HIWIN® MIKROSYSTEM

HIMC3 & E Series Servo Drive

Technical Information

HIWIN Support

About HIWIN

HIWIN®

Linear Motor System

Automated Transport / AOI Application / Precision Positioning / Semiconductor Application

- Air Bearing Platform
- XY Stage
- Gantry Systems
- Single-Axis Linear Motor Stage

Linear Motor

Machine Tool / Semiconductor / Touch Panel / Laser Manufacturing Machine / Glass Cutting Machine

- Iron Core Linear Motor-LMSA, LMSA-Z, LMFA, LMFC, LMFP, LME Series
- Ironless Linear Motor-LMC Series
- Tubular Motor-LMT Series

Torque Motor / Direct Drive Motor

Machine Tools / Lithium-ion Battery / Gear Machining and Inspection

- Torque Motor-TM-5 / IM-2, TMRW, TM-5 (J0) Series

Display / Automation / Semiconductor / Lithium-ion Battery / Robot / Laser Cutting / AOI Inspection

- Direct Drive Motor-DMS, DMY, DMN, DMT, DMH Series

Controller / Drive / AC Servo Motor

Semiconductor / SMT / 3C Electronics / Automation Equipment / New Energy Equipment / Industrial Machinery

- Controller-HIMC3
- Drive-E1, E2, D1, D2T/D2T-LM Series
- AC Servo Motor-E, FR Series

Linear Actuator / Servo Actuator

Medical / Automation / Electric Servo Press / Barrier-free Equipment Industry

- Servo Actuator-LAA Series
- Linear Actuator-LAM, LAS, LAN, LAC Series

Position Measurement System

PCB / Automobile Automation / Automation / Solar Process Equipment / Laser Cutting

- High Resolution-PM, APM Series
- Signal Translator
- High Performance Counter

Semiconductor Subsystem

Semiconductor / LED / Panel

- EFEM (Equipment Front End Module)
- Wafer Robot
- Load Port
- Wafer Aligner

Multi-Axis Robot

Pick-and-Place / Assembly / Array and Packaging / Semiconductor / Electro-Optical Industry / Automotive Industry / Food Industry

- Articulated Robot
- SCARA Robot
- Electric Gripper
- Integrated Electric Gripper

Single-Axis Robot

Precision / Semiconductor / Medical / FPD

- KK, SK
- KS, KA
- KU, KE, KC

Torque Motor Rotary Table

Medical / Automotive Industry / Machine Tools / Machinery Industry

- RAB Series
- RAS Series
- RCV Series
- RCH Series

Wire-cut EDM / Die-sinker EDM / Small-hole Drilling EDM

- RAS-E Series
- RCV-E Series
- RCH-E Series

Ballscrew

Precision Ground / Rolled

- Super S Series
- Super T Series
- Mini Roller
- Ecological & Economical Lubrication Module E2
- Auxiliary Lubrication Module EL
- Rotating Nut (R1, R2)
- Energy-Saving & Thermal-Controlling (Cool Type)
- Heavy Load Series (RD)

Linear Guideway

Automation / Semiconductor / Medical

- Ball Type-HG, EG, WE, MG, CG
- Quiet Type-QH, QE, QW, QR
- Other-RG, E2, PG, SE, RC

HIWIN® MIKROSYSTEM

Contents

HIMC3 & E Series Servo Drive

HIMC3 & E Series Servo Drive

Supports a variety of controllers and motors

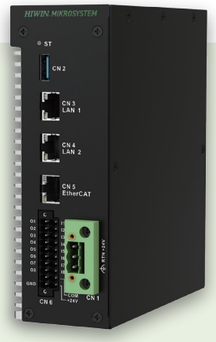
Note: EtherCAT® is a registered trademark of Beckhoff Automation Co., Ltd. MECHATROLINK is a registered trademark of MECHATROLINK Members Association. PROFINET® is a registered trademark of PROFIBUS & PROFINET International (PI). EtherNet/IP® is a registered trademark of ODVA, Inc. SIEMENS, YASKAWA, KEYENCE, BECKHOFF, ACS, OMRON, TRIO, ROCKWELL are trademarks of the respective companies.

1. HIMC3

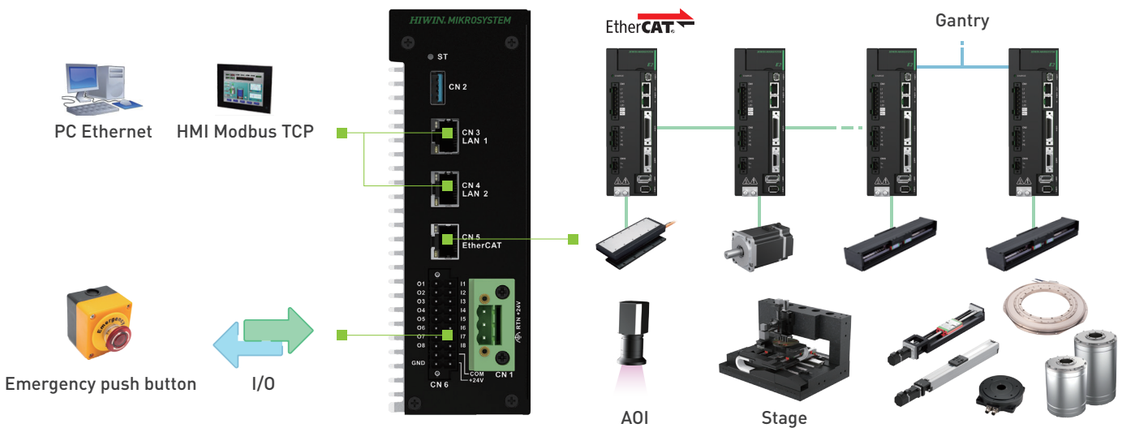
1-1 Features

- Maximum 16 motion axes
- Maximum 32 SubDevices
- Intel® Atom® 4-core x6 series processor
- Optimized for real-time featuring Intel® TCC
- 4GB LPDDR4 memory
- Up to 250 µs controller cycle time
- 10/100/1000 Mbps TCP/IP host communication
- Multi-task HMPL programming with maximum 64 user tasks
- 1D/2D/3D compensation function
- Point-to-point motion, linear and circular interpolation, etc.
- Programming API library for C/C++/C#/Python/LabVIEW
- Support CANopen over EtherCAT (CoE) communication
- Support Modbus TCP and ASCII TCP communication
- CE/UL certified

HIMC3
Multi-axis motion controller for demanding industrial applications



1-2 Applications



Note: It can be flexibly expanded with third-party EtherCAT devices, such as stepper motor drives or IO modules.

Semiconductor | PCB | Server | Automation | VDU | Metal and other printing

Note: EtherCAT® is a registered trademark of Beckhoff Automation Co., Ltd.

1-3 Model Explanation

MC – 16 – 03 – 01 - 00

Maximum number of axes
16: Up to 16 motion axes

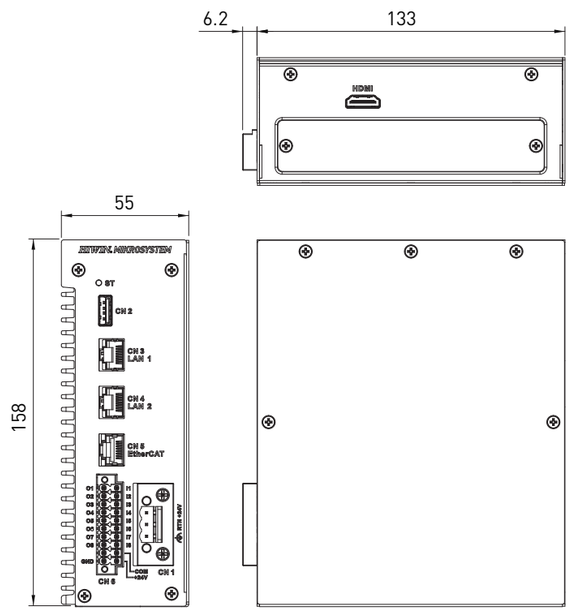
Hardware options
03: Intel® Atom® x6 Series

Additional features
General Function: 00

Communication
EtherCAT (CoE): 01

1-4 HIMC3 Specification

Item	Specification
Main power input	DC 24 V, 0.6 A
Host communication	• 2x Ethernet ports: 10/100/1000 Base-T Ethernet TCP/IP • Modbus TCP and ASCII command
Maximum motion axes	Up to 16 motion axes
Maximum SubDevices	Up to 32 SubDevices (servo drive and I/O module)
Cycle time	250 µs / 500 µs / 1000 µs / 2000 µs / 4000 µs
Motion control	• Single axis motion: point-to-point, JOG motion, PVT motion • Group interpolation: multi-axis linear, circular interpolation
Accuracy compensation	1D/2D/3D error mapping
User script programming	HMPL (HIWIN Motion Programming Language) • Up to 64 tasks running in parallel • Up to 10 MB memory size of user program
High level programming	Library for C/C++/C#/Python/LabVIEW
I/O	Built-in digital 8 input and 8 output ports



2. E Series Servo Drive

2-1 Features

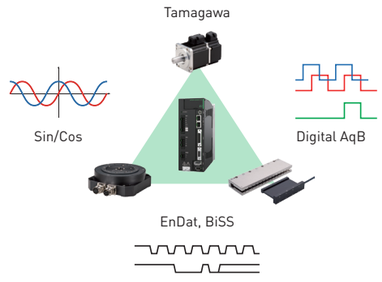
- 3.2 kHz speed response
- Tuneless function
- Advanced auto tuning
- Ripple compensation
- Unique gantry control function
- Network with industrial communication devices
- Support various motor types
- Built-in STO function
- Support various encoder interface protocols such as Digital, Analog, Tamagawa, EnDat, and BiSS-C

Applications

Industries related to VDU, semiconductor, automation, laser cutting, PCB, etc.

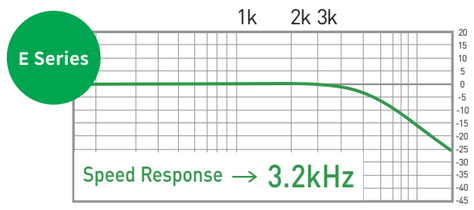
1 Support Various Encoder / Motor Types

Support AC Servo Motors, Direct Drive Motors, Linear Motors, and various encoder formats.



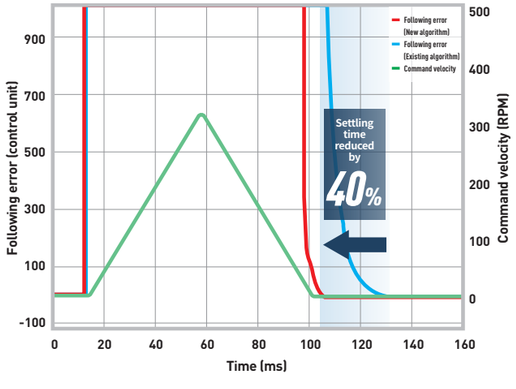
2 3.2 kHz Speed Response

Higher speed response, faster settling time, and higher productivity.



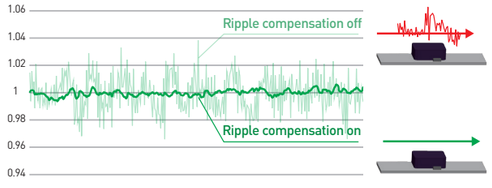
3 Fast In-Position Performance

Fast and accurate precision positioning achieves fast response and increases equipment productivity.
With our next-generation algorithm, the vibration of mechanism can be suppressed and the shaking in positioning can be solved, which improves the performance of servo motor to quickly enter the designated target position.



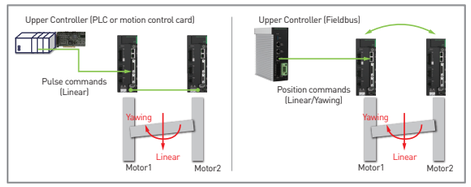
4 Ripple Compensation

Effectively suppress the speed ripple caused by motor cogging, and allow ironcore motor to achieve smooth motion in detection and scanning applications.



5 Unique Gantry Control Function

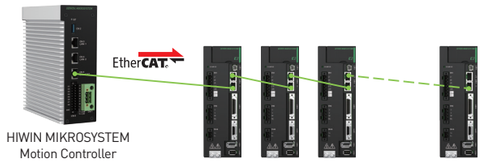
Connect two fast-response drives with drive-level control circuit and linear & yaw movement to achieve high performance of a controller on a wide-span gantry.



6 Network with Industrial Communication

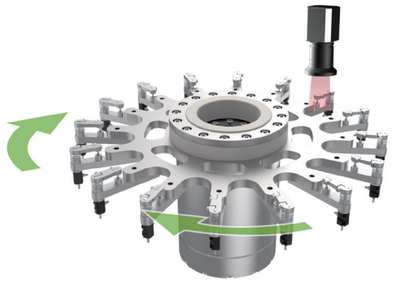
Support EtherCAT®, MECHATROLINK-III, PROFINET and EtherNet/IP. E series servo drive can also be connected to HIWIN EtherCAT (CoE) controllers.

Note: EtherNet/IP is only applicable to E2 series servo drive.



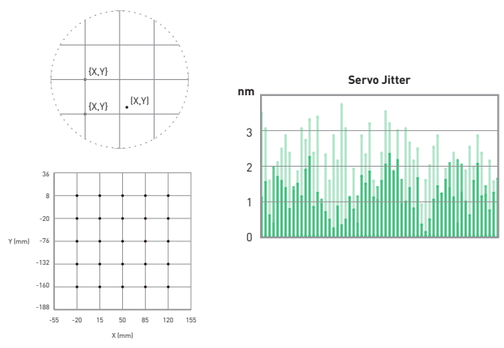
7 Built-in Multi-Motion Function

Tabulated pull-down menu of motion commands to simplify programming of typical motions.



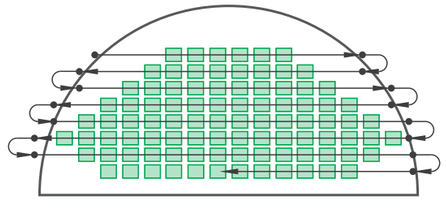
8 High Accuracy in Nano-Positioning

GT model supports nano-positioning for semiconductor equipment with high accuracy and supports 2D error map by using two sets of servo drives to achieve high accuracy and straightness on XY plane.

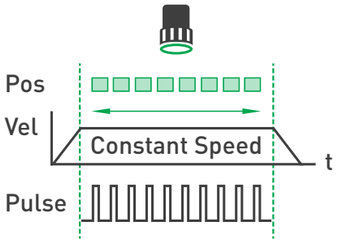


9 Position trigger output function

Support high-speed position trigger output function with the trigger time less than 100 ns. External line scan cameras, exposure units and laser devices can be triggered during high-speed movement, with the selection of fixed or random interval position trigger mode.



Detection Path



Defect Measurement

10 Built-in STO Function

Built-in Safe Torque Off (STO) circuit can be integrated to STO system to protect personnel and equipment.

Product	Model	EU Directives		UL Approval	Functional Safety	UK Conformity Assessed	Federal Communications Commission
		CE	RoHS Directive	cULus	TÜVRheinland CERTIFIED Functional Safety	UKCA	FC
E2 Series Servo Drive	ED2□-□□-003-1	✓	✓	✓	✓	-	-
	ED2□-□□-006-1	✓	✓	✓	✓	-	-
	ED2□-□□-009-1	✓	✓	✓	✓	-	-
	ED2□-□□-012-4	✓	✓	✓	✓	-	-
	ED2□-□□-018-2	✓	✓	✓	✓	-	-
	ED2□-□□-009-3	✓	✓	✓	✓	-	-
E1 Series Servo Drive	ED1□-□□-0422	✓	✓	✓	✓	✓	-
	ED1□-□□-0522	✓	✓	✓	✓	-	-
	ED1□-□□-1022	✓	✓	✓	✓	✓	-
	ED1□-□□-1222	✓	✓	✓	✓	-	-
	ED1□-□□-2022	✓	✓	✓	✓	-	-
	ED1□-□□-2032	✓	✓	✓	✓	✓	-
	ED1□-□□-4032	✓	✓	✓	✓	✓	-
	ED1□-□□-5033	✓	✓	✓	✓	✓	-
	ED1□-□□-7533	✓	✓	✓	✓	✓	-
Excellent Smart Cube (ESC)	ESC-□□-□□□	✓	✓	-	-	-	✓

Note: ED2□-□□-003/006/009-5-R does not have functional safety certification.

2-2 E2 Series Servo Drive

2-2-1 Model Explanation

E D 2 S - V 0 - 0 0 3 - 1 - C - 0 0

Type
S: Standard
F: Fieldbus

Control Interface
S V0: Voltage command and Pulse
F E0: EtherCAT (CoE)*1
F P0: PROFINET*1
F R0: EtherNet/IP*1
F L3: MECHATROLINK-III*1

Rated Output
003: 3 Arms
006: 6.3 Arms
009: 9.4 Arms
012: 12 Arms
018: 18 Arms

Power Input
1PH/3PH 100~240 Vac; 48~120 Vdc: 1
(Rated 003, 006, 009)
3PH 200~240 Vac: 2
(Rated 018)
3PH 200~480 Vac: 3
(Rated 009)
1PH/3PH 100~240 Vac: 4
(Rated 012)
1PH 100~240 Vac: 5
(Rated 003, 006, 009, Function Model R)

Function Model
AC: A
Basic: B
Rich: R
Advanced: C
GT: T

Reserved

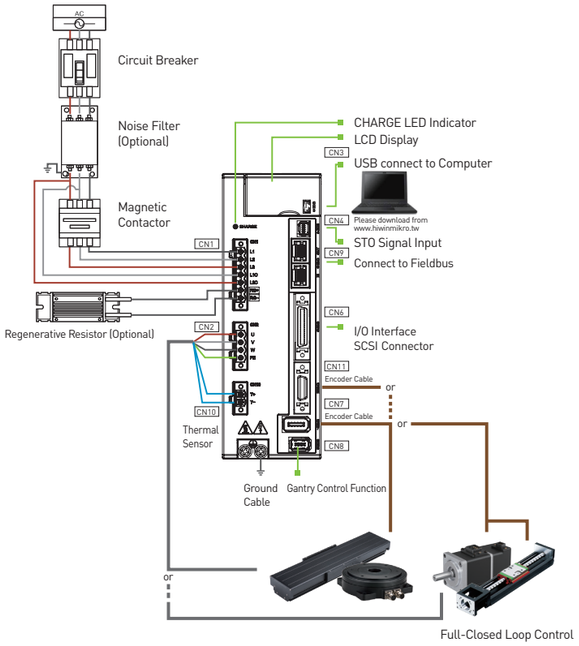
Note:*1. EtherCAT® is a registered trademark of Beckhoff Automation Co., Ltd.
PROFINET® is a registered trademark of PROFIBUS & PROFINET International (PI).
EtherNet/IP® is a registered trademark of ODVA, Inc.
MECHATROLINK is a registered trademark of MECHATROLINK Members Association.

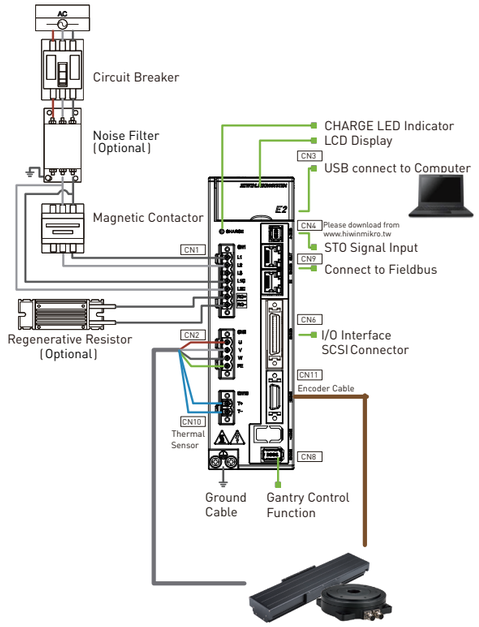
2-2-2 Function Explanation

Function Model	*AC*	*Basic*	*Rich*	*Advanced*	*GT*
Supported Motor	AC Servo Motor	Linear Motor, Direct Drive Motor	Linear Motor, Direct Drive Motor	AC Servo Motor, Linear Motor, Direct Drive Motor	
Speed Response Bandwidth	3.2 kHz	0.3 kHz	3.2 kHz	3.2 kHz	3.2 kHz
Supported Function	• Multi-motion function • Velocity ripple compensation • Fast tuning function • Tuneless function of AC motor • Gantry control function • Position trigger	• Multi-motion function • Velocity ripple compensation • Fast tuning function	• Multi-motion function • Velocity ripple compensation • Fast tuning function • Gantry control function • Position trigger (Differential, single-ended)	• Multi-motion function • Velocity ripple compensation • Fast tuning function • Tuneless function of AC motor • Gantry control function • Position trigger • Electronic cam	• Multi-motion function • Velocity ripple compensation • Fast tuning function • Tuneless function of AC motor • Gantry control function • Position trigger • 2D error map • Nano-positioning

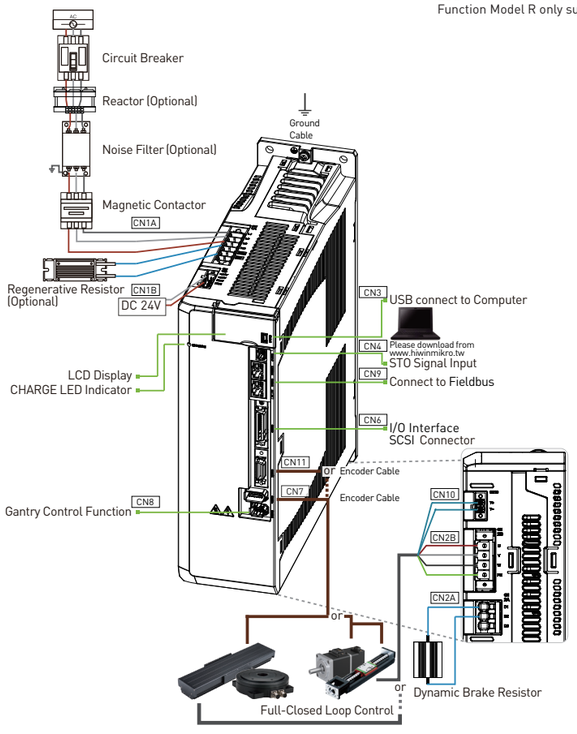
- ***AC:*** High-speed response drive that supports various functions. It is applicable to HIWIN EM1 series AC servo motors.
- ***Basic:*** It can be applied in the original application scenarios where HIWIN D1 series drives are used. It is applicable to linear motors and direct drive motors, and can be applied in general automatic transfer machines.
- ***Rich:*** It is applicable to linear motors and direct drive motors. It is a high-speed response drive that supports various advanced functions and integrates differential pulse input (position mode), voltage command (speed, torque command) and Fieldbus interface into one.
- ***Advanced:*** High-speed response drive that supports various functions. It supports EM1 series AC servo motors, linear motors, and direct drive motors.
- ***GT:*** Similar to Advanced model but has additional high-level functions of nano-positioning and 2D error map. If 2D error map function is applied, gantry control function is not available.

2-2-3 Hardware Interface



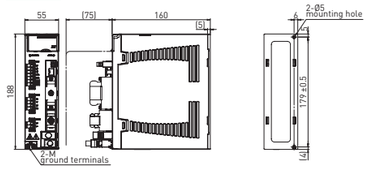


ED2□-□□-003/006/009-5-R
Function Model R only supports single phase input power



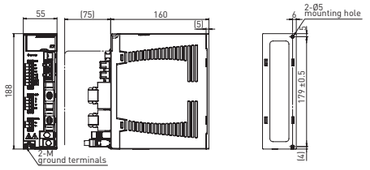
ED2S-□□-003-1 / ED2S-□□-006-1

Standard



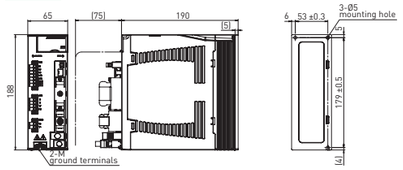
ED2F-□□-003-1 / ED2F-□□-006-1
ED2F-□□-003-5 / ED2F-□□-006-5

Fieldbus



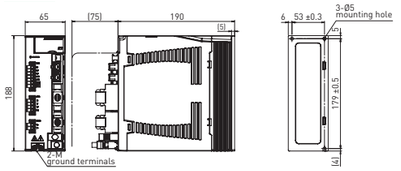
ED2S-□□-009-1

Standard



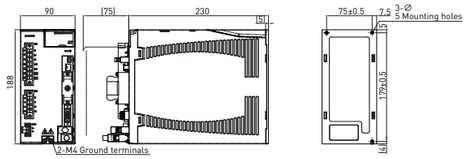
ED2F-□□-009-1 / ED2F-□□-009-5

Fieldbus



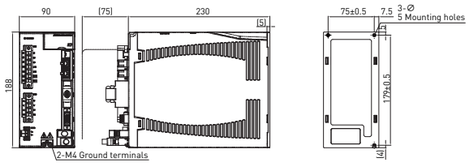
ED2S-□□-012-4 / ED2S-□□-018-2

Standard



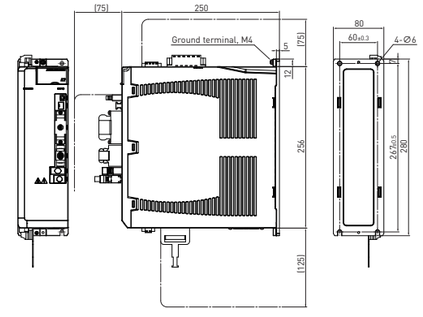
ED2F-□□-012-4 / ED2F-□□-018-2

Fieldbus



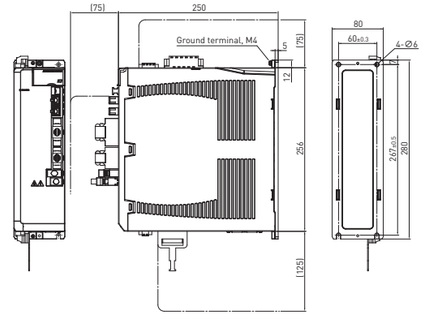
ED2S-□□-009-3

Standard



ED2F-□□-009-3

Fieldbus



Unit: mm

2-2-4 Drive Specification

110 V / 220 V Power specification

Servo Drive Model			003	006	009	012	018
Input Power	DC Power	Rated Voltage	DC 48 ~ 120 Vdc			-	
		Rated Current (A)	3.1	6.0	8.6	-	
	Single Phase Main Power	Rated Voltage (Line to Line)	AC 100 ~ 240 Vrms, 50 ~ 60 Hz				-
		Rated Current (Arms)	5.8	9.0	12.8	21.4	-
	Three Phase Main Power	Rated Voltage (Line to Line)	AC 200 ~ 240 Vrms, 50 ~ 60 Hz				
		Rated Current (Arms)	2.5	5.0	6.8	8.8	15.5
	Control Power	Rated Voltage (Line to Line)	1 PH / AC 100 ~ 240 Vrms, 50 ~ 60 Hz				
		Rated Current (Arms)	0.14	0.14	0.23	0.16	0.16
	Inrush Current of Main Power (Apk)		14.2	14.2	23.4	25.1	25.1
	Inrush Current of Control Power (Apk)		17.7	17.7	17.7	17.7	17.7
Output Power	Phase Voltage		3 PH / AC 240 Vrms max.				
	Max Rated Power (W)		500	1000	1200	2000	3500
	Peak Current (Arms)		12	18	28.3	55	55
	Rated Current (Arms)		3	6.3	9.4	12	18
Power Loss Data (W)			< 40	< 60	< 80	< 180	< 240
PWM Modulation Frequency			16 kHz			8 kHz	
Dynamic Brake			• Built-in dynamic brake function • Delay time of relay: 20 ms				
Built-in Resistor for Dynamic Brake			-	-	5.1 Ohm / 7 W	6 Ohm / 10 W	
Regenerative Energy Protection	Regenerative Resistor		• Without built-in regenerative resistor. Connect to external regenerative resistor if needed.				
	Allowable Resistance of External Regenerative Resistor		Min. 40 Ohm			Min. 12 Ohm	
	Protection of Regenerative Resistor Enabled		+HV > 370 Vdc				
	Protection of Regenerative Resistor Disabled		+HV < 360 Vdc				
	Overvoltage Protection		390 Vdc				
Environment	Operating Temperature		0 ~ 45°C				
Fan cooling			No	Yes	Yes	Yes	Yes
Weight (kg)			Standard: 1.18 kg Fieldbus: 1.20 kg	Standard: 1.20 kg Fieldbus: 1.22 kg	Standard: 1.72 kg Fieldbus: 1.74 kg	Standard: 2.52 kg Fieldbus: 2.54 kg	Standard: 2.52 kg Fieldbus: 2.54 kg

Note: Function Model Rich supports 003~009. For input power, it only supports single phase 100~240 Vac.

400 V Power specification

Servo Drive Model			009
Input Power	Three Phase Main Power	Rated Voltage (Line to Line)	AC 200 ~ 480 Vrms, 50 ~ 60 Hz
		Rated Current (Arms)	10
		Inrush Current (Apk)	50
	Control Power		DC 24 V±15%, 1A
Output Power	Phase Voltage		3 PH / AC 480 Vrms max.
	Max Rated Power (W)		3000
	Peak Current (Arms)		26
	Rated Current (Arms)		9.4
Power Loss Data (W)			< 300
PWM Modulation Frequency			8 kHz
Dynamic Brake			• Built-in dynamic brake function • No built-in dynamic brake resistor*1 • Delay time of relay: 20 ms
Lowest Value allowed for External Dynamic Brake Resistor			10 Ohm
Regenerative Energy Protection	Regenerative Resistor		• Without built-in regenerative resistor. Connect to external regenerative resistor if needed.
	Allowable Resistance of External Regenerative Resistor		Min. 27 Ohm
	AC 220 V	Protection of Regenerative Resistor Enabled	+HV > 370 Vdc
		Protection of Regenerative Resistor Disabled	+HV < 360 Vdc
	AC 380 V	Protection of Regenerative Resistor Enabled	+HV > 620 Vdc
		Protection of Regenerative Resistor Disabled	+HV < 600 Vdc
	AC 480 V	Protection of Regenerative Resistor Enabled	+HV > 770 Vdc
		Protection of Regenerative Resistor Disabled	+HV < 755 Vdc
	Overvoltage Protection		800 Vdc
Environment	Operating Temperature		0 ~ 45°C
Fan Cooling			Yes
Weight (kg)			Standard: 3.10 kg Fieldbus: 3.12 kg

Note: *1.When using a 400 V servo drive in high-speed motion applications, it is recommended to install a suitable dynamic brake resistor, refer to section 5.4.4.2 in "E2 Series Servo Drive User Manual."

110 V / 220 V / 400 V General specification

Category				Servo Drive Specification
Control Method				IGBT PWM space vector control
Applicable Motor				AC Servo Motor, Direct Drive Motor, Linear Motor
STAT LED Indicator				• Blinking red: Error • Blinking green: Ready • Green: Enabled • There is no STAT LED indicator on Fieldbus servo drive
CHARGE LED Indicator				• Red: The main power is supplied • No light: The main power is not supplied
Analog Output				• Channel: 2 • Resolution: 12 bit • Output voltage range: ±10 V • Accuracy: ±2% • Maximum output current: ±10 mA
Control Function	Position Mode	Command Source		Pulse command from controller
		Signal Type		• Pulse / Direction • CW / CCW • AqB
		Isolated Circuit		High-speed optical coupler
		Input Signal		• Differential input (2.8 Vdc ≦ potential difference ≦ 3.7 Vdc) • Single-ended input (12~24 Vdc)
		Maximum Input Bandwidth		• Differential: 5 Mpps • Single-ended: 200 Kpps
		Electronic Gear		Gear ratio: pulses / counts
				Pulses: 1~1,073,741,824
				Counts: 1~1,073,741,824
	Velocity Mode	Command Source		DC voltage command from controller
		Analog Input	Impedance	14 kΩ
			Signal Format	±10 Vdc
			Maximum Input Bandwidth	100 Hz
			Specification	16 bit A/D input (V-REF+/-)
	Torque Mode	Command Source		DC voltage command from controller
		Analog Input	Impedance	14 kΩ
			Signal Format	±10 Vdc
			Maximum Input Bandwidth	100 Hz
			Specification	16 bit A/D input (T-REF+/-)
Control Mode				• Position mode • Velocity mode • Torque mode • Full-closed loop mode (Dual loop mode)
Computer Communication	Standard USB2.0 (Mini USB type)			Connect the servo drive with the computer to set parameters, monitor physical quantities and execute trial operation via software Thunder.
Encoder	Power Supply			+5.1 Vdc ±5 %, 2000 mA
	Signal Format	Serial signal	TAMAGAWA	• Resolution: 23 bit • Bandwidth: 5 MHz
			BiSS-C	• Maximum Data Length: 64 bit • Bandwidth: 5 MHz
			EnDat	• Maximum Data Length: 64 bit • Bandwidth: 4 MHz
		Incremental signal	Digital	• AqB and Z-phase signals • The maximum input bandwidth of each phase is 12.5 MHz. • Quadruple frequency: 50 Mcounts/s
			Analog	• SIN/COS signal (differential signal) • The maximum input bandwidth is 1 MHz • Input signal is 0.3~1.2 Vpp
	Safety Function			• Encoder power malfunction detection • Encoder alarm protection (Digital differential signal) • Main power overvoltage and undervoltage protection
	Maximum Position Counting Range			-2,147,483,648 ~ 2,147,483,647 (32 bit)

Category			Servo Drive Specification
Encoder Output	Emulated Encoder Output	Z Phase (Fieldbus servo drive does not support)	• Serial encoder and incremental encoder (AqB, sin/cos) are supported • The width of output signal can be adjusted by parameter • Digital differential signal output • Z-phase open collector output is supported • Two output methods can be selected - Only outputs one Z-phase signal for total travel distance - Outputs one Z-phase signal per one revolution
		A / B Phase	• Serial encoder and digital encoder (AqB) are supported • Differential signal output • The maximum output bandwidth is 18 Mcounts/s • The scaling of output can be adjusted. For instance, ten encoder counts = one emulated encoder count.
	Buffered Encoder Output	Z Phase	• Only supports digital encoder (AqB) • Differential signal output • Supports Z phase open-collector output
		A / B Phase	• Only supports digital encoders (AqB) • Differential signal output, maximum output bandwidth 50 Mcounts/s
General-purpose I/O	Input		• The functions of general-purpose inputs (Optical couplers) can be defined by users • E2 series servo drive provides ten general-purpose inputs (I1 to I10) Fieldbus servo drive only provides eight general-purpose inputs (I1 to I8) 5~24 Vdc/5 mA (Each input pin)
	Output		• The functions of general-purpose outputs (Optical couplers) can be defined by users • E2 series servo drive provides five general-purpose outputs (O1 to O5) 24 Vdc/0.1 A (Each output pin)
	Position Trigger (PT)*		• Supports high-speed position trigger function • Differential signal 3.3 V, maximum current 20 mA • Single-ended signal 5 V, maximum current 10 mA
Other Function			• Gantry synchronization control function* • Motor over temperature protection (PTC)
Environment	Storage Temperature		-20℃ ~ 65℃
	Humidity		Operating and storage temperature: 20 to 85% RH (Non-condensing)
	Altitude		Approved for use at 3,000 M or lower height above sea level
	Vibration		10 Hz ~ 57 Hz: 0.075 mm amplitude 58 Hz ~ 150 Hz: 1G
	IP Rating		IP20
	Power System		TT / TN system

Note: *The information is for brief reference only. For some of the functions, the eleventh code number of the servo drive needs to be confirmed. Refer to section 2.1.3 in "E2 Series Servo Drive User Manual" and "E2-R Series Servo Drive User Manual."

2-3 E1 Series Servo Drive

2-3-1 Model Explanation

ED1 S – V G – 0 4 2 2 – 0 1 - 0 0

Type
S: Standard
F: Fieldbus

Control Interface
S: V: Voltage command and Pulse
F: E: EtherCAT(CoE)*1
H: mega-ulink(MoE)*2
L: MECHATROLINK-III*1
P: PROFINET*1

Special Function
G: Gantry
N: Without special function

Rated Output
110 V/220 V: 04: 400 W, 05: 500 W, 10: 1 kW, 12: 1.2 kW, 20: 2 kW, 40: 4 kW
400 V: 50: 5 kW, 75: 7.5 kW

AC Phase
Single/Three phase: 2
(400 W~2 kW drive)
Three phase: 3
(4 kW~7.5 kW drive)

AC Voltage
110 V / 220 V (100 Vac ~ 240 Vac): 2
400 V (380 Vac ~ 480 Vac): 3

Motor Type
AC servo motor: A
General (AC/LM/DM/TM): 0
GT (nano precision function, 2D error map, support DC 48 ~ 120 V): T

Safety Certification
STO safety function: 1

Reserved

Note:*1. EtherCAT® is a registered trademark of Beckhoff Automation Co., Ltd. MECHATROLINK is a registered trademark of MECHATROLINK Members Association. PROFINET® is a registered trademark of PROFIBUS & PROFINET International (PI).
*2. mega-ulink interface is applicable to HIWIN MoE HIMC motion controller or API/MPI library integrated in a computer. When using API/MPI library, please note: it only supports Windows XP/7/10 instead of Windows 11 or above.
*3. EnDat® is a registered trademark of HEIDENHAIN GmbH. BiSS® is a registered trademark of iC-Haus GmbH.

Encoder Translator

E S C – S S – S 0 1

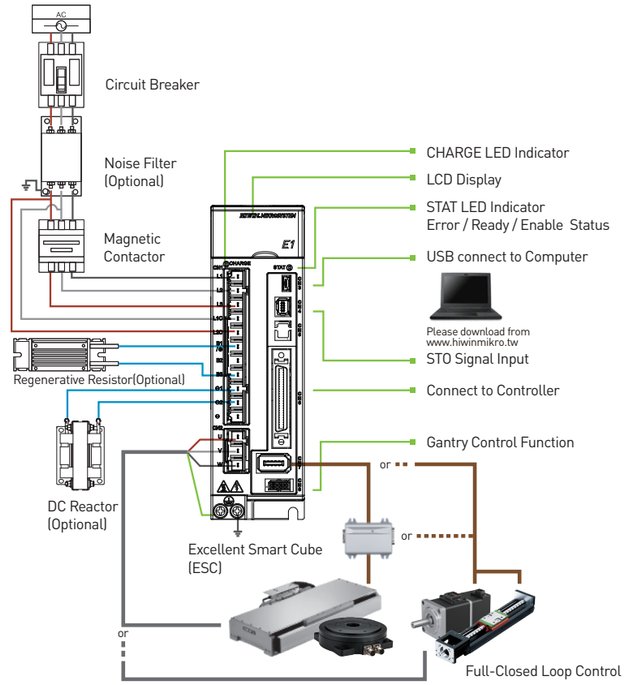
Type
AN: Analog encoder
Thermal sensor (TS) signal and digital Hall sensor function are supported.

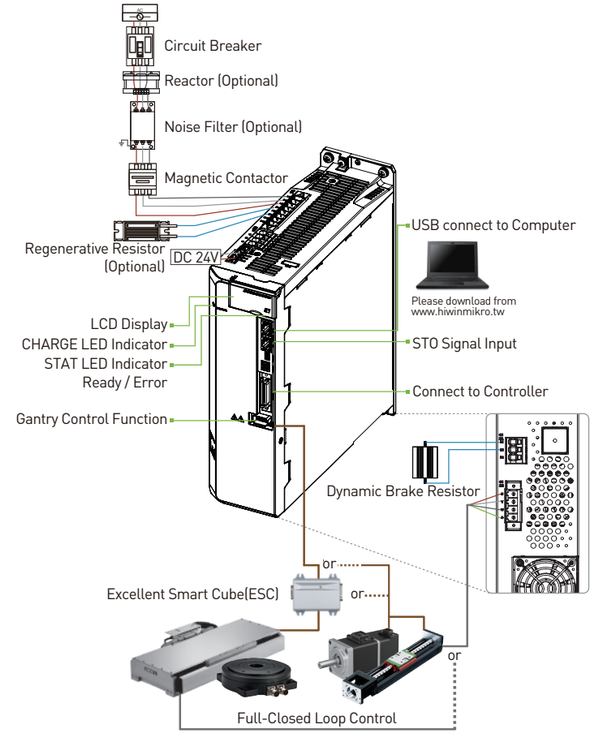
SS: Two serial encoders, one analog encoder and one digital encoder (for dual-loop)
Thermal sensor (TS) signal and digital Hall sensor function are supported.

Function
Full Function Type: S01
General Type: S02

Note: 1. ESC-SS supports EnDat*3 2.1/2.2 or BiSS-C*3 serial encoder.
2. In full-closed loop control, ESC-SS-S01 and ESC-SS-S02 can support two sets of encoders at the same time. Refer to section 8.16.1 in "E1 Series Servo Drive User Manual" for the detailed arrangements.

2-3-2 Hardware Interface

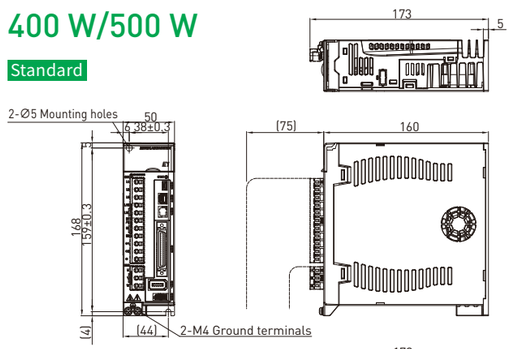




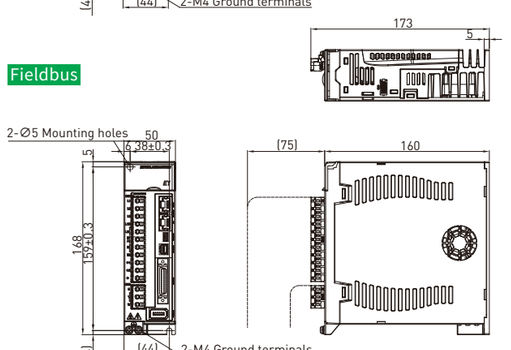
Note: Please refer to chapter 5 in "E1 Series Servo Drive User Manual" for detailed wiring.

400 W/500 W

Standard

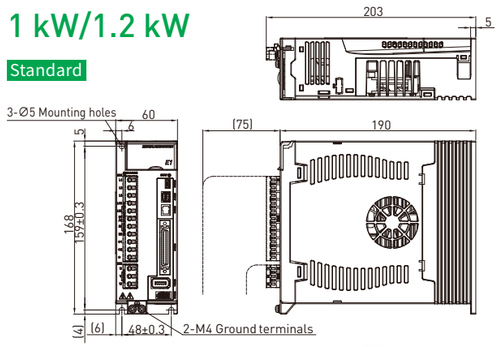


Fieldbus



1 kW/1.2 kW

Standard



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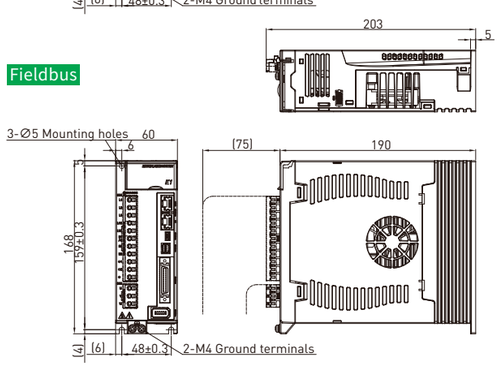
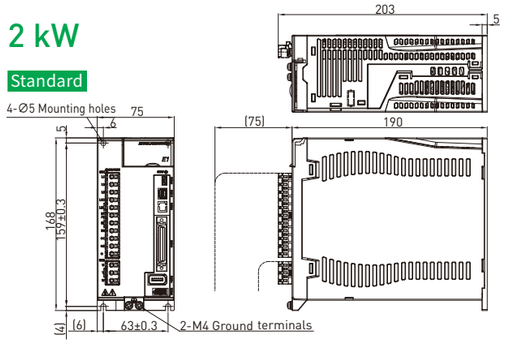
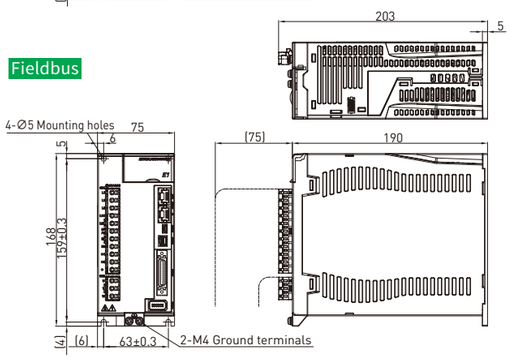


2 kW

Standard

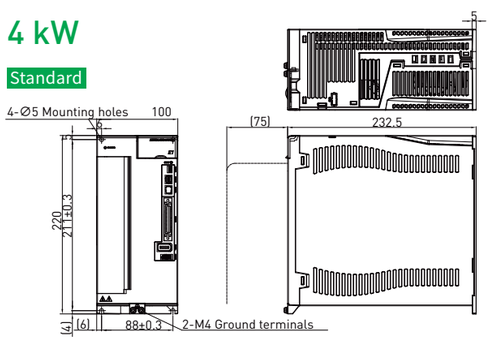


Fieldbus

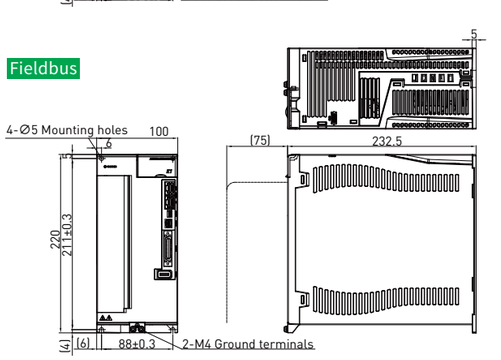


4 kW

Standard



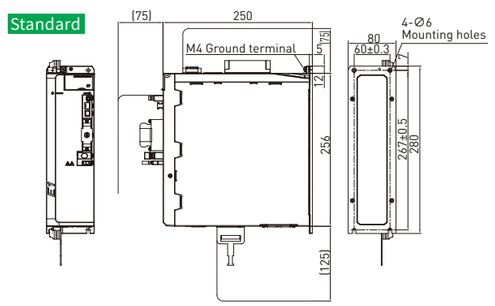
Fieldbus



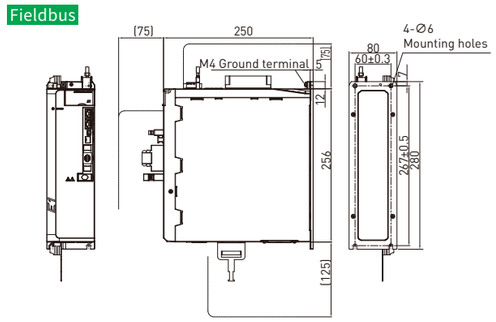
(Unit: mm)

5 kW

Standard

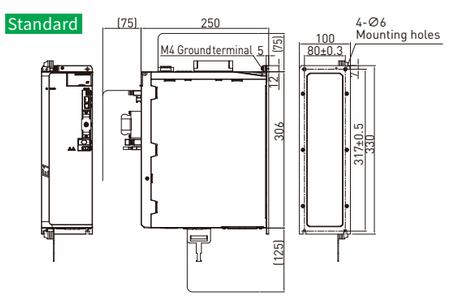


Fieldbus

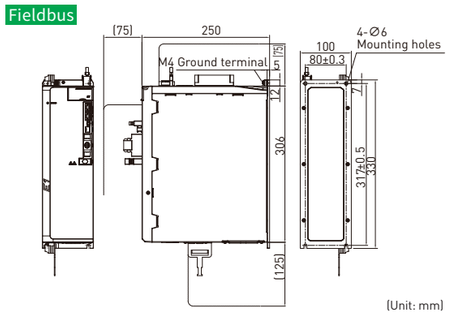


7.5 kW

Standard



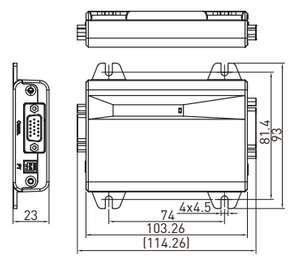
Fieldbus



(Unit: mm)

2-3-3 ESC Hardware

Excellent Smart Cube(ESC)



Item	Description					
Max. Output Voltage	+5.0 V ± 5%					
Max. Output Current	650 mA					
Supported Signal Type	Digital Hall Sensor	Analog Incremental Signal	Digital Incremental Signal	Absolute Type*2		
	Hall U/ V/ W	SIN / COS / Reference	A/ B/ Index	BiSS-C	Tamagawa	EnDat 2.1 / 2.2
Max. Signal Bandwidth	2 kHz	1 MHz (Min. multiplier factor: 4 times)*1 (Max. multiplier factor : 4096 times)	5 MHz	5 MHz		4 MHz
Max. Data Length	-	-	-	46 bit*3	-	46 bit*3
Input Signal Format	5V CMOS / TTL	Differential signal (RS422) 0.4 Vpp ~ 1.2 Vpp	Differential signal (RS422) 5 V TTL	Differential signal (RS485)		
Motor Thermal Protection (TS)	Supports thermal sensor based on positive temperature coefficient (PTC) thermistor					
Operating Temperature	0 °C to +45 °C					
Storage Temperature	-20 °C to +65 °C					
Ingress Protection Rating	IP20					

Note:
(1) *1. A multiplier factor should be a multiple of 4.
*2. The counting length of the travel distance cannot be more than 32 bit. For example, if the resolution is 1nm/count, the total travel distance cannot be more than 4.29 m.
*3. BiSS-C or EnDat supports 30-bit single-turn resolution and 16-bit multi-turn resolution.
(2) EM1 series servo motor with ESC only supports 23-bit resolution.

2-3-4 Drive Specification

110 V / 220 V Power specification

Rated Output			400 W	500 W	1 kW	1.2 kW	2 kW	4 kW
Input Power	Single Phase Main Power	Rated Voltage (Line to Line)	AC 100 ~ 120 Vrms, 50~60 Hz AC 200 ~ 240 Vrms, 50~60 Hz				AC 200 ~ 240 Vrms, 50~60 Hz	-
		Rated Current (Arms)	2.9	3.8	6.58	11.1	11.1	-
	Three Phase Main Power	Rated Voltage (Line to Line)	AC 200 ~ 240 Vrms, 50~60 Hz					
		Rated Current (Arms)	1.46	2.1	3.3	5.78	11.3	17.0
	Control Power		1 Ø/AC 100 ~120 Vrms, 50~60 Hz					
			1 Ø/AC 200 ~240 Vrms, 50~60 Hz					
	Inrush Current of Main Power (Apk)		14.2	14.2	23.4	23.4	24	36.2
	Inrush Current of Control Power (Apk)		17.7	17.7	17.7	17.7	17.7	17.7
	Leakage current (mA)*2		0.65	0.65	0.65	0.65	0.67	0.94
Output Power	Phase Voltage		3 Ø/AC 240 Vrms max.					
	Max Rated Power (W)		400	500	1 k	1.2 k	2 k	4 k
	Peak Current (Arms)		10	10	23.3	23.3	42	75
	Rated Current (Arms)		2.5	3	5.6	9	12(9)*1	25
Power Loss Data (W)			< 40	< 40	< 80	< 80	< 160	< 320
PWM Modulation Frequency			16 kHz			8 kHz		
Dynamic Brake			• Built-in dynamic brake function • Delay time of relay: 20 ms					
Built-in Resistor for Dynamic Brake			-		5.1 Ohm /7 W		6 Ohm /10 W	6 Ohm /40 W
Regenerative Energy Protection	Regenerative Resistor		• 400 W/500 W: Without built-in regenerative resistor Connect to external regenerative resistor if needed. • 1 kW/1.2 kW/2 kW/4 kW: With built-in regenerative resistor, connected to external regenerative resistor to increase regenerative capacity					
	Built-in Regenerative Resistor		-		40 Ohm /40 W		12 Ohm /60 W	13 Ohm /120 W
	DC Link Capacitance [uF]		820		1410		2240	3280
	Protection of Regenerative Resistor Enabled		+HV > 370 Vdc					
	Protection of Regenerative Resistor Disabled		+HV < 360 Vdc					
	Overvoltage Protection		390 Vdc					
Environment	Operating Temperature		0~45 °C (45~50 °C is acceptable when derated value is applied. Please refer to section 4.5 in "E1 Series Servo Drive User Manual.")					
Weight (kg)			1.1	1.1	1.6	1.6	1.9	3.4

Note: *1. When using 1-phase 200 V AC to 240 V AC power supply, operate the servo amplifier at 75% (9 Arms) or smaller effective load ratio.
*2. These are the leakage current values without using power supply filter, and the values may be different based on the applicational environment.

400 V Power specification

Rated Output			5 kW	7.5 kW
Input Power	Three Phase Main Power	Rated Voltage (Line to line)	AC 380 ~ 480 Vrms, 50~60 Hz	
		Rated Current (Arms)	12.6	17.6
		Inrush Current (Apk)	50	
	Control Power		DC 24 V±15%, 2A	
	Leakage current (mA)*2		0.38	0.41
Output Power	Phase Voltage		3 Ø/AC 480 Vrms max.	
	Max. Rated Power (W)		5 k	7.5 k
	Peak Current (Arms)		42	85
	Rated Current (Arms)		16	27.4
Power Loss Data (W)			< 250	< 525
PWM Modulation Frequency			8 kHz	
Dynamic Brake			• Built-in dynamic brake function • No built-in dynamic brake resistor*1 • Delay time of relay: 20 ms	
Lowest Value allowed for External Dynamic Brake Resistor			10 Ohm	
Regenerative Energy Protection	Regenerative Resistor		• 5 kW: With built-in regenerative resistor. Connect to external regenerative resistor to increase regenerative capacity. • 7.5 kW: Without built-in regenerative resistor. Connect to external regenerative resistor if needed.	
	Built-in Regenerative Resistor		27 Ohm /180 W	-
	DC Link Capacitance [uF]		560	840
	AC 380 V	Protection of Regenerative Resistor Enabled	+HV > 620 Vdc	
		Protection of Regenerative Resistor Disabled	+HV < 600 Vdc	
	AC 480 V	Protection of Regenerative Resistor Enabled	+HV > 770 Vdc	
		Protection of Regenerative Resistor Disabled	+HV < 755 Vdc	
	Overvoltage Protection		800 Vdc	
Environment	Operating Temperature		0~40 °C	
Weight (kg)			4.0	5.3

Note: *1.When using a 400 V servo drive in high-speed motion applications, it is recommended to install a suitable dynamic brake resistor, refer to section 5.4.4.2 in "E1 Series Servo Drive User Manual."
*2.These are the leakage current values without using power supply filter, and the values may be different based on the applicational environment.

110 V / 220 V / 400 V General specification

Category				Servo Drive Specification
Cooling Method				Fan cooling
Control Method				IGBT PWM space vector control
Applicable Motor				AC/DM/LM (Depending on encoder type, Excellent Smart Cube (ESC) may be required.)
STAT LED Indicator				• Blinking red: Error • Blinking green: Ready • Green: Enabled • There is no STAT LED indicator on Fieldbus servo drive.
CHARGE LED Indicator				• Red: The main power is supplied. • No light: The main power is not supplied.
Analog Output				• Channel: 2 • Resolution: 12 bit • Output voltage range: ±10 V • Accuracy: ±2% • Max. output current: ± 10 mA
Control Function	Position Mode	Command Source		Pulse command from controller
		Signal Type		• Pulse/Direction • CW/CCW • AqB
		Isolated Circuit		High-speed optical coupler
		Input Signal		Differential input (high level is higher than 2.85 V, low level is lower than 0.85 V) or single-ended input (12~24 VDC)
		Max. Input Bandwidth		• Differential: 5 Mpps • Single-ended: 200 Kpps
		Electronic Gear		Gear ratio: pulses/counts Pulses: 1~1,073,741,824 Counts: 1~1,073,741,824
	Velocity Mode	Command Source		DC voltage command from controller
		Analog Input	Impedance	14 kOhm
			Signal Format	±10 Vdc
			Max. Input Bandwidth	100 Hz
			Specification	16 bit A/D input (V-REF+/-)
	Torque Mode	Command Source		DC voltage command from controller
		Analog Input	Impedance	14 kOhm
			Signal Format	±10 Vdc
			Max. Input Bandwidth	100 Hz
			Specification	16 bit A/D input (T-REF+/-)
Control Mode				• Position mode • Velocity mode • Torque mode • Full-closed loop mode (Dual loop mode)
Computer Communication		Standard USB2.0 (Mini USB type)		Connect the servo drive with your computer to set parameters, monitor physical quantities and execute trial operation via software Thunder

Category				Servo Drive Specification
Encoder	Power Supply			+5.1 Vdc ±5%, 700 mA
	Signal Format			• Serial signal Resolution: 23 bit (Single-turn/multi-turn absolute encoder) Bandwidth: 5 MHz • Incremental signal (Digital differential TTL signal) AqB and Z-phase signals Quadruple frequency, 20 Mcounts/s
	Safety Function			• Encoder power malfunction detection • Short circuit protection • Undervoltage protection • Overvoltage protection • Encoder alarm protection (Digital differential TTL signal)
	Position Counting Range			-2,147,483,648~2,147,483,647 (32 bit)
	Linear Motor/Direct Drive Motor			Depending on encoder type, Excellent Smart Cube (ESC) may be required.
Encoder Output	Emulated Encoder Output	Z Phase		• Serial encoder and incremental encoder (AqB, sin/cos) are supported. • The width of output signal can be adjusted by parameter. • Digital differential signal output • Z-phase open collector output is supported. • Two output methods can be selected. - Outputs one Z-phase signal per one revolution. - Only outputs one Z-phase signal for total travel distance. • Fieldbus servo drive does not support Z phase output.
		A/B Phase		• Serial encoder and digital encoder (AqB) are supported. • Differential signal output. The max. output bandwidth is 18 Mcounts/s. • The scaling of output can be adjusted. For instance, ten encoder counts = one emulated encoder count. • Fieldbus servo drive is only supported by firmware version 2.8.16 (included) or above.
	Buffered Encoder Output	Z Phase		• Only supports digital encoder (AqB). • Differential signal output. • Supports Z phase open-collector output.
		A/B Phase		• Only supports digital encoders (AqB). • Differential signal output, max. output bandwidth 20 Mcounts/s.
General-purpose I/O	Input			• The functions of general-purpose inputs (Optical couplers) can be defined by users. • E1 series servo drive provides ten general-purpose inputs (I1 to I10). Fieldbus servo drive only provides eight general-purpose inputs (I1 to I8) 24 V/5 mA (Each input pin)
	Output			• The functions of general-purpose outputs (Optical couplers) can be defined by users. • E1 series servo drive provides five general-purpose outputs (O1 to O5) 24 V/0.1 A (Each output pin)
	Position Trigger (PT)			• The pins for position trigger (PT) output function are CN6-46 and 47 (Differential signal). • Differential 3.3 V, max. current 20 mA.
Optional Function				Gantry synchronization control function
Environment	Storage Temperature			-20 °C~65 °C
	Humidity			Operating and storage temperature: 20 to 85% RH (Non-condensing)
	Altitude			Approved for use at 1,000 M or lower height above sea level (1000~3000M is acceptable when derated value is applied. Please refer to section 4.5 in "E1 Series Servo Drive User Manual")
	Vibration			Less than 0.5 G Frequency 10 to 500 Hz (No continuous use under resonance frequency)
	IP Rating			IP20
	Cleanliness			• No corrosive materials and flammable gas. • No water, oil and chemical agent splash. • Environment with less soil, dust, salt and iron powder.

MEMO

HIMC3 & E Series Servo Drive Technical Information

Publication Date：August 2024, first edition
June 2025, 2nd edition

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