CURTIS

A KOHLER COMPANY

Motor Controllers

ACF2-T / ACF2-D

Integrated Dual AC Traction and DC Pump Motor Controller

AC F2-T / ACF2-D

Superb Performance and Value

The Curtis Model AC F2-T integrates three separate motor controllers into a compact, rugged unit. The AC F2-T provides independent control of dual AC induction or PMAC traction motors and control of a DC hydraulic pump motor. Curtis Model AC F2-D provides a dual traction-only version without the DC Pump Control. Both models use dual, high-performance ARM Cortex microprocessors that provide a category 2 designated architecture for functional safety. The controllers also provide efficient motor control and flexible system control.

The AC F2-T and AC F2-D are suitable for electric-traction aerial work platforms and mobile elevating work platforms such as scissor lifts, vertical mast lifts and articulated boom lifts. Both models are also suitable for other dual-drive electric traction applications such as 3-wheel counterbalance forklifts. Models AC F2-T and AC F2-D allow vehicle designers to define and control the dynamic performance of the traction and hydraulic systems, and also provide comprehensive system management and CAN capabilities.

FEATURES

- Field-oriented motor control algorithms maintain optimal performance under all operating conditions.
- Accurate and responsive control of DC hydraulic pump motor speed and current (AC F2-T only).
- Fully programmable proportional valve and load-hold valve drivers for hydraulic system control.
- Rugged housing with a small footprint for the power rating.
- Heavy-duty M6 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.
- IP67 environmental protection as per IEC 60529.
- Exceeds latest global conformance requirements for functional safety, electrical safety and EMC.
- CE/UKCA marked as a programmable safety device.
- UL583/cUL583 recognized component.

Motors

- Two separate 3-phase bridges provide efficient, independent control of dual AC induction and/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.
- Half-bridge DC pump output provides efficient control of DC series or compound hydraulic motors (AC F2-T only).

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 BMS (Battery Management Systems) typically found on lithium battery packs.

Powerful, High Performance 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.
- EN280 compliant.

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 system controllers.

Highly Flexible I/O

- All I/O pins are multi-function, and can be configured to provide up to:
  - 3 digital inputs
  - 9 analog inputs
  - 8 output drivers
  - 2 motor temperature sensors
  - 2 quadrature encoder inputs
  - 2 Sine/Cosine position inputs
  - +5V and +12V external power (200mA)

Inertial Measurement Unit (IMU)

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

Comprehensive CAN Capabilities

- Fully CANopen compliant per CiA 301.
- Compatible with SAE J1939 and other 29-bit CANbus protocols (with appropriate VCL application software).
- Models available with or without an integrated CAN termination resistor.

Improved 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

- Models AC F2-T and AC F2-D are 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 3150

A CAN-based color LCD vehicle status display in a rugged 52 mm diameter housing.

- Battery Discharge Indicator, Service (Hours) Counter and Diagnostic/ Message Center functions.
- Sealed to IP67 front and IP65 rear.
- CE/UKCA compliant.
- UL583 recognized component.
- Optional heater.
- For more information, see the Curtis Instrumentation page.

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. For more information, see the Curtis Programming page.

MODEL CHART

AC F2-T

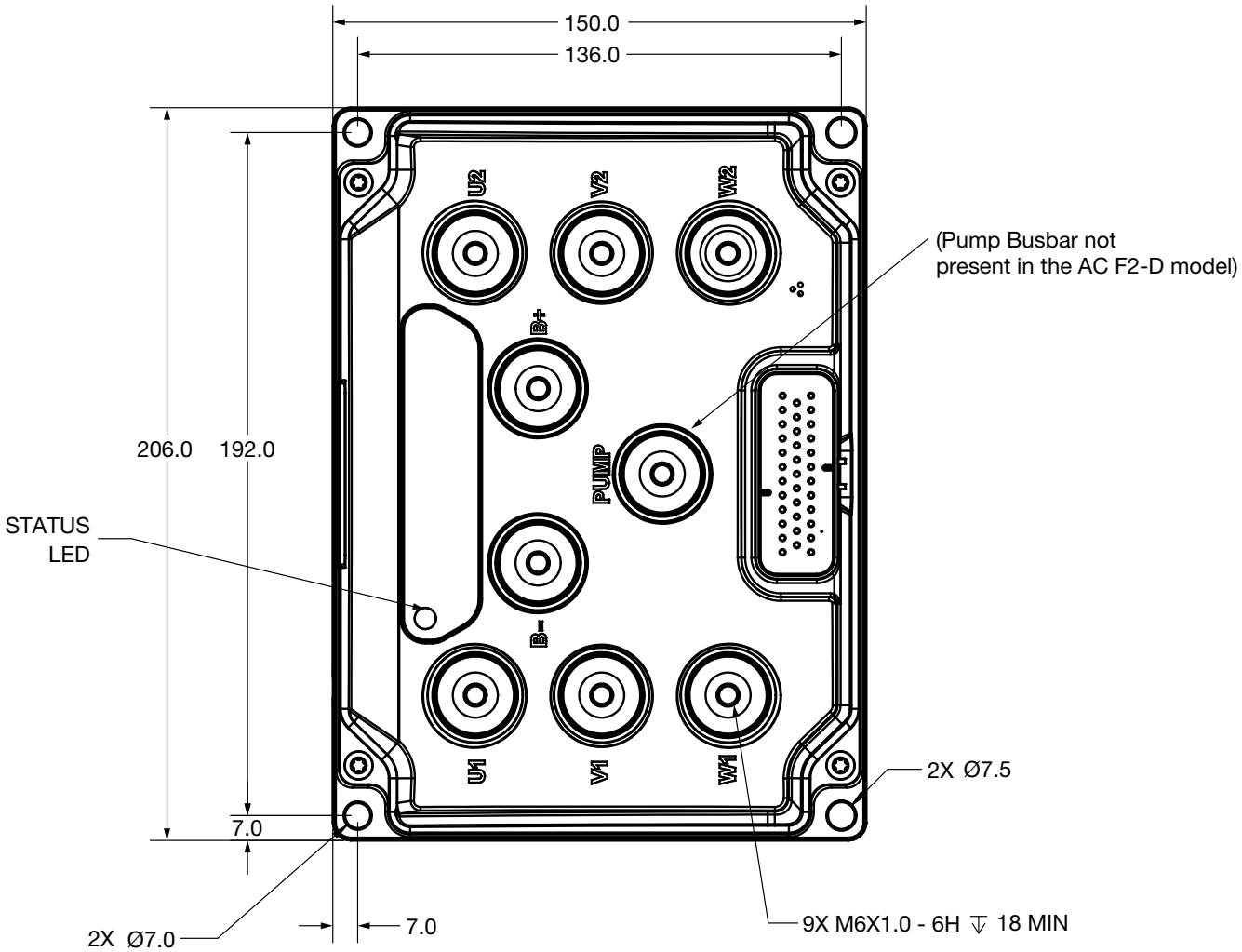
Model Number	Nominal Battery Voltage	Traction Max Current [S2-2 min]	Traction Max Current [S2-60 min]	Pump Max Current
AC F2-T 24-120-240	24V	2x 120 Arms	2x 48 Arms	240A
AC F2-T 24-200-280	24V	2x 200 Arms	2x 80 Arms	280A
AC F2-T 48-120-240	48V	2x 120 Arms	2x 48 Arms	240A
AC F2-T 48-240-240	48V	2x 240 Arms	2x 94 Arms	240A

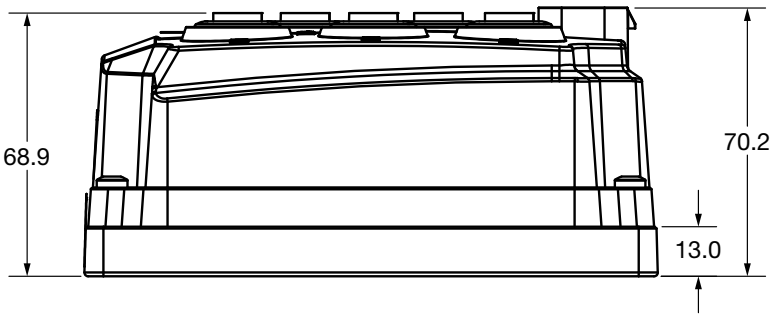
AC F2-D

Model Number	Nominal Battery Voltage	Traction Max Current [S2-2 min]	Traction Max Current [S2-60 min]	Pump Max Current
AC F2-D 24-120	24V	2x 120 Arms	2x 48 Arms	N/A
AC F2-D 24-200	24V	2x 200 Arms	2x 80 Arms	N/A
AC F2-D 48-120	48V	2x 120 Arms	2x 48 Arms	N/A
AC F2-D 48-240	48V	2x 240 Arms	2x 94 Arms	N/A

DIMENSIONS

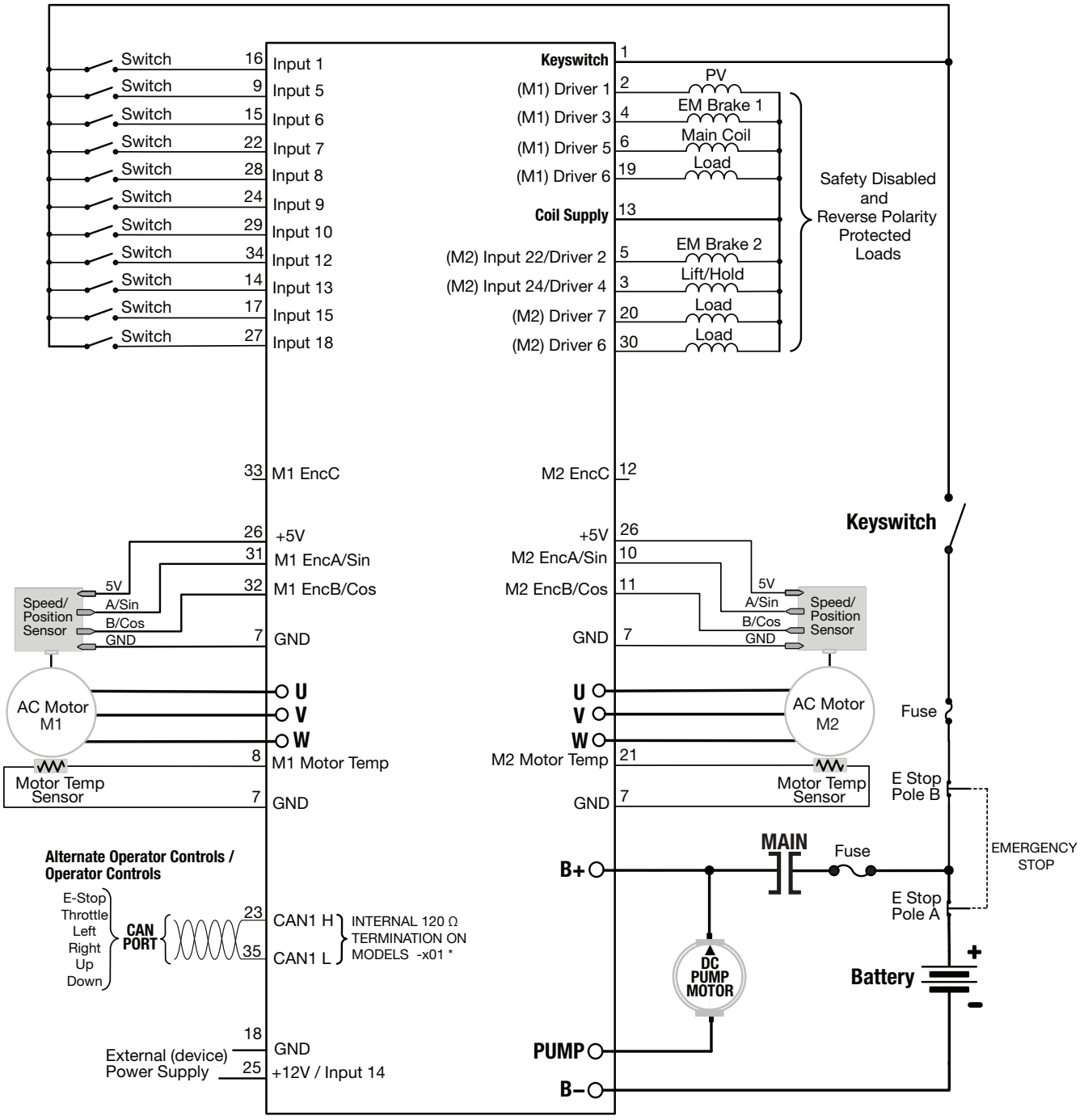
AC F2-T and AC F2-D





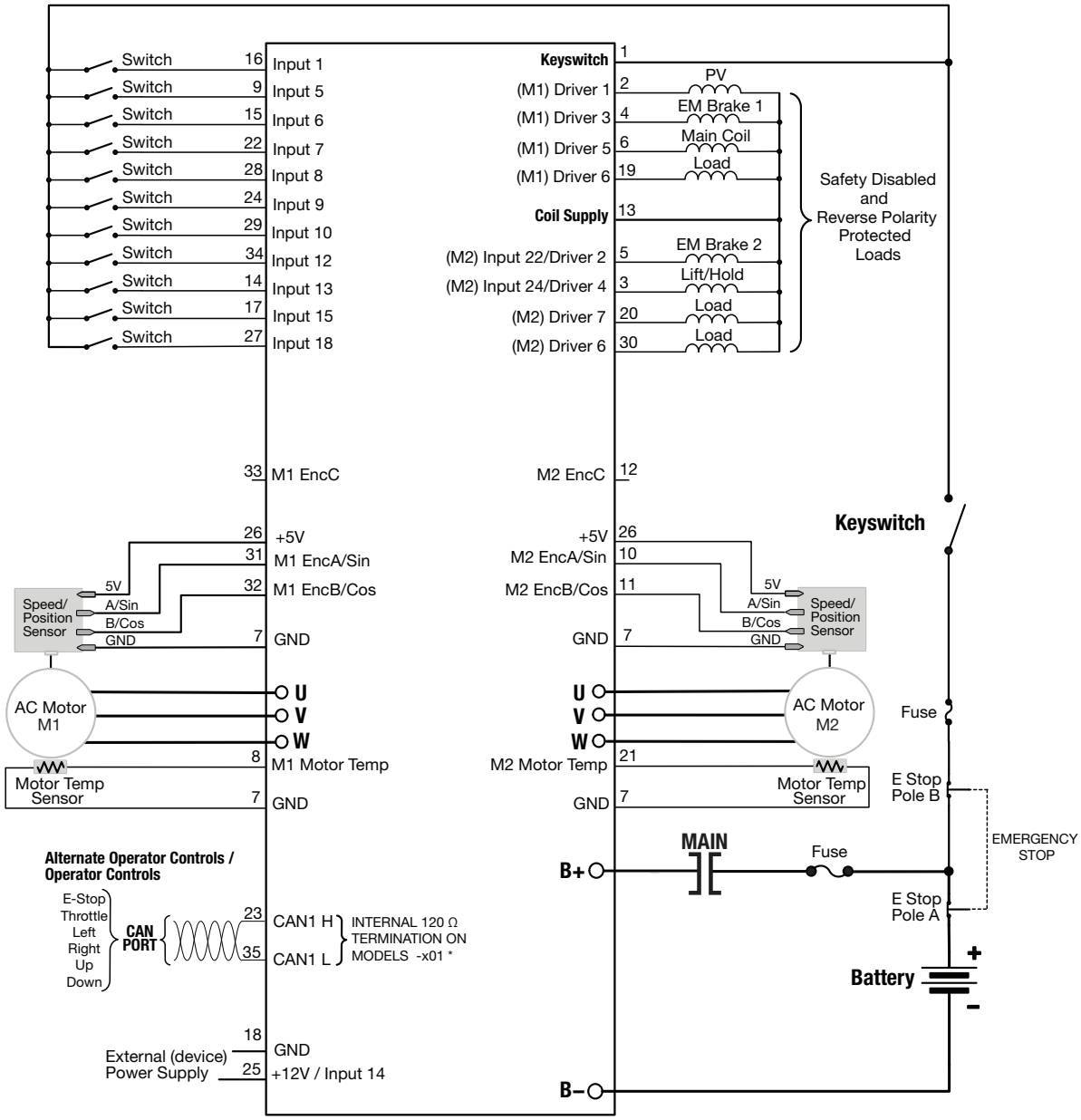
CONNECTOR WIRING

AC F2-T



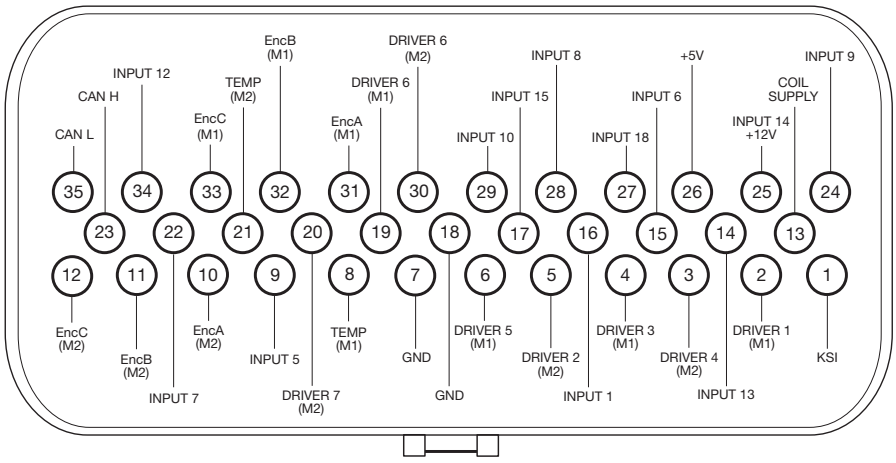
CONNECTOR WIRING

AC F2-D



PINOUT CHART

AC F2-T and AC F2-D



SPECIFICATIONS

Nominal Input Voltage	24V	36V/48V
Undervoltage	12V	18V
Overvoltage	30V	63V
Traction PWM Frequency	10kHz	
Pump PWM Frequency	18kHz	
Maximum Controller Output Frequency	599Hz	
Electrical Isolation to Heatsink	500Vac	
Storage Ambient Temperature	–40°C to 95°C	
Operating Ambient Temperature	–40°C to 50°C	
Traction 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	IP67	
Weight	1.5kg (3.3lbs)	
Dimensions W x L x H	206 mm x 150 mm x 70 mm	
EMC	Designed to the requirements of EN 12895:2015	
Safety	Designed to the requirements of EN 1175:2020, EN ISO 13849-1:2015 and EN280	
UL	UL583/cUL583 recognized component	

WARRANTY Two year limited warranty from time of delivery.

The Curtis Difference
You feel it when you drive it

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Specifications subject to change without notice

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