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201501-AE

YAMAHA
Revs Your Heart

New product information

YAMAHA'S Next-Generation SCARA Robot: The YK-TW Orbit Type

NEW YK350TW YK500TW

The new YK350TW is more compact

Resolves the shortcomings of previous SCARA and parallel-link robots

Offers both superior positioning accuracy and high speed

A ceiling-mount configuration allows 360 ° arm rotation

A smaller equipment footprint, with no dead space at the center of the motion range

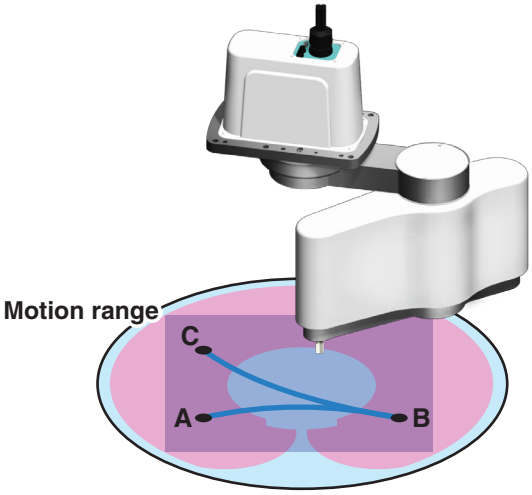
This next-generation YK-TW Series SCARA robot effectively resolves the shortcomings of previous SCARA and parallel-link robots

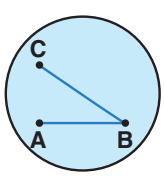
Layout design freedom

User: We want a smaller equipment footprint.

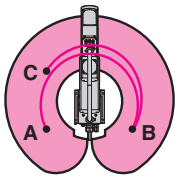
The YK-TW can move anywhere through the full ϕ 1000 mm[*2] downward range.

Featuring a ceiling-mount configuration with a wide arm rotation angle, the YK-TW can access any point within the full ϕ 1000 mm downward range. This eliminates all motion-related restrictions with regard to pallet and conveyor placement operations, while dramatically reducing the equipment footprint.





Orbit type SCARA robot



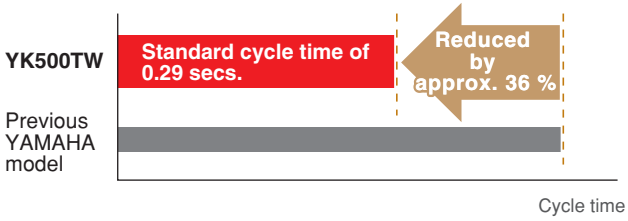
Standard type SCARA robot

Higher productivity

User: We need to reduce our tact times.

The YK-TW offers a standard cycle time of 0.29 secs.[*2]

The Y-axis (arm 2) passes beneath the X-axis (arm 1) and it has a horizontal articulated structure, allowing it to move along the optimal path between points. Moreover, the optimized weight balance of the internal components reduces the cycle time by 36 % as compared to previous models.



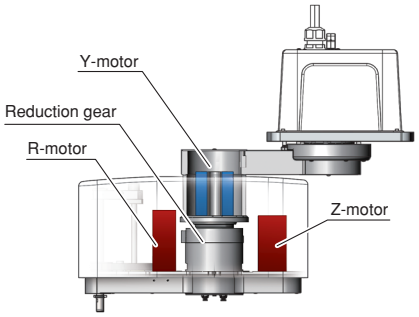
The standard cycle time for moving a 1-kg load horizontally 300 mm and up/down 25 mm is shortened by approx. 36 % compared to previous YAMAHA models.

Higher quality

User: We want a higher quality assembly system.

The YK-TW offers a repeated positioning accuracy of ±0.01 mm[*1] (XY axes).

This is a much higher repeated positioning accuracy than that offered by a parallel-link robot. This was accomplished by optimizing the robot's weight balance through an extensive re-design of its internal construction. The lightweight yet highly rigid arm has also been fitted with optimally tuned motors to enable high accuracy positioning.



Hollow construction

The Y-motor and reduction gear feature a hollow construction which allows them to be housed inside the harness arm.

360 ° rotation is possible.

Optimized rotation center of gravity moment

The weight balance was optimized by placing the R-motor and Z-motor at the left and right sides respectively.

Reduced inertia enables high-speed motion.

Suitable for a wide range of applications

User: We need to move heavy workpieces at high speeds.

The YK-TW can handle workpieces weighing up to 5 kg[*1].

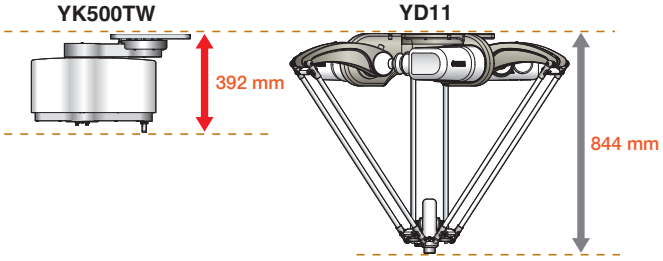
Handles loads up to 5 kg. Also accommodates arm-end tools which tend to be heavy, making it highly adaptable to various applications.

Smaller equipment footprint

User: We want to reduce the height of our equipment.

The YK-TW offers both a low height and a small footprint.

The YK-TW height is only 392 mm. This compact size enables more freedom in the equipment layout design.

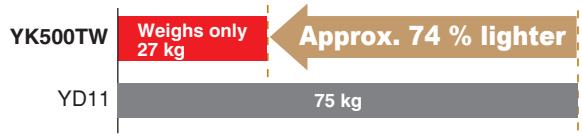


*1. Applies to the YK350TW *2. Applies to the YK500TW

Easy installation

User: Parallel-link robots require large frames which complicate installation...

The YK-TW has a total height of only 392 mm, and weighs only 27 kg[*2].
Due to its low inertia, a sturdy frame is not required.



An optional dedicated installation frame is available for the YK-TW.
For details, contact a YAMAHA sales representative.

Environment resistant

User: Operating our equipment in stringent environments is worrisome...

The YK-TW features the same type of resolver as those used in hybrid automobiles and aircraft.

This resolver is a magnetic position sensor. It features a simple construction with no electronic or optical parts, making it far less susceptible to failure than conventional optical encoders. It is this superior environment resistance and low failure rate that makes it reliable enough for use in many fields such as hybrid automobiles and aircraft, etc., where reliability is essential.

Ordering method

YK350TW / YK500TW - **130** - [ ] - [ ] - [ ]

Model	Z axis stroke	Tool flange	Hollow shaft	Cable
	130: 130mm	No entry: None F: With tool flange	No entry: None S: With hollow shaft	3L: 3.5m 5L: 5m 10L: 10m

RCX340-4 Note - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

Controller / Number of controllable axes	Safety standard	Option A (OP.A)	Option B (OP.B)	Option C (OP.C)	Option D (OP.D)	Option E (OP.E)	Absolute battery

RCX240 - [ ] - **R3** - [ ] - [ ] - [ ] - [ ] - **BB**

Controller	CE Marking	Regeneratizve unit	Expansion I/O	Network option	iVY System	Gripper	Battery

Note. RCX340 controller will be supported from March, 2015 or later.

RCX240 / RCX340 : Specify various controller setting items. ▶P.6,7

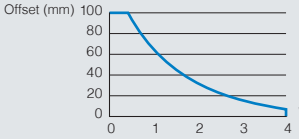
Specifications

				YK350TW	YK500TW
Axis specifications	X-axis	Arm length		175 mm	250 mm
	Y-axis	Rotation angle		+/- 225 °	
		Arm length		175 mm	250 mm
		Rotation angle		+/- 225 °	
	Z-axis	Stroke		130 mm	
	R-axis	Rotation angle		+/- 720 °	
AC servo motor output	X-axis / Y-axis / Z-axis / R-axis			750 W / 400 W / 200 W / 105 W	
Deceleration mechanism	X-axis / Y-axis / Z-axis / R-axis	Speed reducer		Harmonic drive / Harmonic drive / Ball screw / Belt speed reduction	
		Transmission method	Motor to speed reducer	Timing belt / Direct-coupled / Timing belt / Timing belt	
			Speed reducer to output	Direct-coupled / Direct-coupled / Direct-coupled / Timing belt	
Repeatability Note 1	XY axes			+/- 0.01 mm	+/- 0.015 mm
	Z-axis			+/- 0.01 mm	
	R-axis			+/- 0.01 °	
Maximum speed	XY axes synthesis			5.6 m/sec	6.8 m/sec
	Z-axis			1.5 m/sec	
	R-axis			3000 °/sec	
Maximum payload Note 2				5 kg	4 kg
Standard cycle time Note 3				0.32 sec (RCX340) / 0.38 sec (RCX240)	0.29 sec
R-axis tolerable moment of inertia Note 4		Rated		0.005 kgm²	
		Maximum		0.05 kgm²	
User wiring				0.15 sq × 8 wires	
User tubing (Outer diameter)				ϕ 6 × 2	ϕ 4 × 2
Travel limit				1.Soft limit 2.Mechanical stopper (X,Y,Z axis)	
Robot cable length				Standard: 3.5 m Option: 5 m,10 m	
Weight				26 kg	27 kg

Note 1. This is the value at a constant ambient temperature.
Note 2. Tool flange specifications (optional) apply to the YK350TW (4 kg) and the YK500TW (3 kg).
Note 3. When moving a 1 kg load back and forth 300 mm horizontally and 25 mm vertically (rough positioning arch motion).
Note 4. Limits must be placed on parameters such as acceleration according to the moment of inertia being used.

* The recommended positional relationships regarding the center of the load weight (center of gravity position) and the offset amount from the R-axis center are shown in the graph below.

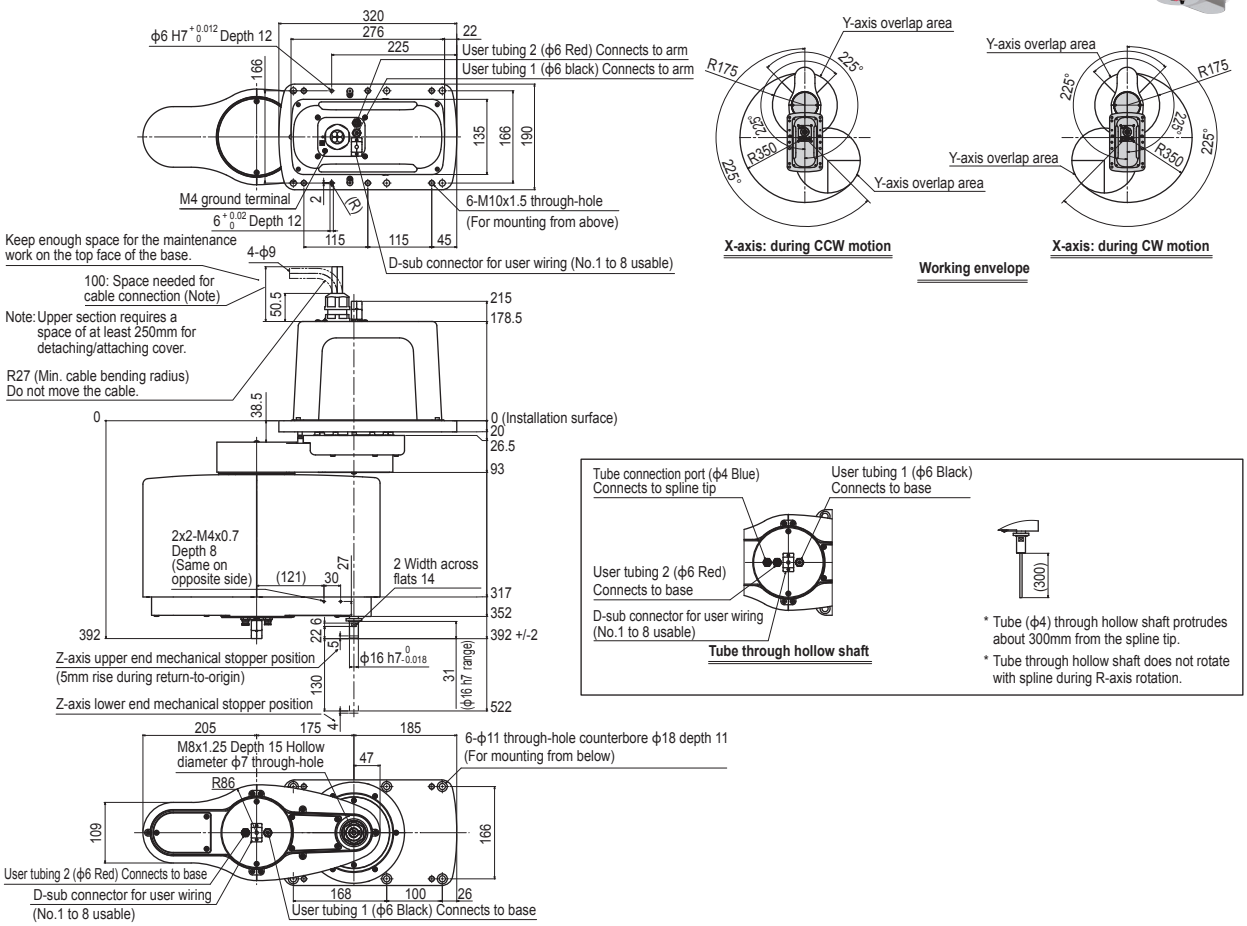
R-axis moment of inertia (load inertia)



* Applies only to the YK350TW.
When the payload exceeds 4kg, it is predicted that the R-axis moment of inertia may exceed the rated value. So, make proper parameter setting.

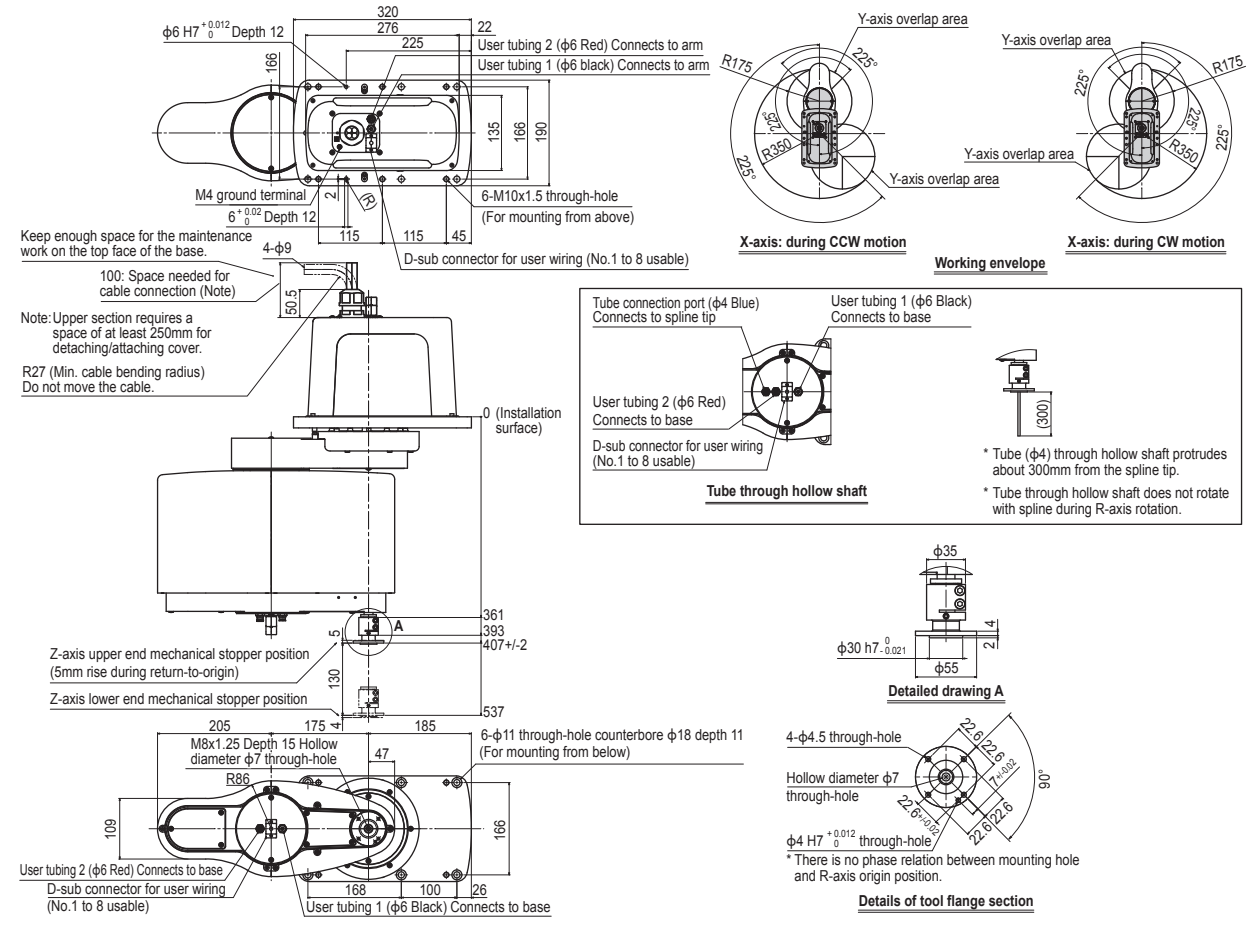
External view of YK350TW

Standard type



Working envelope

Tool flange mount type



Working envelope

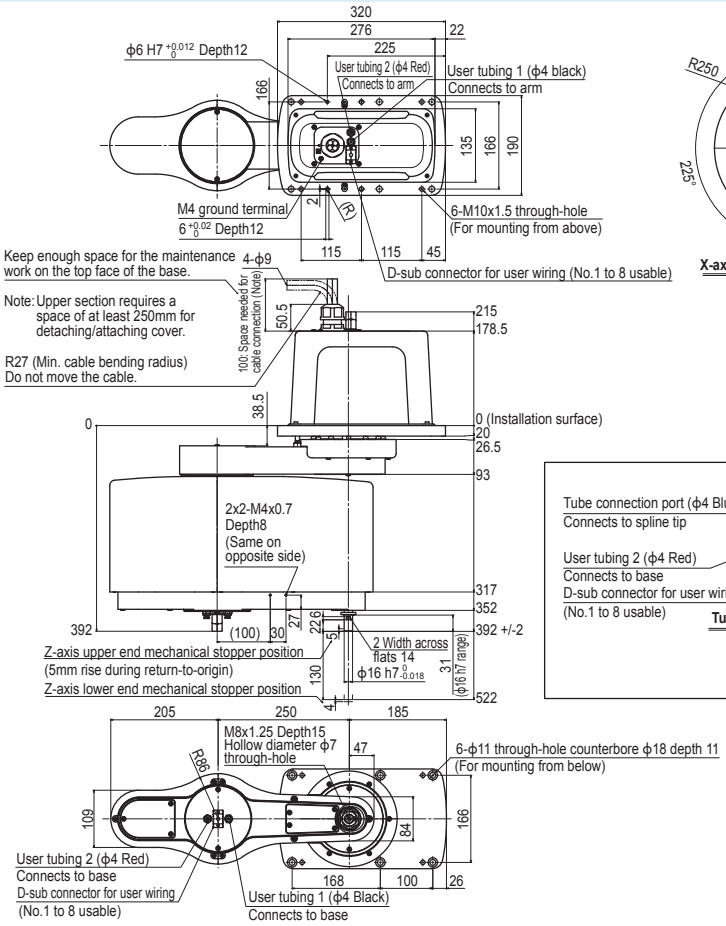
Detailed drawing A

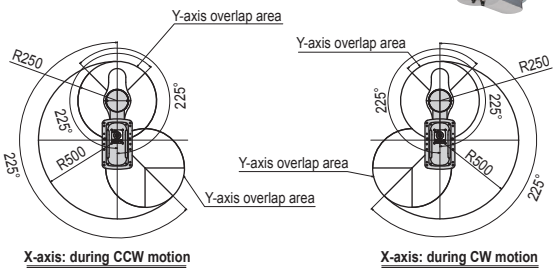
* There is no phase relation between mounting hole and R-axis origin position.

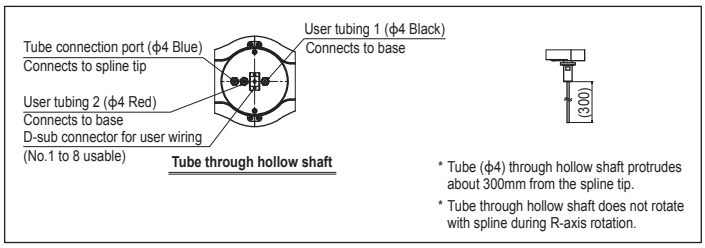
Details of tool flange section

External view of YK500TW

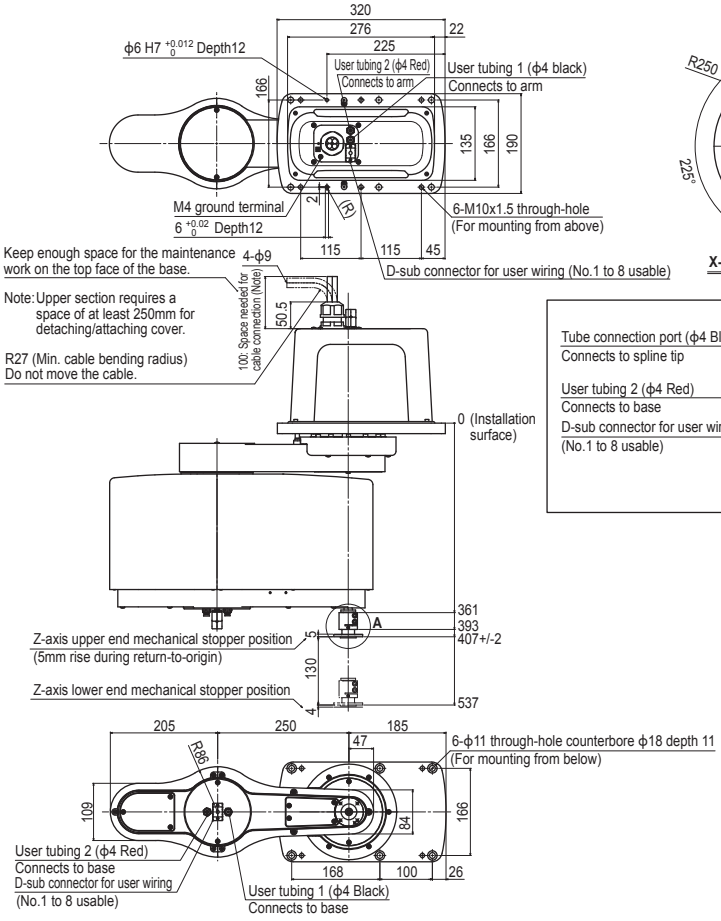
Standard type

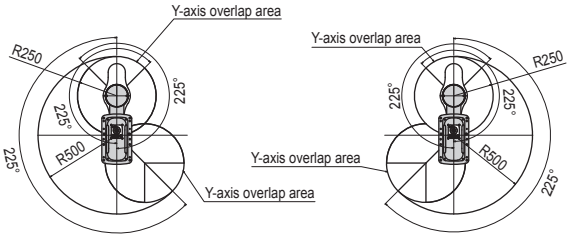


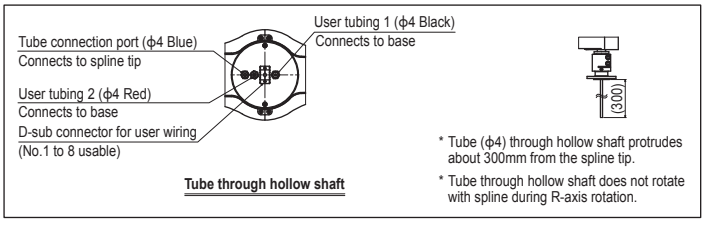


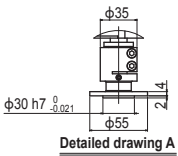


Tool flange mount type

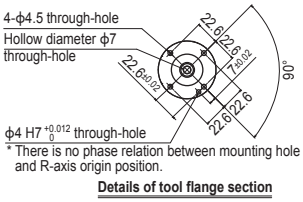








Detailed drawing A



* There is no phase relation between mounting hole and R-axis origin position.

Details of tool flange section

Controller ordering method

Controller	Usable for CE	Regenerative unit	Option I/O Note 1	Network Option	iVY System Option board	Gripper	Battery
RCX240		R3					BB
RCX240: Standard model	No entry: Standard	R3: RGU-3	N, P: Standard I/O 16/8	No entry: None	No entry: None	No entry: None	BB: 4pcs
	E: CE marking		N1, P1: 40/24 points	CC: CC-Link	VY: iVY (Vision)	GR: Gripper	
			N2, P2: 64/40 points	DN: DeviceNet	TR: iVY+Light+Tracking		
			N3, P3: 88/56 points	PB: Profibus	LC: iVY+Light		
			N4, P4: 112/72 points	EN: Ethernet			
				EP: EtherNet/IP			
				YC: YC-Link Note 2			

Note 1. Use N to N4 when NPN is selected on the I/O board, and P to P4 when PNP is selected.
Note 2. Available only for the master.
(The YC-Link system controls an SR1 series single-axis controller in accordance with communications received from an RCX series multi-axis controller. Using the YC-Link system allows control of up to 8 axes (or up to 6 axes with synchronous control)).

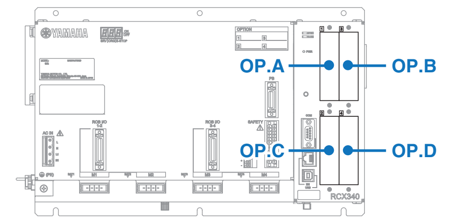
NEW

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
RCX340								
	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 1 Note 4	--- Note 3	--- Note 3	--- Note 3	VY : iVY without light Note 8	3 : 3 pcs.
	2 : 2 axes		NE : EXP.DIO(NPN) Note 2 Note 4	NE : EXP.DIO(NPN) Note 2 Note 4	NE : EXP.DIO(NPN) Note 2 Note 4	NE : EXP.DIO(NPN) Note 2 Note 4	LC: iVY with light Note 8	2 : 2 pcs.
			PS : STD.DIO(PNP) Note 1 Note 4	--- Note 3	--- Note 3	--- Note 3		1 : 1 pc.
			PE : EXP.DIO(PNP) Note 2 Note 4	PE : EXP.DIO(PNP) Note 2 Note 4	PE : EXP.DIO(PNP) Note 2 Note 4	PE : EXP.DIO(PNP) Note 2 Note 4		0 : 0 pc.
			GR : Gripper	GR : Gripper	GR : Gripper	GR : Gripper		
			TR : Tracking Note 5 Note 8	TR : Tracking Note 5 Note 8	TR : Tracking Note 5 Note 8	TR : Tracking Note 5 Note 8		
			YM1 : YC-Link/E master Note 6	YM1 : YC-Link/E master Note 6	YM1 : YC-Link/E master Note 6	YM1 : YC-Link/E master Note 6		
			YS2 to 4 : YC-Link/E slave Note 6	YS2 to 4 : YC-Link/E slave Note 6	YS2 to 4 : YC-Link/E slave Note 6	YS2 to 4 : YC-Link/E slave Note 6		
			EP : Ethernet/IP Note 7	EP : Ethernet/IP Note 7	EP : Ethernet/IP Note 7	EP : Ethernet/IP Note 7		
			PB : Profibus Note 7	PB : Profibus Note 7	PB : Profibus Note 7	PB : Profibus Note 7		
			CC : CC-Link Note 7	CC : CC-Link Note 7	CC : CC-Link Note 7	CC : CC-Link Note 7		
			DN : DeviceNet Note 7	DN : DeviceNet Note 7	DN : DeviceNet Note 7	DN : DeviceNet Note 7		

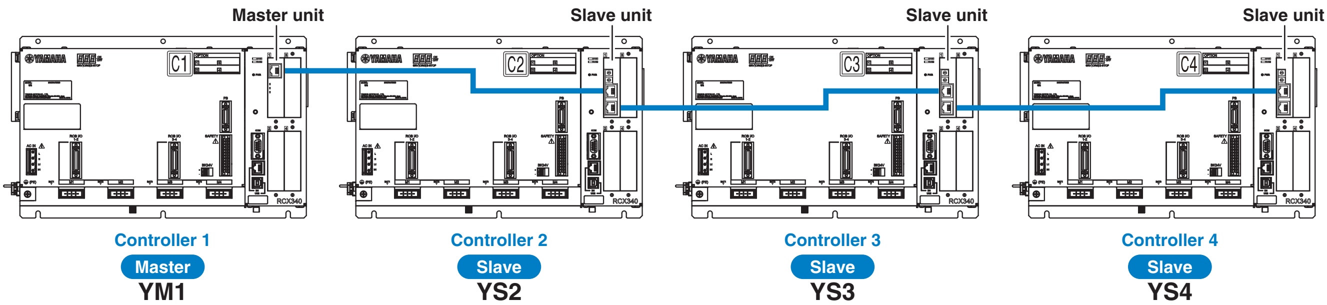
Please select desired selection items from the upper portion of the controller option A in order.

Note 1. [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).
Note 2. [EXP.DIO] Parallel I/O board expansion specifications
General-purpose input 24 points, general-purpose output 16 points
Note 3. Only one DIO STD specification board can be selected. Therefore, this board cannot be selected in OP.B to OP.D.
Note 4. Be careful not to mix NPN and PNP of DIO.
Note 5. Only one tracking board can be selected.
Note 6. Select only one master or slave board for YC-Link/E.
For details, see the "YC-Link/E ordering explanation" given below.
Additionally, when ordering YC-Link/E, please specify what robot is connected to what number controller.
Note 7. Be careful not to mix field buses (CC/DN/PB/EP).
Note 8. Tracking • iVY: For available timing, please consult YAMAHA.

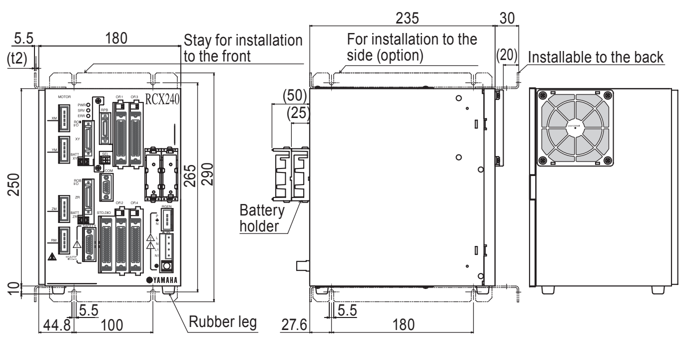
Controller options



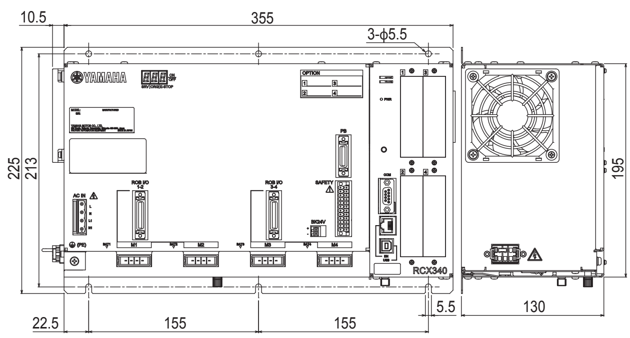
RCX340 YC-Link/E ordering explanation



External view of RCX240



External view of RCX340



Controller basic specifications

Item				RCX240	NEW RCX340 Note
Basic specifications	Connected motor capacity			1600 W or less (in total for 4 axes)	
	Power capacity			2500 VA	
	Dimensions			W 180 × H 250 × D 235mm (main unit only)	W 355 × H 195 × D 130mm (main unit only)
	Weight			6.5 kg (main unit only)	6.2 kg (main unit only)
	Power supply voltage			Single-phase 200 to 230 V AC +/-10 % maximum, 50/60 Hz	
Axis control	No. of controllable axes			The max. 4 axes (or 4 axes with simultaneous control)	The max. 4 axes (or 6 axes with simultaneous control) controller link allows an expansion to a max. of 16 axes (4 robots).
	Drive method			AC full digital servo	
	Position detection method			Resolver or magnetic linear scale	
	Control method			PTP motion (point to point), ARCH motion, linear interpolation, circular interpolation	
	Coordinate systems			Joint coordinates, Cartesian coordinates	
	Position display units			Pulses, mm, degree	
	Speed setting			1 to 100 % (1 % steps, This setting can be made even by programming.)	
	Acceleration/deceleration setting			Automatic acceleration setting by robot model and tip weight parameter Setting by acceleration coefficient and deceleration rate parameters (1 % steps) Can be changed by programming. Zone control (Only the SCARA robot can set an optimum speed corresponding to the arm position.)	
Program-ming	Program language			YAMAHA BASIC II conforming to JIS B8439 (SLIM language)	
	Multi-task			Max. 8 tasks	Max. 16 tasks
	Sequence program			1 program	
Memory	Memory capacity			364 KB (total capacity of program and points) (Available capacity for program when the maximum number of points is used: 84 KB)	2.1 MB (total of program and point data) (Available capacity for program when the maximum number of points is used: 300 KB)
	Program			100 programs (maximum number of programs) 9999 lines (maximum number of lines per program)	
	Point			10000 points (maximum number of points)	30000 points (maximum number of points)
	Point teaching method			MDI (coordinate data input), direct teaching, teaching playback, offline teaching (data input from external unit)	
	System backup (Internal memory backup)			Lithium battery (service life about 4 years at 0 to 40 °C)	
	Internal flash memory			512 KB (ALL data only)	–
External I/O	SAFETY		Input	Emergency stop input, Service mode input (NPN/PNP specification is set according to STD. DIO setting) ENABLE switch input (enabled only when RPB-E is in use)	Emergency stop ready input, 2 systems Auto mode input, 2 systems (Applies only CE specs.) ENABLE switch input (enabled only when PBX-E is in use)
			Output	MOTOR POWER READY output	Emergency stop contact output, 2 systems Enable contact output, 2 systems (enabled only when PBX-E is in use) Motor power ready output, 2 systems
	Brake output			Relay contact	Transistor output (PNP open collector)
	Origin sensor input			Connectable to 24 V DC B-contact (normally closed) sensor	
	External communications			RS-232C: 1CH (D-SUB 9-pin (female)) RS-422: 1CH (dedicated for programming box)	RS-232C: 1CH (D-SUB 9-pin (female)) Ethernet: 1CH (In conformity with IEEE802.3u/IEEE802.3) 100Mbps/10Mbps (100BASE-TX/10BASE-T) Applicable to Auto Negotiation USB: 1CH (B type) RS-422: 1CH (dedicated to PBX)
General specifications	Operating temperature			0 to 40 °C	
	Storage temperature			–10 to 65 °C	
	Operating humidity			35 to 85 % RH (no condensation)	
	Noise immunity			Conforms to IEC61000-4-4 Level 3	
	Protective structure			IP10	IP20
Options	Optional boards	Option slots		4 slots	
		Parallel I/O	Standard specifications	STD.DIO : Dedicated input 10 points, dedicated output 11 points General-purpose input 16 points, general-purpose output 8 points	Dedicated input 8 points, dedicated output 9 points General-purpose input 16 points, general-purpose output 8 points (max. 1 board, NPN/PNP specs. selection)
			Expansion specifications	24 points general-purpose inputs per board, 16 points general-purpose outputs per board (max. 4 boards, NPN/PNP specs. compatible)	
		Serial I/O	CC-Link	Remote I/O: Dedicated input/output: 16 points each General-purpose input/output: 96 points each Remote register: Input/output: 16 words each	
			DeviceNet™		
			PROFIBUS		
			EtherNet/IP™		
			Ethernet	Conforms to Ethernet (IEEE 802.3) 10Mbps (10BASE-T)	Standard equipment
		iVY		Camera input (2ch), camera trigger input, PC connection input	–
		Tracking		AB phase input, lighting trigger input, lighting power supply input/output	
		Lighting control		lighting trigger input, lighting power supply input/output	
		Gripper control		Number of controlled axes: 1 axis per board, max. 2 boards Position detection format: Optical rotor encoder Min. setting unit: 0.01 mm	Number of controlled axes: 1 axis per board, max. 4 boards Position detection format: Optical rotor encoder Min. setting unit: 0.01 mm
	Programming box			RPB, RPB-E	PBX, PBX-E
	Absolute battery			XY axes: 3.6 V, 5400 mAH (2700 mAH, 2 batteries)	3.6V 2750 mAH / axis Backup retention time: About 1 year
				ZR axes: 3.6 V, 5400 mAH (2700 mAH, 2 batteries)	
				Backup retention time: About 1 year	
	Regenerative unit			RGU-3	Internal (built in)
	Support software for personal computer			VIP+	RCX-Studio

Note. RCX340 controller will be supported from March, 2015 or later.