



CURTIS

A KOHLER COMPANY

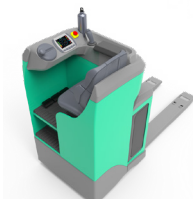


ACF2-C ACF3-C

AC Motor Controller and DC Pump System Controllers



CE UK
CA





The Ultimate Class III Pedestrian Truck Combi Control System

Curtis Models AC F2-C and AC F3-C are integrated AC Traction and DC Pump System Controllers. These models consist of an AC motor controller and a Half-bridge DC hydraulic pump and proportional valve control system. The AC F2-C and AC F3-C use dual ARM Cortex microprocessors to provide high performance and category 2 functional safety.

Models AC F2-C and AC F3-C are optimized for use as a Combi traction and hydraulic controller on 1.0–2.0 ton class III pedestrian-operated powered pallet and stacker trucks. The controllers are also suitable for traction and hydraulic pump control on other types of battery powered vehicles, such as small aerial scissor lift platforms. Vehicle designers can define and control the dynamic performance of drivetrains and hydraulic pump systems. The AC F2-C and AC F3-C also provide comprehensive vehicle management and CAN capabilities.

To build a state-of-the-art Class III truck control system, pair Models AC F2-C and AC F3-C with the Curtis Model 3150, which uses a color LCD screen to display vehicle status information.

FEATURES

- ▶ Field-oriented motor control algorithms maintain optimal performance under all operating conditions.
- ▶ Fully integrated Half-bridge hydraulic pump controller.
- ▶ Rugged housing with a small footprint for the power rating.
- ▶ Heavy duty M6 busbars for motor and battery connectors.
- ▶ Built-in fuse stud for hassle-free mounting of fuse.
- ▶ Sealed, 35-pin AMPseal I/O connector.
- ▶ Impervious to most oils, solvents, degreasers and other chemicals often encountered by industrial vehicles.
- ▶ IMU for measurement of orientation, movement and impact detection (AC F3-C option).
- ▶ IP67 environmental protection as per IEC 60529.
- ▶ Exceeds global conformance requirements for functional safety, electrical safety and EMC.
- ▶ CE/UKCA marked as a programmable safety device.
- ▶ UL583:
 - AC F2-C: Recognized Component
 - AC F3-C: Pending

Motors

- ▶ Works with any AC induction or PMAC motor.
- ▶ Motor auto-characterization simplifies on-truck pairing with different motor types.
- ▶ Comprehensive library of AC motor types stored in controller memory.
- ▶ Variable speed Half-bridge DC pump output provides superior regulation of pump motor speed and current demand.





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.
- ▶ Configurable overvoltage and undervoltage protection parameters.
- ▶ Wide operating voltage range allows use with cell chemistries such as lithium ion.
- ▶ Configurable CANbus and VCL allow easy integration with the Battery Management Systems (BMS) typically found on lithium battery packs.

High Performance Dual Microprocessors

- ▶ Dual-micro architecture achieves category 2 functional safety under EN ISO 13849-1:2015 and EN 1175:2020.
- ▶ Blazing processor speeds for precise regulation of voltage, frequency and current.

Customize Your Vehicle with VCL

- ▶ The Curtis Vehicle Control Language (VCL) enables Curtis AC motor controllers to operate as system controllers, eliminating the need for costly, additional controllers.

Highly Flexible I/O

- ▶ All I/O pins are multi-function, and can be configured to provide up to:
 - 23 digital inputs
 - 13 analog inputs
 - 2 potentiometer sources
 - 7 output drivers, including proportional valve drivers
 - 2 quadrature encoder inputs
 - Sine/Cosine sensor inputs
 - +5V and +12V external power (200mA)



Comprehensive CAN Capabilities

- ▶ Dual independent CAN ports. Each port can run different bit rates and protocols, with full CANopen and/or J1939 compatibility. Perfect for hybrid vehicles or to bridge CANopen ports at different bit rates.
- ▶ Full galvanic CAN isolation (AC F3-C option).
- ▶ 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 CiA 301.
- ▶ Acts as a 'CAN interpreter' that allows third-party CAN devices with differing profiles to work on the same CAN network.

Improved Diagnostics

- ▶ Status LED for at-a-glance system troubleshooting.
- ▶ Thermal cutback, warning, and automatic shutdown protect the motor and controller.
- ▶ Error logging, fault history and CAN Emergency Messages.

CAN-based Programming

- ▶ Programmable over the CANbus.
- ▶ Supports most CAN-based service tools used by major industrial truck manufacturers worldwide.
- ▶ Develop, configure, optimize and debug vehicle systems with the Curtis Integrated Toolkit.





SYSTEM ACCESSORIES



Curtis Model 3150

A CAN-based color LCD vehicle status display in a rugged 52 mm diameter housing is the ideal partner to Models AC F2-C and AC F3-C.

- ▶ Battery Discharge Indicator, Service (Hours) Counter and Diagnostic/Message Center functions.
- ▶ Sealed to IP67 front and IP65 rear.
- ▶ CE/UKCA compliant.
- ▶ UL583 recognized component.
- ▶ Optional heater.
- ▶ For more information, see the [Curtis Instrumentation page](#).

The Curtis Integrated Toolkit

The Curtis Integrated Toolkit (CIT) provides a suite of development and diagnostic tools for working with CAN systems that use Curtis and third-party CAN devices. CIT consists of the following tools:

- ▶ **Launchpad**
Starting point and project editor.
- ▶ **Programmer**
Configure parameters, view monitor values, and view active faults and the fault history.
- ▶ **TACT**
Stand-alone oscilloscope and data-logging tool.
- ▶ **VCL Studio**
Editor and compiler for VCL software.
- ▶ **Menu Editor**
Create and modify programming menus.
- ▶ **Package & Flash**
Load your software into CAN devices.

The Curtis Integrated Toolkit is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim, etc. For more information, see the [Curtis Programming page](#).

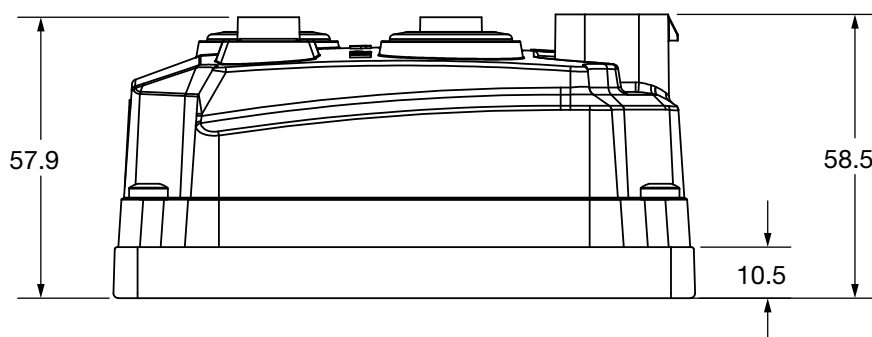
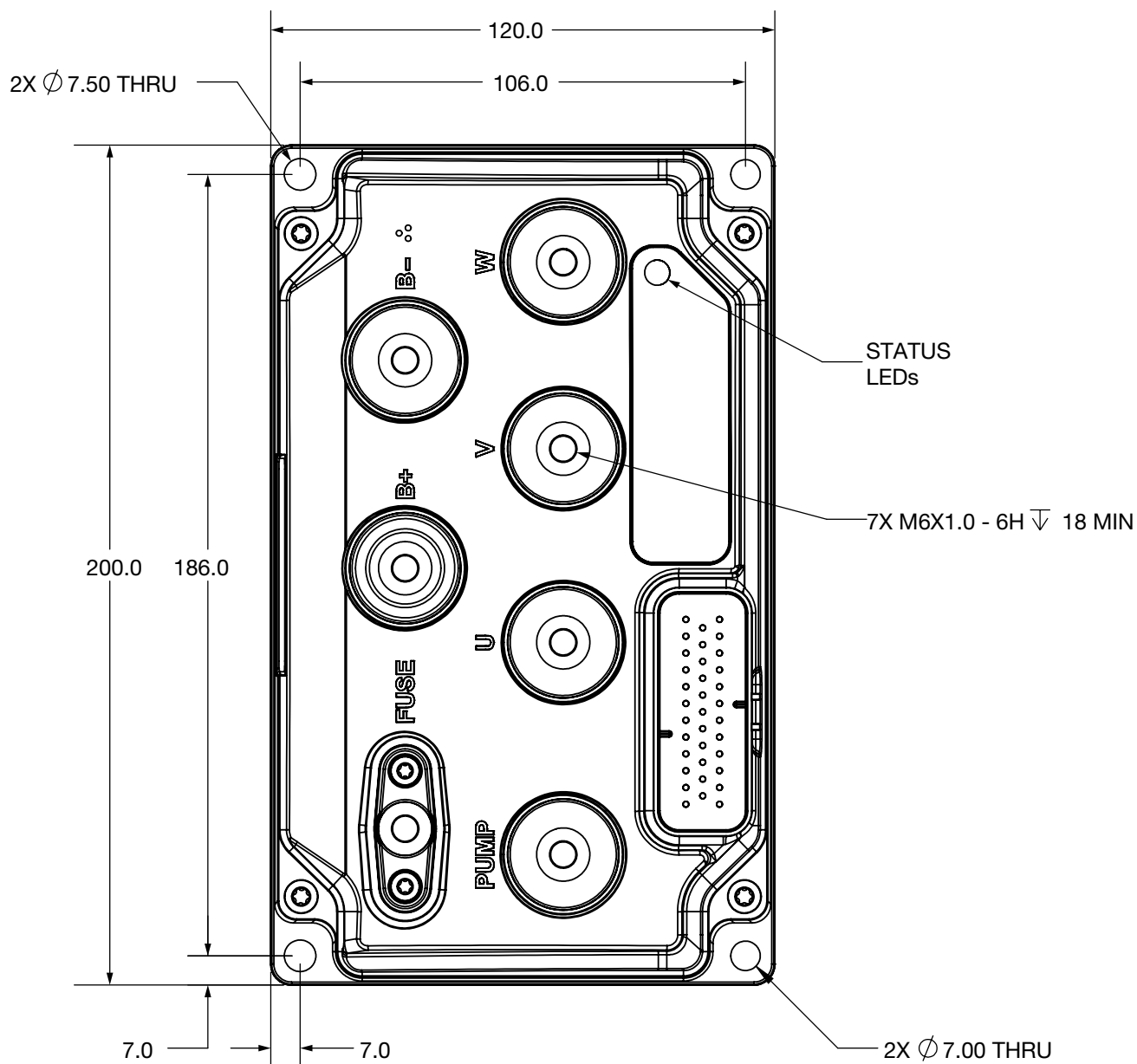
MODEL CHART

Model Number	Nominal Battery Voltage	Traction Max Current [S2-2 min]	Traction Max Current [S2-60 min]	Pump Max Current	IMU	Isolated CAN
AC F2-C 24-120-200-001	24V	120Arms	120Arms	200A	No	No
AC F2-C 24-200-200-001	24V	200Arms	150Arms	200A	No	No
AC F2-C 24-240-280-001	24V	240Arms	150Arms	280A	No	No
AC F2-C 24-280-300-001	24V	280Arms	130Arms	300A	No	No
AC F2-C 48-150-200-001	36-48V	150Arms	130Arms	200A	No	No
AC F2-C 48-240-240-001	36-48V	240Arms	140Arms	240A	No	No
AC F3-C 24-375-400-001	24V	375Arms	205Arms	400A	No	No
AC F3-C 24-375-400-101	24V	375Arms	205Arms	400A	Yes	Yes
AC F3-C 48-350-350-001	36-48V	350Arms	180Arms	350A	No	No
AC F3-C 48-350-350-101	36-48V	350Arms	180Arms	350A	Yes	Yes



DIMENSIONS

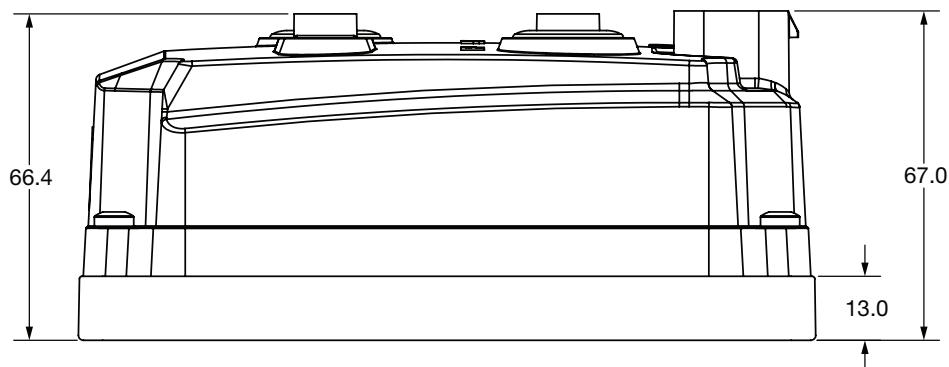
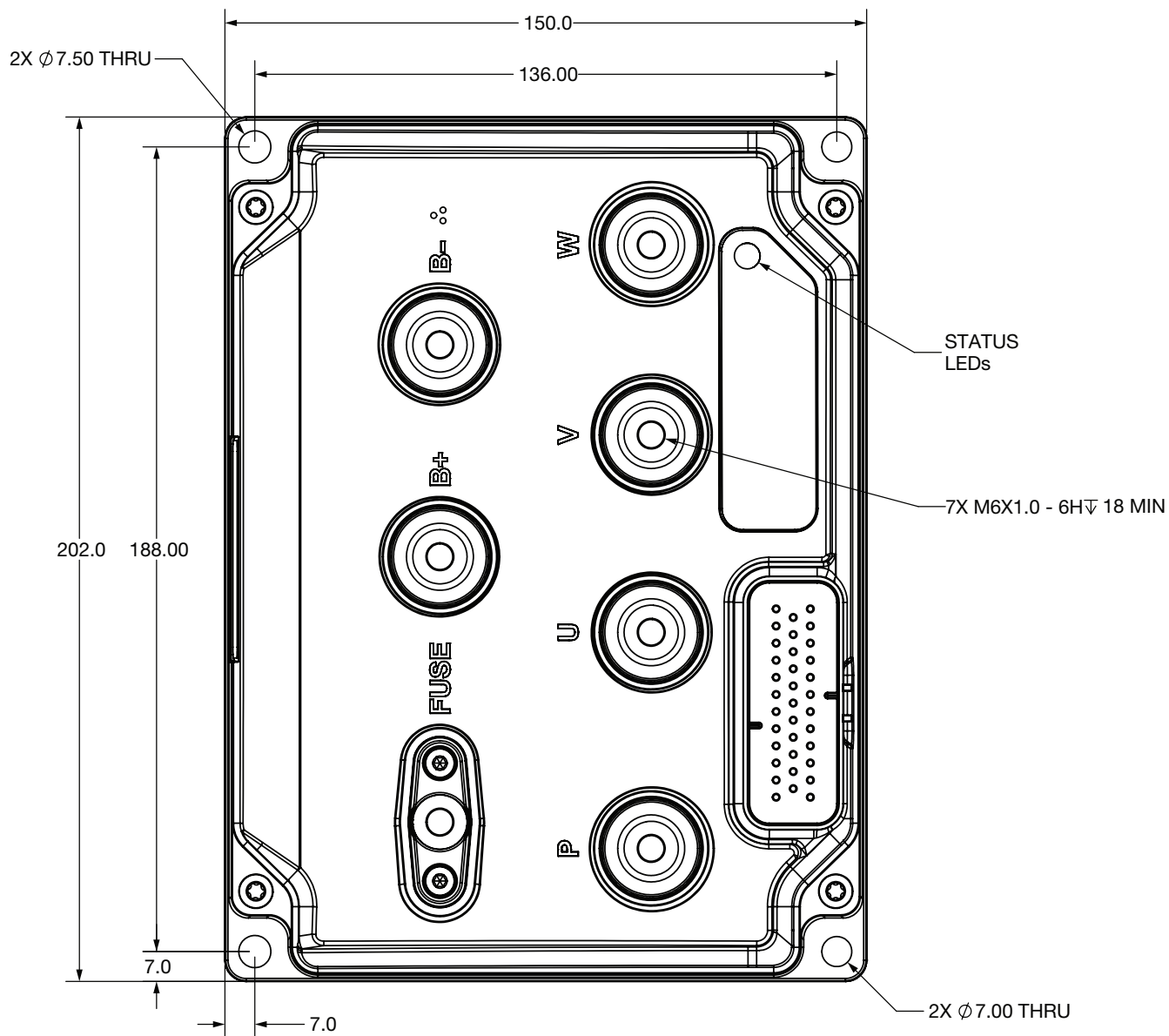
AC F2-C



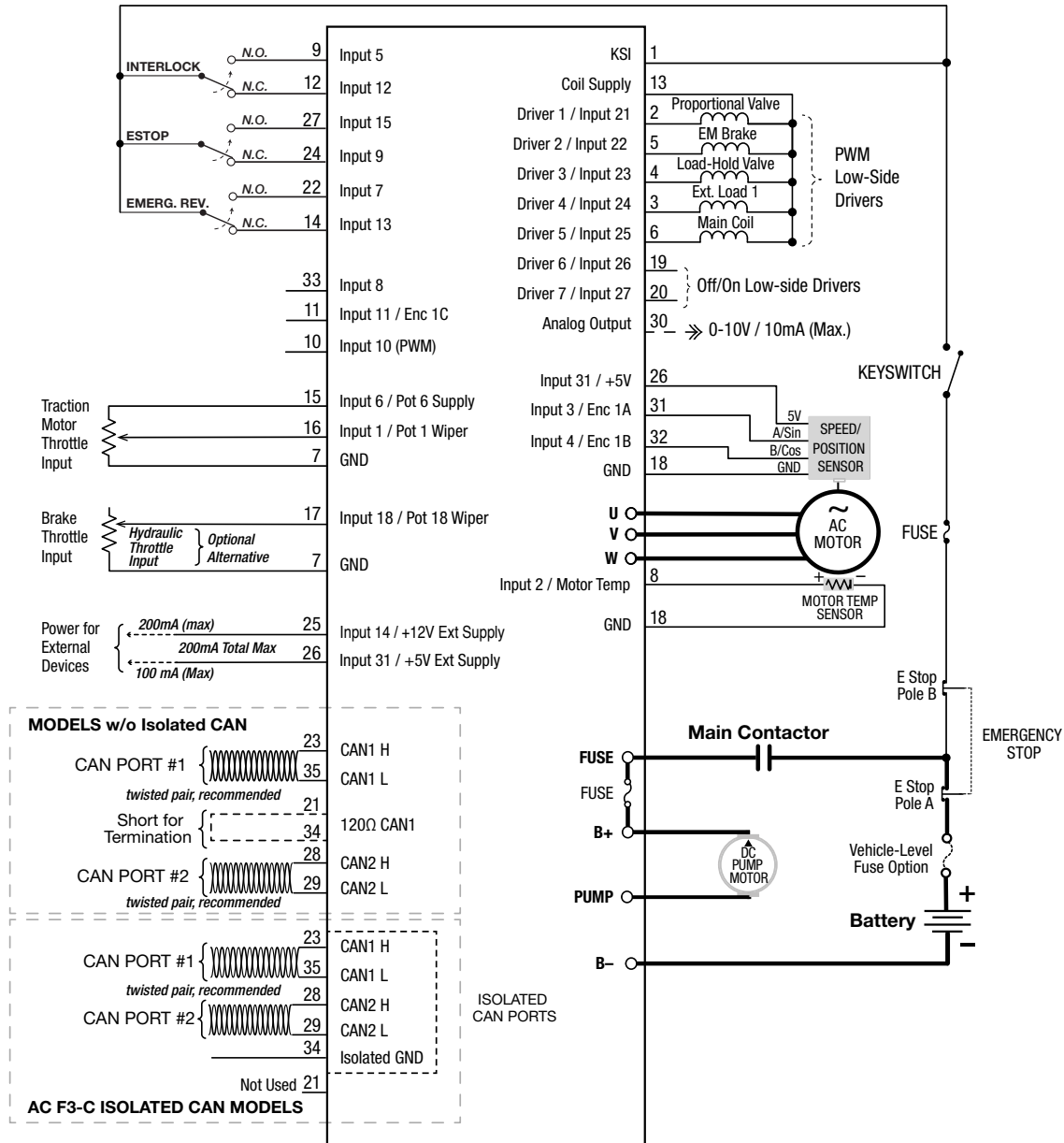


DIMENSIONS

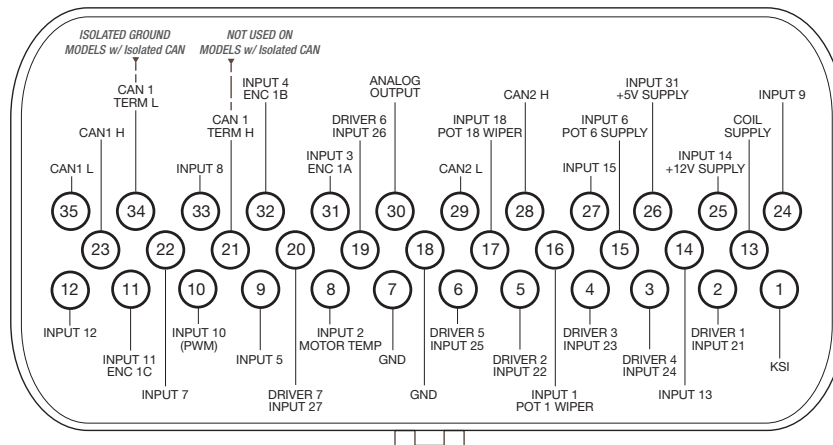
AC F3-C



CONNECTOR WIRING



PINOUT CHART





SPECIFICATIONS

Nominal Input Voltage	24V	36V/48V
Undervoltage	12V	18V
Overvoltage	30V	63V
PWM Frequency	10 kHz nominal (configurable)	
Maximum Controller Output Frequency	599Hz	
Electrical Isolation to Heatsink	500VAC	
Storage Ambient Temperature	-40°C to 95°C	
Operating Ambient Temperature	-40°C to 50°C	
Traction 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	AC F2-C: 8000 hours AC F3-C: 20,000 hours	
Package Environmental Rating	IP67	
Weight	AC F2-C: 1.4Kg AC F3-C: 2.1Kg	
Dimensions W x L x H	AC F2-C: 200mm x 120mm x 57.5mm AC F3-C: 202mm x 150mm x 67mm	
EMC	Designed to the requirements of EN 12895:2015	
Safety	Designed to the requirements of EN ISO 13849-1:2015 and EN 1175:2020	
UL	UL583: AC F2-C: Recognized Component; AC F3-C: Pending	

WARRANTY Two year limited warranty from time of delivery.

The Curtis Difference
You feel it when you drive it

