

# Program Controller XSEL Series XSEL-RA/SA



www.intelligentactuator.com

# A single controller can operate up to 40 axes. Greater capacity as compared with the conventional XSEL controller

# Corresponds to actuators with built-in battery-less absolute encoders as standard.

Corresponds to actuators with built-in battery-less absolute encoders as standard. No battery maintenance is required since there is no battery. Since home-return operation is not required at start up or after emergency stop or malfunction, this reduces your operation time, resulting in reduced production costs.

#### The advantages of battery-less

- 1. Periodic replacement of the battery is not required.
- 2. No installation space for battery required.
- 3. Battery-related errors do not occur.







# Shortening of program processing time

The processing capacity has been enhanced due to the improved performance of on-board CPU. This increases the SEL language instruction processing speed, which allows the program processing time to be shortened.

### (Example)

Instruction Controller Instruction processing time (ms)

worus		1 5 1 1
Division instruction DIV (Local integer)	Conventional models RA/SA	Approx. 1/15 reduced
Output processing instruction BTON	Conventional models RA/SA	Approx. 1/5 reduced



# Improved functions

The data capacity has been significantly expanded as compared with the conventional XSEL controller.

	RA/SA		R/S	P/Q
No. of programs	255	<b>2</b> time	s 128	128
No. of steps	20,000	2 time	s 9,999	9,999
No. of position data	25,384 (8-axis)	1.5 times	16,000 (8-axis)	20,000 (6-axis)

# More advanced XSEL-RA/SA is now available!



# Compliant with Ethernet/USB as standard

Equipped with Ethernet and USB port as the PC software interface and general message communication interface.

	Controller side connector	Communication speed
Ethernet	10/100/1,000BASE-T (RJ-45)	10/100/1,000Mbps
USB	USB2.0 (Mini-B)	480M (High speed) 12Mbps (Full speed)





# **Expanded motion control**

Up to 32 axes of IAI position controller with MECHATROLINK III can be connected to perform program control using the XSEL controller.

[Connectable controllers: PCON-CB, ACON-CB, DCON-CB, SCON-CB, MCON, MECHATROLINK III specifications]

Up to 40 axes can be operated and controlled using a single controller in combination with up to 8 connected axes of the XSEL controller. Capable of operating at the positioner function and synchronization control function (\*). \* The SCARA robot controller cannot use

the synchronization control function.





# External equipment can be controlled easily

Output operation data field has been added to the positioning data. Signals for controlling external equipment can be easily output for each target position. This eliminates the conventionally required time to create a program to send the signal. Extensive network compatible Option

"DeviceNet", "CC-Link" or "PROFIBUS" can be used simultaneously with "EtherNet/IP (\*)" or "EtherCAT".

\* Capable of Ethernet communication.





Output operation data item



Positioning data editing screen



#### List of Models

Multi-axis program controller that can operate servo motor type actuators. Allows simultaneous control of up to 8 axes.

Type Name	RA	SA	
Name	High-function type	High-function type (Safety category compatible type)	
External view			
Туре	Standard specification	Safety category specification	
Max. no. of connected axes	8 axes		
No. of programs	255 points		
No. of program steps	20	,000 steps	
No. of positions (*1)	1-axis: 55,000; 3-axis: 41,250; 5-axis: 33,000; 7-axis: 27,500 2-axis: 47,142; 4-axis: 36,666; 6-axis: 30,000; 8-axis: 25,384		
Total no. of connectable W (*2)	Single-phase 1,600W/Three-phase 2,400W		
Motor power	Single-phase 200VAC/Three-phase 200VAC		
Control power supply	Single-phase 200VAC		
Safety category (*3)	B Safety category 4 compatible		
Safety standard	CE compliant		

(\*1) The number of positions varies by the number of axes supported by the controller.

(\*2) In vertical motion, the maximum output per axis will be limited to under 600W.

(\*3) To comply to the safety category, the customer will need to install a safety circuit outside the controller.

Type Name	RAX	SAX	RAXD8	SAXD8
Name	SCARA 1-unit, single-axis a	and cartesian specification	SCARA 2-unit specification	
External view				
Туре	Standard specification	Safety category specification	Standard specification	Safety category specification
Max. no. of connected axes	8 axes			
No. of programs	255 points			
No. of program steps	20,000 steps			
No. of positions (*1)	1-axis: 55,000; 3-axis: 41,250; 5-axis: 33,000; 7-axis: 27,500 2-axis: 47,142; 4-axis: 36,666; 6-axis: 30,000; 8-axis: 25,384			
Total no. of connectable W (*2)	Three-phase 2,400W			
Motor power	Three-phase 200VAC			
Control power supply	Single-phase 200VAC			
Safety category (*3)	B Safety category 4 compatible B Safety category 4 compatible			Safety category 4 compatible
Safety standard	CE compliant			

(\*1) The number of positions varies by the number of axes supported by the controller.

(\*2) In vertical motion, the maximum output per axis will be limited to under 600W.

(\*3) To comply to the safety category, the customer will need to install a safety circuit outside the controller.



#### Single-axis and cartesian specifications XSEL-RA/SA type



\* Notes when single-axis robot and cartesian robot are selected

The total wattage of the single-axis robot and cartesian robot that can be connected to XSEL-RA/SA is 2,400W for the three-phase specification and 1,600W for the single-phase specification.

Although the maximum wattage per axis is 750W, please make sure that the total wattage of each axis does not exceed the specified wattage.

#### Actuators that cannot be connected

Please note that the following models cannot be operated with XSEL-RA/SA.

- · LSA series (excluding LSAS Series) · RCS2-SRA7/SRGS7/SRGD7 Series · RCS3-CTZ5C/CT8C
- RCS2-RA13R (With load cell) RCS3-RA4R/RA6R/RA7R/RA8R/RA10R/RA15R/RA20R
- Incremental types of following models

RCS25N Series NS-SXM
/SZM

#### The maximum connectable actuators when connecting LSAS (linear servo actuator)

When connecting the LSAS series to the single-phase specification, please calculate the total wattage based on the "Output value for controller wattage calculation" in the table below.

In addition, make sure that the total wattage of LSAS and actuators other than LSAS is equal to or less than 1,600W.

Actuator type	Applicable driver output [W]	No. of sliders [pcs]	Output value for controller wattage calculation [W]
N10SS	100	1	300
N10SM	100	2	600
N15SS	200	1	600
N15SM	200	2	1,200
N15HS	200	1	600
N15HM	200	2	1,200

LSAS motor wattage conversion table in single-phase specification

#### The maximum connectable actuators when connecting direct drive motor

When connecting the DD/DDA motor series, please calculate the total wattage based on the "Output value for controller wattage calculation" in the table below and make sure it does not exceed the maximum number of connected units. In addition, make sure that the total wattage of DD/DDA Series and actuators other than DD/DDA Series is equal to or less than 1,600W.

Actuator type	Applicable driver output [W]	Max. no. of connected units of DD/DDA motor [unit]	Output value for controller wattage calculation [W]
T18S/T18CS	200	2	600
LT18S/LT18CS	200	2	600
H185/H18CS	600	1	1,200
LH18S/LH18CS	600	1	1,200

DD/DDA motor wattage conversion table in single-phase specification connection DD/DDA motor wattage conversion table in three-phase specification connection

Actuator type	Applicable driver output [W]	Max. no. of connected units of DD/DDA motor [unit]	Output value for controller wattage calculation [W]
T18S/T18CS	200	8	200
LT18S/LT18CS	200	8	200
H18S/H18CS	600	2	600
LH18S/LH18CS	600	2	600



Note: When the brake option is selected with IX-NNN or NNC 1205/1505/1805, be sure to specify the model number of the IX type with the brake option (1205B/1505B/1805B).

#### Actuators that cannot be connected

Please note that the following models cannot be operated with the 5th~8th axis of XSEL-RAX/SAX.

- LSA Series (excluding LSAS Series) • RCS2-SRA7/SRG57/SRGD7 Series • RCS3-CTZ5C/CT8C • RCS2-RA13R (with load cell) • RCS3-RA4R/RA6R/RA7R/RA8R/RA10R/RA15R/RA20R - Incremental types of following models RCS2-□ 5N Series NS-SXM□/SZM□

The limit of connectable additional axis actuators when connecting to XSEL-RAX/SAX

For SCARA controllers, there is a limit to the total wattage of the additional axis actuator motor that can be connected besides SCARA robots. Make sure that it does not exceed the "total wattage and number of connectable axes" in the following table.

SCAPA type		Total wattage and number of connectable axes	
	<b>SCAKA type</b>		Three-phase specification
Ultra-compact	NN*1205 / NN*1505 / NN*1805	1,500W	4 axes (Up to 750W per axis)
Compact	NN*2515H / TNN3015H / UNN3015H NN*3515H / TNN3515H / UNN3515H	1,500W	4 axes (Up to 750W per axis)
Medium	NN*50  H / HNN5020H / INN5020H NN*60  H / HNN6020H / INN6020H	600W	4 axes (Up to 600W per axis)
Large	NN*70	No	
High-speed	NSN5016H / NSN6016H	No	

#### The limit of connectable SCARA robots when connecting to XSEL-RAXD/SAXD

Up to 2 SCARA robots can be connected to the SCARA controller, but there is a limit to the combination. Select the connectable combinations.

SCARA type for SCARA 2-unit specification

First unit		Second unit		
Ultra-compact	NN*1205 / NN*1505 / NN*1805			Medium
Compact	NN*2515H / NN*3515H TNN3015H / UNN3015H TNN3515H / UNN3515H	Ultra-compact	Compact	
Medium	NN*50□□H / NN*60□□H HNN5020H / INN5020H HNN6020H / INN6020H			
Large	NN*70□ □ H / NN*80□ □ H HNN70□ □ H / INN70□ □ H HNN80□ □ H / INN80□ □ H	No		
High-speed	NSN5016H / NSN6016H	No		

Г



(Note 1) When connecting an actuator with brake, the brake power supply +24V is required.

#### I/O Wiring Diagram

#### Input External input specification (NPN specification)

Item	Specification
Input voltage	24VDC ± 10%
Input current	7mA, 1 circuit
ON/OFF voltage	ON voltage: min. 16.0VDC; OFF voltage: max. 5.0VDC
Isolation method	Photocoupler isolation



**Input** External input specification (PNP specification)

Item	Specification
Input voltage	24VDC ± 10%
Input current	7mA, 1 circuit
ON/OFF voltage	ON voltage: min. 8VDC; OFF voltage: max. 19VDC
Isolation method	Photocoupler isolation



#### I/O Signal Table

andard	l I/O sig	nal tab	ole (When N1 or P1 is selected
Pin No.	Category	Port No.	Standard setting
1		-	24V connection
2		000	Program start
3		001	General-purpose input
4		002	General-purpose input
5		003	General-purpose input
6		004	General-purpose input
7		005	General-purpose input
8		006	General-purpose input
9		007	Program No. (PRG No.1)
10		008	Program No. (PRG No.2)
11		009	Program No. (PRG No.4)
12		010	Program No. (PRG No.8)
13		011	Program No. (PRG No.10)
14		012	Program No. (PRG No.20)
15		013	Program No. (PRG No.40)
16		014	General-purpose input
1/	Input	015	General-purpose input
18		016	General-purpose input
19		017	General-purpose input
20		018	General-purpose input
21		019	General-purpose input
22		020	General-purpose input
23		021	General-purpose input
24		022	General-purpose input
25		025	General purpose input
20		024	General-purpose input
2/		025	General-purpose input
20		020	General-purpose input
30		027	General-purpose input
31		020	General-purpose input
32		030	General-purpose input
33		031	General-purpose input
34		300	Alarm output
35		301	Ready output
36		302	Emergency stop output
37		303	General-purpose output
38		304	General-purpose output
39		305	General-purpose output
40		306	General-purpose output
41		307	General-purpose output
42	Output	308	General-purpose output
43		309	General-purpose output
44		310	General-purpose output
45		311	General-purpose output
46		312	General-purpose output
47		313	General-purpose output
48		314	General-purpose output
49		315	General-purpose output
50		-	0V connection

Expanded	I/O sign	al table (When N1 or P1 is selected)
Pin No.	Category	Standard setting
		24V connection
2		General-purpose input
		General-purpose input
4		General-purpose input
5		General purpose input
7		Conoral purpose input
~ ~		Conoral purpose input
0		General purpose input
10		General purpose input
11		General purpose input
12		General purpose input
13		General purpose input
14		General-purpose input
15		General-purpose input
16		General-purpose input
17	Input	General-purpose input
18		General-purpose input
19		General-purpose input
20		General-purpose input
21		General-purpose input
22		General-purpose input
23	1	General-purpose input
24	1	General-purpose input
25		General-purpose input
26		General-purpose input
27		General-purpose input
28		General-purpose input
29		General-purpose input
30		General-purpose input
31		General-purpose input
32		General-purpose input
33		General-purpose input
34		General-purpose output
35		General-purpose output
36		General-purpose output
3/		General-purpose output
38		General-purpose output
39		General-purpose output
40		Caparal purpose output
41	Output	General purpose output
42	Output	Caparal purpose output
43		Conoral purpose output
44		General-purpose output
45		General-purpose output
40		General-purpose output
47		General-purpose output
49		General-purpose output
50		0V connection

#### Output External input specification (NPN specification)

ltem	Specification		
Load voltage	24VDC		
Maximum load current	100mA/1 point 400mA/8 ports. (Note)	TD62084 (equivalent) used	
Leakage current	Max. 0.1mA/1 contact		
Isolation method	Photocoupler isolation		
No.300 + n + 7 is	400mA. n = 0 or multiple of 8.)	24V common terminal	
Internal drour Bouily		ge absorber Load + External power supply - 24VDC±10%	
Equiva	nent circuit	uv common terminai	

#### **Output** External input specification (PNP specification)

	-		
Item		Specification	
	Load voltage	24VDC	
	Maximum load current	100mA/1 point 400mA/8 ports. (Note)	TD62784 (equivalent) used
	Leakage current	Max. 0.1mA/1 contact	
	Isolation method	Photocoupler isolation	

Note: The maximum load current will be 400mA per 8 ports from the output port No.300. (The maximum load current between the output port No.300 + n and No.300 + n + 7 is 400mA. n = 0 or multiple of 8.)



31 32

38 39 40

50

Output

#### Pin No. Category Standard setting 24V connection General-purpose input General-purpose input General-purpose input 4 General-purpose input General-purpose input General-purpose input General-purpose input General-purpose input General-purpose input Input 10 11 12 13 General-purpose input General-purpose input General-purpose input General-purpose input General-purpose input 14 General-purpose input 16 General-purpose input General-purpose output 18 19 20 General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output 21 22 23 24 25 General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output 26 27 28 General-purpose output General-purpose output General-purpose output General-purpose output 29 30

General-purpose output General-purpose output General-purpose output General-purpose output

General-purpose output

General-purpose output General-purpose output General-purpose output

General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output

General-purpose output OV connection

Expanded I/O signal table (When N2 or P2 is select

	Category	Port No.	Standard setting
1	-	-	External power supply (24VDC) for the pin No. 2~25, 51~74
2		000	Program start
4		001	General-purpose input
5		003	General-purpose input
6		004	General-purpose input
/		005	General-purpose input
9		007	Program No. (PRG No.1)
10		008	Program No. (PRG No.2)
11		009	Program No. (PRG No.4)
13		010	Program No. (PRG No.10)
14	Input	012	Program No. (PRG No.20)
15		013	Program No. (PRG No.40)
17		014	General-purpose input
18		016	General-purpose input
19		017	General-purpose input
20		018	General-purpose input
22		020	General-purpose input
23		021	General-purpose input
24		022	General-purpose input
26	-	-	External power supply (24VDC) for the pin No. 27~50, 76~99
27		024	General-purpose input
28		025	General-purpose input
30		026	General-purpose input
31		028	General-purpose input
32		029	General-purpose input
33		030	General-purpose input
35		032	General-purpose input
36		033	General-purpose input
37		034	General-purpose input
38	Input	035	General-purpose input
40		037	General-purpose input
41		038	General-purpose input
42		039	General-purpose input
43		040	General-purpose input
45		042	General-purpose input
46		043	General-purpose input
47		044	General-purpose input
49		046	General-purpose input
50		047	General-purpose input
52		300	Ready output
53		302	Emergency stop output
54		303	General-purpose output
56		304	General-purpose output
57		306	General-purpose output
58		307	General-purpose output
59 60		308	General-purpose output
61		310	General-purpose output
62	Output	311	General-purpose output
63		312	General-purpose output
65		314	General-purpose output
66		315	General-purpose output
67		316	General-purpose output
69		318	General-purpose output
70		319	General-purpose output
71		320	General-purpose output
73		321	General-purpose output
74		323	General-purpose output
75	-	-	External power supply (0V) for the pin No. 2~25, 51~74
70		324	General-purpose output
78		325	General-purpose output
79		327	General-purpose output
80		328	General-purpose output
82		329	General-purpose output
83		331	General-purpose output
84		332	General-purpose output
85 86		333	General-purpose output
87	Outraint	335	General-purpose output
88	output	336	General-purpose output
89		337	General-purpose output
91		339	General-purpose output
92		340	General-purpose output
93		341	General-purpose output
94 95		342	General-purpose output
96		344	General-purpose output
07		345	General-purpose output
97			
97 98		346	General-purpose output

Pin No.	Catogory	Port No	Standard cotting
	category		External power supply (24//DC) for the pip No. 2-25, 51-74
2	-		General-purpose input
3			General-purpose input
4			General-purpose input
5			General-purpose input
6			General-purpose input
8			General-purpose input
9			General-purpose input
10			General-purpose input
11			General-purpose input
12			General-purpose input
13	Input		General-purpose input
15			General-purpose input
16			General-purpose input
17			General-purpose input
18			General-purpose input
19			General-purpose input
20			General-purpose input
22			General-purpose input
23			General-purpose input
24			General-purpose input
25			General-purpose input
26	-	-	External power supply (24VDC) for the pin No. 27~50, 76~99
27			General-purpose input
29			General-purpose input
30			General-purpose input
31			General-purpose input
32			General-purpose input
33			General-purpose input
35			General-purpose input
36			General-purpose input
37			General-purpose input
38	Input		General-purpose input
39	·		General-purpose input
40			General-purpose input
42			General-purpose input
43			General-purpose input
44			General-purpose input
45			General-purpose input
40			General-purpose input
48			General-purpose input
49			General-purpose input
50			General-purpose input
51			General-purpose output
52			General-purpose output
54			General-purpose output
55			General-purpose output
56			General-purpose output
57			General-purpose output
58			General-purpose output
60			General-purpose output
61			General-purpose output
62	Output		General-purpose output
63	Juiput		General-purpose output
64			General-purpose output
65			General-purpose output
67			General-purpose output
68			General-purpose output
69			General-purpose output
70		1	General-purpose output
/1			General-purpose output
73			General-purpose output
74			General-purpose output
75	-	-	External power supply (0V) for the pin No. 2~25, 51~74
76			General-purpose output
77			General-purpose output
79			General-purpose output
80			General-purpose output
81			General-purpose output
82		ļ	General-purpose output
83			General-purpose output
85			General-purpose output
86			General-purpose output
87	Output		General-purpose output
88	output		General-purpose output
89			General-purpose output
90			General-purpose output
91			General-purpose output
u) i			General-purpose output
92			
92 93 94			General-purpose output
92 93 94 95			General-purpose output General-purpose output
92 93 94 95 96			General-purpose output General-purpose output General-purpose output General-purpose output
92 93 94 95 96 97 98			General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output
92 93 94 95 96 97 98 99			General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output General-purpose output

Expanded multi-point I/O signal table (When N3 or P3 is selected)

# 8

#### **Specification Table** Item Description Controller type RA SA RAX/RAXD SAX/SAXD 20W~750W 12W~750W Compatible motor output 1~4 axes: SCARA robot 5~8 axes: SCARA robot or additional axes Number of controlled axes 1~8 axes [Three-phase] Up to 2,400W Max. output of connected [Three-phase] Up to 2,400W axes [Single-phase] Up to 1,600W Motor input power-supply [Three-phase] 200/230VAC ±10% [Three-phase] 200/230VAC ±10% voltage [Single-phase] 200/230VAC ±10% **Control power input** Single-phase 200/230VAC ±10% Power frequency 50/60Hz Not less than 10MΩ Insulation resistance (Between the power supply terminal and I/O terminal, and between the external terminal batch and case, at 500VDC) Insulation withstanding voltage 1,500VAC (1 min) Power capacity (max) 5,094VA (at max. output of connected axes) Position detection method Incremental, absolute, battery-less absolute Safety circuit configuration Duplication not possible Duplication possible Duplication not possible Duplication possible Drive-source cutoff method Internal relay cut-off External safety circuit Internal relay cut-off External safety circuit Normally-closed input (External power supply, duplication possible) Normally-closed input (External power supply, duplication possible) Normally-closed input (Internal power supply) Normally-closed input (Internal power supply) **Emergency stop input** Normally-closed input (Internal power supply) Normally-closed input (External power supply, duplication possible) Normally-closed input (Internal power supply) Normally-closed input (External power supply, duplication possible) **Enable input** Speed setting 1mm/s~ Upper limit depends on the actuator specification Acceleration/ 0.01G~ Upper limit depends on the actuator specification deceleration setting Programming language Super SEL language No. of programs 255 programs 20,000 steps (total) No. of program steps No. of multi-tasking 16 programs programs Varies by the number of controlled axes No. of positions 1-axis: 55,000; 3-axis: 41,250; 5-axis: 33,000; 7-axis: 27,500 2-axis: 47,142; 4-axis: 36,666; 6-axis: 30,000; 8-axis: 25,384 Data recording element Flash ROM + non-volatile RAM (FRAM): system battery (button battery) not required Data input method Teaching pendant or PC software I/O 48-point PIO board (NPN/PNP), Standard I/O I/O 96-point PIO board (NPN/PNP) 2 boards attachable Serial communication function Teaching port (D-sub25 pin), USB port (Mini-B) 1ch RS232C port (D-sub 9 pin), Ethernet (RJ-45) DeviceNet, CC-Link, PROFIBUS-DP, EtherNet/IP, EtherCAT **Fieldbus communication** function (EtherNet/IP, EtherCAT and DeviceNet, CC-Link, PROFIBUS-DP can be simultaneously attached) **Clock function** Retention time: about 10 days Charging time: about 100 hours **Regenerative resistance** Built-in $1k\Omega/20W$ regenerative resistor (Can be expanded by external regenerative resistance unit connection) Absolute battery AB-5 (built into the controller) Motor overcurrent, overload, motor driver temperature check, Protection function overload check, encoder disconnection detection, soft limit over, system malfunction, absolute battery abnormality, etc. [4-axis three-phase] about 3.8kg Without absolute [4-axis] about 4.4kg [4-axis single phase] about 4.4kg [4-axis] about 4.4kg [4-axis] about 3.8kg [8-axis] about 5.3kg [8-axis three-phase] about 4.7kg [8-axis] about 5.3kg [8-axis] about 4.7kg battery unit [8-axis single phase] about 5.3kg Weight [4-axis three-phase] about 4.4kg [4-axis] about 5.0kg [4-axis] about 5.0kg [4-axis] about 4.4kg With absolute [4-axis single phase] about 5.0kg battery unit [8-axis] about 6.0kg [8-axis three-phase] about 5.4kg [8-axis] about 6.0kg [8-axis] about 5.4kg [8-axis single phase] about 6.0kg

Ambient temperature,<br/>humidity and environment0 ~ 40°C, 85% RH or less (non-condensing), avoid corrosive gas and excessive dust

\* For the power supply capacity etc., please refer to the operation manual or contact IAI.

Specification Table

#### XSEL-RA/SA

	Controllor		Front		
	Spec		Battery-less absolute spec./Incremental spec./ Quasi absolute spec./Index absolute spec.	Absolute spec./Multi-rotation absolute spec.	Side View
PA	Single-phase/	1~4-axis spec.			
KA	spec.	5~8-axis spec.			
	Single-phase	1~4-axis spec.			(Battery-less absolute/ Incremental spec./ Quasi absolute spec./ Index absolute spec.)
SA -	spec.	5~8-axis spec.			
	Three-phase spec.	1~4-axis spec.			(Absolute spec./ Multi-rotation absolute spec.)
		5~8-axis spec.			

\* If absolute specification is included for more than 1 connected actuator, the external dimensions will be that of the absolute specification.

#### XSEL-RAX/RAXD/SAX/SAXD

	Controllor		Front			
	Spec	lier	Battery-less absolute spec./Incremental spec./ Quasi absolute spec./Index absolute spec.	Absolute spec./Multi-rotation absolute spec.	Side View	
RAX RAXD	Three-phase	4-axis spec.				
	spec.	5~8-axis spec.			(Battery-less absolute/ Incremental spec./ Quasi absolute spec./ Index absolute spec.)	
SAX	SAX Three-phase SAXD spec.	4-axis spec.				
SAXD		5~8-axis spec.			(Absolute spec./ Multi-rotation absolute spec.)	

\* If absolute specification is included for more than 1 connected single actuator, the external dimensions will be that of the absolute specification. However, when only connecting the SCARA robot, the external dimensions will be that of the incremental specification as the battery will be attached to the SCARA. Controllers for large type (arm length 700/800) and high-speed type will have the controller size of the 8-axis specification.

#### **Names of Each Part**



#### 1 FG connection terminal

It is the connection end for connecting the housing FG (Frame ground). Be sure to ground properly for the protection against noise.

#### 2 AC power input connector

A connector for 200VAC three-phase input. It consists of 6 terminals of the motor power terminal, control power supply terminal and PE terminal. It only standardly comes with the terminal block.

Caution Do not touch the connector while power is supplied to avoid an electric shock.

#### 3 External regenerative resistance unit connector

A connector for connecting a regenerative resistor unit that's connected when the capacity is insufficient with the built-in regenerative resistor at high acceleration/high-load, etc. The necessity of an external regenerative resistance unit depends on the application such as the axis configuration.

#### 4 Encoder/axis sensor connector

A connector for connecting an encoder of the actuator and axis sensors such as LS, CREEP, and OT. \*: LS, CREEP and OT are optional.

#### 5 Motor connector

A connector for driving the motor of the actuator.

#### 6 Teaching connector

The teaching interface is to be connected to IAI teaching pendant or PC (PC software) for the operation and setting of the controller.

#### 7 System I/O connector

An I/O connector that controls the safety operations of the controller. In the safety category specification, it is possible to configure the safety circuits of up to category 4 with this connector and external safety circuit.

#### 8 Panel window

It consists of 7 segment LEDs with 4 digits and 6 LED lamps that indicate the status of the controller.

#### 9 Mode switch

This switch is used to specify the mode of operation of the controller. It is a lever lock type toggle switch for preventing wrong operation that can be operated by pulling toward the user.

Switch position	٦	Function
MANU (Manual mode) Top		Teaching tool can be used.
AUTO (Automatic mode)	Bottom	Teaching tool cannot be used. (Note) Be sure to attach the <b>G</b> supplied dummy plug to the teaching connector. If not, the emergency stop cannot be released.

#### 10 Standard I/O connector

48-point I/O or 96-point DIO board (option) is mounted.

#### 11 EtherNet connector

Communication port for connecting the EtherNet communication device.

#### 12 USB connector

USB device connector for connecting to a PC.

#### 13 General RS232C port connector

A port for connecting general RS232C devices.



#### 14 Expanded motion control connector

A connector for IAI controllers (MECHATROLINK III specification).

#### 15 Field network board (optional) mounting position 1

Equipped with the field network board (option) for EtherNet/IP or EtherCAT.

#### 16 Field network board (optional) mounting position 2

Equipped with the field network board (option) for CC-Link, DeviceNet or PROFIBUS-DP.

#### 17 SD card slot connector

A connector to be used for system update. Not used in normal operation.

#### 18 Brake power connector

A power supply connector for the brake of the actuator. External 24VDC power supply is required. If this power is not supplied, the brake of the actuator cannot be released. Make sure to use a power supply for axes with brake.

#### 19 Brake release switch connector

A connector for connecting the switch for releasing the brake of the actuator from the outside of the controller. When short-circuiting the COM terminal and BKMRL<sup>\*</sup> terminal of the connector, the brake will be released. Used for moving the actuator by hand in case of power failure or abnormality of the controller.

#### 20 Brake release switch

A switch to be used to release the brake of the actuator with brake forcibly (released by supplying power). When starting up the device or moving the actuator by hand during teaching or in case of abnormality, switch to the RLS side to force the brake to be released. As long as it is not required, keep the switch to the NOM side.

Switch position		Function
RLS (Brake release) Left		The brake is forcibly released.
NOM (Automatic mode)	Right	The brake is automatically controlled by the controller. Servo ON: Brake release Servo OFF: Brake enabled

The switch is not available for the axes with brake of some SCARA robots for the SCARA controllers.

#### 21 System operational status LED lamp 1

Status LED lamps that indicate system operating status (Motion control master, SD card) and the operating status of the network interface 1.

#### 22 System operational status LED lamp 2

Status LED lamps that indicate system operating status (Main CPU) and the operating status of the network interface 2.

#### 23 System operation setting switch

4-pole DIP switch for setting the system operation mode.

#### 24 Conveyor tracking connector

A connector for the conveyor tracking encoder. Standardly equipped for the SCARA controller.

#### 25 Absolute battery unit

The unit will be attached in the absolute specification.

#### Option

#### Regenerative resistance unit

Model **RESU-1** (Standard specification) **RESUD-1** (DIN rail mounting specification)

Specification		
Model	RESU-1	RESUD-1
Weight	About	t 0.4kg
Built-in regenerative resistance value	235Ω	2 80W
Unit mounting method	Screw mount	DIN rail mount
Attached cable	CB-ST-I	REU010

#### Description

Unit that converts the regenerative current generated in motor deceleration to heat. Although the controller is equipped with a regenerative resistance inside, an additional regenerative unit may be necessary if the load in the vertical axis is large and the capacity is insufficient.

#### <When connecting a single-axis robot>

Installation criteria Determined by the total motor wattage of connected axes.

Horizontal specification				
Total motor wattage	Required number of regenerative resistances			
100W	0			
~600W	1			
~1,200W	2			
~1,800W	3			
~2,400W	4			



1.5

<RESU-1>

#### Vertical specification

Total motor wattage	Required number of regenerative resistances
100W	0
~600W	1
~1,000W	2
~1,400W	3
~2,000W	4
~2.400W	5



#### <When connecting a SCARA robot>

#### Estimated installation criteria

Mod	el Number	Required number of regenerative resistances
	1205	
	1505	0
	1805	
NNN	2515H	
	3015H	1
UNN	3515H	
HNN	50**H	2
INN	60**H	3
NNC	70**H	
	80**H	4
	10040	4
	12040	
NCN	5016H	2
INZIN	6016H	3

The required number is for a single SCARA robot. When connecting a single-axis robot as an additional axis, be sure to add regenerative resistances for the singleaxis robot.

Examples: When operating IX-NNN2515H and ISA-MXM (200W). IX-NNN2515H ...... 1 unit required ISA-MXM (200W) ... 1 unit required

Therefore, 2 regenerative resistances are required.

#### Absolute data backup battery



#### Dummy plug

Model AB-5

Features



Features A dummy plug to be attached to the teaching connector when a PC or teaching pendant is not connected.

#### Touch panel teaching pendant

**Features** A teaching device equipped with functions such as position teaching, trial operation, and monitoring.

Model TB-02-🗌 External dimensions



#### Specification

Rated voltage	24VDC
Power consumption	3.6W or less (150mA or less)
Ambient operating temperature	0~40°C
Ambient operating humidity	20~85% RH (Non-condensing)
Environmental resistance	IP20
Weight	470g (TB-02 unit only)

#### PC software (For XSEL-RA/RXA/RXAD)

### Model IA-101-X-MW

Features This is start-up support software which comes equipped with functions such as program/position input, trial operation and monitoring. The functions required for debugging has been significantly

improved to reduce the start-up time.

#### ( Notes

\* When using a Safety Category 4 compliant controller, please use IA-101-XA-MW. \* It cannot be used for XSEL-SA/SAX/SAXD.

- \* When separately ordering a PC connection cable for maintenance, the model number will be CB-ST-E1MW050 for the cable
- the model number will be CB-ST-E1MW050 for the cable only and CB-ST-E1MW050-EB when set with an emergency stop box.

Description Software (CD-ROM), supported Windows: XP SP2 or later/Vista/7/8

(Accessories) PC connection cable 5m + emergency stop box (Model CB-ST-E1MW050-EB)



#### Safety category 4 compliant PC software (for XSEL-SA/SAX/SAXD)

Model IA-101-XA-MW \* Only for XSEL-SA/SAX/SAXD. Notes When separately ordering a PC connection cable This is start-up support software which comes equipped with functions such as program/ Features for maintenance, the model number will be position input, trial operation and monitoring. CB-ST-A1MW050 for the cable only and The functions required for debugging has been significantly improved to reduce the start-CB-ST-A1MW050-EB when set with an emergency up time stop box. In addition, the PC connection cable has a duplex circuit for If you do not use a teaching tool, connect the dummy plug DP-2 that comes with the controller to the teaching connector. emergency stop to comply to the Safety Category 4. Description Software (CD-ROM), supported Windows: XP SP2 or later/Vista/7/8 (Accessories) PC connection cable 5m + Emergency stop box (Model: CB-ST-A1MW050-EB) Shield is connected to pin 1 and c Red/Blue 0.255 0.350 .3sq .3sq Teaching pendant Junction box side 1/Blue y/Pink 0.25s PC side 0.3sc t-(1) 0.3sq Short Emergency stop FMG SW BOX side 

#### USB compliant PC software (For XSEL-RA/RXA/RXAD)

Model IA-101-X-USBMW

Features A USB adapter is mounted on the RS232C cable to allow the use on a PC's USB port.

Description Software (CD-ROM), supported Windows: XP SP2 or later/Vista/7/8

(Accessories) PC connection cable 5m + emergency stop box + USB adapter + USB cable 3m



#### PC software (no cable) Model IA-101-N It only comes with the PC software (CD-ROM). Features If you want to connect both the controller and PC side with a USB cable or Ethernet Notes cable, only the software needs to be purchased. A cable that meet the following When operating the actuator by USB connection, be specifications is to be prepared by the customer. sure to connect the stop switch to the system I/O connector. If an emergency switch is not available, use the emergency stop-equipped model "IA-101-X-USBMW". Description Software (CD-ROM), supported Windows: XP SP2 or later/Vista/7/8 Controller side connector Maximum cable length USB cable specification USB Mini-B 5m Ethernet cable specification 10/100/1000BASE-T (RJ-45) 5m USB cable (to be prepared by the user) Ethernet cable (to be prepared by the user) \_\_\_\_\_(L\_\_\_

PC software (CD)

#### **Maintenance Parts**

When placing an order for the replacement cable, please use the model number shown below.

#### Table of compatible cables

	Model nu	mber	Motor cable	Motor robot cable	Encoder cable	Encoder robot cable			
		Madala ath ar than	Motor cable	Motor robot cable	Elicodel cable	Encoder robot cable			
1	RCS2 (CR/VV) RCS3 (CR)	$2 \sim 4$			CB-RCS2-PA	СВ-ХЗ-РАППП			
2		RT			CB-RCS2-PLA	CB-X2-PLA			
3	RCS2	RA13R (Without load cell/ without brake)	CB-RCC-MA	CB-RCC-MA	CB-RCS2-PLA	CB-X2-PLA			
4		RA13R (Without load cell/ with brake)			CB-RCS2-PLA	CB-X2-PLADD [Between the controller and brake] CB-X2-PLADDD			
5	NC	Without LS	-		-	СВ-ХЗ-РАППП			
6	INS	With LS	-	СВ-Х-МАППП	-	CB-X2-PLA			
$\bigcirc$	LSAS	N	-		-	CB-X1-PA			
8	DD DDA	T18□/ LT18□	-	СВ-Х-МАППП	-				
9	DDACR DDW	H180/ LH180	-	СВ-ХМС-МАППП	-				
10	ISW	/A	-	CB-XEU-MA	-	CB-X1-PADDD-WC			
11	ZR		-	СВ-Х-МАППП	-	Z-axis: CB-X1-PA			
12	Models other t	dala athay than () (1)			-	CB-X1-PA□□□ (For 20m or less) *			
	Models other i	.nan () ~ ()	-		-	CB-X1-PADD-AWG24 (For 21m or more)			
13	Models other than ① ~ ① with LS		Models other than $(1) \sim (1)$		-	CB-X1-PLA (For 20m or less) *			
			-		-	CB-X1-PLADD-AWG24 (For 21m or more)			
14	14 IX (Joint cable specification)		_	СВ-Х-МАППП	-	СВ-Х1-РАППП			

\* Those that do not have the battery-less absolute specification will also be CB-X1-PA

	Model number	PIO flat cable
		CB-X-PIO
15	XSEL- RA/SA/RAX/RAXD/SAX/SAXD	Multipoint PIO flat cable
		CB-X-PIOH

# Model Number CB-RCC-MA

\* Please indicate the cable length (L) in □□□, maximum 30m, E.g.) 080 = 8m

\* Please indicate the cable length (L) in \_\_\_\_, maximum 30m, E.g.) 080 = 8m



 Wiring
 Signal
 No.
 Signal
 Wiring

 PE
 1
 U
 2
 V
 0.75sq

 U
 2
 V
 3
 W
 (Crimped)

 W
 4
 PE
 4
 PE

Minimum bending radius r = 50mm or more (Dynamic bending condition) \* Please use the robot cable if the cable has to be installed through the cable track.

Model Number CB-RCS2-PA



Minimum bending radius r = 50mm or more (Dynamic bending condition) \* Please use the robot cable if the cable has to be installed through the cable track.













Minimum bending radius r = 50mm or more (Dynamic bending condition) \* Please use the robot cable if the cable has to be installed through the cable track.

**Maintenance Parts** 

#### Model Number



Minimum bending radius r = 44mm or more (Dynamic bending condition) \* Only robot cable is available for this model.

\* If you require ISB/ISDB (encoder type is battery-less absolute) with the cable of 21m or longer, select the CB-X1-PA

#### CB-X1-PA Model Number



Minimum bending radius r = 44mm or more (Dynamic bending condition) \* Only robot cable is available for this model.

Minimum bending radius r = 54mm or more (Dynamic bending condition)

\* If you require ISB/ISDB (encoder type is battery-less absolute) with the cable of 21m or longer, select the CB-X1-PLA



#### CB-X1-PLA Model Number

(41)

 $\langle \widehat{\oplus} \rangle$ 

Controller side

\* Only robot cable is available for this model.





CB-X1-PLA \* Please indicate the cable length (L) in Model Number . maximum 30m, E.g.) 210 = 21m (41) LS side (13) Ð (Front view) Actuator side Controller side Minimum bending radius r = 54mm or more (Dynamic bending condition)

LS side

Actuator side

\* Only robot cable is available for this model.



Please indicate the cable length (L) in □□□, maximum 30m, E.g.) 080 = 8m

Please indicate the cable length (L) in  $\Box \Box \Box$ , maximum 30m, E.g.) 080 = 8m

#### **Maintenance Parts**

### Model Number CB-XEU-MA



Plug GIC2.5,	/4-STF-7.6	52 (F	Phoenix)	Plug connector 99-4222-00-04 (BINDE						
Wiring	Signal	No.		No.	Signal	Wiring				
	PE	1		•	PE					
0.75cm	U	2		1	U	0.75sa				
0.7554	V	3		2	V	(Crimped)				
	W	4		3	W	ľ ' '				

Minimum bending radius r = 48mm or more (Dynamic bending condition) \* Only robot cable is available for this model.

#### Model Number CB-X1-PA





Minimum bending radius r = 38mm or more (Dynamic bending condition) \* Only robot cable is available for this model.



(White/blue cable colors indicate the band color/insulator color)



#### \* Please indicate the cable length (L) in \_\_\_\_, maximum 10m, E.g.) 080 = 8m

No.	Color	Wiring	No.	Color	Wiring	No.	Color	Wiring
1	Brown 1		18	Gray 2		35	Green 4	
2	Red 1		19	White 2		36	Blue 4	
3	Orange 1		20	Black 2		37	Purple 4	
4	Yellow 1		21	Brown-3		38	Gray 4	
5	Green 1		22	Red 3		39	White 4	
6	Blue 1		23	Orange 3		40	Black 4	Flat
7	Purple 1	Flat	24	Yellow 3	Flat	41	Brown-5	cable
8	Gray 1	cable	25	Green 3	cable A	42	Red 5	(pressure-
9	White 1	(pressure-	26	Blue 3	(pressure-	43	Orange 5	welded)
10	Black 1	weided)	27	Purple 3	weidedy	44	Yellow 5	
11	Brown-2		28	Gray 3		45	Green 5	
12	Red 2		29	White 3		46	Blue 5	
13	Orange 2		30	Black 3		47	Purple 5	
14	Yellow 2		31	Brown-4		48	Gray 5	
15	Green 2		32	Red 4		49	White 5	
16	Blue 2		33	Orange 4		50	Black 5	
17	Purple 2		34	Yellow 4				

### Model Number **CB-X-PIOH**

\* Please indicate the cable length (L) in \_\_\_\_, maximum 10m, E.g.) 080 = 8m

		Cable 1									Cable 2											
		Pir No	Color	Port No.	Function	Nc	Color	Port No.	Function	Categor	Pin No.	Color	Port No.	Function	P Creator N	in lo.	olor	Port No.	Function			
		- 1	Brown-1	-	External power supply (24VDC) for the pin No. 2~25, 51~74	- 26	Blue-3	-	External power supply (24VDC) for the pin No. 27~50, 76~99		51	Brown-1	300	Alarm output	7	76 B	lue-3	324	General-purpose output			
CN1	Г	2	Red-1	000	Program start	27	Purple-3	024	General-purpose input		52	Red-1	301	Ready output	- 02	77 Pur	rple-3	325	General-purpose output			
51 == 1		3	Orange-1	001	General-purpose input	28	Gray-3	025	General-purpose input		53	Orange-1	302	Emergency stop output	1	78 Gr	ray-3	326	General-purpose output			
		4	Yellow-1	002	General-purpose input	29	White-3	026	General-purpose input		54	Yellow-1	303	General-purpose output	- 2	79 Wł	hite-3	327	General-purpose output			
		5	Green-1	003	General-purpose input	30	Black-3	027	General-purpose input		55	Green-1	304	General-purpose output	8	BO Bla	ack-3	328	General-purpose output			
		6	Blue-1	004	General-purpose input	31	Brown-4	028	General-purpose input		56	Blue-1	305	General-purpose output	8	31 Bro	own-4	329	General-purpose output			
		7	Purple-1	005	General-purpose input	32	Red-4	029	General-purpose input		57	Purple-1	306	General-purpose output	1	32 Re	ed-4	330	General-purpose output			
		8	Gray-1	006	General-purpose input	33	Orange-4	030	General-purpose input		58	Gray-1	307	General-purpose output	1	33 Ora	inge4	331	General-purpose output			
	nector	9	White-1	007	Program No. (PRG No.1)	34	Yellow-4	031	General-purpose input		59	White-1	308	General-purpose output	1	34 Yel	low-4	332	General-purpose output			
		10	Black-1	008	Program No. (PRG No.2)	35	Green-4	032	General-purpose input		60	Black-1	309	General-purpose output	1	35 Gri	een-4	333	General-purpose output			
		11	Brown-2	009	Program No. (PRG No.4)	36	Blue-4	033	General-purpose input	ţ	61	Brown-2	310	General-purpose output	칠통	36 BI	lue-4	334	General-purpose output			
		12	Red-2	010	Program No. (PRG No.8)	37	Purple-4	034	General-purpose input	Ϊ	62	Red-2	311	General-purpose output	불년	37 Pur	rple-4	335	General-purpose output			
		± 13	Orange-2	011	Program No. (PRG No.10)	+ 38	Gray-4	035	General-purpose input	9	63	Orange-2	312	General-purpose output	<u>ا</u>	38 Gr	ray-4	336	General-purpose output			
Socket: Flat cable (50-core)		<u>ē</u> 14	Yellow-2	012	Program No. (PRG No.20)	<u>ē</u> 39	White-4	036	General-purpose input		64	Yellow-2	313	General-purpose output	1	89 Wł	hite4	337	General-purpose output			
UIEC 100D 1 27D (Uieren)		= 15	Green-2	013	Program No. (PRG No.40)	= 40	Black-4	037	General-purpose input		65	Green-2	314	General-purpose output	2	90   Bla	ack-4	338	General-purpose output			
HIF6-100D-1.2/R (HIF0SE)		16	Blue-2	014	General-purpose input	41	Brown-5	038	General-purpose input		66	Blue-2	315	General-purpose output	4	91 Bro	own-5	339	General-purpose output			
Cable 1 (1~50 pins)		17	Purple-2	015	General-purpose input	42	Red-5	039	General-purpose input		67	Purple-2	316	General-purpose output	1	92 Re	ed-5 1	340	General-purpose output			
		18	Gray-2	016	General-purpose input	43	Orange-5	040	General-purpose input		68	Gray-2	317	General-purpose output	1	93 Ora	inge-5	341	General-purpose output			
(		19	White-2	017	General-purpose input	44	Yellow-5	041	General-purpose input		69	White-2	318	General-purpose output	4	94 Yel	low-5	342	General-purpose output			
Cable 2 (51~100 pins)		20	Black-2	018	General-purpose input	45	Green-5	042	General-purpose input		70	Black-2	319	General-purpose output	4	95 Gri	een-5	343	General-purpose output			
		21	Brown-3	019	General-purpose input	46	Blue-5	043	General-purpose input		71	Brown-3	320	General-purpose output	4	96 BI	ue-5	344	General-purpose output			
		22	Red-3	020	General-purpose input	47	Purple-5	044	General-purpose input		72	Red-3	321	General-purpose output	4	97 Pu	rple-5	345	General-purpose output			
			1	1	1	23	Orange-3	021	General-purpose input	48	Gray-5	045	General-purpose input		73	Orange-3	322	General-purpose output	4	98 Gr	ray-5	346
		24	Yellow-3	022	General-purpose input	49	White-5	046	General-purpose input		74	Yellow-3	323	General-purpose output	9	99 Wł	hite-5	347	General-purpose output			
		25	Green-3	023	General-purpose input	50	Black-5	047	General-purpose input		75	Green-3	-	External power supply (0V) for the pip No. 2-25, 51-74	- 1	OO Bla	ack-5	-	External power supply (0V)			

Catalog No. CE0243-1A (0916)

#### IAI America, Inc.

 Headquarters: 2690 W. 237th Street, Torrance, CA 90505
 (800) 736-1712

 Chicago Office: 110 E. State Pkwy, Schaumburg, IL 60173
 (800) 944-0333

 Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
 (888) 354-9470

#### www.intelligentactuator.com

The information contained in this product brochure may change without prior notice due to product improvements.

#### IAI Industrieroboter GmbH Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany

**IAI (Shanghai) Co., Ltd.** Shanghai Jiahua Business Center A8-303, 808, Hongqiao Rd., Shanghai 200030, China

**IAI Robot (Thailand) Co., Ltd.** 825 Phairojkijja Tower 12th Floor, Bangna-Trad RD., Bangna, Bangna, Bangkok 10260, Thailand