YK-X
Series

Product Lineup

YK-TW	Omni directional model
YK-XG/YK-X	Completely beltless model Note
YK-XR	Low cost high performance model
YK-XGS	Wall mount/inverse model
YK-XGP	Dust-proof & drip-proof model

Note. Excepting for YK1200X

SCARA ROBOTS

Arm length of 120 mm to 1200 mm, full-selection of lineup is top in the world. Completely beltless structure pursues the features of SCARA robots to their utmost limits.

NEW Low cost high performance model
YK400XR

History of 30 years

The first YAMAHA robots were SCARA robots. Since the first SCARA robot called "CAME" was produced in 1979, some 30 years of SCARA robot innovations have continually appeared. These SCARA robots have undergone countless modifications in an ever changing marketplace and amassed a hefty record of successful products making them an essential part of the YAMAHA robot lineup.

1979
<YK7000>

Comprehensive line of YAMAHA SCARA robots

Orbit type P.338

■ Arm length 500 mm
■ Maximum payload 4 kg

YK500TW

Extra small type P.342

■ Arm length 120 mm to 220 mm
■ Maximum payload 1 kg

YK120XG/YK150XG/YK180XG

YK180X/YK220X

Small type P.347

■ Arm length 250 mm to 400 mm
■ Maximum payload 5 kg

Low cost high performance model
YK400XR

YK400XR

YK250XG/YK350XG/YK400XG

Medium type P.354

■ Arm length 500 mm to 600 mm
■ Maximum payload 5 kg to 20 kg

YK500XGL

YK500XG

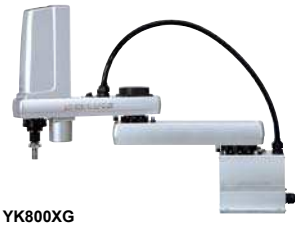
YK600XGL

YK600XG/XGH

Large type P.361

■ Arm length 700 mm to 1200 mm
■ Maximum payload 20 kg to 50 kg

YK700XG



YK800XG

YK900XG

YK1000XG

YK1200X

Wall mount/inverse model P.367

YK300XGS to YK1000XGS

Wall mount type

Inverse type

■ Wall mount type
Type where the robot body is installed in the wall.

■ Inverse type
Type where the wall-mount type is installed upside down.

Dust-proof & drip-proof model P.377

YK250XGP/YK350XGP/YK400XGP
YK500XGLP/YK600XGLP

YK500XGP to YK1000XGP

Plays active part in the working environment with a large amount of water or dust (protection class equivalent to IP65).

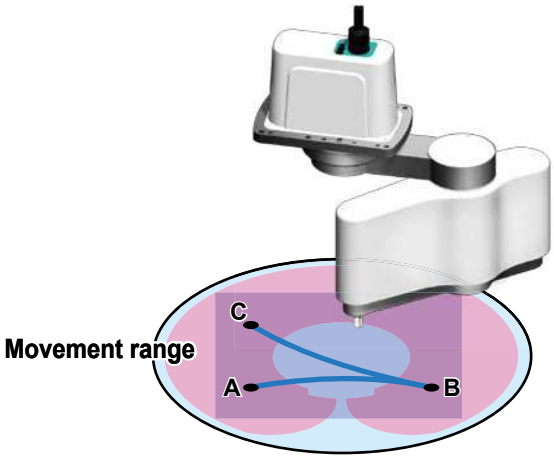
● Please consult YAMAHA for anti-droplet protection for fluids other than water.

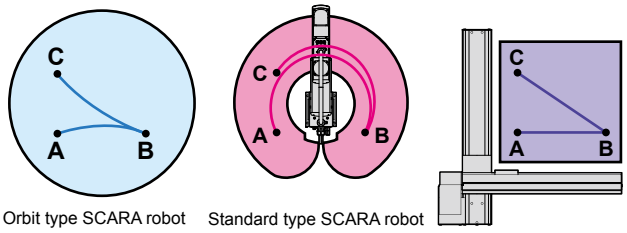
YK-TW Orbit type

YK-TW POINT 1

Accessible to 360 °-whole area under equipment

360 °-whole area under the equipment is covered by the hanging installation and wide arm turning angle. The plane working envelope is improved approx. 120 % when compared to YAMAHA's conventional model with an arm length of 500 mm. There is no dead space at the center of the working envelope. This ensures an operation range of ϕ 1,000 mm x 130 mm. As the working envelope is cylindrical, the pallet or conveyor installation direction is not restricted and the flexibility of the system design is improved.



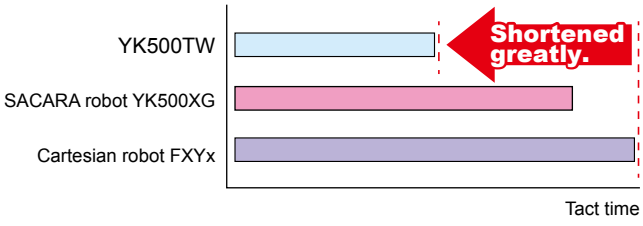


Orbit type SCARA robot YK500TW

Standard type SCARA robot YK500XG

Cartesian robot FXYx

Comparison of robot tact times



YK-TW POINT 2

Low overall height makes the equipment compact.

The overall height is as low as 392 mm. This can lower the center of gravity of the overall equipment. Therefore, the equipment can be downsized without needing any rigid frame. As the production equipment is made compact, this shortens a period of time necessary for the workpiece transfer.

YK-TW POINT 3

Tact is shortened by high-speed movement.

Use of a horizontal articulated structure, in which the Y-axis (2nd arm) can pass under the X-axis (1st arm) makes it possible to move between the points through the optimum route at a high speed. This greatly contributes to shortening of the tact time in the light load transfer process, such as electrical or food industry.

Standard cycle time is 0.29 sec.

When performing a reciprocation operation with a load of 1 kg, a horizontal movement of 300 mm, and a vertical movement of 25 mm, the standard cycle time is shortened about 36 % when compared to YAMAHA's conventional model.

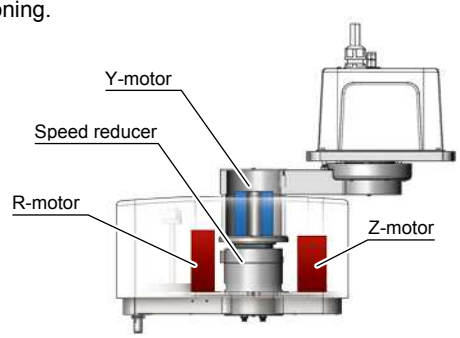
YK-TW POINT 4

High speed and highly accurate positioning by high mechanical rigidity

Repeated positioning accuracy +/- 0.015 mm

High accuracy and high load transferable by parallel link robot

The internal structure of the robot was reviewed strictly to optimize the weight balance. Additionally, a motor tuned optimally for the lightweight and highly rigid arm was incorporated to achieve the high speed and highly accurate positioning.



Hollow structure is used.

Y-motor and speed reducer have a hollow structure, the harnesses can be stored inside the arm.

360 ° Rotation

Heavy components are arranged at the center.

R-motor and Z-motor are arranged on the left and right, respectively to optimize the weight balance.

Inertia is reduced to make the high-speed operation possible

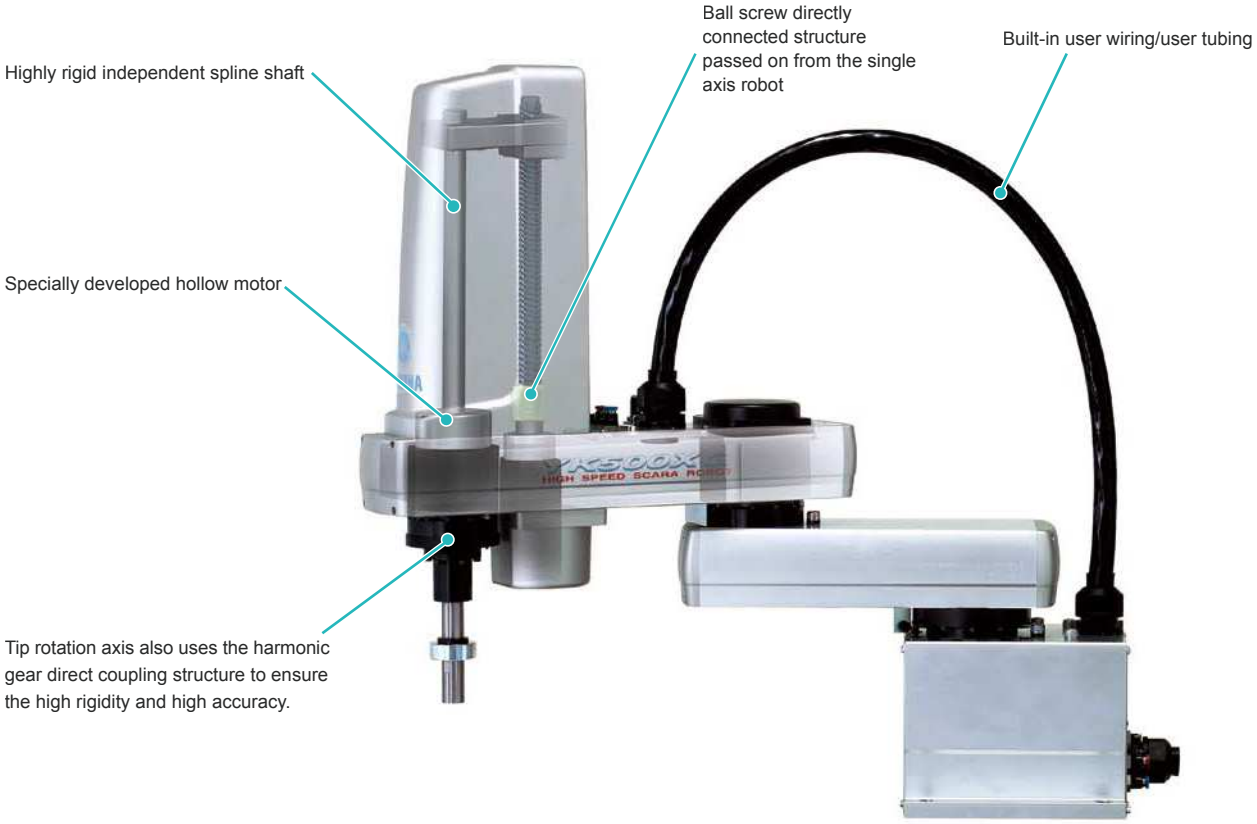
YK-TW POINT 5

Resolver is used for position detector.

Resolver is a magnetic position detector. The resolver features a simple structure without using electronic components and optical elements, and less potential failure factors when compared to general optical encoders. The resolver has high environment resistance and low failure ratio, and is used in a wide variety of fields aiming at reliability such as automobile or aircraft industry.

Integral structure designed for optimal operation

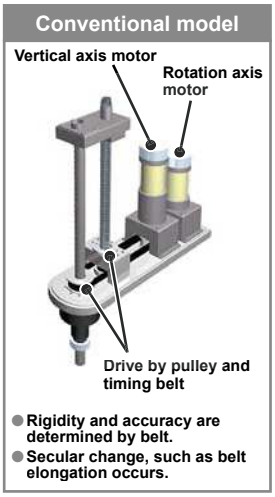
Note. The following shows an example of YK500XG.

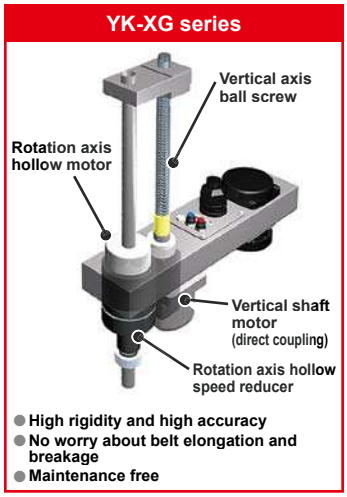


YK-XG POINT 1

Completely beltless structure

A completely beltless structure was achieved using a ZR-axis direct coupling structure. This completely beltless structure greatly reduces waste motion. This structure also maintains high accuracy for an extended period of time. Additionally, this structure ensures maintenance-free operation for an extended period of time without worrying about belt breakage, elongation, or secular deterioration (except for Orbit type and large type).

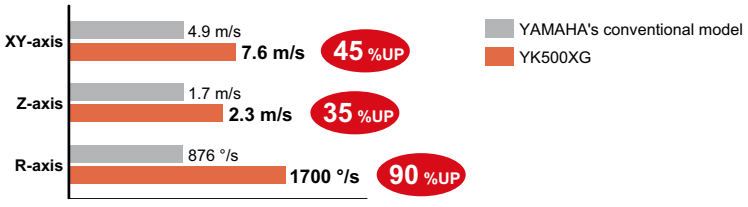




YK-XG POINT 2

High speed

The standard cycle time is fast. Additionally, YAMAHA also places special emphasis on the tact time in the practical working area. The speed reduction ratio or maximum motor RPM was reviewed to greatly improve the maximum speed. This contributes to improvement of the tact time.



YK-XG POINT 3

Resolver is used for position detector.

As the resolver uses a simple and rigid structure without using electronic components and optical elements, it features high environment resistance and low failure ratio. Detection problems due to electronic component breakdown, dew condensation on or oil sticking to the disk that may occur in optical encoders do not occur in the resolver due to its structure. Additionally, as the absolute specifications and incremental specifications use the same mechanical specifications and common controller, the specifications can be changed only by setting parameters. Furthermore, even when the absolute battery is consumed completely, the robot can still operate as the incremental specifications. So, even if a trouble occurs, the line stop is not needed to ensure the safe production line. The backup circuit has been completely renovated and now has a backup period of one year in the non-energizing state.

Note. The resolver has a simple structure without using electronic components. So, the resolver is highly resistant to low and high temperatures, impacts, electrical noise, dust particles, and oil, etc., and is used in automobiles, trains, and aircrafts that particularly require the reliability.

Optical encoder

- Optical type
- Electronic components are required and structure is complicated.
- Electronic component malfunction, or dew condensation on or oily content sticking to disk may occur easily.

Detection failure

Resolver

- Magnetic type
- Simple structure only with iron core and winding has less potential failure factors.
- Immune to shock and electric noise.

High reliability

YK-XG POINT 4

Excellent maintenance ability

The covers of YAMAHA SCARA robot YK-XG series can be removed forward or upward. The cover is separated from the cable, so the maintenance work is easy. Additionally, the grease replacement of the harmonic gear needs many steps to disassemble the gear and may cause positional deviation. However, since the harmonic gear of the YAMAHA SCARA robot uses long-life grease, the grease replacement is not needed.

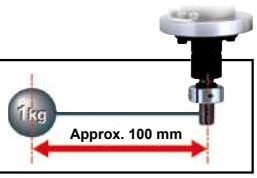
YK-XG POINT 5

Surprising R-axis tolerable moment of inertia

The SCARA robot performance cannot be expressed only by the standard cycle time. In actual operating environments, there are various workpieces, such as heavy workpiece or workpiece with large offset. At this time, since the robot with low R-axis tolerable moment of inertia needs to decrease the speed during operation, the cycle time decreases greatly. All YAMAHA SCARA robot YK-XG types have the tip rotation axis directly coupled to the speed reducer. Since the R-axis tolerable moment of inertia is very high when compared to a general structure in which the moment of inertia is transmitted by a belt after decelerating, the robot can operate at a high speed even with workpieces that have been offset.

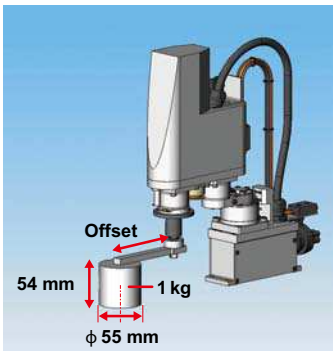
YK120XG
(R-axis tolerable moment of inertia: 0.1 kgfcm^2)

When the tip load weight is 1 kg,
it is possible to operate at **approx. 100 mm** offset.



R-axis tolerable moment of inertia: Comparison between YK120XG and other company's model

When the offset from the R-axis to the center of gravity of the load is large, the inertia becomes large and the acceleration during operation is restricted. The R-axis tolerable moment of inertia of YAMAHA XG series is exceedingly large when compared to other company's SCARA robots in the similar class, so it can operate at a high speed even in the offset state.



When the load weight is 1 kg (refer to the right in the figure,)

Offset (mm)	Inertia (kgfcms^2)	Operation	
		YK120XG	Company A
0	0.0039	○	○
45	0.025	○	×
97	0.1	○	×

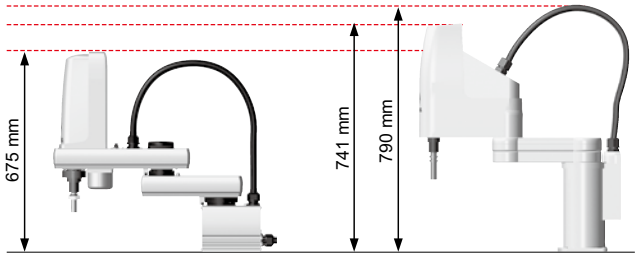
○: Operable ×: Out of catalog value tolerance range

◆ R-axis tolerable moment of inertia: YK120XG ..... 0.1 kgfcms^2
Company A ..... 0.0039 kgfcms^2

YK-XG POINT 6

Compact

As the cable layout is changed, the cable height becomes lower than the main body cover. Additionally, use of extruded material base and motor with low overall height achieves the lowest overall height in the same class.



YK500XG YAMAHA's conventional model

YK-XG POINT 7

Hollow shaft and tool flange options are selectable.

Hollow shaft that allows easy wiring to the tip tool and tool flange for tool mounting are provided as options.

Hollow shaft option convenient for routing of air tubes and harness wires

Note. YK250XG to YK400XG
YK500XGL/YK600XGL

Tool flange option for easy mounting of a tool to the tip

Note. YK250XG to YK1000XG

YK-XG POINT 8

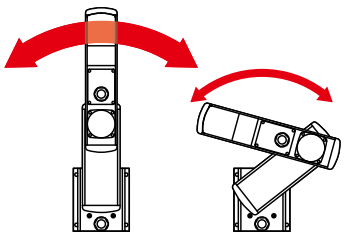
Zone control (= Optimal acceleration/deceleration automatic setting) function

In the SCARA robot, the load applied to the motor and speed reducer in the arm folded state greatly differs from that in the arm extended state. YAMAHA SCARA robot automatically selects optimal acceleration and deceleration from the arm postures at operation start and operation end. Therefore, the robot does not exceed the tolerance value of the motor peak torque or speed reducer allowable peak torque only by entering the initial payload. So, full power can be extracted from the motor whenever needed and high acceleration/deceleration are maintained.

For X-axis of YK500XG

The torque in the arm folded state is 5 or more times different from that in the arm extended state.

This may greatly affect the service life, vibration during operation, and controllability.

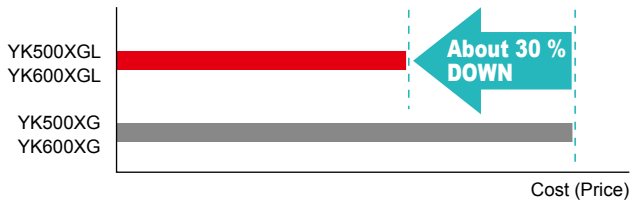


If the motor torque exceeds the peak value
→ **This may adversely affect the controllability and mechanical vibration, etc.**
If the torque exceeds the tolerable peak torque value of the speed reducer
→ **This may cause early breakage or shorten the service life extremely.**

YK-XG POINT 9

Low price models with the arm length 500 mm/600 mm specifications are also added to the product lineup.

The customers require to use SCARA robots at a more affordable price. Models YK500XGL/YK600XGL were developed to meet these customer's requests. About 30 %-cost reduction was achieved when compared to the conventional models YK500XG/600XG.



NEW

YK-XR Low cost high performance model YK400XR

YK-XR POINT 1

Shortest cycle time in this class

A standard cycle time of 0.45 sec. is achieved by drawing out the robot performance to its maximum level.

YK-XR POINT 2

Superior cost performance

Most economical price in YAMAHA's similar robot class without sacrificing its existing features.

YK-XR POINT 3

With versatile and high performance controller RCX340.

Combination of YK400XR robot and new RCX340 controller enable operation up to 16 axes with simple easy networking.

YK-XGS Wall mount/inverse model

Hanging type is renewed. Completely beltless structure and high rigidity

As the conventional hanging type is changed to the wall mount type, the flexibility of the system design is improved. The production equipment can be downsized. Additionally, as an inverse type that allows upward operation is also added to the product lineup, the flexibility of the working direction is widened. Furthermore, use of a completely beltless structure achieves a maximum payload of 20 kg and a R-axis tolerable moment of inertia of 1 kgm^2 Note that are the top in the class. A large hand can also be installed. So, this robot is suitable for heavy load work.

Note. YK700XGS to YK1000XGS

Inverse type

YK-XGP Dust-proof & drip-proof model

Up/down bellows structure improves the dust-proof and drip-proof performance.

The dust-proof and drip-proof type that can be operated even in a work environment where water or particle dust scatters was renewed to a completely beltless structure. The belt does not deteriorate and poor environment resistance is improved. Additionally, an up/down bellows structure is used to improve the dust-proof and drip-proof performance.

Note. YK250XGP to YK600XGLP

Protection class equivalent to IP65 (IEC60529)

Seals are added to the joints to maintain the dust-proof and drip-proof performance without air purging. The robot conforms to the protection class equivalent to IP65 (IEC60529).

IP 6 5

Class of protection against invasion of water: 5
Water injected from any direction does not affect adversely.
The standard pressure of the injected water is 30 KPa (30 KN/m^2, 0.3 kgf/cm).
The injection speed is 12.5 liters/min. and the injection time is 3 min.
Note. The water injected under conditions exceeding those shown above may enter the unit.

Class of protection against solid objects: 6
No invasion of particle dust.

Dust-proof and drip-proof connector for user wiring is provided as standard.

YK250XGP to 600XGLP (arm part)

YK250XGP to 600XGLP (base part)

Model/Type		Model	Arm length (mm)	Maximum payload (kg)	Standard cycle time (sec.)	Page
Omni directional model		NEW YK350TW	400	5.0	0.32 (RCX340) / 0.38 (RCX240)	P.338
		YK500TW	500	5.0 (RCX340) / 4.0 (RCX240) Note 3	0.29	P.340
Completely beltless model	Micro-mini type (Tiny)	YK120XG	120	1.0	0.33	P.342
		YK150XG	150			P.343
		YK180XG	180			P.344
		YK180X	180		0.39	P.345
		YK220X	220		0.42	P.346
	Small type	YK250XG	250	5.0 (4.0) Note 2	0.49	P.347
		YK350XG	350			P.349
		NEW YK400XG	400			P.351
Low cost high performance model		YK400XR	400	3.0 (2.0) Note 2	0.45	P.353
Completely beltless model	Medium type	YK500XGL	500	5.0 (4.0) Note 2	0.59	P.354
		YK500XG	500	10.0	0.45	P.356
		YK600XGL	600	5.0 (4.0) Note 2	0.63	P.357
		YK600XG	600	10.0	0.46	P.359
		YK600XGH	600	20.0	0.47	P.360
	Large type	NEW YK700XGL	800	10.0	0.50	P.361
		YK700XG	700	20.0	0.42	P.362
		YK800XG	800		0.48	P.363
		YK900XG	900		0.49	P.364
		YK1000XG	1000			P.365
–		YK1200X	1200	50.0	0.91	P.366
Wall mount/inverse model		YK300XGS Note 1	300	5.0 (4.0) Note 2	0.49	P.367
		YK400XGS Note 1	400			P.369
		YK500XGS	500	10.0	0.45	P.371
		YK600XGS	600		0.46	P372
		YK700XGS	700	20.0	0.42	P.373
		YK800XGS	800		0.48	P.374
		YK900XGS	900		0.49	P.375
		YK1000XGS	1000		0.6	P.376
Dust-proof & drip-proof model		YK250XGP	250	5.0	0.49	P.377
		YK350XGP	350			P.379
		YK400XGP	400			P.381
		YK500XGLP	500	4.0	0.74	P.383
		YK500XGP	500	8.0	0.55	P.385
		YK600XGLP	600	4.0	0.74	P.386
		YK600XGP	600	8.0	0.56	P.388
		YK600XGHP	600	18.0	0.57	P.389
		YK700XGP	700		0.52	P.390
		YK800XGP	800		0.58	P.391
		YK900XGP	900		0.59	P.392
		YK1000XGP	1000			P.393

Note 1. The YK300XGS and YK400XGS are custom-order products. For details about the delivery time, please contact YAMAHA.
Note 2. For the option specifications (tool flange mount type and user wiring/tubing through spline type), the maximum payload becomes the value in ( ).
Note 3. For the option specifications (tool flange mount type), the maximum payload becomes 4 kg (RCX340) or 3 kg (RCX240).