



CURTIS

A KOHLER COMPANY



Motor Controllers

# *HVi F5-R*

## AC High Voltage Motor Controller



CE UK  
CA





## Superb Performance and Value

The Curtis Model HVi F5-R Motor Controller is designed for 400V battery class applications up to 100kW. Model HVi F5-R provides accurate speed and torque control of 3-phase AC induction and PMAC motors.

The HVi F5-R uses dual, high-performance 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 and on-engine generator (OEG) hybrid systems on mobile equipment applications such as material handling trucks, mobile elevating work platforms, airport ground support and construction equipment.

## FEATURES

### Fit for Purpose

- ▶ 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 aluminum housing with a small footprint for the power rating.
- ▶ Liquid-cooled (50/50 water/glycol with a 65°C maximum coolant temperature).
- ▶ IP6K9K/IP67 ingress protection.
- ▶ Sealed, 35-pin Ampseal I/O connector.
- ▶ 8–32V isolated logic board.
- ▶ A mounting kit is supplied.
- ▶ CE/UKCA marked as a programmable safety device.
- ▶ UL583 recognized component.

### Motors

- ▶ Works with any AC induction or PMAC motor up to approximately 100kW.
- ▶ Motor auto-characterization simplifies on-truck pairing with different induction motor types.
- ▶ Supports most motor position sensors, including resolver, sine/cosine and quadrature AB incremental sensors.

### 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 supports 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.



### Flexible I/O

- ▶ 8–32V isolated logic:
  - Dual CANbus
  - 2 thermistors
  - 4 digital outputs
  - 2 digital inputs
  - 2 analog inputs (configurable)
  - 5V external supply
  - CAN termination option
  - Inputs for quadrature, sine/cosine and resolver motor position sensors

### Comprehensive CAN Capabilities

- ▶ Configurable 11 or 29 bit protocol support for CANopen or J1939 use.
- ▶ Dual independent CAN ports with full galvanic isolation.
- ▶ 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.

### Diagnostic and Safety Features

- ▶ Internal active discharge.
- ▶ Motor active short circuit protection in event of overvoltage.
- ▶ Thermal cutback, warning and automatic shutdown protect the motor and controller.
- ▶ High voltage interlock (HVIL).
- ▶ Error logging, fault history and CAN Emergency Messages.

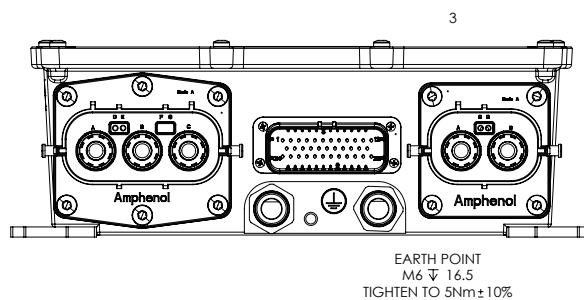
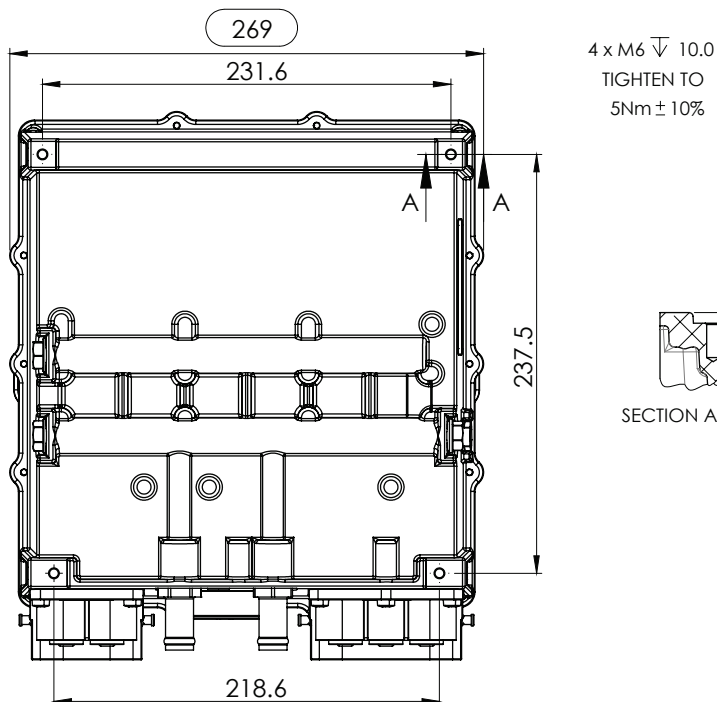
### CAN-based Programming

- ▶ Model HVi F5-R is 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.

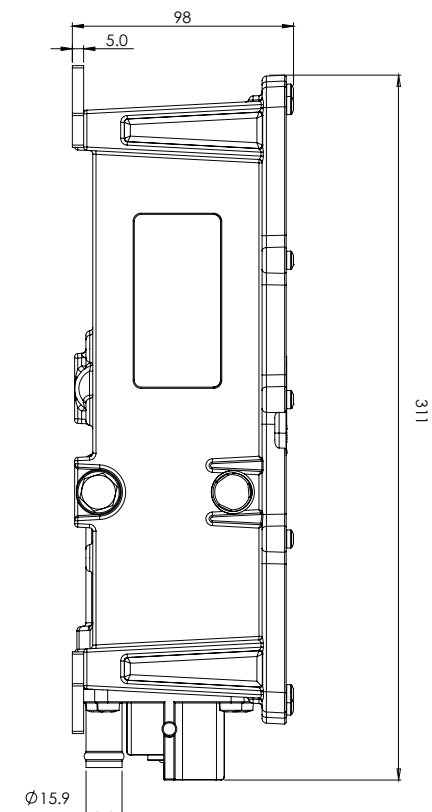
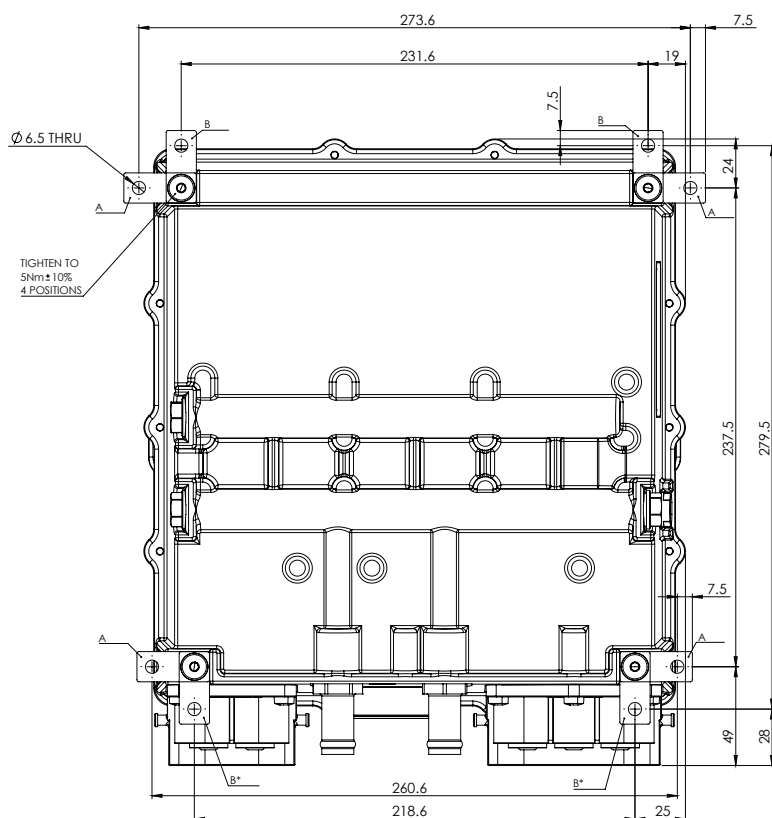


## DIMENSIONS

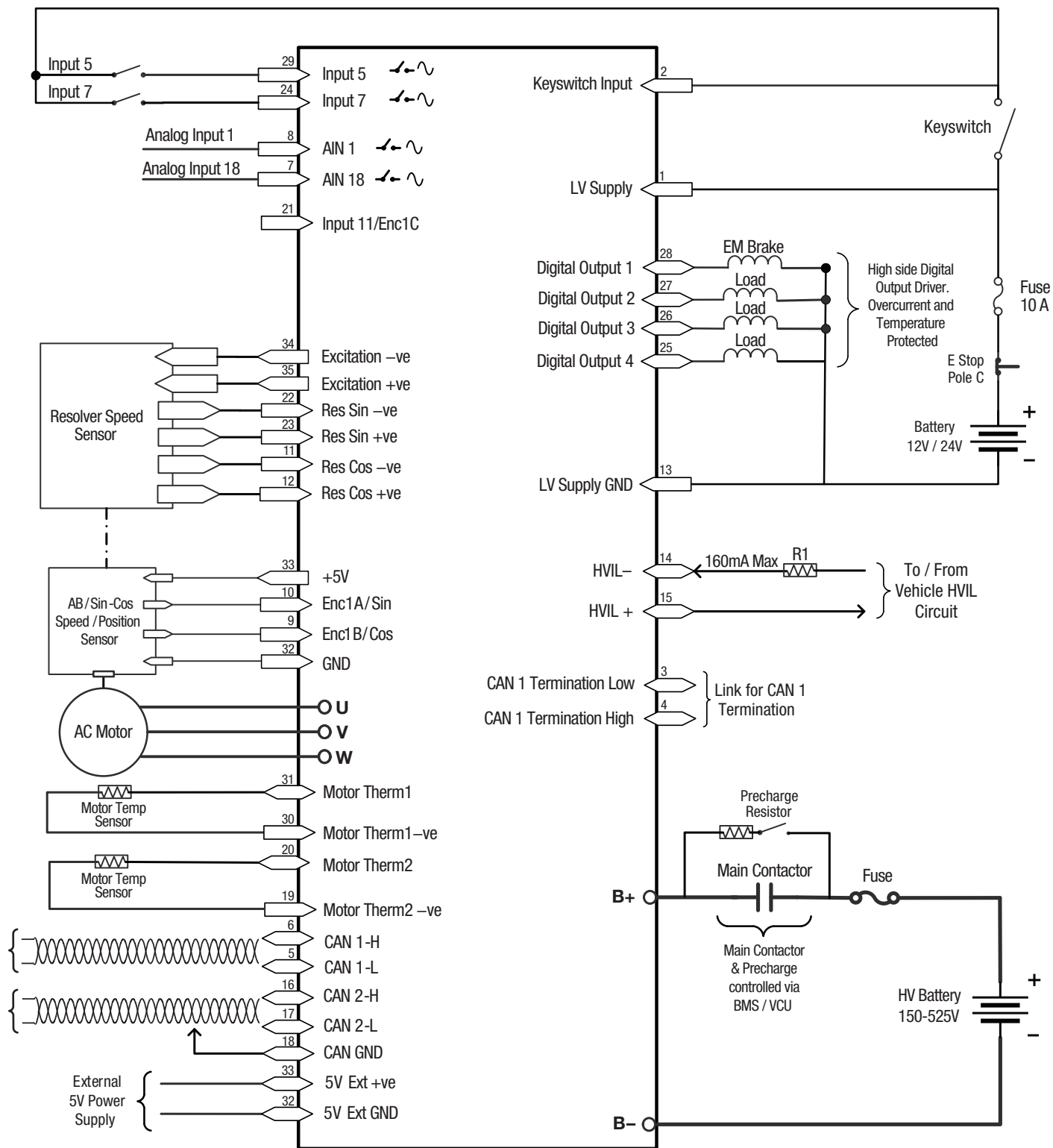
### Without Mounting Kit



### With Mounting Kit



Note: The positions marked with asterisks are not recommended for most applications due to partial obstruction.





## SPECIFICATIONS

Model No.		HVi F5-R-400-200-001	HVi F5-R-400-300-001
Operating Voltage Range		<b>Without Derating:</b> 150–500VDC <sup>1</sup> / <b>With Derating:</b> 500–525VDC	
LV Supply Voltage Range		12–24 VDC (8–32 VDC)	
Maximum Controller Output Frequency		599Hz <sup>2</sup>	
PWM Frequency		10 kHz nominal	
Current [Arms]	Continuous, 60 min.	100Arms	150Arms
	S2, 2 min. (Max.)	200Arms	300Arms
Coolant		50/50 water-glycol mix	
Nominal Flow Rate		10 l/min	
Maximum Coolant Cavity Pressure		<2 bar	
Coolant Temperature Range		–40°C to 65°C <sup>3</sup>	
Storage Ambient Temperature		–40°C to 95°C <sup>3</sup>	
Operating Ambient Temperature		–40°C to 85°C <sup>3</sup>	
Weight		7.2 kg	
Dimensions		315 mm x 290 mm x 98 mm	
Ingress Protection		IP6K9K/IP67	
Motor Sensor Support		Resolver, sine/cosine, quadrature AB	
EMC		Designed to the requirements of EN12895:2015+A1:2019, ISO 13766-1:2018 and ISO 13766-2:2018. UNECE Regulation 10 Revision 6:2019. Approved at ESA level.	
Safety		Designed to the requirements of EN 1175-1:2020 and EN ISO 13849-1:2015	
Environmental & Chemical		Designed to the requirements of ISO 16750-3 & -4 and ISO 19014-3	
UL		UL recognized component per UL583	
Design Life		20,000 hours <sup>4</sup>	

1: Overvoltage protection cuts back the regenerative braking (regen) current when the voltage is above 500 VDC.

2: Higher frequencies are supported. For more information, contact the Curtis sales-support office in your region.

3: Coolant may freeze at lower temperatures.

4: The lifetime current rating  $\geq$  30% of the maximum current rating.

**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.