

R88D-KN□□□-ECT-L

# Accurax G5 linear drive

**Accurate motion control in a compact size servo drive family. EtherCAT and safety built-in.**

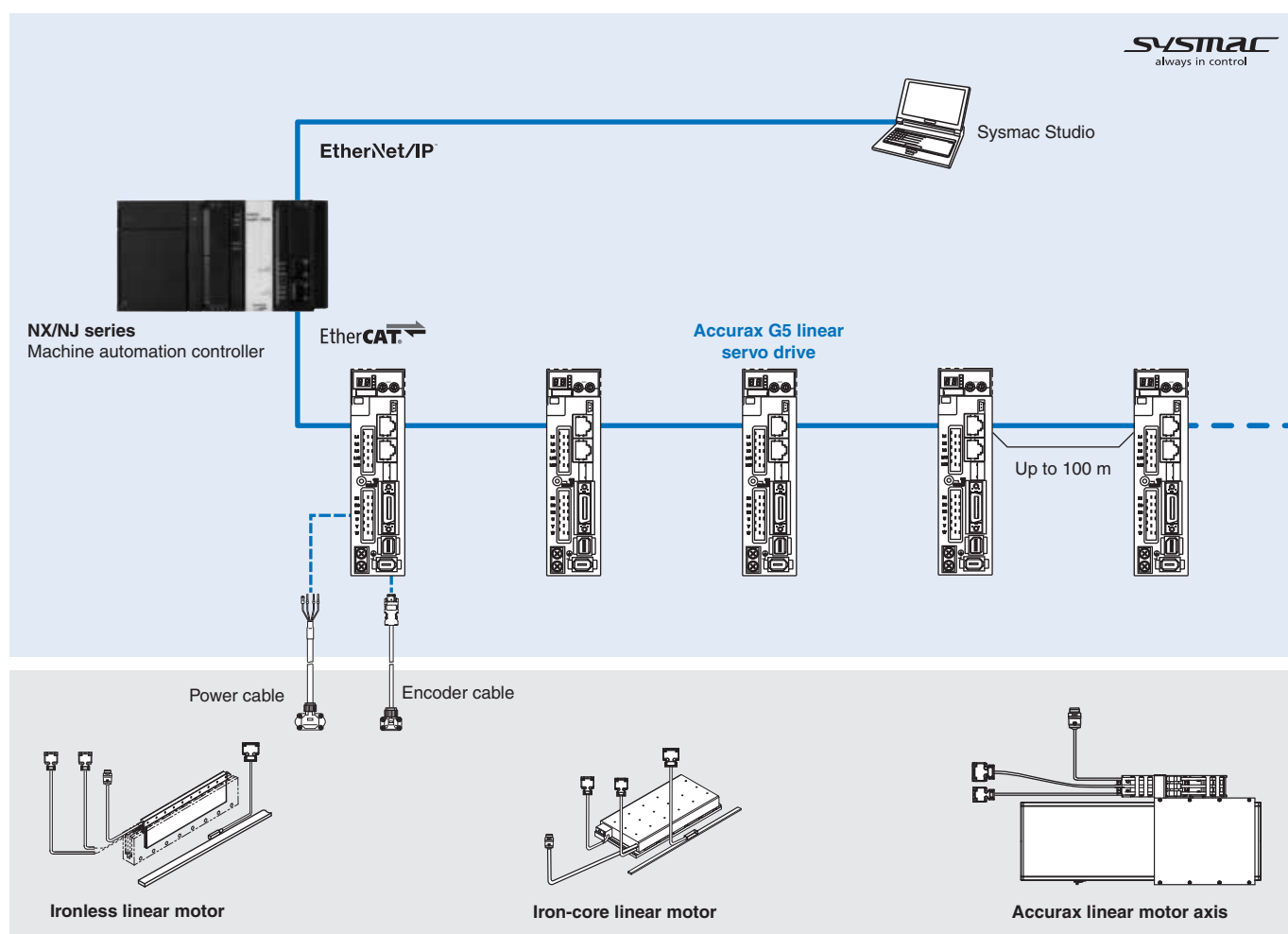
- Ironless and iron-core motor types
- Safety conforming ISO13849-1 PL-d
- High-response frequency of 2 kHz
- High resolution serial encoder for greater accuracy provided by 20 bits encoder
- Real time auto-tuning
- Advanced tuning algorithms (Anti-vibration function, torque feedforward, disturbance observer)

## Ratings




- Iron-core motors - 48 to 760 N (2000 N peak force)
- Ironless motors - 29 to 423 N (2100 N peak force)



## System configuration

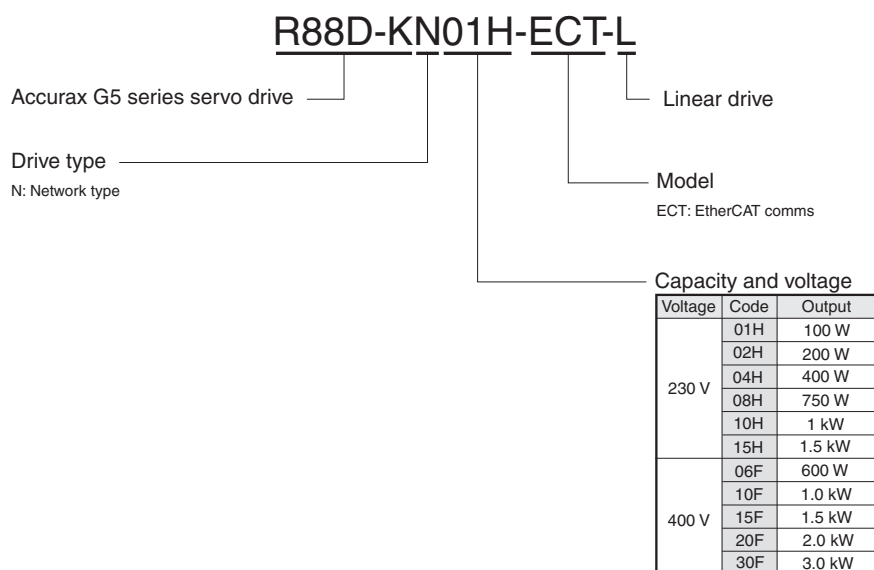


## Servo motor supported

Linear servo motor				Accurax G5 linear drive EtherCAT model		
Type	Rated force	Peak force	Model		230V	400V
Linear motor coil						
R88L-EC-FW-□ Iron-core motors  230 V/400 V	48 N	105 N	Coil without connectors	R88L-EC-FW-0303-ANPC	R88D-KN02H-ECT-L	R88D-KN06F-ECT-L
	96 N	210 N		R88L-EC-FW-0306-ANPC	R88D-KN04H-ECT-L	R88D-KN10F-ECT-L
	160 N	400 N		R88L-EC-FW-0606-ANPC	R88D-KN08H-ECT-L	R88D-KN15F-ECT-L
	240 N	600 N		R88L-EC-FW-0609-ANPC	R88D-KN10H-ECT-L	R88D-KN20F-ECT-L
	320 N	800 N		R88L-EC-FW-0612-ANPC	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L
	608 N	1600 N		R88L-EC-FW-1112-ANPC	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L
	760 N	2000 N		R88L-EC-FW-1115-ANPC	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L
	48 N	105 N	Coil with connectors	R88L-EC-FW-0303-APLC	R88D-KN02H-ECT-L	R88D-KN06F-ECT-L
	96 N	210 N		R88L-EC-FW-0306-APLC	R88D-KN04H-ECT-L	R88D-KN10F-ECT-L
	160 N	400 N		R88L-EC-FW-0606-APLC	R88D-KN08H-ECT-L	R88D-KN15F-ECT-L
	240 N	600 N		R88L-EC-FW-0609-APLC	R88D-KN10H-ECT-L	R88D-KN20F-ECT-L
	320 N	800 N		R88L-EC-FW-0612-APLC	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L
	608 N	1600 N		R88L-EC-FW-1112-APLC	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L
	760 N	2000 N		R88L-EC-FW-1115-APLC	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L
R88L-EC-GW-□ Ironless motors  230 V	29 N	100 N	Coil without connectors	R88L-EC-GW-0303-ANPS	R88D-KN02H-ECT-L	—
	58 N	200 N		R88L-EC-GW-0306-ANPS	R88D-KN08H-ECT-L	—
	87 N	300 N		R88L-EC-GW-0309-ANPS	R88D-KN10H-ECT-L	—
	70 N	240 N		R88L-EC-GW-0503-ANPS	R88D-KN02H-ECT-L	—
	140 N	480 N		R88L-EC-GW-0506-ANPS	R88D-KN04H-ECT-L	—
	210 N	720 N		R88L-EC-GW-0509-ANPS	R88D-KN08H-ECT-L	—
	141 N	700 N		R88L-EC-GW-0703-ANPS	R88D-KN04H-ECT-L	—
	282 N	1400 N		R88L-EC-GW-0706-ANPS	R88D-KN08H-ECT-L	—
	423 N	2100 N	R88L-EC-GW-0709-ANPS	R88D-KN10H-ECT-L	—	
	29 N	100 N	Coil with connectors	R88L-EC-GW-0303-APLS	R88D-KN02H-ECT-L	—
	58 N	200 N		R88L-EC-GW-0306-APLS	R88D-KN08H-ECT-L	—
	87 N	300 N		R88L-EC-GW-0309-APLS	R88D-KN10H-ECT-L	—
	70 N	240 N		R88L-EC-GW-0503-APLS	R88D-KN02H-ECT-L	—
	140 N	480 N		R88L-EC-GW-0506-APLS	R88D-KN04H-ECT-L	—
	210 N	720 N		R88L-EC-GW-0509-APLS	R88D-KN08H-ECT-L	—
	141 N	700 N		R88L-EC-GW-0703-APLS	R88D-KN04H-ECT-L	—
	282 N	1400 N		R88L-EC-GW-0706-APLS	R88D-KN08H-ECT-L	—
	423 N	2100 N	R88L-EC-GW-0709-APLS	R88D-KN10H-ECT-L	—	
Accurax linear motor axis						
R88L-EA-AF-□ Linear motor axis 	48 N	105 N	R88L-EA-AF-0303-□	R88D-KN02H-ECT-L	R88D-KN06F-ECT-L	
	96 N	210 N	R88L-EA-AF-0306-□	R88D-KN04H-ECT-L	R88D-KN10F-ECT-L	
	160 N	400 N	R88L-EA-AF-0606-□	R88D-KN08H-ECT-L	R88D-KN15F-ECT-L	
	240 N	600 N	R88L-EA-AF-0609-□	R88D-KN10H-ECT-L	R88D-KN20F-ECT-L	
	320 N	800 N	R88L-EA-AF-0612-□	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L	
	608 N	1600 N	R88L-EA-AF-1112-□	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L	
	760 N	2000 N	R88L-EA-AF-1115-□	R88D-KN15H-ECT-L	R88D-KN30F-ECT-L	

## Type designation

### Servo drive



## Servo drive specifications

### Single-phase, 230 V

Linear servo drive type			R88D-KN	02H-ECT-L	04H-ECT-L	08H-ECT-L	10H-ECT-L	15H-ECT-L	
Applicable linear servo motor			R88L-EC-	FW-0303	FW-0306	FW-0606	FW-0609	FW-0612	
				GW-0303	GW-0506	GW-0306	GW-0309	FW-1112	
				GW-0503	GW-0703	GW-0509	GW-0709	FW-1115	
				—	—	GW-0706	—	—	
Basic specifications	Power		W	200	400	750	1000	1500	
	Continuous output current		Arms	1.6	2.6	4.1	5.9	9.4	
	Max. output current		Arms	4.8	7.8	12.3	16.9	28.2	
	Input power		Main circuit	Single-phase/3-phase, 200 to 240 VAC +10% to −15% (50/60 Hz)					
	Supply		Control circuit	Single-phase, 200 to 240 VAC +10% to −15% (50/60 Hz)					
	Control method			IGBT-driven PWM method, sinusoidal drive					
	Feedback			Serial encoder (incremental/absolute value)					
	Conditions	Usage/storage temperature			0 to 55°C/−20 to 65°C				
		Usage/storage humidity			90% RH or less (non-condensing)				
		Altitude			1000 m or less above sea level				
		Vibration/shock resistance (max.)			5.88 m/s <sup>2</sup> 10 to 60 Hz (Continuous operation at resonance point is not allowed)/19.6 m/s <sup>2</sup>				
	Configuration			Base mounted					
	Approx. weight		kg	0.8	1.1	1.6	1.8		

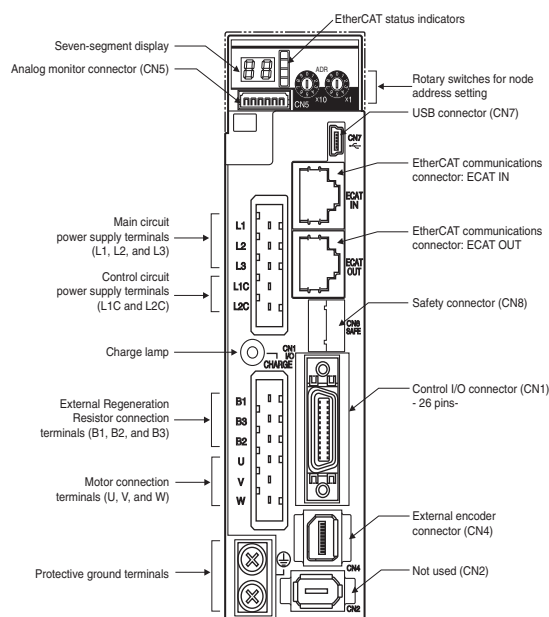
### Three-phase, 400 V

Linear servo drive type		R88D-KN	06F-ECT-L	10F-ECT-L	15F-ECT-L	20F-ECT-L	30F-ECT-L		
Applicable linear servo motor		R88L-EC-	FW-0303	FW-0306	FW-0606	FW-0609	FW-0612		
			—	—	—	—	FW-1112		
			—	—	—	—	FW-1115		
Basic specifications	Power		kW	0.6	1	1.5	2	3	
	Continuous output current		Arms	1.5	2.9	4.7	6.7	9.4	
	Max. output current		Arms	6.4	8.7	14.1	19.7	28.2	
	Input power	Main circuit	3-phase, 380 to 480 VAC +10 to −15% (50/60Hz)						
	Supply	Control circuit	24 VDC ±15%						
	Control method		IGBT-driven PWM method, sinusoidal drive						
	Feedback	Serial encoder	Incremental or absolute encoder						
	Conditions	Usage/storage temperature		0 to 55°C/−20 to 65°C					
		Usage/storage humidity		90% RH or less (non-condensing)					
		Altitude		1000 m or less above sea level					
		Vibration/shock resistance (max.)		5.88 m/s <sup>2</sup> 10 to 60 Hz (Continuous operation at resonance point is not allowed)/19.6 m/s <sup>2</sup>					
	Configuration		Base mounted						
	Approx. weight		kg	1.9			2.7	4.7	

## General specifications

Performance		Frequency characteristics	2 kHz
EtherCAT interface	Command input		EtherCAT commands (for sequence, motion, data setting/reference, monitor, adjustment, and other commands).
	CiA402 Drive profile		Cyclic synchronous position mode Cyclic synchronous velocity mode Cyclic synchronous torque mode Touch probe function Torque limit function Homing mode
I/O signal	Sequence input signal		- Multi-function input × 8 by parameter setting (forward/reverse drive prohibition, emergency stop, external latch, origin proximity, forward/reverse torque limit, general purpose monitor inputs).
	Sequence output signal		1 × servo drive error output 2 × multi-function outputs by parameters setting (servo ready, brake release, speed limit detection, force limit detection, zero speed detection, warning output, position completion, error clear attributed, remote output, speed detection, position command status, speed command status)
Integrated functions	USB communications	Interface	Personal computer/Connector mini-USB
		Communications standard	Compliant with USB 2.0 standard
		Function	Parameter setting and status monitoring
	EtherCAT communications	Communications protocol	IEC 61158 Type 12, IEC 61800-7
		Physical layer	100BASE-TX (IEEE802.3)
		Connectors	RJ45 × 2 ECAT IN: EtherCAT input × 1 ECAT OUT: EtherCAT output × 1
		Communications media	Category 5 or higher (cable with double, aluminium tape and braided shielding is recommended)
		Communications distance	Distance between nodes: 100 m max.
		LED indicators	RUN × 1 ERR × 1 L/A IN (Link/Activity IN) × 1 L/A OUT (Link/activity OUT) × 1
	Automatic load inertia detection		Automatic motor parameter setting. One parameter rigidity setting.
	Dynamic brake (DB)		Built-in. Operates during main power OFF, servo alarm, servo OFF or overtravel.
	Regenerative processing		Internal resistor included in models from 600 W to 5 kW. Regenerative resistor externally mounted (option).
	Overtravel (OT) prevention function		DB stop, deceleration stop or coast to stop during P-OT, N-OT operation
	Encoder divider function		Optional division possible
	Protective functions		Overcurrent, overvoltage, undervoltage, overspeed, overload, encoder error, overheat...
	Analog monitor functions for supervision		Analog monitor of motor speed, speed reference, torque reference, command following error, analog input ... The monitoring signals to output and their scaling can be specified with parameters. Number of channels: 2 (Output voltage: ±10 VDC)
	Panel operator	Display functions	2 × digit 7-segment LED display shows the drive status, alarm codes, parameters...
		Switches	2 × rotary switches for setting the node address
CHARGE lamp		Lits when the main circuit power supply is turned ON.	
Safety terminal	Functions	Safety Torque OFF function to cut off the motor current and stop the motor. Output signal for failure monitoring function.	
	Conformed standards	EN ISO13849-1:2008 (PL- d, Performance Level d), IEC61800-5 -2:2007 (function STO, Safe Torque OFF), EN61508:2001 (Safety Integrity Level 2, SIL2), EN954-1:1996 (CAT3).	
External encoder feedback		Serial signal and line-driver A-B-Z encoder	

## Servo drive part names



**Note:** The above picture shows 230 V servo drives models only. The 400 V servo drives have 24 VDC power input terminals for control circuit instead of L1C and L2C terminals.

## I/O specifications

### Terminals specifications

Symbol	Name	Function
L1	Main power supply input terminal	AC power input terminals for the main circuit
L2		
L3		
L1C	Control power supply input terminal	AC power input terminals for the control circuit (for 200V single/three-phase servo drives only).
L2C		
24 V		DC power input terminals for the control circuit (for 400V three-phase servo drives only).
0 V		
B1	External regeneration resistor connection terminals	Servo drives below 750 W: no internal resistor is connected. Leave B2 and B3 open. Connect an external regenerative resistor between B1 and B2.
B2		
B3		Servo drives from 750 W to 5 kW: short-circuit in B2 and B3 for internal regenerative resistor. If the internal regenerative resistor is insufficient, connect an external regenerative resistor between B1 and B2 and remove the wire between B2 and B3.
U	Servo motor connection terminals	Terminals for outputs to the servomotor.
V		
W		

### I/O signals (CN1) - Input signals

Pin No.	Signal name	Function
6	I-COM	± pole of external DC power. The power must use 12 V to 24 V (±5%)
5	E-STOP	Emergency stop
7	P-OT	Forward run prohibited
8	N-OT	Reverse run prohibited
9	DEC	Origin proximity
10	EXT3	External latch input 3
11	EXT2	External latch input 2
12	EXT1	External latch input 1
13	SI-MON0	General purpose monitor input 0
14	—	Terminals not used. Do not connect.
15	—	
17	—	
18	—	
19	—	
20	—	
21	—	
22	—	
23	—	
24	—	
—	PCL	Forward force limit
	NCL	Reverse force limit
	SI-MON1	General-purpose monitor input 1
	SI-MON2	General-purpose monitor input 2
Shell	FG	Shield ground. Connected to frame ground if the shield wire of the I/O signal cable is connected to the connector shell.
16	GND	Signal ground. It is insulated with power supply (I-COM) for the control signal in the servo drive.

### I/O signals (CN1) - Output signals

Pin No.	Signal name	Function
1	BRK-OFF+	External brake release signal
2	BRK-OFF	
25	S-RDY+	Servo ready: ON when there is no servo alarm and control/main circuit power supply is ON
26	S-RDY-	
3	ALM+	Servo alarm: Turns OFF when an error is detected
4	ALM-	
—	INP1	Position complete output 1
	TGON	Motor speed detection
	F_LIMIT	Force limit detection
	ZSP	Zero speed
	VCMP	Speed conformity output
	WARN1	Warning 1
	WARN2	Warning 2
	PCMD	Position command status
	INP2	Position complete output 2
	VLIMIT	Speed limit detection
	ALM-ATB	Error clear attribute
	VCMD	Speed command status
	R-OUT1	Remote output 1
	R-OUT2	Remote output 1

## External encoder connector (CN4)

Pin No.	Signal name	Function
1	E5V	External scale power supply output. Use at 5.2 V $\pm$ 5% and at or below 250 mA.
2	E0V	This is connected to the control circuit ground connected to connector CN1.
3	PS	External scale signal I/O (serial signal).
4	/PS	
5	EXA	External scale signal input (Phase A, B, and Z signals). Performs the input and output of phase A, B and Z signals.
6	/EXA	
7	EXB	
8	/EXB	
9	EXZ	
10	/EXZ	
Shell	FG	Shield ground

## Monitor connector (CN5)

Pin No.	Signal name	Function
1	AM1	Analog monitor output 1. Outputs the analog signal for the monitor. Use the parameters setting to select the output to monitor. Default setting: Motor rotation speed 1 V/(500 mm/s).
2	AM2	Analog monitor output 2. Outputs the analog signal for the monitor. Use the parameters setting to select the output to monitor. Default setting: Motor rotation speed 1 V/(33% of nominal force).
3	GND	Ground for analog monitors 1,2.
4	—	Terminals not used. Do not connect.
5	—	
6	—	

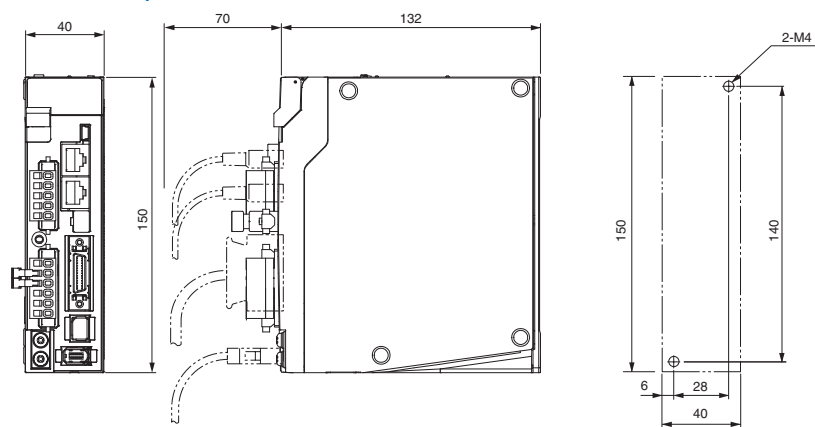
## Safety connector (CN8)

Pin No.	Signal name	Function
1	—	Not used. Do not connect.
2	—	
3	SF1—	Safety input 1 & 2. This input turns OFF the power transistor drive signals in the servo drive to cut off the current output to the motor.
4	SF1+	
5	SF2—	
6	SF2+	
7	EDM—	A monitor signal is output to detect a safety function failure.
8	EDM+	
Shell	FG	Frame ground.

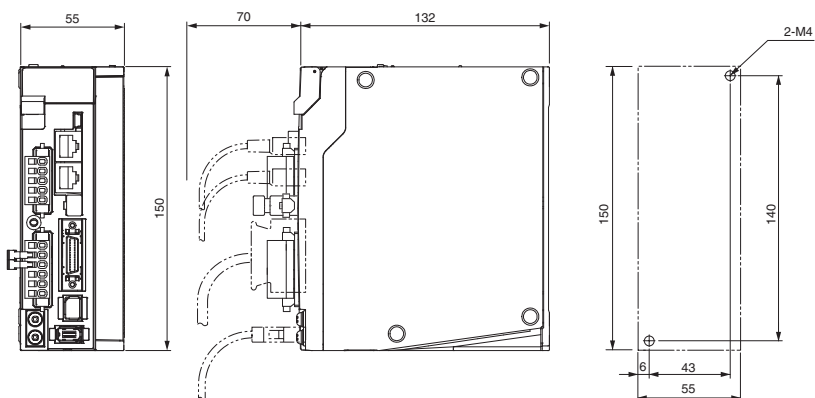
# Dimensions

## Servo drives

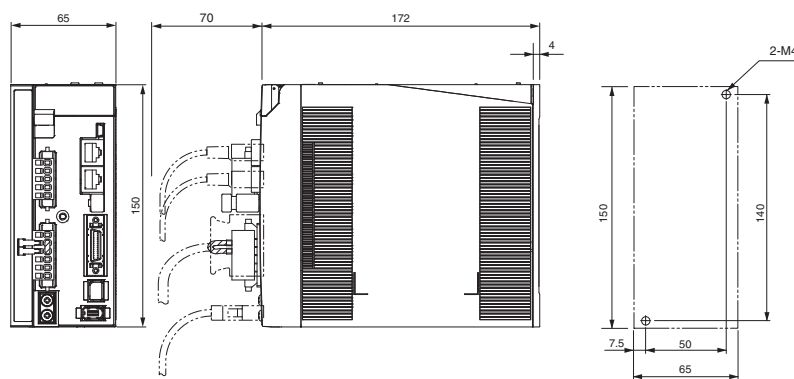
### R88D-KN02H-ECT-L (230 V, 200 W)



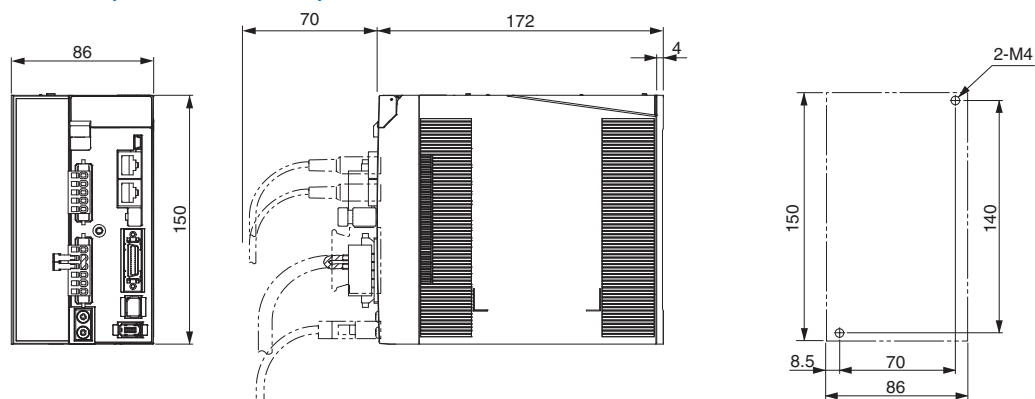
### R88D-KN04H-ECT-L (230 V, 400 W)



### R88D-KN08H-ECT-L (230 V, 800 W)



### R88D-KN10H/15H-ECT-L (230 V, 1 to 1.5 kW)

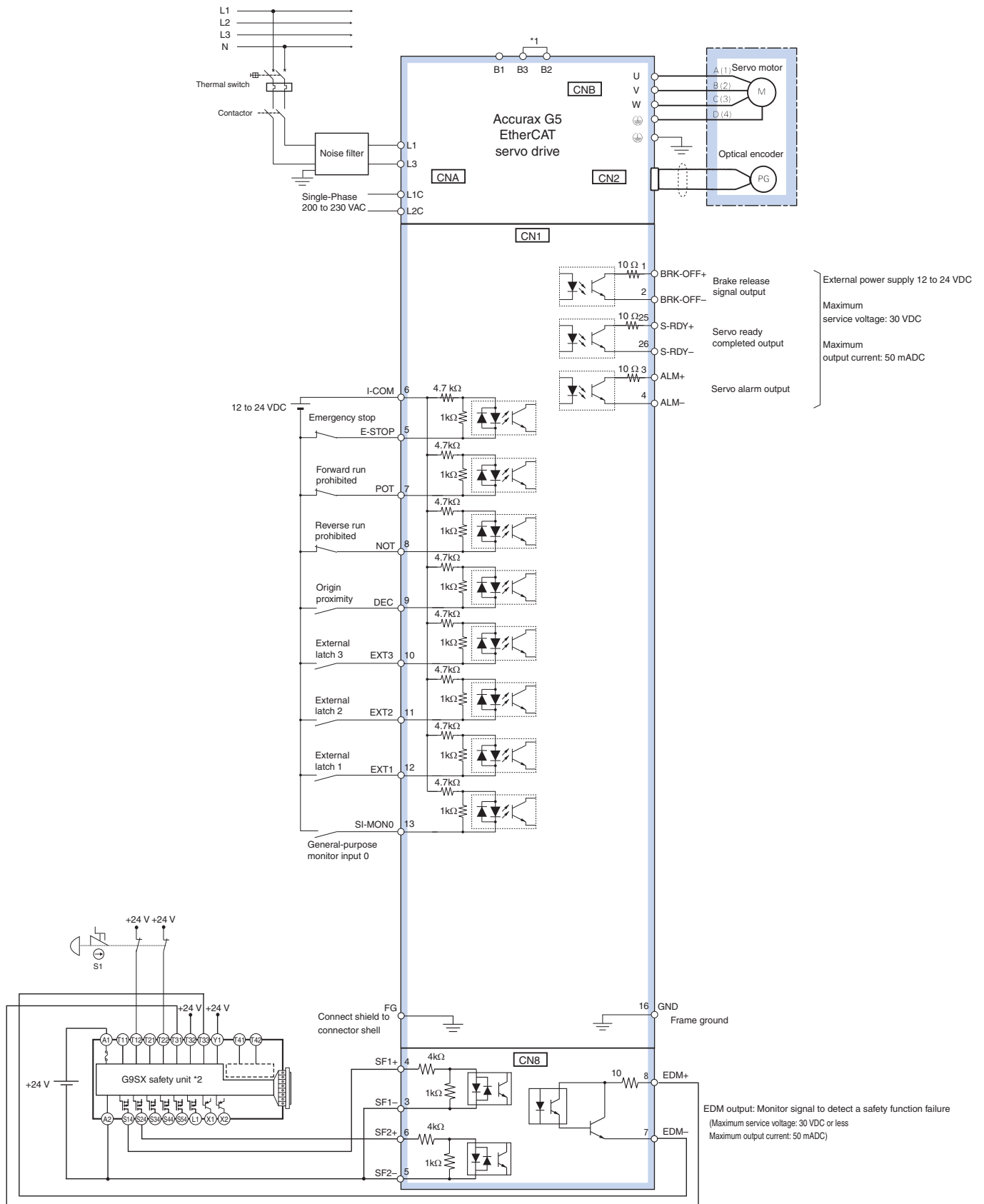






# Installation

## Single-phase, 230 VAC

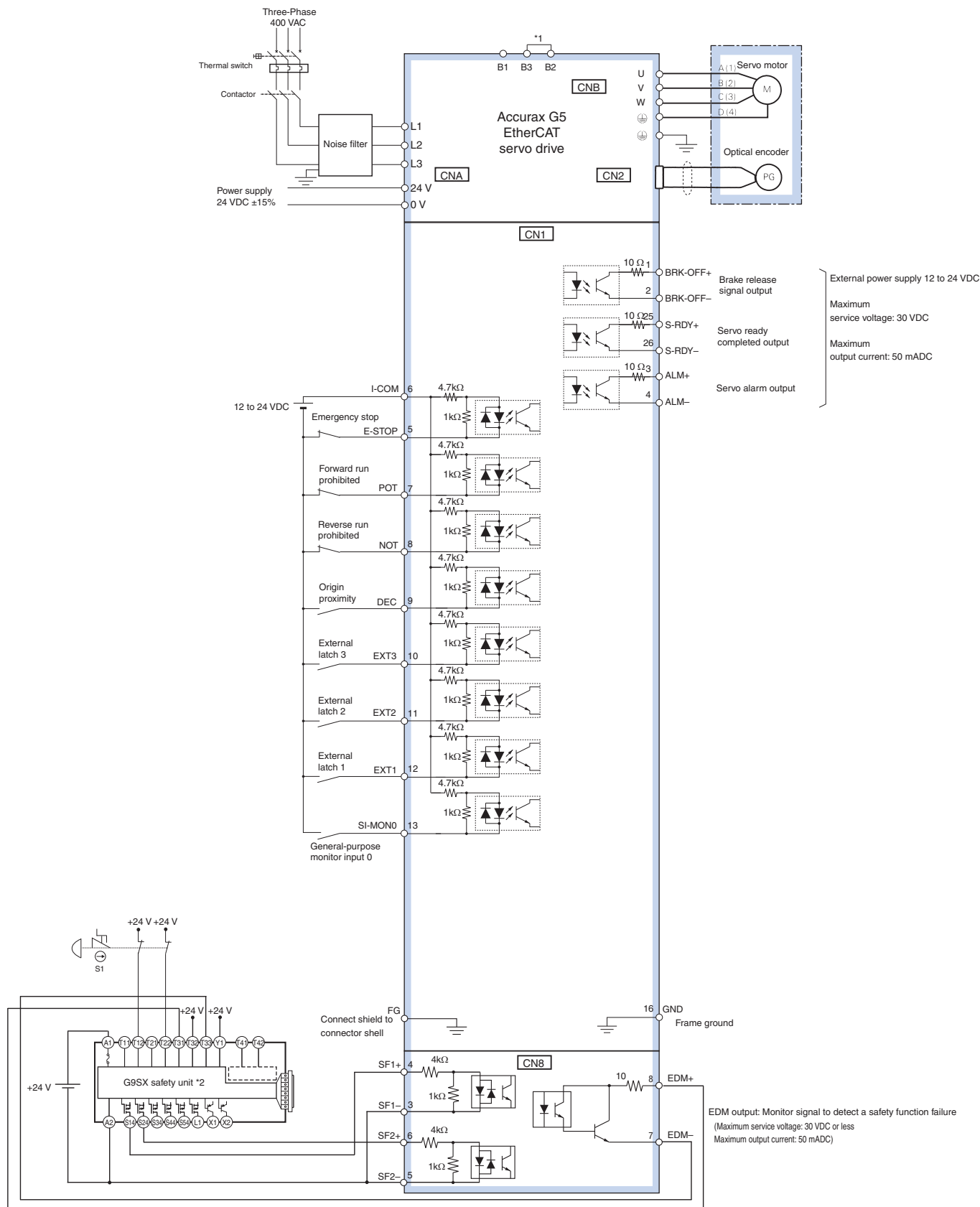


\*1 For servo drives from 750 W, B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an external regenerative resistor between B1 and B2.

\*2 Wiring diagram example using the G9SX safety unit. If a safety unit is not used, keep the factory safety bypass connector installed in the CN8.

**Note:** The input function of pins 5 and 7 to 13, and output function of pins 1, 2, 25 and 26, can be changed via parameter settings.

## Three-phase, 400 VAC



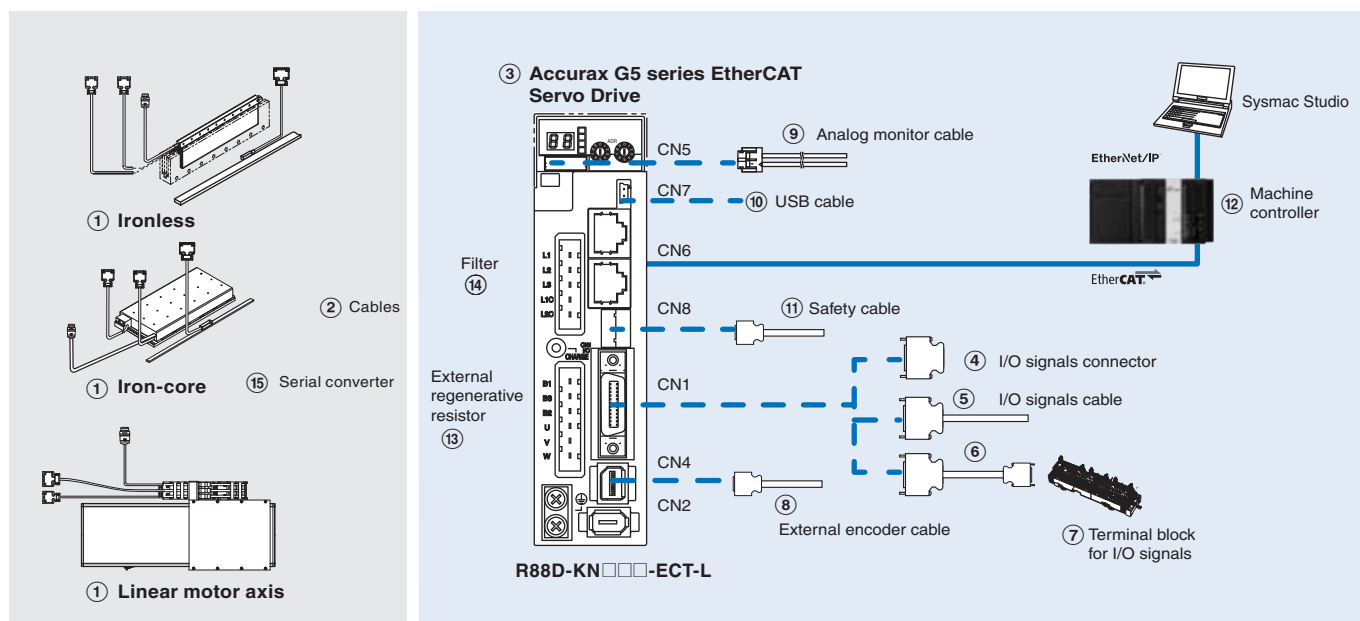
\*1 Normally B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an external regenerative resistor between B1 and B2.

\*2 Wiring diagram example using the G9SX safety unit. If a safety unit is not used, keep the factory safety bypass connector installed in the CN8.

**Note:** The input function of pins 5 and 7 to 13, and output function of pins 1, 2, 25 and 26, can be changed via parameter settings.

# Ordering information

## Accurax G5 series EtherCAT reference configuration



**Note:** The symbols ①②③④⑤... show the recommended sequence to select the components in Accurax G5 servo system

### Servo motors, power & encoder cables

**Note:** ①② Refer to the Accurax linear motor chapter for linear motor, cables or connectors selection

### Servo drives

Symbol	Specifications	Servo drive models	① Compatible Accurax G5 Linear motors		
			Iron-core motors	Ironless motors	Linear motor axis
③	1 phase 230 VAC	R88D-KN02H-ECT-L	R88L-EC-FW-0303-□	R88L-EC-GW-0303-□ R88L-EC-GW-0503-□	R88L-EA-AF-0303-□
		R88D-KN04H-ECT-L	R88L-EC-FW-0306-□	R88L-EC-GW-0506-□ R88L-EC-GW-0703-□	R88L-EA-AF-0306-□
		R88D-KN08H-ECT-L	R88L-EC-FW-0606-□	R88L-EC-GW-0306-□ R88L-EC-GW-0509-□ R88L-EC-GW-0706-□	R88L-EA-AF-0606-□
		R88D-KN10H-ECT-L	R88L-EC-FW-0609-□	R88L-EC-GW-0309-□ R88L-EC-FW-0709-□	R88L-EA-AF-0609-□
		R88D-KN15H-ECT-L	R88L-EC-FW-0612-□	-	R88L-EA-AF-0612-□
			R88L-EC-FW-1112-□ R88L-EC-FW-1115-□		R88L-EA-AF-1112-□ R88L-EA-AF-1115-□
	3 phase 400 VAC	R88D-KN06F-ECT-L	R88L-EC-FW-0303-□	-	R88L-EA-AF-0303-□
		R88D-KN10F-ECT-L	R88L-EC-FW-0306-□	-	R88L-EA-AF-0306-□
		R88D-KN15F-ECT-L	R88L-EC-FW-0606-□	-	R88L-EA-AF-0606-□
		R88D-KN20F-ECT-L	R88L-EC-FW-0609-□	-	R88L-EA-AF-0609-□
		R88D-KN30F-ECT-L	R88L-EC-FW-0612-□	-	R88L-EA-AF-0612-□
			R88L-EC-FW-1112-□ R88L-EC-FW-1115-□		R88L-EA-AF-1112-□ R88L-EA-AF-1115-□

### Signals cables for I/O general purpose (CN1)

Symbol	Description	Connect to	Model
④	I/O connector kit (26 pins)	For I/O general purpose	- R88A-CN01C
⑤	I/O signals cable	For I/O general purpose	1 m R88A-CPKB001S-E 2 m R88A-CPKB002S-E
⑥	Terminal block cable	For I/O general purpose	1 m XW2Z-100J-B34 2 m XW2Z-200J-B34
⑦	Terminal block (M3 screw and for pin terminals)		- XW2B-20G4
	Terminal block (M3.5 screw and for fork/round terminals)		- XW2B-20G5
	Terminal block (M3 screw and for fork/round terminals)		- XW2D-20G6

## External encoder cable (CN4)

Symbol	Name		Model
⑧	External encoder cable	5 m	R88A-CRKM005SR-E
		10 m	R88A-CRKM010SR-E
		20 m	R88A-CRKM020SR-E

## Analog monitor (CN5)

Symbol	Name		Model
⑨	Analog monitor cable	1 m	R88A-CMK001S

## USB personal computer cable (CN7)

Symbol	Name		Model
⑩	USB mini-connector cable	2 m	AX-CUSBM002-E

## Cable for safety (CN8)

Symbol	Name		Model
⑪	Safety cable	3 m	R88A-CSK003S-E

## Machine controller

Symbol	Name		Model
⑫	IPC machine controller	Industrial box PC type	NY512-□
		Industrial panel PC type	NY532-□
	NX7 series	CPU unit	NX701-□
		Power supply unit	NX-PA9001 (220 VAC) NX-PD7001 (24 VDC)
	NJ series	CPU unit	NJ501-□
			NJ301-□
			NJ101-□
		Power supply unit	NJ-PA3001 (220 VAC) NJ-PD3001 (24 VDC)
	NX1 series	CPU unit	NX1P2-□

## External regenerative resistor

Symbol	Regenerative resistor unit model	Specifications
⑬	R88A-RR08050S	50 Ω, 80 W
	R88A-RR080100S	100 Ω, 80 W
	R88A-RR22047S	47 Ω, 220 W
	R88A-RR50020S	20 Ω, 500 W

## Filters

Symbol	Applicable servodrive	Filter model	Manufacturer	Rated current	Leakage current	Rated voltage
⑭	R88D-KN02H-ECT-L	R88A-FIK102-RE	Rasmi Electronics Ltd.	2.4 A	3.5 mA	250 VAC single-phase
	R88D-KN04H-ECT-L	R88A-FIK104-RE		4.1 A	3.5 mA	
	R88D-KN08H-ECT-L	R88A-FIK107-RE		6.6 A	3.5 mA	
	R88D-KN10H-ECT-L, R88D-KN15H-ECT-L	R88A-FIK114-RE		14.2 A	3.5 mA	
	R88D-KN06F-ECT-L, R88D-KN10F-ECT-L, R88D-KN15F-ECT-L	R88A-FIK304-RE		4 A	0.3 mA/32 mA <sup>*1</sup>	400 VAC three-phase
	R88D-KN20F-ECT-L	R88A-FIK306-RE		6 A	0.3 mA/32 mA <sup>*1</sup>	
	R88D-KN30F-ECT-L	R88A-FIK312-RE		12.1 A	0.3 mA/32 mA <sup>*1</sup>	

<sup>\*1</sup> Momentary peak leakage current for the filter at switch-on/off.

## Connectors

Specifications	Model
External encoder connector (for CN4)	R88A-CNK41L
Safety I/O signal connector (for CN8)	R88A-CNK81S

## Computer software

Specifications	Model
Sysmac Studio version 1.0 or higher	SYSMAC-SE2□□□
CX-Drive version 2.60 or higher	CX-DRIVE 2.60

**Note:** If CX-One is installed on the same computer as Sysmac Studio, it must be CX-One v4.2 or higher

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.  
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.