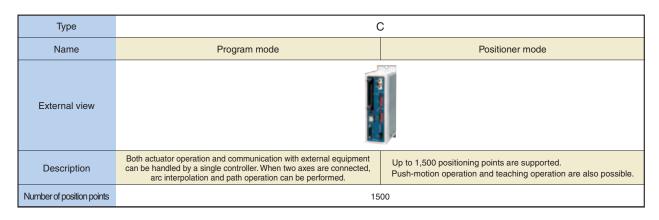
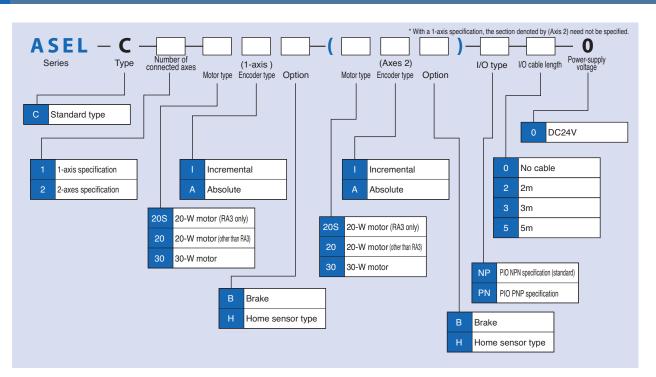


Type List

Program controller capable of operating RCA series actuator. Various control functions are combined into a single unit.



Model



Controller -Integrated Type

Slider Type

Rod

Arm / Fla Type

Gripper / Rotary Typ

h Cleanr /pe Typ

ntroller Spla

Controller Models

Gateway unit

2 PS-2

PCON

SCON

SE

SSEL

ASEL 346

Refer to p. 354 for a replacement cable.

Slider Type

Rod

Arm / Flat Type

Gripper/ Rotary Type

Cleanro e Type

ntroller Spl

Controller Models

PS-24

ERC2

ACON

ᆸ

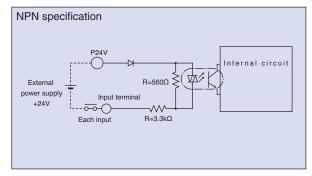
ASEL

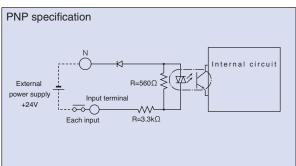
SSEL

I/O Specifications

■Input Part External input specifications

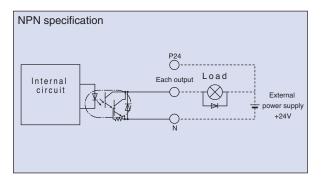
Item	Specification
Input voltage	DC24V ± 10%
Input current	7mA/1circuit
ON/OFF voltage	ON voltage (Min.) NPN:DC16V/PNP:DC8V
ON/OFF voltage	OFF voltage (Max.) NPN:DC5V/PNP:DC19V
Insulation method	Photocoupler

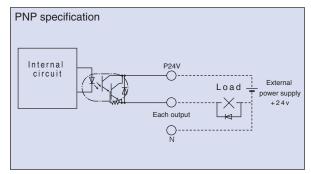




Output Part External output specifications.

Item	Specification
Load voltage	DC24V
Max. load current	1mA/point 400mA/8point total
Leak current	Max. 0.1mA/1point
Insulation method	Photocoupler





Explanation of I/O Functions

The ASEL controller lets you select either the "program mode" in which the actuator is operated by programs input to the controller, or the "positioner mode" in which the actuator moves to the positions specified by PLC signals received from the host. The positioner mode provides the following five input patterns each supporting different applications.

■ Controller Functions by Type

0		Fort we
Operation	on mode	Features
Program mode		Various operations including linear/arc interpolation operation, path operation ideal for coating processes, etc., arch-motion operation and palletizing operation can be performed using the Super SEL language that lets you program complex control actions using simple commands.
	Standard mode	A basic operation mode in which a position number is specified and then a start signal is input to start operation. Push-motion operation and 2-axis linear interpolation operation are also supported.
	Product-type switchover mode	Multiple works of the same shape with slightly different hole positions can be handled using movement commands to the same position numbers by simply changing the product type number.
Positioner mode	2-axis independent mode	With a 2-axis controller, each axis can be commanded and operated separately.
	Teaching mode	The slider (rod) can be moved via an external signal to store the achieved position as position data.
	DS-S-C1 compatible mode	If you were using a DS-S-C1 controller before, you can replace it with a ASEL controller without having to change the host programs. * This mode does not ensure actuator compatibility.

Splash Proof Typ

Controller

Controller Models

> ateway unit

> > S-24

3

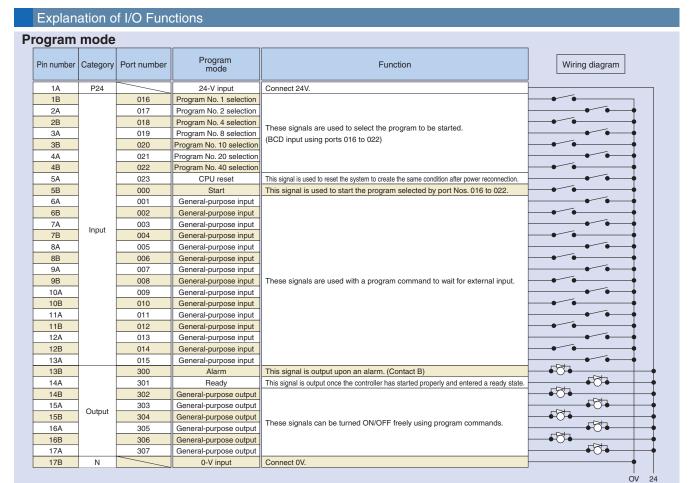
A

SCON

PSEL

ASEL

SSEL



Positioner, Standard Mode Port Positioner, standard mode Wiring diagram **Function** numbe 1A P24 24-V input Connect 24V. 1B 016 Position input 10 017 Port Nos. 007 to 019 are used to specify a target position number 2A Position input 11 2B 018 Numbers can be specified either as BCD or binary codes. Position input 12 ЗА 019 Position input 13 3B 020 4A 021 4B 022 5A 023 Error reset This signal is used to reset minor errors. (The power must be reconnected to reset serious errors.) 5B 000 Start This signal is used to cause the actuator to start moving to the selected position. 6A 001 Home return This signal is used to perform home return This signal is used to switch the servo on/off. 6B Servo ON 002 7A 003 Push This signal is used to perform push-motion operation Input 7B 004 Pause When this signal is turned OFF while the actuator is moving, the actuator will pause. When the signal is turned ON, the actuator will resume and complete the remaining operation. 8A 005 Cancellation When this signal is turned OFF while the actuator is moving, the actuator will stop and the remaining operation will be cancelled 8B 006 Interpolation setting With a 2-axis specification, turning ON this signal causes the actuator to move via linear interpretable. 9A 007 Position input 1 9B 008 Position input 2 10A 009 Position input 3 Port Nos. 007 to 019 are used to specify a target position number. 10B 010 Position input 4 Numbers can be specified either as BCD or binary codes 11 A 011 Position input 5 11B 012 Position input 6 12A 013 Position input 7 12B 014 Position input 8 13A 015 Position input 9 13B 300 This signal is output upon an alarm. (Contact B) Alarm **₽** 14A 301 Ready This signal is output once the controller has started properly and entered a ready state. 14B 302 Position complete This signal is output upon completion of movement to the specified position. 15A 303 Home return complete This signal is output upon completion of home return **6** 15B 304 Servo ON output This signal is output while the servo is on. **₽** 16A 305 Push motion complete This signal is output upon completion of push-motion operation 16B 306 This signal is output when the system-memory backup battery voltage has dropped (to the warning level). System-memory backup battery error **-**17A 307 Absolute-data backup battery error This signal is output when the absolute-data backup battery voltage has dropped (to the warning level). 17B

Controller -Integrated Type

Slider Type

Rod Type

> Arm / Flat Type

Gripper / Rotary Type

Splash C roof Type

ontroller p

Controller

-24 Gate un

ERC2

ACON

PSEL

SSEL

ASEL

XSEL

Positioner, Product-Type Switchover Mode Positioner, Positioner, Positioner,

Pin number	Category	Port number	Positioner, product-type switchover mode	Function	Wiring diagram
1A	P24		24-V input	Connect 24V.	
1B		016	Position/product type input 10		
2A		017	Position/product type input 11	Port Nos. 007 to 022 are used to specify a target position number and a	
2B		018	Position/product type input 12	product type number.	—
3A		019	Position/product type input 13	Position numbers and product type numbers are assigned by parameter	
3B		020	Position/product type input 14	settings.	
4A	1	021	Position/product type input 15	Numbers can be specified either as BCD or binary codes.	
4B		022	Position/product type input 16		
5A		023	Error reset	This signal is used to reset minor errors. (The power must be reconnected to reset serious errors	
5B		000	Start	This signal is used to cause the actuator to start moving to the selected position.	•
6A		001	Home return	This signal is used to perform home return.	•••
6B		002	Servo ON	This signal is used to switch the servo on/off.	••
7A	Input	003	Push	This signal is used to perform push-motion operation.	•••
7B	Iriput	004	Pause	When this signal is turned OFF while the actuator is moving, the actuator will pause. When the signal is turned ON, the actuator will resume and complete the remaining operation.	—
8A		005	Cancellation	When this signal is turned OFF while the actuator is moving, the actuator will stop and the remaining operation will be cancelled.	
8B		006	Interpolation setting	With a 2-axis specification, turning ON this signal causes the actuator to move via linear interpolation.	—
9A		007	Position/product type input 1		
9B		800	Position/product type input 2		—
10A		009	Position/product type input 3	Port Nos. 007 to 022 are used to specify a target position number and a	—
10B		010	Position/product type input 4	product type number.	
11A		011	Position/product type input 5	Position numbers and product type numbers are assigned by parameter	
11B		012	Position/product type input 6	settings.	-
12A		013	Position/product type input 7	Numbers can be specified either as BCD or binary codes.	
12B		014	Position/product type input 8		<u> </u>
13A		015	Position/product type input 9		
13B		300	Alarm	This signal is output upon an alarm. (Contact B)	
14A		301	Ready	This signal is output once the controller has started properly and entered a ready state.	
14B		302	Position complete	This signal is output upon completion of movement to the specified position.	
15A	Output	303	Home return complete	This signal is output upon completion of home return.	
15B	Julian	304	Servo ON output	This signal is output while the servo is on.	
16A		305	Push motion complete	This signal is output upon completion of push-motion operation.	
16B		306	System-memory backup battery error	This signal is output when the system-memory backup battery voltage has dropped (to the warning level).	
17A		307	Absolute-data backup battery error	This signal is output when the absolute-data backup battery voltage has dropped (to the warning level).	
17B	N		0-V input	Connect 0V.	

Po	sitione	er, 2-ax	cis Inc	lepen	dent	Mode

n number	Category	Port number	Positioner	Function	Wiring diagram
1A	P24		24-V input	Connect 24V.	
1B		016	Position input 10		
2A		017	Position input 11	Port Nos. 010 to 022 are used to specify a target position number.	
2B		018	Position input 12	Position numbers for axis 1 and those for axis 2 are assigned by parameter	
3A		019	Position input 13	settings.	
3B	020 021	Position input 14	_		
4A		021	Position input 15	Numbers can be specified either as BCD or binary codes.	
4B		022	Position input 16	_	
5A		023	Error reset	This signal is used to reset minor errors. (The power must be reconnected to reset serious errors.)	
5B		000	Start 1	This signal is used to cause the actuator to start moving to the selected position.	-
6A		001	Home return 1	This signal is used to move axis 1 to the home.	
6B		002	Servo ON 1	This signal is used to switch on/off the servo for axis 1.	•••
7A	Innut	003	Pause 1	When this signal is turned OFF while axis 1 is moving, the actuator will pause. When the signal is turned ON, the actuator will resume and complete the remaining operation.	
7B	Input	004	Cancellation 1	This signal is used to cancel the movement of axis 1.	-
8A		005	Start 2	This signal is used to cause axis 2 to start moving to the selected position.	—
8B		006	Home return 2	This signal is used to move axis 2 to the home.	—
9A		007	Servo ON 2	This signal is used to switch on/off the servo for axis 2.	
9B		800	Pause 2	When this signal is turned OFF while axis 2 is moving, the actuator will pause. When the signal is turned ON, the actuator will resume and complete the remaining operation.	—•
10A		009	Cancellation 2	This signal is used to cancel the movement of axis 2.	—
10B		010	Position input 1	Port Nos. 010 to 022 are used to specify a target position number.	
11A		011	Position input 2	Position numbers for axis 1 and those for axis 2 are assigned by parameter	—
11B		012	Position input 3	settings.	—
12A		013	Position input 4	Settings.	
12B		014	Position input 5	Numbers can be specified either as BCD or binary codes.	
13A		015	Position input 6	Numbers can be specified either as BOD or binary codes.	
13B		300	Alarm	This signal is output upon an alarm. (Contact B)	• 0.
14A		301	Ready	This signal is output once the controller has started properly and entered a ready state.	
14B		302	Position complete 1	This signal is output upon completion of movement of axis 1 to the specified position.	→
15A	Output	303	Home return complete 1	This signal is output upon completion of home return of axis 1.	
15B	Juiput	304	Servo ON output 1	This signal is output while the servo for axis 1 is on.	
16A		305	Position complete 2	This signal is output upon completion of movement of axis 2 to the specified position.	
16B		306	Home return complete 2	This signal is output upon completion of home return of axis 2.	→
17A		307	Servo ON output 2	This signal is output while the servo for axis 2 is on.	──
17B	N		0-V input	Connect 0V.	

Gripper / Rotary Type

> Cleanroor Type

Splash Proof Typ

Contro

Controller

Gateway unit

OV

PS-24

RC2

SCO

PSE

ASEL

SSEL

XSE

Explanation of I/O Functions

Positioner, Teaching Mode Wiring diagram Pin number Category Port number Positioner Function 1A 24-V input Connect 24V. 1B 016 Axis 1 JOG-While this signal is input, axis 1 moves in the negative direction. 2A 017 Axis 2 JOG+ While this signal is input, axis 2 moves in the positive direction. 2B 018 Axis 2 JOG-While this signal is input, axis 2 moves in the negative direction ЗА 019 Inching specification (0.01mm ЗВ 020 These signals are used to specify an inching travel distance. Inching specification (0.1mm) 4A 021 Inching specification (0.5mm) (The travel distance is the sum of values specified by port Nos. 019 to 022.) 4B 022 Inching specification (1mm) 5A 023 Error reset This signal is used to reset minor errors. (The power must be reconnected to reset serious errors.) 5B 000 Start This signal is used to cause the actuator to start moving to the selected position 001 Servo ON 6A This signal is used to switch the servo on/off. 6B 002 Pause When this signal is turned OFF while the actuator is moving, the actuator will pause. When the signal is turned ON, the actuator will n 7A 003 Position input 1 Input 7B 004 Position input 2 8A 005 Position input 3 8B 006 Position input 4 Port Nos. 003 to 013 are used to specify a target position number and a 9Α 007 Position input 5 position number under which to input the current position. 9B 800 Position input 6 10A 009 Position input 7 When the teaching mode specification signal at port No. 014 is ON, the 10B 010 Position input 8 current value will be written under the specified position number upon 11A 011 Position input 9 turning ON of the start signal at port No. 000. 11B 012 Position input 10 12A 013 Position input 11 12B 014 Teaching mode specification Axis 1 JOG+ 13A 015 While this signal is input, axis 1 moves in the positive direction. **₽** 13B 300 Alarm This signal is output upon an alarm. (Contact B) **5** 14A 301 Ready This signal is output once the controller has started properly and entered a ready state. **₽** 14B 302 Position complete This signal is output upon completion of movement to the specified position 15A 303 Home return complete This signal is output upon completion of home return Output **₽** Servo ON output 15B 304 This signal is output while the servo is on **-**16A 305 16B 306 System-memory backup battery error This signal is output when the system-memory backup battery voltage has dropped (to the warning level). **5** 17A 307 Absolute-data backup battery error This signal is output when the absolute-data backup battery voltage has dropped (to the warning level) 17B 0-V input Ν Connect 0V

Positioner, DS-S-C1 Compatible Mode

in number	Category	Port number	Positioner	Function	Wiring diagram
1A	P24		24-V input	Connect 24V.	
1B		016	Position No.1000	(Same as port Nos. 004 to 015)	-
2A		017	-	-	
2B		018	-	-	
3A		019	-	-	
3B		020	-	-	
4A		021	-	-	
4B		022	-	-	
5A		023	CPU reset	This signal is used to reset the system to create the same condition after power reconnection.	-
5B		000	Start	This signal is used to cause the actuator to start moving to the selected position.T	-
6A		001	Hold (pause)	When this signal is turned OFF while the actuator is moving, the actuator will pause. When the signal is turned ON, the actuator will resume and complete the remaining operation.	-
6B		002	Cancellation	When this signal is turned OFF while the actuator is moving, the actuator will stop and the remaining operation will be cancelled.	
7A		003	Interpolation setting	With a 2-axis specification, turning ON this signal causes the actuator to move via linear interpolation.	
7B	Input	004	Position No.1		
8A		005	Position No.2		
8B		006	Position No.4		
9A		007	Position No.8		
9B		800	Position No.10	Dort New 2004 to 240 and resold to promit to the section of the se	
10A		009	Position No.20	Port Nos. 004 to 016 are used to specify a target position number.	—
10B		010	Position No.40	Numbers can be specified either as BCD or binary codes.	-
11A		011	Position No.80		—
11B		012	Position No.100		—
12A		013	Position No.200		—
12B		014	Position No.400		
13A		015	Position No.800		
13B		300	Alarm	This signal is output upon an alarm. (Contact A)	-
14A		301	Ready	This signal is output once the controller has started properly and entered a ready state.	
14B		302	Position complete	This signal is output upon completion of movement to the specified position.	• O •
15A	Output	303	-	-	
15B	Juiput	304	-	-	
16A		305	-	-	
16B		306	System-memory backup battery error	This signal is output when the system-memory backup battery voltage has dropped (to the warning level).	
17A		307	Absolute-data backup battery error	This signal is output when the absolute-data backup battery voltage has dropped (to the warning level).	
17B	N		0-V input	Connect 0V.	

Controlled Integrated

Slider

Rod

Arm / Flat Type

Gripper / Rotary Type

Splash C Proof Type

way Controll

PS-24

PCON ERC2

ACON

SCON

PSEL

ASEL

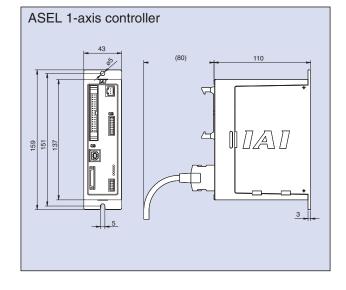
SSEL

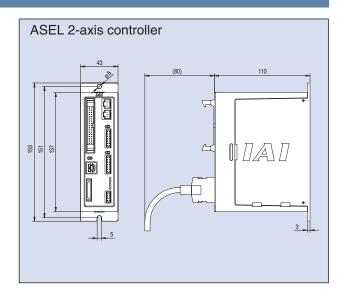
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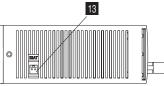
Specification Table

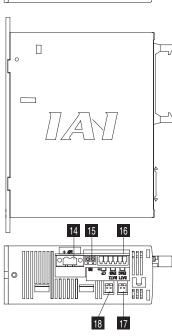
	ll					
	Item	Specification				
	Connectable actuators	RCA series actuator				
Suc	Input power supply	DC24V ±10%				
atic	Power-supply capacity	Control power: 1.2A max.				
ific	11,7 1 7	Motor power: Rating 1.7A / Peak 5A (per axis)				
Basic specifications	Dielectric strength voltage	500VDC, 10MΩ or above				
CS	Breakdown resistance	500VAC, 1 minute				
asi	Rush current	30A max.				
Ш	Vibration resistance	XYZ directions One-side amplitude 0.035 mm (continuous), 0.075 ç 4.9m/s2 (continuous), 0.8m/s2 (continuous)				
	Number of controlled axes	1 axis/2 axes				
Control specifications	Maximum total output of connected axes	60W (30W+30W)				
Control	Position detection method	Incremental encoder / Absolute encoder				
Sor	Speed setting	From 1mm/s. The maximum limit varies depending on the actuator.				
) ed	Acceleration setting	From 0.01G. The maximum limit varies depending on the actuator.				
0,	Operation method	Program operation / Positioner operation (switchable)				
	Programming language	Super SEL language				
	Number of programs	64 programs				
Program	Number of program steps	2,000 steps				
ogra	Number of multi-tasking programs	8 programs				
Pro	Number of positioning points	1,500 points				
	Data storage device	Flash ROM (A system-memory backup battery can be added as an option)				
	Data input method	Teaching pendant or PC software				
	Number of I/O points	24 input points / 8 output points (NPN or PNP selectable)				
io	I/O power supply	Externally supplied 24VDC ± 10%				
cat	PIO cable	CB-DS-PIO□□□(supplied with the controller)				
ū	Serial communication function	RS232C (D-sub, half-pitch connector) / USB connector				
Communication	Field network	(To be supported in the future)				
S	Motor cable	CB-ACS-MA□□□(20m max.)				
	Encoder cable	CB-ACS-PA□□□(20m max.)				
	Protective functions	Motor overcurrent, motor driver temperature check, overload check, encoder open-circuit check,				
l Suc		soft limit over, system error, battery error, etc.				
era atic	Ambient operating temperature, humidity	0~40°C 10~95% (non-condensing)				
General specifications	Operating ambience	Free from corrosive gases. In particular, there shall be no significant powder dust.				
Deg	Protection class	IP20				
S	Weight	Approx. 450g				
	External dimensions	43mm (W) ×159mm (H) ×110mm (D)				

External Dimensions









Motor connector for axis 1 Connect the motor cable of the axis 1 actuator.

Connect the motor cable of the axis 2 actuator.

3 Brake switch for axis 1

2 Motor connector for axis 2

This switch is used to release the axis brake. Setting it to the left position (RLS side) forcibly releases the brake, while setting it to the right position (NOM side) causes the controller to automatically control

4 Encoder connector for axis 1

Connect the encoder cable of the axis 1 actuator.

5 Brake switch for axis 2

This switch is used to release the axis brake. Setting it to the left position (RLS side) forcibly releases the brake, while setting it to the right position (NOM side) causes the controller to automatically

6 Encoder connector for axis 2

Connect the encoder cable of the axis 2 actuator.

7 Status indicator LEDs

These LEDs are used to indicate the operating condition of the controller.

Indication details are as follows:

PWR:This LED indicates that the controller is receiving

RDY:This LED indicates that the controller is ready to perform program operation.

ALM:This LED indicates that the controller is abnormal. EMG:This LED indicates that an emergency stop is actuated and the drive source is cut off.

SV1:This LED indicates that the axis 1 actuator servo is on. SV2:This LED indicates that the axis 2 actuator servo is on.

8 Panel unit connector

A connector for the panel unit (optional) that displays the controller status and error numbers.

9 I/O connector

A connector for interface I/Os.

A 34-pin flat connector is used for the DIO (24 IN/8 OUT) interface. The I/O power is also supplied to the controller through this connector (pins 1 and 34).

10 Mode switch

This switch is used to specify the running mode of the controller. The left position indicates the MANU (manual operation) mode, while the right position indicates the AUTO (automatic operation) mode. Teaching can only be performed as manual operation, and automatic operation using external I/Os is not possible in the MANU mode.

11 USB connector

A connector for PC connection via USB. If the USB connector is connected, the TP connector is disabled and all communication inputs to the TP connector are cut off.

12 Teaching pendant (TP) connector

A half-pitch I/O 26-pin connector that connects a teaching pendant when the running mode is MANU. A special conversion cable is needed to connect a conventional D-sub, 25-pin connector.

13 System-memory backup battery connector

If you wish to retain the various data recorded in the SRAM of the controller even after the power is cut off, connect the necessary battery to this connector.

This battery is installed externally to the unit. The controller does not come standard with the battery (it must be specified as an option).

14 Motor power input connector

This connector is used to input the motor power. It consists of a 2-pin, 2-piece connector by Phoenix Contact.

15 External regenerative resistor connector

A connector for the regenerative resistor that must be connected when the built-in regenerative resistor alone does not offer sufficient capacity in high-acceleration/high-load operation, etc. Whether or not an external regenerative resistor is necessary depends on the conditions of your specific application such as the axis configuration.

16 Control power/system input connector

This connector is used to connect the control power input, emergency stop switch, and enable switch.

It consists of a 6-pin, 2-piece connector by Phoenix Contact.

17 Absolute-data backup battery connector for axis 1

A connector for the battery that backs up absolute data when the actuator uses an absolute encoder. Secure installation of the battery is the customer's responsibility.

18 Absolute-data backup battery connector for axis 2

A connector for the battery that backs up absolute data when the actuator uses an absolute encoder. Secure installation of the battery is the customer's responsibility.



Options

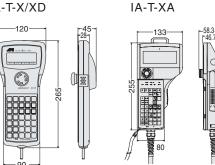
Teaching pendant

A teaching device providing program/position input function, test operation function, monitoring function, and more.

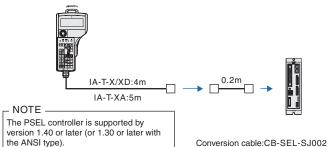
Model

Model	Description
IA-T-X-J	Standard type with connector conversion cable
IA-T-X	Standard type
IA-T-XD-J	Deadman switch type with connector conversion cable
IA-T-XD	Deadman switch type
IA-T-XA-J	ANSI type with connector conversion cable
IA-T-XA	ANSI type

IA-T-X/XD 120



Configuration



Specifications

Item	IA-T-X/XD	IA-T-XA	
Ambient operating temperature, humidity	Temperature 0~40°C, Humi	dity 85% RH or below	
Operating ambience	Free from corrosive gases. In particular, there shall be no significant powder dust.	Protective structure conforming to IP54	
Weight	Approx. 650g	Approx. 600g (excluding cable)	
Cable length	4m	5m	
Display	LCD with 20 characters x 4 lines	LCD with 32 characters x 8 lines	

PC Software (Windows Only)

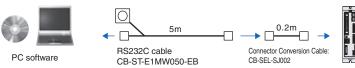
Features

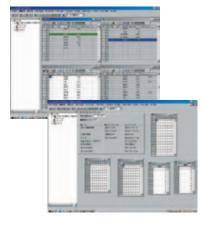
A startup support software program offering program/position input function, test operation function, monitoring function, and more. The functions needed for debugging have been enhanced to help reduce the startup time.

Model

IA-101-X-MW-J (with RS232C Cable + Connector Conversion Cable)

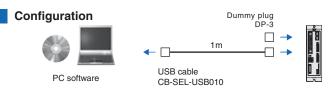
Configuration





The PSEL controller is supported by version 7.0.0.0 or later.

IA-101-X-USB (with USB Cable) Model

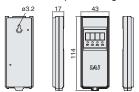


Options

Panel Unit

A display for checking controller error Features codes and active program numbers.

Model PU-1(Cable Length 3m)



Features When connecting your SSEL controller to a PC using a USB cable, install this plug on the teaching port to cut off the enable circuit. (This plug comes with the PC software IA-101-X-USB.)

DP-3 Model

Dummy plug



Absolute-Data Backup Battery

This battery backs up absolute data when an absolute-type actuator is operated. Same as the system-memory backup

AB-5 Model



USB cable

Model

■ Features Use this cable to connect your controller with USB port to a PC.

If your controller has no USB port (XSEL), connect a RS232C cable to a USB cable via a USB conversion adapter and connect the USB cable to the USB port

(Refer to the PC software IA-101-X-USBMW.)

CB-SEL-USB010 (Cable Length 1m)



System-Memory Backup Battery

If your programs use global flags, etc., Features you need this battery to retain data even after the power is turned off.

Model AB-5-CS (with Case) AB-5 (Battery Only)



Connector conversion cable

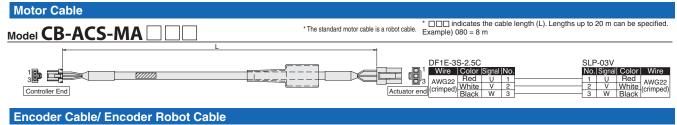
Features This conversion cable is used to connect a D-sub, 25-pin connector for teaching pendant or PC software to the teaching connector (half-pitch) on the ASEL controller

CB-SEL-SJ002 (Cable Length 0.2m) Model

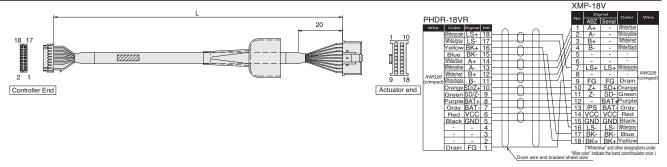


Spare Parts

Should you require spare parts after the purchase of your product for replacing the original cables, etc., refer to the model names specified below.



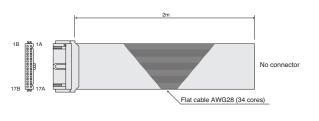
Model CB-ACS-PA A robot cable can be specified as an option.



I/O Flat Cable

Model CB-DS-PIO

* □□□ indicates the cable length (L). Lengths up to 20 m can be specified.



No.	Color	Wire	No.	Color	Wire
1A	Brown1		9B	Gray2	
1B	Red1		10A	White2	
2A	Orange1		10B	Black2	
2B	Yellow1		11A	Brown-3	
ЗА	Green1		11B	Red3	
3B	Blue1		12A	Orange3	
4A	Purple1		12B	Yellow3	
4B	Gray1	Flat cable	13A	Green3	Flat cable
5A	White1	pressure	13B	Blue3	pressure
5B	Black1	-welded	14A	Purple3	-welded
6A	Brown-2		14B	Gray3	
6B	Red2		15A	White3	
7A	Orange2		15B	Black3	
7B	Yellow2		16A	Brown-4	
8A	Green2		16B	Red4	
8B	Blue2		17A	Orange4	
9A	Purple2		17B	Yellow4	