IAI
Quality and Innovation

GB

Large-Capacity Controller

X-SEL P/Q/QX

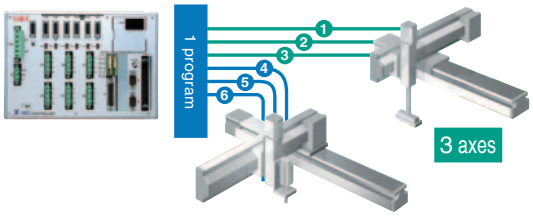
www.intelligentactuator.de

1 Maximum output of 2400 W

Six 400 W single-axis robots or three 750 W single-axis robots can be operated simultaneously.

2 Capable of driving one to six axes

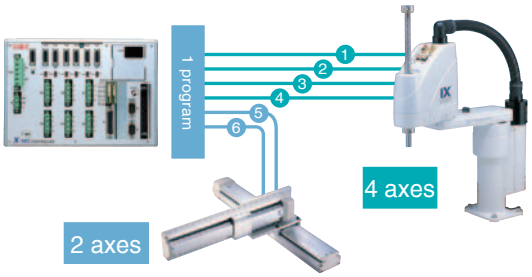
A maximum of six axes can be operated complementarily using only one controller unit. Six axes are operated with a single program allowing easy programming.



3 Controlling SCARA robots (4 axes) plus 2 additional axes

The X-SEL-QX can control SCARA robots plus up to two axes in a combination of single-axis and/or cartesian robots (total wattage: 2400 W) (*1). If the SCARA robot has an arm length of 500/600, two 750 W axes can be operated together.

(*1) Single-axis robots may not be connectable depending on the type of SCARA robot. For details, refer to the notes under “Models.”



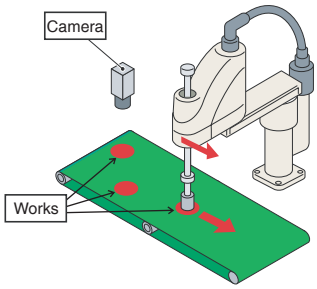
4 “Global type” for applications that require conformance to safety category 4

The “global type” does not have a built-in drive-source cutoff circuit. Instead, it cuts off the drive source using an external safety circuit. This design conforms to safety category 4 under ISO 13849-1.
The large-capacity global types Q and QX conform to the ANSI and CE Mark standard.

5 Conveyor tracking function (Optional)

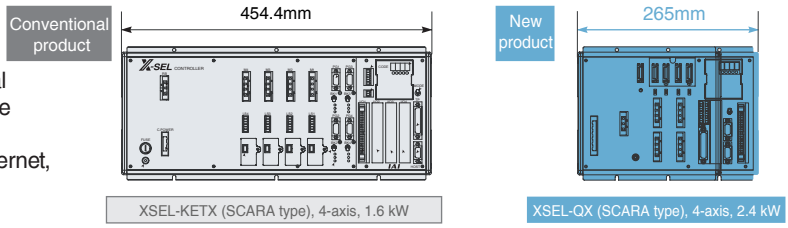
The QX can be configured to detect works on the conveyor using a vision system and handle them synchronously with the conveyor movement. The conveyor tracking function will surely improve the work efficiency of your equipment.

(Note) The conveyor tracking function is effective only if the actuator has an arm length of 500/600. Also, this function may not be supported under certain operating conditions. If you are considering adding the conveyor tracking option, consult IAI’s Sales Department.



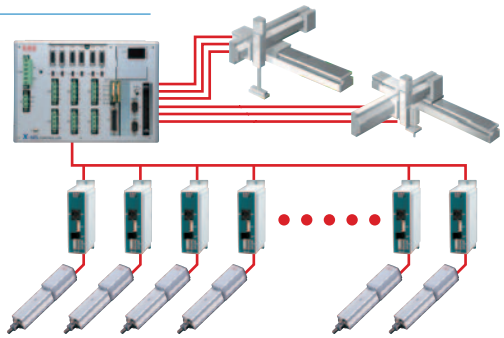
6 Compact, high performance and CE-compliant

- Approx. 40% slimmer than IAI’s conventional controllers X-SEL-KE/KET/KETX.
- Significantly faster than IAI’s conventional controllers (the command processing time is around half).
- Connectable to DeviceNet, CC-Link, Ethernet, Profibus and other networks.
- Conforming to the CE Mark standard.



7 ROBO Cylinder Gateway Function

- Up to 16 ROBO Cylinder axes can be additionally operated via serial communication using the gateway function.
- ROBO Cylinders can be operated using SEL language programs. You can also change the position data of your ROBO Cylinder or read the current ROBO Cylinder position.



X-SEL Series Product Lineup

	XSEL-KE	XSEL-KET	XSEL-KETX	XSEL-P	XSEL-Q	XSEL-QX
	Standard Actuator Type	Global Actuator Type (Safety Category 4)	Global SCARA Type (Safety Category 4)	Large-capacity Standard Actuator Type	Large-cap. Global Actuator Type (Safety Category 4)	Large-cap. Global SCARA Type (Safety Category 4)
Operating method	Program operation			Program operation		
Programs	64 programs (6000 steps)			128 programs (9999 steps)		
Number of positions	3000 positions			20000 positions		
Maximum number of connectable axes	4 axes			6 axes		
Maximum output	1.6 kW			1.6 kW / 2.4 kW		
Power supply	Single-phase 100VAC / Single-phase 230VAC			Single-pase 230VAC / Three-phase 230VAC		
Safety category	B	Corresponds to Category 4	Corresponds to Category 4	B	Corresponds to Category 4	Corresponds to Category 4
Safety standard	CE	CE, ANSI (*1)	CE, ANSI (*1)	CE	CE, ANSI (*1)	CE, ANSI (*1)

*1 To support ANSI, the ANSI-compatible teaching pendant (SEL-TD or IA-T-XA) is required.

Larger Program Data Capacity of new X-SEL-P/Q/QX Generation

The program data capacity of the XSEL controller has increased as follows:

		Current Model	Enhancement Specifications
		P/Q/QX	P/Q/QX
Programs	Number of Programs	64	128
	Number of Program Steps	6000	9999
Position Data	Number of Positions (Positions that can be backed up by the battery)	4000 (4000)	20000 (10000)
Number of Error Records		100	200
ROBO Cylinder Gateway Function		None	Standard Feature

- The enhanced XSEL controllers are available only with controller firmware (main CPU application) of version 0.68 or later (P/Q types) or version 0.34 or later (QX types).
- The enhanced XSEL controllers only support PC software (IA-101-X-MW) of version 7.2.0.0 or later.
- The enhanced XSEL controllers only support IA-T-X (XD) teaching pendants version 1.4.4 or later and SEL-T (TD) teaching pendants of version 1.0.1 or later.

New ROBO Cylinder Gateway Function

The ROBO Cylinder gateway function controls ROBO Cylinders from an XSEL controller via serial communication. Use of the gateway function significantly reduces the hassle of wiring compared to the PIO control method, and you can also operate ROBO Cylinders using SEL language programs from your XSEL controller.

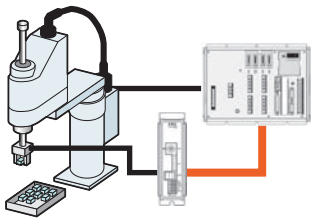
Specifications

Item	Description
Maximum number of connectable ROBO Cylinder axes	16
Maximum number of axes operable by XSEL controller	6
Supported ROBO Cylinder series	ERC2/RCP2/RCP3/RCA/RCA2/RCS2
Connectable controllers	ERC2/PCON/ACON/SCON/ROBONET
Communication protocol	Modbus

Examples of Use (Example of replacing a PIO-controlled system with a gateway system)

Operate a SCARA robot chuck consisting of a ROBO Gripper using the gateway function.

While the PIO-controlled system had to measure loads in the previous process and sort them based on their size to transfer accordingly, the gateway system allows length measurement to be performed by the ROBO Gripper. As a result, the process has become shorter.



<Comparison of PIO Control and Gateway Function>

	PIO Control	Gateway Function
Hassle of Wiring	Many cables must be wired	Only two cables need to be wired
Control Method	ON/OFF control of I/Os only	Programs can be used
Moving Positions	Positions must be input to the controller before hand	Positions can be instructed from an XSEL controller
Current chuck position	Checked by the completed position number	The current position can be checked numerically

Connected Units

The following units are needed to use the ROBO Cylinder gateway function. (Contact IAI for the wiring method and other details)

Name	Model	Remarks
RS232 conversion unit	RCB-CV-GW	One RS232 conversion unit is required for one XSEL controller
Communication cable	CB-RCB-SI0050	One communication cable is required for one XSEL controller
Controller link cable	CB-RCB-CTL002	The number of controller link cables must be the same as the number of ROBO Cylinder controllers connected

Models

ACTUATOR MODELS

XSEL	-	P	-	3	-	400AL	-	200AL	-	60ABL	-	PR	-	P1	-	EEE	-	2	-	2
①		②		③		④		⑤		⑤		⑥		⑦		⑧		⑨		⑩

SCARA MODELS

XSEL	-	QX6	-	NNN5020	-	750AL	-	750ABL	-	PR	-	P1	-	EEE	-	2	-	3
①		②		③		④		⑤		⑥		⑦		⑧		⑨		⑩

① Series	② Controller type	③ Number of axes or IX robot model	④ Motor output of first actuator axis	⑤ Motor output of next actuator axis	⑥ Dedicated network slot	⑦ Standard I/O	⑧ Expansion I/O			⑨ I/O flat cable length	⑩ Power-supply voltage
						Slot 1	Slot 2	Slot 3	Slot 4		
XSEL	P4 (standard actuator 4-axis type) P5 (standard actuator 5-axis type) P6 (standard actuator 6-axis type) Q4 (global actuator 4-axis type) Q5 (global actuator 5-axis type) Q6 (global actuator 6-axis type) QX4 (global SCARA 4-axis type) QX5 (global SCARA 5-axis type) QX6 (global SCARA 6-axis type)	1 (1 axis) 2 (2 axes) 3 (3 axes) 4 (4 axes) 5 (5 axes) 6 (6 axes) NNN1205~8040 (Standard type) NSN5016~6016 (High-speed type) NNW2515~8040 (Dustproof/splash-proof type) T/UNN3015~3515 (Wall mount type) H/INN5020~8040 (Ceiling mount type) NNC1205~8040 (Cleanroom type)	Blank (No single axis) 20□ (20W) 30□ (30W) 60□ (60W) 100□ (100W) 200□ (200W) 400□ (400W) 600□L (600W) 750□L (750W)	Blank (No single axis) 20□ (20W) 30□ (30W) 60□ (60W) 100□ (100W) 200□ (200W) 400□ (400W) 600□L (600W) 750□L (750W)	Blank (No network) DV (DeviceNet) CC (CC-Link) PR (ProfiBus) ET (Ethernet)	E (Not used) N1 I/O board NPN32/16 N2 I/O board NPN16/32 P1 I/O board PNP32/16 P2 I/O board PNP16/32	E (Not used) N1 I/O board NPN32/16 N2 I/O board NPN16/32 P1 I/O board PNP32/16 P2 I/O board PNP16/32	E (Not used) N1 I/O board NPN32/16 N2 I/O board NPN16/32 P1 I/O board PNP32/16 P2 I/O board PNP16/32	E (Not used) N1 I/O board NPN32/16 N2 I/O board NPN16/32 P1 I/O board PNP32/16 P2 I/O board PNP16/32	2 (Standad specification: 2m) 3 (3m) 5 (5m) 0 (None)	2 Single-phase 230V 3 Three-phase 230V

① Series
Indicate the series name.

② Controller type
Indicate the controller type.

P1-6 Large-capacity, 1~6-axis ACTUATOR specification
Q1-6 Large-capacity, 1~6-axis ACTUATOR specification conforming to safety category 4 (global version)
QX4 Large-capacity, dedicated SCARA specification conforming to safety category 4 (global version)
QX5 Large-capacity, 5-axis (SCARA + 1 axis) specification conforming to safety category 4 (global version)
QX6 Large-capacity, 6-axis (SCARA + 2 axes) specification conforming to safety category 4 (global version)

③ Number of axes or IX robot model
Indicate the actuator axes or the SCARA type to be operated.

Notes
* If the SCARA robot has an arm length of 700/800, the QX connects up to 5 axes (SCARA + 1 axis).
* The high-speed type connects up to 4 axes (SCARA only).

④ Motor output of axis 1 or 5 (single-axis robot)
Indicate the motor output of axis 1 of a multi-/single-axis robot or of the single-axis robot connected as axis 5 of the QX5/QX6. In □, enter codes corresponding to the encoder type and desired option(s).
* If you are selecting multiple options, enter the corresponding codes in alphabetical order after the encoder type code. If you are ordering your controller without options, enter only the encoder type code.

(Encoder type A: Absolute / I: Incremental)
(Options B: Brake / C: Creep sensor
L: Limit switch
M: Master-axis designation in synchronized operation
S: Slave-axis designation in synchronized operation)
Leave the space blank for the QX4.

⑤ Motor output of other or axis 6 (single-axis robot)
Indicate the motor output of axis 2~6 of multi- or other single-axis robot or of the single-axis robot connected as axis 6 of the QX6. The content of □ conforms to the same explanation for axis 5. Leave the space blank for the QX4.

⑥ Dedicated network slot
Indicate an applicable network if you want to connect the P/Q/QX to DeviceNet, CC-Link, ProfiBus or Ethernet

⑦ Standard I/O (Slot 1)
Indicate the specification of the standard slot (slot 1).

⑧ Expansion I/O (Slots 2 to 4)
Indicate the specification of the expansion slots (slots 2 to 4).
Take note that use of expansion slots will change the external dimensions.

⑨ I/O flat cable length
Indicate the length of the signal wire connecting each I/O board and the PLC.
* If you have selected "E (Not used)" for the standard and expansion I/Os, "0 (None)" will be selected automatically.

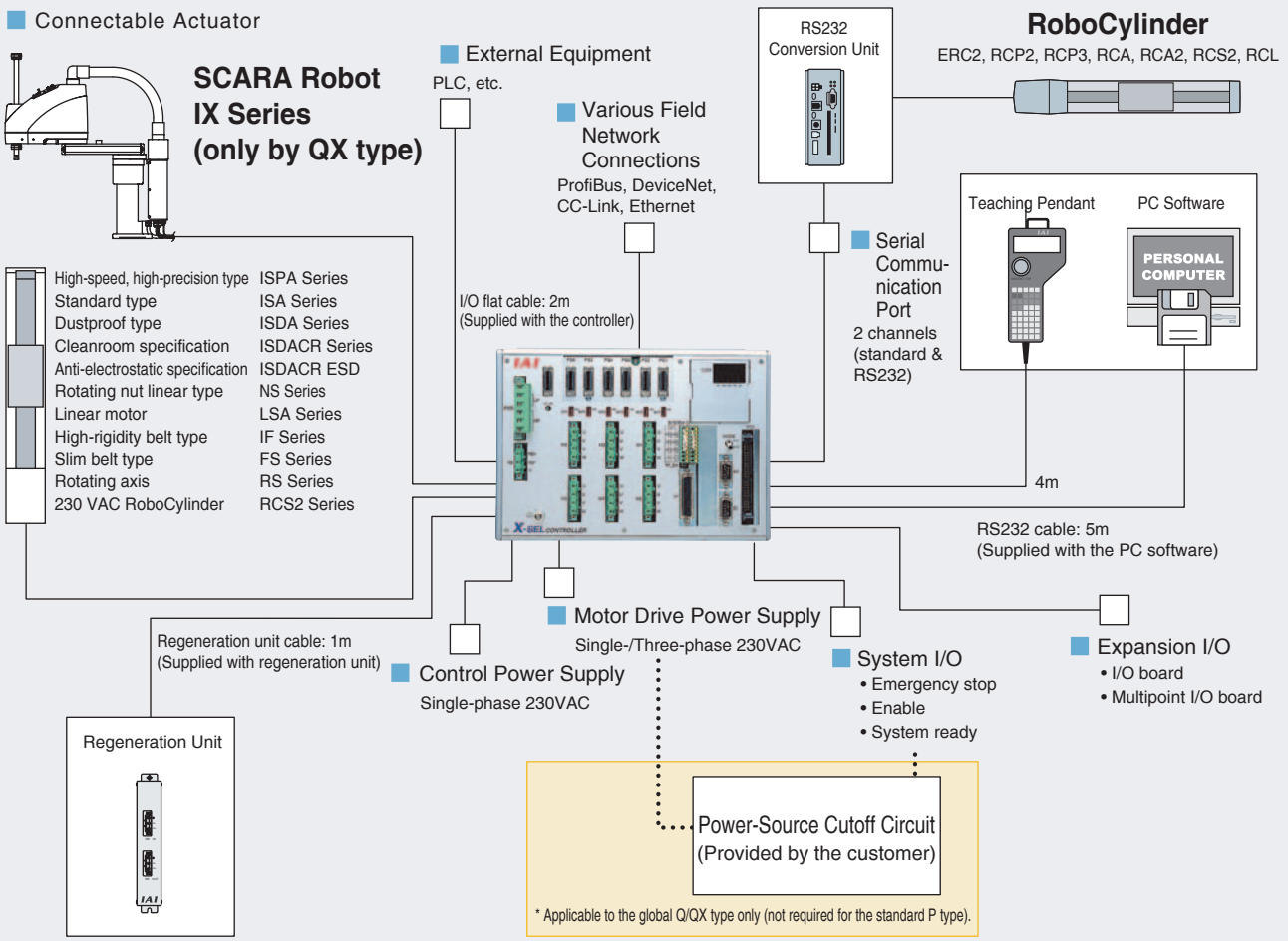
⑩ Power-supply voltage
Indicate the voltage of the main controller power supply.

Specifications

	Large-capacity Actuator type		Large-capacity Scara type	
	P4 / Q4	P5 / P6 / Q5 / Q6	QX4	QX5 / QX6
Total output when maximum number of axes are connected	2400 W (three-phase 230 VAC) / 1600 W (single-phase 230 VAC)			
Control power input	Single-phase 200/230VAC (-15%, +10%)			
Motor power input	2.4 kW type: three-phase 230VAC (-10%, +10%) / 1.6 kW type: Single-phase 230VAC (-15%, +10%)			
Max. Power capacity (*5)	4878 VA (600 W x 4 axes)	4998 VA (400 W x 4 axes)	3625 VA (*1)	5005 VA (*2)
Safety circuit configuration	Redundant configuration not supported		Redundant configuration supported	
Drive-power cutoff method	P type: Internal cutoff relay Q type: External safety circuit		External safety circuit	
Enable input	P type: Contact-B input (internal power supply type) (Q type: redundant)		(external power supply type, redundant)	
Position detection method	Incremental encoder / absolute encoder			
Speed setting (*3)	1mm/sec~2000mm/sec			
Acceleration/deceleration setting (*3)	0.01G~1G			
Programming language	Super SEL Language			
Number of program steps	9999 steps (total)			
Number of positions	20000 positions (total; 10000 positions can be backed up by the battery)			
Number of programs	128 programs			
Operating temperature/humidity	0~40°C, 10~95% (non-condensing)			
Weight (*4)	P type: 5.2 kg Q type: 4.5 kg	P type: 5.7 kg Q type: 5.0 kg	4.5 kg	5.0 kg

*1 When a SCARA robot of 700/800 arm length is operated.
*2 When a SCARA robot of 500/600 arm length and two 750-W axes are operated.
*3 The maximum limit varies depending on the actuator type.
*4 The controller weight includes the absolute battery, brake mechanism and expansion I/O box.
*5 Based on the maximum wattage of each connected axis.

System Configuration



Options

Teaching Pendant

Model : SEL-T (Standard)
SEL-TD (With deadman switch)
IA-T-XA (ANSI/CE Mark compliant type)

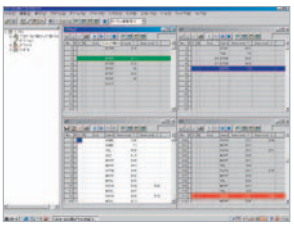
This teaching device supports program/position input, test operation, monitoring, etc.

* SEL-T/TD of version 1.0.0 or older and IA-T-XA of version 1.4.3 or older cannot be used with the P/Q/QX controllers.

SEL-T/TD IA-T-XA

PC Software

Model : IA-101-X/XA-CW (XA: Q/QX type)
With a PC link cable
(equipped with a D-sub, 9-pin connector on the PC end)
IA-101-X-USBMW
With USB adapter cable



This software is a startup support tool offering the functions needed to input programs/positions and perform debugging.

* Program versions older than 7.2.0 cannot be used with the enhanced P/Q/QX controllers.

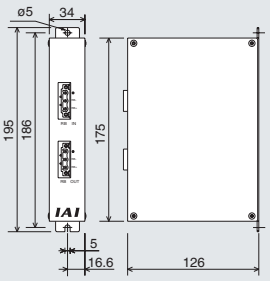
Regeneration Unit

Model : REU-1

This unit converts to heat the regenerative current produced when the motor decelerates.
The regeneration unit may be required depending on the total motor output of single-axis robots connected to the controller (SCARA robots do not require this unit).
Refer to the table shown to the right for a guideline on whether or not the regeneration unit is required and if so, how many.

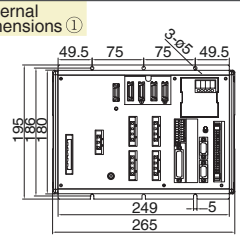
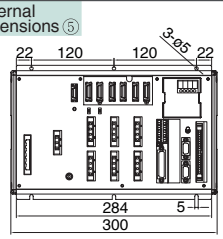
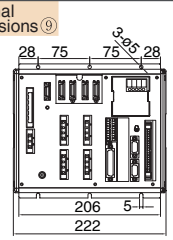
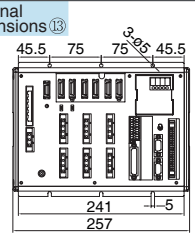
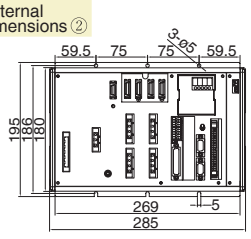
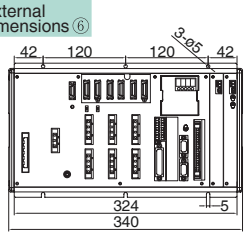
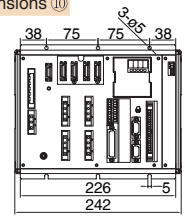
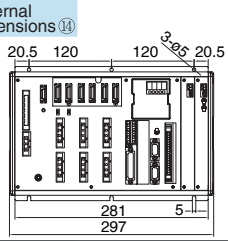
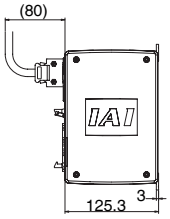
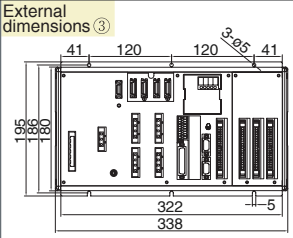
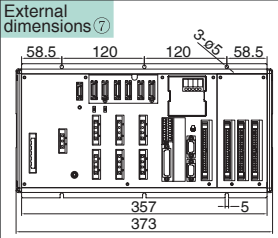
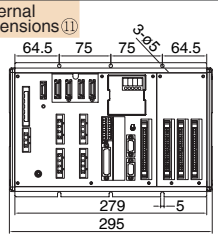
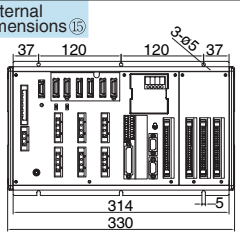
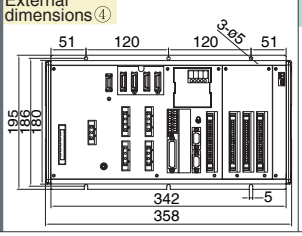
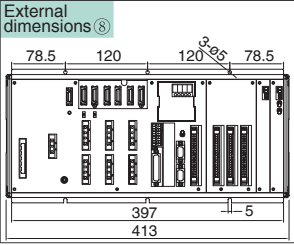
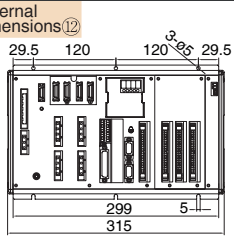
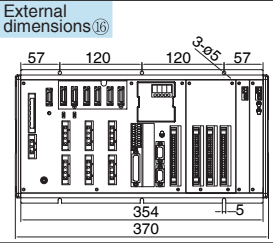
Motor output	Horizontal application	Vertical application
0 ~ 100W	Not required	Not required
~ 200W	Not required	1 unit
~ 400W	1 unit	1 unit
~ 600W	1 unit	1 unit
~ 800W	1 unit	1 unit
~ 1000W	1 unit	2 units
~ 1200W	2 units	2 units
~ 1500W	2 units	3 units

External Dimensions



External Dimensions

The external dimensions of X-SEL-P/Q/QX controllers vary depending on the number of connected axes, the type (arm length) of connected SCARA robot, use/non-use of expansion I/O, and types of direct-coupled axes. In the table below, select the controller specification meeting your specific requirements and refer to the drawing of the corresponding number.

	X-SEL-P 1.6/2.4 kW type, X-SEL-Q/QX 1.6 kW type		X-SEL-Q/QX 2.4 kW type		
	1-4 axes (P/Q-1/2/3/4) or SCARA only (QX4)	5-6 axes (P/Q-5/6) or SCARA + direct-coupled axes (QX5/6)	1-4 axes (Q-1/2/3/4) or SCARA only (QX4)	5-6 axes (Q-5/6) or SCARA + direct-coupled axes (QX5/6)	Side view (common)
Without expansion I/O	External dimensions ① 	External dimensions ⑤ 	External dimensions ⑨ 	External dimensions ⑬ 	
	External dimensions ② 	External dimensions ⑥ 	External dimensions ⑩ 	External dimensions ⑭ 	* All controller types have the same height 
With expansion I/O	External dimensions ③ 	External dimensions ⑦ 	External dimensions ⑪ 	External dimensions ⑮ 	
	External dimensions ④ 	External dimensions ⑧ 	External dimensions ⑫ 	External dimensions ⑯ 	

ACTUATOR CONTROLLER SPECIFICATIONS In the case of the following specifications, the overall width will follow the table (mounting hole positions are the same).	P type (1-/3-ph.), 1.6 kW Q type (1-ph.)		2.4 kW Q type (3-ph.)	
	Axis 1 to axis 4	Axis 5 to axis 6	Axis 1 to axis 4	Axis 5 to axis 6
With absolute battery/brake unit *1	285 ②	340 ⑥	242 ⑩	297 ⑭
With I/O expansion base *2	338 ③	373 ⑦	295 ⑪	330 ⑮
With I/O expansion base + absolute battery/brake unit *3	358 ④	413 ⑧	315 ⑫	370 ⑯

*1 With absolute battery or brake, or absolute battery with brake.
*2 When expansion I/Os are added.
*3 With absolute battery or brake, or absolute battery with brake, plus expansion I/Os.

SCARA		Controller							
		1.6 kW QX type (1-phasis)				2.4 kW QX type (3-phasis)			
		SCARA only (QX4)		SCARA + direct-coupled axes(QX5/QX6)		SCARA only (QX4)		SCARA + direct-coupled axis(es)(QX5/QX6)	
Type	Arm length	Without expansion I/O	With expansion I/O	Without expansion I/O	With expansion I/O	Without expansion I/O	With expansion I/O	Without expansion I/O	With expansion I/O
Standard type Cleanroom type Wall mount type Ceiling mount type	120	External dimensions ①	External dimensions ③	External dimensions ⑤ (*1)	External dimensions ⑦ (*2)	External dimensions ⑨	External dimensions ⑪	External dimensions ⑬ (*3)	External dimensions ⑮ (*4)
	150								
	180								
	250	External dimensions ②	External dimensions ④	External dimensions ⑥	External dimensions ⑧	External dimensions ⑩	External dimensions ⑫	External dimensions ⑭	External dimensions ⑯
	350								
	500								
	600								
	700	External dimensions ⑥ (*5)	External dimensions ⑧ (*5)	–	–	External dimensions ⑭ (*5)	External dimensions ⑯ (*5)	–	–
	800								
High-speed type	500								
	600								

(*1) If the direct-coupled axis has a brake or is of absolute encoder specification, refer to external dimensions ⑥.
(*2) If the direct-coupled axis has a brake or is of absolute encoder specification, refer to external dimensions ⑧.
(*3) If the direct-coupled axis has a brake or is of absolute encoder specification, refer to external dimensions ⑭.
(*4) If the direct-coupled axis has a brake or is of absolute encoder specification, refer to external dimensions ⑯.
(*5) Due to the large motor wattage of the SCARA robot, the external dimensions of a 6-axis configuration apply even when only four axes are connected.

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