CURTIS

A KOHLER COMPANY

Motor Controllers
PRELIMINARY

ACF5-DE

Dual AC Motor Controller

CE UK CA

AC F5-DE

Superb Performance

The Curtis Model AC F5-DE consists of two motor controllers. The product can be operated as a dual system controller or as two independent controllers. Model AC F5-DE provides fully independent speed and torque control of dual 3-phase AC induction or PMAC traction motors. Both controllers include 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 AC F5-DE is for electric traction, hydraulic pump and on-engine generator (OEG) hybrid systems on mobile equipment applications such as material handling trucks, aerial work platforms and construction equipment. Model AC F5-DE is also suitable for other dual-drive electric traction applications such as 3-wheel counterbalance forklifts. The controller also provides comprehensive system management and CAN capabilities.

FEATURES

Fit for Purpose

- High-efficiency, field-oriented motor control algorithms.
- Real-time motor torque and power estimates optimize vehicle-level power.
- Resolver position sensor support (optional).
- Rugged housing with a small footprint for the power rating.
- Heavy-duty M6 busbars for motor connectors and M8 busbars for battery connectors.
- Sealed, 35-pin AMPseal I/O connector.
- Impervious to most oils, solvents, degreasers and other chemicals often encountered by industrial vehicles.
- IP65 / 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 (pending).

Motors

- Two separate 3-phase bridges provide independent control of dual AC induction or PMAC motors (dependent on installed software).
- Motor auto-characterization simplifies on-truck pairing with different induction motor types.
- Comprehensive library of AC 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

- The controllers can be operated as a dual system that combines two controllers in a single package, or as two independent controllers.
- 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 perform 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:

Resolver Model

- Sixteen inputs
- Five output drivers
- Two motor temperature sensors
- Inputs for two resolver position sensors
- +5V and +12V external power supplies

Non-Resolver Model

- Nineteen inputs
- Six output drivers
- Two motor temperature sensors
- Inputs for two motor position sensors, such as encoders or Hall sensors
- +5V and +12V external power supplies

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™ INTEGRATED TOOLKIT

Curtis Models 3301T and 3401T

Models 3301T and 3401T are CAN-based color LCD status displays. The 3301T and 3401T enable vehicle operators to view vehicle status in any lighting condition. Either model is an ideal partner to Model AC F5-DE.

- Screen sizes:
  - Model 3301T: 3.5″
  - Model 3401T: 4.3″
- I/Os and CAN functionality enable vehicle management, monitoring and control in a single integrated unit.
- Face is sealed to IP65; rear is sealed to IP65 for electronic components.
- 12–96V nominal operating voltage range.
- CE 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.

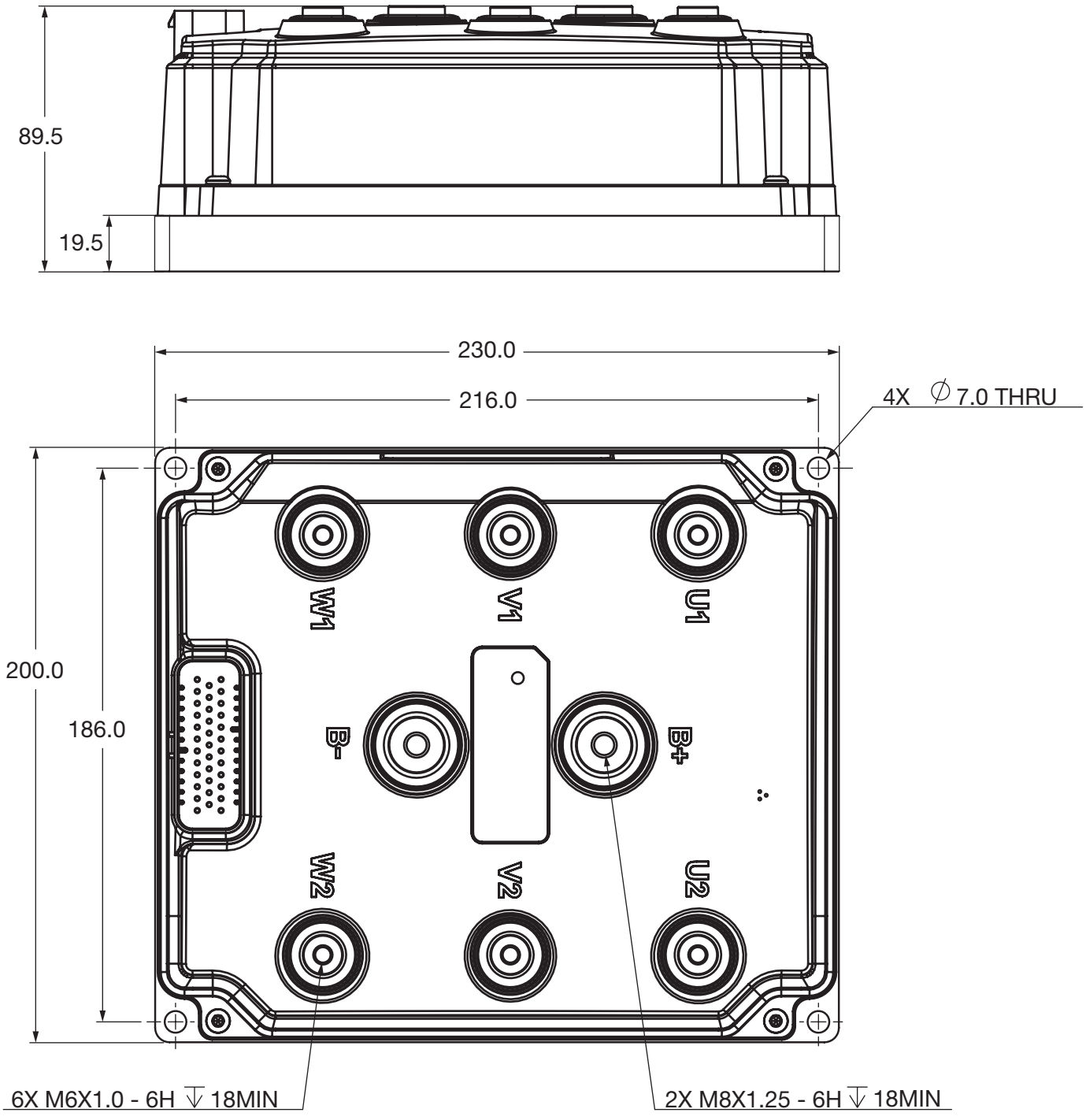
The Curtis Integrated Toolkit is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim, etc. For more information, see the Curtis Programming page.

MODEL CHART

Model Number	Nominal Battery Voltage	Maximum Current: [S2-1 min]	Maximum Current: [S2-60 min]	Resolver
AC F5-DE 80-400-0*XX*	72–80V	2X 400Arms*	2X 150Arms*	No
AC F5-DE 80-400-4*XX*	72–80V	2X 400Arms*	2X 150Arms*	Yes

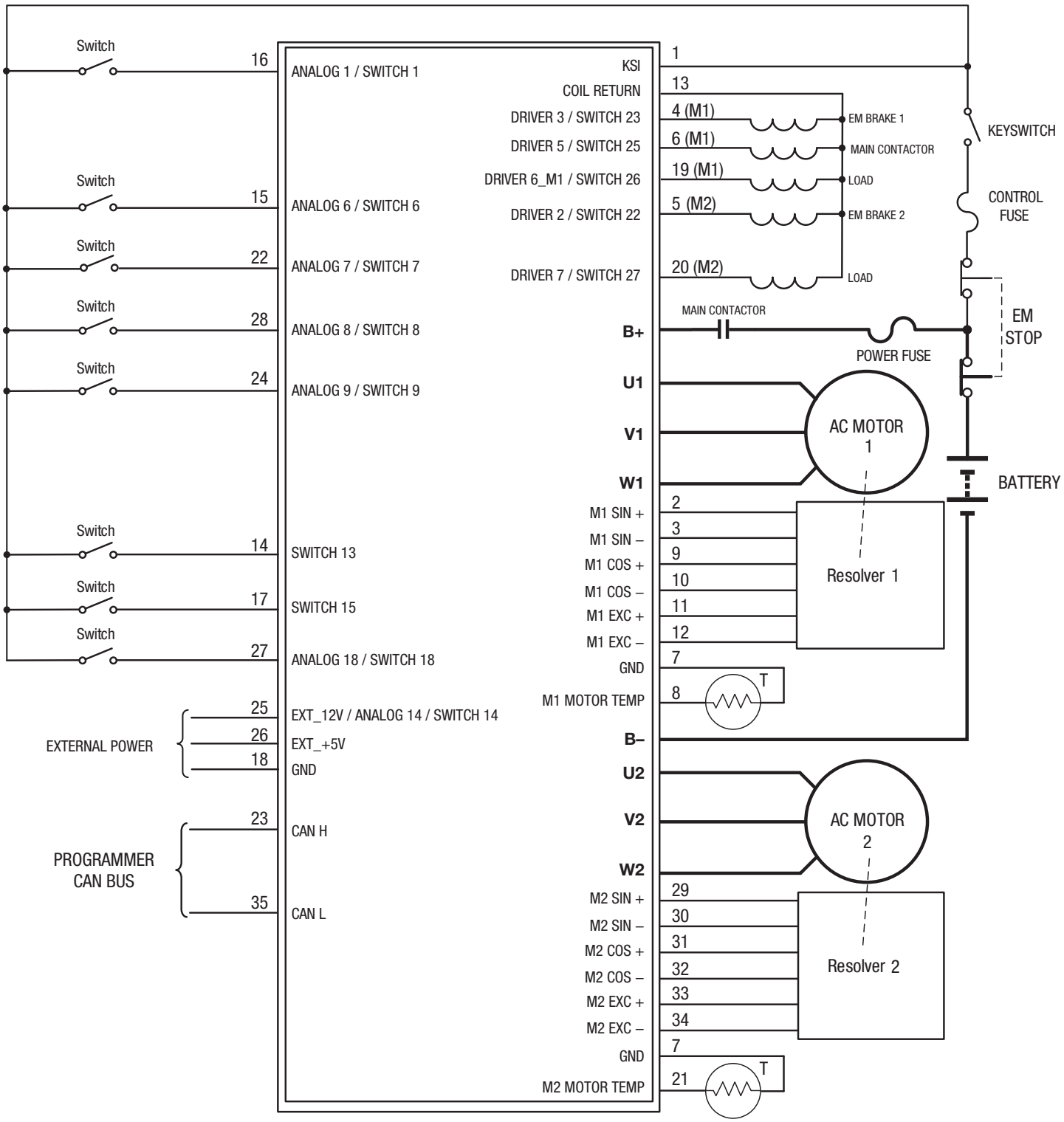
*Subject to change, please contact your Curtis sales representative for more information.

DIMENSIONS


89.5
19.5
230.0
216.0
4X ∅ 7.0 THRU
200.0
186.0
W1
V1
U1
B-
B+
W2
V2
U2
6X M6X1.0 - 6H ↧ 18MIN
2X M8X1.25 - 6H ↧ 18MIN

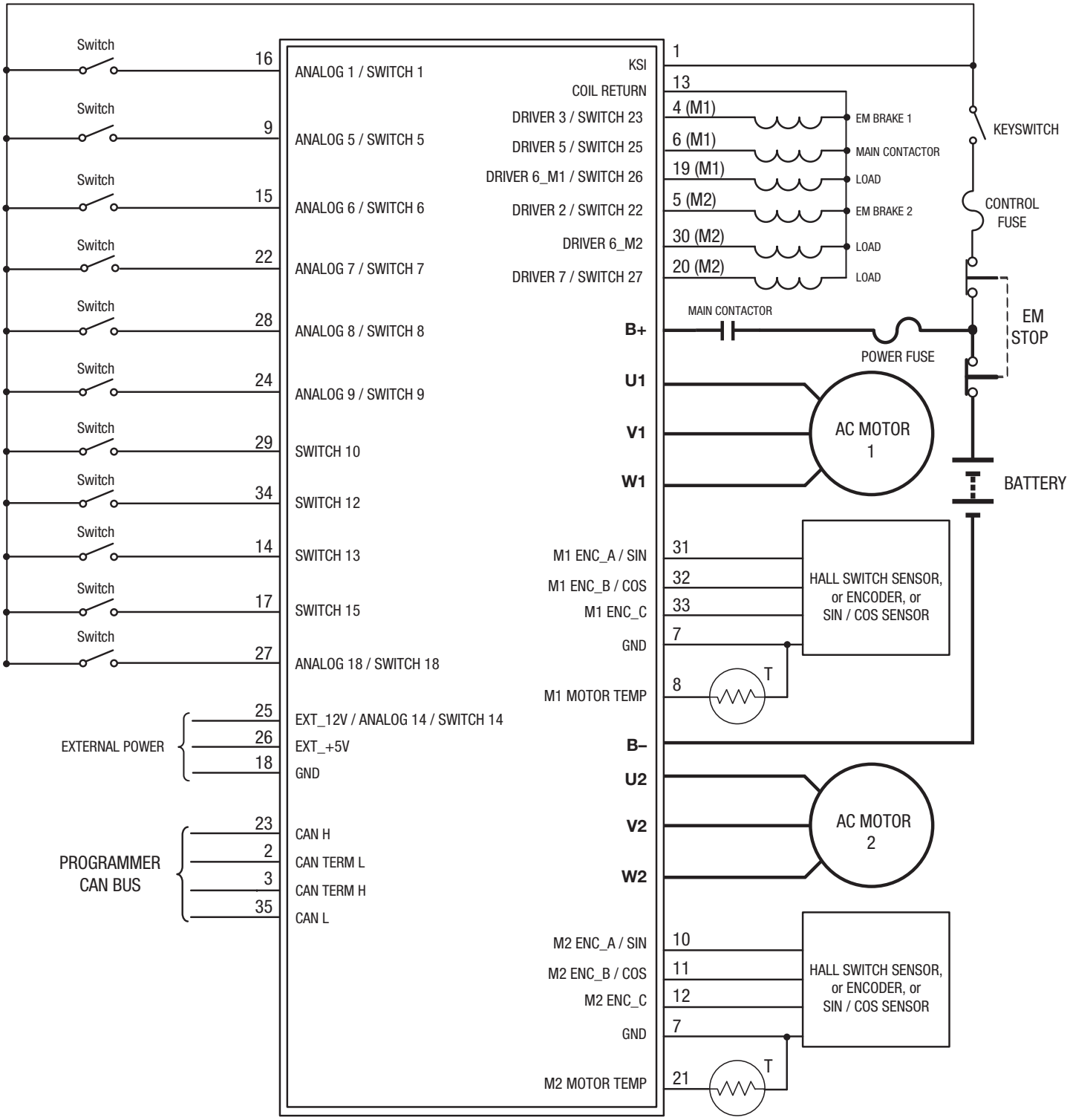
CONNECTOR WIRING

Resolver Model



CONNECTOR WIRING

Non-Resolver Model



SPECIFICATIONS

Nominal Input Voltage	72–80V
Minimum Voltage	36V
Maximum Voltage	112V
Severe Overvoltage Voltage	122V
PWM Frequency	10kHz nominal (configurable)
Maximum Controller Output Frequency	599Hz
Electrical Isolation to Heatsink	1200Vac
Storage Ambient Temperature	–40°C to 85°C
Operating Ambient Temperature	–40°C to 50°C
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	8000 hours
Package Environmental Rating	IP65/IP67
Weight	4.5kg
Dimensions W x L x H	230mm x 200mm x 90mm
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 (pending)

WARRANTY Two year limited warranty from time of delivery.

The Curtis Difference
You feel it when you drive it

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® Kohler is a registered trademark of Kohler Co.

Specifications subject to change without notice

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