IAI
Quality and Innovation

Field Network Type
(DeviceNet, CC-Link, PROFIBUS-DP, EtherCAT, EtherNet/IP)

XSEL-R/S, RX/SX, RXD/SXD

First Step Guide First Edition

Thank you for purchasing our product.
Make sure to read the Safety Guide and detailed Instruction Manual (CD/DVD) included with the product in addition to this First Step Guide to ensure correct use.
This Instruction Manual is original.

⚠ Warning : Operation of this equipment requires detailed installation and operation instructions which are provided on the CD/DVD Manual included in the box this device was packaged in. It should be retained with this device at all times.
A hard copy of Manual can be requested by contacting your nearest IAI Sales Office listed at the back cover of the Instruction Manual or on the First Step Guide.

Product Check

This product is comprised of the following parts if it is of standard configuration:
If you find any fault in the contained model or any missing parts, contact us or our distributor.

1. Parts (Options are excluded.)

No.	Part Name	Remarks	Quantity R/RX/RXD	Quantity S/SX/SXD
1	Controller	Refer to “How to read the model plate” and “How to read the model of the controller.”		
Accessories				
2	System I/O plug	MC1.5/9-ST-3.5 (Maker: PHOENIX CONTACT)	2	2
3	AC Power Supply plug	GMSTB2.5/6-STF-7.62 (Maker: PHOENIX CONTACT)	1	1
4	Brake Power Input Plug	MC1.5/2-ST-3.5 (Maker: PHOENIX CONTACT)	1	1
5	Dummy plug	DP-2	-	1
6	For DeviceNet Type	SMSTB2.5/5-STF-5.08AU (Maker: PHOENIX CONTACT)	1	1
7	For CC-Link Type	MSTB2.5/5-ST-5.08AU (Maker: PHOENIX CONTACT)	1	1
8	First Step Guide		1	1
9	Operation Manual (CD/DVD)		1	1
10	Safety Guide		1	1

2. Teaching Tool (Optional accessory)
The personal computer application software or teaching pendant is required for the operations including program creation and setup such as position setting and parameter setting with teaching. Any of teaching tools needs to be prepared.

No.	Part Name	Model	Applicable Controller R/RX/RXD	Applicable Controller S/SX/SXD
1	PC Software (with RS232C Cable + Emergency Stop Box)	IA-101-X-MW	○	×
2	PC Software (with USB Conversion Adapter + RS232C Cable + Emergency Stop Box)	IA-101-X-USBMW	○	×
3	PC Software (Safety Categories 4 compliance cable + Emergency Stop Box)	IA-101-XA-MW	○	○
4	Teaching pendant	SEL-T	○	○
5	Teaching pendant (with deadman switch)	SEL-TD	○	○
6	Teaching pendant (with deadman switch + TP adapter (IA-LB-TG))	SEL-TG	○	○
7	Teaching pendant	IA-T-X	○	×
8	Teaching pendant (with deadman switch)	IA-T-XD	○	×

3. Operation manuals related to this product, which are contained in the operation manual (CD/DVD).

No.	Name	Manual No.
1	SEL language programming manual	ME0224
2	XSEL Controller P/Q/PX/QX/PCT/QCT/R/S/RX/SX/RXD/SXD RC Gateway Function Operation Manual	ME0188
3	PC Software IA-101-X-MW/IA-101-X-USBMW Operation Manual	ME0154
4	Teaching pendant SEL-T/TD/TG Operation Manual	ME0183
5	Teaching pendant IA-T-X/XD Operation Manual	ME0160
6	DeviceNet Operation Manual	ME0124
7	CC-Link Operation Manual	ME0123
8	PROFIBUS-DP Operation Manual	ME0153
9	Ethernet Operation Manual	ME0140
10	EtherCAT Operation Manual	ME0309
11	EtherNet/IP Operation Manual	ME0308
12	IA Net Operation Manual	ME0307

4. How to read the model plate

Model → MODEL XSEL-R-8-400A-200A-100AB-60A-400A-200A-100AB-60A-EPEIA-DGN1-2-3
Serial number → SERIAL No.200198765 MADE IN JAPAN

5. How to read the model
5.1 Multi-Axis Type Controller

XSEL – R – 8 – 400A – 200A – 100AB – 60A – 400A – 200A – 100AB – 60A – EPEIA – DGN1 – 2 – 3
❶ ❷ ❸ ❹(Axis 1) ❹(Axis 2) ❹(Axis 3) ❹(Axis 4) ❹(Axis 5) ❹(Axis 6) ❹(Axis 7) ❹(Axis 8) ❺ ❻ ❼ ❽

Model table

❶ Series	❷ Controller type	❸ Number of axes	❹ Details of axis 1 to axis 8 (Note 1): Motor Wattage	Encoder type	Brake	Creep	Home Sensor (LS)	Synchronization Designation	❺ Network Slot: Slot 1	Slot 2	Slot 3	❻ I/O slots: Slot 1	Slot 2	❼ I/O Flat cable length	❽ Power supply voltage
XSEL	R (Standard Type) S*1 (Global Type)	1 (1-axis) 2 (2-axis) 3 (3-axis) 4 (4-axis) 5 (5-axis) 6 (6-axis) 7 (7-axis) 8 (8-axis)	12 (12W) 20 (20W) 30D (30W for DS) 30R (30W for RS) 60 (60W) 100 (100W) 100S (100W for Linear) 150 (150W) 200 (200W) 200S (200W for Linear) 300 (300W) 400 (400W) 600 (600W) 750 (750W)	I (Incremental) A (Absolute) G (Spurious Absolute)	Not Specified (w/o Brake) B (w/ Brake)	Not Specified (w/o Creep) C (w/ Creep)	Not Specified (w/o Home Sensor) L (w/ Home Sensor)	Not Specified (No Synchronization) M (Master-Axis Designation) S (Slave-Axis Designation)	E Not for use EP EtherNet/IP Communication Board EC EtherCAT Communication Board	E Not for use DV DeviceNet Input256/Output256 CC CC-Link Input256/Output256 PR PROFIBUS Input256/Output256	E IA Net not Corresponding IA IA Net Corresponding	E (Not for use) N1 Extension PIO Input32/Output16 NPN Board N2 Extension PIO Input16/Output32 NPN Board N3 Extension PIO Input48/Output48 NPN Board P1 Extension PIO Input32/Output16 PNP Board P2 Extension PIO Input16/Output32 PNP Board P3 Extension PIO Input48/Output48 PNP Board MC Electronic Cam Pulse I/O Board DG DV Gateway Master Board	E (Not for use) N1 Extension PIO Input32/Output16 NPN Board N2 Extension PIO Input16/Output32 NPN Board N3 Extension PIO Input48/Output48 NPN Board P1 Extension PIO Input32/Output16 PNP Board P2 Extension PIO Input16/Output32 PNP Board P3 Extension PIO Input48/Output48 PNP Board MC Electronic Cam Pulse I/O Board	2 : 2m (Standard) 3 : 3m 5 : 5m 0:None (*1)	2: Single-phase 200V 2L: Only for Linear Single-phase 200V 3: 3-phase 200V 3L: Only for Linear 3-phase 200V

*1 In this type, the safety circuit can be configured with the motor driving power source separated.
Note 1 Any of the RCS2-R**7 series, RCS-RB75 series unit, RCS-G20, RCS-R* or the linear motor actuator (LSA) is not connected.

5.2 SCARA Robot + Additional Axes (4 axes Max.) Type Controller

XSEL – RX8 – NNN5020H – 400A – 200A – 100AB – 60A – EPEIA – DGN1 – 2 – 3
❶ ❷ ❸ ❹(Axis 5) ❹(Axis 6) ❹(Axis 7) ❹(Axis 8) ❺ ❻ ❼ ❽

Model table

❶ Series	❷ Controller type	❸ SCARA Robot Model	❹ Details of axis 5 to axis 8 (Note 1): Motor Wattage	Encoder type	Brake	Creep	Home Sensor (LS)	Synchronization Designation	❺ Network Slot: Slot 1	Slot 2	Slot 3	❻ I/O slots: Slot 1	Slot 2	❼ I/O Flat cable length	❽ Power supply voltage
XSEL	RX4 (1unit of SCARA) RX5 (1unit of SCARA+Single Axis 1Axis) RX6 (1unit of SCARA+Single Axis 2Axis) RX7 (1unit of SCARA+Single Axis 3Axis) RX8 (1unit of SCARA+Single Axis 4Axis) SX4*1 (1unit of SCARA) SX5*1 (1unit of SCARA+Single Axis 1Axis Safety Category Type) SX6*1 (1unit of SCARA+Single Axis 2xis Safety Category Type) SX7*1 (1unit of SCARA+Single Axis 3Axis Safety Category Type) SX8*1 (1unit of SCARA+Single Axis 4Axis Safety Category Type)	NNN1205 to 8040H NSN5016H to 6016H (High-Speed Type) NNC1205 to 8040H (Clean Type) NNW2515H to 8040H (Splash Proof Type) TNN3015H to 3515H (Wall-Mount Type) UNN3015H to 3515H (Wall-Mount Inverse Type) HNN5020H to 8040H (Ceiling-Mount Type) INN5020H to 8040H (Inverse type)	12 (12W) 20 (20W) 30D (30W for DS) 30R (30W for RS) 60 (60W) 100 (100W) 100S (100W for Linear) 150 (150W) 200 (200W) 200S (200W for Linear) 300 (300W) 400 (400W) 600 (600W) 750 (750W)	I (Incremental) A (Absolute) G (Spurious Absolute)	Not Specified (w/o Brake) B (w/ Brake)	Not Specified (w/o Creep) C (w/ Creep)	Not Specified (w/o Home Sensor) L (w/ Home Sensor)	Not Specified (No Synchronization) M (Master-Axis Designation) S (Slave-Axis Designation)	E Not for use EP EtherNetIP Communication Board EC EtherCAT Communication Board	E Not for use DV DeviceNet Input256/Output256 CC CC-Link Input256/Output256 PR PROFIBUS Input256/Output256	E IA Net not Corresponding IA IA Net Corresponding	E (Not for use) N1 Extension PIO Input32/Output16 NPN Board N2 Extension PIO Input16/Output32 NPN Board N3 Extension PIO Input48/Output48 NPN Board P1 Extension PIO Input32/Output16 PNP Board P2 Extension PIO Input16/Output32 PNP Board P3 Extension PIO Input48/Output48 PNP Board DG DV Gateway Master Board	E (Not for use) N1 Extension PIO Input32/Output16 NPN Board N2 Extension PIO Input16/Output32 NPN Board N3 Extension PIO Input48/Output48 NPN Board P1 Extension PIO Input32/Output16 PNP Board P2 Extension PIO Input16/Output32 PNP Board P3 Extension PIO Input48/Output48 PNP Board	2 : 2m (Standard) 3 : 3m 5 : 5m 0:None (*1)	3: 3-phase 200V

*1 In this type, the safety circuit can be configured with the motor driving power source separated.
Note 1 Any of the RCS2-R**7 series, RCS-RB75 series unit, RCS-G20, RCS-R* or the linear motor actuator (LSA) is not connected.

[Restrictions on Connected Axes to XSEL-RX/SX]

SCARA Model	Total Wattage and Number of Connectable Axes: Single-phase type	Total Wattage and Number of Connectable Axes: 3-phase type
IX-NNN1205/1505/1805	1500W in total or less (4 axes at maximum) 750W max. for 1 axis	1500W in total or less (4 axes at maximum) 750W max. for 1 axis
IX-□N□2515H/3015H/3515H		1500W in total or less (4 axes at maximum) 750W max. for 1 axis
IX-□N□5020H/6020H		600W in total or less (4 axes at maximum) 600W max. for 1 axis
IX-□N□70□□H/□80□□H		unavailable
IX-NSN5016H/6016H		unavailable

5.3 SCARA Robot 2-Unit Connection Dedicated Controller

XSEL – RXD8 – NNN5020H – NNN5020H – EPEIA – DGN1 – 2 – 3
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽

Model table

❶ Series	❷ Controller type	❸ SCARA Robot Model 1	❹ SCARA Robot Model 2	❺ Network Slot: Slot 1	Slot 2	Slot 3	❻ I/O slots: Slot 1	Slot 2	❼ I/O Flat cable length	❽ Power supply voltage
XSEL	RXD8 (For connection of 2 units of SCARA) SXD8*1 (For connection of 2 units of SCARA Safety Category Type)	NNN1205 to 1805 NNN2515H to 6030H (Standard Type) NNC1205 to 1805 NNC2515H to 6030H (Clean Type) NNW2515H to 6030H (Splash Proof Type) TNN3015H to 3515H (Wall-Mount Type) UNN3015H to 3515H (Wall-Mount Inverse Type) HNN5020H to 6020H (Ceiling-Mount Type) INN5020H to 6020H (Inverse type)	NNN1205 to 1805 NNN2515H to 6030H (Standard Type) NNC1205 to 1805 NNC2515H to 6030H (Clean Type) NNW2515H to 6030H (Splash Proof Type) TNN3015H to 3515H (Wall-Mount Type) UNN3015H to 3515H (Wall-Mount Inverse Type) HNN5020H to 6020H (Ceiling-Mount Type) INN5020H to 6020H (Inverse type)	E Not for use EP EtherNet/IP Communication Board EC EtherCAT Communication Board	E Not for use DV DeviceNet Input256/Output256 CC CC-Link Input256/Output256 PR PROFIBUS Input256/Output256	E IA Net not Corresponding IA IA Net Corresponding	E (Not for use) N1 Extension PIO Input32/Output16 NPN Board N2 Extension PIO Input16/Output32 NPN Board N3 Extension PIO Input48/Output48 NPN Board P1 Extension PIO Input32/Output16 PNP Board P2 Extension PIO Input16/Output32 PNP Board P3 Extension PIO Input48/Output48 PNP Board DG DV Gateway Master Board	E (Not for use) N1 Extension PIO Input32/Output16 NPN Board N2 Extension PIO Input16/Output32 NPN Board N3 Extension PIO Input48/Output48 NPN Board P1 Extension PIO Input32/Output16 PNP Board P2 Extension PIO Input16/Output32 PNP Board P3 Extension PIO Input48/Output48 PNP Board	2 : 2m (Standard) 3 : 3m 5 : 5m 0:None (*1)	3: 3-phase 200V

*1 In this type, the safety circuit can be configured with the motor driving power source separated.

[Limitations in SCARA Robot Combination in XSEL-RXD/SXD]
(1) 3-phase type

First Unit	Second Unit
IX-NNN1205/1505/1805 IX-□N□2515H/3015H/3515H	IX-NNN1205/1505/1805 IX-□N□2515H/3015H/3515H
IX-□N□5020H/6020H	IX-NNN1205/1505/1805

Basic Specifications

Specifications

Specification Item			XSEL-R/RX/RXD	XSEL-S/SX/SXD
Number of controlled axes			XSEL-R/S : 1-axis to 8-axis XSEL-RX/SX : SCARA Robot 1-axis to 4-axis, Additional 5-axis to 8-axis XSEL-RXD/SXD : SCARA Robot 1-axis to 4-axis , 5-axis to 8-axis	
Applicable motor capacity			20W to 750W	
Total connectable wattage			3-phase type controller: 2400W Single-phase type controller: 1600W (Only for R/S)	
Abnormal control supply voltage			Single-phase AC200V to 230V±10%	
Motor Driving Source Voltage			3-phase AC200V to 230V±10% / Single-phase AC200V to 230V±10%	
Power Supply Frequency			50Hz/60Hz	
Rush Current (Note 1)	Control power supply		60A	
	Motor drive power supply	Less than 1200W	60A (MAX.)	
		1200W or more	120A (MAX.)	
Leakage Current (Note 2) (Excluding Higher Harmonic Content)	Control power supply		0.4mA	0.2mA
	Motor drive power supply		2mA or less	
Heat Generation			[Refer to the Item for the Power Capacity and Heating Value]	
PIO Power Supply (Note 3)			DC24V±10% (Supplied from external equipment)	
Electromagnetic Brake Power Supply (For the actuator with the brake)			DC24V±10% Per 1 actuator Approx. 0.35A (Supplied from external equipment)	
Transient Power Cutoff Durability			10ms (when power source frequency 50Hz is used), 8ms (when power source frequency 60Hz is used)	
Motor Control System			AC Full - digital Servo	
Applicable Encoder			Incremental Serial Encoder or Absolute Serial Encoder	
Speed Setting			From 1mm/s The upper limit depends on the specifications of actuator	
Acceleration Setting			From 0.01G The upper limit depends on the specifications of actuator	

Specification Item		XSEL-R/RX/RXD	XSEL-S/SX/SXD
Serial Communication Interface	Teaching port	RS232C: 1CH (X-SEL Serial Communication protocol (Format B)) Baud rate : MAX. 115.2kbps Connector: D-sub 25 pin	
	Port 1	RS232C: 1CH (X-SEL Serial Communication protocol (Format B)) Baud rate: MAX. 115.2kbps Connector: D-sub 9 pin Control available with serial communication (Cable length Max.10m)	
	Port 2	[General-purpose RS232C] RS232C: 1CH (X-SEL Serial Communication protocol (Format B)) Baud rate: MAX. 115.2kbps Connector: D-sub 9 pin Control available with serial communication (Cable length Max.10m)	
		[RC Gateway] RS485: 1CH (Modbus protocol RTU/ASCII conformance) Baud rate: MAX. 230.4kbps Connector: D-sub 9 pin Control available with serial communication (Cable length Max.100m)	
External Interface	PIO Type	PIO Board MAX. 2 pieces Signal I/O dedicated for 24V DC (Input and output ports, selected from NPN/PNP) [Refer to 5. How to read controller model code]	
	Field Network Type	DeviceNet, CC-Link, PROFIBUS, EtherNet/IP, EtherCAT (For either of DeviceNet, CC-Link or PROFIBUS and either of EtherNet/IP or EtherCAT, the boards can be inserted at the same time.) [Refer to each Fieldbus Instruction Manual]	
Expanded I/O Unit (option)		PIO Board MAX. 4 pieces	
Data Setting and Input		PC software or teaching pendant	
Program Specification		Super SEL language	
Max. Number of Program Steps		9999 Step	
Max. Number of Positions		1-Axis Type: 53332 positions, 5-Axis Type: 22856 positions 2-Axis Type: 40000 positions, 6-Axis Type: 20000 positions 3-Axis Type: 32000 positions, 7-Axis Type: 17776 positions 4-Axis Type: 26666 positions, 8-Axis Type: 16000 positions	
Max. Number of Programs		128 programs	
Max. Number of Multitask Programs		16 programs	
Data Retention Memory		Flash ROM + FRAM	
Clock Function		Retaining time after power turned OFF: approximately 10 days Time for battery charge after power is ON after the clock data is lost: approximately 100 hours	
Panel Unit PU-1 (option)		Controller status display	
System I/O		Emergency stop input, safety gate input, system ready output and other safety circuit inputs and outputs	
Safety Circuit Configuration	Drive-source Cutoff Method	Internal Relay	External Safety Circuit
	Emergency-Stop Input	B Contact Input (internal power supply)	B Contact Input (external power supply, duplication available)
	Enable Input	B Contact Input (internal power supply)	B Contact Input (external power supply, duplication available)
System Ready Output		No-voltage contact (relay) output Max.200mA (24V DC)	
Protective Functions		Motor over current, overload, motor driver temperature check, overload check, encoder open circuit detection, soft limit over, system abnormality, battery abnormality	
Regenerative Resistor		Equipped with built-in 1kΩ/20W regenerative resistor Extension available with connecting an external regenerative resistor	
Absolute Battery		Actuators except for SCARA Robot: Built in controller (AB-5) SCARA Robot: Built in main body	
Protection Function against Electric Shock		Class I In case grounding conducted on ground terminal in addition to basic insulation for electric shock proof.	
Overvoltage Category		Category II Voltage durability 2500V at less than 300V AC for input rating	
Insulation Resistance		10MΩ or more (Between power terminal and I/O terminal and also all external terminals and case at the power supply of 500V DC)	
Insulation strength		1500V AC for 1 min.	
Cooling Method		Forced Air-Cooling	
Environment	Surrounding air temperature	0 to +40°C	
	Surrounding humidity	85% RH or less (non-condensing)	
	Surrounding environment	[Refer to the Item for the Installation Environment]	
	Surrounding storage temperature	-20 to 70°C (The Absolute Battery is excluded.)	
	Surrounding storage humidity	85% RH or less (non-condensing)	
	Maximum Operation Height	1000m	
	Vibration Resistance	10 to 57Hz in XYZ directions/Pulsating amplitude 0.035mm (continuous), 0.075mm (intermittent) 57 to 150Hz/4.9m/s² (continuous), 9.8m/s² (intermittent)	
	Protection Class	IP20	
	Pollution Degree	Pollution Degree 2	
External Dimensions		[Refer to the External dimensions]	
Weight	With no Absolute Battery Unit	Approx. 5.2kg	3-phase type: Approx. 4.7kg Single-phase type: Approx. 5.2kg
	With the Absolute Battery Unit	Approx. 5.8kg	3-phase type: Approx. 5.3kg Single-phase type: Approx. 5.8kg

Note 1 Rush current at the power connection continues for 3 msec. Note that the value of in-rush current differs depending on the impedance of the power supply line.

Note 2 Leak current varies depending on the capacity of connected motor, cable length and the surrounding environment. Measure the leak current at the point where a ground fault circuit interrupter is to be installed when leakage protection is conducted.
Regarding the leakage breaker, it is necessary to have a clear purpose for selection such as a fire protection or protection of human body. Use the harmonic type (for inverter) for a leakage breaker.

Note 3 Power supply is not necessary if PIO is not to be used.

Note 4 The converter box is to be used for the connection when connecting an actuator of ABZ (UVW) Parallel Encoder LSA Series or RCS2-RA7/SRA7 Series.

[Power Capacity and Heating Value]

Rated Power Capacity [VA] = Total Capacity of Motor Power [VA] + Total of the power consumption at the control part [VA]

Heating Value [W] = Total Output Loss [W] + (Total of internal power consumption [VA] × 0.7 (Efficiency) × 0.6 (Power factor))

- Select the Motor Driving Power [VA] from the Table 1 and 2.
- Figure out the total of the power consumption at the control part [VA] with the total of power of the actually mounted components • quantity, by selecting the applicable ones from Table 3 Control Power Source (Internal Consumption and External Consumption).
- To calculate the sum total of output loss [W], refer to the “Output Loss” column in Table 1 below and select the values corresponding to the output losses of each connected actuator.
- For the inner power demand (VA) for calculating the heating value (W) in the control unit, select the components which are being placed, from the columns of Control Power Supply (Internal Consumption) and External Power Supply (Internal Consumption) in Table 3 and calculate it using the formula “Power • Quantity of the Placement Component”

Table: 1 Motor Volt Amperage of Single-Axis Actuator and Output Loss

Wattage of Actuator Motor [W]	Motor Power Capacity [VA]	Output loss = Heat Generation [W]
20	26	1.58
30	46	2.07
60	138	3.39
100	234	6.12
150	328	8.30
200	421	9.12
40	796	19.76
600	1164	27.20
750	1521	29.77
100 (Linear Actuator LSAS-N10SS)	379	37
200 (Linear Actuator LSAS-N15SS)	486	37
200 (Linear Actuator LSAS-N15HS)	773	39

Table: 2 Motor Volt Amperage of SCARA Robot and Output Loss

SCARA Robot	Wattage [W] (Rated output)	Motor Power Capacity [VA] (Note 1)	Output loss = Heat Generation [W]
NN□1205, NN□1505, NN□1805	129.8	216.3	8.13
NN□2515H, NN□3515H, TNN3015H, TNN3515H, UNN3015H, UNN3515H	1117.9	1863.1	44.8
NN□50□□H, NN□60□□H, HNN5020H, HNN6020H, INN5020H, INN6020H	2218.0	3696.7	69.7
NN□70□□H, NN□60□□H, HNN7020H, HNN8020H, INN7020H, INN8020H	3880.6	6467.7	93.2
NSN5016H, NSN6016H	4102.9	6338.1	95.2

Note 1 Calculated with 0.6 for power factor

Table: 3 Motor Driving Power and Output Loss

			Control power supply		External Power Source (24VDC)		Quantity	
			Internal Consumption [VA]	External Consumptio [VA]	Internal Consumption [VA]	External Consumption [VA]		
Base Unit			31.4				1	
Driver	Per Board		6.26				Multiply the coefficient [Refer to Table 4] on the values on the left for each number of the connected axes.	
Encoder Section	Per axis		2.38	3.57				
Fan Unit	Per fan		5.71					
Axis Sensor	Per axis		4.57					
I/O Board	DIO (48 points)	N1, N2 P1, P2	5.95		14.52		0 to 2	Number of PCBs on PIO Board 1 and 2
	DIO (96 points)	N3, P3	8.33		26.81		0 to 2	
	Electronic Cam	MC	16.7				0 to 2	
Network Module	DeviceNet	DV	1.98		3.43		0 to 1	Number of PCBs on Field Network Board 1
	CC-Link	CC	5.67				0 to 1	
	PROFIBUS-DP	PR	1.98				0 to 1	
	EtherNet/IP	EP	1.98				0 to 1	Number of PCBs on Field Network Board 2
	EtherCAT	EC	3.93				0 to 1	
Teaching pendant	IA-T-X/XD			3.57			0 to 1	
	SEL-T/TD/TG			6.67			0 to 1	
Brake	Per axis		SCARA Robot 0.28 Added Axis 0.14		2.5	SCARA Robot 1.0 Added Axis 5.8	Total number of brake-equipped actuators 0 to 8	
Connector terminal	Per axis					5.7	0 to 8	

Table: 4 Number of Controlled Parts

Number of the connected axes.	1-Axis	2-Axis	3-Axis	4-Axis	5-Axis	6-Axis	7-Axis	8-Axis
Driver	1	1	2	2	3	3	4	4
Encoder Section	1	2	3	4	5	6	7	8
Fan Unit	XSEL-R/RX/RXD : 6 Unit XSEL-S/SX/SXD (3-phase type) : 5 Unit XSEL-S (Single-phase type) : 6 Unit							
Axis Sensor	1	2	3	4	5	6	7	8

[Selection of Circuit Interrupter]

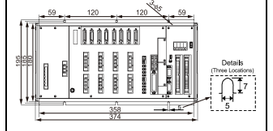
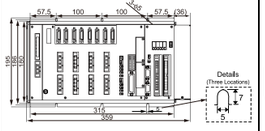
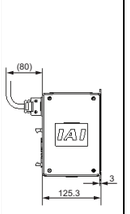
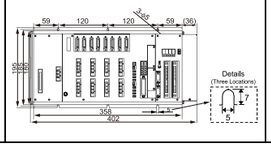
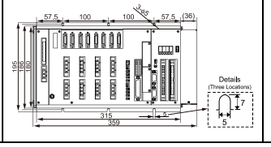
- 3 times of the rated current flows to the controller during the acceleration/deceleration. Select one that does not trip when the above current passes. When it trips, select the breaker with a rated current one rank above. (Confirm that Operation Characteristic Curve described in the catalogue of each manufacturer.)
- Select the breaker that does not trip with the rush current.
(Confirm that Operation Characteristic Curve described in the catalogue of each manufacturer.)
- For the rated breaking current, select the current value which can break the current even when a short circuit occurs.
Rated Breaking Current > Short-circuit Current = Primary Power Supply Capacity / Power Voltage
- Consider margin for the rated current on the circuit breaker.

Rated current of circuit breaker >
rated voltage amperage [VA] / AC input voltage × Margin (1.2 to 1.4 for reference)

[Selection of Leakage Breaker]

- Regarding the leakage breaker, it is necessary to have a clear purpose for selection such as a fire protection or protection of human body.
- Leak current varies depending on the capacity of connected motor, cable length and the surrounding environment. Measure the leak current at the point where a ground fault circuit interrupter is to be installed when leakage protection is conducted.
- Use the applicable to higher harmonics type leakage breaker.

External Dimensions

Controller Type	R/RX/RXD S (Single-phase type)	S/SX/SXD (3-phase type)	Side View
Absolute Battery Non-Equipped Type			
Absolute Battery Equipped Type			

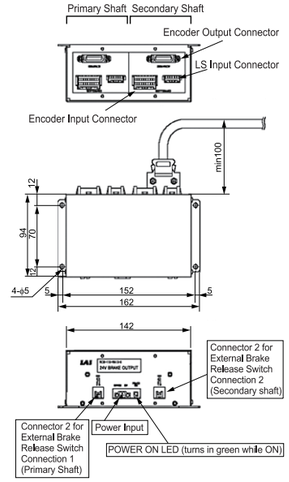
Brake Box (Option): RCB-110-RA13-0

Brake Box: A brake release unit dedicated for NS-MZMS, NS-MZMM, NS-LZMS, NS-LZMM, ZR
Brakes for two axes can be controlled with one brake box.

[Specification]

Item	Specification
Input Power Supply Voltage	24V DC/10%
Input Power Supply Current	1A
Heat Generation	1.2W
Connection Cable	Encoder Cables (Model CB-RCS2-PLA010) 1m
Environment	Follows the environmental specifications of the main body
External Dimensions	W162 × H94 × D65.5mm
Weight	0.8kg

[External Dimensions]



[24V Power Supply Connector]

Connector on Cable Side (Enclosed in standard package)	MC1.5/2-STF-3.5 (PHOENIX CONTACT)		
Applicable Cable	AWG28 to 16		
Terminal Assignment	Pin No.	Signal	Information
	1	0V	Power Supply Grounding for Brake Excitation
	2	24VIN	For Brake Excitation and 24V Power Supply

[Connectors 1 and 2 for external brake release switch connection]

Connected Equipment	Brake Release Switch		
Connector on Cable Side (Please prepare separately)	XAP-02V-1 (Contact BXA-001T-P0.6)(JST)		
Switch Rating	30V DC Minimum Current 1.5mA		
Terminal Assignment	Pin No.	Signal	Information
	1	BKMRL	Brake Release Switch Input
	2	COM	Power Supply Output for Brake Release Switch Input

(Note) Short circuit of pin No. 1 and 2 of this connector releases the brake compulsorily.
Brake release is available in the same manner as the brake release switch equipped on the main body.
Do not keep the compulsory release condition while in automatic operation.

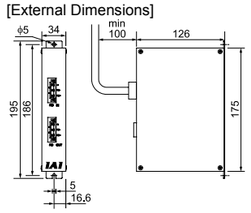
Regenerative Resistor Unit (Option): REU-1

This is a unit that converts the regenerative current to heat when the motor decelerates.

[Specification]

Item	Specification
Internal Regenerative Resistor	220Ω/80W
Accessories*1	Controller link cable (Model CB-ST-REU010) 1m
Environment	Follows the environmental specifications of the main body
External Dimensions	W34 × H195 × D126mm
Weight	0.9kg

[External Dimensions]



[Number of Connectable]

To calculate the total number of necessary units, select the suitable conditions from the table below for the actuator type connected to XSEL controller and sum up the numbers.

Total Number of Connected Units = Number in 1) + Number in 2) + Number in 3)

Calculation Table for Necessary Number of Regenerative Units

No.	Actuator Type		Quantity
1)	Total capacity of single-axis actuator motors in horizontally oriented installation	0 to 200W	Not required
		to 1000W	1 Unit
		to 1200W	2 Units
		to 2000W	3 Units
		to 2400W	4 Units
2)	Total capacity of single-axis actuator motors in vertically oriented installation	0 to 100W	Not required
		to 800W	1 Unit
		to 1200W	2 Units
		to 1600W	3 Units
		to 2000W	4 Units
3)	SCARA Robot	IX-NNN1205/1505/1805	Not required
		IX-NNN2515H/3515H, IX-NNW2515H/3515H, IX-TNN(UNN)3015H/3515H, IX-NNC2515H/3515H	1 Unit / Per controller
		IX-NNN50□□H/60□□H, IX-NNW50□□H/60□□H, IX-HNN(INN)50□□H/60□□H, IX-NNC50□□H/60□□H	3 Units / Per controller
		IX-NNN70□□H/80□□H, IX-NNW70□□H/80□□H, IX-HNN(INN)70□□H/80□□H, IX-NNC70□□H/80□□H IX-NNN10040/12040	4 Units / Per controller
		IX-NSN5016H/NSN6016H	3 Units / Per controller

Installation Environment

This product is capable for use in the environment of pollution degree 2*1 or equivalent.
*1 Pollution Degree 2: Environment that may cause non-conductive pollution or transient conductive pollution by frost (IEC60664-1).

1. Installation Environment

Do not use this product in the following environment:

- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity exceeds 85%RH
- Location exposed to corrosive gases or combustible gases
- Location exposed to significant amount of dust, salt or iron powder
- Location subject to direct vibration or impact
- Location exposed to direct sunlight
- Location where the product may come in contact with water, oil or chemical droplets
- Environment that blocks the air vent [Refer to Noise Elimination and Mounting Method]

When using the product in any of the locations specified below, provide a sufficient shield.

- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

2. Storage and Preservation Environment

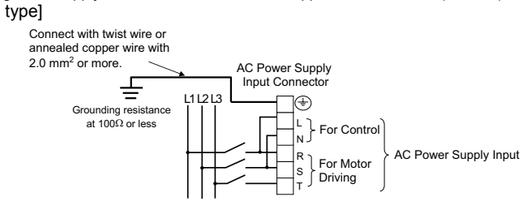
- Storage and preservation environment follows the installation environment. However, the ambient temperature should be from -20 to 70°C and the relative humidity to be 85%RH at maximum. Especially in a long-term storage, consider to avoid condensation of surrounding air.
  Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.

Installation and Noise Elimination

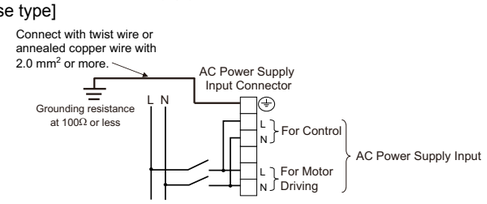
1. Protective Ground

For grounding, make sure to conduct grounding resistance 100Ω or less.
The wiring should apply a twist line or an annealed copper wire of 2.0mm^2 (AWG14) or more.

[3-phase type]

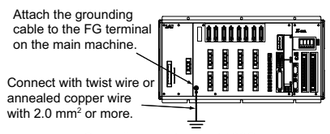


[Single-phase type]

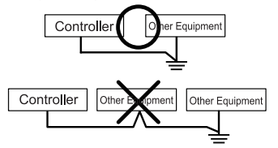


2. Noise Elimination Grounding (Frame Ground)

For grounding, make sure to conduct grounding resistance 100Ω or less.
Connect with twist wire or annealed copper wire with 2.0mm^2 (AWG14) or more.



Grounding resistance at 100Ω or less



Do not share the ground wire with or connect to other equipment.
Ground each controller separately.

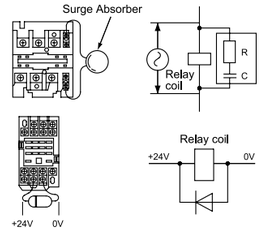
3. Precautions regarding wiring method

1) Use a twisted cable for connection to the power supply.
2) To reduce the interference to each other, have the I/O line, communication and encoder lines, power and driving supply lines separate from each other.

4. Noise Sources and Elimination

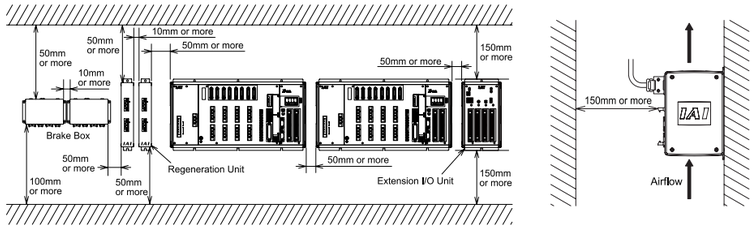
Carry out noise elimination measures for power devices on the same power path and in the same equipment.
The following are examples of measures to eliminate noise sources:

1) AC solenoid valves, magnet switches and relays
   [Measure] Install a Surge Absorber parallel with the coil.
2) DC solenoid valves, magnet switches and relays
   [Measure] Install a diode parallel with the coil.
   Use a DC relay with a built-in diode.



5. Heat Radiation and Installation

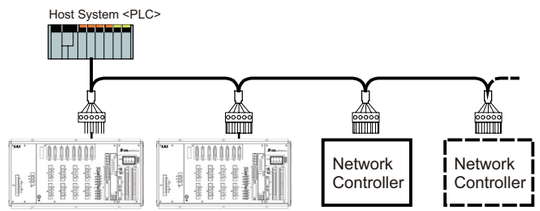
Conduct design and manufacture in consideration of the control box size, controller layout and cooling in such a way that the temperature around the controller will be 40°C or less.



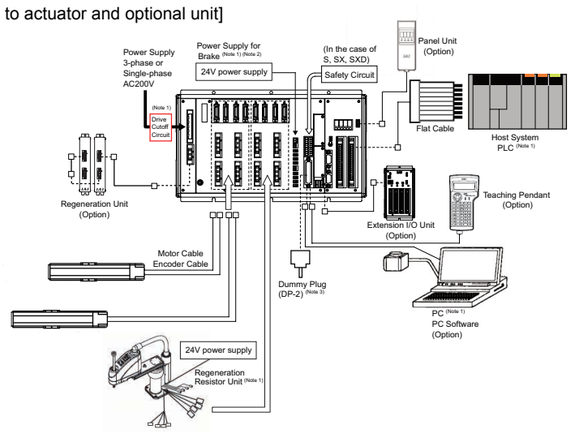
Wiring Layout Diagram

⚠ Caution: In the case of ICSA, ICSPA (Orthogonal Robot) and SCARA robot, a number is attached to each cable.
Connect it according to the controller connector number.
For the actuator regarded as that for single-axis robot, the connector Nos. are not indicated.
In such case, give a number to each connector to avoid any mistake.

[Network Wiring]



[Connection to actuator and optional unit]

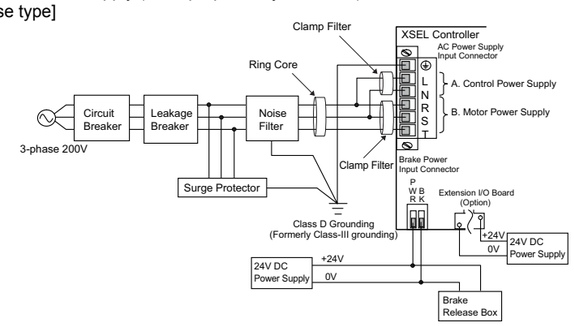


Note 1 Please prepare separately.
Note 2 For an actuator equipped with a brake and the SCARA Robot of those except for IX-NNN1205/1505/1805 (equipped with no brake), supply of power +24V to the controller for the brake operation is required.
Note 3 Put the dummy plug (DP-2) when a connection of the teaching tool such as PC is not necessary.

⚠ Warning:
- In the case PC is connected to XSEL-S, SX or SXD, internal components of the controller may get burnt down if the following cable is used.
- Standard PC cable B-ST-E1MW050 (black) enclosed in PC Software IA-101-X-MW Even though the PC software can be used, use CB-ST-A1MW050 (gray) for the cable.

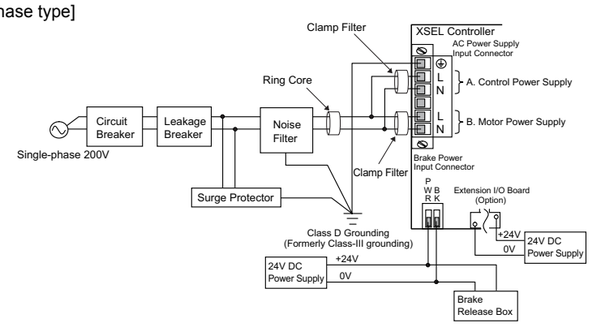
Wiring for the Power/Emergency Stop Circuit and Brake Forced Release Switch

● Wiring for Power Supply (to be prepared by customer)
[3-phase type]



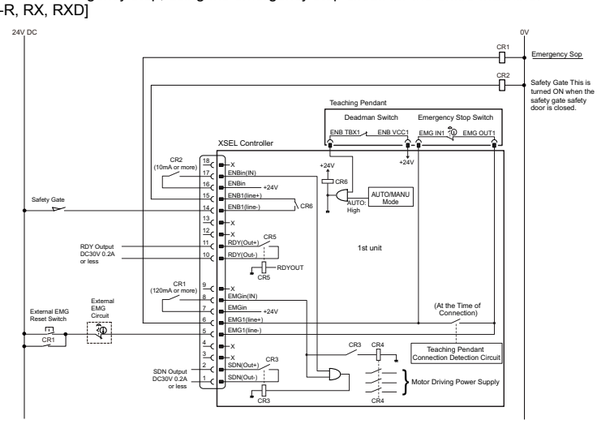
The power consumption and heat generation of X-SEL controller may differ depending how to construct the options. Select the circuit breaker and leakage breaker that suits to the specification.
In order to prevent noise disturbance, it is recommended to apply a noise filter, clamp filter, etc. [Refer to the instruction manual of XSEL-R/S.]
In the case that the actuator with the brake is not to be connected, it is not required to arrange the wiring for the brake power.

[Single-phase type]

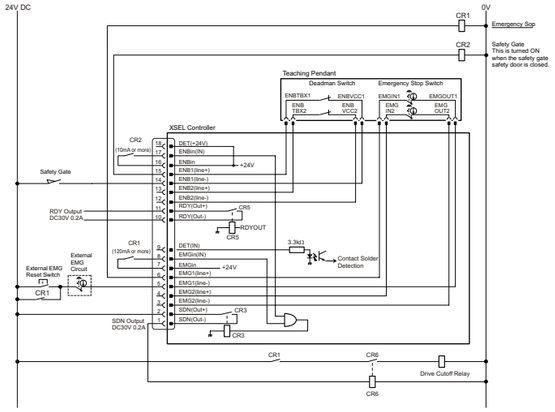


The power consumption and heat generation of X-SEL controller may differ depending how to construct the options. Select the circuit breaker and leakage breaker that suits to the specification.
In order to prevent noise disturbance, it is recommended to apply a noise filter, clamp filter, etc. [Refer to the instruction manuals for XSEL-R/S]
In the case that the actuator with the brake is not to be connected, it is not required to arrange the wiring for the brake power.

● Wiring for Emergency Stop Input
This shows of emergency stop, using the emergency stop circuit for the entire machine.
[XSEL-R, RX, RXD]



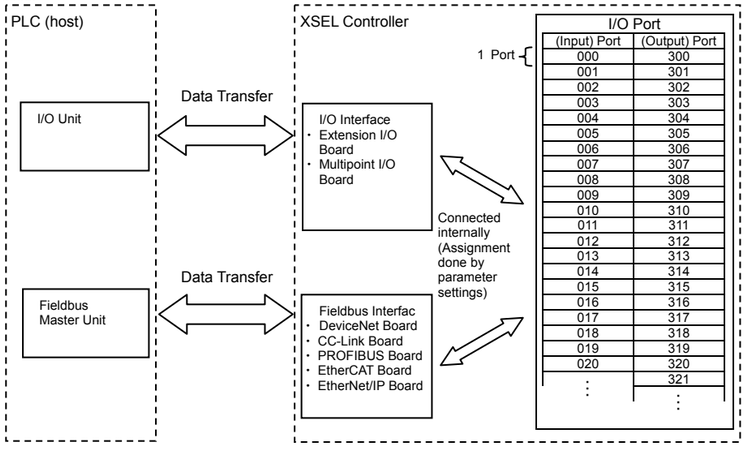
[XSEL-S, SX, SXD]



⚠ Note:
- Do not fail to lay out (EMGin, EMG1, SDN, ENBin and ENB1) regardless of the safety category.
- EMG2 and ENB2 are mandatory to realize Safety Category 3, and they enable the double layout of the safety circuit.
- DET is an input to detect the operational errors (mainly at soldered contact points of relay) in the safety circuit, and do not forget to use it if it is required to have XSEL Controller detect the contact solder. When closing in the safety circuit side to control the contact solder and other errors, it is possible to realize Safety Category 4 without connecting to the controller. [Refer to the operation manual of XSEL-R/S/RX/SX/RXD/SXD]

XSEL I/O Port

I/O port is a point to receive and send data located inside the controller. 1 port can handle data of 1 contact (1 bit). Data are sent and received via either PIO (24V input and output) or field network. Connection to one port is available from only one of PIO or field network. Set a parameter to determine which of PIO or field network is to be used.



● I/O Mapping

Shown below are the I/O port numbers and their functions of XSEL Controller at the delivery.
The allocation of the XSEL port numbers or functions, can be changed using the I/O parameter setting.

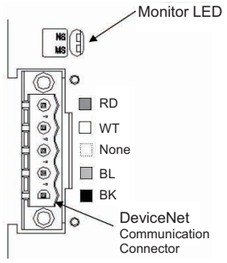
[Settings of Standard I/O Ports at Delivery]

	Port No.	Function		Port No.	Function
Input	000	Program Start	Output	300	Alarm Output
	001	Universal Input		301	Ready Output
	002	Universal Input		302	Emergency Stop Output
	003	Universal Input		303	Universal Output
	004	Universal Input		304	Universal Output
	005	Universal Input		305	Universal Output
	006	Universal Input		306	Universal Output
	007	Program Specification (PRG No.1)		307	Universal Output
	008	Program Specification (PRG No.2)		308	Universal Output
	009	Program Specification (PRG No.4)		309	Universal Output
	010	Program Specification (PRG No.8)		310	Universal Output
	011	Program Specification (PRG No.10)		311	Universal Output
	012	Program Specification (PRG No.20)		312	Universal Output
	013	Program Specification (PRG No.40)		313	Universal Output
	014	Universal Input		314	Universal Output
	015	Universal Input		315	Universal Output
	⋮	⋮		⋮	⋮

(Note) Number of I/O ports is:
- Input 000 to 299 or 1000 to 3999
- Output 300 to 599 or 4000 to 6999

DeviceNet

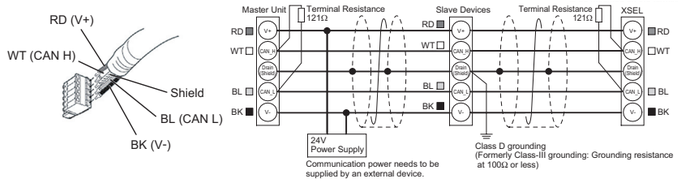
[Refer to the instruction manuals for DeviceNet]



Monitor LED ○ Illuminating, ×OFF, ☆Flashing

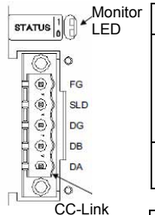
LED	Color	Indication Status	Indication Description
NS	green	○	Online, Communication in normal condition
		☆	Online, No connection established
	Orange		Critical link error
		☆	Connection timeout
	green / Orange	☆ (Illuminated by turns)	Self-testing
	-	×	Offline/ No power supply
MS	green	○	Normal operation
		☆	Configuration setting not established or not complete → test run required
	Orange	○	An error that cannot be recovered
		☆	An error that can be recovered
	green / Orange	☆ (Illuminated by turns)	Self-testing
	–	×	No power supply

Connector Name	DeviceNet Connector	
Cable Side	MSTB2.5/5-ST-5.08 ABGY AU	Enclosed in standard package Manufactured by PHOENIX CONTACT
Controller Side	MSTBA2.5/5-G-5.08 ABGY AU	



CC-Link

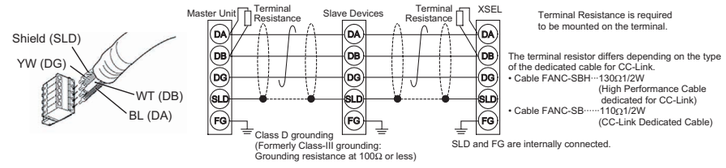
[Refer to the instruction manuals for CC-Link]



Monitor LED ○ Illuminating, ×OFF, ☆Flashing

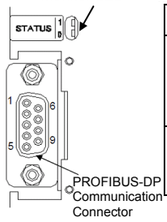
LED	Color	Indication Status	Indication Description
STATUS1	Orange	○	Error in reception data to self station Communication setting error (station setting, baud rate setting, etc.)
		☆	The station No. and baud rate set values are changed from ones set at the time of reset cancellation (flashes in 0.4sec cycle)
		×	In normal communication
STATUS0	green	○	Turns on when communication is started, and turns off when communication is disconnected for the specified time

Connector Name	CC-Link Connector	
Cable Side	MSTB2.5/5-ST-5.08AU	Enclosed in standard package Manufactured by PHOENIX CONTACT
Controller Side	MSTBA2.5/5-G-5.08AU	



PROFIBUS-DP

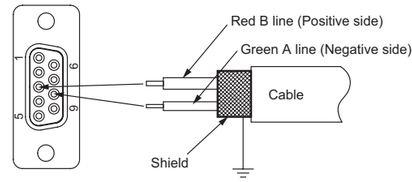
[Refer to the instruction manuals for PROFIBUS-DP]



Monitor LED ○ Illuminating, ×OFF, ☆Flashing

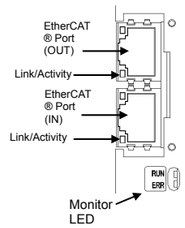
LED	Color	Indication Status	Indication Description
Operation Mode	green	○	Online (Communication in normal condition)
		☆	Online (Cleared)
	Orange	☆(1HZ)	Parameterizing data error
		☆(2HZ)	Configuration error
	-	×	Online ／ No power supply
Status	green	○	Completed
		☆	Completed (with network check event)
	Orange	○	exceptional error
	-	×	No power supply ／ Initializing not executed

Connector Name	PROFIBUS-DP Connector	
Cable Side	9-pin D-sub Connector (Male)	Please prepare separately
Controller Side	9-pin D-sub Connector (Female)	



EtherCAT

[Refer to the instruction manuals for EtherCAT]

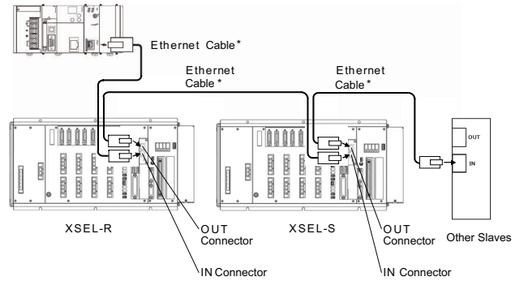


Monitor LED ○Illuminating, ×OFF, ☆Flashing

LED	color	Indication Status	Indication Description
RUN	green	○	Communication in normal condition (OPERATION condition)
		☆ ON 0.2sec/OFF 0.2sec	Under configuration condition in mailbox communication (PRE-OPERATION condition)
		☆ ON 0.2sec/OFF 1sec	Configuration complete (SAFE-OPERATION condition)
	Orange	○	An error that cannot be recovered (Module error)
	-	×	Initial condition (INIT condition) / No power supply
ERR	Orange	○	An error that cannot be recovered (Module error)
		☆ 0.2sec cycle	Network construction error
		☆ On 0.2sec 2 times / OFF 1sec	Communication error (Watchdog timeout)
	-	×	No power supply / No abnormality
RUN Link/ Activity	green	○	Linked (Communication traffic not detected)
		☆ 0.05sec cycle	Linked (Communication traffic detected)
	-	×	No link / No power supply

Connector Name	EtherCAT Connector	
Cable Side	8P8C Modular Plug	Straight STP cable with Category 5e or more
Controller Side	8P8C Modular Jack	

PLC(EtherCAT® Master Unit)

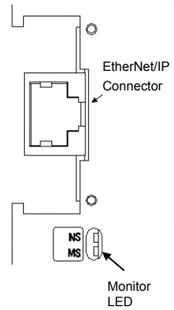


* Ethernet Cable: 100m or less of straight cable with Category 5e or more
(Double shielded cable braided with aluminum foil recommended)

Note 1 Only the daisy chain is supported in the network topology.
Note 2 There are IN and OUT designated for the communication port for EtherCAT. Be careful not to plug in the communication cable in the wrong way.
Note 3 There is no need of terminal treatment.

EtherNet/IP

[Refer to the instruction manuals for EtherNet/IP]

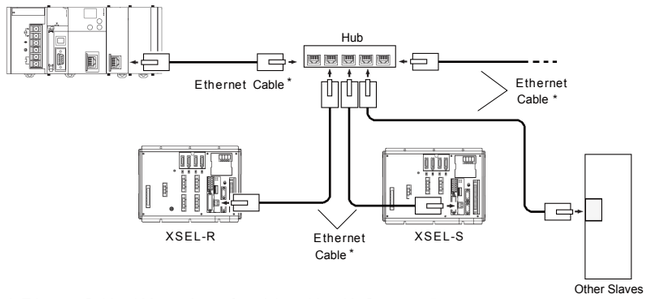


Monitor LED ○Illuminating, ×OFF, ☆Flashing

LED	Color	Indication Status	Indication Description
NS	green	○	Online, Communication in normal condition
		☆	Online, No connection established
	Orange	○	IP address duplication, Critical link error
		☆	Connection Timeout
	-	×	No power supply / No abnormality
MS	green	○	Normal Operation
		☆	Configuration setting not established or not complete, Test run required
	Orange	○	An error that cannot be recovered
		☆	An error that can be recovered
	-	×	No power supply

(Note) When only TCP/IP messages are used, both NS and MS flash in green.

PLC (EtherNet/IP Master Unit)



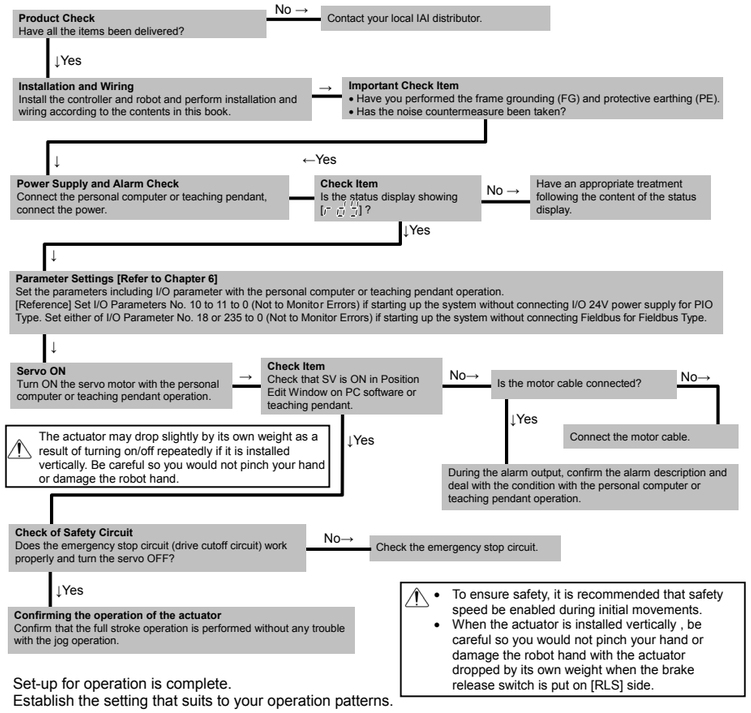
* Ethernet Cable: 100m or less of straight cable with Category 5e or more
(Double shielded cable braided with aluminum foil recommended)

(Note) There is no need of terminal treatment.

Starting Procedures

When using this product for the first time, make sure to avoid omission and incorrect wiring by referring to the procedure below. “PC” stated in this section means “PC software“.

⚠ Note:
- Make sure to put the brake release switch of the controller on the right side (NOM) before turning ON the power. If on the left (RLS), the actuator may drop with its weight and pinch yourself or damage the work piece.
- Make sure to connect the robot with the manufacturing number indicated on the controller.
  Connecting a robot not indicated may cause a wrong operation.



⚠
- To ensure safety, it is recommended that safety speed be enabled during initial movements.
- When the actuator is installed vertically , be careful so you would not pinch your hand or damage the robot hand with the actuator dropped by its own weight when the brake release switch is put on [RLS] side.

Set-up for operation is complete.
Establish the setting that suits to your operation patterns.

● Troubleshooting

Shown below are the alarms that you may often see after power up. Please follow the instructions below.
Please refer to the Operation Manual for other alarms.

Status display	Status contents	Cause and Remedy
E-G	During Emergency-stop	It is not an alarm. • It is generated when the emergency stop switch in the teaching pendant or the personal computer application software is not cancelled. In such case, cancel it. • It is generated when the personal computer cable is not connected to the emergency stop box. Please establish the connection. • Check the emergency stop circuit.
Enb	Safety Gate Remains Open Deadman Switch OFF	It is not an alarm. • It is generated when the system I/O ENB signal is opened. Check the ENB signal. (It is generated when the safety gate is open. Close the safety gate.) • This occurs when AUTO/MANU switch is on MANU side for XSEL-R/RX/RXD Controller but PC or teaching pendant is not connected. Connect the personal computer or the teaching pendant or set the AUTO/MANU switch to “AUTO”. • When the actuator is to be started up, hold the deadman switch on the teaching pendant to turn it ON.
ACF	AC Power Interruption Momentary Power Failure Power Voltage Drop	It is generated when the power voltage is not supplied. It will be generated, for example, in the case that the 100V AC is supplied to the controller with 200V AC specified. Check the power supply.
E914	Absolute Data Backup Battery Voltage Error	It will be generated in the case that the battery has not been attached, or the battery voltage is dropped. In the case of the actuator for the single-axis robots or Cartesian robots with the absolute data specifications, it is generated when the power is connected for the first time. Perform the absolute reset.
Ed19	Encoder Reception Time Out	It is generated when the encoder is broken, the cable is broken or the encoder cable is not connected to the controller. Check the wiring.
EE69 EE6C	24V I/O error DO Output Current Error	It is generated when the +24V power for I/O is not supplied. Check the power supply. (How to start up the controller without connecting the I/O 24V power) Set the I/O parameter No. 10 to No. 13 corresponding to “0”.
Ed5□	FieldBus Error	It is generated when the fieldbus link connection is not established. Check the link cable connection, I/O parameter and PLC parameter settings. (How to start up the controller without connecting the field bus) Set the I/O parameter No. 18 or No. 235 corresponding to “0”.
E6A8	RC Gateway Serious Breakdown Error	When the RC gateway is used and an error occurs in the controller mount SIO (serial communication), it is caused. The following causes are supposed. • All effective RC axes are missing (not recognized). → A cable disconnection or wire breaking is supposed. Check the wiring. • The power switch on the main CPU shows 0V. → Set the +5V power switch to right side (+5V supply side). • The DPRAM access right can not be obtained for one hour or more in the mount SIO. → Check the parameters for the X-SEL or RC controller. • A serious error such as a CPU error is caused in the mount SIO. → It is caused by the hardware breakdown. Consult with our company.

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