ High-efficiency means more of your battery's energy is converted to motor output power.
- ▶ Fully configurable over- and under-voltage protection parameters.
- ▶ Wide operating voltage range allows use with the latest cell chemistries such as lithium ion.
- ▶ Configurable CANbus and VCL allows easy integration with the BMS (Battery Management Systems) typically found on lithium battery packs.

### Powerful, High Performance Dual Microprocessors

- ▶ Dual-micro architecture achieves up to PL=D, category 2 functional safety under EN ISO 13849-1 / EN1175-1:1998+A1:2010.
- ▶ Ultra-fast processor speeds allow highly accurate control and regulation of voltage, frequency and current.
- ▶ Hardware 'ready' for the forthcoming prEN1175:2019.

### Customize Your Vehicle with VCL

- ▶ The Curtis VCL (Vehicle Control Language) allows Curtis AC motor controllers to perform as 'vehicle managers', eliminating the need for costly, additional system controllers.

### Inertial Measurement Unit (IMU)

- ▶ Six-Axis IMU for measurement of orientation, movement and impact detection (optional).



### Highly Flexible I/O

- ▶ All I/O pins are multi-function, and can be configured to provide up to:
  - 27 digital inputs
  - 9 analog inputs
  - 2 potentiometer sources
  - 7 output drivers

### Comprehensive CAN Master Capabilities

- ▶ Configurable 11 or 29 bit protocol support for CANopen or J1939 use.
- ▶ Dual independent CAN ports, available with full galvanic isolation (optional).
- ▶ 'Plug and Play' support for Curtis CAN displays and a variety of CAN tiller heads from leading manufacturers FREI and REMA.
- ▶ Fully compliant with CANopen protocol DS301 profile.
- ▶ Capable of acting as 'CAN interpreter' allowing 3rd party CAN devices with differing profiles to work on the same CAN network.

### Improved Diagnostics

- ▶ Integrated, high visibility Status LED with simplified flash code sequence for at-a-glance system troubleshooting.
- ▶ Thermal cutback, warning, and automatic shutdown provide protection to motor and controller.
- ▶ Error logging and fault history tables with CAN Emergency Messages.

### CAN-based Programming

- ▶ Model AC F4-A is programmable over the CANbus. This allows 'vehicle level' communication with many of the CAN-based service tools used by the major industrial truck manufacturers worldwide.
- ▶ Allows use of the Curtis Integrated Toolkit of development tools.





## SYSTEM ACCESSORIES



### Curtis Model 3141

A cost-effective, CAN-based LCD vehicle status display in a rugged 52mm diameter housing is the ideal partner to model AC F4-A.

- ▶ Large, easy-to-read 16-segment format LCD.
- ▶ Battery Discharge Indicator, Service (Hours) Counter and Diagnostic/ Message Center functions.
- ▶ Sealed to IP65 (IP67 optional).
- ▶ 12–48V nominal operating voltage range.
- ▶ CE compliant, UL583 recognized component.
- ▶ Optional backlight and heater.



### The Curtis Integrated Toolkit

A fully integrated suite of development and diagnostic tools for use on CAN systems using Curtis and other 3rd party CAN-based products. It is comprised of the following tools that run in a shared environment:

- ▶ **Launchpad**  
Starting point and project editor.
- ▶ **Programmer**  
Used to configure parameter, view monitor values, and view active faults and the fault history.
- ▶ **TACT**  
Improved version of the stand-alone oscilloscope/ datalogging tool.
- ▶ **VCL Studio**  
Editor and compiler for VCL software.
- ▶ **Menu Editor**  
Tool to create and modify programming menus.
- ▶ **Package & Flash**  
Downloader tool to load you software into the CAN device.

The Curtis Integrated Toolkit is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim, etc. Contact your local Curtis Sales office for further information.

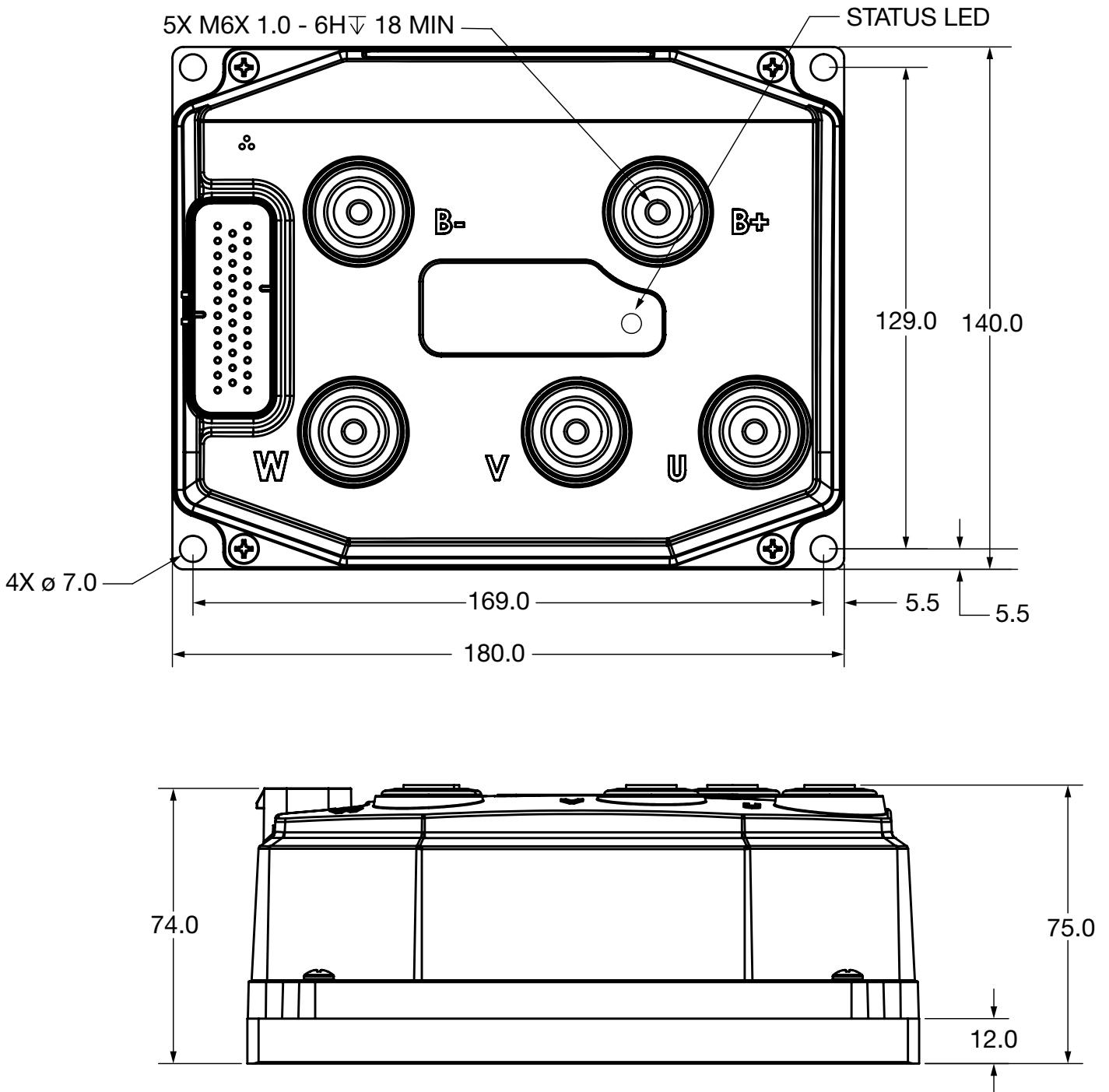
## MODEL CHART

Model	Nominal Battery Voltage:	Maximum Current: [S2-2 min]	Maximum Current: [S2-60]	IMU	Isolated CAN
AC F4-A 24-375-001	24V	375Arms	185Arms	No	No
AC F4-A 24-375-101	24V	375Arms	185Arms	Yes	Yes
AC F4-A 36-500-001	24–36V	500Arms*	175Arms*	No	No
AC F4-A 36-500-101	24–36V	500Arms*	175Arms*	Yes	Yes
AC F4-A 48-375-001	36–48V	375Arms	175Arms	No	No
AC F4-A 48-375-101	36–48V	375Arms	175Arms	Yes	Yes
AC F4-A 48-450-001	36–48V	450Arms*	175Arms*	No	No
AC F4-A 48-450-101	36–48V	450Arms*	175Arms*	Yes	Yes
AC F4-A 80-250-001	48–80V	250Arms*	145Arms*	No	Yes
AC F4-A 80-250-101	48–80V	250Arms*	145Arms*	Yes	Yes

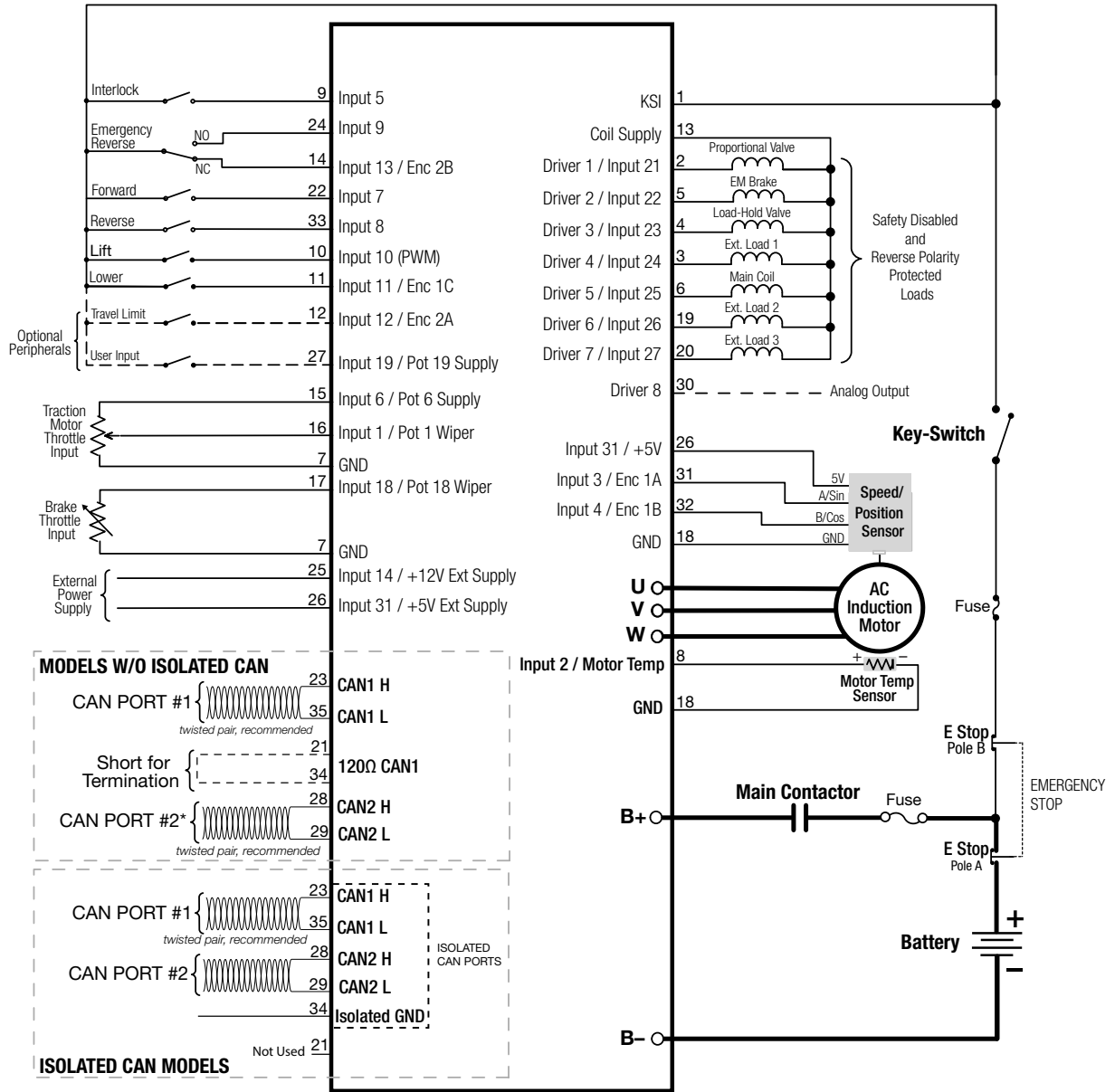
\*Subject to change, please contact your Curtis sales representative for more information.



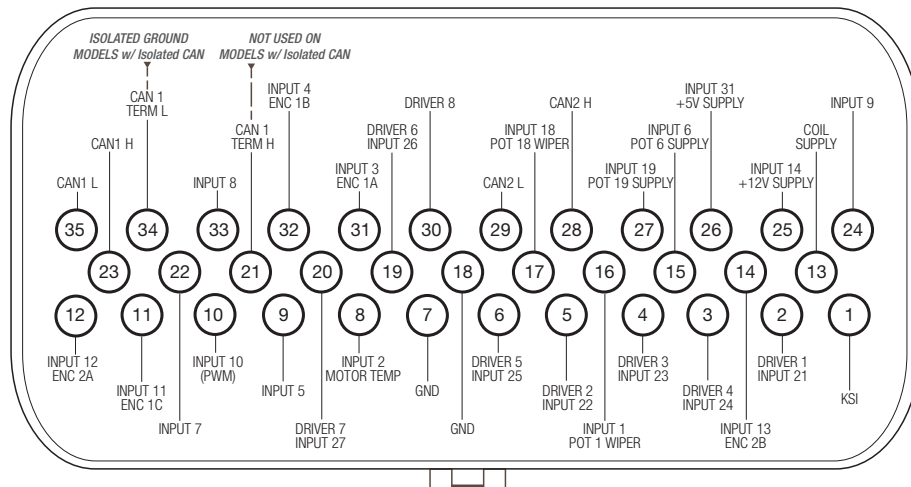
## DIMENSIONS



## CONNECTOR WIRING



## PINOUT CHART





## SPECIFICATIONS

Nominal Input Voltage	24V	36–48V	48–80V
Minimum Voltage	12V	18V	24V
Brownout Voltage	8V	12V	16V
Maximum Voltage	33V	63V	100V
PWM Frequency	10 kHz nominal (adjustable)		
Maximum Controller Output Frequency	800Hz		
Electrical Isolation to Heatsink	500Vac		
Storage Ambient Temperature	–40°C to 95°C		
Operating Ambient Temperature	–40°C to 50°C		
Thermal Cutback	Controller linearly reduces maximum current limit with an internal heatsink temperature from 85°C (185°F) to 95°C (203°F); complete cutoff occurs above 95°C (203°F) and below –40°C (–40°F).		
Design Life	20,000 hours		
Package Environmental Rating	IP65 and IP67		
Weight	1.9Kg (4.4lbs)		
Dimensions W x L x H	180mm x 140mm x 75mm		
EMC	Designed to the requirements of EN 12895:2015		
Safety	Designed to the requirements of EN ISO 13849-1:2015		
UL	UL583 Pending		

**WARRANTY** Two year limited warranty from time of delivery.

The Curtis Difference   
**You feel it when you drive it**



is a trademark of Curtis Instruments, Inc.

Specifications subject to change without notice

©2021 Curtis Instruments, Inc.

50354 REV D 8/21