



ECAT-2091S

EtherCAT Single Axis Stepper Motor Controller/ Driver

Features

- 1 x Stepper motor (2-phase bipolar stepper motor)
- Drive capability up to 1.5A coil current (with proper cooling and airflow up to 2.0A)
- Voltage range of the motor: 5 to 46 VDC
- 1 x 5V power supply for encoder. Limitation: the output current should not exceed 150mA
- 1 x Encoder interfaces (A, B, Z), differential
- 2x Digital input: Reference switch input, latch input
- 1 x Digital output
- Highest resolution: 256 microsteps per full step
- Automatic current reduction to reduce heat when motor is not moving
- Over-temperature protection
- Optically isolated I/O
- LED indicators for I/O, EtherCAT and motion status
- EtherCAT:
  - 2 x RJ-45 bus interface
  - Distance between stations up to 100 m (100BASE-TX)
  - Support daisy chain connection
  - EtherCAT conformance test tool verified
  - Supports Free-Run, SM synchron and Distributed Clock (DC) operation modes
- Removable terminal block connector

Introduction

The ECAT-2091S stepper motor controller is a cost-effective, two-phase bipolar stepper driver. A motor voltage range between 5 and 46 VDC and a peak motor coil current of 1.5A without cooling is being supported. When operating in a properly ventilated environment (cooling fan) the ECAT-2091S can drive the motor at a current level of up to 2.0A. The maximum running motor current, microstep resolution and other motion parameters are software selectable.

The ECAT-2091S is a standard EtherCAT slave and an EtherCAT master is required to operate the device. The ECAT-2091S supports three operation modes: Free-Run, SM synchron and Distributed Clock (DC).

Two-phase bipolar stepper motors can be directly connected to the ECAT-2091S device. The device is designed to operate in a open loop. Configuration and motion control has to be done by the EtherCAT master and the application program. The coil current and step control is beina done by a stepper motor driver IC. An integrated ramp generator automatically calculates the acceleration and deceleration distance. In position mode the controller drives the motor to the target position and in velocity mode accelerates the motor to the target velocity. A minimum set of configuration data consists of acceleration, deceleration and maximum motion velocity. After receiving the target position the motor driver starts controlling the motion movement. All motion parameters can be changed on the fly.

The ECAT-2091S has a 32 bit high frequency encoder counter which counts the input signal of an external incremental encoder. The encoder can for example be used for homing purposes and for consistency checks.

High resolution of up to 256 microsteps per full step is supported for a ensuring smooth and precise motor operation.

Two digital input channels are provided. The digital inputs can be set to act as a simple DI, as a left and right hardware limit switch which automatically stops the motor when activated, or a latch trigger for latching the current motor and encoder position.

The module must be supplied by two power sources. A motor supply and a 24 VDC control supply.

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Hardware Specifications

Model		Specification
Motor outputs		
Number of Outputs		1 × Stepper motor, 2 phases
Output Current		peak 1.5 A (with proper airflow up to 2.0A)
Voltage Range of the Motor Output		5 to 46 VDC
Current Controller Frequency		24.5 kHz
Maximum Step Frequency		8.388 MHz
Microsteps per step		256, 128, 64, 32, 16, 8, 4, 2
Encoder		
Number of Encoder Inputs		1 × Encoder counter (A, B, Z), differential
Maximum Encoder Pulse Frequency		4 MHz
Power supply		5V (Restriction: the output current should not exceed 150 mA)
Digital Inputs		
Number of Digital Inputs		2
Wet contact	ON Voltage Level	+19 to 30 VDC
	OFF Voltage Level	+11 VDC MAX
Photo-Isolation		3750 VDC
Digital Output		
Number of Digital Outputs		1
Output Type		Open collector
Load Voltage		+5 to 30 VDC
Max. Load Current		100 mA
Isolation Voltage		3750 VDC
LED Indicators		
Diagnostic LED		Power, EtherCAT status, Digital IO, driving, temperature warning, over-temperature error, phase A and B under-voltage
Communication Interface		
Connector		2 × RJ-45
Protocol		EtherCAT
Distance Between Stations		Max. 100 m (100BASE-TX)
Data Transfer Medium		Ethernet/EtherCAT Cable (Min. CAT 5), Shielded
Power		
Input Voltage Range		20 V ~ 30 VDC
EMS Protection		
ESD (IEC 61000-4-2)		4 KV Contact for each channel
EFT (IEC 61000-4-4)		Signal: 1 KV Class A; Power: 1 KV Class A
Surge (IEC 61000-4-5)		1 KV Class A
Mechanism		
Installation		DIN-Rail
Dimensions (W× L × H)		33 mm × 120 mm × 117 mm
Case Material		Metal
Environment		
Operating Temperature		-25 ~ +40°C
Storage Temperature		-30 ~ +80°C
Relative Humidity		10 ~ 90% RH, Non-condensing

Table 1: Technical data

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Dimensions (Units: mm)

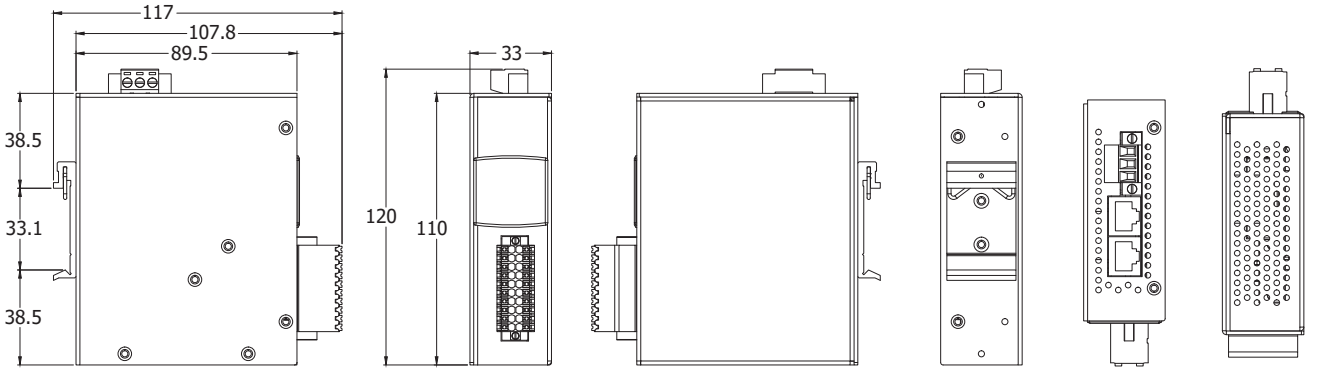


Figure 1: Dimensions of the ECAT-2091S

Pin Assignments



Name	Signal
F.G	Frame ground
GND	Power supply: Ground 0V (from negative power contact)
+Vs	Power supply: +24 VDC (from positive power contact)
IN	EtherCAT signal input
OUT	EtherCAT signal input

Table 2: ECAT-2091S power supply and EtherCAT interfaces

Figure 2: ECAT-2091S side view with power supply and EtherCAT connection

Name	Signal	Signal Description
OA1	Output	Motor winding A1
OA2	Output	Motor winding A2
OB1	Output	Motor winding B1
OB2	Output	Motor winding B2
LL	Input	Right limit switch for motor
RL	Input	Left limit switch for motor
GDO0	Output	General purpose digital output channel 0
DI.COM		Common DI supply: 0V or +10 to +24 VDC (0V for current sinking)
+VS		+24 VDC
GND		Ground 0V

Table 3: Connection interfaces for the motor current outputs, digital inputs and output



Name	Signal	Signal Description
A+	Input	Encoder input A+
A-	Input	Encoder input A-
B+	Input	Encoder input B+
B-	Input	Encoder input B-
C+	Input	Encoder input C+
C-	Input	Encoder input C-
+5V	Output	Power supply to encoder Limitation: • The output current should not exceed 150mA • Only one encoder should be connected
+VM	Input	Motor power supply +5 to 46 VDC (from positive power contact)
+VS		+24 VDC
GND		Ground 0V

Table 4: Connection interfaces for the encoder and motor power supply

Figure 3: ECAT-2091S front view with motor and encoder in- and outputs

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Wire connection

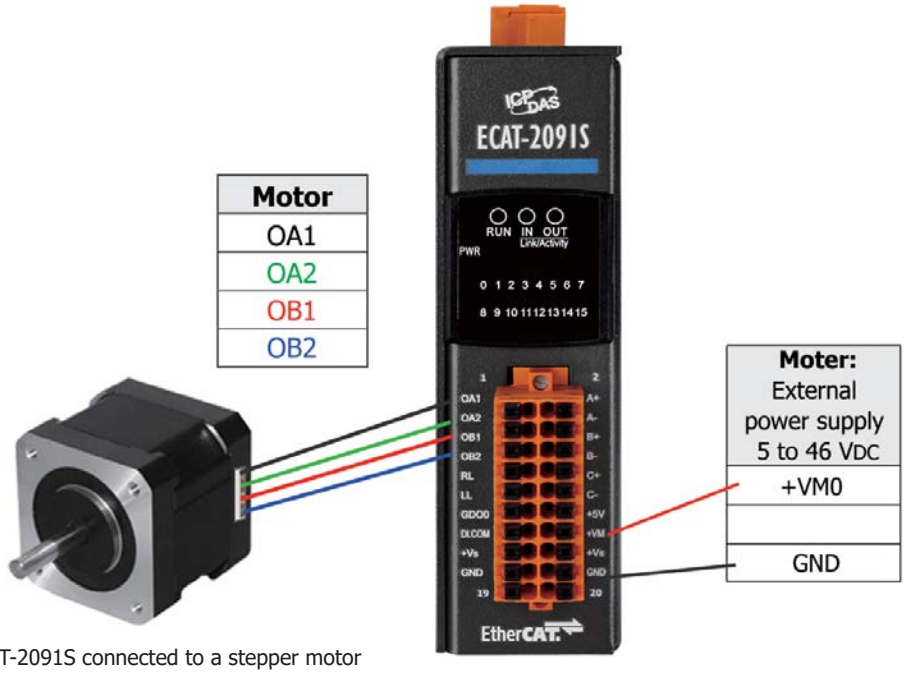


Figure 4: ECAT-2091S connected to a stepper motor

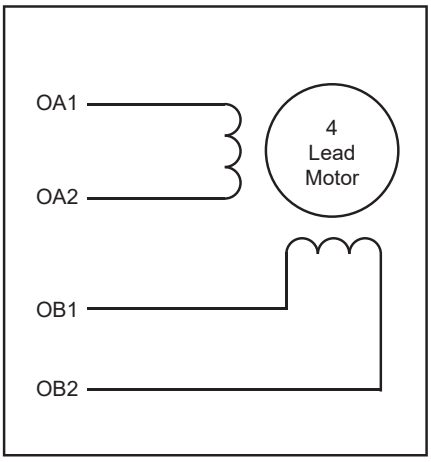


Figure 5: Four lead bipolar motor connection

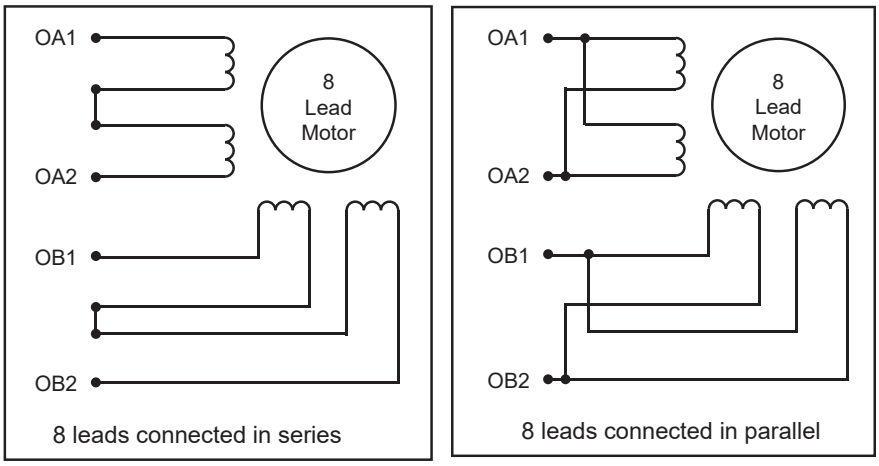


Figure 6: Eight lead bipolar motor connection (left: series, right: parallel)

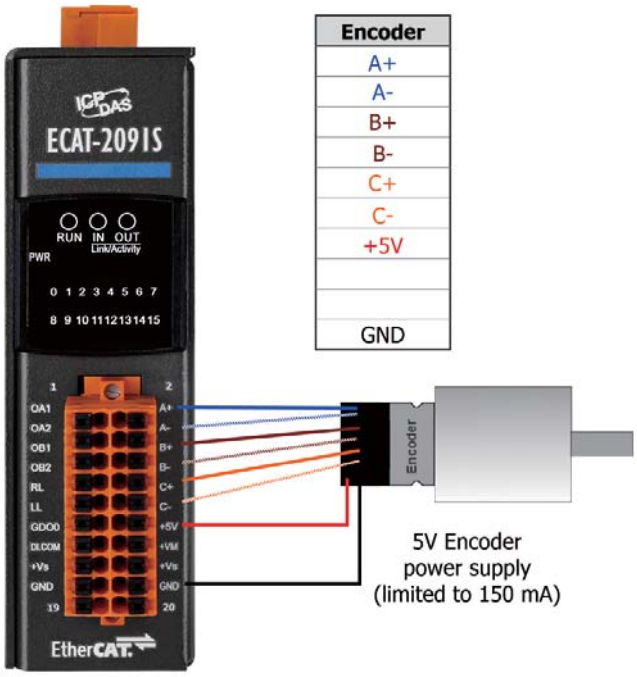


Figure 7: Differential encoder connection

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Digital Input Channel

Digital Input Channel

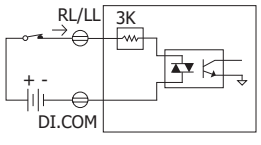
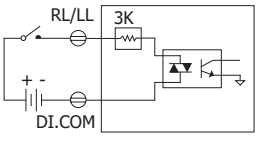
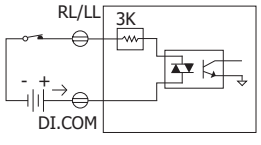
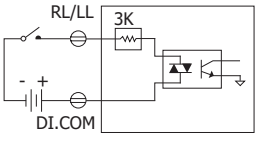
Digital Input	Readback as 1	Readback as 0
Sink	+10 ~ +24 VDC	OPEN or <4 VDC
		
Source	+10 ~ +24 VDC	OPEN or <4 VDC
		

Figure 9: Digital inputs RL and LL

Digital Output Channel

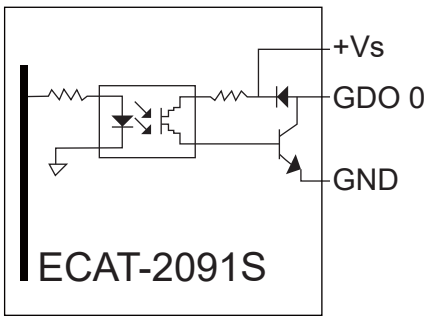


Figure 10: General purpose DO block diagram

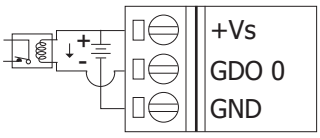
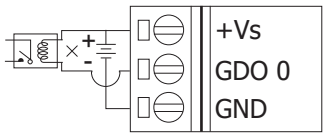
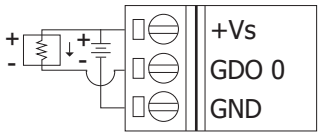
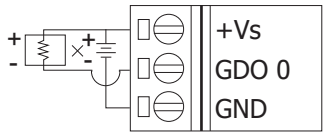
Output Type	ON State Readback as 1	OFF State Readback as 0
Drive Relay		
Resistance Load		

Figure 11: General purpose DO channel 0

Application Example



Ordering Information

ECAT-2091S CR	EtherCAT single axis stepper motor controller/ driver (RoHS)

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