
# AC F16-R

AC Motor Controller with VCL

Parker CURTIS

# Superb Performance

The Curtis Model AC F16-R Motor Controller provides accurate speed and torque control of 3-phase AC induction and PMAC motors.

Model AC F16-R 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 is designed for electric traction, hydraulic pump, marine boat propulsion, and on-engine generator (OEG) hybrid systems on mobile equipment applications such as forklift and warehouse trucks, airport ground support equipment, mobile elevating work platforms (MEWPs), on-road EVs, construction equipment, and agricultural equipment.

Model AC F16-R provides isolated logic, which enables all I/Os to be powered by a 12–24V power supply. The AC F16-R is also a powerful system controller that can operate as a commander device on the CANbus.

All models include the following features.

# Features

## Fit for Purpose

- Isolated logic allows all I/Os to run off a 12–24V power supply.
- Field-oriented motor control algorithms maintain optimal performance for 3-phase AC motors under all operating conditions.
- Real-time motor torque and power estimates optimize vehicle-level power.
- Rugged housing with a small footprint for the power rating.
- Heavy-duty 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 environmental protection as per IEC 60529.
- Exceeds global conformance requirements for functional safety, electrical safety and EMC.
- CE marked as a programmable safety device.
- UL583/cUL583 recognized component.

## Motors

- Works with any AC induction or PMAC motor.
- Motor auto-characterization simplifies on-truck pairing with different induction motor types.
- Comprehensive library of AC induction and PMAC motor types stored in controller memory.

## 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.

# 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.

## Powerful 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.

## Inertial Measurement Unit (IMU)

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

## Flexible I/O

- All I/O pins are multi-function, use 12–24V isolated logic, and can be configured to provide up to:
  - Twenty-seven digital inputs
  - Nine analog inputs
  - Two potentiometer sources
  - Seven output drivers
  - Inputs for resolver position sensor (resolver models)

## Comprehensive CAN Capabilities

- Configurable 11 or 29 bit protocol support for CANopen or J1939 use.
- Dual independent CAN ports.
- Plug and play support for Curtis CAN displays.
- 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 3250R

The 3250R (NX2) is a 2.1" color touch-screen gauge in a rugged 52mm diameter housing.

- 480x480 high resolution LCD, 600 nits with optical bonding.
- CAN-FD communicates out of the box with F-series controllers.
- Fully OEM customizable interface and logic.
- Optional WIFI, Bluetooth and RFID.
- IP67 front and rear.

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.

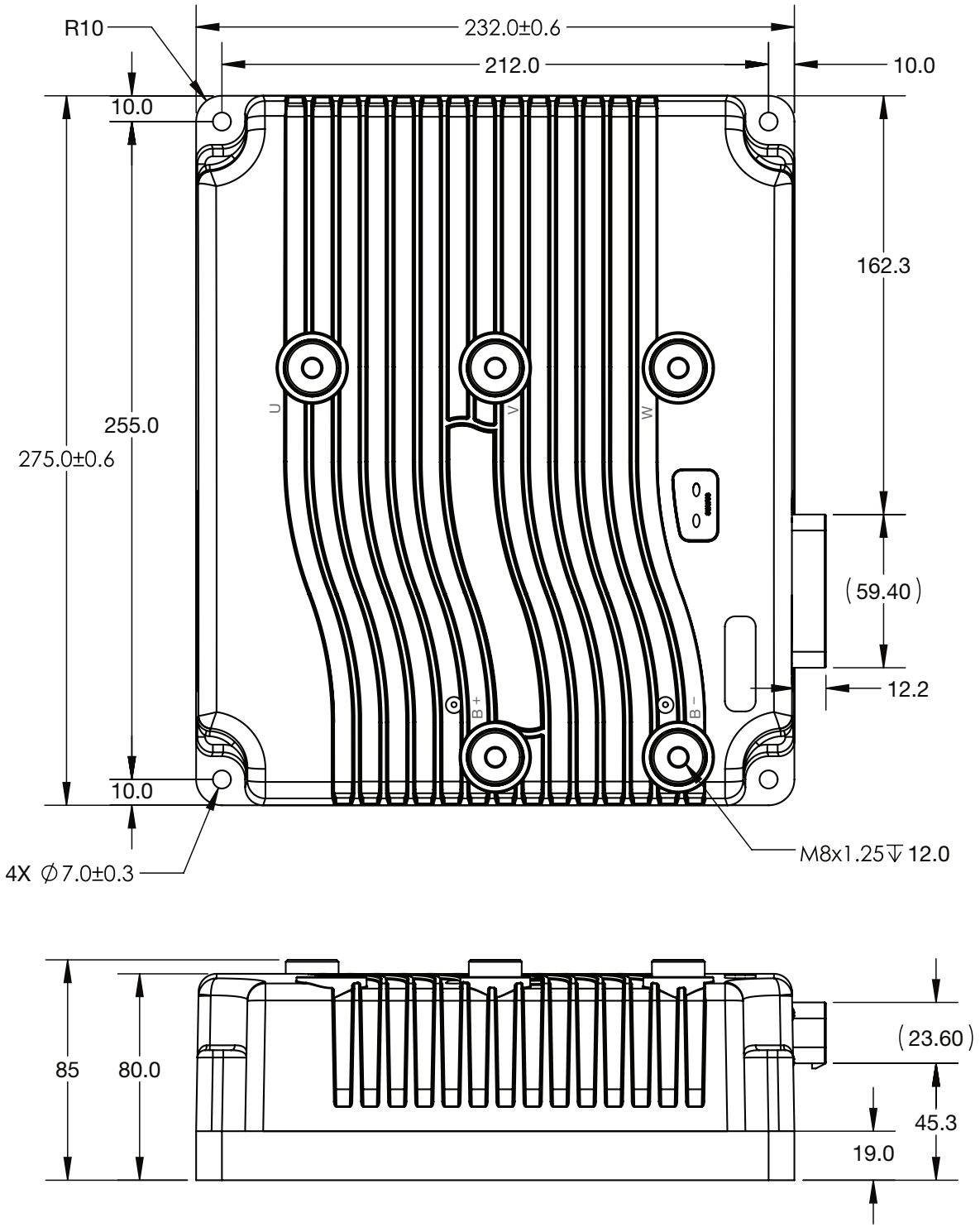
- **The Curtis Integrated Toolkit** is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim, etc.

## Model Chart

| Model Number | Nominal Voltage (DC bus) | Nominal Voltage (Isolated Logic) | Maximum Current: [S2–2 minutes]* | Typical Current [S2-60 minutes]* | IMU |
|---|---|---|---|---|---|
| AC F16-R 108-900-001 | 72–108V | 12–24V | 900Arms | 360Arms | No |
| AC F16-R 108-900-301 | 72-108V | 12–24V | 900Arms | 360Arms | Yes |
| AC F16-R 144-700-001 | 72-144V | 12–24V | 700Arms | 200Arms | No |

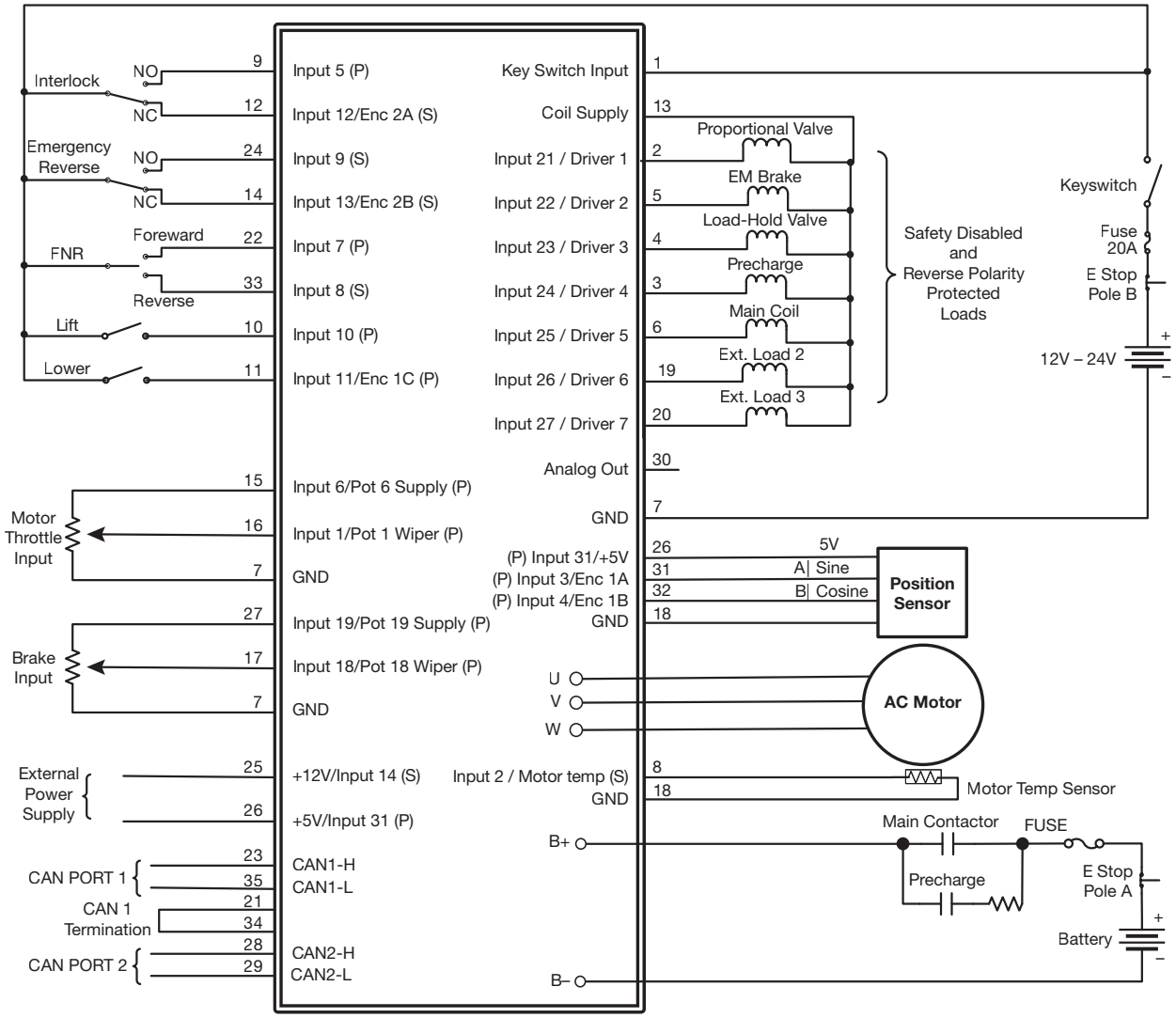
* The S2-2 minute and S2–60 minute ratings are the currents typically reached before thermal cutback occurs. The ratings are based on mounting the controller to a 6 mm thick vertical steel plate with 6 km/h (1.7 m/s) airflow perpendicular to the plate and operating the controller with an ambient temperature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

# Dimensions (mm)



# Connector Wiring

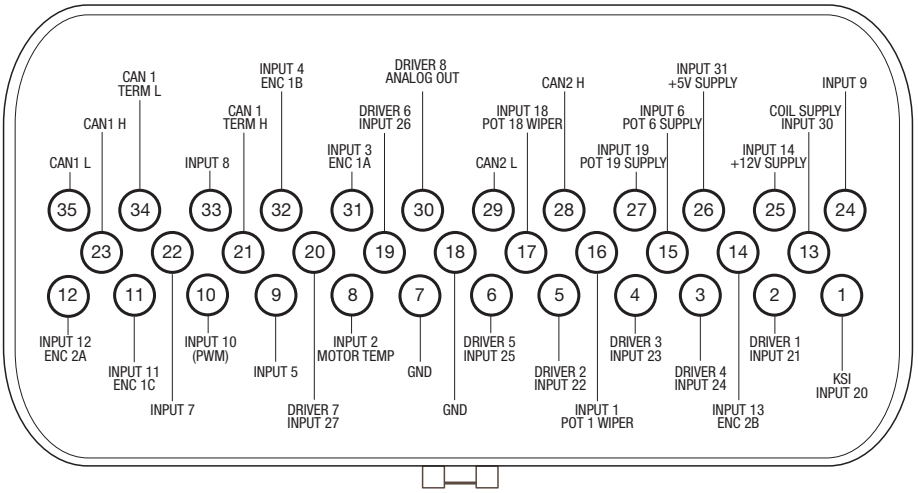
Standard Model




Dual Voltage Wiring

# Pinout Chart

Standard Model



# Specifications

| | | |
|---|---|---|
| Nominal Input Voltage (DC bus) | 72–108V | 72–144V |
| Minimum Voltage | 30V | 36V |
| Maximum Voltage | 120V | 170V |
| Nominal Voltage (Isolated Logic) | 12–24V | |
| Design Life | 5000 hours | |
| PWM Frequency | 10 kHz nominal (configurable) | |
| Maximum Controller Output Frequency | 599Hz | |
| Electrical Isolation to Heatsink | 500 VAC | |
| Storage Ambient Temperature | –40°C to 95°C | |
| Operating Ambient Temperature | –40°C to 50°C | |
| Thermal Cutback | Controller linearly reduces the 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. | |
| Ingress Protection | IP65 | |
| EMC | Designed to the requirements of EN 12895:2015+A1:2019. | |
| Safety | Designed to the requirements of EN ISO 13849-1:2015 and EN 1175:2020. | |
| UL | UL583/cUL583 recognized component | |
| Weight | 7.0 kg | |
| Dimensions W x L x H | 275mm x 232mm x 85mm | |
| Mounting | Clearance holes for 4x M6 Bolts | |
| Power Connections | 5x M8x1.25 | |

**Note:** Regulatory compliance of the complete vehicle system with the controller installed is the responsibility of the vehicle OEM. Output frequencies above 599Hz are possible if required - please contact Curtis for further information.

# Warranty

Two year limited warranty from time of delivery.

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