YAMAHA
Revs Your Heart

New Product Information

Made it possible to balance

Safety × Maintaining productivity

Dedicated for RCX340

RCX3-SMU

Speed Monitoring Unit

Target robots

Compatible with standard robots with 3 or more axes that can be connected to RCX340!

SCARA robot YK-X series / Cartesian robot XY-X series / Pick & place robot YP-X series, etc.

Dedicated for RCX340

RCX3-SMU

Speed Monitoring Unit

Made it possi

Safety × Mainta

"Safety function"

Growing importance

In recent years, safety awareness has been on the rise, particularly in Europe, and ensuring safety has become an increasingly important perspective.
The RCX3-SMU is the first Yamaha robot-related product that has acquired the functional safety certification*.
Yamaha Robot Controller "RCX340" can be connected to the dedicated optional unit "RCX3-SMU" to support functional safety.

*Plans to obtain safety function certification in 2024

List of safety functions

Functions	Descriptions
STO	Shuts off the main power supply of the controller and shifts to a safety status
SS1-r/t	Monitors the deceleration stop of the robot, and executes <SF001>STO if it deviates from the deceleration conditions specified by the parameter.
Speed monitoring (SLS)	Monitors whether the robot speed deviates from the value specified by the parameter, and executes <SF002>SS1-r/t if it deviates.
Area monitoring (SLP)	Monitors whether the robot position deviates from the range specified by the parameter, and executes <SF002>SS1-r/t if it deviates.
PBX-E Emergency stop Switch	Monitors whether the emergency stop switch on the programming box is pressed, and executes <SF002>SS1-r/t if it is pressed.
PBX-E Enable Switch	Monitors whether the enable switch on the programming box is at the center position during the manual mode, and executes <SF002>SS1-r/t if it is not.
Safety input (Emergency stop)	Monitors the input of emergency stop contact from an external device, and executes <SF002>SS1-r/t when the contact is open.
Safety input (Mode selection)	Monitors the status of the Auto mode signal and Manual mode signal from an external device. If the status is changed, <SF002>SS1-r/t will be executed to change the operation mode.
Safety input (Manual mode Protective stop)	Monitors whether the contact of an external device is closed during manual mode, and executes <SF002>SS1-r/t if it turns open.
Safety input (Auto mode Protective stop)	Monitors whether the contact of an external device is closed during automatic mode, and executes <SF002>SS1-r/t if it turns open.
Safety input (Auto mode Speed monitoring)	Monitors whether the contact of an external device is closed during automatic mode, and if it turns open, enables <SF003> Speed Monitoring even in automatic mode.
Safety input (Area monitoring)	Monitors whether the contact of an external device is closed, and if it turns open, enables <SF004> Area Monitoring.
Safety output	Selects and outputs the status of RCX3-SMU among emergency stop status/safety status/operable status/automatic mode status.

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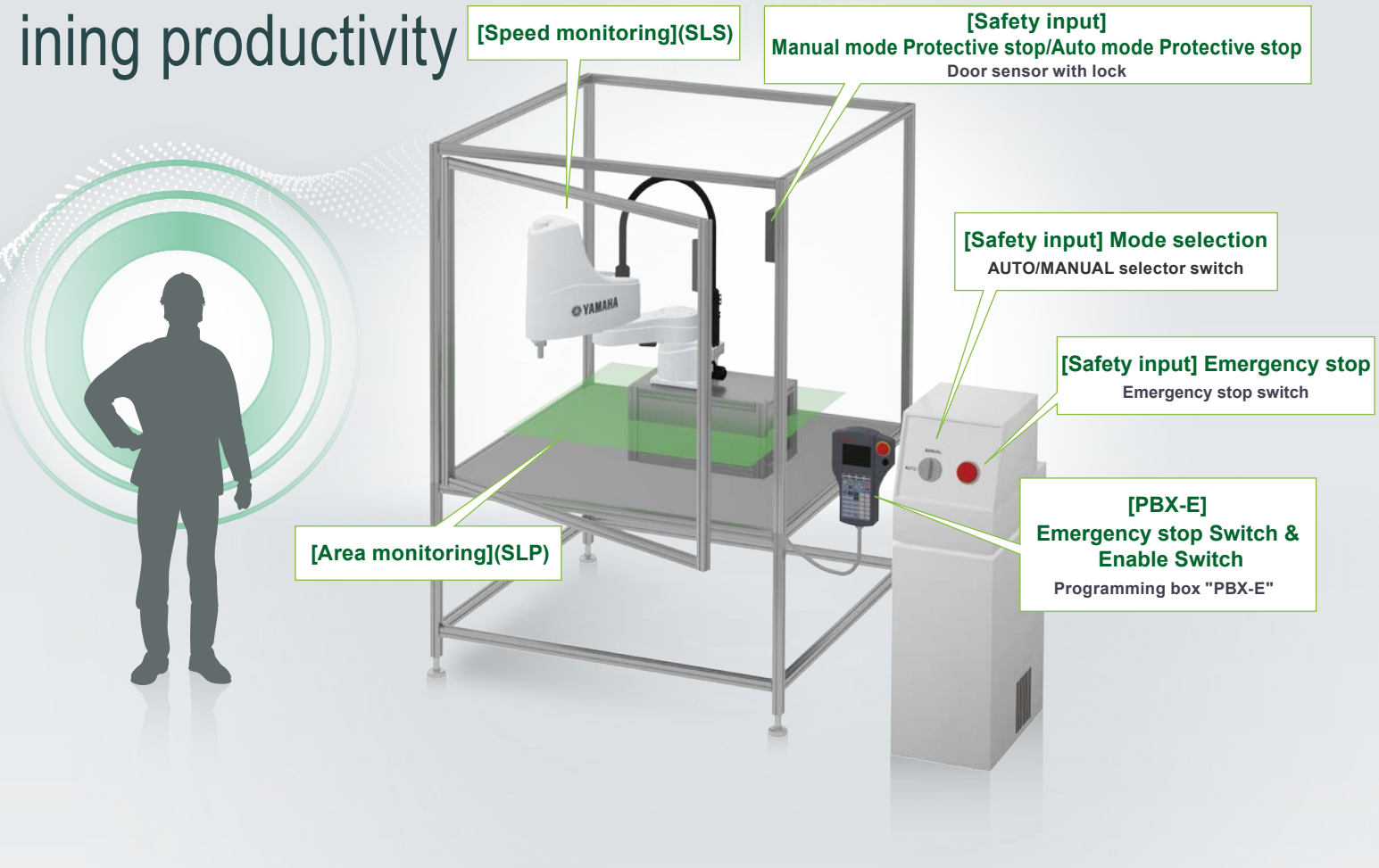


Compatible standards*

- Safety Standards for Industrial Robots ISO10218-1:2011
- Standards for Functional Safety of Machinery IEC 62061:2021
- Functional Safety Standards EN ISO 13849-1:2015

*Plans to obtain safety function certification in 2024

NEW

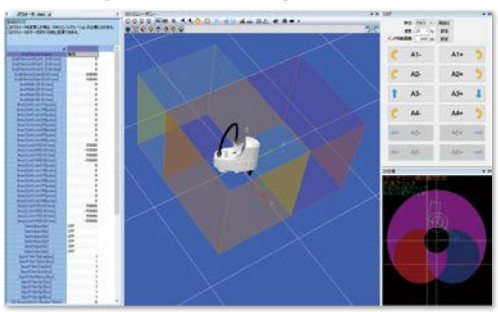
Protective stop

Unlike an emergency stop, which stops the entire device, a protective stop allows you to stop only a single robot. This makes equipment recovery easier and leads to improved production efficiency.

Easy setup with support software

All settings for RCX3-SMU can be set up using the support software "RCX-Studio 2020".
Parameter adjustment, settings, and backup of the RCX3-SMU can be performed intuitively within one application.

Setting the monitoring area



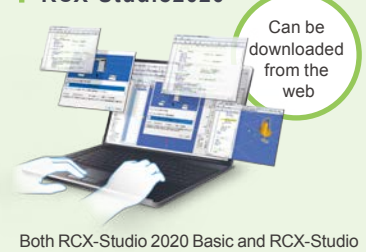
- The monitoring area can be confirmed on the 3D simulator.
- You can adjust the area while checking the robot's installation layout and operation.
- Adjustments can be made offline without the robot and SMU.

*The above image is under development and subject to change.
*When setting up the SMU, please use an Ethernet cable as the communication cable between the PC and the controller.

Parameter settings for safety functions

SMU parameters can be set from the SMU configurator.

Support software RCX-Studio2020



Both RCX-Studio 2020 Basic and RCX-Studio 2020 Pro software can be downloaded from the website.

*A dedicated USB key is required to use the functions of RCX-Studio2020 without restrictions.
*Compatible with RCX-Studio2020 Ver.3.3.0 or later

Use Case

Use case

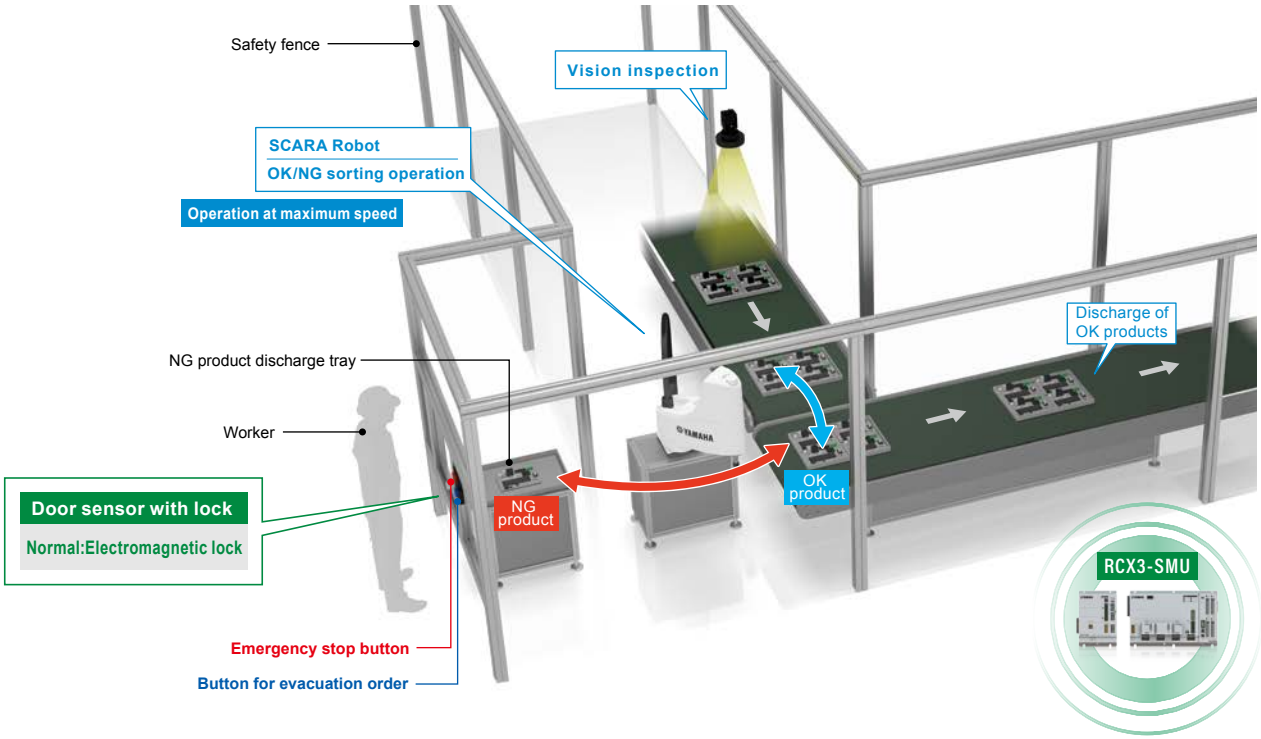
Ensuring worker safety when taking out NG products

RCX3-SMU
During Automatic mode

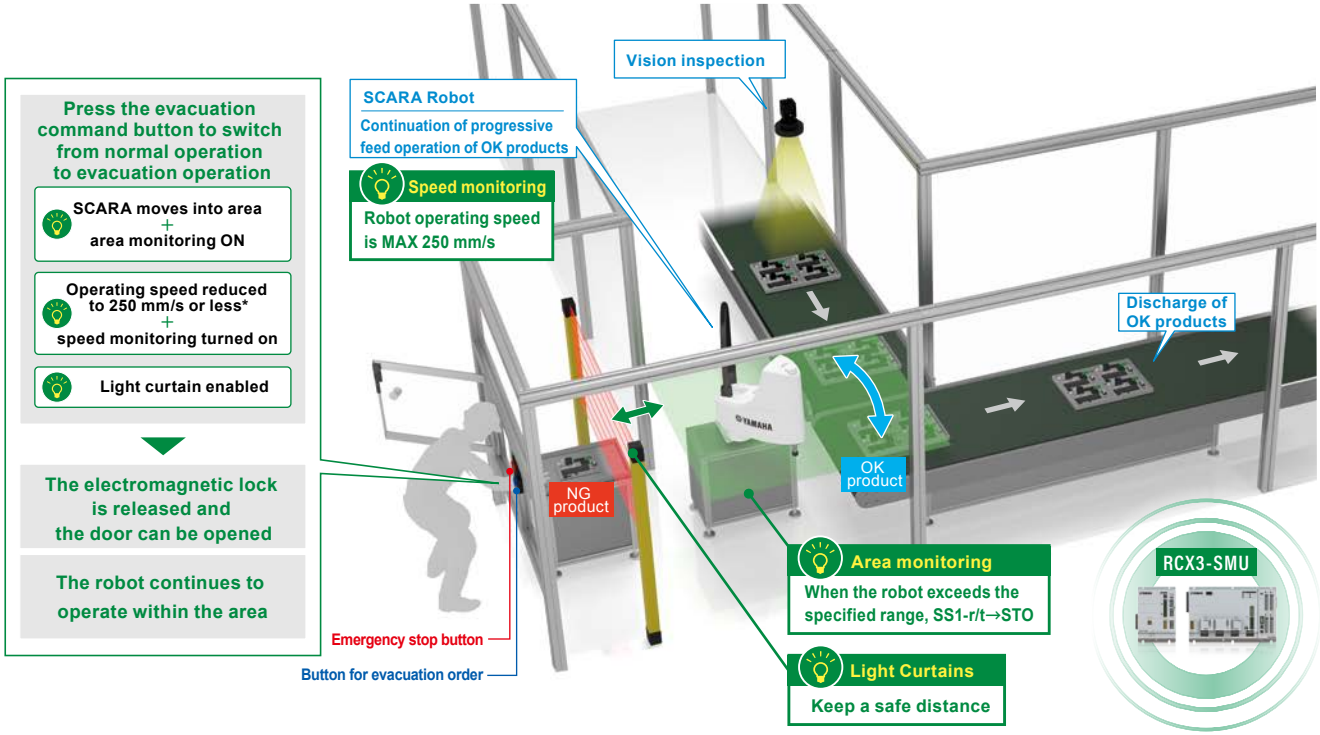
Board inspection process
If an NG product is produced, a worker must reach in and take it out.

It is the customer's responsibility to implement appropriate safety measures for equipment that uses robots.
Simply installing the RCX3-SMU will not prevent damage to people or equipment.
Please perform risk assessment and countermeasures.

■ Sorting of inspection OK/NG products by SCARA robot during normal operation



■ NG product removal work by the worker



* The evacuation operation and electromagnetic lock release require programming in the host device and RCX340.

Specifications

Basic specifications

Item		RCX3-SMU
Basic specifications	Name	RCX3-SMU
	Type	Speed Monitoring Unit
	Supported Controller	RCX340-S *YC-Link/E not supported
	Target robots	Standard robot with 3 or more axes that can be connected to RCX340 (Some multi-robots are not compatible. Please contact YAMAHA sales for details.)
	Max. number of monitored axes	4 axes
	Max.number of monitored robots	1 robot
	Dimensions (W x H x D mm)	155 × 195 × 130
	Main unit weight	2.6 kg
	Cooling method	Forced air cooling
	Power supply	INPUT Single-phase 200-230 V±10%, 50/60 Hz, Min. 0.3 A, Max. 12.7 A OUTPUT Single-phase 200-230 V±10%, 50/60 Hz, Max. 12.5 A
Input/Output Interface	Indicators	STATUS/ALARM/BEAT
	Power supply for safety I/O	Input COMMON × 1 Output COMMON × 1
	Safety Input	Emergency stop/automatic mode/manual mode/general purpose x 4
	Safety Output	General purpose x 2
Built-in	Safety circuit	Main power switch circuit
	Noise filter	Built-in noise filter
	Surge absorber	Built-in surge absorber

Safety functions PLd, Cat. 3 (ISO13849-1) Compliant with SIL2 (EN62061)

Safety functions	RCX3-SMU	
STO	PFHd [×10-9]: 88 DCavg [%]: 94.7	MTTFd [Year]: 1304 SFF [%]: 97.4
SS1	PFHd [×10-9]: 175 DCavg [%]: 93.7	MTTFd [Year]: 652 SFF [%]: 96.9
Speed monitoring	PFHd [×10-9]: 175 DCavg [%]: 93.7	MTTFd [Year]: 652 SFF [%]: 96.9
Area monitoring	PFHd [×10-9]: 175 DCavg [%]: 93.7	MTTFd [Year]: 652 SFF [%]: 96.9
PBX-E emergency stop switch	PFHd [×10-9]: 174 DCavg [%]: 93.7	MTTFd [Year]: 656 SFF [%]: 97.0
PBX-E enable switch	PFHd [×10-9]: 174 DCavg [%]: 93.7	MTTFd [Year]: 656 SFF [%]: 97.0
Safety input (emergency stop)	PFHd [×10-9]: 175 DCavg [%]: 93.7	MTTFd [Year]: 653 SFF [%]: 96.9
Safety input (mode selection) (manua mode)	PFHd [×10-9]: 175 DCavg [%]: 93.7	MTTFd [Year]: 653 SFF [%]: 96.9
Safety input (mode selection) (auto mode)	PFHd [×10-9]: 174 DCavg [%]: 93.7	MTTFd [Year]: 656 SFF [%]: 96.9

Safety functions	RCX3-SMU	
Safety input (manual mode protective stop)	PFHd [×10-9]: 174 DCavg [%]: 93.7	MTTFd [Year]: 654 SFF [%]: 96.9
Safety input (auto mode protective stop)	PFHd [×10-9]: 174 DCavg [%]: 93.7	MTTFd [Year]: 654 SFF [%]: 96.9
Safety input (auto mode speed monitoring)	PFHd [×10-9]: 174 DCavg [%]: 93.7	MTTFd [Year]: 654 SFF [%]: 96.9
Safety input (area monitoring)	PFHd [×10-9]: 174 DCavg [%]: 93.7	MTTFd [Year]: 654 SFF [%]: 96.9
Safety output (emergency stop status)	PFHd [×10-9]: 65 DCavg [%]: 97.0	MTTFd [Year]: 1752 SFF [%]: 98.4
Safety output (safety status)	PFHd [×10-9]: 65 DCavg [%]: 97.0	MTTFd [Year]: 1752 SFF [%]: 98.4
Safety output (operable status)	PFHd [×10-9]: 65 DCavg [%]: 97.0	MTTFd [Year]: 1752 SFF [%]: 98.4
Safety output (auto mode status)	PFHd [×10-9]: 65 DCavg [%]: 97.0	MTTFd [Year]: 1752 SFF [%]: 98.4

*Plans to obtain safety function certification in 2024

Operating environment

Operating environment	RCX3-SMU
Ambient temperature/humidity	Operation: 0 to 40ºC, 35 to 85% RH (no condensation)
	Storage: -10 to 65ºC, 95% RH (no condensation)
Atmosphere	Indoors without direct sunlight. No corrosive or flammable gas, oil mist, dust, zinc acid gas, or radioactive exposure.
Vibration resistance	10-57 Hz in XYZ each direction, half amplitude 0.075 mm, 57-150 Hz, 9.8 m/s^2
Degrees of protection	IP20
Altitude	0 to 2000 m above sea level

Specifications

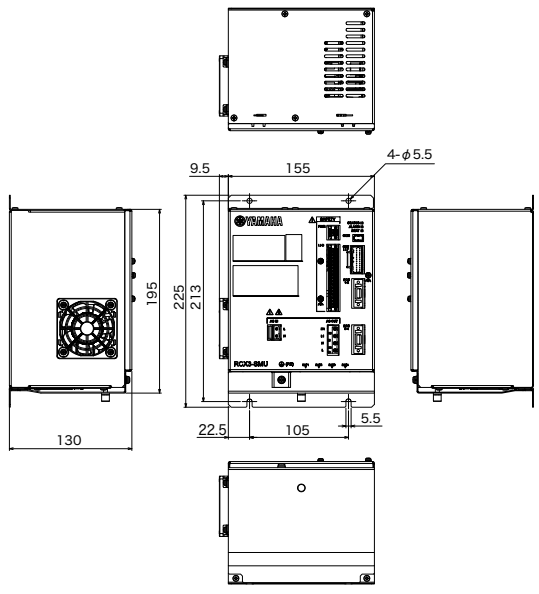
Applicable standards

Applicable standards	RCX3-SMU
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General requirements
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements
IEC 62061:2021	Safety of machinery - Functional safety of safety-related control systems
EN ISO 13849-1:2015	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN ISO 10218-1:2011	Robotics - Safety requirements - Part 1: Industrial robots
EN 61800-5-1:2007/A11:2021	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
EN 61800-5-2:2017	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional

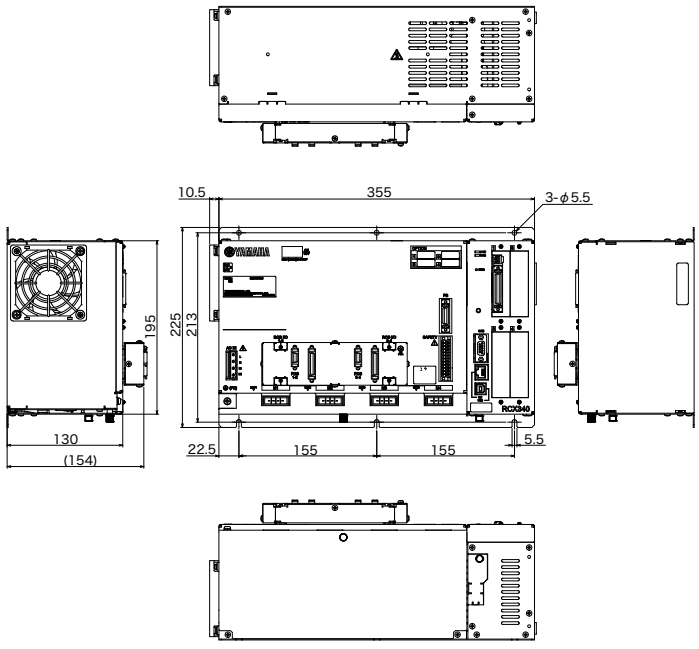
*Plans to obtain safety function certification in 2024

Dimensions

RCX3-SMU



RCX340-S



RCX340Controller: Select safety standard "S" to use RCX3-SMU.

RCX340 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

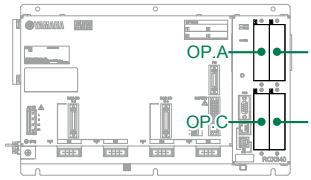
Controller	No. of controllable axes	Safety standards	Controller option A (OP.A)	Controller option B (OP.B)	Controller option C (OP.C)	Controller option D (OP.D)	Controller option E (OP.E)	Absolute battery
	4 : 4 axes	N: Normal	No entry: Non-selection	No entry: Non-selection	No entry: Non-selection	No entry: Non-selection	No entry: Non-selection	4 : 4 pcs.
	3 : 3 axes	E : CE	NS : STD.DIO(NPN) Note 2 Note 5	--- Note 4	--- Note 4	--- Note 4	WY: with RCXiVY2+, without lighting	3 : 3 pcs.
	2 : 2 axes Note 1	K : KCs	NE : EXP.DIO(NPN) Note 2 Note 5	NE : EXP.DIO(NPN) Note 3 Note 5	NE : EXP.DIO(NPN) Note 3 Note 5	NE : EXP.DIO(NPN) Note 3 Note 5	WL: with RCXiVY2+, with lighting	2 : 2 pcs.
		S : SMU compatible	PS : STD.DIO(PNP) Note 2 Note 5	--- Note 4	--- Note 4	--- Note 4		1 : 1 pc.
			PE : EXP.DIO(PNP) Note 3 Note 5	PE : EXP.DIO(PNP) Note 3 Note 5	PE : EXP.DIO(PNP) Note 3 Note 5	PE : EXP.DIO(PNP) Note 3 Note 5		0 : 0 pc.
			GR : Gripper	GR : Gripper	GR : Gripper	GR : Gripper		
			TR : Tracking Note 6	TR : Tracking Note 6	TR : Tracking Note 6	TR : Tracking Note 6		
			YM1 : YC-Link/E master Note 7	YM1 : YC-Link/E master Note 7	YM1 : YC-Link/E master Note 7	YM1 : YC-Link/E master Note 7		
			YS2 to 4: YC-Link/E slave Note 7	YS2 to 4: YC-Link/E slave Note 7	YS2 to 4: YC-Link/E slave Note 7	YS2 to 4: YC-Link/E slave Note 7		
			EP : Ethernet/IP™ Note 7	EP : Ethernet/IP™ Note 8	EP : Ethernet/IP™ Note 8	EP : Ethernet/IP™ Note 8		
			PB : PROFIBUS Note 8	PB : PROFIBUS Note 8	PB : PROFIBUS Note 8	PB : PROFIBUS Note 8		
			CC : CC-Link Note 8	CC : CC-Link Note 8	CC : CC-Link Note 8	CC : CC-Link Note 8		
			DN : DeviceNet™ Note 8	DN : DeviceNet™ Note 8	DN : DeviceNet™ Note 8	DN : DeviceNet™ Note 8		
			PT : PROFINET Note 8	PT : PROFINET Note 8	PT : PROFINET Note 8	PT : PROFINET Note 8		
			ES : EtherCAT Note 8	ES : EtherCAT Note 8	ES : EtherCAT Note 8	ES : EtherCAT Note 8		

Note. The image is of the RCX340-S (SMU compatible) specification.

Please select desired selection items from the upper portion of the controller option A in order.

Note 1. Safety standard "S" cannot be selected for 2 axes.
Note 2. [STD.DIO] Parallel I/O board standard specifications
Dedicated input 8 points, dedicated output 9 points, general-purpose input 16 points, general-purpose output 8 points
Do not mix with field bus (CC/DN/PB/EP/PT/ES).
Note 3. [EXP.DIO] Parallel I/O board expansion specifications
General-purpose input 24 points, general-purpose output 16 points
Note 4. Only one DIO STD specification board can be selected.
Therefore, this board cannot be selected in OP.B to OP.D.
Note 5. Select either NPN or PNP in DIO.
Note 6. Only one tracking board can be selected.
Note 7. Select only one master or slave board for YC-Link/E.
For details, refer to "YC-Link/E ordering explanation" below.
Additionally, when ordering YC-Link/E, please specify what robot is connected to what number controller.
Note 8. Select only one fieldbus in a controller (CC/DN/PB/EP/PT/ES).

●Controller option board position



RCX3-SMU main unit: This is the main unit of the speed monitoring unit.

Name	Model
RCX3-SMU	KNH-M4100-00

Standard accessories

Name	Model	Quantity
Power connector	KNH-M4421-00	1
Wiring lever	KNH-M657M-00	1

Name	Model	Quantity
SAFETY PWR connector	KNH-M4422-00	1

Name	Model	Quantity
SAFETY I/O connector	KNH-M4423-00	1

Name	Model	Quantity
Absolute battery	KCA-M53G0-02	4

Optional parts: The following four types of cables are required to use RCX3-SMU. Select the cable you need below.

Power cable that connects RCX3-SMU to RCX340

Name	Model	Cable length
AC POWER cable	KNH-M53E0-00	0.5m
	KNH-M53E0-10	1m
	KNH-M53E0-20	2m

Communication cable between RCX3-SMU and RCX340.

Name	Model	Cable length
COM cable	KNH-M538F-00	0.5m
	KNH-M538F-10	1m
	KNH-M538F-20	2m

Safety input/output cable between RCX3-SMU and RCX340.

Name	Model	Cable length
CNT I/F cable	KNH-M5370-00	0.5m
	KNH-M5370-10	1m
	KNH-M5370-20	2m

Cable for each resolver for 1st-2nd axis/3rd-4th axis between RCX3-SMU and RCX340.

Name	Model	Cable length	Label
ROBO I/O cable	KNH-M5361-00	0.5m	Yellow For 1st-2nd axis
	KNH-M5361-10	1m	
	KNH-M5361-20	2m	
	KNH-M5361-40	0.5m	Silver For 3rd-4th axis
	KNH-M5361-50	1m	
	KNH-M5361-60	2m	

Safety Precautions

Read the instruction manual thoroughly to operate the robot in a correct manner.

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