CURTIS

Motor Controllers

AC F16-R

AC Motor Controller with VCL

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/UKCA marked as a programmable safety device.
- UL583/cUL583 recognized component (pending).

Motors

- Works with any AC induction or PMAC motor.
- Motor auto-characterization simplifies 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

- 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™ INTEGRATED TOOLKIT

enGage® NX VII (NX7) Model 3750

The Curtis enGage® NX VII (NX7) is a cutting-edge 7-inch, 1000-nit touchscreen display. Designed for versatility and innovation, it supports advanced features such as sophisticated graphical animations, wireless connectivity, digital video, machine learning, and more, including:

- OEM Customization with Qt.
- CAN FD supporting CANopen and J1939.
- Analog and Digital Video.
- Light sensor automatically adjusts to ambient light conditions.
- Gigabit Ethernet.
- Optional WIFI, Bluetooth and RFID.
- The NX7 provides many other features. For more information, see the NX7 datasheet.

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.

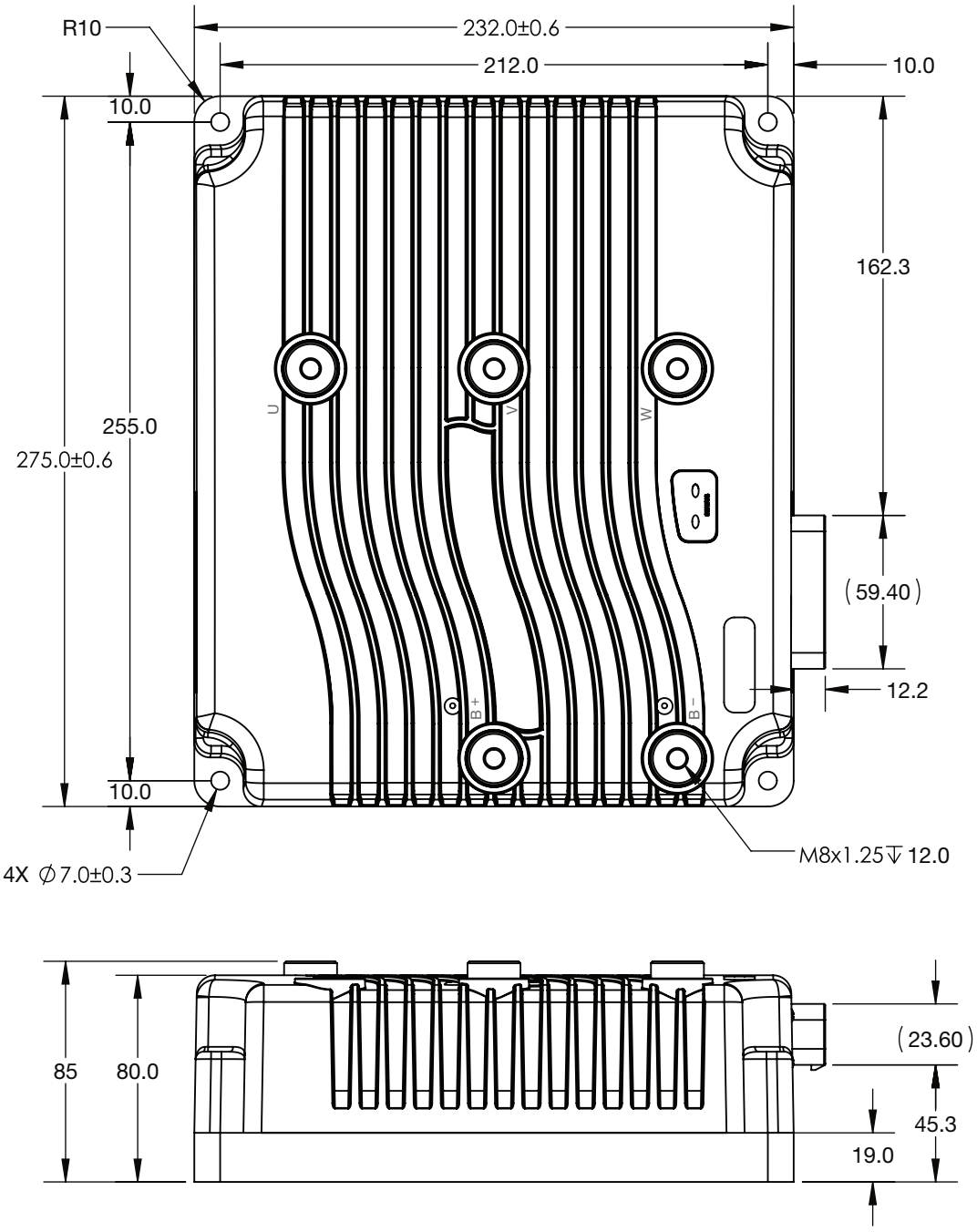
MODEL CHART

Model Number	Nominal Voltage (DC bus)	Nominal Voltage (Isolated Logic)	Maximum Current: [S2–2 minutes]*	Typical Current: [S2–60 minutes]*
AC F16-R 108-900-001	72–108V	12–24V	900Arms	360Arms
AC F16-R 144-700-001	72-144V	12–24V	700Arms	200Arms

** 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.*

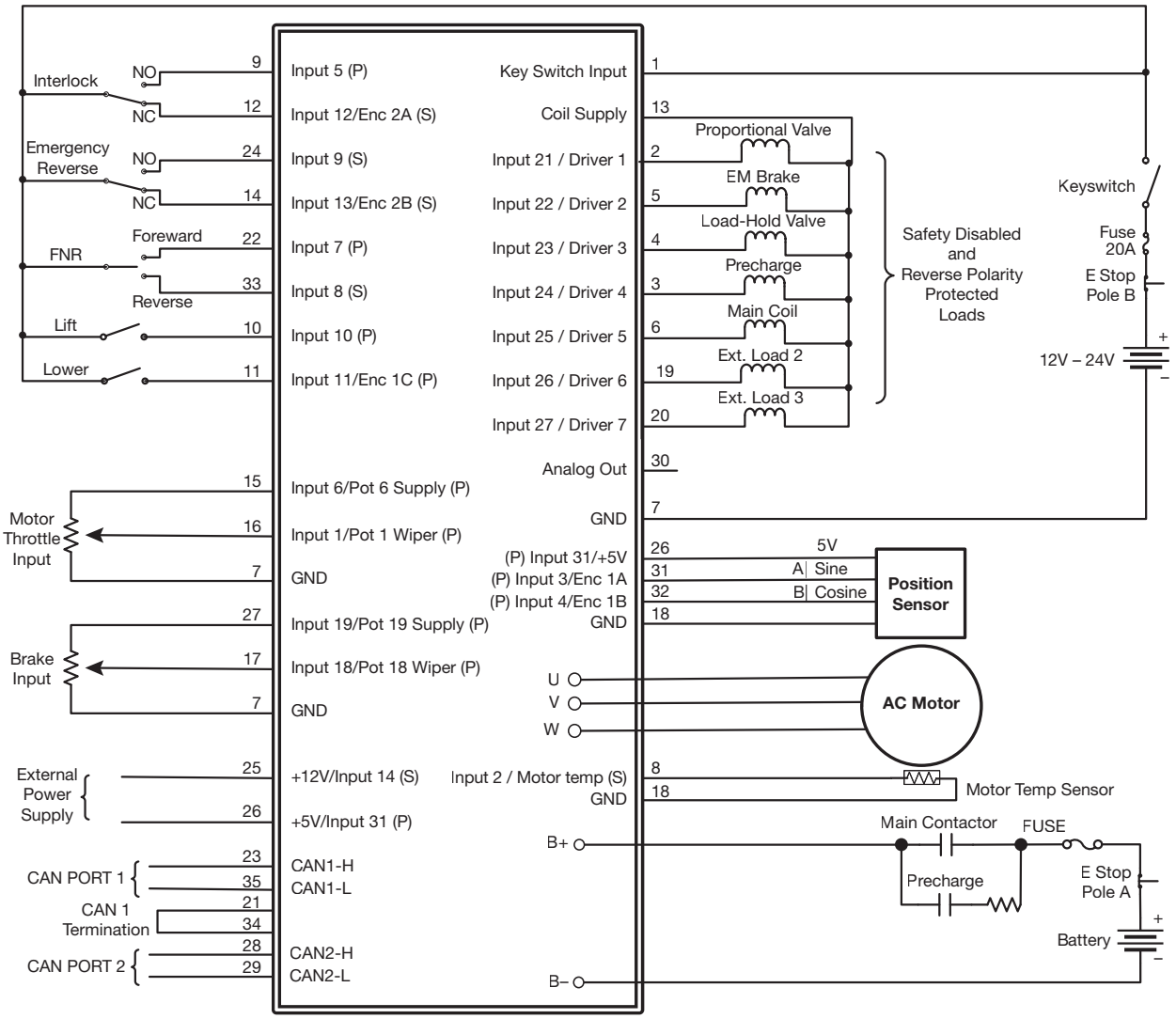
Note: Both models are available with resolver support. Please contact your Curtis sales representative for more information.

DIMENSIONS


R10
232.0±0.6
212.0
10.0
10.0
162.3
255.0
275.0±0.6
U
V
W
B+
B-
(59.40)
12.2
10.0
4X ∅7.0±0.3
M8x1.25↧12.0
85
80.0
(23.60)
45.3
19.0

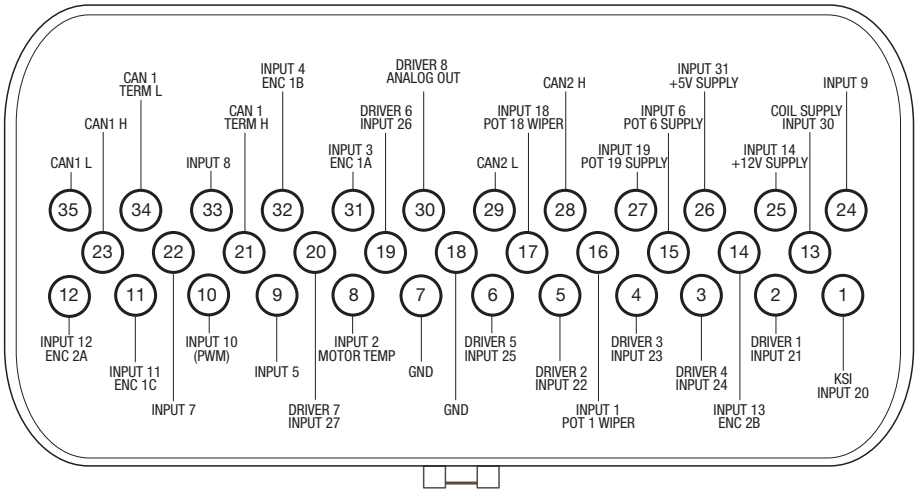
CONNECTOR WIRING

Standard Model



PINOUT CHART

Standard Model



SPECIFICATIONS

Nominal Input Voltage (DC bus)	72–108V	72–144V
Minimum Voltage	36V	36V
Maximum Voltage	130V	185V
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 (pending)	
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.

The Curtis Difference
You feel it when you drive it