CURTIS

Motor Controllers

ACF2-AE

AC Motor Controller with VCL

AC F2-AE

Superb Performance and Value

The Curtis Model AC F2-AE motor controller provides accurate speed and torque control of 3-phase AC induction, PMAC and BLDC motors at an attractive price point.

Model AC F2-AE is optimized for use as a traction controller on 1.0 ton-2.0 ton Class III pedestrian-operated powered pallet trucks. The controller is also suitable for traction or hydraulic pump control on other types of battery powered vehicles.

The AC F2-AE includes dual ARM Cortex microprocessors that provide a category 2 designated architecture for functional safety, as well as efficient motor control and flexible system control. The controller offers flexible I/Os with mappable pins and fully complies with the CANopen standard.

FEATURES

Fit for Purpose

- Field-oriented motor control algorithms maintain optimal performance for 3 phase AC motors under all operating conditions.
- Advanced Pulse Width Modulation results in efficient battery usage, low motor harmonics, low torque ripple, and minimized switching losses.
- Real-time motor torque and power estimates.
- Customizable power limiting maps minimize motor heating and provide consistent performance over varying states-of-charge.
- Internal battery-state-of-charge, hour meter, and maintenance timers.
- Rugged housing with a small footprint for the power rating.
- Heavy duty M6 busbars for motor and battery connectors.
- Insulated metal substrate power base maximizes reliability by providing superior heat transfer.
- Sealed, 23-pin AMPseal I/O connector.
- Impervious to most oils, solvents, degreasers and other chemicals often encountered by industrial vehicles.
- 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/cUL583 recognized component.

Motors

- Closed-loop current and voltage-compensated output driver control with proportional valve control features.
- Works with any AC induction, PMAC or BLDC motor.
- Motor auto-characterization simplifies on-truck pairing with different induction motor types.
- Comprehensive library of AC motor types stored in controller memory.
- Supports the following types of motor position sensors:
  - Quadrature encoders with open collector outputs
  - Three-line quadrature encoders with open collector outputs.
  - Sine/cosine position sensors
  - Hall sensors

FEATURES continued

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

- Curtis' renowned field-oriented control algorithms and PWM switching technology assure maximum torque and system efficiency across the entire torque/speed spectrum.
- Smooth and predictable drive control that only Curtis can deliver.

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.

Powerful Dual Microprocessors

- Dual-micro architecture achieves category 2 functional safety under EN ISO 13849-1:2023.
- 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.

Flexible I/O

- All I/O pins are multi-function, and can be configured to provide up to:
  - Seventeen digital Inputs
  - Nine analog Inputs
  - One potentiometer source
  - Five output drivers, including a proportional valve driver
  - One motor temperature sensor
  - +5V and +12V external power supplies
  - One motor position sensor

Comprehensive CAN Capabilities

- Configurable 11 or 29 bit protocol support for CANopen or J1939 use.
- Plug and play support for Curtis CAN displays and CAN tiller heads from leading manufacturers FREI and REMA.
- Fully CANopen compliant per CiA 301.
- Acts as a "CAN interpreter" that allows third-party CAN devices with differing profiles to work on the same CANbus.

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 Model AC F2-AE.

- 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.

CURTIS™ INTEGRATED TOOLKIT

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.

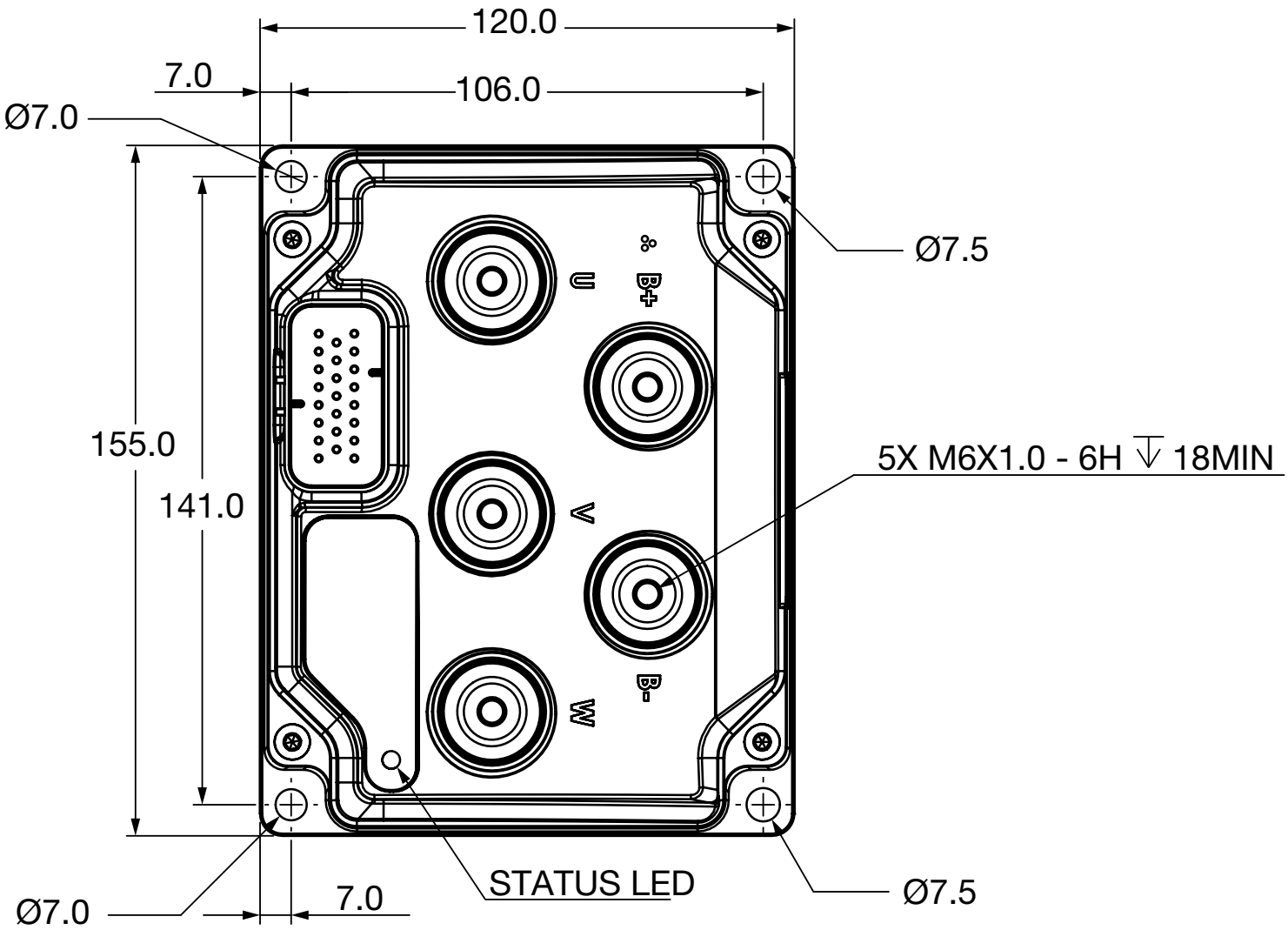
MODEL CHART

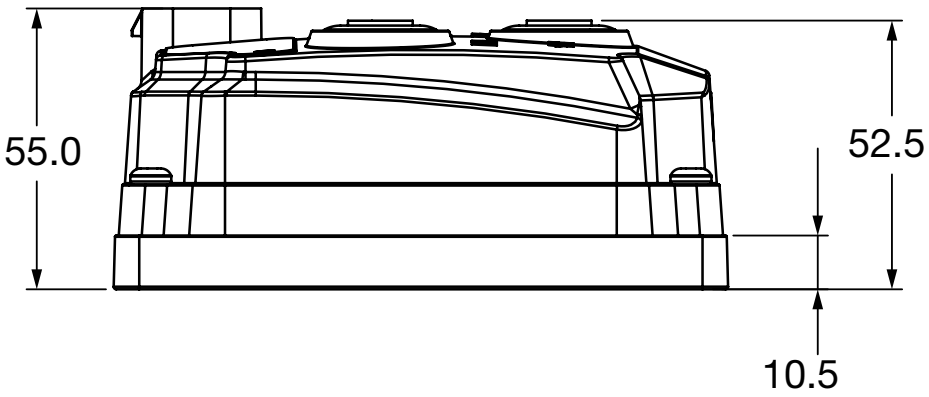
Model	Nominal Battery Voltage	Current Rating	Current Rating [S2 – 60 minutes]**	Internal 120Ω CAN Termination
AC F2-AE 24-280-051*	24V	280Arms [S2-1 minute]**	130 Arms	No
AC F2-AE 24-240-001	24V	240Arms [S2-2 minutes]**	150 Arms	Yes

** Model AC F2-AE 24-280-051 is only for hydraulic pump applications.*

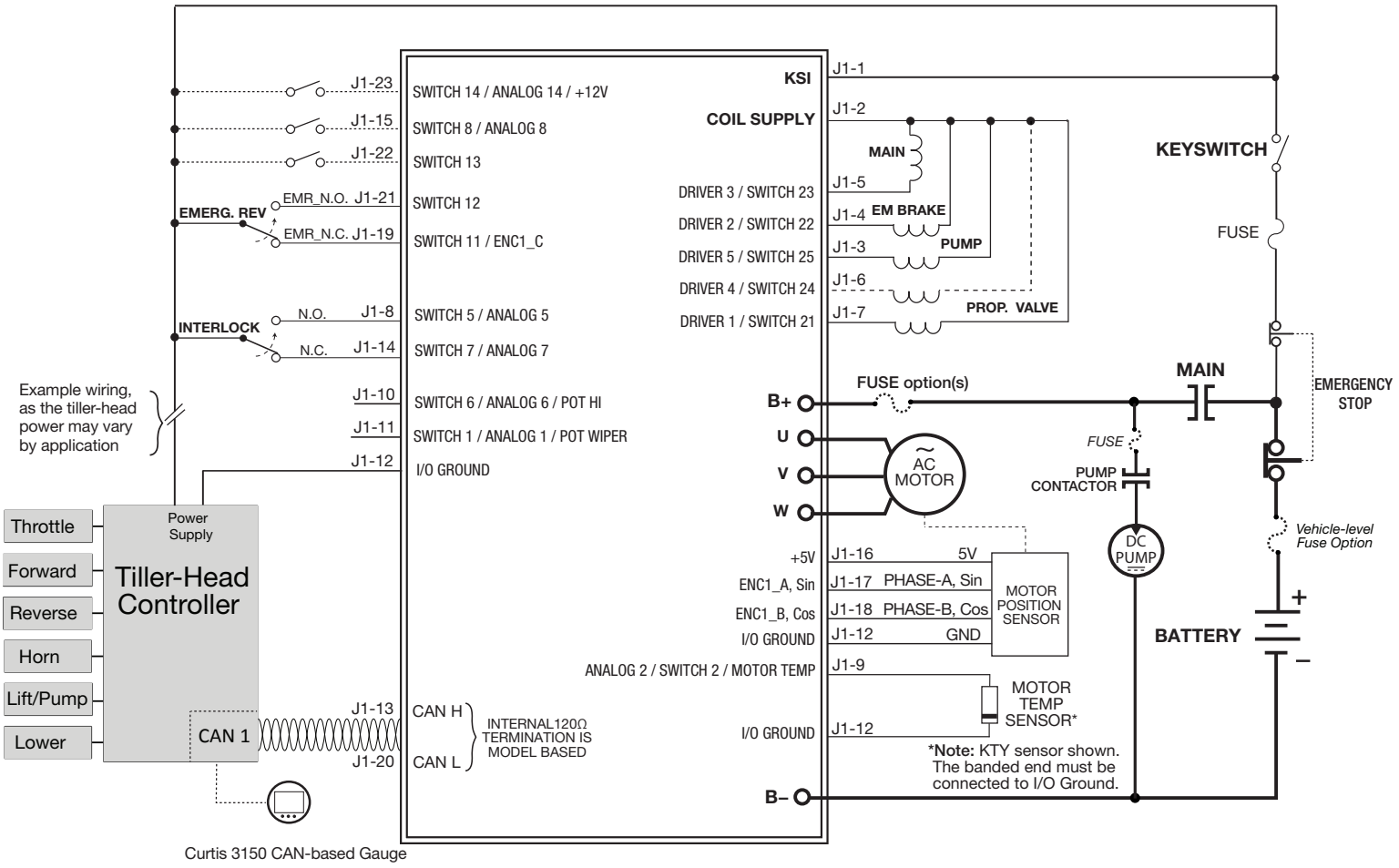
***The S2-1 minute, S2-2 minute and S2-60 minute ratings are the currents typically reached before thermal cutback occurs. The ratings are based on mounting the controller to a 6 mm thick vertical steel plate with 6 km/h (1.7 m/s) airflow perpendicular to the plate and operating the controller with an ambient temperature of 25°C.*

DIMENSIONS (mm)



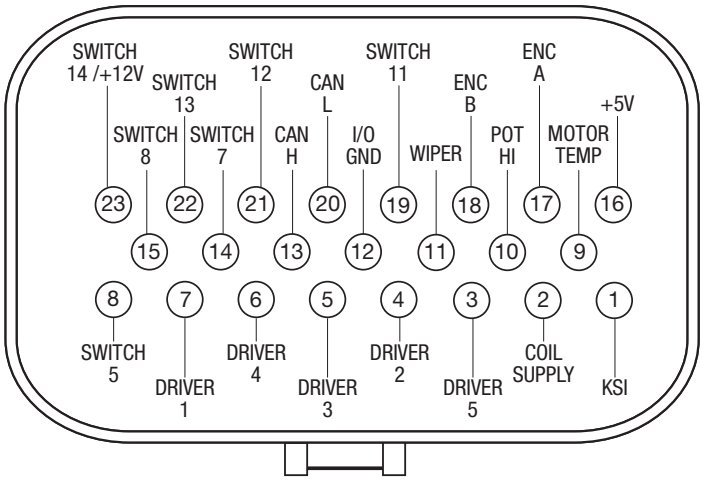


CONNECTOR WIRING

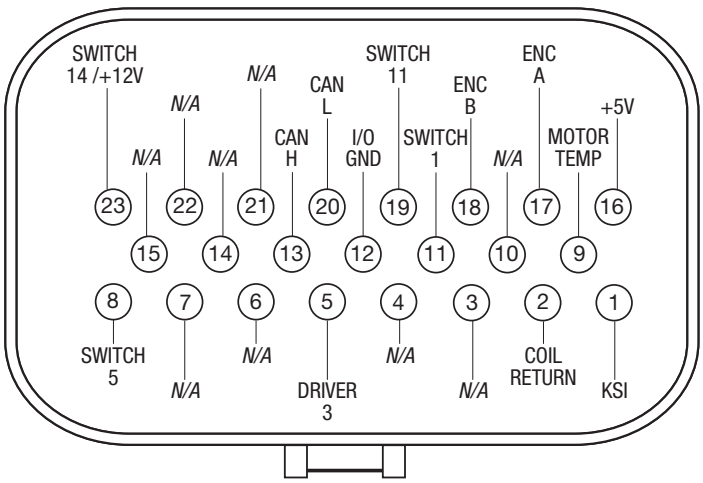


PINOUT CHARTS

Model AC F2-AE 24-240-001



Model AC F2-AE 24-280-051



SPECIFICATIONS

Nominal Voltage	24V
Minimum Voltage	12V
Maximum Voltage	30V
PWM Frequency	10kHz nominal (configurable)
Maximum Controller Output Frequency	500Hz
Electrical Isolation to Heatsink	500VAC
Storage Ambient Temperature	–40°C to 85°C
Operating Ambient Temperature	–40°C to 50°C
Thermal Cutback	Controller linearly reduces maximum current limit when the internal heatsink temperature is between 85°C and 95°C; complete cutoff occurs above 95°C and below –40°C.
Design Life	8000 hours
Ingress Protection	IP67 environmental protection as per IEC 60529
Weight	1.0kg
Dimensions W x L x H	120mm x 155mm x 55mm
Mounting	2x ø7.0 mm and 2x ø7.5 mm
Power Connections	5x M6x1.0
EMC	Designed to the requirements of EN 12895:2015+A1:2019
Safety	Designed to the requirements of EN ISO 13849-1:2023
UL	UL recognized component per UL583/cUL583

Note: *Regulatory compliance of the complete vehicle system with the controller installed is the responsibility of the vehicle OEM.*

WARRANTY

Two year limited warranty from time of delivery.

The Curtis Difference
You feel it when you drive it

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