![IAI logo] **IAI** — Quality and Innovation

RCS2/RCS3/Single-axis Robot/ Linear Motor Position Controller

S CON-CA

www.intelligentactuator.de

SCON Servo Controllers
Have Become Even More Advanced!

SCON controllers have been dramatically revamped with new functions.

| Basic specifications	
Number of positioning points:	Up to 512 points
Power-supply voltage types:	Single-phase 115 VAC
	Single-phase 230 VAC
Encoder type:	Incremental
	Absolute

1 Increasing the actuator's load capacity with offboard tuning <Standard function>

Offboard tuning is a function to increase the acceleration/deceleration when the load mass is small, or decrease the acceleration/deceleration when the load mass is large, so that the actuator is set to operate optimally for the given load mass. For details ➜P3

Correlation diagram of acceleration/deceleration and payload
RCS2-SA5C 20W, lead 20 (horizontal installation)

- Standard specification
- Offboard tuning specification

Payload [kg]
Acceleration/deceleration [G]
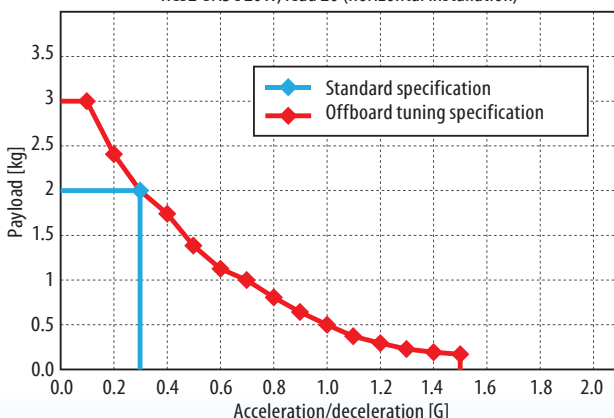
2 Supporting major field networks <Optional function>

Direct connection is now possible not only to DeviceNet, CC-Link (*1) and PROFIBUS-DP, but also to MECHATROLINK, CompoNet, EtherCAT and EtherNet/IP. The actuator can also be operated by specifying coordinate values directly via a field network.
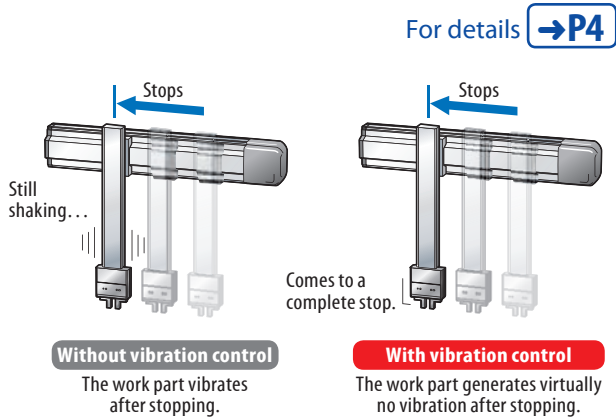(*1) CC-Link was changed from remote I/O to remote device.

For details ➜P4

CC-Link   CompoNet™

EtherCAT®   EtherNet/IP™

1

3 Vibration control function
<Standard function>

A vibration control function has been added that suppresses vibration of the work part installed on the slider when the actuator's slider moves. This function shortens the time the actuator waits for vibration to settle, and consequently shortens the cycle time.

For details ➡P4

Stops

Stops

Still shaking…

Comes to a complete stop.

Without vibration control	With vibration control
The work part vibrates after stopping.	The work part generates virtually no vibration after stopping.

4 Force control function
Actuator: <Optional function>
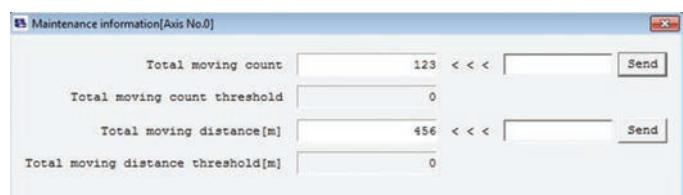Controller: <Standard function>

The RCS2-RA13R comes with a force control function that allows for accurate push-motion operation by feeding back the push force using the dedicated load cell fitted on the actuator.

For details ➡P5
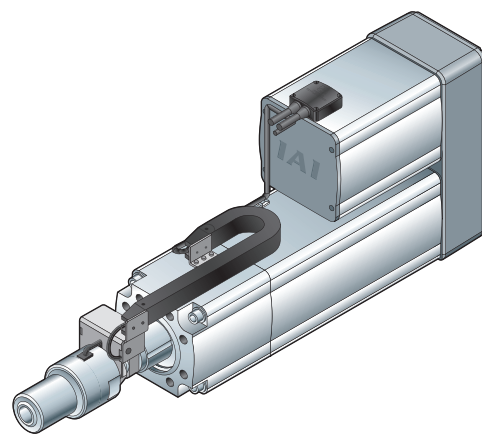
5 Checking when to maintain based on the total number of movements and total distance travelled
<Standard function>

The total number of actuator movements and the total distance travelled are calculated and recorded in the controller, and when the predetermined count or distance is exceeded, a signal is output to an external device. You can use this function to check when the actuator needs re-greasing or periodic inspection.

Maintenance information[Axis No.0]

Total moving count   123 < < <   Send
Total moving count threshold   0
Total moving distance[m]   456 < < <   Send
Total moving distance threshold[m]   0

6 Keeping the alarm generation times with the calendar function
<Standard function>

The clock function has been added to facilitate the analysis of the alarms because the time and date of each alarm that has occurred is now shown on the alarm history screen.
(The time and date data is retained for 10 days.)
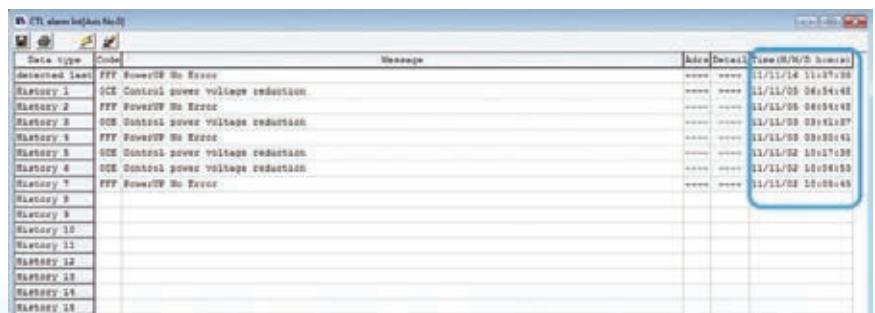
Offboard Tuning Function

Increasing the Actuator's Load Capacity

Offboard tuning is a function to automatically set an optimal gain according to the load, in order to improve the payload and acceleration/deceleration and thereby increase the payload capacity and shorten the takt time.

Supported by PC software Ver. 8.05.00.00 or later

Offboard tuning provides the following three benefits:
① By setting a lower acceleration/deceleration, a load exceeding the rated payload can be transported.
② If the load is smaller than the rated payload, the acceleration/deceleration can be increased.
③ The maximum speed can be increased.

Example) The graph on the right shows the benefits of offboard tuning with an RCS2-SA5C of lead 20.

① When the acceleration/deceleration is lowered to 0.1 G from the rated acceleration of 0.3 G, the maximum payload increases from 2 kg to 3 kg.

② If the load is small, the acceleration/deceleration can be increased to a maximum of 1.5 G.

③ The maximum speed can be increased from the standard specification of 1300 mm/s to 1660 mm/s.
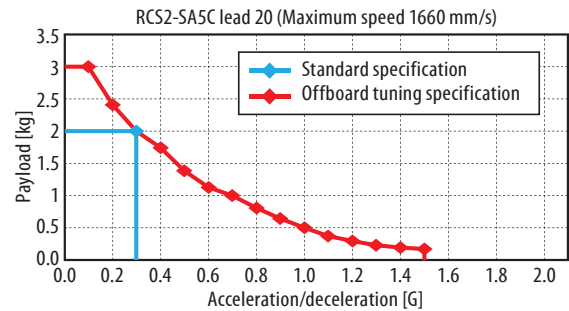
Offboard tuning is effective only when a SCON-CA controller is combined with one of the actuators listed below. Also note that the specific benefits vary depending on the actuator model. (See the table below.)

RCS2-SA5C lead 20 (Maximum speed 1660 mm/s)

Standard specification
Offboard tuning specification

■Models Supporting Offboard Tuning and Benefits

Series	Type	Lead	Motor	Horizontal installation					
				Standard specification			After offboard tuning		
				Rated acceleration	Payload	Maximum speed	Maximum acceleration	Payload	Maximum speed
		mm	W	G	kg	mm/s	G	kg	mm/s
RCS2	SA4C	10	20	0.3	4	665	1.5	0.5	665
	SA5C	20	20		2	1300	1.5	0.2	1660
	SA6C	20	30		3	1300	1.5	0.25	1660
	SA7C	16	60		12	800	2	1	1060
	SS7C	12	60		15	600	2	2	800
	SA4R	10	20		4	665	0.8	1	665
	SA5R	12	20		4	800	0.8	1	800
	SA6R	12	30		6	800	0.8	1	800
	SA7R	16	60		12	800	0.8	3.5	800
	SS7R	12	60		15	600	0.8	4	600
	RA4C	12	20		3	600	1	0.25	600
			30		4	600	1.5	0.25	600
	RA5C	16	60		12	800	1.5	2	800
			100		15	800	1.5	2.5	800
RCS3	SA8C/SS8C	30	100	1	1	1800	2	0.25	2000
			150		2	1800	2	0.5	2000
	SA8R/SS8R	30	100		1	1800	1.2	0.25	1800
			150		2	1800	1.2	1	1800
RCS2CR	SA4C	10	20	0.3	4	665	0.3	4	665
	SA5C	20	20		2	1300		2	1330
	SA6C	20	30		3	1300		3	1330
	SA7C	16	60		12	800		12	800
	SS7C	12	60		15	600		15	600
RCS3CR	SA8C/SS8C	30	100	1	1	1800	1	1	1800
			150		2	1800		2	1800
ISB ISPB	SXM/SXL	16	60	1.2	3.5	960	2	1.5	960
	MXM/MXL	30	100		3	1800		0.75	1800
			200		9	1800		4.5	1800
	LXM/LXL	40	200		6	2400		2	2400
			400		15	2400		6.5	2400
ISDB ISPDB	S	16	60	1	4.5	960	1.8	1.8	960
	M	30	100		4	1800		1.25	1800
			200		12	1800		5.5	1800
	L	40	200		7	1800		2.5	1800
			400		17	1800		7	1800
SSPA	SXM	30	200	1.2	10	1800	2	4.5	1800
	MXM	40	400		13.5	2400		5.5	2400
	LXM	50	750		20	2500		8	2500
ISDBCR ISPDBCR	S	16	60	1	4.5	960	1	4.5	960
	M	30	100		4	1800		4	1800
			200		12	1800		12	1800
	L	40	200		7	1800		7	1800
			400		17	1800		17	1800
SSPDACR	SXM	30	200	1.2	10	1600	1.2	10	1600
	MXM	40	400		13.5	1600		13.5	1600
	LXM	50	750		20	1600		20	1600

Network Function

Supporting Major Field Networks

Most of the major networks are supported, which means the controller can communicate with various equipment through simple, wire-saving connections.

■ Supported Networks

DeviceNet

CC-Link

PROFIBUS DP

CompoNet

MECHATROLINK

EtherCAT

EtherNet/IP

■ Operating Method

To operate the actuator via a network, you can do so by selecting one of the nine operation modes classified under the following two types of movement methods.

(1) Movement by position number specification
Enter the target position, speed, acceleration/deceleration, etc., under a position number in the position data table of the controller and specify the position number via a network to operate the actuator.

| Operation modes | Remote I/O mode (3 types) Position/simple direct mode (2 types) |

(2) Movement by direct numerical specification
The target position, speed, acceleration/deceleration, etc., are directly sent as numerical values to operate the actuator.

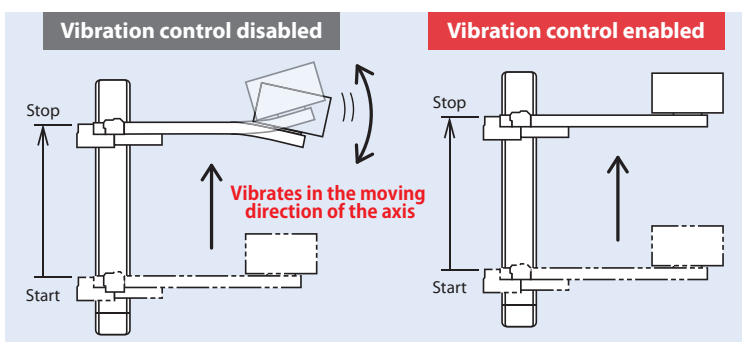| Operation modes | Half direct mode (3 types) Full direct mode (1 type) |

■ List of Functions by Operation Mode

	Movement by position number specification					Movement by direct numerical specification			
	Remote I/O mode			Position/simple direct mode		Half direct mode			Full direct mode
	1	2	3	1	2	1	2	3	
Position data specified operation	—	—	—	○	○	○	○	○	○
Direct speed/acceleration specification	—	—	—	—	—	○	○	○	○
Push-motion operation	○	○	○	○	○	○	○	○	○
Current position read	—	○	○	○	○	○	○	○	○
Current speed read	—	○	○	○	○	○	○	○	○
Position number specified operation	○	○	○	○	○	—	—	—	—
Completed position number read	○	○	○	○	○	—	—	—	—
Maximum number of position tables	512	512	512	768	768	Not used	Not used	Not used	Not used
Force control	△	△	○	—	○	—	○	—	○
Vibration control	○	○	○	○	○	—	—	○	○

Note The contents of the above table and numbers of occupied bytes (numbers of occupied stations) vary depending on the network type. For details, refer to the operation manual.

Vibration Control

Shortening the Cycle Time

Vibration control is a function to suppress vibration of the work part overhanging from the slider surface of the actuator. Since the time the actuator remains on standby until the work part stops vibrating is shortened and the next operation can be started right away, this function can effectively shorten the cycle time, etc.

Vibration control disabled

Vibration control enabled

Stop

Start

Vibrates in the moving direction of the axis

Stop

Start

The following types of vibration can be suppressed:

① Vibration of the load induced by the IAI's actuator, where the load vibrates in the same direction as the moving direction of the actuator
② Vibration at frequencies of 0.5 Hz to 30Hz

Note Take note that the following types of vibration are not covered by vibration control:
• Vibration not caused by an actuator operation (caused by an external force)
• Vibration whose source is located not in the moving direction of the actuator
• Vibration that has already started before the actuator moves
• Vibration resulting from operation in the pulse-train input mode
• Vibration resulting from home return operation or push-mode operation

Force Control Function

Usable As a Simple Servo Press

Force control is a function that allows for more accurate push control than the traditional push-motion operation, by feeding back the push force via the dedicated load cell (actuator option) fitted on the actuator. When this function is enabled on an actuator of the ultra-high thrust type where the dedicated load cell can be mounted, the actuator can be used as a simple servo press of up to 2 tons (19600 N) in capacity.
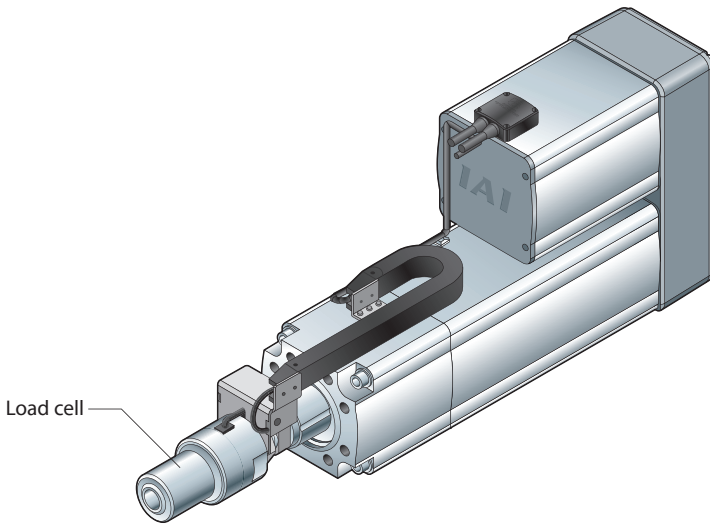
Load cell

■Load Cell Specifications

| Item	Specification
Load cell method	Strain gauge, hollow cylinder type
Rated capacity	20000N
Allowable overload	200%R.C*
Accuracy	±1%R.C*
Specified temperature range	0~40℃
Dielectric voltage	DC50V

*RC: Rated capacity

Note
• The optional load cell is used only for push-motion operation. Force control cannot be implemented in tensile direction.
• The load cell has a life of 2 million pushes.
• The load cell specifications apply to the load cell alone and not to the actuator as a whole.
• The force control function cannot be used if the actuator operates in the pulse-train mode.

■Purpose of Use
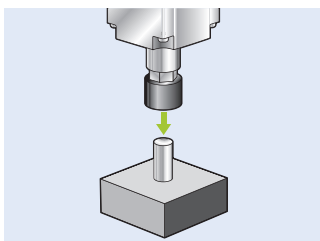
Press-fitting pins
The push force can be controlled accurately.
Also, defects can be recognized by setting an appropriate threshold even when the pins to be press-fitted are thin and loose.
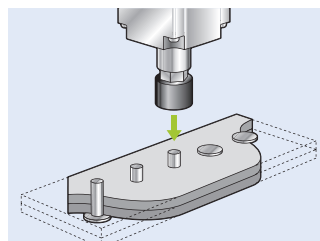
Clinching
A different push force can be set precisely for each product, and whether the clinching completion position has been reached can be checked, as well.

■How to Use

An ultra-high thrust actuator with load cell (RCS2-RA13R) is required to implement force control. Push-motion operation is performed in the same manner as before, so all you need is to set a desired push force in the position data table in percent (%).

With brake

Brake power supply
DC24V
Encoder table with load cell wiring
Model CB-XEU2-PLLA□□□
Connect to the back
Brake box
RCB-110-RA13-0
RCS2-RA13R
(with load cell)
CB-LDC-CTL□□□-JY
Motor cable model CB-XEU-MA□□□
CB-XEU2-PLA010 (supplied with the brake box)

Without brake

Encoder table with load cell wiring
Model CB-XEU2-PLLA□□□
RCS2-RA13R
(with load cell)
Motor cable model CB-XEU-MA□□□
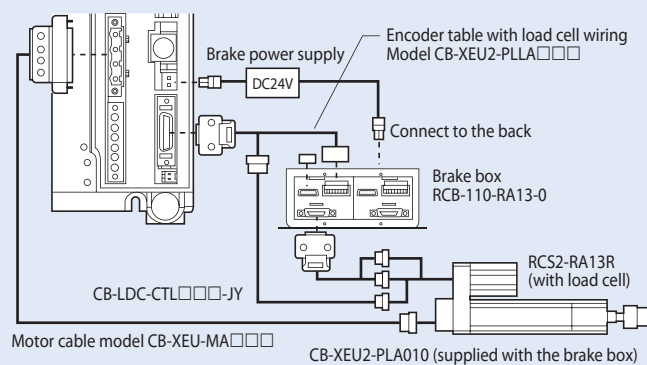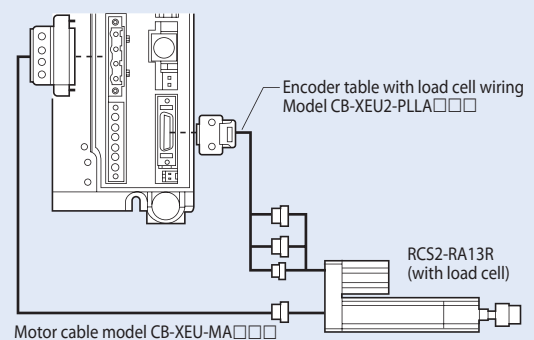
Ultra-high Thrust Actuator with Load Cell <RCS2-RA13R-LCT/LCN>

■ Model Specification Items

RCS2 — RA13R — [ ] — 750 — [ ] — [ ] — T2 — [ ] — [ ] — LCT/LCN

Series	Type	Encoder type	Motor type	Lead	Stroke	Applicable controller	Cable length	Options	Load cell model
		I: Incremental specification A: Absolute specification	750: Servo motor 750W	2.5: 2.5mm 1.25: 1.25mm	50: 50mm 〜 200: 200mm (every 50mm)	T2: SCON SSEL XSEL-P/Q	N: None P: 1 m S: 3 m M: 5 m X□□: Specified length R□□: Robot cable	Refer to the options table below. * Be sure to enter codes indicating the motor side-mounted direction and cable exit position, respectively.	LCT: With cable track for load cell wiring LCN: Without cable track for load cell wiring

■ External Dimensions

Cable track for load cell wiring

(286) (154.5) (130)

ø70 ø50 154.5

124 90 (st+439.5)
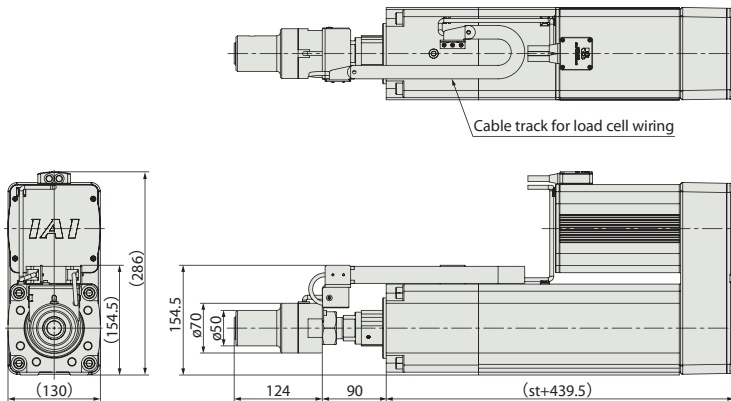
■ Correlation Diagram of Push Force and Current Limit
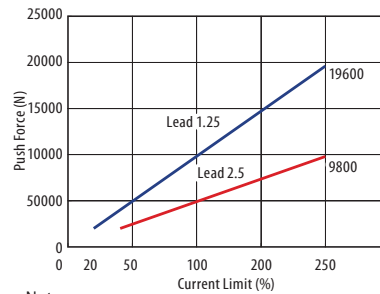
Note:
• The accuracy of push force corresponds to the accuracy range of the load cell (±1% of rated capacity).
• The push force can be adjusted in a range of 2000 N to 9800 N when the lead is 2.5, or in a range of 2000 N to 19600 N when the lead is 1.25.

POINT
Notes on selection

(1) When push-motion operation is performed, the continuous operating time is determined by the push force you have set. Also note that the continuous operation thrust that factors in the load and duty must be smaller than the rated thrust even during normal operation.
(2) The value of the payload assumes an acceleration of 0.02 G when the lead is 2.5, or ac-celeration of 0.01 G when the lead is 1.25. The above value is at the maximum acceleration.
(3) The value of the horizontal payload assumes that no external force is applied to the rod from any direction other than the moving direction.
(4) If the actuator comes with a brake (optional), the brake box (supplied with the brake) is required in addition to the actuator and controller.

■ Actuator Specifications
■ Leads and Payloads

Model number	Motor output (W)	Lead (mm)	Maximum acceleration (G)	Maximum payload Horizontal (kg)	Maximum payload Vertical (kg)	Rated thrust (N)	Continuous push force (N)	Maximum push force (N)	Stroke (mm)
RCS2-RA13R-①-750-2.5-②-T2-③-④	750	2.5	0.02	400	200	5106	3567	9800	50~200 (every 50mm)
RCS2-RA13R-①-750-1.25-②-T2-③-④		1.25	0.01	500	300	10211	7141	19600	

Code explanation ① Encoder type ② Stroke ③ Cable length ④ Options

■ Stroke and Maximum Speed

Lead (mm) \ Stroke (mm)	50	100	150	200
2.5	85	120	125	
1.25	62			

(unit: mm/s)

■ Cable Length

Type	Cable code	
Standard type	**P** (1m)	
	S (3m)	
	M (5m)	
Special length	**X06** (6m) ~**X10** (10m)	
	X11 (11m) ~**X15** (15m)	
	X16 (16m) ~**X20** (20m)	
Robot cable	**R01** (1m) ~**R03** (3m)	
	R04 (4m) ~**R05** (5m)	
	R06 (6m) ~**R10** (10m)	
	R11 (11m) ~**R15** (15m)	
	R16 (16m) ~**R20** (20m)	

■ Actuator Specifications

Item	Description
Drive system	Ball screw Ø32mm, rolled C10
Positioning repeatability	±0.01mm
Backlash	0.2mm or less
Rod diameter	Ø50mm (ball spline)
Allowable rod load moment	120 N-m
Ambient operating temperature, humidity	0 to 40℃, 85% RH or less (Non-condensing)
Push-motion operation life of load cell	2 million operations (*1)

(*1) The actuator life is 10 million operations. The load cell can be replaced.

■ Options

Name	Option code	
Brake (with brake box)	**B**	
Brake (without brake box)	**BN**	
Motor side-mounted to the top	**MT1/MT2/MT3**	
Motor side-mounted to the right	**MR1/MR2**	
Motor side-mounted to the left	**ML1/ML3**	
Flange	**FL**	
Foot bracket	**FT**	
With load cell (with cable track for the wiring)	**LCT**	
With load cell (without cable track for the wiring)	**LCN**	

Details of the SCON-CA Controllers

List of Models

Model	SCON-CA						
External view							
I/O type	Standard specification	Network connection specification (optional)					
I/O type specification	PIO connection specification (*1)	DeviceNet	CC-Link	PROFIBUS-DP	CompoNet	MECHATROLINK	EtherCAT	EtherNet/IP
I/O type code	NP/PN	DV	CC	PR	CN	ML	EC	EP
Applicable encoder type	Incremental / Absolute	Incremental/Absolute						

(*1) If the controller is operated in the pulse-train mode, only an incremental encoder can be used.

Model

SCON – CA – ☐ ☐ ☐ – ☐ – ☐ – ☐

Series — Type — Motor type — Encoder type — Option — I/O type — I/O cable length — Power supply voltage

CA	High-function type

HA	High-acceleration/ deceleration specification

Please refer to each actuator catalog for the detail.

1	Single phase 115VAC
2	Single phase 230VAC

20	20W motor
30D	30W motor (for RCS2)
30R	30W motor (for RS)
60	60W motor
100	100W motor
100S	For LSA-N10
150	150W motor
200	200W motor
200S	For LSA-S10H/N15
300S	For LSA-N19
400	400W motor
600	600W motor
750	750W motor
750S	For 750W actuator with load cell

I	Incremental
A	Absolute

NP	PIO NPN specification (standard)
PN	PIO PNP specification
DV	DeviceNet connection specification
CC	CC-Link connection specification
PR	PROFIBUS-DP connection specification
CN	CompoNet connection specification
ML	MECHATROLINK connection specification
EC	EtherCAT connection specification
EP	EtherNet/IP connection specification

0	No cable
2	2m (Standard)
3	3m
5	5m

*If "DV","CC","PR","CN","ML,""EC" or "EP" is selected for the I/O type, select "0" for the I/O cable length.

System Configuration

PLC

*If the host unit is of the open-collector type, use the optional AK-04/JM-08. (See below.)

I/O flat cable
<Model CB-PAC-PI0020>
Cable length
Standard 2m (comes with the controller)

Field network
DeviceNet
CC-Link
PROFIBUS-DP
CompoNet
MECHATROLINK
EtherCAT
EtherNet/IP

Pulse-train control plug + shell (comes with the controller)

Pulse-train control cable
<Model CB-SC-PIOS□□□>
(Options)

Absolute data backup battery
(See P14.)
<Model AB-5>
(comes with the controller with the absolute specification)

Main power supply Single phase 115VAC
Single phase 230VAC

* Be sure to use a noise filter when connecting the power supply.

Recommended model: NF2010A-UP (Manufacturer: Soshin Electric)
(You can also purchase this noise filter through IAI. Contact us for details.)

Regenerative resistance unit
(See P14.)
<Model REU-2>
(Options)

PC software
(See P14)
RC 232 connection version
<Model RCM-101-MW-EU>
USB connection version
<Model RCM-101-USB-EU>
* The cable is supplied with the PC software.

Teaching pendant
(See P14.)
<Model CON-PTA-C-ENG>
<Model CON-T-ENG>

Motor cable
<Model CB-XEU-MA□□□>
Standard 1m/3m/5m

Encoder cable
Standard: CB-XEU3-PA□□□
With load cell: CB-XEU2-PLLA□□□
Standard 1m/3m/5m

**Actuator
RCS2 Series/RCS3 Series/Single-Axis Robot/
Linear Motor**

●Pulse Converter: AK-04

Open-collector command pulses are converted to differential command pulses. Use this converter if the host controller outputs open-collector pulses.

▌ Specification

Item	Specification
Input power	24 VDC±10% (Max. 50mA)
Input pulse	Open-collector (Collector current: 12mA max.)
Input frequency	200kHz or less
Output pulse	Differential output (10mA max.) (26C31 or equivalent)
Mass	10g or less (excluding cable connectors)
Accessories	37104-3122-000L (e-CON connector) x 2 Applicable wire: AWG Nos. 24 to 26
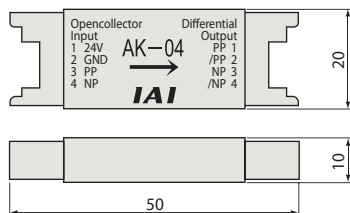
●Pulse Converter: JM-08

Difference feedback pulses are converted to open-collector feedback pulses. Use this converter if the host controller inputs open-collector pulses.

▌ Specification

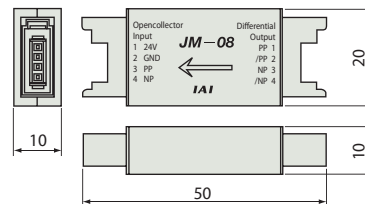| Item	Specification
Input power	24 VDC±10% (Max. 50mA)
Input pulse	Differential input (10 mA max.) (conforming to RS422)
Input frequency	500kHz or less
Output pulse	24-VDC open-collector (Collector current: 25mA max.)
Mass	10g or less (excluding cable connectors)
Accessories	37104-3122-000FL (e-CON connector) x 2 Applicable wire: AWG Nos. 24 to 26

8

Operation Modes

With this controller, you can select a desired control method from the two modes of positioner mode and pulse-train control mode.
In the positioner mode, you can enter position data (target position, speed, acceleration, etc.) in the controller under the desired numbers and then specify each number externally via a I/O (input/output signal) to operate the actuator.
Also, in the positioner mode, you can select the desired operation mode from the eight modes using the parameter.
In the pulse-train control mode, you can control the travel, speed, acceleration, etc., by sending pulses from an external pulse generator.

Mode		Number of positioning points	Features
Positioner mode	Positioning mode	64 points	Standard factory-set mode. Specify externally a number corresponding to the position you want to move to, to operate the actuator.
	Teaching mode	64 points	In this mode, you can move the slider (rod) via an external signal and register the stopped position in the position data table.
	256-point mode	256 points	In this mode, the number of positioning points available in the positioning mode has been increased to 256 points.
	512-point mode	512 points	In this mode, the number of positioning points available in the positioning mode has been increased to 512 points.
	Solenoid value mode 1	7 points	In this mode, the actuator can be moved only by turning signals ON/OFF, just like you do with an air cylinder of solenoid valve type.
	Solenoid value mode 2	3 points	In this mode, the output signal is set to the same as the air cylinder auto switch in the solenoid valve mode.
	Force mode 1	32 points	In this mode, you can move to positions under force control in the positioning mode. (Up to 32 positioning points are available.)
	Force mode 2	5 points	In this mode, you can move to positions under force control in the solenoid valve mode. (Up to five positioning points are available.)
Pulse-train control mode		—	There is no need to enter position data in the controller, and the customer can operate the actuator freely based on custom control.

I/O Signal Table * You can select one of nine types of I/O signal assignments.

Pin No.	Category	Positioning point	Parameter (PIO pattern) selection								Pulse-train mode
			0	1	2	3	4	5	6	7	0
			Positioning mode	Teaching mode	256-point mode	512-point mode	Solenoid value mode 1	Solenoid value mode 2	Force mode 1	Force mode 2	Standard mode
			64 points	64 points	256 points	512 points	7 points	3 points	32 points	5 points	—
1A	24V		P24								P24
2A	24V		P24								P24
3A	—		NC								NC
4A	—		NC								NC
5A	Input	IN0	PC1	PC1	PC1	PC1	ST0	ST0	PC1	ST0	SON
6A		IN1	PC2	PC2	PC2	PC2	ST1	ST1(JOG+)	PC2	ST1	RES
7A		IN2	PC4	PC4	PC4	PC4	ST2	ST2(–)	PC4	ST2	HOME
8A		IN3	PC8	PC8	PC8	PC8	ST3	—	PC8	ST3	TL
9A		IN4	PC16	PC16	PC16	PC16	ST4	—	PC16	ST4	CSTP
10A		IN5	PC32	PC32	PC32	PC32	ST5	—	—	—	DCLR
11A		IN6	—	MODE	PC64	PC64	ST6	—	—	—	BKRL
12A		IN7	—	JISL	PC128	PC128	—	—	—	—	RMOD
13A		IN8	—	JOG+	—	PC256	—	—	CLBR	CLBR	—
14A		IN9	BKRL	JOG–	BKRL	BKRL	BKRL	BKRL	BKRL	BKRL	—
15A		IN10	RMOD	RMOD	RMOD	RMOD	RMOD	RMOD	RMOD	RMOD	—
16A		IN11	HOME	HOME	HOME	HOME	HOME	—	HOME	HOME	—
17A		IN12	*STP	*STP	*STP	*STP	*STP	—	*STP	*STP	—
18A		IN13	CSTR	CSTR/PWRT	CSTR	CSTR	—	—	CSTR	—	—
19A		IN14	RES	RES	RES	RES	RES	RES	RES	RES	—
20A		IN15	SON	SON	SON	SON	SON	SON	SON	SON	—
1B	Output	OUT0	PM1	PM1	PM1	PM1	PE0	LS0	PM1	PE0	PWR
2B		OUT1	PM2	PM2	PM2	PM2	PE1	LS1(TRQS)	PM2	PE1	SV
3B		OUT2	PM4	PM4	PM4	PM4	PE2	LS2(–)	PM4	PE2	INP
4B		OUT3	PM8	PM8	PM8	PM8	PE3	—	PM8	PE3	HEND
5B		OUT4	PM16	PM16	PM16	PM16	PE4	—	PM16	PE4	TLR
6B		OUT5	PM32	PM32	PM32	PM32	PE5	—	TRQS	TRQS	*ALM
7B		OUT6	MOVE	MOVE	PM64	PM64	PE6	—	LOAD	LOAD	*EMGS
8B		OUT7	ZONE1	MODES	PM128	PM128	ZONE1	ZONE1	CEND	CEND	RMDS
9B		OUT8	PZONE/ZONE2	PZONE/ZONE1	PZONE/ZONE1	PM256	PZONE/ZONE2	PZONE/ZONE2	PZONE/ZONE1	PZONE/ZONE1	ALM1
10B		OUT9	RMDS	RMDS	RMDS	RMDS	RMDS	RMDS	RMDS	RMDS	ALM2
11B		OUT10	HEND	HEND	HEND	HEND	HEND	HEND	HEND	HEND	ALM4
12B		OUT11	PEND	PEND/WEND	PEND	PEND	PEND	—	PEND	PEND	ALM8
13B		OUT12	SV	SV	SV	SV	SV	SV	SV	SV	*OVLW/*ALML
14B		OUT13	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS	—
15B		OUT14	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM	ZONE1
16B		OUT15	*BALM	*BALM	*BALM	*BALM	*BALM	*BALM	*BALM	*BALM	ZONE2
17B	—		—								—
18B	—		—								—
19B	0V		N								N
20B	0V		N								N

* In the above table, signals in ( ) represent functions available before the home return.
* In the above table, signals preceded by * are turned OFF while the actuator is operating.

Explanation of the I/O Signal Functions

The table below explains the functions assigned to the controller's I/O signals.
The available signals vary depending on the controller type and settings, so use the signal table of each controller to check the functions available with that controller.
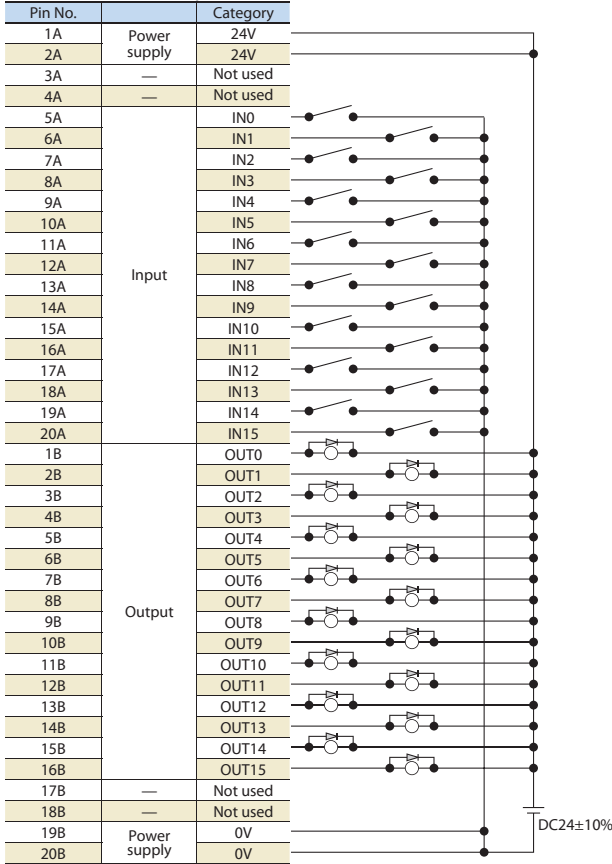
Category	Signal abbreviation	Signal name	Description of function
Input	CSTR	PTP strobe (start signal)	The actuator starts moving to the position set by the command position.
	PC1~PC256	Command position number	The position number of the target position is input (binary input).
	BKRL	Forced brake release	The brake is forcibly released.
	RMOD	Operation mode switching	The operation mode can be switched when the MODE switch on the controller is in the AUTO position. (The switch position is AUTO when this signal is OFF, or MANU when the signal is ON.)
	*STP	Pause	The actuator will decelerate to a stop when this signal turns OFF while the actuator is moving. The remaining movement will be suspended while the actuator is stopped and the movement will resume once the signal turns ON.
	RES	Reset	The alarm will be reset when the signal turns ON. The remaining travel can be cancelled by turning this signal ON while the actuator is paused (*STP is OFF).
	SON	Servo ON	The servo is ON while this signal is ON, and remains OFF while this signal is OFF.
	HOME	Home return	When this signal turns ON, the actuator performs home return operation.
	MODE	Teaching mode	When this signal turns ON, the actuator switches to the teaching mode. (Switching will not occur if CSTR, JOG+ and JOG- are all OFF and the actuator is still moving.)
	JISL	Jog/inch switching	When this signal turns OFF, the actuator can be jogged with JOG+ and JOG-. When the signal is ON, the actuator can be inched with JOG+ and JOG-.
	JOG+, JOG-	Jog	When the JISL signal is OFF, the actuator starts jogging in + or − direction upon detection of the ON edge of this signal. If the OFF edge of this signal is detected during jogging, the actuator decelerates to a stop.
	PWRT	Current position write	In the teaching mode, specify a position and then turn this signal ON for at least 20ms, and the current position will be written to the specified position.
	ST0~ST6	Start signal	In the solenoid valve mode, the actuator moves to the specified position when this signal turns ON. (The start signal is not required.)
	CLBR	Load cell calibration command	Load cell calibration starts when this signal has remained ON for at least 20ms.
Output	PEND/INP	Positioning complete	This signal turns ON when the actuator enters the in-position band after movement. If the actuator exceeds the in-position band, the PEND signal does not turn OFF, but the INP signal turns OFF. PEND and INP can be switched using a parameter.
	PM1~PM256	Complete position number	The position number of the position reached at the end of positioning is output (binary output).
	HEND	Home return completion	This signal turns ON upon completion of home return.
	ZONE1/ZONE2	Zone	This signal turns ON if the current actuator position is within the range set by the parameter.
	PZONE	Position zone	This signal turns ON when the current actuator position enters the range set in the position data table after position movement. This signal can be used with ZONE1, but PZONE becomes effective only when moving to a specified position.
	RMDS	Operation mode status output	The operation mode status is output. This signal turns ON when the controller is in the manual mode.
	*OVLW	Overload warning	This signal is ON in a normal condition, and turns OFF when the overload warning level is exceeded. (Operation will continue.)
	*ALML	Minor failure alarm	This signal is ON in a normal condition, and turns OFF when a message-level alarm occurs. (Operation will continue.)
	*ALM	Alarm	This signal is ON when the controller is in a normal condition, and turns OFF when an alarm occurs.
	MOVE	Moving	This signal is ON while the actuator is moving (also during home return and push-motion operation).
	SV	Servo ON	This signal is ON while the servo is ON.
	*EMGS	Emergency stop output	This signal is ON when no emergency stop is actuated on the controller, and turns OFF when an emergency stop is actuated.
	*BALM	Absolute battery voltage low warning	If the controller is of the absolute specification, this signal turns OFF when the voltage of the absolute battery drops. (Operation will continue.)
	MODES	Teaching mode output	This signal turns ON when the actuator enters the teaching mode via MODE signal input. It turns OFF once the actuator returns to the normal mode.
	WEND	Write complete	This signal is OFF immediately after switching to the teaching mode, and turns ON once writing is completed according to the PWRT signal. When the PWRT signal turns OFF, this signal also turns OFF.
	PE0~PE6	Current position number	This signal turns ON when the actuator has completed moving to the target position in the solenoid valve mode.
	CEND	Load cell calibration complete	This signal turns ON upon completion of load cell calibration. When the CLBR signal turns OFF, this signal also turns OFF.
	LOAD	Load output judgment signal	During push-motion operation, this signal is output when the current value set for the "threshold" is exceeded within the range of "Zone+" and "Zone−" set in the position data table. The signal is used to determine if press-fitting action has been performed correctly.
	TRQS	Torque level output	This signal is output when the motor current reaches the current value set for the "threshold" in the position data table after the slider (rod) has collided with an obstacle, etc., during movement in push-motion operation.
	LS0~LS2	Limit switch output	This signal turns ON when the current actuator position enters the in-position band set before and after the target position. If the home return has already completed, this signal is output even before a movement command is issued or while the servo is OFF.

* In the above table, signals preceded by * are normally ON and turn OFF while the actuator is operating.

I/O Wiring Diagram
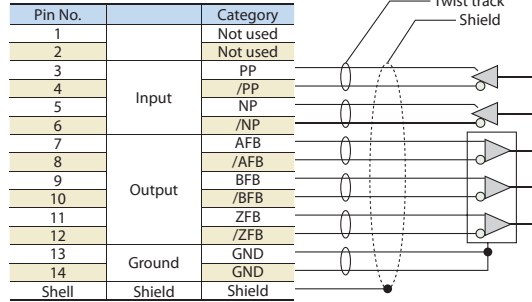
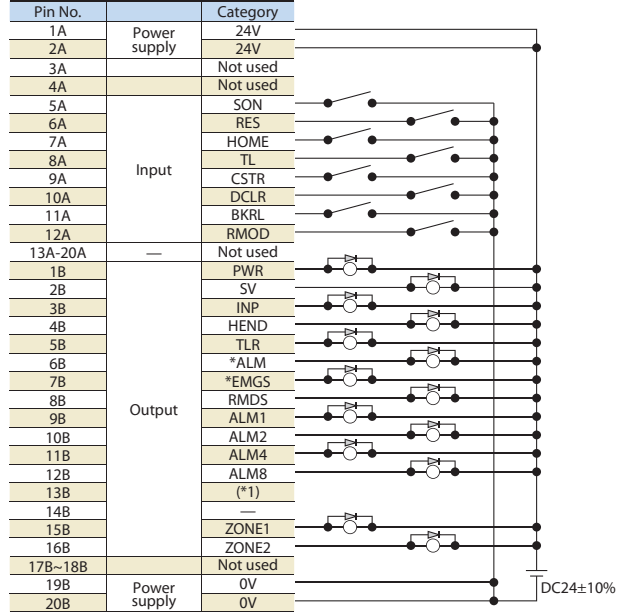### ● Positioning mode/Teaching mode/ Solenoid valve mode

PIO connector (NPN specification)

Pin No.		Category
1A	Power supply	24V
2A		24V
3A	—	Not used
4A	—	Not used
5A	Input	IN0
6A		IN1
7A		IN2
8A		IN3
9A		IN4
10A		IN5
11A		IN6
12A		IN7
13A		IN8
14A		IN9
15A		IN10
16A		IN11
17A		IN12
18A		IN13
19A		IN14
20A		IN15
1B	Output	OUT0
2B		OUT1
3B		OUT2
4B		OUT3
5B		OUT4
6B		OUT5
7B		OUT6
8B		OUT7
9B		OUT8
10B		OUT9
11B		OUT10
12B		OUT11
13B		OUT12
14B		OUT13
15B		OUT14
16B		OUT15
17B	—	Not used
18B	—	Not used
19B	Power supply	0V
20B		0V

DC24±10%

*Connect Pins 1A and 2A to 24 V, and Pins 19B and 20B to 0 V.

● Pulse Train Mode (Differential Output)

Pulse connector

Pin No.		Category
1		Not used
2		Not used
3	Input	PP
4		/PP
5		NP
6		/NP
7	Output	AFB
8		/AFB
9		BFB
10		/BFB
11		ZFB
12		/ZFB
13	Ground	GND
14		GND
Shell	Shield	Shield

Twist track
Shield

PIO connector (NPN specification)

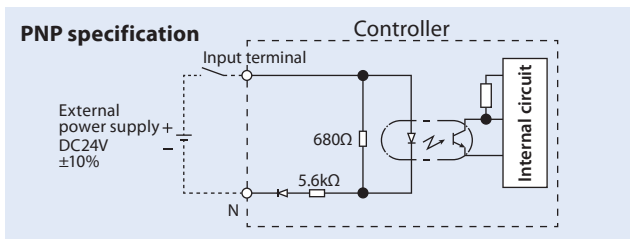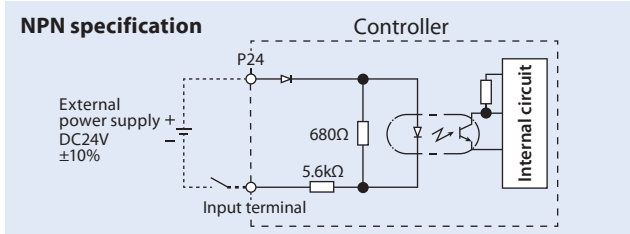| Pin No.		Category
1A	Power supply	24V
2A		24V
3A		Not used
4A		Not used
5A	Input	SON
6A		RES
7A		HOME
8A		TL
9A		CSTR
10A		DCLR
11A		BKRL
12A		RMOD
13A-20A	—	Not used
1B	Output	PWR
2B		SV
3B		INP
4B		HEND
5B		TLR
6B		*ALM
7B		*EMGS
8B		RMDS
9B		ALM1
10B		ALM2
11B		ALM4
12B		ALM8
13B		(*1)
14B	—	
15B		ZONE1
16B		ZONE2
17B~18B		Not used
19B	Power supply	0V
20B		0V

DC24±10%

* Be sure to connect to the shell the shied of the twist track cable connected to the PULSE connector. Also **keep the cable length to 10m or less**.
* Connect Pins 1A and 2A to 24 V, and Pins 19B and 20B to 0 V
(*1)-/*ALML/*OVLW/*BALM (switchable with parameters)
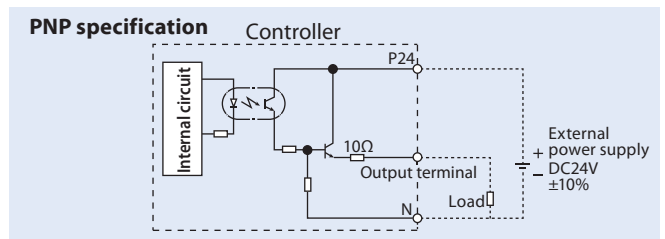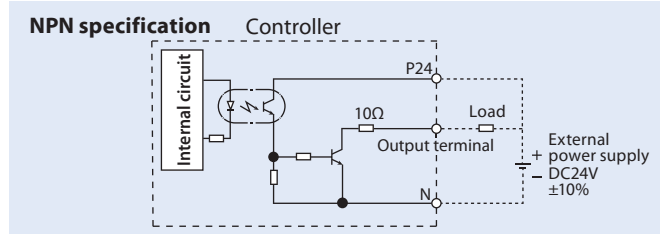
I/O Specification

● Input Part External Input Specifications

Item	Specification
Input voltage	24VDC±10%
Input current	4mA/1 circuit
ON/OFF voltage	ON voltage: 18VDC min. OFF voltage: 6VDC max.
Isolation method	Photocoupler

NPN specification

Controller
P24
External power supply + DC24V ±10%
680Ω
5.6kΩ
Input terminal
Internal circuit

PNP specification

Controller
Input terminal
External power supply + DC24V ±10%
680Ω
5.6kΩ
N
Internal circuit

● Output Part External Output Specifications

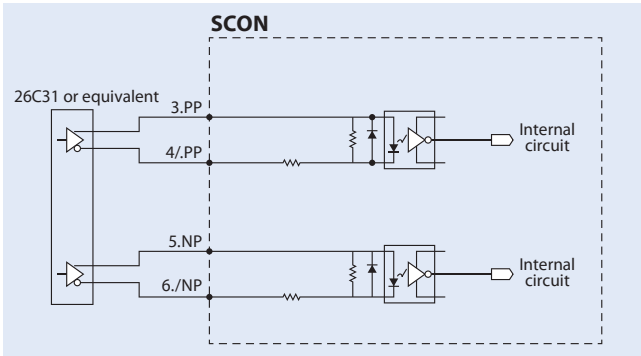| Item	Specification
Load voltage	24VDC
Maximum load current	100mA/1 point, 400mA/8 points
Leak current	0.1mA max./1 point
Isolation method	Photocoupler

NPN specification

Controller
Internal circuit
P24
10Ω
Load
Output terminal
External + power supply DC24V ±10%
N

PNP specification

Controller
Internal circuit
P24
10Ω
Output terminal
Load
External + power supply DC24V ±10%
N

Pulse-Train Type I/O Specification (Differential Line Driver Specification)

● Input Part

| Maximum number of input pulses : Line driver interface 2.5Mpps |
| Isolation method : Photocoupler isolation |

SCON

26C31 or equivalent
3.PP
4./PP → Internal circuit
5.NP
6./NP → Internal circuit

● Output Part

| Maximum number of output pulses : Line driver interface 2.5Mpps |
| Isolation/non-isolation : Non-isolation |

SCON

26C32 or equivalent
7.AFB
8./AFB → Internal circuit
9.BFB
10./BFB → Internal circuit
11.ZFB
12./ZFB → Internal circuit
13.GND
14.GND
GND   GND
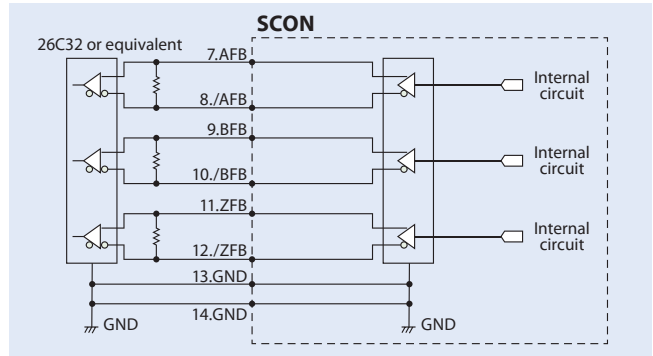
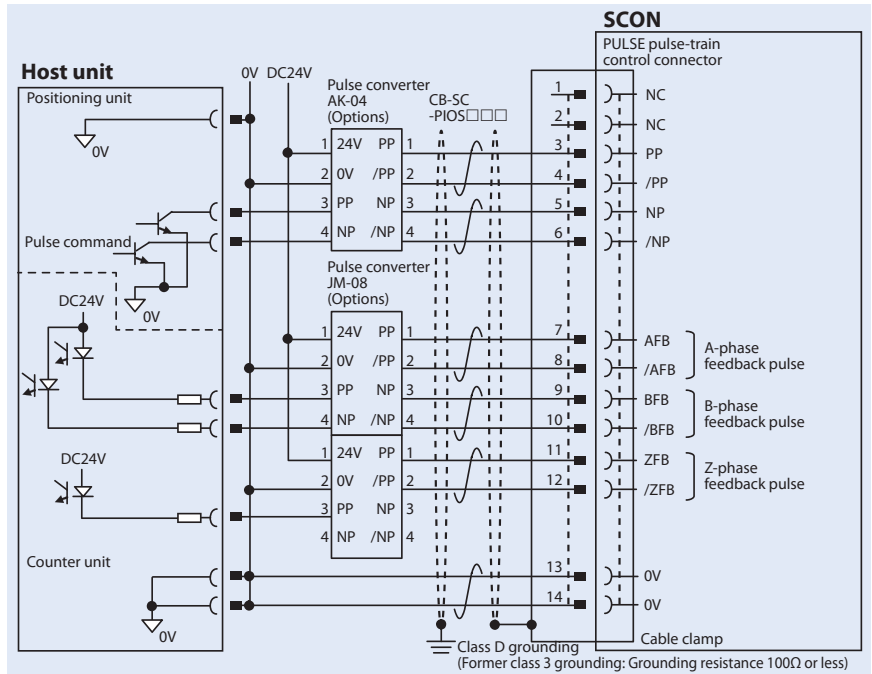## Pulse-Train Type I/O Specification (Open-collector Specification)

The AK-04 (Options) is needed to input pulses. The JM-08 (Options) is needed to output pulses.

Maximum number of input pulses:
200kpps (The AK-04 is needed.)
Maximum number of output pulses:
200kpps (The JM-08 is needed.)

* The 24-VDC power supply connected to the AK-4 must be shared with the PIO interface.
* Keep the length of the cable connecting the pulse output unit (PLC) and AK-04/JM-08 as short as possible.
Also keep the cable between the AK-04/JM-08 and **PULSE connector to 2m or less**.

Note
Use the same power supply for open collector input/output to/from the host and for the AK-04, JM-08.

SCON
PULSE pulse-train control connector

Host unit — Positioning unit — 0V
Pulse command
Counter unit

Pulse converter AK-04 (Options)
Pulse converter JM-08 (Options)

CB-SC-PIOS□□□

1	NC
2	NC
3	PP
4	/PP
5	NP
6	/NP
7	AFB — A-phase feedback pulse
8	/AFB
9	BFB — B-phase feedback pulse
10	/BFB
11	ZFB — Z-phase feedback pulse
12	/ZFB
13	0V
14	0V

Cable clamp
Class D grounding
(Former class 3 grounding: Grounding resistance 100Ω or less)

Command Pulse Input Patterns

	Command pulse train pattern	Input terminal	Forward	Reverse
Negative logic	Forward pulse-train	PP·/PP		
	Reverse pulse-train	NP·/NP		
	A forward pulse-train indicates the amount of motor rotation in the forward direction, while a reverse pulse-train indicates the amount of motor rotation in the reverse direction.			
	Pulse-train	PP·/PP		
	Sign	NP·/NP	Low	High
	The command pulse is used for the amount of motor rotation, while the sign indicates the rotating direction.			
	Phase A/B pulse-train	PP·/PP		
		NP·/NP		
	Command phases A and B having a 90° phase difference (multiplier is 4) indicate the amount of rotation and the rotating direction.			
Positive logic	Forward pulse train	PP·/PP		
	Reverse pulse-train	NP·/NP		
	Pulse-train	PP·/PP		
	Sign	NP·/NP	High	Low
	Phase A/B pulse-train	PP·/PP		
		NP·/NP		

Specification Table

Item	Specification	
Applicable motor capacity	Less than 400W	400W or more
Connected actuator	RCS2/RCS3 series actuator/single-axis robot/linear motor	
Number of controlled axes	1 axis	
Operation method	Positioner type/pulse-train type	
Number of positioning points	512 points (PIO specification), 768 points (fieldbus specification)	
Backup memory	Nonvolatile memory (FRAM)	
I/O connector	40-pin connector	
Number of I/O points	16 input points/16 output points	
I/O power supply	Externally supplied 24VDC±10%	
Serial communication	RS485 1ch	
Peripherals communication cable	CB-PAC-PIO□□□	
Command pulse-train input method (Note 1)	Differential line driver output supported	
Maximum input pulse frequency	Differential line driver method: 2.5Mpps max./Open-collector method (pulse converter used): 200kpps max.	
Position detection method	Incremental encoder/absolute encoder	
Emergency stop function	Available (built-in relay)	
Forced electromagnetic brake release	Brake release switch ON/OFF	
Motor cable	CB-XEU-MA□□□ (20m max.)	
Encoder cable	CB-XEU3-PA□□□ (20m max.)	
Input power supply	Single-phase AC90V to AC126.5V Single-phase AC180V to AC253V	Single-phase AC180V to AC253V
Power-supply capacity (Note 2)	20W/74VA 30W (other than RS)/94VA 30W (RS)/186VA 60W/186VA 100W/282VA 150W/376VA 200W/469VA	100W (LSA-N10)(*)/331VA 200W (LSA-S10H, N15S)(*)/534VA 200W (LSA-N15H)(*)/821VA 300W (LSA-N19)(*)/710VA 400W/968VA 600W/1212VA 750W/1569VA
Vibration resistance	XYZ directions – 10 to 57Hz: Single amplitude 0.035mm (continuous), 0.075mm (intermittent) 58 to 150Hz: 4.9 m/s² (continuous), 9.8 m/s² (intermittent)	
Ambient operating temperature	0 ~ 40°C	
Ambient operating humidity	85%RH or less (non-condensing)	
Operating ambience	Not exposed to corrosive gases	
Protection degree	IP20	
Mass	Approx. 900g (+ 25g for the absolute specification)	Approx. 1.2kg (+ 25g for the absolute specification)
External dimensions	58mm (W) x 194mm (H) x 121mm (D)	72mm (W) x 194mm (H) x 121mm (D)

(Note 1) For the command pulse input method, use the differential line driver method resistant to noise. If the open-collector method must be used, use the optional pulse converter (AK-04/JM-08) to convert open-collector pulses to differential pulses.
(Note 2) Controllers operating any of the actuator models denoted by (*) shall conform to the external dimensions of controllers for 400 W or more, even when the output is less than 400W.
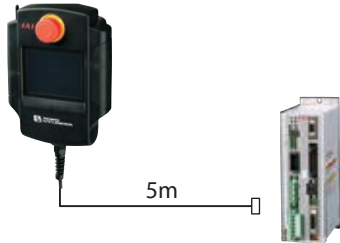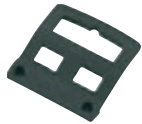
External dimensions
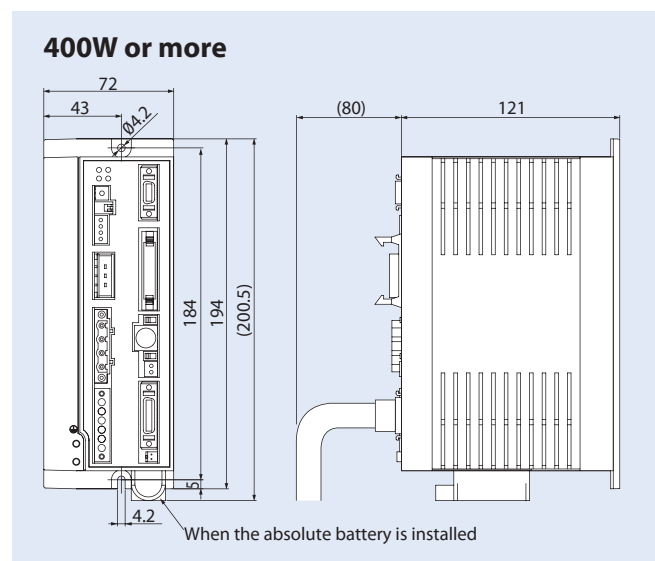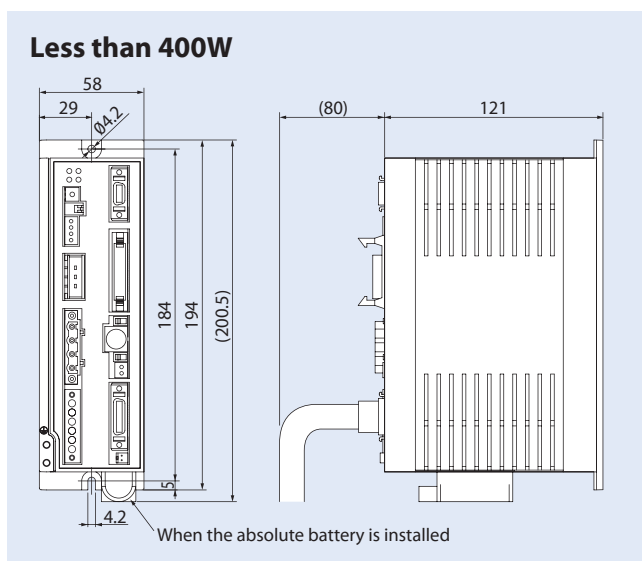
Less than 400W

When the absolute battery is installed

400W or more

When the absolute battery is installed
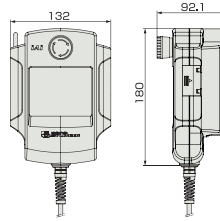
Options

Teaching Pendant

▌Features — Teaching device offering position input, test operation, monitoring and other functions.

▌Model — **CON-PTA-C-ENG** (Touch panel teaching pendant)
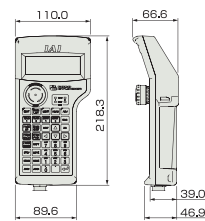**CON-T-ENG** (Standard Type teaching pendant)

▌Configuration

5m

▌CON-T-ENG options
• Wall-mounting hook
Model: **HK-1**

• Strap
Model: **STR-1**

CON-PTA-C-ENG

132   92.1   180

CON-T-ENG

110.0   66.6   218.3   89.6   39.0   46.9

▌Specification

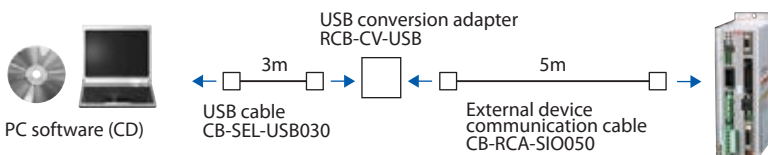| Item	CON-PTA-C-ENG	CON-T-ENG
Data input	○	○
Actuator operation	○	○
Ambient operating temperature/humidity	Temperature 0 to 40°C, humidity 85%RH or less	
Operating ambience	Free from corrosive gases or significant powder dust.	
Protection degree	IP40	IP54
Mass	Approx. 570g	Approx. 400g
Cable length	5m	
Display	65536 colors White LED backlight	20 characters x 4 lines LCD display

PC Software (Windows Only)

▌Features — This startup support software provides functions to input positions, perform test operations and monitor data, among others.
Incorporating all functions needed to make adjustments, this software helps shorten the initial startup time.

▌Model number **RCM-101-MW-EU** (With external device communication cable + RS232 conversion unit)
▌Configuration

Offboard tuning is supported only in Ver. 8.05.00.00 or later.

PC software (CD)

RS232 conversion adapter RCB-CV-MW

0.3m

5m

External device communication cable CB-RCA-SIO050
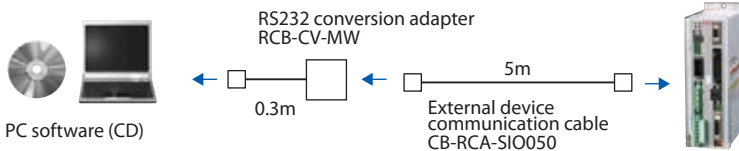
▌Model number **RCM-101-USB-EU** (With external device communication cable + USB adapter + USB cable)
▌Configuration

Offboard tuning is supported only in Ver. 8.05.00.00 or later.

PC software (CD)

USB conversion adapter RCB-CV-USB

3m

USB cable CB-SEL-USB030

5m

External device communication cable CB-RCA-SIO050

Regenerative Resistance Unit

▌Features — This unit converts regenerative current that generates when the motor decelerates, to heat. Check the total wattage of the actuators to be operated and provide a regenerative resistance unit or units if required.

▌Model **REU-2** (for SCON/SSEL)
▌Specification

Unit mass	0.9Kg
Built-in regenerative resistor	220Ω 80W
Unit-controller connection cable (supplied)	CB-SC-REU010 (for SSEL)

* If two regenerative units are required, arrange one REU-2 and one REU-1.

▌Guide for Required Quantity

	Horizontal	Vertical
0 unit	~ 100W	~ 100W
1 unit	~ 400W	~ 400W
2 unit	~ 750W	~ 750W

* The required regenerative resistance may be more than as specified above depending on the operating conditions.

▌Guide for Required Quantity (RCS2-RA13R only)

	Lead 2.5	Lead 1.25
Horizontal	1 unit	0 unit
Vertical	1 unit	1 unit

* The required regenerative resistance may be more than as specified above depending on the operating conditions.

▌External Dimensions
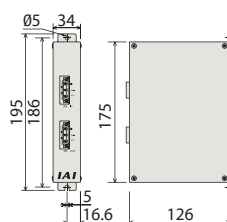
Ø5   34   195   186   175   5   16.6   126

Absolute Data Backup Battery

▌Features — Absolute data backup battery used when an actuator of absolute specification is operated.

▌Model number **AB-5**

ISO 9001
BUREAU VERITAS
Certification

IAI
Quality and Innovation

IAI
Quality and Innovation

Light Position Controller for RCS2/RCS3/
Single-axis Robot/Cartesian Robot

S CON-CAL

www.intelligentactuator.de
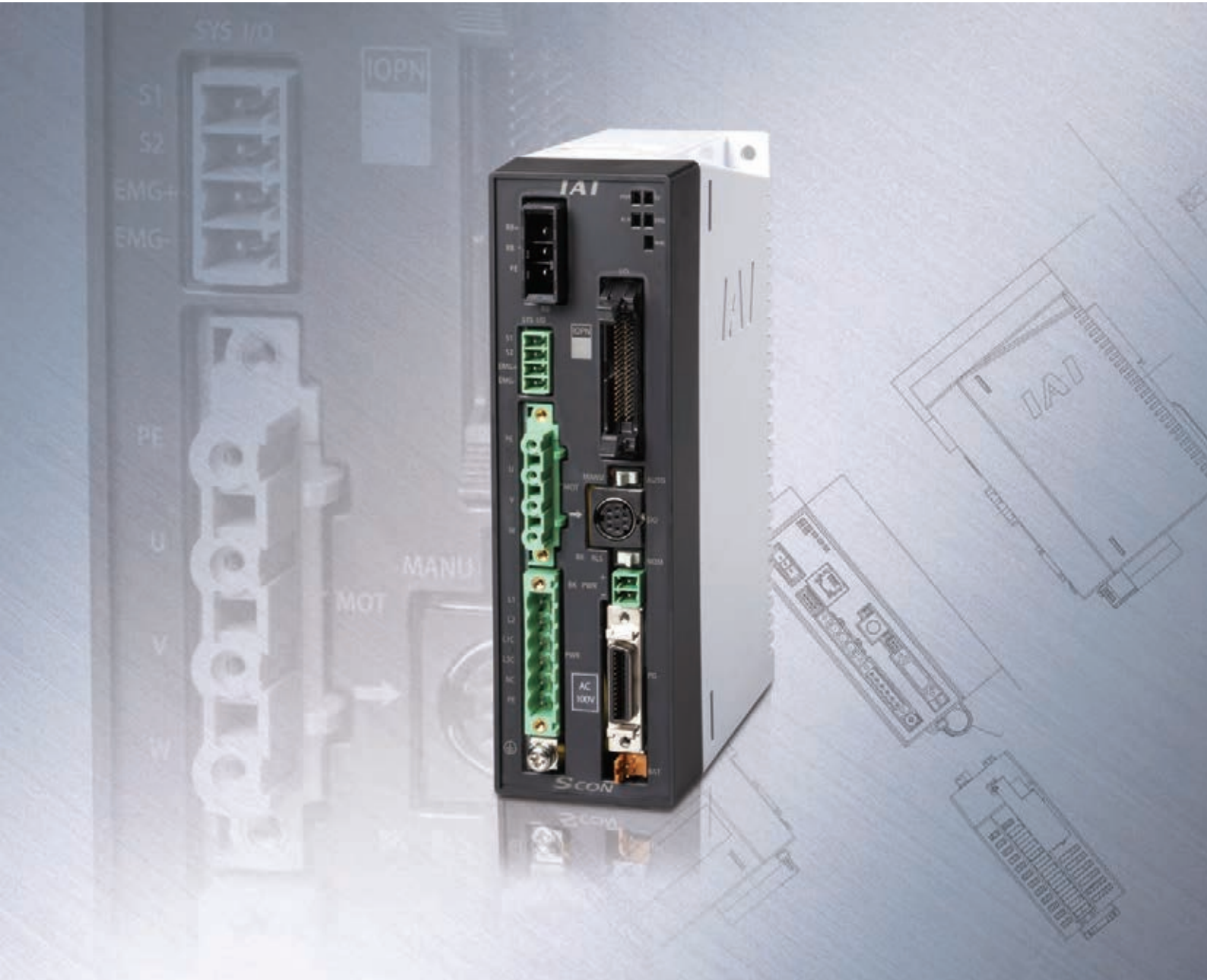
The small SCON-CAL controller is the newest addition to the SCON series. The compact controller saves you installation space.

1 Smaller

■ The SCON-CAL measures only 49 mm wide, 158 mm high and 116 mm deep, making it substantially smaller than the SCON-CA.

34% smaller in volume

116mm
158mm
49mm
SCON-CAL

121mm
194mm
58mm
SCON-CA
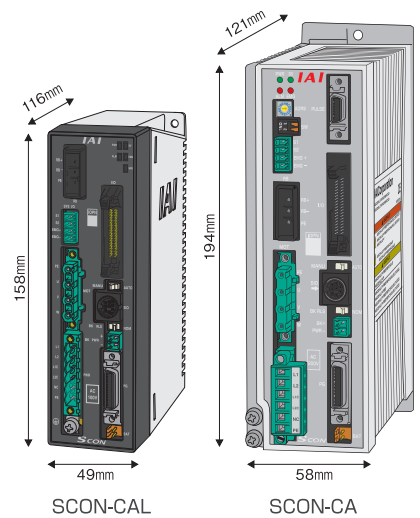
■ Multiple SCON-CALs can be installed without leaving any space in between, which helps reduce the installation space for your control panel.

264mm
194mm
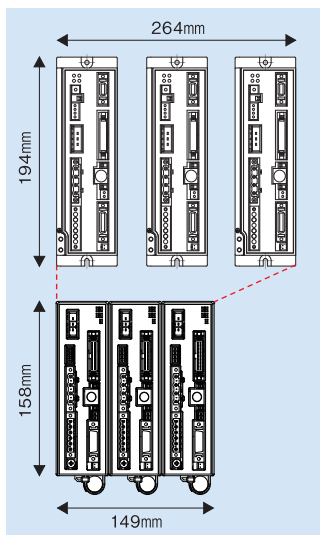
Installing three SCON-CAs

Installation space: Approx. 53% less
Installation width: Approx. 43% less

158mm
149mm

Installing three SCON-CALs

10 mm

Regenerative resistance unit

SCON-CAL

The space between the SCON-CAL and regenerative resistance unit is also reduced to 10 mm from the 30 mm required by any existing controller.
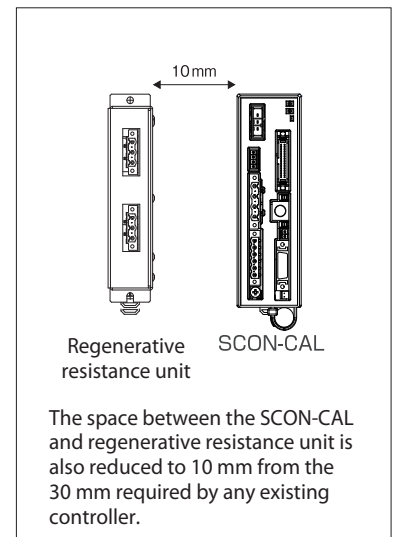
The smaller controller reduces the size of your control panel.

2 Easier to Maintain

WRG

■ When the absolute battery voltage or fan speed drops, the "WRG (warning)" LED turns on to alert the situation. With this function, you are informed visually when to replace each maintenance part. (The controller can also be set up to output a warning signal.)

■ The total number of actuator movements and the total distance travelled are calculated and recorded in the controller, and when the predetermined count or distance is exceeded, a signal is output to an external device. You can use this function to check when the actuator needs re-greasing or periodic inspection. Past alarms are displayed to facilitate the analysis of the alarms because the time and date of each alarm that has occurred is now shown on the alarm history screen.

3 Supporting Various Field Networks

CC-Link, DeviceNet, PROFIBUS-DP, CompoNet, EtherCAT, EtherNet/IP, PROFINET IO are supported.

4 Safety Category Compliant

All you need is to provide a proper external circuit, and your equipment will meet the requirements for Safety Categories 1 to 4.

5 Mountable on DIN Rails

The DIN rail mounting specification is available as an option.

6 Differences among SCON-CA/SCON-CAL/MSCON

[Function Comparison Table]

		SCON-CA	SCON-CAL	MSCON
Supported encoders		Incremental Absolute	Incremental Absolute	Incremental Absolute
Pulse train control		○	—	—
Servo monitor function (*1)		○	—	○
Offboard tuning (*2)		○	△ Servo monitor analysis not supported.	○
Vibration control function (*3)		○	△ Servo monitor analysis not supported.	○
Axis address setting method		Rotary switch	Parameter	Fixed
Global support		—	○	—
Number of connectable axes		1 axis	1 axis	1 to 6 axes
Supported motor wattages	12W/20W/30W 60W/100W motor 150W/200W motor	○	○	○
	400W/600W/750W motor	○	—	—
	LSA-S10H/N15, N19, LSAS-N15 and LSA-N10/LSAS-N10	○	—	—
	750W actuator motor with load cell	○	—	—

<<Explanation of Functions>>
(*1) Servo monitor function: You can check the current speed, position, etc.
(*2) Offboard tuning: An optimal servo gain is calculated according to the load.
(*3) Vibration control function: When the actuator slider moves, oscillation (vibration) of the work installed on the slider is suppressed.

SCON-CAL Controller

Model	SCON-CAL / CGAL							
External view								
I/O type (*1)	Standard specification	Network connection specification (optional) (*2)						
I/O type specification	PIO connection specification	DeviceNet	CC-Link	PROFIBUS-DP	CompoNet	EtherCAT	EtherNet/IP	PROFINET IO
I/O type code	NP/PN	DV	CC	PR	CN	EC	EP	PRT
Applicable encoder type	Incremental / Absolute	Incremental/Absolute						

(*1) This product does not support pulse train control.   (*2) If a netwok specification is selected, PIOs are not available.

Model

SCON – ☐ – ☐ ☐ ☐ – ☐ – ☐ – ☐ – ☐

Series | Type | Motor type | Encoder type | Option | I/O type | I/O cable length | Power supply voltage | Controller mounting specification

CAL	Standard type
CGAL	Global type

12	12W motor
20	20W motor
30D	30W motor (other than RS)
30R	30W motor (for RS)
60	60W motor
100	100W motor
150	150W motor
200	200W motor

I	Incremental
A	Absolute

(Blank)	No option
HA	High-acceleration /deceleration specification

NP	PIO NPN specification
PN	PIO PNP specification
DV	DeviceNet connection specification
CC	CC-Link connection specification
PR	PROFIBUS-DP connection specification
CN	CompoNet connection specification
EC	EtherCAT connection specification
EP	EtherNet/IP connection specification
PRT	PROFINET IO connection specification

0	No cable
2	2m
3	3m
5	5m

* If DV, CC, PR, CN, EC, EP or PRT is selected for the I/O type, select "0" for the I/O cable length.

1	Single phase AC115V
2	Single phase AC230V

(Blank)	Screw fastening specification
DN	DIN rail mounting specification

System Configuration

PLC

Field network

DeviceNet
CC-Link
PROFIBUS-DP
CompoNet
EtherCAT
EtherNet/IP
PROFINET IO

Controller accessory
I/O flat cable
(See P.14)
<Model CB-PAC-PI0020>
Cable length
Standard 2m

* Note
PIO control and field networking are
mutually exclusive.

Main power supply | Single phase AC115V
Single phase AC230V

* Be sure to use a noise filter when
connecting the power supply.

Recommended model: NF2010A-UP
(Manufacturer: Soshin Electric)
Noise filter can be purchased through IAI.
Please contact us for details.

Controller accessory
(Absolute specification only)
**Absolute data
backup battery**
(See P.11)
<Model AB-5>

Option
**Regenerative
resistance unit**
(See P.12)
<Model RESU-2>
<Model RESUD-2>

PC compatible software
RS232 connection version
(See P.11)
<Model RCM-101-MW>
USB connection version
<Model RCM-101-USB>
* The cable is supplied with
the PC compatible software.

Teaching pendant
(See P.11)
<Model TB-01-☐> (*)

(*) CE certification
coming soon.

Motor cable
(See P.12)

**Actuator
RCS Series/RCS3 Series/Single-Axis Robot**

Encoder cable
(See P.12)

*The actuators which cannot be connected to SCON-CAL
• Actuators which motor wattage is greater than 200 W
• Linear motors
• Incremental types of the following models:
+ NS-S types + RCS2-SRA7BD, SRGD7BD, SRGS7BD
+ Mini RoboCylinder RCS2-RN5N, RP5N, GS5N, GD5N,
SD5N, TCA5N, TWA5N, TFA5N

4

SCON-CAL Controller

Operation Modes

This controller only supports the positioner control mode.
In the positioner mode, you can enter position data (target position, speed, acceleration, etc.) in the controller under the desired numbers and then specify each number externally via a I/O (input/output signal) to operate the actuator.
Also, in the positioner mode, you can select the desired operation mode from the six modes using the parameter.

Mode		Number of positioning points	Features
Positioner mode	Positioning mode	64 points	Standard factory-set mode. Specify externally a number corresponding to the position you want to move to, to operate the actuator.
	Teaching mode	64 points	In this mode, you can move the slider (rod) via an external signal and register the stopped position in the position data table.
	256-point mode	256 points	In this mode, the number of positioning points available in the positioning mode has been increased to 256 points.
	512-point mode	512 points	In this mode, the number of positioning points available in the positioning mode has been increased to 512 points.
	Solenoid valve mode 1	7 points	In this mode, the actuator can be moved only by turning signals ON/OFF, just like you do with an air cylinder of solenoid valve type.
	Solenoid valve mode 2	3 points	In this mode, the output signal is set to the same as the air cylinder auto switch in the solenoid valve mode.

I/O Signal Table * You can select one of six types of I/O signal assignments.

Pin No.	Category		Parameter (PIO pattern) selection					
			0	1	2	3	4	5
			Positioning mode	Teaching mode	256-point mode	512-point mode	Solenoid valve mode 1	Solenoid valve mode 2
		Positioning point	64 points	64 points	256 points	512 points	7 points	3 points
1A	24V		P24					
2A	24V		P24					
3A	—		NC					
4A	—		NC					
5A	Input	IN0	PC1	PC1	PC1	PC1	ST0	ST0
6A		IN1	PC2	PC2	PC2	PC2	ST1	ST1(JOG+)
7A		IN2	PC4	PC4	PC4	PC4	ST2	ST2(−)
8A		IN3	PC8	PC8	PC8	PC8	ST3	—
9A		IN4	PC16	PC16	PC16	PC16	ST4	—
10A		IN5	PC32	PC32	PC32	PC32	ST5	—
11A		IN6	—	MODE	PC64	PC64	ST6	—
12A		IN7	—	JISL	PC128	PC128	—	—
13A		IN8	—	JOG+	—	PC256	—	—
14A		IN9	BKRL	JOG−	BKRL	BKRL	BKRL	BKRL
15A		IN10	RMOD	RMOD	RMOD	RMOD	RMOD	RMOD
16A		IN11	HOME	HOME	HOME	HOME	HOME	—
17A		IN12	*STP	*STP	*STP	*STP	*STP	—
18A		IN13	CSTR	CSTR/PWRT	CSTR	CSTR	—	—
19A		IN14	RES	RES	RES	RES	RES	RES
20A		IN15	SON	SON	SON	SON	SON	SON
1B	Output	OUT0	PM1	PM1	PM1	PM1	PE0	LS0
2B		OUT1	PM2	PM2	PM2	PM2	PE1	LS1(TRQS)
3B		OUT2	PM4	PM4	PM4	PM4	PE2	LS2(−)
4B		OUT3	PM8	PM8	PM8	PM8	PE3	—
5B		OUT4	PM16	PM16	PM16	PM16	PE4	—
6B		OUT5	PM32	PM32	PM32	PM32	PE5	—
7B		OUT6	MOVE	MOVE	PM64	PM64	PE6	—
8B		OUT7	ZONE1	MODES	PM128	PM128	ZONE1	ZONE1
9B		OUT8	PZONE/ZONE2	PZONE/ZONE1	PZONE/ZONE1	PM256	PZONE/ZONE2	PZONE/ZONE2
10B		OUT9	RMDS	RMDS	RMDS	RMDS	RMDS	RMDS
11B		OUT10	HEND	HEND	HEND	HEND	HEND	HEND
12B		OUT11	PEND	PEND/WEND	PEND	PEND	PEND	—
13B		OUT12	SV	SV	SV	SV	SV	SV
14B		OUT13	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS
15B		OUT14	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM
16B		OUT15	*BALM	*BALM	*BALM	*BALM	*BALM	*BALM
17B	—		NC					
18B	—		NC					
19B	0V		N					
20B	0V		N					

* In the above table, signals in ( ) represent functions available before the home return.
* In the above table, signals preceded by * are negative logic signals. Negative logic input signals are processed when turned OFF. Negative logic output signals normally remain ON while the power is supplied, and turn OFF when the signal is output.

Explanation of the I/O Signal Functions

The table below explains the functions assigned to the controller's I/O signals.

The available signals vary depending on the settings. Check the available functions.
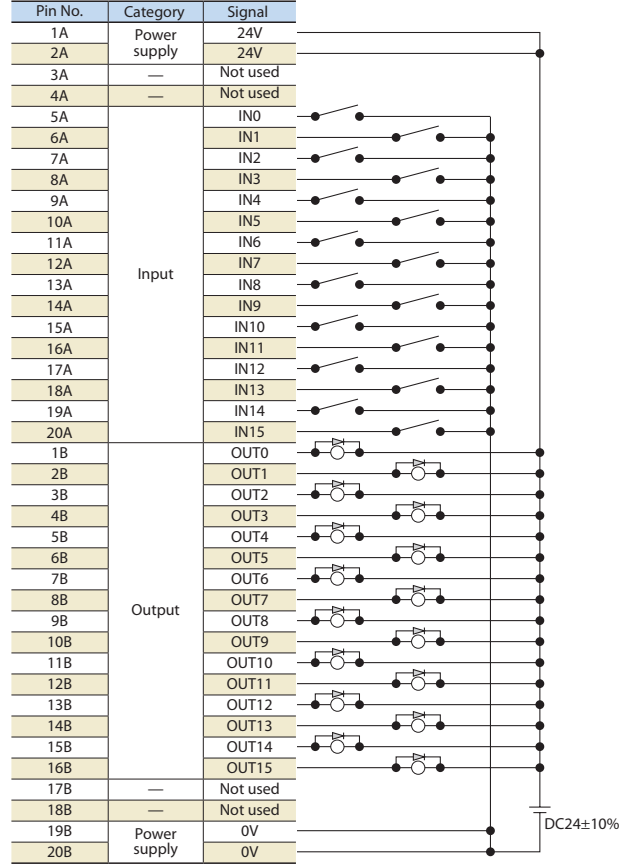
Category	Signal abbreviation	Signal name	Description of function
Input	CSTR	PTP strobe (start signal)	The actuator starts moving to the position set by the command position.
	PC1~PC256	Command position number	The position number of the target position is input (binary input).
	BKRL	Forced brake release	The brake is forcibly released.
	RMOD	Operation mode switching	The operation mode can be switched when the MODE switch on the controller is in the AUTO position. (The switch position is AUTO when this signal is OFF, or MANU when the signal is ON.)
	*STP	Pause	The actuator will decelerate to a stop when this signal turns OFF while the actuator is moving. The remaining movement will be suspended while the actuator is stopped and the movement will resume once the signal turns ON.
	RES	Reset	The alarm will be reset when the signal turns ON. The remaining travel can be cancelled by turning this signal ON while the actuator is paused (*STP is OFF).
	SON	Servo ON	The servo is ON while this signal is ON, and remains OFF while this signal is OFF.
	HOME	Home return	When this signal turns ON, the actuator performs home return operation.
	MODE	Teaching mode	When this signal turns ON, the actuator switches to the teaching mode. (Switching will not occur if CSTR, JOG+ and JOG- are all ON and the actuator is still moving.)
	JISL	Jog/inch switching	When this signal turns OFF, the actuator can be jogged with JOG+ and JOG-. When the signal is ON, the actuator can be inched with JOG+ and JOG-.
	JOG+, JOG-	Jog	When the JISL signal turns OFF, the actuator can be jogged in the positive direction when the ON edge of the JOG+ signal is detected, or in the negative direction when the ON edge of the JOG- signal is detected. If the OFF edge is detected while the actuator is jogging with each signal, the actuator will decelerate to a stop. When the JISL signal turns ON, the actuator can be inched.
	PWRT	Current position write	In the teaching mode, specify a position and then turn this signal ON for at least 20ms, and the current position will be written to the specified position.
	ST0~ST6	Start signal	In the solenoid valve mode, the actuator moves to the specified position when this signal turns ON. (The start signal is not required.)
Output	PEND	Positioning complete	This signal turns ON when the actuator enters the in-position band after movement. Even if the actuator exceeds the in-position band, the PEND signal does not turn OFF, but the INP signal turns OFF. PEND and INP can be switched using a parameter.
	PM1~PM256	Complete position number	The position number of the position reached at the end of positioning is output (binary output).
	HEND	Home return completion	This signal turns ON upon completion of home return.
	ZONE1, ZONE2	Zone	This signal turns ON if the current actuator position is within the range set by the parameter.
	PZONE	Position zone	This signal turns ON when the current actuator position enters the range set in the position data table after position movement. This signal can be used with ZONE1/ ZONE2, but PZONE becomes effective only when moving to a specified position.
	RMDS	Operation mode status output	The operation mode status is output. This signal turns ON when the controller is in the manual mode.
	*ALM	Alarm	This signal is ON when the controller is in a normal condition, and turns OFF when an alarm occurs.
	ALM1~ALM8	Alarm code output signal	When an alarm occurs, a detail of the alarm is output as a binary code.
	MOVE	Moving	This signal is ON while the actuator is moving (also during home return and push-motion operation).
	SV	Servo ON	This signal is ON while the servo is ON.
	*EMGS	Emergency stop output	This signal is ON when no emergency stop is actuated on the controller, and turns OFF when an emergency stop is actuated.
	*BALM	Absolute battery voltage low warning	This signal turns OFF to provide a warning when the absolute battery voltage drops, fan speed drops or overloading occurs. (The actuator continues to operate.)
	MODES	Teaching mode output	This signal turns ON when the actuator enters the teaching mode via MODE signal input. It turns OFF once the actuator returns to the normal mode.
	WEND	Write complete	This signal is OFF immediately after switching to the teaching mode, and turns ON once writing is completed according to the PWRT signal. When the PWRT signal turns OFF, this signal also turns OFF.
	PE0~PE6	Current position number	This signal turns ON when the actuator has completed moving to the target position in the solenoid valve mode.
	LS0~LS2	Limit switch output	This signal turns ON when the current actuator position enters the in-position band set before and after the target position. If the home return has already completed, this signal is output even before a movement command is issued or while the servo is OFF.

* In the above table, signals preceded by * are negative logic signals, which are normally ON while the power is supplied, and turn OFF when the signal is output.

I/O Wiring Diagram

Positioning mode/Teaching mode/Solenoid valve mode

PIO connector (NPN specification)

Pin No.	Category	Signal
1A	Power supply	24V
2A		24V
3A	—	Not used
4A	—	Not used
5A	Input	IN0
6A		IN1
7A		IN2
8A		IN3
9A		IN4
10A		IN5
11A		IN6
12A		IN7
13A		IN8
14A		IN9
15A		IN10
16A		IN11
17A		IN12
18A		IN13
19A		IN14
20A		IN15
1B	Output	OUT0
2B		OUT1
3B		OUT2
4B		OUT3
5B		OUT4
6B		OUT5
7B		OUT6
8B		OUT7
9B		OUT8
10B		OUT9
11B		OUT10
12B		OUT11
13B		OUT12
14B		OUT13
15B		OUT14
16B		OUT15
17B	—	Not used
18B	—	Not used
19B	Power supply	0V
20B		0V

DC24±10%

*Connect Pins 1A and 2A to 24 V, and Pins 19B and 20B to 0 V.

I/O Specification

Input Part External Input Specifications

Item	Specification
Input voltage	DC24V ±10%
Input current	4mA/1 circuit
ON/OFF voltage	ON voltage: DC18V min. OFF voltage: DC6V max.
Isolation method	Photocoupler

NPN specification

Controller

External power supply + − DC24V ±10%

P24

680Ω

5.6kΩ

Internal circuit

Input terminal

PNP specification

Controller

Input terminal

External power supply + − DC24V ±10%

680Ω

5.6kΩ

N

Internal circuit
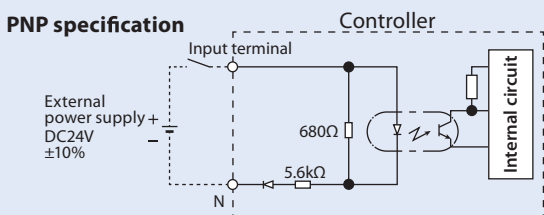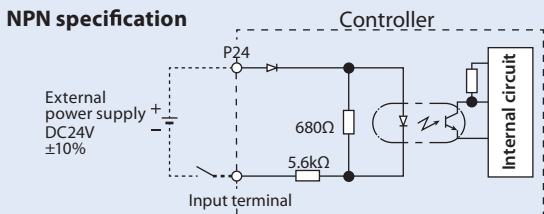
Output Part External Output Specifications

Item	Specification
Load voltage	DC24V
Maximum load current	50mA/1 point, 400mA/8 points
Leak current	0.1mA max./1 point
Isolation method	Photocoupler

NPN specification

Controller

Internal circuit

P24

10Ω

Load

Output terminal

External + power supply − DC24V ±10%

N

PNP specification

Controller

Internal circuit

P24

10Ω

Output terminal

Load

N

External + power supply − DC24V ±10%

SCON-CAL Controller
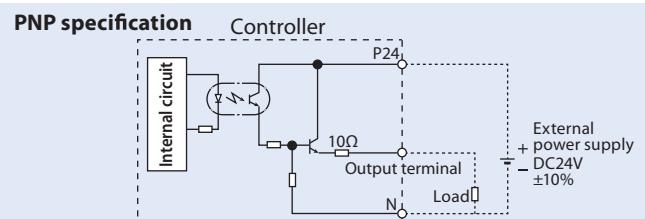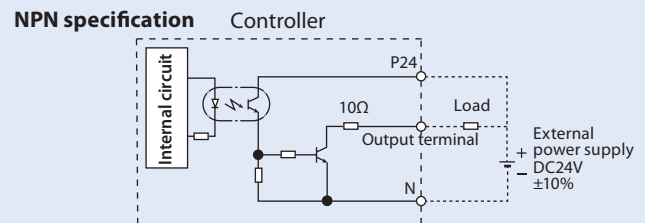
Specification Table

Item		Specification
Applicable motor capacity		200W or less
Connected actuator		RCS2/RCS3 series actuator/single-axis robot
Number of controlled axes		1 axis
Operation method	Positioner	○
	Direct value	○ (Available only for the Fieldbus specification)
	Pulse train	—
Number of positioning points		512 points (PIO specification), 768 points (Fieldbus specification)
Backup memory		Nonvolatile memory (FRAM)
I/O connector		40-pin connector
Number of I/O points		16 input points/16 output points (Not available for the Fieldbus specification)
I/O power supply		Externally supplied 24VDC±10%
Serial communication		RS485　1ch
Peripherals communication cable		CB-PAC-PIO □□□
Position detection method		Incremental encoder/absolute encoder
Emergency stop function		Standard type (CAL): Available (Built-in cutoff relay) Global type (CGAL): Not available (External cutoff relay)
Forced electromagnetic brake release		Brake release switch ON/OFF
Input power supply		Single-phase AC100V to AC115V ±10% Single-phase AC200V to AC230V ±10%
Power-supply capacity		12W/89VA 20W/74VA 30W (other than RS)/94VA 30W (RS)/186VA 60W/186VA 100W/282VA 150W/376VA 200W/469VA
Vibration resistance		XYZ directions – 10 to 57Hz: Single amplitude 0.035mm (continuous), 0.075mm (intermittent) 58 to 150Hz: 4.9 m/s^2 (continuous), 9.8 m/s^2 (intermittent)
Calendar/ Clock function	Retention time	Approx. 10 days
	Charge time	Approx. 100 hours
Protective functions		Overcurrent, abnormal temperature, low fan speed monitor, encoder disconnection, etc.
Operating temperature range		0 ~ 40℃
Operating humidity range		85%RH or less (non-condensing)
Operating ambience		Not exposed to corrosive gases
Installation	Installation direction	Vertical installation (Exhaust side on top)
	Installation method	Screw mounting or DIN rail mounting
Air cooling method		Forced air cooling
Protection degree		IP20 or equivalent
Mass		Approx. 560g (+ 25g for the absolute specification)
External dimensions		49 mm (W) x 158 mm (H) x 116 mm (D)

8

Screw Mounting Specification

49

130.7

116

φ 4.5

(6)

158

146.5

(17)

4.5

22.5

(6)
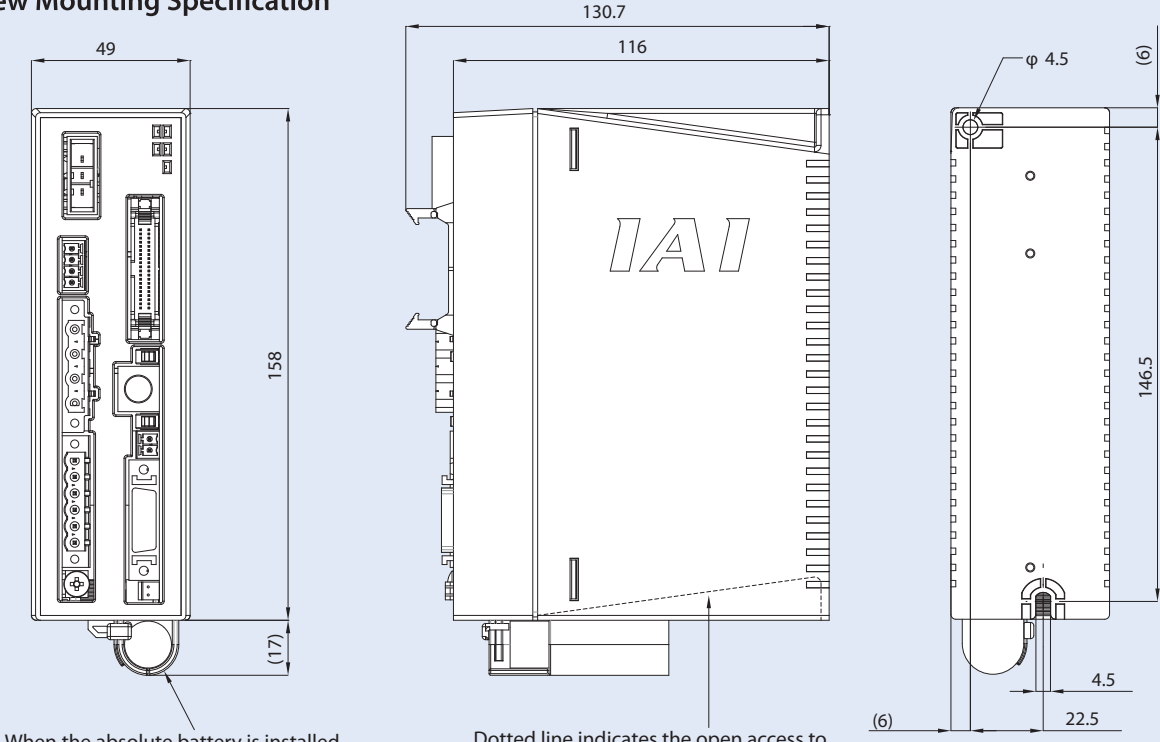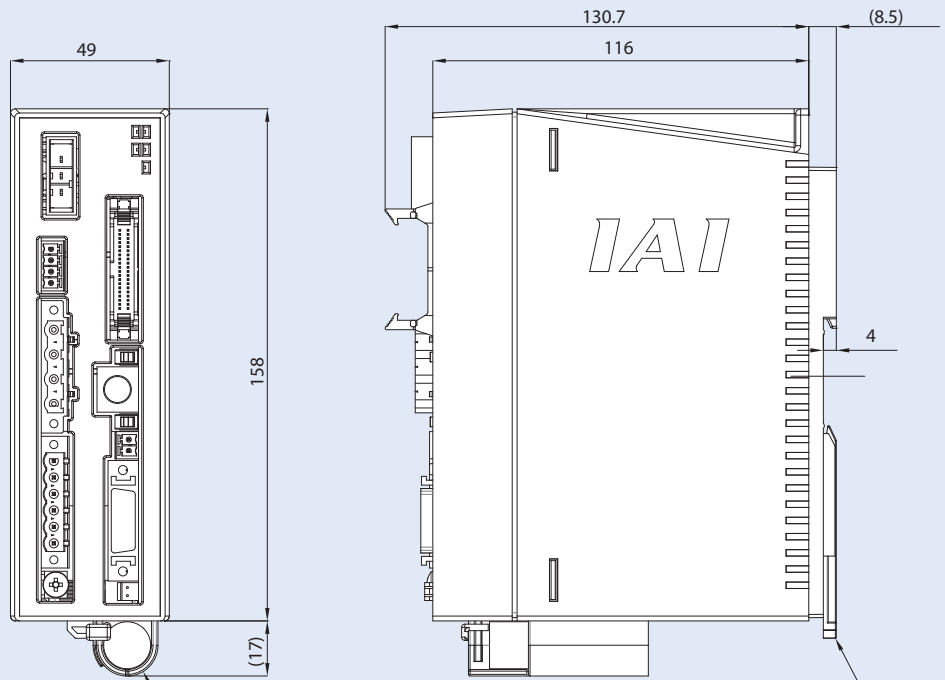
When the absolute battery is installed
(Absolute encoder specification)

Dotted line indicates the open access to
the screw mount.
The controller can be mounted with a
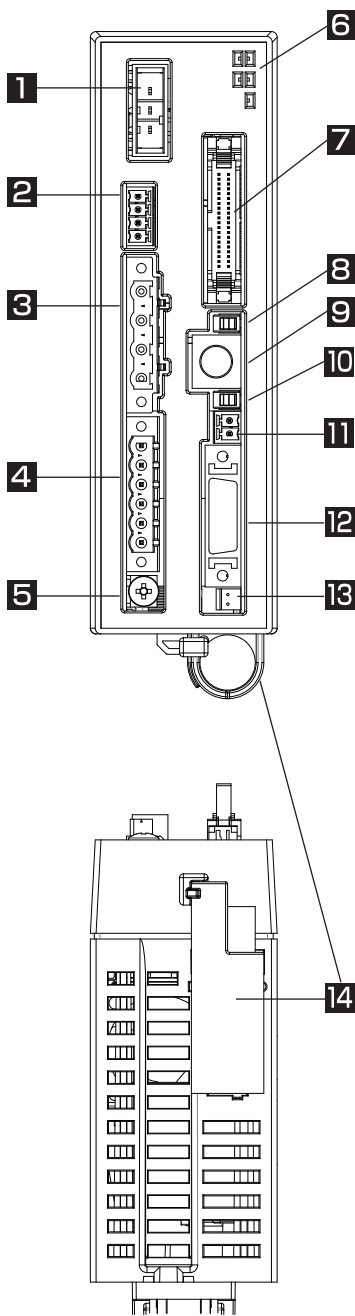screw driver without removing the cover.

DIN Rail Mounting Specification

49

130.7

(8.5)

116

158

4

(17)

When the absolute battery is installed
(Absolute encoder specification)

DIN rail mounting specification

Name of Each Part

1 Regenerative resistance unit connector

Connector for the resistance unit that absorbs regeneration current produced when the actuator decelerates to stop.

2 System I/O connector

Connector for the emergency stop switch, etc.

3 Motor connector

Connector for the motor cable of the actuator

4 Power supply connector

AC power connector. Divided into the control power input and motor power input.

5 Grounding screw

Protective grounding screw. Always ground this screw.

6 LED display

These LED colors indicate the condition of the controller.

Name	Color	Explanation
PWR	Green	Lits when the system is ready (after power is ON, CPU normal function)
SV	Green	Lits when servo is ON
ALM	Orange	Lits during an alarm
EMG	Red	Lits during an emergency stop
WRG	Orange	Flashes when ABS battery voltage is low or a rotational speed of the fan decreases, etc.

7 PIO connector

Connector for the cable connecting input/output signals to the peripheral equipments of PLC, etc.

8 Operating mode switch

Name	Explanation
MANU	Does not receive PIO commands
AUTO	Can receive PIO commands

*For a standard specification, the emergency stop switch on the teaching pendant becomes effective when the line is connected, regardless of whether this switch is set to AUTO or MANU.

9 SIO connector

Connector for the teaching pendant or PC communications cable.

10 Brake release switch

This is the electromagnetic brake forced release switch, integrated with the actuator.
*It is necessary to connect the DC24V power for the brake drive.

11 Brake power connector

Brake power DC 24V supply connector (only required when the brake equipped actuator is connected)

12 Encoder connector

Connector for the encoder

13 Absolute battery connector

Connector for the absolute data backup battery. (Required only for absolute encoder specifications)

14 Absolute battery holder

Battery holder for installing the absolute data backup battery

10

SCON-CAL Controller

Options

Teaching Pendant

▌Features　Teaching device offering position input, test operation, monitoring and other functions.

▌Model　**TB-01-C-ENG (*)**　(*) CE certification coming soon.

▌Configuration

5m

The SCON-CAL is supported by **Ver. 2.30** or later.
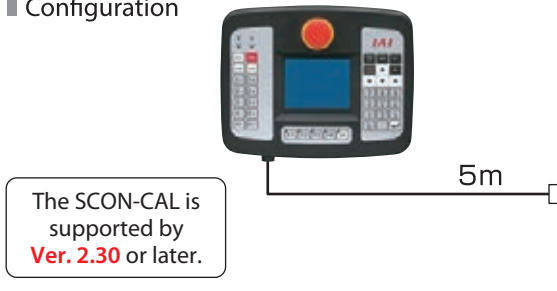
Dummy Plug

▌Features　This plug is needed when the actuator is operated with a safety category compliant controller (SCON-CGAL).

▌Model　**DP-5**

PC Compatible Software (Windows Only)

▌Features　This startup support software provides functions to input positions, perform test operations and monitor data, among others.
Incorporating all functions needed to make adjustments, this software helps shorten the initial startup time.

▌Model　**RCM-101-MW-ENG**　(External device communication cable + RS232 conversion unit included)

The SCON-CAL is supported by **Ver. 9.07.00.00** or later.

▌Configuration

PC compatible software (CD)

RS232 conversion adapter **RCB-CV-MW**

0.3m

5m

External device communication cable **CB-RCA-SIO050**
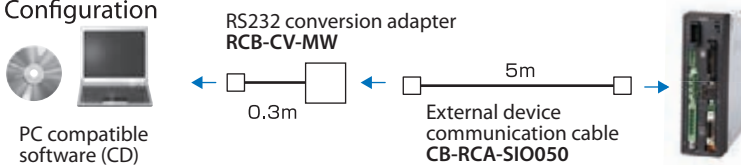
▌Model　**RCM-101-USB-ENG**　(External device communication cable + USB conversion adapter + USB cable included)

The SCON-CAL is supported by **Ver. 9.07.00.00** or later.
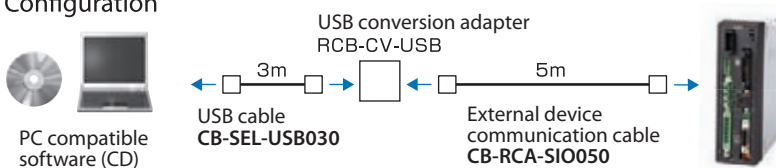
▌Configuration

PC compatible software (CD)

USB conversion adapter RCB-CV-USB

3m

USB cable **CB-SEL-USB030**

5m

External device communication cable **CB-RCA-SIO050**

Absolute Data Backup Battery

▌Features　Absolute data backup battery used when an actuator of absolute specification is operated.

▌Model　**AB-5**　(Battery only)　　**AB-5-CS3**　(With case)

11

Regenerative Resistance Unit

▎Features   This unit converts regenerative current that generates when the motor decelerates, to heat. Check the total wattage of the actuators to be operated and provide a regenerative resistance unit or units if required.

▎Model **RESU-2** (Standard specification)
           RESUD-2 (DIN rail mounting specification)

▎Specification

Model	RESU-2	RESUD-2
Unit mass	Approx. 0.4 kg	
Built-in regenerative resistor	235Ω 80W	
Actuator mounting method	Screw mounting	DIN rail mounting
Supplied cable	CB-SC-REU010	

▎External Dimensions

〈RESU-2〉

〈RESUD-2〉
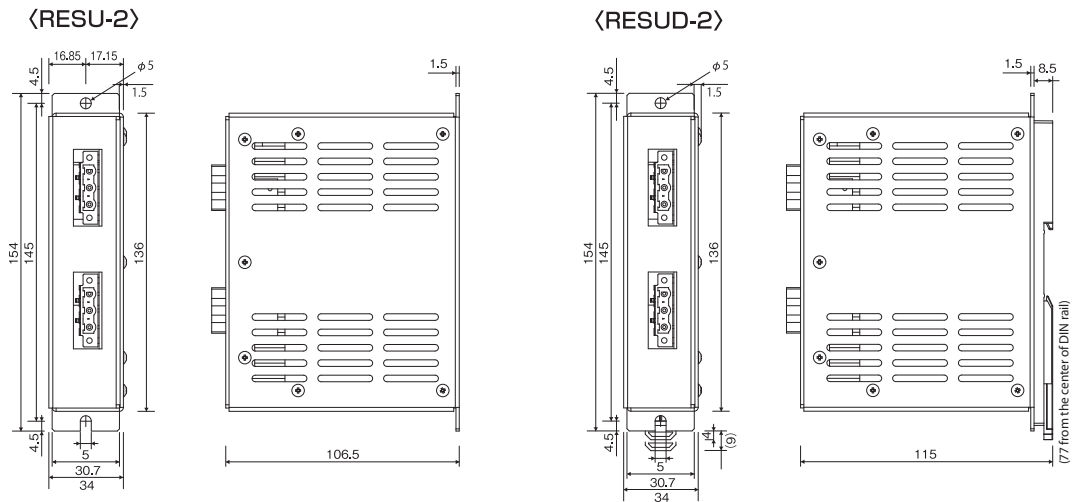
▎Guide for Required Quantity

	Horizontal	Vertical
0 unit	～100W	
1 unit	～200W	

* The required regenerative resistance may be more than as specified above depending on the operating conditions.

Replacement Fan Unit

▎Model **SCON-FU**

[Maintenance Cables]

Connected actuator		Motor cable		Encoder cable	
		Standard cable	Robot cable	Standard cable	Robot cable
RCS3 RCS2 RCS3CR RCS2CR RCS2W	RTC□L RT6	CB-RCC-MA□□□ see P13	CB-RCC-MA□□□-RB CB-XEU-MA□□□ see P13	CB-RCS2-PLA□□□ see P14	CB-X2-PLA□□□ CB-XEU2-PLA□□□ see P14
	Other models			CB-RCS2-PA□□□ see P13	CB-X3-PA□□□ CB-XEU3-PA□□□ see P13
Other models	NS w/o LS	CB-X-MA□□□ CB-XEU-MA□□□ see P13		CB-X3-PA□□□ CB-XEU3-PA□□□ see P13	
	NS w/ LS			CB-X2-PLA□□□ CB-XEU2-PLA□□□ see P14	
	Model other than NS w/o LS			CB-X1-PA□□□ CB-XEU1-PA□□□ see P13	
	Model other than NS w/ LS			CB-X1-PLA□□□ CB-XEU1-PLA□□□ see Back Page	
	ISWA			CB-X1-PA□□□-WC see Back Page	

* All actuators other than the RCS3/RCS2 series come standard with a robot cable.

12

Maintenance Parts

Please refer to the models listed below if a cable needs to be exchanged, etc., after your purchase.

Model number		Description	Compatibility
	CB-RCC-MA☐☐☐	Motor cable	for RCS2 / RCS3
	CB-RCC-MA☐☐☐-RB	Motor robot cable	
	CB-X-MA☐☐☐	Motor robot cable	for models other than RCS2 / RCS3
	CB-XEU-MA☐☐☐	EU motor robot cable	for RCS2 / RCS3 and other models

* Enter the cable length (L) into ☐☐☐. Compatible to a Maximum of 30 meters.
Ex.: 080 = 8m

(Fig.: Motor cable CB-RCC-MA☐☐☐ / CB-RCC-MA☐☐☐-RB / CB-X-MA☐☐☐ with plastic connector)

Minimum bending R: r = 51 mm or more (for movable use)
* If the cable must be guided in a cable track, use a robot cable.

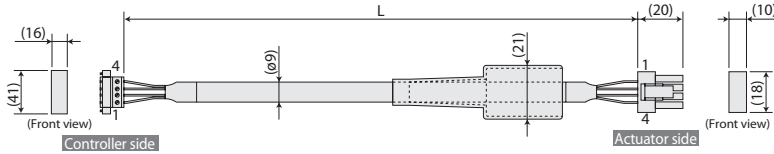| Wire	Color	Signal	No.		No.	Signal	Color	Wire
0.75sq	Green	PE	1		1	U	Red	0.75sq (crimped)
	Red	U	2		2	V	White	
	White	V	3		3	W	Black	
	Black	W	4		4	PE	Green	

(Fig.: EU motor robot cable CB-XEU-MA☐☐☐, EU version with M18 plastic round connector)

Minimum bending R: r = 51 mm or more (for movable use)
*Only robot cable is available for this model

Wire	Color	Signal	No.		No.	Signal	Color	Wire
0.75sq	Green/yellow	PE	1		⏚	PE	Green/yellow	0.75sq (crimped)
	Black/white"1"	U	2		1	U	Black/white"1"	
	Black/white"2"	V	3		2	V	Black/white"2"	
	Black/white"3"	W	4		3	W	Black/white"3"	

Model number		Description	Compatibility
	CB-RCS2-PA☐☐☐	Encoder cable	for RCS2 / RCS3
	CB-X3-PA☐☐☐	Encoder robot cable	for NS / RCS2 / RCS3
	CB-XEU3-PA☐☐☐	EU encoder robot cable	

* Enter the cable length (L) into ☐☐☐. Compatible to a Maximum of 30 meters.
Ex.: 080 = 8m

(Fig.: Encoder cable CB-RCS2-PA☐☐☐ / CB-X3-PA☐☐☐ with plastic connector)
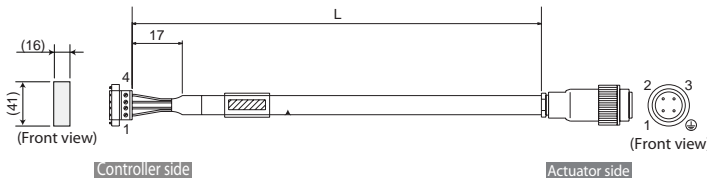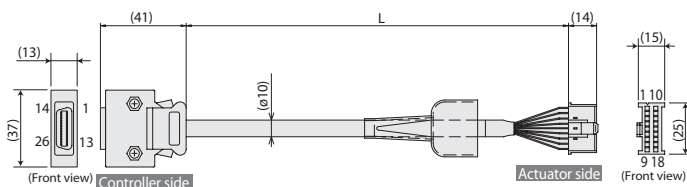

Minimum bending R: r = 58 mm or more (for movable use)
* If the cable must be guided in a cable track, use a robot cable.

Wire	Color	Signal	No.
AWG26 (soldered)	–	–	10
	–	–	11
	–	E24V	12
	White/green	0V	13
	White/orange	LS	26
	–	CREEP	25
	–	OT	24
	–	RSV	23
	–	–	9
	–	–	18
	–	–	19
	White/blue	A+	1
	White/yellow	A-	2
	White/red	B+	3
	White/black	B-	4
	White/purple	Z+	5
	White/gray	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Gray	BAT-	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	–	–	22

The shield is connected to the hood by a clamp.

No.	Signal	Color	Wire
1	A	White/blue	AWG26 (crimped)
2	Ā	White/yellow	
3	B	White/red	
4	B̄	White/black	
5	Z	White/purple	
6	Z̄	White/gray	
7	LS+	White/orange	
8	–	–	
9	FG	(Ground)	
10	SD	Orange	
11	SD	Green	
12	BAT+	Purple	
13	BAT-	Gray	
14	VCC	Red	
15	GND	Black	
16	LS-	White/green	
17	BK-	Blue	
18	BK+	Yellow	

Ground wire and braided shield

(Fig.: EU encoder robot cable CB-XEU3-PA☐☐☐, EU version with metal connector)

Minimum bending R: r = 58 mm or more (for movable use)

Wire	Color	Signal	No.
AWG26 (soldered)	–	–	10
	–	–	11
	–	E24V	12
	White/green	0V	13
	White/orange	LS	26
	–	CREEP	25
	–	OT	24
	–	RSV	23
	–	–	9
	–	–	18
	–	–	19
	White/blue	A+	1
	White/yellow	A-	2
	White/red	B+	3
	White/black	B-	4
	White/purple	Z+	5
	White/gray	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Grey	BAT-	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	–	–	22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	SD	Orange	AWG26 soldered
2	SD	Green	
3	A+	White/blue	
4	A-	White/yellow	
5	LS+	White/orange	
6	B+	White/red	
7	B-	White/black	
8	Z+	White/purple	
9	Z-	White/gray	
10	VCC	Red	
11	GND	Black	
12	BAT+	Purple	
13	BAT-	Grey	
14	LS-	White/green	
15	BK-	Blue	
16	BK+	Yellow	

A shield is connected to shield soldered part

Ground wire and braided shield

Model number	CB-RCS2-PLA□□□	Limit switch encoder cable	for RCS2 Rotary type
	CB-X2-PLA□□□	Limit switch encoder robot cable	for LS specification models
	CB-XEU2-PLA□□□	EU limit switch encoder robot cable	NS / RCS2 Rotary type

* Enter the cable length (L) into □□□. Compatible to a Maximum of 30 meters.
Ex.: 080 = 8m

(Fig.: LS encoder cable CB-RCS2-PLA□□□ / CB-X2-PLA□□□ with plastic connector)

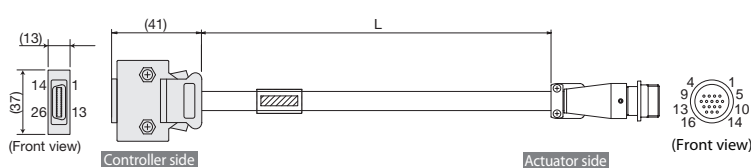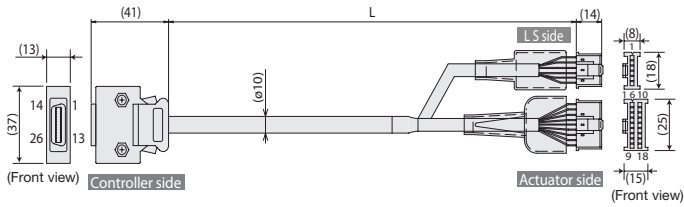Minimum bending R: r = 58 mm or more (for movable use)
* If the cable must be guided in a cable track, use a robot cable.

Wire	Color Stand. Cable	Color Robot Cable	Signal	No.
	–	–	–	10
	–	–	–	11
	Brown/white	White/orange	E24V	12
	Gray/white	White/green	0V	13
	Red/white	Brown/blue	LS	26
	Black/white	Brown/yellow	CREEP	25
	Yellow/black	Brown/red	OT	24
	Pink/black	Brown/black	RSV	23
	–	–	–	9
	–	–	–	18
	–	–	–	19
AWG26 (soldered)	Pink	White/blue	A+	1
	Purple	White/yellow	A–	2
	White	White/red	B+	3
	Blue/red	White/black	B–	4
	Orange/white	White/purple	Z+	5
	Green/white	White/gray	Z–	6
	Blue	Orange	SRD+	7
	Orange	Green	SRD–	8
	Black	Purple	BAT+	14
	Yellow	Grey	BAT–	15
	Green	Red	VCC	16
	Brown	Black	GND	17
	Gray	Blue	BKR–	20
	Red	Yellow	BKR+	21
				22

The shield is connected to the hood by a clamp.

No.	Signal	Color Robot Cable	Color Stand. Cable	Wire
1	E24V	White/orange	Brown/white	AWG26 (crimped)
2	0V	White/green	Gray/white	
3	LS	Brown/blue	Red/white	
4	CREEP	Brown/yellow	Black/white	
5	OT	Brown/red	Yellow/black	
6	RSV	Brown/black	Pink/black	

No.	Signal	Color Robot Cable	Color Stand. Cable	Wire
1	A	White/blue	Pink	
2	Ā	White/yellow	Purple	
3	B	White/red	White	
4	B̄	White/black	Blue/red	
5	Z	White/purple	Orange/white	
6	Z̄	White/gray	Green/white	
7	–	–	–	
8	–	–	–	
9	FG	Floating ground	Floating ground	
10	SD	Orange	Blue	AWG26 (crimped)
11	S̄D	Green	Orange	
12	BAT+	Purple	Black	
13	BAT–	Grey	Yellow	
14	VCC	Red	Green	
15	GND	Black	Brown	
16	–	–	–	
17	BK–	Blue	Gray	
18	BK+	Yellow	Red	

("Brown/white" in cable color indicates the colors of line/insulator.)

(Fig.: EU LS encoder robot cable CB-XEU2-PLA□□□, EU version with metal connector)
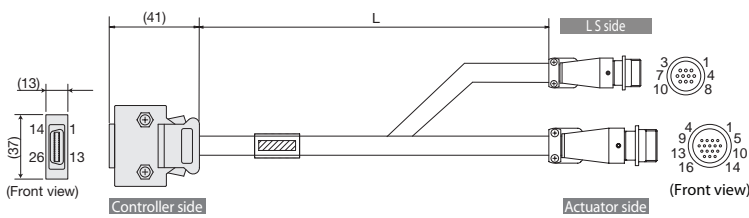
Minimum bending R: r = 58 mm or more (for movable use)

Wire	Color	Signal	No.
	–	–	10
	–	–	11
	White/orange	E24V	12
	White/green	0V	13
	Brown/blue	LS	26
	Brown/yellow	CREEP	25
	Brown/red	OT	24
	Brown/black	RSV	23
	–	–	9
	–	–	18
	–	–	19
AWG26 (soldered)	White/blue	A+	1
	White/yellow	A-	2
	White/red	B+	3
	White/black	B-	4
	White/purple	Z+	5
	White/gray	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Grey	BAT–	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	–	–	22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	E24V	White/orange	
2	0V	White/green	
3	–	–	
4	LS	Brown/blue	AWG26 soldered
5	CREEP	Brown/yellow	
6	OT	Brown/red	
7	RSV	Brown/black	
8/9/10	–	–	

No.	Signal	Color	Wire
1	SD	Orange	
2	S̄D	Green	
3	A+	White/blue	
4	A-	White/yellow	
5	–	–	
6	B+	White/red	
7	B-	White/black	
8	Z+	White/purple	AWG26 soldered
9	Z-	White/gray	
10	VCC	Red	
11	GND	Black	
12	BAT+	Purple	
13	BAT-	Grey	
14	–	–	
15	BK-	Blue	
16	BK+	Yellow	

A shield is connected to shield soldered part

("White/orange" in cable color indicates the colors of line/insulator.)

| Model number | CB-X1-PA□□□ | Encoder robot cable | for models |
| | CB-XEU1-PA□□□ | EU encoder robot cable | other than NS / RCS2 / RCS3 |

* Enter the cable length (L) into □□□. Compatible to a Maximum of 30 meters.
Ex.: 080 = 8m

(Fig.: Encoder robot cable CB-X1-PA□□□ with plastic connector)

Minimum bend radius R: r = 44mm or larger (for movable use)
*Only robot cable is available for this model.

Wire	Color	Signal	No.
	—	—	10
	—	—	11
	—	E24V	12
	—	OV	13
	—	LS	26
	—	CREEP	25
	—	OT	24
	—	RSV	23
	—	—	9
	—	—	18
	—	—	19
AWG26 (soldered)	—	A+	1
	—	A-	2
	—	B+	3
	—	B-	4
	—	Z+	5
	—	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Gray	BAT-	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	—	—	22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	BAT+	Purple	
2	BAT-	Gray	
3	SD	Orange	
4	S̄D	Green	AWG26 (crimped)
5	VCC	Red	
6	GND	Black	
7	FG	Ground	
8	BK-	Blue	
9	BK+	Yellow	

Braided ground & shield wire

(Fig.: EU encoder robot cable CB-XEU1-PA□□□, EU version with metal connector)

Minimum bend radius R: r = 44mm or larger (for movable use)
*Only robot cable is available for this model.

Wire	Color	Signal	No.
	–	–	10
	–	–	11
	–	E24V	12
	–	0V	13
	–	LS	26
	–	CREEP	25
	–	OT	24
	–	RSV	23
	–	–	9
	–	–	18
	–	–	19
AWG26 (soldered)	–	A+	1
	–	A-	2
	–	B+	3
	–	B-	4
	–	Z+	5
	–	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Grey	BAT–	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	–	–	22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	SD	Orange	
2	S̄D	Green	
3	–	–	
4	–	–	
5	–	–	
6	–	–	
7	–	–	
8	–	–	
9	–	–	
10	VCC	Red	AWG26 soldered
11	GND	Black	
12	BAT+	Purple	
13	BAT-	Grey	
14	–	–	
15	BK-	Blue	
16	BK+	Yellow	

A shield is connected to shield soldered part

Ground wire and braided shield

14

Maintenance Parts

Model number	CB-X1-PLA□□□	Limit switch encoder robot cable	for LS specification models
	CB-XEU1-PLA □□□	EU limit switch encoder robot cable	other than NS / RCS2 / RCS3

* Enter the cable length (L) into □□□. Compatible to a Maximum of 30 meters.
Ex.: 080 = 8m

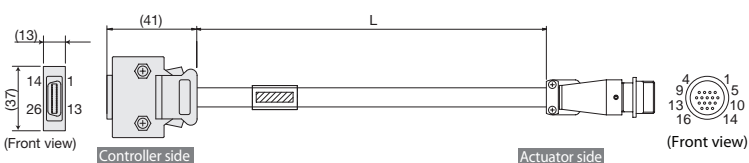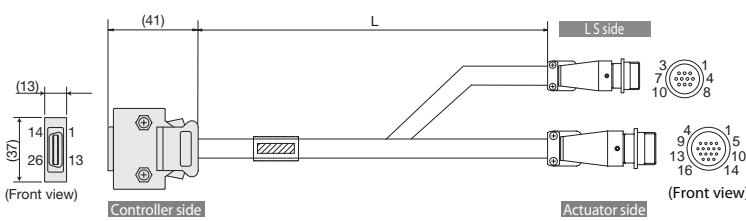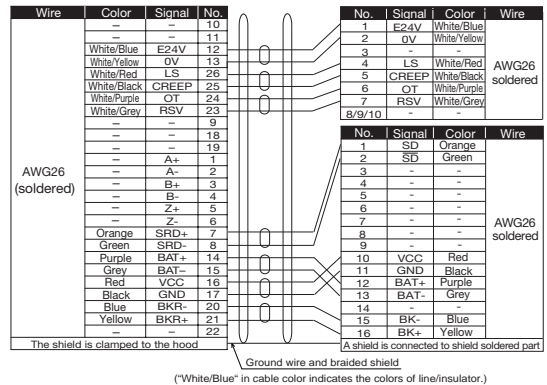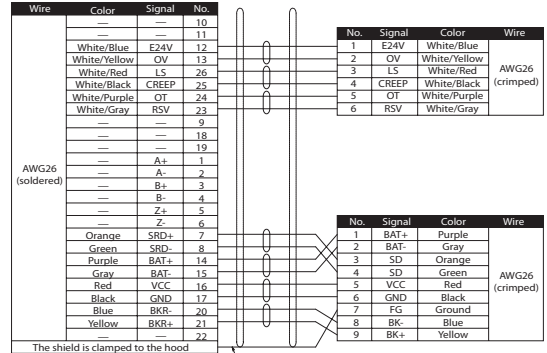(Fig.: LS encoder robot cable CB-X1-PLA□□□ with plastic connector)

Minimum bend. radius R: r = 54mm or larger (for movable use)
*Only robot cable is available for this model.

Wire	Color	Signal	No.
—	—	—	10
—	—	—	11
	White/Blue	E24V	12
	White/Yellow	OV	13
	White/Red	LS	26
	White/Black	CREEP	25
	White/Purple	OT	24
	White/Gray	RSV	23
	—	—	9
AWG26 (soldered)	—	—	18
	—	—	19
	—	A+	1
	—	A-	2
	—	B+	3
	—	B-	4
	—	Z+	5
	—	Z-	6
Orange	SRD+	7	
Green	SRD-	8	
Purple	BAT+	14	
Gray	BAT-	15	
Red	VCC	16	
Black	GND	17	
Blue	BKR-	20	
Yellow	BKR+	21	
	—	—	22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	E24V	White/Blue	AWG26 (crimped)
2	OV	White/Yellow	
3	LS	White/Red	
4	CREEP	White/Black	
5	OT	White/Purple	
6	RSV	White/Gray	

No.	Signal	Color	Wire
1	BAT+	Purple	AWG26 (crimped)
2	BAT-	Gray	
3	SD	Orange	
4	SD	Green	
5	VCC	Red	
6	GND	Black	
7	FG	Ground	
8	BK-	Blue	
9	BK+	Yellow	

Braided ground & shield wire
(White/Blue in cable color indicates the colors of line/insulator.)

(Fig.: EU LS encoder robot cable CB-XEU1-PLA□□□, EU version with metal connector)

Minimum bend. radius R: r = 54mm or larger (for movable use)
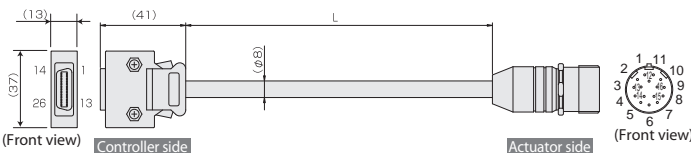*Only robot cable is available for this model.

Wire	Color	Signal	No.
—	—	—	10
—	—	—	11
	White/Blue	E24V	12
	White/Yellow	OV	13
	White/Red	LS	26
	White/Black	CREEP	25
	White/Purple	OT	24
	White/Grey	RSV	23
	—	—	9
	—	—	18
AWG26 (soldered)	—	—	19
	—	A+	1
	—	A-	2
	—	B+	3
	—	B-	4
	—	Z+	5
	—	Z-	6
Orange	SRD+	7	
Green	SRD-	8	
Purple	BAT+	14	
Grey	BAT-	15	
Red	VCC	16	
Black	GND	17	
Blue	BKR-	20	
Yellow	BKR+	21	
	—	—	22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	E24V	White/Blue	AWG26 soldered
2	0V	White/Yellow	
3			
4	LS	White/Red	
5	CREEP	White/Black	
6	OT	White/Purple	
7	RSV	White/Grey	
8/9/10	-		

No.	Signal	Color	Wire
1	SD	Orange	AWG26 soldered
2	SD	Green	
3	-		
4	-		
5	-		
6	-		
7	-		
8	-		
9	-		
10	VCC	Red	
11	GND	Black	
12	BAT+	Purple	
13	BAT-	Grey	
14	-		
15	BK-	Blue	
16	BK+	Yellow	

Ground wire and braided shield
A shield is connected to shield soldered part
("White/Blue" in cable color indicates the colors of line/insulator.)

Model number	CB-X1-PA □□□ -WC	Encoder robot cable	(Dedicated motor robot cable: CB-XEU-MA□□□, see P. 13)	for splash-proof slider ISWA

* Enter the cable length (L) into □□□. Compatible to a Maximum of 30 meters.
Ex.: 080 = 8m

Minimum bend. radius R: r = 44mm or larger (for movable use)
*Only robot cable is available for this model.

Wire	Color	Signal	No.
—	—	—	10
—	—	—	11
	—	E24V	12
	—	OV	13
	—	LS	26
	—	CREEP	25
	—	OT	24
	—	RSV	23
	—	—	9
	—	—	18
AWG26 (soldered)	—	—	19
	—	A+	1
	—	A-	2
	—	B+	3
	—	B-	4
	—	Z+	5
	—	Z-	6
Orange	SRD+	7	
Green	SRD-	8	
Purple	BAT+	14	
Gray	BAT-	15	
Red	VCC	16	
Black	GND	17	
Blue	BKR-	20	
Yellow	BKR+	21	
	—	—	22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	SD	Orange	AWG26 (soldered)
2	SD	Green	
3	—		
4	—		
5	—		
6	—		
7	—		
8	—		
9	—		
10	VCC	Red	
11	GND	Black	
12	BAT+	Purple	
13	BAT-	Gray	
14	—		
15	BK-	Blue	
16	BK+	Yellow	

Ground wire and braided shield
The shield is connected to metal sleeve
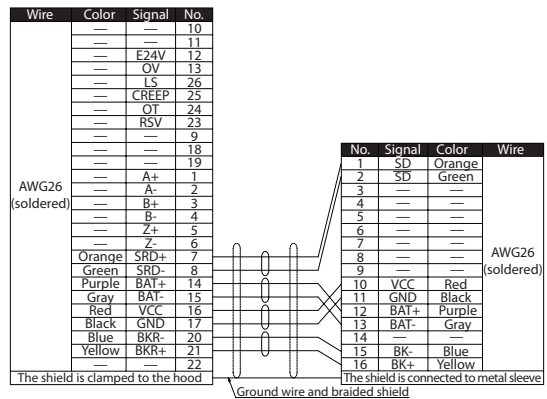
Model number	CB-PAC-PIO □□□	PIO Flat Cable

* Enter the cable length (L) into □□□. Compatible to a Maximum of 10 meters.
Ex.: 080 = 8m

Flat cable (20-core) x 2
Half-pitch MIL socket
HIF6-40D-1.27R (Hirose)
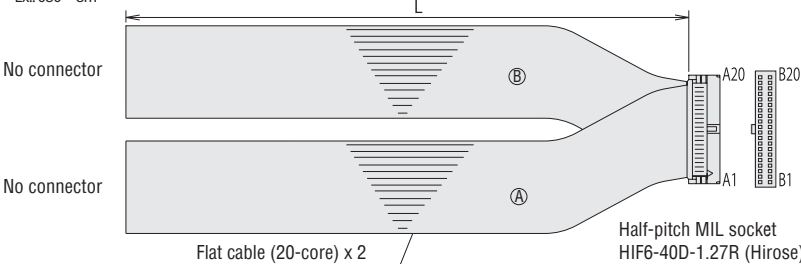
HIF6-40D-1.27R

No.	Signal name	Cable color	Wiring
A1	24V	Brown-1	
A2	24V	Red-1	
A3	—	Orange-1	
A4	—	Yellow-1	
A5	IN0	Green-1	
A6	IN1	Blue-1	
A7	IN2	Purple-1	
A8	IN3	Gray-1	
A9	IN4	White-1	
A10	IN5	Black-1	Flat cable Ⓐ (pressure-welded)
A11	IN6	Brown-2	
A12	IN7	Red-2	
A13	IN8	Orange-2	
A14	IN9	Yellow-2	
A15	IN10	Green-2	
A16	IN11	Blue-2	
A17	IN12	Purple-2	
A18	IN13	Gray-2	
A19	IN14	White-2	
A20	IN15	Black-2	

No.	Signal name	Cable color	Wiring
B1	OUT0	Brown-3	
B2	OUT1	Red-3	
B3	OUT2	Orange-3	
B4	OUT3	Yellow-3	
B5	OUT4	Green-3	
B6	OUT5	Blue-3	
B7	OUT6	Purple-3	
B8	OUT7	Gray-3	
B9	OUT8	White-3	
B10	OUT9	Black-3	Flat cable Ⓑ (pressure-welded)
B11	OUT10	Brown-4	
B12	OUT11	Red-4	
B13	OUT12	Orange-4	
B14	OUT13	Yellow-4	
B15	OUT14	Green-4	
B16	OUT15	Blue-4	
B17	—	Purple-4	
B18	—	Gray-4	
B19	0V	White-4	
B20	0V	Black-4	