ACF6-AE

AC Motor Controller with VCL

Parker CURTIS

Superb Performance and Value

The Curtis Model AC F6-AE Motor Controller provides accurate speed and torque control of 3-phase AC induction, PMAC and BLDC motors.

Model AC F6-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 is designed for electric traction, hydraulic pump 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, construction equipment, golf cars and turf care machinery. The AC F6-AE is also a powerful system controller that can operate as a commander device on the CANbus.

Model AC F6-AE is CANopen compliant. The controller provides flexible I/Os with mappable pins and support for an optional motor position sensor.

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.
- Resolver position sensor support for reliable and accurate motor position feedback (optional).
- Rugged housing with a small footprint for the power rating.
- Heavy-duty busbars for motor and battery connectors.
- Insulated metal substrate power base provides heat transfer for superior reliability.
- Tin-plated 35-pin I/O connector with a maximum continuous current of 8A per pin.
- Impervious to most oils, solvents, degreasers and other chemicals often encountered by industrial vehicles.
- Rugged sealed housing and connectors meet IP67 environmental sealing standards for use in harsh environments.
- Exceeds global conformance requirements for functional safety, electrical safety and EMC.
- CE marked as a programmable safety device (pending).
- UL583/cUL583 recognized component (pending).

Motors

- 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 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 advanced 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 13849-1:2023 and EN 1175:2025.
- 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).

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.

Flexible I/O

Many of the pins are multi-function, and can be configured to provide up to:

Resolver Model

- Twenty-one digital switch inputs
- Seven analog inputs
- Five output drivers
- One potentiometer source
- Input for one resolver position sensor
- Input for one motor temperature sensor

Non-Resolver Model

- Twenty-seven digital switch inputs
- Nine analog inputs
- Seven output drivers
- Two potentiometer sources
- Inputs for two motor position sensors, such as encoders or Hall sensor
- One analog output
- One motor temperature sensor

Comprehensive CAN Capabilities

- Configurable 11 or 29 bit protocol support for CANopen or J1939 use.
- Dual independent CAN ports. A full galvanic isolation option is available.
- 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.

System Accessories

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.

- 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.

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:

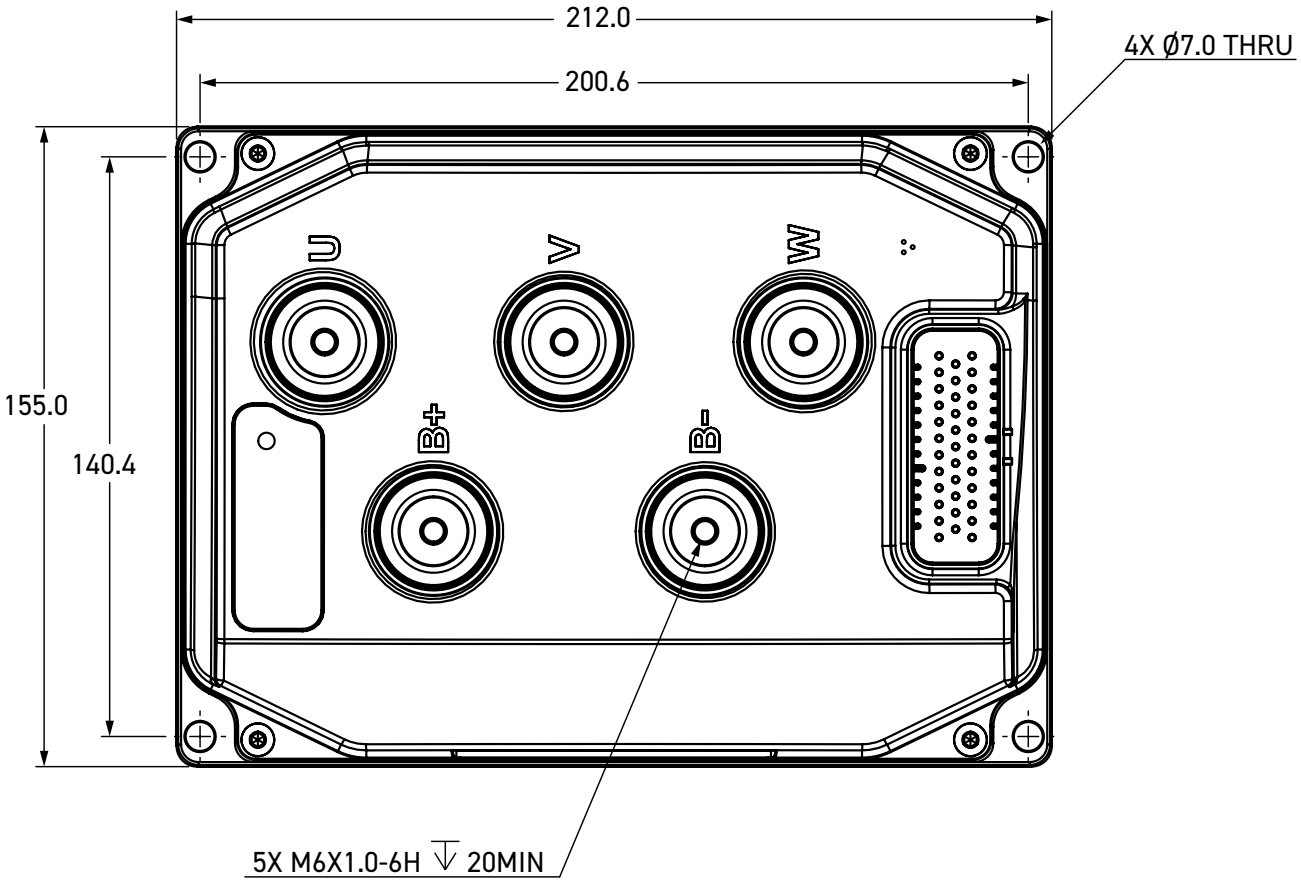
- **Launchpad**
  Starting point and project editor.
- **Programmer**
  Configure parameters, view monitor values, and view active faults and the fault history.
- **TACT**
  Stand-alone oscilloscope and data-logging tool.
- **VCL Studio**
  Editor and compiler for VCL software.
- **Menu Editor**
  Create and modify programming menus.
- **Package & Flash**
  Load your software into CAN devices.

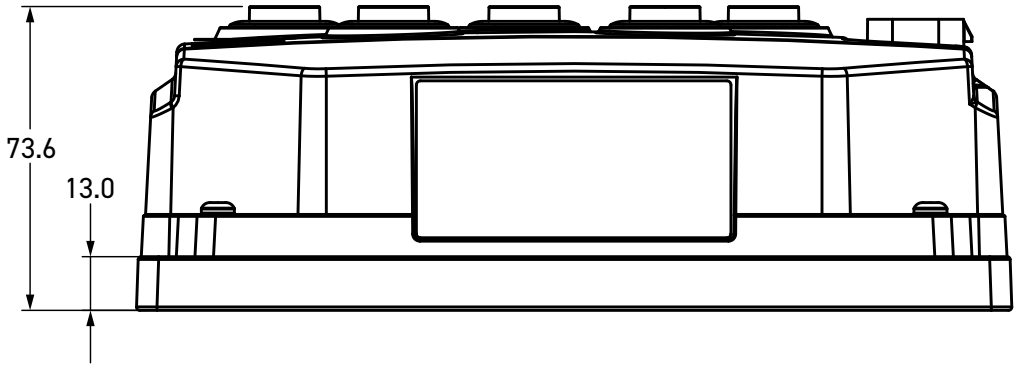
- **The Curtis Integrated Toolkit** is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim, etc.

Model Chart

Model	Nominal Voltage	Current Rating [S2-2 minutes]	Current Rating [S2-60 minutes]	Resolver	IMU	Isolated CAN	Resolver Transformation Ratio
AC F6-AE 80-450-601	48–80V	450Arms	205Arms	Yes	No	Yes	0.28
AC F6-AE 80-450-201	48–80V	450Arms	205Arms	No	No	Yes	N/A

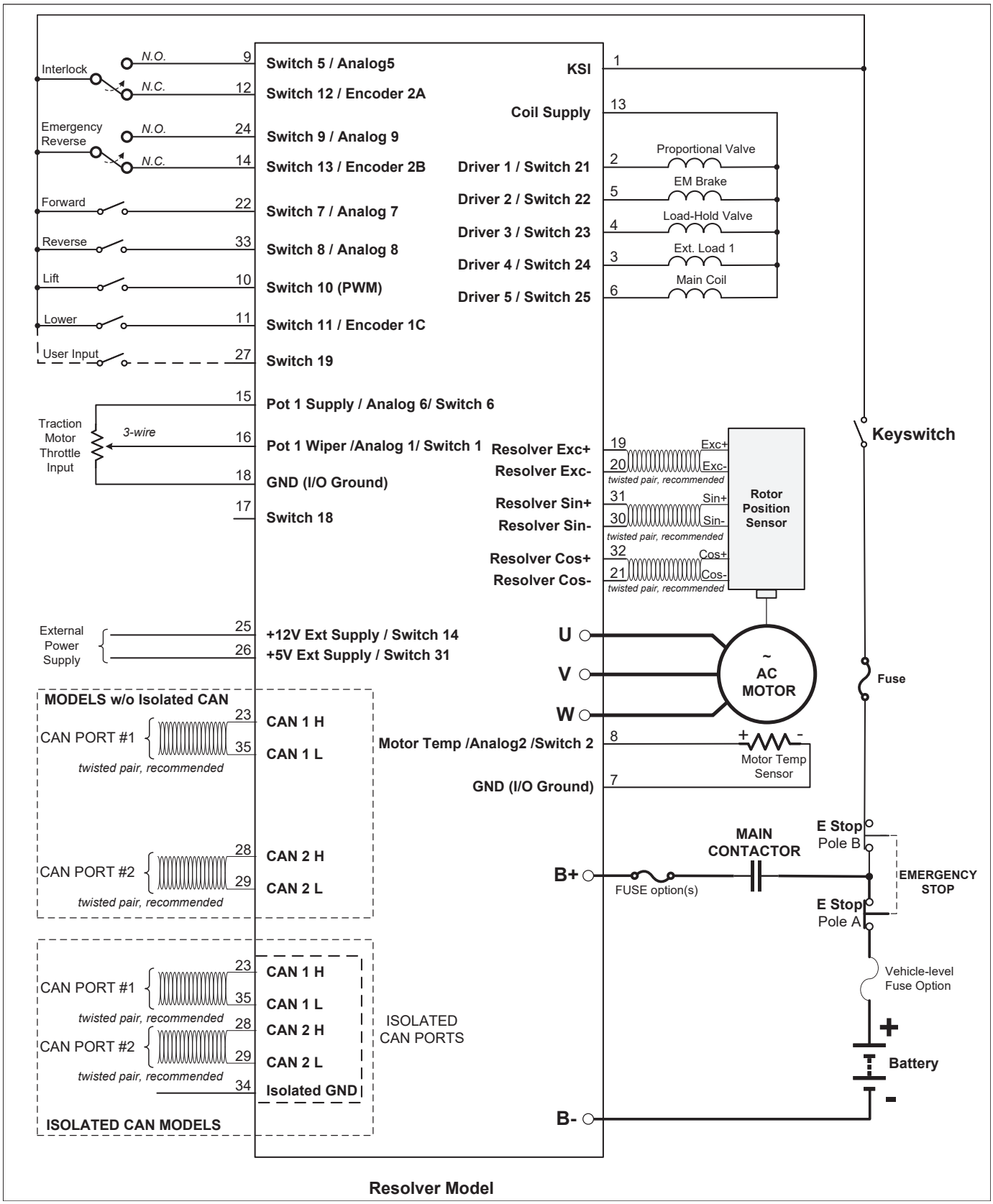
Dimensions (mm)





Connector Wiring

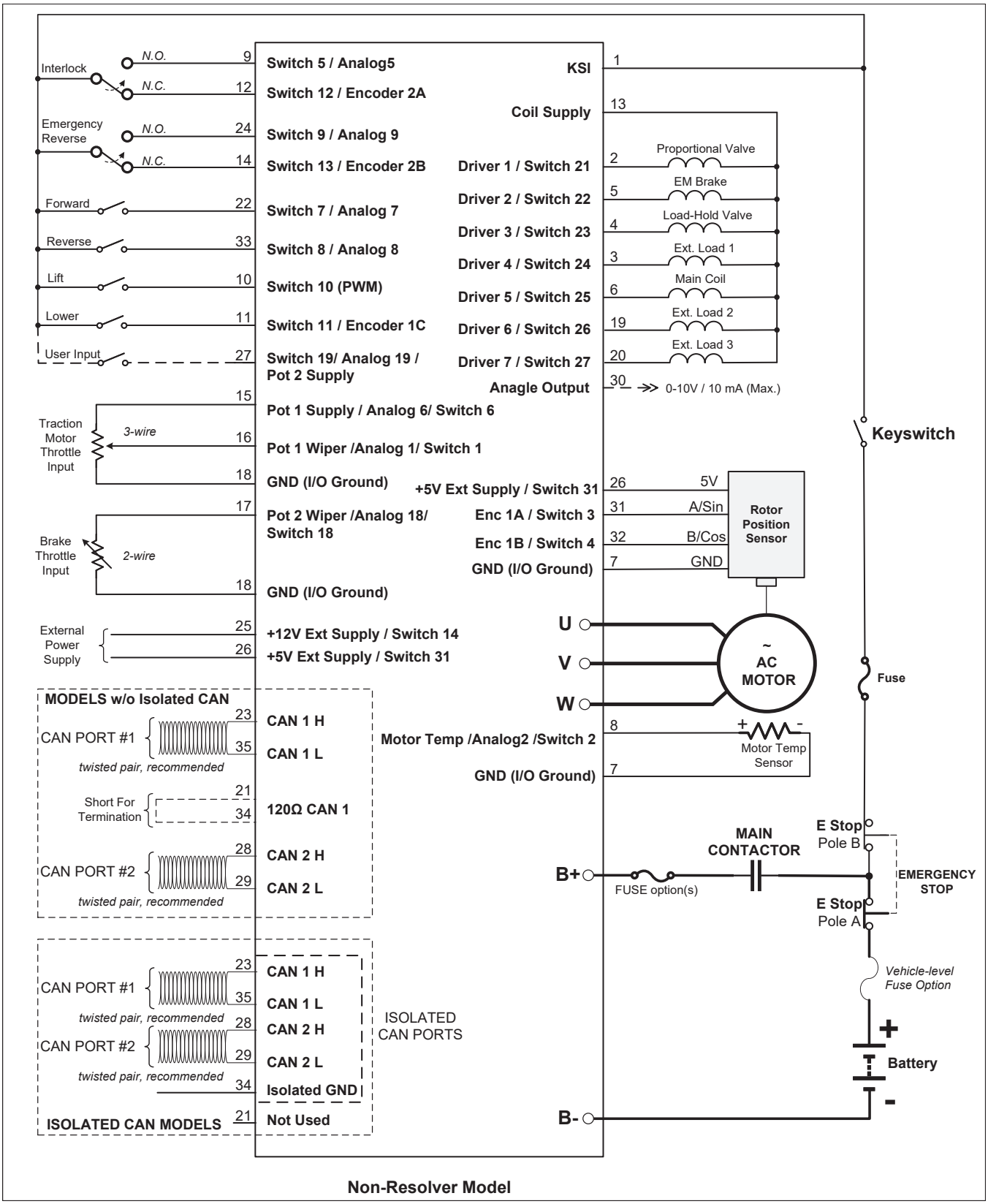
Resolver Model



Resolver Model

Connector Wiring

Non-Resolver Model



Non-Resolver Model

Logic Connector I/Os

Pin	Resolver Model	Non-Resolver Model
1	KSI / Switch 20	KSI / Switch 20
2	Driver 1 / Switch 21	Driver 1 / Switch 21
3	Driver 4 / Switch 24	Driver 4 / Switch 24
4	Driver 3 / Switch 23	Driver 3 / Switch 23
5	Driver 2 / Switch 22	Driver 2 / Switch 22
6	Driver 5 / Switch 25	Driver 5 / Switch 25
7	GND	GND
8	Motor Temp / Analog 2 / Switch 2	Motor Temp / Analog 2 / Switch 2
9	Analog 5 / Switch 5	Analog 5 / Switch 5
10	Switch 10	Switch 10
11	Encoder 1C / Switch 11	Encoder 1C / Switch 11
12	Encoder 2A / Switch 12	Encoder 2A / Switch 12
13	Coil Supply / Switch 30	Coil Supply / Switch 30
14	Encoder 2B / Switch 13	Encoder 2B / Switch 13
15	Pot 1 Supply / Analog 6 / Switch 6	Pot 1 Supply / Analog 6 / Switch 6
16	Pot 1 Wiper / Analog 1 / Switch 1	Pot 1 Wiper / Analog 1 / Switch 1
17	Switch 18	Pot 2 Wiper / Analog 18 / Switch 18

Pin	Resolver Model	Non-Resolver Model
18	GND	GND
19	Resolver Exc (+)	Driver 6 / Switch 26
20	Resolver Exc (–)	Driver 7 / Switch 27
21	Resolver Cos (–)	120Ω CAN Termination
22	Analog 7 / Switch 7	Analog 7 / Switch 7
23	CAN 1H	CAN 1H
24	Analog 9 / Switch 9	Analog 9 / Switch 9
25	+12V Ext Supply / Switch 14	+12V Ext Supply / Switch 14
26	+5V Ext Supply / Switch 31	+5V Ext Supply / Switch 31
27	Switch 19	Pot 2 Supply / Switch 19
28	CAN 2H	CAN 2H
29	CAN 2L	CAN 2L
30	Resolver Sin (–)	Analog Output
31	Resolver Sin (+)	Switch 3 / Enc 1A
32	Resolver Cos (+)	Switch 4 / Enc 1B
33	Analog 8 / Switch 8	Analog 8 / Switch 8
34	Isolated GND	Isolated GND
35	CAN 1L	CAN 1L

Specifications

Nominal Voltage	48–80V
Minimum Voltage	24V
Maximum Voltage	112V
Design Life	20,000 hours
Maximum Controller Output Frequency	599 Hz
PWM Frequency	10 kHz nominal (configurable)
Electrical Isolation to Heatsink	1200 Vac
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.
Ingress Protection	IP67
Weight	2.9 Kg
Dimensions W x L x H	212mm x 155mm x 73.6mm
EMC	Designed to the requirements of EN12895:2015+A1:2019
Mounting	4X M6 Bolts
Power Connections	5x M6x1.0
I/O Connections	35-pin AMPSEAL connector (tin plated). The maximum continuous current is 8A per pin.
Safety	Designed to the requirements of 2006/42/EC, EN 13849-1:2023, and EN 1175:2025
UL	UL583/cUL583 recognized component (pending)

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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