

X-SEL Controller J/K Type

First Step Guide Second Edition

Controller for Single-Axis Robots and Cartesian Robots: XSEL-J, K, KE, KT, KET

Controller for SCARA Robot: XSEL-JX, KX, KETX

DeviceNet, CC-Link, PROFIBUS

Thank you for purchasing our product.

Make sure to read the Safety Guide and detailed Instruction Manual as well as this First Step Guide to ensure correct use. This Instruction Manual is original.

* Using or copying all or a part of this Operation Manual without permission is prohibited.

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	Model	J	JK	K	KE	KT	KET	KX	KETX
1	Controller	Refer to "How to read the model plate" and "How to read the model of the controller".								
Accessories										
2	I/O Flat cable	CB-X-PIO*** **indicates the cable length	One unit is attached per installed PIO board.							
3	Battery for the Absolute Data Maintenance	IA-XAB-BT	○		○	○	○	○	○	
4	Connector terminal	IA-LB-KT						○	○	○
5	Connector terminal dummy plug							○	○	○
6	Connector terminal cable	Length : 1 m						○	○	○
7	Noise filter	MXB-1210-33 (Maker : DENSEI-LAMBDA)						○	○	○
8	System I/O plug	MC1.5/6-ST-3.5 (Maker : PHOENIX CONTACT)	○	○	○	○	○	○	○	○
9	AC Power Supply plug	GMSTB2.5/3-STF-7.62 (Maker : PHOENIX CONTACT)	○	○	○	○	○	○	○	○
10	I/O24V Power Supply plug	MC1.5/2-ST-3.5 (Maker : PHOENIX CONTACT)			○	○	○	○	○	○
11	For DeviceNet specification	SMSTB2.5/5-ST-5.08AU (Maker : PHOENIX CONTACT) Terminal Resistance : 121Ω	○	○	○	○	○	○	○	○
12	For CC-Link specification	MSTB2.5/5-ST-5.08AU (Maker : PHOENIX CONTACT) Terminal Resistance : 130Ω1/2W for FANC-SBH cable 110Ω1/2W for FANC-SB cable	○	○	○	○	○	○	○	○
13	AC Power Supply plug for Motor drive	PC4/2-ST-7.62 (Maker : PHOENIX CONTACT)						○	○	○
14	First Step Guide	ME0231	○	○	○	○	○	○	○	○
15	Safety Guide	M0194	○	○	○	○	○	○	○	○

*1 This is attached in the case of the unit with the brake.

2. Teaching Tool (Option)

The personal computer application software or teaching pendant is required for the operations including program creation and setup such as position teaching and parameter setting. Use either of them.

No.	Part Name	Model
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 (for XSEL-KT, KET, KETX RS232C Cable + Emergency Stop Box)	IA-101-XA-MW
4	Teaching pendant	SEL-T*1
5	Teaching pendant (with deadman switch)	SEL-TD*1
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

*1: The SEL-T/TD Teaching Pendant can not be used with the XSEL-J/JX controller.

3. Operation manuals related to this product

No.	Name	Manual No.
1	XSEL-J/K Controller Operation Manual	ME0116
2	XSEL-JX/KX Controller Operation Manual	ME0119
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 Operation Manual	ME0153
9	X-SEL Ethernet Operation Manual	ME0140
10	Multi-Point I/O Board Operation Manual	ME0138
11	Multi-Point I/O Board Dedicated Terminal Board Operation Manual	ME0139

4. How to read the model plate

Model → MODEL XSEL-J-3-400A-200AB-CC-EEE-0-2
 Serial number → SERIAL No. 600206442 MADE IN JAPAN

5. How to read the model of the controller

Controller for Single-Axis actuator and Cartesian actuator XSEL-J, K, KE, KT, KET

XSEL - K - 3 - 400A - 200ACL - 60ABL - N1 - EEE - 2 - 2
 ① ② ③ ④ (Axis 1) ④ (Axis 2) ④ (Axis 3) ⑤ ⑥ ⑦ ⑧

Model table

① Series	② Controller type	③ Number of axes	④ Details of axis 1 to axis 4						⑤ Standard I/O (Slot 1)	⑥ Expansion I/O slots			⑦ I/O Flat cable length	⑧ Power- supply voltage
			Motor Output	Encoder type	Brake	Creep	Home Sensor (LS)	Synchro- nization Desig- nation		Slot 2	Slot 3	Slot 4		
XSEL	J (Compact type) K (General- Purpose type) KE (CE- compliant) KT (*1) KET (CE- compliant) *1	1 (1-axis) 2 (2-axis) 3 (3-axis) 4 (4-axis)	20 (20W) 30D (30W for DS) 30R (30W for RS) 60 (60W) 100 (100W) 150 (150W) 200 (200W) 300 (300W) 400 (400W) 600 (600W) 750 (750W)	I (Incre- mental) A (Abso- lute)	Not Specified (w/o brake)	Not Specified (w/o creep)	Not Specified (w/o home sensor)	Not Specified (No synchro- nization) M (Master- axis designa- tion) S (Slave-axis designa- tion)	N1 (32 inputs/ 16 outputs NPN board)	E (Not used) C CC-Link connection 16/16 board	E (Not used) C CC-Link connection 16/16 board	E (Not used) C CC-Link connection 16/16 board	2 : 2m (Standard) 3 : 3m 5 : 5m 0 : None	1: Single- phase 100V 2: Single- phase 200V
			N3 (48 inputs/ 48 outputs NPN board)						N1 Expansion I/O NPN32/16	N1 Expansion I/O NPN32/16	N1 Expansion I/O NPN32/16			
			P1 (48 inputs/ 48 outputs PNP board)						N2 Expansion I/O NPN16/32	N2 Expansion I/O NPN16/32	N2 Expansion I/O NPN16/32			
			P3 (48 inputs/ 48 outputs PNP board)						N3 Expansion I/O NPN48/48	N3 Expansion I/O NPN48/48	N3 Expansion I/O NPN48/48			
			DV DeviceNet 256/256 board						P1 Expansion I/O PNP32/16	P1 Expansion I/O PNP32/16	P1 Expansion I/O PNP32/16			
			CC CC-Link 256/256 board						P2 Expansion I/O PNP16/32	P2 Expansion I/O PNP16/32	P2 Expansion I/O PNP16/32			
			PR PROFIBUS 256/256 board						P3 Expansion I/O PNP48/48	P3 Expansion I/O PNP48/48	P3 Expansion I/O PNP48/48			
			ET Ethernet Data communication board						SA Expansion I/O Type A	SA Expansion I/O Type A	SA Expansion I/O Type A			
									SB Expansion I/O Type B	SB Expansion I/O Type B	SB Expansion I/O Type B			
									SC Expansion I/O Type C	SC Expansion I/O Type C	SC Expansion I/O Type C			

Controller for SCARA robot XSEL-JX, KX, KETX

XSEL - KX - NNN5020 - N1 - EEE - 2 - 2
 ① ② ③ ④ ⑤ ⑥ ⑦

Model table

① Series	② Controller type	③ IX Robot Model	④ Standard I/O	⑤ Expansion I/O slots			⑥ I/O Flat cable length	⑦ Power supply voltage
XSEL	JX (Compact type) KX (General-Purpose type) KETX (CE-compliant) *1	NNN2515 to 8040 (Standard type)	N1 32 input/16 output NPN board	E (Not used) C (CC-Link connection) 16/16 board	E (Not used) C (CC-Link connection) 16/16 board	E (Not used) C (CC-Link connection) 16/16 board		
		NSN5016 to 6016 (High-speed type)	N3(*3) 48 input/48 output NPN board	N1 Expansion I/O NPN32/16	N1 Expansion I/O NPN32/16	N1 Expansion I/O NPN32/16		
		NNW2515 to 8040 (Dustproof/Splash proof type)	P1 32 input/16 output PNP board	N2 Expansion I/O NPN16/32	N2 Expansion I/O NPN16/32	N2 Expansion I/O NPN16/32		
		TNN3015 to 3515 (Wall-mount type)	P3(*2) 48 input/48 output PNP board	N3(*3) Multipoint I/O NPN 48/48	N3(*3) Multipoint I/O NPN 48/48	N3(*3) Multipoint I/O NPN 48/48		
		UNN3015 to 3515 (Wall-mount Inverse type)	DV DeviceNet 256/256 board	P1 Expansion I/O PNP32/16	P1 Expansion I/O PNP32/16	P1 Expansion I/O PNP32/16		
		HNN5020 to 8040 (Ceiling-mount type)	CC CC-Link 256/256 board	P2 Expansion I/O PNP16/32	P2 Expansion I/O PNP16/32	P2 Expansion I/O PNP32/32		
		INN5020 to 8040 (Ceiling-mount Inverse type)	CC CC-Link 256/256 board	P3(*3) Multipoint I/O PNP48/48	P3(*3) Multipoint I/O PNP48/48	P3(*3) Multipoint I/O PNP48/48		
			SA(*4) Expansion SIO type A	SA(*4) Expansion SIO type A	SA(*4) Expansion SIO type A	SA(*4) Expansion SIO type A		
			SB(*4) Expansion SIO type B	SB(*4) Expansion SIO type B	SB(*4) Expansion SIO type B	SB(*4) Expansion SIO type B		
		NNC2515 to 8040 (Clean room type)	ET Ethernet Data communication board	SC(*4) Expansion SIO type C	SC(*4) Expansion SIO type C	SC(*4) Expansion SIO type C	2 : 2m 3 : 3m 5 : 5m 0 : None	2: Single-phase 200V

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

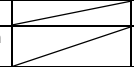
*2 N3 and P3 that can be inserted into the standard I/O (slot 1), are used for J and JX types.

*3 N3 and P3 that can be inserted into the extended I/O (slots 2 to 4), are used for K, KE, KT, KET, KX and KETX types.

*4 SA, SB and SC can not be used for J or JX type.

Basic Specifications

Specifications

Specification Item		XSEL-J	XSEL-K	XSEL-KE	XSEL-KT	XSEL-KET
Max. No. of Connectable Axes		4-axis				
Max. Connected Axis Output		100VAC Type	400W	800W		
		200VAC Type	800W *1	1600W		
Supply voltage		100VAC Type	Single-phase 100V to 115V ±10 %			
		200VAC Type	Single-phase 200V to 230V ±10 %			
Power frequency		50Hz/60Hz				
Rush Current *2		90A (MAX)	180A (MAX)			
Leakage Current *3 (Excluding Higher Harmonic Content)		1-axis the time of connection : 0.7mA 3-axis the time of connection : 1.3mA		2-axis the time of connection : 1.0mA 4-axis the time of connection : 1.6mA		
Momentary Power Interruption Tolerance		50Hz : 10msec, 60Hz : 8msec				
Insulation Resistance		10MΩ or more (Between power terminal and I/O terminal and also all external terminals and case at the power supply of 500VDC).				
Insulation Strength		1500VAC for 1 min. (Note 1) (actuator the time of connection 1000VAC for 1 min.)				
Axis Control System		AC Full – digital Servo				
Position detection method		Incremental Encoder or Absolute Encoder				
Battery for Backup		For Absolute Data Backup: IA-XAB-BT manufactured by our company				
		For System Memory Backup: CR2032				
Program language		Super SEL language				
Max. Number of program steps		6000 steps				
Max. Number of position		3000 positions				
Max. Number of programs		64 programs				
Max. Number of multitask programs		16 programs				
Data storage device		Flash ROM + SRAM battery backup				
Data input method		Teaching pendant or PC software				
Standard I/O Interface		32 Input Points (Total of Dedicated Input Points + Universal Input Points) 16 Output Points (Total of Dedicated Output Points + Universal Output Points)				
Expanded I/O Interface		(Refer to the Item for the How to read the model)				
Teaching Port RS232C (Special Protocol)		D-sub 25 Pin				
Serial communication function RS232C				D-sub 9 Pin		
Expanded serial communication function RS232C, RS485, RS422				Addition of Expansion I/O slots available (Refer to the Item for the Product Check).		
Serial communication cable length						
		RS232C	15 m or less			
		RS485	100m or less			
		RS422	100m or less			
System I/O		Emergency-stop input, enable input, system ready output				
Protective functions		Motor overcurrent, overload, motor driver temperature check, encoder open circuit detection, soft limit over, system abnormality, battery abnormality etc.				
Drive-source cutoff method		Internal Semiconductor	Internal relay		External Cut off	
Circuit protector for power supply		None	None	Internal	None	Internal
Environment	Surrounding air temperature	0 to +40°C				
	Surrounding humidity	30% to 85%RH (non-condensing)				
	Surrounding environment	(Refer to the Item for the Installation Environment).				
	Surrounding storage temperature	-10 to 65°C				
	Surrounding storage humidity	90%RH or less (non-condensing)				
	Vibration resistance	10 to 57 Hz in XYZ directions/Pulsating amplitude 0.035 mm (continuous), 0.075 mm (intermittent)				
		57 to 150 Hz in XYZ directions/4.9 m/s ² (continuous), 9.8 m/s ² (intermittent)				
Protection class		IP10				
Cooling method		Forced air cooling				
Weight		For 1-axis : 2.6kg		For 1, 2-axis : 6.0kg		
		For 2-axis : 3.3kg		For 3, 4-axis : 7.0kg		
		For 3, 4-axis : 5.0kg				
External dimensions		(Refer to the Item for the External Dimensions).				

*1 When the vertical type actuator is included, the watt amount of the vertical type actuator should be smaller than 600W in total.

*2 Rush current at the power connection continues for about 20msec. Consider the safety rate at the time when rush current passes. Take the greatest care because the rush current value varies depending on the impedance in the power.

*3 The leakage current is shown as the value indicated in the controller connected to the actuator. The leakage current from controller power cable or noise filter is not included. The leakage current varies depending on the surrounding environments. When the leakage protective measure is taken, measure the leakage current at the leakage breaker installation location.

Table 1: Motor Drive Power Factor and Output Loss

Actuator Motor Capacity [W]	Motor Drive Power Factor [W]	Output Loss [W]
20	15.6	1.58
30	27.6	2.07
60	83.0	3.93
100	140.1	6.12
150	196.1	8.30
200	252.6	9.12
400	477.5	19.76
600	698.2	27.20
750	912.8	29.77

Table 2: Control Power Capacity*4

Brake	None	1-axis	2-axis	3-axis	4-axis
1-axis controller [W]	17.5	27.3	-	-	-
2-axis controller [W]	23.4	33.2	42.9	-	-
3-axis controller [W]	29.3	39.1	48.8	58.6	-
4-axis controller [W]	35.3	45.0	54.8	64.5	74.3

*4 For the control power capacity, the amount as much as for the total number of connectable axes is required even when some

[Power Capacity and Heating Value]

Rated Power Capacity [VA] = (Motor Drive Power Factor [W] *¹ + Control Power Capacity [W] *²) + 0.6 [Power Factor]

Heating Value [W] = Total Output Loss [W] *³ + Control Power Capacity [W] *²

- *1 Select the Motor Drive Power Factor [W] from the Table 1. However, at the time of acceleration or deceleration, the motor driving power reaches max. three times more of the regular level.
- *2 The Control Power Capacity [W] is determined based on the number of connectable axes and the number of brake axes in the controller. Select it from the table 2.
- *3 For the Total Output Loss [W], select the output losses for all the actuators to be connected from the Table 1 and calculate it.

Controller for SCARA robot Specifications

Specification Item		XSEL-JX	XSEL-KX	XSEL-KETX
Max. No. of Connectable Axes		1 unit of SCARA Robot		
Max. Connected Axis Output		450W		
Supply voltage		200VAC Type	1750W	
Power frequency		200VAC Type	Single-phase 200V to 230V ±10%	
Rush Current* ¹		50Hz/60Hz		90A (MAX)
Leakage Current* ² (Excluding Higher Harmonic Content)		180A (MAX)		
Momentary Power Interruption Tolerance		1.6mA		
Insulation Resistance		50Hz : 10msec, 60Hz : 8msec		
Insulation Strength		10MΩ or more (Between power terminal and I/O terminal and also all external terminals and case at the power supply of 500VDC).		
Axis Control System		1500VAC for 1 min. (SCARA robot the time of connection 1000VAC for 1 min.)		
Position detection method		AC Full – digital Servo		
Battery for Backup		Absolute Encoder		
Program language		For Absolute Data Backup: AB-3 manufactured by our company (built-in the main SCARA robot)		
Number of program steps		For System Memory Backup: CR2032		
Number of position		Super SEL language		
Number of programs		6000 steps		
Number of multitask programs		3000 positions		
Data storage device		64 programs		
Data input method		16 programs		
Standard I/O Interface		Flash ROM + SRAM battery backup		
Expanded I/O Interface		Teaching pendant or PC software		
Teaching Port RS232C (Special Protocol)		32 Input Points (Total of Dedicated Input Points + Universal Input Points) 16 Output Points (Total of Dedicated Output Points + Universal Output Points)		
Serial communication function RS232C		(Refer to the Item for the Product Check).		
Expanded serial communication function RS232C, RS485, RS422		D-sub 25 Pin		
Serial communication		D-sub 9 Pin		
System I/O		Addition of Expansion I/O slots available (Refer to the Item for the Product Check).		
Protective functions		Emergency-stop input, enable input, system ready output		
Drive-source cutoff method		Motor overcurrent, overload, motor-driver temperature check, encoder-open detection, soft limit over, system error, etc.		
Circuit protector for power supply		Internal Semiconductor		
Environment		None		
Surrounding air temperature		None		
Surrounding humidity		None		
Surrounding environment		None		
Surrounding storage temperature		None		
Surrounding storage humidity		None		
Vibration resistance		None		
Protection class		IP10		
Cooling method		Forced air cooling		
Weight		5.0kg		
External dimensions		7.0kg		
		(Refer to the Item for the External Dimensions).		

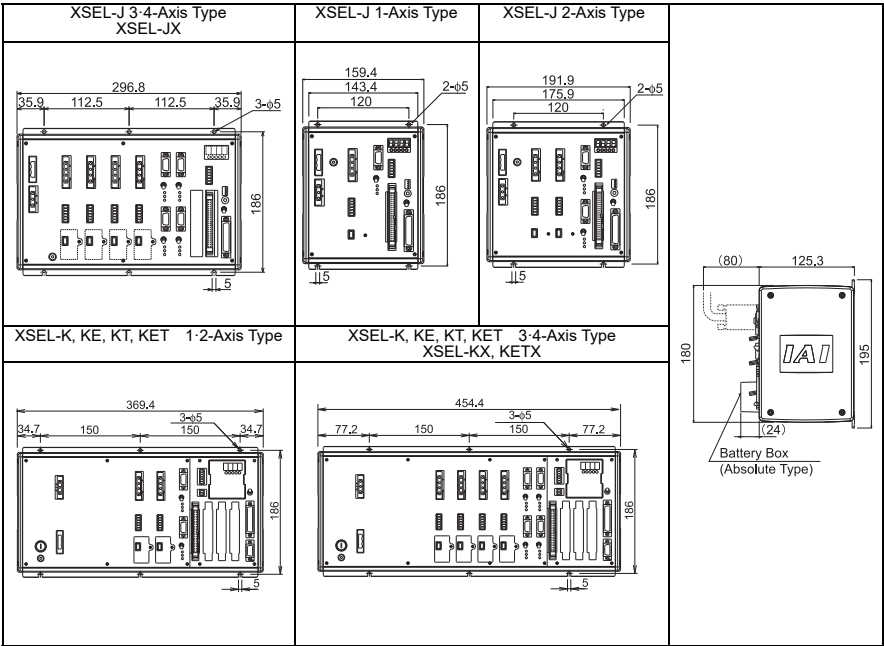
- *1 Rush current at the power injection continues for 20msec. Consider the safety rate at the time when rush current passes. Take the greatest care because the rush current value varies depending on the impedance in the power line.
- *2 The leakage current is shown as the value indicated in the controller connected to the actuator. The leakage current from controller power cable or noise filter is not included. The leakage current varies depending on the surrounding environments. When the leakage protective measure is taken, measure the leakage current at the leakage breaker installation location.

[Power Capacity and Heating Value]

Model	Power Capacity [VA] * ³	Heating Value [W]
IX-NNN70□□/IX-NNN80□□,IX-HNN70□□/IX-HNN80□□ IX-INN70□□/IX-INN80□□,IX-NNW70□□/IX-NNW80□□ IX-NNC70□□/IX-NNC80□□	3625	133
IX-NNN50□□/IX-NNN60□□,IX-HNN5020/IX-HNN6020 IX-INN5020/IX-INN6020,IX-NNW50□□/IX-NNW60□□ IX-NNC50□□/IX-NNC60□□	1963	99
IX-NSN5016/IX-NSN6016	3228	121
IX-NNN2515/IX-NNN3515,IX-TNN3015/IX-TNN3515 IX-UNN3015/IX-UNN3515,IX-NNW2515/IX-NNW3515 IX-NNC2515/IX-NNC3515	1118	81

- *3 However, at the time of acceleration or deceleration, the motor driving power reaches max. Three times more of the regular level.

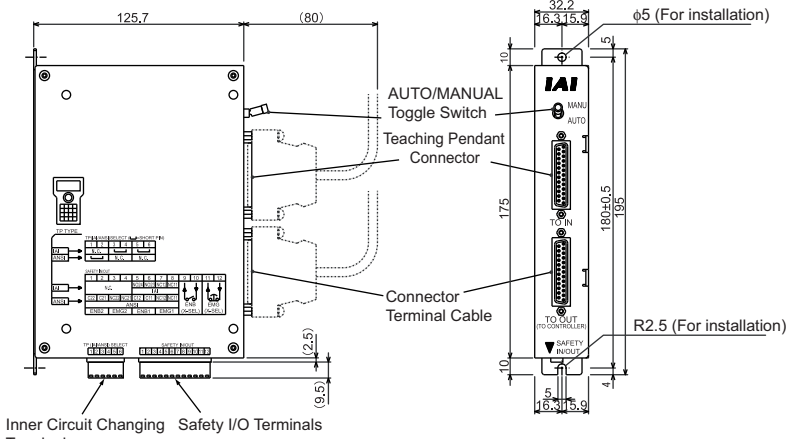
External Dimensions



Note: The front panel in the figure shows the condition when the controller for the actuator XSEL-J or K for the single-axis robots and Cartesian robots is used.

Connector terminal for XSEL-KT/KET/KETX IA-LB-KT

The connector terminal is the unit required for shutdown the motor driving power for XSEL-KT/KET/KETX, using the emergency stop button (Deadman Switch) on the teaching pendant.



Regeneration Resistor Unit (Option) : REU-1

Regenerative Resistance Unit: This unit converts the regenerative current brought at the time of the motor deceleration into heat.

The regenerative resistance is not required for the SCARA robot controller XSEL-JX, KX and KETX.

[Installation Standards]

It is not required when it is used horizontally.

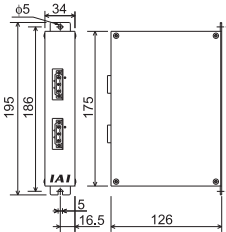
[External Dimensions]

When it is used vertically:

Connected Actuator Motor Capacity Total	XSEL-J	XSEL-K/KE/KT/KET
0 to 200W	Not required	Not required
to 400W	1 Unit	Not required
to 600W	1 Unit	1 Unit
to 800W	2 Units	1 Unit
to 1200W	-	2 Units
to 1600W	-	3 Units

[Specifications]

Item	Specifications
Dimensions	W34mm×H195mm×D126mm
Weight	0.9kg
Built-in regeneration resistor	220Ω 80W
Accessory	Controller link cable (model : CB-ST-REU010) 1m



Installation Environment

Do not use this product in the following environment

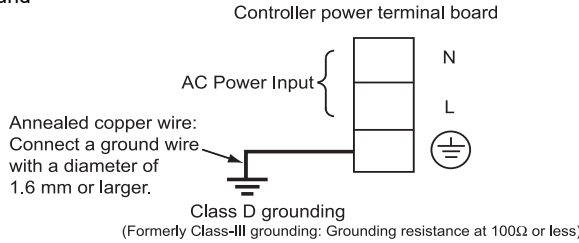
- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity smaller than 10% or larger than 85%RH
- Location exposed to corrosive gases or combustible gases
- Location exposed 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

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

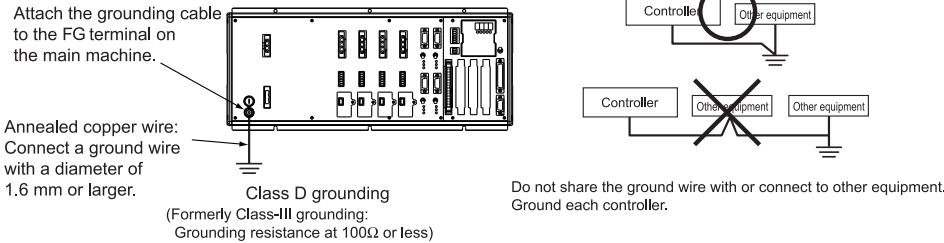
- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

Installation and Noise Elimination

1. Protective Ground



2. Noise Elimination Grounding (Frame Ground)



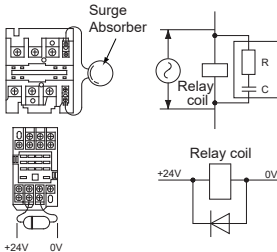
3. Precautions Regarding Wiring Method

- (1) Use a twisted cable for connection to power supply.
- (2) Separate the I/O cable, communication line/encoder line, and power/driving cable each other.

4. Noise Sources and Elimination

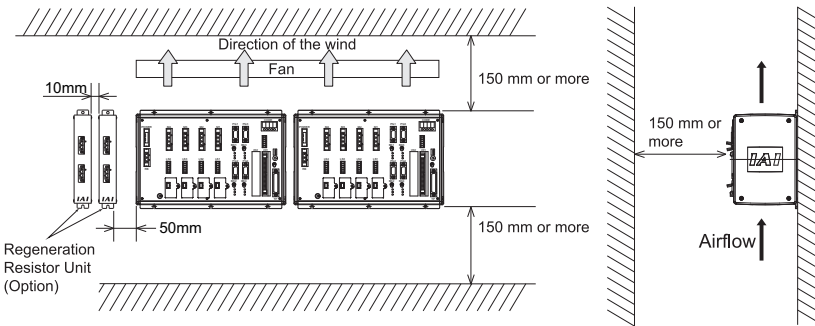
Carry out noise elimination measures for power devices on the same power path and in the same equipment. The following are examples of measures to eliminate noise sources.

- (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.



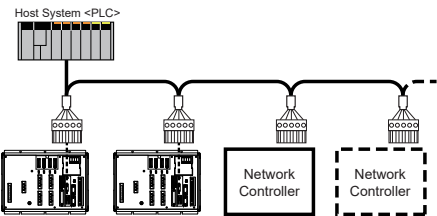
5. Heat Radiation and Installation

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.

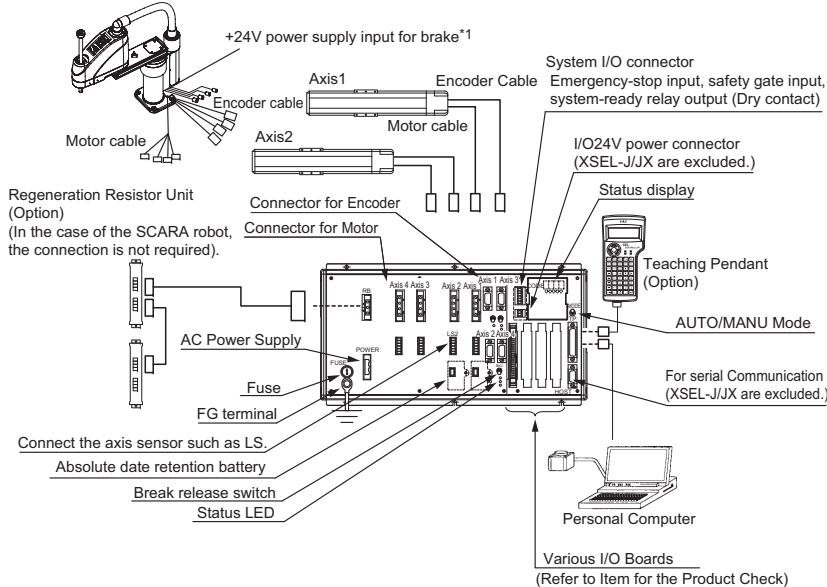


Connection Diagram

[System Diagram]



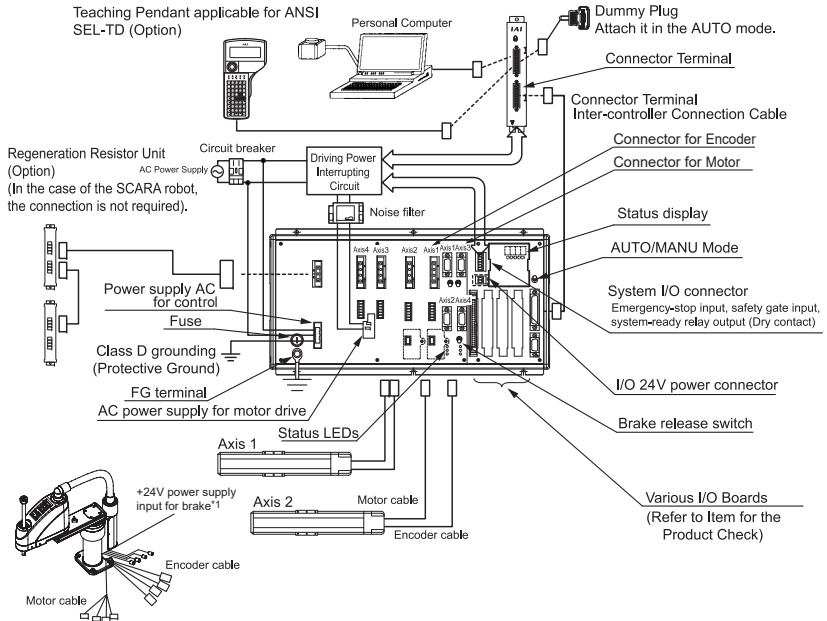
[XSEL- J, K, KE, JX, KX]



The figure shows the built-in relay interrupting using the controller for Single-Axis Robots and Cartesian Robots: XSEL-K. For XSEL-J and KE, the same wire arrangement is applied. The SCARA robot controller XSEL-KX are applicable for four axes. For XSEL-K, the same wire arrangement is applied.

*1 In the case of SCARA robot, the supply of the power +24V for the brake is required for the robot main body.

[XSEL- KT, KET, KETX]



The figure shows the built-in relay interrupting using the controller for Single-Axis Robots and Cartesian Robots: XSEL-K. For XSEL-KET, the same wire arrangement is applied. The SCARA robot controller XSEL-KX are applicable for four axes. For XSEL-K, the same wire arrangement is applied.

*1 In the case of SCARA robot, the supply of the power +24V for the brake is required for the robot main body.

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. If any of them is connected incorrectly, it might cause a damage to or malfunction of the motor or PC board. If any of them is connected incorrectly, it might cause a burning or malfunction of the motor or PC board.

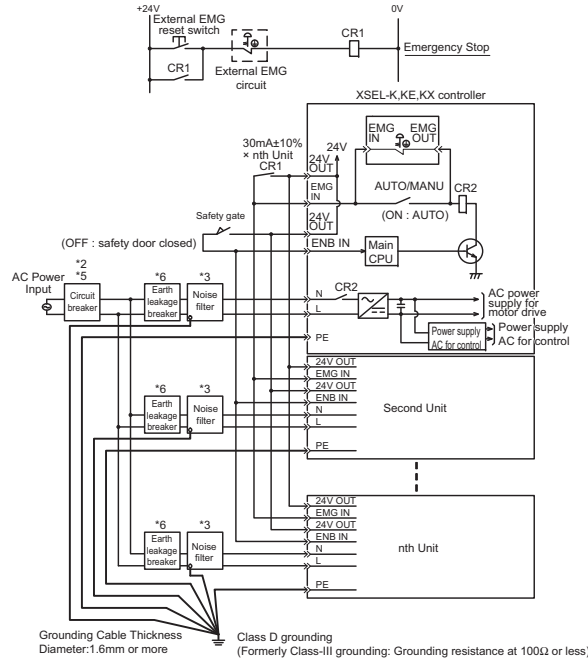
Power Supply and Emergency Stop Circuit

[XSEL-K, KE, KX, J, JX]

Shown is an example when two or more controllers on the whole system emergency stop circuit, are stopped in an emergency.

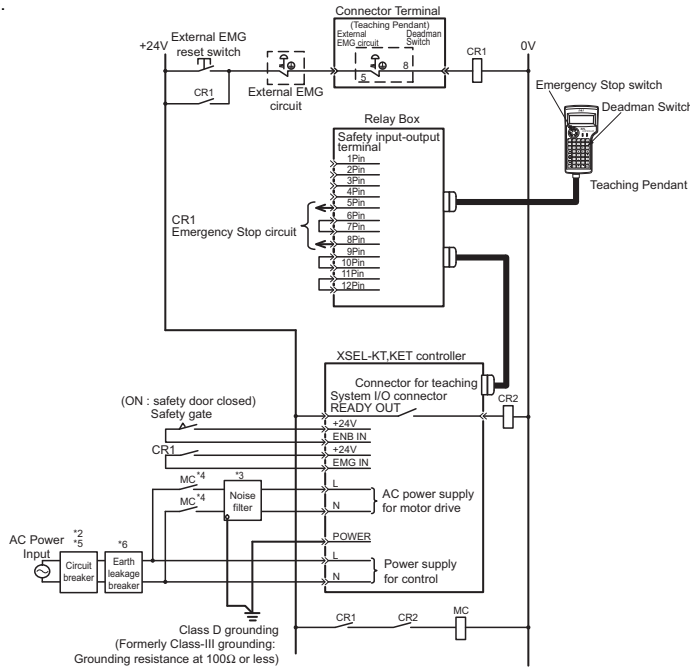
The figure shows the built-in relay interrupting using the XSEL-K, KE or KX controller.

The XSEL-J or JX controller motor driving power is supplied through the interruption of built-in semi-conductor.



[XSEL-K, KE, KX, J, JX]

When it is installed into category 3 or 4 of the system, refer to the instruction manual for the connection procedure.



*1 Use IEC60947-5-1 or its equivalent as the emergency stop switch. IEC60947-5-1: Refer to Section 1 "Electrical Machine Control Circuit Equipment" in the Vol. 5 "Control Circuit Equipment and Switches" in the "Low Pressure Switch and Control Unit".

Complied JIS Standards: JIS C 8201-5-1

*2 For the selection of the circuit breaker, perform it according to the following items.
Breaker Teaching pendant Value > Power Capacity + AC Input Voltage
(For the Power Capacity, refer to the Item for the Power Capacity and Heating Value).
·The current might pass through the controller three times more of the rated current at the acceleration. Select one that does not trip when the above current passes. When it trips, select the breaker with a rated current one rank above.
·Select the breaker that does not trip with the rush current.(Refer to the performance characteristic curve graph described in the manufacturer's catalog.)
·For the rated breaking current, select the current value which can break the current even when a short circuit occurs.
Breaking current > A short circuit occurs = Primary Power Supply Capacity + Power-Supply voltage
Select the breaking current value for the circuit breaker leaving some margin.
*3 Make sure to install the noise filter.
Select the noise filter with the same calculation as that for the circuit breaker.

Recommended Noise Filter Model (Manufacturer: Denset-Lambda)		
Actuator type	Current value	Parts
Actuator for other than SCARA robot	10A or less	MXB-1210-33
	10 to 20A or less	MXB-1220-33
SCARA Robot Arm Length : 700/800 Type, High-speed type	10 to 20A or less	MXB-1220-33
SCARA Robots other than the above	10A or less	MXB-1210-33

*4 For the MC capacity, select it with the same calculation as that for the circuit breaker.

*5 The circuit protector is built in the XSEL-KE, KET and KETX. However, the short-circuit breaking capacity is 500A. When the breaking capacity is not enough, install the external breaker with the required breaking capacity to protect from short-circuit and for grounding.

Built-in Circuit Protector SER-F-11-62-10A-BWT (Manufacturer: Sanken-Airpax)

Specification Item	Performance
Rated Voltage, Rated Current	250V 10A
Short-Circuit Braking Capacity	500A

*6 When the leakage breaker is to be installed, it is required to select it with the purpose clarified such as protection from fire or human body protection.
For the leakage breaker, measure the leakage current at the location where the leakage breaker is installed, and select it. Use the "applicable to higher harmonics type" leakage breaker.

CAUTION : Take care of the following points, otherwise, it may burnout the motor.
• Do not turn ON and OFF the motor driving AC power with the control AC power turned OFF.
• Inject the motor driving AC power after the READY signal is turned ON.
• Do not turn ON and OFF the motor driving AC power repeatedly.
When the power is to be connected, connect the power 5 or more seconds after the power is turned OFF.
• When the control detects the cold start level error, remove the cause and then connect the power. In the case of an overload error, connect the power again after a sufficient interval (at least one minute or more).

I/O Port on X-SEL

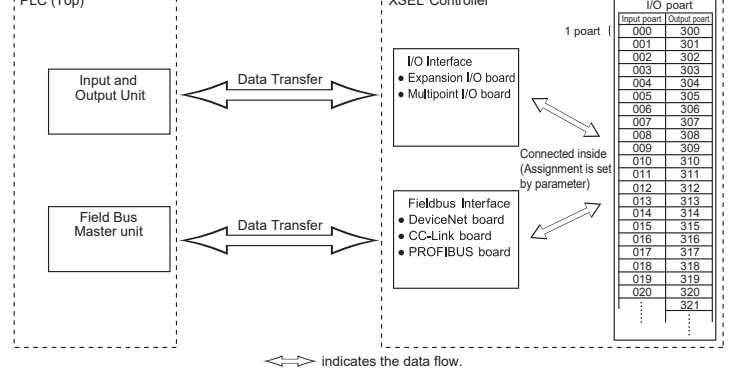
I/O port is the area that the data inside the XSEL controller is transferred from.

Data of 1 contact (1 bit) can be transferred in 1 port.

Data is transferred via PIO (24V input and output) or the fieldbus.

Either PIO or fieldbus can be connected to one port.

Set the parameter whether PIO or fieldbus is to be used.



• I/O Map
Shown below is the list of I/O port numbers and their functions of XSEL controller at the delivery. XSEL port number and the function assignment can be changed with the I/O parameter. [Refer to the "XSEL Controller Operation Manual" for the details.]

Input	Poart No.	Functions	Output	Poart No.	Functions
	000	Program start		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 appointment (PRG No.1)		307	Universal Output
	008	Program appointment (PRG No.2)		308	Universal Output
	009	Program appointment (PRG No.4)		309	Universal Output
	010	Program appointment (PRG No.8)		310	Universal Output
	011	Program appointment (PRG No.10)		311	Universal Output
	012	Program appointment (PRG No.20)		312	Universal Output
	013	Program appointment (PRG No.40)		313	Universal Output
	014	Universal Input		314	Universal Output
	015	Universal Input		315	Universal Output
	...	...		...	...

Note) Number of input and output ports is:

Input 000 to 299 (MAX, 300 Point)
Output 300 to 599 (MAX, 300 Point)

Be careful with the number of input and output ports when using a fieldbus board and I/O board together.

Initial Settings (I/O Parameters)

I/O Parameters				
No.	Parameter Name	Initial Value (Reference)	Input Pange	Remarks
1	I/O port assignment type	1	0, 1	0: Fixed assignment 1: Automatic assignment (Priority: fieldbus board → standard I/O board (slot 1) to
14	Number of ports using network I/F card remote input	64	0 to 256	Multiple of 8 Enter the number of input ports that are used for the fieldbus. For the numbers 14 and 15, input the same number that is bigger than the other between the two.
15	Number of ports using network I/F card remote output	64	0 to 256	Multiple of 8 Enter the number of input ports that are used for the fieldbus. For the numbers 14 and 15, input the same number that is bigger than the other between the two.
16	Input port start number with fixed network I/F module assignments	0	-1, 0 to 299	Multiple of 8 (A negative value is invalid) Enter from which input port the fieldbus is used.
17	Output port start number with fixed network I/F module assignments	300	-1, 300 to 599	Multiple of 8 (A negative value is invalid) Enter from which output port the fieldbus is used.
18	Network I/F module error monitor	1	0 to 5	0: Not to monitor 1: Monitor

* Refer to the Operation Manual for each fieldbus when using fieldbus and PIO together.

* The occupied address on PLC is determined depending on the number of used inputs and outputs. Refer to the Operation Manual of the master unit for the details.

DeviceNet

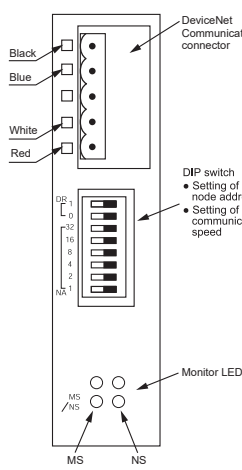
Specifications

Item	Specifications			
Communication standard	A certified DeviceNet 2.0 interface module is used.			
	Group 2 only server			
Communication specification	Master-slave connection			Insulated node of network powered operation type
				Bit strobe
	Polling			
	Cyclic			
Communication speed	500k/250k/125k (Changed by DIP switches)			
Communication cable length (*1)	Communication speed	Maximum network length	Maximum branch length	Total network length
	500kbps	100m	6m	39m
	250kbps	250m		78m
	125kbps	500m		156m
	Note) When a thick DeviceNet cable is used.			
Communication Power supply	24VDC (supplied from DeviceNet)			
Communication power current consumption	60mA			
Occupied nodes	1 Node			
Connector	Manufactured by PHOENIX CONTACT MSTBA2.5/5-G-5.08AUM (*2)			

(*1) Refer to the operation manuals for your master unit and PLC in the case of T-branch communication.

(*2) The cable-side connector is a standard accessory.

Manufactured by PHOENIX CONTACT SMSTB2.5/5-ST-5.08AU



Setting of DIP switch

The following can be carried out by DIP switches:

- (1) Setting of node address
 - (2) Setting of communication speed
- (Note) Turn the power off before setting the DIP switches.

(1) Setting of node address (MAC ID)

In the DeviceNet, a maximum of 64 nodes can be connected.

Set the node address (MAC ID) following the table below with the hexadecimal numbers.

DIP switch						
Node Address (MAC ID)	NA32	NA16	NA8	NA4	NA2	NA1
0	0	0	0	0	0	0
1	0	0	0	0	0	1
2	0	0	0	0	1	0
3	0	0	0	0	1	1
...	...	...	...	...	...	...
60	1	1	1	1	0	0
61	1	1	1	1	0	1
62	1	1	1	1	1	0
63 (Master Unit)	1	1	1	1	1	1

(Note) node address is corresponded to the remote I/O address on PLC. It is able to set 256 inputs and 256 outputs at maximum on this DeviceNet Card. Therefore, node addresses corresponding to the number of used inputs and outputs are able to be occupied on PLC. Be careful of the setting duplication of the node addresses. (Refer to the PLC Operation Manual for the details.)

(2) Setting of communications speed

Set the communication speed following the table below.

DIP switch		
Communication speed	DR1	DR0
125kbps	0	0
250kbps	0	1
500kbps	1	0
Setting to prohibited	1	1

Display of monitor LEDs

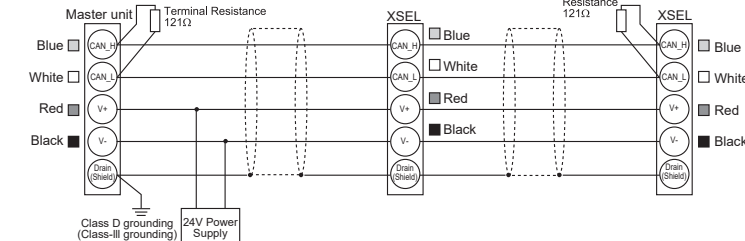
The two LEDs of MS and NS on the front face of the board indicate the node status and network status. (The remaining two LEDs are not used.)

These LEDs illuminate in one of two colors (red or green), and each LED indicates a different monitored status, as shown in the table below.

MS (Module Status) LED This LED indicates the status of the board (node).
NS (Network Status) LED This LED indicates the status of the network.

LED	Color	Display condition	Description (meaning of indication)
MS	GN	Lighting	The node is operating normally.
	RD	Lighting	A hardware error is present. The board must be replaced.
		Flashing	A minor error, such as a DIP switch setting error or configuration error, is present. A normal condition can be restored by a reset operation, etc.
	—	Off	Power is not supplied from XSEL main unit. Repair of XSEL main unit or board replacement is required.
NS	GN	Lighting	Connection is established and normally communicating.
		Flashing	On the line but connection is not established. Communication is stopped. (Network is normally operating)
	RD	Lighting	Node addresses are duplicated or busoff is detected. Communication is disabled.
		Flashing	Communication error (Communication timeout is detected)
	—	Off	● Not on the line.
			● DeviceNet power is not supplied.

Connection



CC-Link

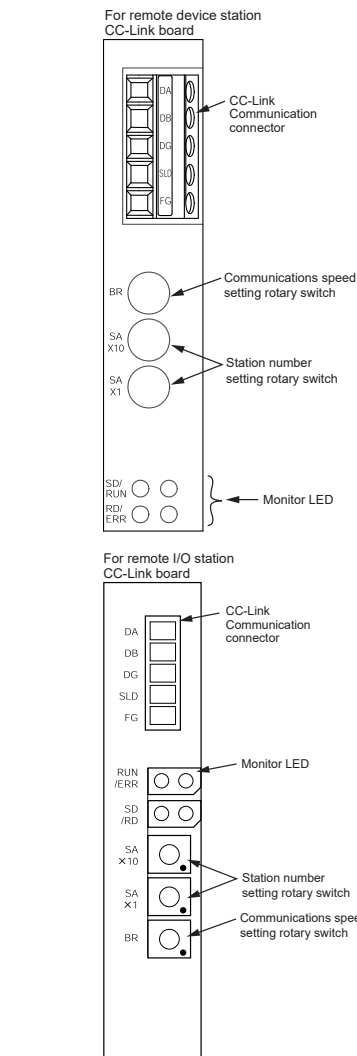
Specifications

Item	Specifications					
Communication standard	CC-Link Ver1.10					
Communication speed	10M/5M/2.5M/525k/156kbps					
Communication method	Broadcast polling system					
Synchronization system	Frame synchronization system					
Encoding system	NRZI					
Transmission path format	Bus format (EIA RS485 conformance)					
Transmission format	HDLC conformance					
Error control system	CRC (X36+X12+X5+1)					
Number of occupied stations	XSEL-J/K : Remote device station Max3 station					
	XSEL-K : Remote I/O station 1 station					
Communication cable length (*1)	Communication speed (bps)	10M	5M	2.5M	625k	156k
	Overall cable length (m)	100	160	400	900	1200
Connector (*2)	Manufactured by PHOENIX CONTACT MSTBA2.5/5-G-5.08AU(X-SEL)					

(*1) Refer to the operation manuals for your master unit and PLC in the case of T-branch communication.

(*2) The cable-side connector is a standard accessory.

Manufactured by PHOENIX CONTACT MSTB2.5/5-ST-5.08AU



Rotary switches

The following can be carried out by rotary switches:

- Setting of station number
 - Setting of communications speed
- (Note) Turn the power off before setting the rotary switches.

a. Setting of station number

In the CC-Link, a maximum of 64 stations can be connected.

The station number is set in the 1 to 64 range by the two rotary switches.

SA×10 Sets the tens place.

SA×1 Sets the ones place.

Rotary switch selection number	Station number	
	SA×10	SA×1
0 (Master Unit)	0	0
1	10	1
2	20	2
3	30	3
4	40	4
5	50	5
6	60	6
7	—	7
8	—	8
9	—	9

b. Setting of communications speed

The communications speed is set by the rotary switch BR.

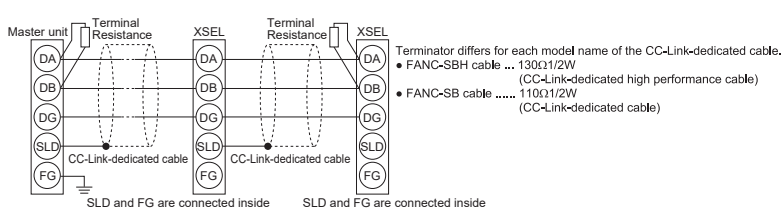
Rotary switch selection number	Communication speed
0	156kbps
1	825kbps
2	2.5Mbps
3	5Mbps
4	10Mbps
Setting to 5 or more prohibited	Error

Display of monitor LEDs

The four LEDs mounted on the front of the board can indicate the board operating state and network condition.

LED	Color	Display condition	Description (meaning of indication)
RUN	GN	Lighting	Lights when communications start and turns off when communications are interrupted for a fixed time or longer.
SD	GN	Lighting	Lights during data transmission
RD	GN	Lighting	Lights during data reception
ERR	RD	Lighting	Local station address receiving data has an error.
		Flashing	Setting by the communications speed setting rotary switch was changed during communications. Setting by the station number setting rotary switch was changed during communications.

Connection

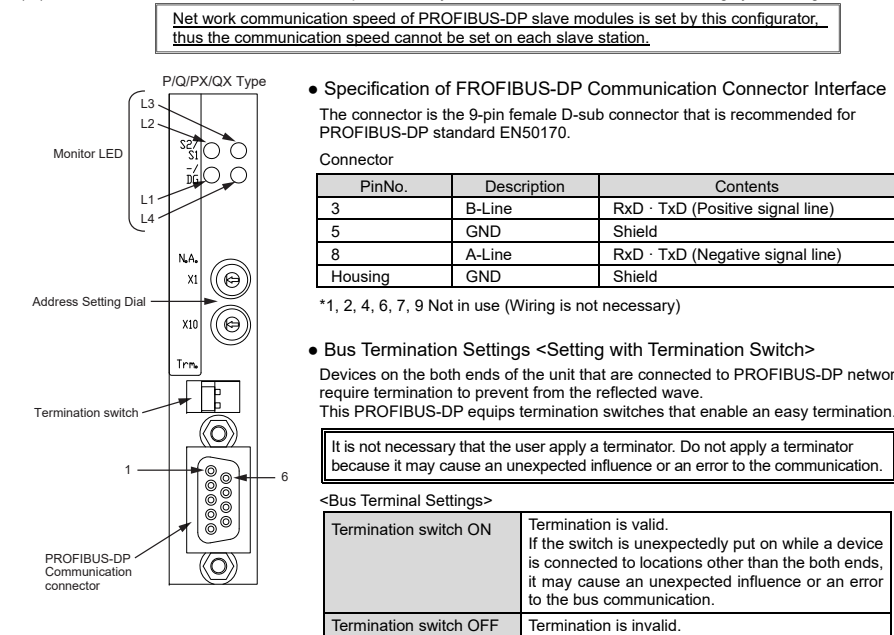


PROFIBUS

Specifications

Item	Specifications		Remarks
Communication profile	PROFIBUS-DP		
Communication method	Hybrid system		Adopting master/slave system and token-passing
Number of connected stations	32 stations/segments		Available up to 126 stations with utilizing repeater
Communication data length	244 bytes/frames Max.		
Physical profile	RS485		* Generally RS485 * 9-pin Dsub is recommended for IP20
Communication speed (kbps)	9.6/19.2/93.75/187.5/500 1500/3000/6000/12000		(*1)
Transfer distance	Total network Max.	Communication speed	Cable type
	100m	12,000/6,000/3,000kbps	Type A Cable
	200m	1,500kbps	
	400m	500kbps	
	1000m	187.5kbps	
	1200m	9.6/19.2/93.75kbps	
Topology	Bus / Tree / Star		
Cable	Twisted pair cable Shield cable		Type A Cable

(*1) PROFIBUS-DP network communication speed can only be set in PROFIBUS-DP network setting by the configurator.



Specification of FROFIBUS-DP Communication Connector Interface

The connector is the 9-pin female D-sub connector that is recommended for PROFIBUS-DP standard EN50170.

PinNo.	Description	Contents
3	B-Line	RxD · TxD (Positive signal line)
5	GND	Shield
8	A-Line	RxD · TxD (Negative signal line)
Housing	GND	Shield

*1, 2, 4, 6, 7, 9 Not in use (Wiring is not necessary)

Bus Termination Settings <Setting with Termination Switch>

Devices on the both ends of the unit that are connected to PROFIBUS-DP network require termination to prevent from the reflected wave. This PROFIBUS-DP equips termination switches that enable an easy termination.

It is not necessary that the user apply a terminator. Do not apply a terminator because it may cause an unexpected influence or an error to the communication.

<Bus Terminal Settings>	
Termination switch ON	Termination is valid. If the switch is unexpectedly put on while a device is connected to locations other than the both ends, it may cause an unexpected influence or an error to the bus communication.
Termination switch OFF	Termination is invalid.

Setting of node address <Setting with address setting dial>

Address setting of PROFIBUS-DP slave stations is to be performed using "×1" and "×10" of the rotary switches shown in the diagram above.

How to set:

Node address number = (set value of "×10" rotary switch × 10) + (set value of "×1" rotary switch × 1)

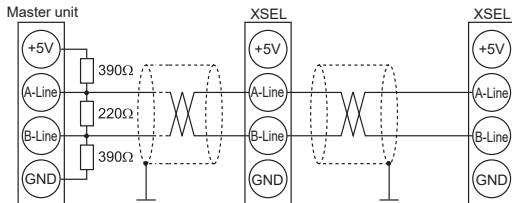
Target setting station number	Example of rotary switch setting	
	"×10" Setting (×10)	"×1" Setting (×1)
9	0	9
12	1	2

Note 1) For the setting of PROFIBUS-DP station number, PROFIBUS-DP master station is always set to 0, thus slave stations can be set to 1~99.

Display of monitor LEDs

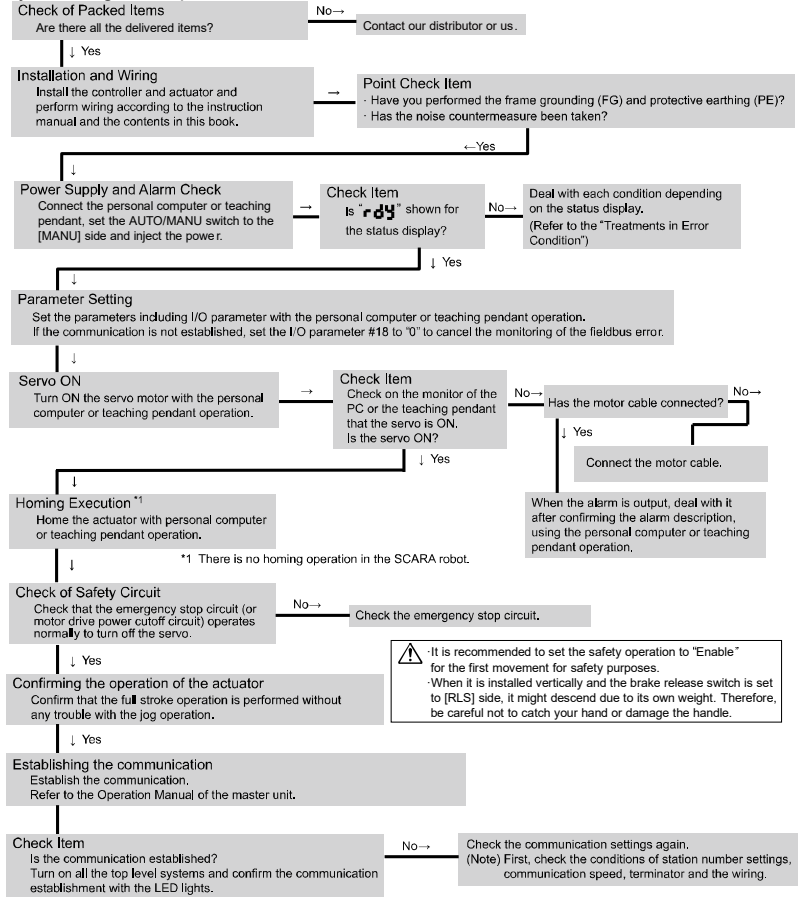
LED	Color	Status	Definition	Description (Cause)
L1	—	Not in use	Not defined	—
L2	GN	On	Normal communication condition	• Shows the system being in normal operation (On fieldbus line)
L3	RD	On	Offline	• On fieldbus line
L4	RD	Off	No abnormalities	—
		1Hz Flashing	I/O size error	• LED flashes when an error is detected in the size of the set I/O.
		2Hz Flashing	Connection not established	• Equipment setting error (internal error)
		4Hz Flashing	Communication hardware error	• LED flashes when an error is detected in the communication related hardwares at the system initializing.

Connection



Starting Procedures

When using this product for the first time, make sure to avoid mistakes and incorrect wiring by referring to the procedure below.



Set-up for operation is complete. Start adjusting the system operation.

Troubleshooting

For X-SEL, the operation status can be checked with the status LEDs on the front panel.

● For DeviceNet ○: Lighting ●: Off ⊙: Flashing

Monitor LED				Status	Treatment
MS		NS			
GN	RD	GN	RD		
○	—	○	—	In normal operation	
○	—	●	●	Waiting for master to finish node address duplication check	● Confirm that the communication speed of the mater and all the slaves are set the same. ● After correcting the settings, reboot the system. ● Confirm that the connectors are connected correctly.
○	—	⊙	—	Waiting for the completion of connection with the master	● Confirm if the master is operating with no abnormality. ● Confirm that the controller is registered in the scan list on the master.
—	○	●	●	Hardware error	● Please contact us.
—	⊙	●	●	Error in DIP switch setting	● Confirm that the communication speed is set the same as the master setting. ● Confirm if the configuration setting is established correctly.
○	—	—	○	Node addresses are duplicated or busoff (communication stop caused by data error being repeated) is detected.	● Correct the node address, and then reboot the system. ● Check the influence of noise, e.g. check if there is a source of noise nearby, or if the communication cable is laid parallel to a power line.
○	—	—	⊙	Communication timeout	● Confirm that the communication speed is set the same as the master setting.
NS repeats to light in green and flash in green. Or, NS repeats to flash in red and green.				Communication error	● Confirm that the controller is registered in the scan list on the master. ● Confirm that the I/O area is not duplicated with another slave. ● Confirm that the I/O area is not exceeded over the master unit allowable area (for fixed assignment).

● For CC-Link ○: Lighting ●: Off ⊙: Flashing

STATUS 1	STATUS 0	Status
○	○	This status does not exist
○	●	- Error occurred (CRC error, station number setting error or communication speed setting error) - From the power being on or software reset to the completion of CC-Link initializing
●	○	Data exchanged in normal condition
●	●	Short in power supply system, broken remote station power supply or short of communication cable
⊙	○	This status does not exist
⊙	●	Setting of station number or communication speed is changed during a communication

● For PROFIBUS

LED	Color	Display condition	Description (meaning of indication)
STATUS 1	GN	Lighting	On the fieldbus line and communication in normal condition
		Flashing	Off the fieldbus line
	OR	Flashing	Communication error occurred
STATUS 0	GN	Lighting	In normal operation
		Flashing	Preparing the operation
	OR	Lighting	Error is detected in communication related hardware while preparing the operation.

Troubleshooting

The following alarm displays are frequently generated at the start-up operation. Take the measure referring to the following description. When any of the other alarms is output, refer to the operation manual.

Status display	Status contents	Cause and Remedy
E r 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. - Check the emergency stop circuit.
o P G	Safety gate remains open.	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.) - It is generated when the standard personal computer cable or the teaching pendant is connected to the XSEL-KT, KET or KETX controller. Use the personal application software (IX-101-XA-MW) r the teaching pendant (SEL-TD) applicable to the XSEL-KT, KET and KETX controller.
d S F	Deadman switch OFF	It is not an alarm. - It is generated when the AUTO/MANU switch has been set to "MANU" and the personal computer or the 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.
A C F	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 100VAC is supplied to the controller with 200VAC specified. Check the power supply.
E C A 1	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.
E d 1 2	Encoder Disconnection Error	It is generated when the cable is broken or the encoder cable is not connected to the controller. Check the wiring.
E d 1 9	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.
E E 6 9 E E 6 C	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 the standard or extended I/O board to "0".
E d S □	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 to "0".



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